

# SECTION 4B

## REAR AXLE

**CAUTION:** This vehicle is equipped with a Supplemental Inflatable Restraint System (SIR). Refer to **CAUTIONS** in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring location view in Section 9J before performing service on or around SIR components or wiring. Failure to follow **CAUTIONS** could result in possible air bag deployment, personal injury or otherwise unneeded SIR repairs.

**NOTICE:** Always use the correct fastener in the proper location. When you replace a fastener, use **ONLY** the exact part number for that application. General Motors will call out those fasteners that require a replacement after removal. General Motors will also call out the fasteners that require thread lockers or thread sealant. **UNLESS OTHERWISE SPECIFIED**, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and joint clamping force, and may damage the fastener. When you install fasteners, use the correct sequence and tightening specifications. Following these instructions can help you avoid damage to parts and systems.

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### GENERAL DESCRIPTION

#### REAR AXLE ASSEMBLY

**Figure 1**

The rear axle assembly contains two rigid axle shafts which transfer engine torque to the rear wheels. These axle shafts are supported in the rear axle housing by bearings at both outer ends, and driven by the differential assembly which is mounted in the center of the rear axle housing. A propeller shaft turns the differential assembly and transfers power to the rear axle shafts. The rear axle housing is sealed and contains a synthetic gear lubricant which lubricates the differential assembly and axle shafts bearings. The rear axle housing is also vented to prevent excessive heat buildup (Figure 1).

Rear trailing rods connect the rear axle housing to the frame and act as pivot points for the housing as it moves up and down with the rear suspension. Coil springs support the rear of the vehicle and are seated into the frame and rear axle housing axle. Shock absorbers are fitted between the rear axle housing and the frame to help to reduce road vibration and rough pavement. An upper control arm is fitted to the body by bushings, and to the rear differential carrier by a rear control arm ball joint to prevent the rear axle housing from moving in a lateral direction.

#### DIFFERENTIAL ASSEMBLY

**Figure 2**

The differential assembly uses a hypoid, beveled ring and pinion gear set. It consists of a ring gear which is mounted to the differential case and a pinion

## 4B-2 REAR AXLE

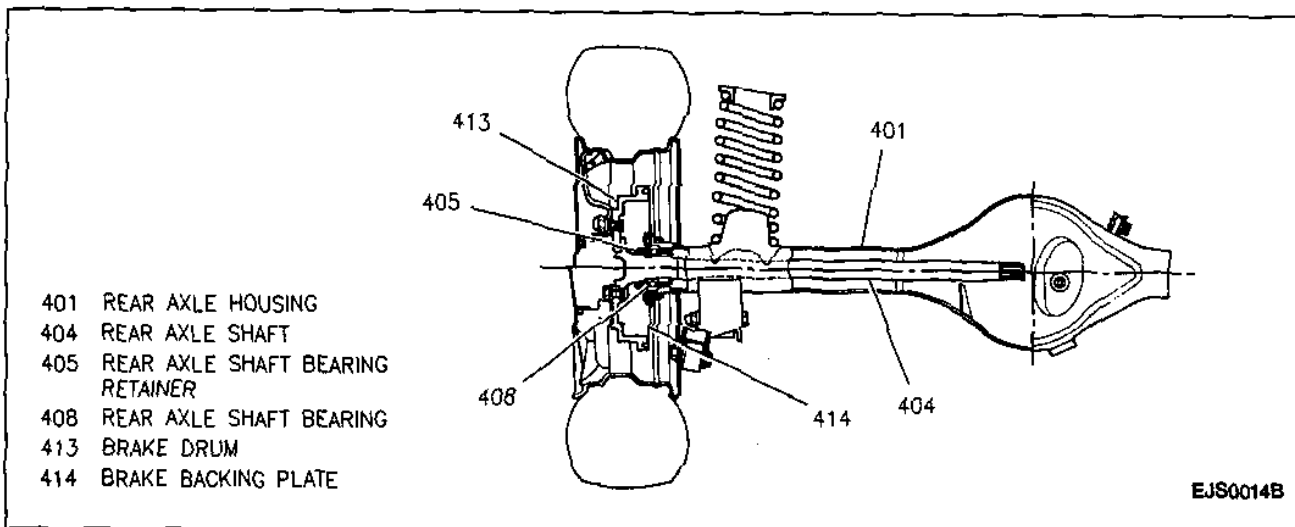


Figure 1—Rear Axle

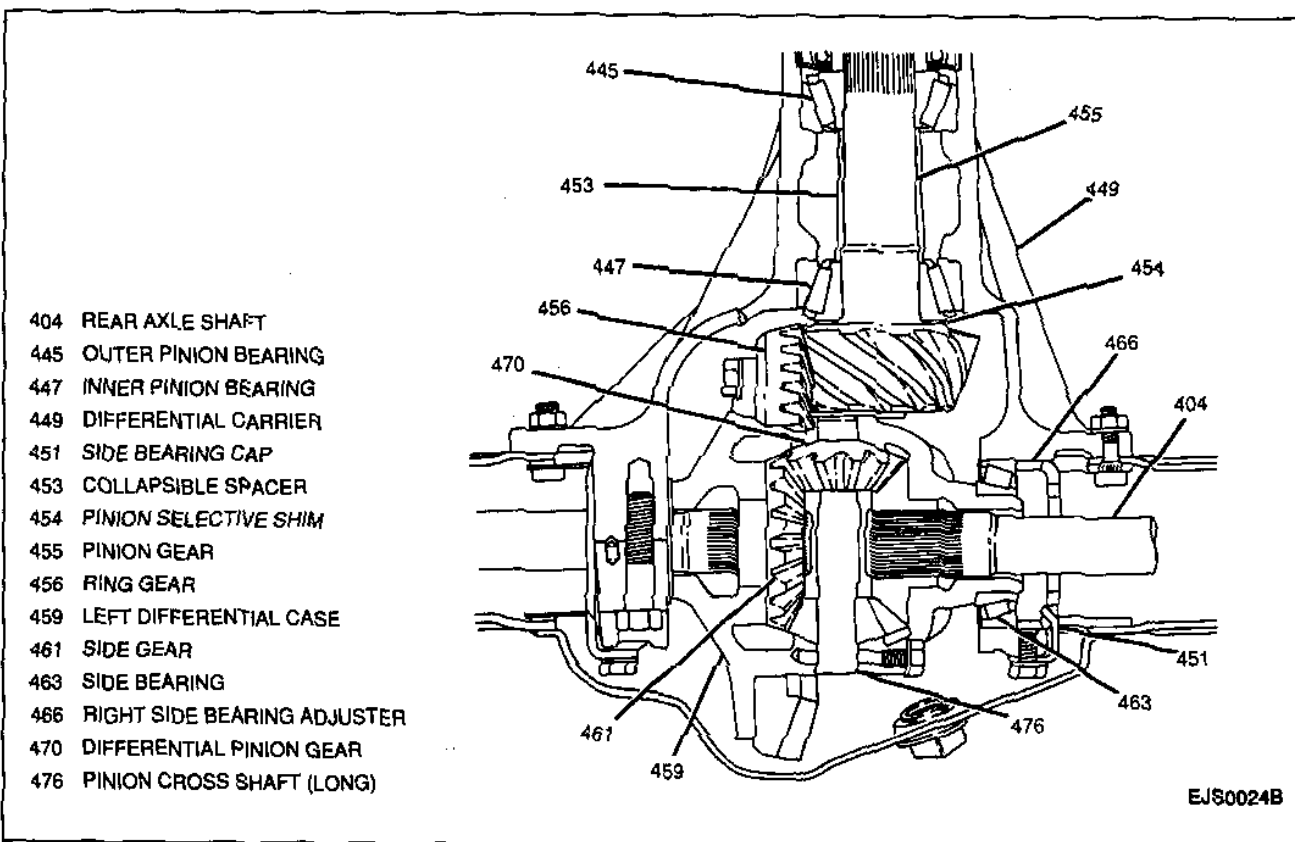


Figure 2—Typical Differential

gear which is mounted in the differential carrier. The ring and pinion gears are in constant mesh with each other (Figure 2). A set of six gears are mounted inside the differential case. Two of these gears are known as side gears and the other four are known as differential pinion gears. Each side gear is splined to an axle shaft which causes each axle shaft to turn when its side gear rotates. The differential pinion gears are mounted on a pinion cross shaft and are free to rotate on it. The pinion shaft is fitted into a bore in the differential case and is held in place by a pinion shaft roll pin.

The differential case is mounted in the differential carrier where the pinion gear drives the ring gear, differential case, and the side and differential pinion gears. The differential carrier is mounted near the center of the rear axle housing. For removal and installation procedures, refer to "Rear Differential Carrier" later in this section. For differential carrier overhaul procedures, refer to UNIT REPAIR later in this section.

## REAR AXLE OPERATION

Engine torque is provided by a rear propeller shaft that is bolted to the pinion gear by a universal joint and pinion flange. The pinion gear is in constant mesh with the ring gear and causes it to turn. The ring gear then rotates the differential case causing the differential pinion gears to turn with the case. This causes the side gears and both rear axle shafts to rotate. When both wheels have equal traction, the pinion gears do not rotate on the cross shaft. This is due to an input force that is equally divided between the side gears. In other words, the pinion gears revolve with the cross shaft but do not rotate around it. When the vehicle turns a corner, the outer axle must turn faster than the inner axle. When the inner axle turns slower than the outer, it slows its side gear. The differential pinion gears will roll around the slower side gear providing torque to the outer axle shaft.

## REAR WHEEL SPEED SENSOR (ABS) If equipped with ABS

A four wheel antilock braking system is optional equipment on this vehicle. The rear wheel speed sensor is mounted on the rear differential carrier. The rear wheel speed sensor consists of a magnetic core, with a magnet and coil. The speed sensor exciter ring is mounted on the differential case behind the ring gear and rotates with it. An electrical impulse is produced each time a gear tooth of the speed sensor exciter ring passes the rear wheel speed sensor allowing it to receive a signal in direct proportion to rear axle speed. This signal is then sent to the electronic brake control module (EBCM). For more information and diagnostic procedures, refer to SECTION 5E1 or SECTION 8A.

## DIAGNOSIS

The most essential part of rear axle service, as with any mechanical repair, is proper diagnosis of the problem. In axle work, one of the most difficult areas to diagnose is noise. Any gear driven unit, especially a gear driven axle where engine torque occurs at a 90 degree angle, produces a certain amount of noise. An interpretation should be made for each vehicle to determine whether a noise is normal or if a problem actually exists. One way of determining this is road testing an identical vehicle with the same options under the same conditions. If the same amount of noise is audible at the same speeds and under the same conditions, it may be deemed commercially acceptable since it is unlikely that the exact same problem exists in both vehicles. A normal amount of noise must be expected and cannot be eliminated by conventional repairs or adjustments. However, if a noise proves to be extremely loud or unusual, then it should be investigated. This can be accomplished by a road test and a systematic check of the components associated with the rear axle to isolate the noise.

## PRELIMINARY CHECKS

In order to perform an accurate road test, it is important that certain checks be performed to eliminate other possible problems that may point to the rear axle. Make sure to check the following items before performing a road test.



### Inspect

1. Tires for correct inflation pressure. Refer to SECTION 3E.
2. Rear axle housing for correct oil level. Refer to "Checking Rear Axle Oil Level" later in this section.
3. Undercarriage for loose attaching rear axle parts which may cause noise. Refer to SECTION 10-3.
4. Rear suspension for any loose or worn components. Refer to SECTION 3D.

## ROAD TEST

When road testing a vehicle, a smooth asphalt road surface is preferable because it dampens a high degree of road noise. Road test the vehicle to verify the problem and the speed and/or rpm at which the problem occurs. Once the problem has been verified, duplicate the noise under varying road conditions to eliminate the possibility of road noise. Once the noise and the conditions under which it exists has been verified, the type of noise and its location must be identified.

## DETERMINING THE TYPE OF NOISE

Many noises thought to be coming from the rear axle may actually be originating from other sources such as tires, road surfaces, wheel bearings, engine, transmission or body. Because noise is a major factor in determining or diagnosing a rear axle problem, a thorough and careful check should be made to determine the source of the noise before proceeding with rear axle repair.

### Road Noise

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

### Tire Noise

Tire noise can be easily mistaken for rear axle noise. Because noise can transmit or dissipate through the vehicle body, noise coming from the front tires can also be mistaken for a rear axle noise. Tires showing uneven wear or that are underinflated, are usually noisy and may produce vibrations which can appear at other places on the vehicle. This is particularly true with low tire pressure. For tire inspection procedures, refer to SECTION 3.

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### Engine and Transmission Noise

The engine or transmission may sometimes produce noises which may be mistaken for rear axle noise. To determine which unit is actually causing the noise, record the speed, rpm and other conditions at which the noise is most pronounced. Then stop the vehicle in a quiet place to avoid interference with other extraneous noises. With the transmission in neutral, slowly run the engine speed up and down to the engine speeds that correspond with the vehicle speed at which the noise was most pronounced. If the noise is produced with the vehicle at a standstill, the problem lies in the engine or transmission and not the rear axle.

### Brake Noise

Most noises caused by the front or rear brakes are rotational and occur once every wheel revolution. During a road test, duplicate the conditions under which the noise is most pronounced and gently apply the brakes. If the noise immediately appears or disappears when lightly depressing the brake pedal, the noise may be caused by an out of round brake rotor or drum. For brake diagnosis and repair procedures, refer to SECTION 5.

### Body Boom Noise or Vibration

Objectionable "body boom" noise or vibration usually occurs at 90 to 100 km/h (55 to 65 mph) and can be caused by an out of balance propeller shaft. Excessive looseness or wear at the propeller shaft sliding yoke splines may also cause a propeller shaft to be unbalanced. For propeller shaft inspections procedures, refer to SECTION 4A.

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

- Bearing noise.
- Gear noise.

### Rear Axle Shaft Bearing Noise

A rough rear axle shaft bearing produces a vibration or growl which continues with the vehicle coasting and the transmission in neutral. A brinelled rear axle shaft bearing causes a knock or click approximately every two revolutions of the rear wheel. Since the rear axle shaft bearing rollers do not travel at the same speed as the rear axle shaft, this condition can be diagnosed by supporting the rear axle with a hydraulic floor jack and spinning the rear wheels by hand and listening at the hub for evidence of a rough or brinelled rear axle shaft bearing.

**CAUTION: DO NOT operate the vehicle with the rear axle supported by a hydraulic floor jack. Should either one of the wheels touch the ground while operating, serious bodily injury could result.**

### Pinion Bearing Noise

Pinion bearing failures can be distinguished because they rotate at a higher rate of speed than the differential side bearings or rear axle shaft bearings.

Rough or excessively worn pinion bearings produce a continuous low pitched whirring or scraping noise on low speed acceleration from a stop.

### Side Bearing Noise

Side bearings produce a constant rough noise at a lower pitch than with pinion bearing noise. Side bearing noise may also fluctuate with rear axle bearing noise.

### Side Gear and Pinion Gear Noise

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

### Ring and Pinion Gear Noise

There are two basic types of gear noise. One type is produced by broken, bent, overheated or forcibly damaged gear teeth. This noise is usually quite audible through all speed ranges and can be easily diagnosed upon visual inspection. This type of damage generally results from the following:

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

Any damage will progressively lead to complete erosion of the gear teeth and eventually, a fracture will result if the initial damaging condition is not corrected.

Another common cause of hypoid gear tooth fracturing is extended overloading or shock loading—causing the differential pinion gears and cross shaft to seize. This can result from lubrication breakdown caused by excessive wheel spin. The second type of gear noise pertains to the contact pattern of the ring and pinion gear teeth. This form of abnormal gear noise can be recognized because it produces a cycling pitch (whine) and will be very pronounced at the speed range in which it occurs. This noise may occur under one or all of the following conditions:

**"Drive"** —is under acceleration or heavy pull. The pinion gear riding on the drive side of the ring gear.

**"Float"** —is only enough throttle to keep the engine from pulling the vehicle (between "Drive" and "Coast"). The vehicle slows down gradually with the engine pulling only slightly.

**"Coast"** —is with the throttle closed and vehicle in gear. The pinion gear riding on the coast side of the ring gear.

Gear noise tends to peak at a narrow speed range or ranges and tends to remain constant in pitch. Bearing noise will vary in pitch and vehicle speeds. For further diagnosis, refer to the "Rear Axle Noise Diagnosis Charts" (Figures 3 and 4).

CONDITION	INSPECT COMPONENT	FOR PROBABLE CAUSE
GROANING NOISE IN FORWARD OR REVERSE	REAR AXLE LUBRICANT	LOW LUBRICANT LEVEL CONTAMINATION
NOISE CHANGES ON A DIFFERENT TYPE OF ROAD	WHEELS AND TIRES	IMBALANCE OR IMPROPER INFLATION
NOISE TONE IS LOWERED WITH VEHICLE SPEED	WHEELS AND TIRES	IMBALANCE OR IMPROPER INFLATION
CLUNK OR KNOCK ON ROUGH ROAD OPERATION	REAR AXLE SHAFTS	EXCESSIVE END PLAY
CLUNK NOISE ON ACCELERATION OR DECELERATION	PINION SHAFT OR PINION BEARINGS	WEAR OR DAMAGE
	DIFFERENTIAL CASE SIDE GEAR HUB	WORN, OVERSIZED OR DAMAGED
	UNIVERSAL JOINTS	WEAR OR DAMAGE
CONTINUOUS LOW-PITCHED WHIRRING OR SCRAPING NOISE AT LOW SPEED	PINION BEARINGS	WEAR OR DAMAGE
KNOCK OR CLICK EVERY TWO REVOLUTIONS OF REAR WHEELS	REAR AXLE SHAFT BEARINGS	LOW LUBRICANT LEVEL WEAR OR DAMAGE
NOISE MOST PRONOUNCED ON TURNS	DIFFERENTIAL SIDE GEARS AND PINION GEARS	WEAR OR DAMAGE EXCESSIVE BACKLASH
NOISE IS THE SAME IN DRIVE OR COAST	WHEELS AND TIRES	IMBALANCE OR IMPROPER INFLATION

Figure 3 - Rear Axle Noise Diagnosis Chart - 1 of 2

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CONDITION	INSPECT COMPONENT	FOR PROBABLE CAUSE
NOISE IS IN DRIVE OR COAST (CONT.)	FRONT WHEEL BEARINGS	WEAR OR DAMAGE
	PROPELLER SHAFT	EXCESSIVE DRIVE LINE ANGLE
DRIVE NOISE, COAST NOISE OR FLOAT NOISE	RING AND PINION GEARS	INCORRECT BACKLASH INCORRECT PINION DEPTH WEAR OR DAMAGE

Figure 4 - Rear Axle Noise Diagnosis Chart - 2 of 2

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## ON-VEHICLE SERVICE


**Tighten**

### CHECKING REAR AXLE OIL LEVEL

**Figure 5**

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Rear axle housing oil level/filler plug from rear axle housing (Figure 5).


**Inspect**

- Rear axle oil level. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole. If oil level is low and no oil leaks exist, adjust oil level using 80W-90 GL5 lubricant GM P/N 12345977, or equivalent.
3. Install rear axle housing oil level/filler plug into rear axle housing (Figure 5).

- Rear axle housing oil level/filler plug to 50 N.m (37 lb. ft.).

4. Lower vehicle.

### REAR AXLE OIL CHANGE PROCEDURE

**Figure 5**

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Place a drain pan or suitable container under rear axle housing.
3. Remove rear axle housing oil level/filler plug from rear axle housing (Figure 5).
4. Remove rear axle housing drain plug from rear axle housing and drain rear axle housing (Figure 5).
5. Apply Loctite® pipe sealant GM P/N 1052080, or equivalent, to the threaded portion of the rear axle housing drain plug.

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6. Install rear axle housing drain plug into rear axle housing after rear axle housing has completely drained (Figure 5).



### Tighten

- Rear axle housing drain plug to 25 N.m (18 lb. ft.).
7. Refill the rear axle housing with approximately 2.2 liters (4.6 pts.) of 80W-90 GL5 lubricant GM P/N 12345977, or equivalent. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole.
  8. Install rear axle housing oil level/filler plug into rear axle housing (Figure 5).



### Tighten

- Rear axle housing oil level/filler plug to 50 N.m (37 lb. ft.).
9. Remove drain pan from under rear axle housing.
  10. Lower vehicle.

## REAR AXLE SHAFT AND BEARING

Figures 5 through 17



### Remove or Disconnect

Tools Required:

J 34866 Rear Axle Shaft Remover

J 2619-01 Slide Hammer

J 22912-01 Rear Bearing Remover

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Place a drain pan or suitable container under rear axle housing.
3. Rear axle housing oil level/filler plug from rear axle housing (Figure 5).
4. Rear axle housing drain plug from rear axle housing and drain rear axle housing (Figure 5).

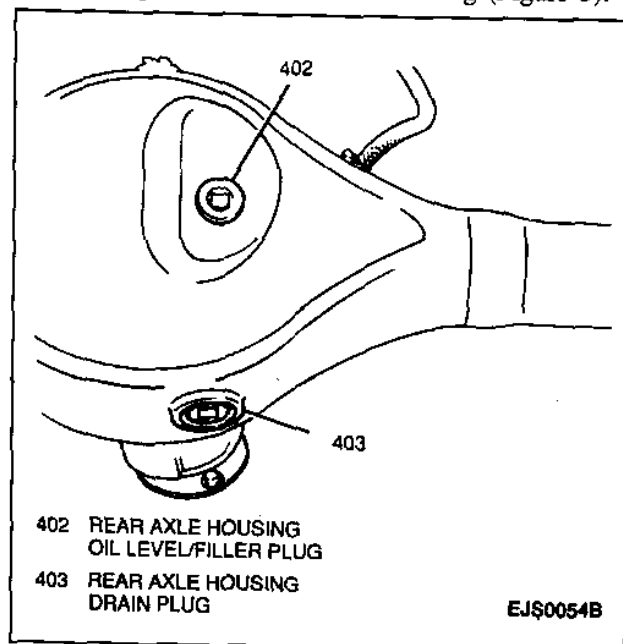


Figure 5 - Rear Axle Housing Oil Level/Filler Plug

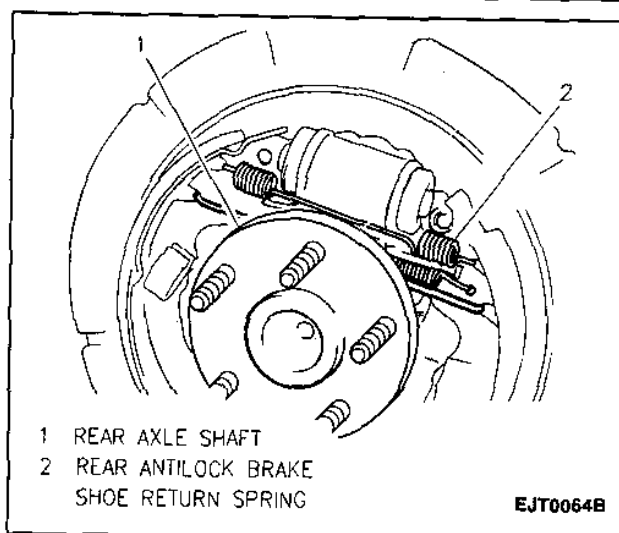


Figure 6—Rear Antilock Brake Shoe Return Spring

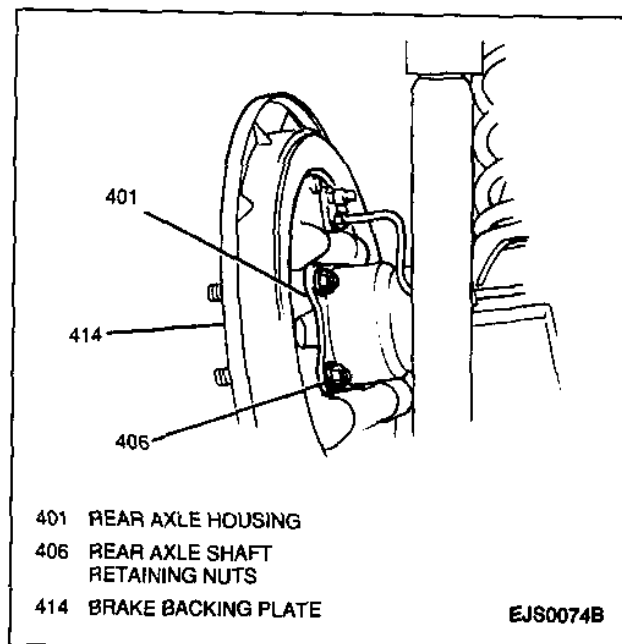


Figure 7—Removing Rear Axle Shaft Retaining Nuts

5. Rear tire and wheel assembly. Refer to SECTION 3E.
6. Rear brake drum from rear axle. Refer to SECTION 5.
7. Rear antilock brake shoe return spring from both rear brake shoes (Figure 6).
8. Four rear axle shaft retaining nuts from rear axle shaft bearing retainer studs behind brake backing plate (Figure 7).



### Important

- DO NOT remove the brake backing plate with the rear axle shaft. If this precaution is not observed, inner seal damage may result.
9. Rear axle shaft and bearing from rear axle housing using a J 34866 with a J 2619-01 (Figure 8).

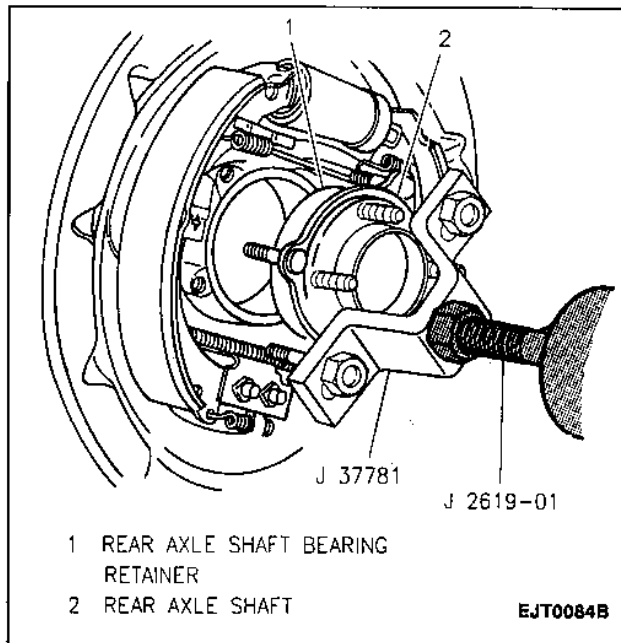


Figure 8—Removing Rear Axle Shaft

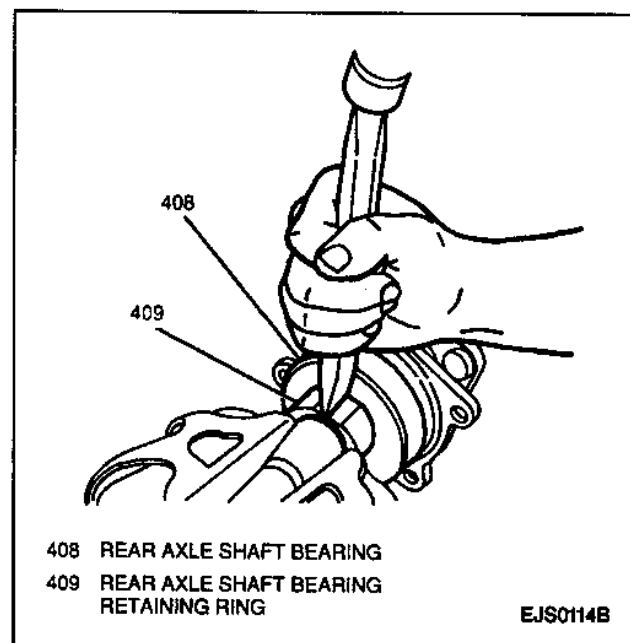


Figure 11—Removing Rear Axle Shaft Bearing Retainer Ring

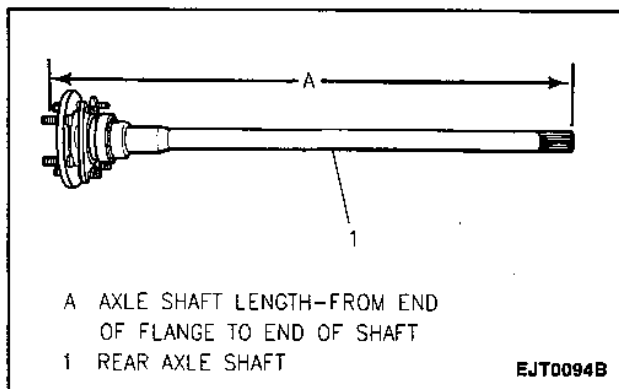


Figure 9—Rear Axle Shaft Lengths

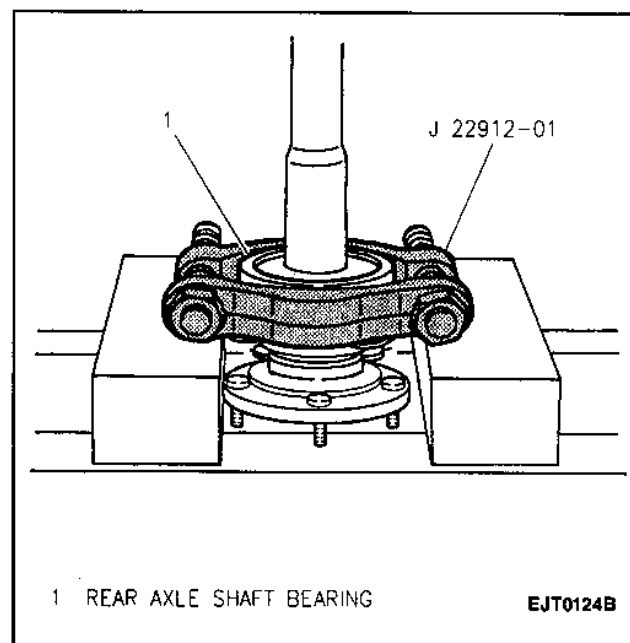


Figure 12—Removing Rear Axle Shaft Bearing

**! Important**

- Right and left rear axle shafts are different lengths. The right rear axle shaft is 722.5 mm (28.4-inches) in length. The left rear axle shaft is 679.5 mm (26.8-inches) in length. When removing both axle shafts, make sure they are installed in their respective sides of the rear axle housing.

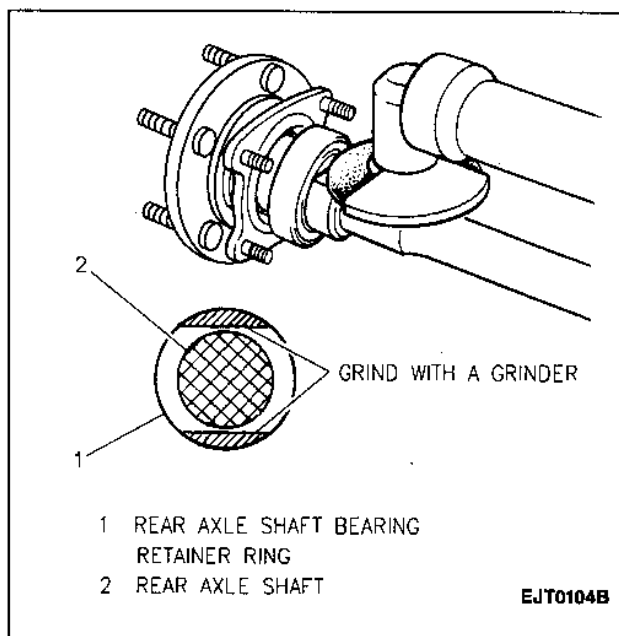


Figure 10—Grinding Rear Axle Shaft Bearing Retainer Ring

## 4B-8 REAR AXLE

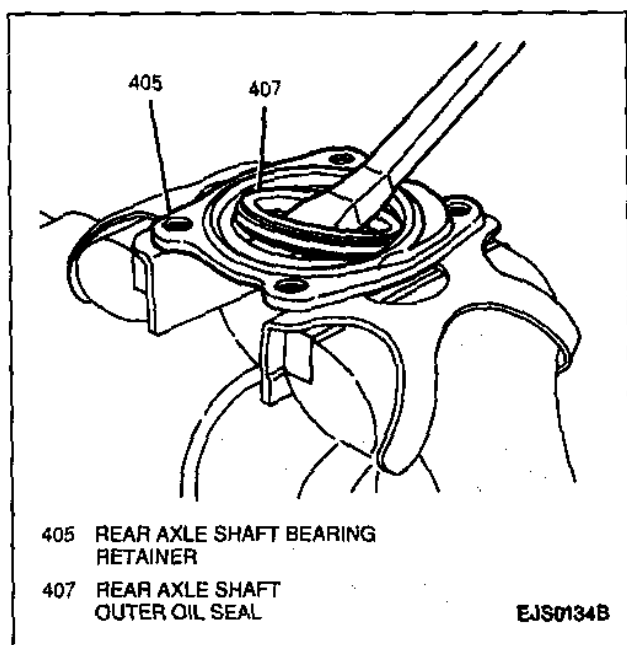


Figure 13—Removing Rear Axle Shaft Outer Oil Seal

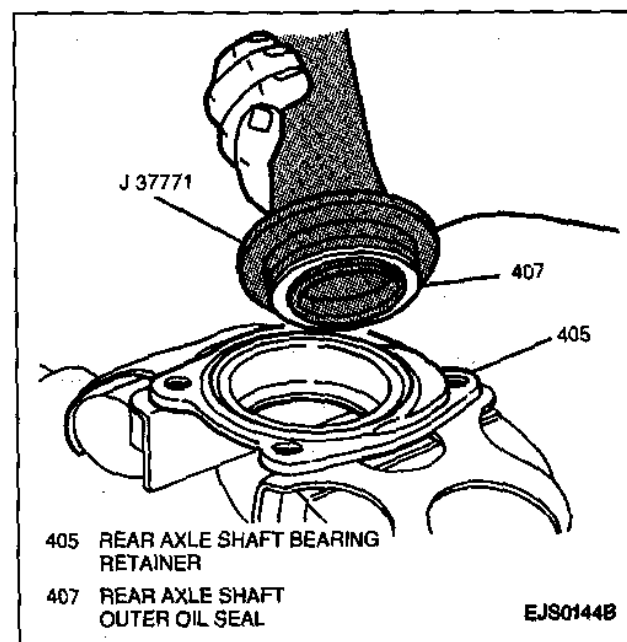


Figure 14—Installing Rear Axle Shaft Outer Oil Seal

### Measure

- Rear axle shaft length. Length should be measured from the differential end of the shaft to the outside edge of the axle shaft flange (Figure 9).

10. Using a hand grinder, flatten two opposite sides of the rear axle shaft bearing retainer ring (Figure 10).

**NOTICE:** Use caution not to grind on the axle shaft itself. If the axle shaft is damaged by grinding, the shaft may become weak or unbalanced causing vibration, bearing or seal failure.

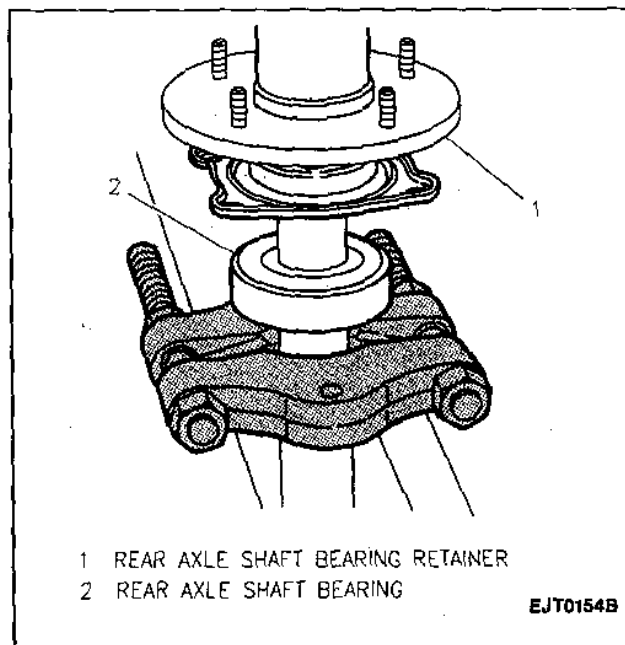


Figure 15—Installing Rear Axle Shaft Bearing

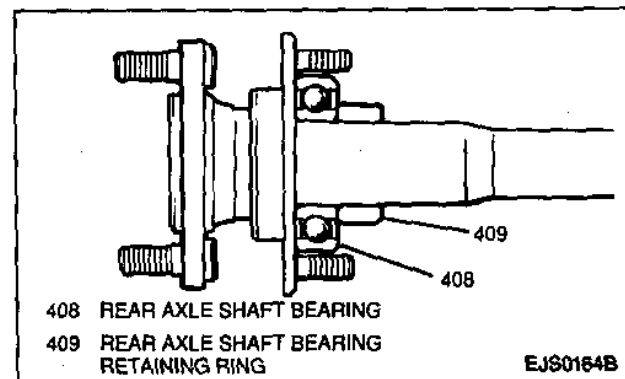


Figure 16—Rear Axle Shaft Bearing Retainer Ring Position

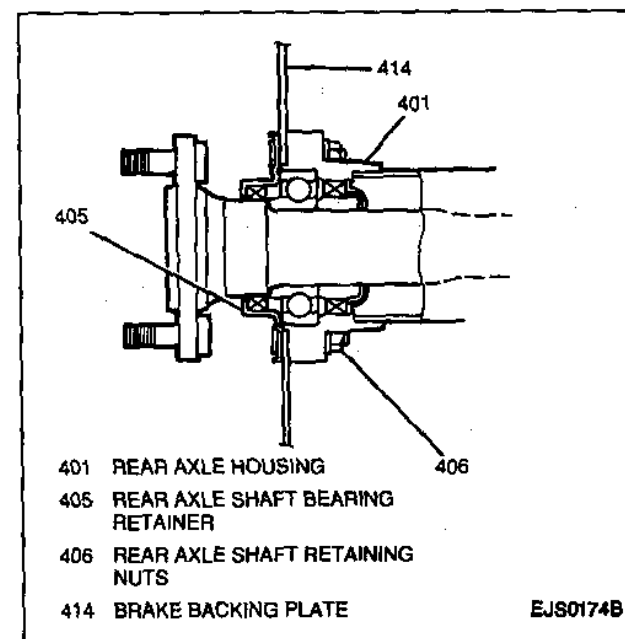


Figure 17—Rear Axle Shaft Installation



11. Rear axle shaft bearing retainer ring on axle shaft using a hammer and cold chisel (Figure 11).
12. Rear axle shaft bearing from rear axle shaft using a J 22912-01 and a hydraulic press. Place the J 22912-01 on the rear axle shaft between the rear axle shaft bearing and the rear axle shaft bearing retainer. Then place the rear axle shaft in a hydraulic press and slowly press the rear axle shaft bearing off the rear axle shaft (Figure 12).
13. Rear axle shaft bearing retainer from rear axle shaft.
14. Rear axle shaft outer oil seal from the rear axle shaft bearing retainer (Figure 13).

### Inspect

1. Rear axle shaft bearing for brinelling or roughness. Replace as necessary.
2. Rear axle shaft for flat spots or blue discoloration indicating overheating. Replace as necessary.

### Install or Connect

#### Tools Required:

- J 37771 Rear Axle Bearing Retainer Seal Installer
- J 22912-01 Rear Bearing Remover

1. Apply wheel bearing lubricant GM P/N 1051344, or equivalent, to the inner surface of the new rear axle shaft outer oil seal.
2. Rear axle shaft outer oil seal into the rear axle shaft bearing retainer using a J 37771 (Figure 14).
3. Rear axle shaft bearing retainer onto the rear axle shaft.
4. Rear axle shaft bearing onto the rear axle shaft using the J 22912-01 and a hydraulic press. With the concave side facing away from the rear axle shaft bearing, place the J 22912-01 on the rear axle shaft below the rear axle shaft bearing. Then place the rear axle shaft in a hydraulic press and slowly press the rear axle shaft bearing to its original position behind the rear axle shaft bearing retainer (Figure 15).
5. Rear axle shaft bearing retainer ring onto the rear axle shaft using a J 22912-01 and a hydraulic press. With the concave side facing away from the rear axle shaft bearing retainer ring, place the J 22912-01 on the rear axle shaft below the rear axle shaft bearing retainer ring. Then place the rear axle shaft in a hydraulic press and slowly press the rear axle shaft bearing retainer ring past the shaft taper to its original position behind the rear axle shaft bearing (Figure 16).

### Inspect

- Rear axle shaft inner oil seal for cuts or other damage. Replace as necessary. Refer to "Rear Axle Shaft Inner Oil Seal" later in this section.
6. Apply wheel bearing lubricant GM P/N 1051344, or equivalent, to the rear axle inner oil seal lip in the rear axle housing.

7. Apply wheel bearing lubricant GM P/N 1051344, or equivalent, to the rear axle shaft bearing retainer ring mating surface on the brake backing plate.
8. Rear axle shaft and bearing into the rear axle housing making sure the rear axle shaft bearing is firmly seated into the rear axle housing (Figure 17).
9. Four rear axle shaft retaining nuts to rear axle shaft retainer studs behind brake backing plate (Figure 17).

### Tighten

- Rear axle shaft retaining nuts to 23 N.m (17 lb. ft.).
10. Rear antilock brake shoe return spring to both rear brake shoes (Figure 6).
  11. Rear brake drum to rear axle. Refer to SECTION 5.
  12. Rear tire and wheel assembly. Refer to SECTION 3E.
  13. Apply Loctite® pipe sealant GM P/N 1052080, or equivalent, to the threaded portion of the rear axle housing drain plug.
  13. Rear axle housing drain plug into rear axle housing (Figure 5).

### Tighten

- Rear axle housing drain plug to 25 N.m (18 lb. ft.).
14. Refill the rear axle housing with approximately 2.2 liters (4.6 pts.) of 80W-90 GL5 lubricant GM P/N 12345977, or equivalent. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole.
  15. Rear axle housing oil level/filler plug into rear axle (Figure 5).

### Tighten

- Rear axle housing oil level/filler plug to 50 N.m (37 lb. ft.).
16. Remove drain pan from under rear axle housing.
  17. Lower vehicle.

## REAR AXLE SHAFT INNER OIL SEAL

*Figures 5, 18 and 19*

### Remove or Disconnect

#### Tools Required:

- J 26941 Axle Shaft Seal Remover
- J 23907 Slide Hammer

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Place a drain pan or suitable container under rear axle housing.
3. Rear axle housing oil level/filler plug from rear axle housing (Figure 5).
4. Rear axle housing drain plug from rear axle housing and drain rear axle housing (Figure 5).

## 4B-10 REAR AXLE

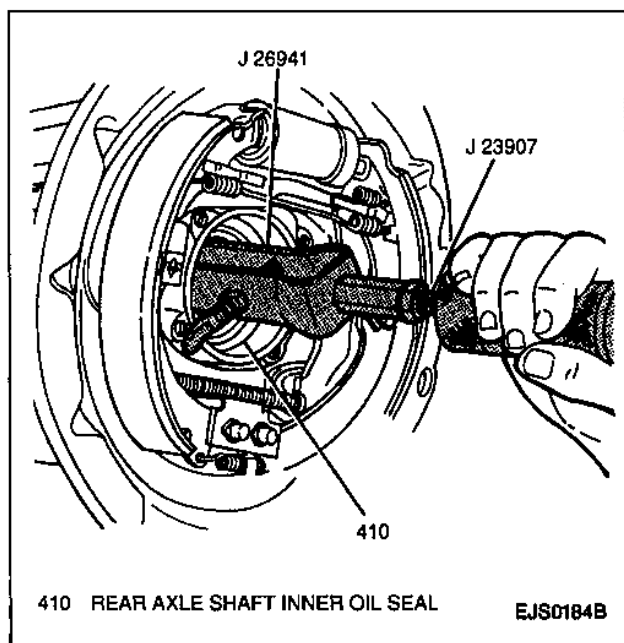


Figure 18—Removing Rear Axle Shaft Inner Oil Seal

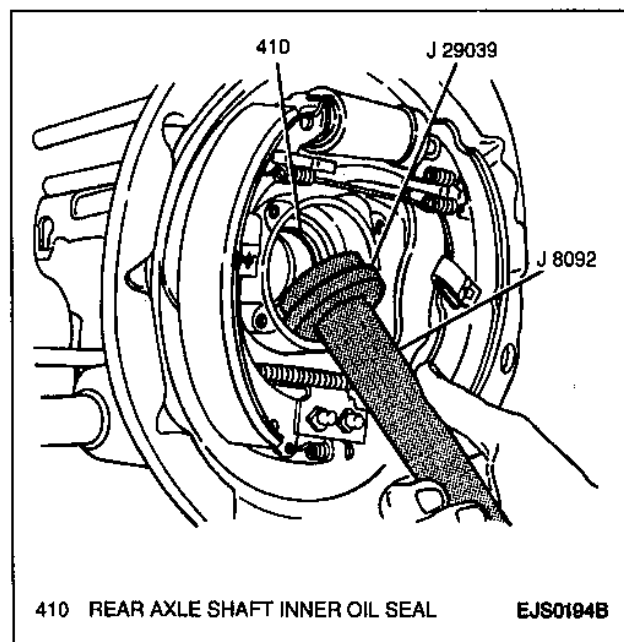


Figure 19—Installing Rear Axle Shaft Inner Oil Seal

5. Rear tire and wheel assembly. Refer to SECTION 3E.
6. Rear brake drum from rear axle. Refer to SECTION 5C.
7. Rear axle shaft from rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.
8. Rear axle shaft inner oil seal from rear axle housing using a J 26941 with a J 23907 (Figure 18).

### Inspect

- Rear axle inner oil seal protector for damage. Replace as necessary.

### Install or Connect

Tools Required:

J 29039 Axle Shaft Inner Oil

Seal Installer

J 8092 Driver Handle

1. New rear axle shaft inner oil seal into rear axle housing using a J 29039 and a J 8092 (Figure 19).
2. Apply wheel bearing lubricant GM P/N 1051344, or equivalent, to the new rear axle shaft inner oil seal lip.
3. Rear axle shaft into rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.
4. Rear brake drum to rear axle. Refer SECTION 5C.
5. Rear tire and wheel assembly. Refer to SECTION 3E.
6. Apply Loctite® pipe sealant GM P/N 1052080, or equivalent, to the threaded portion of the rear axle housing drain plug.
7. Rear axle housing drain plug into rear axle housing (Figure 5).

### Tighten

- Rear axle housing drain plug to 25 N·m (18 lb. ft.).
8. Refill the rear axle housing with approximately 2.2 liters (4.6 pts.) of 80W-90 GL5 lubricant GM P/N 12345977, or equivalent. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole.
  9. Rear axle housing oil level/filler plug into rear axle housing (Figure 5).

### Tighten

- Rear axle housing oil level/filler plug to 50 N·m (36 lb. ft.).
10. Remove drain pan from under rear axle housing.
  11. Lower vehicle.

## DIFFERENTIAL CARRIER

**Figures 5 and 20 through 25**

### Remove or Disconnect

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Place a drain pan or suitable container under rear axle housing.
3. Rear axle housing oil level/filler plug from rear axle housing (Figure 5).
4. Rear axle housing drain plug from rear axle housing and drain rear axle housing (Figure 5).
5. Rear tire and wheel assemblies. Refer to SECTION 3E.
6. Rear brake drums from rear axle. Refer SECTION 5C.

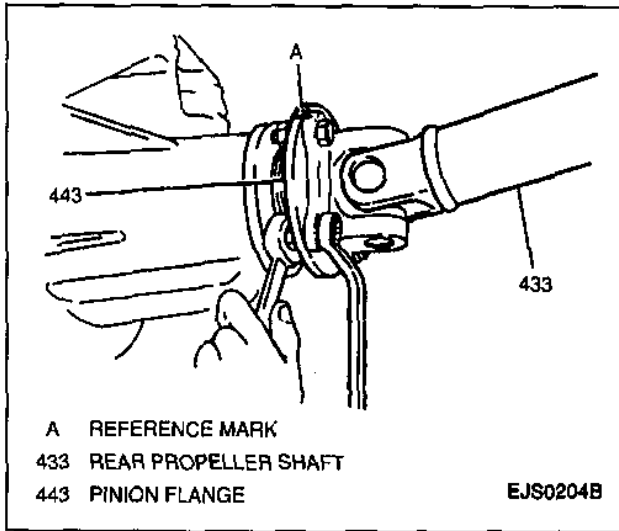


Figure 20—Removing Rear Propeller Shaft

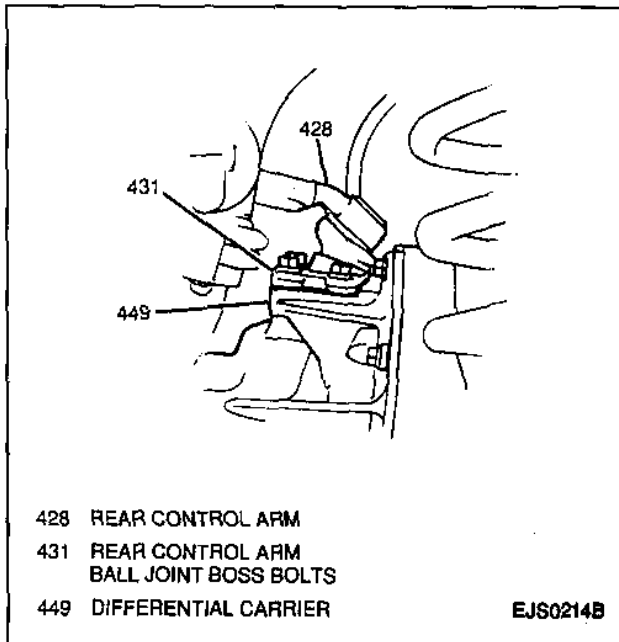


Figure 21—Removing Rear Control Arm Joint Boss Bolts

7. Both rear axle shafts from rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.

**! Important**

- To ensure rear propeller shaft balance, an index mark (reference mark) must be placed on the differential pinion flange and the rear propeller shaft flange so that the rear propeller shaft can be installed in the same position from which it was removed (Figure 20). If this procedure is not followed, a driveline imbalance may result causing vibration, premature component wear or other undesirable characteristics.
8. Four bolts, four nuts and rear propeller shaft from vehicle (Figure 20).

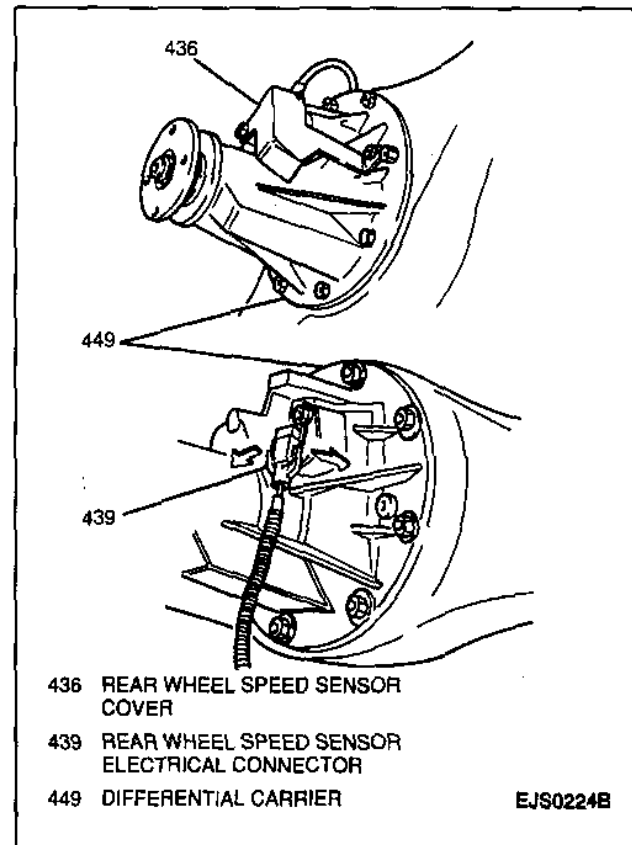


Figure 22—Disconnecting Rear Wheel Speed Sensor

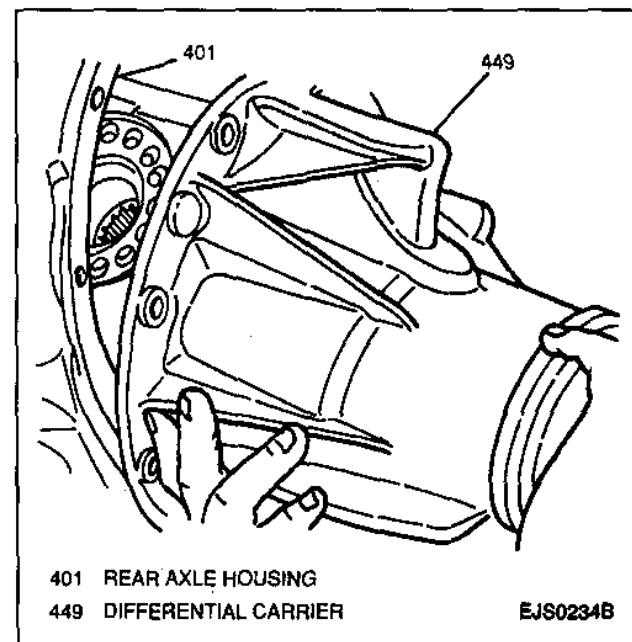


Figure 23—Removing Differential Carrier

9. Loosen both rear control arm through bolts and nuts.
10. Two bolts securing Load Sensing Proportioning Valve (LSPV) spring bracket to upper control arm (if equipped).
11. Four bolts from rear control arm ball joint boss and separate rear control arm ball joint boss from differential carrier (Figure 21).

## 4B-12 REAR AXLE

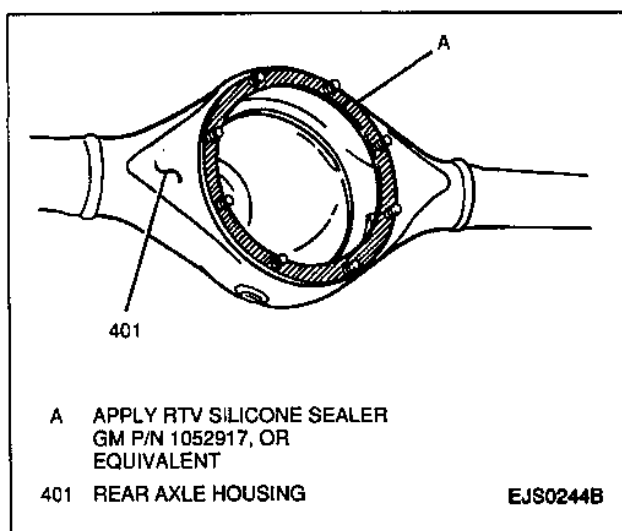


Figure 24—Sealer Application

12. Two bolts and rear wheel speed sensor cover from differential carrier if equipped (Figure 22).
13. Electrical connector from rear wheel speed sensor if equipped (Figure 22).
14. Eight nuts and differential carrier from rear axle housing (Figure 23).



### Clean

- Oil and sealant from differential carrier and rear axle housing mating surfaces.



### Inspect

- For disassembly and inspection procedures, refer to "UNIT REPAIR" later in this section.



### Install or Connect

1. Apply RTV silicone sealer GM P/N 1052917, or equivalent, to the differential carrier mating surface on the rear axle housing.
2. Differential carrier into rear axle housing; secure with eight nuts (Figure 25).



### Tighten

- Differential carrier nuts to 55 N.m (41 lb. ft.).
3. Electrical connector to rear wheel speed sensor if equipped (Figure 22).
  4. Rear wheel speed sensor cover to differential carrier; secure with two bolts if equipped (Figure 22).



### Tighten

- Rear wheel speed sensor cover bolts to 15 N.m (11 lb. ft.).
5. Rear control arm ball joint boss to differential carrier; secure with four bolts (Figure 21).

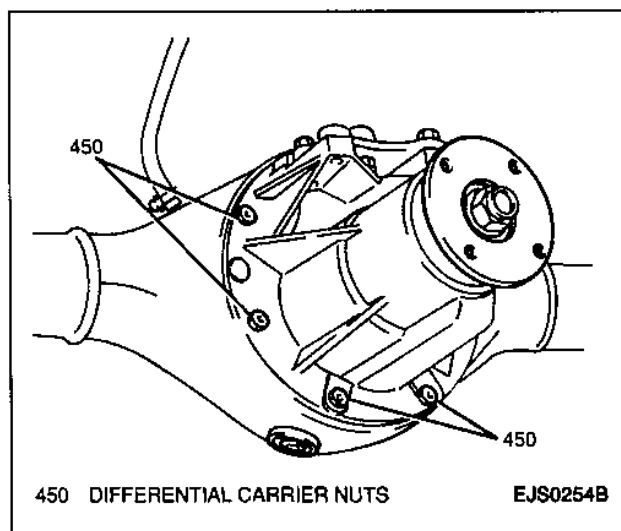


Figure 25—Differential Carrier Nuts



### Tighten

- Rear control arm ball joint boss bolts to 50 N.m (36 lb. ft.).
  - Rear control arm through bolts and nuts to 90 N.m (66 lb. ft.).
6. LSVP load sensing spring bracket to upper control arm; securing with two bolts (if equipped).



### Tighten

- Load sensing spring bracket bolts to 18 to 25 N.m (13.5 to 20.0 lb. ft.).



### Important

- Use the index (reference) marks made in the removal procedure to ensure correct rear propeller shaft installation.
7. Rear propeller shaft into vehicle; secure with four nuts and bolts (Figure 20).



### Tighten

- Rear propeller shaft nuts and bolts to 50 N.m (36 lb. ft.).
8. Both rear axle shafts into rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.
  9. Rear brake drums to rear axle. Refer to SECTION 5C.
  10. Rear tire and wheel assemblies. Refer to SECTION 3E.
  11. Apply Loctite® pipe sealant GM P/N 1052080, or equivalent, to the threaded portion of the rear axle housing drain plug.
  12. Rear axle housing drain plug into rear axle housing (Figure 5).



### Tighten

- Rear axle housing drain plug to 25 N.m (18 lb. ft.).
- 13. Refill the rear axle housing with approximately 2.2 liters (4.6 pts.) of 80W-90 GL5 lubricant GM P/N 12345977, or equivalent. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole.
- 14. Rear axle housing oil level/filler plug into the rear axle housing (Figure 5).



### Tighten

- Rear axle housing oil level/filler plug to 50 N.m (36 lb. ft.).
- 15. Remove drain pan from under rear axle housing.
- 16. Lower vehicle.

## REAR AXLE HOUSING

Figures 5 and 8 through 34



### Remove or Disconnect

#### Tools Required:

J 26941 Axle Shaft Seal Remover

J 23907 Slide Hammer

1. Raise and suitably support vehicle. Refer to SECTION 0A.
2. Place a drain pan or suitable container under rear axle housing.
3. Rear axle housing oil level/filler plug from rear axle housing (Figure 50).
4. Rear axle housing drain plug from rear axle housing and drain rear axle housing (Figure 5).
5. Rear tire and wheel assemblies. Refer to SECTION 3E.
6. Rear brake drums from rear axle. Refer to SECTION 5C.
7. Both rear axle shafts from rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.
8. Both rear axle shaft inner oil seals from rear axle housing using a J 26941 with a J 23907 (Figure 18).
9. Both rear axle shaft inner oil seal protectors from rear axle housing.



### Important

- To ensure rear propeller shaft balance, an index mark (reference mark) must be placed on the differential pinion flange and the rear propeller shaft flange so that the rear propeller shaft can be installed in the same position from which it was removed. If this procedure is not followed, a driveline imbalance may result causing vibration, premature component wear or other undesirable characteristics.
- 10. Four bolts, four nuts and rear propeller shaft from vehicle (Figure 20).

11. Loosen both rear control arm through bolts and nuts (Figure 26).
12. Remove drain pan from under rear axle housing.
13. Lower vehicle so that the rear axle housing may be supported with a hydraulic jack.
14. Support rear axle housing with a suitable hydraulic floor jack (Figure 27).
15. Two bolts securing Load Sensing Proportioning Valve (LSPV) spring bracket to upper control arm (if equipped).
16. Four bolts at rear control arm ball joint boss and separate rear control arm ball joint boss from differential carrier (Figure 21).
17. Two bolts and rear wheel speed sensor cover from differential carrier if equipped (Figure 22).
18. Electrical connector from the rear wheel speed sensor if equipped (Figure 22).
19. Eight differential carrier nuts and differential carrier from rear axle housing (Figure 23).
20. Rear brake fluid pipes from rear wheel cylinders and separate both brake backing plates from rear axle housing (Figure 28).

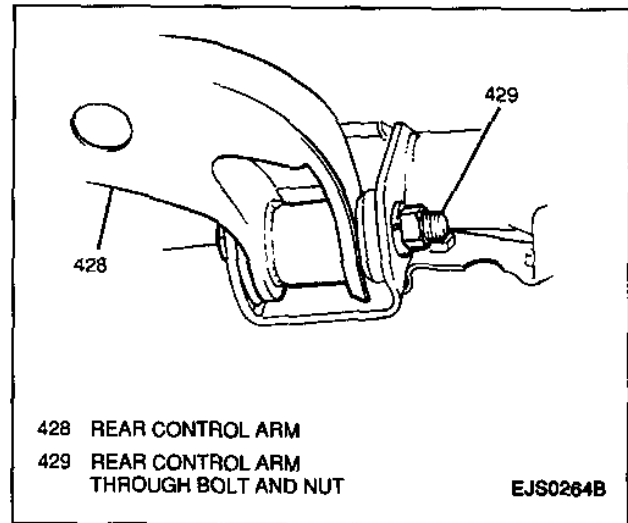


Figure 26—Rear Control Arm Nut and Bolt

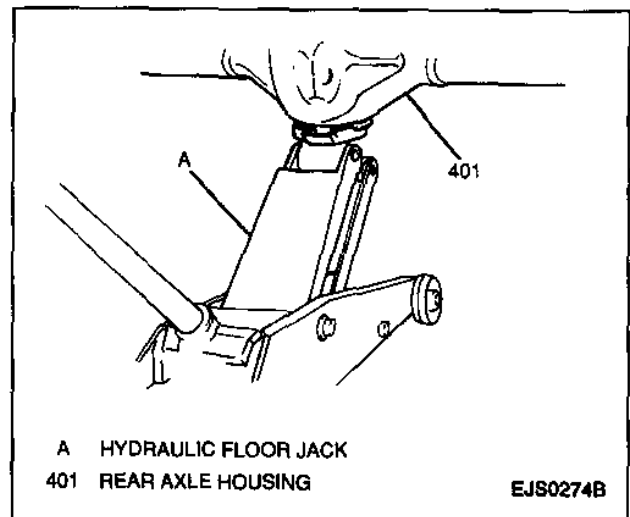


Figure 27—Supporting Rear Axle Housing

## 4B-14 REAR AXLE

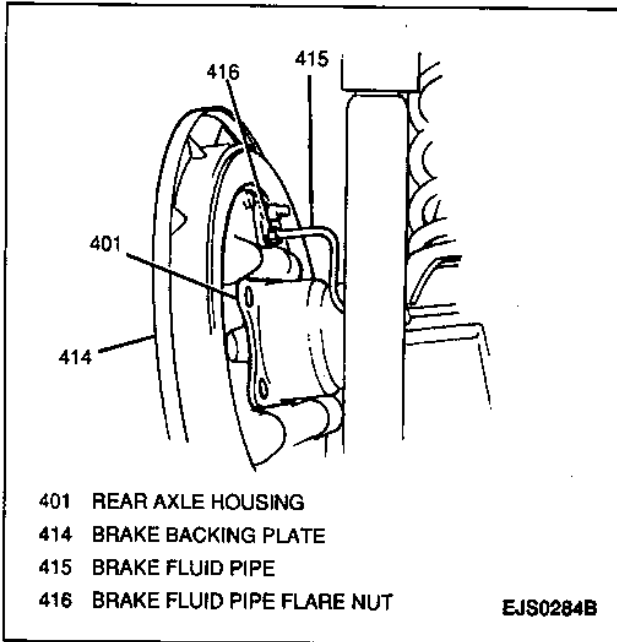


Figure 28—Rear Brake Fluid Pipe and Backing Plate

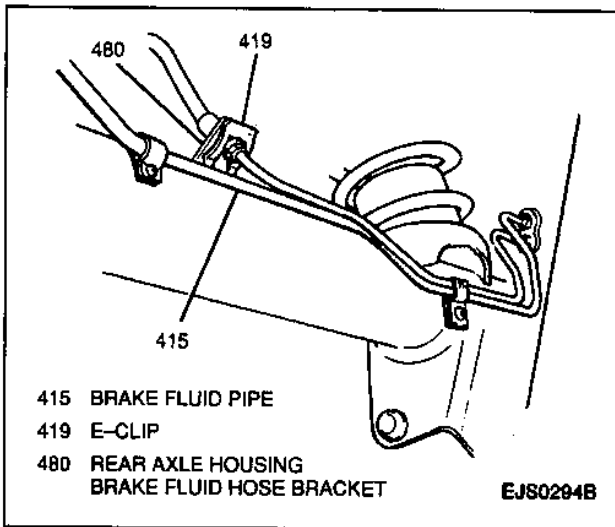


Figure 29—E-Clip and Brake Fluid Pipe Clamp Screws

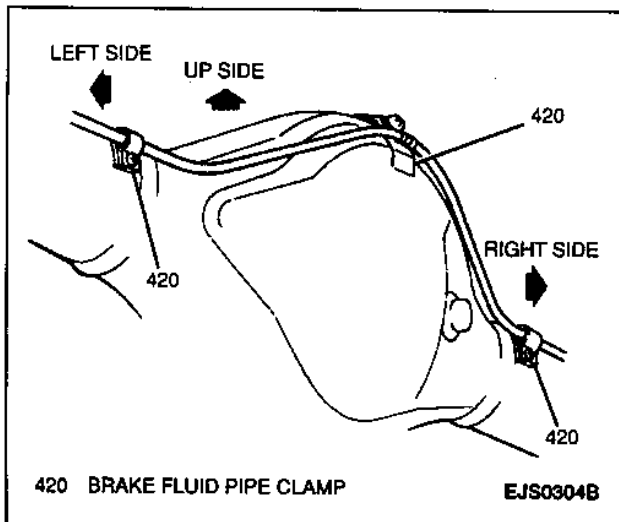


Figure 30—Brake Fluid Pipe Clamp Screws

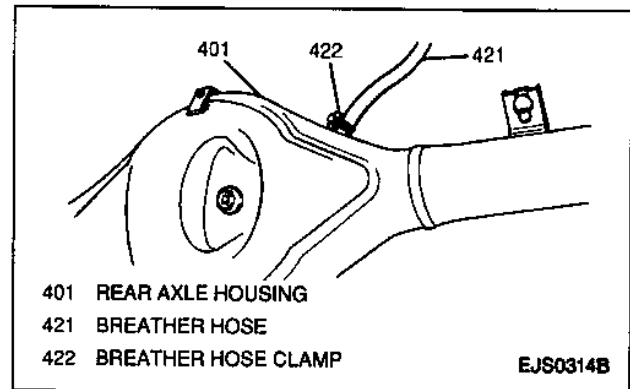


Figure 31—Rear Axle Housing Breather Hose and Clamp

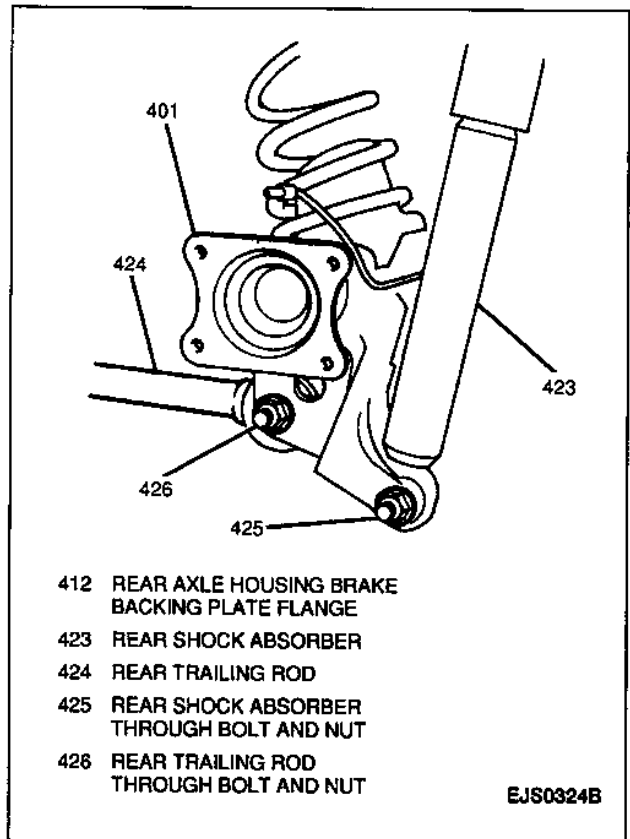


Figure 32—Rear Shock Absorber and Rear Trailing Rod Through Bolts and Nuts

21. One E-clip and brake fluid hose from rear axle housing brake fluid hose bracket (Figure 29).
22. Five screws from brake fluid pipe clamps and separate brake fluid pipes from rear axle housing (Figures 29 and 30).
23. One clamp and rear axle housing breather hose from rear axle housing (Figure 31).
24. Two nuts and two washers (one from each side) from lower rear shock absorber through bolts at rear axle housing (Figure 32).
25. Two nuts and two washers (one from each side) from rear trailing rods at rear axle housing (Figure 32).

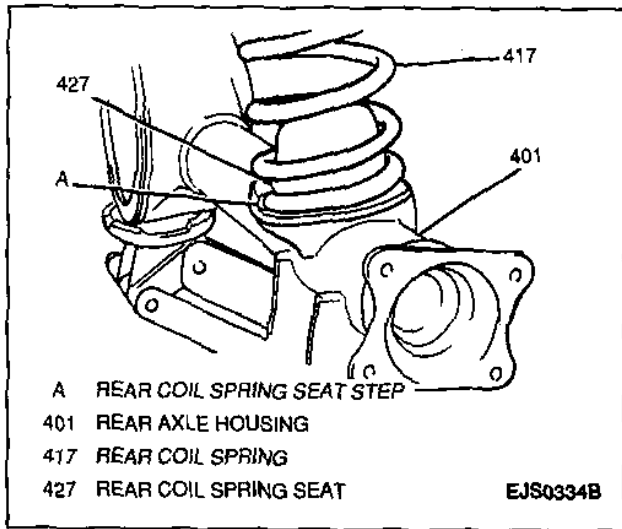


Figure 33—Rear Coil Spring Installation

**CAUTION:** Rear coil springs are under pressure. Lower hydraulic floor jack under rear axle housing slowly until coil spring pressure is relieved. If rear coil springs become unseated while under pressure during removal, serious bodily injury may result.

26. Slowly lower hydraulic floor jack until coil spring pressure is relieved.
27. Two through bolts (one from each side) and separate rear shock absorbers from rear axle housing.
28. Two through bolts (one from each side) and separate rear trailing rods from rear axle housing.
29. Both rear coil springs from rear axle housing.
30. Rear axle housing from under vehicle.



#### Clean

- Rear axle housing thoroughly with solvent and dry.



#### Inspect

- Rear axle housing mating surfaces and flanges for cracks or other damage. Replace as necessary.



#### Install or Connect

Tools Required:

J 29039 Axle Shaft Inner Oil

Seal Installer

J 8092 Driver Handle

1. Position rear axle housing under vehicle with hydraulic floor jack.
2. Two rear coil springs to their proper positions on the rear axle housing spring seats (Figure 33).

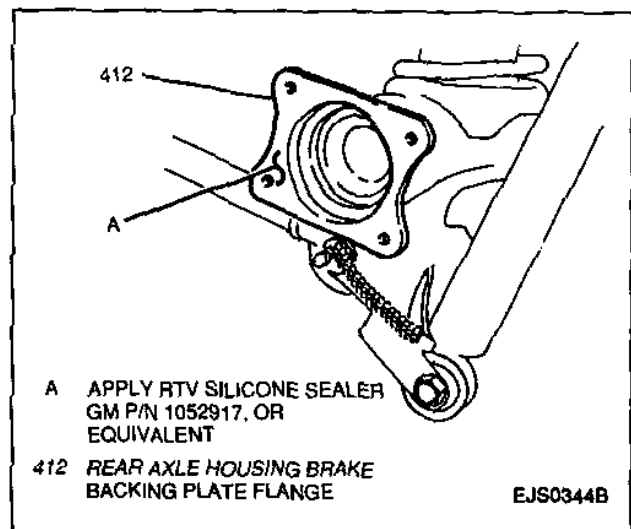


Figure 34—Rear Axle Housing Brake Backing Plate Flange



#### Important

- When installing the rear coil springs in their spring seats, make sure that the spring end with the stepped portion (landing) is aligned with the stepped portion of the rear axle housing (Figure 33).
3. Both trailing rods to rear axle housing and insert two through bolts (one in each side).
  4. Both rear shock absorbers to rear axle housing and insert two through bolts (one in each side).

**CAUTION:** During rear coil spring installation, raise hydraulic floor jack slowly making sure rear coil springs seat correctly. If rear coil springs become unseated while under pressure during installation, serious bodily injury may result.

5. Slowly raise rear axle housing with hydraulic floor jack until rear coil springs are positioned in the upper spring seats.
6. Two nuts and washers (one on each side) to rear trailing rod through bolts at rear axle housing (Figure 32).



#### Tighten

- Rear trailing rod through bolts and nuts to 90 N.m (66 lb. ft.).
7. Two nuts and washers (one on each side) to lower rear shock absorber through bolts at rear axle housing (Figure 32).



#### Tighten

- Lower rear shock absorber through bolts and nuts to 90 N.m (66 lb. ft.).
8. Rear axle breather hose to rear axle housing; secure with one clamp (Figure 31).

## 4B-16 REAR AXLE

9. Brake fluid pipes and five brake pipe clamps to rear axle housing; secure with five screws (Figures 29 and 30).
10. Brake hose to rear axle housing brake hose bracket; secure with E-clip (Figure 29).
11. Apply RTV silicone sealer GM P/N 1052917, or equivalent, to the rear axle housing brake backing plate flanges (Figure 34).
12. Apply RTV silicone sealer GM P/N 1052917, or equivalent, to the differential carrier mating surface on the rear axle housing (Figure 24).
13. Differential carrier into rear axle housing; secure with eight nuts (Figure 25).

### Tighten

- Differential carrier nuts to 55 N.m (41 lb. ft.).
14. Electrical connector to the rear wheel speed sensor if equipped (Figure 22).
  15. Rear wheel speed sensor cover to differential carrier; secure with two bolts if equipped (Figure 22).

### Tighten

- Rear wheel speed sensor cover bolts to 15 N.m (11 lb. ft.).
16. Rear control arm ball joint boss to differential carrier; secure with four bolts (Figure 21).

### Tighten

- Rear control arm ball joint boss bolts to 50 N.m (37 lb. ft.).
  - Rear control arm through bolts and nuts to 90 N.m (66 lb. ft.).
17. LSV load sensing spring bracket to upper control arm; securing with two bolts (if equipped).

### Tighten

- Load sensing spring bracket bolts to 18 to 25 N.m (13.5 to 20.0 lb. ft.).
18. Remove hydraulic floor jack from under rear axle housing.
  19. Raise and suitably support vehicle. Refer to SECTION 0A.

### Important

- Use the index (reference) marks made in the removal procedure to ensure correct rear propeller shaft installation.
20. Rear propeller shaft into vehicle; secure with four nuts and bolts (Figure 20).

### Tighten

- Rear propeller shaft nuts and bolts to 50 N.m (36 lb. ft.).
21. Both rear axle shaft inner oil seal protectors into rear axle housing.

22. New rear axle shaft inner oil seals into rear axle housing using a J 29039 and a J 8092 (Figure 19).
23. Apply wheel bearing lubricant GM P/N 1051344, or equivalent, to the new seal lip.
24. Both rear axle shafts into rear axle housing. Refer to "Rear Axle Shaft and Bearing" earlier in this section.
25. Rear brake drums to rear axle. Refer SECTION 5C.
26. Bleed rear brakes. For rear brake bleeding procedures, refer to SECTION 5.
27. Rear tire and wheel assemblies. Refer to SECTION 3E.
28. Apply Loctite® pipe sealant GM P/N 1052080, or equivalent, to the threaded portion of the rear axle housing drain plug.
29. Rear axle housing drain plug into rear axle housing (Figure 5).

### Tighten

- Rear axle housing drain plug to 25 N.m (18 lb. ft.).
30. Refill the rear axle housing with approximately 2.2 liters (4.6 pts.) of 80W-90 GL5 lubricant GM P/N 12345977, or equivalent. Oil level should be even with the bottom of the rear axle housing oil level/filler plug hole.
  31. Rear axle housing oil level/filler plug into rear axle housing (Figure 5).

### Tighten

- Rear axle housing oil level/filler plug to 50 N.m (36 lb. ft.).
32. Lower vehicle.

## UNIT REPAIR

### DIFFERENTIAL CARRIER DISASSEMBLY

Figures 35 through 54

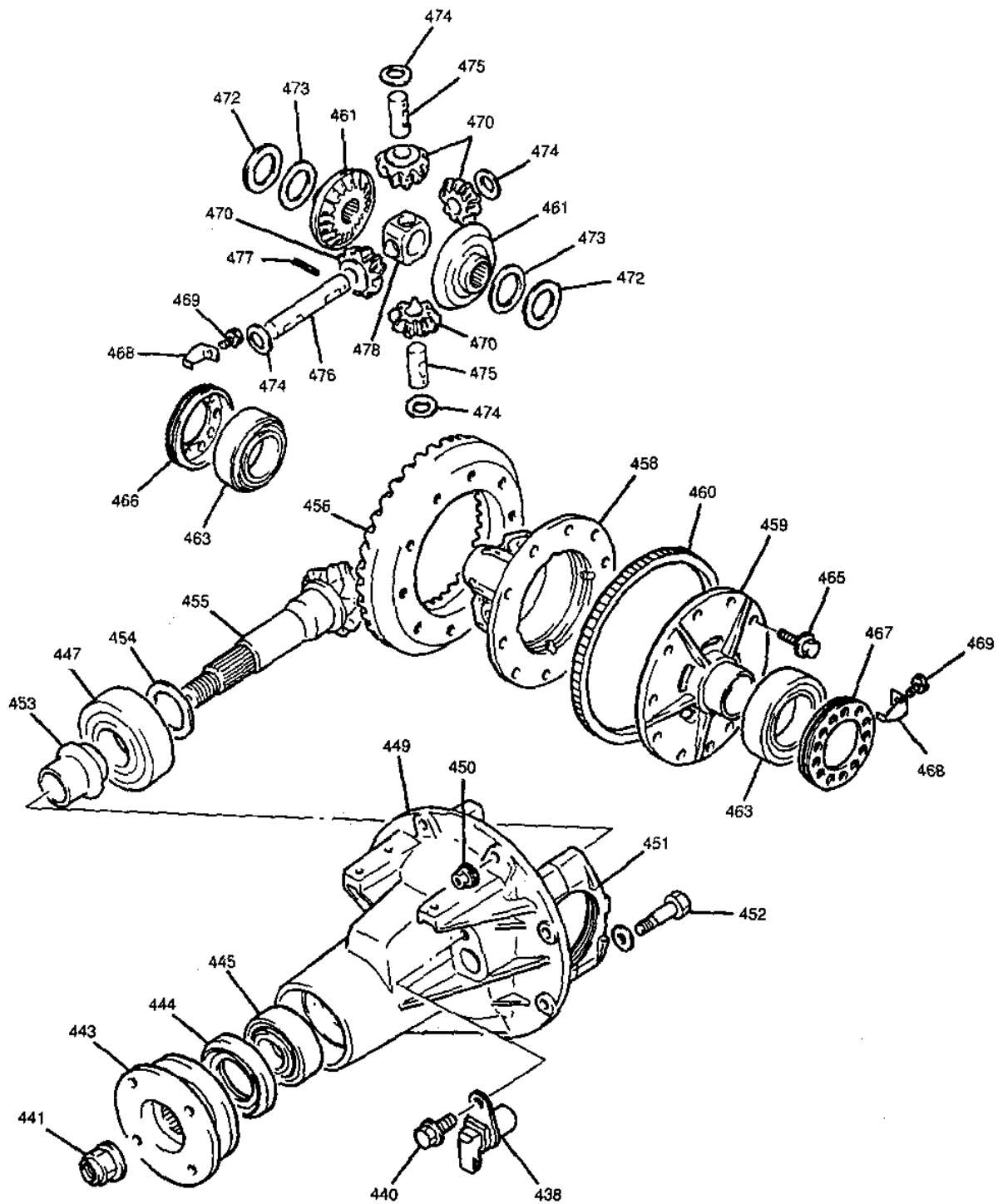
### Remove or Disconnect

Tools Required:

- J 3289-21 Differential Holding Fixture
- J 37769 Differential Holding Fixture Adapters
- J 3289-20 Holding Fixture Bench Mount
- J 8614-01 Flange Holder
- J 22912-01 Rear Bearing Remover
- J 22888-D Side Bearing Remover
- J 8107-4 Differential Side Bearing Remover Plug
- J 26941 Axle Shaft Seal Remover
- J 23907 Slide Hammer

1. Mount differential carrier into a J 3289-21 with the J 37769.
2. Place differential carrier and holding fixture into a J 3289-20 (Figure 37).





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Figure 35—Differential Carrier Components

## 4B-18 REAR AXLE

- |                                  |                                  |
|----------------------------------|----------------------------------|
| 438 REAR WHEEL SPEED SENSOR      | 460 RWAL EXCITER RING            |
| 440 RWAL BRAKE SPEED SENSOR BOLT | 461 SIDE GEAR                    |
| 441 PINION FLANGE NUT            | 463 SIDE BEARING                 |
| 443 PINION FLANGE                | 465 RING GEAR BOLTS              |
| 444 PINION SEAL                  | 466 RIGHT SIDE BEARING ADJUSTER  |
| 445 OUTER PINION BEARING         | 467 LEFT SIDE BEARING ADJUSTER   |
| 447 INNER PINION BEARING         | 468 SIDE BEARING LOCK PLATE      |
| 449 DIFFERENTIAL CARRIER         | 469 SIDE BEARING LOCK PLATE BOLT |
| 450 DIFFERENTIAL CARRIER NUTS    | 470 DIFFERENTIAL PINION GEAR     |
| 451 SIDE BEARING CAP             | 472 SIDE GEAR WASHER             |
| 452 SIDE BEARING CAP BOLT        | 473 SIDE GEAR SPRING WASHER      |
| 453 COLLAPSIBLE SPACER           | 474 PINION WASHER                |
| 454 PINION SELECTIVE SHIM        | 475 PINION CROSS SHAFT (SHORT)   |
| 455 PINION GEAR                  | 476 PINION CROSS SHAFT (LONG)    |
| 456 RING GEAR                    | 477 CROSS SHAFT ROLL PIN         |
| 458 RIGHT DIFFERENTIAL CASE      | 478 CROSS SHAFT JOINT            |
| 459 LEFT DIFFERENTIAL CASE       |                                  |

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Figure 36—Differential Carrier Components -Legend

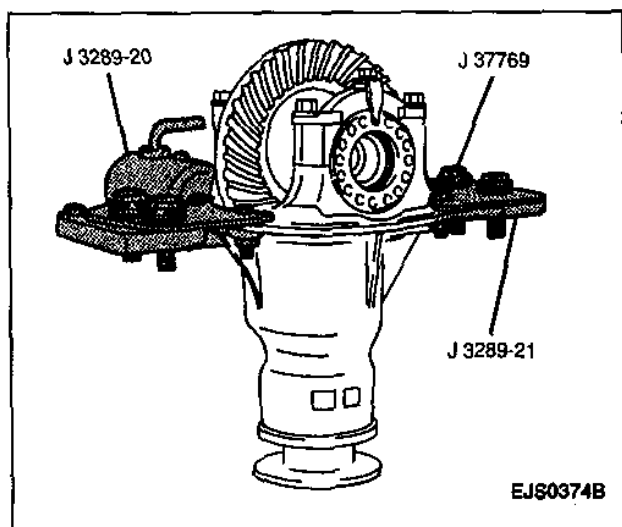


Figure 37—Differential Carrier Mounting

3. Inscribe alignment marks on differential side bearing caps to ensure proper assembly.
4. Two bolts and side bearing lock plates from side bearing caps (Figure 38).
5. Four bolts and side bearing caps from differential carrier (Figure 39).
6. Side bearing adjusters and bearing races from differential carrier (Figure 40).
7. Differential ring gear and case from differential carrier.
8. Turn differential carrier and holding fixture over so that pinion flange nut is horizontal (90 degrees).
9. One bolt and rear wheel speed sensor if equipped.
10. Unstake pinion flange nut.
11. Pinion flange nut from pinion gear using a J 8614-01 to hold the pinion flange stationary (Figures 41 and 42).

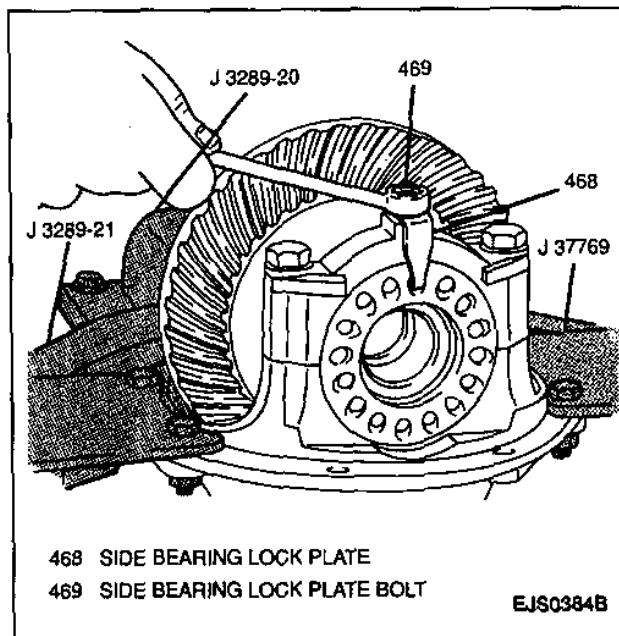


Figure 38—Removing Side Bearing Lock Plate Bolts

12. Pinion gear from differential carrier (Figure 43).
13. Pinion seal from differential carrier using a J 26941 with a J 23907 (Figure 44).
14. Outer pinion bearing from differential carrier (Figure 45).
15. Inner pinion bearing race from differential carrier using a large drift punch and hammer. Tap around the rear of the rear of the bearing race and slowly drive each race out evenly (Figure 46).
16. Outer pinion bearing race from differential carrier using a large drift punch and hammer. Tap around the rear of the rear of the bearing race and slowly drive each race out evenly (Figure 47).

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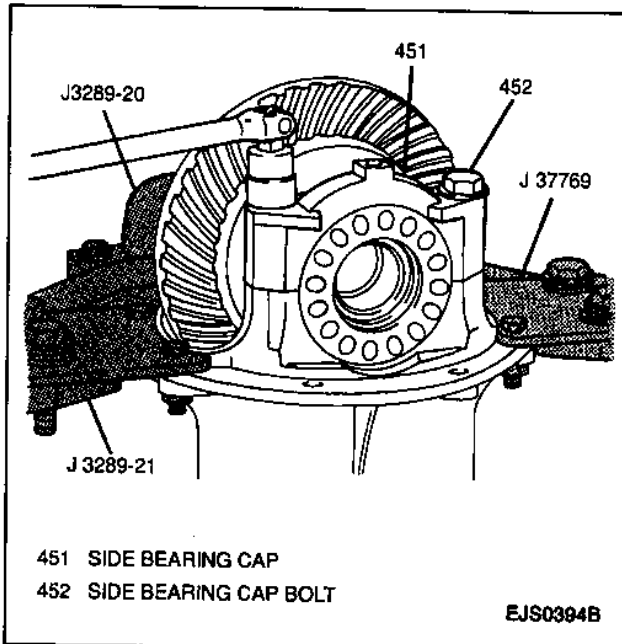


Figure 39—Removing Side Bearing Cap Bolts

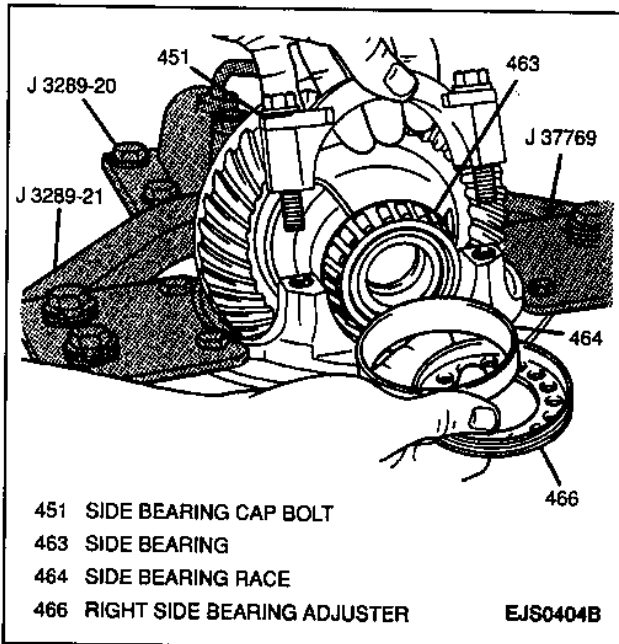


Figure 40—Removing Side Bearing Adjusters and Races

17. Side bearings from differential case using a J 22888-D with a J 8107-4 (Figure 48).
18. Ten bolts and ring gear from differential case (Figure 49).
19. Separate right and left differential case halves.
20. Speed sensor exciter ring from left case using a copper hammer. Tap gently around the outer edge of the exciter ring evenly until the exciter ring is free of the left differential case half.
21. Three roll pins from right differential case using a hammer and standard drift punch and disassemble side gears and washers, differential pinion gears and washers, cross shafts, and pinion cross shaft joint (Figure 50).

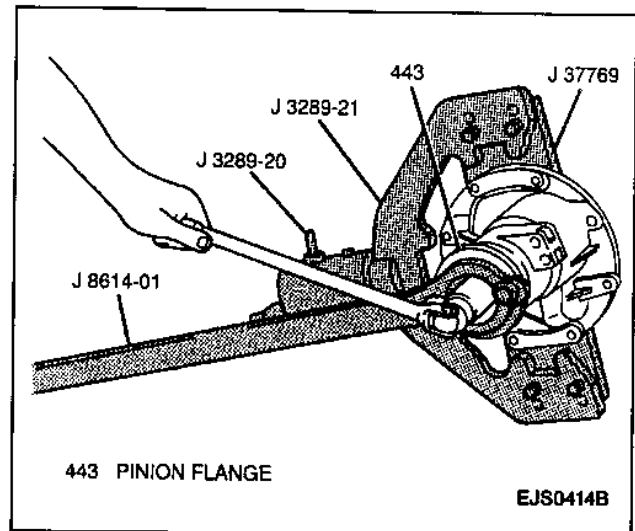


Figure 41—Removing Pinion Flange Nut

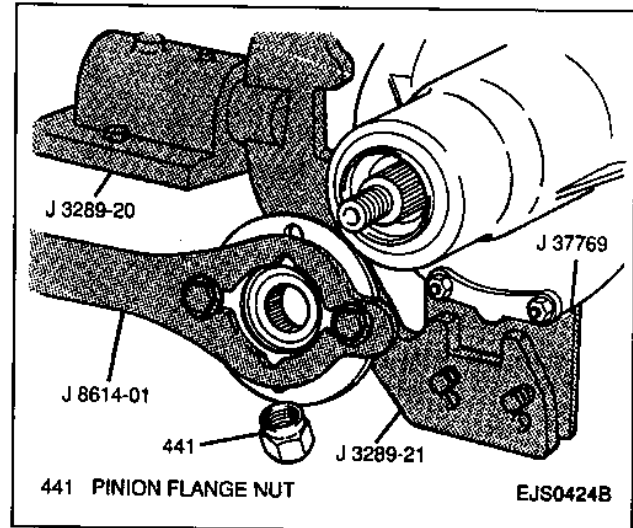


Figure 42—Pinion Nut and Pinion Flange

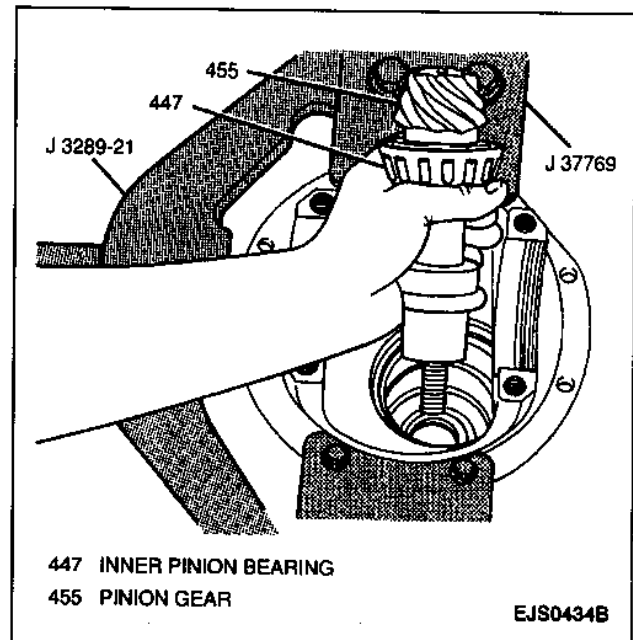


Figure 43—Removing Pinion Gear

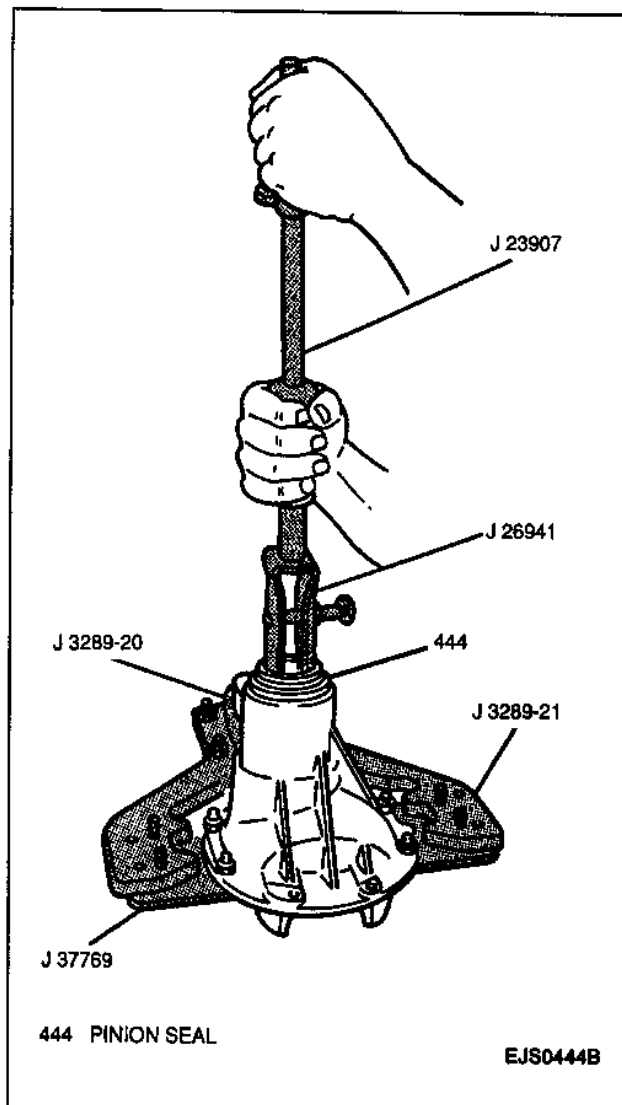


Figure 44—Removing Pinion Seal

22. Collapsible spacer from pinion gear shaft.
23. Inner pinion bearing from pinion gear shaft using a J 22912-01. Place the J 22912-01 on the pinion gear shaft with the concave side toward the pinion gear. Then place the pinion gear in a hydraulic press and remove the rear pinion bearing (Figure 51).
24. Pinion selective shim from pinion shaft.



### Clean

- All parts thoroughly with solvent and air dry. If compressed air is used to dry parts, DO NOT spin dry roller bearings with compressed air or bearing damage may result.



### Inspect

1. Differential carrier and case halves for cracks or stripped threads. Replace as necessary (Figures 52 and 53).
2. Ring and pinion gears for excessive or unusual wear, cracks, overheating or other damage.

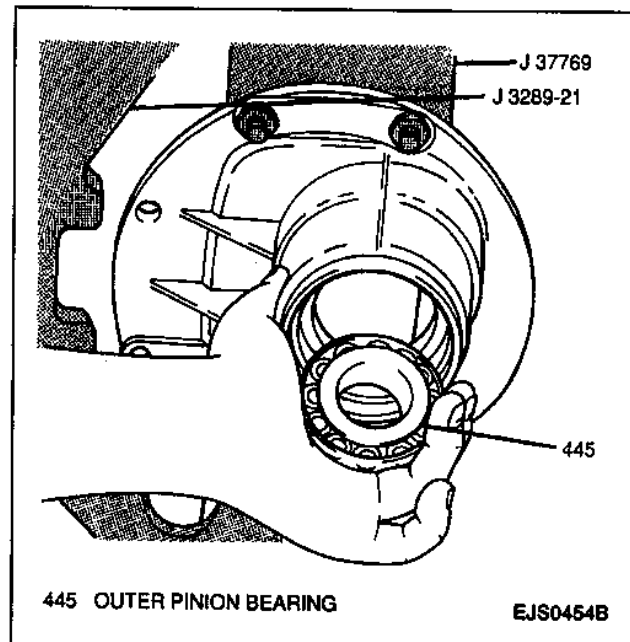


Figure 45—Removing Outer Pinion Bearing

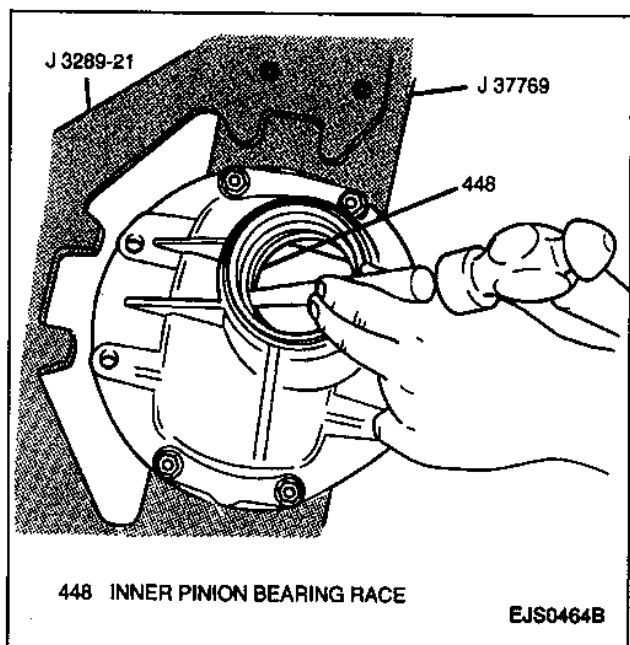


Figure 46—Removing Inner Pinion Bearing Race

Replace as necessary (Figure 54).

3. All roller bearings and races for roughness, brinelling, or other wear or damage. Replace as necessary.
4. Side and differential pinion gears for unusual wear or damage. Replace as necessary.



### Important

- Differential components are set to very close tolerances and prone to wear should one component fail. To ensure accurate adjustment and even wear, the ring and pinion gears as well as all tapered roller bearings and races must be replaced as sets.

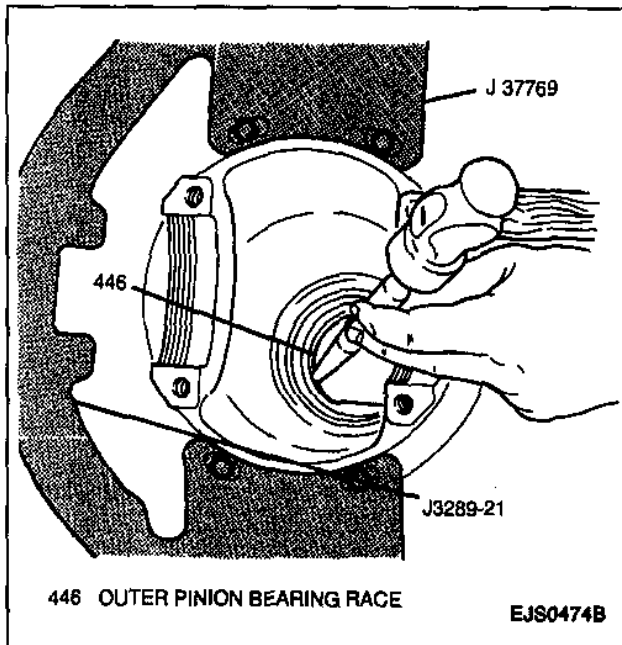


Figure 47—Removing Outer Pinion Bearing Race

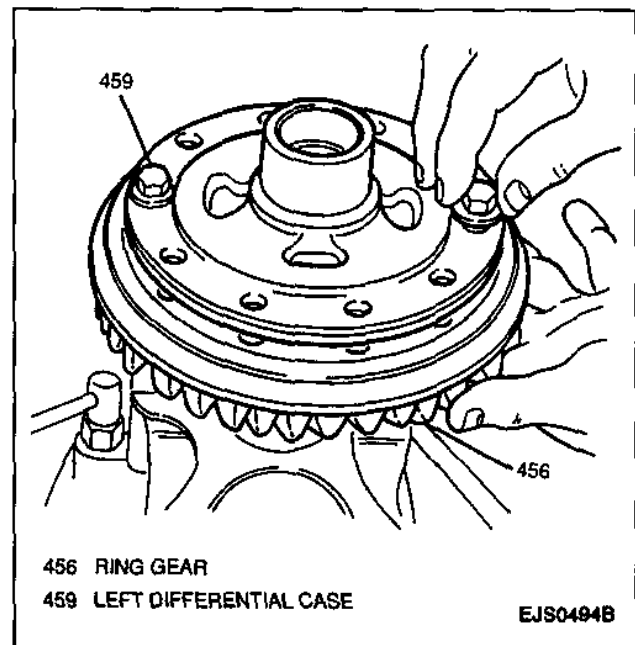


Figure 49—Removing Ring Gear Bolts

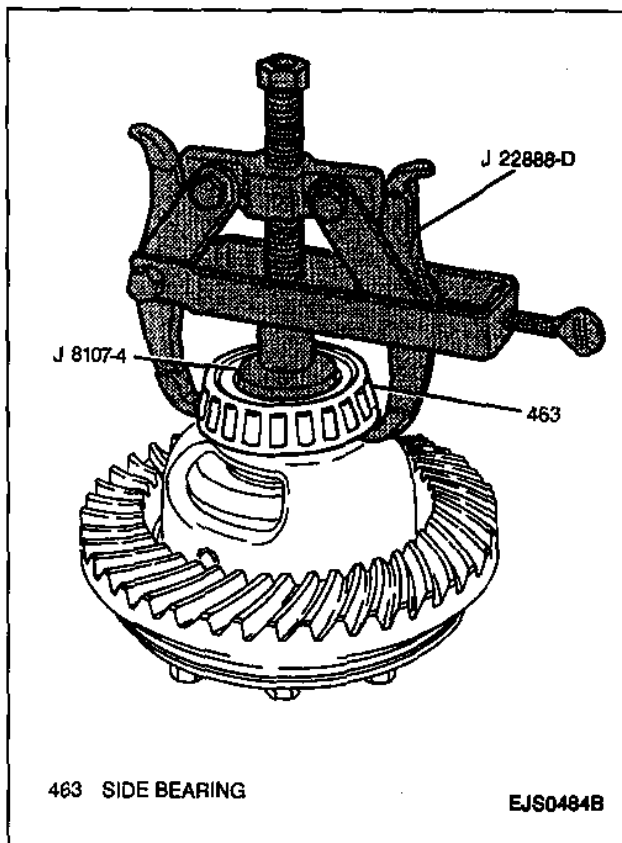


Figure 48—Removing Side Bearings

## DIFFERENTIAL CARRIER ASSEMBLY

Figures 55 through 88

### Install or Connect

Tools Required:  
J 8107-4 Differential Side Bearing  
Remover Plug

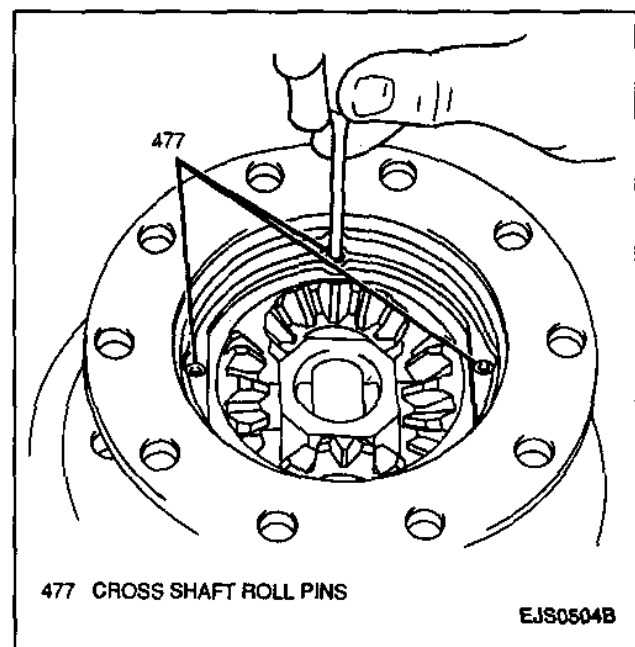


Figure 50—Removing Roll Pins From Differential Case

J 8092 Driver Handle  
J 37758 Pinion Outer Race Installer  
J 37759 Pinion Inner Bearing Race Installer  
J 35138 Side Gear Thrust Play Tool  
J 38891 Wheel Speed Sensor Ring Installer  
J 38890 Differential Torque Check Tool

1. Rear wheel antilock (ABS) speed sensor exciter ring onto left differential case half using a J 38891 exciter ring installer and a J 8107-04 (Figure 55). Place the exciter ring inside the J 38891 on a hydraulic press. Then, center the left differential case half in the exciter ring with a J 8107-4 side in the left axle shaft bore and slowly press the left differential case half evenly into the exciter ring.

## 4B-22 REAR AXLE

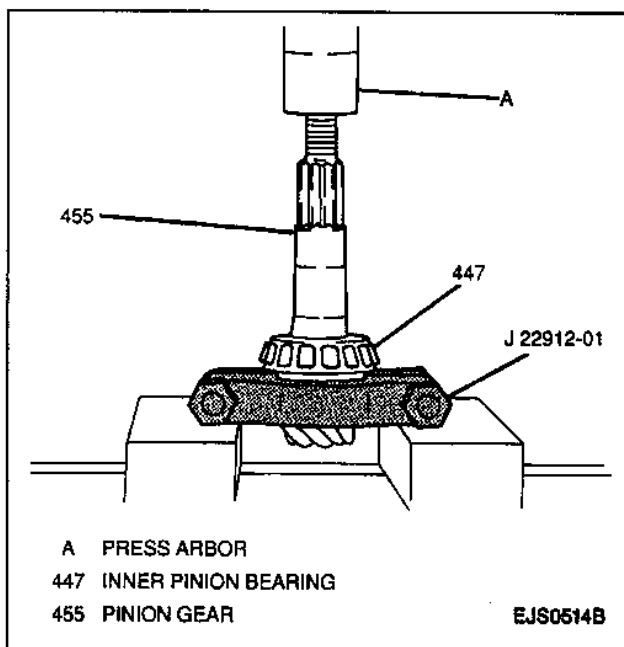


Figure 51—Removing Inner Pinion Bearing

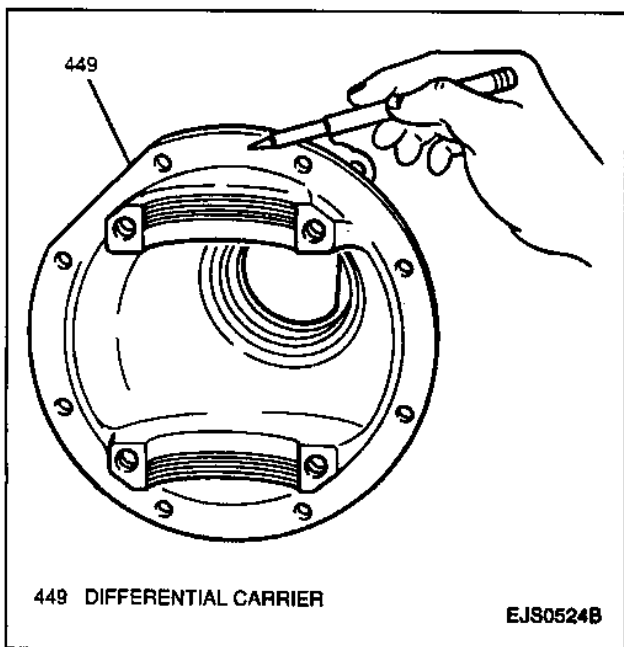


Figure 52—Inspecting Differential Carrier

### Important

- Observe hydraulic pressure gage during speed sensor exciter ring installation. Pressure exerted on the exciter ring should not exceed 500 kg (1102 lbs.). If pressure higher than specified is needed to install the left differential case into the exciter ring, the two components may be misaligned. Reposition the left differential case in the exciter ring so that pressure will be even around the perimeter and repeat the installation procedure.

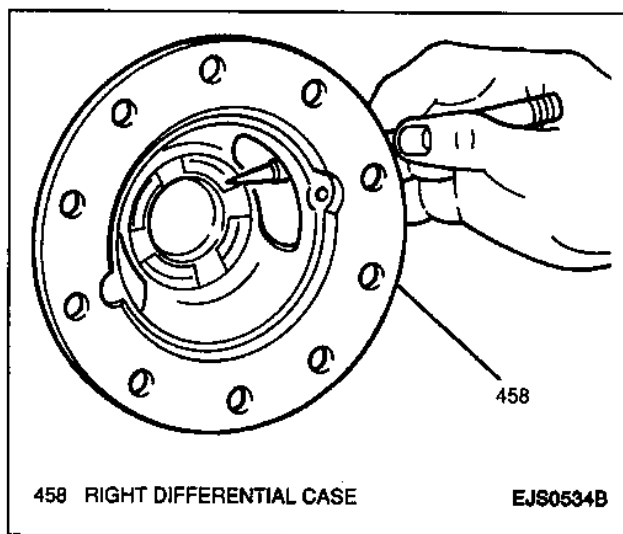


Figure 53—Inspecting Differential Case

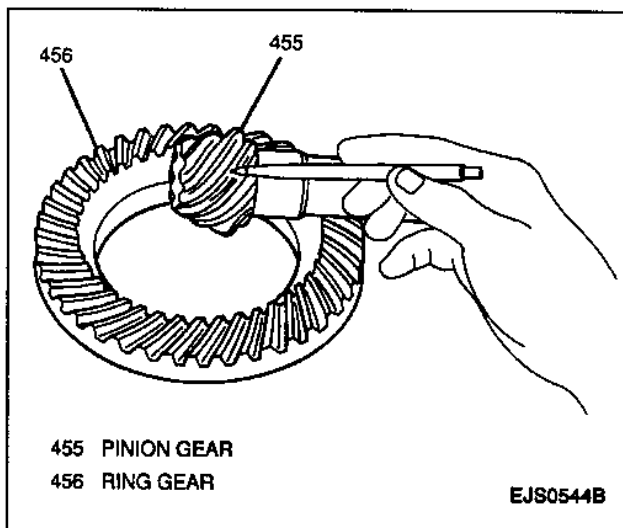


Figure 54—Inspecting Ring and Pinion Gears

### Inspect

- Left differential case face to make sure the speed sensor exciter ring is flush with or higher than the left differential case (Figure 56).
- Rear wheel speed sensor; secure with rear wheel speed sensor bolt if equipped.

### Tighten

- Rear wheel speed sensor bolt to 23 N.m (17 lb. ft.).
- Right side gear and washers, differential pinion gears and washers, cross shafts and pinion cross shaft joint in right differential case (Figure 57).

### Measure

Tool Required:  
J 8001 Dial Indicator Set

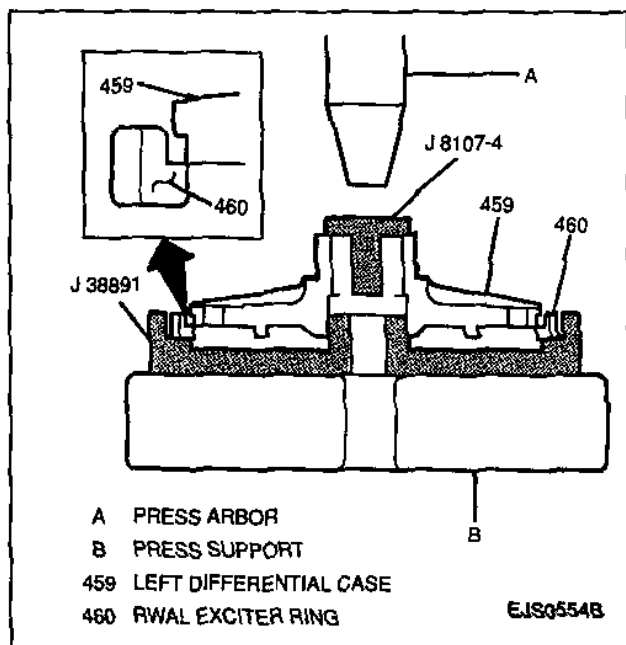


Figure 55—Installing Speed Sensor Exciter Ring Onto Left Differential Case

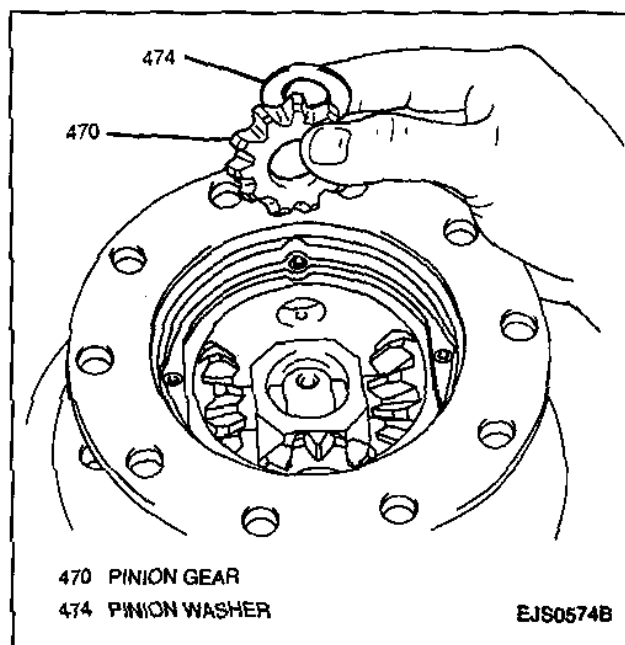


Figure 57—Installing Differential Pinion Gears

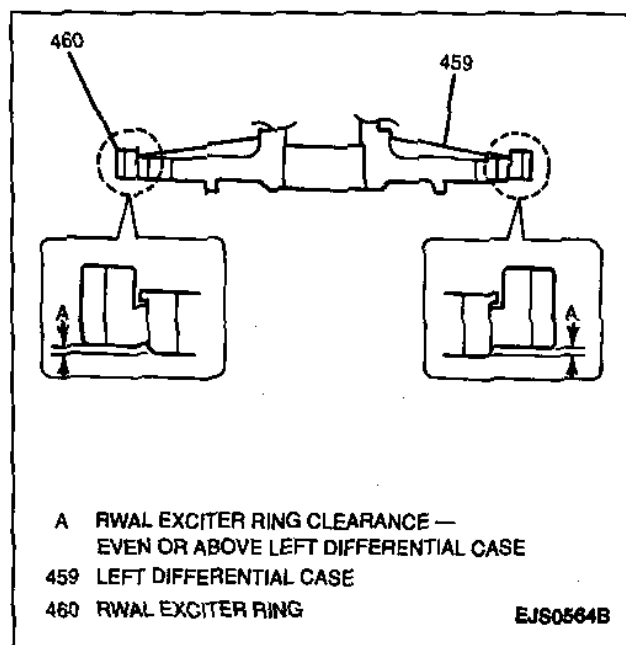


Figure 56—Speed Sensor Exciter Ring Position on Left Differential Case

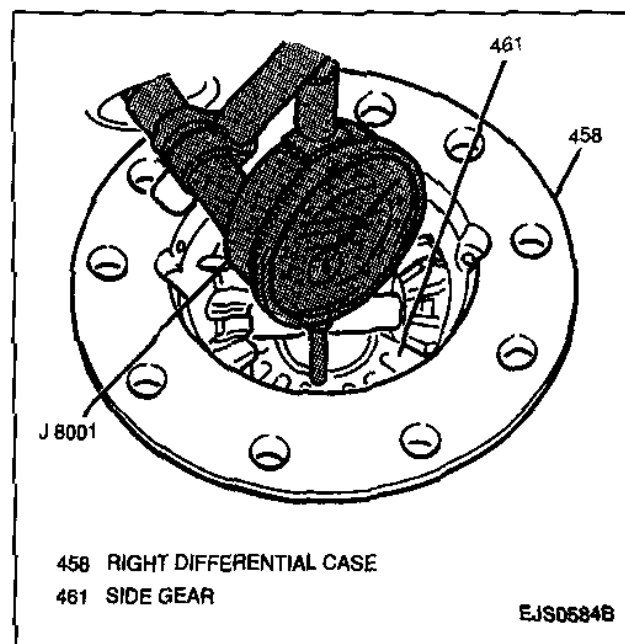


Figure 58—Measuring Right Differential Side Gear End Play

- Right differential side gear end play using a J 8001 (Figure 58). Insert fingers through the bottom openings of the right differential case half and move the right differential side gear up and down while observing the J 8001. Right differential side gear end play should measure 12 to 37 mm (0.005 to 0.014-inch). If right differential side gear end play is too high or low, replace the selective shim with the appropriate size to obtain correct end play.
- 4. Cross shaft roll pins into right differential case half. Roll pin ends should be flush with the right differential case surface (Figure 59).

- 5. Left differential side gear and washers into right differential case (Figure 60).
- 6. Left differential case half and ring gear to right differential case half; secure with ten bolts (Figure 61).

### Tighten

- Ring gear bolts to 80-90 N.m (58-65 lb. ft.).

## 4B-24 REAR AXLE

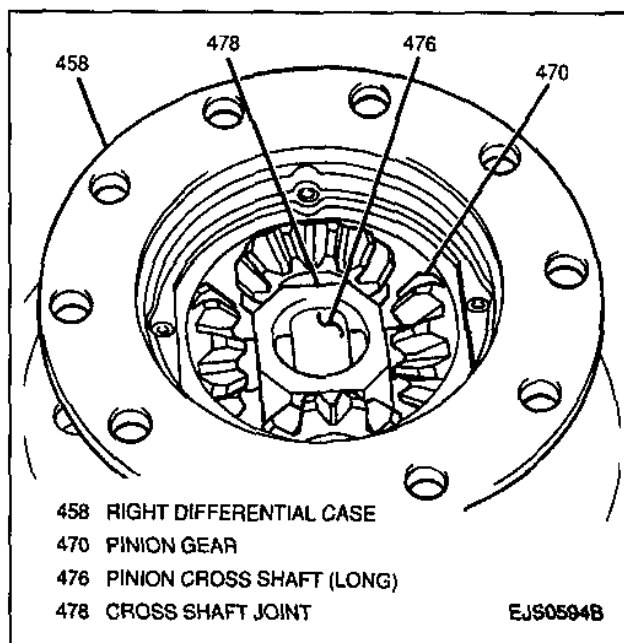


Figure 59—Cross Shaft Roll Pin Installation

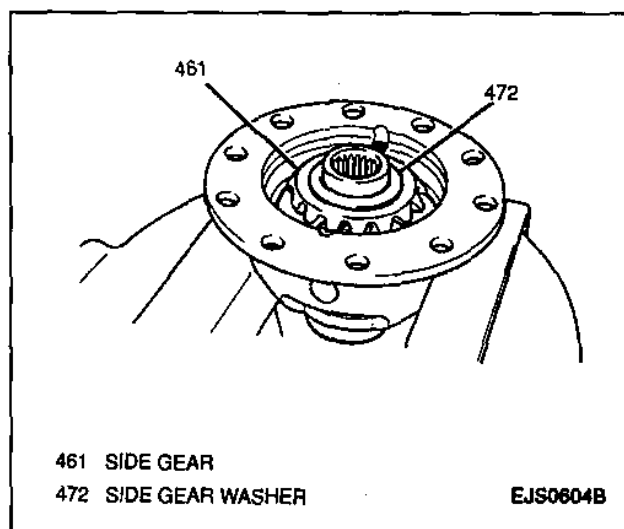


Figure 60—Left Side Gear With Washers

### Measure

#### Tools Required:

J 8001 Dial Indicator Set

J 35138 Side Gear Thrust Play Tool

J 38890 Differential Torque Check Tool

1. Left differential side gear end play using a J 8001 and a J 35138 (Figure 62). Insert the J 35138 in through the left axle shaft differential case bore and adjust until the J 35138 has a firm grasp on the left differential side gear. Then, move J 35138 up and down while observing the J 8001. Left differential side gear end play should measure 12 to 37 mm (0.005 to 0.014-inch). If left differential side gear end play is too high or low, replace the selective shim with the appropriate size to obtain correct end play.

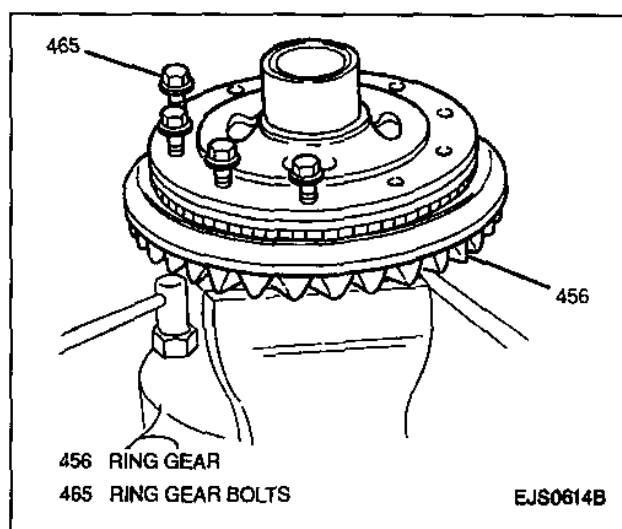


Figure 61—Installing Ring Gear Bolts

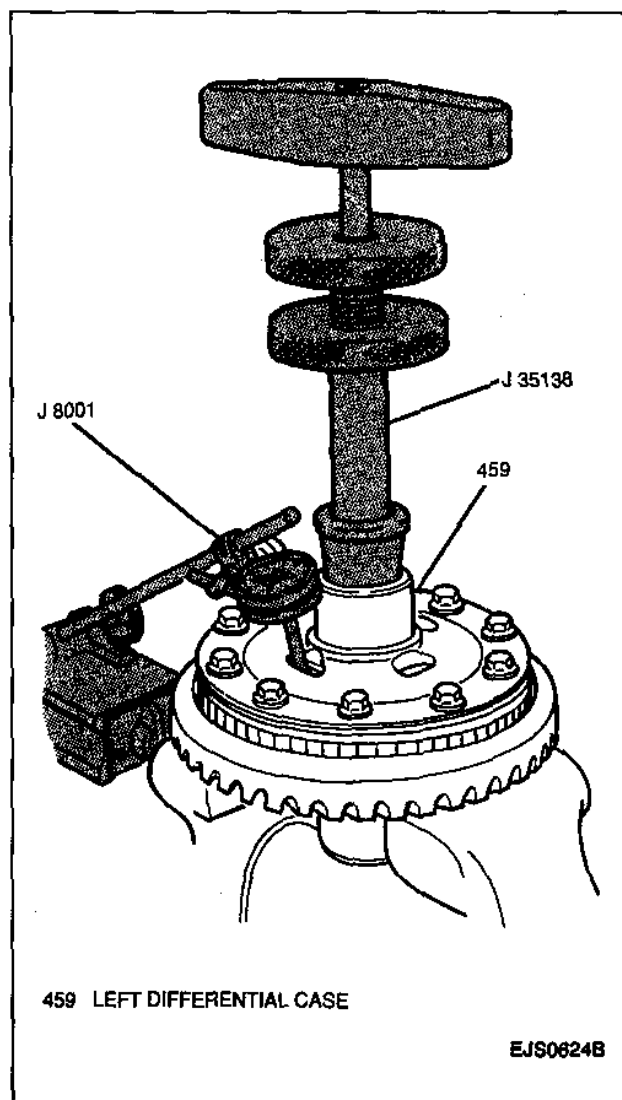


Figure 62—Measuring Left Differential Side Gear End Play



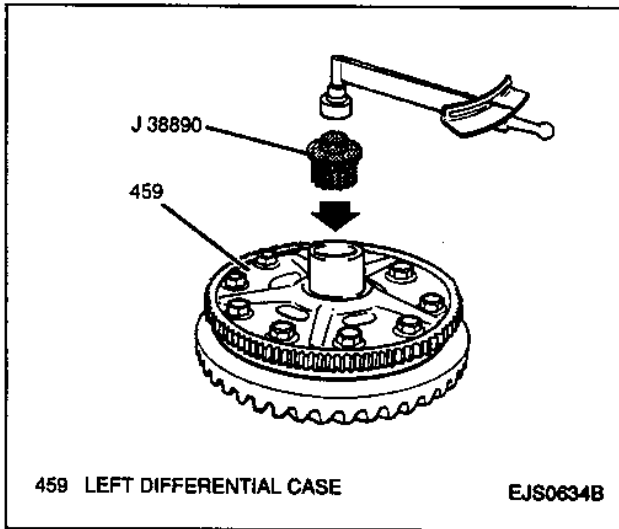


Figure 63—Measuring Side Gear Preload

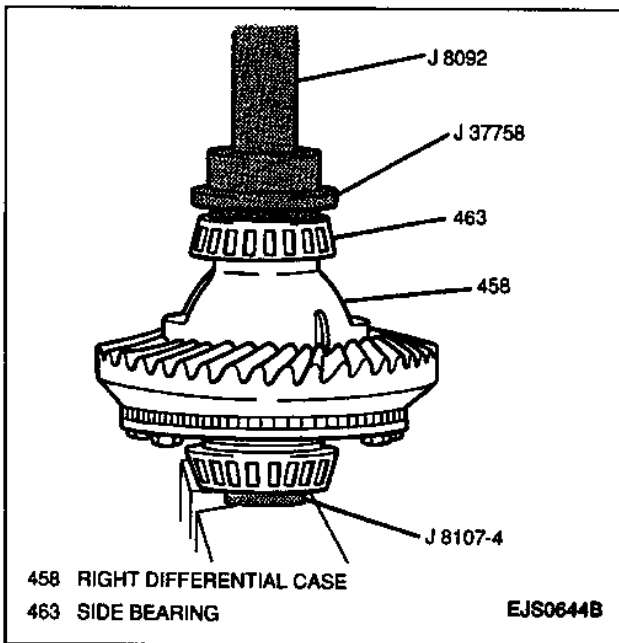


Figure 64—Installing Right Differential Side Bearing

2. Side gear preload using a J 38890. Insert the J 38890 into either side bearing and with a torque wrench, measure the side bearing preload (Figure 63). Maximum side gear preload should be 2.4 N·m (21lb. in.). If preload exceeds specification, inspect side and differential pinion gears for foreign material or damage.

### Important

- After correct end play and preload has been obtained, remove the ring gear bolts and apply Loctite® 414 GM P/N 12345093, or equivalent, to the threaded portion of each ring gear bolt and install into differential case assembly.

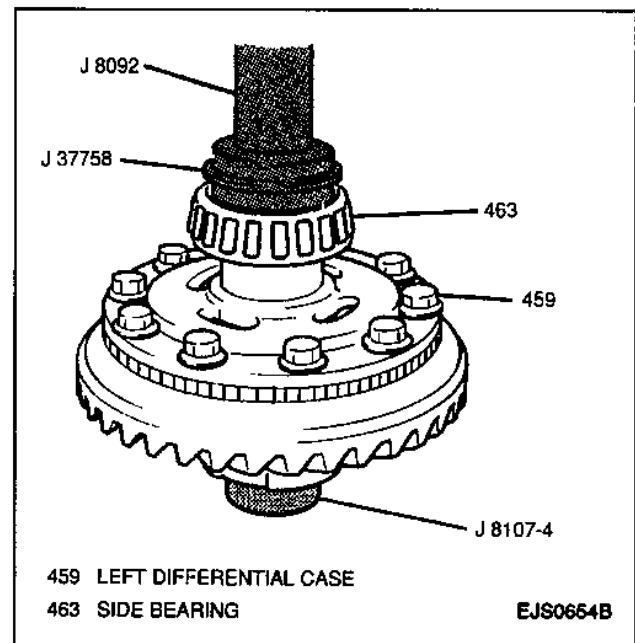


Figure 65—Installing Left Differential Side Bearing

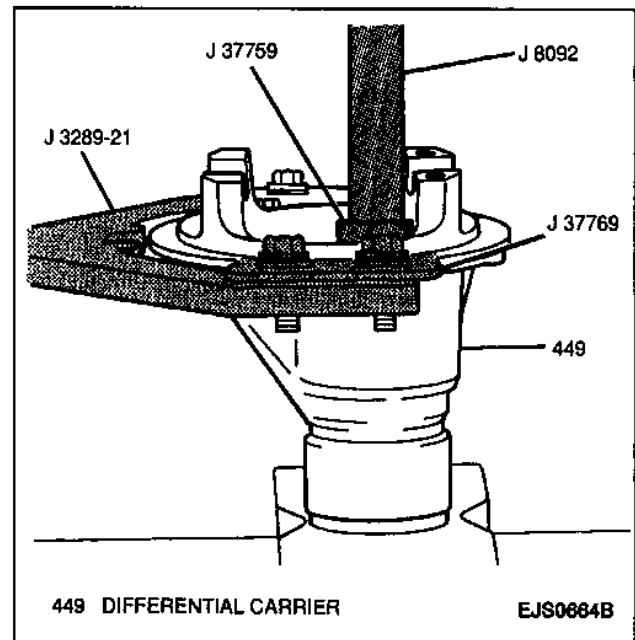


Figure 66—Installing Inner Pinion Bearing Race

### Tighten

- Ring gear bolts to 80-90 N·m (58-65 lb. ft.).
- 7. Right differential side bearing on the right side of the differential case assembly using a J 37758 with a J 8092 (Figure 64). Place the differential case assembly on a hydraulic press and using a J 8107-4 for support. Then, using the J 37759 with the J 8092, place the right differential side bearing on the right differential case with the taper side up and slowly press the right differential side bearing onto the right differential case.

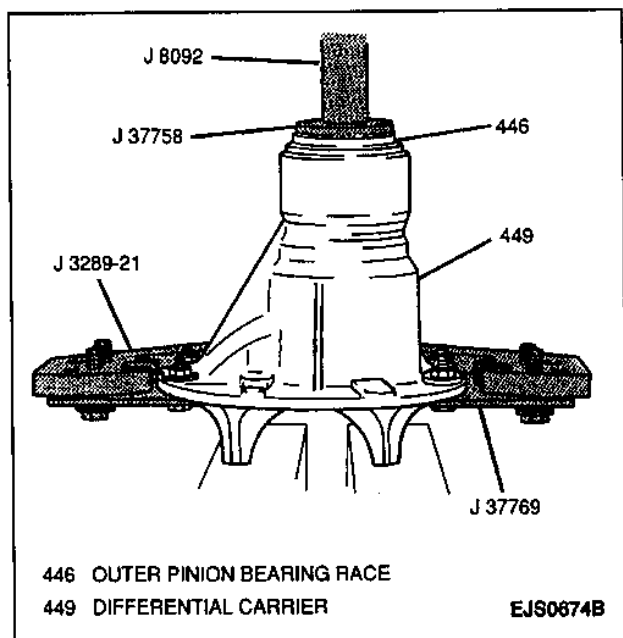


Figure 67—Installing Outer Pinion Bearing Race

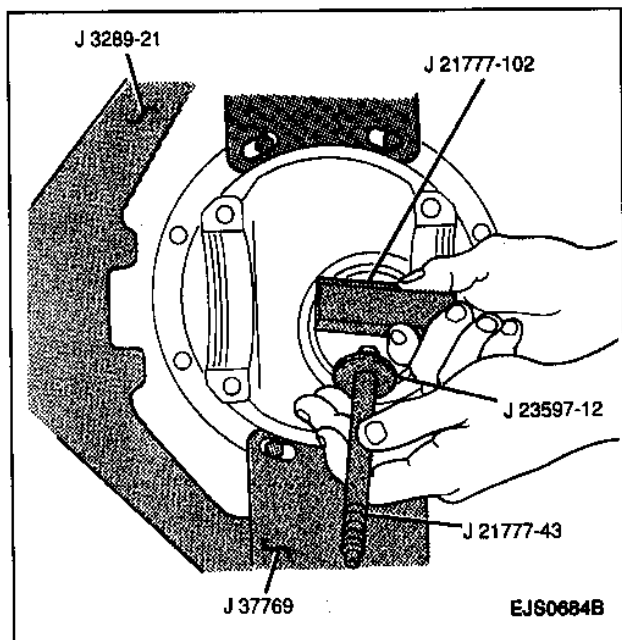


Figure 68—Assembling Gage Block and Stud

8. Left differential side bearing to the left side of the differential case assembly using a J 37758 with a J 8092 and a J 8107-4 (Figure 65). Place the differential case assembly on a hydraulic press with a J 8107-4 for support and to protect the right differential side bearing. Then, using the J 37758 with the J 8092, place the left differential side bearing on the left differential case with the taper side up and slowly press the left differential side bearing evenly onto the left differential case.
9. Inner pinion bearing race using a J 37759 with a J 8092 (Figure 66). Place the differential carrier on a hydraulic press and position the inner pinion bearing race over its bore. Then,

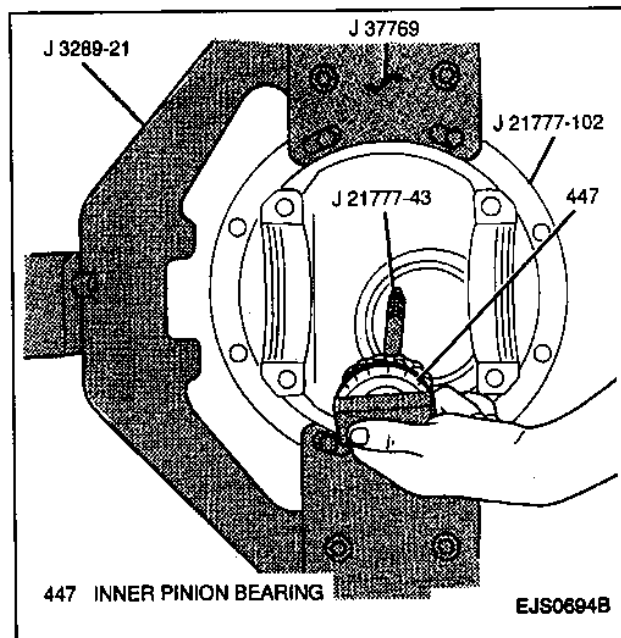


Figure 69—Installing Inner Pinion Bearing With Gage Block and Stud

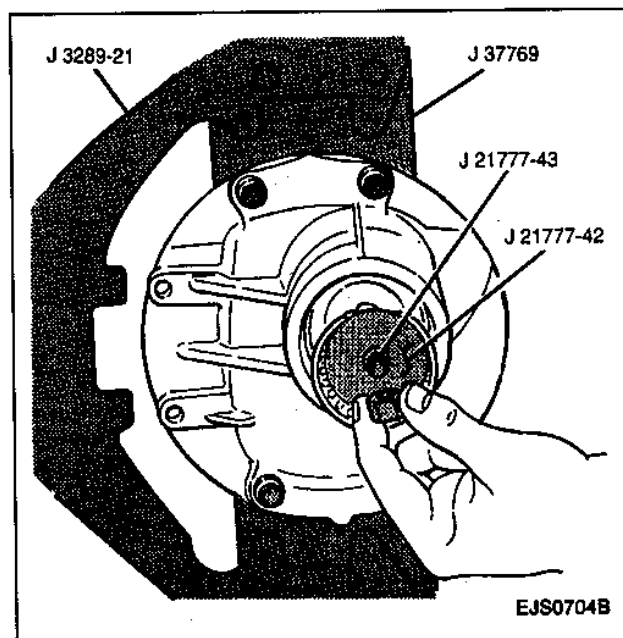


Figure 70—Installing Outer Pinion Bearing, Pilot Washer and Nut

- using the J 37759 inner with the J 8092, slowly press the inner pinion bearing race evenly into the differential carrier.
10. Outer pinion bearing race using a J 37758 with a J 8092 (Figure 67). Place the differential carrier on a hydraulic press and position the outer pinion bearing race over its bore. Then, using the J 37758 with the J 8092, slowly press the outer pinion bearing race evenly into the differential carrier.

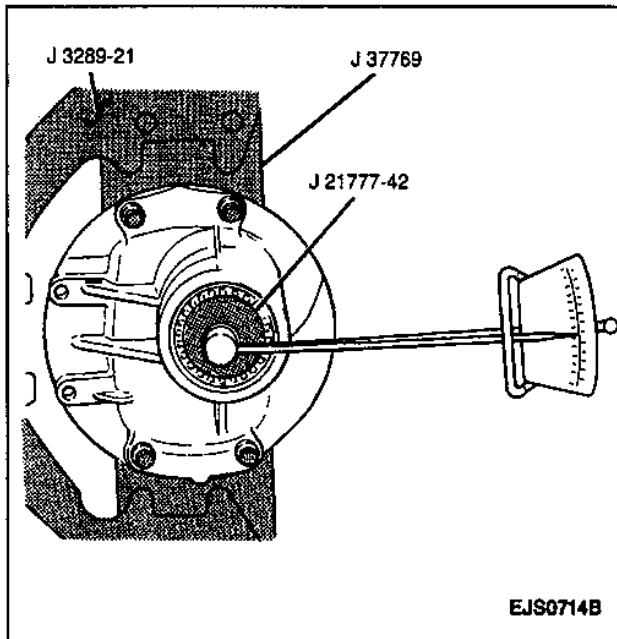


Figure 71—Adjusting Jam Nut Torque

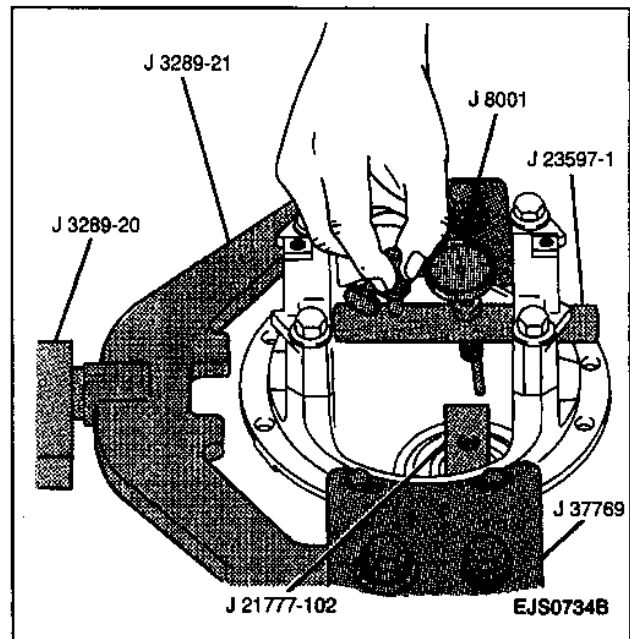


Figure 73—Installing Dial Indicator

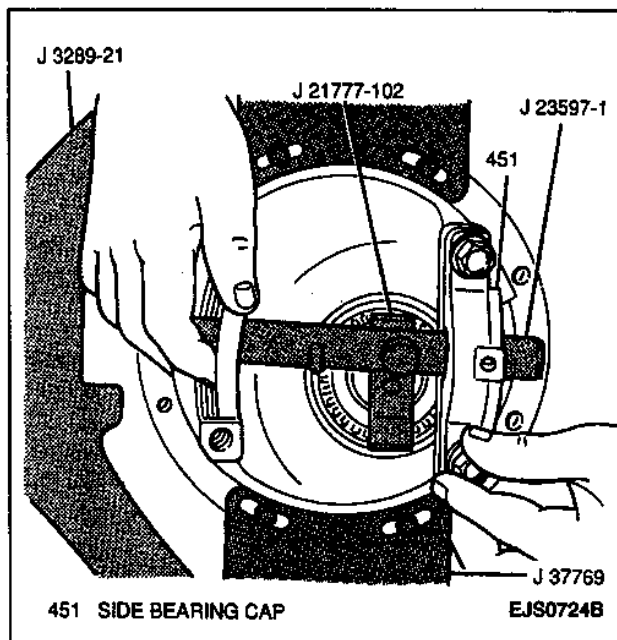


Figure 72—Installing Side Bearing Discs and Arbor

### Setting Pinion Depth

Pinion depth (the distance from the face of the pinion gear to the center line of the ring gear) is critical to all differentials. Each ring and pinion gear set is matched so as to produce the best tooth contact pattern. This relationship (pinion depth) is controlled by placing the proper selective shim between the pinion gear and the inner bearing. If the original ring and pinion gears and pinion bearings are reused, the original size selective shim will set the proper pinion depth. Pinion depth is set with a J 21777-B Pinion Setting Gage Set which provides a "nominal" or "zero" as a gaging reference to find the pinion center.

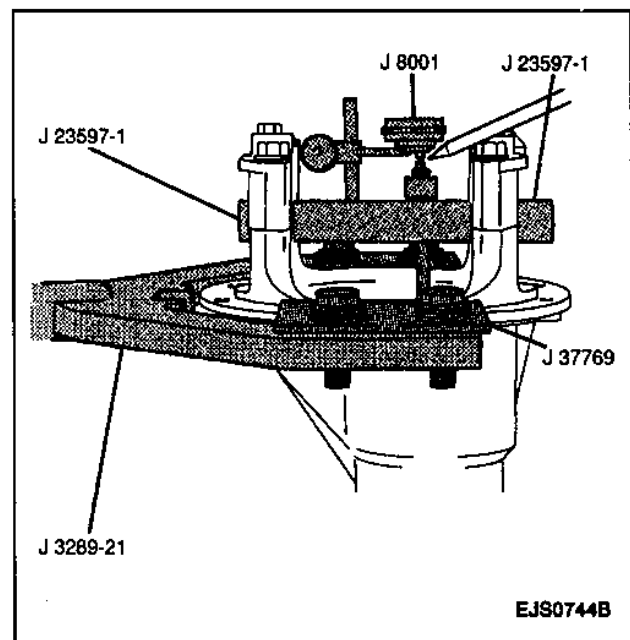


Figure 74—Setting Dial Indicator Position

### Pinion Depth Setting Procedure

Figures 68 through 76

#### Tools Required:

- J 8001 Dial Indicator Set\*
- J 23597-1 Arbor\*
- J 23597-12 Pilot Washer\*
- J 21777-42 Pilot Washer\*
- J 21777-43 Stud Assembly\*
- J 21777-101 Side Bearing Discs\*
- J 21777-102 Gage Plate\*

\* Included in J 21777-B Pinion Setting Gage Kit

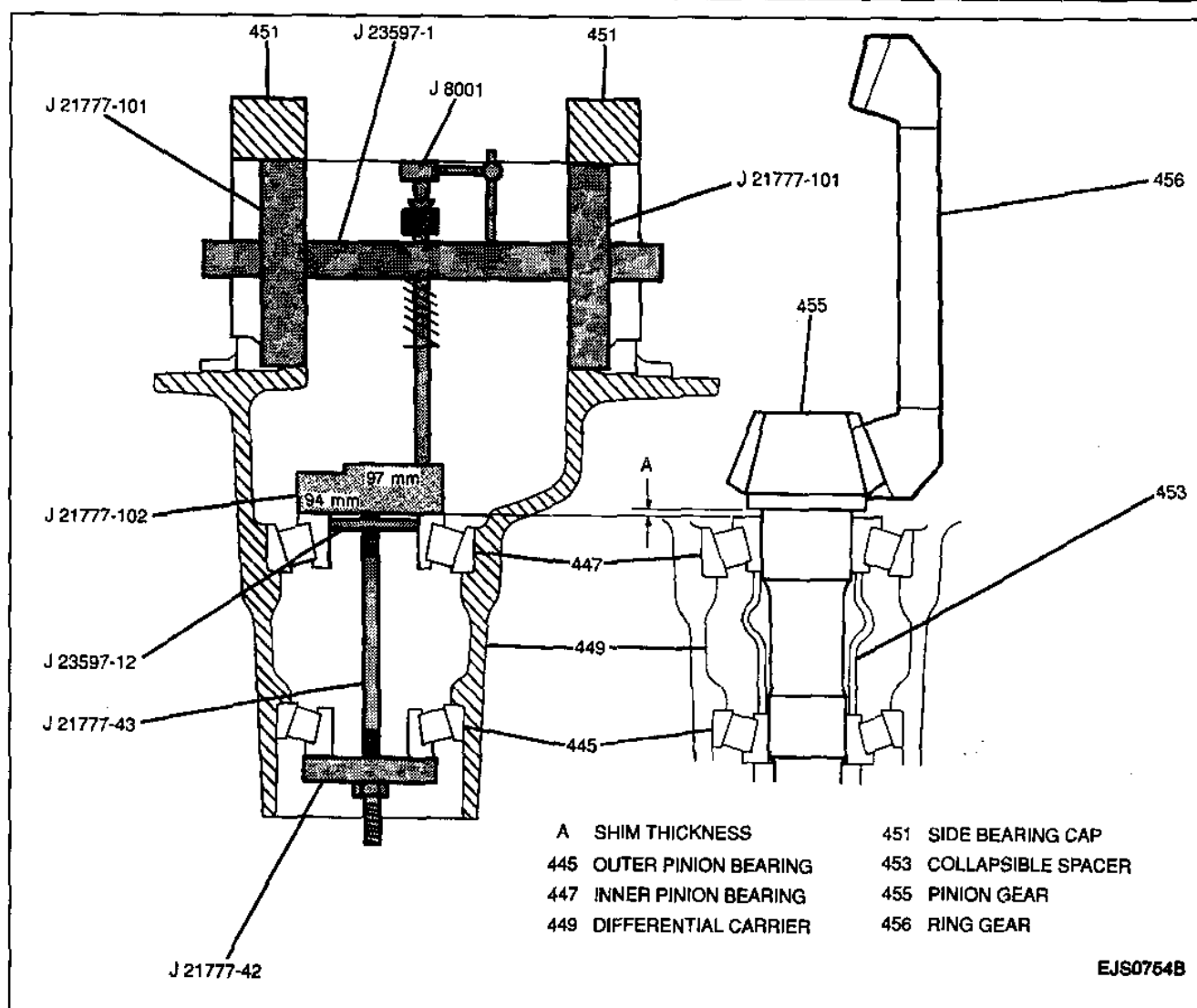


Figure 75—Special Tool Assembly for Measuring Pinion Depth

1. Lubricate both inner and outer pinion bearings with wheel bearing lubricant GM P/N 1051344, or equivalent.
2. Place both inner and outer pinion bearings into the differential carrier and install a J21777-102, a J 23597-12, a J 21777-43 and a J 21777-42 (Figures 68, 69 and 70).
3. Hold the J 21777-43 stationary and tighten the jam nut to 2 N·m (18 lb. in.) (Figure 71).
4. Rotate the J 21777-102 25 revolutions to make sure the pinion bearings are fully seated.
5. Retighten the jam nut to 2 N·m (18 lb. in.).
6. Install the J 21777-101 in the side bearing bores with a J 23597-1 through both side bearing discs (Figure 72).
7. Rotate the J 21777-102 until both gaging levels are parallel with the J 21777-101.
8. Install the dial indicator spring loaded plunger extension through the J 23597-1 and position over the 97 mm level of the J 21777-102 (Figure 73).
9. Install a J 8001 to the J 23597-1 and position the gage plunger over the plunger extension and slightly load the indicator (Figures 74 and 75).
10. Rotate the J 8001 adjustable face so that 0 is aligned with the dial indicator needle.
11. Slowly rotate the J 23597-1 back and forth so that the spring loaded plunger extension sweeps back and forth across the 97 mm level of the J 21777-102 while observing the dial indicator.
12. Stop the J 23597-1 at the dial indicator's greatest point of deflection.
13. Without disturbing the J 8001 needle setting, rotate the J 8001 adjustable face so that 0 is aligned with the dial indicator needle.
14. Slowly rotate the J 23597-1 one way until the spring loaded plunger extension is no longer making contact with the J 21777-102.
15. Record the deflection reading on the J 8001.
16. This reading indicates the selective shim size required for the correct pinion depth. Refer to the "Pinion Depth Selective Shims" chart for the appropriate shim (Figure 76).

PART NUMBER	AVAILABLE SHIM THICKNESSES	
	mm	In.
96057678	0.30	0.012
96057667	1.00	0.039
96057668	1.03	0.041
96057669	1.06	0.042
96057670	1.09	0.043
96057671	1.12	0.044
96057672	1.15	0.045
96057673	1.18	0.046
96057674	1.21	0.047
96057675	1.24	0.048
96057676	1.27	0.049
96057677	1.30	0.050

Figure 76 - Pinion Depth Selective Shims

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17. Remove the J 8001 and spring loaded plunger extension from the J 23597-1.
18. Remove the J 23597-1 and the two J 21777-101 from the differential carrier.
19. Remove the J 21777-102, the J 23597-12, the J 21777-43 and the J 21777-42 from the differential carrier.
20. Remove both inner and outer pinion bearings from the differential carrier.

### Setting Pinion Bearing Preload

Figures 77 through 81

#### Install or Connect

Tools Required:

J 6133-01 Pinion Bearing Installer

J 25273 Pinion Seal Installer

1. Appropriate pinion selective shim on the pinion gear shaft.

2. Inner pinion bearing on the pinion gear shaft using a J 6133-01 (Figure 77). Place the pinion gear on a hydraulic press and install the inner pinion bearing on the pinion gear shaft with the tapered side facing away from the pinion gear. Then, place the J 6133-01 on the pinion shaft and slowly press the inner pinion bearing into place.
3. New collapsible spacer on the pinion gear shaft with the short shank toward the pinion gear.
4. Outer pinion bearing and pinion gear into differential carrier (Figure 78).
5. New pinion oil seal into differential carrier using a J 25273 (Figure 79).
6. Apply wheel bearing lubricant GM P/N 1051344, or equivalent to the new pinion oil seal lip.
7. Pinion flange onto pinion gear; secure with pinion flange nut. Do not tighten fully.

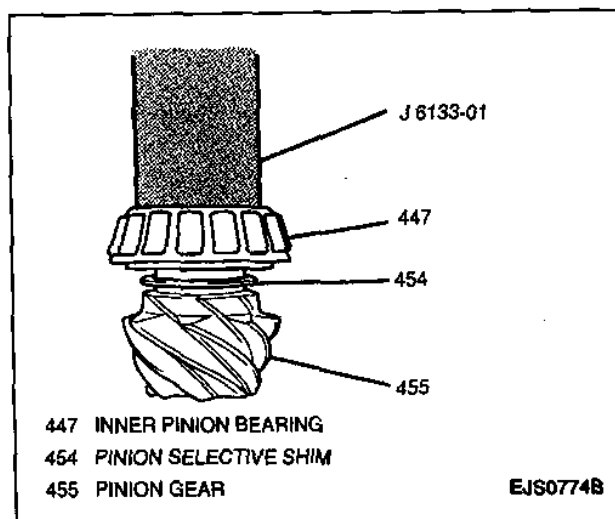


Figure 77—Installing Inner Pinion Bearing

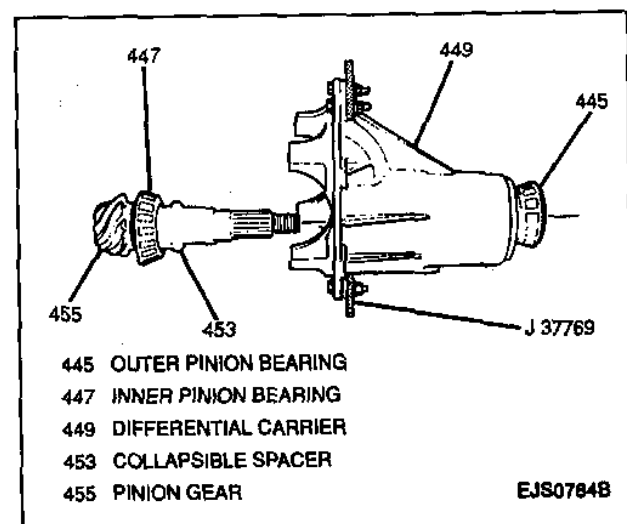


Figure 78—Installing Pinion Gear and Outer Pinion Bearing

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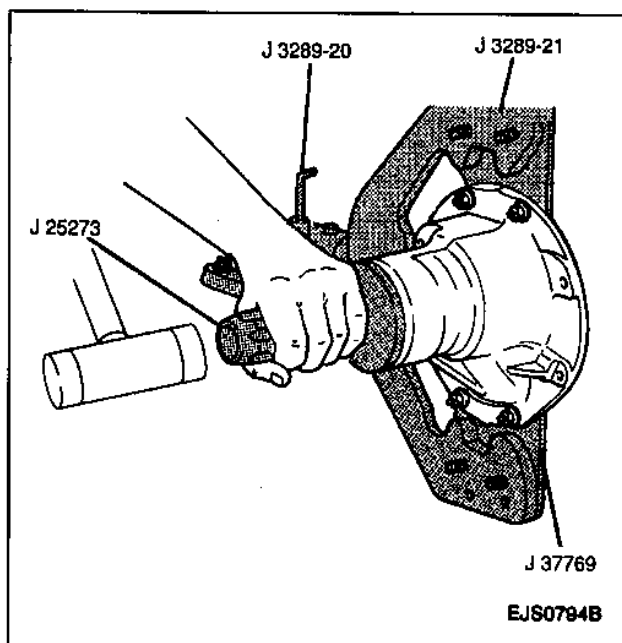


Figure 79—Installing Pinion Oil Seal

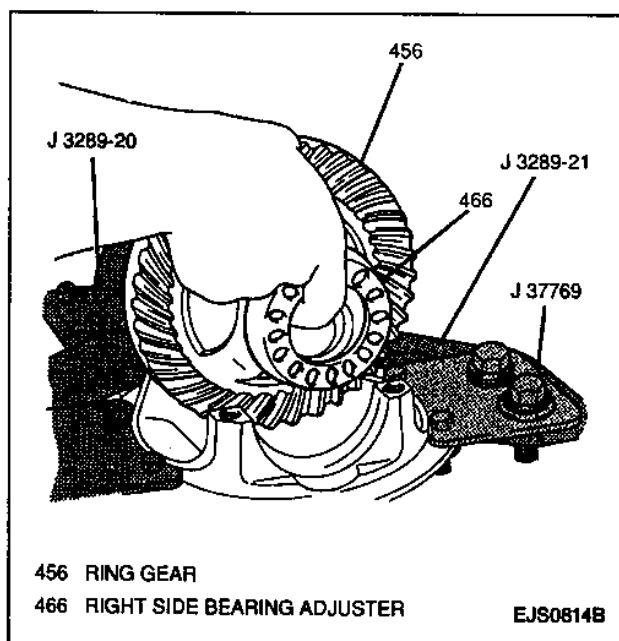


Figure 81—Installing Differential Assembly Into Differential Carrier

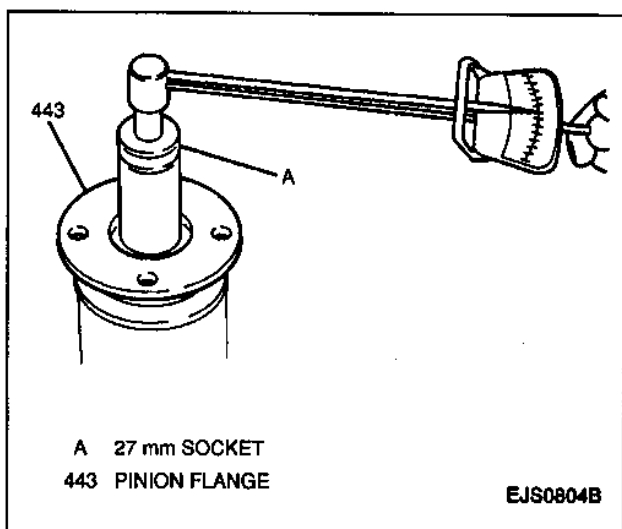


Figure 80—Measuring Pinion Bearing Preload

### ! Important

- Use caution not to overtighten the pinion flange nut when adjusting bearing preload. Tighten the pinion flange nut gradually while taking frequent pinion bearing preload measurements with a torque wrench. If the pinion flange nut is overtightened, the collapsible spacer will crush requiring a new collapsible spacer before pinion bearing preload can be properly adjusted.

### Adjust

Tool Required:

- J 8614-01 Flange Holder
- Pinion bearing preload using a J 8614-01 to hold the pinion flange stationary while tightening the pinion flange nut. Tighten the nut gradually in increments of 5 N.m

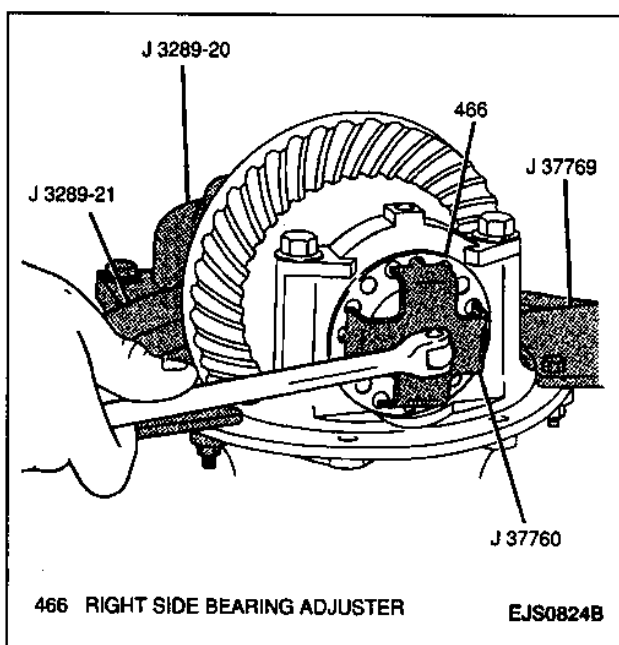


Figure 82—Loosening Right Side Bearing Adjuster

(44 lb. in.). Between each increment of tightening, remove the J 8614-01, rotate the pinion gear 5 revolutions in order to ensure pinion bearing seating and measure pinion bearing preload.

### Measure

- Pinion bearing preload using a torque wrench. The pinion gear should require 1.2 N.m (11 lb. in.) of torque in order to rotate. If pinion bearing preload is less than specified, repeat the adjustment procedure until proper pinion bearing preload has been attained (Figure 80).

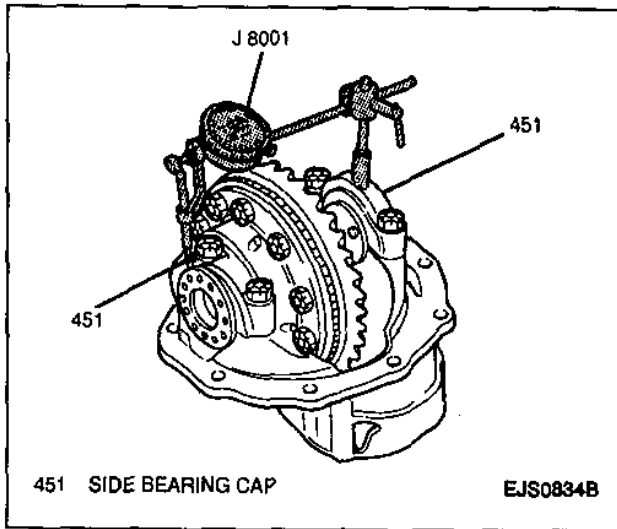


Figure 83—Measuring Case Spread Between Side Bearing Caps

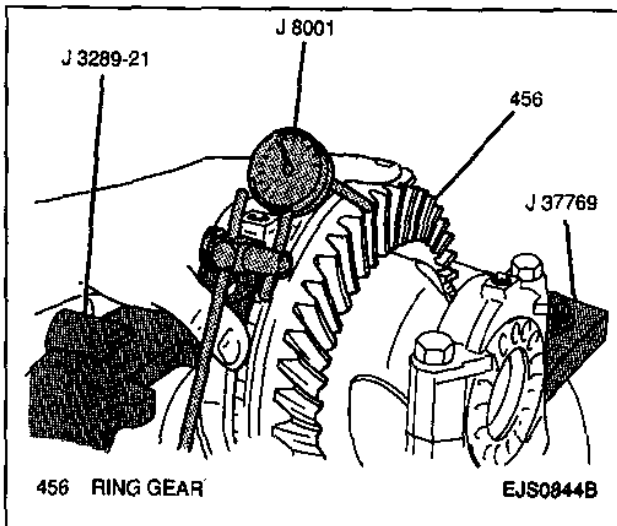


Figure 84—Installing Dial Indicator

8. Stake the pinion flange nut.
9. Differential side bearing races onto the differential side bearings.
10. Differential assembly into the differential carrier (Figure 81).
11. Both side bearing adjusters into differential carrier (Figure 80).
12. Both side bearing caps onto differential carrier; secure with four side bearing cap bolts.

**! Important**

- Make sure the right and left side bearing caps are in their correct positions according to the marks scribed during disassembly. The left side bearing cap is on the ring gear side of the carrier. The right side bearing cap is on the Pinion side of the carrier.

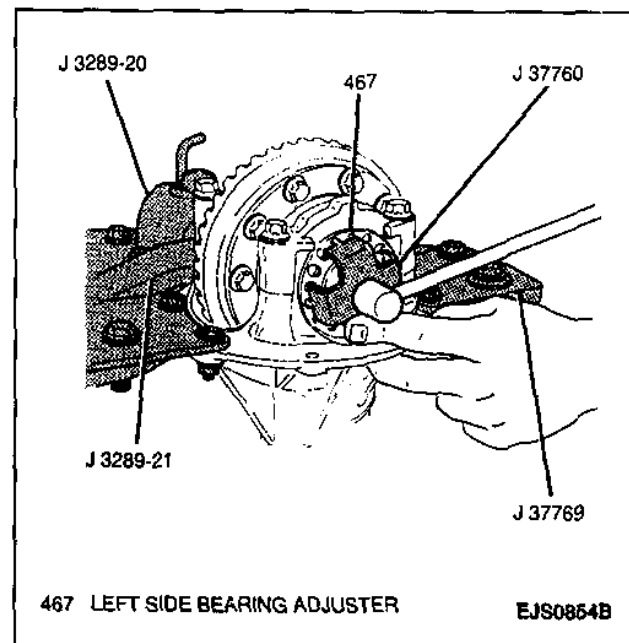


Figure 85—Adjusting Differential Backlash

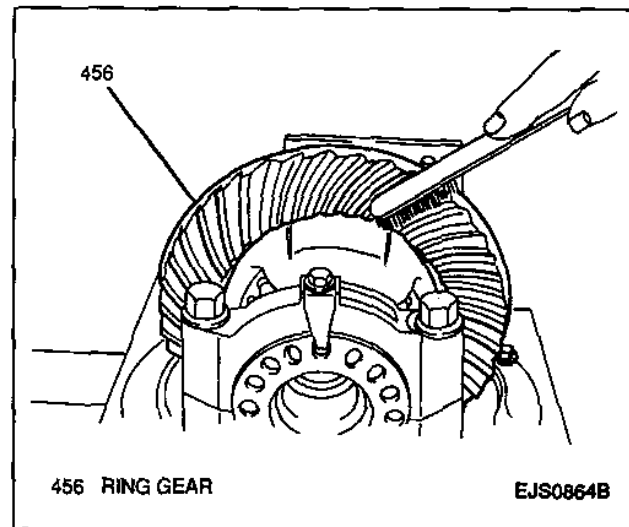


Figure 86—Applying Gear Marking Compound

**Tighten**

- Differential side bearing cap bolts to 40 N·m (30 lb. ft.).

**Side Bearing Preload and Backlash Adjustment Procedure**

Side bearing preload is necessary to maintain the correct bearing pressure on both sides of the differential case so that the differential case will turn evenly at all speeds. Side bearing preload is measured by the distance between the side bearing caps or case spread. Once the differential side bearing preload has been adjusted, it must be maintained throughout the differential backlash adjustment procedure. Setting differential backlash is very important to the service life of the ring and pinion gears. Setting differential backlash determines the amount of depth at which the ring gear will contact the pinion gear. This determines

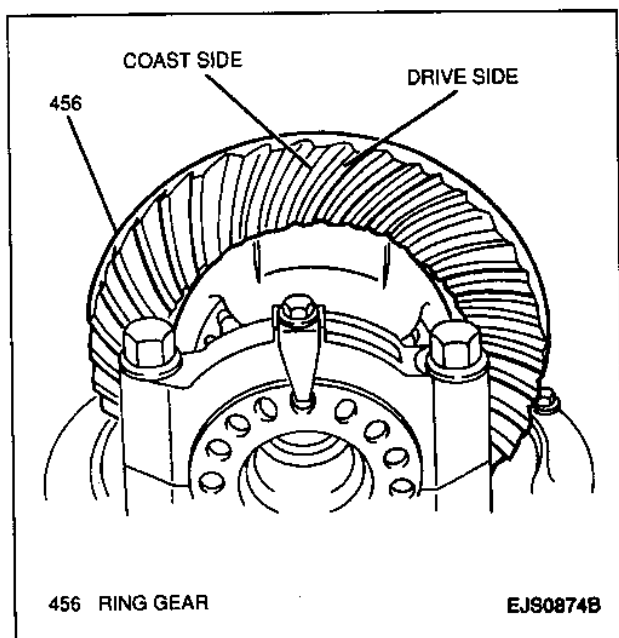


Figure 87—Checking Gear Contact Pattern

the distance of the pinion gear teeth from the drive side and the coast side of the ring gear teeth. The deeper the gears mesh, the less amount of backlash. The more shallow the mesh, the more backlash is created. This adjustment is vital for correct differential operation.

### Side Bearing Preload Adjustment Procedure

**Figures 82 and 83**

Tools Required:

J 8001 Dial Indicator Set  
J 37760 Spanner Wrench

1. Loosen the right differential side bearing adjuster using a J 37760 until it no longer makes contact with the right differential side bearing race (Figure 82).
2. Tighten the left differential side bearing adjuster using a J 37760 until the ring gear is fully engaged with the pinion gear (0.000 backlash).

### Inspect

1. The right adjuster making sure it is not making contact with the right side bearing race.
2. Pinion gear for binding by grasping the pinion flange and rotating the pinion gear several times.
3. Install a J 8001 on the differential carrier between the center of each side bearing cap to measure case spread (Figure 82).
4. Tighten the right adjuster using a J 37760 until the adjuster makes contact with the right side bearing race.
5. Rotate the J 8001 adjustable face until indicator needle reads 0.

### Adjust

- Differential side bearing preload by tightening the right adjuster using a J 37760 until the J 8001 reads 0.0508 to 0.1524 mm (0.002 to 0.006-inch). This specification indicates the amount of case spread between the centers of both side bearing caps.

### Backlash Adjustment Procedure

**Figures 84 and 85**

Tools Required:

J 8001 Dial Indicator Set  
J 37760 Spanner Wrench

1. Install a J 8001 to the differential carrier with the dial indicator plunger against a ring gear tooth (Figure 84).
2. While holding the pinion gear stationary, move the ring gear back and forth as far as it will travel without turning the pinion gear.
3. Observe the J 8001 while moving the ring gear as described in step 2. Differential backlash should be within 0.203 to 0.381 mm (0.008 to 0.015-inch). If differential backlash is above specification, loosen the right adjuster approximately 1/4 turn and tighten the left adjuster 1/4 turn using the J 37760 (Figure 85). This will move the ring gear closer to the pinion gear causing a tighter mesh and less backlash. If differential backlash below specification, loosen the left adjuster 1/4 turn and tighten the right adjuster 1/4 turn using the J 37760. This will move the ring gear away from the pinion gear causing a looser mesh and more backlash. Use this procedure until the most accurate differential backlash is obtained.

### Important

- In order to preserve differential side bearing preload, any time a side bearing adjuster is loosened, the other adjuster **MUST** be tightened the same amount. The last motion of this adjustment must be in a tightening direction.

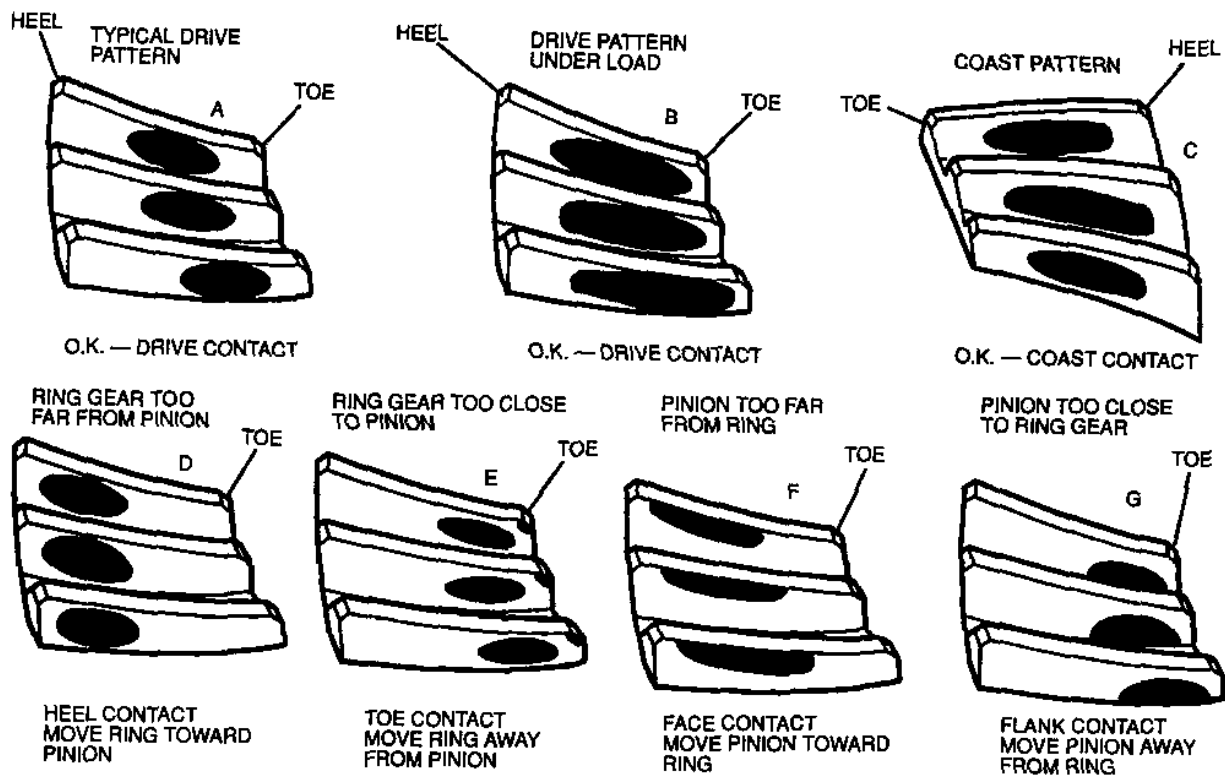
### Tighten

- Differential side bearing cap bolts to 100 N·m (72 lb. ft.).
4. Install both side bearing lock plates; secure with two bolts.

### Tighten

- Both side bearing lock plate bolts to 14 N·m (10 lb. ft.).





<p>OUTER END</p> <p>DRIVE SIDE</p> <p>DRIVE ON FRONT DIFF.</p> <p>COAST SIDE</p> <p>COAST ON FRONT DIFF.</p> <p>INNER END</p>	NORMAL CONTACT		<p>OFFSET COAST AND DRIVE PATTERN</p> <p>REPLACE DIFFERENTIAL CARRIER</p>
	<p>HIGH CONTACT</p> <p>PINION DEPTH IS TOO SHALLOW. INCREASE PINION SELECTIVE SHIM SIZE</p>		<p>ERRATIC CONTACT PATTERNS</p> <ol style="list-style-type: none"> <li>1. INSPECT PINION GEAR FOR PROPER SEATING</li> <li>2. REPLACE RING AND PINION GEAR SET</li> <li>3. REPLACE DIFFERENTIAL CARRIER</li> </ol>
	<p>LOW CONTACT</p> <p>PINION DEPTH IS TOO DEEP. DECREASE PINION SELECTIVE SHIM</p>		<p>INSUFFICIENT CONTACT PATTERNS</p> <ol style="list-style-type: none"> <li>1. REPLACE RING AND PINION GEAR SET</li> <li>2. REPLACE DIFFERENTIAL CASE</li> </ol>

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Figure 88—Gear Contact Patterns

## 4B-34 REAR AXLE

### Ring and Pinion Contact Pattern Checking Procedure

Figures 86, 87 and 88

1. Apply a light coating of gear marking compound GM P/N 1052351, or equivalent, to all ring gear teeth not making contact with the pinion gear (Figure 86).
2. Insert a standard drift punch between the ring gear and the differential carrier to bind the ring gear and simulate a drag.
3. Using a wrench, slowly and evenly turn the pinion gear until the ring gear has made one complete revolution. Because of the drag simulated on the ring gear, this will produce a contact pattern on the drive side of the ring gear (pinion gear driving ring gear).

#### Important

- In order to ensure an accurate gear contact pattern, make sure the ring gear turns one revolution only.

4. Turn the pinion gear in the opposite direction with drag simulated on the ring gear and a contact pattern on the coast side of the ring gear (ring gear driving pinion gear).

The drive side of the ring gear tooth is convex and the coast side of the ring gear tooth is concave (Figure 87). The contact pattern area should be even around the ring gear. Uneven contact around the ring gear indicates excessive ring gear runout. The drive pattern should be centrally located between the top and bottom of the ring gear tooth. Under an increased load, the pattern spreads out and tends to move toward the heel of the tooth. To compensate for this, the contact pattern can be somewhat closer to the toe. Under heavy loading conditions, uphill or rapid acceleration, the pattern may extend almost the full distance from toe to heel. Use the "Gear Contact Patterns" chart to determine if a correct contact pattern exists (Figure 88). If excessive contact pattern error is present with proper backlash specification, check pinion for proper selective shim.

## SPECIFICATIONS

### FASTENER TORQUES

Rear Axle Housing Oil Level/Filler Plug .....	50 N.m (37 lb. ft.)
Rear Axle Housing Drain Plug .....	25 N.m (18 lb. ft.)
Rear Axle Shaft Retaining Nuts .....	23 N.m (17 lb. ft.)
Differential Carrier Nuts .....	55 N.m (41 lb. ft.)
ABS Brake Speed Sensor Cover Bolts .....	15 N.m (11 lb. ft.)
ABS Brake Speed Sensor Bolt .....	23 N.m (17 lb. ft.)
Rear Control Arm Ball Joint Boss Bolts .....	50 N.m (37 lb. ft.)
Rear Control Arm Through Bolts and Nuts .....	60 N.m (43 lb. ft.)
Rear Propeller Shaft Bolts and Nuts .....	50 N.m (37 lb. ft.)
Rear Trailing Rod Through Bolts and Nut .....	90 N.m (66 lb. ft.)
Lower Shock Absorber Through Bolts and Nuts .....	90 N.m (66 lb. ft.)
Ring Gear Bolts .....	90 N.m (65 lb. ft.)
Differential Side Bearing Cap Bolts .....	100 N.m (72 lb. ft.)
Side Bearing Lock Plate Bolts .....	33 N.m (25 lb. ft.)

### REAR AXLE SPECIFICATIONS

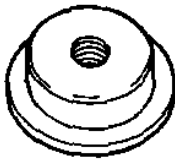
Rear Axle Shaft Length Right Rear Axle Shaft .....	722.5 mm (28.4 in.)
Left Rear Axle Shaft .....	679.5 mm (26.8 in.)
Differential Side Gear End Play .....	12 to 37 mm (0.005 to 0.014 in.)
Differential Side Gear Preload (Maximum) .....	2.4 N.m (21 lb. in.)
Differential Side Bearing Preload (Case Spread) .....	0.0508 to 0.1524 mm (0.002 to 0.006 in.)
Pinion Bearing Preload Starting Torque .....	1.2 N.m (11 lb. in.)
Differential Backlash .....	0.203 to 0.381 mm (0.008 to 0.015 in.)

### OIL CAPACITY (APPROXIMATE)

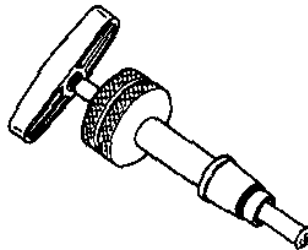
Rear Axle Housing Drain and Refill .....	2.2 liters (4.6 pts.)
Lubricant Recommended .....	80W-90 GL5 Lubricant GM P/N 12345977, or equivalent

# SPECIAL TOOLS

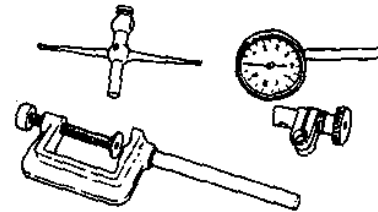
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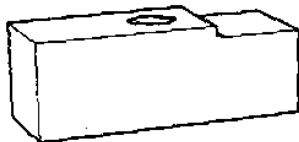
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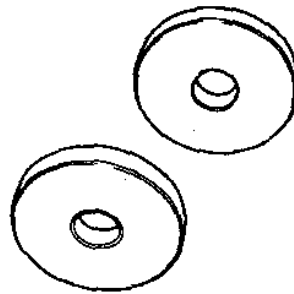
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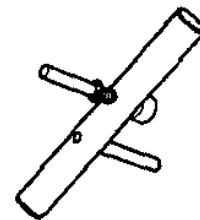
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J 21777-101



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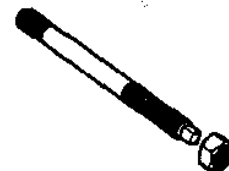
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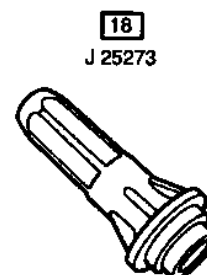
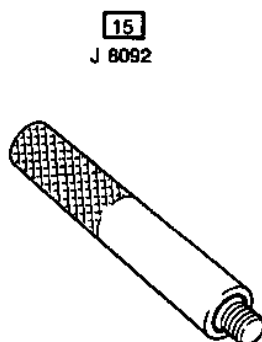
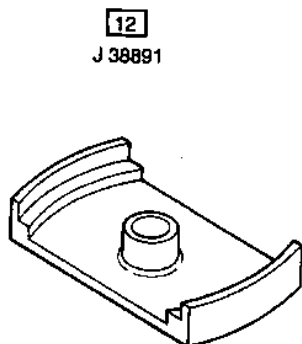
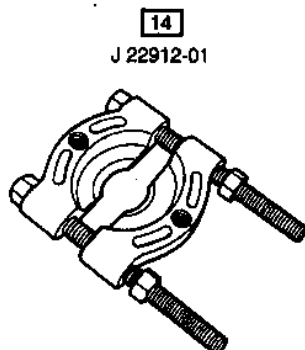
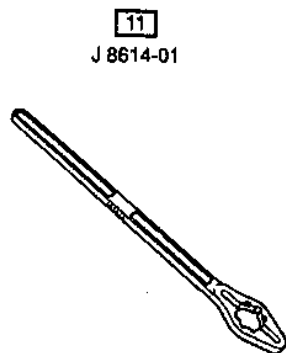
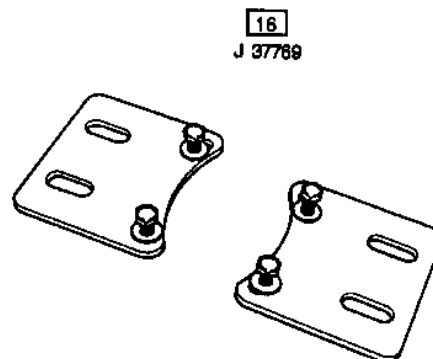
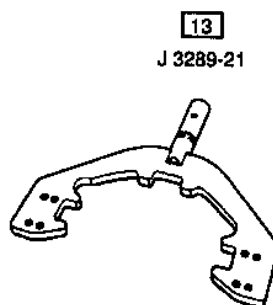
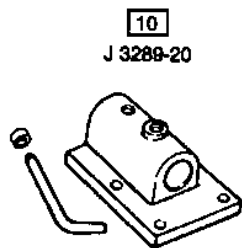
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J 21777-43



- 1** PINION INNER BEARING RACE INSTALLER
- 2** GAGE PLATE
- 3** PILOT WASHER
- 4** SIDE GEAR THRUST PLAY TOOL
- 5** SIDE BEARING DISCS

- 6** PILOT WASHER
- 7** DIAL INDICATOR SET
- 8** ARBOR
- 9** STUD ASSEMBLY

## 4B-36 REAR AXLE

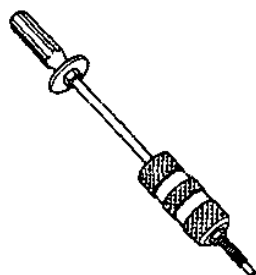


- 10** HOLDING FIXTURE BENCH MOUNT
- 11** FLANGE HOLDER
- 12** WHEEL SPEED SENSOR RING INSTALLER
- 13** DIFFERENTIAL HOLDING FIXTURE
- 14** REAR BEARING REMOVER

- 15** DRIVER HANDLE
- 16** DIFFERENTIAL HOLDING FIXTURE ADAPTERS
- 17** SIDE BEARING REMOVER
- 18** PINION SEAL INSTALLER

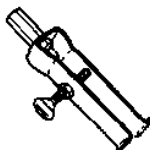
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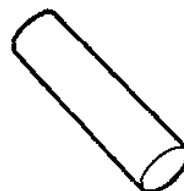
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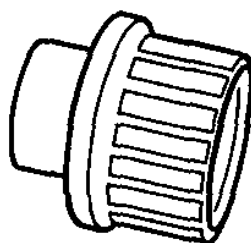
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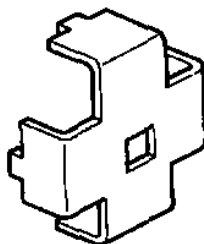
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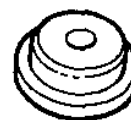
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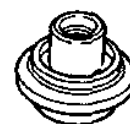
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J 8107-4



25

J 37758



- 19 SLIDE HAMMER
- 20 DIFFERENTIAL TORQUE CHECK TOOL
- 21 AXLE SHAFT SEAL REMOVER
- 22 SPANNER WRENCH
- 23 PINION BEARING INSTALLER
- 24 DIFFERENTIAL SIDE BEARING REMOVER PLUG
- 25 PINION OUTER RACE INSTALLER