Drive Axle - Locking/Limited Slip - Hummer H2

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Pinion Shaft Lock Bolt	36 N.m	27 lb ft

SCHEMATIC AND ROUTING DIAGRAMS

DIFFERENTIAL LOCK SCHEMATICS

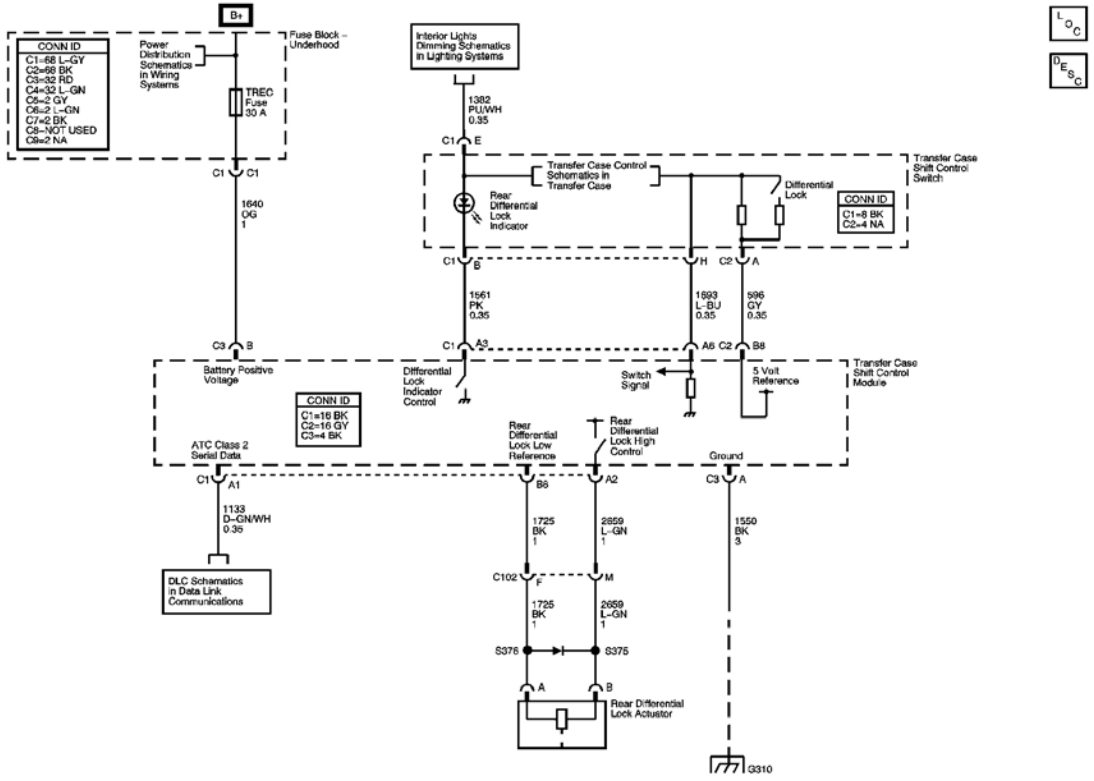


Fig. 1: Differential Lock Schematics
Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

REAR AXLE COMPONENT VIEWS

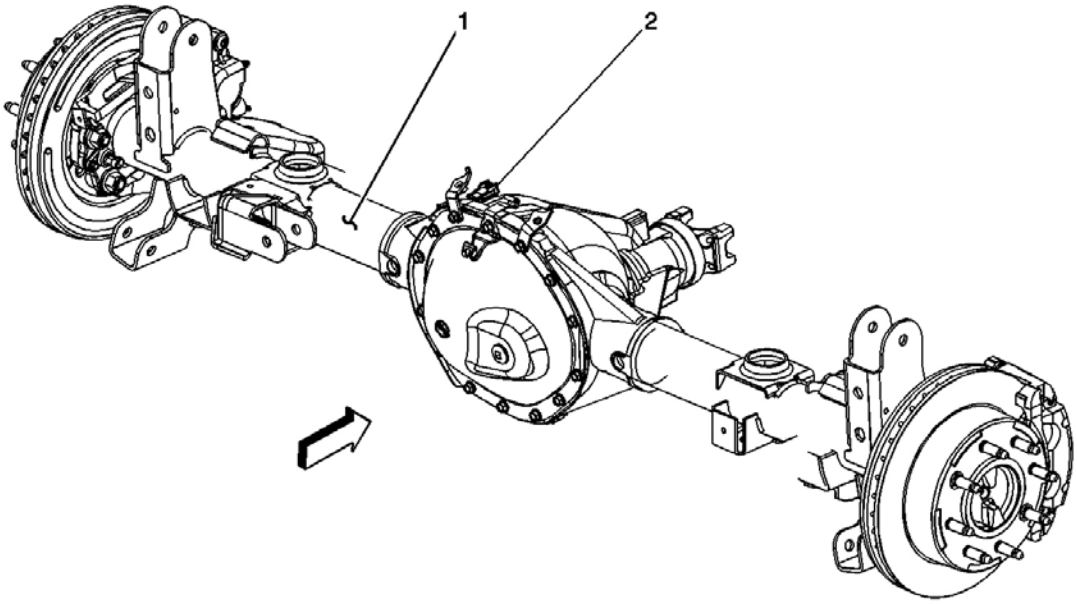


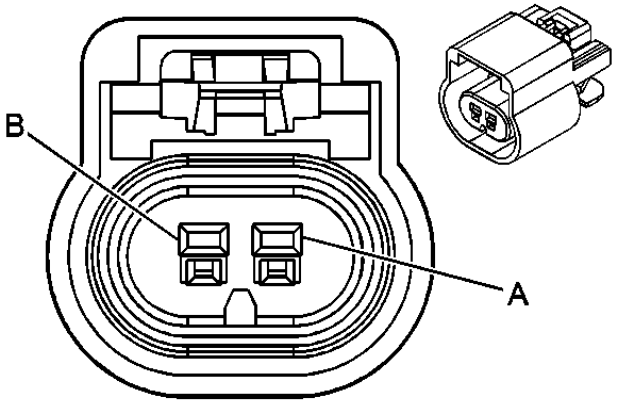
Fig. 2: Rear Differential Lock Actuator Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Rear Axle
2	Rear Differential Lock Actuator

REAR AXLE CONNECTOR END VIEWS

Rear Differential Lock Terminal Identification Actuator



Connector Part Information		• 15326801 • 2-Way F GT 150 Series (BK)	
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BK	1725	Rear Differential Lock - Low Reference
B	L-GN	2659	Rear Differential Lock - High - Control

LOCKING DIFFERENTIAL DISASSEMBLED VIEWS

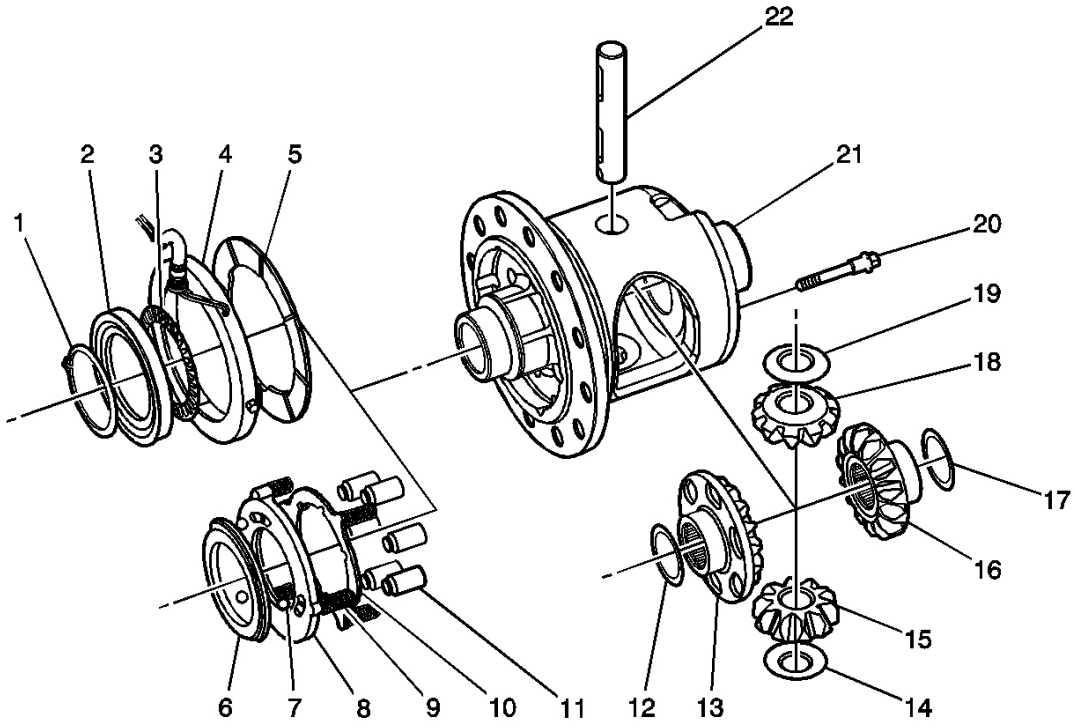


Fig. 3: Locking Differential Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 3

Callout	Component Name
1	Differential Bearing Retainer Ring
2	Differential Bearing Race
3	Differential Bearing Assembly
4	Locking Differential Coil Assembly
5	Locking Differential Coil Plate
6	Locking Differential Ball Bearing Plate - Outboard
7	Locking Differential Ball Bearing Assembly
8	Locking Differential Ball Bearing Plate - Inboard
9	Locking Differential Clutch Spring
10	Locking Differential Clutch Spring Retainer
11	Differential Carrier Lock Pin
12	Differential Side Gear Thrust Washer
13	Locking Differential Side Gear
14	Pinion Thrust Washer
15	Differential Pinion Gear
16	Differential Side Gear

17	Differential Side Gear Thrust Washer
18	Differential Pinion Gear
19	Pinion Thrust Washer
20	Differential Pinion Shaft Lock Screw
21	Electric Locking Differential Case Assembly
22	Differential Pinion Gear Shaft

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - LOCKING/LIMITED SLIP REAR AXLE

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

DTC C0388

Circuit Description

The rear differential control circuit consists of a actuator (coil) which engages and disengages the rear axle differential lock. The rear differential actuator consists of a coil assembly, and a locking assembly with springs and pins to lock the rear differential, all within the rear differential assembly.

The rear axle differential lock actuator consists of the following circuits:

- The rear differential lock control circuit, which is connected to the transfer case shift control module and supplies battery voltage.
- The rear differential lock return (ground) circuit, which is also connected to the transfer case shift control module.

Whenever the rear differential lock has been requested the transfer case shift control module provides battery voltage through the rear differential lock control circuit, and provides ground through the rear differential lock return circuit through a current limiting driver.

Whenever a rear differential lock is requested the transfer case must be in 4 LO and the vehicle speed must be below 5 km/h (3 mph) for the request to be accepted. The rear differential lock will remain locked up to 32 km/h (20 mph) after which the rear differential lock will disengage.

This DTC detects a short to ground, short-to-voltage, or an open circuit.

Conditions for Running the DTC

- The ignition is ON.

- System voltage is 9-18 volts.

Conditions for Setting the DTC

- The transfer case shift control module monitors the state of the rear axle differential lock actuator. The transfer case shift control module reads the rear differential lock control, and the rear differential lock return circuits for a high and low voltage. The DTC will set if these circuits are high when a low voltage is expected or when the circuits are low when a high voltage is expected.
- The DTC will set if this circuit is high when a low voltage is present or when the circuit is low when a high voltage is present.

Action Taken When the DTC Sets

- All rear differential lock requests will be disabled. Transfer case mode shifts will not be affected
- SERVICE 4WD indicator will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The Transfer case shift control module will clear the DTC if the condition for setting the DTC is not currently present.
- A history DTC will clear after 33 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step determines of the coil has excessive resistance or if the windings are shorted together.

3: This step determines if the coil or pigtail is shorted to ground.

4: This step determines if either the differential lock control or differential lock return circuits are shorted to ground.

5: This step determines if the differential lock control and differential lock return circuits are shorted together.

6: This step tests for an open or high resistance in both the return and control circuits.

7: This step refers to transfer case shift control module replacement.

8: This step refers to encoder motor replacement.

DTC C0388

Step	Action	Value (s)	Yes	No
Schematic Reference: Transfer Case Control Schematics in Transfer Case - BW 4484 Connector End View Reference: Rear Axle Connector End Views				
	Did you perform the Diagnostic System Check - Transfer Case?			Go to **Diagnostic System Check -**

1		or	Go to **Step 2**	**Transfer Case** in Transfer Case - BW4484
2	1. Disconnect the rear differential lock harness from the rear differential lock coil pigtail. 2. With a DMM, measure the resistance of the rear differential lock coil and pigtail by probing the rear differential lock return and the rear differential lock control circuits. Was the resistance reading within the specified values?	2.2-4.3 ohm	Go to **Step 3**	Go to **Step 8**
3	With the connector still disconnected, with a DMM, probe the return then the control circuits and check for resistance to ground. Did the DMM indicate a short to ground?	-	Go to **Step 8**	Go to **Step 4**
4	1. Disconnect connector C1 from the transfer case shift control module. 2. Disconnect the rear differential lock harness from the rear differential coil pigtail. 3. With a DMM, check for a short to power or short to ground on the differential lock control and differential lock return circuits. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	-	Go to **Step 9**	Go to **Step 5**
5	**IMPORTANT:** **This circuit contains a reversed bias diode. The red lead of the DMM must be placed on the rear differential lock high control circuit, and the black lead on the rear differential lock low reference circuit. This is done to avoid showing the circuits falsely shorted together.** Check the differential lock control and the differential lock return circuits for being shorted together. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems.Was the condition found and corrected?	-	Go to **Step 9**	Go to **Step 6**
6	Check the suspect circuit for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	-	Go to **Step 9**	Go to **Step 7**
7	Replace the transfer case shift control module. Refer to **Transfer Case Shift Control Module Replacement** in Transfer Case - BW4484. Was the repair completed?	-	Go to **Step 9**	-
	Replace the rear differential lock coil. Refer to **Locking**		Go to	

8	**Differential Coil Assembly Replacement** . Was the repair completed?	-	**Step 9**	-
9	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	-	Go to **Step 1**	System OK

SYMPTOMS - LOCKING/LIMITED SLIP REAR AXLE

Review the system and operation in order to familiarize yourself with the system functions. Refer to **Locking Differential Description and Operation** .

Visual/Physical Inspection

- Inspect the system for the following:
  - Loose or missing fasteners
  - Obvious damage or conditions which may cause the symptom.
- Check the system for proper operation. Refer to **Locking Differential Diagnosis** .

Symptom List

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

- **Electronic Rear Differential Lock Will Not Engage**
- **Electronic Rear Differential Lock Will Not Disengage**

LOCKING DIFFERENTIAL DIAGNOSIS

1. Block the right front and rear wheels.
2. Turn the Ignition ON - Do not start the engine.
3. Place the transmission in NEUTRAL.
4. Shift the transfer case into 4 LOW.
5. Engage the differential lock switch.
6. Raise the left front wheel off the ground. Refer to **Lifting and Jacking the Vehicle** in General Information.

   Support the left front wheel with safety stands.

7. Raise the left rear wheel off the ground. Refer to **Lifting and Jacking the Vehicle** in General Information.

   Support the left rear wheel with safety stands.

8. Attempt to rotate the left rear wheel 1 full revolution clockwise and counterclockwise by hand.
    - If the wheel does not rotate 1 full revolution in either direction, the locking differential is engaging properly.
    - If the wheel rotates more than 1 revolution in either direction, the locking differential is not engaging properly.
9. Disengage the differential lock switch.
10. Attempt to rotate the left rear wheel 1 full revolution clockwise and counterclockwise by hand.
    - If the wheel rotates 1 full revolution in either direction, the locking differential is disengaging properly.
    - If the wheel does not rotate more than 1 revolution in either direction, the locking differential is not disengaging properly.
11. If the locking differential is not functioning properly, remove the differential and determine the cause of failure. Refer to **Differential Replacement** in Rear Drive Axle and **Locking Differential Disassemble** .

ELECTRONIC REAR DIFFERENTIAL LOCK WILL NOT ENGAGE

Circuit Description

The rear differential control circuit consists of a actuator (coil) which engages and disengages the rear axle differential lock. The rear differential actuator consists of a coil assembly, and a locking assembly with springs and pins to lock the rear differential, all within the rear differential assembly.

The rear axle differential lock actuator consists of the following circuits:

- The rear differential lock control circuit, which is connected to the transfer case shift control module and supplies battery voltage.
- The rear differential lock return (ground) circuit, which is also connected to the transfer case shift control module.

Whenever the rear differential lock has been requested the transfer case shift control module provides battery voltage through the rear differential lock control circuit, and provides ground through the rear differential lock return circuit through a current limiting driver.

Whenever a rear differential lock is requested the transfer case must be in 4LO and the vehicle speed must be below 5 km/h (3 mph) for the request to be accepted. The rear differential lock will remain locked up to 32 km/h (20 mph) after which the rear differential lock will disengage.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step determines if the fault is present or intermittent.

3: This step determines if the transfer case shift control module is receiving a differential lock request from the transfer case shift control switch.

4: This step determines if a bad switch is causing the symptom.

5: This step determines if a short, open, or high resistance in the 5-volt reference or switch signal circuits is causing the symptom.

6: This step determines of the coil has excessive resistance or if the windings are shorted together.

7: This step determines if the coil or pigtail is shorted to ground.

8: This step determines if either the differential lock control or differential lock return circuits are shorted to ground.

9: This step tests for an open or high resistance in both the return and control circuits.

10: This step refers to transfer case shift control module replacement.

11: This step refers to encoder motor replacement.

12: This advises to replace the transfer case shift control switch.

Electronic Rear Differential Lock Will Not Engage

Step	Action	Value (s)	Yes	No
Schematic Reference: Differential Lock Schematics **Connector End View Reference: Rear Axle Connector End Views**				
1	Did you perform the Diagnostic System Check - Transfer Case?	-	Go to **Step 2**	Go to **Diagnostic System Check - Transfer Case** in Transfer Case - BW4484
2	Verify the fault is present. Perform the Locking Differential functional check. Refer to **Locking Differential Diagnosis** Does the system operate normally?	-	Go to **Testing for Intermittent Conditions and Poor Connections** in Wiring Systems	Go to **Step 3**
3	While observing the rear axle lock request on the scan tool, request the rear differential lock ON by pressing the rear differential lock button. Does the scan tool indicate rear axle lock ON?	-	Go to **Step 6**	Go to **Step 4**
4	1. With a DMM, check the resistance of the transfer case shift control switch. 2. While depressing and holding the differential lock button, probe the 5-volt reference and switch signal circuit pins on the back of the switch. Is the switch within the specified value?	64.25-65.55 ohm	Go to **Step 5**	Go to **Step 12**
	Check the 5-volt reference and switch signal circuits for an open, short, or high resistance between the transfer case shift control switch,			

5	and the transfer case shift control module. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	-	Go to **Step 13**	Go to **Step 6**
6	1. Disconnect the rear differential lock harness from the rear differential lock coil pigtail. 2. With a DMM, measure the resistance of the rear differential lock coil and pigtail by probing the rear differential lock return and the rear differential lock control circuits. Was the resistance reading within the specified values?	2.2-4.3 ohm	Go to **Step 7**	Go to **Step 11**
7	With the connector still disconnected, with a DMM, probe the return then the control circuits and check for resistance to ground. Did the DMM indicate a short to ground?	-	Go to **Step 11**	Go to **Step 8**
8	1. Disconnect the C1 from the transfer case shift control module. 2. Disconnect the rear differential lock harness from the rear differential coil pigtail. 3. Turn the ignition ON. 4. With a DMM, check for a short to power or short to ground on the differential lock control and differential lock return circuits. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	-	Go to **Step 13**	Go to **Step 9**
9	Check the differential lock control and differential lock return circuits for an open or high resistance. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	-	Go to **Step 13**	Go to **Step 10**
10	Replace the transfer case shift control module. Refer to **Transfer Case Shift Control Module Replacement** in Transfer Case - BW4484. Was the repair completed?	-	Go to **Step 13**	-
	Replace the electronic locking differential			

11	locking mechanism and/or side gear. Refer to **Locking Differential Disassemble** and **Locking Differential Assemble** . Was the repair completed?	-	Go to **Step 13**	-
12	Replace the transfer case shift control switch. Refer to **Transfer Case Shift Control Switch Replacement** in Transfer Case - BW4484. Was the repair completed?	-	Go to **Step 13**	-
13	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for allowing the symptom to occur. Does the symptom occur?	-	Go to **Step 1**	System OK

ELECTRONIC REAR DIFFERENTIAL LOCK WILL NOT DISENGAGE

Circuit Description

The rear differential control circuit consists of a actuator (coil) which engages and disengages the rear axle differential lock. The rear differential actuator consists of a coil assembly, and a locking assembly with springs and pins to lock the rear differential, all within the rear differential assembly.

The rear axle differential lock actuator consists of the following circuits:

- The rear differential lock control circuit, which is connected to the transfer case shift control module and supplies battery voltage.
- The rear differential lock return (ground) circuit, which is also connected to the transfer case shift control module.

Whenever the rear differential lock has been requested the transfer case shift control module provides battery voltage through the rear differential lock control circuit, and provides ground through the rear differential lock return circuit through a current limiting driver.

Whenever a rear differential lock is requested the transfer case must be in 4LO and the vehicle speed must be below 5 km/h (3 mph) for the request to be accepted. The rear differential lock will remain locked up to 32 km/h (20 mph) after which the rear differential lock will disengage.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2: This step determines if the differential lock is engaged due to an electrical condition or a mechanical condition.

3: This step determines if the differential lock high control circuit is shorted to power and if the differential low reference circuit is shorted to ground.

4: This step indicates the transfer case shift control module needs replaced.

5: This step checks for the possibility of the rear differential mechanically binding causing it to stay on.

Electronic Rear Differential Lock Will Not Disengage

Step	Action	Yes	No
Schematic Reference: Differential Lock Schematics **Connector End View Reference: Rear Axle Connector End Views**			
1	Did you perform the Diagnostic System Check-Transfer Case?	Go to **Step 2**	Go to **Diagnostic System Check - Transfer Case** in Transfer Case - BW4484
2	Disconnect the rear differential lock harness from the rear differential lock coil pigtail at the rear differential, and verify the fault is present. Refer to **Locking Differential Diagnosis** . Does the system operate normally?	Go to **Step 3**	Go to **Step 5**
3	Check the rear differential lock high control circuit for a short to power and the differential lock low reference for a short to ground. Refer to **Circuit Testing** and **Wiring Repairs** in Wiring Systems. Was the condition found and corrected?	Go to **Step 6**	Go to **Step 4**
4	Replace the transfer case shift control module. Refer to **Transfer Case Shift Control Module Replacement** in Transfer Case - BW4484. Was the repair completed?	Go to **Step 6**	-
5	Replace the electronic locking differential locking mechanism and/or side gear. Refer to **Locking Differential Disassemble** and **Locking Differential Assemble** . Was the condition repaired?	Go to **Step 6**	-
6	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for allowing the symptom to re-occur. Does the symptom re-occur?	Go to **Step 1**	System OK

REPAIR INSTRUCTIONS

LOCKING DIFFERENTIAL COIL ASSEMBLY REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the differential assembly. Refer to **Differential Replacement** in Rear Drive Axle.
3. Remove the differential side bearing. Refer to **Differential Side Bearings Replacement** in Rear Drive

Axle.

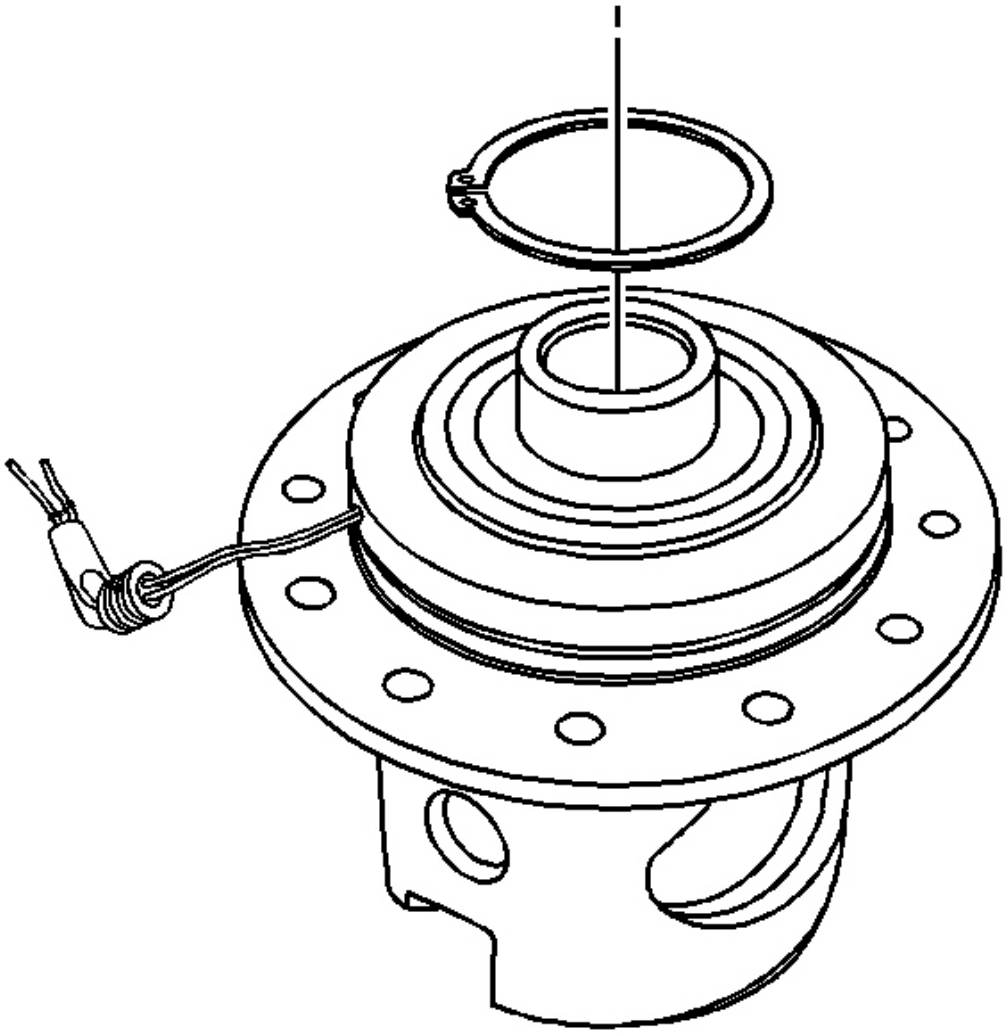


Fig. 4: Differential Bearing Retainer
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The differential bearing race must be compressed in order to remove the differential bearing retainer.

4. Remove the differential bearing retainer by performing the following steps:
    1. With the aid of an assistant, push the differential bearing race down towards the differential case in

order to relieve the pressure against the differential bearing retainer.

2. Remove the differential bearing retainer.

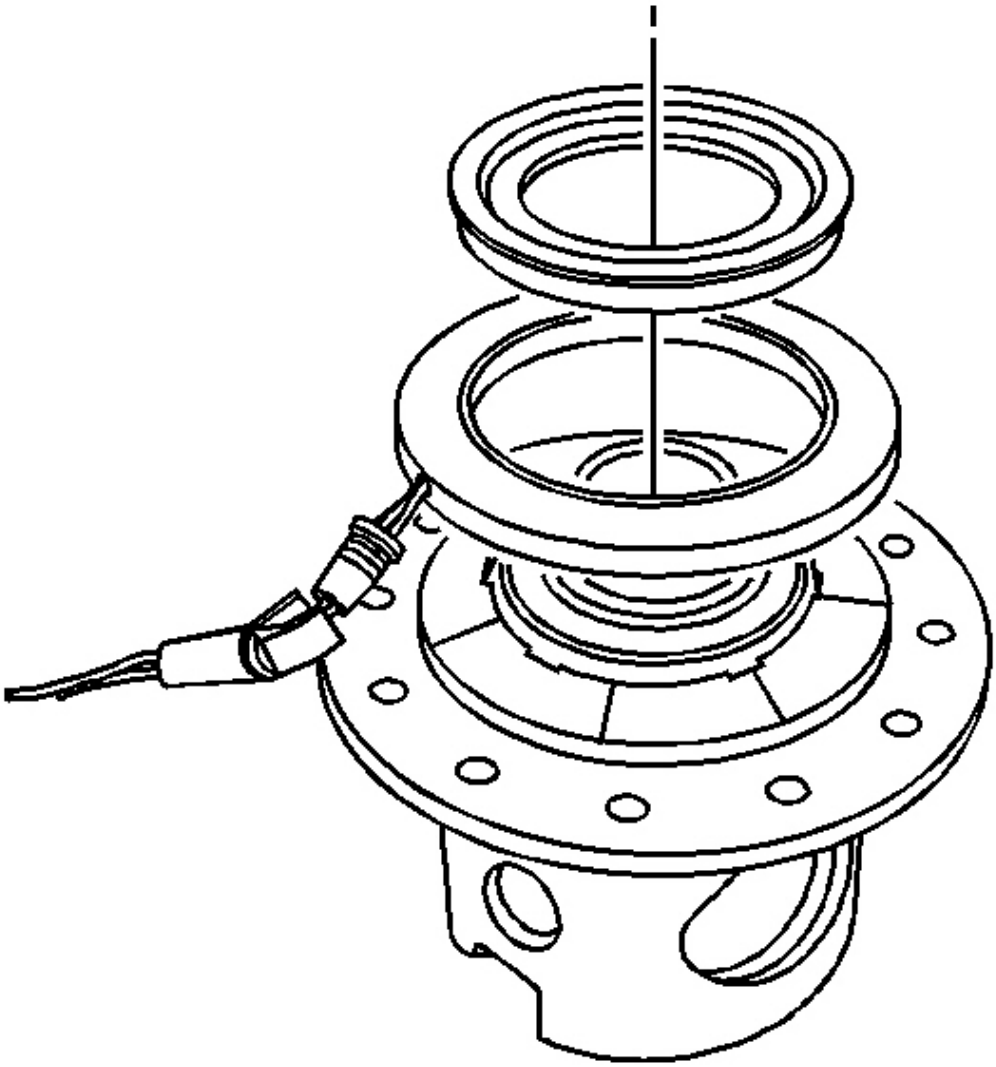


Fig. 5: Differential Bearing Race
Courtesy of GENERAL MOTORS CORP.

5. Remove the differential bearing race.
6. Remove the locking differential coil assembly.

Installation Procedure

1. Lubricate the differential bearing assembly, the differential coil assembly and the differential bearing race with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

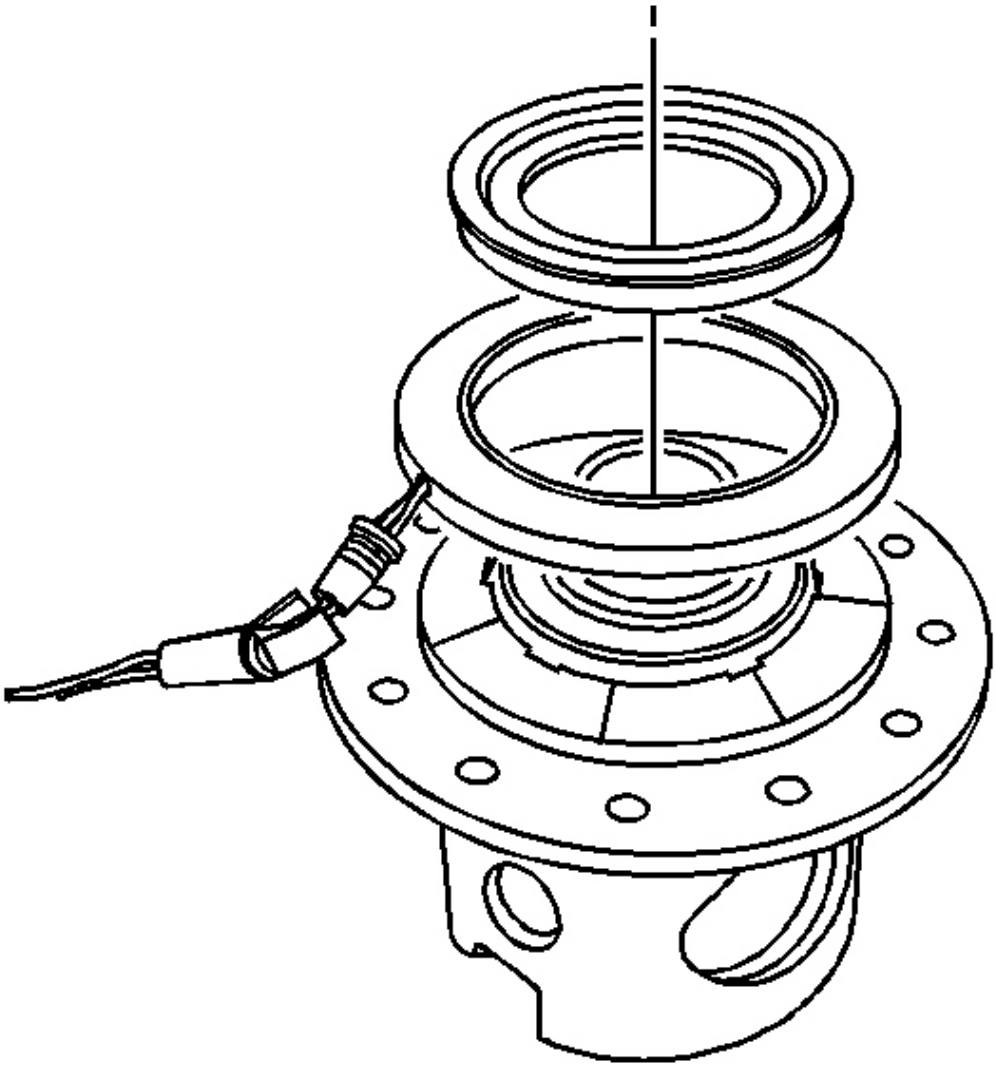


Fig. 6: Differential Bearing Race
Courtesy of GENERAL MOTORS CORP.

2. Install the locking differential coil assembly.

3. Install the differential bearing race.

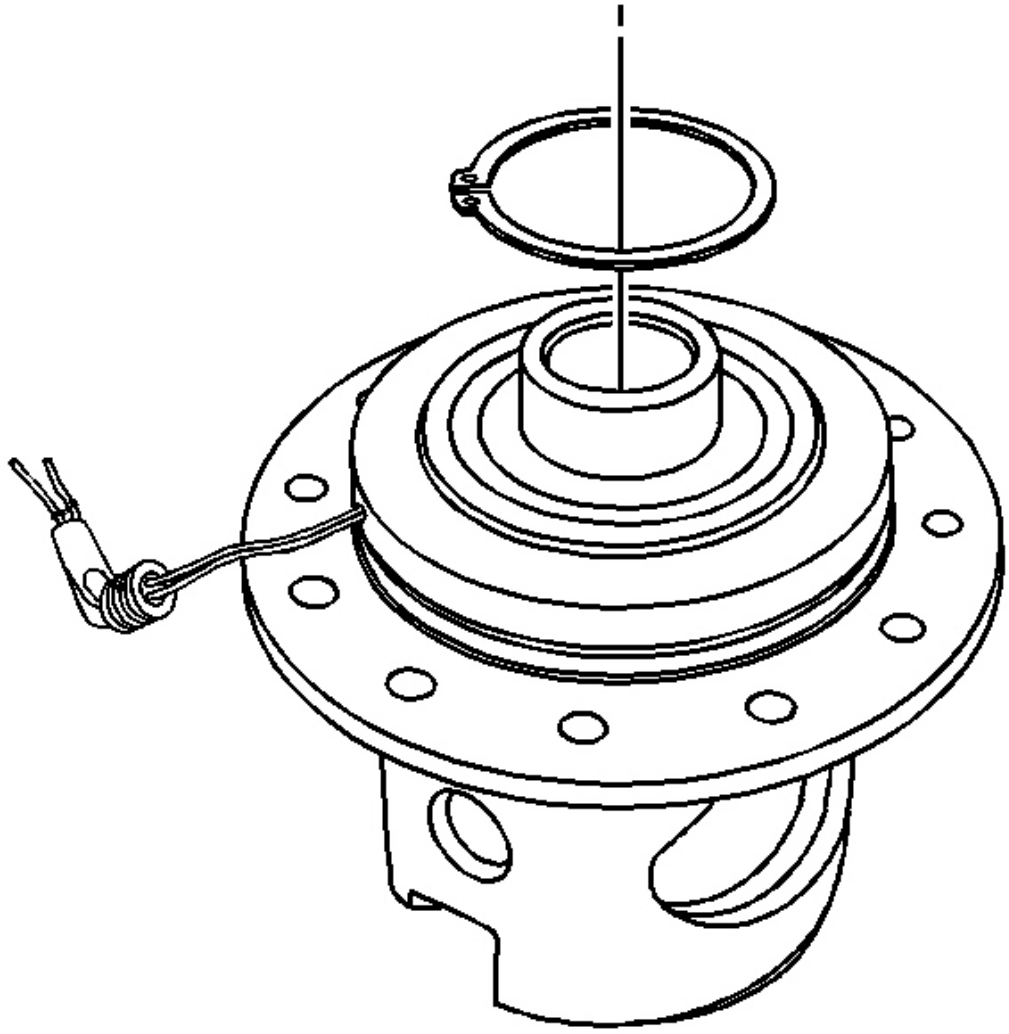


Fig. 7: Differential Bearing Retainer
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The differential bearing race must be compressed in order to install the differential bearing retainer.

4. Install the differential bearing retainer by performing the following steps:
    1. Install the differential bearing retainer.

2. With the aid of an assistant, push the differential bearing race down towards the differential case in order to compress the differential bearing retainer and differential coil assembly against the locking differential coil plate.
3. Install the differential bearing retainer.

   Make sure the differential bearing retainer is evenly and fully seated in the differential bearing retainer slot before releasing the differential bearing race.

5. Install the differential side bearing. Refer to **Differential Side Bearings Replacement** in Rear Drive Axle.
6. Install the differential assembly. Refer to **Differential Replacement** in Rear Drive Axle.
7. Lower the vehicle.

LOCKING DIFFERENTIAL DISASSEMBLE

1. Remove the differential side bearings. Refer to **Differential Side Bearings Replacement** in Rear Drive Axle.
2. Remove the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** in Rear Drive Axle.

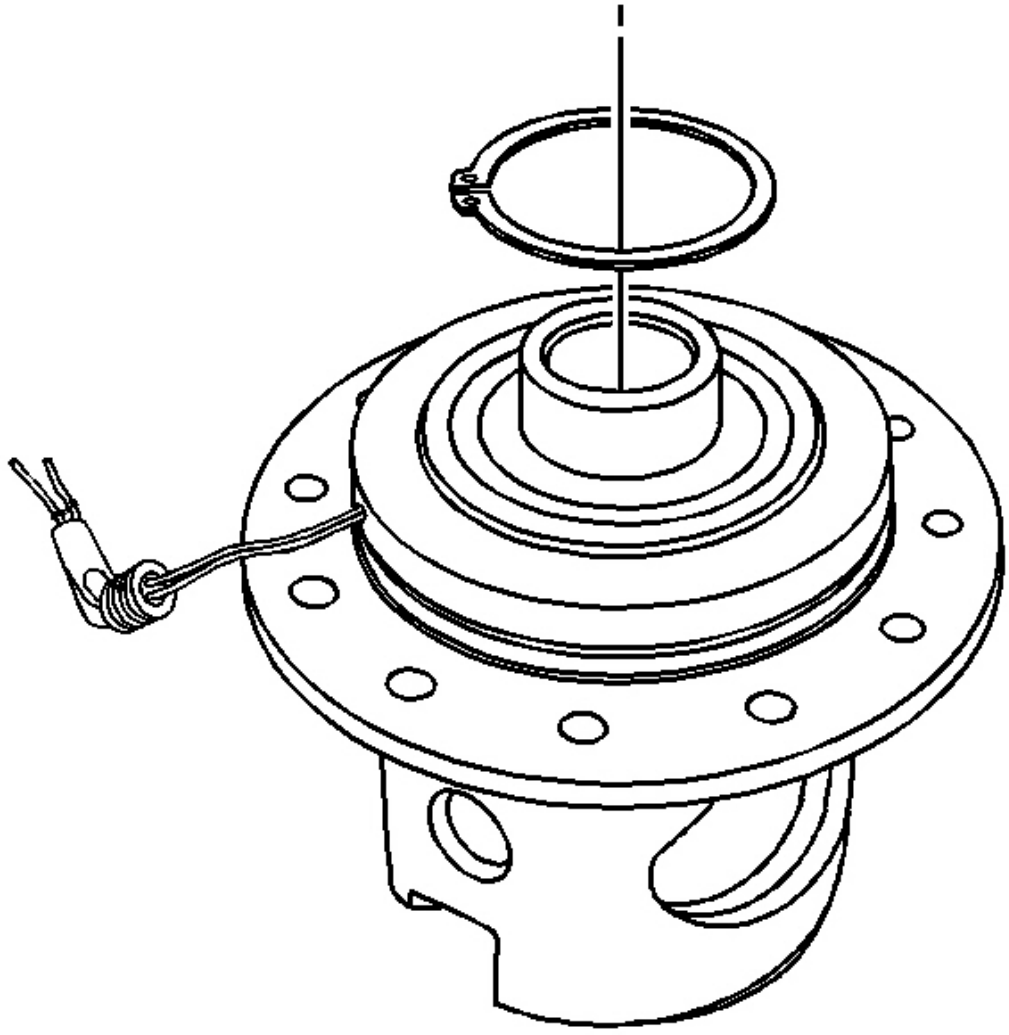


Fig. 8: Differential Bearing Retainer
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The differential bearing race must be compressed in order to remove the differential bearing retainer.

3. Remove the differential bearing retainer by performing the following steps:
    1. With the aid of an assistant, push the differential bearing race down towards the differential case in order to relieve the pressure against the differential bearing retainer.
    2. Remove the differential bearing retainer.

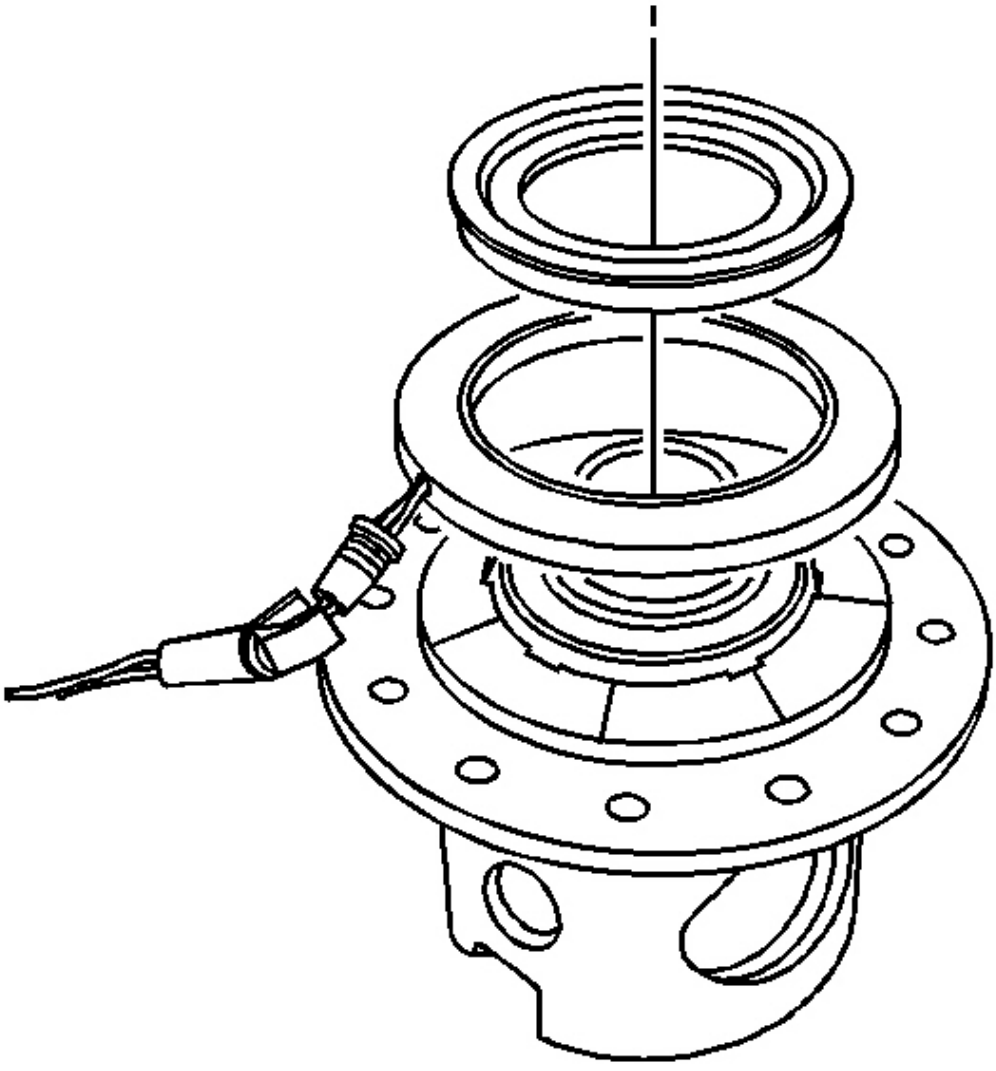


Fig. 9: Differential Bearing Race
Courtesy of GENERAL MOTORS CORP.

4. Remove the differential bearing race.
5. Remove the locking differential coil assembly.

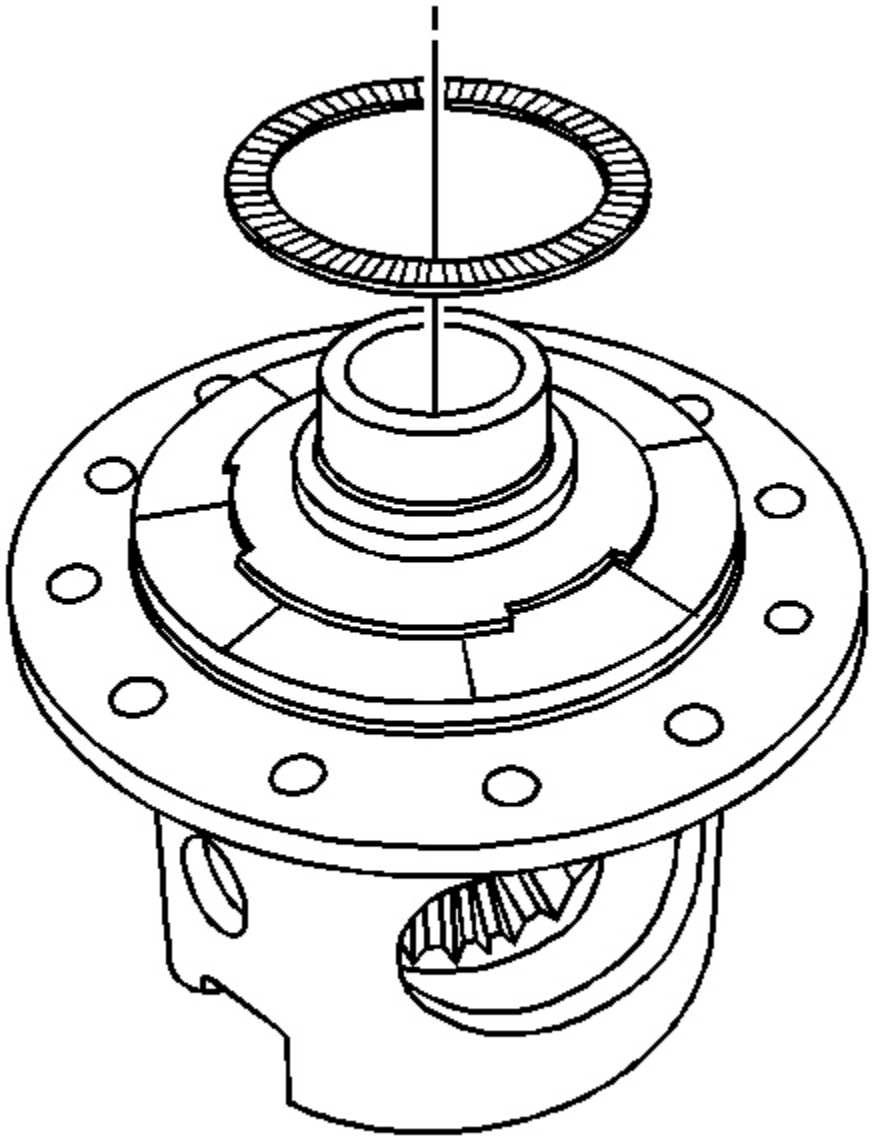


Fig. 10: Removing Differential Bearing Assembly
Courtesy of GENERAL MOTORS CORP.

6. Remove the differential bearing assembly.

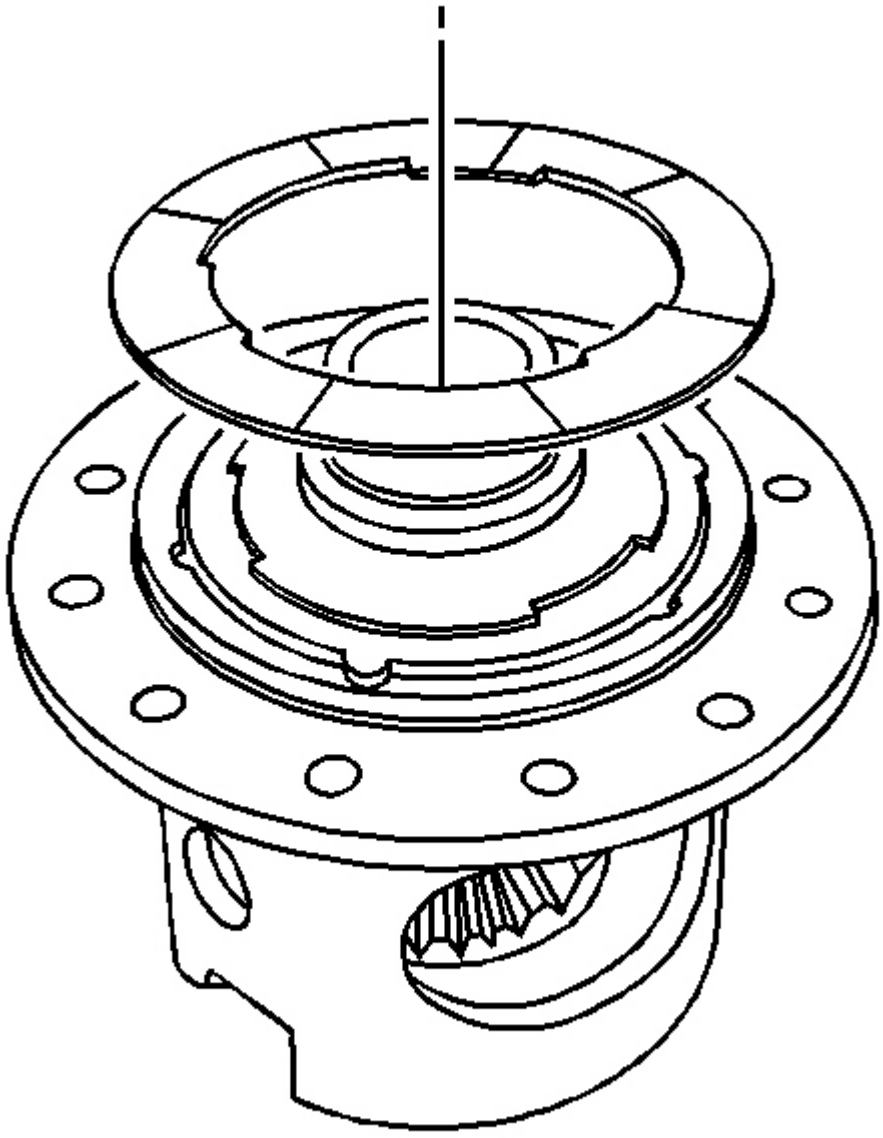


Fig. 11: Locking Differential Coil Plate
Courtesy of GENERAL MOTORS CORP.

7. Remove the locking differential coil plate.

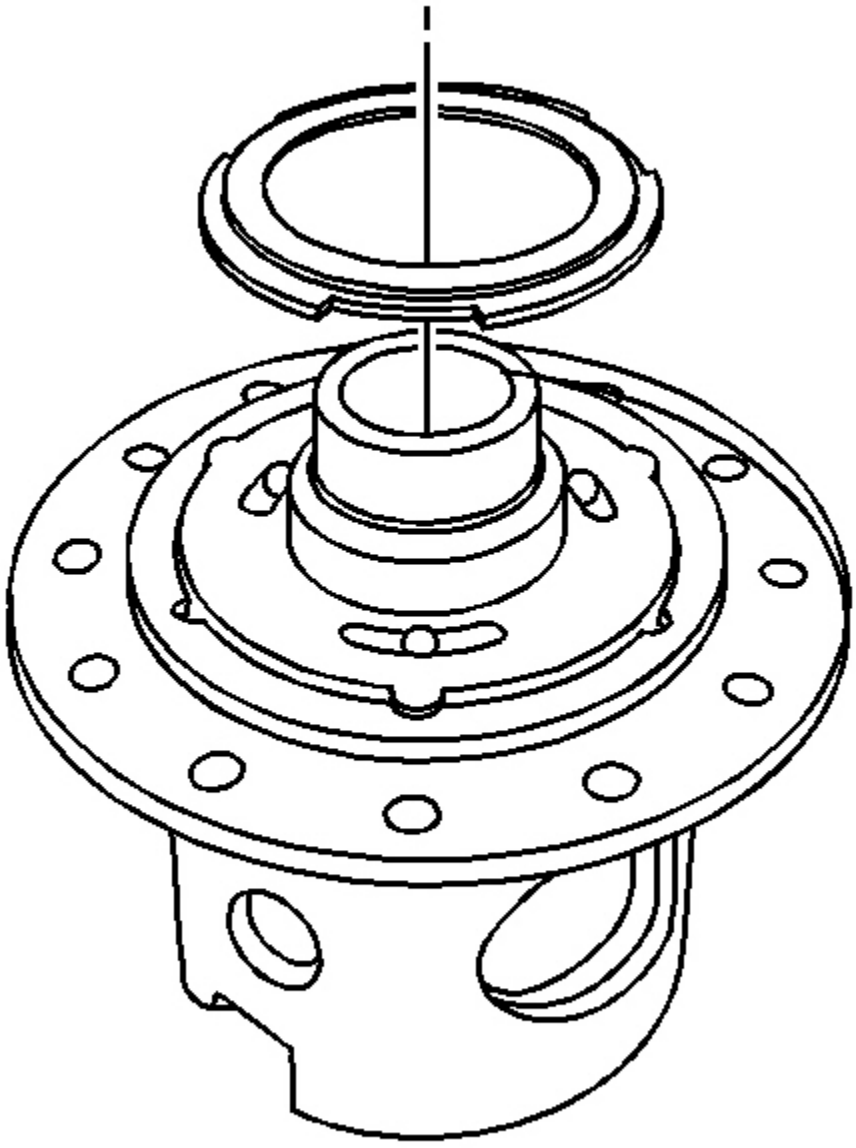


Fig. 12: Outboard Locking Differential Ball Bearing Plate
Courtesy of GENERAL MOTORS CORP.

8. Remove the outboard locking differential ball bearing plate.

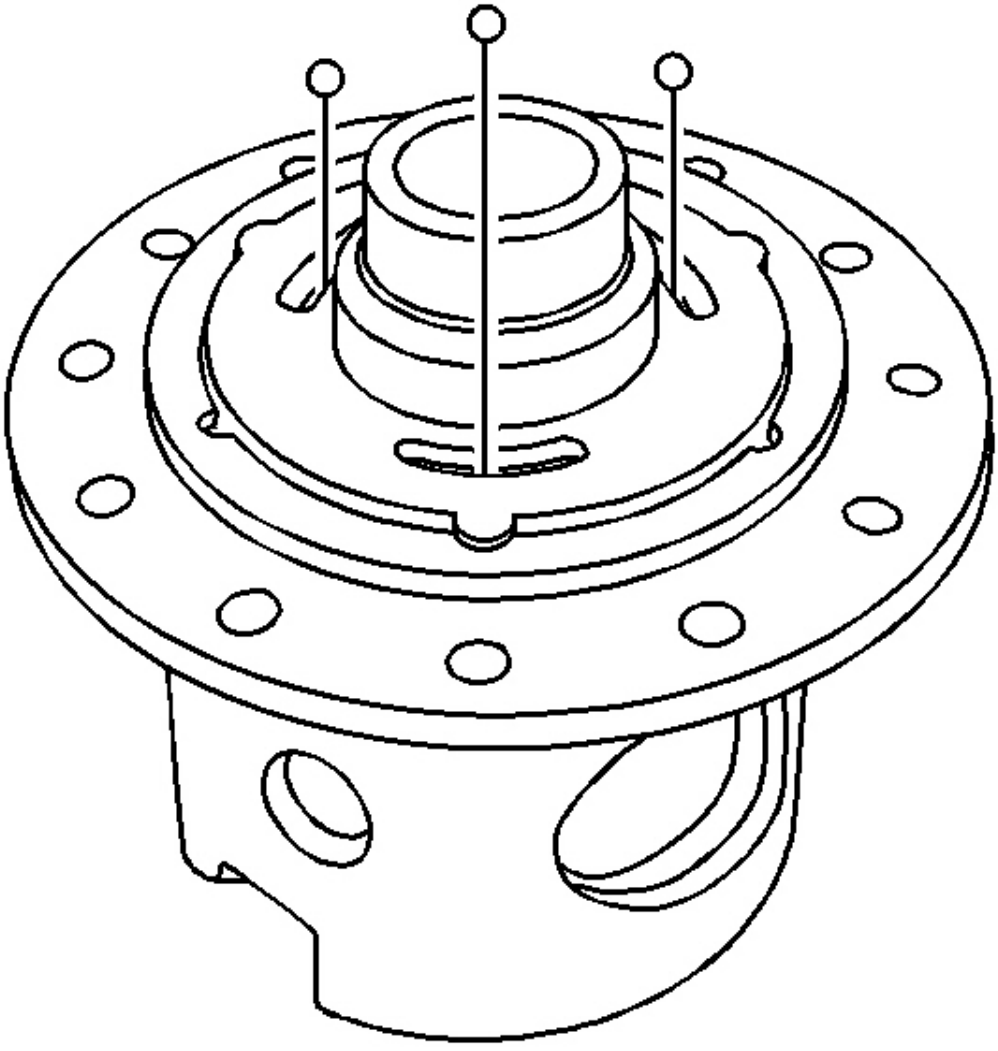


Fig. 13: Locking Differential Ball Bearings
Courtesy of GENERAL MOTORS CORP.

9. Remove the locking differential ball bearings.

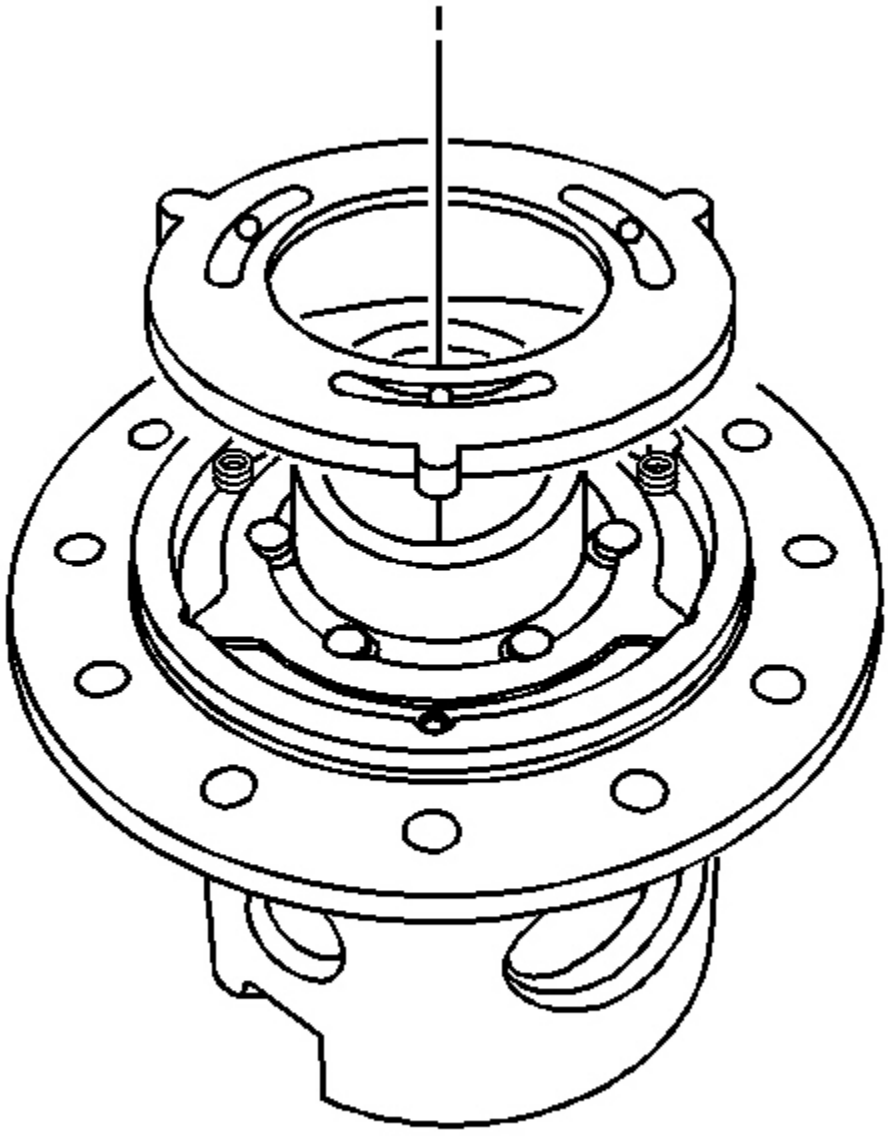


Fig. 14: Inboard Locking Differential Ball Bearing Plate
Courtesy of GENERAL MOTORS CORP.

10. Remove the inboard locking differential ball bearing plate.

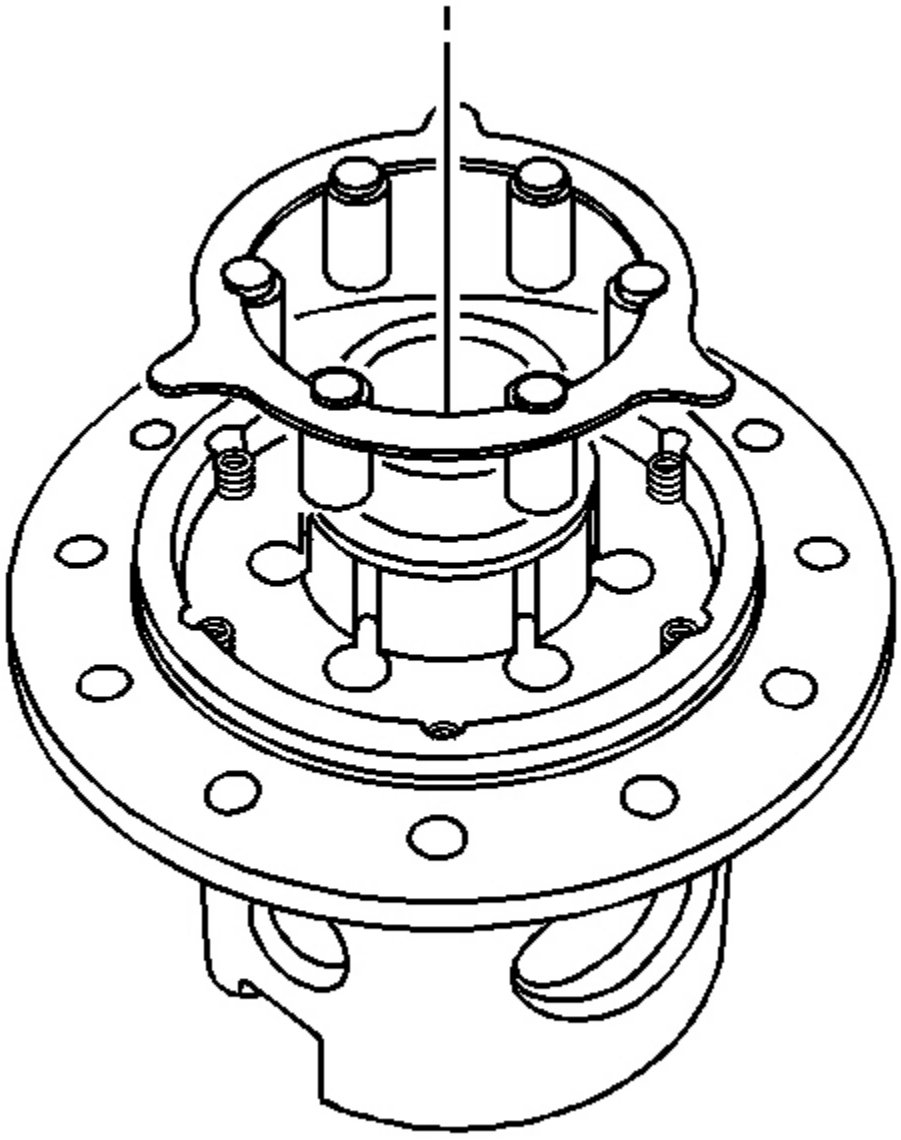


Fig. 15: Locking Differential Clutch Spring Retainer & Differential Carrier Lock Pins
Courtesy of GENERAL MOTORS CORP.

11. Remove the locking differential clutch spring retainer and the differential carrier lock pins.

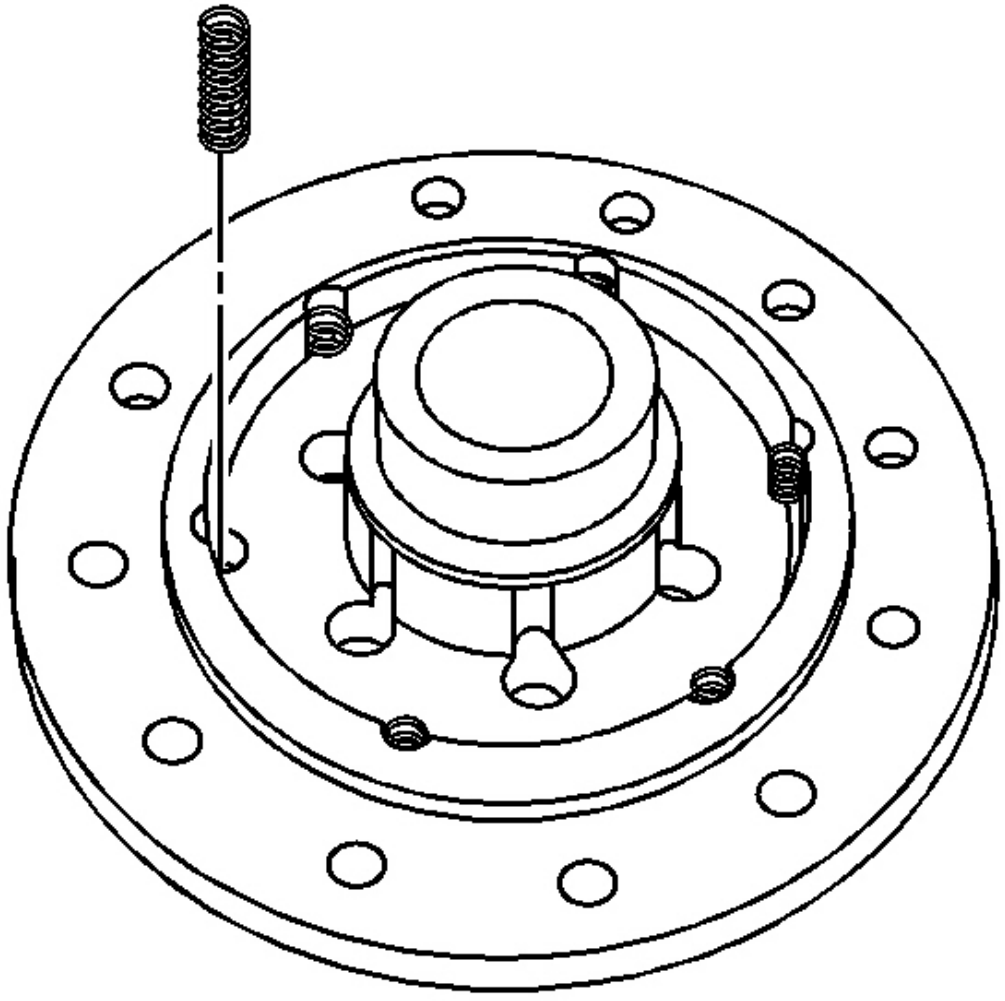


Fig. 16: Locking Differential Clutch Springs
Courtesy of GENERAL MOTORS CORP.

12. Remove the locking differential clutch springs.

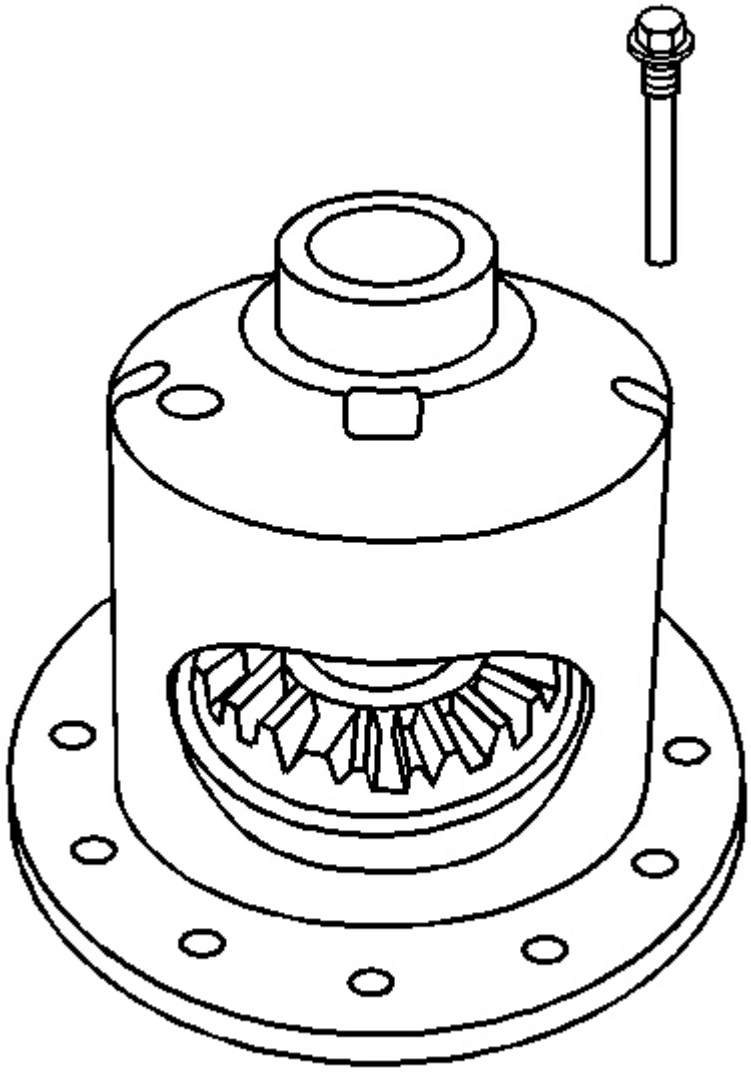


Fig. 17: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

13. Remove the pinion shaft lock screw.

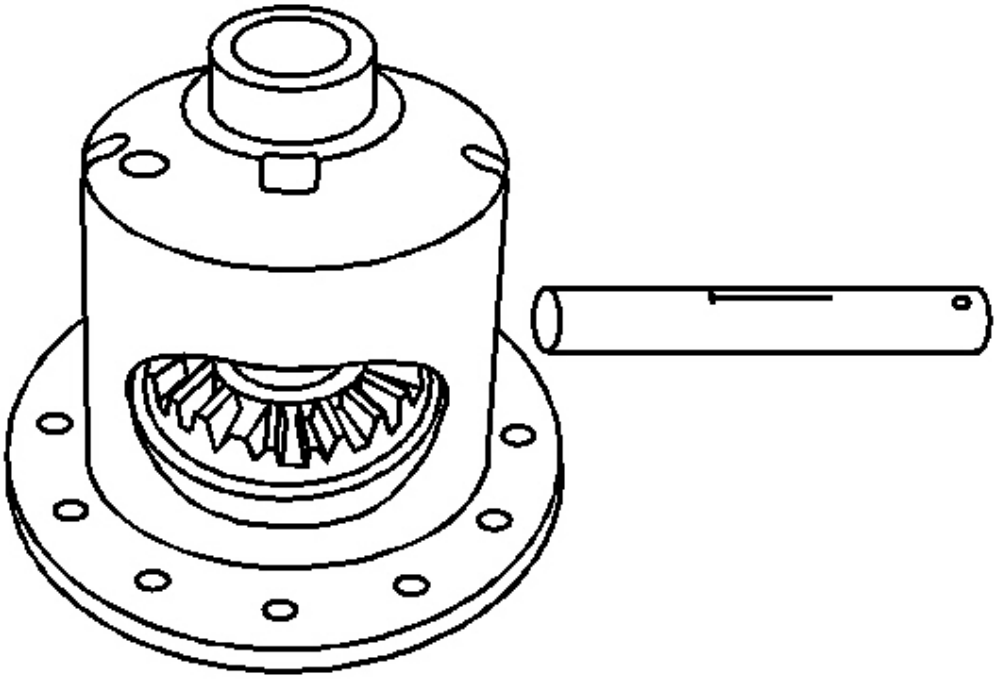


Fig. 18: Pinion Gear Shaft
Courtesy of GENERAL MOTORS CORP.

14. Remove the pinion gear shaft.

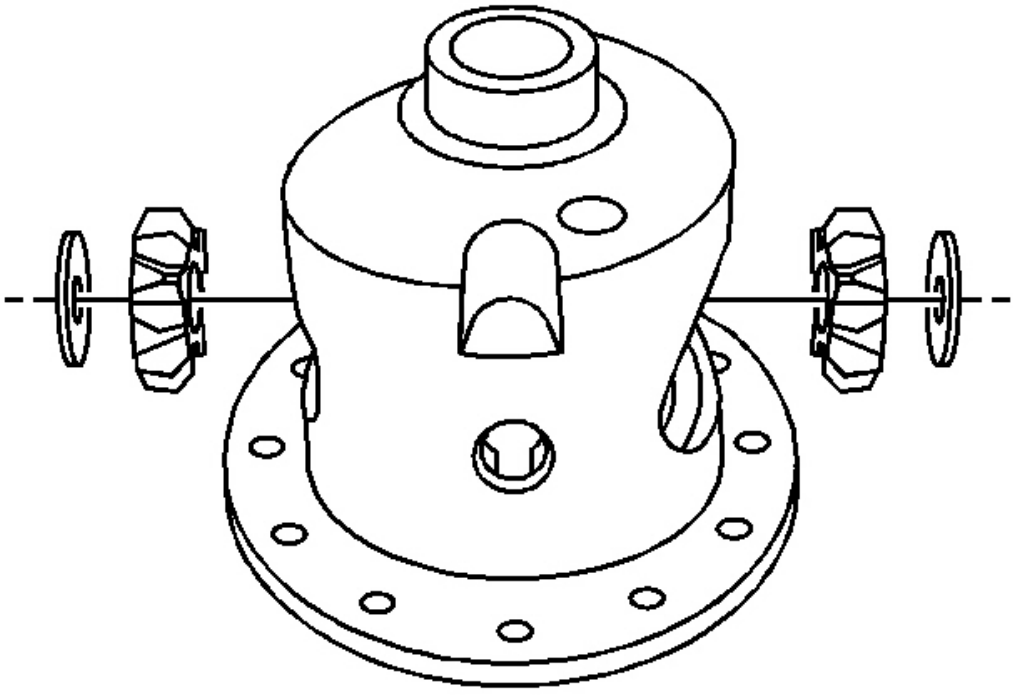


Fig. 19: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

15. Remove the two differential pinion gear thrust washers.

    Drive the pinion gear thrust washers out using a brass drift and a hammer.

16. Remove the two differential pinion gears.

    Rotate the differential side gears in opposite directions in order to remove the differential pinion gears.

    Mark the differential pinion gears and the thrust washers top and bottom.

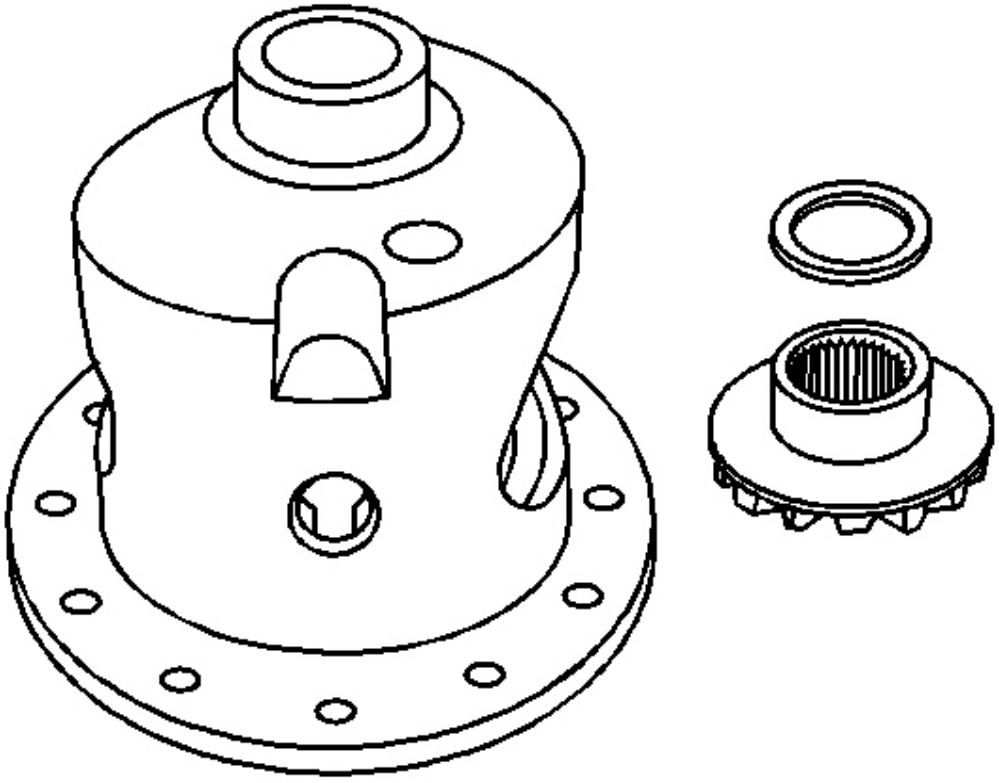


Fig. 20: Differential Side Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

17. Remove the differential side gear and the side gear thrust washer.

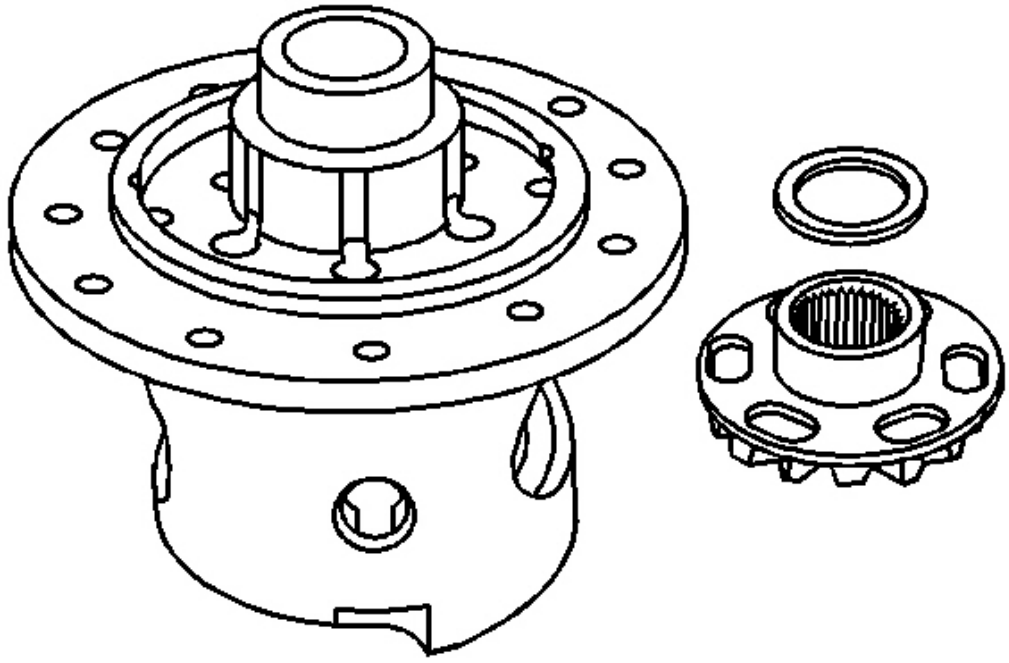


Fig. 21: Locking Differential Side Gear & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

18. Remove the locking differential side gear and thrust washer.

    Mark the differential side gears and the thrust washers left and right.

LOCKING DIFFERENTIAL CLEANING AND INSPECTION

1. Clean all of the parts using an approved solvent.
2. Visually inspect all the parts for excessive wear or breakage. Replace the parts if necessary.
3. Check the pinion gear and the side gear teeth for any the following conditions:
   - Wear
   - Cracks
   - Scoring
   - Spalling
4. Check the thrust washer for wear.
5. Check the fit of the side gears on the axle shafts.
6. Check the differential case for cracks and scoring.

IMPORTANT: Do not replace the thrust sleeve unless this is necessary.

7. Check the thrust sleeve for excessive wear.
8. Check the side gear bore for scoring. if scoring is present, replace the entire differential.
9. Replace the differential if you find any damage to the case.

LOCKING DIFFERENTIAL ADJUSTMENT

Tools Required

J 7872 Magnetic Base Dial Indicator. See **Special Tools and Equipment** .

Locking Differential Side Gear Backlash Adjustment

IMPORTANT: If it is necessary to replace the left side gear, the right side gear, or the thrust washers, the entire differential must be adjusted. The differential is adjusted using selective thickness thrust washers between the side gears and the case and adjusting the pinion gear to side gear backlash.

1. Lubricate the pinion gears, the side gears, the thrust washers and locking components using axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

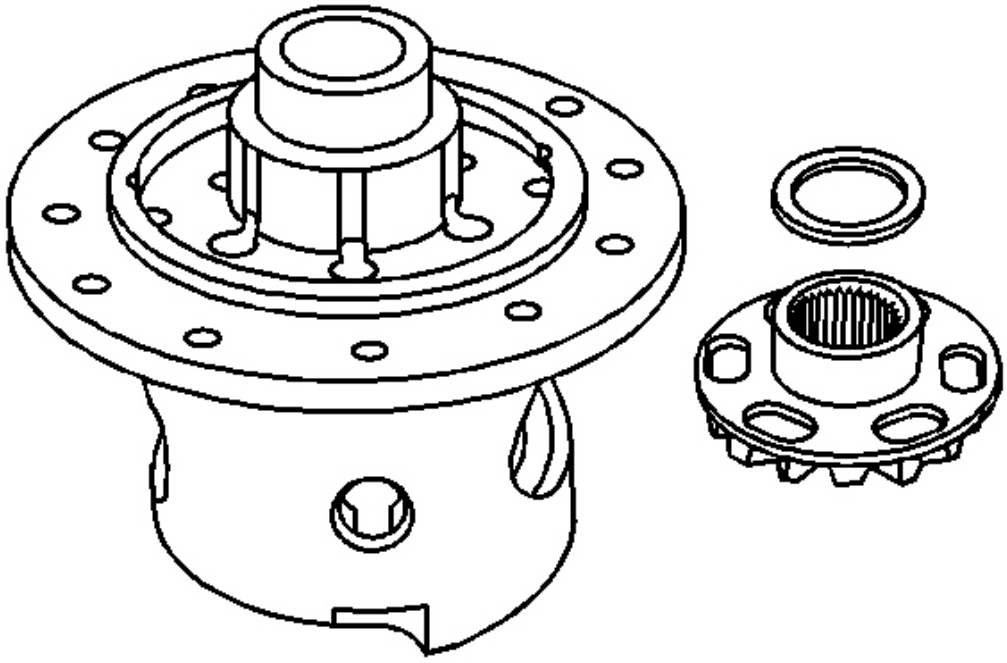


Fig. 22: Locking Differential Side Gear & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

2. Install the differential side gear thrust washer to the locking differential side gear.

   If the original differential side gear thrust washer is not available, install a 25.40 mm (1.000 in) thrust washer.

3. Install the locking differential side gear and thrust washer into the ring gear side of the differential case.

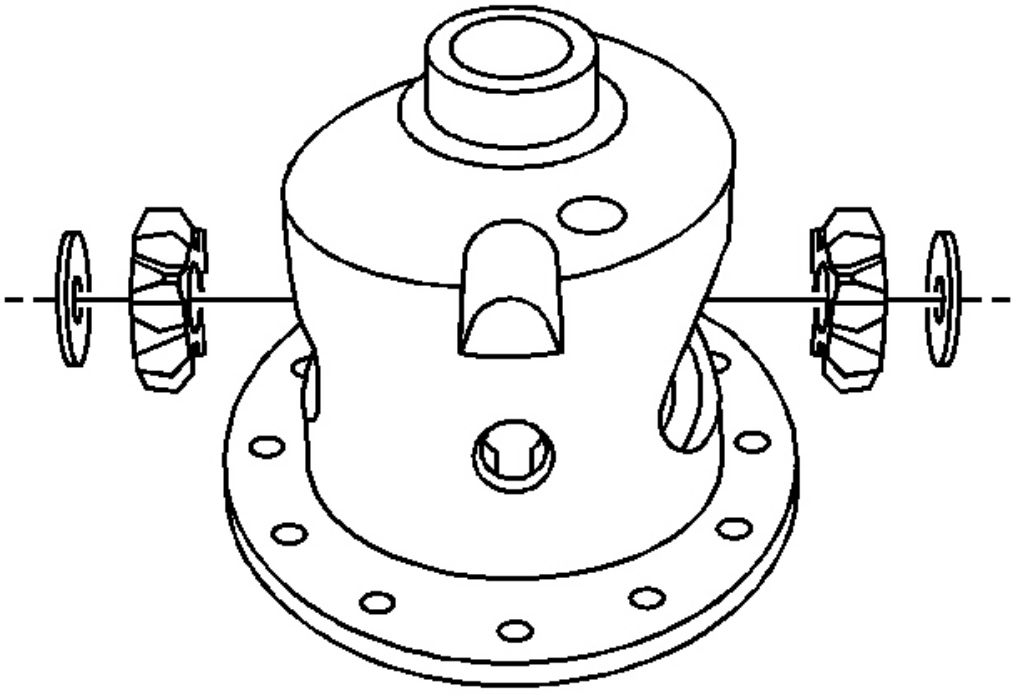


Fig. 23: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

4. Install the differential pinion gears and the thrust washers by doing the following:
    1. Position both pinion gears and each thrust washer into each side of the differential window.

       Place the pinion gears 180 degrees across from each other.

    2. Rotate the differential side gears until both pinion gears are directly opposite the opening in the differential case.

       Line up the pinion shaft opening in each of the pinion gears with the pinion shaft opening in the differential case.

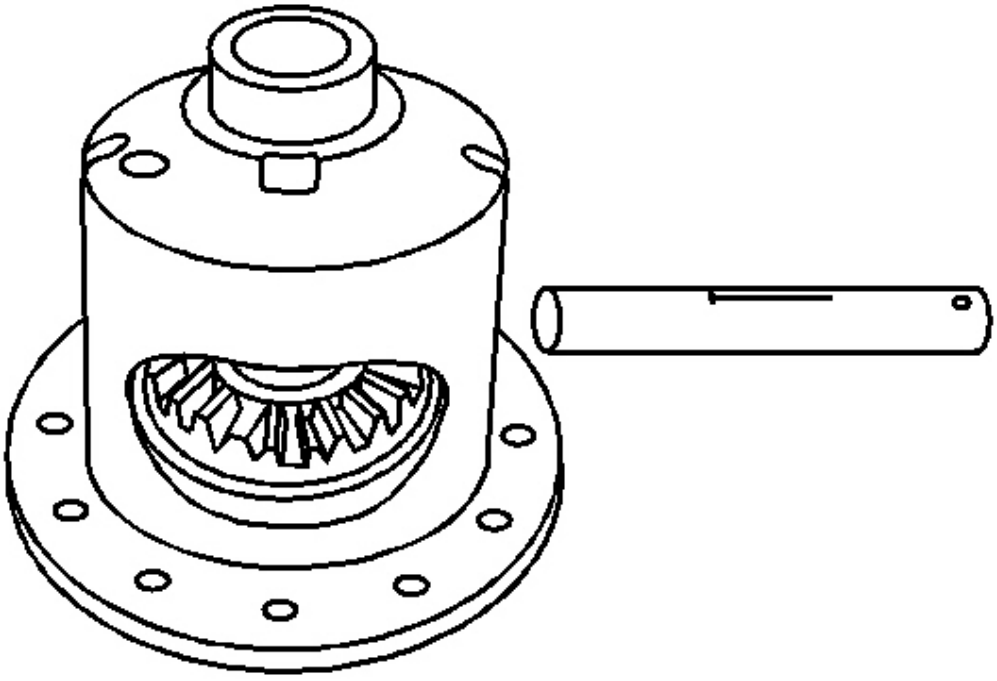


Fig. 24: Pinion Gear Shaft
Courtesy of GENERAL MOTORS CORP.

5. Install the pinion shaft.
6. If the pinion shaft cannot be installed, remove the pinion gears and thrust washers, the locking differential side gear and differential thrust washer.
7. Install a smaller differential side thrust washer and re-install the locking differential side gear, the pinion gears and thrust washers and the pinion shaft.

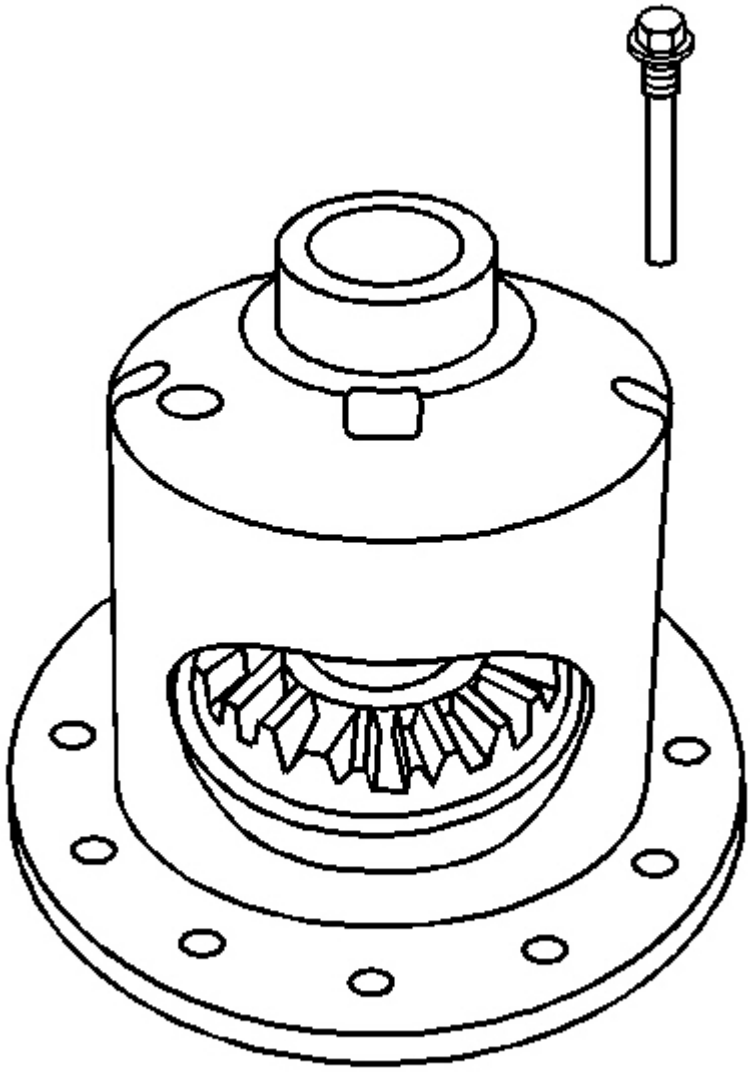


Fig. 25: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

8. Install the pinion shaft lock bolt.

   Do not torque the pinion shaft lock bolt at this time.

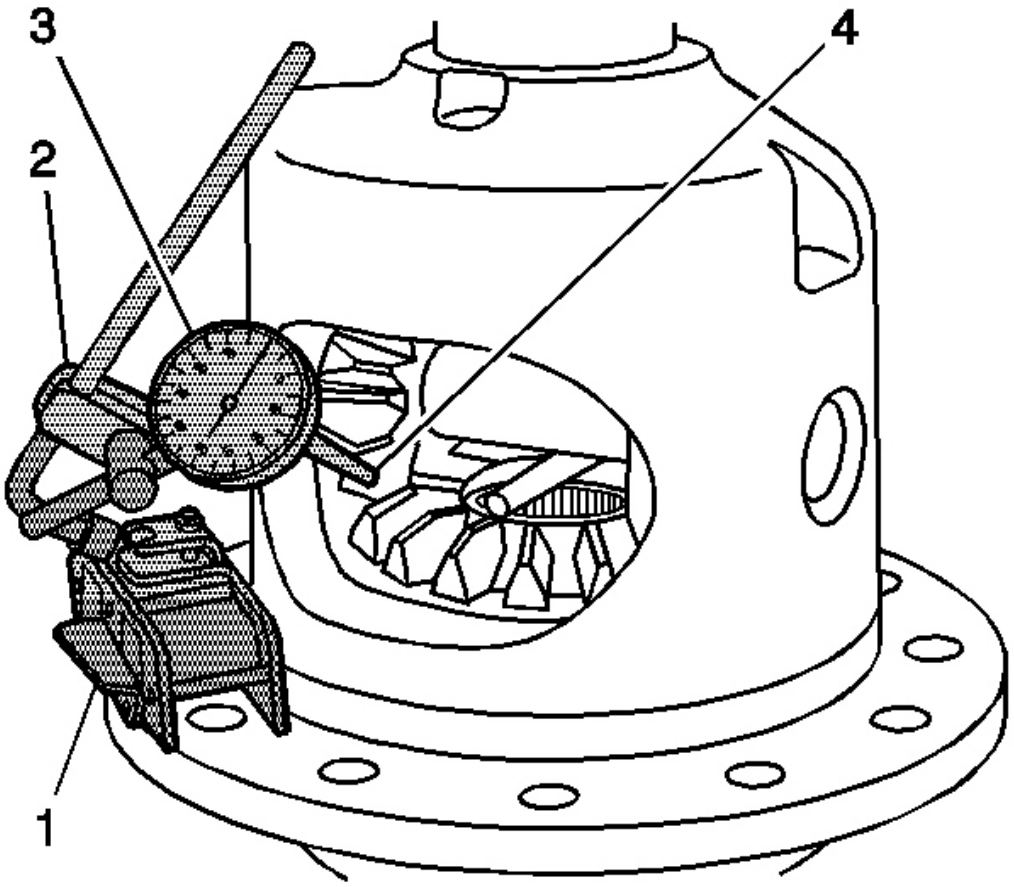


Fig. 26: Measuring Backlash Of Pinion Gear Closest To Pinion Shaft Lock Bolt & Locking Differential Side Gear
Courtesy of GENERAL MOTORS CORP.

9. Measure the backlash of the pinion gear closest to the pinion shaft lock bolt and the locking differential side gear by doing the following:
    1. Rotate the pinion gear so that one of the teeth is perpendicular to the ring gear flange.
    2. Install a brass drift between the locking differential side gear and the pinion shaft in order to prevent the side gear from moving.
    3. Install the **J 7872** (1) to the ring gear flange. See **Special Tools and Equipment** .
    4. Loosely clamp the J 7872-2 (2) and the J 8001-3 (3) onto the stem on the **J 7872** (1). See **Special Tools and Equipment** .
    5. Install the J 7872-3 (4) to the J 8001-3 (3).
    6. Place the contact pad of the J 7872-3 (4) onto one of the teeth of the pinion gear closest to the

locking differential side gear.

Preload the dial of the J 8001-3 approximately 3/4 of a turn clockwise.

7. Tighten the lock nut of the J 7872-2 (2) finger tight.
8. Turn the dial of the J 8001-3 until the needle and the dial face indicate ZERO.
9. Pull the pinion gear firmly into the differential case seat.
10. Rotate the pinion gear back and forth.
11. Measure the backlash.

    Specification: The backlash between the locking differential side gear and the pinion gears should be 0.051-0.076 mm (0.002-0.003 in).

10. If the backlash is too large, disassemble the differential, install the next larger size side gear thrust washer, re-assemble the differential and recheck the backlash.
11. If the backlash is too small, disassemble the differential, install next smaller size side gear thrust washer, re-assemble the differential and recheck the backlash.

Locking differential side gear thrust washers are available in the following sizes:

Washer Sizes:

- 19.05 mm (0.750 in)
- 20.32 mm (0.800 in)
- 21.59 mm (0.850 in)
- 22.86 mm (0.900 in)
- 24.13 mm (0.950 in)
- 25.40 mm (1.000 in)
- 26.67 mm (1.050 in)
- 27.94 mm (1.100 in)
- 29.21 mm (1.150 in)
- 30.48 mm (1.200 in)
- 31.75 mm (1.250 in)

Differential Side Gear Backlash Adjustment

1. Remove the following from the differential case:
    1. The pinion shaft lock bolt
    2. The pinion shaft
    3. The pinion gears
    4. The pinion gear thrust washers
    5. The locking differential side gear

6. The locking differential side gear thrust washer

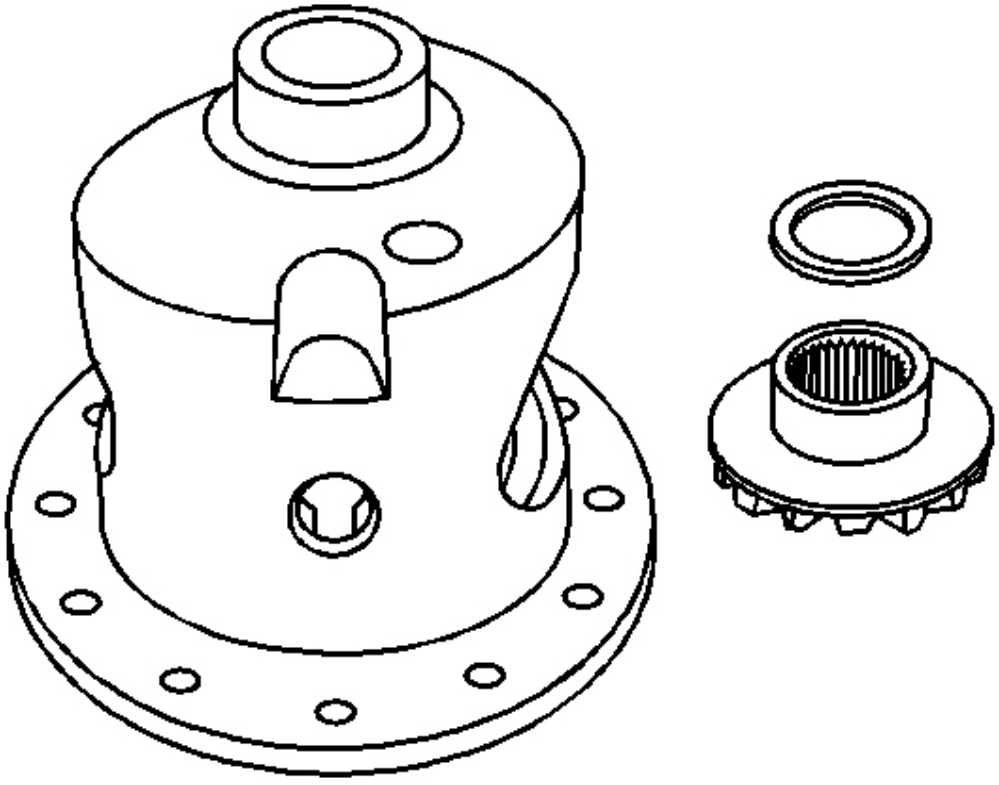


Fig. 27: Differential Side Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

2. Install the differential side gear thrust washer into the bell-end of the differential case.
3. Install the differential side gear into the bell-end of the differential case.

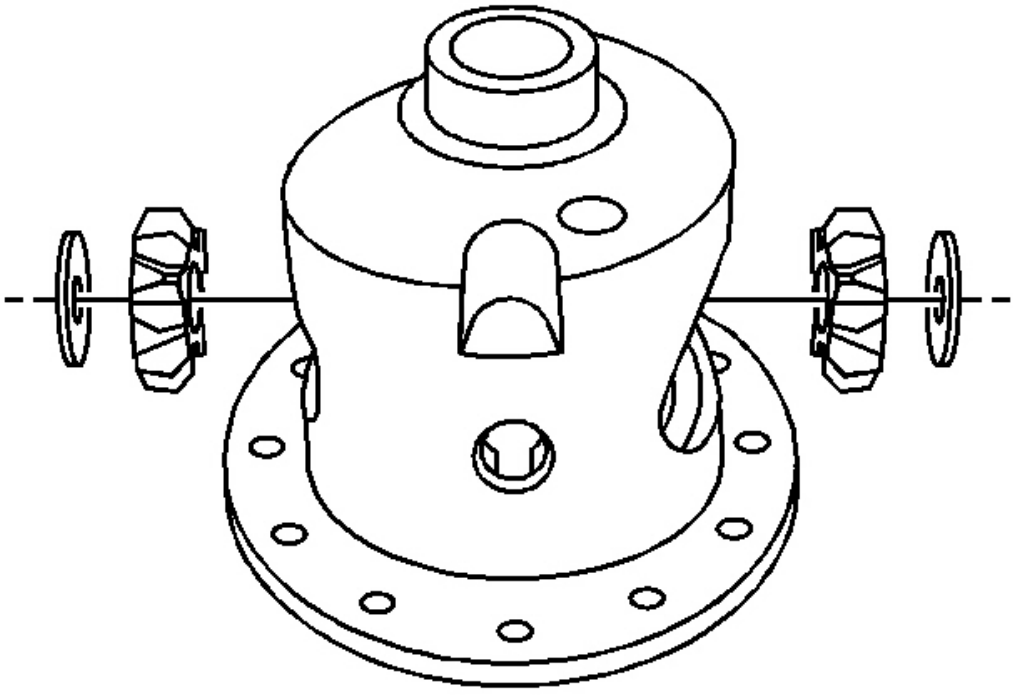


Fig. 28: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

4. Install the differential pinion gears by doing the following:
    1. Position both pinion gears and each thrust washer into each side of the differential window.

       Place the pinion gears 180 degrees across from each other.

    2. Rotate the differential side gears until both pinion gears are directly opposite the opening in the differential case.

       Line up the pinion shaft opening in each of the pinion gears with the pinion shaft opening in the differential case.

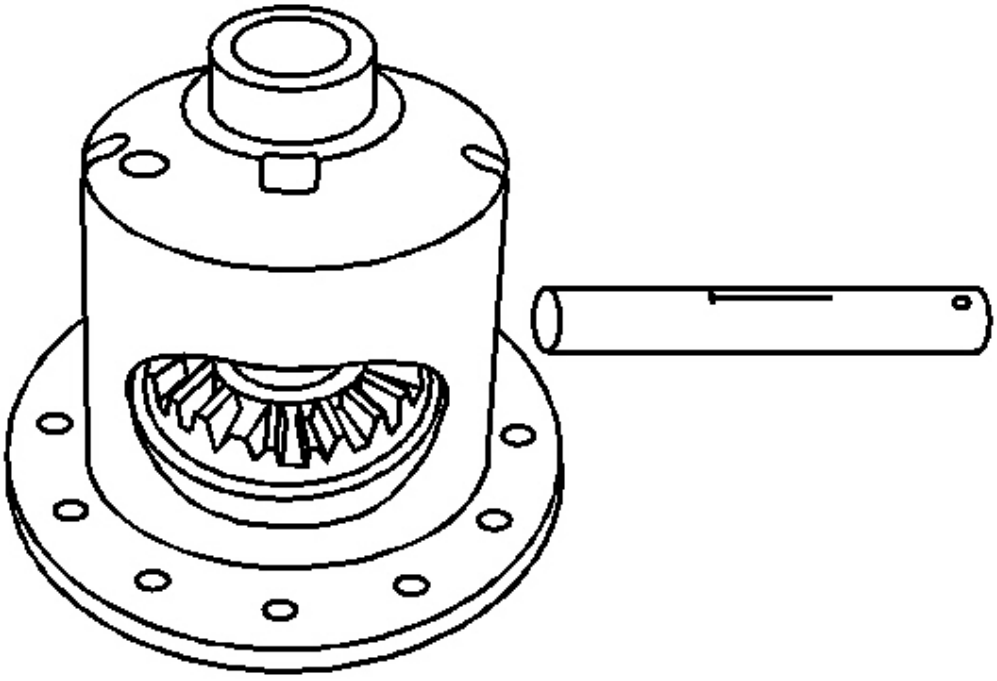


Fig. 29: Pinion Gear Shaft
Courtesy of GENERAL MOTORS CORP.

5. Install the pinion shaft.
6. If the pinion shaft cannot be installed, remove the pinion gears and thrust washers, the locking differential side gear and differential thrust washer.
7. Install a smaller differential side thrust washer and re-install the locking differential side gear, the pinion gears and thrust washers and the pinion shaft.

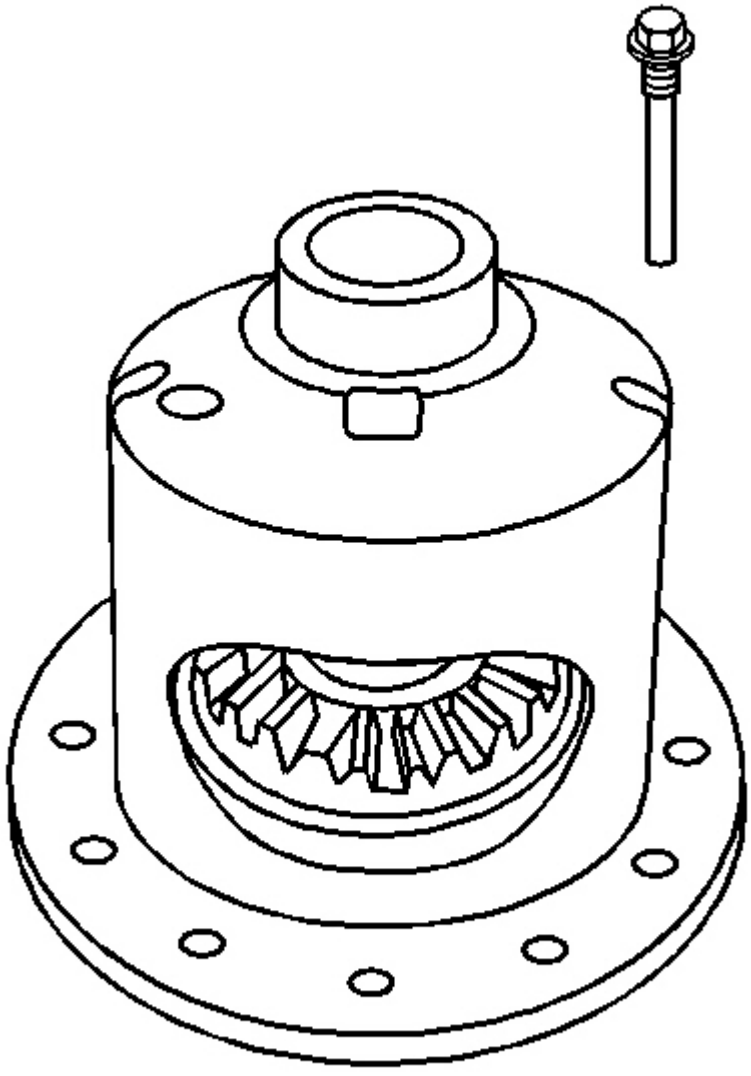


Fig. 30: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

8. Install the pinion shaft lock bolt.

   Do not torque the pinion shaft lock bolt at this time.

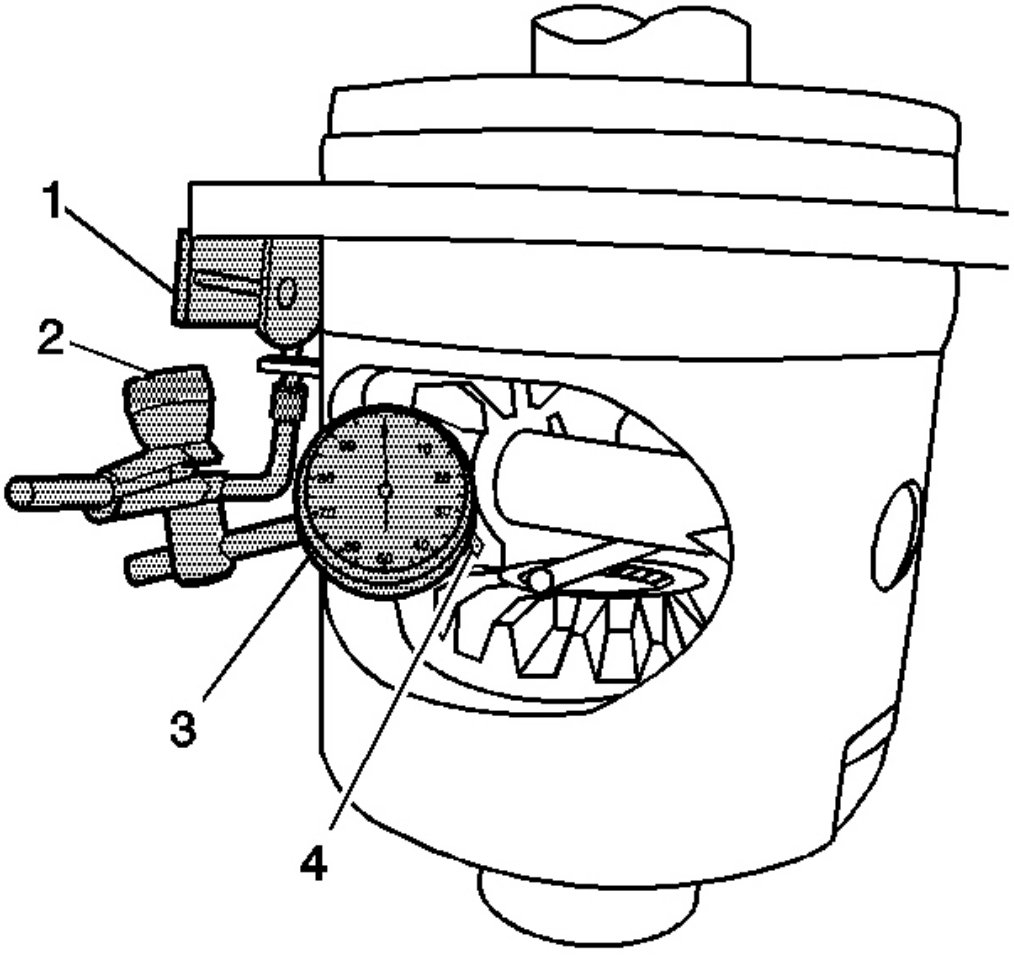


Fig. 31: Measuring Backlash Of Pinion Gear Closest To Pinion Shaft Lock Bolt & Differential Side Gear
Courtesy of GENERAL MOTORS CORP.

9. Measure the backlash of the pinion gear closest to the pinion shaft lock bolt and the differential side gear by doing the following:
    1. Rotate the pinion gear so that one of the teeth is perpendicular to the ring gear flange.
    2. Install a brass drift between the locking differential side gear and the pinion shaft in order to prevent the side gear from moving.
    3. Install the **J 7872** (1) to the ring gear flange. See **Special Tools and Equipment** .
    4. Loosely clamp the J 7872-2 (2) and the J 8001-3 (3) onto the stem on the **J 7872** (1). See **Special Tools and Equipment** .

5. Install the J 7872-3 (4) to the J 8001-3 (3).
6. Place the contact pad of the J 7872-3 (4) onto one of the teeth of the pinion gear closest to the locking differential side gear.

   Preload the dial of the J 8001-3 approximately 3/4 of a turn clockwise.

7. Tighten the lock nut of the J 7872-2 (2) finger tight.
8. Turn the dial of the J 8001-3 until the needle and the dial face indicate ZERO.
9. Pull the pinion gear firmly into the differential case seat.
10. Rotate the pinion gear back and forth.
11. Measure the backlash.

    Specification: The backlash between the locking differential side gear and the pinion gears should be 0.051-0.076 mm (0.002-0.003 in).

10. If the backlash is too large, disassemble the differential, install the next larger size side gear thrust washer, re-assemble the differential and recheck the backlash.
11. If the backlash is too small, disassemble the differential, install next smaller size side gear thrust washer, re-assemble the differential and recheck the backlash.

Differential side gear thrust washers are available in the following sizes:

Washer Sizes:

- 19.05 mm (0.750 in)
- 20.32 mm (0.800 in)
- 21.59 mm (0.850 in)
- 22.86 mm (0.900 in)
- 24.13 mm (0.950 in)
- 25.40 mm (1.000 in)
- 26.67 mm (1.050 in)
- 27.94 mm (1.100 in)
- 29.21 mm (1.150 in)
- 30.48 mm (1.200 in)
- 31.75 mm (1.250 in)

LOCKING DIFFERENTIAL ASSEMBLE

IMPORTANT:

- **If the same differential side gears and the thrust washers are being used, install the differential side gears and the thrust washers in their original locations.**

- **The locking differential side gear and the differential side gear are not interchangeable. The side gears must be installed in the correct location in order for the locking differential to function properly.**

1. Measure the backlash of the pinion gears to differential side gear and locking differential side gear. Refer to **Locking Differential Adjustment** .

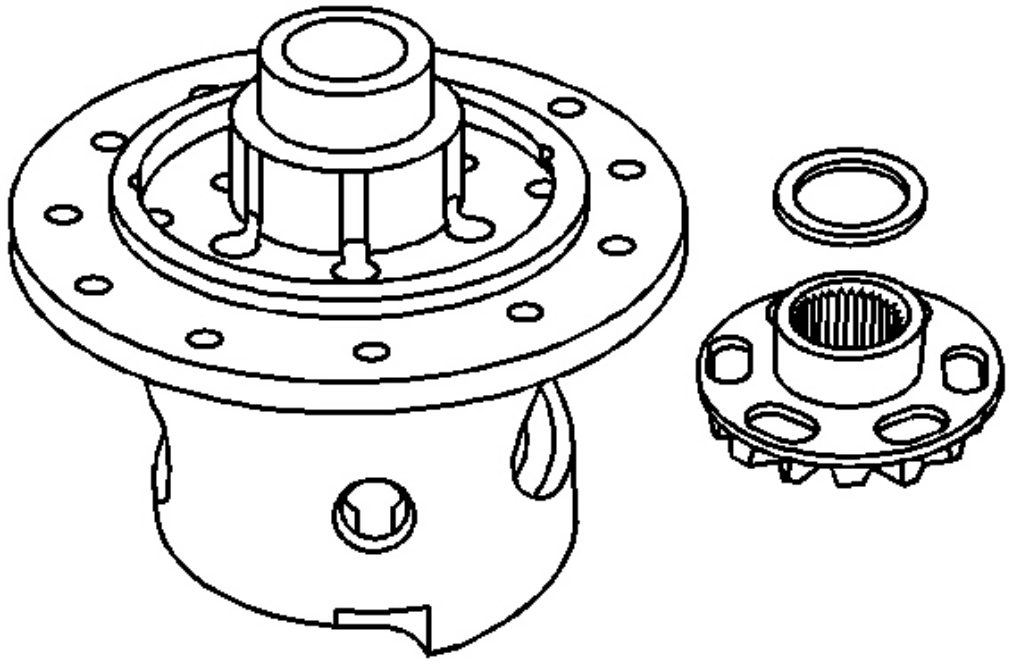


Fig. 32: Locking Differential Side Gear & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

2. Install the differential side gear thrust washer to the locking differential side gear.
3. Install the locking differential side gear and thrust washer into the ring gear side of the differential case.

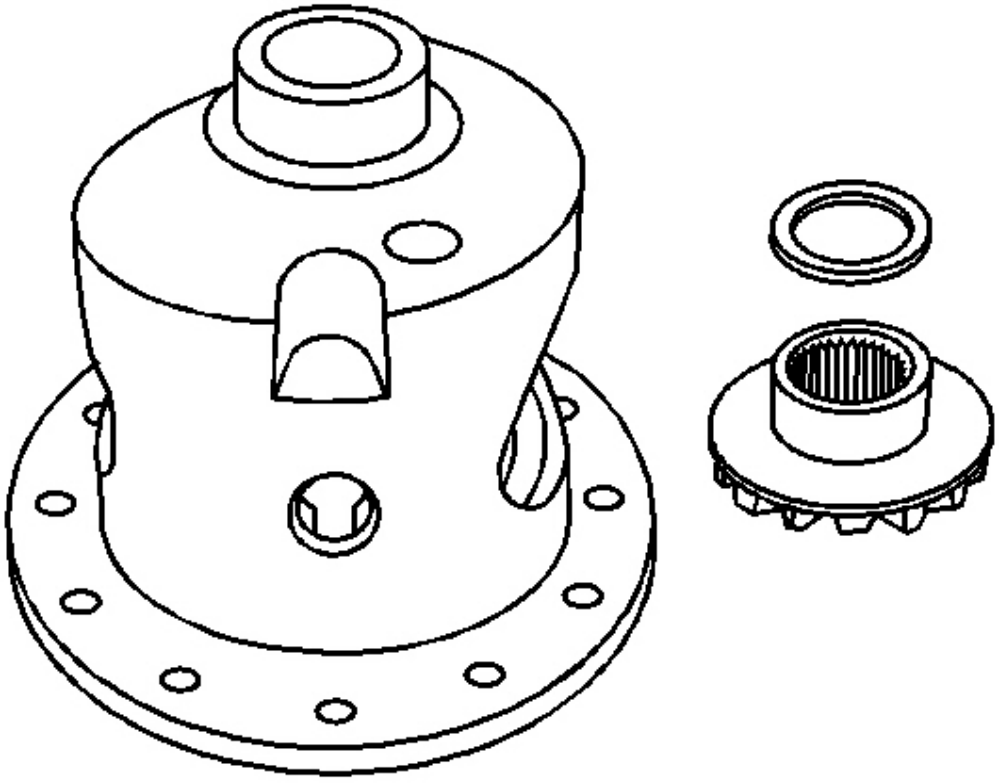


Fig. 33: Differential Side Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

4. Install the differential side gear thrust washer to the differential side gear.
5. Install the differential side gear and thrust washer into the bell side of the differential case.

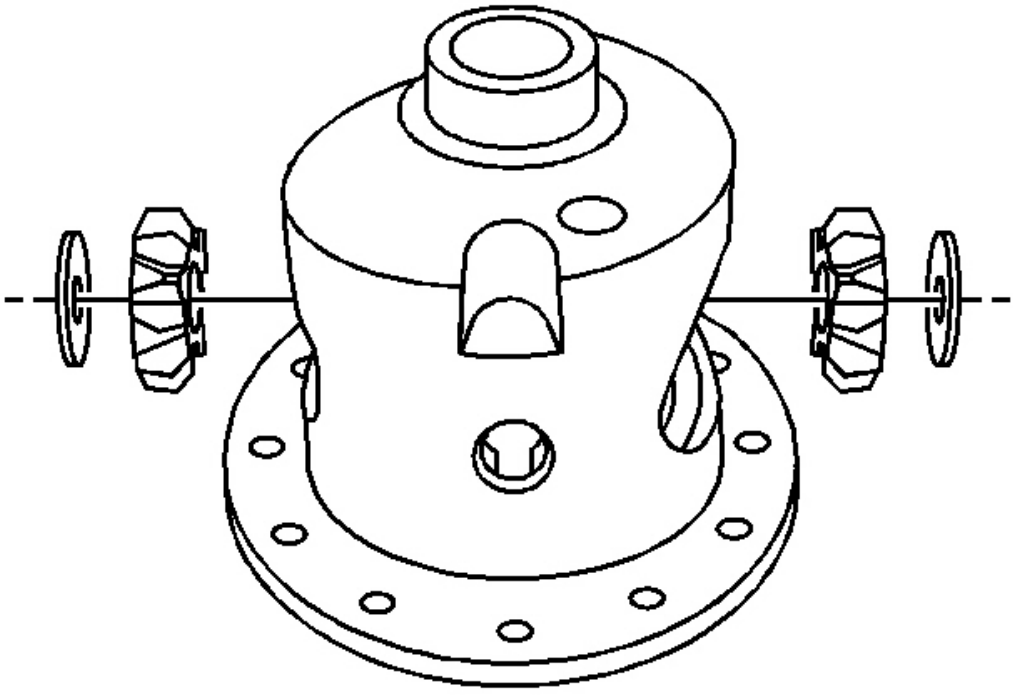


Fig. 34: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

6. Install the differential pinion gears and thrust washers by doing the following:
    1. Position both pinion gears and thrust washers between the differential side gears.

       Place the pinion gears and thrust washers 180 degrees across from each other.

    2. Rotate the differential side gears until both pinion gears and thrust washers are directly opposite the opening in the differential case.

       Line up the pinion shaft opening in each of the pinion gears with the pinion shaft opening in the differential case.

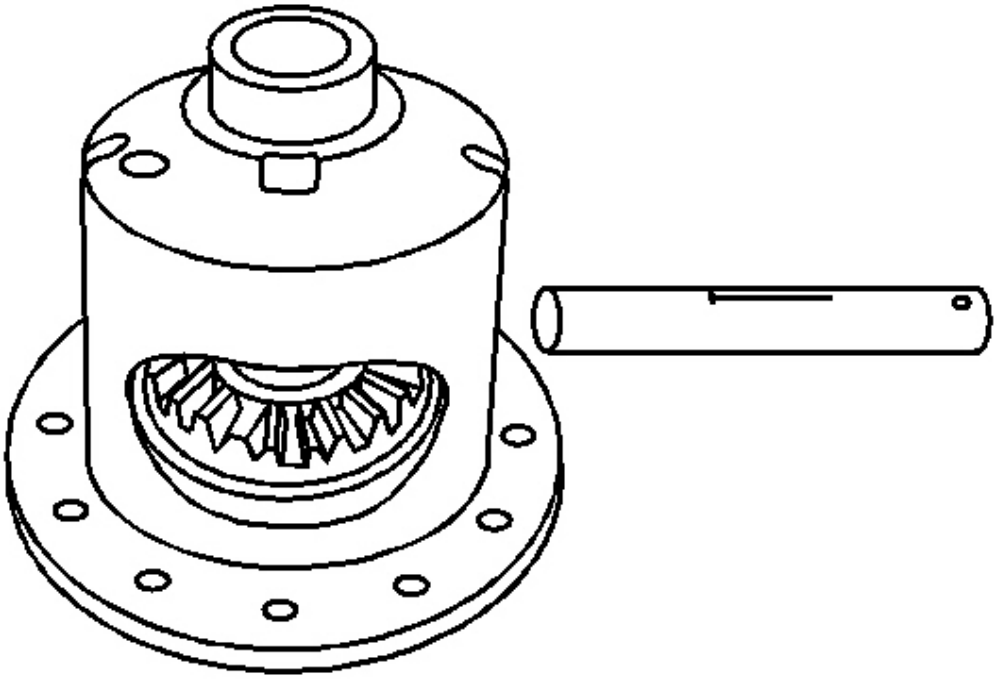


Fig. 35: Pinion Gear Shaft
Courtesy of GENERAL MOTORS CORP.

7. Install the pinion shaft.

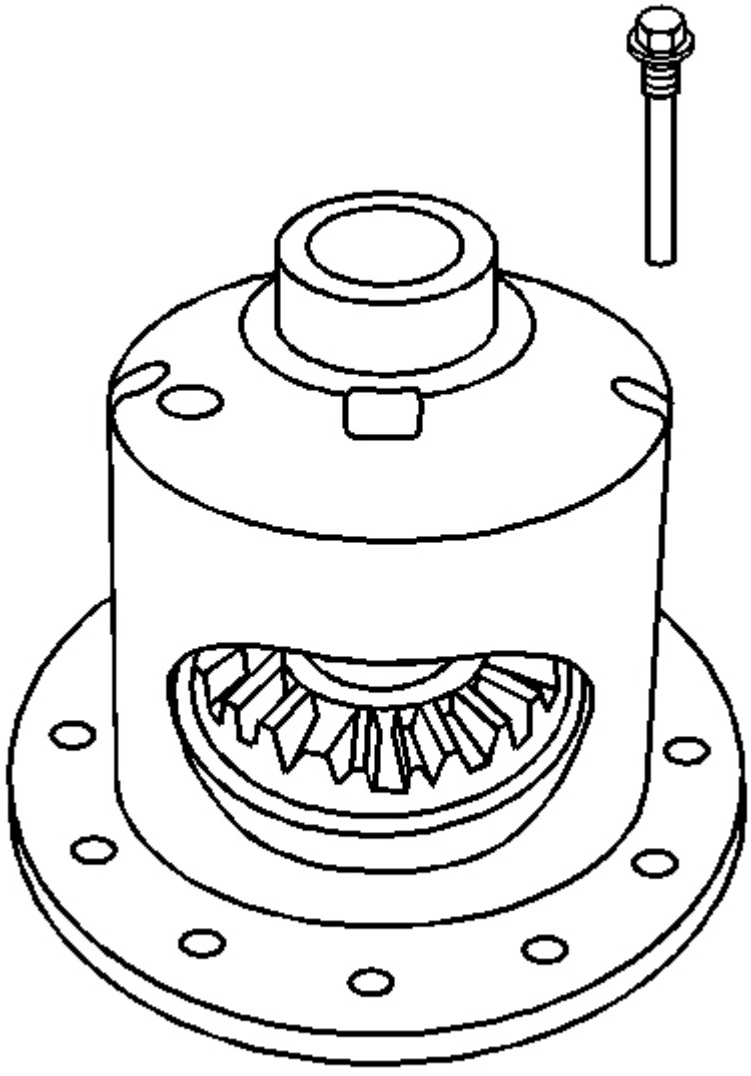


Fig. 36: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Install a new pinion shaft lock bolt.

   Tighten: Tighten the new pinion shaft lock bolt to 50 N.m (37 lb ft).

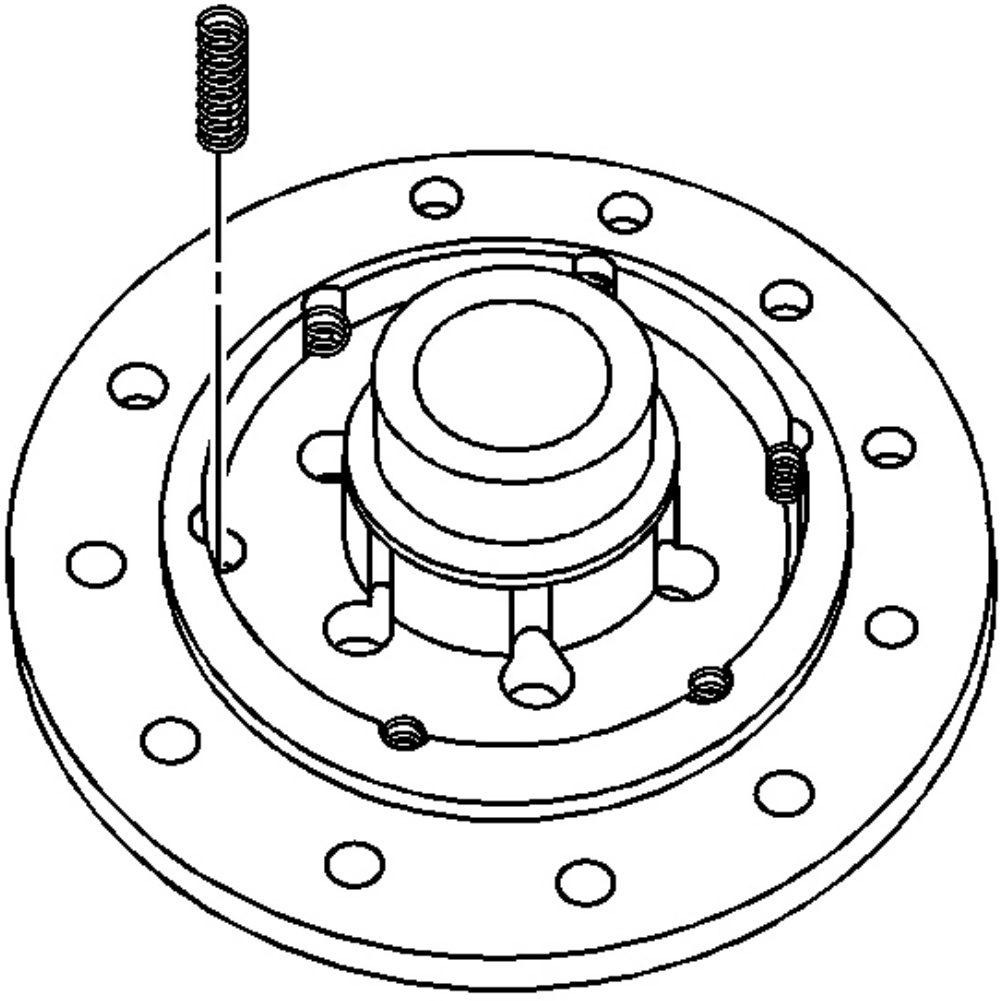


Fig. 37: Locking Differential Clutch Springs
Courtesy of GENERAL MOTORS CORP.

9. Install the locking differential clutch springs.

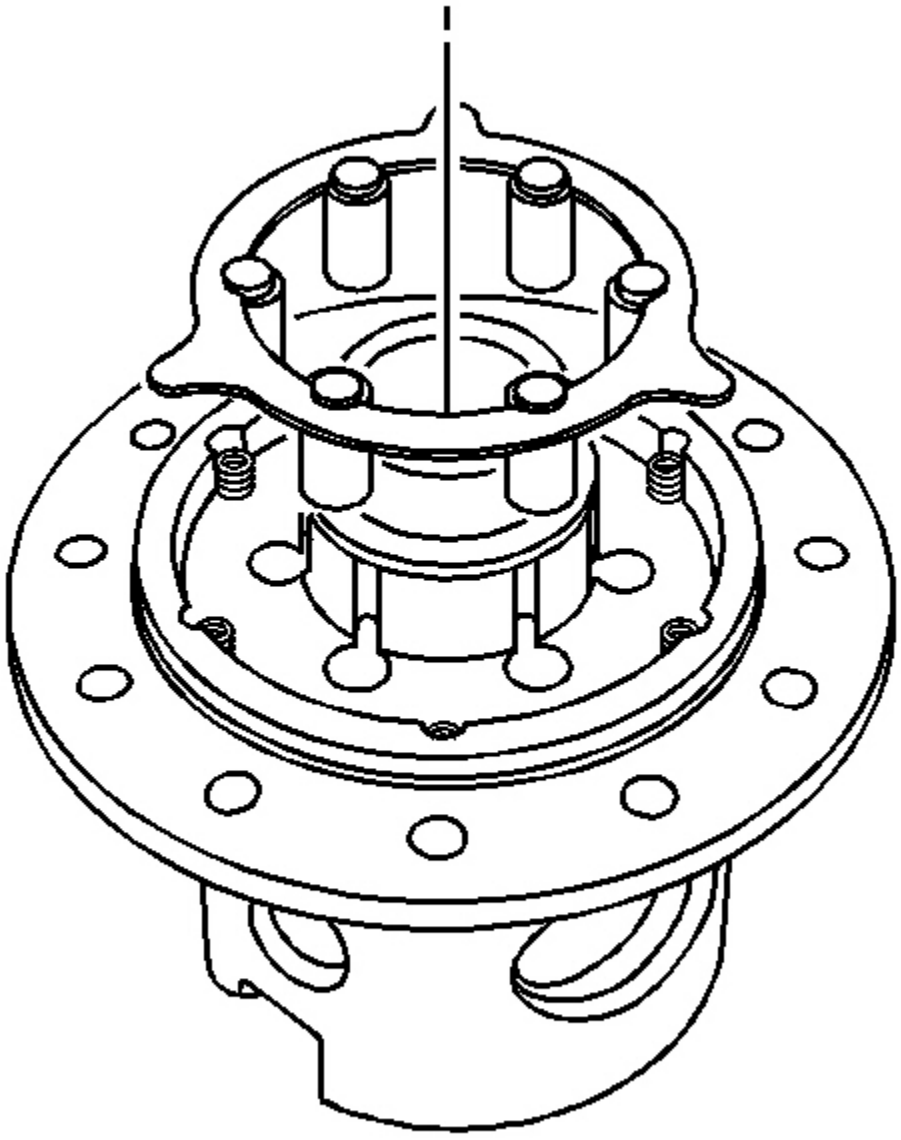


Fig. 38: Locking Differential Clutch Spring Retainer & Differential Carrier Lock Pins
Courtesy of GENERAL MOTORS CORP.

10. Install the locking differential clutch spring retainer and the differential carrier lock pins.

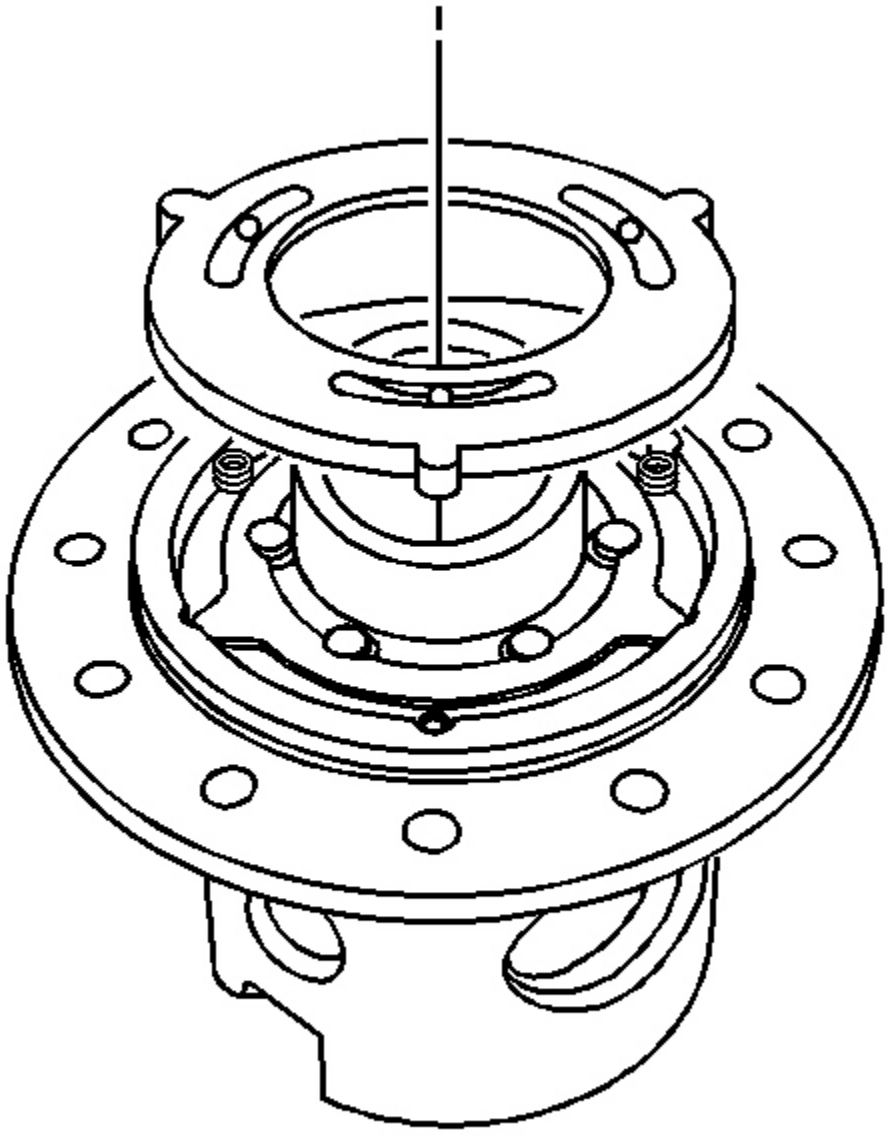


Fig. 39: Inboard Locking Differential Ball Bearing Plate
Courtesy of GENERAL MOTORS CORP.

11. Install the inboard locking differential ball bearing plate.

    Place the inboard locking differential ball bearing plate on the three exposed differential clutch springs.

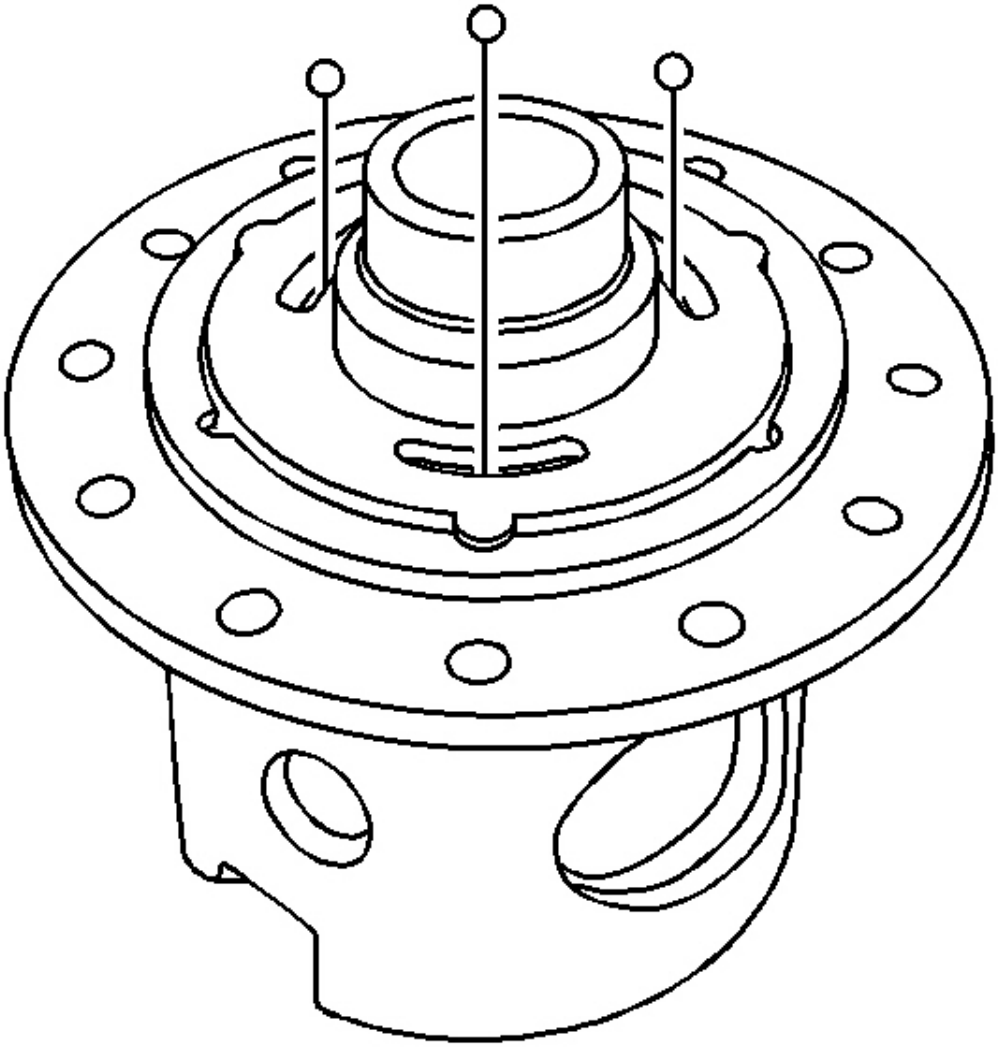


Fig. 40: Locking Differential Ball Bearings
Courtesy of GENERAL MOTORS CORP.

12. Install the locking differential ball bearings.

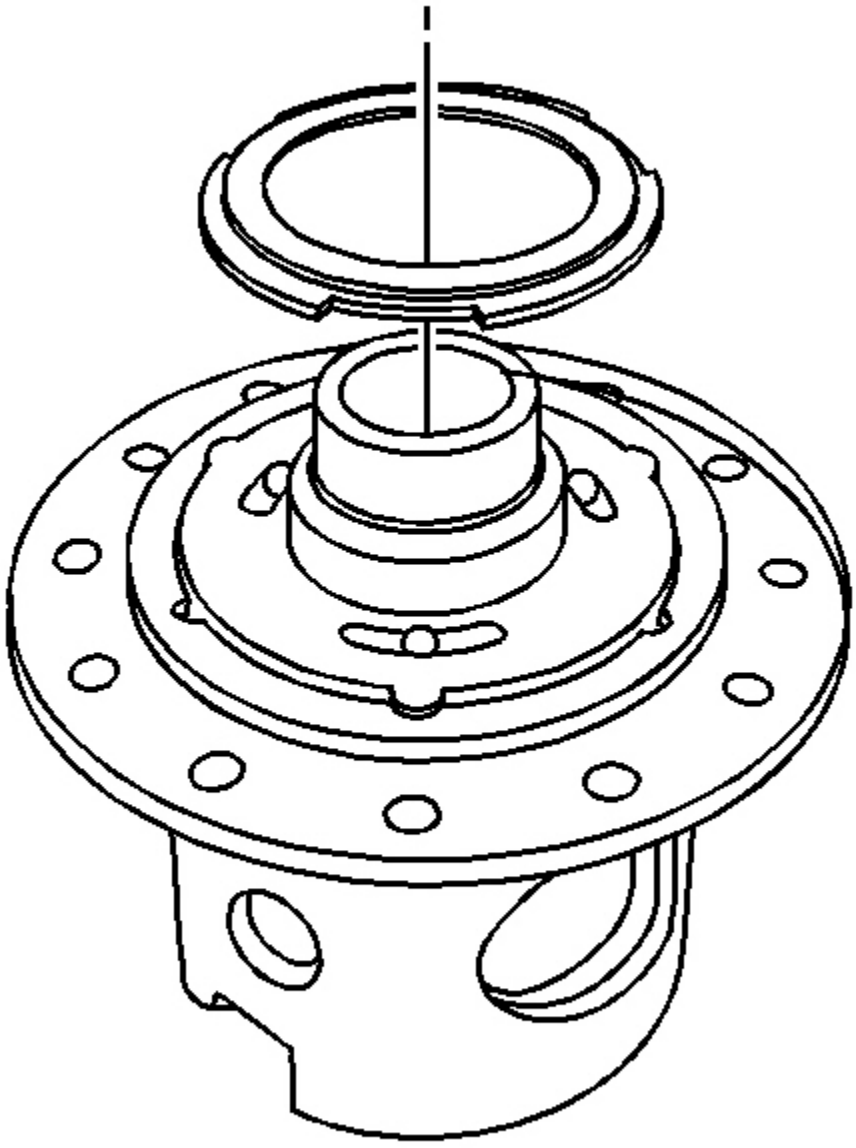


Fig. 41: Outboard Locking Differential Ball Bearing Plate
Courtesy of GENERAL MOTORS CORP.

13. Install the outboard locking differential ball bearing plate.

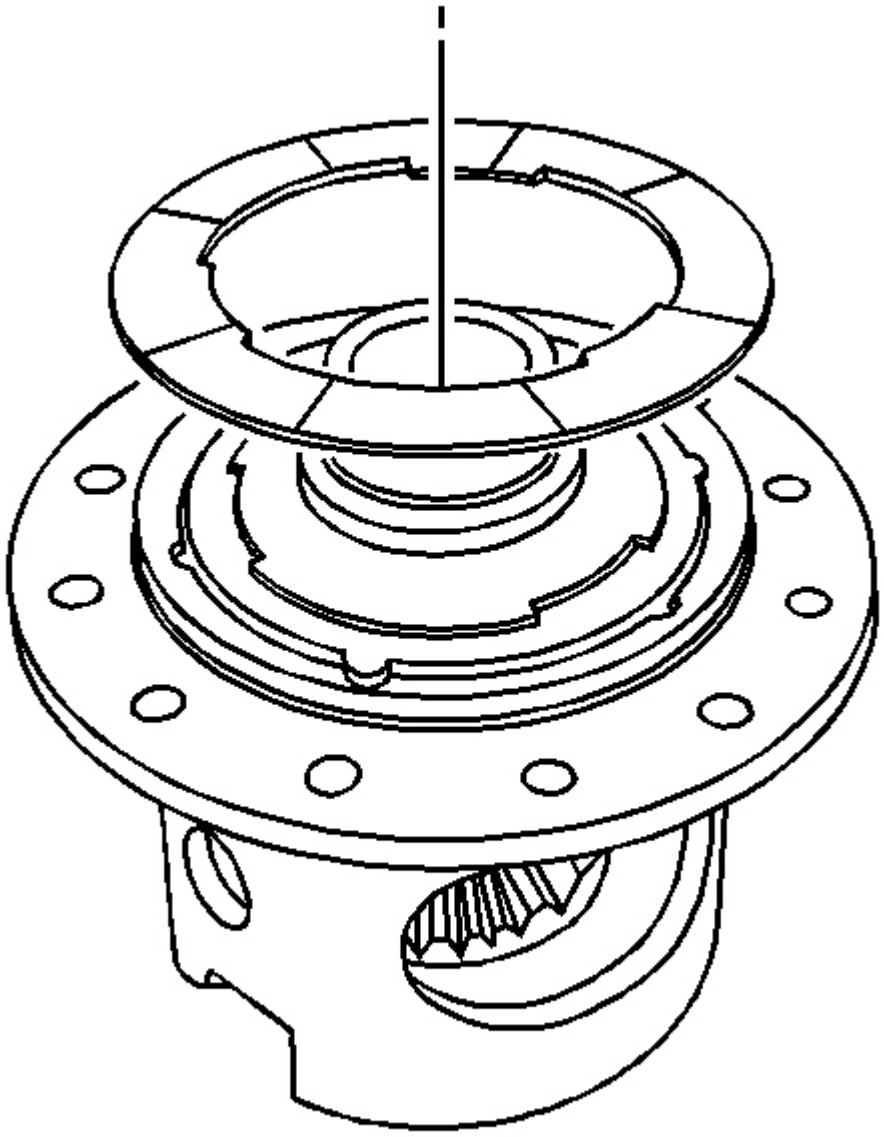


Fig. 42: Locking Differential Coil Plate
Courtesy of GENERAL MOTORS CORP.

14. Install the locking differential coil plate.

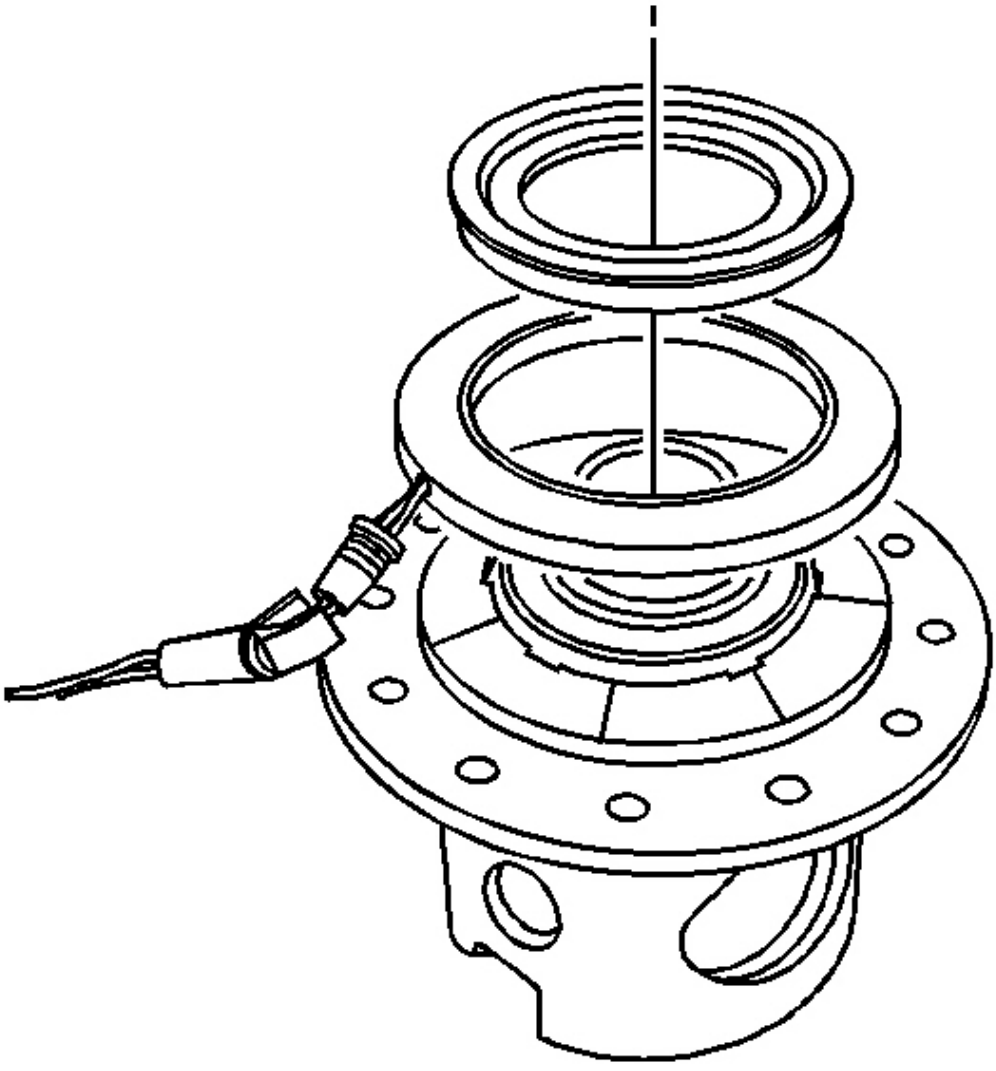


Fig. 43: Differential Bearing Race
Courtesy of GENERAL MOTORS CORP.

15. Install the locking differential coil assembly.
16. Install the differential bearing race.

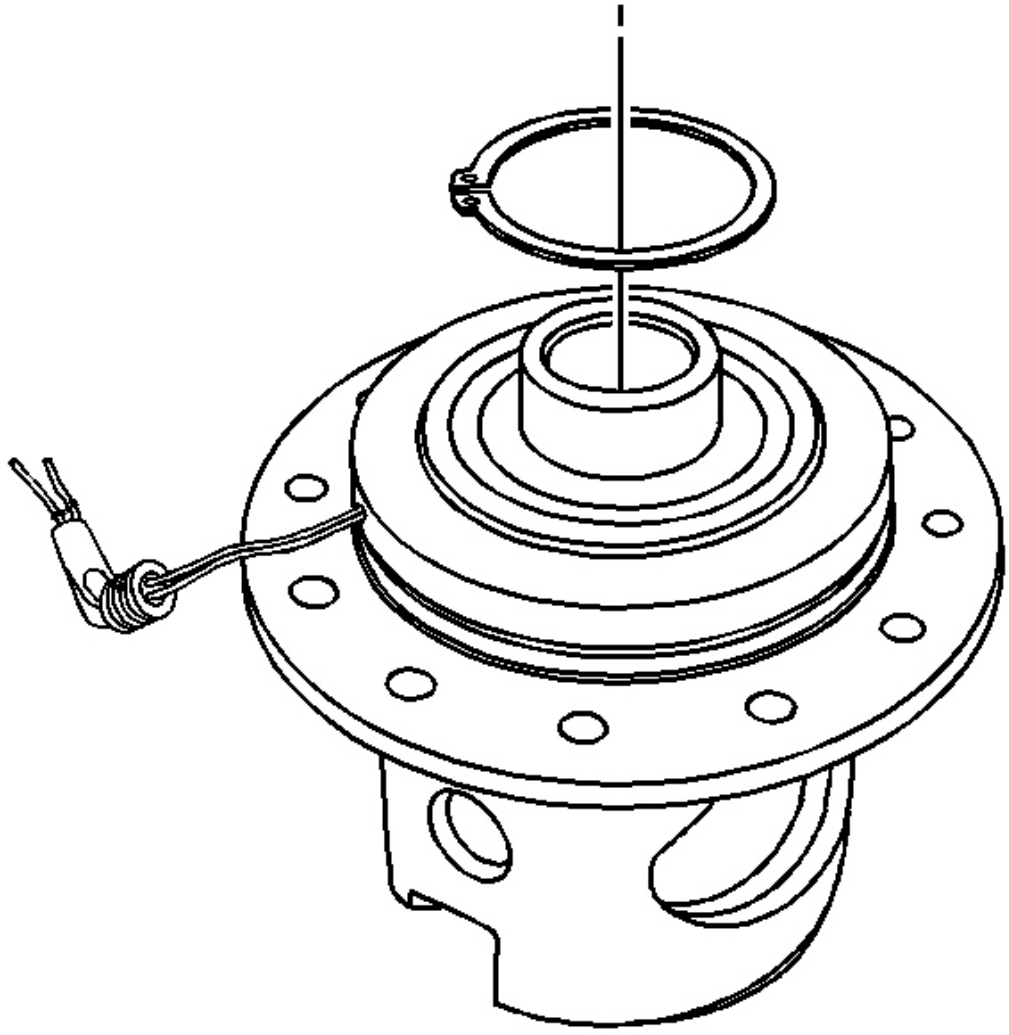


Fig. 44: Differential Bearing Retainer
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The differential bearing race must be compressed in order to install the differential bearing retainer.

17. Install the differential bearing retainer by performing the following steps:
    1. Install the differential bearing retainer.
    2. With the aid of an assistant, push the differential bearing race down towards the differential case in order to compress the differential bearing retainer and differential coil assembly against the locking

differential coil plate.

3. Install the differential bearing retainer.

   Ensure the differential bearing retainer is evenly and fully seated in the differential bearing retainer slot before releasing the differential bearing race.

18. Install the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** in Rear Drive Axle.
19. Install the differential side bearings. Refer to **Differential Side Bearings Replacement** in Rear Drive Axle.

DESCRIPTION AND OPERATION

LOCKING DIFFERENTIAL DESCRIPTION AND OPERATION

The electronic locking differential consists of the following components:

- Differential Bearing Retainer Race
- Differential Bearing Race
- Differential Bearing Assembly
- Locking Differential Coil Assembly
- Locking Differential Coil Plate
- Locking Differential Ball Bearing Plate - Outboard
- Locking Differential Ball Bearing Assembly
- Locking Differential Ball Bearing Plate - Inboard
- Locking Differential Clutch Spring
- Locking Differential Clutch Spring Retainer
- Differential Carrier Lock Pins
- Differential Case
- Differential Pinion Gears and Thrust Washers
- Locking Differential Side Gear and Thrust Washer
- Differential Side Gear and Thrust Washer

The electronic locking differential is a combination of an open differential and an electrically energized coil assembly. When the coil is not energized, the differential operates in the same manner as an open differential. The locking differential coil assembly is located on the left side of the differential case. The locking differential coil is held stationary within the differential case housing through the lock tab on the coil and the hold down lock that attaches to the differential bearing cap. The remainder of the locking components: the locking differential coil plate, the locking differential ball bearing plates, the clutch springs and the lock pins are located within the differential case and rotate at the same speed as the differential case. The locking function of the differential is accomplished by a combination of vehicle and user inputs. In order to the differential coil to energize, the vehicle must be operating under the following conditions:

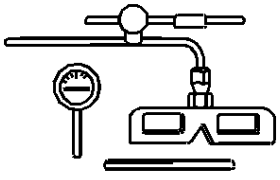
- The transfer case indicator switch indicates 4 LO.
- The vehicle's speed must be less than 4.8 km/h (3 mph).
- The differential lock switch is turned ON.
- The left to right rear wheel speed difference is less than 50 RPM.

Once the above conditions are met, the automatic transfer case shift control module sends a signal to energize the coil. The energized coil creates a magnetic field that allows the outboard locking differential ball bearing plate to rotate at a slower speed than inboard locking differential ball bearing plate and the differential case. The difference in the 2 speeds causes the ball bearings that are between the outboard and the inboard ball bearing plate to move along their respective ramps and separate the 2 ball bearing plates. The separation increases the width of the plates and allows the differential lock pins to be pushed through the differential case towards the locking differential side gear. The locking differential side gear has 6 notches that accept the differential lock pins. Once the differential lock pins are engaged, the locking differential side gear can no longer rotate independently of the differential case. Since the locking differential side gear is now apart of the differential case and turning at the same speed as the ring gear, the pinion gears that are perpendicular to the locking differential side gear, cannot rotate within the differential case. This causes the bell-side differential side gear to rotate at the same speed as the locking differential side gear. The driving force generated by the ring gear, is transmitted through the locking differential side gear, through the pinion gears, to the bell-side differential side gear. The axle shafts, which are splined to each side gear, receive the force and rotate together at the same speed along with the differential case and ring gear. The will remain the locked position until the vehicle's speed exceeds 32 km/h (20 mph) or the operator turns OFF the differential lock switch or the transfer case is shifted into 4 HI, 2 HI or NEUTRAL. The locking differential coil will de-energize and the differential will function as an open differential.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J 7872 Magnetic Base Dial Indicator

Front Drive Axle - Hummer H2

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Differential Adjuster Lock Nut Bolt	20 N.m	15 lb ft
Differential Carrier Assembly Case Bolts	78 N.m	58 lb ft
Differential Carrier Assembly Mounting Bolts and Nuts	100 N.m	75 lb ft
Differential Carrier Assembly Hole Plug	28 N.m	21 lb ft
Inner Axle Shaft Housing to Frame Mounting Bolt and Nut	100 N.m	75 lb ft
Inner Axle Shaft Housing to Differential Carrier Assembly Bolts	40 N.m	30 lb ft
Pinion Shaft Lock Bolt	53 N.m	39 lb ft
Plug, Drain and Fill	33 N.m	24 lb ft
Ring Gear Bolts	138 N.m	102 lb ft
Stabilizer Link Nut	18 N.m	13 lb ft
Vent Connector	20 N.m	15 lb ft
Wheel Drive Shaft Inboard Flange Bolts	79 N.m	58 lb ft
Yoke Retainer Bolts	25 N.m	18 lb ft

AXLE PRELOAD AND BACKLASH SPECIFICATIONS

Axle Preload and Backlash Specifications

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

SEALERS, ADHESIVES, AND LUBRICANTS

Sealers, Adhesives, and Lubricants

Application	Type of Material	GM Part Number

Differential Carrier Assembly Case Mating Surfaces	Sealant	1052942 (Canadian P/N 10953466) or equivalent
Differential Carrier Assembly Hole Plug	Sealant	12346004 (Canadian P/N 10953480) or equivalent
Front Drive Axle	Lubricant	12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115
Front Drive Axle Inner Shaft Housing to Differential Carrier Assembly	Sealant	1052942 (Canadian P/N 10953466) or equivalent
Pinion Yoke Splines	Sealant	12346004 (Canadian P/N 10953480) or equivalent

COMPONENT LOCATOR

FRONT DRIVE AXLE DISASSEMBLED VIEWS

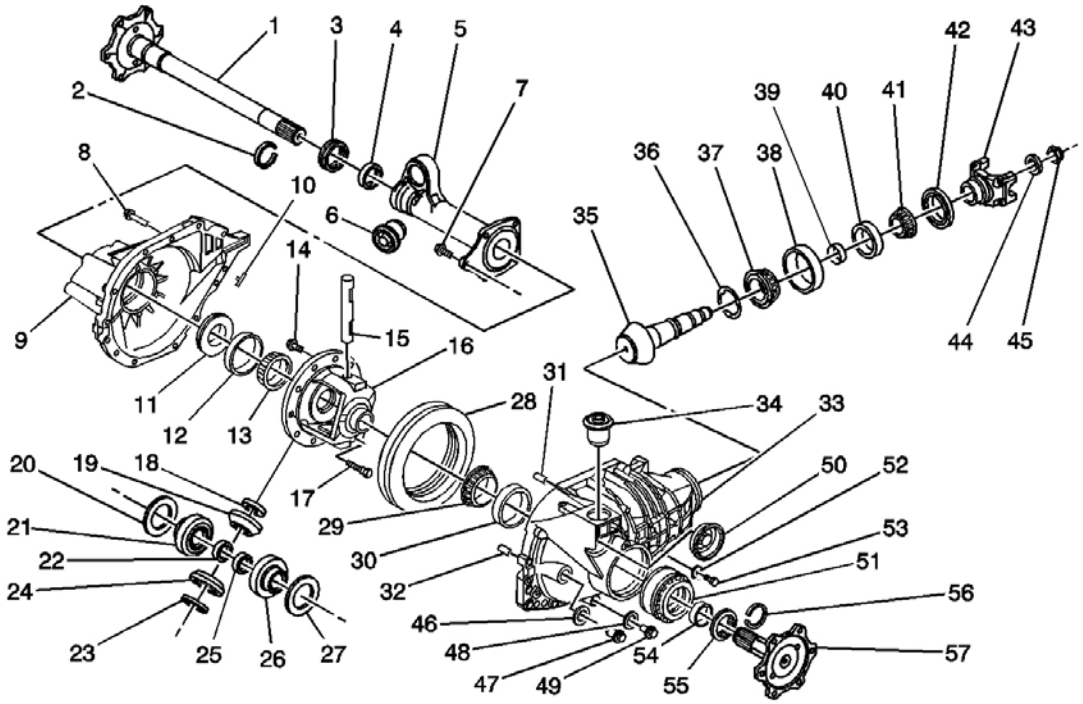


Fig. 1: Front Drive Axle Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Front Drive Axle Inner Shaft
2	Front Drive Axle Inner Shaft Retaining Ring

3	Front Drive Axle Inner Shaft Seal
4	Front Drive Axle Inner Shaft Bearing
5	Front Drive Axle Inner Shaft Housing
6	Front Drive Axle Housing Bracket Bushing
7	Front Drive Axle Inner Shaft Housing Bolt
8	Front Differential Carrier Case Bolt
9	Front Differential Carrier Case Half
10	Front Differential Bearing Adjuster Lock Pin
11	Front Differential Bearing Adjuster Nut and Sleeve
12	Front Differential Case Side Bearing Cup
13	Front Differential Case Side Bearing
14	Front Differential Ring Gear Bolt
15	Front Differential Pinion Gear Shaft
16	Front Differential Case
17	Differential Pinion Gear Shaft Lock Bolt
18	Differential Pinion Gear Thrust Washer
19	Differential Pinion Gear
20	Differential Side Gear Thrust Washer
21	Differential Side Gear
22	Front Differential Side Gear Spacer
23	Differential Pinion Gear Thrust Washer
24	Differential Pinion Gear
25	Front Differential Side Gear Spacer
26	Differential Side Gear
27	Differential Side Gear Thrust Washer
28	Front Differential Ring Gear
29	Front Differential Case Side Bearing
30	Front Differential Side Gear Bearing Cup
31	Front Differential Case Half Lock Pin
32	Front Differential Case Half Lock Pin
33	Front Differential Carrier Case Half
34	Front Differential Carrier Bushing
35	Front Differential Drive Pinion Gear
36	Front Differential Drive Pinion Gear Inner Bearing Shim
37	Front Differential Drive Pinion Inner Bearing
38	Front Differential Drive Pinion Inner Bearing Cup
39	Front Differential Drive Pinion Gear Bearing Spacer
40	Front Differential Drive Pinion Gear Outer Bearing Cup
41	Front Differential Drive Pinion Gear Outer Bearing
42	Front Differential Drive Pinion Bearing Gear Oil Seal
43	Front Differential Drive Pinion Bearing Gear Yoke

44	Front Differential Drive Pinion Bearing Gear Yoke Washer
45	Front Differential Drive Pinion Bearing Gear Yoke Nut
46	Front Differential Carrier Oil Drain Plug Washer
47	Front Differential Carrier Oil Drain Plug
48	Front Differential Carrier Oil Fill Plug Washer
49	Front Differential Carrier Oil Fill Plug
50	Front Differential Carrier Hole Plug
51	Front Differential Bearing Adjuster and O-Ring Seal
52	Front Differential Bearing Adjuster Nut Lock
53	Bolt
54	Front Drive Axle Inner Shaft Bearing
55	Front Drive Axle Inner Shaft Bearing
56	Front Drive Axle Inner Shaft Retaining Ring
57	Front Drive Axle Inner Shaft

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - FRONT DRIVE AXLE

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

SYMPTOMS - FRONT DRIVE AXLE

Before beginning diagnosis, review the system description and operation in order to familiarize yourself with the system functions. Refer to **Front Drive Axle Description and Operation** .

Noise Diagnosis

Any gear-driven unit produces a certain amount of noise that is normal and that conventional repairs or adjustment cannot eliminate. Slight noise that is heard only at a certain speed or under unusual or remote conditions is acceptable. For example, this noise tends to reach a peak at speeds from 60-100 km/h (40-60 mph) depending upon road and load conditions, or upon gear ratio and tire size. Noise of this kind does not indicate trouble in the axle assembly.

When an axle is suspected of being noisy, make a thorough test in order to determine whether the noise originates in the tires, road surface, wheel bearings, engine, transmission, propeller shaft, or axle assembly.

Classifying the Symptom

Front Drive Axle symptoms can usually be classified into the following categories:

- Leaks
- Noises
- Vibrations

Leak and noise related symptoms are diagnosed within the Front Drive Axle section. For vibration related symptoms, refer to **Diagnostic Starting Point - Vibration Diagnosis and Correction** in Vibration Diagnosis and Correction.

Visual/Physical Inspection

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

Symptoms List

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

- **Front Drive Axle Noises**
- **Noisy in Drive**
- **Noisy When Coasting**
- **Intermittent Noise**
- **Constant Noise**
- **Noisy on Turns**
- **Front Axle Lubricant Leak Diagnosis**

FRONT 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 ring and pinion gear replacement or adjustment, depending on the mileage of the gear set.

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 front axle side bearing. This noise can be confused with front wheel bearing noise. Inspect and replace the bearings and the affected components as required.

Front Wheel Bearing Noise

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

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

Knock at Low Speeds

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

Backlash Clunk

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

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

Inspect, adjust or replace the affected components as necessary.

NOISY IN DRIVE

Noisy in Drive

Checks	Action
Excessive pinion to ring gear backlash	Adjust the pinion to ring gear backlash. Refer to **Backlash Inspection and Adjustment** .
Worn pinion and ring gear	Replace the pinion and the ring gear. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Differential Case Assembly Disassemble** • **Differential Case Assembly Assemble**

	• **Pinion Bearing Cup Installation** • **Differential Carrier Assembly - Assemble**
Worn pinion bearings	Replace the pinion bearings. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Pinion Bearing Cup Installation** • **Differential Carrier Assembly - Assemble**
Loose pinion bearings	Adjust the pinion bearings preload. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Differential Carrier Assembly - Assemble** • **Backlash Inspection and Adjustment**
Excessive pinion end play	Adjust the pinion end play. Refer to **Differential Carrier Assembly - Assemble** .
Worn differential bearings	Replace the differential bearings. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Differential Case Assembly Disassemble** • **Differential Case Assembly Assemble** • **Differential Carrier Assembly - Assemble**
Loose differential bearings	Adjust the differential bearing preload. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Differential Carrier Assembly - Assemble**
Excessive ring gear runout	Replace the ring gear. Perform the following procedures: • **Differential Carrier Assembly - Disassemble** • **Differential Carrier Assembly - Assemble**
Low oil level	Fill the fluid level to specifications with the proper lubricant. Refer to **Lubricant Level Inspection - Front Drive Axle** .
Wrong or poor grade oil	Drain and refill the system with the proper lubricant. Refer to **Lubricant Replacement - Front Drive Axle** .

NOISY WHEN COASTING

Noisy When Coasting

Checks	Action
DEFINITION: Noise is audible when slowing down and disappears when driving.	
Worn pinion and ring gear	Adjust or replace the pinion and the ring gear. Refer to **Differential Carrier Assembly - Disassemble** .
Pinion and ring gear too tight	Adjust the pinion and the ring gear backlash. Refer to **Backlash Inspection and Adjustment** .

INTERMITTENT NOISE

Intermittent Noise

Checks	Action
Warped ring gear	Replace the ring gear. Refer to **Differential Carrier Assembly - Disassemble** .
Loose differential case assembly	Set the differential case assembly to the proper preload and backlash. Refer to **Differential Carrier Assembly - Assemble** and **Backlash Inspection and Adjustment** .

CONSTANT NOISE

Constant Noise

Checks	Action
Flat spot on the pinion or the ring gear teeth	Replace the pinion and the ring gear. Refer to **Differential Carrier Assembly - Disassemble** .
Flat spot on the pinion bearing	Replace the bearing. Refer to **Differential Carrier Assembly - Disassemble** .
Worn pinion splines	Replace the pinion. Refer to **Differential Carrier Assembly - Disassemble** .

NOISY ON TURNS

Noisy on Turns

Checks	Action
Worn differential side gears and pinions	Replace the differential side gears and pinions. Refer to **Differential Case Assembly Disassemble** .
Worn differential spider	Replace the spine gears. Refer to **Differential Case Assembly Disassemble** .
Worn axle shaft splines	Replace the axle shaft. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .

WHEEL BEARING WEAR - FRONT DRIVE AXLE (TAPERED)

Tapered Roller Bearing Diagnosis

Consider the following factors when diagnosing bearing condition:

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

Abrasive Roller Wear

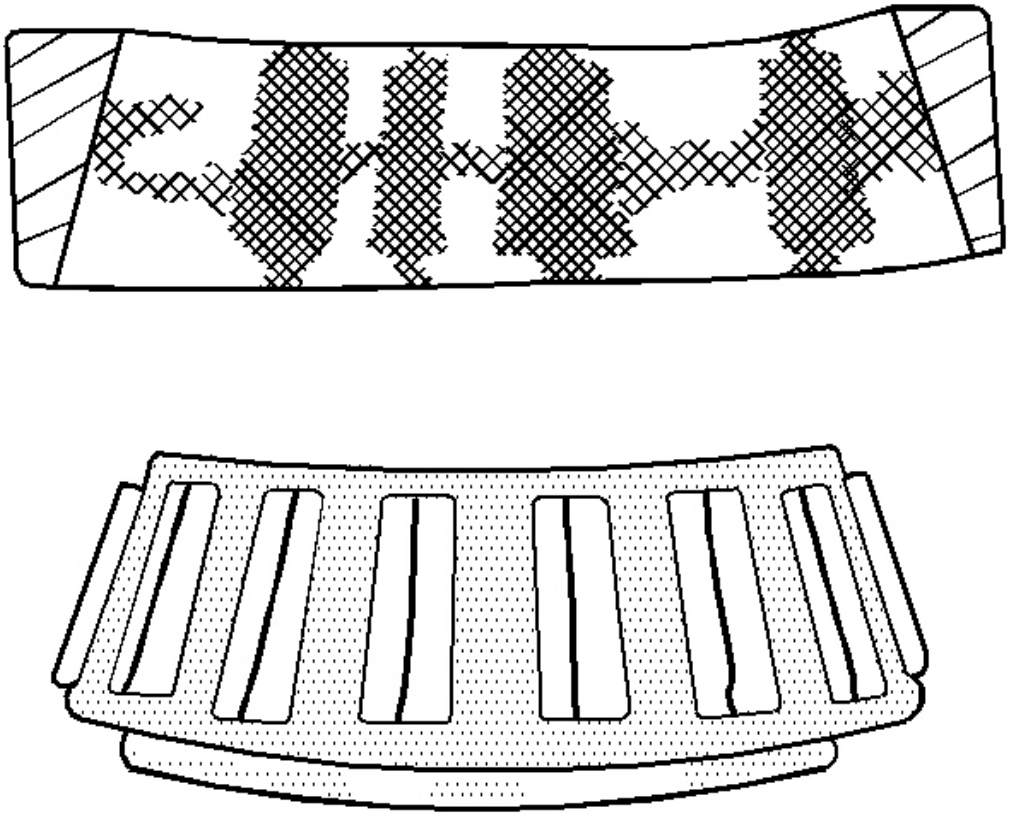


Fig. 2: Abrasive Roller Wear
Courtesy of GENERAL MOTORS CORP.

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

Abrasive Step Wear

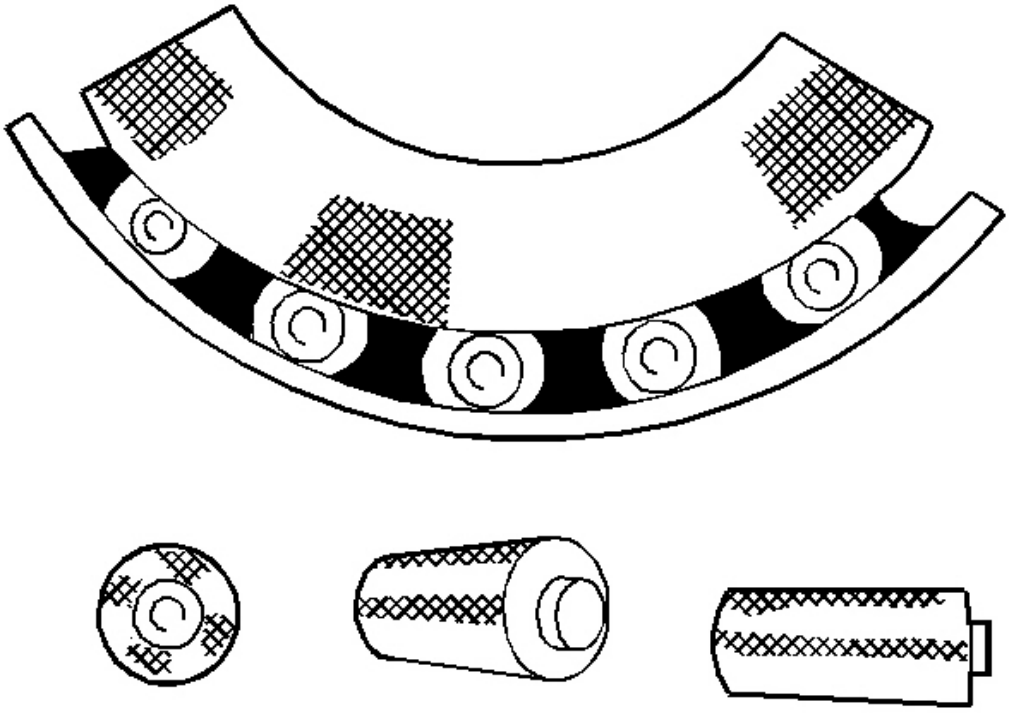


Fig. 3: Abrasive Step Wear
Courtesy of GENERAL MOTORS CORP.

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

Galling

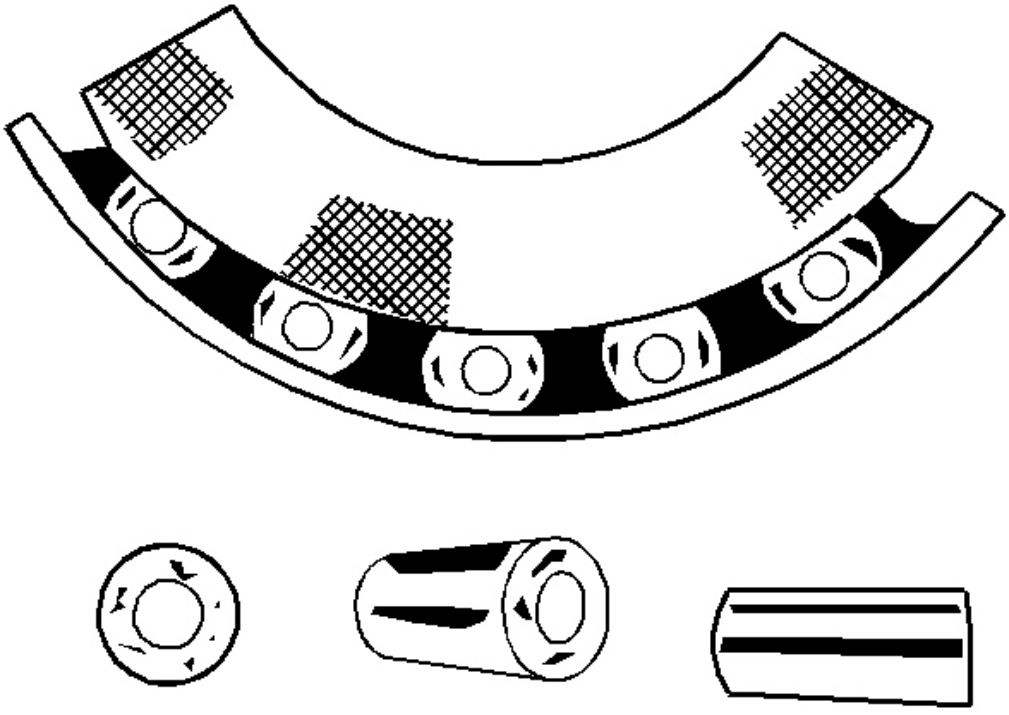


Fig. 4: Galling
Courtesy of GENERAL MOTORS CORP.

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

Etching

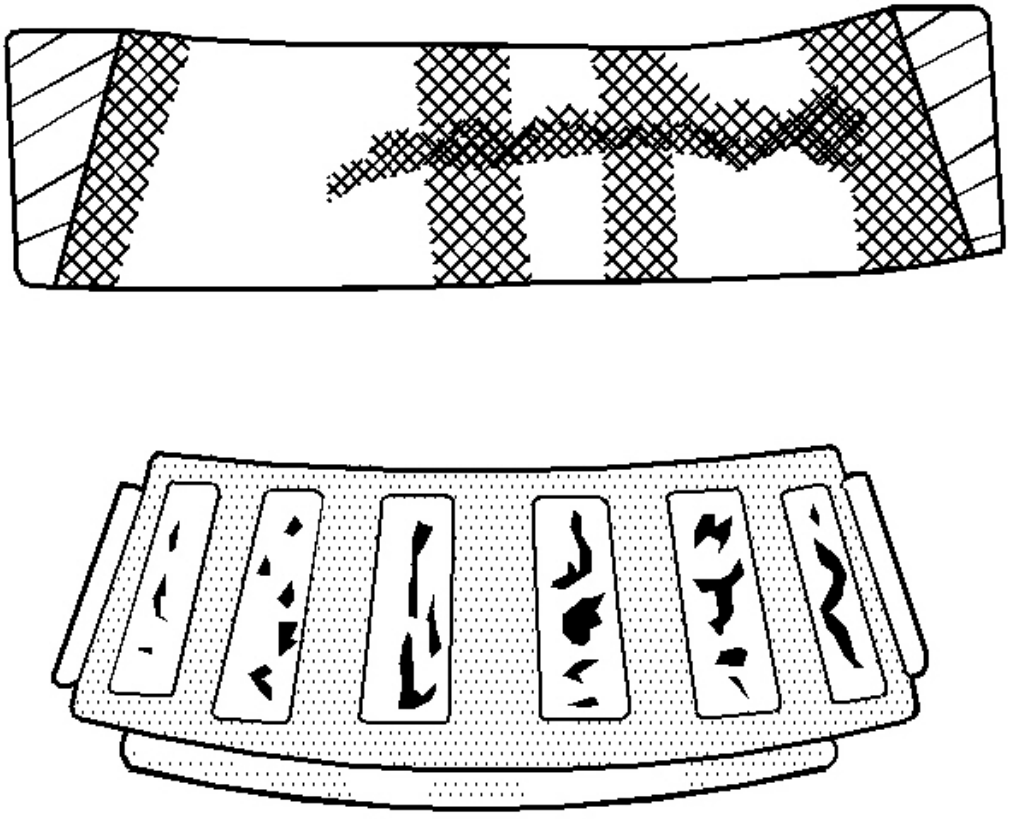


Fig. 5: Etching
Courtesy of GENERAL MOTORS CORP.

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

Bent Cage

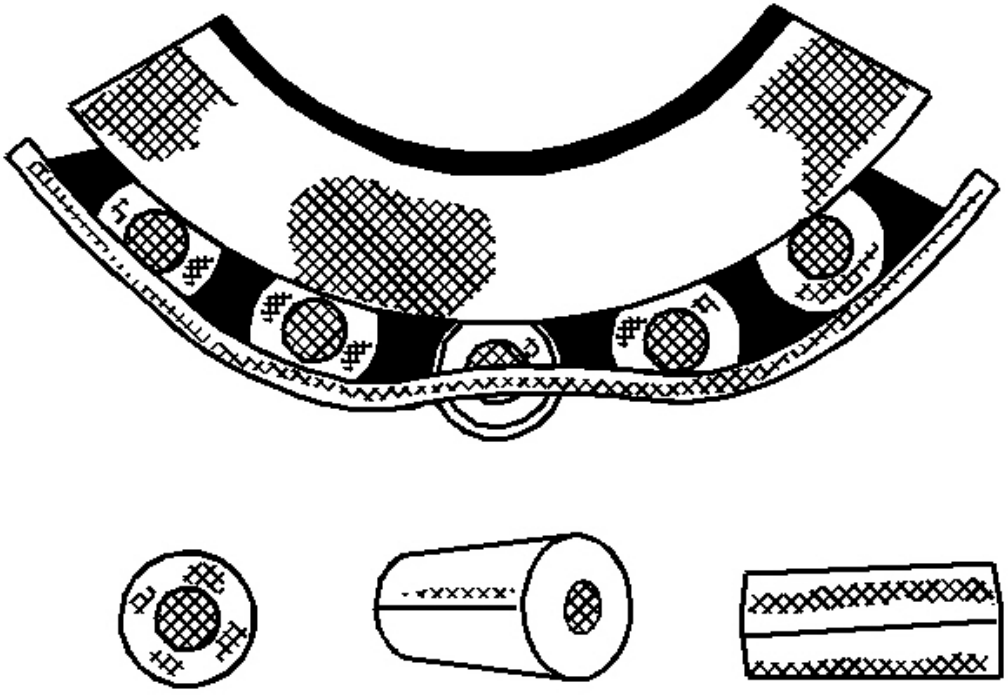


Fig. 6: Bent Cage
Courtesy of GENERAL MOTORS CORP.

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

Cage Wear

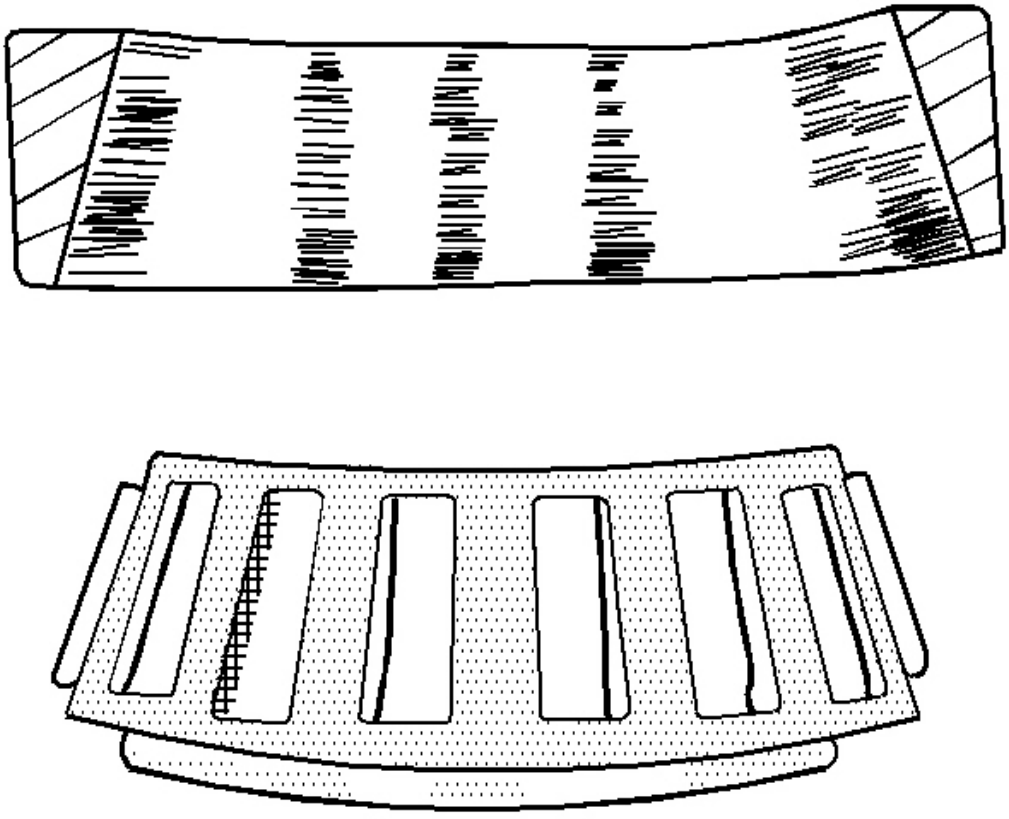


Fig. 7: Cage Wear
Courtesy of GENERAL MOTORS CORP.

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

Indentations

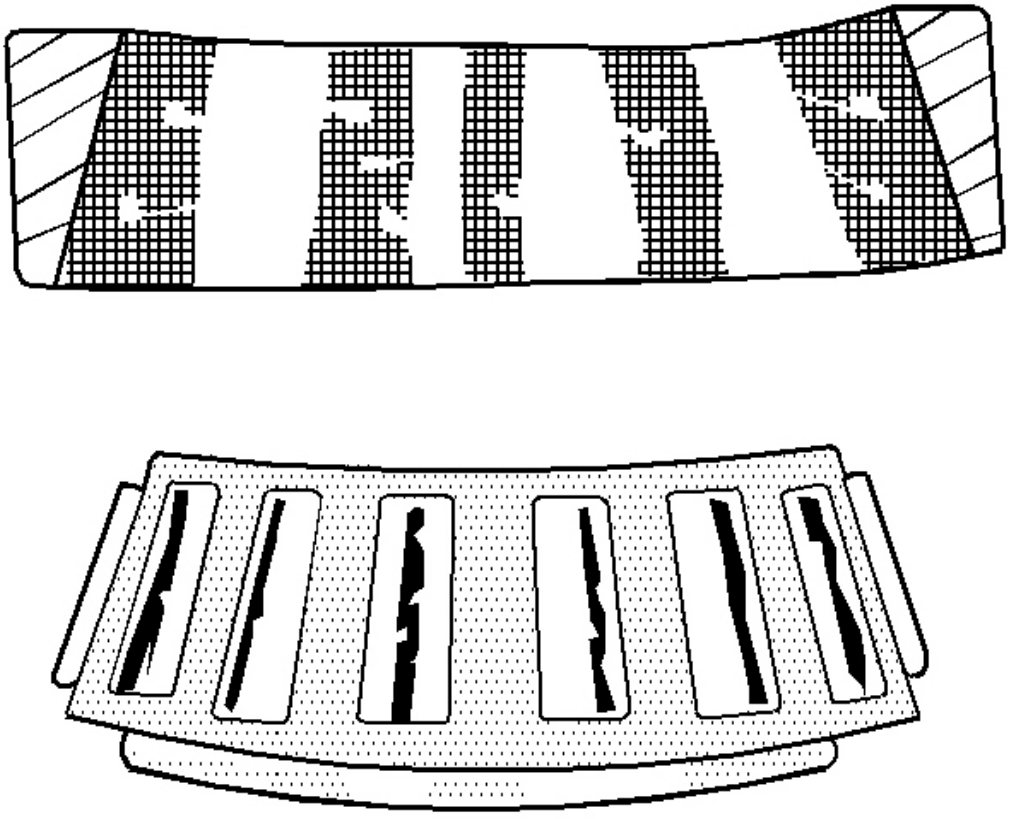


Fig. 8: Damaged Areas
Courtesy of GENERAL MOTORS CORP.

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

Frettage

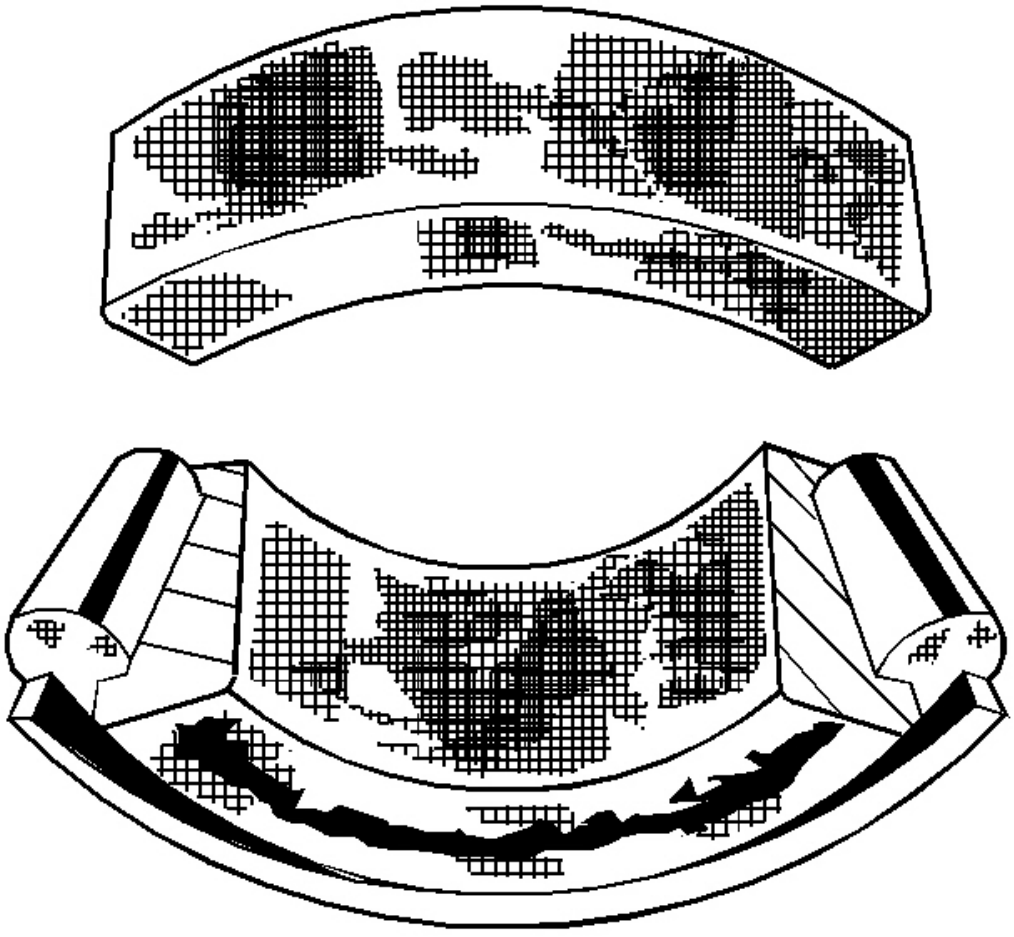


Fig. 9: Frettage
Courtesy of GENERAL MOTORS CORP.

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

Smears

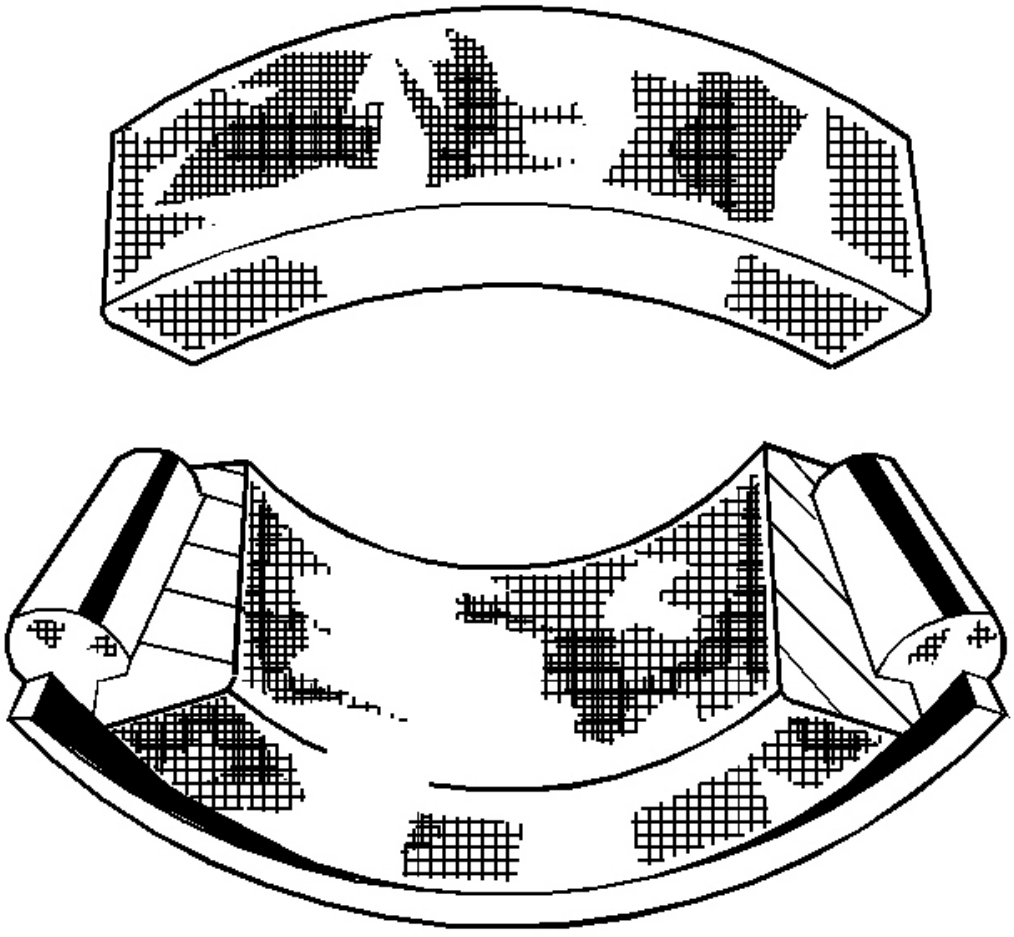


Fig. 10: Smears
Courtesy of GENERAL MOTORS CORP.

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

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

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

Stain Discoloration

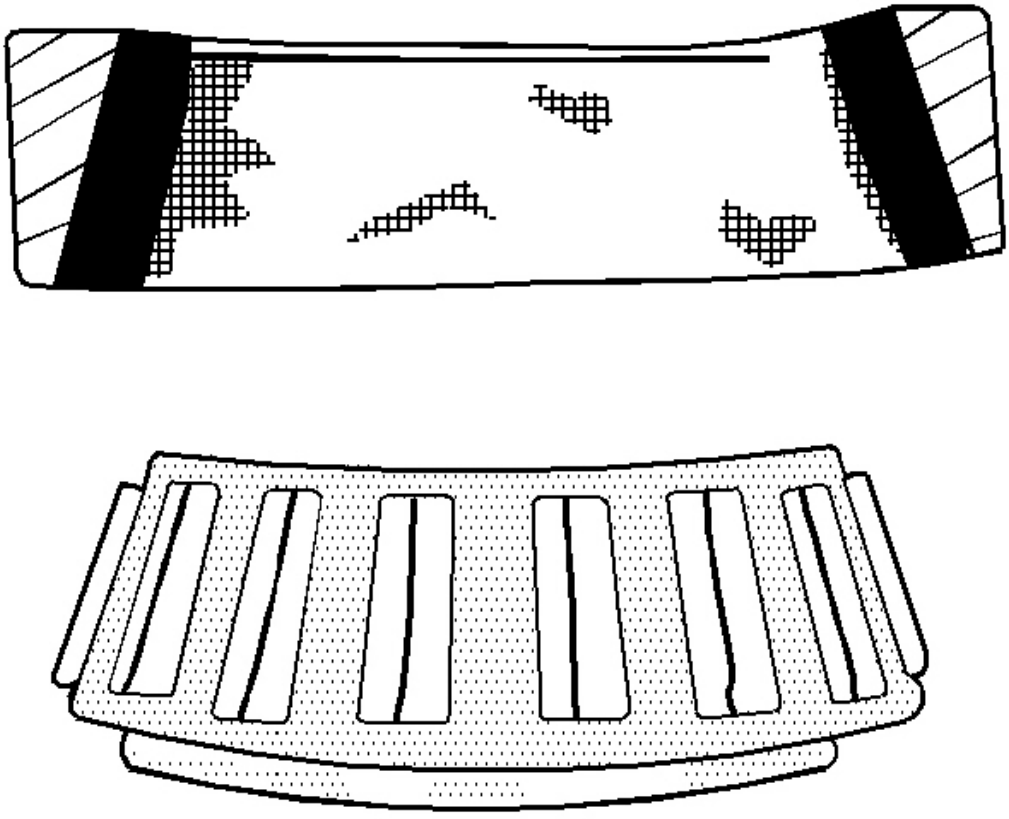


Fig. 11: Stain Discoloration
Courtesy of GENERAL MOTORS CORP.

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

Heat Discoloration

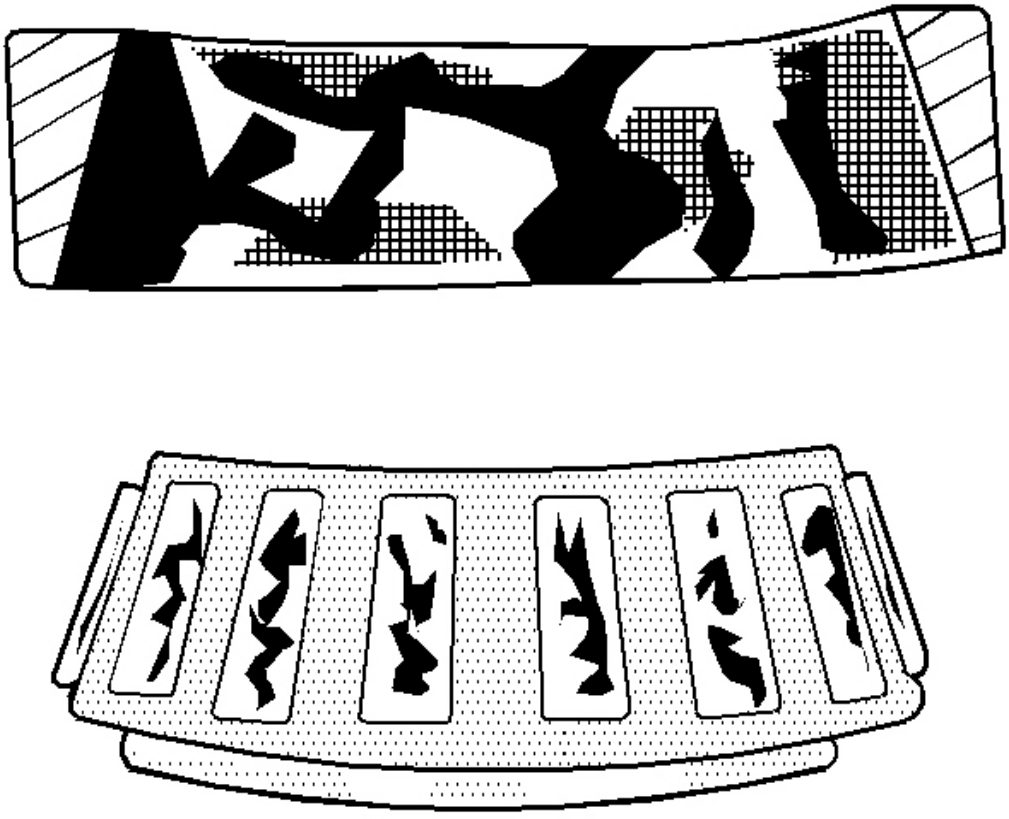


Fig. 12: Heat Discoloration
Courtesy of GENERAL MOTORS CORP.

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

Misalignment

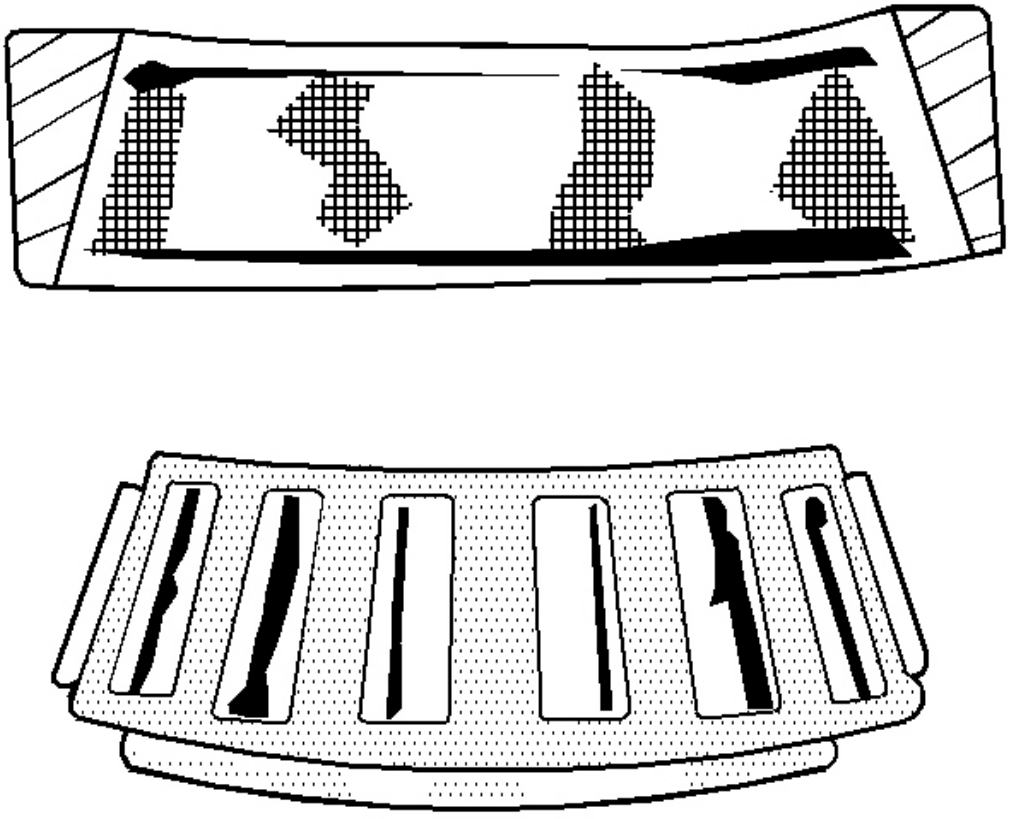


Fig. 13: Misalignment
Courtesy of GENERAL MOTORS CORP.

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

Cracked Inner Race

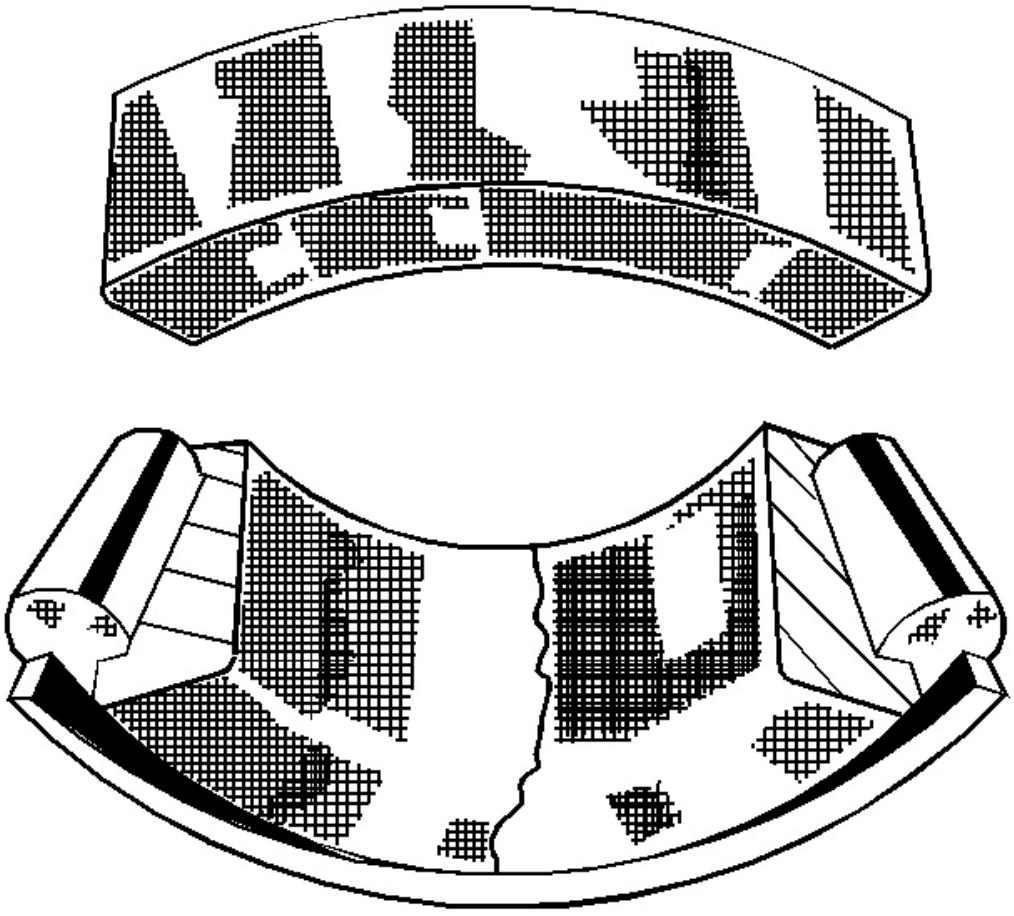


Fig. 14: Cracked Inner Race
Courtesy of GENERAL MOTORS CORP.

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

Fatigue Spalling

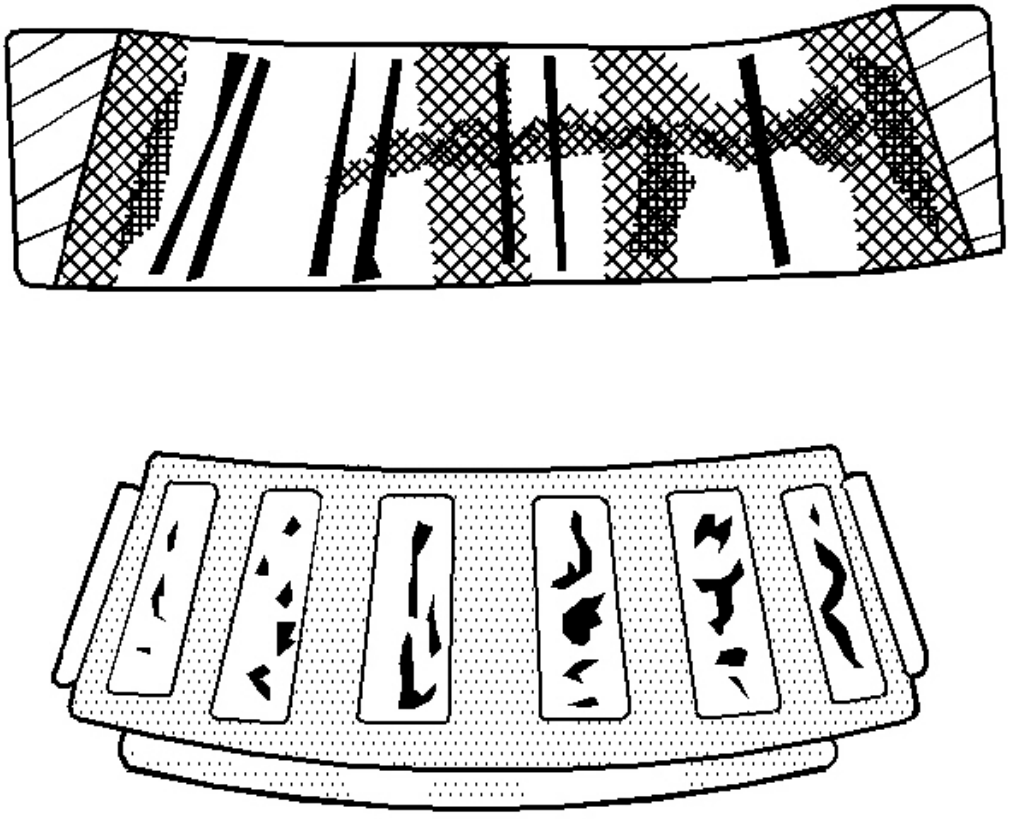


Fig. 15: Fatigue Spalling
Courtesy of GENERAL MOTORS CORP.

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

Brinelling

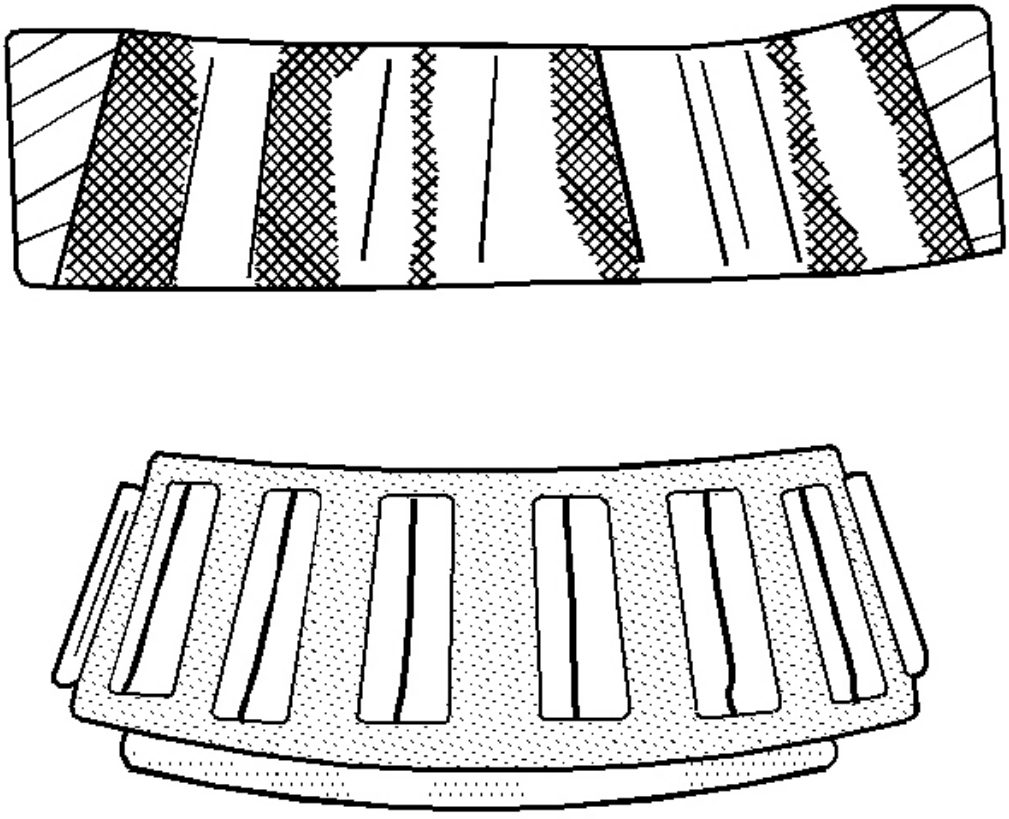


Fig. 16: Brinelling
Courtesy of GENERAL MOTORS CORP.

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

WHEEL BEARING WEAR - FRONT DRIVE AXLE (STRAIGHT)

Straight Roller Bearing Diagnosis

Consider the following factors when diagnosing a bearing condition:

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

Wear (Minor)

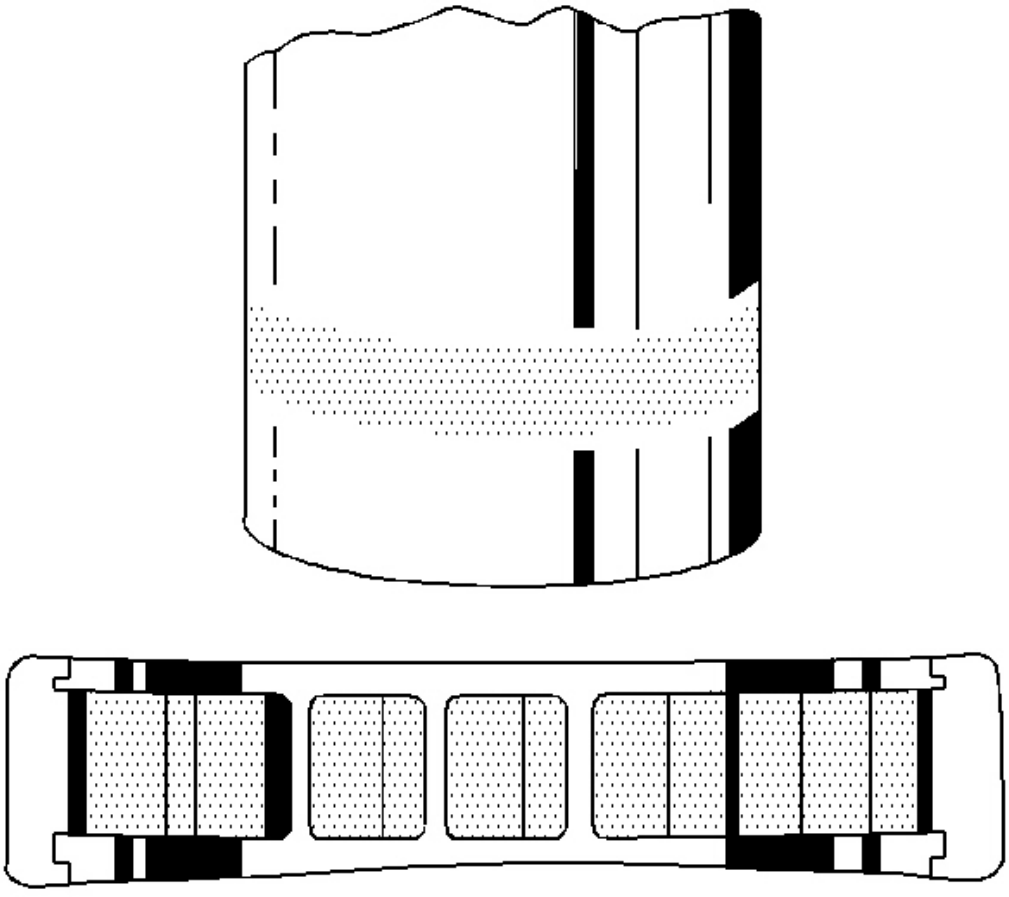


Fig. 17: Minor Wear
Courtesy of GENERAL MOTORS CORP.

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

Wear (Major)

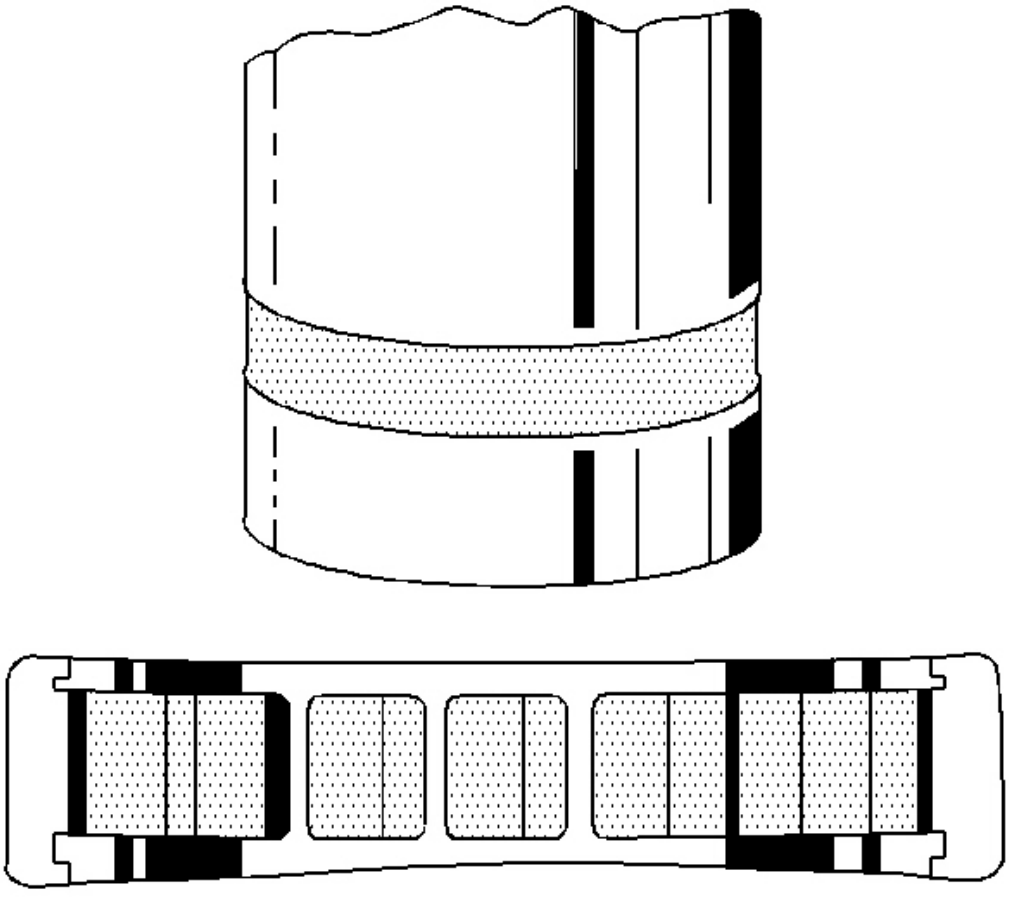


Fig. 18: Major Wear
Courtesy of GENERAL MOTORS CORP.

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

Brinelling

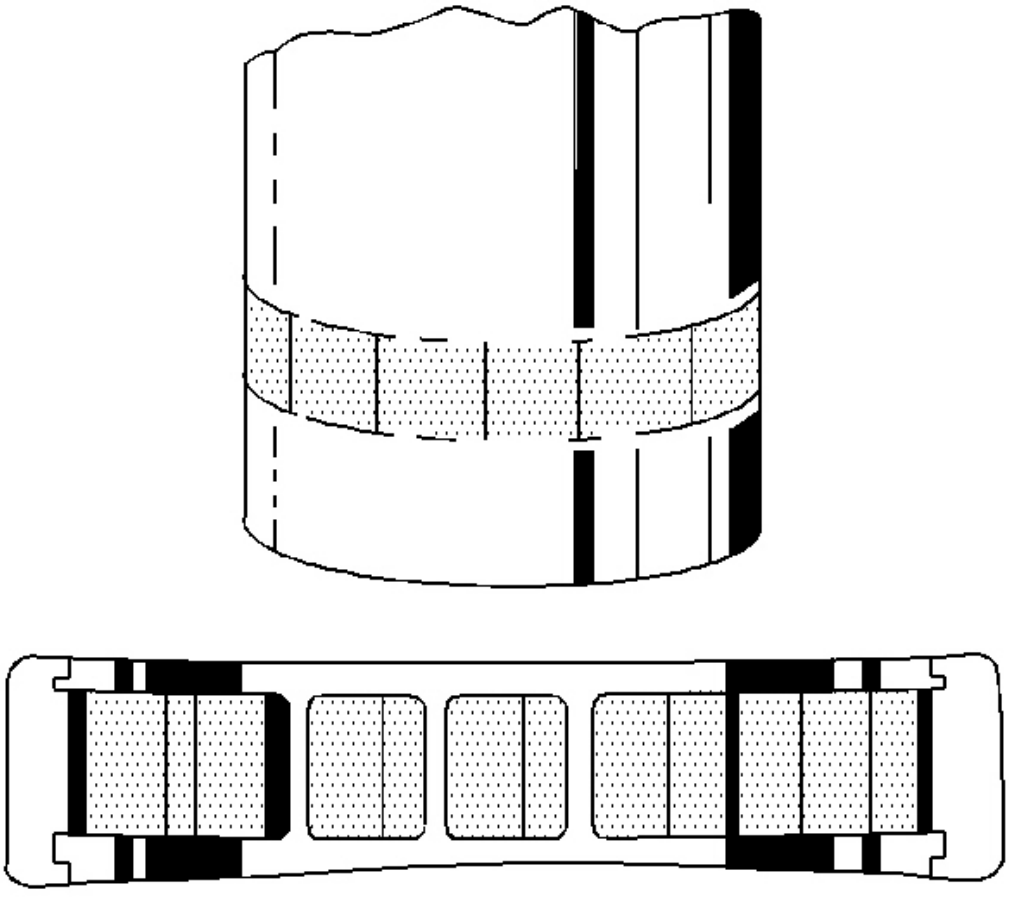


Fig. 19: Brinelling
Courtesy of GENERAL MOTORS CORP.

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

Indentations

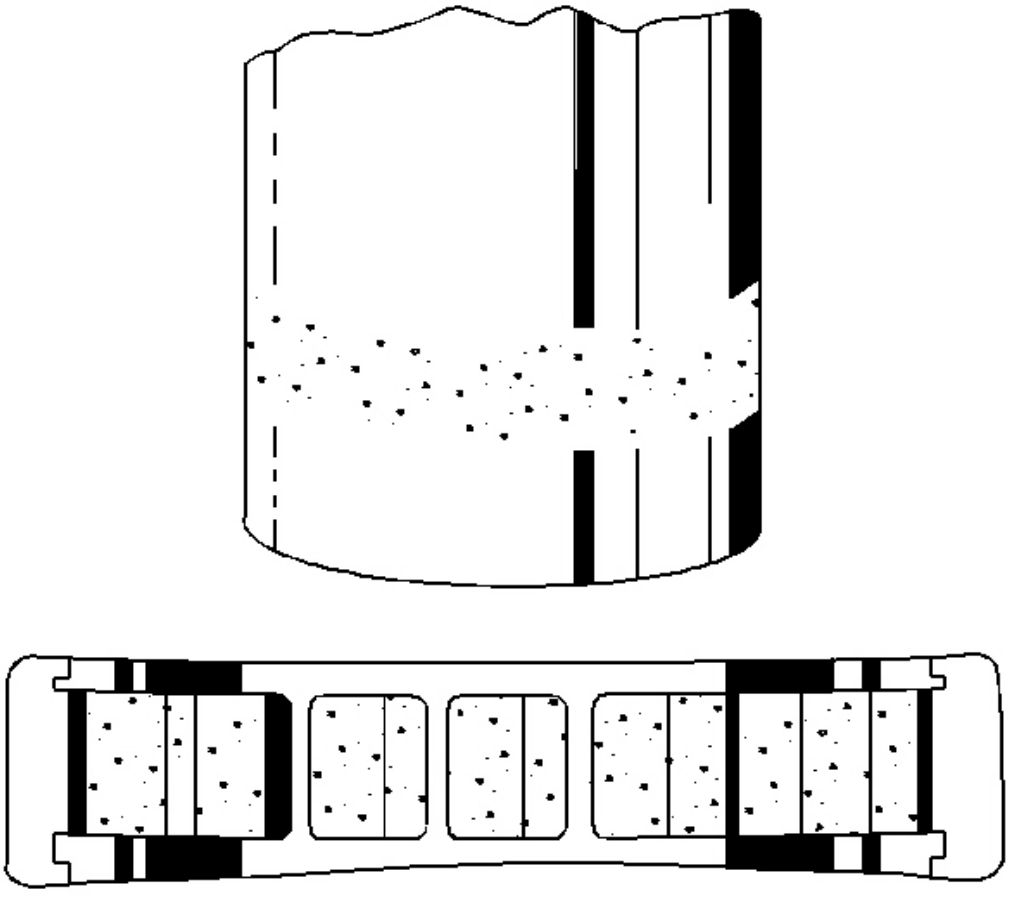


Fig. 20: Indentations
Courtesy of GENERAL MOTORS CORP.

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

Single Edge Pitting

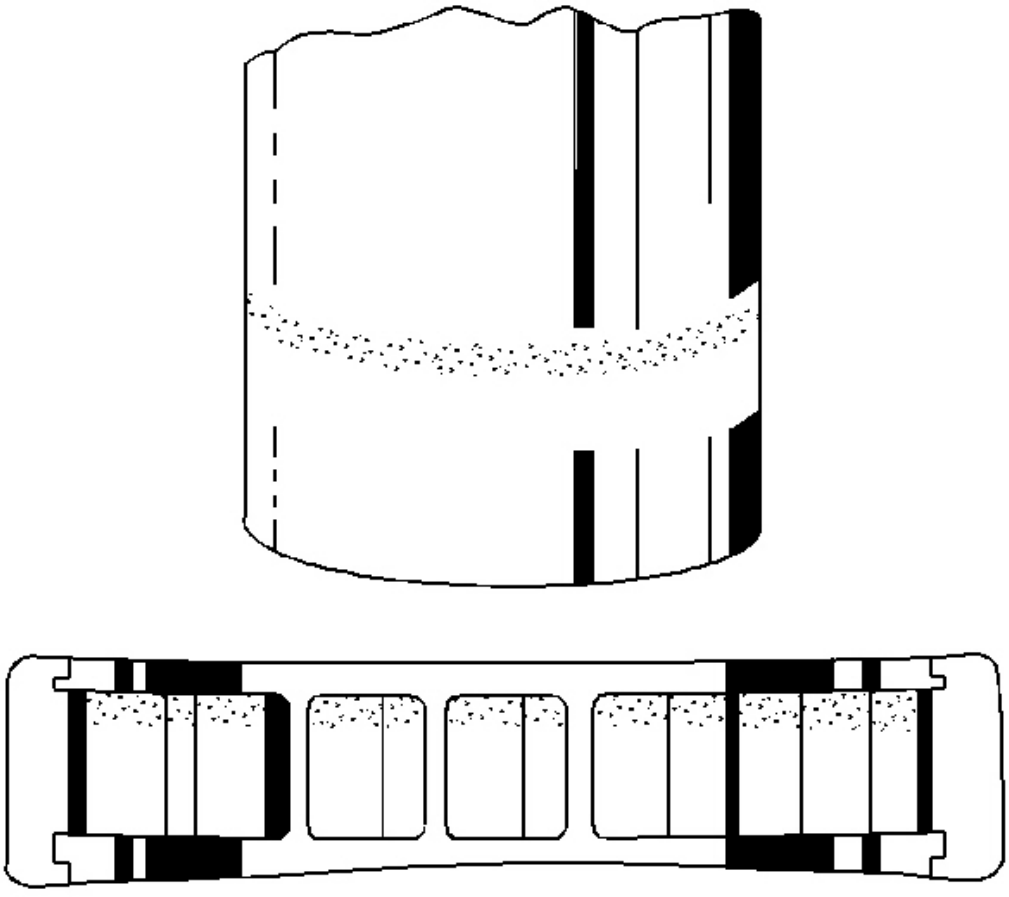


Fig. 21: Single Edge Pitting
Courtesy of GENERAL MOTORS CORP.

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

Double Edge Pitting

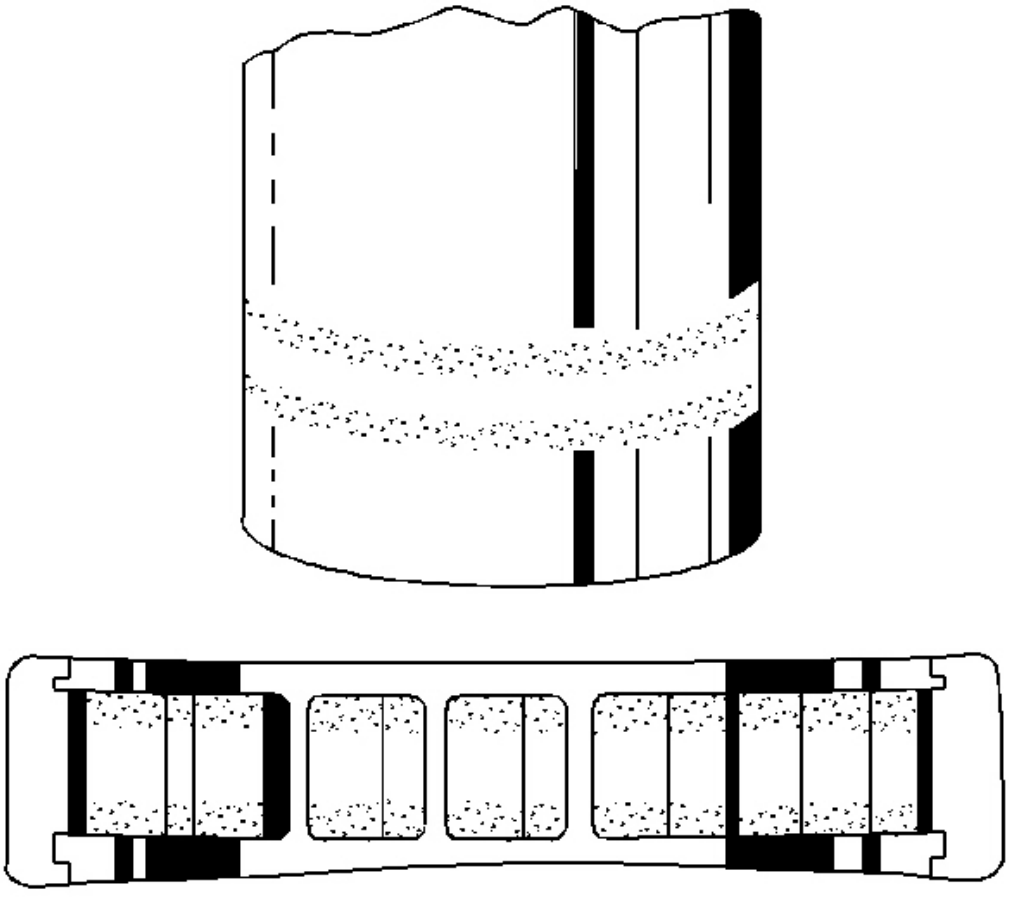


Fig. 22: Double Edge Pitting
Courtesy of GENERAL MOTORS CORP.

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

Misalignment

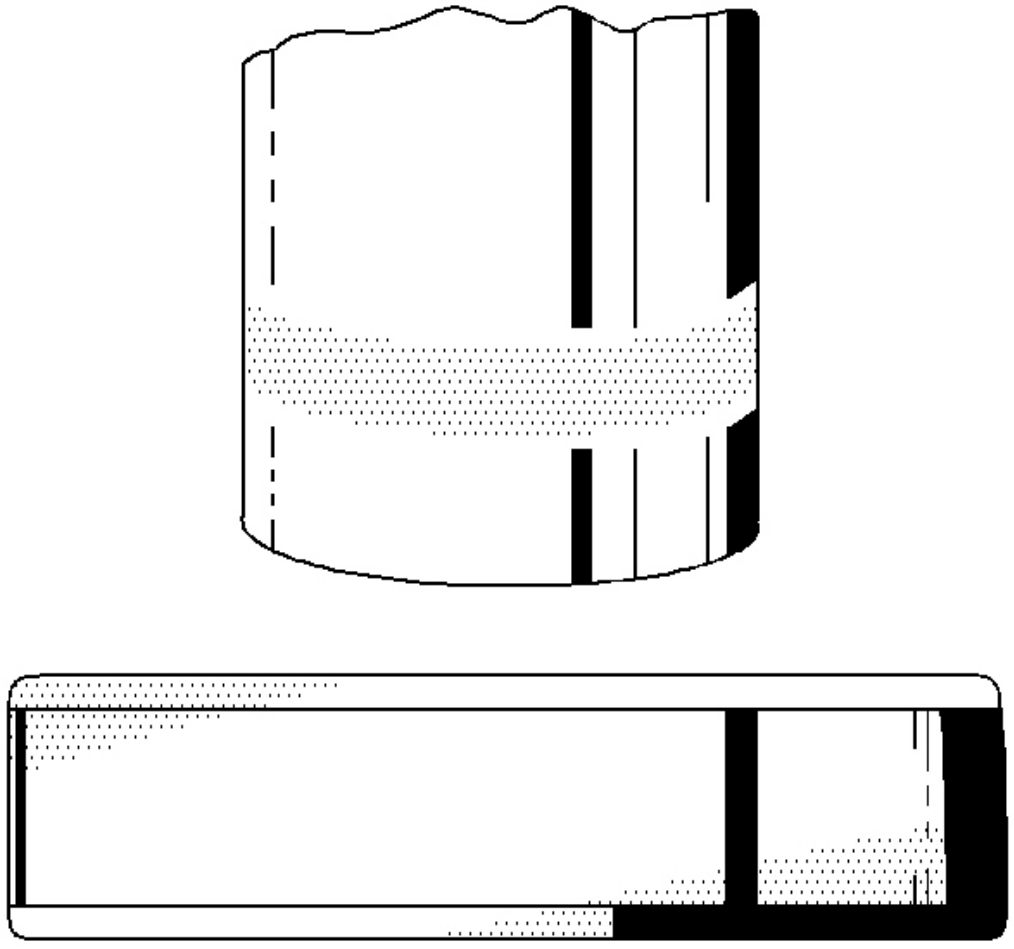


Fig. 23: Misalignment
Courtesy of GENERAL MOTORS CORP.

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

Frettage

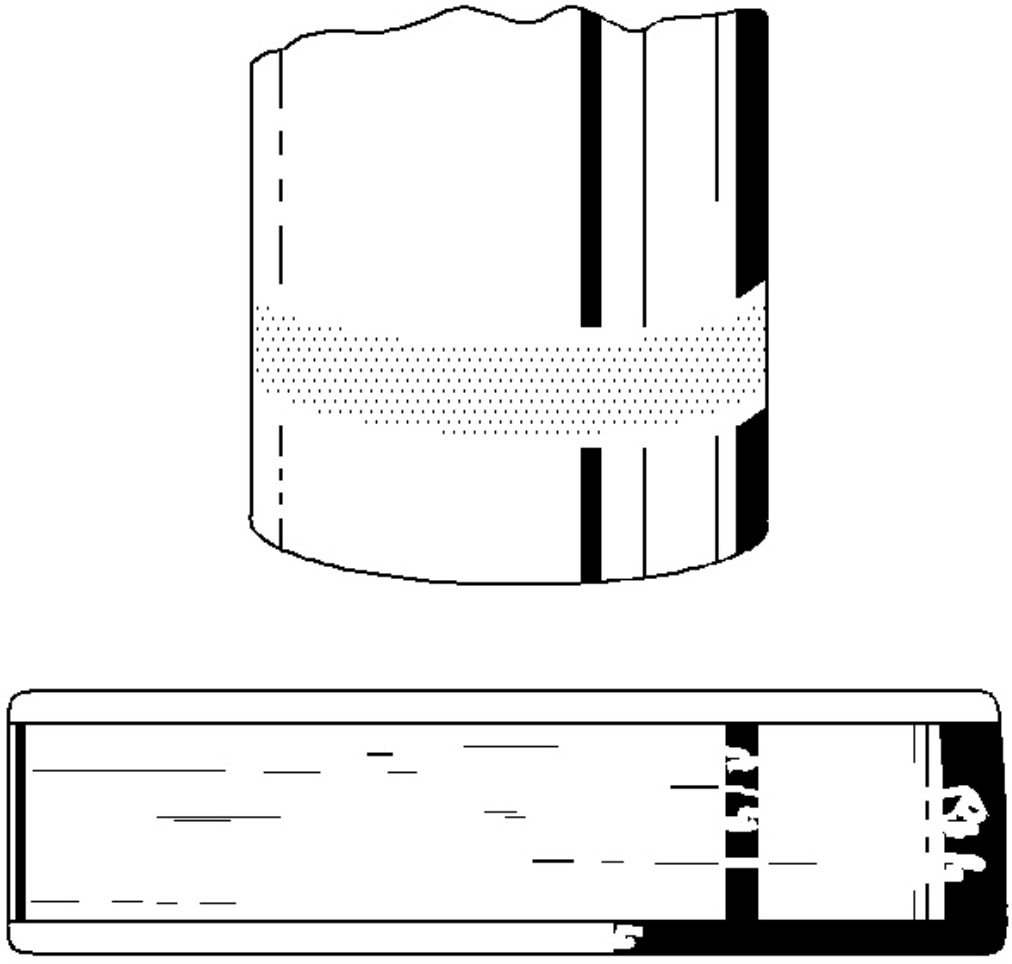


Fig. 24: Frettage
Courtesy of GENERAL MOTORS CORP.

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

Smears

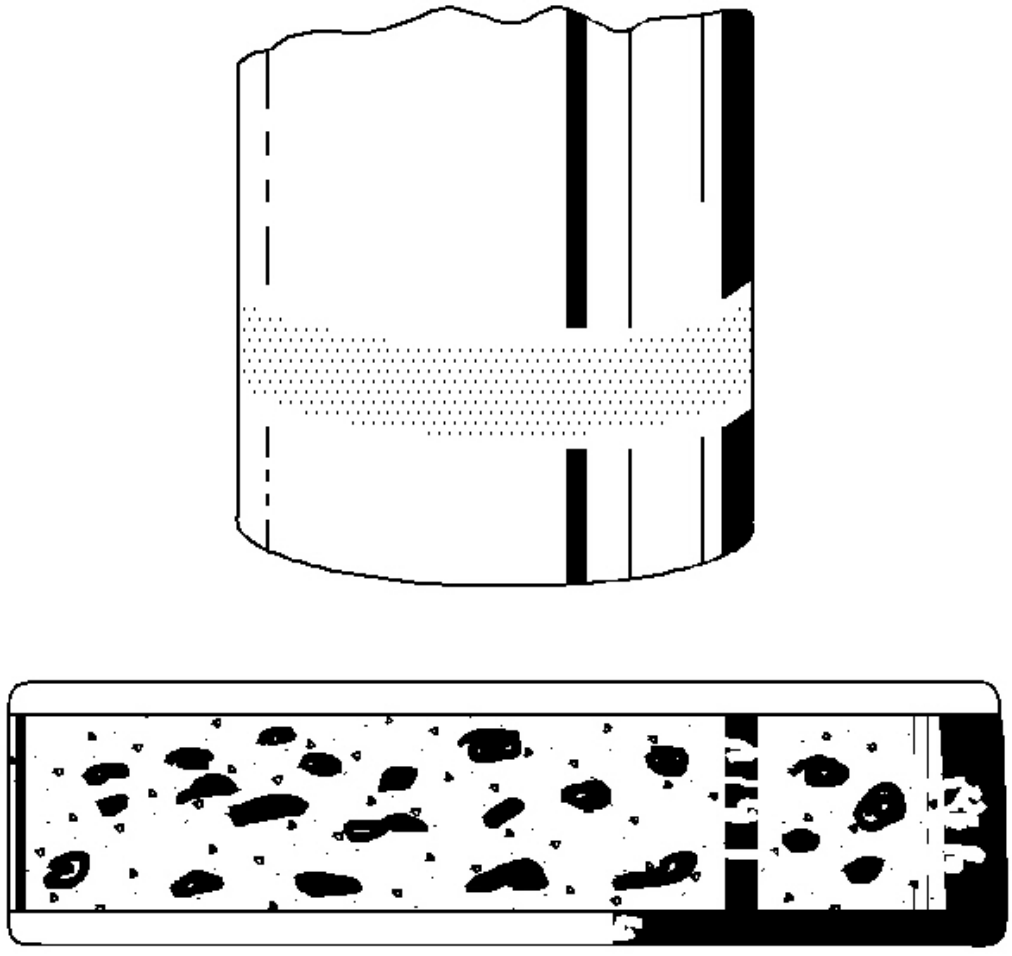


Fig. 25: Smears
Courtesy of GENERAL MOTORS CORP.

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

FRONT AXLE LUBRICANT LEAK DIAGNOSIS

Front axle lubricant leaks can occur at the following locations:

- Axle shaft oil seals
- Differential carrier assembly mating surface

- Drain plug
- Fill plug
- Inner axle tube assembly to differential carrier assembly mating surface
- Pinion yoke oil seal
- Vent tube

Determining the Cause

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

Oil Seals

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

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

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

Sealing Surfaces

Front axles components are assembled using specific sealers. A leak at a surface sealed with sealant is usually caused by a poor fit of the components but can also be caused by the use of the wrong sealant. When correcting a sealant leak, inspect each component for distortion and for nicks or gouges that may prohibit the sealant from sealing properly and when re-assembling the component, use the proper sealant.

Differential Carrier Assembly

Lubricant leaks at the differential carrier assembly can occur at the following locations:

- Drain Plug
- Fill Plug
- Vent tube

Drain and fill plug leaks are usually caused by a loose plug. A vent tube leak can be cause by a loose fitting vent hose or by a vent tube assembly whose interior shield is stuck in the upside down position. Inspect the vent plug's interior shield for unrestricted movement, repair or replace the plug as necessary. Drain or fill plug leaks can be repaired by either tightening the plug or by using an approved sealer on the threads on the plug.

REPAIR INSTRUCTIONS

LUBRICANT LEVEL INSPECTION - FRONT DRIVE AXLE

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Make sure the vehicle is level.
3. Inspect the front axle for leaks. Repair as necessary.
4. Remove the engine protection shield (if equipped). Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
5. Clean the area around the front axle fill plug (1).

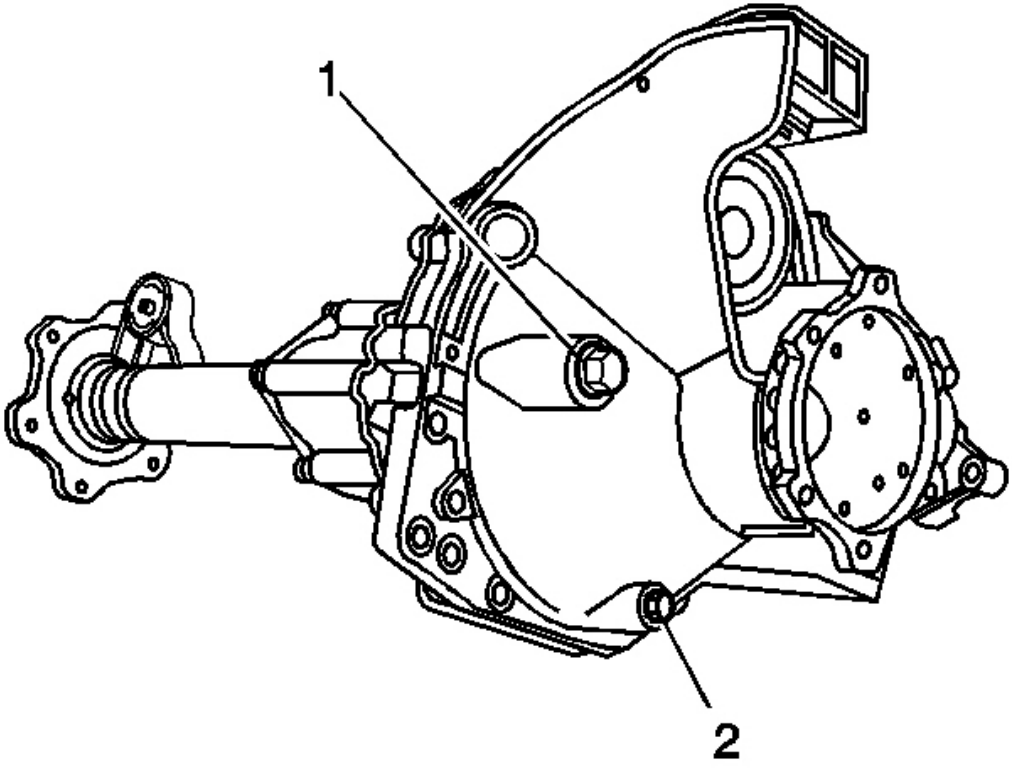


Fig. 26: Front Drive Axle Fill & Drain Plug

Courtesy of GENERAL MOTORS CORP.

6. Remove the front axle fill plug (1).
7. Inspect the oil level.

   Specification: The oil level should be between 0-10 mm (0-0.375 in) below the fill plug opening.

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

   NOTE: Refer to Fastener Notice in Cautions and Notices.

9. Install the fill plug.

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

10. Install the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
11. Lower the vehicle.

LUBRICANT REPLACEMENT - FRONT DRIVE AXLE

Removal Procedure

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

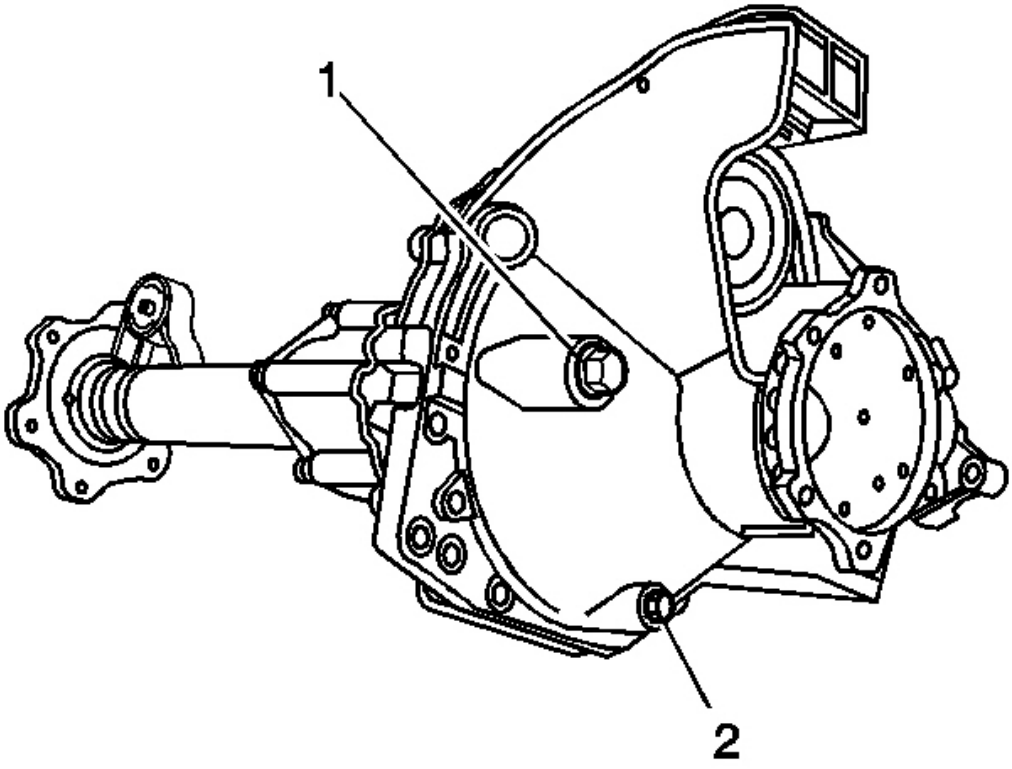


Fig. 27: Front Drive Axle Fill & Drain Plug
Courtesy of GENERAL MOTORS CORP.

2. Remove the front differential carrier shield, if equipped. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
3. Clean the area around the front axle fill plug and the drain plug.
4. Remove the fill plug (1).
5. Remove the drain plug (2).
6. Drain the fluid from the front axle differential.

Installation Procedure

NOTE: Refer to Fastener Notice in Cautions and Notices.

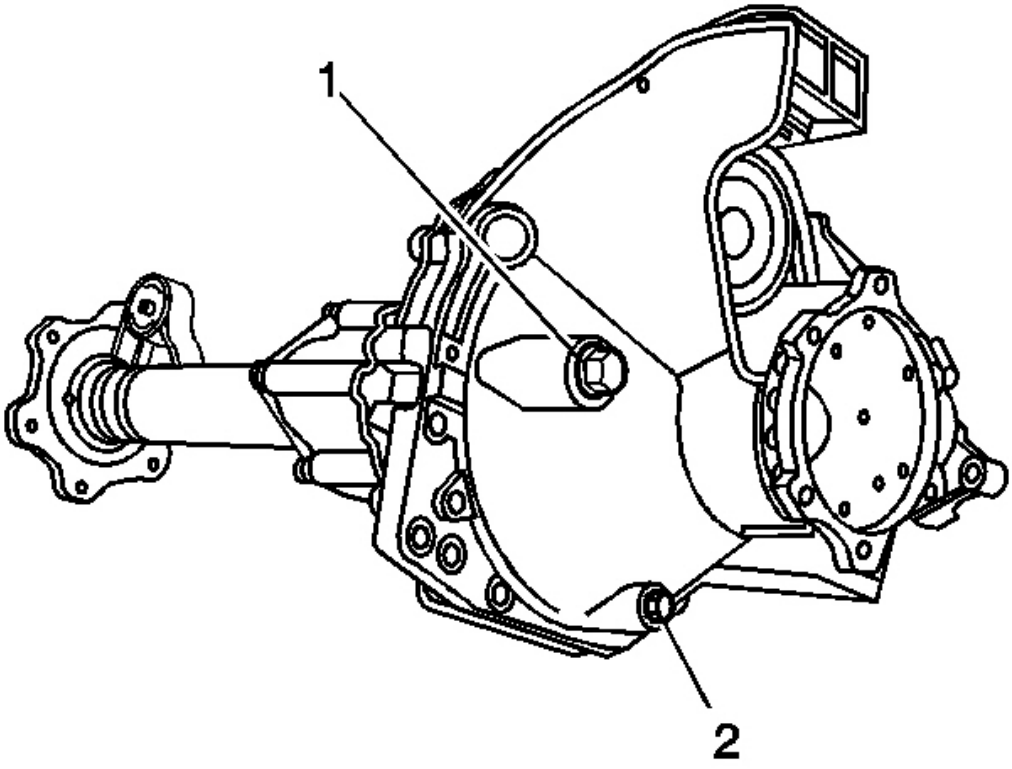


Fig. 28: Front Drive Axle Fill & Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Install the drain plug (2).

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

2. Fill the front differential with lubricant. Use the proper fluid. Refer to **Capacities - Approximate Fluid** and **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.
3. Install the fill plug (1).

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

4. Install the front differential carrier shield, if equipped. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
5. Lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY HOLE PLUG REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer **Lifting and Jacking the Vehicle** in General Information.
2. Turn the front wheels to the left in order to provide access to the left side of the differential carrier assembly.

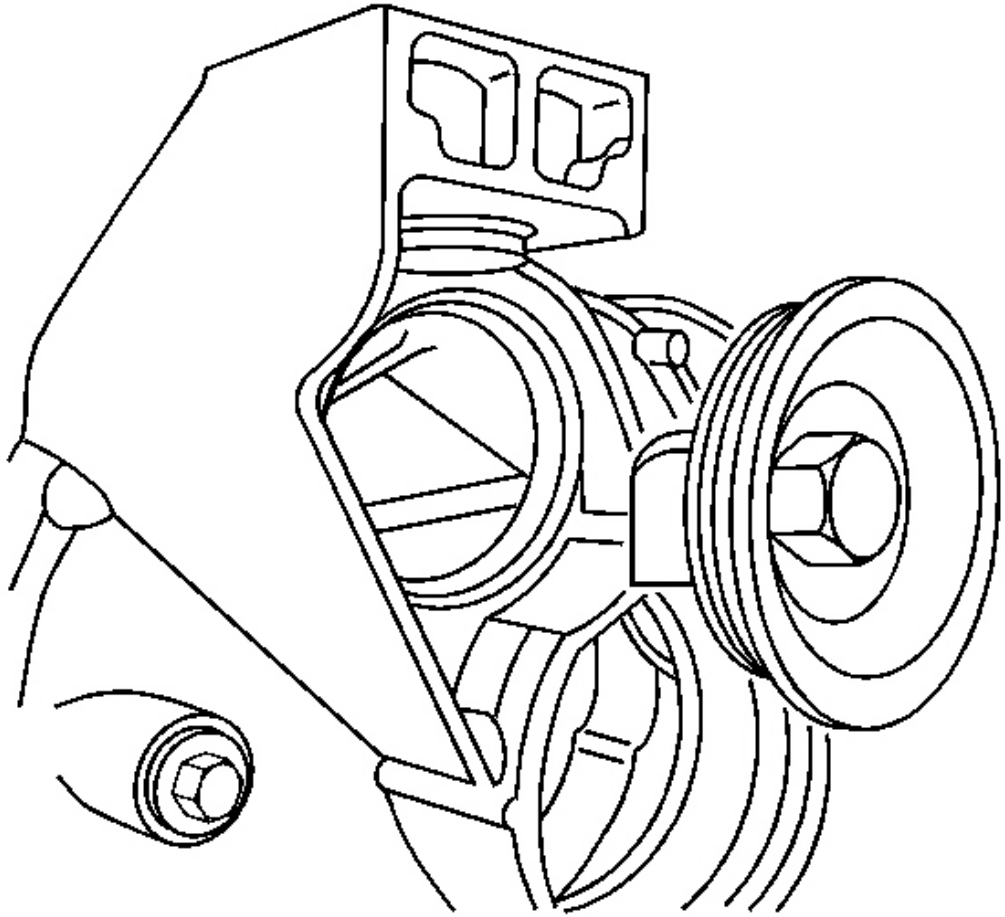


Fig. 29: Differential Carrier Assembly & Hole Plug
Courtesy of GENERAL MOTORS CORP.

3. Remove the differential carrier assembly hole plug from the differential carrier assembly.

Installation Procedure

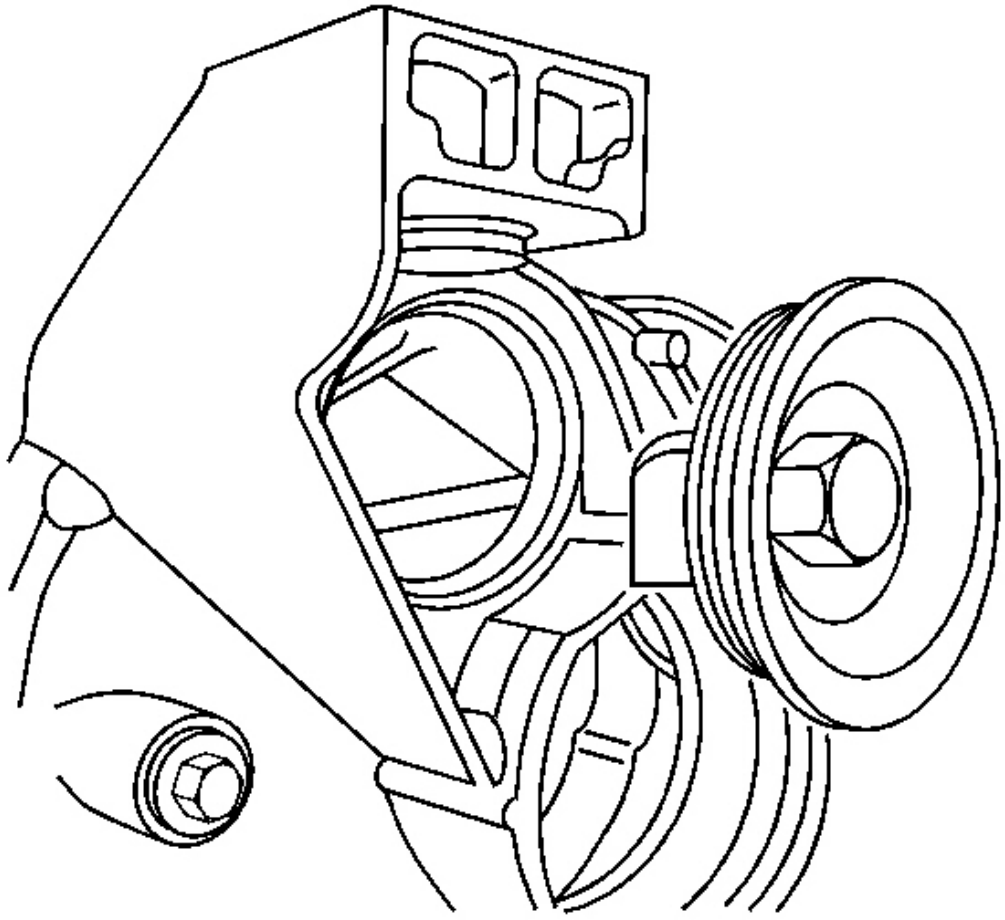


Fig. 30: Differential Carrier Assembly & Hole Plug
Courtesy of GENERAL MOTORS CORP.

1. Install the differential carrier assembly hole plug into the differential carrier assembly.

   Apply a small amount of sealer GM P/N 12346004 (Canadian P/N 10953480) or equivalent onto the threads.

   NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Tighten the differential carrier assembly hole plug.

   Tighten: Tighten the differential carrier assembly hole plug to 28 N.m (21 lb ft).

3. Turn the front wheels to the straight ahead position.
4. Lower the vehicle.

VENT HOSE REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the front differential carrier shield, if equipped. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.

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

3. Remove the vent hose (1) from the wiring bundle.
4. Remove the vent hose from the clip.

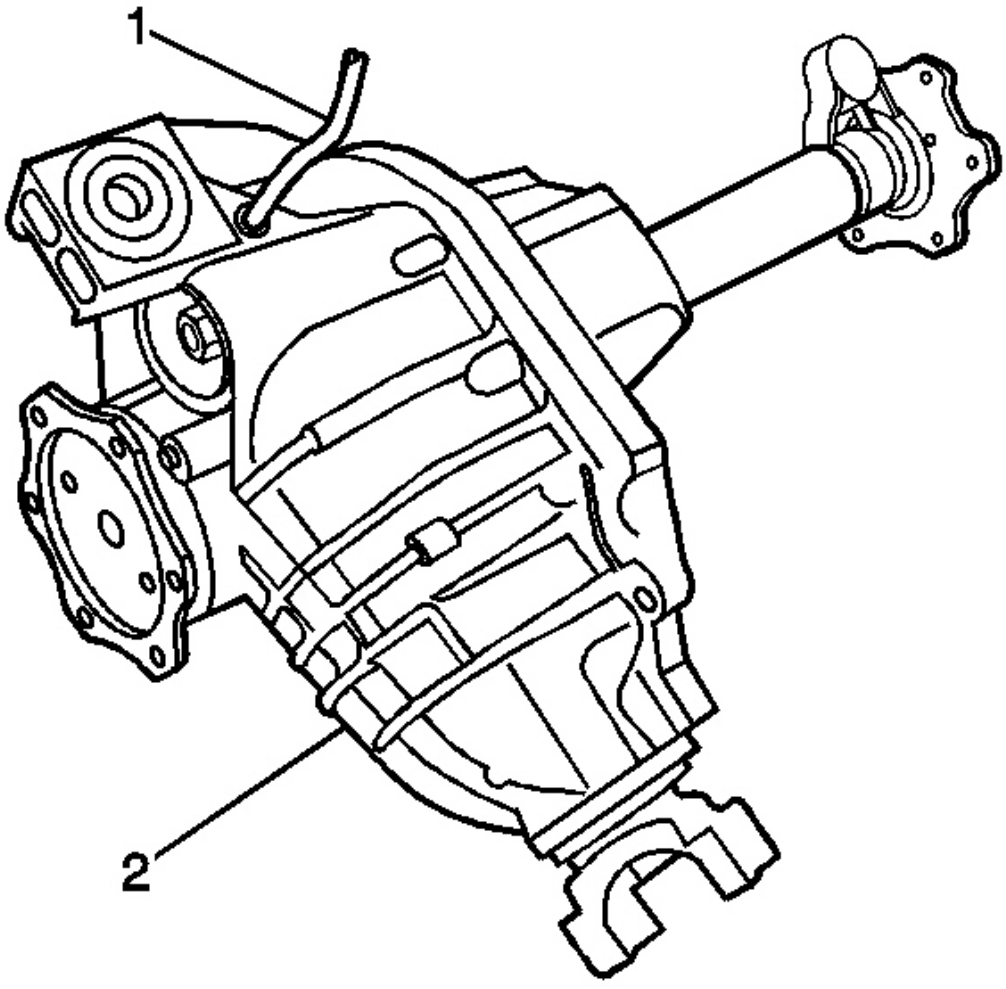


Fig. 31: Identifying Vent Hose & Differential Carrier Case Assembly
Courtesy of GENERAL MOTORS CORP.

5. Remove the vent hose (1) from the differential carrier case assembly (2).
6. Remove the vent hose (1) from the vehicle.

Installation Procedure

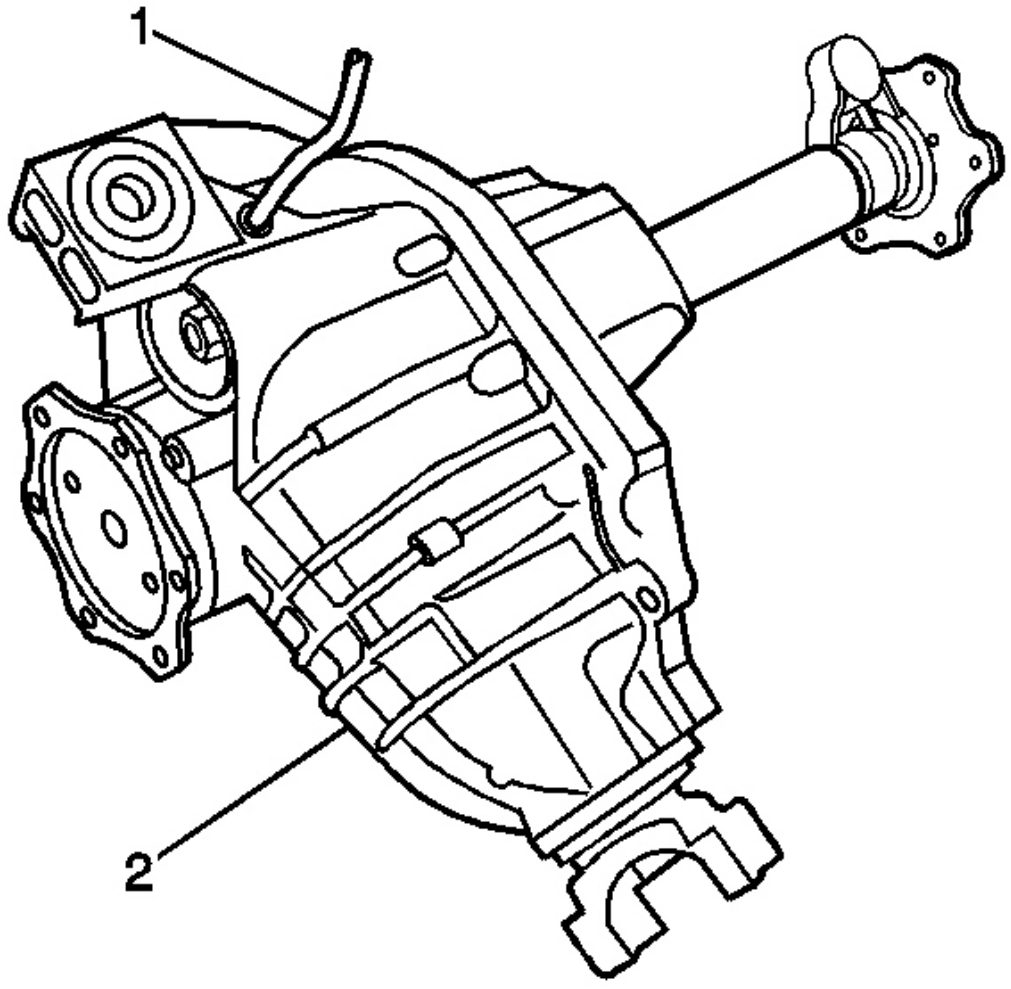


Fig. 32: Identifying Vent Hose & Differential Carrier Case Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the vent hose (1) to the vehicle.
    - Route the vent hose the same way as when removed.
    - Ensure the hose is free of kinks and routes clear of sharp components.
    - Ensure the vent hose is not plugged.
2. Connect the vent hose (1) to the differential carrier case assembly (2).
3. Install the vent hose (1) to the wiring bundle.
4. Install the vent hose to the clip.

5. Install the front differential carrier shield, if equipped. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
6. Lower the vehicle.

VENT HOSE CONNECTOR REPLACEMENT - FRONT DRIVE AXLE

Removal Procedure

1. Raise the vehicle. Refer **Lifting and Jacking the Vehicle** in General Information.
2. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.

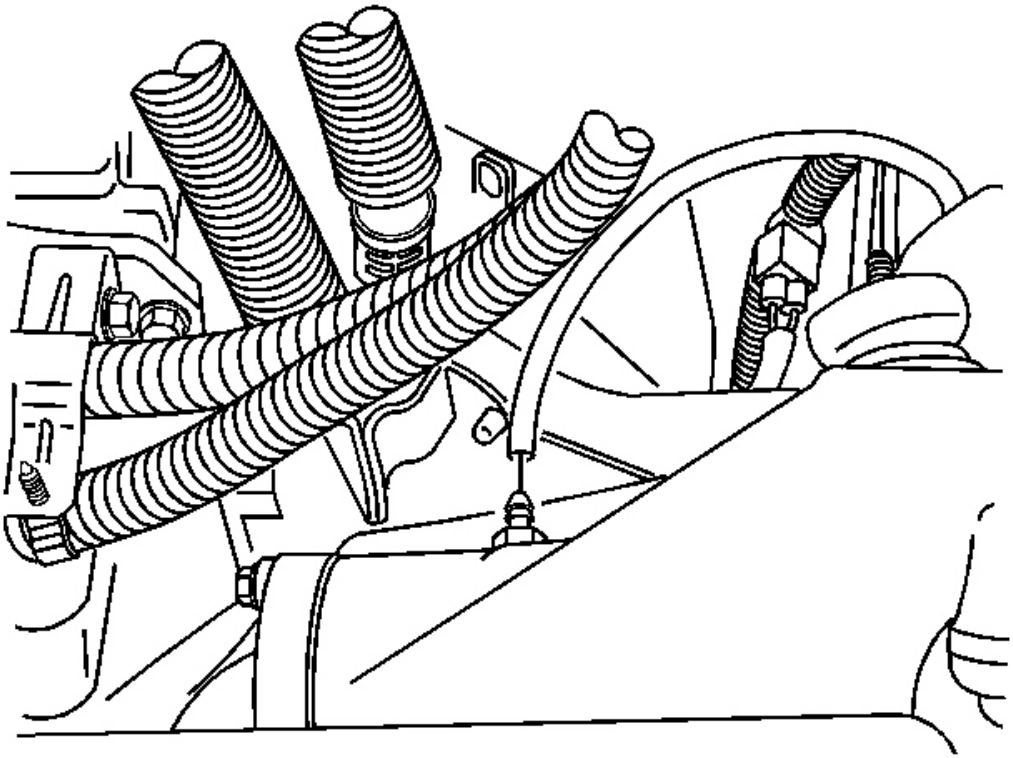


Fig. 33: Front Drive Axle Vent Hose & Vent Hose Connector
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the vent hose from the vent hose connector.

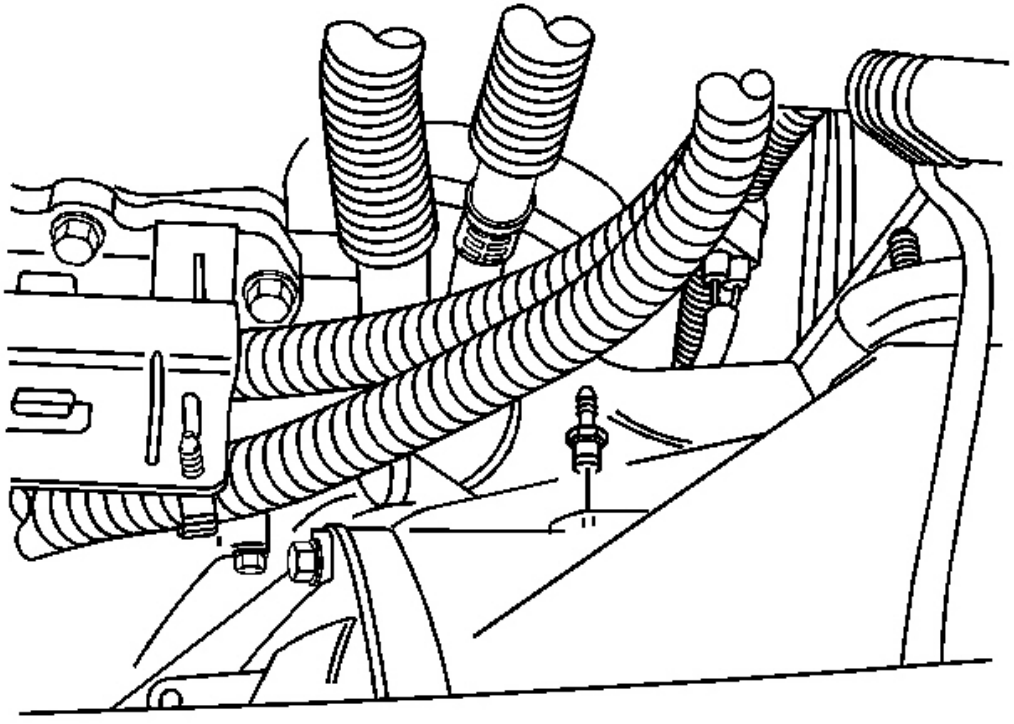


Fig. 34: Front Drive Axle Vent Hose Connector
Courtesy of GENERAL MOTORS CORP.

4. Remove the vent hose connector.

Installation Procedure

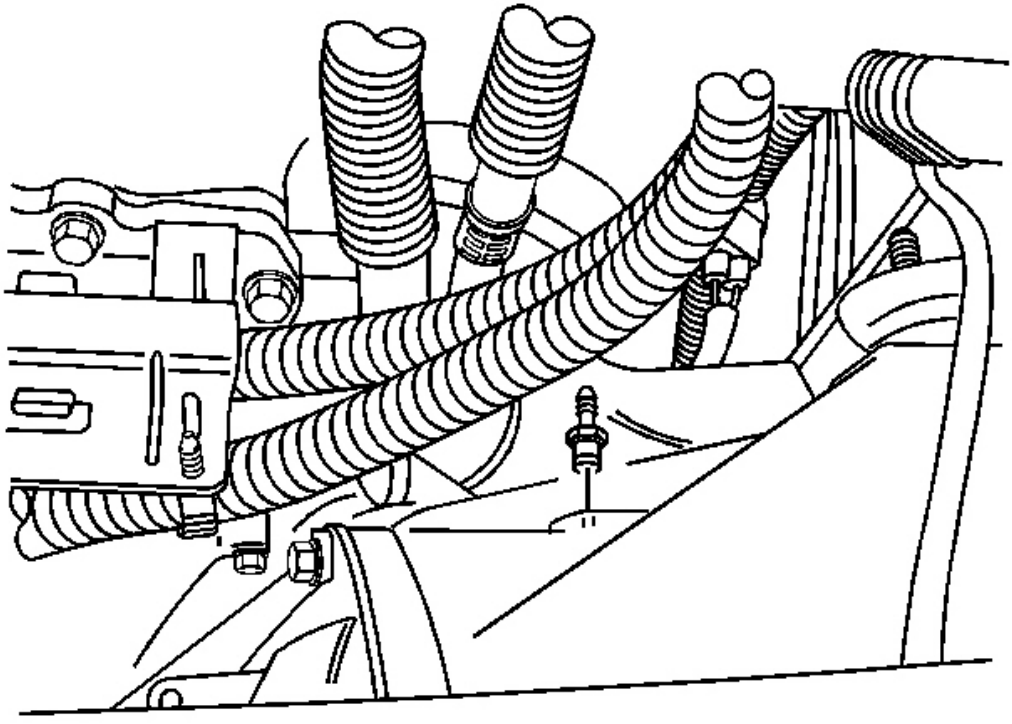


Fig. 35: Front Drive Axle Vent Hose Connector
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the vent hose connector.

   Tighten: Tighten the vent hose connector to 20 N.m (15 lb ft).

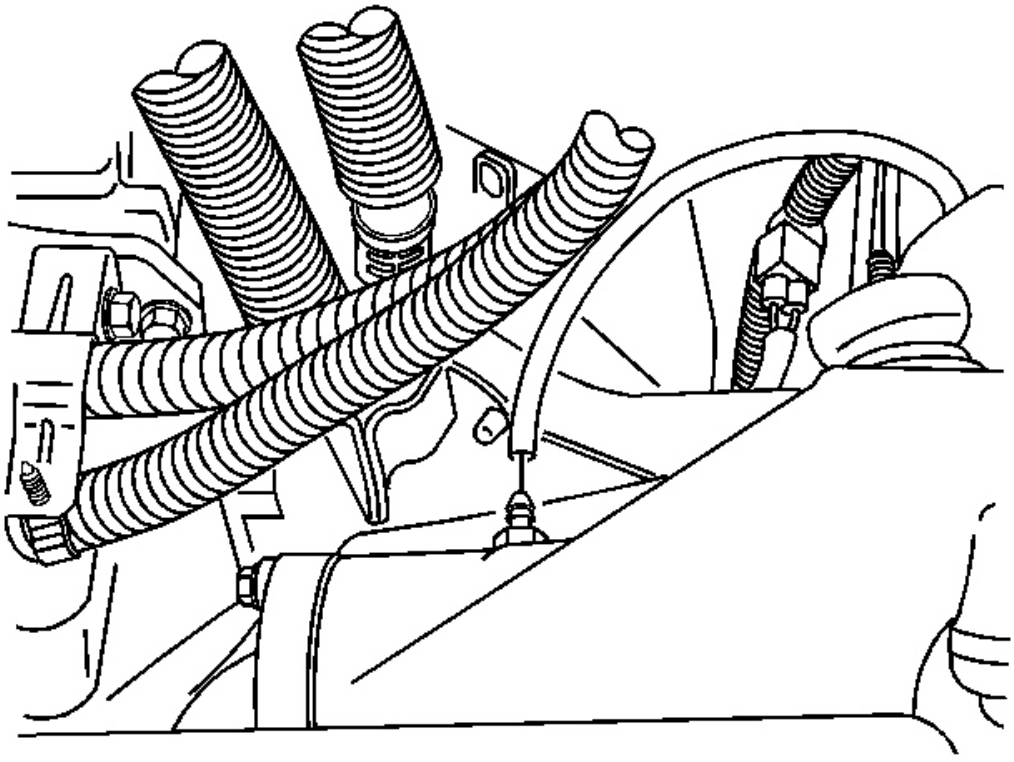


Fig. 36: Front Drive Axle Vent Hose & Vent Hose Connector
Courtesy of GENERAL MOTORS CORP.

2. Connect the vent hose to the vent hose connector.
3. Install the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
4. Lower the vehicle.

INNER SHAFT AND/OR HOUSING REPLACEMENT - FRONT DRIVE AXLE

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Drain the front drive axle. Refer to **Lubricant Replacement - Front Drive Axle** .

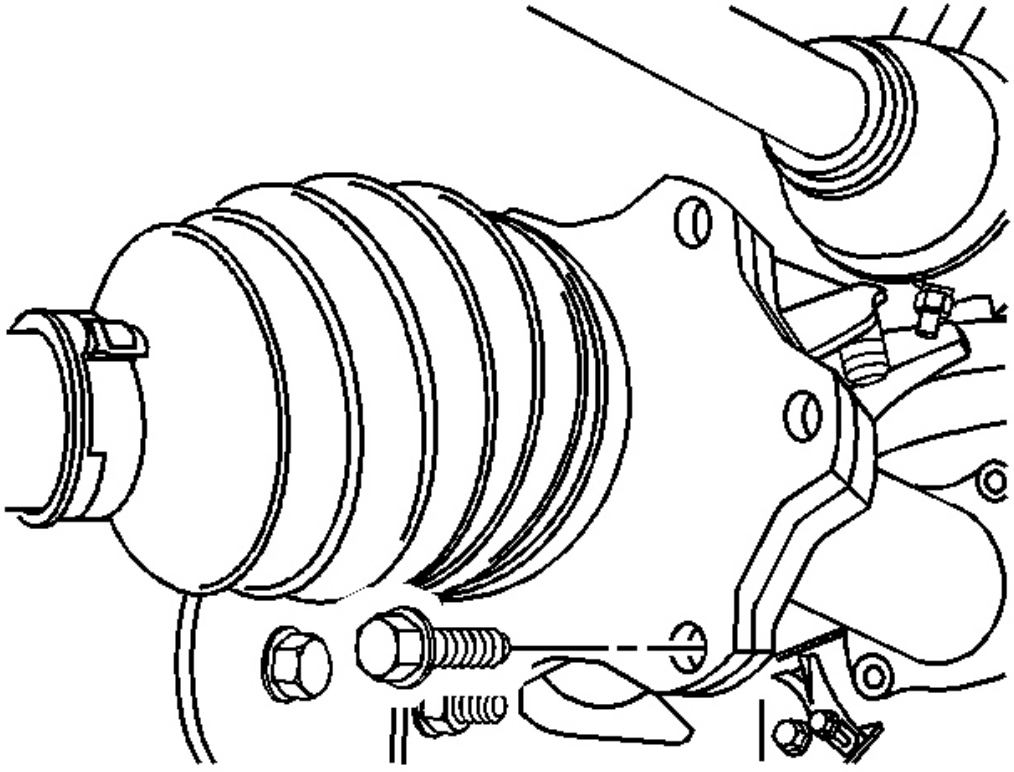


Fig. 37: Wheel Drive Shaft Inboard Flange Bolt - Front Drive Axle
Courtesy of GENERAL MOTORS CORP.

3. Remove the right wheel drive shaft inboard flange bolts from the inner axle shaft.
4. Disconnect the right wheel drive shaft from the inner axle shaft.

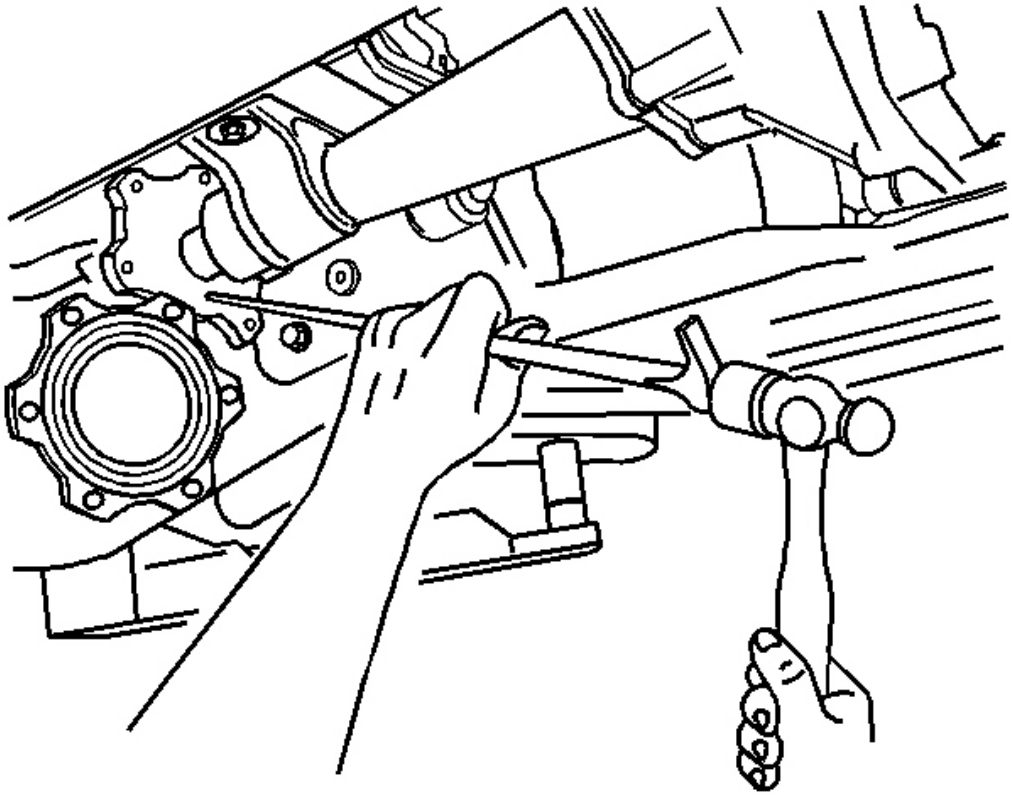


Fig. 38: Disconnecting Front Drive Inner Axle Shaft From Differential Case Side Gear
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the inner axle shaft from the differential case side gear using a hammer and brass drift.

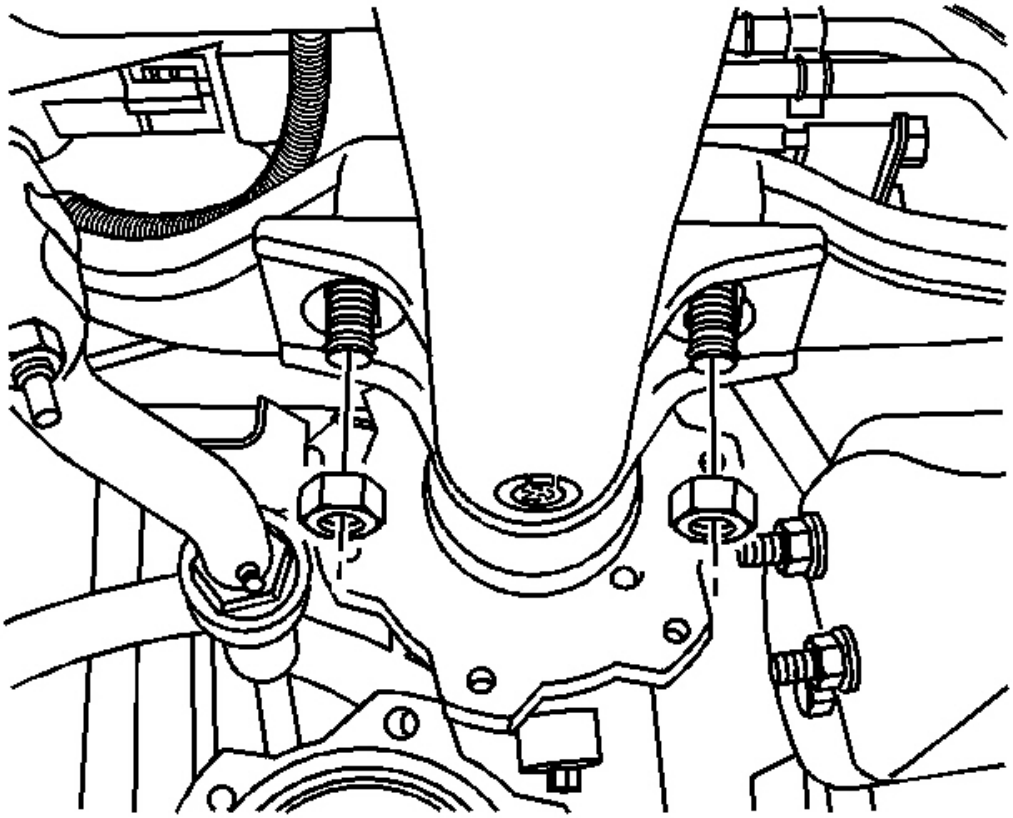


Fig. 39: Front Drive Inner Axle Shaft Housing Nuts
Courtesy of GENERAL MOTORS CORP.

6. Remove the inner axle shaft housing nuts from the bracket.

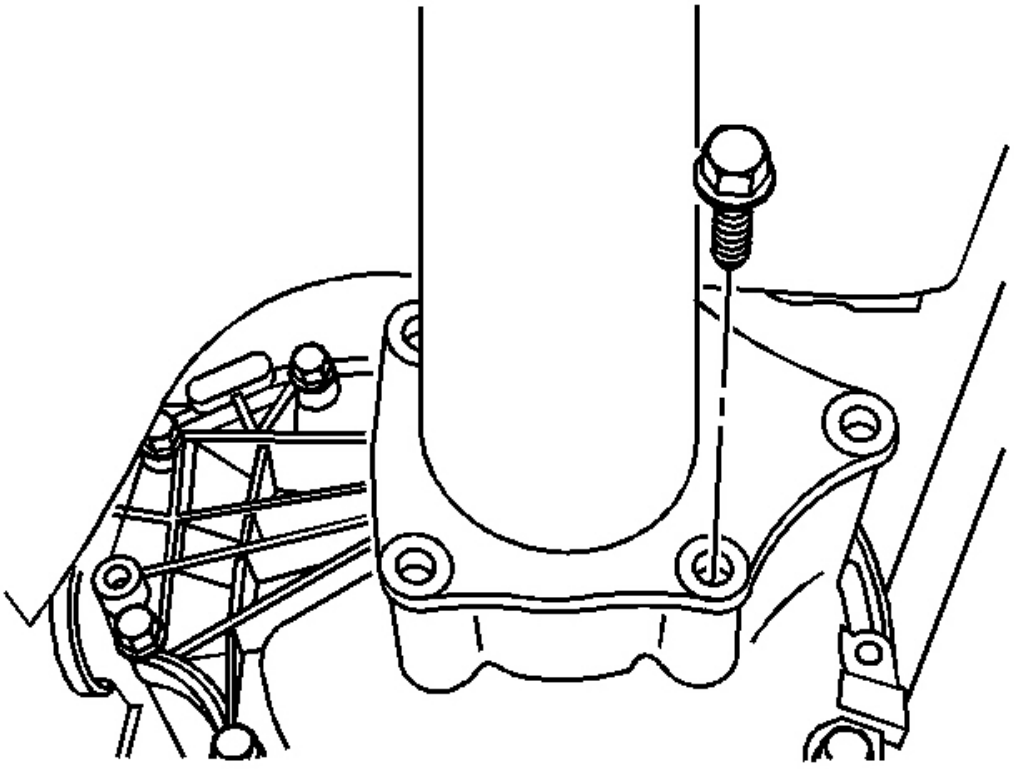


Fig. 40: Front Drive Inner Axle Shaft Housing Bolts
Courtesy of GENERAL MOTORS CORP.

7. Remove the inner axle shaft housing bolts from the differential carrier assembly.
8. Remove the inner axle shaft and inner axle shaft housing from the vehicle.
9. Remove the inner axle shaft from the inner axle shaft housing.
10. Remove the inner axle shaft seal and the bearing from the inner axle shaft housing. Refer to **Inner Axle Seal and/or Bearing Replacement - Front Drive Axle** .

Installation Procedure

1. Install the new inner axle shaft bearing and the new seal to the inner axle shaft housing. Refer to **Inner Axle Seal and/or Bearing Replacement - Front Drive Axle** .
2. Install the inner axle shaft into the inner axle shaft housing.

   Do not install the inner axle shaft completely into the inner axle shaft housing at this time.

3. Apply sealant GM P/N 1052942 (Canadian P/N 10953466) or equivalent to the inner axle housing to

differential carrier sealing surface.

4. Install the inner axle shaft and the inner axle shaft housing to the differential carrier assembly.

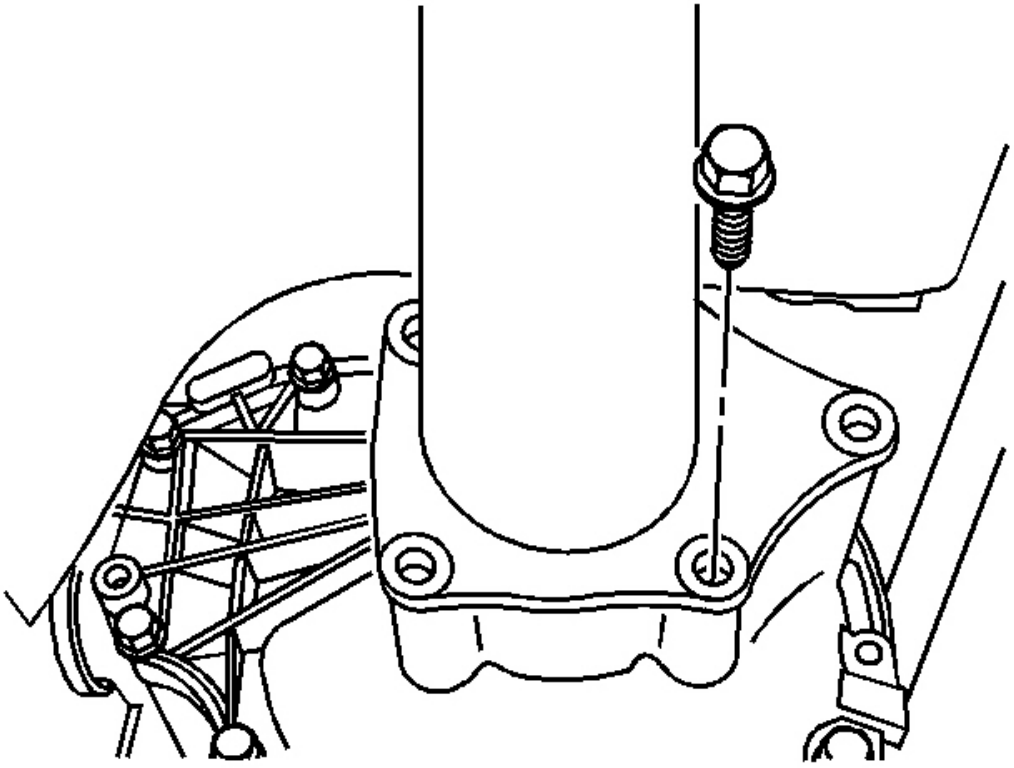


Fig. 41: Front Drive Inner Axle Shaft Housing Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the inner axle shaft housing bolts.

   Tighten: Tighten the inner axle shaft housing bolts to 40 N.m (30 lb ft).

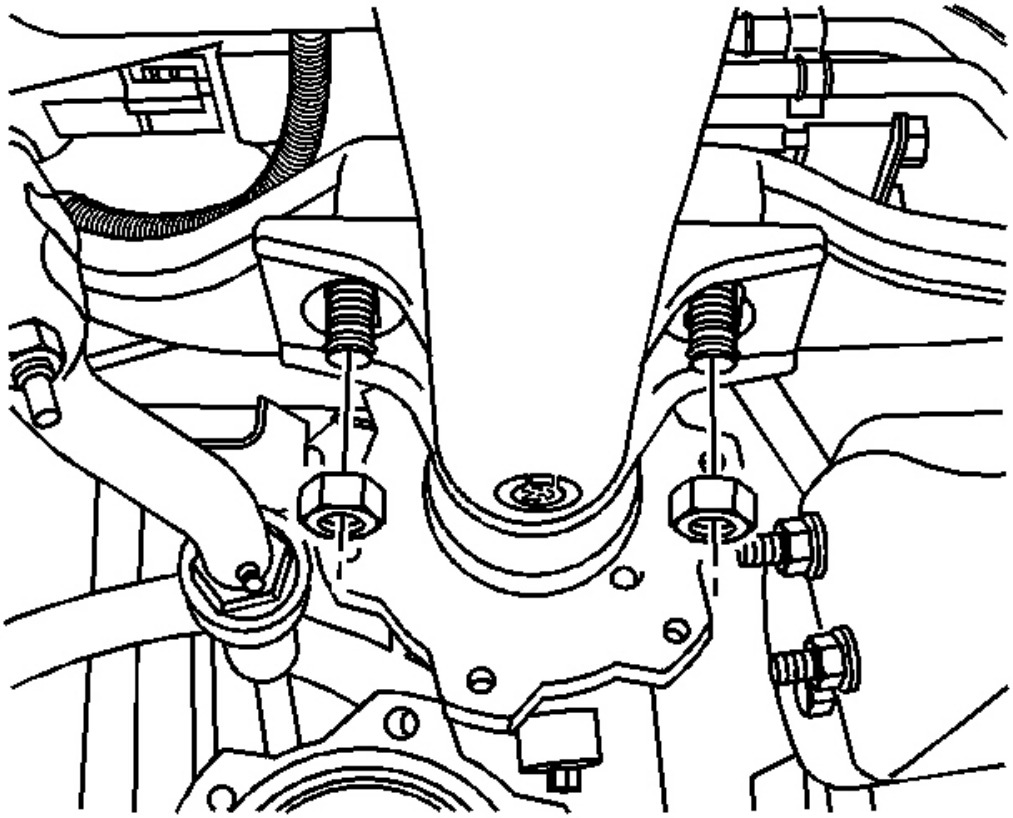


Fig. 42: Front Drive Inner Axle Shaft Housing Nuts
Courtesy of GENERAL MOTORS CORP.

6. Install the inner axle shaft housing nuts to the bracket.

   Tighten: Tighten the inner axle shaft housing nuts to 100 N.m (75 lb ft).

7. Install the inner axle shaft into the differential case side gear by doing the following:
   1. Turn the inner axle shaft and align the splines of the inner axle shaft with the splines on the differential side gear.
   2. Drive the inner axle shaft into the differential case side gear assembly using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.
   3. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.
8. Install the right wheel drive shaft to the inner axle shaft.

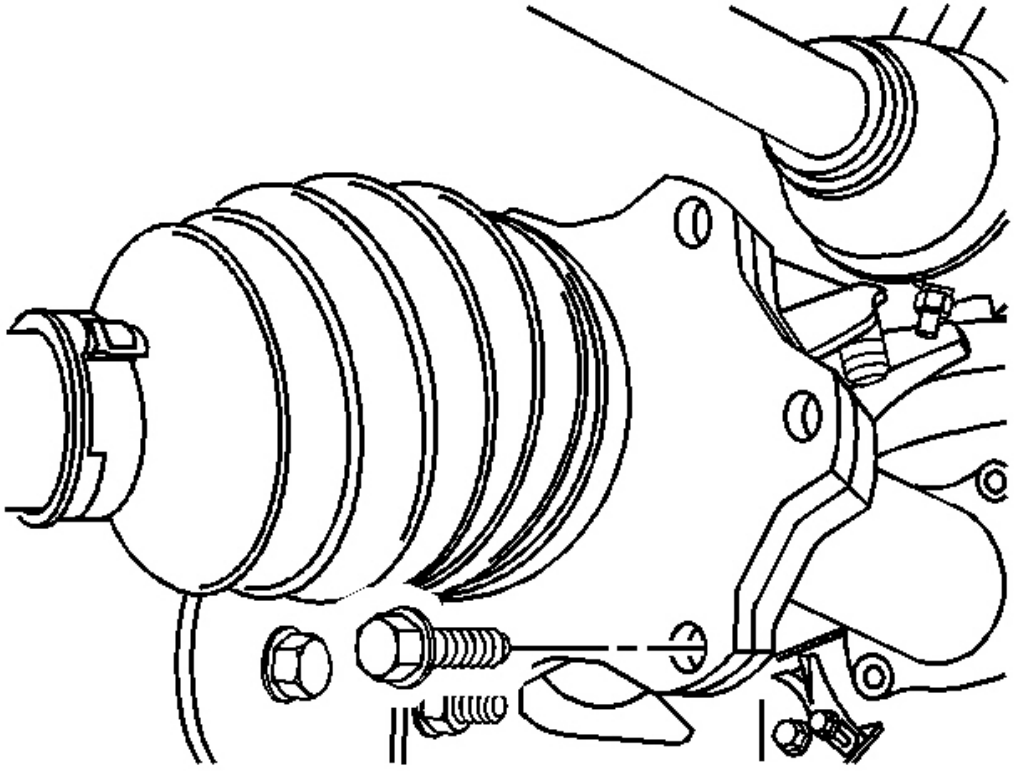


Fig. 43: Wheel Drive Shaft Inboard Flange Bolt - Front Drive Axle
Courtesy of GENERAL MOTORS CORP.

9. Install the right wheel drive shaft inboard flange to inner axle shaft bolts.

   Tighten: Tighten the wheel drive shaft inboard flange to inner axle shaft bolts to 79 N.m (58 lb ft).

10. Fill the front axle with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** and **Capacities - Approximate Fluid** in Maintenance and Lubrication.
11. Lower the vehicle.

INNER AXLE SEAL AND/OR BEARING REPLACEMENT - FRONT DRIVE AXLE

Tools Required

- **J 2619-01** Slide Hammer
- **J 29369-2** Bushing and Bearing Remover (2-3 inch). See **Special Tools and Equipment** .
- **J 36609** Axle Tube Bearing Installer. See **Special Tools and Equipment** .

- **J 45225** Axle Seal Installer. See **Special Tools and Equipment** .
- **J 8092** Universal Driver Handle - 3/4 in - 10. See **Special Tools and Equipment** .

Removal Procedure

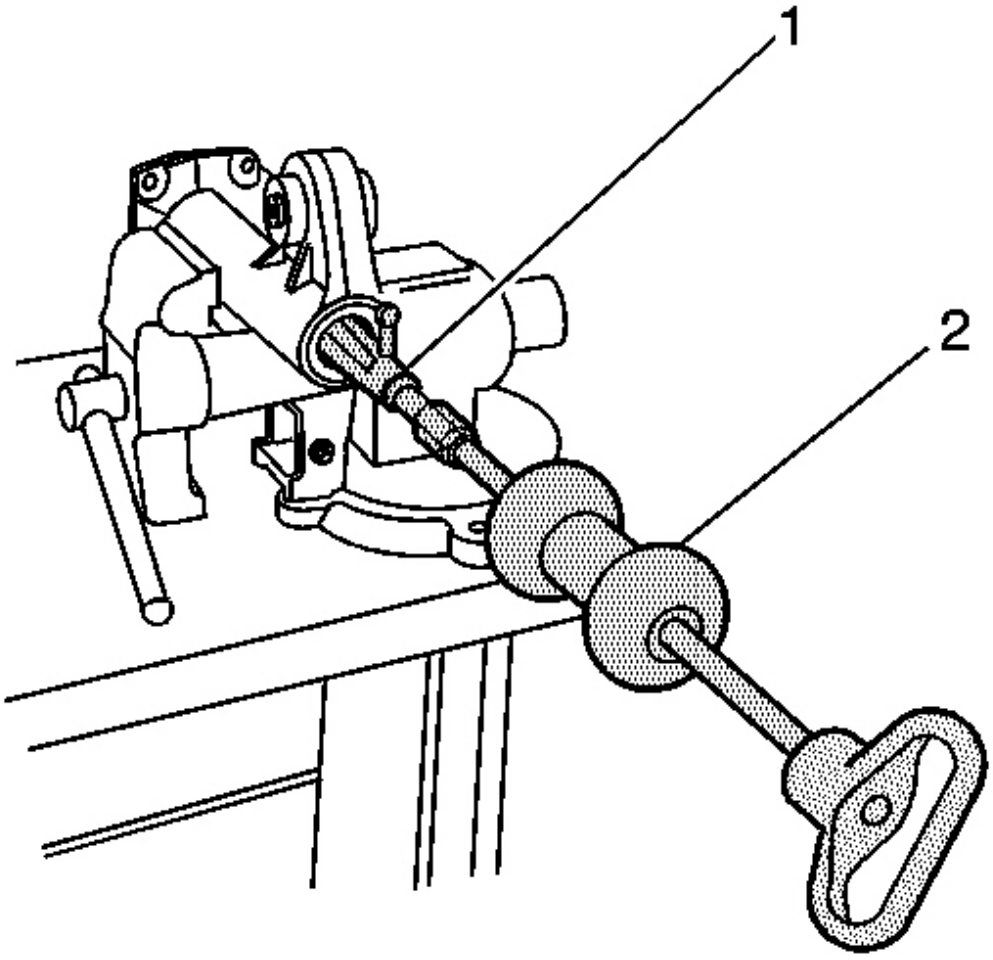


Fig. 44: View Of J 29369-2 & J 2619-01
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Drain the differential carrier assembly. Refer to **Lubricant Replacement - Front Drive Axle** .
3. If replacing the right side seal, perform the following steps:

1. Remove the inner axle shaft and housing assembly from the differential carrier case assembly. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .
2. Install the inner axle shaft housing into a vise.

   Clamp only on the mounting flange of the inner axle shaft housing.

3. Install the **J 29369-2** behind the inner axle shaft seal. See **Special Tools and Equipment** .
4. Install the **J 2619-01** (2) to the **J 29369-2** (1). See **Special Tools and Equipment** .
5. Remove the inner axle shaft seal using the **J 2619-01** .

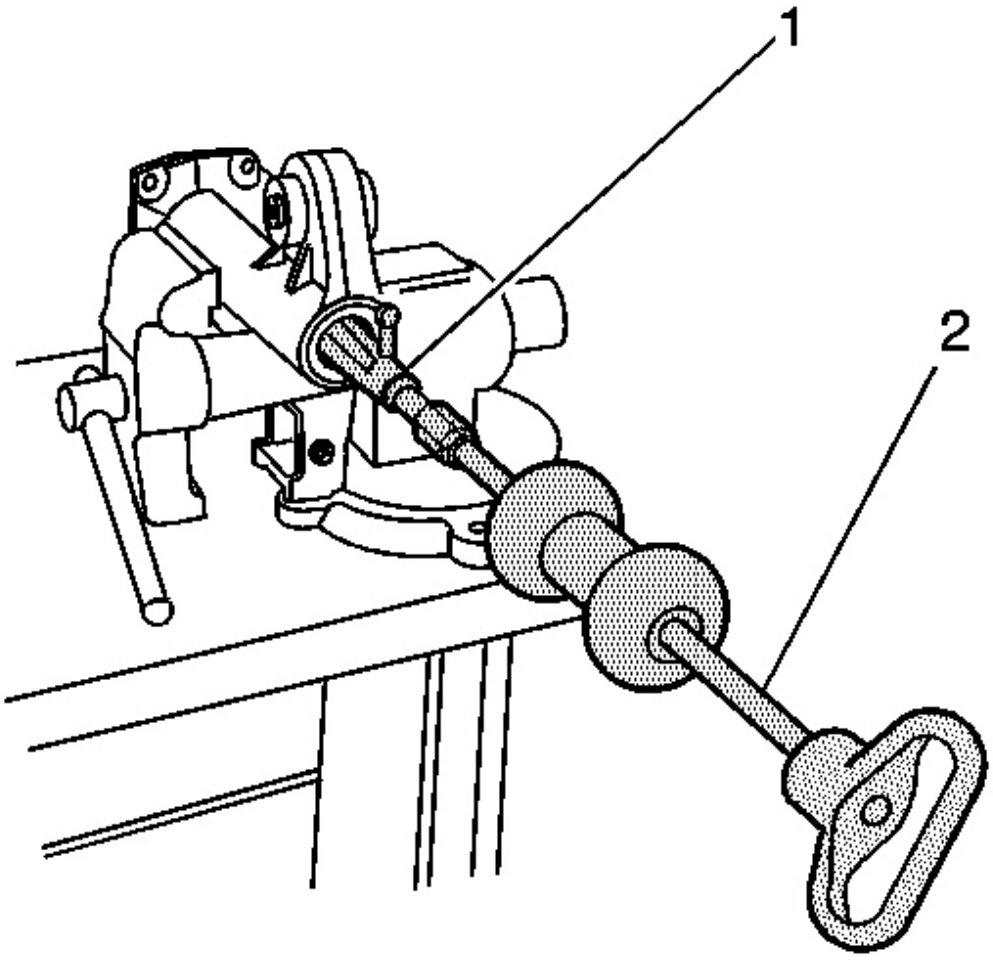


Fig. 45: Installing J 29369-02 Behind Inner Axle Shaft Seal

Courtesy of GENERAL MOTORS CORP.

4. If replacing the right side bearing, perform the following steps:
    1. Remove the inner axle shaft and housing assembly from the differential carrier case assembly. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .
    2. Install the inner axle shaft housing into a vise.

       Clamp only on the mounting flange of the inner axle shaft housing.

    3. Install the **J 29369-2** behind the inner axle shaft seal. See **Special Tools and Equipment** .
    4. Install the **J 2619-01** (2) to the **J 29369-2** (1). See **Special Tools and Equipment** .
    5. Remove the inner axle shaft seal using the **J 2619-01** .
    6. Install the **J 29369-2** behind the inner axle shaft bearing. See **Special Tools and Equipment** .
    7. Install the **J 2619-01** (2) to the **J 29369-2** (1). See **Special Tools and Equipment** .
    8. Remove the inner axle shaft bearing using the **J 2619-01** .

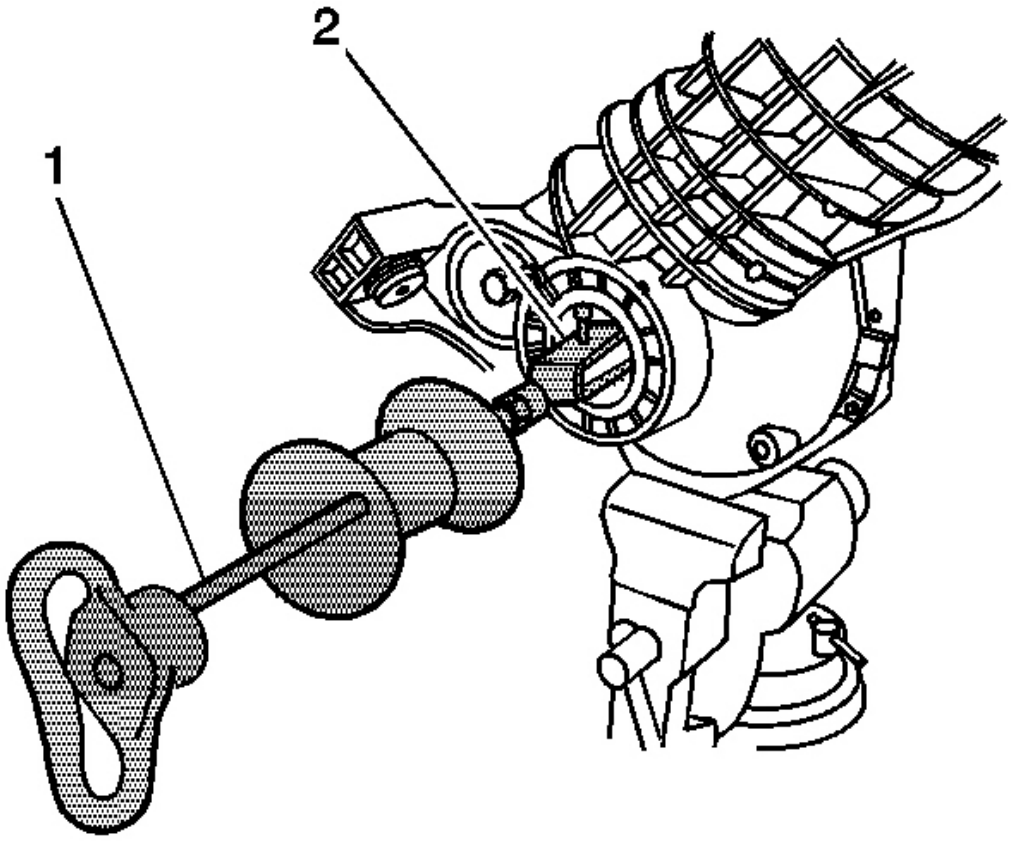


Fig. 46: Installing J 29369-2 Behind Inner Axle Shaft Seal Or Inner Axle Shaft Bearing
Courtesy of GENERAL MOTORS CORP.

5. If replacing the left side seal and/or bearing, perform the following steps:
    1. Remove the differential carrier assembly. Refer to **Differential Carrier Assembly Replacement** .
    2. Place the differential carrier assembly into a vise.

       Clamp only on the mounting flange of the differential carrier assembly case.

    3. Remove the inner axle shaft using a hammer and a brass drift.
    4. Install the **J 29369-2** (2) behind the inner axle shaft seal or the inner axle shaft bearing as necessary. See **Special Tools and Equipment** .
    5. Install the **J 2619-01** (1) to the **J 29369-2** (2). See **Special Tools and Equipment** .
    6. Remove the inner axle shaft seal and/or the inner axle shaft bearing using the **J 2619-01** .

Installation Procedure

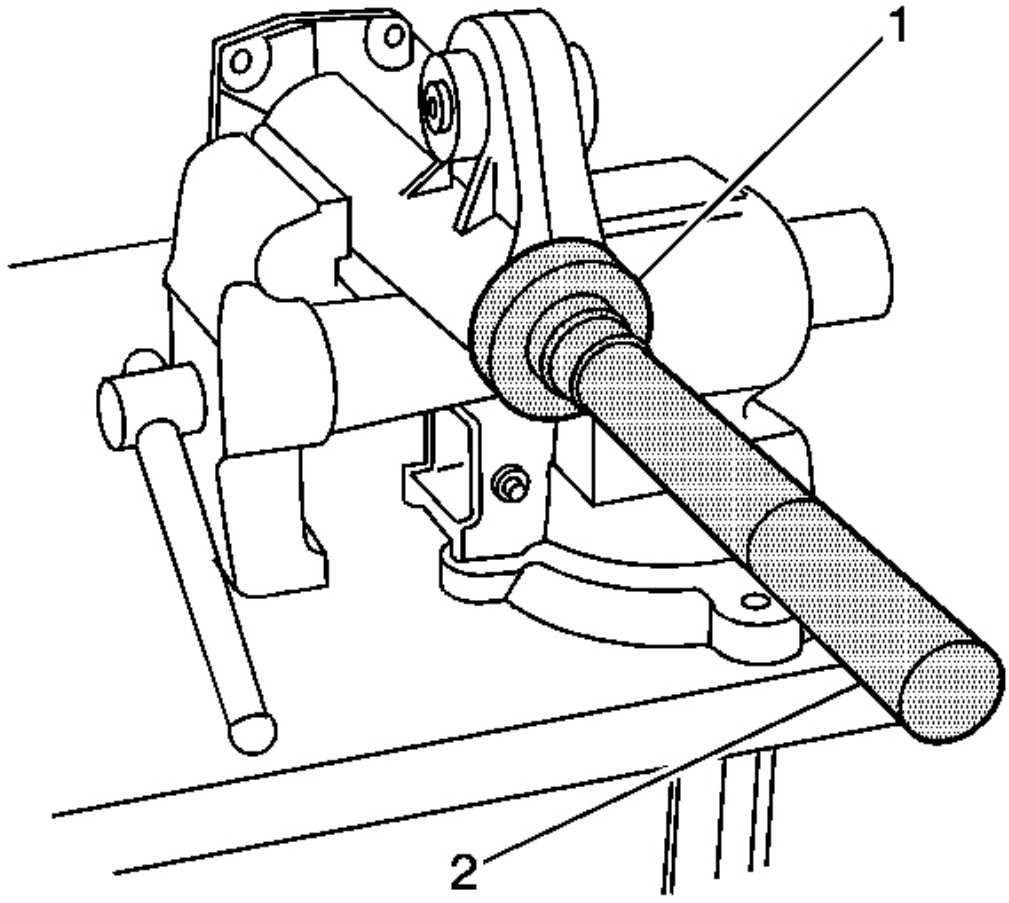


Fig. 47: Installing Bearing With Square Shoulder Using J 36609 & J 8092
Courtesy of GENERAL MOTORS CORP.

1. If installing the right side bearing, perform the following steps:
    1. Install the inner axle shaft housing into a vise.

       Clamp only on the mounting flange of the inner axle shaft housing.

    2. Install the bearing with the square shoulder in using the **J 36609** (1) and the **J 8092** (2). See **Special Tools and Equipment** .
2. If installing the right side inner axle shaft seal, perform the following steps:
    1. Install the inner axle shaft housing into a vise.

Clamp only on the mounting flange of the inner axle shaft housing.

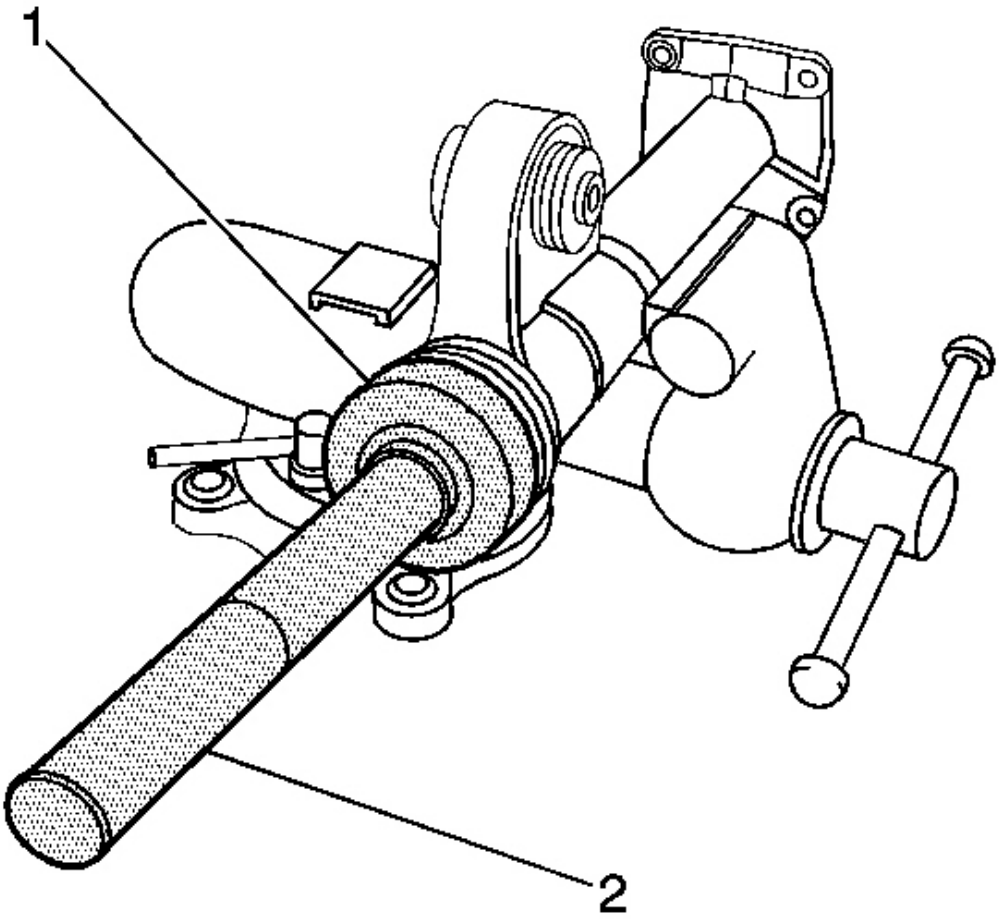


Fig. 48: Installing New Axle Shaft Seal Using J 45225 & J8092
Courtesy of GENERAL MOTORS CORP.

2. Install the new axle shaft seal using the **J 45225** (1) and the **J 8092** (2). See **Special Tools and Equipment** .

3. Install the inner axle shaft into the inner axle shaft housing.

   Carefully tap the inner axle shaft into place with a soft-faced mallet.

4. Install the inner axle shaft and housing assembly to the differential carrier case assembly. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .

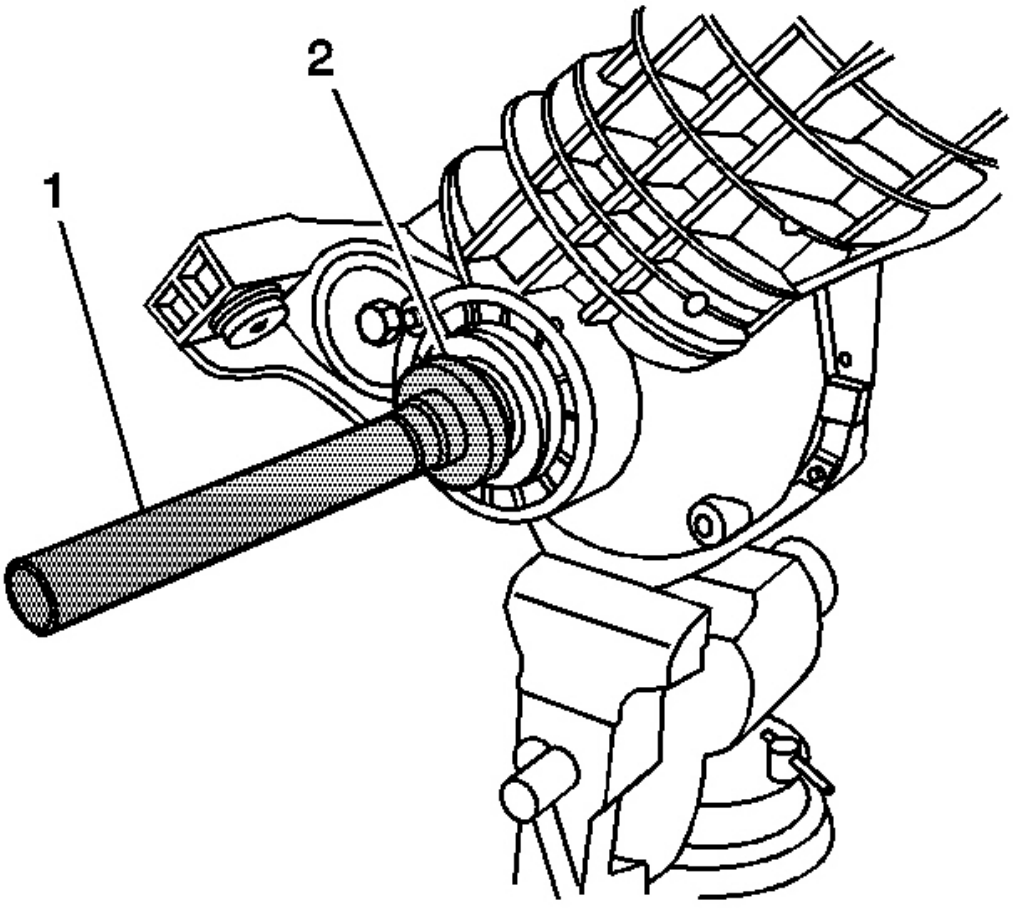


Fig. 49: Installing Left Side Axle Shaft Bearing Using J 36609 & J 8092
Courtesy of GENERAL MOTORS CORP.

5. If installing the left side bearing and/or seal, perform the following steps:
    1. Install the bearing with the square shoulder in using the **J 36609** (2) and the**J 8092** (1). See **Special Tools and Equipment** .
    2. Install the new axle shaft seal using the **J 45225** and the **J 8092** . See **Special Tools and Equipment** .
    3. Install the inner axle shaft into the differential case side gear using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.
    4. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.
    5. Install the front differential carrier assembly. Refer to **Differential Carrier Assembly**

Replacement .

6. Fill the differential carrier assembly. Use the proper fluid. Refer to **Lubricant Replacement - Front Drive Axle** .
7. Lower the vehicle.

DIFFERENTIAL DRIVE PINION FLANGE/YOKE, SEAL, AND DUST DEFLECTOR REPLACEMENT - FRONT

Tools Required

- **J 8614-01** Flange and Pulley Holding Tool. See **Special Tools and Equipment** .
- J 36366 Pinion Oil Seal Installer

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake calipers. Refer to **Brake Caliper Replacement - Front** in Disc Brakes.
4. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
5. Reference mark the relationship of the propeller shaft to the front axle pinon yoke.

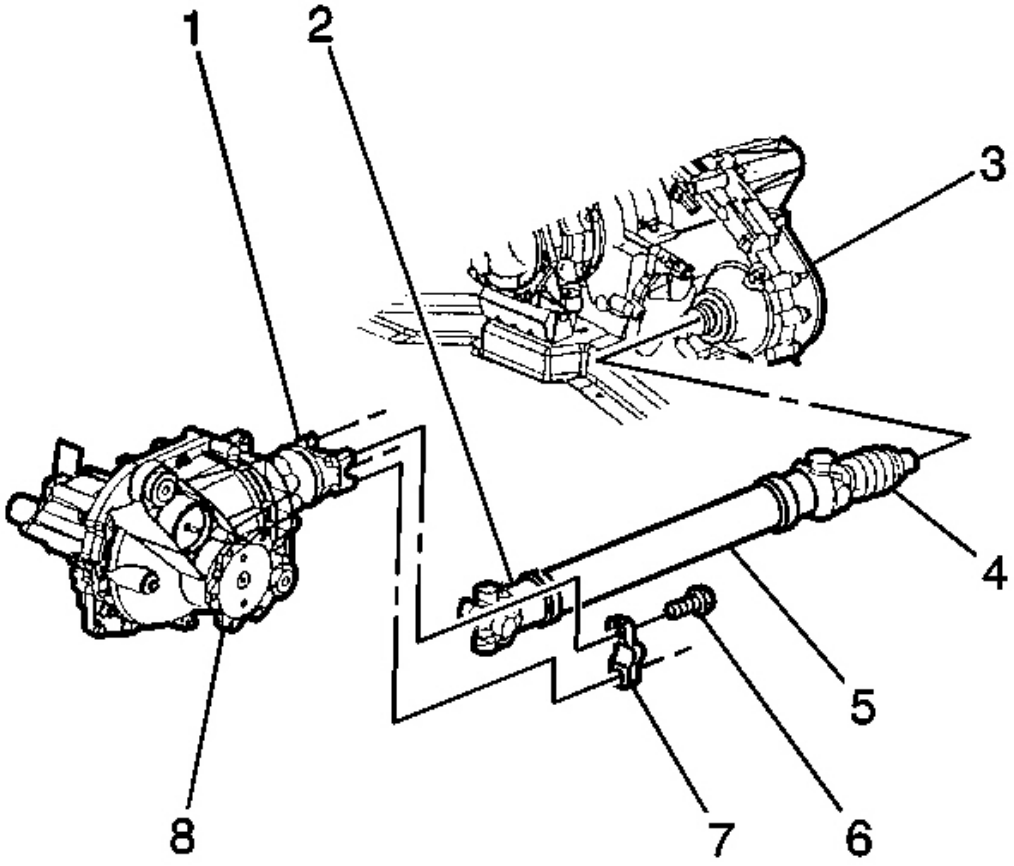


Fig. 50: Propeller Shaft & Front Axle Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

6. Remove the yoke retainer bolts (6) and the yoke retainers (7) from the front axle pinion yoke (1).

NOTE: When removing the propeller shaft, do not attempt to remove the shaft by pounding on the yoke ears or using a tool between the yoke and the universal joint. If the propeller shaft is removed by using such means, the injection joints may fracture and lead to premature failure of the joint.

7. Disconnect the propeller shaft (2) from the front axle pinion yoke (1).

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

8. Support the propeller shaft and move out of the way as necessary.

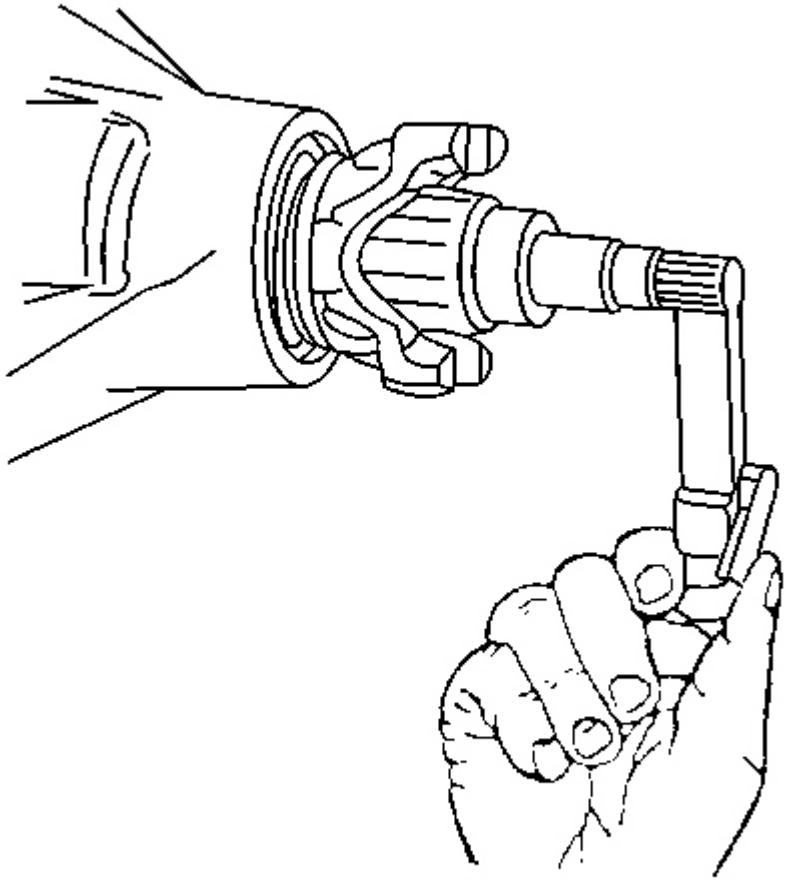


Fig. 51: Measuring Pinion Rotation Torque - Front Axle
Courtesy of GENERAL MOTORS CORP.

9. Measure the torque required in order to rotate the pinion. Use an inch-pound torque wrench. Record the torque value for reassembly. This will give the combined preload for the following components:
    - The pinion bearings
    - The pinion seal
    - The carrier bearings
    - The axle bearings
    - The axle seals

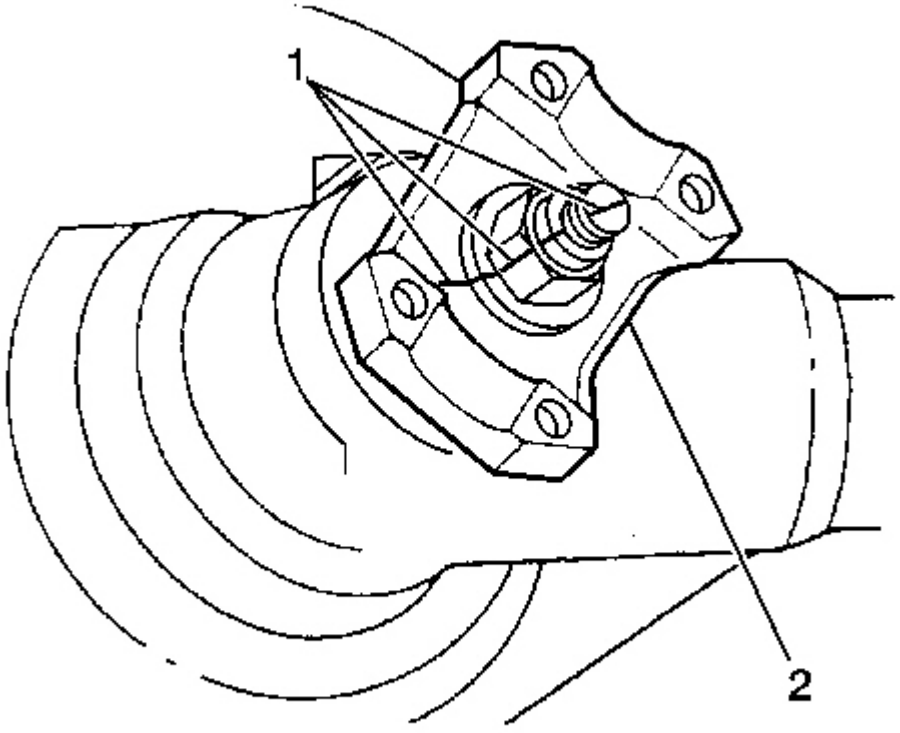


Fig. 52: Scribing Line On Pinion Shaft & Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

10. Scribe a line (1) on the pinion shaft and the pinion yoke (2).

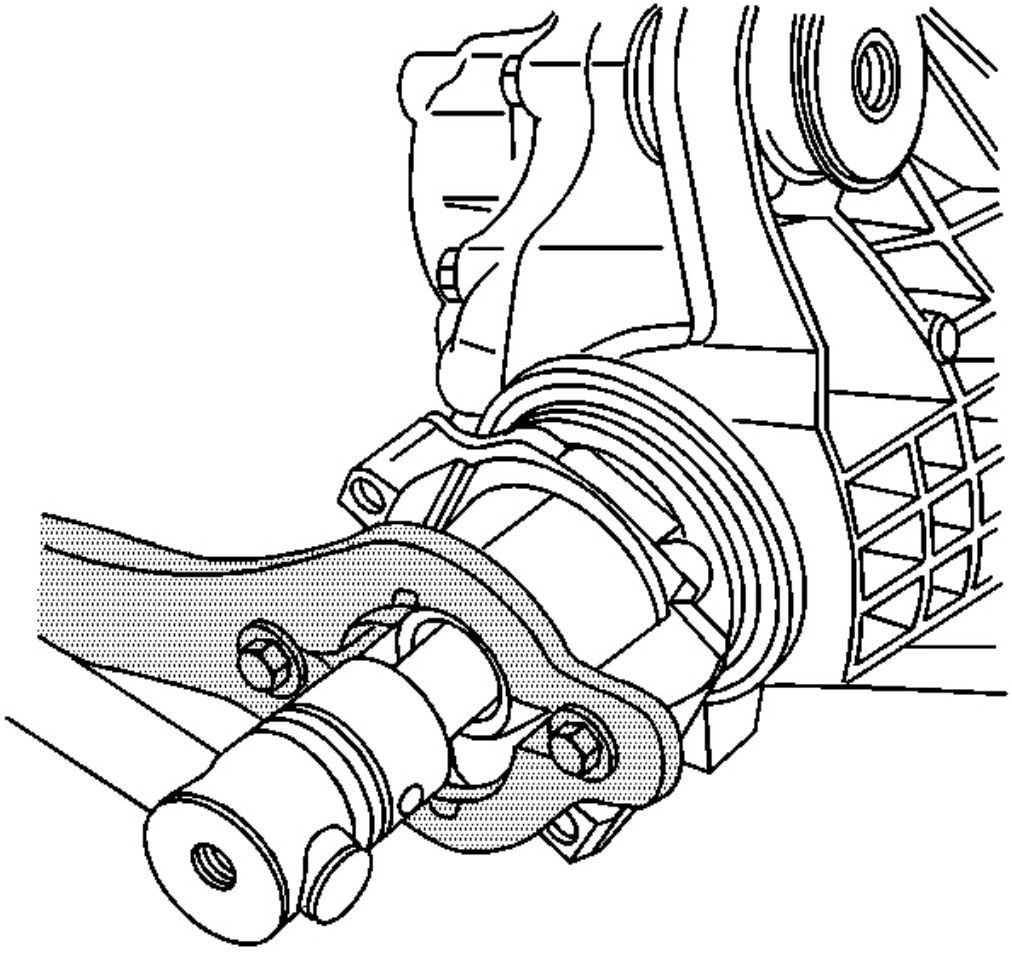


Fig. 53: Installing J 8614-01 Onto Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

11. Install the **J 8614-01** onto the pinion as shown. See **Special Tools and Equipment** .
12. Remove the pinion nut while holding the **J 8614-01** . See **Special Tools and Equipment** .

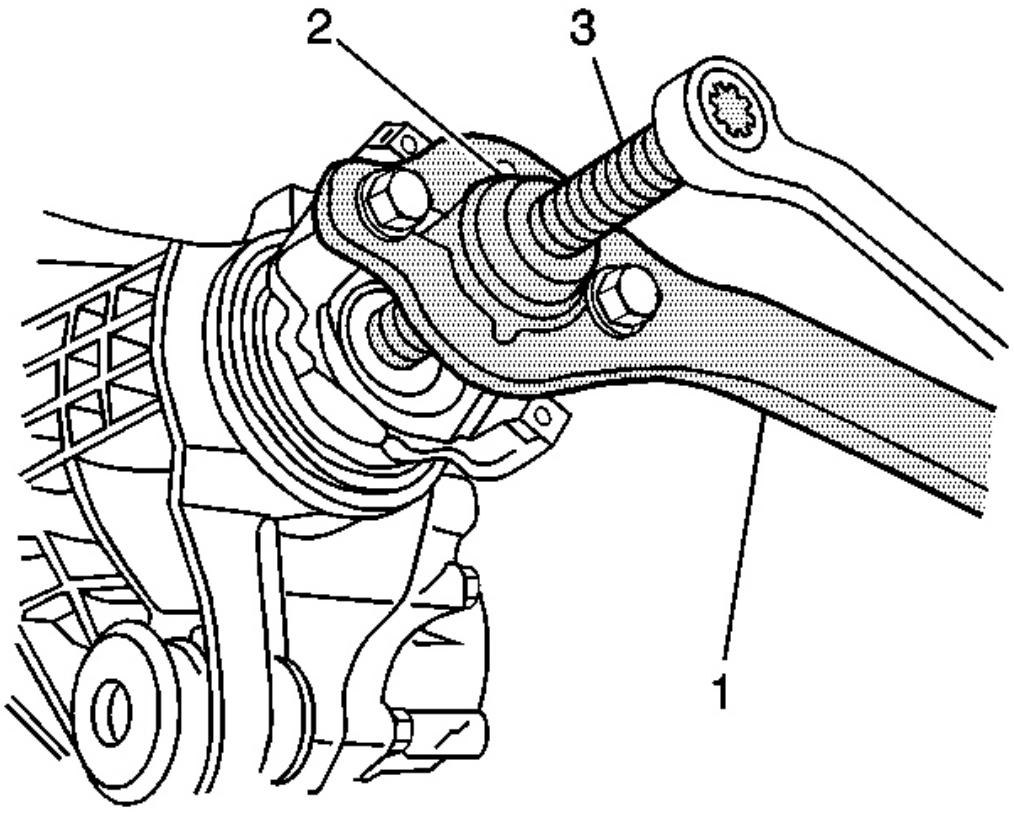


Fig. 54: Remove Pinion Yoke Using J 8614-2 & J 8614-3 Into J 8614-01 (8.25 Inch Axles) Courtesy of GENERAL MOTORS CORP.

13. Install the J 8614-2 (2) and the J 8614-3 (3) into the **J 8614-01** (1) as shown. See **Special Tools and Equipment** .
14. Remove the pinon yoke by turning the J 8614-3 (3) clockwise while holding the **J 8614-01** (1). See **Special Tools and Equipment** .

IMPORTANT: Carefully pry the seal from the bore. Do not distort or scratch the aluminum case.

15. Remove the oil seal using a suitable seal removal tool.

Installation Procedure

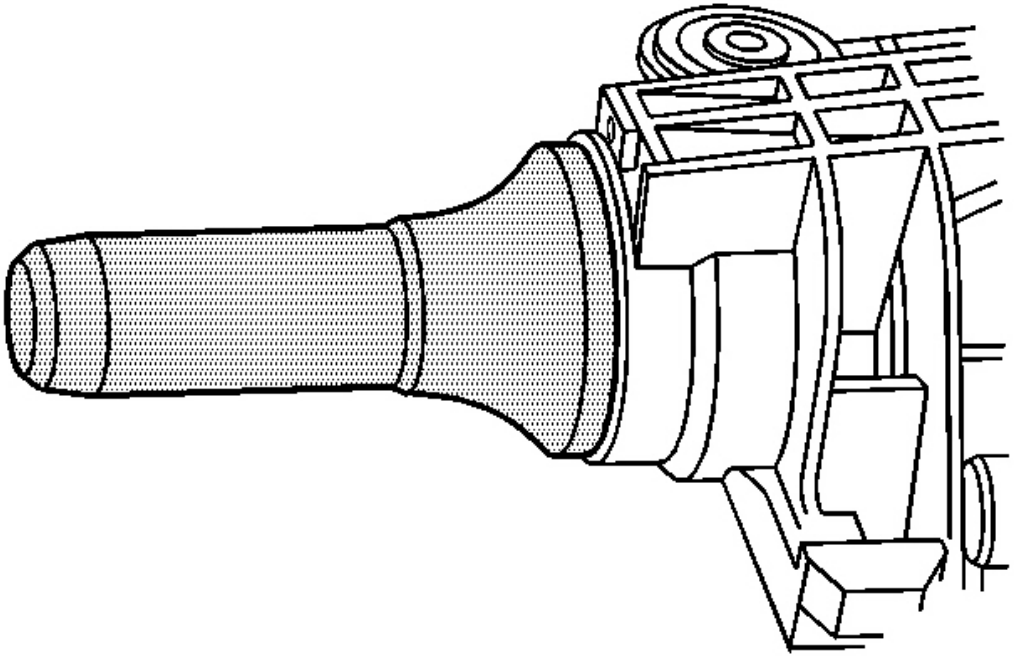


Fig. 55: Installing Oil Seal Using J 36366
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Drive the seal in straight, not at an angle.

1. Install the oil seal by doing the following:
    1. Position the oil seal in the bore.
    2. Install the J 36366 over the oil seal.
    3. Strike the J 36366 with a hammer until the seal flange seats on the axle housing surface.
2. Apply sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the splines of the drive pinion yoke.
3. Install the pinion yoke.

    Align the reference marks made during removal.

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

4. Seat the pinion yoke onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft

threads show through the yoke.

5. Install the washer and a new pinion nut.

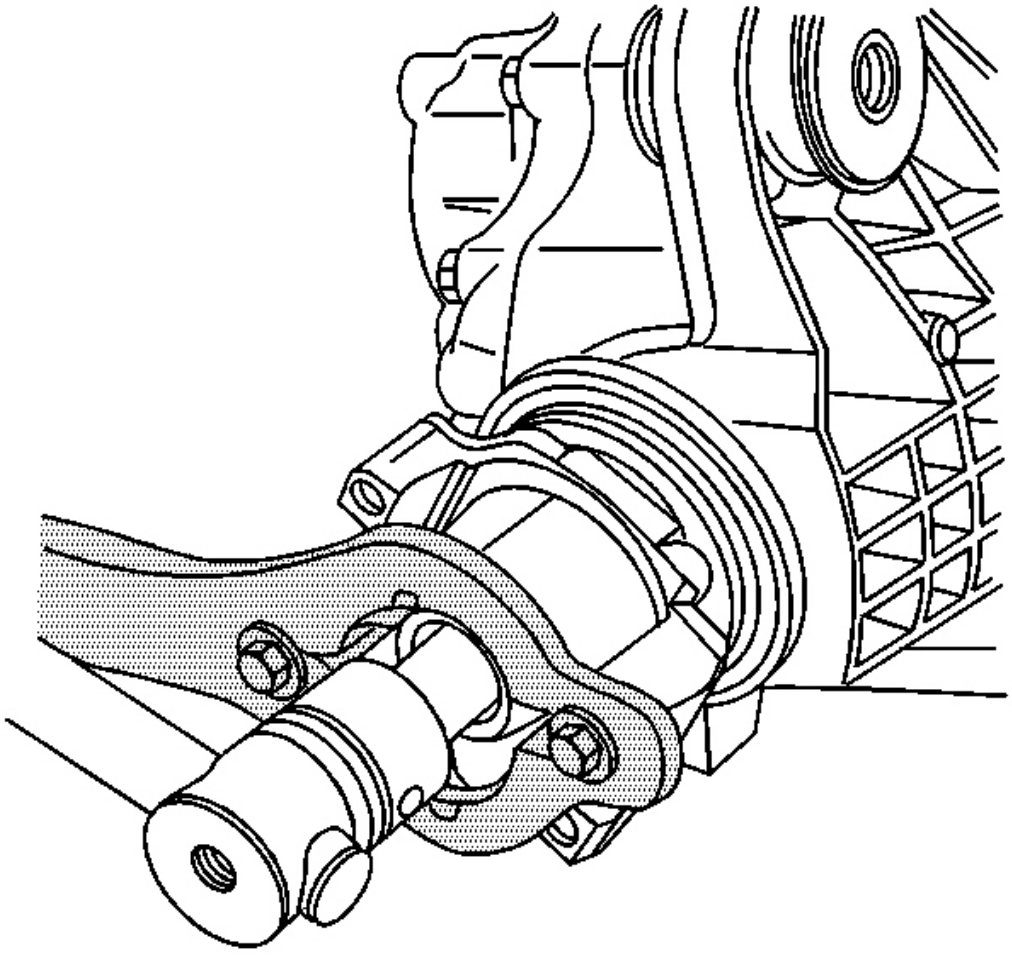


Fig. 56: Installing J 8614-01 Onto Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

6. Install the **J 8614-01** onto the pinion yoke as shown. See **Special Tools and Equipment** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

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

7. Tighten the pinion nut while holding the **J 8614-01** . See **Special Tools and Equipment** .

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

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

   Compare the measurement with the rotating torque recorded earlier.

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

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

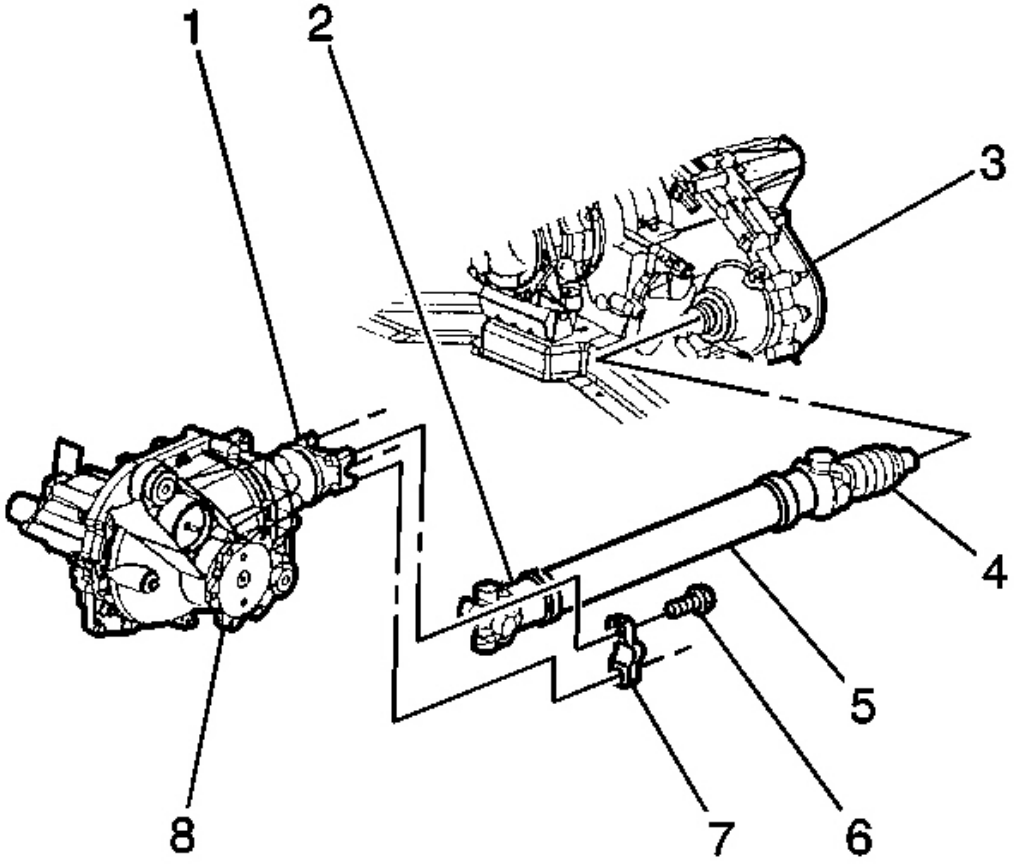


Fig. 57: Propeller Shaft & Front Axle Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

10. Install the propeller shaft (5) to the pinion yoke (1).

    Align the reference marks made during removal.

11. Install the yoke retainers (7) and the yoke retainer bolts (6) to the pinion yoke (1).

    Tighten: Tighten the yoke retainer bolts to 25 N.m (18 lb ft).

12. Inspect the axle lubricant level, and add, if necessary. Refer to **Lubricant Level Inspection - Front Drive Axle** .
13. Install the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
14. Install the brake calipers. Refer to **Brake Caliper Replacement - Front** in Disc Brakes.
15. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
16. Lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY BUSHING REPLACEMENT (DIFFERENTIAL CARRIER)

Tools Required

J 45755 Front Axle Bushing Remover/Installer. See **Special Tools and Equipment** .

Removal Procedure

1. Remove the differential carrier assembly. It is not necessary to drain the differential carrier assembly. Seal the vent tube opening with a piece of tape to prevent the axle lubricant from leaking from the differential carrier assembly. Refer to **Differential Carrier Assembly Replacement** .

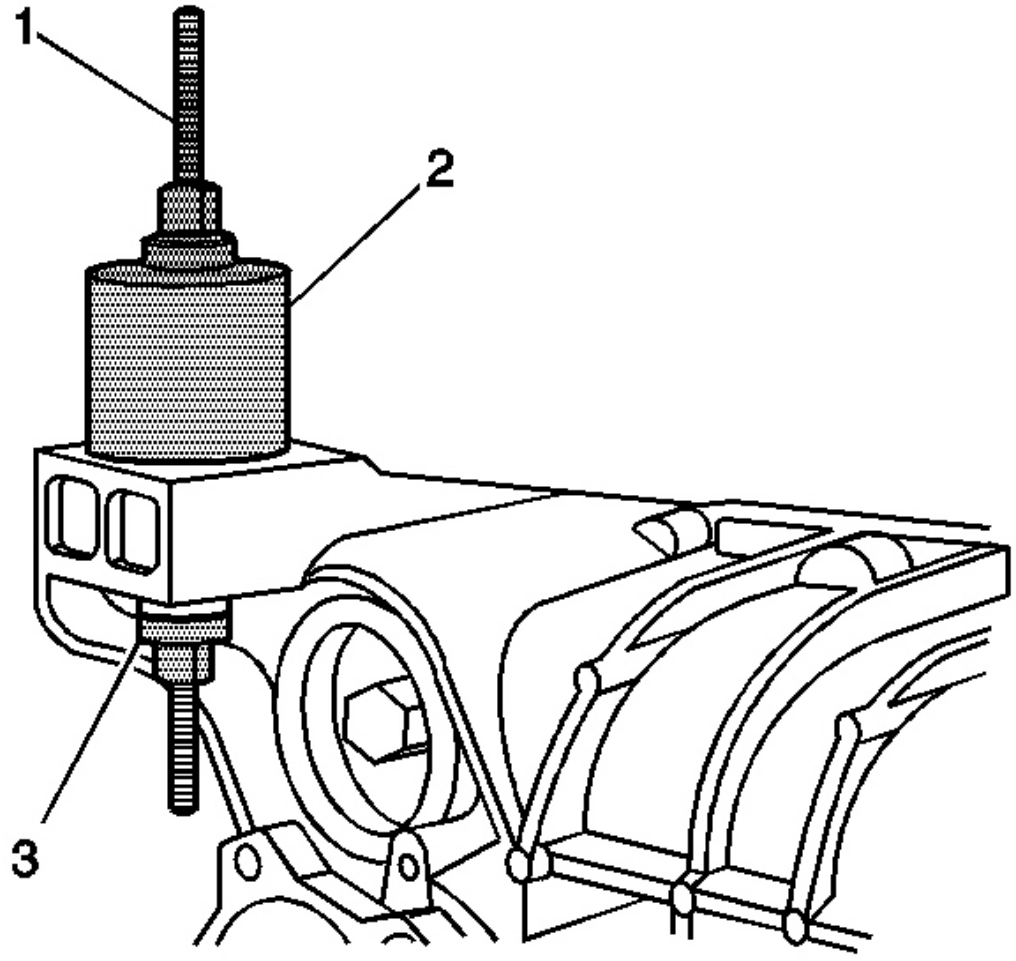


Fig. 58: Installing J 45755-3, J 45755-4, Forcing Screw, Bearing & Washers Over Differential Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the J 45755-3 (2), J 45755-4 (3), and the forcing screw, bearing and the washers (1) over the differential carrier assembly bushing as shown.
3. Remove the differential carrier assembly bushing using the **J 45755** . See **Special Tools and Equipment** .

Installation Procedure

1. Install the differential carrier assembly bushing into the differential carrier assembly bushing bore.

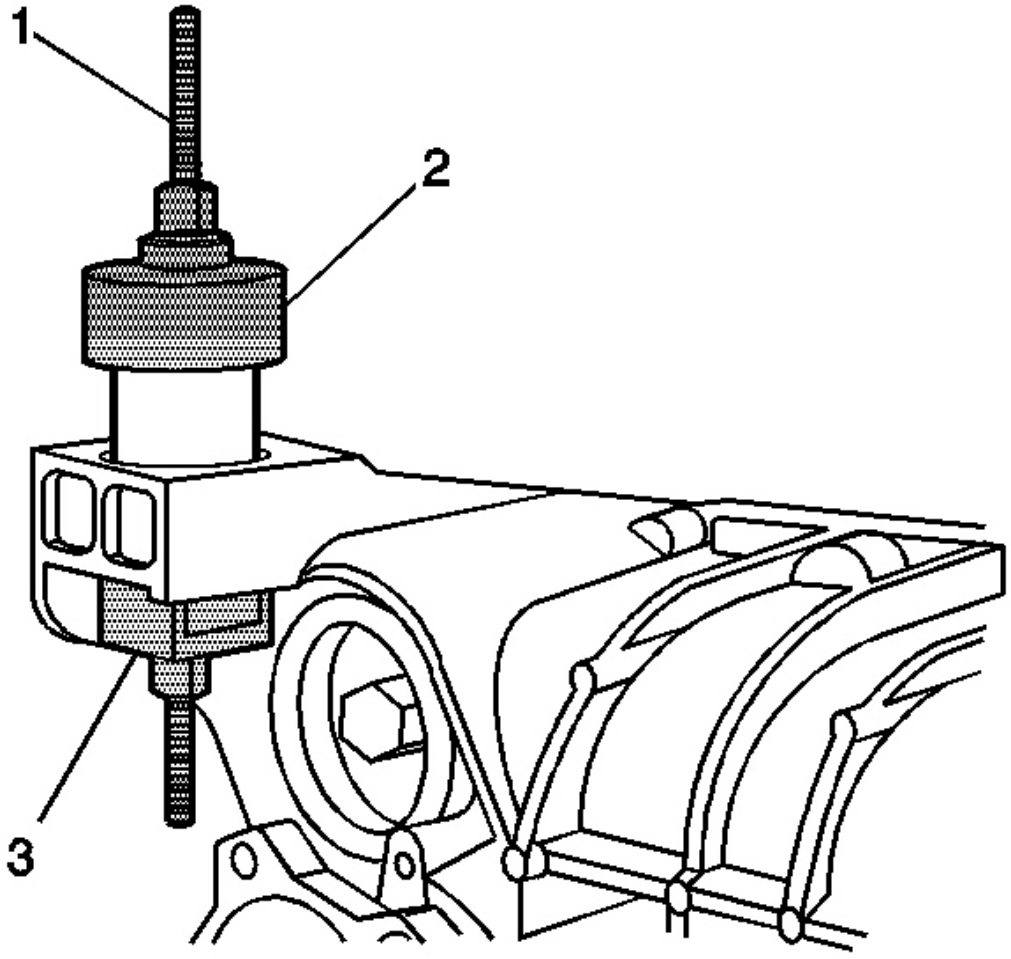


Fig. 59: Installing J 45755-2, J 45755-1, Forcing Screw, Bearing & Washers Over Differential Carrier Assembly Bushing
Courtesy of GENERAL MOTORS CORP.

2. Install the J 45755-2 (2), J 45755-1 (3), and the forcing screw, bearing and washers (1) over the differential carrier assembly bushing as shown.
3. Press the bushing into the differential carrier assembly bushing bore using the **J 45755** . See **Special Tools and Equipment** .
4. Install the differential carrier assembly. Once the differential carrier assembly is installed, remove the piece of tape in order to connect the vent hose. Refer to **Differential Carrier Assembly Replacement** .

DIFFERENTIAL CARRIER ASSEMBLY BUSHING REPLACEMENT (INNER AXLE SHAFT HOUSING)

Tools Required

J 45755 Front Axle Bushing Remover/Installer. See **Special Tools and Equipment** .

Removal Procedure

1. Remove the inner shaft housing. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .
2. Install the inner shaft housing into a vise.

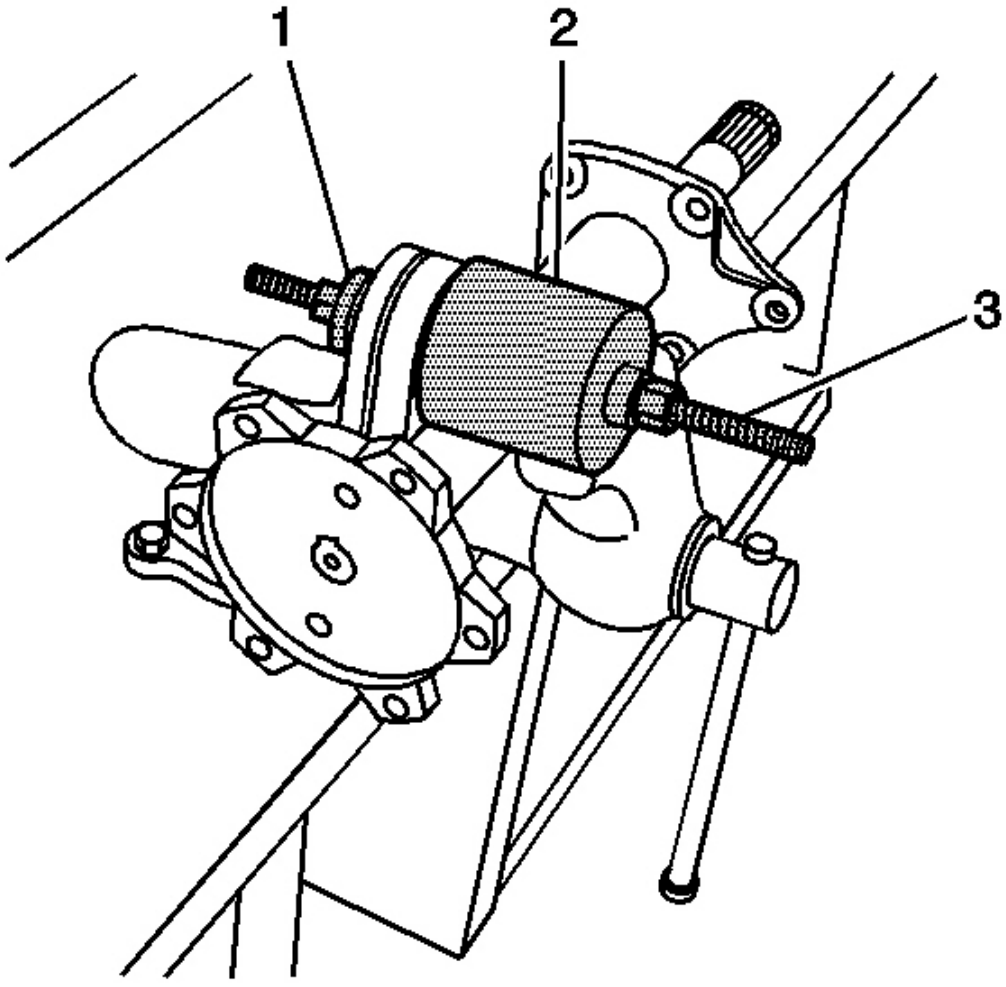


Fig. 60: Installing J 45755-2, J 45755-1, Forcing Screw, Bearing & Washers Over Inner Shaft Housing Bushing

Courtesy of GENERAL MOTORS CORP.

3. Install the J 45755-2 (2), J 45755-1 (1), and the forcing screw, bearing and washers (3) over the inner shaft housing bushing as shown.
4. Remove the inner shaft housing bushing using the **J 45755** . See **Special Tools and Equipment** .

Installation Procedure

1. Install the inner shaft bushing into the inner shaft housing bushing bore.

   Ensure that the inner shaft bushing is positioned so that the bushing is being driven in from the front of the inner shaft housing towards the rear of the inner shaft housing.

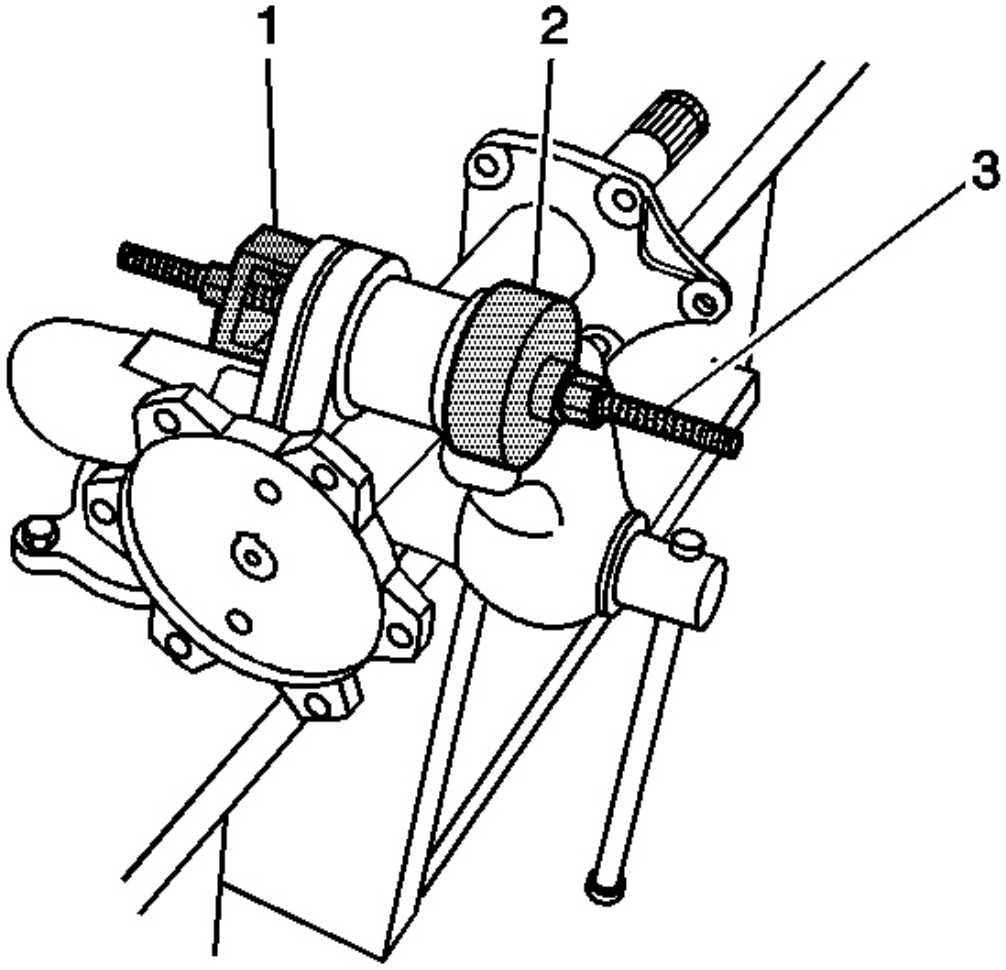


Fig. 61: Installing J 45755-2, J 45755-1, Forcing Screw, Bearing & Washers Inner Shaft Housing Bushing
Courtesy of GENERAL MOTORS CORP.

2. Install the J 45755-2 (2), J 45755-1 (1), and the forcing screw, bearing and washers (3) over the inner shaft housing bushing as shown.
3. Press the bushing into the inner shaft housing bore using the **J 45755** . See **Special Tools and Equipment** .
4. Remove the inner shaft housing from the vise.
5. Install the inner shaft housing. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .

DIFFERENTIAL CARRIER ASSEMBLY REPLACEMENT

Removal Procedure

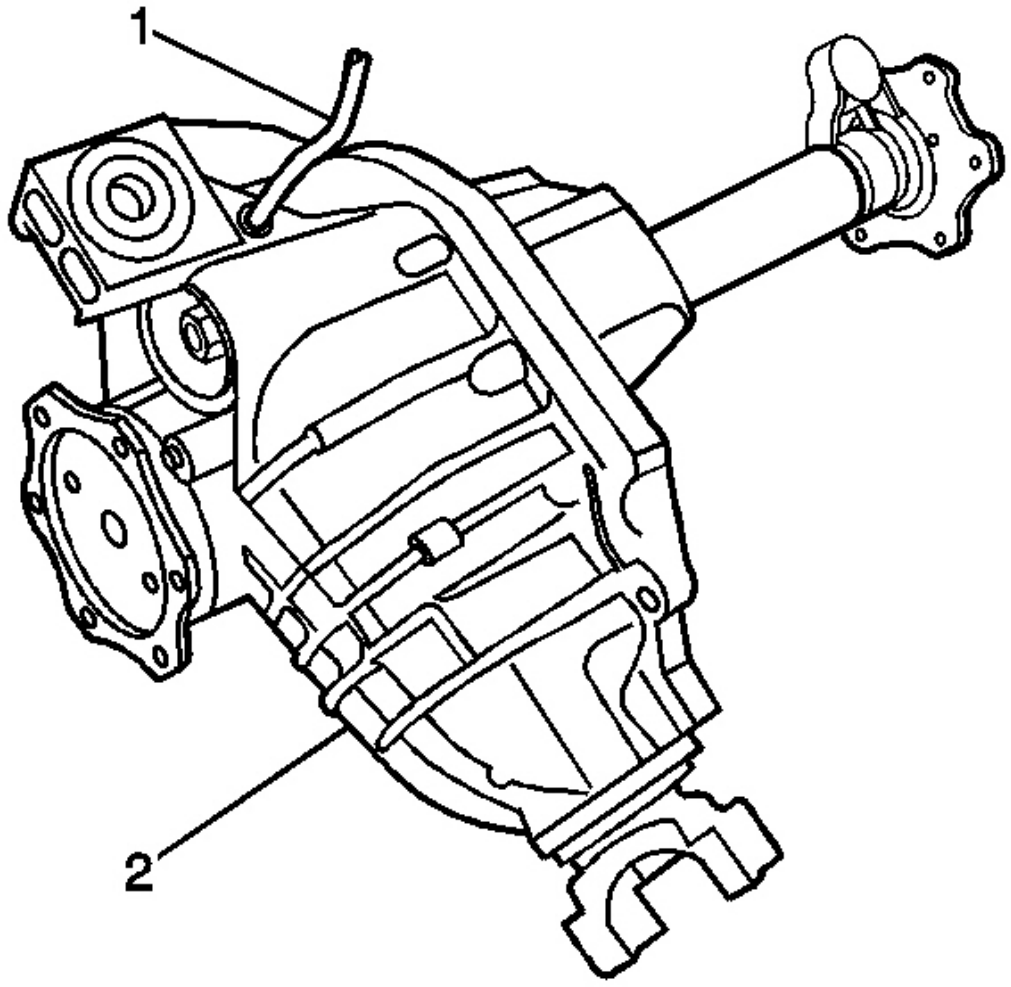


Fig. 62: Identifying Vent Hose & Differential Carrier Case Assembly
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Support the rear end of the vehicle with jack or utility stands.
3. Remove the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
4. Remove the catalytic converter guard. Refer to **Catalytic Converter Guard Replacement** in Frame and Underbody.

5. Drain the front drive axle. Refer to **Lubricant Replacement - Front Drive Axle** .
6. Disconnect the front propeller shaft from the differential carrier assembly. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.
7. Remove the wheel drive shafts from the differential carrier assembly and secure out of the way. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
8. Disconnect the vent hose (1) from the differential carrier assembly (2).
9. Remove the lower control arm crossmember. Refer to **Crossmember Replacement (Lower Control Arm)** in Frame and Underbody.
10. Attach a transmission jack to the differential carrier assembly.

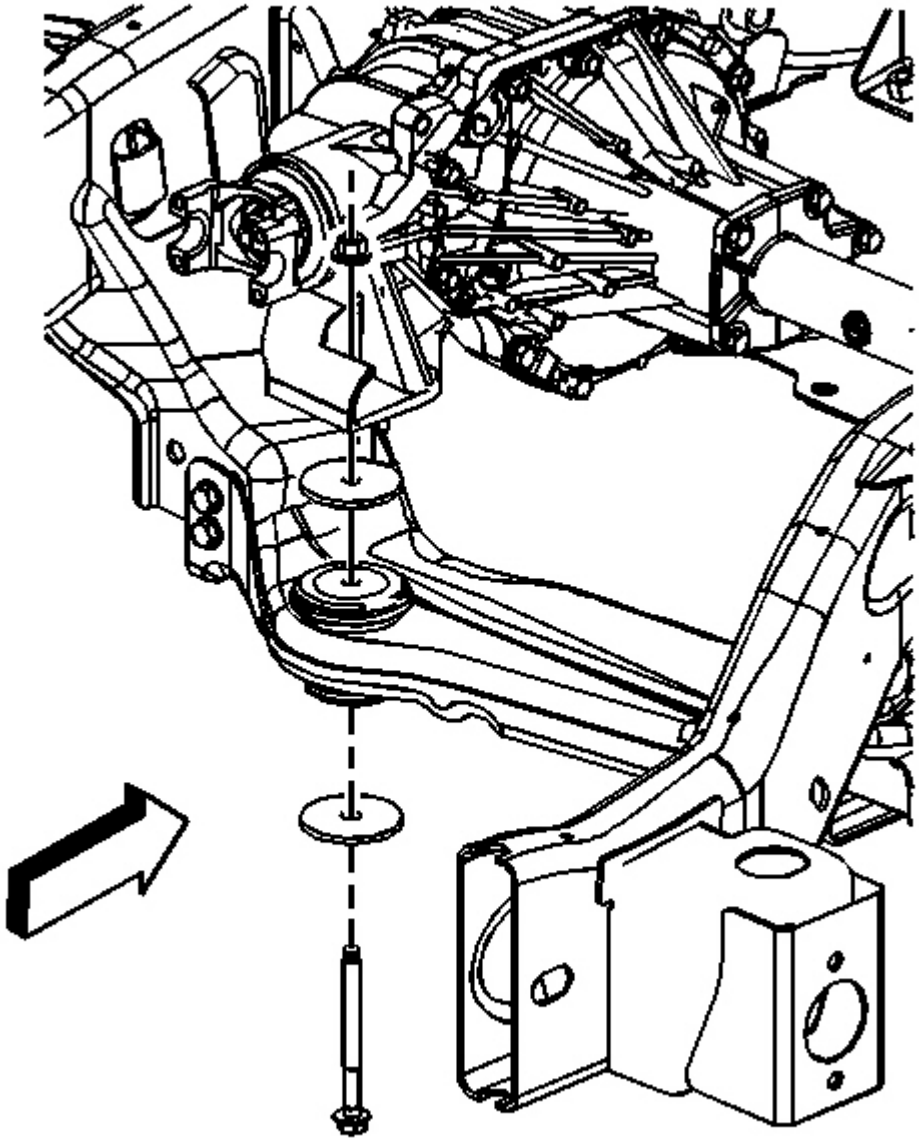


Fig. 63: Differential Carrier Assembly Left & Right Side Axle Mount Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

11. Remove the differential carrier assembly left side axle mount bolt and nut.
12. Remove the differential carrier assembly right side axle mount bolt and nut.
13. Remove the differential carrier assembly from the vehicle.

Installation Procedure

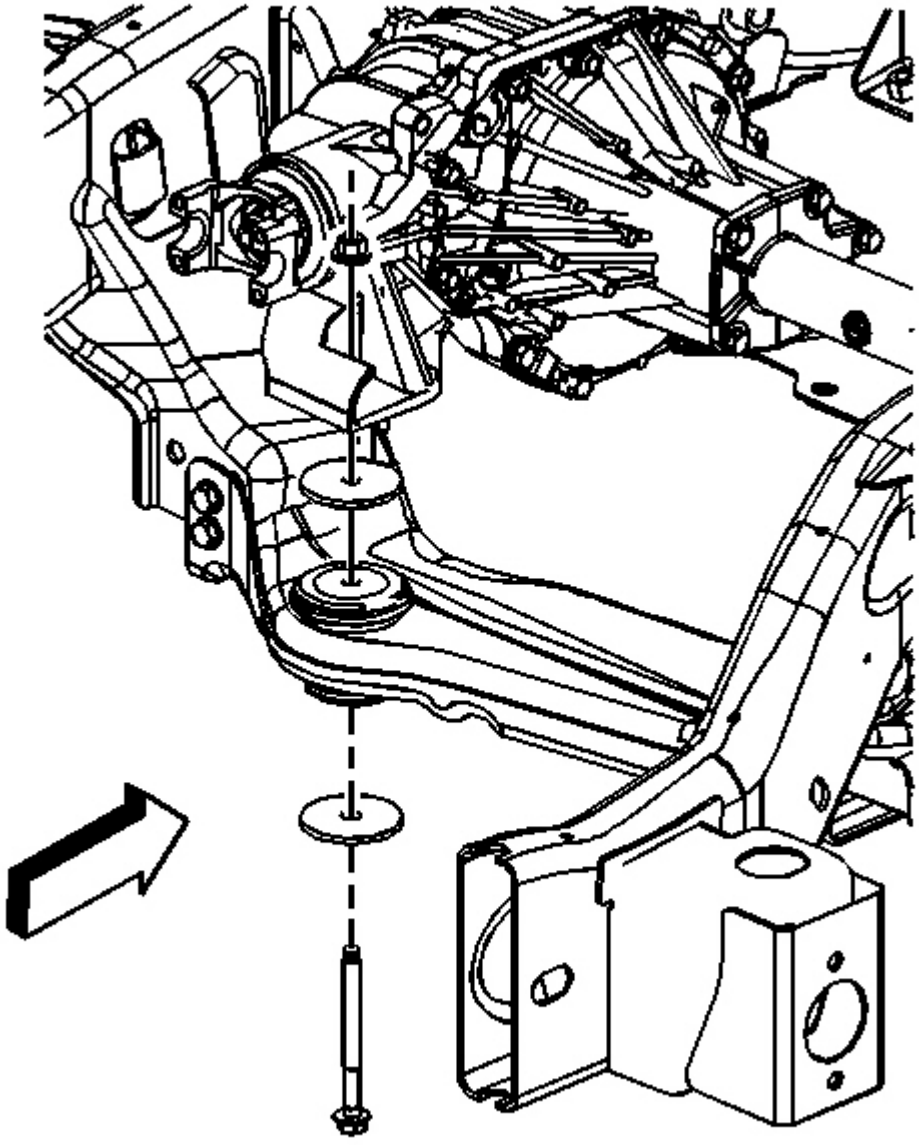


Fig. 64: Differential Carrier Assembly Left & Right Side Axle Mount Bolts & Nuts
Courtesy of GENERAL MOTORS CORP.

1. Install the differential carrier assembly to the vehicle.
2. Perform the following procedure before installing the axle mounting bolts.

1. Remove all traces of the original adhesive patch.
2. Clean the threads of the bolt with brake parts cleaner or the equivalent and allow to dry.
3. Apply Threadlocker GM P/N 12345382 (Canadian P/N 10953489) to the threads of the bolt.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the differential carrier assembly right side axle mount bolt and nut.

   Tighten: Tighten the bolts to 100 N.m (75 lb ft).

4. Install the differential carrier assembly left side axle mount bolt and nut.

   Tighten: Tighten the bolts to 100 N.m (75 lb ft).

5. Remove the transmission jack.
6. Install the lower control arm crossmember. Refer to **Crossmember Replacement (Lower Control Arm)** in Frame and Underbody.

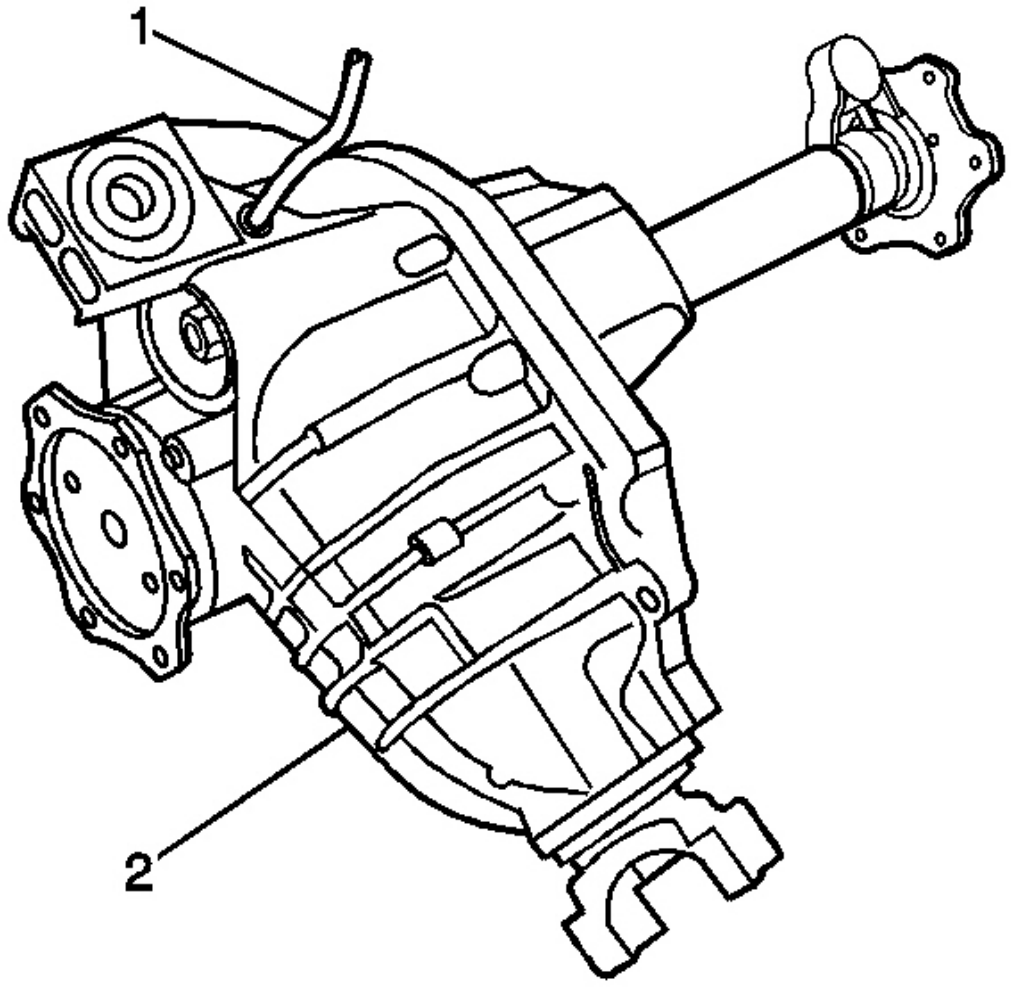


Fig. 65: Identifying Vent Hose & Differential Carrier Case Assembly
Courtesy of GENERAL MOTORS CORP.

7. Connect the vent hose (1) to the differential carrier case assembly (2).
8. Install the wheel drive shafts. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
9. Install the front propeller shaft to the differential carrier assembly. Refer to **Propeller Shaft Replacement - Front** in Propeller Shaft.
10. Inspect the lubricant level and add, if necessary. Refer to **Lubricant Level Inspection - Front Drive Axle** .
11. Install the catalytic converter guard. Refer to **Catalytic Converter Guard Replacement** in Frame and Underbody.

12. Install the engine protection shield. Refer to **Engine Protection Shield Replacement** in Frame and Underbody.
13. Remove the jack or utility stands.
14. Lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY - DISASSEMBLE

Tools Required

- **J 22912-01** Split-Plate Bearing Remover. See **Special Tools and Equipment** .
- **J 2619-01** Slide Hammer
- **J 29369-2** Bushing and Bearing Remover 2-3 in. See **Special Tools and Equipment** .
- **J 36599-A** Side Bearing Nut Wrench. See **Special Tools and Equipment** .
- **J 36615** Side Bearing Nut Wrench. See **Special Tools and Equipment** .
- **J 45754** Pinion Bearing Race Remover/Installer - 9.25 inch Axle
- **J 45755** Front Axle Bushing Remover/Installer. See **Special Tools and Equipment** .
- **J 45765** Pinion Remover - 8.25 inch/9.25 inch Axles
- **J 8614-01** Flange and Pulley Holding Tool. See **Special Tools and Equipment** .

Inspection Procedure

Perform the following before disassembling the axle:

1. Remove the fill plug from the axle.
2. Remove the drain plug from the axle.
3. Drain the axle lubricant.
4. Inspect the oil and the case for metal chips.

   Determine the source of the metal chips, such as a broken gear or bearing cage.

5. Check the ring gear backlash. Refer to **Backlash Inspection and Adjustment** .

This information can be used in order to determine the cause of the axle problem. The information will also help when setting up and preloading the differential case.

Determine the cause of the axle problem before disassembly, if possible.

Disassembly Procedure

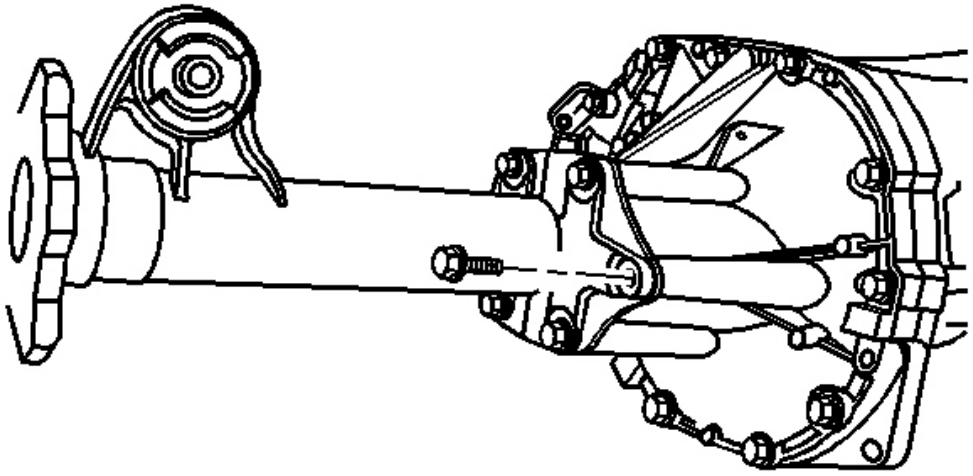


Fig. 66: Inner Axle Shaft Housing & Differential Carrier Assembly Bolts
Courtesy of GENERAL MOTORS CORP.

1. Remove the inner axle shaft housing to differential carrier assembly bolts.

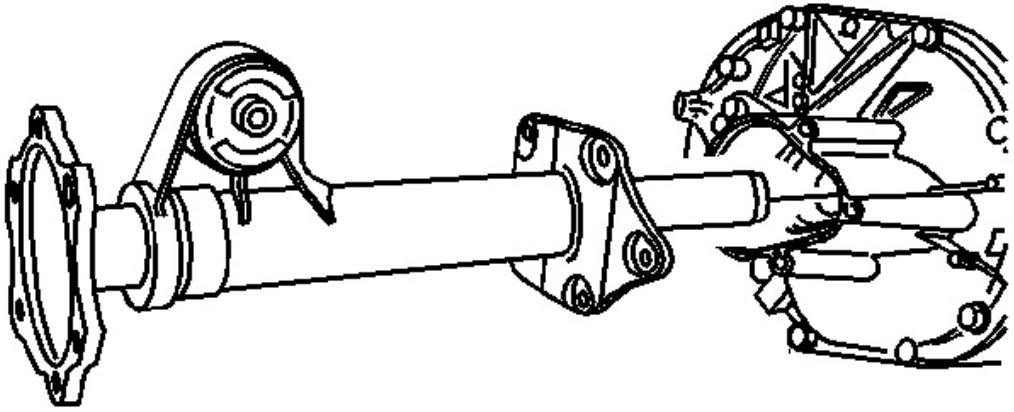


Fig. 67: Inner Axle Housing & Inner Axle Shaft
Courtesy of GENERAL MOTORS CORP.

2. Remove the inner axle housing with the inner axle shaft.
3. Install the inner axle shaft housing into a vise.

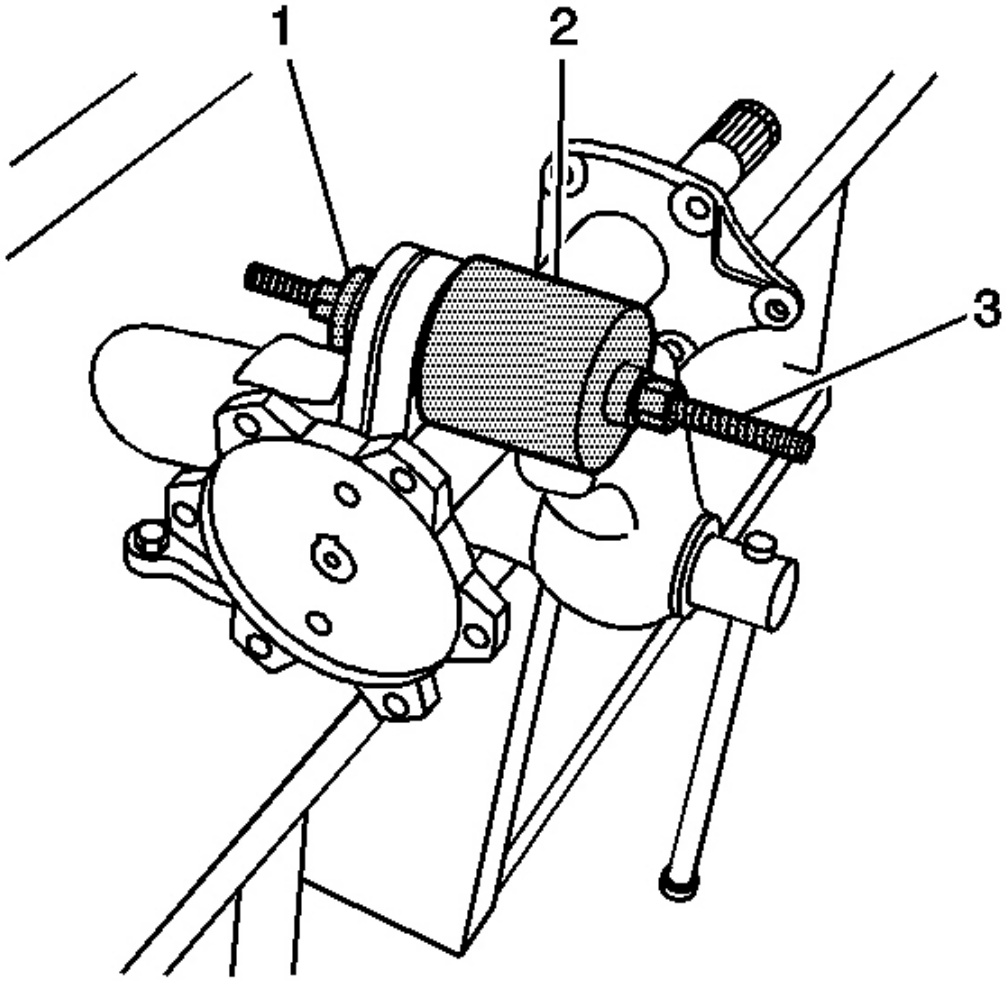


Fig. 68: Installing J 45755-2, J 45755-1, Forcing Screw, Bearing & Washers Over Inner Shaft Housing Bushing
Courtesy of GENERAL MOTORS CORP.

4. Install the J 45755-2 (2), J 45755-1 (1), and the forcing screw, bearing and washers (3) over the inner shaft housing bushing as shown.
5. Remove the inner shaft housing bushing using the **J 45755** . See **Special Tools and Equipment** .
6. Remove the inner axle shaft from the inner axle housing using a hammer and brass drift.

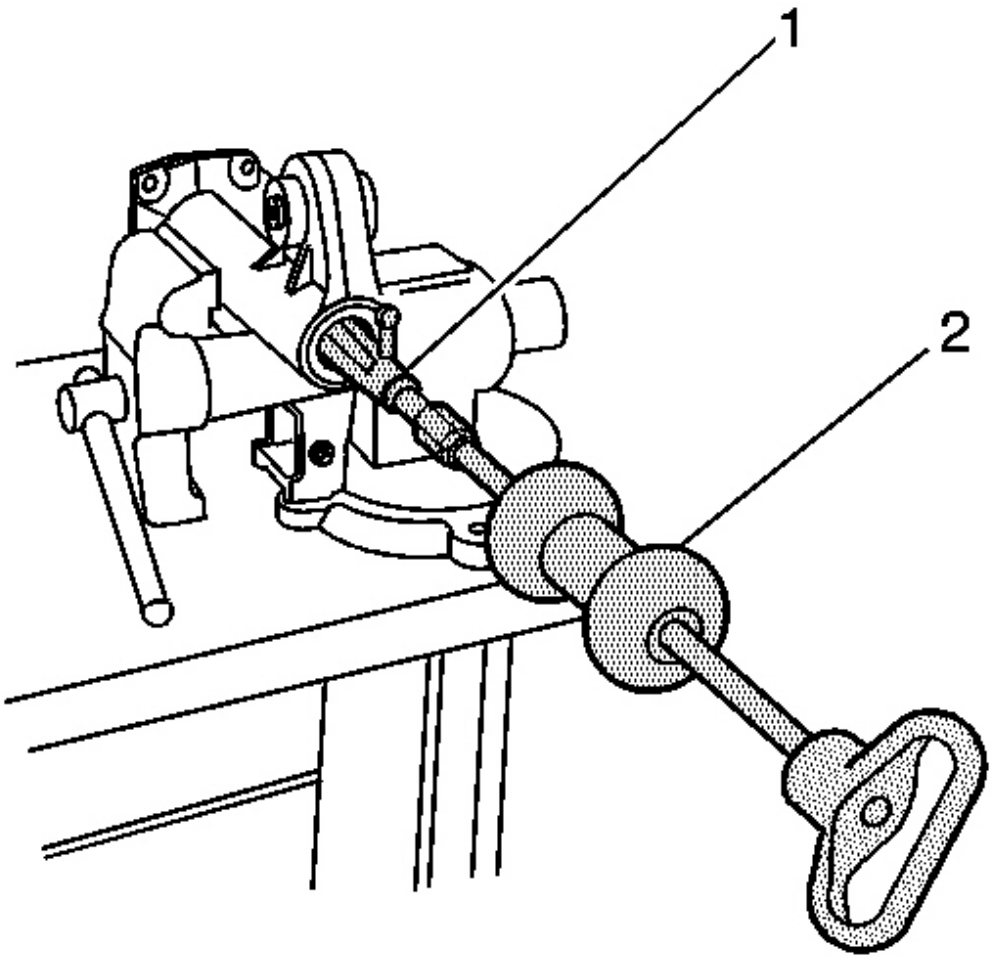


Fig. 69: View Of J 29369-2 & J 2619-01
Courtesy of GENERAL MOTORS CORP.

7. Install the **J 29369-2** behind the inner axle shaft seal. See **Special Tools and Equipment** .
8. Install the **J 2619-01** (2) to the **J 29369-2** (1). See **Special Tools and Equipment** .
9. Remove the inner axle shaft seal using the **J 2619-01** .

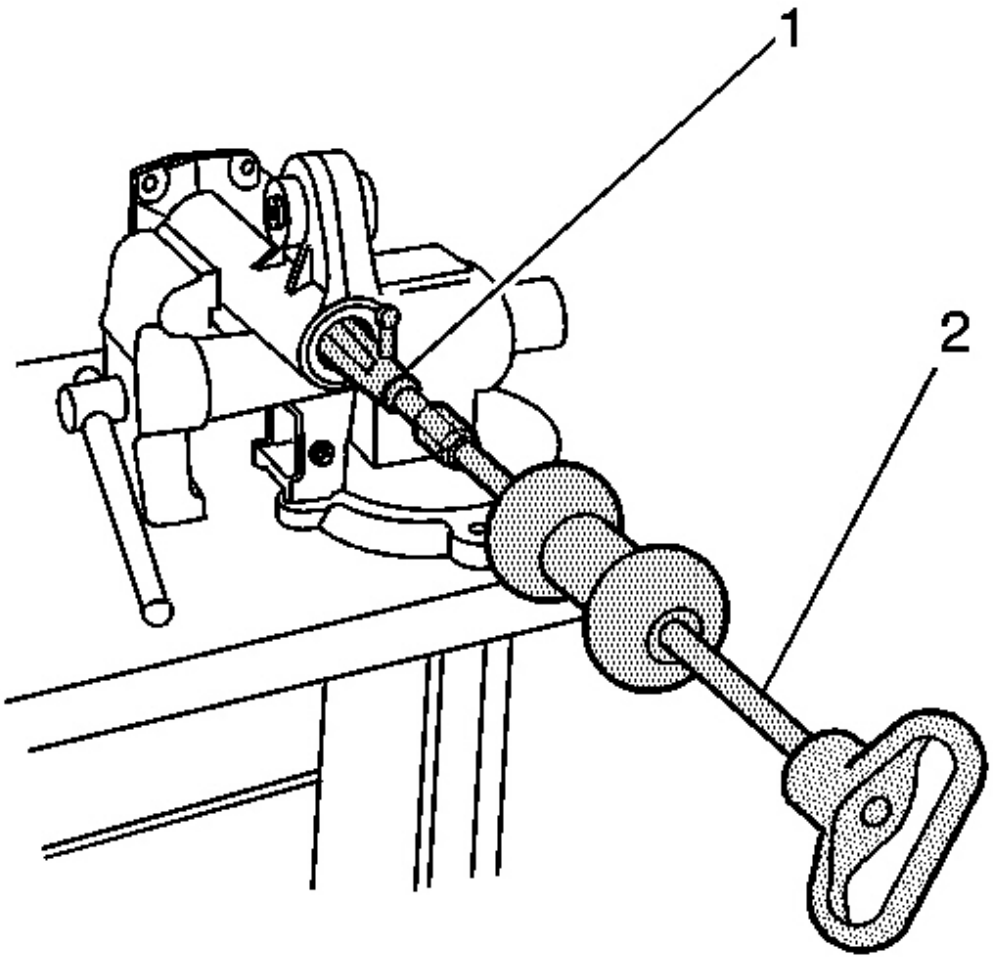


Fig. 70: Installing J 29369-02 Behind Inner Axle Shaft Seal
Courtesy of GENERAL MOTORS CORP.

10. Install the **J 29369-2** behind the inner axle shaft bearing. See **Special Tools and Equipment** .
11. Install the **J 2619-01** (2) to the **J 29369-2** (1). See **Special Tools and Equipment** .
12. Remove the inner axle shaft bearing using the **J 2619-01** .
13. Place the differential carrier assembly into a vise.

    Clamp only on the mounting flange of the differential carrier assembly case.

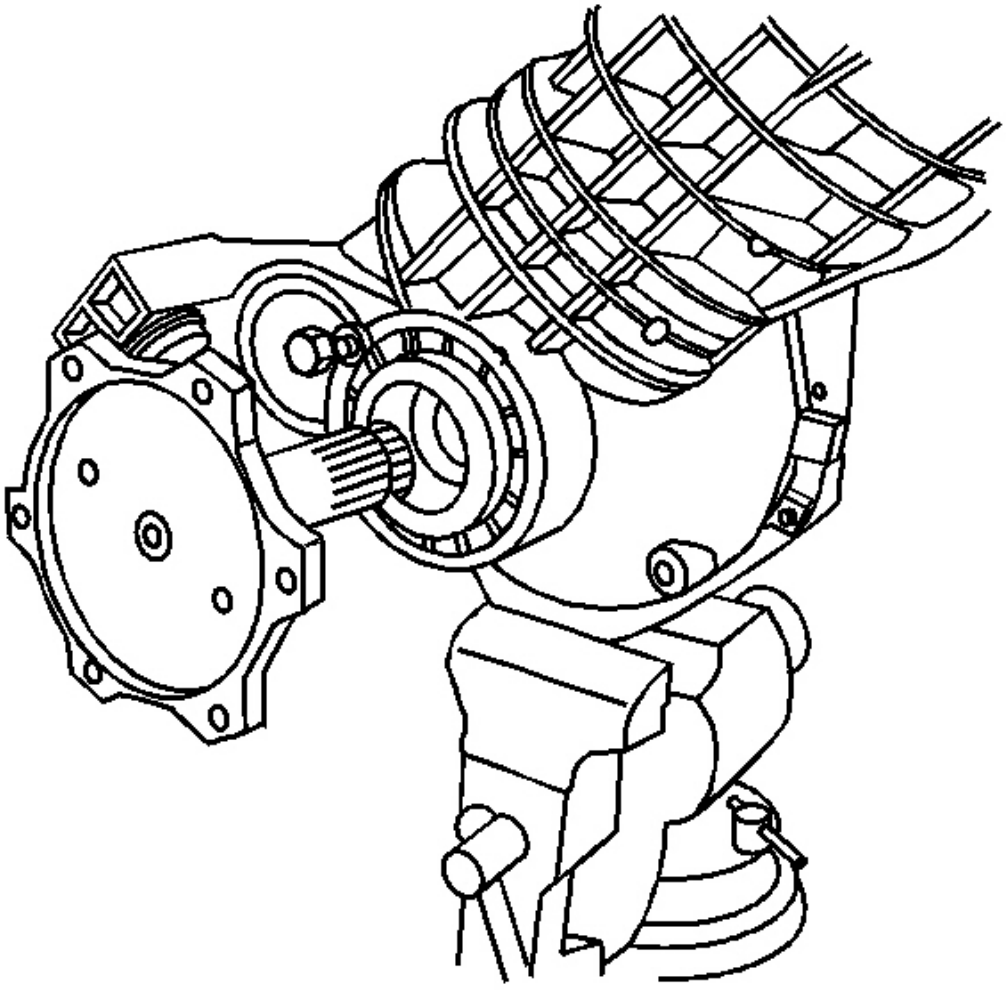


Fig. 71: Removing Left Side Inner Axle Shaft
Courtesy of GENERAL MOTORS CORP.

14. Remove the left side inner axle shaft using a hammer and a brass drift.

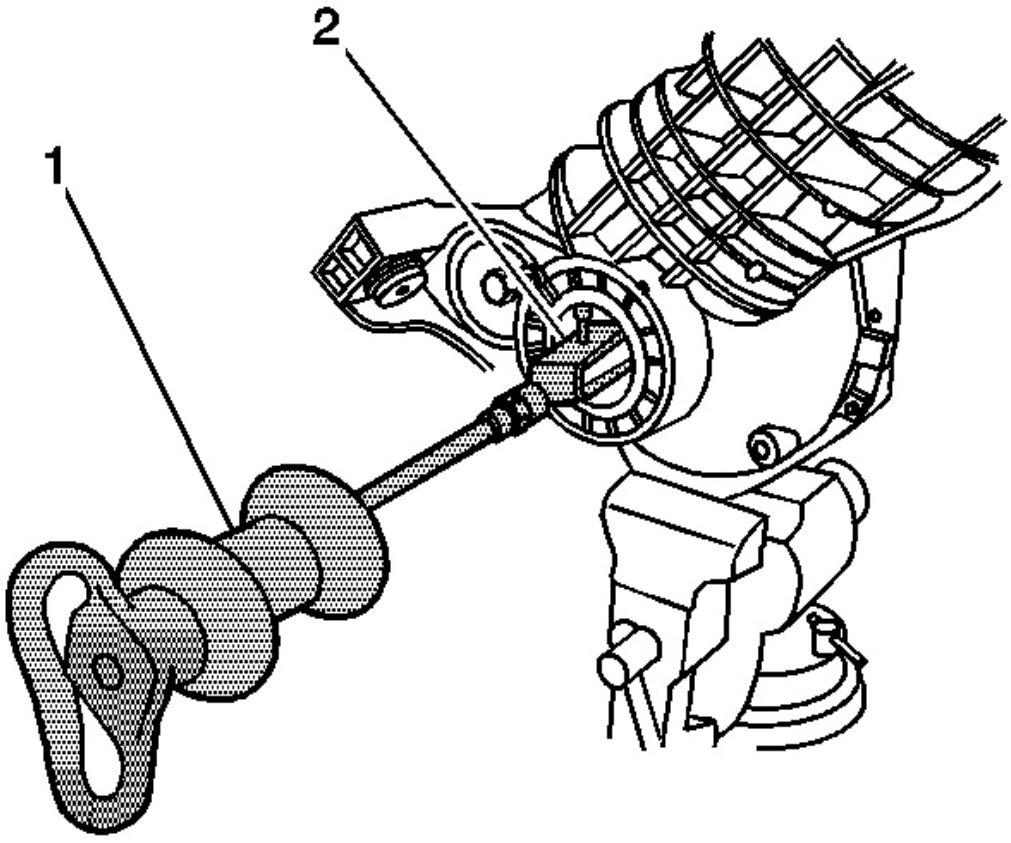


Fig. 72: Installing J 2619-01 & J 29369-2
Courtesy of GENERAL MOTORS CORP.

15. Install the **J 29369-2** (2) behind the inner axle shaft seal. See **Special Tools and Equipment** .
16. Install the **J 2619-01** (1) to the **J 29369-2** (2). See **Special Tools and Equipment** .
17. Remove the inner axle shaft seal using the **J 2619-01** .

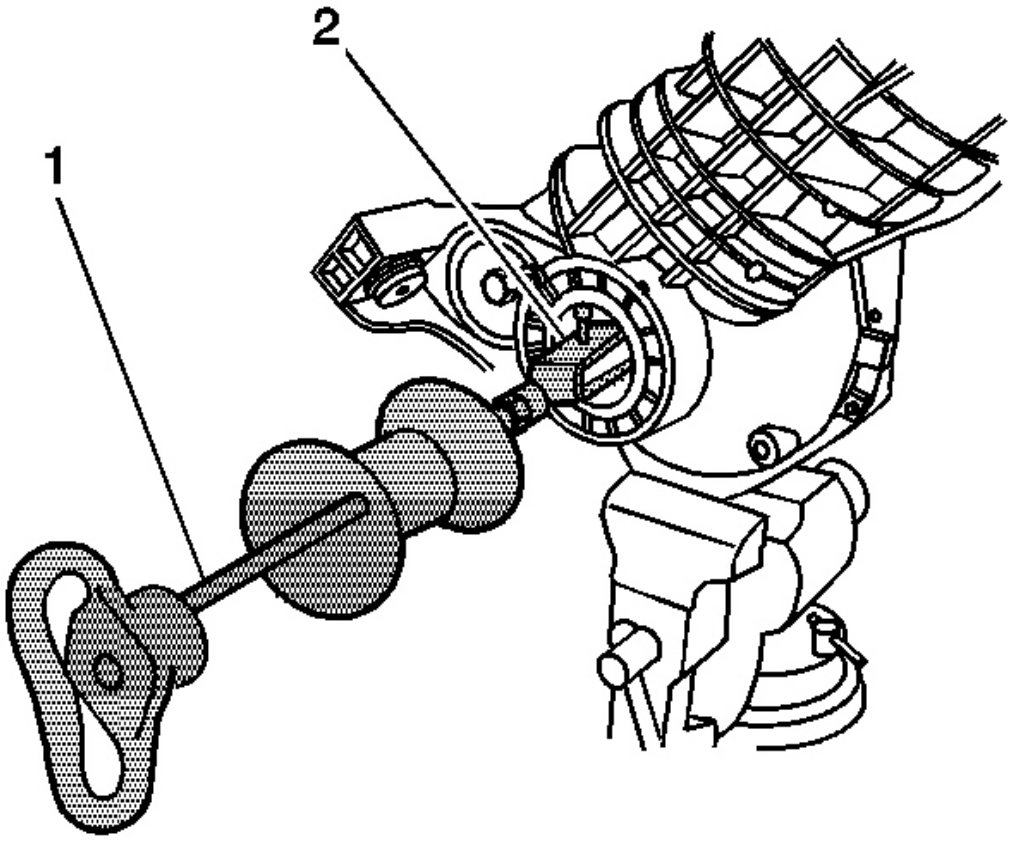


Fig. 73: Installing J 29369-2 Behind Inner Axle Shaft Seal Or Inner Axle Shaft Bearing
Courtesy of GENERAL MOTORS CORP.

18. Install the **J 29369-2** (2) behind the inner axle shaft bearing. See **Special Tools and Equipment** .
19. Install the **J 2619-01** (1) to the **J 29369-2** (2). See **Special Tools and Equipment** .
20. Remove the inner axle shaft bearing using the **J 2619-01** .

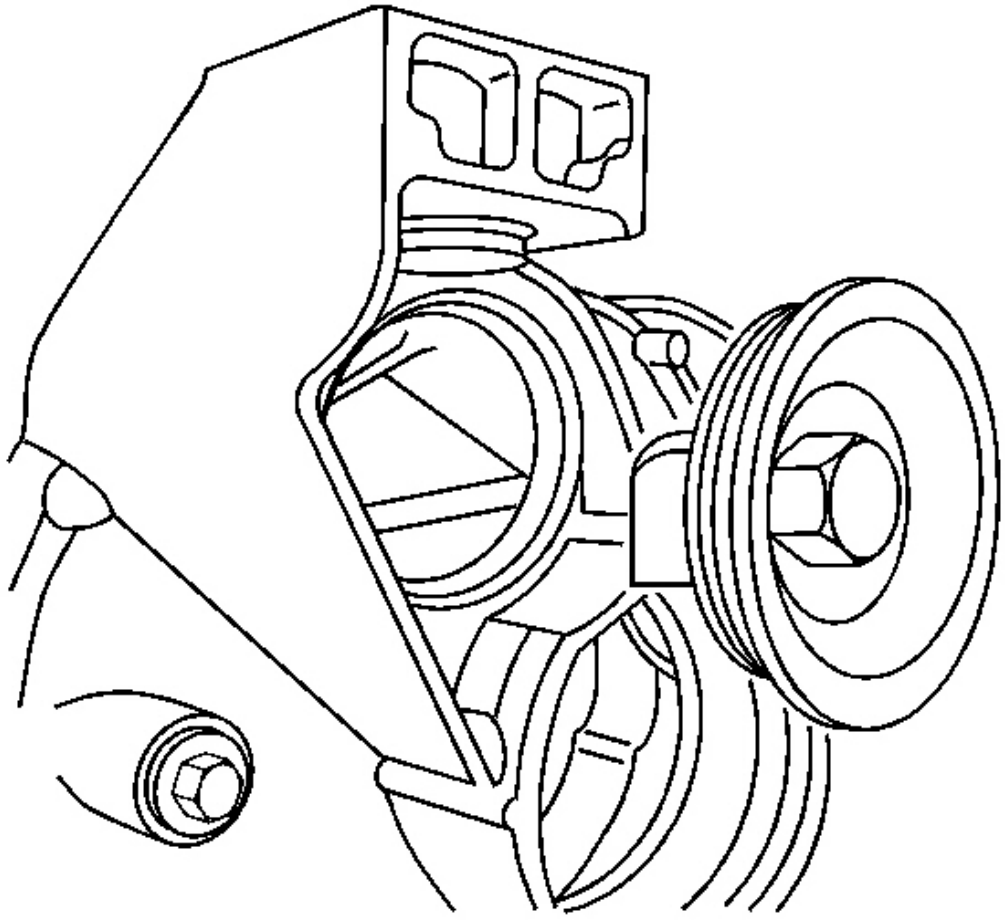


Fig. 74: Differential Carrier Assembly & Hole Plug
Courtesy of GENERAL MOTORS CORP.

21. Remove the front differential carrier hole plug.

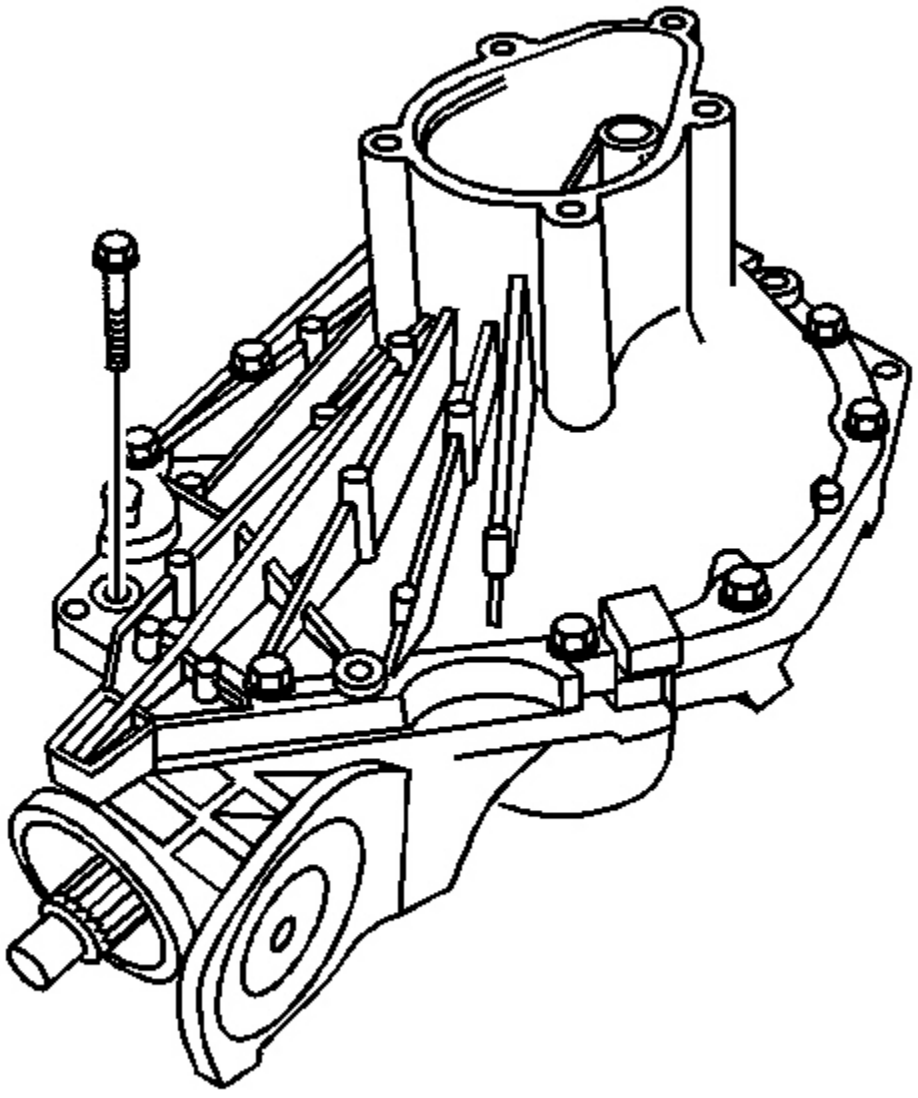


Fig. 75: Removing Differential Carrier Assembly Bolts
Courtesy of GENERAL MOTORS CORP.

22. Remove the differential carrier assembly bolts.

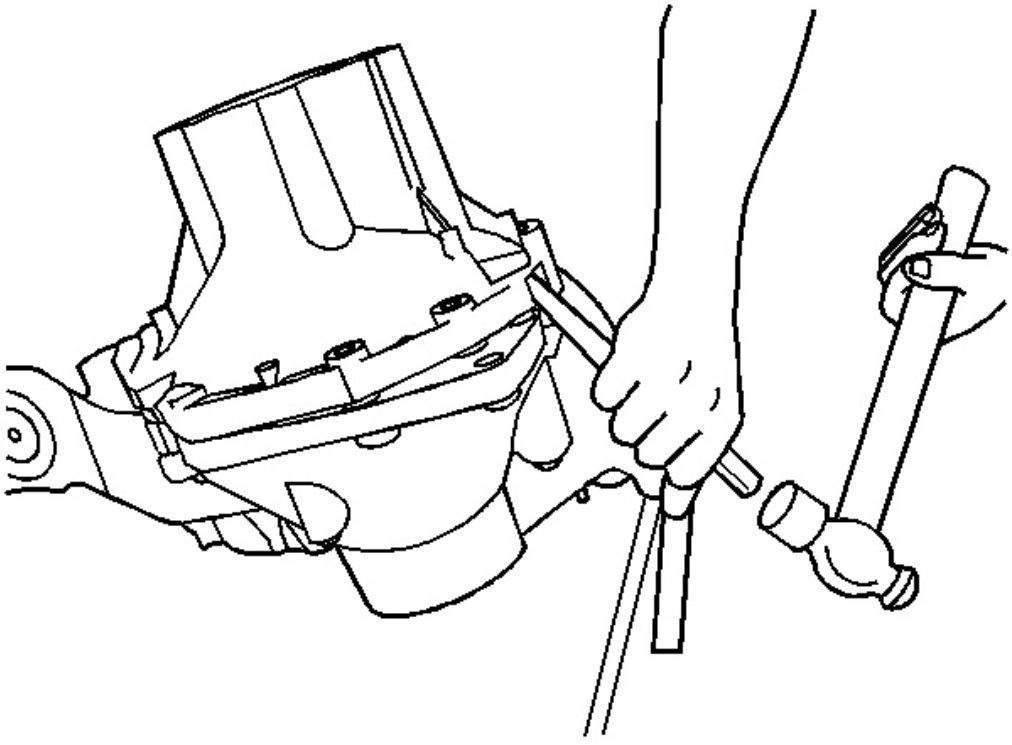


Fig. 76: Separating Left & Right Carrier Case Half By Tapping On Carrier Case Lugs With Hammer
Courtesy of GENERAL MOTORS CORP.

23. Separate the left carrier case half from the right carrier case half by tapping on the carrier case lugs with a brass drift and a hammer.

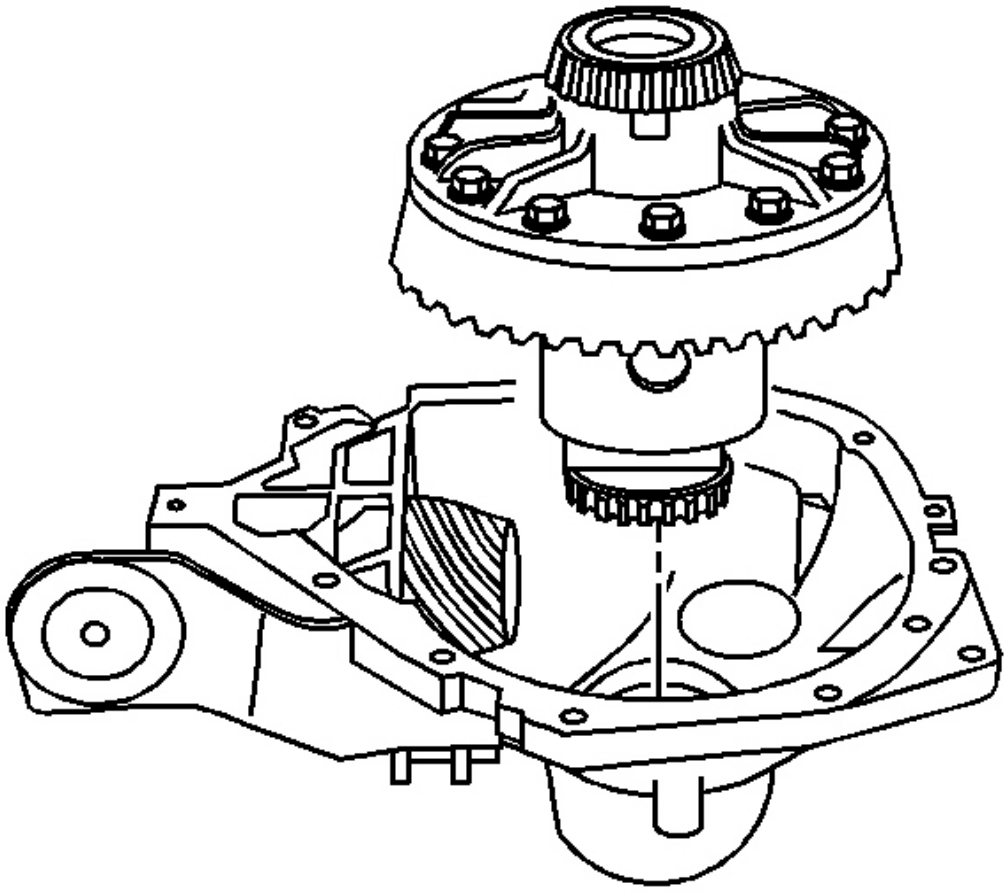


Fig. 77: Differential Case Assembly
Courtesy of GENERAL MOTORS CORP.

24. Remove the differential case assembly.
25. Disconnect the right side differential bearing adjuster nut lock from the differential bearing adjuster nut by prying up on the lock.

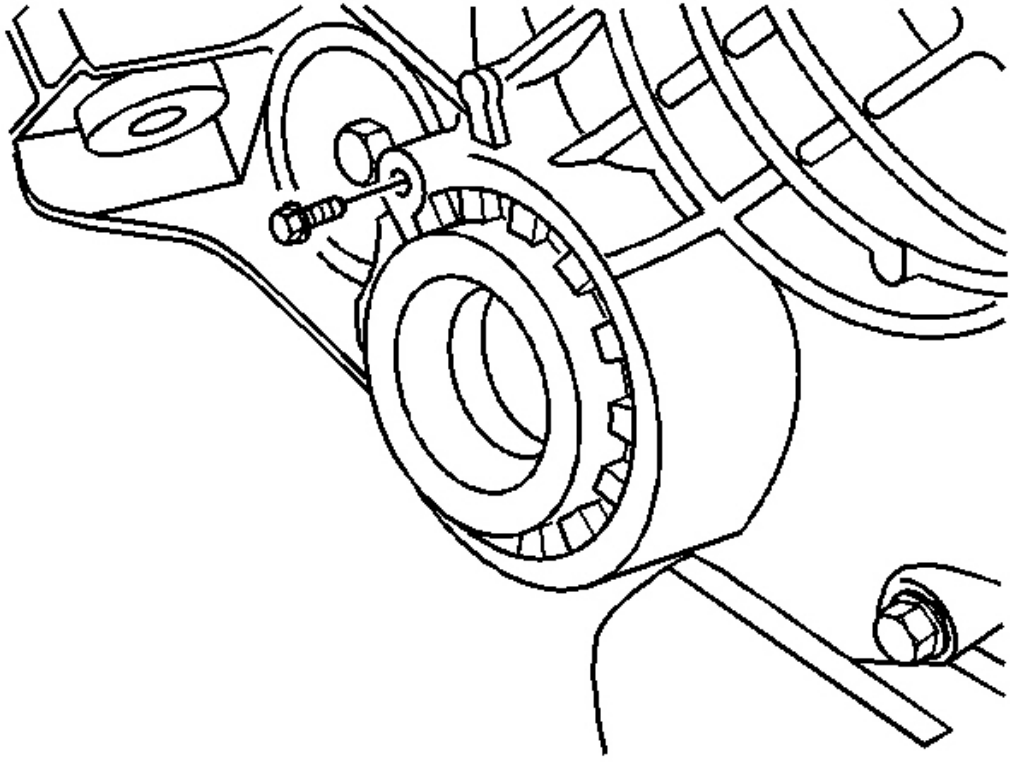


Fig. 78: Differential Adjuster Nut Lock Bolt
Courtesy of GENERAL MOTORS CORP.

26. Remove the differential bearing adjuster nut lock bolt from the differential bearing adjuster nut.

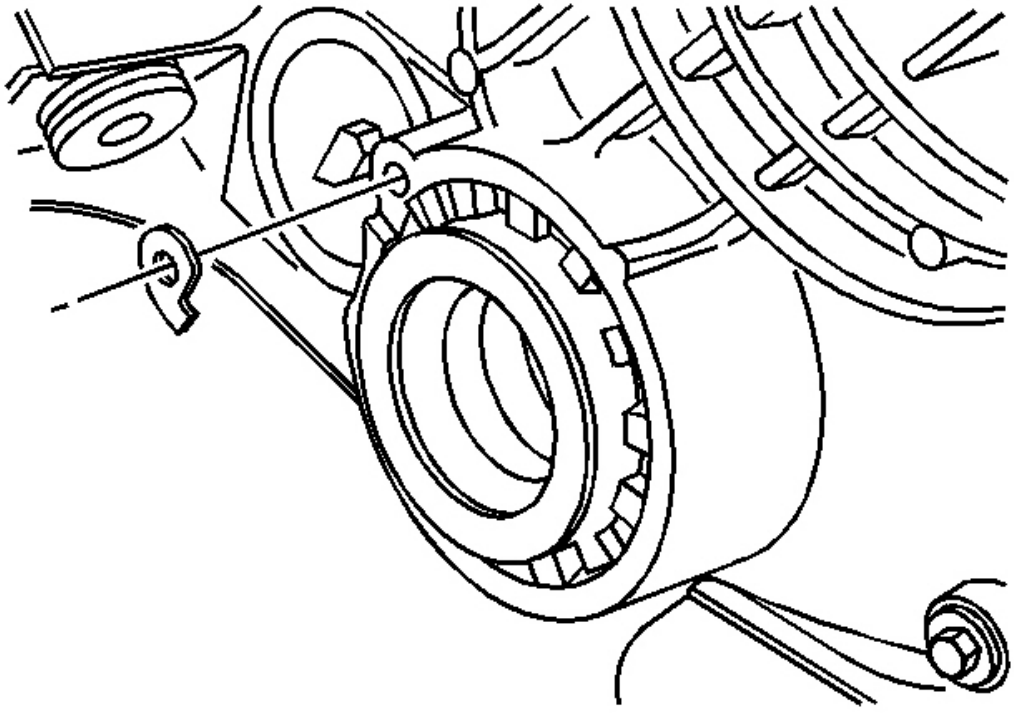


Fig. 79: Differential Adjuster Nut Lock
Courtesy of GENERAL MOTORS CORP.

27. Remove the differential bearing adjuster nut lock from the differential bearing adjuster nut.

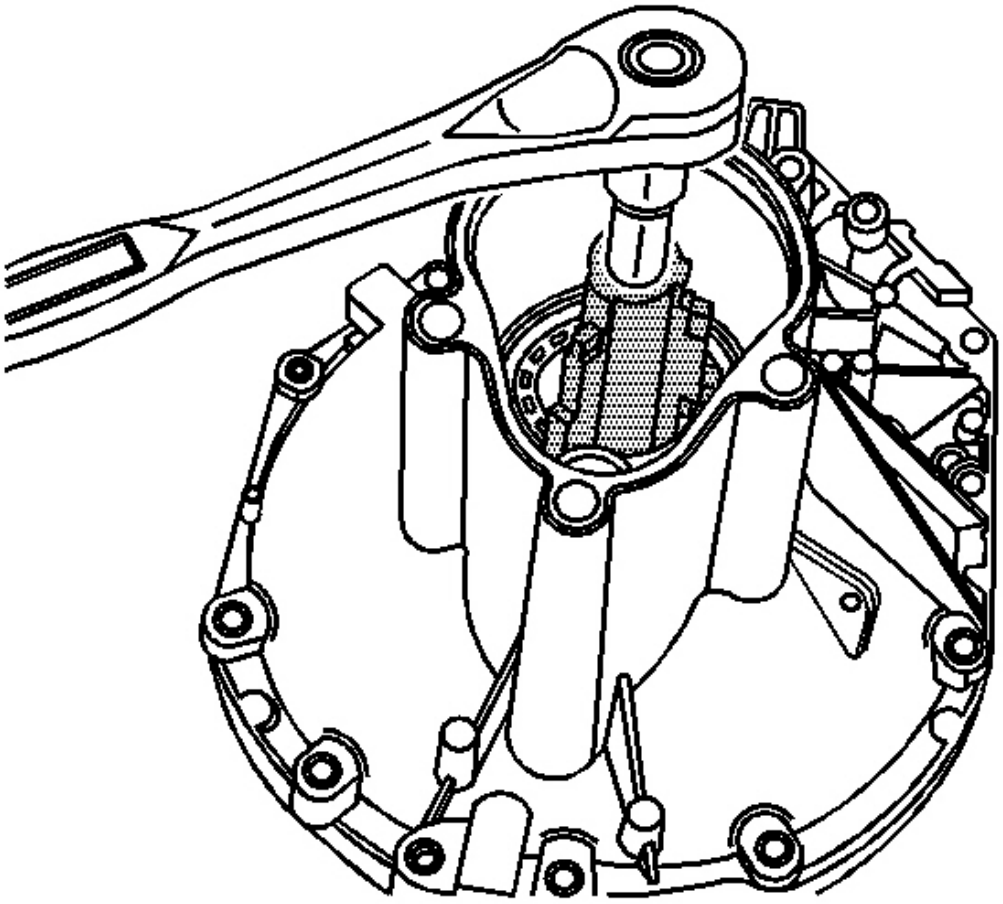


Fig. 80: Remove Right Side Differential Side Bearing Cup, Differential Bearing Adjuster Nut & Differential Bearing Adjuster Sleeve
Courtesy of GENERAL MOTORS CORP.

28. Remove the right side differential side bearing cup, the differential bearing adjuster nut, and the differential bearing adjuster sleeve by doing the following:
    1. Install the **J 36599-A** onto the differential bearing adjuster nut. See **Special Tools and Equipment** .
    2. Turn the **J 36599-A** clockwise in order to push the bearing cup out of the bore. See **Special Tools and Equipment** .
    3. Remove the differential bearing adjuster sleeve using a hammer and a brass drift.

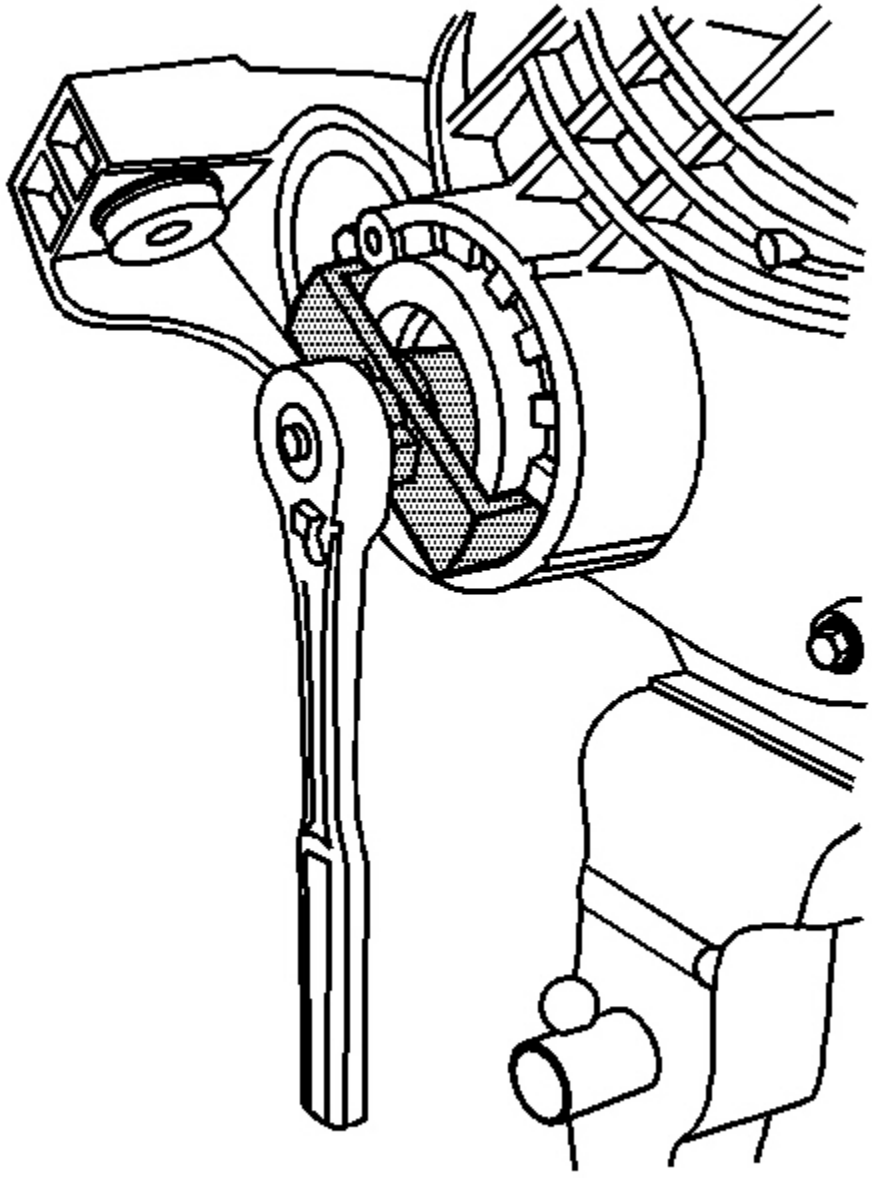


Fig. 81: Turning Left Side Differential Adjuster Nut Sleeve Using J 36615
Courtesy of GENERAL MOTORS CORP.

29. Remove the left side differential bearing adjuster by doing the following:
    1. Install the **J 36615** onto the differential bearing adjuster nut as shown. See **Special Tools and Equipment** .

2. Turn the **J 36615** counterclockwise in order to remove the differential bearing adjuster nut, the O-ring seal and the differential side bearing cup. See **Special Tools and Equipment** .

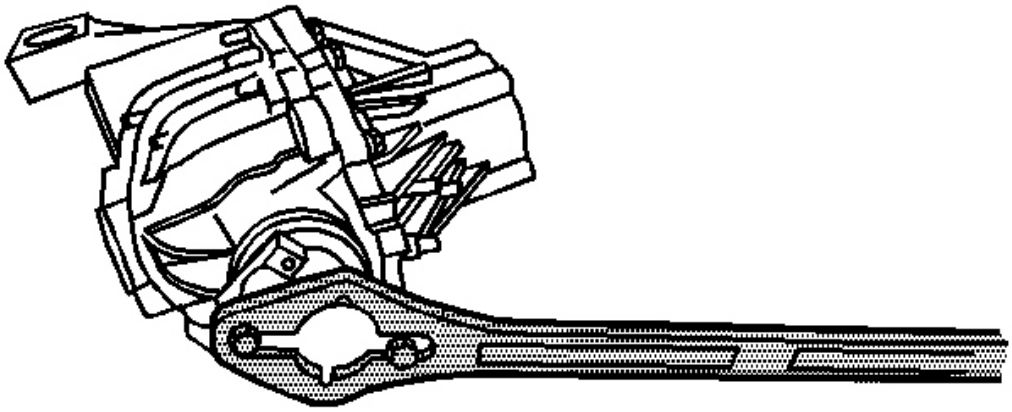


Fig. 82: Installing J 8614-01 Onto Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

30. Install the **J 8614-01** as shown. See **Special Tools and Equipment** .

    Remove the pinion nut while holding the **J 8614-01** . See **Special Tools and Equipment** .

31. Remove the washer.

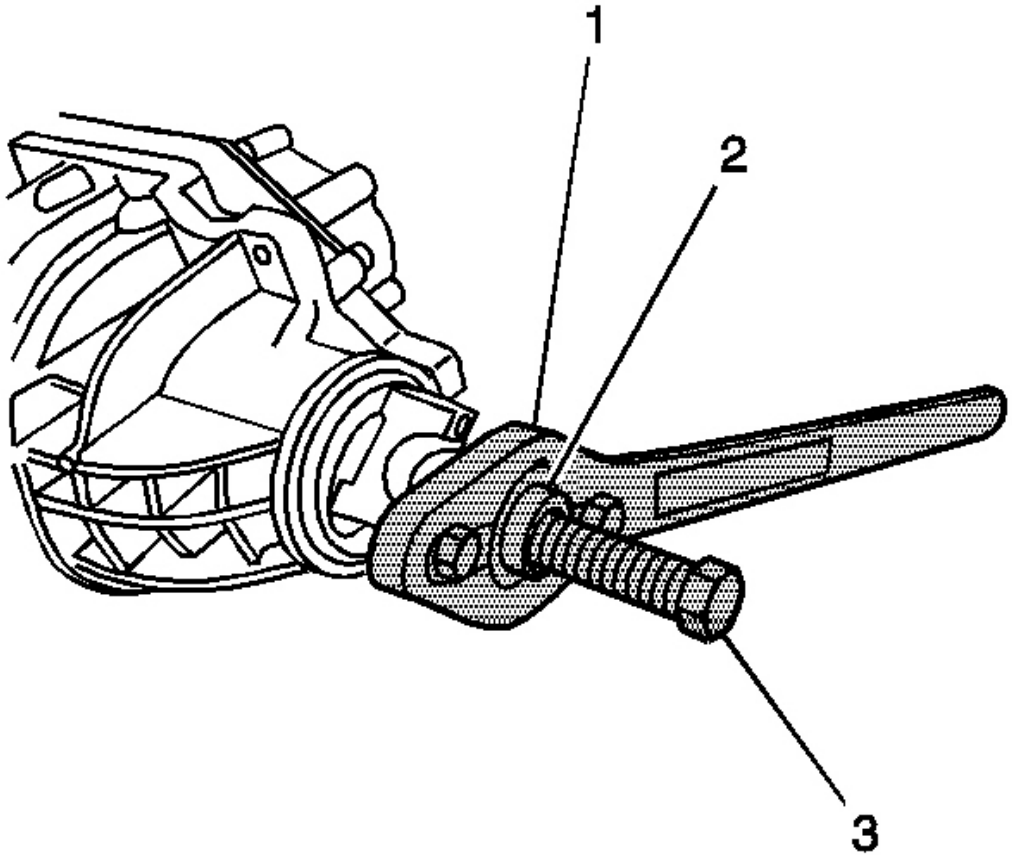


Fig. 83: Installing J 8614-2 & J 8614-3 Into J 8614-01
Courtesy of GENERAL MOTORS CORP.

32. Install the J 8614-2 (2) and the J 8614-3 (3) into the **J 8614-01** (1) as shown. See **Special Tools and Equipment** .
33. Remove the pinion yoke by turning the J 8614-3 (3) clockwise while holding the **J 8614-01** (1). See **Special Tools and Equipment** .

IMPORTANT: Carefully pry the seal from the bore. Do not distort or scratch the aluminum case.

34. Remove the pinion oil seal using a suitable seal removal tool.

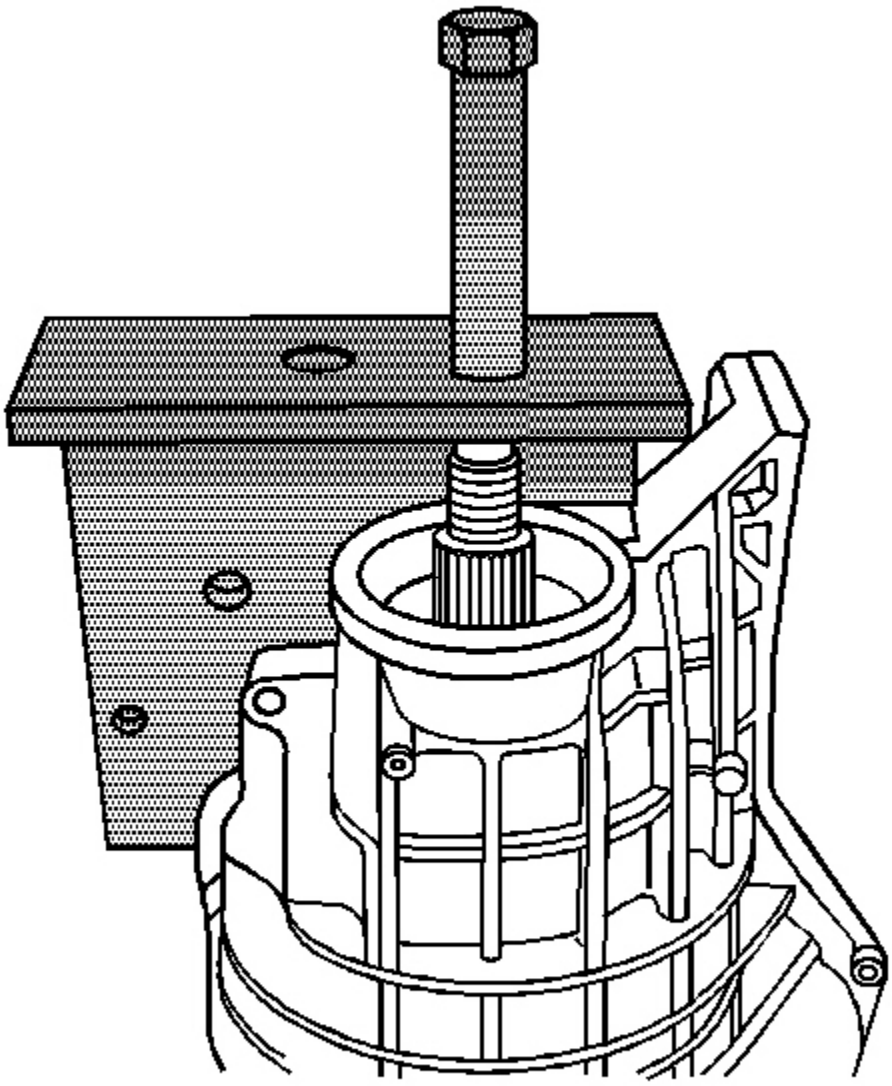


Fig. 84: Installing J 45765 To Left Side Differential Carrier Case Half Over Drive Pinion
Courtesy of GENERAL MOTORS CORP.

35. Install the **J 45765** to the left side differential carrier case half over the drive pinion as shown. See **Special Tools and Equipment** .
36. Turn the forcing screw of the **J 45765** clockwise to remove the following components from the left side differential carrier case half:

- The drive pinion gear
- The pinion gear selectable shim
- The inner pinion bearing
- The collapsible spacer

37. Remove the collapsible spacer from the pinion.
38. Remove the outer pinion bearing from the differential carrier case half.

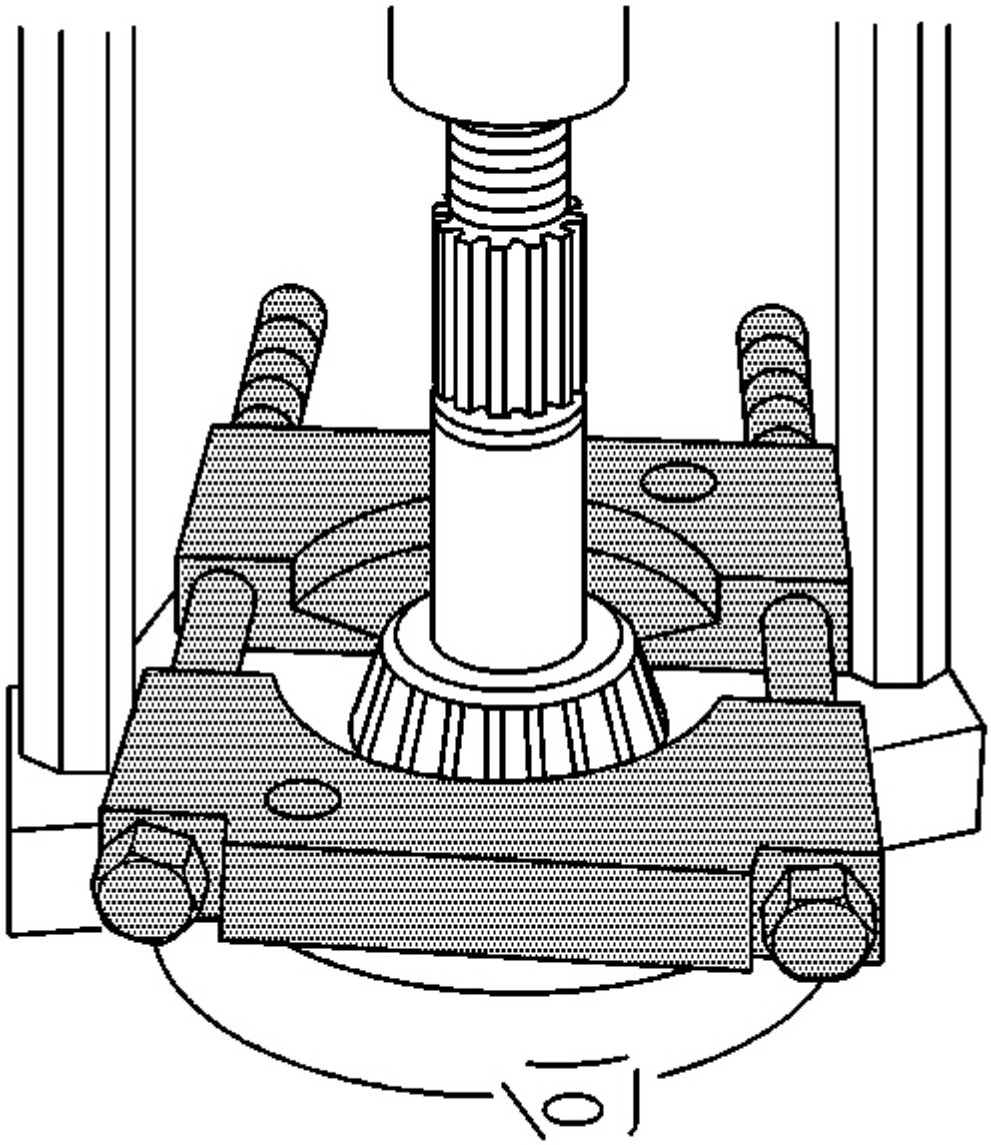


Fig. 85: Removing The Inner Pinion Bearing Using J 22912-01
Courtesy of GENERAL MOTORS CORP.

39. Remove the inner pinion bearing by installing the **J 22912-01** between the pinion bearing and the pinion gear and pressing the bearing off the pinion. See **Special Tools and Equipment** .
40. Remove the pinion gear selectable shim.

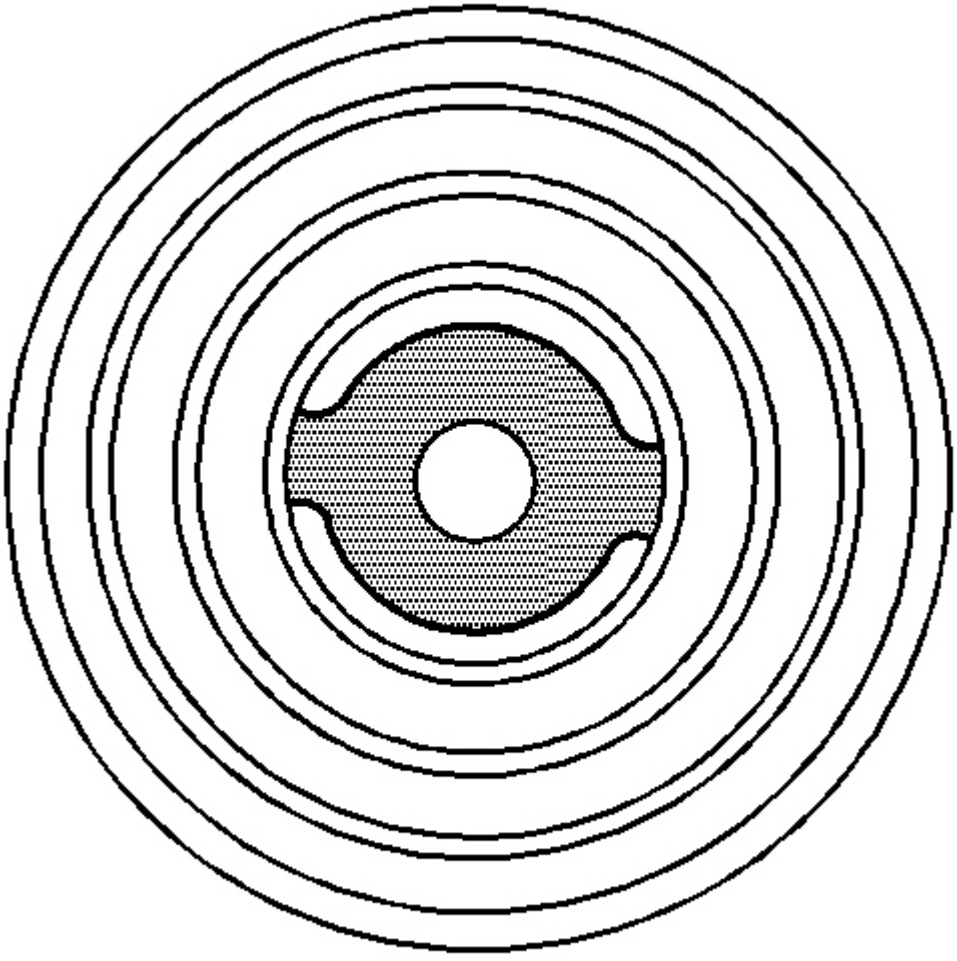


Fig. 86: Installing J 45754-3 Over Inner Pinion Bearing Cup
Courtesy of GENERAL MOTORS CORP.

41. Install the J 45754-3 over the inner pinion bearing cup.

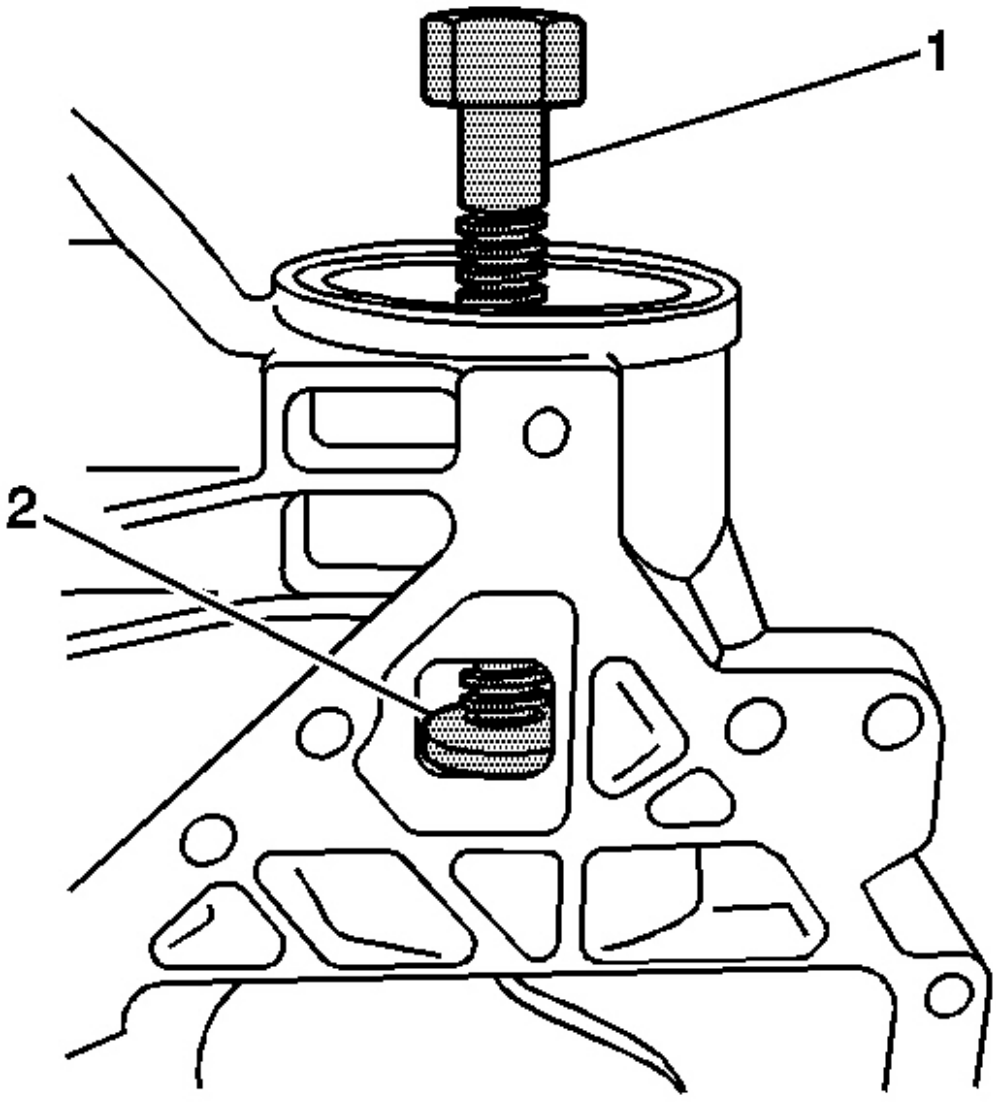


Fig. 87: Installing Forcing Screw Of J 45754 Into J 45754-3
Courtesy of GENERAL MOTORS CORP.

42. Install the forcing screw (1) of the J 45754 into the J 45754-3 (2).
43. Drive out the inner pinion bearing cup by pounding on the forcing screw with a hammer.

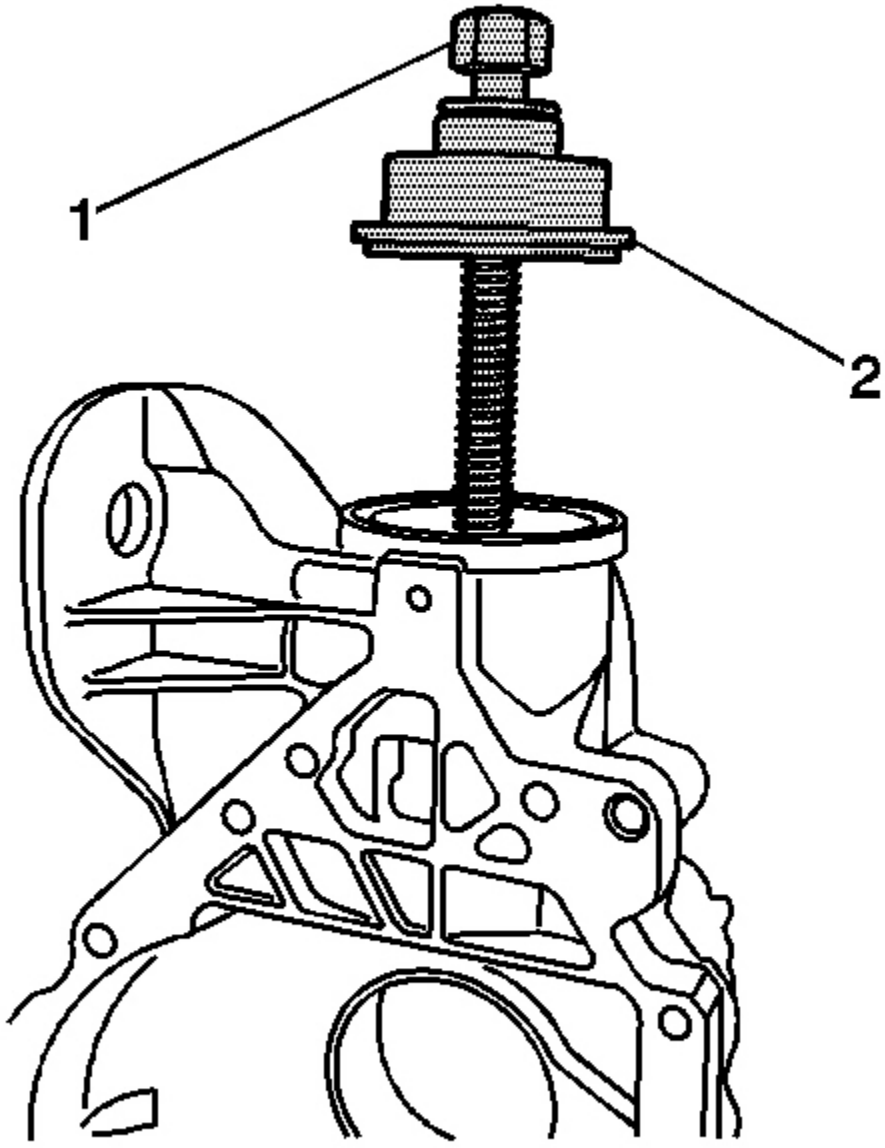


Fig. 88: Installing J 45754-2 & Forcing Screw Over Outer Pinion Bearing Cup Bore
Courtesy of GENERAL MOTORS CORP.

44. Install the J 45754-2 (2) and the forcing screw (1) over the outer pinion bearing cup bore.

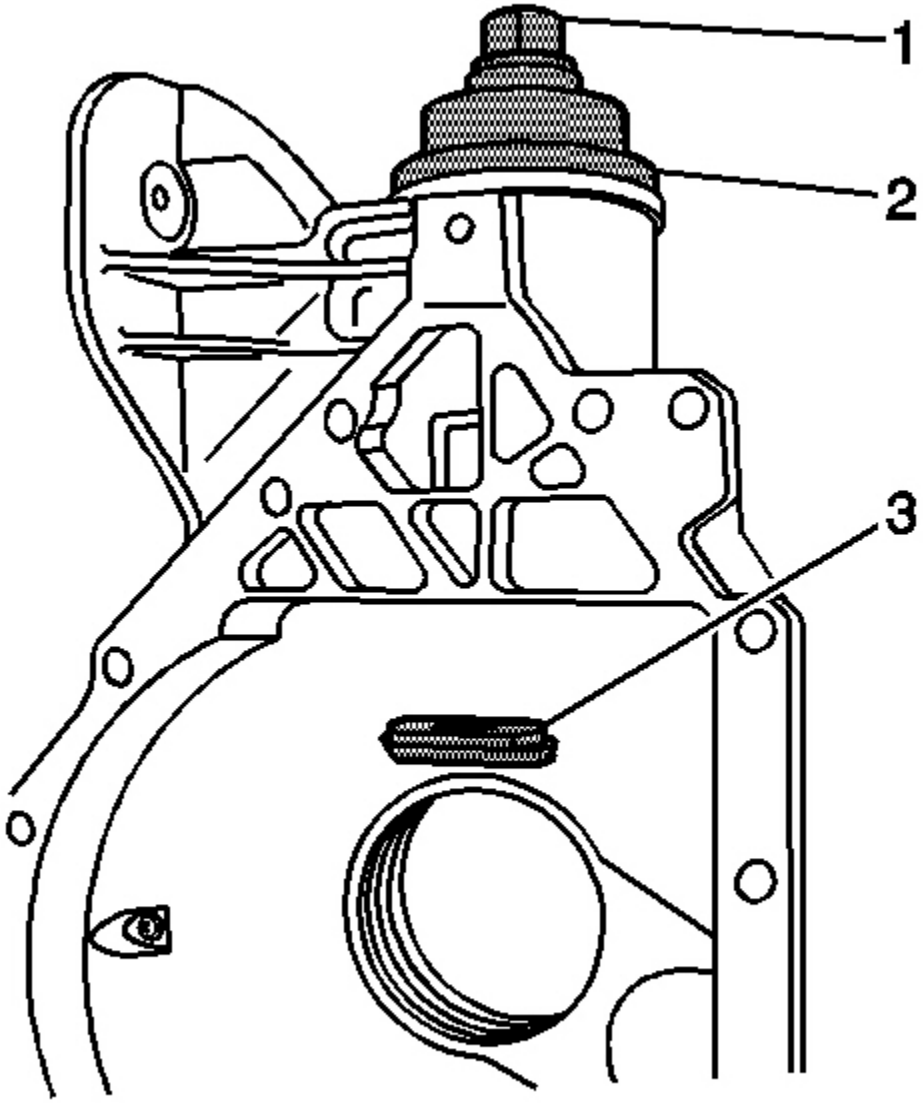


Fig. 89: Installing J 45754-4 Into Pinion Bearing Bore Behind Outer Pinion Bearing Cup
Courtesy of GENERAL MOTORS CORP.

45. Install the J 45754-4 (3) into the pinion bearing bore behind the outer pinion bearing cup.

    Slowly turn the forcing screw (1) until the J 45754-4 is evenly seated behind the outer pinion bearing cup bore and the J 45754-2 (2) is evenly seated over the outer pinion bearing cup bore.

46. Remove the outer pinion bearing cup by turning the forcing screw clockwise.

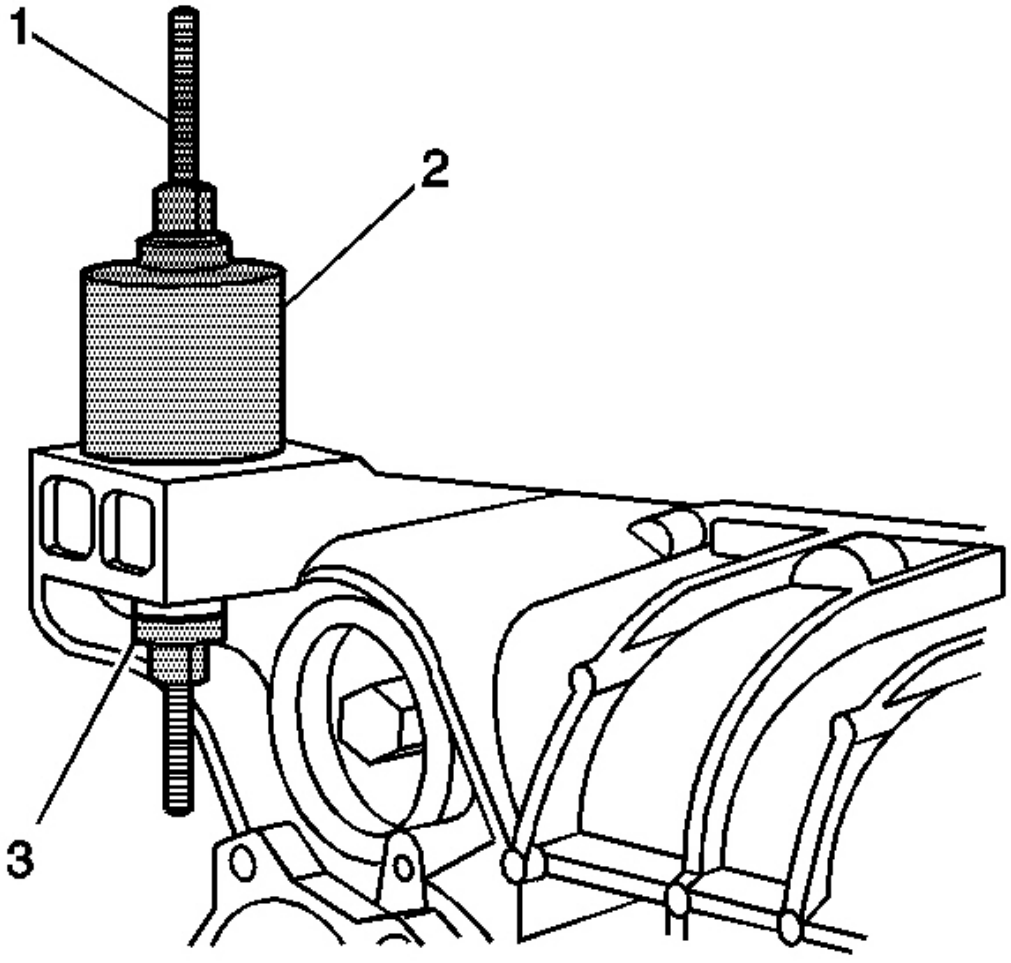


Fig. 90: Installing J 45755-3, J 45755-4, Forcing Screw, Bearing & Washers Over Differential Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

47. Install the J 45755-3 (2), J 45755-4 (3), and the forcing screw, bearing and the washers (1) over the differential carrier assembly bushing as shown.
48. Remove the differential carrier assembly bushing using the **J 45755** . See **Special Tools and Equipment** .

DIFFERENTIAL CASE ASSEMBLY DISASSEMBLE

Tools Required

- **J 22888-D** Side Bearing Remover Kit. See **Special Tools and Equipment** .
- **J 36597** Side Bearing Puller Pilot - 9.25 in Axle

1. Remove the differential side bearing by performing the following steps:
    1. Place the differential case in a vise.

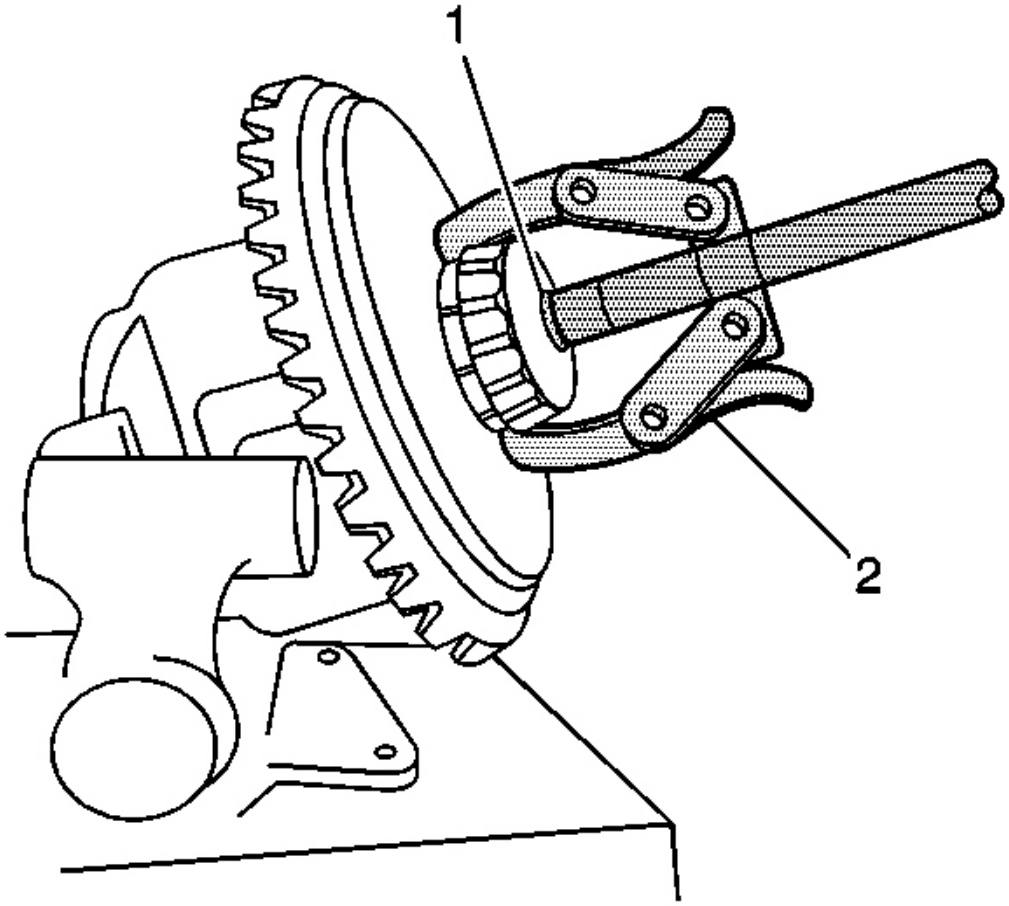


Fig. 91: Removing Differential Side Bearings
Courtesy of GENERAL MOTORS CORP.

    2. Install the J 22888-20A (2) and the **J 36597** (1) as shown. See **Special Tools and Equipment** .
    3. Remove the differential side bearings using the J 22888-20A .

2. Remove the differential assembly from the vise.

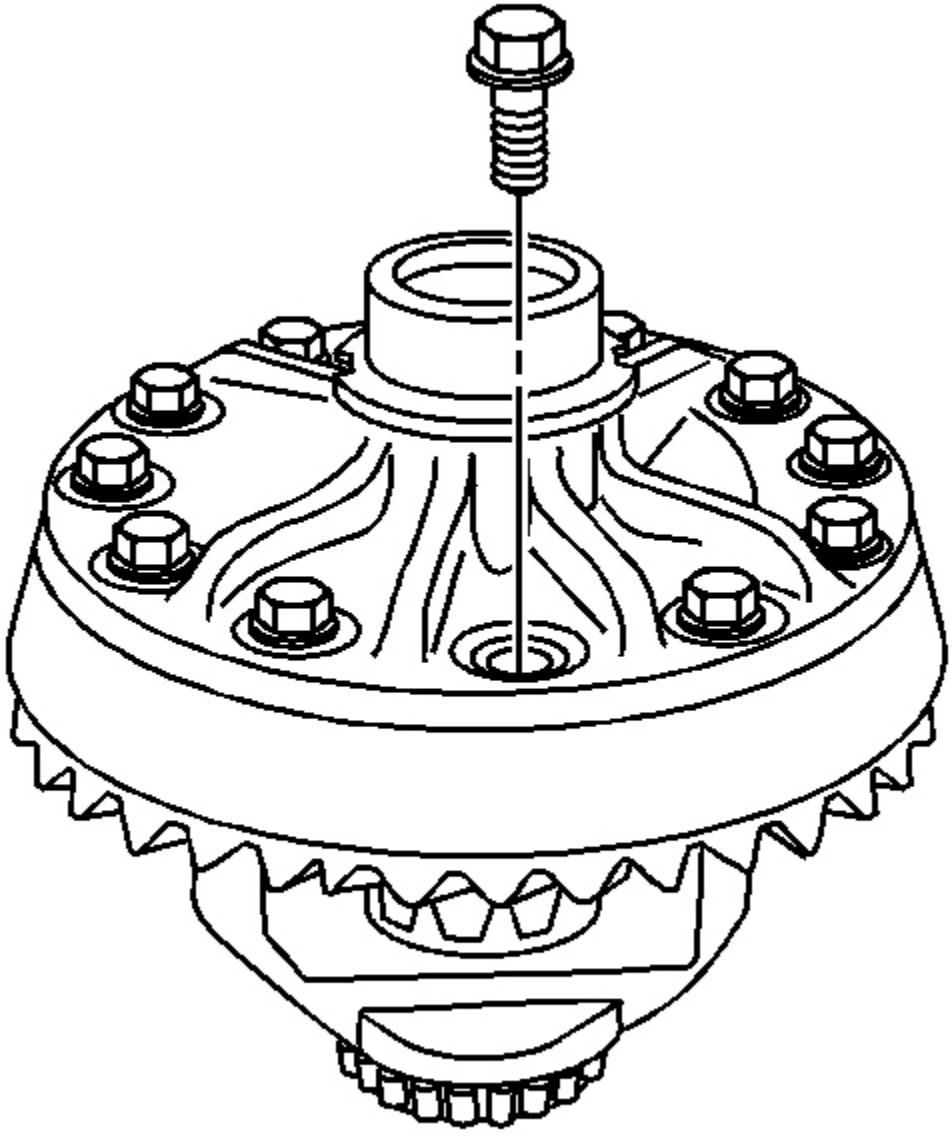


Fig. 92: Identifying Ring Gear Bolts
Courtesy of GENERAL MOTORS CORP.

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

3. Remove the ring gear bolts. Discard the bolts.

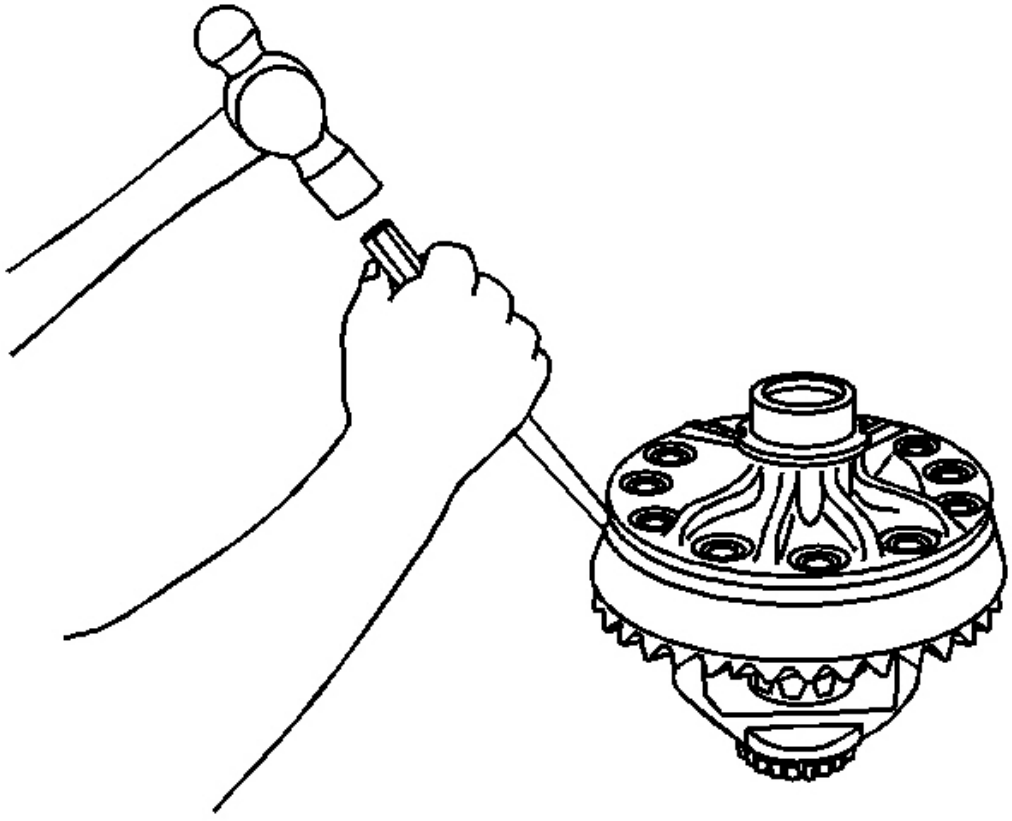


Fig. 93: Removing Ring Gear From Differential Case
Courtesy of GENERAL MOTORS CORP.

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

4. Remove the ring gear from the differential case.

   Drive the ring gear off with a brass drift if necessary.

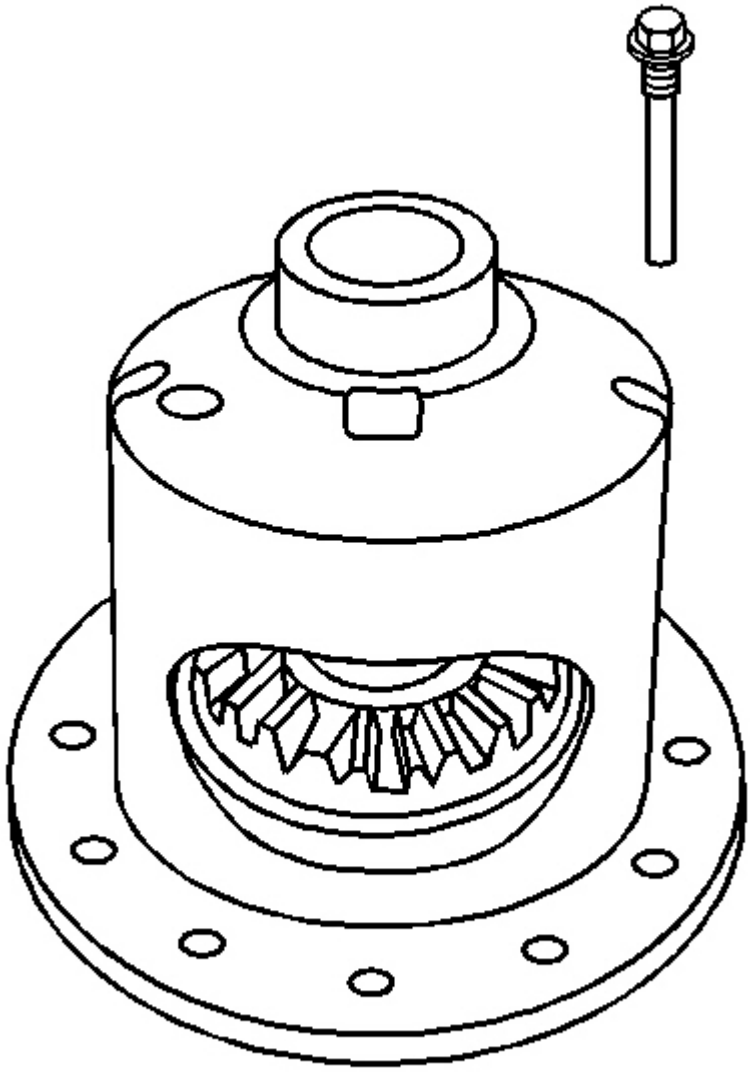


Fig. 94: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the pinion shaft lock bolt.

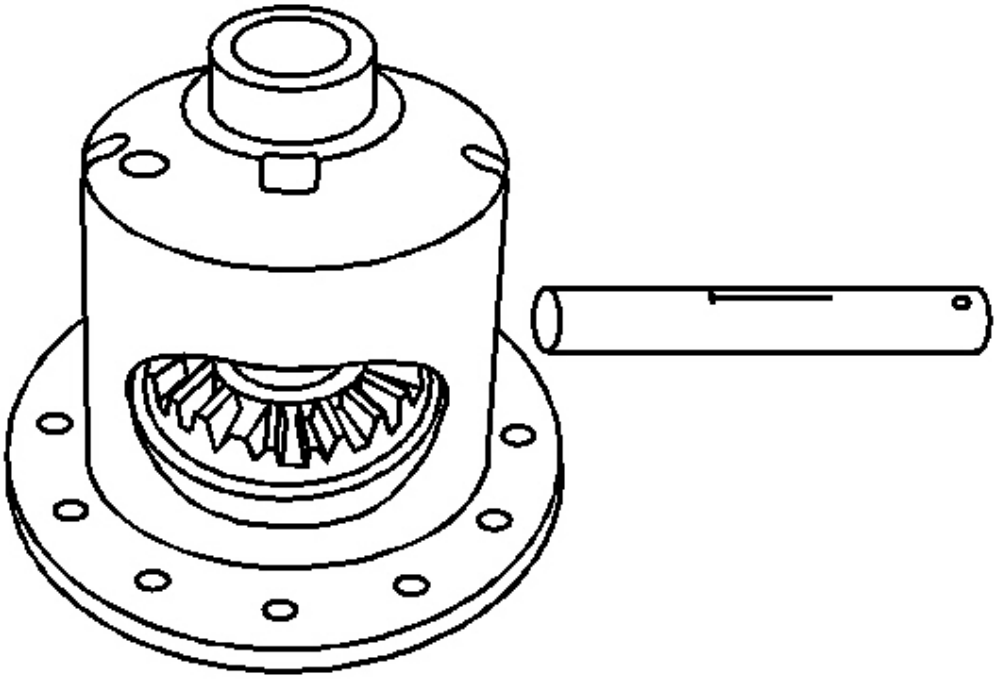


Fig. 95: View Of Differential Components
Courtesy of GENERAL MOTORS CORP.

6. Remove the pinion shaft.
7. Remove the differential side gear spacers.

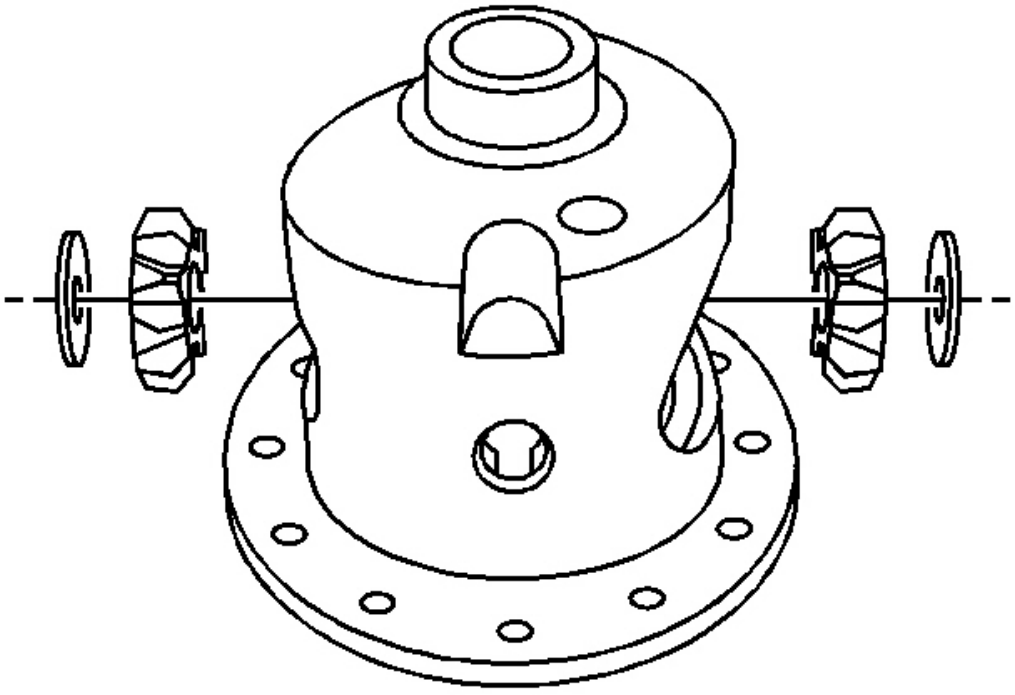


Fig. 96: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

8. Remove the differential pinion gears and thrust washers by performing the following steps:
    1. Drive the pinion gear thrust washers out from the differential case using a hammer and a brass drift.
    2. Roll the differential pinion gears out of the differential case.

    Mark the pinion gears and thrust washers top and bottom.

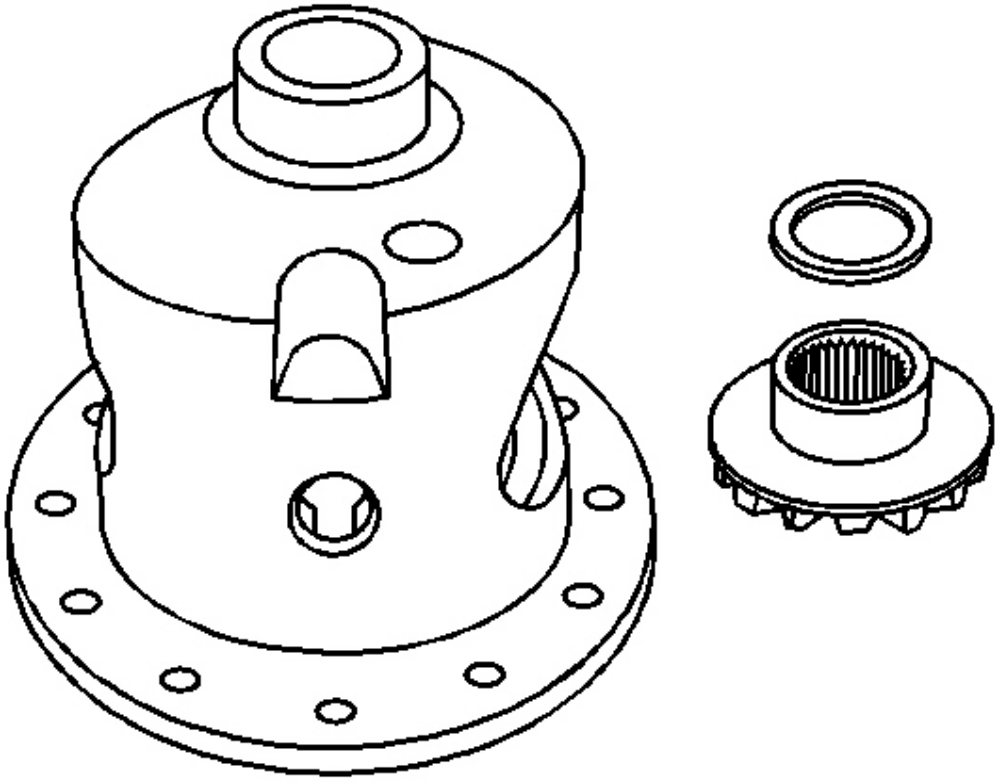


Fig. 97: Differential Side Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

9. Remove the differential side gears and thrust washers.

   Mark the differential side gears and thrust washers left and right.

DIFFERENTIAL CASE BEARINGS INSPECTION

IMPORTANT:

- **When replacing the worn or cracked bearings and the cups, replace the bearings in sets.**
- **The low mileage bearings may have very small scratches and pits on the rollers and the bearing cups from the initial preload.**

  Do not replace a bearing for this reason.

1. Inspect the bearings for smooth rotation after oiling.
2. Inspect the bearing rollers for wear.
3. Inspect the bearing cups for the following conditions:
    - Wear
    - Cracks
    - Brinelling
    - Scoring

DIFFERENTIAL CASE AND GEARS INSPECTION

1. Inspect the following components for excessive wear and/or fit:
    - The pinion gear shaft
    - The thrust washers
    - The differential case for wear, cracks and scoring
    - The fit of the pinion gear shaft in the differential case
    - The fit of the differential side gears in the differential case
    - The fit of the side gears on the axle shafts
2. Inspect the teeth of the pinion gears and the differential side gears for the following conditions:
    - Wear
    - Cracks
    - Scoring
    - Spalling
3. Replace any worn or poor fitting components as necessary.

PINION AND RING GEAR INSPECTION

1. The ring and pinion gears are matched sets and must be replaced any time a replacement of either is necessary.
2. Inspect the pinion and the ring gear teeth for the following conditions:
    - Cracking
    - Chipping
    - Scoring
    - Excessive wear
3. Inspect the pinion gear splines for wear.
4. Inspect the pinion flange splines for wear.
5. Inspect the fit of the pinion flange on the pinion gear.
6. Inspect the sealing surface of the pinion flange for nicks, burrs, or rough tool marks which will damage the inside diameter of the pinion seal and result in an oil leak.
7. Inspect all of the parts for wear and replace as necessary.

THRUST WASHERS, SHIMS, AND ADJUSTER SLEEVES INSPECTION

1. Inspect the shims and the thrust washers for cracks and chips.

   The damaged shims should be replaced with an equally sized service shim.

2. Inspect the adjuster sleeves for damaged threads. Replace if required.

DIFFERENTIAL CASE ASSEMBLY ASSEMBLE

Tools Required

- **J 8092** Universal Driver Handle - 3/4 in - 10. See **Special Tools and Equipment** .
- **J 29710** Differential Side Bearing Installer. See **Special Tools and Equipment** .
- **J 36597** Side Bearing Puller Pilot - 9.25 in Axle

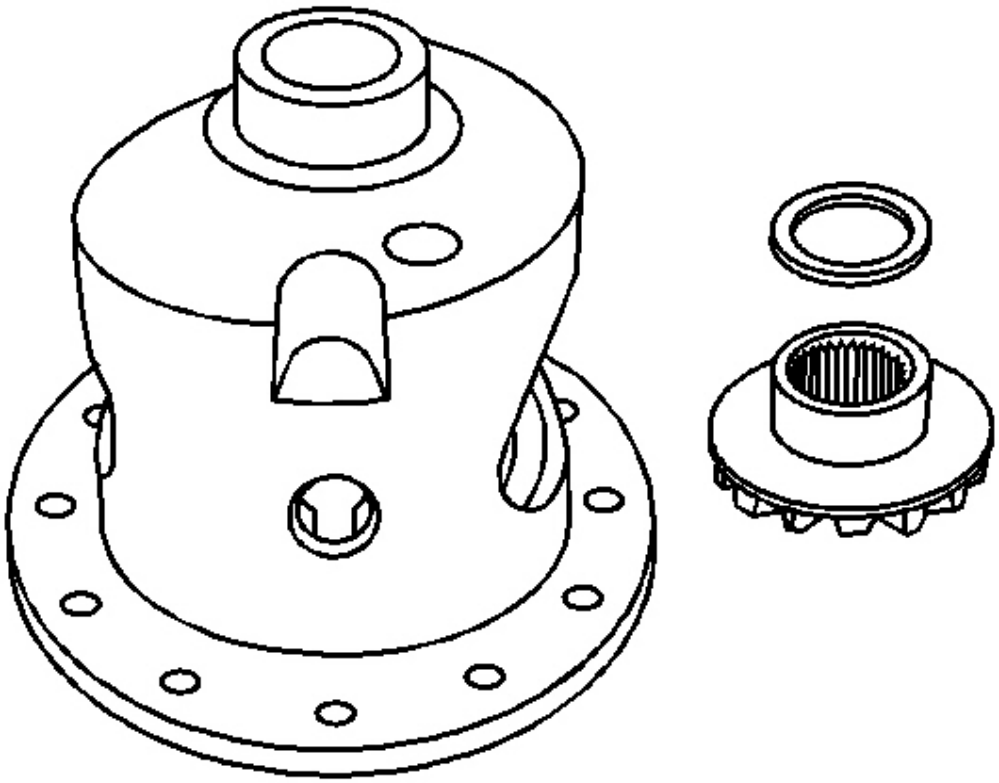


Fig. 98: Differential Side Gears & Thrust Washers

Courtesy of GENERAL MOTORS CORP.

1. Install the thrust washers and the differential side gears into the differential case.

   If the same differential side gears and the thrust washers are being used, install the gears and the washers to the original locations.

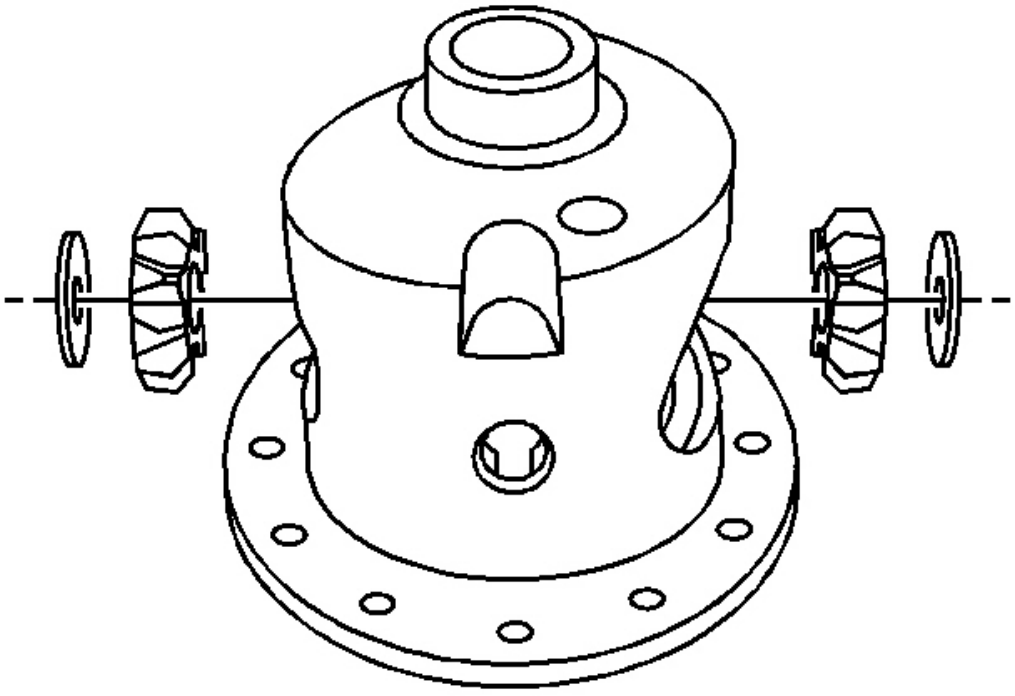


Fig. 99: Differential Pinion Gears & Thrust Washers
Courtesy of GENERAL MOTORS CORP.

2. Install the differential pinion gears by performing the following steps:
   1. Position both pinion gears between the differential side gears directly opposite of each other.
   2. Rotate the differential side gears until the pinion gears are opposite the opening in the differential case in line with the pinion shaft opening.
3. Install the thrust washers in between the pinion gear and differential case using a hammer and brass drift.
4. Install the differential side gear spacers.

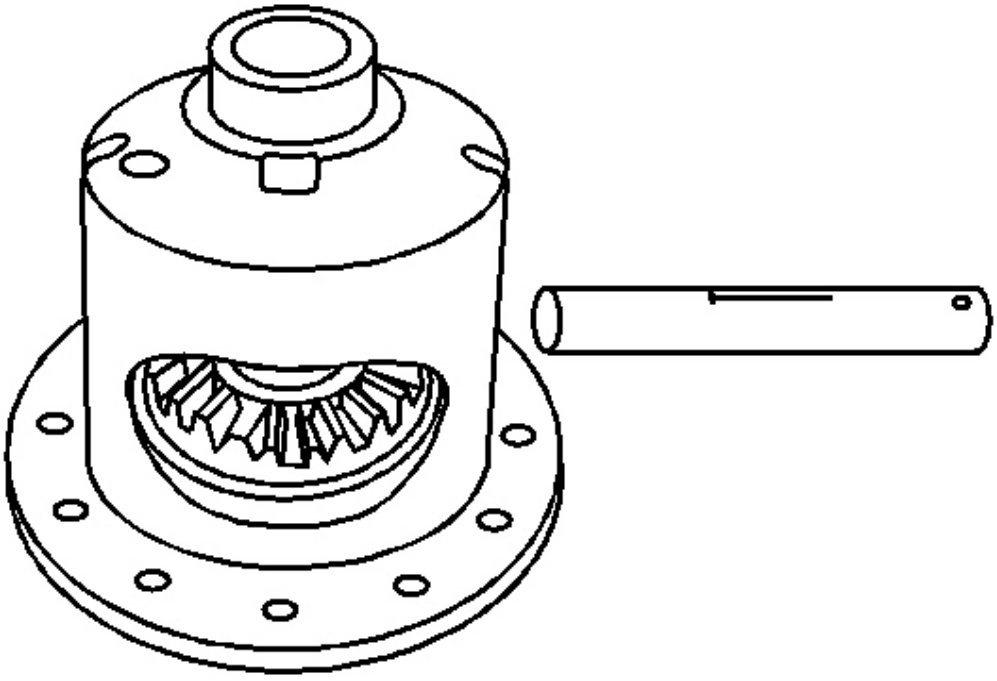


Fig. 100: View Of Differential Components
Courtesy of GENERAL MOTORS CORP.

5. Install the pinion gear shaft.

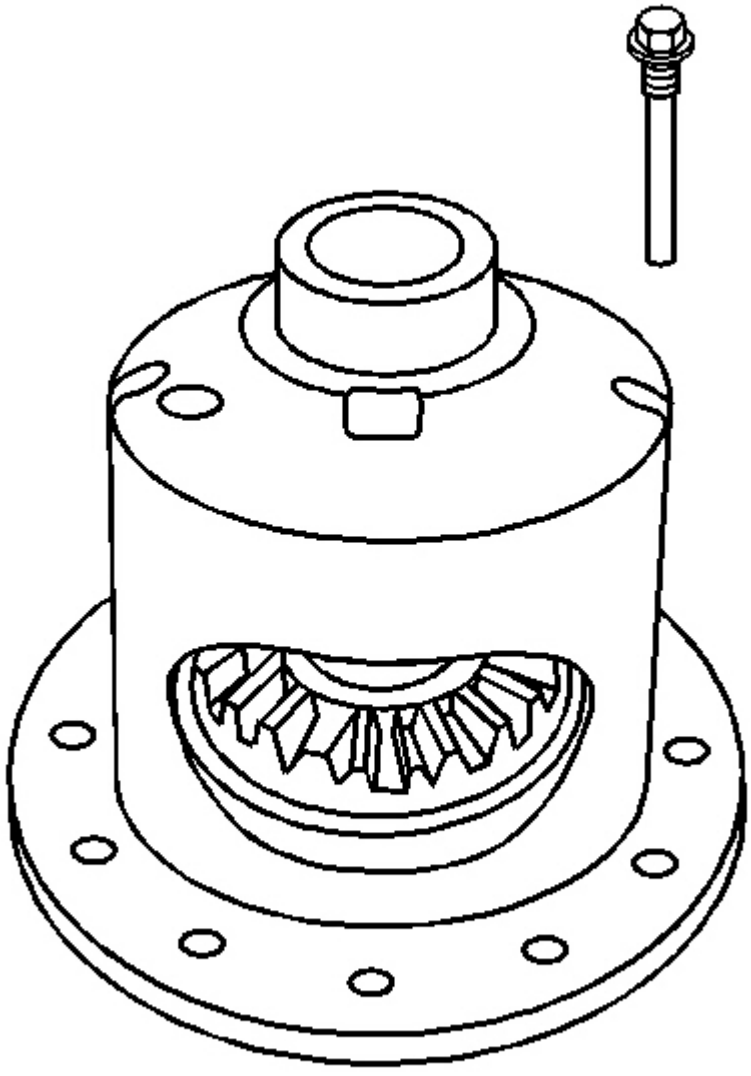


Fig. 101: Pinion Shaft Lock Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Install the pinion shaft lock bolt.

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

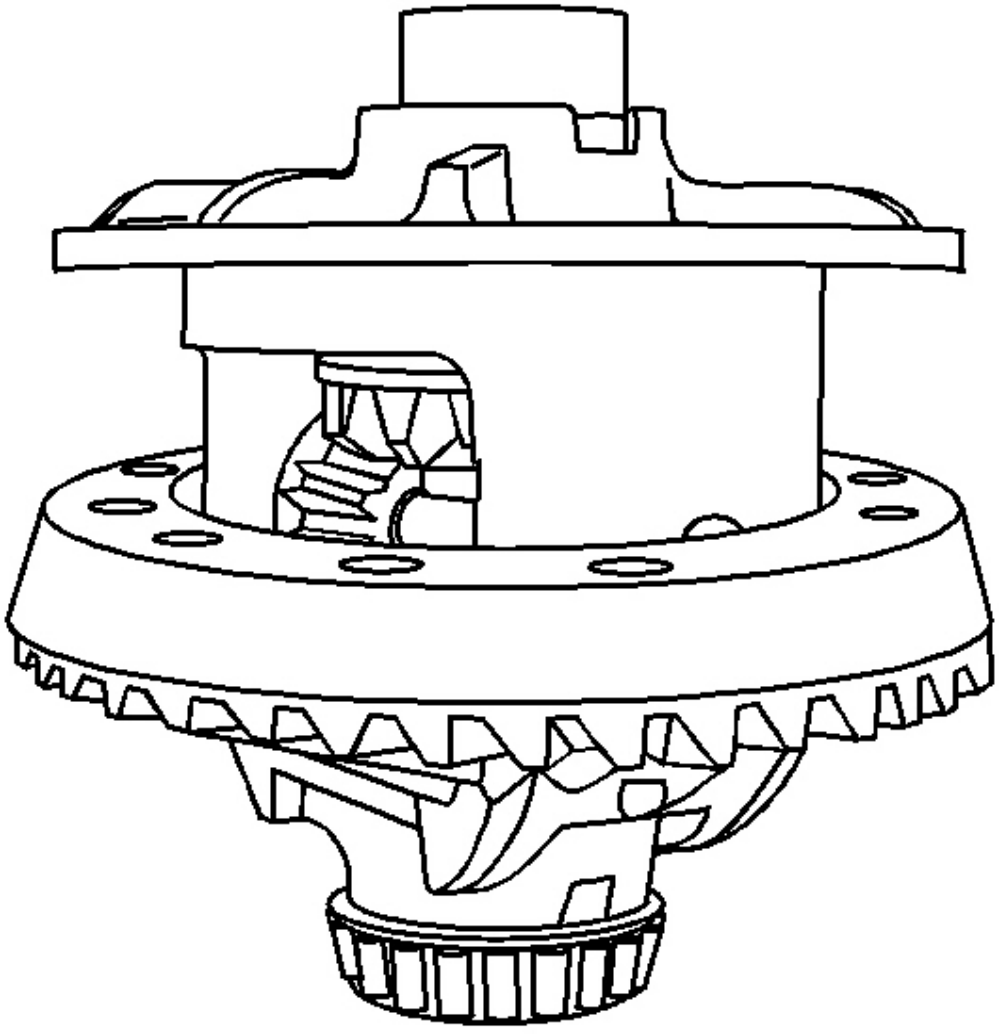


Fig. 102: Installing Ring Gear Onto Differential Case
Courtesy of GENERAL MOTORS CORP.

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

7. Install the ring gear onto the differential case.

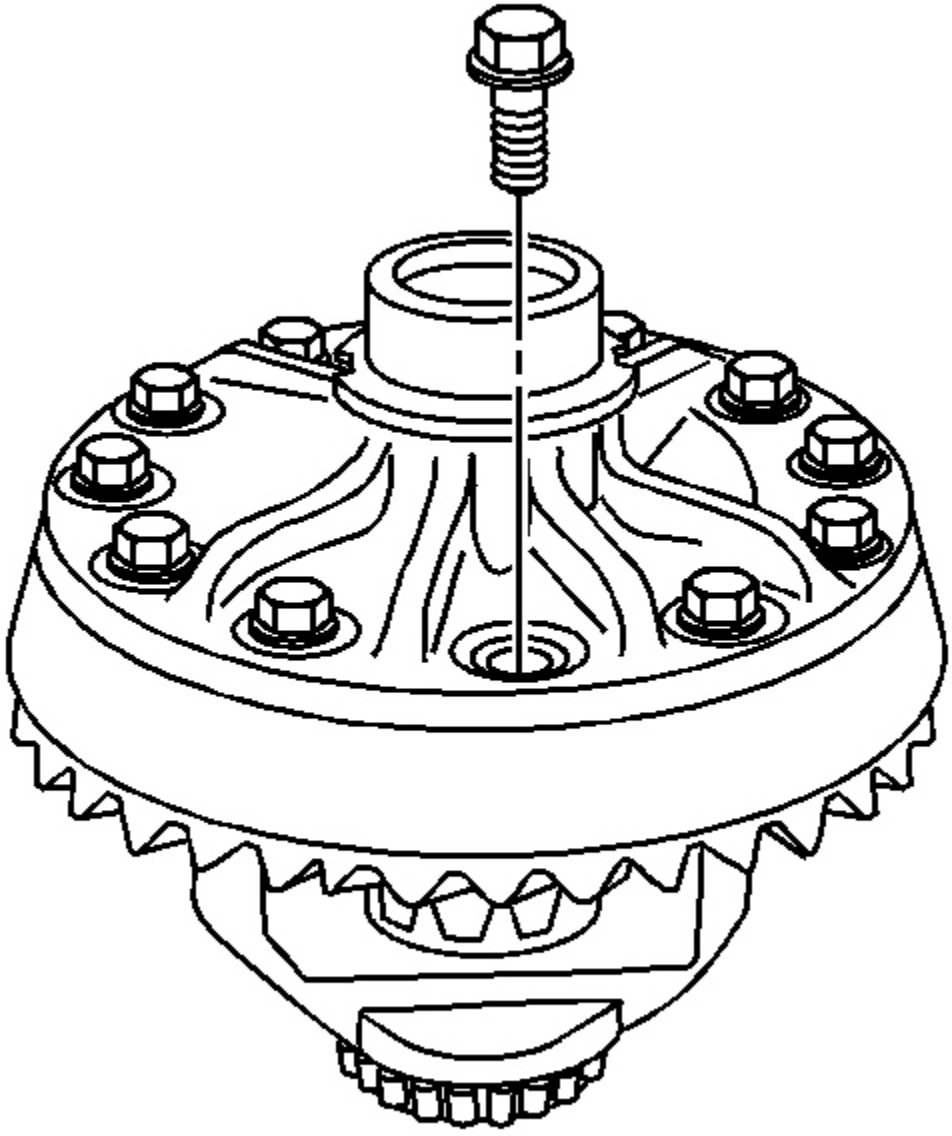


Fig. 103: Identifying Ring Gear Bolts
Courtesy of GENERAL MOTORS CORP.

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

8. Install the new ring gear bolts.

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

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

   Tighten: Tighten the ring gear bolts in sequence to 138 N.m (102 lb ft).

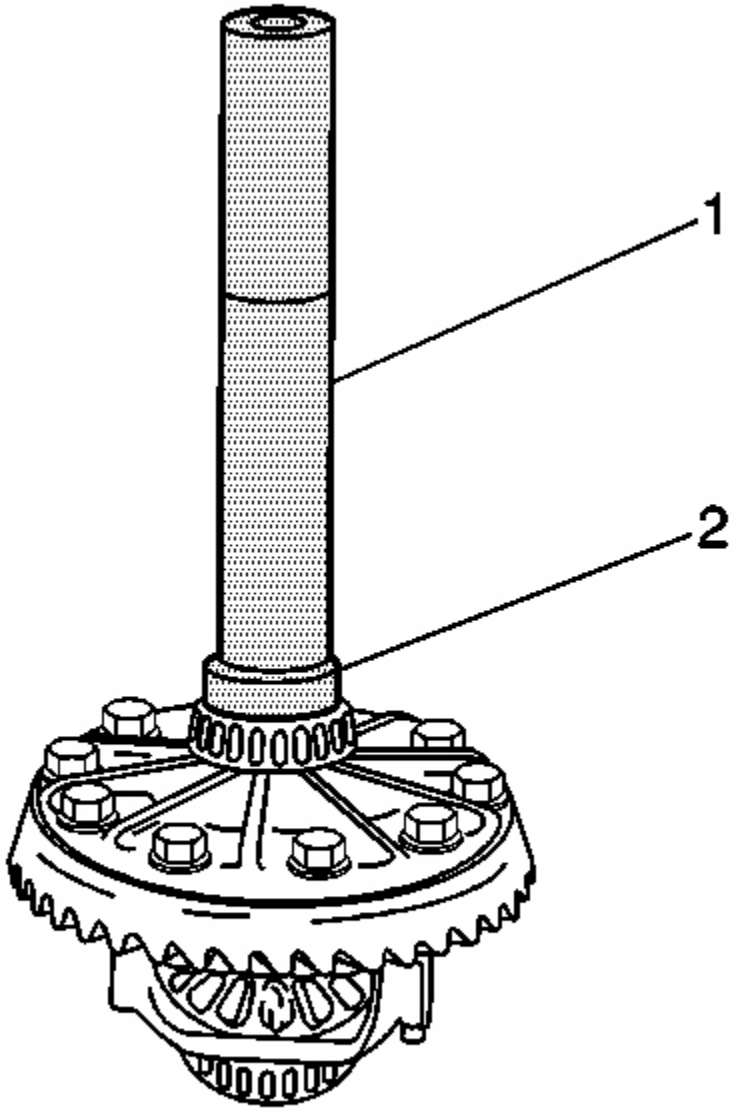


Fig. 104: Driving The Differential Case Bearing Onto The Case J 8092 & J 22761 (8.25 Inch Axle)

Courtesy of GENERAL MOTORS CORP.

10. Install the differential side bearings by performing the following steps:
    1. In order to protect the differential case, install the **J 36597** in the case on the side opposite the bearing installation. See **Special Tools and Equipment** .
    2. Install the **J 29710** (2) and the **J 8092** (1) onto the differential case bearing as shown. See **Special Tools and Equipment** .
    3. Drive the differential case bearing onto the case using the **J 29710** and the **J 8092** . See **Special Tools and Equipment** .

PINION BEARING CUP INSTALLATION

Tools Required

J 45754 Pinion Bearing Race Remover/Installer - 9. See **Special Tools and Equipment** .25 in Axle

1. Before assembly, apply axle lubricant to the following parts. Use the proper fluid. Refer to **Sealers, Adhesives, and Lubricants** .
    - The pinion bearings
    - The pinion and the differential gears
    - The thrust washers
    - The pinion bearing cups

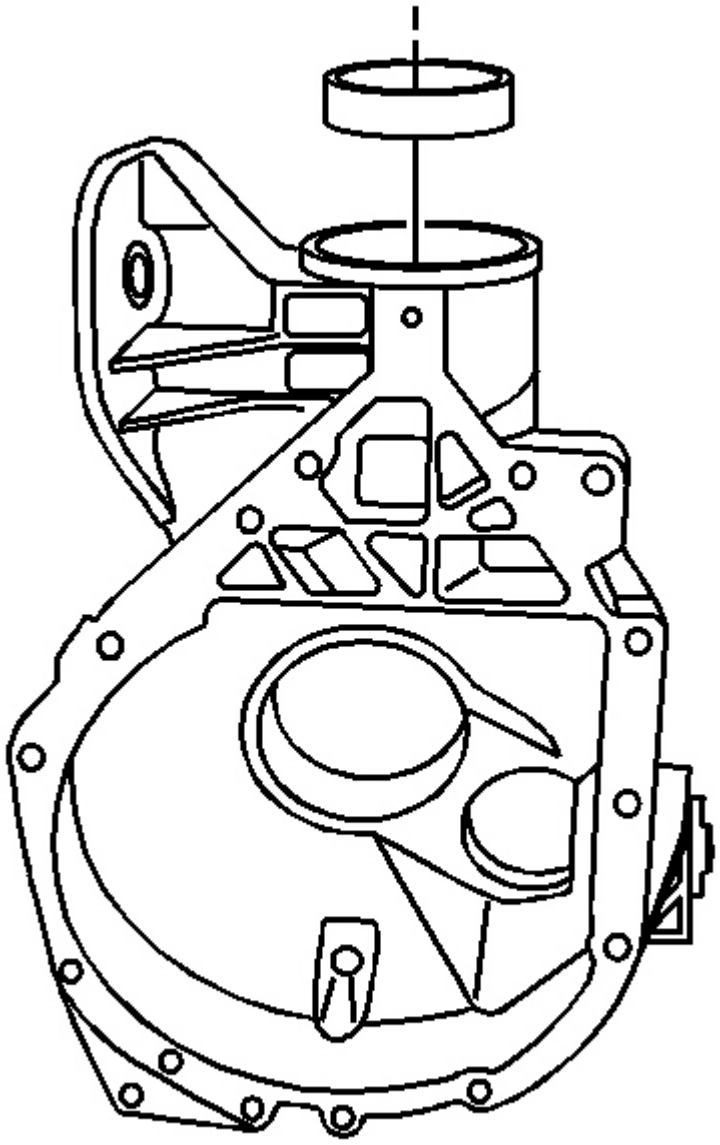


Fig. 105: Installing Outer Pinion Bearing Cup Into Outer Pinion Bearing Cup Bore
Courtesy of GENERAL MOTORS CORP.

2. Install the outer pinion bearing cup into the outer pinion bearing cup bore.

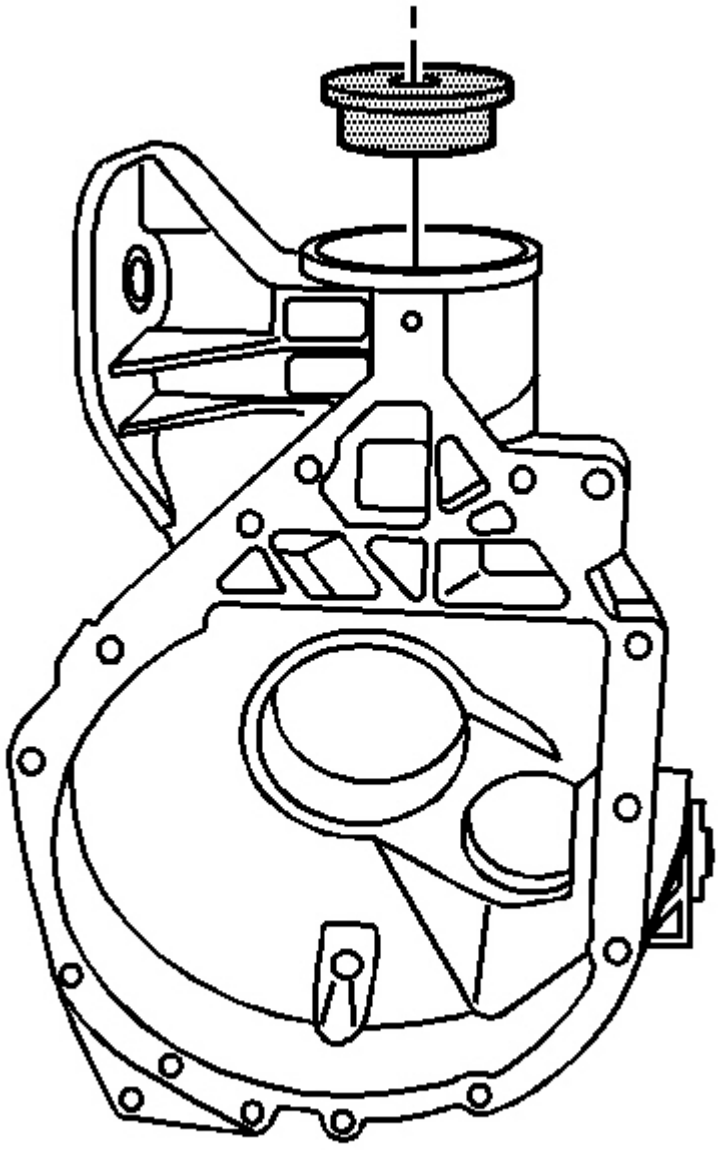


Fig. 106: Installing J 45754-1 Over Outer Pinion Bearing Cup
Courtesy of GENERAL MOTORS CORP.

3. Install the J 45754-1 over the outer pinion bearing cup.

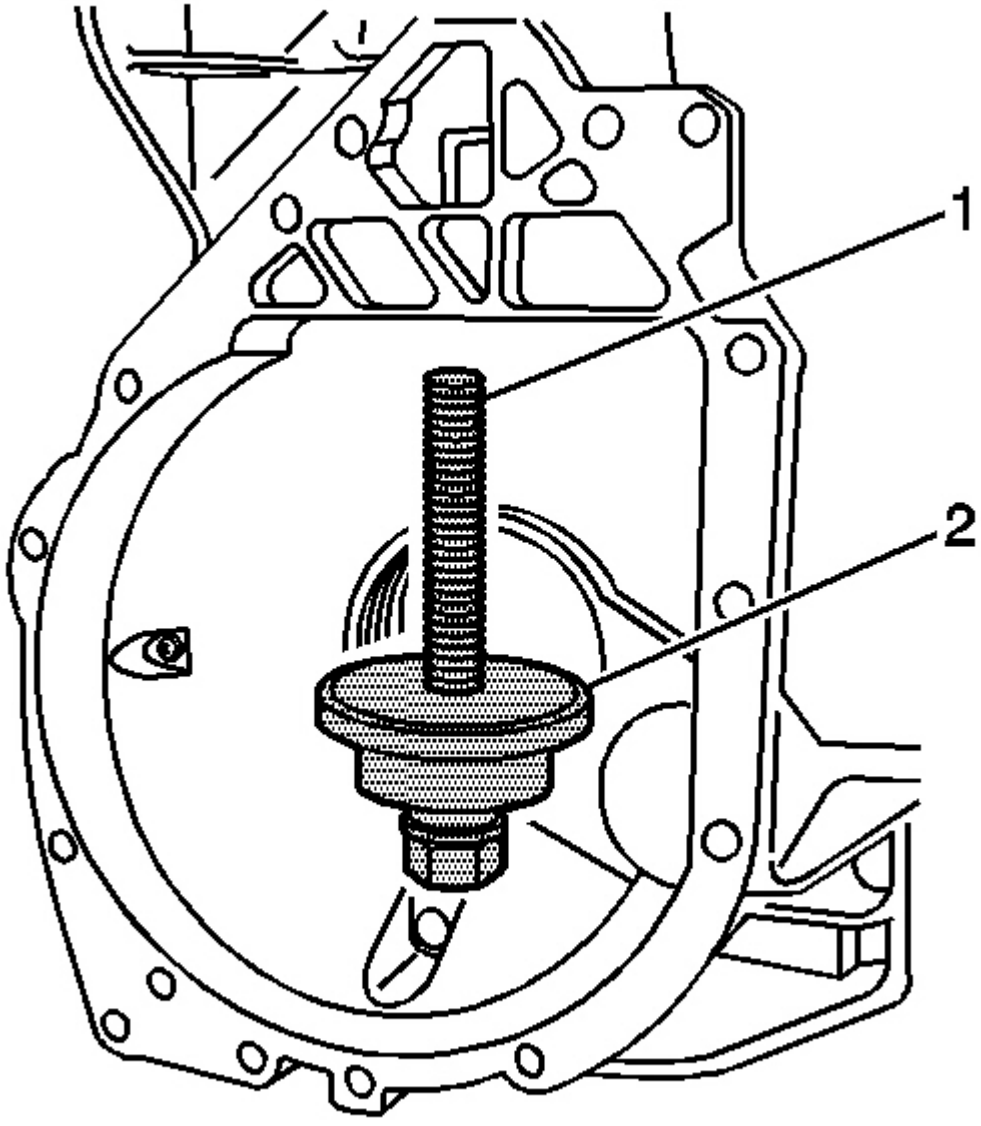


Fig. 107: Installing Forcing Screw & J 45754-2 Into Inner Pinion Bearing Cup Bore
Courtesy of GENERAL MOTORS CORP.

4. Install the forcing screw (1), the J 45754-2 (2) into the inner pinion bearing cup bore.
5. Attach the forcing screw to the J 45754-1.

Slowly turn the forcing screw until the J 45754-1 is evenly seated over the outer pinion bearing cup bore

and the J 45754-2 with the inner pinion bearing cup is evenly seated over the inner pinion bearing cup bore.

6. Turn the forcing screw clockwise slowly in order to draw the outer pinion bearing cup into the outer pinion bearing cup bore.

   Inspect the position of the outer pinion bearing cup as it is being drawn into the outer pinion bearing cup bore to ensure the bearing cup is being pulled straight into the pinion bearing cup bore. If the pinion bearing cup is not being pulled straight into the bearing cup bore, remove the **J 45754** and the outer pinion bearing cup and reposition the outer pinion bearing cup. See **Special Tools and Equipment** .

7. Tighten the forcing screw until the outer pinion bearing cup is seated in the outer pinion bearing cup bore.
8. Remove the **J 45754** . See **Special Tools and Equipment** .

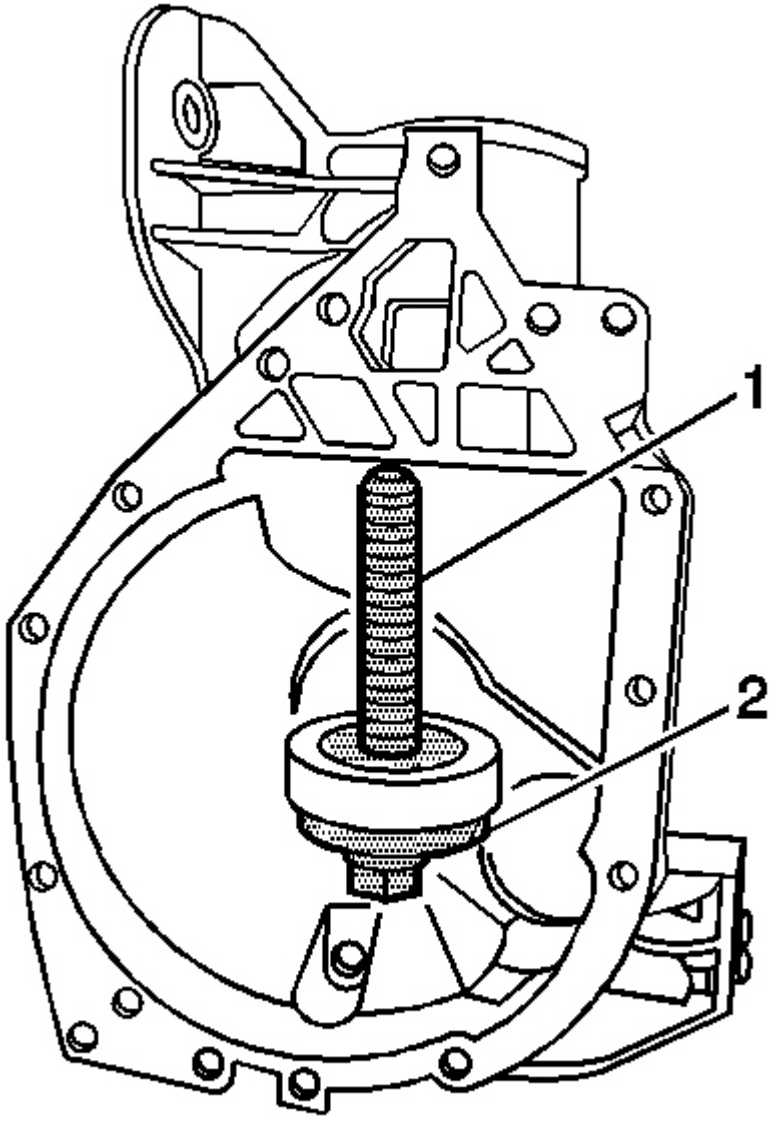


Fig. 108: Installing Inner Pinion Bearing Cup Onto J 45754-2 & Forcing Screw
Courtesy of GENERAL MOTORS CORP.

9. Install the inner pinion bearing cup onto the J 45754-2 (2) and the forcing screw (1).
10. Install the J 45754-2 (2), the forcing screw (1), and the inner pinion bearing cup into the pinion bearing cup bore.

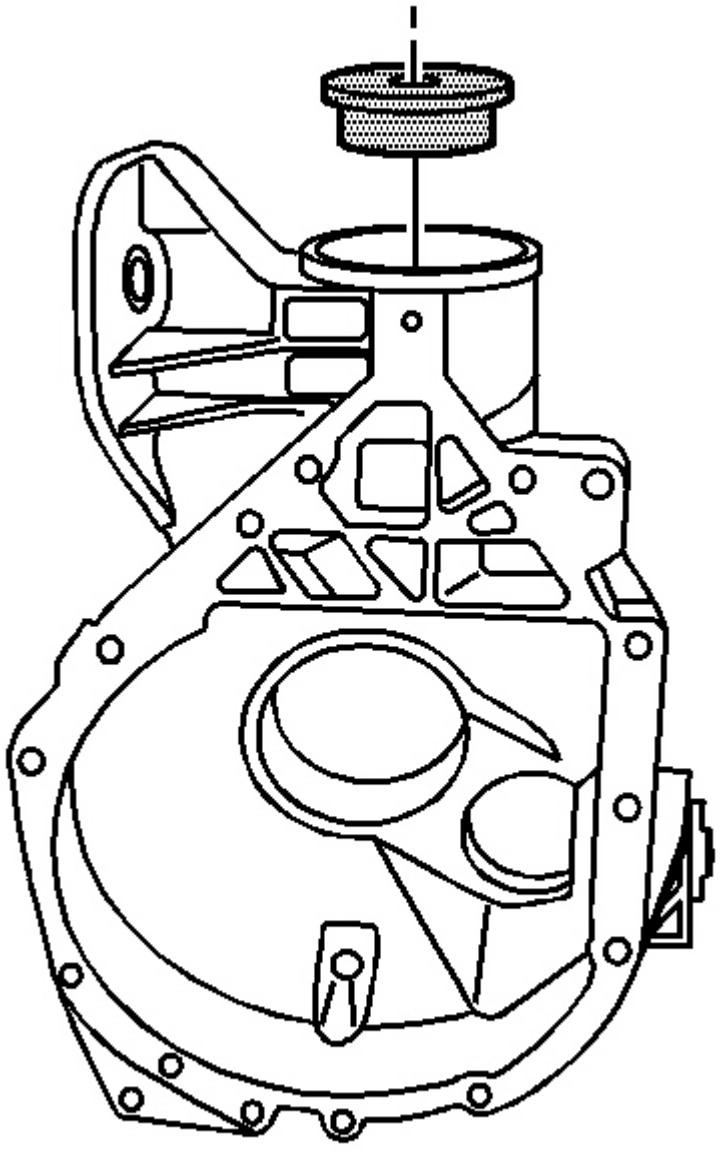


Fig. 109: Installing J 45754-1 Over Outer Pinion Bearing Cup
Courtesy of GENERAL MOTORS CORP.

11. Install the J 45754-1 over the outer pinion bearing cup.
12. Attach the forcing screw to the J 45754-1.

Slowly turn the forcing screw until the J 45754-1 is evenly seated over the outer pinion bearing cup bore

and the J 45754-1 with the inner pinion bearing cup is evenly seated over the inner pinion bearing cup bore.

13. Turn the forcing screw clockwise slowly in order to draw the inner pinion bearing cup into the inner pinion bearing cup bore.

    Inspect the position of the inner pinion bearing cup as it is being drawn into the inner pinion bearing cup bore to ensure the bearing cup is being pulled straight into the pinion bearing cup bore. If the pinion bearing cup is not being pulled straight into the bearing cup bore, remove the **J 45754** and the inner pinion bearing cup and reposition the inner pinion bearing cup. See **Special Tools and Equipment** .

14. Tighten the forcing screw clockwise until the inner pinion bearing cup is seated in the inner pinion bearing cup bore.
15. Remove the **J 45754** . See **Special Tools and Equipment** .
16. Measure the pinion depth and determine the selectable pinion shim thickness. Refer to **Pinion Depth Adjustment** .

PINION DEPTH ADJUSTMENT

Tools Required

- **J 36601** Pinion Shim Selector. See **Special Tools and Equipment** .
- **J 29763** Static Timing Gauge. See **Special Tools and Equipment** .

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

1. Lubricate the pinion bearings with axle lubricant, GM P/N 12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115.

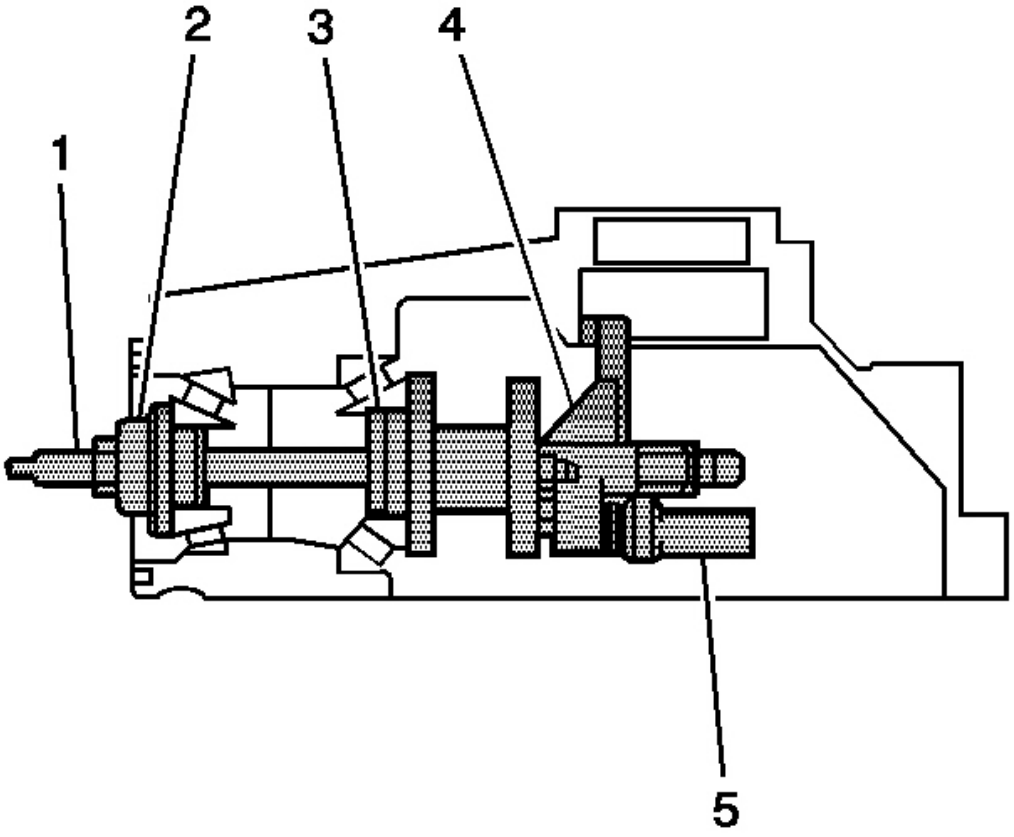


Fig. 110: Assembling J 29763 To J 36601-3 & J 36601-7
Courtesy of GENERAL MOTORS CORP.

2. Assemble the **J 29763** (5) to the J 36601-3 (4) and J 36601-7 (1). See **Special Tools and Equipment** .
3. Assemble the J 21777-8 (3) onto the J 36601-7 (1).
4. Install the pinion bearings and hold them in place.
5. Insert the J 36601-7 (1) with the J 21777-8 (3) through the pinion bearings.
6. Install the J 36601-5 (2), the washer, and the nut to the J 36601-7 (1).
7. While holding the J 36601-3 (4) stationary, install an inch-pound torque wrench on the nut and tighten the nut until a rotating torque of 1.1-2.3 N.m (10-20 lb in) is obtained.

   Rotate the assembly several times in both directions in order to seat the pinion bearings.

8. Check the rotating torque of the assembly. If the torque is less than 1.0 N.m (10 lb in), tighten the nut on the J 36601-7 until a rotating torque of 1.1-2.3 N.m (10-20 lb in) is obtained.

IMPORTANT: The left side differential bearing adjuster assembly must be removed prior to placing the J 36601-3 in the differential side bearing bore.

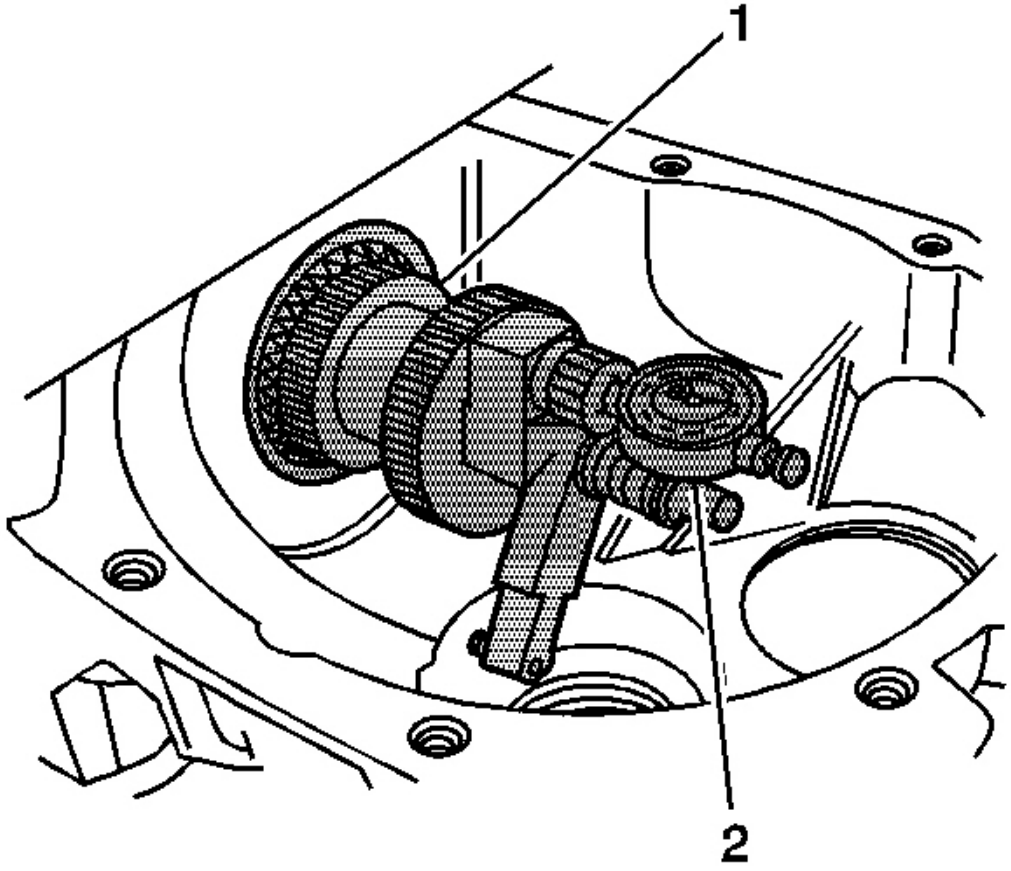


Fig. 111: Adjusting J 29763 To Differential Bearing Bore
Courtesy of GENERAL MOTORS CORP.

9. Adjust the **J 29763** (2) to the differential bearing bore by doing the following:
    1. Loosen the lock nut on the **J 29763** . See **Special Tools and Equipment** .
    2. Place the contact pad of the **J 36601** on the differential side bearing bore. See **Special Tools and Equipment** .
    3. With the contact pad of the **J 36601** touching the differential side bearing bore, push down on the **J 29763** until the needle of the **J 29763** has turned 3/4 of a turn clockwise. See **Special Tools and Equipment** .
    4. Tighten the lock nut of the **J 29763** . See **Special Tools and Equipment** .

10. Rotate the **J 36601** (1) back and forth until the needle of the **J 29763** (2) indicates the lowest point in the differential side bearing bore. See **Special Tools and Equipment** .
11. At the lowest point of deflection, move the housing of the **J 29763** until the needle indicates ZERO. See **Special Tools and Equipment** .
12. Move the **J 36601** back and forth again to verify the zero setting. See **Special Tools and Equipment** . Adjust the housing of the **J 29763** as necessary to set the needle to ZERO. See **Special Tools and Equipment** .

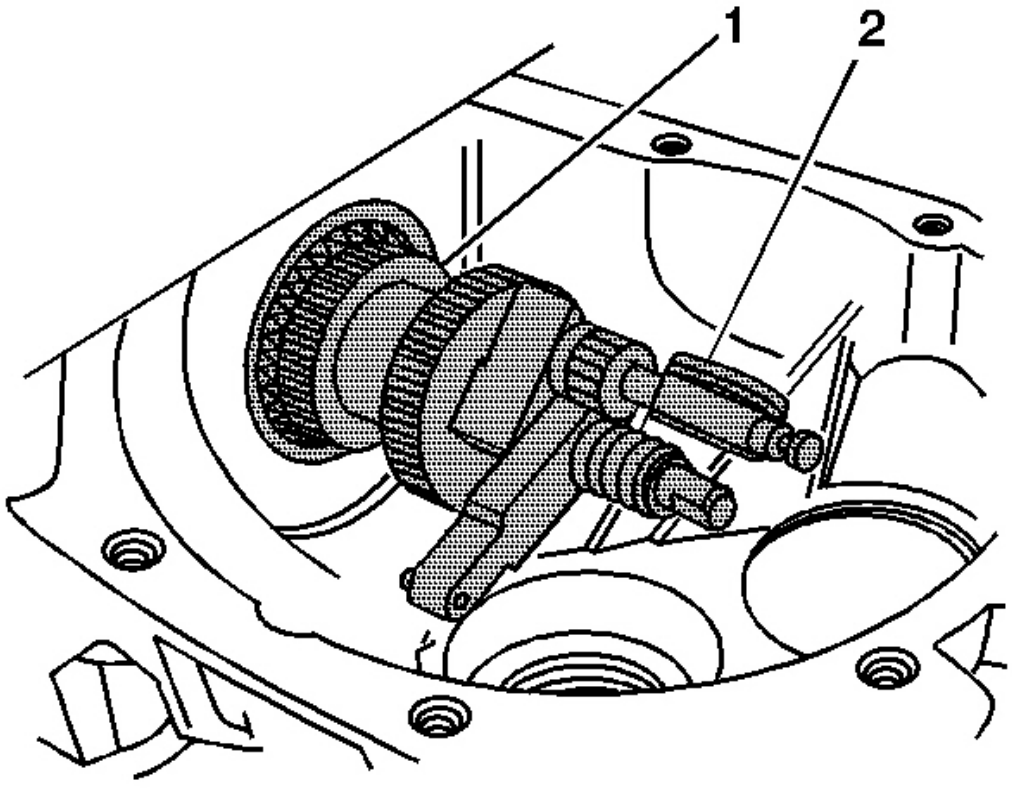


Fig. 112: Grasping J 36601 By Flats & Moving J 36601 Out Of Differential Side Bearing Bore
Courtesy of GENERAL MOTORS CORP.

13. After the ZERO setting is obtained and verified, grasp the **J 36601** (1) by the flats and move the **J 36601** out of the differential side bearing bore. See **Special Tools and Equipment** .
14. The value indicated on the **J 29763** (2) is the thickness of the shim needed in order to set the depth of the pinion. See **Special Tools and Equipment** .
15. Select the shim that indicates the proper thickness. Measure the shim with a micrometer in order to verify that the thickness is correct.

16. Remove the pinion depth setting tools.
17. Remove the pinion bearings.
18. Install the pinion shim between the pinion and the inner pinion bearing. Refer to **Differential Carrier Assembly - Assemble** .

DIFFERENTIAL CARRIER ASSEMBLY - ASSEMBLE

Tools Required

- **J 36366** Pinion Oil Seal Installer. See **Special Tools and Equipment** .
- **J 36599-A** Side Bearing Nut Wrench. See **Special Tools and Equipment** .
- **J 36603** Side Bearing Cup Installer. See **Special Tools and Equipment** .
- **J 36609** Axle Tube Bearing Installer. See **Special Tools and Equipment** .
- **J 36614** Inner Pinion Bearing Installer. See **Special Tools and Equipment** .
- **J 36615** Side Bearing Nut Wrench. See **Special Tools and Equipment** .
- **J 8092** Universal Driver Handle - 3/4 in - 10. See **Special Tools and Equipment** .
- **J 8614-01** Flange and Pulley Holding Tool. See **Special Tools and Equipment** .

1. Install the pinion bearing cups into the differential carrier assembly. Refer to **Pinion Bearing Cup Installation** .
2. Install the selective shim between the inner pinion bearing and the shoulder of the pinion gear.

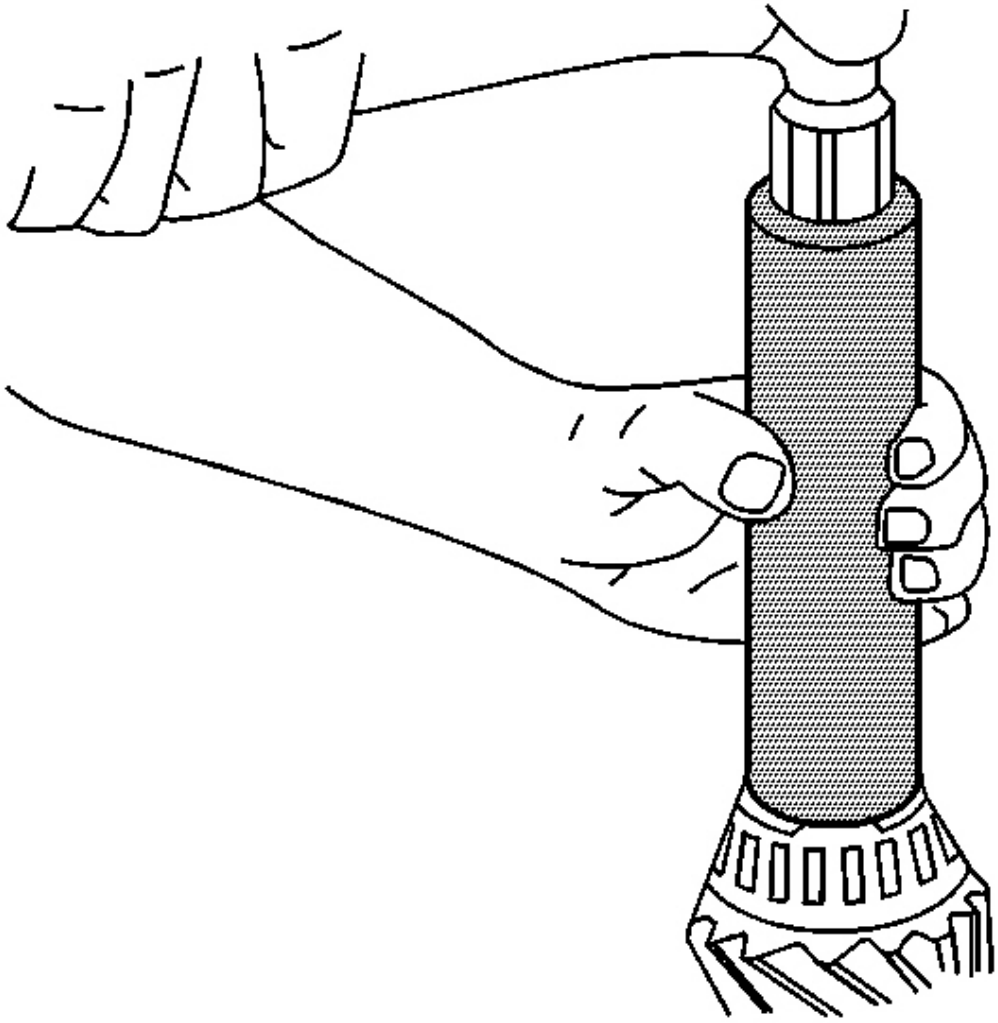


Fig. 113: Installing Inner Pinion Bearing
Courtesy of GENERAL MOTORS CORP.

3. Install the inner pinion bearing onto the pinion gear using the **J 36614** . See **Special Tools and Equipment** .
4. Install the new collapsible spacer onto the pinion gear.
5. Lubricate the pinion bearings with axle lubricant, GM P/N 12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115.

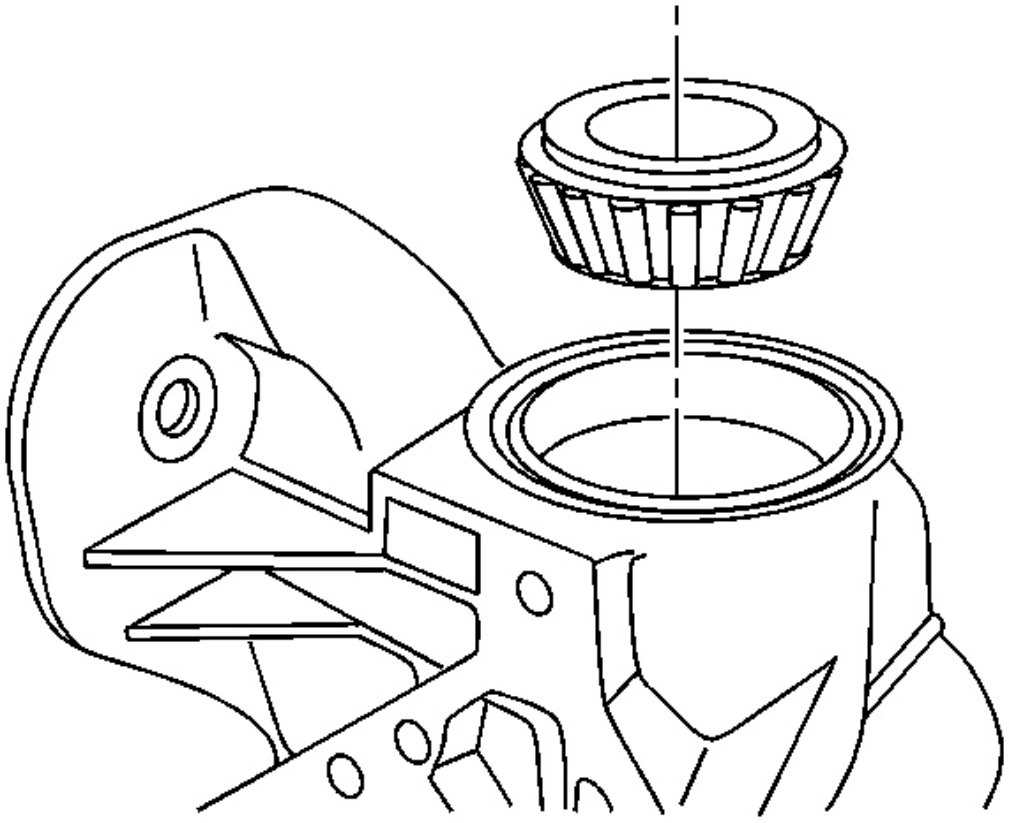


Fig. 114: Installing Outer Pinion Bearing Into Left Differential Carrier Case Half
Courtesy of GENERAL MOTORS CORP.

6. Install the outer pinion bearing into the left differential carrier case half.

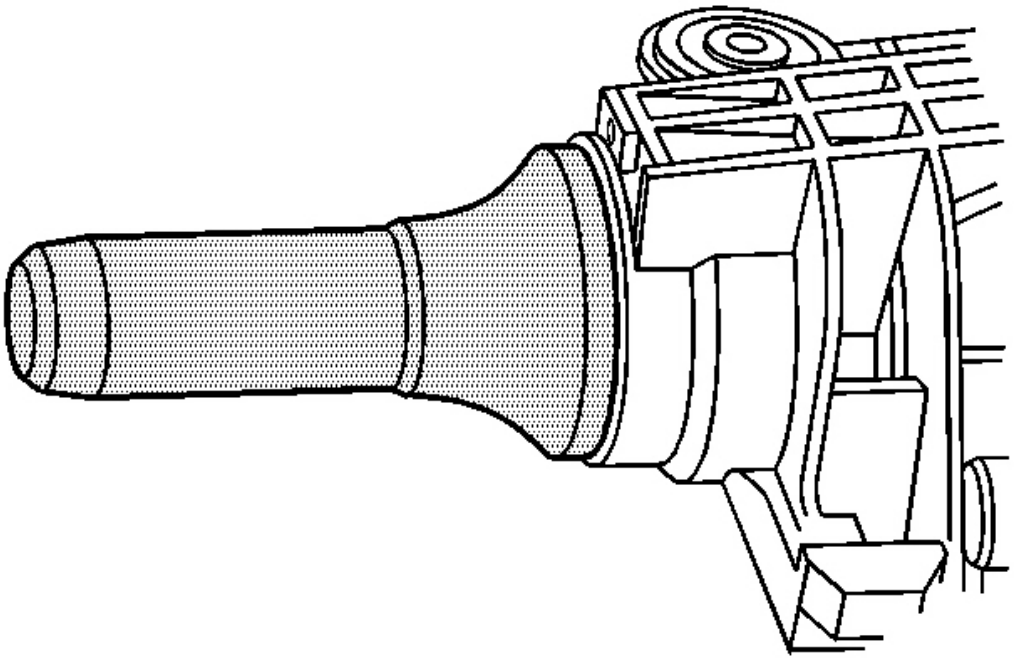


Fig. 115: Installing Oil Seal Using J 36366
Courtesy of GENERAL MOTORS CORP.

7. Install the pinion oil seal using **J 36366** . See **Special Tools and Equipment** .

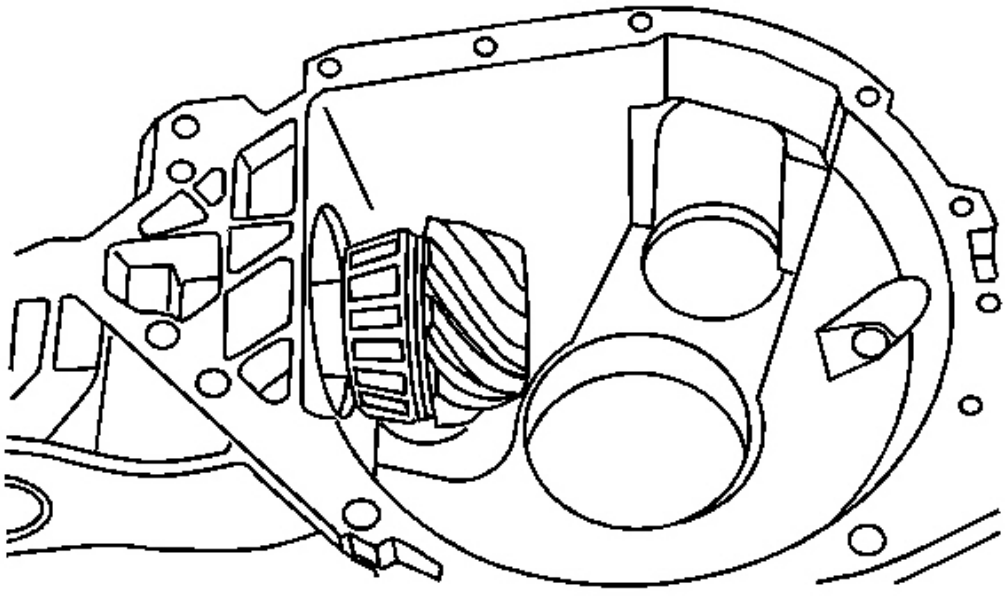


Fig. 116: Applying GM P/N 12346004 Sealant To Splines Of Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

8. Install the pinion gear, with the inner pinion bearing and the new collapsible spacer, into the left differential carrier case half.
9. Apply sealant, GM P/N 12346004 (Canadian P/N 10953480) or equivalent, to the splines of the pinion yoke.

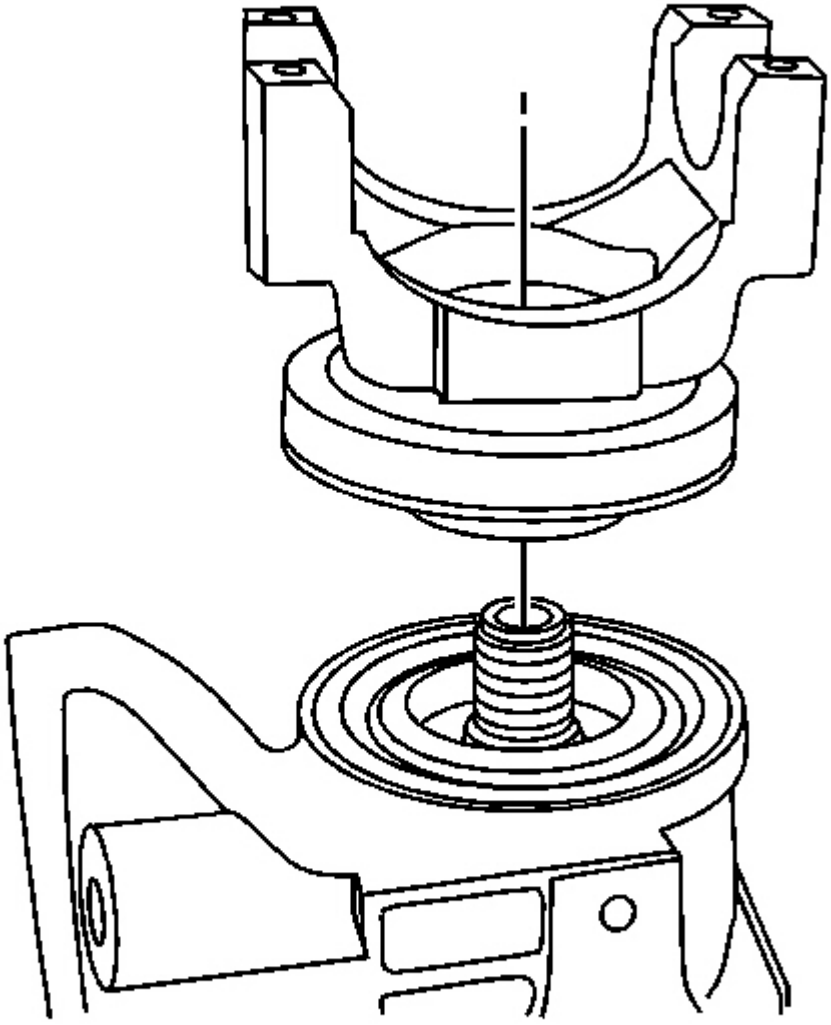


Fig. 117: Installing Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

10. Install the pinion yoke.

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

11. Seat the pinion yoke onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft threads show through the yoke.

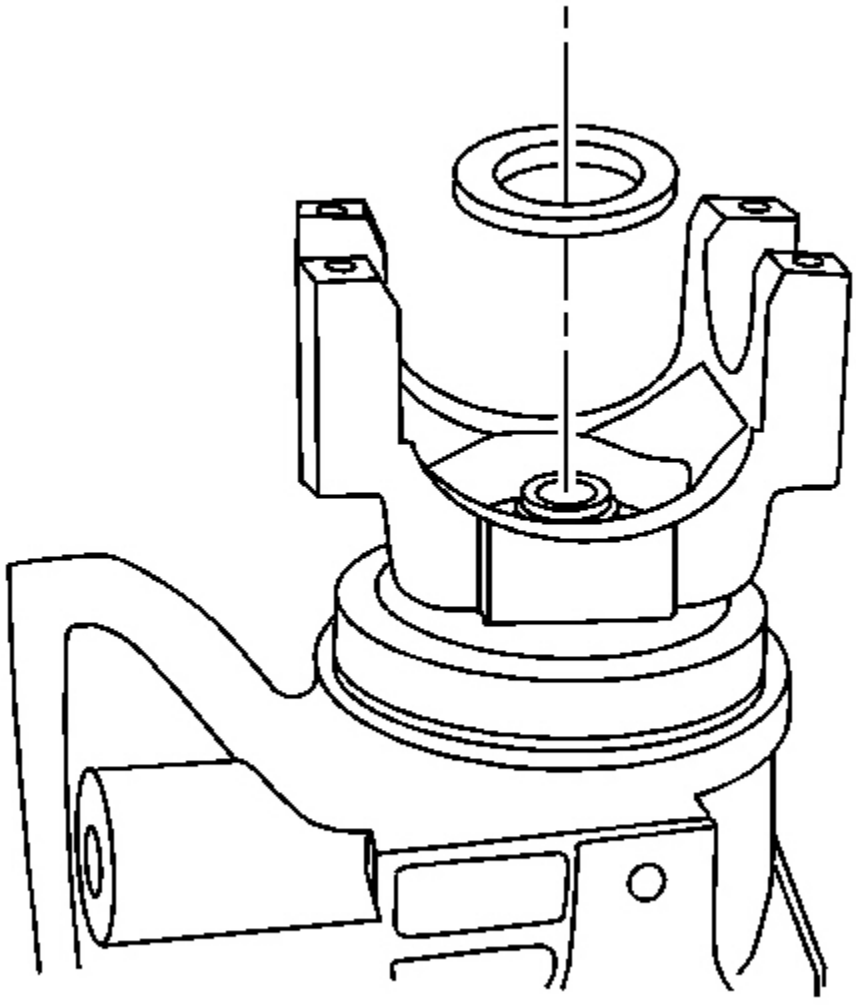


Fig. 118: Installing Washer
Courtesy of GENERAL MOTORS CORP.

12. Install the washer.

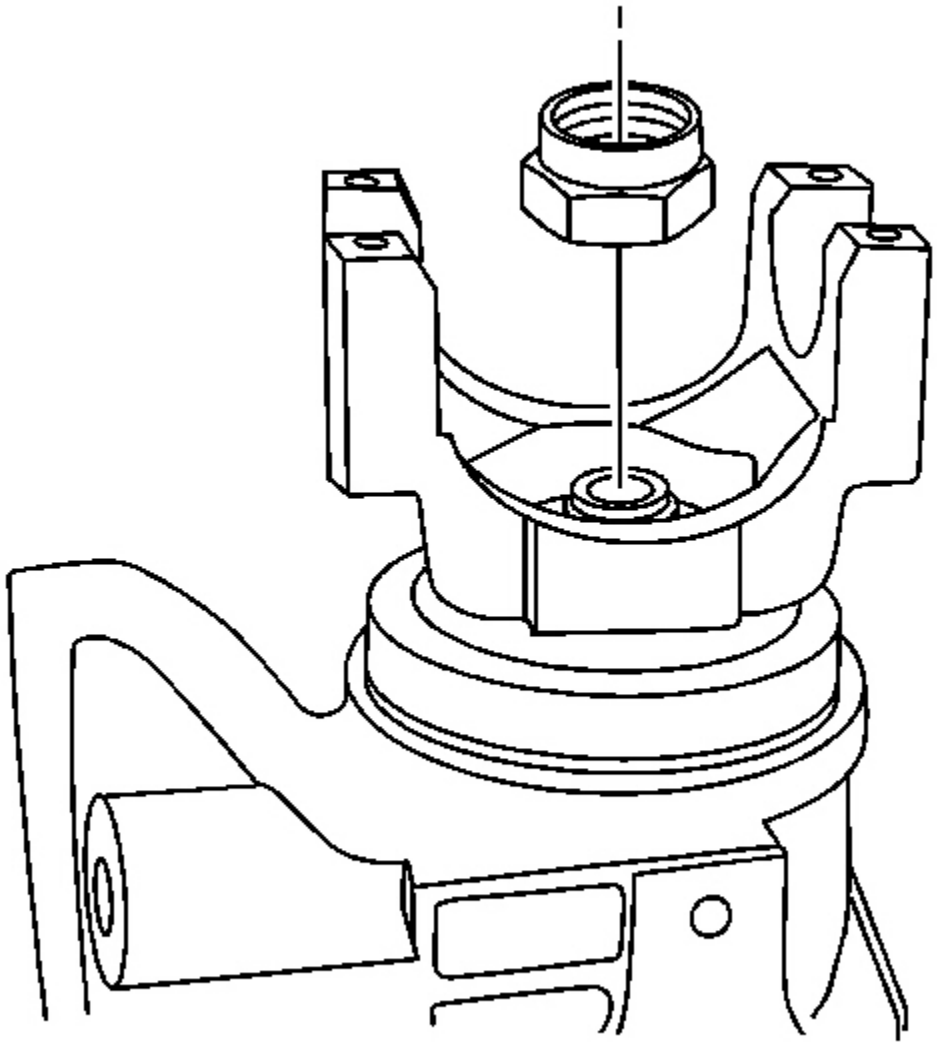


Fig. 119: Installing New Pinion Nut
Courtesy of GENERAL MOTORS CORP.

13. Install the new pinion nut.
14. If the new pinion nut cannot be installed, perform the following steps in order to seat the pinion yoke onto the pinion so that the washer and the new pinion nut can be installed:
    1. Remove the pinion nut washer.
    2. Install the old pinion nut.
    3. Tighten the nut until a few of the shaft threads show through the nut so that the washer and the new

pinion nut can be installed.

4. Remove the old pinion nut.
5. Install the pinion nut washer.
6. Install the new pinion nut.

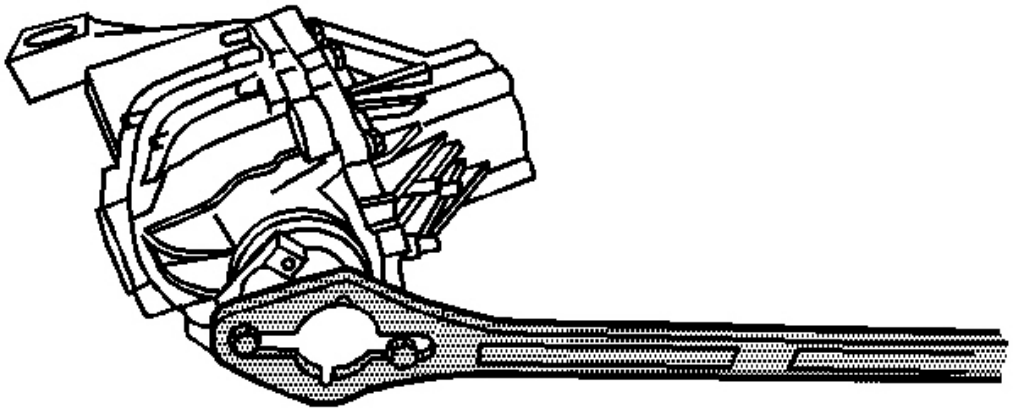


Fig. 120: Installing J 8614-01 Onto Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

15. Install the **J 8614-01** onto the pinion yoke as shown. See **Special Tools and Equipment** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

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

16. Tighten the pinion nut while holding the **J 8614-01** . See **Special Tools and Equipment** .

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

17. Remove the **J 8614-01** . See **Special Tools and Equipment** .
18. Measure the rotating torque of the pinion using an inch-pound torque wrench.

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

19. If the rotating torque measurement is below 1.0 N.m (10 lb in) for used bearings, or 1.7 N.m (15 lb in) for

new bearings, re-install the **J 8614-01** and continue to tighten the pinion nut. See **Special Tools and Equipment** .

Tighten: Tighten the pinion nut, in small increments, as needed, until the torque required in order to rotate the pinion is 1.1-2.3 N.m (10-20 lb in) for used bearings, or 1.7-3.4 N.m (15-30 lb in) for new bearings.

20. Once the specified torque is obtained, rotate the pinion several times to ensure the bearings have seated.

    Recheck the rotating torque and adjust if necessary.

21. Remove the **J 8614-01** . See **Special Tools and Equipment** .
22. Assemble the right side differential adjuster nut into the differential nut sleeve until fully seated.
23. Install the right side differential adjuster nut assembly and the new adjuster lock nut tab into the right side differential carrier case half.

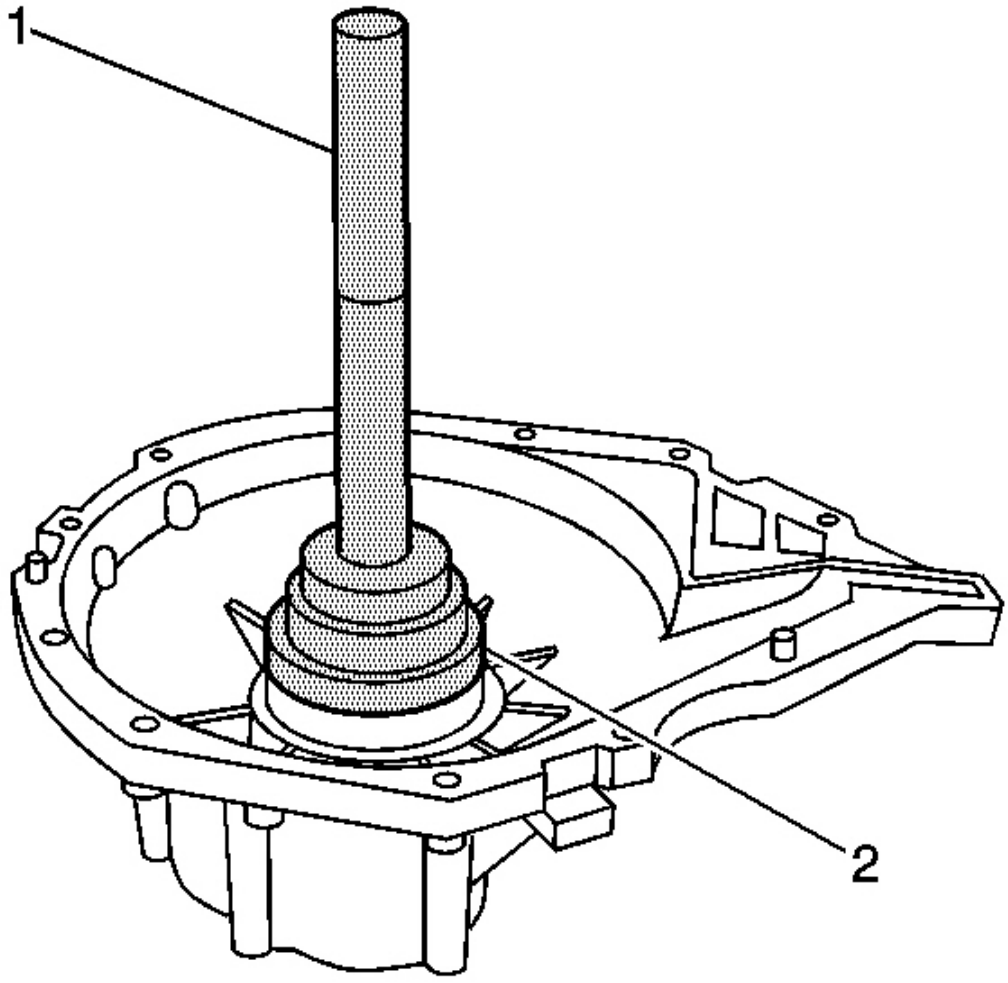


Fig. 121: Driving Right Side Differential Adjuster Nut Assembly & New Adjuster Lock Nut Tab Into Differential Carrier Case Half Using J 36609 & J8092
Courtesy of GENERAL MOTORS CORP.

24. Drive the right side differential adjuster nut assembly and the new adjuster lock nut tab into the differential carrier case half until seated using the **J 36609** (2) and the **J 8092** (1). See **Special Tools and Equipment** .

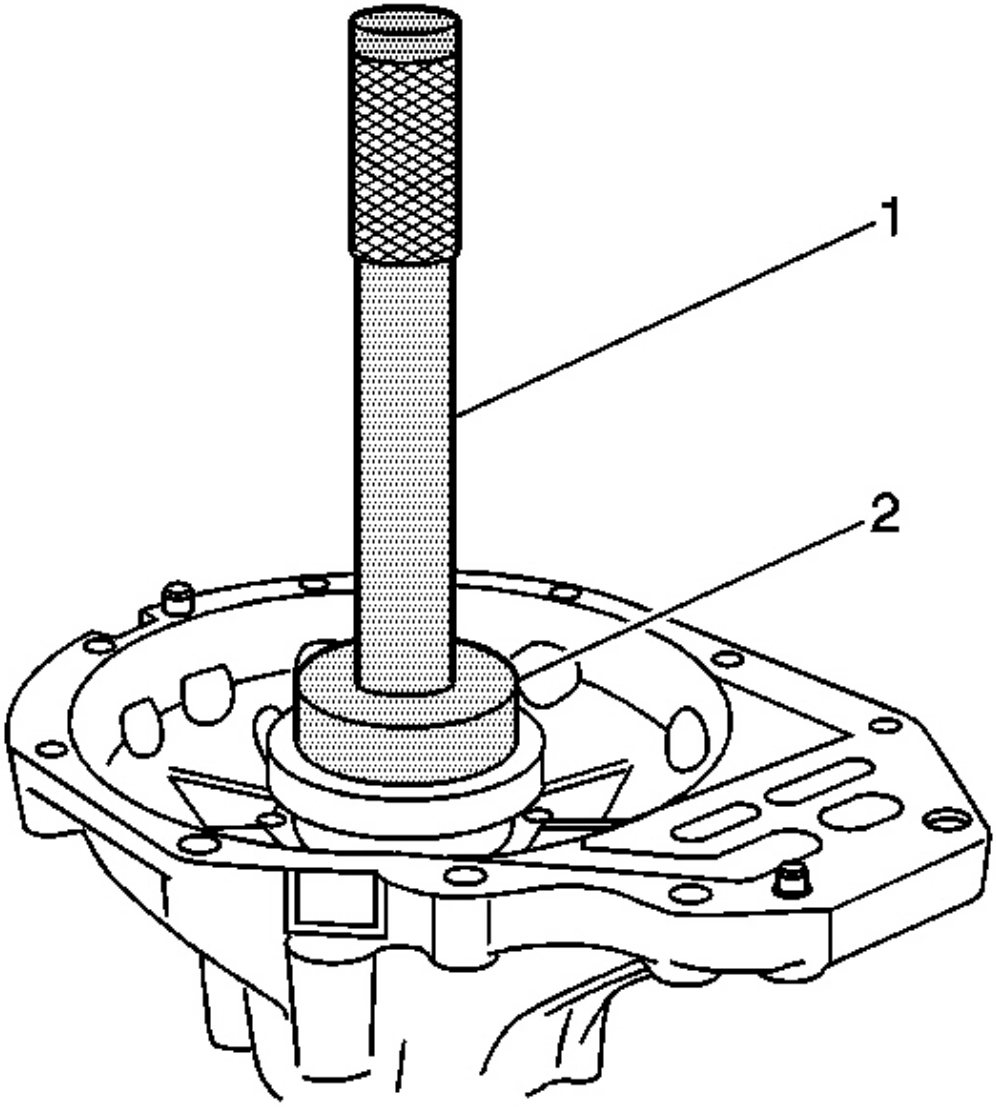


Fig. 122: Installing Right Side Differential Case Side Bearing Cup Into Differential Carrier Case Using J 36603 & J 8092
Courtesy of GENERAL MOTORS CORP.

25. Install the right side differential case side bearing cup into the differential carrier case using the **J 36603** (2) and the**J 8092** (1). See **Special Tools and Equipment** .
26. Install the left side differential adjuster nut assembly into the left side differential carrier case half.

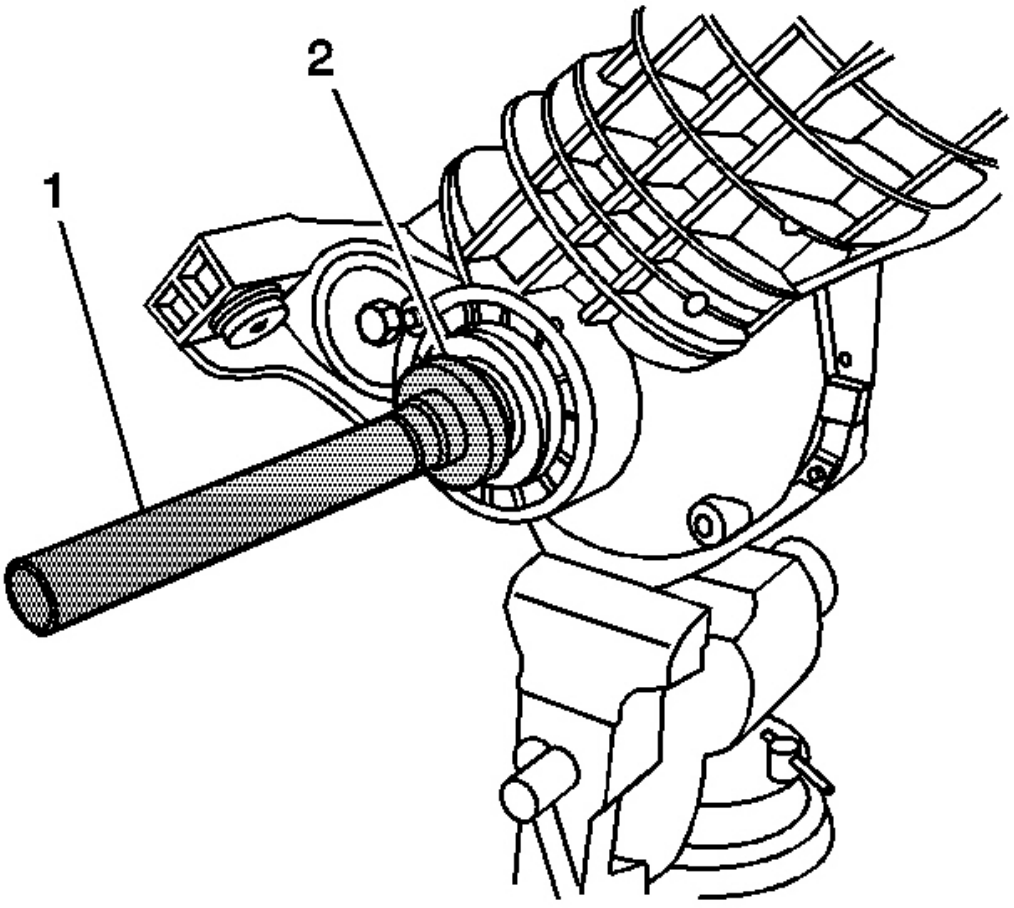


Fig. 123: Installing Left Side Axle Shaft Bearing Using J 36609 & J 8092
Courtesy of GENERAL MOTORS CORP.

27. Install the left side axle shaft bearing into the differential adjuster nut sleeve using the **J 36609** (2) and the **J 8092** (1). See **Special Tools and Equipment** .

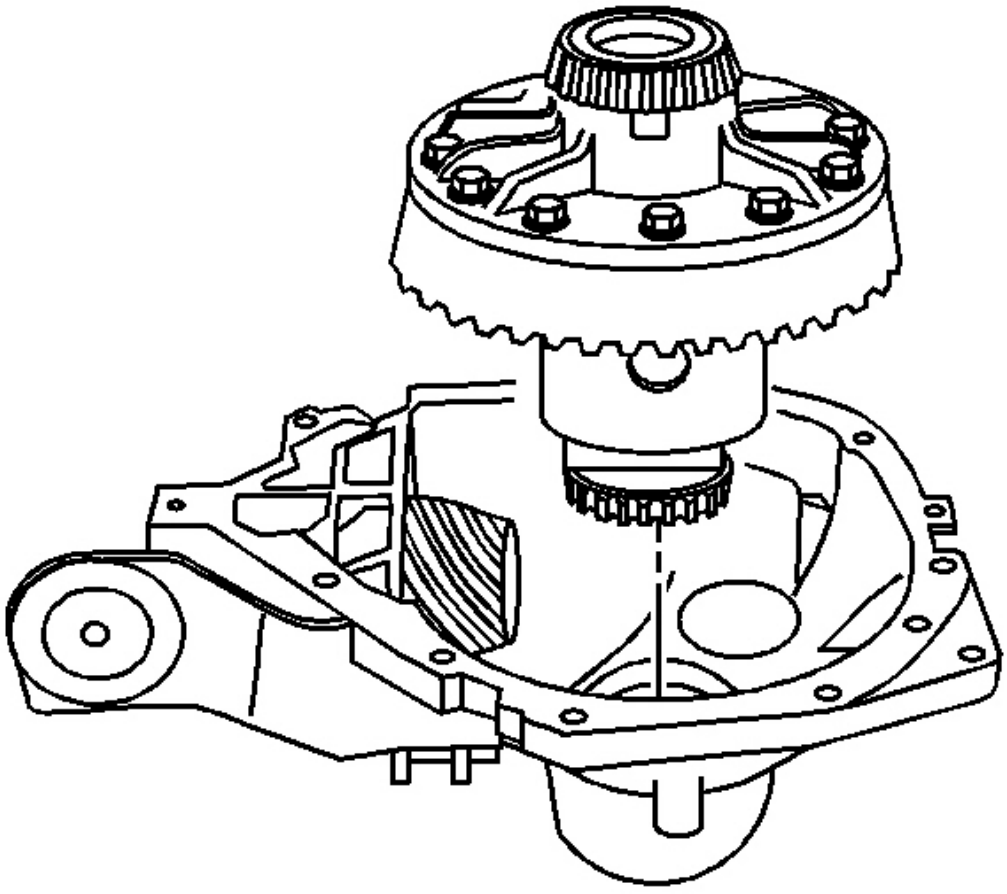


Fig. 124: Differential Case Assembly
Courtesy of GENERAL MOTORS CORP.

28. Install the differential case assembly into the left differential carrier case half.
29. Install the right differential carrier case half to the left differential carrier case half.

    Do not use sealer at this time.

    If the carrier case halves do not make complete contact, use the **J 36599-A** in order to back out the right differential adjuster nut sleeve. See **Special Tools and Equipment** .

30. Install the differential carrier case bolts.

    Tighten: Tighten the differential carrier case bolts to 78 N.m (58 lb ft).

31. Install the differential carrier assembly into a vise.

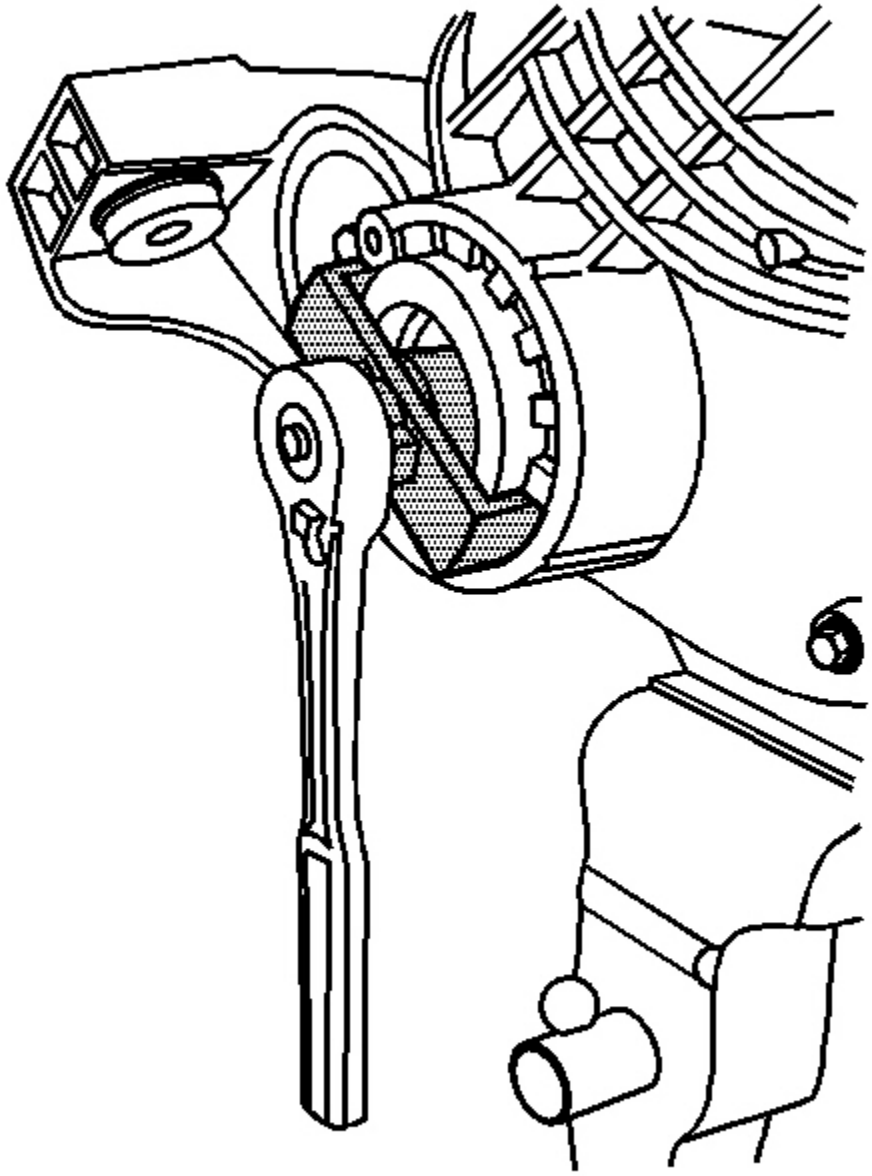


Fig. 125: Turning Left Side Differential Adjuster Nut Sleeve Using J 36615
Courtesy of GENERAL MOTORS CORP.

32. Turn the left side differential adjuster nut sleeve in using the **J 36615** until the differential adjuster nut

contacts the differential side bearing and can no longer be turned. See **Special Tools and Equipment** .

33. Turn the right side differential adjuster nut sleeve in using the**J 36599-A** until the differential adjuster nut contacts the differential side bearing and can no longer be turned. See **Special Tools and Equipment** .
34. Rotate the pinion several times in order to seat the bearings.
35. Measure the rotating torque of the pinion and differential assembly using an inch-pound torque wrench.

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

36. If the rotating torque measurement is below 2.8 N.m (25 lb in) for used bearings, or 3.4 N.m (30 lb in) for new bearings, tighten the differential adjuster nut sleeves one notch at a time on each side until the rotating torque of the pinion and differential assembly is within specifications.
37. If the rotating torque measurement is above 5.1 N.m (45 lb in) for used bearings, or 6.2 N.m (55 lb in) for new bearings, loosen the differential adjuster nut sleeves one notch at a time on each side until the rotating torque of the pinion and differential assembly is within specifications.
38. Once the specified torque is obtained, rotate the pinion several times to ensure the bearings have seated.

    Recheck the rotating torque and adjust if necessary.

39. Measure the drive pinion to ring gear backlash. Refer to **Backlash Inspection and Adjustment** .

BACKLASH INSPECTION AND ADJUSTMENT

Tools Required

- **J 8001** Dial Indicator Set. See **Special Tools and Equipment** .
- **J 36599-A** Side Bearing Nut Wrench. See **Special Tools and Equipment** .
- **J 36615** Side Bearing Nut Wrench. See **Special Tools and Equipment** .

1. Mark the location of the differential adjuster nut sleeves in relation to the differential carrier halves.

   Ensure that the notches can be counted when turned.

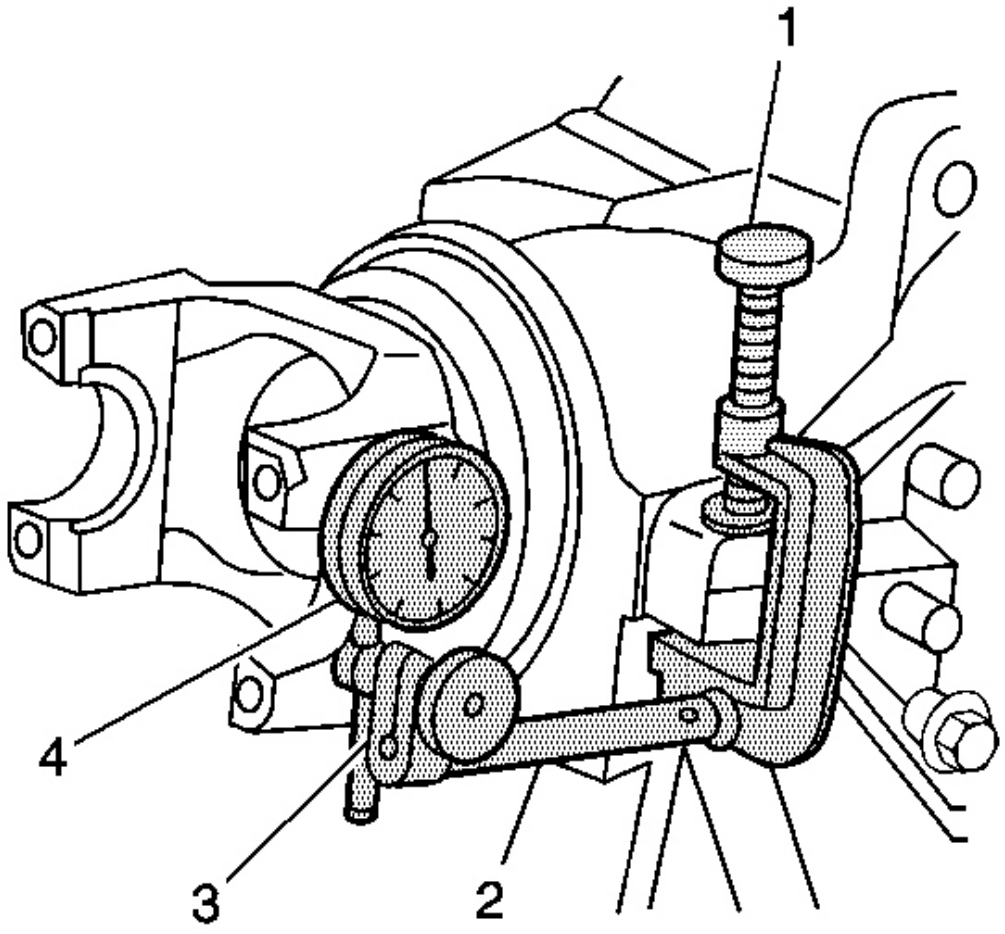


Fig. 126: Installing J 8001-1, J 8001-2 & J 8001-3
Courtesy of GENERAL MOTORS CORP.

2. Install the J 8001-1 (1, 2), the J 8001-2 (3), and the J 8001-3 (4) as shown.

   Ensure that the button contacts the outer edge of the pinion yoke and that the plunger is at a right angle to the pinion yoke.

3. Move the pinion yoke back and forth through the pinion yoke's free play while not allowing the ring gear to move.
4. Record the dial indicator reading.
5. To determine the actual backlash, divide the dial indicator reading by 2.

An actual dial indicator reading of 0.16 mm (0.006 in) means that there is actually 0.08 mm (0.003 in) backlash.

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

IMPORTANT: When adjusting the backlash, observe the following:

- **Always turn the left and the right differential adjuster nut sleeves in equal amounts.**
- **Turning the differential adjuster nut sleeves one notch will change the backlash about 0.08 mm (0.003 in).**

6. If the backlash is too small, increase the backlash by turning the left differential adjuster nut sleeve in one notch using the **J 36615** and the right differential adjuster nut sleeve out one notch using the**J 36599-A** . See **Special Tools and Equipment** .
7. If the backlash is too large, decrease the backlash by turning the right differential adjuster nut sleeve in one notch using the **J 36599-A** and the left differential adjuster nut sleeve out one notch using the **J 36615** . See **Special Tools and Equipment** .
8. Recheck the backlash and adjust as necessary.
9. Recheck the rotating torque of the pinion and differential assembly and adjust as necessary.
10. Once the backlash and rotating torque of the pinion and differential assembly is correct, perform a gear tooth contact pattern check to ensure proper contact between the pinion and the ring gear. Refer to **Gear Tooth Contact Pattern Inspection** .
11. Complete the assembly of the differential carrier. Refer to **Differential Carrier Assembly - Final Assembly** .

DIFFERENTIAL CARRIER ASSEMBLY - FINAL ASSEMBLY

Tools Required

- **J 36609** Axle Tube Bearing Installer. See **Special Tools and Equipment** .
- **J 45225** Axle Seal Installer. See **Special Tools and Equipment** .
- **J 45755** Front Axle Bushing Remover/Installer - 9. See **Special Tools and Equipment** .25 inch Axle
- **J 8092** Universal Driver Handle - 3/4 in - 10. See **Special Tools and Equipment** .

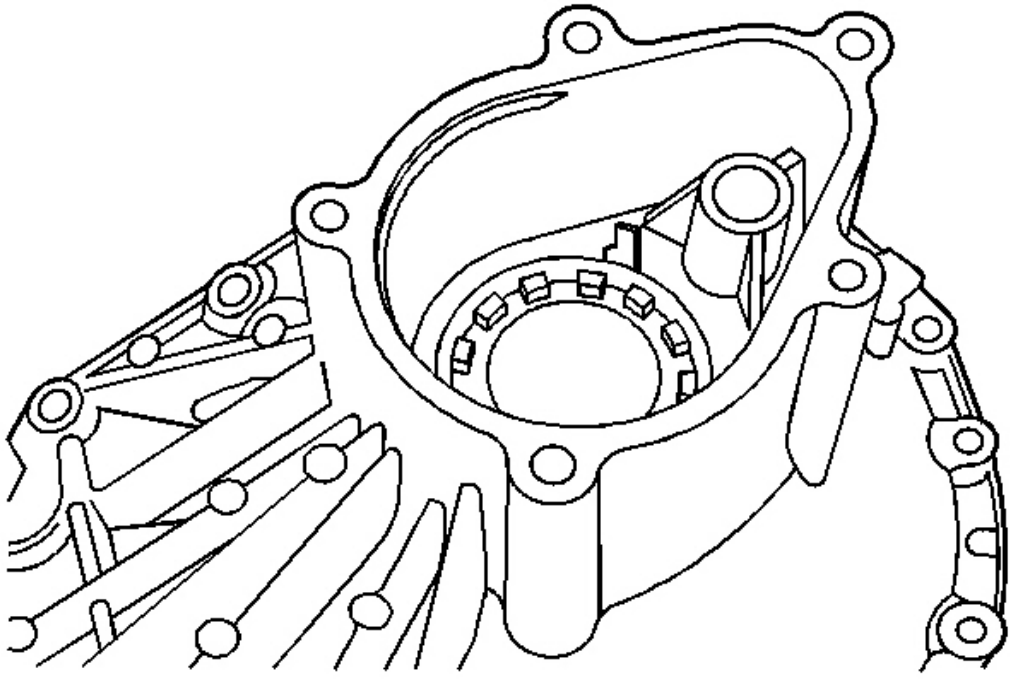


Fig. 127: Bending Right Side Differential Adjuster Nut Lock Tab Over Differential Adjuster Nut Sleeve
Courtesy of GENERAL MOTORS CORP.

1. Bend the right side differential adjuster nut lock tab over the differential adjuster nut sleeve.

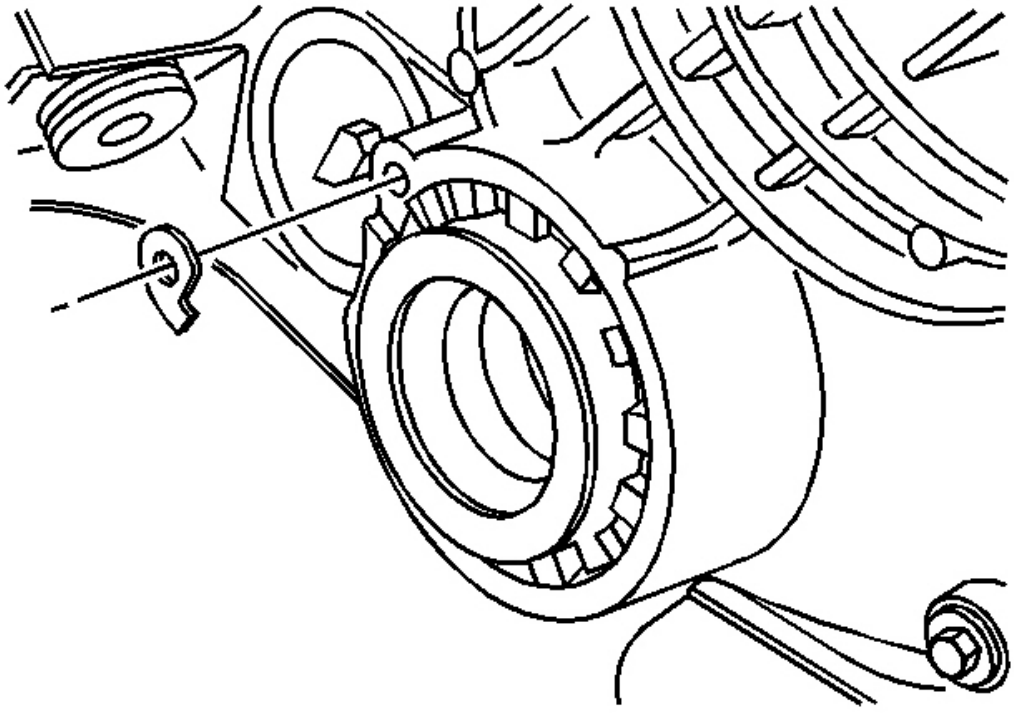


Fig. 128: Differential Adjuster Nut Lock
Courtesy of GENERAL MOTORS CORP.

2. Install the differential adjuster nut lock.

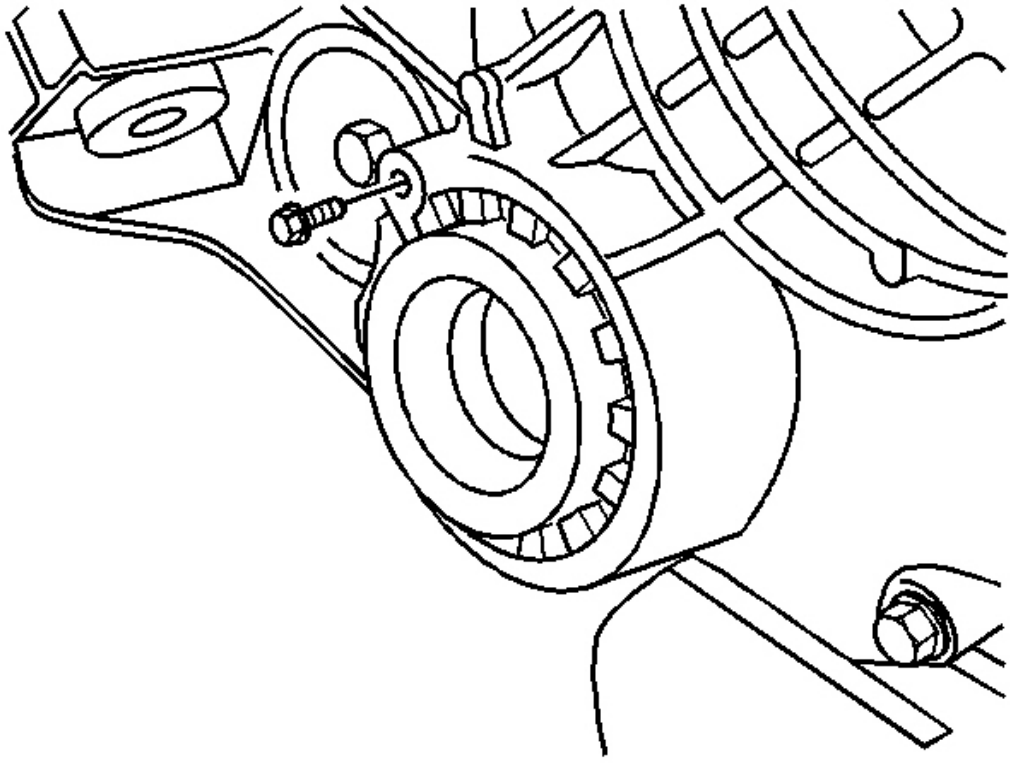


Fig. 129: Differential Adjuster Nut Lock Bolt
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the differential adjuster nut lock bolt.

   Tighten: Tighten the differential adjuster lock nut bolt to 20 N.m (15 lb ft).

4. Remove the differential carrier assembly bolts.
5. Remove the right differential carrier case half.
6. Clean the sealing surface of each half of the differential carrier case and the inner axle housing to differential carrier assembly.

   The surfaces must be clean of all the grease and the oil.

7. Apply a bead of sealer to one differential carrier case half sealing surface. Use the correct sealer. Refer to **Sealers, Adhesives, and Lubricants** .

8. Install the right differential carrier case half.
9. Install the differential carrier case bolts.

   Tighten: Tighten the differential carrier case bolts to 47 N.m (35 lb ft).

10. Install the upper differential carrier assembly bushing into the upper differential carrier assembly bushing bore.

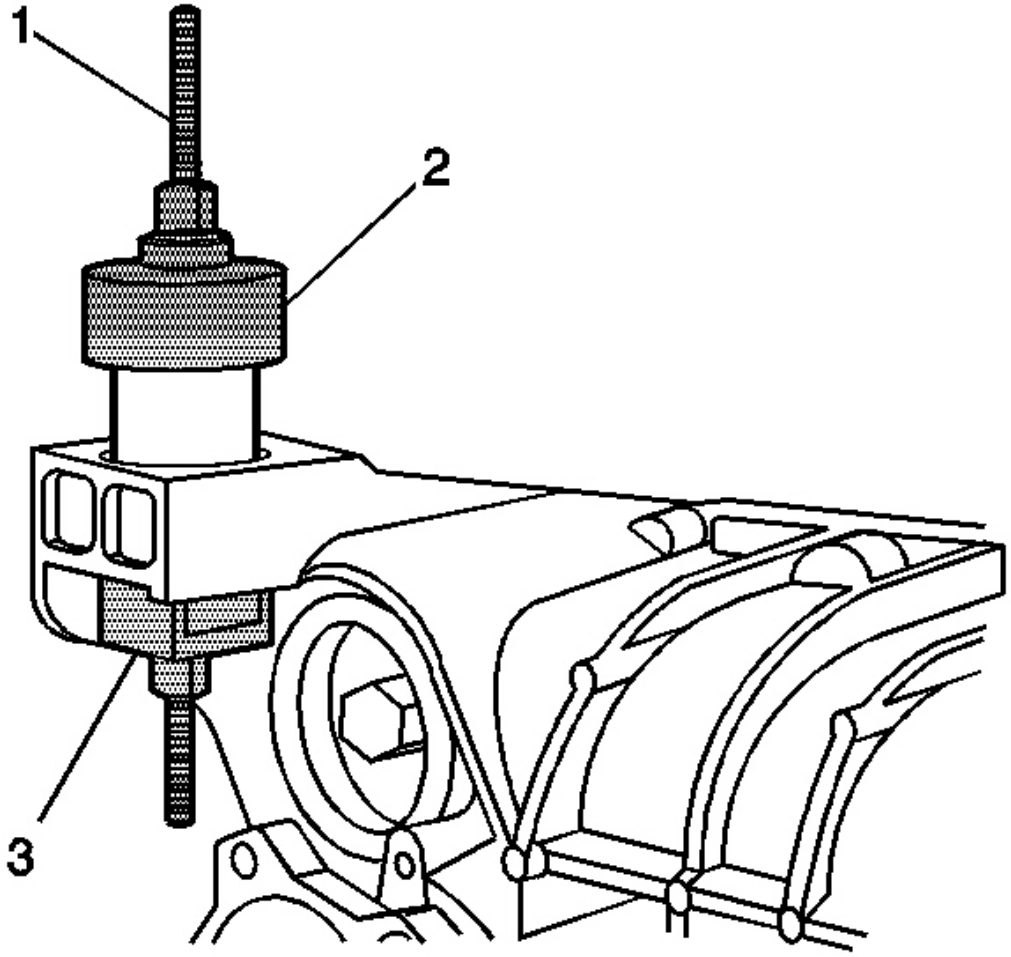


Fig. 130: Installing J 45755-2, J 45755-1, Forcing Screw, Bearing & Washers Over Differential Carrier Assembly Bushing
Courtesy of GENERAL MOTORS CORP.

11. Install the J 45755-2 (2), J 45755-1 (3), and the forcing screw, bearing and washers (1) over the differential carrier assembly bushing as shown.
12. Press the bushing into the differential carrier assembly bushing bore using the **J 45755** . See **Special Tools and Equipment** .

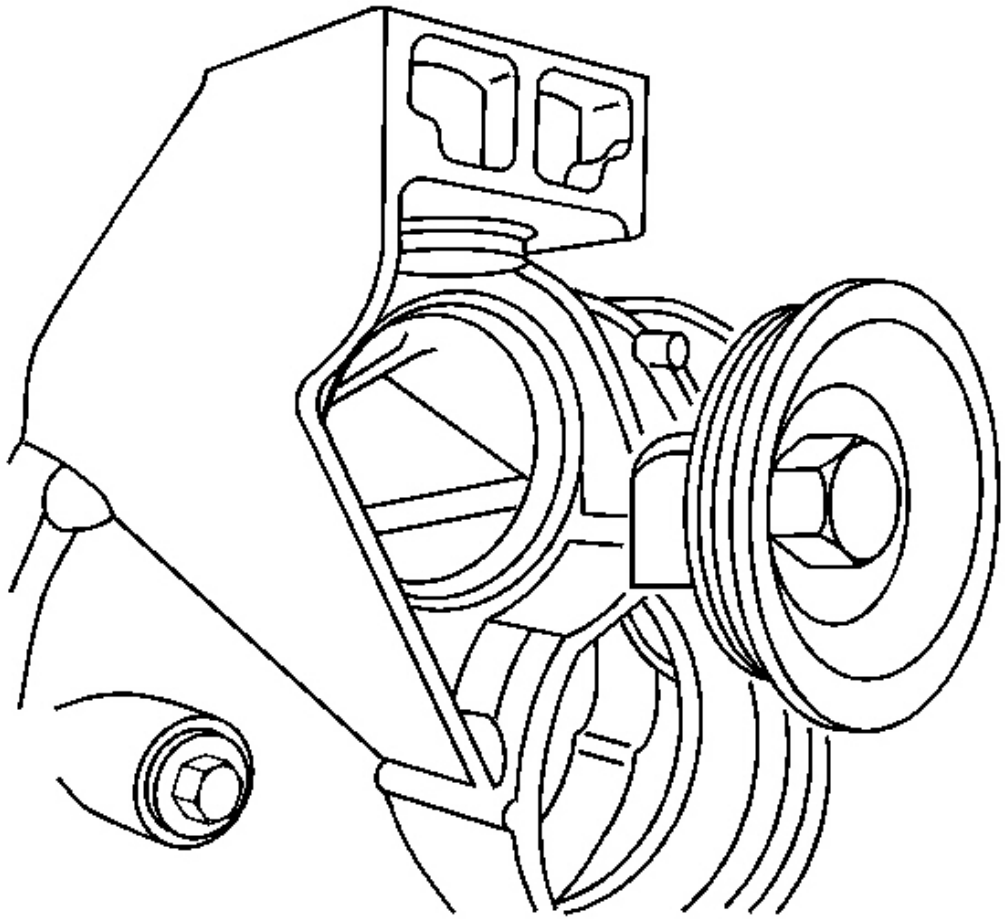


Fig. 131: Differential Carrier Assembly & Hole Plug
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Component Fastener Tightening Notice in Cautions and Notices.

13. Install the differential carrier hole plug.

Tighten: Tighten the differential carrier hole plug to 28 N.m (21 lb ft).

14. Install the new axle shaft seal using the **J 45225** and the **J 8092** . See **Special Tools and Equipment** .
15. Install the left side inner axle shaft into the differential case side gear using a soft-faced mallet until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.
16. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.

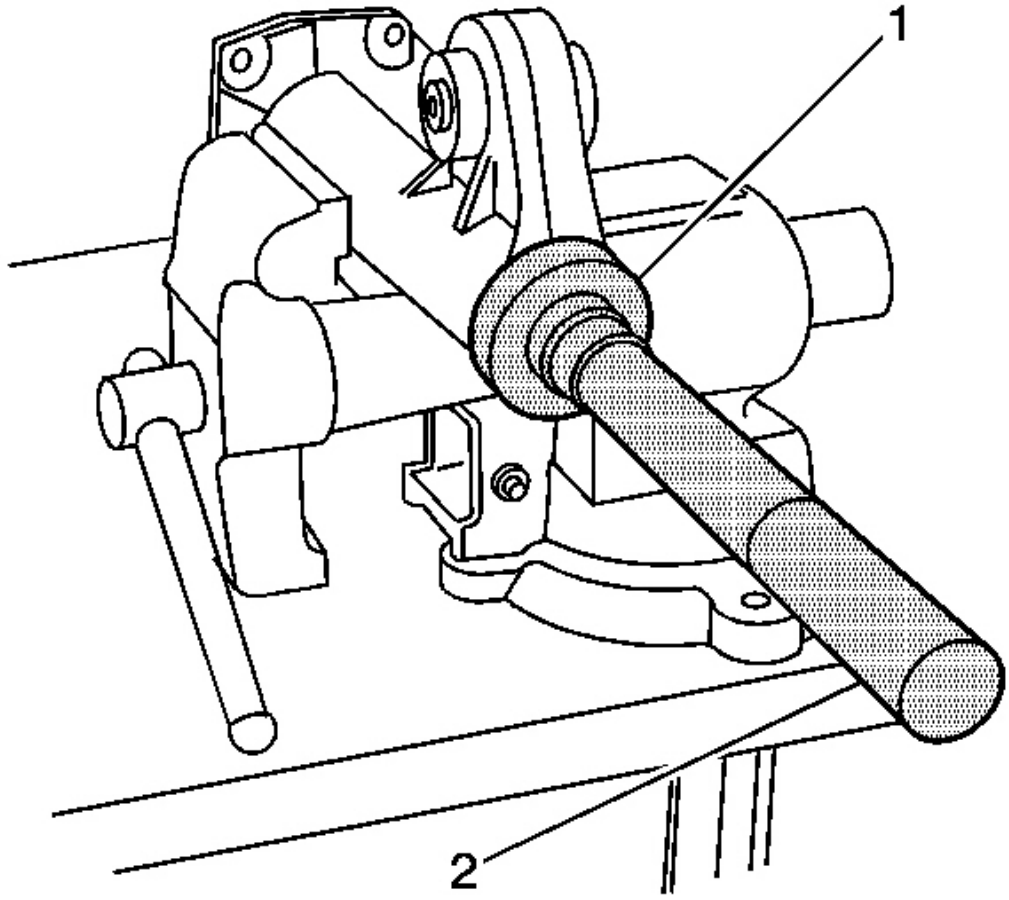


Fig. 132: Installing Bearing With Square Shoulder Using J 36609 & J 8092
Courtesy of GENERAL MOTORS CORP.

17. Install the right side inner axle shaft bearing by performing the following steps:
    1. Install the inner axle shaft housing into a vise.
    2. Install the bearing with the square shoulder in using the **J 36609** (1) and the**J 8092** (2). See **Special Tools and Equipment**

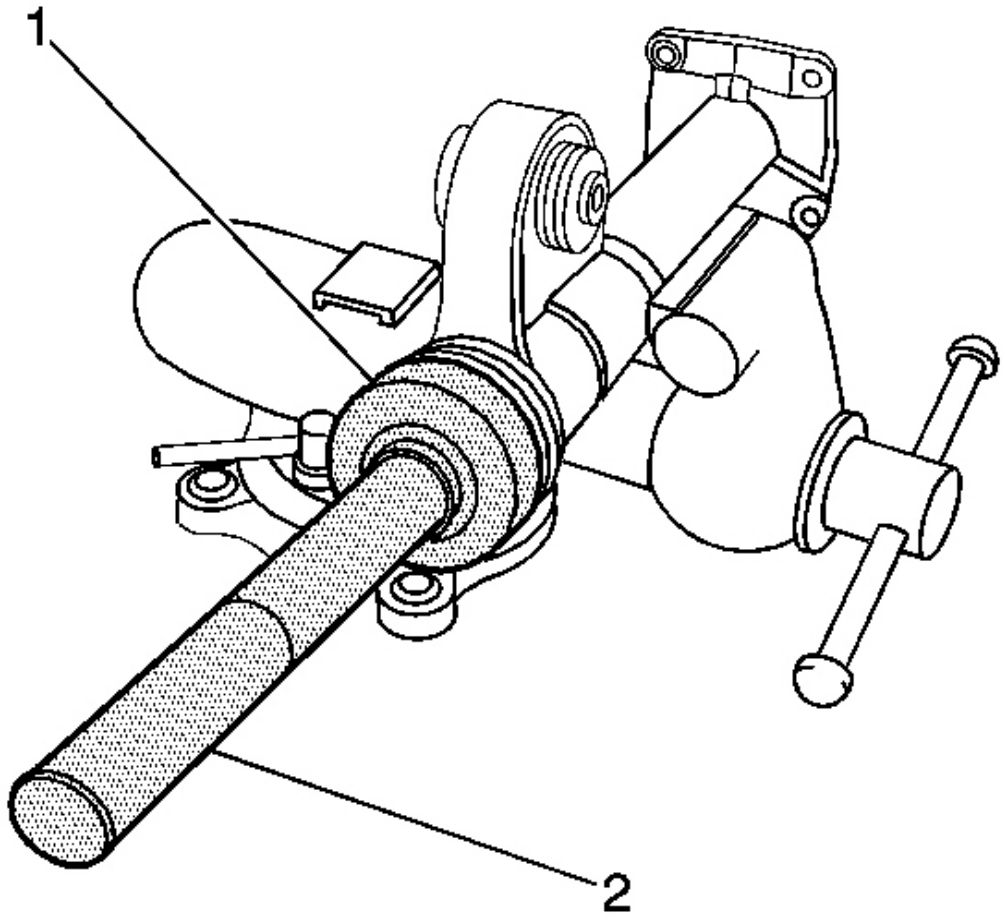


Fig. 133: Installing New Axle Shaft Seal Using J 45225 & J8092
Courtesy of GENERAL MOTORS CORP.

18. Install the right side inner axle shaft seal by performing the following steps:
    - Install the inner axle shaft housing into a vise.
    - Install the new axle shaft seal using the **J 45225** and the**J 8092** . See **Special Tools and Equipment** .

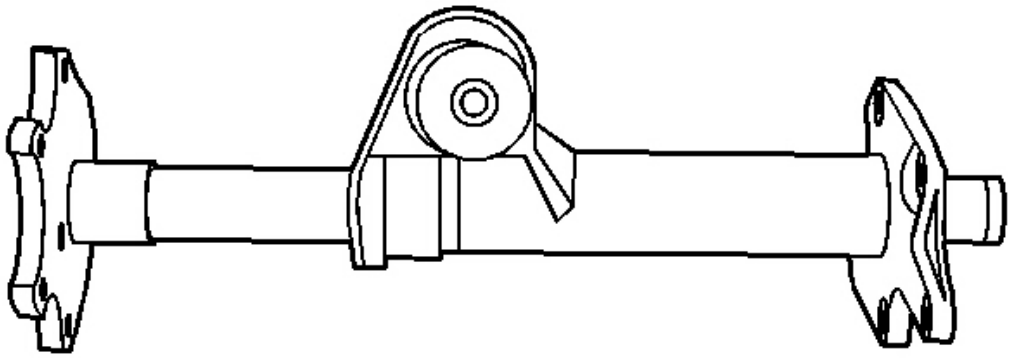


Fig. 134: Install Inner Axle Shaft Into Inner Axle Shaft Housing
Courtesy of GENERAL MOTORS CORP.

19. Install the inner axle shaft into the inner axle shaft housing.

    Carefully tap the inner axle shaft into place with a soft-faced mallet.

20. Apply sealant to the inner axle housing to differential carrier sealing surface. Use the correct sealer. Refer to **Sealers, Adhesives, and Lubricants** .

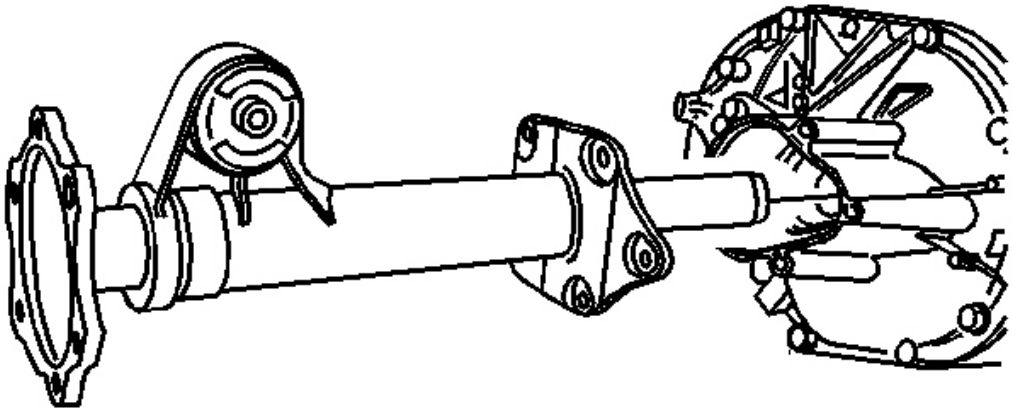


Fig. 135: Inner Axle Housing & Inner Axle Shaft

Courtesy of GENERAL MOTORS CORP.

21. Install the inner axle shaft housing to the differential carrier case.

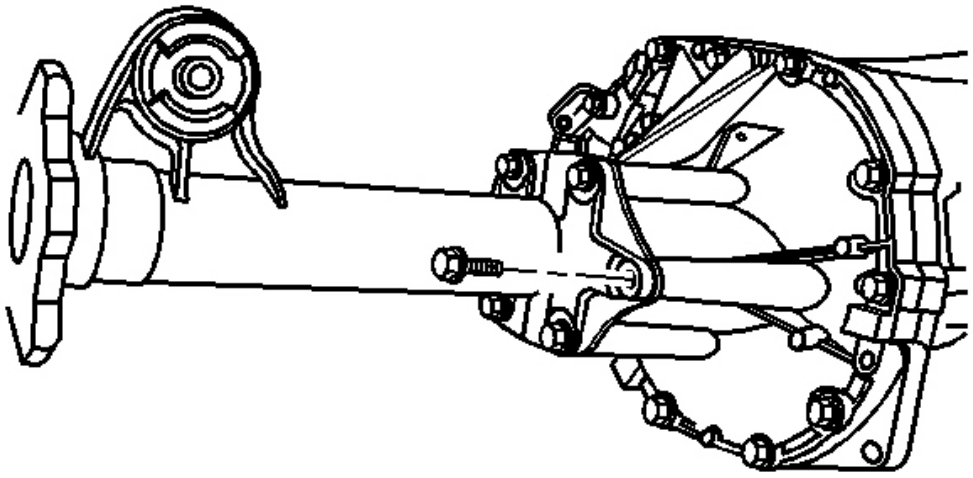


Fig. 136: Inner Axle Shaft Housing & Differential Carrier Assembly Bolts
Courtesy of GENERAL MOTORS CORP.

22. Install the inner axle shaft housing bolts.

    Tighten: Tighten the inner axle shaft housing bolts to 40 N.m (30 lb ft).

    NOTE: Refer to Fastener Notice in Cautions and Notices.

23. Install the drain plug and the washer.

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

24. Fill the differential carrier assembly with axle lubricant. Use the proper fluid. Refer to **Lubricant Replacement - Front Drive Axle** .

25. Install the fill plug and the washer.

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

GEAR TOOTH CONTACT PATTERN INSPECTION

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

Gear Tooth Nomenclature

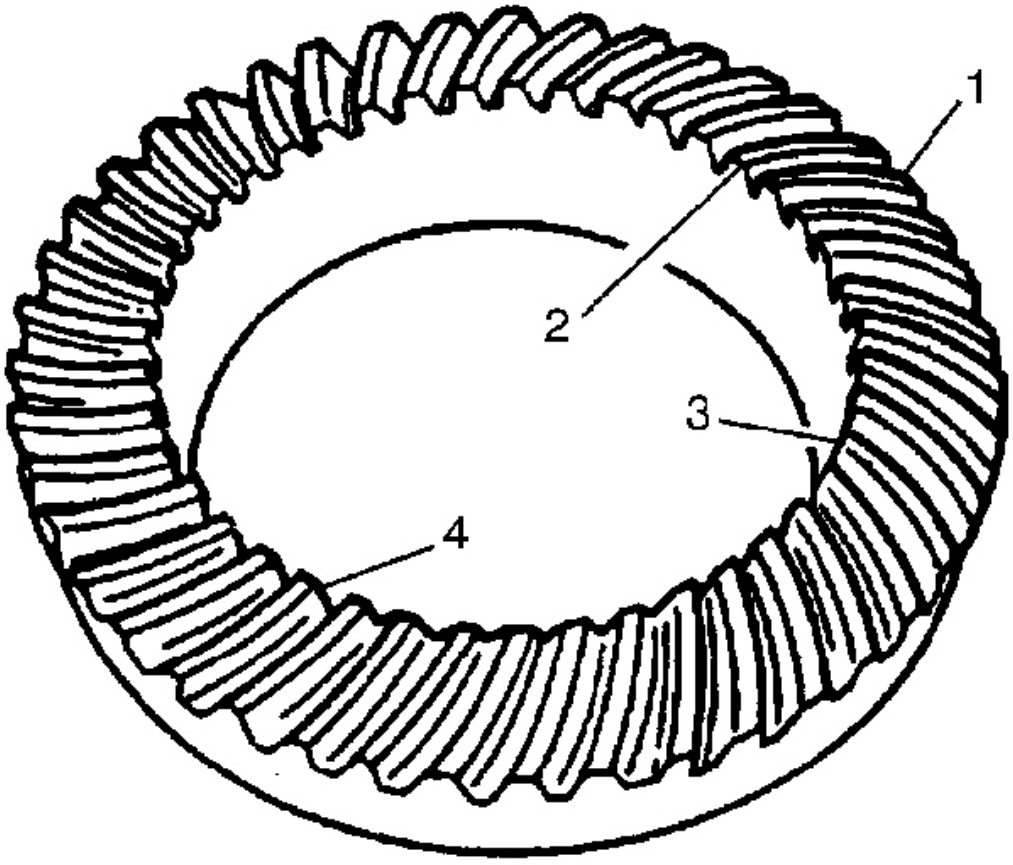


Fig. 137: Gear Tooth Nomenclature
Courtesy of GENERAL MOTORS CORP.

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

Adjustments Affecting Tooth Contact

The following 2 adjustments affect the tooth contact pattern:

- Backlash adjustment
- Pinion depth adjustment

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

Pinion Depth Adjustment

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

Backlash Adjustment

Adjust the backlash by means of moving the side bearing adjuster sleeves which move the case and ring gear assembly closer to or farther from the pinion. Also use the adjuster sleeves in order to set the side bearing preload.

- If the left side adjuster sleeve is moved in, along with an equal outward movement of the right side adjuster, the backlash will increase.
- If the left side adjuster sleeve is moved out, along with an equal inward movement of the right side adjuster, the backlash will decrease.

Testing Procedure

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

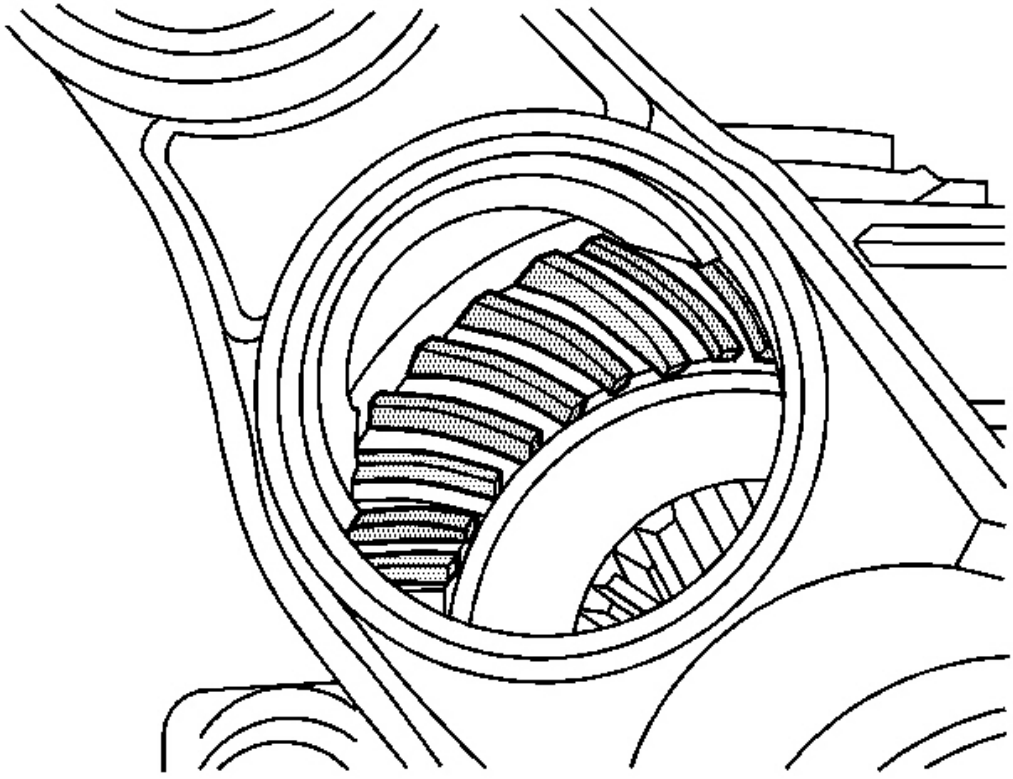


Fig. 138: Applying Gear Marking Compound GM P/N 1052351
Courtesy of GENERAL MOTORS CORP.

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

IMPORTANT: Avoid turning the ring gear excessively.

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

Correct Contact Pattern

Condition

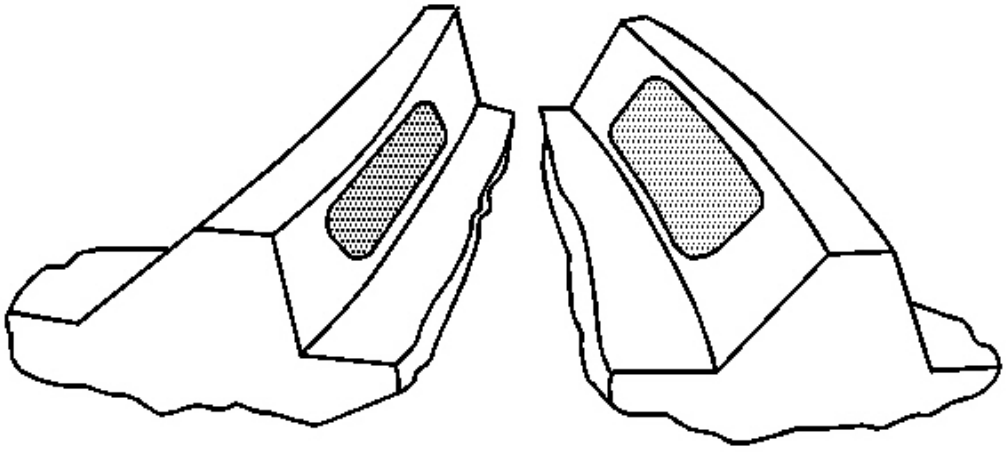


Fig. 139: Correct Contact Pattern
Courtesy of GENERAL MOTORS CORP.

The backlash and pinion depth is correct.

Correction

None required.

Service Hints

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

- Total assembly
- Differential case
- Drive pinion

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

Drive Side Heel - Coast Side Toe Contact Pattern

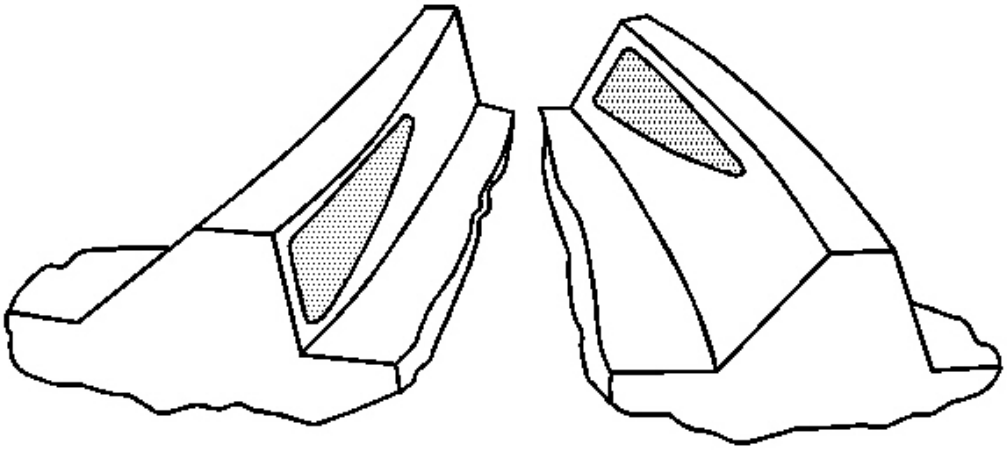


Fig. 140: Drive Side Heel - Coast Side Toe Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

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

Correction

Adjust the pinion depth of drive pinion. Refer to **Pinion Depth Adjustment** .

Drive Side Toe - Coast Side Heel Contact Pattern

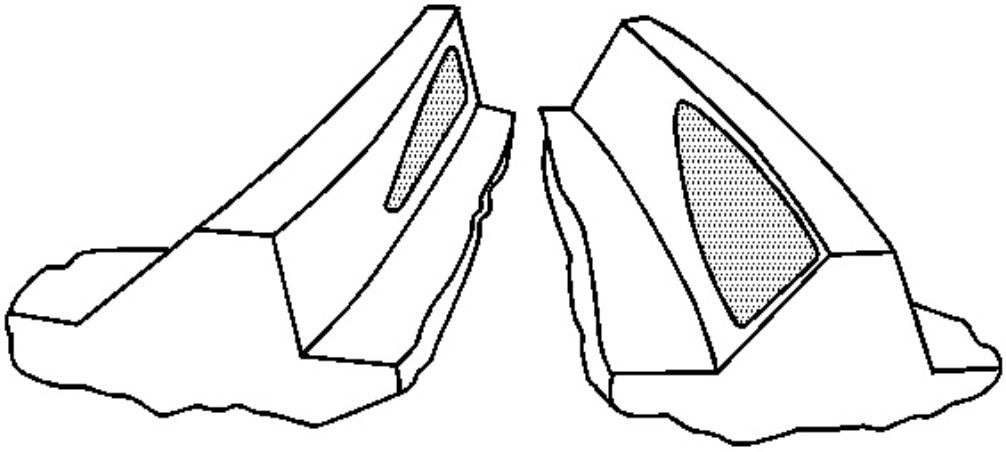


Fig. 141: Drive Side Toe - Coast Side Heel Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

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

Correction

Adjust the pinion depth of drive pinion. Refer to **Pinion Depth Adjustment** .

Drive Side Heel - Coast Side Heel Contact Pattern

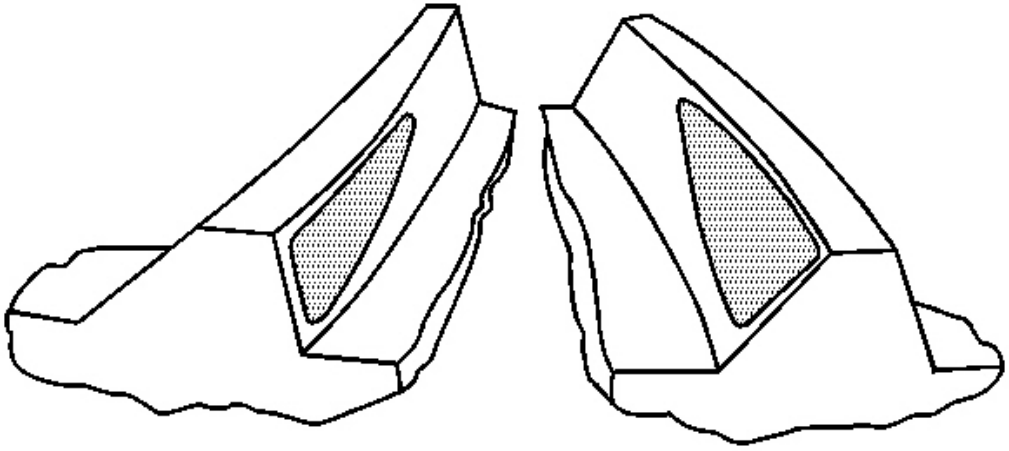


Fig. 142: Drive Side Heel - Coast Side Heel Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

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

Correction

Decrease the backlash. Move the ring gear closer to the drive pinion by adjusting the side bearing adjuster sleeves. Refer to **Backlash Inspection and Adjustment** .

Drive Side Toe - Coast Side Toe Contact Pattern

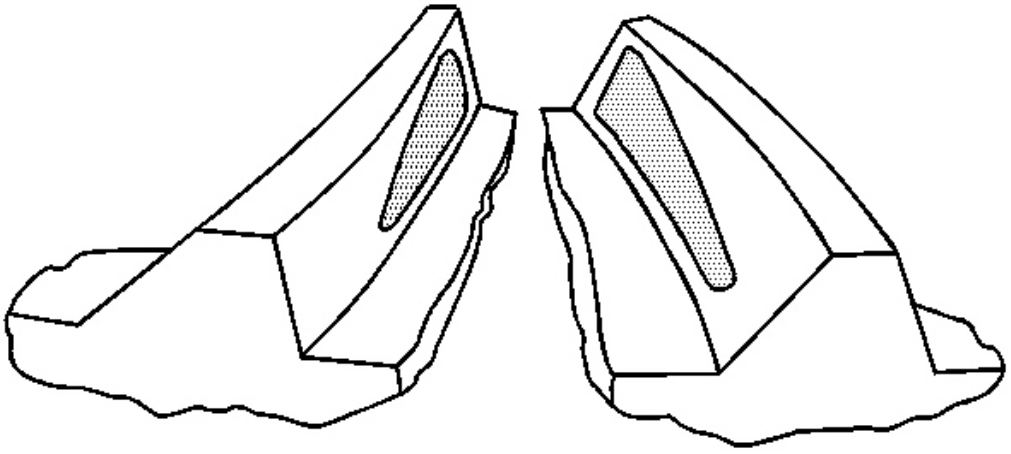


Fig. 143: Drive Side Toe - Coast Side Toe Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

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

Correction

Increase the backlash. Move the ring gear away from the drive pinion by adjusting the side bearing adjuster sleeves. Refer to **Backlash Inspection and Adjustment** .

DESCRIPTION AND OPERATION

FRONT DRIVE AXLE DESCRIPTION AND OPERATION

Full-Time Four Wheel Drive (F4WD) Front Axle Description and Operation

The Full-Time Four Wheel Drive (F4WD) Front Axle consist of the following components:

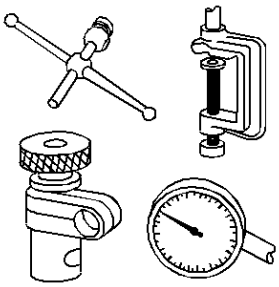
- Differential Carrier Housing
- Differential Assembly
- Output Shaft - Left Side
- Inner Axle Shaft Housing
- Inner Axle Shaft - Right Side

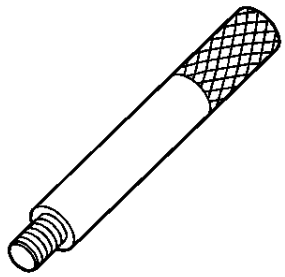
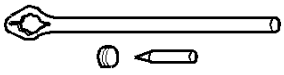
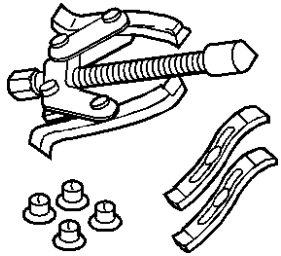
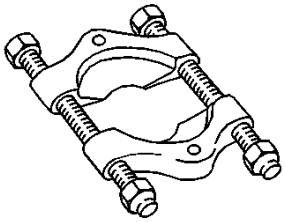
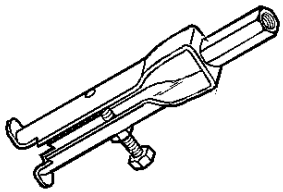
The front axle on Full-Time Four Wheel Drive model vehicles does not have a central disconnect feature in order to engage and disengage the front axle. The left and right axle shafts are connected directly to the differential case assembly. This allows the axle shafts and the propeller shaft to spin continuously. The transfer case controls the amount of torque applied to the front axle. A propeller shaft connects the transfer case to the front axle. The differential carrier assembly uses a conventional ring and pinion gear set to transmit the driving force of the engine to the wheels. The open differential allows the wheels to turn at different rates of speed while the axle continues to transmit the driving force. This prevents tire scuffing when going around corners and premature wear on internal axle parts. The ring and pinion set and the differential are contained within the carrier. The axle identification number is located on top of the differential carrier assembly or on a label on the bottom of the right half of differential carrier assembly. The drive axles are completely flexible assemblies consisting of inner and outer constant velocity CV joints protected by thermoplastic boots and connected by a wheel drive shaft.

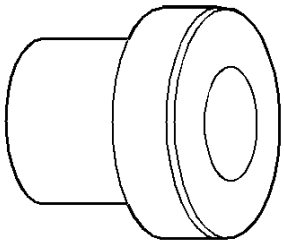
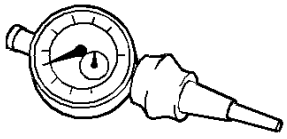
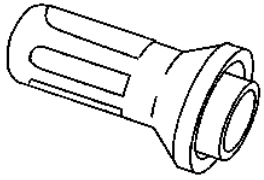
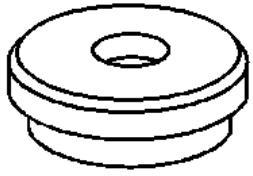
SPECIAL TOOLS AND EQUIPMENT

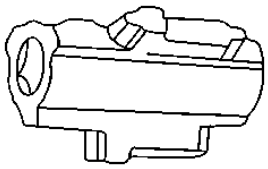
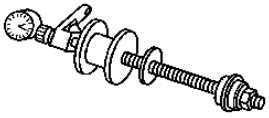
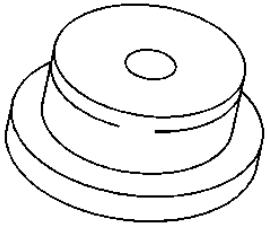
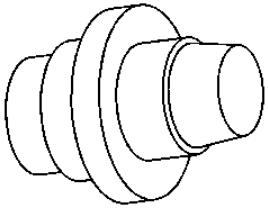
SPECIAL TOOLS

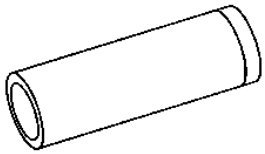
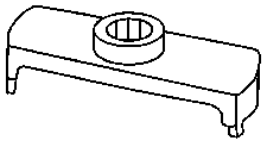
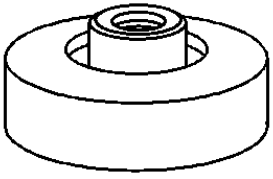
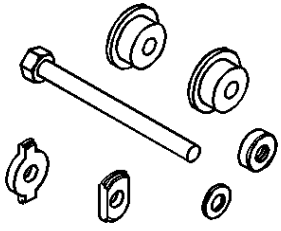
Special Tools

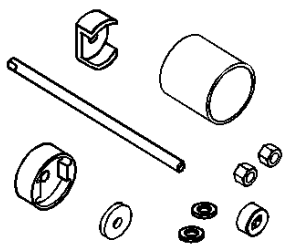
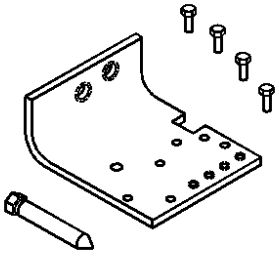
Illustration	Tool Number/Description
	J 2619-01 Slide Hammer
	J 8001 Dial Indicator Set
	J 8092 Universal Driver Handle - 3/4 in - 10

	
	J 8614-01 Flange and Pulley Holding Tool
	J 22888-D Side Bearing Remover Kit
	J 22912-01 Split-Plate Bearing Remover
	J 29369-2 Bushing and Bearing Remover 2-3 in

	J 29710 Differential Side Bearing Installer
	J 29763 Static Timing Gauge
	J 36366 Pinion Oil Seal Installer
	J 36597 Side Bearing Puller Pilot - 9.25 in Axle
	J 36599-A Side Bearing Nut Wrench

	
	J 36601 Pinion Shim Selector
	J 36603 Side Bearing Cup Installer
	J 36609 Axle Tube Bearing Installer
	J 36614 Inner Pinion Bearing Installer

	
	J 36615 Side Bearing Nut Wrench
	J 45225 Axle Seal Installer
	J 45754 Pinion Bearing Race Remover/Installer - 9.25 in Axle
	J 45755 Front Axle Bushing Remover/Installer

	
	J 45765 Pinion Remover - 8.25/9.25 in Axles