

Section 4

Driveline/Axle

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Driveline/Axle

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Propeller Shaft

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Center Bearing Bolts	60/81 N.m	44/59 lb ft
Propeller Shaft Hanger Bracket Nuts	101 N.m	75 lb ft
Propeller Shaft Hanger Nuts	70 N.m	52 lb ft
Propeller Shaft to Transmission Flange With 4 Nuts	75 N.m	55 lb ft
Propeller Shaft to Transmission Flange With 8 Nuts	38 N.m	28 lb ft
Universal Joint Bearing Strap Bolts Series 1480, 1550, 1610	54 N.m	40 lb ft
Universal Joint Bearing Strap Bolts Series 1710, 1710HD	136 N.m	100 lb ft
Universal Joint Cap Screws	44 N.m	33 lb ft
Yoke Nut Series 1480	779 N.m	575 lb ft
Yoke Nut Series 1550	216 N.m	160 lb ft
Yoke Nut Series 1610, 1710	983 N.m	725 lb ft

Diagnostic Information and Procedures

Roughness or Vibration (Diagnosis)

Step	Action	Value(s)	Yes	No
1	Inspect the center bearing. Is the bearing worn?	—	Go to Step 2	Go to Step 3
2	Replace the center bearing. Is roughness or vibration still evident?	—	Go to Step 3	System OK
3	Inspect the hanger. Is the hanger worn?	—	Go to Step 4	Go to Step 5
4	Replace the hanger. Is roughness or vibration still evident?	—	Go to Step 5	System OK
5	Inspect the universal joints. Are the universal joints worn?	—	Go to Step 6	Go to Step 7
6	Replace the bearings. Is roughness or vibration still evident?	—	Go to Step 7	System OK
7	Inspect the universal joints. Do the universal joints require lubrication?	—	Go to Step 8	Go to Step 9
8	Lubricate the universal joints. Is roughness or vibration still evident?	—	Go to Step 9	System OK
9	Inspect the flange bolts. Are the bolts loose?	—	Go to Step 10	Go to Step 11
10	Tighten the flange bolts to specification. Refer to <i>Fastener Tightening Specifications</i> . Is roughness or vibration still evident?	—	Go to Step 11	System OK
11	Inspect the propeller shaft. Is the propeller shaft bent or dented?	—	Go to Step 12	Go to Step 13

4-4 Propeller Shaft

Driveline/Axle

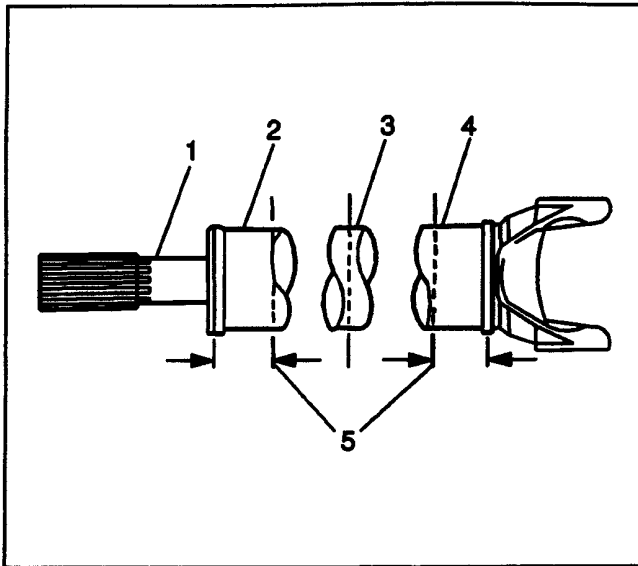
Roughness or Vibration (Diagnosis) (cont'd)

Step	Action	Value(s)	Yes	No
12	Replace the propeller shaft. Is roughness or vibration still evident?	—	Go to Step 13	System OK
13	Inspect the propeller shaft. Is there dirt or debris on the propeller shaft?	—	Go to Step 14	Go to Step 15
14	Clean the propeller shaft. Is roughness or vibration still evident?	—	Go to Step 15	System OK
15	Inspect the tires. Are the tires out of balance?	—	Go to Step 16	Go to Step 17
16	Balance or replace the tires as necessary. Is roughness or vibration still evident?	—	Go to Step 17	System OK
17	Inspect the U-bolt torque. Is the torque excessive?	—	Go to Step 18	Go to Step 19
18	Correct the torque according to specifications. Refer to <i>Fastener Tightening Specifications</i> . Is roughness or vibration still evident?	—	Go to Step 19	System OK
19	Inspect the universal joints. Are the universal joints tight?	—	Go to Step 20	Go to Step 21
20	1. Impact the yokes using a hammer in order to loosen the yokes. 2. Overhaul the universal joint if one of the following conditions exist: • You are unable to loosen the universal joint. • The joint feels rough when rotated by hand. Is roughness or vibration still evident?	—	Go to Step 21	System OK
21	Inspect the universal joints. Are the universal joints worn?	—	Go to Step 22	Go to Step 23
22	1. Overhaul the universal joints. 2. Replace worn parts as necessary. Is roughness or vibration still evident?	—	Go to Step 23	System OK
23	Inspect the companion flange. Are there burrs or gouges on the companion flange?	—	Go to Step 24	Go to Step 25
24	1. Inspect the snap ring locating surfaces on the flange yoke. 2. Rework or replace the companion flange. Is roughness or vibration still evident?	—	Go to Step 25	System OK
25	Inspect the propeller shaft. Is the propeller shaft unbalanced?	—	Go to Step 26	Go to Step 27
26	1. Inspect the propeller shaft for a missing balance weight. 2. Remove the propeller shaft. 3. Install the propeller shaft to the companion flange 180° from the original position. Is roughness or vibration still evident?	—	Go to Step 27	System OK
27	Inspect the parking brake drum, if used. Is the parking brake drum unbalanced?	—	Go to Step 28	Go to Step 29
28	Repair or replace the parking brake drum. Is roughness or vibration still evident?	—	Go to Step 29	System OK

Roughness or Vibration (Diagnosis) (cont'd)

Step	Action	Value(s)	Yes	No
29	Inspect the companion flange. Is the companion flange unbalanced?	—	Go to Step 30	Go to Step 31
30	Repair or replace the companion flange. Is roughness or vibration still evident?	—	Go to Step 31	System OK
31	Inspect the rear joint angle. Is the angle too large or too small?	—	Go to Step 32	Go to Step 33
32	1. Check the trim height at curb weight. 2. Correct the trim height, if necessary. 3. Check the rear joint angle. 4. Correct the rear joint angle. Is roughness or vibration still evident?	—	Go to Step 33	System OK
33	Inspect the slip yoke spline. Is the slip yoke spline excessively loose?	—	Go to Step 34	Go to Step 35
34	Replace the parts as necessary. Is roughness or vibration still evident?	—	Go to Step 35	System OK
35	Inspect the yokes. Are the yokes distorted or damaged?	—	Go to Step 36	Go to Step 37
36	Install the new yokes. Is roughness or vibration still evident?	—	Go to Step 37	System OK
37	Inspect the yokes. Are the yokes out of parallel to each other?	—	Go to Step 38	—
38	Change the propeller shaft. Is roughness or vibration still evident?	—	—	System OK

For additional vibration diagnosis, refer to Vibration Diagnosis in General Information.



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Use a dial indicator in order to inspect each shaft at several locations for excessive runout. Ensure that the readings at each location are within the limits as specified:

Roughness or Vibration (Propeller Shaft Runout)

Application	Specification	
	Metric	English
Splined Shaft (1)	1.30 mm	0.005 in
Front (2)	3.0 mm	0.015 in
Center (3)		
Shafts to 762 mm (30 in)	3.0 mm	0.015 in
Shafts over 762 mm (30 in)	2.5 mm	0.010 in
Rear (4)	3.0 mm	0.015 in
Front to Rear (5)	75.0 mm	3.0 in

Roughness or Vibration (Propeller Shaft Visual Inspect)

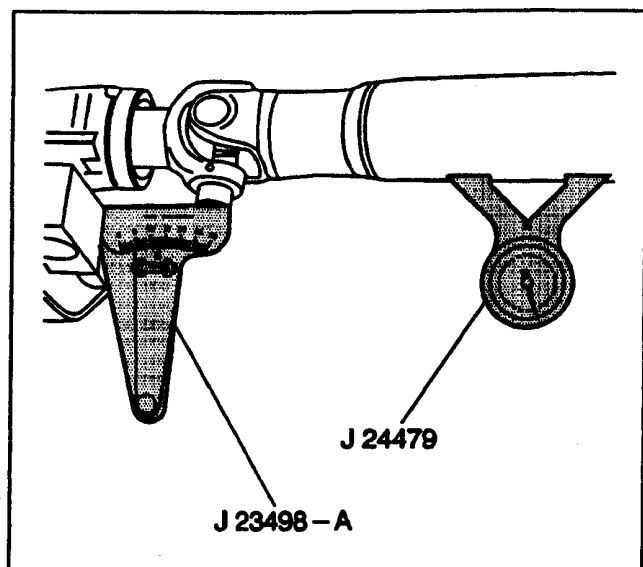
An unbalanced propeller shaft and universal joint assembly may be caused by one or more of the following conditions:

- Missing balance weights
 - Bent, dented, or damaged tubing
 - Worn slip spline (inboard type)
 - Foreign material on the propeller shaft tubing or the end yokes
 - Improperly installed propeller shaft and universal joint assembly
1. Clean all foreign material from the shaft or tube and the end yokes.
 2. Inspect the assembly. If necessary, remove and repair the assembly as required.

Do not replace missing balance weights or straighten a bent tube without the proper tools. Refer to a service outlet that specializes in such work.

Ping, Snap, or Click Noise

Step	Action	Value(s)	Yes	No
1	Inspect the upper control arm bushing bolts at the rear axle. Are the bolts loose?	—	Go to Step 2	Go to Step 3
2	Tighten the bolts to specification. Refer to <i>Fastener Tightening Specifications</i> . Is the ping, snap or click noise still evident?	—	Go to Step 3	System OK
3	Inspect the lower control arm bushing bolts at the rear axle. Are the bolts loose?	—	Go to Step 4	Go to Step 5
4	Tighten the bolts to specification. Refer to <i>Fastener Tightening Specifications</i> . Is the ping, snap or click noise still evident?	—	Go to Step 5	System OK
5	Inspect the companion flange. Is the companion flange loose?	—	Go to Step 6	—
6	1. Remove the companion flange. 2. Turn the companion flange 180° from the original position. 3. Lubricate the splines. 4. Install the companion flange. 5. Tighten the pinion to the specified torque. Refer to <i>Fastener Tightening Specifications</i> . Is the ping, snap or click noise still evident?	—	—	System OK
For additional vibration diagnosis, refer to Vibration Diagnosis in General Information.				



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Repair Instructions

Driveline Angle Adjustment

Tools Required

- J 23498-A Inclinometer
- J 24479 Inclinometer

Correct driveline angles are necessary in order to prevent torsional vibration. There must be at least a $1/2$ degree angle in adjacent components of the propeller shaft in order to promote longer universal joint life.

On some vehicles, adjustable auxiliary transmission mountings are provided for adjusting the angle of the various driveline components. On vehicles that do not have adjustable auxiliary transmission mountings, use spacers or shims at the hanger bracket in order to achieve proper adjustment of the angle of the driveline components. The following procedure covers the checking and adjusting of driveline angles on the vehicles.

Refer to *Driveline Angles Layout* for measurements and angle specifications.

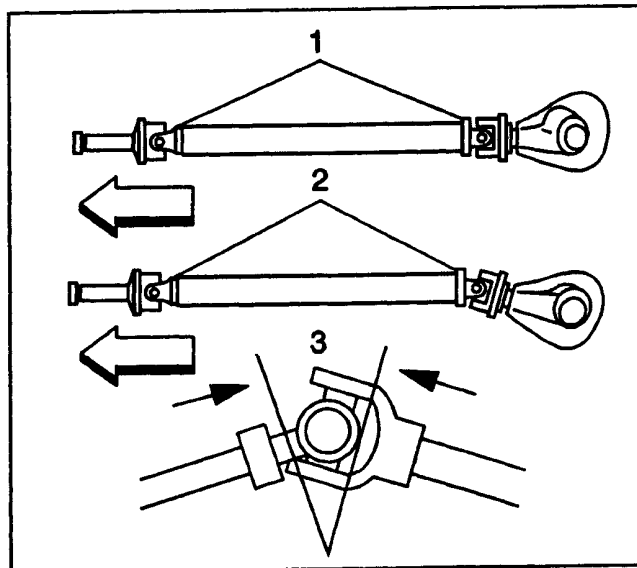
Driveline Angles Inspection

Inspect the driveline angles when the vehicle is unloaded, and again when the vehicle is loaded. Ensure that the vehicle is in its normal operating position, with a full tank of gasoline. Safely block the wheels.

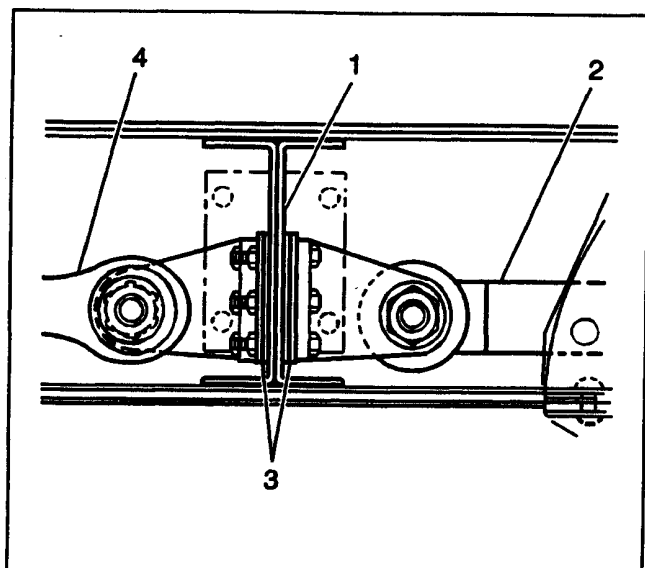
1. Ensure that all of the parts are clean. The parts must be free of dirt or other foreign material in order to obtain an accurate measurement.
2. Measure the tire air pressure. Ensure that the air pressures are at normal operating levels.
3. Measure the ground surface for level. Take the measurements from both front to rear and from side to side.
4. Place the J 23498-A or the J 24479 on the rear propeller shaft bearing cap.
5. Center the bubble in the sight glass and record the measurement. Ensure that the bearing cap is straight up and down.
6. Rotate the propeller shaft 90 degrees. Place the J 23498-A or the J 24479 on the front slip spline yoke bearing cap.
7. Center the bubble on the sight glass and record the measurement.
8. Ensure that the bearing cap is straight up and down.
9. Place the J 23498-A or the J 24479 on the rear propeller shaft bearing cap. Ensure that the bearing cap is straight up and down.
10. Center the bubble in the sight glass and record the measurement.
11. Rotate the propeller shaft 90 degrees. Place the J 23498-A or the J 24479 on the front slip spline yoke bearing cap.
12. Center the bubble on the sight glass and record the measurement.
13. Subtract the smaller figure from the larger figure in order to obtain the rear universal joint angle.

14. Place the *J 23498-A* or the *J 24479* on the front propeller shaft bearing cap.
15. Center the bubble in the sight glass and record the measurement.
16. Rotate the propeller shaft 90 degrees. Place the *J 23498-A* or the *J 24479* on the front slip spline yoke bearing cap.
17. Center the bubble on the sight glass and record the measurement.
18. Subtract the smaller figure from the larger figure in order to obtain the rear universal joint angle.
19. Place the *J 23498-A* or the *J 24479* on the front propeller shaft bearing cap.
20. Center the bubble in the sight glass and record the measurement.
21. Rotate the propeller shaft 90 degrees. Place the *J 23498-A* or the *J 24479* on the front slip spline yoke bearing cap.
22. Center the bubble on the sight glass and record the measurement.
23. Subtract the smaller figure from the larger figure in order to obtain the front universal joint angle.

The recorded measurements determine if the journal cross operating angles of each propeller shaft set is more than 3 degrees. The working angles should not exceed 3 degrees (3). Ensure that the operating angle is greater than 1/2 degree in order to prevent brinelling of the bearing.



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Auxiliary Transmission and Propeller Shaft Angle

Adjust the propeller shaft by raising or lowering the front or rear of the transmission using one of the following components:

- The adjustable mounting bolts
- The adding or removing shims
- The plates
- The washers, etc.

In order to change the transmission angle, raise or lower one end of the transmission more than the other end.

Torque Rod Shimming

The addition or removal of shims (3) from the rear axle torque rod (2) will change the angle of the interaxle drive shaft. Verify the interaxle drive shaft angle and the rear yoke angle measurements after each adjustment is made in order to determine the journal operating angle.

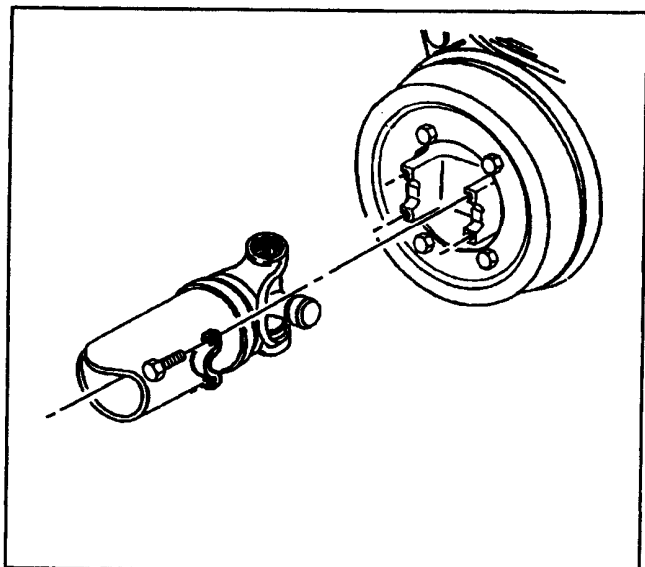
Short Coupled Universal Joints

Install the short coupled universal joints to the front and rear universal joints. Ensure that the angles do not exceed 3 degrees.

One-Piece Propeller Shaft Replacement (Full Yoke/229)

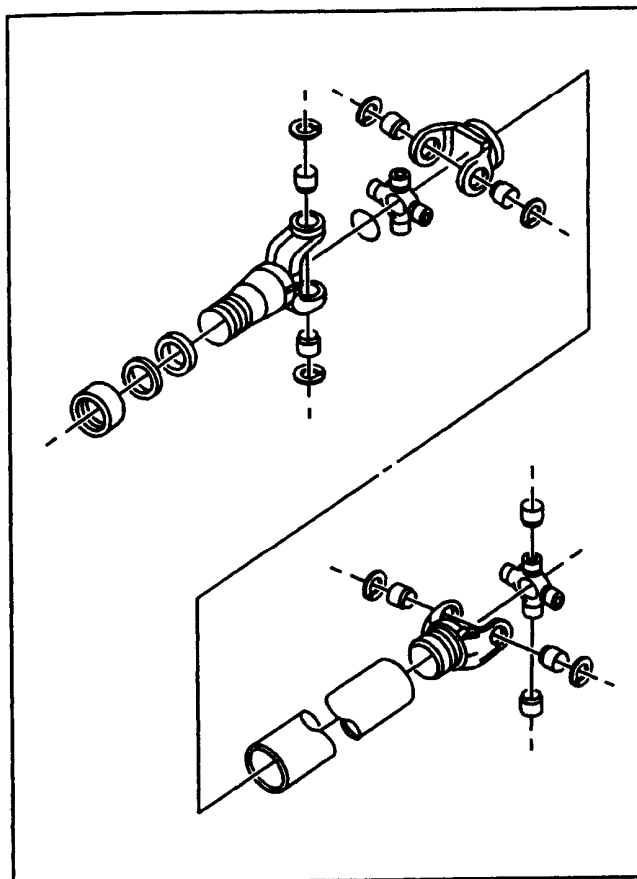
Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 229 mm (9 in) brake drum.



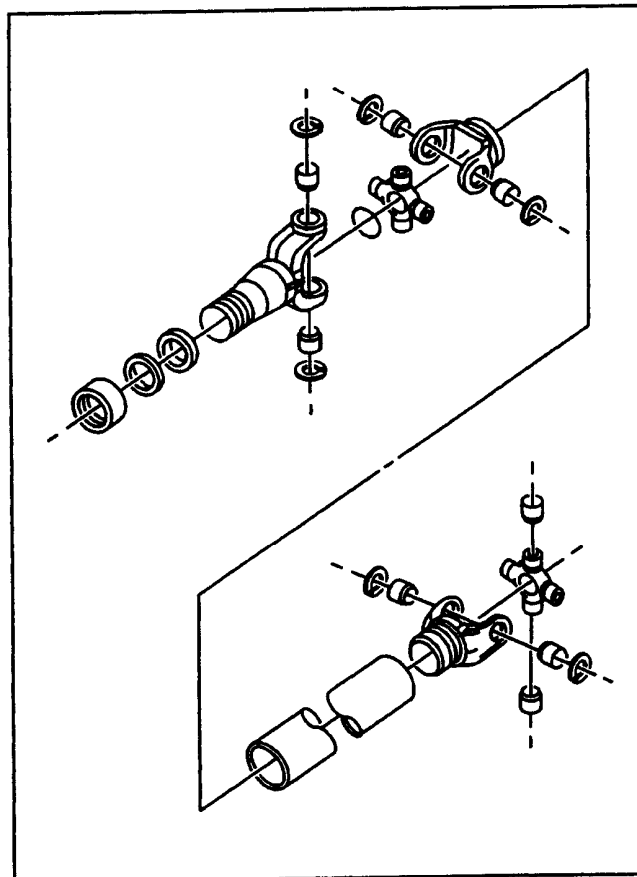
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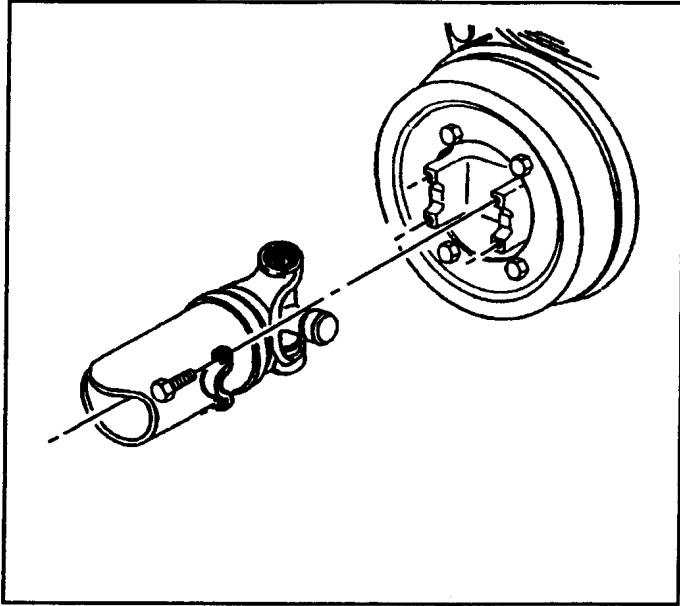
6. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke to the installed propeller shaft splined end.





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4. Install the front propeller shaft to the 229 mm (9 in) brake drum. Keep the alignment marks together.

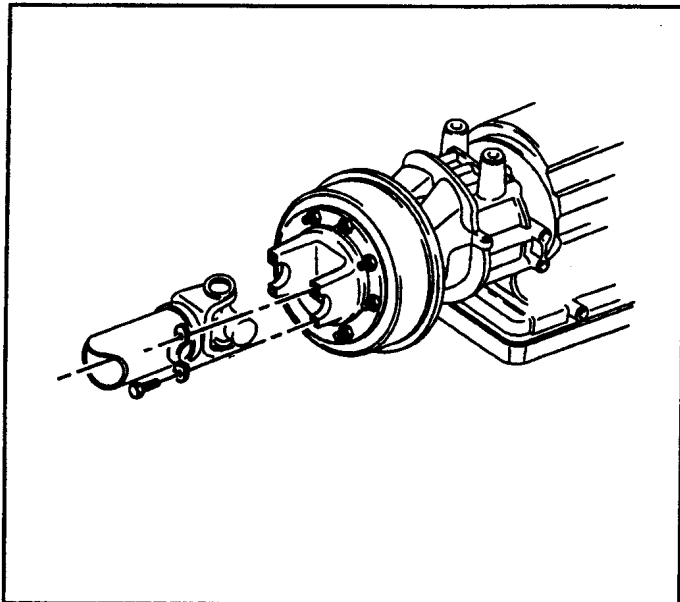
Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

One-Piece Propeller Shaft Replacement (Full Yoke/305)

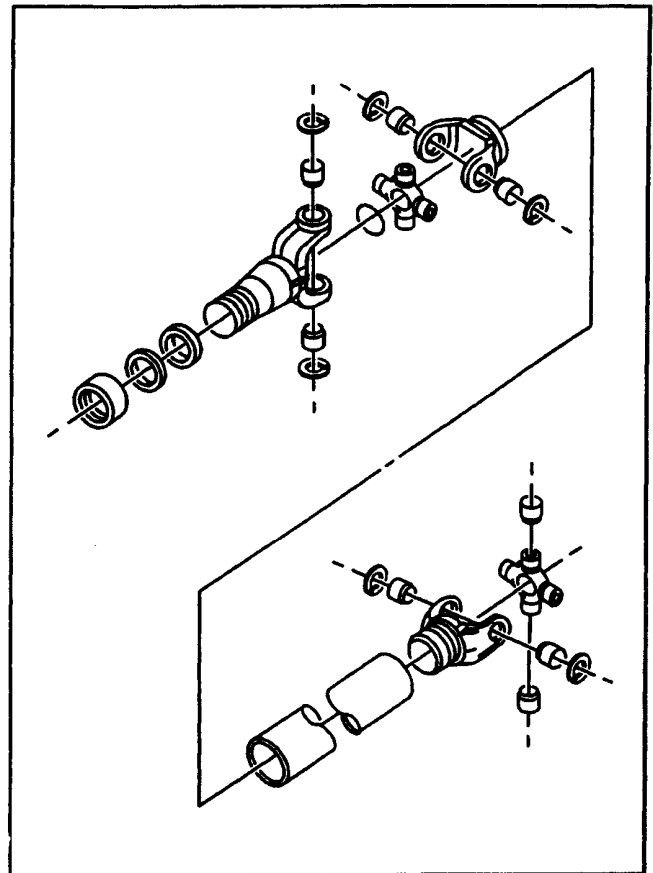
Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 305 mm (12 in) brake drum.



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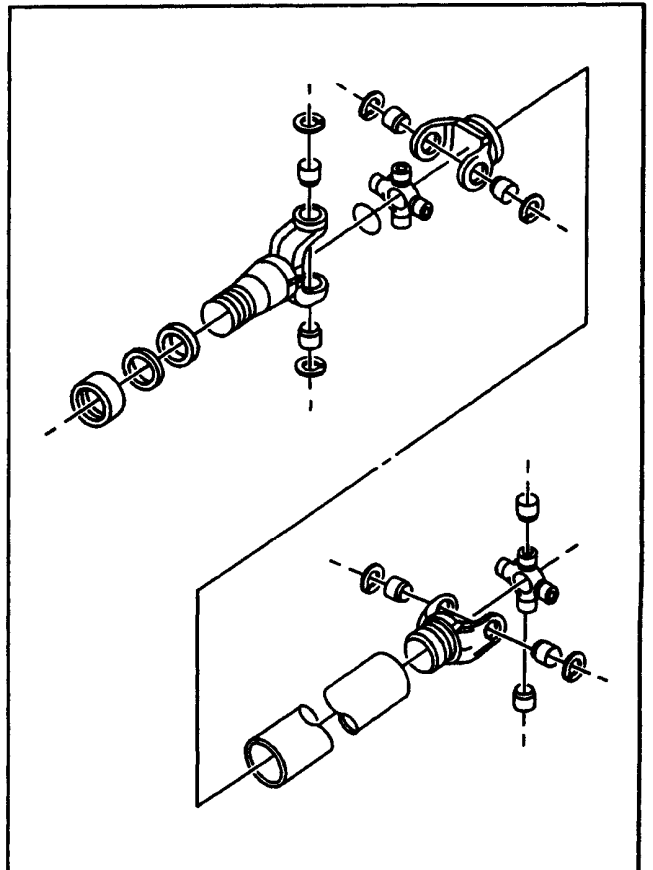
6. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



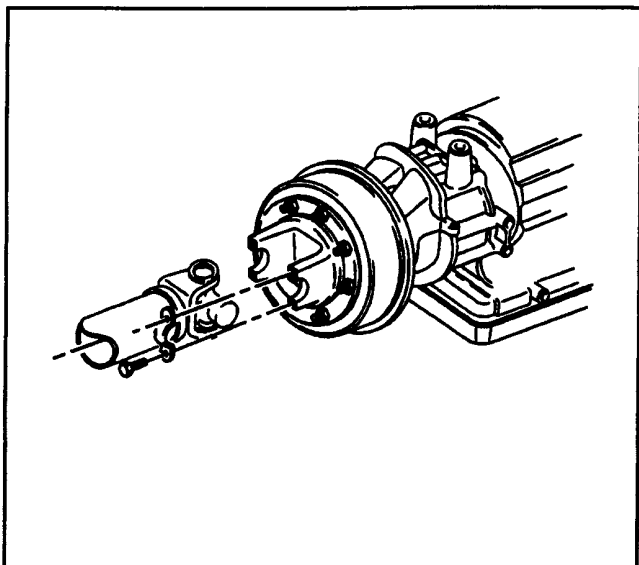
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Installation Procedure

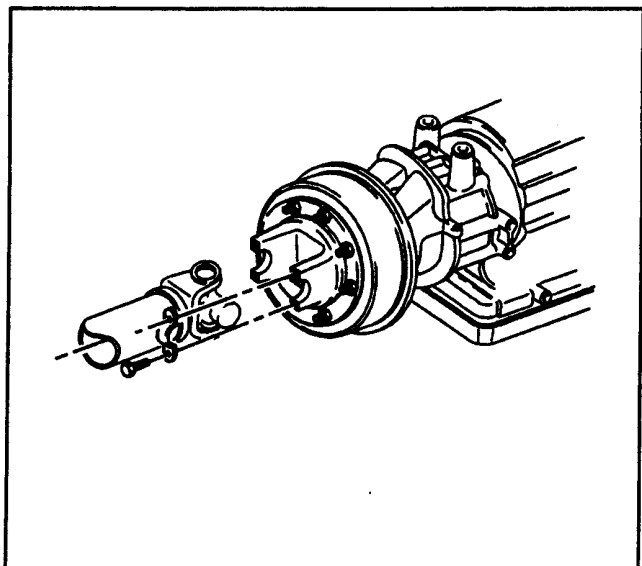
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end.



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4. Install the front propeller shaft to the 305 mm (12 in) brake drum. Keep the alignment marks together.

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

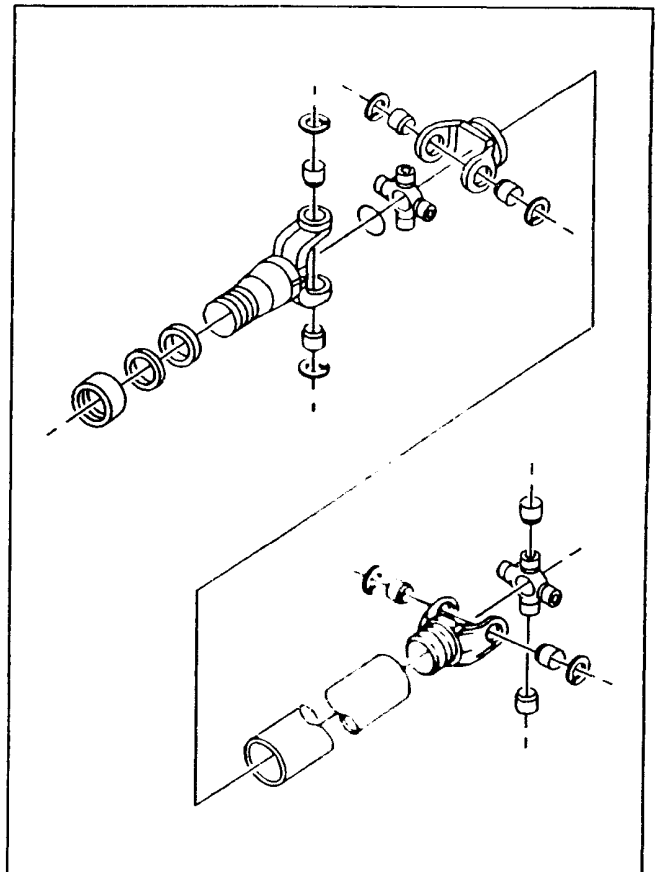
5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

One-Piece Propeller Shaft Replacement (Half Yoke/229)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 305 mm (12 in) brake drum.

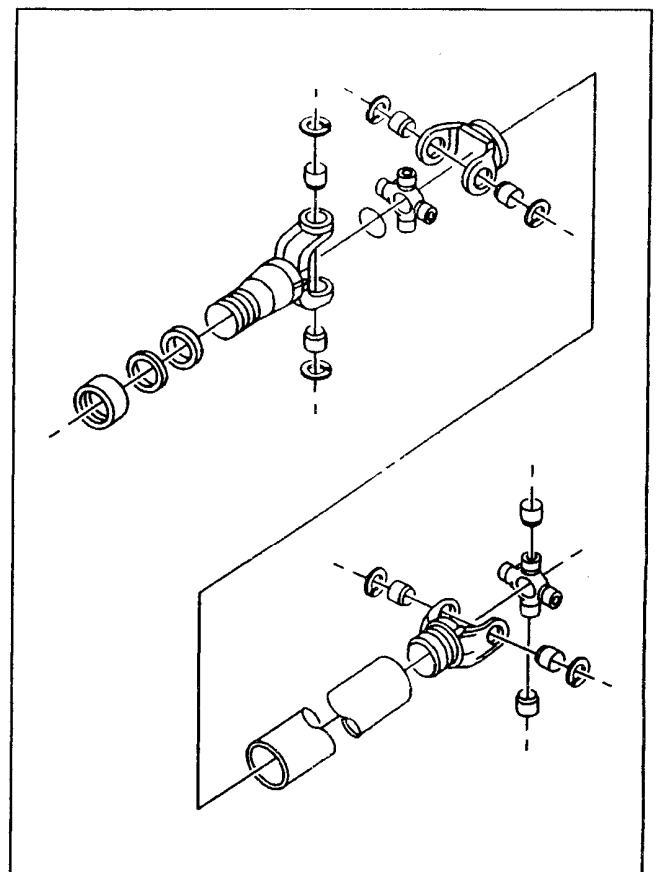
6. Remove the propeller shaft 1480 or 1550 series half round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



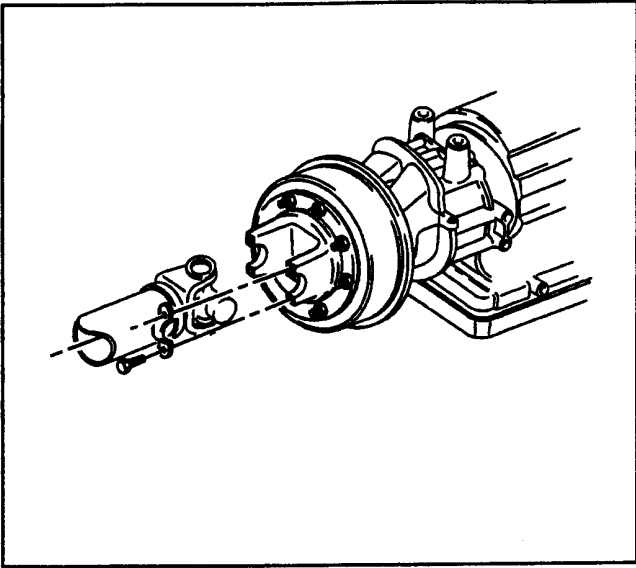
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Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke assembly to the installed propeller shaft splined end.



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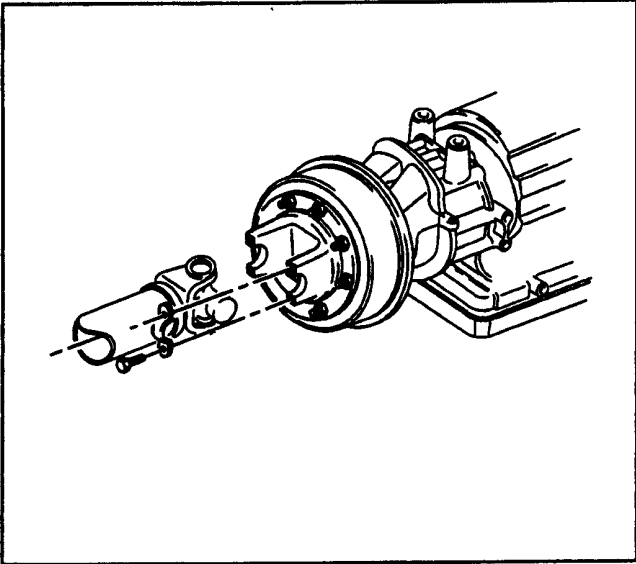


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4. Install the front propeller shaft to the 305 mm (12 in) brake drum. Keep the alignment marks together.

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

5. Install and tighten the propeller shaft full or half round end yoke bolts. Refer to *Fastener Tightening Specifications*.
6. Install the rear propeller shaft to the universal joints.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.



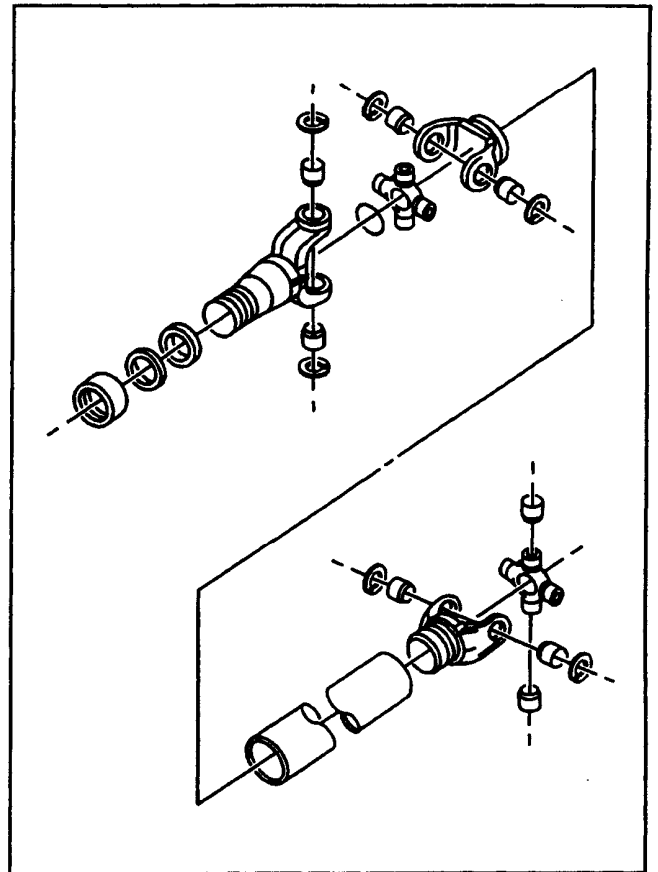
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One-Piece Propeller Shaft Replacement (Half Yoke/305)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 305 mm (12 in) brake drum.

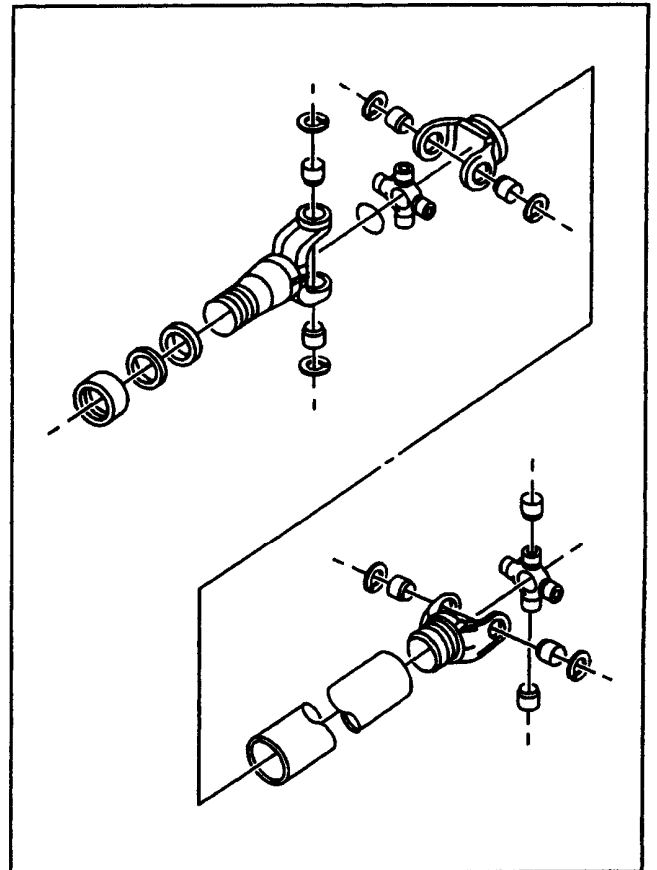
6. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



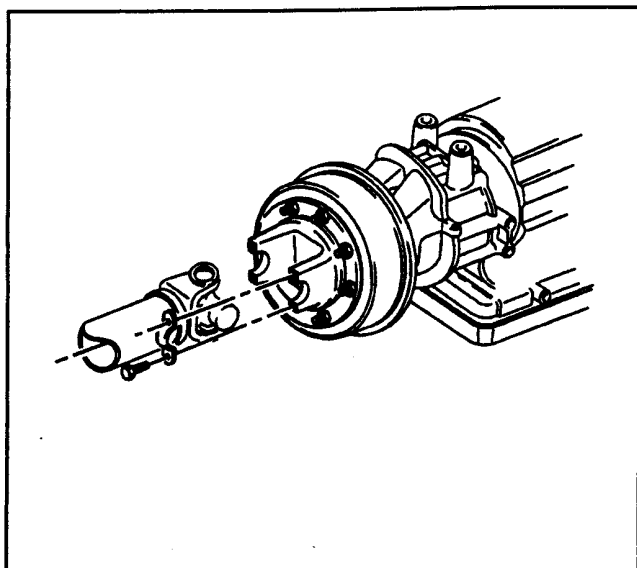
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Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end.



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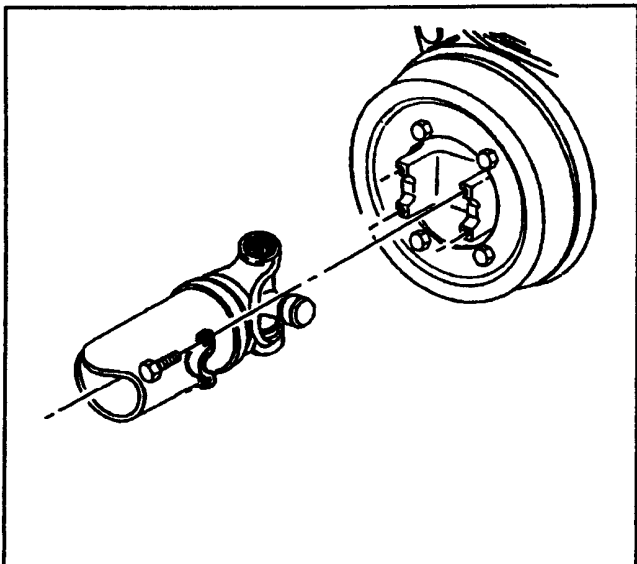


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4. Install the front propeller shaft to the 305 mm (12 in) brake drum. Keep the alignment marks together.

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

5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.



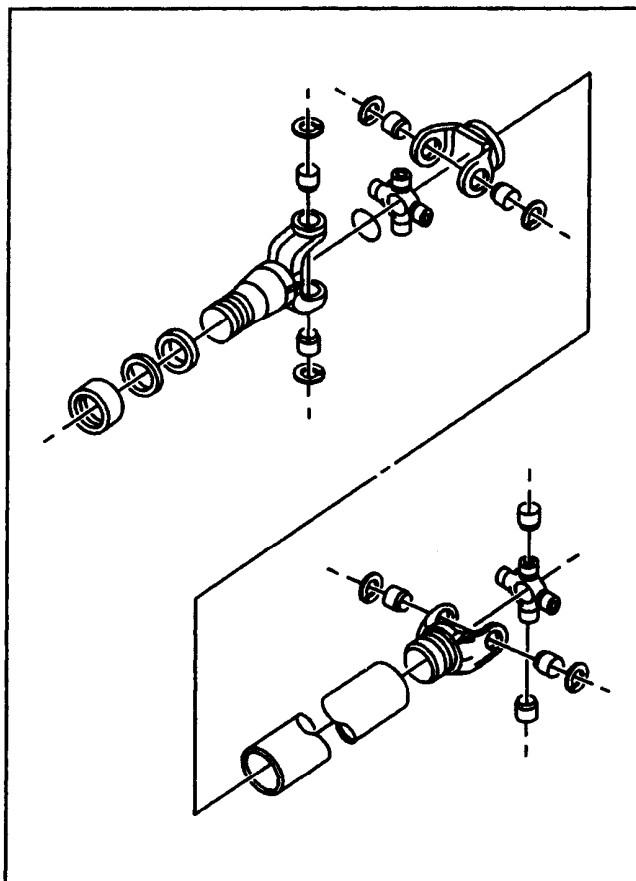
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One-Piece Propeller Shaft Replacement (Outboard Slip/229)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 229 mm (9 in) brake drum.

6. Remove the propeller shaft 1480 or 1550 series half round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



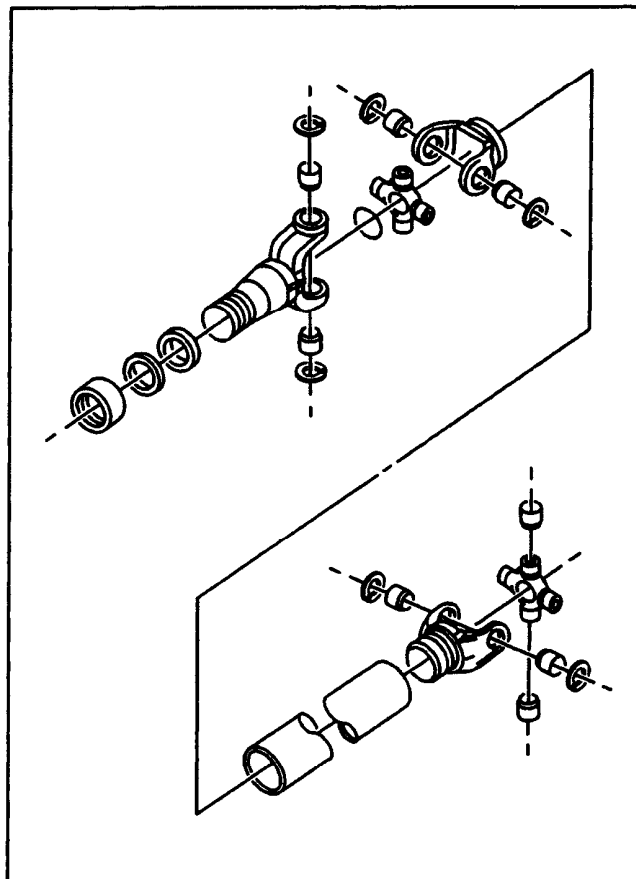
198622

Installation Procedure

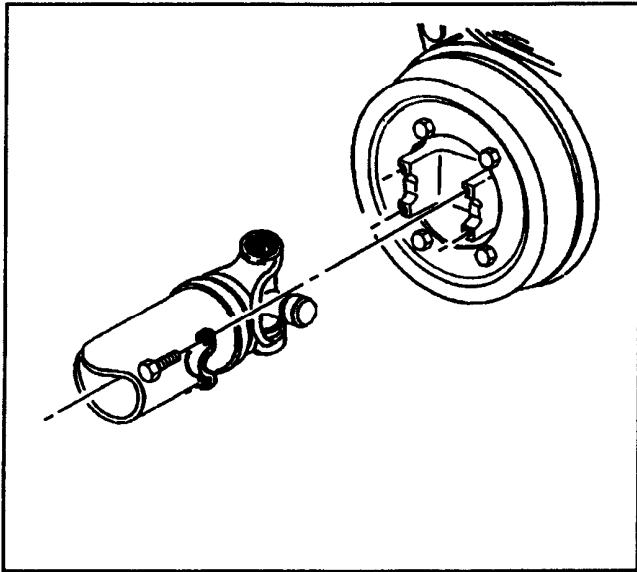
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke assembly to the installed propeller shaft splined end.
4. Install the front propeller shaft to the 229 mm (9 in) brake drum.

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

5. Keep the alignment marks together.



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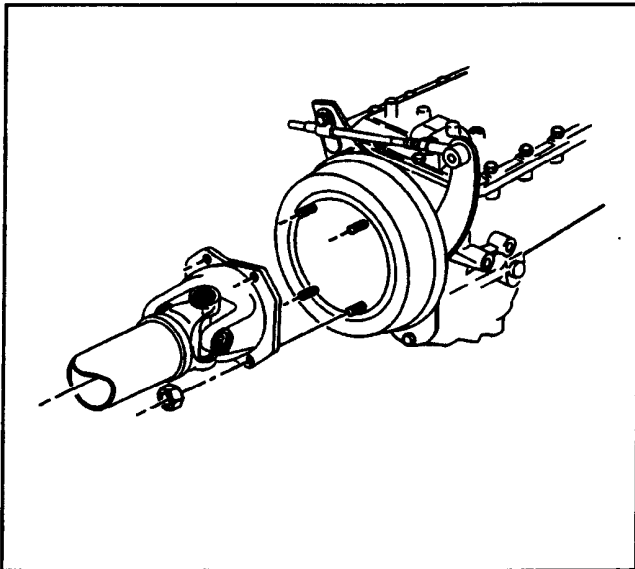


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6. Install and tighten the propeller shaft half round end yoke bolts

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

7. Inspect the propeller shaft for alignment and phasing.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.



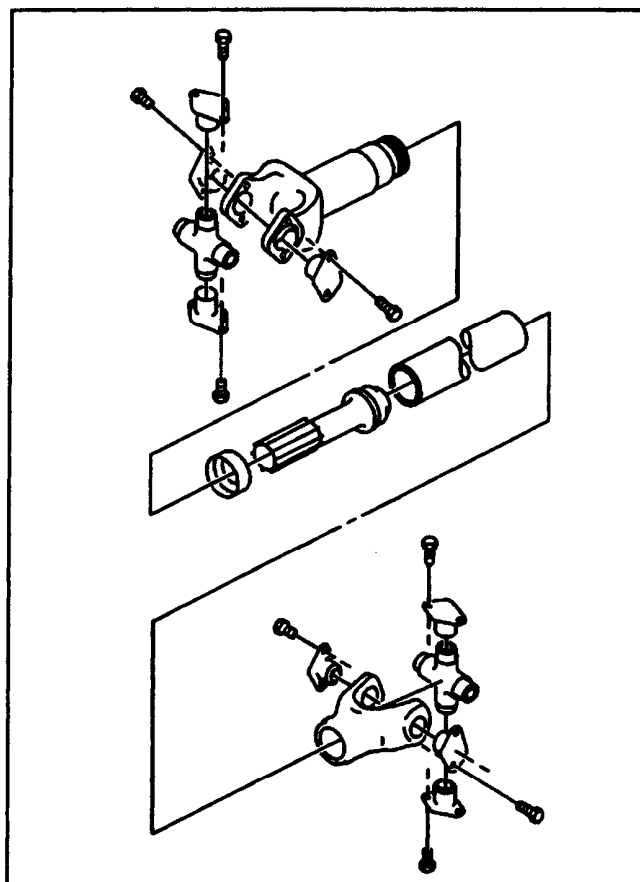
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One-Piece Propeller Shaft Replacement (Outboard Slip/305)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (4 nut) mounting.

6. Remove the propeller shaft 16N, 17N, 18N, 1710 or 1760 series full round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*



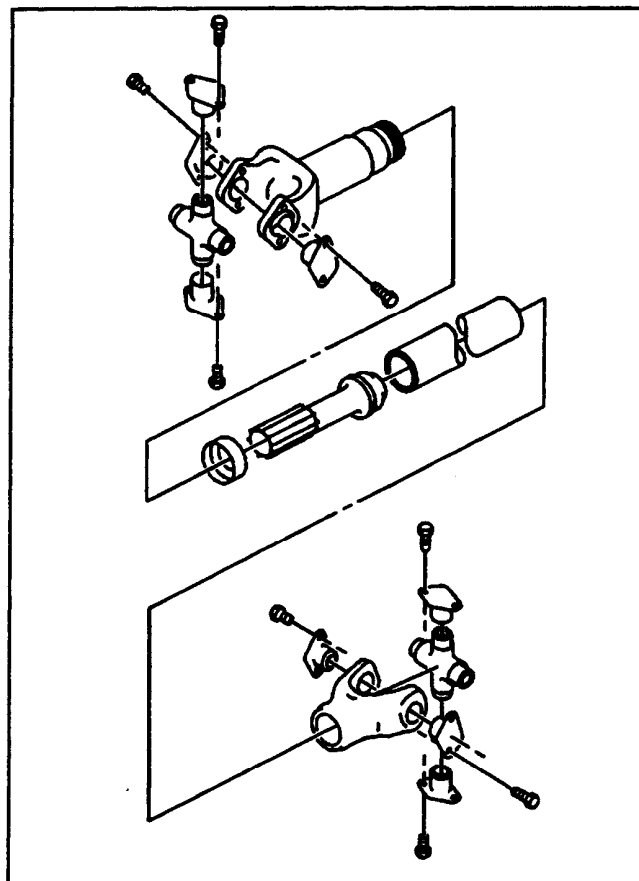
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Installation Procedure

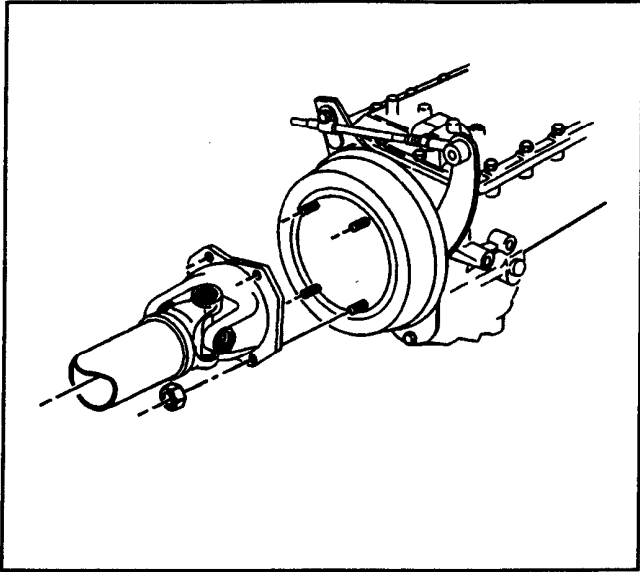
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke assembly to the installed propeller shaft splined end.
4. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.

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

5. Install and tighten the propeller shaft full or half round end yoke bolts. Refer to *Fastener Tightening Specifications*.



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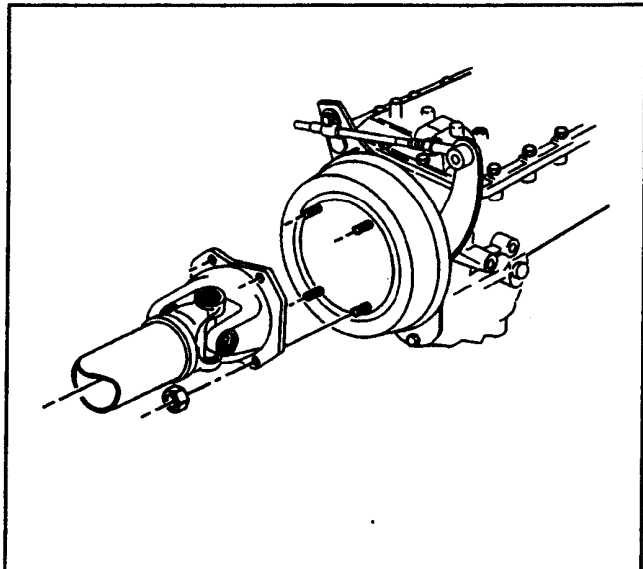


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6. Install the propshaft to the yoke flange.

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

7. Inspect the propeller shaft for alignment and phasing.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.



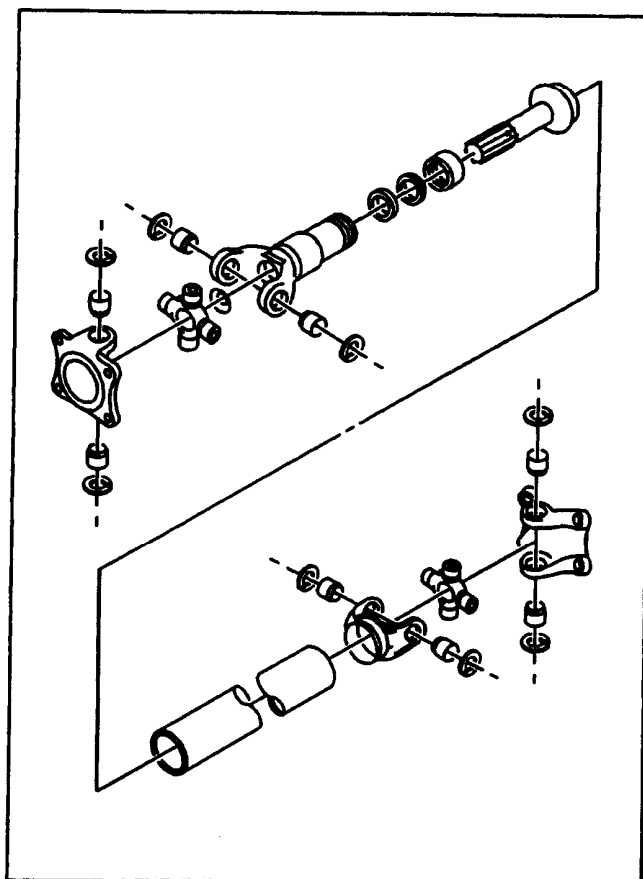
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One-Piece Propeller Shaft Replacement (Inboard Flange/229)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the 229 mm (9 in) brake drum.

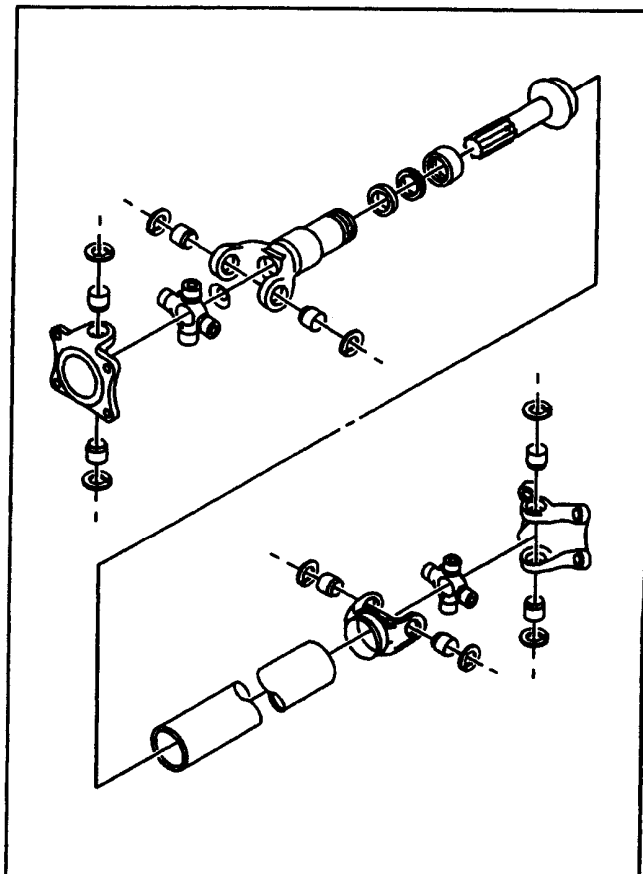
6. Remove the propeller shaft 1480 or 1550 series with inboard slip joint and flange yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



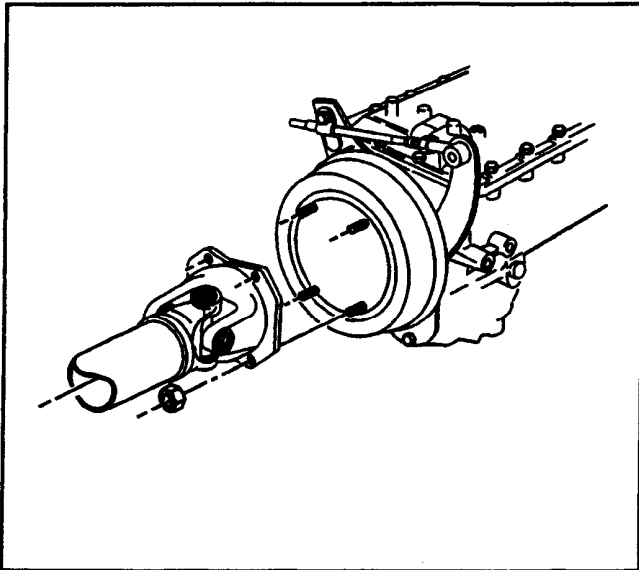
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Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.



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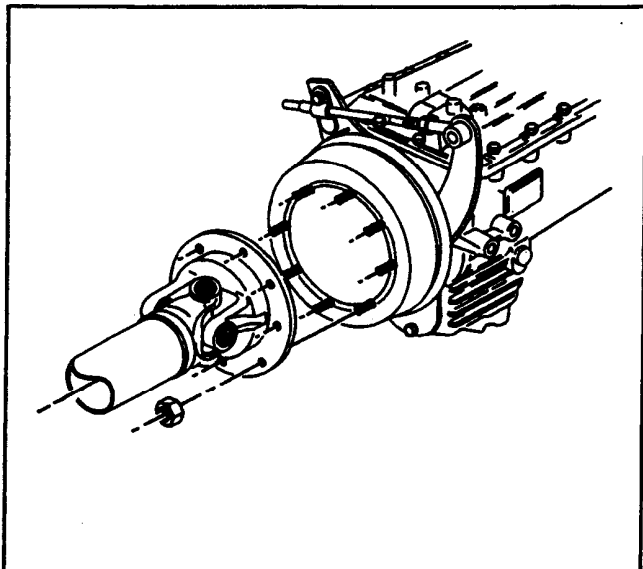


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4. Install the front propeller shaft to the 229 mm (9 in) brake drum. Keep the alignment marks together.

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

5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft inboard slip joint and yoke flange yoke bolts. Refer to *Fastener Tightening Specifications*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.



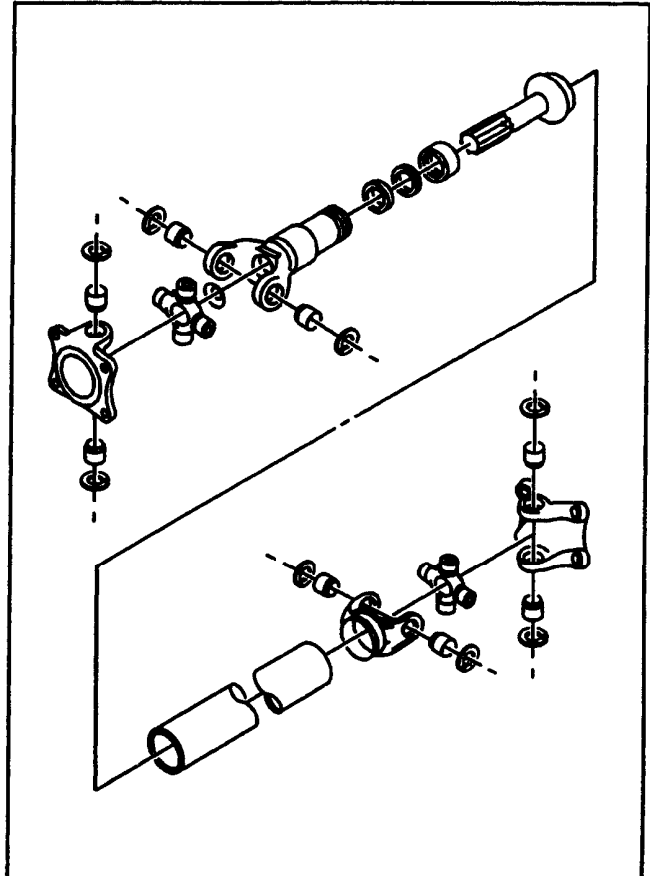
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One-Piece Propeller Shaft Replacement (Inboard Flange/305)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft mounting from the Yoke Flange (8 nut) mounting.

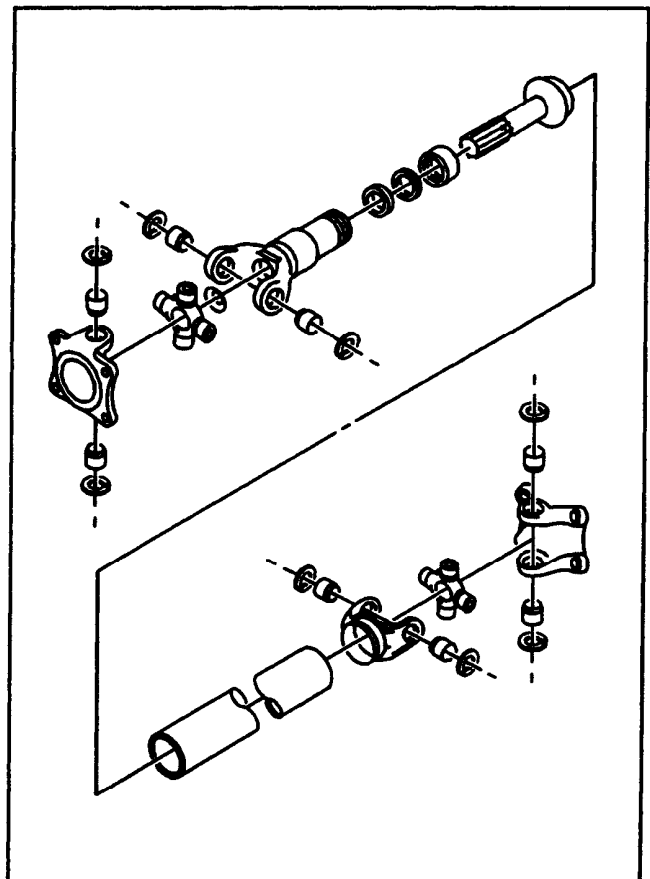
6. Remove the propeller shaft 1480 or 1550 series with inboard slip joint and flange yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



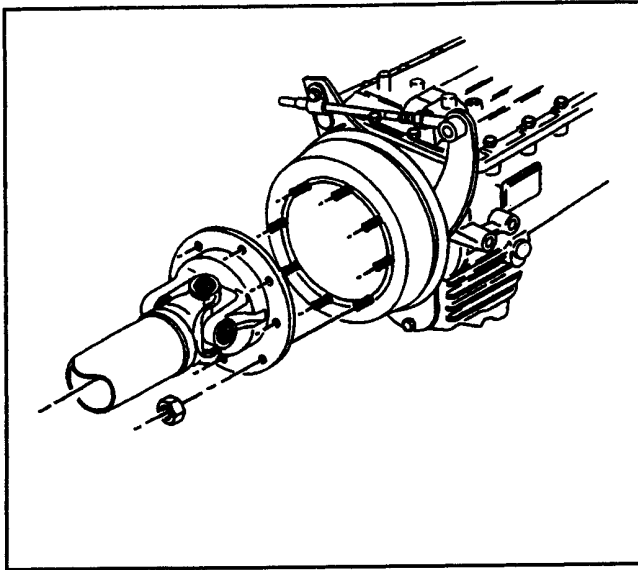
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Installation Procedure

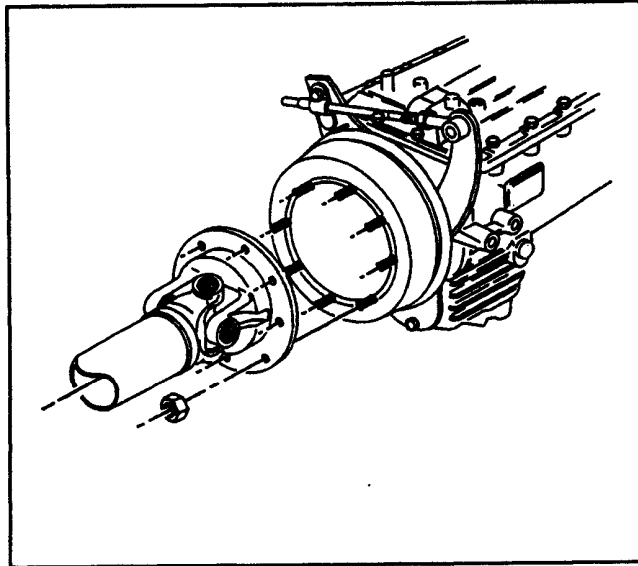
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke to the installed propeller shaft splined end.



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4. Install the front propeller shaft to the Yoke Flange (8 nut) mounting. Keep the alignment marks together.

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

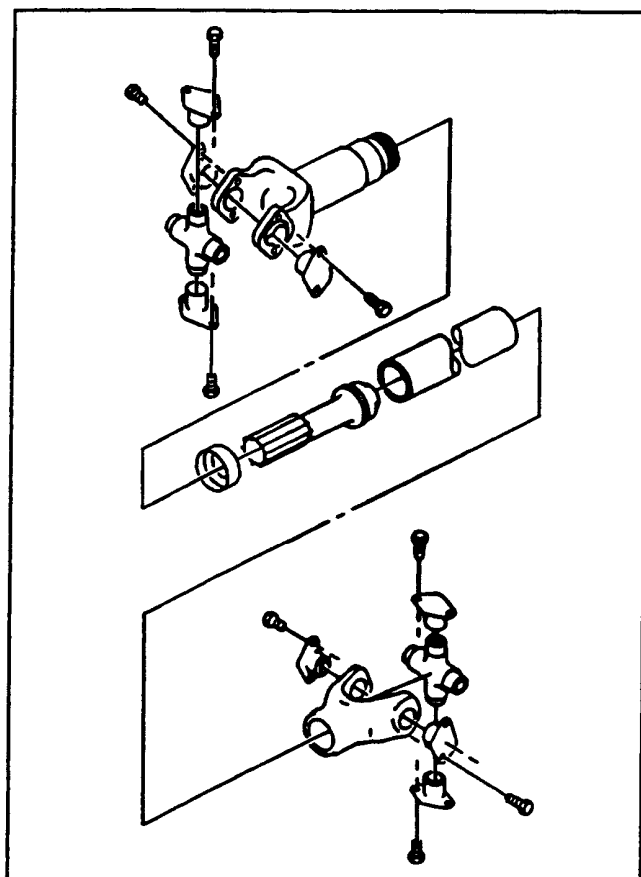
5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft Inboard Slip Joint Flange yoke bolts. Refer to *Fastener Tightening Specifications*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

One-Piece Propeller Shaft Replacement (Inboard Full Yoke/305)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (8 nut) mounting.

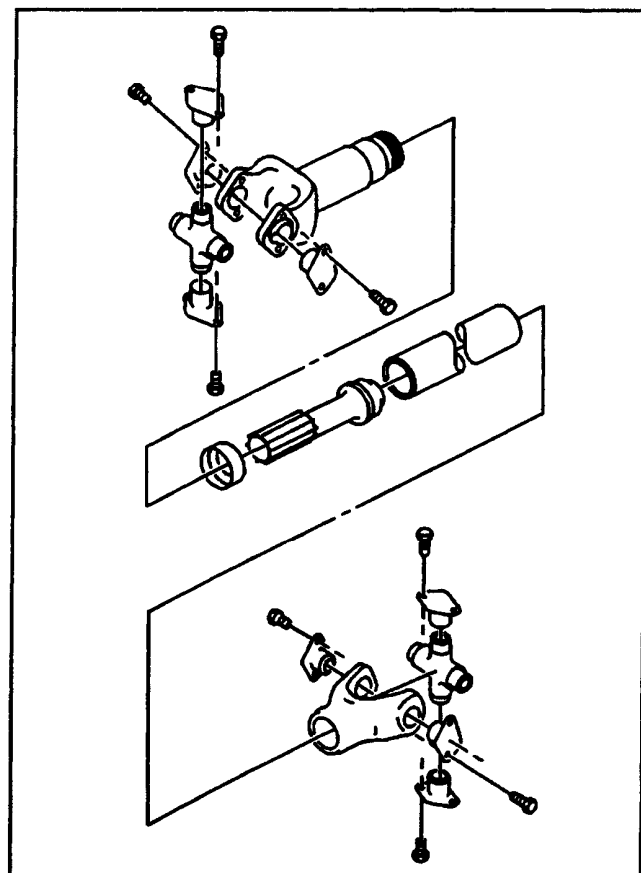
6. Remove the propeller shaft 16N, 17N, 18N, 1710 or 1760 series with inboard slip joint and full round end yoke.
7. Remove the universal joints. Refer to *Universal Joints Replacement*.



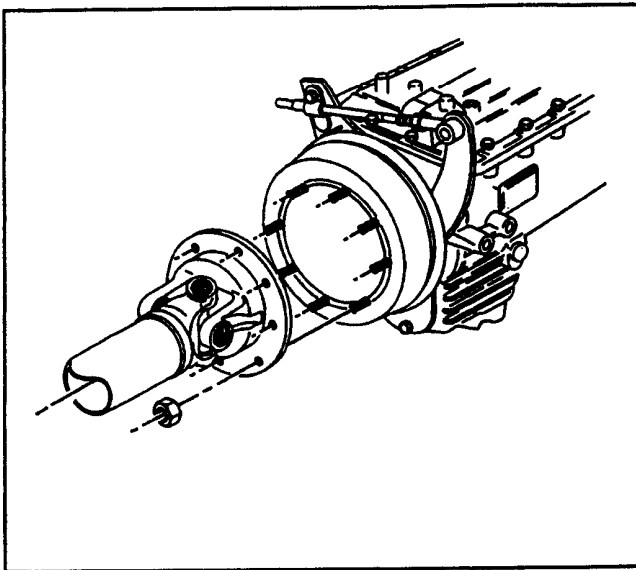
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Installation Procedure

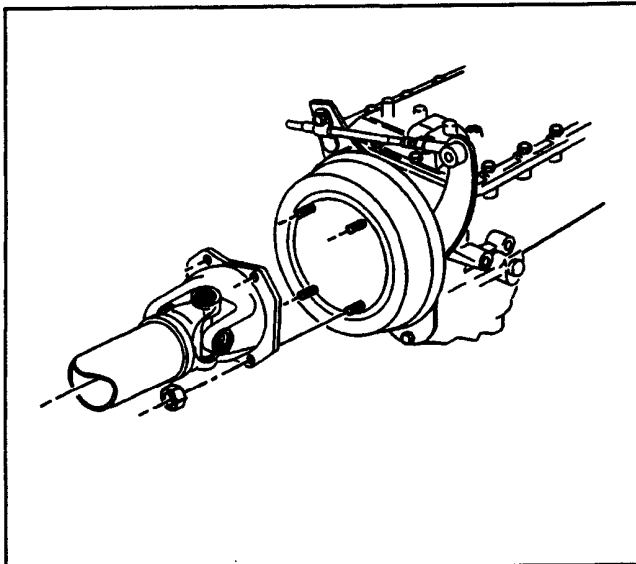
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke to the installed propeller shaft splined end.



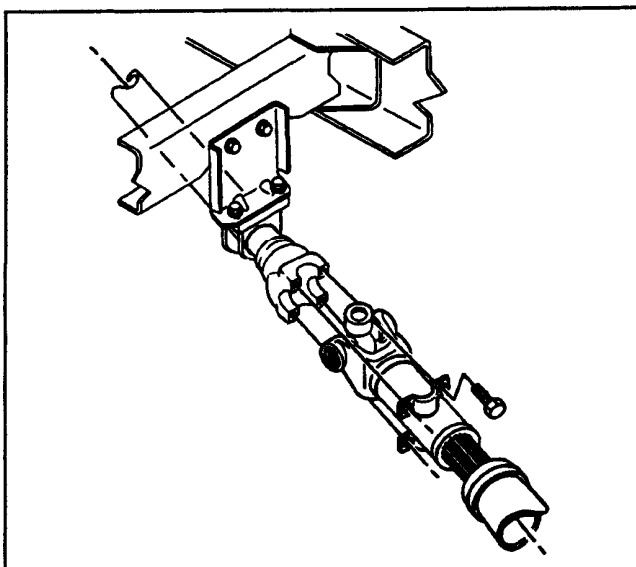
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4. Install the front propeller shaft to the Yoke Flange (8 nut) mounting. Keep the alignment marks together.
5. Install and tighten the propeller shaft inboard slip joint flange full round end yoke bolts. Refer to *Fastener Tightening Specifications*.

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

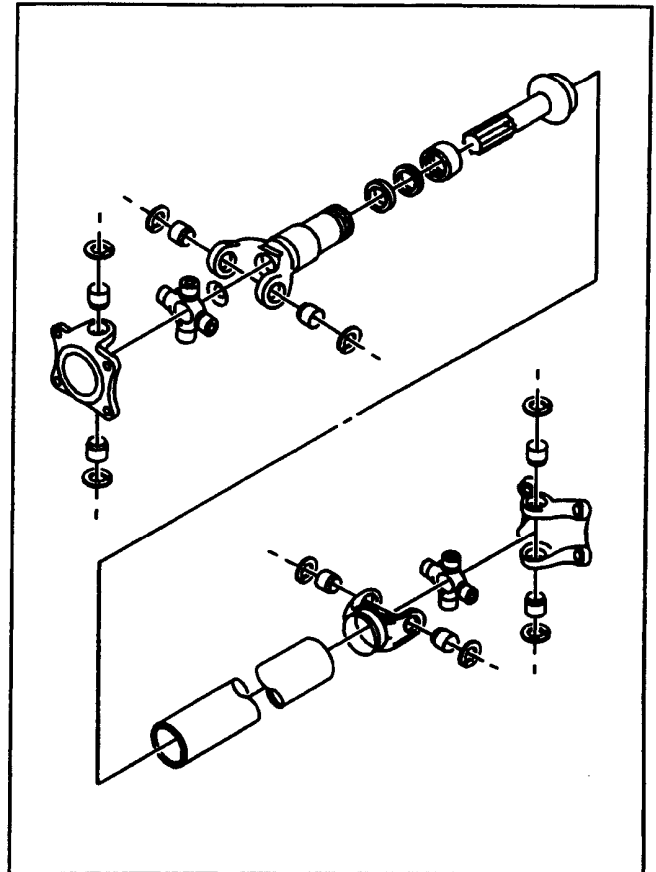
6. Inspect the propeller shaft for alignment and phasing.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Flange)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (4 nut) mounting.
6. Remove the center bearing assembly, if equipped, from the cross member. Refer to *Center Bearing Replacement*.
7. Remove the two piece propeller shaft mounting.
8. Remove the universal joint. Refer to *Universal Joints Replacement*.

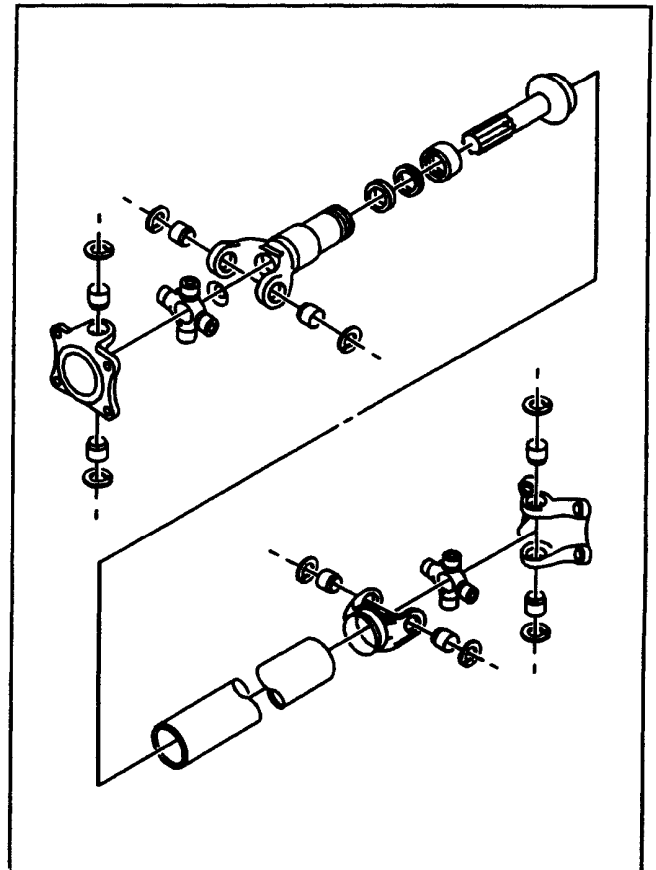
9. Remove the propeller shaft 1480 or 1550 series with inboard slip joint and flange yoke.



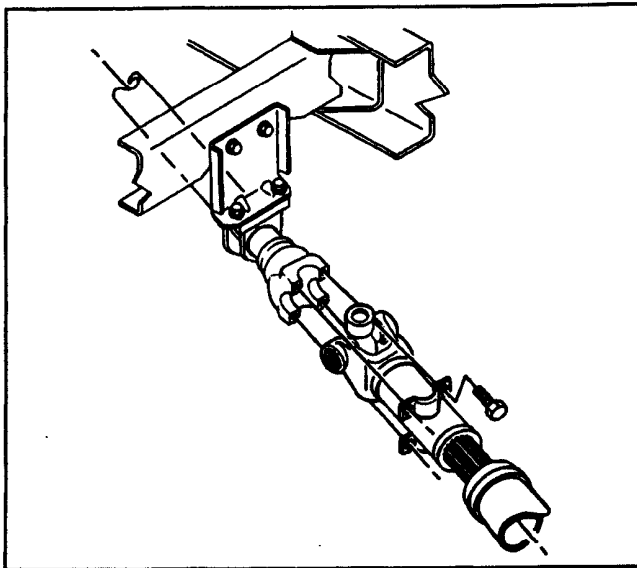
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Installation Procedure

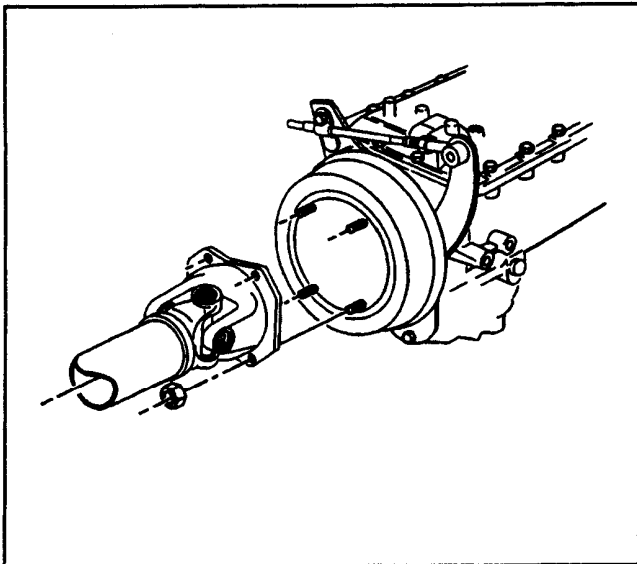
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Center Bearing Replacement*.



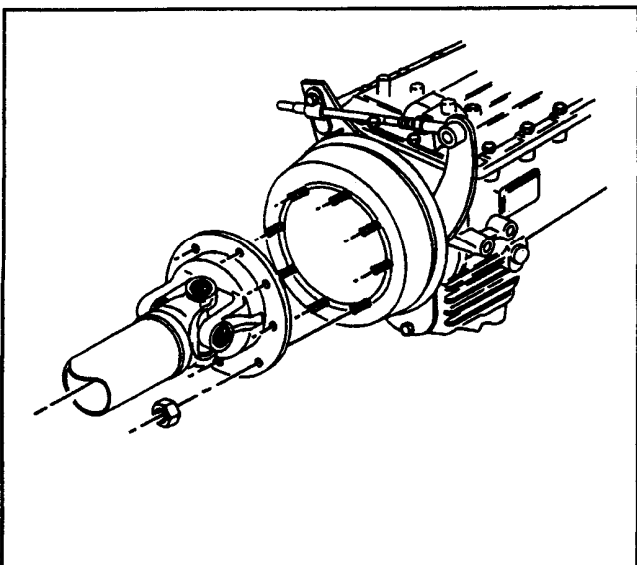
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4. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.

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

5. Install and tighten the propeller shaft inboard slip joint and flange yoke bolts. Refer to *Fastener Tightening Specifications*.

Tighten

Tighten the center bearing mounting bolts to 71 N.m (52 lb ft).

6. Install the rear propeller shaft to the center bearing assembly.

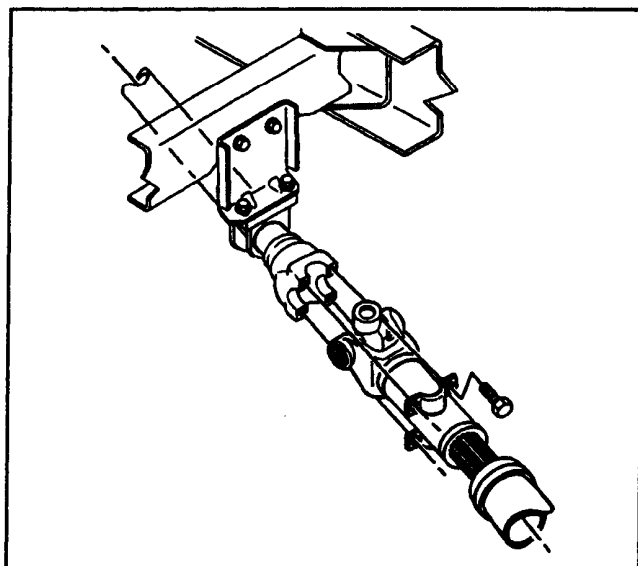
7. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Full)

Removal Procedure

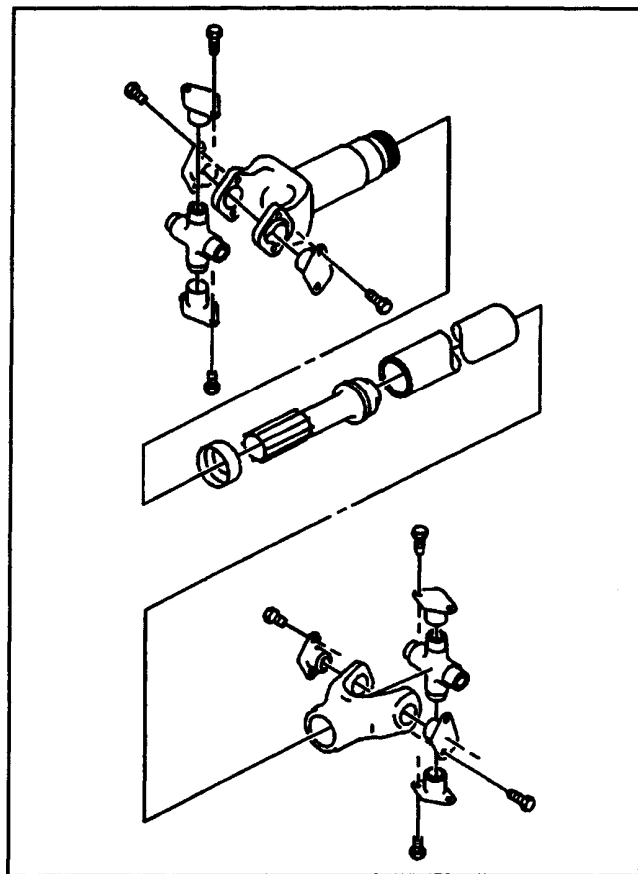
1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (8 nut) mounting.
6. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.

7. Remove the two piece propeller shaft mounting.

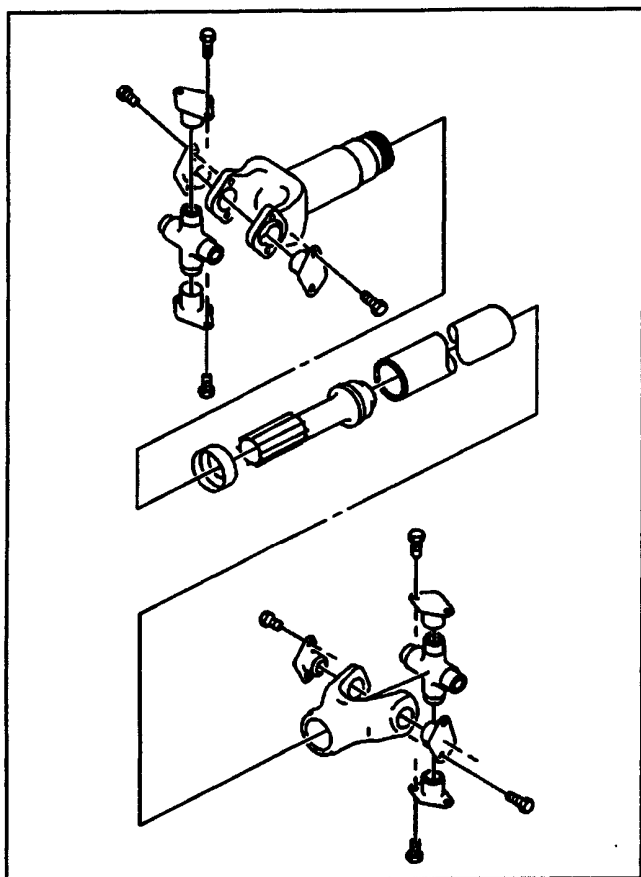


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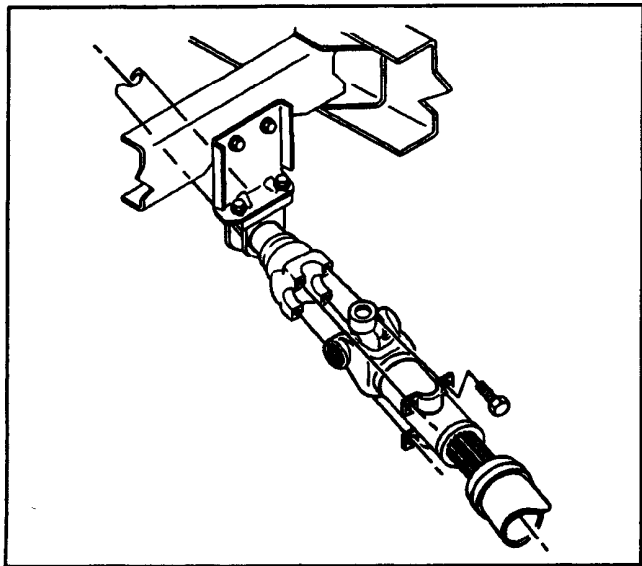
8. Remove the universal joints. Refer to *Universal Joints Replacement*.
9. Remove the propeller shaft 16N, 17N, 18N, 1710 or 1760 series with inboard slip joint and flange yoke.



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Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.

4. Install the front propeller shaft to the Yoke Flange (8 nut) mounting. Keep the alignment marks together.

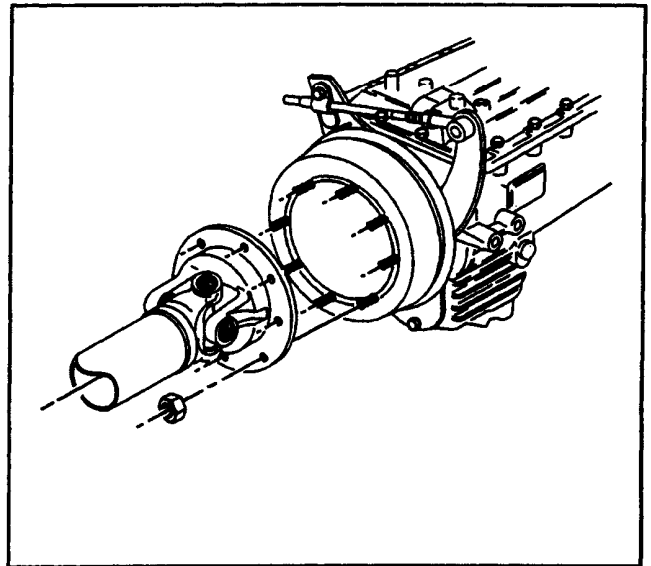
Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install and tighten the propeller shaft inboard slip joint and full round end yoke bolts. Refer to *Fastener Tightening Specifications*.

Tighten

Tighten the center bearing mounting bolts to 71 N·m (52 lb ft).

6. Install the rear propeller shaft to the center bearing assembly.
7. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

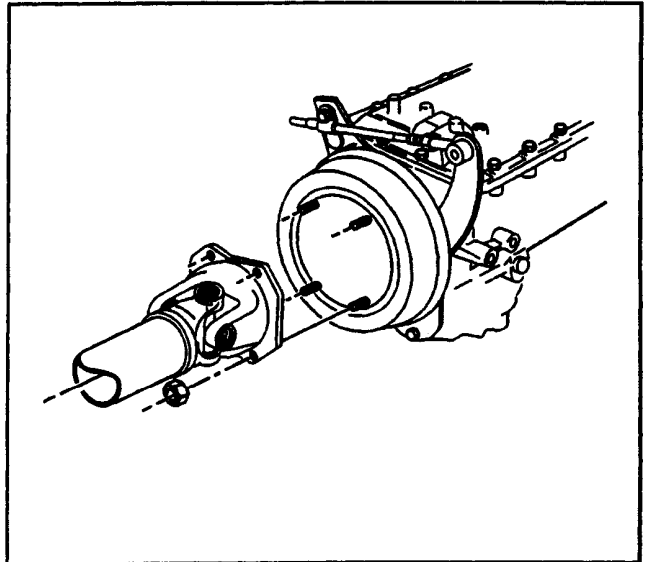


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Two-Piece Propeller Shaft Replacement (Outboard Slip Joint and Half)

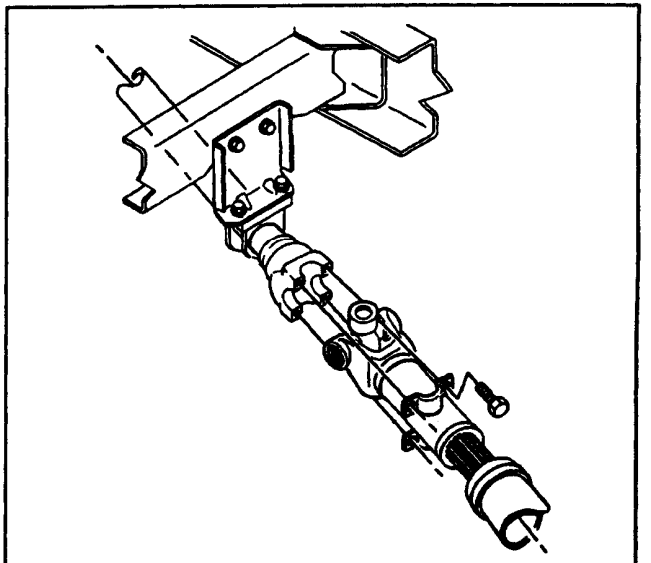
Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (4 nut) mounting.
6. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.

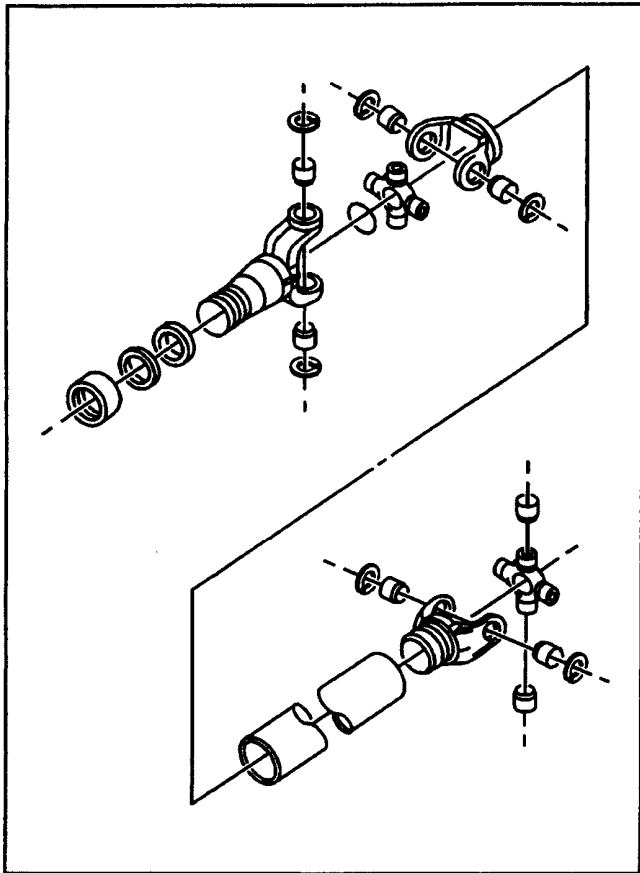


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7. Remove the two piece propeller shaft mounting.

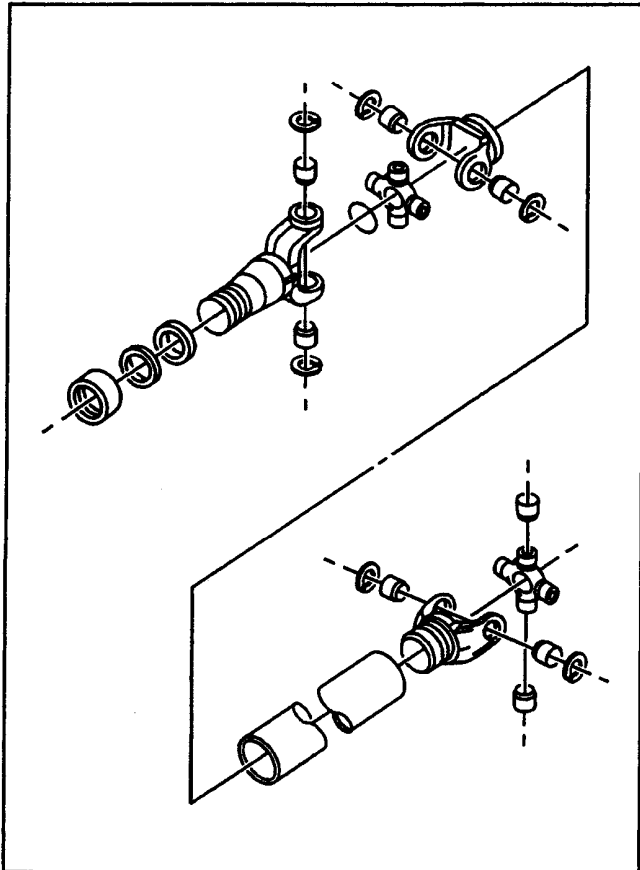


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8. Remove the universal joints. Refer to *Universal Joints Replacement*.
9. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.



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Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.

4. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.

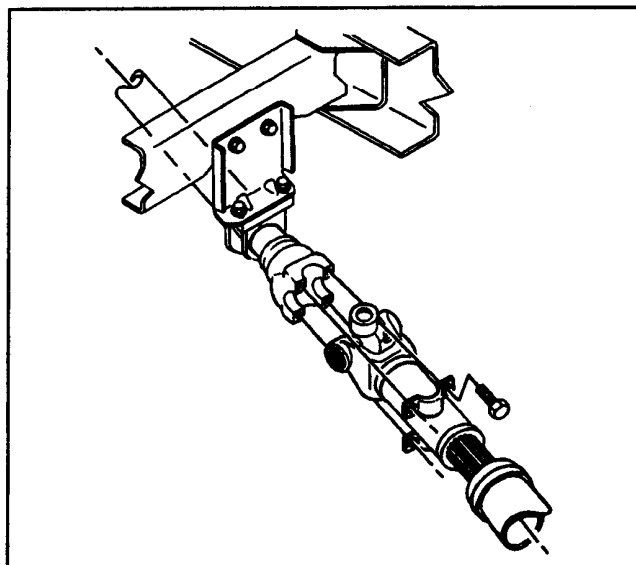
Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install and tighten the propeller shaft outboard slip joint and half round end yoke bolts. Refer to *Fastener Tightening Specifications*.

Tighten

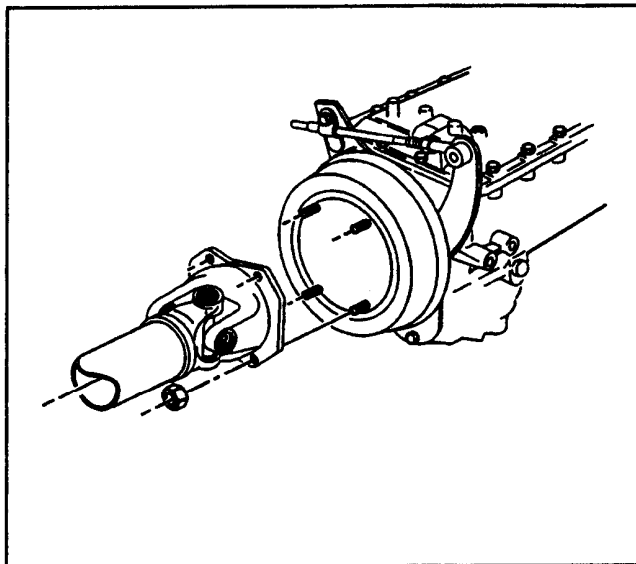
Tighten the center bearing mounting bolts to 71 N.m (52 lb ft).

6. Install the rear propeller shaft to the center bearing assembly.



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7. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

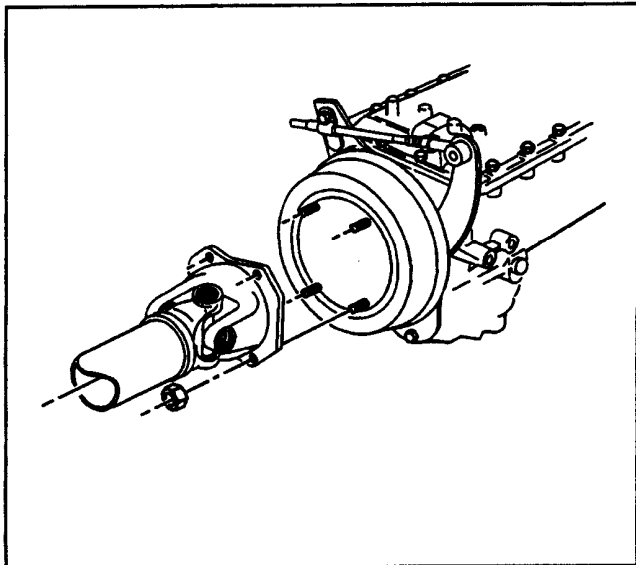


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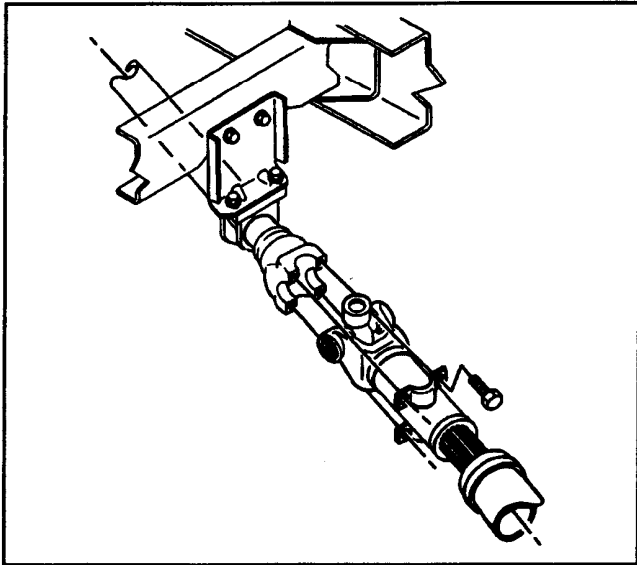
Two-Piece Propeller Shaft Replacement (Center Bearing, Half Yoke)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (4 nut) mounting.
6. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.

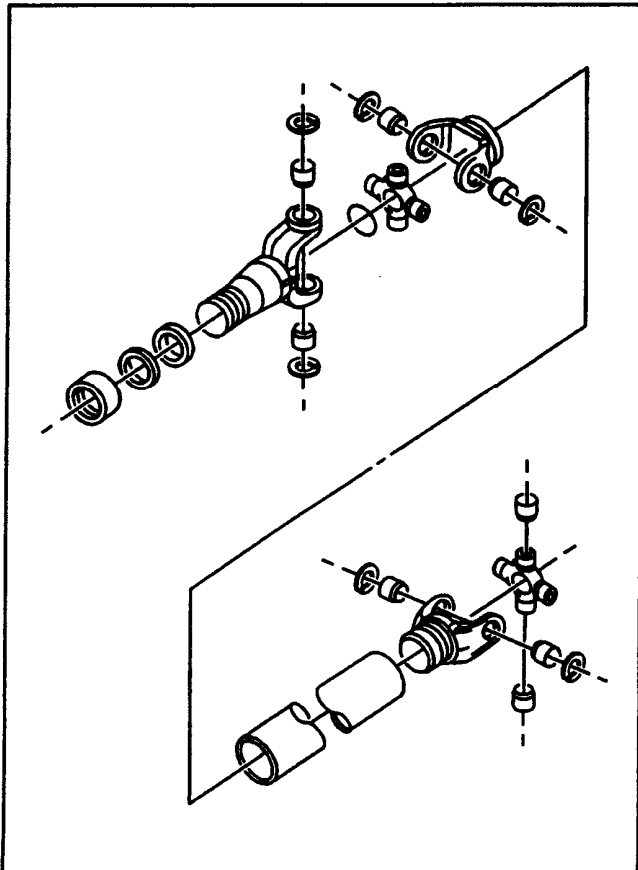


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7. Remove the two piece propeller shaft mounting.
8. Remove the universal joints. Refer to *Universal Joints Replacement*.

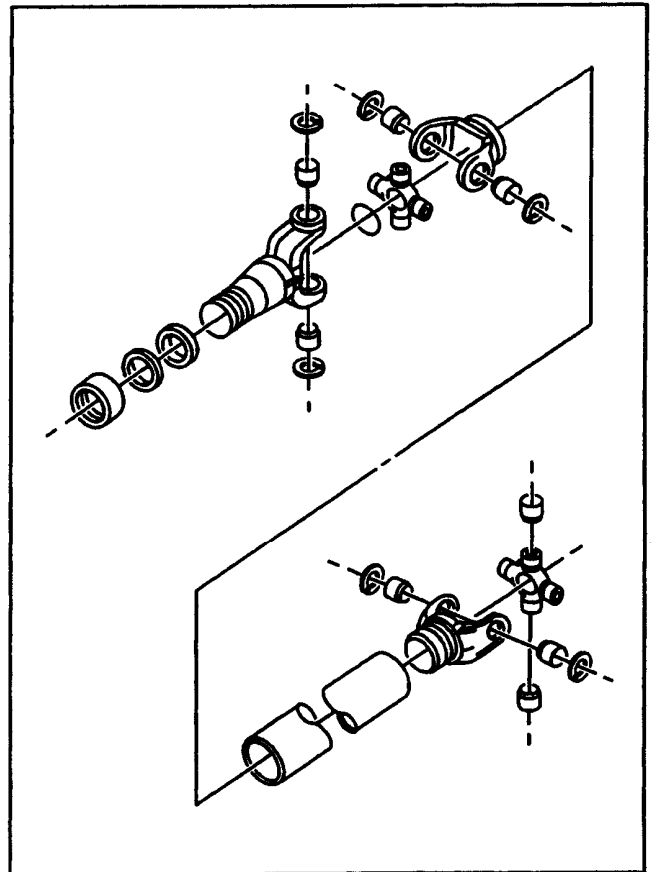


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9. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.

Installation Procedure

1. Support the propeller shaft sections in the installed position.
2. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end.
3. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.



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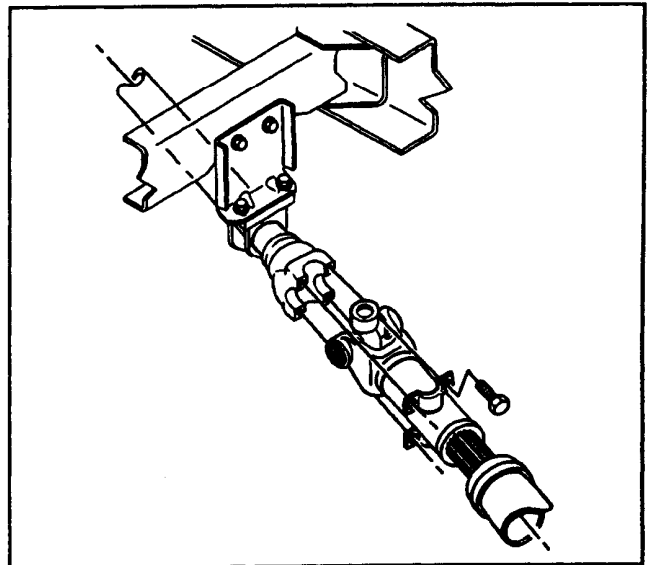
Notice: Refer to *Fastener Notice* in Cautions and Notices.

4. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.

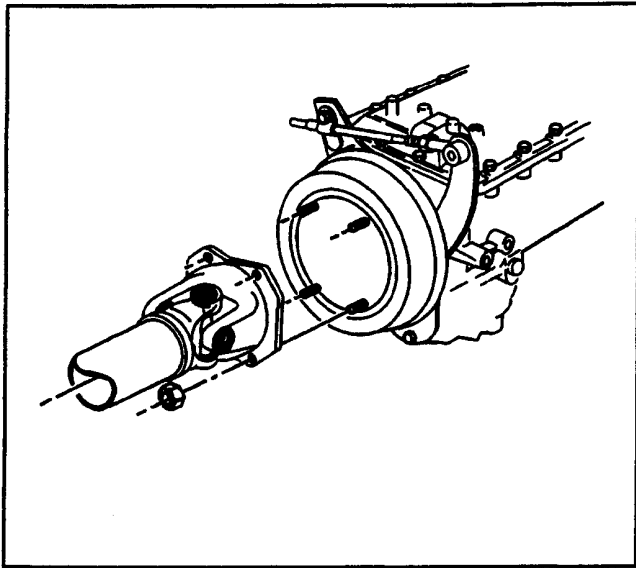
Tighten

Tighten the center bearing mounting bolts to 71 N·m (52 lb ft).

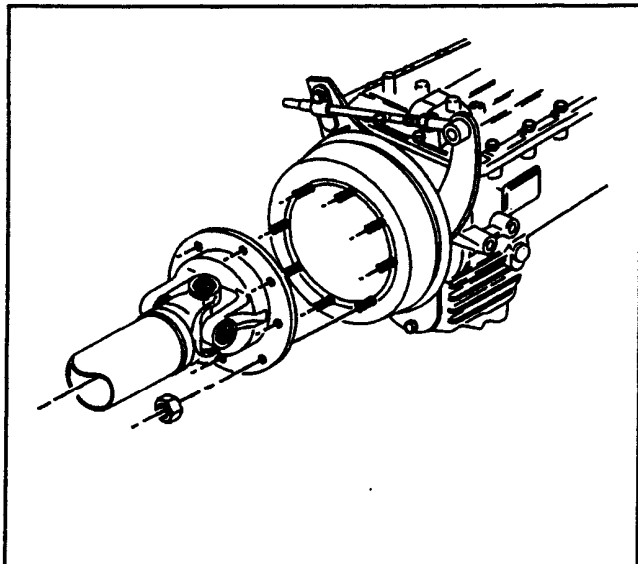
5. Install the rear propeller shaft to the center bearing assembly.



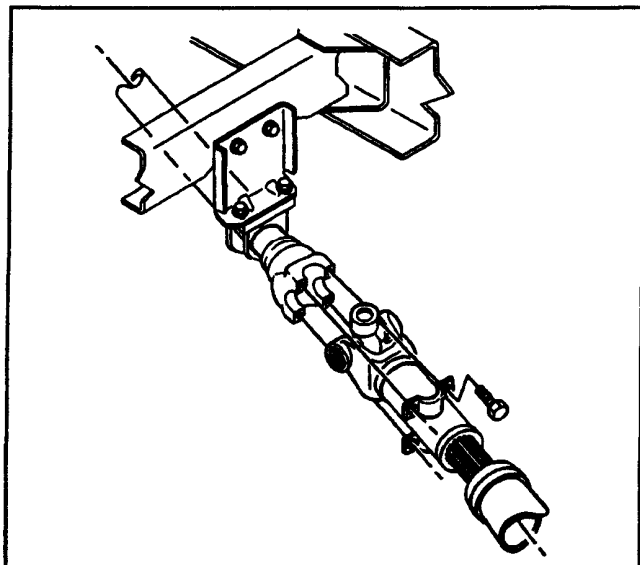
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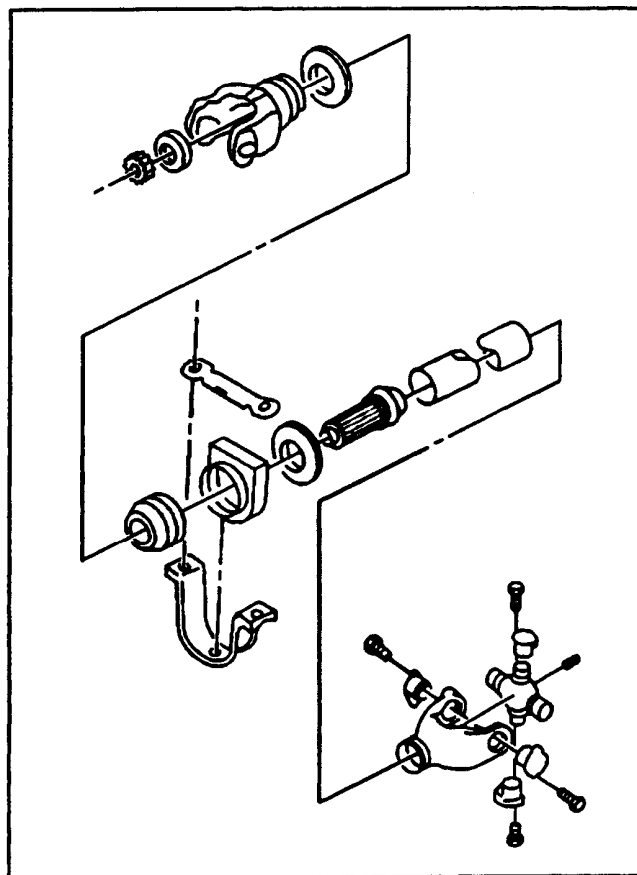
6. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

Two-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (8 nut) mounting.
6. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.
7. Remove the two-piece propeller shaft mounting.

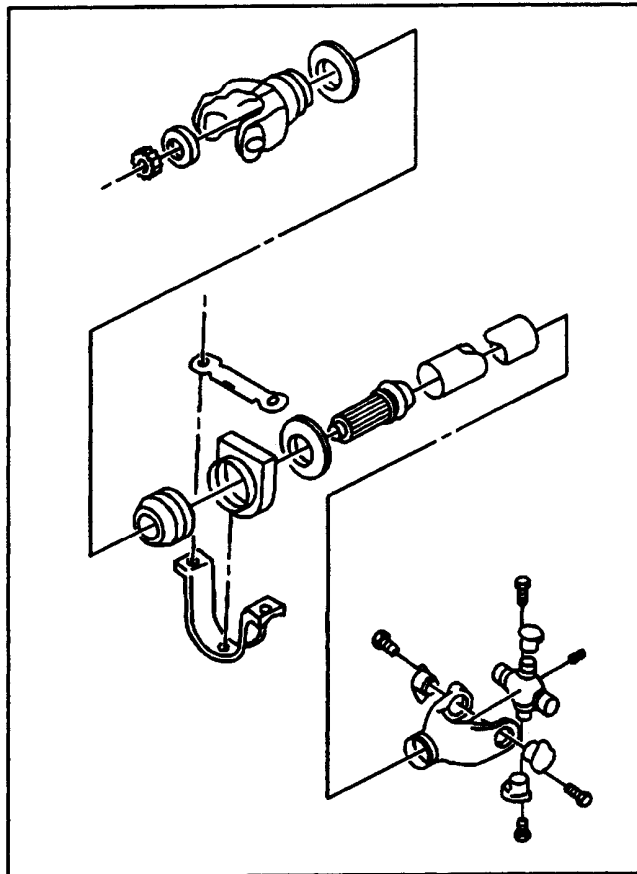
8. Remove the universal joint. Refer to *Universal Joints Replacement*.
9. Remove the propeller shaft 16N, 17N, 18N, 1710, or 1760 series with center bearing and full round or end yoke.



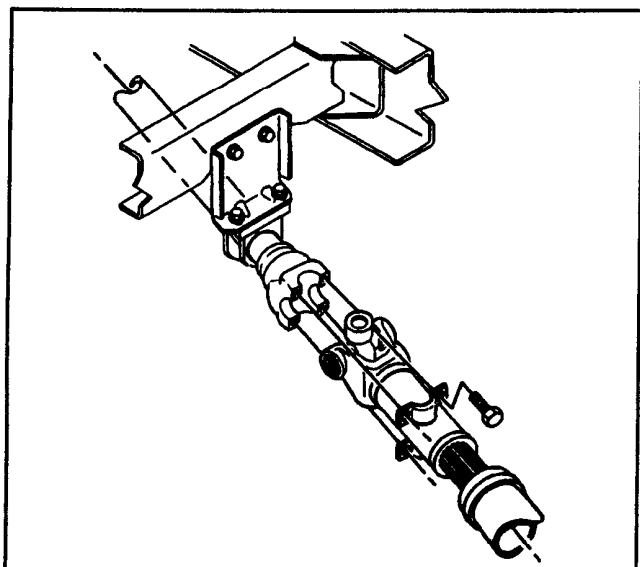
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Installation Procedure

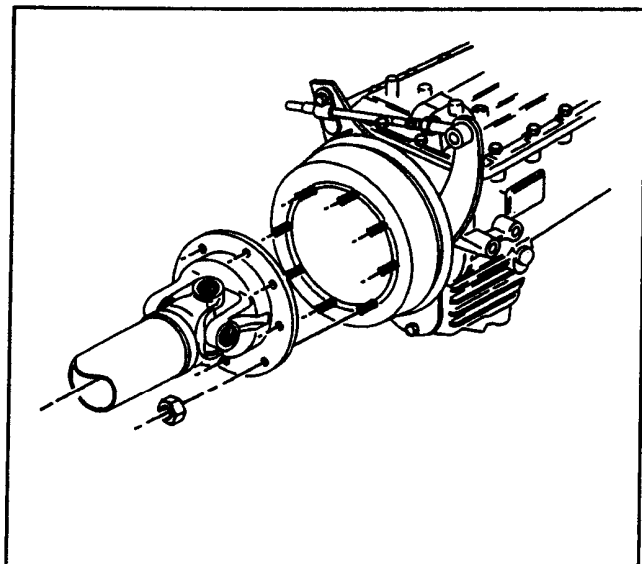
1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end.



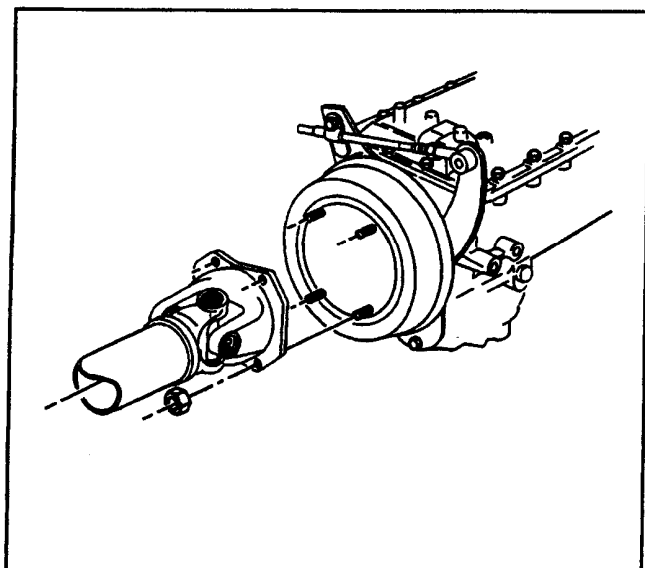
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4. Install the front propeller shaft to the Yoke Flange (8 nut) mounting. Keep the alignment marks together.
5. Install and tighten the propeller shaft full round end yoke bolts. Refer to *Fastener Tightening Specifications*.

Tighten

Tighten the center bearing mounting bolts to 71 N.m (52 lb ft).

6. Install the rear propeller shaft to the center bearing assembly.

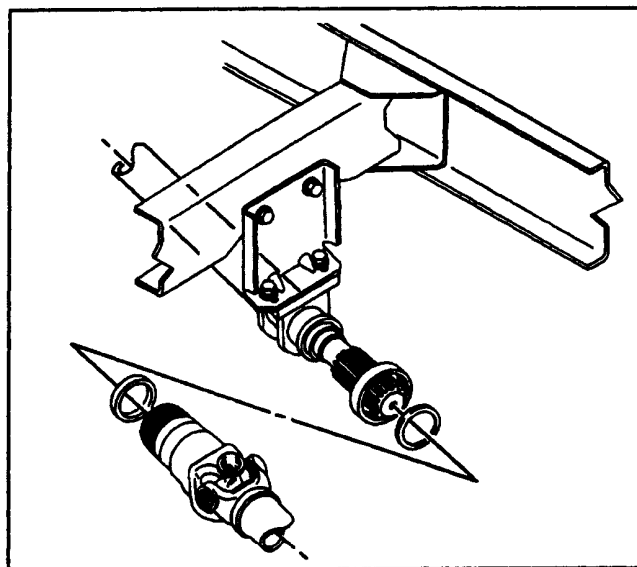
7. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
- Notice:** Refer to *Fastener Notice* in Cautions and Notices.
8. Inspect the propeller shaft for alignment and phasing.
 9. Install the propeller shaft guards, if equipped.
 10. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

Three-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke)

Removal Procedure

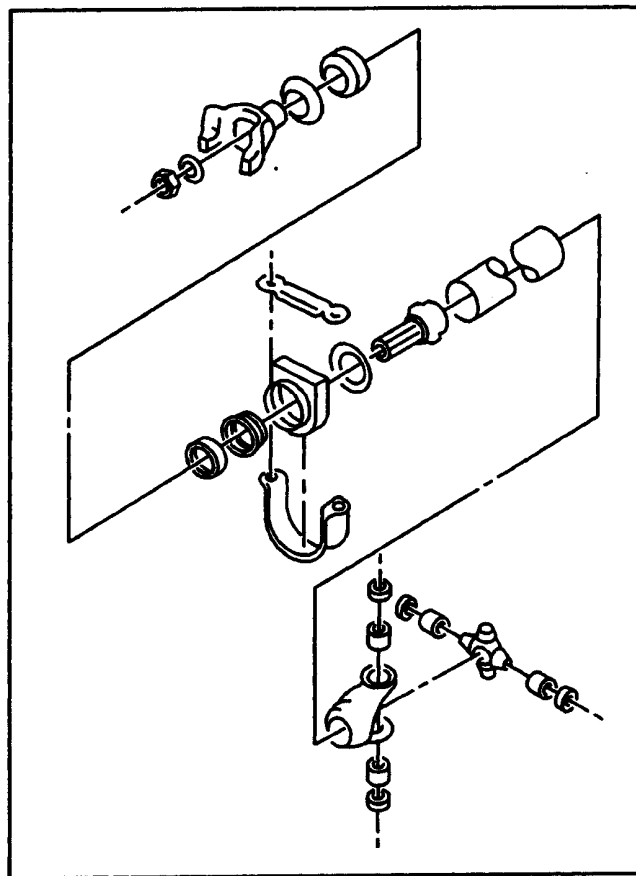
1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the Yoke Flange (4 nut) mounting.
6. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.

7. Remove the three-piece propeller shaft with tandem axle mounting.
8. Remove the universal joints. Refer to *Universal Joints Replacement*.

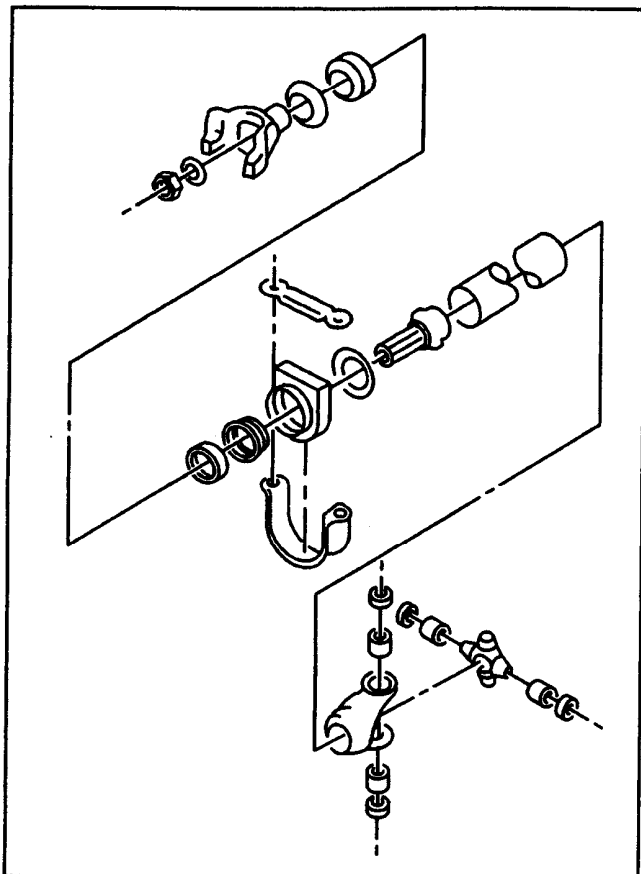


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9. Remove the propeller shaft 1480 or 1550 series with center bearing and full round or end yoke.



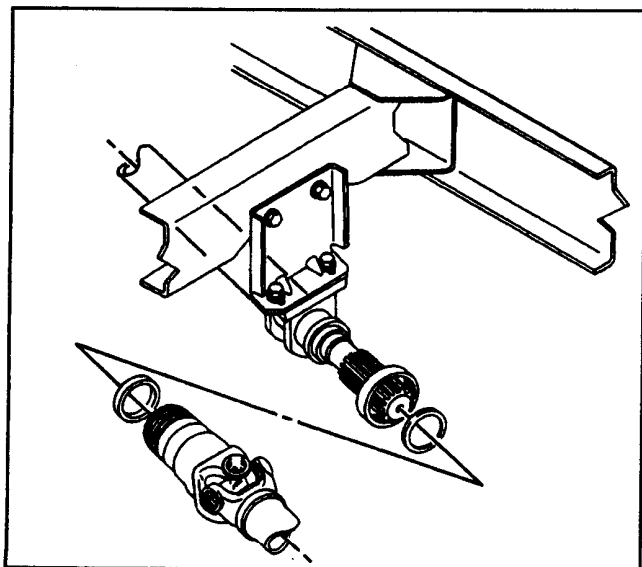
198601



198601

Installation Procedure

1. Install the universal joints to the propelled shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end.



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4. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.

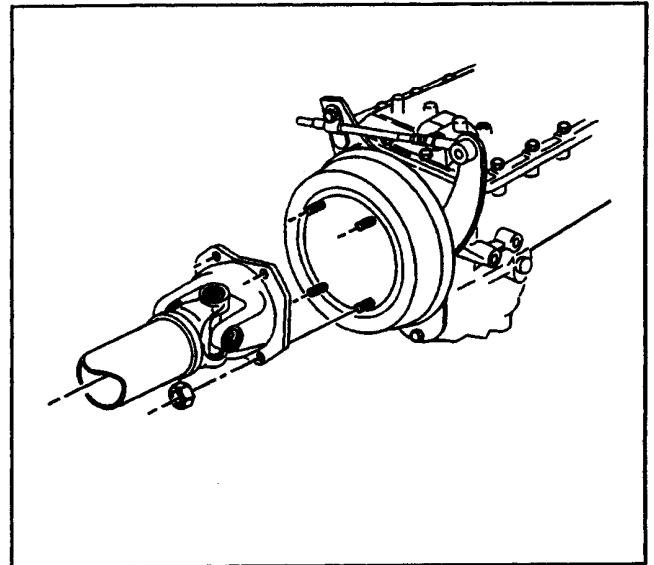
Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.

Tighten

Tighten the center bearing mounting bolts to 71 N·m (52 lb ft).

6. Install the rear propeller shaft to the center bearing universal joint, if equipped.
7. Install the center bearing assembly to the cross frame. Refer to *Center Bearing Replacement*.
8. Install the propeller shaft guards, if equipped.
9. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

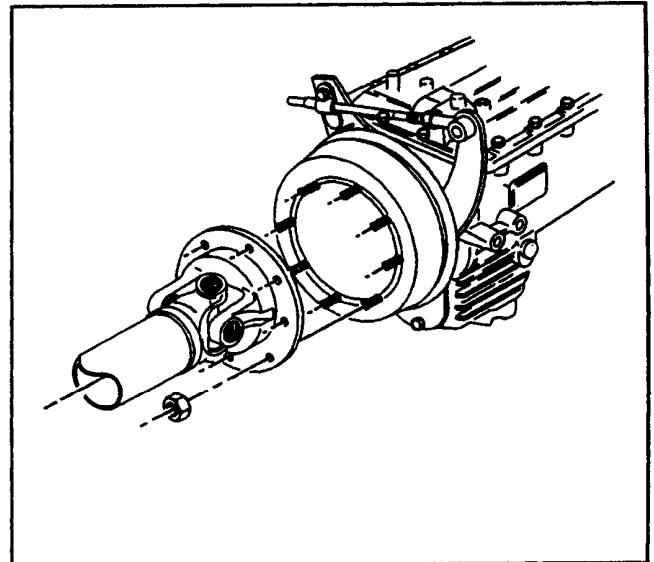


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Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Full Yoke)

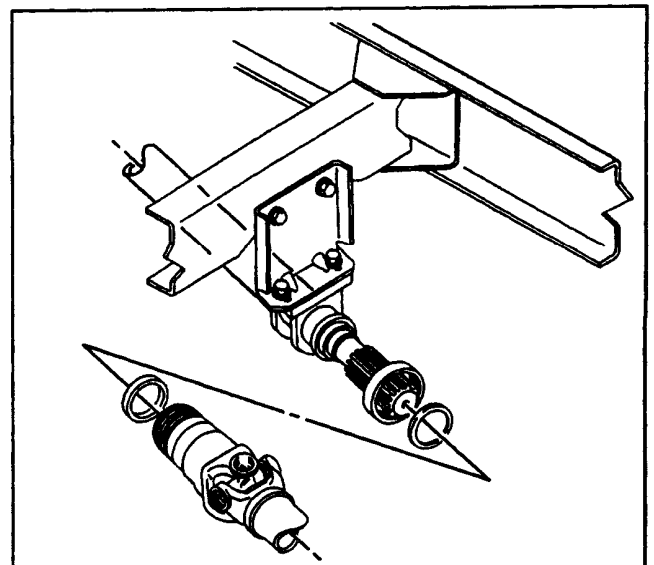
Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft bolts from the Yoke Flange (8 nut) mounting.

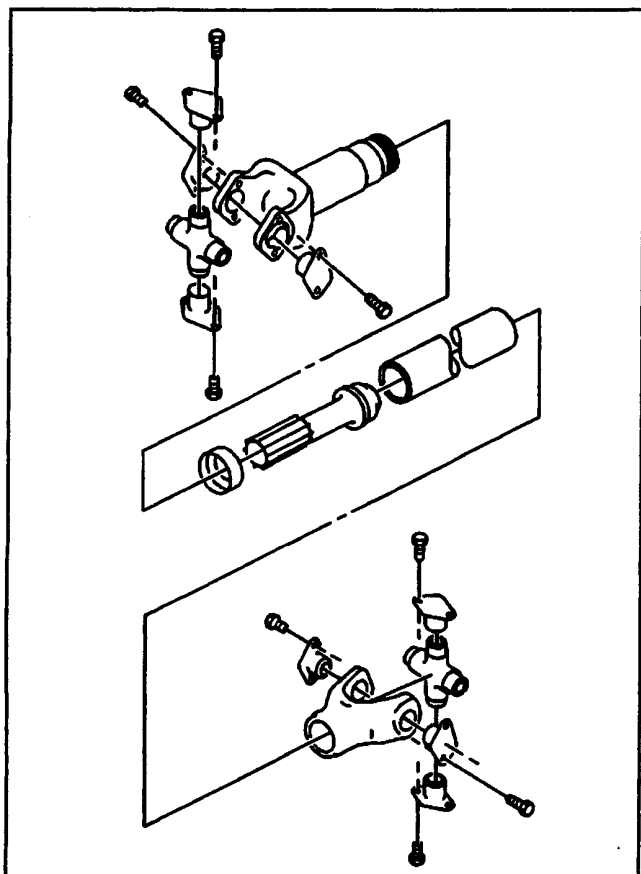


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6. Remove the three-piece propeller shaft with tandem axle mounting.



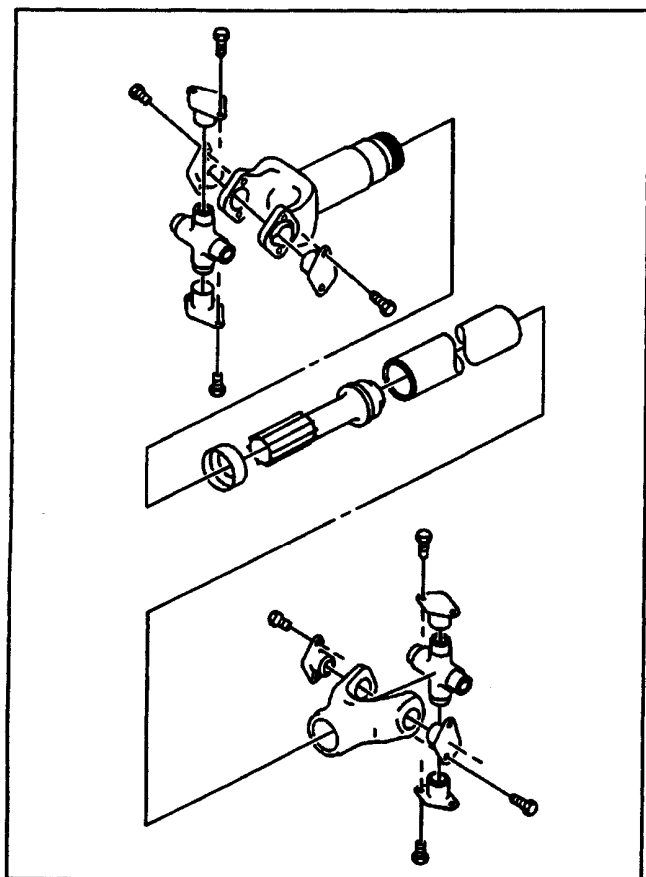
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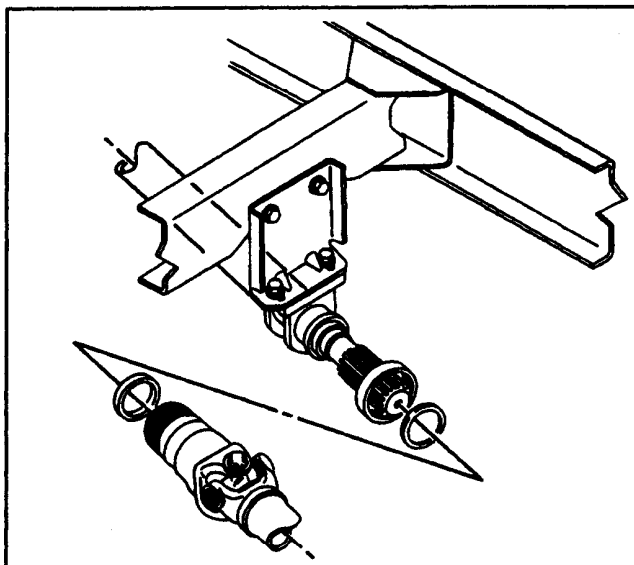
7. Remove the propeller shaft 16N, 17N, 18N, 1710 or 1760 series with inboard slip joint and full round end yoke.
8. Remove the universal joints. Refer to *Universal Joints Replacement*.

Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.



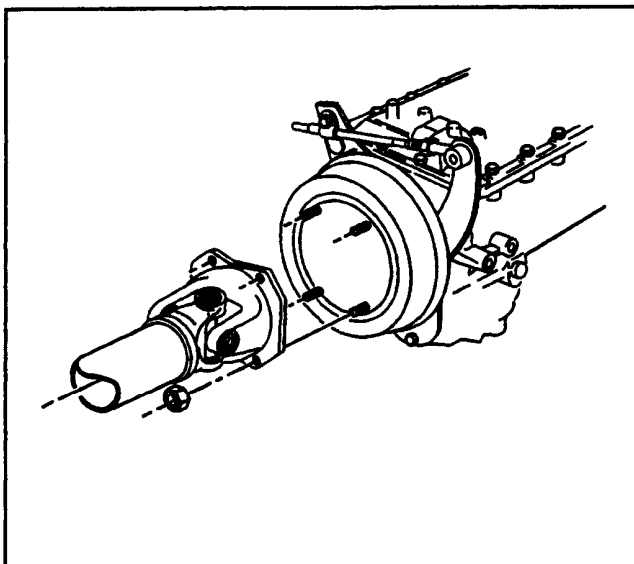
4. Install the front propeller shaft to the Yoke Flange (8 nut) mounting. Keep the alignment marks together.
5. Install and tighten the propeller shaft full or half round end yoke bolts. Refer to *Fastener Tightening Specifications*.



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

6. Inspect the propeller shaft for alignment and phasing.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

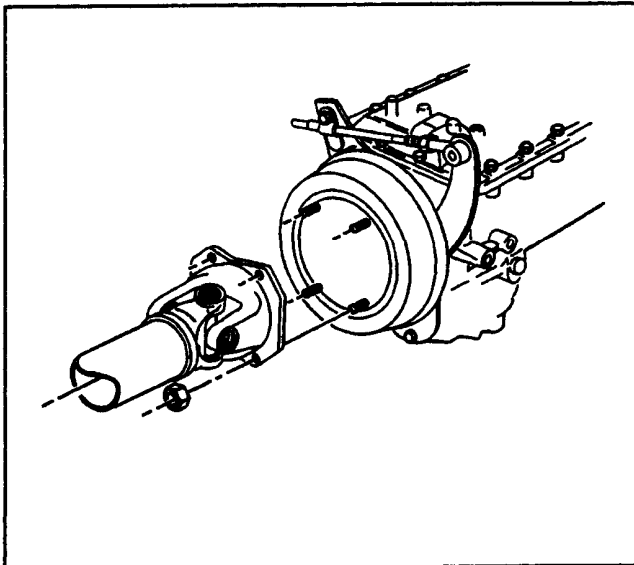


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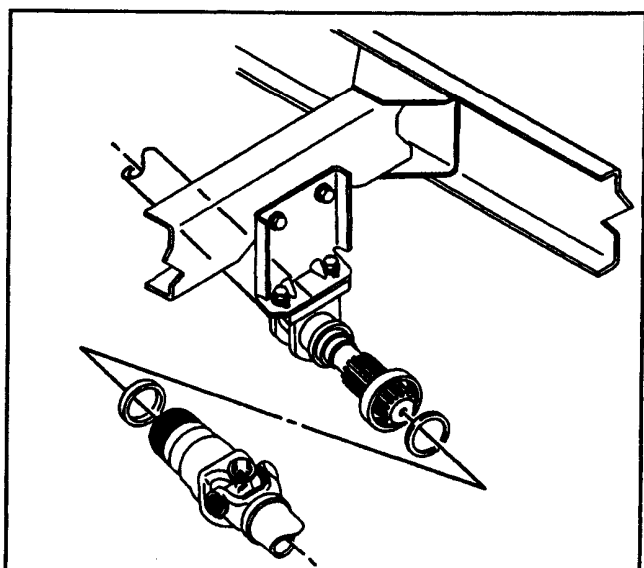
Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Flange)

Removal Procedure

1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft bolts from the Yoke Flange (4 nut) mounting.

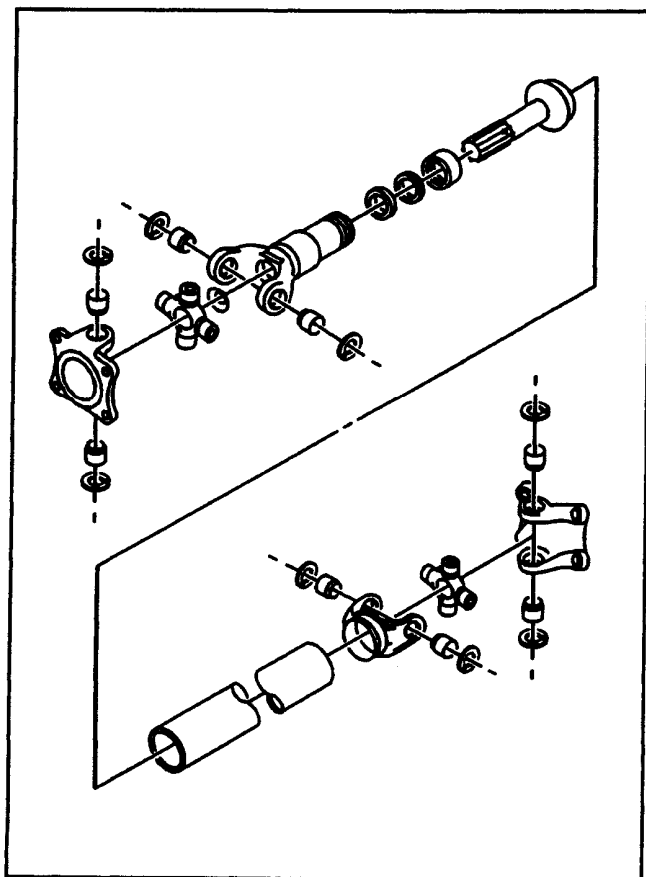


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6. Remove the three-piece propeller shaft with tandem axle mounting.

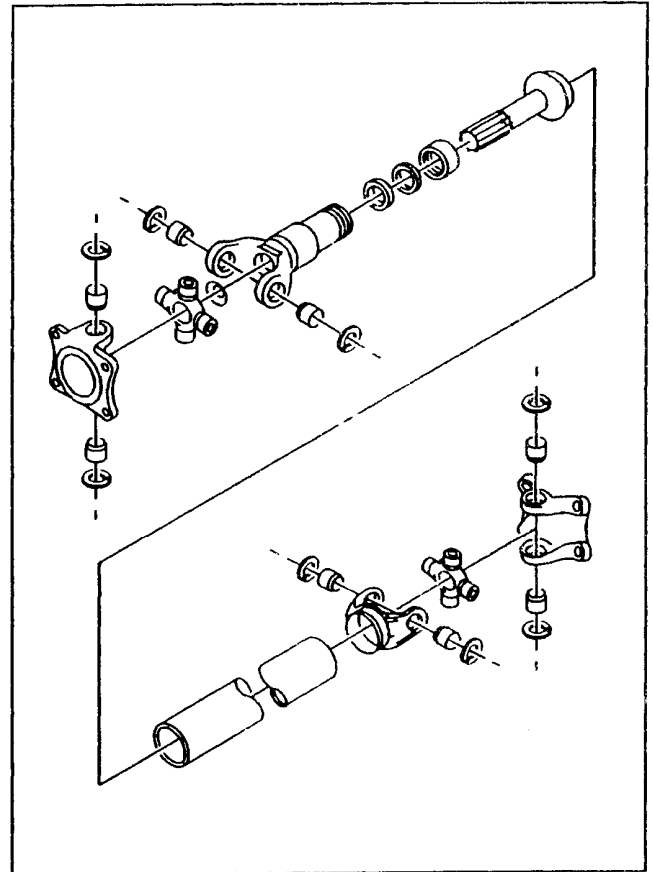


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7. Remove the propeller shaft 1480 or 1550 series with inboard slip joint and flange yoke.
8. Remove the universal joints. Refer to *Universal Joints Replacement*.
9. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.

Installation Procedure

1. Install the universal joints to the propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.

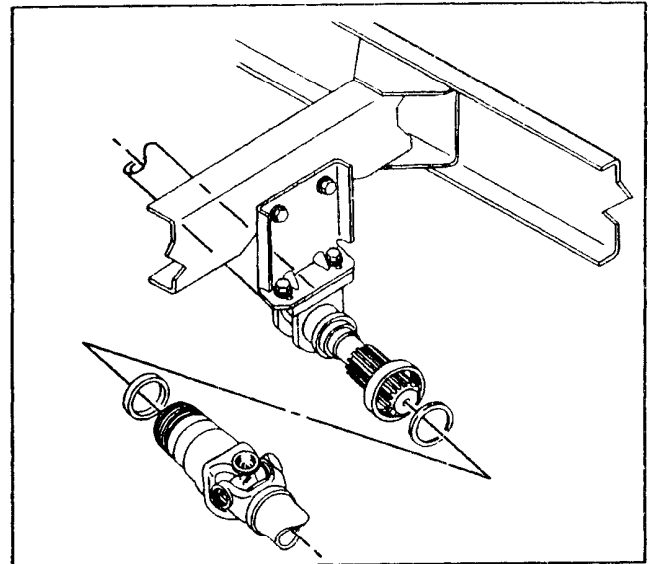


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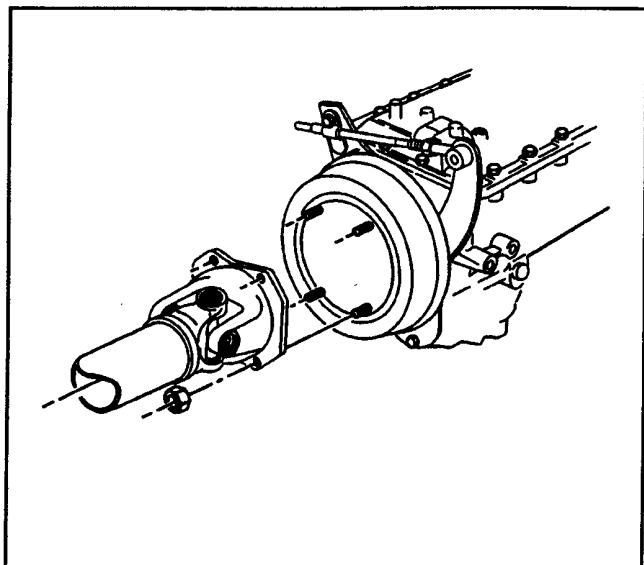
4. Install the front propeller shaft to the Yoke Flange (4 nut) mounting. Keep the alignment marks together.

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

5. Inspect the propeller shaft for alignment and phasing.
6. Install and tighten the propeller shaft flange yoke bolts. Refer to *Fastener Tightening Specifications*.

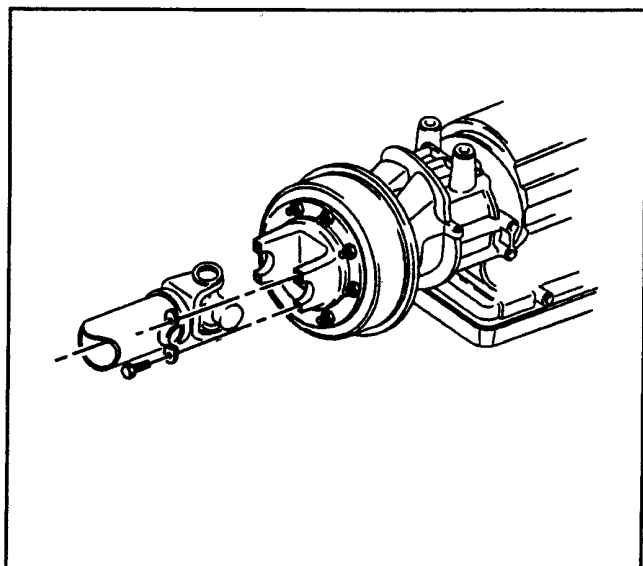


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7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

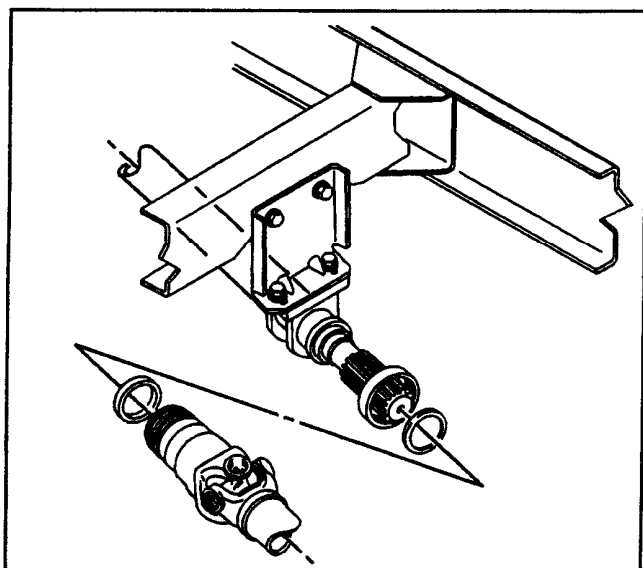


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Three-Piece Propeller Shaft Replacement (Outboard Slip Joint, Half)

Removal Procedure

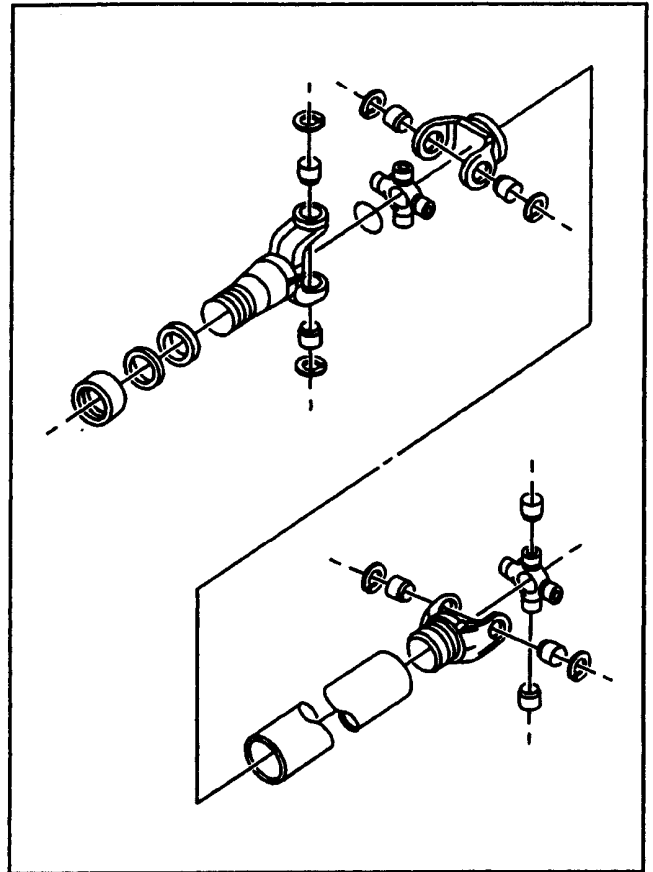
1. Block the wheels.
2. Support the propeller shaft.
3. Mark the universal joints and slip joints with alignment marks.
4. Remove the propeller shaft guards, if equipped.
5. Remove the propeller shaft from the 305 mm (12 in) brake drum.



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6. Remove the three-piece propeller shaft with tandem axle mounting.

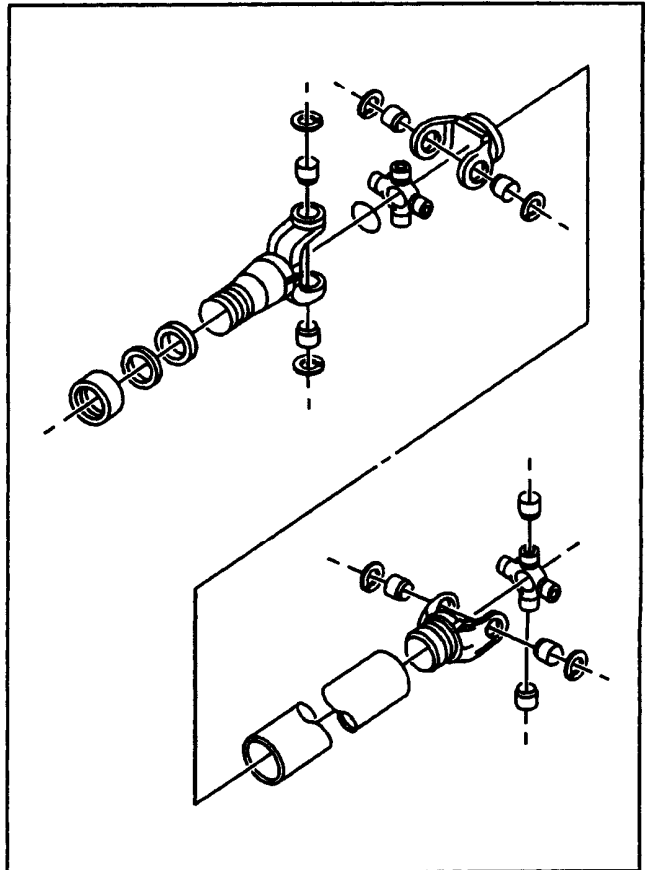
7. Remove the propeller shaft 1480 or 1550 series with outboard slip joint and half round end yoke.
8. Remove the universal joints. Refer to *Universal Joints Replacement*.
9. Remove the center bearing assembly from the cross member. Refer to *Center Bearing Replacement*.



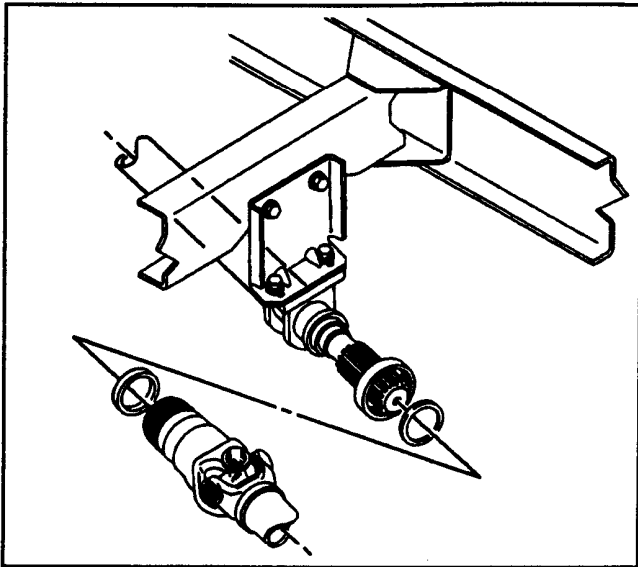
198622

Installation Procedure

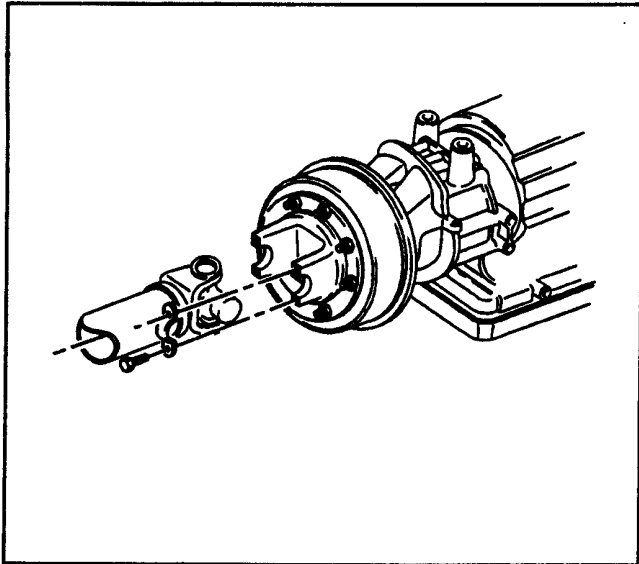
1. Install the universal joints propeller shaft. Refer to *Universal Joints Replacement*.
2. Support the propeller shaft sections in the installed position.
3. Install the slip yoke and the center bearing assembly to the installed propeller shaft splined end. Refer to *Propeller Shaft Assembly Component Lubrication*.



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4. Install the front propeller shaft to the 305 mm (9 in) brake drum. Keep the alignment marks together.
5. Install and tighten the propeller shaft half round end yoke bolts. Refer to *Fastener Tightening Specifications*.

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

6. Inspect the propeller shaft for alignment and phasing.
7. Install the propeller shaft guards, if equipped.
8. Lubricate the universal joints and the slip joints. Refer to *Propeller Shaft Assembly Component Lubrication*.

Propeller Shaft Assembly Component Lubrication

Universal Joints

The journals of the universal joints are drilled and provided with lubrication fittings. Lubricant travels through the fittings to all four oil reservoirs, through a small hole inside of each reservoir, direct to the needle bearings. The seals protect the needle bearings against lubricant leakage, dirt and debris.

1. Lubricate with chassis lubricant. Refer to *Fluid and Lubricant Recommendations* in Maintenance and Lubrication.
2. When greasing the joint, ensure that a flow of grease at all four trunnion seals is visible in order to ensure the lubrication of the joint.
3. If grease does not appear at all four trunnion seals, rotate the universal joint trunnion in all four directions while applying the lubricant under pressure in order to relieve any air lock inside of the joint. Air lock would prevent the lubricant from reaching the bearing area.
4. Loosen the cap bolts and cap enough in order to allow a flow of grease, as necessary.

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

5. Tighten the bolts.

Tighten

Tighten the bolts to 44 N.m (33 lb ft).

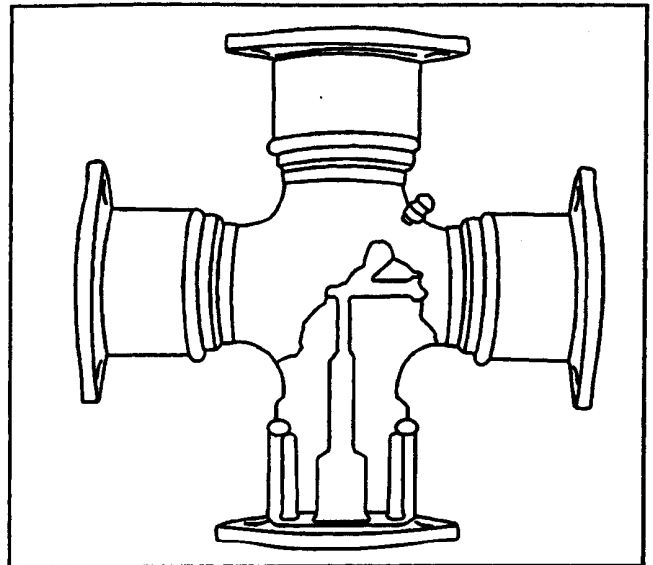
Slip Joint

1. Splines of the slip joint are lubricated through a lubrication fitting installed in the slip yoke. Apply grease gun pressure to the lubrication fitting until the lubricant appears at the pressure relief hole.
2. Cover the pressure relief hole.
3. Apply pressure until the grease appears at the sleeve yoke seal.
4. Lubricate the universal joints and slip yoke splines at the specified periods. Refer to *Maintenance Schedule* in General Information.

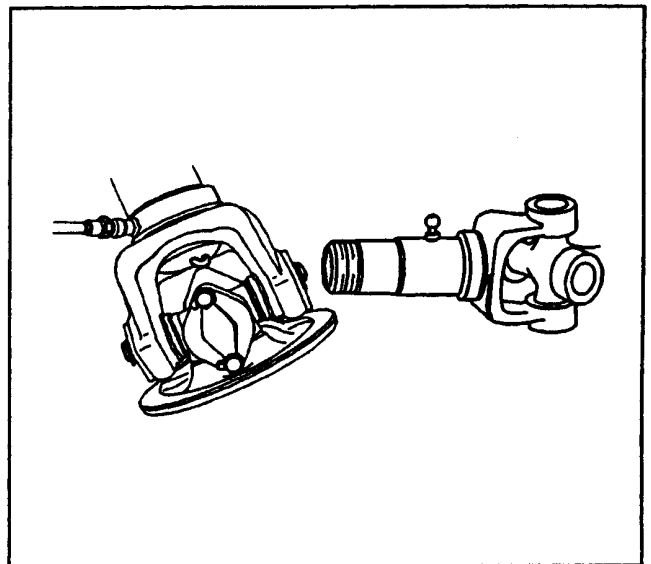
Center Bearing

This bearing is permanently lubricated. Do not attempt to add or change grease within the bearing.

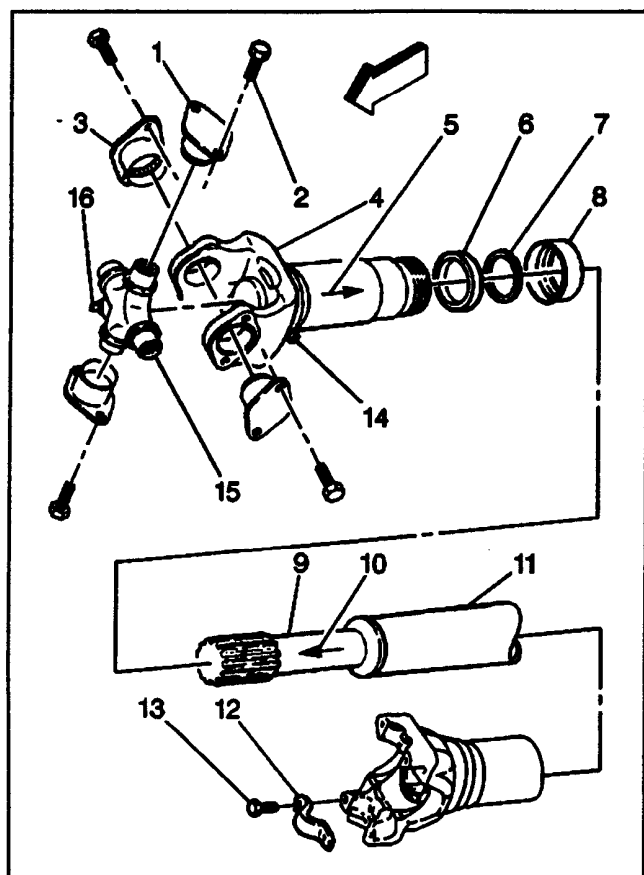
When installing a new center bearing, fill the entire cavity with chassis grease. Ensure that the quantity is sufficient enough in order to fill the cavity to the extreme edge of the slinger surrounding the bearing. This will shield the bearing from water and contaminants.



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Slip Joint Replacement

Removal Procedure

1. Inspect the alignment marks (5) on the propeller shaft and the slip yoke. Punch mark both of the members if the marks are not present.
2. Remove the propeller shaft. Use the following list in order to determine which assembly is to be referenced:
 - If the propeller shaft is a one-piece, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/229)*
 - *One-Piece Propeller Shaft Replacement (Full Yoke/305)*.
 - *One-Piece Propeller Shaft Replacement (Half Yoke/229)*.
 - *One-Piece Propeller Shaft Replacement (Half Yoke/305)*.
 - *One-Piece Propeller Shaft Replacement (Outboard Slip/229)*.
 - *One-Piece Propeller Shaft Replacement (Outboard Slip/305)*.
 - *One-Piece Propeller Shaft Replacement (Inboard Flange/229)*.
 - *One-Piece Propeller Shaft Replacement (Inboard Flange/305)*.
 - *One-Piece Propeller Shaft Replacement (Inboard Full Yoke/305) or*
 - If the propeller shaft is a two-piece, refer to *Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Flange)*.
 - *Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Full)*.
 - *Two-Piece Propeller Shaft Replacement (Outboard Slip Joint and Half)*.
 - *Two-Piece Propeller Shaft Replacement (Center Bearing, Half Yoke)*.
 - *Two-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke)*.
 - If the propeller shaft is a three-piece, refer to *Three-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke)*.
 - *Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Full Yoke)*.
 - *Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Flange)*.
 - *Three-Piece Propeller Shaft Replacement (Outboard Slip Joint, Half)*.
3. Remove the dust cap (8) from the slip yoke tube.
4. Remove the shaft (9).
5. Remove the cork (or felt) seal (6), if used.
6. Remove the steel ring (7), if used.
7. Remove the dust cap (8) from the shaft (9). The dust cap may have an integral rubber seal. If the rubber seal is present there will be no steel ring, cork, or felt seal.
8. Remove the lubrication fitting (14).

9. Clean the slip yoke (4).
10. Clean the slip yoke splines.
11. Clean the shaft splines.
12. Inspect the slip yoke splines for wear or twist.
13. Inspect for backlash between the slip yoke and the shaft. Replace the slip joint if the backlash is excessive.

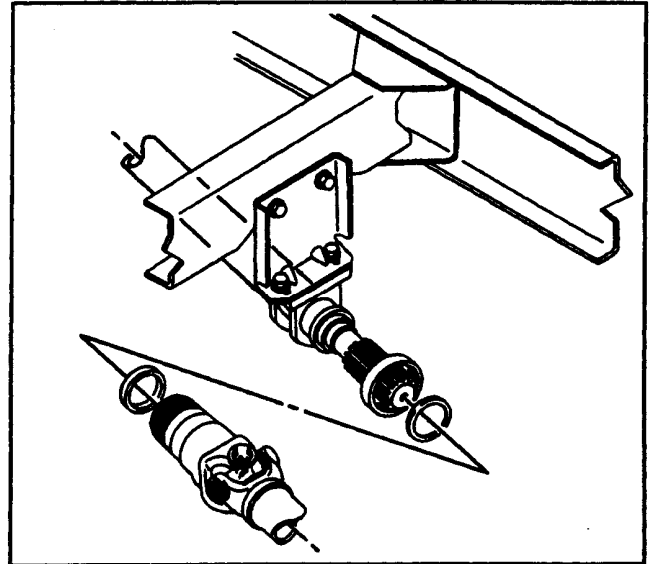
Installation Procedure

1. Connect the dust cap on to the shaft.
2. Install the steel ring on the shaft, if equipped.
3. Install the new cork (or felt) seal on the shaft, if equipped.
4. Lubricate the shaft splines. Refer to *Propeller Shaft Assembly Component Lubrication*.

Notice: The journal crosses must be in the same plane (in Phase), or serious vibration will occur, with resultant damage to the propeller shaft and components.

5. Install the shaft into the slip yoke. Ensure that the yokes are aligned.
6. Install the dust cap onto the slip yoke. Hand tighten the dust cap.
7. Install the lubrication fitting in the slip yoke.
8. Lubricate the slip joint. Refer to *Propeller Shaft Assembly Component Lubrication*.
9. Install the propeller shaft. Use the following list in order to determine which assembly is to be referenced:

- If the propeller shaft is a one-piece, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/229)*.
- *One-Piece Propeller Shaft Replacement (Full Yoke/305)*.
- *One-Piece Propeller Shaft Replacement (Half Yoke/229)*.
- *One-Piece Propeller Shaft Replacement (Half Yoke/305)*.
- *One-Piece Propeller Shaft Replacement (Outboard Slip/229)*.
- *One-Piece Propeller Shaft Replacement (Outboard Slip/305)*.
- *One-Piece Propeller Shaft Replacement (Inboard Flange/229)*.
- *One-Piece Propeller Shaft Replacement (Inboard Flange/305)*.
- *One-Piece Propeller Shaft Replacement (Inboard Full Yoke/305)* or
- If the propeller shaft is a two-piece, refer to *Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Flange)*.
- *Two-Piece Propeller Shaft Replacement (Inboard Slip Joint and Full)*.
- *Two-Piece Propeller Shaft Replacement (Outboard Slip Joint and Half)*.
- *Two-Piece Propeller Shaft Replacement (Center Bearing, Half Yoke)*.



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- *Two-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke).*
- If the propeller shaft is a three-piece, refer to *Three-Piece Propeller Shaft Replacement (Center Bearing, Full Yoke).*
- *Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Full Yoke).*
- *Three-Piece Propeller Shaft Replacement (Inboard Slip Joint, Flange).*
- *Three-Piece Propeller Shaft Replacement (Outboard Slip Joint, Half).*

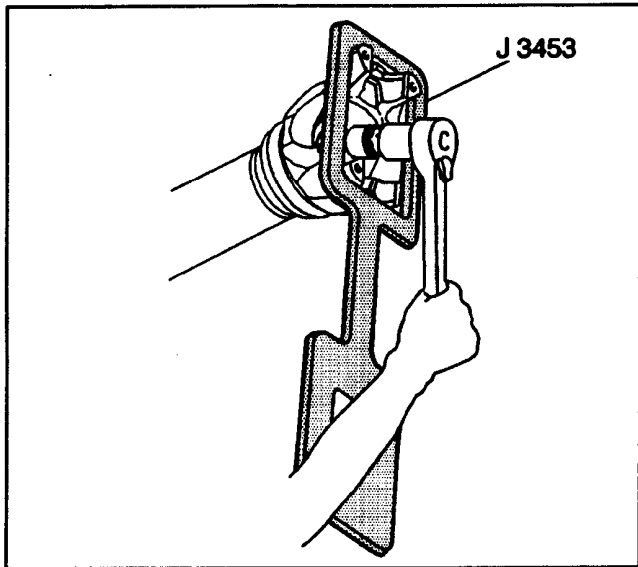
Center Bearing Replacement

Removal Procedure

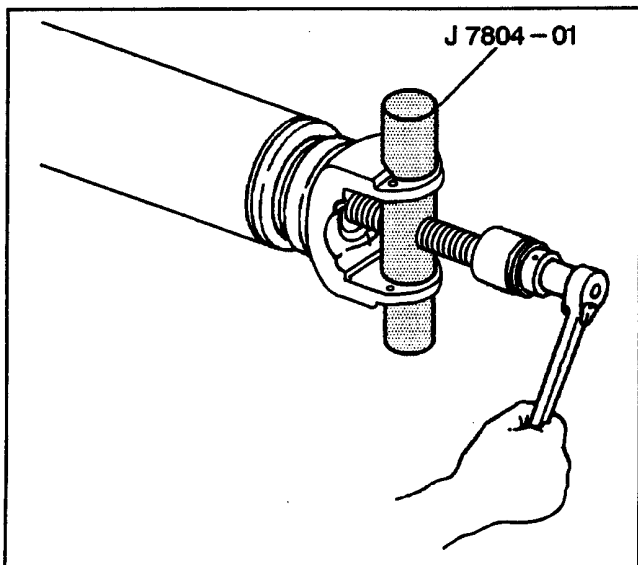
Tools Required

- J 3453 Holding Bar
- J 7804-01 Puller

1. Support the propeller shaft assembly.
2. Remove the universal joint from the yoke. Refer to *Universal Joints Replacement*.
3. Remove the bracket mounting bolts and nuts.
4. Remove the bracket and the retainer.
5. Remove the yoke nut using the J 3453.
6. Remove the yoke from the propeller shaft using the J 7804-01.
7. Remove the slinger.
8. Remove the grease retainer, if equipped.



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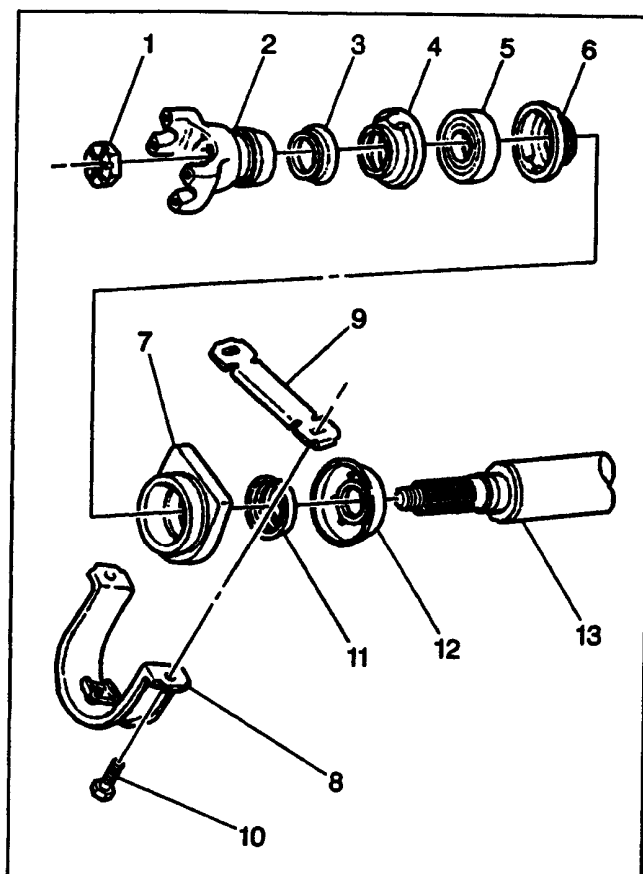


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9. Remove the center bearing (5).
10. Remove the grease retainer (4 and 6), if equipped.
11. Remove the rubber cushion (7).
12. Remove the slinger (11) and dust shield (12), if used.

Notice: Clean bearings in clean mineral spirits paint thinner, or equivalent. Do not spin dry bearings. Bearings can be damaged by use of wrong cleaning solvents and rough handling.

13. Clean the following components:
 - The slingers
 - The grease retainers
 - The center bearing
 - The rubber cushion
14. Inspect the following components for wear or damage:
 - The center bearing
 - The rubber cushion
 - The slingers
 - The grease retainers



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Installation Procedure

Tools Required

J 3453 Holding Bar

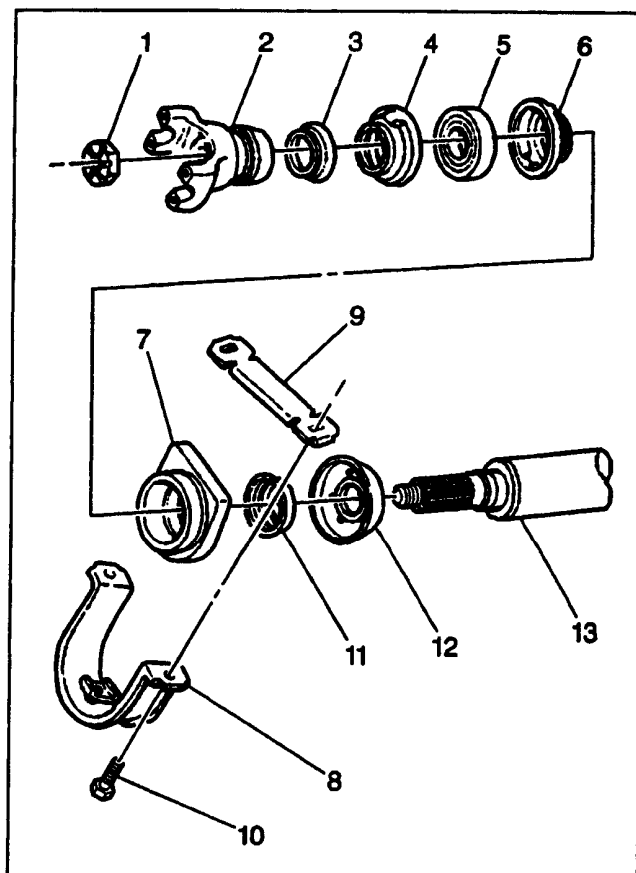
1. Install the lubricant into the grease retainers, if equipped. Refer to *Propeller Shaft Assembly Component Lubrication*.
2. Install the grease retainers (4, 6), if equipped, to the center bearing (5).
3. Install the center bearing (5) into the rubber cushion (7).
4. Install the dust shield (12), if used.
5. Install the slinger (11).
6. Install the center bearing (5) on the propeller shaft (13).
7. Install the slinger (11) on the propeller shaft (13).
8. Install the yoke (2).

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

9. Install the yoke nut (1) using the J 3453.

Tighten

- Tighten the series 1480 nut to 779 N.m (575 lb ft).
- Tighten the series 1550 bolt to 216 N.m (160 lb ft).
- Tighten the series 1610 or 1710 nut to 983 N.m (725 lb ft).



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10. Install the bracket (8) and the retainer (9) to the rubber cushion (7).
11. Install the mounting bolts (10) and nuts.

Tighten

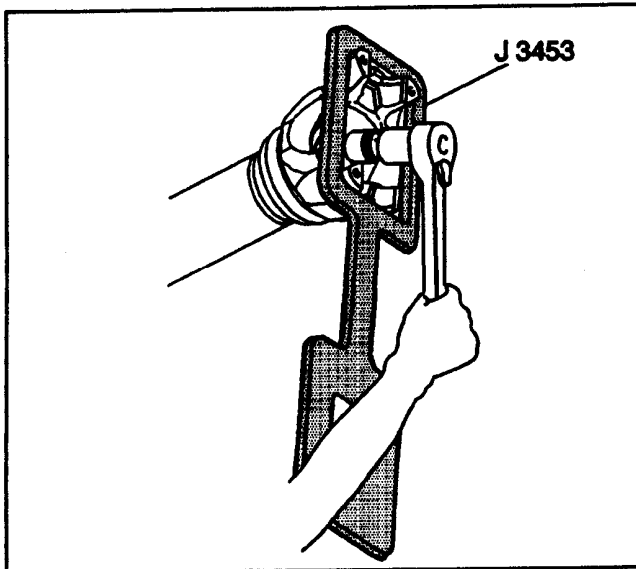
Tighten the propeller shaft hanger nuts to 70 N.m (52 lb ft).

12. Install the universal joint. Refer to *Universal Joints Replacement*.

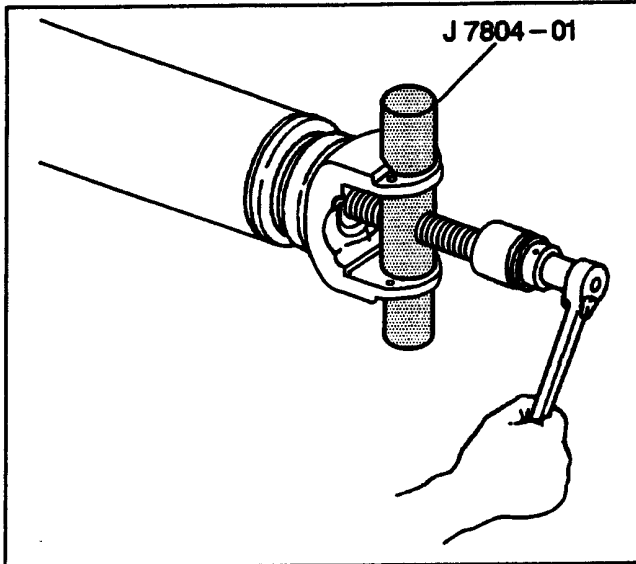
Yoke Replacement**Removal Procedure****Tools Required**

- J 3453 Holding Bar
- J 7804-01 Puller

1. Remove the universal joints. Refer to *Universal Joints Replacement*.
2. Remove the yoke nut or bolt and the washers. Use the J 3453.



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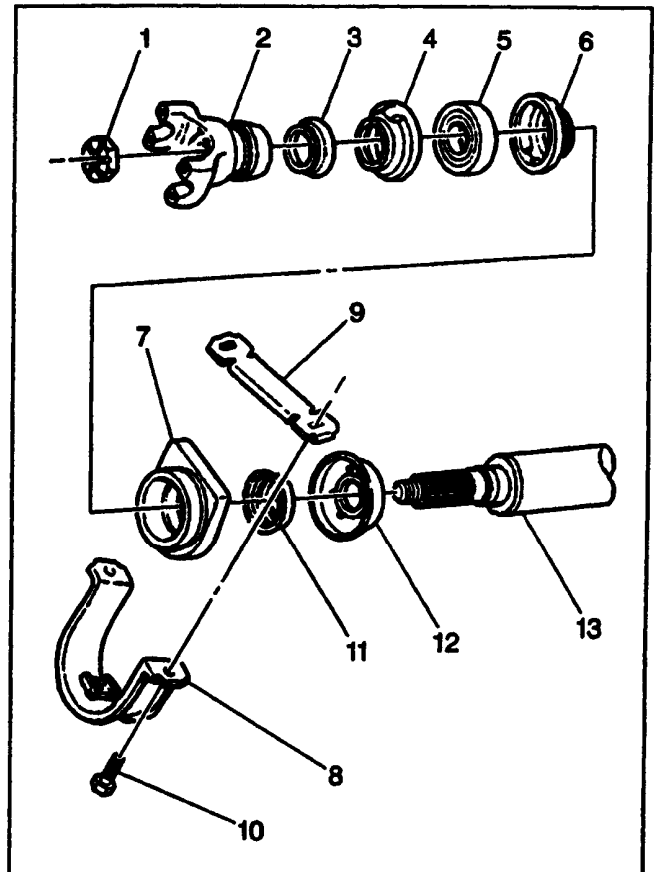
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3. Remove the yoke using the J 7804-01.

Installation Procedure**Tools Required***J 3453 Holding Bar***Important:**

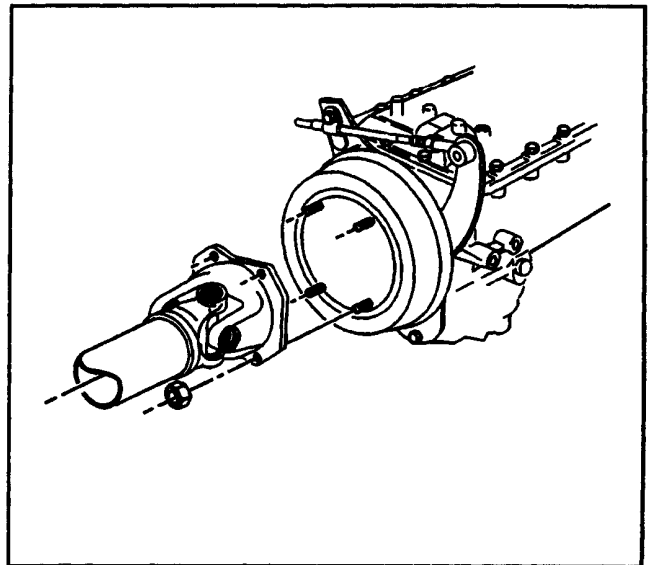
- Ensure that the splines are aligned and the yokes are in phase.
- Tap on the yoke in order to ensure that the yoke is completely seated against the propeller shaft.

1. Install the yoke (2).

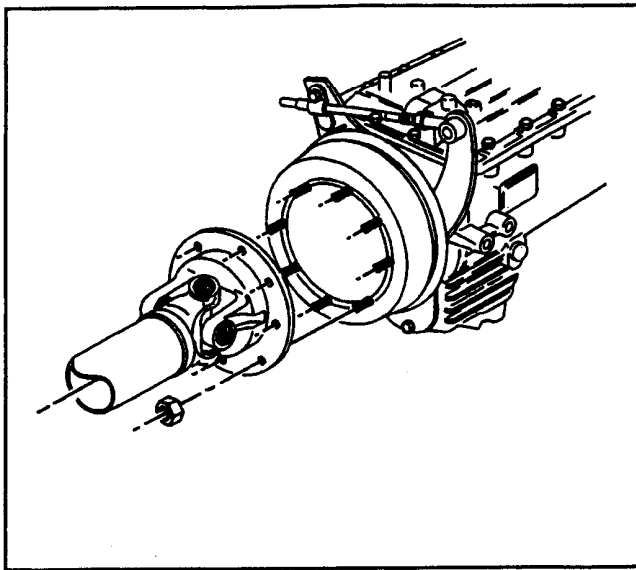


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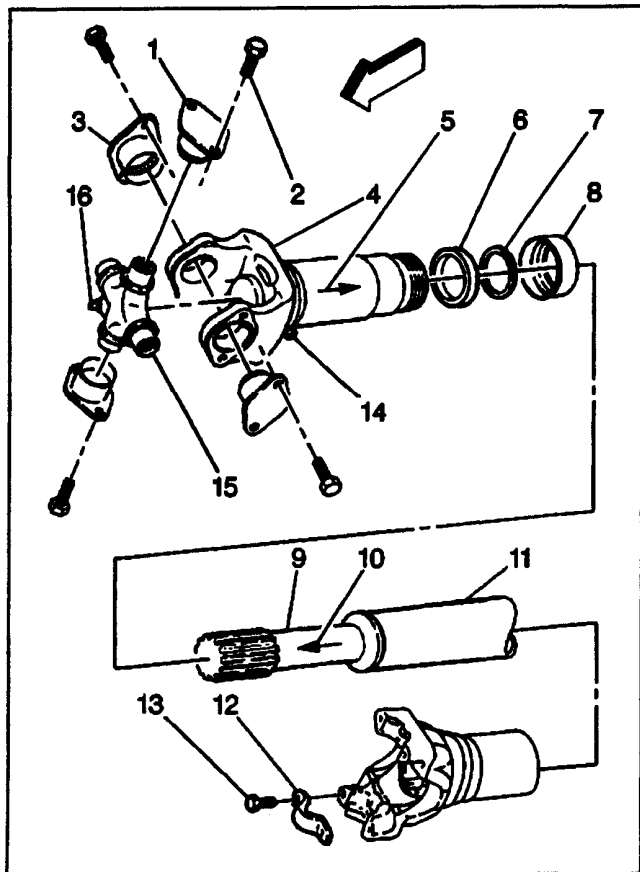
2. Install the yoke nut or bolt and washers with the 4 nut mounting.



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3. Install the yoke nut or bolt and washers with the 8 nut mounting, if used.
4. Install the universal joint. Refer to *Universal Joints Replacement*.

Universal Joints Replacement

Removal Procedure

1. Remove the bolts (13).
2. Remove the bearing straps (12).
3. Remove the cap screws (2).
4. Remove the bearing assemblies (1), as required.
5. Remove the journal (15) from the yoke (4).
6. Remove the lubrication fitting (14, 16).
7. Clean the lubricant passages in the journal cross.

Notice: Clean bearings in clean mineral spirits paint thinner, or equivalent. Do not spin dry bearings. Bearings can be damaged by use of wrong cleaning solvents and rough handling.

8. Clean the needle bearings and the cages.
9. Inspect the bearings for excessive looseness or brinelling. Replace the journal (15) and the bearings, if the bearings are worn, damaged or brinelled.
10. Inspect the yokes for the following conditions:
 - Nicks
 - Burrs
 - Damaged threads
11. Remove the nicks and burrs using a fine file or stone. Chase damaged threads using a bottoming tap.
12. Inspect the bearing cage seals for wear or damage.

Installation Procedure

1. Install the journal (15) into the yoke (4).
2. Install the bearing assemblies (1), if required.
3. Install the bolts (13).
4. Install the bearing straps (12).

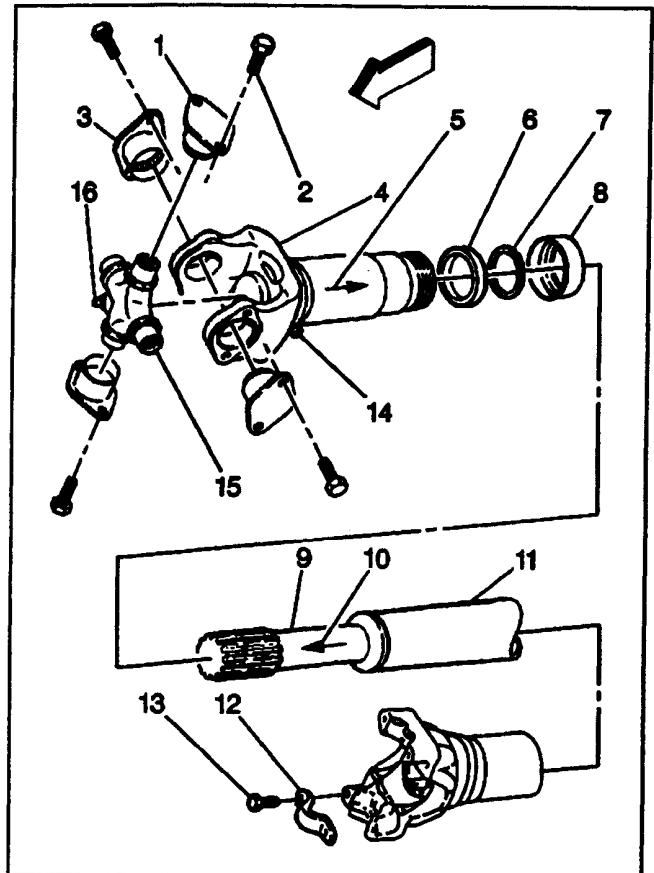
Notice: Refer to *Fastener Notice* in Cautions and Notices.

5. Install the universal joint cap screws (2), if equipped.

Tighten

- For series 1480, 1550, and 1610, tighten the bolts to 54 N.m (40 lb ft).
- For series 1710 and 1710 HD, tighten the bolts to 136 N.m (100 lb ft).
- Tighten the cap screws to 44 N.m (33 lb ft).

6. Install the new lubrication fitting (14, 16).
7. Apply lubricant through the new lubrication fitting. Refer to *Propeller Shaft Assembly Component Lubrication*.

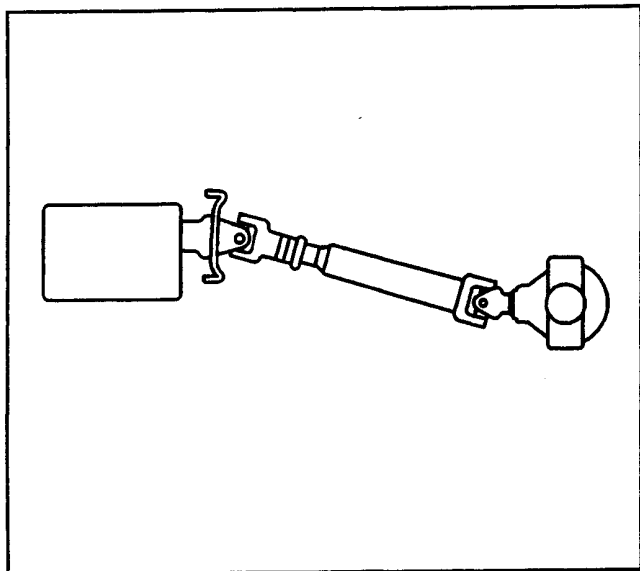


198531

Description and Operation

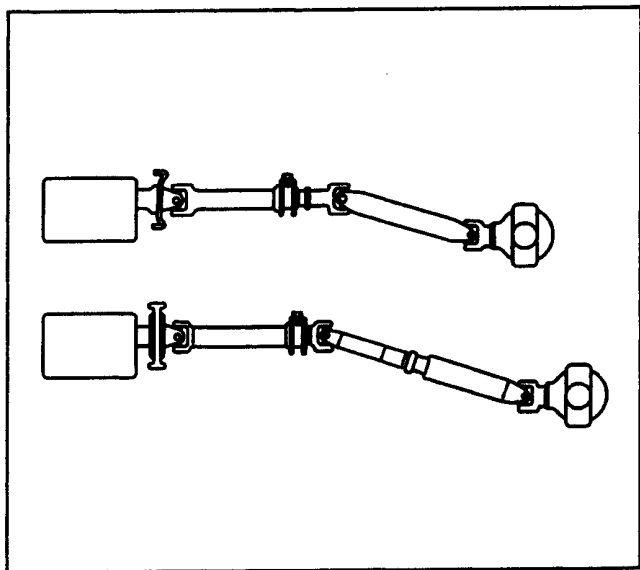
Propeller Shaft Description

The following propeller shafts are available on this vehicle:



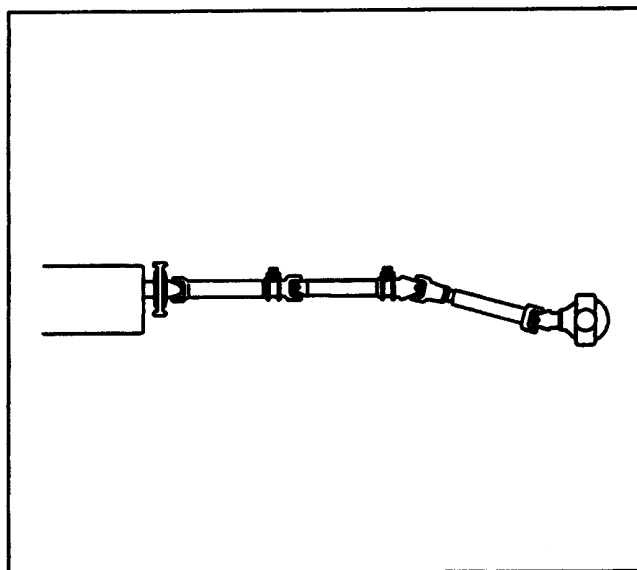
198670

- Single propeller shaft



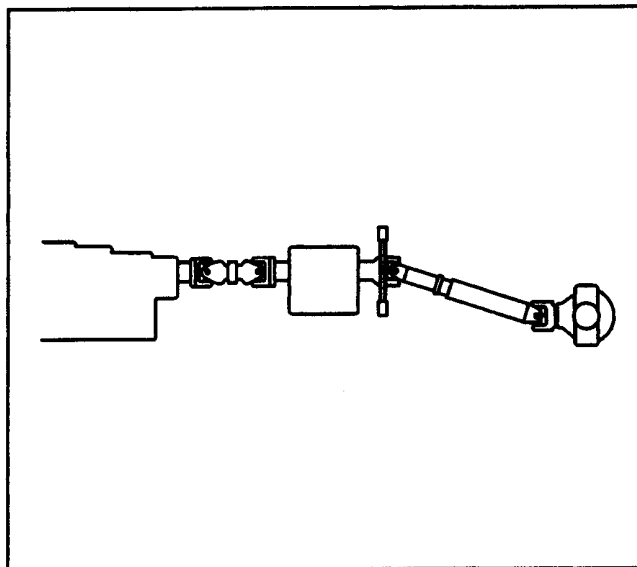
198636

- Dual propeller shafts



198633

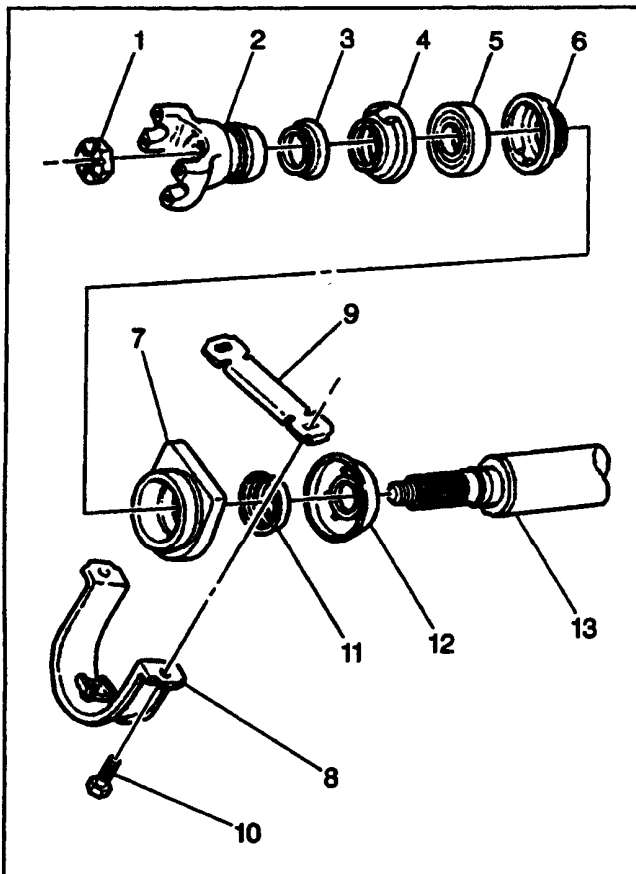
- Multi-propeller shafts



198630

- Propeller shaft with an auxiliary transmission

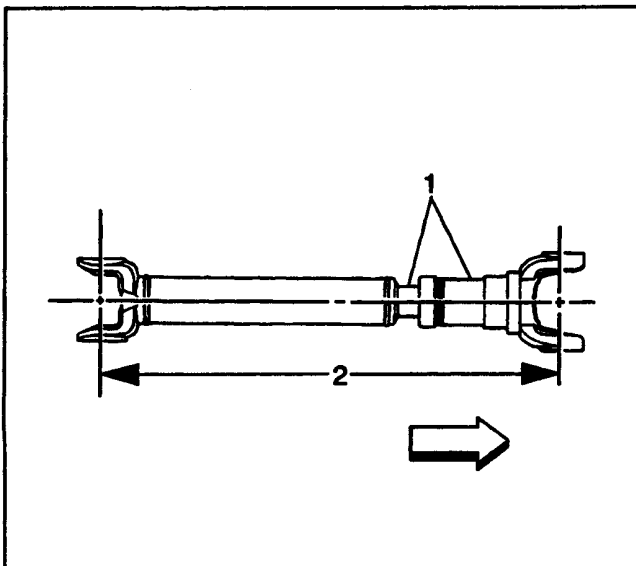
Torque is transmitted from the transmission to the rear axle through one or more propeller shafts and universal joint assemblies. The propeller shaft and universal joint installations and assemblies used on the vehicles are covered in this service manual. The number of propeller shafts and universal joint assemblies varies with vehicle wheelbases and the combinations of transmission and rear axle equipment.



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All propeller shafts (13) are balanced tubular type. A splined slip joint is provided in each drive line. The slip joint is at the forward end of the rear shaft.

Propeller Shaft Phasing Description



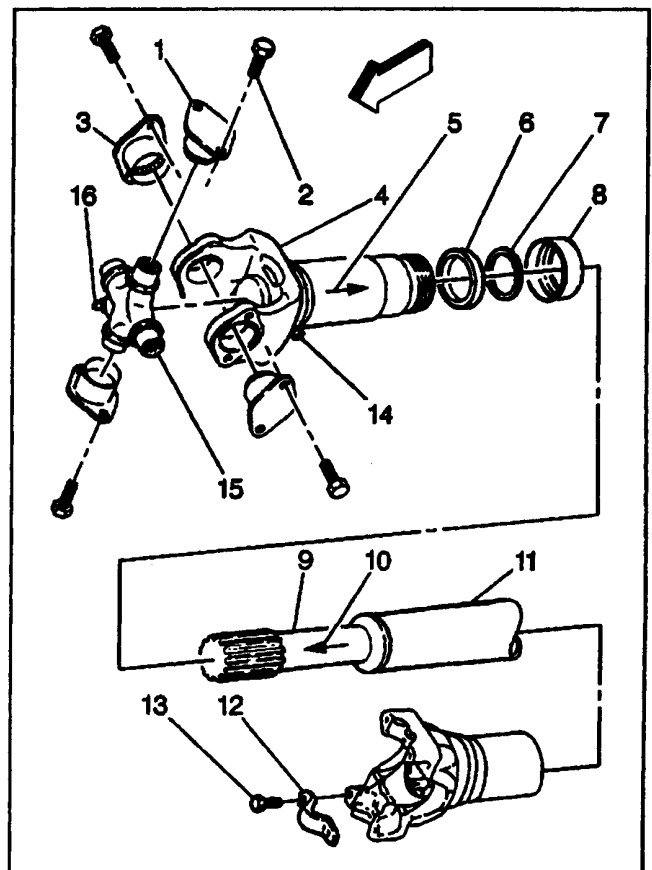
198598

All propeller shafts are designed and built with the yoke lugs (ears) in line with each other. This condition is called phasing. Phasing produces the smoothest running shaft possible.

An out-of-phase propeller shaft may cause phasing.

The shaft will absorb the vibration from the speeding up and slowing down each time the universal joint rotates. Phasing in a propeller shaft is similar to two people snapping a rope at the same time and watching the wave reaction flow to the other end. This is similar to the universal joints on a propeller shaft. The cancellation produces a smooth flow of power to the wheels. Mark the propeller shafts when disassembling, in order to assure proper assembly alignment. Some propeller shafts have alignment arrows stamped on them at the time of production.

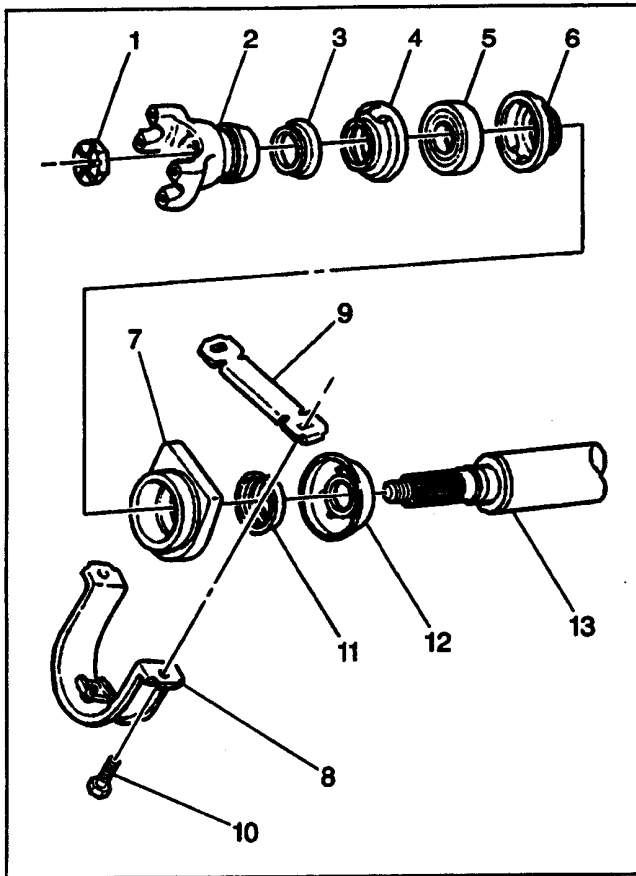
Universal Joint Description



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The needle bearings are installed in the bearing cages. The bearing cages are retained in the yoke (4) using bolts (13) with bearing straps (12).

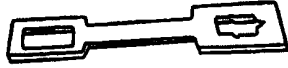
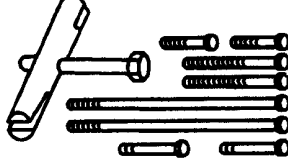
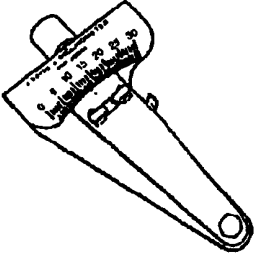
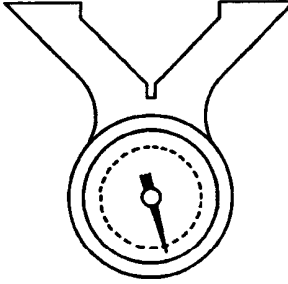
Center Bearing Description



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Center bearings (5) are used in order to support the center portion of the driveline when two or more propeller shafts (13) are used. The bearing (5) is a ball type. The bearing is mounted in a rubber cushion (7) that is attached to a frame cross member. The bearing is prelubricated by the manufacturer.

Special Tools and Equipment

Illustration	Tool Number/ Description
 36470	J 3453 Holding Bar
 36471	J 7804-01 Puller
 8224	J 23498-A Inclinometer
 198640	J 24479 Inclinometer

Rear Drive Axle

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Axle Shaft Mounting Nut		
12 Stud Axle	77 N.m	57 lb ft
8 Stud Axle	155 N.m	114 lb ft
Axle Vent Assembly	14 N.m	124 lb in
Differential Carrier to Axle Housing Bolt		
Dana/Spicer® Model S150-S	150 N.m	111 lb ft
Eaton® Models 15040S and 19050S	128 N.m	94 lb ft
Eaton® Models 19050T	143 N.m	105 lb ft
Eaton® Models 19060S, 19060T, 21060S, 21060T, 22060S, 22060T, 23080S, 23080T and 23105S	227 N.m	167 lb ft
Drain Plug	70 N.m	52 lb ft
Drive Pinion Nut		
Dana Spicer® Model S150-S	1088 N.m	802 lb ft
Eaton® Models 15040S, 19050S, and 19050T	568 N.m	419 lb ft
Eaton® Models 15060S, 21060S, and 22060S	867 N.m	639 lb ft
Eaton® Models 15060T, 21060T, and 22060T	1025 N.m	755 lb ft
Eaton® Model 23080T	1190 N.m	877 lb ft
Eaton® Models 23080S and 23105S	1262 N.m	930 lb ft
Rear Wheel Pinion Outer Nut	169 N.m	125 lb ft
Top-off Plug	67 N.m	49 lb ft

Diagnostic Information and Procedures

Determining Type of Noise

Any gear-driven unit produces a certain amount of noise. This includes an automotive drive axle where engine torque multiplication occurs at a 90 degree turn in the driveline. Perform an interpretation for each vehicle in order to determine whether the noise is normal or if a problem exists. Expect a certain amount of noise that cannot be eliminated by conventional repairs or adjustments.

Normal rear axle noise is a slight noise that is only heard at a certain speed or under unusual or remote conditions. Noise tends to reach a peak at speeds from 64–97 km/H (40–60 mph) depending on the road and load conditions or on the gear ratio and the tire size. This type of noise is not indicative of trouble in the rear axle.

The following vehicle noises are often mistaken for rear axle noise:

- Tires
- Propeller shaft
- Transmission
- Universal joints
- Front wheel bearings
- Rear wheel bearings

The following practices will aid in locating the source of rear axle noises:

- Raise the tire pressure in order to eliminate tire noise. Raising the tire pressure will not silence the tread noise of some of the tread patterns.
- Listen for the noise at varying speeds and road surfaces (drive, float and coast).

Isolate the noise to a specific driveline component. Do not make a random guess. Random guessing may be a costly waste of time.

External Noise

If you suspect that a rear axle is noisy, perform a thorough test in order to determine whether the noise originates from one of the following locations:

- The tires
- The road surface
- The front wheel bearings
- The engine
- The transmission
- The rear axle

Rear axle parts adjustment or replacement will not correct noise that originates in other locations.

Road Noise

Driving on the following road surfaces causes noise which may be mistaken for rear axle noise:

- Brick
- Rough-surfaced concrete

Driving on one of the following different types of road surface will quickly show whether the road surface is the cause of the noise:

- Smooth asphalt
- Dirt

Road noise is usually the same on drive or on coast.

Tire Noise

Tire noise may easily be mistaken for rear axle noise, even though the noisy tires may be located on the front wheels. Tires that exhibit the following conditions are usually noisy and may produce vibrations which seem to originate elsewhere in the vehicle:

- Uneven wear
- Non-skid division surfaces that are worn in saw-tooth fashion (particularly true with low tire pressure)

Tire Noise Test

Tire noise changes according to different road surfaces, but rear axle noise does not. Temporarily inflating the tires to the maximum recommended pressure, for test purposes only, will materially alter the tire noise. Temporarily inflating the tires will not affect the noise caused by the rear axle. Rear axle noise usually stops when coasting at speeds under 48 km/h (30 mph). Tire noise may continue at a lower tone as you reduce the vehicle speed. Rear axle noise usually changes when comparing the pull and the coast conditions. The tire noise remains about the same.

Engine and Transmission Noise

Sometimes a noise which seems to originate in the rear axle is actually caused by the engine or transmission. In order to determine which unit is causing the noise, complete the following steps:

1. Observe the approximate vehicle speeds and conditions under which the noise is most pronounced.
2. Stop the vehicle in a quiet place in order to avoid interfering noises.
3. Place the vehicle in Neutral.
4. Run the engine slowly up and down through the engine speeds that correspond to the vehicle speed at which the noise is most pronounced.

If a similar noise is produced with the vehicle standing, the noise is caused by the engine or the transmission and not the rear axle.

Front Wheel Bearing Noise

Do not confuse loose or rough front wheel bearing noise with rear axle noise. Front wheel drive 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 front vehicle noise to diminish. This light application of the brake takes some weight off of the bearing. Inspect the front wheel bearings for noise. Complete the following steps:

1. Raise and spin the front wheels.
2. Shake the front wheels in order to determine if the front wheel bearings are excessively loose.

Body Boom Noise or Vibration

An unbalanced propeller shaft may cause an objectionable body boom noise or vibration at 89–105 km/h (55–65 mph). Excessive looseness at the propeller shaft spline may contribute to the imbalance. The following items also contribute to the noise problem:

- Undercoating or mud on the propeller shaft — causing an imbalance
- Propeller shaft or companion flange balance weights missing
- Propeller shaft damage — such as bends, dents, or nicks
- Rough tires — switch the tires from a known good vehicle in order to determine a tire fault.

After completing a comprehensive check of the vehicle, if all indications point to the rear axle, further diagnostic steps are necessary in order to determine the rear axle components are at fault. True rear axle noise generally falls into the following two categories:

- Gear noise
- Bearing noise

Rear Axle Noise

If a careful test of the vehicle shows that the noise is not caused by external items, the rear axle is the cause of the noise. Test the rear axle on a smooth level road in order to avoid road noise. Do not test the rear axle for noise by running the vehicle with the rear wheels raised.

Noise in the rear axle may be caused by one of the following conditions:

- A faulty propeller shaft
- Faulty rear wheel bearings
- Misalignment between two universal joints
- Worn differential side gears and pinions
- A mismatched differential drive pinion and ring gear set
- An improperly adjusted differential drive pinion and ring gear set
- A scored differential drive pinion and ring gear set

Rear Wheel Bearing Noise

A rough rear wheel bearing produces a vibration or a growl which continues while the vehicle is coasting and the transmission is in Neutral. A brinelled rear wheel bearing causes a knock or click approximately every two revolutions of the rear wheel. This occurs because the bearing rollers do not travel at the same speed as the rear axle and the rear wheel. Raise the rear wheels and spin the rear wheels by hand. Listen at the rear wheel hubs for evidence of a rough or brinelled rear wheel bearing.

Differential Side Gear and Pinion Noise

Differential side gear movement is relatively slight on straight ahead driving and may seldom cause noise. Noise from the gears is most pronounced during turns. In order to determine pinion bearing failures compare the bearings rotation at higher speeds to the 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. Broken, bent or damaged gear teeth produce the first type of noise. The gear noise is usually audible over the entire speed range and does not present a problem in diagnosis. Hypoid gear tooth scoring generally results from the following conditions:

- Insufficient lubricant
- Improper break-in
- Incorrect lubricant
- Insufficient gear backlash
- Improper differential drive pinion gear and ring gear alignment
- Loss of differential drive pinion gear nut torque

The scoring will progressively lead to the complete erosion of the gear tooth, or the gear tooth pitting. Fracture of the gear tooth will eventually occur if the scoring condition is not corrected.

Other causes of the hypoid tooth fracture include the following items:

- Extended overloading of the gear set — produces fatigue fracture
- Shock loading — results in sudden malfunction

Differential pinion gear and side gears normally do not fail. Common causes of differential malfunctions include the following conditions:

- Shock loading
- Extended overloading
- Seizure of the differential pinion gears to the cross shaft resulting from too much wheel spin and consequent lubrication breakdown

The second type of gear noise pertains to the mesh pattern of the gear teeth. This form of abnormal gear noise produces a cycling pitch (whine). The gear noise will be very pronounced at the speed range at which the noise occurs. This pitch (whine) appears under the following conditions:

- Drive
- Float — Lightly step on the accelerator pedal in order to keep the vehicle from driving the engine.

The vehicle slows down gradually, but the engine still pulls slightly.

- Coast — Allows the vehicle to roll down the road without accelerating.

Gear noise exhibits the following conditions:

- Peaks in a narrow range or ranges
- Remains in constant pitch

Bearing noise will vary in pitch with the vehicle speeds.

Noise Diagnosis**Noise in Drive**

Problem	Action
The drive pinion to the ring gear has excessive backlash.	Adjust the drive pinion to ring backlash.
The drive pinion and the ring gear are worn.	Replace the drive pinion and ring set.
The drive pinion bearings are worn.	Replace the bearings.
The drive pinion bearings are loose.	Adjust the bearings.
The drive pinion has excessive end play.	Adjust the drive pinion end play.
The differential bearings are worn.	Replace the differential bearings.
The differential bearings are loose.	Adjust the bearings.
The rear axle lubricant is low.	Fill with synthetic rear axle lubricant.
The wrong rear axle lubricant is being used.	Replace the rear axle lubricant with the proper synthetic lubricant.
The rear axle housing is bent.	Replace the rear axle housing.

Noisy When Coasting

Problem	Action
Rear axle noises heard on drive will usually be heard also on coasting, although not as loud.	Adjust or replace the drive pinion and ring gear set.
The drive pinion gear and ring are too tight. Noise is audible when slowing down and disappears when driving.	Adjust the drive pinion to ring gear backlash.

Intermittent Noise

Problem	Action
The ring gear is warped.	Replace the differential drive pinion gear and ring gear set.
The differential case bolts are loose.	Tighten the differential case bolts.

Constant Noise

Problem	Action
A flat spot is on the drive gear or on the ring gear teeth.	Replace the differential drive pinion gear and ring gear set.
A flat spot is on the bearing.	Replace the bearing.
The differential drive pinion gear splines are worn.	Replace the differential drive pinion gear and ring gear set.
The rear axle (shaft) housing cover locator holes are worn.	Replace the rear axle shaft.
The wheel hole studs are worn.	Replace the wheel hub studs.
The rear axle shaft is bent.	Replace the rear axle shaft.

Noisy on Turns

Problem	Action
The differential side gears and the pinion gears are worn.	Replace the worn parts.
The differential spider is worn.	Replace the worn parts.
The rear axle shaft splines are worn.	Replace the rear axle shafts.

Two Speed Axle Falls to Shift into High or Low Range

Problem	Action
The electrical circuit is inoperative.	Repair the circuit.
The shift motor assembly is inoperative.	Repair or replace the shift motor assembly.

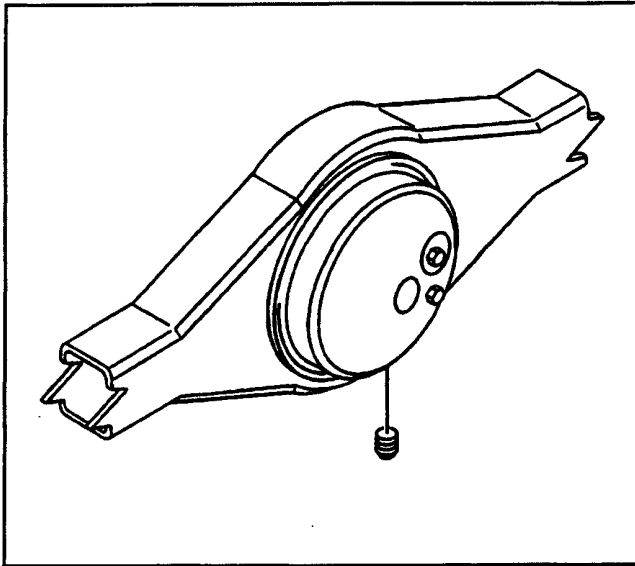
General Information
(Axle Housing Alignment Diagnos)

For rear wheel bearing diagnosis information, refer to Wheel Bearing Test in Front Suspension.

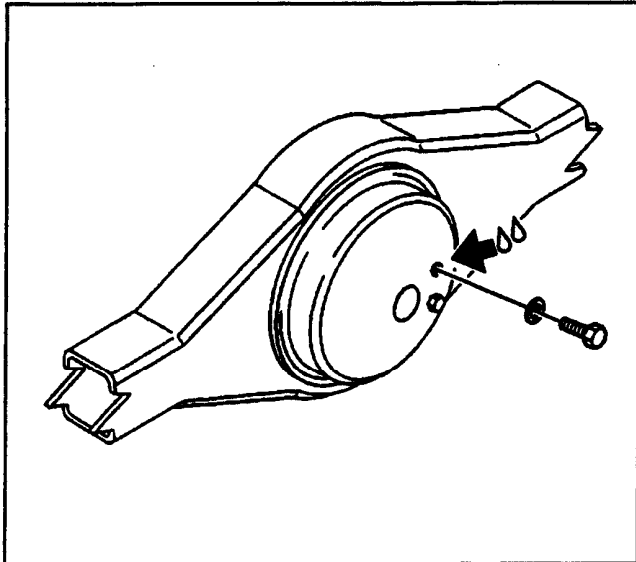
Replace the rear axle if any damage exists which affects the misalignment or the structural integrity of the rear axle housing. Do not weld or straighten the rear axle housing. This process may affect the rear axle housing metallurgy, and cause the rear axle housing to fail completely when under load.

General Information
(Bent Axle Housing Check)

- Block the front wheels.
- Raise and support the rear axle housing using suitable jackstands.
- Inspect the rear wheel bearing adjustment and the rear wheel mounting. Refer to *Wheel Bearing Adjustment*.
- Place a chalk mark in the following locations:
 - On the outer side wall of both the outside rear tires.
 - At the bottom of the rear tires near the ground.
- Measure across the rear tires at the chalk mark using a toe-in gauge. Record the reading.
- Rotate the rear wheels in order to position the chalk marks at the top of the rear wheels.
- Measure across the rear tires at the chalk mark using a toe-in gauge. Record the reading.
- Compare the top measurement with the bottom measurement. Ensure that the measurements are the same within 3.2 mm (0.125 in).
 - If the top measurement is more than 3.2 mm (0.125 in) larger than the bottom measurement, the rear axle is bent at the ends.
 - If the top measurement is more than 3.2 mm (0.125 in) smaller than the bottom measurement, the rear axle housing has sagged.
- Turn the rear wheels in order to position the chalk marks on both rear wheels are parallel to the ground (level with the rear axle housing) and facing toward the rear of the vehicle.
- Measure across the rear tires at the chalk mark using a toe-in gauge. Record the reading.
- Turn the rear wheels half way around in order to position the chalk marks are positioned parallel to the ground (level with the rear axle housing) and facing toward the front of the vehicle.
- Measure across the rear tires at the chalk mark using the toe-in gauge. Record the reading.
- Compare the front and rear readings. Ensure that the readings are the same within 3.2 mm (0.125 in).
 - If the rear measurement is more than 3.2 mm (0.125 in) greater than the front measurement, the rear axle housing is bent forward.
 - If the rear measurement is 3.2 mm (0.125 in) less than the front measurement, the rear axle housing is bent to the rear.



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Repair Instructions

Lubricant Change

Removal Procedure

1. Apply the parking brake.
2. Block the wheels.

Important:

- Drain the rear axle lubricant at normal operating temperature.
- Drain the rear axle lubricant into a suitable container.

3. Remove the rear axle drain plug.
4. Inspect the rear axle housing drain plug for excessive metal particle accumulation. This accumulation is symptomatic of extreme wear.
5. Clean the drain plug.

6. Remove the rear axle housing top-off plug.

Installation Procedure

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

1. Install the rear axle housing drain plug.

Tighten

Tighten the rear axle housing drain plug to 70 N·m (52 lb ft).

Notice: In cases where wheel equipment is being installed, either new or after maintenance activity, the rear wheel hub cavities are empty. Rear wheel bearings and seals must be manually supplied with adequate rear axle lubricant or they will be severely damaged before normal motion of the vehicle can supply the rear axle lubricant to the rear wheel hub cavities. To avoid the risk of premature damage to the rear wheel bearings and the rear wheel hub seals, they must be filled with rear axle lubricant any time the wheel equipment is being installed.

Important: Ensure that the rear axle housing is level.

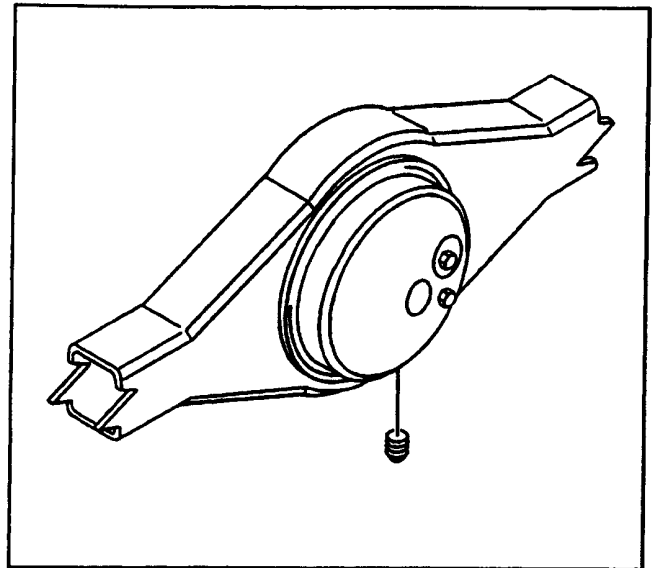
2. Install the rear axle lubricant. Refer to *Approximate Fluid Capacities* in General Information.
 - Fill the rear axle housing using rear axle lubricant until the lubricant is level with the bottom of the rear axle housing filler hole.
 - If the service has been performed at the rear wheels, fill the rear wheel hub cavities. Perform step 4 through step 10 if the rear wheel equipment has been serviced.

3. Install the rear axle housing top-off plug.

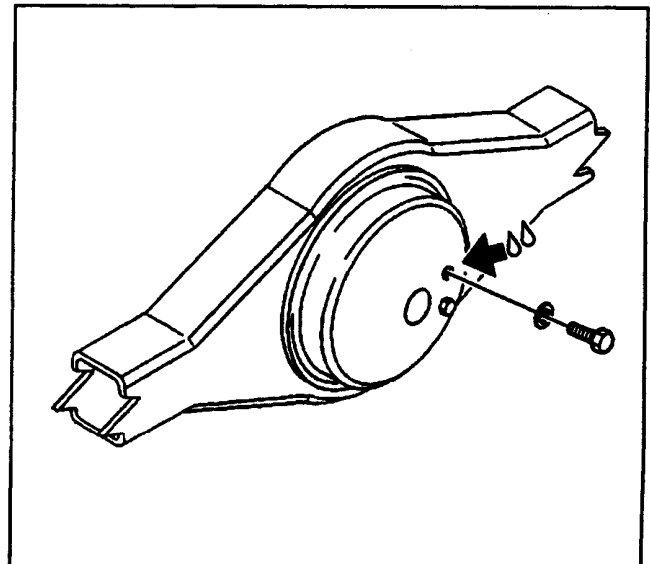
Tighten

Tighten the rear axle housing top-off plug to 67 N·m (49 lb ft).

4. Hand tighten the rear axle housing top-off plug.
5. Raise the left side of the rear axle housing a minimum of 152.4 mm (6 in). Maintain this position for one minute in order to allow the rear axle lubricant to flow into the right side rear axle hub cavity.
6. Lower the rear axle housing.
7. Raise the right side of the rear axle housing a minimum of 152.4 mm (6 in). Maintain this position for one minute in order to allow the rear axle lubricant to flow into the left side rear axle hub cavity.
8. Lower the rear axle housing.



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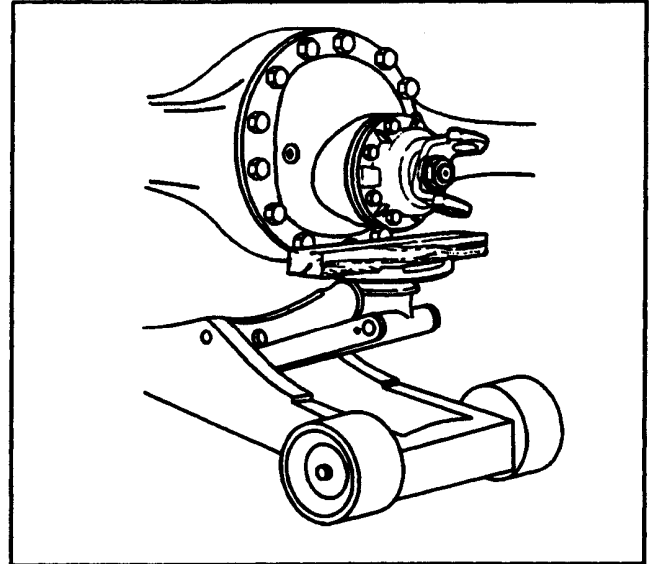
9. Fill the rear axle housing using rear axle lubricant until the lubricant is level with the bottom of the rear axle housing filler hole.
The rear axle housing requires approximately 1.5 L (1.58 qt) of additional rear axle lubricant.
10. Install the rear axle housing top-off plug.
Tighten
Tighten the rear axle housing top-off plug to 67 N.m (49 lb ft).
11. Remove the wheel blocks.

Differential Replacement

Removal Procedure

1. Inspect the rear axle housing for leaks and damage.
2. Clean the rear axle housing with steam.
Important: Shift the two speed rear axle into LOW range, if equipped.
3. Apply the parking brake.
4. Block the wheels.
5. Remove the rear axle housing drain plug. Refer to *Lubricant Change*.
6. Remove the propeller shaft. Refer to the following list in order to select the correct replacement procedure:
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Outboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/229)*.
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/305)*.
 - If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/229)*.
 - If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/305)*.
 - If the propeller shaft is a one-piece 1480 or 1550 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/305)*.
 - If the propeller shaft is a one-piece 1410 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/229)*.
7. Remove the rear axle shafts. Refer to *Axle Shaft Replacement*.
8. Remove the shift motor assembly, if equipped. Refer to *Two Speed Rear Axle Shift Motor Replacement* in Rear Axle Controls.

9. Remove the following components from the differential carrier. DO NOT remove the top two fasteners.
 - The washers
 - The bolts
 - The stud nuts, if equipped.
10. Remove the differential carrier assembly.
 - 10.1. Support and secure the differential carrier to a floor jack.
 - 10.2. Remove the top two fasteners.
11. Clean the rear axle housing and the differential carrier mating surfaces.
12. Clean the rear axle housing bowl interior.
13. Dry the rear axle housing bowl immediately using clean cloths. Then dry the rear axle housing bowl using compressed air.
14. Inspect the rear axle housing for the following conditions:
 - Cracks
 - Loose studs
 - Nicks
 - Burrs



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Installation Procedure

Important:

- Apply a 3.17 mm (0.125 in) diameter bead completely around the rear axle housing differential carrier mating surface and around each threaded hole and stud.
- Install the differential carrier and fasteners within 20 minutes (before the silicone sealer sets).

1. Install the Silicone Sealer (RTV).
2. Install the four temporary alignment studs, if needed.
3. Install the differential carrier.

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

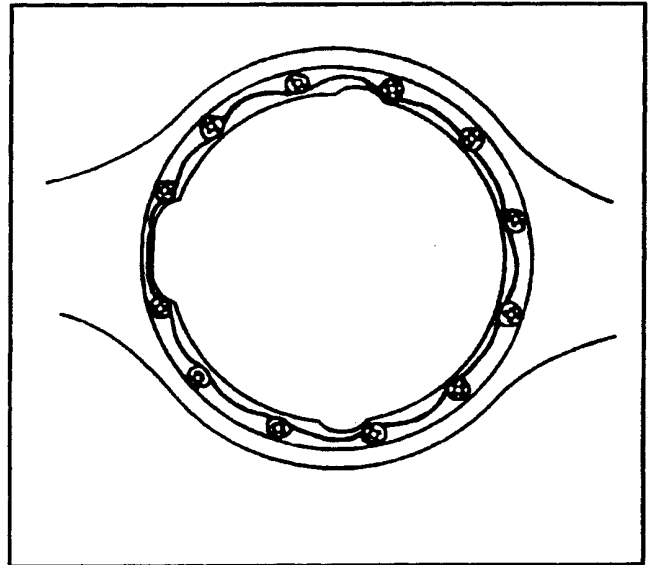
Important:

- Ensure that the threads are clean and free of grease.
- Apply 272 Threadlocker GM P/N 12345493 or equivalent to the threads of each differential carrier bolt.

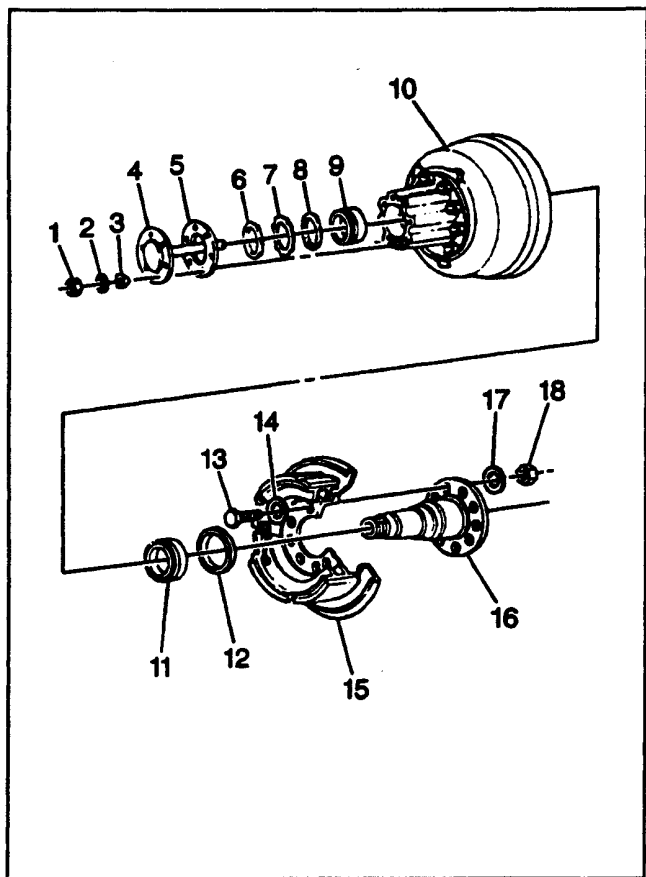
4. Install the following components to the differential carrier:
 - The washers
 - The bolts
 - The nuts, if equipped.

Tighten

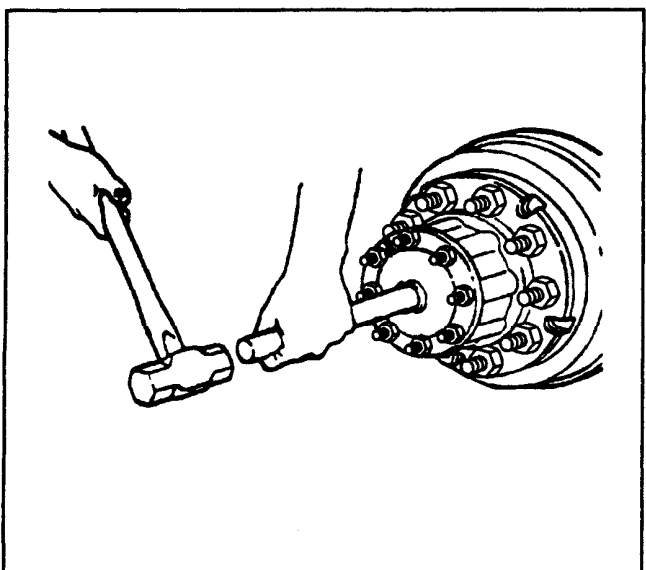
Tighten the differential carrier bolts and nuts to the torques listed in Fastener Tightening Specifications.



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5. Install the propeller shaft.
6. Install the shift motor assembly, if equipped.
7. Install the rear axle shafts.
8. Install the rear axle lubricant. Refer to *Lubricant Change*.
9. Remove the wheel blocks.

Axle Shaft Replacement

Removal Procedure

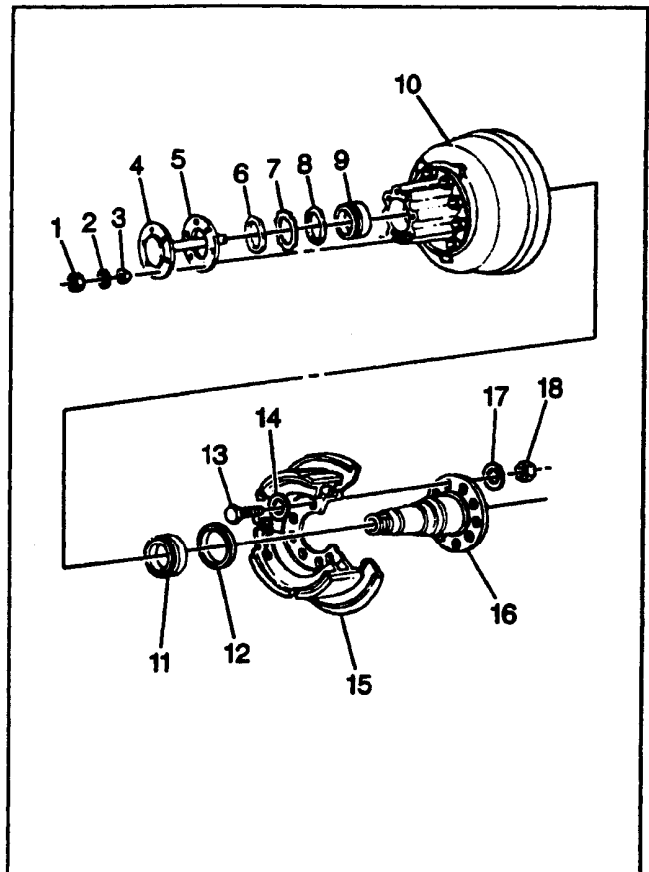
1. Remove the nuts (1,18).
2. Remove the flat washers (2,17).

Notice: Do not strike the axle shaft flange with a hammer. This may damage the shaft. Do not use a chisel or a wedge to loosen the shaft or locators. This will damage the hub, the shaft and the rear wheel bearing seals.

3. Remove the locators (3).

4. Hold a brass drift against the center of the axle shaft flange.
5. Strike the drift a blow using a 2.3 kg (5 lb) hammer.

6. Remove the rear axle shaft (4).
7. Remove the gasket (5).



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Installation Procedure

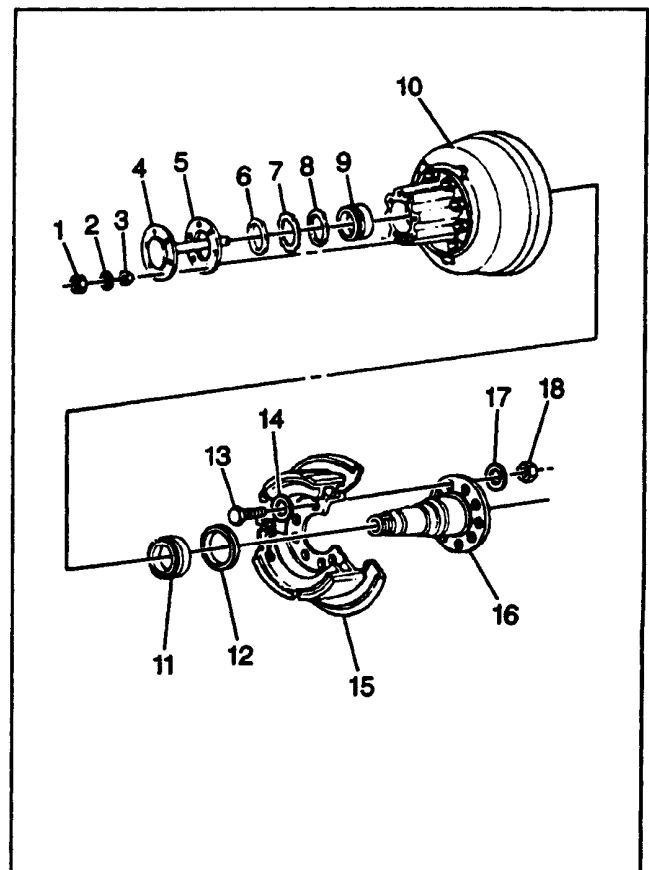
1. Install the new gasket (5).
2. Install the axle shaft (4).
 - 2.1. Dip the splined end in synthetic lubricant before installing. Refer to *Approximate Fluid Capacities* in Maintenance and Lubrication.
 - 2.2. Rotate the axle shaft as needed in order to align the axle shaft flange holes with the studs.
3. Install the locators (3).
4. Install the flat washers (2).

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

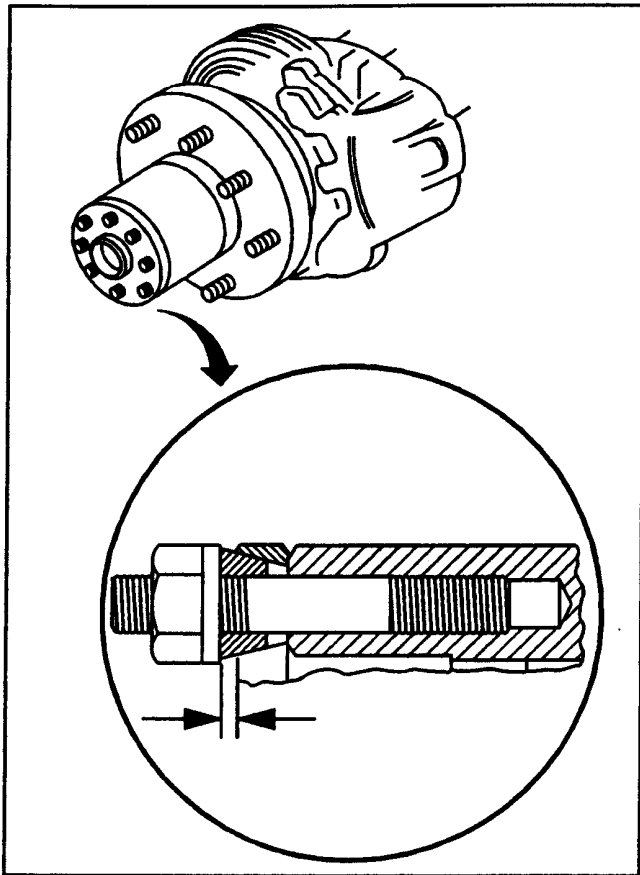
5. Install the nuts (1,18).

Tighten

- Tighten the nuts (12 stud rear axle) to 77 N.m (57 lb ft).
- Tighten the nuts (8 stud rear axle) to 155 N.m (114 lb ft).



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Important: Ensure that clearance is present between the flat washers and the axle flange. If the flat washers contact the axle flange, remove the axle shaft. Inspect and replace the faulty parts.

6. Inspect for clearance between the axle shaft flange and the flat washers.

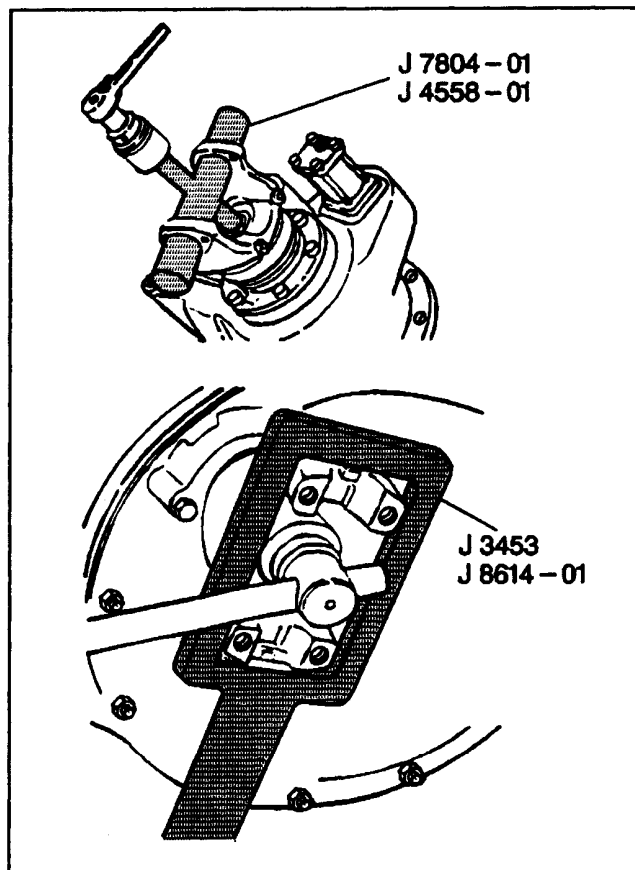
Drive Pinion Yoke Replacement (Input Yoke)

Removal Procedure

Tools Required

- J 7804-01 or J4558-01 Puller
 - J 3453 or J 8614-01 Holding Bar
1. Remove the rear axle propeller shaft.
 2. Refer to the following list in order to select the correct replacement procedure:
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Outboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/229)*.
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/305)*.
 - If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/229)*.
 - If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/305)*.

- If the propeller shaft is a one-piece 1480 or 1550 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/305)*.
 - If the propeller shaft is a one-piece 1410 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/229)*.
3. Remove the inter-axle differential input shaft nut and washer, if equipped.
 4. Remove the input yoke.
 5. Remove the drive pinion seal.
 6. Inspect the input yoke seal surface for damage or scoring. If the seal surface is damaged, replace the input yoke.

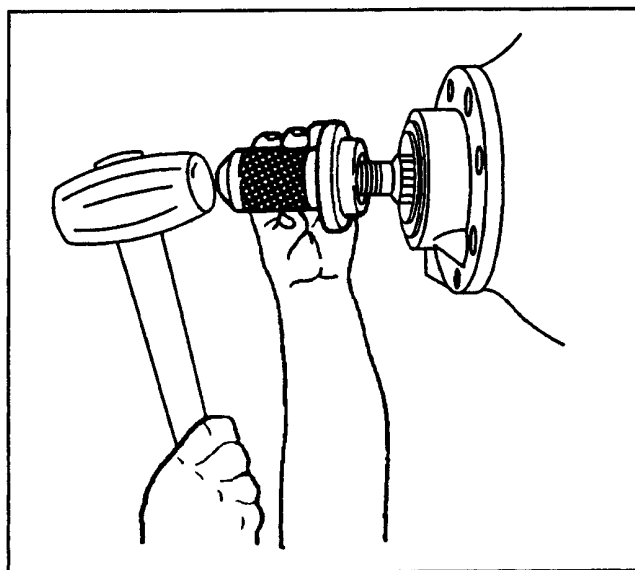


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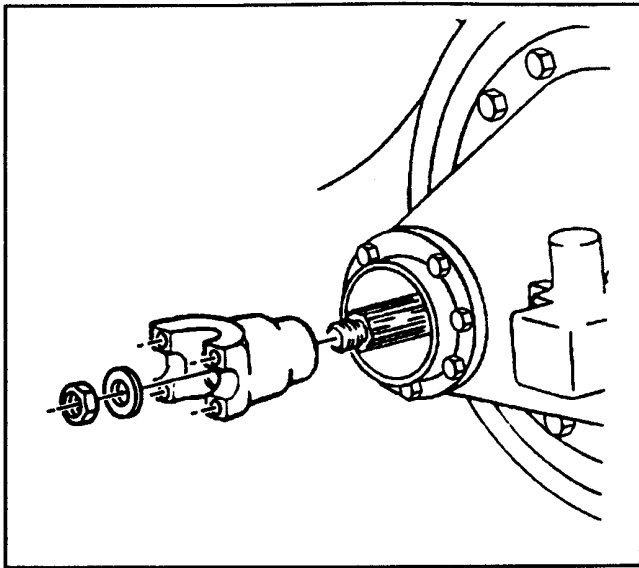
Installation Procedure

Important: Lubricate the new inter-axle differential input shaft seal lip with the rear axle lubricant. For rear axle lubricant specifications, refer to *Fluid and Lubricant Recommendations* in Maintenance and Lubrication.

1. Install the drive pinion seal.



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2. Install the input yoke.

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

Important:

- Ensure that the threads are clean and free of grease.
- Apply 272 Threadlocker GM P/N 12345493 or equivalent to the threads of the inter-axle differential input shaft nut.

3. Install the washer, if equipped, and the new inter-axle differential input shaft nut.

Tighten

Tighten the drive pinion nut to the torque listed in *Fastener Tightening Specifications*.

4. If a new inter-axle differential input shaft nut with pre-applied threadlocker is unavailable, reuse the original inter-axle differential input shaft nut under the following conditions:

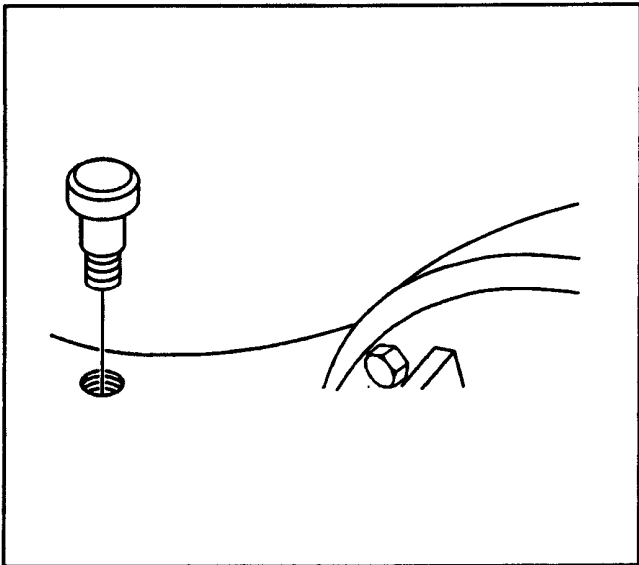
- The nut is in good condition.
- The threadlocker is applied.

5. Remove the wheel blocks.

Vent Hose Replacement

Removal Procedure

Remove the rear axle vent.



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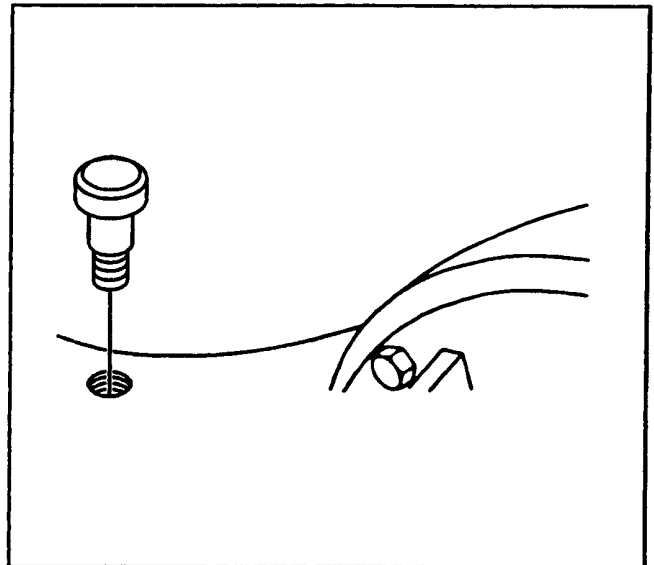
Installation Procedure

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

Install the rear axle vent.

Tighten

Tighten the rear axle vent to 14 N·m (124 lb in).



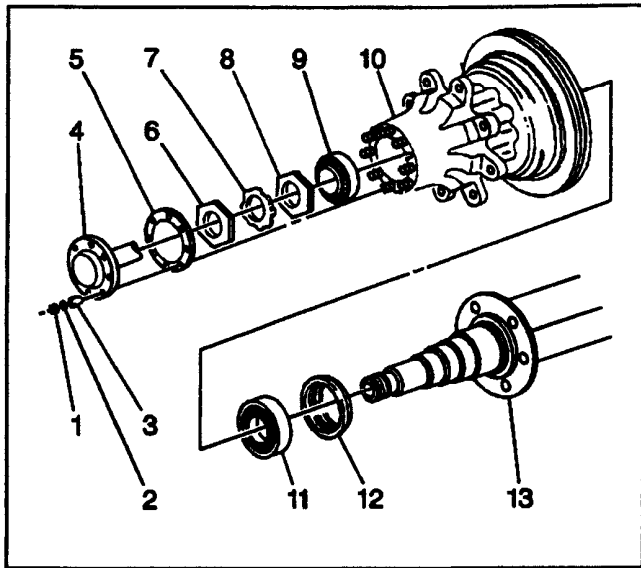
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**Rear Hub and Bearing Replacement
(Hub and Bearing)****Removal Procedure**

Caution: When servicing brake parts, do not create dust by grinding or sanding brake pads, by cleaning brake parts with a dry brush or with compressed air. Many earlier models or aftermarket brake parts may contain asbestos fibers which can become airborne if dust is created during servicing. Breathing dust containing asbestos fibers may cause serious bodily harm. A water dampened cloth or water based solution should be used to remove any dust on brake parts. Equipment is commercially available to perform this washing function. These methods will prevent fibers from becoming airborne.

Important: Ensure that the vehicle rear wheel on the service side is off of the floor.

1. Block the front wheels.
2. Raise the rear axle and place the supports under the frame rails. Ensure that the vehicle rear wheels are off the floor.
3. Release the parking brake.
4. Remove the rear tire and wheel assembly. Refer to *Wheel Removal (Dual/Rear)* in Tires and Wheels.
5. Remove the rear axle shaft. Refer to *Differential Replacement*.
6. Remove the rear brake drum, if equipped.



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7. Remove the following components from the rear wheel bearing:
 - The outer nut (6)
 - The nut lock (7)
 - The rear bearing inner nut (8)
8. Remove the rear hub assembly or hub/rotor assembly (10).
9. Remove the rear wheel bearing outer cone assembly (9).
10. Remove the following components:
 - The rear wheel bearing seal (12)
 - The rear wheel bearing inner cone assembly (11)

Notice: Clean rear wheel bearing cones in clean mineral spirits. Do not spin-dry. Rear wheel bearing cones can be damaged by use of wrong cleaning solvents and rough handling.

11. Clean the rear wheel bearing cones and the rear hub using clean mineral spirits.
12. Clean the rear brake rotor, if equipped, and the rear axle housing spindle. Use Brake Parts Cleaner GM P/N 12345754 or equivalent.
13. Inspect the rear wheel hub. Replace the hub, if damaged.
14. Inspect the rear wheel stud for looseness and damaged threads.
15. Inspect the rear wheel bearing for the following conditions:

Refer to *Wheel Hub, Bearing, and Seal Replacement (Drum Brakes)* in Front Suspension.

 - Wear
 - Chipped edges
 - Flat spots
16. Inspect the rear wheel bearing cups for cracks and pits. Refer to *Wheel Hub, Bearing, and Seal Replacement (Drum Brakes)* in Front Suspension.
17. Inspect the rear axle spindle for damage.
18. Inspect the rear wheel hub bearing seal retainer. Replace the retainer, if damaged. Refer to *Wheel Hub, Bearing, and Seal Replacement (Drum Brakes)* in Front Suspension.
19. Inspect the rear axle (shaft) flange studs for damaged threads and bends.
20. Inspect the rear brake rotor or rear drum brake for scoring. Refer to *Brake Rotor Tolerance or Brake Drum Inspection* in Brakes.

Installation Procedure

- J41107 Oil Seal Installation Kit
 - J 8092 Driver Handle
 - 551-5386 or 551-5318 Fleet Hub Tool
1. Install the synthetic lubricant in the following locations:
 - The bearings
 - The rear axle housing tube
 - The inside of the wheel hub
 - The rear wheel hub bearing seal lip
 - The rear axle spindle seal lip contact surface
 - The rear wheel hub bearing inner cone assembly

Important: When installing the new rear wheel bearing inner cone, always replace the rear wheel bearing inner cup.

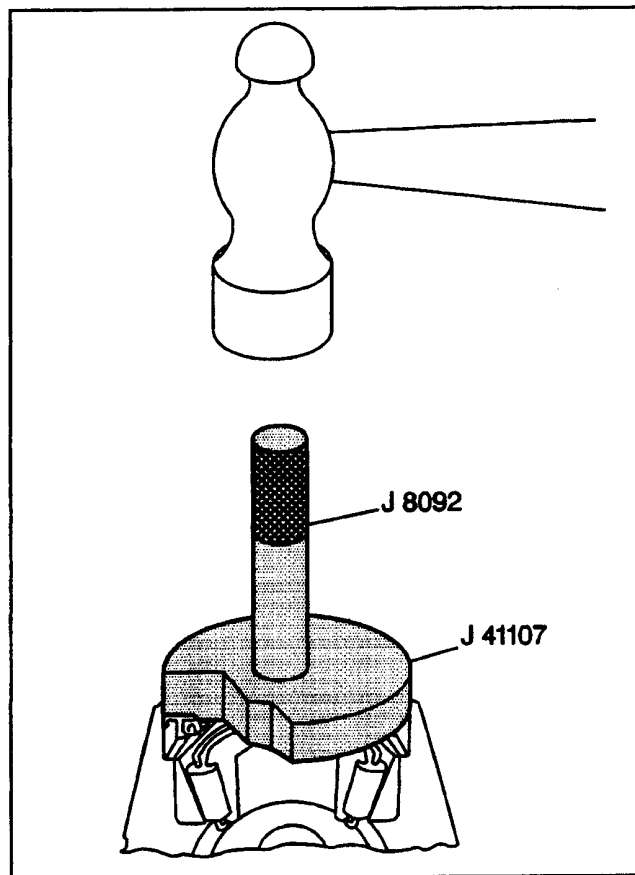
2. Install the rear wheel bearing inner cone. Refer to *Rear Hub and Bearing Replacement (Wheel Bearing Cup)*.
3. Apply Silicone Sealer (RTV) or equivalent to the OD of the rear wheel bearing seal. The silicone sealer will overcome minor faults in the rear wheel bearing seal bore.

Notice: Do not continue to hammer after rear wheel hub bearing seal has bottomed evenly all around, as this will cause damage to the rear wheel hub bearing seal.

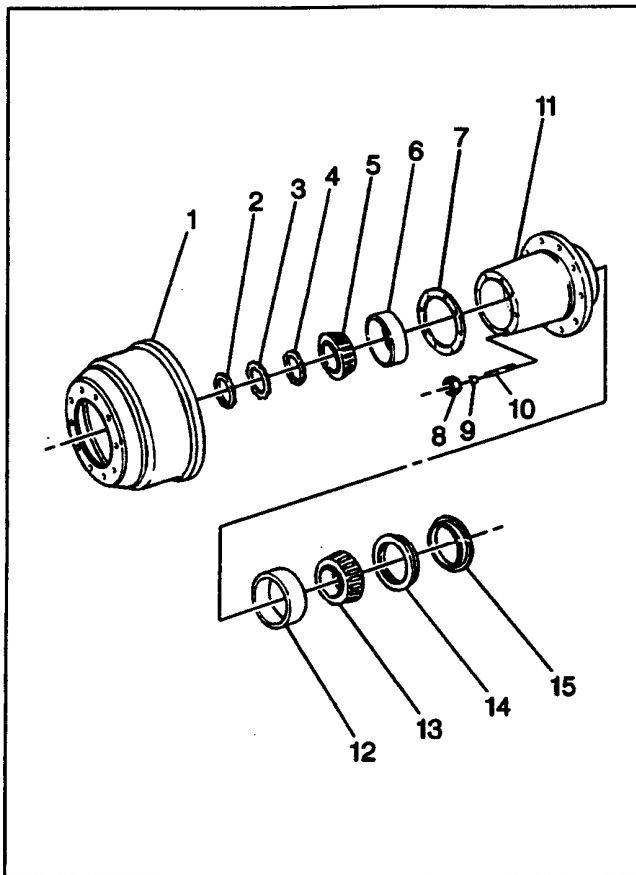
4. Install the rear wheel bearing seal. Perform the following steps:
 - 4.1. Ensure that the rear wheel hub bearing seal lip faces inward.
 - 4.2. Use the J41107 and the J 8092 on the standard rear wheel hub bearing seal.
 - 4.3. Use the 551-5386 or the 551-5318 on the G98 rear wheel hub bearing seal option.
 - 4.4. Hold the tool handle vertical. Strike a sharp blow with the hammer in order to start the rear wheel hub bearing seal into the rear wheel hub bore.
 - 4.5. Tap the rear wheel hub bearing seal down into place.
5. Install the rear hub assembly. Do not damage the rear wheel bearing seal.

Important: When installing a new rear wheel bearing outer cone, always replace the rear wheel bearing outer cup. Refer to *Rear Hub and Bearing Replacement (Wheel Bearing Cup)*.

6. Install the rear wheel bearing outer cone. Push the cone firmly into place.

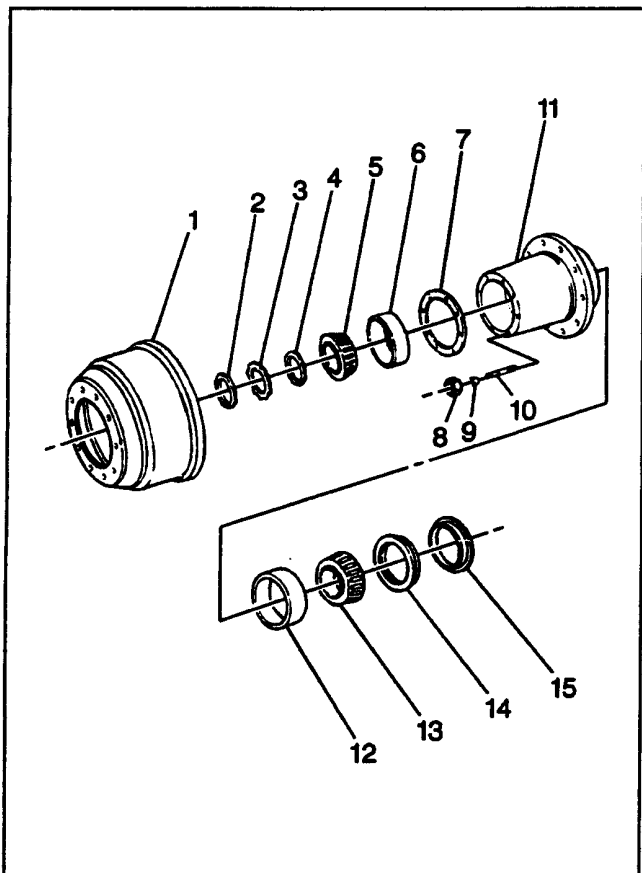


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7. Install the following rear wheel bearing components:
 - 7.1. The inner adjust nut.
 - 7.2. The adjust nut lock.
 - 7.3. The outer adjust nut.
8. Install the rear brake drum, if equipped.
9. Install the rear tire and wheel assembly.
10. Adjust the rear wheel bearings. Refer to *Wheel Bearing Adjustment*.
11. Install the rear axle shaft.
12. Adjust the drum brakes, if equipped. Refer to *Air Drum Brake Adjustment in Brakes*.



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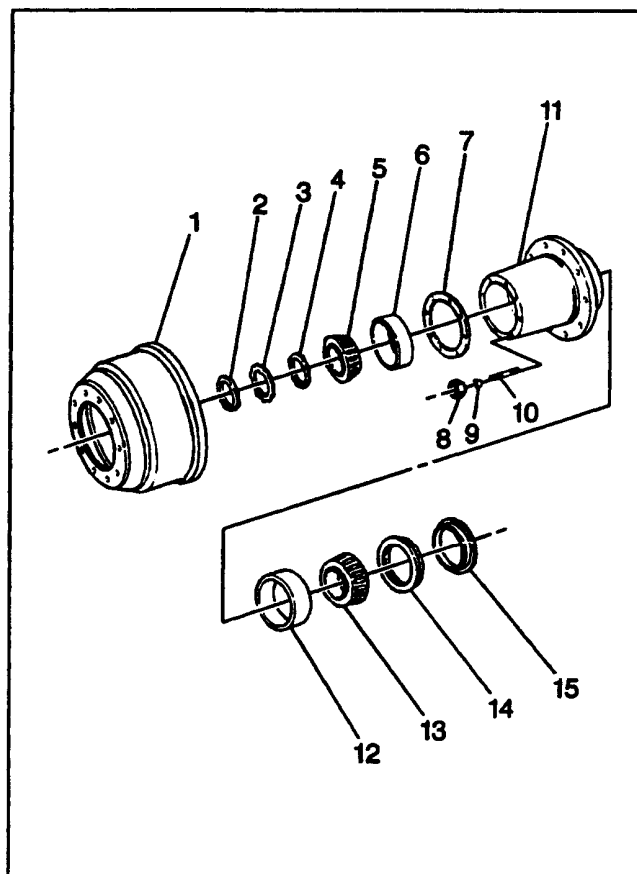
Rear Hub and Bearing Replacement (Wheel Bearing Cup)

Removal Procedure

1. Remove the rear wheel hub. Refer to *Rear Hub and Bearing Replacement (Hub and Bearing)*.
2. Remove the rear wheel bearing cup (12).
Alternately tap on the opposite sides of the rear wheel bearing cup inner edge until the bearing cup is free from the wheel hub. Use a brass drift and a small hammer.

Installation Procedure

1. Install the rear wheel bearing cup. Position the rear wheel bearing cup in the rear wheel hub.
2. Alternately tap on the opposite sides of the rear wheel bearing cup in order to drive the bearing cup in squarely. Use a brass drift and a small hammer.
3. Ensure that the rear wheel bearing cup seats firmly against the hub shoulder.
4. Install the rear wheel hub.



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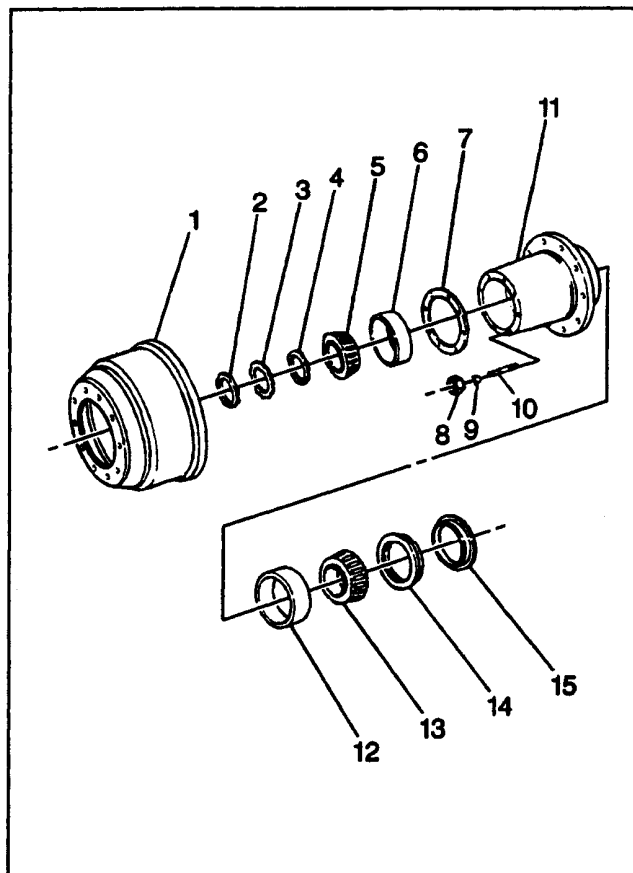
Rear Hub and Bearing Replacement (Wheel Bearing Seal)

For on-vehicle service of the rear wheel hub bearing seal.

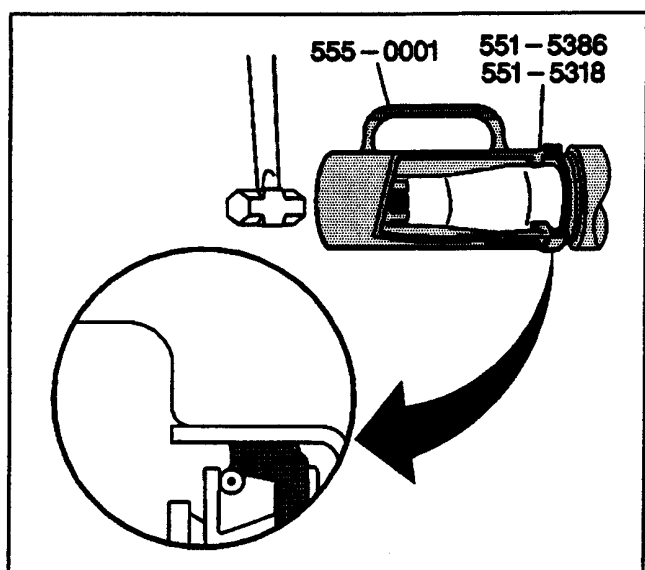
Removal Procedure**Tools Required**

- 555-0001 Universal Tool Body
- 551-5386 or 555-5076 Tool Head

1. Remove the rear wheel hub (11). Refer to *Rear Hub and Bearing Replacement (Hub and Bearing)*.
2. Remove the rear wheel hub bearing seal retainer (15).
 - 2.1. Tap around the outside diameter of the seal retainer (15) with a hammer in order to stretch the metal.
 - 2.2. Use a blunt chisel in order to cut into the rear wheel bearing seal retainer inner flange. The rear wheel bearing seal retainer will be loose enough for removal.
3. Clean the spindle shoulder and threads. Use Brake Parts Cleaner.
4. Remove the burrs from the spindle shoulder.



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Installation Procedure

1. Apply Silicone Sealer (RTV) to the spindle shoulder.
2. Install the new rear wheel bearing seal retainer onto the spindle shoulder.
 - 2.1. Place the rear wheel bearing seal retainer and tool on to the rear axle spindle.
 - 2.2. Tap the end of the tool until the rear wheel bearing seal retainer contacts the rear axle spindle shoulder.
 - 2.3. Rotate the tool and tap several times in order to ensure complete bottoming of the rear wheel bearing seal retainer.
 - 2.4. Wipe off the excess sealer.
3. Ensure that the edge of the rear wheel bearing seal retainer is parallel and flush with the rear axle spindle shoulder face.
4. Install the rear wheel hub.

Axle Housing Replacement

Removal Procedure

Caution: When servicing brake parts, do not create dust by grinding or sanding brake pads, by cleaning brake parts with a dry brush or with compressed air. Many earlier models or aftermarket brake parts may contain asbestos fibers which can become airborne if dust is created during servicing. Breathing dust containing asbestos fibers may cause serious bodily harm. A water dampened cloth or water based solution should be used to remove any dust on brake parts. Equipment is commercially available to perform this washing function. These methods will prevent fibers from becoming airborne.

1. Block the front wheels.
2. Raise and support the vehicle under the frame rails. Ensure that the vehicle rear wheels are off the floor.
3. Release the parking brake.
4. Remove the rear tire and wheel assemblies. Refer to *Wheel Removal (Dual/Rear)* in Tires and Wheels.
5. Remove the rear axle lubricant. Refer to *Lubricant Change*.
6. Remove the propeller shaft. Refer to the following list in order to select the correct replacement procedure:
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Outboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/229)*.
 - If the propeller shaft is a one-piece 1410, 1480, or 1550 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Full Yoke/305)*.

- If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with an Inboard Slip Joint, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/229)*.
 - If the propeller shaft is a one-piece 16N, 17N, 18N, 1710, 1760, or 1810 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Half Yoke/305)*.
 - If the propeller shaft is a one-piece 1480 and 1550 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/305)*.
 - If the propeller shaft is a one-piece 1410 series with a center bearing, refer to *One-Piece Propeller Shaft Replacement (Outboard Slip/229)*.
7. Remove the rear air brake lines, if equipped. Refer to Air Brakes in Brakes.
 8. Remove the shift motor assembly, if equipped. Refer to *Two Speed Rear Axle Shift Motor Replacement* in Rear Axle Controls.
 9. Cage the spring brake chambers, if equipped. Refer to Leaf Spring Removal in Brakes.
 10. Remove the rear brake drum, if equipped.
 11. Remove the rear hub assemblies. Refer to *Rear Hub and Bearing Replacement (Hub and Bearing)*.
 12. Remove the rear brake caliper mounting plate, if equipped.
 13. Remove the rear cam brake assembly, if equipped. Refer to Air Brakes in Brakes.
 14. Remove the wiring attached to the rear axle housing.
 15. Remove the rear axle tie rod, if equipped. Refer to Rear Suspension.
 16. Remove the rear axle control arms (air suspension only). Refer to Air Suspension.
 17. Remove the rear shock absorber from the rear shock absorber lower bracket. Refer to *Shock Absorber Replacement* in Rear Suspension.
 18. Remove the following components:
 - The nuts
 - The washers
 - The U-bolts
 19. Remove the rear shock absorber lower bracket, if equipped. Refer to *Shock Absorber Replacement* in Rear Suspension.
 20. Remove the rear spring anchor plate bracket. Refer to *Leaf Spring Replacement* in Rear Suspension.
 21. Remove the rear axle housing from the suspension.
 - 21.1. Support the axle. Use a hydraulic transmission dolly with adapters in order to properly handle the axle housing.
 - 21.2. Fasten a chain over the top of the housing and to both sides of the dolly.
 22. Remove the differential carrier. Complete the following steps:
 - 22.1. Set the rear axle housing on an axle stand with the differential carrier facing up.
 - 22.2. Remove the following differential carrier components:
 - The bolts
 - The nuts, if equipped
 - The washers
 - 22.3. Strike the differential carrier housing using a rubber mallet in order to break the seal.
 - 22.4. Lift the differential carrier from the rear axle housing. Use a chain lift or equivalent.
 23. Clean the differential carrier seal surface.
 24. Clean the rear brake drum or rear brake rotor, and rear brake assemblies using brake parts cleaner.
 25. Clean the rear wheel bearings. Refer to *Rear Hub and Bearing Replacement (Hub and Bearing)*.
 26. Inspect the new rear axle housing for the following conditions:
 - Damaged threads
 - Cracked welds
 - Damaged flanges

Installation Procedure

1. Install the differential carrier. Refer to *Differential Replacement*.
 - Lift the differential carrier, then lower the carrier onto the rear axle housing.
 - Use a chain lift or equivalent.
2. Install the rear axle assembly to the suspension.
 - Support the rear axle housing using a hydraulic transmission dolly with adapters in order to properly handle the rear axle housing.
 - Fasten a chain over the top of the rear axle housing and to both sides of the dolly.
3. Install the rear spring anchor plate bracket.
4. Install the rear shock absorber lower bracket, if equipped.

Notice: Refer to *Fastener Notice* in Cautions and Notices.
5. Install the following components:
 - The U-bolts
 - The washers
 - The nuts

Tighten

For U-bolt tightening procedures, refer to *Fastener Tightening Specifications*.
6. Install the rear shock absorber to the rear shock absorber lower bracket.

7. Install the rear suspension control arms (air suspension only).
8. Install the rear axle tie rod, if equipped.
9. Install the wiring to the rear axle housing.
10. Install the rear cam brake assembly, if equipped.
11. Install the rear brake caliper mounting plates, if equipped.
12. Install the rear hub assemblies.
13. Install the rear brake drum, if equipped.
14. Uncage the spring brake chambers, if equipped.
15. Install the differential lock air line, if equipped.
16. Install the shift motor assembly, if equipped.
17. Install the air brake lines, if equipped.
18. Install the propeller shafts.

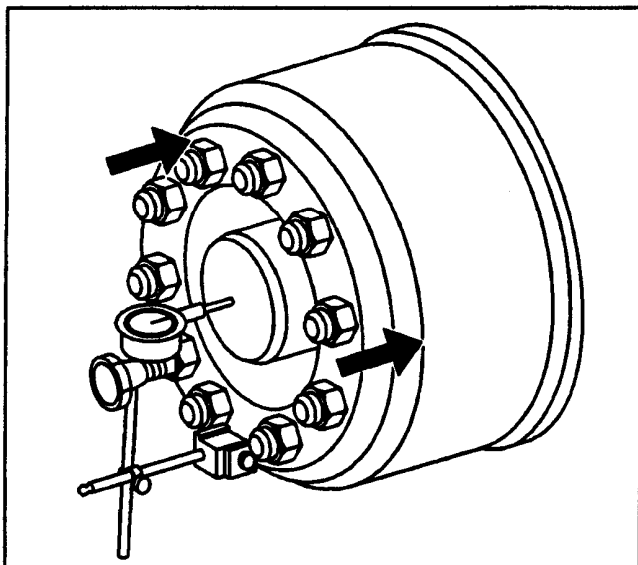
Important: Add 0.94 liters (1 quart) to the power divider of the tandem axle front unit, if equipped.

19. Install the rear axle lubricant. Refer to *Lubricant Change*.
20. Install the rear tire and wheel assemblies.
21. Inspect for air leaks. Refer to Air Leak Test in Brakes.
22. Verify proper brake operation.
23. Remove the wheel blocks.

Wheel Bearing Adjustment

Removal Procedure

1. Block the front wheels.
2. Raise the rear axle and place the jack stands under the frame rails. Ensure that the vehicle rear wheels are off the floor.
3. Release the parking brake.
4. Remove the axle shafts. Refer to *Axle Shaft Replacement*.
5. Use a pry bar in order to move the tire assembly up and down. Observe the following notes:
 - If the rear wheel bearings are properly adjusted, the rear wheel bearing end play should be 0.025–0.178 mm (0.001–0.007 in).
 - The movement of the rear wheel hub in relation to the backing plate or spider assembly will be barely noticeable and the rear wheel will turn freely.
 - If the adjustment is within specification, go to step 3 of the Installation procedure.
 - If the movement is excessive, adjust the rear wheel bearings using all of the following steps.
6. Remove the rear wheel bearing (outer) adjust nut and the rear wheel bearing adjust nut lock.



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7. Loosen the rear wheel bearing (inner) adjust nut.

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

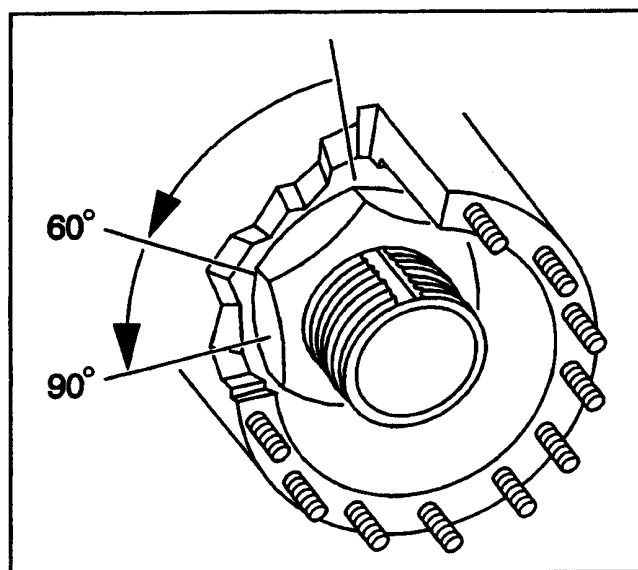
Important: Rotate the rear tire and wheel assembly while tightening the rear wheel bearing (inner) adjust nut in order to ensure proper seating of the rear wheel bearings.

8. Rotate the rear tire and wheel assembly.

Tighten

Tighten the rear wheel bearing (inner) adjust nut to 68 N·m (50 lb ft).

9. Back off the rear wheel bearing (inner) adjust 60–90 degrees (1/6 to 1/4 turn).



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Installation Procedure

1. Install the rear wheel bearing adjust nut lock.

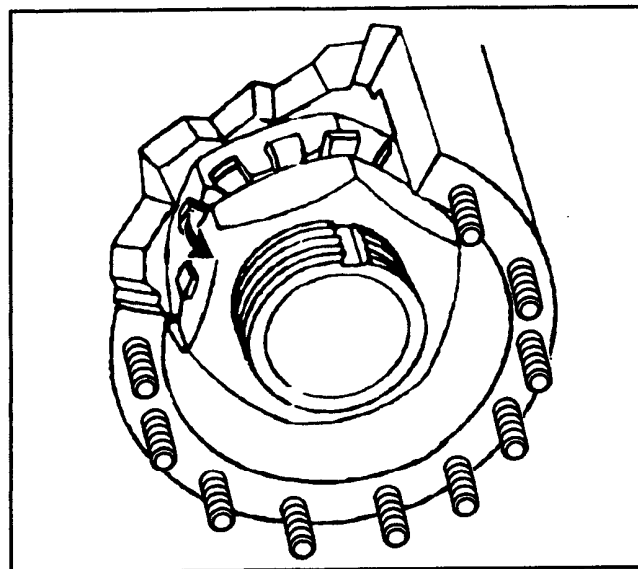
Notice: Refer to *Fastener Notice* in Cautions and Notices.

2. Install the rear wheel bearing (outer) adjust nut.

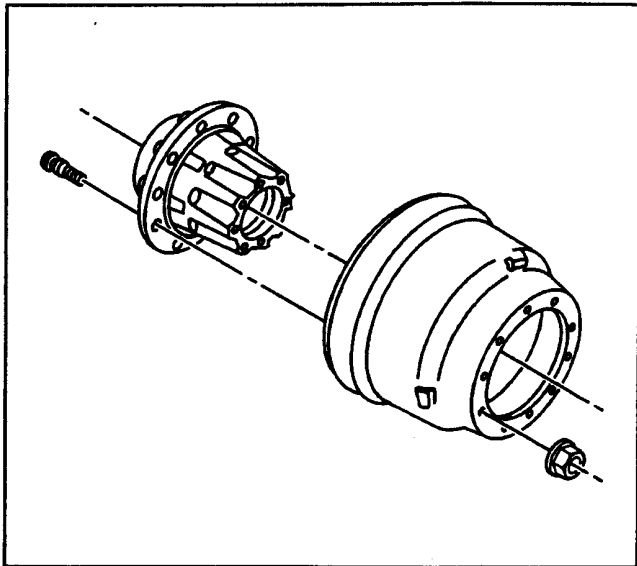
Tighten

Tighten the rear wheel bearing (outer) adjust nut to 169 N·m (125 lb ft).

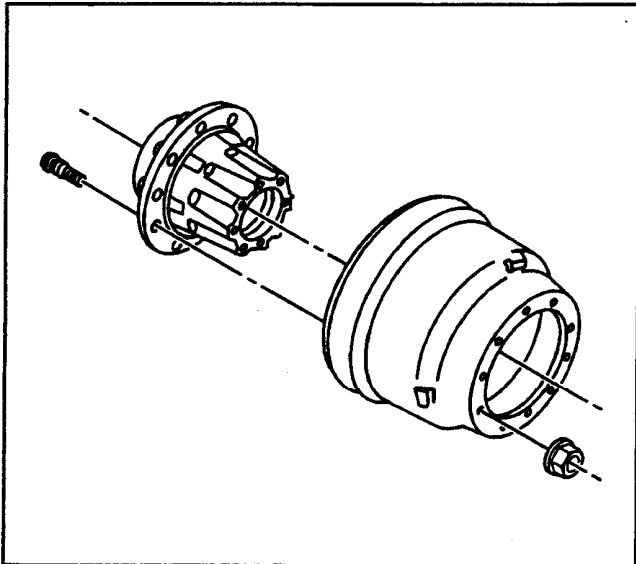
3. Bend one tang of the rear wheel bearing adjust nut lock over the flat of each rear wheel bearing adjust nut.
4. Lower the rear axle housing.
5. Install the rear axle shafts.



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Wheel Hub Bolt Replacement

Removal Procedure

Caution: If any wheel stud is damaged, all wheel studs should be replaced. A loose running wheel may cause only one wheel stud to break, but the other wheel studs could have internal fatigue. Replace only the broken wheel stud and remounting the wheel may cause further damage and personal injury. If the wheel stud holes in the wheels have become enlarged or distorted, replace the wheel.

1. Remove the rear wheel hub. Refer to *Rear Hub and Bearing Replacement (Hub and Bearing)*.
2. Remove the rear wheel hub bolts using a suitable press.

Installation Procedure

1. Install the rear wheel hub bolts using a suitable press.
2. Press the new rear wheel hub bolt threads into place during installation.
3. Do not damage the rear wheel hub bolt threads during installation.

Ensure that the wheel hub bolts are a tight fit into the rear wheel hub.

Description and Operation

Rear Axle Description (Single-Speed Axles)

The single speed rear axles are composed of the following two main components:

- The rear axle housing
- The differential carrier assembly

The banjo-type rear axle housing carries the weight of the vehicle. The rear axle housing provides a machined spindle surface for the rear wheel bearings. The rear wheel hubs rotate on the rear wheel bearings, allowing the rear axle shafts to float within the rear axle housing.

The differential carrier assembly performs the following two functions:

- Changes the driving force 90 degrees from the propeller shaft
- Allows the rear wheels to turn at different speeds

The differential carrier assembly consists of the following components:

- The differential drive pinion gear
- The input yoke (drive pinion)
- The ring gear
- The differential carrier
- The differential case
- The side gears
- The differential gears
- All related bearings

The complete carrier assembly may be removed from the vehicle without removing the rear axle assembly.

Rear Axle Description (Two-Speed Axles)

The two speed rear axle contains two different gear ratios or ranges. The two speed rear axles operate in the same way as the single speed rear axles. The driver selects the range using a control switch on the instrument panel.

A two speed rear axle shift actuator mounted on the rear carrier engages a shift fork. The shift fork selects the range chosen by the driver.

The two speed rear axle shift actuator is electric powered.

The shift fork will perform one of the following functions:

- Slide a collar onto the sun gear of a planetary gear set.
- Slide the entire sun gear assembly in or out of the gear set

Two possible gear ratios may originate from the same gear axle.

Rear Axle Description (Tandem Axles)

A tandem rear axle increases the amount of payload a vehicle may carry. The tandem rear axle increases the traction factor when both rear axles are locked together. A tandem rear axle consists of the following components:

- A rear axle front unit
- A rear axle rear unit

The rear axle front unit has a power divider with an inter-axle differential. The power divider sends power to the individual axle differentials. The power divider allows inter-axle differential action between the two rear axles.

The tandem rear axles have the ability to be locked together, providing power to both the rear axles without the inter-axle differential action.

The inter rear axle differential air shift chamber has the following characteristics:

- Is part of the power divider
- Is mounted to the rear axle front unit differential carrier

The inter rear axle differential air shift chamber controls the tandem rear axles.

The driver controls the electric or air operated inter-axle differential lock system using one of the following items:

- An inter-axle differential lock switch
- An inter-axle differential lock control valve

All the rear axles have a removable differential carrier. The tandem rear axles operate in the same way as the single speed rear axles.

Rear Axle Description (Overhaul - Dana/Spicer)

For complete rear axle identification information, refer to *Rear Axle Identification* in General Information.

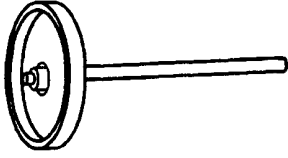
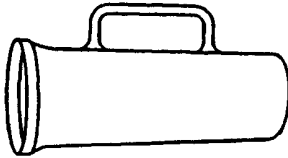
For unit repair information of the Dana/Spicer® differential carrier assembly, contact the Spicer® Support Line at 1-800-666-8688.

Rear Axle Description (Overhaul - Eaton)

For complete rear axle identification information, refer to *Rear Axle Identification* in General Information.

For unit repair information of the Eaton® differential carrier assembly or the power divider, contact Eaton® Roadranger® Service at 1-800-826-HELP (1-800-826-4357).

Special Tools and Equipment

Illustration	Tool Number/ Description
 202853	551-5386 or 551-5318 Fleet Hub Tool
 202857	555-0001 Universal Tool Body

4-88 Rear Drive Axle

Driveline/Axle

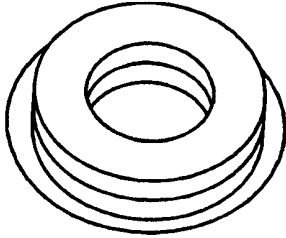
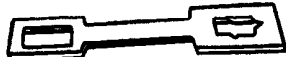
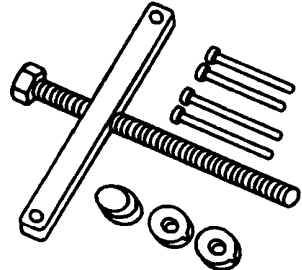
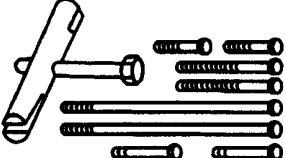
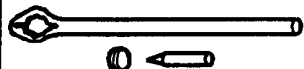
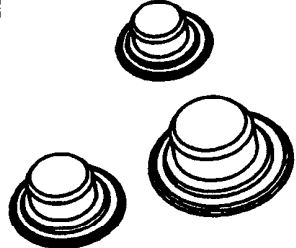
Illustration	Tool Number/ Description
 202855	555-5074 or 555-5076 Tool Head
 36470	J 3453 Holding Bar
 202849	J 4558-01 Puller
 36471	J 7804-01 Puller

Illustration	Tool Number/ Description
 2015	J 8092 Driver Handle
 1507	J 8614-01 Holding Bar
 202860	J 41107 Axle Seal Installer Kit

Rear Axle Controls

Specifications

Fastener Tightening Specifications

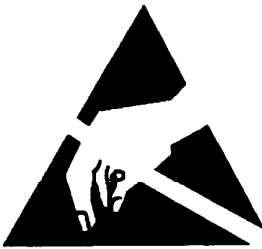
Application	Specification	
	Metric	English
Rear Axle Motor Mounting Stud Nut	54 N.m	40 lb ft
Wiring Harness Clip Nut	1.9 N.m	17 lb in

Schematic and Routing Diagrams

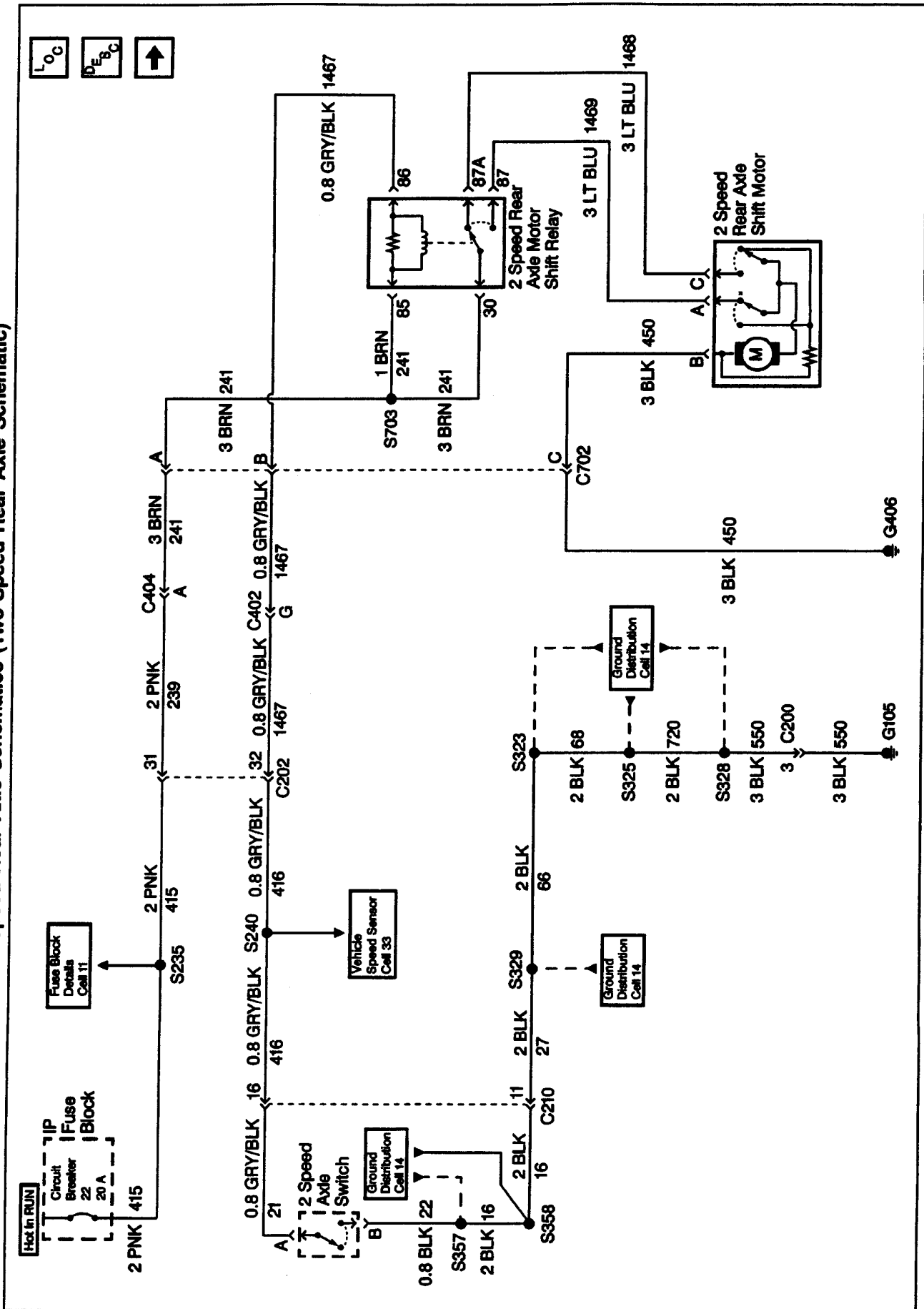
Rear Axle Schematic References

Reference on Schematic	Section Number - Subsection Name
Fuse Block Details Cell 11	8 — Wiring Systems
Ground Distribution Cell 14	8 — Wiring Systems

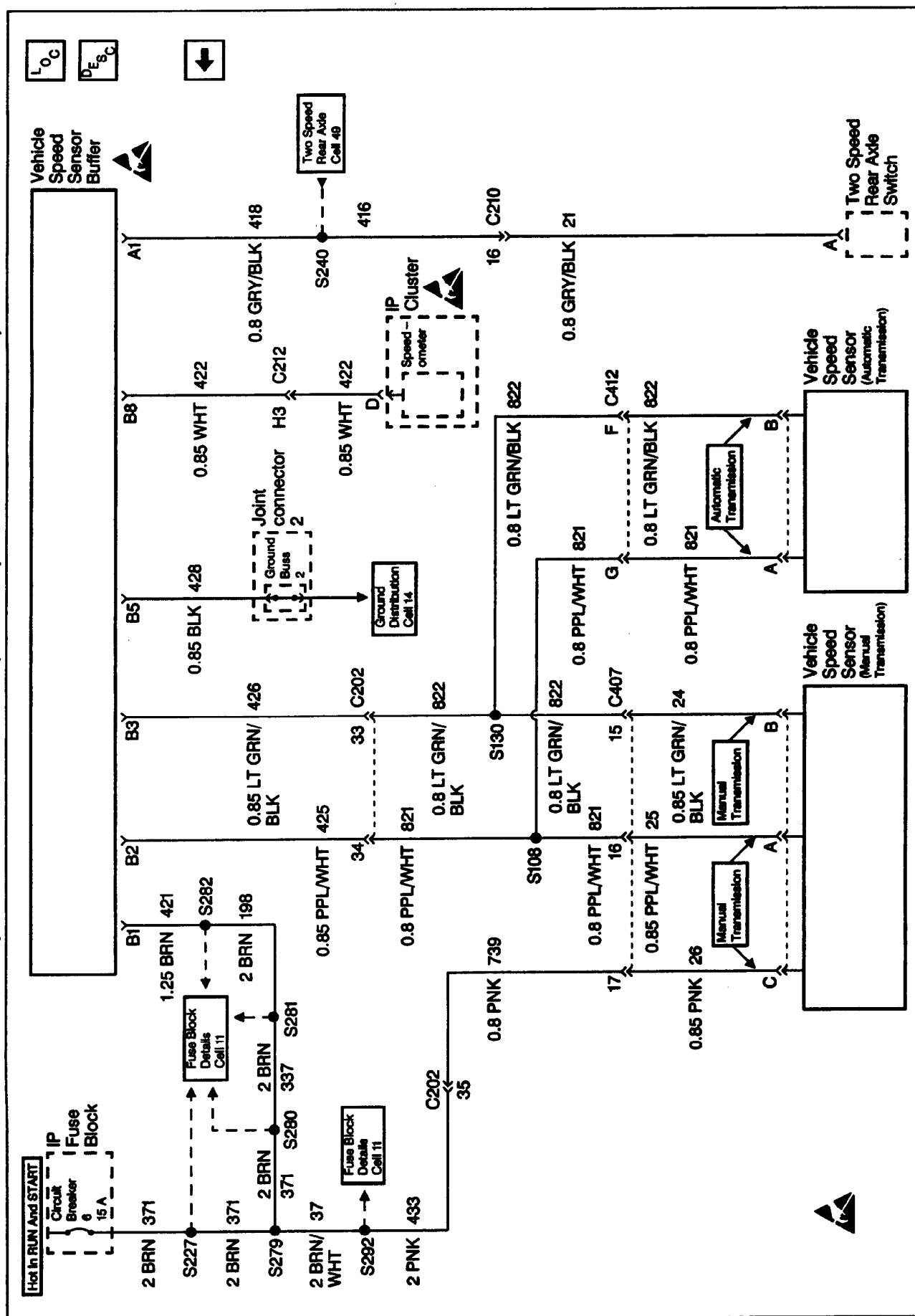
Rear Axle Schematic Icons

Icon	Icon Definition
	Refer to <i>ESD Notice</i> in Cautions and Notices.

Two Speed Rear Axle Schematics (Two-Speed Rear Axle Schematic)



LOC DESC



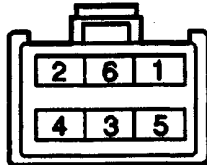
Component Locator

Rear Axle Components

Name	Location	Locator View	Connector End View
IP Fuse Block	On the RH top of the IP, under the access panel	—	—
Two-Speed Rear Axle Shift Motor	On the front of the rear axle housing	—	—
Two-Speed Rear Axle Shift Relay	Mounted on the crossmember forward of the rear axle	—	—
Two-Speed Rear Axle Shift Switch (Automatic Transmission)	In the center of the IP	—	—
Two-Speed Rear Axle Shift Switch (Manual Transmission)	On the transmission shift lever	—	—
C200 (56 cavities)	In the lower IP harness to the front chassis harness, left center of the cab, in the cab interface connector housing	—	—
C210 (16 cavities)	In the lower IP to the floor harness	—	—
C402 (8 cavities)	In the front chassis harness, to the rear chassis and taillamps harness, inside the RH frame rail, inboard of the batteries	—	—
C404 (3 cavities)	In the front chassis harness, to the rear chassis and taillamps harness, inside the RH frame rail, inboard of the batteries	—	—
C702 (3 cavities)	On the RH frame rail forward of the rear axle	—	—
G406 (Two-Speed Rear Axle and Air Brake Dryer)	In the rear chassis and taillamps harness, inboard the RH frame rail, in the ground block (part of the negative battery cable)	—	—
S235	In the lower IP harness, in the main harness at the HVAC and turn/hazard flasher module harness breakout	—	—
S323	In the lower IP harness	—	—
S325	In the lower IP harness	—	—
S328	In the lower IP harness	—	—
S329	In the lower IP harness	—	—
S357	In the floor harness	—	—
S358	In the floor harness	—	—
S703	In the two-speed axle control harness, approximately 5.0 cm (2.0 in) before the relay breakout	—	—

Rear Axle Connector End Views

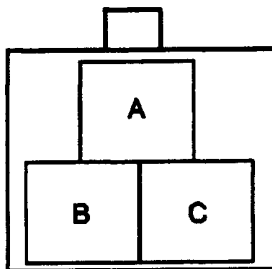
Two Speed Axle Switch (Auto)



237080

Connector Part Information		• 6 Way • Female	
Pin	Wire Color	Circuit No.	Function
1	BLK	152	Two Speed Axle Switch
2	GRA/BLK	151	Two Speed Axle Switch
3	—	—	Not Used
4	BLK/RED	154	Rheostatt
5	BRN	153	Illumination
6	—	—	Not Used

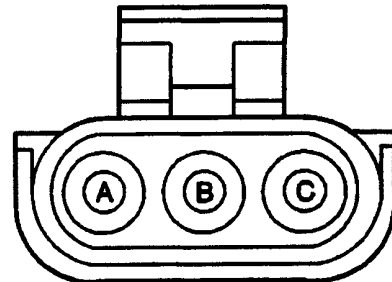
Two Speed Rear Axle Switch (Manual)



339122

Connector Part Information		• 3 Way • Female	
Pin	Wire Color	Circuit No.	Function
A	GRA/BLK	21	Two Speed Rear Axle Input
B	BLK	22	Two Speed Rear Axle Input
C	—	—	Not Used

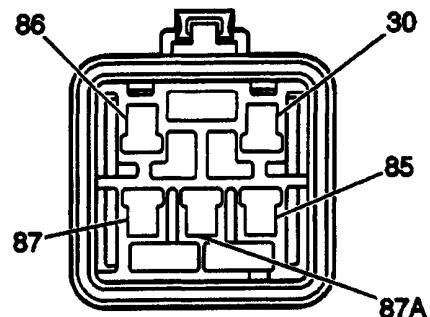
Two Speed Rear Axle Shift Motor (Electric)



309547

Connector Part Information		• 12020737 • 3 Way M Weather Pack (BRN)	
Pin	Wire Color	Circuit No.	Function
A	LT BLU	1469	Two Speed Rear Axle Shift Motor Feed-High
B	BLK	450	Ground
C	LT GRN	1468	Two Speed Rear Axle Shift Motor Feed-Low

Two Speed Rear Axle Shift Motor Relay



39685

Connector Part Information		• 12110539 • 5 Way F Metri-Pack 280 Series Flexlock, Sealed (BLK)	
Pin	Wire Color	Circuit No.	Function
30	BRN	241	Fuse Output-Ignition
85	BRN	241	Fuse Output-Ignition
86	GRA/BLK	1467	Two Speed Rear Axle Shift Motor Relay Output-Coil
87	LT BLU	1469	Two Speed Rear Axle Shift Motor Feed-High
87A	LT GRN	1468	Two Speed Rear Axle Shift Motor Feed-Low

Diagnostic Information and Procedures

Two Speed Rear Axle System Check

1. Inspect Circuit Breaker #22 to determine if it is open. If an open condition exists, Locate and repair the cause of the overload and replace the circuit breaker.
2. Inspect grounds G 105 and G 406 to make certain that they are clean and tight.

3. Inspect for broken (or partially broken) wire inside the insulation. This condition could cause system malfunction but prove to test good in a continuity or voltage test with the system disconnected. These circuits may be intermittent or resistive when in operation. If possible test for a voltage drop when the system is operational.
4. Inspect for proper installation of aftermarket electronic equipment which may affect the integrity of other systems.

Two Speed Rear Axle Shift Motor Diagnosis (High Speed Inoperative)

Step	Action	Value(s)	Yes	No
1	1. Move the two-speed rear axle switch to HIGH. 2. Connect a DVM from CKT 241 (BRN) at the two-speed rear axle motor shift relay to the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 3	Go to Step 2
2	Locate and repair the open in CKT 241 (BRN). Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 3	System OK
3	Connect a DVM between the two-speed rear axle motor shift relay CKT 1469 (LT BLU) and the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 13	Go to Step 4
4	Connect a DVM between the two-speed rear axle motor shift relay CKT 1468 (LT BLU) and the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 6	Go to Step 5
5	Replace the two-speed rear axle motor shift relay. Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 6	System OK
6	1. Disconnect the two-speed rear axle motor shift relay. 2. Connect an ohmmeter across the two-speed rear axle motor shift relay socket terminal 86 and the chassis ground. Did the ohmmeter detect continuity?	—	Go to Step 7	Go to Step 8
7	Replace the two-speed rear axle motor shift relay. Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 8	System OK
8	1. Disconnect the two-speed axle switch. 2. Connect an ohmmeter across the two-speed axle switch terminal A and the chassis ground. Did the ohmmeter detect continuity?	—	Go to Step 10	Go to Step 9
9	Locate and repair the open in one or more of the following circuits: • CKT 21 (GRN/BLK or GRY/BLK) • CKT 416 (GRN/BLK or GRY/BLK) • CKT 1467 (GRN/BLK or GRY/BLK) Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 10	System OK
10	Connect an ohmmeter across the two-speed axle switch terminal B and the chassis ground. Did the ohmmeter detect continuity?	—	Go to Step 11	Go to Step 12
11	Replace the two-speed axle switch. Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 13	System OK

Two Speed Rear Axle Shift Motor Diagnosis (High Speed Inoperative) (cont'd)

Step	Action	Value(s)	Yes	No
12	Locate and repair the open in one or more of the following circuits: • CKT 22 (BLK) • CKT 16 (BLK) • CKT 27 (BLK) • CKT 66 (BLK) • CKT 68 (BLK) • CKT 720 (BLK) • CKT 550 (BLK) Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 13	System OK
13	Connect a DVM from CKT 1469 (LT BLU) at the two-speed rear axle shift motor to the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 15	Go to Step 14
14	Locate and repair the open in CKT 1469 (LT BLU). Is the two-speed rear axle HIGH speed still inoperative?	—	Go to Step 15	System OK
15	1. Disconnect the two-speed rear axle shift motor. 2. Connect a self-powered test lamp from CKT 450 (BLK) at the connector and the chassis ground. Did the test lamp light?	—	Go to Step 16	Go to Step 17
16	Replace the two-speed rear axle motor shift relay. Is the replacement procedure complete?	—	System OK	—
17	Locate and repair the open in CKT 450 (BLK). Is the repair complete?	—	System OK	—

Two Speed Rear Axle Shift Motor Diagnosis (Low Speed Inoperative)

Step	Action	Value(s)	Yes	No
1	1. Move the two-speed rear axle switch to LOW. 2. Connect a DVM from CKT 241 (BRN) at the two-speed rear axle motor shift relay to the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 3	Go to Step 2
2	Locate and repair the open in the CKT 241 (BRN). Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 3	System OK
3	Connect a DVM between the two-speed rear axle motor shift relay CKT 1468 (LT BLU) and the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 11	Go to Step 4
4	Connect a DVM between the two-speed rear axle motor shift relay CKT 1469 (LT BLU) and the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 6	Go to Step 5
5	Replace the two-speed rear axle motor shift relay. Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 6	System OK
6	1. Disconnect the two-speed rear axle motor shift relay. 2. Connect an ohmmeter across the two-speed rear axle motor shift relay socket terminal 86 and the chassis ground. Did the ohmmeter detect continuity?	—	Go to Step 8	Go to Step 7
7	Replace the two-speed rear axle motor shift relay. Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 8	System OK

Two Speed Rear Axle Shift Motor Diagnosis (Low Speed Inoperative) (cont'd)

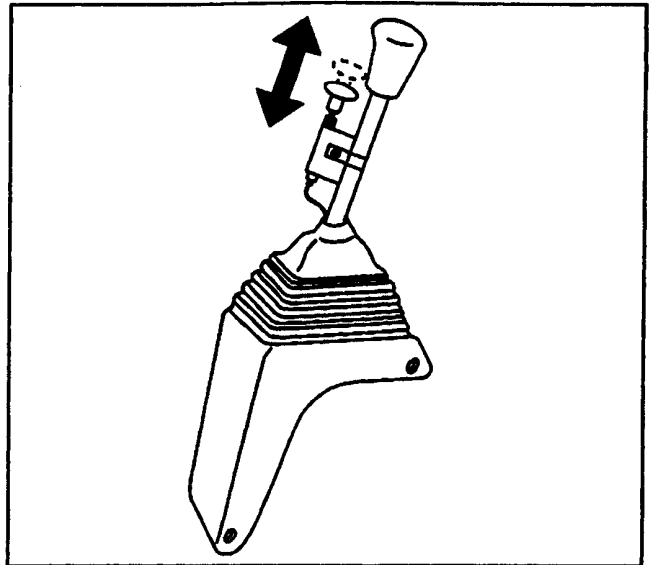
Step	Action	Value(s)	Yes	No
8	1. Disconnect the two-speed axle switch. 2. Connect the ohmmeter across the two-speed axle switch terminal A and the chassis ground. Did the ohmmeter detect continuity?	—	Go to Step 9	Go to Step 10
9	Locate and repair the short to the ground in one or more of the following circuits: • CKT 21 (GRN/BLK or GRY/BLK) • CKT 416 (GRN/BLK or GRY/BLK) • CKT 1467 (GRN/BLK or GRY/BLK) Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 11	System OK
10	Replace the two-speed axle switch. Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 11	System OK
11	Connect a DVM from CKT 1468 (LT BLU) at the two-speed rear axle shift motor to the chassis ground. Did the DVM read a battery voltage?	—	Go to Step 13	Go to Step 12
12	Locate and repair the open in CKT 1468 (LT BLU). Is the two-speed rear axle LOW speed still inoperative?	—	Go to Step 13	System OK
13	1. Disconnect the two-speed rear axle shift motor. 2. Connect a self-powered test lamp from CKT 450 (BLK) at the connector and the chassis ground. Did the test lamp light?	—	Go to Step 14	Go to Step 15
14	Replace the two-speed rear axle motor shift relay. Is the replacement procedure complete?	—	System OK	—
15	Locate and repair the open in CKT 450 (BLK). Is the repair complete?	—	System OK	—

Repair Instructions

Two Speed R/Axle Shift Control Switch Replacement

Removal Procedure

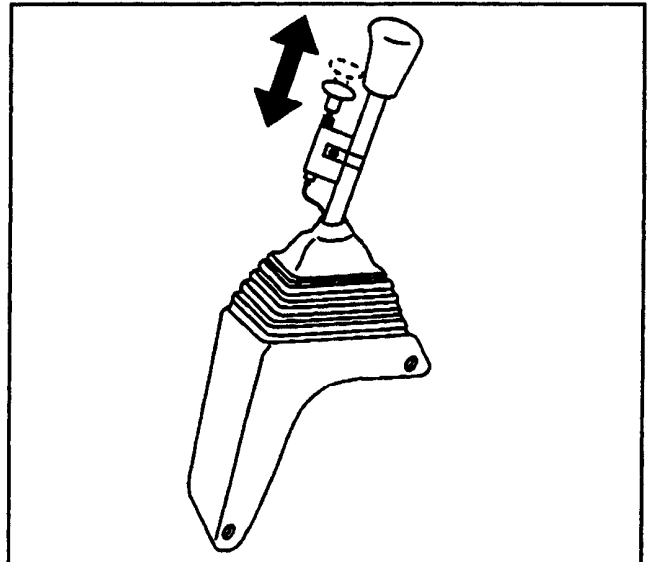
1. Remove the electrical connector.
2. Remove the screw.
3. Remove the clamp.
4. Remove the switch.



216280

Installation Procedure

1. Install the switch.
2. Install the screw.
3. Install the clamp.
4. Install the electrical connector.



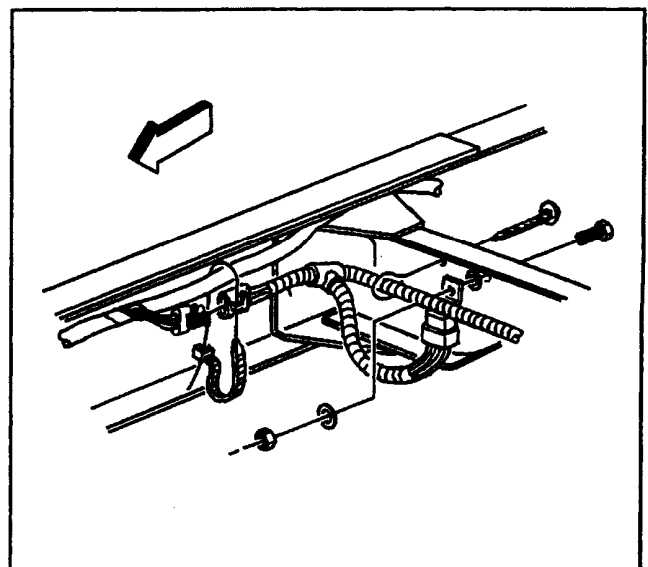
216280

Two Speed Rear Axle Shift Motor Relay Replacement

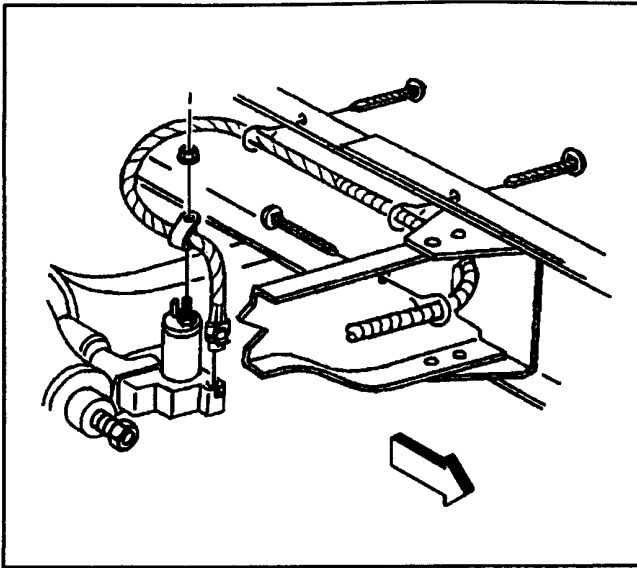
Removal Procedure

Caution: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Remove the electrical connector from the relay.



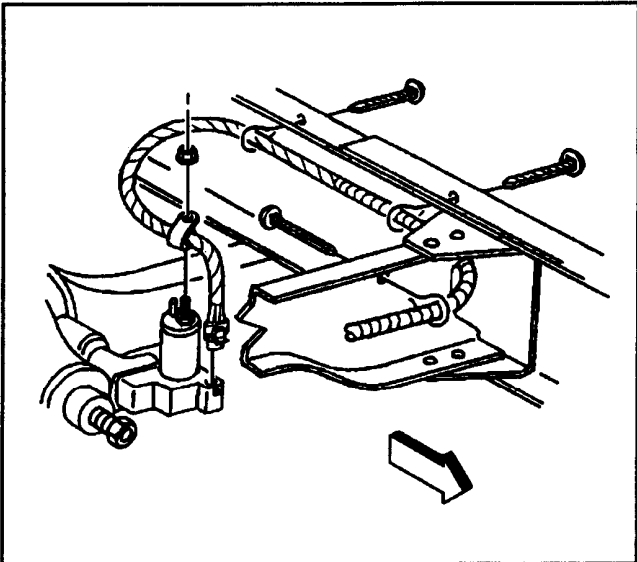
216273



216282

3. Remove the following from the chassis:

- The nut
- The washer
- The bolt

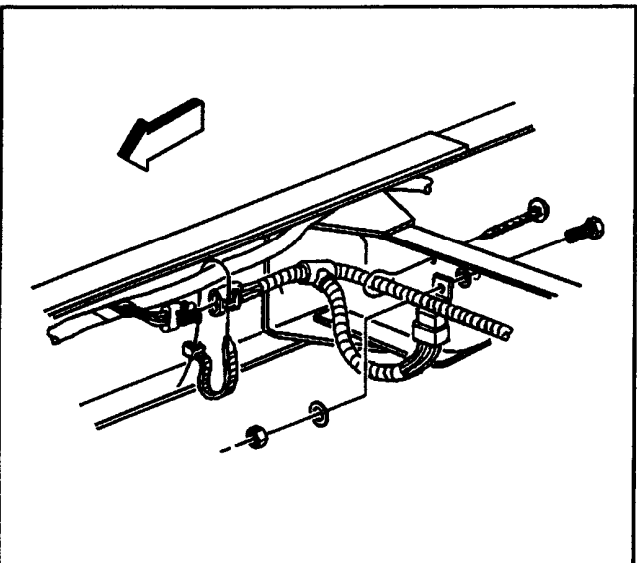


216282

Installation

1. Install the following from the chassis:

- The bolt
- The washer
- The nut



216273

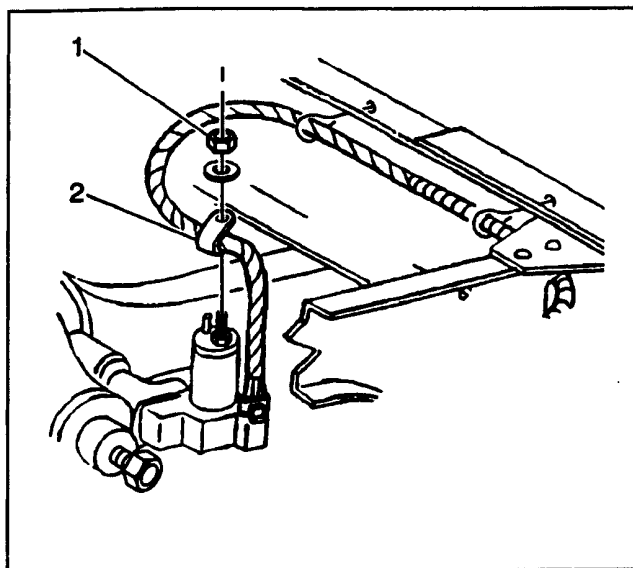
2. Install the electrical connector from the relay.
3. Connect the negative battery cable. Refer to Engine Electrical.

Two Speed Rear Axle Shift Motor Replacement

Removal Procedure

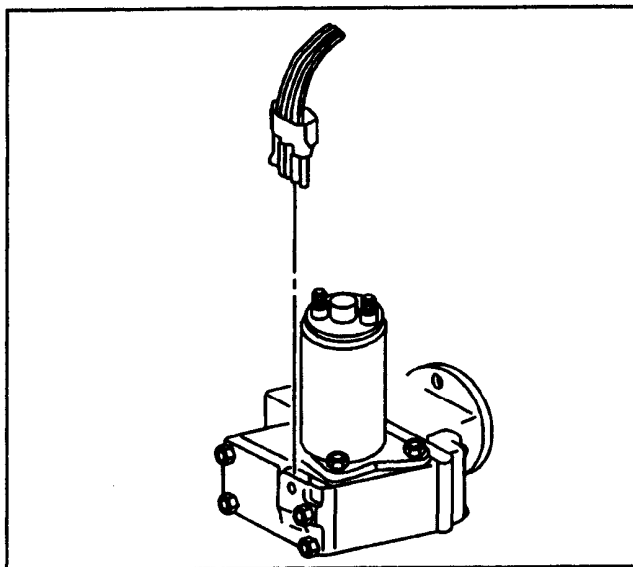
Important: Shift the axle control switch to the LOW range.

1. Remove the wiring harness clip nut (1).
2. Remove the wiring harness clip (2) from the stud.



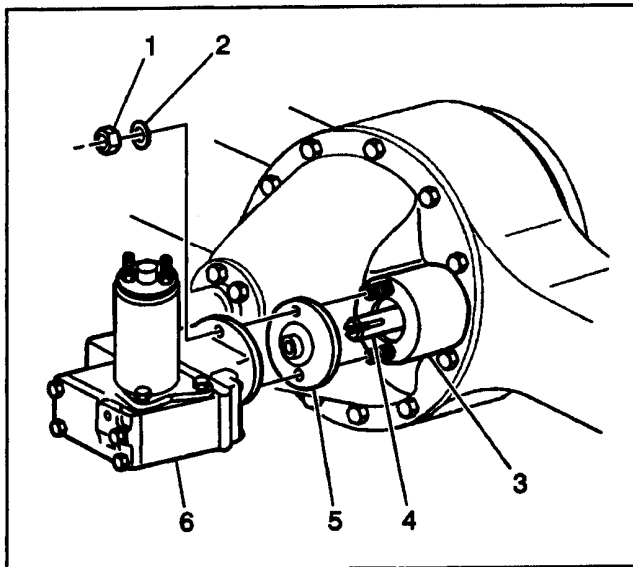
199043

3. Disconnect the wiring harness connector.

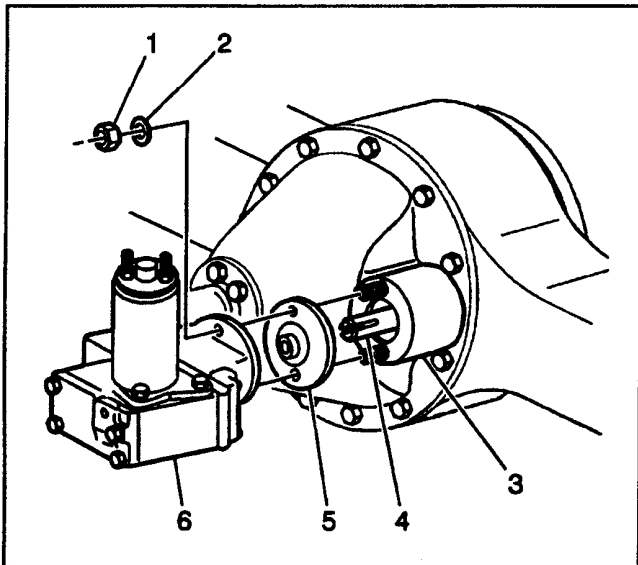


199122

4. Remove the shift motor mounting stud nuts (1).
5. Remove the washers (2).
6. Remove the shift motor (6).
7. Remove the spring from the shift fork (4).
8. Remove the seal (5) from the differential carrier housing (3).



199050



199050

Installation Procedure

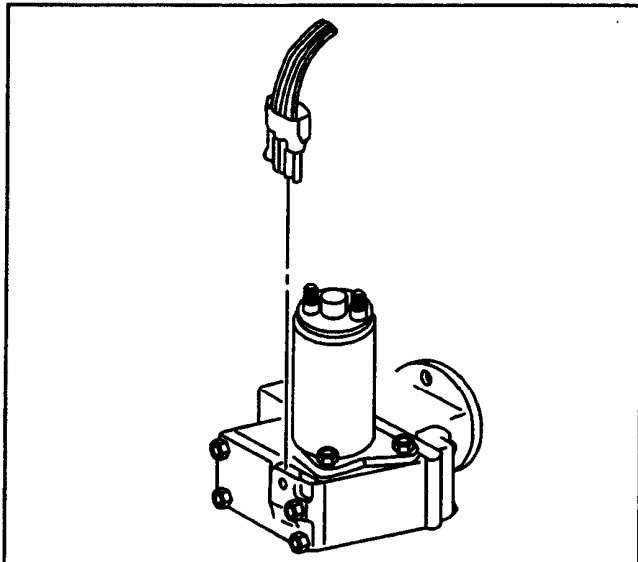
1. Install the seal (5) onto the differential carrier housing (3).
2. Install the spring onto the shift fork (4).
- Important:** Ensure that the actuator lever engages with the shift fork (4).
3. Install the shift motor (6) onto the mounting studs.
4. Install the washers (2).

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

5. Install the shift motor mounting stud nuts (1).

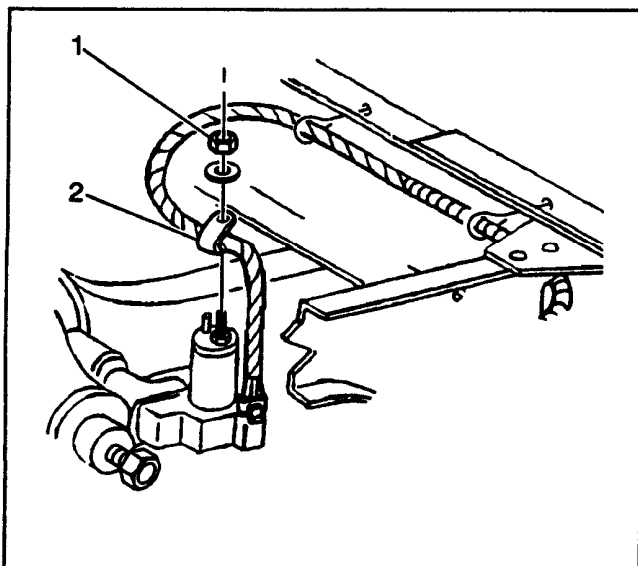
Tighten

Tighten the nuts (1) to 54 N·m (40 lb ft).



199122

6. Connect the wiring harness connector to the shift motor.



199043

7. Install the wiring harness clip (2) onto the stud.
8. Install the wiring harness clip nut (1).
- Tighten**
Tighten the nut (1) to 1.9 N·m (17 lb in).
9. Turn the ignition switch to the ON position.
10. Verify proper operation of the system.

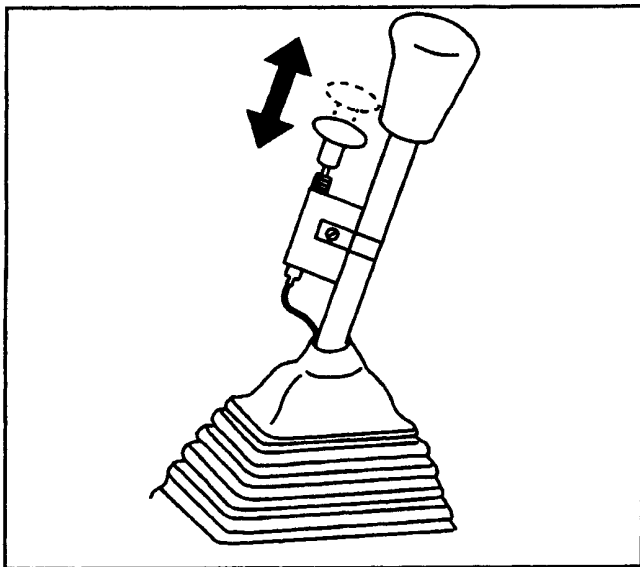
Description and Operation

Two Speed Rear Axle Shift System Description

The electric shift control system includes the following components:

- A control switch
- A speedometer adapter assembly
- A shift motor assembly
- A relay
- A wiring harness

Control Switch

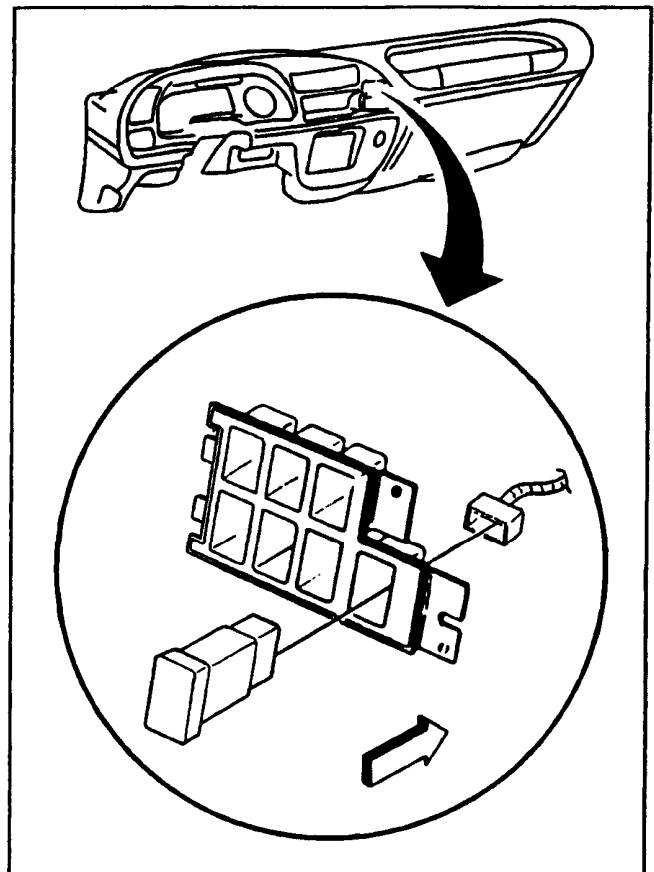


202537

In manual transmission models, the two speed rear axle control switch is mounted on the manual transmission shift lever.

The control switch consists of a shift button that is positioned by the driver in order to operate the two speed shift motor assembly at the rear axle.

The driver selects the axle speed by moving the shift mounted control switch down or up in order to select the LOW or HIGH axle range.



202542

In automatic transmission models, the two speed rear axle control switch is mounted in the instrument panel. The driver selects the axle speed by pushing the switch for the LOW or HIGH axle range.

Relay

The relay is mounted to the crossmember in front of the rear axle.

When the control switch is in the HIGH position a ground is supplied to the relay. This condition actuates the shift motor to the HIGH speed range.

When the control switch is returned to the LOW position the relay is de-energized. This condition returns the shift motor to the LOW speed range.

Shift Motor Assembly

The shift motor assembly is mounted on the differential carrier.

The shift motor shifts the axle into the LOW or HIGH speed range.

Speedometer Adapter Assembly

A speedometer adapter assembly matches the ratio of the speedometer to the ratio of the rear axle.

The adapter gives an accurate speedometer reading when the axle is shifted from one ratio to the other.

The speedometer adapter assembly is electrically connected to the rear axle control switch.

When the shift control switch is placed in the LOW position, an electric signal changes the speedometer adapter assembly to the LOW ratio in order to match the rear axle.

When the shift control switch is placed in the HIGH position, the electric signal is removed and the speedometer adapter assembly reads the HIGH ratio of the rear axle.

Two Speed Rear Axle Circuit Description

The two-speed axle electric shift system consists of the following components:

- A switch
- A relay
- A two-speed rear axle motor

When the two-speed rear axle switch is closed (HIGH speed range), a ground is supplied to the two-speed rear axle motor shift relay. Voltage is applied to the two-speed rear axle shift motor through CKT 1469 (LT BLU). This action moves the control spring to the HIGH range position. When the load on the axle gear is relieved, the axle shifts to the HIGH speed range. The automatic switch in the motor unit moves to a position that opens the input on CKT 1469 (LT BLU) and closes the input on CKT 1468 (LT BLU).

When the two-speed switch is opened (LOW speed range), the two-speed rear axle motor shift relay is de-energized. Battery voltage is supplied through CKT 1468 (LT BLU) to the two-speed rear axle motor. This action moves the control spring to the LOW position. When the load on the axle is relieved, the axle shifts to the LOW range.

Voltage is available at all times to the two-speed rear axle motor shift relay coil and contacts, from circuit breaker #22 through CKT 415, CKT 239, or CKT 241 (PNK or BRN). When the two-speed axle switch is actuated, the switch contacts close. This action connects the ground to the coil of the two-speed rear axle motor shift relay through CKT 21, CKT 416, or CKT 1467 (GRN/BLK or GRY/BLK). The two-speed rear axle shift motor is grounded through CKT 450 (BLK) to G450.