

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Differential Carrier Assembly Case Bolts	48 N·m	35 lb ft
Differential Carrier Assembly to Frame Mounting Bolts	85 N·m	63 lb ft
Front Drive Axle Inner Shaft Housing to Differential Carrier Assembly Bolts	48 N·m	35 lb ft
Front Drive Axle Inner Shaft Housing Bushing to Frame Bolts	85 N·m	63 lb ft
Front Drive Axle Inner Shaft Seal Cover to Differential Carrier Assembly Bolts	18 N·m	13 lb ft
Pinion Gear Shaft Lock Bolt	35 N·m	26 lb ft
Pinion Yoke Retainer Bolts	25 N·m	18 lb ft
Plug, Drain and Fill	33 N·m	24 lb ft
Ring Gear Bolts	84 N·m	62 lb ft
Side Bearing Adjuster Sleeve Lock Tab Bolts	8 N·m	71 lb in
Vent Hose Connector	40 N·m	30 lb ft
Wheel Drive Shaft Inboard Flange Bolts	50 N·m	37 lb ft

[2009 Chevrolet Express - AWD](#) | [Express, Savana \(VIN G/H\) Service Manual](#) | [Driveline/Axle](#) | [Front Drive Axle](#) | [Specifications](#) | **Document ID: 855951**

Axle Preload and Backlash Specifications

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

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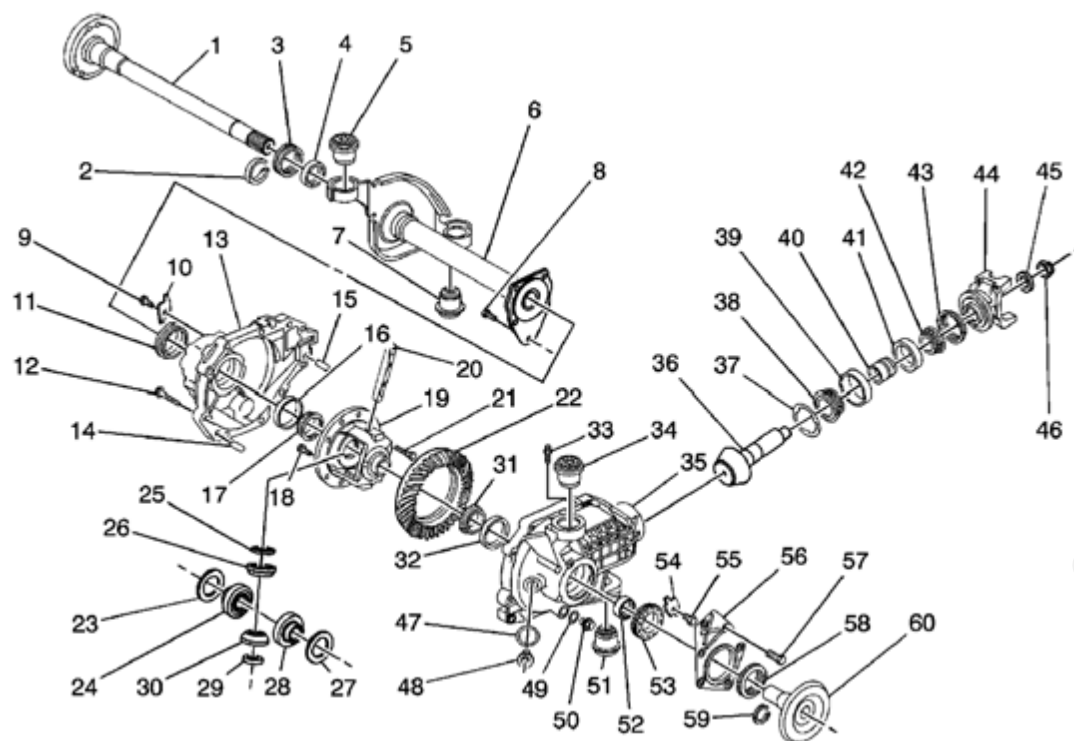
[2009 Chevrolet Express - AWD](#) | [Express, Savana \(VIN G/H\) Service Manual](#) | [Driveline/Axle](#) | [Front Drive Axle](#) | [Specifications](#) | **Document ID: 894251**

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number
Differential Carrier Assembly Case Mating Surfaces	Sealant	1052942 (Canadian P/N 10953466) or equivalent
Front Differential Carrier Assembly Vent Connector	Sealant	12346004 (Canadian P/N 10953480) or equivalent
Front Drive Axle	Lubricant	12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115
Front Drive Axle Inner Shaft Housing to Differential Carrier Assembly	Sealant	1052942 (Canadian P/N 10953466) or equivalent
Pinion Yoke Splines	Sealant	12346004 (Canadian P/N 10953480) or equivalent
Wheel Drive Shaft to Inner Shaft Bolts	Threadlock	12345382 (Canadian P/N 10953489) or equivalent

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Front Drive Axle Disassembled Views



- (1) Front Drive Axle Inner Shaft
- (2) Retaining Ring
- (3) Front Drive Axle Inner Shaft Seal
- (4) Front Drive Axle Inner Shaft Bearing
- (5) Front Differential Carrier Bushing
- (6) Front Drive Axle Inner Shaft Housing
- (7) Front Differential Carrier Bushing
- (8) Bolt
- (9) Bolt
- (10) Front Differential Bearing Adjuster Nut Lock
- (11) Front Differential Bearing Adjuster
- (12) Bolt
- (13) Front Differential Carrier - LH
- (14) Pin
- (15) Pin
- (16) Differential Side Bearing Cup
- (17) Differential Side Bearing
- (18) Ring Gear Bolt

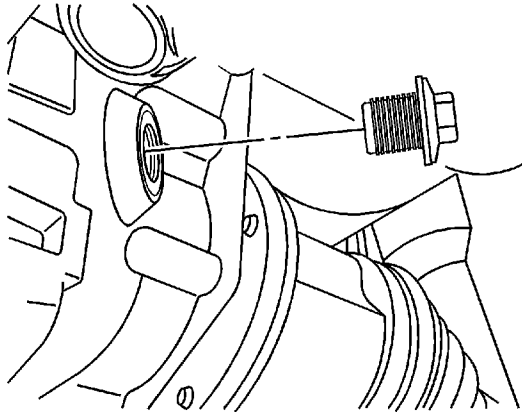
- (19) Differential Case
- (20) Front Differential Pinion Gear Shaft
- (21) Differential Pinion Gear Shaft Bolt
- (22) Ring Gear
- (23) Thrust Washer
- (24) Differential Side Gear
- (25) Thrust Washer
- (26) Pinion Gear
- (27) Thrust Washer
- (28) Differential Side Gear
- (29) Thrust Washer
- (30) Pinion Gear
- (31) Differential Side Bearing
- (32) Differential Side Bearing Cup
- (33) Vent Connector
- (34) Front Differential Carrier Bushing
- (35) Front Differential Carrier - RH
- (36) Drive Pinion Gear
- (37) Front Differential Drive Pinion Gear Shim
- (38) Front Differential Drive Pinion Gear Inner Bearing
- (39) Front Differential Drive Pinion Gear Inner Bearing Cup
- (40) Front Differential Drive Pinion Gear Bearing Spacer
- (41) Front Differential Drive Pinion Gear Outer Bearing Cup
- (42) Front Differential Drive Pinion Gear Outer Bearing
- (43) Front Differential Drive Pinion Gear Seal
- (44) Front Differential Drive Pinion Gear Yoke
- (45) Washer
- (46) Nut
- (47) Front Differential Oil Fill Plug Washer
- (48) Front Differential Oil Fill Plug
- (49) Front Differential Oil Drain Plug Washer
- (50) Front Differential Oil Drain Plug
- (51) Front Differential Carrier Bushing
- (52) Front Drive Axle Inner Shaft Bearing
- (53) Front Differential Bearing Adjuster
- (54) Front Differential Bearing Adjuster Nut Lock
- (55) Bolt
- (56) Front Drive Axle Inner Shaft Seal Cover
- (57) Bolt
- (58) Front Drive Axle Inner Shaft Seal
- (59) Retaining Ring
- (60) Front Drive Axle Inner Shaft

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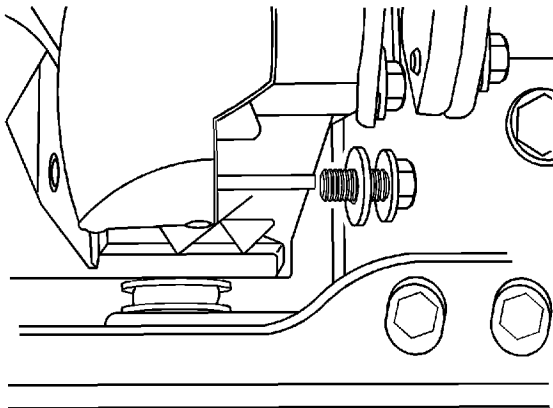
Front Axle Lubricant Replacement

Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Clean the area around the front axle fill plug and the drain plug.



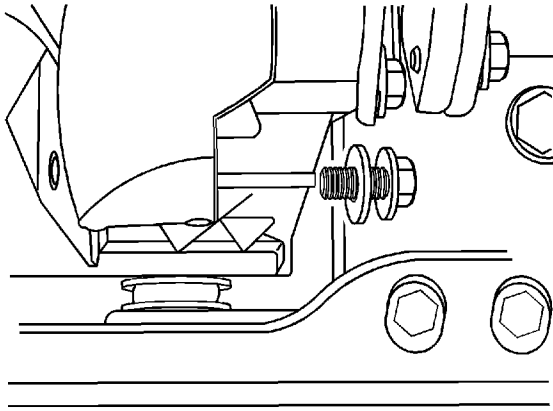
3. Remove the fill plug.



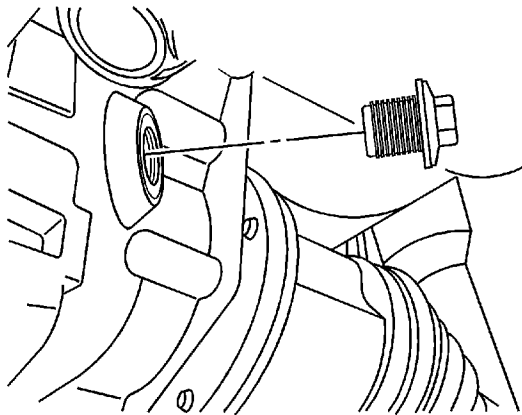
4. Remove the drain plug.
5. Drain the fluid from the front differential carrier assembly.

Installation Procedure

Caution: Refer to [Fastener Caution](#) in the Preface section.



1. Install the drain plug and tighten to **33 N·m (24 lb ft)**.
2. Fill the differential carrier assembly with axle lubricant. Use the proper fluid. Refer to [Approximate Fluid Capacities](#) and [Fluid and Lubricant Recommendations](#).

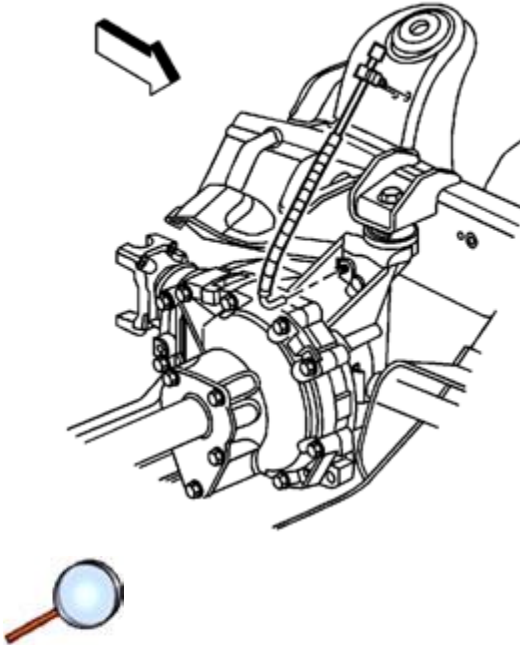


3. Install the fill plug and tighten to **33 N·m (24 lb ft)**.
4. Lower the vehicle.

Vent Hose Replacement

Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

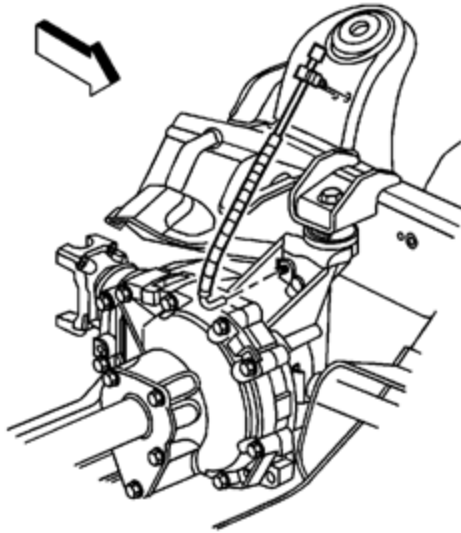


2. Remove the vent hose from the frame.
3. Remove the vent hose from the front axle.

Installation Procedure

Important: When replacing the hose, do the following:

- Route the hose the same way as the original.
- Ensure that the hose is free of kinks.
- Route the hose away from sharp objects.



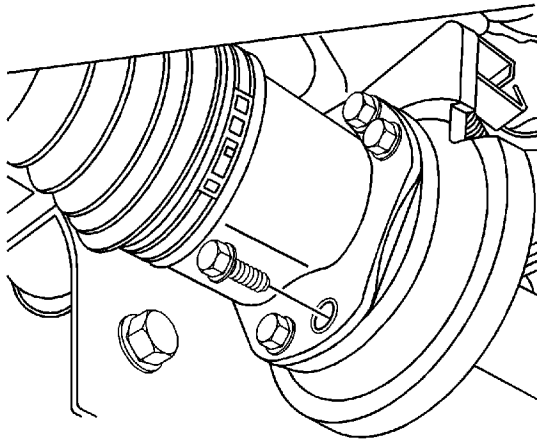
1. Install the vent hose to the front axle.
2. Install the vent hose to the frame.
3. Lower the vehicle.

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Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement

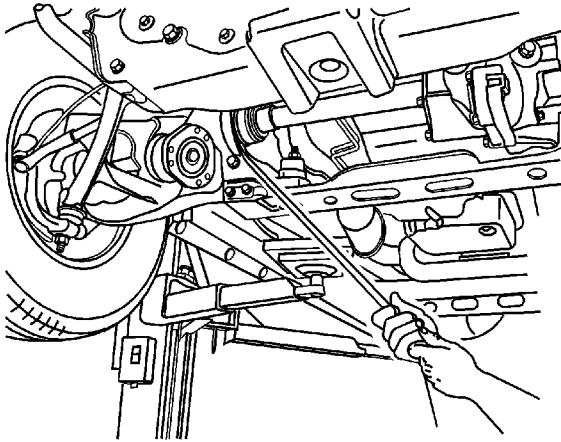
Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Drain the differential carrier assembly. Refer to [Front Axle Lubricant Replacement](#).
3. Remove the engine protection shield. Refer to [Engine Protection Shield Replacement](#).



4. Disconnect the wheel drive shaft from the inner axle shaft. Refer to [Wheel Drive Shaft Replacement](#).

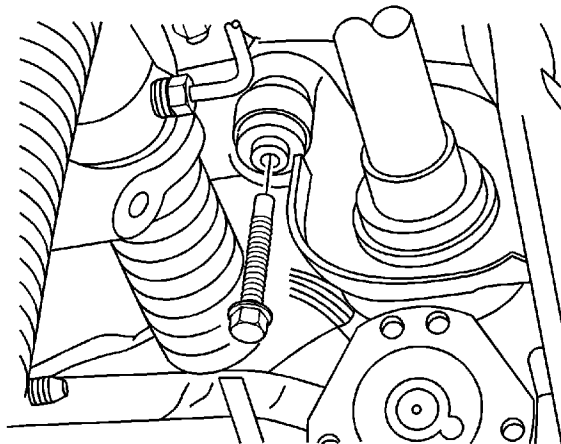
It is not necessary to remove the wheel drive shaft from the vehicle.



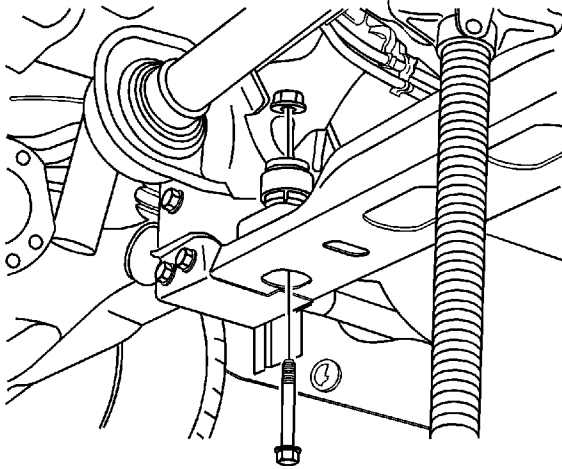
5. Place a pry bar between the inner axle shaft flange and the inner axle shaft housing.
6. Disconnect the inner axle shaft from the differential case side gear using the pry bar.

Do not remove the inner axle shaft at this time.

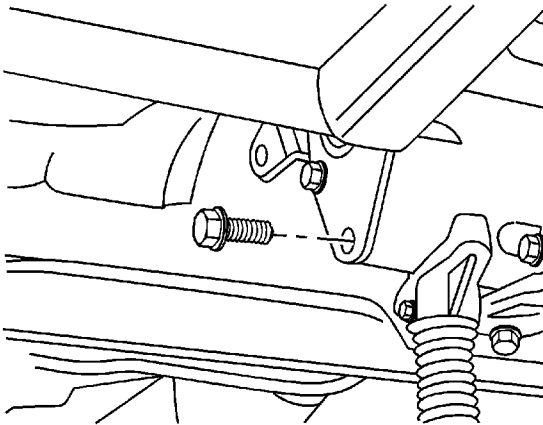
7. Install a support jack underneath the differential carrier assembly.



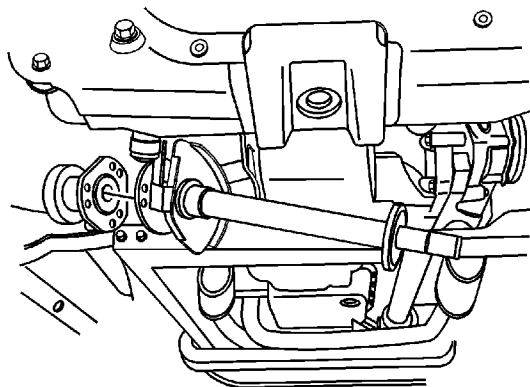
8. Remove the upper inner shaft housing bushing bolt and nut.



9. Remove the lower inner shaft housing bushing bolt and nut.



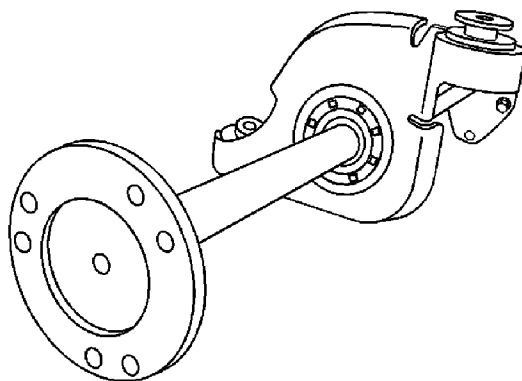
10. Remove the inner axle shaft housing bolts from the differential carrier assembly.



11. Remove the inner axle shaft and inner axle shaft housing from the vehicle.
12. Remove the inner axle shaft from the inner axle shaft housing.
13. Remove the inner axle shaft seal and the bearing from the inner axle shaft housing. Refer to [Front Drive Axle Inner Shaft Seal and Inner Shaft Bearing Replacement](#).

Installation Procedure

1. Install the new inner axle shaft bearing and the new seal to the inner axle shaft housing. Refer to [Front Drive Axle Inner Shaft Seal and Inner Shaft Bearing Replacement](#).

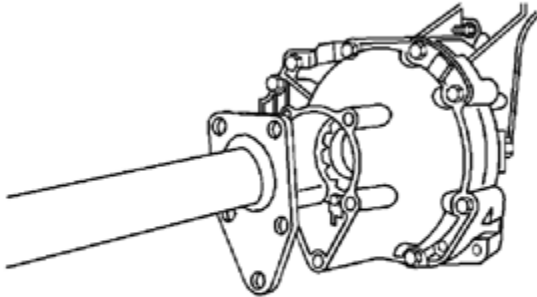


Note: Do not nick or cut the inner axle shaft oil seal.

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

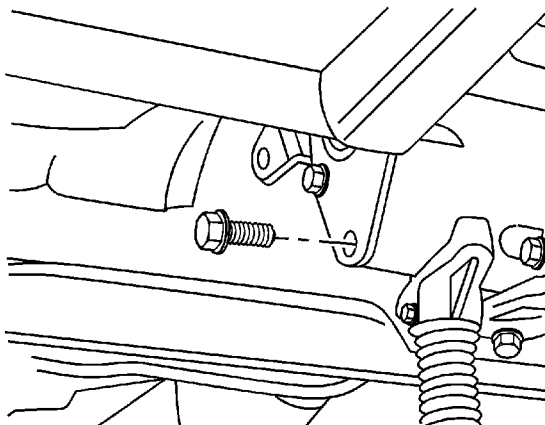
Do not install the inner axle shaft completely into the inner axle shaft housing at this time.

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

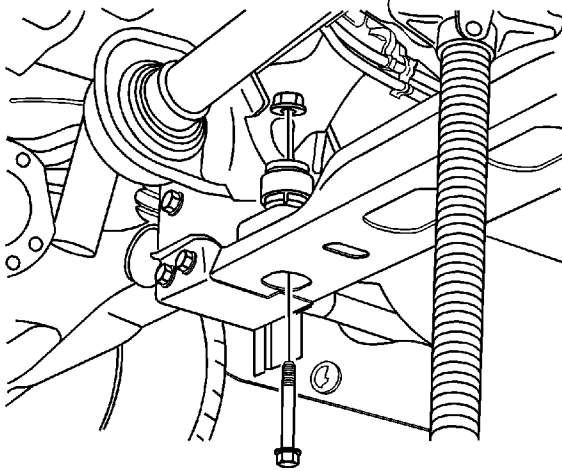


4. Install the inner axle shaft housing with the inner axle shaft to the differential carrier assembly.

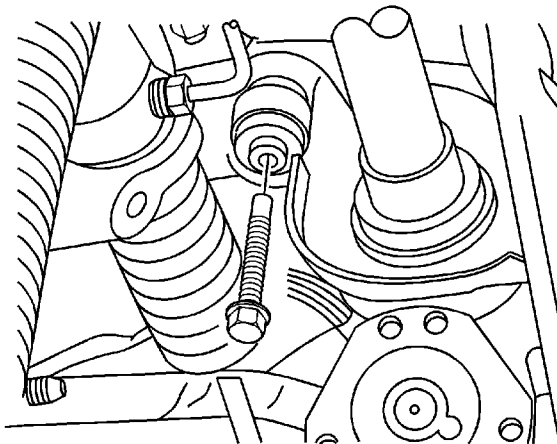
Caution: Refer to [Fastener Caution](#) in the Preface section.



5. Install the inner axle shaft housing bolts and tighten to **48 N·m (35 lb ft)**.



6. Install the lower inner axle shaft housing bushing bolt and nut.



7. Install the upper inner axle shaft housing bushing bolt and nut and tighten to **85 N·m (63 lb ft)**.
8. Remove the support jack.
9. Install the inner axle shaft into the differential case side gear by doing the following:
 - 9.1. Carefully guide the inner axle shaft through the inner axle housing until the retaining ring on the inner axle shaft contacts the differential case side gear.
 - 9.2. Install the inner axle shaft into the differential case side gear by tapping the retaining ring into the retaining groove using a soft-faced mallet and until the retaining ring on the inner axle shaft is fully seated within the groove in the differential case side gear.
 - 9.3. Pull back on the inner axle shaft to ensure that the inner axle shaft is properly retained in the differential case side gear.
10. Install the wheel drive shaft to the inner axle shaft. Refer to [Wheel Drive Shaft Replacement](#).

11. Fill the differential carrier assembly with axle lubricant. Use the proper fluid. Refer to [Front Axle Lubricant Replacement](#).
12. Lower the vehicle.

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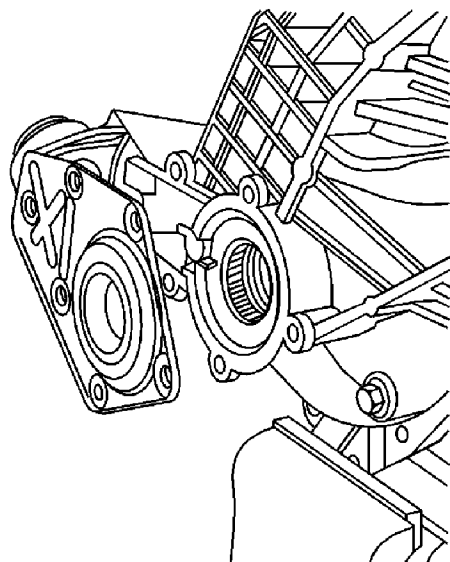
Front Drive Axle Inner Shaft Seal and Inner Shaft Bearing Replacement

Special Tools

- [J 2619-01](#) Slide Hammer
- [J 29369-1](#) Bushing and Bearing Remover
- [J 42211](#) Axle Bearing Installer
- [J 42738](#) Seal Installer
- [J 8092](#) Universal Driver Handle - 3/4 in - 10

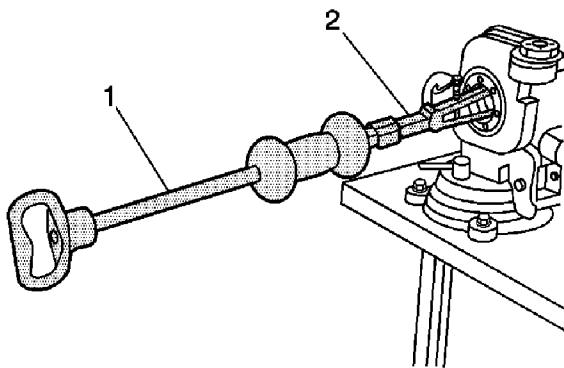
Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Drain the differential carrier assembly. Refer to [Front Axle Lubricant Replacement](#).
3. If replacing the left side seal, perform the following steps:
 - 3.1. Disconnect the wheel drive shaft from the inner shaft flange and set aside. Refer to [Wheel Drive Shaft Replacement](#).
 - 3.2. Remove the inner shaft.
 - 3.3. Remove the inner shaft seal cover bolts.



- 3.4. Remove the inner shaft seal cover assembly.
4. If replacing the left side bearing, perform the following steps:
 - 4.1. Remove differential carrier assembly. Refer to [Differential Carrier Assembly Replacement](#).

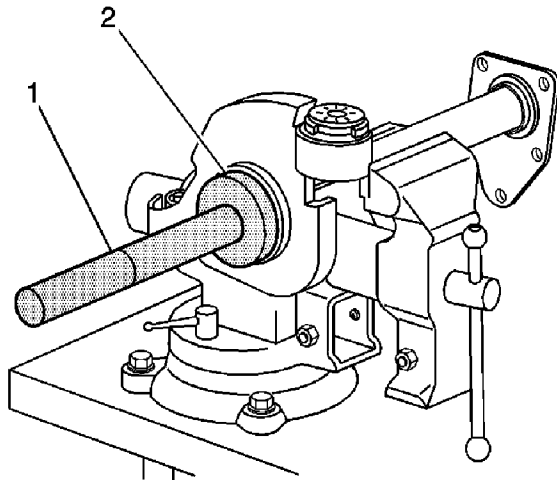
- 4.2. Remove the left inner shaft.
- 4.3. Remove the inner shaft seal cover bolts.
- 4.4. Remove the inner shaft seal cover assembly.
- 4.5. Install the [J 29369-1](#) to the backside of the inner shaft bearing.
- 4.6. Install the [J 2619-01](#) to the [J 29369-1](#).
- 4.7. Remove the inner shaft bearing by pulling on the [J 2619-01](#).
5. If replacing the right side seal and/or bearing, perform the following steps:
 - 5.1. Remove the inner shaft and housing assembly. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).
 - 5.2. Remove the inner shaft from the inner shaft housing.
 - 5.3. Install the inner shaft housing into a vise.



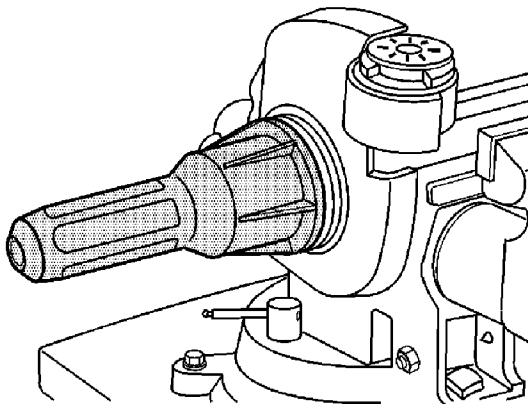
- 5.4. Install the [J 29369-1](#) (2) to the backside of the seal or bearing as necessary.
- 5.5. Install the [J 2619-01](#) (1) to the [J 29369-1](#) (2).
- 5.6. Remove the seal or the seal and bearing by pulling on the [J 2619-01](#).

Installation Procedure

1. If replacing the right side bearing, perform the following steps:
 - 1.1. Install the inner shaft housing into a vise.



- 1.2. Install the bearing with the square shoulder in using the [J 42211](#) (2) and the [J 8092](#) (1).
2. If replacing the right side seal, perform the following steps:
 - 2.1. Install the inner shaft housing into a vise.



- 2.2. Install the new inner shaft seal using the [J 42738](#) .

Note: Carefully guide the inner shaft through the oil seal as to not nick or cut the seal.

- 2.3. Install the inner shaft into the inner shaft housing.

- 2.4. Install the inner shaft and housing assembly. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).
3. If installing the left side bearing, perform the following steps:
 - 3.1. Install the bearing with the square shoulder in using the [J 42211](#) and the [J 8092](#).
 - 3.2. Install the inner shaft seal cover assembly.

Caution: Refer to [Fastener Caution](#) in the Preface section.

- 3.3. Install the inner shaft seal cover bolts and tighten to **18 N·m (13 lb ft)**.
- 3.4. Install the left inner shaft into the differential carrier assembly by performing the following steps:

Note: Carefully guide the inner shaft through the oil seal as to not nick or cut the seal.

- 3.4.1. Carefully guide the inner shaft through the oil seal until the retaining ring on the inner shaft contacts the differential case side gear.
- 3.4.2. Install the inner shaft into the differential case side gear by tapping the retaining ring into the retaining groove using a soft-faced mallet and until the retaining ring on the inner shaft is fully seated within the groove in the differential case side gear.
- 3.4.3. Pull back on the inner shaft to ensure that the inner shaft is properly retained in the differential case side gear.
- 3.5. Install differential carrier assembly. Refer to [Differential Carrier Assembly Replacement](#).
- 3.6. Install the wheel drive shaft to the inner shaft flange. Refer to [Wheel Drive Shaft Replacement](#).
4. Fill the differential carrier assembly with the proper fluid. Refer to [Front Axle Lubricant Replacement](#).
5. Lower the vehicle.

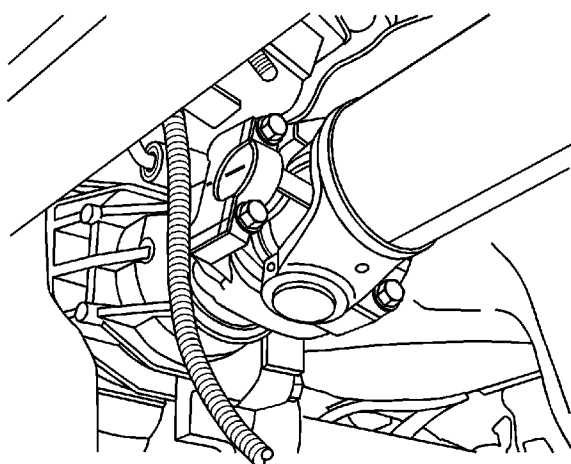
Front Differential Drive Pinion Flange/Yoke, Seal, and Dust Deflector Replacement

Special Tools

- [J 33782](#) Pinion Oil Seal Installer
- [J 8614-01](#) Pinion Flange Holder

Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
3. Remove the brake calipers. Refer to [Front Brake Caliper Replacement](#).

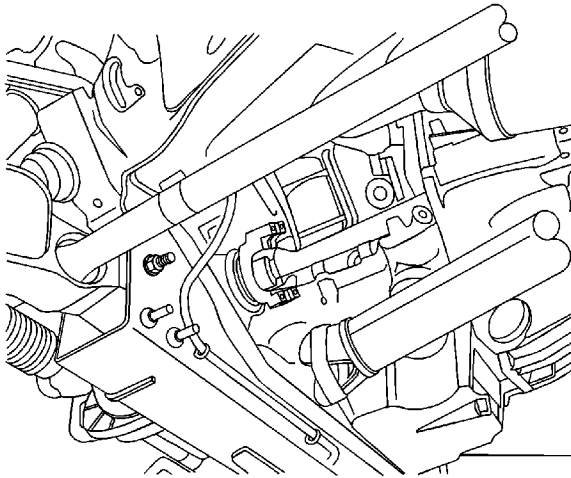


4. Reference mark the relationship of the propeller shaft to the front axle pinion yoke.
5. Remove the pinion yoke retainer bolts and the yoke retainers from the front axle pinion yoke.

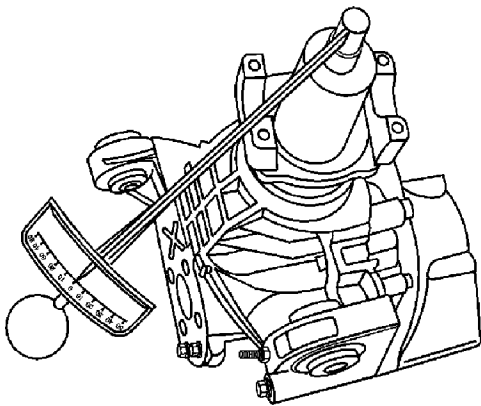
Caution: When removing the propeller shaft, do not attempt to remove the shaft by pounding on the yoke ears or using a tool between the yoke and the universal joint. If the propeller shaft is removed by using such means, the injection joints may fracture and lead to premature failure of the joint.

6. Disconnect the propeller shaft from the front axle pinion yoke.

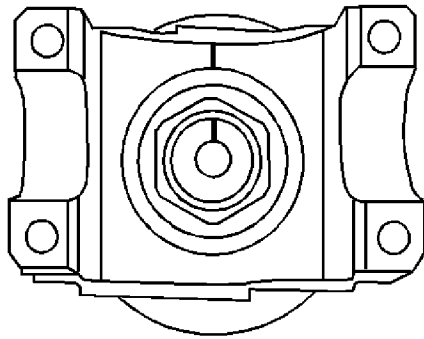
Wrap the bearing cups with tape in order to prevent the loss of bearing rollers.



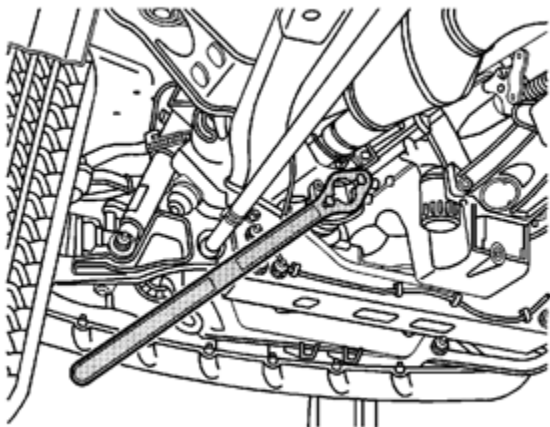
7. Support the propeller shaft and move out of the way as necessary.



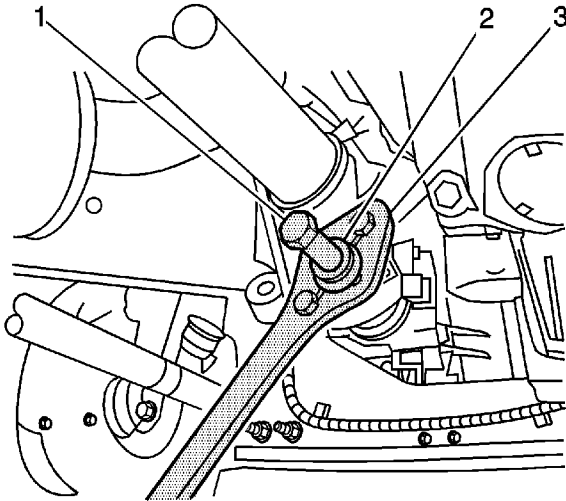
8. Measure the torque required in order to rotate the pinion. Use an inch-pound torque wrench. Record the torque value for reassembly. This will give the combined preload for the following components:
- The pinion bearings
 - The pinion seal
 - The carrier bearings
 - The axle bearings
 - The axle seals



9. Scribe an alignment line between the pinion shaft and the pinion yoke.



10. Install the [J 8614-01](#) onto the pinion yoke as shown.
11. Remove the pinion nut while holding the [J 8614-01](#).

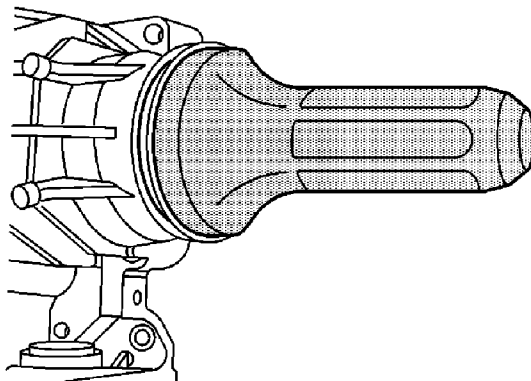


12. Install the J 8614-2 (2) and the J 8614-3 (1) into the [J 8614-01](#) (3) as shown.
13. Remove the pinon yoke by turning the J 8614-3 (1) clockwise while holding the [J 8614-01](#) (3).

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

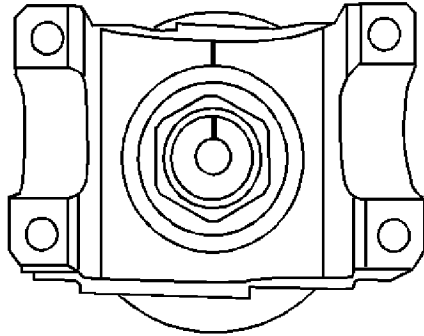
14. Remove the oil seal using a suitable seal removal tool.

Installation Procedure



1. Install the oil seal by doing the following:

- 1.1. Position the oil seal in the bore.
 - 1.2. Install the [J 33782](#) over the oil seal.
 - 1.3. Strike the [J 33782](#) with a hammer until the seal flange seats on the axle housing surface.
2. Apply sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent to the splines of the drive pinion yoke.

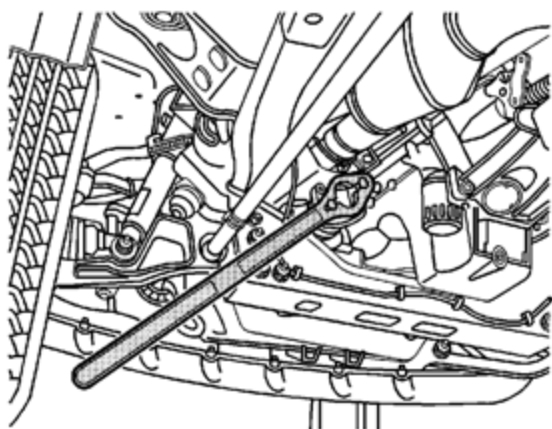


3. Install the pinion yoke.

Align the reference marks made during removal.

Caution: Refer to [Pinion Flange/Yoke Installation Caution](#) in the Preface section.

4. Seat the pinion flange onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft threads show through the flange.
5. Install the washer.
6. Install a new pinion nut.



7. Install the [J 8614-01](#) onto the pinion flange as shown.

Caution: Refer to [Fastener Caution](#) in the Preface section.

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

8. Tighten the pinion nut while holding the [J 8614-01](#).

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

9. Measure the rotating torque of the pinion. Compare the measurement with the rotating torque recorded earlier.

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

10. Once the specified torque is obtained, rotate the pinion several times to ensure the bearings have seated. Recheck the rotating torque and adjust if necessary.
11. Install the propeller shaft to the pinion yoke.

Align the reference marks made during removal.

12. Install the pinion yoke retainers and the bolts and tighten to **25 N·m (18 lb ft)**.
13. Inspect the axle lubricant level, and add, if necessary. Refer to [Front Axle Lubricant Level Inspection](#).
14. Install the brake calipers. Refer to [Front Brake Caliper Replacement](#).
15. Install the tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).
16. Lower the vehicle.

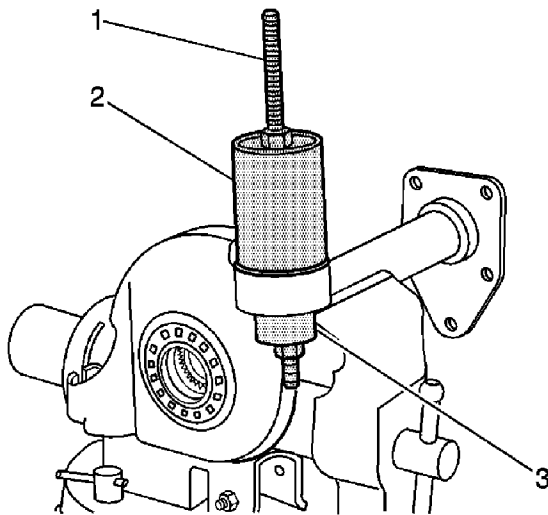
Differential Carrier Assembly Bushing Replacement (Inner Axle Shaft Housing)

Tools Required

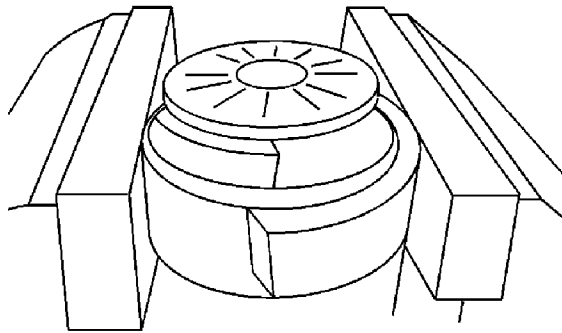
[J 45850](#) Front Axle Bushing Remover/Installer

Removal Procedure

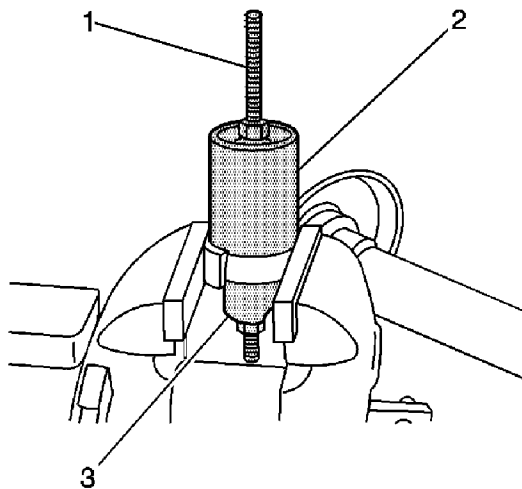
1. Remove the inner shaft housing. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#).
2. If replacing the upper inner shaft housing bushing, install the inner shaft housing into a vise.



3. Install the J 45850-2 (2), the J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the upper inner shaft housing bushing as shown.
4. Remove the upper inner shaft housing bushing by holding the lower nut and tightening the upper nut of the [J 45850](#).

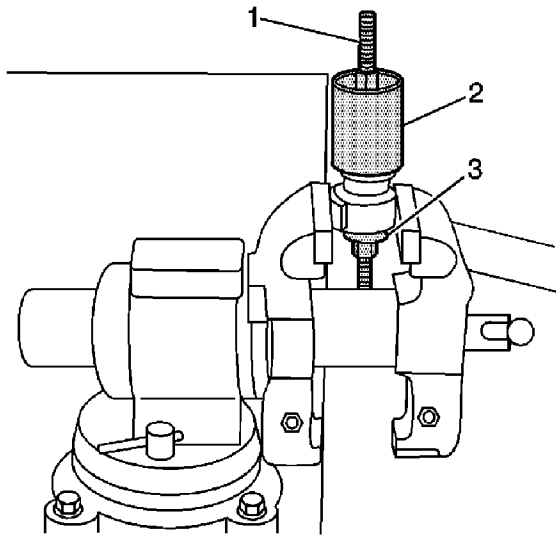


5. If replacing the lower inner shaft housing bushing, install the inner shaft housing into a vise so that the lower inner shaft bushing bore is flush with the jaws of the vise.



6. Install the J 45850-2 (2), J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the lower inner shaft housing bushing as shown.
7. Remove the lower inner shaft housing bushing by holding the lower nut and tightening the upper nut of the [J 45850](#).

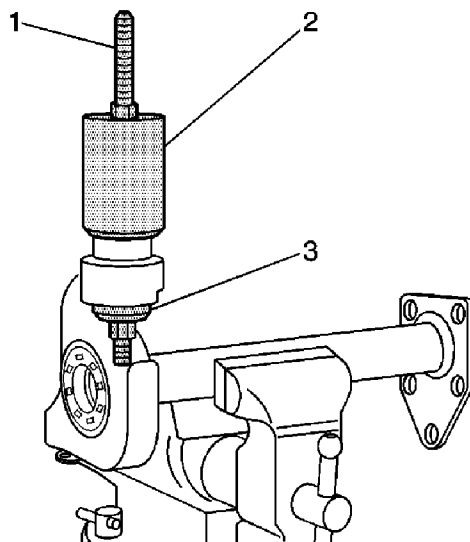
Installation Procedure



1. If replacing the lower inner shaft housing bushing, install the inner shaft housing bushing bore into a vise.
2. Place the lower inner shaft housing bushing over the bushing bore.
3. Install the J 45850-2 (2), J 45850-1 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the inner shaft housing bushing as shown.

Install the J 45850-3 inside the J 45850-2 (2) in order to gain access to the upper nut.

4. Install the lower inner shaft bushing by holding the lower nut and slowly tightening the upper nut in order to pull the bushing into the bushing bore.



5. If replacing the upper inner shaft housing bushing, install the inner shaft housing bushing bore into a vise.
6. Place the upper inner shaft housing bushing over the bushing bore.

7. Install the J 45850-2 (2), J 45850-1 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the inner shaft housing bushing as shown.

Install the J 45850-3 inside the J 45850-2 (2) in order to gain access to the upper nut.

8. Install the upper inner shaft bushing by holding the lower nut and slowly tightening the upper nut in order to pull the bushing into the bushing bore.
9. Remove the inner shaft housing from the vise.
10. Install the inner shaft housing. Refer to [Front Drive Axle Inner Shaft and Inner Shaft Housing Replacement](#) .

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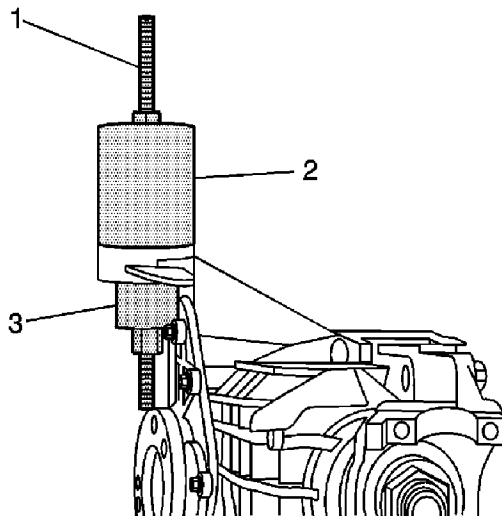
Differential Carrier Assembly Bushing Replacement (Differential Carrier)

Tools Required

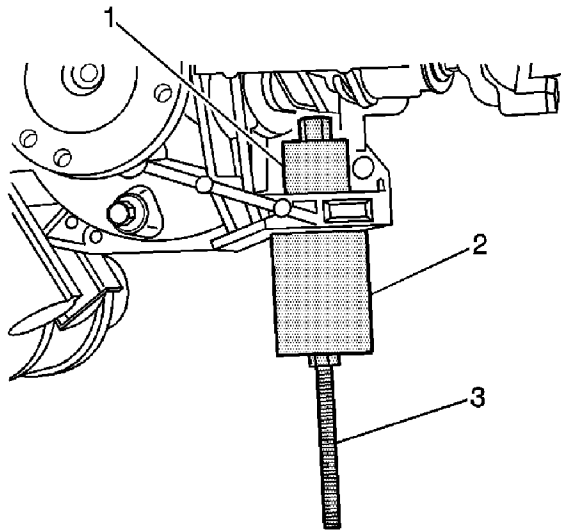
[J 45850](#) Front Axle Bushing Remover/Installer

Removal Procedure

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

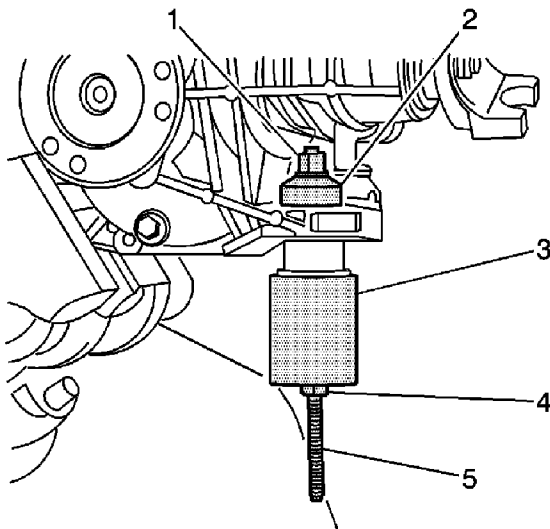


2. If replacing the upper differential carrier assembly bushing, remove the bushing by performing the following steps:
 - 2.1. Install the J 45850-2 (2), the J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the differential carrier assembly bushing as shown.
 - 2.2. Remove the upper differential carrier assembly bushing by holding the lower nut and tightening the upper nut of the [J 45850](#).



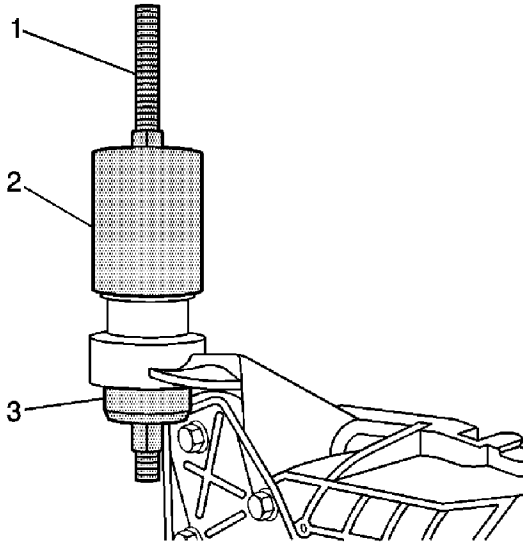
3. If replacing the lower differential carrier assembly bushing, remove the bushing by performing the following steps:
 - 3.1. Install the J 45850-2 (2), the J 45850-3 (1), the forcing screw, the thrust bearing, and the nuts (3) over the differential carrier assembly bushing as shown.
 - 3.2. Remove the lower differential carrier assembly bushing by holding the upper nut and tightening the lower nut of the [J 45850](#).

Installation Procedure



1. If replacing the lower differential carrier assembly bushing, install the bushing by performing the following steps:

- 1.1. Install the differential carrier assembly bushing into the differential carrier assembly bushing bore.
- 1.2. Install the J 45850-2 (3), the J 45850-3 (2), the forcing screw, the thrust bearing, and the nuts (1, 4-5) over the differential carrier assembly bushing as shown.
- 1.3. Install the lower differential carrier assembly bushing by holding the upper nut and tightening the lower nut of the [J 45850](#) .

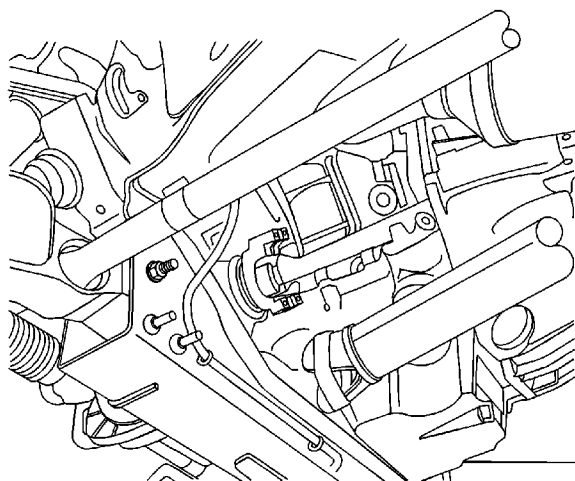


2. If replacing the upper differential carrier assembly bushing, install the bushing by performing the following steps:
 - 2.1. Install the differential carrier assembly bushing into the differential carrier assembly bushing bore.
 - 2.2. Install the J 45850-2 (2), the J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the differential carrier assembly bushing as shown.
 - 2.3. Install the upper differential carrier assembly bushing by holding the lower nut and tightening the upper nut of the [J 45850](#) .
3. Install the differential carrier assembly. Once the differential carrier assembly is installed, remove the piece of tape in order to connect the vent hose. Refer to [Differential Carrier Assembly Replacement](#) .

Differential Carrier Assembly Replacement

Removal Procedure

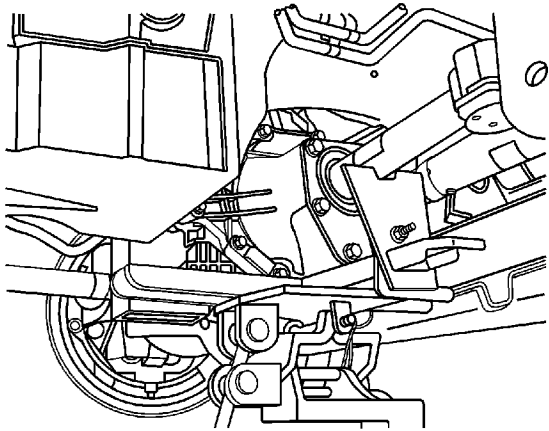
1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Place a jack or utility stands, such as GMTG 123-B67313, at the rear end of the vehicle.
3. Drain the fluid from the differential carrier assembly. Refer to [Front Axle Lubricant Replacement](#).



4. Disconnect the propeller shaft from the differential carrier assembly. Refer to [Front Propeller Shaft Replacement](#).

Support the propeller shaft as necessary.

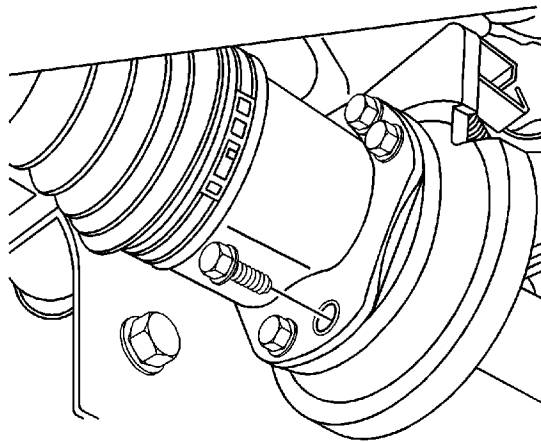
5. Remove the engine protection shield. Refer to [Engine Protection Shield Replacement](#).
6. Remove the front engine crossmember. Refer to [Engine Front Crossmember Replacement](#).



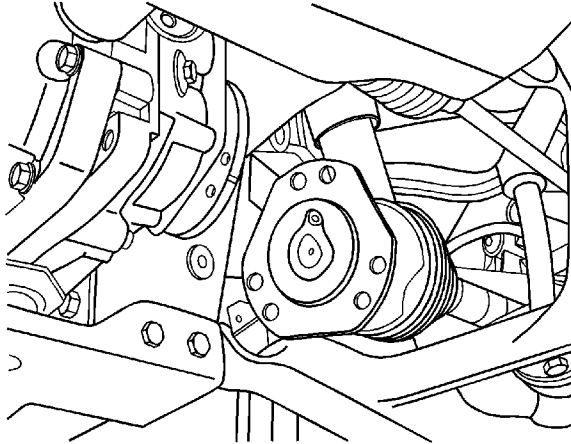
7. Place a transmission jack under the differential carrier assembly.

Secure and support the differential carrier assembly to the transmission jack.

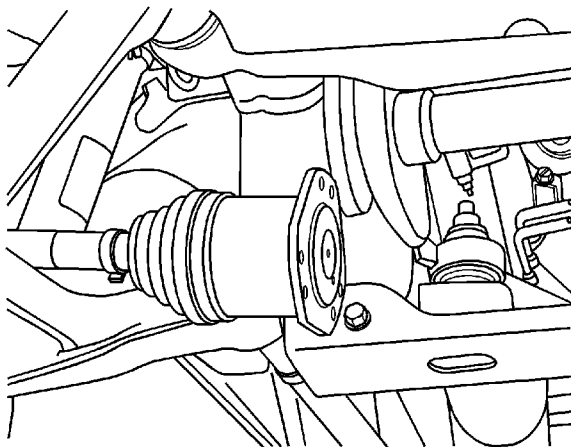
8. Place an alignment mark between the wheel drive shafts and the inner shaft flanges.



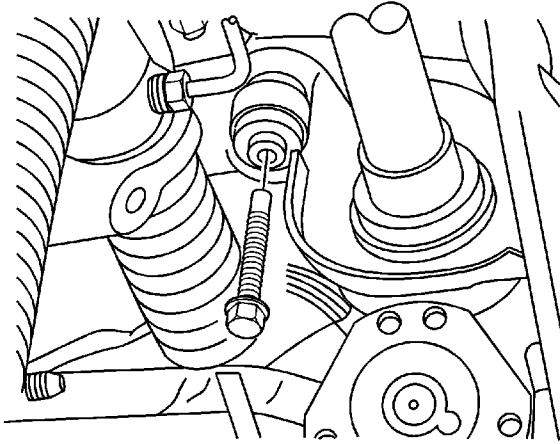
9. Remove the wheel drive shaft to inner shaft bolts.



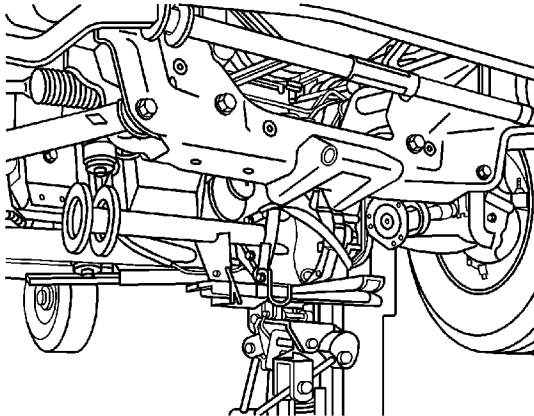
10. Disconnect the left side wheel drive shaft from the inner shaft.



11. Disconnect the right side wheel drive shaft from the inner shaft.
12. Disconnect the differential carrier assembly vent hose from the differential carrier assembly.

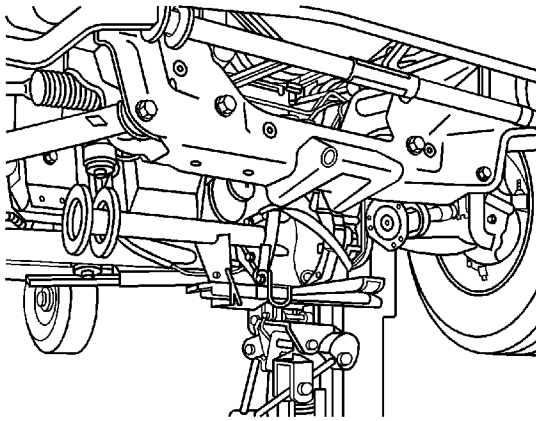


13. Remove the upper inner shaft housing mounting bolt.
14. Remove the upper differential carrier assembly mounting bolt.



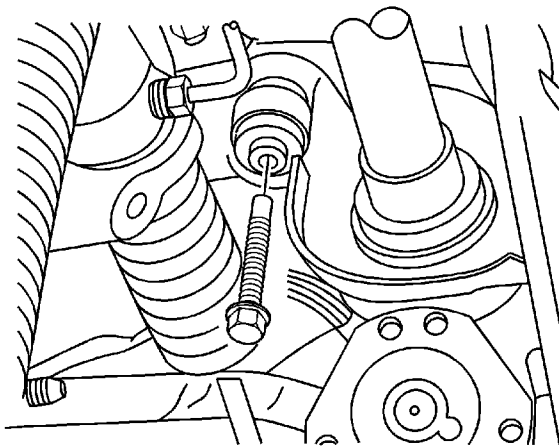
15. Remove the differential carrier assembly.

Installation Procedure



1. Install the differential carrier assembly to the vehicle.
2. Connect the vent hose to the differential carrier assembly.
3. Install the differential carrier assembly upper mounting bolt and the nut.

Do not tighten the bolt to specification at this time.



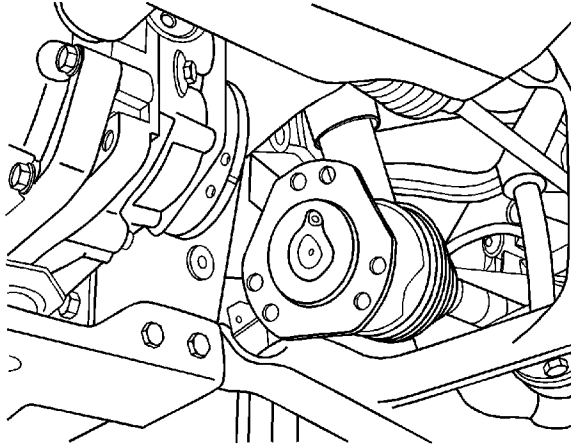
4. Install the inner shaft upper mounting bolt and the nut.

Do not tighten the bolt to specification at this time.

5. Install the front engine crossmember. Refer to [Engine Front Crossmember Replacement](#).

Caution: Refer to [Fastener Caution](#) in the Preface section.

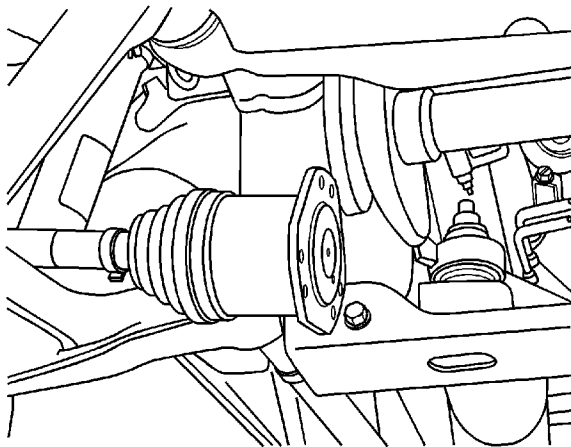
6. Tighten the upper differential carrier assembly and inner shaft housing mounting bolts and tighten to **85 N·m (63 lb ft)**.



7. Connect the left side wheel drive shaft to the inner shaft flange.

Align the marks made during removal.

8. Perform the following procedure before installing the wheel drive shaft to inner shaft bolts:
 - 8.1. Remove all traces of the original adhesive patch.
 - 8.2. Clean the threads of the bolt with denatured alcohol or equivalent and allow to dry.
 - 8.3. Apply threadlocker GM P/N 12345382 (Canadian P/N 10953489) to the threads of the bolts.
9. Install the left side wheel drive shaft to inner shaft bolts and tighten to **50 N·m (37 lb ft)**.

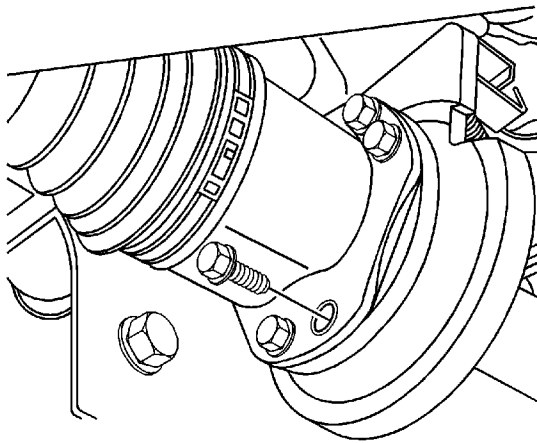




10. Connect the right side wheel drive shaft to the inner shaft flange.

Align the marks made during removal.

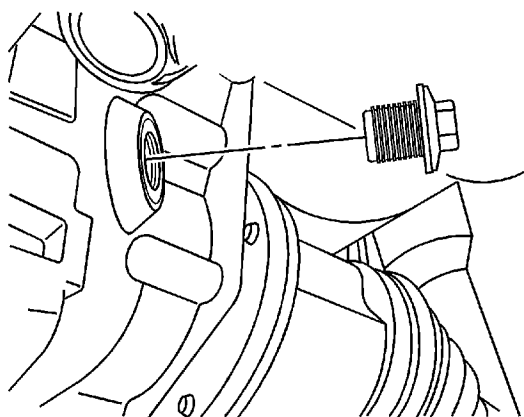
11. Perform the following procedure before installing the wheel drive shaft to inner shaft bolts:
 - 11.1. Remove all traces of the original adhesive patch.
 - 11.2. Clean the threads of the bolt with denatured alcohol or equivalent and allow to dry.
 - 11.3. Apply threadlocker GM P/N 12345382 (Canadian P/N 10953489) to the threads of the bolts.



12. Install the right side wheel drive shaft to inner shaft bolts and tighten to **50 N·m (37 lb ft)**.
13. Install the engine protection shield. Refer to [Engine Protection Shield Replacement](#).
14. Connect the propeller shaft to the differential carrier assembly. Refer to [Front Propeller Shaft Replacement](#).
15. Fill the differential carrier assembly with the proper lubricant. Refer to [Front Axle Lubricant Replacement](#).
16. Remove the jack or utility stands.
17. Lower the vehicle.
18. Inspect the vehicle's Z height and adjust, if necessary. Refer to [Trim Height Inspection](#).

Front Axle Lubricant Level Inspection

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Inspect the front axle for leaks. Repair as necessary.
3. Clean the area around the front axle fill plug.



4. Remove the fill plug.
5. Inspect the oil level.

Specification

The oil level should be between 0-10 mm (0-0.38 in) below the bottom of the fill plug opening.

6. If the level is low, add oil until the level is even with the bottom of the edge of the fill plug opening. Use the proper fluid. Refer to [Fluid and Lubricant Recommendations](#).

Caution: Refer to [Fastener Caution](#) in the Preface section.

7. Install the fill plug and tighten to **33 N·m (24 lb ft)**.
8. Lower the vehicle.

Differential Carrier Assembly Disassemble

Inspection Procedure

Perform the following before disassembling the axle:

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

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

5. Measure the rotating torque of the drive pinion and differential case assembly using an inch-pound torque wrench, if possible. Record the measurement.
6. Check the drive pinion to ring gear backlash, if possible.

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

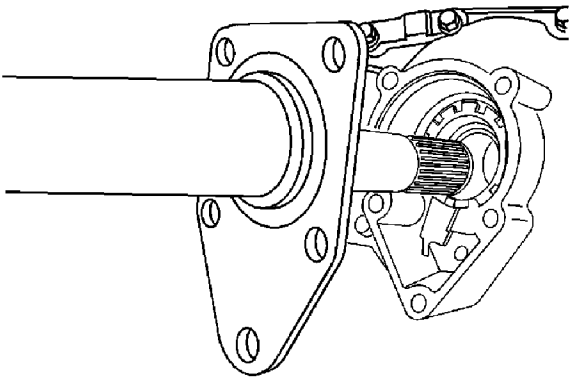
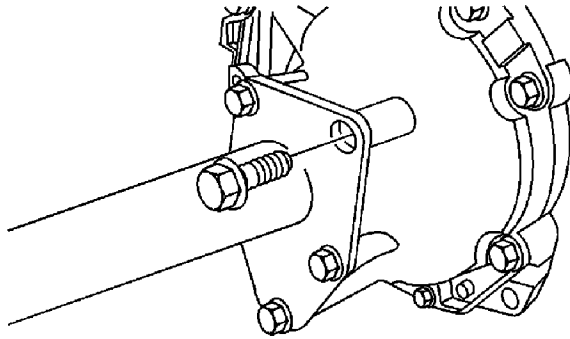
Determine the cause of the axle problem before disassembly, if possible.

Disassembly Procedure

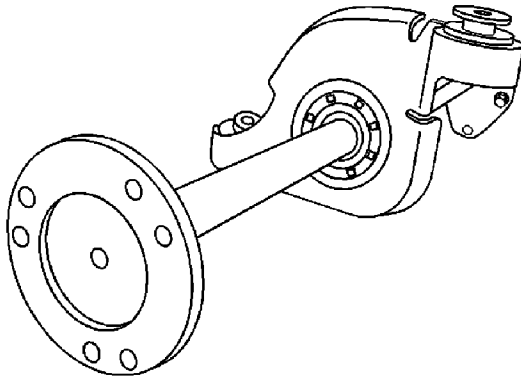
Tools Required

- [J 22912-B](#) Pinion Bearing Remover
- [J 2619-01](#) Slide Hammer
- [J 29369-1](#) Bushing/Bearing Remover
- [J 45224](#) Side Bearing Adjuster
- [J 45232](#) Differential Bearing Adjuster Needle Bearing Installer - LH
- [J 45228](#) Pinion Bearing Cup Remover/Installer
- [J 45234](#) Pinion Remover - 7.25 in Axle
- [J 45850](#) Front Axle Bushing Remover/Installer
- [J 8092](#) Universal Driver Handle - ¾ in - 10
- [J 8614-01](#) Flange and Pulley Holding Tool

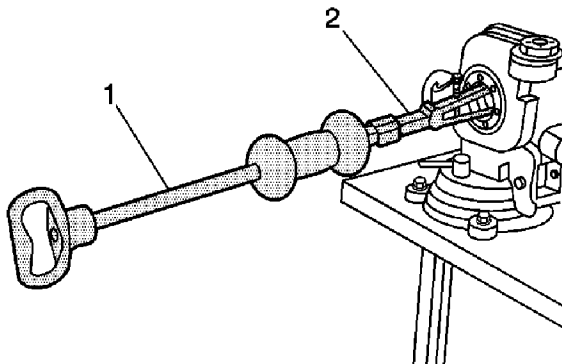
1. Remove the inner housing to differential carrier assembly bolts.



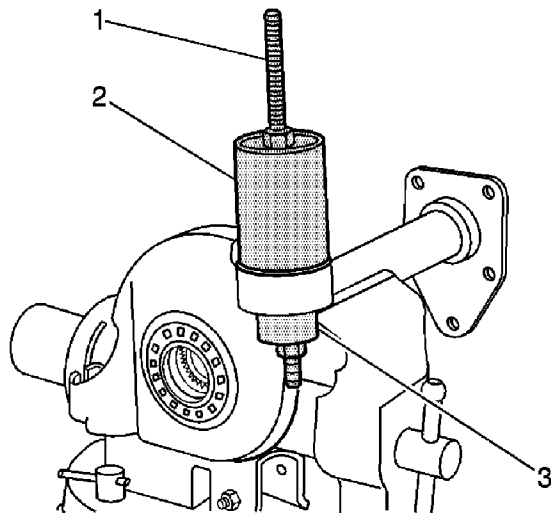
2. Remove the inner housing and inner shaft from the differential carrier assembly.



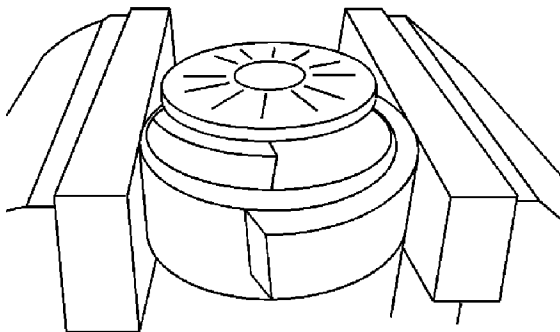
3. Remove the inner shaft.
4. Install the inner shaft housing into a vise.



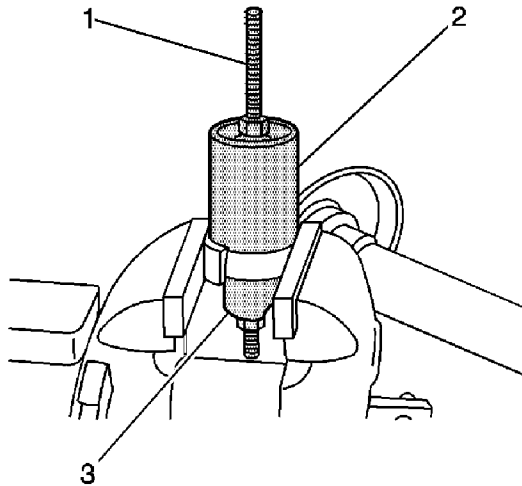
5. Install the [J 29369-1](#) (2) and the [J 2619-01](#) (1) behind the inner shaft bearing.
6. Remove the inner shaft bearing and inner shaft seal using the [J 2619-01](#).



7. Install the J 45850-2 (2), J 45850-3 (1), the forcing screw, bearing, washers and nuts (1) over the upper inner shaft housing bushing as shown.
8. Remove the upper inner shaft housing bushing using the [J 45850](#).
9. Remove the inner shaft housing from the vise.

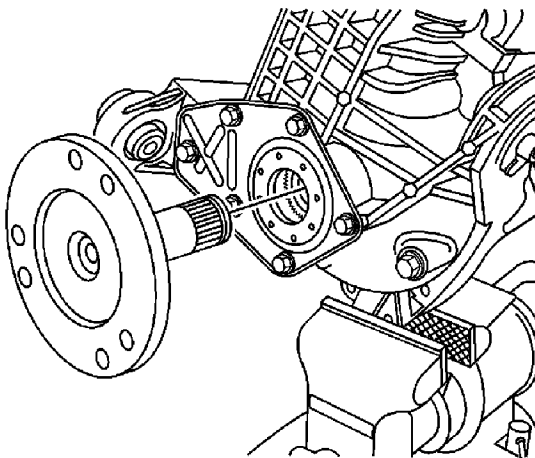


10. Install the inner shaft housing into a vise so that the lower inner shaft bushing bore is flush with the jaws of the vise.

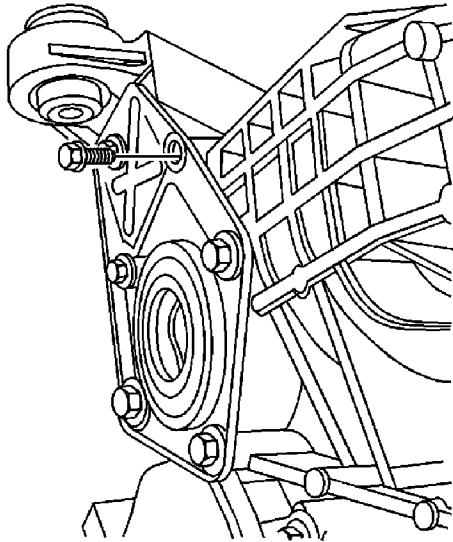


11. Install the J 45850-2 (2), J 45850-3 (1), the forcing screw, bearing, washers and nuts (1) over the lower inner shaft housing bushing as shown.
12. Remove the lower inner shaft housing bushing using the [J 45850](#) .
13. Remove the inner shaft housing from the vise.
14. Install the differential carrier assembly into a vise.

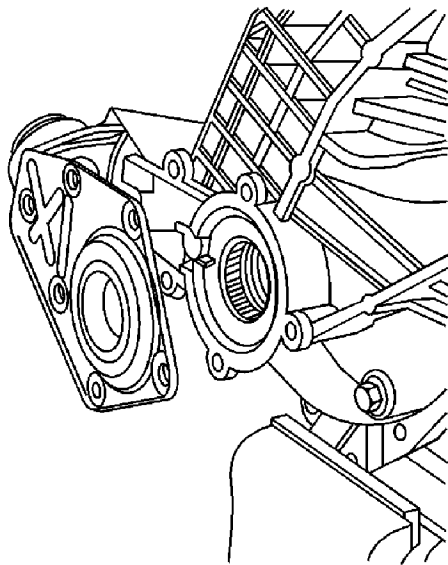
Clamp only on the mounting flange of the differential carrier assembly case.



15. Remove the left inner shaft using a hammer and a brass drift.

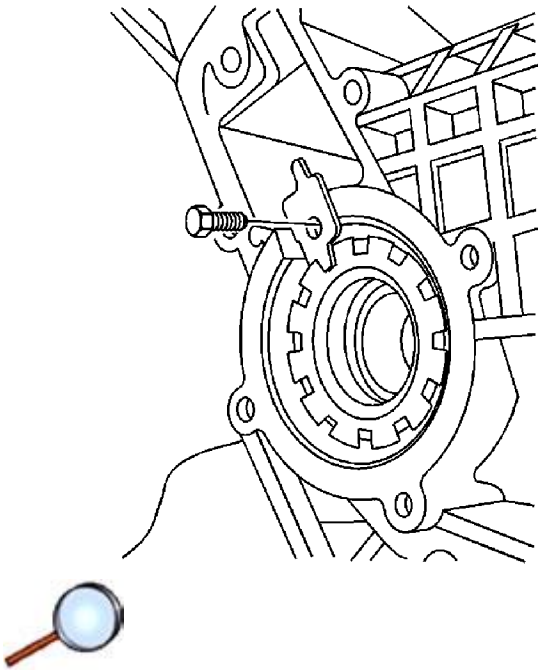


16. Remove the inner shaft seal cover bolts.

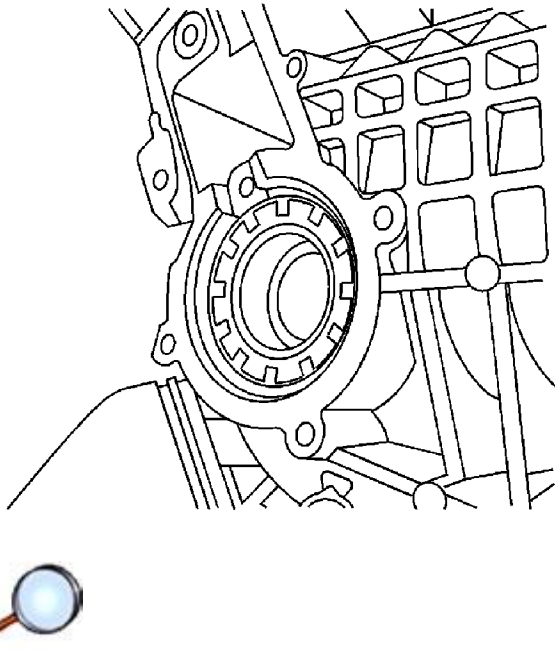


17. Remove the inner shaft seal cover.

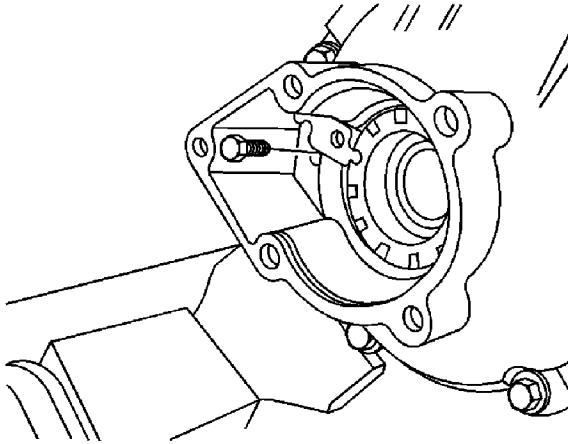
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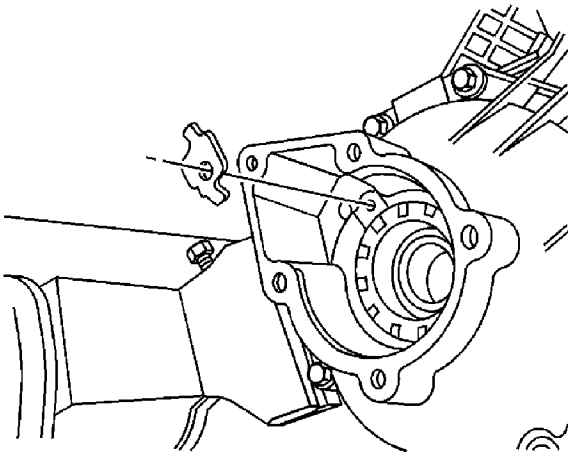
18. Remove the left side differential bearing adjuster lock bolt.



19. Remove the left side differential bearing adjuster lock.

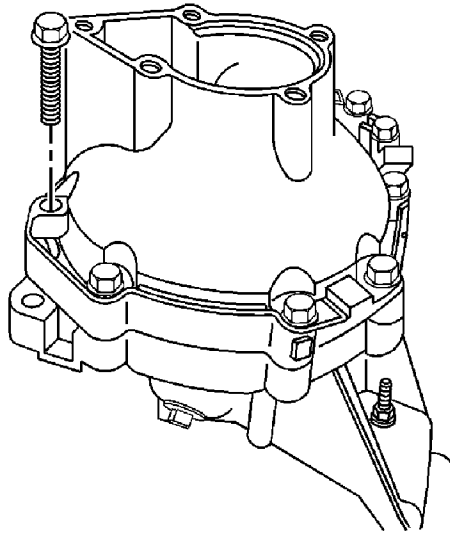


20. Remove the right side differential bearing adjuster lock bolt.

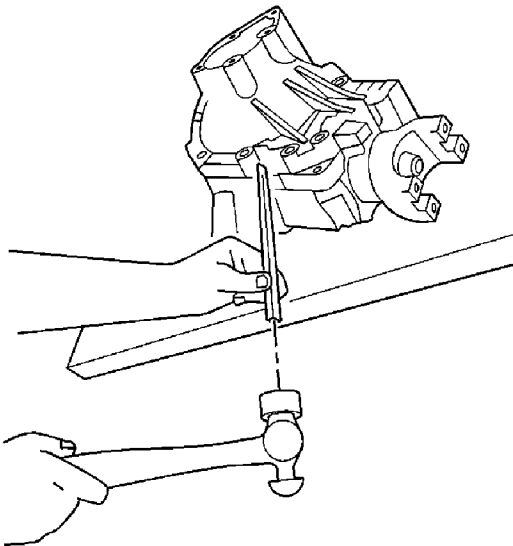


21. Remove the right side differential bearing adjuster lock.
22. Remove the differential carrier assembly from the vise.

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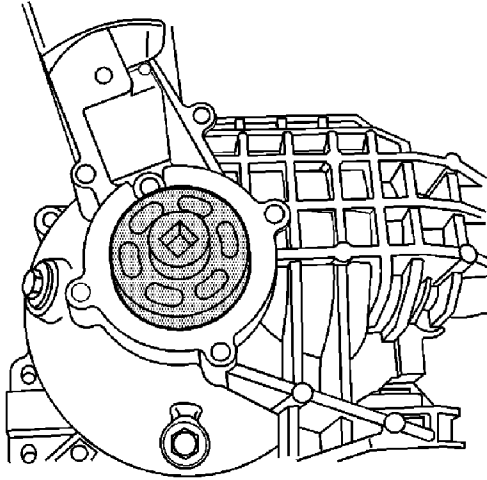


23. Remove the differential carrier assembly bolts.

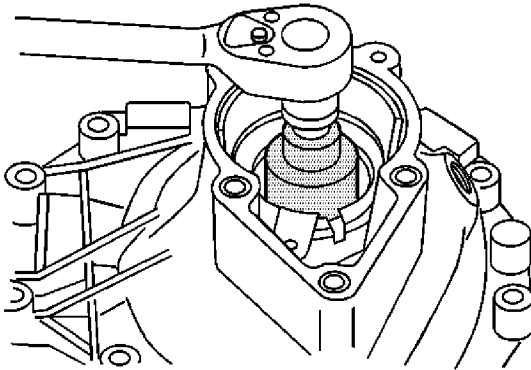


24. Separate the right carrier case half from the left carrier case half by tapping on the carrier case using a hammer and a brass drift.
25. Remove the differential case assembly.

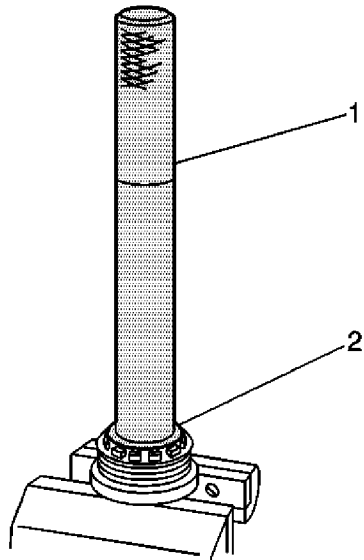
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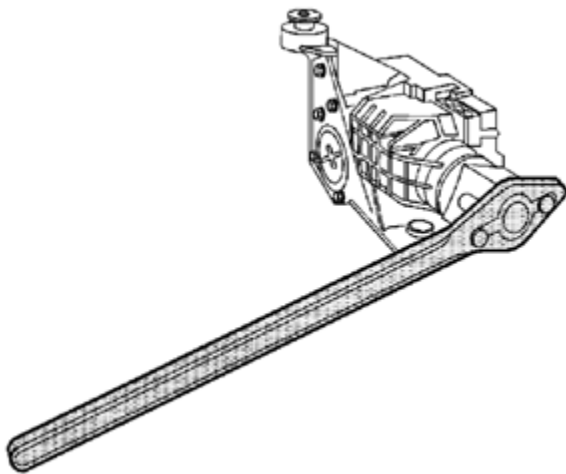
26. Remove the left differential bearing adjuster by doing the following:
 - 26.1. Install the [J 45224](#) onto the differential bearing adjuster.
 - 26.2. Turn the [J 45224](#) counterclockwise in order to remove the differential bearing adjuster.
27. Remove the differential bearing cup.



28. Remove the right differential bearing adjuster by doing the following:
 - 28.1. Install the [J 45224](#) onto the differential bearing adjuster.
 - 28.2. Turn the [J 45224](#) counterclockwise in order to remove the differential bearing adjuster.
29. Remove the differential bearing cup.



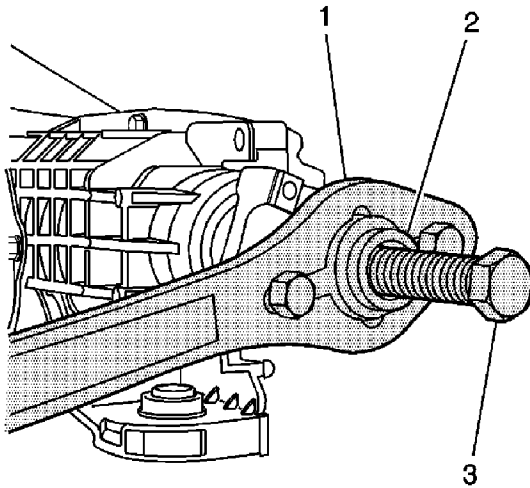
30. Remove the left inner shaft bearing using the [J 45232](#) (2) and the [J 8092](#) (1).



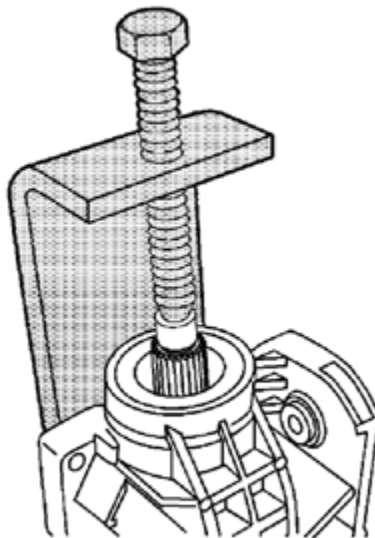
31. Install the [J 8614-01](#) onto the pinion yoke as shown.

Remove the pinion nut while holding the [J 8614-01](#) .

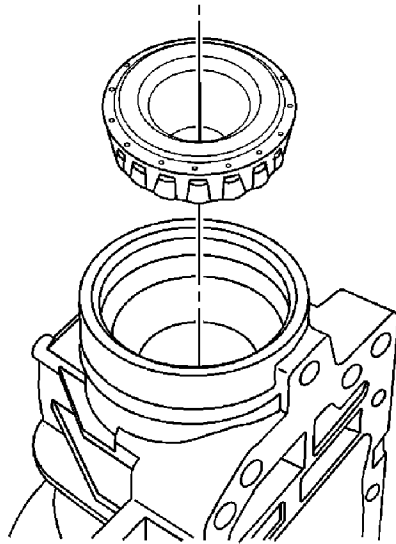
32. Remove the washer.



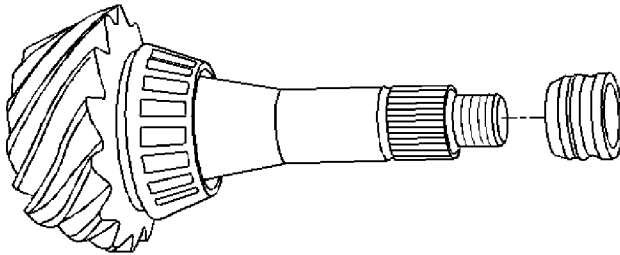
33. Install the J 8614-2 (2) and the J 8614-3 (3) into the [J 8614-01](#) (1) as shown.
34. Remove the pinion yoke by turning the J 8614-3 (3) clockwise while holding the [J 8614-01](#) (1).



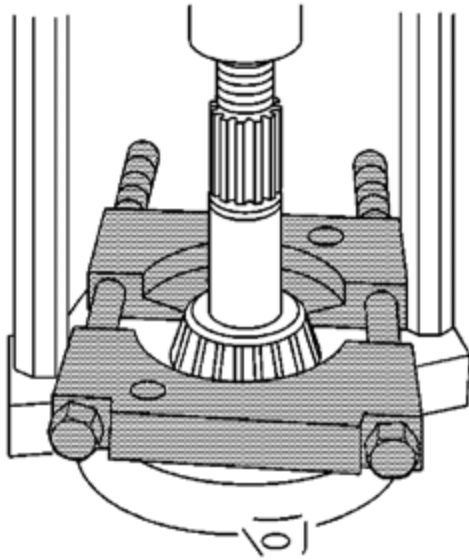
35. Install the [J 45234](#) onto the left differential carrier case and over the drive pinion as shown.
36. Remove the drive pinion by turning the forcing screw of the [J 45234](#) clockwise.
37. Remove the pinion oil seal using a suitable seal removal tool.



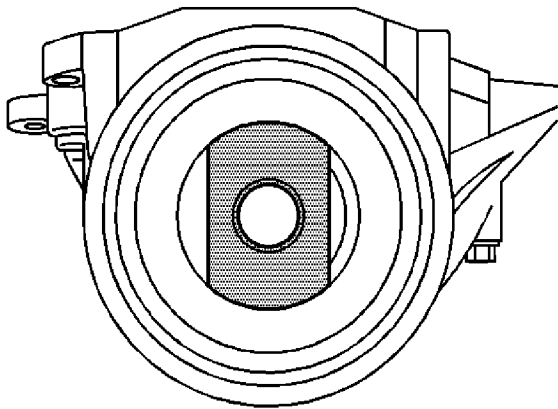
38. Remove the outer pinion bearing.



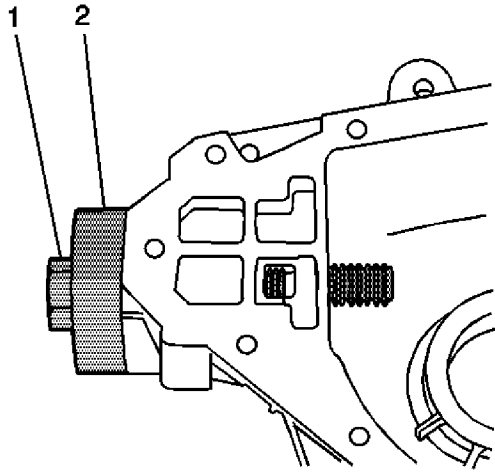
39. Remove the collapsible spacer from the pinion.



40. Remove the inner pinion bearing by installing the [J 22912-B](#) between the pinion bearing and the pinion gear and pressing the bearing off the pinion.
41. Remove the pinion gear selectable shim.



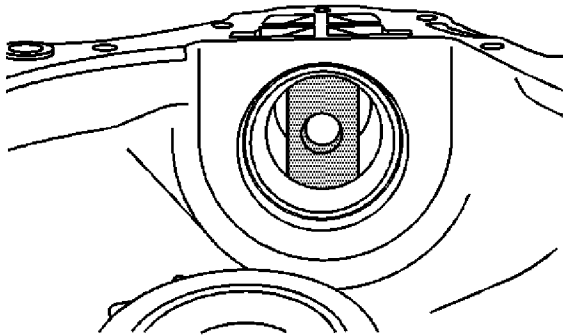
42. Install the J 45228-4 to the outer pinion bearing cup as shown.



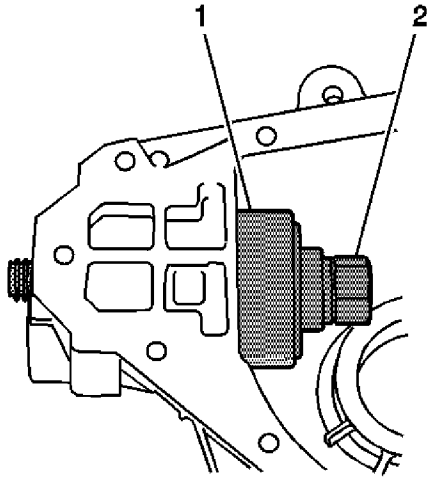
43. Install the J 45228-1 (2) and the J 45228-5 (1) to the J 45228-4.

Seat the ridge of the J 45228-1 (2) into the outer pinion bearing cup bore.

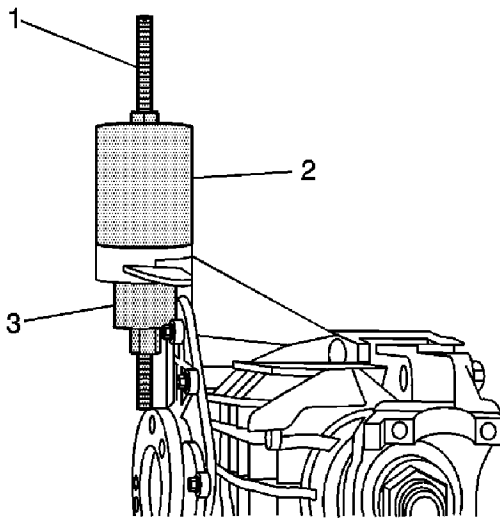
44. Remove the outer pinion bearing cup by turning the J 45228-5 (1) clockwise.



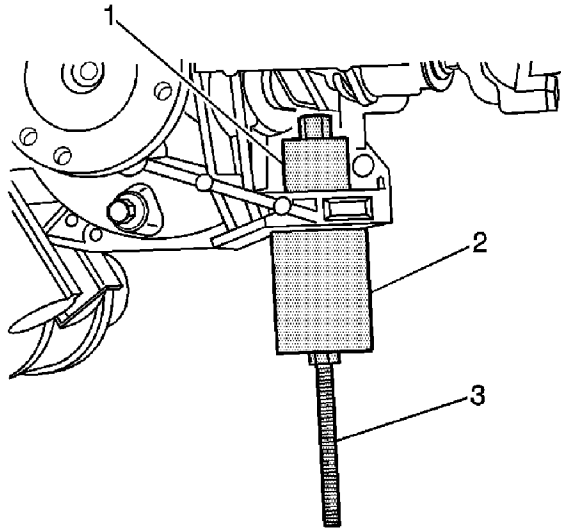
45. Install the J 45228-4 to the inner pinion bearing cup as shown.



46. Install the J 45228-1 (1) and the J 45228-5 (2) to the J 45228-4.
47. Remove the outer pinion bearing cup by turning the J 45228-5 (2) clockwise.



48. Remove the upper differential carrier assembly bushing by performing the following steps:
 - 48.1. Install the J 45850-2 (2), the J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the differential carrier assembly bushing as shown.
 - 48.2. Remove the upper differential carrier assembly bushing by holding the lower nut and tightening the upper nut of the [J 45850](#).



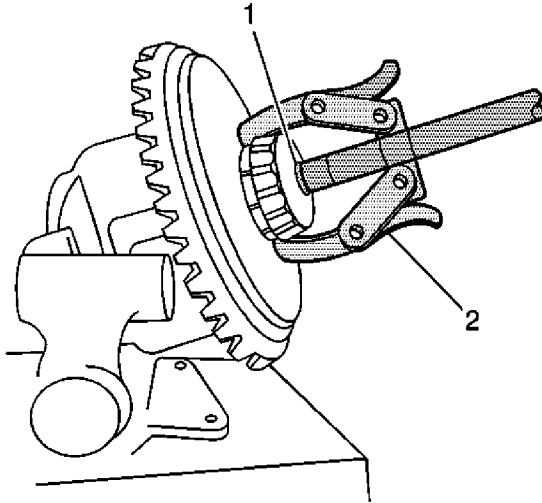
49. Remove the lower differential carrier assembly bushing by performing the following steps:
- 49.1. Install the J 45850-2 (2), the J 45850-3 (1), the forcing screw, the thrust bearing, and the nuts (3) over the differential carrier assembly bushing as shown.
 - 49.2. Remove the lower differential carrier assembly bushing by holding the upper nut and tightening the lower nut of the [J 45850](#) .

Front Differential Case Disassemble

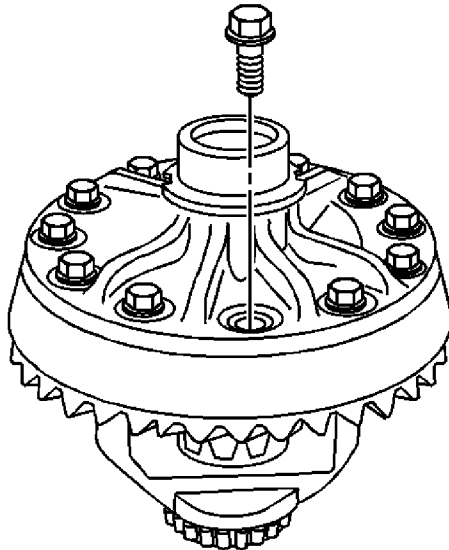
Special Tools

[J 22888-D](#) Side Bearing Remover Kit

1. Place the differential case in a vise.



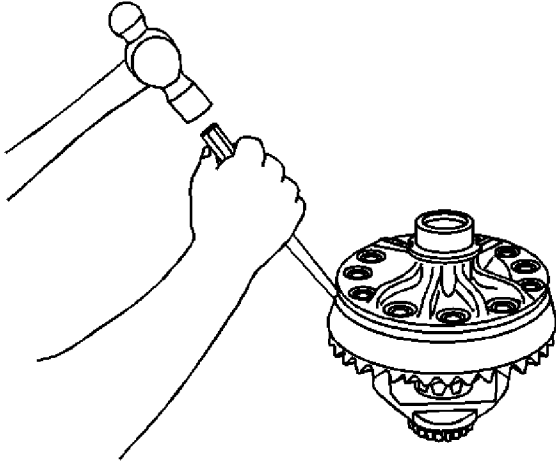
2. Install the [J 22888-20A](#) (2) and the [J 8107-2](#) (1) as shown.
3. Remove the differential side bearings using the [J 22888-20A](#) and the [J 8107-2](#).



Note: The ring gear bolts have left-handed threads.

4. Remove the ring gear bolts.

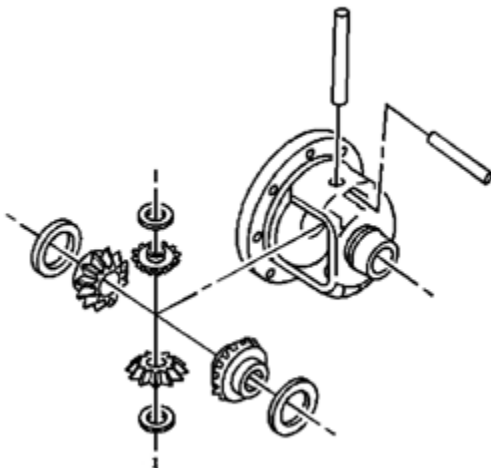
Caution: Do not pry the ring gear from the differential case. Prying the ring gear from the differential case may cause damage to the ring gear and/or the differential case.



5. Remove the ring gear from the differential case.

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

6. Remove the pinion shaft lock bolt.



7. Remove the pinion shaft.
8. Remove the differential pinion gears and the differential side gears.
 - 8.1. Roll the differential pinion gears out of the case with the pinion thrust washers.
 - 8.2. Remove the differential side gears and the side gear thrust washers.

Mark the pinion gears top and bottom and the differential side gears left and right.

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Differential Case Bearings Inspection

Important:

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

Do not replace a bearing for this reason.

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

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Differential Case and Gears Inspection

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

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Pinion and Ring Gear Inspection

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

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Thrust Washers, Shims, and Adjuster Sleeves Inspection

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

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

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

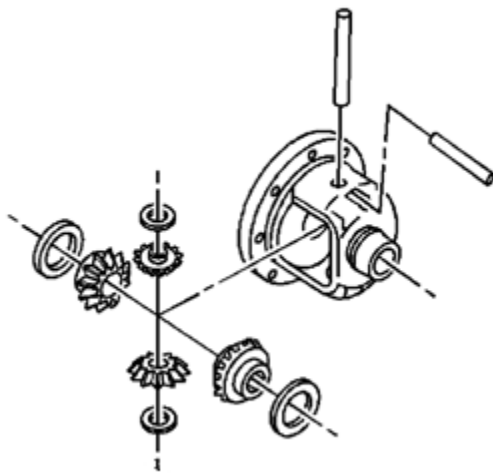
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Front Differential Case Assemble

Special Tools

- [J 8092](#) Universal Driver Handle - 3/4 in - 10
- [J 22888-D](#) Side Bearing Remover Kit
- [J 33790](#) Differential Side Bearing Installer

1. Lubricate the pinion and side gears using axle lubricant. Use the proper fluid. Refer to [Fluid and Lubricant Recommendations](#).



2. Install the differential side gear thrust washers to the differential side gears.
3. Install the differential side gears and thrust washers into the differential case.

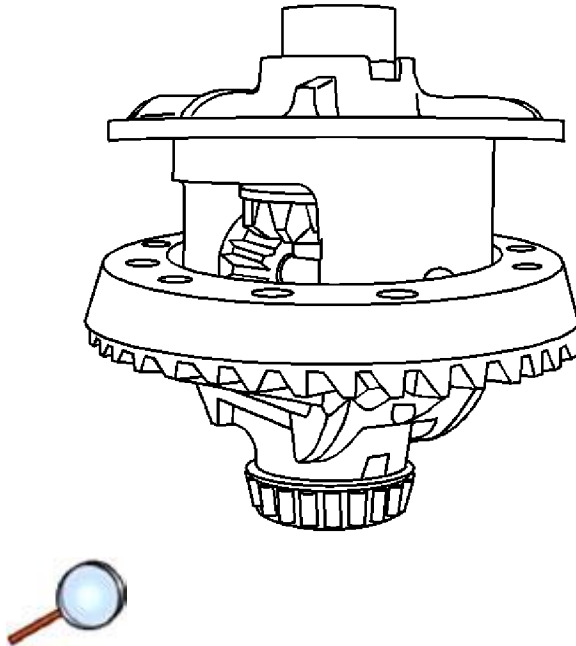
If the same differential side gears and the thrust washers are being used, install the side gears and the thrust washers to their original locations.

4. Install the differential pinion gears and thrust washers by performing the following steps:
 - 4.1. Position one pinion gear between the differential side gears.
 - 4.2. Position the second pinion gear between the differential side gear directly opposite of the first gear.
 - 4.3. Rotate the differential side gears until the pinion gears are directly opposite the opening in the differential case.
 - 4.4. Install the thrust washers.

Rotate the pinion gears toward the differential case opening in order to permit the sliding in of the thrust washers.

5. Install the pinion gea

6. Install the new pinion gear shaft lock pin using a hammer and a brass drift.



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

7. Install the ring gear onto the differential case.

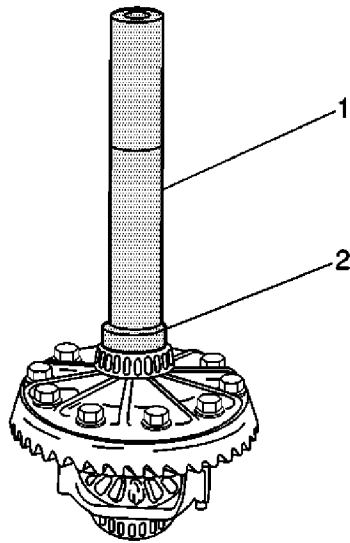
Note: The ring gear bolts have left-hand threads.

8. Install the new ring gear bolts.

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

Caution: Refer to [Fastener Caution](#) in the Preface section.

9. Tighten the ring gear bolts. Tighten the ring gear bolts alternately and in stages, gradually pulling the ring gear onto the differential case and tighten to **84 N·m (67 lb ft)**.



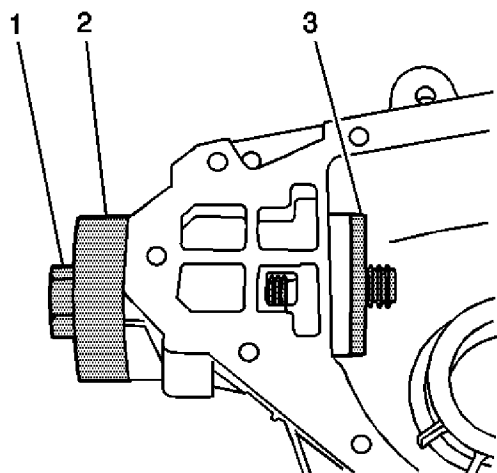
10. Install the differential side bearings by performing the following steps:
 - 10.1. In order to protect the differential case, install the [J 8107-2](#) in the case on the side opposite the bearing installation.
 - 10.2. Install the [J 33790](#) (2) and the [J 8092](#) (1) onto the differential case bearing as shown.
 - 10.3. Install the differential case bearings using the [J 33790](#) and the [J 8092](#) .

Front Differential Drive Pinion Gear Bearing Cup Installation

Tools Required

[J 45228](#) Pinion Bearing Cup Remover and Installer

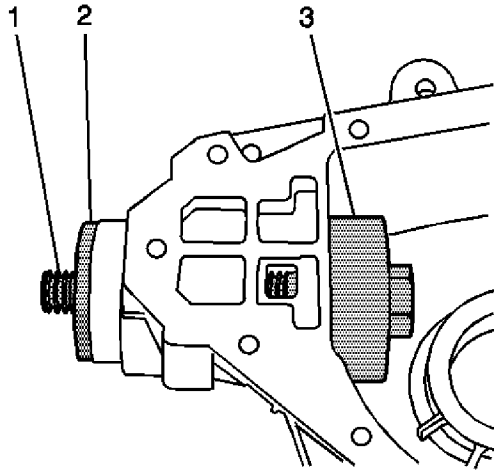
1. Install the inner pinion bearing cup into the inner pinion bearing cup bore.



2. Assemble the J 45228-1 (2), the J 45228-2 (3), and the J 45228-5 (1) into the pinion bearing cup bore as shown.
3. Tighten the J 45228-5 (1) slowly to draw the inner pinion cup into the inner pinion bearing cup bore.

Inspect the position of the inner pinion bearing cup as it is being drawn into the pinion bearing cup bore to ensure the bearing cup is being pulled straight into the pinion bearing cup bore. If the pinion bearing cup is not being pulled straight into the bearing cup bore, remove the [J 45228](#) and the pinion bearing cup and reposition the inner pinion bearing cup.

4. Tighten the J 45228-5 (1) until the inner pinion bearing cup is seated in the inner pinion bearing cup bore.
5. Remove the [J 45228](#).
6. Install the outer pinion bearing cup into the outer pinion bearing cup bore.



7. Assemble the J 45228-1 (3), the J 45228-2 (2), and the J 45228-5 (1) into the pinion bearing cup bore as shown.
8. Tighten the J 45228-5 (1) slowly to draw the outer pinion cup into the outer pinion bearing cup bore.

Inspect the position of the outer pinion bearing cup as it is being drawn into the pinion bearing cup bore to ensure the bearing cup is being pulled straight into the pinion bearing cup bore. If the pinion bearing cup is not being pulled straight into the bearing cup bore, remove the [J 45228](#) and the pinion bearing cup and reposition the outer pinion bearing cup.

9. Tighten the J 45228-5 until the outer pinion bearing cup is seated in the outer pinion bearing cup bore.
10. Remove the [J 45228](#) .

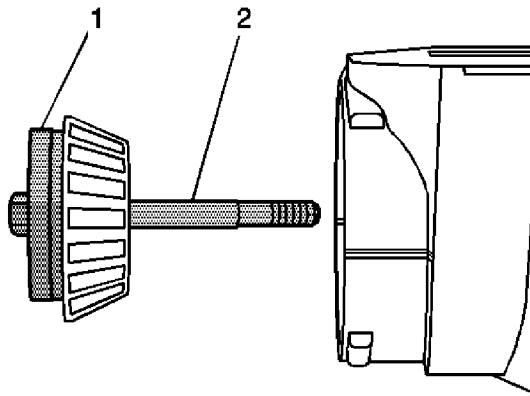
Pinion Depth Adjustment

Tools Required

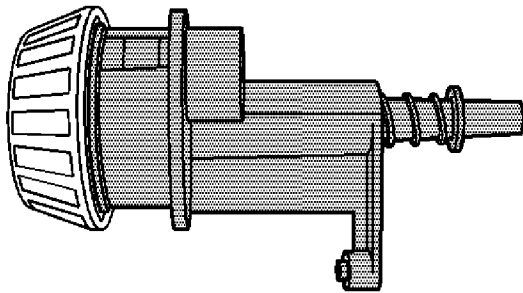
- [J 33838](#) Pinion Setting Gage
- [J 29763](#) Static Timing Gage

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

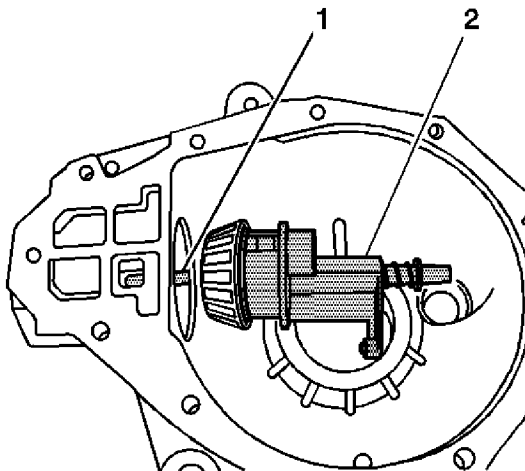
1. Lubricate the pinion bearings with axle lubricant. Refer to [Fluid and Lubricant Recommendations](#).
2. Install the J 33838-2 (1) and the bolt (2) to the outer pinion bearing.



3. Install the J 33838-2 (1) and the bolt (2) with the outer pinion bearing into the differential carrier assembly case half.



4. Install the inner pinion bearing onto the [J 33838](#) as shown.



5. Install the [J 33838](#) (2) with the inner pinion bearing into the differential carrier assembly and the bolt (1).
6. While holding the [J 33838](#) stationary, install an inch-pound torque wrench on the bolt of the [J 33838](#) and tighten the bolt.

Tighten

Tighten the bolt until a rotating torque of 1.7-3.4 N·m (15-30 lb in) for new bearings or 1.0-2.3 N·m (10-20 lb in) for used bearings is obtained.

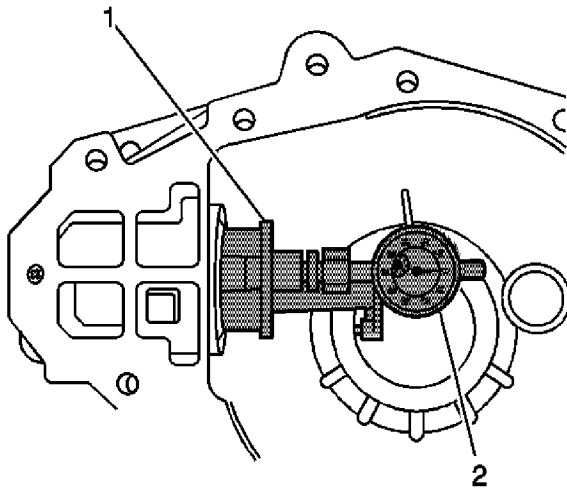
7. Rotate the assembly several times in both directions in order to seat the pinion bearings.
8. Check the rotating torque of the assembly. If the torque is less than 1.7 N·m (15 lb in) for new bearings or 1.0 N·m (10 lb in) for used bearings, continue to tighten the bolt until a

rotating torque of 1.7-3.4 N·m (15-30 lb in) for new bearings or 1.0-2.3 N·m (10-20 lb in) for used bearings is obtained.

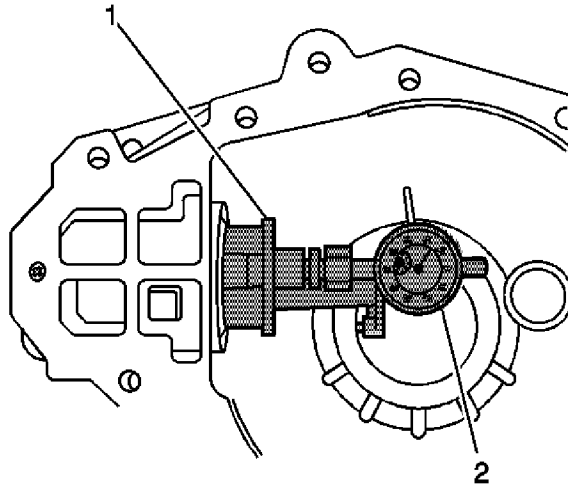
9. Place the contact pad of the [J 33838](#) into the differential side bearing bore.
10. Install the [J 29763](#) to the [J 33838](#) by doing the following:
 - 10.1. Install the collar and the lock nut onto the [J 33838](#).

Do not tighten the lock nut at this time.

- 10.2. Install the [J 29763](#) into the collar.
 - 10.3. Place the stem of the [J 29763](#) onto the contact surface of the [J 33838](#).
 - 10.4. With the stem of the [J 29763](#) touching the contact surface of the [J 33838](#), push down on the [J 29763](#) until the needle of the [J 29763](#) has turned 3/4 of a turn clockwise.
 - 10.5. Tighten the lock nut of the [J 29763](#) finger tight.
11. Rotate the [J 33838](#) back and forth until the needle of the [J 29763](#) indicates the lowest point in the differential side bearing bore.



12. At the lowest point of deflection, move the housing of the [J 29763](#) until the needle indicates ZERO.
13. Move the [J 33838](#) back and forth again to verify the ZERO setting. Adjust the housing of the [J 29763](#) as necessary to set the needle to ZERO.



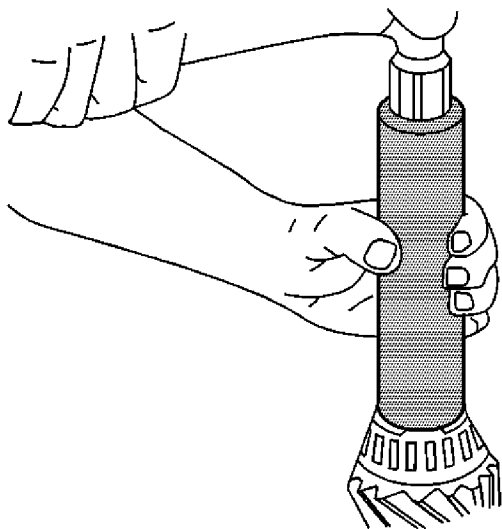
14. After the ZERO setting is obtained and verified, grasp the [J 33838](#) by the flats and move the contact pad of the [J 33838](#) out of the differential side bearing bore.
15. The value indicated on the [J 29763](#) is the thickness of the shim needed in order to set the depth of the pinion.
16. Select the shim that indicates the proper thickness. Measure the shim with a micrometer in order to verify that the thickness is correct.
17. Remove the pinion depth setting tools.
18. Remove the pinion bearings from the pinion depth setting tools.
19. Assemble the differential carrier assembly. Refer to [Differential Carrier Assembly Assemble](#).

Differential Carrier Assembly Assemble

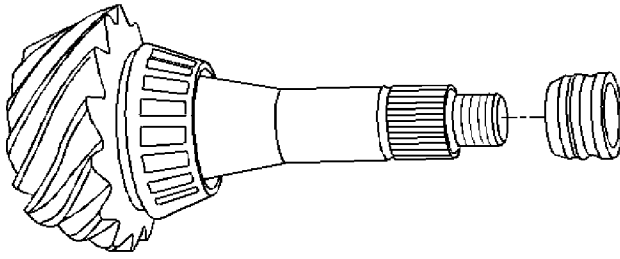
Special Tools

- [J 23423-A](#) Case Bearing Race Installer
- [J 33782](#) Pinion Oil Seal Installer
- [J 33785](#) Pinion Bearing Installer
- [J 45224](#) Side Bearing Adjuster
- [J 45232](#) Differential Bearing Adjuster Needle Bearing Installer - LH
- [J 8092](#) Universal Driver Handle - 3/4 in - 10
- [J 8614-01](#) Flange and Pulley Holding Tool

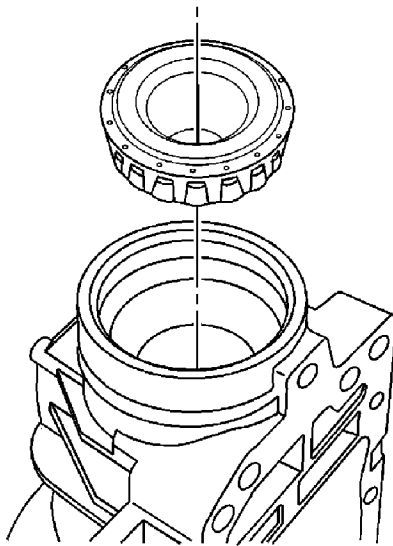
1. Install the selective shim between the inner pinion bearing and the shoulder of the pinion gear.



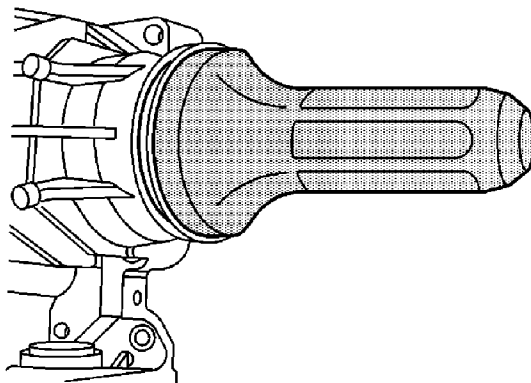
2. Install the inner pinion bearing onto the pinion gear using the [J 33785](#) .



3. Install the new collapsible spacer onto the pinion gear.
4. Lubricate the inner and the outer pinion bearings with the proper axle lubricant. Refer to [Fluid and Lubricant Recommendations](#).



5. Install the outer pinion bearing.



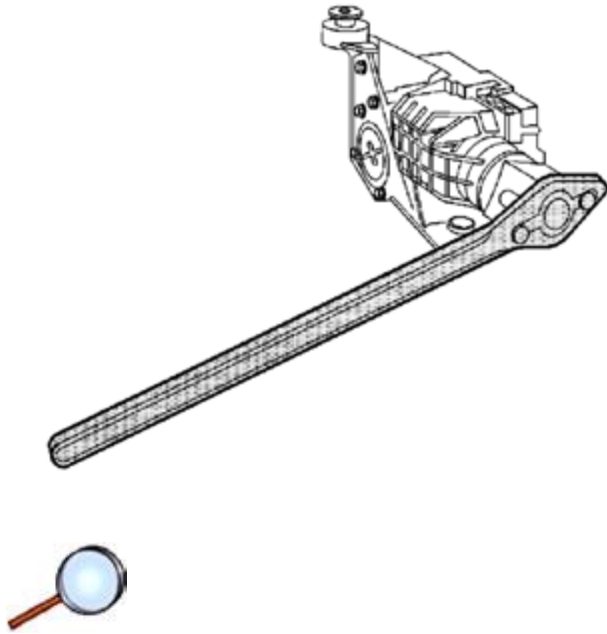
6. Install the oil seal by doing the following:
 - 6.1. Position the oil seal in the bore.
 - 6.2. Install the [J 33782](#) over the oil seal.
 - 6.3. Strike the [J 33782](#) with a hammer until the seal flange seats on the axle housing surface.
7. Install the pinion gear, the selectable shim with inner pinion bearing and the new collapsible spacer, into the left differential carrier case.
8. Apply sealant GM P/N 12346004 (Canadian P/N 10953480) or equivalent, to the splines of the pinion yoke.

Caution: Refer to [Pinion Flange/Yoke Installation Caution](#) in the Preface section.

9. Install the pinion yoke.
10. Install the washer and a new pinion nut.

If the new pinion nut cannot be installed, perform the following steps in order to seat the pinion yoke onto the pinion so that the washer and new pinion nut can be installed:

- 10.1. Remove the pinion nut washer.
- 10.2. Install the old pinion nut.
- 10.3. Tighten the nut until a few of the shaft threads show through the nut so that the washer and new pinion nut can be installed.
- 10.4. Remove the old pinion nut.
- 10.5. Install the pinion nut washer
- 10.6. Install the new pinion nut.



11. Install the [J 8614-01](#) onto the pinion yoke as shown.

Caution: Refer to [Fastener Caution](#) in the Preface section.

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

12. Tighten the pinion nut while holding the [J 8614-01](#).

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

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

Specification

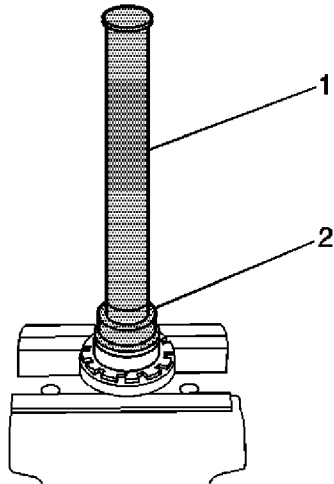
The rotating torque of the pinion should be 1.7-3.4 N·m (15-30 lb in) for new bearings or 1.0-2.3 N·m (10-20 lb in) for used bearings.

14. If the rotating torque measurement is below 1.7 N·m (15 lb in) for new bearings or 1.0 N·m (10 lb in) for used bearings, continue to tighten the pinion nut.

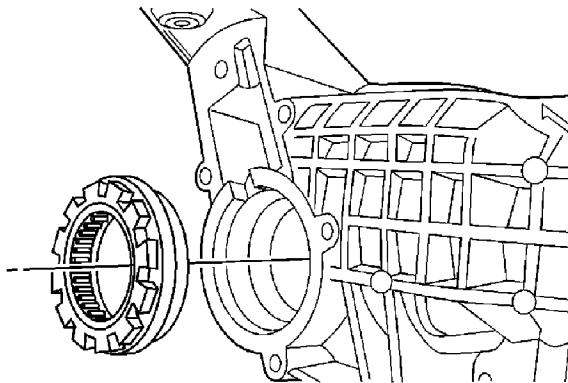
Tighten the pinion nut, in small increments, as needed, until the torque required in order to rotate the pinion is **1.7-3.4 N·m (15-30 lb in)** for new bearings or **1.0-2.3 N·m (10-20 lb in)** for used bearings.

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

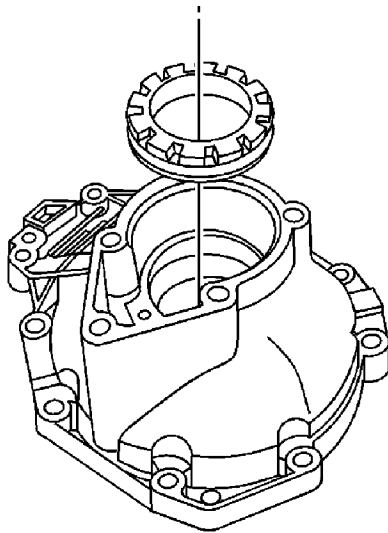
Recheck the rotating torque and adjust if necessary.



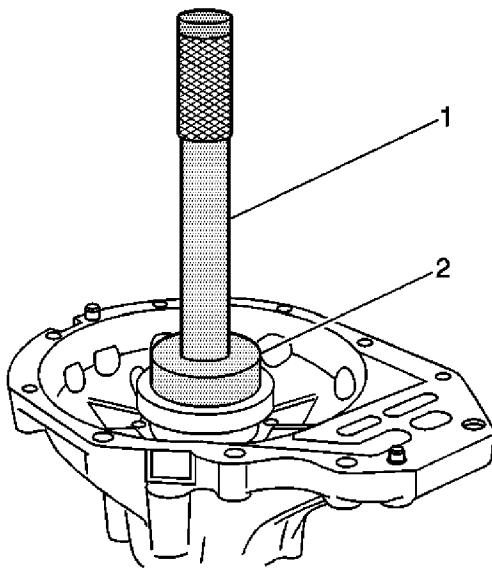
16. Install the left side differential carrier bearing, print side out, to the left side differential adjuster using the [J 45232](#) (2) and the [J 8092](#) (1).



17. Install the left inner shaft bearing and the differential bearing adjuster into the left differential carrier case using the [J 45224](#) .
18. Install the left differential case bearing cup into the left differential carrier assembly case half using the [J 23423-A](#) and the [J 8092](#) .



19. Install the right differential bearing adjuster into the differential case half using the [J 45224](#) .

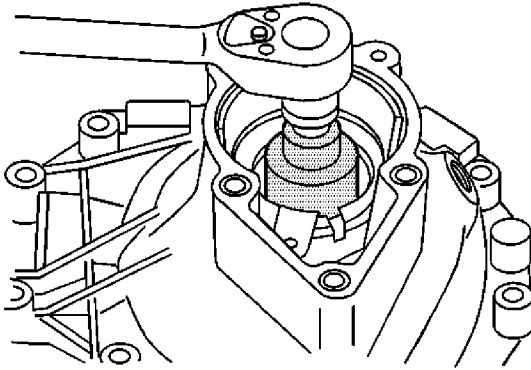


20. Install the right differential case side bearing cup into the right differential carrier case half using the [J 23423-A](#) (2) and the [J 8092](#) (1).
21. Install the differential case assembly into the left differential carrier case half.
22. Install the right differential carrier case half to the left differential carrier case half.

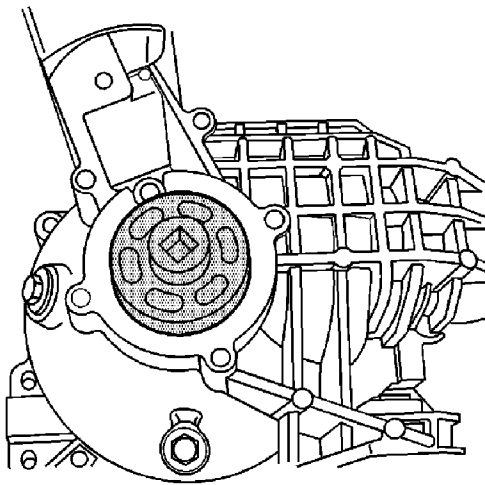
Do not use sealer at this time.

If the carrier case halves do not make complete contact, back out the right differential adjuster nut using the [J 45224](#) .

23. Install the differential carrier case bolts and tighten to **48 N·m (35 lb ft)**.



24. Turn the right side differential adjuster nut sleeve clockwise $1\frac{1}{2}$ revolutions using the [J 45224](#).



25. Using the [J 45224](#), turn the left differential adjuster nut sleeve clockwise in order to preload the differential side bearings against the differential side bearing cups and tighten to **75 N·m (55 lb ft)**.
26. Rotate the pinion several times in order to seat the pinion and differential side bearings.
27. Measure the rotating torque of the drive pinion and differential assembly using an inch-pound torque wrench.

Specification

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

28. If the rotating torque measurement is below 2.8 N·m (25 lb in) for used bearings, or 3.4 N·m (30 lb in) for new bearings, adjust the differential side bearing preload using the following steps:
 - 28.1. Place an alignment mark between the differential adjuster nut sleeve and the differential carrier case, left and right sides.
 - 28.2. Using the [J 45224](#) , turn the left and the right side differential adjuster nut sleeves in or clockwise one notch.
 - 28.3. Measure the rotating torque of the pinion and differential assembly using an inch-pound torque wrench.
 - 28.4. Compare the new measurement to the specification listed in step 29, if the rotating torque of the pinion and differential assembly is not within specifications, continue to tighten the left and right side differential adjuster nut sleeves one notch at a time on each side until the rotating torque of the pinion and differential assembly is within specifications
29. If the rotating torque measurement is above 5.1 N·m (45 lb in) for used bearings, or 6.2 N·m (55 lb in) for new bearings, adjust the differential side bearing preload using the following steps:
 - 29.1. Place an alignment mark between the differential adjuster nut sleeve and the differential carrier case, left and right sides.
 - 29.2. Using the [J 45224](#) , turn the left and the right side differential adjuster nut sleeves out or counterclockwise one notch.
 - 29.3. Measure the rotating torque of the pinion and differential assembly using an inch-pound torque wrench.
 - 29.4. Compare the new measurement to the specification listed in step 29, if the rotating torque of the pinion and differential assembly is not within specifications, continue to loosen the left and right side differential adjuster nut sleeves one notch at a time on each side until the rotating torque of the pinion and differential assembly is within specifications
30. Once the specified rotating torque is obtained, rotate the pinion several times to ensure the bearings have seated.

Recheck the rotating torque and adjust if necessary.
31. Measure the drive pinion to ring gear backlash. Refer to [Backlash Inspection and Adjustment](#).

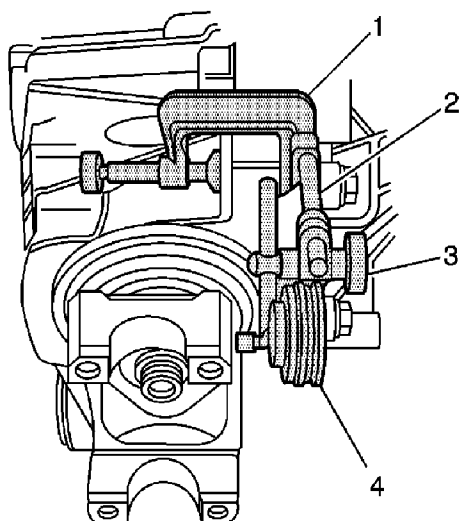
Backlash Inspection and Adjustment

Tools Required

- [J 45224](#) Side Bearing Adjuster
- [J 8001](#) Dial Indicator Set

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

Ensure that the notches can be counted when turned.



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

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

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

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

Specification

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

Important: When adjusting the backlash, observe the following:

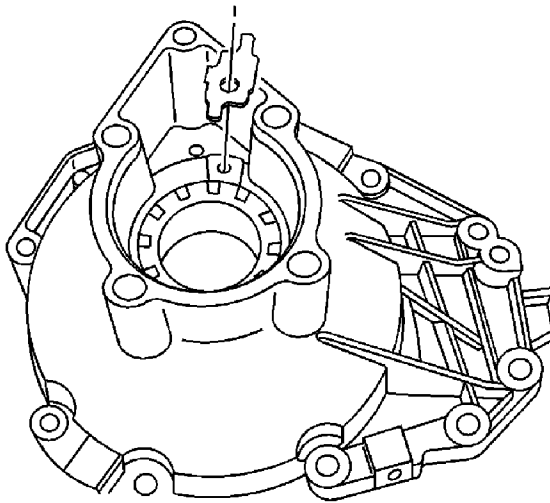
- Always turn the left and the right differential adjuster nut sleeves in equal amounts.
 - Turning the differential adjuster nut sleeves one notch will change the backlash about 0.08 mm (0.003 in).
6. If the backlash is too small, increase the backlash by turning the left differential adjuster nut sleeve in one notch and the right differential adjuster nut sleeve out one notch using the [J 45224](#).
 7. If the backlash is too large, decrease the backlash by turning the right differential adjuster nut sleeve in one notch and the left differential adjuster nut sleeve out one notch using the [J 45224](#).
 8. Recheck the backlash and adjust as necessary.
 9. Recheck the rotating torque of the pinion and differential assembly and adjust as necessary.
 10. Once the backlash and rotating torque of the pinion and differential assembly is correct, perform a gear tooth contact pattern check to ensure proper contact between the pinion and the ring gear. Refer to [Gear Tooth Contact Pattern Inspection](#).
 11. Once the pinion and differential side bearing preload, the backlash, and the gear tooth contact pattern is within specifications, complete the assembly of the differential carrier assembly. Refer to [Differential Carrier Assembly Final Assembly](#).

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Differential Carrier Assembly Final Assembly

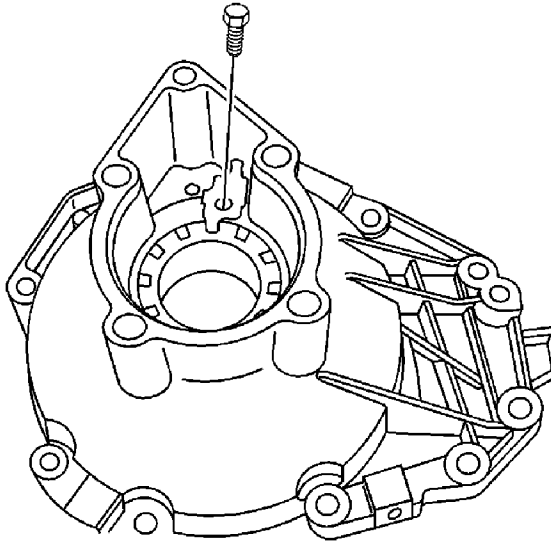
Special Tools

- [J 42211](#) Axle Bearing Installer
- [J 42738](#) Seal Installer
- [J 45850](#) Front Axle Bushing Remover/Installer
- [J 8092](#) Universal Driver Handle - ¾ in - 10

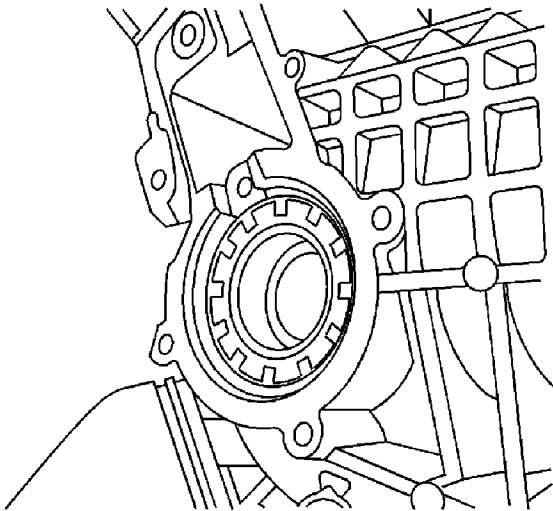


1. Install the right side differential adjuster lock over the differential bearing adjuster.

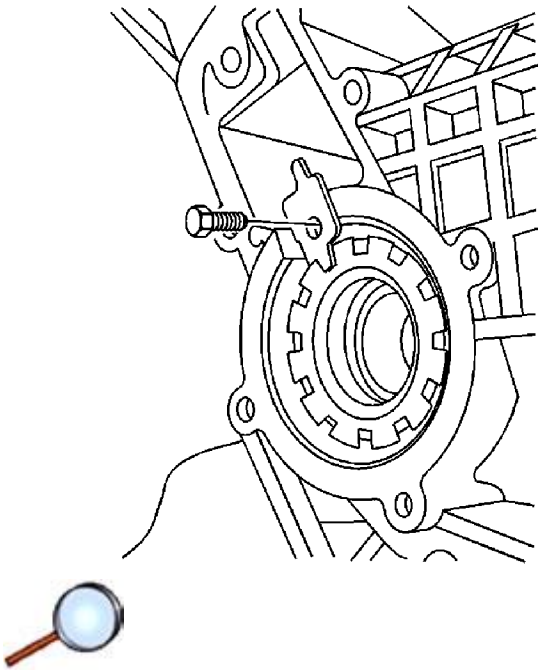
Caution: Refer to [Fastener Caution](#) in the Preface section.



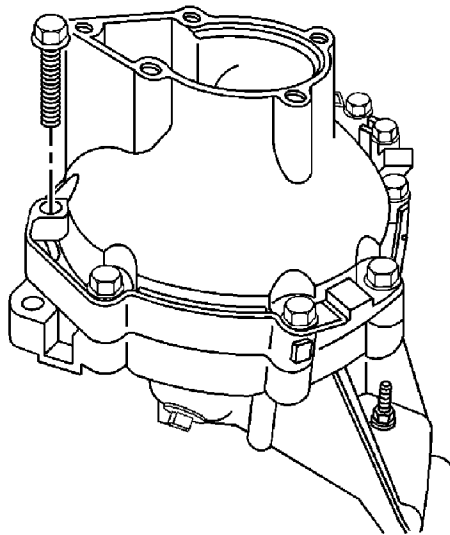
2. Install the right side differential bearing adjuster lock bolt and tighten to **8 N·m (71 lb in)**.



3. Install the left side differential bearing adjuster lock over the differential adjuster.



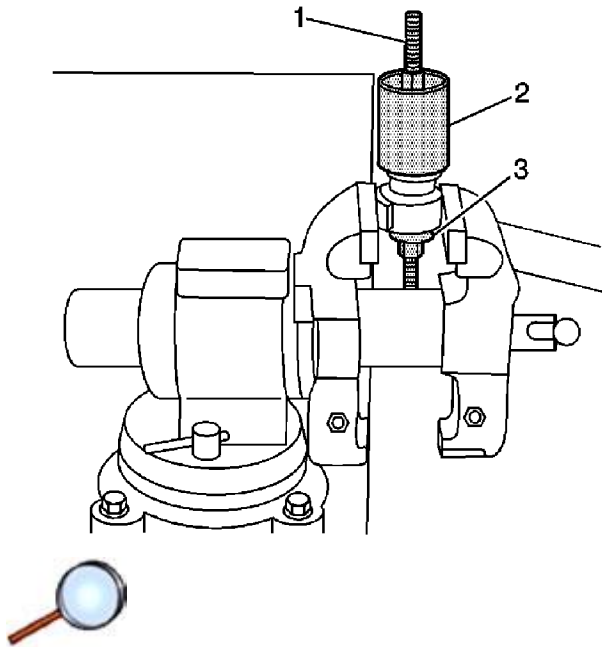
4. Install the left side differential bearing adjuster lock bolt and tighten to **8 N·m (71 lb in)**.



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

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

8. Apply a bead of sealer GM P/N 1052942 (Canadian P/N 10953466) or the equivalent to one side of the differential carrier case half sealing surface.
9. Install the right differential carrier case half.
10. Install the differential carrier case bolts and tighten to **48 N·m (35 lb ft)**.

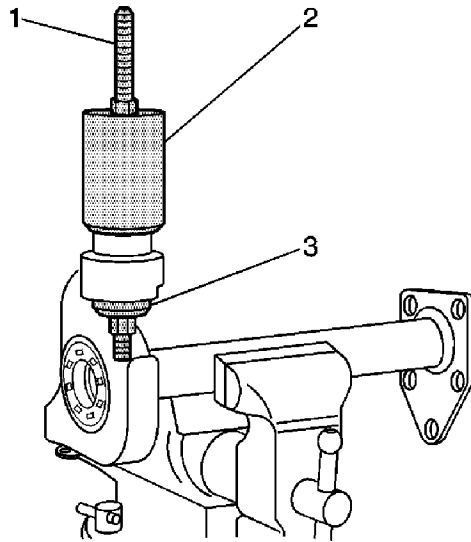


11. Install the lower inner shaft housing bushing by performing the following steps:
 - 11.1. Install the inner shaft housing into a vise.
 - 11.2. Place the lower inner shaft housing bushing over the bushing bore.
 - 11.3. Install the J 45850-2 (2), J 45850-1 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the inner shaft housing bushing as shown.

Install the J 45850-3 inside the J 45850-2 (2) in order to gain access to the upper nut.

- 11.4. Install the lower inner shaft bushing by holding the lower nut and slowly tightening the upper nut in order to pull the bushing into the bushing bore.
- 11.5. Remove the inner shaft housing from the vise.
- 11.6. Install the inner shaft housing into the vise.

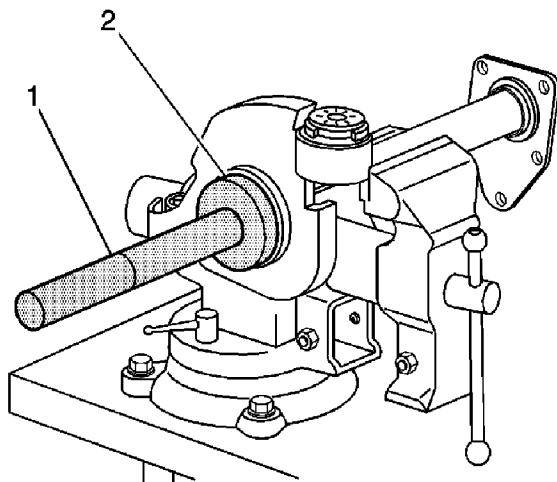
Clamp on the inner shaft housing tube.



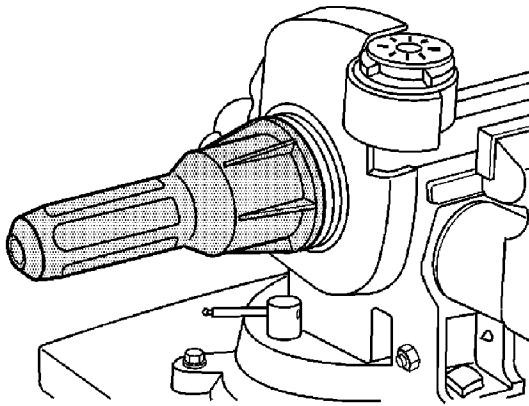
12. Install the upper inner shaft housing bushing by performing the following steps:
 - 12.1. Install the inner shaft housing into a vise.
 - 12.2. Place the upper inner shaft housing bushing over the bushing bore.
 - 12.3. Install the J 45850-2 (2), J 45850-1 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the inner shaft housing bushing as shown.

Install the J 45850-3 inside the J 45850-2 (2) in order to gain access to the upper nut.

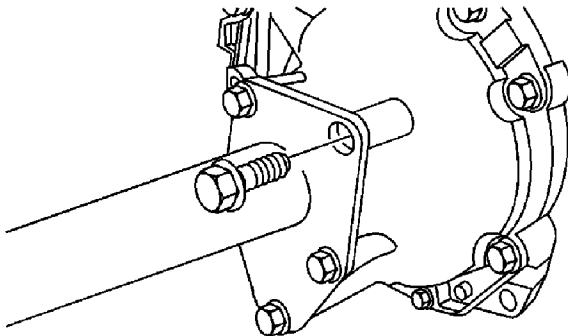
- 12.4. Install the upper inner shaft bushing by holding the lower nut and slowly tightening the upper nut in order to pull the bushing into the bushing bore.



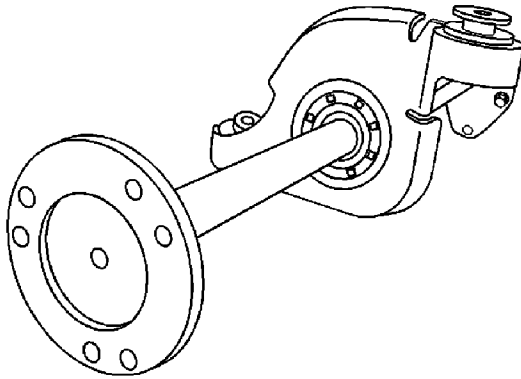
13. Install the bearing with the square shoulder in using the [J 42211](#) (2) and the [J 8092](#) (1).



14. Install the new axle shaft seal using the [J 42738](#) .
15. Remove the inner shaft housing from the vise.
16. Install the differential carrier assembly into a vise.
17. Apply sealant GM P/N 1052492 (Canadian P/N 10953466) or equivalent to the inner housing to differential carrier assembly sealing surface.
18. Install the inner shaft housing to the differential carrier assembly.

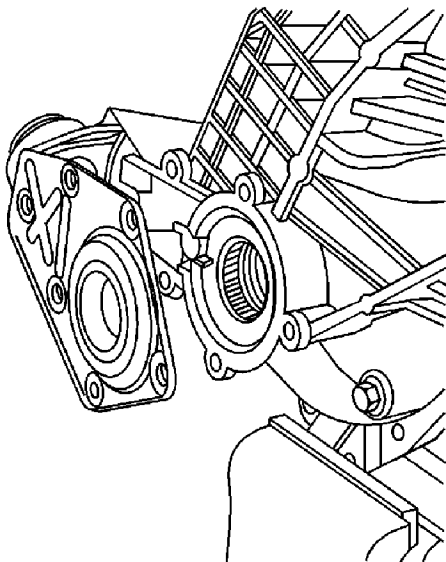


19. Install the inner shaft housing to differential carrier assembly bolts and tighten to **48 N·m (35 lb ft)**.
20. Install the new inner shaft retaining ring.

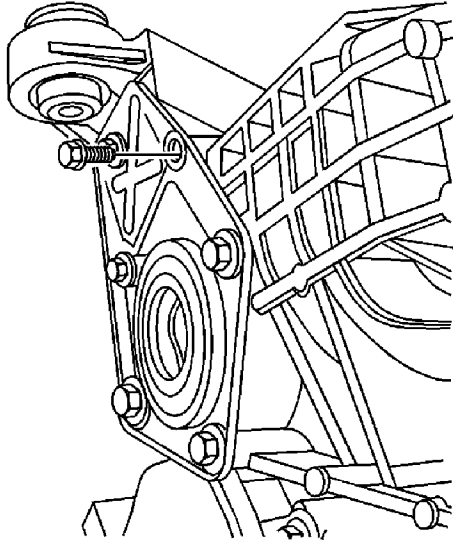


Note: Do not nick or cut the inner shaft oil seal.

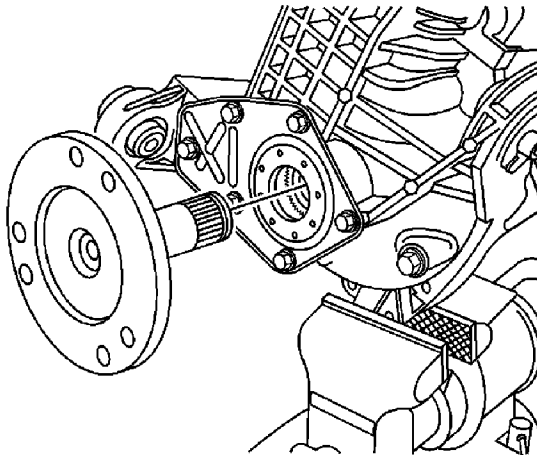
21. Install the inner shaft into the inner shaft housing by performing the following steps:
 - 21.1. Carefully guide the inner shaft through the inner shaft housing until the retaining ring on the inner shaft contacts the differential case side gear.
 - 21.2. Install the inner shaft into the differential case side gear by tapping the retaining ring into the retaining groove using a soft-faced mallet and until the retaining ring on the inner shaft is fully seated within the groove in the differential case side gear.
 - 21.3. Pull back on the inner shaft to ensure that the inner shaft is properly retained in the differential case side gear.



22. Install the inner shaft seal cover.



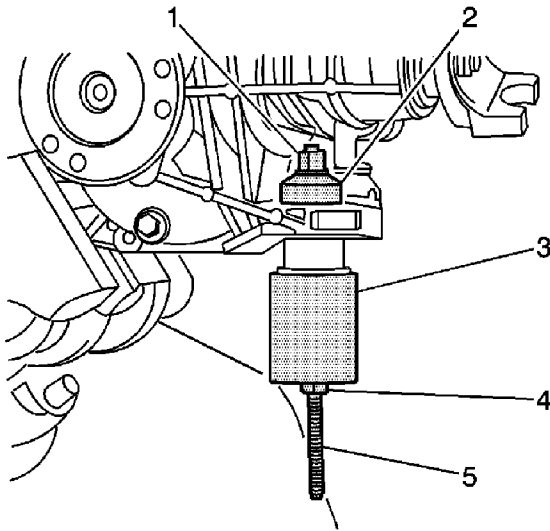
23. Install the inner shaft seal cover bolts and tighten to **18 N·m (13 lb ft)**.
24. Install the new inner shaft retaining ring.



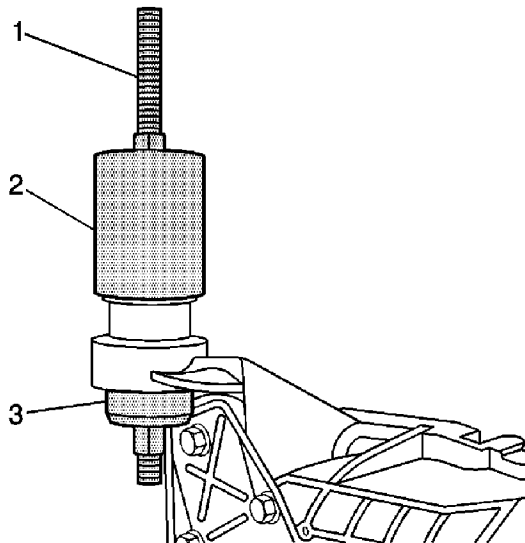
Note: Do not nick or cut the inner shaft oil seal.

25. Install the left inner shaft into the differential carrier assembly by performing the following steps:
- 25.1. Carefully guide the inner shaft through the oil seal until the retaining ring on the inner shaft contacts the differential case side gear.
 - 25.2. Install the inner shaft into the differential case side gear by tapping the retaining ring into the retaining groove using a soft-faced mallet and until the retaining ring on the inner shaft is fully seated within the groove in the differential case side gear.

- 25.3. Pull back on the inner shaft to ensure that the inner shaft is properly retained in the differential case side gear.



26. Install the lower differential carrier assembly bushing by performing the following steps:
- 26.1. Install the differential carrier assembly bushing into the differential carrier assembly bushing bore.
 - 26.2. Install the J 45850-2 (3), the J 45850-3 (2), the forcing screw, the thrust bearing, and the nuts (1, 4-5) over the differential carrier assembly bushing as shown.
 - 26.3. Install the lower differential carrier assembly bushing by holding the upper nut and tightening the lower nut of the [J 45850](#) .



27. Install the upper differential carrier assembly bushing by performing the following steps:

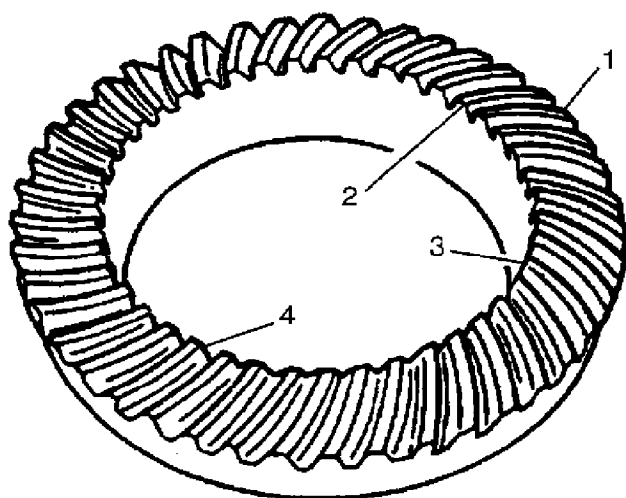
- 27.1. Install the differential carrier assembly bushing into the differential carrier assembly bushing bore.
- 27.2. Install the J 45850-2 (2), the J 45850-3 (3), the forcing screw, the thrust bearing, the washers, and the nuts (1) over the differential carrier assembly bushing as shown.
- 27.3. Install the upper differential carrier assembly bushing by holding the lower nut and tightening the upper nut of the [J 45850](#) .
28. Install the drain plug and the washer and tighten to **33 N·m (24 lb ft)**.
29. Fill the axle with lubricant with the proper fluid. Refer to [Front Axle Lubricant Replacement](#).
30. Install the fill plug and the washer and tighten to **33 N·m (24 lb ft)**.

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Gear Tooth Contact Pattern Inspection

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

Gear Tooth Nomenclature



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

Adjustments Affecting Tooth Contact

The following 2 adjustments affect the tooth contact pattern:

- Backlash adjustment
- Pinion depth adjustment

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

Pinion Depth Adjustment

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

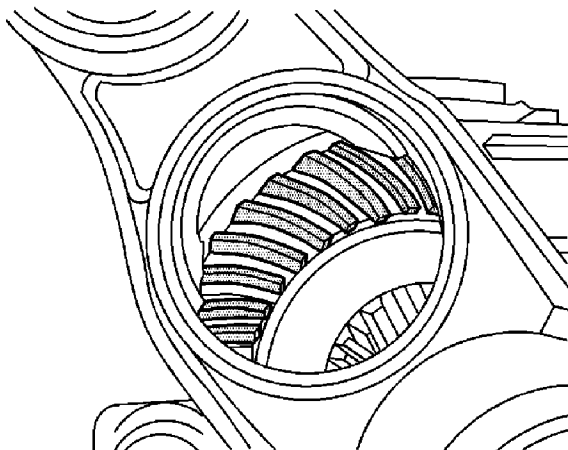
Backlash Adjustment

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

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

Testing Procedure

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



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

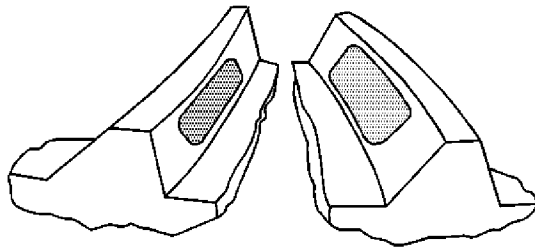
Important: Avoid turning the ring gear excessively.

3. Using a wrench, turn the drive pinion flange/yoke so that the ring gear rotates at least 3 full revolutions.
4. Turn the drive pinion flange/yoke in the opposite direction so that the ring gear rotates at least 3 full revolutions in the opposite direction.
5. Observe the pattern on the ring gear teeth. Compare the pattern with the following illustrations.
6. Once the proper pattern is obtained, continue the assembly of differential carrier. Refer to

[Differential Carrier Assembly Assemble](#) .

Correct Contact Pattern

Condition



The backlash and pinion depth is correct.

Correction

None required.

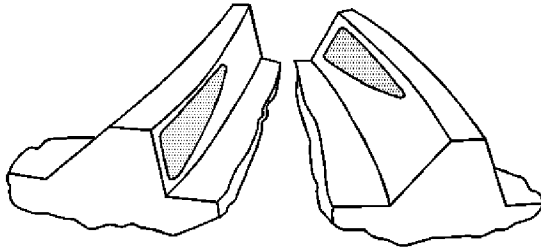
Service Hints

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

- Total assembly
- Differential case
- Drive pinion

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

Drive Side Heel -- Coast Side Toe Contact Pattern



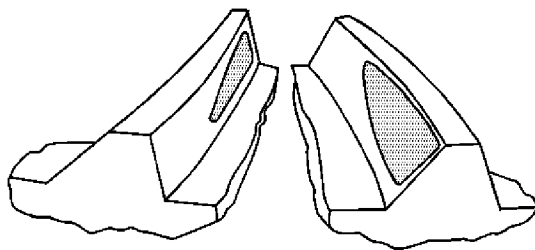
Condition

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

Correction

Adjust the pinion depth of drive pinion. Refer to [Pinion Depth Adjustment](#) .

Drive Side Toe -- Coast Side Heel Contact Pattern





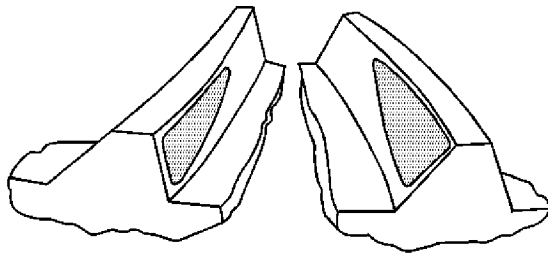
Condition

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

Correction

Adjust the pinion depth of drive pinion. Refer to [Pinion Depth Adjustment](#).

Drive Side Heel -- Coast Side Heel Contact Pattern



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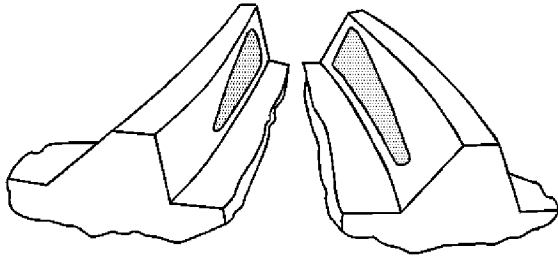
Condition

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

Correction

Decrease the backlash. Move the ring gear closer to the drive pinion by adjusting the side bearing adjuster sleeves. Refer to [Backlash Inspection and Adjustment](#).

Drive Side Toe -- Coast Side Toe Contact Pattern



Condition

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

Correction

Increase the backlash. Move the ring gear away from the drive pinion by adjusting the side bearing adjuster sleeves. Refer to [Backlash Inspection and Adjustment](#).