

2004 Isuzu Ascender LS

2004 DRIVELINE/AXLE Drive Axle - Locking/Limited Slip - Ascender

2004 DRIVELINE/AXLE

Drive Axle - Locking/Limited Slip - Ascender

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

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

THRUST BLOCK SIZES (LOCKING)

Thrust Block Sizes (Locking)

Color Code	8.0" Axle	8.6" Axle
Purple	31.75 mm (1.250")	33.58 mm (1.322")
White	31.85 mm (1.254")	33.68 mm (1.326")
Brown	31.95 mm (1.258")	33.78 mm (1.330")
Yellow	32.05 mm (1.262")	33.88 mm (1.334")
Orange	32.16 mm (1.266")	33.99 mm (1.338")
Pink	32.26 mm (1.270")	34.09 mm (1.342")
Green	32.36 mm (1.274")	34.19 mm (1.346")
Blue	32.46 mm (1.278")	34.29 mm (1.350")

COMPONENT LOCATOR

LOCKING DIFFERENTIAL DISASSEMBLED VIEWS

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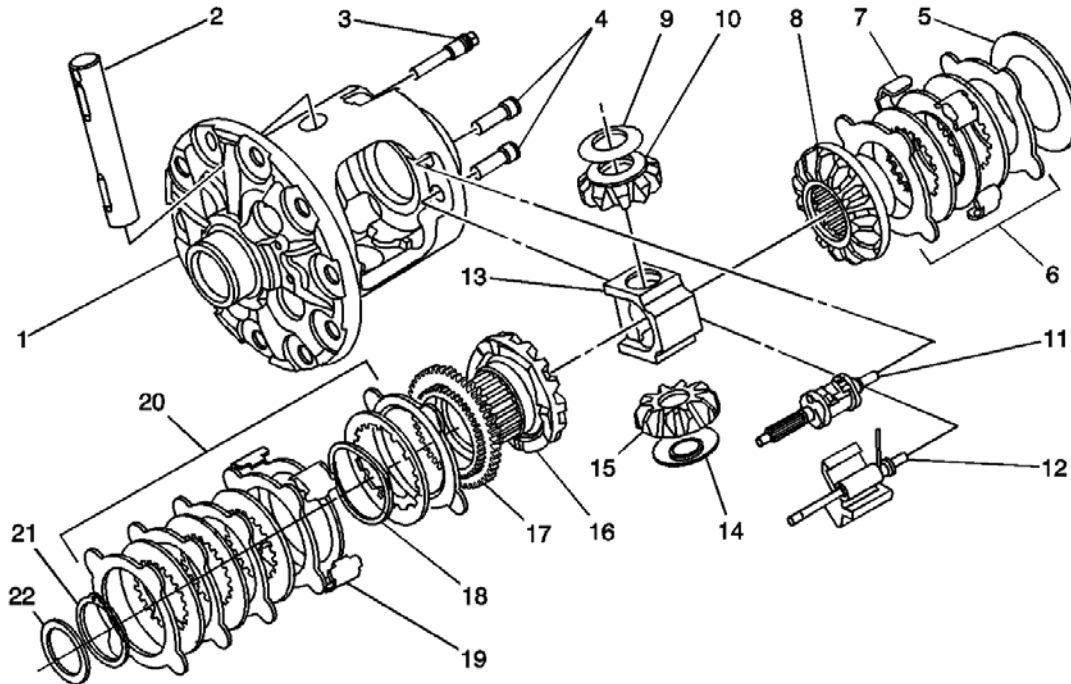


Fig. 1: 8.0 Locking Differential Disassembled View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Differential Housing
2	Differential Pinion Gear Shaft
3	Differential Pinion Gear Shaft Lock Bolt
4	Locking Differential Governor and Lockout Assembly Bushings
5	Locking Differential Clutch Disc Thrust Washer
6	Locking Differential Clutch Disc Pack (5 Discs)
7	Locking Differential Clutch Disc Guide (4 Required)
8	Locking Differential Side Gear
9	Differential Pinion Gear Thrust Washer
10	Differential Pinion Gear
11	Locking Differential Governor Assembly
12	Locking Differential Latching Bracket Assembly
13	Locking Differential Thrust Block
14	Pinion Gear Thrust Washer
15	Differential Pinion Gear
16	Locking Differential Side Gear (Cam Faced)
17	Locking Differential Side Gear (Cam Plate)

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18	Wave Washer
19	Locking Differential Clutch Disc Guide (4 Required)
20	Locking Differential Clutch Disc Pack (10 Discs)
21	Snap Ring
22	Locking Differential Clutch Disc Thrust Washer

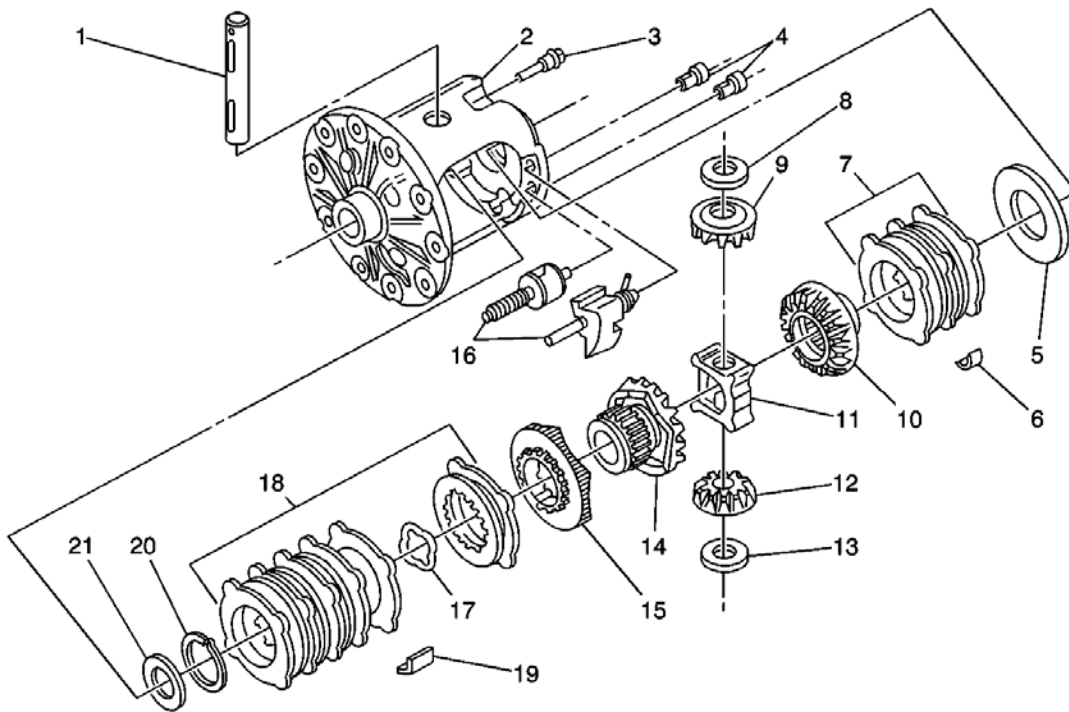


Fig. 2: 8.6 Locking Differential Disassembled View
 Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Differential Pinion Gear Shaft
2	Differential Case
3	Differential Pinion Gear Shaft Lock Bolt
4	Locking Differential Lockout Bushings
5	Locking Differential Clutch Disc Thrust Washer
6	Locking Differential Clutch Disc Guide
7	Locking Differential Clutch Disc Set
8	Differential Pinion Gear Thrust Washer
9	Differential Pinion Gear
10	Locking Differential Side Gear

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11	Locking Differential Thrust Block
12	Differential Pinion Gear
13	Differential Pinion Gear Thrust Washer
14	Locking Differential Side Gear, Cam-Faced
15	Locking Differential Cam
16	Locking Differential Governor
17	Wave Washer
18	Locking Differential Clutch Disc Set
19	Locking Differential Clutch Disc Guide
20	Locking Differential Snap Ring Retainer
21	Locking Differential Clutch Disc Thrust Washer

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.

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

1. Inspect the system for the following:
 - Loose or missing fasteners
 - Obvious damage or conditions which may cause the symptom.
2. 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:

- **Locking Rear Axle Does Not Lock**
- **Locking Rear Axle Locks in Turns**
- **Locking Rear Drive Axle Chatters in Turns**
- **Noise in Addition to Normal Clutch Engagement**

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LOCKING DIFFERENTIAL DIAGNOSIS

1. Place the vehicle on a frame-contact hoist, allowing free rotation of the rear wheels.
2. Hold one wheel stationary. Slowly rotate the other wheel approximately 1/2 revolution per second in both the forward and reversed directions. The wheel should rotate freely. The differential is locking and is broken if both wheels attempt to turn together.
3. Raise the hoist to maximum height with one person in the vehicle.
4. Start the engine. Ensure that the engine is operating at low idle speed (warm engine).
5. Apply the service brake. Place the automatic transmission in drive. Depress the clutch and place the transmission in first gear with a manual transmission.
6. Lock one rear wheel by pulling one parking brake cable from under the vehicle with the aid of an assistant.
7. Release the service brakes or disengage the clutch slowly enough in order to start the free wheel turning. The locked rear wheel remains stationary.
8. Increase the speed of the free wheel. The differential will lock, causing the rotating wheel to stop or both wheels to turn at the same speed. The engine, if equipped with manual transmission, may stall. In order to cause the differential to lock, you may need to accelerate the engine until approximately 16 km/h (10 mph) is indicated on the vehicle speedometer. If the indicated speed can be increased beyond 32 km/h (20 mph) without causing the differential to lock, the unit is not functioning properly. Rapid release of the brakes or clutch, or rapid acceleration of the engine, will invalidate the test.
9. Lock the opposite rear wheel and repeat the procedure.

LOCKING REAR AXLE DOES NOT LOCK

Locking Rear Axle Does Not Lock

Condition	Action
There is little or no preload on the latching bracket.	Replace the governor assembly and the latching bracket. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
Flyweights in the governor assembly are stuck closed.	Replace the governor assembly and the latching bracket. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
The drive teeth on the governor or cam gear assembly are broken.	Replace the cam plate, the governor assembly, and the latching bracket. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Cam Unit Disassemble</u>3. <u>Locking Differential Cam Unit Assemble</u>4. <u>Locking Differential Assemble</u>
The clutch plates are broken.	Replace the clutch plates and the wave spring. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Clutch Disc Assembly - Disassemble (8.0</u>

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Inch Axle) or Locking Differential Clutch Disc Assembly - Disassemble (8.6 Inch Axle)

3. Locking Differential Cam Unit Disassemble
4. Locking Differential Cam Unit Assemble
5. Locking Differential Assemble

LOCKING REAR AXLE LOCKS IN TURNS

Locking Rear Axle Locks in Turns

Condition	Action
The governor assembly is tight in the case.	Free up the governor assembly. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
A governor flyweight spring is broken or weak.	Replace the governor assembly and the latching bracket. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
The flyweight in the governor assembly is stuck open.	Replace the governor assembly and the latching bracket. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
The cam plate or the governor drive teeth are broken.	Replace the cam plate, the governor assembly, and the latching bracket. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Cam Unit Disassemble</u>3. <u>Locking Differential Cam Unit Assemble</u>4. <u>Locking Differential Assemble</u>

LOCKING REAR DRIVE AXLE CHATTERS IN TURNS

Locking Rear Drive Axle Chatters in Turns

Checks	Action
The lubricant is contaminated.	Drain and flush the axle housing thoroughly. Refill with the correct lubricant. Refer to <u>Lubricant Replacement - Rear Drive Axle</u> in Rear Drive Axle.
The clutch plates are deteriorated.	Replace the clutch plates. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Clutch Disc Assembly - Disassemble (8.0 Inch Axle) or Locking Differential Clutch Disc Assembly - Disassemble (8.6 Inch Axle)</u>3. <u>Locking Differential Cam Unit Disassemble</u>4. <u>Locking Differential Cam Unit Assemble</u>5. <u>Locking Differential Assemble</u>

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NOISE IN ADDITION TO NORMAL CLUTCH ENGAGEMENT

Noise in Addition to Normal Clutch Engagement

Checks	Action
The clutch plates are broken.	Replace the clutch plates. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Clutch Disc Assembly - Disassemble (8.0 Inch Axle)</u> or <u>Locking Differential Clutch Disc Assembly - Disassemble (8.6 Inch Axle)</u>3. <u>Locking Differential Cam Unit Disassemble</u>4. <u>Locking Differential Cam Unit Assemble</u>5. <u>Locking Differential Assemble</u>
The thrust block is broken.	Replace the thrust block with a block of identical thickness. Check closely for other damage. Refer to <u>Locking Differential Disassemble</u> and <u>Locking Differential Assemble</u> .
The case is damaged.	Replace the unit. Refer to <u>Differential Replacement</u> in Rear Drive Axle.
The differential gears are broken.	Replace the gears. Refer to the following: <ol style="list-style-type: none">1. <u>Locking Differential Disassemble</u>2. <u>Locking Differential Clutch Disc Assembly - Disassemble (8.0 Inch Axle)</u> or <u>Locking Differential Clutch Disc Assembly - Disassemble (8.6 Inch Axle)</u>3. <u>Locking Differential Cam Unit Disassemble</u>4. <u>Locking Differential Cam Unit Assemble</u>5. <u>Locking Differential Assemble</u>

REPAIR INSTRUCTIONS

LOCKING DIFFERENTIAL DISASSEMBLE

Tools Required

J 26252-A Locking Differential Governor Remover. See Special Tools and Equipment.

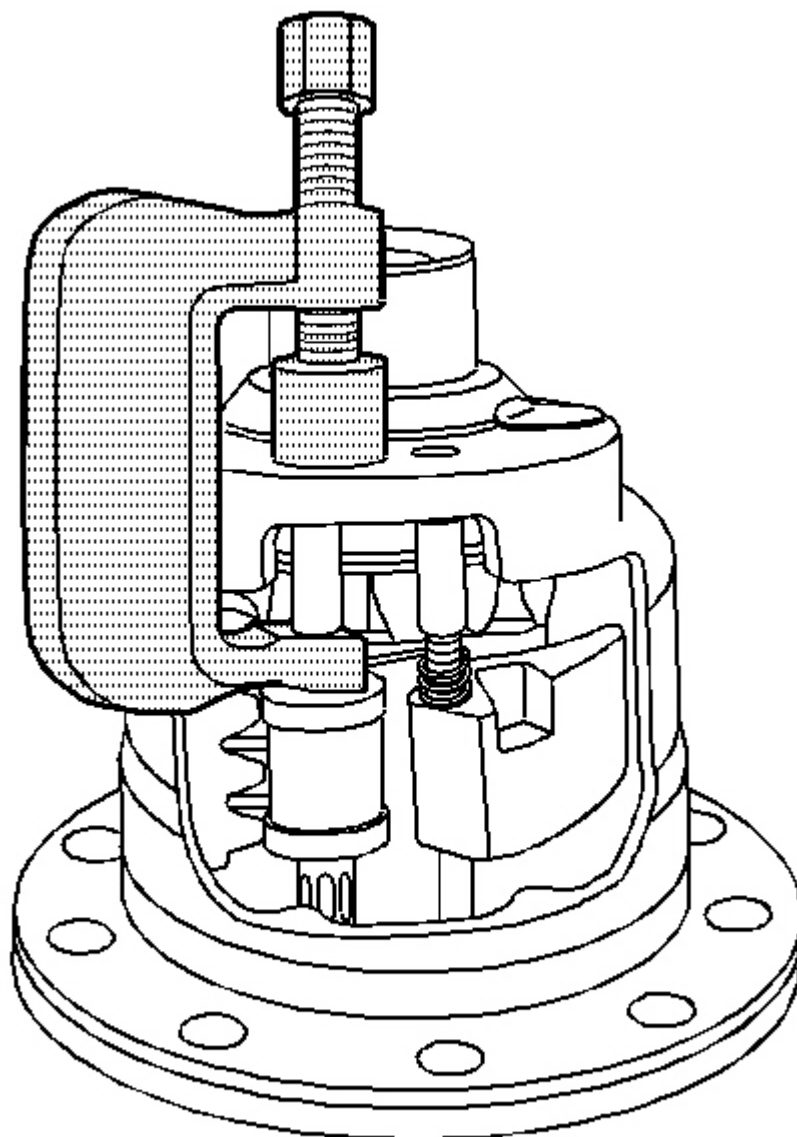


Fig. 3: Locating Governor Bushing
Courtesy of GENERAL MOTORS CORP.

1. Remove the governor bushing using the J 26252 . See **Special Tools and Equipment**.
2. Remove the governor assembly.

To aid in the removal of the governor assembly, turn the side gear as necessary to position the governor

assembly between two of the side gear teeth.

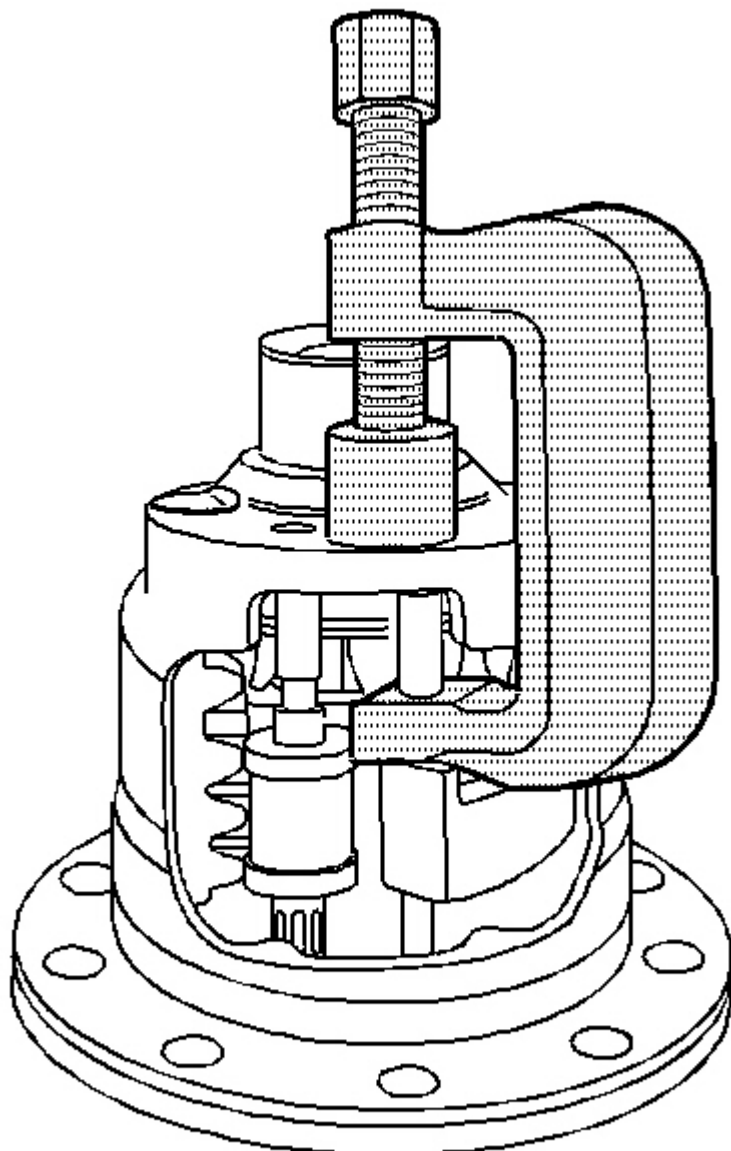


Fig. 4: Latching Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

3. Remove the latching bracket assembly bushing using the **J 26252** . See **Special Tools and Equipment**.

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To aid in the removal of the latching bracket assembly, turn the side gear as necessary to position the latching bracket assembly between two of the side gear teeth.

4. Remove the pinion shaft lock bolt.
5. Remove the pinion shaft.
6. Remove the differential pinion gears and the thrust washers.

Rotate the pinion gears and roll the pinion gears and the thrust washers out of the case through the differential window.

Mark the pinion gears and thrust washers accordingly for re-assembly.

7. Remove the thrust block.
8. Remove the right side gear and clutch discs assembly.
9. Remove the right side shim.

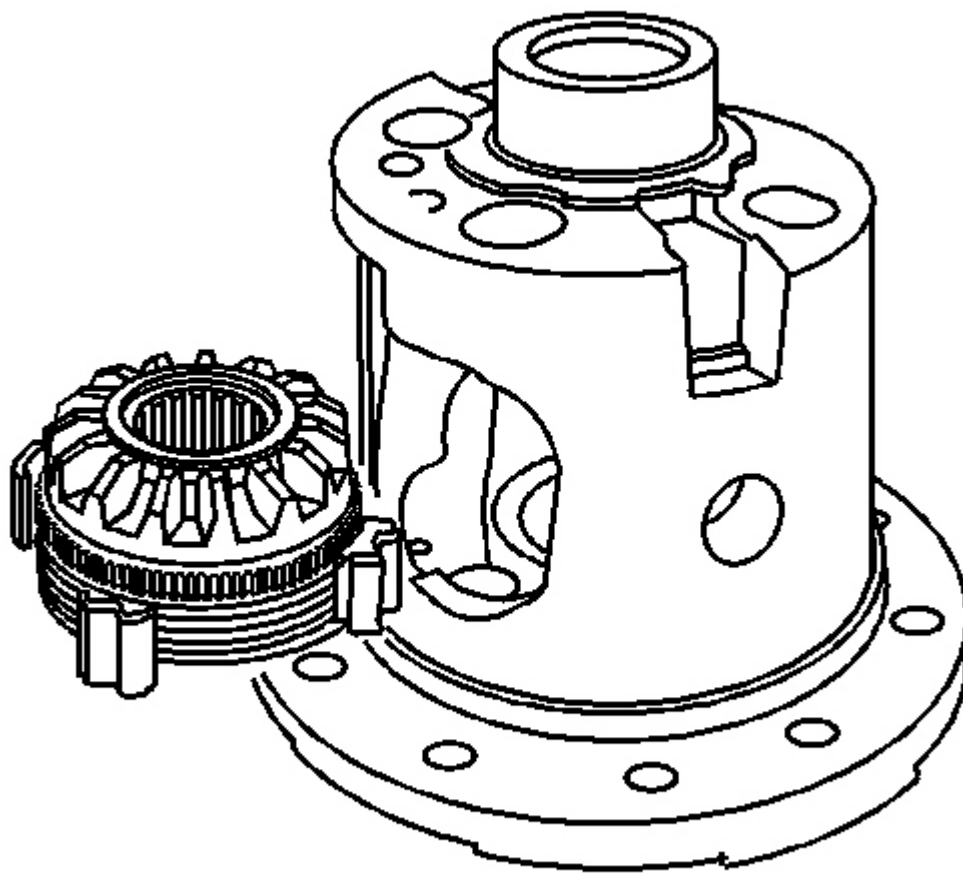


Fig. 5: View Of Left Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

10. Remove the left side gear (cam unit) and clutch discs assembly.

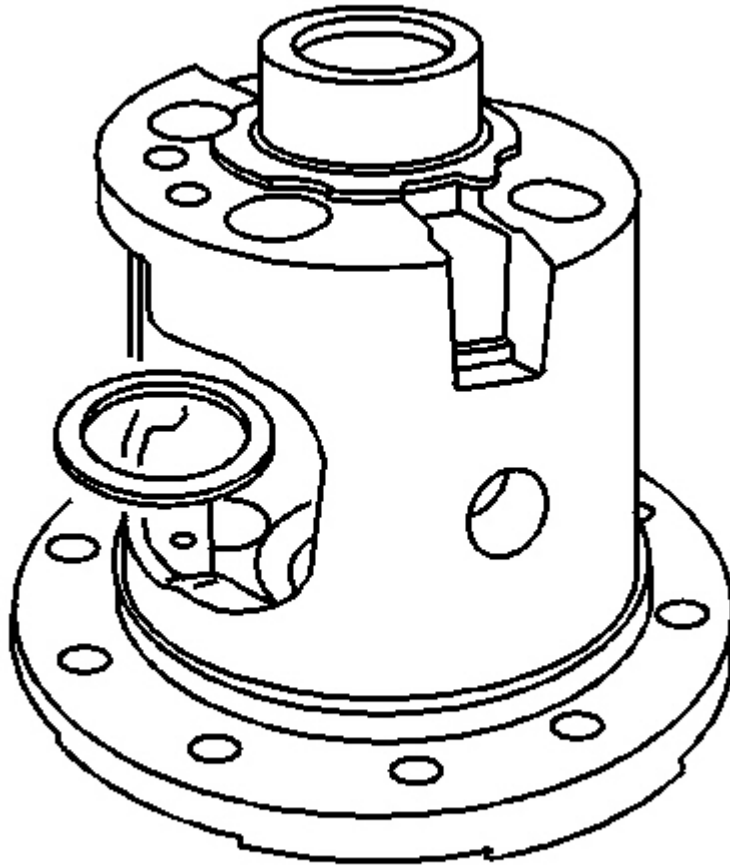


Fig. 6: View Of Left Side Gear Thrust Washer
Courtesy of GENERAL MOTORS CORP.

11. Remove the left side gear thrust washer.

LOCKING DIFFERENTIAL CLUTCH DISC ASSEMBLY - DISASSEMBLE (8.0 INCH AXLE)

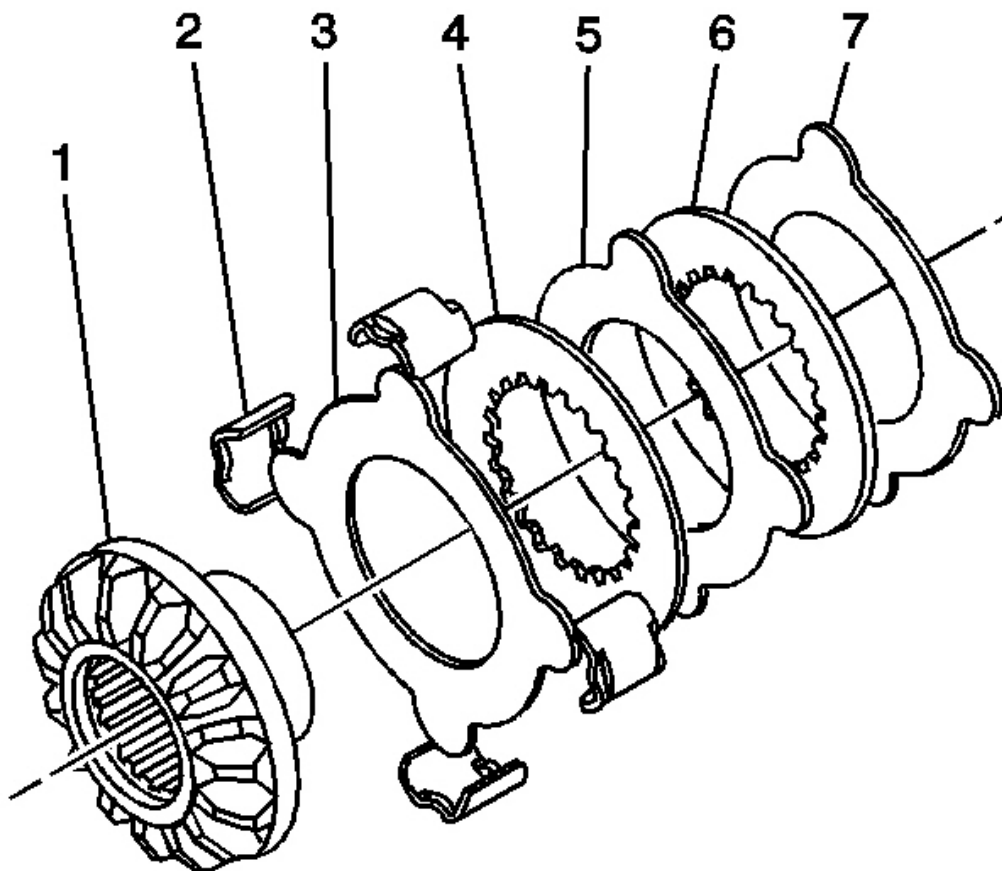


Fig. 7: Removing Locking Differential Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

1. Remove the guide clips (2).
2. Remove the clutch discs and the splined discs (3 - 7) from the side gear (1).

LOCKING DIFFERENTIAL CLUTCH DISC ASSEMBLY - DISASSEMBLE (8.6 INCH AXLE)

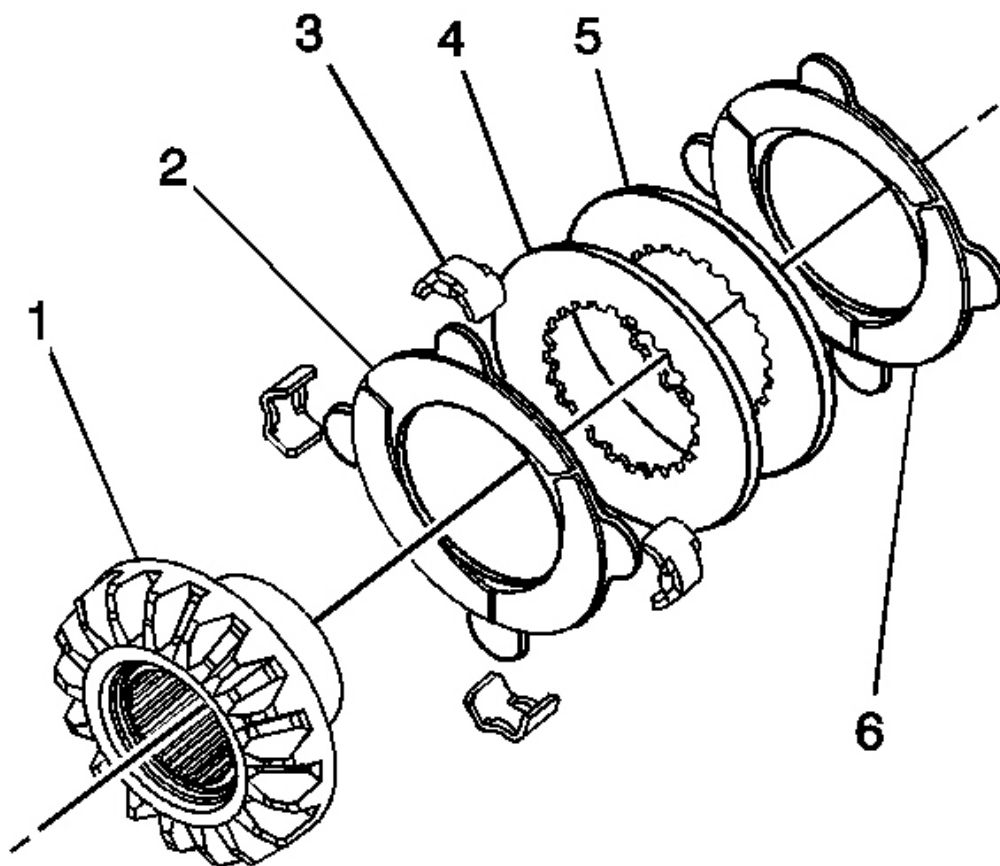


Fig. 8: View Of Locking Differential Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

1. Remove the guide clips (3).
2. Remove the clutch discs and the splined discs (2, 4-6) from the locking differential side gear (1).

LOCKING DIFFERENTIAL CAM UNIT DISASSEMBLE

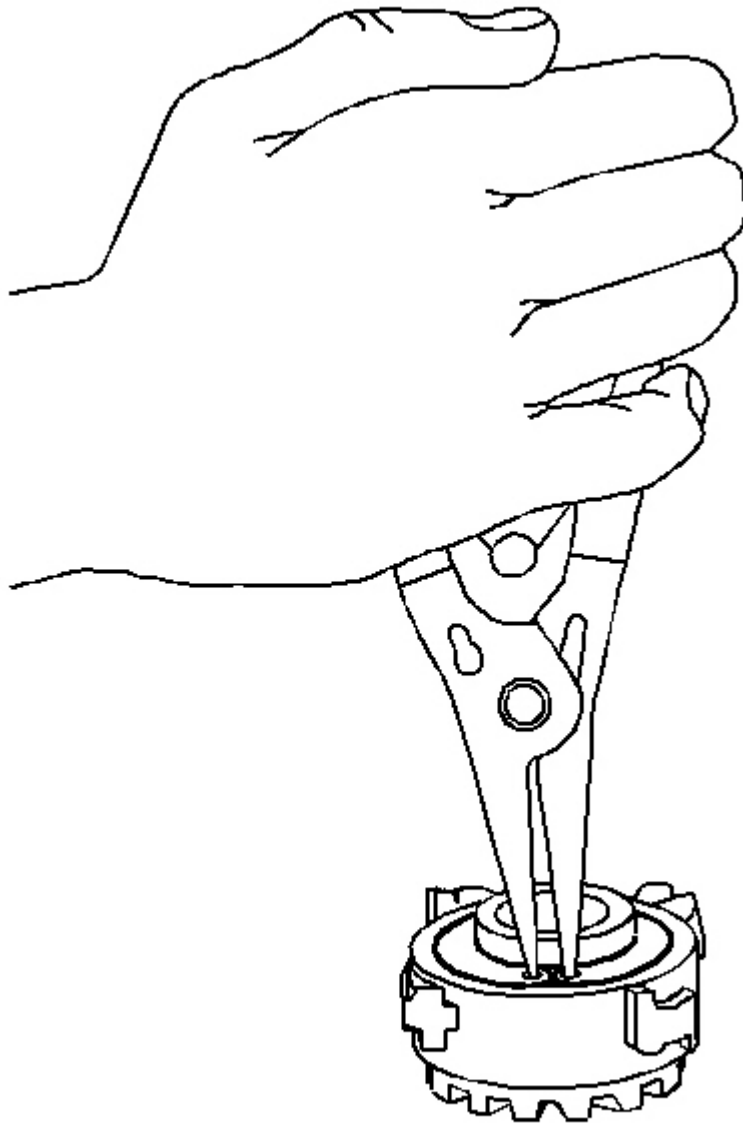


Fig. 9: Locking Differential Retaining Ring
Courtesy of GENERAL MOTORS CORP.

1. Remove the retaining ring.

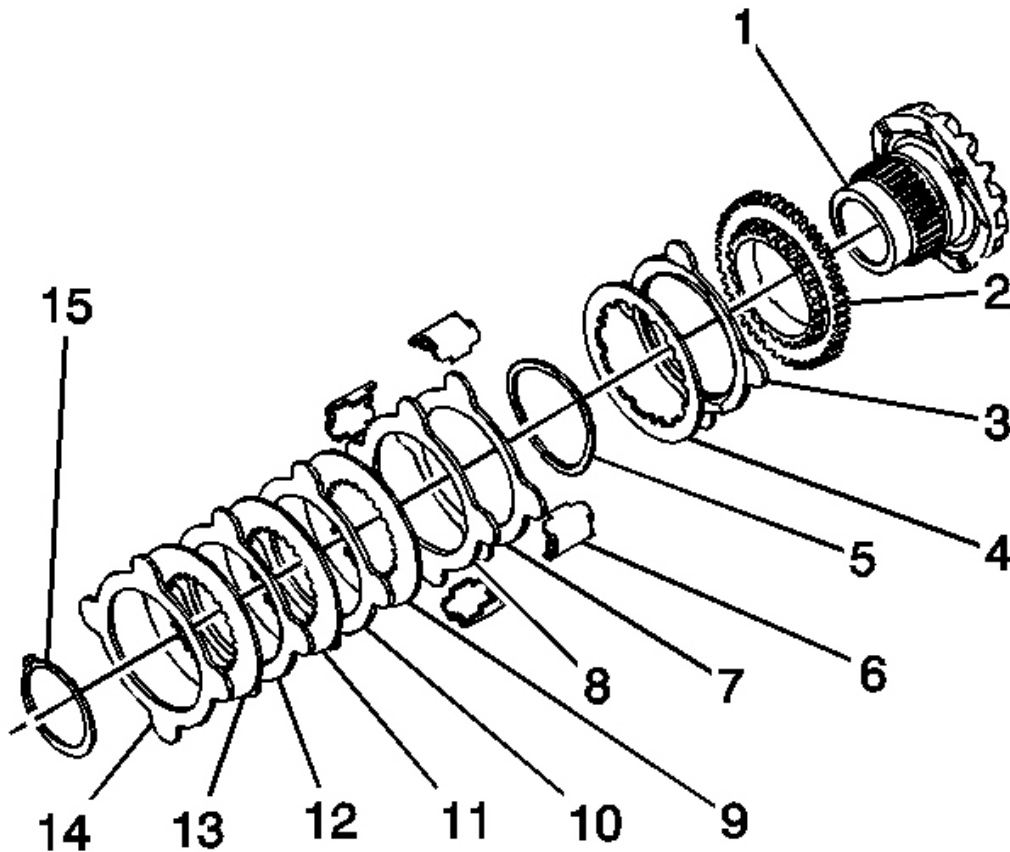


Fig. 10: Exploded View Of Locking Differential Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

2. Disassemble the cam unit and clutch disc assembly as follows:
 1. Remove the guide clips (6).
 2. Remove the clutch discs and the splined discs (7-14).
 3. Remove the wave washer (5).
 4. Remove the fuse disc (4).
 5. Remove the carbon eared disc (3).
 6. Disassemble the cam plate (2) from the cam side gear (1).

LOCKING DIFFERENTIAL CLEANING AND INSPECTION

1. Clean all the parts with an approved solvent.

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2. Visually inspect all the parts for excessive wear or breakage. Replace the parts if necessary.
3. Inspect the pinion gear and the side gear teeth for any the following conditions:
 - Wear
 - Cracks
 - Scoring
 - Spalling
4. Inspect the thrust washer and shim for wear.
5. Inspect the fit of the side gears on the axle shafts.
6. Inspect the differential case for cracks and scoring. Replace the differential if any damage to the case is found.
7. Inspect the side gear bore for scoring. If scoring is present, replace the differential.

IMPORTANT: Do not replace the thrust block unless it is necessary.

8. Inspect the thrust block for excessive wear.

LOCKING DIFFERENTIAL CAM UNIT ASSEMBLE

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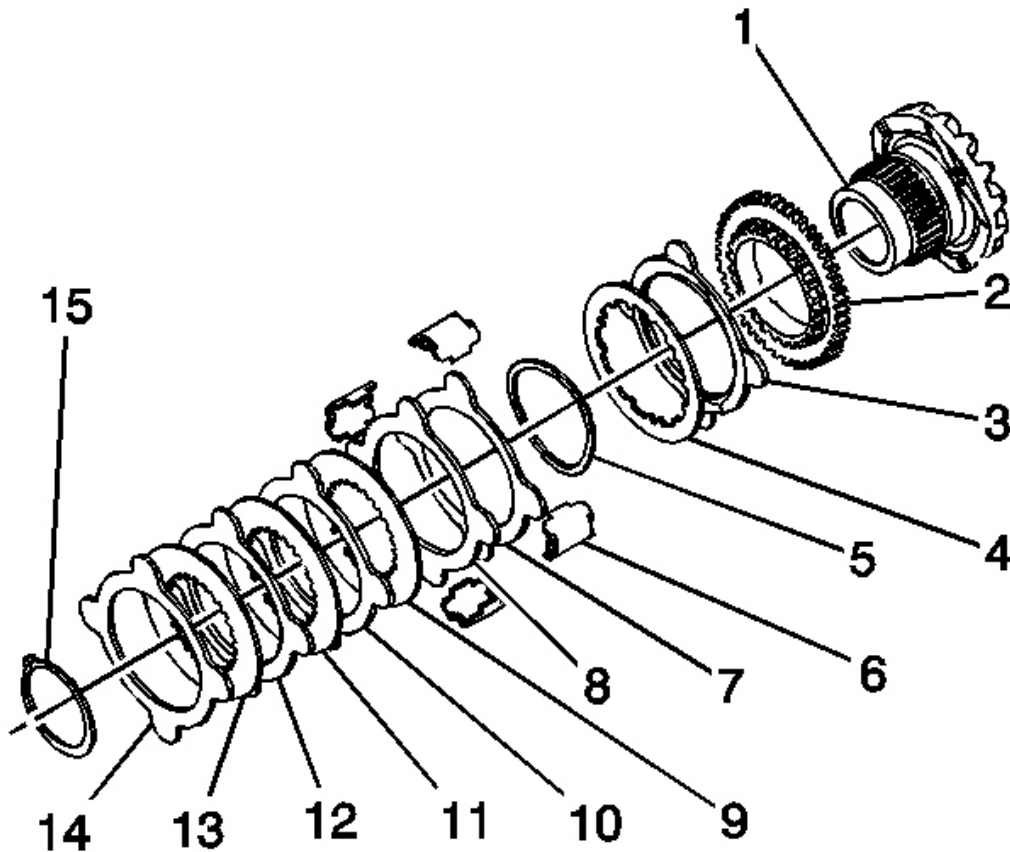


Fig. 11: Exploded View Of Locking Differential Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

1. Apply axle lubricant, GM P/N 12378261 (Canadian P/N 10953455) or equivalent, meeting GM Specification 9986115, to the surface of each disc.
2. Assemble the left side or the flange-end side cam unit and clutch disc assembly as follows:
 1. Install the cam plate (2) to the cam side gear (1).
 2. Install the carbon-faced eared disc (3).
 3. Install the fuse disc (4).
 4. Install the 1st non-carbon eared disc (7).
 5. Install the 2nd non-carbon eared disc (8).
 6. Install the wave washer (5).
 7. Install the 1st splined disc (9).
 8. Install the 3rd non-carbon eared disc (10).

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9. Install the 2nd splined disc (11).
10. Install the 4th non-carbon eared disc (12).
11. Install the 3rd splined disc (13).
12. Install the 5th non-carbon eared disc (14).
13. Install the retaining ring (15).

Compress the clutch disc pack and align the teeth on the 3rd splined disc with the teeth on the cam plate in order to seat the retaining ring in the groove on the cam side gear.

14. Install the guide clips (2) to the clutch disc pack.

Apply grease to the guide clips in order to hold the clips in place on the disc ears.

LOCKING DIFFERENTIAL CLUTCH DISC ASSEMBLY - ASSEMBLE (8.0 INCH AXLE)

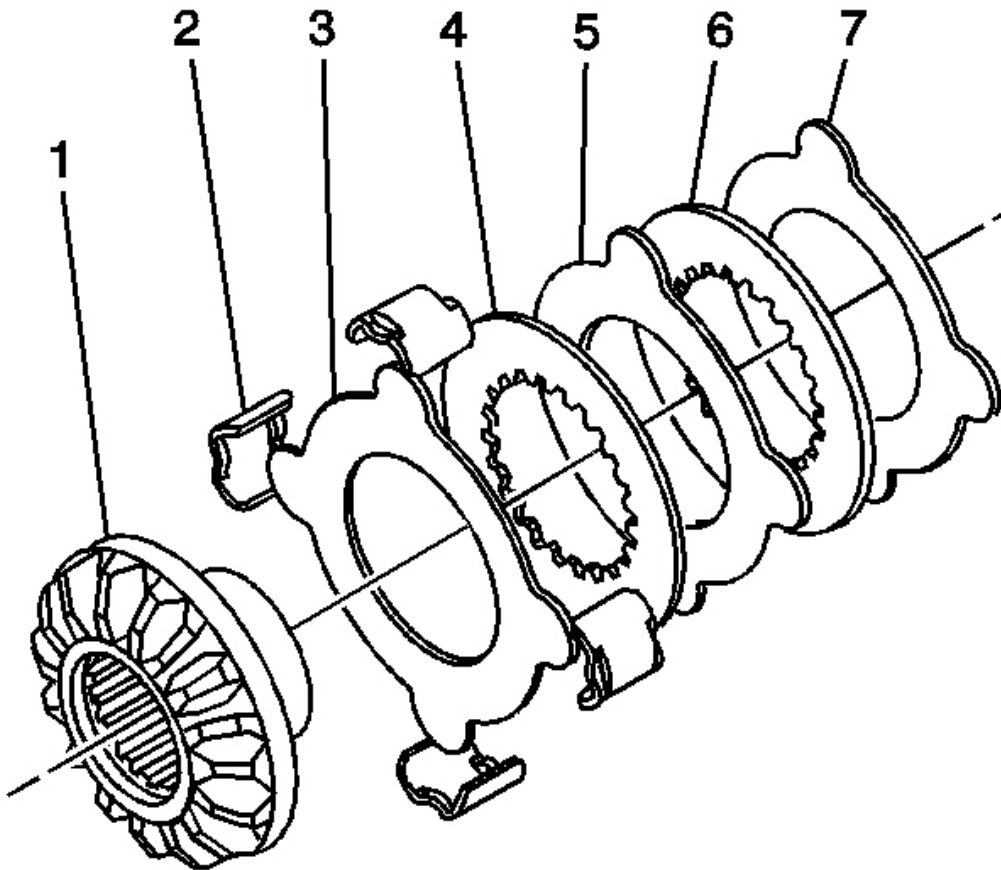


Fig. 12: Removing Locking Differential Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

1. Apply axle lubricant, GM P/N 12378261 or equivalent meeting GM Specification 9986115, to the surface of each disc.
2. Assemble the right side or bell - end side clutch disc assembly as follows:
 1. Install the 1st non-carbon eared disc (3) to the side gear (1).
 2. Install the 1st splined disc (4).
 3. Install the 2nd non-carbon eared disc (5).
 4. Install the 2nd splined disc (6).
 5. Install the 3rd non-carbon eared disc (7).
 6. Install the guide clips (2) to the clutch discs (2-7).

Apply grease to the guide clips in order to hold the clips in place on the disc ears.

LOCKING DIFFERENTIAL CLUTCH DISC ASSEMBLY - ASSEMBLE (8.6 INCH AXLE)

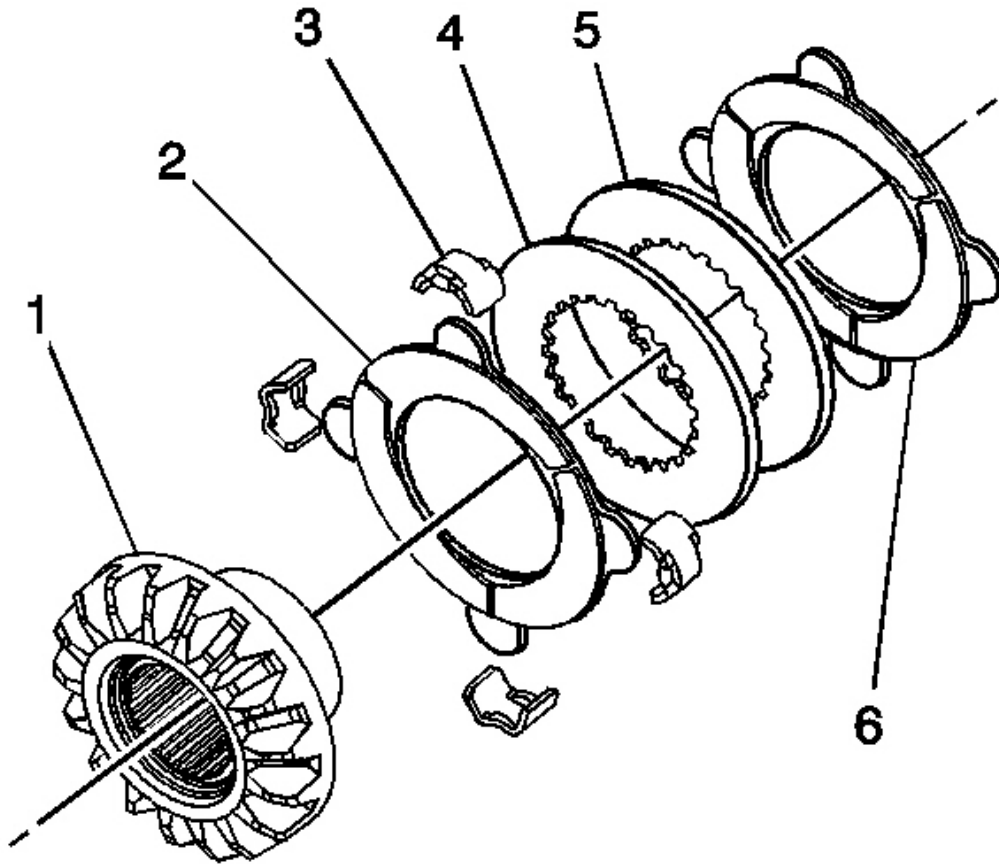


Fig. 13: View Of Locking Differential Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

1. Apply axle lubricant, GM P/N 12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115, to the surface of each disc.
2. Assemble the right side or bell-end side clutch disc assembly as follows:
 1. Install the two-sided carbon eared disc (2) to the side gear (1).
 2. Install the 1st splined disc (4).
 3. Install the 2nd splined disc (5).
 4. Install the one-sided carbon eared disc (6).
 5. Install the guide clips (3) to the clutch discs (2, 4-6).

Apply chassis grease, GM P/N 12377985 (Canadian P/N 88901242) or equivalent, to the guide clips in order to hold the clips in place on the disc ears.

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LOCKING DIFFERENTIAL ADJUSTMENT

Tools Required

- **J 7872** Magnetic Base Dial Indicator. See **Special Tools and Equipment**.
- **J 8001-2** Dial Indicator Sleeve
- **J 8001-3** Dial Indicator

Adjustment of the Differential

IMPORTANT: If it is necessary to replace the left side gear (cam unit) and disc assembly, the right side gear and disc assembly, or the thrust block, the entire differential must be adjusted. The differential is adjusted using selective thickness thrust washers between the clutch pack assemblies and the case and/or different selective thickness thrust blocks.

When adjusting the differential, note the following:

- Build up the clutch disc packs properly.

Proper clearance between parts is critical to the operation of the unit.

- Adjust the backlash and thrust block clearance in the following order:
 1. The left side gear backlash
 2. The right side gear backlash
 3. The thrust block clearance

Left Side Gear Backlash Adjustment

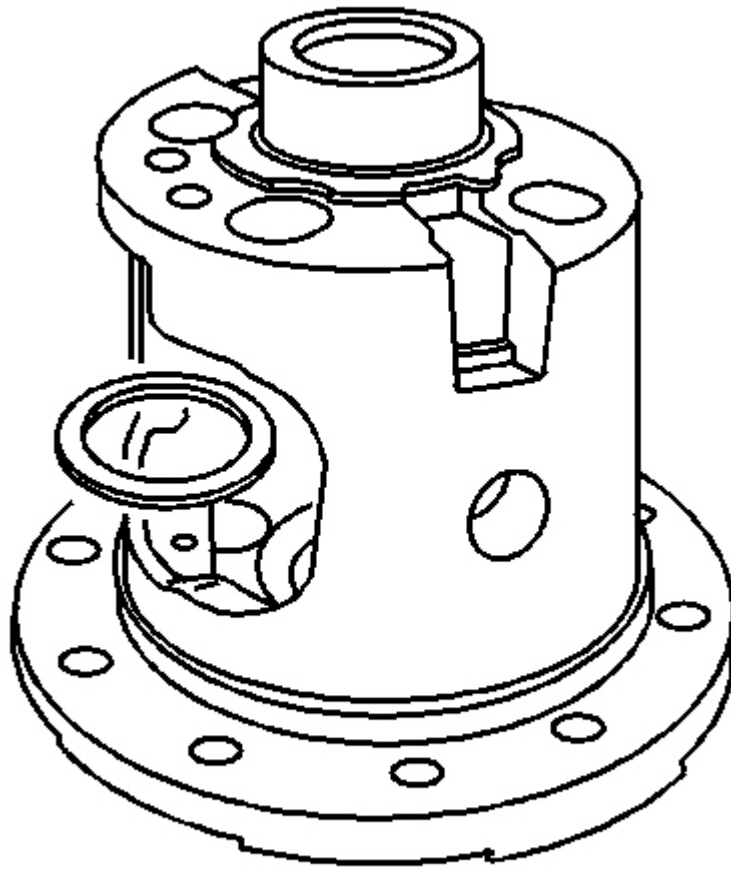


Fig. 14: View Of Left Side Gear Thrust Washer
Courtesy of GENERAL MOTORS CORP.

1. Install the new left side thrust washer into the flange end of the differential case.

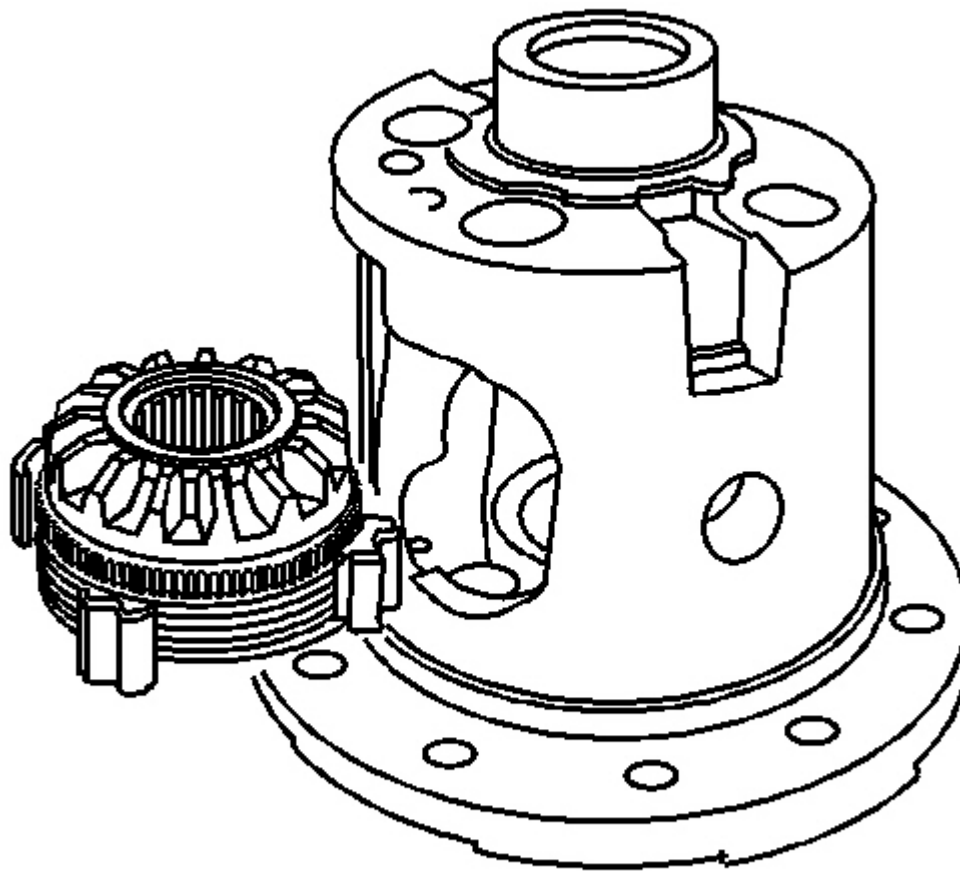


Fig. 15: View Of Left Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the left side gear (cam unit) and clutch pack assembly into the differential case.
3. Install the pinion gears with the pinion thrust washers into the differential case.

Align the openings of the pinion gears and the pinion thrust washer to the pinion shaft opening in the differential case.

4. Install the pinion shaft. It may be necessary to press down on the side gear in order to align the pinion gear shaft opening with the pinion shaft opening in the differential case.

If the pinion shaft cannot be installed after pressing on the side gear, replace the side gear thrust washer with a thinner washer.

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NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the pinion shaft lock bolt.

Tighten: Tighten the pinion shaft lock bolt finger tight.

6. Rotate the pinion gear closest to the lock bolt so that one of the teeth is pointing downward, perpendicular to the ring gear flange.
7. Install a brass drift between the side gear and the pinion shaft.

Press the brass drift in far enough in order to compress the clutch discs.

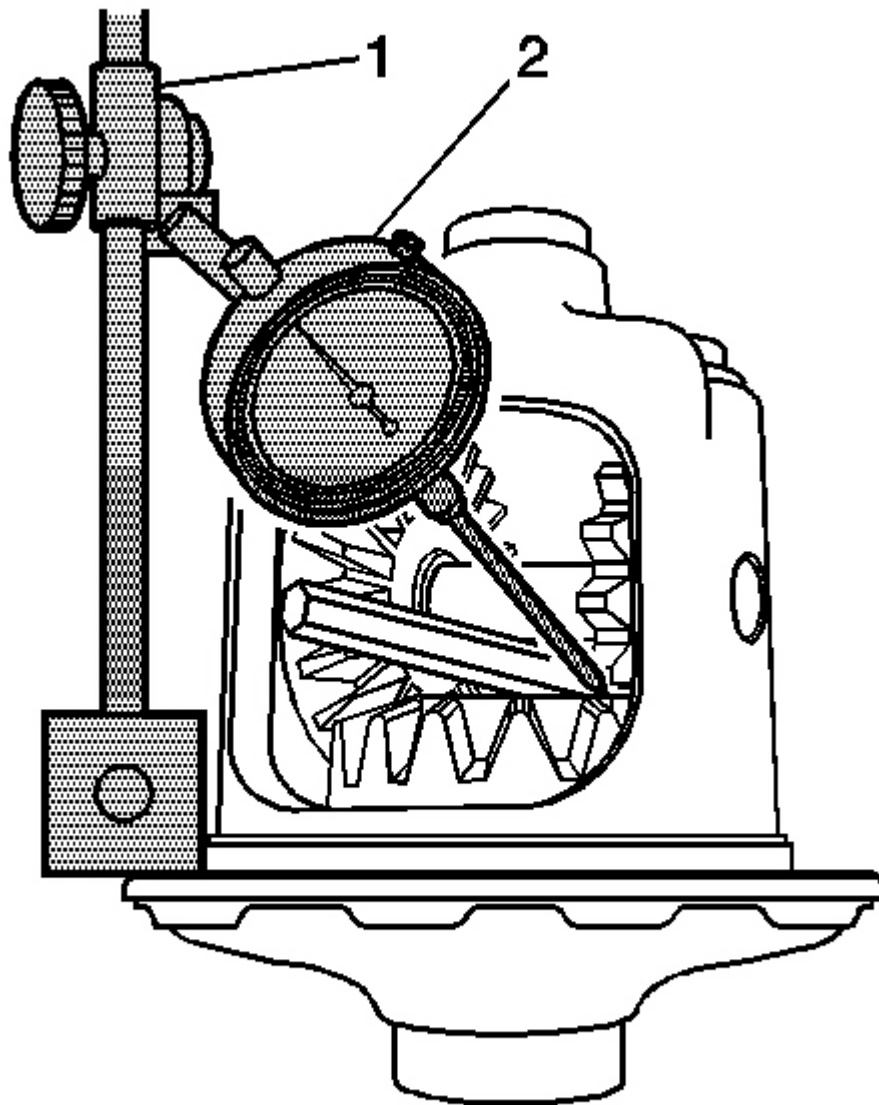


Fig. 16: Measuring Backlash Of Differential Pinion Gear & Side Gear
Courtesy of GENERAL MOTORS CORP.

8. Measure the backlash of the pinion gear and the side gear by doing the following:
 1. Install the **J 7872** (1) to the ring gear flange. See **Special Tools and Equipment**.
 2. Loosely clamp the **J 8001-3** (2) onto the stem on the **J 7872** (1). See **Special Tools and Equipment**.

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3. Place the contact pad of the **J 8001-3** on one of the teeth of the pinion gear closest to the pinion shaft lock bolt.

Turn the dial of the **J 8001-3** until the needle and the dial face indicate zero.

Tighten: Tighten the lock nut of the **J 8001-2** finger tight.

4. Pull the pinion gear firmly into the differential case seat.
5. Rotate the pinion gear back and forth.
6. Measure the backlash.

Specification: The backlash for the pinion gears should be 0.000-0.076 mm (0.000-0.003 in).

9. If the backlash is too large, install a thicker side gear thrust washer and inspect the backlash.
10. If the backlash is too small, install a thinner side gear thrust washer and inspect the backlash.

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

Washer Sizes:

- 0.56 mm (0.022 in)
- 0.68 mm (0.027 in)
- 0.81 mm (0.032 in)
- 0.91 mm (0.036 in)
- 1.02 mm (0.040 in)
- 1.12 mm (0.044 in)
- 1.22 mm (0.048 in)
- 1.32 mm (0.052 in)

Right Side Gear Backlash Adjustment

1. If necessary, remove the following from the differential case:
 1. The pinion lock shaft bolt
 2. The pinion shaft
 3. The pinion gears
 4. The pinion gear thrust washers
 5. The left side gear (cam unit) and clutch disc assembly
2. Install the right side gear thrust washer into the bell-end of the differential case.
3. Install the right side gear and clutch pack assembly into the differential case.
4. Install the pinion gears with the pinion thrust washers into the differential case.

Align the openings of the pinion gears and the pinion thrust washer to the pinion shaft opening in the

differential case.

5. Press down on the side gear and install the pinion shaft.

If the side gear cannot be pressed down far enough to install the pinion shaft, replace the side gear shim with a thinner shim.

6. Install the pinion shaft lock bolt.

Tighten: Tighten the pinion shaft lock bolt finger tight.

7. Rotate the pinion gear so that one of the teeth is pointing downward, perpendicular to the ring gear flange.

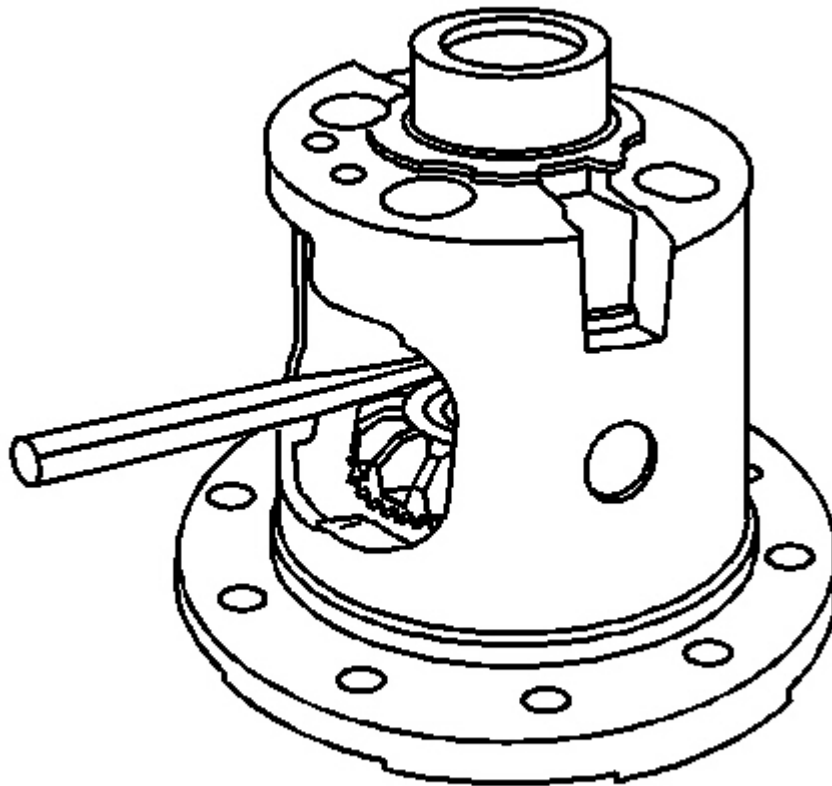


Fig. 17: Installing Brass Drift Between Locking Differential Side Gear & Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

8. Install a brass drift between the side gear and the pinion shaft.

Press the brass drift in enough, in order to compress the clutch discs.

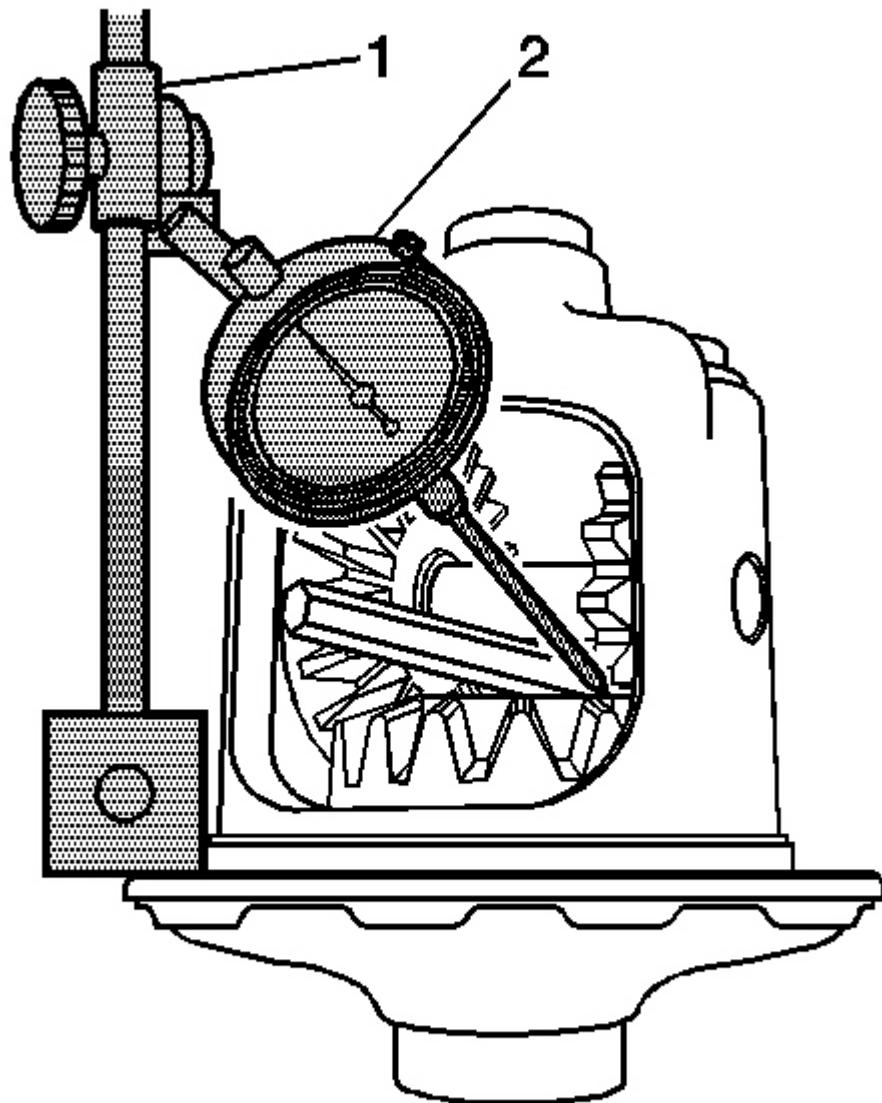


Fig. 18: Measuring Backlash Of Differential Pinion Gear & Side Gear
Courtesy of GENERAL MOTORS CORP.

9. Measure the backlash of the pinion gear and the right side gear by doing the following:
 1. Install the **J 7872** (1) to the ring gear flange. See **Special Tools and Equipment**.

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2. Loosely clamp the **J 8001-3** (2) onto the stem on the **J 7872** (1). See **Special Tools and Equipment**.
3. Place the contact pad of the **J 8001-3** on one of the teeth of the pinion gear closest to the pinion shaft lock bolt.

Turn the dial of the **J 8001-3** until the needle and the dial face indicate zero.

Tighten: Tighten the lock nut of the **J 8001-2** finger tight.

4. Pull the pinion gear firmly into the differential case seat.
5. Rotate the pinion gear back and forth.
6. Measure the backlash.

Specification: The backlash for the pinion gears should be 0.000-0.076 mm (0.000-0.003 in).

10. If the backlash is too large, install a thicker side gear shim and recheck the backlash.
11. If the backlash is too small, install a thinner side gear shim and recheck the backlash again.

Right side gear shims are available in the following sizes:

Shim Sizes:

- 0.254 mm (0.010 in)
- 0.381 mm (0.015 in)
- 0.508 mm (0.020 in)
- 0.635 mm (0.025 in)
- 0.762 mm (0.030 in)
- 0.899 mm (0.035 in)
- 1.016 mm (0.040 in)
- 1.143 mm (0.045 in)

Thrust Block Clearance Adjustment

IMPORTANT: The left and right side gear backlash measurements must be done before the thrust block measurement can be completed.

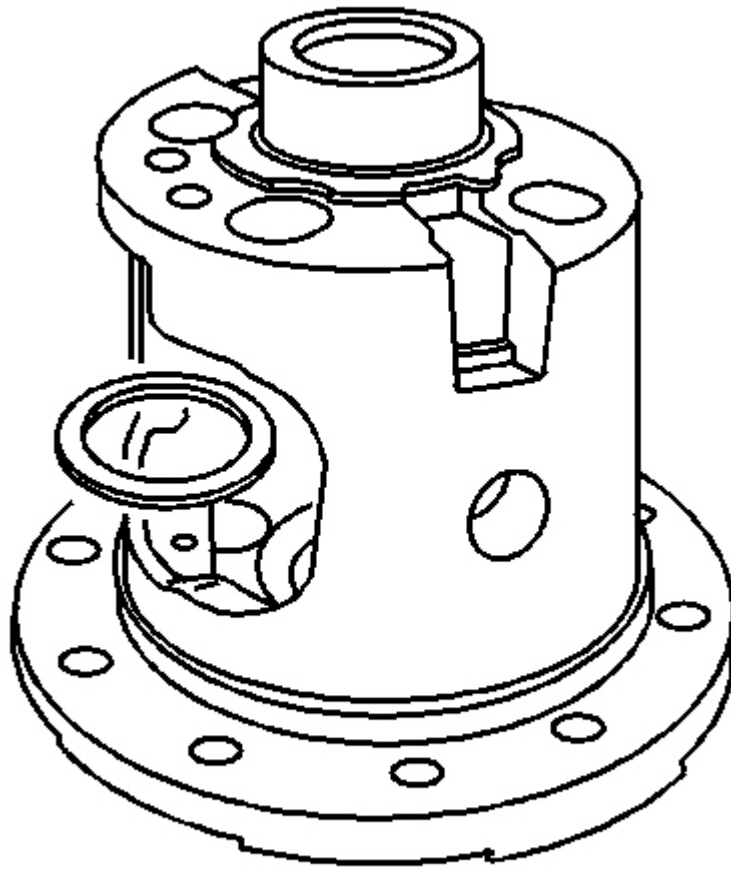


Fig. 19: View Of Left Side Gear Thrust Washer
Courtesy of GENERAL MOTORS CORP.

1. Install the left side gear thrust washer into the differential case.

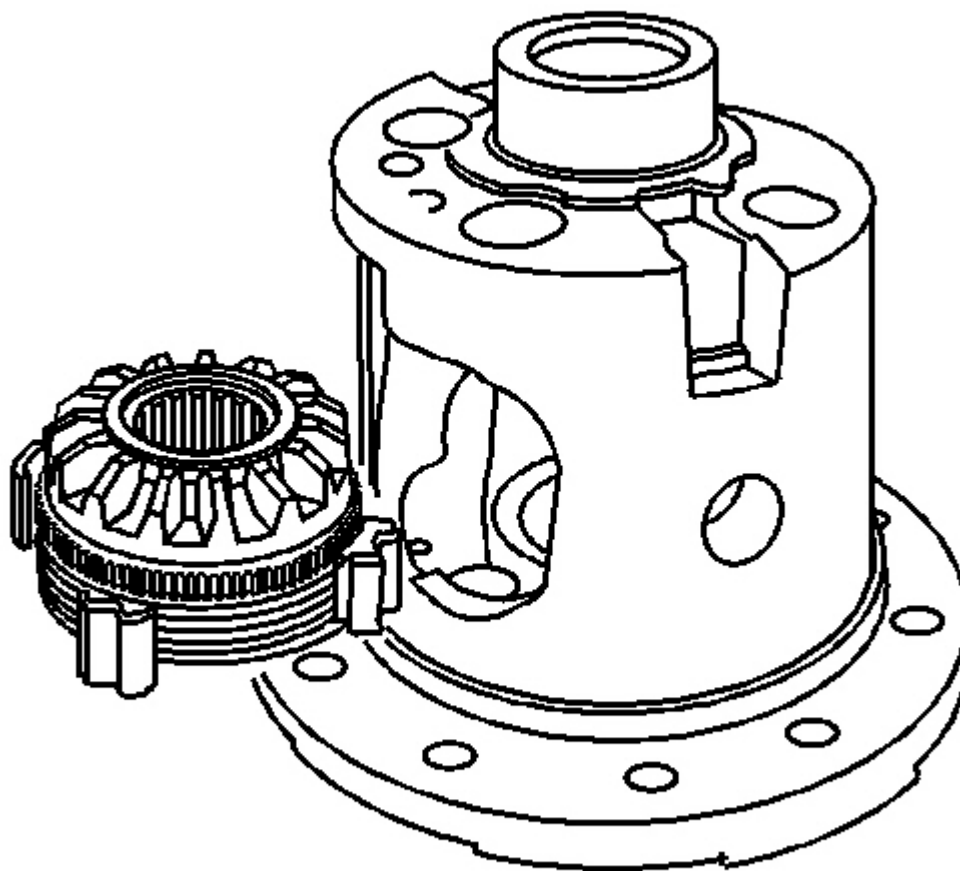


Fig. 20: View Of Left Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the left side gear (cam unit) and clutch disc assembly into the differential case.
3. Install the right side shim into the differential case.
4. Install the right side gear and clutch disc assembly into the differential case.
5. Install the pinion shaft.
6. Install the pinion shaft bolt.

Tighten: Tighten the pinion shaft bolt finger tight.

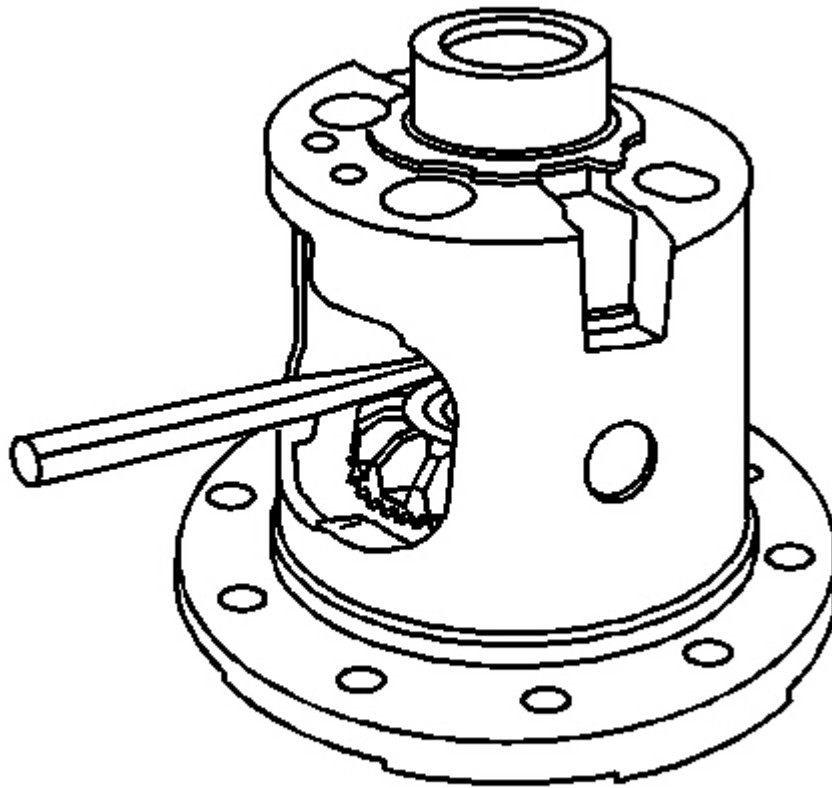


Fig. 21: Installing Brass Drift Between Locking Differential Side Gear & Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

7. Install a brass drift between the left side gear and the pinion shaft.

Press the brass drift in far enough in order to compress the clutch disc assembly and hold the left side gear assembly in place.

8. Install a brass drift between the right side gear and the pinion shaft.

Press the brass drift in far enough, in order to hold the right side gear assembly in place.

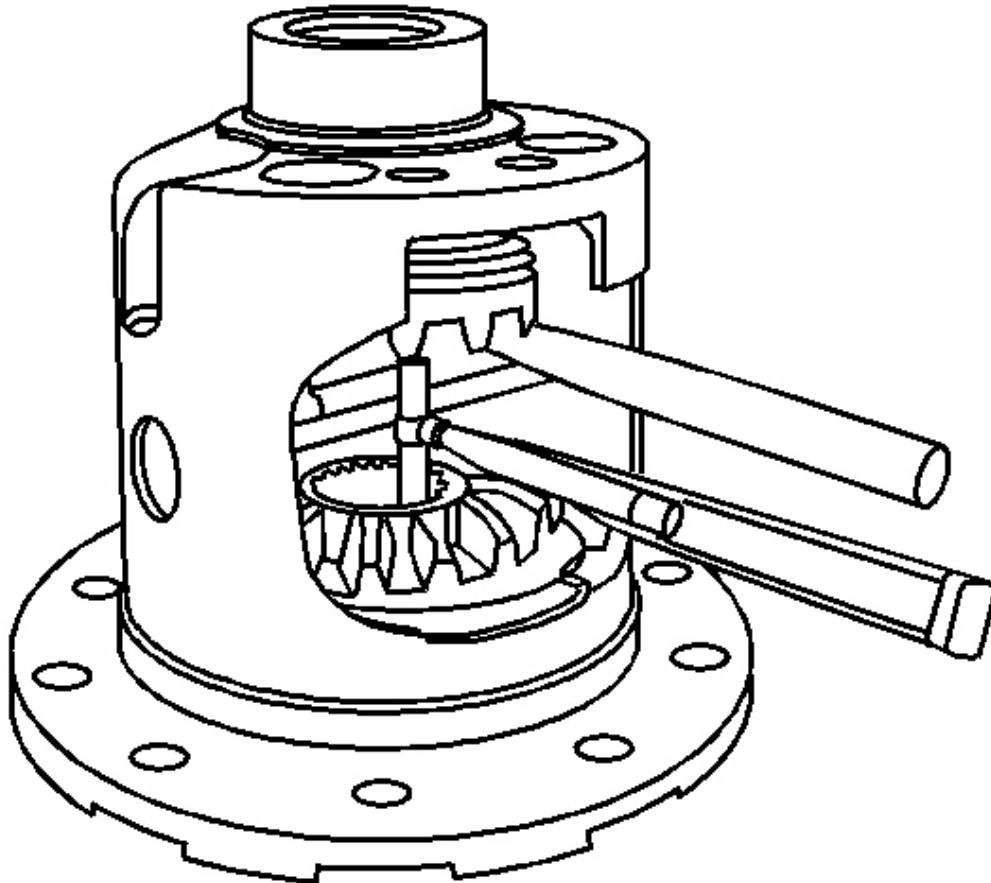


Fig. 22: Measuring Distance Between Side Gear Faces
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not measure the distance between the side gear teeth.

9. Measure the distance between the side gear faces using a 25.4-50.8 mm (1-2 in) telescoping gage.
10. Remove the telescoping gage.
11. Measure the telescoping gage with a micrometer. Record the measurement.
12. Compare the measurement obtained in Step 11 to the thrust block sizes available. If the measurement is equal to one of the thrust blocks sizes available, then select that thrust block.
13. If the measurement obtained in Step 11 is not equal to one of the thrust blocks sizes available, then select the thrust block that is smaller than the measurement.

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For example, if the measurement is 32.13 mm (1.265 in), select the 32.05 mm (1.262 in) thrust block.

IMPORTANT: The backlash must be rechecked and adjusted to specification anytime the left and/or the right thrust washers are replaced.

14. If the measurement obtained in Step 11 is less than 31.75 mm (1.250 in), then reduce the left side gear thrust washer or the right side gear shim thickness in order to increase the thrust block opening.
15. If the measurement obtained in Step 11 is greater than 32.52 mm (1.280 in), then increase the left side gear thrust washer or the right side gear shim thickness in order to decrease the thrust block opening.
16. Inspect the left and/or right side gear backlash and adjust as necessary.
17. Inspect the thrust block clearance and adjust as necessary.

LOCKING DIFFERENTIAL ASSEMBLE

IMPORTANT: The left and right side gear backlash and thrust block thickness measurement must be completed before the components of the locking differential can be assembled.

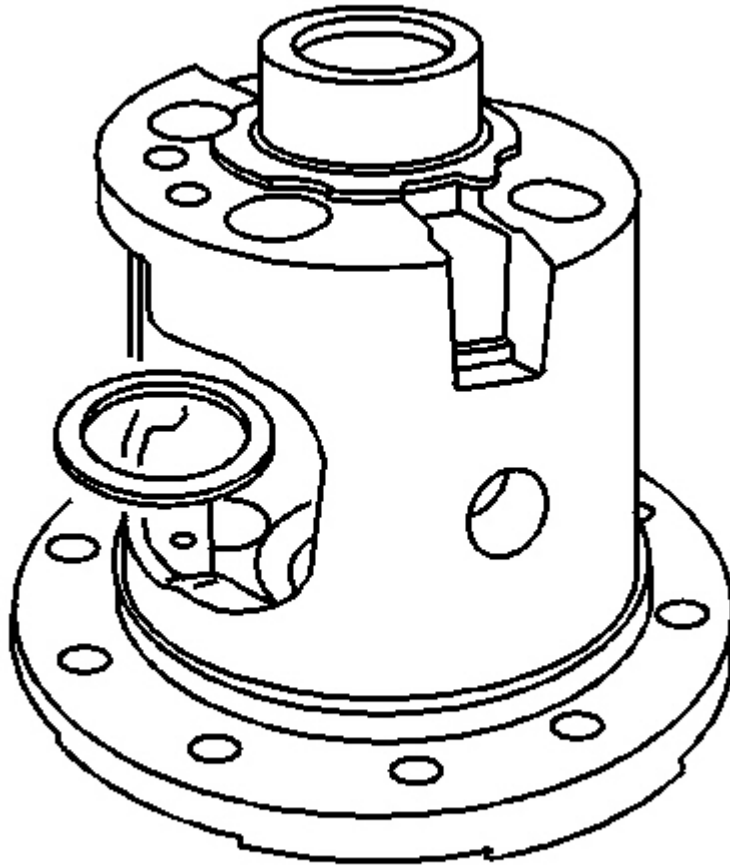


Fig. 23: View Of Left Side Gear Thrust Washer
Courtesy of GENERAL MOTORS CORP.

1. Install the left side gear thrust washer.

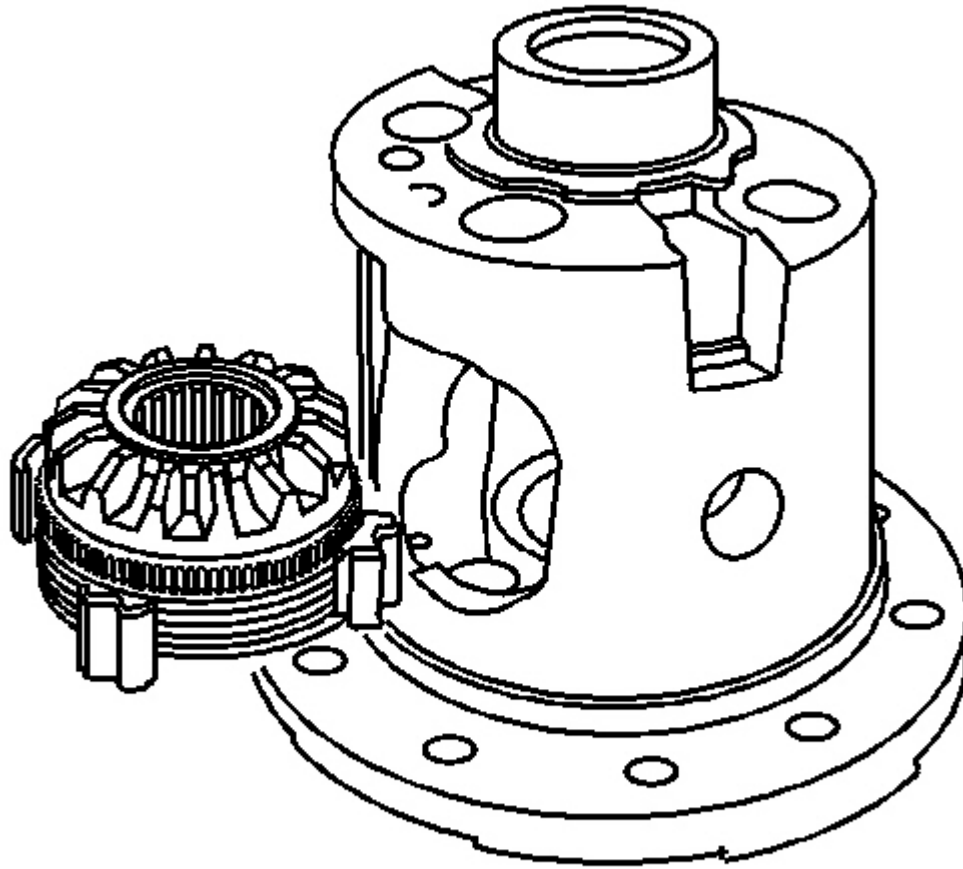


Fig. 24: View Of Left Side Gear Cam Unit & Clutch Disc Assembly
Courtesy of GENERAL MOTORS CORP.

2. Install the left side gear (cam unit) and clutch disc assembly.
3. Install the right side gear thrust washer.
4. Install the right side clutch pack assembly.
5. Install the right side gear.

IMPORTANT: If the original pinion gears and thrust washers are being re-used, install the pinion gears and thrust washers on the same side as when removed.

6. Install the pinion gear and the pinion thrust washers.

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Place the pinion gears and the pinion thrust washers 180 degrees apart.

7. Rotate the pinion gears and the pinion thrust washers 90 degrees and align the pinion gears with the pinion shaft opening in the differential case.
8. Install the thrust block.

The open side of the thrust block must face the window opening.

9. Install the pinion shaft.
10. Install the new pinion shaft lock bolt.

Tighten the pinion shaft lock bolt finger tight.

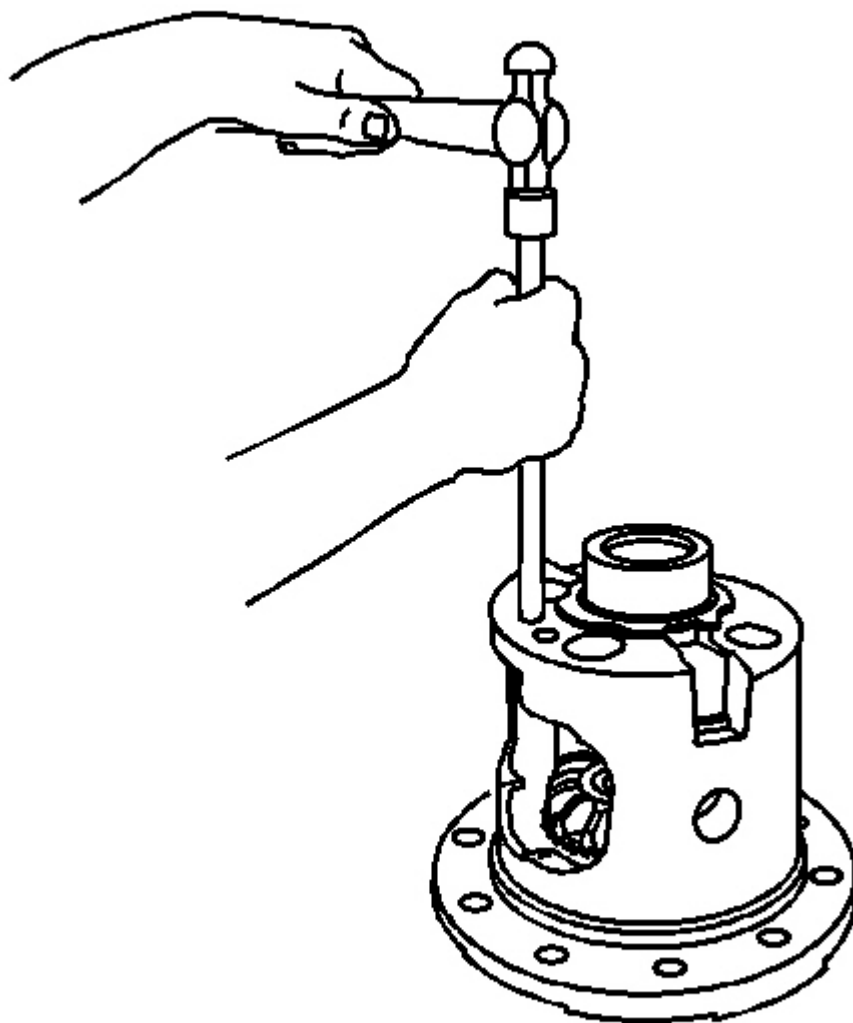


Fig. 25: Installing Governor Assembly
Courtesy of GENERAL MOTORS CORP.

11. Install the governor assembly.
12. Install the governor bushing using a hammer and a brass drift.

Specification: Press the bushing into place until there is 0.025-0.076 mm (0.010-0.030 in) of shaft end play.

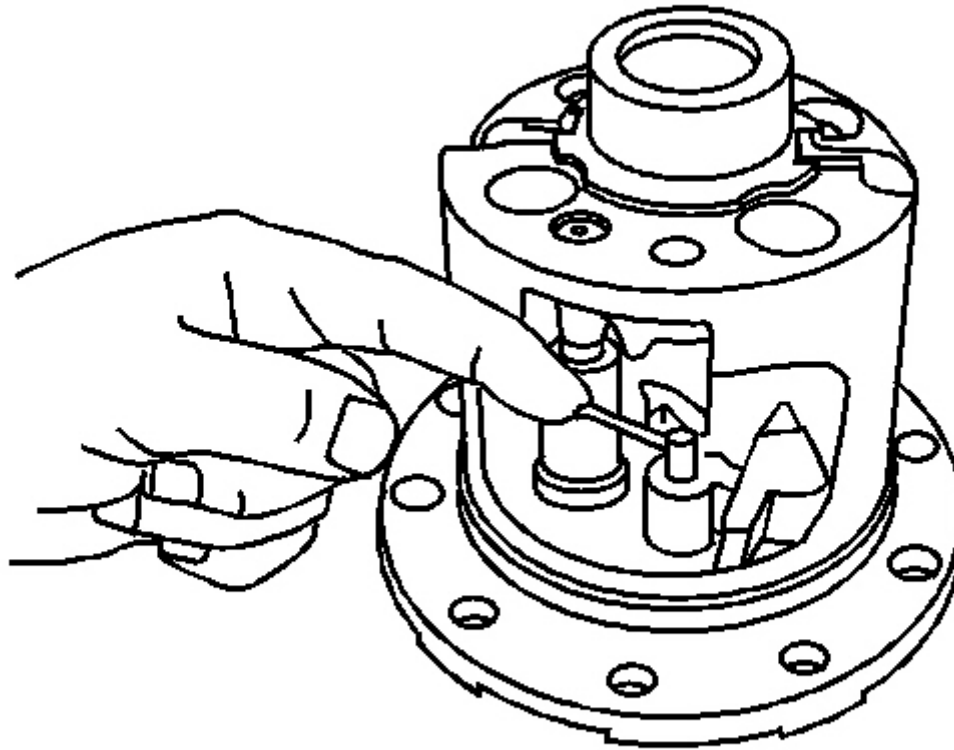


Fig. 26: Installing Latching Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

13. Install the latching bracket assembly.

The straight end of the latching bracket spring must be over and outside the governor assembly shaft.

14. Install the latching bracket bushing using a hammer and a brass drift.

Specification: Press the bushing into place until there is 0.000-0.051 mm (0.000-0.002 in) of shaft end play.

15. Tighten the pinion shaft lock bolt.

Tighten: Tighten the pinion shaft lock bolt to 36 N.m (27 lb ft).

DESCRIPTION AND OPERATION

LOCKING DIFFERENTIAL DESCRIPTION AND OPERATION

The locking differential consists of the following components:

- Differential case - 1 or 2 piece
- Locking differential spider - 2 piece case only
- Pinion gear shaft - 1 piece case only
- Differential pinion gear shaft lock bolt - 1 piece case only
- 2 clutch discs sets
- Locking differential side gear
- Thrust block
- Locking differential clutch disc guides
- Differential side gear shim
- Locking differential clutch disc thrust washer
- Locking differential governor
- Latching bracket
- Cam plate assembly
- Differential pinion gears
- Differential pinion gear thrust washers

The optional locking differential (RPO G80) enhances the traction capability of the rear axle by combining the characteristics of a limited-slip differential and the ability of the axle shafts to "lock" together when uneven traction surfaces exist. The differential accomplishes this in 2 ways. First by having a series of clutch plates at each side of the differential case to limit the amount of slippage between each wheel. Second, by using a mechanical locking mechanism to stop the rotation of the right differential side gear, or the left differential side gear on the 10.5 inch axle, in order to transfer the rotating torque of the wheel without traction to the wheel with traction. Each of these functions occur under different conditions.

Limited-Slip Function

Under normal conditions, when the differential is not locked, a small amount of limited-slip action occurs. The gear separating force developed in the right-hand (left-hand side on 10.5 inch axle) clutch pack is primarily responsible for this.

The operation of how the limited-slip function of the unit works can be explained when the vehicle makes a right-hand turn. Since the left wheel travels farther than the right wheel, it must rotate faster than the ring gear and differential case assembly. This results in the left axle and left side gear rotating faster than the differential case. The faster rotation of the left-side gear causes the pinion gears to rotate on the pinion shaft. This causes the right-side gear to rotate slower than the differential case.

Although the side gear spreading force produced by the pinion gears compresses the clutch packs, primarily the right side, the friction between the tires and the road surface is sufficient to overcome the friction of the clutch packs. This prevents the side gears from being held to the differential case.

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Locking Function

Locking action occurs through the use of some special parts:

- A governor mechanism with 2 flyweights
- A latching bracket
- The left side cam plate and cam side gear

When the wheel-to-wheel speed difference is 100 RPM or more, the flyweights of the governor will fling out and one of them will contact an edge of the latching bracket. This happens because the left cam side gear and cam plate are rotating at a speed different, either slower or faster, than that of the ring gear and differential case assembly. The cam plate has teeth on its outer diameter surface in mesh with teeth on the shaft of the governor.

As the side gear rotates at a speed different than that of the differential case, the shaft of the governor rotates with enough speed to force the flyweights outward against spring tension. One of the flyweights catches its edge on the closest edge of the latching bracket, which is stationary in the differential case. This latching process triggers a chain of events.

When the governor latches, it stops rotating. A small friction clutch inside the governor allows rotation, with resistance, of the governor shaft while one flyweight is held to the differential case through the latching bracket. The purpose of the governor's latching action is to slow the rotation of the cam plate as compared to the cam side gear. This will cause the cam plate to move out of its detent position.

The cam plate normally is held in its detent position by a small wave spring and detent humps resting in matching notches of the cam side gear. At this point, the ramps of the cam plate ride up on the ramps of the cam side gear, and the cam plate compresses the left clutch pack with a self-energizing action.

As the left clutch pack is compressed, it pushes the cam plate and cam side gear slightly toward the right side of the differential case. This movement of the cam side gear pushes the thrust block which compresses the right-hand side gear clutch pack.

At this point, the force of the self-energizing clutches and the side gear separating force combine to hold the side gears to the differential case in the locking stage.

The entire locking process occurs in less than 1 second. The process works with either the left or right wheel spinning, due to the design of the governor and cam mechanism. A torque reversal of any kind will unlatch the governor, causing the cam plate to ride back down to its detent position. Cornering or deceleration during a transmission shift will cause a torque reversal of this type. The differential unit returns to its limited-slip function.

The self-energizing process would not occur if it were not for the action of one of the left clutch discs. This energizing disc provides the holding force of the ramping action to occur. It is the only disc which is splined to the cam plate itself. The other splined discs fit on the cam side gear.

If the rotating speed of the ring gear and differential case assembly is high enough, the latching bracket will pivot due to centrifugal force. This will move the flyweights so that no locking is permitted. During vehicle driving, this happens at approximately 32 km/h (20 mph) and continues at faster speeds.

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When comparing the effectiveness of the locking differential, in terms of percent-of-grade capability to open and limited-slip units, the locking differential has nearly 3 times the potential of the limited-slip unit under the same conditions.

Locking Differential Torque-Limiting Disc

The locking differential design was modified in mid-1986 to include a load-limiting feature to reduce the chance of breaking an axle shaft under abusive driving conditions. The number of tangs on the energizing disc in the left-hand clutch pack was reduced allowing these tangs to shear in the event of a high-torque engagement of the differential locking mechanism.

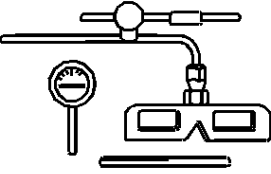
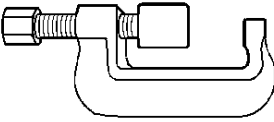
At the time of failure of the load-limiting disc, there will be a loud bang in the rear axle and the differential will operate as a standard differential with some limited-slip action of the clutch packs at low torques.

The service procedure, when the disc tangs shear, involves replacing the left-hand clutch plates and the wave spring. It is also necessary to examine the axle shafts for twisting because at high torques it is possible to not only shear the load-limiting disc, but to also twist the axle shafts.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J 7872 Magnetic Base Dial Indicator
	J 26252-A Locking Differential Governor Remover