Section 4

Driveline/Axle

Propeller Shaft

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Center Bearing Mounting Bolt	35 N·m	26 lb ft
Front Axle Yoke Retainer Bolt	20 N·m	15 lb ft
Rear Axle Yoke Retainer Bolt C/K 1,2,3 Except C3500HD	20 N·m	15 lb ft
Rear Axle Yoke Retainer Bolt C3500HD	37 N·m	27 lb ft
Transmission Parking Brake Drum Flange Bolt	37 N·m	27 lb ft
Transfer Case Yoke Retainer Bolt	20 N·m	15 lb ft
Transmission Yoke Retainer Bolt	20 N·m	15 lb ft

Propeller Shaft Runout Specifications

Propeller Shaft	Front Check	Center Check	Rear Check
One Piece	0.025 in	0.050 in	0.025 in
Two Piece Driveshaft:			
Front Piece	0.025 in	0.005 in*	—
Rear Piece	—	0.030 in**	0.030 in
*This measurement must be taken on the ground surface near the spline with the rear propeller shaft removed.			
**This measurement must be taken with the rear propeller shaft mounted on the front shaft which is within specifications.			

GM SPO Group Numbers

Application	GM SPO Group Number
Center Bearing, Bearing, Cushion and Retainer	5.600
Propeller Shaft	5.544
Propeller Shaft Bearing Shields, Slinger and Washer	5.601
Propeller Shaft Bolt, Bracket, Hanger, Nut, Reinforcement, Support and Washer	5.598
Propeller Shaft Internal Cam and Shoe Brake Bolt, Drum, Nut, Plate, Shield, Shoe Kit, Spring and Washer	5.605
Propeller Shaft Pinion Deflector, Flange and Yoke	5.545
Propeller Shaft Universal Joint, Joint Kit	5.548
Propeller Shaft Universal Joint Trunnion Ring and Seal	5.560
Universal Joint and Power Divider Deflector and Yoke	5.555
Universal Joint Sleeve Yoke Bushing, Cap, Nut and Washer	5.556
Universal Joint Trunnion and Yoke Bolt, Boot Kit, Clamp, Nut and Retainer	5.586
Universal Joint Yoke Trunnion Bearing	5.566

Diagnostic Information and Procedures

Leak at Front Slip Yoke

Checks	Action
DEFINITION: An occasional drop of lubricant leaking from the splined yoke is normal and requires no attention.	
The slip yoke barrel is burred, nicked, corroded, or worn.	• Replace the seal. • Smooth minor burrs by careful use of crocus cloth or fine stone honing. • Replace a badly burred yoke.
A defective transmission rear oil seal.	Replace the transmission rear oil seal and replenish the transmission oil.

Roughness or Vibration (Normal)

Checks	Action
DEFINITION: The roughness or vibration occurs while driving the vehicle at various speeds.	
A bent or dented propeller shaft.	Replace the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece*.
Undercoating is on the propeller shaft.	Clean the propeller shaft.
The tires are unbalanced at 48-80 km/h (30-50 mph).	Balance or replace the tires.
The universal joints are tight.	On snap ring retainer U-joints, tap the yokes with a hammer in order to free up the U-joints. If you are unable to free up the U-joints, or if the joint feels rough, replace the joint.
The universal joints are worn.	Replace the worn universal joints.
The companion flange is bent or has excessive runout.	Refer to *Pinion Installation* in Vibration Diagnosis.
Burrs or gouges are on the companion flange.	• Inspect the snap ring locating surfaces on the flange yoke. • Deburr or replace the companion flange.
The propeller shaft, parking brake drum, or the companion flange is unbalanced.	• Check for a missing balance weight on all three components. • rotate the propeller shaft in the companion flange 180 degrees.
Incorrect rear joint angle usually as result of the angle being too large.	• Inspect and correct the trim height at curb weight. • Inspect and correct the joint angle. Refer to *Driveline Vibration Analysis* in Vibration Diagnosis.
Excessive looseness at the slip spline.	Replace the necessary parts.
Distorted or damaged yokes or flanges.	Install new yokes or flanges.
The yokes are out of phase on two-piece propeller shaft system.	Re-index the propeller shaft.
The driveline vibration is at 80 km/h (50 mph).	Inspect the propeller shaft for runout and for missing balance weights. Refer to *Driveline Vibration Analysis* in Vibration Diagnosis.
The propeller shaft and axle flange paint marks are misaligned by more than 90 degrees.	Align the paint marks as close as possible.

Roughness or Vibration (Above 56 km/h 35 MPH)

Checks	Action
DEFINITION: One hears or feels a roughness when driving the vehicle above 56 km/h (35 mph).	
The tires are unbalanced or worn.	Balance or replace the tires.

Ping, Snap, or Click Noise

Checks	Action
DEFINITION: A ping, snap or click is usually heard on initial load after the transmission is in gear, either forward or reverse.	
The rear springs or upper and lower control arms have loose bushing bolts.	Tighten the bolts to specified torque refer to *Fastener Tightening Specifications*.
A loose fixed yoke or companion flange.	Tighten the bolts and pinion nut to specified torque refer to *Fastener Tightening Specifications*.
Worn or damaged universal joints.	Replace the universal joints. Refer to *Universal Joints Replacement (Nylon Injected Ring Type)* or *Universal Joints Replacement (External Snap Ring Type)*.

Knock or Clunk Noise

Checks	Action
DEFINITION: Knocking or clunking noise occurs when operating the vehicle in high gear or coasting in neutral at 16 km/h (10 mph).	
A worn or damaged universal joint.	Replace the worn or damaged universal joint. Refer to *Universal Joints Replacement (Nylon Injected Ring Type)* and *Universal Joints Replacement (External Snap Ring Type)*.
The side gear hub counterbore in the differential is worn oversize.	Replace the differential case and/or the side gears.

Scraping Noise

Checks	Action
DEFINITION: A scraping noise occurs when driving the vehicle at various speeds.	
The pinion flange, or center bearing is rubbing.	Correct the interference.

Squeak Noise

Checks	Action
DEFINITION: When driving the vehicle at various speeds a squeaking sound occurs.	
Lack of lubricant.	Replace the universal joints as required. Refer to *Universal Joints Replacement (Nylon Injected Ring Type)* and *Universal Joints Replacement (External Snap Ring Type)*.

Shudder on Acceleration at Low Speed

Checks	Action
DEFINITION: When accelerating the vehicle at low speed a shudder occurs.	
Bolts are loose or missing at the flanges.	Replace or tighten the bolts to specified torque. Refer to *Fastener Tightening Specifications*.
The joint angle is excessive or incorrectly set.	Shim under the transmission support mount in order to change the joint angle. Use the standard shim P/N 1254001, or shim the axle pinion down.
The universal joint is worn.	Replace the universal joint. Refer to *Universal Joints Replacement (Nylon Injected Ring Type)* or *Universal Joints Replacement (External Snap Ring Type)*.

Repair Instructions

Propeller Shaft Replacement (Front Axle - All Except NP8)

Removal Procedure

1. Raise the vehicle on a hoist.
2. Remove the front differential carrier shield, if used. Refer to *Shield Replacement*.

Important: Observe and accurately reference mark all driveline components relative to the propeller shaft and axles before disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each other as they were when removed. In addition, published specifications and torque values, as well as any measurements made prior to disassembly must be followed.

3. Reference mark the relationship of the propeller shaft to the front axle and the transfer case flange.
4. Remove the bolts and the retainers from the front axle.
5. Remove the bolts and retainers from the transfer case.

Notice: 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. Remove the propeller shaft.
7. Compress the propeller shaft forward enough to disengage, then move the propeller shaft rearward.
8. Avoid dropping the bearing cap assemblies from the yoke ends.
9. Clean all parts with an approved solvent.
10. Inspect the splines for damage, wear, burrs, and twisting.
11. Inspect the universal joint bearings for wear.
12. Inspect the propeller shaft for any evidence of damage.

Installation Procedure

1. Extend the propeller shaft to its full length, then compress it about half its stroke.
2. Install the propeller shaft to the front axle by lining up the reference marks made previously.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the retainers and bolts.

   Tighten

   Tighten the retainer bolts to 20 N·m (15 lb ft).
4. Install the propeller shaft to the transfer case.
   4.1. Line up the reference marks made previously.
   4.2. Adjust the propeller shaft length.
   4.3. Support the propeller shaft.
5. Install the retainers and bolts.

   Tighten

   Tighten the retainer bolts to 20 N·m (15 lb ft).
6. Install the front differential carrier shield, if equipped. Refer to *Shield Replacement*.

Important: If the slip spline is dry or corroded, it may be necessary to disconnect the propeller shaft from the vehicle. Wipe the spline clean before installation.

7. Apply chassis lubricant at the slip spline grease fitting until the grease begins to leave through the vent hole.

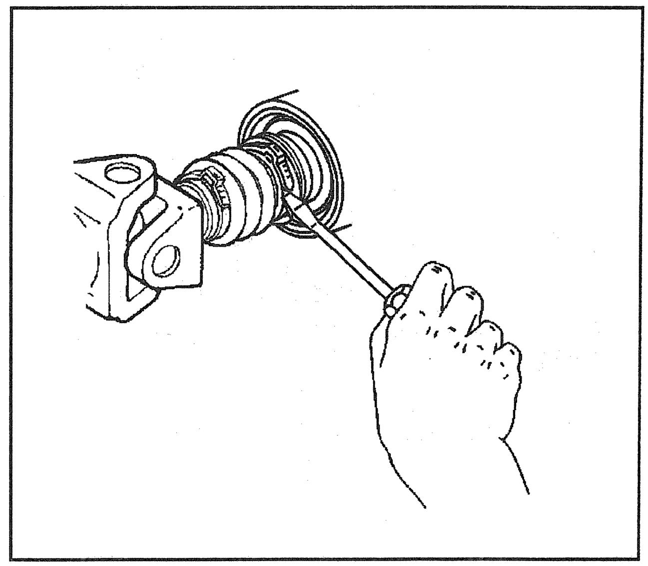
Propeller Shaft Replacement (Front Axle - NP8)

Removal Procedure

Tools Required

J 43218 Clamp Pliers

1. Position the transmission range select lever to Neutral (N) and release the park brake.
2. Raise and support the vehicle.
3. Remove the transfer case shield, if equipped. Refer to *Shield Replacement*.
4. Remove the nut securing the transmission control lever to the manual control shaft.
5. Remove the transmission control lever from the manual control shaft.
6. Check the universal joints for looseness.
7. Remove the boot clamp at the transfer case end by prying up the exposed end of the clamp with a flat bladed tool.



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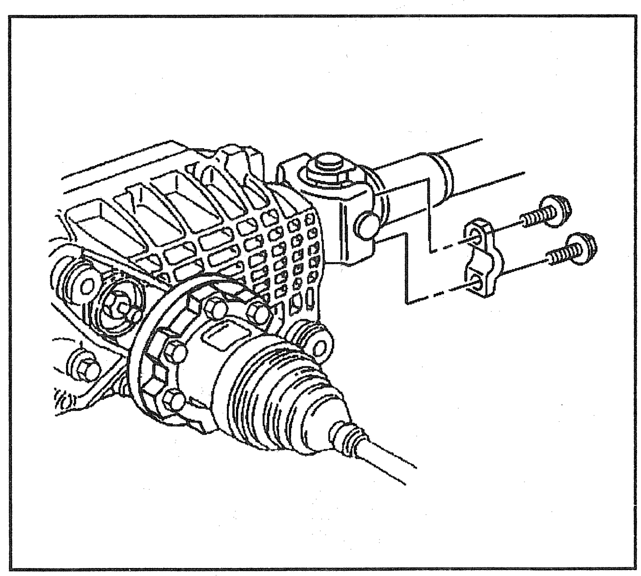
Important: Observe and accurately reference mark all driveline components relative to the propeller shaft and axles before disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each other as they were when removed. In addition, published specifications and torque values, as well as any measurements made prior to disassembly must be followed.

8. Reference mark the relationship of the propeller shaft to the front axle.
9. Remove the bolts and the retainers from the front axle.



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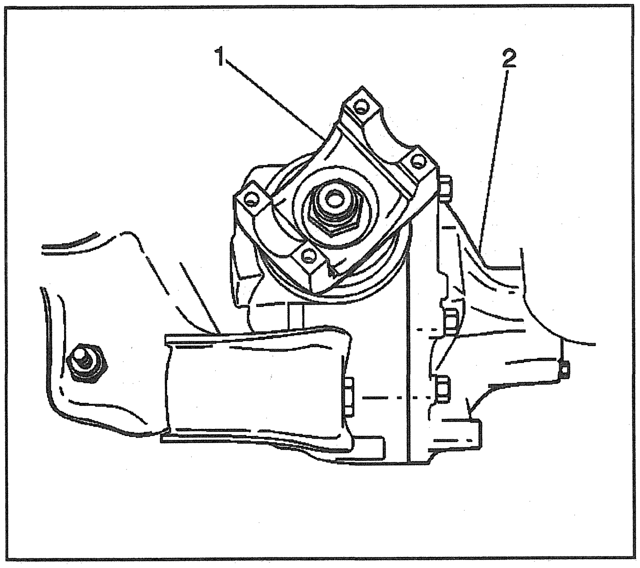

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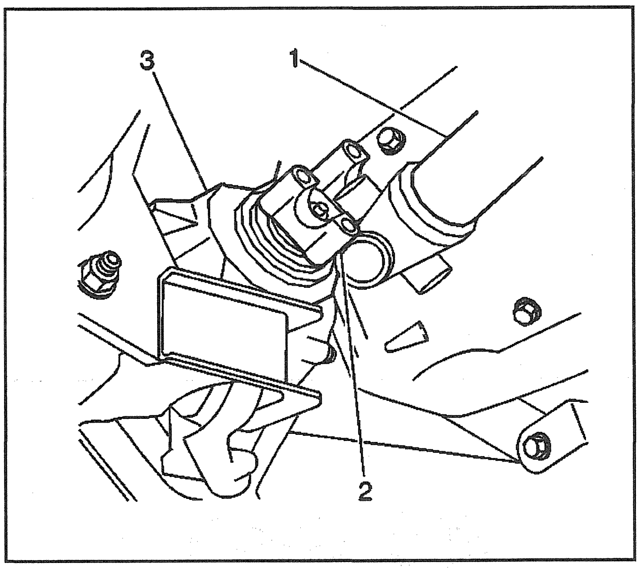
10. Rotate the front axle yoke (1) until the retainer ends are at the 2:00 and 8:00 positions.
11. Slide the propeller shaft rearward enough to disengage.

Notice: 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.

12. Disengage the propeller shaft by moving it rearward.



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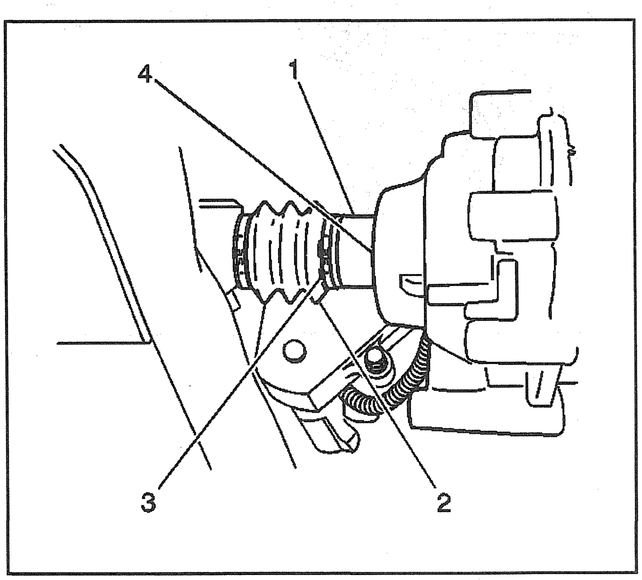
13. Rotate the propeller shaft (1) 90 degrees in relation to the front axle yoke (2).



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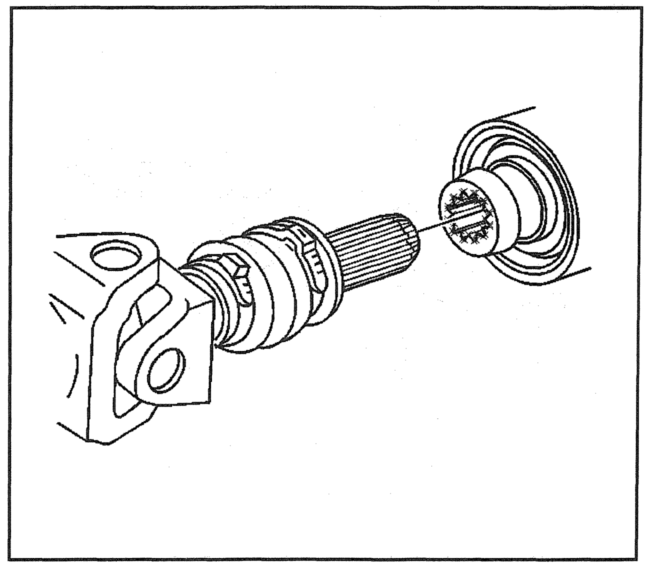
14. Slide the propeller shaft boot (2) out of the groove on the OD of the output shaft (1).
15. Remove the propeller shaft from the transfer case output shaft by sliding it forward.

Important: Avoid dropping the bearing cap assemblies of the yoke end.

16. Remove the propeller shaft.
17. Inspect the propeller shaft for any evidence of damage.

Installation Procedure

1. Verify that the splines of the transfer case are coated with sufficient grease. If not, use special Teflon grease (GM P/N 12345879).
2. Place the new clamp in the groove of the propeller shaft boot.
3. Install the propeller shaft splines into the transfer case output shaft.
4. Install the boot onto the transfer case output shaft until the boot snaps into the groove on the OD of the output shaft.
5. Install the propeller shaft to the front axle.
    5.1. Line up the reference marks made previously.
    5.2. Install the propeller shaft to the flange.



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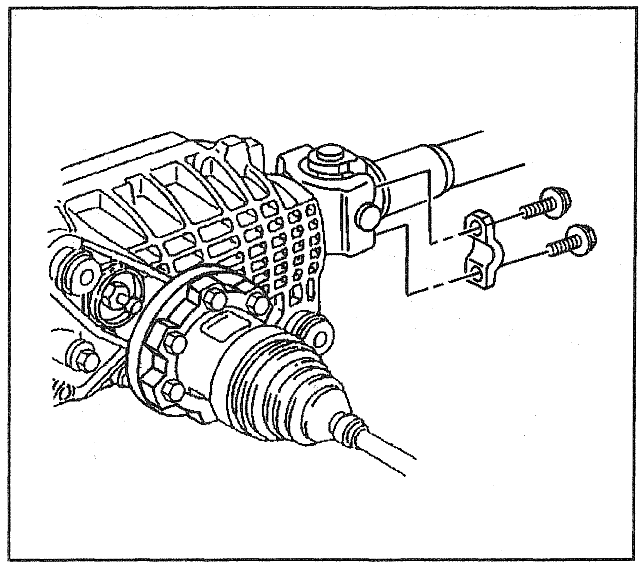
Notice: Refer to *Fastener Notice* in Cautions and Notices.

6. Install the retainers and bolts.

    Tighten
    Tighten the retainer bolts to 20 N·m (15 lb ft).
7. Install the transmission control lever to the manual control shaft with the nut.

    Tighten
    Tighten the transmission control lever nut to 28 N·m (21 lb ft).



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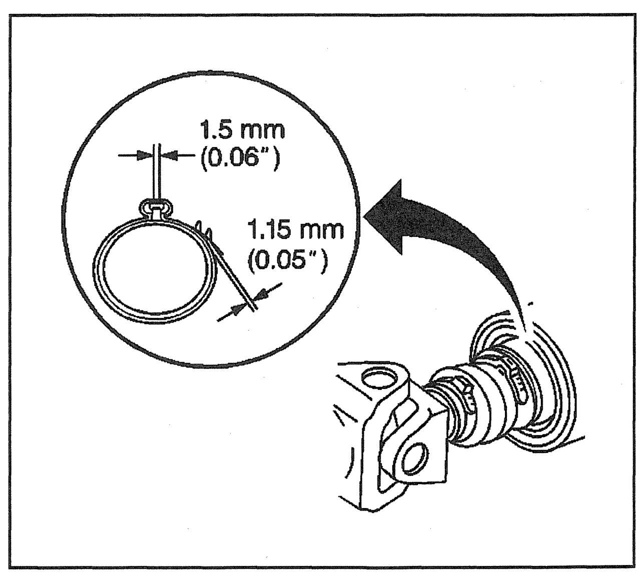
8. Crimp the clamp with *J 43218* according to crimping specifications.
9. Install the transfer case shield, if equipped. Refer to *Shield Replacement.*
10. Lower the vehicle.
11. Position the steering column transmission shift lever to PARK (P).



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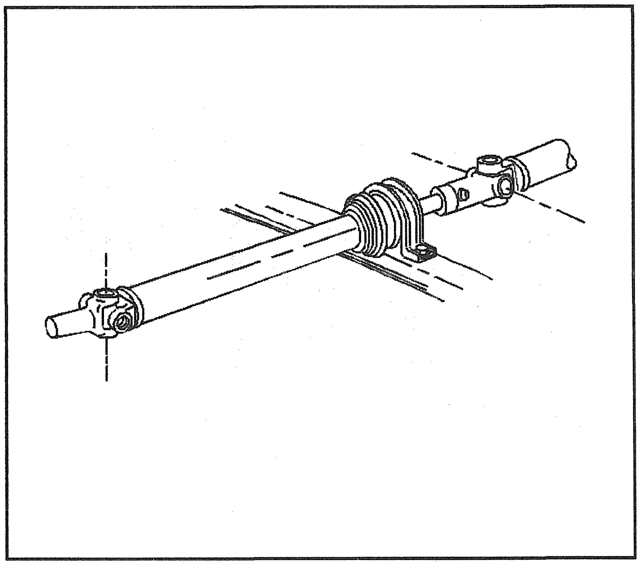

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Propeller Shaft Replacement (System Balanced Assembly)

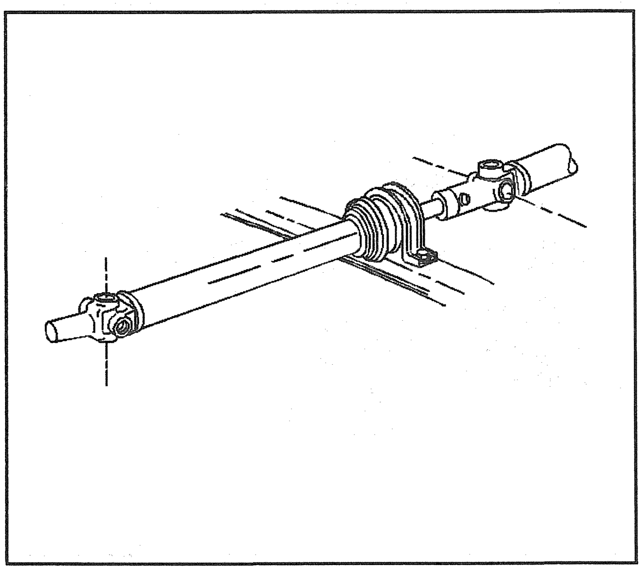
Removal Procedure

Important: If one propeller shaft of a system balanced assembly is replaced, the mating shaft must be rebalanced with the replaced shaft.

1. Raise the vehicle on a hoist.

Important: Center slip yokes to spline shafts, end yokes, companion flanges, etc. must not be rotated from their original position during reassembly.

2. Reference mark all propeller shaft related components for reassembly including flanges and yokes.
3. Remove the bolts and retainers.
4. Remove the propeller shaft.
5. Clean the propeller shaft, universal joints, and attachments with an approved solvent.



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Installation Procedure

1. Install the propeller shaft.
2. Install the bolts and retainers.

   Tighten

   - Tighten the bolts to 20 N·m (15 lb ft).
   - Tighten the bolts 37 N·m (27 lb ft).

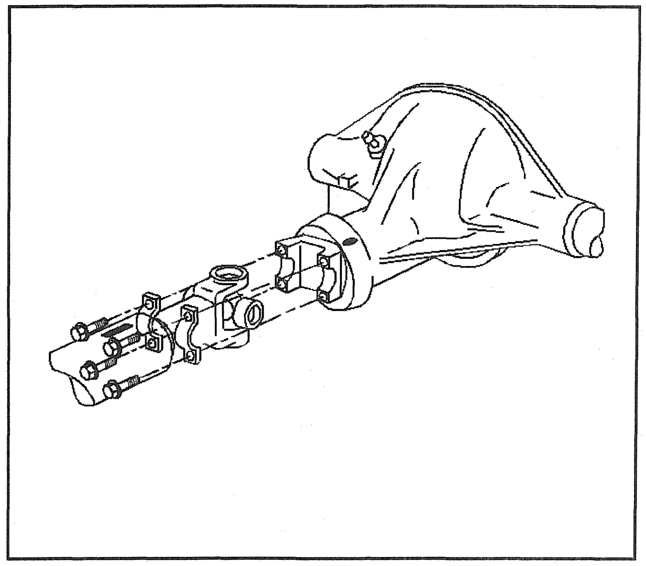
Notice: Refer to *Fastener Notice* in Cautions and Notices.

Propeller Shaft Replacement - One-Piece

Removal Procedure

Important: Observe and accurately reference mark all driveline components relative to the propeller shaft and axles before disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each other as they were when removed. In addition, published specifications and torque values, as well as any measurements made prior to disassembly must be followed.

1. Reference mark the propeller shaft to pinion flange connection.
2. Reference mark the slip yoke to the transmission for proper reassembly.
3. When servicing driveshafts with the pop on seal, do not remove the seal from the sleeve. Removal of the seal causes damage to the seal lip where it contacts the sleeve yoke. If removal of the seal is necessary, replace the seal with a new unit.
4. Remove the bolts.
5. Remove the retainers.



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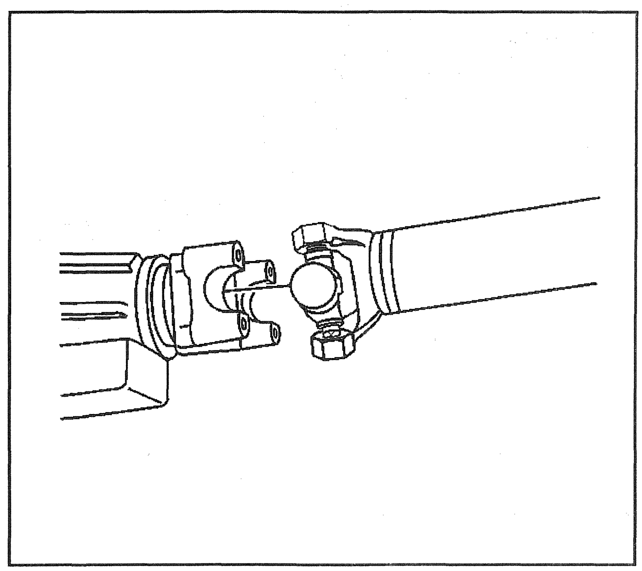
Notice: When removing the propeller shaft, do not attempt to remove the shaft by pounding on the yoke ears or using a tool between the yoke and the universal joint. If the propeller shaft is removed by using such means, the injection joints may fracture and lead to premature failure of the joint.

6. Remove the yoke and cross assembly, wrapping the bearing cups with tape in order to prevent the loss of bearing rollers.
7. Remove the propeller shaft.



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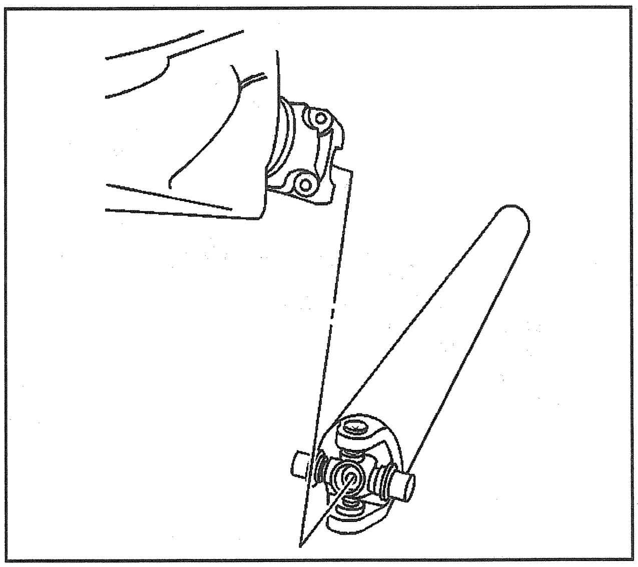

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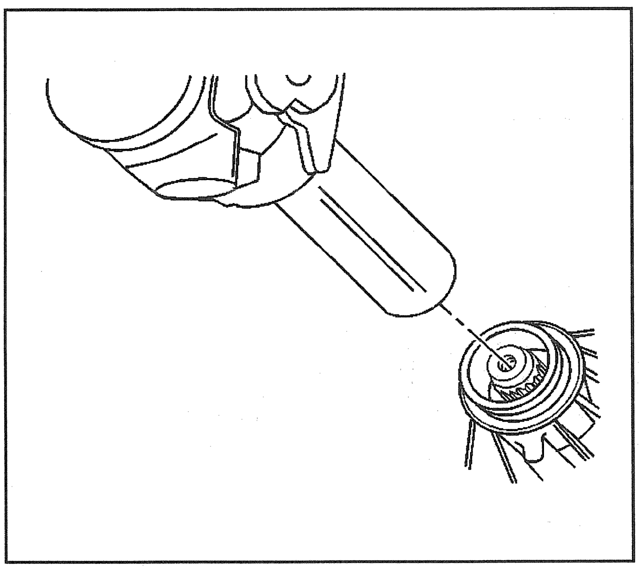
8. Remove the propeller shaft.
   8.1. Slide the propeller shaft forward.
   8.2. Lower the propeller shaft.
   8.3. Do not allow the universal joint to incline greatly. The joint may fracture.
   8.4. Remove the propeller shaft from the transmission.



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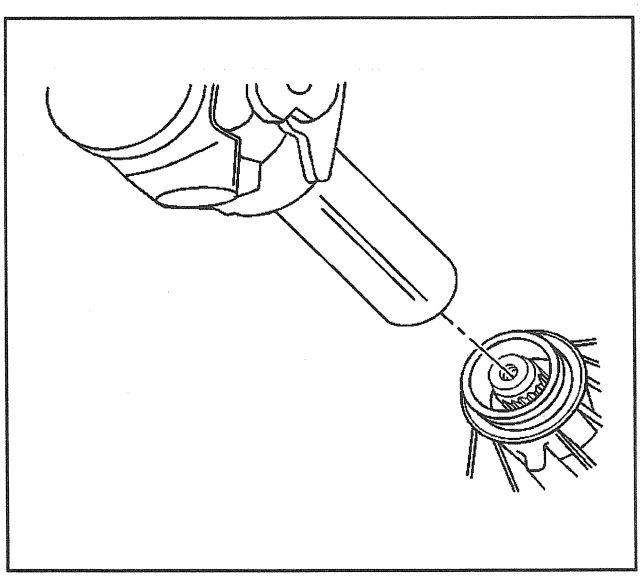
9. Use the following procedure in order to remove the front propeller shaft:
   9.1. Always support the propeller shaft.
   9.2. Do not allow the universal joint to bend deeply as the universal joint could fracture.
   9.3. Remove the propeller shaft with a rearward movement.
10. Clean all parts with an approved solvent.
11. Inspect the outer diameter of the transmission yoke for burrs. Burring damages the transmission seal.
12. Inspect the slip yoke splines for wear.
13. Inspect for twisted slip yoke splines or possibly the wrong universal joint.
14. Inspect the universal joint bearings for wear. Replace as necessary.



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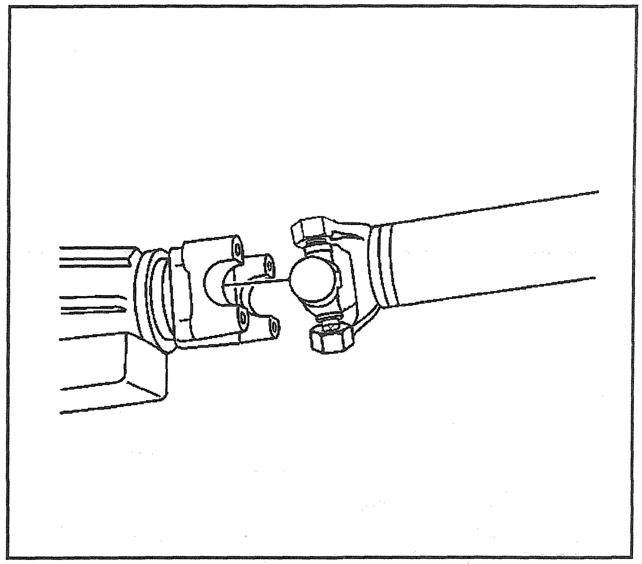
Installation Procedure

1. Install the propeller shaft into the transmission.
2. Lubricate the slip joint spline with chassis grease.
3. Align the reference marks on the pinion flange and the propeller shaft rear yoke.

4. Install the yoke and cross assembly onto the fixed yoke.



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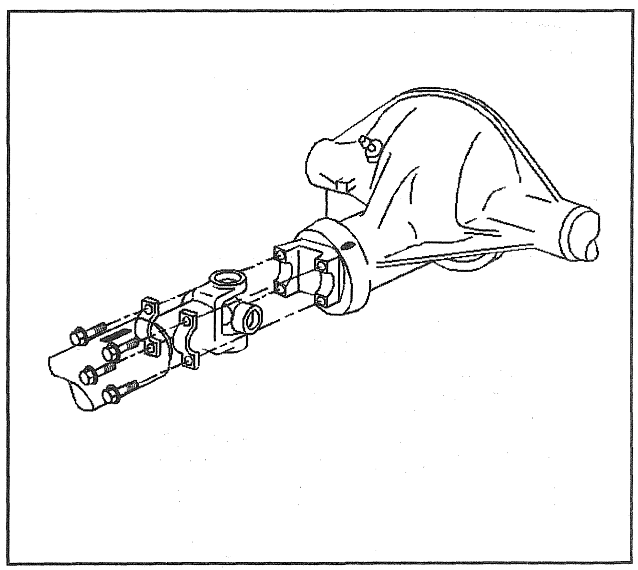
5. Install the retainers.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

6. Install the bolts.

   Tighten

   Tighten the bolts to 20 N·m (15 lb ft).



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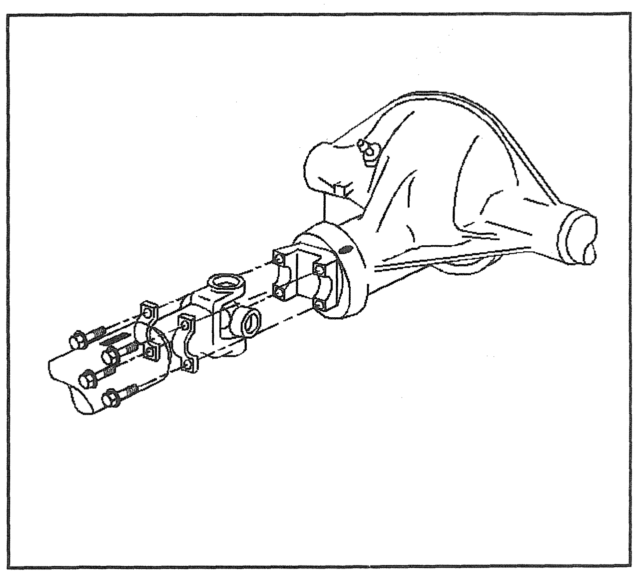
Propeller Shaft Replacement - Two-Piece

Removal Procedure

1. Raise the vehicle on a hoist.

Important: Observe and accurately reference mark all driveline components relative to the propeller shaft and axles before disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each other as they were when removed. In addition, published specifications and torque values, as well as any measurements made prior to disassembly must be followed.

2. Reference mark the propeller shaft to pinion flange connection.
3. Reference mark the slip yoke to the transmission for proper reassembly.



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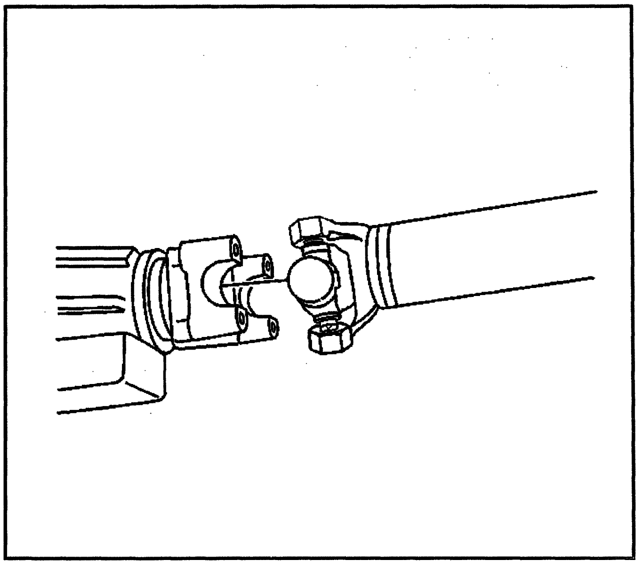
4. When servicing propeller shafts with the pop on seal, do not remove the seal from the sleeve. Removal of the seal causes damage to the seal lip where it contacts the sleeve yoke. If removal of the seal is necessary, replace the seal with a new part.
5. Remove the retainer bolts.
6. Remove the retainers.



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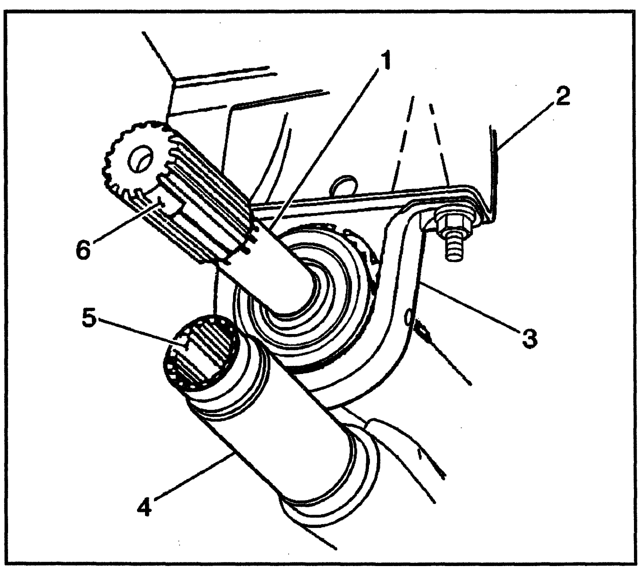
Notice: When removing the propeller shaft, do not attempt to remove the shaft by pounding on the yoke ears or using a tool between the yoke and the universal joint. If the propeller shaft is removed by using such means, the injection joints may fracture and lead to premature failure of the joint.

7. Remove the yoke and cross assembly, wrapping the bearing cups with tape in order to prevent the loss of bearing rollers.



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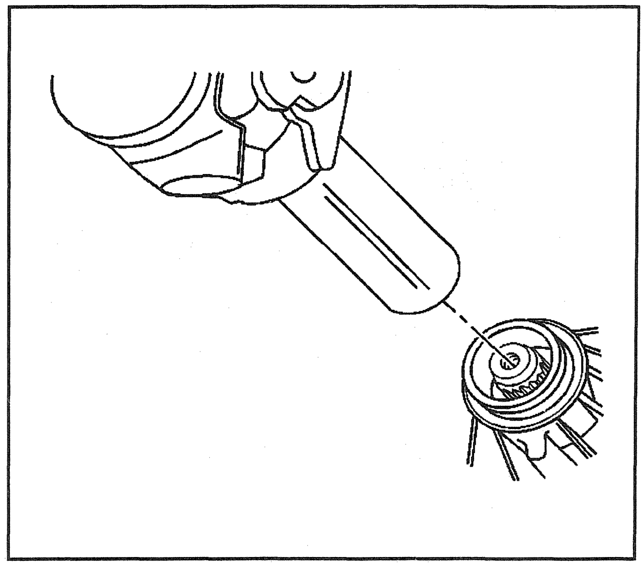
8. For two-piece Dana propeller shafts, pull the slip yoke (4) out of the stub shaft (1).
9. For two-piece American Axle and Manufacturing propeller shafts, unscrew the threaded cap on the center slip yoke.
10. Remove the propeller shaft.
    - 10.1. Slide the propeller shaft forward.
    - 10.2. Lower the propeller shaft and remove the propeller shaft.
    - 10.3. Do not allow the universal joint to incline greatly. The joint may fracture.
11. Remove the center bearing support bolts.
12. Remove the center support bearing nuts and washers.
13. Remove the center bearing support (3).

14. Remove the front propeller shaft.
    14.1. Support the propeller shaft.
    14.2. Do not allow the universal joint to bend deeply as the universal joint could fracture.
    14.3. Remove the propeller shaft with a rearward movement.
15. Clean all parts with an approved solvent.
16. Inspect the outer diameter of the transmission yoke for burrs. Burring damages the transmission seal.
17. Inspect the slip yoke splines for wear.
18. Inspect for twisted slip yoke splines or possibly the wrong universal joint.
19. Inspect the universal joint bearings for wear. Replace as necessary.



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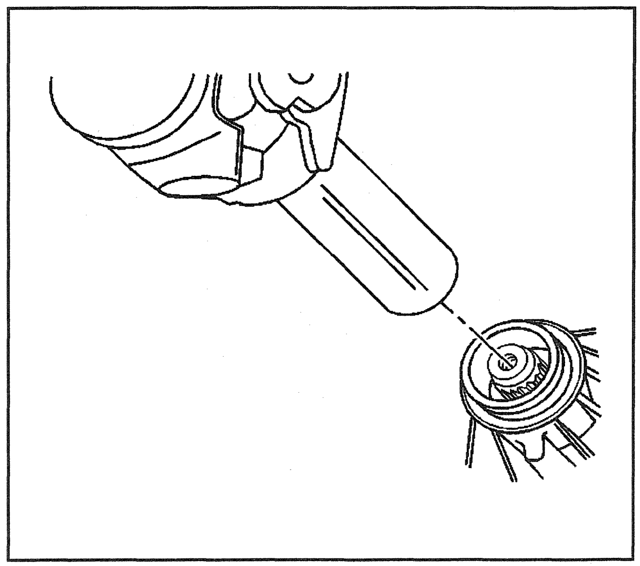
Installation Procedure

1. Install the propeller shaft into the transmission.
2. Ensure that the slip joint splines are lubricated.
3. Bottom the propeller shaft yoke in the transmission.



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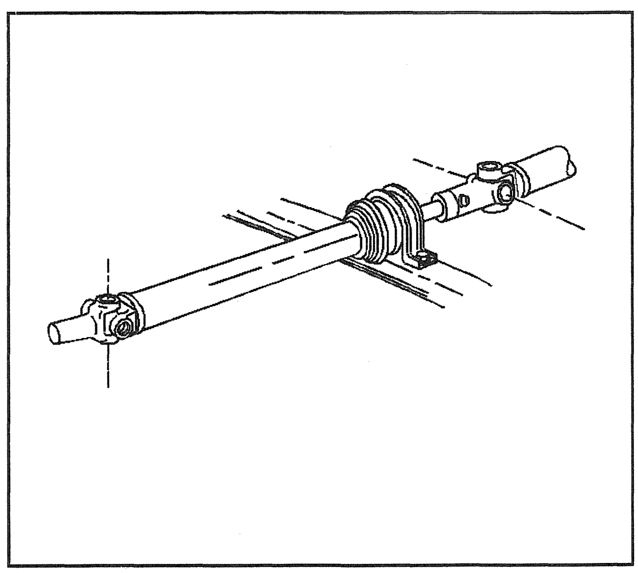
4. Install the center bearing support.
5. Align the center bearing support 90 degrees to the propeller shaft center lines.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

6. Install the center bearing support bolts.

   Tighten

   Tighten the center bearing support bolts to 35 N·m (26 lb ft).



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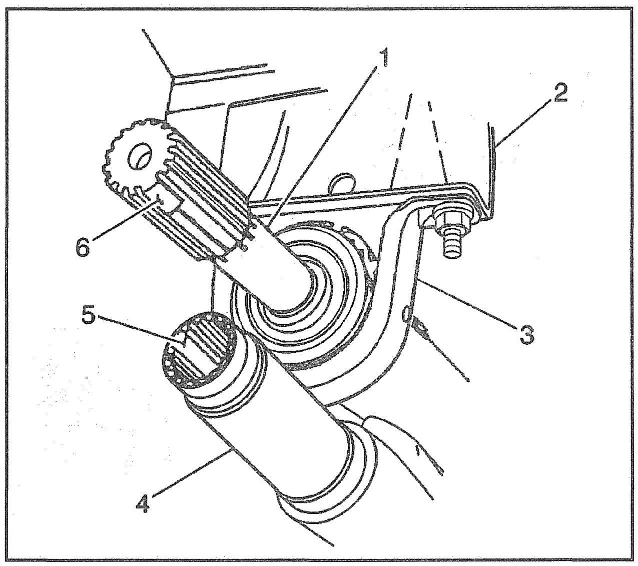

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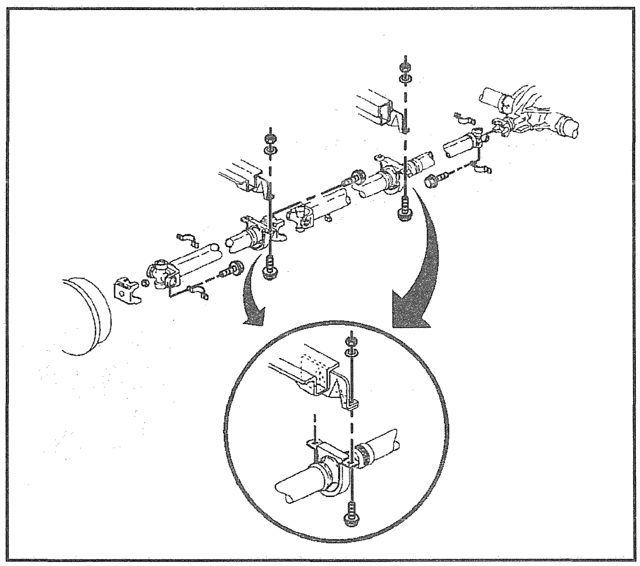
7. Install the slip yoke (4) by aligning the missing tooth (5) with the bridged tooth (6) on the splined shaft (1).
8. Support the propeller shaft.
9. Ensure the slip yoke ears are horizontal.
10. Align the reference marks and install the propeller shaft to the rear differential yoke.
11. Install the retainers.
12. Install the bolts.

    Tighten

    Tighten the bolts to 20 N·m (15 lb ft).
13. Inspect for proper joint fit.
14. Lubricate the center slip joint on two-piece shaft.



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Propeller Shaft Replacement - Three-Piece

Removal Procedure

1. Raise the vehicle on a hoist.

Important: Observe and accurately reference mark all driveline components relative to the propeller shaft and axles before disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each other as they were when removed. In addition, published specifications and torque values, as well as any measurements made prior to disassembly must be followed.

2. Reference mark the rear propeller shaft to the pinion flange connection.
3. Support the rear propeller shaft.
4. Remove the bolts from the pinion flange.
5. Remove the retainers.

Important: Do not pound on the original propeller shaft yoke ears. The plastic injection joints may fracture. Never pry or place any tool between a yoke and a universal joint. Tape the bearing cups onto the yoke in order to prevent the loss of bearing rollers.

6. Remove the yoke and the universal joint assembly from the pinion flange.
7. Remove the rear propeller shaft.
    - Slide the rear propeller shaft forward.
    - Lower the rear propeller shaft and withdraw under the rear axle.
    - Do not allow the universal joint assembly to incline greatly. The joint may fracture.
    - Reference mark the intermediate propeller shaft to front propeller shaft yoke.
    - Support the intermediate propeller shaft.

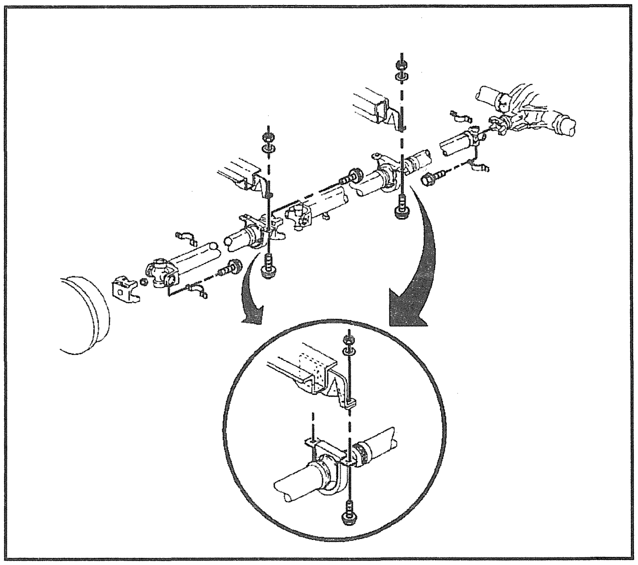
8. Remove the bolts from the front propeller shaft yoke at the front center bearing support.
9. Remove the retainers.
10. Remove the nuts from the intermediate shaft center bearing support.
11. Remove the bolts and washers.
12. Remove the intermediate propeller shaft center bearing support from the hanger.

Important: Do not pound on the original propeller shaft yoke ears. The plastic injection joints may fracture. Never pry or place any tool between a yoke and a universal joint. Tape the bearing cups onto the yoke in order to prevent the loss of bearing rollers.

13. Remove the yoke and the universal joint assembly from the front propeller shaft rear yoke.
14. Remove the intermediate propeller shaft.
    - Reference mark the front the propeller shaft to the yoke or to the parking break drum.
    - Support the front propeller shaft.
15. Remove the bolts and the retainers from the yoke.
16. Remove the nuts from the front propeller shaft center bearing support.
17. Remove the bolts and washers.

Important: Do not pound on the original propeller shaft yoke ears. The plastic injection joints may fracture. Never pry or place any tool between a yoke and a universal joint. Tape the bearing cups onto the yoke in order to prevent the loss of bearing rollers.

18. Remove the front propeller shaft center bearing support from the hanger.
19. Remove the front propeller shaft.
20. Clean all parts with an approved solvent.
21. Inspect for proper installation and uniform seating of all universal joint bearing cups.
22. Inspect the intermediate propeller shaft to rear propeller shaft slip yoke splines for twisting or wear.
23. Inspect the inside of the rear propeller shaft slip yoke for spline twisting or wear.
24. Inspect the front and rear center bearing support rubber insulators for deterioration or separation from the support frame work.
25. Inspect the propeller shaft assemblies for damage.



156865

Installation Procedure

1. Install the front propeller shaft to the yoke.
    - Make sure the reference marks are aligned.
    - Support the front propeller shaft.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the bolts and retainers to the yoke. Maintain alignment.

    Tighten

    Tighten the bolts to 20 N·m (26 lb ft).
3. Install the intermediate propeller shaft to the front propeller shaft yoke while maintaining alignment and supporting the propeller shaft.
4. Install the bolts and retainers.

    Tighten
    - Tighten the bolts to 35 N·m (26 lb ft)
    - Tighten the nuts to 35 N·m (26 lb ft)
5. Install the rear center bearing support to the hanger.
6. Align the center bearing support 90 degrees to both the front and intermediate propeller shaft center lines.
7. Inspect for proper installation and uniform seating of all universal joint bearing cups.
8. Inspect the intermediate propeller shaft to rear propeller shaft slip yoke splines for twisting or wear.
9. Inspect the inside of the rear propeller shaft slip yoke for spline twisting or wear.
10. Inspect the front and rear center bearing support rubber insulators for deterioration or separation from the support frame work.
11. Inspect the propeller shaft assemblies for damage.
12. Install the bolts and washers.
13. Install the nuts while supporting the rear propeller shaft.

    Tighten

    Tighten the nuts to 35 N·m (26 lb ft).
14. Install the rear propeller shaft to the rear axle pinion flange while making sure the reference marks are aligned.
15. Install the bolts and retainers.

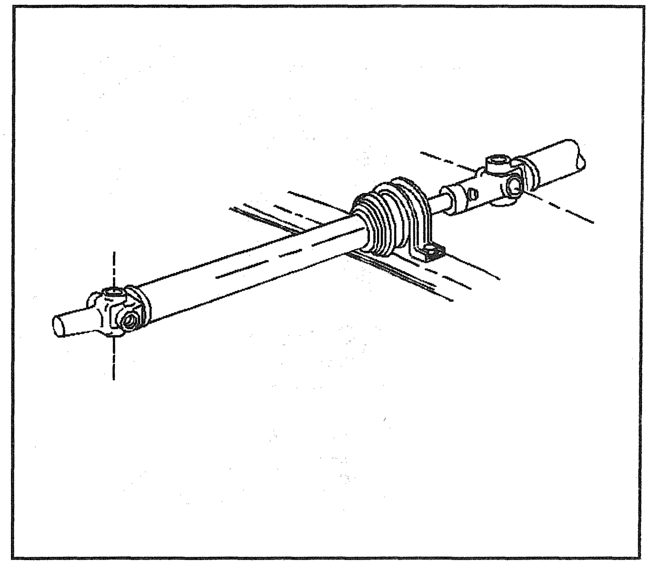
    Tighten

    Tighten the bolts to 37 N·m (27 lb ft).

Center Bearing Replacement

Removal Procedure

1. Raise and suitably support the vehicle.
2. Remove the rear propeller shaft. Refer to *Propeller Shaft Replacement - Two-Piece* or *Propeller Shaft Replacement - Three-Piece.*
3. Remove the front or intermediate propeller shaft.
4. Remove the center bearing.
    - Stand the propeller shaft on end in press with the center bearing supported by press bars.
    - Press the propeller shaft down and off the center bearing.



1236

Installation Procedure

1. Install the center bearing onto the propeller shaft by pressing the center bearing onto the shaft using a press.
2. Install the front or intermediate propeller shaft.
3. Install the rear propeller shaft. Refer to *Propeller Shaft Replacement - Two-Piece* or *Propeller Shaft Replacement - Three-Piece.*

Notice: Refer to *Fastener Notice* in Cautions and Notices.

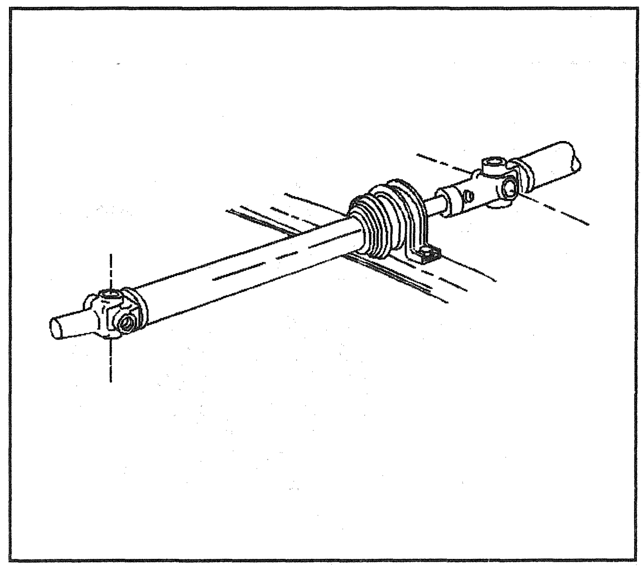
Important: The center bearing must be aligned in order to prevent damage to the propeller shaft assembly. When bolting the center bearing in place, be sure to keep it perpendicular (90 degrees plus or minus 1 degree) to the propeller shaft.

4. Install the center bearing.

    Tighten

    Tighten the center bearing nuts to 35 N·m (26 lb ft).

5. Remove the safety stands and lower the vehicle.



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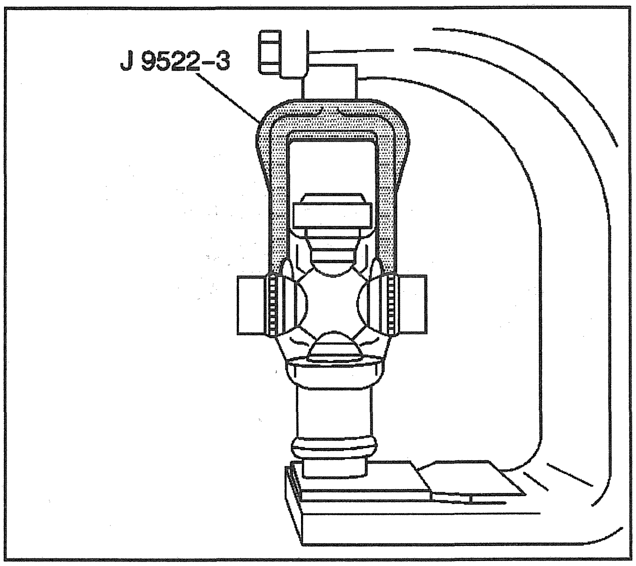

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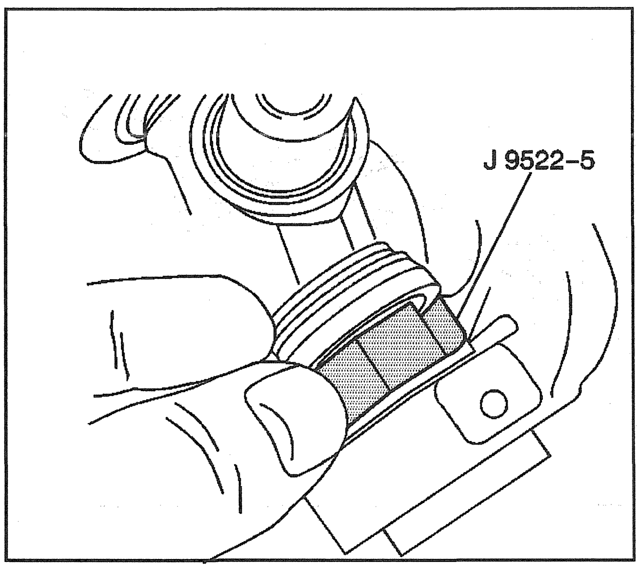


1227

Universal Joints Replacement (Nylon Injected Ring Type)

Disassembly Procedure

Tools Required

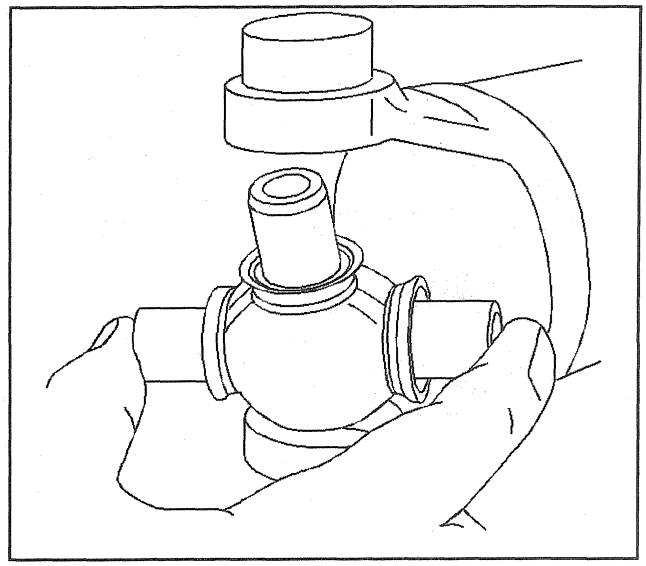
- J 9522-3 Universal Joint Bearing Separator
- J 9522-5 Universal Joint Bearing Spacer Remover

Notice: Never clamp propeller shaft tubing in a vise. Clamping could dent or deform the tube causing an imbalance or unsafe condition. Always clamp on one of the yokes and support the shaft horizontally. Avoid damaging the slip yoke sealing surface. Nicks may damage the bushing or cut the lip seal.

1. Support the propeller shaft in a line horizontal with the table of a press.
2. Mark the propeller shaft as to which end is the transmission end and which end goes to the rear axle.
3. Place the universal joint so that the lower ear of the yoke is supported on a 30 mm (1 1/8 in) socket.
4. In order to shear the plastic retaining ring on the bearing cup, place *J 9522-3* on the open horizontal bearing cups and press the lower bearing cup out of the yoke ear.
5. If the bearing cup is not completely runnion seats freely into the bearing cup.
6. With the trunnion seated in the bearing cup press the bearing cup into the yoke until it is flush with the yoke ear.
7. Rotate the propeller shaft and press the opposite bearing cup out of the yoke
8. Mark the orientation of the slip yoke to the tube for proper reassembly.
9. Remove the cross from the yoke.
10. Remove the remaining universal joint parts from the yoke. If you are replacing the front universal joint, remove the bearing cups in the slip yoke in the same manner.
11. Inspect the retaining ring grooves for plastic.
12. Inspect the bearing cup bores in the yoke ears for burrs or imperfections.
13. Clean the remains of the sheared plastic bearing retainers from the grooves in the yoke.
14. The sheared plastic may prevent the bearing cups from being pressed into place and thus prevent the bearing retainers from being properly seated.

Assembly Procedure

1. Remove the bearing cups from the universal joint.
2. Use you finger in order to coat the needle bearings in the bearing cup with a thin layer of chassis grease.
3. Assemble one bearing cup part way into one side of the yoke.
4. Turn the yoke ear toward the bottom.
5. Assemble the cross into the yoke so the trunnion seats freely into the bearing cup.
6. With the trunnion seated in the bearing cup press the bearing cup into the yoke until it is flush with the yoke ear.

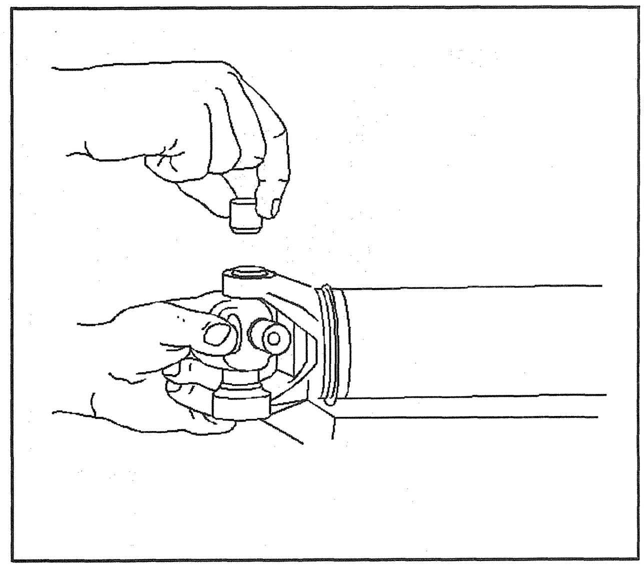


1223

7. Assemble the opposite bearing cup part way into the yoke ear.
8. Make sure that the trunnions are started straight and true into both bearing cups.
9. Press the opposite bearing cup into the yoke ear while working the cross all the time in order to check for free unbinding movement of the trunnions in the bearing cups.

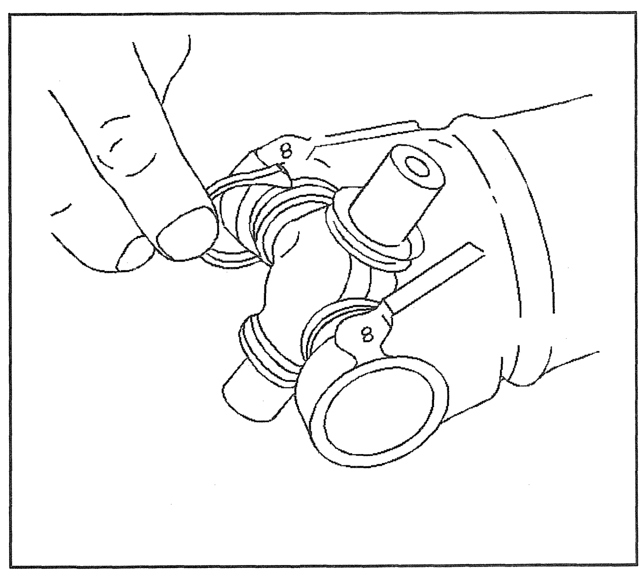
Important: If there seems to be a hangup or binding, stop pressing, and check the needle bearings for misalignment in the bearing cup.

10. Press the bearing cup into the yoke until the bearing retainer groove clears the inside of the yoke.



1224

11. Assemble the bearing retainer in the retainer groove.
12. Continue pressing until both retainers can be snapped into place.



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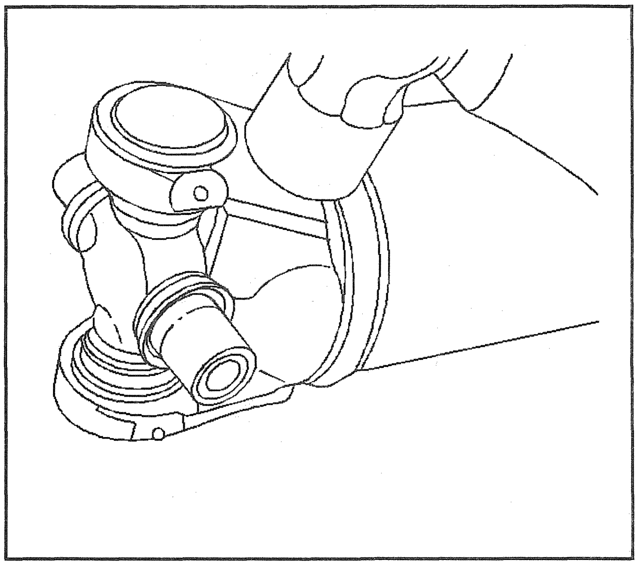

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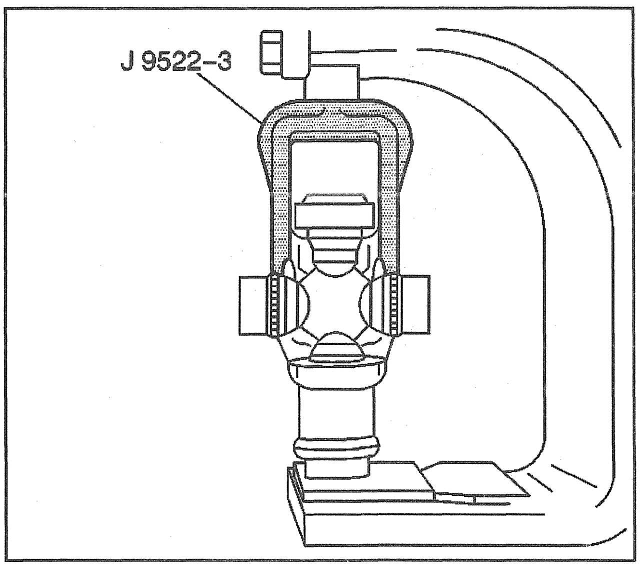
13. If seating the retainer is difficult, spring the yoke slightly with a firm blow from a dead blow hammer.
14. It may be necessary to lubricate the snap ring with a slight amount of chassis grease so it seats in the bearing cup groove.



1222

Universal Joints Replacement (External Snap Ring Type)

Disassembly Procedure

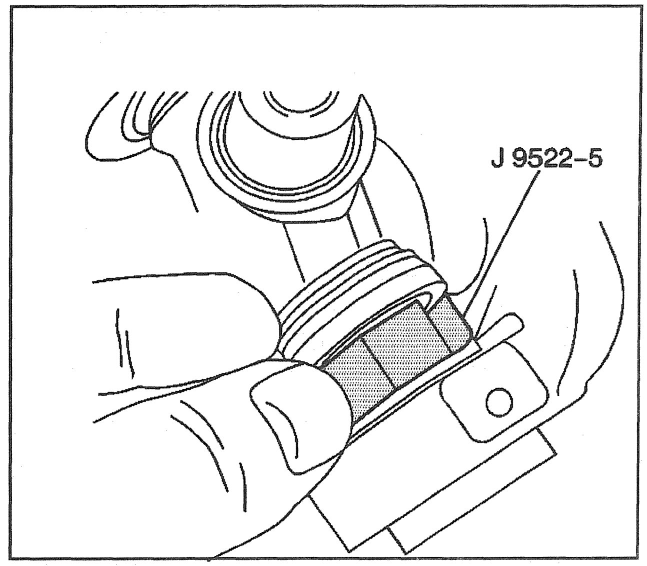
Tools Required

- *J 9522-3* Universal Joint Bearing Separator
- *J 9522-5* Universal Joint Bearing Spacer Remover

Notice: Never clamp propeller shaft tubing in a vise. Clamping could dent or deform the tube causing an imbalance or unsafe condition. Always clamp on one of the yokes and support the shaft horizontally. Avoid damaging the slip yoke sealing surface. Nicks may damage the bushing or cut the lip seal.

1. Support the propeller shaft in a line horizontal with the table of a press.
2. Mark the propeller shaft in order to show which end connects to the transmission and which end goes to the rear axle.
3. Disassemble the snap rings by pinching the ends together with a pair of pliers.
4. If the ring does not readily snap out of the groove in the yoke, tap the end of the cup lightly in order to relieve the pressure from the ring.
5. Place the universal joint so that the lower ear of the yoke is supported on a 30 mm (1 1/8 in) socket.

6. Place *J 9522-3* on the open horizontal bearing cups and press the lower bearing cup out of the yoke ear.
7. If the bearing cup is not completely removed, lift the cross and insert *J 9522-5* between the seal and bearing cup being removed and continue pressing it out of the yoke.
8. Rotate the propeller shaft and press the opposite bearing cup out of the yoke.
9. Mark the orientation of the slip yoke to the tube for proper reassembly.
10. Remove the cross from the yoke.
11. Remove the remaining the universal joint parts from the yoke.
12. If the front universal joint is being replaced, remove the bearing cups in the slip yoke in the same manner.
13. Inspect the retaining ring grooves for dirt, corrosion, or pieces of the old ring.
14. Inspect the bearing cup bores for burrs or imperfections.
15. Clean the retaining ring grooves. Corrosion, dirt, rust, or pieces of the old retaining ring may prevent the bearing cups from being pressed into place or prevent the bearing retainers from being properly seated.



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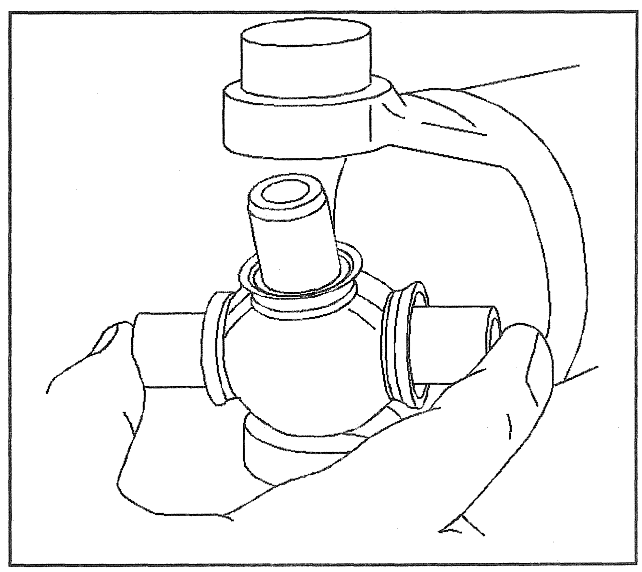
Assembly Procedure

1. Remove the bearing cups from the universal joint.
2. Use your finger in order to coat the needle bearings in the bearing cup with a thin layer of chassis grease.
3. Assemble one bearing cup part way into one side of the yoke. Turn the yoke ear toward the bottom.
4. Assemble the cross into the yoke so that the trunnion seats freely into the bearing cup.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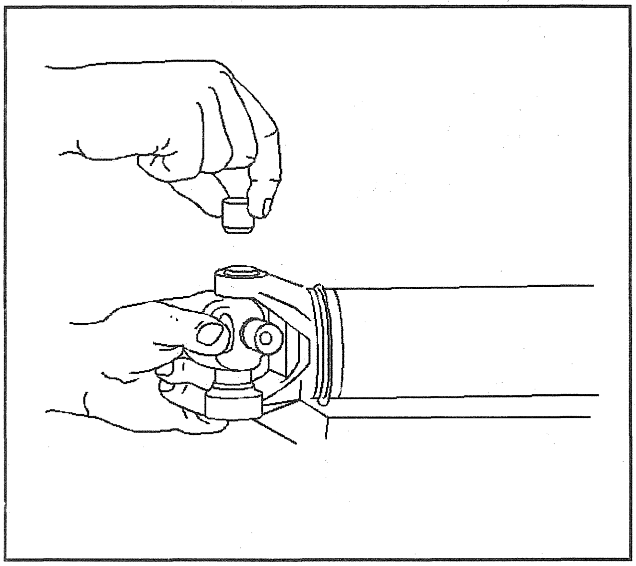
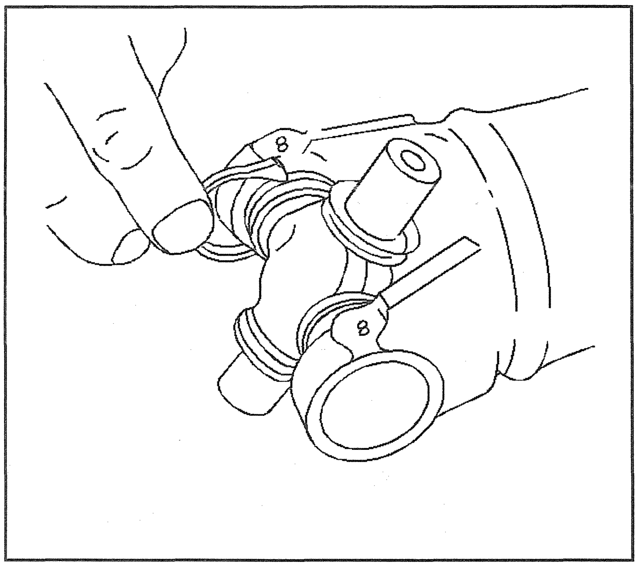


1224

5. With the trunnion seated in the bearing cup, press the bearing cup into the yoke until it is flush with the yoke ear.
6. Install the opposite bearing cup part way into the yoke ear.
7. Make sure that the trunnions are started straight and true into both bearing cups.
8. Press the opposite bearing cup into the yoke ear while working the cross all the time in order to check for free unbinding movement of the trunnions in the bearing cups.

Important: If there seems to be a hang up or binding, stop pressing, and check the needle bearings for misalignment in the bearing cup.

9. Press the bearing cup into the yoke until the bearing cup retainer groove is visible over the top of the bearing cup.



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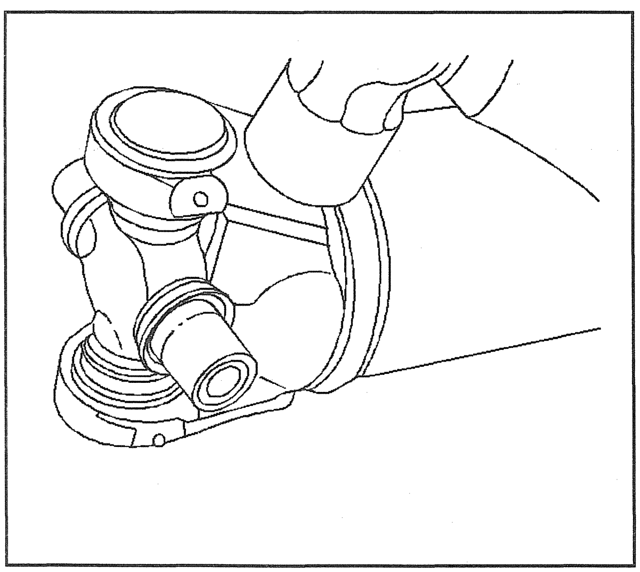
10. Assemble the bearing retainer in the retainer groove.
11. Continue pressing until both retainers can be snapped into place.



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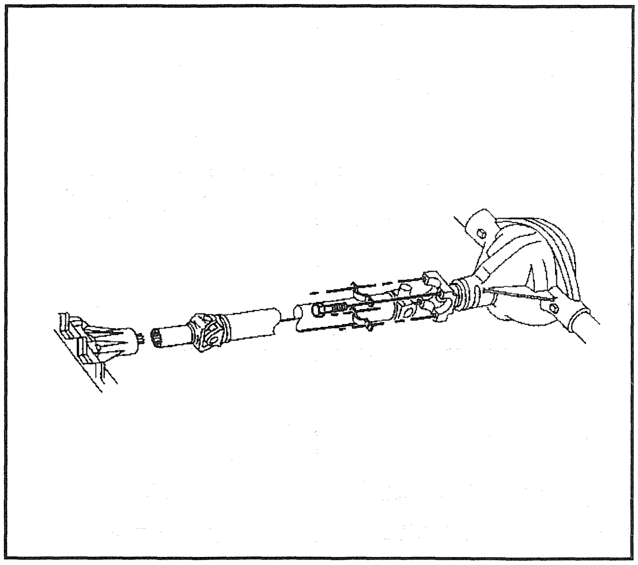
12. If the retainer is difficult to seat, the yoke can be sprung slightly with a firm blow from a dead blow hammer.
13. It may be necessary to lubricate the snap ring with a slight amount of chassis grease so that the snap ring seats in the bearing cup groove.

Description and Operation

Propeller Shaft Description

Propeller shafts transmit torque from the transmission to the rear axle. The number of propeller shafts varies with the vehicle wheel base combination of transmission, transfer case, (front drive), and rear axle equipment.

Propeller shafts have universal joints at each end in order to accommodate angle variations between the transmission and rear axle, and the rear axle position caused by suspension motion. All propeller shafts are the balanced tubular type.



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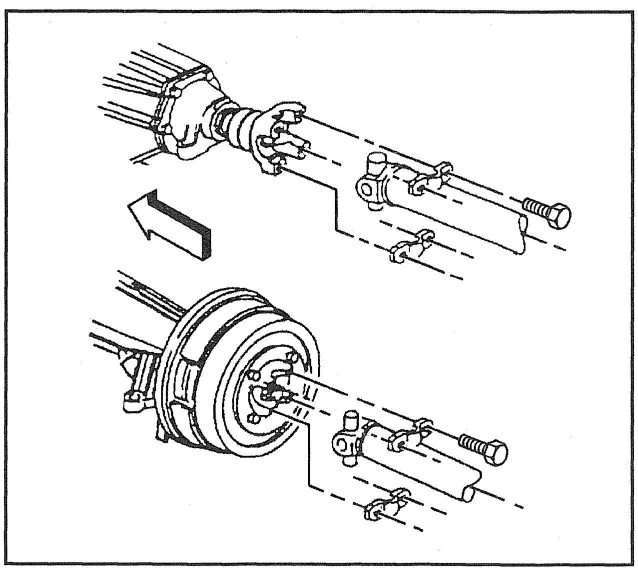
For a one-piece propeller shaft, a splined slip joint connects the driveline to the transmission.

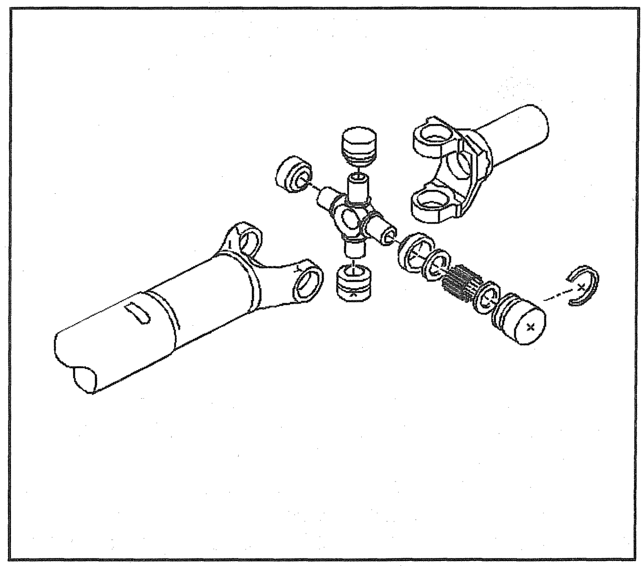


156382

For two-piece and three-piece propeller shafts, a fixed yoke connects the driveline to the transmission.

Vehicles with two or more propeller shafts use a center bearing. The center bearing is usually near the rear of the front propeller shaft. The slip joint is at the forward end of the rear propeller shaft.

Universal Joint Description



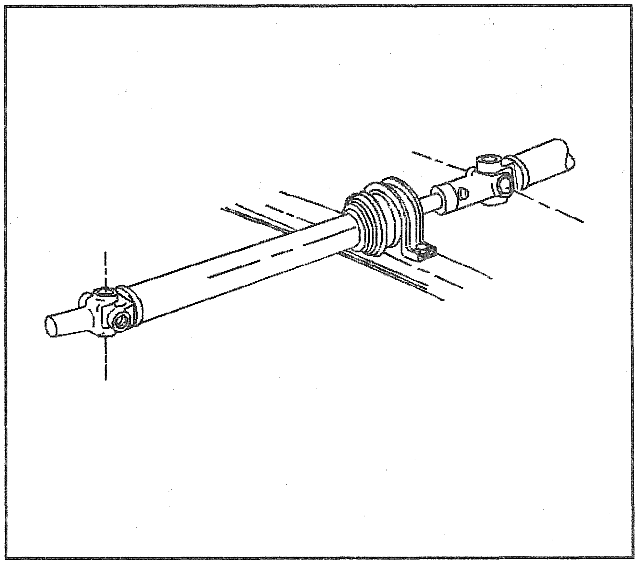
1237

Universal joints are designed to handle the effects of various loadings and rear axle windup during acceleration and braking. Within the designed angle variations, the universal joint operates efficiently and safely. When the design angle changes or is exceeded, the operational life of the joint may decrease.

The trunnion bearings used in universal joints are the needle roller type. Round bearing cups hold the needle rollers in place on the trunnions. Either snap rings or injected plastic hold the bearing cups in the yokes.

The Original Equipment Manufacturer (OEM) universal joints are lubricated for life and cannot be lubricated on the vehicle. A service kit which consists of a spider with bearing assemblies and snap rings may be installed if a universal joint becomes worn or noisy. If it is necessary to repair a universal joint, you must remove the propeller shaft from the vehicle. Avoid jamming, bending, or over-angulating any parts of the propeller shaft assembly. Avoid damaging the propeller weld yokes and slip yoke ears upon installation or removal of U-joints.

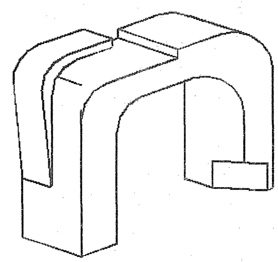
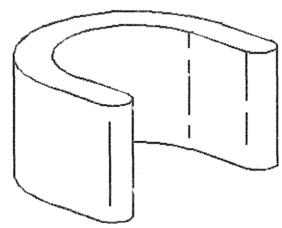
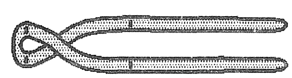
Center Bearing Description



1236

Center bearings support the driveline when using two or more propeller shafts. The center bearing is a ball bearing mounted in a rubber cushion that attaches to a frame crossmember. The manufacturer prelubricates and seals the bearing. The cushion allows vertical motion at the driveline and helps isolate the vehicle from vibration.

Special Tools and Equipment

Illustration	Tool Number/Description
 803	J 9522-3 U Joint Bearing Separator
 805	J 9522-5 U Joint Bearing Spacer Remover (Use with J 9522-3)
 415471	J 43218 Clamp Pliers

Wheel Drive Shafts

Specifications

Fastener Tightening Specifications

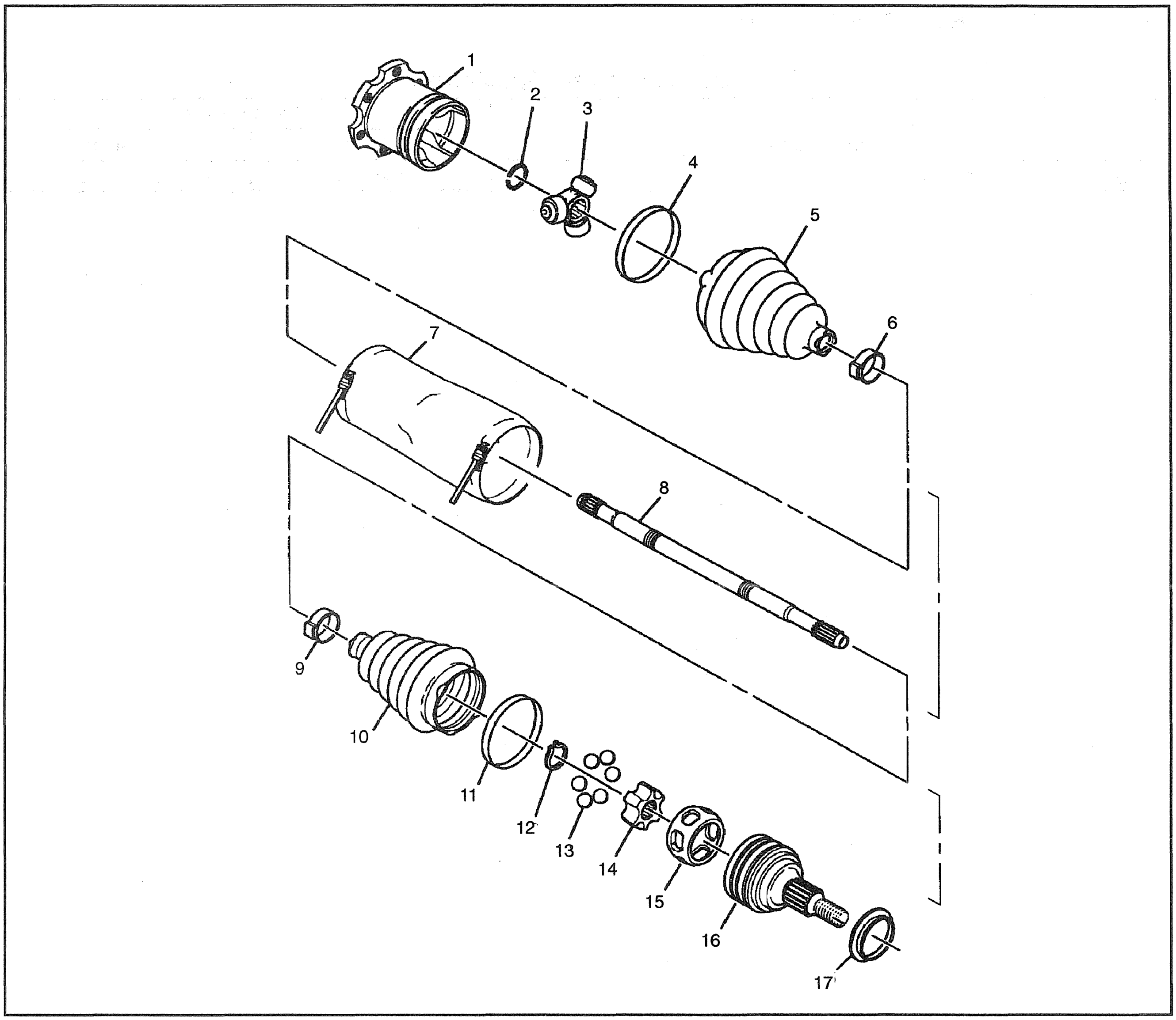
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Small Seal Retaining Clamp	136 N·m	100 lb. ft.

Visual Identification

Disassembled Views

Halfshaft Disassembled View



227225

Legend

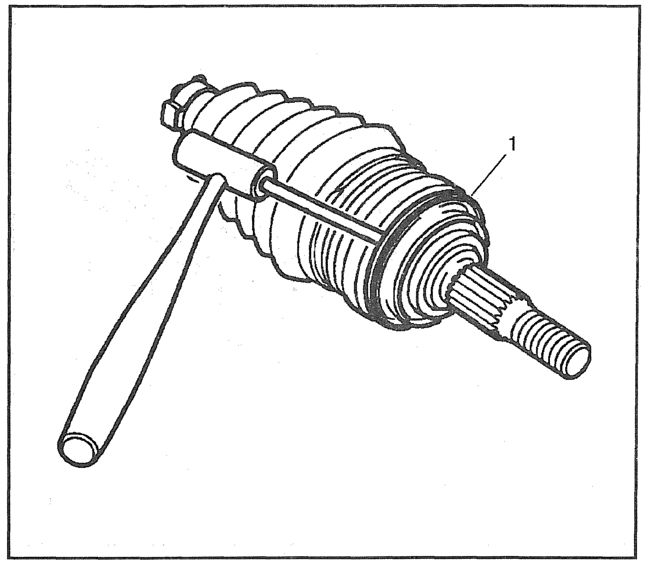
(1) Tripot Housing Assembly
(2) Spacer Ring
(3) Tripot Joint Spider Assembly
(4) Swage Ring
(5) Tripot Joint Boot
(6) Small Boot Retaining Clamp
(7) Halfshaft Boot Cover (Optional)
(8) Halfshaft Bar
(9) Small Boot Retaining Clamp
(10) CV Joint Boot
(11) Swage Ring
(12) Race Retaining Ring
(13) Ball
(14) CV Joint Inner Race
(15) CV Joint Cage
(16) CV Joint Outer Race
(17) Deflector Ring

Repair Instructions

Deflector Ring Replacement

Disassembly Procedure

1. Inspect the deflector ring (1).
2. Replace the deflector ring (1) if the deflector ring (1) is damaged.
3. Use a hammer and a brass drift to tap the damaged deflector ring (1) off of the CV joint.
4. Discard the deflector ring (1).



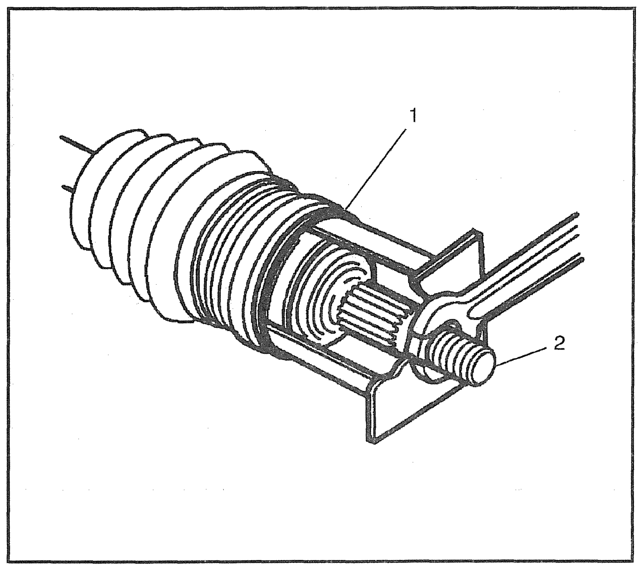
211904

Assembly Procedure

Tools Required

- 3 inch or 4 inch pipe coupling
- 12 mm x 12 mm steel plate with a 28 mm hole drilled in the center. The plate must be at least 3 mm thick.
- M24 x 2.0 nut

1. Put the new deflector ring (1) into position on the CV joint.
2. Put the 3 inch or 4 inch pipe coupling against the deflector ring (1). Put the 12 mm x 12 mm steel plate over the pipe. The halfshaft bar (2) will protrude through the 28 mm hole in the steel plate.



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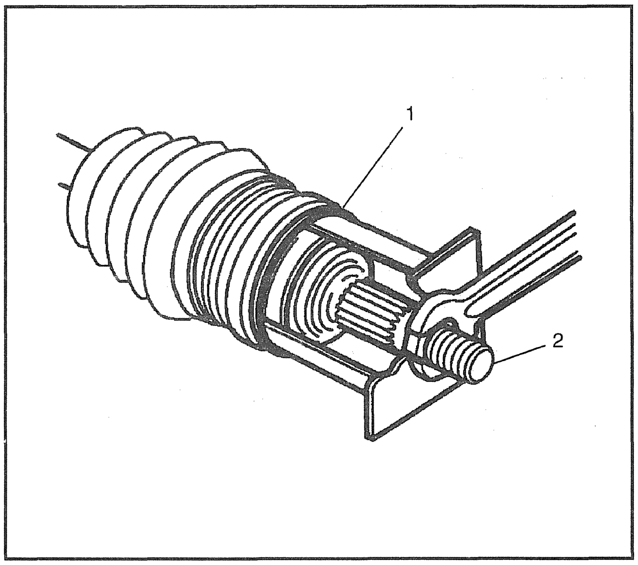
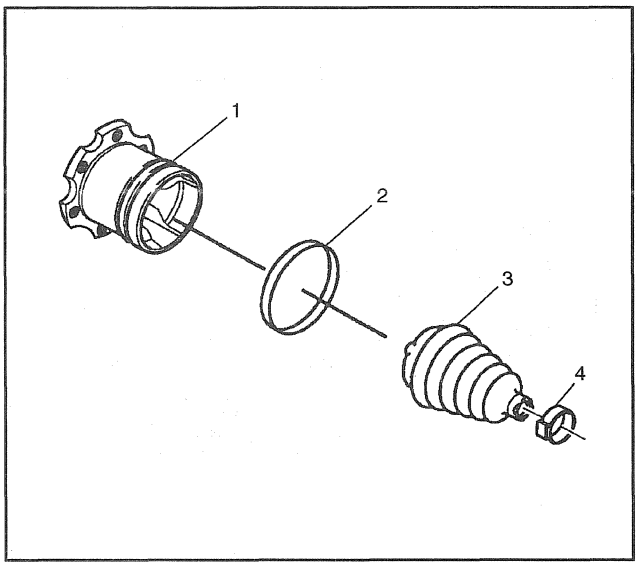


212015

3. Install the M24 x 2.0 nut on the halfshaft bar. Tighten the M24 x 2.0 nut until the deflector ring (1) bottoms against the CV joint.

Important: If the tripot end of the halfshaft assembly does not require service, follow the directions for the installation of the halfshaft boot cover; refer to *Wheel Drive Shafts Boot Cover Replacement.*

4. Remove the M24 x 2.0 nut, the 12 mm steel plate and the 3 inch or 4 inch pipe coupling.



212024

Inner Joint and Seal Replacement

Disassembly Procedure

Tools Required

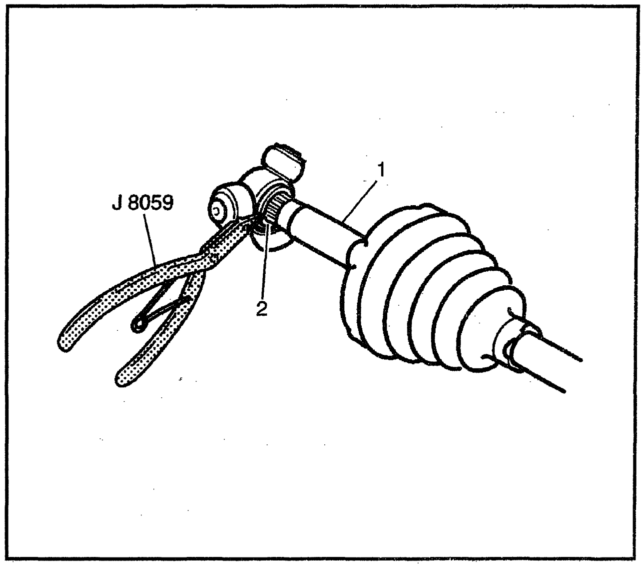
J 8059 Snap Ring Pliers

Notice: With removal of the halfshaft for any reason, the transmission sealing surface (the tripot male/female shank of the halfshaft) should be inspected for corrosion. If corrosion is evident, the surface should be cleaned with 320 grit cloth or equivalent. Transmission fluid may be used to clean off any remaining debris. The surface should be wiped dry and the halfshaft reinstalled free of any buildup.

1. Use a hand grinder in order to cut through the swage ring (2). Do not damage the tripot housing (1).
2. Remove the tripot housing (1) from the halfshaft.
3. Wipe the grease off of the tripot assembly roller bearings and the tripot housing (1).
4. Thoroughly degrease the tripot housing (1).
5. Allow the tripot housing (1) to dry prior to assembly.

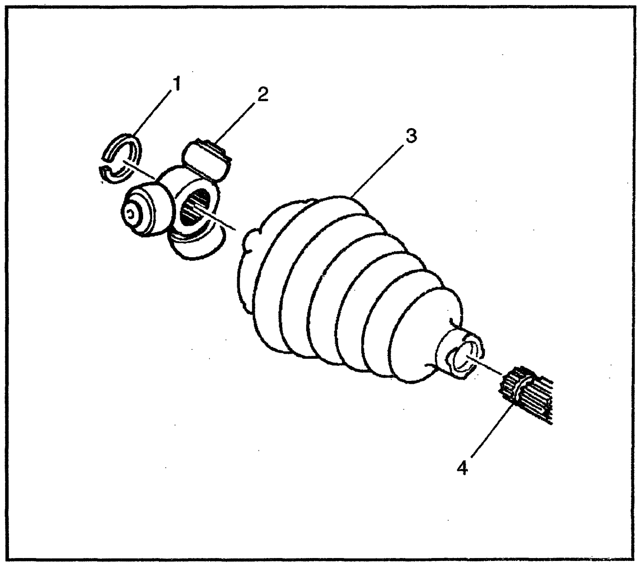
Important: Handle the tripot spider assembly with care. Tripot balls and needle rollers may separate from the spider trunnion if the tripot balls and needle rollers are not handled carefully.

6. Use side cutters to cut away the small boot clamp.
7. Spread the spider spacer ring (2) with *J 8059* (or equivalent).



221915

8. Remove the following items from the halfshaft bar:
   - 8.1. The spacer ring (1)
   - 8.2. The spider assembly (2)
   - 8.3. The tripot boot (3)
9. Clean the halfshaft bar (4). Use a wire brush in order to remove any rust in the boot mounting area (grooves).
10. Inspect the needle rollers, needle bearings, and trunnion. Check the tripot housing for unusual wear, cracks, or other damage. Replace any damaged parts.



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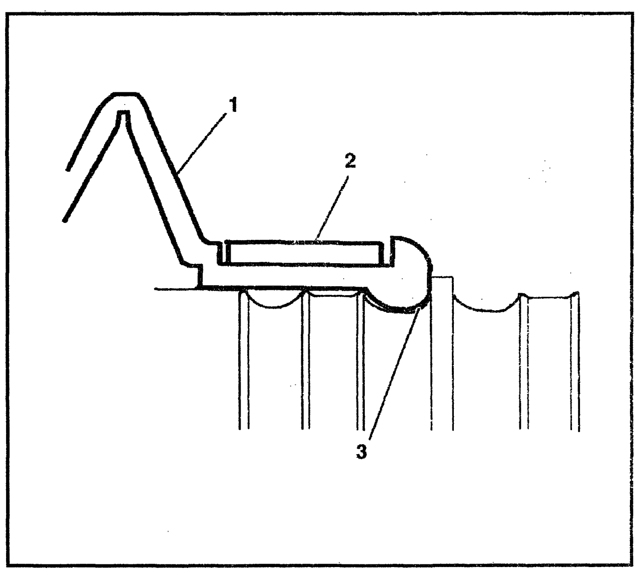
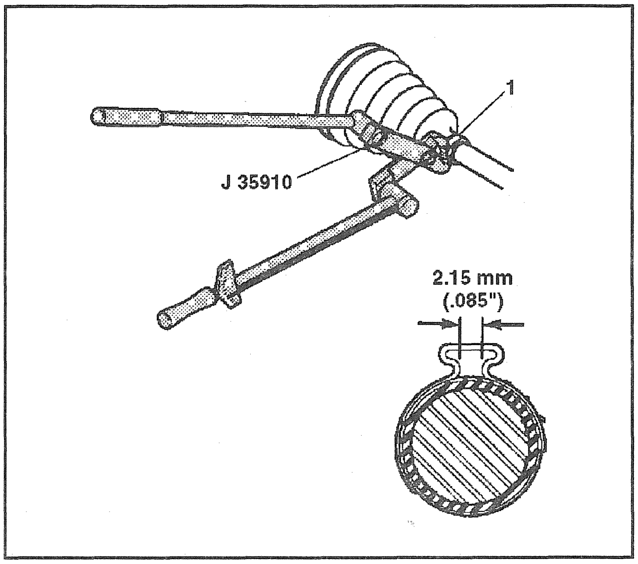
Assembly Procedure

- *J 35910* Seal Clamp Tool
- *J 36652* Split Plate Swage Clamp (K10 models)
- *J 36652* Split Plate Swage Clamp (K20/K30 models)

1. Place the new small boot clamp (2) onto the small end of the joint boot (1). Slide the joint boot (1) and small boot clamp (2) onto the halfshaft bar.
2. Position the small end of the joint boot (1) into the joint boot groove (3) on the halfshaft bar.



386688

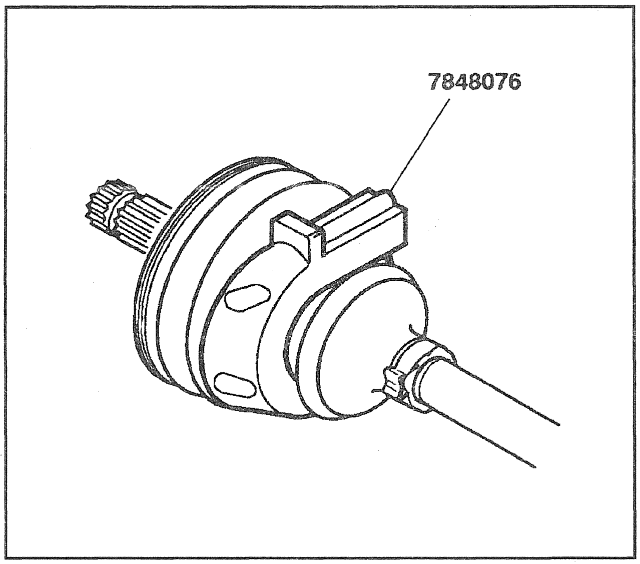


214026

3. Secure the small boot clamp (1) with *J 35910* (or equivalent), a breaker bar, and a torque wrench.

   Tighten

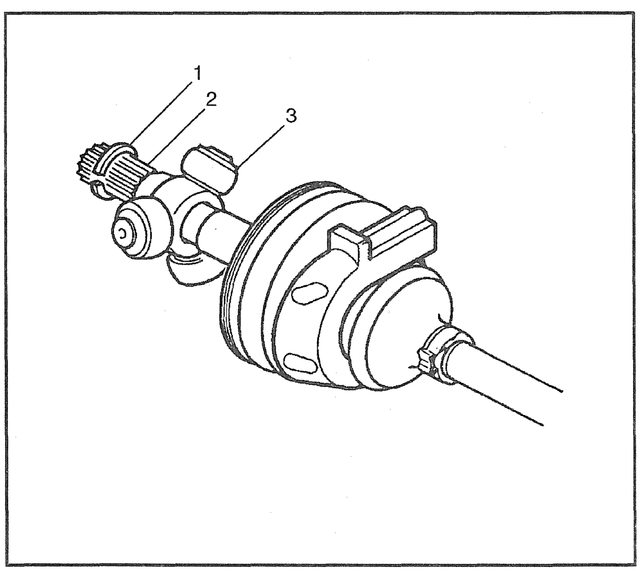
   Tighten the small boot clamp (1) to 136 N·m (100 lb ft).
4. Check the gap dimension on the clamp ear.



214938

Important: You must assemble the CV joint with the convolute retainer in the correct position, as illustrated. The CV joint boot will be damaged if the CV joint assembly does not meet the specified dimension.

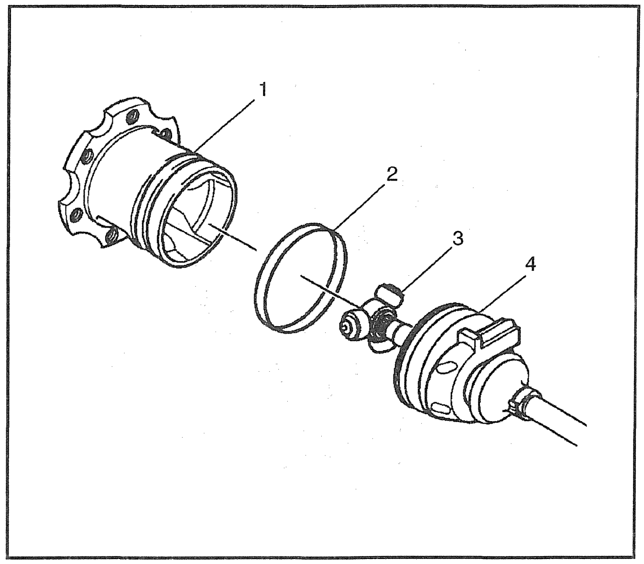
5. Install the convolute retainer over the inboard joint boot, being sure to capture three convolutions.



212035

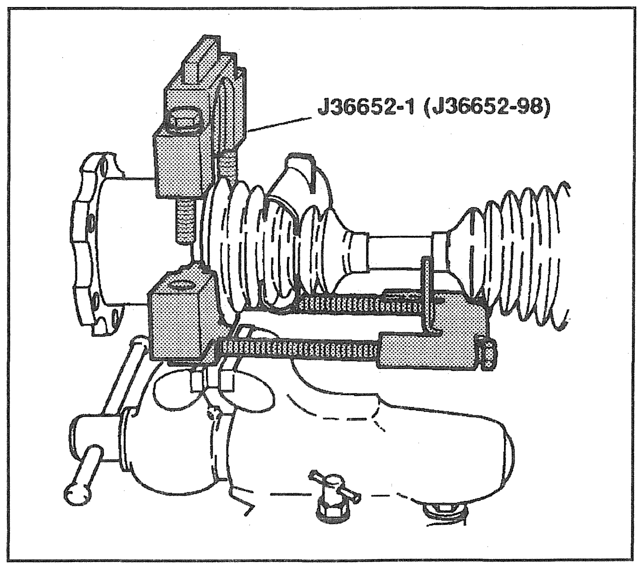
6. Install tripot spider assembly (3) onto the halfshaft bar (2) with the counterbore towards the end of the halfshaft bar (2).
7. Install the spacer ring (1) in the groove at the end of the halfshaft bar (2).
8. Push the spider assembly (3) back toward the end of the halfshaft bar (2) until the spacer ring is covered by the spider assembly (3) counterbore.
9. Pack the tripot boot and the tripot housing with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.

10. Reassemble the tripot housing (1) and the tripot boot using the following procedure:
    10.1. Pinch the swage ring (2) slightly by hand in order to distort it into an oval shape.
    10.2. Slide the distorted swage ring (2) over the large diameter of the boot.
    10.3. Place the tripot housing (1) over the spider assembly (3).
    10.4. Install the boot onto the tripot housing (1).
    10.5. Align the tripot boot (1), with the swage ring (2) in place, over the flat area on the tripot housing (1).



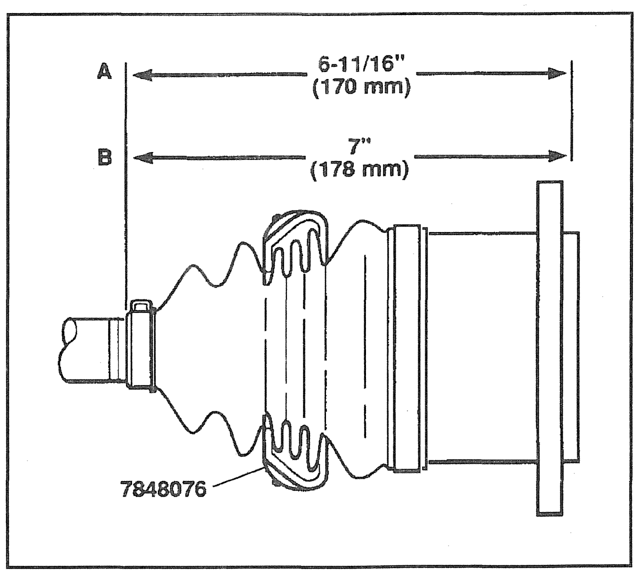
212048

11. Mount *J 36652* in a vise.
12. Install the bottom half of the split-plate swage clamp. For K10 models, use *J 36652*.
13. For K20/K30 models, use *J 36652*.

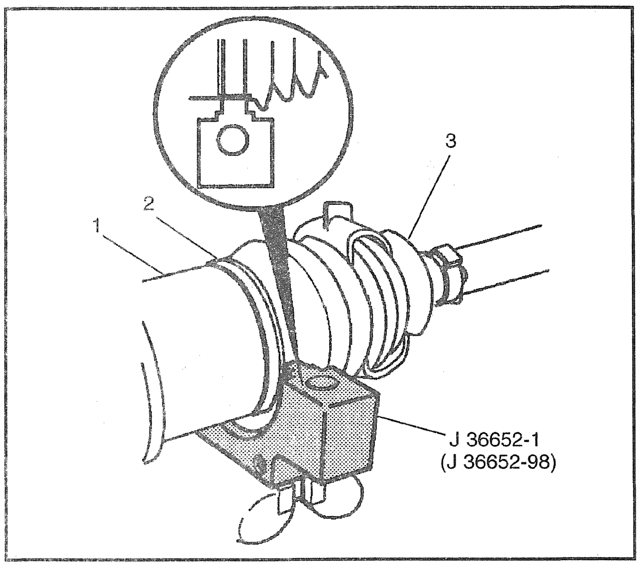


214958

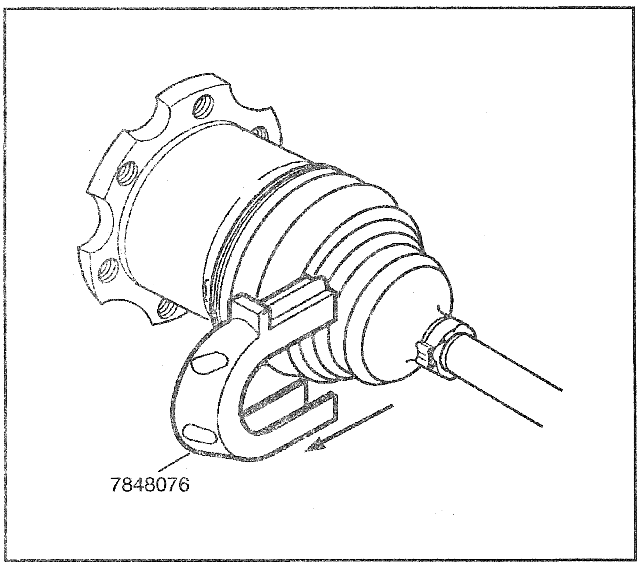
14. Check the inboard stroke position.
    - Use measurement A for the K10 models.
    - Use measurement B for the K20 and K30 models.



214960



212054



214966

15. Position the inboard end (tripot end) of the halfshaft assembly in *J 36652*.
16. Install the top half of the proper size tool on the lower half of the tool. For K10 models, use *J 36652*.
17. For K20/K30 models, use *J 36652*.
18. Align the swage ring (2) and the swage ring clamp.
19. Insert the bolts.

    Tighten

    Hand tighten the bolts in *J 36652* until the bolts are snug.
20. Align the following during this procedure:
    - The tripot boot (3)
    - The housing (1)
    - The swage ring (2)

      Tighten

      Tighten each bolt 180 degrees at a time. Alternate between the bolts until both sides of the top half of *J 36652* touch the bottom half of the *J 36652*.
21. Loosen the bolts and remove the halfshaft assembly from *J 36652*.
22. Remove the convolute retainer from the boot.

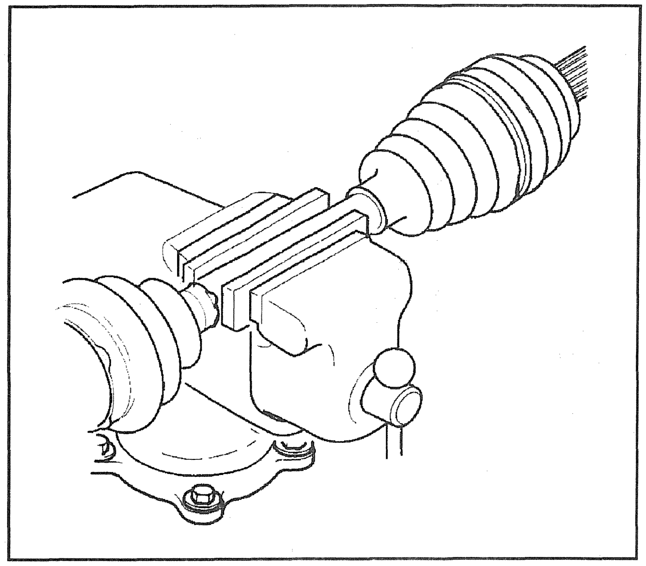
Outer Joint and Seal Replacement

Disassembly Procedure

Tools Required

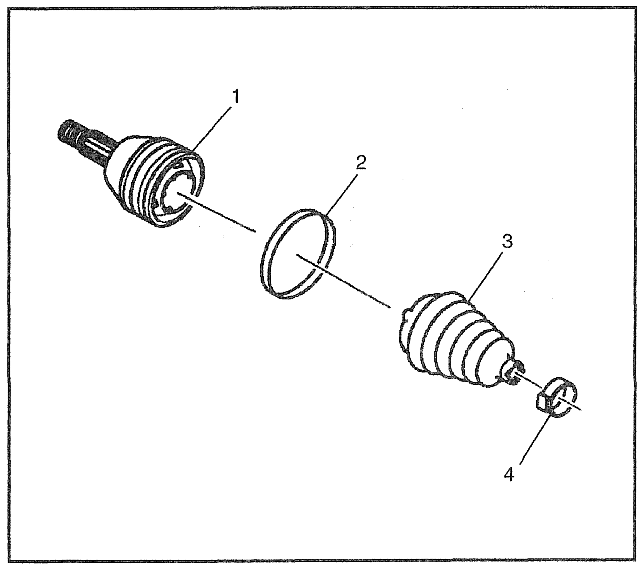
J 8059 Snap Ring Pliers

1. Place protective covers over the vise jaws. Place the halfshaft in the vise.



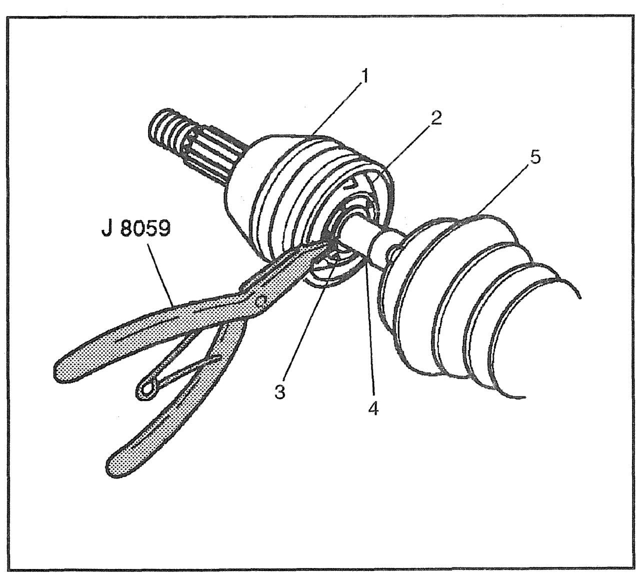
243155

2. Use a hand grinder to cut through the swage ring (2). Do not damage the CV joint outer race (1).
3. Use side cutters to cut off the small boot clamp (4).

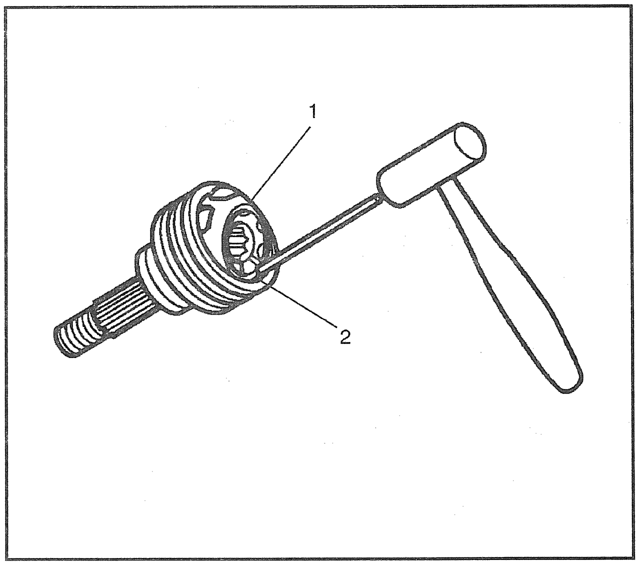


211906

4. Slide the boot (5) down the halfshaft bar (4) and away from the CV joint outer race (1). Wipe all grease away from the face of the CV joint.
5. Find the halfshaft bar retaining snap ring (3), which is located in the inner race (2). Spread the snap ring ears apart using *J 8059* (or equivalent).
6. Pull the CV joint (1) and the CV joint boot (5) from the halfshaft bar (4). Discard the old CV joint boot (5).

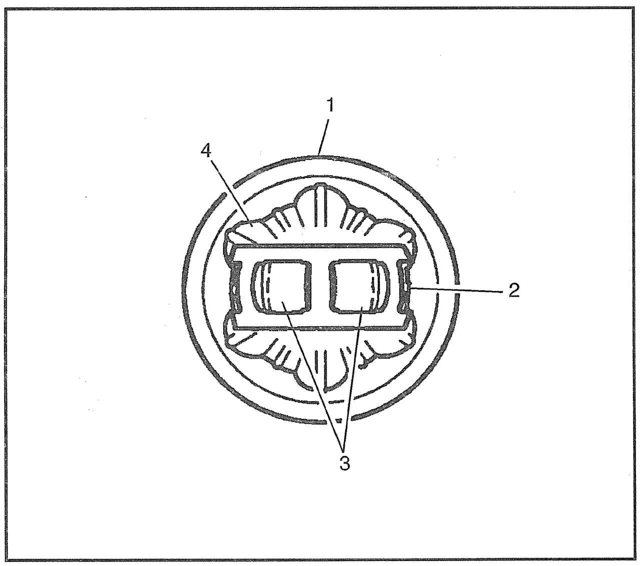


212684



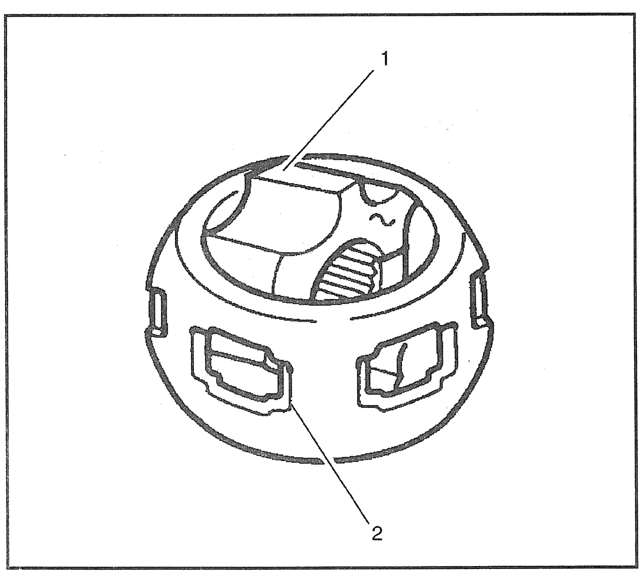
211933

7. Place a brass drift against the CV joint cage (1).
8. Tap gently on the brass drift with a hammer in order to tilt the cage (1).
9. Remove the first chrome alloy ball (2) when the CV joint cage (1) tilts.
10. Tilt the CV joint cage (1) in the opposite direction to remove the opposing chrome alloy ball (2).
11. Repeat this process to remove all six of the balls.



214946

12. Pivot the CV joint cage (4) and the inner race 90 degrees to the center line of the outer race (1). At the same time, align the cage windows (3) with the lands of the outer race (2).
13. Lift out the cage (4) and the inner race.



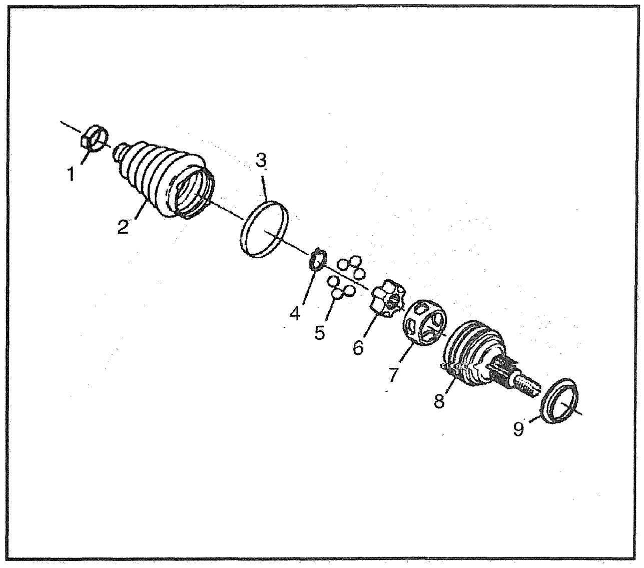
214947

14. Remove the inner race (1) from the cage (2) by rotating the inner race (1) upward.
15. Clean the following items thoroughly with cleaning solvent. Remove all traces of old grease and any contaminates.
    15.1. The inner and outer race assemblies
    15.2. The CV joint cage
    15.3. The chrome alloy balls
16. Dry all the parts.
17. Check the CV joint assembly for unusual wear, cracks, or other damage.
18. Replace any damaged parts.
19. Clean the halfshaft bar. Use a wire brush to remove any rust in the boot mounting area (grooves).

Assembly Procedure

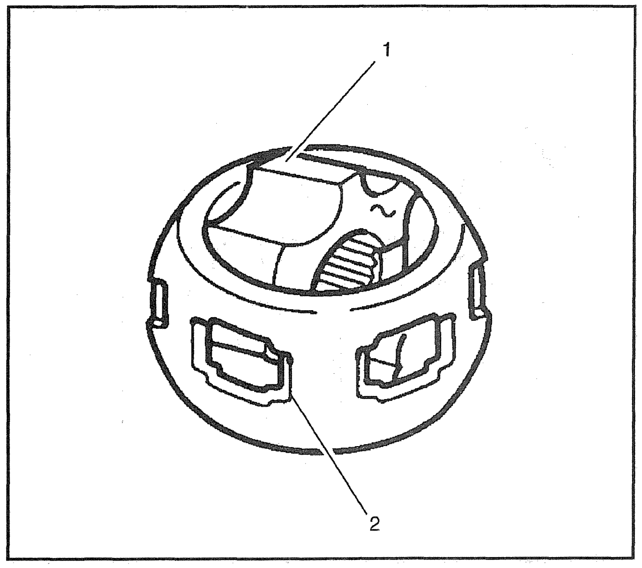
- *J 35910* Seal Clamp Tool
- *J 36652* Split Plate Swage Clamp (K10 models)
- *J 36652* Split Plate Swage Clamp (K20/K30 models)

1. Inspect all of the parts for unusual wear, cracks, or other damage. Replace the CV joint assembly if necessary.
2. Put a light coat of the recommended grease on the inner (6) and the outer race (8) grooves.



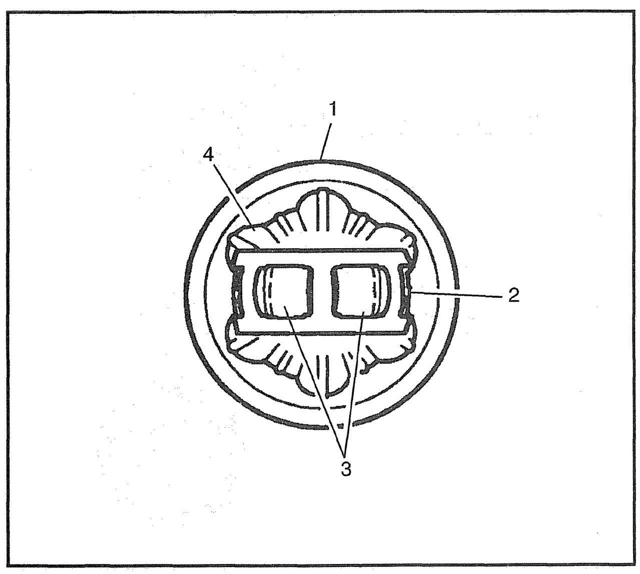
214951

3. Hold the inner race (1) at 90 degrees to the centerline of the cage (2).
4. Align the lands of the inner race (1) with the windows of the cage (2).
5. Insert the inner race (1) into the cage (2), by rotating the inner race (1) downward.

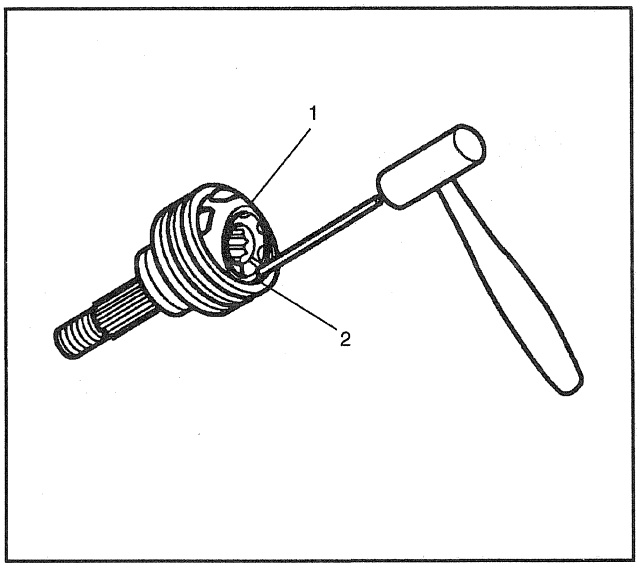


214947

6. Insert the cage (4) and inner race into the outer race (1).

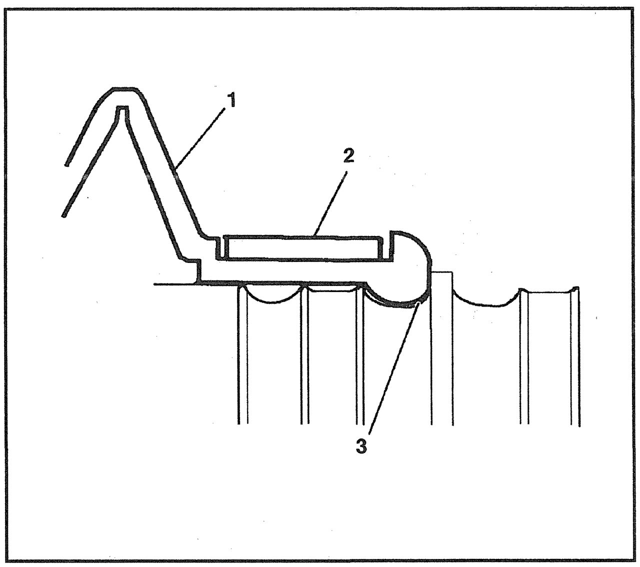


214946



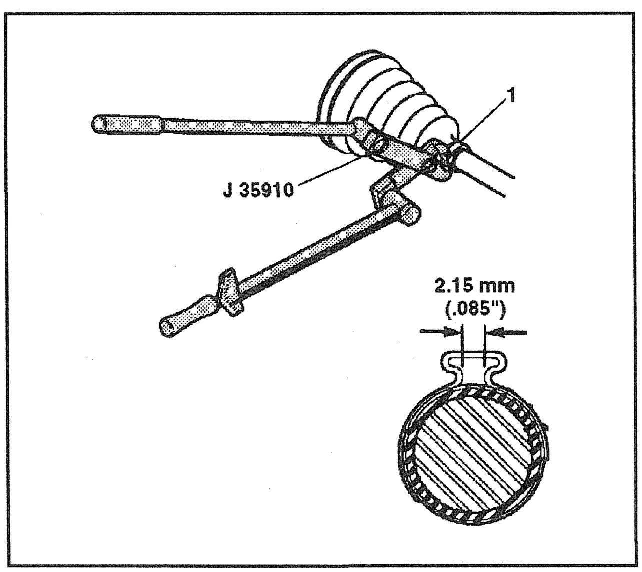
211933

7. Place a brass drift against the CV joint cage (1).
8. Tap gently on the brass drift with a hammer in order to tilt the cage (1).
9. Install the first chrome alloy ball (2) when the CV joint cage (1) tilts.
10. Tilt the CV joint cage (1) in the opposite direction to install the opposing chrome alloy ball (2).
11. Repeat this process in order to install all six of the balls.



386688

12. Pack the CV joint boot (1) and the CV joint assembly with the grease supplied in the kit. The amount of grease supplied in this kit has been pre-measured for this application.
13. Place the new small boot clamp (2) onto the CV joint boot (1).
14. Slide the CV joint boot (1) onto the halfshaft bar.
15. Position the small end of the CV joint boot (1) into the joint boot groove (3) on the halfshaft bar.



214026

16. Secure the small boot clamp (1) using *J 35910* (or equivalent), a breaker bar, and a torque wrench.

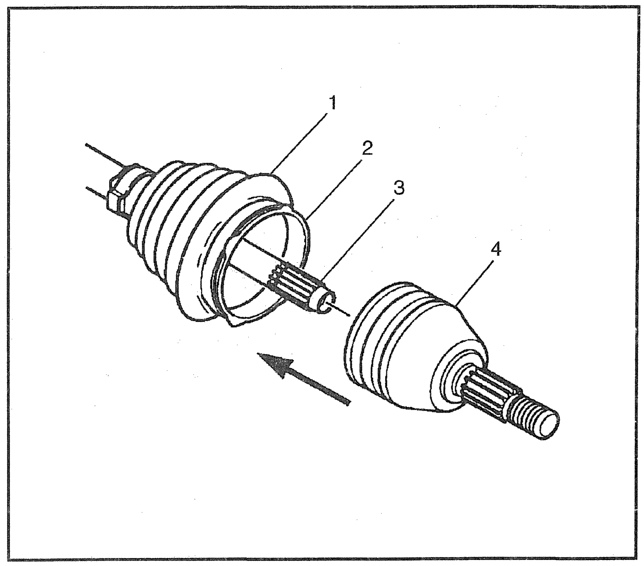
 Tighten

 Tighten the small clamp (1) to 136 N·m (100 lb ft). Check the gap dimension on the clamp ear.

17. Pinch the new swage ring (2) slightly by hand to distort it into an oval shape.
18. Slide the distorted swage ring (2) over the large diameter of the boot (1).

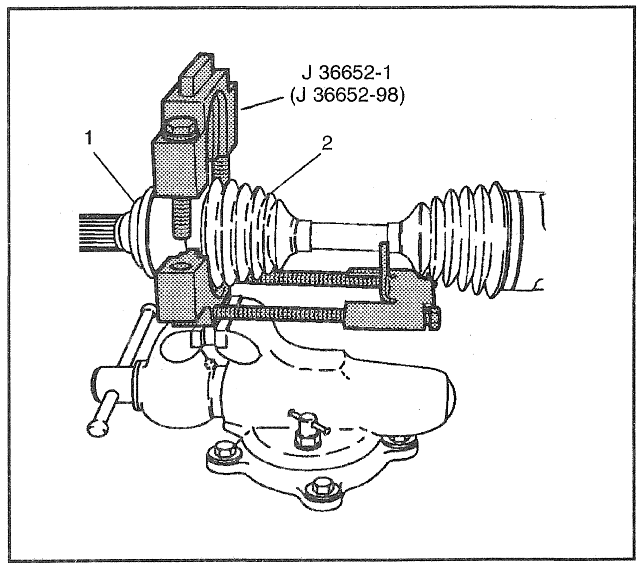
Important: Be sure that the retaining ring side of the CV joint inner race faces the halfshaft bar (3) before installation.

19. Slide the CV joint (4) onto the halfshaft bar (3). The retaining snap ring inside of the inner race engages in the halfshaft bar groove with a click when the CV joint (4) is in the proper position.
20. Pull on the CV joint (4) to verify engagement.
21. Slide the large diameter of the CV joint boot (1), with the large swage ring (2) in place, over the outside edge of the CV joint outer race (4).



212006

22. Clamp the CV joint boot (2) tightly to the CV joint outer race (1) with the large swage ring (4), using the following procedure:
    22.1. Mount *J 36652* in a vise.
    22.2. Install the bottom half of the split-plate swage clamp. For K10 models, use *J 36652*.
    22.3. For K20/K30 models, use *J 36652*.
    22.4. Position the CV joint end (outboard end) of the halfshaft assembly in the bottom half of *J 36652*.



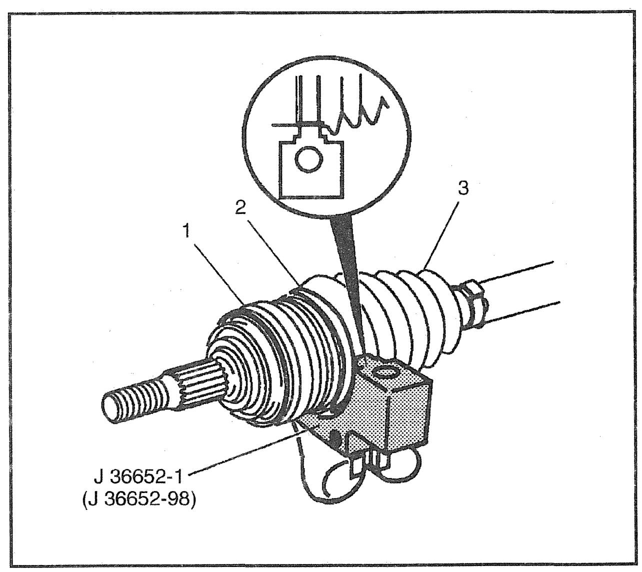
214030

23. Align the following during this procedure:
    - The CV joint boot (3)
    - The CV joint assembly (1)
    - The swage ring (2)
24. Install the top half of *J 36652* onto the lower half of the tool, over the CV joint boot (3) and the CV joint assembly (1).
25. Align the swage ring (2) and the swage ring clamp.
26. Insert the bolts into *J 36652*. Hand tighten the bolts until the bolts are snug.

Tighten

Tighten each bolt 180 degrees at a time. Alternate between the bolts until both sides of the top half of *J 36652* touch the bottom half of the tool.

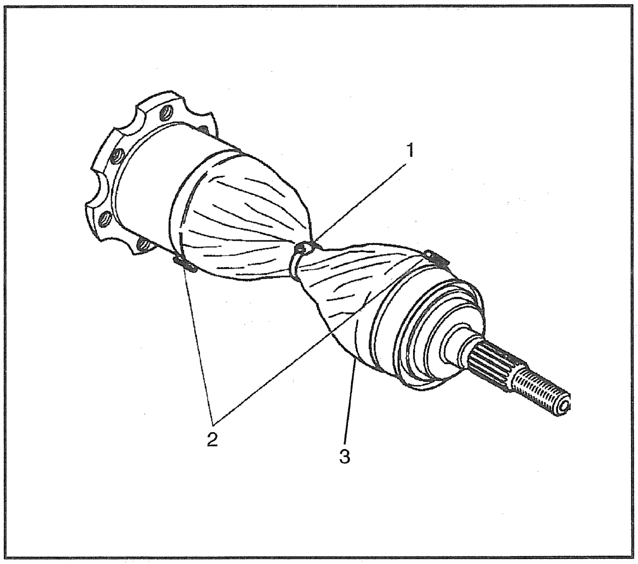
27. Loosen the bolts and remove the halfshaft assembly from *J 36652*.



214033

Wheel Drive Shafts Boot Cover Replacement

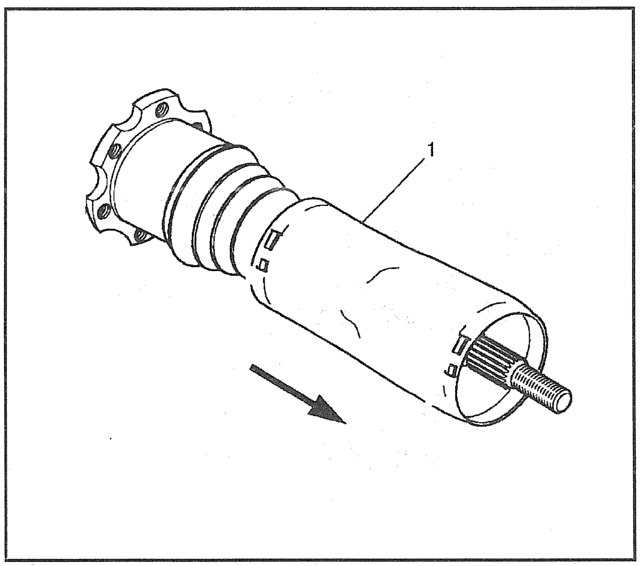
Disassembly Procedure



212151

1. Use side cutters to cut the halfshaft boot cover clamps (2) and the nylon strap (1).

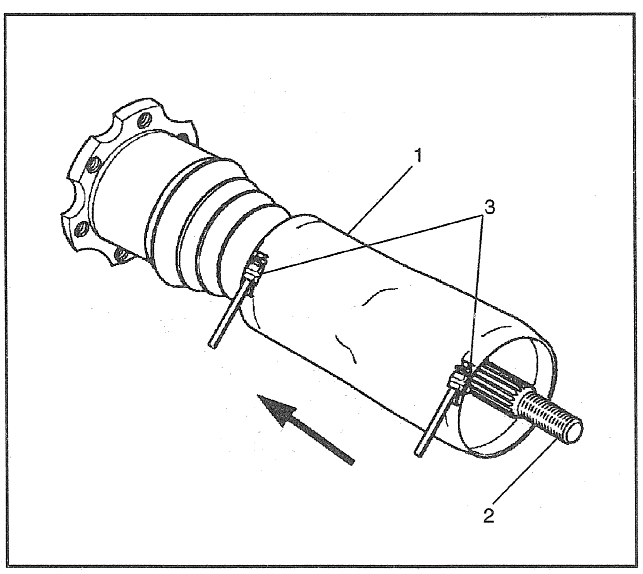
Important: If the halfshaft boot cover will be reused, do not damage the halfshaft boot cover while removing the clamps.



211901

2. Slide the halfshaft boot cover (1) off of the halfshaft, over the CV joint end.
3. Check the halfshaft boot cover (1) for rips, tears, worn spots or other damage. Reuse the halfshaft boot cover (1) if there is no damage visible.

Assembly Procedure



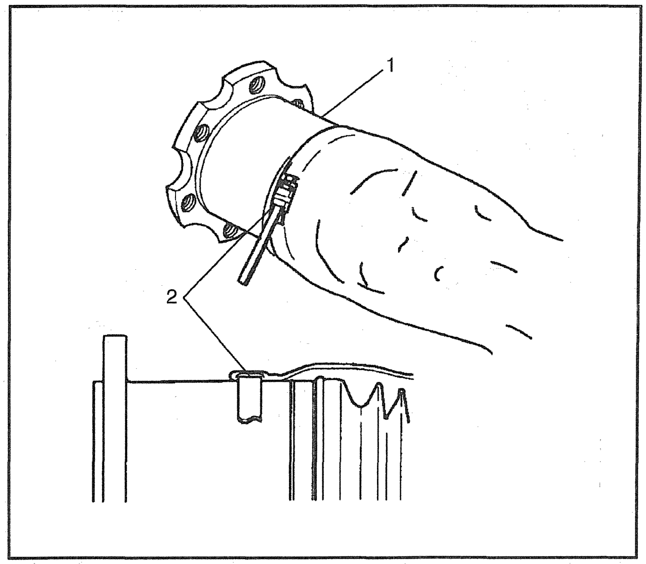
212067

Tools Required

J 41187 Band-it Type Tool

1. Insert new clamps (3) into the original halfshaft boot cover (1) (if you are reusing the original halfshaft boot cover.
2. Slide the halfshaft boot cover (1) onto the halfshaft assembly (2), starting at the outboard (CV joint) end.

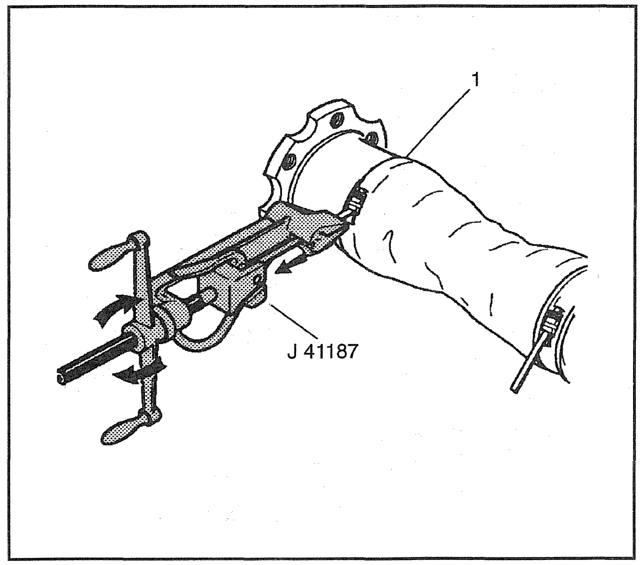
3. Align the inboard clamp (2) on the inboard joint (1). Align the boot cover seam so the seam is straight.



212079

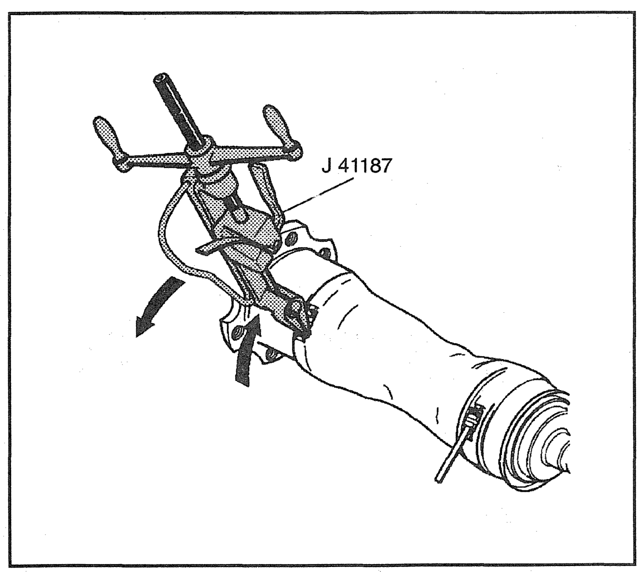
Important: Tighten the boot cover clamp (1) as tight as possible without deforming the retaining clip. Clamps that are not tight enough allow the cover to slide upon the joint. This causes shortened service life.

4. Use *J 41187* in order to tighten the inboard boot cover clamp (1).

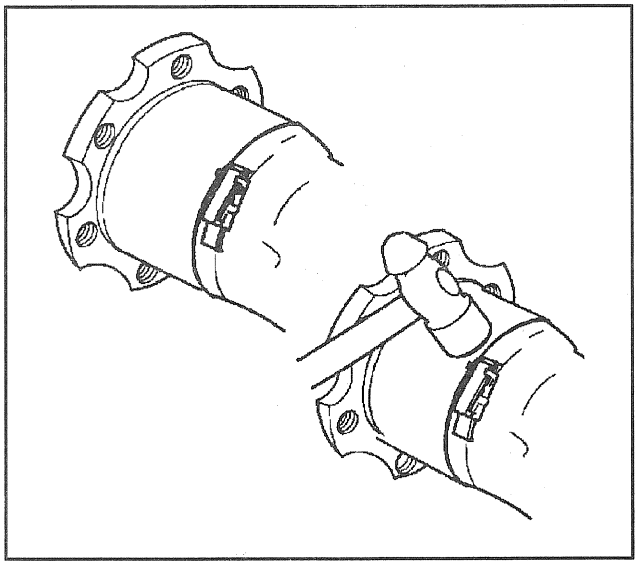


214971

5. Rotate *J 41187* toward the clip in order to bend the band onto the clip.
6. Pull on the tool's cutting handle in order to cut off the excess band.

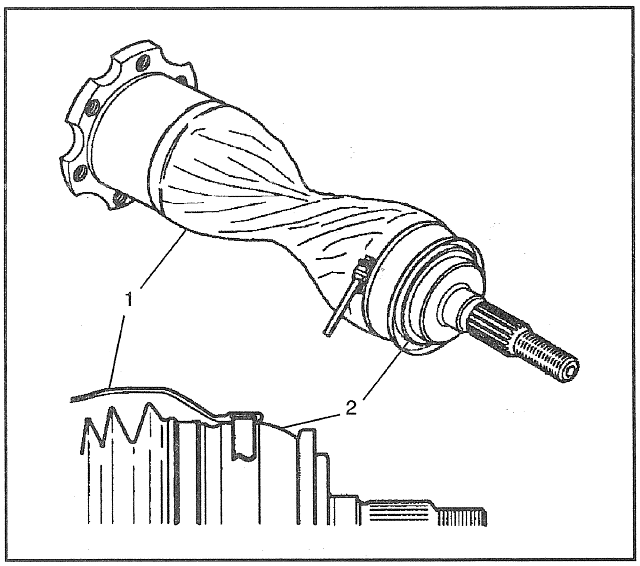


214977



212084

7. Pound the band flat between the latch tabs. Peen the latch tabs over in order to lock the band into position.

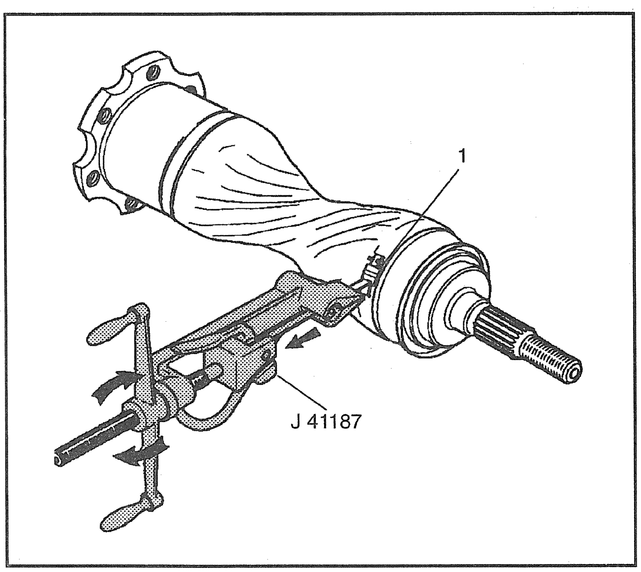


212088

8. Twist the halfshaft boot cover (1):
   - K10 = 180 degrees
   - K20/K30 = 90 degrees

Important: Be sure that the inboard tab of the halfshaft boot cover (1) is 180 degrees opposite the outboard tab of the halfshaft boot cover (1) before proceeding.

9. Position the outboard end of the halfshaft boot cover (1) over the CV joint (2) flat.

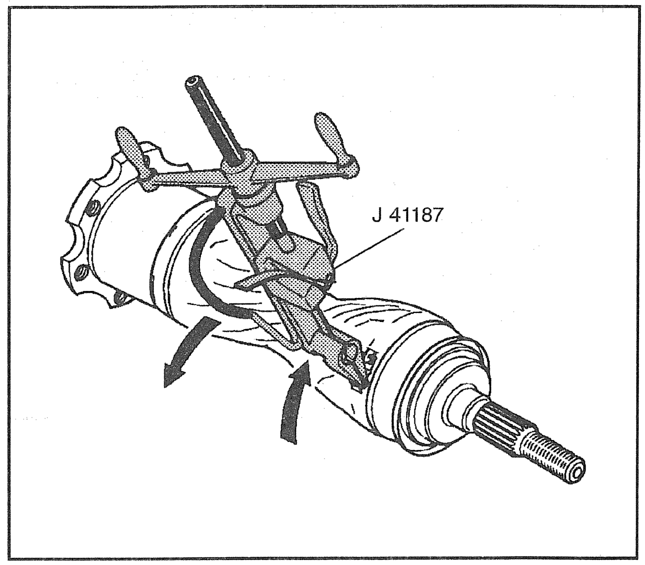


214980

Important: Tighten the boot cover clamp (1) as tight as possible without deforming the retaining clip. Clamps that are not tight enough allow the cover to slide upon the joint. This causes shortened service life.

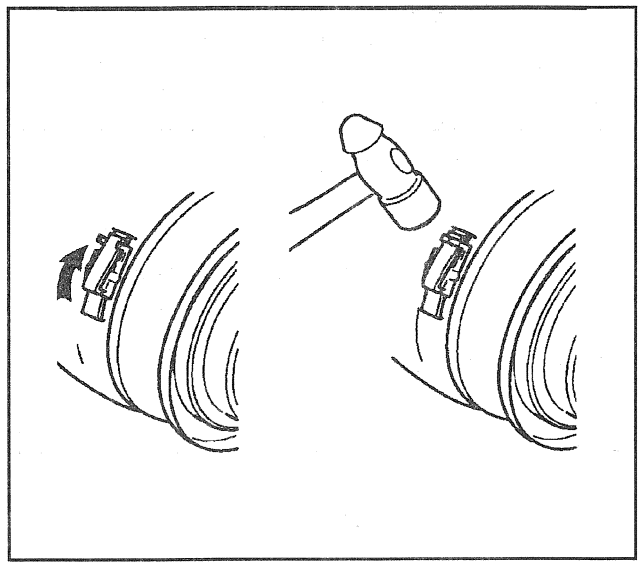
10. Use *J 41187* in order to tighten the outboard cover clamp (1).

11. Rotate *J 41187* toward the clip in order to bend the band onto the clip.
12. Pull the tool's cutting handle in order to cut off the excess band.

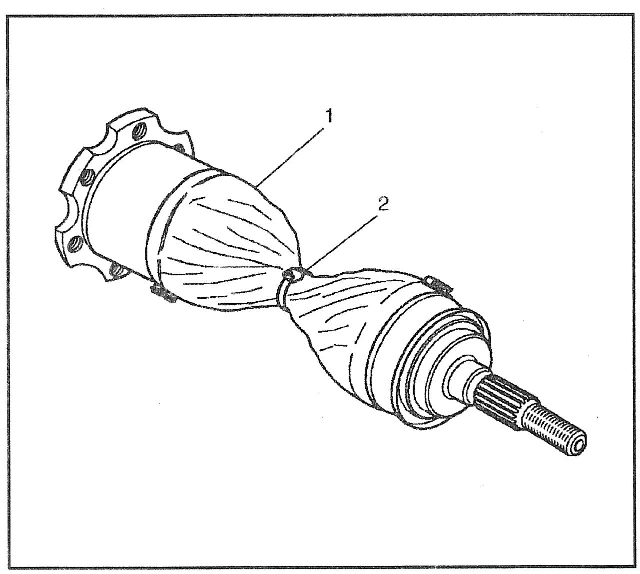


214984

13. Pound the band flat between the latch tabs. Peen the latch tabs over in order to lock the band into position.

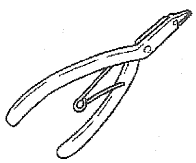
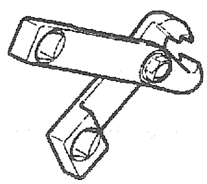
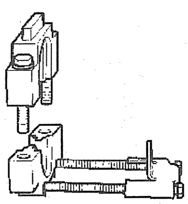
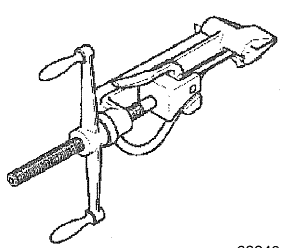

212094

14. Gather the halfshaft boot cover material at the center. Wrap the halfshaft boot cover (1) tightly with the nylon strap (2) provided in the kit.



212099

Special Tools and Equipment

Illustration	Tool Number/ Description
 221884	J 8059 Snap Ring Pliers
 221882	J 35910 Eared Seal Clamp
 222481	J 36652 Split Plate Swage Clamp
 222484	J 41187 Band-it type tool

Front Drive Axle

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Axle Shaft Tube to Carrier Bolts	40 N·m	30 lb ft
Brake Pipe Support Bracket Nut	18 N·m	13 lb ft
Carrier Frame Screws	22 N·m	16 lb ft
Carrier Mounting Bolts and Nuts	95 N·m	70 lb ft
Drive Axle (Halfshaft) Nut at Front Hub	225 N·m	165 lb ft
Drive Axle (Halfshaft) Bolts	78 N·m	58 lb ft
Electric Motor Actuator	20 N·m	15 lb ft
Engagement Switch	20 N·m	15 lb ft
Front Differential Carrier Shield Bolts	34 N·m	25 lb ft
Lower Shock Absorber Mounting Nut	73 N·m	54 lb ft
Outer Tie Rod Nut	62 N·m	46 lb ft
Plug, Drain and Fill	33 N·m	24 lb ft
RH Axle Tube to Frame Nuts	95 N·m	70 lb ft
Stabilizer Bar Clamp to Frame Bolts	33 N·m	24 lb ft
Universal Joint Clamp Bolts	20 N·m	15 lb ft
Upper Control Arm Stud Nut	100 N·m	75 lb ft

Lubrication Specifications

Application	Specification	
	Metric	English
K1 and K2 Models-Fill to Level of the Filler Plug Hole	1.66 liters	3.5 pints
K3 Models-Fill to Level of the Filler Plug Hole	1.85 liters	3.9 pints
Type Recommended	SAE 80W-90 GL5 Gear Lubricant (SAE 80W GL5 in Canada)	

GM SPO Group Numbers

Application	GM SPO Group Number
Front Axle, Axle Kit, Shaft and Shaft Kit	6.055
Front Axle Bearing, Bolt, Cover, Deflector, Nut, Ring, Seal, Shim, Sleeve, Spacer and Washer	6.056
Front Drive Axle Shifter/Lock Actuator, Clip, Connector, Fork, Ring, Rivet, Shaft, Spring and Washer	6.058

Diagnostic Information and Procedures

Noise Diagnosis (Causes of Noise)

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

When an axle is suspected of being noisy, make a thorough test in order to determine whether the noise originates in the tires, road surface, wheel bearings, engine, transmission, propeller shaft, or axle assembly. The following procedures will help locate the source of the noise: Raising tire pressure in order to eliminate tire noise (although this will not silence tread noise of mud and snow tires), listening for the noise on varying road surfaces, and listening for noise at varying speeds such as drive, float, and coast conditions.

Noise Diagnosis (Determining Type of Noise)

Road Noise

Driving on certain road surfaces, such as brick or rough-surfaced concrete, causes noise which may be mistaken for tire or rear axle noise. Driving on a different type of road, such as smooth asphalt or dirt, will quickly show whether the road surface is the cause of noise. Road noise usually is the same in drive as in coast.

Tire Noise

Tire noise may easily be mistaken for axle noise. Tire noise changes with different road surfaces; axle noise does not. Temporarily inflating all tires to 345 kPa (50 psi) pressure, for test purposes alters the noise caused by tires only materially, but does not affect noise caused by the axle. Axle noise usually stops when coasting at speeds under 30 miles per hour. Tire noise still continues with lower tone as the vehicle speed reduces.

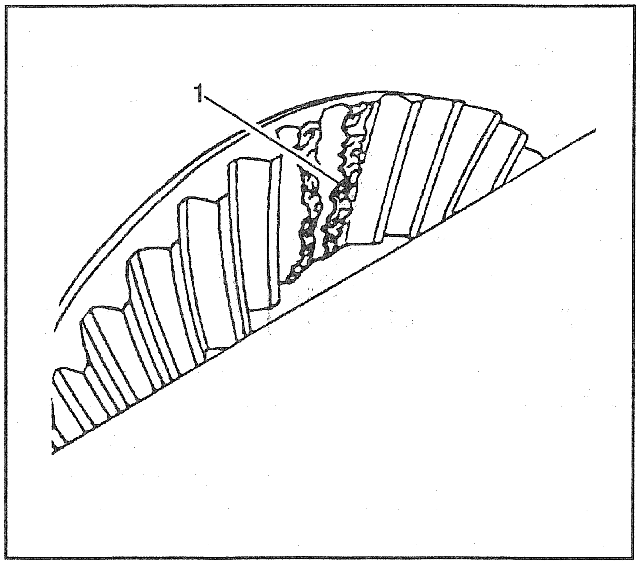
Engine and Transmission Noises

In order to determine which unit causes the noise, take note of approximate vehicle speeds and conditions under which the noise is most pronounced. Then stop the vehicle in a quiet place in order to stop interfering noises. With the transmission in neutral, run the engine slowly up and down the engine speeds corresponding to the vehicle speed at which the noise was most pronounced. If a similar noise is produced with the vehicle standing still, the engine or transmission is the cause, not the axle.

Wheel Bearing Noise

A brinelled wheel bearing causes a knock or click approximately every two revolutions of the wheel, since the bearing rollers do not travel at the same speed as the axle and wheel. With the wheels jacked up, spin the wheels by hand while listening at the hubs for evidence of a rough or brinelled wheel bearing or loose bearings.

Gear Noise



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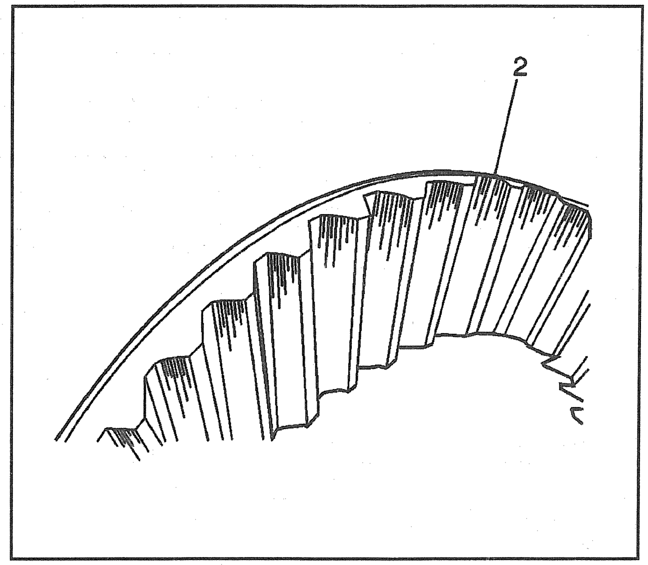
There are two basic types of gear noise. The first type is produced by broken, bent, or forcibly damaged gear teeth (1), which is usually quite audible over the entire speed range, and presents no difficulty in diagnosis. For example, hypoid gear tooth scoring generally results from the following: insufficient lubricant, improper break-in, wrong lubricant, insufficient gear backlash, improper ring and pinion alignment, or loss of drive pinion nut torque. The scoring progressively leads to complete erosion of the gear tooth or gear tooth pitting and then eventual fracture if the initial scoring is not corrected.

Another cause of hypoid gear fracture is extended overloading of the gear set, which produces fatigue fracture, or shock loading, and can result in sudden failure.



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The second type of gear noise pertains to the mesh pattern of the gear teeth (2). This form of abnormal gear noise is recognizable because it produces a cycling pitch (whine) and is pronounced in the speed range at which it occurs, appearing under either drive, float, or coast conditions. Gear noise tends to peak in a narrow speed range or ranges and will tend to remain constant in pitch. Bearing noise varies in pitch with vehicle speeds.

Front Drive Axle Diagnosis (Clicking Noise in Turns)

Checks	Action
DEFINITION: A clicking noise occurs when driving the vehicle at varying speeds.	
Worn out or damaged CV joint	Replace the CV joint.

Front Drive Axle Diagnosis (Clunk Accelerating from Coast)

Checks	Action
DEFINITION: A clunking noise occurs when accelerating the vehicle from coast.	
Loose CV joint to output shaft bolts	Tighten the output shaft bolts.
A damaged inner CV joint	Replace the inner CV joint.

Front Drive Axle Diagnosis (Shudder or Vibration)

Checks	Action
DEFINITION: A shudder or vibration occurs when accelerating the vehicle.	
An excessive CV joint angle	Repair the CV joint angle.
Worn or damaged CV joints	Replace the CV joints.
Sticking spider assembly (inner CV joint)	Lubricate or replace the inner CV joint.
Sticking joint assembly (outer CV joint)	Lubricate or replace the outer CV joint.

Front Drive Axle Diagnosis (Vibration at Highway Speeds)

Checks	Action
DEFINITION: Vibration occurs while driving the vehicle at highway speeds.	
Out of balance or out of round tires	Balance or replace the tires.
Front end out of alignment	Align the front end.

Front Drive Axle Diagnosis (Front Drive Axle Leaks)

Checks	Action
DEFINITION: Fluid leaks from the front drive axle.	
Worn differential output seals	Repair the seals.
Inspect the mating area between the axle tube and the differential housing.	Reseal the differential housing mating area with RTV sealant.
Inspect the vent hose connector.	Replace the vent hose connector.

Four-Wheel-Drive Diagnosis (4WD Will Not Engage)

Checks	Action
DEFINITION: Four wheel drive will not engage.	
A blown fuse (A/C-HTR fuse)	Replace the fuse.
Feed wire to transfer case switch open	Repair the open wire.
The transfer case switch is faulty.	Replace the transfer case switch.
The wires to the front axle actuator are open.	Repair the open wiring.
The front axle actuator is faulty.	Replace the axle actuator.
The axle is damaged internally.	Repair the axle as necessary. Refer to *Differential Carrier Overhaul*

Four-Wheel-Drive Diagnosis (4WD Does Not Disengage)

Checks	Action
DEFINITION: The four-wheel drive will not disengage.	
The transfer case switch is faulty.	Replace the transfer case switch.
The front axle actuator is faulty.	Replace the actuator.
The internal axle is damaged.	Repair the internal axle as necessary. Refer to Drive Axle Unit Repair in Driveline/Axle.

Four-Wheel-Drive Diagnosis (Indicator Light Not Off)

Checks	Action
DEFINITION: The four-wheel drive indicator light will not turn off.	
The front axle switch is faulty.	Replace the front axle switch.

Four-Wheel-Drive Diagnosis (Indicator Light Not On)

Checks	Action
DEFINITION: Four-wheel drive engages but the indicator light will not come on.	
The bulb is burned out.	Replace the bulb.
The front axle switch is faulty.	Replace the front axle switch.

Electric Motor Actuator Check

1. Apply 12–volt battery voltage to the actuator terminals.

   The plunger should extend within several seconds.
2. Disconnect the actuator from the power source.

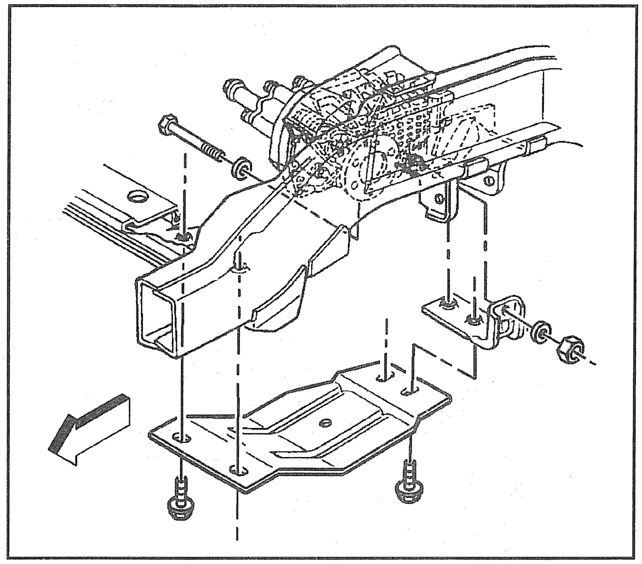
   The plunger should retract within several seconds.
3. If the actuator does not operate as specified, replace the actuator.

Repair Instructions

Lubricant Change

Removal Procedure

1. Remove the front differential carrier shield, if equipped. Refer to *Shield Replacement*.



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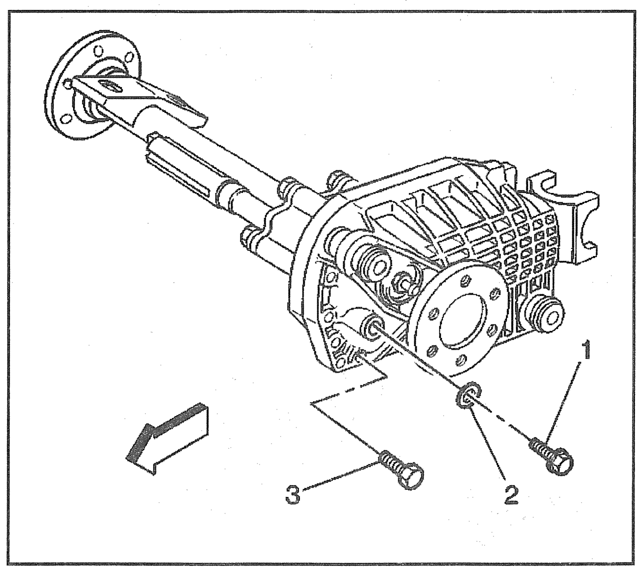
2. Remove the fill plug (1) and the washer (2).
3. Remove the drain plug (3).
4. Drain the fluid from the differential.



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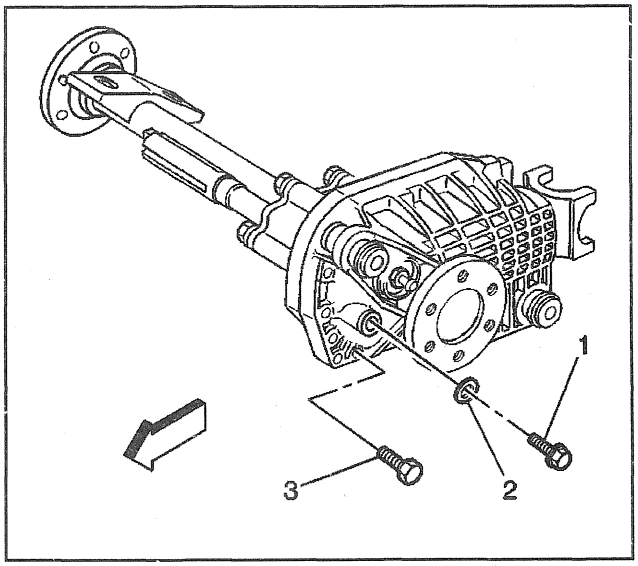

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Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

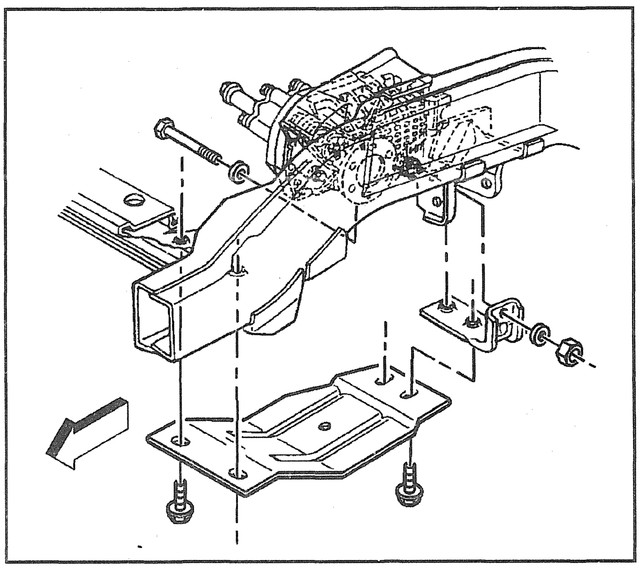
1. Install the drain plug (3).

   Tighten

   Tighten the drain plug (3) to 33 N·m (24 lb ft).
2. Fill the differential. Refer to *Lubrication Specifications*.
3. Install the washer (2) and the fill plug (1).

   Tighten

   Tighten the fill plug (1) to 33 N·m (24 lb ft).



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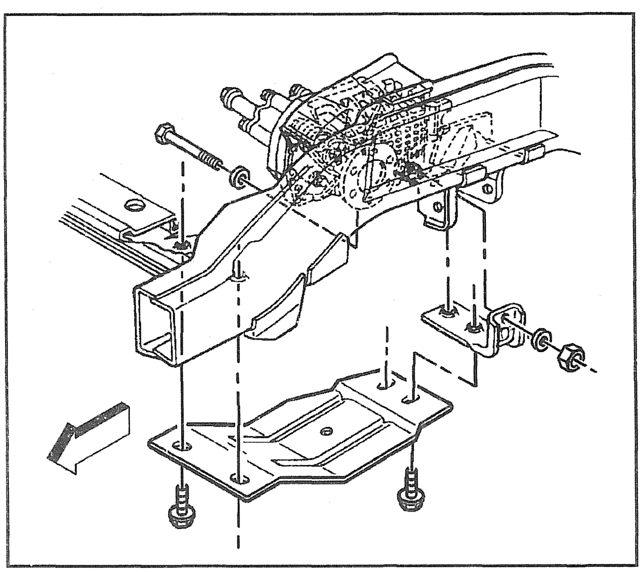
4. Install the front differential carrier shield. Refer to *Shield Replacement*.



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Shield Replacement

Removal Procedure

1. Remove the bolts.
2. Remove the front differential carrier shield.

Installation Procedure

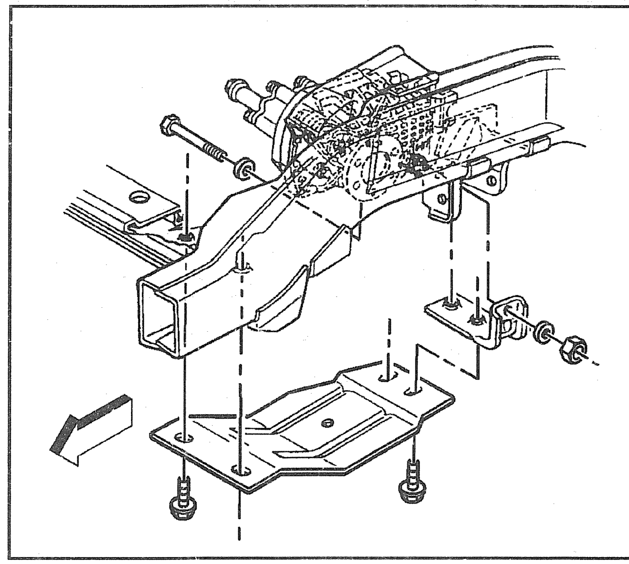
1. Install the front differential carrier shield.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the bolts.

   Tighten

   Tighten the bolts to 34 N·m (25 lb ft).



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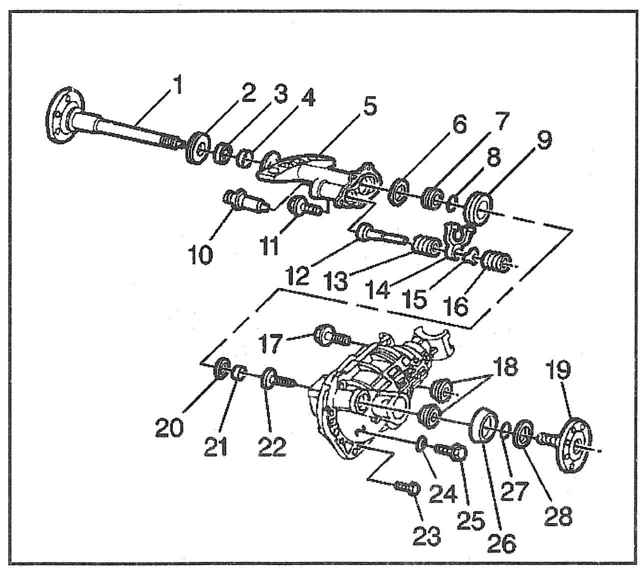
Indicator Switch Replacement

Removal Procedure

1. Remove the front differential carrier shield (if equipped). Refer to *Shield Replacement.*
2. Remove the electrical connector from the indicator switch located on the upper left side of the output shaft tube (5).
3. Remove the indicator switch.



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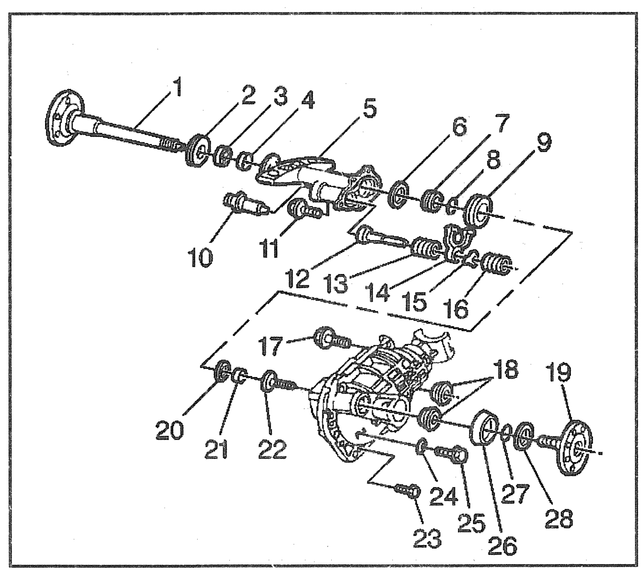
Installation Procedure

1. Coat the indicator switch threads with sealer GM P/N 1052942.
2. Install the indicator switch to the output shaft tube (5).
3. Install the electrical connector.
4. Install the front differential carrier shield (if equipped). Refer to *Shield Replacement.*



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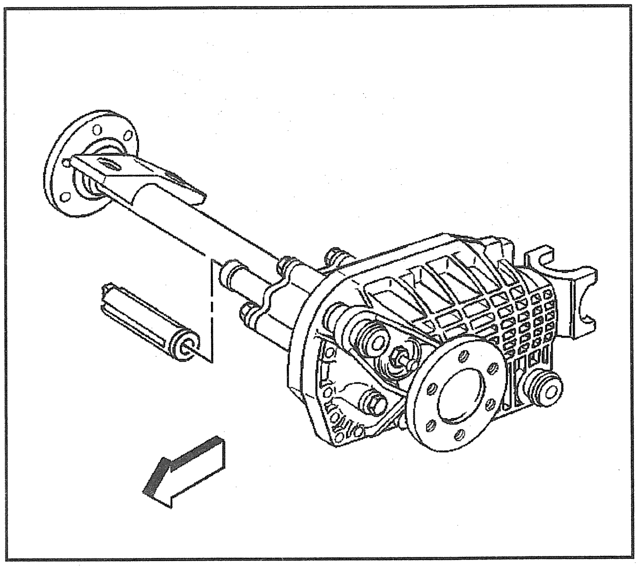
Electric Motor Actuator Replacement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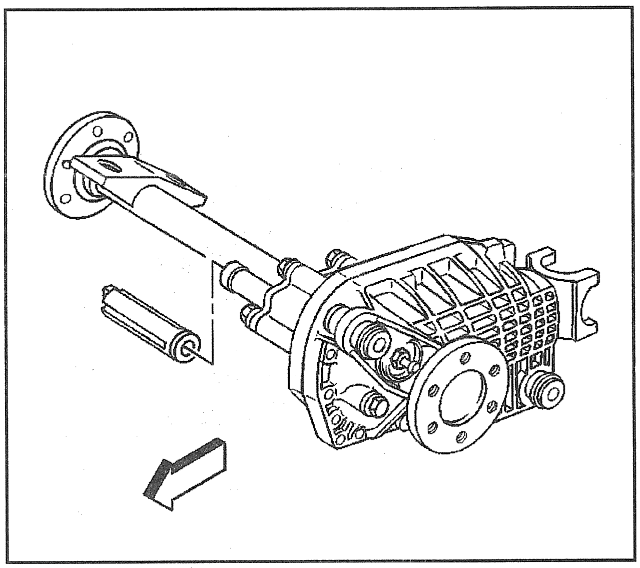
Removal Procedure

1. Remove the front differential carrier shield (if equipped). Refer to *Shield Replacement.*
2. Remove the electrical connector from the actuator.
3. Remove the electric motor actuator by unthreading.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Installation Procedure

1. Coat the threads of the electric motor actuator with sealant GM P/N 1052942.

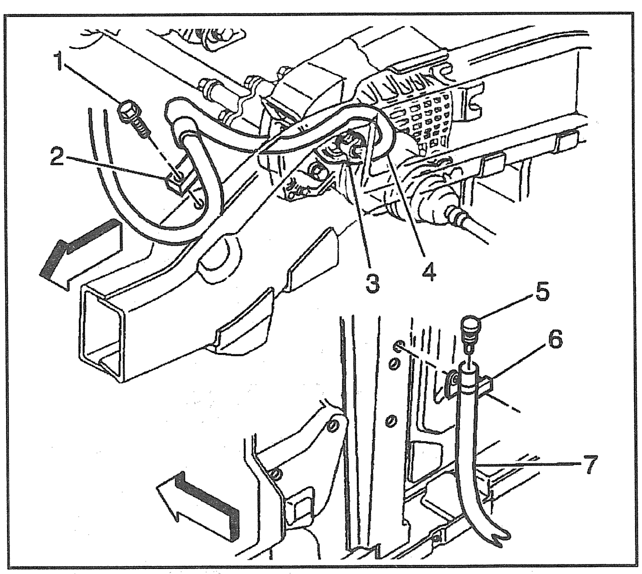
Notice: Refer to *Fastener Notice* In Cautions and Notices.

2. Install the electric motor actuator.

   Tighten

   Tighten the actuator to 20 N·m (15 lb ft)
3. Install the electrical connector.
4. Install the front differential carrier shield (if equipped). Refer to *Shield Replacement.*

Vent Hose Replacement



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Removal Procedure

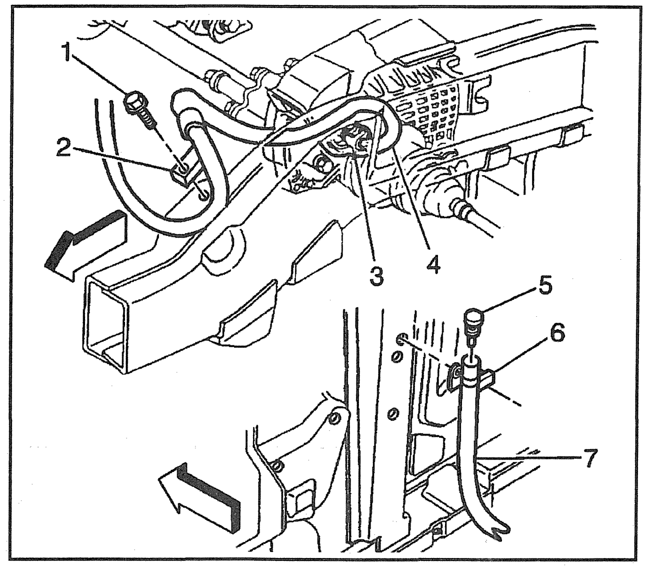
1. Remove the front differential carrier shield (if equipped). Refer to *Shield Replacement.*
2. Remove the clamp (3).

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

3. Remove the vent hose (4) from the axle.
4. Remove the bolt (1).
5. Remove the clip (6).
6. Remove the vent hose (7).

Installation Procedure

1. Install the vent hose (4) to the vehicle.
   - Route the same way as when removed.
   - Make sure the hose is free of kinks and is routed clear of sharp components.
   - Make sure the vent is not plugged.
2. Install the clip (6).
3. Install the bolt (1) and the clamp (2).
4. Install the vent hose (4) to the axle fitting.
5. Install the clamp (3).
6. Install the front differential carrier shield (if equipped). Refer to *Shield Replacement*.



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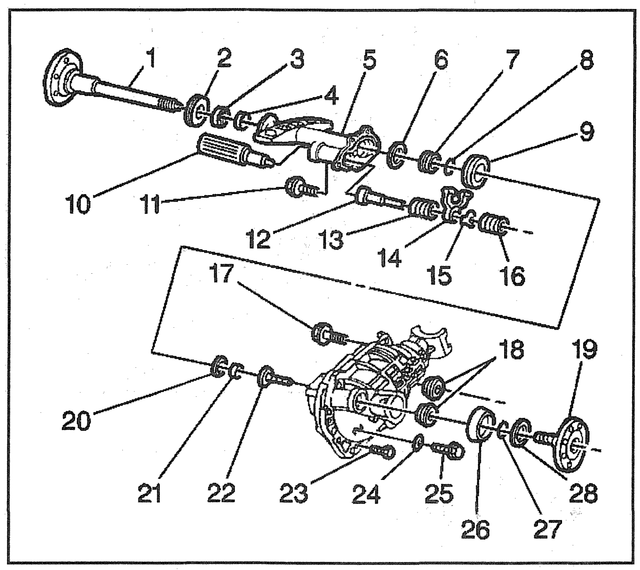
Shift Fork Replacement

Removal Procedure

1. Remove the axle shaft (output shaft) and tube assembly. Refer to *Output Shaft, Bearing, and Tube Replacement (Right Side)*.
2. Remove the shift shaft (12), damper spring (13), fork (14) and clip (15) assembly.
3. Remove the spring (16) from the carrier case. Take care not to dislodge the shim (20) from the axle shaft (output shaft).



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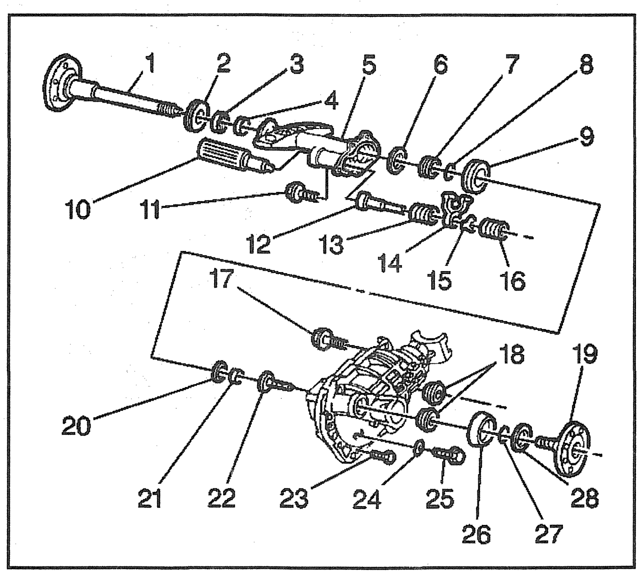
Installation Procedure

1. Install the spring (16) into the carrier case.
2. Install the shift shaft (12), damper spring (13), fork (14), and clip (15) assembly into the axle tube. Make sure that the clip fully seats into the groove on the shift lever.
3. Install the axle shaft (output shaft) and tube assembly. Refer to *Output Shaft, Bearing, and Tube Replacement (Right Side)*.



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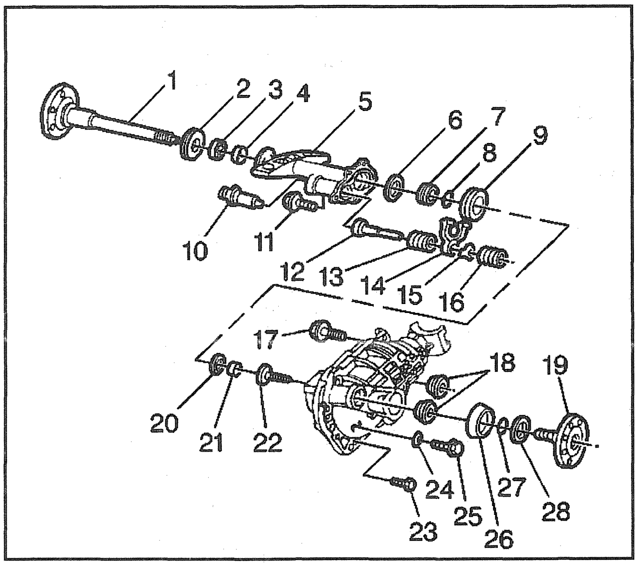
Shift Mechanism Inspection

1. Inspect the carrier connector for damaged splines and teeth. Replace as required.
2. Inspect the shift fork for wear, scoring, and damage to the thrust surfaces. Replace as required.
3. Inspect the differential sleeve and the inner output shaft for damaged splines and teeth. Replace as required.
4. Inspect the damper spring for breakage.
5. Inspect the differential actuator and the engagement switch for damage and frayed wiring.



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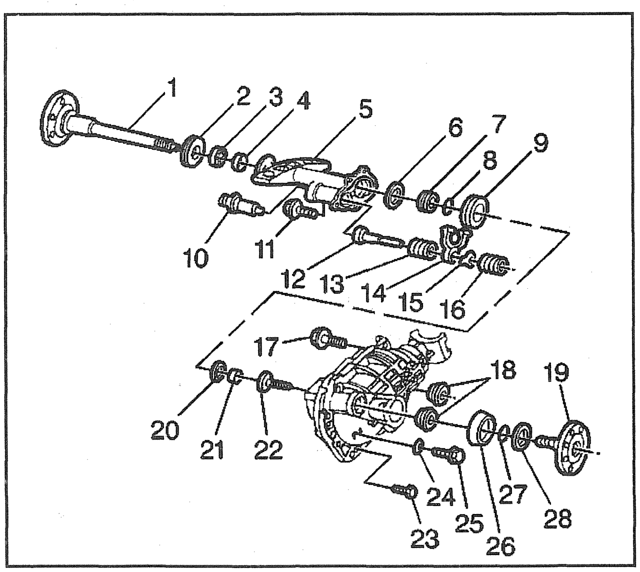
Output Shaft, Bearing, and Tube Replacement (Right Side)

Removal Procedure

1. Raise the vehicle and support it using safety stands.
2. Remove the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.
3. Remove the housing bolts (11) from the carrier.

Important: Keep the open end of the tube up.

4. Remove the axle shaft (output shaft) tube from the carrier.



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Disassembly Procedure

Tools Required

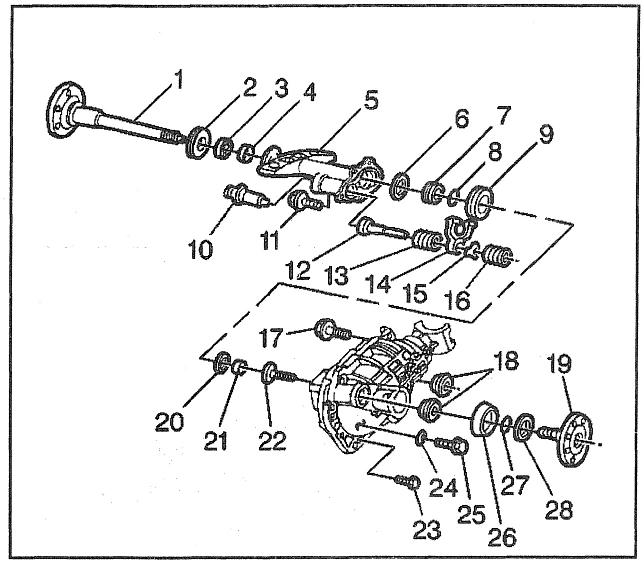
- *J 29369-1* Bearing Remover (K2 models)
- *J 29369-2* Bearing Remover (K3 models)

1. In a vise, hold the axle shaft (output shaft) tube by the mounting flange.
2. Remove the sleeve (9).
3. Remove the gear (7).
4. Remove the thrust washer (6).
5. Remove the axle shaft (output shaft) (1). Tap out the axle shaft with a soft mallet.
6. Remove the seal (3). Pry out the seal with a screwdriver.
7. Remove the bearing (4). Use the *J 29369-1* or the *J 29369-2* and a slide hammer.
8. Clean the parts in a suitable solvent.
9. Clean the gasket surfaces on the axle shaft (output shaft) tube and carrier housing.

Assembly Procedure

- *J 36609* Bearing Installer
- *J 36600 Axle* Seal Installer (K2 Models)
- *J 22833* Seal Installer (K3 Models)

1. Assemble the new bearing (4). Use the *J 36609*.
2. Apply axle lubricant to the bearing.
3. Install the new seal (3). Use the *J 36600 Axle* or the *J 22833*.
4. Install the axle shaft (output shaft) (1).
5. Place a small amount of grease on the thrust washer in order to hold it in place.
6. Install the thrust washer (6).
7. Make sure the tabs on the washer align with the slot in the axle shaft (output shaft) tube.
8. Install the gear (7).
9. Install the sleeve (9).



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Installation Procedure

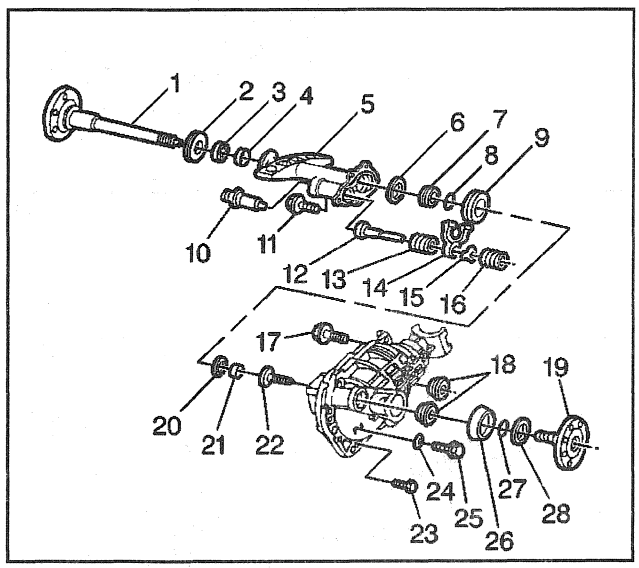
1. Apply sealant GM P/N 12345739 or equivalent to the carrier sealing surface.
2. Install the axle shaft (output shaft) tube (5) to the carrier.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the bolts (19).

   Tighten

   Tighten the bolts to 40 N·m (30 lb ft).
4. Install the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.
5. Lower the vehicle.



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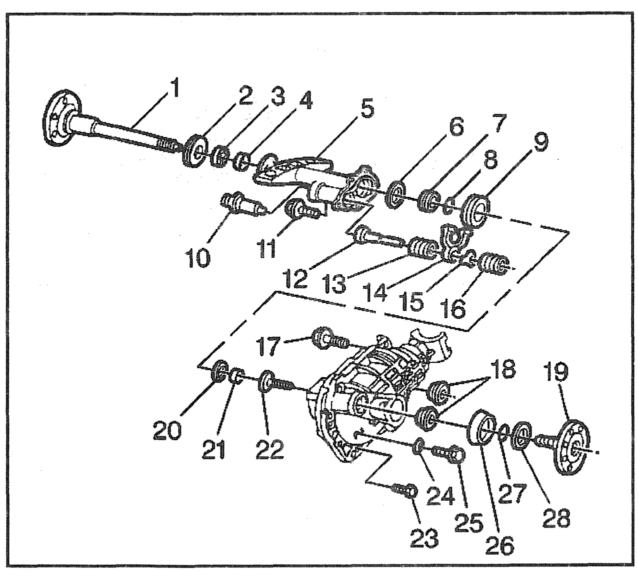
Axle Shaft and Seal Replacement

Removal Procedure

Tools Required

- *J 36600* Seal Installer (K2 Models)
- *J 22833* Seal Installer (K3 Models)
- *J 23907* Puller/Slide Hammer/Clutch Pilot Bearing Remover

1. Raise the vehicle and support with safety stands.
2. Remove the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.
3. Remove the axle shaft (output shaft) (19).



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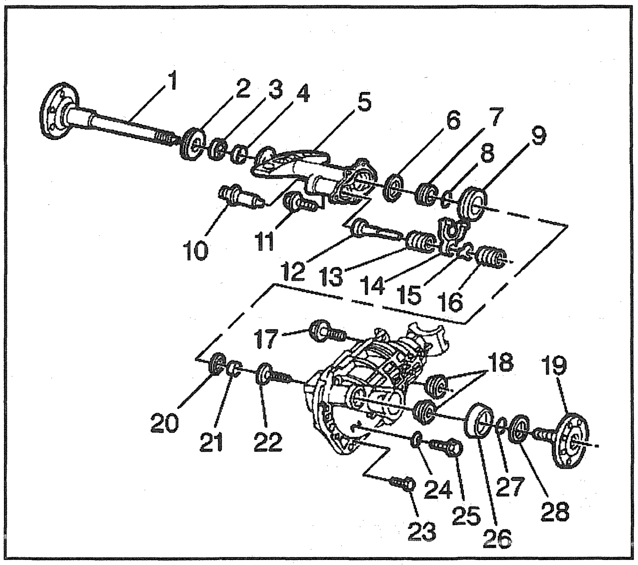

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Important: Do not damage the case.

4. Attach a slide hammer with adapter to the axle shaft (output shaft) and pull the axle shaft from the case.
5. Remove the deflector (28).
6. Remove the seal (26).
7. Remove the bearing (21). Use the *J 23907*.

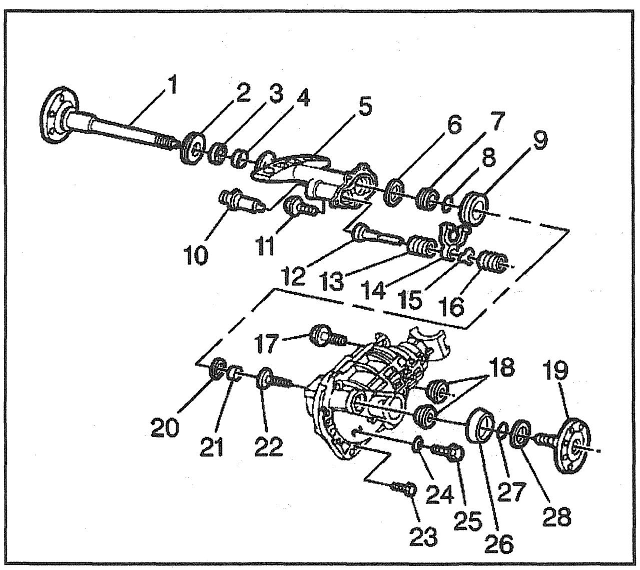
Installation Procedure

Tools Required

- *J 36600* Seal Installer (K2 Models)
- *J 22833* Seal Installer (K3 Models)
- *J 23907* Puller/Slide Hammer/Clutch Pilot Bearing Remover
- *J 22761* Differential Side Bearing Installer

Important: You may need to attach 1/2 inch by 13 inch long extension handle onto the slide hammer for easier pulling of the bearing.

1. Install the bearing with the square shoulder in. Use the *J 22761*.
2. Install the new seal (26). Use the *J 36600* or *J 22833*.
3. Install the deflector (28).
4. Install the axle shaft (output shaft) (19).
5. Carefully tap the axle shaft (output shaft) (19) into place with a soft mallet.
6. Install the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.



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Differential Pilot Bearing Replacement

Removal Procedure

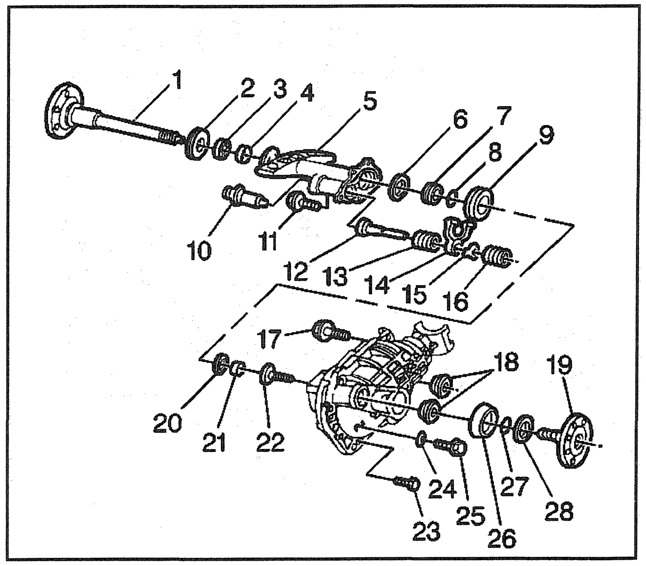
Tools Required

- *J 34011*
- *J 33842* Pilot Bearing Installer

1. Remove the axle shaft (output shaft) and tube assembly. Refer to *Output Shaft, Bearing, and Tube Replacement (Right Side).*
2. Remove the shim (20).
3. Remove differential pilot bearing (21). Use the *J 34011*.

Installation Procedure

1. Install the shim (20).
2. Install the differential pilot bearing (21). Use the *J 33842*.
3. Lubricate the bearing with axle lubricant.
4. Install the axle shaft (output shaft) and tube assembly. Refer to *Output Shaft, Bearing, and Tube Replacement (Right Side)*.



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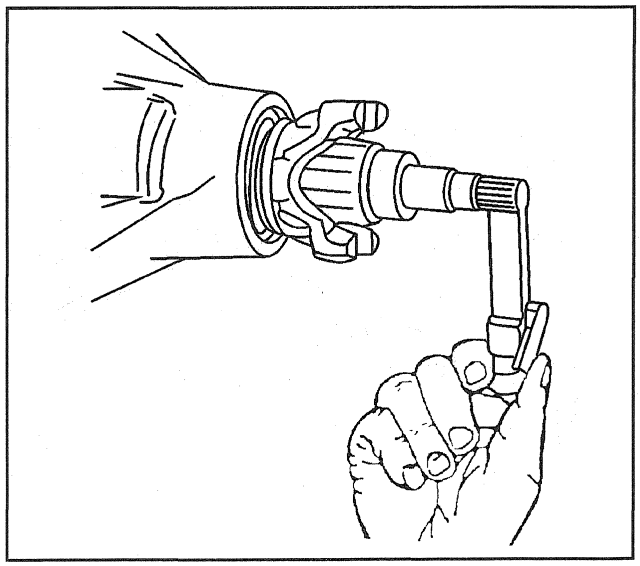
Pinion, Flange, and Dust Deflector Replacement

Removal Procedure

Tools Required

- *J 8614-01* Companion Flange Holder and Remover
- *J 36366* Seal Installer

1. Raise the vehicle on a hoist.
2. Remove the propeller shaft from the axle. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* or *Propeller Shaft Replacement (Front Axle - NP8)*.
3. Tie the propeller shaft to a frame rail or crossmember.
4. Measure the torque required to rotate the pinion. Record the torque value for reassembly.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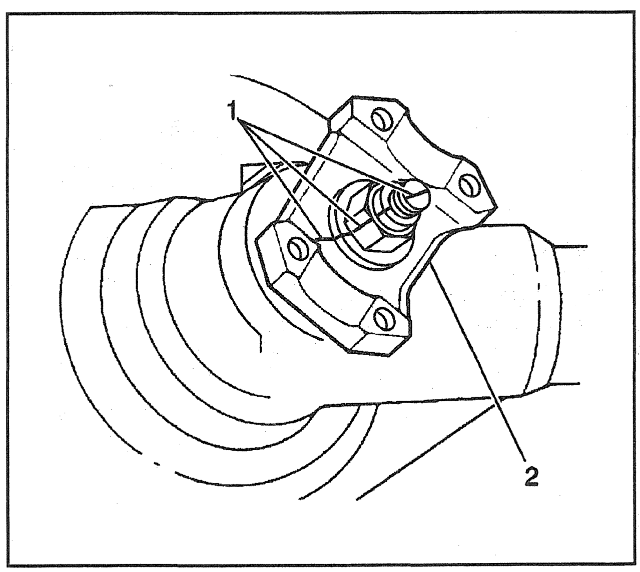
5. Scribe a line (1) on the pinion stem, pinion nut and the companion flange (2) and record the number of exposed threads on the pinion stem.



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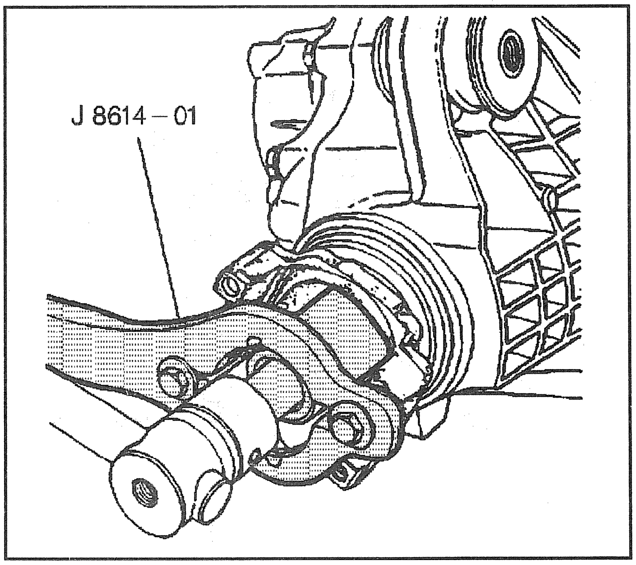

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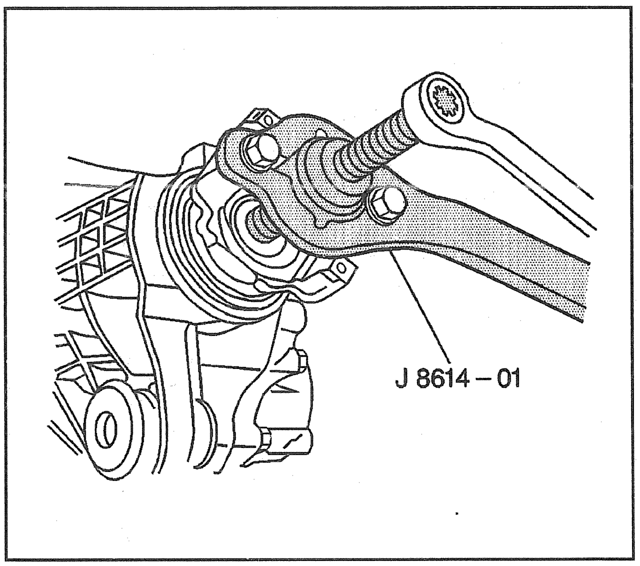
6. Remove the nut. Use the *J 8614-O1*.
7. Position the *J 8614-O1* on the flange so that the four notches on the tool face the flange.



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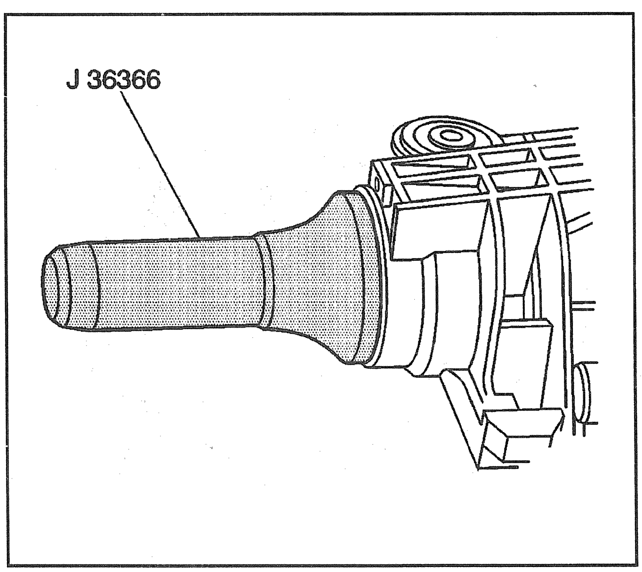
8. Remove the flange. Use the *J 8614-O1*. Use the special nut and forcing screw.

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

9. Remove the oil seal.
10. Inspect the pinion flange for a smooth oil seal surface.
11. Inspect the pinion flange for worn drive splines.
12. Replace the pinion flange if necessary.
13. Remove the dust deflector.
    - Tap the deflector from the flange.
    - Clean up the stake points on the flange.



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Installation Procedure

Tools Required

- *J 8614-O1* Companion Flange Holder and Remover
- *J 36366* Seal Installer

Important: Stake the new deflector at three new equally spaced positions. You must stake the new deflector in such a way that you do not damage the seal operating surface.

1. Install the dust deflector on the flange.

Important: Position the oil seal in the bore, then place the *J 36366* over the oil seal. Strike the *J 36366* with a hammer until the seal flange seats on the axle housing surface. Drive the seal in straight, not at an angle, as this will damage the aluminum housing.

2. Install the oil seal. Use the *J 36366*.

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

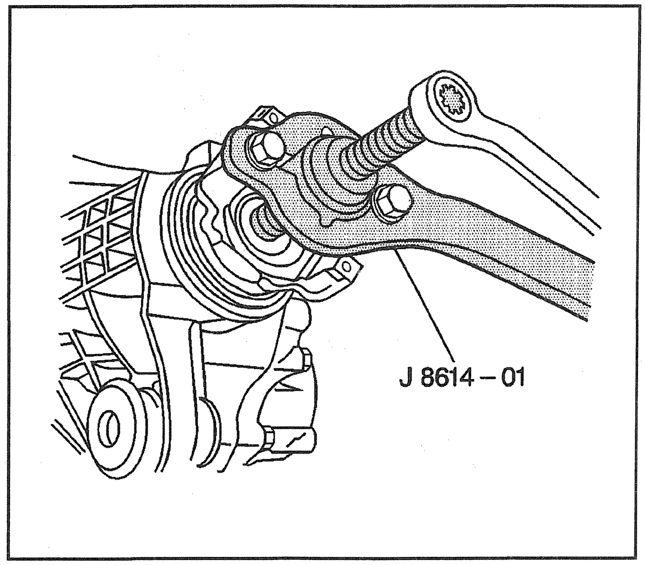
3. Install the flange onto the pinion using the *J 8614-01*.
4. Place the washer and a new nut on the pinion threads and tighten the nut to the original scribed position using the scribe marks and exposed threads as reference.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Measure the rotating torque of the pinion and compare this with the rotating torque recorded earlier.

   Tighten

   Tighten the pinion nut by small increments until the torque required to rotate the pinion is 0.35 N·m (3 lb in) greater than the original torque.
6. Install the propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* or *Propeller Shaft Replacement (Front Axle - NP8)*.
7. Lower the vehicle.



157175

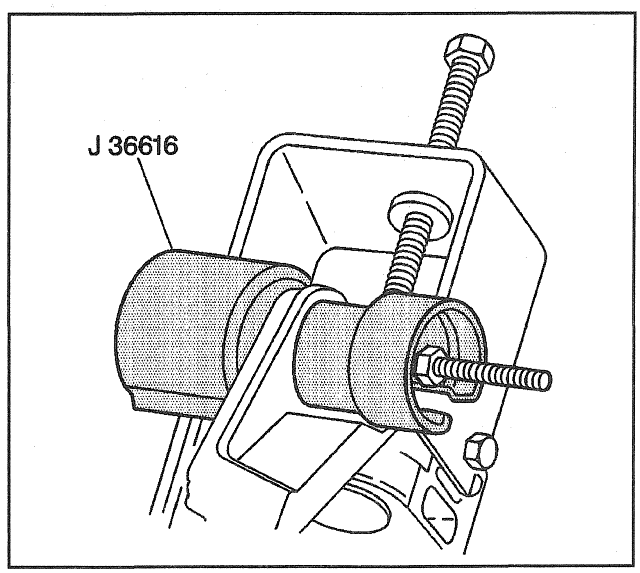
Differential Carrier Bushing Replacement

Removal Procedure

Tools Required

J 36616 Bushing Remover and Installer

1. Remove the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.
2. Remove the carrier bushing. Use the *J 36616*.



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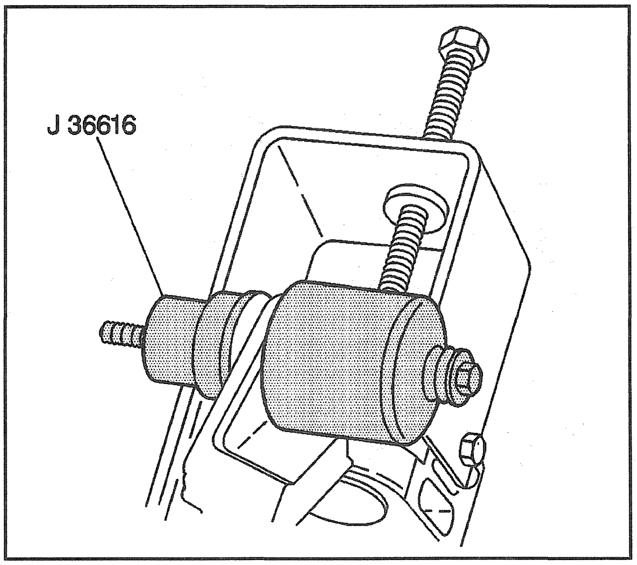

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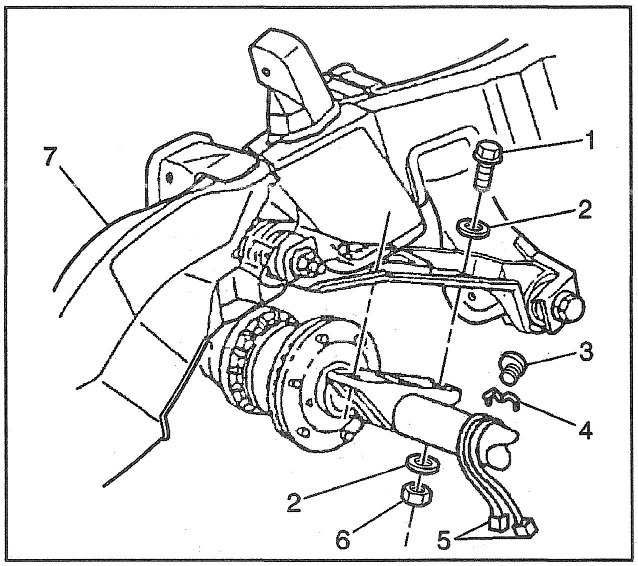
Installation Procedure

1. Install the carrier bushing. Use the *J 36616*.
2. Install the differential carrier assembly. Refer to *Differential Carrier Assembly Replacement*.



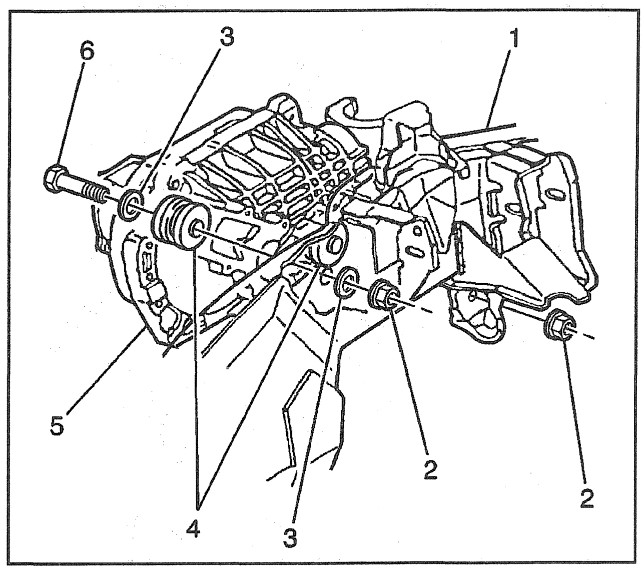
156654

Differential Carrier Assembly Replacement

Removal Procedure

1. Raise the vehicle and support with jack stands.
2. Drain the front axle. Refer to *Lubricant Change*.
3. Remove the front propeller shaft at the carrier yoke. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)*.
4. Wire the propeller shaft out of the way.
5. Remove the left and right drive axle (halfshaft). Refer to *Halfshaft Assembly Replacement*.
6. Remove the screws (1), nuts (6), and washers (2).
7. Remove the wiring at the axle (5).
8. Remove the vent hose at the axle. Refer to *Vent Hose Replacement*
9. Remove the carrier lower mounting bolt.
10. Remove the right side inner tie rod end from the relay rod. Refer to *Tie Rod Replacement (All Except C3500HD)* in Steering Linkage
11. For some models, remove the engine oil filter.

12. Attach a transmission jack to the carrier (5).
13. Remove the upper carrier mounting bolt (6).
14. Remove the carrier from the vehicle.



156656

Installation Procedure

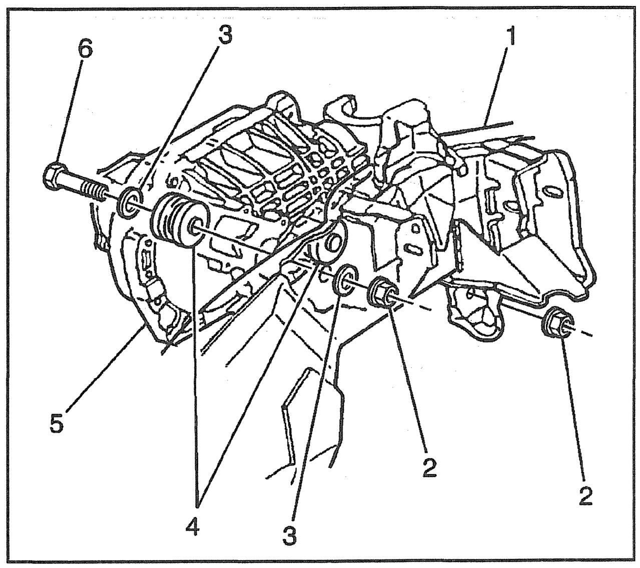
1. Install the carrier to the vehicle.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the carrier mounting bolts (6), nuts (2) and washers (3).

   Tighten

   Tighten the bolts to 110 N·m (80 lb ft).
3. Remove the transmission jack.
4. Install the new engine oil filter if your model required that you remove the engine oil filter.
5. Install the tie rod. Refer to *Tie Rod Replacement (All Except C3500HD)* in Steering Linkage



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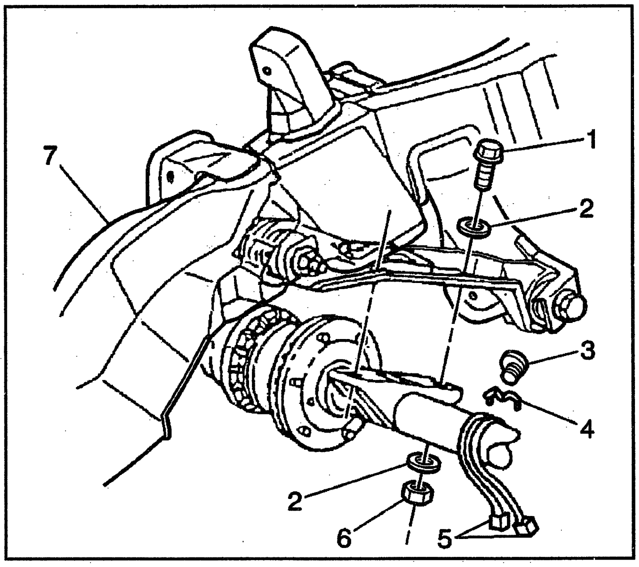


156654

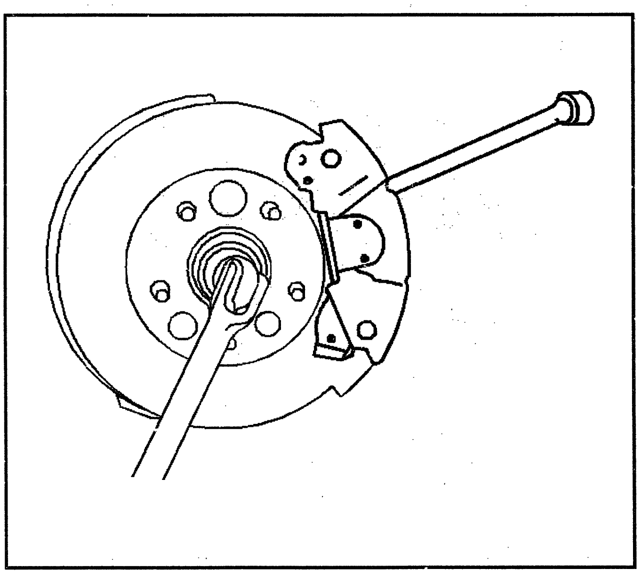
6. Install the axle tube bolts (1), nuts (6), and washers (2).

   Tighten

   - For K2 models tighten the nuts to 100 N·m (75 lb ft).
   - For K3 models tighten the nuts to 145 N·m (106 lb ft).
7. Install the vent hose. Refer to *Vent Hose Replacement.*
8. Install the wiring.
9. Install the left and right drive axle (halfshaft). Refer to *Halfshaft Assembly Replacement.*
10. Install the front propeller shaft to the carrier yoke.

    Tighten

    Tighten the universal joint clamp bolts to 20 N·m (15 lb ft).
11. Fill the front axle. Refer to *Lubricant Change.*
12. Add engine oil as necessary. Refer to *Approximate Fluid Capacities* in Maintenance and Lubrication.



1932

Halfshaft Assembly Replacement

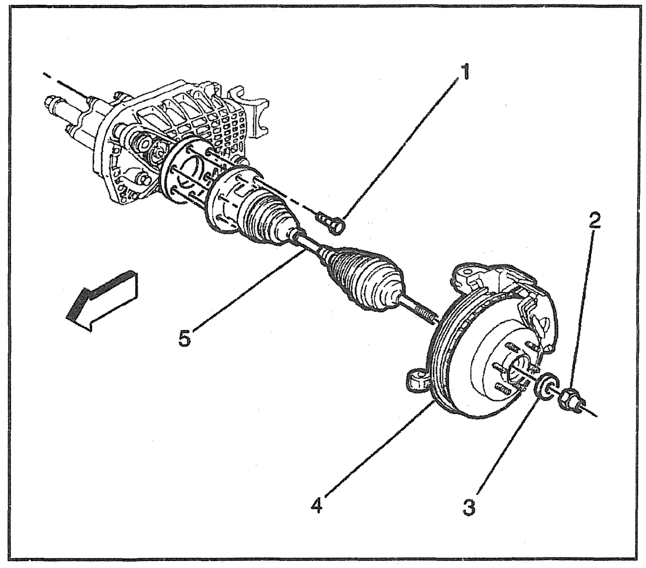
Removal Procedure

Tools Required

- *J 24319-01* Steering Linkage Puller
- *J 36605* Front Knuckle Seal Installer
- *J 36607* Upper Ball Joint Separator
- *J 29193* Steering Linkage Installer (12 mm)

1. Raise the vehicle and support it with safety stands.
2. Insert a drift or large screwdriver through the brake caliper into one of the brake rotor vanes in order to prevent the drive axle (halfshaft) from turning.
3. Remove the wheel and tire assembly.

4. Remove the drive axle (halfshaft) hub nut (2) and washer (3).
5. Loosen, but do not remove, the 6 bolts (1) securing the inboard C/V joint drive flange to the output shaft companion flange.
6. Wrap shop towels around both the inner and outer C/V joint boots in order to avoid damage to the boots during removal and installation.



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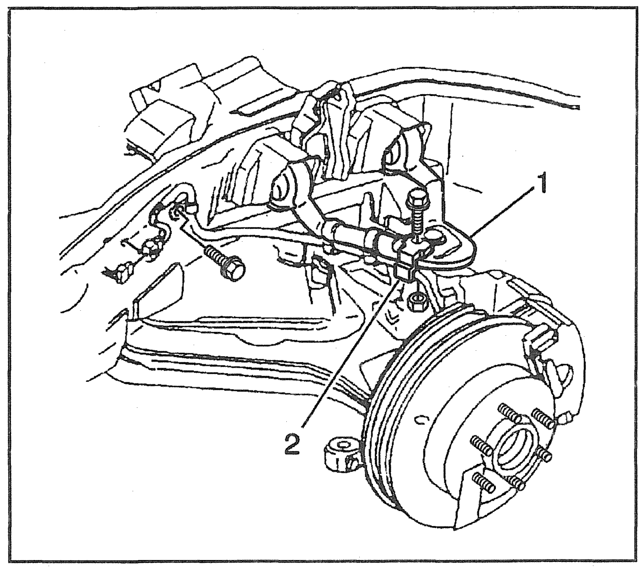
7. Remove the wheel speed sensor wire support bracket (2) from the upper control arm (1) in order to allow extra travel of the knuckle (all K-models).

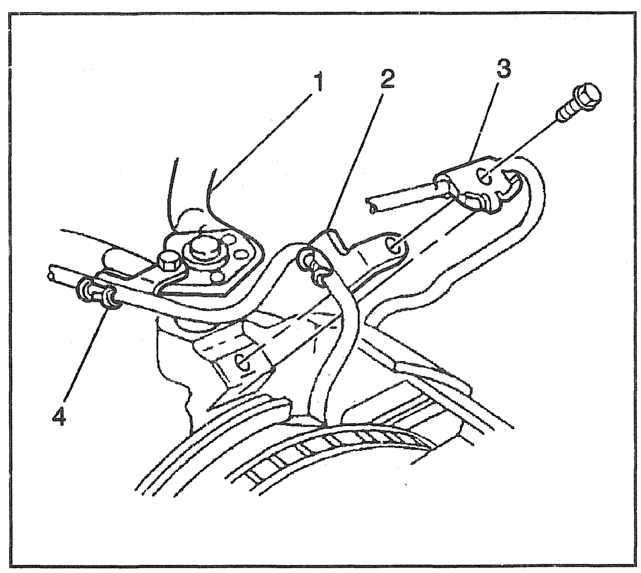


156608

8. Remove the wire and the brake line support brackets (2) from the knuckle on 8600# and heavier GVWR.

Important: Do not reuse the nut.

9. Remove the prevailing torque nut from the outer tie rod.



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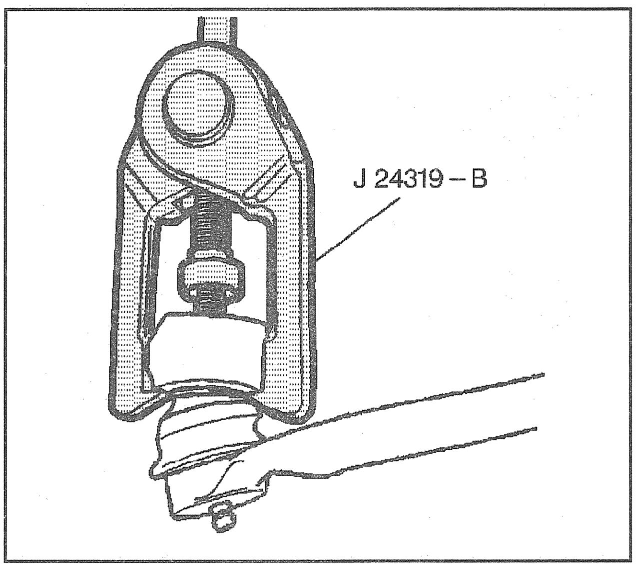

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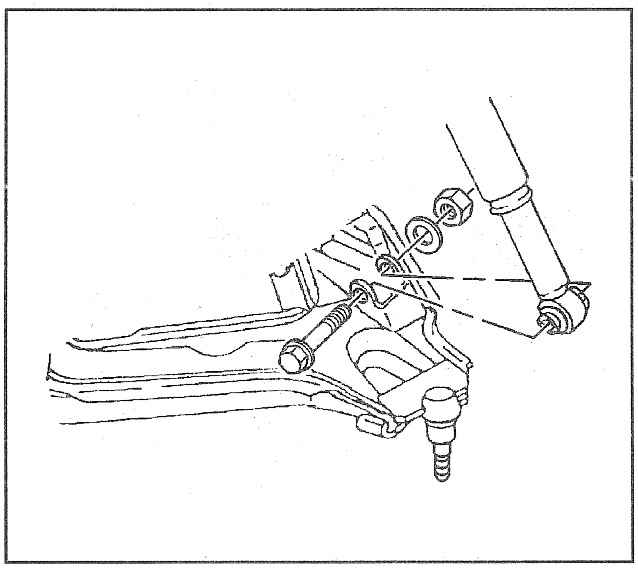
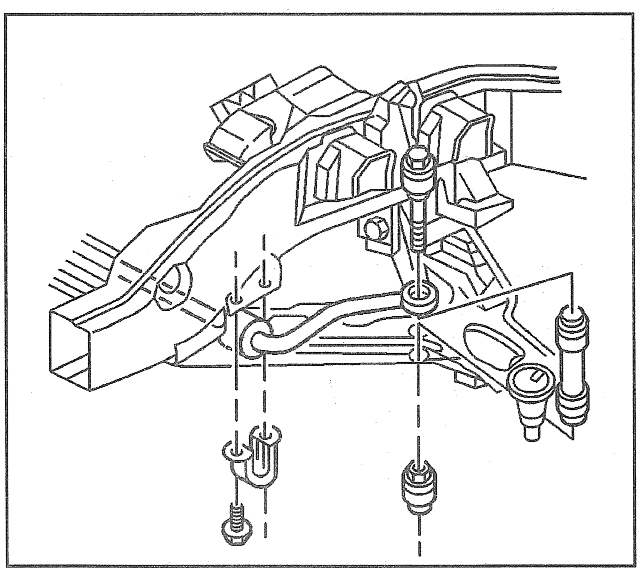
Notice: Do not disengage the joint by driving a wedge-type tool between the joint and the knuckle. This may cause seal damage.

10. Separate the outer tie rod ball stud from the steering knuckle. Use the *J 24319-01*.
11. Push the linkage to the opposite side of the vehicle and secure the outer tie rod up and out of the way which will provide the needed clearance in order to remove the drive axle (halfshaft).



156613

12. Remove the lower shock mounting nut, washers, and bolt.
13. Collapse the shock absorber and secure if necessary.



157041

14. Remove the stabilizer shaft components as follows:
    - 14.1. Remove the stabilizer shaft bushing and bracket.
    - 14.2. Remove the stabilizer shaft bolt, spacer, and nut assembly at the lower control arm.

Notice: This is required on K vehicles with 8050 lb and below GVW rating in order to provide needed clearance for drive axle (halfshaft) removal.

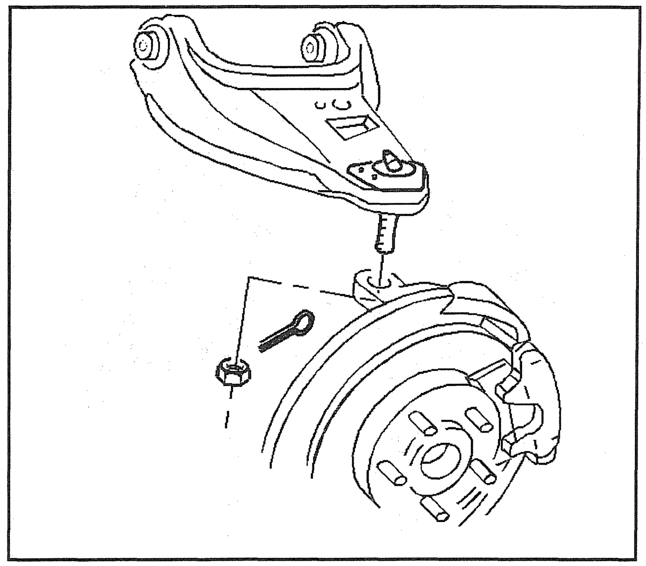
Caution: A suitable support must be placed under the lower control arm at the correct location in order to maintain torsion bar tension before servicing the wheel drive shaft. Failure to support the lower control arm at the correct location will allow the torsion bar tension to release, damaging suspension components and potentially resulting in personal injury.

15. Position the floor jack or stand behind the steering knuckle.

16. Remove the cotter pin from the upper control arm ball joint stud.
17. Loosen (do not remove at this time) the stud nut on the upper ball joint stud.
18. Loosen the stud from the knuckle using the *J 36607*.
19. Remove the nut.
20. Remove the stud from the knuckle.

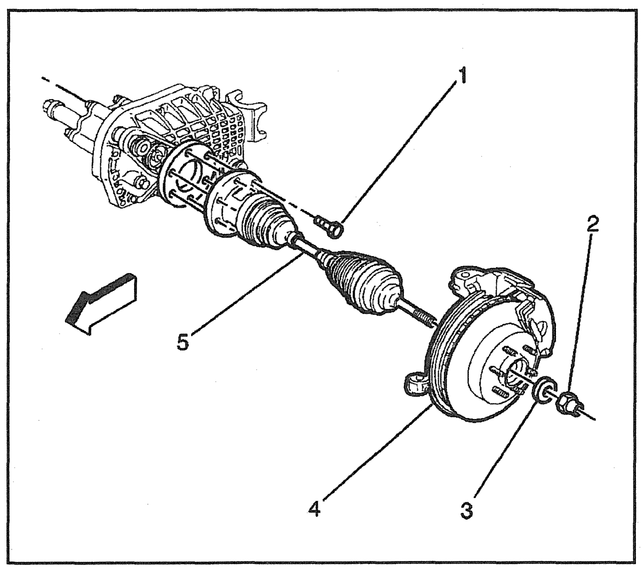
Important: Cover the shock mounting bracket and the ball stud on the lower control arm with a shop towel in order to prevent possible drive axle (halfshaft) boot damage during removal and installation.

21. Remove the knuckle assembly using a hammer and brass drift or equivalent in order to separate the outer C/V joint splined shank from the knuckle hub.



1943

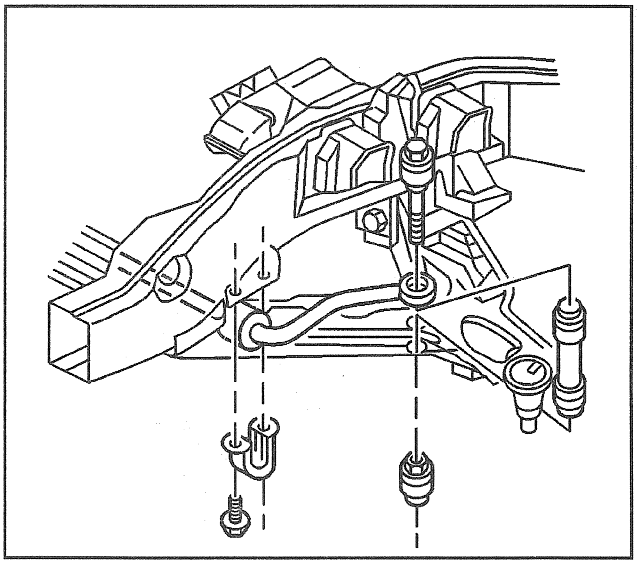
22. Remove the six bolts (1) from the inboard joint flange.
    - Support the inboard end of the drive axle (halfshaft).
    - Move the knuckle and hub assembly outward in order to free the splined shank from the hub.
23. Remove the drive axle (halfshaft) from the vehicle.
24. For unit repair of the drive axle (halfshaft), refer to Drive Axle Unit Repair in Driveline/Axle.



156607

Important: Wipe the wheel bearing seal area on the knuckle clean.

25. Inspect the seal for cuts or tears.
26. Lubricate the seal lip.
27. If the seal is cut or torn, inspect the wheel bearing for damage and replace the seal.
28. Do the following in order to replace the seal:
    - Pry the old seal from the knuckle.
    - Discard the old seal.
    - Lubricate the new seal lip.
    - Use the *J 36605* in order to install the seal into the knuckle.



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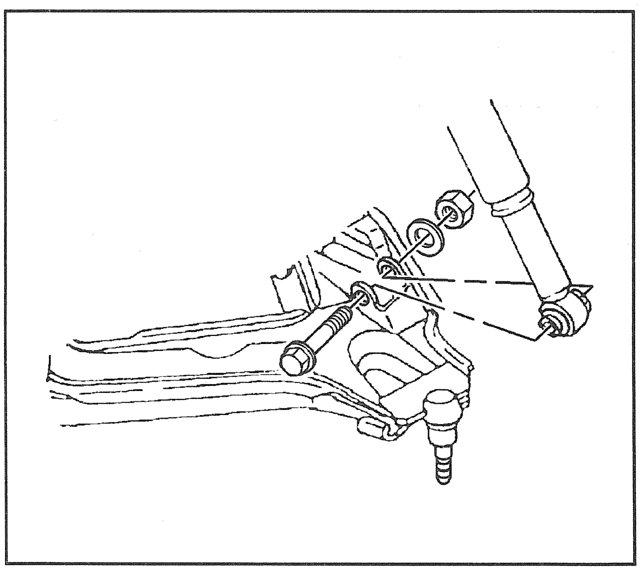


156613

Installation Procedure

1. Prior to drive axle (halfshaft installation, cover the shock mounting bracket, lower control arm ball stud, and all other sharp edges with shop towels so that the drive axle (halfshaft) boot is not damaged during assembly.

Important: Do not lubricate the drive axle (halfshaft) splines and knuckle with grease.

2. Insert the outer C/V joint splined shank into the knuckle hub and secure the inboard C/V joint flange to companion flange with bolts. Do not tighten.
3. Install the upper ball joint to the steering knuckle.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Install the stud nut.

   Tighten

   Tighten the stud nut to 100 N·m (75 lb ft).
5. Install the cotter pin.
6. Lubricate the upper ball joint until grease appears at the seal.
7. Install the stabilizer shaft bushing, bracket, and bolts.

   Tighten

   Tighten the bolts (5) to 33 N·m (24 lb ft).
8. Install the stabilizer shaft link bolt assembly, spacer, and nut assembly.

   Tighten

   Obtain torque by running the nut assembly to the unthreaded portion of the bolt, then tighten to 18 N·m (13 lb ft).
9. Remove the floor jack or stand from the beneath the lower control arm.
10. Install the shock absorber to the lower shock mounting bracket.
11. Install the shock mounting bolt, washer, and nut.

    Tighten

    Tighten the nut to 73 N·m (54 lb ft).
12. Install the outer tie rod to the steering knuckle using the *J 29193*.

    Tighten

    Tighten the tool to 54 N·m (40 lb ft).
13. Install the new outer tie rod prevailing torque nut.

    Tighten

    Tighten the nut to 62 N·m (46 lb ft).
14. Install the brake pipe support bracket to the upper control arm.

    Tighten

    Tighten the nut to 62 N·m (46 lb ft).

Important: Make sure that the brake hose is not twisted or kinked, or damage to the hose could result.

15. Install the brake pipe support bracket to the upper control arm.

    Tighten

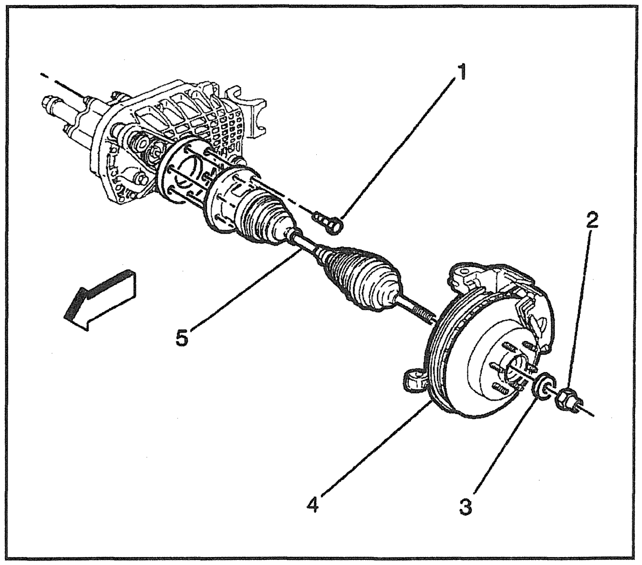
    Tighten the nut to 17 N·m (13 lb ft).
16. Install the hub nut washer (3) and the nut (2).
17. Seat the shank splines in the hub.
18. Insert a drift through the brake caliper in order to prevent the drive axle from turning.

    Tighten

    Tighten the inboard flange bolts to 78 N·m (58 lb ft).
19. Install the hub nut.

    Tighten

    Tighten the hub nut to 225 N·m (165 lb ft).
20. Remove the drift.
21. Install the wheels.
22. Remove the safety stands.
23. Lower the vehicle.



156607

Differential Carrier Overhaul

Inspection Procedure

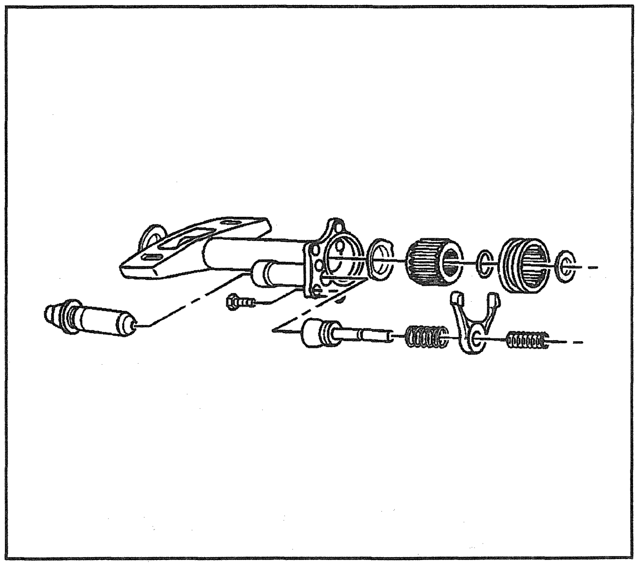
Perform the following checks before disassembling the axle:

1. Remove the drain plug from the axle.

   Drain the axle lubricant.
2. Check the ring gear backlash. Refer to *Backlash Inspection and Adjustment.*

   This information can be used to determine the cause of the axle problem. The information will also help when setting up the shim packs for locating and preloading the differential case.
3. Inspect the case for metal chips.

   Determine the source of the metal chips, such as a broken gear or bearing cage.
4. Determine the cause of the axle problem before disassembly, if possible.


206820

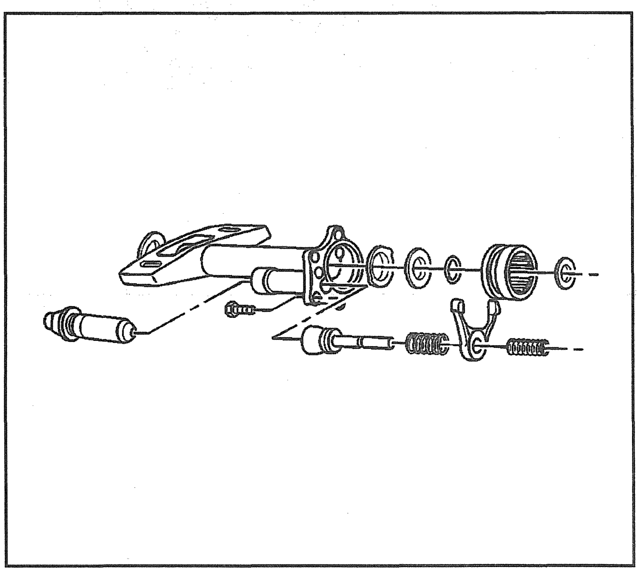
Disassembly Procedure

Tools Required

- *J 29369-1* Bearing Remover (T, K1 and K2 Models)
- *J 29369-2* Bearing Remover (K3 Models)
- *J 29307* Slide Hammer
- *J 34011* Pilot Bearing Remover
- *J 36599* Adjusting Sleeve Wrench
- *J 36615* Adjuster Plug Wrench (K3 Models)
- *J 8614-O1* Pinion Remover
- *J 36598* Holding Fixture and Pinion Service Tool
- *J 8612-B* Pinion Bearing Remover (T, K1 and K2 Models)

- *J 36606 Inner Pinion Bearing Remover* Pinion Bearing Remover (K3 Models)
- *J 22888* Side Bearing Puller
- *J 8107-2* Side Bearing Puller Pilot (T, K1 and K2 Models)
- *J 36597 Side Bearing Puller Pilot (K3)* Side Bearing Puller Pilot (K3 Models)
- *J 36616* Bushing Replacer
- *J 2619-01* Slide Hammer
- *J 36598* Holding Fixture

1. Remove the differential actuator.
2. Remove the engagement switch.
3. Remove the bolts.
4. Remove the axle tube with the right output shaft.
5. Remove the differential sleeve.
6. Remove the following parts:
   - The shift shaft
   - The damper spring
   - The shift fork
   - The shifter shaft ring
7. Remove the spring.
8. Remove the shim.
9. For the T, K1, and K2 models, remove the carrier connector with the retainer ring.
   9.1. Clamp the axle tube in a vise.
   Clamp only on the mounting flange.
   9.2. Strike the inside of the shaft flange with a brass hammer in order to dislodge the carrier connector.
10. For the K3 models, remove the following parts:
    - The snap ring
    - The washer
    - The thrust washer



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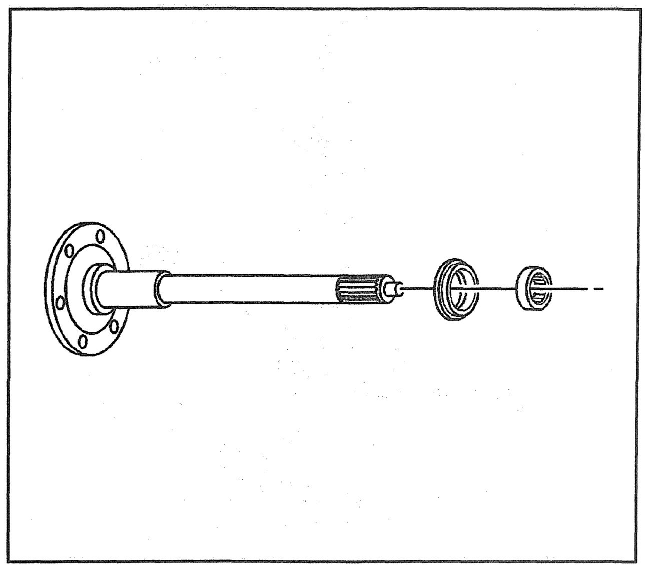
11. Remove the right output shaft.



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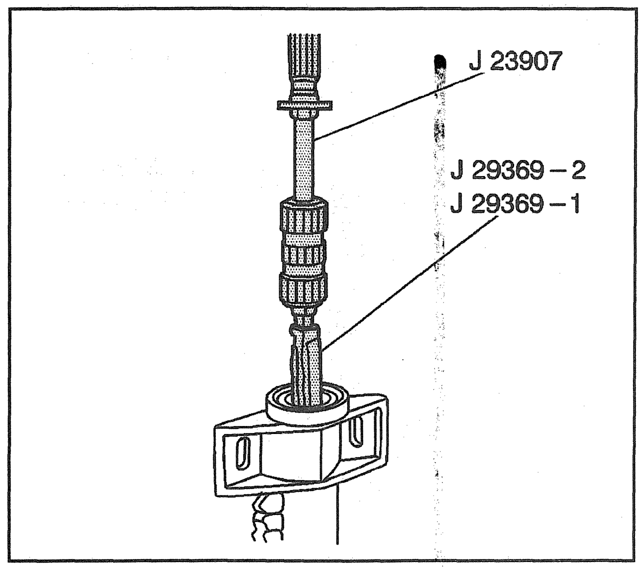
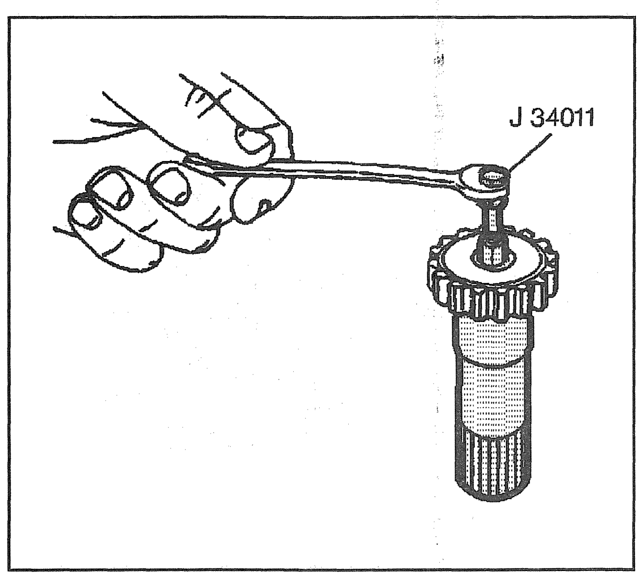
12. Remove the seal and the output shaft bearing.
    - For the T, K1, and K2 models, use the *J 29369-1*.
    - For the K3 model, use the *J 29369-2* or the *J 29307*.
13. Remove the output shaft.



210137

14. Use the *J 34011* in order to remove the differential pilot bearing.



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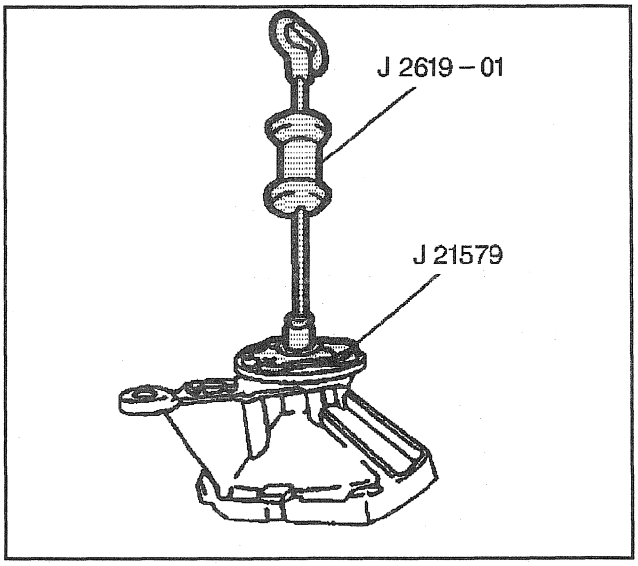

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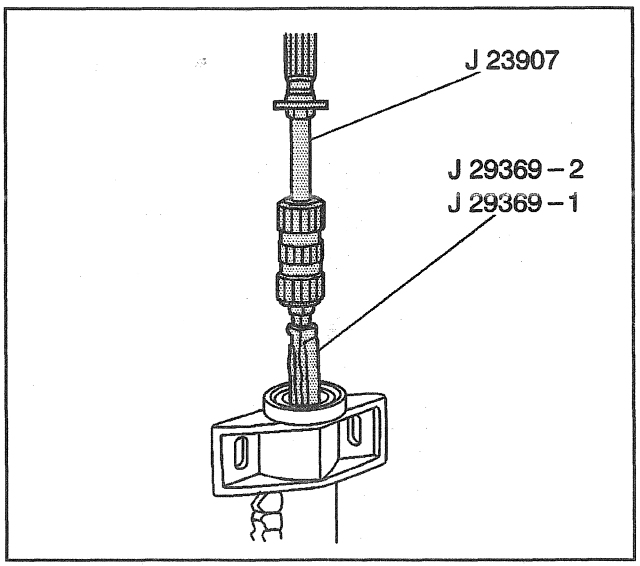
15. Use the *J 2619-01* in order to remove the left output shaft.
16. Remove the seal.

    Pry the seal out with a removal tool.



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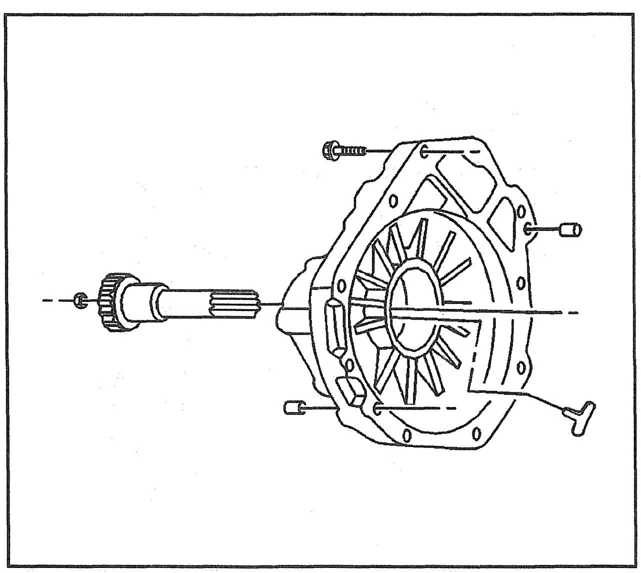
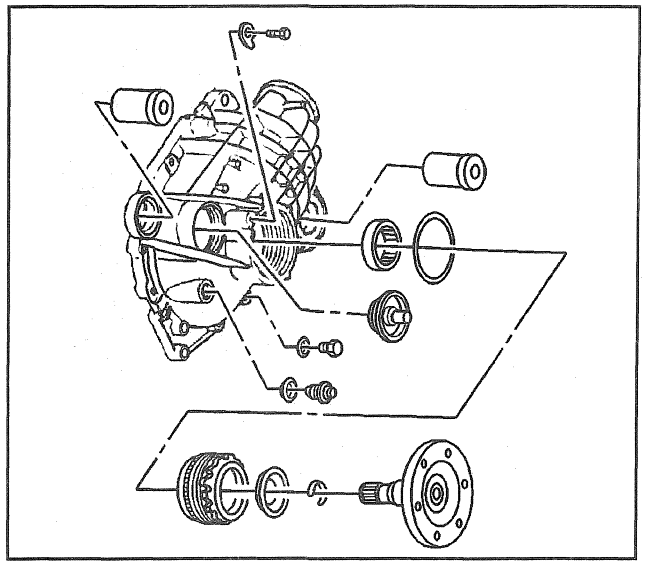
17. Remove the bearings.
    - For the T, K1, and K2 models, use the *J 29369-1*.
    - For the K3 model, use the *J 29369-2* or the *J 29307*.
18. Remove the bolts.


205917

19. Remove the right side carrier half.

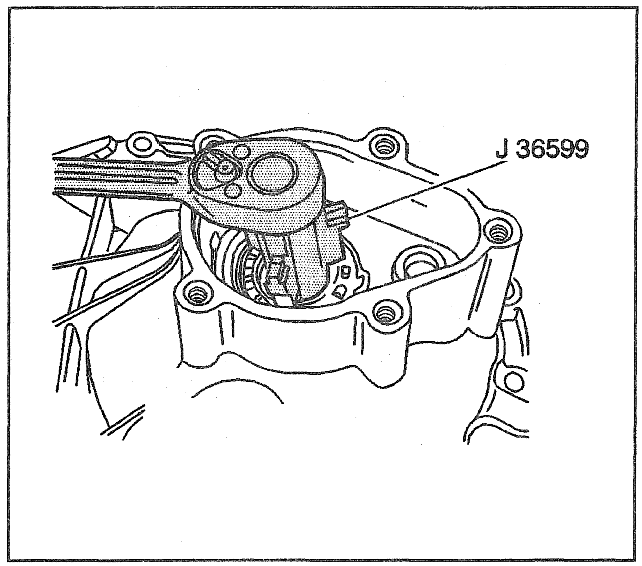
    Tap on the cast lugs provided.

20. Remove the differential assembly.
    Pry up on the locks.
    Pry the right side only on the K3 model.
21. For the K3 model, remove the bolt and the lock.



205918

22. Remove the sleeve(s) and the side bearing cups.
    - Turn the sleeve(s) in order to push the bearing cup(s) out of the bore(s).
    - Use the *J 36599*.
    - For the K3 model, remove the sleeve(s) and side bearing cups only from the right side.



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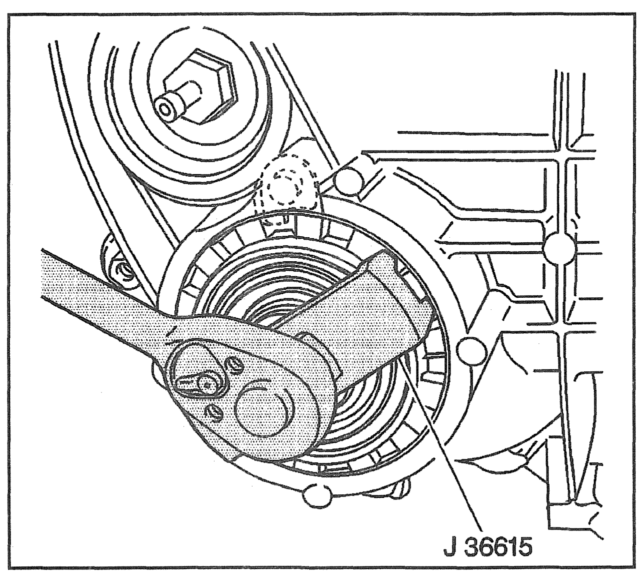
23. For the K3 model, use the *J 36615* in order to remove the adjuster plug with the side bearing cup and the O-ring seal.



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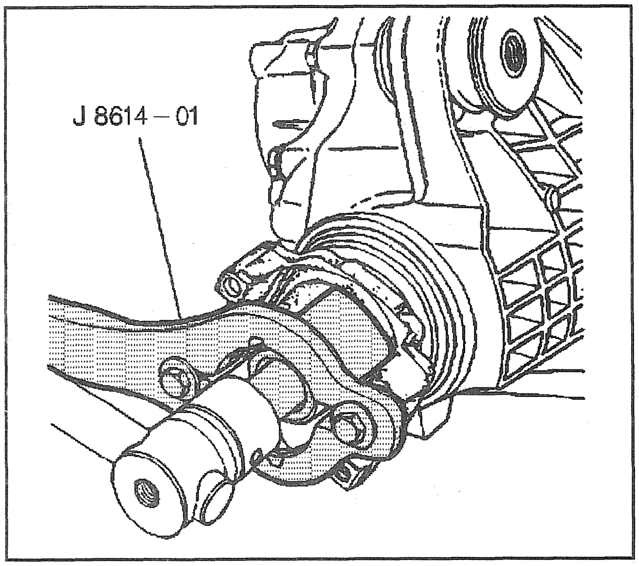

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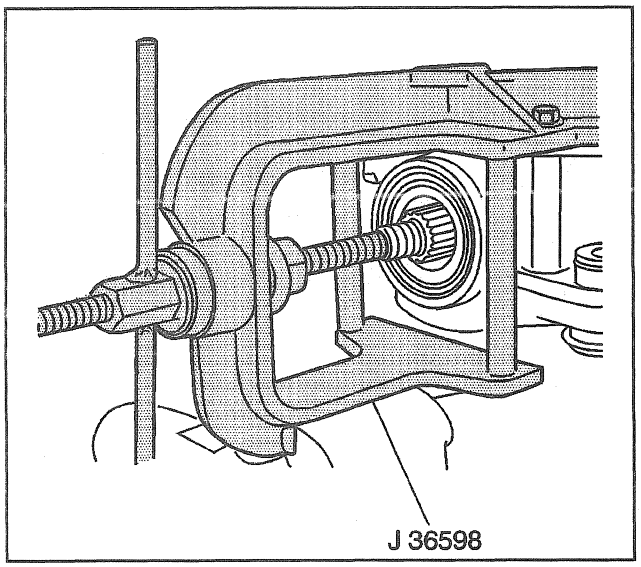
24. Remove the nut.

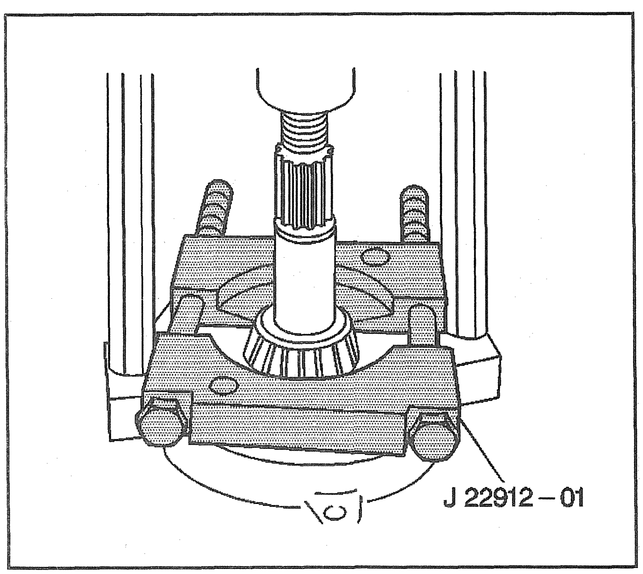
    Use the *J 8614-O1* in order to hold the pinion flange.
25. Remove the washer.
26. Use the *J 8614-O1* in order to remove the pinion flange with the deflector.



205916

27. Mount the left carrier case in the *J 36598*.

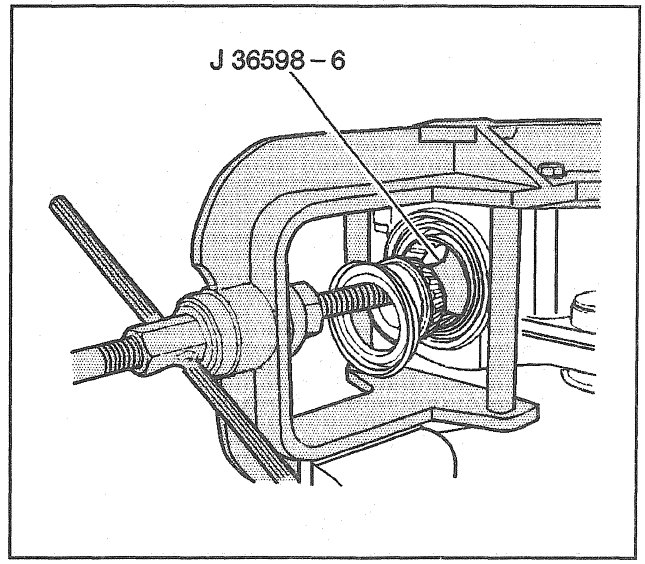
    For the T, K1, and K2 models, use the adapter plate *J 36598*.
28. Use the *J 36598* in order to remove the ring and pinion with the following parts:
    - The shim
    - The bearing cone
    - The spacer
29. Remove the spacer from the pinion.



210154

30. Remove the pinion bearing.
    - For the T, K1, and K2 models, use the *J 8612-B*.
    - For the K3 model, use the *J 36598* and a press.
31. Remove the shim.

32. Use the *J 36598* in order to remove the following parts:
    - The seal
    - The bearing cup
    - The cone



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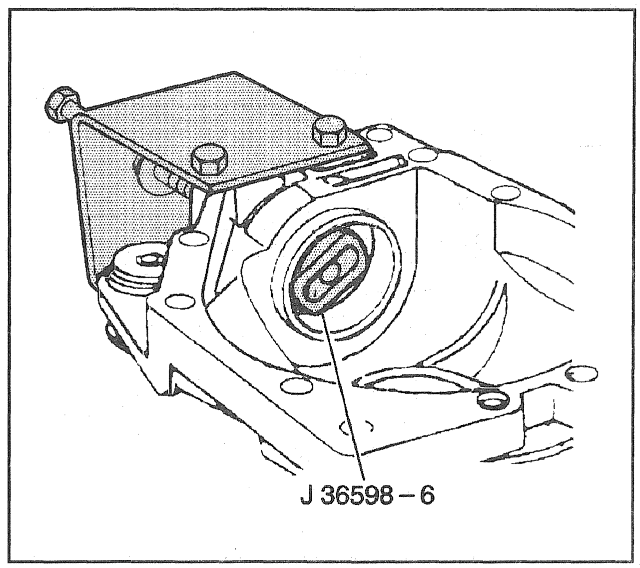
33. Use the *J 36615* in order to remove the bearing cup.



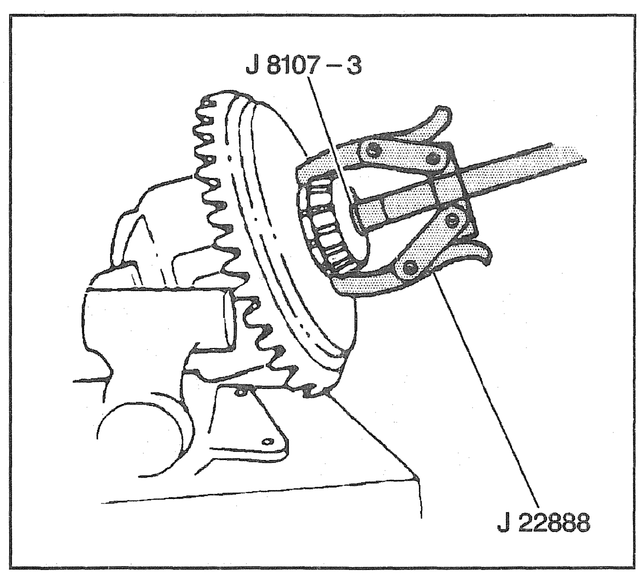
210172

34. Remove the side bearings.
    - For the T, K1, and K2 models, use the *J 22888* and the *J 8107-2*.
    - For the K3 model, use the *J 36597 Side Bearing Puller Pilot (K3)* and a press.

Notice: Do not pry the ring gear from the case. This will damage the ring gear and the differential case.

35. Remove the ring gear bolts.

    The ring gear bolts have left-handed threads.



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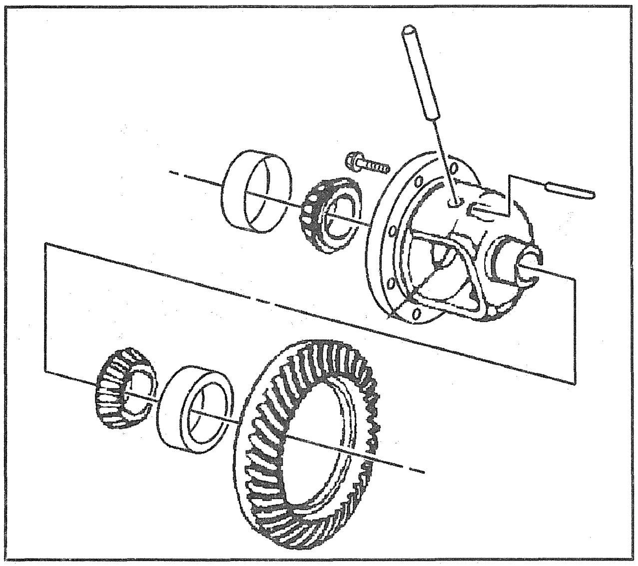

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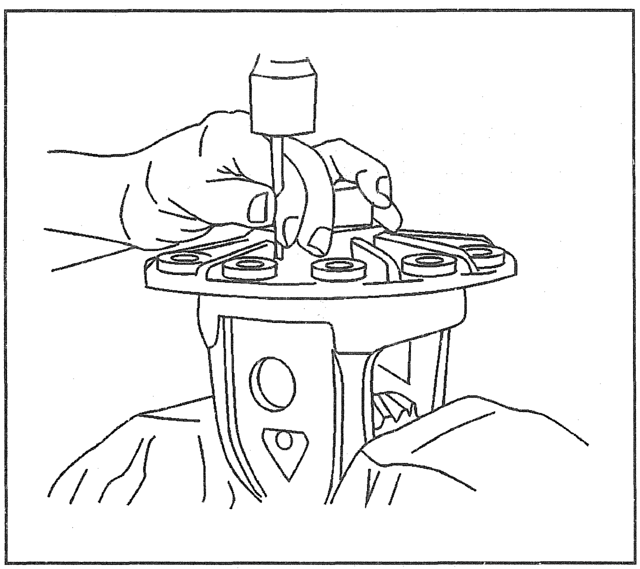
36. Remove the ring gear from the differential case.

    Drive the ring gear off with a brass drift.



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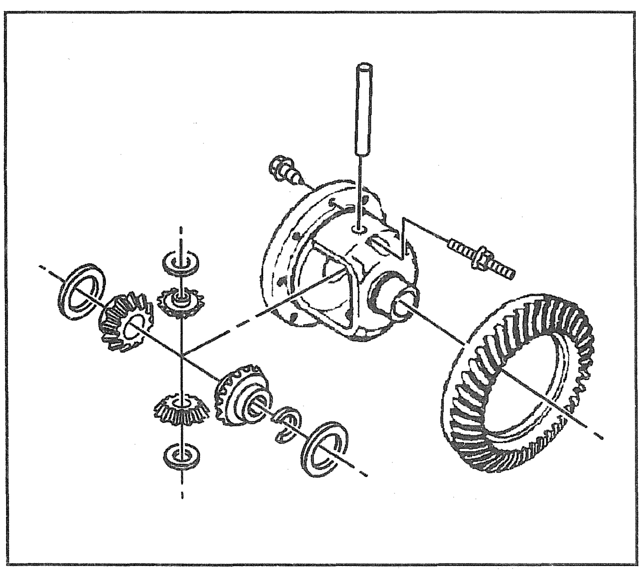
37. For the T, K1, and the K2 models, remove the pin.

    Use a drift and a hammer in order to drive out the pin.



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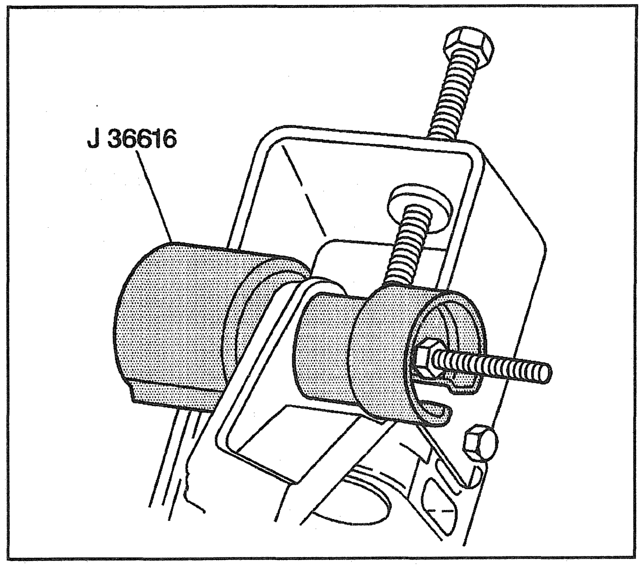
38. For the K3 model, remove the bolt.
39. Remove the shaft.
40. Remove the differential pinion gears and the side gears.
    40.1. Roll the pinion gears out of the case with the pinion thrust washers.
    40.2. Remove the side gears and the side gear thrust washers.

    Mark the gears and the differential case as left and right.

    40.3. For the K3 model, remove the spacer.
41. Remove the vent plug.

    Use a 6-point deep socket.

42. Use the *J 36616* in order to remove the bushings.



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Inspection Procedure

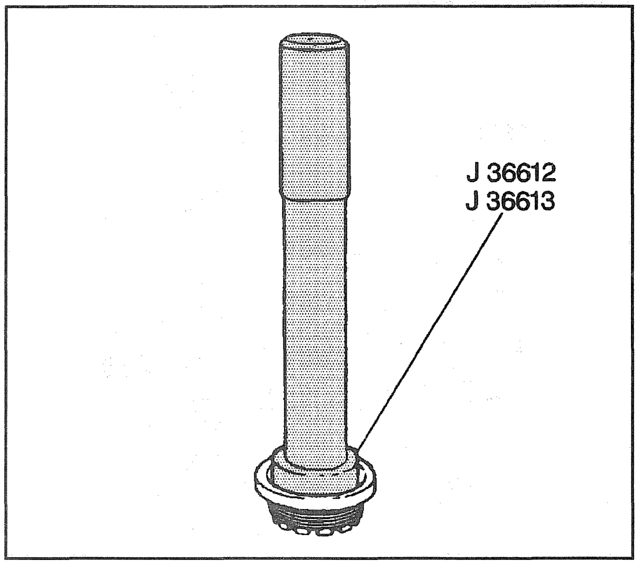
Thoroughly and carefully inspect all of the drive units before assembly. Thorough inspection of the parts for wear or stress and replacement of worn parts will help prevent costly drive component repair after the reassembly.

Axle Housing Inspection

1. Inspect the axle housing bore for nicks or burrs that would prevent the outer diameter of the pinion seal from sealing. Remove any burrs.
2. Inspect the bearing cup surfaces for nicks or burrs. Remove any burrs.
3. Replace the housing if any cracks are found.
4. Inspect the housing for the following materials:
   - Metal chips
   - Dirt
   - Rust
5. If the above materials are found, refer to *Cleaning Carrier Components*.

Differential Inspection

1. Inspect the pinion gear shaft for unusual wear.
2. Inspect the pinion gear and the side gear teeth for the following conditions:
   - Wear
   - Cracks
   - Scoring
   - Spalling
3. Inspect the thrust washers for wear.
4. Inspect the fit of the differential side gears in the differential case.
5. Inspect the fit of the side gears on the axle shafts.
6. Inspect the differential case for cracks and scoring.
7. Inspect all the parts for wear. Replace as necessary.



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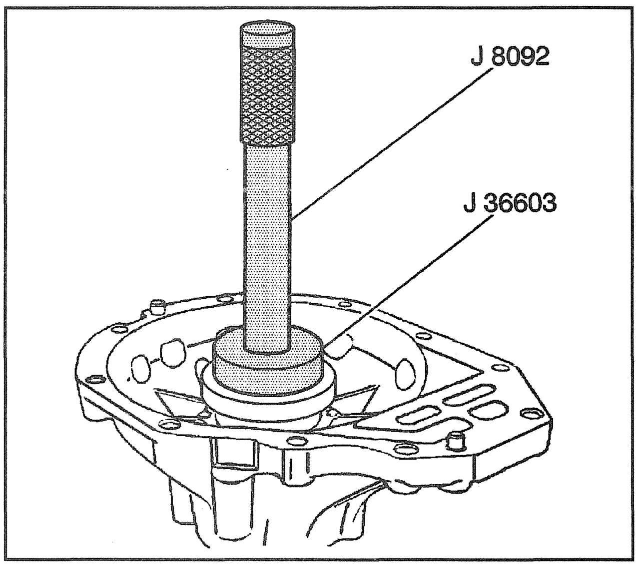
Differential Assembly Installation

Tools Required

- *J 36612* Bearing Installer (T, K1, and K2 models)
- *J 36613 Bearing Installer* Bearing Installer (K3 model)
- *J 36513* Driver Handle
- *J 36599* Sleeve Adjusting Wrench
- *J 36615* Adjuster Plug Wrench (K3 model)
- *J 36603* Side Bearing Cup Installer

1. For the T, K1, and K2 models, use the *J 36513* and the *J 36612* in order to install the bearings to the sleeves.
2. For the K3 model, use the *J 36613 Bearing Installer* in order to install the adjuster plug.
3. For the K3 model, install the new O–ring seal to the adjuster plug.



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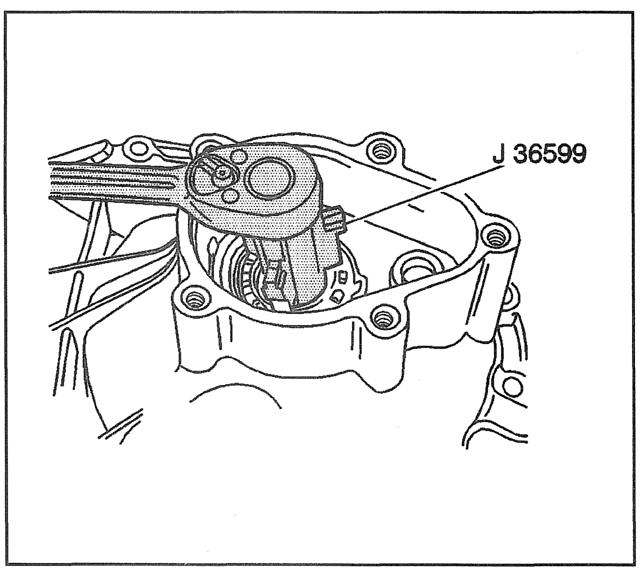
4. For the T, K1, and K2 models, use the and the *J 36599* in order to install the sleeves to the carrier case.
5. For the K3 model, use the *J 36615* in order to install the right sleeve to the carrier case.

   Use the *J 36599* in order to install the adjuster plug.
6. Use the *J 36603* with the *J 36513* in order to install the side bearing cups.



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7. Install the differential assembly to the carrier case half.
   - Place the differential assembly into the carrier case half which contains the pinion gear.
   - For T, K1, and K2 models, use the *J 36599* in order to turn the left sleeve in until the backlash is felt between the ring and the pinion.

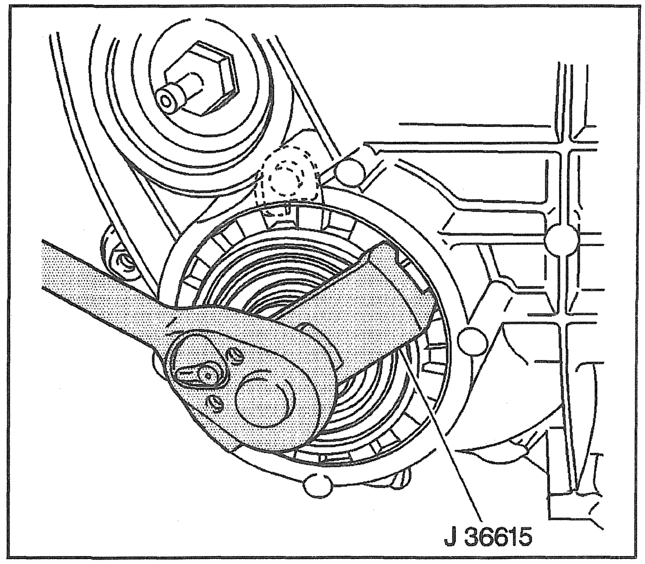
8. For the K3 model, use the *J 36615* in order to turn the adjuster plug in until the backlash is felt between the ring and the pinion.
9. Remove the carrier case from the *J 36599*
10. Install the carrier case halves.

    Do not use sealer at this time.

    If the carrier halves do not make complete contact, use the *J 36599* in order to back out the right sleeve.
11. Install the bolts.

    Tighten

    Tighten the bolts to 47 N·m (35 lb ft).



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Cleaning Carrier Components

Cleaning Procedure

1. Do not steam–clean the drive parts having found and polished the following surfaces:
    - The gears
    - The bearings
    - The shafts
2. Disassemble all of the parts before cleaning.
3. Clean the parts in a suitable solvent.
4. Dry the parts immediately after cleaning.
    - Use soft, clean, lintless rags.
    - Parts may be dried with compressed air.
    - Do not allow the bearings to spin while drying them with compressed air.

Ring and Pinion 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.

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.

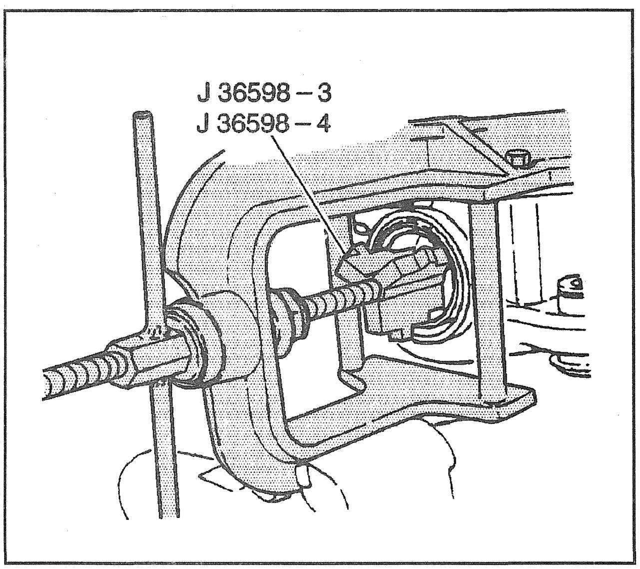
  Do not replace a bearing for this reason.

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

Thrust Washers, Shims, and Adjuster Sleeves

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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Pinion Bearing Cup Installation

Tools Required

- *J 36598* Holding Fixture and Pinion Service Tool
- *J 36598* Adapter Plate (T, K1, K2 models)

Important: At assembly, apply axle lubricant to all of the following parts:

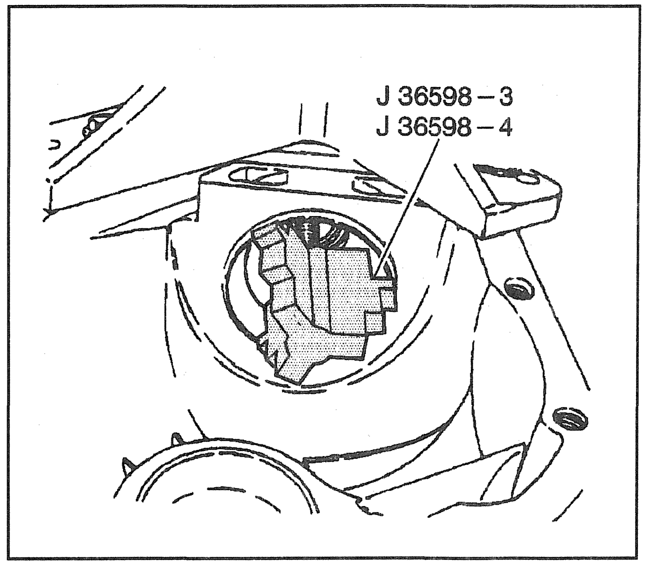
- The bearings
- The seal lips
- The gears
- The thrust washers
- The bearing surfaces

1. Mount the left carrier case in the *J 36598*.

   For the T, K1, and K2 models, use the *J 36598* adapter plate.
2. Tighten the attaching bolts securely.
3. Install the outer bearing cup.
   - For the T, K1, and K2 models, use the forcing screw and the *J 36598*.
   - For the K3 model, use the *J 36598*.

4. Install the inner bearing cup.
   4.1. Remove the *J 36598* or the *J 36598* from the forcing screw.
   4.2. Place the pilot *J 36598* in the pinion seal bore.
   4.3. Extend the forcing screw through the pinion bore.
   4.4. For the T, K1, and K2 models, install the *J 36598* on the forcing screw.

   For the K3 model, install the *J 36598* on the forcing screw.
   4.5. Rotate the forcing screw until the installer is snug against the bearing cup.
   4.6. Rotate the tool several times in order to ensure the bearing cup is not cocked in the bore.
5. Pull the bearing cup into place with the forcing screw.



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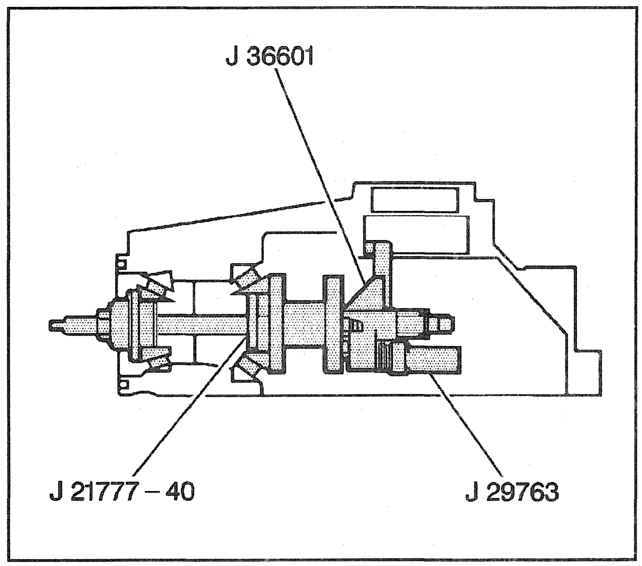
Pinion Depth Adjustment

- *J 36601* Pinion Depth Setting Gauge
- *J 29763* Dial Indicator
- *J 21777-40* Pinion Setting Gauge Set

1. The pinion depth is adjusted by selecting a shim of the proper thickness.
2. Lubricate the pinion bearings liberally with axle lubricant.
3. For the T, K1, and K2 models, assemble the *J 29763* to the proper gauging arm.
4. For the K3 model, assemble the *J 29763* to the proper gauging arm.
5. Install the pinion bearings and hold them in place.
6. For the T, K1, and K2 models, insert the threaded rod of the *J 36601* through the pinion bearings.
7. Install the proper pilot, washer, and nut.
8. Tighten the nut while holding the threaded rod with a wrench in order to adjust bearing preload.
   8.1. Adjust the nut in order to obtain a preload of 1.0–1.6 N·m (10–15 lb in) using an inch pound torque wrench.
   8.2. Rotate the shaft several times in order to ensure that the bearings are seated.
   8.3. Take another measurement.
9. Push the dial indicator downward until the needle rotates about 3/4 turns.



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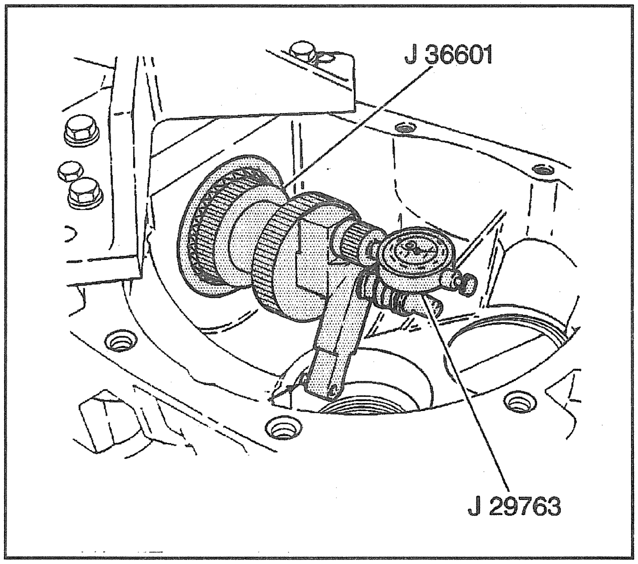

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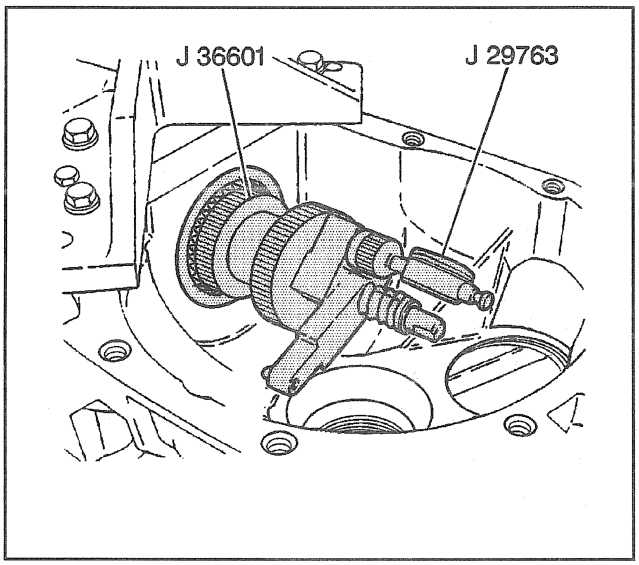
10. Tighten the dial indicator in this position.
11. Set the button of the *J 36601* on the differential bearing bore.
12. Rotate the tool slowly back and forth until the dial indicator reads the lowest point of the bore.
    12.1. Set the dial indicator to ZERO.
    12.2. Repeat the rocking action to the tool in order to verify the ZERO setting.



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13. After the ZERO setting is obtained and verified, grasp the gauging arm by the flats and move the tool button out of the differential side bearing bore.
14. Record the dial indicator reading.

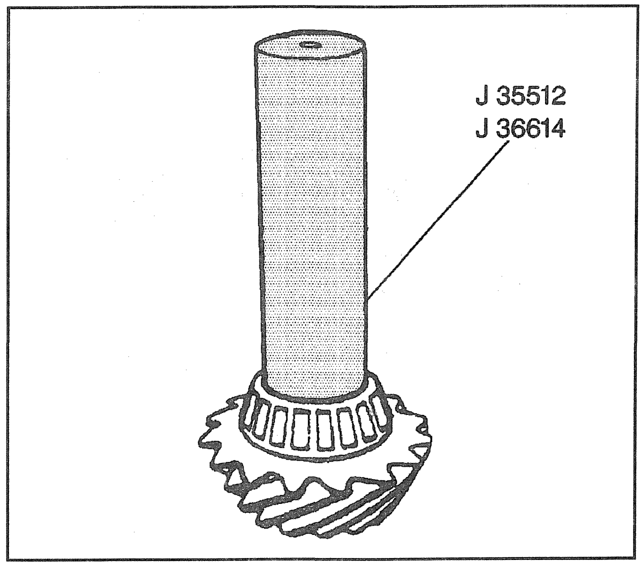
Notice: Proper pinion depth setting is a two–step procedure. Both procedures must be performed to ensure proper axle performance and prevent system damage.

15. Setup dimension arrived at with the indicator is to be considered a starting point.
16. Gear tooth pattern check is necessary to fine tune the pinion depth and may indicate addditional shim changes to the pinion stem.
    16.1. Setup dimension arrived at with the indicator is to be considered a starting point.
    16.2. Gear tooth pattern check is necessary to fine tune the pinion depth and may indicate addditional shim changes to the pinion stem.
    16.3. The dial indicator reading is equal to the required shim size.
17. Remove the tool and the bearing cones.

Pinion Installation

- *J 35512* Bearing Installer (T, K1, and K2 Models)
- *J 36614* Bearing Installer (K3 Models)
- *J 8614-O1* Pinion Flange Remover
- *J 36366* Seal Installer

1. Install the shim to the pinion gear.
   Use the proper size shim.
2. For the T, K1, and K2 models, use the *J 35512* in order to install the bearing onto the pinion gear.
3. For the K3 model, use the *J 36614* in order to install the bearing onto the piston gear.
4. Install the new spacer onto the pinion gear.



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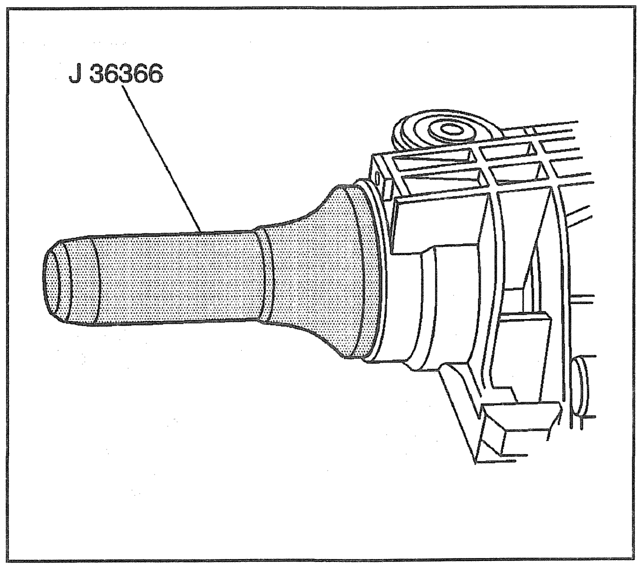
5. Install the bearing into the case.
6. Install the seal into the case using the *J 36366*.
7. Install the pinion gear, with the bearing and the spacer, to the case.



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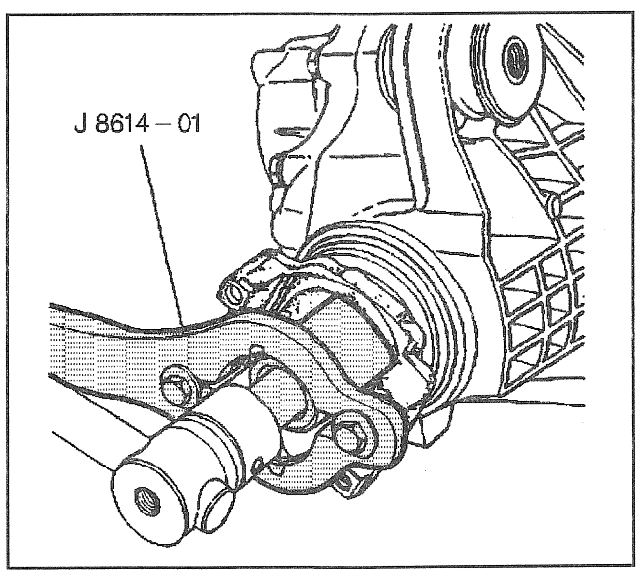
8. Install the deflector, the flange, the washer and the nut using the following procedure:
   - Apply PST Sealant GM P/N 1052080 or the equivalent, to the pinion gear threads and on both sides of the washer.
   - Tighten the nut until no end play is detectable while holding the flange with the *J 8614-O1.*
   - No further tightening should be attempted until the bearing preload has been checked.



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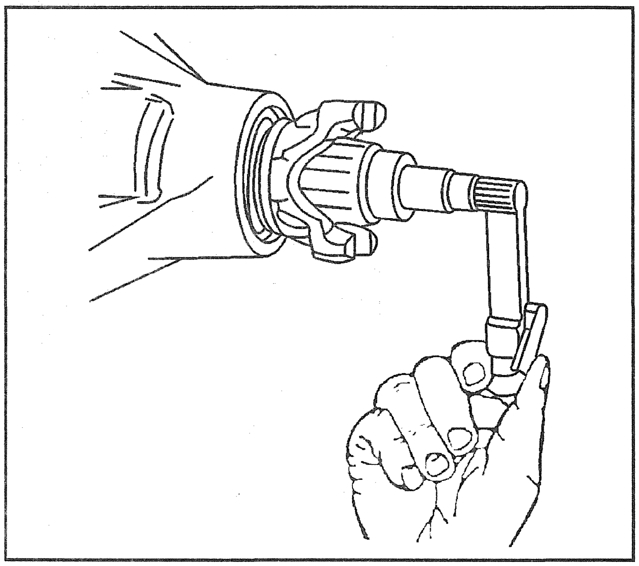
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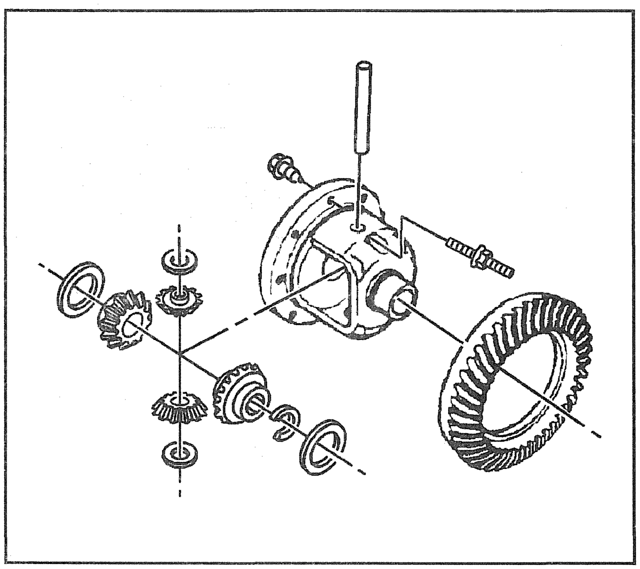
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9. Measure the pinion bearing preload.
   9.1. Use an inch-pound torque wrench.
        The correct preload is 1.7-2.8 N·m (15-25 lb in).
   9.2. Rotate the pinion witht he torque wrench and note the reading.
   9.3. If the preload torque is below specifications, continue torquing the pinion nut in small increments. Check the preload after each tightening.
        Each tightening will increase the bearing preload by several inch pounds.
        If the bearing preload is exceeded, the pinion will have to be removed, and a new collapsible spacer installed.
   9.4. Once the preload has been obtained, rotate the pinion several times in order to ensure the bearings are seated.
   9.5. Recheck the preload, and adjust as necessary.

Differential Case Assembly Assemble

Tools Required

- *J 22761* Side Bearing Installer (T, K1, and K2 models)
- *J 29710* Side Bearing Installer (K3 model)
- *J 8092* Driver Handle

1. Install the thrust washers and the side gears into the differential case.
   If the same gears and the washers are being used, install the gears and washers to the original locations.
2. Install the pinion gears.
   - Position one pinion gear between the side gears.
   - Rotate the gears until the pinion gear is directly opposite the opening in the case.
   - Place the other pinion gear between the side gears.

   Line up the hole in both pinion gears.
3. Install the thrust washers.
   Rotate the pinion gears toward the opening in order to permit the sliding in of the thrust washers.
4. For the T, K1, and K2 models, install the shaft and pin.
5. For the K3 models, install the bolt.
6. Install the ring gear onto the differential case.

Important: Install new bolts. Do not reuse the old bolts.

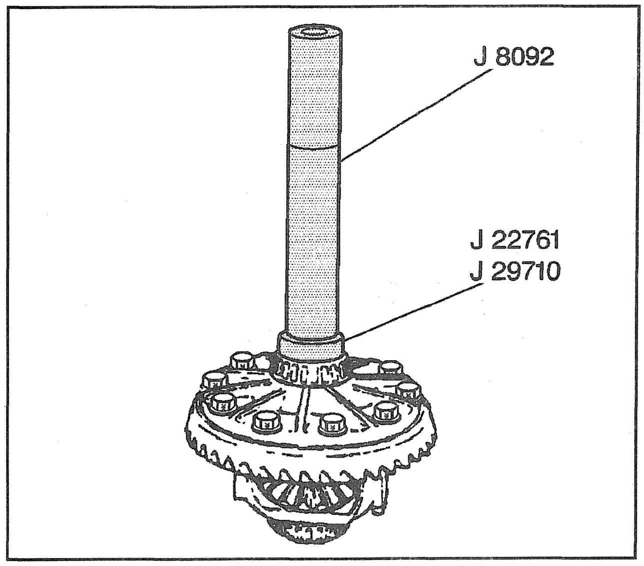
7. Install the bolts.
   The bolts have left hand threads.

   Tighten

   Tighten the bolts alternating in progressive steps to 120 N·m (88 lb ft).

Notice: Refer to *Fastener Notice* in Caution and Notices.

8. For the T, K1, and K2 models, use the *J 22761* in order to install the side bearings.
9. For the K3 model, use the *J 8092* in order to install the side bearings.



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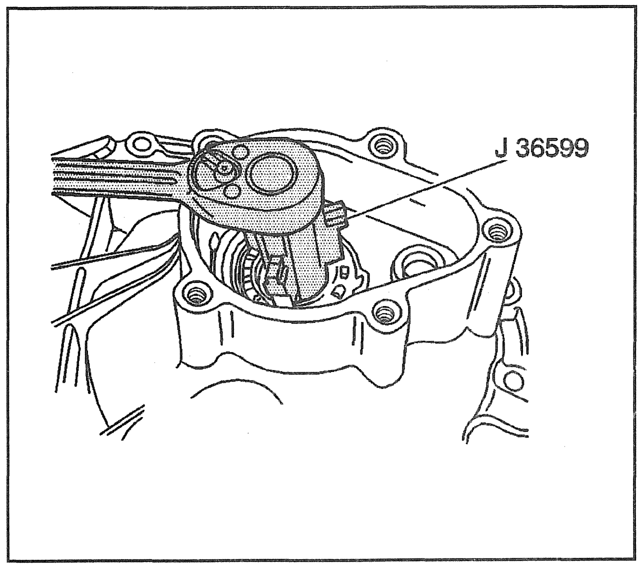
Carrier Case Assembly

Installation Procedure

1. Bend the lock over the sleeves.

   For the K3 model, bend the lock over the sleeves on the right side.



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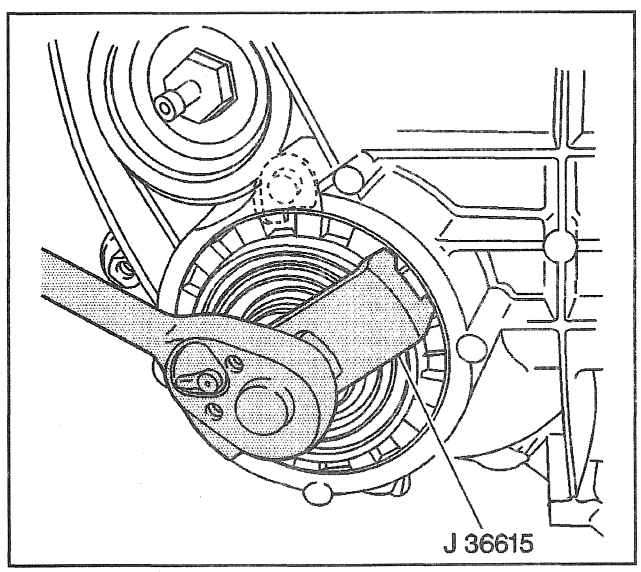
2. For the K3 model, install the bolt and the lock.



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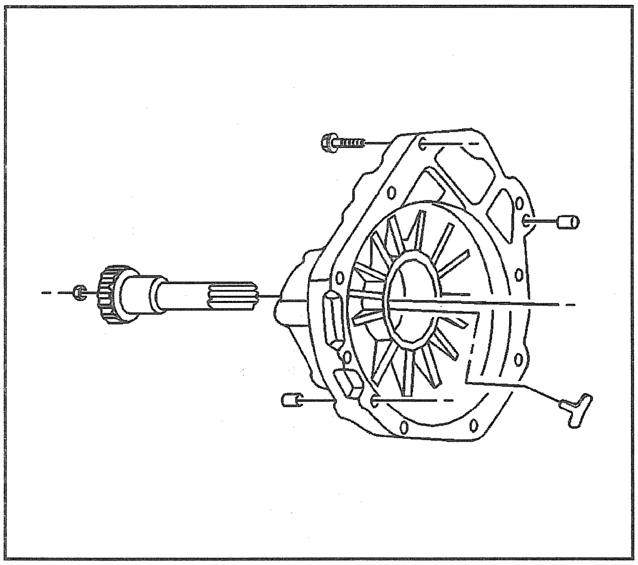

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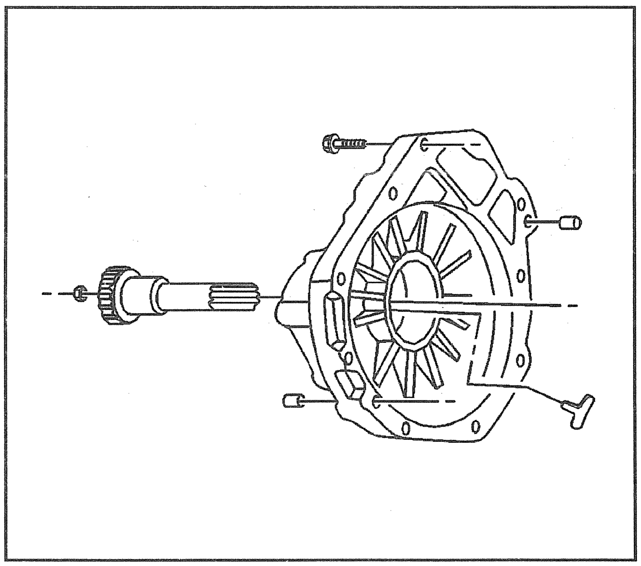
Removal Procedure

1. Remove the bolts.
2. Remove the right carrier case half.
3. Clean the carrier case and the axle tube sealing surfaces.

   Remove all the grease and the oil.



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Installation Procedure

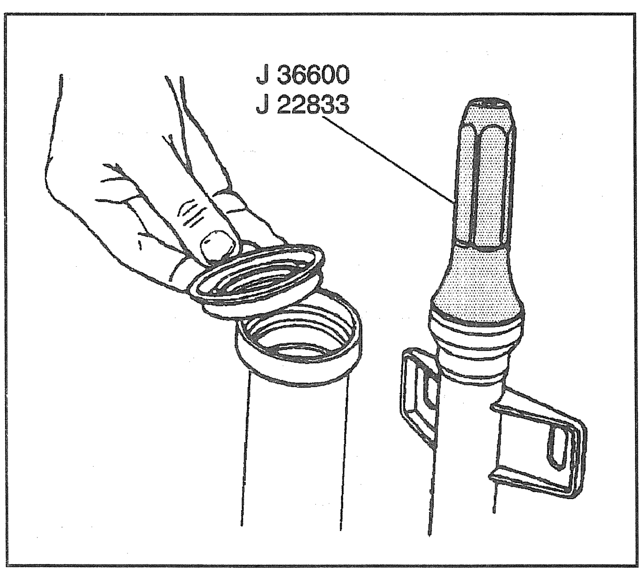
Tools Required

- *J 36600 Axle* Output Shaft Seal Installer (K1, K2 models)
- *J 22833* Output Shaft Seal Installer (K3)
- *J 33842* Pilot Bearing Installer
- *J 36616* Bushing Replacer Set

1. Apply a bead of sealer GM P/N 105942 or the equivalent to one carrier case half sealing surface.
2. Install the right carrier case half.
3. Install the bolts.

   Tighten

   Tighten the bolts to 47 N·m (35 lb ft).



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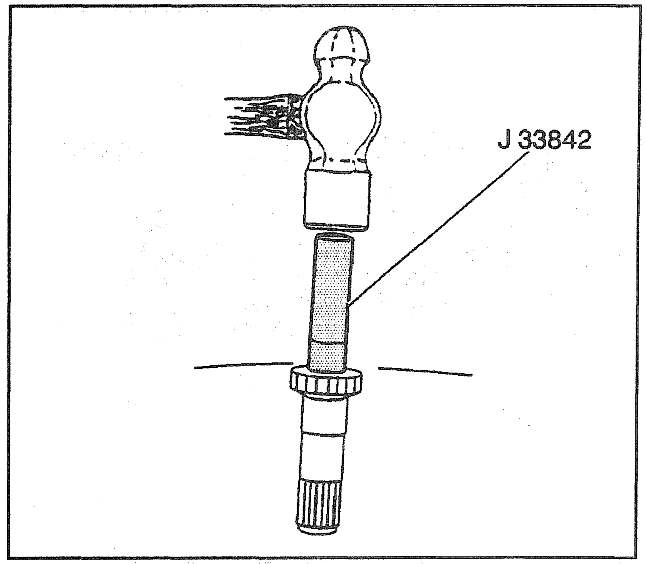
4. For the T, K1, and K2 models, use the *J 36600 Axle* in order to install the left seal. Drive the seal into place with a soft faced hammer.
5. For the K3 model, use the *J 22833* in order to install the left seal. Drive the seal into place with a soft faced hammer.
6. Install the shaft.

   Drive in place with a brass hammer.

7. Use the *J 33842* in order to install the bearing to the output shaft.
8. Install the output shaft to the carrier.



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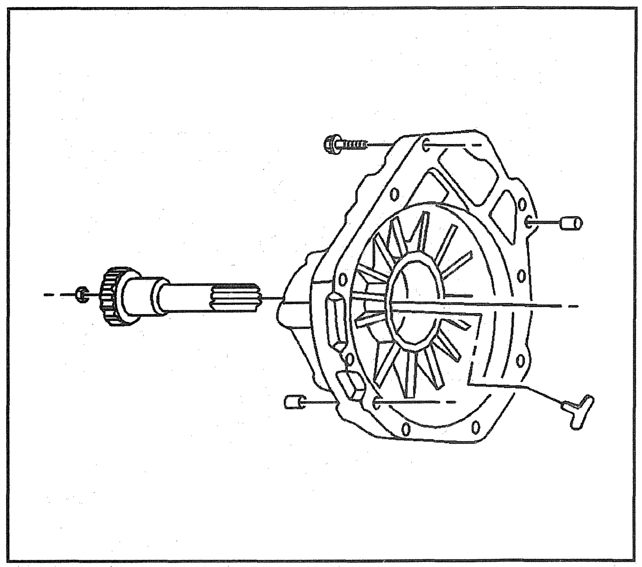
9. Install the vent plug.

   Use a small amount of sealer GM P/N 105942 or the equivalent on the threads.



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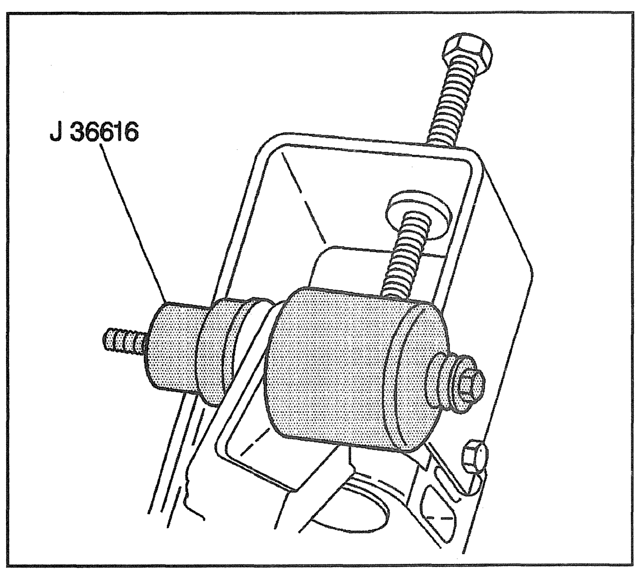
10. Use the *J 36616* in order to install the bushings.



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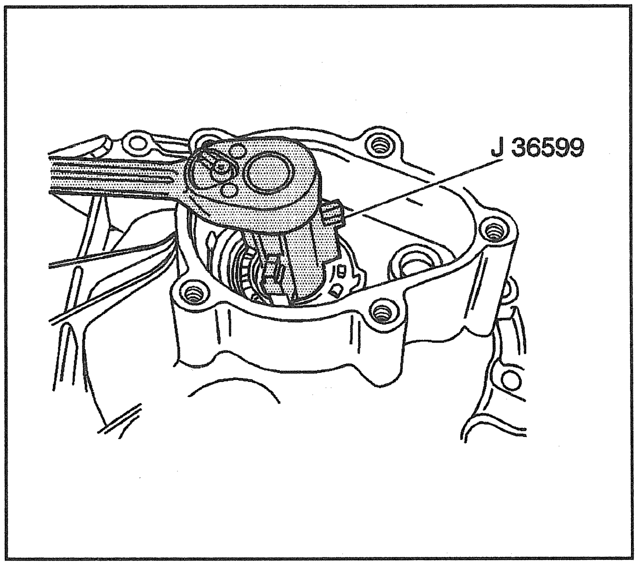

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Backlash Inspection and Adjustment

Tools Required

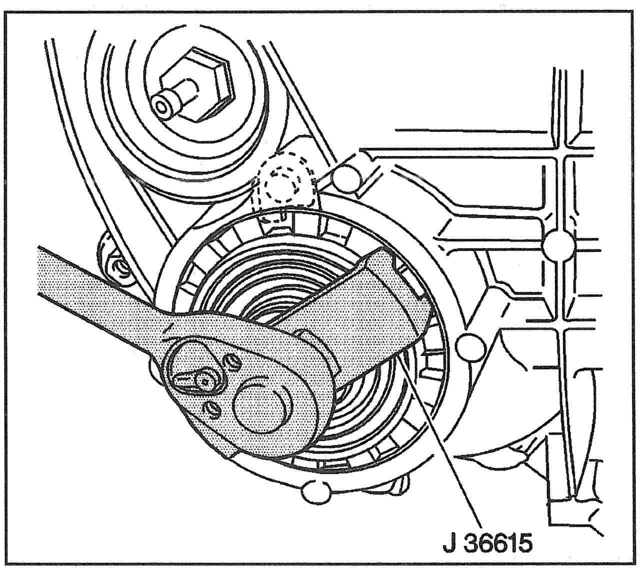
J 8001 Dial Indicator Set

1. Use the *J 36599* in order to tighten the right sleeve.

   Tighten

   Tighten the right sleeve to 140 N·m (100 lb ft).

Notice: Refer to *Fastener Notice* in Caution and Notices.



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2. For the T, K1, and K2 models, use the *J 36599* in order to tighten the left sleeve.

   Tighten

   Tighten the left sleeve to 140 N·m (100 lb ft).
3. For the K3 model, use the *J 36615* in order to tighten the adjuster plug.

   Tighten

   Tighten the adjuster plug to 140 N·m (100 lb ft).
4. Mark the location of the adjusting sleeves in relation to the carrier halves.

   Ensure that the notches in the adjusting sleeves can be counted when turned.
5. Turn the right sleeve OUT two notches.
6. For the T, K1, and K2 models, turn the left sleeve in one notch.
7. For the K3 model, turn the adjuster plug in one notch.
8. Rotate the pinion several times in order to seat the bearings.

Measuring Backlash

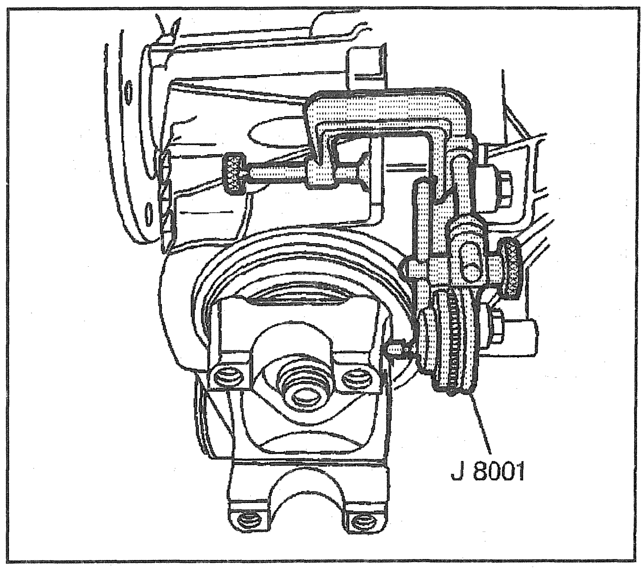
1. Install a dial indicator so the button contacts the outer edge of the pinion flange.

   Ensure that the plunger is at a right angle to the pinion flange.
2. Move the pinion flange through the pinion flange's free play while holding the differential carrier.

   Record the dial indicator reading.
3. Divide the dial indicator reading by 2 in order to obtain the actual backlash when using this method.

   A dial indicator reading of 0.16 mm means that there is actually 0.08 mm backlash.
4. In order to adjust the backlash, use the following procedure:
   - The gear backlash should be between 0.08–0.25 mm (0.0003–0.010 in) with a preferred specification of 0.13–0.18 mm (0.005–0.007 in).
   - If the backlash is incorrect, adjust the sleeves as necessary. Always maintain the one notch preload on the side bearings.

     Example: If necessary to turn the right sleeve in one notch, then turn the left sleeve out one notch.
   - In order to increase the backlash, turn the left sleeve in and turn the right sleeve out an identical amount.
   - In order to decrease the backlash, turn the right sleeve in and turn the left sleeve out an identical amount.
   - Changing the sleeves one notch changes the backlash about 0.08 mm (0.003 in).



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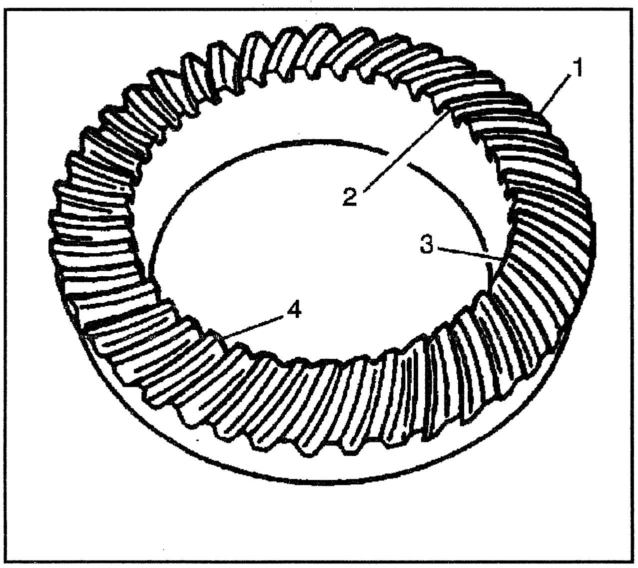
Gear Tooth Contact Pattern Check

Before the final assembly of the differential, a gear tooth contact pattern check should be performed.

A gear tooth contact pattern check is NOT a substitute for adjusting the pinion depth and the backlash. The gear tooth contact pattern check is a final check in order to verify the correct running position of the ring gear and the drive pinion. Any gear sets which are not aligned properly may be noisy and have a short life. With a pattern check, the best contact between the ring gear and the drive pinion for low noise level and long life can be ensured.

Gear Tooth Terms



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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 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). The toe end of the tooth is smaller than the heel end.

Testing Procedure

1. Wipe the oil out of the carrier.
   Carefully clean each tooth of the ring gear.
2. Apply gear marking compound sparingly to all ring gear teeth using a medium stiff brush.
   When properly used, the area of pinion tooth contact will be visible when hand load is applied.
3. Using a torque wrench, apply a load until a torque of 62 N·m (45 lb ft) is required to turn the pinion.
   - A test that is made without loading the gears will not give a satisfactory pattern.
   - Turn the companion flange with a wrench so that the ring gear rotates one full revolution.
   - Then reverse the rotation so that the ring gear rotates one revolution in the opposite direction.
   - Excessive turning of the ring gear is not recommended.
4. Observe the pattern on the ring gear teeth.

Adjustments Affecting Tooth Contact

There are two adjustments, backlash and pinion depth, which will affect the tooth contact pattern. The effects of the bearing preloads are not easily seen on hand loaded teeth pattern tests. Make the adjustments within specifications before proceeding with the backlash and the drive pinion adjustments.

Adjust the pinion depth and the backlash as necessary, in order to obtain the correct pattern.

The pinion depth is adjusted by increasing or decreasing the shim thickness between the pinion head and the inner race of the rear bearing. The shim is used in the differential in order to compensate for the manufacturing tolerances. Increasing the shim thickness will move the pinion closer to the centerline of the ring gear.

The backlash is adjusted by means of the side bearing adjusting sleeves which move the entire case and the ring gear assembly closer to, or farther from the drive pinion. The adjusting sleeves are also used in order to set side the bearing preload. In order to increase the backlash, turn the left sleeve in and turn the right sleeve out an identical amount.

In order to decrease the backlash, turn the right sleeve in and turn the left sleeve out an identical amount.

The contact pattern must be centrally located up and down on the face of the ring gear teeth.

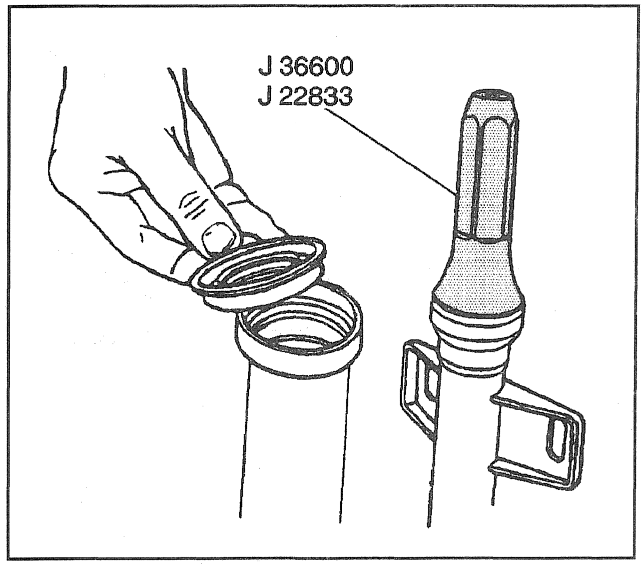
Axle Tube Assembly

Assembly Procedure

Tools Required

- *J 36609* Bearing Installer
- *J 36600* Seal Installer (T, K1, and K2 models)
- *J 36609* Seal Installer (K3 model)

1. Use the *J 36609* in order to install the bearing.
   Drive into place with a hammer.
2. For the T, K1, and K2 models, use the *J 36600* in order to install the seal.



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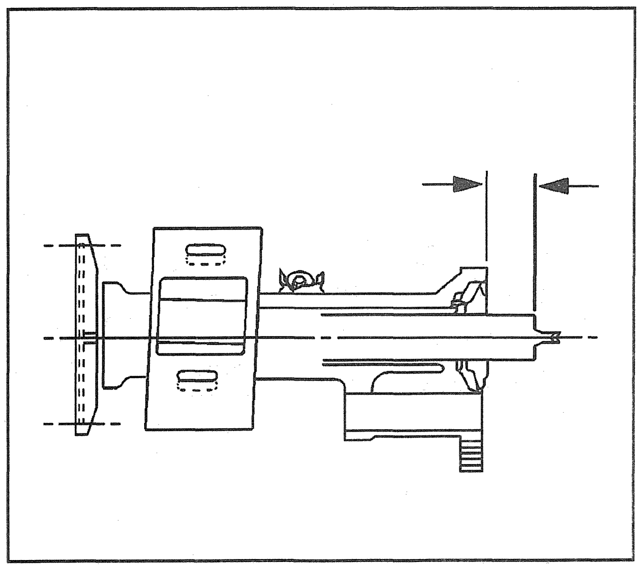
3. For the K3 models, use the *J 36609* in order to install the seal.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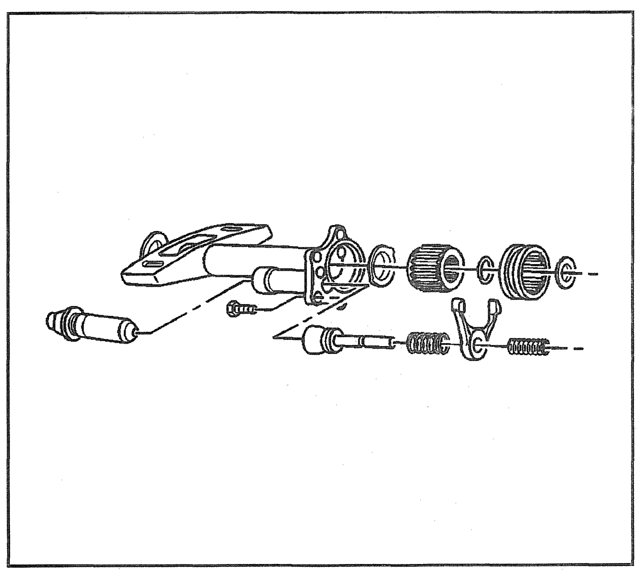
4. Install the shaft to the axle tube.
5. Install the washer. Align the tabs with the slots in the tube.
6. For the T, K1, and K2 models, install the gear with the retaining ring.
   Drive the gear into place with a plastic hammer.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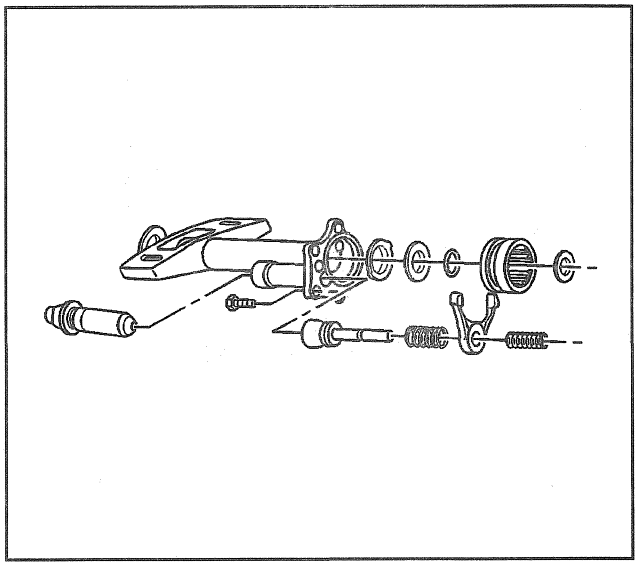

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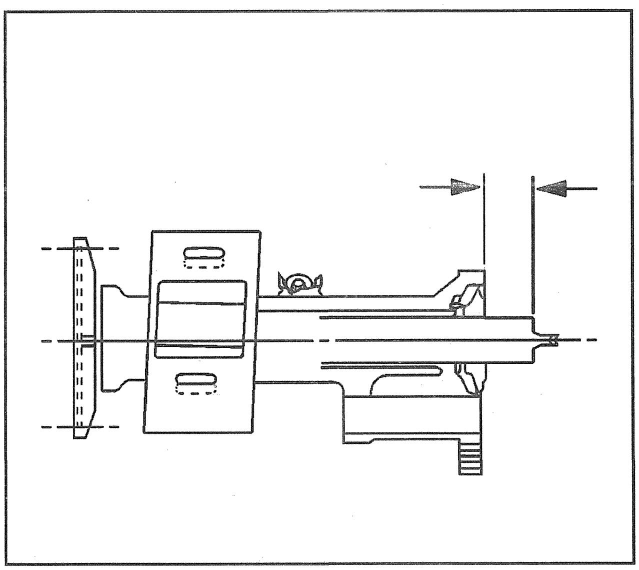
7. For the K3 model, install the washer and the new snap ring.

   Ensure the snap ring is properly seated in the groove.



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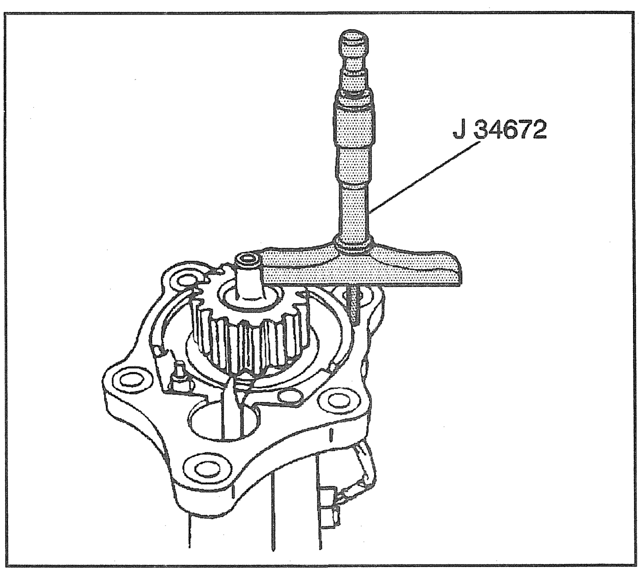
Output Shaft Shim Selection

Tools Required

J 34672 Depth Gauge

1. Select the proper size output shaft shim if any of the following parts were replaced:
   - The shaft
   - The axle tube
   - The output shaft
   - The carrier case
   - The ring and pinion gears
   - The differential case
   - The bearings
   - For T, K1, and K2 models, the carrier connector
2. Push on the inner end of the shaft, and move the shaft outboard as far as it will go. The shaft must be in this position when measuring dimension A.



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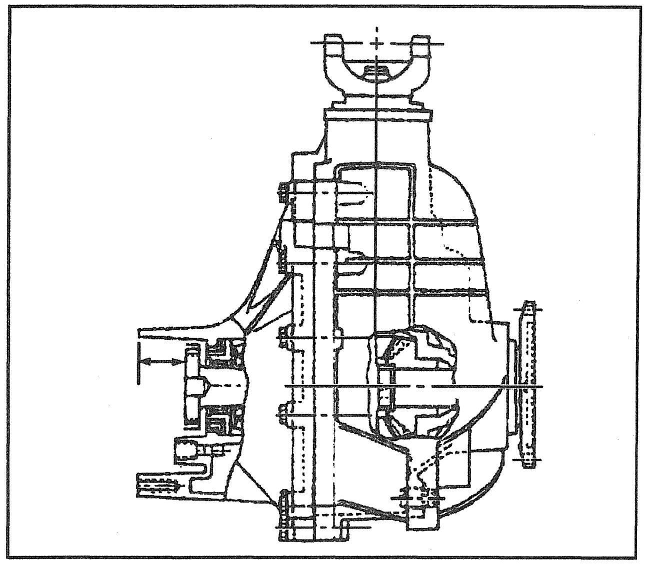
3. Use the *J 34672* in order to measure dimension A.
   - For the T, K1, and K2, install the tube flange machined surface to the inner surface of the connector.
   - For the K3, install the tube flange machined surface to the inner surface of the axle shaft shoulder.

4. Measure the dimension B.

   Install the carrier machined surface to the outer surface of the output shaft.
5. Subtract the dimension A from the dimension B.
6. The correct shim size will be one size smaller than the figure obtained in the previous step.

   Note the following examples:
   - If the figure obtained in step 5 was 3.53 mm, use a 3.30 mm shim.
   - For the T, K1, and K2 models, if the figure obtained in step 5 was 3.30 mm, use a 2.70 mm shim.
   - For the K3 model, if the figure obtained in step 5 was 3.30 mm, use a 2.80 mm shim.
7. For the T, K1, and K2 models, shims are available in the following sizes:
   - 1.27 mm
   - 1.78 mm
   - 2.29 mm
   - 2.70 mm
   - 3.30 mm
   - 3.81 mm
8. For the K3 models, shims are available in the following sizes:
   - 1.80 mm
   - 2.30 mm
   - 2.80 mm
   - 3.30 mm
   - 3.80 mm
   - 4.30 mm
   - 4.80 mm



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Alternate Method

Tools Required

J 8001 Dial Indicator

Important: Use this method only if the proper tools for calculating the shim size are unavailable.

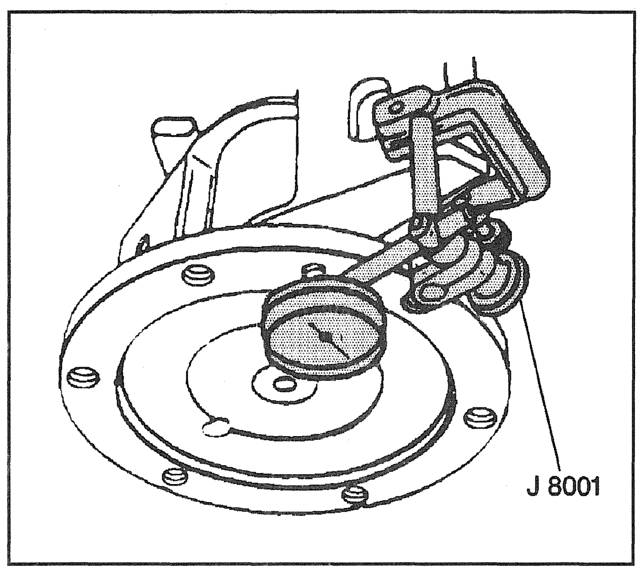
1. Install the original shim to the shaft.

   Use the chassis grease in order to hold the shim in place.
2. Install the assembled axle tube and the shaft to the carrier.

   Do not use sealer at this time.
3. Install the bolts.

   Tighten

   Tighten the bolts to 40 N·m (30 lb ft).



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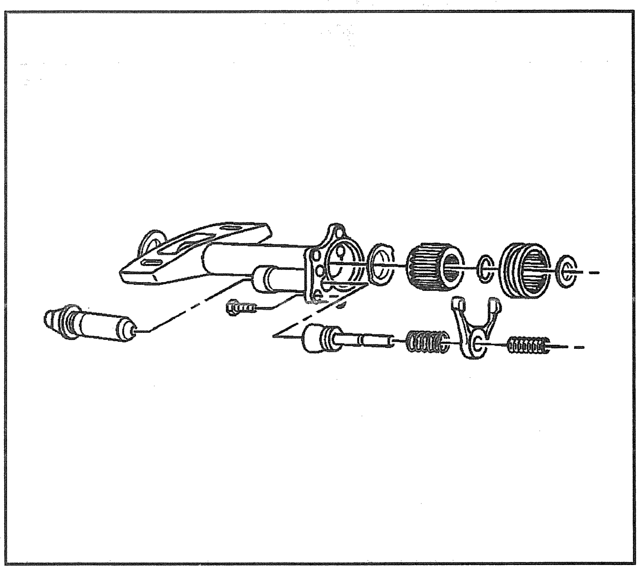
4. Measure the shaft end play using the following procedure:
   4.1. Install the *J 8001* or the equivalent on the axle tube end.

        The plunger of the indicator must be at a right angle to the axle flange.
   4.2. Move the shaft back and forth and read the end play.

        The correct end play is 0.03–0.51 mm (0.001–0.020 in).
   4.3. If the end play is incorrect, install a thicker or thinner shim as needed in order to bring the end play into the specified range.
   4.4. Install the bolts.
   4.5. Install the axle tube assembly.



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Differential Carrier Final Assembly

1. Clean the sealing surfaces of the tube and the carrier assembly.

   Remove all the oil and the grease.
2. Install the shim to the output shaft.

   Hold the shim in place with grease.
3. Install the sleeve.
4. Install the spring.
5. Install the following parts to the carrier case:
   - The shift shaft
   - The damper spring

     The damper spring fits into the shift fork indentation.
   - The shift fork
   - The clip assembly

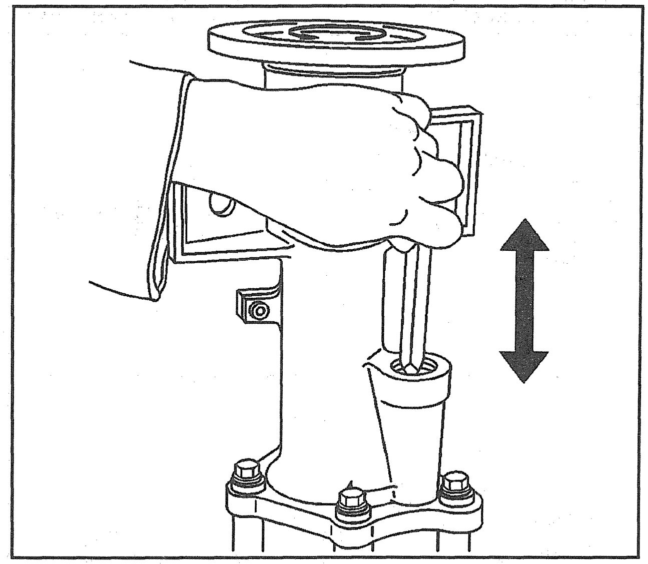
     Ensure that the clip is seated in the groove of the shift shaft.
6. Apply a bead of sealer GM P/N 1052942 or the equivalent to the tube sealing surface.
7. Install the assembled tube to the carrier assembly.
8. Install the bolts.

   Tighten

   Tighten the bolts to 40 N·m (30 lb ft).

Notice: Refer to *Fastener Notice* in Caution and Notices.

9. Inspect the shift mechanism operation.
   - 9.1. Insert a drift into the actuator hole in the axle tube.
   - 9.2. Rotate the axle flange while moving the shift fork with the drift.
   - 9.3. The shift mechanism should work smoothly, without binding.



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10. Install the actuator.

    Apply the sealer GM P/N 1052942 or the equivalent to the threads.
11. Install the switch.

    Apply the sealer GM P/N 1052942 or the equivalent to the threads.
12. Install the axle lubricant, as specified.
13. Install the drain and fill plugs with sealing washers.

    Tighten
    - Tighten the actuator bolts to 22 N·m (16 lb ft).
    - Tighten the switch bolts to 5 N·m (45 lb in).
    - Tighten the drain and fill plug to 33 N·m (24 lb in).

Description and Operation

Front Drive Axle Description

The Front Axle on four-wheel drive model vehicles has a central disconnect feature that, under most conditions, allows shifting into and out of four-wheel drive when the vehicle is in motion. An electric motor actuator engages the central disconnect feature.

The axle uses a conventional ring and pinion gear set in order to transmit the driving force of the engine to the wheels. The differential allows the wheels to turn at different rates of speed while the axle continues to transmit the driving force. This prevents tire scuffing when going around corners and premature wear on internal axle parts. The ring and pinion set and the differential are contained within an aluminum carrier. You can find the axle identification number on a tag attached to the right axle tube.

The drive axles (halfshafts) are completely flexible assemblies consisting of inner and outer constant velocity CV joints protected by thermoplastic boots and connected by an axle shaft (output shaft).

Special Tools and Equipment

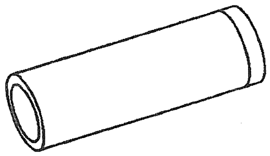
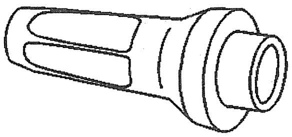
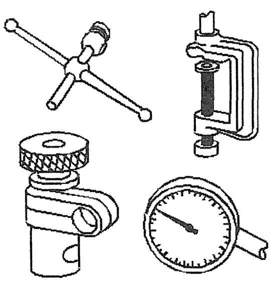
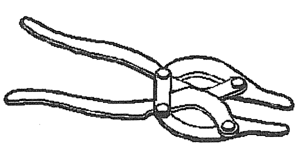
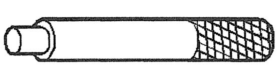
Illustration	Tool Number/ Description
 156584	J 3612 Pinion Bearing Installer (K15-K25 Models)
 156805	J 3660 Axle Seal Installer (K15-K25 Models)
 2014	J 8001 Dial Indicator Set
 5616	J 8059 Snap Ring Pliers
 2015	J 8092 Driver Handle

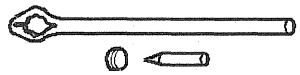
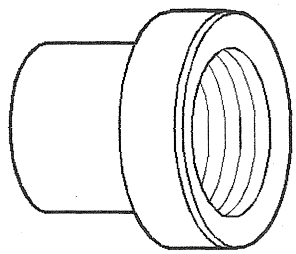
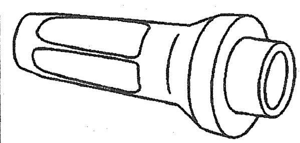
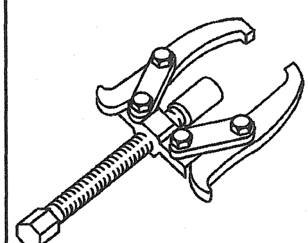
Illustration	Tool Number/ Description
 1507	J 8614 Pinion Flange Remover
 5328	J 22761 Differential Side Bearing Installer (K15-25)
 156798	J 22833 Axle Seal Installer (K35 Models)
 162966	J 22888 Differential Side Bearing Puller

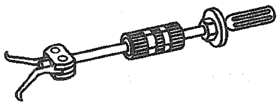
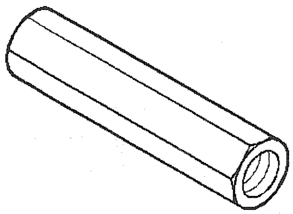
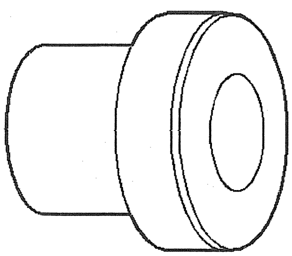
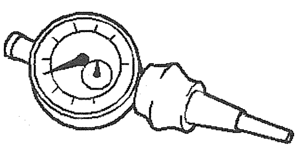
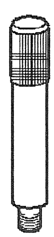
Illustration	Tool Number/ Description
 163061	J 23907 Slide Hammer
 136	J 29193 Steering Linkage Installer-12 mm
 5325	J 29710 Differential Side Bearing Installer (K35)
 5714	J 29763 Dial Indicator
 5622	J 33842 Differential Pilot Bearing Installer

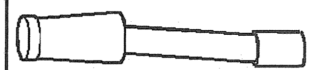
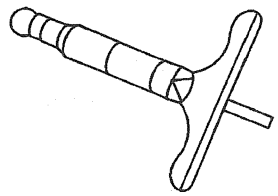
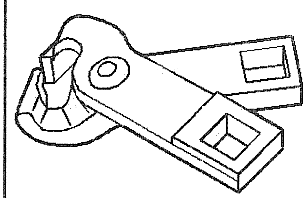
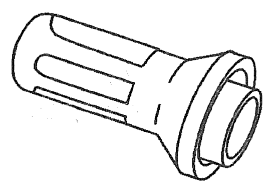
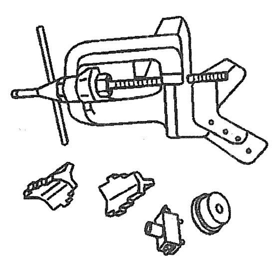
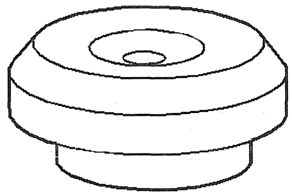
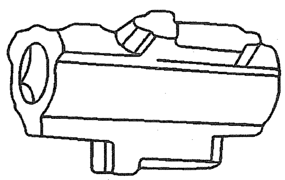
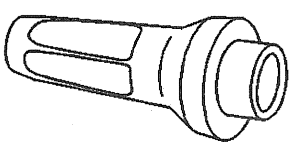
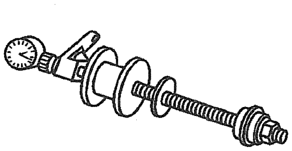
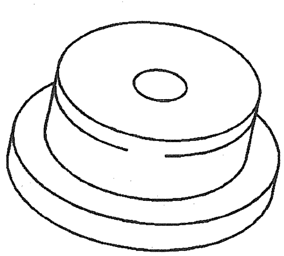
Illustration	Tool Number/ Description
 9099	J 34011 Differential Pilot Bearing Remover
 156600	J 34672 Depth Gauge
 5625	J 35910 Drive Axle Seal Clamp Pliers
 157993	J 36366 Pinion Seal Installer
 156592	J 36578 Holding Fixture and Pinion Service Tool

Illustration	Tool Number/ Description
 5322	J 36597 Side Bearing Puller Pilot (K35)
 156594	J 36599 Side Bearing Adjuster Wrench
 156805	J 36600 Axle Tube Seal Installer (K2 Models)
 156597	J 36601 Pinion Depth Setting Gauge
 156605	J 36603 Side Bearing Cup Installer

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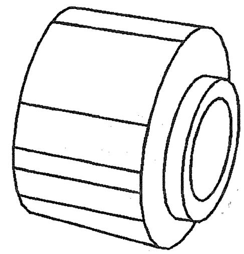
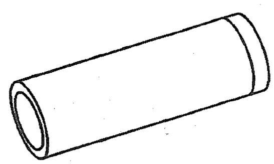
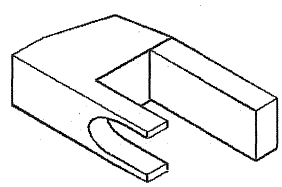
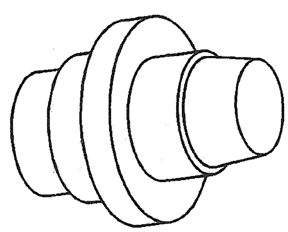
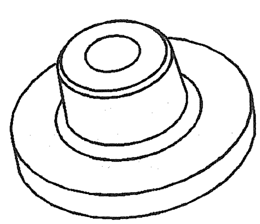
 156895	J 36605 Knuckle Seal Installer
 156586	J 36606 Pinion Bearing Installer (K35 Models)
 2032	J 36607 Ball Joint Separator
 156807	J 36609 Axle Tube Bearing Installer
 156578	J 36612 Output Shaft Bearing Installer (K15-25)

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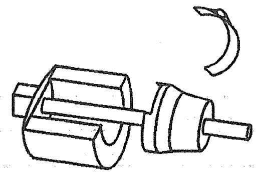
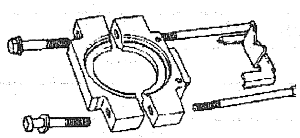
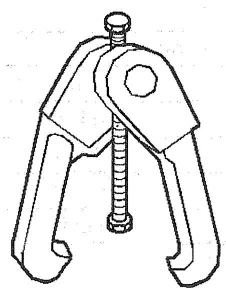
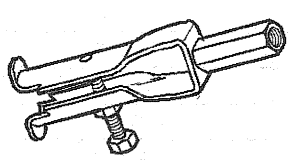
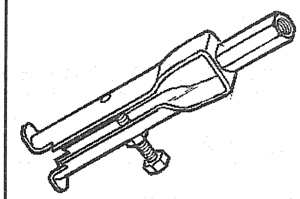
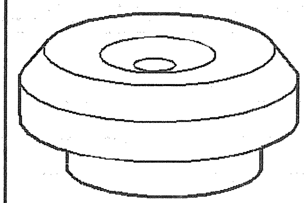
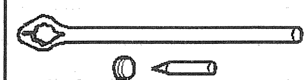
 156810	J 36616 Case Bushing Replacer
 5725	J 36652 Clamp Swage Tool Set
 133	J 24319-B Steering Linkage Puller
 57531	J 29369-1 Axle Tube Bearing and Seal Remover (K15-25)

Illustration	Tool Number/ Description
 57540	J 29369-2 Axle Tube Bearing and Seal Remover (K35)
 5322	J 8107-2 Side Bearing Puller Pilot (K15-25)
 1507	J 8614-01 Pinion Flange Holder

Rear Drive Axle

Specifications

Fastener Tightening Specifications (8 1/2 and 8 5/8)

Application	Specification	
	Metric	English
Brake Backing Plate	47 N·m	35 lb ft
Carrier Cover	27 N·m	20 lb ft
Filler Plug	34 N·m	25 lb ft
Pinion Shaft Lock Screw	34 N·m	25 lb ft

Fastener Tightening Specifications (9 1/2 In Ring Gear)

Application	Specification	
	Metric	English
Brake Backing Plate	142 N·m	105 lb ft
Carrier Cover	27 N·m	20 lb ft
Filler Plug	24 N·m	18 lb ft
Pinion Shaft Lock Screw	34 N·m	25 lb ft

Fastener Tightening Specifications (10 1/2 In Ring Gear)

Application	Specification	
	Metric	English
Axle Flange Bolt	150 N·m	110 lb ft
Brake Backing Plate	150 N·m	110 lb ft
Carrier Cover	34 N·m	25 lb ft
Filler Plug	35 N·m	26 lb ft

Fastener Tightening Specifications (11 Inch Ring Gear)

Application	Specification	
	Metric	English
Axle Shaft Cap	21 N·m	15 lb ft
Bearing Cap Bolts	115 N·m	85 lb ft
Brake Backing Plate	105 N·m	78 lb ft
Carrier Cover	47 N·m	35 lb ft
Driving Pinion Nut	637 N·m	470 lb ft
Filler Plug	33 N·m	24 lb ft
Outer Wheel Bearing Locknut	88 N·m	65 lb ft
Ring Gear Bolts	298 N·m	220 lb ft

Spacer and Shim Specifications

Shim Type	mm	inch
Differential Bearing Adjusting Shim	0.0726	0.003
Differential Bearing Adjusting Shim	0.1270	0.005
Differential Bearing Adjusting Shim	0.2540	0.010
Differential Bearing Adjusting Shim	0.7620	0.030
Outer Pinion Bearing Preload Shim	0.3556	0.014
Outer Pinion Bearing Preload Shim	0.3810	0.015
Outer Pinion Bearing Preload Shim	0.4064	0.016
Outer Pinion Bearing Preload Shim	0.4572	0.018

Spacer and Shim Specifications (cont'd)

Shim Type	mm	inch
Outer Pinion Bearing Preload Shim	0.5080	0.020
Outer Pinion Bearing Preload Shim	0.3534	0.021
Outer Pinion Bearing Preload Shim	0.5588	0.022
Outer Pinion Bearing Preload Shim	0.5842	0.023
Outer Pinion Bearing Preload Shim	0.7620	0.030
Inner Pinion Bearing Preload Shim	0.0762	0.003
Inner Pinion Bearing Preload Shim	0.1270	0.005
Inner Pinion Bearing Preload Shim	0.2540	0.010
Outboard Shim	5.18	0.204
Outboard Shim	5.26	0.207
Outboard Shim	5.33	0.210
Outboard Shim	5.41	0.213
Outboard Shim	5.49	0.216
Outboard Shim	5.56	0.219
Outboard Shim	5.64	0.222
Outboard Shim	5.72	0.225
Outboard Shim	5.79	0.228
Outboard Shim	5.87	0.231
Outboard Shim	5.94	0.234
Outboard Shim	6.02	0.237
Outboard Shim	6.10	0.240
Outboard Shim (Non-Selective)	4.98	0.196
Outboard Shim (Non-Selective)	4.88	0.192
Inboard Shim	0.84	0.330
Inboard Shim	0.69	0.270

Pinion Bearing and Differential Bearing Preload

Application	Specification	
	Metric	English
New Drive Pinion Bearings Preload	47 N·m	35 lb ft
New Drive Pinion Bearings Final Tightening	57 N·m	42 lb ft
Existing Differential Case Bearing Preload Tightening	57 N·m	42 lb ft
Existing Differential Case Bearing Final Tightening	68 N·m	50 lb ft

Lubrication Specifications

Application	Specification	
	Metric	English
American Axle 8½ and 8⅝ Inch Ring Gear	2.0 liters	2.1 quarts
American Axle 9½ Inch Ring Gear	2.6 liters	2.7 quarts
American Axle 10½ Inch Ring Gear	3.08 liters	3.25 quarts
Dana 11 Inch Ring Gear	4.0 liters	4.2 quarts
C3500HD models in applications requiring extreme overload/trailer tow conditions at high speeds (above 45 MPH) for extended periods of time should have lubricant changed every 3,000 miles or 3 months, whichever comes first. If synthetic lubricant (GM P/N 12346140 or equivalent) is used, the change interval may be extended to 30,000 miles.		

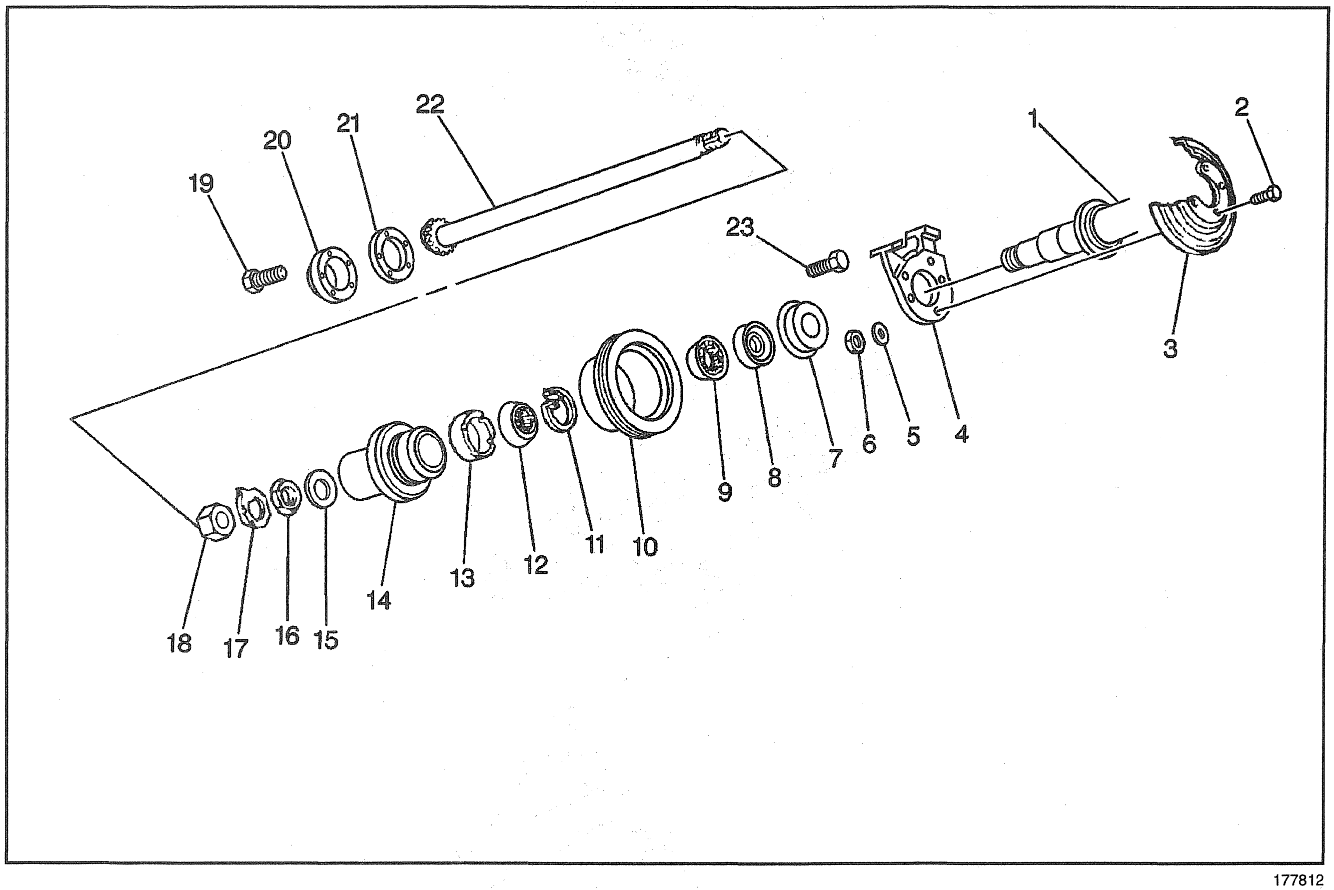
GM SPO Group Numbers

Application	GM SPO Group Number
Rear Axle	5.386
Rear Axle Bolt, Clip, Connector, Housing, Stud and Vent	5.387
Front and Rear Axle Bumper	5.395
Rear Axle Housing Bolt and Cover	5.398
Rear Axle Housing Cover Gasket	5.399
Rear Axle Shaft	5.420
Rear Axle Shaft Bolt, Cap, Gasket and Lock	5.422
Pinion Shaft Front Bearing, Cone and Cup	5.447
Differential Drive Pinion Front and Center Bearing Bolt and Spacer	5.453
Differential Pinion Cage Shim	5.458
Differential Rear Pinion Bearing Shim and Shim Kit	5.460
Differential Drive Pinion Seal	5.469
Pinion Bearing and Oil Seal Retainer	5.476
Drive Pinion Rear and Intermediate Baffle, Bearing, Cone and Cup	5.484
Final Drive Bracket, Shield and Washer	5.500
Differential Carrier	5.505
Differential Carrier Bolt, Bushing, Pin and Washer	5.506
Differential Carrier Housing Magnet	5.508
Differential and Planet Case, Cover and Differential	5.510
Differential Locking Bushing, Cam, Disc Set, Governor and Guide	5.511
Differential Locking Shaft	5.517
Pinion Shaft Lock Bolt and Pin	5.518
Differential Pinion Spider	5.520
Differential Pinion Gear	5.526
Differential Side with Pinion Gear Kit	5.527
Differential Side Gear	5.528
Ring and Pinion Gear Kit and Gear Set	5.529
Ring Gear Bolt	5.531
Differential Side Bearing	5.536
Differential Bearing Adjusting Adjuster, Lock, Nut, Ring, Shim, Shim Kit, Sleeve and Spacer	5.537
Differential Bearing Adjusting Nut Lock	5.539
Differential Pinion Thrust Block and Washer	5.542
Differential Side Gear Thrust Shim, Sleeve and Washer	5.543

Component Locator

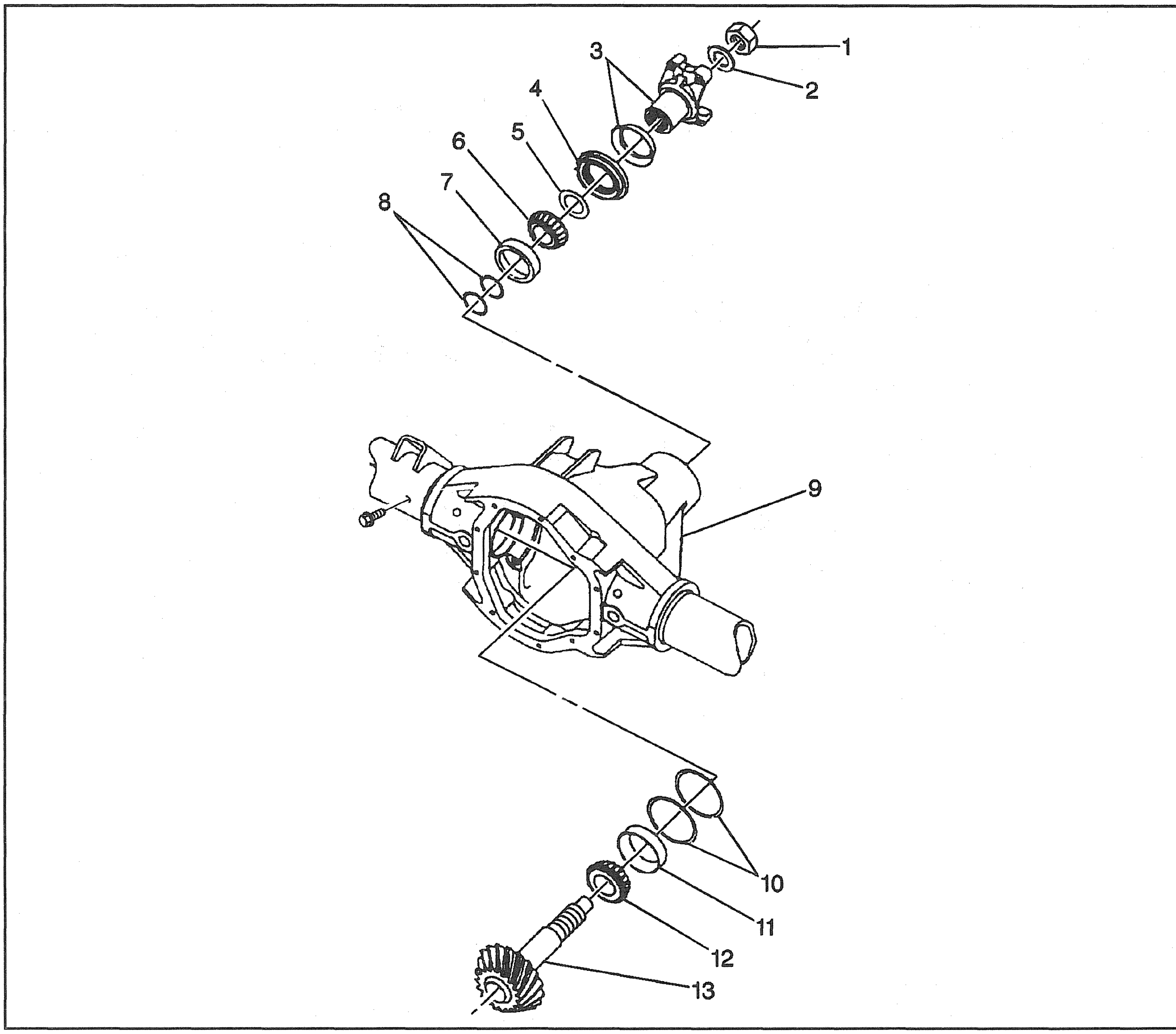
Rear Axle Disassembled Views

Full-Floating Axle Wheel End Components



Legend

(1) Wheel Hub Bolt
(2) Caliper Mounting Plate Bolt
(3) Dust Shield
(4) Caliper Mount Bracket
(5) Washer
(6) Nut
(7) Wheel Bearing Oil Deflector
(8) Oil Seal
(9) Inner Bearing
(10) Rear Brake Rotor
(11) Retaining Ring
(12) Outer Bearing
(13) Wheel Bearing Spacer
(14) Rear Wheel Hub
(15) Wheel Bearing Washer
(16) Adjuster Nut
(17) Lock Washer
(18) Outer Locknut
(19) Rear Axle Shaft Bolt
(20) Axle Shaft Cap
(21) Axle Shaft Gasket
(22) Rear Axle Shaft



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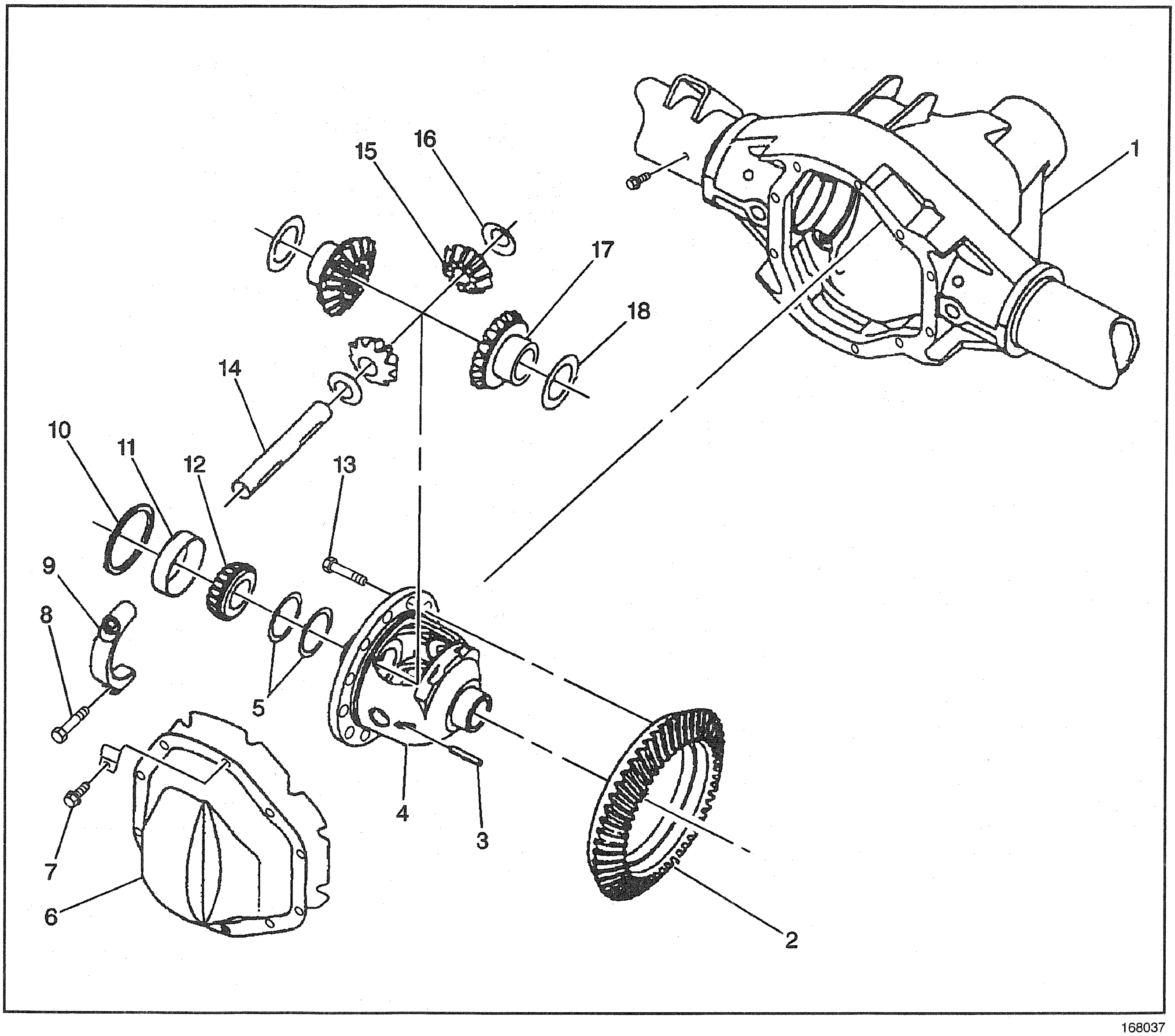
Legend

(1) Pinion Nut
(2) Washer
(3) Pinion Flange/Yoke
(4) Pinion Oil Seal
(5) Slinger
(6) Outer Pinion Bearing Cone
(7) Outer Pinion Bearing Cup
(8) Preload Shims
(9) Axle Housing
(10) Shims
(11) Inner Pinion Bearing Cup
(12) Inner Pinion Bearing Cone
(13) Pinion



Legend

(1) Axle Housing
(2) Ring Gear
(3) Roll Pin
(4) Differential Case
(5) Shim
(6) Cover
(7) Cover Bolt
(8) Bearing Cap Bolts
(9) Bearing Cap
(10) Shim
(11) Bearing Cup
(12) Bearing Cone
(13) Ring Gear Bolt
(14) Pinion Shaft
(15) Pinion Gear
(16) Pinion Thrust Washer
(17) Side Gear
(18) Side Gear Thrust Washer

Diagnostic Information and Procedures

Determining Type of Noise

Rear Axle Noise

The proper diagnosis is an important part of rear axle repair. In axle work, one of the most difficult conditions to diagnose is noise. Locating a broken axle shaft or broken differential gear presents little or no problem, but locating and isolating axle noise can be an entirely different matter.

Any gear driven unit, especially an automotive drive axle where the engine torque multiplication occurs at a 90 degree turn in the driveline, produces a certain amount of noise. Therefore, an interpretation must be made for each vehicle to determine where the noise is normal or if a problem actually exists. A certain amount of noise must be expected and cannot be eliminated by conventional repairs or adjustment.

Normal axle noise can be described as a slight noise heard only at a certain speed or under unusual or remote conditions. For example, the noise tends to reach a peak at speeds from 60 to 100 km/h (40 to 60 mph) depending on road and load conditions, or on gear ratio and tire size. This slight noise is in no way indicative of trouble in the axle assembly.

Driveline noises may confuse even the best technician. Vehicle noises coming from tires, transmission, propeller shaft, universal joints, and front or rear wheel bearings are often mistaken for axle noise. Such practices as raising tire pressure to eliminate tire noise (although this will not silence tread noise of mud and snow tires), or listening for the noise at varying speeds and road surfaces (drive, float, and coast conditions), will aid in locating the source of alleged axle noises. Every effort should be made to isolate the noise to a specific driveline component instead of a making random guess that could be a costly waste of time.

External Noise

Noise which seems to be coming from the rear axle may actually be produced somewhere else. Determine whether the noise might originate in the tires, road surface, front wheel bearings, engine, or transmission.

Road Noise

Driving on certain road surfaces, such as brick or rough-surfaced concrete, causes noise which may be mistaken for tire or rear axle noise. Driving on a different type of road, such as smooth asphalt or dirt, will quickly show whether the road surface is the cause of noise. Road noise usually is the same in drive as in coast.

Tire Noise

Tire noise can easily be mistaken for rear axle noise, even though noisy tires may be located on the front wheels. Tires worn unevenly, or having surfaces on non-skid divisions worn in sawtooth fashion, are usually noisy and may produce vibrations which seem to originate elsewhere in the vehicle. This is particularly true with low tire pressure.

Tire Noise Test

Tire noise changes with different road surfaces, but rear axle noise does not. Temporarily inflating tires to 345 kPa (50 psi) pressure, for test purposes only, will materially alter noise caused by tires but will not affect noise caused by the rear axle. Rear axle noise usually stops when coasting at speeds under 30 mph; however, tire noise continues but with lower tone as the vehicle speed is reduced. Rear axle noise usually changes when the tire pulls in a forward direction or when the vehicle coasts down the road and tire noise remains about the same.

Engine and Transmission Noises

Sometimes a noise which seems to originate in the rear axle is actually caused by the engine or transmission. To determine which unit is actually causing the noise, observe approximate vehicle speeds and conditions under which the noise is the most pronounced; then stop the vehicle in a quiet place to avoid interfering noises. With the transmission in neutral, run the engine slowly up and down through the engine speeds corresponding to the vehicle speed at which the noise was most pronounced. If a similar noise is produced with the vehicle standing, it is caused by the engine or transmission and not the rear axle.

Front Wheel Bearing Noise

Loose or rough front wheel bearings will cause noise which may be confused with rear axle noise; however, front wheel bearing noise does not change when comparing pull and coast conditions. Light application of the brake, while holding the vehicle speed steady, will often cause the wheel bearing noise to diminish, since this takes some weight off the bearing. Front wheel bearings may be easily checked for noise by jacking up the wheels and spinning them, and also by shaking the wheels to determine if the bearings are excessively loose.

Body Boom Noise or Vibration

Objectionable body boom noise or vibration at 55–65 mph (90–100 km/h) can be caused by an unbalanced propeller shaft. Excessive looseness at the spline can contribute to this unbalance.

Other items that may also contribute to the noise problem are as follows:

- Undercoating or mud on the shaft, causing unbalance
- Shaft or companion flange balance weights missing
- Shaft damage, such as bends, dents, or nicks
- Rough tires (Switch tires from a known good vehicle in order to determine a tire fault.)

If after making a comprehensive check of the vehicle, all indications point to the rear axle, further diagnostic steps are necessary to determine the axle components at fault. True rear axle noise generally falls into two categories: gear noise and bearing noise.

Rear Axle Noise

If a careful test of the vehicle shows that the noise is not caused by external items, it is then reasonable to assume that noise is caused by the rear axle assembly. Test the rear axle on a smooth level road to avoid road noise. It is not advisable to test the rear axle for noise by running with the rear wheels jacked up.

Noise in the rear axle assembly may be caused by a faulty propeller shaft, faulty wheel bearings, fault differential or pinion shaft bearings, misalignment between two U-joints, or worn differential side gears and pinions. Noise may be caused by a mismatched, improperly adjusted, or scored ring and pinion gear set.

Rear Wheel Bearing Noise

A rough rear wheel produces a vibration or growl which continues with the vehicle coasting and the transmission in neutral. A brinelled rear wheel bearing causes a knock or click, approximately every two revolutions of the rear wheel, since the bearing rollers do not travel at the same speed as the rear axle and wheel. With the rear wheels jacked up, spin the rear wheels by hand while listening at the hubs for evidence of a rough or brinelled wheel bearing.

Differential Side Gear and Pinion Noise

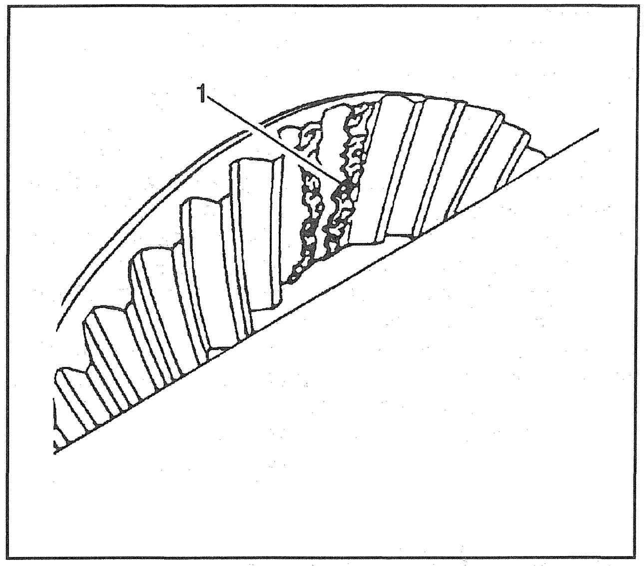
Differential side gears and pinions seldom cause noise since their movement is relatively slight on straight ahead driving. Noise produced by these gears will be most pronounced on turns.

Pinion bearing failures can be determined by how the bearings rotate at higher speeds as opposed to differential side bearings and axle shaft bearings. Rough or brinelled pinion bearings produce a continuous low-pitched whirring or scraping noise starting at a low speed.

Side bearings produce a constant rough noise pitched lower than pinion bearing noise. Side bearing noise may also fluctuate in the previous rear wheel bearing test.

Gear Noise

There are two basic types of gear noise.



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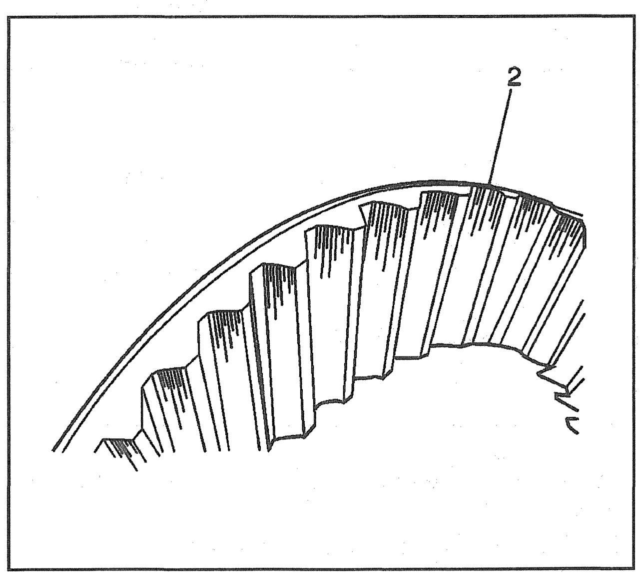
The first type is produced by broken, bent, or forcibly damaged gear teeth (1) and is usually quite audible over the entire speed range and presents no particular problem in diagnosis. For example, hypoid gear tooth scoring generally results from the following: insufficient lubricant, improper break-in, incorrect lubricant, insufficient gear backlash, improper ring and pinion gear alignment, or loss of drive pinion nut toque. The scoring will progressively lead to complete erosion of the gear tooth, or gear tooth pitting and then eventual fracture if the initial scoring condition is not corrected.

Other causes of hypoid tooth fracture are extended overloading of the gear set which will produce fatigue fracture, or shock loading which will result in sudden malfunction.



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Differential pinion and side gears rarely give trouble. Common causes of differential malfunction are shock loading, and seizure of the differential pinions to the cross shaft resulting from excessive wheel spin and consequent lubrication breakdown (2). The second type of gear noise pertains to the mesh pattern of the gear teeth. This form of abnormal gear noise can be recognized because it produces a cycling pitch (whine) and will be very pronounced in the speed range at which it occurs, appearing under either drive, float or coast conditions. Drive is acceleration or heavy pullout. Coast is allowing the vehicle to roll down the road without accelerating and float is lightly stepping on the accelerator pedal to keep the vehicle from driving the engine; the vehicle slows down gradually but the engine still pulls slightly. Gear noise tends to peak in a narrow speed range or ranges and will tend to remain constant in pitch. Bearing noise will vary in pitch with vehicle speeds.

Refer to *Rear Axle Wheel Bearing Wear* for bearing diagnoses.

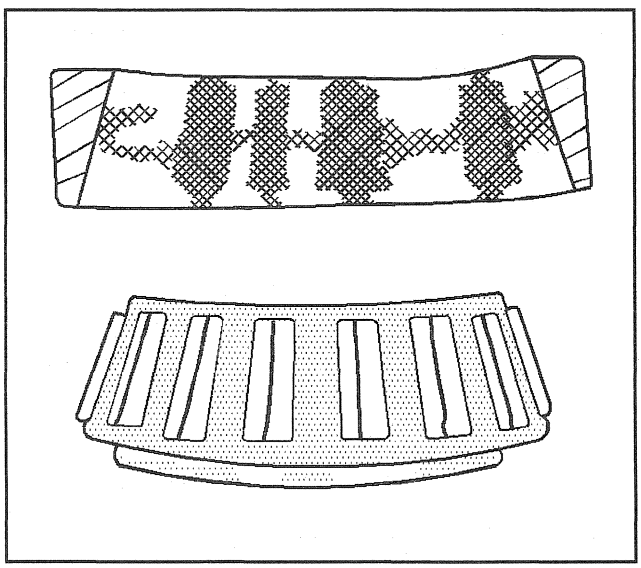
Rear Axle Wheel Bearing Wear

Tapered Roller Bearing Diagnosis

Consider the following factors when diagnosing bearing condition:

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

Abrasive Roller Wear

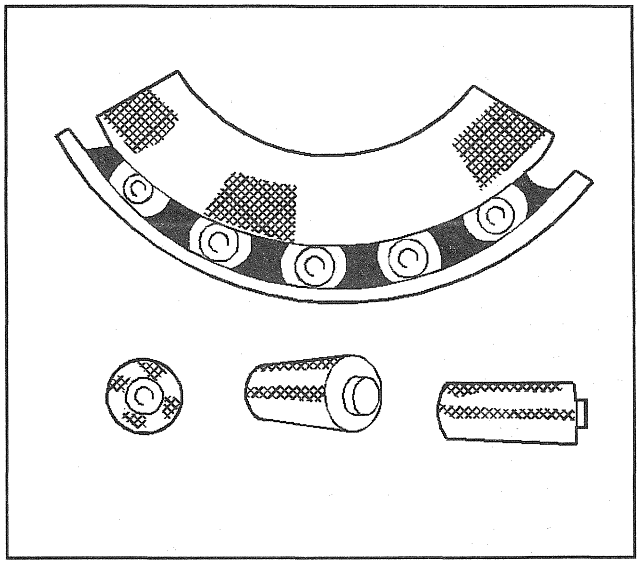


1452

The pattern on the races and the rollers is caused by fine abrasives.

1. Clean all of the parts and the housings.
2. Check the seals and the bearings.
3. Replace any leaky, rough, or noisy bearings.

Abrasive Step Wear

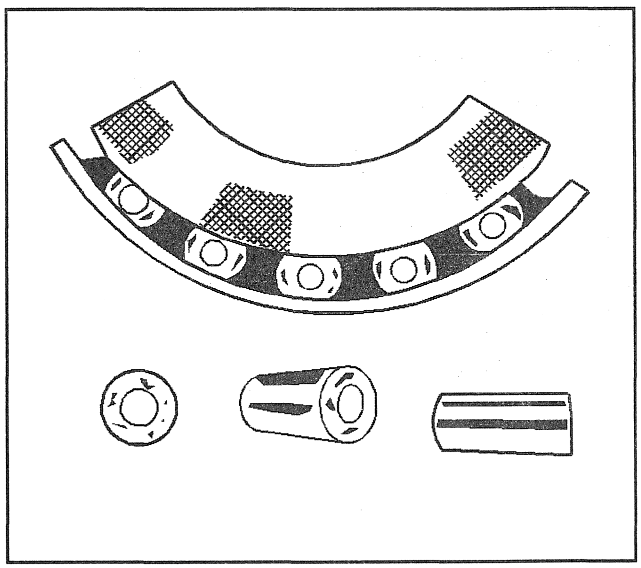


1453

The pattern on the roller ends is caused by fine abrasives.

1. Clean all of the parts and the housings.
2. Check the seals and the bearings.
3. Replace any leaky, rough, or noisy bearings.

Galling

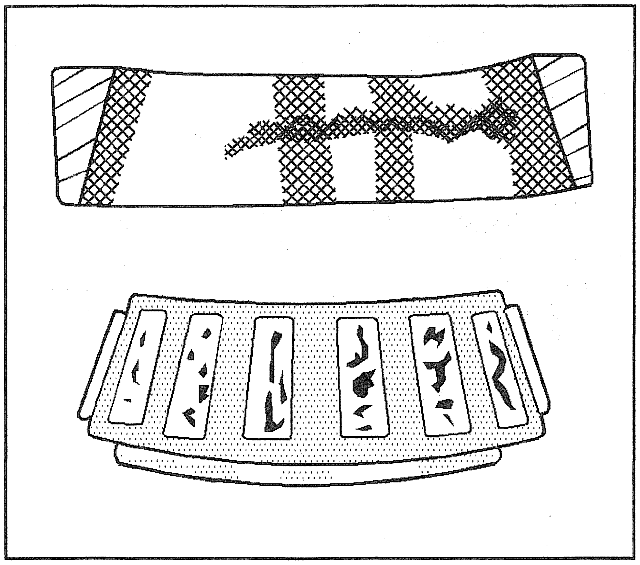


1454

The metal smears on the roller ends are due to overheating, lubricant failure, or lubricant overload.

1. Replace the bearing.
2. Check the seals.
3. Check for proper lubrication.

Etching

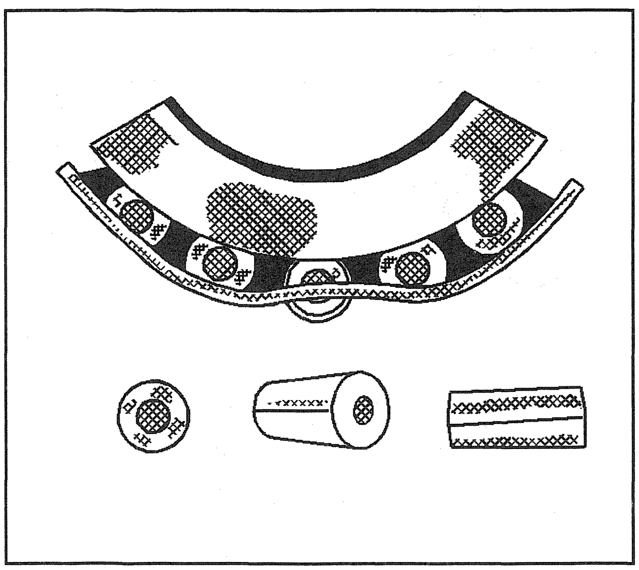


1455

The bearing surfaces appear gray or grayish black in color, with related etching away of material usually at roller spacing.

1. Replace the bearings.
2. Check the seals.
3. Check for proper lubrication.

Bent Cage

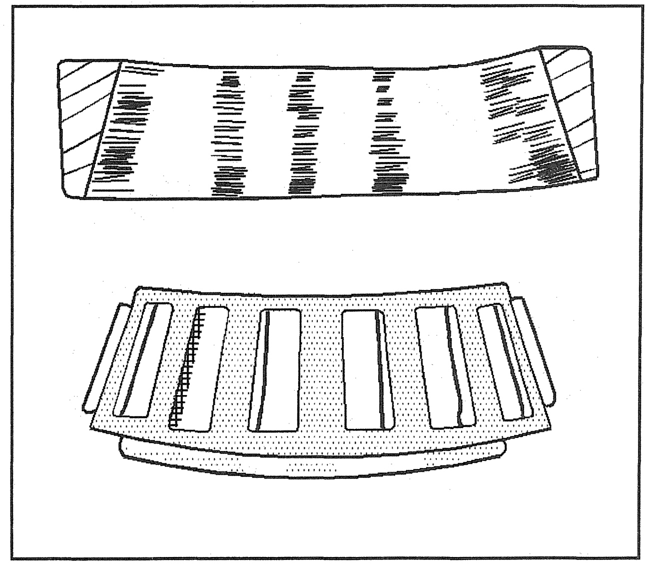


1648

When a cage is damaged due to improper handling or improper tool usage.

Replace the bearing.

Cage Wear

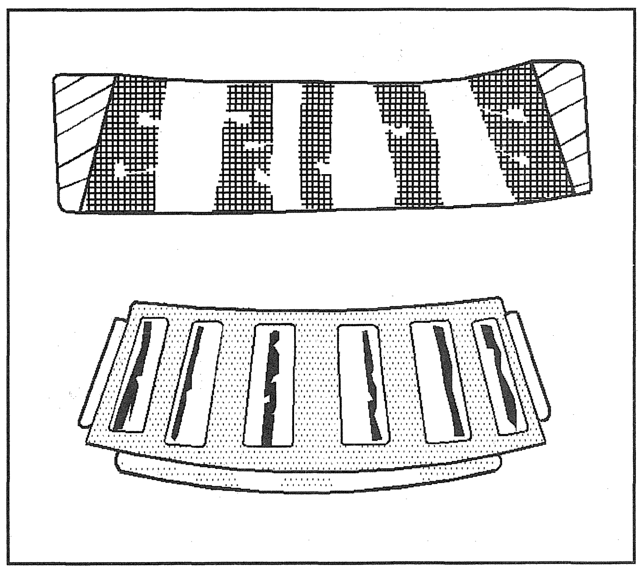


1457

The wear around the outside diameter of the cage and the roller pockets is caused by abrasive material or inefficient lubrication.

1. Clean the related parts and the housings.
2. Check the seals.
3. Replace the bearings.

Indentations

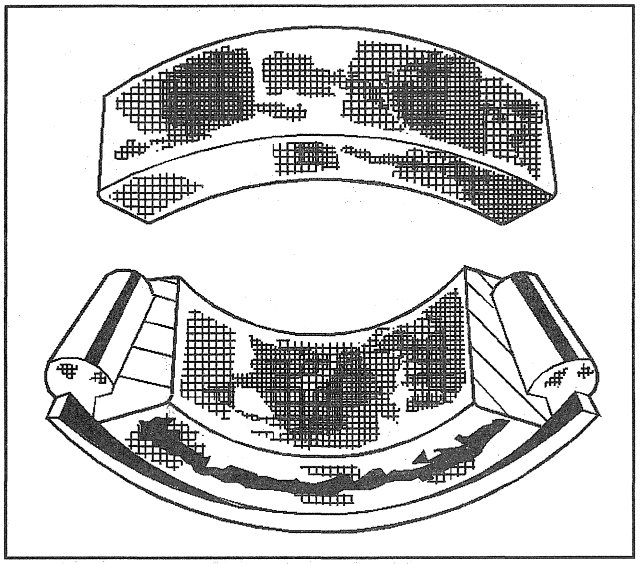


1458

The surface depressions on the race and the rollers are caused by hard particles of foreign matter.

1. Clean all the parts and the housings.
2. Check the seals.
3. Replace rough or noisy bearings.

Frettage



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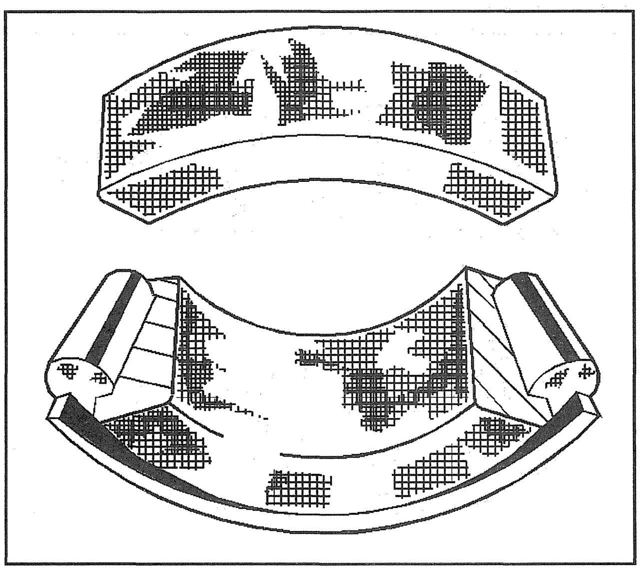
The corrosion caused by small relative movement of parts with no lubrication.

1. Replace the bearing.
2. Clean the related parts.
3. Check the seals.
4. Check for proper lubrication.

Smears



1460

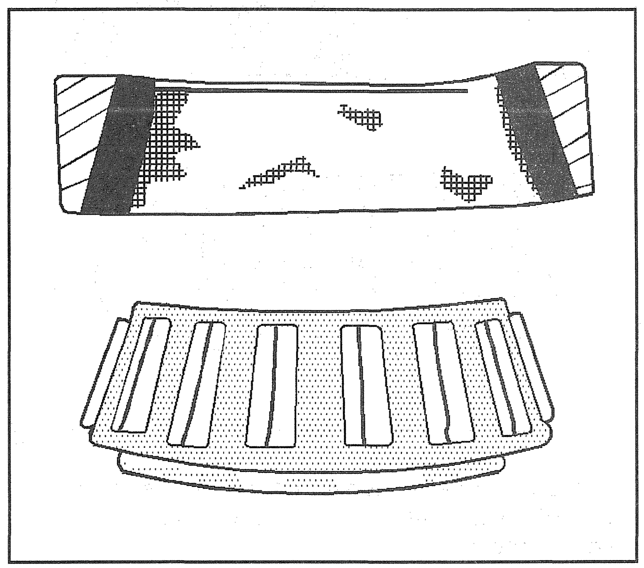
The smearing of the metal is due to slippage. Slippage can be caused by the following factors:

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

If this condition occurs, perform the following:

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

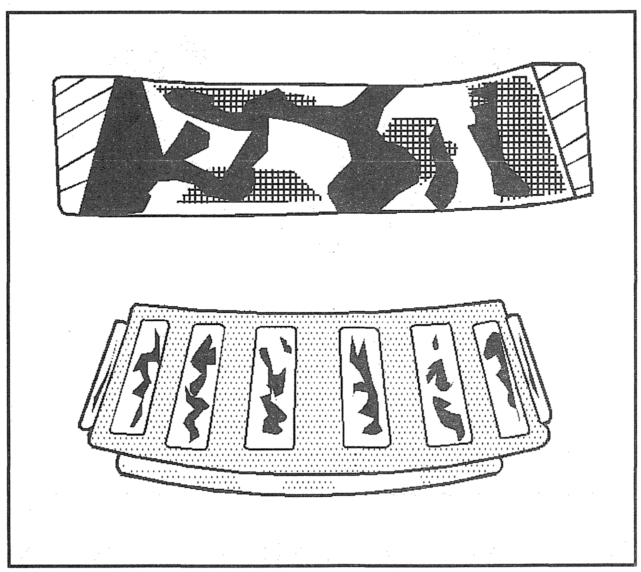
Stain Discoloration



1461

The discoloration on the bearings is caused by incorrect lubrication or moisture and ranges in color from light brown to black. Reuse the bearing if you can remove the stains with light polishing and there is no evidence of overheating. Check the seals and the related parts for damage.

Heat Discoloration



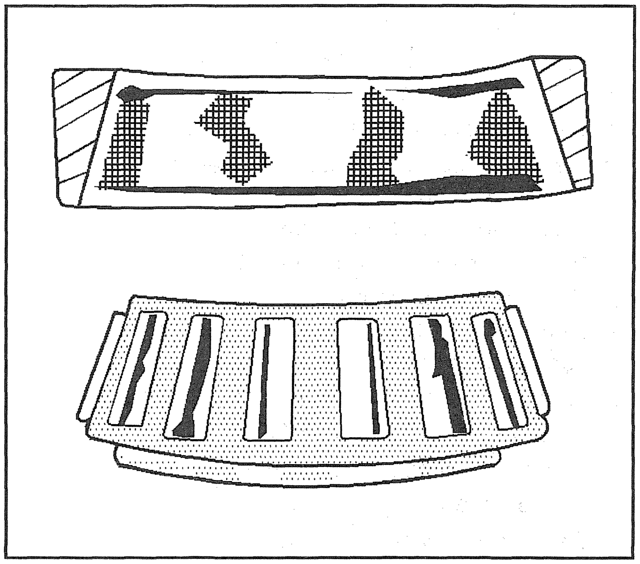
1462

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

If overheating damage is indicated, perform the following:

1. Replace the bearings.
2. Check the seals and the other related parts.

Misalignment

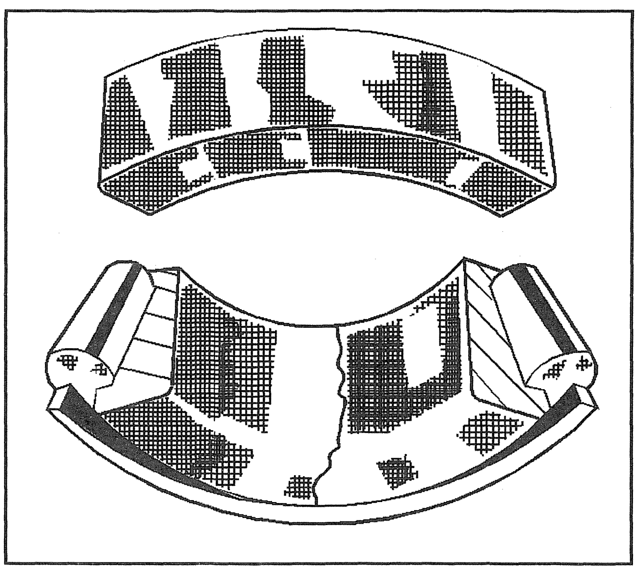


1463

The outer race is misaligned due to a foreign object.

1. Clean the related parts.
2. Replace the bearing.
3. Ensure the races are properly sealed.

Cracked Inner Race

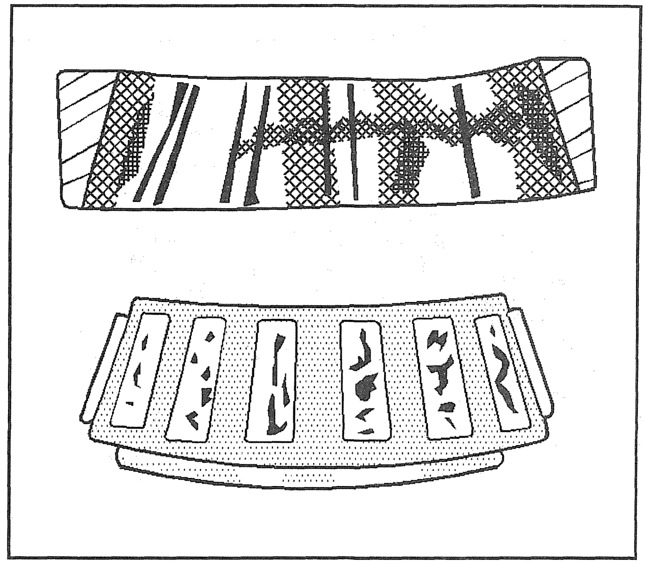


1464

The race is cracked due to improper fit, cocking, or poor bearing seats.

1. Replace the bearing.
2. Correct bearing seats.

Fatigue Spalling

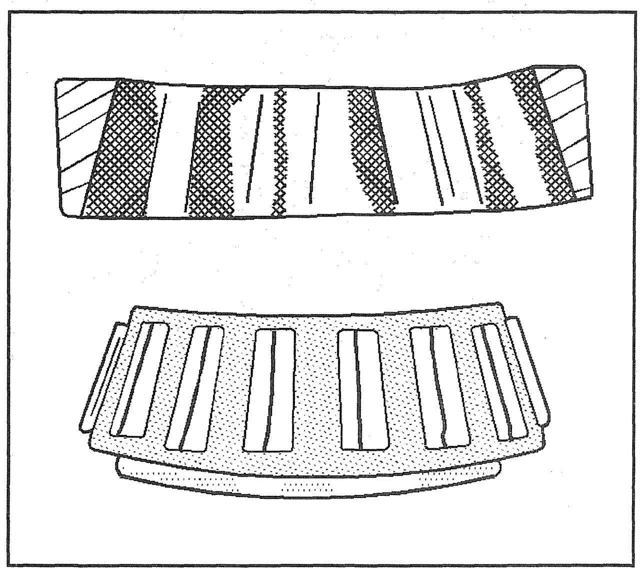


1465

The surface is flaked with metal due to bearing fatigue.

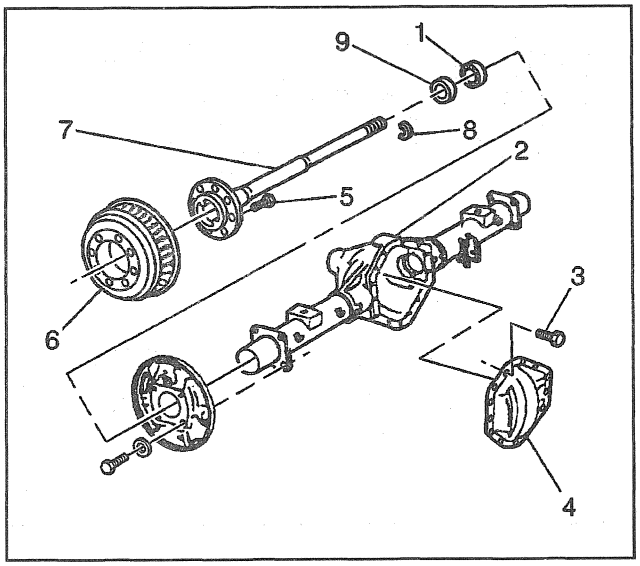
1. Replace the bearing.
2. Clean all related parts.

Brinelling



1466

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



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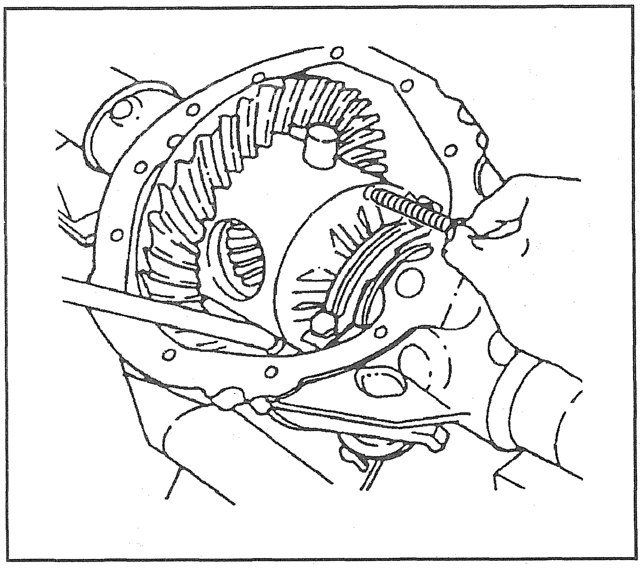
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Repair Instructions

Oil Seal and/or Bearing Replacement

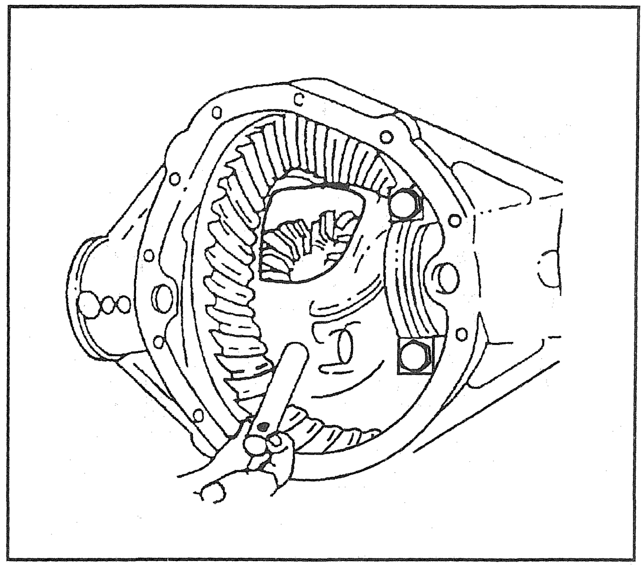
Removal Procedure

Tools Required

- *J 2619-01* Driver Handle.
- *J 23690* Axle Shaft Bearing Installer.
- *J 29709* Axle Shaft Bearing Installer
- *J 21128* Axle Shaft and Pinion Seal Installer.
- *J 29713* Axle Shaft Bearing Installer (9½ in ring gear)

1. Raise the vehicle on a hoist.
2. Remove the wheel and tire assembly.
3. Remove the brake drum (6).
4. Clean the dirt from the carrier cover (4) and surrounding area.
5. Remove the carrier cover bolts (3) and clips.
6. Remove the carrier cover (4) from the housing (2).
   - Catch the oil in a drain pan
   - Remove any gasket material
7. Remove the screw.

8. On axles without a locking differential, remove the pinion shaft.



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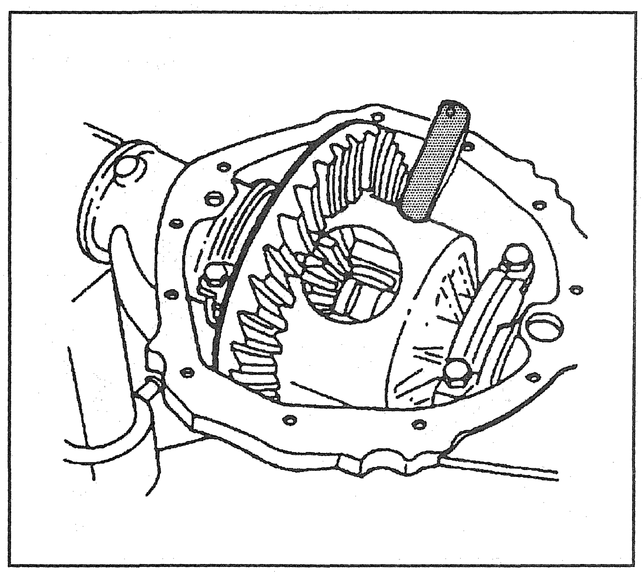
9. On axles with a locking differential, remove the shaft part way, and rotate the case until the pinion shaft touches the housing.



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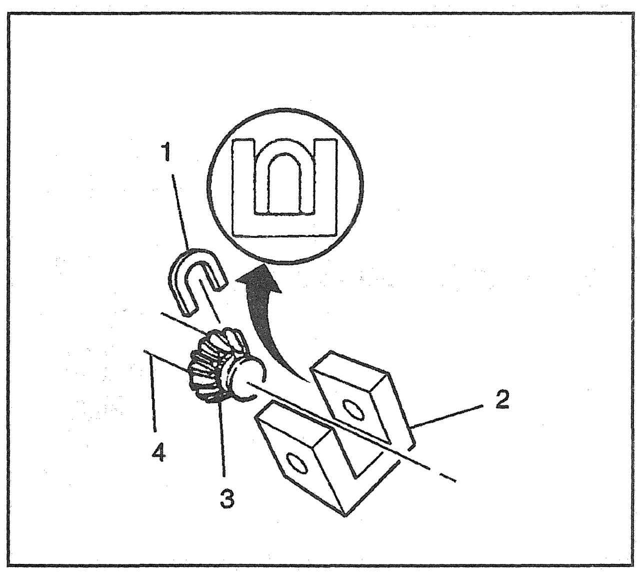
10. On axles with a locking differential, use a screwdriver or similar tool to enter the differential case and rotate the lock (1) until it aligns with the thrust block (2).



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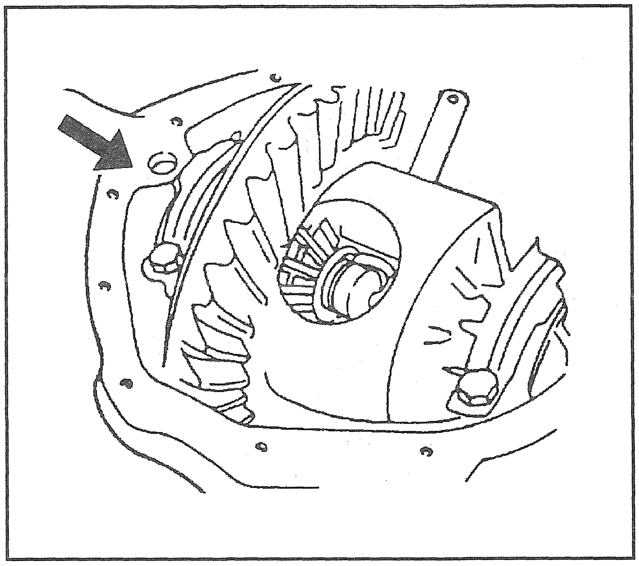

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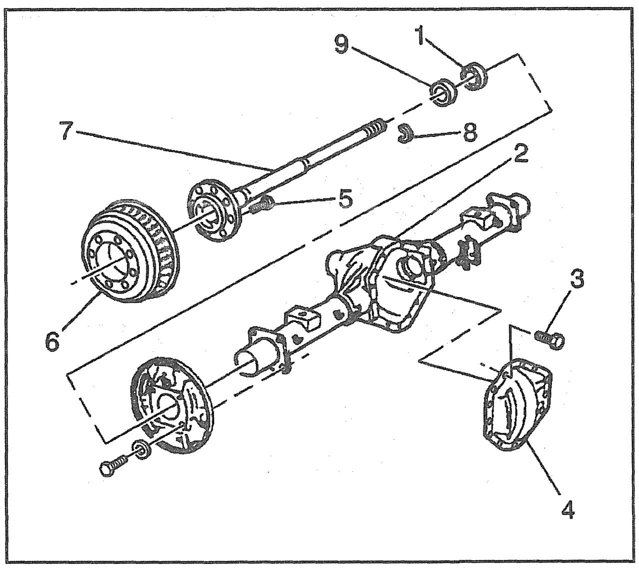
11. Push the flange of the axle shaft toward the differential. Refer to *Shaft Damage* in General Information.
12. Remove the lock from the button end of the axle shaft.



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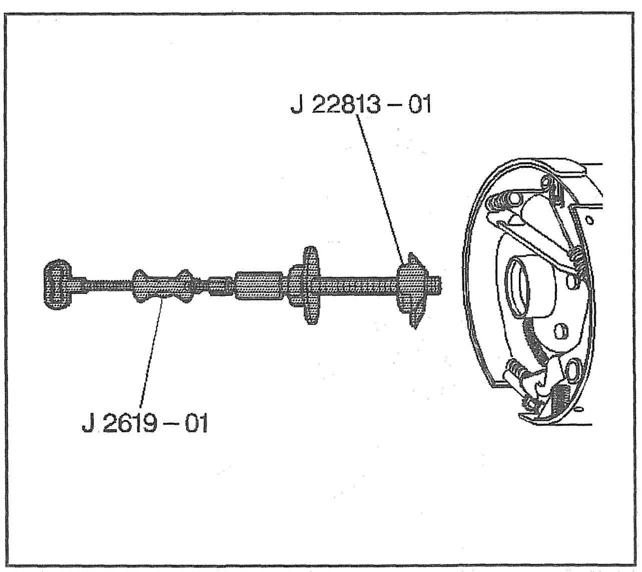
Important: Carefully slide the axle shaft (7) out in order not to damage the seal (9).

13. Remove the axle shaft (7) from the housing (2).
14. Use the *J 23689* to remove the seal (9).
15. Use the *J 23689* for 8½ and 8⅝ inch ring gear axles or the *J 29712* for 9½ inch ring gear axles to pull the bearing (1) from the housing (2).

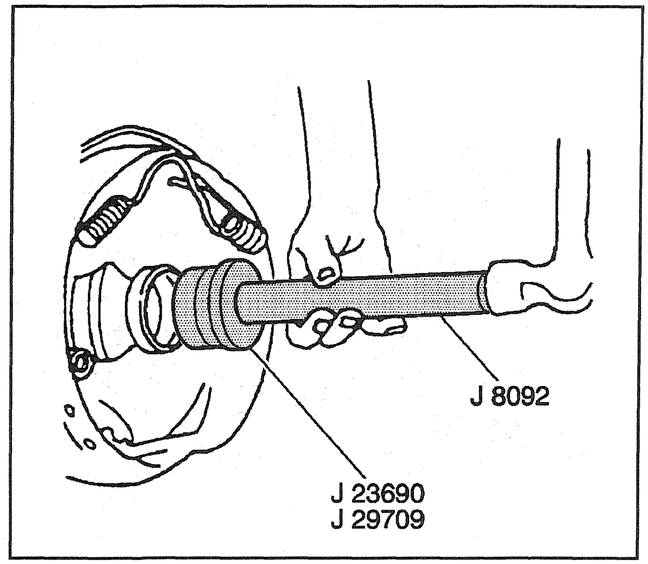


1477

16. Insert the tool into the axle bore so that it grasps behind the bearing.
17. Tighten the nut and washer against the face of the bearing.
18. Pull the bearing out using the *J 2619-01*.
19. Inspect all parts. Replace as necessary.

Installation Procedure

1. Lubricate the axle cavity between the seal lips and the bearing with wheel bearing lubricant. Refer to *Lubrication Specifications* in Maintenance and Lubrication.
2. Install the bearing using the *J 23690* for 8½ and 8⅝ in ring gear axles and the *J 29709* for 9½ in ring gear axles.
3. Drive the bearing into the axle housing until the tool bottoms against the tube.



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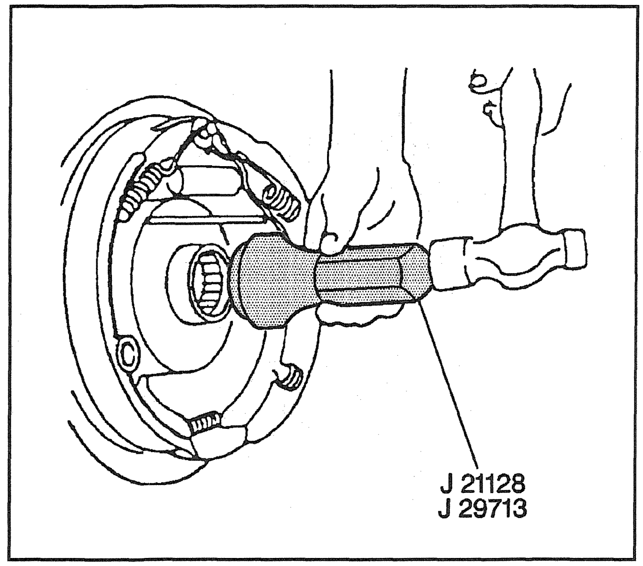
4. Install the seal using the *J 21128* for 8½ and 8⅝ in ring gear axles and the *J 29713* for 9½ in ring gear axles.
5. Drive the tool into the bore until the seal bottoms flush with the tube.



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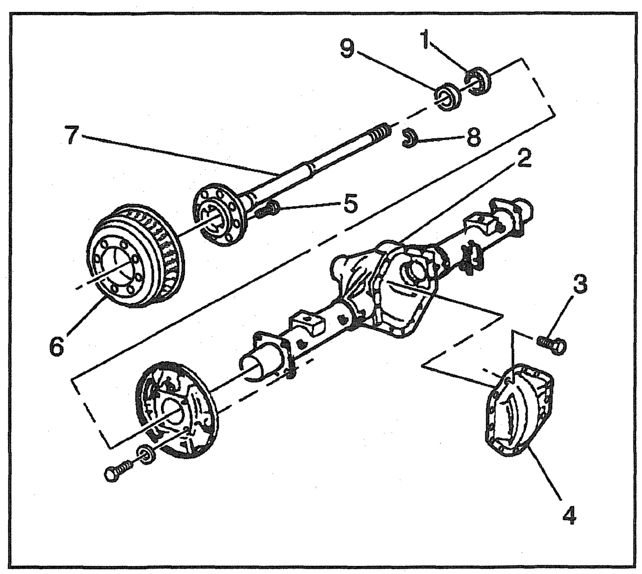
Important: Carefully insert the axle shaft (7) in order not to damage the seal (9).

6. Install the axle shaft (7) into the housing (2).
7. Slide the axle shaft (7) into place allowing the splines to engage the differential side gear.
8. On axles without a locking differential, place the lock (8) on the button end of the axle shaft (7).



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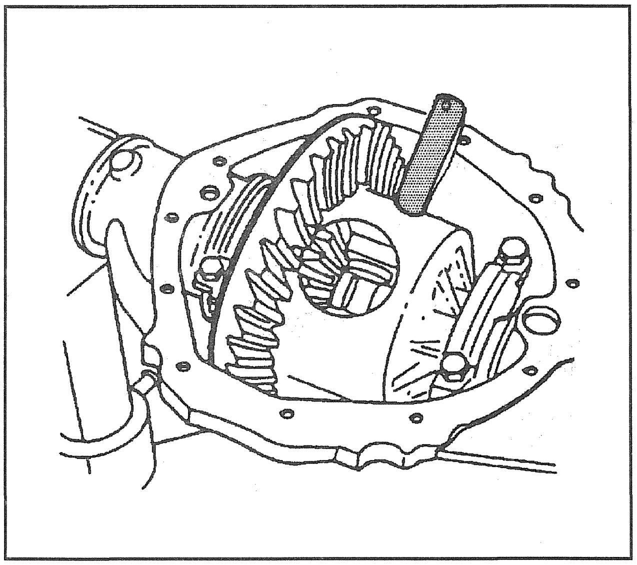

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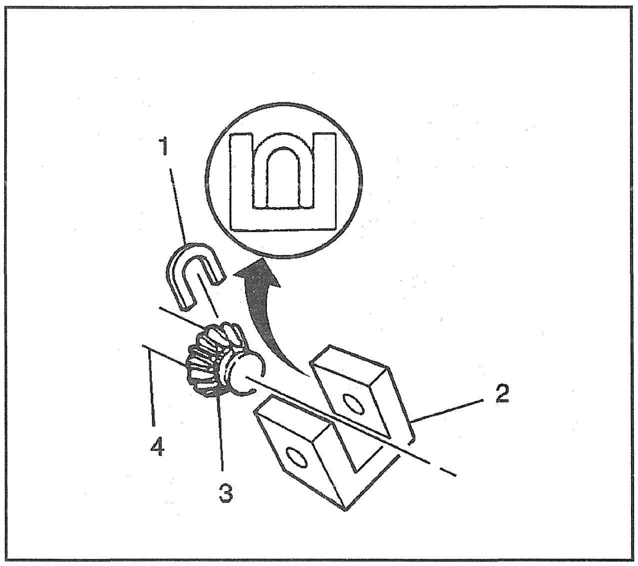
9. On axles with a locking differential, keep the pinion shaft partially withdrawn.



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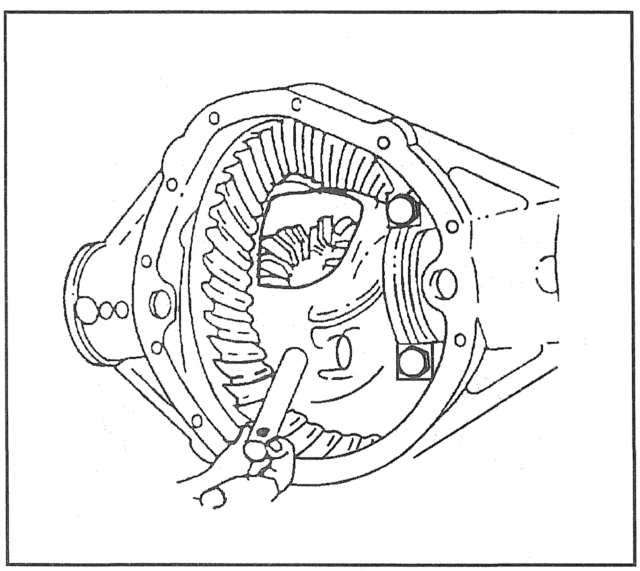
10. On axles with a locking differential, place the lock (1) on the axle shaft (3) so that the ends are flush with the thrust block (2).
11. Pull the shaft flange outward in order to seat the lock in the differential side gear.



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Important: Anytime a differential pinion shaft locking screw is removed, coat the screw threads with Loctite 242 before reinstalling. The screw has an adhesive coating in order to prevent the screw from loosening in the case. Removing the screw removes the adhesive on the screw.

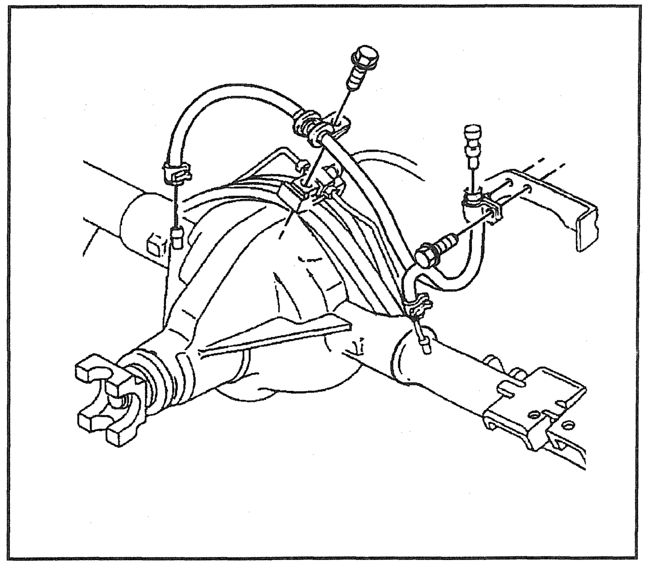
12. Align the hole in the pinion shaft with the screw hole in the differential case.

13. Install the screw

    Tighten

    Tighten the screw to 3.4 N·m (25 lb ft).

Notice: Refer to *Fastener Notice* in Caution and Notices.

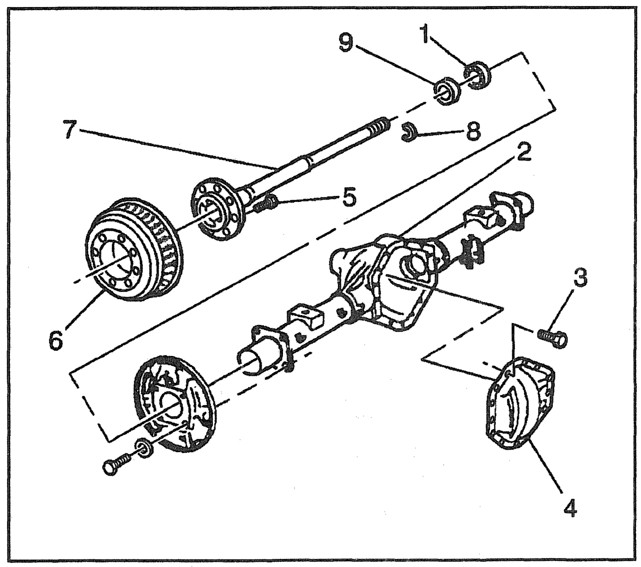


156407

14. Install the carrier cover gasket or RTV (if used).
15. Install the carrier cover (4).
16. Install the carrier cover bolts (3) and clips.

    Tighten

    Tighten the bolts (3) in a crosswise pattern to 27 N·m (20 lb ft).
17. Install the brake drum (6).
18. Install the wheel and tire assembly.
19. Lower the vehicle.
20. Fill the housing with axle lubricant to the filler plug hole level. Refer to Refer to *Lubrication Specifications* in Maintenance and Lubrication.



159446

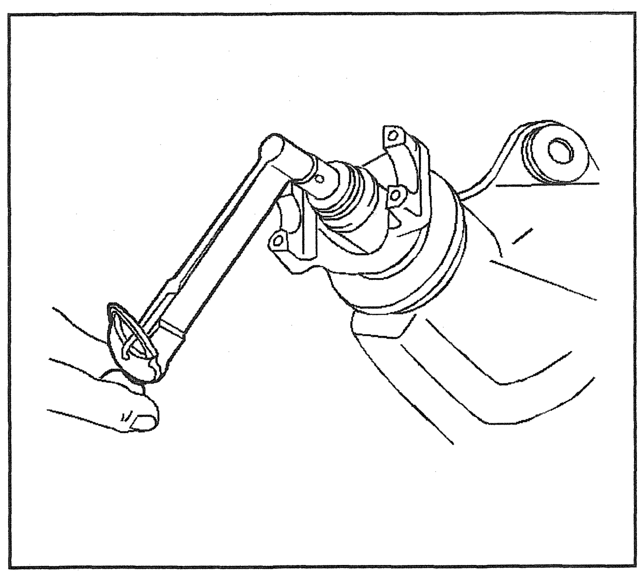
Pinion Oil Seal Replacement (Semi-Floating Axle)

Removal Procedure

Tools Required

- *J 5853-B* Torque Wrench
- *J 8614-O1* Companion Flange Holder/Remover
- *J 22388* Pinion Oil Seal Installer (9½ in ring gear axle)
- *J 22836* Pinion Oil Seal Installer (8½ and 8⅝ in ring gear axles)
- *J 22804-1* Pinion Oil Seal Spacer

The pinion oil seal and the companion flange may be replaced with the carrier assembly installed in the vehicle.

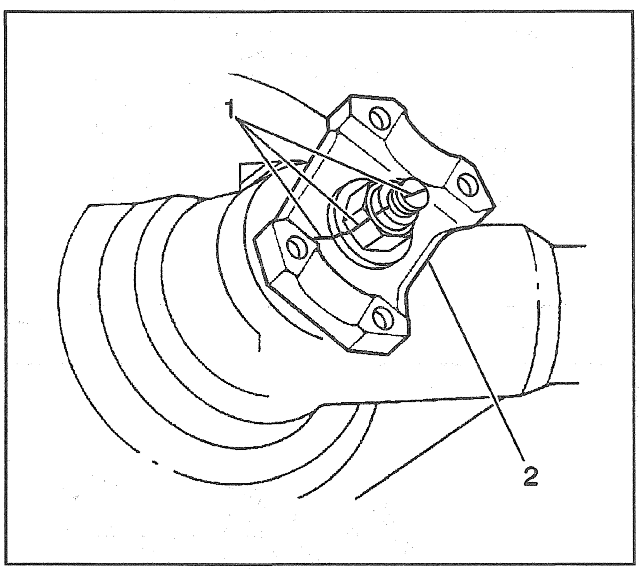


1497

1. Raise the vehicle on a hoist and support the vehicle with safety stands.
2. Remove the rear wheels and brake drums.

Important: Observe and accurately mark the positions of all driveline components relative to the propeller shaft and axles prior to disassembly. These components include the propeller shaft, drive axles, pinion flanges, output shafts, etc. Reassemble all components in the exact relationship the components had to each other during removal. Follow specifications and torque values. Follow any measurements made prior to disassembly.

3. Accurately marked the installed position of the rear propeller shaft.
4. Remove the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece*.
   - Use a piece of tape in order to hold the bearing caps
   - Secure the propeller shaft so that the propeller shaft is out of the way
   - Do not put unnecessary stress on the universal joints in securing the propeller shaft
5. Use a *J 5853-B* in order to measure the torque required to turn the pinion.
6. Record the torque measurement, which gives the combined pinion bearing, seal, carrier bearing, axle bearing and seal preload.
7. Make an accurate alignment mark (1) on the pinion stem, pinion flange nut, and pinion flange (2).
8. Record the number of exposed threads on the pinion stem.



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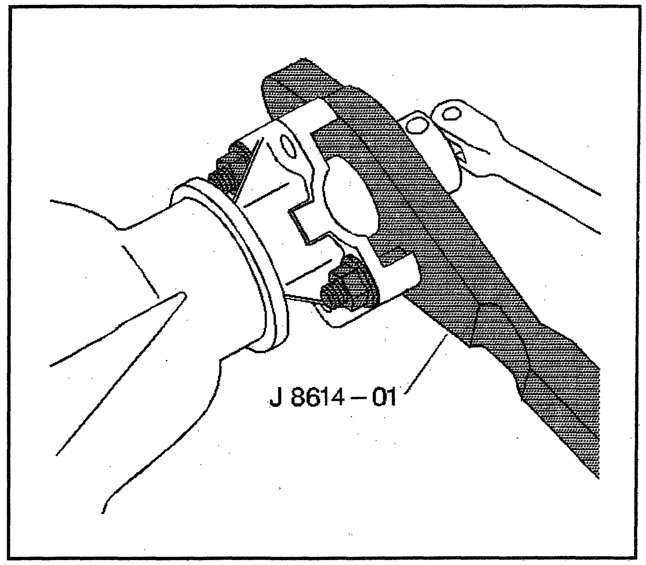
9. Hold the pinion flange with the *J 8614-O1*.
10. Remove the pinion flange nut and washer.
11. Use a container to catch any lubricant.
12. Remove the pinion flange using the *J 8614-O1* with the remover attachment.

Important: Avoid damaging the machined surfaces.

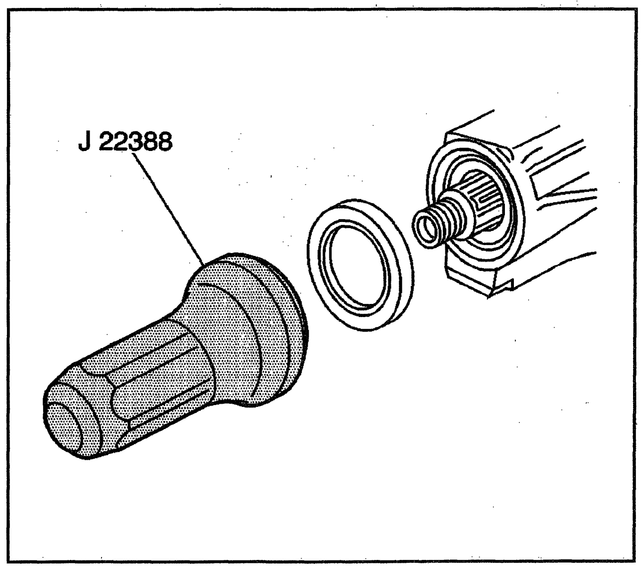
13. Pry the oil seal from the bore.
14. Thoroughly clean any foreign material from the contact area.
15. Replace any parts as necessary.



1496

Installation Procedure

1. Install the oil seal into the bore using the *J 22804-1* and either the *J 22388* (9½ in ring gear axles) or the *J 22836* (8½ and 8⅝ in ring gear axles).
2. Turn the *J 22804-1* from the installed position 180 degrees to ensure proper installation against the pinion flange.
3. Lubricate the cavity between the new seal lips with a high melting point lubricant for bearings.



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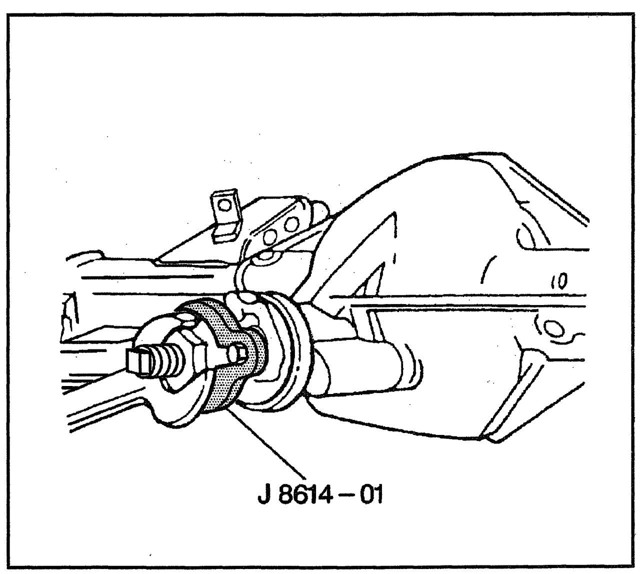
Important: Do not hammer the pinion flange onto the pinion stem.

4. Install the pinion flange using the *J 8614-O1*.



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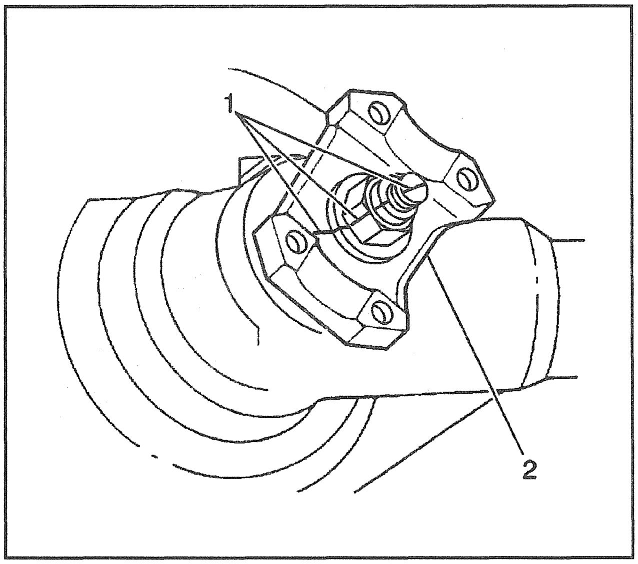

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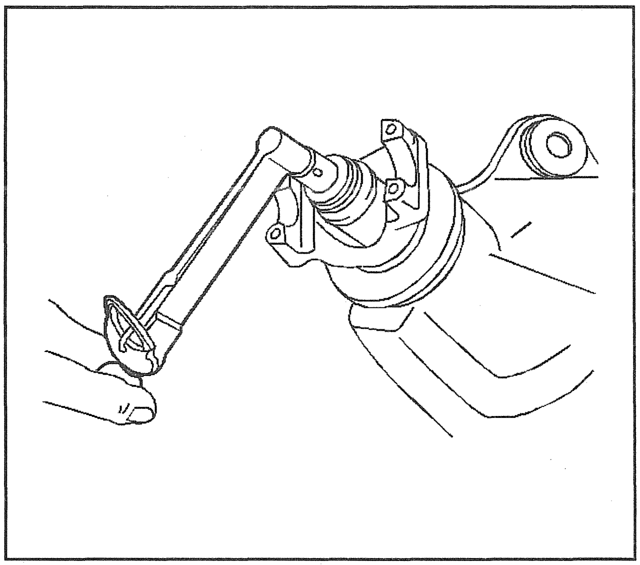
5. Use the alignment marks (1) in the installation of the pinion flange (2).
6. Install a washer and a new nut.

   Tighten

   Tighten the nut on the pinion stem as close as possible to the alignment marks without going past the mark.

Notice: Refer to *Fastener Notice* in Caution and Notices.

- Use the record of the alignment marks and the thread count as a reference.
- Tighten the nut a little at a time and turn the pinion flange several times after each tightening in order to set the rollers.



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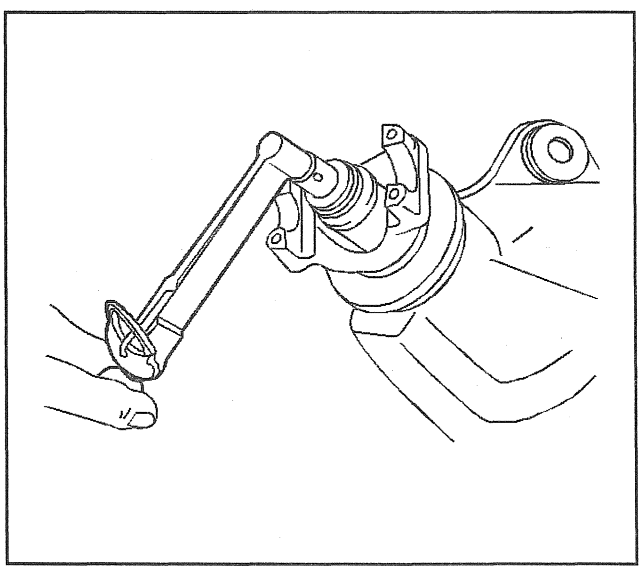
Important: If the preload torque value recorded earlier was less than 3 lb in, reset the torque specification to 3–5 lb in.

7. Measure the torque required to rotate the pinion using the *J 5853-B*.
8. Compare the measurement of the torque with the measurement made during the removal procedure.
9. Continue tightening and measuring a little at a time until the preload is achieved.
10. Install the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece*.
11. Install the retainers and bolts.

    Tighten

    Tighten the bolts to 20 N·m (15 lb ft).
12. Install the rear wheels and brake drums.
13. Lubricate the rear axle as necessary.



1497

Pinion Oil Seal Replacement (10 1/2 Inch Ring Gear)

Removal Procedure

Tools Required

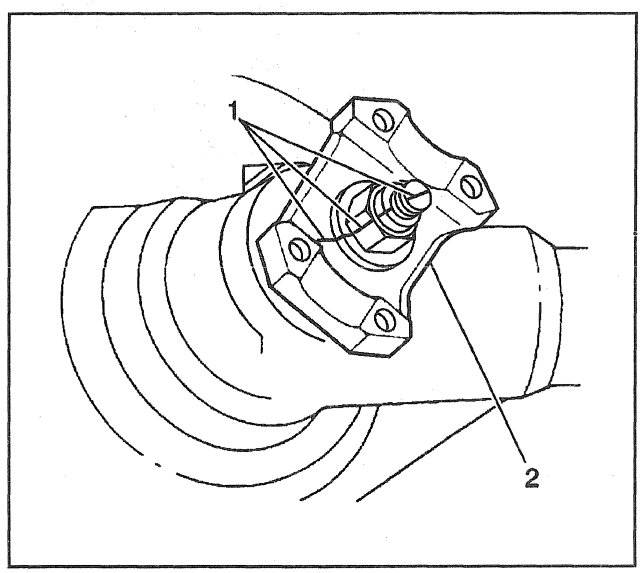
- *J 8614-O1* Companion Flange Holder/Remover
- *J 24384* Pinion Oil Seal Installer
- *J 5853-B* Torque Wrench

The pinion oil seal and the companion flange may be replaced with the carrier assembly installed in the vehicle.

1. Raise the vehicle on a hoist and support with safety stands.

Important: Observe and mark the positions of all driveline components relative to the propeller shaft and axles prior to disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. All components must be reassembled in the exact relationship to each as the components had prior to disassembly. Follow all specifications and torque values, as well as any measurements made prior to disassembly.

2. Mark the installed position of the rear propeller shaft.
3. Disconnect the propeller shaft. Refer to *Propeller Shaft Replacement (One-Piece)* or *Propeller Shaft Replacement - Two-Piece*.
   - Use a piece to tape in order to hold the bearing caps
   - Secure the propeller shaft up and out of the way in a manner that does not put unnecessary stress on the universal joints
4. Measure the amount of torque required to turn the pinion using the *J 5853-B*.
   - Record the torque measurement for reassembly
   - The measurement give the combined pinion bearing, seal, and carrier bearing preload.
5. Make an alignment mark (1) on the pinion stem, pinion flange (2), and pinion flange nut.
6. Record the number of exposed threads on the pinion stem for a reference.



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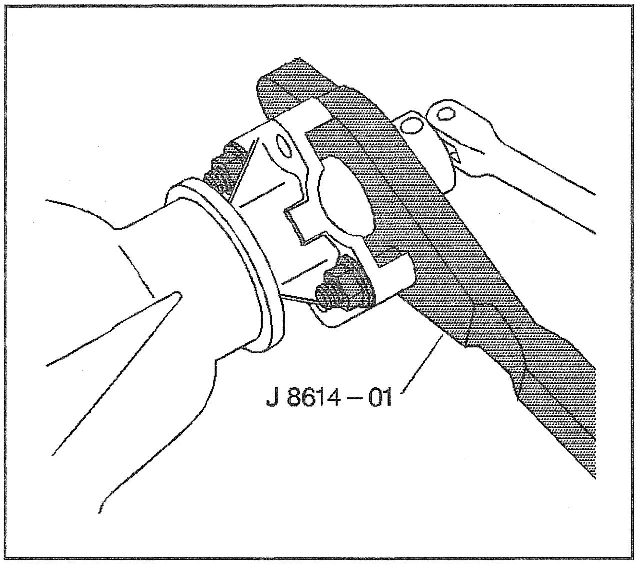
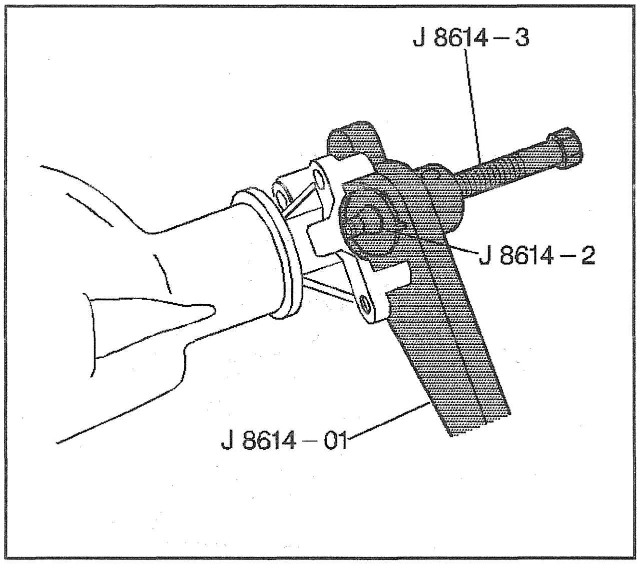


1496

7. Hold the pinion flange with the *J 8614-O1*.
8. Remove the pinion flange nut and washer.

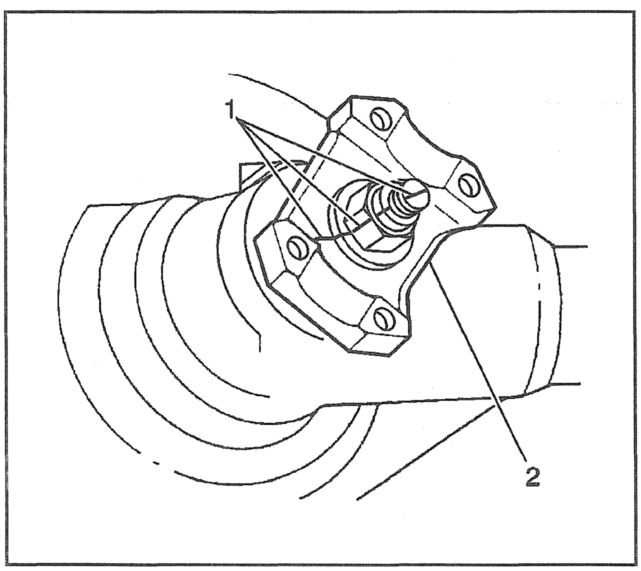


1494

9. Remove the pinion flange using the *J 8614-O1*.
10. Use a container to catch any lubricant.

Important: Do not damage the machined surfaces

11. Pry the oil seal from the bore.
12. Thoroughly clean foreign material from the contact area
13. Replace parts as necessary.



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Installation Procedure

Tools Required

- *J 8614-O1* Companion Flange Holder/Remover
- *J 24384* Pinion Oil Seal Installer
- *J 5853-B* Torque Wrench

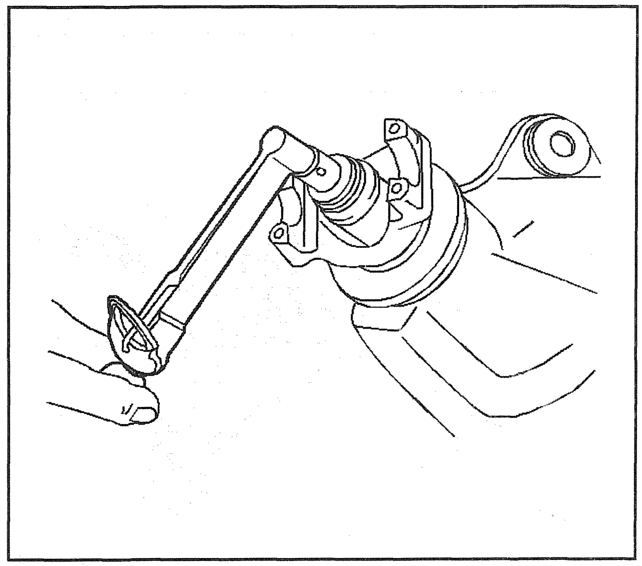
Notice: Use the correct fastener in the correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

1. Lubricate the cavity between the lips of the new seal with a high melting point lubricant.
2. Install the oil seal into the bore using the *J 24384*.

Important: Do not hammer the pinion flange (2) onto the pinion stem.

3. Install the pinion flange using the alignment marks (1) as a reference
4. Install the washer and a new pinion nut.
   - Tighten the pinion nut on the pinion stem as close to the alignment mark (1) as possible without going past the mark
   - Use the alignment mark and the thread count as a reference
   - Tighten the nut a little at a time and turn the pinion flange (2) several times after each tightening in order to set the rollers

Important: If the recorded preload torque value was less than 3 lb in, reset the torque specification to 3–5 lb in.



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5. Measure the torque required to rotate the pinion.
   - Compare the rotating torque with the recorded value
   - Continue tightening the pinion nut and measuring the torque until the recorded value is achieved
6. Align the propeller shaft with the alignment marks.
7. Connect the propeller shaft. Refer to *Propeller Shaft Replacement (One-Piece)* or *Propeller Shaft Replacement - Two-Piece.*
8. Install the retainers and bolts.

   Tighten

   Tighten the bolts to 20 N·m (15 lb ft).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

9. Add lubricant to the rear axle as necessary. Refer to Refer to *Fluid and Lubricant Recommendations* in Maintenance and Lubrication.

Pinion Oil Seal Replacement (11 Inch Ring Gear)

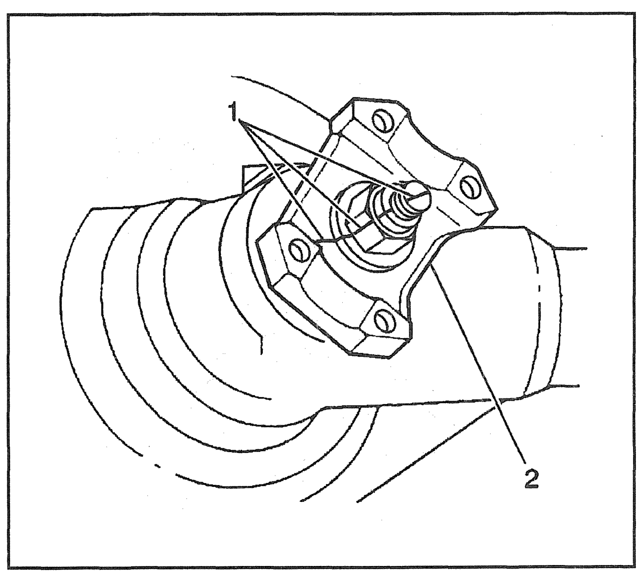
Removal Procedure

Tools Required

- *J 8614-O1* Pinion Flange Holder/Remover
- *J 24384* Pinion Oil Seal Installer

The pinion oil seal and the pinion flange may be replaced with the carrier assembly installed in the vehicle.

1. Raise the vehicle.
2. Disconnect the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece.*
3. Make an alignment mark (1) on the pinion stem, pinion nut and pinion flange (2) for use as an installation guide.



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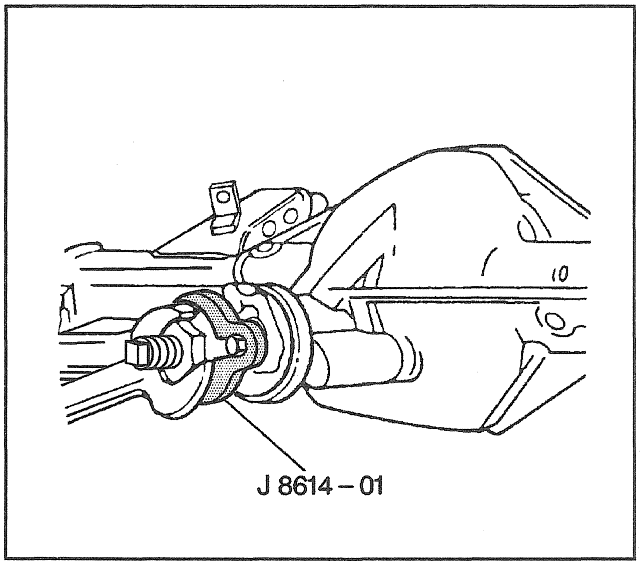

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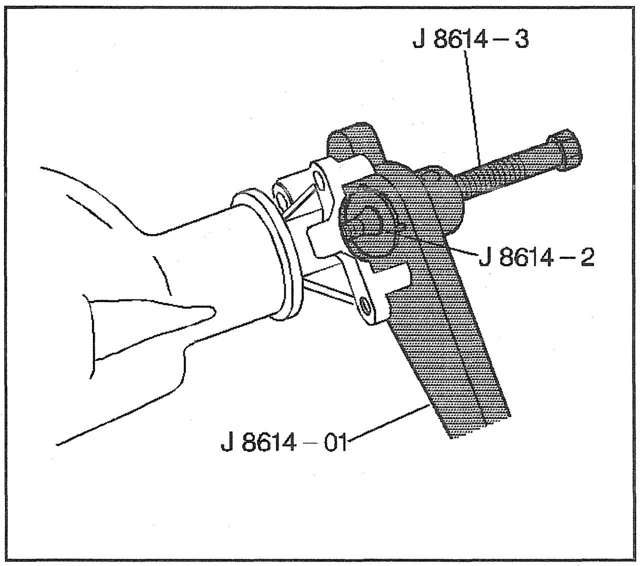
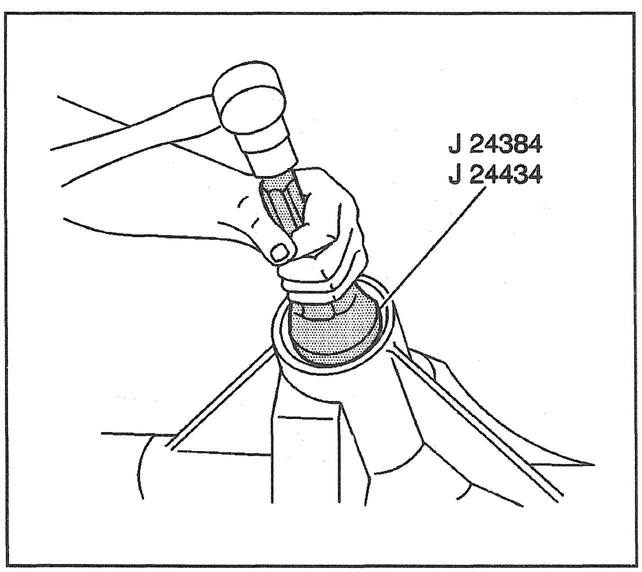
4. Remove the pinion nut using *J 8614-01*.



1494

5. Remove the flange using *J 8614-01* with the special nut and forcing screw.
6. Pry the oil seal from the bore.
   - Do not damage the machined surfaces
   - Clean any foreign material from the contact area
7. Inspect the following
   - The oil seal mating surfaces for any burrs which may cause seal failure
   - Flange deflector for any abnormality such as cracking or distortion
8. Replace parts as necessary.



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Installation Procedure

Tools Required

- *J 8614-01* Pinion Flange Holder/Remover
- *J 24384* Pinion Oil Seal Installer

1. Lubricate the inside diameter of the new oil seal with extreme pressure lubricant such as GM P/N 9985038.
2. Install the oil seal into the bore using the *J 24384*.

Important: Do not coat the bearing.

3. Pack the cavity between the pinion stem, pinion flange and pinion nut with a non-hardening sealer such as Permatex® Type A or the equivalent.

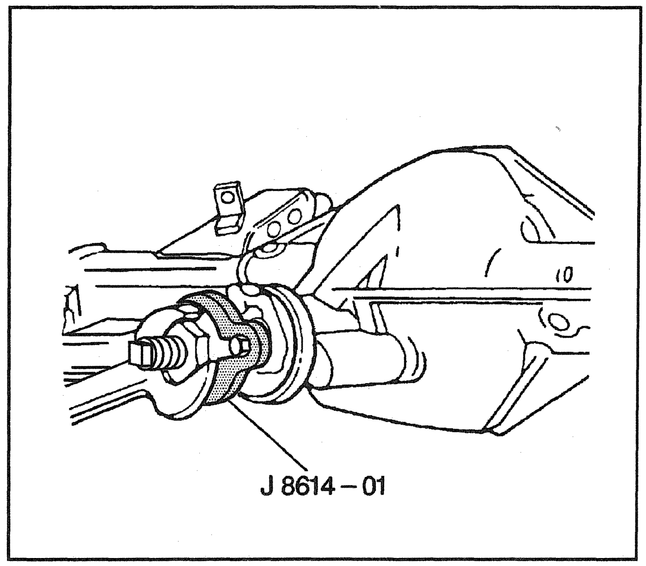
4. Install the pinion flange using the *J 8614-O1* and use the alignment marks as a guide.
5. Install the pinion nut using the *J 8614-O1* and use the alignment marks as a guide.

   Tighten

   Tighten the pinion nut to 596–678 N·m (440–550 lb ft).

Notice: Refer to *Fastener Notice* in Caution and notices.

6. Install the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece.*

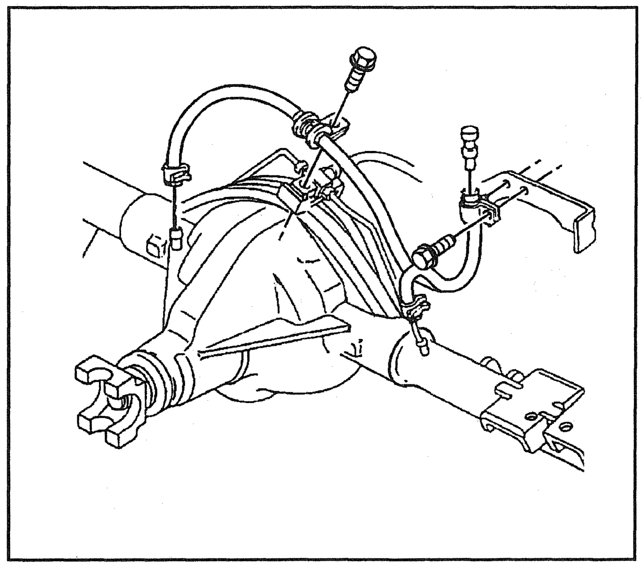


156437

Vent Hose Replacement

Removal Procedure

The axle vent hose is located on the axle carrier on 8½, 8⅝, and 9½ in ring gear axles.



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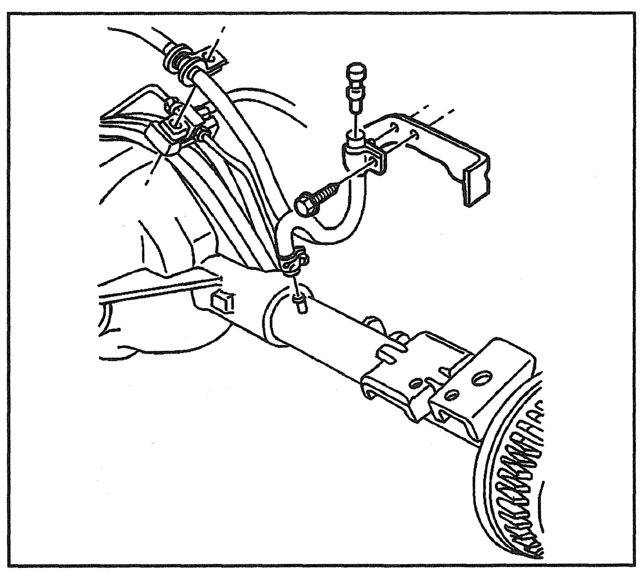
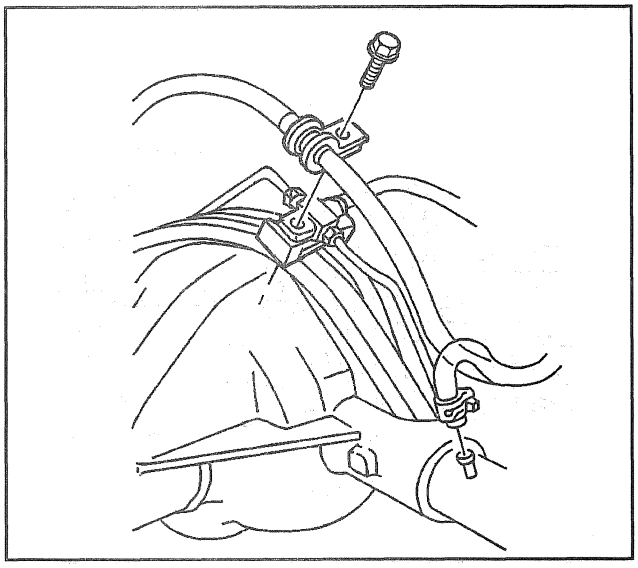
1. Remove the vent clamp bolt from the brake bracket.
2. Remove the vent clamp from the brake bracket.
3. Remove the vent assembly from the vent hose.
4. Remove the vent clamp from the vent hose.



157127



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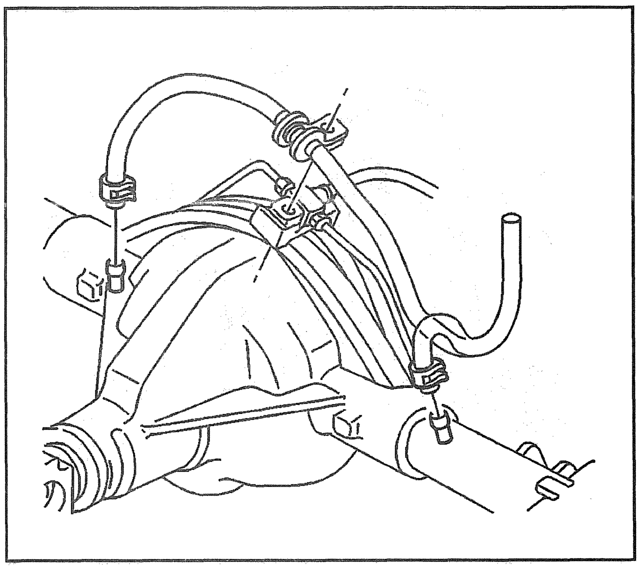
5. Remove the vent clamp bolt from the vent hose clamp and brake junction block.



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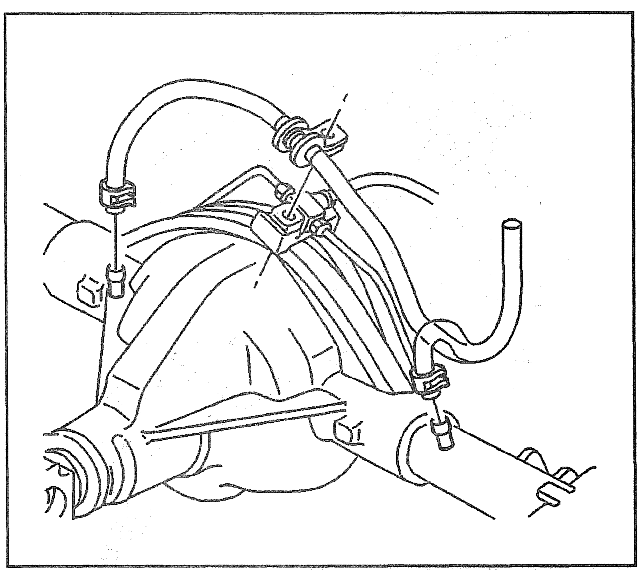
6. Remove the vent hose clamps and vent hose from the axle nipples.
7. Remove the vent hose clamps from the vent hose.

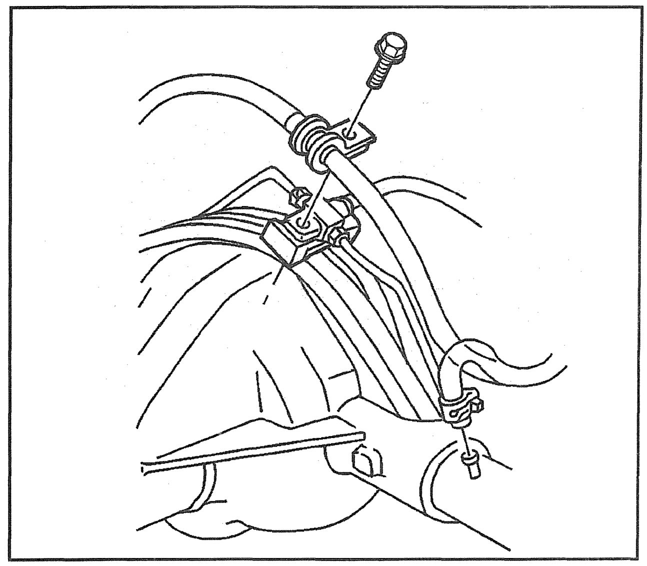


157129

Installation Procedure

1. Connect vent hose clamps to the vent hose.
2. Connect the vent hose clamps and the vent hose to the axle nipples.

3. Install the vent hose clamp bolt to the vent hose clamp and the brake junction block.



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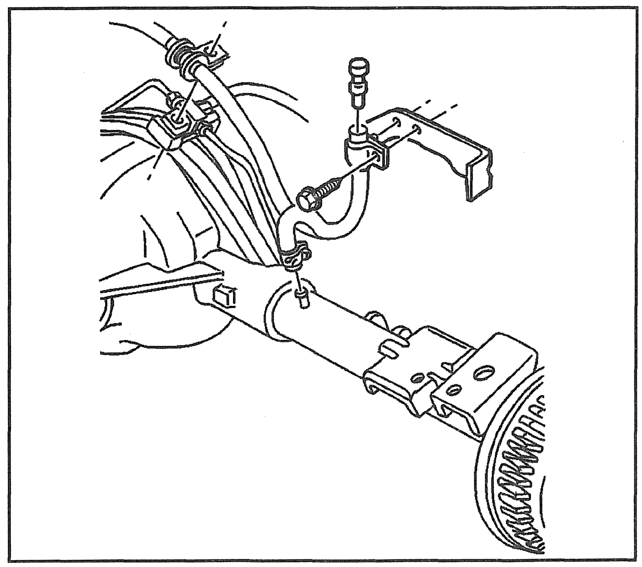
4. Connect the vent hose clamp to the vent hose.
5. Install the vent assembly to the vent hose.
6. Connect the vent hose clamp to the brake bracket.
7. Install the vent hose clamp bolt to the vent hose clamp and the brake bracket.



157127

Inspection Before Disassembly

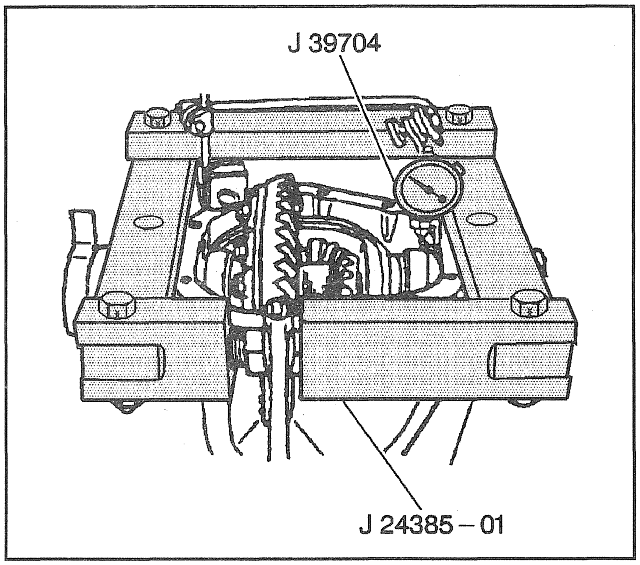
1. Remove the cover and drain the oil.

Important: Use this information in the diagnosis of an axle problem. Information on ring gear backlash also helps in setting shim packs for locating and preloading the differential case.

2. Check the ring gear backlash. Refer to *Backlash Adjustment*.

Important: If possible, determine the cause the axle problem before disassembly of the axle.

3. Inspect the case for metal chips and shavings. Determine where the chips and shavings came from, such as a broken gear or bearing cage.



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Drive Axle Disassemble

Removal Procedure

Tools Required

- *J 8107-2* Side Bearing Puller Plug
- *J 8614-O1* Pinion Flange Holder
- *J 24385-01* Differential Housing Spreader
- *J 29721* Differential Side Bearing Remover
- *J 29721-70* Side Bearing Adapters
- *J 39330* Bearing Race Remover
- *J 39331* Outer Bearing Race Remover
- *J 39704* Dial Indicator
- *J 39709* Universal Handle

1. Place the axle in a suitable support.
2. Remove the bolts from the cover and the cover. This will drain the oil.
3. Pull the axle shafts out of the axle housing to the point where the axle shafts are clear of the differential case.
4. Remove the bearing cap bolts.

Important: Corresponding letters are stamped on the bearing caps and axle housing. The bearing caps must be reassembled exactly as removed.

5. Remove the bearing caps.
6. Assemble the *J 24385-01* to the differential housing.

Notice: You may use the older style gage set if you already have them. The new style gages use the bearings as part of the gage system, while the older style uses a master block that acts as a master bearing.

7. Assemble the *J 39704*.
8. Preset the gage to a minimum of 5 mm (0.200 in). Rotate the indicator housing to zero on the dial.

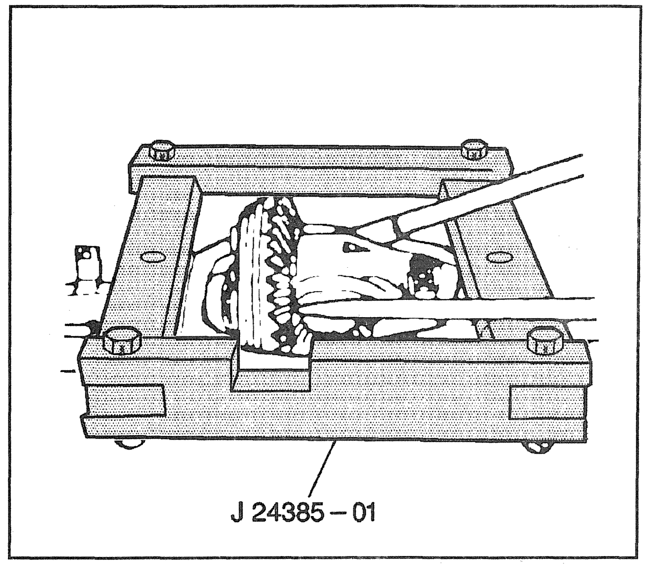
Notice: Do not spread the axle housing more than 0.38 mm (0.015 inch). Overspreading the housing may result in component damage.

9. Spread the housing while examining the *J 39704*.

10. Remove the case from the housing using two pry bars.
11. Remove the *J 24385-01* from the housing.

Important: Mark the bearing cups left and right and place each bearing cup with the corresponding proper bearing cap.

12. Remove the bearing caps.



168049

Important: Mark the bearings left and right and place each bearings with the corresponding set of bearing cap and cup.

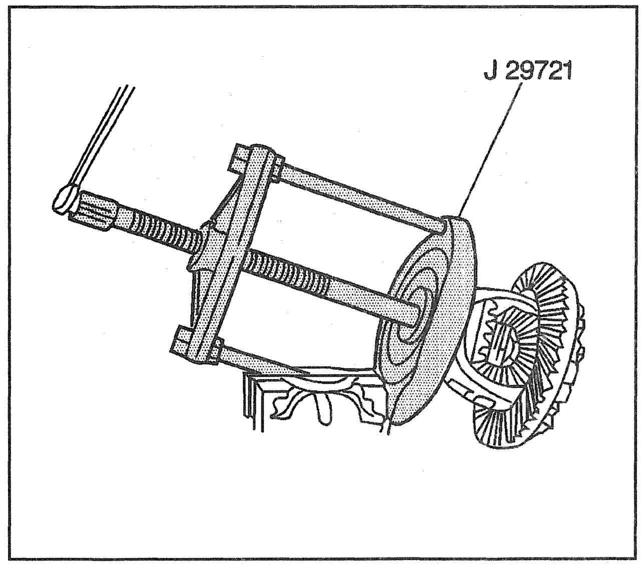
13. Remove the bearings using the *J 8107-2 J 29721* and *J 29721-70*

Important: Mark the shims left or right.

14. Remove the shims.
15. Check the outboard spacers for damage such as bends or deep groves caused by worn bearings. Replace any damaged spacers at the time of assembly.
16. Place towels over the jaws of the vice. Place the differential case in the vice

Important: Replace the ring gear bolts with new ones at the time of assembly.

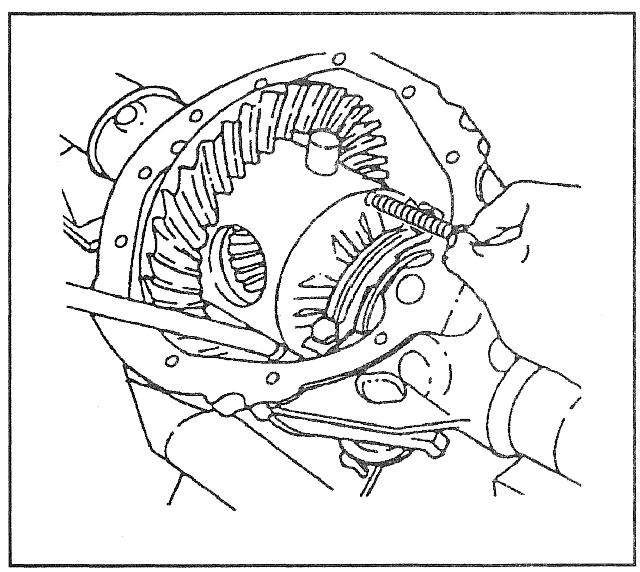
17. Remove the ring gear bolts. Discard the ring gear bolts.



168046

Notice: Do not pry the ring gear from the case. This will damage the ring gear and differential case.

18. Remove the lock pin screw.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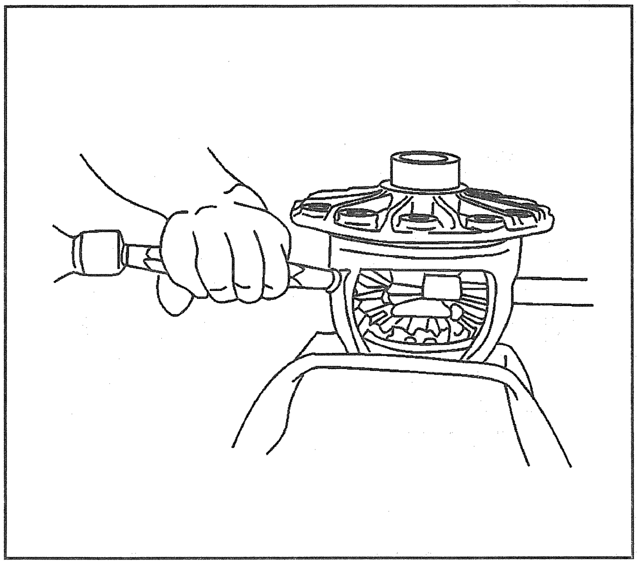

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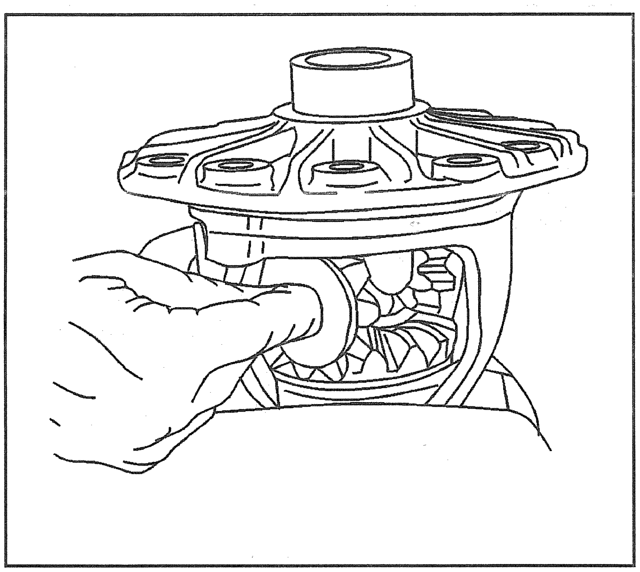
19. Remove the pinion shaft using a hammer and brass drift.



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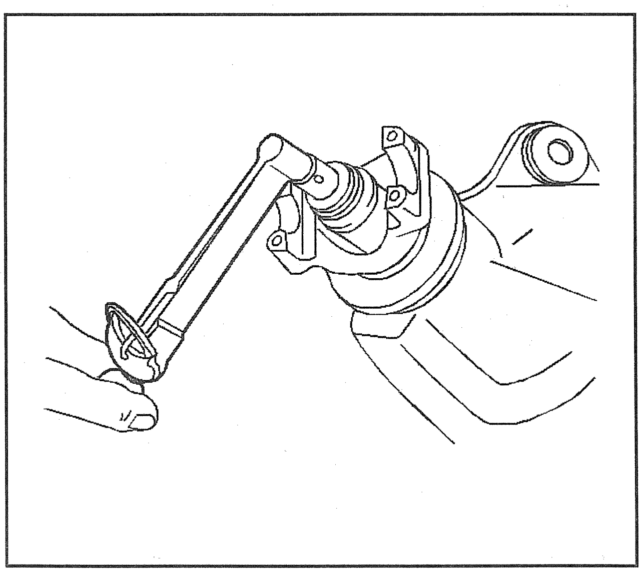
20. Rotate the side gears until the pinion gears are in the opening of the case. Remove the pinion gears and thrust washers.

Important: Mark the side gears and thrust washers left and right

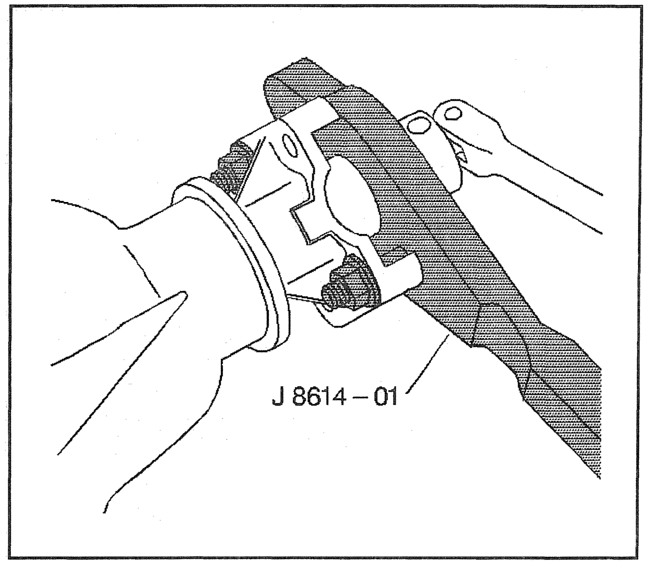
21. Remove the side gears and thrust washers.
22. Replace the cover using two bolts in order to keep the pinion from falling.



1497

23. Measure the drive pinion rotating torque. Record the measurement.
24. Check for looseness of the pinion assembly by moving the assembly back and forth. Looseness indicates excessive bearing or pinion wear.

25. Remove the pinion nut and washer using the *J 8614-O1* in order to hold the pinion.



1496

26. Remove the pinion flange using the *J 8614-O1*.
27. Use a soft-faced hammer to tap the pinion in order to remove the pinion from the pinion bore.
28. Remove the cover and the pinion from the vehicle.

Important: Keep the shims together

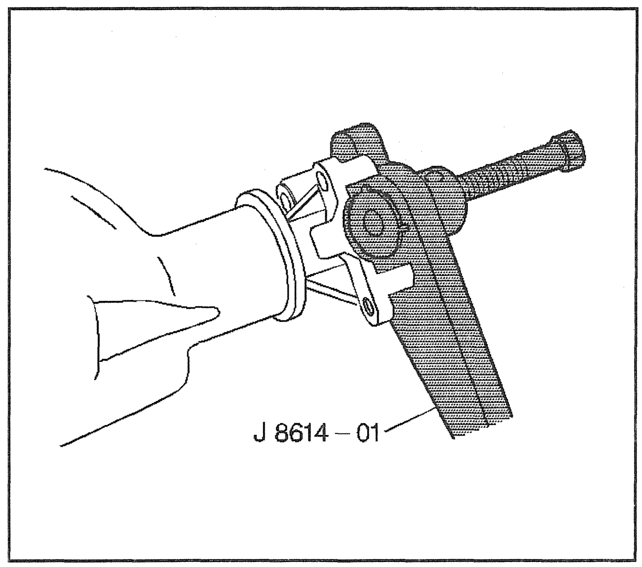
29. Remove the pinion preload shims.
30. Remove the pinion seal.
31. Remove the outer bearing and oil slinger.
32. Remove the pinion outer bearing cups from the axle using *J 39330*.

Important: Keep the shims together.

33. Remove the pinion outer adjusting shims and baffle, if used.
34. Remove the pinion inner bearing cup using the *J 39331*.

Important: Keep the shims together

35. Remove the pinion outer adjusting shims and baffle, if used.



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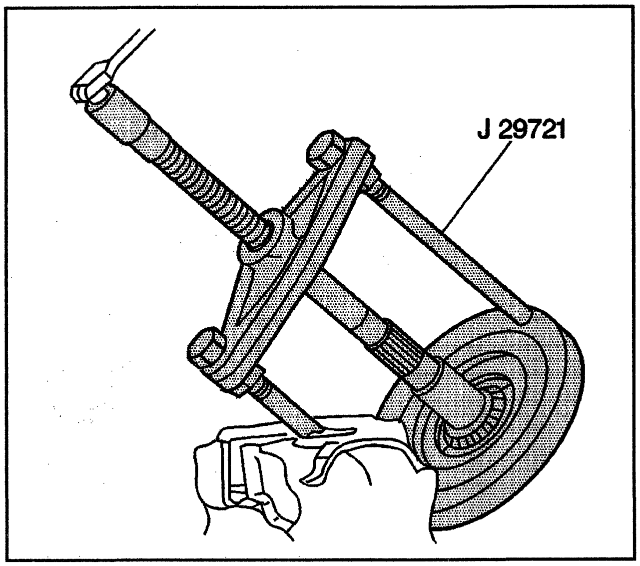


168059

36. Remove the pinion inner bearing using the *J 29721* and the *J 29721-70*.

Axle Housing Inspection

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

- Inspect for nicks or burrs that could prevent the outer diameter of the pinion seal from sealing. Remove any burrs.
- Inspect the bearing cup bores for nicks or burrs. Remove any burrs that are found.
- Inspect the housing for cracks. Replace the housing if any cracks are found.
- Inspect the housing for foreign material such as metal chips, dirt, or rust.

Differential Inspection

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

- Inspect the pinion gear shaft for unusual wear.
- Inspect the pinion gear and side gear teeth for wear, cracks, scoring, and spalling.
- Inspect the thrust washers for wear.
- Inspect the fit of the side gears in the differential case.
- Inspect the fit of the side gears on the axle shafts.
- Inspect the differential case for cracks and scoring.
- Inspect all parts for wear. Replace parts as necessary.

Pinion and Ring Gear Inspection

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

Important: Ring and pinion gears are matched sets and both are replaced any time a replacement of either is necessary.

- Inspect the pinion and ring gear teeth for cracking, chipping, scoring, and excessive wear.
- Inspect the pinion gear splines for wear.
- Inspect the pinion flange splines for wear.
- Inspect the fit of the pinion gear splines on the pinion flange.
- Inspect the sealing surface of the pinion flange for nicks, burrs, or rough tool marks that could cause damage to the inside diameter of the seal and result in an oil leak.
- Replace all worn or broken parts.

Bearings Inspection

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

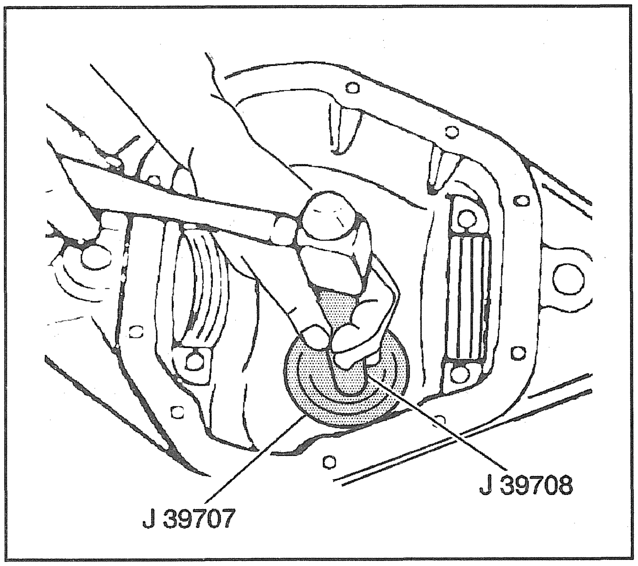
Important: Bearings and cups are matched sets. Replace both bearing and cup when either part requires replacement.

- Oil the bearings. Inspect the bearings for smooth rotation.
- Inspect the bearing rollers for wear.
- Inspect the bearing cups for wear, cracks, brinelling, and scoring.

Shims Inspection

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

Inspect shims for cracks and chips. Replace damaged shims with a service shim of an equal size.



168086

Pinion Depth Adjustment

Tools Required

- *J 7818* Rear Pinion Bearing Cup Installer
- *J 8092* Driver Handle
- J 39701 Master Discs
- *J 39702* Arbor
- *J 39704* Dial Indicator
- *J 39707* Cup Installer
- J 39708 Handle
- J 41689 Pinion Height Block
- J 41690 Master Pinion Block
- J 41691 Adapter Cone
- J 41692 Threaded Rod

1. Clean the carrier bores and all tools. Make sure the pinion bore is free of nicks and dirt.

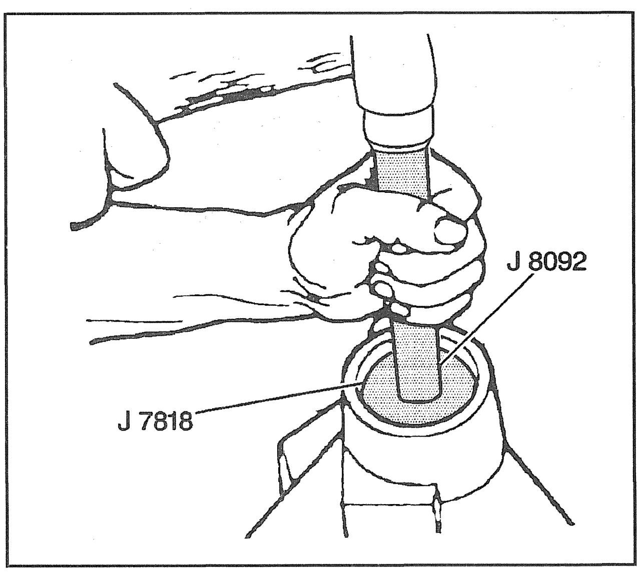
Important: Make sure the cup is seated.

2. Drive the inner bearing cup into the axle assembly using the J 39708 and *J 39707*

Pinion Depth Adjustment

Pinion Marking	Distance Between Ring Gear Marking And Pinion Head	Shim Pack
Positive (+)	Must Increase	Decrease
Negative (-)	Must Decrease	Increase
Zero (0)	OK	Use Nominal Setting

3. Drive the outer bearing cup into the axle assembly using the *J 7818* and *J 8092*.
4. Install the inner bearing cone into the inner bearing cup.

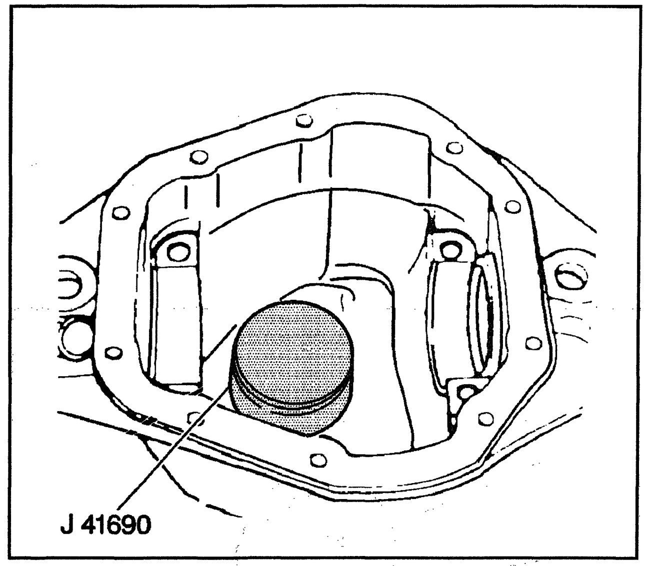


168079

Notice: You may use the older style gage set if you already have them. The new style gages use the bearings as part of the gage system, while the older style uses a master block that acts as a master bearing.

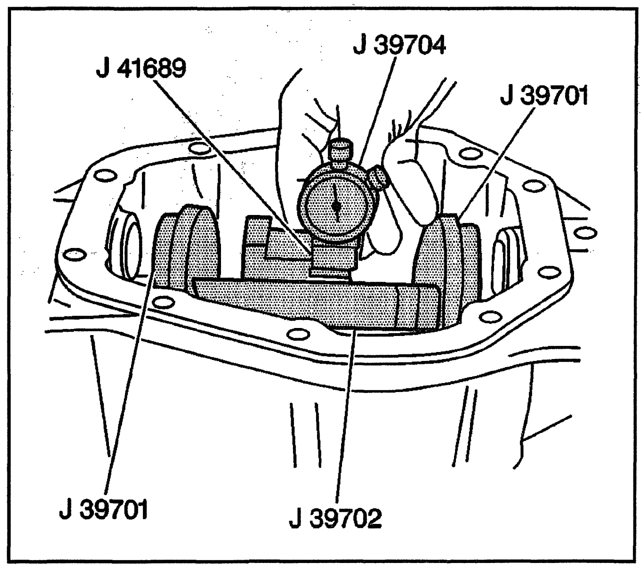
Important: Install the outer bearing cone with the J 41691.

5. Assemble the J 41690 and J 41689 into the carrier housing using the J 41691 and J 41692.
6. Tighten the cone by hand until all end play is removed from the gage assembly.
7. Assemble the *J 39702* and J 39701 into the carrier housing.



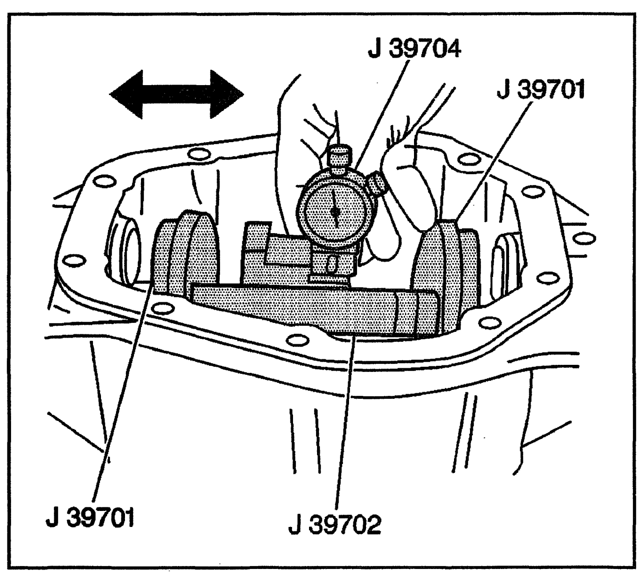
168083

8. Place the *J 39704* on the upper step of the J 41689.
   - Apply pressure to the block of the *J 39704*, pushing down on the J 41689.
   - While applying pressure, set the *J 39704* at zero.



168399

9. Slide the *J 39704* over the *J 39702*.
10. Record the reading at the point of greatest deflection, when the needle of the *J 39704* is centered between movement to the left and right.
    - This reading determines the amount of shims needed for a nominal pinion setting.
    - The pinion marking may change the pinion depth by adding or deleting shims.
    - Refer to the pinion marking table.

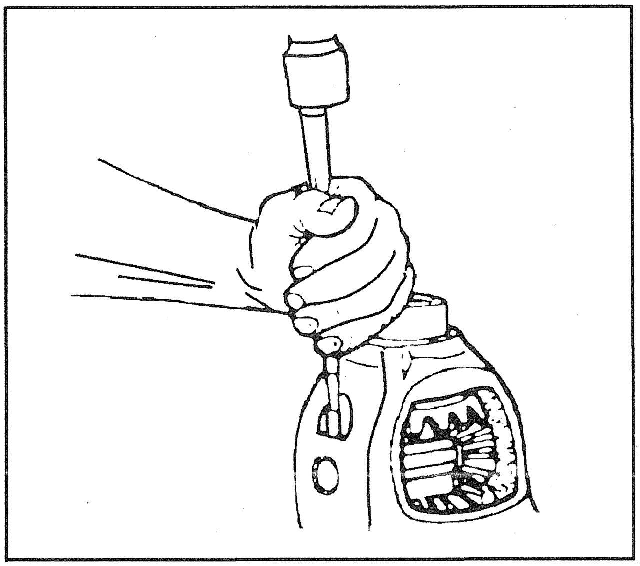


168401

11. After determining the pinion marking, remove the *J 39704*,*J 39702*, J 41689, J 41692, J 41691, and J 41690.

Important: If a baffle or oil slinger is used, measure the baffle or oil slinger. Include this measurement in the shim pack.

12. Measure with a micrometer each shim separately. Add the dimensions in order to obtain the total shim pack thickness.



168067

Differential Case Assembly

Tools Required

- *J 24385-01* Differential Case Spreader
- *J 39705* Master Differential Bearings

1. Lubricate all parts with an axle lubricant.
2. Install new thrust washers to the side gears.

Important: Install the side gears to the same side that the side gears were on when removed.

3. Install the side gears to the differential case.
4. Install the pinion gears to the differential without the thrust washers.
   4.1. Install the pinion gears to the side gears so that the holes in the pinion gears are 180 degrees apart.
   4.2. Rotate the pinion gears into place. Verify that the pinion gears line up with the pinion shaft holes.
5. Rotate the pinion gears toward the differential opening in order to allow enough space for the pinion thrust washers to slide in.
6. Install the pinion shaft.
7. Align the roll pin holes in the differential case and the pinion shaft.
8. Install the roll pin.
   8.1. Peen metal from the case over the lock pin in two places that are 180 degrees apart.
   8.2. Make sure the mating surfaces of the differential case and the ring gear are clean and free of burrs.
9. Align the holes in the differential case and the holes in the ring gear. Press the ring gear onto the case.

Important: Tighten the ring gear bolt in stages in order to gradually pull the ring gear onto the differential case.

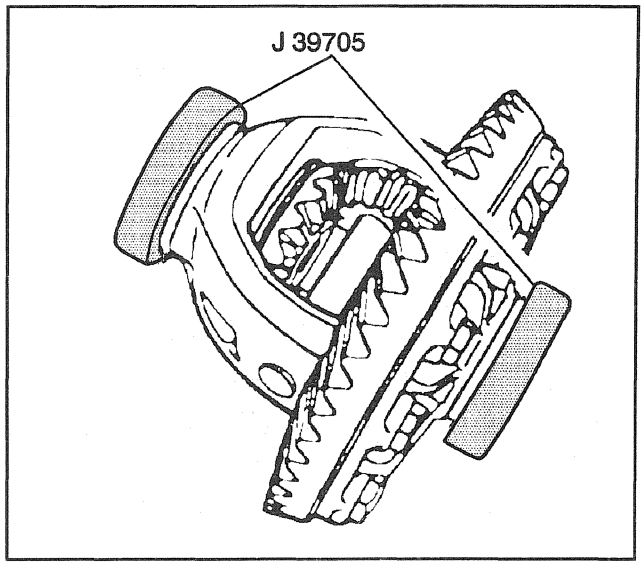
Notice: Refer to *Fastener Notice* in Cautions and Notices.

10. Install new ring gear bolts.

    Tighten

    Tighten the ring gear bolts in sequence to 298 N·m (220 lb ft).

11. Install the *J 39705* to the differential.
    - Refer to *Determining Total Shim Pack Size* in this section.
    - Put the outboard spacers in place, if outboard spacers are used.



168068

Determining Total Shim Pack Size

Tools Required

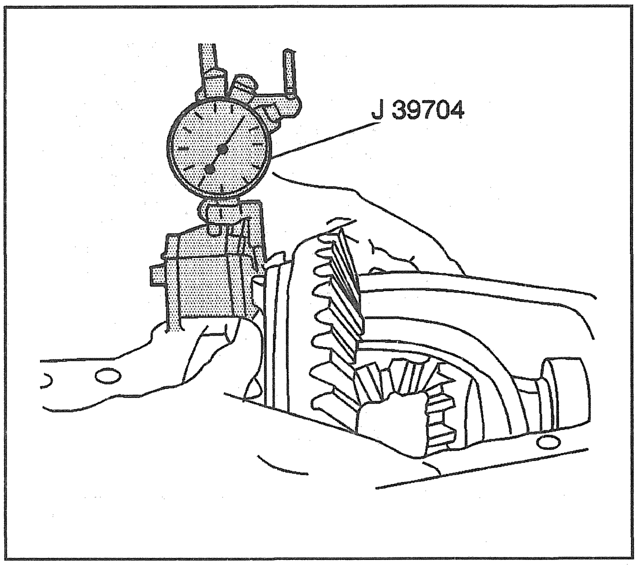
J 39704 Dial Indicator

Notice: Both methods for setting differential bearing preload and gear backlash are described. All Model 80 axle assemblies can be serviced by using the outboard selective shim method.

Notice: If the original axle assembly has the outboard selective shims, it should not be serviced using the inboard shims for preload/backlash adjustment.
In other words, if you have outboard selective shims, you must stay with that method. If the axle assembly uses in board shims and outboard spacers (non-selective), you may use the outboard selective shim method for service.

Notice: If your axle assembly has selective outboard spacers and one 0.76 mm (0.030 inch) shim (each side) between the differential case and bearing cone. Make your measurements with the outboard spacers removed, but with the 0.76 mm (0.030 inch) shim assembled on the differential case trunion placed between the case and the master differential bearings. The selective outboard spacers are available in sizes (thickness) from 5.18 mm (0.2040 inch) to 6.10 mm (0.2400 inch), in 0.08 mm (0.003 inch) increments. The dial indicator should have the capability of making measurements up to 12.7 mm (0.500 inch).

Notice: If your axle assembly has outboard spacers, but controls the preload and backlash by using selective shims (each side) between the differential case and bearing cone. Make the measurements with the outboard spacers installed in the housing, but do not place any shims on the differential case hubs between the case and master differential bearings. The selective shims placed between the bearing cone and differential case are available in 0.08, 0.13, 0.25, 0.76 mm (0.003, 0.005, 0.010, 0.030 inch) sizes.
The dial indicator should have the capability of making measurements up to 3.81 mm (0.150 inch).



168076

1. Assemble the case to the axle housing. The pinion must not be installed.
2. Mount the *J 39704* on the ring gear bolt side of the differential housing.
3. Force the differential assembly as far as possible in the direction of the *J 39704*.
4. Preload the *J 39704* one half of its travel.
5. Place the tip of the *J 39704* on a flat surface of the differential next to a ring gear bolt.
6. Mark with chalk the location of the tip of the *J 39704*.
7. Zero the dial indicator.
8. Force the differential case as far as possible in the direction away from the *J 39704*. Repeat this step until the same reading is obtained.
9. Record the number of thousandths that the dial indicator traveled, not the reading on the dial. This is the measurement of the shim pack without the bearing preload, which will be added later.
10. Remove the *J 39704*.
11. **Important**

Do not remove the *J 39704* from the differential.

Remove the differential from the housing.

Important: Removal of the spacers prevents the spacers from falling out during the installation of the pinion gear. Mark the spacers and indicate from which side you removed the spacers. Reassemble the spacers as removed in order to ensure that the shim pack measurement is correct.

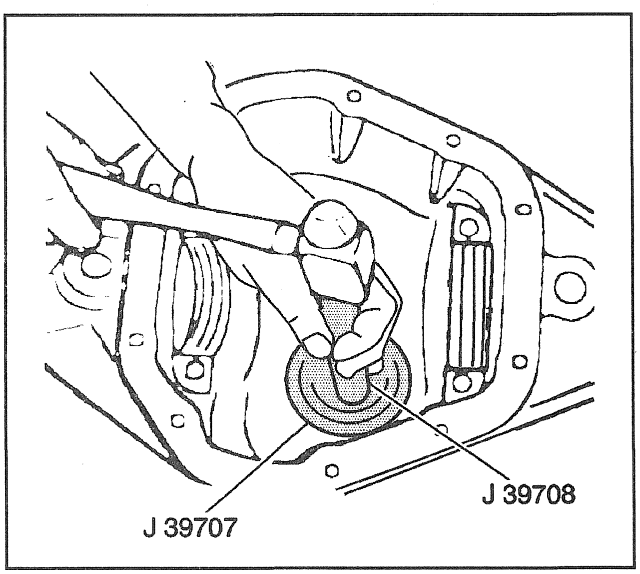
12. Remove any spacers used in the procedure from the housing.

Pinion Installation

Tools Required

- *J 5590* Rear Pinion Bearing Cone Installer
- *J 8614-O1* Pinion Flange Remover
- *J 39707* Rear Pinion Bearing Cup Installer
- J 39708 Handle
- J 41696 Pinion Seal Installer

1. Place the required amount of shims in the inner bearing bore. Include the baffle, if used.
2. Drive the inner bearing cup into the axle assembly using the J 39708 and *J 39707*. Make sure the cup is seated on the shims.



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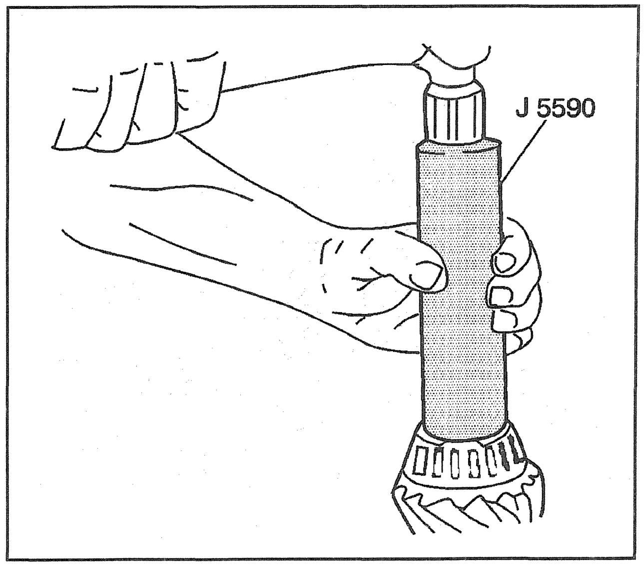
3. Install the inner bearing cone on the pinion. Drive the inner bearing cone onto the pinion shaft using the *J 5590*.
4. Apply a light coat of axle lubricant to the lip of the pinion seal.
5. Install the outer bearing cone, slinger, and oil seal using the J 41689.
6. Install the preload shims onto the pinion gear.
7. Install the pinion into the axle housing.



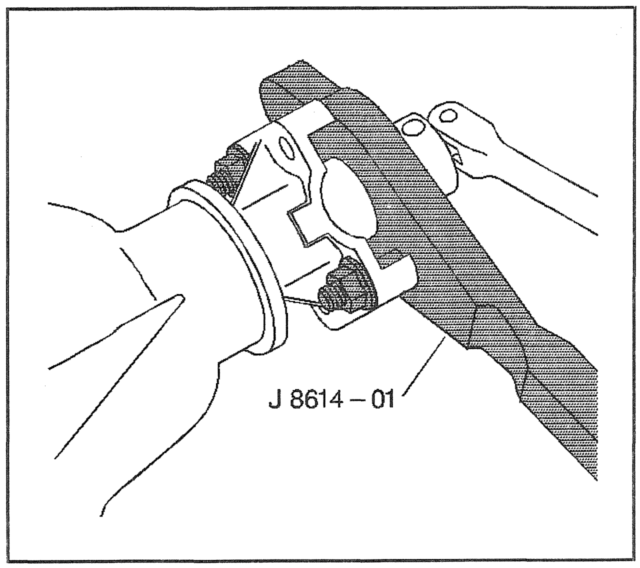
168087

Notice: Refer to *Fastener Notice* in Cautions and Notices.

8. Install the washer and new pinion nut.

   Tighten

   Tighten the pinion nut to 637 N·m (470 lb ft) while holding the pinion with the *J 8614-O1*.
9. Tighten the nut until the pinion end play is just taken up. Rotate the pinion while tightening the nut in order to seat the bearings.
10. Once there is no end play, check the preload torque.
11. Remove the *J 8614-O1*.



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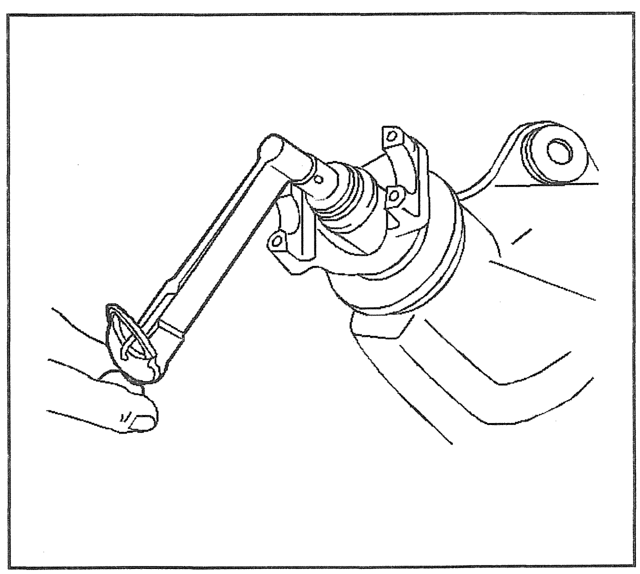
Important: The pinion preload should be at or below 4 N·m (35 lb in) on new bearings, or 1.2 N·m (10 lb in) on old bearings.

12. Check the pinion preload by rotating the pinion with a torque wrench.
13. Once the specified preload has been obtained, make sure the bearings are seated by rotating the pinion several times.
14. Recheck the pinion preload. Adjust the pinion preload as necessary.



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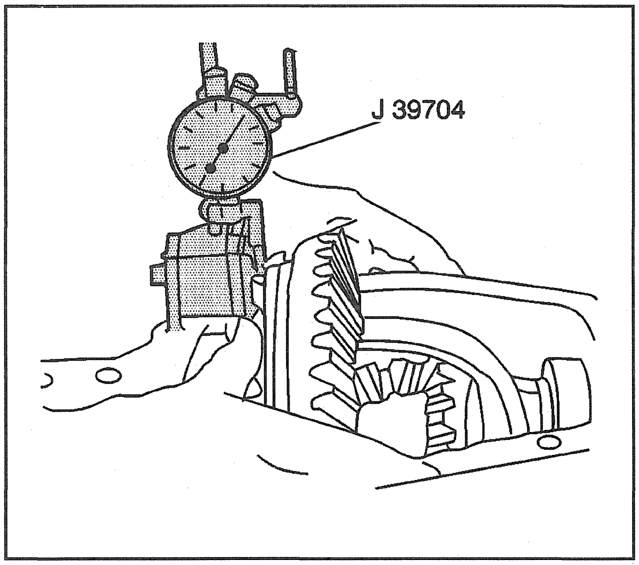


168076

Differential to Axle Housing Assemble

- *J 8001* Dial Indicator Set
- *J 8092* Driver Handle
- *J 23690* Differential Side Bearing Installer
- *J 24385-01* Differential Housing Spreader
- *J 39704* Master Differential Bearings

Notice: If your axle assembly has selective outboard spacers and one 0.76 mm (0.030 inch) shim (each side) between the differential case and bearing cone. Make your measurements with the outboard spacers removed, but with the 0.76 mm (0.030 inch) shim assembled on the differential case trunion placed between the case and the master differential bearings. The selective outboard spacers are available in sizes (thickness) from 5.18 mm (0.2040 inch) to 6.10 mm (0.2400 inch), in 0.08 mm (0.003 inch) increments. The dial indicator should have the capability of making measurements up to 12.7 mm (0.500 inch).

Notice: If your axle assembly has outboard spacers, but controls the preload and backlash by using selective shims (each side) between the differential case and bearing cone. Make the measurements with the outboard spacers installed in the housing, but do not place any shims on the differential case hubs between the case and master differential bearings. The selective shims placed between the bearing cone and differential case are available in 0.08, 0.13, 0.25, 0.76 mm (0.003, 0.005, 0.010, 0.030 inch) sizes. The dial indicator should have the capability of making measurements up to 3.81 mm (0.150 inch).

1. Force the ring gear to mesh with the pinion. Rock the ring gear in order to allow the gear teeth to mesh.

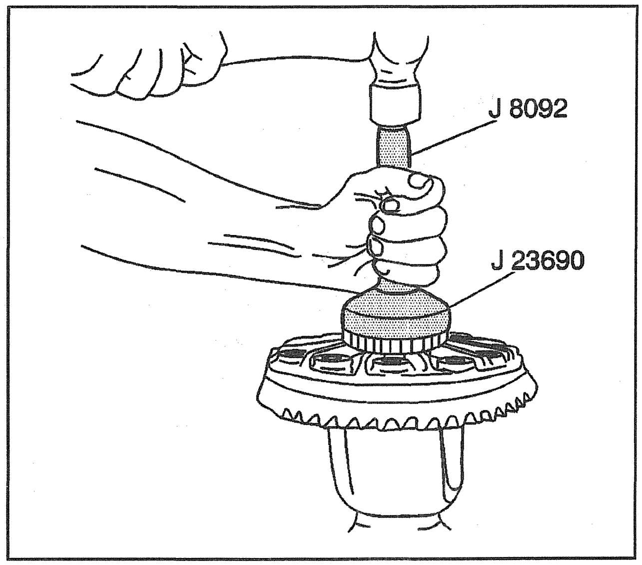
Important: The pinion must be installed

2. Assemble the differential with the master bearings installed to the axle.
3. Mount a *J 8001* with a magnetic base on the ring gear bolt side of the housing.
4. Place the indicator tip of the *J 8001* on the chalk mark made earlier.
5. With force still applied to the differential case, set the *J 8001* to zero.
6. Force the differential case away from the pinion gear in order to obtain a reading from the *J 8001*.
7. Repeat the last step until a consistent reading is obtained. Record the reading.
8. Remove the *J 8001* and the differential case from the axle housing.
9. Remove the *J 39705* from the differential case.

10. Subtract the reading taken of the differential movement from the total shim pack size determined earlier. Refer to *Determining Total Shim Pack Size.*
    - Use the reading taken of the differential movement for the shim size on the ring gear side.
    - Use the remainder from the equation in the last step for the shim size on the side opposite of the ring gear.
    - Add an additional 0.25 mm (0.010) in) of shims to the side opposite of the ring gear in order to preload the bearings.

Important: If the axle assembly uses the outboard selective spacers, place the 0.76 mm (0.030 in) shim on the hub that was used along with the master bearings to make the measurement. Then select the appropriate outboard selective spacer and assemble the outboard selective spacer into the housing.

11. Place the proper shims on the differential side of the bearing hub (ring gear side) and drive the differential bearing onto the hub using the *J 8092* and *J 23690.*



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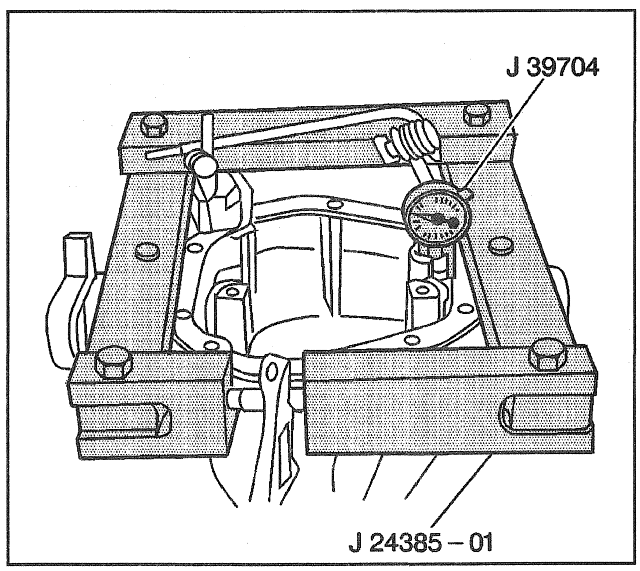
Important: If the axle assembly uses the outboard selective spacers, place the 0.76 mm (0.030 in) shim on the hub that was used along with the master bearings to make the measurement. Then select the appropriate outboard selective spacer and assemble the outboard selective spacer into the housing.

12. Place the proper shims on the differential side of the bearing hub (opposite of the ring gear) and drive the differential bearing onto the hub using *J 8092* and *J 23690.*
13. Assemble the *J 24385-01* to the axle housing.
14. Assemble the *J 8001.*
15. Preset the *J 39704* to at least 0.05 mm (0.020 in).
16. Rotate the indicator housing in order to zero the dial.

Notice: Do not spread the axle housing more than 0.38 mm (0.015 inch). Overspreading the housing may result in component damage.

17. Spread the housing while watching the *J 8001.*
18. Remove the *J 8001.*
19. Place the bearing cups onto the bearings.
20. Install the differential assembly into the carrier.
21. Seat the differential assembly into the axle using a soft-faced hammer.



168093

22. Remove the *J 24385-01*.

Important: Install the bearing caps into the exact positions from which each had prior to removal.

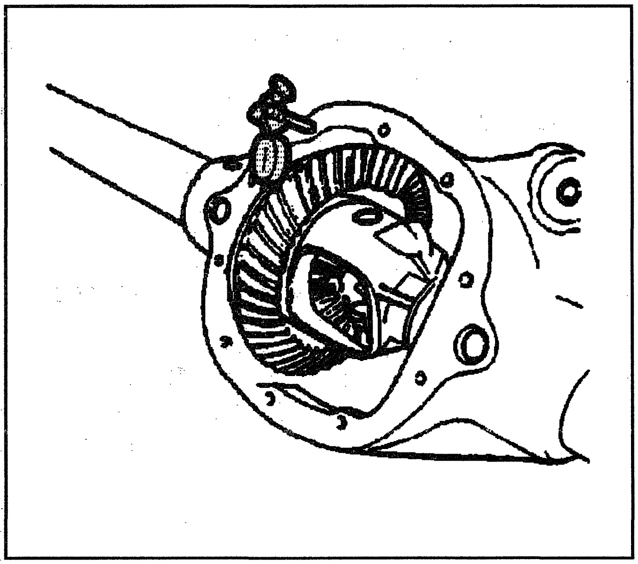
23. Install the bearing caps.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

24. Install the bearing cap bolts.

    Tighten

    Tighten the bearing cap bolts to 115 N·m (85 lb ft).



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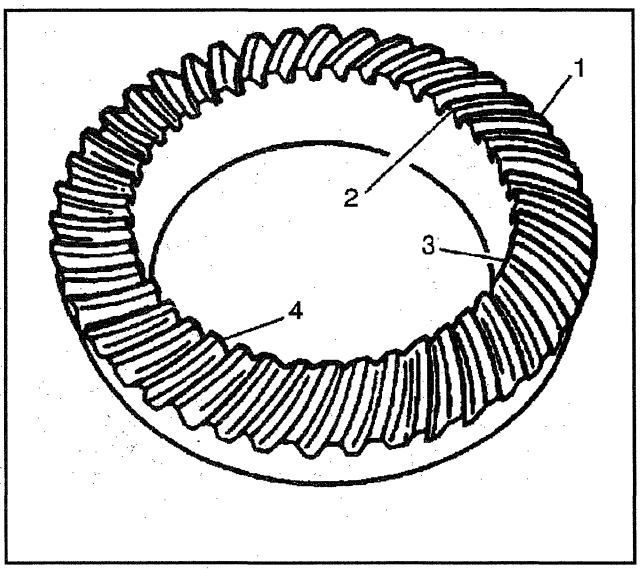
Backlash Adjustment

Checking Backlash

1. Mount a *J 39704* with a magnetic base to the axle housing.

Backlash Adjustment

Less Than 0.13 mm (0.005 in)	0.13–0.23 mm (0.005–0.009 in)	Greater Than 0.23 mm (0.009 in)
Move shims from the ring gear side to the side opposite of the ring gear	No change	Move shims from the side opposite of the ring to the ring gear side.



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2. Place the indicator tip of the *J 39704* on the heel end (1) of the ring gear tooth.

Important: The measurement must not vary more than 0.05 mm (0.002 in) between the points checked.

3. Check the backlash at three equally spaced points.

Important: The reduction in the shim pack on one side must be equal to the increase in the shim pack on the other side.

4. If the backlash needs adjustment, remove the differential case from the housing.
5. If the backlash is correct, change the preload on each side by an equal amount.
6. Make a final gear pattern check. Refer to *Gear Tooth Contact Pattern Check.*

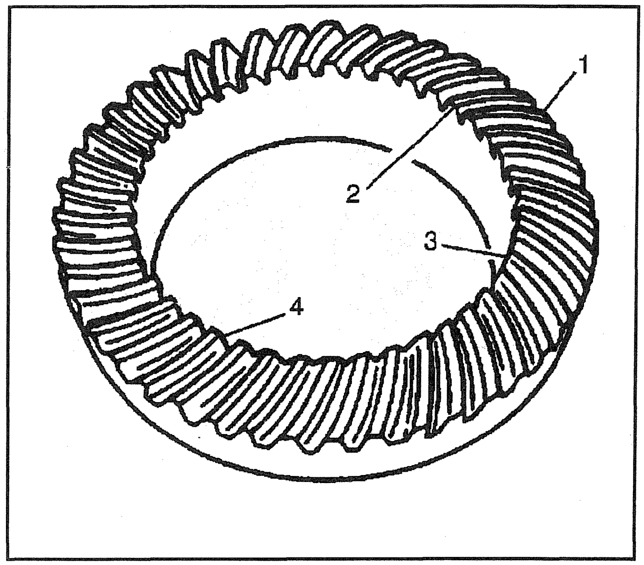
Gear Tooth Contact Pattern Check

Before final assembly of the differential, perform a gear tooth pattern check.

This contact patter 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 drive pinion. Gear sets which are not positioned properly may be noisy, have a short life, or both. 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).



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Testing Procedure

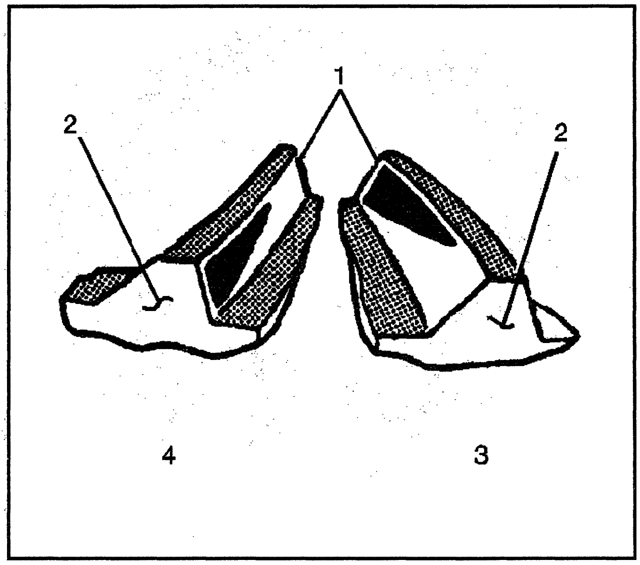
1. Wipe the oil out of the axle housing. Carefully clean each tooth of the ring gear.
2. Use a medium stiff brush in order to sparingly apply gear marking compound to all of the ring gear teeth.

Important: A test made without loading the gears does not give a satisfactory pattern.

3. Use the parking brake in order to apply a load until a torque of 61 N·m (45 lb ft) is required in order to turn the pinion.

Important: Avoid excessive turning of the ring gear.

4. Turn the companion flange with a wrench so that the ring gear rotates one full revolution.
5. Reverse the rotation so that the ring gear rotates one revolution in the opposite direction.
6. Observe the pattern on the ring gear teeth. Compare the pattern with the following illustrations. Use the legend below:
   - 6.1. (1) Toe
   - 6.2. (2) Heel
   - 6.3. (3) Coast side (Concave)
   - 6.4. (4) Drive side (Convex)



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Condition

- The backlash is correct.
- The pinion depth is incorrect. The pinion gear is too far away from the ring gear.

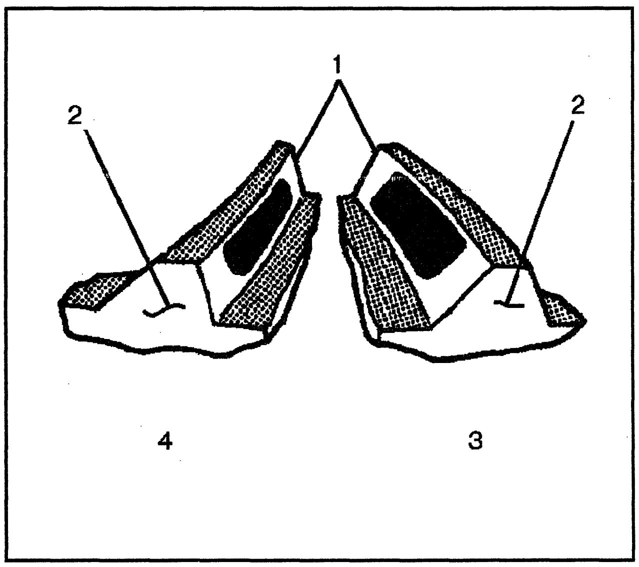
Correction

Increase the thickness of the pinion shim. Refer to *Pinion Depth Adjustment.*

Service Hints

How to check the pattern:

1. Brush gear marking compound on the ring gear teeth.
2. Rotate the pinion clockwise six times.
3. Rotate the pinion counterclockwise six times.
4. Observe the tooth contact pattern. Make any necessary corrections.



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Condition

- The backlash is correct.
- The pinion depth is correct.

Correction

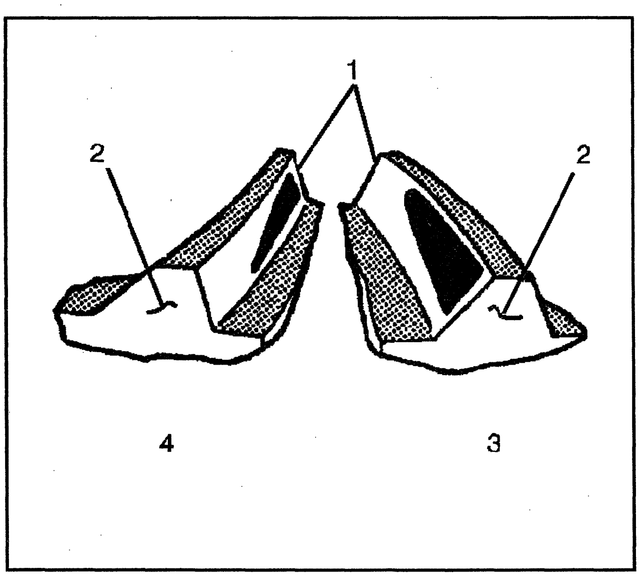
Correction may not be necessary.

Service Hints

Loose bearings on the pinion or in the differential case may cause patterns that vary. Check the following preload settings:

- Total assembly
- Differential case
- Pinion

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



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Condition

- The backlash is correct.
- The pinion depth is incorrect.

Correction

Decrease the thickness of the pinion shim. Refer to *Pinion Depth Adjustment.*

Service Hints

The shims which adjust the pinion depth are located:

- Between the inner pinion bearing cone and the hear of the pinion gear
- Between the inner pinion bearing cup and the rear axle housing

Adjustments Affecting Tooth Contact

There are two adjustments that affect the tooth contact pattern: backlash and drive pinion depth. 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 drive pinion adjustments.

Adjust the position of the drive 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.

Adjust the backlash by means of the side bearing adjusting shims which move the case and ring gear assembly closer to, or farther from, the drive pinion. Also use the adjusting shims to set the side bearing preload.

If the thickness of the right shim is increased, along with an equal decrease in the thickness of the left shim, backlash will increase.

If the thickness of the left shim is increased, along with an equal decrease in the thickness of the right shim, the backlash will decrease.

Drive Axle Final Assembly

1. Apply a thin layer of sealant to the axle cover.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the axle cover to the axle with the bolts.

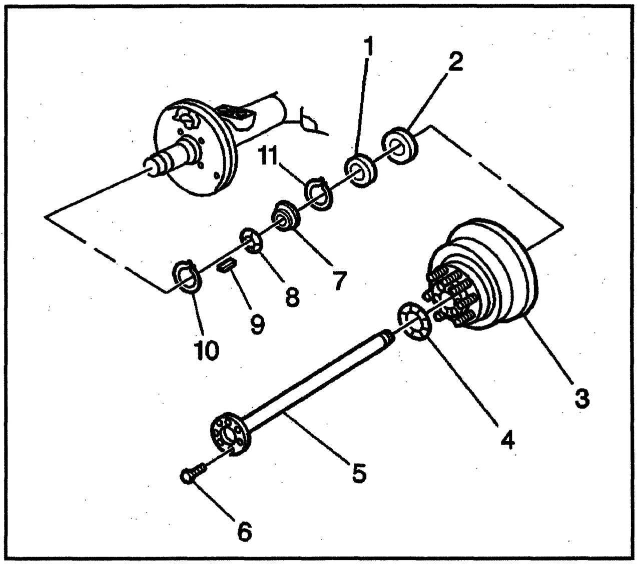
   Tighten

   Tighten the axle cover bolts to 47 N·m (35 lb ft).

3. Fill the axle with oil. Refer to *Lubrication Specifications*.
4. Install the fill plug to the case.

   Tighten

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



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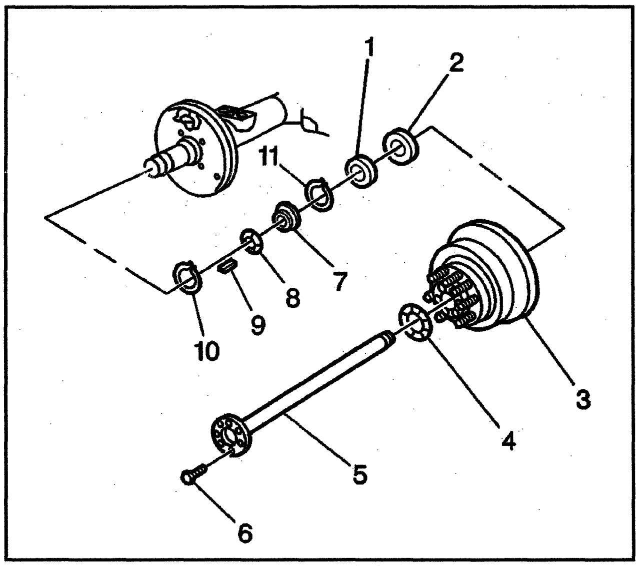
Axle Replacement (10 1/2 In Ring Gear)

Removal Procedure

1. Remove the bolts (6).
2. Lightly rap the axle shaft flange with a soft-faced hammer in order to loosen the shaft.
3. Grip with a locking plier the rib on the axle shaft flange and twist in order to start the axle shaft (5) removal.
4. Remove the axle shaft (1) from the tube.
5. Clean the axle shaft flange.
6. Remove the gasket (4) and RTV.
7. Clean the outside face of the hub assembly (3).
8. Inspect all parts and replace as necessary.



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Installation Procedure

1. Install the axle shaft (5) with a gasket (4) or RTV applied.
   - Be sure the shaft splines mesh into the differential side gear.
   - Align the holes in the axle shaft flange with the holes in the hub (3).
2. Install the bolts (6).

   Tighten

   Tight the bolts (6) to 150 N·m (110 lb ft).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

Axle Replacement (11 Inch Ring Gear)

Removal Procedure

For Full-Floating Axle Wheel End Components refer to *Rear Axle Disassembled Views.*

1. Remove the axle cap bolts.
2. Tap the axle cap lightly with a soft-faced hammer to loosen the gasket.
3. Grip the rib on the axle shaft with a locking plier and twist to start the axle shaft removal.
4. Remove the axle shaft from the tube.
5. Remove the old RTV or gasket.
6. Clean the hub assembly.
7. Inspect the shaft to see if it is bent.
8. Inspect the shaft spline for chips, burrs, cracking, or excessive wear.
9. Replace any damaged components.

Installation Procedure

1. Install the axle shaft with RTV or the gasket, being sure that the shaft splines mesh into the differential side gear.
2. Install the axle cap and the bolts.

   Tighten

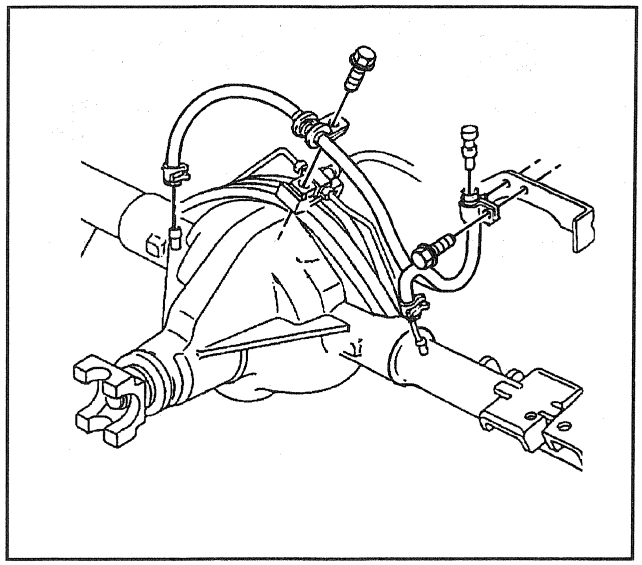
   Tighten the cap bolts to 20 N·m (15 lb ft).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

Axle Replacement (Rear Axle Assembly)

Removal Procedure

1. Raise the vehicle on a hoist.
2. Support the axle assembly with a suitable lifting device.
3. Drain the lubricant from the axle housing.
4. Disconnect the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece.*
   - Tie the propeller shaft to a side rail or crossmember
   - Tape the bearing cups to prevent loss of the needle bearings
5. Remove the wheel and brake drum or hub and drum assembly. Refer to *Brake Lining Replacement (Duo-Servo Drum Brakes)* or *Brake Lining Replacement (Leading/Trailing Drum Brakes)* or *Wheel Cylinder Replacement (Leading/Trailing Drum Brakes)* or *Wheel Cylinder Replacement (Components-Leading/Trailing)* or *Wheel Cylinder Replacement (Duo-Servo Drum Brakes)*
6. Disconnect the parking brake cable from the lever and at the brake backing plate. Refer to *Park Brake Cable Replacement (Front Cable)* or *Park Brake Cable Replacement (Rear Cable - 1Ton)* or *Park Brake Cable Replacement (Parking Brake Cable)* or *Park Brake Cable Replacement (Rear Cable - 1/2 and 3/4 Ton)* in Parking Brake.
7. Disconnect the hydraulic brake pipes from the connectors. Refer to *Brake Pipe Replacement* in Hydraulic Brakes.
8. Disconnect the shock absorbers from the axle brackets. Refer to *Shock Absorber Replacement (C Model)* or *Shock Absorber Replacement (K Model)* in Rear Suspension.
9. Remove the vent hose from the axle vent fitting. Refer to *Vent Hose Replacement.*
10. Remove the nuts and washers from the U-bolts.
11. Remove the U-bolts, spring plates, and spacers from the axle assembly.
12. Lower the axle assembly.



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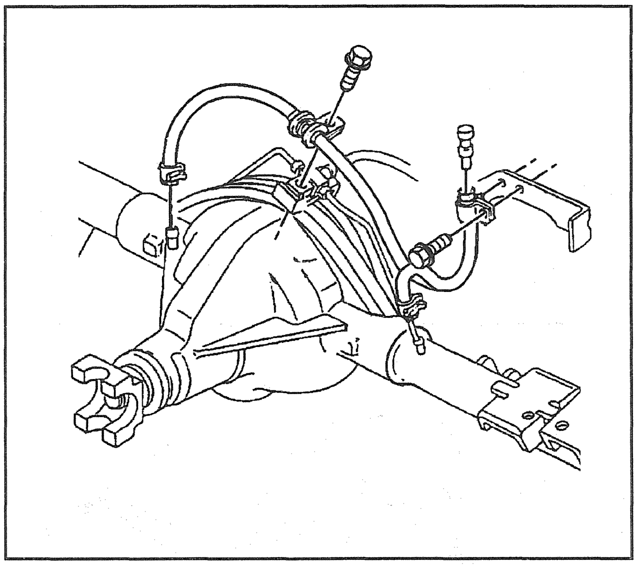

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Installation Procedure

1. Place the axle assembly under the vehicle.
2. Align the axle assembly with the springs.
3. Connect the spacers, spring plates, and U-bolts to the axle assembly.
4. Raise the axle assembly.
5. Install the washers and nuts to the U-bolts.
6. Install the vent hose to the axle vent fitting (if used). Refer to *Vent Hose Replacement.*
7. Connect the shock absorbers to the axle brackets. Refer to *Shock Absorber Replacement (C Model)* or *Shock Absorber Replacement (K Model)* in Rear Suspension.
8. Connect the hydraulic brake pipes to the connectors. Refer to *Brake Pipe Replacement* in Hydraulic Brakes.
9. Connect the parking brake cable to the lever and the brake backing plate. Refer to *Park Brake Cable Replacement (Front Cable)* or *Park Brake Cable Replacement (Rear Cable - 1Ton)* or *Park Brake Cable Replacement (Parking Brake Cable)* or *Park Brake Cable Replacement (Rear Cable - 1/2 and 3/4 Ton)* in Parking Brake.
10. Install the wheel and brake drum or hub and drum assembly. Refer to *Brake Lining Replacement (Duo-Servo Drum Brakes)* or *Brake Lining Replacement (Leading/Trailing Drum Brakes)* or *Wheel Cylinder Replacement (Leading/Trailing Drum Brakes)* or *Wheel Cylinder Replacement (Components-Leading/Trailing)* or *Wheel Cylinder Replacement (Duo-Servo Drum Brakes).*

Important:

- 10.1. Check axle lubricant level at the filler plug hole.
- 10.2. Lubricate as necessary. Refer to Refer to *Fluid and Lubricant Recommendations* in Maintenance and Lubrication.
- 10.3. Bleed the brake system, check brake operation, and adjust if necessary. Refer to *Hydraulic Brake System Bleeding* in Hydraulic Brakes.
- 10.4. Check for fluid leaks.
- 10.5. Road test the vehicle.

11. Connect the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece.*

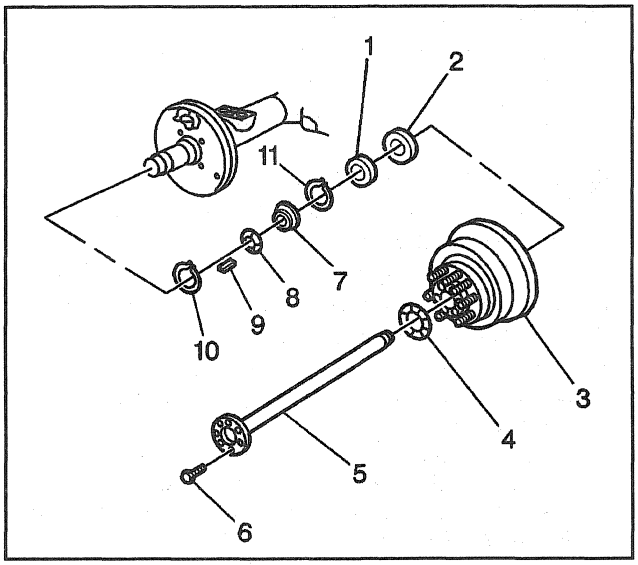
Axle Replacement (Assembly Replacement 11 Inch)

Removal Procedure

1. Raise the vehicle and place jack stands under the frame side rails for support.
2. Drain the lubricant from the axle housing.
3. Disconnect the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece*.
4. Remove the tire and wheel assembly.
5. Remove the brake drum or hub and drum.
6. Disconnect the parking brake cable from the lever and at the brake flange plate. Refer to *Park Brake Cable Replacement (Front Cable)* or *Park Brake Cable Replacement (Rear Cable - 1Ton)* or *Park Brake Cable Replacement (Parking Brake Cable)* or *Park Brake Cable Replacement (Rear Cable - 1/2 and 3/4 Ton)* in Parking Brake.
7. Disconnect hydraulic brake pipes from the connectors. Refer to *Brake Pipe Replacement* in Hydraulic Brakes.
8. Disconnect the shock absorbers from the axle brackets.
9. Disconnect the vent hose from the axle vent fitting.
10. Support the axle assembly with a hydraulic floor jack.
11. Remove the nuts and washers from the U-bolts.
12. Remove the U-bolts, spring plates, and spacers from the axle assembly.
13. Lower the axle assembly.

Installation Procedure

1. Place the axle assembly under the vehicle.
2. Align the axle assembly with the springs.
3. Connect the spacers, spring plates, and U-bolts to the axle assembly.
4. Raise the axle assembly.
5. Install the washers and nuts to the U-bolts.
   - Firmly thread the nuts.
   - Adjust the alignment of the axle assembly.
6. Connect the vent hose to the axle vent fitting.
7. Connect the shock absorbers to the axle brackets.
8. Connect the hydraulic brake lines to the connectors. Refer to *Brake Pipe Replacement* in Hydraulic Brakes.
9. Connect the parking brake cable to the level and the flange plate. Refer to *Park Brake Cable Replacement (Front Cable)* or *Park Brake Cable Replacement (Rear Cable - 1Ton)* or *Park Brake Cable Replacement (Parking Brake Cable)* or *Park Brake Cable Replacement (Rear Cable - 1/2 and 3/4 Ton)* in Parking Brake.
10. Install the brake drum or hub and drum.
11. Install the tire and wheel assembly.
12. Connect the propeller shaft. Refer to *Propeller Shaft Replacement - One-Piece* or *Propeller Shaft Replacement - Two-Piece*.
13. Fill the axle assembly with axle lubricant to the filler plug hole level. Refer to *Lubrication Specifications*.
14. Bleed the brake system, check brake operation and adjust if necessary. Refer to *Hydraulic Brake System Bleeding* in Hydraulic Brakes.
15. Remove the jack stands and lower the vehicle.
16. Check axle operation.
17. Check for fluid leaks.
18. Road test the vehicle.



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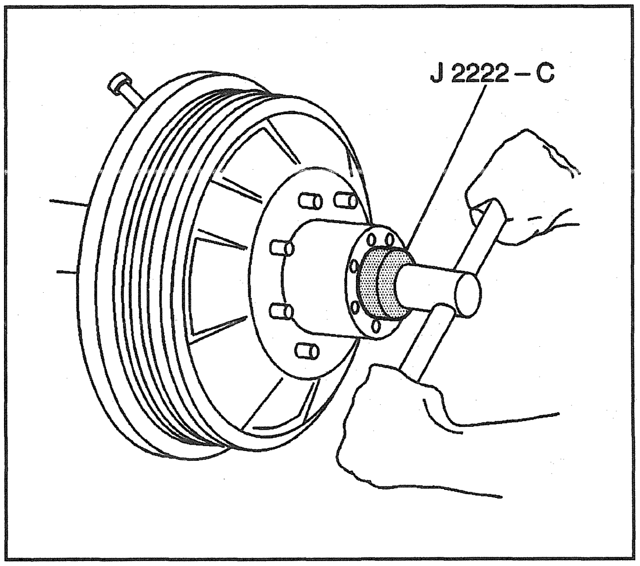
Hub and Drum Assembly Replacement

Removal Procedure

Tools Required

J 2222-C Wheel Bearing Nut Wrench

1. Raise the vehicle until the wheel is free to rotate.
2. Remove the wheel and tire.
3. Remove the axle shaft (5). Refer to *Axle Replacement (11 Inch Ring Gear).*
4. Remove the retaining ring (10).
5. Remove the key (9).



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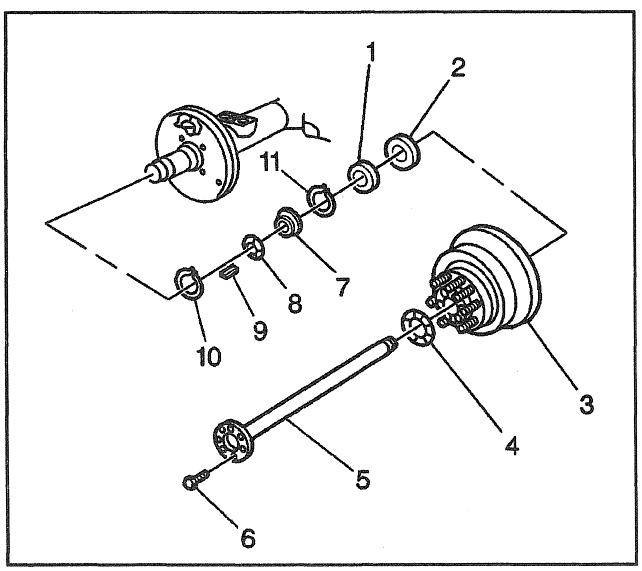
6. Remove the adjusting nut using the *J 2222-C.*
7. Remove the washer.



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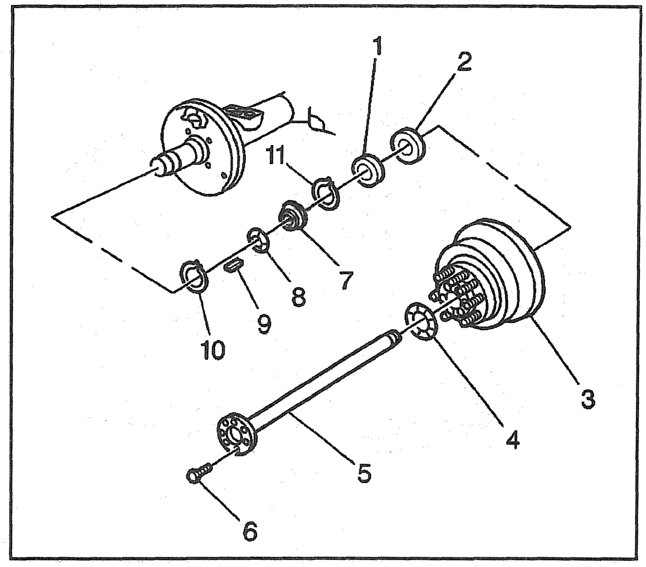
8. Remove the hub and drum (3).

Installation Procedure

1. Install the hub and drum (3) on the axle tube.
   - Be sure the bearings and the oil seal are positioned properly.
   - Apply a light coat of high melting point EP bearing lubricant to the contact surfaces and the outside of the axle tube.
2. Install the washer.
3. Place the tang into the keyway.



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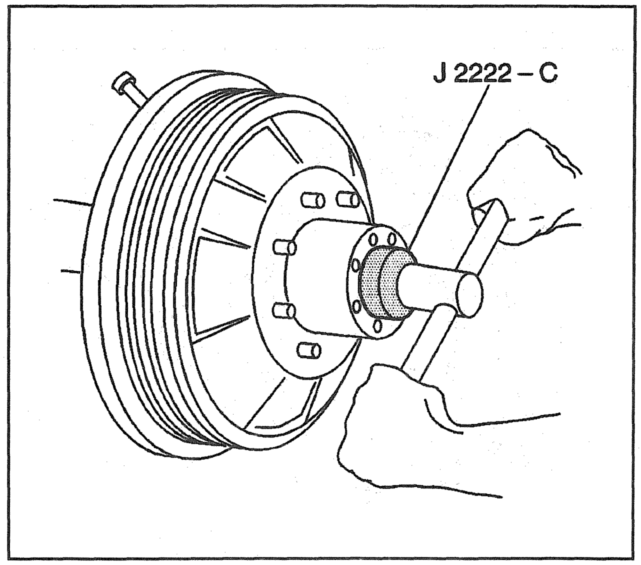
4. Install the adjusting nut.
5. Adjust the bearing preload. Refer to *Axle Replacement (11 Inch Ring Gear)*



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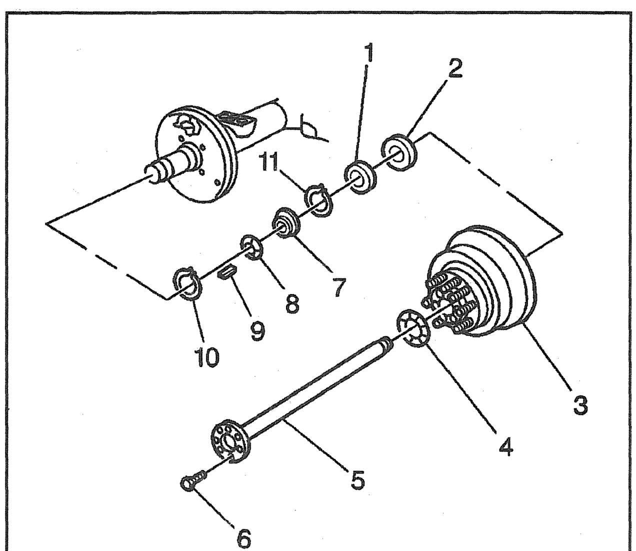
6. Install the key (9).
7. Install the retaining ring (10).
8. Install the axle shaft. Refer to *Axle Replacement (11 Inch Ring Gear).*
9. Install the wheel and tire.
10. Lower the vehicle.



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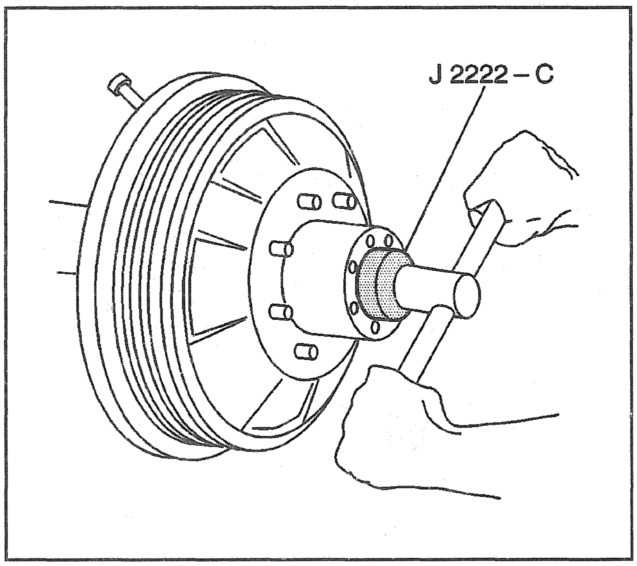

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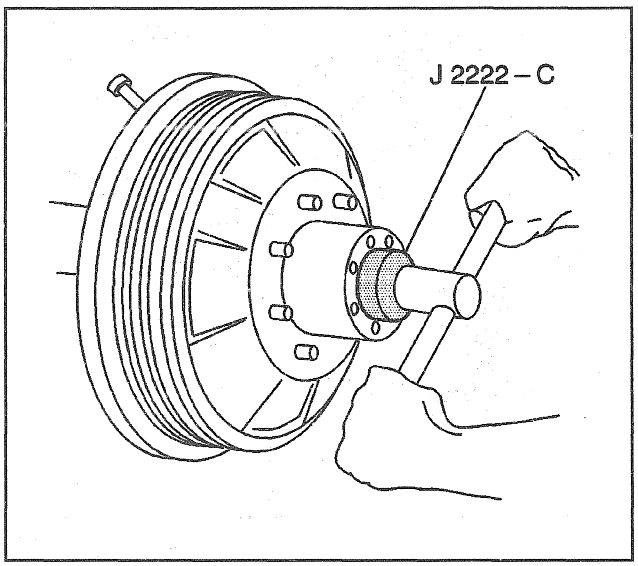

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Hub and Rotor Assembly Replacement

Removal Procedure

For Full-Floating Axle Wheel End Components Refer to *Rear Axle Disassembled Views.*

Tool Required

J 2222-C Wheel Bearing Nut Wrench

1. Raise the vehicle until the wheel is free to rotate.
2. Remove the tire and the wheel assembly.
3. Remove the axle shaft. Refer to *Axle Replacement (11 Inch Ring Gear).*
4. Remove the nut using *J 2222-C.*
5. Remove the retaining ring.
6. Remove the lock or the key.
7. Remove the adjusting nut.
8. Remove the washer.
9. Remove the hub and the rotor.
   Inspect for any worn or damaged parts.
   Replace any defective parts.

Installation Procedure

1. Connect the hub and rotor to the tube being sure that the bearings and the oil seal are positioned properly.
2. Apply a light coat of high melting point EP bearing lubricant to the contact surfaces and on the outside of the axle tube.
3. Install the washer and engage the tang in the keyway.
4. Install the adjusting nut.

   Tighten

   - Tighten the adjusting nut to 68 N·m (50 lb ft) while turning the hub.
   - Back-off the locknut and re-tighten it to 41 to 54 N·m (30 to 40 lb ft) while rotating the hub.
   - Back-off the nut 135 degrees to 150 degrees.
   - The final bearing adjustment is 0.025 to 0.25 mm (0.001 to 0.010 inch).

Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install the lockwasher and the outer locknut.
6. Bend on of the ears of the lockwasher over the inner nut to a minimum of 30 degrees.
7. Bend one of the ears of the lockwasher over the outer nut to a minimum of 60 degrees.

   Tighten

   Tighten the nut to 88 N·m (65 lb ft).
8. Install the axle shaft. Refer to *Axle Replacement (11 Inch Ring Gear).*
9. Install the tire and the wheel assembly.
10. Lower the vehicle.

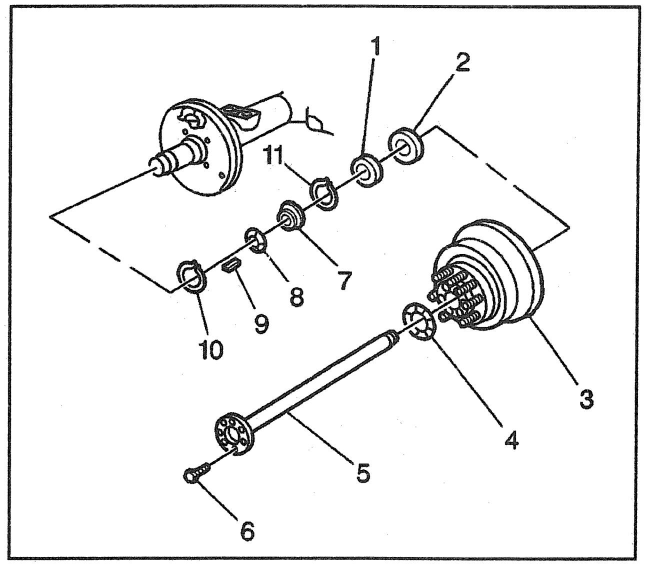
Bearing Cup Replacement (10 1/2 Inch Ring Gear)

Removal Procedure

Tools Required

- *J 8092* Driver Handle
- *J 8608* Pinion Bearing Cup Installer
- *J 24426* Outer Bearing Cup Installer
- *J 24427* Inner Wheel Bearing Cup Installer
- *Axle Shaft Seal Installer*

1. Raise the vehicle until the wheels are free to rotate.
2. Remove the hub and drum. Refer to *Hub and Drum Assembly Replacement*.
3. Remove the oil seal (2).
4. Use a drill to remove the inner bearing and the cup (1).
5. Use snap ring pliers to remove the retaining ring (11).
6. Remove the outer bearing ring using *J 24426* and *J 8092*.



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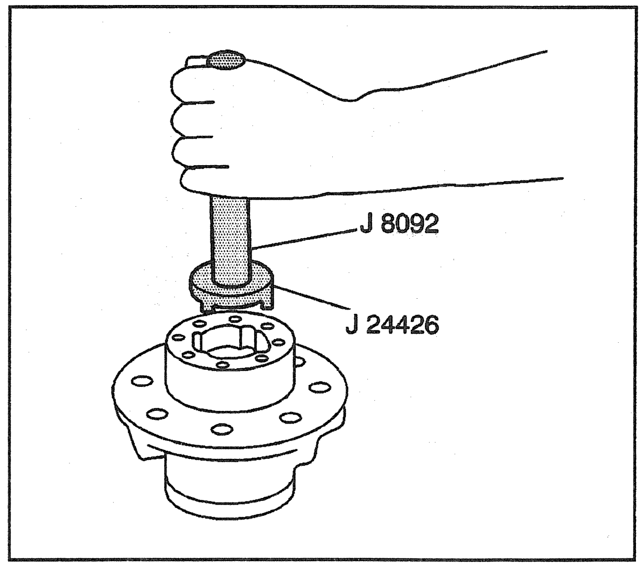

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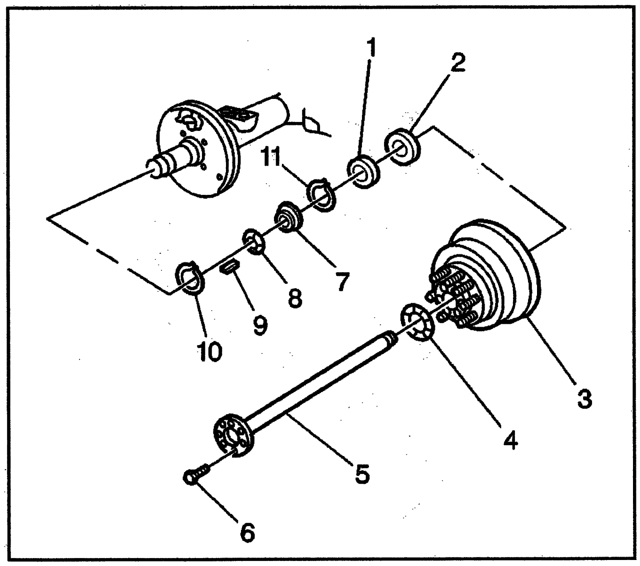

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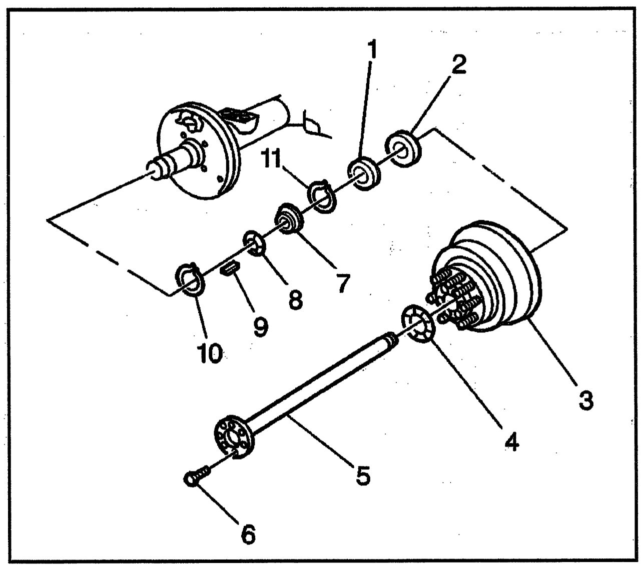
7. Drive the bearing and the cup (8) from the hub (3).
8. Clean the old oil sealing compound from the oil seal bore in the hub.
9. Clean the bearing assemblies in a solvent using a stiff brush in order to remove the old lubricant.
   - Dry the bearings with compressed air.
   - Do not spin the bearings.
10. Clean the lubricant from the axle housing and from inside the hub.
11. Remove the gasket material from the hub and the axle shaft.
12. Inspect the bearings for wear, chipped edges or other damage.
13. Check for flat or rough spots on the rollers.
14. Inspect the cups for pits and cracks.
15. Replace parts as necessary.



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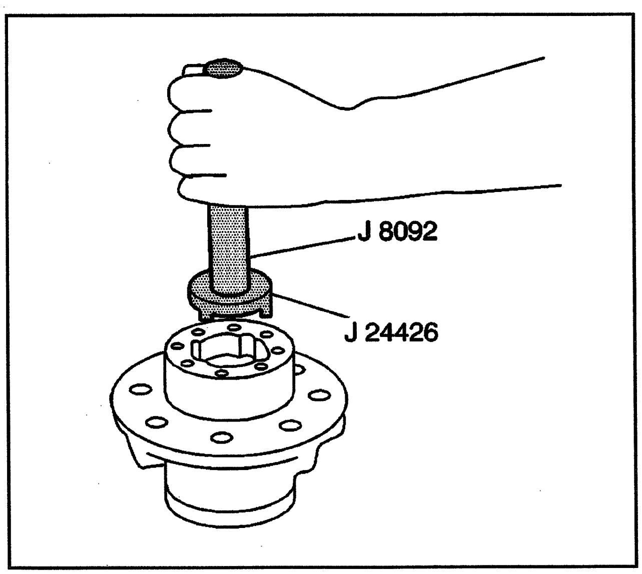
Installation Procedure

Tools Required

- *J 8092* Driver Handle
- *J 8608* Pinion Bearing Cup Installer
- *J 24426* Outer Bearing Cup Installer
- *J 24427* Inner Wheel Bearing Cup Installer
- *Axle Shaft Seal Installer.*

1. Install the outer bearing cup (8) into the hub (3).



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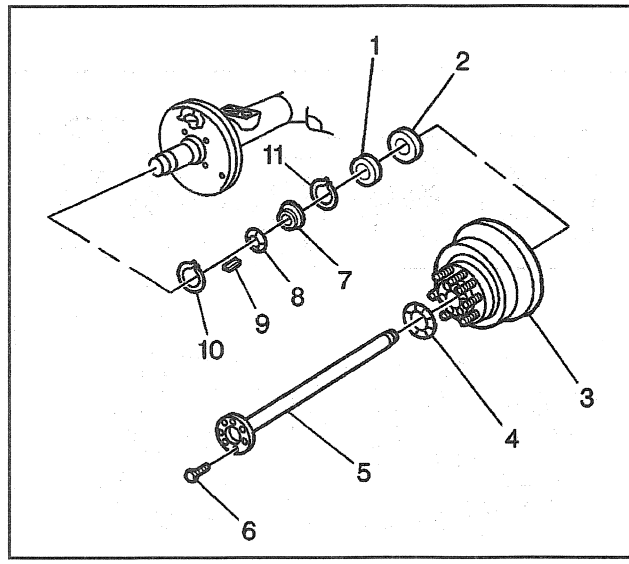
Important: Install the *J 8608* upside down on the *J 8092* so that the chamfer does not contact the bearing cup.

2. Drive the outer bearing cup into hub using the *J 8608* and the *J 8092*.

3. Drive the outer bearing cup (7) beyond the retaining ring groove.
4. Install the retaining ring (11) in the groove.
5. Drive the outer bearing cup onto the retaining ring (11) using the *J 24426*.
6. Install the inner bearing cup using the *J 24427* and the *J 8092*.
7. Drive the inner bearing cup until it is seated against the hub shoulder.
8. Install the inner bearing (1).
9. Install a new oil seal (2) using the *Axle Shaft Seal Installer*.
10. Install the hub and drum assembly (3). Refer to *Hub and Drum Assembly Replacement*.
11. Install the wheel bearing adjusting nut (8).
12. Adjust the bearing preload. Refer to *Wheel Bearing Adjustment (10 1/2 Inch Ring Gear)*.
13. Install the axle shaft (5). Refer to *Axle Replacement (11 Inch Ring Gear)*.



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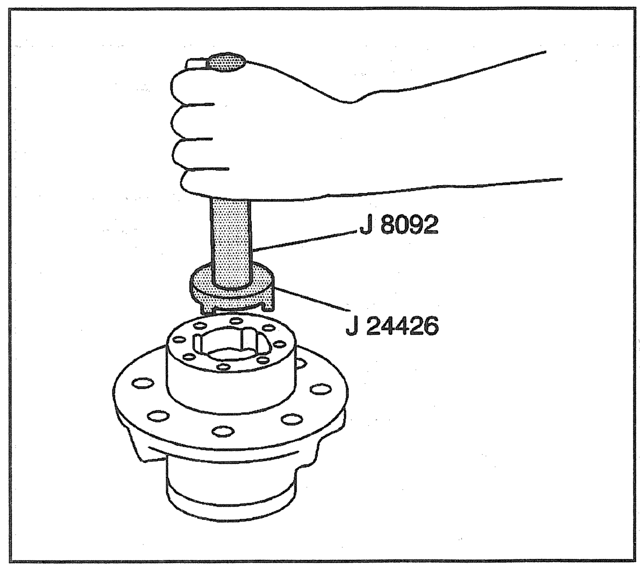
Bearing Cup Replacement (11 Inch Ring Gear)

Removal Procedure

Tools Required

- *J 8092* Drive Handle
- *J 8608* Outer Pinion Bearing Cup Installer
- *J 24426* Outer Wheel Bearing Cup Installer
- *J 24427* Inner Wheel Cup Bearing Installer
- *J 39114-A* Axle Shaft Seal Installer

1. Raise the vehicle until the wheels are free to rotate.
2. Remove the axle shaft. Refer to *Axle Replacement (11 Inch Ring Gear)*.
3. Remove the hub and drum assembly. Refer to *Hub and Drum Assembly Replacement*.
4. Remove the inner bearing and the oil seal.
   - Lay the drum on a flat surface using a shop towel in order to catch the bearing and the seal.
   - Use a drift to remove the bearing cup and the seal.
5. Remove the retaining ring using snap ring pliers.
6. Remove the outer bearing using *J 8092* with *J 24426*.
7. Drive the bearing and the cup from the hub.
8. Clean the old sealing compound from the oil seal bore in the hub.
9. Clean the bearing assemblies in a solvent using a stiff brush to remove the old lubricant. Dry the bearings with compressed air. Do not spin the bearings.
10. Clean the lubricant from the axle tube and from inside the hub.



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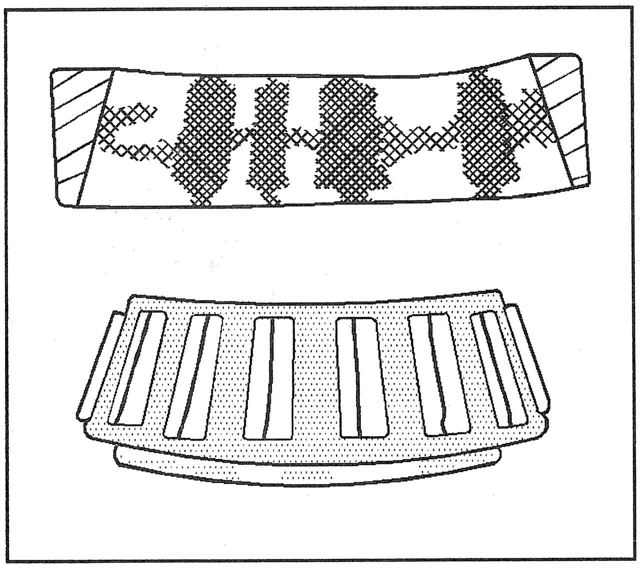

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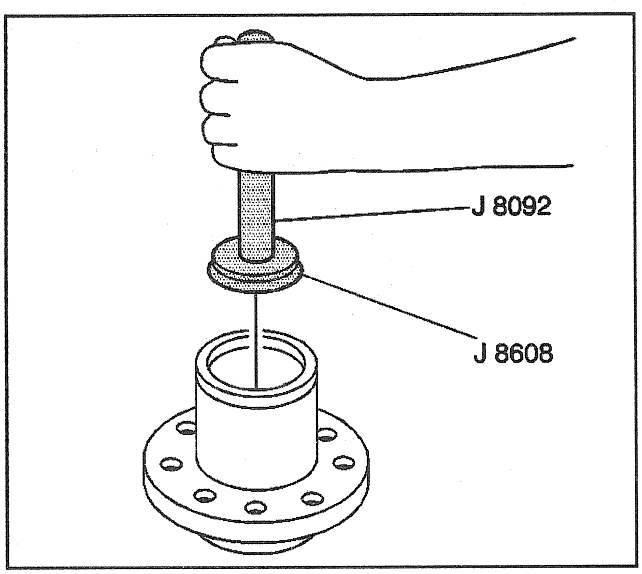
11. Clean the gasket material, if used, from the hub and the axle shaft.
12. Inspect the bearings for any wear, chipped edges or other damage.
13. Check for any flat or rough spots on the rollers.
14. Check the cups for any pits or cracks.
15. Replace and discard the old oil seal.
16. Pack the inner and the outer bearing with wheel bearing lubricant GM P/N 1051344. Refer to *Lubrication Specifications*.



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Installation Procedure

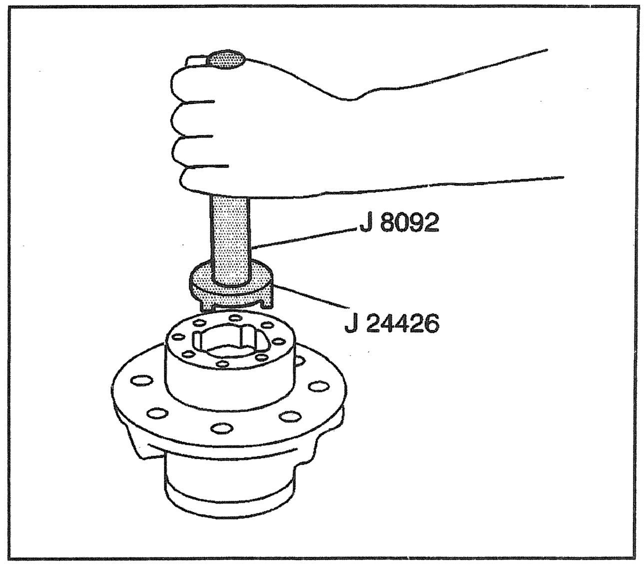
Tools Required

- *J 8092* Drive Handle
- *J 8608* Outer Pinion Bearing Cup Installer
- *J 24426* Outer Wheel Bearing Cup Installer
- *J 24427* Inner Wheel Cup Bearing Installer
- *J 39114-A* Axle Shaft Seal Installer

1. Install the outer bearing cup into the hub using *J 8092* and *J 8608*. Drive the cup beyond the retaining ring groove.

Important: Be sure to install *J 8608* Upside down on *J 8092* so that the chamfer does not contact the bearing cup.

2. Install the retaining ring into the groove. Drive the cup back onto the retaining ring using *J 24426*.



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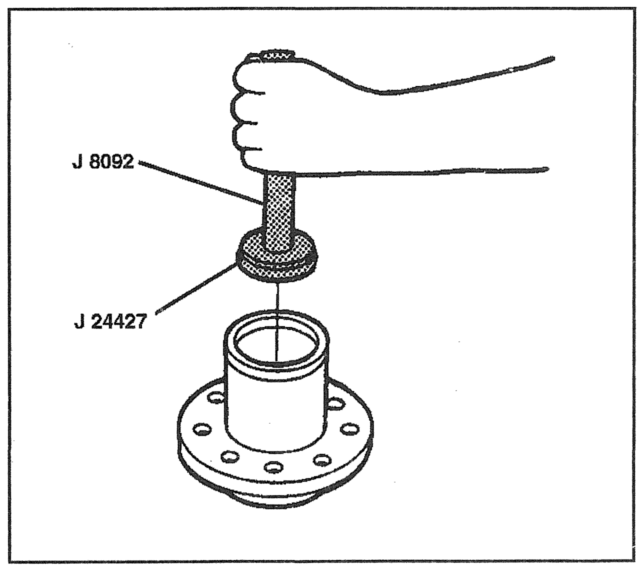
3. Install the inner bearing cup using *J 8092* and *J 24426*. Drive the cup into place until it sits against the hub shoulder.
4. Install the inner bearing.
5. Install the new oil seal using *J 39114-A*.
6. Install the outer bearing.
7. Install the hub and drum.



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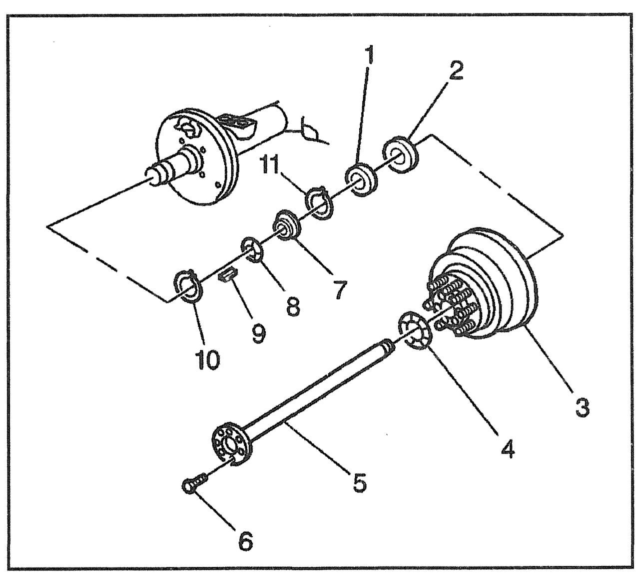
Wheel Bearing Adjustment (10 1/2 Inch Ring Gear)

Removal Procedure

Tools Required

J 2222-C Wheel Bearing Nut Wrench

1. Make sure the brakes are fully released and do not drag.
2. Pull or push the tire at the top back and forth in order to check the wheel bearing play.
   - Use a pry bar under the tire as an alternative.
   - If the wheel bearing adjustment is correct, movement of the brake drum in relation to the brake backing plate will be barely noticeable.
   - If the movement of the brake drum in relation to the brake backing plate is excessive, adjust the bearings.



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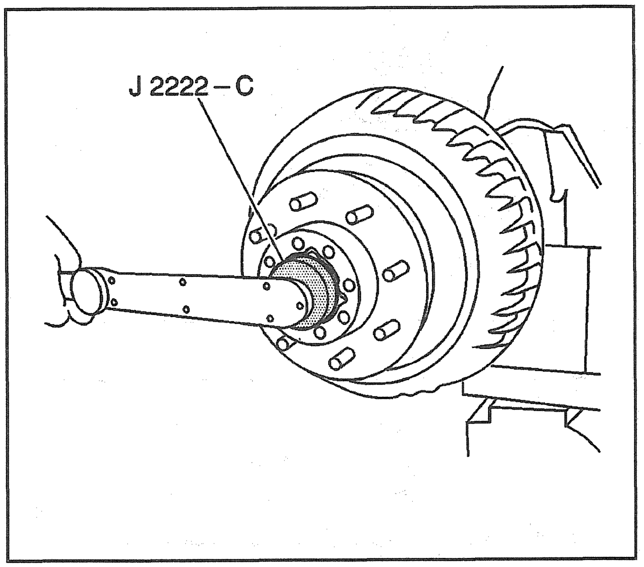
3. Raise the vehicle until the wheel is free to spin.
4. Remove the axle shaft. Refer to *Axle Replacement (10 1/2 In Ring Gear).*
5. Clean the following from the keyway, the threads, and the adjusting nut (8).
6. Remove the retaining ring (10).
7. Remove the key (9).

Notice: Refer to *Fastener Notice* in Cautions and Notices.



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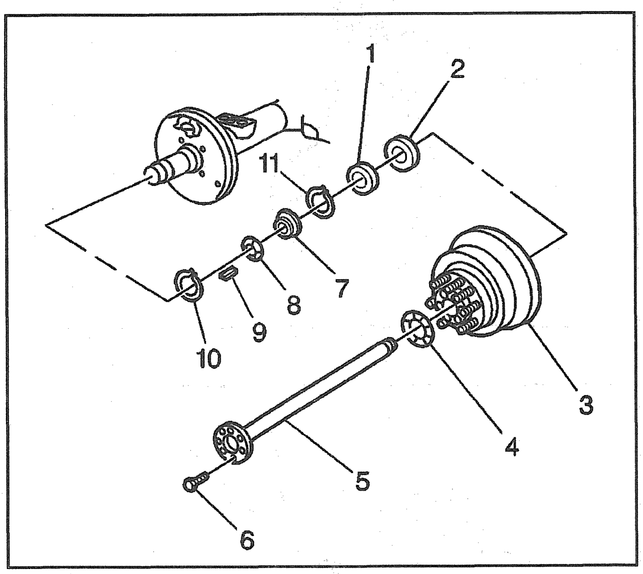
8. Tighten the wheel bearing adjusting nut.

   Tighten

   Tighten the adjusting nut to 68 N·m (50 lb ft) using the *J 2222-C.*

   - Rotate the drum in the opposite direction as the adjusting nut turns.
   - Make sure the inner bearing roller assembly is seated against the spindle shoulder.
9. Adjust the adjusting nut as follows:
   9.1. Back off the adjusting nut one quarter turn.
   9.2. Retighten the adjusting nut to 17 N·m (13 lb ft).
   9.3. Align the closest adjusting nut slot with the keyway in the axle spindle.



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Installation Procedure

1. Install the key (9) into the keyway and adjusting nut slot.
2. Install the retaining ring (10).
3. Make sure the retaining ring is seated.
4. Install the axle shaft. Refer to *Axle Replacement (10 1/2 In Ring Gear).*

Wheel Bearing Adjustment (11 Inch Ring Gear Axle)

Diagnostic Procedure

Tools Required

J 2222-C Wheel Bearing Nut Wrench

1. Make sure the brakes are fully released and do not drag.
2. Pull or push the tire at the top back and forth in order to check the wheel bearing play.
   - Use a pry bar under the tire as an alternative.
   - If the wheel bearing adjustment is correct, movement of the brake drum in relation to the brake backing plate will be barely noticeable.
   - If the movement of the brake drum in relation to the brake backing plate is excessive, adjust the bearings.

Removal Procedure

1. Raise the vehicle until the wheel spins freely.
2. Remove the axle shaft. Refer to *Axle Replacement (10 1/2 In Ring Gear).*
3. Remove the retaining ring.
4. Remove the rear wheel bearing axle adjusting nut key.
5. Adjust the adjusting nut.

   Tighten

   Tighten the adjusting nut to 68 N·m (50 lb ft) with the *J 2222-C* while rotating the hub assembly.
6. Make sure the bearing cones are seated and in contact with the spindle shoulder.
7. Back off the adjusting nut and retighten the adjusting nut while rotating the hub.
8. Back off the adjusting nut.
9. Retighten the adjusting nut while rotating the hub assembly.

   Tighten

   Tighten the adjusting nut to 47 N·m (35 lb ft).
10. Back off the adjusting nut 135–150 degrees.

Installation Procedure

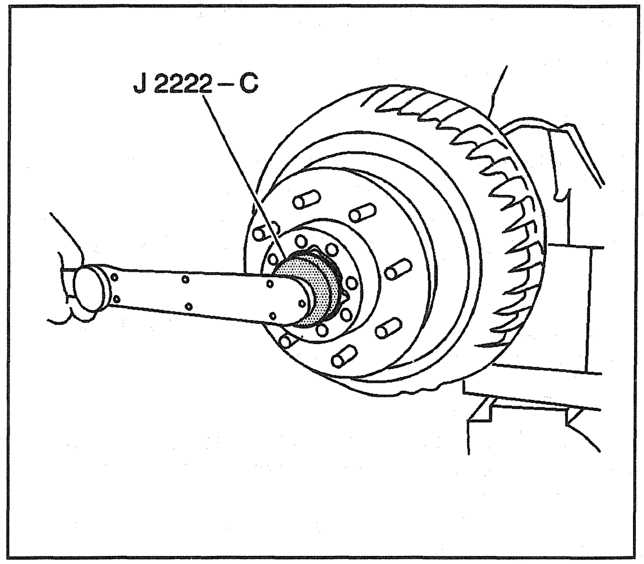
1. Install the lock washer
2. Bend one tang of the retaining washer over a flat of the adjusting nut to a minimum of 30 degrees.
3. Install the outer retaining nut.

   Tighten

   Tighten the outer retaining nut to a minimum of 88 N·m (65 lb ft)

Notice: Refer to *Fastener Notice* in Caution and Notices.

4. Make the final bearing adjustment 0.025–0.25 mm (0.001–0.010 in).
5. Bend one tang of the retaining washer over a flat of the outer nut to a minimum of 60 degrees.
6. Add wheel bearing grease in the bearings.
7. Install the axle shaft. Refer to *Axle Replacement (10 1/2 In Ring Gear).*



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Description and Operation

Rear Axle Description

General Description

These trucks use various rear axles. The axles can be identified by the ring gear size in inches, by manufacturer (American Axle Manufacturing or Dana) and by the type of axle shaft used (semi-floating or full-floating). American Axle Manufacturing axles include the 8½, 8⅝, 9½, and 10½ inch ring gear axle. Dana supplies an 11 inch ring gear axle. The locking differential is supplied by Eaton.

Rear Axle Operation

A basic differential has a set of four gears. Two are side gears and two are pinion gears. Some differentials have more than two pinion gears. Each side gear is splined to an axle shaft; so each axle shaft turns when its side gear rotates.

The pinion gears are mounted on a differential pinion shaft, and the gears are free to rotate on this shaft. The pinion shaft is fitted into a bore in the differential case and is at right angles to the axle shafts.

Power is transmitted through the differential as follows: the drive pinion rotates the ring gear. The gear, being bolted to the differential case, rotates the case. The differential pinion, as it rotates with the case, forces the pinion gears against the side gears. When both wheels have equal traction, the pinion gears do not rotate on the pinion shaft because the input force on the pinion gear is equally divided between the two side gears. Therefore, the pinion gears revolve with the pinion shaft, but do not rotate around the shaft itself. The side gears, being splined to the axle shafts and in mesh with the pinion gears, rotate the axle shafts.

If a vehicle were always driven in a straight line, the ring and pinion gears would be sufficient. The axle shaft could then be solidly attached to the ring gear and both driving wheels would turn at equal speed.

However, if it became necessary to turn a corner, the tires would scuff and slide because the outside wheel would travel further than the inside wheel. To prevent tire scuffing and sliding, the differential allows the axle shafts to rotate at different speeds.

When the vehicle turns a corner, the inner wheel turns slower than the out wheel and slows its rear axle side gear (as the shaft is splined to the side gear). the rear axle pinion gears will roll around the slowed rear axle side gear, driving the rear axle side gear and wheel faster.

Locking Rear Axle

The locking rear differential allows for normal differential function as indicated in the standard rear axle description. Additionally, the locking rear differential uses multi-disc clutch packs and a speed sensitive engagement mechanism that locks both wheels together if one wheel should spin excessively during slow vehicle operation.

Under light loads, the clutch plates alone tend to lock axle shafts to the differential case, and therefore, locking each other. This is due primarily to the gear separating load developed on the right clutch pack. This induced clutch torque capacity resists motion between the side gear and the rear axle differential case. The differential allows the wheels to turn at different speeds while the axle shafts continue to transmit the driving force. Also, heavier throttle application will cause an axle speed differential, but this starts the full-lock feature of the unit.

Full locking is accomplished through the use of a heavyweight governor mechanism, cam system, and multi-disc clutch packs. The flyweights on the governor mechanism move outward to engage a latching bracket whenever the wheel-to-wheel speed varies by approximately 100 RPM or more. This action retards a cam which, in turn, compresses the multi-disc clutch packs locking both side gears to the case. The 100 RPM wheel-to-wheel speed allows for cornering without differential lockup.

At vehicle speeds above approximately 32 km/h (20 mph), the latching bracket overcomes a spring preload and swings away from the flyweights. At this vehicle speed or greater, the differential is designed not to lock, since added traction is generally not needed.

All axle parts of vehicles equipped with the locking rear axle are interchangeable with those equipped with the conventional rear axle, except for the case assembly.

Dana Model 80 (11 Inch Ring Gear)

The Dana 11 inch ring gear axle uses a conventional ring and pinion gear set to transmit the driving force of the engine to the rear wheels. The gear set transfers the driving force at a 90 degree angle from the propeller shaft to the axle shafts.

This axle is full-floating. The wheel hubs support the axle shaft at the wheel ends. The shaft at the wheel end is supported and splined to the hub inner-diameter. The differential supports the other splined end of the shaft.

Two tapered roller bearings support the pinion gear. A shim pack between the inner pinion bearing cup and the axle housing sets the pinion depth. A shim pack at the front of the axle housing between the bearing cone and pinion gear sets the pinion bearing preload.

The ring gear bolts to the differential case.

Two tapered rolling bearings support the differential case. Two methods are in use in order to control the differential bearing preload and drive gear to pinion gear backlash.

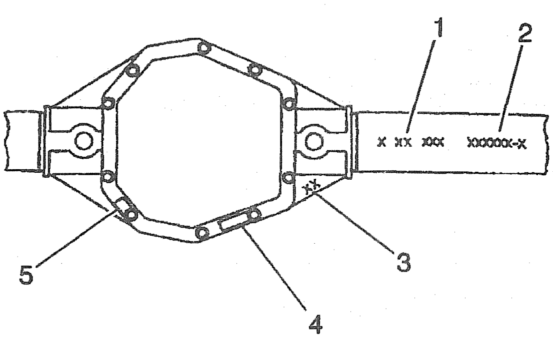
One method uses a 0.76 mm (0.030 inch) hardened shim and a selective outboard spacer shim. The location of the hardened shim is between each differential bearing cone and the differential case. The location of the selective outboard spacer shim is between each differential bearing cup and the housing.

The other method uses selective shims between each differential bearing cone and the differential case, with outboard spacers between each differential bearing cup and the housing.

When moving the ring gear with outboard selective shims, choose shims of different thickness in order to accommodate the change. For example: if a change requires a shim on the ring gear side that is 0.13 mm (0.005 inch) thinner, then the opposite side will require a shim that is 0.13 mm (0.005 inch) thinner.

On axles built using the other method, accomplish gear movement by moving shims from one side of the differential case to the other. If the differential preload needs to be changed, equal amounts must be added or subtracted from each side.

Spread the axle housing in order to remove the differential from the housing. When the spreader is removed, the housing sets the bearing preload. Two bearing caps hold the differential in the axle housing. A pinion seal, hub seal, and RTV between the cover and the housing seals the axle.



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A part number (2) and manufacturing date (1) on the right axle tube, cover plate side, identifies all Dana axles. The model number (3) is cast on the carrier. Tags attached to the differential cover plate carry information on limited slip lubrication (4) and the axle ratio (5). The carrier does not have a drain plug.

Special Tools and Equipment

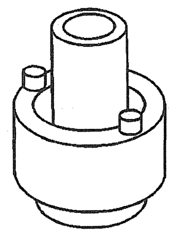
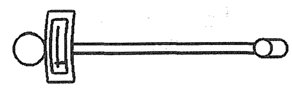
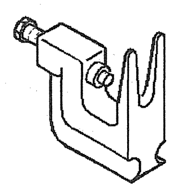
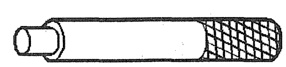
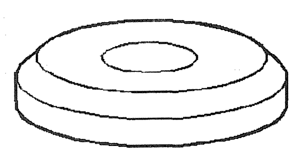
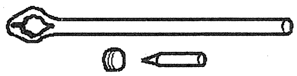
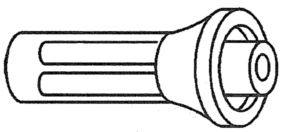
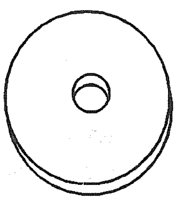
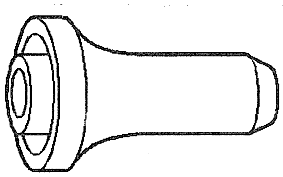
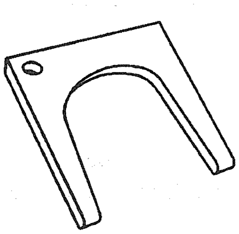
Illustration	Tool Number/Description
 156470	J 2222C Wheel Bearing Nut Wrench
 156497	J 5853-B Torque Wrench
 130	J 6627-A Wheel Stud Remover
 2015	J 8092 Driver Handle
 5332	J 8608 Pinion Bearing Cup Installer

Illustration	Tool Number/Description
 1507	J 8614-01 Companion Flange Holder
 156502	J 21128 Axle Shaft and Pinion Seal Installer
 156498	J 22349 Pinion Bearing Cup Installer
 5327	J 22388 Pinion Oil Seal Installer (9½ in)
 156541	J 22804-1 Pinion Oil Seal Spacer

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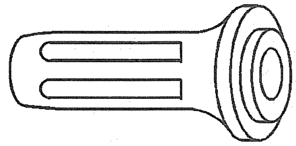
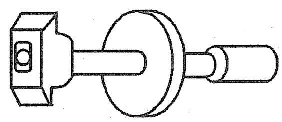
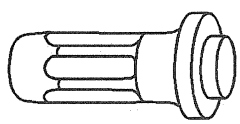
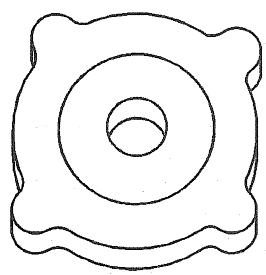
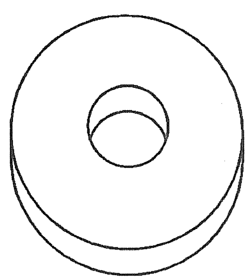
 156544	J 22836 Pinion Seal Installer (8½ in)
 156500	J 23689 Axle Shaft Bearing Remover (Large Shaft)
 36473	J 24384 Dana Pinion Seal Installer
 36475	J 24426 Outer Wheel Bearing Cup Installer
 36474	J 24427 Inner Wheel Bearing Cup Installer

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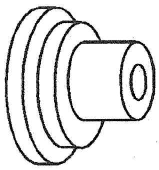
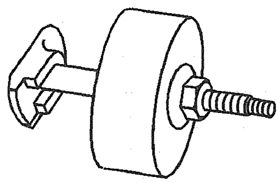
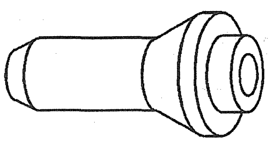
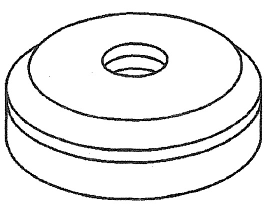
 156531	J 29709 Axle Shaft Bearing Installer
 156545	J 29712 Axle Shaft Bearing Remover (9½ in)
 156537	J 29713 Axle Shaft Bearing Installer (9½ in)
 36472	J 39114-A Axle Shaft Seal Installer

Rear Drive Axle - Locking/Limited Slip Rear Axle

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
7 5/8, 8 1/2, and 8 5/8″ Differential Lockscrew	36 N·m	27 lb ft
9 1/2″ Differential Lockscrew	50 N·m	37 lb ft

Thrust Block Sizes (Locking)

Color Code	7 5/8″	8 1/2″ and 8 5/8″	9 1/2″
Purple	1.260″	1.322″	1.598″
White	1.264″	1.326″	1.602″
Brown	1.268″	1.330″	1.606″
Yellow	1.272″	1.334″	1.610″
Orange	1.276″	1.338″	1.614″
Pink	1.280″	1.342″	1.618″
Green	1.284″	1.346″	1.622″
Blue	1.288″	1.350″	1.626″
Black	—	—	1.630″

Reaction Block, 10 1/2 Inch Axle

Gear Size	Reaction Block Size
10 1/2″	0.787″

Lubrication Specifications

Application	Type of Material	GM Part Number
GL-5 80W90	Lubricant	—

Repair Instructions

Locking Differential Disassemble (10 1/2 Case)

Removal Procedure

Tools Required

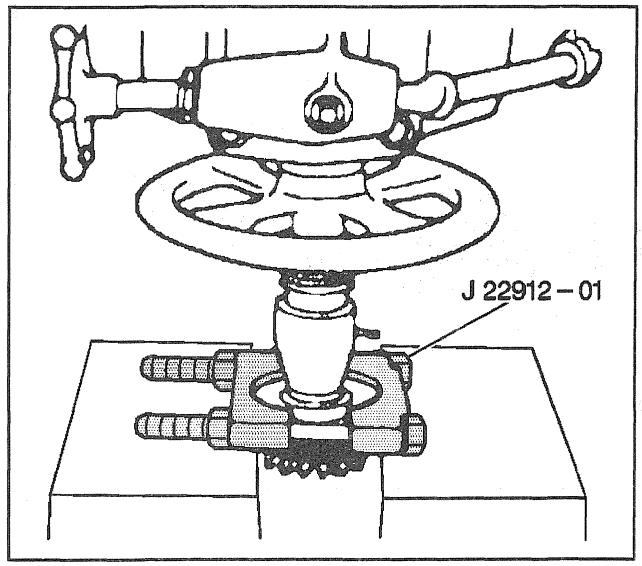
J 22912-01 Bearing Remover

1. Remove the ring gear and the differential side bearings. Refer to *Drive Axle Disassemble* in Rear Drive Axle.
2. Remove the case screws.

   Set the unit on the right side case half.
3. Remove the case halves.
   3.1. Pry the halves apart at the yoke hole location.
   3.2. Hold the side gear in the left side case half.
4. Remove the governor assembly.
5. Remove the latching bracket assembly.
6. Remove the left side gear.
7. Remove the left side clutch plates and the guide clips.
8. Remove the left side gear thrust washer.
9. Remove the following parts:
   - The reaction blocks
   - The pinion yoke
   - The pinion gears
   - The pinion thrust washers
10. Remove the right cam unit from the differential.
11. Remove the right side gear thrust washer.

    Measure and record the overall length of the gear assembly from the front of the gear to the back of the thrust sleeve including the side gear thrust washer.
12. Remove the thrust sleeve using the *J 22912-01*.

    Press the sleeve from the side gear.
13. Remove the clutch plates.
14. Remove the guide clips.
15. Remove the wave washer.
16. Remove the cam plate.
17. Remove the side cam gear.



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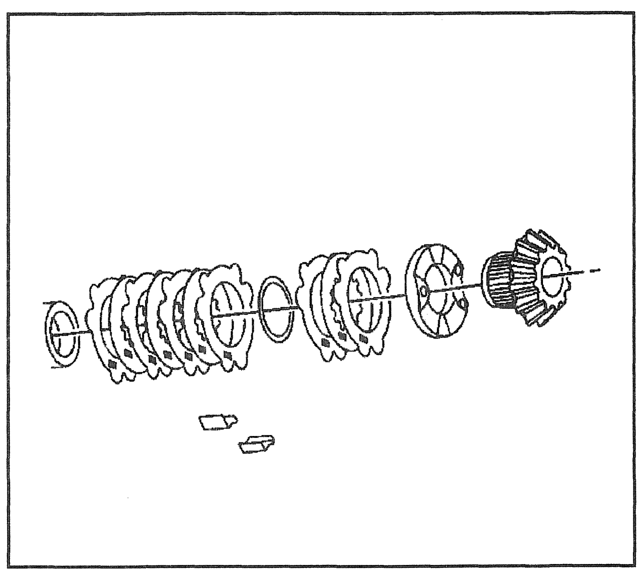

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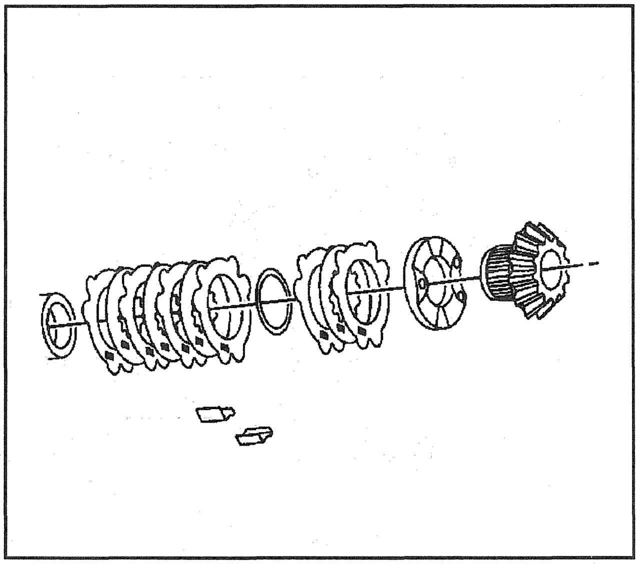

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Cleaning and Inspection Procedure

1. Clean all the parts with an approved solvent.
2. Inspect the following parts:
   - The pinion gear and the side gear for wear, cracks, scoring, and spalling
   - The thrust washers for wear
   - The fit of the side gears on the axle shafts
   - The differential case for cracks and scoring
   - The thrust sleeve for excessive wear

     Do not replace the thrust sleeve unless necessary.
   - All the parts for excessive wear and breakage
3. Replace parts as necessary.

Important: If any damage to the differential case is found, the differential must be replaced.

4. Inspect the side gear bore for scoring.

   If scoring is present, replace the differential.

Cam Unit Assembly

1. Install a cam plate to the side cam gear.
2. Install a wave washer.
3. Install the clutch plates.

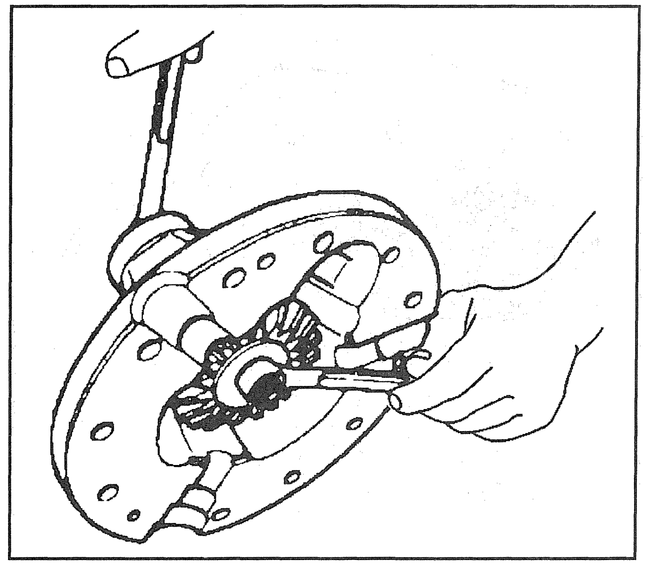
   Alternate the plates and position the wave washer as shown.
4. Install the thrust sleeve.

   Press the thrust sleeve flush with the side gear disc spline.
5. Install the guide clips to the plates.
   - 5.1. Use a chassis grease in the clips in order to hold the clips in place on the plates.
   - 5.2. If the side gear or the thrust sleeve has been replaced, measure and record the overall length of the gear to the back of the thrust sleeve including the side gear thrust washer.
   - 5.3. Compare the reading with the reading obtained earlier.
   - 5.4. If the new reading is more than 0.0762 mm (0.003 in) higher or lower than the original, select a side gear thrust washer that will return the reading closest to the original reading.

Adjustment of the Differential

1. If it is necessary to replace the cam gear, the right hand side gear, or the reaction blocks, the entire differential must be adjusted. The differential is adjusted using selective thickness thrust washers behind each side gear, and the selective thickness thrust washers between the reaction blocks.
2. Build up the differential properly.

   The proper clearance between parts is critical to the operation of the unit.
3. Note the three adjustments necessary as follow:
   - The left side gear backlash
   - The right side gear backlash
   - The thrust block clearance



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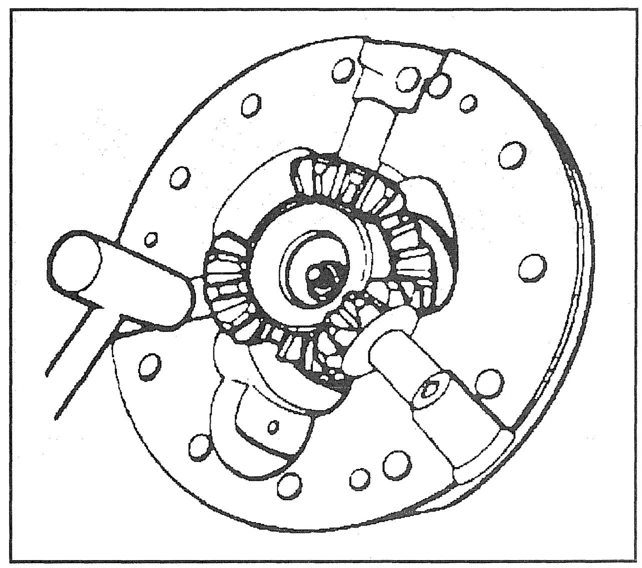
Right Side Gear Backlash Adjustment

1. Install the cam unit and the side gear thrust washer to the right case half.
2. Clamp the cam unit in place using a set of washers, nut, and a bolt long enough to hold the cam unit in place.
3. Place the pinion gears and the pinion thrust washers on the pinion yoke.
4. Install the yoke firmly to the differential case half.
5. Loosen the nut.
6. Index one pinion gear tooth to point downward, perpendicular to the case half face.

   Tighten the nut.



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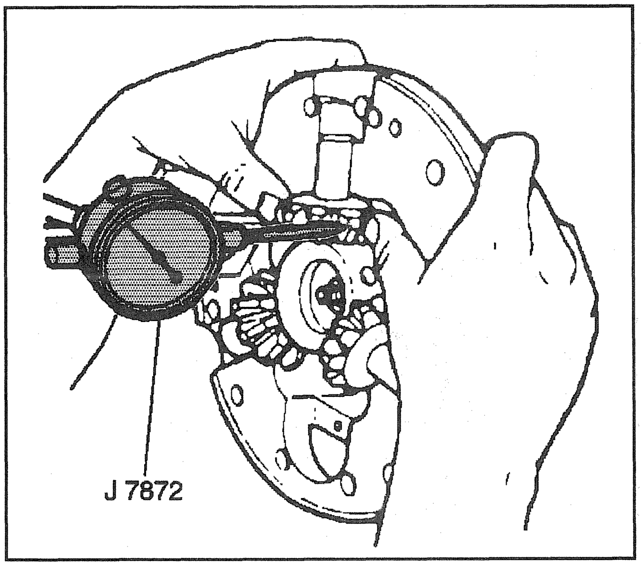

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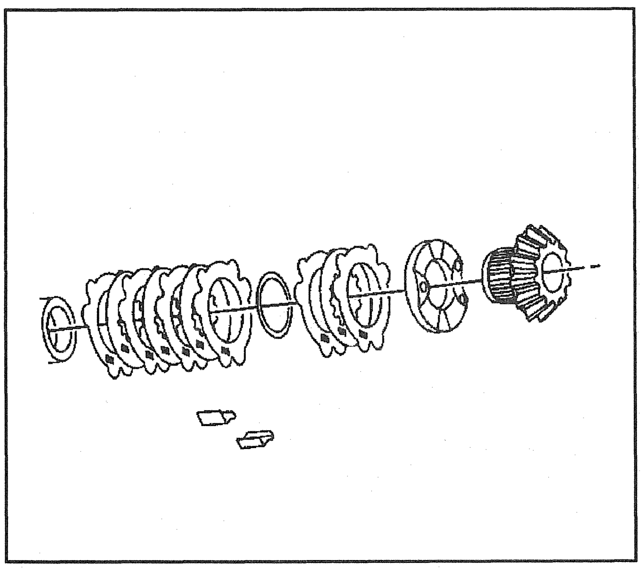

206994

7. Mount a dial indicator on the case half face using a magnetic base.
8. Place the stem of the dial indicator on the pinion gear tooth.
9. Pull the pinion gear firmly into the seat.
   - Rotate the gear back and forth while reading the dial indicator.
   - Record the reading.
   - Do not unseat the pinion yoke.

     This will make the backlash reading inaccurate.
10. Repeat steps 5 through 9 on the remaining two pinions.
11. The backlash should be between 0.254 and 0.457 mm (0.010 and 0.018 in).
12. If the backlash is too high, use a thicker side gear thrust washer.
13. If the backlash is too low, use a thinner side gear thrust washer.

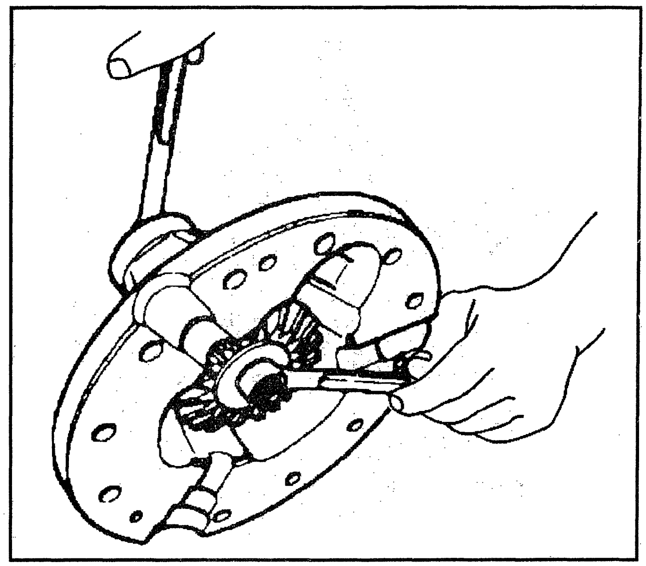
Left Side Gear Backlash Adjustment

1. Assemble the clutch plates.

   Alternate the plates as shown.
2. Assemble the guide clips to the plates.

   Use grease in the clips in order to hold them in place on the plates.
3. Install the following parts to the differential:
   - The side gear thrust washer
   - The clutch plate assembly
   - The left side gear

4. Install the clamp the side gear in place using a set of washers, a nut, and a bolt long enough to hold the side gear in place.
5. Place the pinion gears and the pinion thrust washers on the pinion yoke.



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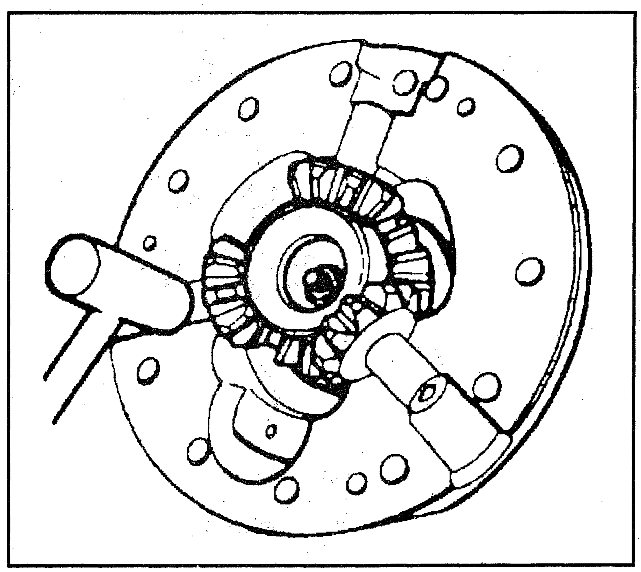
6. Install the yoke firmly to the differential case half.
7. Loosen the nut and the index one pinion gear tooth to point downward, perpendicular to the case half face.

   Tighten the nut.



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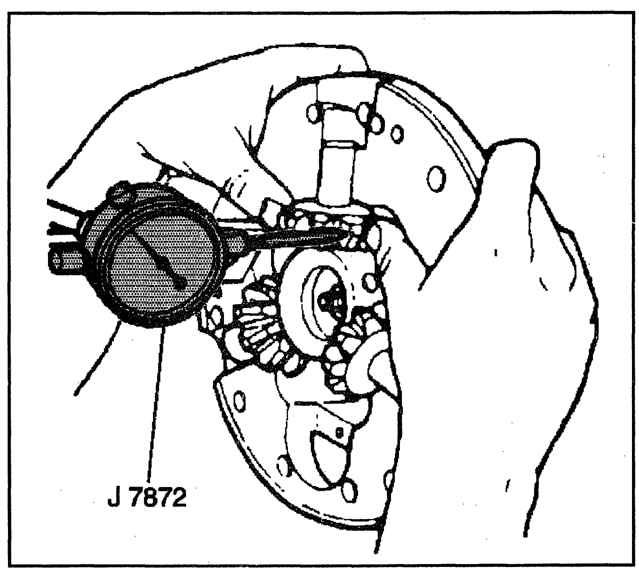
8. Mount a dial indicator on the case half face using a magnetic base.
9. Place the stem of the dial indicator on the pinion gear tooth.
10. Pull the pinion gear firmly into the seat.
    - Rotate the gear back and forth while reading the dial indicator.
    - Record the reading.
    - Do not unseat the pinion yoke. This will make the backlash reading inaccurate.
11. Repeat steps 7 through 10 on the other two pinions.
12. The backlash should be between 0.051 and 0.254 mm (0.002 and 0.010 in).
13. If the backlash is too high, use a thicker pinion thrust washer.
14. If the backlash is too low, use at a thinner position thrust washer.



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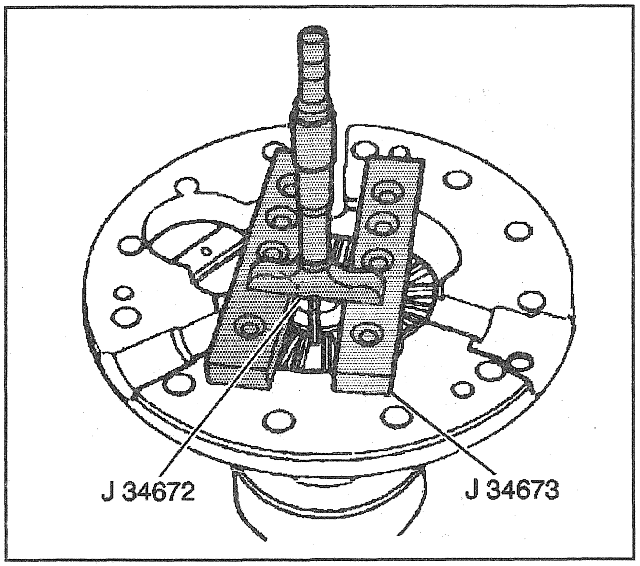

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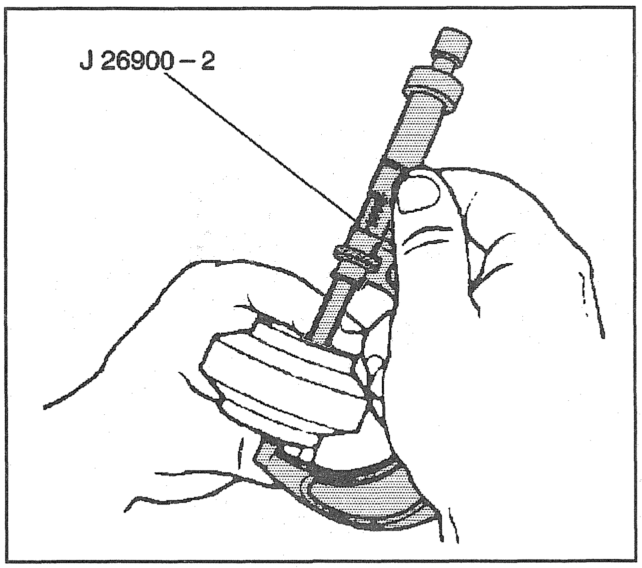
Reaction Block Clearance Adjustment

1. Install the left side gear thrust washer, the clutch plates, and the side gear.

   Bolt the parts into position. Refer to Left Side Gear Backlash Adjustment in this section..
2. Install the right side gear thrust washer and cam assembly.

   Bolt the parts into position. Refer to Right Side Gear Backlash Adjustment in this section.
3. Measure the distance from the side gear face to the case half face.
   - 3.1. The thickness of the straight edge must be subtracted from the reading.
   - 3.2. Add the measurement of both sides together. This is the side gear spread.



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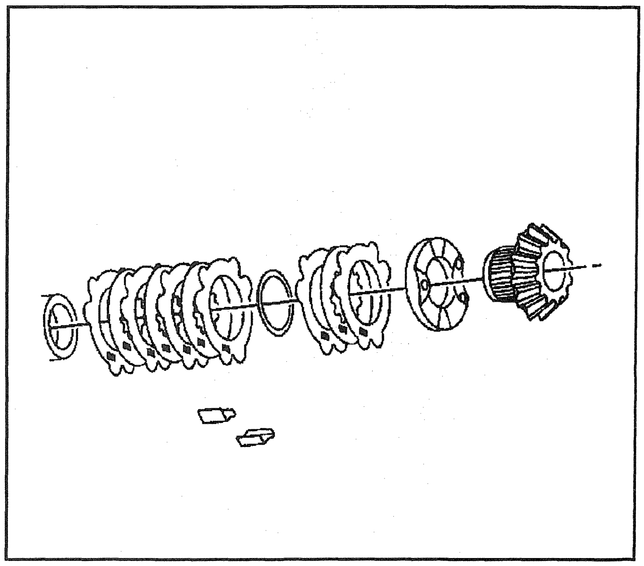
4. Measure the thickness of the original reaction blocks and the reaction block thrust washers together.
5. If the combined reaction block and the thrust washer thickness is not 0.000 to 0.1524 mm (0.000 to 0.006 in) less than the side gear spread, adjust the clearance using the following procedure:
   - Select a new reaction block thrust washer of the correct thickness in order to obtain 0.000 to 0.1524 mm (0.000 to 0.006 in) clearance.
   - Reshim the left and/or the right clutch disc pack.

     Maintain the side gear backlash. Refer to Right Side or Left Side Gear Backlash Adjustment in this section.
   - Some of the older locking differentials had select fit reaction blocks without a between thrust washer. These models require replacing the reaction blocks with the correct thickness reaction block.

Assembly of the Differential

1. Install the right thrust washer.
2. Install the right cam unit. Refer to Cam Unit Assembly in this section.
3. Install the following parts:
   - The reaction blocks
   - The reaction block thrust washer
   - The pinion yoke
   - The pinion gears
   - The pinion thrust washers
4. Install the left thrust washer.

   Assemble the plates as shown.



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5. Install the left side gear.
6. Install the latching bracket assembly.
7. Install the governor assembly.

   The straight end of the latching bracket spring must be over and outside the governor assembly shaft.
8. Install the case halves together.

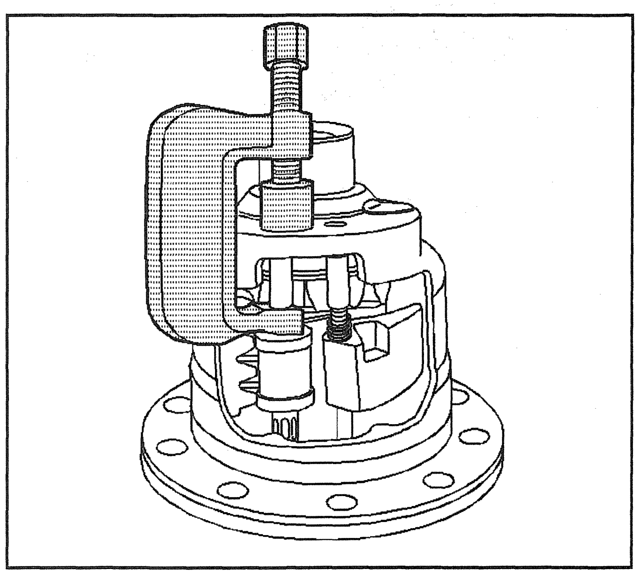
   Hold the side gear in the left side case half.
9. Install the case screws.
10. Install the ring gear and the differential side bearings. Refer to Assembly of the Rear Axle in 10 1/2 Inch Ring Gear.

Locking Differential Disassemble (8 1/2 and 9 1/2 Case)

Tools Required

J 26252 Governor Remover

1. Remove the governor bushing using *J 26252*.



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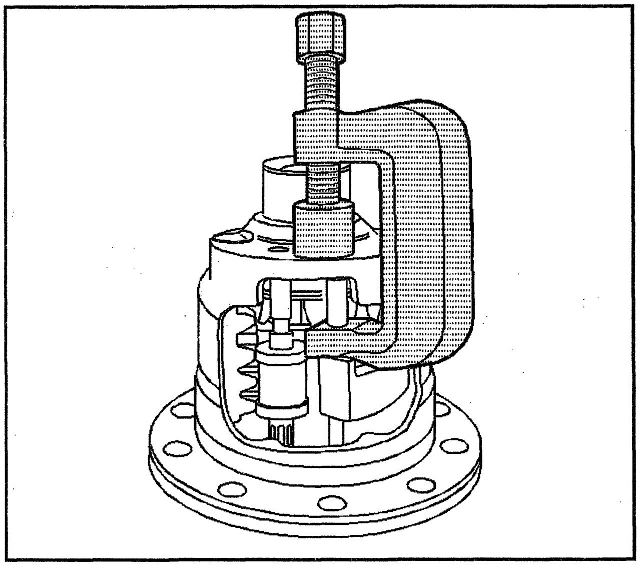

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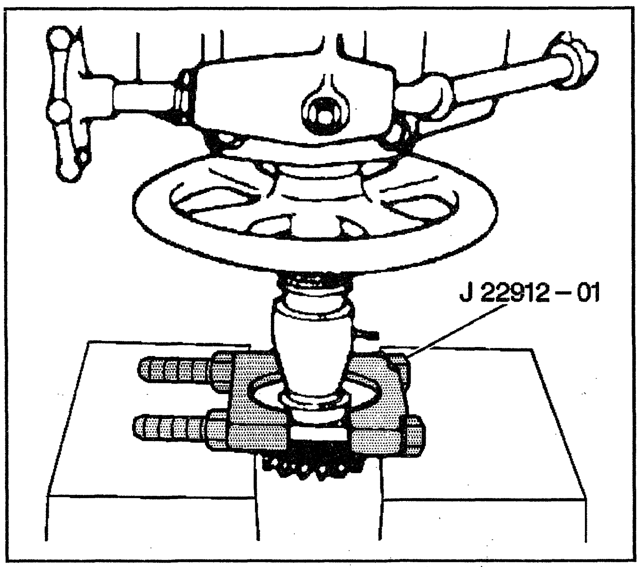

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2. Remove the E-clips that hold the latching bracket on the shaft. Move the bracket down the shaft.
3. Remove the latching bracket bushing using the *J 26252*.
4. Remove the latching bracket, the shaft, and the spring from the case.
5. Remove the governor assembly from the case.
6. Remove the lock screw.
7. Remove the pinion shaft.
8. Remove the differential pinion gear and pinion thrust washer.

   Rotate one of the side gears and roll the gears out of the case.
9. Remove the thrust block and the right side gear.
10. Remove the right clutch plates and the side thrust washer.
11. Remove the left side gear, the cam plate, and the clutch plates as an assembly (cam unit).
12. Remove the side gear thrust washer.

Locking Differential Cam Unit Disassemble (10 1/2 Assembly)

Tools Required

J 22912-01 Bearing Remover

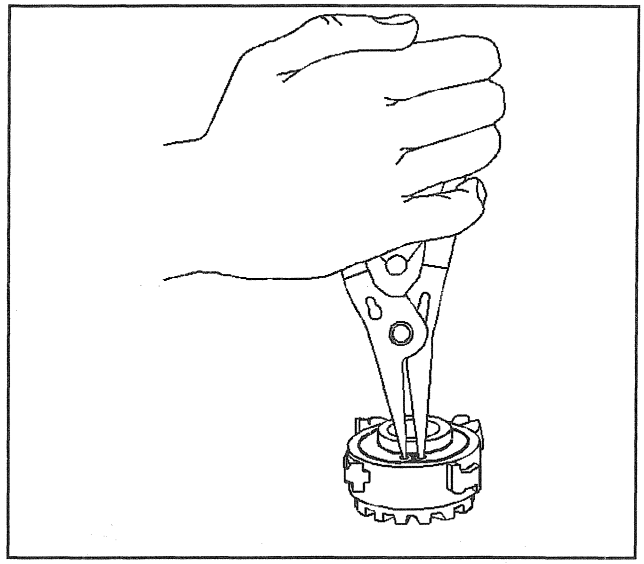
1. Measure and record the overall length of the gear assembly from the front of the gear to the back of the side thrust sleeve, including the side gear thrust washer.
2. Remove the guide clips.
3. Remove the side thrust sleeve using the *J 22912-01*.

   Press the sleeve from the side gear.
4. Remove the clutch plates.
5. Remove the wave washer.
6. Remove the cam plate.
7. Remove the side cam gear.

Locking Differential Cam Unit Disassemble (7 5/8 and 8.6 Assembly)

Removal Procedure

1. Remove the retaining ring using snap ring pliers.
2. Remove the clutch plates and the guide clips.



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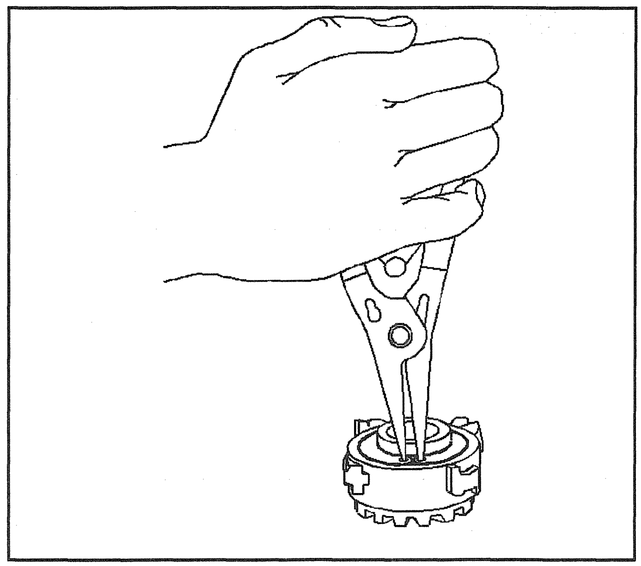
Installation Procedure

1. Install the cam plate to the side cam gear.
2. Install the wave washer.
3. Install the clutch plates (7 5/8 ring gear = 8 plates, 8.6 ring gear = 10 plates). Alternate the plates.
4. Install the retaining ring (18).
5. Install the guide clips (13) and (16) to the clutch plates. Use grease in the clips in order to hold the clips in place on the plates.



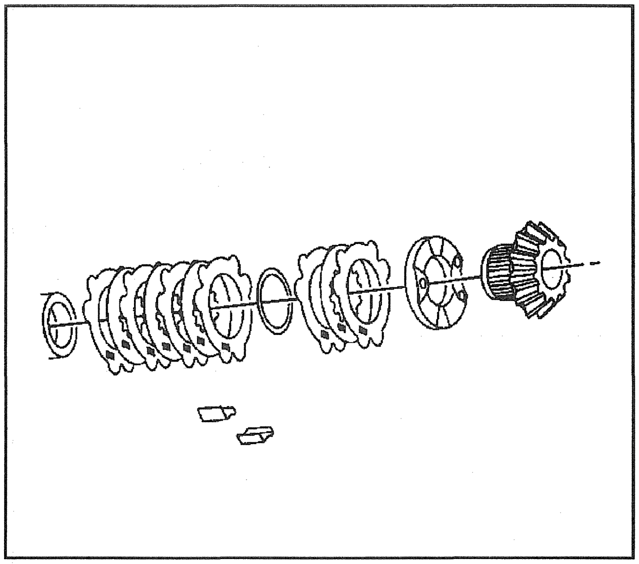
6343

Locking Differential Cleaning and Inspection

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

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

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



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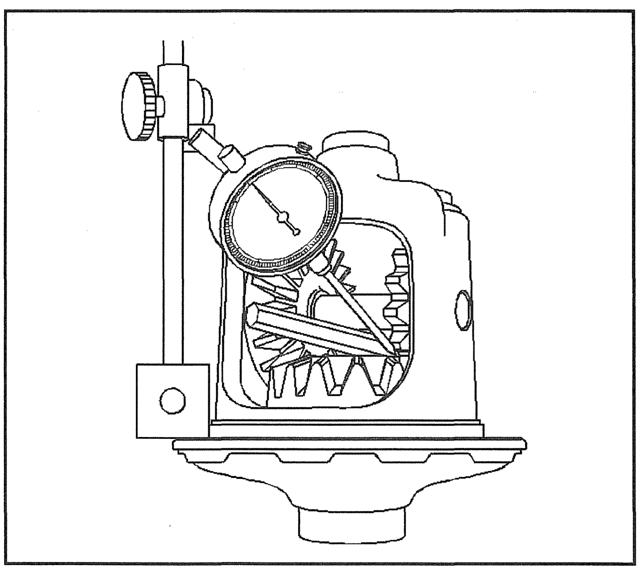
Locking Differential Cam Unit Assemble

1. Install the cam plate to the side cam gear.
2. Install the wave washer.
3. Install the clutch plates.

   Alternate the plates as shown.
4. Install the thrust sleeve.

   Press the thrust sleeve flush with the side gear disc splines.
5. Install the guide clips to the clutch plates.
6. Install the guide clips to the clutch plates.
   - 6.1. Use grease in the clips in order to hold the clips in place on the plates.
   - 6.2. If the side cam gear or the side thrust sleeve has been replaced, measure and record the overall length of the gear assembly from the front of the gear to the back of the side thrust sleeve, including the side gear thrust washer.
   - 6.3. Compare the reading with the reading obtained earlier in this section.
   - 6.4. If the new reading is more than 0.0762 mm (0.003 in) higher or lower than the original, select a thrust washer that will return the reading closest to the original reading.



7531

Locking Differential Adjustment

1. Assemble the clutch plates. Alternate the plates as shown.
2. Assemble the guide clips and to the plates. Use grease in order to hold the clips in place on the plates.
3. Install the side gear thrust washer, the clutch plate assembly and the right side gear to the differential.
4. Place the pinion gears and the thrust washers into the differential.
5. Align the gears and the washers with the pinion shaft hole.
6. Press down on the side gear. Install the pinion shaft and the lock screw. Use a thinner side gear thrust washer if you can not press the side gear down far enough to install the pinion shaft.
7. Rotate the pinion gear closest to the lock screw so that one of the teeth is pointing downward (perpendicular to the ring gear flange).
8. Insert a large tapered tool, such as a screwdriver, firmly between the side gear and the pinion shaft.

9. Mount and zero in a dial indicator to the ring gear flange. Place the stem of the indicator on one of the teeth of the pinion gear closest to the lock screw.
10. Pull the pinion gear firmly into the gear's seat. Rotate the gear back and forth while reading the dial indicator. Record the reading.
11. Repeat steps 7 through 9 for the opposite pinion gear.
12. The backlash should be between 0.051–0.243 mm (0.002–0.010 in).
13. Use a thicker side gear thrust washer if the backlash is too high. Use a thinner washer if the backlash is too low.

Locking Differential Assemble

1. Install the left side gear thrust washer.
2. Install the cam unit. Refer to *Locking Differential Cam Unit Disassemble (7 5/8 and 8.6 Assembly)*.
3. Install the right side gear thrust washer.
4. Install the right clutch plates with the guide clips. Assemble the unit as shown.
5. Install the right side gear.
6. Install the thrust block, the pinion thrust washer, and the pinion gear.
    6.1. Place the pinion gears into the differential 180 degrees apart.
    6.2. Rotate the gears and the thrust block into position.
    6.3. The open side of the thrust block must face the small window opening.

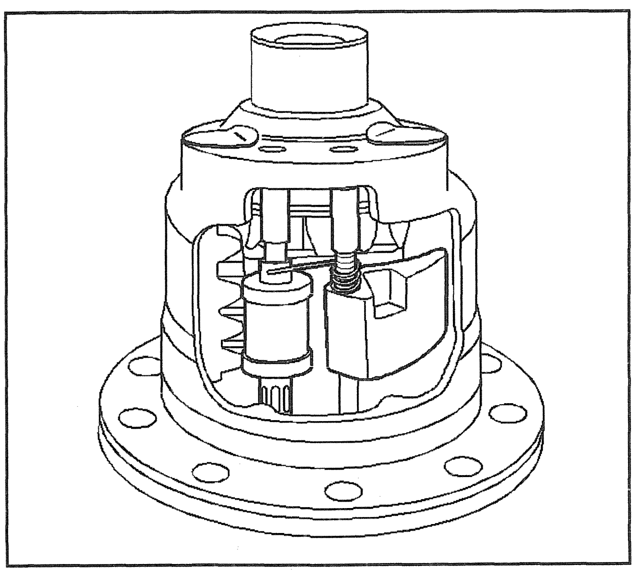
Important: Install a new lock screw, finger tight.

7. Install the pinion shaft.
8. Tighten to specifications after installation in the vehicle. Refer to *Fastener Tightening Specifications* in Rear Drive Axle.

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

9. Install the governor assembly and the latching bracket bushing.
10. Install the governor bushing.
    10.1. Use the bushing with a straight hole, not tapered.
    10.2. Press the bushing in far enough to give 0.1016–0.508 mm (0.004–0.020 in) shaft end play.
11. Install the latching bracket bushing.

    Press the bushing in far enough to eliminate all of the end play.



6108

Special Tools and Equipment

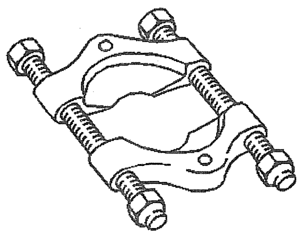
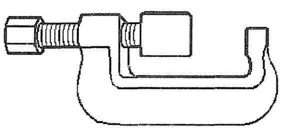
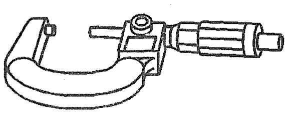
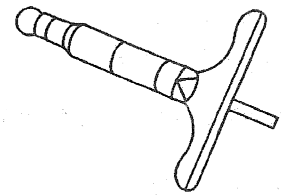
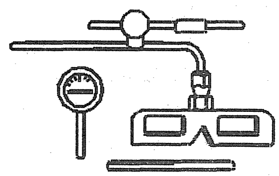
Illustration	Tool Number/ Description
 162970	J 22912-01 Rear Pinion Bearing Cone Remover
 5309	J 26252 Locking Differential Governor Remover
 163031	J 26900-2 1-2″ Micrometer

Illustration	Tool Number/ Description
 156600	J 34672 Depth Gauge
 35463	J 7872 Mag Base and Indicator

Transfer Case

Specifications

Fastener Tightening Specifications (Manual Shift Transfer Case)

Application	N·m	Lb Ft	Lb In
Adapter to Transfer Case Bolts	45	33	—
Adapter to Transmission Bolts	45	33	—
Drain and Fill Plugs	47	35	—
Propeller Shaft Yoke Nuts	149	110	—
Shift Control to Floor Panel Bracket Bolts	11	—	97
Transfer Case Shield Bolts	35	26	—
Transfer Case Shift Control Bezel Screws	2	—	18
Transfer Case Vent Hose Clip Nut	6	—	53

Approximate Fluid Capacities

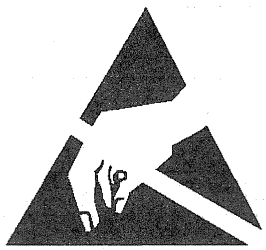
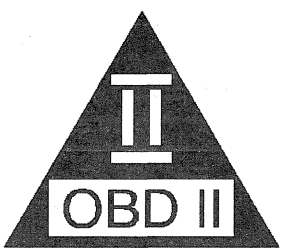
Application	Liters	Gallons	Quarts
NV261 Transfer Case — Use Dexron® III Oil GM P/N 12346143	2.2	—	2.3

Schematic and Routing Diagrams

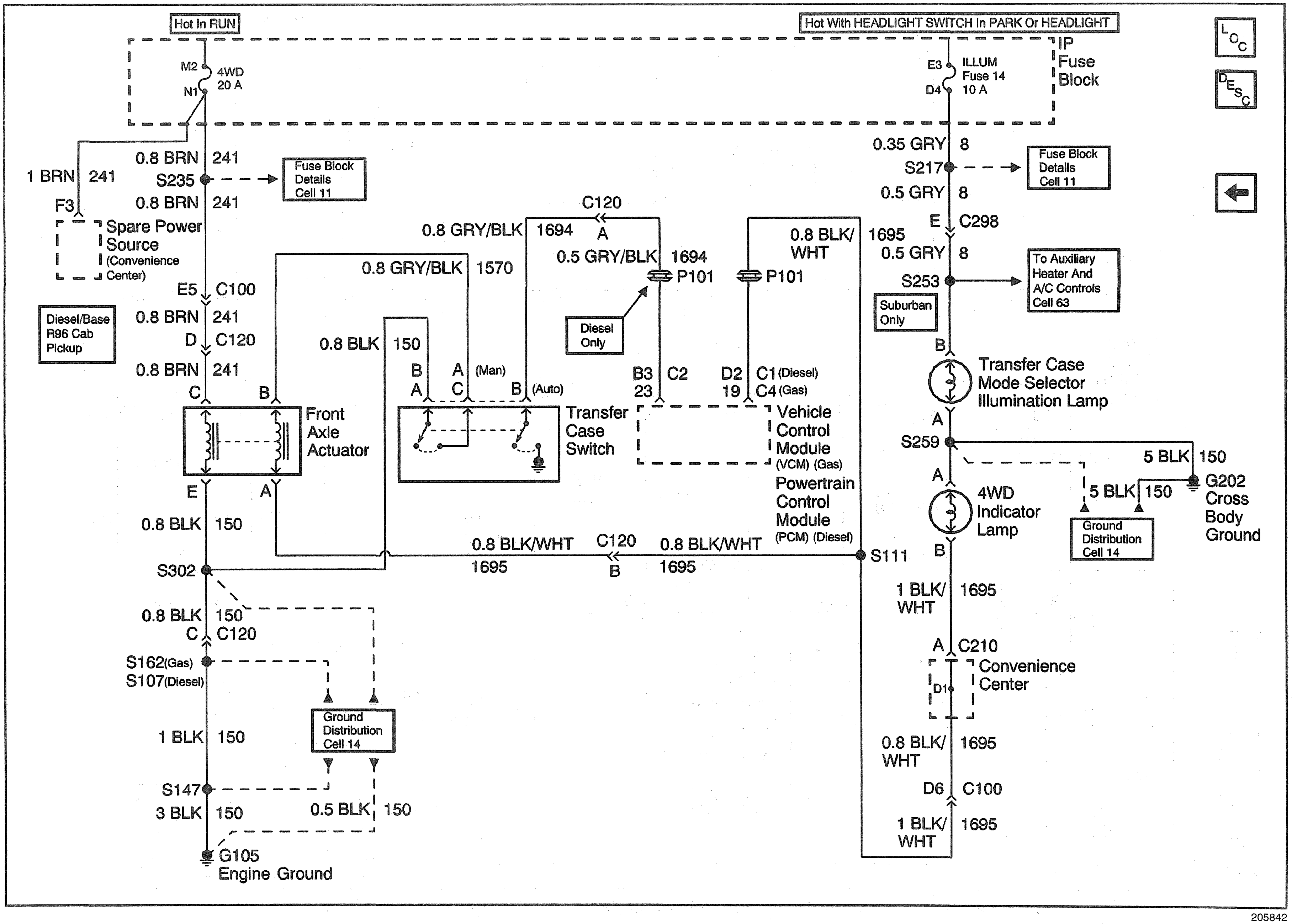
Transfer Case Control Schematic References

Reference on Schematic	Section Number Subsection Name
Fuse Block Details Cell 11	8 - Wiring Systems
Ground Distribution Cell 14	8 - Wiring Systems
Instrument Panel Cell 81	8 - Instrument Panel, Gauges and Console
Power Distribution Cell 10	8 - Wiring Systems

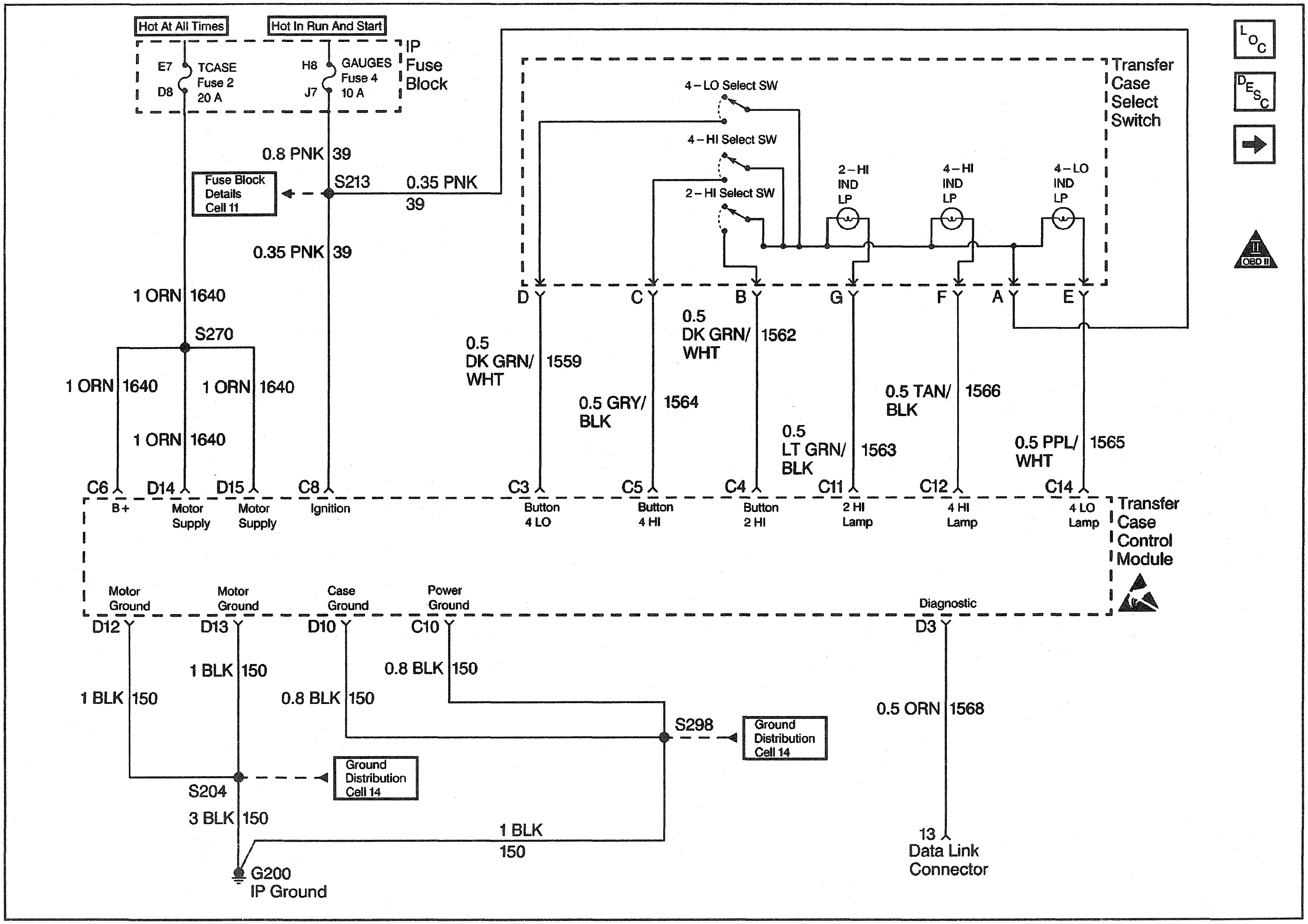
Transfer Case Control Schematic Icons

Icon	Icon Definition
 19384	Refer to Electrostatic Discharge (ESD) Sensitive Devices in Cautions and Notices
 19385	Refer to OBD II Symbol Description Notice in Cautions and Notices

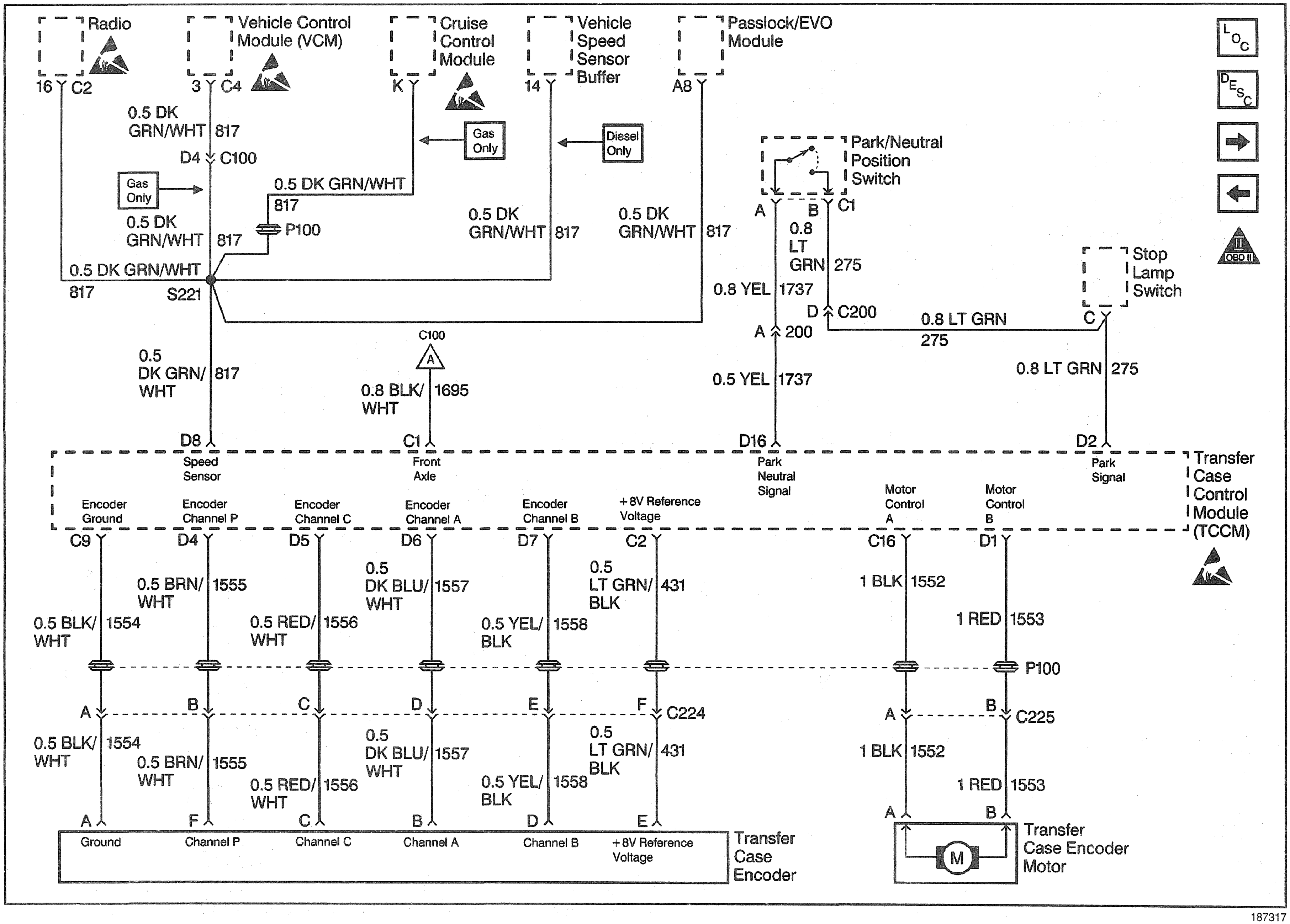
Transfer Case Control Schematics (Selectable 4WD) (Power, GND and DLC (Page 1 of 2))



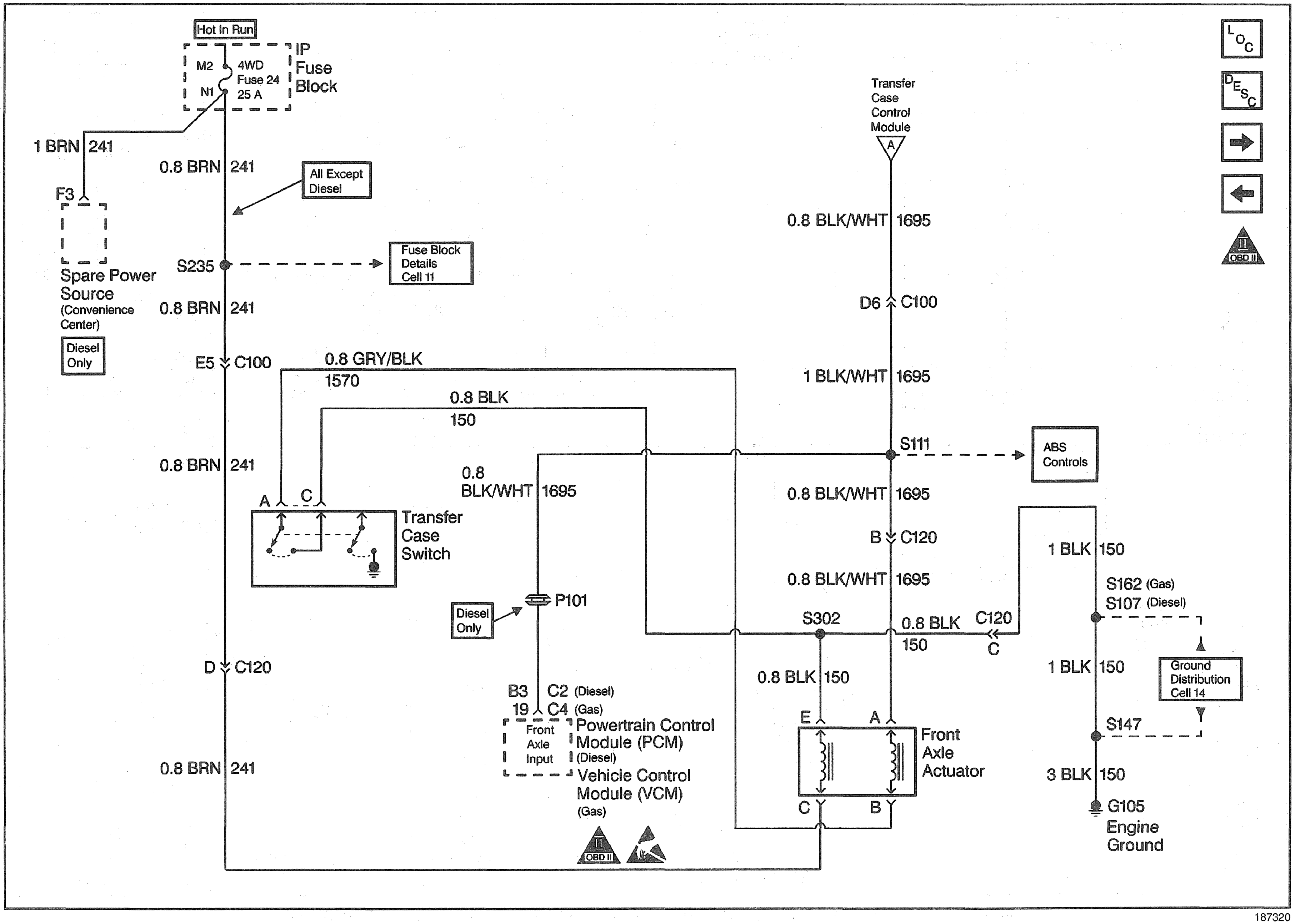
Transfer Case Control Schematics (Selectable 4WD) (Power, GND and DLC (Page 2 of 2))



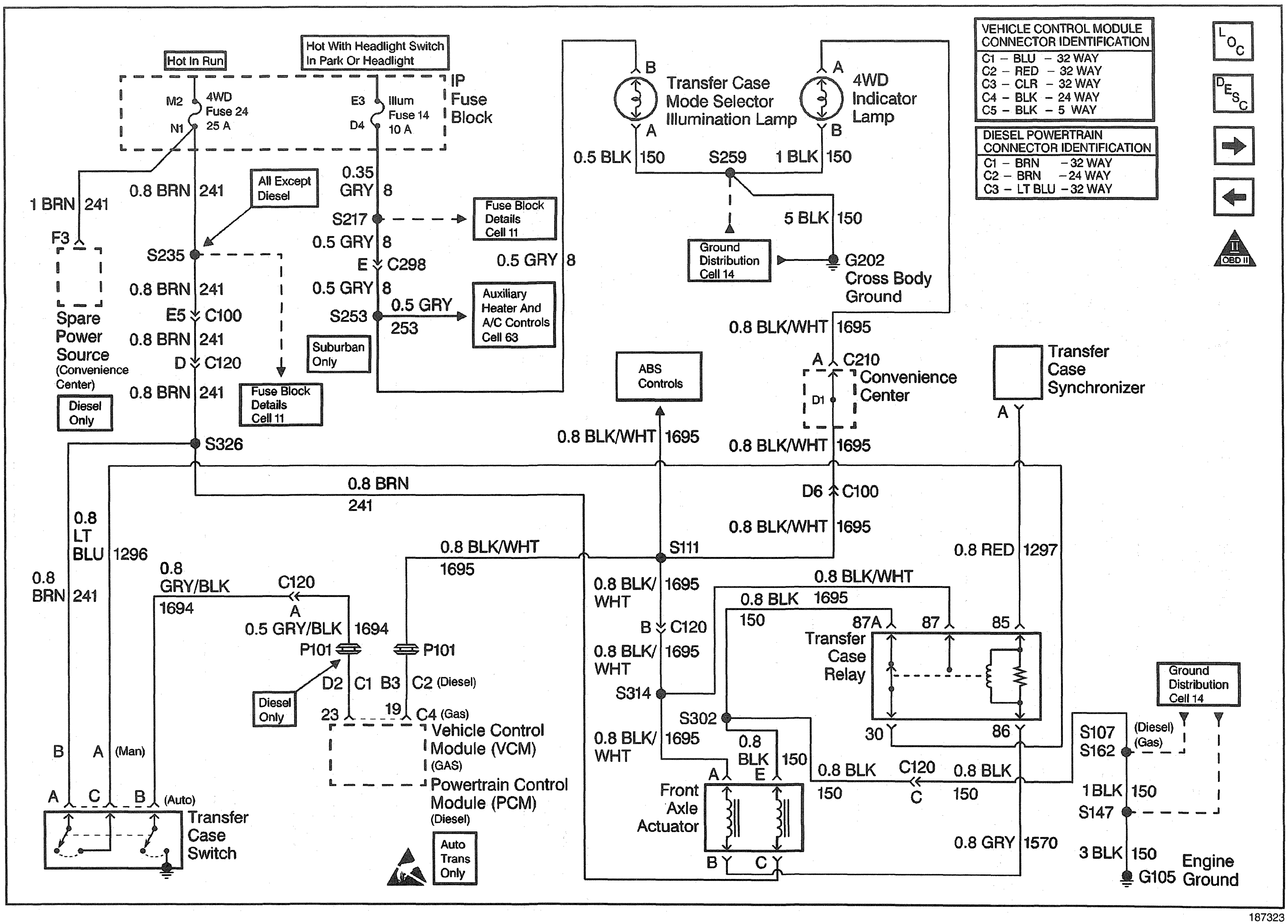
Transfer Case Control Schematics (Selectable 4WD) (Transfer Case Encoder)



Transfer Case Control Schematics (Selectable 4WD) (Transfer Case Switch and Front Axle Actuator (Page 1 of 2))



Transfer Case Control Schematics (Selectable 4WD) (Transfer Case Switch and Front Axle Actuator (Page 2 of 2))



Component Locator

Transfer Case Control Components

Name	Location	Locator View	Connector End View
Automatic Transfer Case Control Module	Under LH side of IP, near Convenience Center	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
Convenience Center	Under LH of IP, on Bulkhead	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
Cruise Control Module	LR of Engine Compartment, near Bulkhead	*Cruise Control Component Views* in Cruise Control	*Cruise Control Connector End Views* in Cruise Control
Selectable Four-Wheel Drive Indicator	Center floor console	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
Front Axle Actuator	RH rear side of the front drive axle	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
IP Fuse Block	LH of IP, near LF Door Jamb Switch	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
Instrument Cluster	Upper LH of IP, near Steering Column	*Instrument Cluster Component Views* in Instrument Panel, Gauges, and Console	*Instrument Cluster Connector End Views* in Instrument Panel, Gauges, and Console
Park/Neutral Position Switch	At LH Center of Transmission	*Automatic Transmission Electronic Component Views (Internal)* in Automatic Transmissions-4L60-E or *Automatic Transmission Electronic Component Views (Internal)* in Automatic Transmissions-4L80-E	*AT Internal Connector End Views* in Automatic Transmissions-4L60-E or *AT Internal Connector End Views* in Automatic Transmissions-4L80-E
Powertrain Control Module	Under RH end of IP, above Blower Motor, behind IP Compartment Box	*Engine Controls Component Views* in Engine Controls (6.5L)	*PCM Connector End Views* in PCM Connector End Views
Radio	Center of IP	*Entertainment Component Views* in Entertainment	*Entertainment Connector End Views* in Entertainment
Stoplamp Switch	Top of Brake Pedal	*Hydraulic Brakes Component Views* in Hydraulic Brakes	*Hydraulic Brakes Connector End Views* in Hydraulic Brakes
Transfer Case Control Module (TCCM)	Under the I/P on the steering column support bracket	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Encoder Motor	RH side, center of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Mode Selector Illumination Lamp	In the Switch	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Relay	RH rear of the engine compartment, near the center of the cowl	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Select Switch	On the I/P	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Switch (M30)	LH top of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*

Transfer Case Control Components (cont'd)

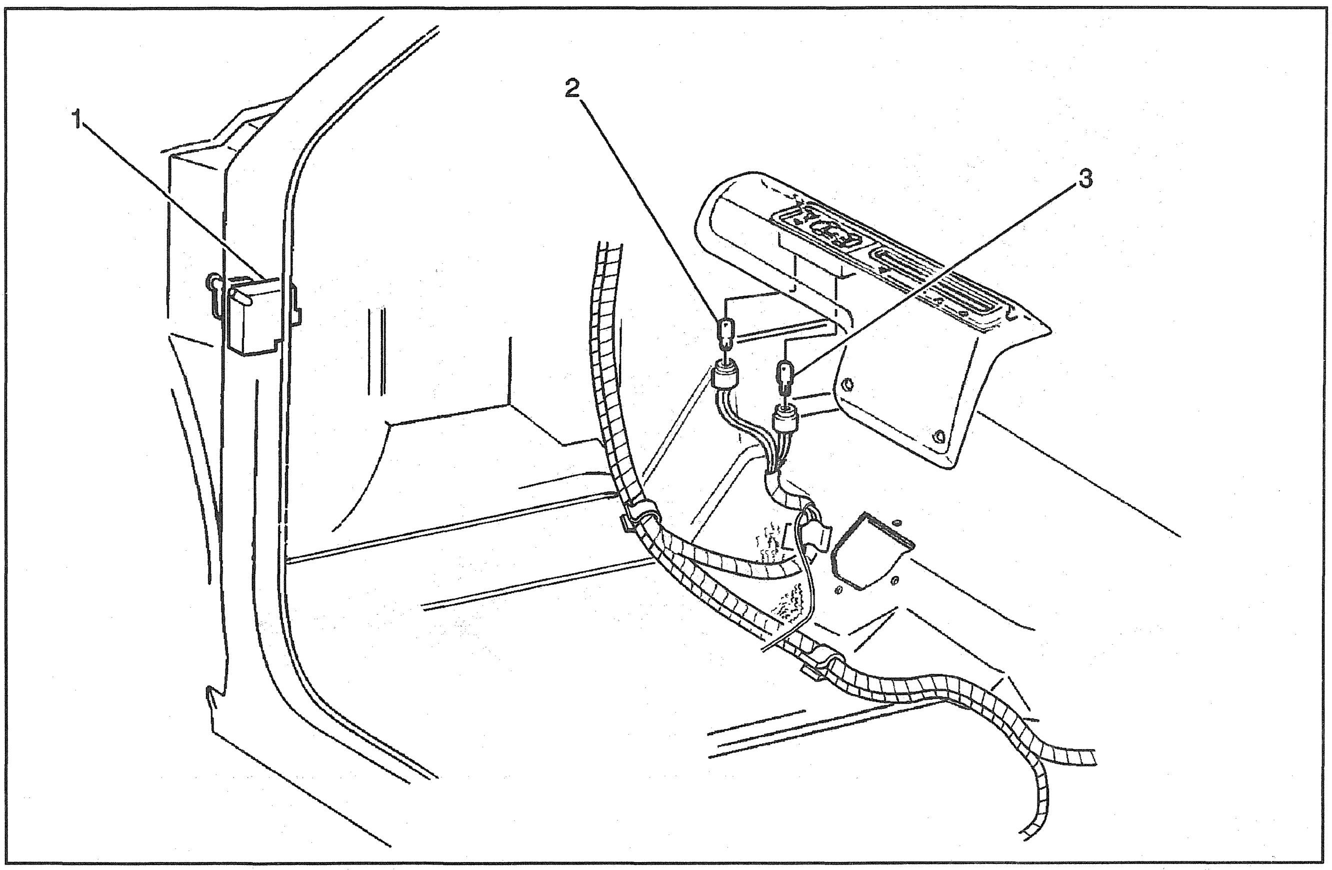
Name	Location	Locator View	Connector End View
Transfer Case Switch (MG5)	LH top of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Switch (MT1)	LH top of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Switch (MW3)	LH top of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Transfer Case Synchronizer	Top of the transfer case	*Transfer Case Control Component Views (Selectable 4WD)*	*Transfer Case Control Connector End Views (Selectable 4WD)*
Vehicle Control Module	Engine Compartment, near EBCM	*Engine Controls Component Views* in Engine Controls(4.3L), *Engine Controls Component Views* in Engine Controls(5.0/5.7L), or *Engine Controls Component Views* in Engine Controls(7.4L)	*VCM Connector End Views* in Engine Controls(4.3L), *VCM Connector End Views* in Engine Controls(5.0/5.7L), or *VCM Connector End Views* in Engine Controls(7.4L)
Vehicle Speed Sensor Buffer	Under RH of IP	*Engine Controls Component Views* in Engine Controls(6.5L)	*Engine Controls Connector End Views* in Engine Controls(6.5L)
C100	Engine Harness to IP Harness, LR of Engine Compartment, at Bulkhead	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C120	Rear of the engine, near the transmission	*Harness Routing Views* in Wiring Systems	*Transfer Case Control Connector End Views (Selectable 4WD)*
C131	IP Harness, approx. 8 cm from Wiper Motor Breakout	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C132	IP Harness, approx. 8 cm from Wiper Motor Breakout	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C200	Behind RH of IP, near Heater Motor, in foam wrap	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C210	At Convenience Center	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C224	LH rear of the engine compartment, under the brake master cylinder	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C225	LH rear of the engine compartment, under the brake master cylinder	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C227	Near Stoplamp Switch	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C228	Crossbody Harness to RF Seat	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
C298	RH Side of IP	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
G103	RF of Engine, front of Intake Manifold	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G104	RF of Engine	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G105 (Diesel)	RH top of the cylinder head	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems

Transfer Case Control Components (cont'd)

Name	Location	Locator View	Connector End View
G200	Behind LH of IP, below Fuse Block	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G202	RH of IP, mounted to HVAC Plenum Bracket	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
P100	LH rear of the engine compartment, at the bulkhead	*Harness Routing Views* in Wiring Systems	*Harness Routing Views* in Wiring Systems
S103	Engine Harness, Approx. 13 cm from EGR Valve Breakout, toward Taillamp Harness Breakout	—	—
S111	Engine Harness, Approx. 10 cm from EBCM Breakout	—	—
S107	Engine Harness, Approx. 18 cm from EBCM Breakout, toward EGR Valve Breakout	—	—
S147	Engine Harness, Approx. 8 cm from EGR Valve Breakout	—	—
S204	IP Harness, approx. 10 cm from Steering Column Harness Breakout	—	—
S213	IP Harness, approx. 4 cm from Steering Column Harness Breakout	—	—
S215	IP Harness, approx. 8 cm from Instrument Cluster Breakout, toward Radio Connectors Breakout	—	—
S221	IP Harness, approx. 40 cm from Instrument Cluster Breakout	—	—
S235	IP Harness, approx. 8 cm from Steering Column Harness Breakout	—	—
S236	IP Harness, approx. 10 cm from Steering Column Harness, near P100	—	—
S298	IP Harness, approx. 24 cm from Instrument Cluster Breakout, toward Radio Breakout	—	—
S302	Selectable 4WD Harness, approx. 10 cm from Transfer Case Relay Breakout, toward Front Axle Switch	—	—

Transfer Case Control Component Views (Selectable 4WD)

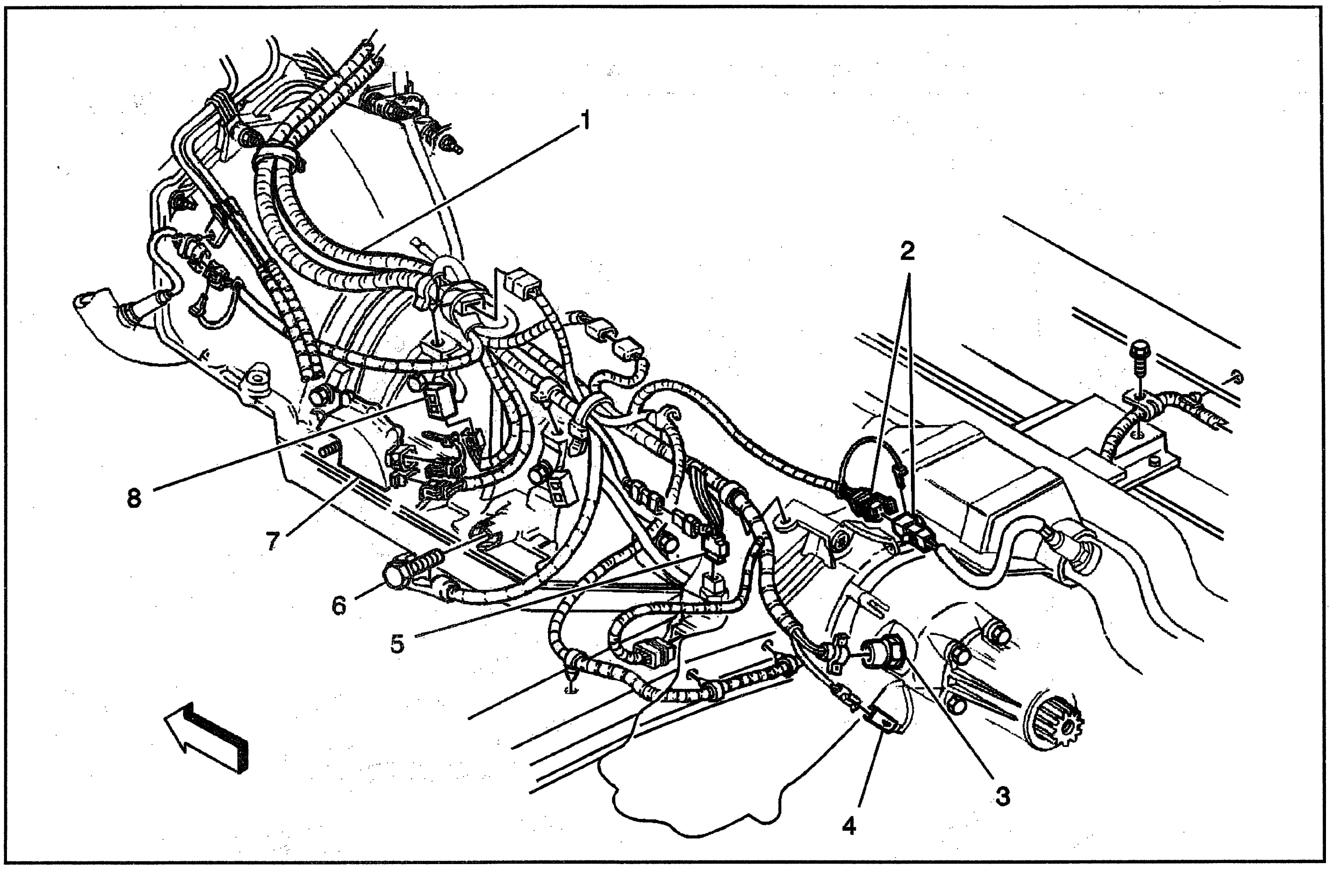
Selectable Four-Wheel Drive Indicator Wiring



Legend

(1) Convenience Center
(2) Selectable Four-Wheel Drive Indicator Lamp
(3) Transfer Case Shift Illumination Lamp

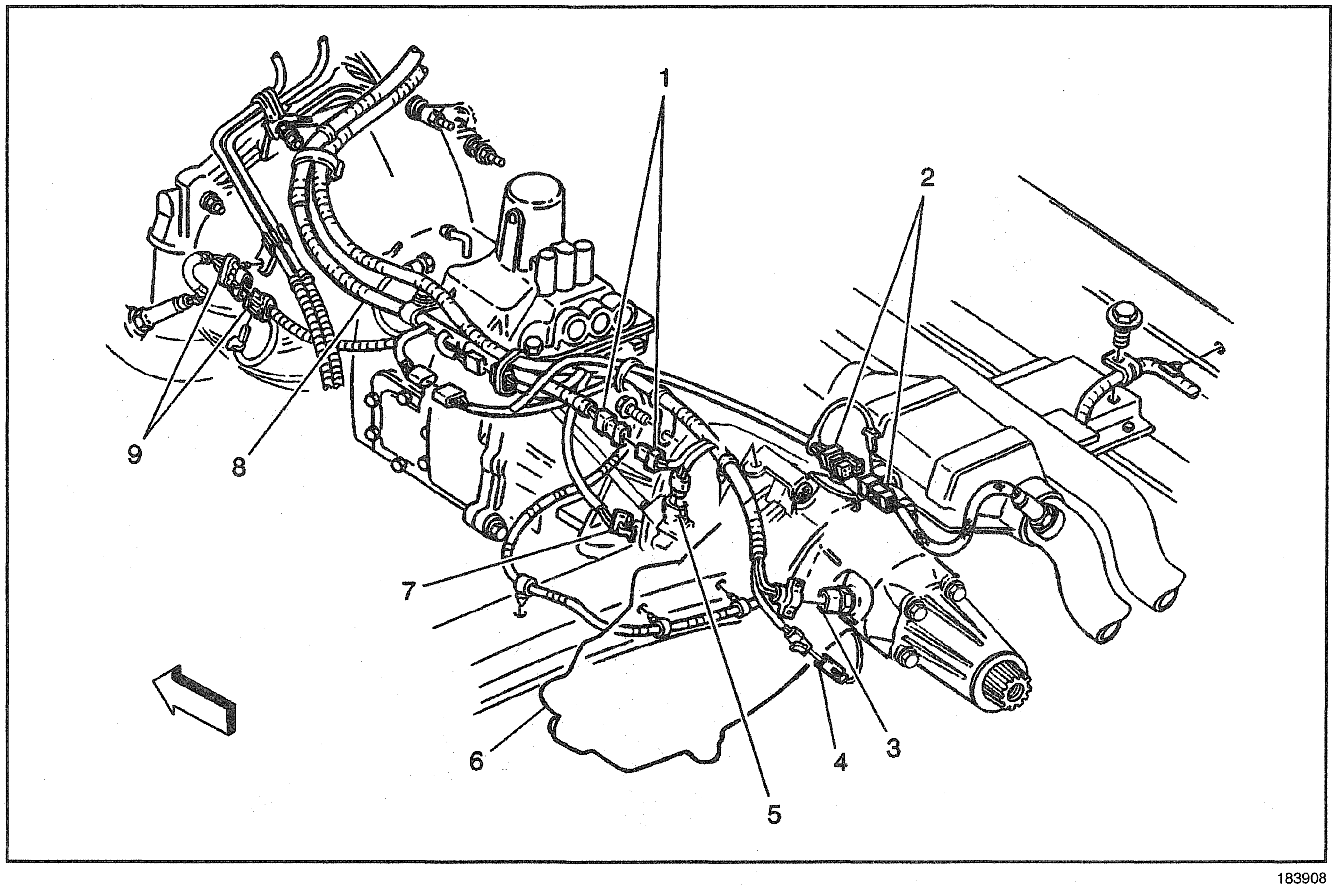
Transfer Case Switch (MT1) and Synchronizer



Legend

(1) Engine Harness
(2) Heated Oxygen Sensor Connectors
(3) Vehicle Speed Sensor
(4) Transfer Case Synchronizer
(5) Transfer Case Switch
(6) Transmission Connector
(7) Park/Neutral Position Switch
(8) Transmission Input Speed Sensor

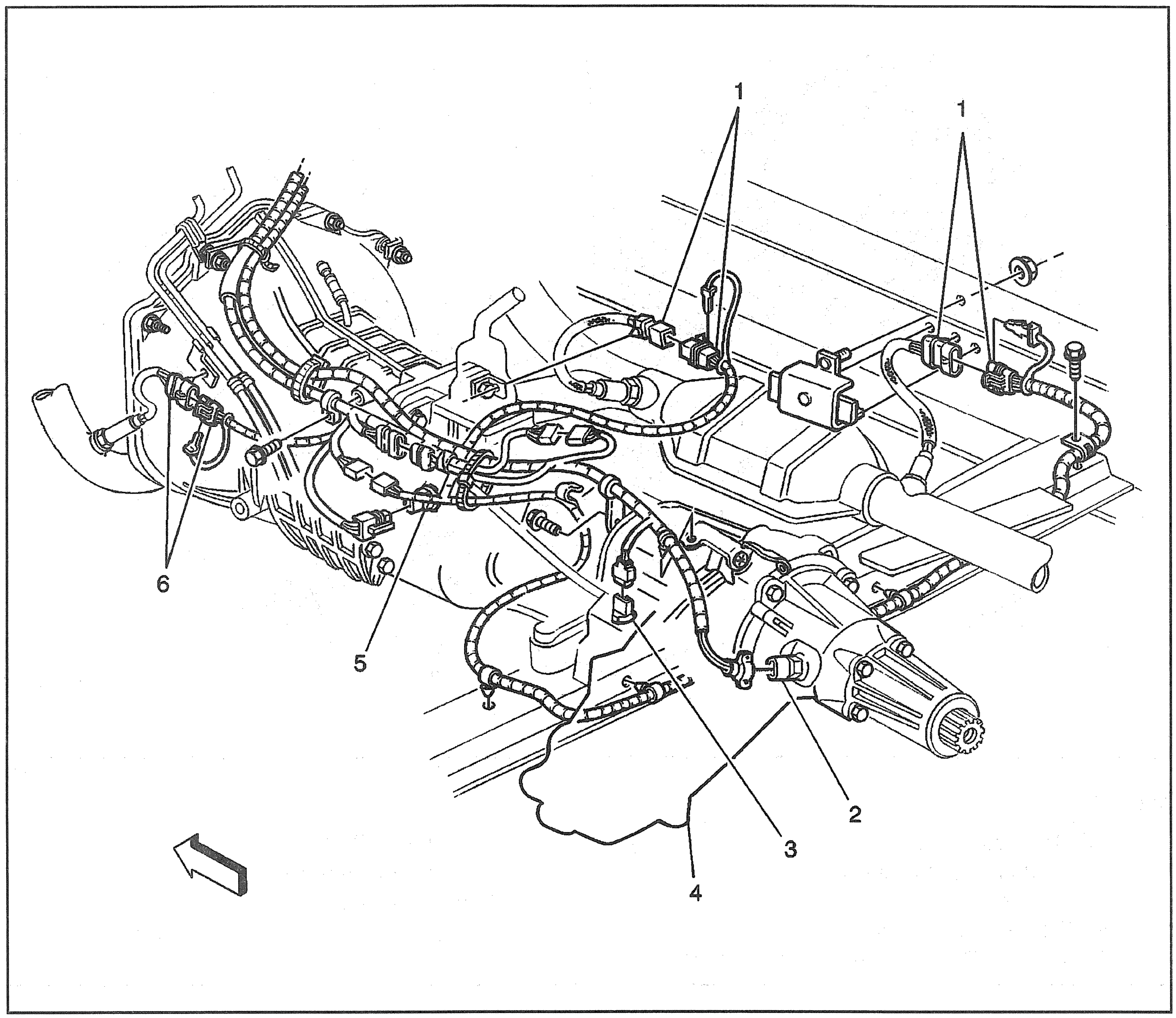
Transfer Case Switch (MW3) and C120



Legend

(1) Connector C120
(2) Heated Oxygen Sensor
(3) Vehicle Speed Sensor
(4) Transfer Case Synchronizer
(5) Transfer Case Switch (½ ton and ¾ ton)
(6) Transfer Case
(7) Transfer Case Switch (1 ton)
(8) Engine Harness
(9) Heated Oxygen Sensor Connector

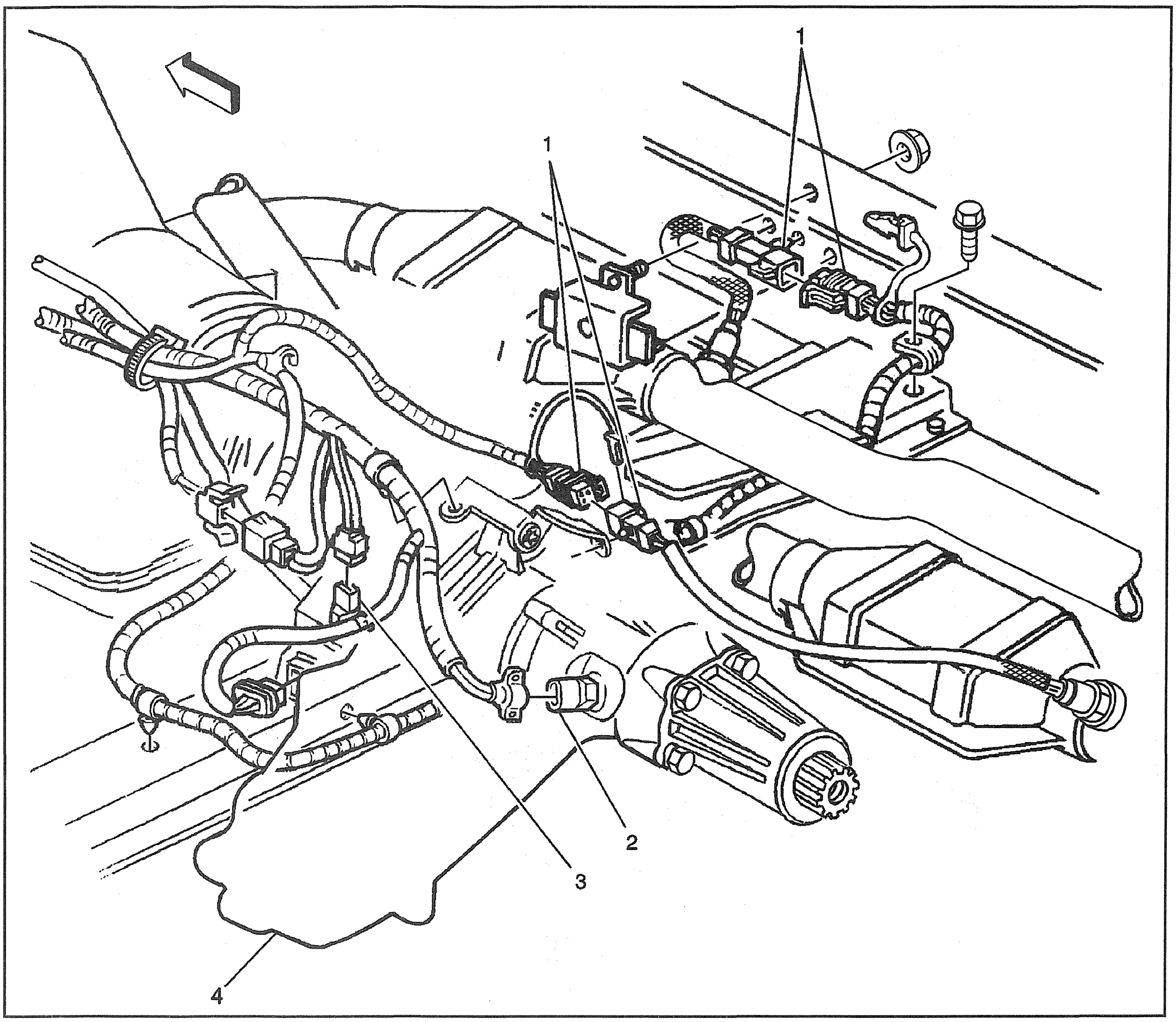
Transfer Case Switch (MG5)



Legend

(1) Heated Oxygen Sensor Connectors
(2) Vehicle Speed Sensor
(3) Transfer Case Switch
(4) Transfer Case
(5) Back-Up Lamp Switch
(6) Heated Oxygen Sensor Connector

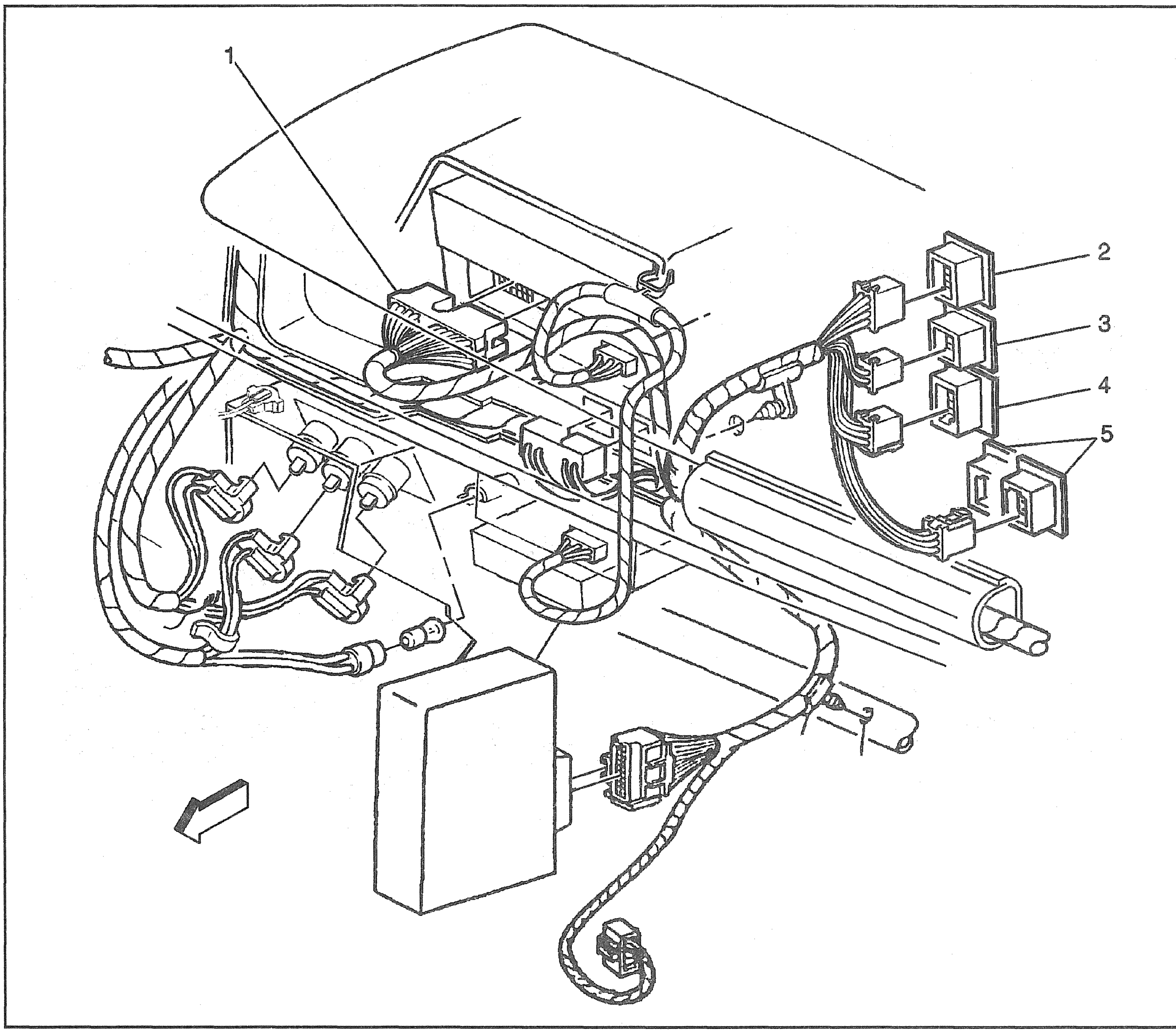
Transfer Case Switch (M30)



Legend

(1) Heated Oxygen Sensor Connectors
(2) Vehicle Speed Sensor
(3) Transfer Case Switch
(4) Transfer Case

Transfer Case Select Switch

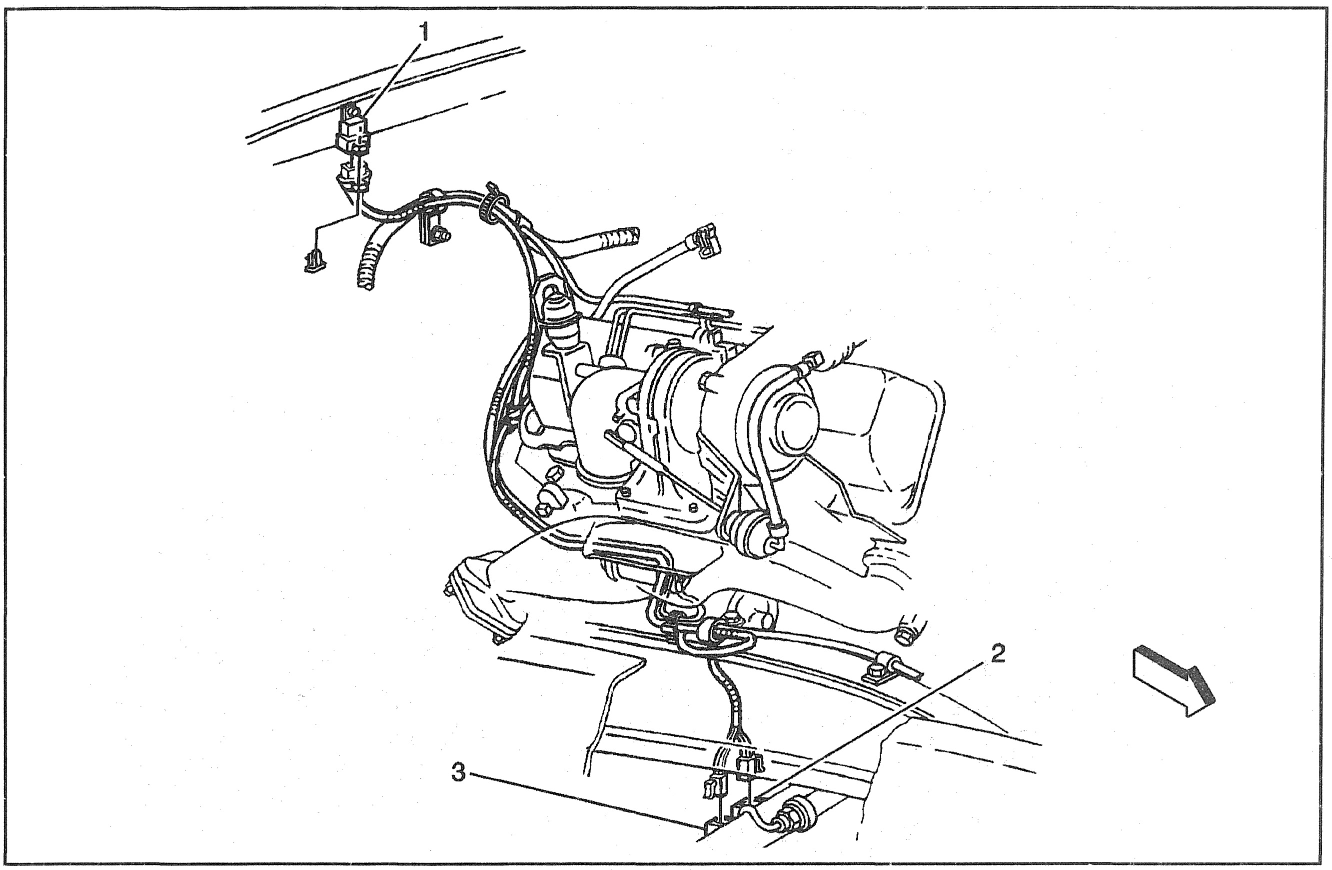


183948

Legend

(1) Radio Connector
(2) Rear Wiper Switch
(3) Cargo Lamp Switch
(4) Rear Fan Switch
(5) Electric Shift Transfer Case Switch or Fog Lamp Switch

Transfer Case Relay

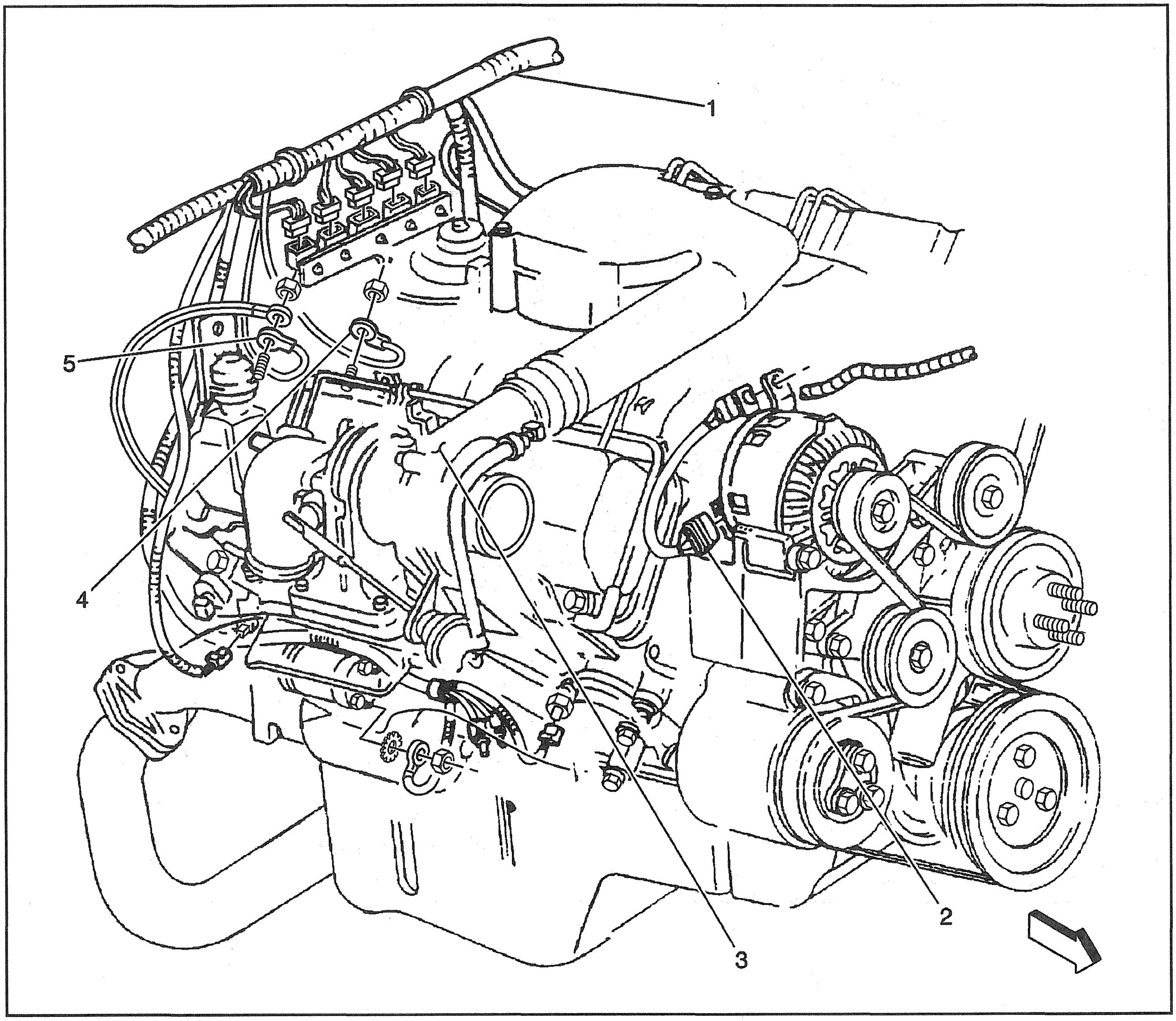


183902

Legend

(1) Transfer Case Relay
(2) Front Axle Actuator
(3) Front Axle Switch

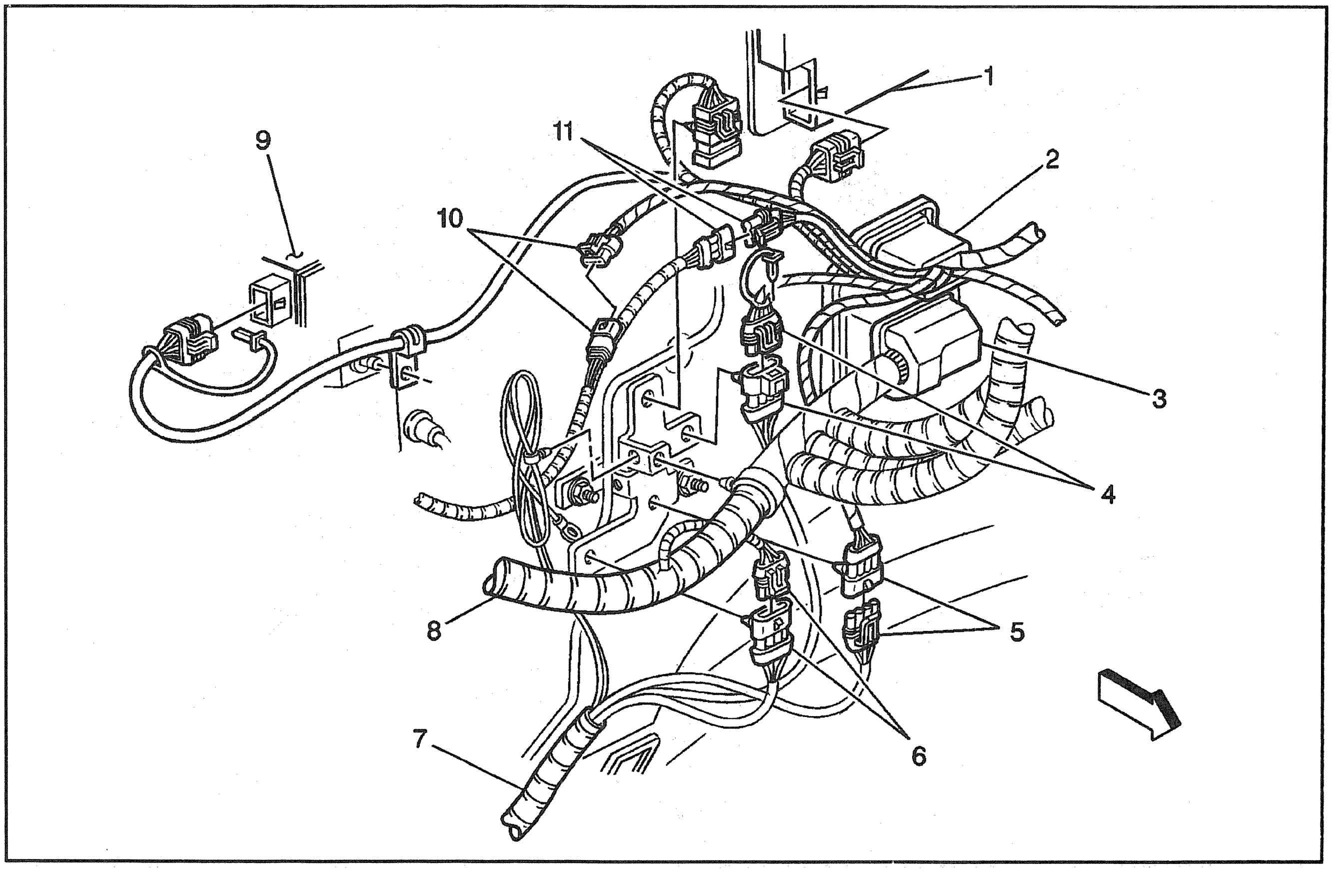
6.5L Diesel Engine, RH Side



Legend

(1) Engine Harness
(2) Generator Connector
(3) Turbo
(4) Grounds G150 And G105
(5) Ground G104

C224 and C225

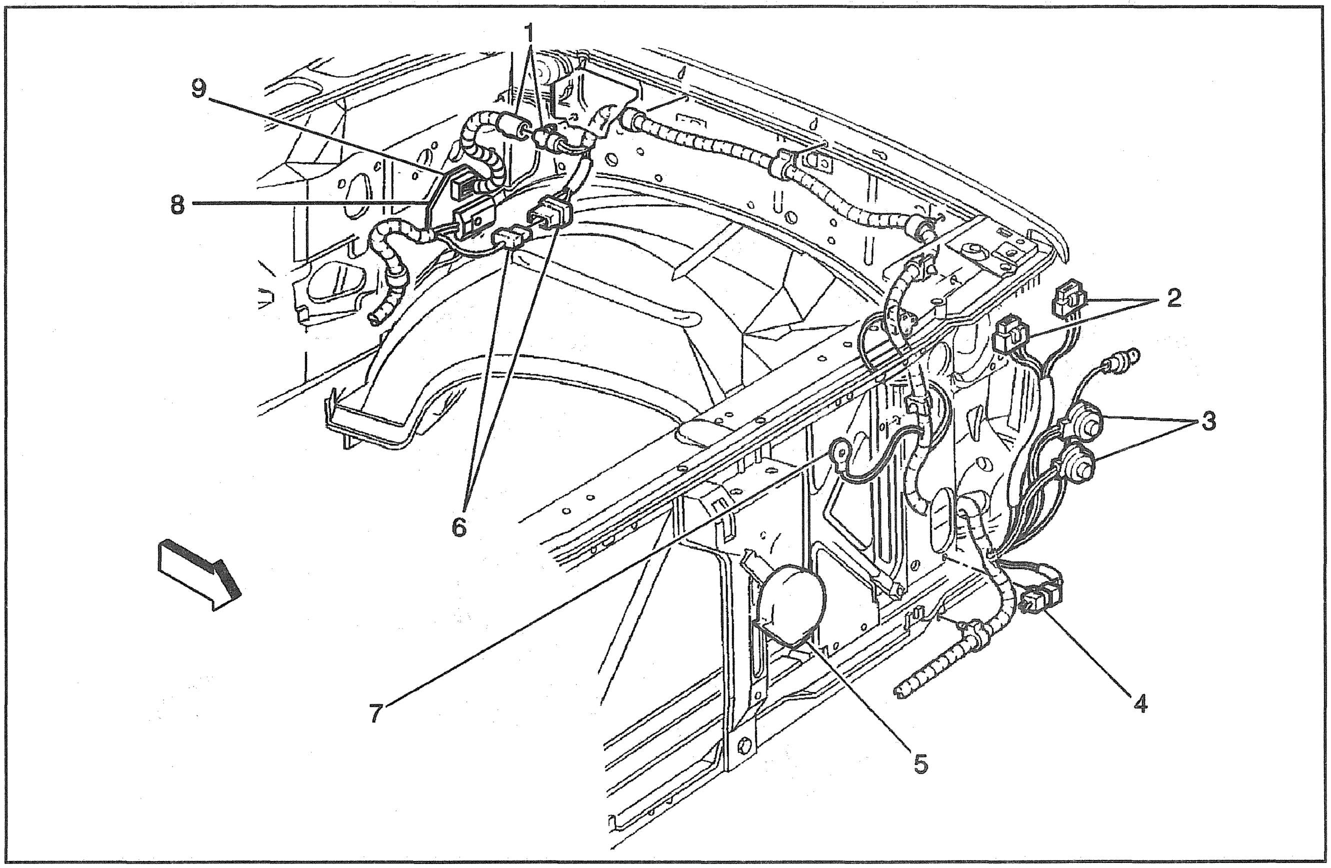


183911

Legend

(1) Cruise Control Module
(2) Pass Through Grommet P100
(3) Connector C100
(4) Connector C110
(5) Connector C104
(6) Connector C111
(7) Rear Lamp Harness
(8) Engine Harness
(9) Windshield Wiper Motor
(10) Connector C225
(11) Connector C224

P100

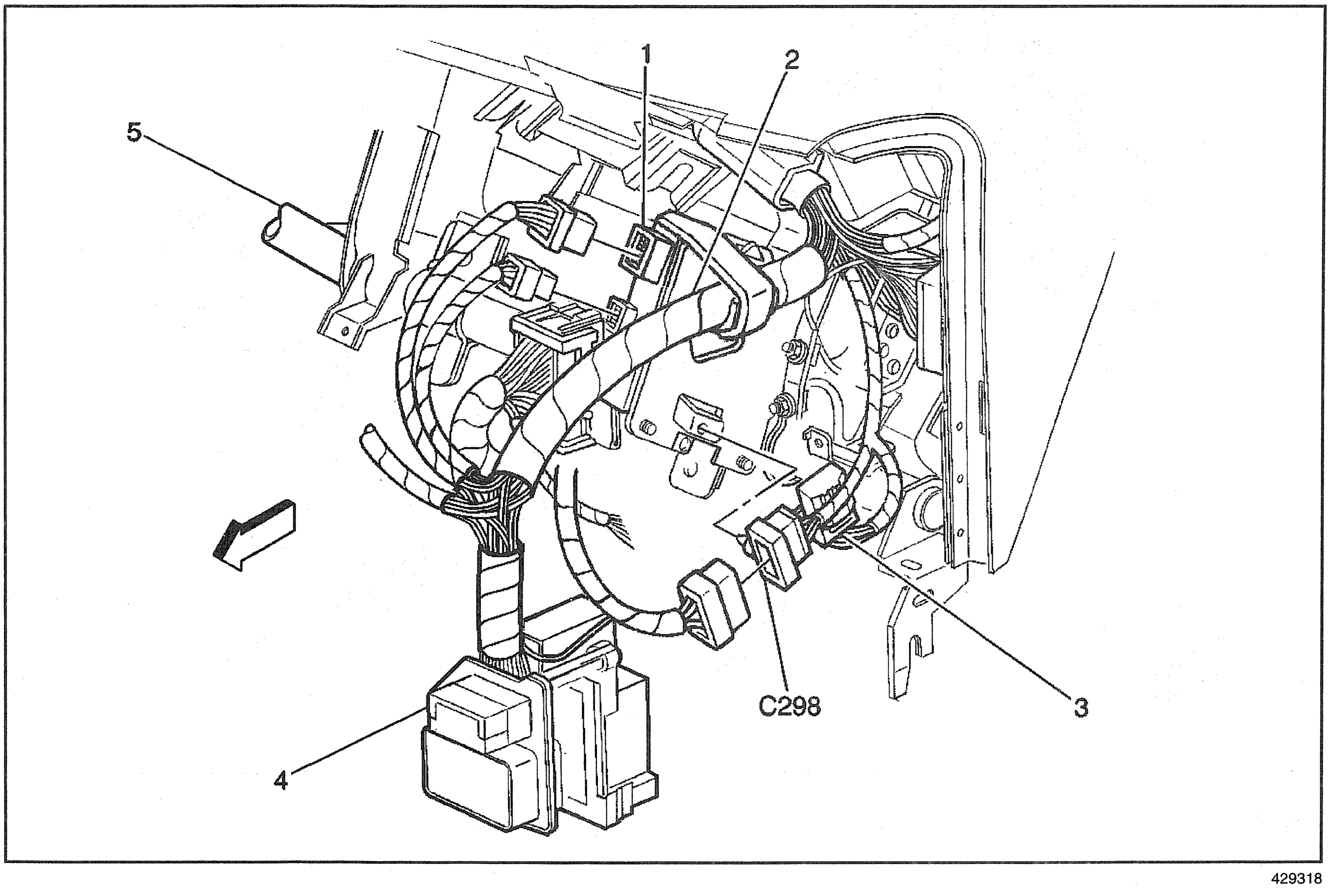


Legend

(1) Connector C102
(2) LH Front Headlamp Connectors (Composite)
(3) Park And Turn Lamp LH Front
(4) LH Fog Lamp Connector
(5) Horn
(6) Connector C101
(7) Ground G113
(8) Connector C100
(9) Pass Through Grommet P100

Transfer Case Control Component Views (Automatic 4WD)

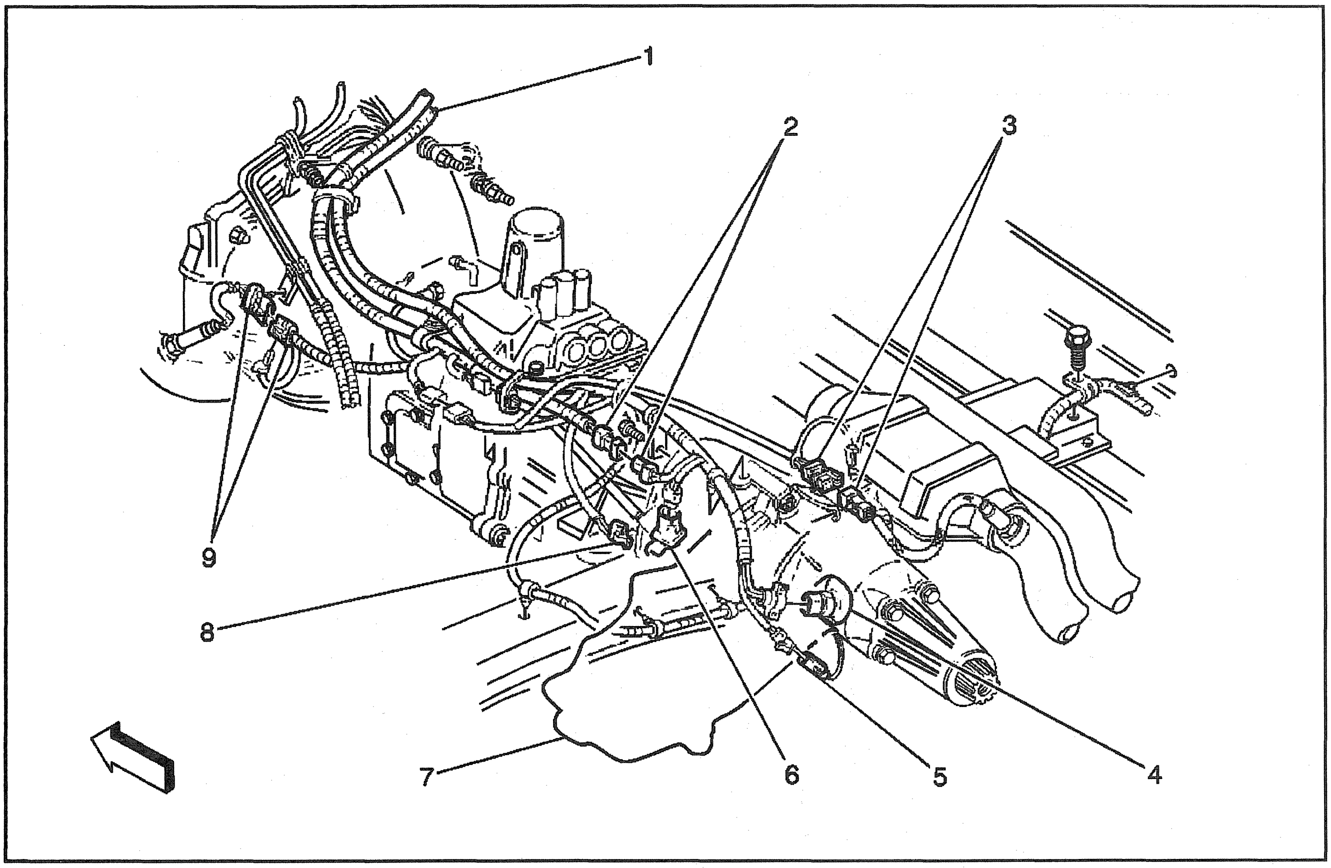
Automatic 4WD Support Wiring



Legend

- (1) Automatic Transfer Case Control Module
- (2) IP Harness
- (3) Daytime Running Lights Control (DRL) Module
- (4) Convenience Center
- (5) IP Reinforcement Brace

4WD Support Wiring

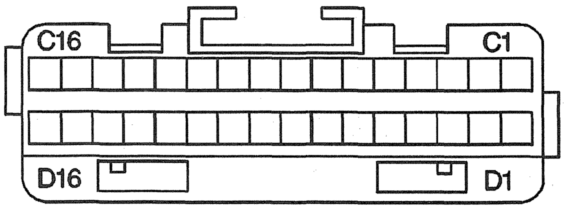


429328

Legend

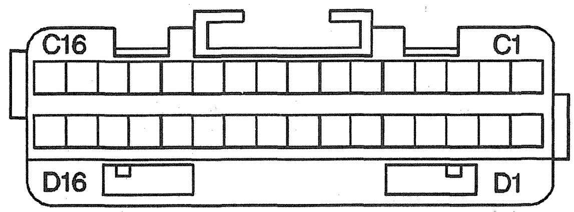
(1) Engine Harness
(2) Inline Connector: C120
(3) Right Bank Heated Oxygen Sensor Connector
(4) Vehicle Speed Sensor
(5) Transfer Case Syncronizer
(6) Transfer Case Switch (1/2 Ton, 3/4 Ton)
(7) Transfer Case
(8) Transfer Case Switch
(9) Left Bank Heated Oxygen Sensor Connector

Transfer Case Control Connector End Views (Selectable 4WD)



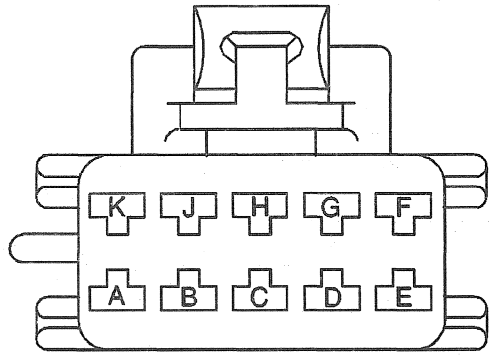
Connector Part Information	• 12045470 • 32-Way F Micro-Pack 100 Series Natural		
Pin	**Wire Color**	**Circuit No.**	**Function**
C1	BLK/WHT	1695	Front Axle Switch
C2	LT GRN/BLK	431	5V Reference Voltage
C3	DK GRN/ WHT	1559	Transfer Case Select Switch Output—4 Low
C4	WHT	1562	Transfer Case Select Switch Output—2 High
C5	GRY/BLK	1564	Transfer Case Select Switch Output—4 High
C6	ORN	1640	Battery Fused Feed
C7	—	—	Not Used
C8	PNK	39	Ignition Fused Feed
C9	BLK/WHT	1554	Encoder Ground
C10	BLK	150	Ground
C11	PNK	1563	Indicator Lamp Output—2 High
C12	TAN/BLK	1566	Indicator Lamp Output—4 High
C13	—	—	Not Used
C14	PPL/WHT	1565	Indicator Lamp Output—4 Low
C15	—	—	Not Used
C16	BLK	1552	Transfer Case Motor Feed CW
D1	RED	1553	Transfer Case Motor Feed CCW

Transfer Case Control Connector End Views (Selectable 4WD) (cont'd)



Connector Part Information	• 12045470 • 32-Way F Micro-Pack 100 Series Natural		
Pin	**Wire Color**	**Circuit No.**	**Function**
D2	LT GRN	275	Park/Neutral Position Switch Output—Park
D3	ORN	1568	Transfer Case Control Module Diagnostics Enable
D4	BRN/WHT	1555	Encoder Channel P
D5	RED/WHT	1556	Encoder Channel C
D6	DK BLU/ WHT	1557	Encoder Channel A
D7	YEL/BLK	1558	Encoder Channel B
D8	DK GRN/ WHT	817	Vehicle Speed Signal
D9	—	—	Not Used
D10	BLK	150	Ground
D11	—	—	Not Used
D12	BLK	150	Ground
D13	BLK	150	Ground
D14	ORN	1640	Battery Fused Feed
D15	ORN	1640	Battery Fused Feed
D16	YEL	1737	Park/Neutral Position Switch Output—Park/Neutral

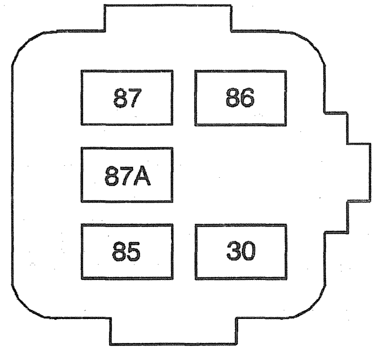
Transfer Case Select Switch



183888

Connector Part Information	• 12064769 • 10-Way F Metri-Pack 150 Series Natural		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	PNK	39	Ignition Fused Feed
B	WHT	900	Transfer Case Select Switch Output—2 High
C	GRY/BLK	1564	Transfer Case Select Switch Output—4 High
D	DK GRN/WHT	1559	Transfer Case Select Switch Output—4 Low
E	PPL/WHT	1565	Indicator Lamp Output—4 Low
F	TAN/BLK	1566	Indicator Lamp Output—4 High
G	PNK	901	Indicator Lamp Output—2 High
H	BLK	150	Ground
J	GRY	8	Instrument Panel Lamp Feed
K	—	—	Not Used

Transfer Case Relay

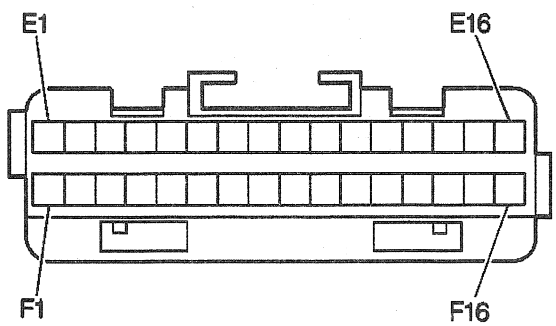


183886

Connector Part Information	• 12110539 • M/P 280 FLXLK		
Pin	**Wire Color**	**Circuit No.**	**Function**
30	LT/BLU	1296	Four Wheel Drive Relay Feed-Coil
85	RED	1297	Four Wheel Drive Synchronizing Relay Feed-Coil
86	GRY/BLK	1570	Front Axle Actuator Output
87	BLK/WHT	1695	Four Wheel Drive Front Wheel Lock Telltale Feed
87A	BLK	150	Ground

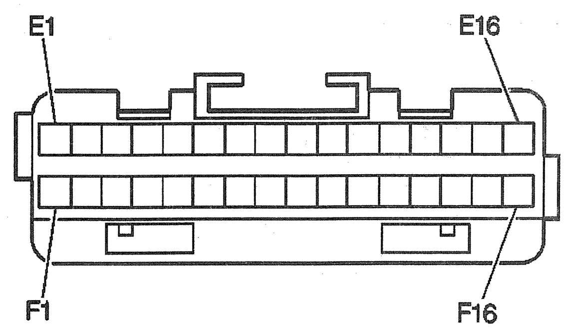
Transfer Case Control Connector End Views (Automatic 4WD)

Automatic Transfer Case Control Module



73221

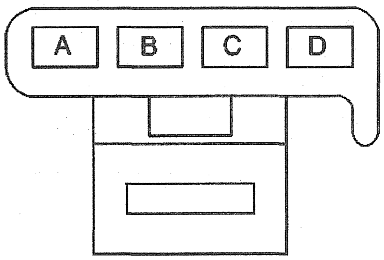
Connector Part Information	• 12052107 • ASM 32M (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
E1	TAN	1569	Transfer Case Lock Solenoid Output
E2	LT BLU/BLK	1567	Service 4WD/AWD Indicator Lamp Output
E3	PNK	1561	AWD Indicator Lamp Output
E4	LT GRN/BLK	1563	2 'HI' Indicator Lamp Output
E5	BRN/WHT	1555	Transfer Case Position Switch Encoder Signal - Channel P
E6	RED/WHT	1556	Transfer Case Position Switch Encoder Signal - Channel C
E7	YEL/BLK	1558	Transfer Case Position Switch Encoder Signal - Channel B
E8	DK BLU/WHT	1557	Transfer Case Position Switch Encoder Signal - Channel A
E9	PPL	1807	Serial Data Signal - Class B - 10400 BAUD - Primary
E10	BRN	241	Fuse Output - Ignition 3 - Type III Fuse
E11	—	—	Not Used
E12	YEL	400	VSS Signal
E13	PPL	401	VSS Return
E14	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
E15	—	—	Not Used
E16	BLK/WHT	451	ECM Ground



73221

Connector Part Information	• 12052107 • ASM 32M (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
F1	PPL/WHT	1565	4 'LO' Indicator Lamp Output
F2	TAN/BLK	1566	4 'HI' Indicator Lamp Output
F3	BRN	1560	Neutral Indicator Lamp Output
F4	GRY/BLK	1570	Front Axle Actuator Output
F5	LT BLU	2221	VSS Signal
F6	DK GRN	2222	VSS Return
F7	GRY/BLK	1694	4WD Switch Signal - Low
F8	—	—	Not Used
F9	—	—	Not Used
F10	—	—	Not Used
F11	—	—	Not Used
F12	BLK/WHT	1554	Transfer Case Encoder Signal Return
F13	LT GRN/BLK	431	Reference Voltage Feed - 8 Volt Reference
F14	LT GRN/BLK	431	Reference Voltage Feed - 8 Volt Reference
F15	LT GRN	275	Transmission Mounted Neutral Safety Switch Output - Park
F16	LT BLU/BLK	1693	4WD Switch Signal

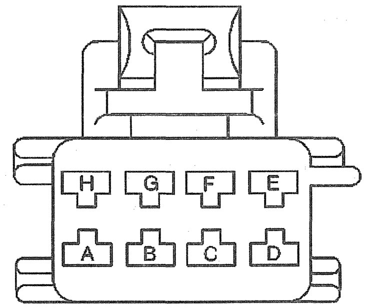
Automatic Transfer Case Module



62450

Connector Part Information	• 12052856 • CONN 4F M/P 280 (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	1552	Transfer Case Motor Feed - CW
B	RED	1553	Transfer Case Motor Feed - CCW
C	BLK	150	Ground
D	ORN	1640	Fuse Output - Battery - Type III Fuse

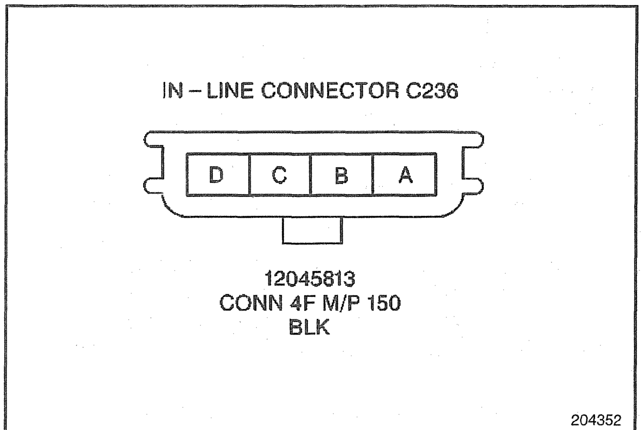
Automatic Transfer Case Select Switch, Connector C1



62463

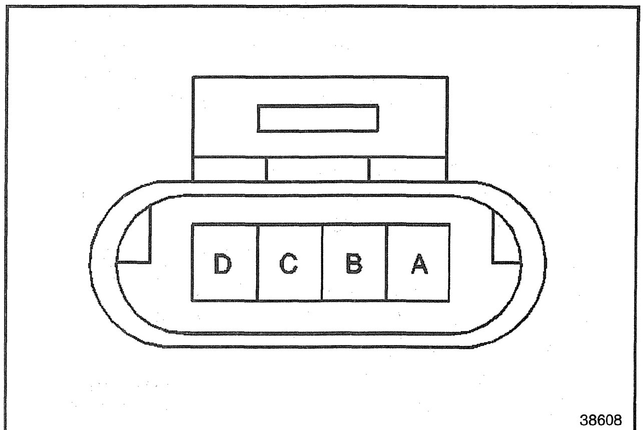
Connector Part Information	• 12064766 • CONN 8F M/P 150 (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
B	LT BLU/ BLK	1693	4WD Switch Signal
C	PPL/WHT	1565	4 'LO' Indicator Lamp Output
D	TAN/BLK	1566	4 'HI' Indicator Lamp Output
E	LT GRN/ BLK	1563	2 'HI' Indicator Lamp Output
F	PNK	1561	4WD Indicator Lamp Output
G	BLK	150	Ground
H	GRY	8	IP Lamp Feed

Automatic Transfer Case Select Switch, Connector C2



Connector Part Information	• 12045813 • CONN 4F M/P 150 (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	—	—	Not Used
B	PPL/WHT	1382	LED Dimming Signal
C	BRN	241	Use Output - Ignition 3 - Type III Fuse
D	BRN	1560	Neutral Indicator Lamp Output

Front Axle Actuator



Connector Part Information	• 12077591 • ASM 5F M/P 150 (BLACK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
B	GRY/BLK	1570	Front Axle Actuator Output
C	BRN	241	Fuse Output - Ignition 3 - Type II Output
E	BLK	150	Ground

Diagnostic Information and Procedures

Troubleshooting Hints (Selectable 4WD)

- Make sure all mechanical components are operative before diagnosing the electrical portion of the Selectable Four-Wheel Drive (S4WD) system.
- To determine whether the vehicle is in two-wheel drive or four-wheel drive, lift the vehicle so that the wheels can spin freely.
- Make sure that the 4WD,TCASE, GAUGES and ILLUM fuses are not open. If open, LOCATE and REPAIR the source of the overload and replace the fuse(s).
- CHECK for a broken (or partially broken) wire inside of the insulation which could cause system failure but prove good in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring fuse voltage drop with the system operational (under load).
- CHECK for proper installation of aftermarket electronic equipment which may affect the integrity of other systems. Refer to Troubleshooting Procedures.
- While performing diagnostic procedures, the ignition switch must be in RUN and the S4WD control lever must be in the S4WD ENGAGED position.

Troubleshooting Hints (Automatic 4WD)

- Make sure all mechanical components are operative before diagnosing the electrical portion of the Automatic Four-Wheel Drive System.
- To determine whether the vehicle is in two-wheel drive or four-wheel drive, lift the vehicle so that the wheels can spin freely.
- Make sure that the 4WD,TCASE, GAUGES and ILLUM fuses are not open. If open, LOCATE and REPAIR the source of the overload and replace the fuse(s).
- CHECK for a broken (or partially broken) wire inside of the insulation which could cause system failure but prove good in a continuity/voltage check with a system disconnected. These circuits may be intermittent or resistive when loaded, and if possible, should be checked by monitoring fuse voltage drop with the system operational (under load).
- CHECK for proper installation of aftermarket electronic equipment which may affect the integrity of other systems. See to Troubleshooting Procedures.

System Diagnosis (Automatic 4WD)

Self-Diagnosis

The two speed Auto transfer case system utilizes a part time front axle. The system allows the driver to select the transfer case position with a touch of a button. The following positions can be selected: 4-wheel drive high range (4H), All Wheel Drive (AUTO), 2-Wheel Drive high range (2H), Neutral (N), and 4-Wheel Drive low range (4L).

The Auto Transfer Case (ATC) Control Module controls all the shifting action of the transfer case based on input from the driver as well as information from the Vehicle Control Module (VCM) /Powertrain Control Module (PCM).

4WD (4H or 4L) mode: This is accomplished by engaging the front axle, applying PWM to an electric motor to apply maximum torque, (fully compressing the transfer case clutch plates) to the front axle, then removing the ground on circuit 1569, thus locking the motor in position and stop the PWM to the motor.

AUTO mode: When in this mode of operation, the system should engage the front axle, then it monitors the front and rear propshaft speeds for any speed differences. When the system senses rear wheel slip, a difference of propshaft speed between front and rear, the Auto Transfer Case (ATC) Control Module will use pulse width modulation (PWM) to drive an electric motor. This motor transfers only the required torque to the front wheels to gain additional traction on slippery surfaces up to 75 mph. There is no torque applied to the front wheels until the module senses rear wheel slip.

Throttle anticipation (only operational when in AUTO mode): If the vehicle is below 5 mph and the accelerator is pressed quickly beyond a set point, the system will automatically transfer a percentage of torque to the front wheels to help prevent the rear wheels from slipping, as in a hard acceleration from a stopped position.

The Auto Transfer Case (ATC) Control Module also has the capability of engaging the front axle while the vehicle is in motion. It does this by applying PWM to the electric motor to apply torque to the front axle, this action is used to match the speed of the front and rear propshafts. After the module senses the proper speed, it then supplies a ground on circuit 1570 to engage the front axle.

The Auto Transfer Case (ATC) Control Module will accept a mode shift only when the engine is running and a valid Motor/Encoder signal is present. A mode shift is any shift between 2H, 4H, and AUTO.

The Auto Transfer Case (ATC) Control Module will permit a range shift only if the following conditions are met within 30 seconds of the request:

- Engine running
- Transmission in Neutral
- Vehicle speed below 3 mph
- Proper Motor/Encoder signal present

A range shift is a shift between high range (2H, 4H, and AUTO) and low range (4L).

The Auto Transfer Case (ATC) Control Module will permit a range shift into or out of Neutral only if the following conditions are met:

- Ignition ON
  Transmission in neutral
- Vehicle speed at zero

Diagnostic Aids

A Scan Tool reads and displays the following information:

- Diagnostic Trouble code(s)
- Code status bit (are codes set or not)
- Transfer case lock status
- Lamp in the switch/lamp assembly
- Motor/Encoder gear position
- Ignition (3) voltage
- Front propshaft speed sensor (KPH)
- Front axle switch (open/closed)
- Front axle requested position (engaged/disengaged)
- Rear propshaft speed sensor (KPH)
- Mode switch position request
- Park switch (open/closed)
- 4WD (Adapt) Mode Auto bit
- Current Mode corrective action PWM
- Average and highest PWM applied during last slip recovery event
- Throttle anticipation mode
- Average and highest PWM applied during last Throttle anticipation corrective action event
- Difference between front and rear propshaft RPM
- Adapt event counter
- Throttle position sensor percentage

A Scan Tool can actuate (turn on/off or change modes) of the following:

- Clear Auto Transfer Case (ATC) DTCs
- Service 4WD lamp (tell tail)
- Transfer Case Lock
- All lamps in switch assembly (4WD, 2H, 4H, 4L, and Neutral)
- Front Axle
- Request 4WD (Adapt) Mode
- Request 2H Mode
- Request 4H Mode
- Request 4L Mode
- Request Neutral
- Drive ATC Motor to various position. 50% PWM max with 5 second time out with 10 second wait before re-activating

Test Decription

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

1. This step checks the class II communication between the ATC module and the scan tool as well as the other modules that communicate over the Class II data bus.
4. This step checks the system operation (static) to see if it will set a DTC related to a system failure.
5. This step checks the Park Switch input for proper operation.

Step	Action	Value(s)	Yes	No
1	1. Install a scan tool. 2. Turn the ignition switch to the ON position. Use a scan tool in order to try to communicate with each module on the Class II data bus, Auto Transfer Case (ATC) Control Module, Electronic Brake Control Module (EBCM), and Vehicle Control Module (VCM), or Powertrain Control Module (PCM). Does the scan tool communicate with all the modules?	—	*Go to Step 2*	Go to DLC Pin Assignment
2	Use a scan tool in order to check for any DTCs in the Antilock Brake System. Are there any DTCs in the Antilock Brake System?	—	Go to Applicable DTC Table in the Antilock Brake System	*Go to Step 3*
3	Use a scan tool in order to check for any DTCs in the PCM/VCM. Are there any DTCs in the VCM/PCM?	—	Go to Applicable DTC Table in PCM/VCM Section	*Go to Step 4*

Step	Action	Value(s)	Yes	No
4	Check for any DTCs in the Auto Transfer Case (ATC) Control Module. Are there any Auto Transfer Case DTCs?	—	Go to Applicable DTC Table	*Go to Step 5*
5	1. Scan tool installed. 2. Set park brake. Place transmission in Neutral. 3. Start engine and let idle. **Important:** Allow time to complete the shift request before requesting the nest shift. 4. With the scan tool, read the Motor/Encoder Gear Position as you shift the transfer case through all modes. Does the scan tool show the correct gear position or requested gear position of the transfer case?	—	*Go to Step 6*	Go to *DTC C0327 Encoder Circuit Malfunction*
6	1. Scan tool installed. 2. Park brake set and transmission in Neutral. 3. Use the scan tool in order to read the Gear Position as you shift the transmission from Neutral to Park and back to neutral. Does the scan tool show the correct gear position or requested gear position of the transmission?	—	*Go to Step 7*	Go to *DTC C0357 Park Switch Circuit High* or Symptom Diagnosis for park switch
7	1. Check for any DTCs. Road test vehicle if necessary to identify customer complaint. While driving the vehicle, shift from 2H to AUTO and 4WD. 2. Use the scan tool in order to check for any DTCs. Are there any DTCs?	—	Go to Applicable DTC Table	System OK

Diagnostic Trouble Codes

Diagnostic Trouble Code (DTC) 1

When the ignition switch is positioned to RUN the TCCM test to determine if RAM standby Power (maintained battery power) to the TCCM was lost since the ignition was last turned OFF. When power is interrupted on pin C6 of the TCCM, the TCCM stores a loss of RAM standby power.

Diagnostic Trouble Code (DTC) 2

During electronic shifting, the TCCM check the motor/encoder for normal operation. If the motor/encoder does not function correctly enough times, the TCCM stores a motor/encoder failure DTC 2.

Diagnostic Trouble Code (DTC) 3

The TCCM performs a test each time the electronic–shift motor is turned ON or OFF. If the motor does not function properly the TCCM stores a motor circuit failure DTC 3, and the shift select buttons blink in order to inform the driver of a problem.

Diagnostic Trouble Code (DTC) 4

Each time the ignition is turned ON, the TCCM tests the memory, the program, and the internal system in order to ensure that the TCCM is operating properly. If the TCCM detects a fault within the TCCM, the TCCM stores a RAM/ROM memory failure (DTC) 4.

When the TCCM is running a diagnostic, and a code 4 is displayed by the shift select buttons, replace the TCCM.

Obtaining Diagnostic Trouble Codes

1. The diagnostic trouble codes are displayed on the three transfer case shift select buttons. The shift select buttons are located on the instrument panel when the connector pin 13 on the data link cable is grounded, and the ignition switch has been OFF for at least five seconds prior to positioning the ignition switch to run the shift select buttons will blink various times together in order to indicate a diagnostic trouble code from 1 to 4.
   1.1. Position the ignition switch to OFF.
   Ensure the ignition switch is positioned to OFF for at least 6 seconds.
   1.2. Connect pin 13 on the data link cable to a vehicle ground source.
   The data link connector is located in the cab under the instrument panel on the drivers side.
   1.3. Position the ignition switch to RUN.
   1.4. Note the shift select buttons for blinking codes. Refer to *Diagnostic Trouble Codes*.
2. If the shift select buttons all blink one time and stop, and do not continue to blink, no fault codes are stored in the TCCM.

3. The transfer case shift select buttons will blink in order to identify any stored DTC. If only one code is stored in the TCCM memory, that code will blink repeatedly with a three second delay between blinking sequences. If more than one code is stored, the first code will blink once, then after a three seconds delay, the next code will blink. This sequence will continue until pin 13 is no longer grounded.
4. When reading the diagnostic trouble codes, the number of shift select buttons blinks will indicate the code number.

Clearing Memory (Selectable 4WD)

Important: The codes will not clear if the 15–amp 4WD fuse is not removed for at least 30 seconds.

The code 1 will continue to occur until the ignition switch is cycled from RUN to OFF five times.

1. Perform the following in order to clear the diagnostic trouble codes (DTC) and in order to clear the stored memory from the transfer case control module (TCCM).
2. Turn the ignition switch to the OFF position.
3. Remove the 15–amp 4WD fuse.
4. Wait at least 40 seconds then replace the fuse.
5. Cycle the ignition switch from RUN to OFF five times in order to clear the diagnostic trouble code 1 from the TCCM.

Transfer Case Functional Test

Step	Action	Value(s)	Yes	No
1	1. Ensure the transmission shift select is in the PARK position. 2. Turn the ignition switch to the OFF position for 6 seconds. 3. Turn the ignition switch to the RUN position and note the three transfer case shift select buttons. Do all three shift select buttons blink once?	—	Go to *Step 2*	Go to Functional Test Failed Step 2
2	Did one of the shift select buttons stay lit in order to indicate the transfer case shift position?	—	Go to *Step 3*	Go to Functional Test Failed Step 4
3	1. Shift the transfer case to 4HI. 2. Shift the transfer case to 2HI. 3. shift the transfer case back to 4HI. Does the transfer case mode shift between 4HI and 2HI?	—	Go to *Step 4*	Go to Functional Test Failed Step 6
4	1. Apply the park brake. 2. For automatic transmissions, place the transmission shift select in the PARK position. 3. For manual transmissions, shift the transmission into first gear. 4. Place the ignition switch in the RUN position. 5. Place the transfer case in the 4HI position. 6. Press the 4LO transfer case shift select button. Does the 4LO shift select button blink for 30 seconds and the stop blinking when the 4HI shift select button illuminates?	—	Go to *Step 5*	Go to Functional Test Failed Step 8

Transfer Case Functional Test (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Place the ignition switch in the RUN position. 2. Place the transfer case in the 4HI position. 3. Press the 4Lo transfer case shift select button and note the blinking. 4. For automatic transmissions, position the transmission shift select to NEUTRAL. 5. For manual transmissions, push the clutch pedal to the floor panel. Does the 4LO shift select button stop blinking and stay lit when the transmission is shifted to neutral (for automatic transmissions) or the clutch pedal is pushed in (for manual transmissions)?	—	Go to *Step 6*	Go to Functional Test Failed Step 8
6	1. Press the 2HI shift select button and shift the transfer case into 2HI. 2. For automatic transmissions, position the transmission shift select in the PARK position. 3. For manual transmissions, position the transmission into the first gear. 4. Position the ignition switch to OFF. 5. Using a wire, connect pin 13 on the data link connector to a vehicle ground source. 6. Position the ignition switch to RUN. Do all three shift select buttons blink once and then stay OFF?	—	Test complete transfer case electronic shift system operates properly.	Go to Functional Test Failed Step 9

Functional Test Failed

Step	Action	Value(s)	Yes	No
1	Were you sent here from Electric Shift System Functional Test?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	Did any of the three shift select buttons blink once?	—	Go to *Step 3*	Go to All Shift Select Buttons Do Not Light
3	Did one of the shift select buttons stay lit in order to indicate the transfer case shift position?	—	Go to *Step 4*	Go to *Step 5*
4	Does the transfer case mode shift between 4HI and 2HI?	—	Go to *Step 5*	Go to *Step 6*
5	1. Position the ignition switch to RUN. 2. Position the transmission to neutral. 3. Push the vehicle forward about five feet. Does the transfer case mode shift between 4HI and 2HI?	—	Go to transfer case mechanical diagnosis.	Go to Reduced or No Mode and Range Shift Operation
6	Does more that one shift select button stay lit?	—	Go to More Than One Shift Select Button Remains Lit	Go to Reduced or No Mode and Range Shift Operation
7	1. Apply the park brake. 2. For automatic transmissions, place the transmission shift select in PARK. 3. For manual transmissions, shift the transmission into first gear. 4. Position the ignition switch to RUN. 5. Press the 4LO transfer case shift select button. Does the 4LO shift select button blink for 30 seconds?	—	Go to *Step 8*	Go to *Step 9*

Functional Test Failed (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Position the ignition switch to RUN. 2. Press the 4LO transfer case shift select button and note the blinking. 3. For automatic transmissions, position the transmission shift select to neutral. 4. For manual transmissions, push the clutch pedal to the floor panel. Does the 4LO shift select button stop blinking and stay lit when the transmission is shifted to neutral (automatic transmissions) or when the clutch pedal is pushed in (manual transmissions)?	—	Go to Perform a Diagnostic On the TCCM	Go to Reduced or No Mode and Range Shift Operation
9	Does the transfer case range shift to 4LO?	—	Go to All Shift Select Buttons Remain Lit	Go to Reduced or No Mode and Range Shift Operation

All Shift Select Buttons Do Not Light

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	1. Check the 10 AMP Illumination fuse (number 5) in the IP fuse block for an open. 2. Check the 10 AMP power fuse (number 15) in the IP fuse block for an open. 3. Check the 20 Amp ATC fuse in the underhood bussed electrical center (UBEC) for an open. Is one of the fuses open?	—	Go to *Step 3*	Go to All Shift Select Buttons Remain Lit
3	1. Replace the fuse. 2. Turn the ignition switch to the RUN position. 3. Check the operation of the electronic shift system. 4. Check the fuse for an open. Is the fuse open?	—	Go to *Step 4*	Go to Electric Shift Transfer Case Functional Test
4	1. Turn the ignition switch to the OFF position. 2. Check pins C1 and C2 on the shift select switch for a ground if fuse 5 or 15 in the IP block was open. 3. Check CKT 1640 for a ground if the ATC fuse was open. Was one of the CKT grounded?	—	Go to *Step 5*	Go to *Step 6*
5	1. Position the ignition switch to OFF. 2. Repair the grounded CKT. 3. Replace the fuse. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—
6	Check pin A on the back of the shift select switch for B+ voltage. Is B+ voltage on pin A?	—	Go to *Step 8*	Go to *Step 7*
7	1. Open wire in CKT 1220 between the fuse and pin C1, or CKT 241between the fuse and pin C2. 2. Repair the open. 3. Check for loose electrical connectors. Is the repair complete?	—	Go to Electric Shift Transfer Case Functional Test	—

All Shift Select Buttons Do Not Light (cont'd)

Step	Action	Value(s)	Yes	No
8	1. Position the ignition switch to RUN. 2. Do not unplug the harness connector from the shift select switch. 3. Depress all three shift select buttons as the following pins are checked for B+ voltage. 4. Check pins A, B, and F on the back of the shift select switch for B+ voltage. Is B+ voltage at pin A, B, or F?	—	Go to *Step 9*	Go to *Step 10*
9	1. Position the ignition switch to OFF. 2. Ensure pin D10 on the TCCM is grounded. Is pin D10 grounded?	—	Go to *Step 12*	Go to *Step 11*
10	1. Position the ignition switch to OFF. 2. Replace the shift select switch. Has the shift select switch been replaced?	—	Go to Electric Shift Transfer Case Functional Test	—
11	1. An open in CKT 1050 between pin D10 and ground. 2. Repair the open in CKT 1050. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—
12	Check pins C6 and C8 on the TCCM for B+ voltage. Is B+ voltage at pins C6 and C8?	—	Go to Perform a Diagnostic On the TCCM	Go to *Step 13*
13	1. If no B+ is on C6, an open exists on CKT 40 between the fuse and pin C6 on the TCCM. 2. If no B+ is on C8, an open exist on CKT 241 between the fuse and pin C8 on the TCCM. Is the open repaired?	—	Go to Electric Shift Transfer Case Functional Test	—

One or Two Shift Select Buttons Do Not Light

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	Position the ignition switch to OFF for at least 6 seconds. Position the ignition switch to RUN. Can mode and range shifts be made?	—	Go to *Step 3*	Go to Reduced or No Mode and Range Shift Operation
3	1. If the 2H1 button will not light, check for and open on CKT 1563 between pin G on the shift select switch and pin C11 on the TCCM. 2. If the 4H1 button will not light, check for an open on CKT 1566 between pin F on the shift select switch and pin C12 on the TCCM. 3. If the 4L0 button will not light, check for an open on CKT 1565 between pin E on the shift select switch and pin C14 on the TCCM. Is an open found on the CKT checked	—	Go to *Step 4*	Go to *Step 5*
4	Repair the open CKT. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—

One or Two Shift Select Buttons Do Not Light (cont'd)

Step	Action	Value(s)	Yes	No
5	1. If 2H1 does not light, check for B+ voltage at pin C11 on the TCCM. 2. If 4H1 does not light, check for B+ voltage at pin C12 on the TCCM. 3. If 4L0 does not light, check for B+ voltage at pin C14 on the TCCM. Is B+ voltage at the checked pin?	—	Go to *Step 8*	Go to *Step 6*
6	1. If 2H1 does not light, check for a open in CKT 1563 between pin G on the shift select switch and pin C11 on the TCCM. 2. If 4H1 does not light, check for an open in CKT 1566 between pin F on the shift select switch and pin C12 on the TCCM. 3. If 4L0 does not light, check for an open in CKT 1565 between pin E on the shift select switch and pin C14 on the TCCM. Is the checked CKT open?	—	Go to *Step 7*	Go to *Step 8*
7	1. Position the ignition switch to OFF. 2. Repair the open in the CKT. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—
8	1. Position the ignition switch to OFF. 2. If 2H1 does not light, position a jumper from pin C11 to a vehicle ground source. 3. If 4H1 does not light, position a jumper from pin C12 to a vehicle ground source. 4. If 4L0 does not light, position a jumper from pin C14 to a vehicle ground source. 5. Position the ignition switch to RUN. Does the shift select button light?	—	Go to Perform a Diagnostic On the TCCM	Go to *Step 9*
9	Replace the shift select switch. Has the switch been replaced?	—	Go to Electric Shift Transfer Case Functional Test	—

All Shift Select Buttons Remain Lit

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	1. Position the ignition switch to OFF for at least 6 seconds. 2. Position the ignition switch to RUN. Can any mode or range shifting be made?	—	Go to *Step 3*	Go to *Step 8*
3	Can shift modes (2H1 to 4H1 to 2H1) be made?	—	Go to *Step 4*	Go to *Step 7*
4	1. Position the ignition switch to RUN. 2. Check for B+ voltage at pins D2 and D16 on the TCCM. Was B+ voltage on both pins?	—	Go to Perform a Diagnostic On the TCCM	Go to *Step 5*

All Shift Select Buttons Remain Lit (cont'd)

Step	Action	Value(s)	Yes	No
5	1. Position the ignition switch to OFF. 2. Check for an open between CKT 1737 and D16 on the TCCM. 3. Check for an open between CKT 275 and D2 on the TCCM. Was an open found on one of the CKT?	—	Go to *Step 6*	Go to Perform a Diagnostic On the TCCM
6	1. Ensure the ignition switch is positioned to OFF. 2. Repair the open in the CKT. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—
7	1. Position the ignition switch to RUN. 2. If 2H1 can not be selected, check for an open on CKT 1562 between pin C4 on the TCCM and Pin B on the shift select switch. 3. If 4H1 can not be selected, check for an open on CKT 1564 between pin C5 on the TCCM and pin C on the shift select switch. Was an open found on one of the CKT?	—	Go to *Step 6*	Go to Perform a Diagnostic On the TCCM
8	1. Position the ignition switch to RUN. 2. Check for an open on CKT 1555 between pin D5 on the TCCM and pin C on the motor/encoder. Was an open found on CKT 1555?	—	Go to *Step 6*	Go to Perform a Diagnostic On the TCCM

More Than One Shift Select Button Remains Lit

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	1. If 2H1 remains lit, check for a ground in CKT 1563 between pin C on the shift select switch and pin C11 on the TCCM. 2. If 4H1 remains lit, check for a ground in CKT 1566 between pin F on the shift select switch and pin C12 on the TCCM. 3. If 4L0 remains lit, check for a ground in CKT 1565 between pin E on the shift select switch and pin C14 on the TCCM. Is the checked CKT grounded?	—	Go to *Step 3*	Go to Perform a Diagnostic On the TCCM
3	1. Ensure the ignition switch is positioned to OFF. 2. Repair the ground in the CKT. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—

No Shift Select Buttons Remain Lit

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	Check for an open in CKT 1554 between pin A on the motor/encoder and pin C9 on the TCCM. Is CKT 1554 open?	—	Go to *Step 3*	Go to Perform a Diagnostic On the TCCM
3	1. Ensure the ignition switch is positioned to OFF. 2. Repair the open in the CKT 1554. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—

Reduced or No Mode and Range Shift Operation

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	1. Ensure the electrical harness connector and pins to the motor/encoder are clean and not corroded. 2. Ensure the electrical harness connector to the motor/encoder is properly installed. 3. Check the following CKT between the motor/encoder and the TCCM. 4. Check for opens and grounds on CKT 31, CKT 940, CKT 1552, CKT 1553 and CKT 1555. 5. Check for opens and grounds on CKT 1556, CKT 1557 and CKT 1558. Are any opens or grounds found on any of the CKT?	—	Go to *Step 3*	Go to Perform a Diagnostic On the TCCM
3	1. Ensure the ignition switch is position to OFF. 2. Repair the open or ground in the CKT. Is the repair completed?	—	Go to Electric Shift Transfer Case Functional Test	—

Perform a Diagnostic On the TCCM

Step	Action	Value(s)	Yes	No
1	Were you sent here from a diagnostic table?	—	Go to *Step 2*	Go to Electric Shift Transfer Case Functional Test
2	Perform a diagnostic on the TCCM. Go to Obtaining Stored Diagnostic Trouble Codes (DTC) in this section.	—	—	—

Four-Wheel-Drive Does Not Disengage (Selectable 4WD)

Step	Action	Value(s)	Yes	No
1	1. Place the transfer case in the RWD position. 2. Disconnect the transfer case switch. Did the S4WD disengage?	—	Replace the transfer case switch.	*Go to Step 2*
2	Disconnect the front axle actuator. Did the S4WD disengage?	—	Repair the short to battery in CKT 1296.	Replace the front axle actuator.

Four-Wheel-Drive Does Not Engage (Selectable 4WD)

Step	Action	Value(s)	Yes	No
DEFINITION: 4WD Will Not Engage				
1	Disconnect Front Axle Actuator. Place Transfer Case Select Switch in 4WD. Connect a test lamp from Front Axle Actuator Terminal B to ground with the Ignition Switch in Run. Does the test lamp light?	—	Check for open CKT 150. If OK, REPLACE Front Axle Actuator.	Go to Step 2.
2	Disconnect Transfer Case Switch. Connect a test lamp from Terminal A for CKT 241 to ground with Ignition Switch in RUN. Does the test lamp light?	—	Go to Step 3.	Repair Open in CKT 241.
3	Connect a fused jumper between CKT 241 and CKT 1296 of Transfer Case Switch. Connect a test lamp from Terminal B to ground and the Front Axle Actuator with the Ignition Switch in the RUN position. Does the test lamp light?	—	REPLACE the Transfer Case Switch.	REPAIR open in CKT 1296.

Four-Wheel-Drive Indicator Does Not Light (Selectable 4WD)

Step	Action	Value(s)	Yes	No
1	1. Disconnect the S4WD indicator lamp. 2. Place the transfer case switch to S4WD. 3. With the ignition switch in RUN, connect a test lamp from terminal B to ground. Does the test lamp illuminate?	—	Check or replace the bulb. If OK, repair the open in CKT 150.	Check for an open in CKT 1695. If OK, replace the front axle actuator.

Four-Wheel-Drive Indicator Does Not Turn Off (Selectable 4WD)

Step	Action	Value(s)	Yes	No
1	1. Place the transfer case in the RWD position. 2. Disconnect the Transfer Case Switch. Did the Indicator Lamp go off?	—	Replace the transfer case switch.	Repair the short to battery in CKT 1296.

Transfer Case Electronic Shift System Diagnosis (Selectable 4WD)

Notice: Make any repairs that are necessary to correct the operation of electric shift system. After making repairs, clear the TCCM memory and perform the functional test in order to ensure the electric shift system operates properly.

Important: Perform a TCCM diagnostic test in order to ensure the TCCM is operating properly before performing the electronic shift system functional test.

1. If DTC 4 is stored in the TCCM memory, replace the TCCM.
2. Use the following is information that may help you understand some of the terminology used in the diagnostic tables:
   - The ignition switch to the RUN position.

     Position the ignition switch from OFF to RUN but do not start the engine.
   - The ground source refers to any exposed metal surface on the vehicle connected directly or indirectly to the negative terminal of the battery.
   - The shift select refers to the selector that positions or shifts the automatic transmission or the transfer case.
   - The blinking refers to flashing light passing through the red plastic shift select buttons.
   - Shift the transfer case refers to pressing one of the three shift select buttons to shift the transfer case into either 2HI, 4HI, or 4LO.

Transfer Case Diagnosis (Selectable 4WD)

Notice: Make any repairs that are necessary to correct the operation of electric shift system. After making repairs, clear the TCCM memory and perform the functional test in order to ensure the electric shift system operates properly.

1. Prior to performing the electronic shift system functional test, perform a TCCM diagnostic test in order to ensure the TCCM is operating properly. Refer to *Obtaining Diagnostic Trouble Codes*.

   If DTC 4 is stored in the TCCM memory, replace the TCCM.
2. Use the following is information that may help you understand some of the terminology used in the diagnostic tables:
   - The ignition switch to the RUN position.

     Position the ignition switch from OFF to RUN but do not start the engine.
   - The ground source refers to any exposed metal surface on the vehicle connected directly or indirectly to the negative terminal of the battery.
   - The shift select refers to the selector that positions or shifts the automatic transmission or the transfer case.
   - The blinking refers to flashing light passing through the red plastic shift select buttons.
   - Shift the transfer case refers to pressing one of the three shift select buttons to shift the transfer case into either 2HI, 4HI, or 4LO.

Repair Instructions

Oil Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to *Vehicle Lifting Caution* in General Information.
2. Place a container under the drain plug in order to catch the oil.
3. Remove the fill plug.
4. Remove the drain plug. Allow the oil to drain.

Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the drain plug.

   Tighten

   - Tighten the New Venture Gear drain plugs to 47 N·m (35 lb ft).
   - Tighten the Borg–Warner drain plugs to 25 N·m (18 lb ft).
2. Install the transfer case oil. Refer to *Approximate Fluid Capacities.*
3. Fill the transfer case until the oil level is at the bottom of the oil fill plug hole.
4. Install the fill plug.

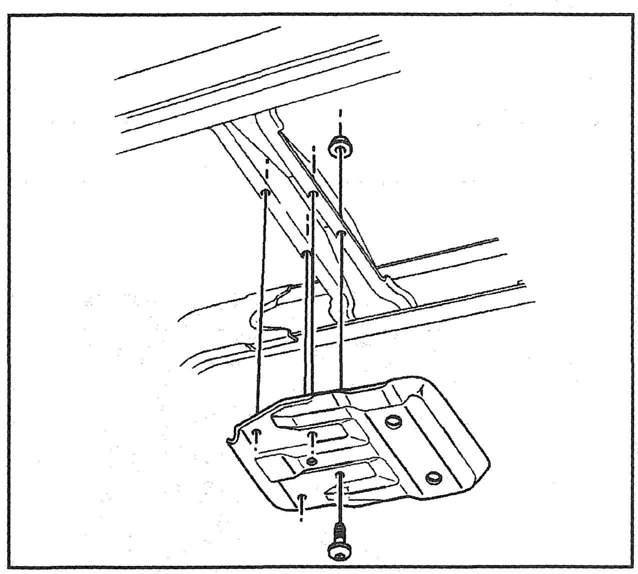
   Tighten

   - Tighten the New Venture Gear drain plugs to 47 N·m (35 lb ft).
   - Tighten the Borg–Warner drain plugs to 25 N·m (18 lb ft).
5. Lower the vehicle.

Shield Replacement

Removal Procedure

1. Raise and support the vehicle.
2. Remove the four bolts and the nuts securing the transfer case shield to the frame.
3. Remove the shield from the frame.



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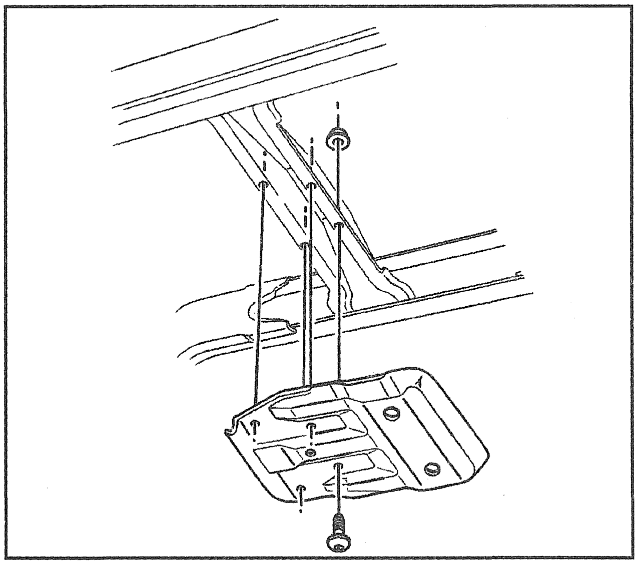

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Installation Procedure

1. Install the shield to the frame.

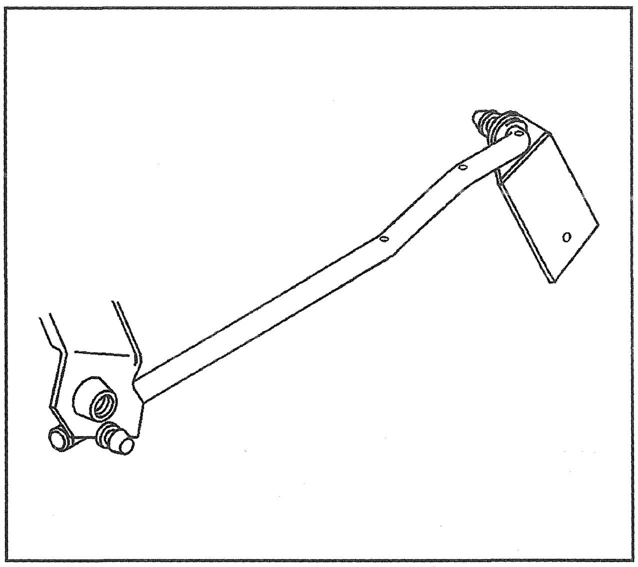
Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the four bolts and the nuts securing the transfer case shield to the frame.

   Tighten

   Tighten the bolts and the nuts to 35 N·m (26 lb ft).

3. Lower the vehicle.



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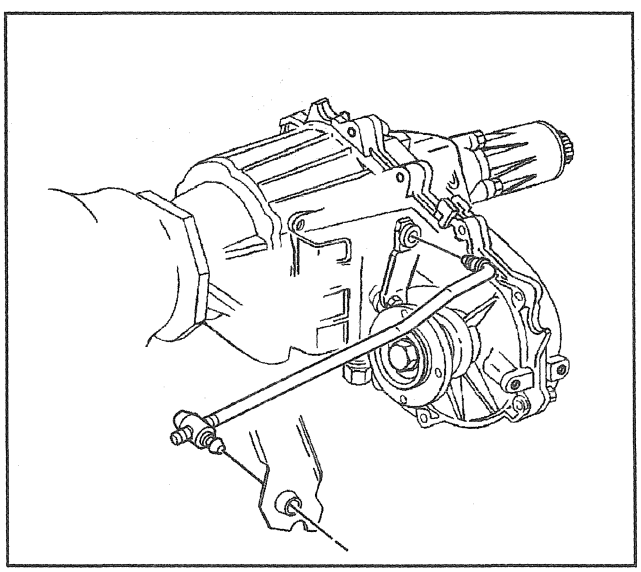
Shift Cable Replacement

1. Place the shift lever in the 4HI position.
2. Raise and support the vehicle.
3. Disconnect the linkage rod from the console shift lever.
4. Shift the transfer case into 4HI position (the transfer case shift lever in full forward detent).
   A click sound indicates that the transfer case lever is all the way back.



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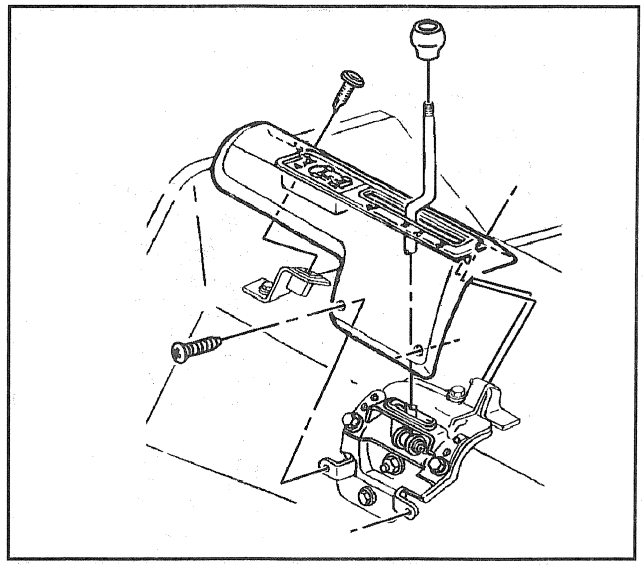
5. Adjust the swivel in order to align with the notch in the console shift lever.
6. Connect the linkage rod to the console shift lever.
7. Lower the vehicle.

Shift Lever Replacement - On Vehicle

Removal Procedure

1. Remove the shift knobs from the transfer case shift lever.
2. Remove the four screws securing the transfer case shift control bezel to the floor panel bracket and the shift bracket.
3. Remove the wiring harness from the transfer case shift control bezel.

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



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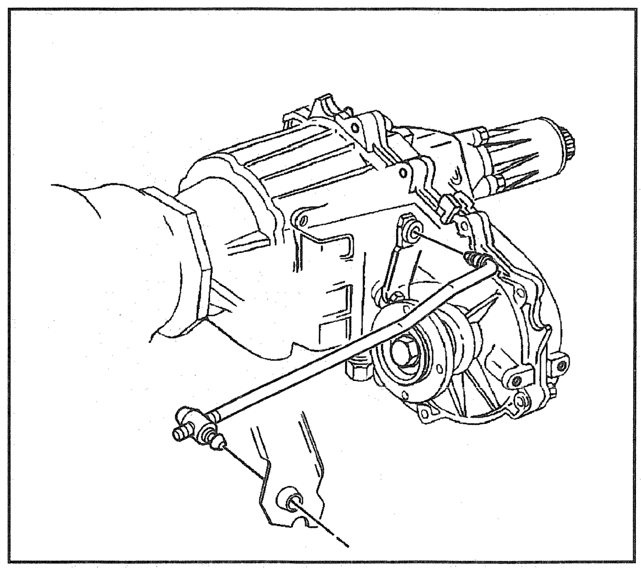
4. Remove the shift lever end from the transfer case linkage rod.



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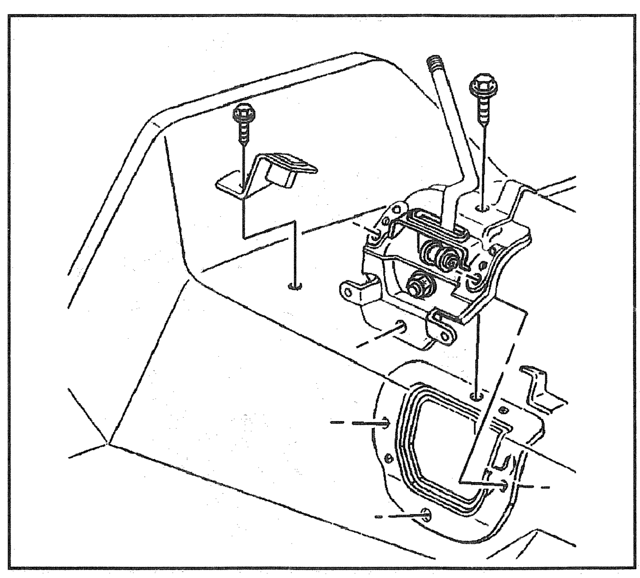
5. Remove the four bolts securing the transfer case shift control to the floor panel bracket.



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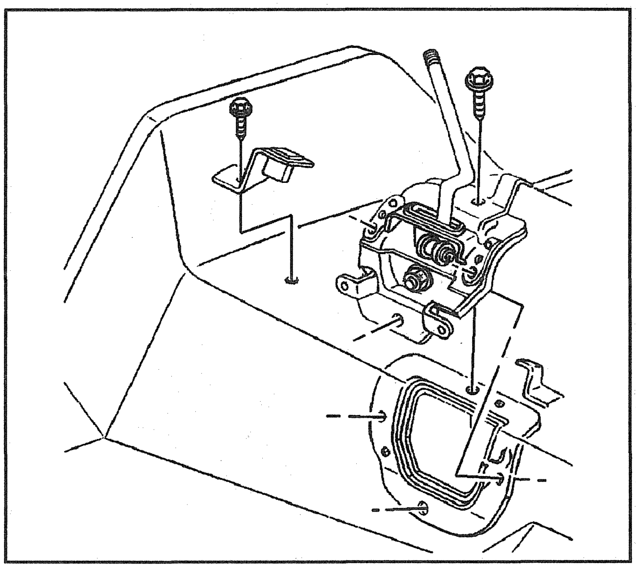

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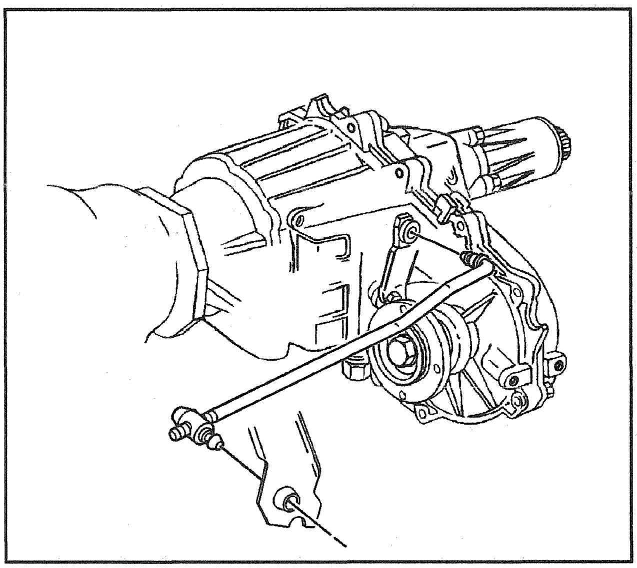
Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the four bolts securing the transfer case shift control to the floor panel bracket.

   Tighten

   Tighten the transfer case control bolts to 11 N·m (97 lb in).



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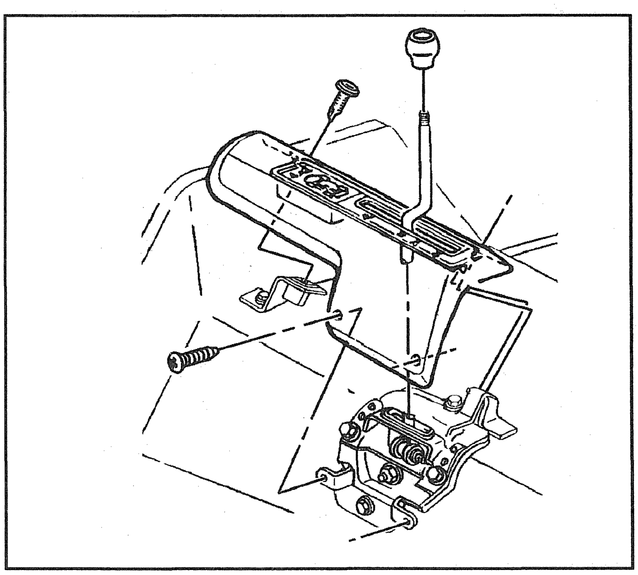
2. Install the shift lever end to the transfer case linkage rod.

   Lower the vehicle.



175319

3. Install the wiring harness to the transfer case shift control bezel.
4. Install the four screws securing the transfer case shift control bezel to the floor panel bracket and the shift bracket.

   Use the locator pin on the transfer case shift control bezel in order to aid in positioning the bezel onto the brackets.

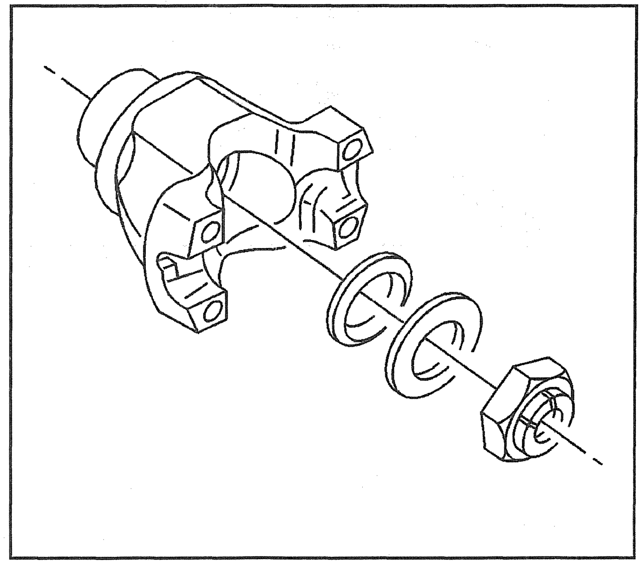
   Tighten

   Tighten the transfer case shift control bezel screws to 2 N·m (18 lb in).
5. Install the shift knob to the transfer case shift lever.

Transfer Case Output Shaft Seal Replacement (New Venture)

Removal Procedure

1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the front or the rear propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* or *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
3. Remove the propeller shaft yoke nut and the flat washers.
4. The yoke nut and the flat washers are not used at the rear on some models.
5. Remove the propeller shaft yoke.
6. Remove the transfer case shield. Refer to *Shield Replacement*.
7. Remove the seal.
   - Use a screwdriver in order to remove the seal.
   - Do not damage the sealing bore.



175414

Installation Procedure

Tools Required

J 29162

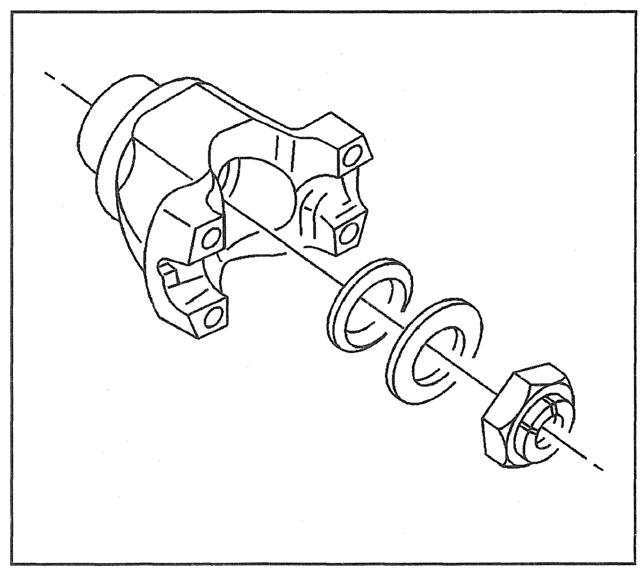
1. Install the seal.
   1.1. Lubricate the seal lips with petroleum jelly or with transmission oil.
   1.2. Install the seal using the J 33843
   1.3. For all of the vehicles except the K30 with dual rear wheels, install the New Venture Gear transfer case.
2. Install the transfer case shield. Refer to *Shield Replacement*.
3. Install the propeller shaft yoke.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Install the flat washers and the nut, if used.

   Tighten

   Tighten the New Venture Gear propeller shaft yoke nuts to 149 N·m (110 lb ft).
5. Install the propeller shaft.
   - Check the transfer case oil level and add oil as necessary. Refer to *Approximate Fluid Capacities*.
   - Lower the vehicle.



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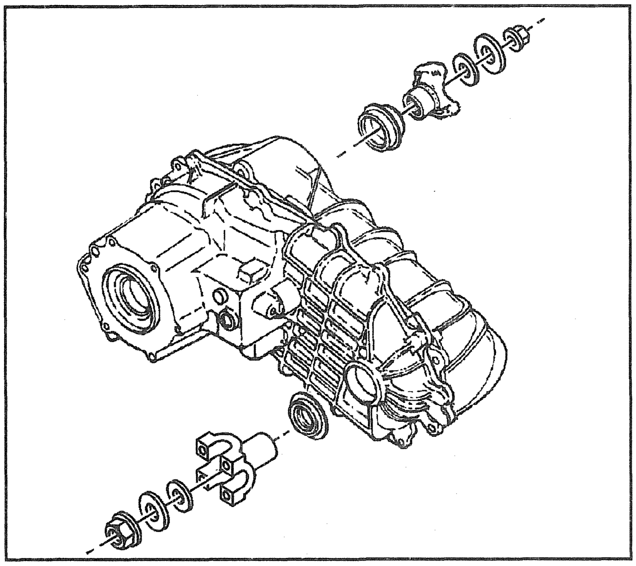


175421

Transfer Case Output Shaft Seal Replacement (Borg-Warner)

Removal Procedure

Important: This procedure applies to the front output shaft seal replacement and to the rear output shaft seal replacement.

1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the front or the rear propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* or *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
3. Remove the propeller shaft yoke nut and the flat washers.

   The yoke nut and the flat washers are not used at the rear on some models.
4. Remove the propeller shaft yoke.
5. Remove the transfer case shield. Refer to *Shield Replacement*.
6. Remove the seal.

   Use a screwdriver in order to remove the seal. Do not damage the sealing bore.

Installation Procedure

Tools Required

J 29162 Front Output Shaft Seal Installer (NV241 Transfer Case)

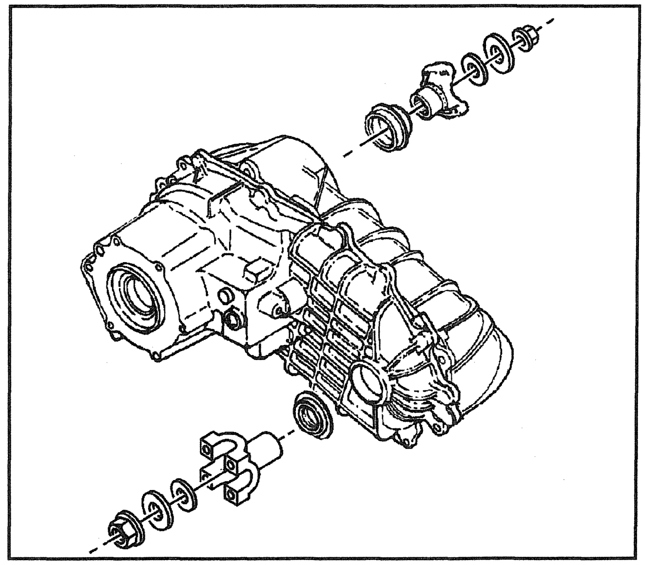
1. Install the seal using the following procedure:
   1.1. Lubricate the seal lips with petroleum jelly or with transmission oil.
   1.2. Install the seal using the *J 29162*
   1.3. For the K30 with dual rear wheels, install the Borg–Warner transfer case.
2. Install the transfer case shield. Refer to *Shield Replacement*.
3. Install the propeller shaft yoke.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Install the flat washers and the nut, if used.

   Tighten
   - Tighten the rear propeller shaft yoke nuts to 170 N·m (125 lb ft).
   - Tighten the front propeller shaft yoke nut to 225 N·m (165 lb ft).

5. Install the propeller shaft.
   - Check the transfer case oil level and add oil as necessary. Refer to *Approximate Fluid Capacities*.
   - Lower the vehicle.



175421

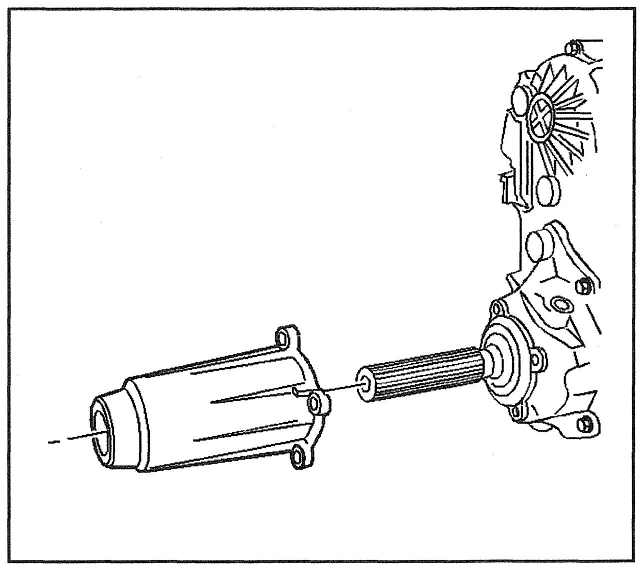
Rear Extension Housing Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the rear propeller shaft. Refer to *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
3. Remove the yoke.
4. Remove the four bolts that secure the rear extension housing to the rear retainer housing.

   Remove the rear extension housing from the rear retainer housing.

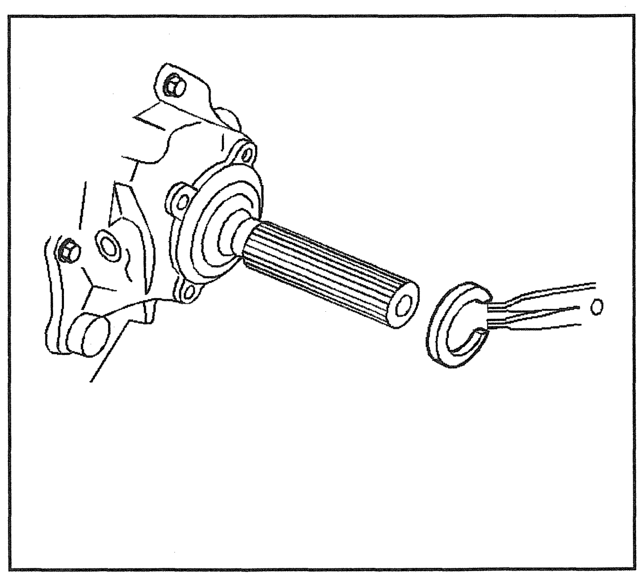
   Tap the extension housing with a rubber mallet in order to free the rear retainer housing.



2233

5. Remove the rear bearing retainer snap ring.
6. Remove the five bolts securing the rear retainer housing to the transfer case.
7. Remove the rear retainer housing.
8. Remove the seal.

   Use a screwdriver. Do not damage the sealing bore.
9. Clean the gasket surfaces with a suitable solvent.



2234

Installation Procedure

1. Install the rear retainer housing.
   - Make sure the gasket surfaces are clean and free of grease and oil.
   - Apply the RTV sealer GM P/N 12345739 to the rear retainer housing sealing surfaces.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Secure the rear retainer housing to the transfer case with the five bolts.

   Apply GM P/N 12345382 or the equivalent to the threads of the bolts.

   Tighten

   Tighten the rear retainer housing bolts to 40 N·m (30 lb ft).
3. Install the snap ring.
4. Install the rear extension housing to the transfer case.
   - Clean the gasket surfaces thoroughly.
   - Apply RTV sealer GM P/N 12345739 to the rear extension housing sealing surfaces.
5. Install the four bolts that secure the rear extension housing to the rear retainer housing.

   Apply GM P/N 12345382 or the equivalent to the threads of the bolts.

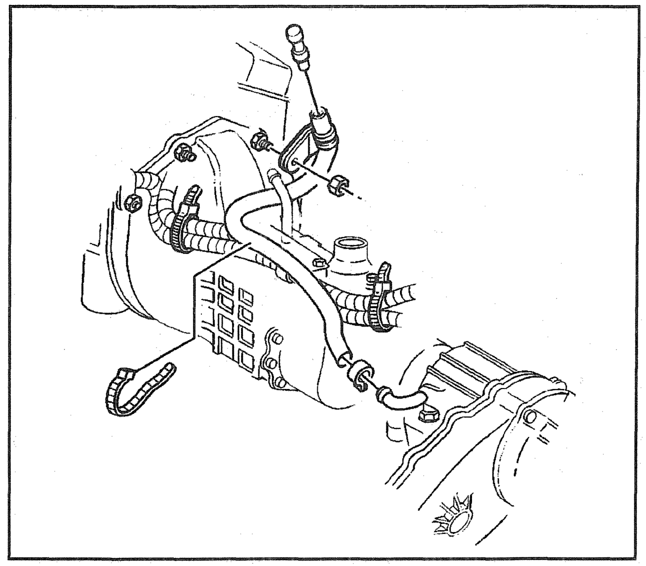
   Tighten

   Tighten the rear extension housing bolts to 31 N·m (23 lb ft).
6. Install the seal.
   - Lubricate the seal lips with transmission oil or with petroleum jelly.
   - Install the seal using the *J 29162*
7. Install the rear propeller shaft and the yoke.
   - Check the transfer case oil level. Add oil if necessary. Refer to *Approximate Fluid Capacities*.
   - Lower the vehicle.

Transfer Case Replacement (Selectable Four Wheel Drive)

Removal Procedure

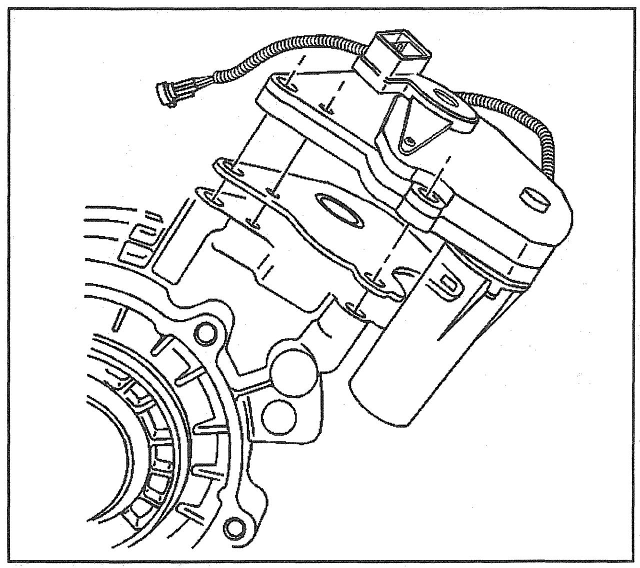
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the transfer case shield. Refer to *Shield Replacement*.
3. Remove the front propeller shaft. Refer to *Propeller Shaft Replacement - Two-Piece* in Propeller Shaft.
4. Remove the rear propeller shaft. Refer to *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
5. Disconnect the vehicle speed sensor electrical connector.
6. Disconnect the wiring harness from the transfer case.



175384

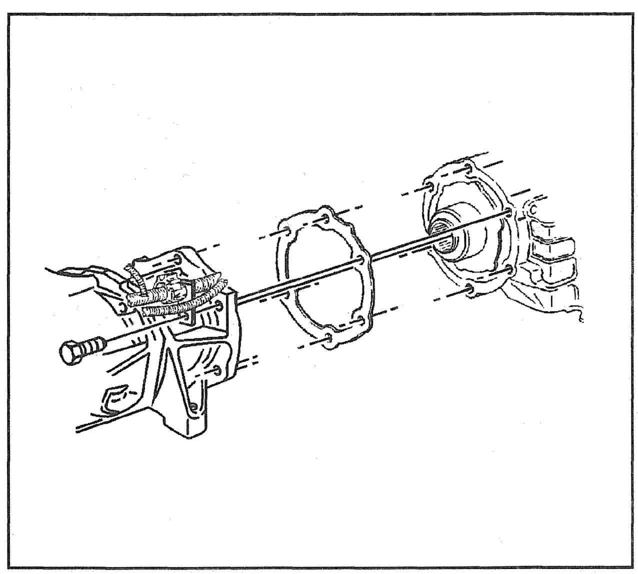
7. Remove the transfer case motor/encoder.

   Support the transfer case with a jack.



165643

8. Remove the bolts securing the transfer case to the transmission adapter.
9. Remove the gasket.



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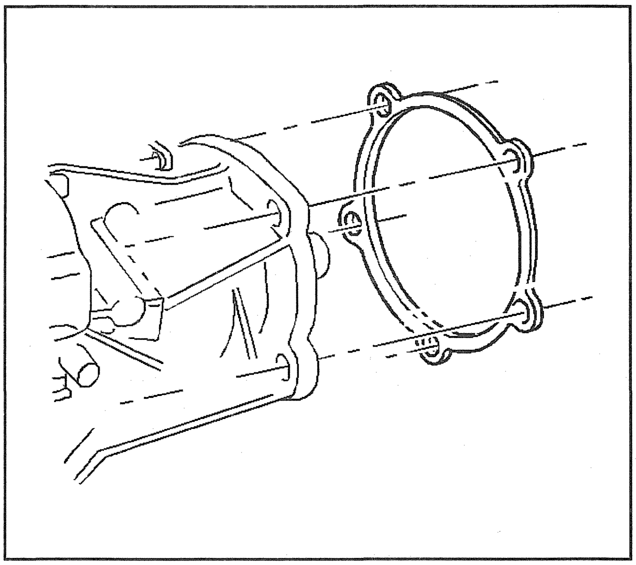
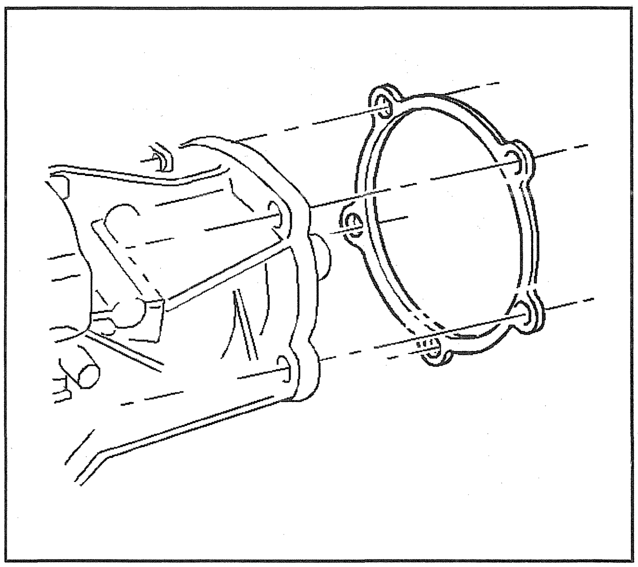


2214

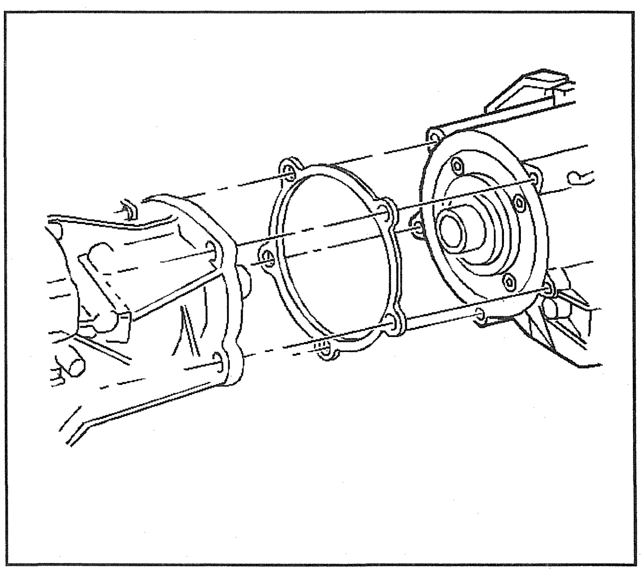
10. Discard the gasket.



2214

Installation Procedure

1. Install a new gasket to the transmission. Use a gasket sealer in order to hold the gasket in place.



2213

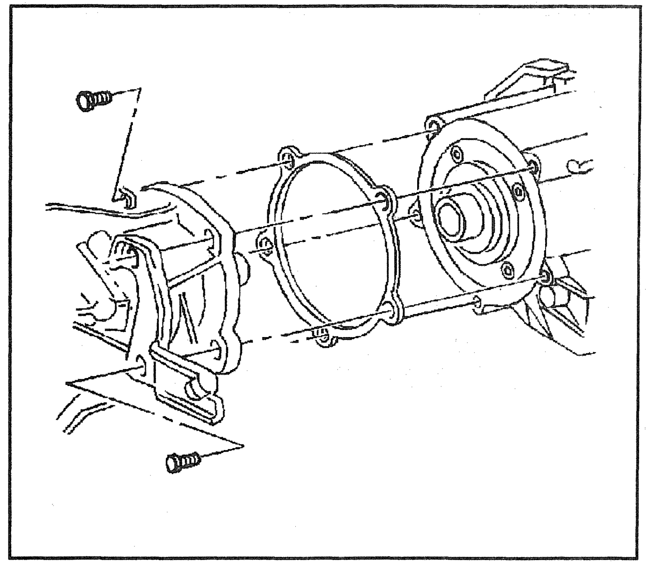
2. Install the transfer case to the transmission adapter.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the bolts that secure the transfer case to the transmission adapter.

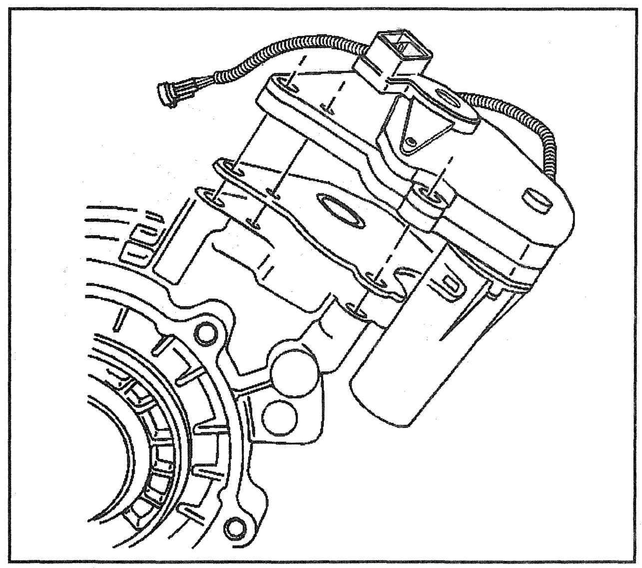
   Tighten

   Tighten the bolts to 45 N·m (33 lb ft).



2217

4. Install the transfer case motor/encoder.
5. Remove the jack from the transfer case.
6. Install the electrical connectors and the wiring harness to the transfer case with the new straps.
7. Install the rear propeller shaft. Refer to *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
8. Install the front propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* in Propeller Shaft.
9. Install the transfer case shield. Refer to *Shield Replacement.*
   - Check the transfer case lubricant level. Add oil as necessary. Refer to *Approximate Fluid Capacities.*
   - Lower the vehicle.

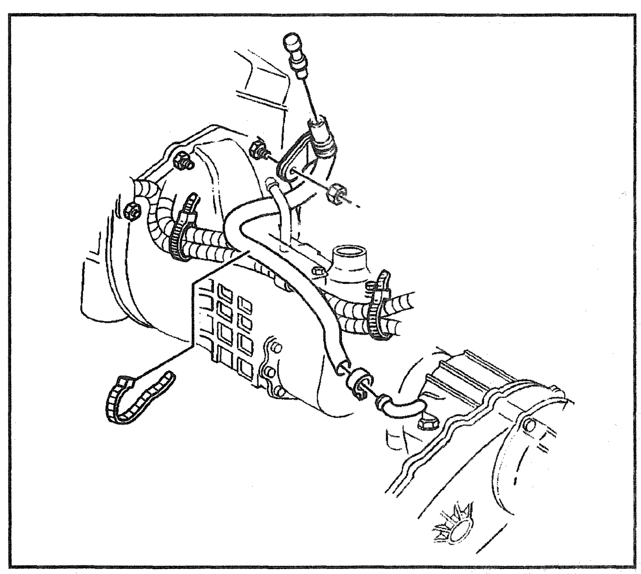


165643

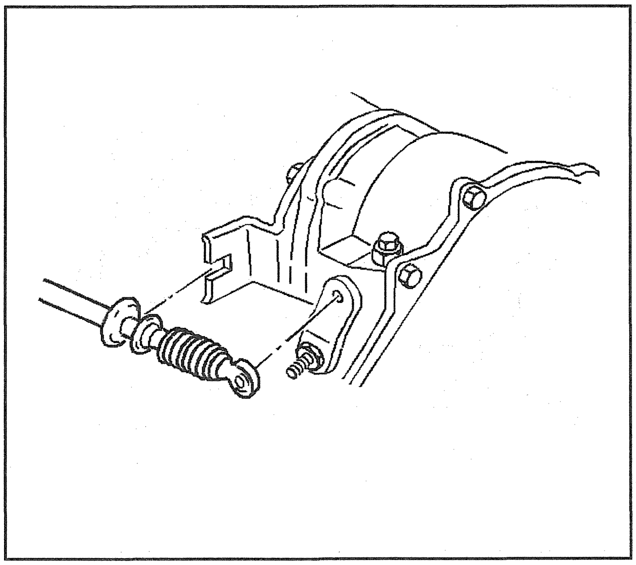
Transfer Case Replacement (Manual Four Wheel Drive)

Removal Procedure

1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the propeller shafts. Refer to *Propeller Shaft Replacement (Rear)* and *Propeller Shaft Replacement (Front)* in Propeller Shaft.
3. Disconnect the vehicle speed sensor electrical connector.
4. Disconnect the wiring harness from the transfer case.



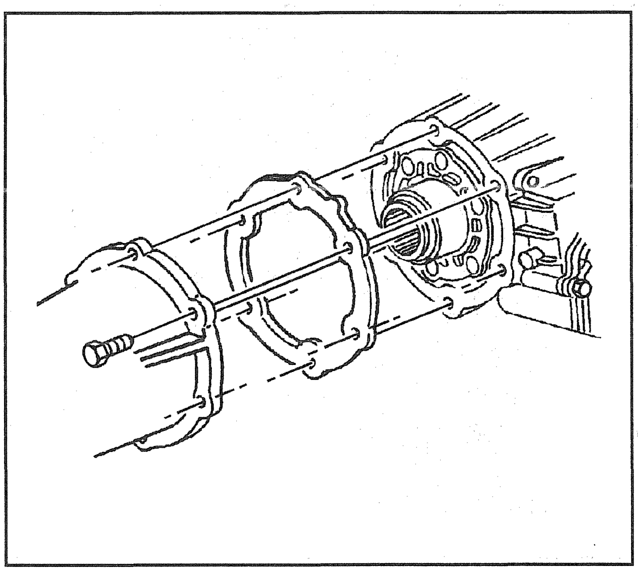
175384



1313

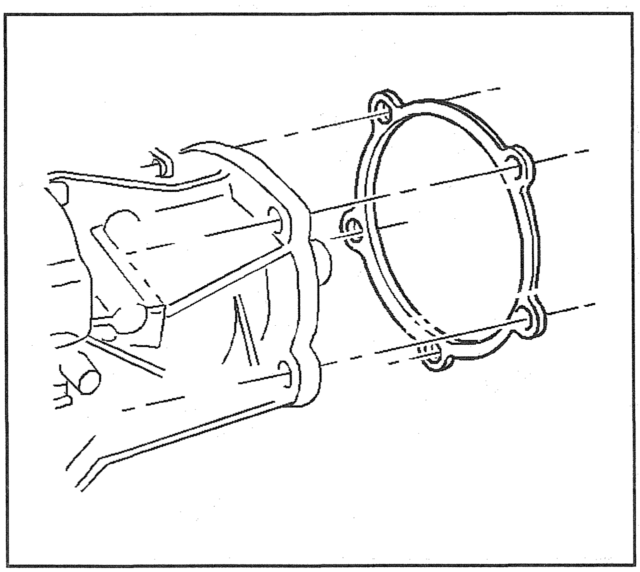
5. Disconnect the transfer case shift cable at the transfer case.

   Support the transfer case with a jack.



175406

6. Remove the bolts securing the transfer case to the transmission adapter.
7. Remove the gasket.

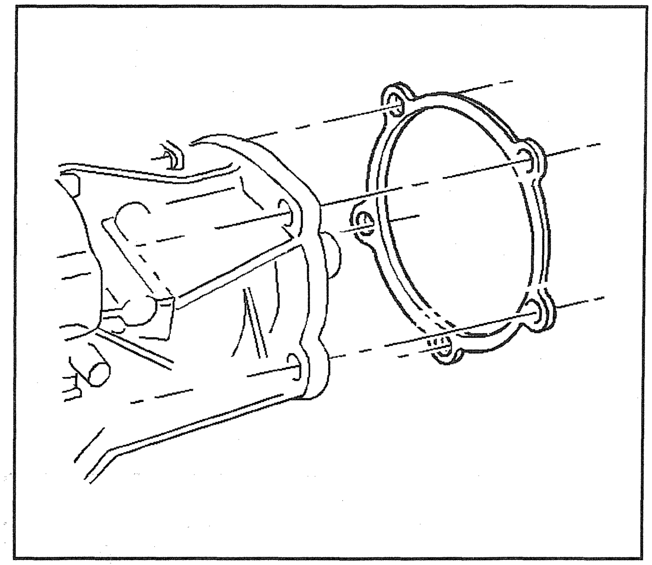


2214

8. Discard the gasket.

Installation Procedure

1. Install a new gasket to the transmission. Use a gasket sealer in order to hold the gasket in place.



2214

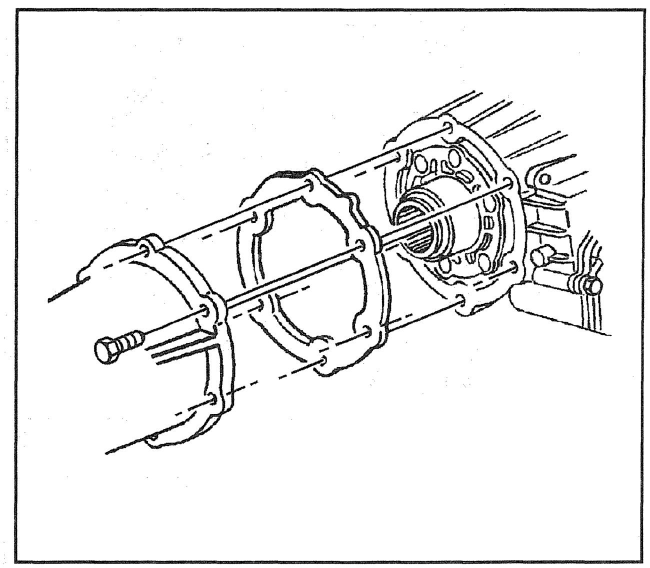
2. Install the transfer case to the transmission adapter.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the bolts that secure the transfer case to the transmission adapter.

   Tighten

   Tighten the bolts to 45 N·m (33 lb ft).
4. Remove the jack from the transfer case.
5. Install the transfer case shift linkage at the transfer case.
6. Install the electrical connectors and the wiring harness to the transfer case with the new straps.
7. Remove the propeller shafts. Refer to *Propeller Shaft Replacement (Rear)* and *Propeller Shaft Replacement (Front)* in Propeller Shaft.
   - Check the transfer case lubricant level. Add oil as necessary. Refer to *Lubrication Specifications.*
   - Lower the vehicle.



175406

Adapter Replacement

Removal Procedure

1. Remove the transfer case. Refer to *Transfer Case Replacement (Manual Four Wheel Drive).*
2. Remove the bolts securing the adapter to the transmission.
3. Raise the rear of the transmission slightly.
4. Remove the adapter from the transmission.
5. Remove the seal.

Installation Procedure

1. Install the new seal to the transmission.

   Lubricate the seal lips with the transmission oil or the petroleum jelly.

2. Install the adapter to the transmission.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the six bolts securing the adapter to the transmission.

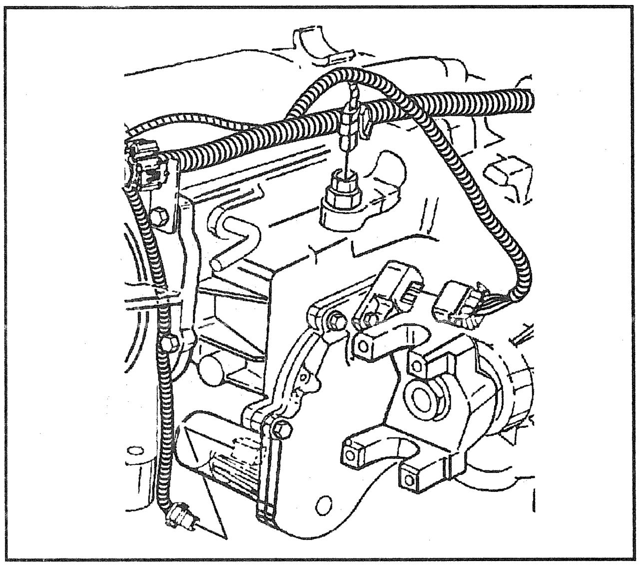
   Tighten

   Tighten the adapter bolts to 45 N·m (33 lb ft).

4. Install the transfer case. Refer to *Transfer Case Replacement (Manual Four Wheel Drive).*

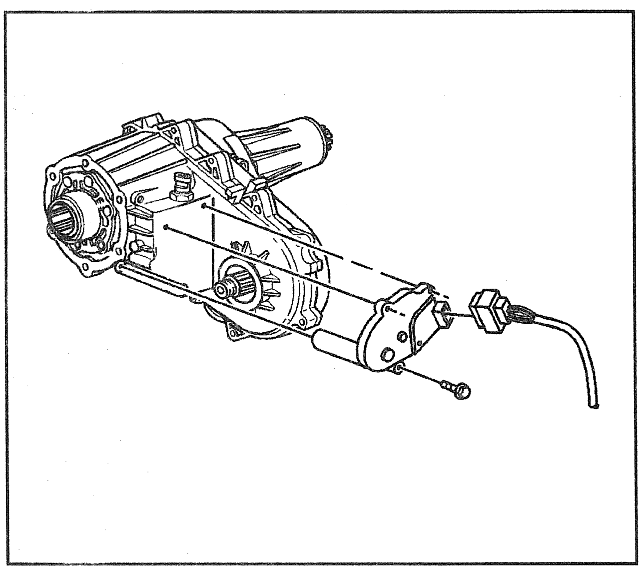
Motor/Encoder Replacement (Selectable 4WD)

Removal Procedure



177160

1. Remove the transfer case shield. Refer to *Shield Replacement.*
2. Remove the transfer case wiring harness connectors from the motor/encoder.



177164

3. Remove the four bolts that secure the motor/encoder to the transfer case.

Installation Procedure

1. Install the with a motor/encoder.

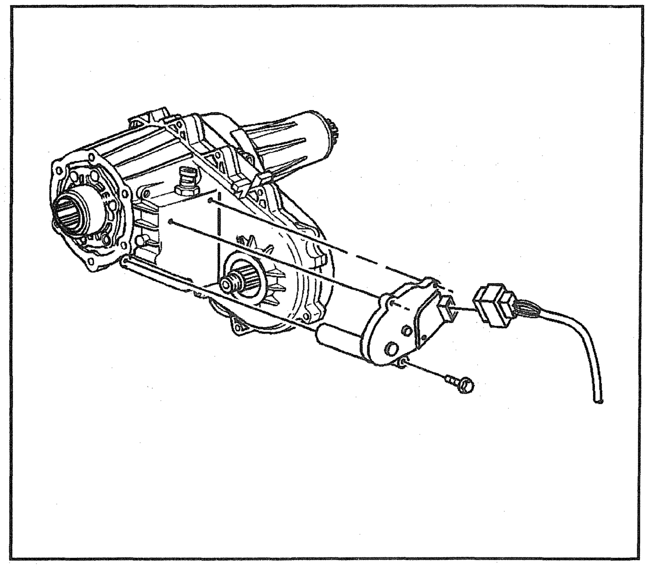
Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the four bolts securing the motor/encoder to the transfer case.

   Tighten

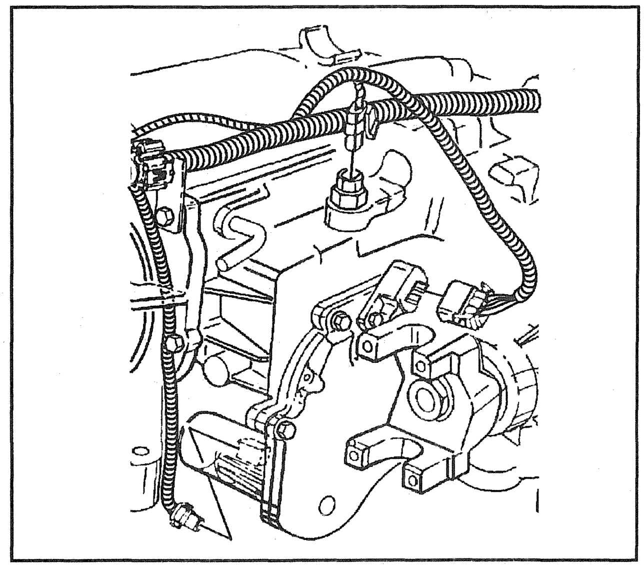
   Tighten the motor/encoder bolts to 25 N·m (18 lb ft).

   - Remove all gasket material remaining from the motor/encoder.
   - Ensure the motor/encoder aligns properly with the transfer case interior shifting components.
   - Align the motor/encoder mating surface detent with the transfer case mating surface detent.



177164

3. Install the wiring harness connectors to the motor/encoder.
4. Install the transfer case shield. Refer to *Shield Replacement*.
5. Perform a functional test on the electronic shift select system in order to test the motor/encoder. Refer to *Transfer Case Functional Test.*

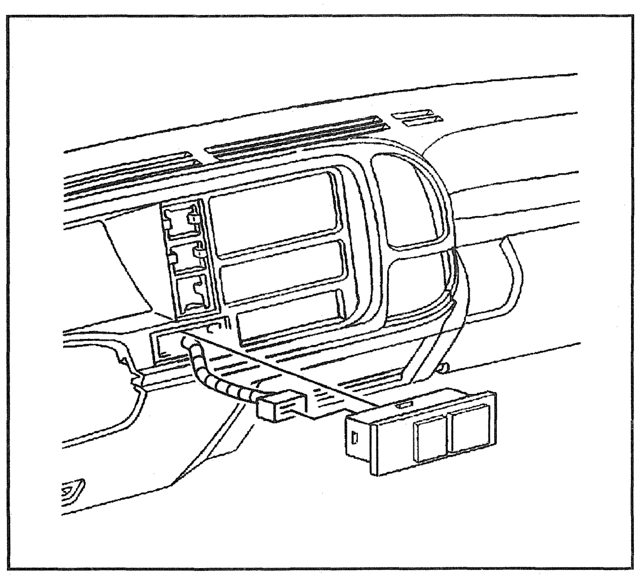


177160

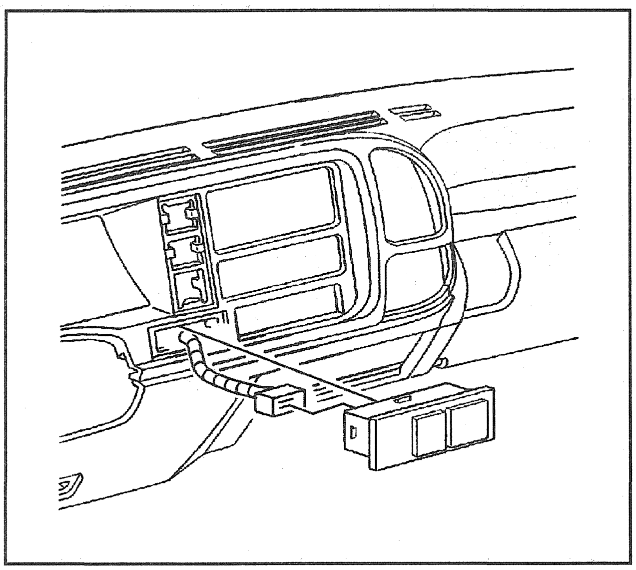
Transfer Case Driver Control Switch Replacement (Selectable 4WD)

Removal Procedure

1. Remove the shift select switch from the instrument panel.
   - Pull the tabs on the rear of the switch in.
   - Pull the switch straight out from the panel.
2. Remove the electrical connector from the shift select switch.



177180

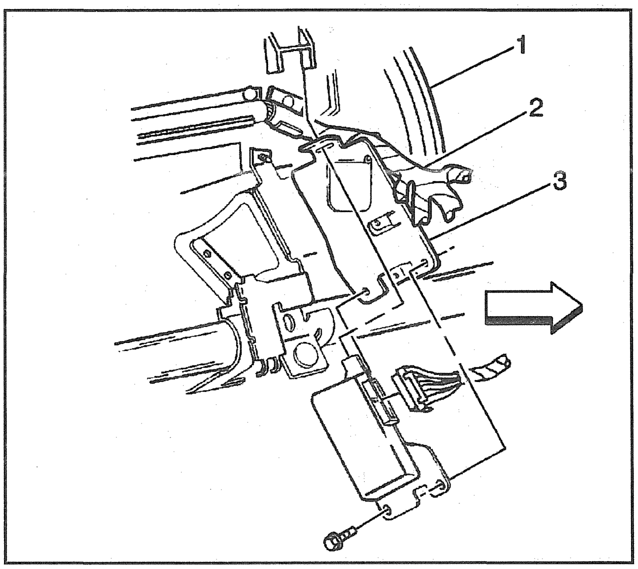


177180

Installation Procedure

1. Install the electrical connector to the shift select switch.
2. Install the shift select switch into the instrument panel.

   Ensure the shift select switch locks into the instrument panel.



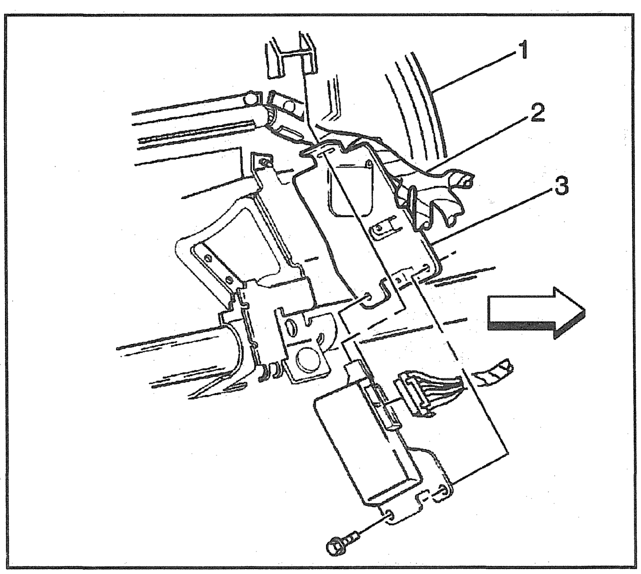
177176

Transfer Case Control Module Replacement (Auto Transfer Case)

Removal Procedure

1. Remove the lower instrument panel trim.
2. Remove the two screws securing the transfer case control module to the bracket.

   The bracket is mounted on the I/P reinforcement.
3. Remove the electrical connector from the transfer case control module.



177176

Installation Procedure

1. Install the electrical connector to the transfer case control module.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the two screws securing the transfer case control module to the bracket.

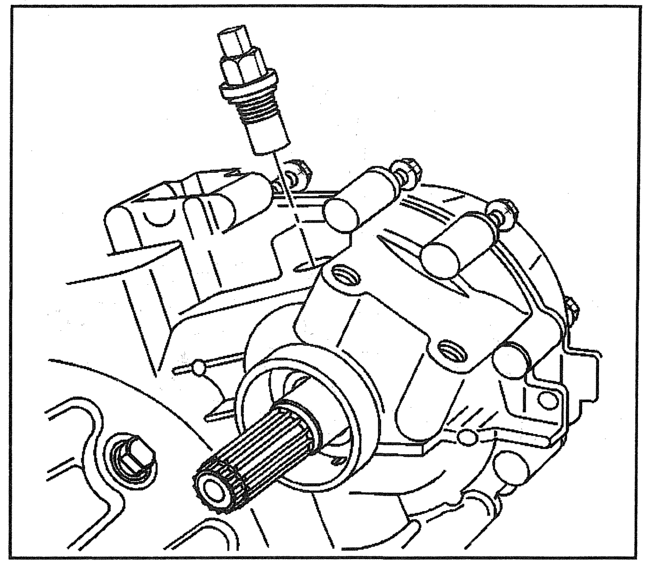
   Tighten

   Tighten the transfer case control module screws to 8 N·m (71 lb ft).
3. Install the lower instrument panel trim.

Speed Sensor Replacement (Front Speed Sensor Replacement)

Removal Procedure

1. Remove the electrical connector from the speed sensor.
2. Remove the front speed sensor from the transfer case.



163707

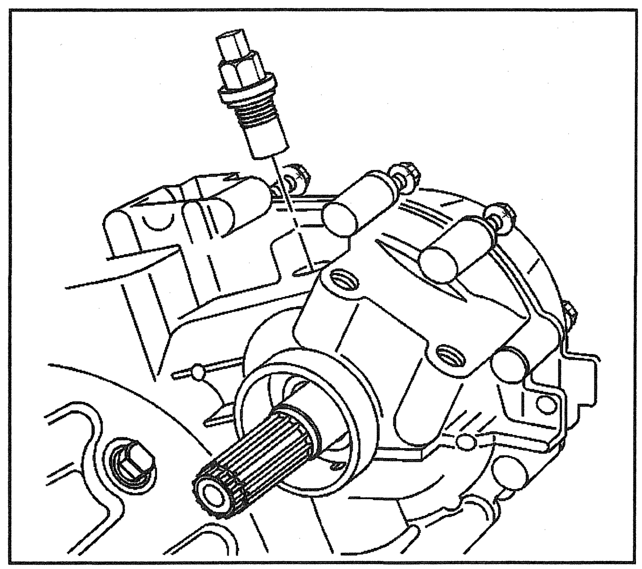
Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the front speed sensor into the transfer case.

   Tighten

   Tighten the front speed sensor to 31N·m (23 lb ft).
2. Install the electrical connector to the speed sensor.

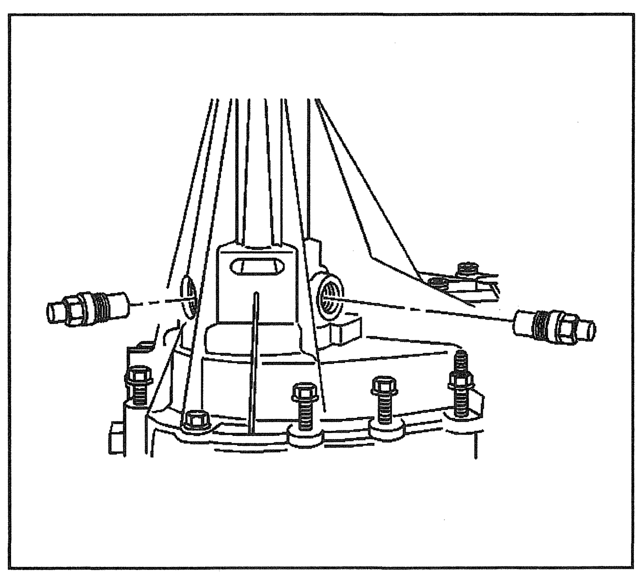


163707

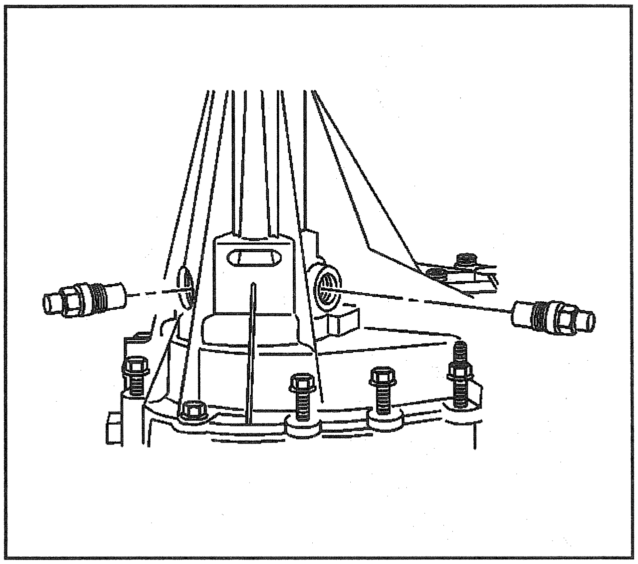
Speed Sensor Replacement (Rear Speed Sensor Replacement)

Removal Procedure

1. Remove the two electrical connectors from the two rear speed sensors.
2. Remove the two rear speed sensors from the transfer case.



163714



163714

Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the two rear speed sensors to the transfer case.

   Tighten

   Tighten the rear speed sensors to 31N·m (23 lb ft).
2. Install the two electrical connectors to the two rear speed sensors.

Transfer Case Electrical Connector Replacement (Selectable 4WD)

Removal Procedure

Remove the four electrical connector from the speed sensors and the motor/encoder.

Installation Procedure

Install the four electrical connector to the speed sensors and the motor/encoder.

Description and Operation

Transfer Case Description (Selectable 4WD)

The transfer case is used to provide power flow from the transmission to the front axle. The transfer case also provides a way of disconnecting the front axle in order to provide better fuel economy and quieter operation when the vehicle is driven on the roads where the four–wheel drive is not required. The transfer case provides an additional gear reduction when placed in low range. This is useful when difficult off–road conditions are encountered.

The New Venture Gear Models NV241 or NV243 transfer case is used on all of the four–wheel drive vehicles under 9200 lb GVW. The NV243 is similar to the NV241 except that it contains an electric shift motor/encoder attached to the transfer case in the area where the shift lever is ordinarily mounted.

The K30 Models with single or dual rear wheels will use the Borg–Warner Models 4401 or 4470 transfer case. Both of these transfer cases use a shift lever and a shift linkage in order to change the operating range.

The Models NV241, 4401, and 4470 are aluminum case, chain driven units with four modes of operation; neutral, two wheel drive high range, four wheel drive high range, and four wheel drive low range. The gear reduction for low range is provided by a planetary gear set.

A floor mounted shift lever is used in order to select the operating range for the NV241, the 4401, and the 4470. The indicator lamps on the floor console show the current mode of operation. When four–wheel drive indicator lamp is designed to come ON whenever the front axle has engaged. A slight delay for the front axle indicator lamp to come ON is normal.

The New Venture Gear Model NV243 is electronically actuated. The vehicles equipped with this model have no transfer case selector lever. The operator selects 2HI, 4HI, or 4LO by pushing one of three switches mounted on the instrument panel. During normal driving the transfer case is in the 2HI mode. When the transfer case is in 2HI both the 4HI and the 4LO switch circuits are open, and both lights are OFF. When the four–wheel drive has been selected, the four–wheel drive indicator lamp on the switch turns on when the front axle has engaged. The lamp will blink while the front axle is engaging. For more information on the electrical operation of the NV243, refer to *Transfer Case System Description (Selectable 4WD).*

Two–Wheel Drive Operation

When the transfer case is in the 2 WHEEL range, the torque flows from the input gear to the range shift hub and the main shaft, through the propeller shaft to the rear axle.

2HI to 4HI

Important: Shifting into the 4HI range causes the following conditions to occur.

1. The front axle indicator lamp does not come on until the front axle engages.
2. The torque flows from the input gear to the mainshaft the same as in the two–wheel position.

   The shift linkage moves the mode synchronizer sleeve into engagement with the clutch teeth of the drive sprocket. This locks the drive sprocket to the mainshaft through the synchronizer sleeve.
3. The torque is transmitted through the drive sprocket and the drive chain to the driven sprocket and the output shaft. The torque then flows through the front propeller shaft to the front axle.
4. The shift mechanism in the transfer case closes the transfer case switch.

   The current is then applied to the front axle thermal actuator and the front axle switch. In the K30 vehicles, the power is also supplied by the transfer case relay to the transfer case synchronizer.
5. The thermal actuator contains a heating element, a gas charge, and a piston.

   When the current is applied, the heating element heats the gas. The gas expands, pushing the piston out after a delay of a few seconds. The piston actuates the shift fork in the front axle. This connects the right axle output shaft to the front axle differential. The torque is then available at the front wheels.
6. The front axle shift mechanism, when fully engaged, closes a switch, causing the front axle indicator lamp to come ON.
7. If the shift lever is moved back to the 2 WHEEL position, the operations in the preceding steps are reversed. The current to the thermal actuator is turned OFF. The gas cools and the piston retracts allowing the shift fork in the front axle in order to return to the two–wheel drive position.

Four–Wheel Drive Low Range Operation

When the transfer case is shifted into the 4LO position, the torque flow and the operation is similar to the 4HI range, except that the range shift hub engages the planetary carrier. The planetary gear set then provides a gear reduction to the front and the rear axles.

Electronic Synchronizer Operation (Borg–Warner)

The electronic synchronizer is used in model 4401 and 4470 transfer cases in order to provide smoother shifting. The system requires no maintenance or service.

The system consists of a relay and a clutch coil (electromagnet) inside the transfer case. The clutch coil replaces the conventional blocker ring. When energized, the clutch coil provides synchronization, resulting in a smooth shift. When the transfer case lever is moved to 4HI or 4LO position, the current is supplied to the normally closed relay. The current flows through the relay to the clutch coil. when the front axle engages, the axle switch energizes the relay coil. The relay switch then opens, and the current to the clutch coil is interrupted.

Identification

For New Venture Gear Transfer Cases, an identification tag is attached to the rear case half. The tag provides the transfer case model number, the low range reduction ratio, and the assembly part number.

For the Borg–Warner Transfer Cases, an identification tag is attached to an extension housing bolt. The tag provides the transfer case model number, the serial number, a build date, and a low range reduction ratio.

Transfer Case System Description (Selectable 4WD)

The New Venture Gear Model NV243 is an electronically controlled optional transfer case for use on four wheel drive K trucks. The driver selects 2HI, 4HI, or 4LO by pushing one of three illuminating shift select buttons mounted on the instrument panel. The shift select buttons display the transfer case mode and range, self-test, diagnostic trouble codes, and electronic shift mechanical engaging problems.

During normal driving the transfer case is in the 2HI mode. When the transfer case is in the 2HI mode. When the transfer case is in 2HI both the 4HI and 4LO switch circuits are open, and both lights are OFF. When the four–wheel drive shift select button has been pressed, the four–wheel drive indicator lamp under the sift select button turns ON when the front axle has engaged. The shift select button will blink while the front axle is engaging. This is a normal condition.

The shifting of the transfer case is performed by a motor/encoder that receives drive signals from the transfer case control module (TCCM). When the driver selects one of the transfer case shift select buttons, request signals are sent to the TCCM. If the correct input signals exists, the TCCM will send drive voltages to the motor/encoder. The motor/encoder will position the transfer case to the ordered shift position.

Transfer Case System Description (Automatic 4WD)

The two speed Auto transfer case system utilizes a part time front axle. The system allows the driver to select the transfer case position with a touch of a button. The following positions can be selected: 4-wheel drive high range (4H), All Wheel Drive (AUTO), 2 Wheel Drive high range (2H), Neutral (N), and 4-Wheel Drive low range (4L).

The Auto Transfer Case (ATC) Control Module controls all the shifting action of the transfer case based on input from the driver as well as information from the Vehicle Control Module (VCM) /Powertrain Control Module (PCM).

4WD (4H or 4L) mode: This is accomplished by engaging the front axle, applying PWM to an electric motor to apply maximum torque, (fully compressing the transfer case clutch plates) to the front axle, then removing the ground on circuit 1569, thus locking the motor in position and stop the PWM to the motor.

AUTO mode: When in this mode of operation, the system should engage the front axle, then it monitors the front and rear propshaft speeds for any speed differences. When the system senses rear wheel slip, a difference of propshaft speed between front and rear, the Auto Transfer Case (ATC) Control Module will use pulse width modulation (PWM) to drive an electric motor. This motor transfers only the required torque to the front wheels to gain additional traction on slippery surfaces up to 75 mph. There is no torque applied to the front wheels until the module senses rear wheel slip.

Throttle anticipation (only operational when in AUTO mode): If the vehicle is below 5 mph and the accelerator is pressed quickly beyond a set point, the system will automatically transfer a percentage of torque to the front wheels to help prevent the rear wheels from slipping, as in a hard acceleration from a stopped position.

The Auto Transfer Case (ATC) Control Module also has the capability of engaging the front axle while the vehicle is in motion. It does this by applying PWM to the electric motor to apply torque to the front axle, this action is used to match the speed of the front and rear propshafts. After the module senses the proper speed, it then supplies a ground on circuit 1570 to engage the front axle.

The Auto Transfer Case (ATC) Control Module will accept a mode shift only when the engine is running and a valid Motor/Encoder signal is present. A mode shift is any shift between 2H, 4H, and AUTO.

The Auto Transfer Case (ATC) Control Module will permit a range shift only if the following conditions are met within 30 seconds of the request:

- Engine running
- Transmission in Neutral
- Vehicle speed below 3 mph
- Proper Motor/Encoder signal present

A range shift is a shift between high range (2H, 4H, and AUTO) and low range (4L).

The Auto Transfer Case (ATC) Control Module will permit a range shift into or out of Neutral only if the following conditions are met:

- Ignition ON
  Transmission in neutral
- Vehicle speed at zero

Automatic 4WD Diagnostic Aids

A Scan Tool reads and displays the following information:

- Diagnostic Trouble code(s)
- Code status bit (are codes set or not)
- Transfer case lock status
- Lamp in the switch/lamp assembly
- Motor/Encoder gear position
- Ignition (3) voltage
- Front propshaft speed sensor (KPH)
- Front axle switch (open/closed)
- Front axle requested position (engaged/disengaged)
- Rear propshaft speed sensor (KPH)
- Mode switch position request
- Park switch (open/closed)
- 4WD (Adapt) Mode Auto bit
- Current Mode corrective action PWM
- Average and highest PWM applied during last slip recovery event
- Throttle anticipation mode

- Average and highest PWM applied during last Throttle anticipation corrective action event
- Difference between front and rear propshaft RPM
- Adapt event counter
- Throttle position sensor percentage

Scan Tool

A Scan Tool can actuate (turn on/off or change modes) of the following:

- Clear Auto Transfer Case (ATC) DTCs
- Service 4WD lamp (tell tail)
- Transfer Case Lock
- All lamps in switch assembly (4WD, 2H, 4H, 4L, and Neutral)
- Front Axle
- Request 4WD (Adapt) Mode
- Request 2H Mode
- Request 4H Mode
- Request 4L Mode
- Request Neutral
- Drive ATC Motor to various position. 50% PWM max with 5 second time out with 10 second wait before re-activating

Mode Shifts

The mode shifts are shifts from 2HI to 4HI and 4HI to 2HI. A mode shift can be accomplished in any gear position and at any vehicle speed. If the system is in 2HI, the driver can shift into 4HI merely by pressing the 4HI shift select button. The 4HI button will blink status whenever a 2HI or 4HI shift is initiated and will continue to blink until the TCCM completes the shift. After the shift into 4HI is accomplished, the 4HI status lamp remains lit to indicate that the system is in 4HI.

There is a difference between when the TCCM sends voltage signals in order to engage a four wheel drive shift and when the vehicle is truly in four wheel drive. The transfer case can be shifted into 4HI and the front axle may not be engaged.

The driver can shift from 4HI back to 2HI by pressing the 2HI shift select button. The 2HI shift select button blinks until the shift to 2HI is complete. The 2HI shift select button will remain on once the shift is mechanically complete.

Range Shifts

1. The range shifts are the shifts between the HI and the LO ranges.
   - 2HI to 4LO
   - 4HI to 4LO
   - 4LO to 4HI
   - 4LO to 2HI
2. A range shift can only be made with the automatic transmission in neutral or with the manual transmission clutch fully depressed. The shift occurs when the vehicle speed is below three miles per hour.

   Whenever a shift into 4LO is initiated, the 4LO shift select button blinks. The 4LO shift select button will continue to blink until the shift is completed mechanically or until 30 seconds elapses. The 4LO shift select button must be on and not blinking prior to shifting the transmission into gear or releasing the clutch pedal.

If a range shift is initiated when the transmission is engaged or the vehicle speed is above 3 mph, the 4LO shift select button will blink for 30 seconds and no range shift actually occurs, the TCCM will default and position the transfer case into 4HI.

Transfer Case Control Module Description

1. The TCCM performs the following functions:
   - Receives input signals
   - Processes the signal information
   - Develops output signals
   - Sends the output signal in order to control the shifting of the transfer case
2. The TCCM receives input signals from the following sources:
   - The transfer case shift select buttons
   - The NSBU switch on the vehicles with automatic transmissions
   - The clutch position switch on the vehicles with manual transmissions
   - The vehicle sped sensor calibrator module
   - The encoder/motor range and the mode feedback signals
   - The diagnostic enable
   - The front axle mechanical status signal
3. In order to ensure the electronic shift system is operating properly, the transfer case control module (TCCM) continually performs diagnostics checks on itself and other parts of the electronic shift system when the ignition switch is in the run position. The following are different types of system checks that the TCCM continually performs.

RAM/ROM Check

The TCCM compares the current internal operating program with a stored operating program. This comparison allows the TCCM in order to evaluate if the TCCM's RAM and ROM are operating properly. Should the TCCM detect a problem with the internal operating program, a diagnostic trouble code (DTC) of 4 is stored indicating the TCCM memory is damaged. Replace the TCCM. Refer to *Transfer Case Control Module Description.*

Data Memory Retention Check

The TCCM checks the stored diagnostic trouble code memory to see if the memory has changed since the ignition switch was last positioned to OFF. This self test checks in order to see if the RAM standby power supply has been interrupted. If the TCCM detects a RAM standby power supply interruption, (the loss of stored diagnostic trouble code) the TCCM stores a DTC of 1 indicating RAM standby power failure.

This condition occurs when the TCCM is disconnected from the wiring harness or battery power is removed. The DTC of 1 automatically clears from the TCCM after cycling the ignition switch ON and OFF five times.

Encoder Signal Check

The TCCM checks the encoder signal in order to verify that the transfer case is in either 2HI, 4HI, or 4LO.

Encoder Switch Monitor Check

While the transfer case shifts, the encoder within the electric–shift motor is monitored for the proper operating sequence. If during a shift, the encoder changes to an incorrect position, an error counter in the TCCM starts to count the number of times the encoder fails. If the encoder fails eight times, the TCCM produces a DTC of 2 indicating an Encoder Fault. When this happens, the TCCM outputs a signal in order to default the rail shift pattern in the encoder in order to allow for only shifts into 2HI and 4LO.

In order to protect against transient, random encoder faults caused by vibration, contamination, electrical noise, etc., the error counter reduces the count by one each time a good encoder value is detected. The encoder must fail 25 percent of the time for the TCCM to store a DTC of 2 and indicate a damaged encoder.

Motor and Relay Voltage Checks

Whenever the electric–shift motor is turned ON or OFF the motor and the electrical circuits are tested both in the de–energized and energized condition. If one or both voltage relays fail to detect the proper voltage after energizing or de–energized and energized condition. If one or both of the voltage relays fail to detect the proper voltage after energizing or de–energizing, the shift is aborted by the TCCM and a DTC of 3 is stored in order to indicate a faulty TCCM motor circuit.

If one or both relays fail to detect the proper voltage after de–energizing, both relays are turned ON by the TCCM, (even with the ignition switch positioned OFF) in order to prevent the motor from running. The TCCM then stores a DTC of 3 in order to indicate a faulty TCCM motor circuit. All of the status lamps blink three times, stop, and repeat the blinking continuously in order to alert the driver that the electronic shift system requires immediate repair. The battery will drain when this condition occurs, regardless of the ignition switch position.

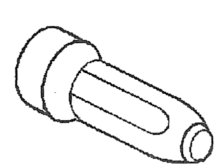
Motor/Encoder Circuit Operation

The TCCM operates the motor/encoder in one direction by energizing one relay while the second relay is de–energized. The TCCM operates the motor in the reverse direction by energizing the second relay while the first relay is de–energized. The encoder part of the motor/encoder sends shift positioning signals to the TCCM.

The motor/encoder converts a shaft position, representing a mode of range selection, into electrical signals for use by the TCCM. By interpreting the four channels (P, A, B, C) of the encoder, the transfer case control module can detect what position the transfer case is in 2HI, 4HI, 4LO, or in transition between any of the two.

The four hall effect sensors of the motor/encoder are used for channels (A, B, C, and P). These sensors provide a path to ground when a magnet passes over them. A rotating magnetic ring causes the hall effect sensors voltage to drop from 5 to 0 volts. The TCCM detects the voltage of all the channels and interprets the current transfer case shift position.

Special Tools and Equipment

Illustration	Tool Number/Description
 404841	J 29162 Output Shaft Seal Installer

Transfer Case - NVG 246-NP8 (Two Speed Automatic)

Specifications

Fastener Tightening Specifications (Auto Transfer Case)

Application	Specification	
	Metric	English
Motor/Encoder Bolts	25	18 lb ft
Transfer Case Control Module Screws	8	71 lb in

Approximate Fluid Capacities

Application	Liters	Gallons	Quarts
NV261 Transfer Case — Use Dexron® III Oil GM P/N 12346143	2.2	—	2.3

Scan Tool Data List

The scan tool provides the following capabilities:

- Displays the data list.
- Displays current and history trouble codes.
- Clear the diagnostic trouble codes after a repair is completed.

Make sure the scan tool contains the latest diagnostic information before attempting to communicate with the transfer case shift control module. To use the scan tool, connect it to the Data Link Connector (DLC) and turn the ignition switch to the RUN position. The scan tool reads the Class 2 serial data sent from the transfer case shift control module connector C1 terminal E9 to the DLC terminal 2.

The Transfer Case Scan Tool Data List contains all the ATC related parameters that are available on the scan tool. The list is arranged in the order as they appear on the scan tool.

Use the Transfer Case Scan Tool Data List only after the following is determined:

- Transfer Case Diagnostic System Check is completed.
- No Diagnostic Trouble Codes (DTCs) are set.
- Transfer Case Diagnostics indicates the system is functioning properly.

Scan tool values from a properly operating system may be used for comparison with the automatic transfer case system you are diagnosing. The Transfer Case Scan Tool Data List represents values recorded under the following conditions:

- Engine is at idle
- Closed throttle
- Gear is in PARK or NEUTRAL
- Accessories are OFF

Important: Make sure the scan tool that you are using is functioning properly. Use of a malfunctioning scan tool can result in misdiagnosis and unnecessary parts replacement.

Only the parameters listed below are referenced in this service manual for use in diagnosis. If all values are within the typical range described below, refer to Intermittents and Poor Connections for diagnosis.

Scan Tool Data List

Scan Tool Parameter	Units Displayed	Typical Data Value
Engine is at Idle, Upper Radiator Hose is Hot, Closed Throttle, Gear is in PARK or NEUTRAL, Closed Loop, and Accessories are OFF		
TP Angle	%	0
Front Propshaft Speed	rpm	0
Rear Propshaft Speed	rpm	0
ATC Slip Speed	rpm	0
Slip Adapt Mode	Enabled/Disabled	Disabled
Slip Adapt PWM	% DC	0
Last Adapt Highest PWM	% DC	Varies
Ignition 3	Volts	Battery Positive Voltage
Encoder Circuit P	On/Off	On
Encoder Circuit A	On/Off	Off
Encoder Circuit B	On/Off	On
Encoder Circuit C	On/Off	Off
Commanded Mode Indicator	2WD / 4WD High / 4WD Low / Auto 4WD	Varies
Encoder Gear Position	2WD / 4WD High / 4WD Low / Auto 4WD	Varies
Mode Switch Selector	On/Off	Off
2WD High Indicator Light	On/Off	Off
Auto 4WD Indicator Light	On/Off	On
4WD High Indicator Light	On/Off	Off
4WD Low Indicator Light	On/Off	Off
Neutral Indicator Light	On/Off	Off
Service 4WD Lamp	On/Off	Off
4WD Lamp Open	Yes/No	No
4WD Lamp Shorted	Yes/No	No
Transfer Case Lock	Enabled/Disabled	Enabled
Front Axle Switch	Locked/Unlocked	Locked
Front Axle Switch Requested	Yes/No	Yes
Park Switch	Closed/Open	Closed
Software ID	Number	Varies
GM Part Number	Number	Varies

Scan Tool Data Definitions

The ATC Scan Tool Data Definitions contain a brief description of all ATC related parameters available on the scan tool. The list is in the order it appears on the scan tool.

TP (Throttle Position) Angle: The scan tool displays a range of 0–100 %. The TP Angle is computed by the PCM from the TP sensor voltage. The TP Angle should read 0 percent at idle and 100 percent at Wide-Open Throttle (WOT).

Front Propshaft Speed: The scan tool displays a range of 0–8192 RPM. This parameter indicates the rotational speed of the front propshaft.

Rear Propshaft Speed: The scan tool displays a range of 0–8192 RPM. This parameter indicates the rotational speed of the rear propshaft.

ATC Slip Speed: The scan tool displays a range of 0–8192 RPM. This parameter indicates the RPM difference between the front and rear propshafts.

Slip Adapt Mode: The scan tool displays Enabled or Disabled. This parameter indicates if the transfer case shift control module is currently attempting to prevent front to rear propshaft slip.

Slip Adapt PWM: The scan tool displays a range of 0–100 %. This parameter indicates the duty cycle applied to the ATC motor.

Last Adapt Highest PWM: The scan tool displays a range of 0–100 %. This parameter indicates the highest duty cycle applied to the ATC motor during the last slip event.

Ignition 3: The scan tool displays a range of 0–25.5 volts. This parameter indicates the voltage measured by the transfer case shift control module at its ignition feed.

Encoder Circuit P: The scan tool displays On or Off. This parameter indicates whether transfer case shift control module is sensing voltage on the Encoder Circuit P (On=<1 Volt, Off=3 Volts).

Encoder Circuit A: The scan tool displays On or Off. This parameter indicates whether transfer case shift control module is sensing voltage on the Encoder Circuit A (On=<1 Volt, Off=3 Volts).

Encoder Circuit B: The scan tool displays On or Off. This parameter indicates whether transfer case shift control module is sensing voltage on the Encoder Circuit B (On=<1 Volt, Off=3 Volts).

Encoder Circuit C: The scan tool displays On or Off. This parameter indicates whether transfer case shift control module is sensing voltage on the Encoder Circuit C (On=<1 Volt, Off=3 Volts).

Commanded Mode Indicator: The scan tool displays a range of Auto 4WD to 4WD Low. This parameter indicates the current mode in which ATC is operating.

Encoder Gear Position: The scan tool displays a range of Auto 4WD to 4WD Low. This parameter indicates the actual transfer case sector shaft position as sensed by the encoder.

Mode Switch Selected: The scan tool displays On or Off. This parameter indicates the ATC mode switch button currently depressed by the driver.

2WD High Indicator Light: The scan tool displays On or Off. This parameter indicates if the 2WD High Indicator Light is being commanded by the transfer case shift control module.

Auto 4WD Indicator Light: The scan tool displays On or Off. This parameter indicates if the Auto 4WD Indicator Light is being commanded by the transfer case shift control module.

4WD High Indicator Light: The scan tool displays On or Off. This parameter indicates if the 4WD High Indicator Light is being commanded by the transfer case shift control module.

4WD Low Indicator Light: The scan tool displays On or Off. This parameter indicates if the 4WD Low Indicator Light is being commanded by the transfer case shift control module.

Neutral Indicator Light: The scan tool displays On or Off. This parameter indicates if the Neutral Indicator Light is being commanded by the transfer case shift control module.

Service 4WD Lamp: The scan tool displays On or Off. This parameter indicates if the SERVICE indicator (AWD/4WD) Lamp is being commanded by the transfer case shift control module.

4WD Lamp Open: The scan tool displays Yes or No. This parameter indicates if the 4WD Lamp circuit is open or shorted to ground, when a Yes is displayed.

4WD Lamp Shorted: The scan tool displays Yes or No. This parameter indicates if the 4WD Lamp circuit is shorted to voltage or a loss of driver ground, when a Yes is displayed.

Transfer Case Lock: The scan tool displays Enabled or Disabled. This parameter indicates if the transfer case shift control module is commanding the transfer case motor brake On.

Front Axle Switch: The scan tool displays Locked or Unlocked. This parameter indicates the feedback states of the front axle switch.

Front Axle Switch Requested: The scan tool displays Yes or No. This parameter indicates if the front axle switch has been requested by the transfer case shift control module.

Park Switch: The scan tool displays Open or Closed. This parameter indicates the feedback states of the Park/Neutral Switch.

Software ID: The scan tool displays a four-digit number. This parameter indicates the transfer case shift control module calibration version number.

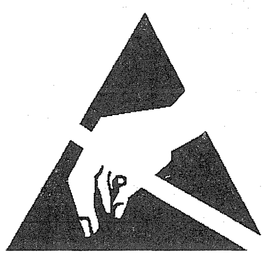
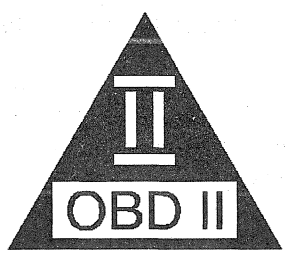
GM Part Number: The scan tool displays an eight-digit number. This parameter indicates the transfer case shift control module GM software number.

Schematic and Routing Diagrams

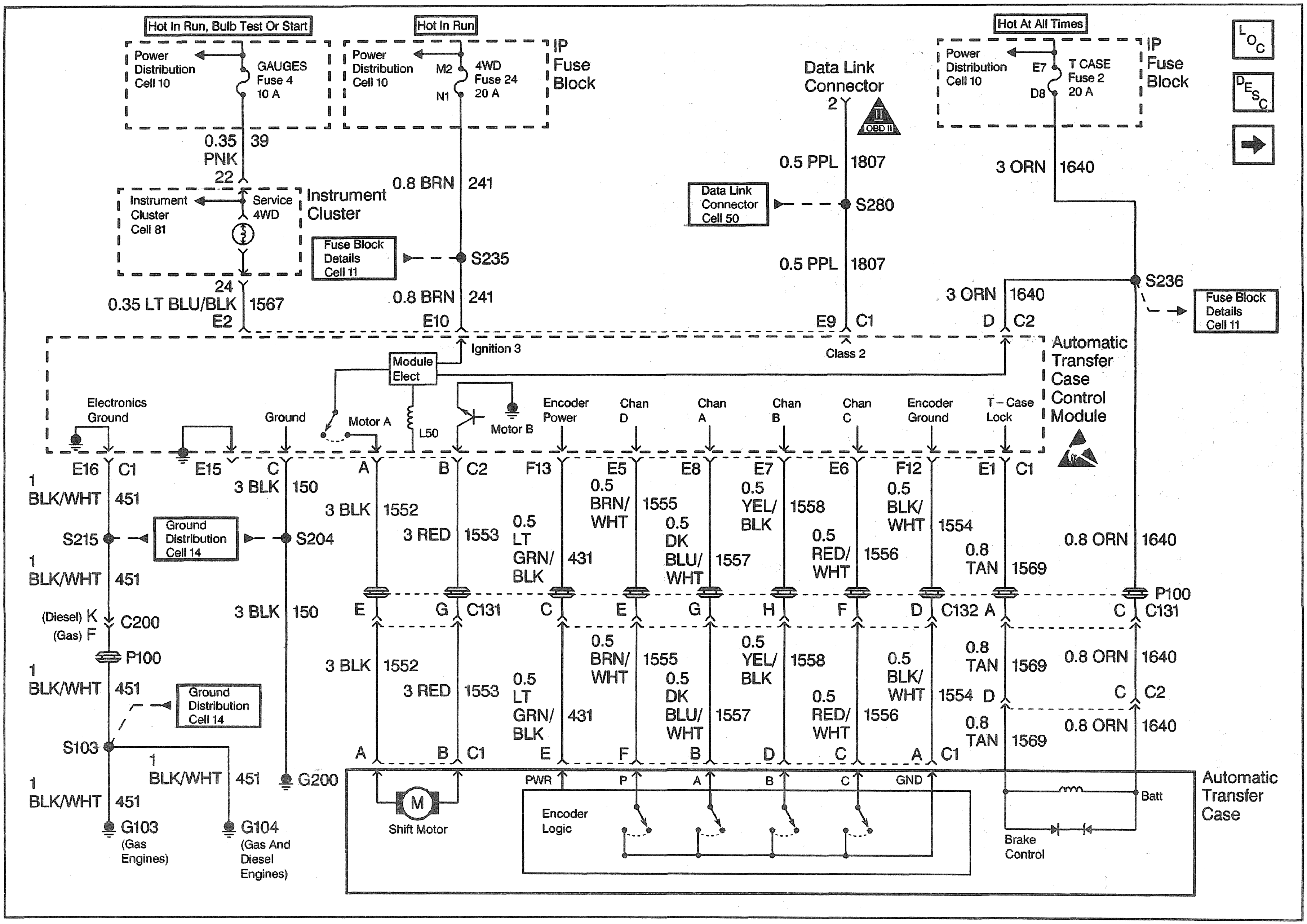
Transfer Case Control Schematic References

Reference on Schematic	Section Number - Subsection Name
Data Link Controls Cell – 50	8 – Data Link Communications
Exterior Lighting Cell – 110	8 – Lighting Systems
Ground Distribution Cell – 14	8 – Wiring Systems
Power Distribution Cell – 10	8 – Wiring Systems

Transfer Case Control Schematic Icons

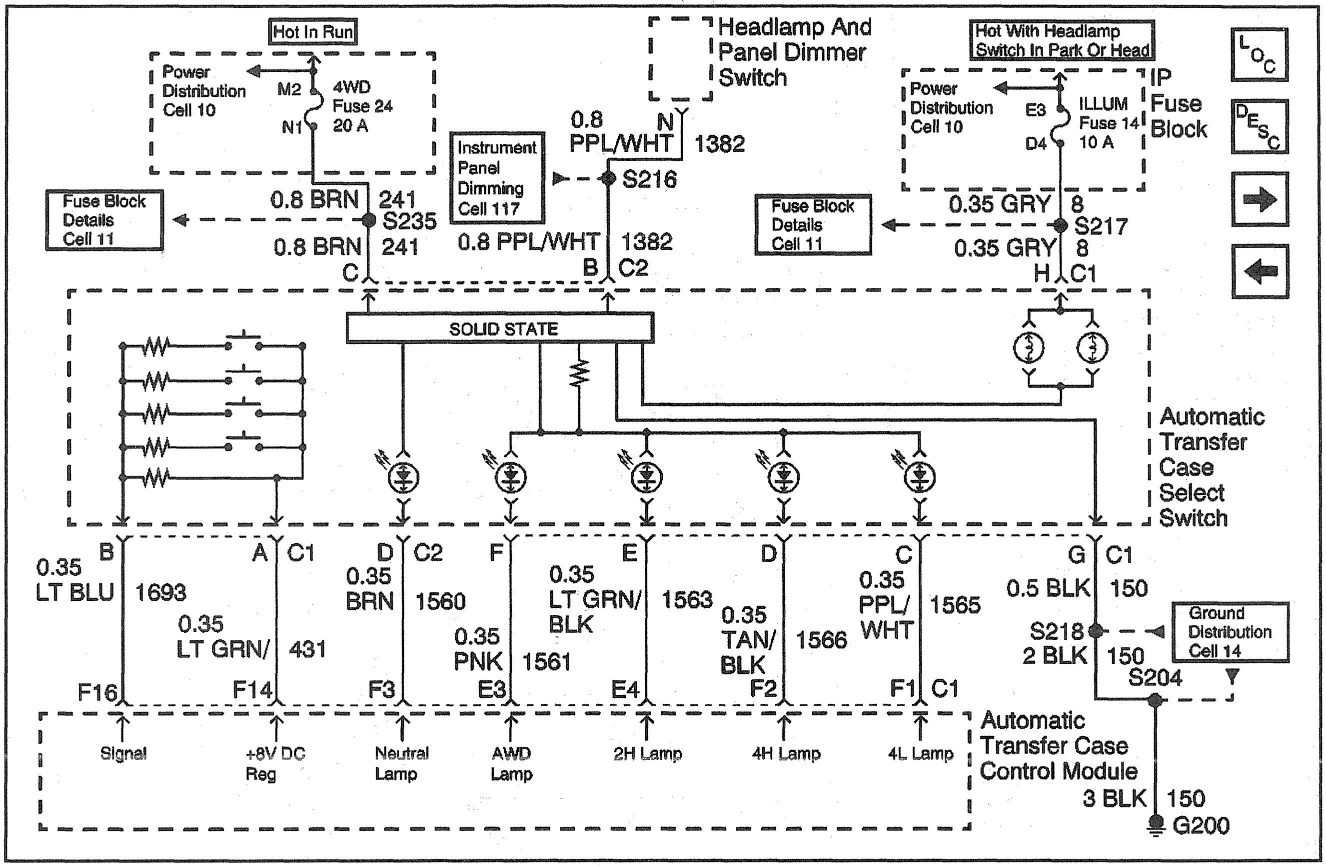
Icon	Icon Definition
 19384	Refer to *ESD Notice* in Cautions and Notices
 19385	Refer to *OBD II Symbol Description Notice* in Cautions and Notices

Transfer Case Control Schematics (Automatic 4WD) (Power, GND and DLC)



183198

Transfer Case Control Schematics (Automatic 4WD) (Active Transfer Case Select Switch Controls)



183183

Component Locator

Transfer Case Control Components

Name	Location	Locator View	Connector End View
Brake/Transmission Shift Interlock (BTSI) Solenoid	On the left side of the IP, to the right of the steering column, under the support bracket	*Standard Wheel/Column Component Views* in Steering Wheel and Column	*Standard Wheel/Column Connector End Views* in Steering Wheel and Column
Headlamp and Panel Dimmer Switch	Lower Left side of the IP	*Lighting Systems Component Views* in Lighting Systems	*Lighting Systems Connector End Views* in Lighting Systems
Instrument Cluster	On the upper left end of the IP, above the steering column	*Instrument Cluster Component Views* in Instrument Panel and Console	*Instrument Cluster Connector End Views* in Instrument Panel and Console
IP Fuse Block	To the left of the IP, near the left front door jamb switch	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
Park/Neutral Position (PNP) Switch	At LH center of Transmission	*Automatic Transmission Electronic Component Views (Internal)* in Automatic Transmssions- 4L60-E or *Automatic Transmission Electronic Component Views (Internal)* in Automatic Transmissions- 4L80-E	*AT Internal Connector End Views* in Automatic Transmission- 4L60-E or *AT Internal Connector End Views* in Automatic Transmissions- 4L80-E
Powertrain Control Module (PCM) (Diesel)	Under RH end of IP, above Blower Motor, behind IP Compartment Box	*Engine Controls Component Views* in Engine Controls	*PCM Connector End Views* in PCM Connector End Views
Stoplamp Switch	On the top of the brake pedal	*Hydraulic Brakes Component Views* in Lighting Systems	*Hydraulic Brakes Connector End Views* in Lighting Systems
Tranfer Case Encoder Motor	LH Center of Transfer Case	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
Transfer Case Control Module (TCCM) (Selectable 4WD)	Under IP, near the convience center	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
Transfer Case Select Switch	Center of IP, RH of steering column shift lever	*Transfer Case Control Component Views*	*Transfer Case Control Connector End Views*
Vehicle Control Module (VCM) (Gas)	Engine Compartment, near EBCM	*Engine Controls Component Views*(4.3L), *Engine Controls Component Views* (5.0, 5.7L), or *Engine Controls Component Views* (7.4L) in Engine Controls.	*VCM Connector End Views*(4.3L), *VCM Connector End Views* (5.0, 5.7L), or *VCM Connector End Views* (7.4L) in VCM Connector End Views
C100	Part of the engine harness to IP harness, in the left rear side of the engine compartment, at the bulkhead	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C120	Part of the engine harness to front axle actuator, in the rear of the engine, near the transmission	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C131	IP harness, Inline to Active Transfer Case Control harness	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C132	IP harness, Inline to Active Transfer Case Control harness	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C200	Behind the right side of the IP, near the heater motor, in foam wrap	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems

Transfer Case Control Components (cont'd)

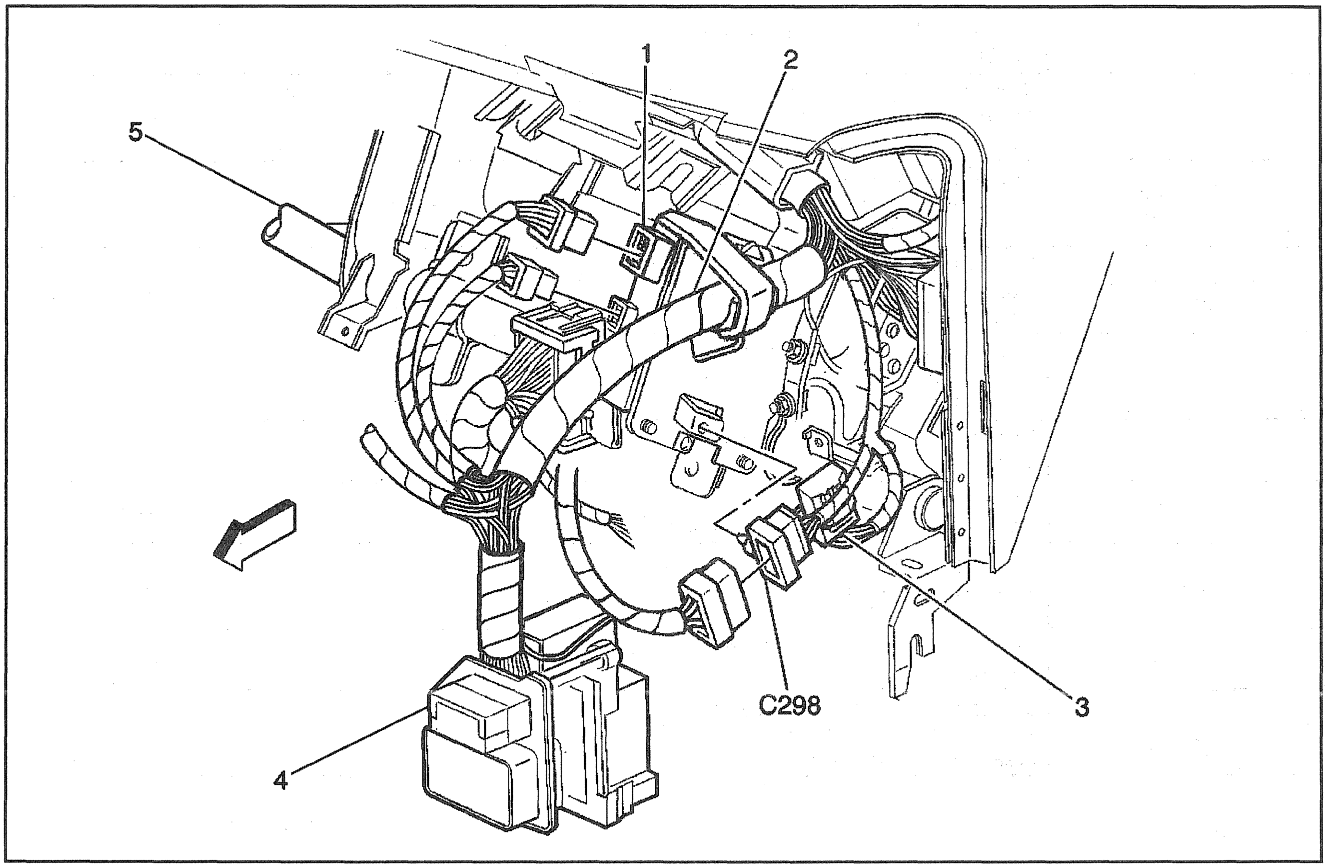
Name	Location	Locator View	Connector End View
C227 (Stoplamp Switch)	IP harness, Inline to the Stoplamp Switch	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
C266	Part of the IP harness to steering column harness, to the left side of the steering column, near the bulkhead	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
G103 (Gas)	On the right front side of the engine, near the thermostat housing	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G104 (5.0L/5.7L)	Backside of the right cylinder head	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G104 (6.5L)	Top rear of the right cylinder head	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G104 (7.4L)	Backside of the engine block, below the right cylinder head	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G105 (Gas)	On the right front side of the engine block	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G105 (Diesel)	Right Rear of the cylinder head, cylinder #7 intake bolt	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
G200	Behind the left side of the IP, below the fuse block, on the tie bar	*Power and Grounding Component Views* in Wiring Systems	*Power and Grounding Connector End Views* in Wiring Systems
P100	In the left rear side of the engine compartment, at the bulkhead, above C100	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
P101	In the right rear side of the engine compartment, at the bulkhead	*Harness Routing Views* in Wiring Systems	*Inline Harness Connector End Views* in Wiring Systems
S103 (5.0L, 5.7L)	Engine harness, approx. 8 cm (3 in) from EGR valve breakout, toward taillamp harness breakout	—	—
S103 (6.5L)	Engine harness, approx. 12 cm (4.7 in) from starter solenoid breakout, towards the Underhood Lamp harness breakout	—	—
S103 (7.4L - A/T)	Engine harness, approx. 8 cm (3 in) from the EGR Valve harness breakout, towards the Ignition Coil harness breakout	—	—
S103 (7.4L - M/T)	Engine Harness, approx. 4 cm (1.5 in) from the Fuel Injector harness breakout, towards the Taillamp harness breakout	—	—
S147 (Gas)	engine harness, approx. 5 cm (2 in) from EGR valve breakout, toward taillamp harness breakout	—	—
S147 (Diesel)	Engine harness, approx. 4 cm (1.5 in) from starter motor solenoid breakout	—	—
S162 (5.0L, 5.7L)	Engine harness, approx. 17 cm (6.5 in) from starter solenoid breakout, toward LH oxygen sensor breakout	—	—
S162 (7.4L)	Engine harness, approx. 15 cm (6 in) from RH bank oxygen sensor breakout, toward starter solenoid breakout	—	—
S204	IP harness, approx. 10 cm (4 in) from C100, towards Data Link Connector (DLC)	—	—

Transfer Case Control Components (cont'd)

Name	Location	Locator View	Connector End View
S213	IP harness, approx. 4 cm (1.5 in) from steering column harness breakout, towards the DLC	—	—
S215	IP harness, approx. 8 cm (3 in) from instrument cluster breakout, toward radio connectors breakout	—	—
S216 (Diesel and Uplevel)	IP harness, approx, 12 cm (4.5 in) from instrument cluster breakout, toward radio connectors breakout	—	—
S216 (Gas, all except uplevel	IP harness, approx. 16 cm (6 in) from instrument cluster breakout, toward radio connectors breakout	—	—
S217	IP harness, approx. 16 cm (6 in) from instrument cluster harness breakout, toward radio connectors breakout	—	—
S218	IP harness, approx. 16 cm (6 in) from inflatable restraint switch breakout	—	—
S235	IP harness, approx. 4 cm (1.5 in) from steering column harness breakout, C100	—	—
S236	IP harness, approx. 10 cm (4 in) into steering column harness towards the Steering Column	—	—
S280	IP harness, approx. 5 cm (2 in) from DLC breakout	—	—
S302	Selectable 4WD harness, approx. 10 cm (4 in) from the Tranfer Case Relay breakout, toward the Front Axle Switch	—	—

Transfer Case Control Component Views

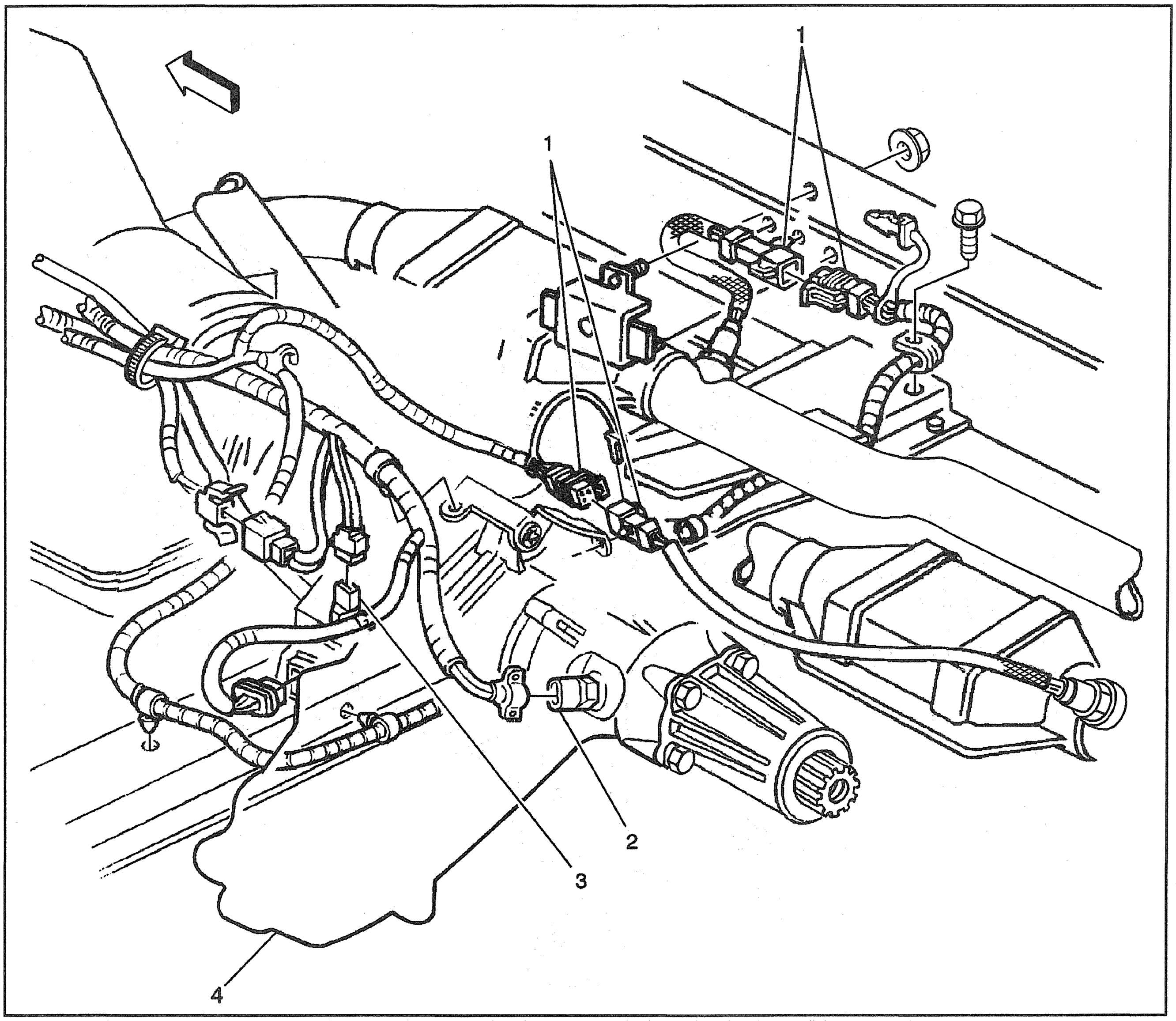
Automatic 4WD Support Wiring



Legend

(1) Automatic Transfer Case Control Module
(2) IP Harness
(3) Daytime Running Lights Control (DRL) Module
(4) Convenience Center
(5) IP Reinforcement Brace

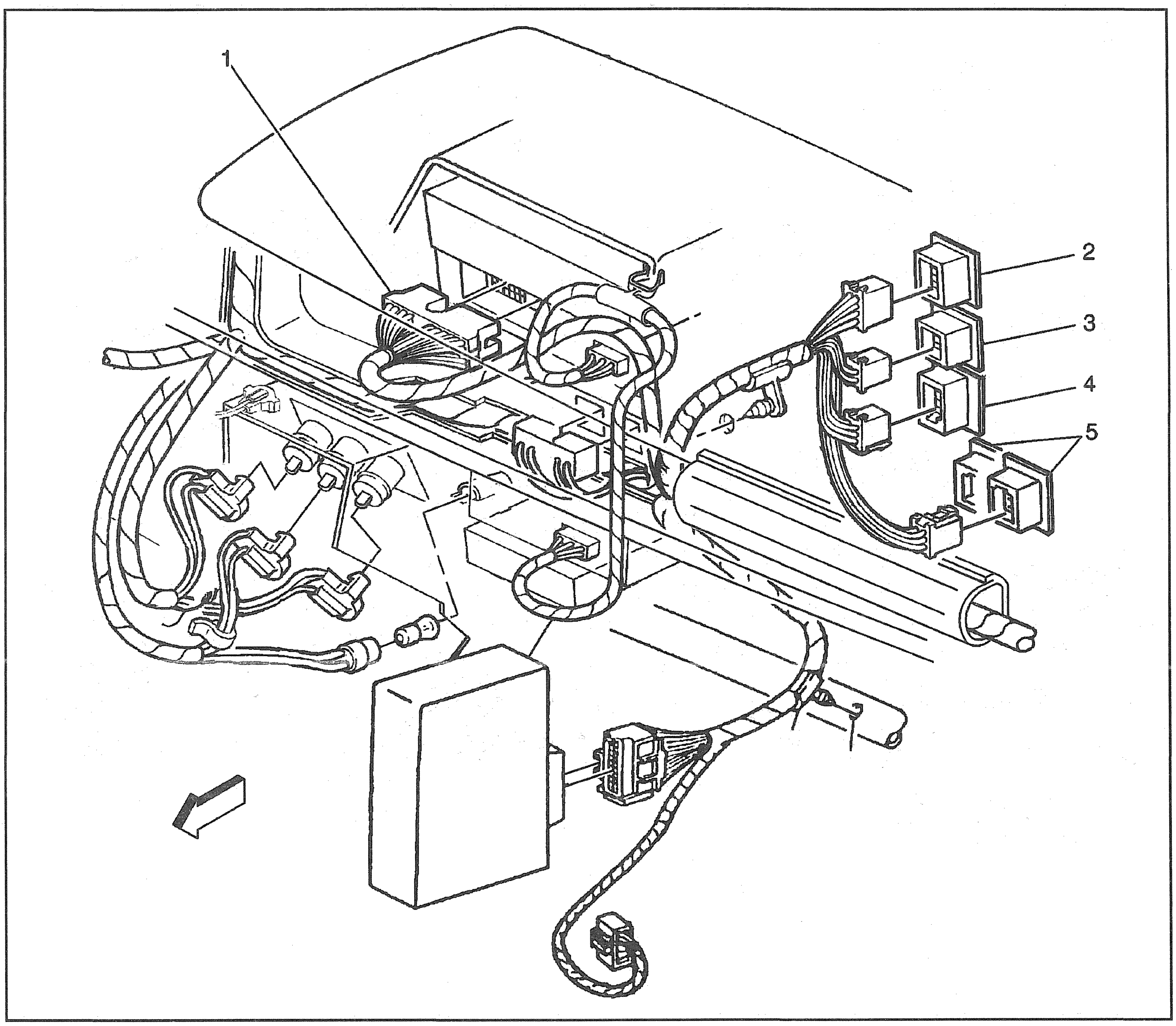
Transfer Case Switch (M30)



Legend

(1) Heated Oxygen Sensor Connectors
(2) Vehicle Speed Sensor
(3) Transfer Case Switch
(4) Transfer Case

Transfer Case Select Switch

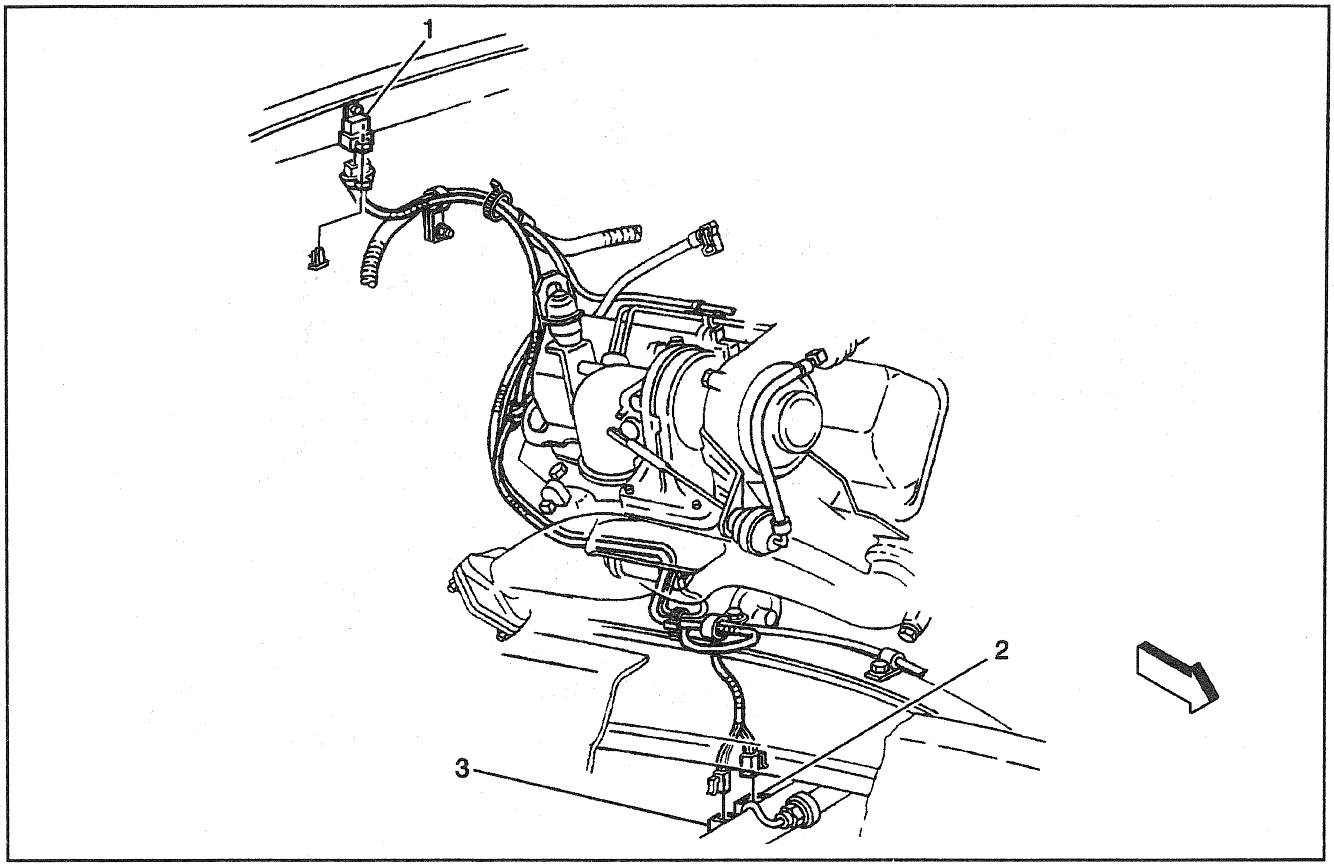


183948

Legend

(1) Radio Connector
(2) Rear Wiper Switch
(3) Cargo Lamp Switch
(4) Rear Fan Switch
(5) Electric Shift Transfer Case Switch or Fog Lamp Switch

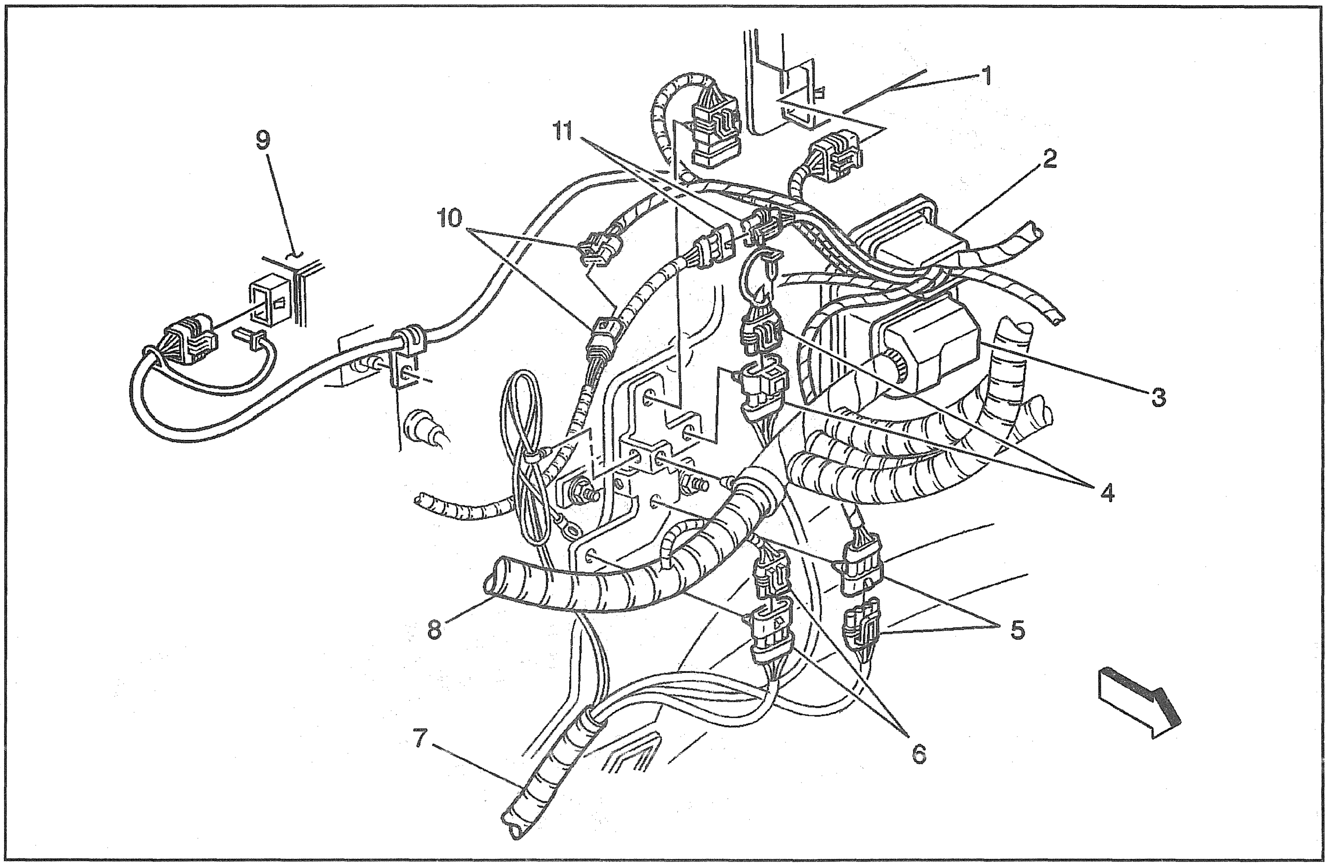
Transfer Case Relay



Legend

(1) Transfer Case Relay
(2) Front Axle Actuator
(3) Front Axle Switch

C224 and C225

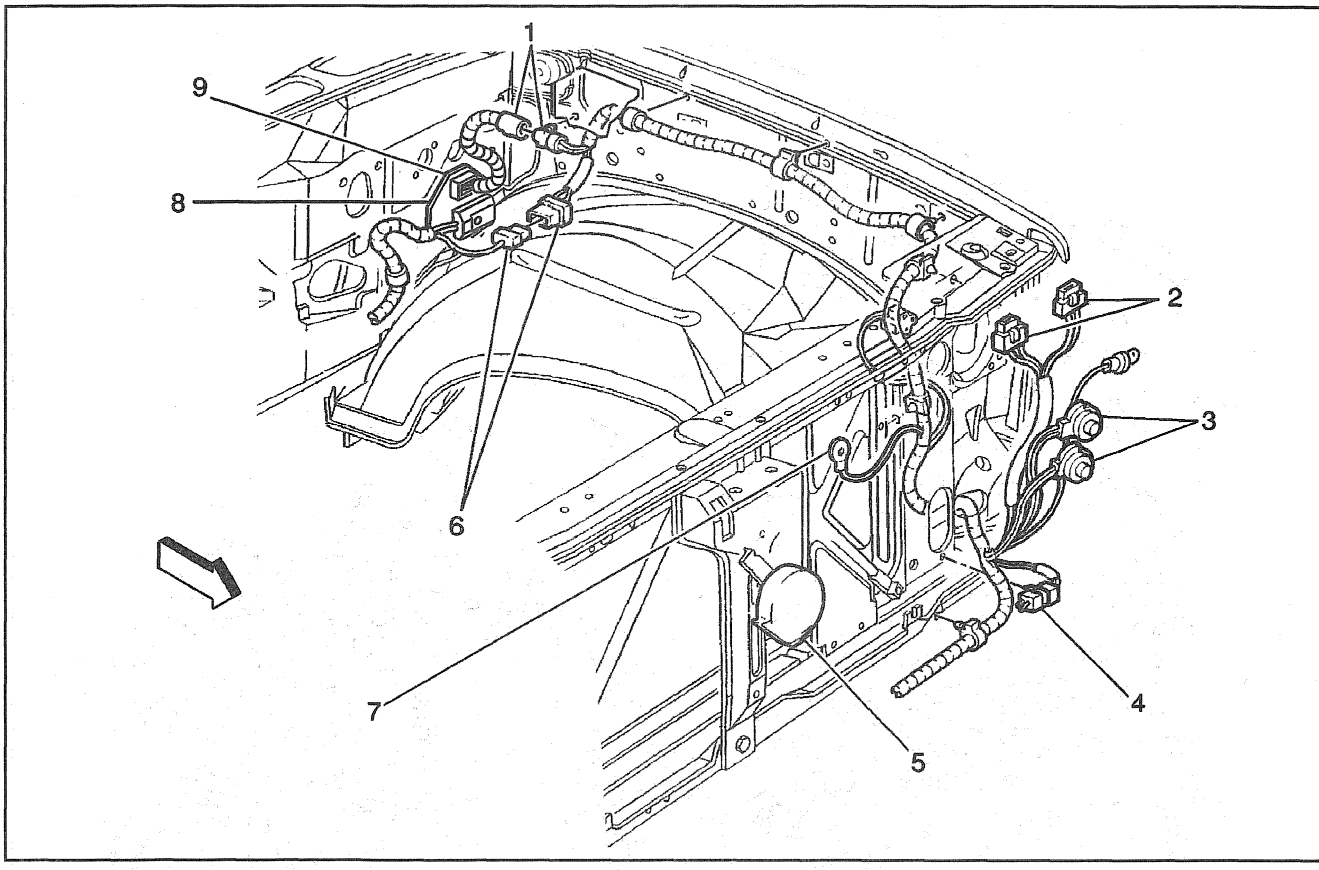


183911

Legend

(1) Cruise Control Module
(2) Pass Through Grommet P100
(3) Connector C100
(4) Connector C110
(5) Connector C104
(6) Connector C111
(7) Rear Lamp Harness
(8) Engine Harness
(9) Windshield Wiper Motor
(10) Connector C225
(11) Connector C224

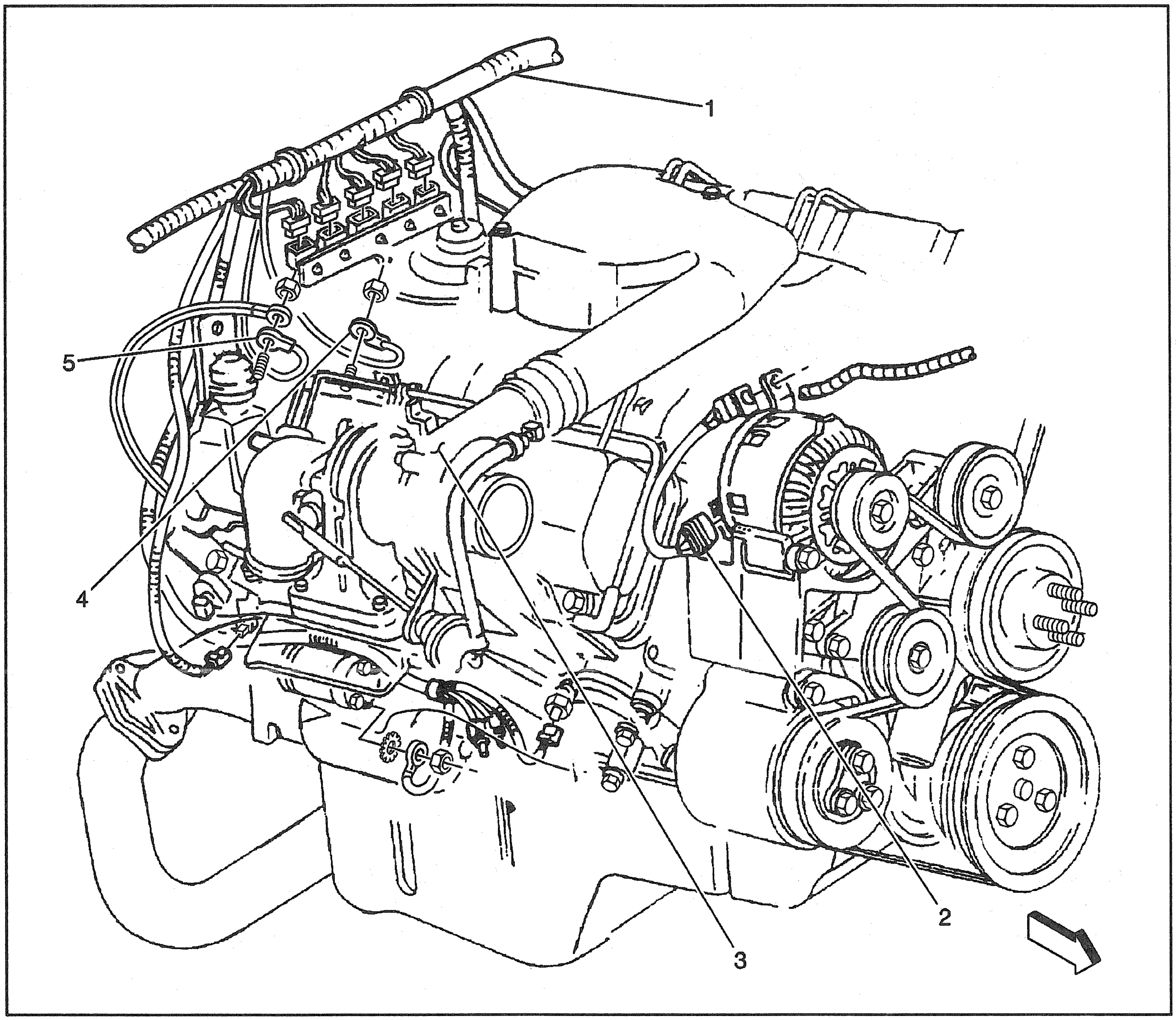
P100



Legend

(1) Connector C102
(2) LH Front Headlamp Connectors (Composite)
(3) Park And Turn Lamp LH Front
(4) LH Fog Lamp Connector
(5) Horn
(6) Connector C101
(7) Ground G113
(8) Connector C100
(9) Pass Through Grommet P100

6.5L Diesel Engine, RH Side

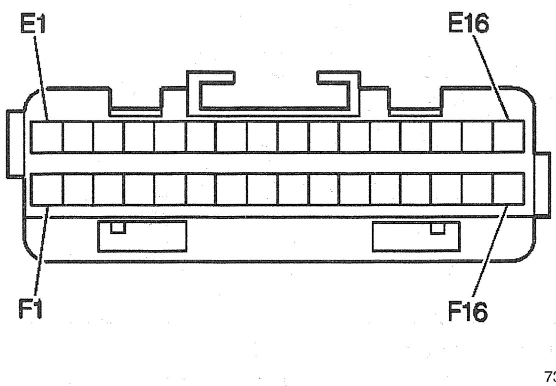


Legend

(1) Engine Harness
(2) Generator Connector
(3) Turbo
(4) Grounds G150 And G105
(5) Ground G104

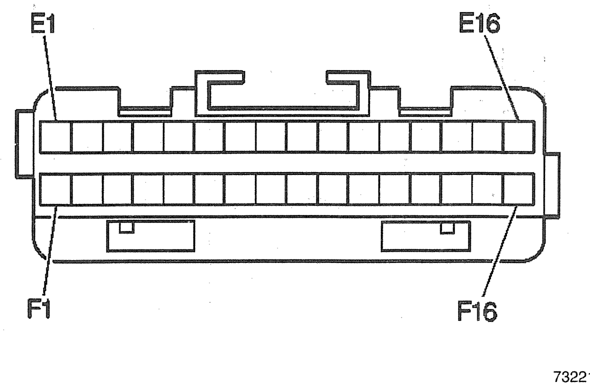
Transfer Case Control Connector End Views

Transfer Case Shift Control Module C1



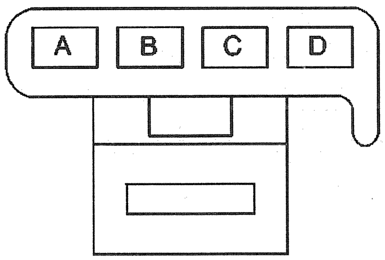
Connector Part Information		• 12052107 • ASM 16F 100 Series (BLK)	
Pin	Wire Color	Circuit No.	Function
E1	TAN	1569	Transfer Case Lock Solenoid Output
E2	LT BLU/ BLK	1567	Service 4WD/AWD Indicator Lamp Output
E3	PNK	1561	AWD Indicator Lamp Output
E4	LT GRN/ BLK	1563	2 'HI' Indicator Lamp Output
E5	BRN/WHT	1555	Transfer Case Position Switch Encoder Signal - Channel P
E6	RED/WHT	1556	Transfer Case Position Switch Encoder Signal - Channel C
E7	YEL/BLK	1558	Transfer Case Position Switch Encoder Signal - Channel B
E8	DK BLU/ WHT	1557	Transfer Case Position Switch Encoder Signal - Channel A
E9	PPL	1807	Serial Data Signal - Class B - 10400 BAUD - Primary
E10	BRN	241	Fuse Output - Ignition 3 - Type III Fuse
E11	—	—	Not Used
E12	YEL	400	Front Propshaft Sensor Signal
E13	PPL	401	Front Propshaft Sensor Return
E14	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
E15	—	—	Not Used
E16	BLK/WHT	451	ECM Ground

Transfer Case Shift Control Module C1 (cont'd)



Connector Part Information		• 12052107 • ASM 16F 100 Series (BLK)	
Pin	Wire Color	Circuit No.	Function
F1	PPL/WHT	1565	4 'LO' Indicator Lamp Output
F2	TAN/BLK	1566	4 'HI' Indicator Lamp Output
F3	BRN	1560	Neutral Indicator Lamp Output
F4	GRY/BLK	1570	Front Axle Actuator Output
F5	LT BLU	2221	Rear Propshaft Signal
F6	DK GRN	2222	Rear Propshaft Return
F7	GRY/BLK	1694	4WD Switch Signal - Low
F8 - 11	—	—	Not Used
F12	BLK/WHT	1554	Transfer Case Encoder Signal Return
F13	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
F14	LT GRN/BLK	431	Reference Voltage Feed - 8 Volt Reference
F15	LT GRN	275	Transmission Mounted Neutral Safety Switch Output - Park
F16	LT BLU/ BLK	1693	4WD Switch Signal

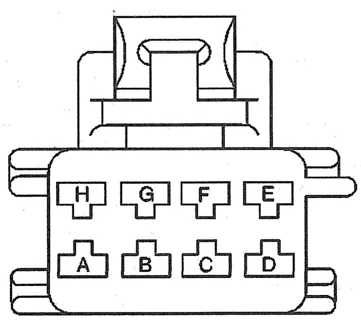
Transfer Case Shift Control Module Connector C2



62450

Connector Part Information	• 12052856 • CONN 4F M/P 280 (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	BLK	1552	Transfer Case Motor Feed - CW
B	RED	1553	Transfer Case Motor Feed - CCW
C	BLK	150	Ground
D	ORN	1640	Fuse Output - Battery - Type III Fuse

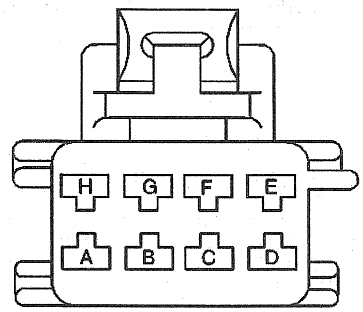
Transfer Case Select Switch Connector C1



62463

Connector Part Information	• 12064766 • CONN 8F M/P 150 (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
B	LT BLU/ BLK	1693	4WD Switch Signal
C	PPL/WHT	1565	4 'LO' Indicator Lamp Output
D	TAN/BLK	1566	4 'HI' Indicator Lamp Output

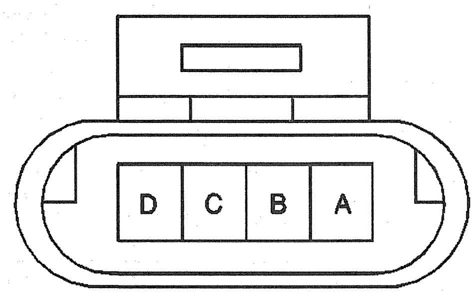
Transfer Case Select Switch Connector C1 (cont'd)



62463

Connector Part Information	• 12064766 • CONN 8F M/P 150 (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
E	LT GRN/ BLK	1563	2 'HI' Indicator Lamp Output
F	PNK	1561	4WD Indicator Lamp Output
G	BLK	150	Ground
H	GRY	8	IP Lamp Feed

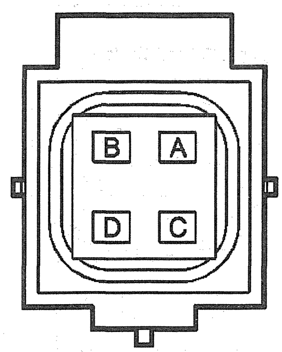
Transfer Case Select Switch, Connector C2



38608

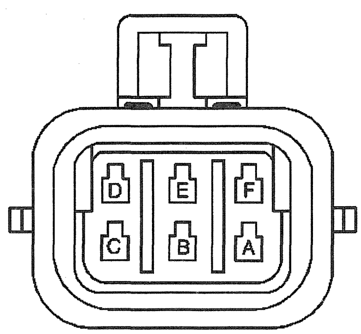
Connector Part Information	• 12045813 • CONN 4F M/P 150 (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	—	—	Not Used
B	PPL/WHT	1382	LED Dimming Signal
C	BRN	241	Use Output - Ignition 3 - Type III Fuse
D	BRN	1560	Neutral Indicator Lamp Output

Transfer Case Encoder Motor Connector C1



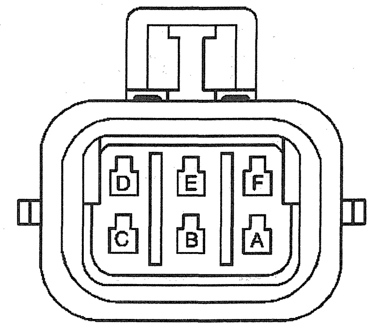
Connector Part Information		• 12191399 • 4F Metri-Pack 280 Series, Flexlock, Sealed (BLK)	
Pin	Wire Color	Circuit No.	Function
A	BLK	1552	Transfer Case Motor Feed - Clockwise
B	RED	1553	Transfer Case Motor Feed - Counterclockwise
C	ORG	1640	Fuse Output - Battery - Type III Fuse
D	TAN	1569	Transfer Case Lock Solenoid Output

Transfer Case Encoder Motor Connector C2



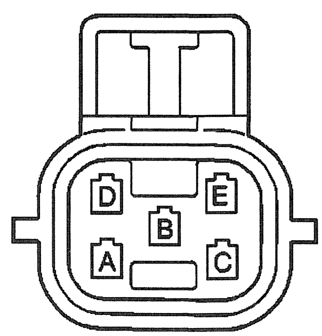
Connector Part Information		• 12052848 • 6 Way F Metri-Pack 150 Series, Sealed (BLK)	
Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	1554	Transfer Case Encoder Signal Return
B	DK BLU/WHT	1557	Transfer Case Position Switch Encoder Signal
C	RED/WHT	1556	Transfer Case Position Switch Encoder Signal

Transfer Case Encoder Motor Connector C2 (cont'd)



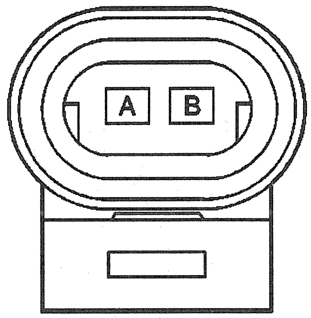
Connector Part Information		• 12052848 • 6 Way F Metri-Pack 150 Series, Sealed (BLK)	
Pin	Wire Color	Circuit No.	Function
D	YEL/BLK	1558	Transfer Case Position Switch Encoder Signal
E	LT GRN/ BLK	431	Reference Voltage Feed - 8 Volt Reference
F	BRN/WHT	1555	Transfer Case Position Switch Encoder Signal

Front Axle Actuator



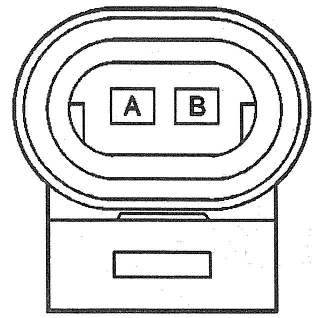
Connector Part Information		• 12077591 • ASM 5F M/P 150 (BLK)	
Pin	Wire Color	Circuit No.	Function
A	BLK/WHT	1695	4WD Front Wheel Lock Telltale Feed
B	GRY/BLK	1570	Front Axle Actuator Output
C	BRN	241	Fuse Output - Ignition 3 - Type II Output
D	–	–	Not Used
E	BLK	150	Ground

Prop Shaft Speed Sensor, Front Connector



Connector Part Information	• 12162194 • 2F Metri-Pack 150.2 Series, Sealed (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	YEL	400	Vehicle Speed Sensor Signal
B	PPL	401	Vehicle Speed Sensor Return

Prop Shaft Speed Sensor, Rear Connector



Connector Part Information	• 12162194 • 2F Metri-Pack 150.2 Series, Sealed (BLK)		
Pin	**Wire Color**	**Circuit No.**	**Function**
A	LT BLU	2221	Vehicle Speed Sensor Signal
B	DK GRN	2222	Vehicle Speed Sensor Return

Diagnostic Information and Procedures

Intermittents and Poor Connections

Most intermittents are caused by faulty electrical connections or wiring. Some items to check are:

- Poor mating of connector halves, or terminals not fully seated in the connector body (backed out).
- Dirt or corrosion on the terminals—The terminals must be clean and free of any foreign material which could impede proper terminal contact.
- Damaged connector body, exposing the terminals to moisture and dirt, as well as not maintaining proper terminal orientation with the component or mating connector.
- Improperly formed or damaged terminals— All connector terminals in problem circuits should be checked carefully to ensure good contact tension. Use a corresponding mating terminal to check for proper tension.
- *J 35616-A* Connector Test Adapter Kit must be used whenever a diagnostic procedure requests checking or probing a terminal. Using the adapter will ensure that no damage to the terminal will occur, as well as giving an idea of whether contact tension is sufficient.
- Poor terminal to wire connection— Some conditions which fall under this description are poor crimps, poor solder joints, crimping over wire insulation rather than the wire itself, corrosion in the wire to terminal contact area, etc.
- Wire insulation which is rubbed through, causing an intermittent short as the bare area touches other wiring or parts of the vehicle.
- Wiring broken inside the insulation. This condition could cause a continuity check to show a good circuit, but if only one or two strands of a multi-strand type wire are intact, resistance could be far too high.

To avoid any of the above problems when making wiring or terminal repairs, always follow the instructions for wiring and terminal repairs.

Transfer Case General Diagnosis

Diagnostic Trouble Codes

The Transfer Case Diagnostic System Check must always be the starting point of any system diagnosis. The Transfer Case Diagnostic System Check verifies proper SERVICE indicator (AWD/4WD) lamp operation and checks for ATC diagnostic trouble codes (DTC) using the scan tool. The following describes the difference between current and history DTCs:

- Current DTCs – Malfunctions that are presently being detected. Random access memory (RAM) stores the current DTCs. Turning the ignition switch to the OFF position resets current DTCs and logs the codes in history. The presence of a current DTC will cause the transfer case shift control module to turn ON the SERVICE indicator (AWD/4WD) lamp.
- History DTCs – All malfunctions detected since last clearing of history memory. Electrically erasable programmable read only memory (EEPROM) stores the history DTCs. A scan tool clear codes command will erase history DTCs.

Use of Special Tools

You should be familiar with the tools in this service category listed under the heading Special Tools. You should know how to measure voltage and resistance. Diagnosis requires proper use of the following tools:

- The *Scan Tool*
- The *J 39200* Digital Multimeter
- The *J 35616-A* Connector Test Adapter Kit

Transfer Case Diagnostic System Check

These diagnostic procedures will help you to find and repair automatic transfer case (ATC) system malfunctions. This service category also contains information for repairing ATC system malfunctions. For best results, use the diagnostic tables, and follow the sequence listed below:

1. Perform the Transfer Case Diagnostic System Check. All ATC diagnostics must begin with the Transfer Case Diagnostic System Check.
   The Transfer Case Diagnostic System Check determines the following:
   - Proper SERVICE indicator (AWD/4WD) lamp operation
   - Ability of the transfer case shift control module to communicate through the data link connector (DLC)
   - Existence of ATC diagnostic trouble codes (DTC)

2. Refer to the diagnostic table as directed by the Transfer Case Diagnostic System Check. The diagnostic tables will help enable you to diagnose any ATC system malfunction. Bypassing these procedures may result in the following:
   - Extended diagnostic time
   - Incorrect diagnosis
   - Incorrect parts replacement
3. Repeat the Transfer Case Diagnostic System Check after you perform any repair or diagnostic procedures. This will verify that you correctly performed the repair. This will also ensure that no other malfunctions exist.

Circuit Description

The ignition switch supplies Ignition 3 voltage to the transfer case shift control module at connector C1 terminal E10 using the 4WD Fuse. When the ignition switch is first turned to the RUN position, the transfer case shift control module responds by flashing the SERVICE indicator (AWD/4WD) lamp for approximately 2 seconds, then turning it OFF, while performing tests on the ATC system. The transfer case shift control module will continue to perform tests on the ATC system during a normal drive cycle.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2. This test checks for proper operation of the Serial Data line.
3. This test will identify the stored diagnostic trouble codes and whether or not they are current or history.
7. The SERVICE 4WD lamp should turn off after approximately 2 seconds.

Transfer Case Diagnostic System Check

Step	Action	Value(s)	Yes	No
1	1. Turn the ignition switch to the RUN position. 2. Observe the SERVICE indicator (AWD/4WD) lamp on the instrument cluster. Did the SERVICE indicator (AWD/4WD) lamp turn ON?	—	Go to *Step 2*	Go to *Service Indicator Does Not Light*
2	1. Turn the ignition to OFF. 2. Connect a *Scan Tool* to the Data Link Connector (DLC). Follow the directions in the instruction manual of the scan tool. 3. Turn the ignition switch to the RUN position. 4. Attempt to communicate with the transfer case shift control module. Does the scan tool communicate with the module?	—	Go to *Step 3*	Go to *Data Link Communications System Check* in Electrical Diagnosis
3	Request for ATC Diagnostic Trouble Codes (DTCs) display. Are there any Current DTCs present in the module?	—	Go to *Diagnostic Trouble Codes*	Go to *Step 4*
4	Are there any History DTCs present?	—	Go to *Step 11*	Go to *Step 5*
5	1. Set parking brake. 2. Start the vehicle engine. 3. Depress brake pedal and hold. 4. Place transmission in Neutral. 5. Use the scan tool to monitor Encoder Gear Position while depressing each of the transfer case select buttons. Do all the transfer case select buttons enable the appropriate mode for the Encoder Gear Position?	—	Go to *Step 6*	Go to *Range/Mode Switch Inoperative*
6	Do all Mode Switch Indicator Lamps light when their corresponding switch is depressed?	—	Go to *Step 7*	Go to *Switch Indicator Lamps Do Not Light - One or More*

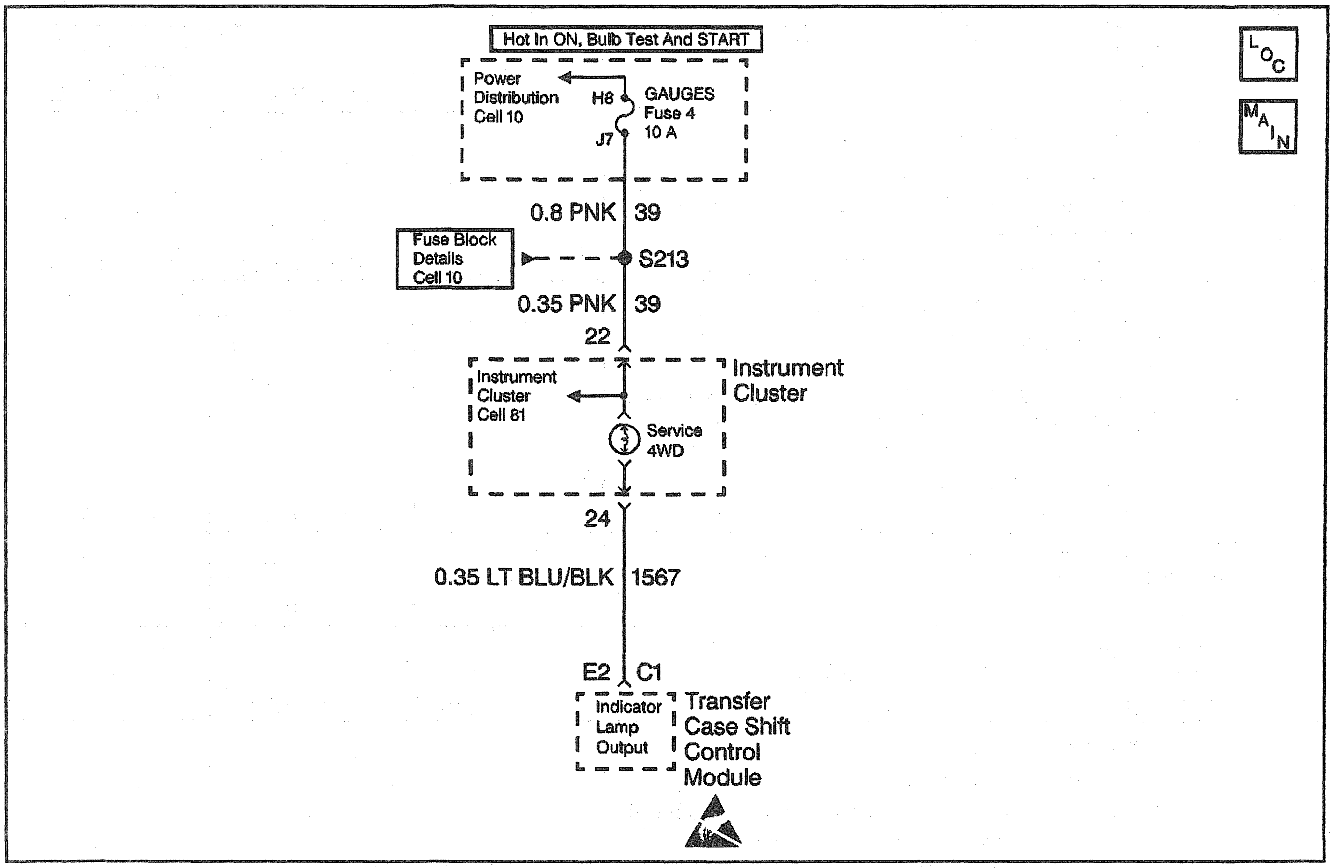
Transfer Case Diagnostic System Check (cont'd)

Step	Action	Value(s)	Yes	No
7	1. Turn the ignition to OFF. 2. Turn the ignition switch to the RUN position. 3. Observe the SERVICE indicator (AWD/4WD) lamp on the instrument cluster. Did the SERVICE indicator (AWD/4WD) lamp turn ON and turn OFF after approximately 2 seconds?	—	Go to *Step 8*	Go to *Service Indicator Stays ON When Key is ON*
8	Was the vehicle brought in for a performance concern?	—	Go to *A Powertrain On Board Diagnostic (OBD) System Check* for 4.3L, *A Powertrain On Board Diagnostic (OBD) System Check* for 5.0, 5.7L, and *A Powertrain On Board Diagnostic (OBD) System Check* for 6.5L	Go to *Step 9*
9	1. Take the vehicle on a road test. 2. Attempt to duplicate the customer's complaint. 3. After the road test check for ATC DTCs. Were there any Current ATC DTCs present?	—	Go to *Diagnostic Trouble Codes*	Go to *Step 10*
10	Were there any mechanical problems identified on the road test?	—	Go to Transfer Case Mechanical System Diagnosis	System OK
11	1. A History DTC indicates a malfunction has been repaired (but DTCs were not cleared) or that malfunction is intermittent. 2. Record any History DTCs set. 3. Clear ATC DTCs. 4. Take vehicle on a road test. 5. Attempt to engage AWD. 6. After the road test check for ATC DTCs. Were there any ATC DTCs present?	—	Go to *Diagnostic Trouble Codes*	Go to *Step 12*
12	Refer to Diagnostic Aids for the recorded History DTC. Are the repairs complete?	—	Go to *Step 1*	—

Diagnostic Trouble Codes

Symptom/DTC	Diagnostic Table
DTC B0768	*DTC B0768 Service Indicator Circuit High*
DTC B2725	*DTC B2725 ATC Mode Switch Circuit Malfunction*
DTC C0300	*DTC C0300 Rear Speed Sensor Malfunction*
DTC C0305	*DTC C0305 Front Speed Sensor Malfunction*
DTC C0308	*DTC C0308 Motor A/B Circuit Low*
DTC C0309	*DTC C0309 Motor A/B Circuit High*
DTC C0310	*DTC C0310 Motor A/B Circuit Open*
DTC C0315	*DTC C0315 Motor Ground Circuit Open*
DTC C0323	*DTC C0323 T-Case Lock Circuit Low*
DTC C0324	*DTC C0324 T-Case Lock Circuit High*
DTC C0327	*DTC C0327 Encoder Circuit Malfunction*
DTC C0357	*DTC C0357 Park Switch Circuit High*
DTC C0362	*DTC C0362 4LO Discrete Output Circuit High*
DTC C0367	*DTC C0367 Front Axle Control Circuit High*
DTC C0374	*DTC C0374 General System Malfunction*
DTC C0376	*DTC C0376 Front/Rear Shaft Speed Mismatch*
DTC C0550	*DTC C0550 ECU Malfunction*
DTC C0611	*DTC C0611 VIN Information Error*
U-Code DTC	Refer to the applicable table in Data Link Connector (DLC) in Electrical Diagnosis

DTC B0768 Service Indicator Circuit High



450722

Circuit Description

The transfer case shift control module controls the SERVCE indicator (AWD/4WD) lamp, located in the instrument cluster, by grounding CKT 1567. Voltage to the lamp is supplied via the GAUGE Fuse, CKT 39. The fuse is located in the IP Fuse Block.

Conditions for Setting the DTC

After the transfer case shift control module commands the lamp on, the module senses a voltage greater than 7 V on CKT 1567.

Conditions for Clearing the MIL/DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- Use a scan tool in order to clear history DTCs.

Test Description

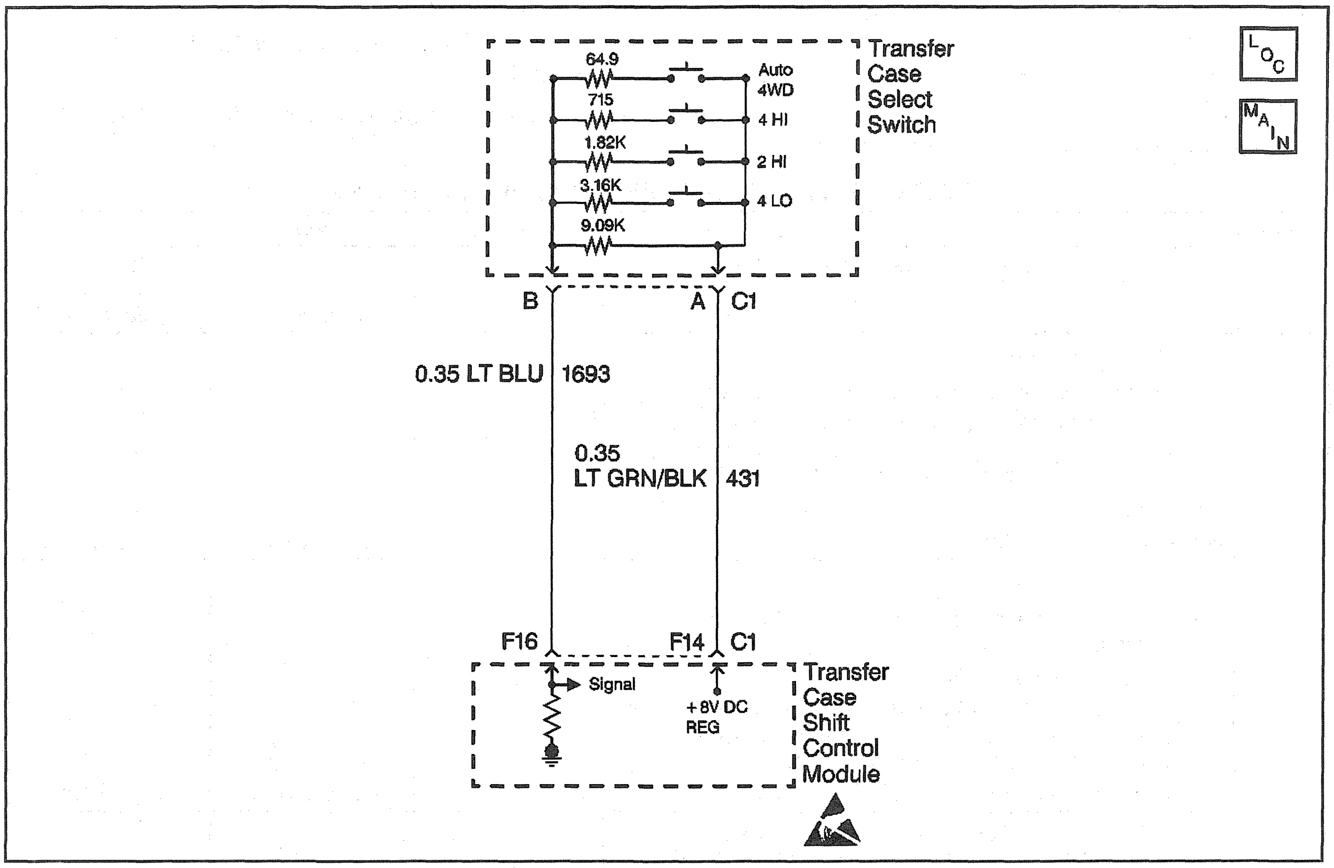
The number(s) below refer to the step number(s) on the diagnostic table.

3. This step determines whether circuit 1567 is shorted to voltage.
6. Jumping terminal E2 of the transfer case shift control module harness connector to ground should provide a complete path to ground for the SERVICE indicator (AWD/4WD) lamp. This step attempts to eliminate the instrument cluster and wiring from fault.

DTC B0768 Service Indicator Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect the instrument cluster connector. 3. Inspect the instrument cluster connector terminals for damage or corrosion Are the terminals damaged or corroded?	—	Go to *Step 5*	Go to *Step 3*
3	1. Disconnect the instrument cluster harness connector. 2. Disconnect both transfer case shift control module connectors. 3. Connect a *J 39200* Digital Multimeter DMM between connector C1 terminal E2 at the transfer case shift control module harness and ground. 4. Turn the ignition to RUN. Is the voltage reading greater than the specified voltage?	0 V	Go to *Step 4*	Go to *Step 6*
4	Repair a short to voltage in CKT 1567. Refer to *Wiring Repairs*. Is the repair complete?	—	Go to *Step 11*	—
5	Repair the instrument cluster wire harness connector. Refer to *Connector Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 11*	—
6	1. Turn the ignition OFF. 2. Reconnect the instrument cluster. 3. Connect a 3 A fused jumper wire from terminal E2 at the transfer case shift control module to ground. 4. Turn the ignition to RUN. Does the SERVICE indicator (AWD/4WD) lamp light?	—	Go to *Step 7*	Go to *Step 8*
7	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 11*	—
8	Inspect instrument cluster SERVICE indicator (AWD/4WD) lamp for faulty bulb. Is the bulb good?	—	Go to *Step 11*	Go to *Step 9*
9	Replace instrument cluster SERVICE indicator (AWD/4WD) bulb. Refer to *Instrument Cluster Lamp Replacement* in Instrument Cluster. Is the repair complete?	—	Go to *Step 10*	—
10	Remove instrument cluster for service. Refer to *IP Cluster Replacement* in Instrument Cluster. Is the repair complete?	—	Go to *Step 11*	—
11	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 12*	—
12	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC B2725 ATC Mode Switch Circuit Malfunction



450729

Circuit Description

The range/mode switch circuit consists of 4 normally open switches. The transfer case shift control module supplies a regulated 8 volt DC to the switch through CKT 431. The switch has CKT 1693 to return current to the transfer case shift control module through a 9.09 K resistor located inside the switch.

The transfer case shift control module constantly monitors this signal voltage to determine the condition of the mode switch circuit. If no buttons are pressed, and the transfer case shift control module detects a voltage level outside the possible range (approx. 0.5–1.0 volts) for longer than 5 minutes, the transfer case shift control module will set this DTC or if a button is held down or sticks for a period longer than 5 minutes. When each of the switches is depressed they will complete a circuit through their own specific resistor. The transfer case shift control module continuously monitors the switch input to determine whether the 4HI, AUTO 4WD, 2HI, and 4LO button selectors are made by the driver. Neutral may be obtained if the following conditions are met:

- The engine is running.
- The automatic transmission is in neutral (or the clutch pedal is depressed on a manual transmission application).
- The vehicle speed is below 3 MPH.
- The transfer case is in the 2HI mode.

Once these conditions have been met, pressing and holding both the 2HI and 4LO buttons for 10 seconds will shift the transfer case into neutral, turning on the red neutral indicator lamp.

This DTC detects an open, short to ground, or voltage on CKT 431 and CKT 1693, and a faulty switch assembly.

Conditions for Setting the DTC

- The system constantly monitors the voltage on CKT 1693.
- If the system detects a voltage level outside the possible range produced when no buttons are depressed, (approx. 0.5–1.0 volts), the DTC is logged.

Action Taken When the DTC Sets

- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

3. This step determines if circuit 1693 is shorted to voltage.
6. This step determines if circuit 1693 is open.
10. This step determines if circuit 431 is shorted to voltage.
14. This step determines if circuit 431 is shorted ground.
16. This step determines if circuit 431 is open.

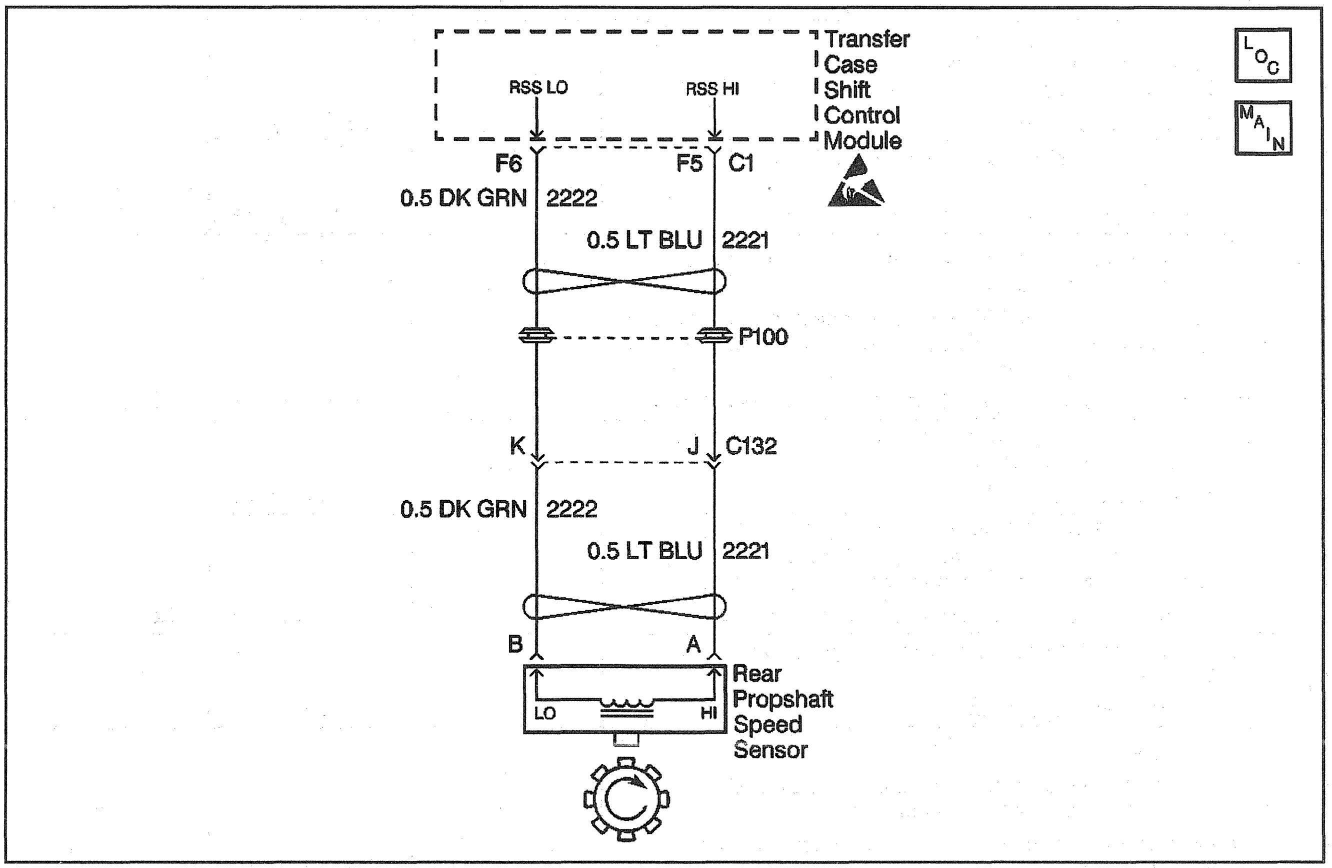
DTC B2725 ATC Mode Switch Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect the Selector Mode Switch connectors. 3. Use a *J 39200* Digital Multimeter DMM in order to measure the voltage from the Selector Mode Switch harness connector C1 terminal A to ground. 4. Turn the ignition On. Is the voltage within the specified values?	7–9 V	Go to *Step 3*	Go to *Step 9*
3	1. Turn the ignition OFF. 2. Disconnect the transfer case shift control module harness connectors. 3. Turn the ignition to Run. 4. Use a *J 39200* DMM in order to measure the voltage from transfer case shift control module harness connector C1 terminal F16 to ground. Is the voltage greater than the specified value?	0 V	Go to *Step 11*	Go to *Step 4*
4	Connect a *J 39200* DMM and measure the resistance between Selector Mode Switch harness connector C1 terminal B to ground. Is the resistance measured less than the specified value?	OL	Go to *Step 5*	Go to *Step 6*
5	Repair a short to ground in CKT 1693. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 18*	—
6	Connect a *J 39200* DMM from Selector Mode Switch harness connector C1 terminal B to transfer case shift control module harness connector C1 terminal F16 Is the resistance measured within the specified value?	0–5 Ω	Go to *Step 7*	Go to *Step 8*
7	Replace the Selector Mode Switch. Refer to *Transfer Case Driver Control Switch Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 18*	—
8	Repair open CKT 1693. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 18*	—
9	Was the voltage in Step 2 within the specified value?	Greater than 9 V	Go to *Step 10*	Go to *Step 14*
10	1. Turn the ignition OFF. 2. Disconnect the transfer case shift control module connectors. 3. Connect a *J 39200* DMM between the transfer case shift control module connector C1 terminal A to ground. 4. Turn the ignition to RUN. Is the voltage greater than the specified value?	0 V	Go to *Step 13*	Go to *Step 12*
11	Repair a short to voltage in CKT 1693. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 18*	—

DTC B2725 ATC Mode Switch Circuit Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
12	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 18*	—
13	Repair a short to voltage in CKT 431. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 18*	—
14	1. Disconnect the transfer case shift control module harness connectors. 2. Connect a *J 39200* DMM and measure the resistance between Selector Mode Switch harness connector C1 terminal A to ground. Is the resistance measured less than the specified value?	OL	Go to *Step 15*	Go to *Step 16*
15	Repair a short to ground in CKT 431. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 18*	—
16	Connect a *J 39200* DMM from Selector Mode Switch harness connector C1 terminal A to transfer case shift control module harness connector C1 terminal F14 Is the resistance measured within the specified value?	0–5 Ω	Go to *Step 12*	Go to *Step 17*
17	Repair open CKT 431. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 18*	—
18	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 19*	—
19	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0300 Rear Speed Sensor Malfunction



450732

Circuit Description

The rear propshaft speed sensor is a permanent magnet (PM) generator. The PM generator produces a pulsing AC voltage. The AC voltage level and number of pulses increases as speed increases. The module converts the pulsating AC voltage to a propshaft RPM which is used for calculations. The propshaft RPM can be displayed with a scan tool. The module only monitors this input when the vehicle is in 2H.

This DTC detects an open, short to ground, or faulty sensor.

Conditions for Setting the DTC

The system will log the DTC if the rear propshaft input indicates a speed of less than 16 RPM for 30 seconds while all of the following are true:

- The transmission is NOT in Park/Neutral.
- The engine is running.
- The front axle is engaged.
- The rear propshaft speed exceeds 512 RPM.
- The vehicle speed on Class 2 Data bus exceeds 10 mph.

Action Taken When the DTC Sets

- All shifts to AUTO (Adapt) mode will be disabled. If the current mode is AUTO, the system will not allow any further adaptive events (correct slip).
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

4. This step determines if the rear speed sensor is able to generate AC current and indicates that both the sensor and wiring to the transfer case shift control module is good.
5. This step measures the internal resistance of the rear speed sensor and whether or not it is within acceptable limits.
7. This step determines if circuit 2222 has a short to voltage.

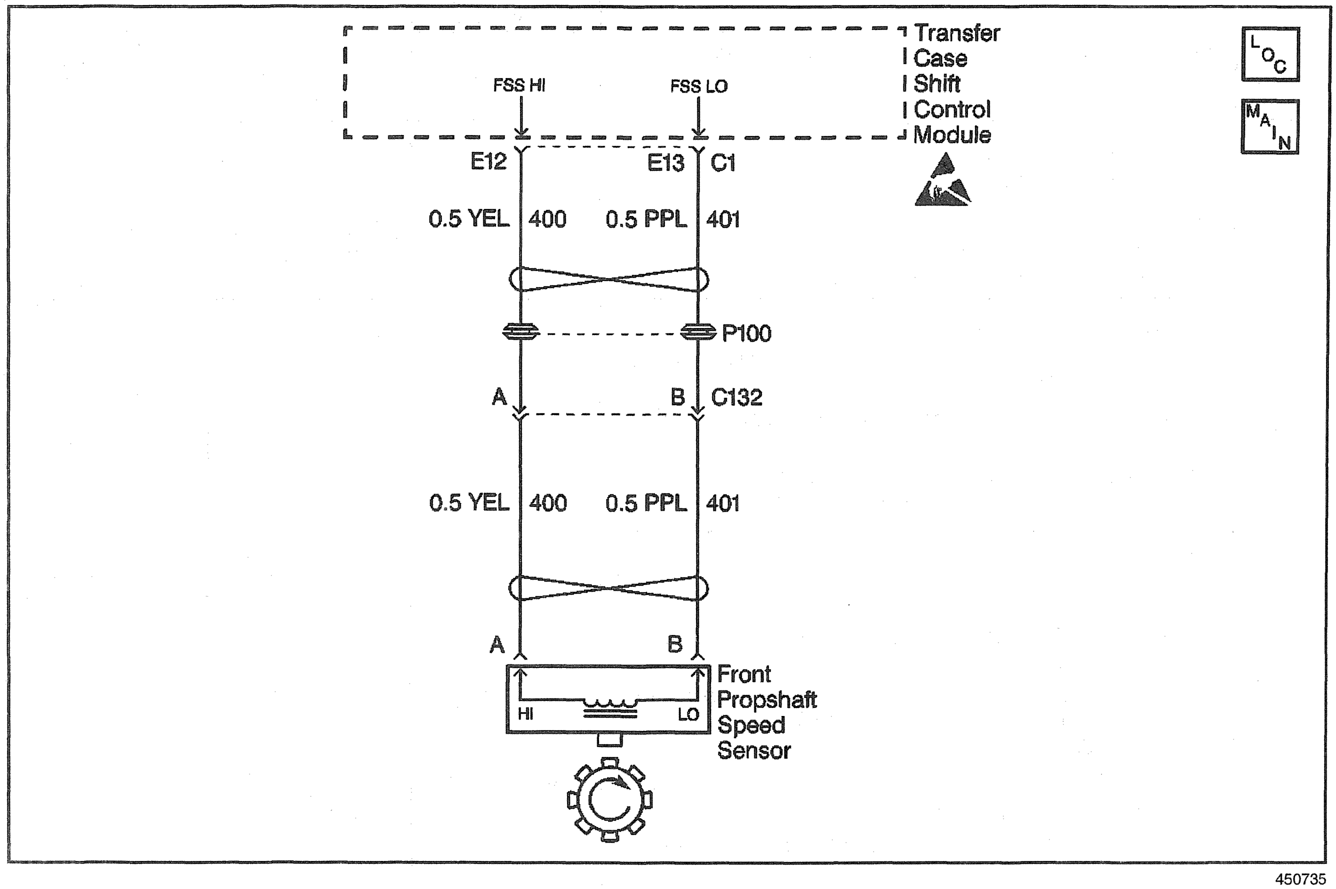
DTC C0300 Rear Speed Sensor Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Connect a *Scan Tool.* 3. Turn the ignition to RUN 4. Check for Powertrain DTCs Were there any Vehicle Speed DTCs found?	—	Go to applicable powertrain DTC table	Go to *Step 3*
3	1. Connect a *Scan Tool.* 2. Drive the vehicle for a short test drive while observing the ATC Data List. 3. Note the value of the Rear Propshaft Speed at a set speed. 4. Change the scan tool screen to reflect the Transmission Data List. 5. Compare the Rear Propshaft Speed previously noted to the Transmission OSS (Output Shaft Speed) at the same speed. Are the rpm values approximately equal at the same speeds?	—	Go to *Step 22*	Go to *Step 4*
4	1. Turn the ignition to OFF. 2. Disconnect the transfer case shift control module connectors. 3. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminals F5 and F6. 4. Block the front wheels. 5. Place the transmission in neutral. 6. Raise and support the rear axle so that the wheels turn freely. 7. Rotate the rear propshaft by hand while observing the AC voltage reading on the *J 39200* DMM. Does the voltage vary between the specified values?	0–0.5 AC V	Go to *Step 20*	Go to *Step 5*
5	1. Disconnect the transfer case rear propshaft speed sensor. 2. Measure the resistance of the rear propshaft speed sensor. Is the resistance reading within the specified values?	1300–2700 Ω	Go to *Step 6*	Go to *Step 21*
6	Measure the resistance between transfer case shift control module harness connector C1 terminals F5 and F6. Is the resistance reading less than the specified value?	OL	Go to *Step 15*	Go to *Step 7*
7	1. Turn the ignition to Run. 2. Measure voltage between transfer case shift control module connector C1 terminal F6 and ground. Is the voltage greater than the specified value?	0 V	Go to *Step 16*	Go to *Step 8*
8	Measure the resistance between transfer case shift control module harness connector C1 terminal F6 and ground. Is the resistance reading less than the specified value?	OL	Go to *Step 17*	Go to *Step 9*
9	Measure voltage between transfer case shift control module harness connector C1 terminal F5 to ground. Is the voltage greater than the specified value?	0 V	Go to *Step 18*	Go to *Step 10*
10	Measure the resistance between transfer case shift control module harness connector C1 terminal F5 and ground. Is the resistance reading less than the specified value?	OL	Go to *Step 19*	Go to *Step 11*

DTC C0300 Rear Speed Sensor Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
11	Measure the resistance between transfer case shift control module harness connector C1 terminal F6 and transfer case rear propshaft speed sensor terminal B. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 12*	Go to *Step 14*
12	Measure the resistance between transfer case shift control module harness connector C1 terminal F5 and transfer case rear propshaft speed sensor terminal A. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 22*	Go to *Step 13*
13	Repair an open in CKT 2221 between the rear propshaft speed sensor and the transfer case shift control module. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
14	Repair an open in CKT 2222 between the rear propshaft speed sensor and the transfer case shift control module. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
15	Repair a short between CKT 2221 and CKT 2222. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
16	Repair a short to voltage condition in CKT 2222. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
17	Repair a short to ground condition in CKT 2222. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
18	Repair a short to voltage condition in CKT 2221. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
19	Repair a short to ground condition in CKT 2221. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
20	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair completed?	—	Go to *Step 22*	—
21	Replace the transfer case rear propshaft speed sensor. Refer to *Speed Sensor Replacement (Rear Speed Sensor Replacement).* Is the repair completed?	—	Go to *Step 22*	—
22	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 23*	—
23	Clear all the ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0305 Front Speed Sensor Malfunction



Circuit Description

The front propshaft speed sensor is a permanent magnet (PM) generator. The PM generator produces a pulsing AC voltage. The AC voltage level and number of pulses increases as speed increases. The module converts the pulsating AC voltage to a propshaft RPM which is used for calculations, and to monitor the difference between the front and rear propshaft speed. It is also used in the AUTO (Adapt) mode of operation to determine the amount of slip and the percent of torque to apply to the front axle The module only looks at this input when the vehicle is in AUTO (Adapt) mode, 4H, and 4L ranges. The propshaft RPM can be displayed with a scan tool. The module only monitors this input when the vehicle is AUTO, 4H, or 4L.

This DTC detects an open, short to ground, or faulty sensor.

Conditions for Setting the DTC

The system will log the DTC if the front propshaft input indicates a speed of less than 16 RPM for 30 seconds while all of the following are true:

- The transmission NOT in Park/Neutral.
- The engine is running.
- The front axle is engaged.
- The rear Propshaft speed exceeds 512 RPM.
- The vehicle speed On Class 2 Data bus exceeds 10 mph.

Action Taken When the DTC Sets

- All Shifts to AUTO (Adapt) mode will be disabled. If the current mode is AUTO, the system will not allow any further adaptive events (correct slip).
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

4. This step determines if the front speed sensor is able to generate AC current and indicates that both the sensor and wiring to the transfer case shift control module is good.
5. This step measures the internal resistance of the front speed sensor and whether or not it is within acceptable limits.
7. This step determines if circuit 401 has a short to voltage.

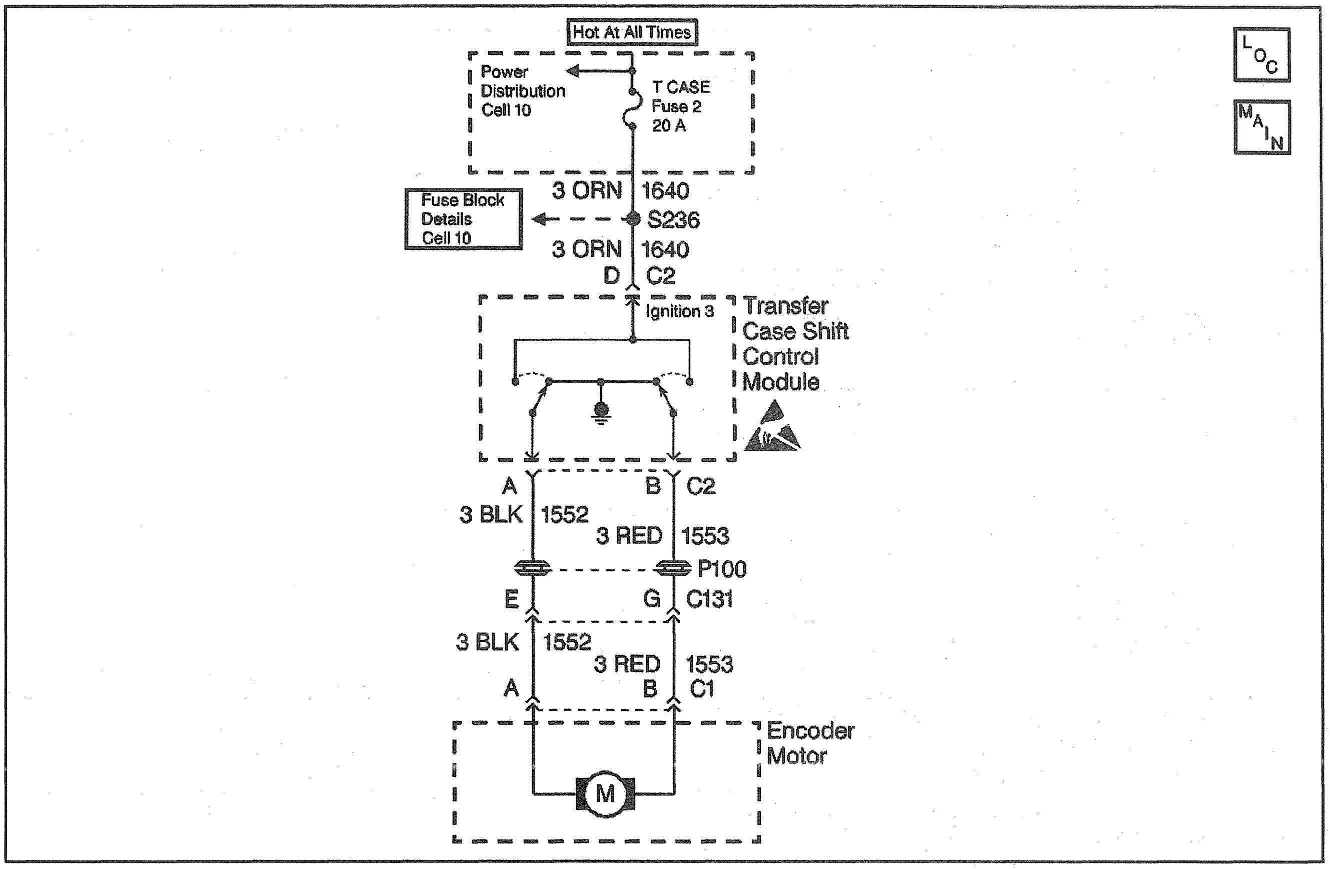
DTC C0305 Front Speed Sensor Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Connect a *Scan Tool* 3. Turn the ignition to RUN. 4. Check for Powertrain DTCs. Were there any vehicle speed DTCs found?	—	Go to applicable powertrain DTC table	Go to *Step 3*
3	1. Connect a *Scan Tool.* 2. Drive the vehicle for a short test drive while observing the ATC Data List. 3. Note the value of the Front Propshaft Speed at a set speed. 4. Compare the Front Propshaft Speed previously noted to the Rear Propshaft Speed at the same speed. Are the rpm values within 10 percent of each other at the same speeds?	—	Go to *Step 22*	Go to *Step 4*
4	1. Turn the ignition to OFF. 2. Disconnect the transfer case shift control module connectors. 3. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminals E12 and E13. 4. Block the rear wheels. 5. Place the transmission in neutral. 6. Raise and support the front axle so that the wheels turn freely. 7. Rotate the propshaft by hand while observing the AC voltage reading on the DMM. Does the voltage vary between the specified values?	0–0.5 AC V	Go to *Step 20*	Go to *Step 5*
5	1. Disconnect the transfer case front propshaft speed sensor. 2. Measure the resistance of the front propshaft speed sensor. Is the resistance reading within the specified values?	1300–2700 Ω	Go to *Step 6*	Go to *Step 22*
6	Measure the resistance between transfer case shift control module harness connector C1 terminals E12 and E13. Is the resistance reading less than the specified value?	OL	Go to *Step 15*	Go to *Step 07*
7	1. Turn the ignition to RUN. 2. Measure voltage between the transfer case shift control module harness connector C1 terminal E12 and ground. Is the voltage greater than the specified value?	0 V	Go to *Step 16*	Go to *Step 8*
8	Measure the resistance between the transfer case shift control module harness connector C1 terminal E12 and ground. Is the resistance reading less than the specified value?	OL	Go to *Step 17*	Go to *Step 9*
9	Measure voltage between the transfer case shift control module harness connector C1 terminal E13 and ground. Is the voltage greater than the specified value?	0 V	Go to *Step 18*	Go to *Step 10*
10	Measure the resistance between the transfer case shift control module harness connector C1 terminal E13 and ground. Is the resistance reading less than the specified value?	OL	Go to *Step 19*	Go to *Step 11*

DTC C0305 Front Speed Sensor Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
11	Measure the resistance between the transfer case shift control module harness connector C1 terminal E12 and front propshaft speed sensor terminal A. Is the resistance reading with in the specified value?	0–5 Ω	Go to *Step 12*	Go to *Step 13*
12	Measure the resistance between the transfer case shift control module connector C1 terminal E13 and front propshaft speed sensor terminal B. Is the resistance reading with in the specified value?	—	Go to *Step 22*	Go to *Step 14*
13	Repair an open in CKT 400 between the front propshaft speed sensor and the transfer case shift control module. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
14	Repair an open in CKT 401 between the propshaft speed sensor and the transfer case shift control module. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
15	Repair a short between CKT 400 and CKT 401. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
16	Repair a short to voltage condition in CKT 400. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
17	Repair a short to ground condition in CKT 400. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
18	Repair a short to voltage condition in CKT 401. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
19	Repair a short to ground condition in CKT 401. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
20	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 22*	—
21	Replace the front speed sensor. Refer to *Speed Sensor Replacement (Front Speed Sensor Replacement).* Is the action complete?	—	Go to *Step 22*	—
22	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 23*	—
23	Clear all the ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0308 Motor A/B Circuit Low



450736

Circuit Description

The transfer case motor is a bi-directional, permanent magnet, DC motor. When energized, (through CKTS 1552, 1553, and the ground CKT 150 the module utilize for the motor control), the motor, through a series of gears, rotates a shaft which moves the mode and range forks to shift the transfer case between 4H, AUTO (Adapt), 2H, N, and 4L ranges.

This DTC detects a short to ground on CKT 1552 and 1553, a shorted motor.

Conditions for Setting the DTC

- The system will test the motor circuits:
  - The system checks for unwanted voltage.
  - The system supplies voltage on one circuit and reads the voltage back on the other.
- If the system detects a problem with the circuits, the DTC is logged.
- The transfer case shift control module senses a low voltage return on CKT 1552 or 1553 when a high voltage is expected.

Action Taken When the DTC Sets

- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the MIL/DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

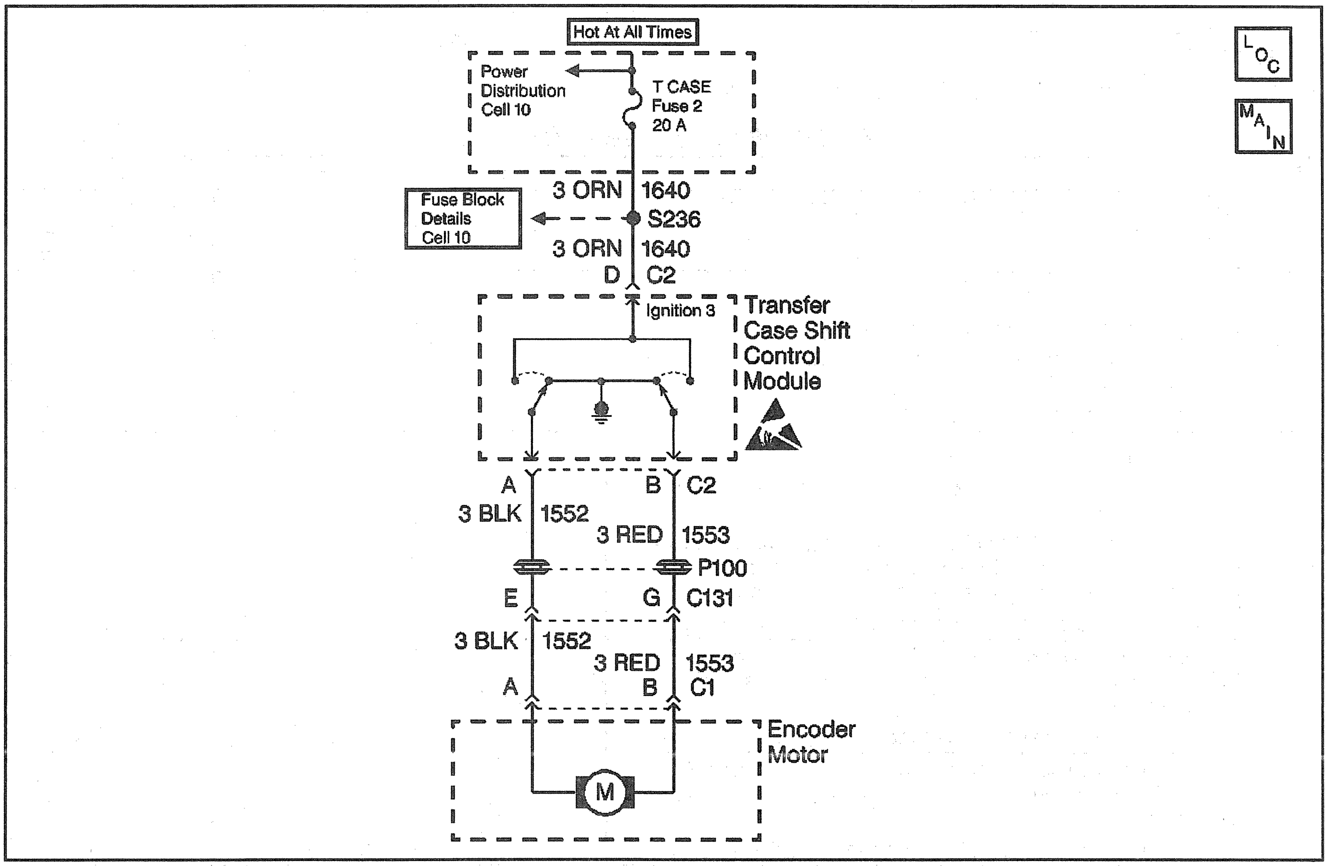
2. Listens for an audible motor noise when the encoder operates. Command both the ON and OFF states. Repeat the commands as necessary.
3. Tests for a short to ground in the Motor Control A circuit or module.
4. Tests for a short to ground in the Motor Control B circuit or module.
5. Tests for a higher than normal resistance in the Motor Control A and B circuits and through the module.
6. Tests for a short to ground in the encoder motor windings.

7. Tests for continuity across the motor circuit. Resistance readings vary depending on the location of brush contact inside the motor assembly.
8. Tests Motor Control A circuit for a short to ground.
9. Tests Motor Control B circuit for a short to ground.
10. Tests Motor Control A and B circuits for an open or high resistance.

DTC C0308 Motor A/B Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Install a scan tool. 2. Turn the ignition ON, with the engine OFF. 3. With the scan tool, command the Motor A/B control ON and OFF. Does the Encoder Motor turn ON and OFF?	—	Go to Diagnostic Aids	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the four wire connector at the transfer case. 3. Connect a *J 39200* Digital Multimeter DMM between the Motor Control A circuit harness connector C1 terminal A and ground at the transfer case. Is the resistance reading less than the specified value?	10 K Ω	Go to *Step 8*	Go to *Step 4*
4	Connect a DMM between the Motor Control B circuit harness connector C1 terminal B and ground at the transfer case. Is the resistance reading less than the specified value?	10 K Ω	Go to *Step 9*	Go to *Step 5*
5	Connect a DMM between the Motor Control A and B circuit harness connector C1 terminals A and B at the transfer case. Is the resistance reading less than the specified value?	2 Ω	Go to *Step 10*	Go to *Step 6*
6	Test terminals A and B at the transfer cas side of the harness for a short to ground. Was a problem found?	—	Go to *Step 11*	Go to *Step 7*
7	Test for continuity across the motor circuit. Was there continuity?	—	Go to *Step 12*	Go to *Step 11*
8	1. Disconnect the transfer case shift control module. 2. Test Motor Control A circuit harness connector C1 terminal A for a short to ground. Was the condition found and corrected?	—	Go to *Step 13*	Go to *Step 12*
9	1. Disconnect the transfer case shift control module. 2. Test Motor Control B circuit harness connector C1 terminal B for a short to ground. Was the condition found and corrected?	—	Go to *Step 13*	Go to *Step 12*
10	1. Disconnect the transfer case shift control module. 2. Test Motor Control A and B circuit harness connector C1 terminals A and B for an open or high resistance. Was the condition found and corrected?	—	Go to *Step 13*	Go to *Step 12*
11	Replace the transfer case encoder motor. Refer to *Motor/Encoder Replacement (Automatic 4WD).* Are the repairs complete?	—	Go to *Step 13*	—
12	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Are the repairs complete?	—	Go to *Step 13*	—
13	1. Use the scan tool in order to clear the DTCs. 2. Operate the vehicle within the Conditions for Running the DTC as specified in the supporting text. Does the DTC reset?	—	Go to *Step 2*	System OK

DTC C0309 Motor A/B Circuit High



450736

Circuit Description

The transfer case motor is a bi-directional, permanent magnet, DC motor. When energized, (through CKT 1552, 1553, and the ground CKT 2150, the module utilize for motor control), the motor, through a series of gears, rotates a shaft which moves the mode and range forks to shift the transfer case between 4H, Adapt, 2H, N, and 4L ranges.

This DTC detects a short to Voltage on CKTS 1552 and 1553, a shorted motor.

Conditions for Setting the DTC

- The system will test the motor circuits by reading the voltage on each circuit.
- If the system detects a problem with the circuits, the DTC is logged.
- The transfer case shift control module senses a high voltage on CKTS 1552 or 1553 when a low voltage is expected.

Action Taken When the DTC Sets

- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

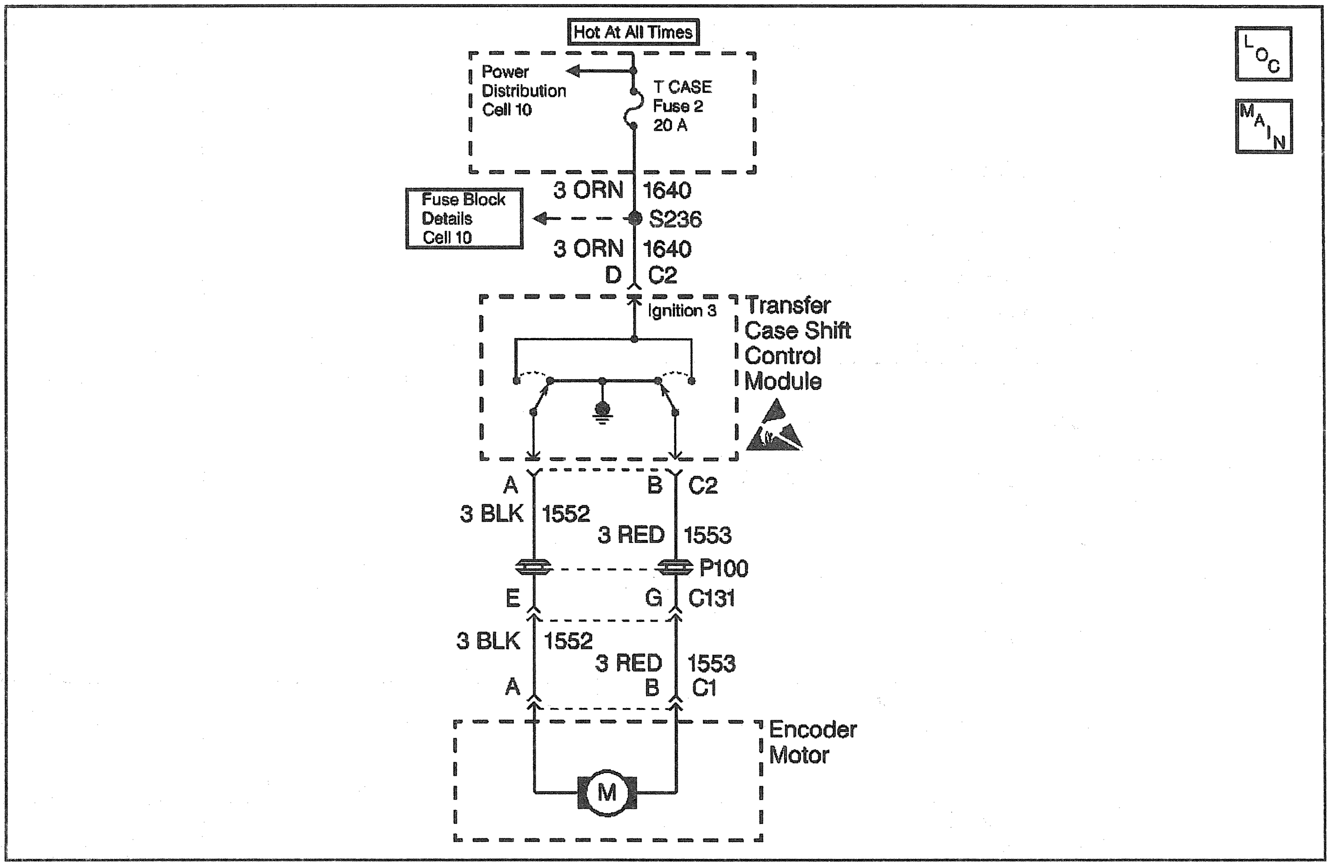
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if there is a short to voltage on circuit 1552.

DTC C0309 Motor A/B Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect both transfer case shift control module connectors. 3. Connect a *J 39200* Digital Multimeter DMM between the transfer case shift control module harness connector C2 terminal A and ground. 4. Turn the ignition to RUN. Is the voltage reading greater than the specified value?	0 V	Go to *Step 3*	Go to *Step 5*
3	1. Turn the ignition OFF. 2. Disconnect the transfer case encoder motor. 3. Connect the *J 39200* DMM between the transfer case shift control module harness connector C2 terminals A and ground. 4. Turn the ignition to RUN. Is the voltage reading greater than the specified value?	0 V	Go to *Step 4*	Go to *Step 6*
4	Repair a short to voltage in CKT 1552. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 7*	—
5	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 7*	—
6	Repair a short to voltage in CKT 1553. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 7*	—
7	1. Ensure the ignition is OFF. 2. Reconnect all previously disconnected components. Are all the ATC components connected and properly mounted?	—	Go to *Step 8*	—
8	Clear all ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0310 Motor A/B Circuit Open



450736

Circuit Description

The transfer case motor is a bi-directional, permanent magnet, DC motor. When energized, (through CKTS 1552, 1553, and the ground CKT 150, the module utilize for motor control), the motor, through a series of gears, rotates a shaft which moves the mode and range forks to shift the transfer case between 4H, AUTO (Adapt), 2H, N, and 4L ranges.

This DTC detects an open on CKTS 1552 and 1553, an open motor.

Conditions for Setting the DTC

- The system will test the motor circuits by checking for unwanted voltage.
- The system supplies voltage on each of the motor circuits and reads the voltage back on the other circuit.
- If the system detects a problem with the circuits, the DTC is logged. The transfer case shift control module senses a low voltage return on CKTS 1552 or 1553 when a high voltage is expected.

Action Taken When the DTC Sets

- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

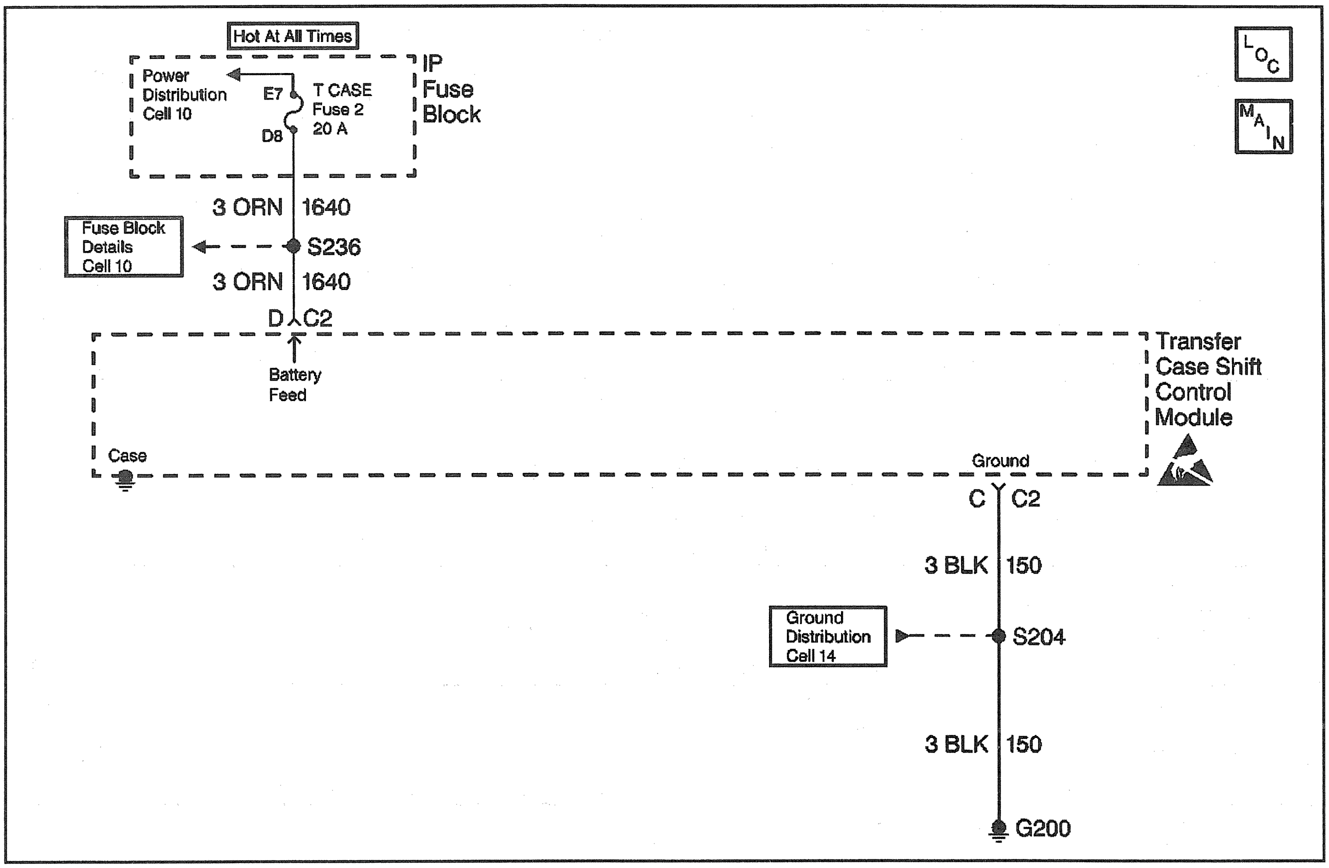
The number(s) below refer to the step number(s) on the diagnostic table.

4. This step determines if circuit 1552 is open.
5. This step determines if circuit 1553 is open.

DTC C0310 Motor A/B Circuit Open

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Disconnect the transfer case encoder motor. 2. Inspect the transfer case encoder motor harness connector. 3. Check the terminals for proper connection. Are the terminals damaged or corroded?	—	Go to *Step 8*	Go to *Step 3*
3	Use a *J 39200* Digital Multimeter DMM to measure resistance across the encoder motor. Is the resistance measured within the specified values?	2–10 Ω	Go to *Step 4*	Go to *Step 7*
4	1. Disconnect the transfer case shift control module connectors. 2. Measure the resistance between the transfer case shift control module harness connector C2 terminal A and the encoder motor harness connector terminal A. Is the resistance measured within the specified values?	0–10 Ω	Go to *Step 5*	Go to *Step 9*
5	Measure the resistance between the transfer case shift control module harness connector C2 terminal B and the encoder motor harness connector terminal B. Is the resistance measured within the specified values?	0–5 Ω	Go to *Step 6*	Go to *Step 10*
6	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 11*	—
7	Replace the transfer case encoder motor. Refer to *Motor/Encoder Replacement (Automatic 4WD).* Are the repairs complete?	—	Go to *Step 11*	—
8	Repair the harness connector. Refer to *Connector Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
9	Repair open in CKT 1552. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
10	Repair open in CKT 1553. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
11	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 12*	—
12	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0315 Motor Ground Circuit Open



450737

Circuit Description

The transfer case motor is a bi-directional, permanent magnet, DC motor. When energized, (through CKTS 1552, 1553, and the ground CKT 150, the module utilize for motor control), the motor, through a series of gears, rotates a shaft which moves the mode and range forks to shift the transfer case between 4H, AUTO (Adapt), 2H, N, and 4L ranges.

This DTC detects an open ground CKT 150.

Conditions for Setting the DTC

The system test the motor circuits:

- The system checks for unwanted voltage.
- The system supplies voltage on each of the motor circuits and reads the voltage back on the other circuit.
- The system checks for opens and shorts on the motor circuits, its applies voltage to the motor and the voltage on the ground circuit.
- If the system detects a high voltage return on the ground circuit, the DTC is logged. The transfer case shift control module senses a low voltage return on CKT 150 when a low voltage is expected.

Action Taken When the DTC Sets

1. All shifting will be disabled.
2. The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

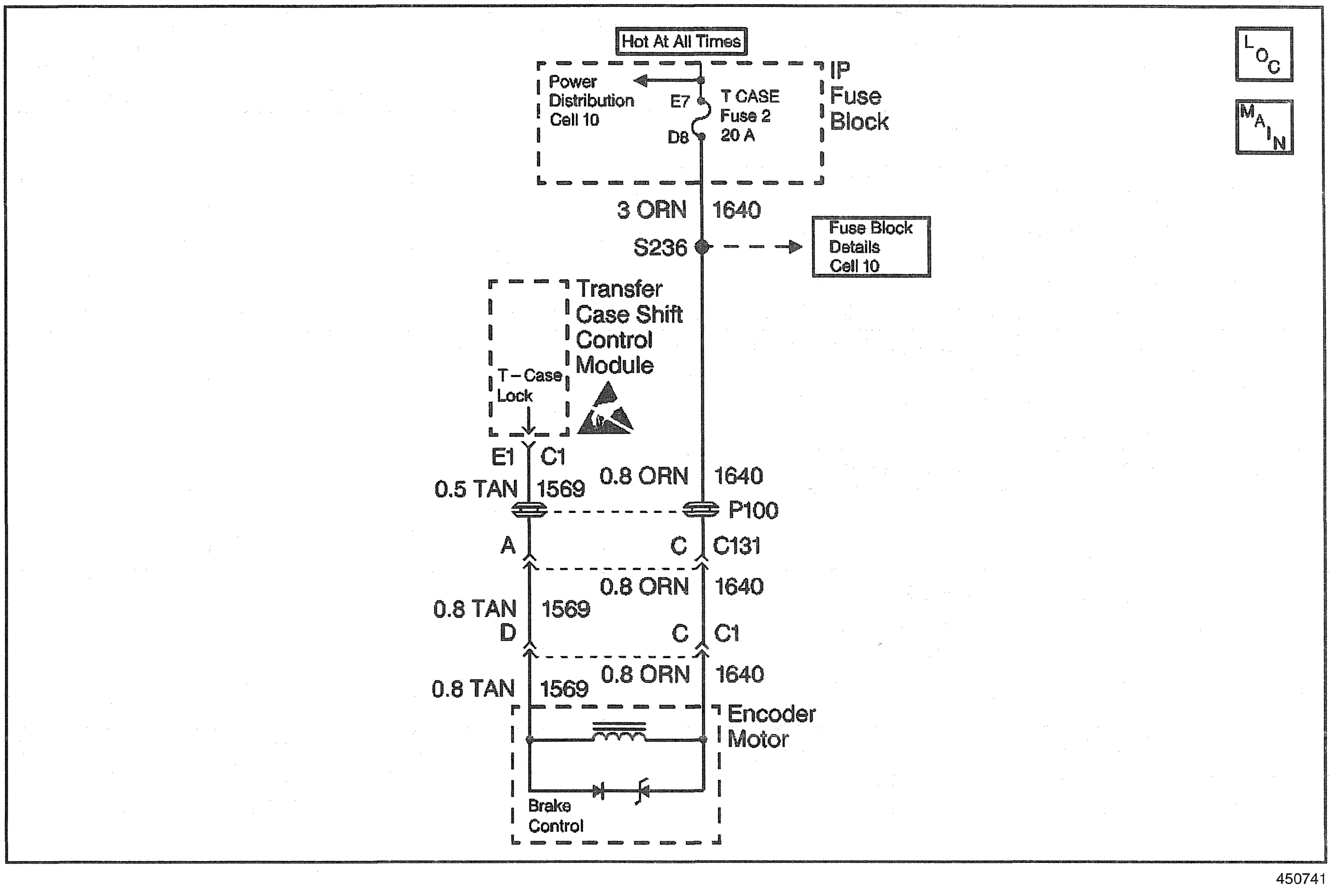
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if there is an open in circuit 150.

DTC C0315 Motor Ground Circuit Open

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect connector C2 at the transfer case shift control module. 3. Use a *J 39200* Digital Multimeter DMM in order to measure the resistance between harness connector C2 terminal C to ground. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 4*	Go to *Step 3*
3	Repair a loose or open in ground CKT 150 between the transfer case shift control module and splice pack SP 204. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 5*	—
4	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD)*. Is the repair complete?	—	Go to *Step 5*	—
5	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 6*	—
6	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0323 T-Case Lock Circuit Low



Circuit Description

The transfer case shift control module controls the transfer case lock solenoid.

The lock is energized (locking action released, grounding CKT 1569) during gear shifts and in AUTO (Adapt) mode of operation. When power or ground is removed from the lock solenoid, (locking action applied), the transfer case motor is prevented from moving. In this manner, the system is capable of providing a 4H and 4L lock-up without the need of additional vehicle power to hold the transfer case in these positions.

This DTC detects an open lock solenoid coil, CKT 1569 open, open feed (CKT 1640) to the solenoid.

Conditions for Setting the DTC

- The system will try to turn the lock solenoid off by opening the ground circuit.
- If the module is unable to de-energize the solenoid, the system will not attempt to de-energize the solenoid again during that ignition cycle.
- Auto transfer case lock output reads back as a low voltage when a high voltage is expected.

Action Taken When the DTC Sets

- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

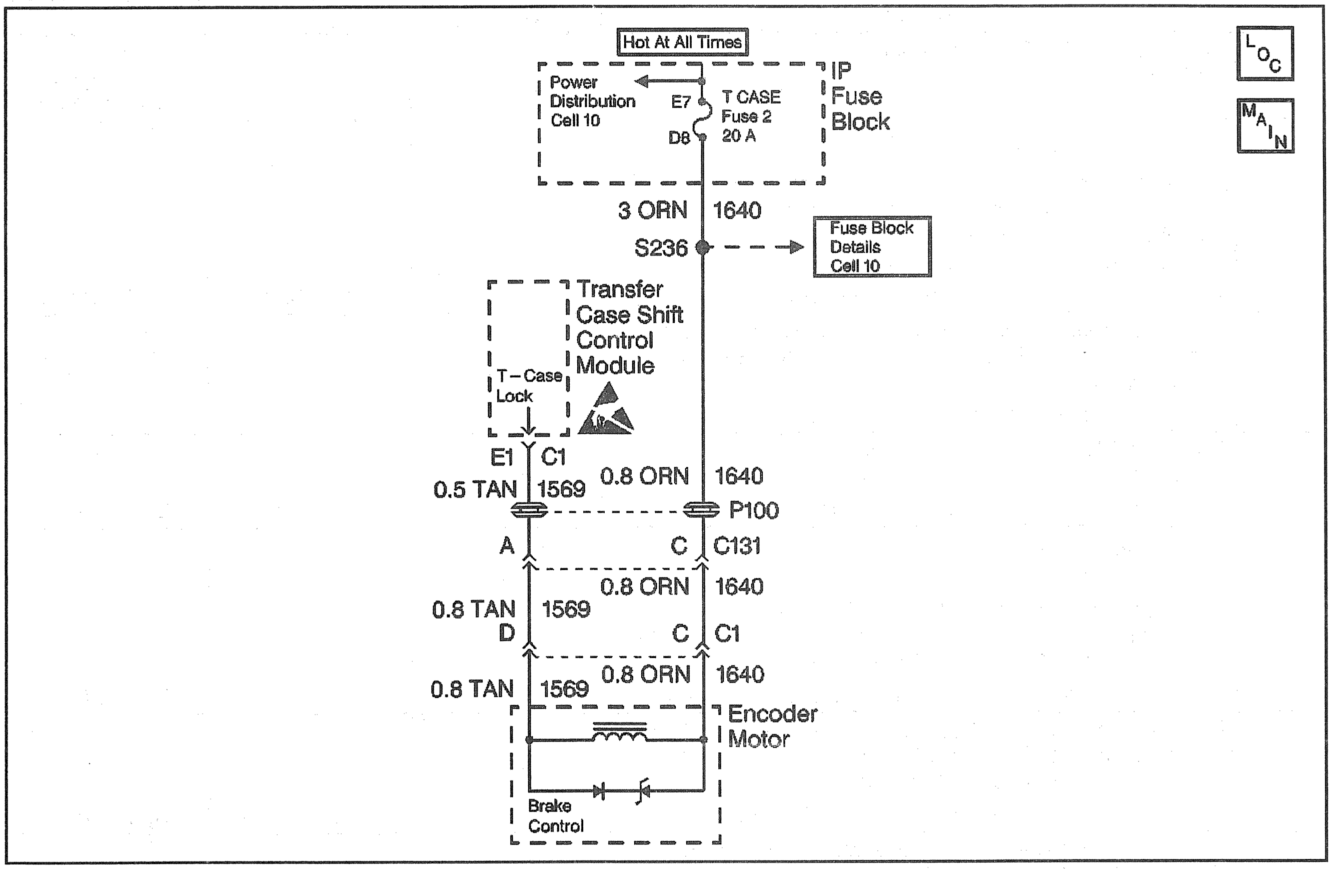
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if battery voltage exists on circuit 1640.
4. This step determines if the internal resistance of the encoder motor lock circuit is within specified limits.
6. This step determines whether circuit 1569 is open.

DTC C0323 T-Case Lock Circuit Low

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition to the OFF position. 2. Disconnect the transfer case encoder motor harness. 3. Connect a *J 39200* Digital Multimeter DMM from the encoder motor harness connector C1 terminal C to ground in order to measure the voltage. Is the voltage with in the specified values?	9–14 V	Go to *Step 4*	Go to *Step 3*
3	Repair an open in CKT 1640 between splice S236 and the transfer case encoder motor. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
4	Use a *J 39200* DMM in order to measure the resistance across the encoder motor lock circuit. Is the resistance reading within the specified values?	20–80 Ω	Go to *Step 5*	Go to *Step 7*
5	1. Disconnect the transfer case shift control module connectors. 2. Use the *J 39200* DMM in order to measure the resistance between transfer case shift control module connector C1 terminal E1 and ground. Is the resistance reading less than the specified value?	OL	Go to *Step 8*	Go to *Step 6*
6	Measure the resistance between transfer case shift control module connector C1 terminal E1 and the transfer case encoder motor connector C1 terminal D. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 10*	Go to *Step 9*
7	Replace the transfer case encoder motor (lock solenoid). Refer to *Motor/Encoder Replacement (Automatic 4WD).* Is the repair completed?	—	Go to *Step 11*	—
8	Repair an short to ground in CKT 1569. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
9	Repair an open in CKT 1569. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 11*	—
10	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair completed?	—	Go to *Step 11*	—
11	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 12*	—
12	Clear all the ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0324 T-Case Lock Circuit High



450741

Circuit Description

The transfer case shift control module controls the transfer case lock solenoid. The lock is energized (locking action released, by grounding CKT 1569) during gear shifts and in AUTO (Adapt) mode of operation. When power or ground is removed from the lock solenoid (locking action applied, releasing the ground on CKT 1569), the transfer case motor is prevented from moving. In this manner the system is capable of providing a 4H and 4L lock-up without the need of additional vehicle power to hold the transfer case in these positions.

This DTC detects a shorted lock solenoid coil, CKT 1569 shorted to a 12 V circuit.

Conditions for Setting the DTC

Transfer Case Lock Solenoid output reads back as a high voltage when a low voltage is expected.

Action Taken When the DTC Sets

- The system will try to turn the lock solenoid on, grounding CKT 1569; if unable to energize the solenoid, the system will not attempt to energize the solenoid again during that ignition cycle.
- All shifting will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

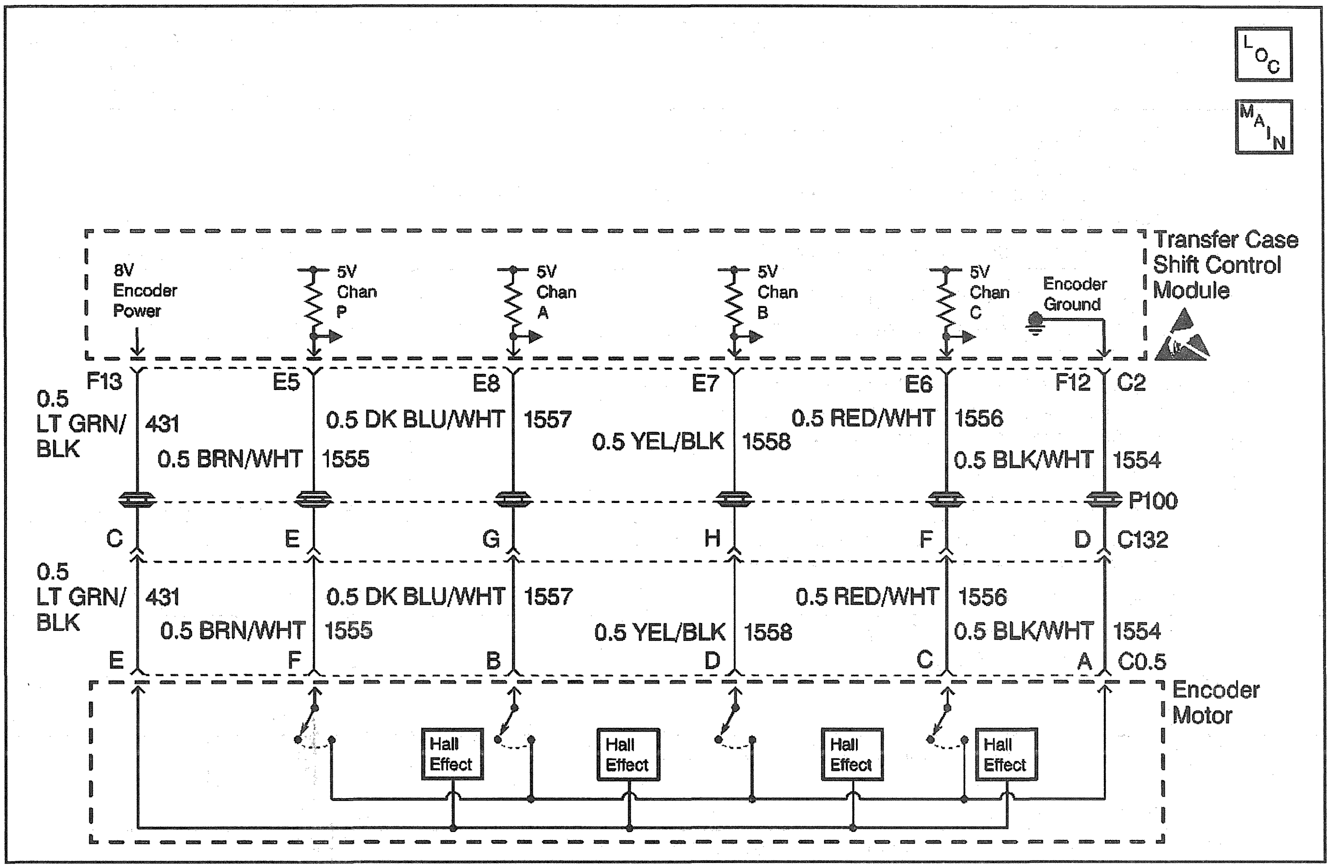
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the internal resistance of the encoder motor lock circuit is within the specified resistance.
3. This step determines if circuit 1569 is shorted to voltage.

DTC C0324 T-Case Lock Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Disconnect the transfer case encoder motor harness. 2. Use a *J 39200* Digital Multimeter DMM in order to measure the resistance across the encoder motor lock circuit. Is the resistance reading within the specified values?	20–80 Ω	Go to *Step 3*	Go to *Step 4*
3	1. Turn the ignition to the OFF position. 2. Disconnect the transfer case shift control module connectors. 3. Connect a *J 39200* DMM from the transfer case shift control module harness connector C1 terminal E1 to ground in order to measure voltage. 4. Turn the ignition to the run position. Is the voltage greater than the specified value?	0 V	Go to *Step 6*	Go to *Step 5*
4	Replace the transfer case encoder motor (lock solenoid). Refer to *Motor/Encoder Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 7*	—
5	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 7*	—
6	Repair a short to voltage condition in CKT 1569. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 7*	—
7	Reconnect all ATC system components, make sure all components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 8*	—
8	Clear all the ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0327 Encoder Circuit Malfunction



450747

Circuit Description

The transfer case encoder is a switch that converts a shaft position, representing a mode or range position, into electrical signals for use by the transfer case shift control module. The encoder houses 4 Hall effect sensors that are used for channels P, A, B, and C. These sensors provide a path to ground, when a magnet, (part of the shift rail), passes over them.

The transfer case shift control module supplies an 8 V reference and a ground circuit for the encoder Hall effect sensors to function via CKT 431 and 1554 respectfully.

The transfer case shift control module supplies 5 V on all the channels, thus as these channels are pulled to ground, the module can interpret the location of the transfer case shift position.

This DTC detects an open, short to ground, or a short to voltage (12 V) in CKT 431, an open in CKT 1554, an open, short to ground, or short to voltage (12 V) in the encoder channel CKTS 1555, 1557, 1558, or 1556.

Conditions for Setting the DTC

The transfer case shift control module reads back all high or low voltage on the encoder channel circuits.

Action Taken When the DTC Sets

- All motor activity will stop and the transfer case lock engaged.
- A default rail to rail shift may be allowed, (toggle between 4H and 2H).
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2. This test will help to isolate whether or not the fault exits in the transfer case motor encoder.
3. This test will determine if the suspect encoder circuit is shorted to ground.
6. This test will help determine if one or more encoder channels are shorted together.

8. This test will determine if the suspect encoder circuit is open.

14. This test determines if CKT 431 is shorted to power.

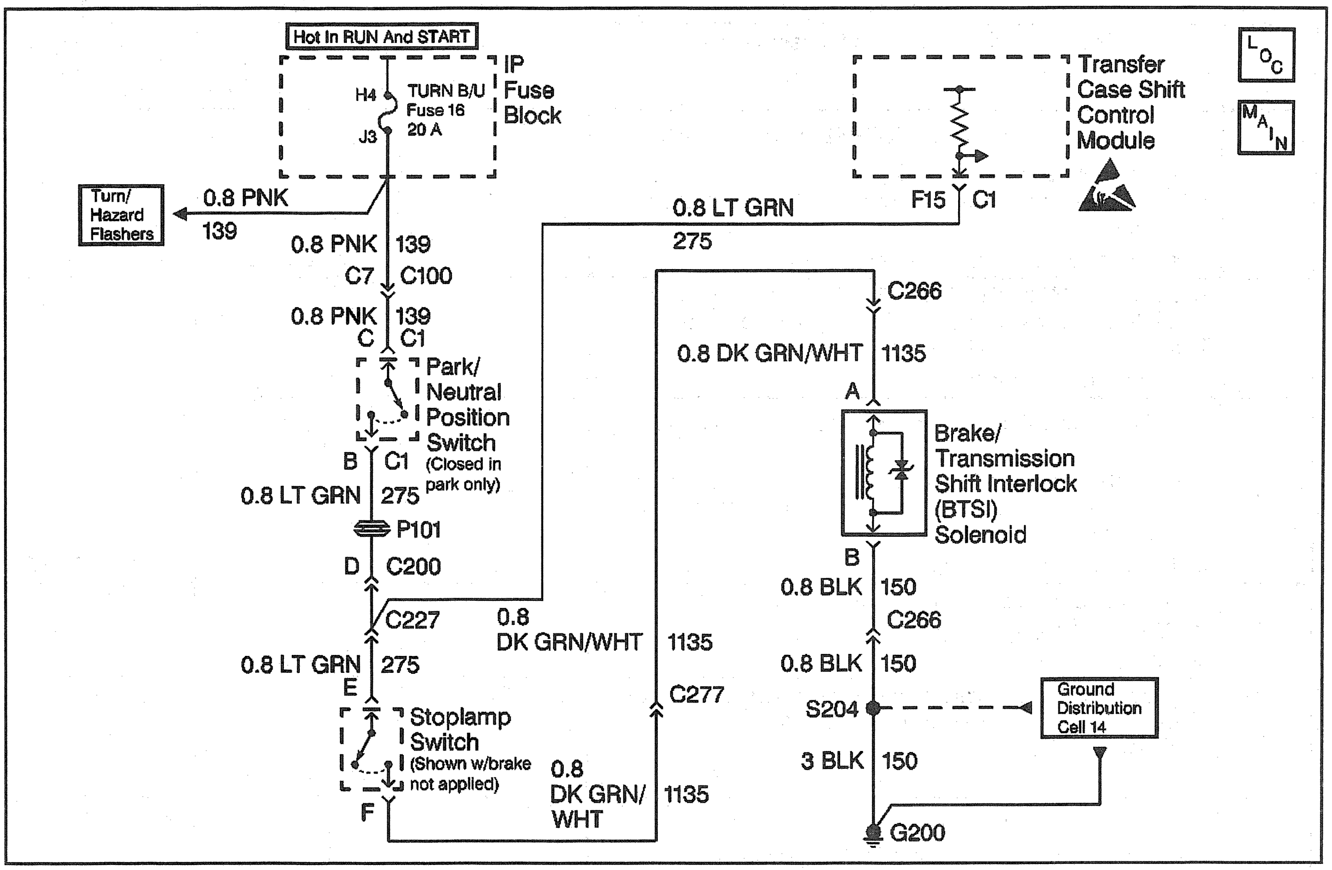
DTC C0327 Encoder Circuit Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool* and select the transfer case data list. 2. Turn ignition to RUN. 3. Observe the states of the Encoder Circuit P, A, B and C. Do all circuits display OFF?	—	Go to *Step 5*	Go to *Step 3*
3	1. Identify which Encoder Circuit stays ON. 2. Disconnect both transfer case shift control module connectors. 3. Use a *J 39200* Digital Multimeter DMM to measure the resistance in the suspect circuit to ground. Is the resistance reading less than the specified value?	OL	Go to *Step 4*	Go to *Step 21*
4	Repair short to ground in the suspect circuit. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
5	Use a *J 39200* DMM to measure voltage between transfer case encoder harness connector C1 terminal E and A. Is the voltage within the specified values?	7–9 V	Go to *Step 6*	Go to *Step 13*
6	1. Use the *Scan Tool* to monitor the states of the Encoder Circuit P, A, B and C. 2. Individually jumper the transfer case encoder harness connector C1 terminals F, B, D and C (one terminal at a time) to terminal A. Does more than one Encoder Circuit display ON simultaneously?	—	Go to *Step 10*	Go to *Step 7*
7	Do all the circuits display ON when their individual circuit is jumped to terminal A?	—	Go to *Step 11*	Go to *Step 8*
8	1. Identify which Encoder Circuit stays OFF. 2. Disconnect both transfer case shift control module connectors. 3. Use a *J 39200* DMM to measure the resistance across the suspect circuit. Is the resistance reading across the suspect circuit within the specified values?	0–5 Ω	Go to *Step 21*	Go to *Step 9*
9	Repair open in the suspect circuit. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
10	Repair a shorted condition between the circuits that were simultaneously turn ON in Step 6. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
11	Use a *J 39200* DMM to measure voltage between transfer case encoder harness connector C1 terminals F, B, D and C to terminal A. Is the voltage within the specified values?	4.8–5.1 V	Go to *Step 12*	Go to *Step 21*
12	Replace transfer case encoder. Refer to *Motor/Encoder Replacement (Automatic 4WD)*. Is the action complete?	—	Go to *Step 22*	—
13	Was the voltage reading previously measured in Step 5 greater than 9 volts?	—	Go to *Step 14*	Go to *Step 15*

DTC C0327 Encoder Circuit Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
14	1. Disconnect both transfer case shift control module connectors. 2. Turn the ignition to RUN. 3. Use a *J 39200* DMM to measure voltage from transfer case encoder harness connector C1 terminal E to ground. Is the voltage reading within the specified values?	0–0.5 V	Go to *Step 21*	Go to *Step 17*
15	Use a *J 39200* DMM to measure resistance from transfer case encoder harness connector C1 terminal A to ground. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 16*	Go to *Step 18*
16	1. Disconnect both transfer case shift control module connectors. 2. Use a *J 39200* DMM to measure resistance from transfer case shift control module harness connector C1 terminal F13 to the transfer case encoder harness connector C1 terminal E. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 22*	Go to *Step 20*
17	Repair short to power in CKT 431. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
18	1. Disconnect both transfer case shift control module connectors. 2. Use a *J 39200* DMM to measure resistance from transfer case shift control module connector C1 terminal F12 to encoder motor harness connector C2 terminal A.. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 21*	Go to *Step 19*
19	Repair open in CKT 1554. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
20	Repair open in CKT 431. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 22*	—
21	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 22*	—
22	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 23*	—
23	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0357 Park Switch Circuit High



450803

Circuit Description

The park switch supplies a 12 V input to the module when the vehicle is in PARK. The module uses this input to determine if the vehicle is in PARK/NEUTRAL. If the vehicle is in PARK, the module will not allow a range shift from 2H, 4H, or AUTO (Adapt) mode to 4L range.

This DTC detects voltage on CKT 275 (LT GRN) at the module when the module sees a front or rear propshaft speed signal, or vehicle speed form the VCM/PCM over the Class 2 data bus.

Conditions for Setting the DTC

The transfer case shift control module detects voltage on CKT 584 at the module when the module sees a front or rear propshaft speed signal, or vehicle speed form the VCM over the Class 2 data bus 10 mph or over for 10 consecutive seconds.

Action Taken When the DTC Sets

- Whenever PARK/NEUTRAL was true, the module would believe the transmission was in PARK.
- All range shifts will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

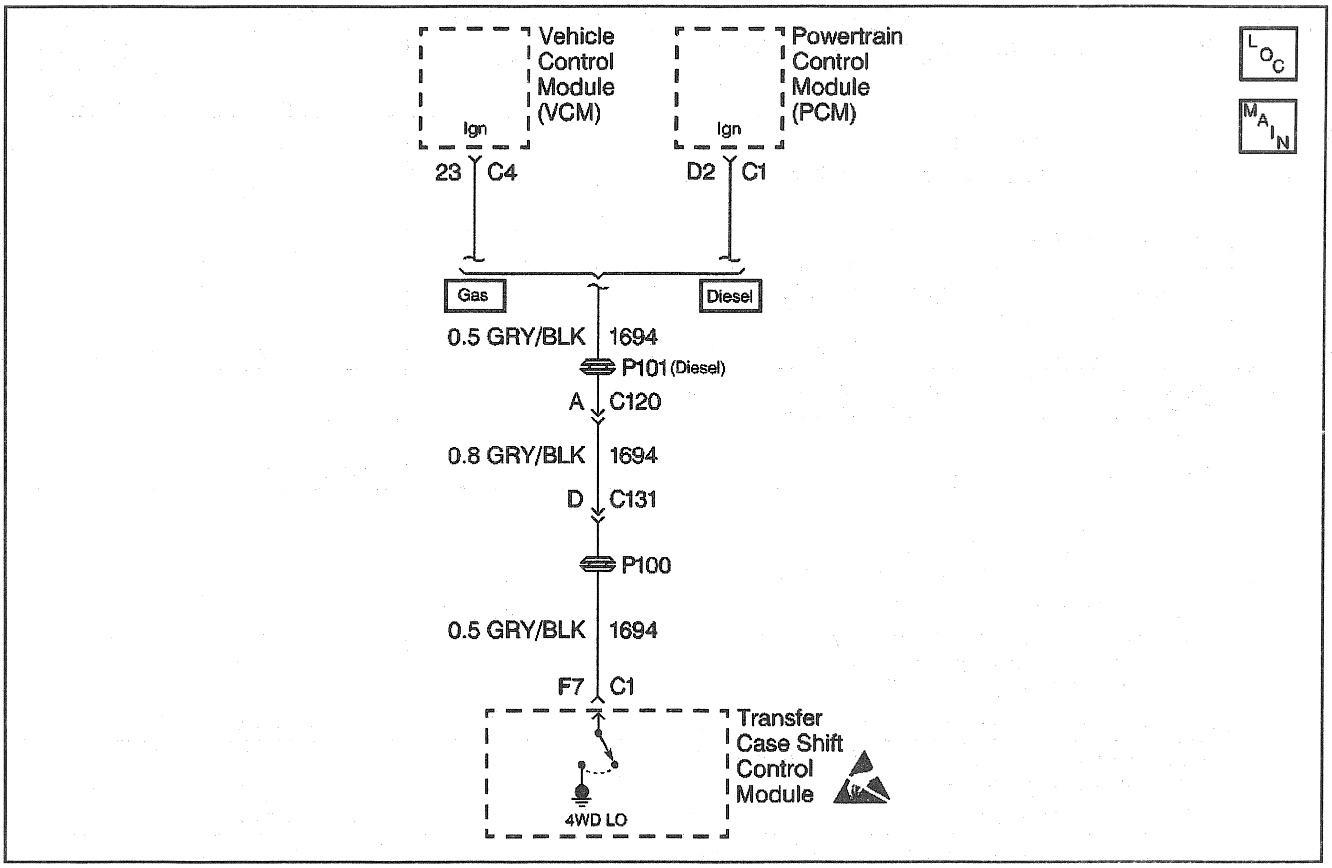
The number(s) below refer to the step number(s) on the diagnostic table.

4. This step determines if circuit 275 is shorted to voltage.

DTC C0357 Park Switch Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Disconnect the PARK/NEUTRAL position switch. 2. Turn the ignition ON, engine OFF. 3. Use the *Scan Tool* in order to read the Park Switch states. Does the scan tool indicate an open switch?	—	Go to *Step 4*	Go to *Step 3*
3	Replace the PARK/NEUTRAL Position Switch. Refer to *Park/Neutral Back Up Switch Replacement* for 4L60E Transmissions or 4L80E Transmissions. Is the action complete?	—	Go to *Step 7*	—
4	1. Disconnect the transfer case shift control module connectors. 2. Connect a *J 39200* Digital Multimeter DMM between the transfer case shift control module connector C1 terminal F15 to ground. Is the voltage within the specified values?	0–0.5 V	Go to *Step 5*	Go to *Step 6*
5	Repair a short to voltage in CKT 275. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 7*	—
6	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 7*	—
7	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 8*	—
8	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0362 4LO Discrete Output Circuit High



450753

Circuit Description

CKT 1694 is used to notify the vehicle control module (VCM) powertrain control module (PCM) that the vehicle is in 4WD low range. The vehicle control module (VCM) powertrain control module (PCM) supplies 12 V on this circuit. The transfer case shift control module supplies a ground on this circuit when the vehicle is in 4WD low range.

This DTC detects an transfer case shift control module problem, a short to voltage on CKT 1694.

Conditions for Setting the DTC

- After the system turns the output on, (grounding CKT 1694), and reads back a high voltage, the DTC is set. The system will not attempt it again during that ignition cycle.
- The transfer case shift control module reads back a high voltage when a low voltage is expected on the 4 low discrete output, CKT 1694.

Action Taken When the DTC Sets

- May affect the transmission shift points.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exits.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

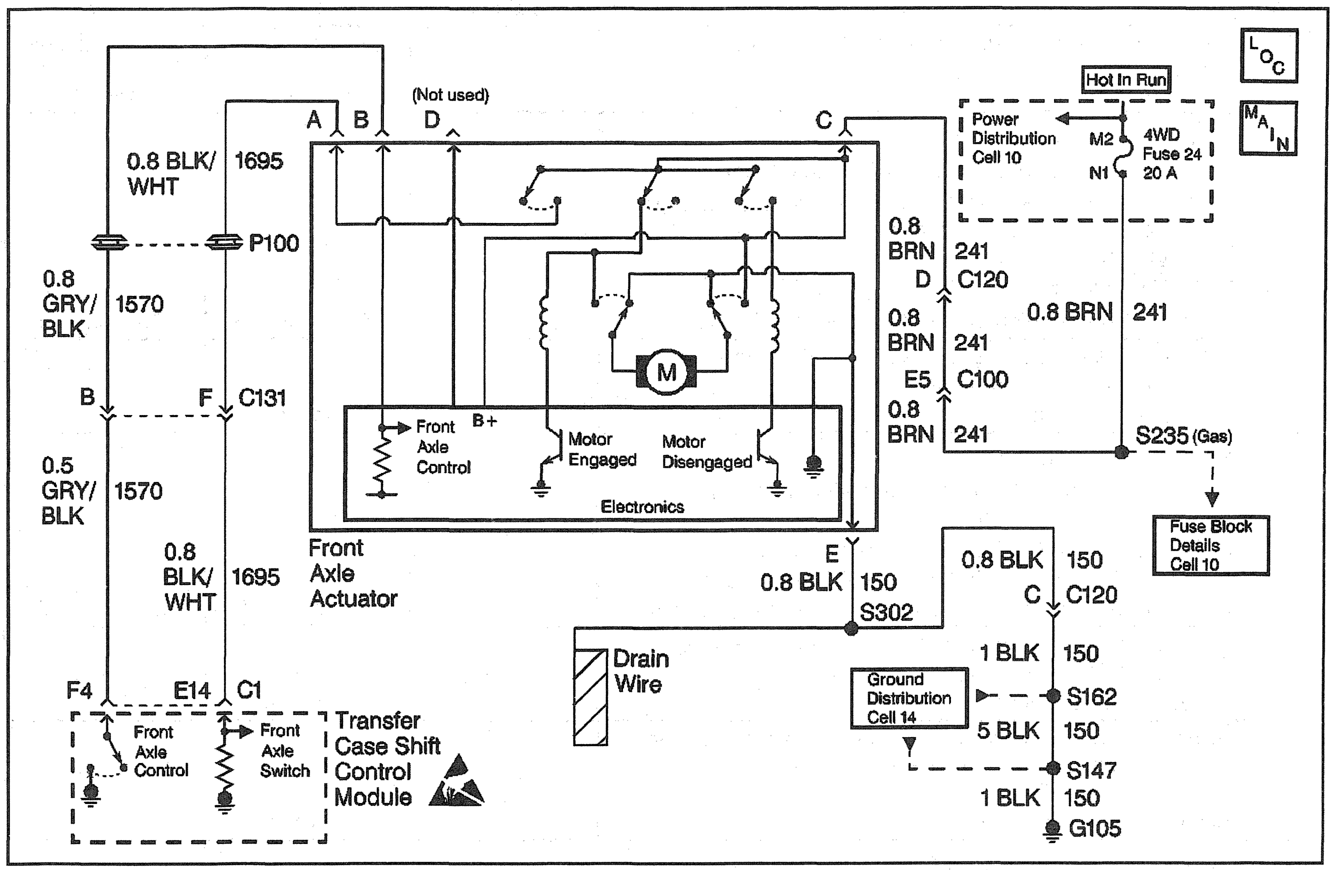
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module is receiving the specified voltage from the Powertrain Control Module (PCM).
4. This step determines if circuit 1694 has a short to voltage.

DTC C0362 4LO Discrete Output Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect both transfer case shift control module connectors. 3. Turn the ignition ON, engine OFF. 4. Use a DMM in order to measure the voltage between the transfer case shift control module connector C1 terminal F7 to ground. Is the voltage reading within the specified values?	11–13.5 V	Go to *Step 3*	Go to *Step 4*
3	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 7*	—
4	1. Turn the ignition OFF. 2. Disconnect the Vehicle Control Module (VCM)/Powertrain Control Module (PCM) connectors. 3. Turn the ignition ON. 4. Use a DMM in order to measure the voltage between the transfer case shift control module connector C1 terminal F7 to ground. Is the voltage reading within the specified value?	11–13.5 V	Go to *Step 5*	Go to *Step 6*
5	Repair a short to voltage in CKT 1694. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 7*	—
6	Replace the Powertrain Control Module (PCM). Refer to *PCM Replacement/Programming* and *VCM Replacement/Programming*. Is the action complete?	—	Go to *Step 7*	—
7	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 8*	—
8	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0367 Front Axle Control Circuit High



Circuit Description

The transfer case shift control module controls the engagement and disengagement of the front axle by grounding (engaging) CKT 1570. The front axle will be disengaged in 2H and neutral only, it should be engaged in the all other modes. This DTC detects a shorted actuator, a short to 12 V on CKT 1570.

Conditions for Setting the DTC

- The system will try to engage the front axle. If it can not engage the front axle, the system will not attempt it again during that ignition cycle.
- The transfer case shift control module reads back the front axle output as a high voltage when a low voltage is expected.

Action Taken When the DTC Sets

- All shifting for 4WD and AUTO (Adapt) mode will be disabled.
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycle without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2. This test will determine if CKT 1570 is shorted to voltage.
4. This test will determine if whether the short to voltage in CKT 1570 is the result of an internal short to power within the transfer case shift control module.

DTC C0367 Front Axle Control Circuit High

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Disconnect front axle switch/actuator connector. 3. Connect a *J 39200* Digital Multimeter DMM from the front axle actuator harness connector terminal B to ground. 4. Turn the ignition to RUN, engine OFF. Is the voltage reading greater than the specified values?	0–0.5 V	Go to *Step 4*	Go to *Step 3*
3	Replace the front axle switch/actuator. Refer to *Electric Motor Actuator Replacement.* Is the repair complete?	—	Go to *Step 7*	—
4	1. Turn the ignition OFF. 2. Disconnect both transfer case shift control module harness connectors. 3. Connect a *J 39200* DMM between the front axle actuator harness connector terminal B to ground. Is the voltage reading greater than the specified values?	0–0.5 V	Go to *Step 5*	Go to *Step 6*
5	Repair short to voltage in CKT 1570. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 7*	—
6	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD)* Is the action complete?	—	Go to *Step 7*	—
7	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 8*	—
8	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0374 General System Malfunction

Circuit Description

The transfer case shift control module senses rear to front slip, a difference of rear to front wheel speed, attempts to correct the difference by turning on the motor, internal to the transfer case, to apply torque to the front wheels.

Conditions for Setting the DTC

The transfer case shift control module is unable to correct sensed slip for 10 consecutive seconds.

Conditions for Clearing the MIL/DTC

- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- Use a scan tool in order to clear history and current DTCs.

Test Description

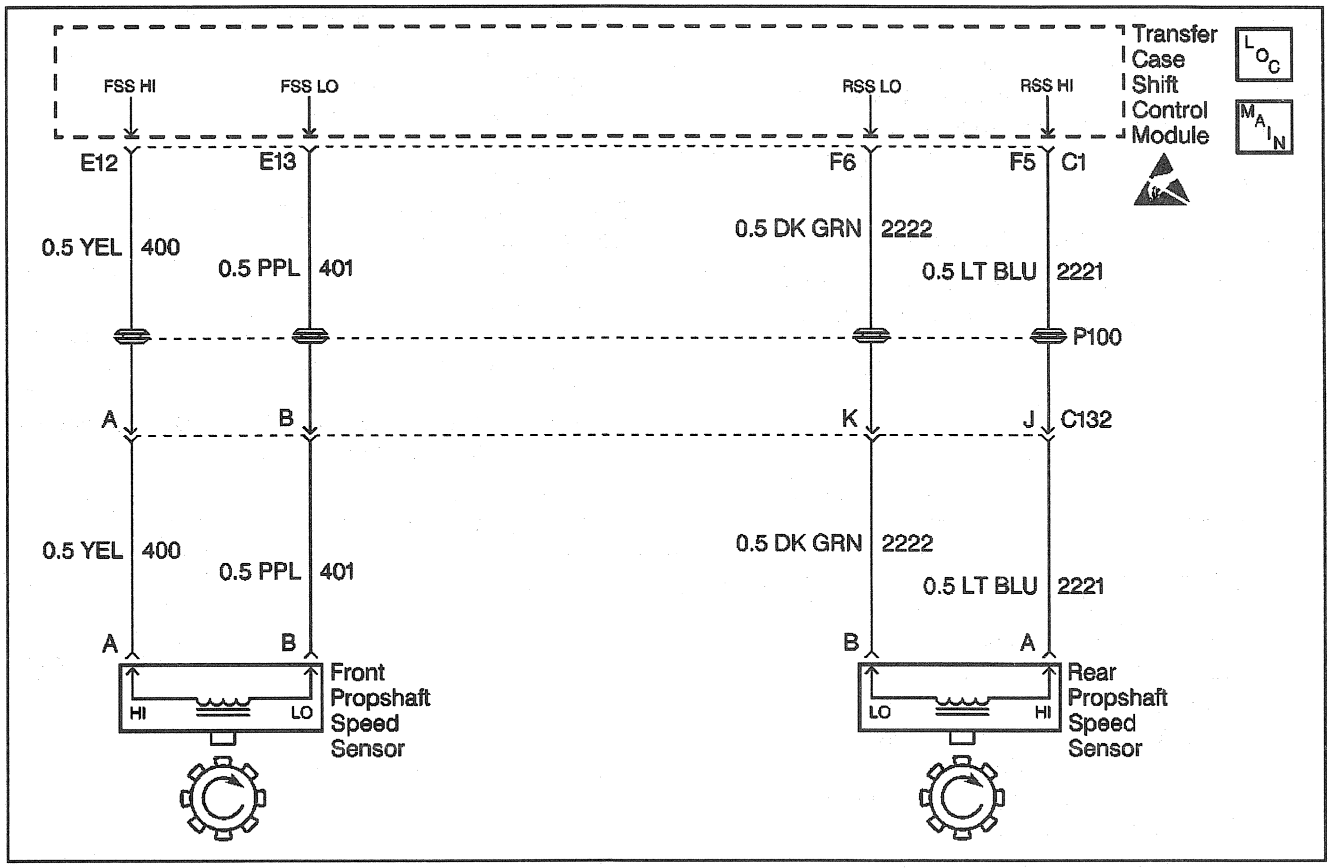
The number(s) below refer to the step number(s) on the diagnostic table.

2. This test checks for proper operation of the serial data line.
3. This test will identify the stored diagnostic trouble codes and whether or not they are current or history.
5. The SERVICE indicator (AWD/4WD) lamp should turn off after approximately 2 seconds.

DTC C0374 General System Malfunction

Step	Action	Value(s)	Yes	No
1	**Important:** If DTC C0300 or C0305 is also present perform the diagnostic for these DTCs before continuing. Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Place transmission in PARK. 2. Turn the Ignition to the RUN position. 3. Connect the *Scan Tool.* 4. Use the *Scan Tool* to command Encoder Motor A and Encoder Motor B On. Is the encoder motor turning on (buzzing noise)?	—	Go to *Step 5*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Disconnect the wire harness at the encoder motor. 3. Turn the ignition switch to RUN. 4. Use the *Scan Tool* to check for DTCs. Did DTC C0310 set?	—	Go to *Step 7*	Go to *Step 4*
4	Replace transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Has the transfer case shift control module been replaced?	—	Go to *Step 8*	—
5	1. Using the *Scan Tool* manually command gear position by using the device control for the ATC Mode Switch. 2. Use the Increase and Decrease buttons on the scan tool to command through all the Mode Switch states while observing Encoder Gear Position. Does the Encoder Gear Position state change as commanded by the scan tool?	—	Go to *Step 6*	Go to *Step 7*
6	Remove transfer case and overhaul. Refer to Transfer Case - New Venture Gear 246 in the Transmission Unit Repair Manual (TURM). Are the repairs complete?	—	Go to *Step 8*	—
7	Replace the transfer case encoder motor. Refer to *Motor/Encoder Replacement (Automatic 4WD)* Is the repair complete?	—	Go to *Step 8*	—
8	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0376 Front/Rear Shaft Speed Mismatch



450760

Circuit Description

The front and rear propshaft speed sensor is a permanent magnet (PM) generator. The PM generator produces a pulsing AC voltage. The AC voltage level and number of pulses increases as speed increases. The module converts the pulsating AC voltage to a propshaft RPM which is used for calculations. The module only looks at these inputs together when the vehicle is in 4H, 4L, and AUTO (Adapt) range only. The propshaft RPM can be displayed with a scan tool.

This DTC detects greater than 20% difference in the speed sensor inputs.

Conditions for Setting the DTC

The transfer case shift control module detects continued readings of front and rear propshaft speed signal which do not match. Module can not determine propshaft speed.

The system will log the DTC if the front and rear propshaft inputs indicates a speed of less than 20% difference for 40 seconds while all of the following are true:

- the transmission NOT in Park/Neutral.
- The engine is running.
- The front axle is engaged.
- The front propshaft indicates speed less than 75 mph.
- The front propshaft or rear propshaft speed exceeds 512 RPM.
- the vehicle speed On Class 2 Data bus exceeds 10 mph.

Action Taken When the DTC Sets

- All Shifts to AUTO (Adapt) mode will be disabled. If the current mode is AUTO, the system will not allow any further adaptive events (correct slip).
- The SERVICE indicator (AWD/4WD) lamp will be latched on for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- A history DTC will clear after 100 consecutive ignition cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

4. This step attempt to determine whether a fault exists in the rear propshaft speed sensor circuit.
5. This step attempts to determine whether a fault exists in the front propshaft speed sensor circuit.

DTC C0376 Front/Rear Shaft Speed Mismatch

Step	Action	Value(s)	Yes	No
1	**Important:** If DTC C0300 is also present perform the diagnostic for DTC C0300 before continuing. Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition OFF. 2. Inspect the following for a mismatch: • Front and rear axle ratios • All tires • Front or rear propshaft missing 3. Inspect that the speed sensors are wired correctly by comparing vehicle wire harness to the system schematics. Inspect the connectors for proper connection and for loose terminals. Was a problem found?	—	Go to *Step 6*	Go to *Step 3*
3	1. Turn the ignition OFF. 2. Connect a *Scan Tool.* 3. Turn the ignition to RUN. 4. Check for Powertrain DTCs. Were there any Vehicle speed DTCs found?	—	Go to applicable powertrain DTC table	Go to *Step 4*
4	1. Connect a *Scan Tool.* 2. Drive the vehicle while observing the ATC data list. 3. Note the value of the rear propshaft speed at a set speed. 4. Change the scan tool screen to reflect the Transmission Data List. 5. Compare the rear propshaft speed previously noted to the Transmission OSS (Output Shaft Speed) at the same speed. Are the rpm values approximately equal at the same speeds?	—	Go to *Step 5*	Go to *Step 7*
5	1. Continue driving the vehicle while observing the ATC data list. 2. Compare the rear propshaft speed to the front propshaft speed at the same speed. Are the rpm values approximately equal at the same speeds?	—	Go to *Step 8*	Go to *Step 9*
6	Repair/replace as necessary. Is the action complete?	—	Go to *Step 10*	—
7	Replace the transfer case rear vehicle speed sensor. Refer to *Speed Sensor Replacement (Front Speed Sensor Replacement).* Are the repairs complete?	—	Go to *Step 10*	—
8	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Are the repairs complete?	—	Go to *Step 10*	—
9	Inspect/replace the front transfer case vehicle speed sensor reluctor wheel for damage, misalignment, and slipping. Are the repairs complete?	—	Go to *Step 10*	—

DTC C0376 Front/Rear Shaft Speed Mismatch (cont'd)

Step	Action	Value(s)	Yes	No
10	1. Ensure that the ignition is OFF. 2. Properly mount and reconnect all ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 11*	—
11	Clear all ATC codes. Have all the ATC codes been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0550 ECU Malfunction

Circuit Description

At each power up the module runs a self test on the following:

- EEPROM Checksum
- ROM Checksum
- RAM Checksum
- RAM Malfunction
- Relay Malfunction

Conditions for Setting the DTC

- Critical operational parameters stored in EEPROM have failed checksum test indicating invalid data.
- Masked ROM code has failed checksum test indicating that masked ROM data is no longer valid.
- ROM code has failed checksum test indicating that ROM data is no longer valid.
- One or more RAM locations have failed operational test indicating that some portions of RAM are not functional.
- Motor circuit test has indicated that one of the module's relays is not able to make contact.

Action Taken When the DTC Sets

The SERVICE indicator (AWD/4WD) lamp will be latched on and the system will be disabled.

Conditions for Clearing the DTC

- Replace the transfer case shift control module.
- Perform the Transfer Case Diagnostic System Check.

DTC C0611 VIN Information Error

Circuit Description

The transfer case shift control module uses the VIN information for calculations that are required for the different calibrations used based on axle ratio, transmission, tire size, and engine. The system does not know which calibration to use without this information.

Conditions for Setting the DTC

The transfer case shift control module does not receive a valid VIN digit for the correct application, K truck, L van or T truck within 2 seconds after power up.

Action Taken When the DTC Sets

- The ignition counts since last fault will be cleared.
- The system will be disabled until valid VIN data is received.
- The SERVICE indicator (AWD/4WD) lamp will be latched on.

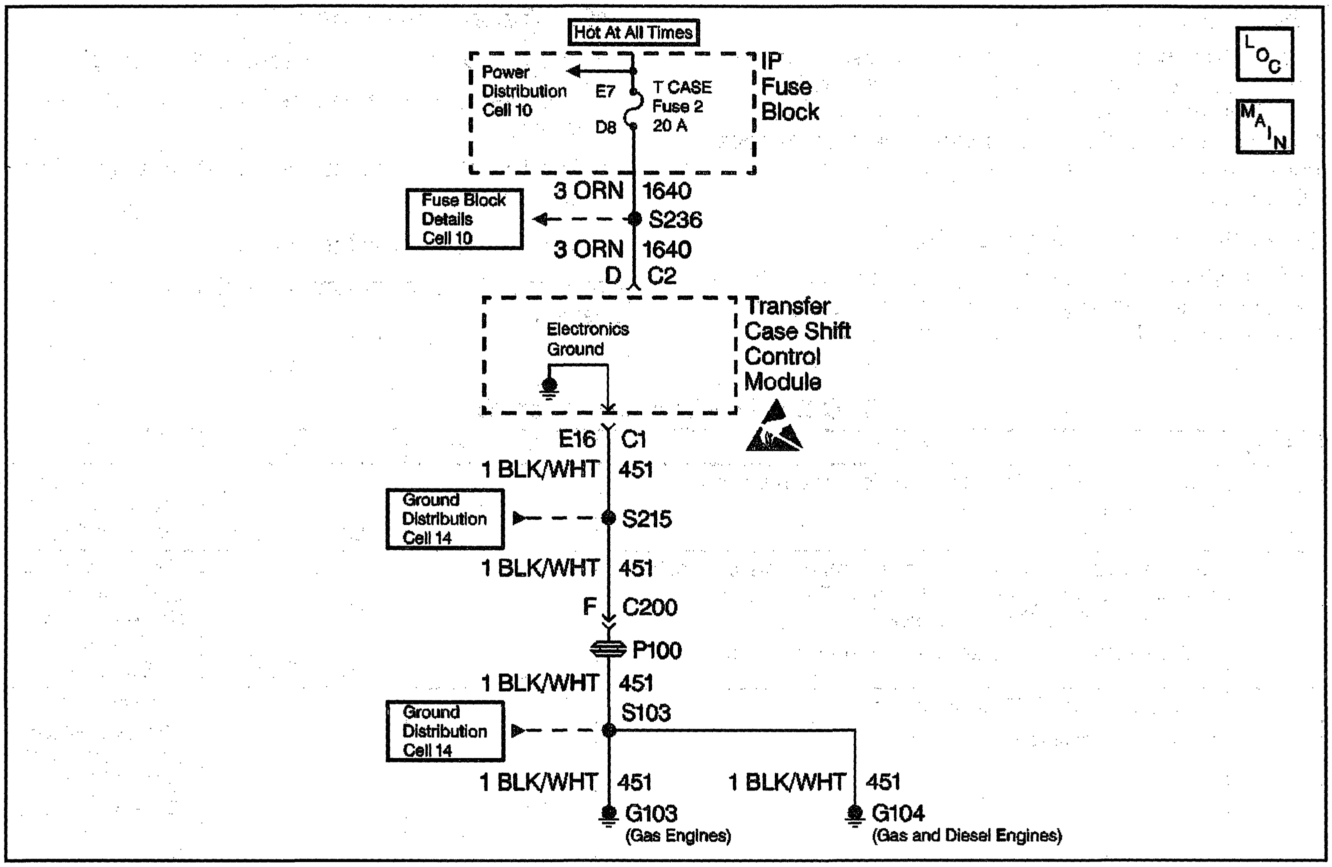
Conditions for Clearing the DTC

A history DTC will clear after a valid VIN digit is received.

DTC C0611 VIN Information Error

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	Using a *Scan Tool,* check all the components connected to the Class 2 serial data line. Refer to *Data Link Communications System Check.* Is the Class 2 serial data line communicating properly?	—	Go to *Step 3*	Go to *Data Link Communications System Check* in Electrical Diagnosis.
3	Check the VCM EEPROM calibration. Is the PCM calibration correct?	—	Go to *Step 4*	Go to *A Powertrain On Board Diagnostic (OBD) System Check* for 4.3L, *A Powertrain On Board Diagnostic (OBD) System Check* for 5.0, 5.7L, and *A Powertrain On Board Diagnostic (OBD) System Check* for 6.5L
4	Check the transfer case shift control module for the correct part number. Is the transfer case shift control module part number correct?	—	Go to *Step 5*	*Step 5*
5	Replace the transfer shift control module with the correct part number. Have all the ATC components been reconnected and properly mounted?	—	Go to *Transfer Case Diagnostic System Check*	—

DTC C0895 Device Voltage Malfunction



450764

Circuit Description

The direct battery supply line (circuit 1640) provides the power to the module and motor circuitry.

This DTC detects a intermittent absence of battery voltage at the module when the module sees an ignition on voltage.

Conditions for Setting the DTC

The transfer case shift control module did not power up 8 out of the last 19 ignition cycles.

Action Taken When the DTC Sets

There are no default actions associated with this DTC. The SERVICE AWD/4WD lamp will not be latched on.

Conditions for Clearing the DTC

- Current DTC

  The transfer case shift control module will clear the DTC if the condition for setting the DTC no longer exists.
- History DTC
  - Once 100 consecutive ignition cycles without a fault present.
  - You issue a scan tool CLEAR CODES command.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

4. This step determines if an intermittent open exists in circuit 1640.
6. This step determines if an intermittent open exists in circuit 1640.

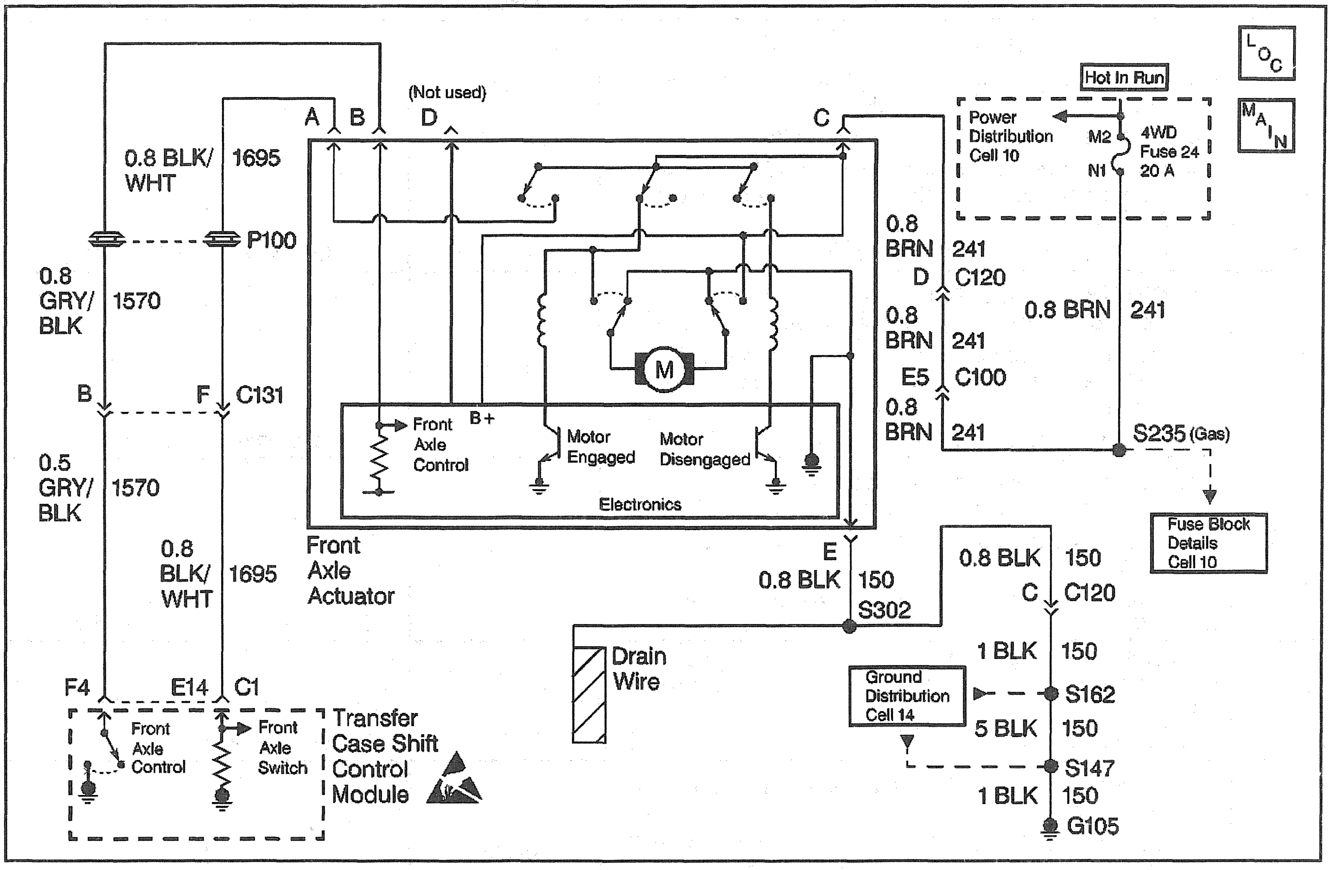
DTC C0895 Device Voltage Malfunction

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	Inspect the ATC Fuse in the Underhood Bussed Electrical Center. Is the fuse good?	—	Go to *Step 9*	Go to *Step 3*
3	1. Replace fuse. 2. Turn the ignition switch to the RUN position for 10 seconds. 3. Turn the ignition switch to the OFF position. 4. Remove the ATC Fuse. 5. Inspect the fuse. Is the fuse good?	—	Go to *Step 4*	Go to *Step 9*
4	1. Disconnect connector C2 at the transfer case shift control module. 2. Connect a *J 39200* DMM from cavity D (ORN) 1640 to ground and check for voltage. 3. While observing the DMM display wiggle the wire harness. Did the DMM display ever drop below battery voltage?	9–14 V	Go to *Step 5*	Go to *Step 6*
5	Repair a open condition in CKT 1640. Are the repairs complete?	—	Go to *Step 12*	—
6	1. Connect the *J 39200* from cavity C (BLK) 150 to ground and check for resistance. 2. While observing the *J 39200* display wiggle the wire harness. Is the resistance measured ever greater than the specified values?	0–5 Ω	Go to *Step 7*	Go to *Step 8*
7	Repair an open or poor ground condition in CKT 150. Refer to Wiring Repairs in Electrical Diagnosis. Are the repairs complete?	—	Go to *Step 12*	—
8	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 12*	—
9	1. Turn Ignition switch to the OFF position. 2. Disconnect connectors C1 at the underhood bussed electrical center and C2 at the shift control module. 3. Connect a *J 39200* from cavity D 1640 to ground and check for resistance. 4. While observing the DMM display wiggle the wire harness. Is the resistance measured ever less than the specified value?	OL	Go to *Step 11*	Go to *Step 10*
10	1. Replace the transfer case shift control module. Refer to transfer case shift control module replacement. 2. Replace ATC Fuse. Are the repairs complete?	—	Go to *Step 12*	—
11	1. Repair a short to ground condition in CKT 1640. 2. Replace the ATC Fuse. Are the repairs complete?	—	Go to *Step 12*	—

DTC C0895 Device Voltage Malfunction (cont'd)

Step	Action	Value(s)	Yes	No
12	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 13*	—
13	Clear all ATC codes. Have all the ATC codes been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Front Axle Will Not Engage



450757

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

3. This step determines if the front axle actuator has a good power and ground supplied to it.
4. This step determines if the transfer case shift control module is providing the ground signal to the front axle actuator through terminal B in order to drive the front axle actuator motor.
5. This step determines if the transfer case shift control module is able to sense voltage on CKT 1695.

Front Axle Will Not Engage

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition ON, engine OFF. 2. Connect a *Scan Tool* in order to monitor Front Axle Switch status. 3. Use the *Scan Tool* to engage the front Axle. Does the Front Axle Switch display change from Unlocked to Locked?	—	Go to *Step 6*	Go to *Step 3*

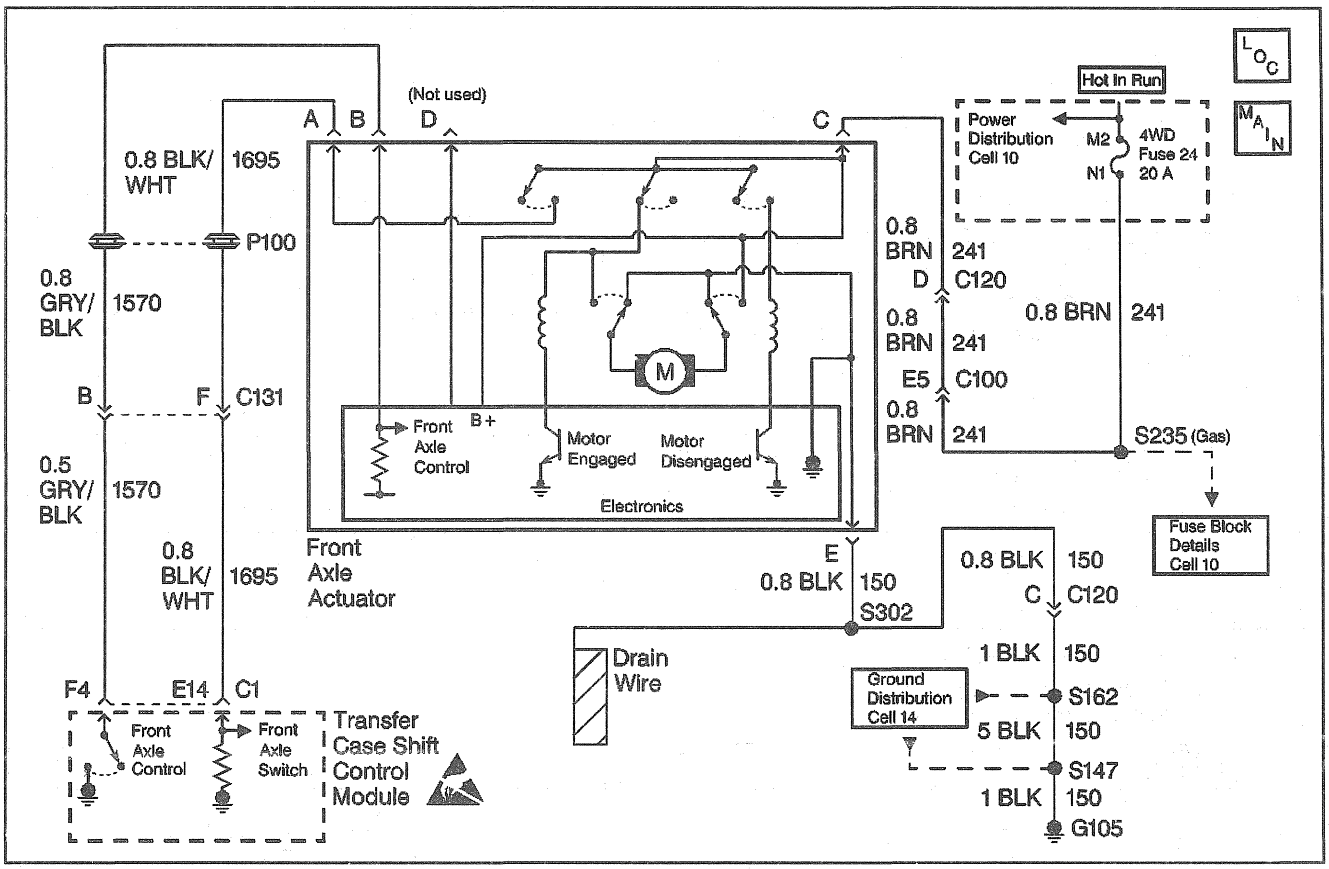
Front Axle Will Not Engage (cont'd)

Step	Action	Value(s)	Yes	No
3	1. Turn the ignition Off. 2. Disconnect the harness connector at the Front Axle Actuator. 3. Turn the ignition switch On, engine Off. 4. Connect a *J 39200* Digital Multimeter DMM between harness connector terminals C and E at the Front Axle Actuator. Is the voltage within the value specified?	9–14 V	Go to *Step 4*	Go to *Step 9*
4	1. Connect a *J 39200* DMM between Front Axle Actuator harness connector terminals B and C. 2. Monitor the voltage reading on the *J 39200* DMM while using the *Scan Tool* in order to engage the front axle. Is the voltage reading within the specified values?	9–14 V	Go to *Step 5*	Go to *Step 14*
5	1. Connect a jumper wire between the front axle actuator harness connector terminals A and C. 2. Use the *Scan Tool* in order to read the Front Axle Switch status. Does the *Scan Tool* show the Front Axle Switch status Locked?	—	Go to *Step 17*	Go to *Step 7*
6	Inspect the front axle for mechanical concerns, if no mechanical concerns are present replace the Front Axle Actuator. Is the repair complete?	—	Go to *Step 19*	—
7	1. Disconnect the connectors at the transfer case shift control module. 2. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminal E14 and front axle actuator harness connector terminal A. Is the resistance reading within the specified values?	0–0.5 V	Go to *Step 16*	Go to *Step 8*
8	Repair open in CKT 1695. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 19*	—
9	1. Connect a *J 39200* DMM between Front Axle Actuator harness connector terminals C and ground. 2. Observe the voltage reading on the *J 39200* DMM. Is the voltage reading within the specified values?	9–14 V	Go to *Step 10*	Go to *Step 11*
10	Repair open in CKT 2150. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 19*	—
11	Inspect the 4WD fuse in CKT 241 for continuity. Is the fuse good?	—	Go to *Step 12*	Go to *Step 13*
12	Repair open in CKT 241. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 19*	—
13	1. Replace 4WD fuse in CKT 241. 2. Turn the ignition On, engine Off. 3. Wait 2 minutes and reinspect the fuse. Is the fuse good?	—	Go to *Step 19*	Go to *Step 18*

Front Axle Will Not Engage (cont'd)

Step	Action	Value(s)	Yes	No
14	1. Disconnect the connectors at the transfer case shift control module. 2. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminal F4 and front axle actuator harness connector terminal B. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 16*	Go to *Step 15*
15	Repair open in CKT 1296. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 19*	—
16	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 19*	—
17	Replace the front axle actuator. Refer to *Electric Motor Actuator Replacement.* Is the action complete?	—	Go to *Step 19*	—
18	Repair short to ground in CKT 241. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 19*	—
19	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 20*	—
20	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Front Axle Will Not Disengage



450757

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

3. This step determines if the front axle actuator has a good power and ground supplied to it.
4. This step determines if the transfer case shift control module is providing the ground signal to the front axle actuator through terminal B in order to drive the front axle actuator motor.
5. This step determines if the transfer case shift control module is able to sense voltage on CKT 1695.
6. This step determines if the front axle switch is suppling power to the transfer case shift control module.

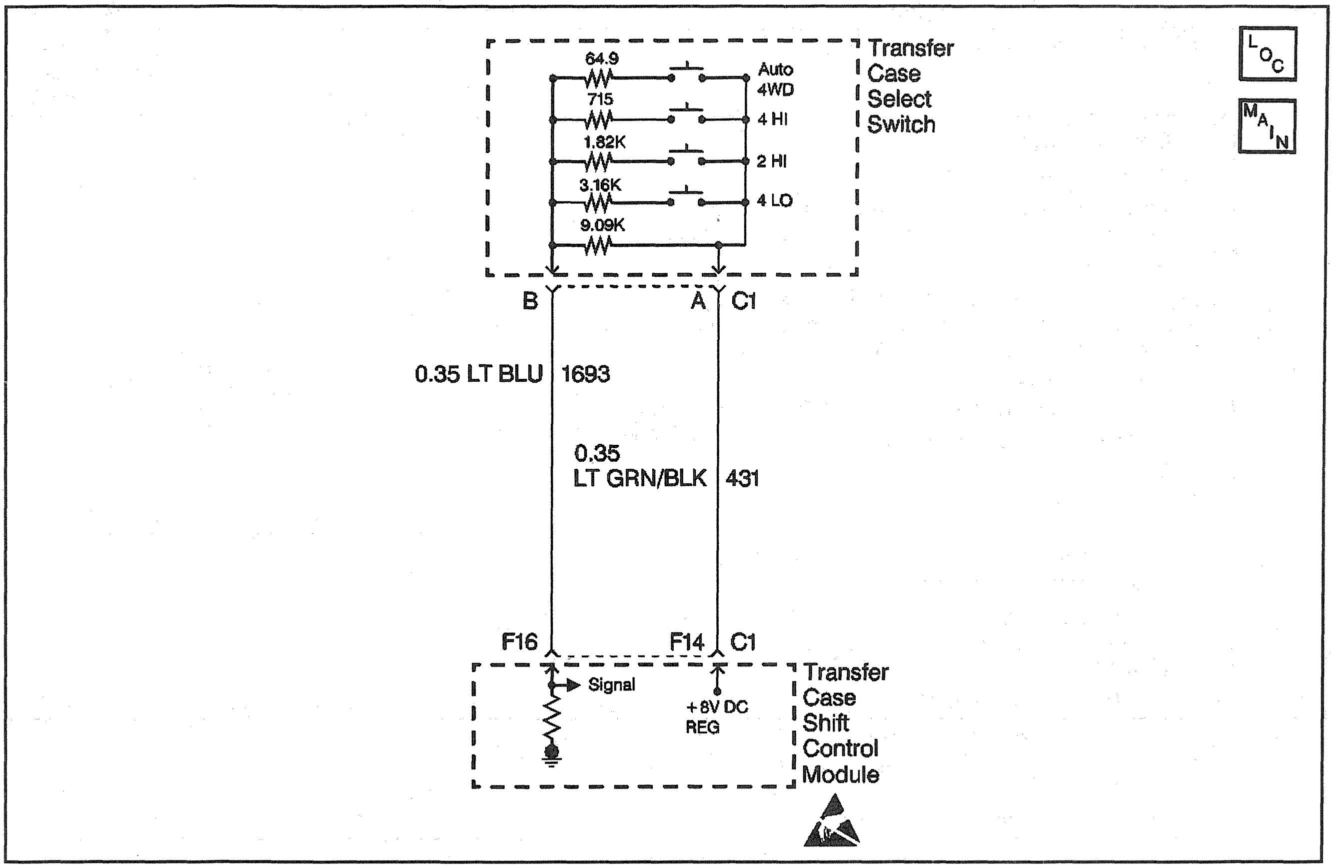
Front Axle Will Not Disengage

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition On, engine Off. 2. Ensure that the vehicle is in 2WD mode. 3. Use the *Scan Tool* in order to read the Front Axle Switch status. Does the *Scan Tool* show the Front Axle Switch status Locked?	—	Go to *Step 6*	Go to *Step 3*
3	1. Turn the ignition Off. 2. Disconnect the harness connector at the Front Axle Actuator. 3. Turn the ignition switch On, engine Off. 4. Connect a *J 39200* Digital Multimeter DMM between harness connector terminals C and E at the Front Axle Actuator. Is the voltage within the value specified?	9–14 V	Go to *Step 4*	Go to *Step 12*
4	1. Connect a *J 39200* DMM between Front Axle Actuator harness connector terminals B and C. 2. Monitor the voltage reading on the *J 39200* DMM while using the *Scan Tool* in order to engage the front axle. Is the voltage reading within the specified value?	9–14 V	Go to *Step 5*	Go to *Step 17*
5	1. Connect a jumper wire between Front Axle Actuator harness connector terminals A and C. 2. Use the *Scan Tool* in order to read the Front Axle Switch status. Does the *Scan Tool* show the Front Axle Switch status Locked?	—	Go to *Step 20*	Go to *Step 10*
6	1. Disconnect the Front Axle Actuator connector. 2. Use the *Scan Tool* in order to read the Front Axle Switch status. Does the *Scan Tool* show the Front Axle Switch status Locked?	—	Go to *Step 8*	Go to *Step 7*
7	Inspect the front axle for mechanical concerns, if no mechanical concerns are present replace the Front Axle Actuator. Is the repair complete?	—	Go to *Step 22*	—
8	1. Connect a *J 39200* DMM between Front Axle Actuator harness connector terminals A and E. 2. Observe the voltage reading on the *J 39200* DMM. Is the voltage reading within the specified values?	0–0.5 V	Go to *Step 19*	Go to *Step 9*
9	Repair a short to voltage in CKT 1695. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
10	1. Disconnect the connectors at the transfer case shift control module. 2. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminal E14 and front axle actuator harness connector terminal A. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 19*	Go to *Step 11*
11	Repair open in CKT 1695. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—

Front Axle Will Not Disengage (cont'd)

Step	Action	Value(s)	Yes	No
12	1. Connect a *J 39200* DMM between Front Axle Actuator harness connector terminals C and ground. 2. Observe the voltage reading on the *J 39200* DMM. Is the voltage reading within the specified values?	9–14 V	Go to *Step 13*	Go to *Step 14*
13	Repair open in CKT 2150. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
14	Inspect the 4WD fuse in CKT 241 for continuity. Refer to *Wiring Repairs* in Wiring Systems. Is the fuse good?	—	Go to *Step 15*	Go to *Step 16*
15	Repair open in CKT 241. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
16	1. Replace 4WD fuse in CKT 241. 2. Turn the ignition On, engine Off. 3. Wait 2 minutes and reinspect the fuse. Is the fuse good?	—	Go to *Step 22*	Go to *Step 21*
17	1. Disconnect the connectors at the transfer case shift control module. 2. Connect a *J 39200* DMM between transfer case shift control module harness connector C1 terminal F4 and front axle actuator harness connector terminal B. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 19*	Go to *Step 18*
18	Repair open in CKT 1296. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
19	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 22*	—
20	Replace the front axle actuator. Refer to *Electric Motor Actuator Replacement.* Is the action complete?	—	Go to *Step 22*	—
21	Repair short to ground in CKT 241. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 22*	—
22	1. Ensure that the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 23*	—
23	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Range/Mode Switch Inoperative



450729

Circuit Description

The range/mode switch circuit consists of 4 normally open switches. The transfer case shift control module supplies a regulated 8 volt DC to the switch through CKT 431. The switch has CKT 1693 to return current to the transfer case shift control module through a 9.09 K resistor located inside the switch.

The transfer case shift control module constantly monitors this signal voltage to determine the condition of the mode switch circuit. If no buttons are pressed, and the transfer case shift control module detects a voltage level outside the possible range (approx. 0.5–1.0 volts) for longer than 5 minutes, the transfer case shift control module will set this DTC or if a button is held down or sticks for a period longer than 5 minutes. When each of the switches is depressed they will complete a circuit through their own specific resistor. The transfer case shift control module continuously monitors the switch input to determine whether the 4HI, AUTO 4WD, 2HI, and 4LO button selectors are made by the driver.

Neutral may be obtained if the following conditions are met:

- The engine is running.
- The automatic transmission is in neutral (or the clutch pedal is depressed on a manual transmission application).
- The vehicle speed is below 3 MPH.
- The transfer case is in the 2HI mode.

Once these conditions have been met, pressing and holding both the 2HI and 4LO buttons for 10 seconds will shift the transfer case into neutral, turning on the red neutral indicator lamp.

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module is receiving an input from the Mode/Range Switch.
3. This step determines if the inability to change ranges is due to a faulty switch or transfer case shift control module.

Range/Mode Switch Inoperative

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool*. 2. Turn the ignition to RUN, engine ON. 3. Place transmission into neutral (or clutch pedal depressed on manual transmission applications). 4. Set Parking Brake. **Important:** Neutral Range will only be obtained by pressing and holding both the 2HI and 4LO buttons simultaneously for 10 seconds. Refer to Circuit Description. 5. Observe Commanded Mode Indicator states on the *Scan Tool* while depressing each of the Mode/Range buttons. Does the state change with the press of any of the Mode/Range buttons?	—	Go to *Step 5*	Go to *Step 3*
3	1. Use a *Scan Tool* in order to command through the ranges of the Mode/Range Switch. 2. Continue to observe Commanded Mode Indicator states on the *Scan Tool* while commanding through all ranges. Does the Mode Indicator state change?	—	Go to *Step 5*	Go to *Step 4*
4	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD)*. Is the action complete?	—	Go to *Step 6*	—
5	Replace the Mode/Range Switch. Refer to *Transfer Case Driver Control Switch Replacement (Automatic 4WD)*. Is the action complete?	—	Go to *Step 6*	—
6	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 7*	—
7	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

No Correction for Slip in AWD Mode

Test Description

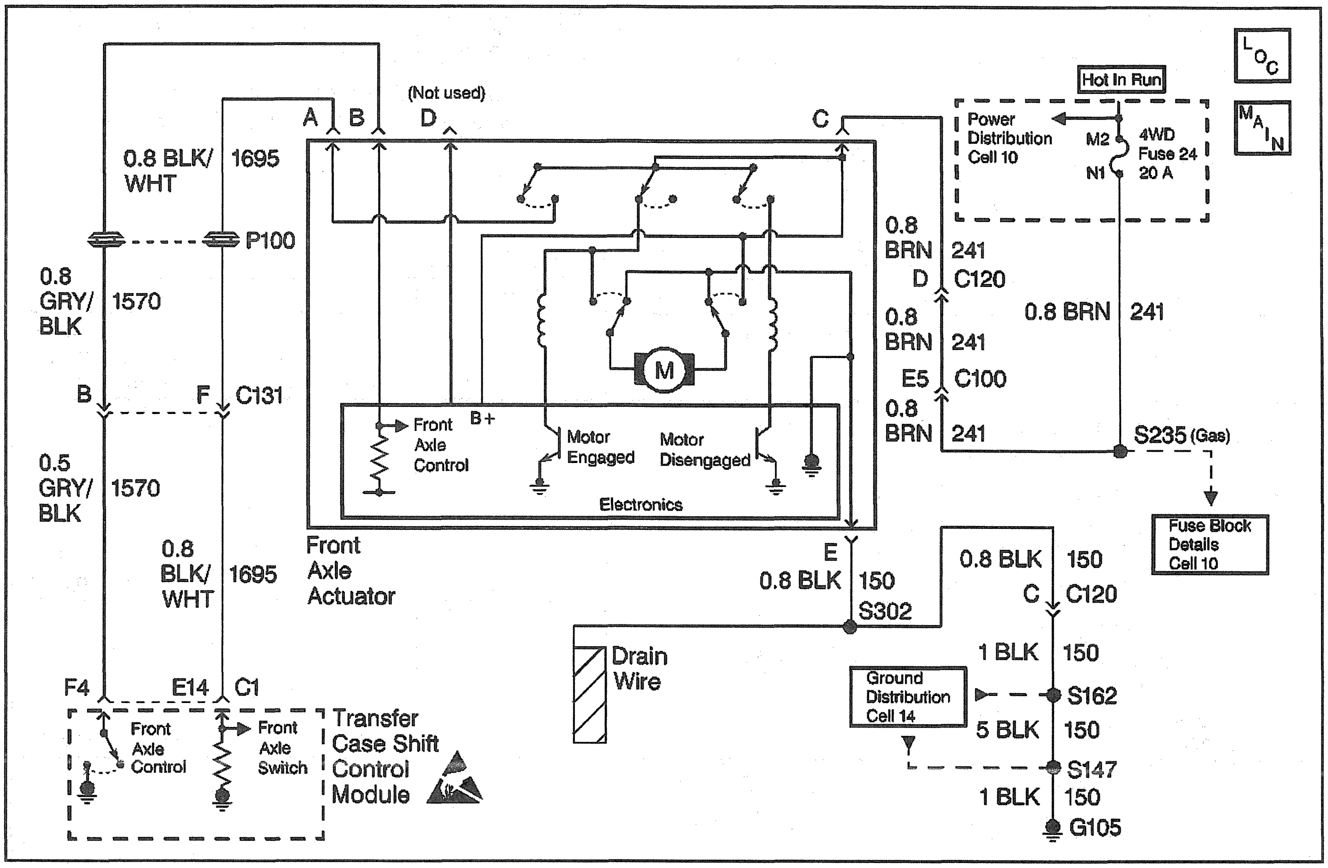
The number(s) below refer to the step number(s) on the diagnostic table.

2. The front axle switch should be in the Locked position while the vehicle is in the 4WD mode. This step determines if the front axle switch is Locked during 4WD mode.
3. This step determines if the front axle switch is Locked during AWD mode.
4. This step determines if there is a mechanical failure or a faulty transfer case shift control module.

No Correction for Slip in AWD Mode

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool*. 2. Turn the engine ON. 3. Ensure the vehicle is in 4WD mode. 4. Use the *Scan Tool* in order to view the state of the Front Axle Switch. Is the Front Axle Switch Locked?	—	Go to *Step 3*	Go to *Front Axle Will Not Engage*
3	1. Change Range/Mode state to AWD. 2. Use the *Scan Tool* in order to view the state of the Front Axle Switch. Does the state of the Front Axle Switch continue to display Locked?	—	Go to *Step 4*	Go to *Step 6*
4	1. Change Range/Mode state to back to 4WD mode. 2. Drive the vehicle for a short test drive while observing the ATC Data List. 3. Note the values of the Front and Rear Propshaft Speed at a set speed. 4. Compare the Front and Rear Propshaft Speed previously noted at the same speed. Are the rpm values approximately equal at the same speeds?	—	Go to *Step 6*	Go to *Step 5*
5	Inspect front axle and transfer case for mechanical failure. Repair/replace as needed. Are the repairs complete?	—	Go to *Step 7*	—
6	Replace transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD)*. Is the action complete?	—	Go to *Step 7*	—
7	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 8*	—
8	Clear all the ATC DTCs. Are all the ATC DTCs cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Switch Indicator Lamps Flash Continuously



450757

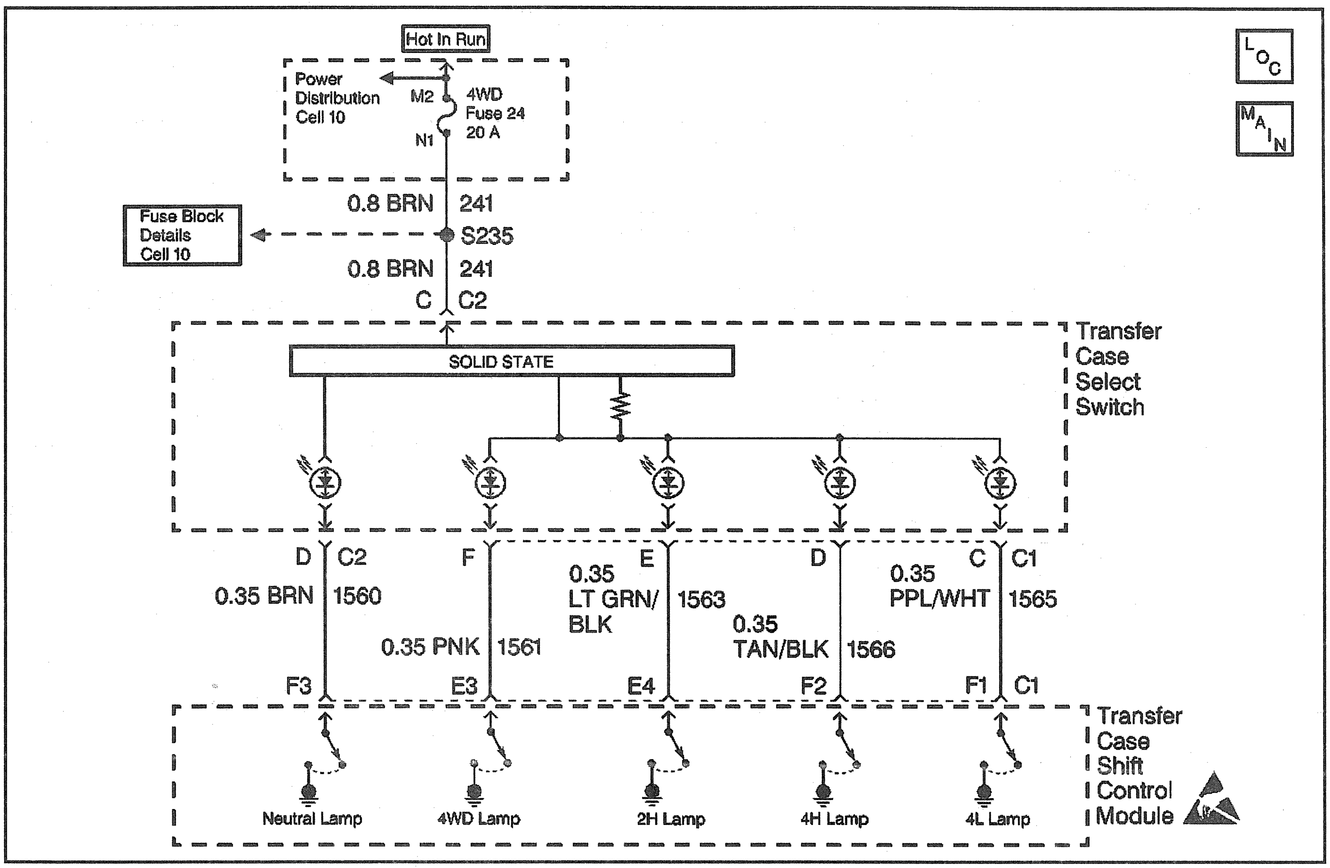
Switch Indicator Lamps Flash Continuously

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Turn the ignition ON, engine OFF. 2. Connect a *Scan Tool* in order to determine Front Axle Switch status. Does the Front Axle Switch status show the front axle Locked?	—	Go to *Step 6*	Go to *Step 3*
3	Continue to use the *Scan Tool* in order to determine if the transfer case is in Auto 4WD, 4WD HI or 4WD Low mode. Is the transfer case in Auto 4WD, 4WD HI or 4WD Low mode?	—	Go to *Step 4*	Go to *Step 13*
4	1. Disconnect the connectors at the transfer case shift control module. 2. Turn the ignition ON, engine OFF. 3. Measure the voltage between the transfer case shift control module connector C1 terminal F4. Is the voltage within the specified values?	9–14 V	Go to *Step 13*	Go to *Step 5*
5	Connect a *J 39200* Digital Multimeter DMM between the transfer case shift control module harness connector C1 terminal F4 and the front axle actuator terminal A. Is the resistance reading within the specified values?	0–5 Ω	Go to *Step 14*	Go to *Step 11*

Switch Indicator Lamps Flash Continuously (cont'd)

Step	Action	Value(s)	Yes	No
6	Continue to use the *Scan Tool* in order to determine if the transfer case is in 2WD mode. Is the transfer case in 2WD mode?	0–5 Ω	Go to *Step 7*	Go to *Step 13*
7	1. Disconnect connectors at the transfer case shift control module. 2. Measure the voltage between the transfer case shift control module harness connector C1 terminal F4 and ground. Is the voltage reading within the specified value?	0 V	Go to *Step 13*	Go to *Step 8*
8	1. Disconnect the Front Axle Actuator connector. 2. Measure the voltage between the Front Axle Actuator harness connector terminal A and Ground. Is the voltage reading within the specified value?	0 V	Go to *Step 9*	Go to *Step 12*
9	Inspect the front axle to determine if the front axle is mechanically applied. Is the front axle mechanically applied?	—	Go to *Step 10*	Go to *Step 14*
10	Service the front axle for a mechanical failure. Is the repairs complete?	—	Go to *Step 16*	—
11	Repair an open in CKT 1695. Refer to *Wiring Repairs* in wiring systems. Is the repair complete?	—	Go to *Step 16*	—
12	Repair a short to voltage in CKT 1695. Refer to *Wiring Repairs* in wiring systems. Is the repair complete?	—	Go to *Step 16*	—
13	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 16*	—
14	Replace the front axle actuator. Refer to *Indicator Switch Replacement.* Is the repair complete?	—	Go to *Step 16*	—
15	Replace the front drive axle clutch solenoid. Refer to *Electric Motor Actuator Replacement.* Is the repair complete?	—	Go to *Step 16*	—
16	Reconnect all ATC system components, make sure all the components are properly mounted. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 17*	—
17	Clear all the ATC DTCs. Are all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Switch Indicator Lamps Remain ON - Two or More



450766

Test Description

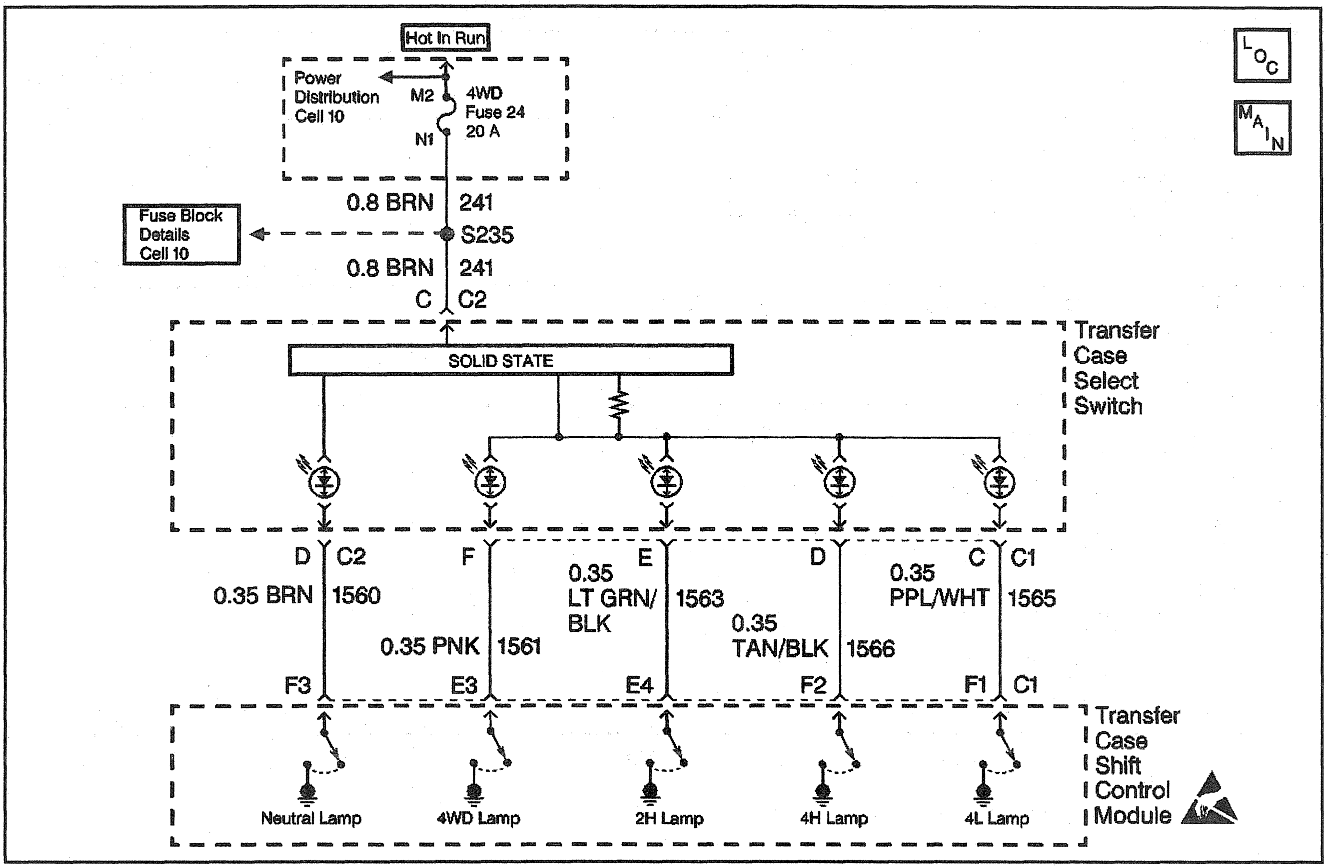
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module can electronically control the all indicator lamp circuits.
4. This step determines which indicator lamp the transfer case shift control module is correctly commanding on.
5. This step determines whether there is a short to ground in one of the indicator lamp control circuits.

Switch Indicator Lamps Remain ON - Two or More

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool.* 2. Turn the ignition ON, engine OFF. 3. Use the *Scan Tool* in order to command all the indicator lamps off. Do all the lamps go off?	—	Go to *Step 3*	Go to *Step 4*
3	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the repair complete?	—	Go to *Step 9*	—
4	1. Use the *Scan Tool* in order to determine which mode the transfer case is in. 2. Use this information to determine which lamp circuit(s) is at fault. 3. Disconnect both connectors at the Range/Mode switch. 4. Connect a *J 39200* Digital Multimeter DMM and check for resistance from the Range/Mode switch harness connector terminal(s) of the suspected circuit(s) to ground. Is the resistance reading within the specified value?	OL	Go to *Step 7*	Go to *Step 5*
5	1. Disconnect both connectors at the transfer case shift control module. 2. Connect a *J 39200* Digital Multimeter DMM and check for resistance from the Range/Mode switch harness connector terminal(s) of the suspected circuit(s) to ground. Is the resistance reading within the specified value?	OL	Go to *Step 8*	Go to *Step 6*
6	Repair a short to ground condition. Refer to *Wiring Repairs* in Wiring Systems. Are the repairs complete?	—	Go to *Step 9*	—
7	Replace the range/mode switch. Refer to *Transfer Case Driver Control Switch Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 9*	—
8	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 9*	—
9	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 10*	—
10	Clear all ATC DTCs. Have all ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Switch Indicator Lamps Do Not Light - One or More



450766

Test Description

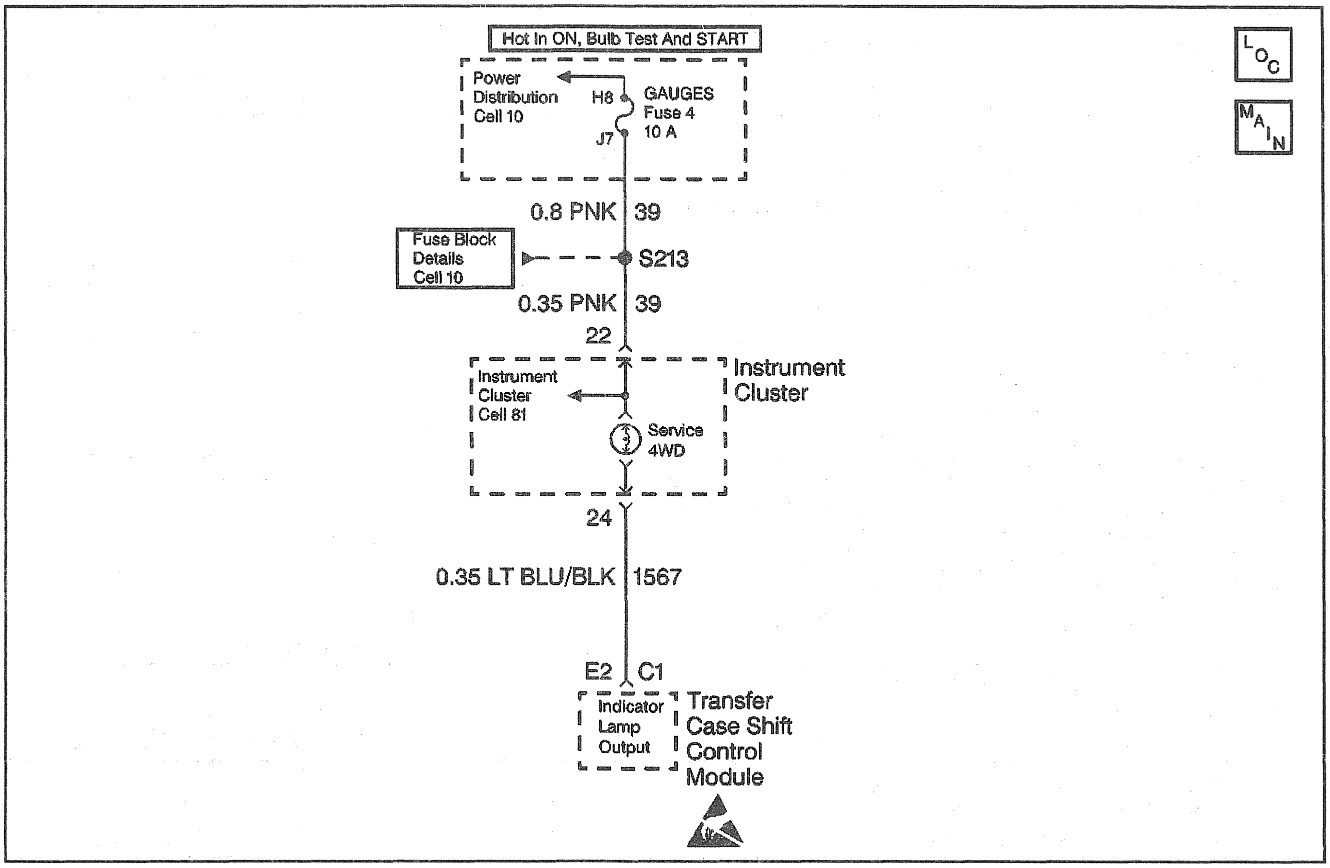
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module has electronic control of the switch indicator lamps.
4. This step provides a ground to the indicator lamp circuits in order to eliminate the transfer case shift control module.
5. This step checks for B+ in the indicator lamp circuits.

Switch Indicator Lamps Do Not Light - One or More

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool*. 2. Turn the ignition to RUN, engine OFF. 3. Use the *Scan Tool* in order to command each of the switch indicator lamps On. Do the switch indicator lamps turn On?	—	Go to *Step 7*	Go to *Step 3*
3	1. Use the *Scan Tool* to view the ATC Data List. 2. Observe the states of the Indicator Lamps. 3. Use the *Scan Tool* in order to command each of the switch indicator lamps On. Do each of the switch indicator lamp states change from OFF to ON as Indicator Lamps are commanded ON?	—	Go to *Step 7*	Go to *Step 4*
4	1. Disconnect both connectors at the transfer case shift control module. 2. Use a fused jumper wire in order to jump to ground each of the indicator lamp circuits. Do each of the lamps illuminate when its circuit is grounded?	—	Go to *Step 7*	Go to *Step 5*
5	Connect a *J 39200* Digital Multimeter DMM between the suspect circuit and ground in order to measure voltage. Is the voltage within the specified value?	9–14 V	Go to *Step 8*	Go to *Step 6*
6	Inspect the suspect circuit(s) for open. Refer to *Wiring Repairs* in Wiring Systems. Were the suspected circuit(s) open?	—	Go to *Step 9*	Go to *Step 8*
7	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 10*	—
8	Replace the range/mode switch. Refer to *Transfer Case Driver Control Switch Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 10*	—
9	Repair an open in the suspect circuit(s). Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 10*	—
10	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 11*	—
11	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Service Indicator Stays ON When Key is ON



450722

Test Description

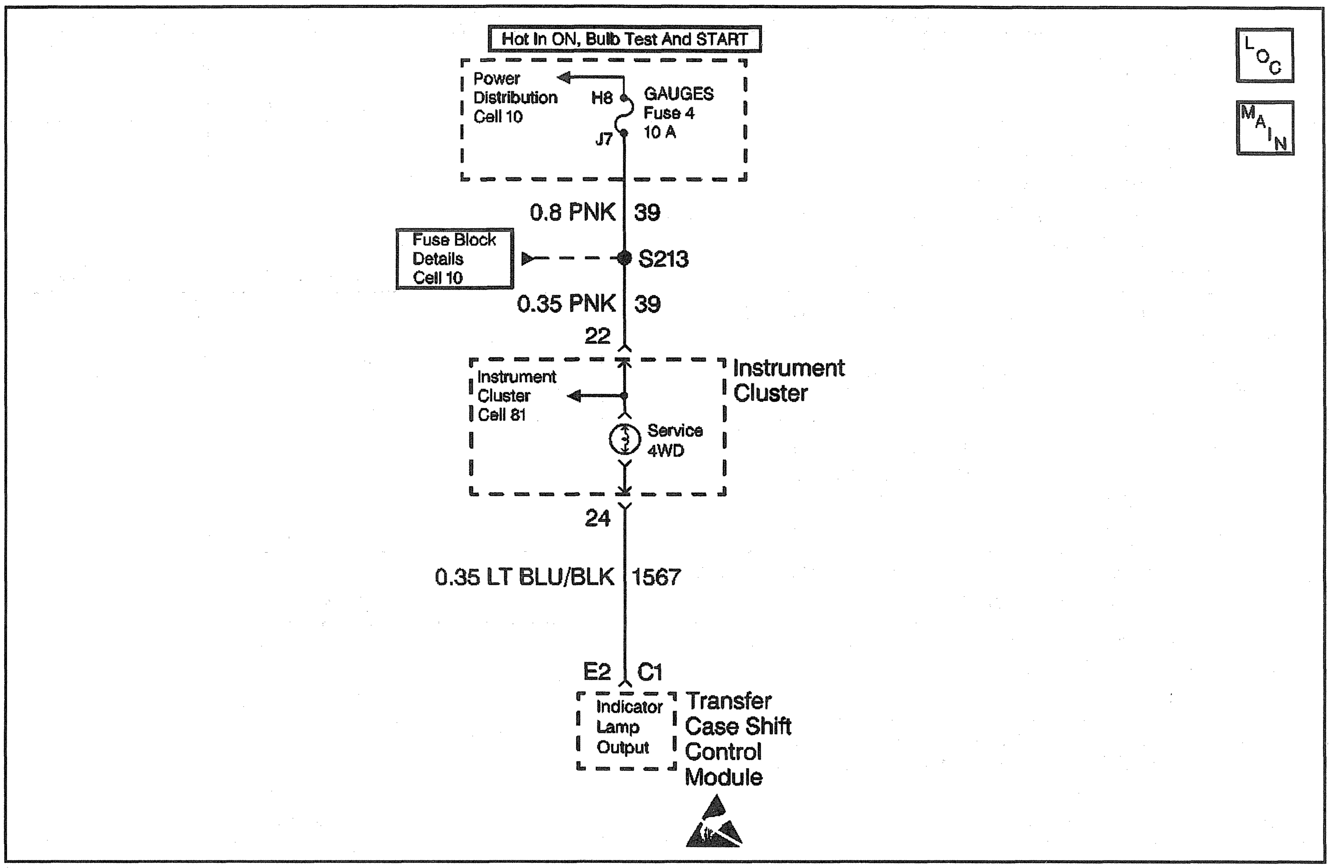
The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module has electronic control of the Service Indicator.
3. This step determines if there is an internal short to ground in the transfer case shift control module.
4. This step determines if CKT 1567 is shorted to ground.

Service Indicator Stays ON When Key is ON

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool*. 2. Turn the ignition to RUN, engine OFF. 3. Use the *Scan Tool* in order to command the Service Indicator Off. Does the Service Indicator turn Off?	—	Go to *Step 7*	Go to *Step 3*
3	Disconnect both connectors at the transfer case shift control module. Does the Service Indicator turn Off?	—	Go to *Step 7*	Go to *Step 4*
4	1. Disconnect the connector at the Instrument cluster. 2. Connect a *J 39200* Digital Multimeter DMM and measure the resistance between the Instrument Cluster harness connector terminal 24 and ground. Is the resistance within the specified value?	OL	Go to *Step 5*	Go to *Step 6*
5	Service Instrument Cluster for short to ground condition. Is the action complete?	—	Go to *Step 8*	—
6	Repair a short to ground in CKT 1567. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 8*	—
7	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD)*. Is the action complete?	—	Go to *Step 8*	—
8	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 9*	—
9	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Service Indicator Does Not Light



450722

Test Description

The number(s) below refer to the step number(s) on the diagnostic table.

2. This step determines if the transfer case shift control module has electronic control of the Service Indicator.
3. This step determines if there is an internal fault with the transfer case shift control module.
4. This step check CKT 1567 for open.
5. This step check CKT 39 for open.

Service Indicator Does Not Light

Step	Action	Value(s)	Yes	No
1	Was the Transfer Case Diagnostic System Check performed?	—	Go to *Step 2*	Go to *Transfer Case Diagnostic System Check*
2	1. Connect a *Scan Tool.* 2. Turn the ignition to RUN, engine OFF. 3. Use the *Scan Tool* in order to command the Service Indicator On. Does the Service Indicator turn On?	—	Go to *Step 11*	Go to *Step 3*
3	1. Turn the ignition to RUN, engine OFF. 2. Disconnect both connectors at the transfer case shift control module. 3. Connect a fused jumper wire from the at the transfer case shift control module harness connector C1 terminal E2 to ground. Does the Service Indicator turn On?	—	Go to *Step 11*	Go to *Step 4*
4	1. Disconnect the connector at the Instrument cluster. 2. Connect a *Scan Tool* Digital Multimeter DMM between the instrument cluster harness connector terminal 24 and transfer case shift control module harness connector C1 terminal E2 and measure the resistance. Is the resistance within the specified values?	0–5Ω	Go to *Step 5*	Go to *Step 8*
5	Connect a *Scan Tool* DMM between the instrument cluster harness connector terminal 22 and ground. Is the voltage reading within the specified values?	9–14 V	Go to *Step 6*	Go to *Step 9*
6	Inspect the Service Indicator lamp bulb for open. Is the Service Indicator lamp bulb for open?	—	Go to *Step 10*	Go to *Step 7*
7	Service Instrument Cluster for an open condition. Is the action complete?	—	Go to *Step 12*	—
8	Repair open in CKT 1567. Refer to Wiring Repairs in Electrical Diagnostics. Is the repair complete?	—	Go to *Step 12*	—
9	Repair open in CKT 39. Refer to *Wiring Repairs* in Wiring Systems. Is the repair complete?	—	Go to *Step 12*	—
10	Replace the Service Indicator lamp bulb. Refer to *Instrument Cluster Lamp Replacement* in the instrument cluster. Is the repair complete?	—	Go to *Step 12*	—
11	Replace the transfer case shift control module. Refer to *Transfer Case Control Module Replacement (Automatic 4WD).* Is the action complete?	—	Go to *Step 12*	—
12	1. Ensure the ignition is OFF. 2. Properly mount and reconnect all previously disconnected ATC components. Have all the ATC components been reconnected and properly mounted?	—	Go to *Step 13*	—
13	Clear all ATC DTCs. Have all the ATC DTCs been cleared?	—	Go to *Transfer Case Diagnostic System Check*	—

Repair Instructions

Oil Replacement

Removal Procedure

1. Raise and support the vehicle. Refer to *Vehicle Lifting Caution* in General Information.
2. Place a container under the drain plug in order to catch the oil.
3. Remove the fill plug.
4. Remove the drain plug. Allow the oil to drain.

Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

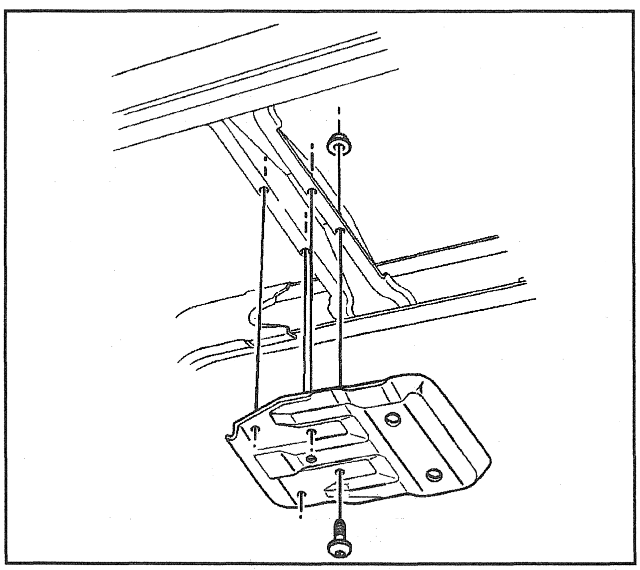
1. Install the drain plug.

   Tighten

   - Tighten the New Venture Gear drain plugs to 47 N·m (35 lb ft).
   - Tighten the Borg–Warner drain plugs to 25 N·m (18 lb ft).
2. Install the transfer case oil. Refer to *Approximate Fluid Capacities*.
3. Fill the transfer case until the oil level is at the bottom of the oil fill plug hole.
4. Install the fill plug.

   Tighten

   - Tighten the New Venture Gear drain plugs to 47 N·m (35 lb ft).
   - Tighten the Borg–Warner drain plugs to 25 N·m (18 lb ft).
5. Lower the vehicle.



175368

Shield Replacement

Removal Procedure

1. Raise and support the vehicle.
2. Remove the four bolts and the nuts securing the transfer case shield to the frame.
3. Remove the shield from the frame.

Installation Procedure

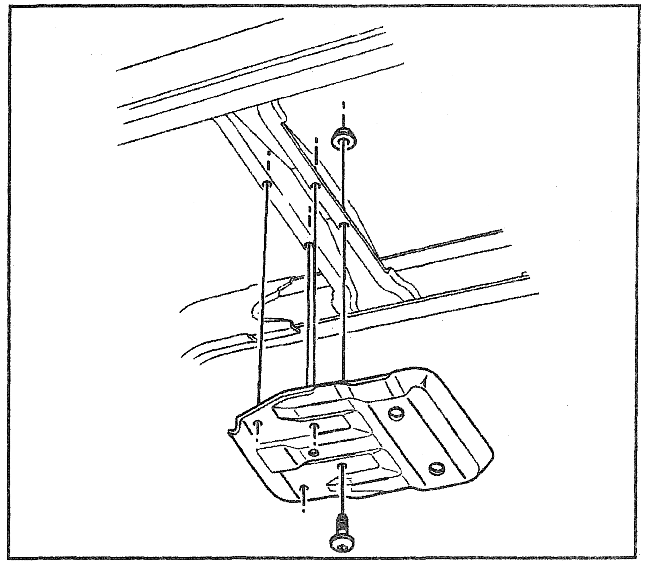
1. Install the shield to the frame.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the four bolts and the nuts securing the transfer case shield to the frame.

   Tighten

   Tighten the bolts and the nuts to 35 N·m (26 lb ft).
3. Lower the vehicle.

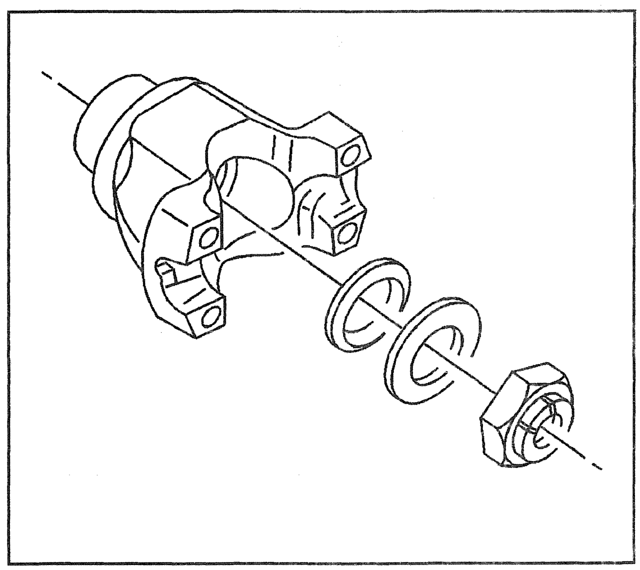


175368

Transfer Case Output Shaft Seal Replacement (New Venture)

Removal Procedure

1. Raise the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the front or the rear propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)* or *Propeller Shaft Replacement (System Balanced Assembly)* in Propeller Shaft.
3. Remove the propeller shaft yoke nut and the flat washers.
4. The yoke nut and the flat washers are not used at the rear on some models.
5. Remove the propeller shaft yoke.
6. Remove the transfer case shield. Refer to *Shield Replacement*.
7. Remove the seal.
   - Use a screwdriver in order to remove the seal.
   - Do not damage the sealing bore.



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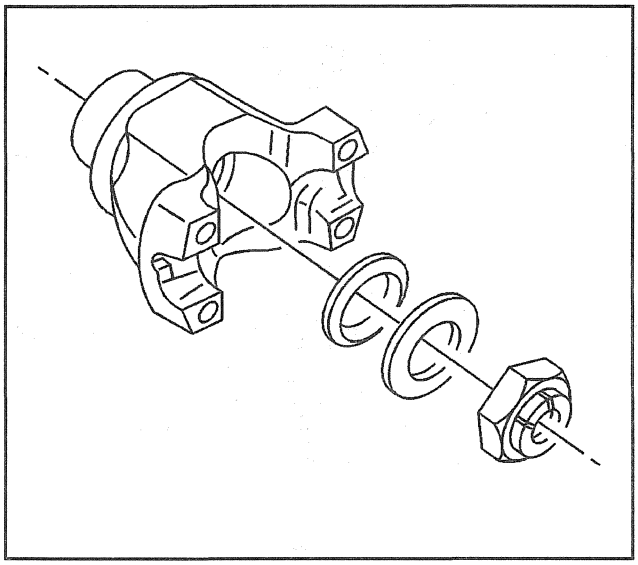


175414

Installation Procedure

Tools Required

J 29162

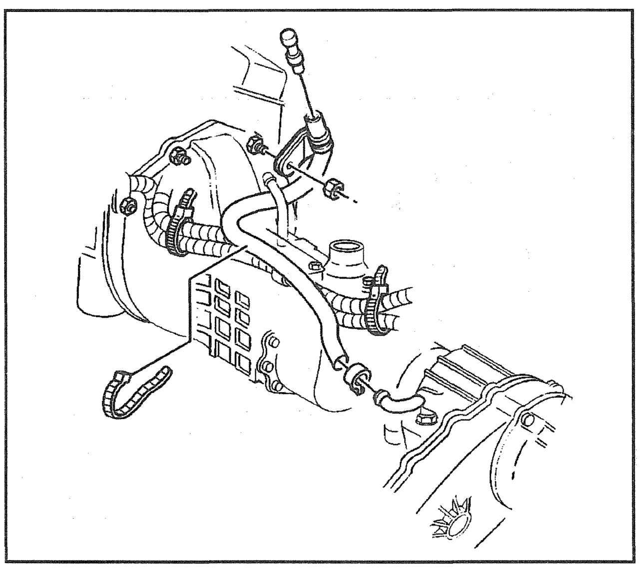
1. Install the seal.
   1.1. Lubricate the seal lips with petroleum jelly or with transmission oil.
   1.2. Install the seal using the J 33843
   1.3. For all of the vehicles except the K30 with dual rear wheels, install the New Venture Gear transfer case.
2. Install the transfer case shield. Refer to *Shield Replacement.*
3. Install the propeller shaft yoke.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Install the flat washers and the nut, if used.

   Tighten

   Tighten the New Venture Gear propeller shaft yoke nuts to 149 N·m (110 lb ft).
5. Install the propeller shaft.
   - Check the transfer case oil level and add oil as necessary. Refer to *Approximate Fluid Capacities.*
   - Lower the vehicle.



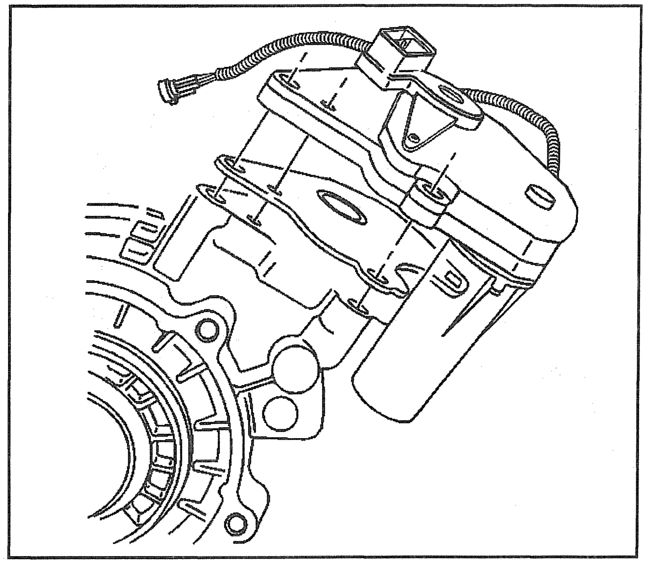
175384

Transfer Case Replacement (Auto Four Wheel Drive)

Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle* in General Information.
2. Remove the transfer case shield. Refer to *Shield Replacement.*
3. Remove the front propeller shaft. Refer to *Propeller Shaft Replacement - Two-Piece.*
4. Remove the rear propeller shaft. Refer to *Propeller Shaft Replacement (System Balanced Assembly).*
5. Disconnect the vehicle speed sensor electrical connector.
6. Disconnect the wiring harness from the transfer case.

7. Remove the transfer case motor/encoder.
   Support the transfer case with a jack.



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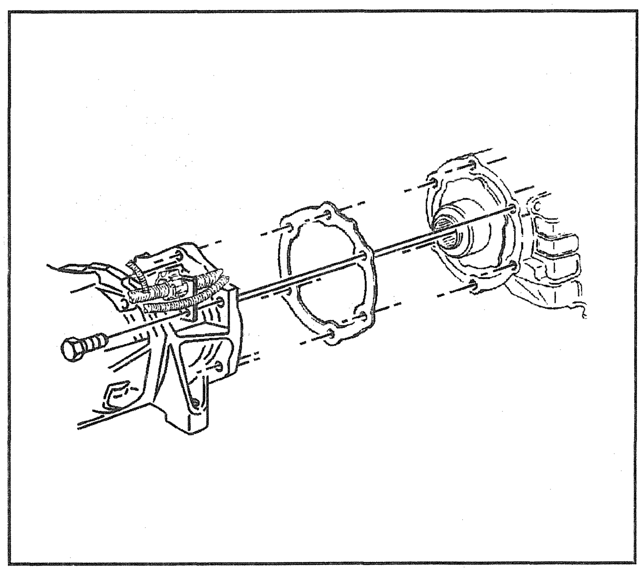
8. Remove the bolts securing the transfer case to the transmission adapter.
9. Remove the gasket.



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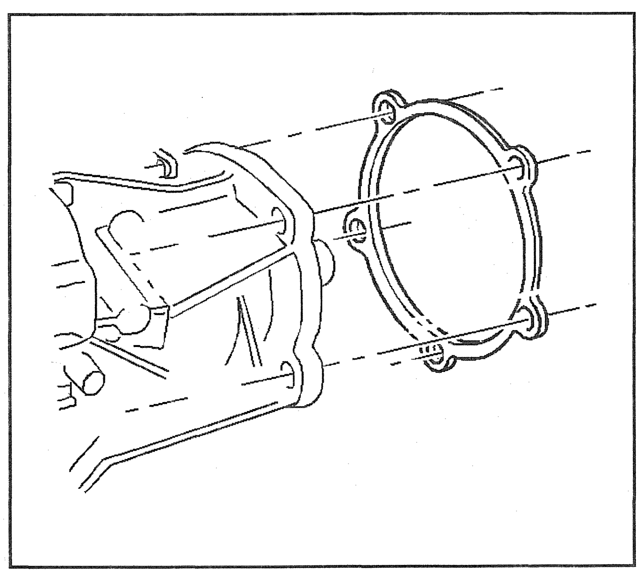
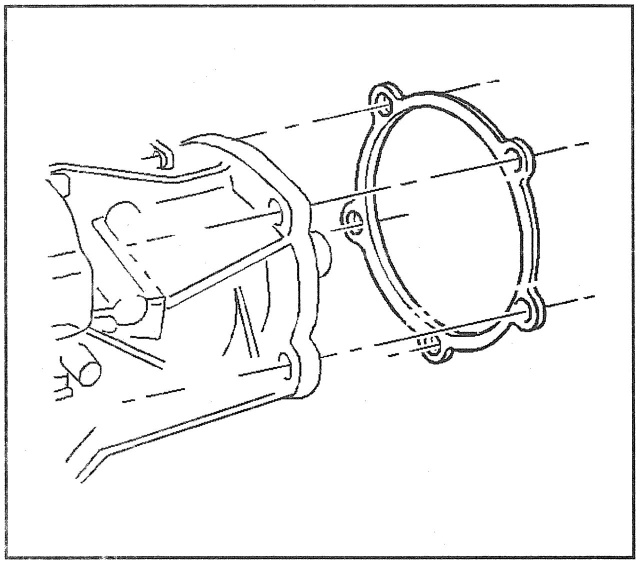
10. Discard the gasket.



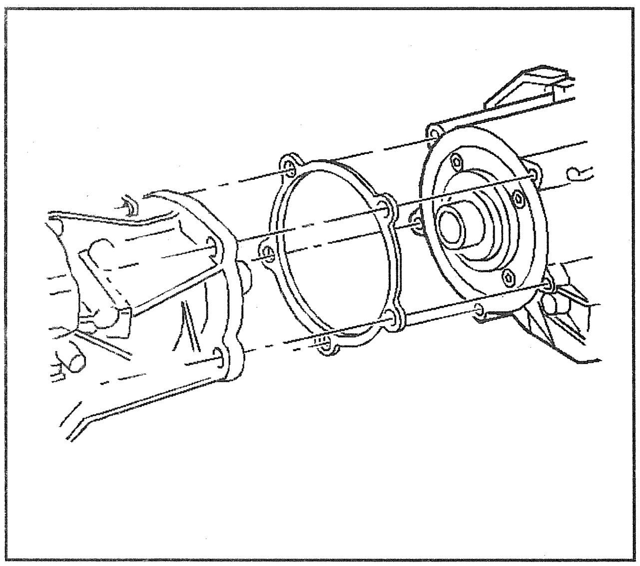
2214



2214

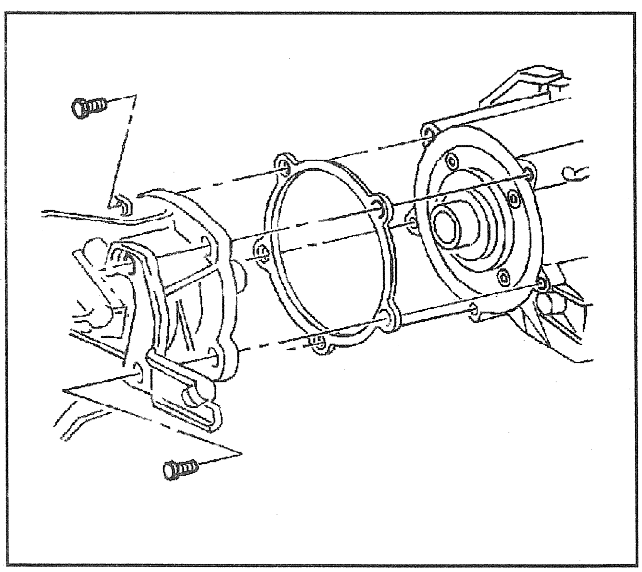
Installation Procedure

1. Install a new gasket to the transmission. Use a gasket sealer in order to hold the gasket in place.



2213

2. Install the transfer case to the transmission adapter.



2217

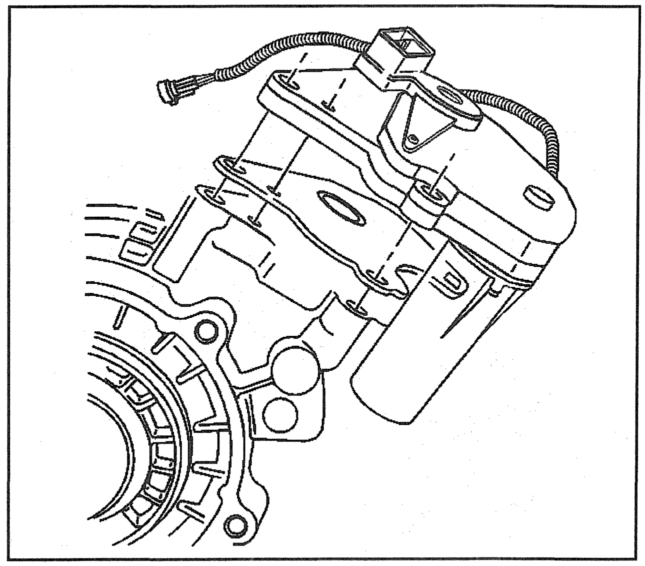
Notice: Refer to *Fastener Notice* in Cautions and Notices.

3. Install the bolts that secure the transfer case to the transmission adapter.

   Tighten

   Tighten the bolts to 45 N·m (33 lb ft).

4. Install the transfer case motor/encoder.
5. Install the electrical connectors and the wiring harness to the transfer case with the new straps.
6. Install the rear propeller shaft. Refer to *Propeller Shaft Replacement (System Balanced Assembly)*.
7. Remove the jack from the transfer case.
8. Install the front propeller shaft. Refer to *Propeller Shaft Replacement (Front Axle - All Except NP8)*.
9. Install the transfer case shield. Refer to *Shield Replacement*.
   - Check the transfer case lubricant level. Add oil as necessary. Refer to *Approximate Fluid Capacities*.
   - Lower the vehicle.

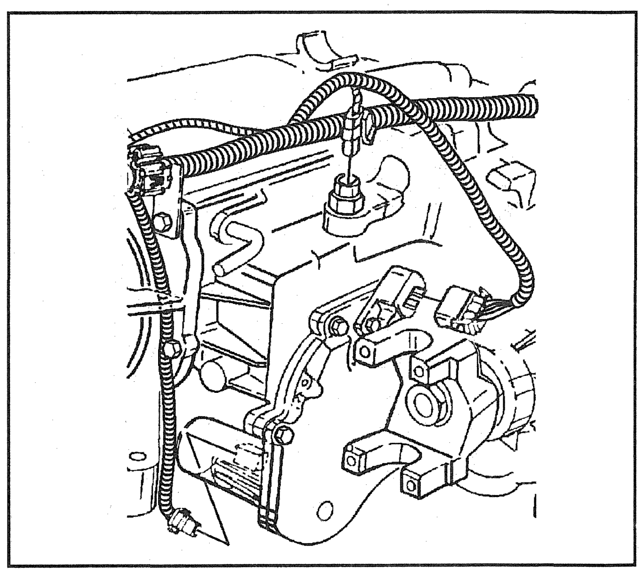


165643

Motor/Encoder Replacement (Automatic 4WD)

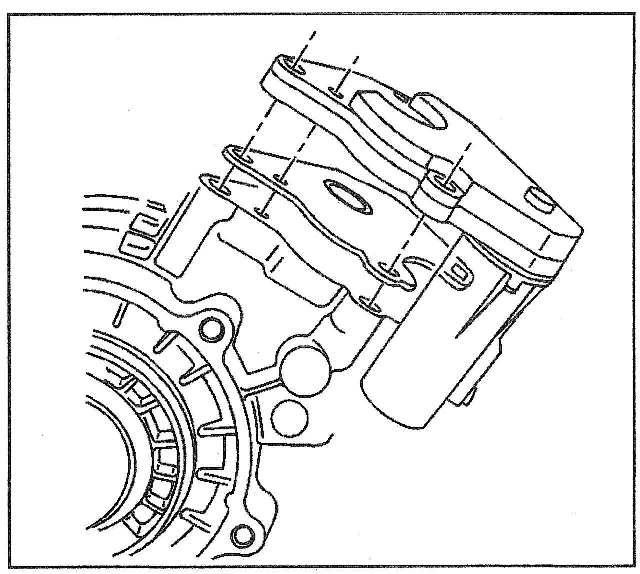
Removal Procedure

1. Remove the transfer case shield. Refer to *Shield Replacement*.
2. Remove the transfer case wiring harness connectors from the motor/encoder.

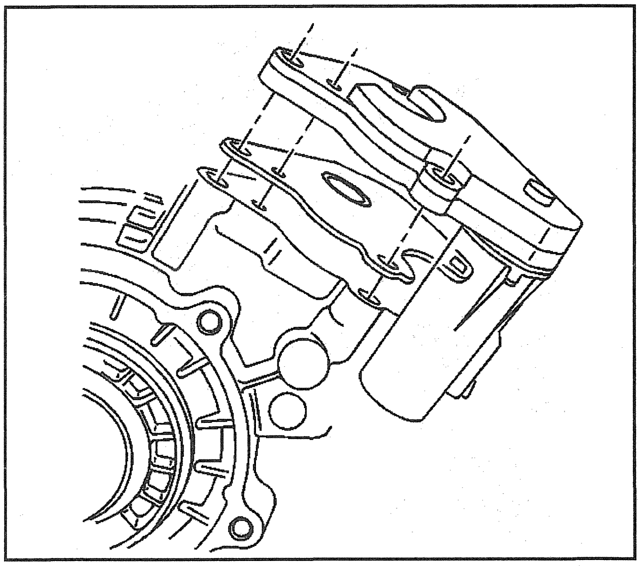


177160

3. Remove three bolts securing the motor/encoder gasket and motor/encoder to the transfer case.



165625



165625

Installation Procedure

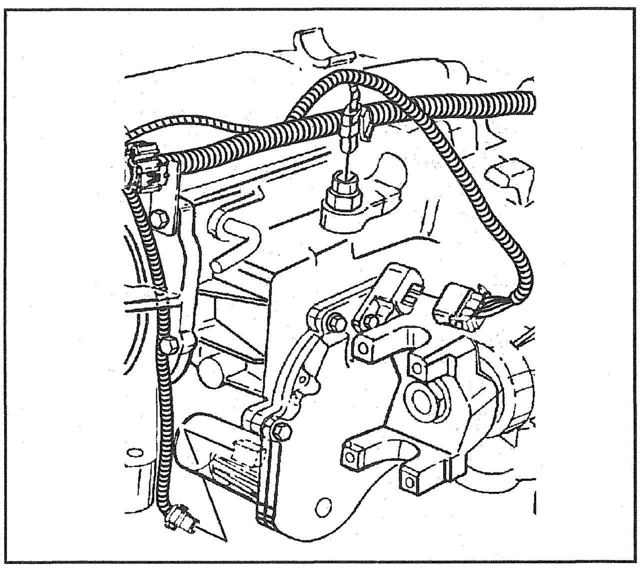
Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install three bolts securing the motor/encoder gasket and motor/encoder to the transfer case.

   Tighten

   Tighten the motor/encoder bolts to 25 N·m (18 lb ft).

   - Remove all gasket material remaining from the motor/encoder.
   - Ensure the motor/encoder aligns properly with the transfer case interior shifting components.
   - Align the motor/encoder mating surface detent with the transfer case mating surface detent.



177160

2. Install the transfer case wiring harness connector to the motor/encoder.
3. Install the transfer case shield. Refer to *Shield Replacement*.

Transfer Case Driver Control Switch Replacement (Automatic 4WD)

Removal Procedure

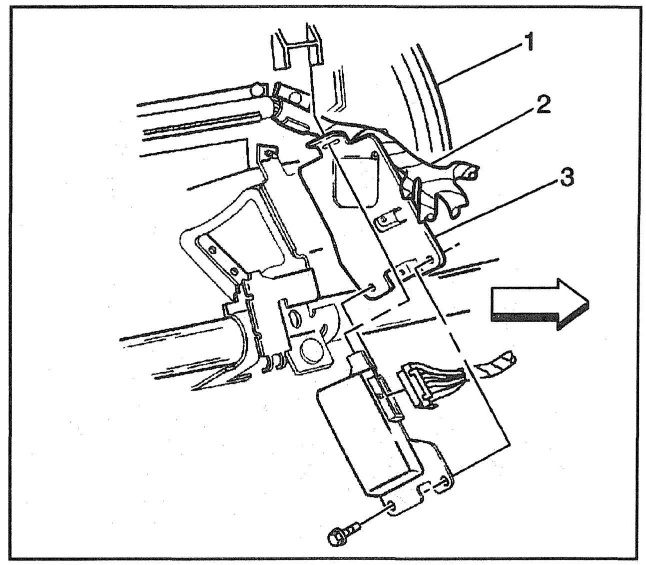
1. Remove the automatic transfer case switch from the instrument panel.
   - Pull the tabs on the rear of the switch in.
   - Pull the switch straight out from the panel.
2. Remove the electrical connector from the automatic transfer case switch.

Installation Procedure

1. Install the electrical connector to the automatic transfer case switch.
2. Install the automatic transfer case switch into the instrument panel.
3. Ensure the automatic transfer case switch locks into the instrument panel.

Transfer Case Control Module Replacement (Automatic 4WD)

Removal Procedure

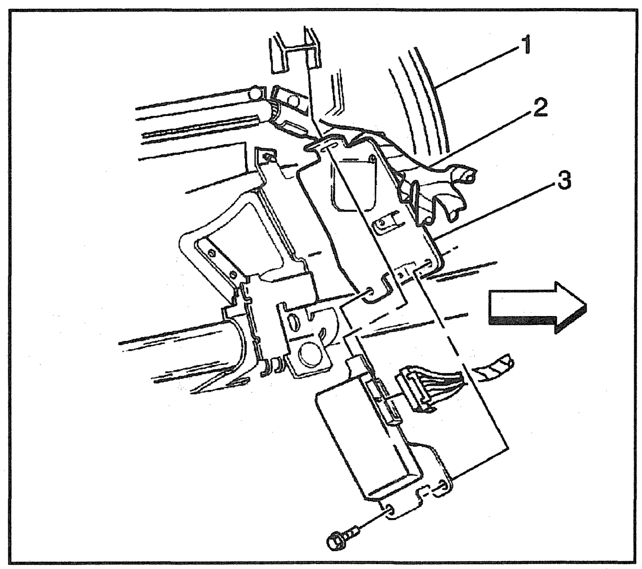


177176

1. Remove the lower instrument panel trim.
2. Remove the two screws securing the auto transfer case control module to the bracket.

   The bracket is mounted on the I/P reinforcement.
3. Remove the electrical connector from the auto transfer case control module.

Installation Procedure



177176

1. Install the electrical connector to the auto transfer case control module.

Notice: Refer to *Fastener Notice* in Cautions and Notices.

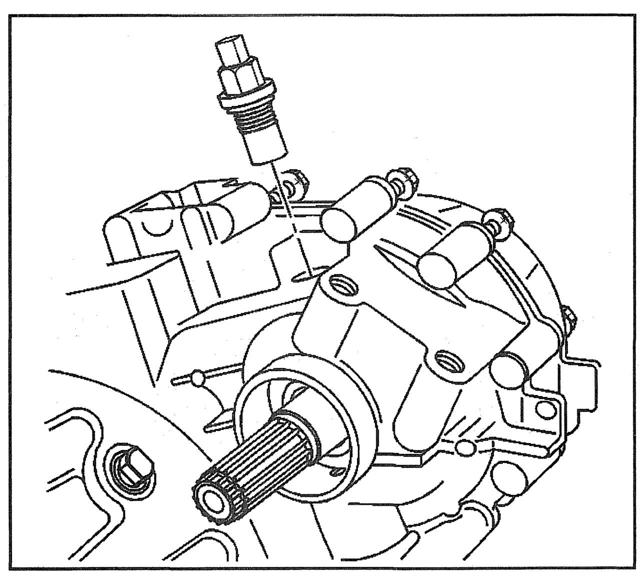
2. Install the two screws securing the auto transfer case control module to the bracket.

   Tighten

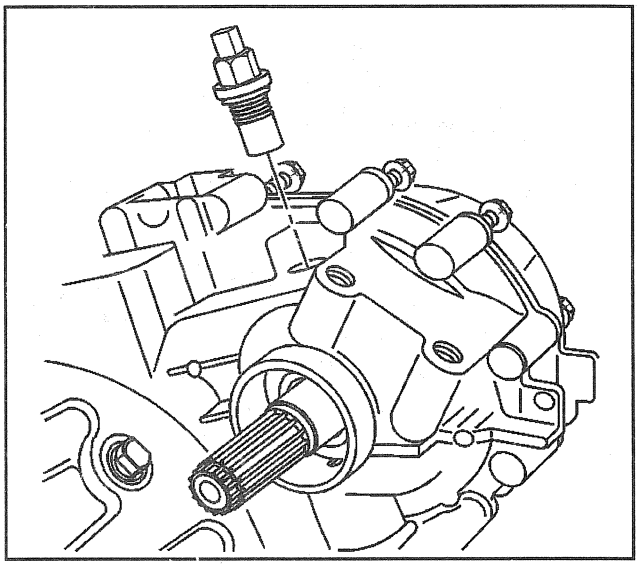
   Tighten the transfer case control module screws to 8 N·m (71 lb ft).
3. Install the lower instrument panel trim.

Speed Sensor Replacement (Front Speed Sensor Replacement)

Removal Procedure


163707

1. Remove the electrical connector from the speed sensor.
2. Remove the front speed sensor from the transfer case.



163707

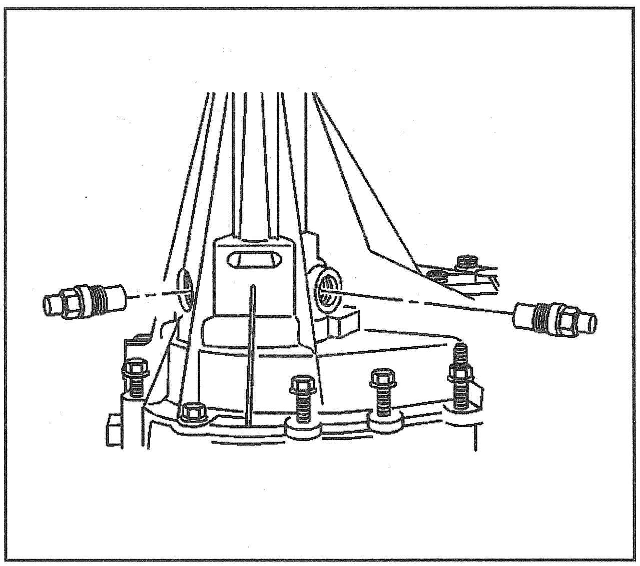
Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the front speed sensor into the transfer case.

   Tighten

   Tighten the front speed sensor to 31N·m (23 lb ft).
2. Install the electrical connector to the speed sensor.

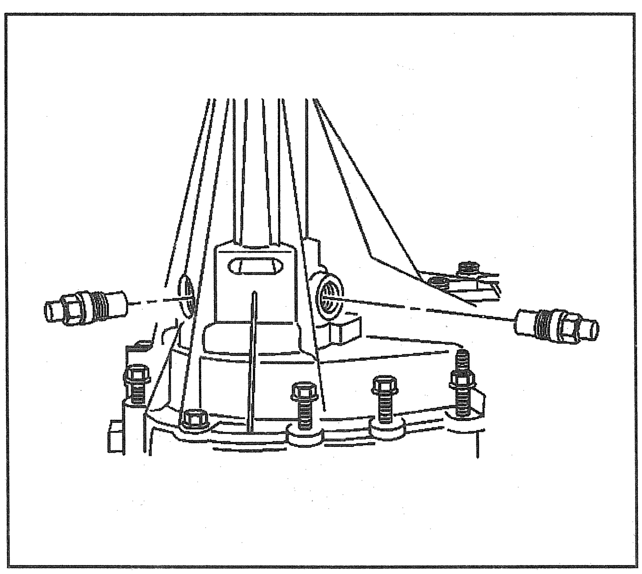


163714

Speed Sensor Replacement (Rear Speed Sensor Replacement)

Removal Procedure

1. Remove the two electrical connectors from the two rear speed sensors.
2. Remove the two rear speed sensors from the transfer case.



163714

Installation Procedure

Notice: Refer to *Fastener Notice* in Cautions and Notices.

1. Install the two rear speed sensors to the transfer case.

   Tighten

   Tighten the rear speed sensors to 31N·m (23 lb ft).
2. Install the two electrical connectors to the two rear speed sensors.

Description and Operation

Transfer Case Circuit Description

Transfer Case Shift Control Module

The transfer case shift control module uses the VIN information for calculations that are required for the different calibrations used based on axle ratio, transmission, tire size, and engine. The system does not know which calibration to use without this information.

The direct battery supply line (CKT 1640) provides the power to the module and motor circuitry.

Transfer Case Encoder Motor

The transfer case encoder motor consists of a permanent magnet (PM) DC motor and gear reduction assembly. It is located on the left hand side (drivers side) of the transfer case. When activated it turns the sector shaft of the transfer case (clockwise or counter clockwise) to shift the transfer case. The encoder motor is controlled with a pulse width modulated (PWM) circuit within the transfer case shift control module. This circuit consists of a driver on both the Motor A and Motor B circuits. The encoder motor is bi-directional to allow the motor to shift the transfer case from 2HI or 4HI to neutral and 4LO positions.

Transfer Case Encoder

The encoder is mounted to the transfer case encoder motor assembly and is replaced as an assembly. The encoder converts the sector shaft position (representing a mode or range) into electrical signals inputs to the automatic transfer case control module. The module can detect what position the transfer case is in by monitoring the 4 encoder channels (P, A, B, and C). These inputs translates into AUTO, 2H, 4H, Neutral, and 4L or in transition between gears.

Transfer Case Motor Lock

The transfer case motor lock is used to provide a 2H, 4H, and 4L lock-up feature. When the lock circuit is energized, the transfer case encoder motor is allowed to turn. When the transfer case is placed 2H, 4H, or 4L the motor lock circuit has no power provided to it and the lock is applied. This assures that the transfer case remains in the current gear position. When AUTO is selected the motor lock remains applied until an adaptive mode (torque is applied to the front propshaft) is required. During an adaptive mode the motor lock circuit is energized and the motor lock is released, enabling the encoder motor to turn and apply torque to the front propshaft.

Transfer Case Speed Sensors

There are three speed sensors on the automatic transfer case (ATC), two on the rear output shaft and one on the front output shaft. Each speed sensor is a permanent magnet (PM) generator. The PM generator produces a pulsing AC voltage. The AC voltage level and number of pulses increases as speed increases.

Vehicle Speed Sensor

One of the two on the rear output shaft is the vehicle speed sensor (VSS) input to the powertrain control module (PCM). The PCM sends this information to the transfer case shift control module via the Class 2 Serial Data bus.

Rear Propshaft Speed Sensor

The automatic transfer case control module converts the pulsating AC voltage from the rear transfer case speed sensor to a rear propshaft speed in RPM to be used for calculations. The rear propshaft speed can be displayed with a scan tool.

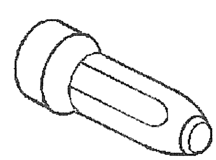
Front Propshaft Speed Sensor

The transfer case shift control module converts the pulsating AC voltage from the front transfer case speed sensor to front propshaft speed in RPM to be used for calculations, and to monitor the difference between the front and rear sensor speed. It is also used in the AUTO (Adapt) mode of operation to determine the amount of slip and the percent of torque to apply to the front axle. The front propshaft speed can be displayed with a scan tool.

SERVICE indicator (4WD/AWD) Lamp

The SERVICE indicator (4WD/AWD) lamp is an integral part of the cluster and cannot be serviced separately. This lamp is used to inform the driver of the vehicle of malfunctions within the automatic transfer case (ATC) system. The SERVICE indicator (4WD/AWD) lamp is controlled by the transfer case shift control module via CKT 1567.

Special Tools and Equipment

Illustration	Tool Number/Description
 404841	J 29162 Output Shaft Seal Installer

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