

2002 Chevrolet Corvette

2002-03 DRIVE AXLES Differentials & Axle Shafts - Corvette

2002-03 DRIVE AXLES

Differentials & Axle Shafts - Corvette

DESCRIPTION & OPERATION

Motion is transferred from the engine crankshaft/flywheel through the driveline support, propeller shaft, assembly to either the 4L60-E (M30) automatic transmission or the ZF (MM6) 6-speed manual transmission. The splined output shaft of the transmission drives the pinion, which in turn, rotates the ring gear and differential case assembly. The limited slip differential distributes torque/power to the rear wheels via individual axle shaft assemblies. The limited-slip differential is of a conventional separator plate and friction disc type design.

The differential housing, side covers, pinion housing, and differential case halves are constructed of cast aluminum. The internal components incorporate a hypoid gear set, ring and pinion, carrier assembly, and pinion housing assembly. The pinion is supported in a pinion housing by tapered roller bearings. The pinion is positioned rearward of the ring gear centerline

All models have a 7 5/8 inch ring gear. Each ring gear has specific setup dimensions, A1 and A2 values, stamped onto the side area of the gear. The A1 and A2 values are unique to each ring gear/pinion and are determined during the manufacturers gear/pinion noise and vibration setup and testing. The vehicle speed sensor reluctor ring is incorporated into the outside area of the ring gear. The vehicle speed sensor detects the rotational pulses produced by the reluctor ring and send the signal to the Vehicle Control Module (VCM).

The differential assembly is available in three gear ratios. The 3.42 ratio axle is used in all manual transmission applications. The 2.73 ratio axle is standard equipment for automatic transmission applications with an optional 3.15 ratio axle available

AXLE RATIO & IDENTIFICATION

Service parts identification label contains Regular Production Options (RPO) codes that can help to properly service the vehicle. The service parts label can be found on the inside of the glove compartment door, on the passenger side of the instrument panel. See **AXLE RATIO IDENTIFICATION** .

AXLE RATIO IDENTIFICATION

GM RPO Code	Axle Ratio
GU2	2.73 : 1
GU6	3.42 : 1
G90	3.15 : 1

LUBRICATION

LUBRICANT LEVEL CHECK

1. Raise and support the vehicle. Clean any dirt from around the differential fill plug. Remove the fill plug, lubricant tag, and washer from the differential. Check the differential fluid level, it should be even with the bottom of the fill plug hole to no lower than 0.25" (6 mm) below the opening.
2. Add new fluid if necessary. Fill with synthetic axle lubricant (1237826). If necessary, add enough limited-slip differential lubricant additive (1052358), or equivalent to maintain the original ratio of 1.69 qt. (1.6 L) of axle lubricant to 4.0 oz. (118 ml) of limited-slip additive.
3. Install the fill plug, lubricant tag, and washer to the differential. Tighten the differential fill plug to specification. See **TORQUE SPECIFICATIONS** . Lower the vehicle.

LUBRICANT CHANGE

1. Raise and support vehicle. Clean any dirt from around the differential drain plug. Remove the drain plug and washer from the differential. Drain the fluid.
2. Install the drain plug and washer to the differential. Tighten the differential drain plug to specification. See **TORQUE SPECIFICATIONS** .
3. Clean any dirt from around the differential fill plug. Remove the fill plug, lubricant tag, and washer from the differential. Fill the differential with fluid. Fill with synthetic axle lubricant (1237826). Add approximately 4.0 oz. (118 ml) limited-slip differential lubricant additive (1052358). Check the fluid level to ensure it is even with the bottom of the fill plug hole to no lower than 0.25 in. (6 mm) below the opening.
4. Install the fill plug, lubricant tag, and washer to the differential. Tighten the differential fill plug to specification. See **TORQUE SPECIFICATIONS** . Lower the vehicle.

TROUBLE SHOOTING

NOTE: For testing and procedures not covered in this article, see appropriate table in **GENERAL TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

REAR AXLE LUBRICANT LEAK DIAGNOSIS

NOTE: Inspect for the proper gear oil levels prior to performing system diagnosis. See **LUBRICANT LEVEL CHECK UNDER** lubrication.

Check following items for failure. Repair as necessary:

- Restricted or damaged vent valve assembly.
- Worn, scored, or missing drain and/or fill plug sealing washers.
- Damaged speed sensor and/or "O" ring seal.

- Leaking transmission mounting stud.
- Rear cover "O" ring seal.
- Left or right side cover "O" ring seal.
- Worn or damaged axle shaft oil seals.
- Worn or damaged carrier seal plate "O" ring or oil seal - automatic transmission only.
- Housing or side cover porosity.

REMOVAL & INSTALLATION

NOTE: Some of the following procedures require servicing suspension components near differential assembly. For more detailed information on suspension components, see appropriate REAR - CORVETTE article in SUSPENSION.

CAUTION: DO NOT use corrosive cleaning agents, engine degreasers, solvents, or similar agents on or near fiberglass transverse leaf spring. These materials could cause extensive damage to spring. Use care not to scratch fiberglass transverse leaf spring.

AXLE VIBRATION DAMPER

Removal

1. Raise and support vehicle. Remove the LH rear tire and wheel assembly.
2. Remove the damper/tuned absorber mounting bolts. Remove the damper/tuned absorber.

Installation

Install the damper/tuned absorber to the differential. Install the damper/tuned absorber mounting bolts. Tighten the damper/tuned absorber mounting bolts to specification. See **TORQUE SPECIFICATIONS** . Install the LH rear tire and wheel assembly. Lower the vehicle.

AXLE SHAFTS

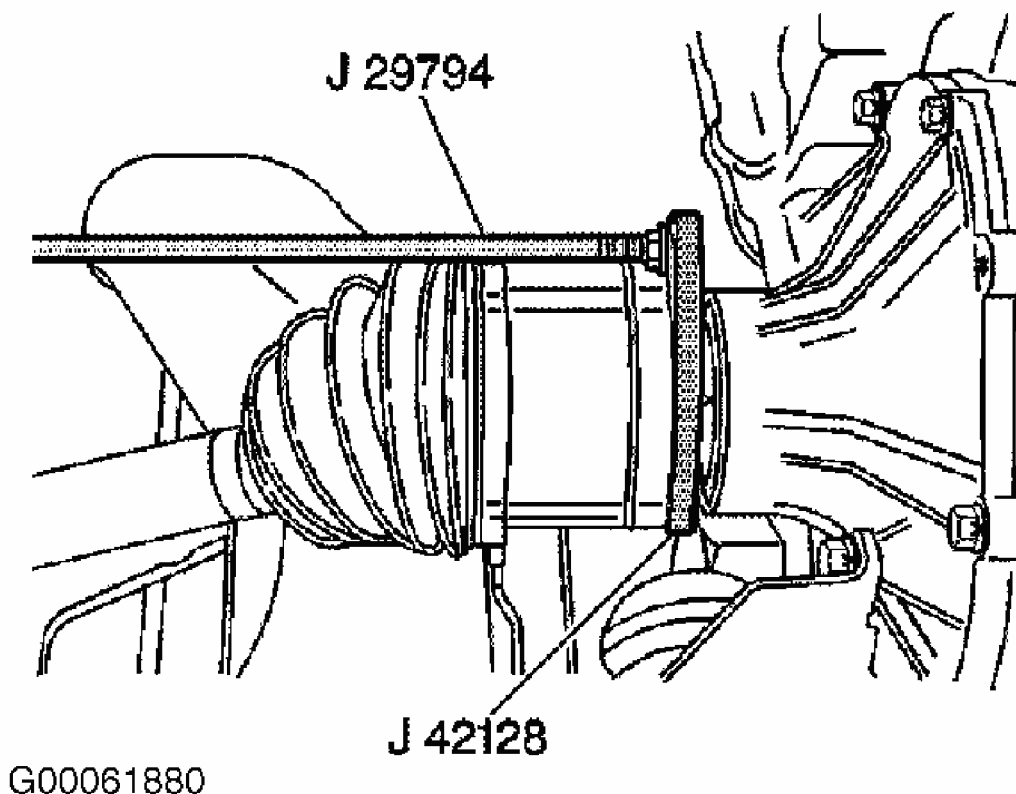
Removal

1. Shift the transmission into PARK (A/T) or NEUTRAL (M/T). Apply the parking brake. Raise and support vehicle. Remove the tire and wheel assembly.
2. Insert a drift or punch into the brake rotor cooling fins and against the brake caliper to prevent the wheel hub and bearing from turning. Remove the spindle nut retaining the

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- rear wheel axle shaft to the hub. Remove the drift or punch. Release the parking brake
3. Remove the rear transverse spring. See appropriate REAR - CORVETTE article in SUSPENSION. Separate the outer tie rod end from the knuckle and reposition the tie rod toward the rear of the vehicle.
 4. Disconnect the wheel speed sensor electrical connector. Disconnect the parking brake cable from the parking brake lever. Remove the parking brake cable from the bracket and reposition toward the rear.
 5. Install Rear Hub Spindle Remover (J 42129) onto the wheel hub and secure with wheel nuts. Begin to disengage the axle shaft from the wheel hub and bearing. This will provide additional clearance to the lower ball joint nut. Separate the lower ball joint from the suspension knuckle. Disengage the axle shaft completely from the wheel hub and bearing.
 6. Support the axle shaft. Support the suspension knuckle and upper control arm and reposition the knuckle toward the front of the vehicle. Assemble the Axle Shaft Remover (J 42128), Extension (J 29794), and Slide Hammer (J 2619-01). Install the Axle Shaft Remover evenly onto the rear beveled surface of the axle shaft inner joint housing. See **Fig. 1**.
 7. Disengage the axle shaft from the rear axle differential using the Axle Shaft Remover, Extension, and Slide Hammer, then remove the tool assembly. Remove the axle shaft from the vehicle. Remove Rear Hub Spindle Remover from the wheel hub.



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Fig. 1: Removing Axle Shafts**Courtesy of GENERAL MOTORS CORP.****Installation**

1. Position the axle shaft to the rear axle differential output shaft. Carefully align and guide the axle shaft onto the differential output shaft. Engage the axle shaft fully onto the differential output shaft using light force. Check to be certain that the axle shaft is fully seated on the differential output shaft. Begin to position the suspension knuckle to the axle shaft. Align and carefully guide the axle shaft into the wheel hub and bearing but do not seat fully. This will provide additional clearance to the lower ball joint nut. Connect the lower ball joint to the suspension knuckle.
2. Install the parking brake cable into the bracket. Connect the parking brake cable to the parking brake lever. Connect the wheel speed sensor electrical connector.
3. Connect the outer tie rod end to the suspension knuckle. Install the rear transverse spring. See appropriate REAR - CORVETTE article in SUSPENSION.
4. Set the parking brake. Insert a drift or punch into the brake rotor cooling fins and against the caliper to prevent the wheel hub and bearing from turning. Begin to install the axle shaft retaining nut onto the axle shaft by hand. Slowly tighten the nut to draw

the axle shaft to the wheel hub and bearing. Tighten the axle shaft spindle nut to specification. See **TORQUE SPECIFICATIONS** .

5. Remove the drift or punch. Release the parking brake. Install the tire and wheel assembly. Tighten wheel lug nuts to specification. Lower the vehicle.

CATALYTIC CONVERTERS

CAUTION: In order to avoid being burned, DO NOT service the exhaust system while it is still hot. Service the system when it is cool. Always wear protective goggles and gloves when removing exhaust parts as falling rust and sharp edges from worn exhaust components could result in serious personal injury.

Removal

1. Raise and suitably support the vehicle.
2. Remove the Connector Position Assurance (CPA) locks from the oxygen sensor connectors.
3. Disconnect the oxygen sensor electrical connectors.
4. Remove the oxygen sensor clips to the heat shields.

CAUTION: Handle the oxygen sensors carefully in order to prevent damage to the component. Keep the oxygen sensor electrical connector and the exhaust inlet end free of contaminants. DO NOT use cleaning solvents on the sensor. DO NOT drop or mishandle the sensor.

5. Remove the oxygen sensors.
6. Remove the exhaust pipe-to-exhaust manifold nuts.
7. Install adjustable jack stands under the front and rear of the catalytic converter assembly.
8. Remove the exhaust pipe hanger lower bolts.
9. Remove the exhaust pipe brace lower bolts.
10. Remove the exhaust muffler bolts.
11. Remove the exhaust muffler gaskets.
12. Lower the jack stands.
13. With the aid of an assistant, remove the catalytic converter assembly from the jack stands.

Installation

CAUTION: When inspecting or replacing exhaust system components, make sure there is adequate clearance from all points on the underbody to prevent overheating of the floor pan and possible damage to the passenger compartment insulation and trim materials.

1. With the aid of an assistant, install the catalytic converter assembly to the jack stands.
2. Raise the jack stands in order to position the catalytic converter assembly.
3. Install NEW exhaust muffler gaskets.
4. Install all exhaust bolts until snug to ensure correct alignment of the catalytic converter assembly.
5. Remove the adjustable jack stands.

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

6. Tighten the exhaust muffler bolts to specification in the following sequence:
 - A. Left inboard
 - B. Left outboard
 - C. Right inboard
 - D. Right outboard
7. Tighten the exhaust pipe-to-exhaust manifold nuts to specification. See **TORQUE SPECIFICATIONS**.
8. Tighten the exhaust pipe brace bolts to specification.
9. Tighten the exhaust pipe hanger bolts to specification.

CAUTION: Handle the oxygen sensors carefully in order to prevent damage to the component. Keep the electrical connector and the exhaust inlet end free of contaminants. Do not use cleaning solvents on the sensor. Do not drop or mishandle the sensor.

10. Apply Anti-Seize compound (GM 12377953) or equivalent to the threads of the oxygen sensors.
11. Tighten the oxygen sensors to specification. See **TORQUE SPECIFICATIONS** .
12. Install the oxygen sensor clips to the heat shields.
13. Connect the oxygen sensor electrical connectors.
14. Install the oxygen sensor Connector Position Assurance (CPA) locks.
15. Lower the vehicle.

DIFFERENTIAL CARRIER COVER AND SEAL

Removal (Left)

1. Raise and support vehicle. Remove the left rear tire and wheel assembly. Remove the left axle shaft. See **AXLE SHAFTS** . Remove the left muffler assembly. Drain the fluid from the differential. Remove the damper/tuned absorber bolts. Remove the damper/tuned absorber.
2. Loosen the nut retaining the transmission to the transmission left mounting stud. Install a second nut onto the stud. Remove the stud from the differential cover (left). Clean any dirt or debris from around the differential cover (left).
3. Remove the bolts retaining the differential cover (left). Remove the differential cover (left) from the differential. Remove and discard the "O" ring seal from the differential side cover.

Installation (Left)

1. Clean the "O" ring sealing surface on the differential cover (left) and the differential housing. Install a new "O" ring seal to the differential cover. Install the differential cover (left) to the differential.
2. Install the axle cover (left) retaining bolts. Tighten the axle cover (left) bolts to specification. See **TORQUE SPECIFICATIONS** . Using two nuts installed on the stud, install the transmission mounting stud to the differential cover (left). Tighten the transmission mounting stud to specification. Remove the second nut from the transmission mounting stud. Tighten the nut retaining the transmission to the transmission LH mounting stud. Tighten the differential to transmission nut to specification.
3. Install the damper/tuned absorber to the left differential cover (left). Install the bolts mounting the damper/tuned absorber to the differential cover. Tighten the damper/tuned absorber mounting bolts to specification. See **TORQUE SPECIFICATIONS** .
4. Fill the differential with the proper fluids and to the proper level. See **LUBRICANT CHANGE** under LUBRICANT. Install the left muffler assembly. Install the left axle shaft. See **AXLE SHAFTS** Install the left rear tire and wheel assembly. Tighten wheel lug nuts to specification. See **TORQUE SPECIFICATIONS** . Lower the vehicle.

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Removal (Right)

1. Raise and support the vehicle. Remove the right rear tire and wheel assembly. Remove the right axle shaft. See **AXLE SHAFTS** . Remove the right muffler assembly.
2. Drain the fluid from the differential. Clean any dirt or debris from around the differential cover (right). Remove the bolts retaining the differential cover (right). Remove the transmission vent tube retainer (automatic transmission).
3. Remove the differential cover (right) from the differential. Remove and discard the "O" ring seal from the differential cover (right).

Installation (Right)

1. Clean the "O" ring sealing surface on the differential cover (right) and the differential housing. Install a new "O" ring seal to the differential cover (right). Install the differential cover (right) to the differential. Install the transmission vent tube retainer onto the vent tube, then position the retainer to receive the retaining bolt (automatic transmission).
2. Install the axle cover (right) retaining bolts. Tighten the axle cover (right) retaining bolts to specification. See **TORQUE SPECIFICATIONS** . Fill the rear axle differential with the proper fluids and to the proper level. See **LUBRICANT CHANGE** under LUBRICANT. Install the right muffler assembly. Install the right axle shaft. See **AXLE SHAFTS** . Install the right rear tire and wheel assembly. Lower the vehicle.

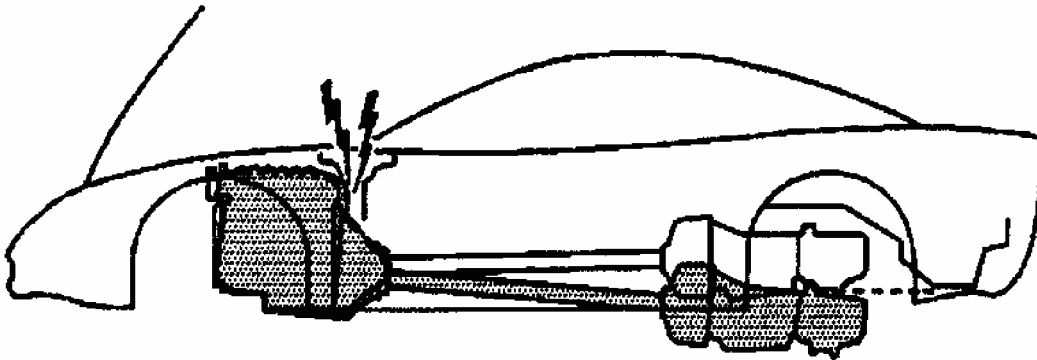
DIFFERENTIAL ASSEMBLY

WARNING: When removing or installing the differential, ensure vehicle is sufficiently supported when removing or adding components from the rear of the vehicle due to weight transfer.

CAUTION: Failure to follow the proper removal and installation procedures may result in damage to the engine crankshaft thrust bearing. When lowering and removing the rear of the driveline, observe the clearance between the rear of the transaxle assembly and the underbody to prevent damage.

CAUTION: When tilting down the rear of the driveline, observe the clearance between the rear of the engine and the composite dash panel. See **Fig. 2** . DO NOT allow the engine to rest unsupported against the composite dash panel, or vehicle damage may result.

NOTE: On models equipped with M/T, when tilting down the rear of the driveline, insert a putty knife or similar tool between the shift control bracket on the driveline support assembly and the brake pipe retainer on the driveline tunnel wall to prevent damage.

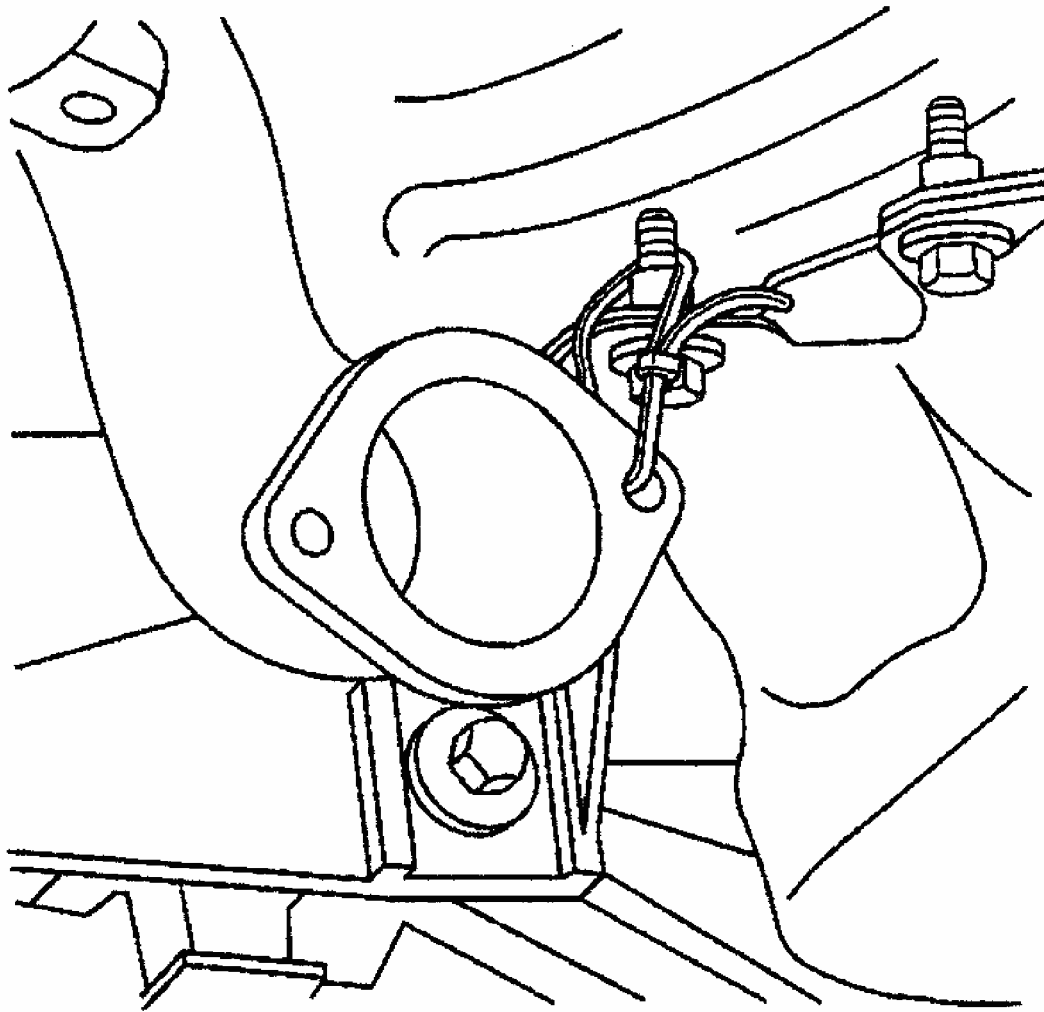


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Fig. 2: Lowering Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

Removal (Automatic Transmission)

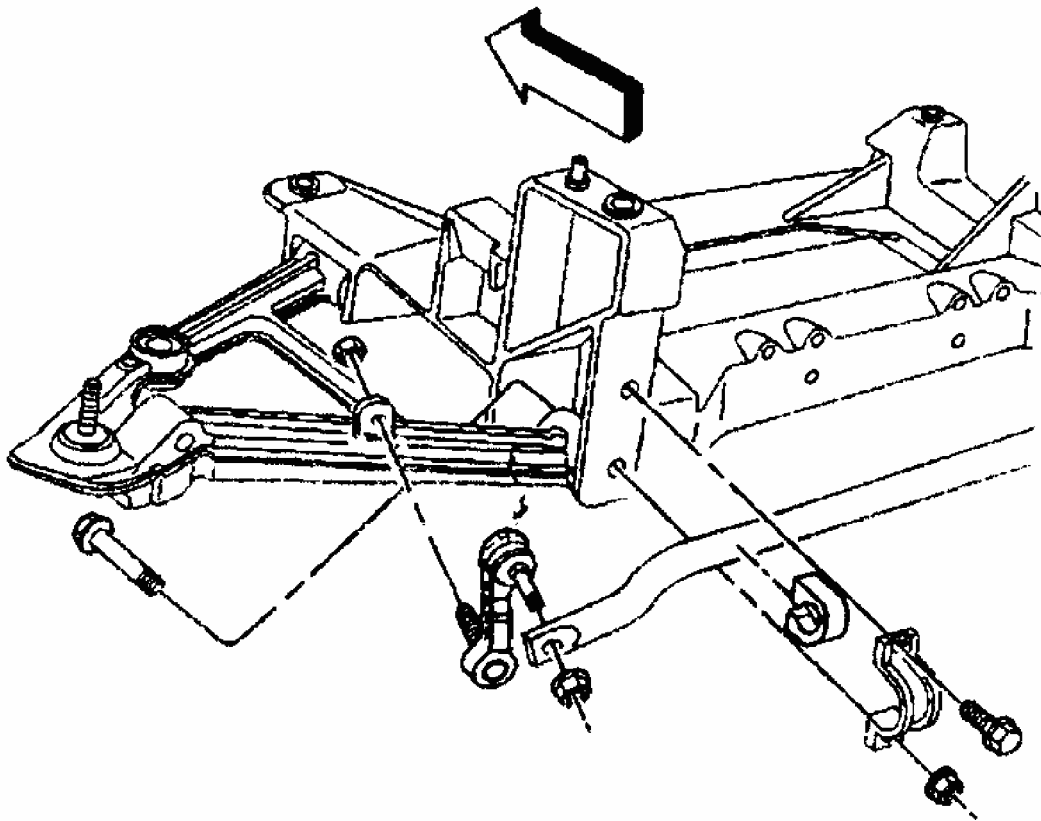
1. Disconnect the negative battery cable.
2. Raise and support vehicle.
3. Remove the rear tire and wheel assemblies.
4. Remove the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
5. Tie off the left muffler assembly to the underbody to support the muffler out of the way. See **Fig. 3** .



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Fig. 3: Securing Left Muffler Aside
Courtesy of GENERAL MOTORS CORP.

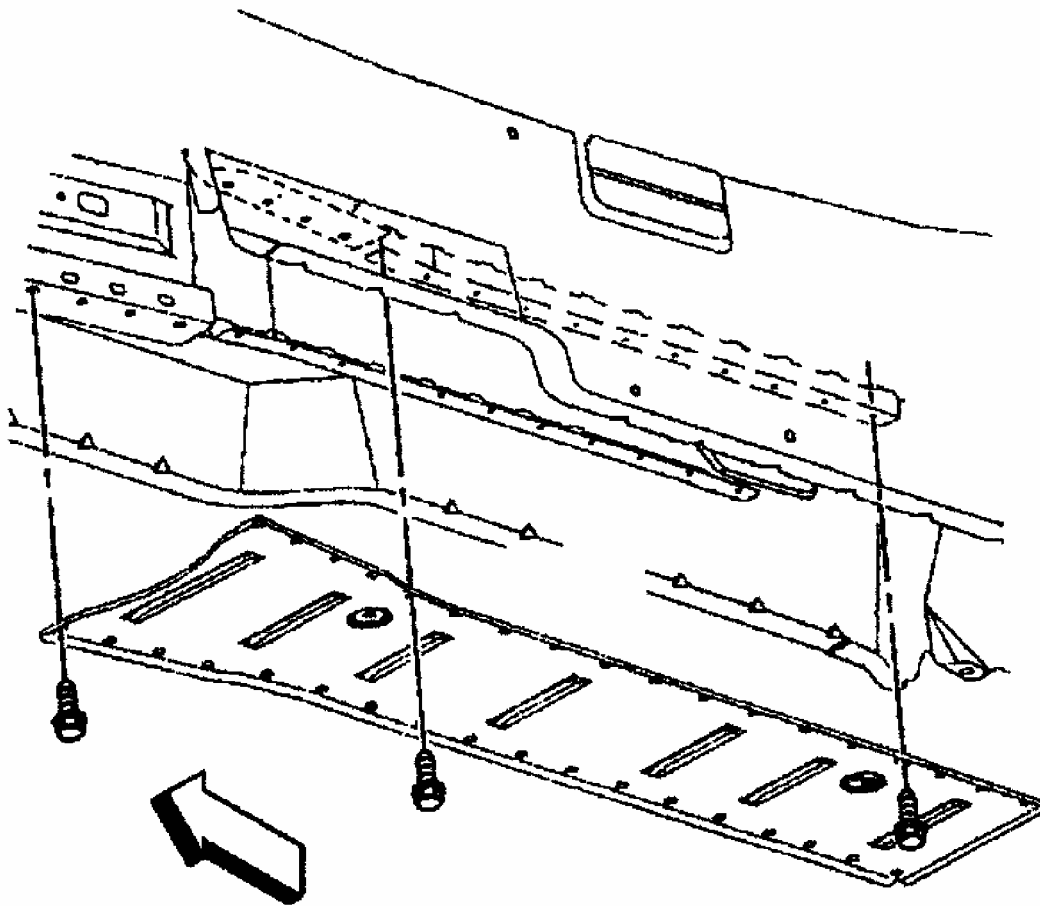
6. Remove the rear stabilizer shaft bracket bolts and nuts. See **Fig. 4** . Remove the rear stabilizer shaft brackets and insulators. Position the stabilizer shaft downwards. Remove the exhaust muffler bolts. Remove the exhaust muffler gasket. Slide the muffler blade out from the hanger. Remove the right muffler.



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Fig. 4: Identifying Rear Stabilizer Shaft & Mounting Brackets
Courtesy of GENERAL MOTORS CORP.

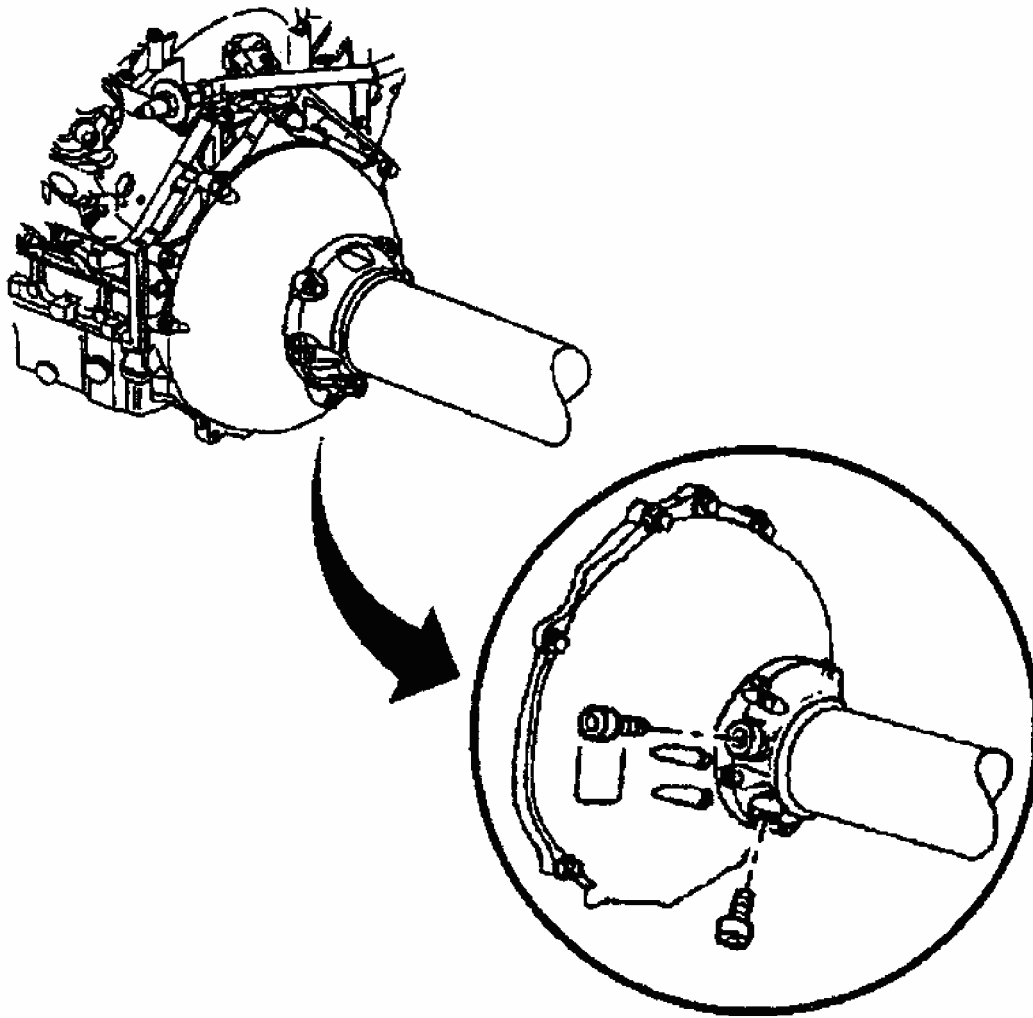
7. Remove the driveline tunnel closeout panel bolts. See **Fig. 5** . Remove the driveline tunnel closeout panel.



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Fig. 5: Identifying Driveline Tunnel Closeout Panel
Courtesy of GENERAL MOTORS CORP.

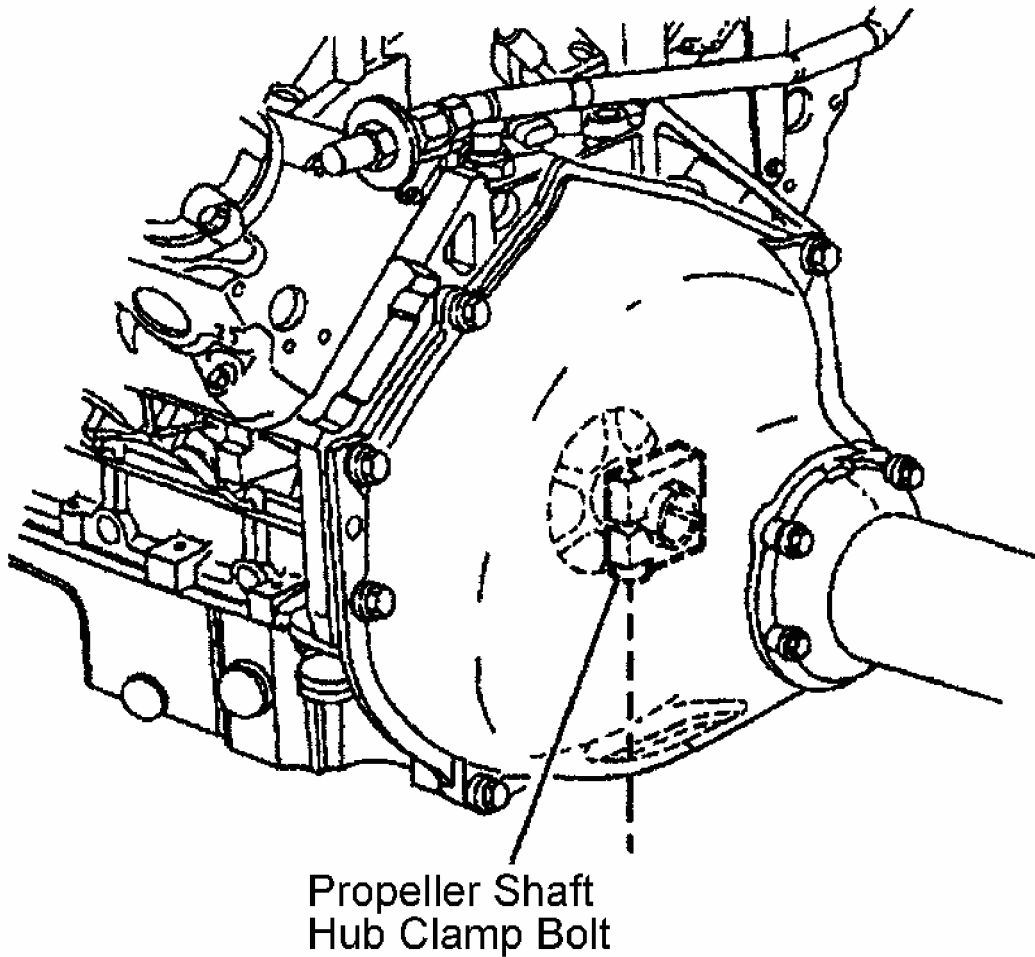
NOTE: The propeller input shaft front bearing positioning bolts are intended to remain torqued to specification and in place until instructed in the installation procedure. The bolts are to be removed, and the plastic plugs reinstalled after the installation is complete. Failure to use the minimum length fastener specified will prevent proper retention of the propeller input shaft front bearing during disassembly or installation.



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Fig. 6: Identifying Driveline Support Assembly Plastic Plugs (A/T)
Courtesy of GENERAL MOTORS CORP.

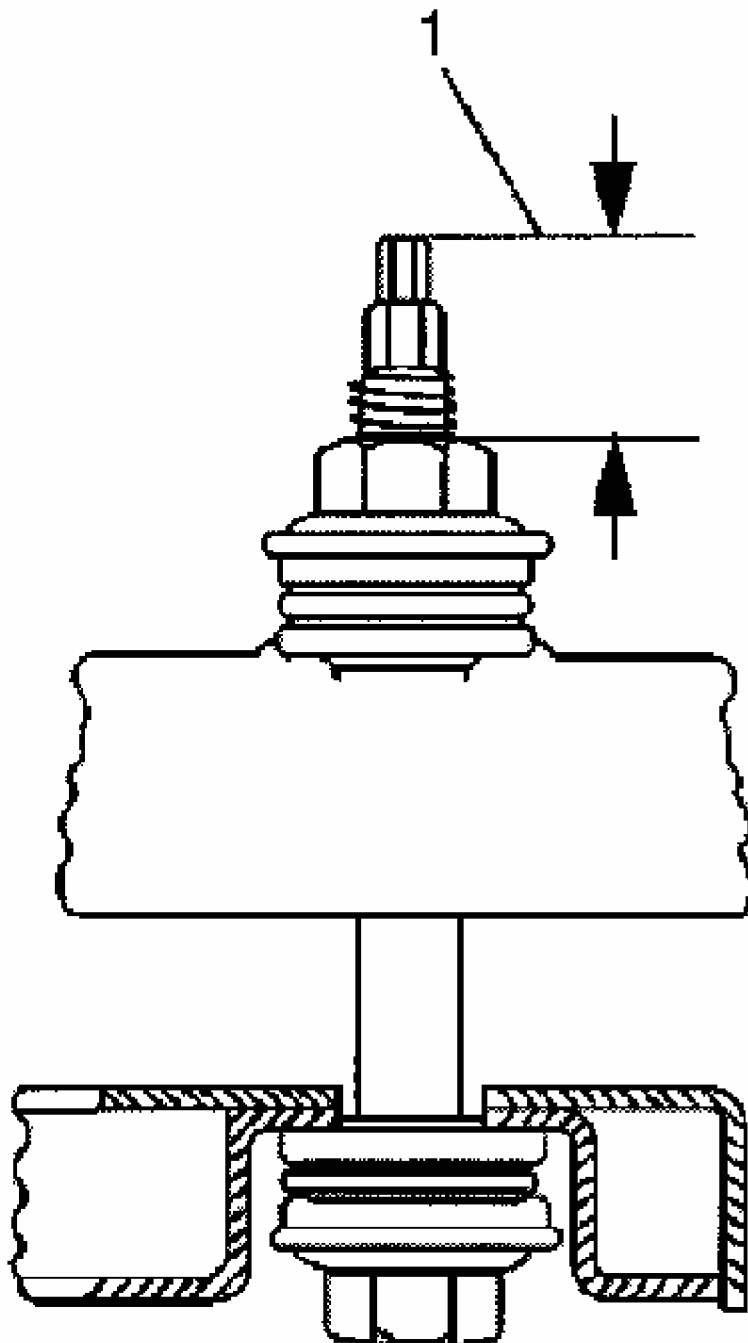
8. Remove the 2 plastic plugs from the front of driveline support assembly. See **Fig. 6** . Install 2 bolts, M10 - 1.5 X 55 mm, or longer, in place of the plastic plugs (The long bolts are used to maintain the propeller shaft front bearing in original position during removal and installation). Tighten the propeller shaft front bearing positioning bolts to 26 ft. lbs. (35 N.m).
9. Using a flat bladed screwdriver, remove the engine flywheel housing access plug.
10. Loosen the propeller shaft hub clamp bolt. See **Fig. 7** . Rotate the engine at the flexplate, if necessary for alignment.



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Fig. 7: Identifying Propeller Shaft Hub Clamp Bolt (A/T)
Courtesy of GENERAL MOTORS CORP.

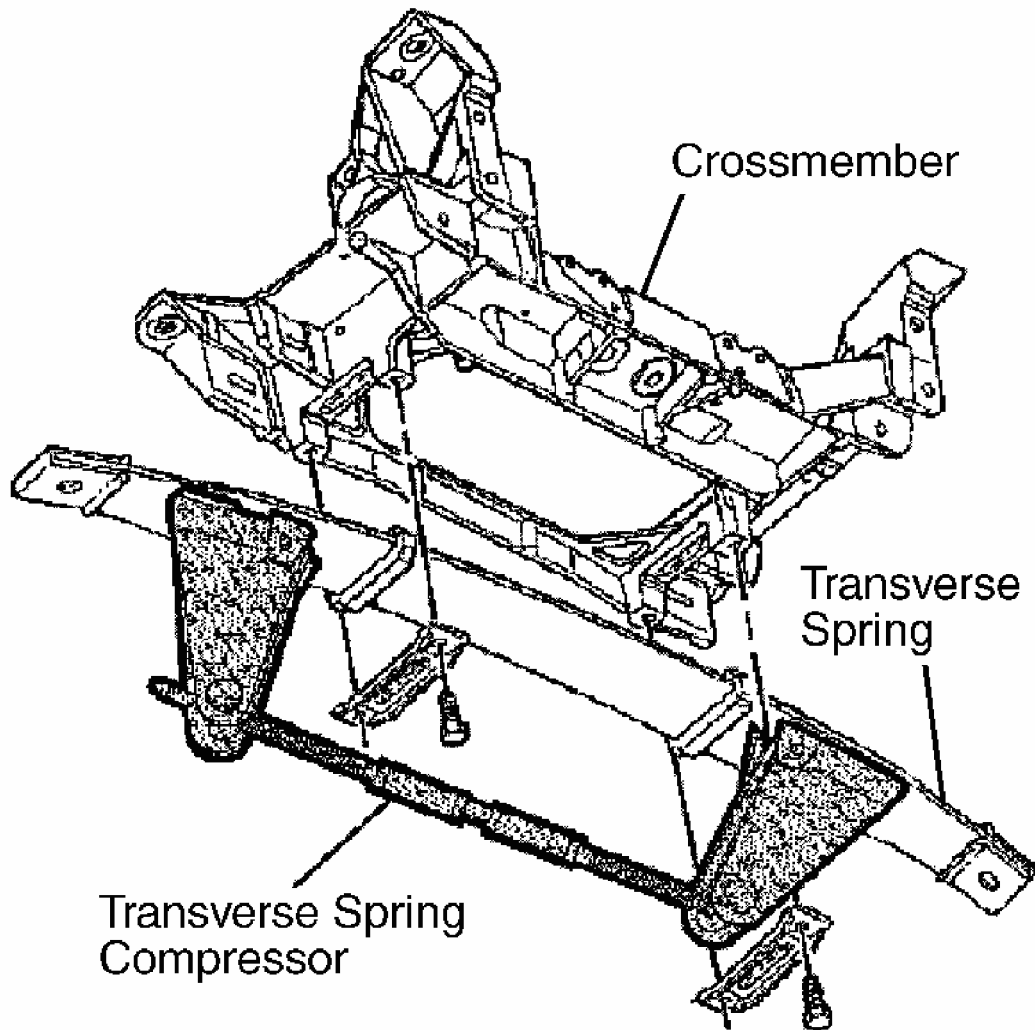
11. Remove the nuts retaining the transmission shift cable bracket to the transmission.
12. Disconnect the transmission shift control cable from the transmission shift lever. Unsnap to release the cable.
13. Reposition the transmission shift cable and bracket.
14. Measure the transverse spring stud height. See **Fig. 8** . This measurement will be used in the installation to set-up the vehicle trim height.



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Fig. 8: Measuring Rear Transverse Spring Stud Height
Courtesy of GENERAL MOTORS CORP.

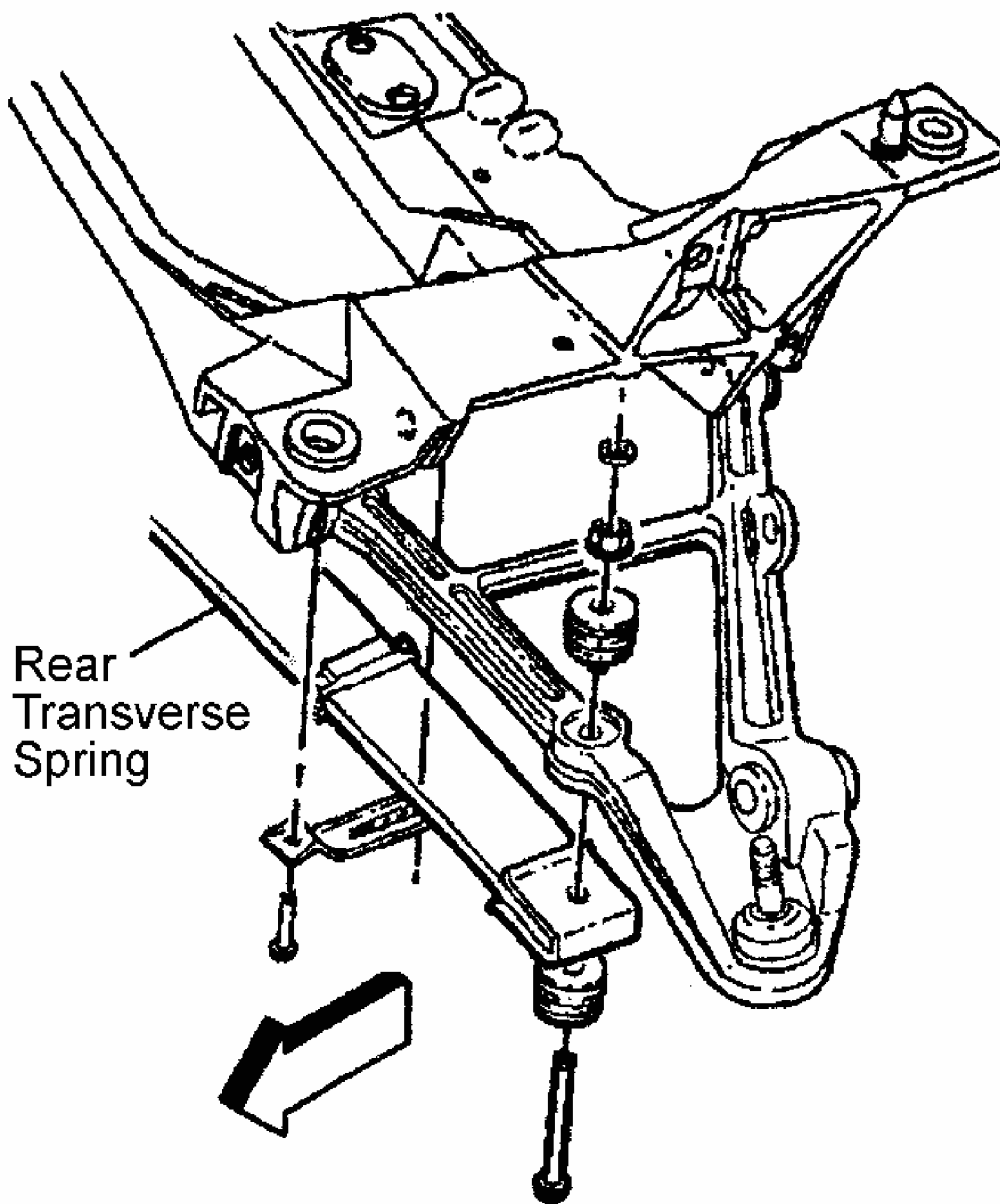
NOTE: Use care not to scratch the rear transverse spring.



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Fig. 9: Installing Rear Transverse Spring Compressor
Courtesy of GENERAL MOTORS CORP.

15. Using the Transverse Spring Compressor (J-33432-A), compress the rear transverse spring. See **Fig. 9** .
16. Remove the retainers, nuts, bolts and insulators retaining the transverse spring to the lower control arms. See **Fig. 10** . Remove the rear transverse spring mounting bolts, spring spacers and insulators from the crossmember. Remove the rear transverse spring.



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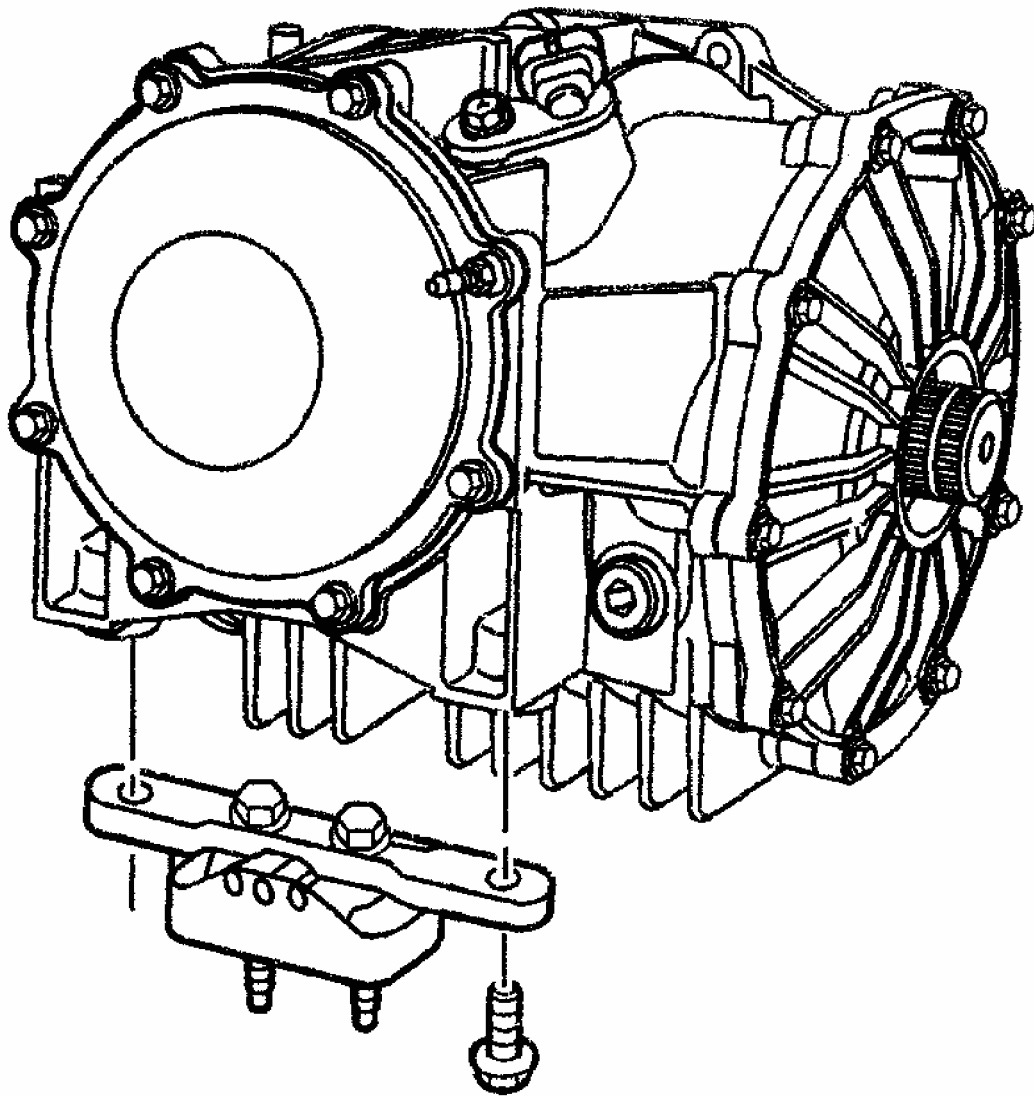
Fig. 10: Removing/Installing Rear Transverse Spring
Courtesy of GENERAL MOTORS CORP.

17. Support the lower control arms.
18. Disconnect the outer tie rod ends from the suspension knuckles.
19. Remove the shock absorber lower mounting bolts.
20. Disconnect the lower ball joints from the suspension knuckles.

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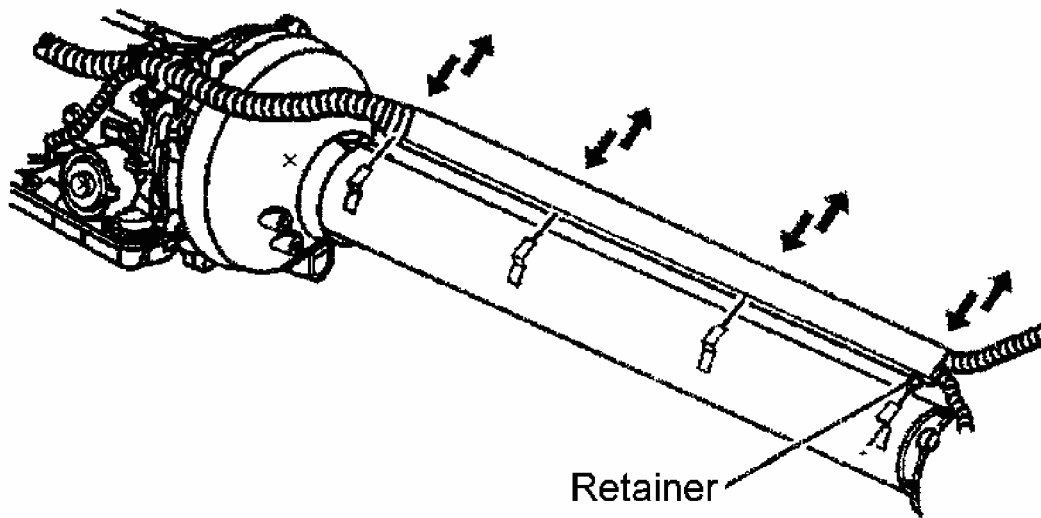
21. Assemble the Drivetrain Support Fixture (J-42055).
22. Install the Drivetrain Support Fixture to a transmission jack.
23. Position and firmly secure the Drivetrain Support Fixture with the transmission jack to the transmission.
24. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember.
25. Remove the transaxle mount-to-rear crossmember nuts.
26. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
27. Using only hand tools, remove the rear suspension crossmember retaining nuts.
28. With the aid of an assistant, slowly lower the rear suspension crossmember away from the vehicle frame rails and remove the crossmember.
29. Remove the transaxle mount bracket-to-differential bolts.
30. Remove the transaxle mount with bracket. See **Fig. 11** . Removing the transaxle mount will allow for greater stability on a workbench after the driveline is removed.



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Fig. 11: Identifying Transaxle Mount & Bracket
Courtesy of GENERAL MOTORS CORP.

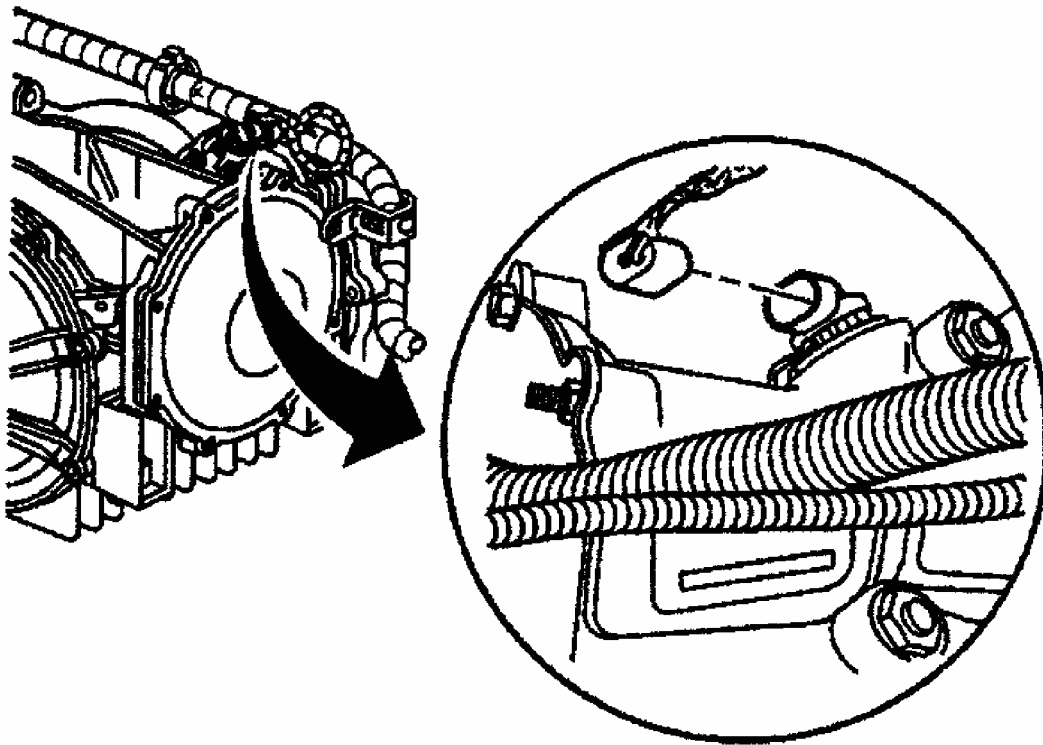
31. Using a pry bar, carefully release the axle shafts from the differential.
32. Tie off the axle shafts to the underbody to support the shafts out of the way. The left muffler assembly pipe toward the rear offers a good location to help support the left axle shaft.
33. Release the retainer securing the wiring harness to the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Slide the harness up out of the brackets and position aside.



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Fig. 12: Removing/Installing Wiring Harness From Driveline Support Assembly
Courtesy of GENERAL MOTORS CORP.

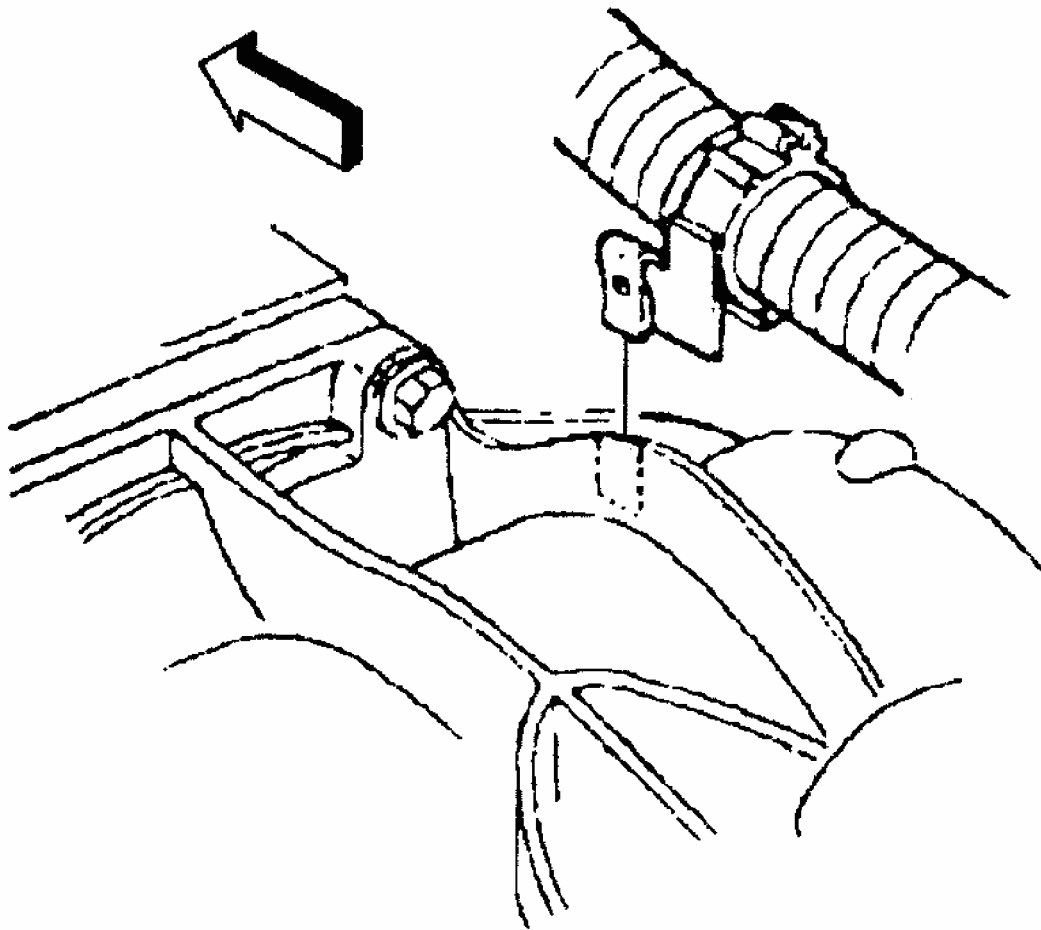
34. Slowly lower the driveline approximately 2.0" (51 mm), while simultaneously adjusting the angle of tilt, in order to access the electrical connectors. See **Fig. 2** .
35. Disconnect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .



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Fig. 13: Locating Vehicle Speed Sensor Connector
Courtesy of GENERAL MOTORS CORP.

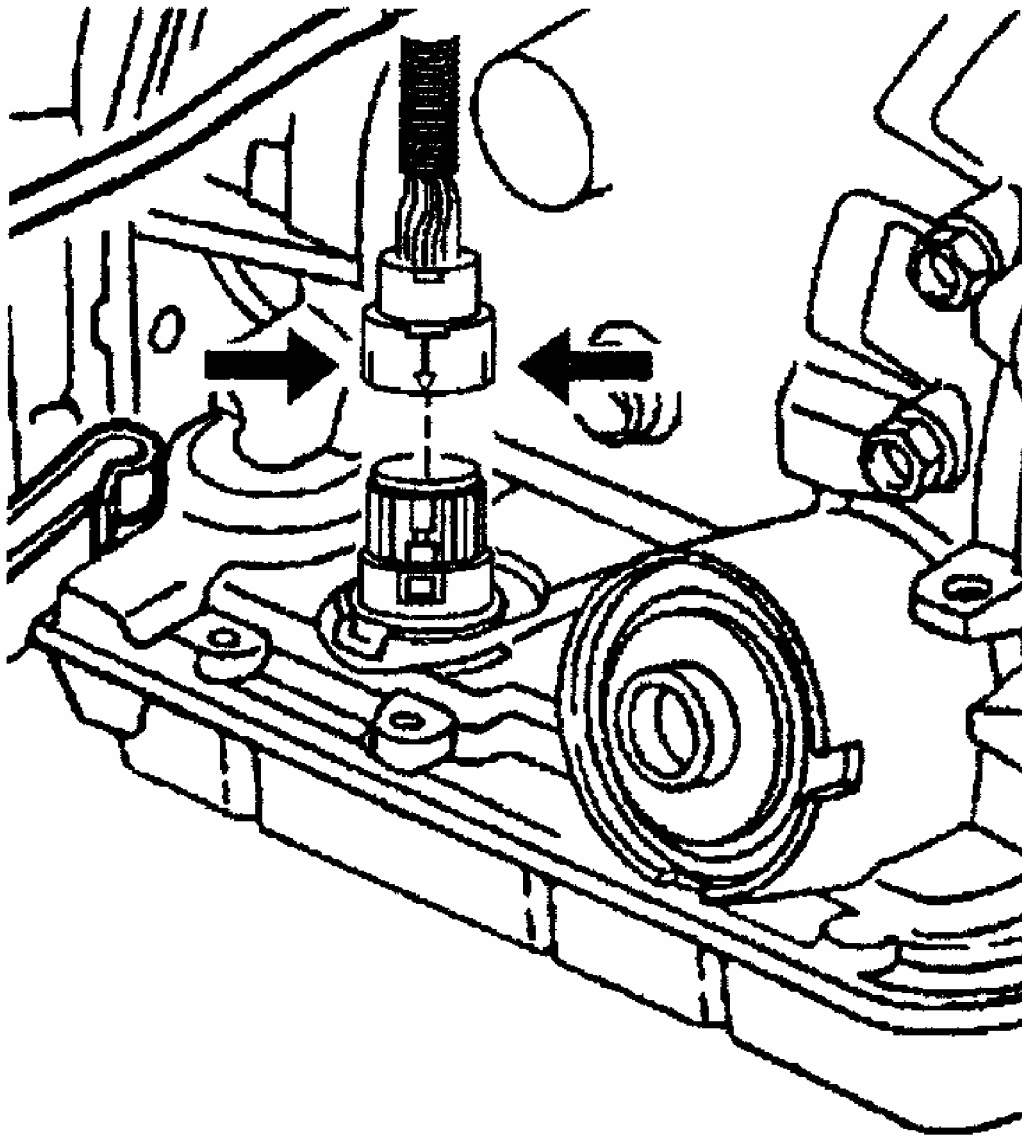
36. Disconnect the wiring harness retainer from the stud at the differential rear cover.
37. Disconnect the wiring harness retainer clip from the top of the differential. See **Fig. 14** .



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Fig. 14: Locating Wiring Harness Retainer At Top Of Differential
Courtesy of GENERAL MOTORS CORP.

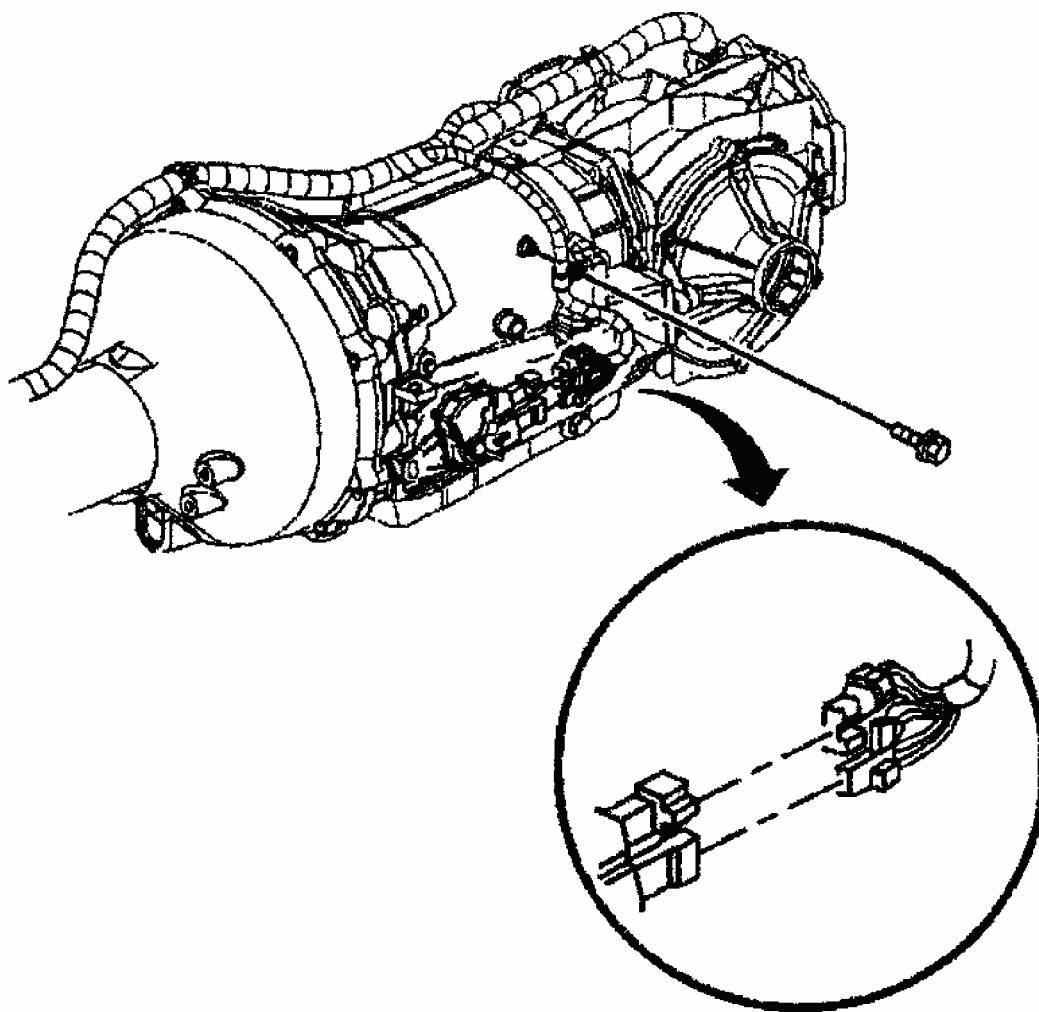
38. Depress both tabs on the transmission harness 20-pin connector and pull straight up to disconnect. See **Fig. 15** . DO NOT pry the connector.



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Fig. 15: Identifying 20-Pin Transmission Harness Connector (A/T)
Courtesy of GENERAL MOTORS CORP.

39. Disconnect the Park/Neutral Position (PNP) switch electrical connectors. See **Fig. 16** .



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Fig. 16: Identifying Park/Neutral Position Sensor Connectors (A/T)
Courtesy of GENERAL MOTORS CORP.

40. Remove the transmission wiring harness-to-left side transmission case retaining bolt. See **Fig. 16** .
41. Slowly lower the driveline, while simultaneously adjusting the angle of tilt, and observe the relationship between the top rear of the differential and the lowest part of the rear compartment panel floor (the center storage compartment between the frame rails). The differential should not be lowered more than approximately even with the specified body point of reference. (The PCV pipes which route along the rear of the engine intake manifold will likely contact the dash panel). See **Fig. 2** .
42. Release the wiring harness from the harness retainer along the top of the transmission.
43. Check to ensure that the wiring harness is free from the driveline being removed.

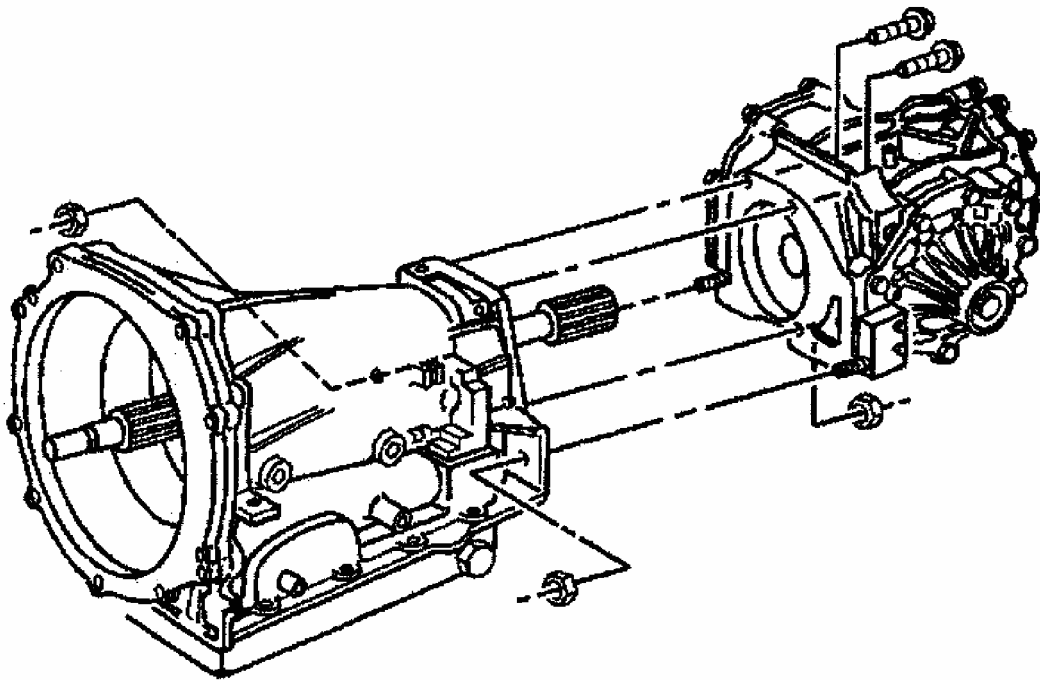
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44. Disconnect the transmission oil cooler rear pipes from the junction fittings at the engine flywheel housing, then cap the pipes and plug the junction fittings to prevent contamination.
45. Using a block of wood to protect the engine oil pan, place a jack under the rear of the engine oil pan to support the engine and prevent contact with the composite dash panel. Remove the driveline support assembly-to-engine flywheel housing bolts.
46. Carefully bend the wiring harness bracket away from the driveline, toward the driveline tunnel wall in order to make a clear removal path for the driveline. Have an assistant insert a flat bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the engine flywheel housing, then begin to pry the driveline loose from the engine.
47. Have an assistant guide the front of the driveline during the removal of the driveline from the vehicle. Slowly lower the driveline, while simultaneously adjusting the angle of tilt and pulling the driveline away from the engine until the propeller input shaft at the front of the driveline support assembly just clears the engine flywheel housing. Slowly lower the driveline completely out of the vehicle.
48. Position a chainfall, or equivalent lift device, in a way which will protect the transmission oil cooler rear pipes and the rear exhaust hangers located on the driveline support assembly.
49. Using the lift device, raise the driveline to relieve the weight from the transmission jack.
50. Disconnect the Drivetrain Support Fixture from the transmission jack ONLY, the Drivetrain Support Fixture will provide stability to the driveline components while working on a bench.
51. Position the driveline on a work bench with the lift device still attached.
52. Support the driveline support assembly and the differential for additional balance.
53. Remove the lift device from the driveline.

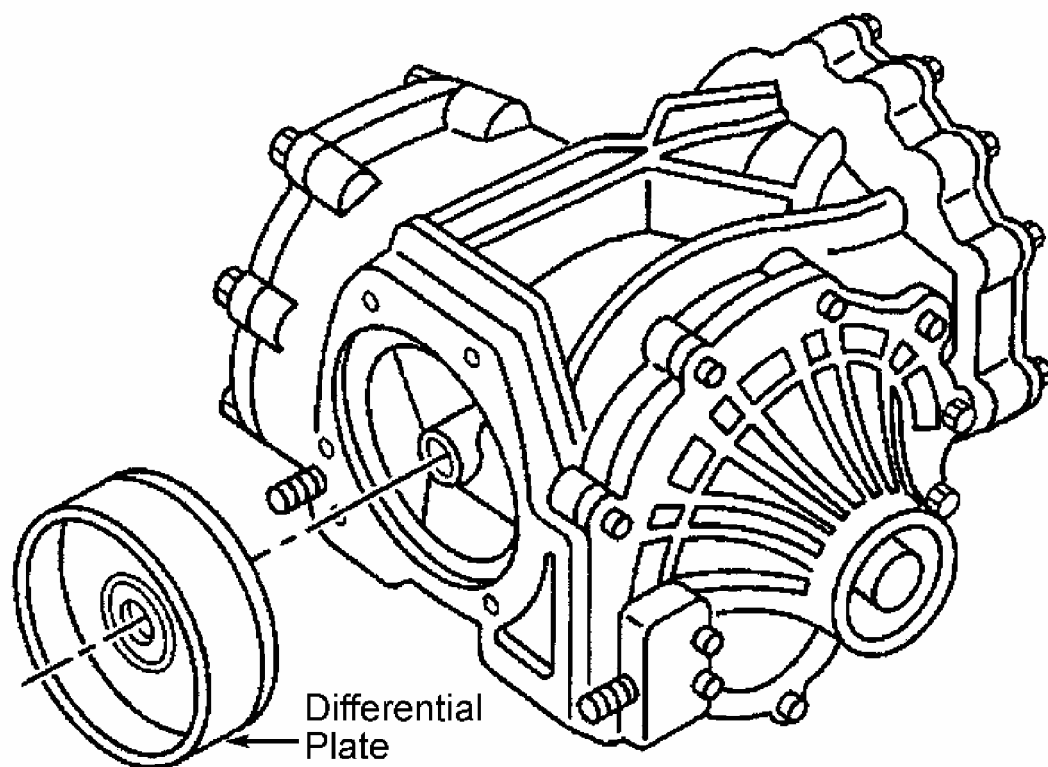
NOTE: **Use care when separating the differential from the transmission so as not to damage the transmission output shaft seal in the differential plate.**

54. Remove the differential-to-transmission bolts and nuts. See **Fig. 17** . SLOWLY slide the differential from the transmission. Remove the differential plate from the differential. See **Fig. 18** .



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Fig. 17: Removing/Installing Differential From Transmission (A/T)
Courtesy of GENERAL MOTORS CORP.



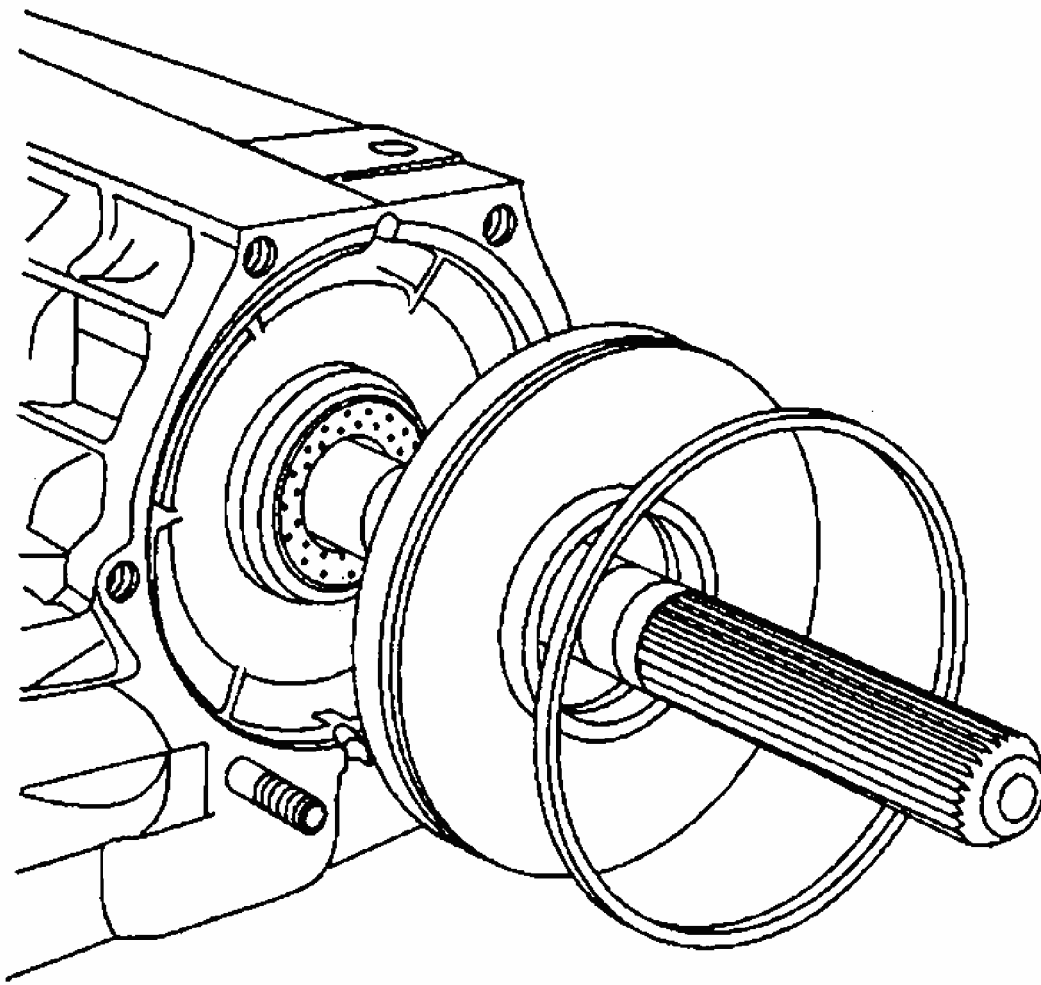
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Fig. 18: Identifying Differential Plate (A/T)
Courtesy of GENERAL MOTORS CORP.

Installation (Automatic Transmission)

NOTE: **Manufacturer recommends flushing transmission oil cooler when servicing driveline support assembly. See OIL COOLER FLUSHING under LUBRICATION in appropriate SERVING A/T article in AUTOMATIC TRANSMISSIONS.**

1. Install the differential plate to the transmission, use care not to damage the transmission output seal in the rear of the plate. See **Fig. 19** . Position the square-lip differential plate seal flush with the transmission case.



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Fig. 19: Installing Differential Plate & Seal
Courtesy of GENERAL MOTORS CORP.

2. Slowly slide the differential to the transmission. Install the differential-to-transmission bolts and nuts. See **Fig. 17** . Tighten the differential-to-transmission bolts and nuts to specification. See **TORQUE SPECIFICATIONS** .
3. Position the chainfall, or equivalent lifting device, in a way which will protect the transmission oil cooler rear pipes and the rear exhaust hangers located on the driveline support assembly. Using the lifting device, raise the driveline off the workbench and position the driveline with the Transmission Support Fixture (J-42055) onto a transmission jack. Connect the Transmission Support Fixture to the transmission jack.
4. Remove the lifting device from the driveline. Position the driveline under the vehicle. Begin to raise the driveline at the approximate angle used during removal. Position the wiring harness along the driveline support assembly and loosely install the harness into

the harness retaining slots. Have an assistant guide the front of the driveline so the propeller input shaft is just to the rear of the engine flywheel housing, then raise the driveline to the proper height and the proper angle to install to the engine.

5. Have an assistant begin to insert the propeller input shaft into the propeller shaft hub while maintaining the proper angle of the driveline. If necessary, use a screwdriver to rotate the shaft slightly to bring the splines into alignment. Slowly seat the driveline to the engine flywheel housing while maintaining the proper angle of the driveline.
6. Reposition the wiring harness bracket from near the driveline tunnel wall to align with the appropriate driveline support assembly bolt hole. Install the driveline support assembly-to-engine flywheel housing bolts. Tighten the driveline support assembly-to-engine flywheel housing bolts to specification. See **TORQUE SPECIFICATIONS** . Install the wiring harness to the wiring harness retainer along the top of the transmission. Slowly raise the driveline to approximately 2.0" (50 mm) below the final installed height.
7. Remove the caps from the transmission oil cooler rear pipes and remove the plugs from the junction fittings at the engine flywheel housing. Align, start and hand-tighten the transmission oil cooler rear pipe-to-junction fittings at the engine flywheel housing. Tighten the transmission oil cooler rear pipe-to-junction fittings at engine flywheel housing to specification. See **TORQUE SPECIFICATIONS** .
8. Install the transmission wiring harness-to-left side transmission case retaining bolt and tighten to specification. See **Fig. 16** . Connect the Park/Neutral Position (PNP) switch electrical connectors.
9. Connect the transmission harness 20-pin connector. See **Fig. 15** . Align the arrows on each half of the connector and insert straight down. Connect the wiring harness clip to the top of the differential. See **Fig. 14** .
10. Connect the wiring harness retainer to the stud at the differential rear cover. Connect the vehicle speed sensor (VSS) electrical connector. See **Fig. 13** .
11. Slowly raise the driveline to final installation height. Remove the jack which supported the engine. Remove the tie-off retainers from the axle shafts. Carefully align and seat the axle shafts to the differential.
12. Install the transaxle mount and bracket to the differential. See **Fig. 11** . Install the transaxle mount bracket-to-differential bolts. Tighten the transaxle mount bracket-to-differential bolts to specification. See **TORQUE SPECIFICATIONS** .
13. With the aid of an assistant, begin to raise the rear suspension crossmember (still firmly attached to a transmission jack), to the vehicle frame rails. Guide the rear suspension crossmember alignment pins into the alignment holes in the vehicle frame rails, and guide the transaxle mount studs into the mounting holes in the crossmember, then raise the crossmember to seat to the frame rails.
14. Using only hand tools, install NEW rear suspension crossmember mounting nuts and tighten to specification. See **TORQUE SPECIFICATIONS** . Remove the transmission jack from the rear suspension crossmember. Release the Transmission Support Fixture from the transmission, then remove the Transmission Support Fixture

and transmission jack.

15. Install the transmission mount-to-rear suspension crossmember nuts. Tighten the transmission mount-to-rear suspension crossmember nuts to specification. Install the differential-to-transmission lower nut. Tighten the differential-to-transmission lower nut to specification. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.
16. Support the lower control arms with a straight jack. Connect the lower ball joints to the suspension knuckles. It may be necessary to use an allen wrench to keep the ball joint studs from spinning while tightening the ball joint stud nuts. Tighten lower control arm ball joint stud nuts to specification in 3 steps. See **TORQUE SPECIFICATIONS** .
17. Install the shock absorber lower mounting bolts and tighten to specification. Connect the outer tie rod ends to the suspension knuckles. Tighten outer tie rod end nuts to specification in 3 steps. See **TORQUE SPECIFICATIONS** .
18. Remove the straight jack from the suspension control arms.
19. Using Transverse Spring Compressor (J-33432-A), compress rear transverse spring. See **Fig. 9** . Install the rear transverse spring to the vehicle. Install the rear transverse spring spacers, insulators and mounting brackets to the crossmember. Tighten the rear transverse spring mounting bracket bolts to specification.
20. Position the transverse spring to the lower control arms and install the spring bolts, insulators and nuts. See **Fig. 10** . Release and remove the Transverse Spring Compressor.

NOTE: **The rear transverse spring stud bolt must have a minimum of 2 threads showing above the nut.**

21. Set the transverse spring stud height to the height measured during removal. See **Fig. 8** . Install the retainers to the bolts.
22. Carefully position the wiring harness into the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Align the harness retainer locator to the hole in the forward bracket, and secure in place.
23. Install the transmission shift cable and bracket into position. Connect the transmission shift cable to the transmission shift lever. Press to secure the cable. Install the nuts retaining the transmission shift cable bracket to the transmission. Tighten the transmission shift cable bracket retaining nuts to specification. See **TORQUE SPECIFICATIONS** .

CAUTION: During this step, the propeller shaft hub clamp bolt is tightened finger-tight only. Vehicle must be completely assembled, ran to operating temperature and allowed to cool to room temperature before final-tightening the propeller shaft hub clamp bolt.

24. Hand-tighten the propeller shaft hub clamp bolt, until finger-tight only. See **Fig. 7** . Remove the propeller input shaft front bearing positioning bolts (M10 - 1.5 X 55 mm) installed into driveline support assembly upon removal. Install the 2 driveline support assembly plastic plugs and tighten to specification. See **Fig. 6** . See **TORQUE SPECIFICATIONS** .
25. Install the driveline tunnel closeout panel bolts and driveline tunnel closeout panel. See **Fig. 5** . Tighten the driveline tunnel closeout panel bolts to specification. Remove the tie-off retainer from the left muffler assembly.
26. Slide the muffler blade into the exhaust hanger. Install a NEW muffler gasket. Install exhaust muffler bolts and tighten to specification. Position the stabilizer shaft upwards. Install the rear stabilizer shaft brackets and insulators. Install the rear stabilizer shaft bracket bolts and nuts and tighten to specification. See **Fig. 4** .
27. Install the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
28. Install the rear tire and wheel assemblies. Tighten wheel lug nuts to specification. Connect the negative battery cable.
29. Program the Remote Keyless Entry (RKE) transmitters. See appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT.

CAUTION: The following steps must be performed in order to provide proper alignment of the propeller shaft hub, the propeller input shaft and the propeller input shaft front bearing.

30. Start and idle engine until normal operating temperature is reached.
31. Turn engine off and allow powertrain to cool to room temperature.
32. Raise and support vehicle.
33. Tighten propeller shaft hub clamp bolt to specification. See **TORQUE SPECIFICATIONS** . See **Fig. 7** .
34. Install engine flywheel housing access plug.
35. Lower the vehicle.

Removal (Manual Transmission)

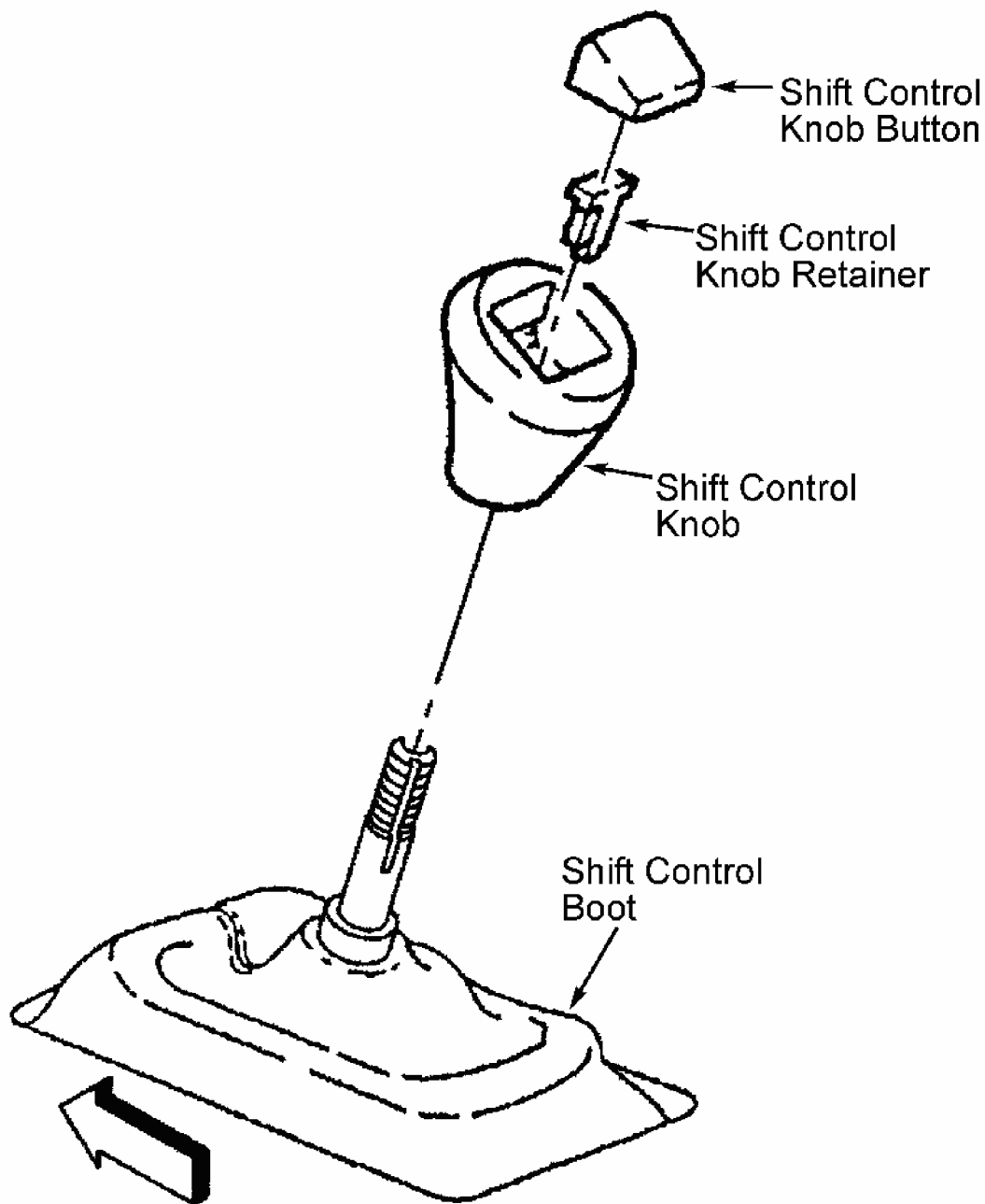
1. Disconnect the negative battery cable. On convertible models, open the folding top stowage compartment lid. Remove the screws attaching the lower sides of the extension panel. Remove the screws attaching the top of the extension panel. Remove the panel upward from the bracket.
2. On all models, open the console door. Pull up on the rear of the electronic traction control/ride control switch in order to release the retaining clips. If the electronic traction control/ride control switch does not release from the trim plate, carefully insert a screwdriver into the recess located at the rear of the switch and gently pull up the rear

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of the switch. Disconnect the electrical connector from the switch.

3. Disconnect the LED connector from the wiring harness connector. Remove the electronic traction control/ride control switch. Using a small flat bladed screwdriver, carefully remove the console retaining nut covers. Remove the nuts retaining the rear of the console. Remove the nuts retaining the front of the console and the instrument panel accessory trim plate.
4. Lift the rear of the console slightly and pull rearward to release the front of the console from under the instrument panel accessory trim plate. Disconnect the electrical connector from the electrical accessory plug. Unscrew the console electrical accessory plug retainer from the console electrical accessory plug housing. Remove the electrical accessory plug retainer and housing from the console.
5. Disconnect the electrical connector from the fuel door release/rear lift window release switch and remove switch from console (if equipped). Remove the console from the vehicle.
6. Carefully pry off the shift control knob button. See **Fig. 20** . Pry the shift control knob retainer out of the slots and remove the retainer. Unscrew the shift control knob.



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Fig. 20: Exploded View Of Shift Control Knob (M/T)
Courtesy of GENERAL MOTORS CORP.

7. Grasp the sides of the shift control boot and apply light pressure in toward the shift control lever to begin to release the shift boot retaining tabs from the instrument panel accessory trim plate. Using light pressure, continue to release the remaining boot retaining tabs. Lift the boot away from the trim plate and remove the boot.

8. Open the cigar lighter door and remove the ashtray. Pry gently at the side edge of the instrument panel accessory trim plate grille with a flat-bladed screwdriver to release the tab. Remove the instrument panel accessory trim plate grille. Remove the accessory trim plate retaining screws next to the cigar lighter and behind the ashtray. Remove the accessory trim plate retaining screw in the grille opening.
9. Grasp the sides of the accessory trim plate near the curve at the base. Pull the trim plate rearward to release the locking tabs. Lift the rear of the trim plate to clear the driveline tunnel studs. Disconnect the electrical connector from the cigar lighter. Rotate the shift control boot and reposition one end down into the shifter opening in the trim plate. Lift the accessory trim plate over the shifter and shift control boot, and remove the trim plate.
10. Remove the shift control closeout boot retaining nuts. Remove the shift control closeout boot. Place shifter in Neutral. Engage shift control neutral lock-pin by pressing down. See **Fig. 21**.

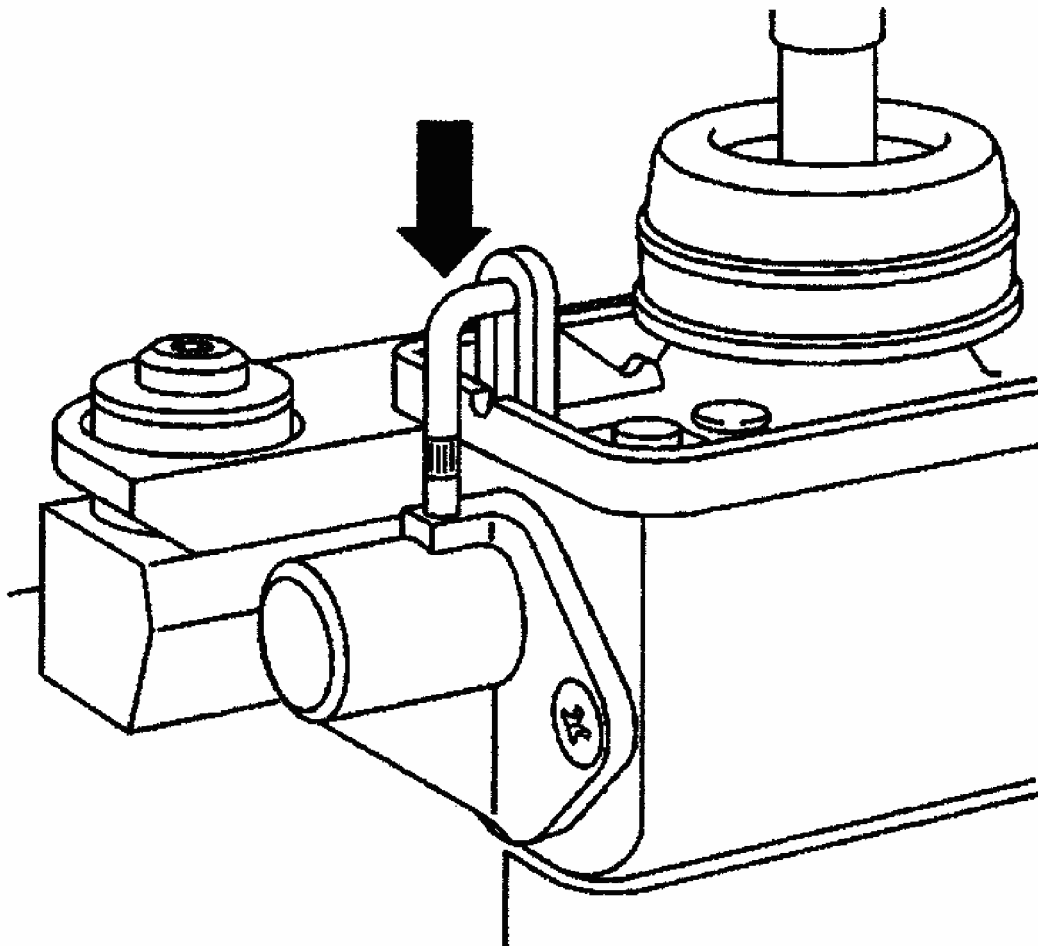


Fig. 21: Identifying Shift Control Neutral Lock-Pin (M/T)
Courtesy of GENERAL MOTORS CORP.

11. Remove transmission shift rod clamp bolt. See **Fig. 22** . Remove shift control mounting bolts. Raise the shift control to release the locator from the shifter bracket on the side of the driveline support assembly. Release the shift control from the transmission shift rod clamp and remove the shift control assembly.

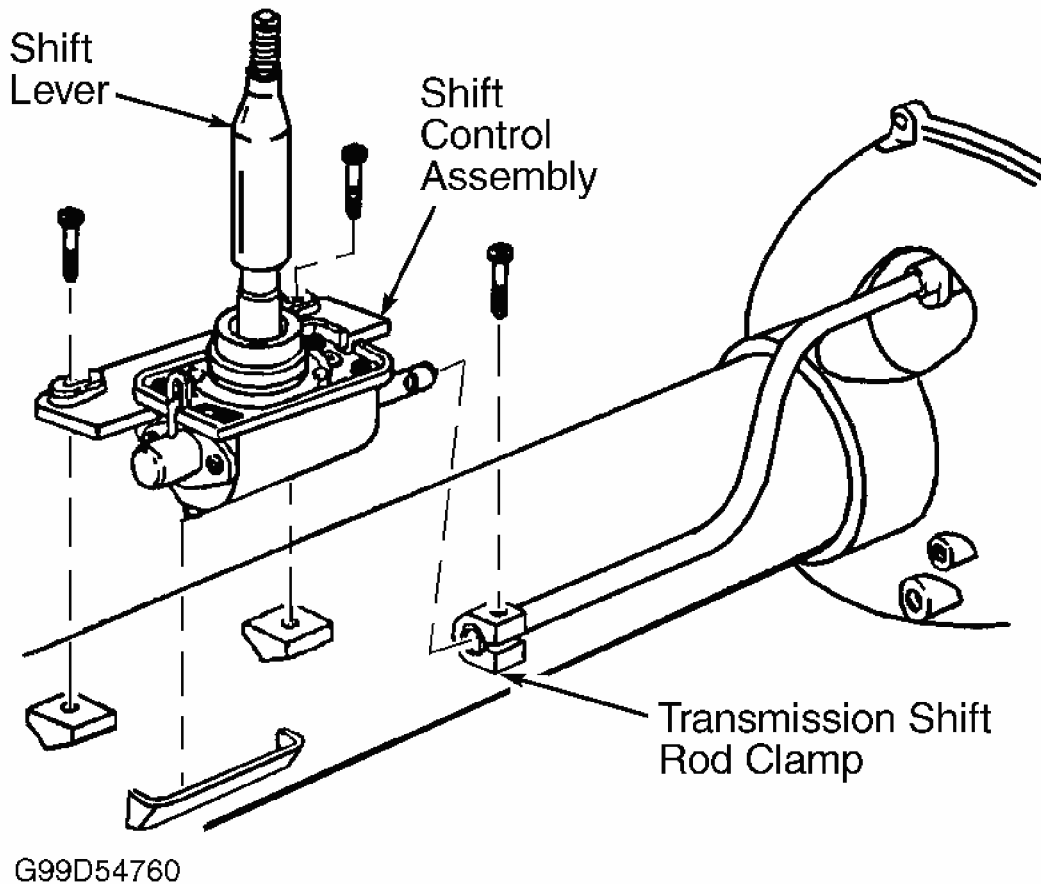


Fig. 22: Removing Shift Control Assembly (M/T)
Courtesy of GENERAL MOTORS CORP.

12. Using a flat bladed tool, carefully pry the instrument panel courtesy lamp assembly from the left lower closeout panel, located under the left side of the instrument panel. Remove the push-on retaining nut from the steering column bracket stud.
13. Release the left lower closeout panel push-in retainers from the instrument panel lower support beam. Insert the instrument panel courtesy lamp assembly up through the opening in the closeout panel. Lower and remove the closeout panel. Release the notch in the right forward edge of the closeout panel from the tab on the accelerator pedal

bracket.

14. Remove the clutch master cylinder pushrod retainer, located on the clutch pedal arm. Disconnect the clutch master cylinder pushrod from the clutch pedal arm. Raise and suitably support the vehicle. Remove the clutch actuator cylinder hose from the hose retaining clip (at the rear of the engine).
15. Using the Hydraulic Clutch Line Separator (J-36221), depress the White circular release ring on the actuator cylinder hose and simultaneously pull lightly on the master cylinder hose to disconnect. Protect both hose coupling ends from dirt and damage.
16. Remove the rear tire and wheel assemblies. Remove the catalytic converter assembly. See **CATALYTIC CONVERTERS**.
17. Tie off the left muffler assembly to the underbody to support the muffler out of the way. See **Fig. 3**. Tie off the right muffler assembly to the underbody in the same manner.
18. Remove the driveline tunnel closeout panel bolts. See **Fig. 5**. Remove the driveline tunnel closeout panel.
19. Measure the transverse spring stud height. See **Fig. 8**. This measurement will be used in the installation to set-up the vehicle trim height.

NOTE: **Use care not to scratch the rear transverse spring.**

20. Using the Transverse Spring Compressor (J-33432-A), compress the rear transverse spring. See **Fig. 9**.
21. Remove the retainers, nuts, bolts and insulators retaining the transverse spring to the lower control arms. See **Fig. 10**. Remove the rear transverse spring mounting bolts, spring spacers and insulators from the crossmember. Remove the rear transverse spring.
22. Support the lower control arms with a straight jack. Disconnect the outer tie rod ends from the suspension knuckles. Remove the shock absorber lower mounting bolts. Disconnect the lower ball joints from the suspension knuckles. Remove the straight jack from the control arms.
23. Assemble the Transmission Support Fixture (J-42055). Install the Transmission Support Fixture to a transmission jack. Position and firmly secure the Transmission Support Fixture with the transmission jack to the transmission.
24. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember. Remove the differential-to-transmission lower nut. Removing the nut at this time will aid in separating the differential from the transmission after the driveline has been removed from the vehicle. Remove the transaxle mount-to-rear crossmember nuts.
25. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
26. Using only hand tools, remove the rear suspension crossmember retaining nuts.

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27. With the aid of an assistant, slowly lower the rear suspension crossmember away from the vehicle frame rails and remove the crossmember.
28. Remove the transaxle mount bracket-to-differential bolts. Remove the transaxle mount with bracket. See **Fig. 11** . Removing the transaxle mount will allow for greater stability on a workbench after the driveline is removed.
29. Using a pry bar, carefully release the axle shafts from the differential. Tie off the axle shafts to the underbody to support out of the way. The muffler assembly pipes toward the rear provide a good location to help support the axle shafts.
30. Release the retainer securing the wiring harness to the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Slide the harness up out of the brackets and position aside.
31. Slowly lower the driveline approximately 2.0" (51 mm), while simultaneously adjusting the angle of tilt, in order to access the electrical connectors. See **Fig. 2** .
32. Disconnect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
33. Disconnect the wiring harness retainer from the stud at the differential rear cover.
34. Disconnect the wiring harness retainer clip from the top of the differential. See **Fig. 14** .
35. Disconnect the backup lamp switch electrical connector. See **Fig. 23** . Disconnect the reverse lockout solenoid electrical connector. Disconnect the gear select (skip shift) solenoid electrical connector. Disconnect the transmission fluid temperature sensor electrical connector, if equipped.

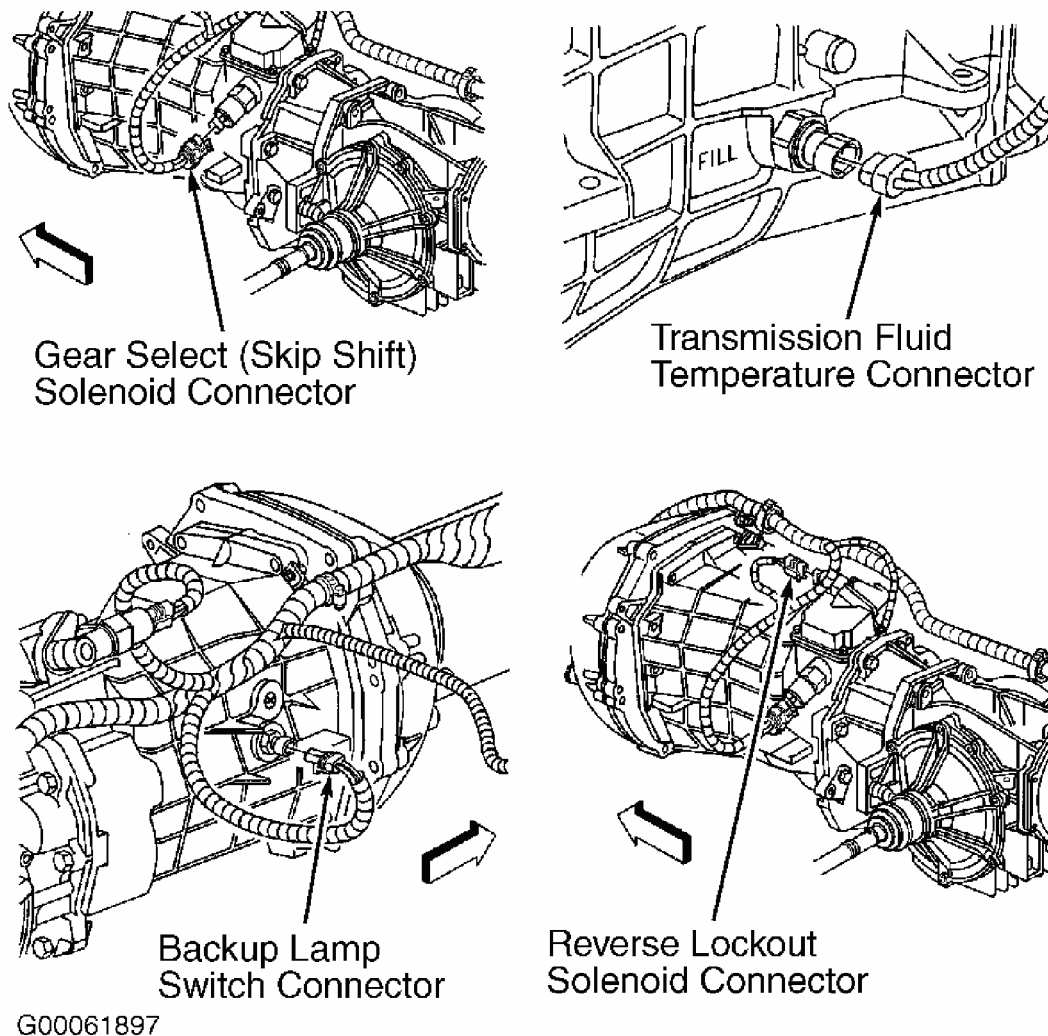


Fig. 23: Identifying Manual Transmission Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

36. Insert a putty knife or similar tool between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the driveline tunnel wall to prevent damage.
37. Slowly lower the driveline, while simultaneously adjusting the angle of tilt, and observe the relationship between the top rear of the differential and the lowest part of the rear compartment panel floor (the center storage compartment between the frame rails). The differential should not be lowered more than approximately even with the specified body point of reference. (The PCV pipes which route along the rear of the engine intake manifold will likely contact the dash panel). See **Fig. 2**.
38. Release the wiring harness from the harness retainer along the top of the transmission. Check to be sure that the wiring harness is free from the driveline being removed.

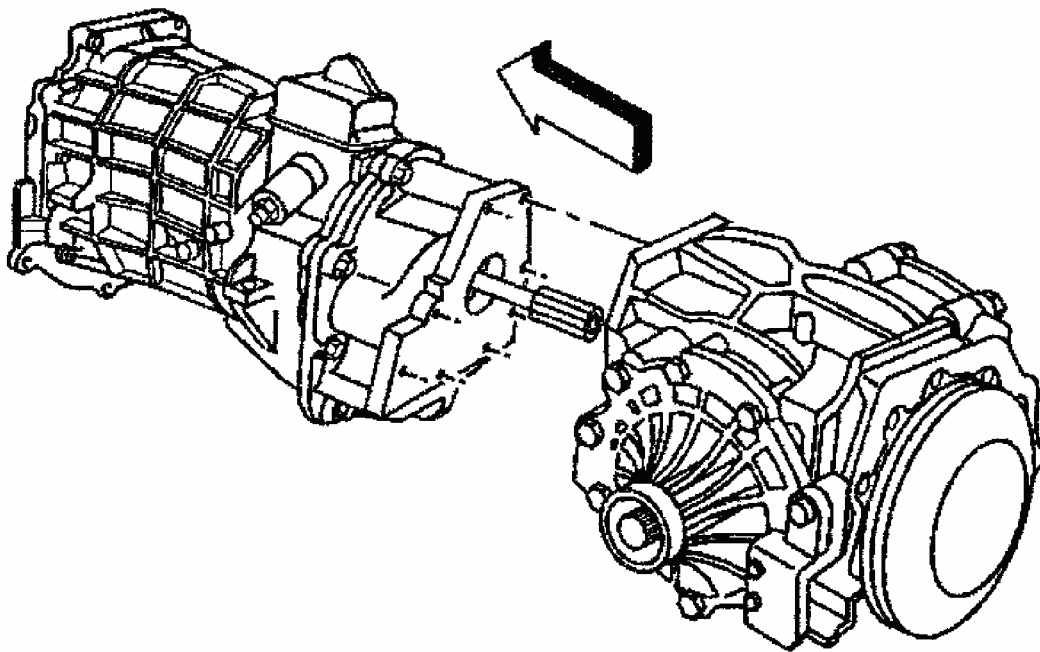
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39. Using a block of wood to protect the engine oil pan, place a jack under the rear of the engine oil pan to support the engine and prevent contact with the composite dash panel. Remove the driveline support assembly-to-engine flywheel housing bolts. Carefully bend the wiring harness bracket away from the driveline toward the driveline tunnel wall in order to make a clear removal path for the driveline.

NOTE: The aid of an assistant will be necessary for the remaining steps.

40. Have an assistant insert a flat-bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the engine flywheel housing, then begin to pry the driveline loose from the engine.
41. Have an assistant guide the front of the driveline during the removal of the driveline from the vehicle. Slowly lower the driveline, while simultaneously adjusting the angle of tilt and pulling the driveline away from the engine until the propeller input shaft at the front of the driveline support assembly just clears the engine flywheel housing. Slowly lower the driveline completely out of the vehicle.
42. Position the chainfall, or equivalent lifting device, in a way which will protect the rear exhaust hangers located on the driveline support assembly. Using the lifting device, raise the driveline to relieve the weight from the transmission jack. Disconnect the Transmission Support Fixture from the transmission jack only. The Transmission Support Fixture will provide stability to the driveline components while working on a bench. Position the driveline on a workbench with the lift device still attached. Support the driveline support assembly and the differential for additional balance. Remove the lifting device from the driveline.
43. Remove the differential-to-transmission bolts and nuts. Slowly slide the differential from the transmission. See **Fig. 24** .

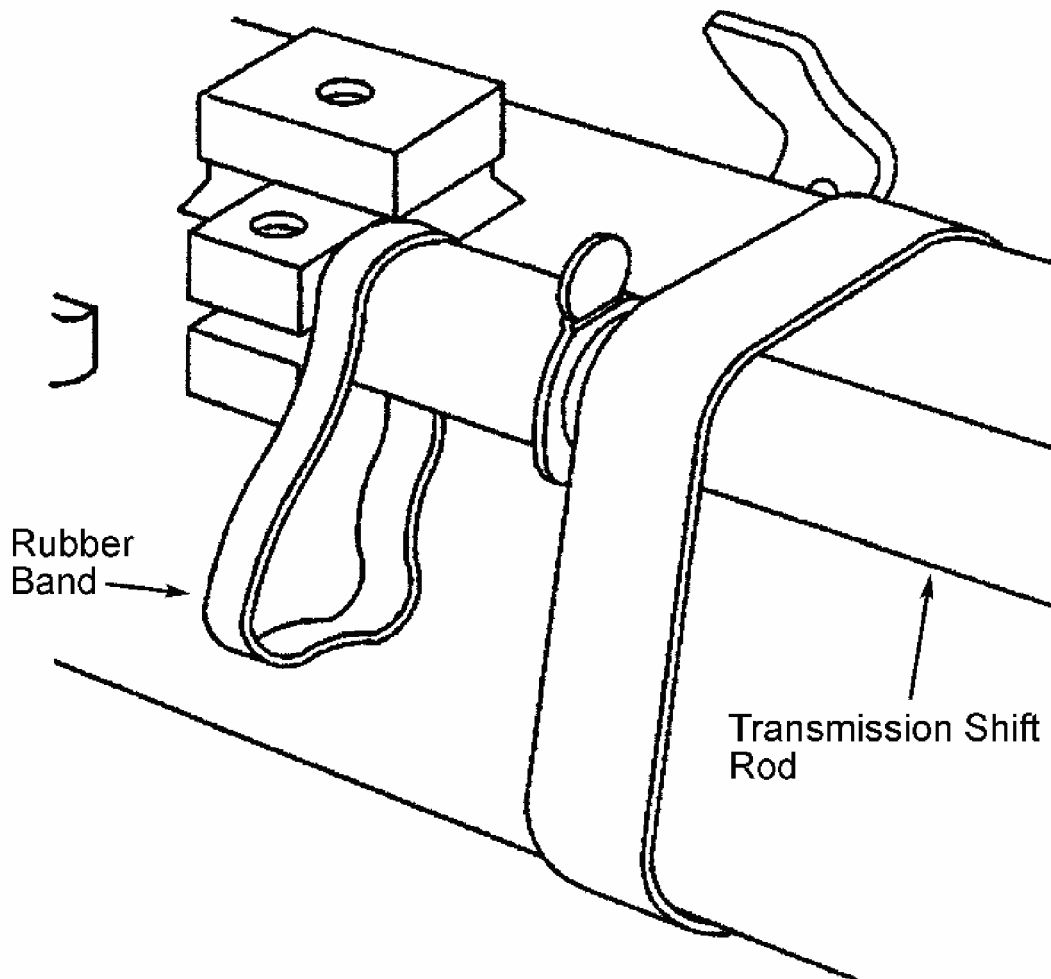


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Fig. 24: Removing/Installing Differential From Transmission (M/T)
Courtesy of GENERAL MOTORS CORP.

Installation (Manual Transmission)

1. Slowly slide the differential to the transmission. See **Fig. 24** .
2. Install the differential-to-transmission bolts and nuts. Tighten the differential-to-transmission bolts and nuts to specification. See **TORQUE SPECIFICATIONS** .
3. Loosely install a rubber band onto the transmission shift rod and position just behind the shift rod clamp. See **Fig. 25** . The rubber band will be used to aid in installing the shift control assembly after the driveline has been installed.



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Fig. 25: Identifying Transmission Shift Rod (M/T)
Courtesy of GENERAL MOTORS CORP.

4. Using a piece of masking tape, or similar tape which can be easily broken, affix the transmission shift rod to the driveline support assembly and position the rod just to the outside of the mounting boss used for the shift control. The tape is intended to keep the shift rod in position to aid in shift control installation after the driveline has been installed.
5. Position the chainfall, or equivalent lifting device, in a way which will protect the rear exhaust hangers located on the driveline support assembly.
6. Using the lifting device, raise the driveline off the workbench and position the driveline with the Transmission Support Fixture (J 42055) onto a transmission jack.
7. Connect the Transmission Support Fixture to the transmission jack.
8. Remove the lifting device from the driveline.

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9. Position the driveline under the vehicle.
10. Begin to raise the driveline at the approximate angle used during removal.
11. Position the wiring harness along the driveline support assembly and loosely install the harness into the harness retaining slots.
12. Have an assistant guide the front of the driveline so the propeller input shaft is just to the rear of the engine flywheel housing, then raise the driveline to the proper height and the proper angle to install to the engine.
13. Have an assistant begin to insert the propeller input shaft into the clutch driven plate hub while maintaining the proper angle of the driveline; if necessary, use a screwdriver to rotate the shaft slightly to bring the splines into alignment.
14. Insert a putty knife, or similar tool, between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the wall of the driveline tunnel.
15. Slowly seat the driveline to the engine flywheel housing while maintaining the proper angle of the driveline.
16. Reposition the wiring harness bracket from near the driveline tunnel wall to align with the appropriate driveline support assembly bolt hole.
17. Install the driveline support assembly-to-engine flywheel housing bolts. Tighten the driveline support assembly-to-engine flywheel housing bolts to specification. See **TORQUE SPECIFICATIONS** .
18. Install the wiring harness to the wiring harness retainer along the top of the transmission.
19. Slowly raise the driveline to approximately 2" (51 mm) below the final installed height.
20. Connect the transmission fluid temperature sensor electrical connector, if equipped. See **Fig. 23** .
21. Connect the gear select (skip shift) solenoid electrical connector.
22. Connect the reverse lockout solenoid electrical connector.
23. Connect the backup lamp switch electrical connector.
24. Connect the wiring harness clip to the top of the differential. See **Fig. 14** .
25. Connect the wiring harness retainer to the stud at the differential rear cover.
26. Connect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
27. Slowly raise the driveline to final installation height.
28. Remove the putty knife, if still in position.
29. Remove the jack which supported the rear of the engine.
30. Remove the tie-off retainers from the axle shafts.
31. Carefully align and seat the axle shafts to the differential.
32. Install the transaxle mount with bracket to the differential. See **Fig. 11** .
33. Install the transaxle mount bracket-to-differential bolts. Tighten the transaxle mount

bracket-to-differential bolts to specification. See **TORQUE SPECIFICATIONS** .

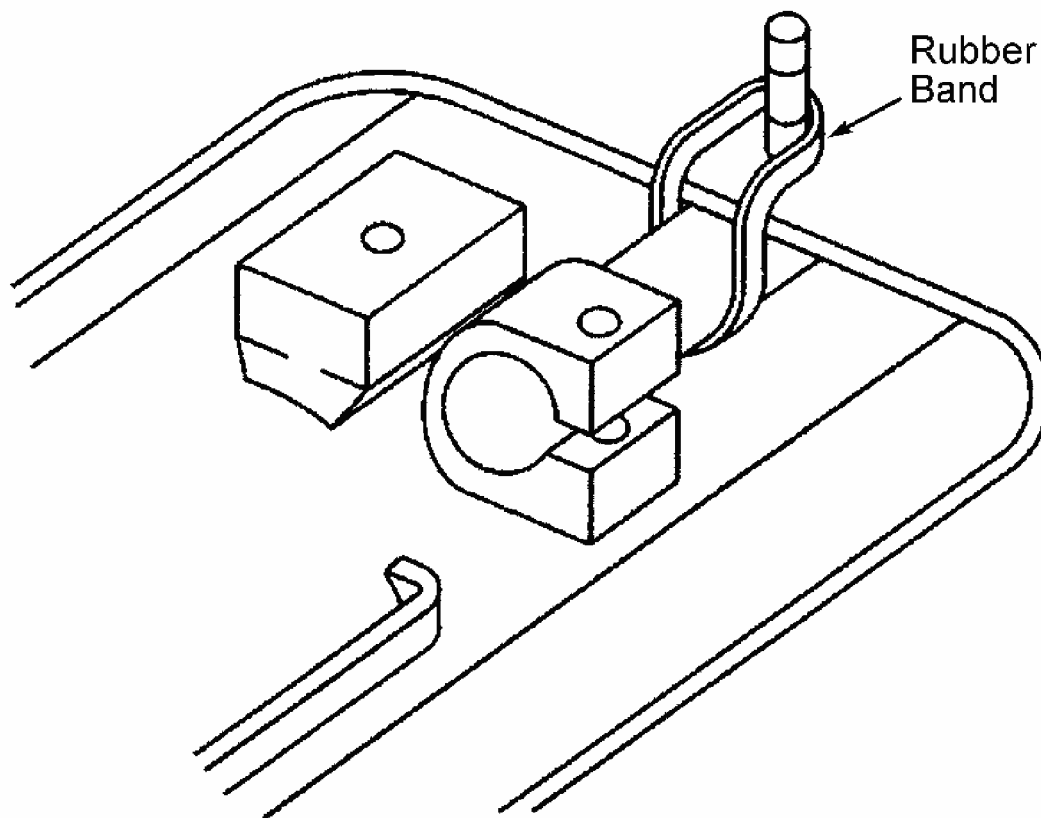
34. With the aid of an assistant, begin to raise the rear suspension crossmember (still firmly attached to a transmission jack), to the vehicle frame rails.
35. Guide the rear suspension crossmember alignment pins into the alignment holes in the vehicle frame rails, and guide the transaxle mount studs into the mounting holes in the crossmember, then raise the crossmember to seat to the frame rails.
36. Using only hand tools, install NEW rear suspension crossmember mounting nuts. Tighten the rear suspension crossmember mounting nuts to specification. See **TORQUE SPECIFICATIONS** .
37. Remove the transmission jack from the rear suspension crossmember.
38. Release the Transmission Support Fixture from the transmission, then remove the Transmission Support Fixture and transmission jack.
39. Install the transaxle mount-to-rear suspension crossmember nuts. Tighten the transaxle mount-to-rear suspension crossmember nuts to specification. See **TORQUE SPECIFICATIONS** .
40. Install the differential-to-transmission lower nut. Tighten the differential-to-transmission lower nut to specification.
41. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.
42. Support the lower control arm with a jack.
43. Connect the lower ball joint to the suspension knuckle. Tighten lower control arm ball joint stud nut to specification in 3 increments. See **TORQUE SPECIFICATIONS** .
44. Install the rear shock absorber lower mounting bolt. Tighten the rear shock absorber lower mounting bolt to specification.
45. Connect the outer tie rod end to the suspension knuckle. Tighten outer tie rod end nut to specification in 3 increments. See **TORQUE SPECIFICATIONS** .
46. Remove the straight jack from the suspension control arm.
47. Repeat steps 42 -46 for opposite side of vehicle.
48. Install the rear transverse spring. See appropriate REAR - CORVETTE article in SUSPENSION.
49. Carefully pull the wiring harness down into the L-shaped brackets along the driveline support assembly, align the harness retainer to the hole in the forward bracket, then secure in place. See **Fig. 12** .

CAUTION: DO NOT rely on an audible click or a visual verification of the clutch hydraulic hose quick connect fitting connection.

50. Connect the clutch actuator cylinder hose to the clutch master cylinder hose. Push together the clutch hydraulic hose quick connect fittings, then pull back on the fittings

to verify engagement.

51. Check the clutch hydraulic hoses for twists or kinks.
52. Install the clutch actuator cylinder hose to the hose retaining clip (at the rear of the engine).
53. Install the driveline tunnel closeout panel and tighten bolts to specification. See **Fig. 5** .
54. Remove the tie-off retainers from the muffler assemblies.
55. Install the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
56. Install the rear tire and wheel assemblies and tighten the wheel lug nuts to specification. See **TORQUE SPECIFICATIONS** .
57. Lower the vehicle.
58. Connect the clutch master cylinder pushrod to the clutch pedal.
59. Install the clutch master cylinder pushrod retainer.
60. Install the left instrument panel lower insulator panel.
61. Grasp the transmission shift rod and pull up to break the masking tape installed earlier to maintain position during installation.
62. Stretch the rubber band, while still installed onto the transmission shift rod, over the rear stud on top of the driveline tunnel to aid in shift control installation. See **Fig. 26** .



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Fig. 26: Installing Shift Control Assembly (M/T)
Courtesy of GENERAL MOTORS CORP.

63. Install the shift control assembly. See **Fig. 22** .
64. Break and remove the rubber band.
65. Install the shift control closeout boot. Check that the closeout boot fully seats to the shift control lever seal and the base of the shift control assembly.
66. Install the shift control closeout boot retaining nuts. Tighten the shift control closeout boot retaining nuts to specification. See **TORQUE SPECIFICATIONS** .
67. Install the instrument panel accessory trim plate.
68. Install the shift control boot over the shift control lever.
69. Align the shift control boot to the IP accessory trim plate opening, then press to lock the boot retaining tabs.
70. Adjust the shape of the boot for appearance, if necessary.
71. Screw the shift control knob onto the shift control lever until the knob bottoms out. See **Fig. 20** .
72. Unscrew the shift control knob just enough to align the retainer slot with the slot on the

shift control lever.

73. Install the shift control knob retainer into the slots and seat fully. See **Fig. 20** .
74. Install the shift control knob button.
75. Install the console.
76. Connect the negative battery cable and tighten bolt to specification. See **TORQUE SPECIFICATIONS** .
77. Program the Remote Keyless Entry (RKE) transmitters. See appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT.
78. Fill and bleed the clutch hydraulic system.

DRIVELINE SUPPORT ASSEMBLY

WARNING: Before servicing any electrical component, the ignition key must be in the OFF or LOCK position and all electrical loads must be OFF, unless instructed otherwise in these procedures. If a tool or equipment could easily come in contact with a live exposed electrical terminal, also disconnect the negative battery cable. Failure to follow these precautions may cause personal injury and/or damage to the vehicle or its components.

WARNING: When removing or installing the driveline support assembly, ensure vehicle is sufficiently supported when removing or adding components from the rear of the vehicle due to weight transfer.

CAUTION: Failure to follow the proper removal and installation procedures may result in damage to the engine crankshaft thrust bearing. When lowering and removing the rear of the driveline, observe the clearance between the rear of the transaxle assembly and the underbody to prevent damage.

CAUTION: When tilting down the rear of the driveline, observe the clearance between the rear of the engine and the composite dash panel. See Fig. 2 . DO NOT allow the engine to rest unsupported against the composite dash panel, or vehicle damage may result.

Removal (Automatic)

1. Disconnect the negative battery cable.
2. Raise and support vehicle.

3. Remove the rear tire and wheel assemblies.
4. Remove the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
5. Tie off the left muffler assembly to the underbody to support the muffler out of the way. See **Fig. 3** .
6. Remove the rear stabilizer shaft bracket bolts and nuts. See **Fig. 4** . Remove the rear stabilizer shaft brackets and insulators. Position the stabilizer shaft downwards. Remove the left side exhaust muffler bolts. Remove the exhaust muffler gasket. Slide the muffler blade out from the hanger. Remove the right muffler.
7. Remove the driveline tunnel closeout panel bolts. See **Fig. 5** . Remove the driveline tunnel closeout panel.
8. Using a flat-bladed screwdriver, remove the rear bellhousing access plug.

NOTE: **The following step must be performed to assure proper torque converter balance during installation.**

9. Reference mark the transmission flexplate to the transmission torque converter through the access hole in the rear bellhousing.
10. Disconnect wiring at starter. Support the starter. Remove starter bolts and starter. Turn engine flexplate through starter opening until one of the flexplate-to-torque converter bolts lines up with access hole in the rear bellhousing. Install Flywheel Holding Tool (J-42386-A) to keep flexplate from turning. Remove first flexplate-to-torque converter bolt. Remove Flywheel Holding Tool. Repeat procedure to remove the 2 remaining flexplate-to-torque converter bolts.

NOTE: **The propeller shaft front bearing positioning bolts are intended to remain torqued to specification and in place until instructed in the installation procedure. The bolts are to be removed, and the plastic plugs reinstalled after the installation is complete. Failure to use the minimum length fastener specified will prevent proper retention of the propeller shaft front bearing during disassembly or installation.**

11. Remove the 2 plastic plugs from the front of driveline support assembly. See **Fig. 6** .
12. Install 2 bolts, M10 - 1.5 X 55 mm, or longer, in place of the plastic plugs (The long bolts are used to maintain the propeller shaft front bearing in original position during removal and installation). Tighten the propeller shaft front bearing positioning bolts to 26 ft. lbs. (35 N.m).
13. Using a flat bladed screwdriver, remove the engine flywheel housing access plug.
14. Loosen the propeller shaft hub clamp bolt. See **Fig. 7** . Rotate the engine at the flexplate, if necessary for alignment.

15. Remove the nuts retaining the transmission shift cable bracket to the transmission.
16. Disconnect the transmission shift control cable from the transmission shift lever.
Unsnap to release the cable.
17. Reposition the transmission shift cable and bracket.

NOTE: Use care not to scratch the rear transverse spring.

18. Measure the transverse spring stud height. See **Fig. 8** . This measurement will be used in the installation to set-up the vehicle trim height. Using the Transverse Spring Compressor (J-33432-A), compress the rear transverse spring. See **Fig. 9** . Remove the retainers, nuts, bolts and insulators retaining the transverse spring to the lower control arms. See **Fig. 10** . Remove the rear transverse spring mounting bolts, spring spacers and insulators from the crossmember. Remove the rear transverse spring.
19. Support one of the lower control arms with a straight jack.
20. Disconnect the outer tie rod end from the suspension knuckle.
21. Remove the shock absorber lower mounting bolts.
22. Disconnect the lower ball joint from the suspension knuckle.
23. Remove the straight jack from the control arm.
24. Repeat steps 19 -23 for the other side of the vehicle.
25. Assemble the Drivetrain Support Fixture (J-42055).
26. Install the Drivetrain Support Fixture to a transmission jack.
27. Position and firmly secure the Drivetrain Support Fixture with the transmission jack to the transmission.
28. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember.
29. Remove the transaxle mount-to-rear crossmember nuts.
30. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
31. Using only hand tools, remove the rear suspension crossmember retaining nuts.
32. With the aid of an assistant, slowly lower the rear suspension crossmember away from the vehicle frame rails and remove the crossmember.
33. Remove the transaxle mount bracket-to-differential bolts. See **Fig. 11** .
34. Remove the transaxle mount with bracket. Removing the transaxle mount will allow for greater stability on a workbench after the driveline is removed.
35. Using a pry bar, carefully release the axle shafts from the differential.
36. Tie off the axle shafts to the underbody to support the shafts out of the way. The left muffler assembly pipe toward the rear offers a good location to help support the left axle shaft.

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37. Release the retainer securing the wiring harness to the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Slide the harness up out of the brackets and position aside.
38. Slowly lower the driveline approximately 2.0" (51 mm), while simultaneously adjusting the angle of tilt, in order to access the electrical connectors. See **Fig. 2** .
39. Disconnect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
40. Disconnect the wiring harness retainer from the stud at the differential rear cover.
41. Disconnect the wiring harness retainer clip from the top of the differential. See **Fig. 14** .
42. Depress both tabs on the transmission harness 20-pin connector and pull straight up to disconnect. See **Fig. 15** . DO NOT pry the connector.
43. Disconnect the Park/Neutral Position (PNP) switch electrical connectors. See **Fig. 16** .
44. Remove the transmission wiring harness-to-left side transmission case retaining bolt. See **Fig. 16** .
45. Slowly lower the driveline, while simultaneously adjusting the angle of tilt, and observe the relationship between the top rear of the differential and the lowest part of the rear compartment panel floor (the center storage compartment between the frame rails). The differential should not be lowered more than approximately even with the specified body point of reference. (The PCV pipes which route along the rear of the engine intake manifold will likely contact the dash panel). See **Fig. 2** .
46. Release the wiring harness from the harness retainer along the top of the transmission.
47. Check to ensure that the wiring harness is free from the driveline being removed.
48. Disconnect the transmission oil cooler rear pipes from the junction fittings at the engine flywheel housing, then cap the pipes and plug the junction fittings to prevent contamination.
49. Using a block of wood to protect the engine oil pan, place a jack under the rear of the engine oil pan to support the engine, and prevent contact with the composite dash panel.
50. Remove the five driveline support assembly-to-engine flywheel housing bolts.
51. Carefully bend the wiring harness bracket away from the driveline and toward the driveline tunnel wall in order to make a clear removal path for the driveline.

NOTE: **The aid of an assistant will be necessary for the remaining steps.**

52. Have an assistant insert a flat-bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the engine flywheel housing. Then, begin to pry the driveline loose from the engine.
53. Have an assistant guide the front of the driveline during the removal of the driveline from the vehicle.
54. Slowly lower the driveline, while simultaneously adjusting the angle of tilt and pulling

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the driveline away from the engine until the propeller input shaft at the front of the driveline support assembly just clears the engine flywheel housing.

55. Slowly lower the driveline completely out of the vehicle.
56. Position a chainfall, or equivalent lift device, in a way which will protect the transmission oil cooler rear pipes and the rear exhaust hangers located on the driveline support assembly.
57. Using the lift device, raise the driveline to relieve the weight from the transmission jack.
58. Disconnect the Drivetrain Support Fixture from the transmission jack only, the Drivetrain Support Fixture will provide stability to the driveline components while working on a bench.
59. Position the driveline on a work bench with the lift device still attached.
60. Support the driveline support assembly and the differential for additional balance.
61. Remove the lift device from the driveline.
62. Disconnect the transmission oil cooler upper and lower pipe fittings from the transmission, then cap the pipes and plug the fittings to prevent contamination.
63. Remove the transmission oil cooler pipe rear clip.
64. Remove the transmission oil cooler pipe middle clip.
65. Remove the transmission oil cooler pipe front and rear clamp bolts and clamps.
66. Remove the transmission oil cooler pipes.
67. Remove the rear exhaust hanger mounting bolts.
68. Remove the rear exhaust hangers from the driveline support assembly.
69. Remove the transmission-to-driveline support assembly bolts/studs.
70. Insert a flat bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the transmission, then begin to pry the driveline support assembly loose from the transmission.
71. Slowly slide the driveline support assembly away from the transmission while supporting the transmission torque converter.
72. Using a strap positioned from side to side, secure the transmission torque converter to the transmission.

Installation

NOTE: Manufacturer recommends flushing transmission oil cooler when servicing driveline support assembly. See OIL COOLER FLUSHING under LUBRICATION in appropriate SERVICING A/T article in AUTOMATIC TRANSMISSIONS.

1. Remove the strap retaining the transmission torque converter.
2. Slowly slide the driveline support assembly to the transmission, while supporting the

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transmission torque converter.

3. Install the transmission-to-driveline support assembly bolts/studs and tighten to specification. See **TORQUE SPECIFICATIONS** .
4. Install the rear exhaust hangers to the driveline support assembly.
5. Install the rear exhaust hanger mounting bolts and tighten to specification.
6. Install transmission oil cooler pipes into position.
7. Install transmission oil cooler pipe front and rear retaining clamps and bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
8. Install transmission oil cooler pipe middle clip.
9. Install transmission oil cooler pipe rear clip.
10. Remove the caps from the transmission oil cooler pipes and remove the plugs from the fittings on the transmission.
11. Align, start and hand-tighten the transmission oil cooler pipe fittings to the transmission fittings. Tighten transmission oil cooler pipe fittings to specification. See **TORQUE SPECIFICATIONS** .
12. Position the chainfall, or equivalent lifting device, in a way which will protect the transmission oil cooler rear pipes and the rear exhaust hangers located on the driveline support assembly.

NOTE: **The aid of an assistant will be necessary for the following steps until the driveline is installed into the vehicle.**

13. Using the lifting device, raise the driveline off the workbench and position the driveline with the Drivetrain Support Fixture (J-42055) onto a transmission jack.
14. Connect the Drivetrain Support Fixture to the transmission jack.
15. Remove the lifting device from the driveline.
16. Position the driveline under the vehicle.
17. Begin to raise the driveline at the approximate angle used during removal.
18. Position the wiring harness along the driveline support assembly and loosely install the harness into the harness retaining slots.
19. Have an assistant guide the front of the driveline so the propeller shaft is just to the rear of the engine flywheel housing, then raise the driveline to the proper height and the proper angle to install to the engine.

CAUTION: Use care not to use too much force to install the propeller shaft into the propeller shaft hub. The propeller shaft front bearing positioning system is designed to withstand an insertion force not greater than 130 lbs. (582 N).

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20. Have an assistant begin to insert the propeller shaft into the propeller shaft hub while maintaining the proper angle of the driveline. If necessary, use a screwdriver to rotate the shaft slightly to position and align the splines.
21. Slowly seat the driveline to the engine flywheel housing while maintaining the proper angle of the driveline.
22. Reposition the wiring harness bracket to the driveline support assembly bolt hole.
23. Install driveline support assembly-to-engine flywheel housing bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
24. Install the wiring harness to the wiring harness retainer along the top of the transmission.
25. Slowly raise the driveline to approximately 2.0" (51 mm) below the final installed height.
26. Remove the caps from the front of the transmission oil cooler pipes and remove the plugs from the junction fittings at the engine flywheel housing.
27. Align, start and hand-tighten the transmission oil cooler pipe-to-junction fittings at the engine flywheel housing. Tighten transmission oil cooler pipe-to-junction fittings at engine flywheel housing to specification.
28. Install the transmission wiring harness-to-left side transmission case retaining bolt and tighten to specification. See **TORQUE SPECIFICATIONS** .
29. Connect the Park/Neutral Position (PNP) switch electrical connectors. See **Fig. 16** .
30. Align the arrows on each half of the transmission wiring harness 20-pin connector and reconnect. See **Fig. 15** .
31. Connect the wiring harness clip to the top of the differential. See **Fig. 14** .
32. Connect the wiring harness retainer to the stud at the differential rear cover.
33. Connect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
34. Slowly raise the driveline to final installation height.
35. Remove the jack which supported the engine.
36. Remove the tie-off retainers from the axle shafts.
37. Carefully align and seat the axle shafts to the differential.
38. Install the transaxle mount and bracket to the differential. See **Fig. 11** .
39. Install the transaxle mount bracket-to-differential bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
40. With the aid of an assistant, begin to raise the rear suspension crossmember (still firmly attached to a transmission jack) to the vehicle frame rails.
41. Guide the rear suspension crossmember alignment pins into the alignment holes in the vehicle frame rails, and guide the transmission mount studs into the mounting holes in the crossmember, then raise the crossmember until it contacts the frame rails.
42. Using only hand tools, install NEW rear suspension crossmember mounting nuts and

tighten to specification.

43. Remove the transmission jack from the rear suspension crossmember.
44. Release the Transmission Support Fixture from the transmission, then remove the Transmission Support Fixture and transmission jack.
45. Install the transmission mount-to-rear suspension crossmember nuts and tighten to specification.
46. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.
47. Support one of the 2 lower control arms with a straight jack.
48. Connect the lower ball joint to the suspension knuckle. It may be necessary to use an allen wrench to keep the ball joint stud from spinning while tightening the ball joint stud nut. Tighten lower control arm ball joint stud nut to specification in 3 steps. See **TORQUE SPECIFICATIONS** .
49. Install the shock absorber lower mounting bolt and tighten to specification.
50. Connect the outer tie rod end to the suspension knuckle. Tighten outer tie rod end nut to specification in 3 steps. See **TORQUE SPECIFICATIONS** .
51. Remove the straight jack from the suspension control arm.
52. Repeat steps 47 -51 for the other side of the vehicle.

NOTE: **The rear transverse spring stud bolt must have a minimum of 2 threads showing above the nut.**

53. Using Transverse Spring Compressor (J-33432-A), compress rear transverse spring. See **Fig. 9** . Install the rear transverse spring to the vehicle. Install the rear transverse spring spacers, insulators and mounting brackets to the crossmember. Tighten the rear transverse spring mounting bracket bolts to specification. Position the transverse spring to the lower control arms and install the spring bolts, insulators and nuts. See **Fig. 10** . Release and remove the Transverse Spring Compressor. Set the transverse spring stud height to the height measured during removal. See **Fig. 8** . Install the retainers to the bolts.
54. Carefully position the wiring harness into the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Align the harness retainer locator to the hole in the forward bracket, and secure in place.
55. Install the transmission shift cable and bracket into position.
56. Connect the transmission shift cable to the transmission shift lever. Press to secure the cable.
57. Install the transmission shift cable bracket nuts to the transmission and tighten to specification. See **TORQUE SPECIFICATIONS** .

NOTE: **The following step must be performed to ensure proper**

torque converter balance during installation.

58. Using a flat-bladed tool, remove the transmission torque converter access plug. Carefully rotate the torque converter, working through the access holes in the rear bellhousing and the transmission housing. Align one of the torque converter bolt holes with the driveline support assembly access hole. Slowly turn the engine flexplate through the starter motor opening until the desired flexplate bolt hole lines up with the torque converter bolt hole using the reference marks made prior to removal.

NOTE: **Hand-start the flexplate-to-torque converter bolts before tightening to ensure proper alignment and to avoid cross threading. Carefully walk the transmission torque converter to the transmission flexplate through the torque converter access plug opening, if necessary. DO NOT use the flexplate-to-torque converter bolts to draw the torque converter to the flexplate.**

59. Install the flexplate to torque converter bolt through the driveline support assembly access hole. Hand-tighten until finger-tight. Slowly turn the engine flexplate through the starter motor opening until the remaining flexplate bolts line up with the driveline support assembly access hole for installation access. Hand-start the remaining flexplate-to-torque converter bolts.
60. Slowly turn the engine flexplate through the starter motor opening until the desired flexplate bolt lines up with the driveline support assembly access hole for installation access. Install the Flywheel Holding Tool (J-42386-A) to the engine flexplate, in order to keep the flexplate from turning. Tighten the first flexplate-to-torque converter bolt to specification. See **TORQUE SPECIFICATIONS** . Remove the Flywheel Holding Tool. Slowly turn the engine flexplate through the starter motor opening until the remaining flexplate bolts line up with the driveline support assembly access hole for access. Reinstall the Flywheel Holding Tool (J-42386-A) to the engine flexplate, in order to keep the flexplate from turning. Tighten the remaining flexplate-to-torque converter bolts to specification, one at a time. Remove the Flywheel Holding Tool.
61. Position the starter motor to the block. Install the starter bolts and tighten to specification. Install the Purple lead wire to the starter solenoid "S" terminal and orient at the 10 o'clock position. Install washer and retaining nut onto starter "S" terminal. Tighten starter "S" terminal nut to specification. Install the Gray lead wire to the starter solenoid positive terminal and orient at the 6 o'clock position. Install the rust-colored lead wire to the starter solenoid positive terminal and orient at the 7 o'clock position. Install the positive battery cable terminal to the solenoid. Install the positive battery cable nut and tighten to specification.

CAUTION: During this step, the propeller shaft hub clamp bolt is tightened finger-tight only. Vehicle must be completely

assembled, ran to operating temperature and allowed to cool to room temperature before final-tightening the propeller shaft hub clamp bolt.

62. Install the torque converter access plug. Install the rear bellhousing access plug. Install and hand-tighten the propeller shaft hub clamp bolt, until finger-tight only. See **Fig. 7** . Remove the propeller shaft front bearing positioning bolts (M10 - 1.5 X 55 mm) installed into driveline support assembly upon removal.
63. Install the 2 driveline support assembly plastic plugs and tighten to specification. See **Fig. 6** .
64. Install driveline tunnel closeout panel and tighten bolts to specification. See **Fig. 5** . See **TORQUE SPECIFICATIONS** .
65. Remove the tie-off retainer from the left muffler. See **Fig. 3** .
66. Slide the muffler blade into the exhaust hanger. Install a NEW muffler gasket. Install exhaust muffler bolts and tighten to specification. Position the stabilizer shaft upwards. Install the rear stabilizer shaft brackets and insulators. Install the rear stabilizer shaft bracket bolts and nuts and tighten to specification. See **Fig. 4** .
67. Install the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
68. Install the rear tire and wheel assemblies. Tighten wheel lug nuts to specification.
69. Lower the vehicle.
70. Connect the negative battery cable.
71. Program the Remote Keyless Entry (RKE) transmitters. See appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT.

CAUTION: The following steps must be performed in order to provide proper alignment of the propeller shaft hub, the propeller input shaft and the propeller input shaft front bearing.

72. Start and idle engine until normal operating temperature is reached.
73. Turn engine off and allow powertrain to cool to room temperature.
74. Raise and support vehicle. Remove engine flywheel housing access plug.
75. Tighten propeller shaft hub clamp bolt to specification. See **TORQUE SPECIFICATIONS** . See **Fig. 7** .
76. Install engine flywheel housing access plug.
77. Flush transmission oil cooler. See OIL COOLER FLUSHING under LUBRICATION in appropriate SERVICING A/T article in AUTOMATIC TRANSMISSIONS.
78. Lower the vehicle.

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1. Disconnect the negative battery cable. On convertible models, open the folding top stowage compartment lid. Remove the screws attaching the lower sides of the extension panel. Remove the screws attaching the top of the extension panel. Remove the panel upward from the bracket.
2. On all models, open the console door. Pull up on the rear of the electronic traction control/ride control switch in order to release the retaining clips. If the electronic traction control/ride control switch does not release from the trim plate, carefully insert a screwdriver into the recess located at the rear of the switch and gently pull up the rear of the switch. Disconnect the electrical connector from the switch.
3. Disconnect the LED connector from the wiring harness connector. Remove the electronic traction control/ride control switch. Using a small flat bladed screwdriver, carefully remove the console retaining nut covers. Remove the nuts retaining the rear of the console. Remove the nuts retaining the front of the console and the instrument panel accessory trim plate.
4. Lift the rear of the console slightly and pull rearward to release the front of the console from under the instrument panel accessory trim plate. Disconnect the electrical connector from the electrical accessory plug. Unscrew the console electrical accessory plug retainer from the console electrical accessory plug housing. Remove the electrical accessory plug retainer and housing from the console.
5. Disconnect the electrical connector from the fuel door release/rear lift window release switch and remove switch from console (if equipped). Remove the console from the vehicle.
6. Carefully pry off the shift control knob button. See **Fig. 20** . Pry the shift control knob retainer out of the slots and remove the retainer. Unscrew the shift control knob.
7. Grasp the sides of the shift control boot and apply light pressure in toward the shift control lever to begin to release the shift boot retaining tabs from the instrument panel accessory trim plate. Using light pressure, continue to release the remaining boot retaining tabs. Lift the boot away from the trim plate and remove the boot.
8. Open the cigar lighter door and remove the ashtray. Pry gently at the side edge of the instrument panel accessory trim plate grille with a flat-bladed screwdriver to release the tab. Remove the instrument panel accessory trim plate grille. Remove the accessory trim plate retaining screws next to the cigar lighter and behind the ashtray. Remove the accessory trim plate retaining screw in the grille opening.
9. Grasp the sides of the accessory trim plate near the curve at the base. Pull the trim plate rearward to release the locking tabs. Lift the rear of the trim plate to clear the driveline tunnel studs. Disconnect the electrical connector from the cigar lighter. Rotate the shift control boot and reposition one end down into the shifter opening in the trim plate. Lift the accessory trim plate over the shifter and shift control boot, and remove the trim plate.
10. Remove the shift control closeout boot retaining nuts. Remove the shift control closeout boot. Place shifter in Neutral. Engage shift control neutral lock-pin by pressing down. See **Fig. 21** .

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11. Remove transmission shift rod clamp bolt. See **Fig. 22** . Remove shift control mounting bolts. Raise the shift control to release the locator from the shifter bracket on the side of the driveline support assembly. Release the shift control from the transmission shift rod clamp and remove the shift control assembly.
12. Using a flat bladed tool, carefully pry the instrument panel courtesy lamp assembly from the left lower closeout panel, located under the left side of the instrument panel. Remove the push-on retaining nut from the steering column bracket stud.
13. Release the left lower closeout panel push-in retainers from the instrument panel lower support beam. Insert the instrument panel courtesy lamp assembly up through the opening in the closeout panel. Lower and remove the closeout panel. Release the notch in the right forward edge of the closeout panel from the tab on the accelerator pedal bracket.
14. Remove the clutch master cylinder pushrod retainer, located on the clutch pedal arm.
15. Disconnect the clutch master cylinder pushrod from the clutch pedal arm.
16. Raise and suitably support the vehicle.
17. Remove the clutch actuator cylinder hose from the hose retaining clip (at the rear of the engine).
18. Using the Hydraulic Clutch Line Separator (J-36221), depress the White circular release ring on the actuator cylinder hose and simultaneously pull lightly on the master cylinder hose to disconnect.
19. Protect both hose coupling ends from dirt and damage.
20. Remove the rear tire and wheel assemblies.
21. Remove the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
22. Tie off the left muffler assembly to the underbody to support the muffler out of the way. See **Fig. 3** . Tie off the right muffler assembly to the underbody in the same manner.
23. Remove the driveline tunnel closeout panel bolts. See **Fig. 5** . Remove the driveline tunnel closeout panel.

NOTE: **Use care not to scratch the rear transverse spring.**

24. Measure the transverse spring stud height. See **Fig. 8** . This measurement will be used in the installation to set-up the vehicle trim height. Using the Transverse Spring Compressor (J-33432-A), compress the rear transverse spring. See **Fig. 9** . Remove the retainers, nuts, bolts and insulators retaining the transverse spring to the lower control arms. See **Fig. 10** . Remove the rear transverse spring mounting bolts, spring spacers and insulators from the crossmember. Remove the rear transverse spring.
25. Support one of the 2 lower control arms with a straight jack.
26. Disconnect the outer tie rod end from the suspension knuckle.

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27. Remove the shock absorber lower mounting bolt.
28. Disconnect the lower ball joint from the suspension knuckle.
29. Remove the straight jack from the control arm.
30. Repeat steps 25 -29 for the other side of the vehicle.
31. Assemble the Transmission Support Fixture (J-42055).
32. Install the Transmission Support Fixture to a transmission jack.
33. Position and firmly secure the Transmission Support Fixture with the transmission jack to the transmission.
34. Disconnect the wiring harness and brake pipe clip retainers from the rear suspension crossmember.
35. Remove the transaxle mount-to-rear crossmember nuts.
36. Position a transmission jack under the rear suspension crossmember and firmly secure the crossmember to the jack.
37. Using only hand tools, remove the rear suspension crossmember retaining nuts.
38. With the aid of an assistant, slowly lower the rear suspension crossmember away from the vehicle frame rails and remove the crossmember.
39. Remove the transaxle mount bracket-to-differential bolts.
40. Remove the transaxle mount with bracket. See **Fig. 11** . Removing the transaxle mount will allow for greater stability on a workbench after the driveline is removed.
41. Using a pry bar, carefully release the axle shafts from the differential.
42. Tie off the axle shafts to the underbody to support out of the way. The muffler assembly pipes toward the rear provide a good location to help support the axle shafts.
43. Release the retainer securing the wiring harness to the L-shaped brackets along the driveline support assembly. See **Fig. 12** . Slide the harness up out of the brackets and position aside.
44. Slowly lower the driveline approximately 2.0" (51 mm), while simultaneously adjusting the angle of tilt, in order to access the electrical connectors. See **Fig. 2** .
45. Disconnect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
46. Disconnect the wiring harness retainer from the stud at the differential rear cover.
47. Disconnect the wiring harness retainer clip from the top of the differential. See **Fig. 14** .
48. Disconnect the backup lamp switch electrical connector. See **Fig. 23** .
49. Disconnect the reverse lockout solenoid electrical connector.
50. Disconnect the gear select (skip shift) solenoid electrical connector.
51. Disconnect the transmission fluid temperature sensor electrical connector, if equipped.
52. Insert a putty knife or similar tool between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the driveline tunnel wall to prevent damage.
53. Slowly lower the driveline while simultaneously adjusting the angle of tilt and

observe the relationship between the top rear of the differential and the lowest part of the rear compartment panel floor (the center storage compartment between the frame rails). The differential should not be lowered more than approximately even with the specified body point of reference. (The PCV pipes which route along the rear of the engine intake manifold will likely contact the dash panel). See **Fig. 2** .

54. Release the wiring harness from the harness retainer along the top of the transmission.
55. Check to be sure that the wiring harness is free from the driveline being removed.
56. Using a block of wood to protect the engine oil pan, place a jack under the rear of the engine oil pan to support the engine and prevent contact with the composite dash panel.
57. Remove the driveline support assembly-to-engine flywheel housing bolts.
58. Carefully bend the wiring harness bracket away from the driveline toward the driveline tunnel wall in order to make a clear removal path for the driveline.

NOTE: The aid of an assistant will be necessary for the remaining steps.

59. Have an assistant insert a flat-bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the engine flywheel housing, then begin to pry the driveline loose from the engine.
60. Have an assistant guide the front of the driveline during the removal of the driveline from the vehicle.
61. Slowly lower the driveline, while simultaneously adjusting the angle of tilt and pulling the driveline away from the engine until the propeller input shaft at the front of the driveline support assembly just clears the engine flywheel housing.
62. Slowly lower the driveline completely out of the vehicle.
63. Position the chainfall, or equivalent lifting device, in a way which will protect the rear exhaust hangers located on the driveline support assembly.
64. Using the lifting device, raise the driveline to relieve the weight from the transmission jack.
65. Disconnect the Transmission Support Fixture from the transmission jack only. The Transmission Support Fixture will provide stability to the driveline components while working on a bench.
66. Position the driveline on a workbench with the lift device still attached.
67. Support the driveline support assembly and the differential for additional balance.
68. Remove the lifting device from the driveline.
69. Remove the clutch actuator cylinder mounting bolts.
70. Remove the clutch actuator cylinder from the driveline support assembly.
71. Remove the rear exhaust hanger mounting bolts.
72. Remove the rear exhaust hangers from the driveline support assembly.

73. Remove the transmission-to-driveline support assembly bolts/studs.
74. Insert a flat-bladed screwdriver, or similar tool, between the edge of the driveline support assembly and the transmission, then begin to pry the driveline support assembly loose from the transmission.
75. Slowly slide the driveline support assembly away from the transmission while guiding the transmission shift rod through the opening in the driveline support assembly.

Installation

NOTE: **Ensure that the clutch hydraulic hoses are positioned away from nearby vehicle components or vehicle damage may result.**

1. Slowly slide the driveline support assembly to the transmission, while guiding the shift rod through the opening in the driveline support assembly.
2. Install transmission-to-driveline support assembly bolts/studs. Tighten transmission-to-driveline support assembly bolts/studs to specification. See **TORQUE SPECIFICATIONS** .
3. Install rear exhaust hangers to driveline support assembly.
4. Install rear exhaust hanger mounting bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
5. Install clutch actuator cylinder to the driveline support assembly.
6. Install clutch actuator cylinder mounting bolts and tighten to specification. See **TORQUE SPECIFICATIONS** .
7. Loosely install a rubber band onto the transmission shift rod and position just behind the shift rod clamp. See **Fig. 25** . The rubber band will be used to aid in installing the shift control assembly after the driveline has been installed.
8. Using a piece of masking tape, or similar tape which can be easily broken, affix the transmission shift rod to the driveline support assembly and position the rod just to the outside of the mounting boss used for the shift control. The tape is intended to keep the shift rod in position to aid in shift control installation after the driveline has been installed.
9. Position the chainfall, or equivalent lifting device, in a way which will protect the rear exhaust hangers located on the driveline support assembly.
10. Using the lifting device, raise the driveline off the workbench and position the driveline with the Transmission Support Fixture (J 42055) onto a transmission jack.
11. Connect the Transmission Support Fixture to the transmission jack.
12. Remove the lifting device from the driveline.
13. Position the driveline under the vehicle.
14. Begin to raise the driveline at the approximate angle used during removal.

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15. Position the wiring harness along the driveline support assembly and loosely install the harness into the harness retaining slots.
16. Have an assistant guide the front of the driveline so the propeller input shaft is just to the rear of the engine flywheel housing, then raise the driveline to the proper height and the proper angle to install to the engine.
17. Have an assistant begin to insert the propeller input shaft into the clutch driven plate hub while maintaining the proper angle of the driveline. If necessary, use a screwdriver to rotate the shaft slightly to bring the splines into alignment.
18. Insert a putty knife, or similar tool, between the edge of the shifter bracket on the side of the driveline support assembly and the brake pipe retainer on the wall of the driveline tunnel.
19. Slowly seat the driveline to the engine flywheel housing while maintaining the proper angle of the driveline.
20. Reposition the wiring harness bracket from near the driveline tunnel wall to align with the appropriate driveline support assembly bolt hole.
21. Install the driveline support assembly-to-engine flywheel housing bolts. Tighten the driveline support assembly-to-engine flywheel housing bolts to specification. See **TORQUE SPECIFICATIONS** .
22. Install the wiring harness to the wiring harness retainer along the top of the transmission.
23. Slowly raise the driveline to approximately 2" (51 mm) below the final installed height.
24. Connect the transmission fluid temperature sensor electrical connector, if equipped. See **Fig. 23** .
25. Connect the gear select (skip shift) solenoid electrical connector.
26. Connect the reverse lockout solenoid electrical connector.
27. Connect the backup lamp switch electrical connector.
28. Connect the wiring harness clip to the top of the differential. See **Fig. 14** .
29. Connect the wiring harness retainer to the stud at the differential rear cover.
30. Connect the Vehicle Speed Sensor (VSS) electrical connector. See **Fig. 13** .
31. Slowly raise the driveline to final installation height.
32. Remove the putty knife, if still in position.
33. Remove the jack which supported the rear of the engine.
34. Remove the tie-off retainers from the axle shafts.
35. Carefully align and seat the axle shafts to the differential.
36. Install the transaxle mount with bracket to the differential. See **Fig. 11** .
37. Install the transaxle mount bracket-to-differential bolts. Tighten the transaxle mount bracket-to-differential bolts to specification. See **TORQUE SPECIFICATIONS** .
38. With the aid of an assistant, begin to raise the rear suspension crossmember (still firmly

attached to a transmission jack), to the vehicle frame rails.

39. Guide the rear suspension crossmember alignment pins into the alignment holes in the vehicle frame rails, and guide the transaxle mount studs into the mounting holes in the crossmember, then raise the crossmember to seat to the frame rails.
40. Using only hand tools, install NEW rear suspension crossmember mounting nuts. Tighten the rear suspension crossmember mounting nuts to specification. See **TORQUE SPECIFICATIONS** .
41. Remove the transmission jack from the rear suspension crossmember.
42. Release the Transmission Support Fixture from the transmission, then remove the Transmission Support Fixture and transmission jack.
43. Install the transaxle mount-to-rear suspension crossmember nuts. Tighten the transaxle mount-to-rear suspension crossmember nuts to specification. See **TORQUE SPECIFICATIONS** .
44. Connect the wiring harness and brake pipe clip retainers to the rear suspension crossmember.
45. Support the lower control arm with a jack.
46. Connect the lower ball joint to the suspension knuckle. Tighten lower control arm ball joint stud nut to specification in 3 increments. See **TORQUE SPECIFICATIONS** .
47. Install the rear shock absorber lower mounting bolt. Tighten the rear shock absorber lower mounting bolt to specification.
48. Connect the outer tie rod end to the suspension knuckle. Tighten outer tie rod end nut to specification in 3 increments. See **TORQUE SPECIFICATIONS** .
49. Remove the straight jack from the suspension control arm.
50. Repeat steps 45 -49 for the other side of the vehicle.
51. Install the rear transverse spring. See appropriate REAR - CORVETTE article in SUSPENSION.
52. Carefully pull the wiring harness down into the L-shaped brackets along the driveline support assembly, align the harness retainer to the hole in the forward bracket, then secure in place. See **Fig. 12** .

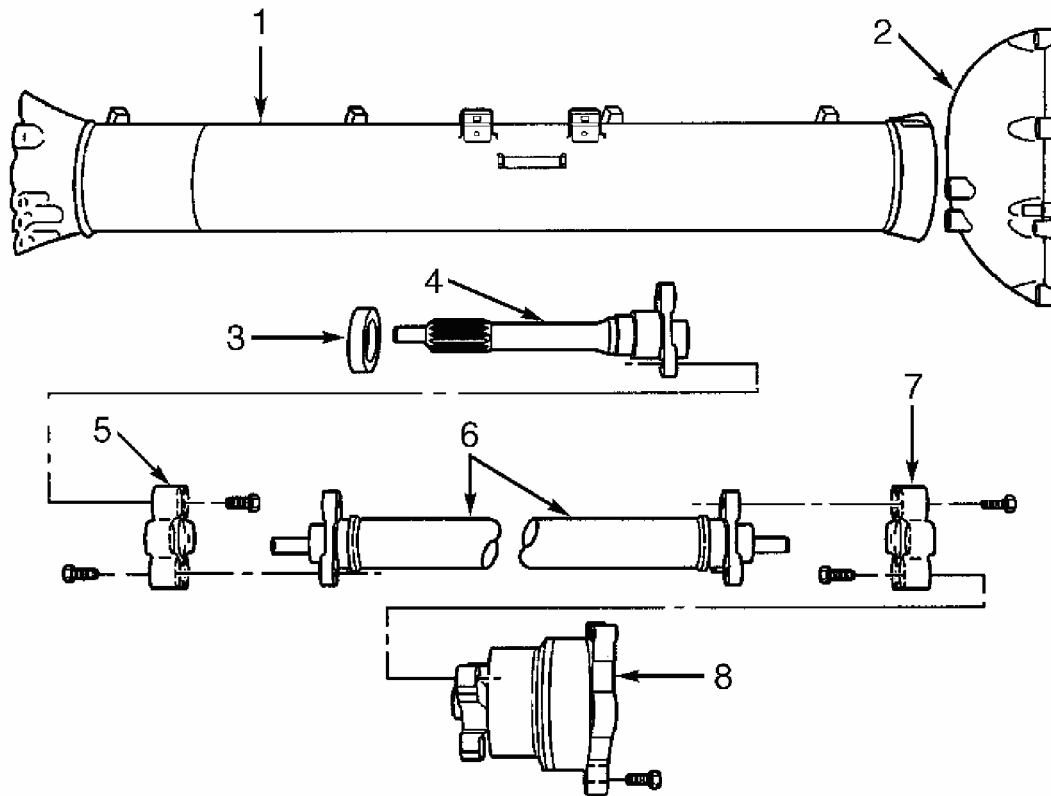
CAUTION: DO NOT rely on an audible click or a visual verification of the clutch hydraulic hose quick connect fitting connection.

53. Connect the clutch actuator cylinder hose to the clutch master cylinder hose. Push together the clutch hydraulic hose quick connect fittings, then pull back on the fittings to verify engagement.
54. Check the clutch hydraulic hoses for twists or kinks.
55. Install the clutch actuator cylinder hose to the hose retaining clip (at the rear of the engine).

56. Install the driveline tunnel closeout panel and tighten bolts to specification. See **Fig. 5** .
57. Remove the tie-off retainers from the muffler assemblies.
58. Install the catalytic converter assembly. See **CATALYTIC CONVERTERS** .
59. Install the rear tire and wheel assemblies and tighten the wheel lug nuts to specification. See **TORQUE SPECIFICATIONS** .
60. Lower the vehicle.
61. Connect the clutch master cylinder pushrod to the clutch pedal.
62. Install the clutch master cylinder pushrod retainer.
63. Install the left instrument panel lower insulator panel.
64. Grasp the transmission shift rod and pull up to break the masking tape installed earlier to maintain position during installation.
65. Stretch the rubber band, while still installed onto the transmission shift rod, over the rear stud on top of the driveline tunnel to aid in shift control installation. See **Fig. 26** .
66. Install the shift control assembly. See **Fig. 22** .
67. Break and remove the rubber band.
68. Install the shift control closeout boot. Check that the closeout boot fully seats to the shift control lever seal and the base of the shift control assembly.
69. Install the shift control closeout boot retaining nuts. Tighten the shift control closeout boot retaining nuts to specification. See **TORQUE SPECIFICATIONS** .
70. Install the instrument panel accessory trim plate.
71. Install the shift control boot over the shift control lever.
72. Align the shift control boot to the IP accessory trim plate opening, then press to lock the boot retaining tabs.
73. Adjust the shape of the boot for appearance, if necessary.
74. Screw the shift control knob onto the shift control lever until the knob bottoms out. See **Fig. 20** .
75. Unscrew the shift control knob just enough to align the retainer slot with the slot on the shift control lever.
76. Install the shift control knob retainer into the slots and seat fully. See **Fig. 20** .
77. Install the shift control knob button.
78. Install the console.
79. Connect the negative battery cable and tighten bolt to specification. See **TORQUE SPECIFICATIONS** .
80. Program the Remote Keyless Entry (RKE) transmitters. See appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT.
81. Fill and bleed the clutch hydraulic system.

Removal & Installation

For an exploded view of the drive shaft assembly, see **Fig. 27** . For drive shaft removal and installation, see **DRIVELINE SUPPORT ASSEMBLY** .



1. Driveline Support Tube

2. Rear Bellhousing

3. Front Bearing

4. Input Shaft

5. Front Coupler

6. Driveshaft

7. Rear Coupler

8. Rear Bearing Assembly

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Fig. 27: Exploded View Of Drive Shaft Case Assembly
Courtesy of GENERAL MOTORS CORP.

OUTPUT SHAFT SEAL REPLACEMENT

Removal

Raise and support vehicle. Remove the appropriate rear tire and wheel assembly. Remove the appropriate rear axle shaft. See **AXLE SHAFTS** . Remove the differential output shaft seal. Take care not to damage any sealing surfaces.

Installation

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Using the Output Shaft Seal Installer (J 36797), install the differential output shaft seal. Install the axle shaft. See **AXLE SHAFTS** . Install the rear tire and wheel assembly. Tighten wheel lug nuts to specification. See **TORQUE SPECIFICATIONS** . Lower the vehicle.

OVERHAUL

DIFFERENTIAL CASE

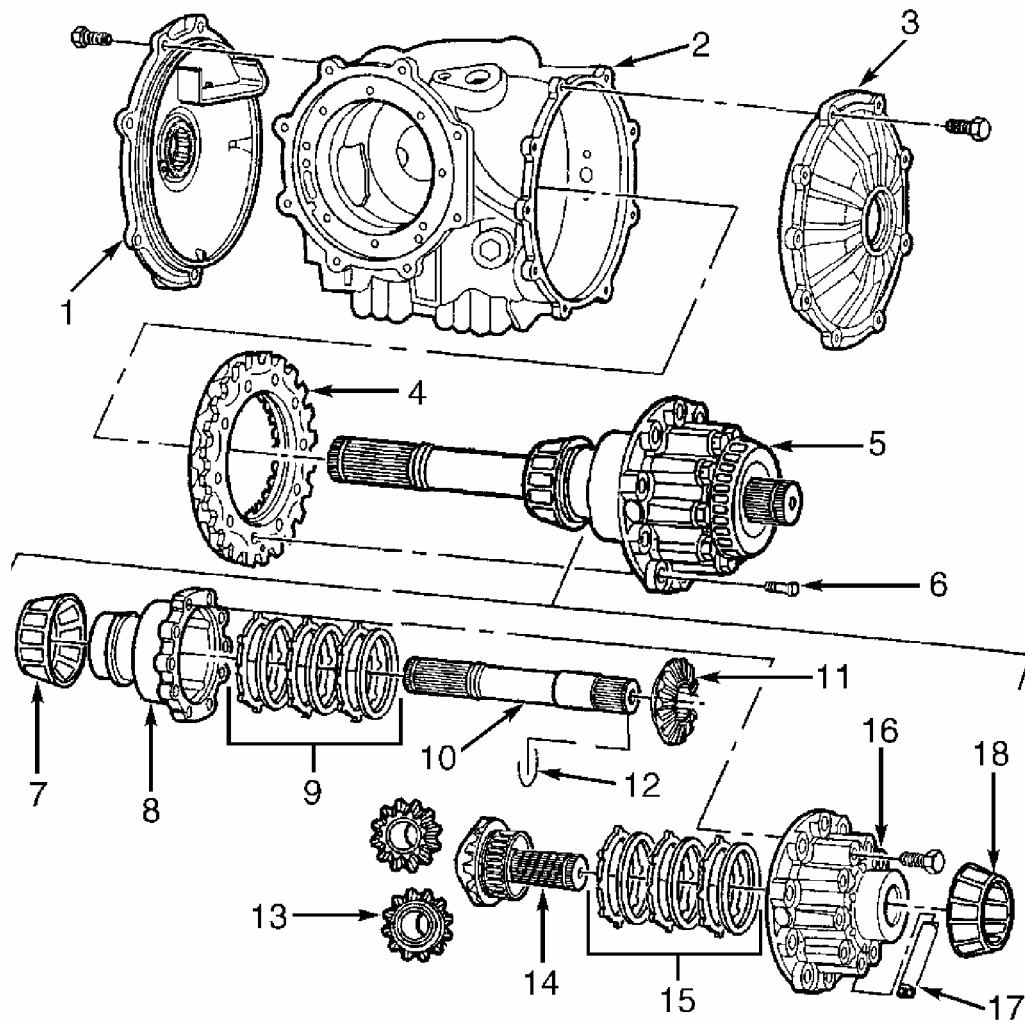
NOTE: **Overhaul assumes differential assembly has been removed. See DIFFERENTIAL ASSEMBLY under REMOVAL & INSTALLATION.**

Disassembly

1. Separate the transmission from the differential assembly, if required. Remove the carrier seal plate, automatic transmission applications, from the front of the differential housing, if required. See **Fig. 28** . Remove the oil seal and "O" ring seal from the seal plate. Discard the oil seals.

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- | | |
|-------------------------------------|-------------------------------------|
| 1. Left Differential Carrier Cover | 10. Left Output Shaft |
| 2. Differential Carrier | 11. Left Side Gear |
| 3. Right Differential Carrier Cover | 12. "C" Clip |
| 4. Ring Gear | 13. Spider Gear |
| 5. Differential Case Assembly | 14. Right Output Shaft & Side Gear |
| 6. Ring Gear Bolt | 15. Right Clutch Pack |
| 7. Left Differential Case Bearing | 16. Right Differential Case |
| 8. Left Differential Case | 17. Pin |
| 9. Left Clutch Pack | 18. Right Differential Case Bearing |

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Fig. 28: Exploded View Of Differential Carrier & Case Assembly
Courtesy of GENERAL MOTORS CORP.

2. Remove the differential mount and bolts. Remove the drain plug and washer and allow the fluid to drain. Remove the fill plug, lubricant tag, and washer.
3. Remove the vehicle speed sensor and bolt. Remove the left cover and bolts. Remove the "O" ring and oil seal from the cover. Remove the magnet from the carrier. Install

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the differential assembly onto the Differential Holding Fixture (J 42173).

4. Install 4 M8 x 1.25 bolts. Tighten the bolts to 25 N.m (18 lb ft). Remove the right cover and bolts from the differential. Remove the "O" ring and oil seal from the cover.
5. Remove the cover - rear, bolts, bolt/stud, and "O" ring. See **Fig. 28** . Install 2 M10 x 1.5 nuts onto the transmission stud. Remove the stud from the differential. Remove the bolts and mount from the differential. Note and mark the position and direction of the mount.
6. Remove the "C" clip from the output shaft. Install the Differential Lifting Tool (J 42155) into the groove of the output shaft in order to remove the differential case assembly.
7. Remove the pinion housing/cage bolts. Heat the differential housing, around the pinion housing, using a Heat Gun (J 25070). Heating the housing will ease in pinion removal. Remove the pinion housing/cage assembly and shims from the differential housing. Mark or tag the shims for assembly. Locate 2 screwdrivers or pry bars to the flange area of the pinion housing/cage to ease in removal.
8. Install the Bearing Race Remover (J 42194) into the right cover in order to remove the bearing race and shims. Position the right cover into a hydraulic press. Using a hydraulic press, remove the bearing race and shims. Mark or tag the shims for assembly.
9. Install the Left Output Shaft Bearing Remover (J 29369-2) into the left cover bearing. Install the Slide Hammer (J 23907) to the J 29369-2 in order to remove the bearing. Remove the bearing. See **Fig. 29** .

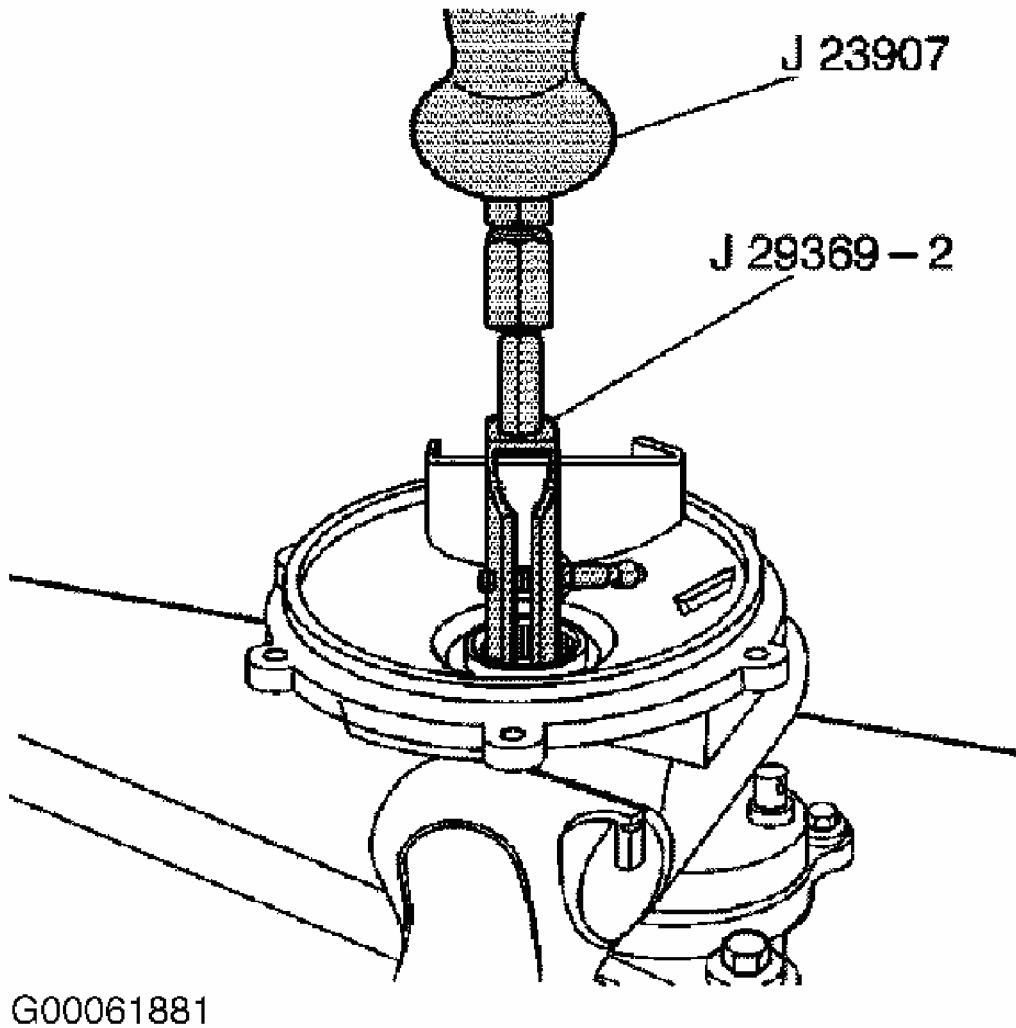


Fig. 29: Removing Left Output Shaft Bearing
Courtesy of GENERAL MOTORS CORP.

10. Install the J 42194 into the differential housing, behind the left bearing race, in order to remove the bearing race and shim. Position the housing into a hydraulic press. Using a hydraulic press, remove the race and shim or shims from the differential housing. Mark or tag the shims for assembly.

Cleaning Differential Housing

1. Clean the differential carrier in solvent. Inspect for the following:
 - Damage to threaded bolt holes
 - Broken flanges
 - Restrictions within the internal oil passages

- Damaged case or cover sealing surfaces
- Damage to the "O" ring seal grooves
- Porosity

See **Fig. 28** .

2. Clean the covers in solvent. Inspect the covers for the following:
 - Damage to the "O" ring seal grooves
 - Damage to the axle shaft oil seal bores
 - Restrictions within the internal oil passages
 - Porosity
 - Dents or damage to the exterior of the cover - rear that may create interference with the pinion shaft
3. Clean the carrier seal plate in solvent. Inspect for the following: Cracks or other damage A damaged oil seal bore A damaged "O" ring seal groove.
4. Clean the pinion components in solvent. Inspect for the following:
 - Damage to the nut threads or locking area
 - Worn or scored bearings
 - The pinion housing/cage for damaged bolt holes, broken flanges, restrictions within the oil passages, worn or loose bearing races and/or race bores
 - The pinion shaft for damaged threads, worn splines, or worn or scored gear teeth

See **Fig. 33** .

Inspecting Differential Case

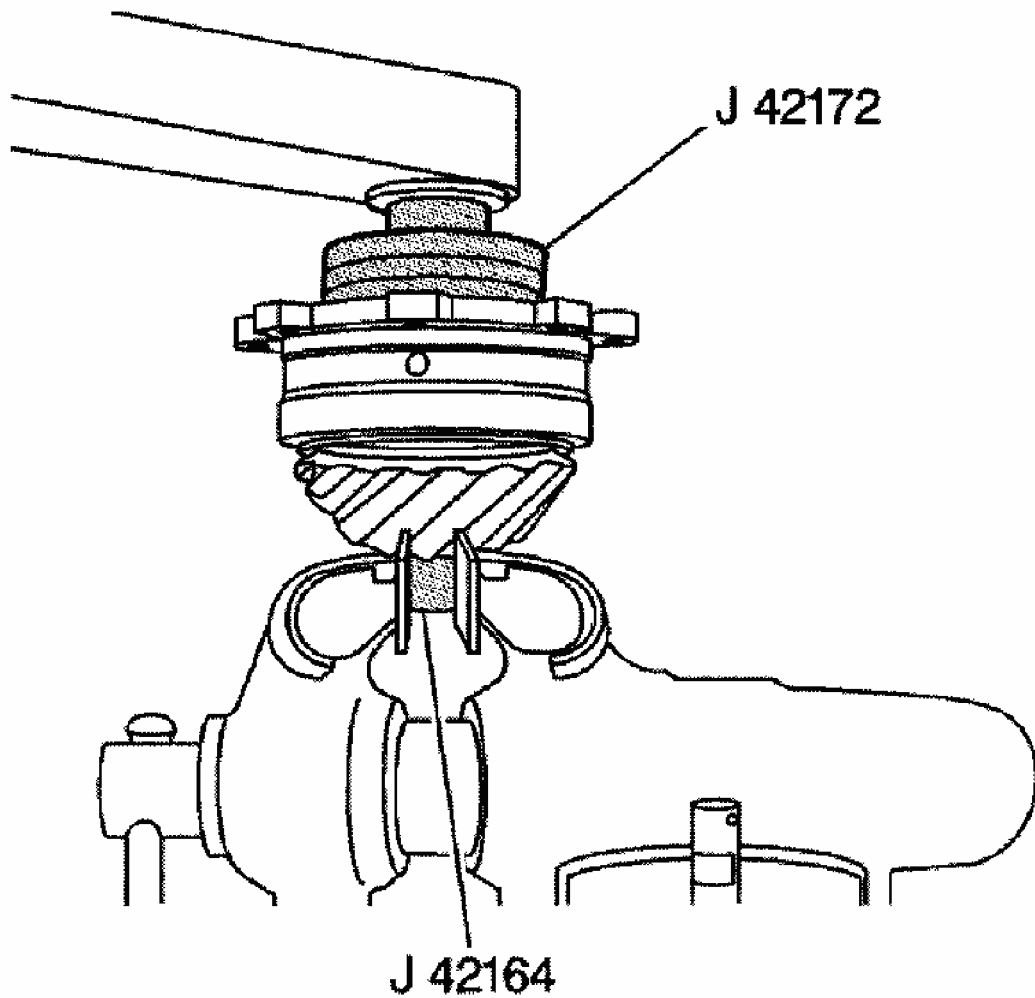
1. Clean the differential case components in solvent. Inspect the components for the following: cracks or other damage, damage to threaded bolt holes, unusual wear, scoring, or grooves in the clutch pack area, and scored or damaged case side bearing mounting flanges.
2. Clean the gears and shafts with solvent. Inspect the gears for the following:
 - Chips or cracks
 - Pitting
 - Heat discoloration
 - Unusual wear
 - Excessive wear or scoring in the side gear pin bores
 - Wear, grooves, or scoring on the side gear pin
 - Scored or worn side gear washers
 - Unusual wear or grooves on the output gear splines
 - Damaged to the ring gear threaded bolt holes
 - Damage to the ring gear vehicle speed sensor reluctor ring lobes

See **Fig. 28** .

3. Inspect the shafts for the following: unusual wear, grooved, worn, or damaged splines, damaged "C" clip grooves, and clutch Discs and Plates.
4. Clean the discs and plates with solvent. Inspect the discs and plates for the following: unusual wear, scoring, or grooves on the separator plate friction surfaces, friction plates with uneven wear or worn friction material. If any one plate or disk in either the left or right pack show signs of wear or scoring replace the complete pack on both sides. Bent or warped plates or discs. Lay the plates and discs on a flat surface and inspect for warpage, worn, scored, or collapsed bellville washer, bearings and Races. See **Fig. 34** and **Fig. 35** .
5. Inspect the bearing rollers and races for the following, pitting, scoring or grooves, and excessive wear or other damage.
6. Inspect the bearing rollers and races for heat discoloration. Heat discoloration ranges from a faint yellow to a dark blue color. This discoloration may result from an overload or improper lubrication. Excessive heat causes softening of the rollers and races. Bearings or races with sign of heat discoloration must be replaced.
7. Inspect for bent bearing cages. Inspect for damaged bearing cages. Inspect the left side cover output shaft bearing for worn or missing needle bearings.

Removing Drive Pinion Cartridge

1. Remove the pinion nut using the Bearing Race Installer/Spanner Wrench (J 42172) and the Pinion Gear Holder (J 42164). See **Fig. 30** .



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Fig. 30: Removing/Installing Pinion Shaft Nut
Courtesy of GENERAL MOTORS CORP.

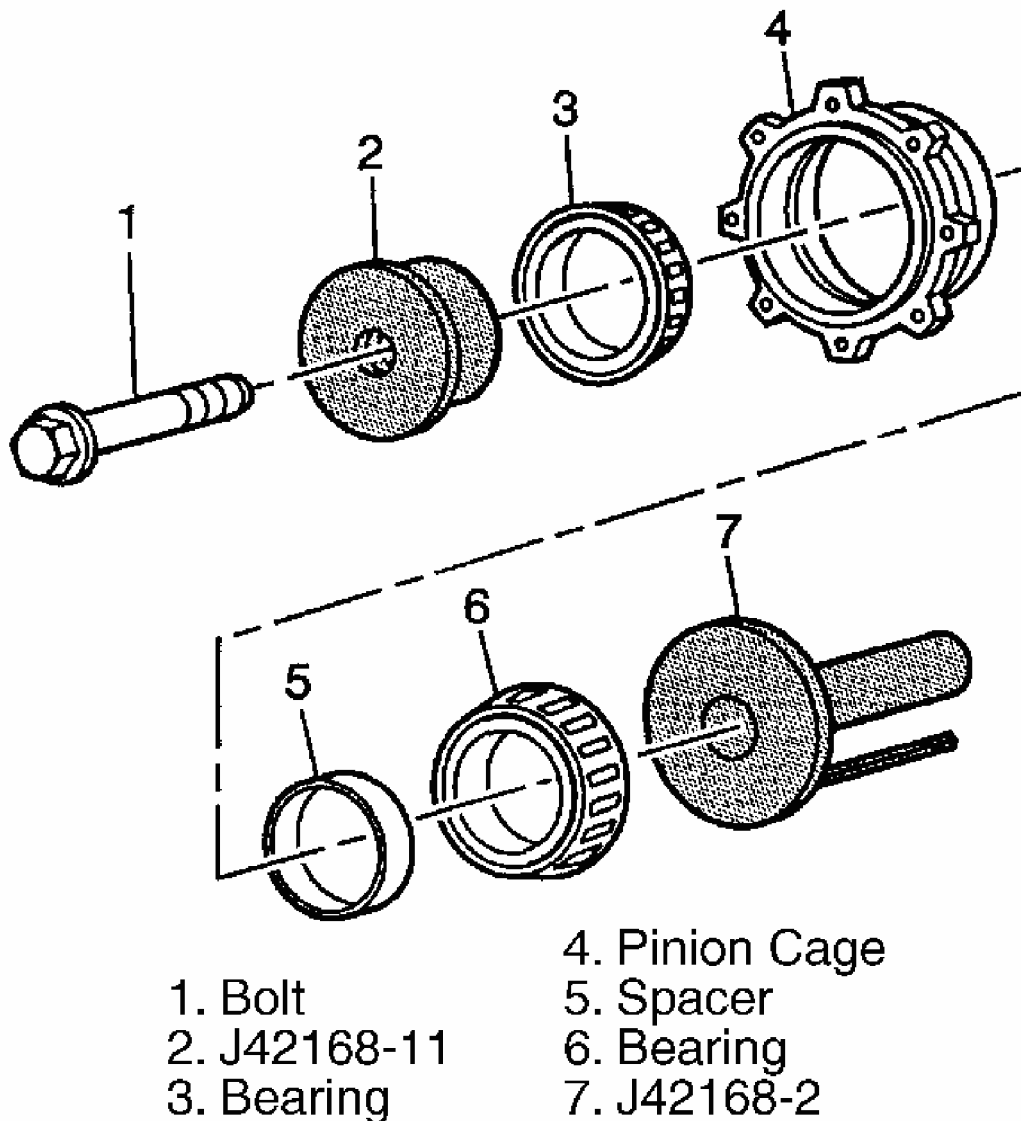
2. Position the pinion housing/cage into a press. Use the Side Gear Compressor (J 42162) and a hydraulic press in order to remove the pinion shaft and bearing from the housing/cage.
3. Remove the nut, bearing, spacer, and pinion shaft from the housing/cage. See **Fig. 33**.
4. Install the Front Pinion Bearing Remover (J 42166) onto the pinion shaft and bearing. Use the J 42162, J 42166, and a hydraulic press in order to remove the bearing from the shaft.
5. Use the Bearing Race Remover (J 42194) and a hydraulic press in order to remove the bearing race from the housing/cage. Use the J 42194 and a hydraulic press in order to remove bearing race from the housing/cage.

Installing Drive Pinion

1. Install the inner bearing race into the pinion housing/cage using the Bearing Race Installer/Spanner Wrench (J 42172) and a hydraulic press.
2. Install the outer bearing race into the pinion housing/cage using the Bearing and Race Installer (J 42170) and a hydraulic press. Install the bearing onto the pinion shaft using the J 42170, Pinion Gear Holder (J 42164), and a hydraulic press. See **Fig. 33** .
3. Assemble the pinion shaft, spacer, and bearing into the housing/cage. Press the bearing onto the pinion shaft using J 42170, J 42164, and a hydraulic press.
4. Install the nut onto the pinion shaft using a torque wrench, J 42172, and J 42164. See **Fig. 30** . Tighten the nut to specification. See **TORQUE SPECIFICATIONS** . Using a punch, stake the areas of the nut into the notches in the end of the pinion shaft. Measure the rotating torque of the pinion shaft using the J 42164. A properly assembled pinion shaft and bearings should have a rotating torque of 22 INCH lb. (2.5 N.m).

Selecting Drive Pinion Shim

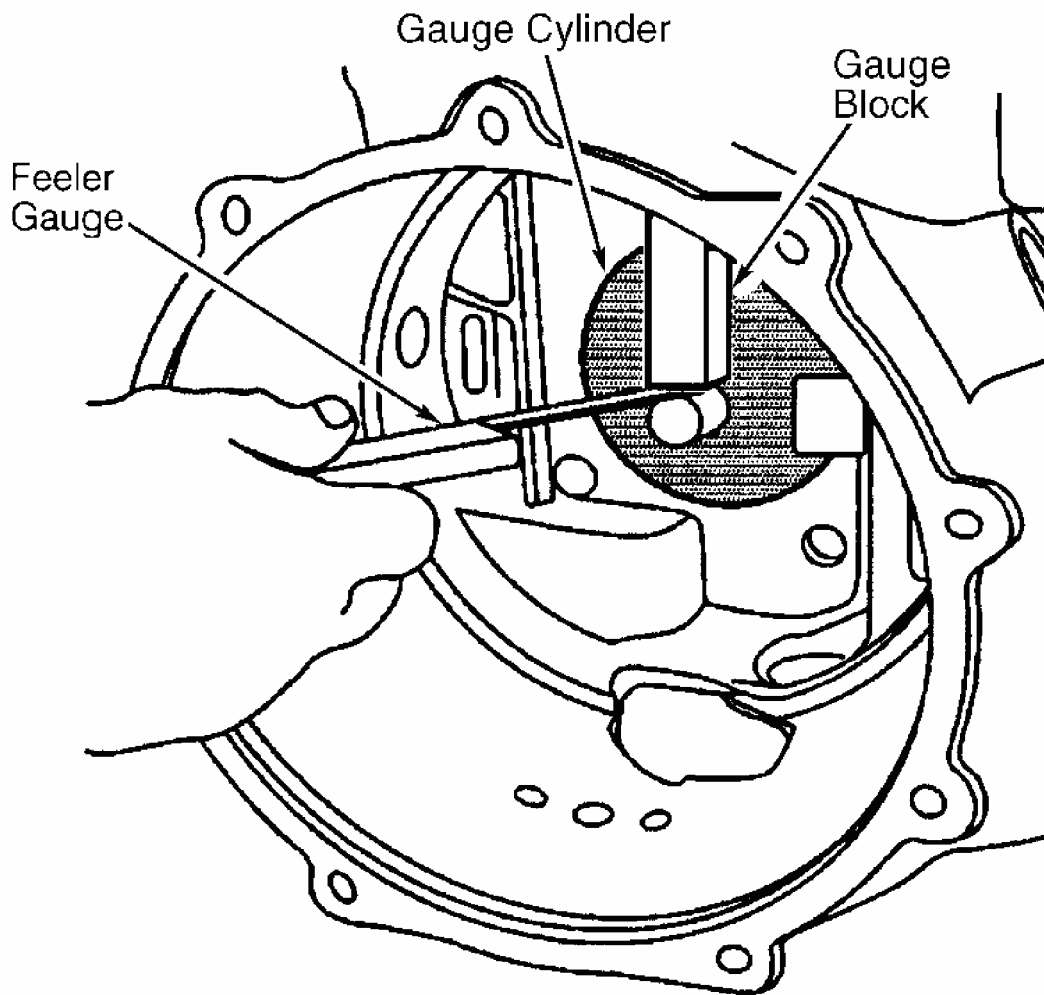
1. Install the differential assembly onto the Differential Holding Fixture (J 42173). Install 4 M8 x 1.25 bolts. Tighten the bolts to 18 ft. lb. (25 N.m).
2. Install the Differential Centerline Cylinder (J 42168-1) into the left bearing race bore of the differential housing. Install the Holding Strap (J 42168-9) and thumbscrew to the J 42168-1. Tighten the thumbscrew until snug.
3. Install the bearing races into the pinion housing/cage. Refer to Drive Pinion Assemble. Install the Pinion Housing Centering Spacer (J 42168-1), bearings, spacer, Shim Gauge Assembly (J 42168-2), and bolt to the pinion housing/cage . See **Fig. 31** . Tighten the bolt until snug.



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Fig. 31: Assembling Pinion Bearing Assembly
 Courtesy of GENERAL MOTORS CORP.

4. Install the pinion housing/cage assembly into the differential housing. The use of M8 x 1.25 dowels or long bolts will ease in pinion housing installation and alignment.
5. Install the pinion housing/cage bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS**.
6. Using a feeler gauge, measure the distance between the J 42168-2 and the J 42168-1. Record the dimension as "B1". See **Fig. 32**.



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Fig. 32: Drive Pinion Shim Selection
Courtesy of GENERAL MOTORS CORP.

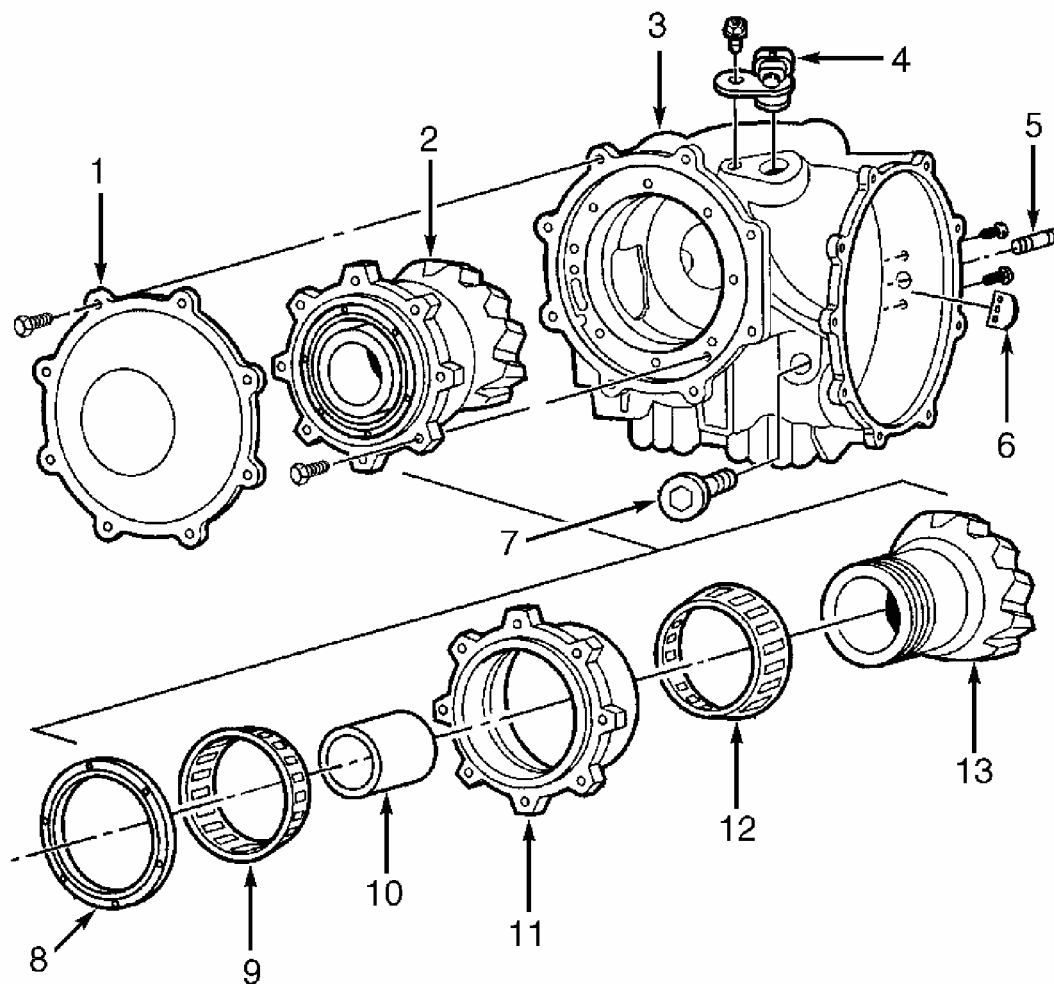
NOTE: The A1 value is a manufacturing variation between the ring gear and pinion. The A1 value may be higher, lower, or equal to 4.055 in. (103.00 mm) nominal value. When subtracting the A nominal value from the A1 value, the B3 calculation may compute to a positive, negative, or zero total.

7. Locate the "A1" value on the side of the ring gear. Subtract the A nominal value of 4.055 in. (103.00 mm) from the "A1" value. Record the calculation as "B3".
8. Add the "B2" value to the "B3" value for the proper pinion housing shim thickness. The "B3" value may be a positive, negative, or zero value. Select shims equal to the calculated value. It may be necessary to round the shim or shims total to obtain the proper size shim pack. If the shim thickness calculation is past the midpoint value,

round the number higher to the next decimal value.

Disassembling Ring Gear & Differential Housing

1. Position the differential case assembly onto the Differential Holding Fixture (J 42173). Remove the ring gear bolts and ring gear. Discard the ring gear bolts. See **Fig. 33**.



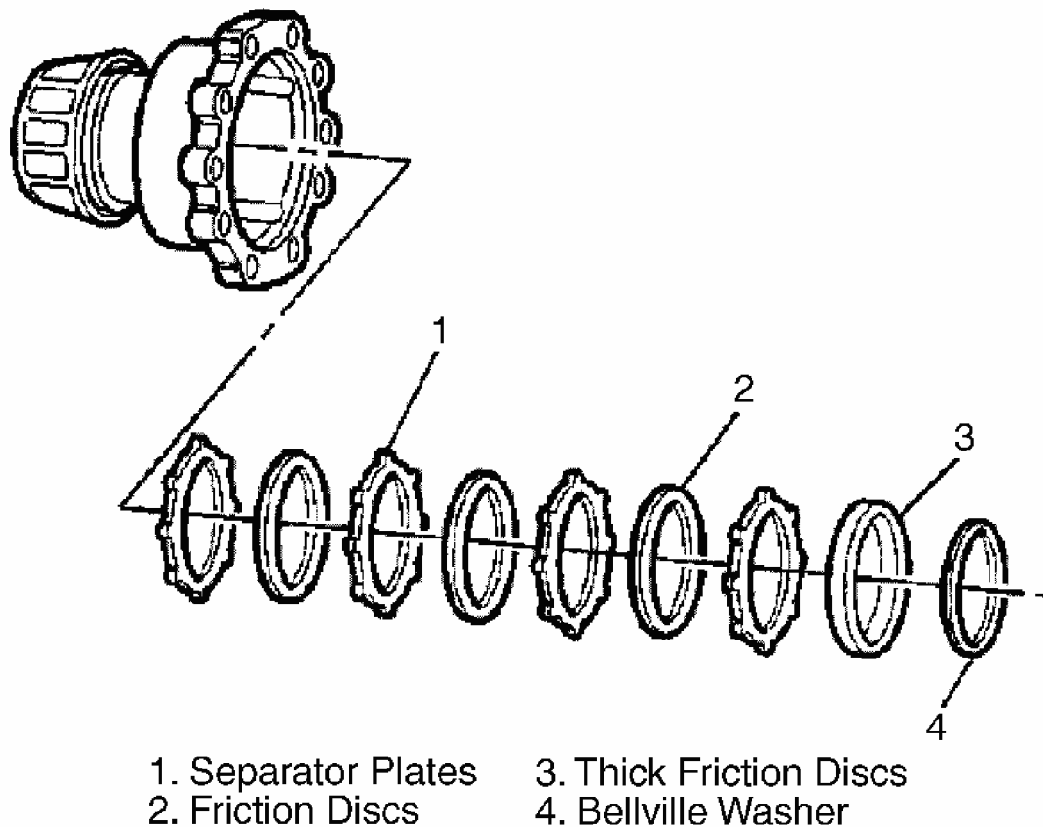
- | | |
|------------------------------------|-------------------------------|
| 1. Differential Carrier Rear Cover | 8. Drive Pinion Nut |
| 2. Drive Pinion Cartridge | 9. Drive Pinion Front Bearing |
| 3. Differential Carrier | 10. Drive Pinion Spacer |
| 4. Vehicle Speed Sensor (VSS) | 11. Drive Pinion Cartridge |
| 5. Transmission Mounting Stud | 12. Drive Pinion Rear Bearing |
| 6. Transmission Stud Mount | 13. Drive Pinion |
| 7. Oil Fill Plug | |

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Fig. 33: Exploded View Of Drive Pinion Assembly
 Courtesy of GENERAL MOTORS CORP.

2. Install the Differential Side Bearing Remover (J 42159) onto the right differential side bearing. Remove the right side bearing from the differential using J 42159, Side Gear Compressor (J 42162), and a hydraulic press.
3. Remove the differential case bolts. Separate the case halves, right and left. Remove the left output shaft and gear from the left case.

NOTE: Friction discs and separator plates develop specific wear patterns. During disc and plate removal, the components must be retained in the specific order in which they were removed.



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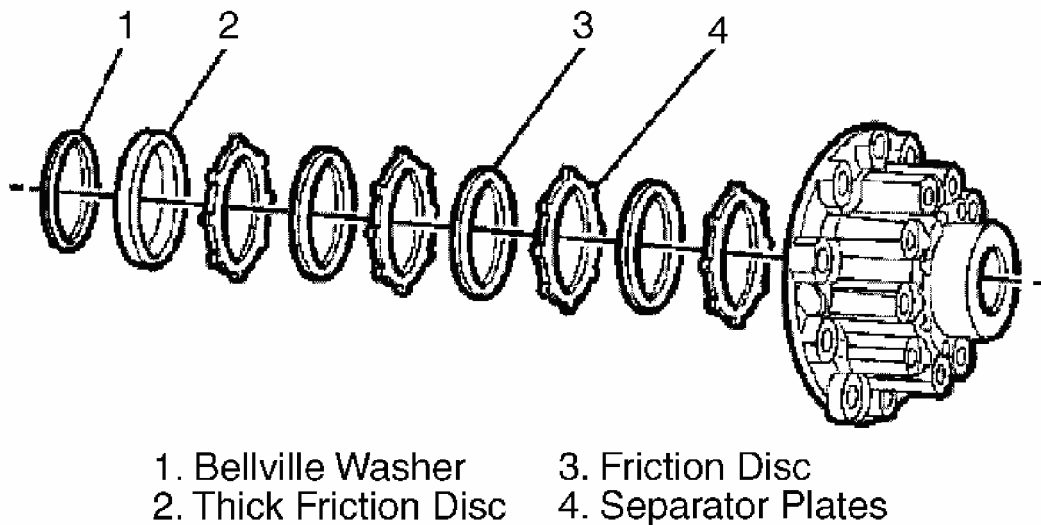
Fig. 34: Exploded View Of Left Clutch Pack
Courtesy of GENERAL MOTORS CORP.

4. Remove the left clutch pack from the left case. Remove the separator plates. Remove the friction discs. Remove the friction disc (thick). Remove the Belleville washer. See **Fig. 34** . Tag the clutch pack to indicate the position of the components.
5. Install the J 42159 onto the left differential side bearing. Remove the left side bearing

from the differential using J 42159, J 42162, and a hydraulic press.

6. Remove the "C" clip from the left output shaft. Remove the gear from the left output shaft. Using the J 42162 and a hydraulic press, compress the bellville washer and clutch pack in order to remove the cross pin from the differential right case.
7. Remove the side gears, side gear washers, and right output shaft and gear from the differential right case. See **Fig. 28** .

NOTE: Friction discs and separator plates develop specific wear patterns. During disc and plate removal, the components must be retained in the specific order in which they were removed.



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Fig. 35: Exploded View Of Right Clutch Pack
Courtesy of GENERAL MOTORS CORP.

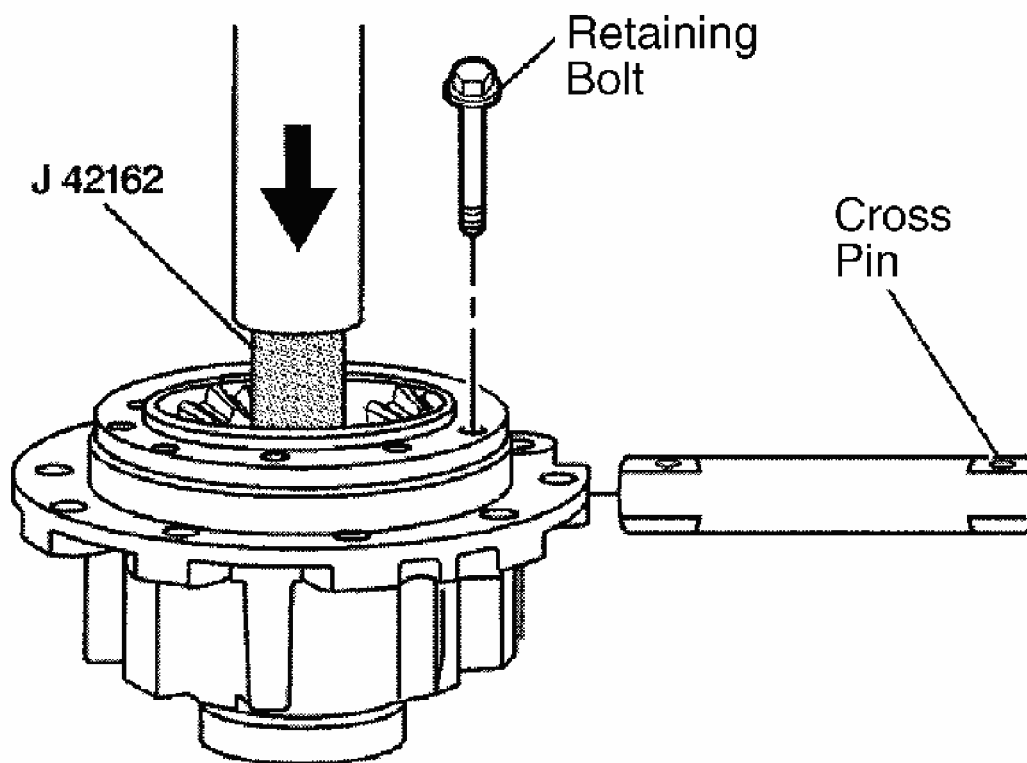
8. Remove the right clutch pack from the right case. Remove the bellville washer. Remove the friction disc (thick). Remove the friction discs. Remove the separator plates. See **Fig. 35** . Tag the clutch pack to indicate the position of the components.

Reassembling Ring Gear and Differential Housing

1. Install the right clutch pack to the right case. Install the separator plates. Install the friction discs. Install the friction disc (thick). Install the bellville washer. See **Fig. 35** .
2. Install the right output shaft and gear, side gears, and washers to the differential right case. See **Fig. 28** .
3. Using the Side Gear Compressor (J 42162) and a hydraulic press, compress the

bellville washer and clutch pack in order to install the cross pin to the differential right case.

4. Using an M8 bolt for alignment, properly position the cross pin into the differential right case. The hole in the pin must align with the hole in the case. During final assembly of the case halves, the pin retaining bolt must be able to pass through the hole in the cross pin. With the pin and case aligned, release the pressure from the press and remove the J 42162 and bolt. See **Fig. 36** .



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Fig. 36: Installing Cross Pin
Courtesy of GENERAL MOTORS CORP.

5. Install the gear to the left output shaft. Install the "C" clip to the left output shaft. Install the left side bearing to the differential using Bearing and Race Installer (J 42170) and a hydraulic press.
6. Install the left clutch pack to the left case. Install the separator plates. Install the friction discs. Install the friction disc (thick). Install the bellville washer. See **Fig. 34** .
7. Install the left output shaft and gear to the left case. Assemble the case halves. Install the case bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
8. Install the right side bearing to the differential using the J 42170 and a hydraulic press.

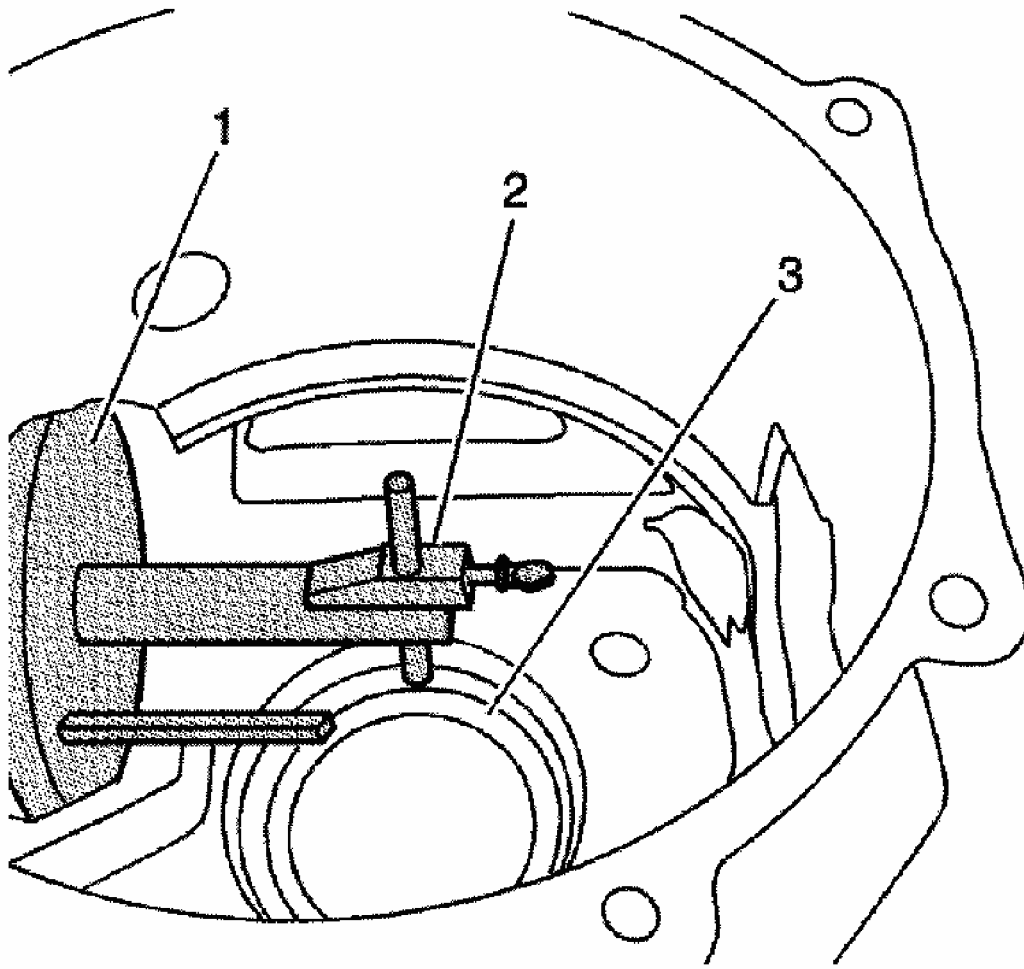
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Install the ring gear to the differential. Use several bolts to properly align the ring gear to the case. A hammer and brass punch may be used to aid in seating the ring gear onto the differential case. Install the NEW ring gear bolts. Position the differential assembly onto the Differential Holding Fixture (J 42173). Tighten the ring gear bolts to specification. See **TORQUE SPECIFICATIONS** .

Installing & Adjusting Differential Side Bearings

1. Remove the Holding Strap (J 42168-9) and thumbscrew from the Differential Centerline Cylinder (J 42168-1). Remove the J 42168-1 from the left bearing race bore of the differential housing.
2. Install the Gauge Plate Assembly (J 42168-13) into a vice. Position the bearing race onto the J 42168-13. Use the Differential Holding Fixture (J 42173) in order to position the differential case onto the J 42168-13 and into the bearing race. Rotate the differential, in both directions, in order to seat the bearing to the race.
3. Install the Depth Gauge (J 42168-7) into the hole in Shim Gauge Assembly (J 42168-2). Loosen the thumbscrew and allow the rod to contact the bottom of the bearing race bore, machined surface. See **Fig. 37** . Tighten the thumbscrew. Remove the J 42168-7 from the J 42168-2.

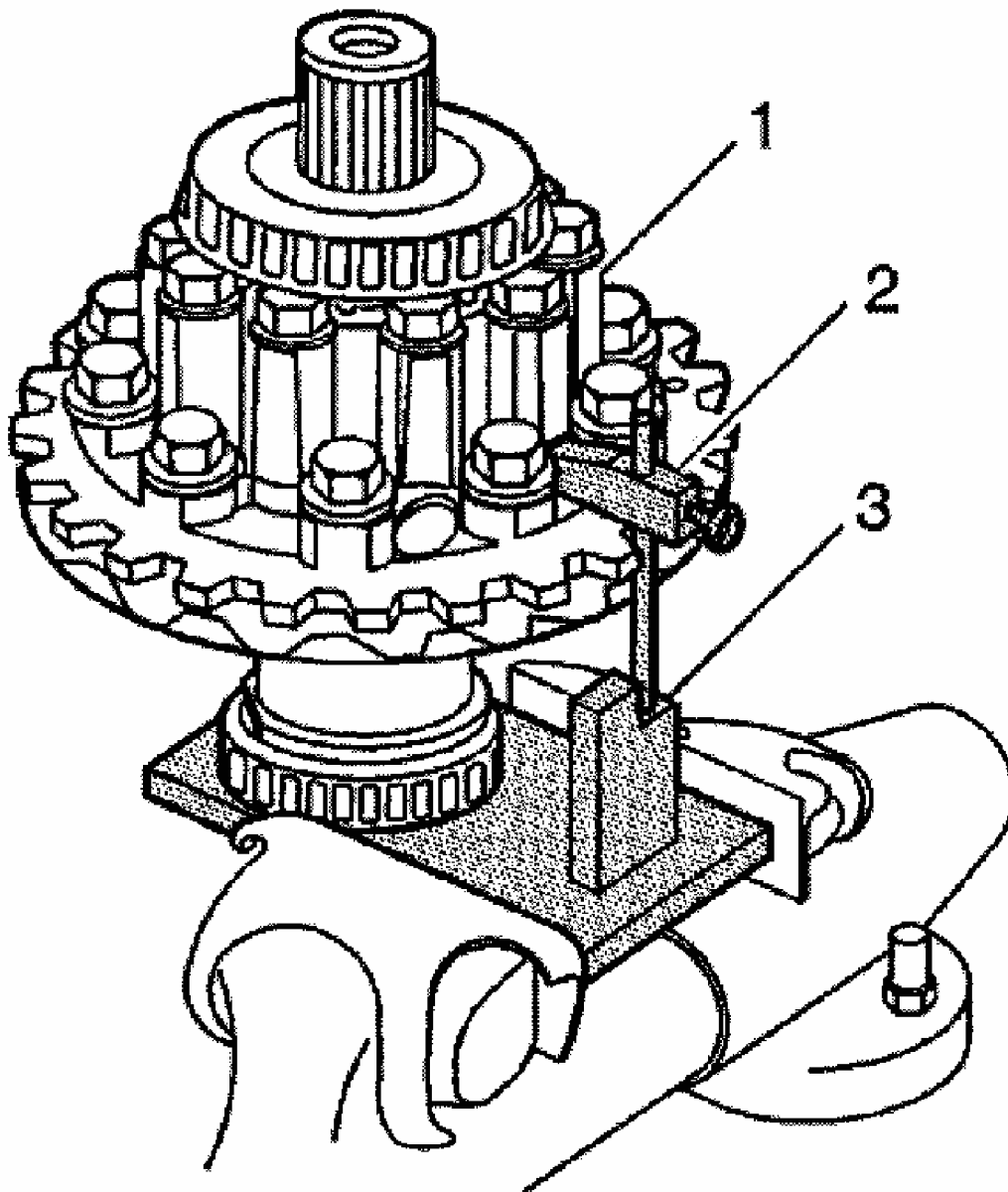


- 1. Shim Gauge Assembly
- 2. Depth Gauge
- 3. Machined Surface

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Fig. 37: Setting Depth Gauge
Courtesy of GENERAL MOTORS CORP.

4. Install the J 42168-7 into one of the two oil passages of the differential. The tapered portion of the tool will wedge and be retained into the differential. Rotate the differential until the rod of J 42168-7 is above the Gauge Plate Assembly (J 42168-13) gauge block. See **Fig. 38**. The J 42168-13 upper gauge block location is used when servicing 2.73 ratio differentials. The lower gauge block location is used when servicing the 3.15 and 3.42 ratio differentials.



1. Differential
2. Depth Gauge
3. Gauge Block

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Fig. 38: Measuring Side Bearing Shim Clearance
Courtesy of GENERAL MOTORS CORP.

5. Using a feeler gauge, measure the distance between the rod of J 42168-7 and the gauge

block of J 42168-13. Record the measurement as dimension "C1". Subtract "C1" value from a "C" nominal value of 0.197 in. (5 mm). Record that calculation as "C2".

NOTE: The "A2" value is a manufacturing variation between the ring gear and pinion. The "A2" value may be higher, lower, or equal to 2.58 in. (65.5 mm), 3.15 and 3.42 ratio differentials, or 2.93 in. (74.5 mm), 2.73 ratio differential, nominal value. When subtracting the "D" nominal value from the "A2" value, the "C3" calculation may compute to a positive, negative, or zero total.

6. Locate the "A2" value on the side of the ring gear. Subtract the "D" nominal value of either 2.58 in. (65.5 mm) or 2.93 in. (74.5 mm) from the "A2" value. Record the calculation as "C3". Add the "C2" value to the "C3" value for the proper left side differential bearing shim thickness. The "C3" value may be a positive, negative, or zero value.
7. Select shims equal to the calculated value. It may be necessary to round the shim or shims total to obtain the proper shim sizes. If the shim thickness calculation is past the midpoint value, round the number to the next decimal value. Remove the pinion housing/cage bolts.
8. Remove the pinion housing/cage from the differential. Remove the Pinion Housing Centering Spacer (J 42168-11), bearings, spacer, and Shim Gauge Assembly (J 42168-2) from the pinion housing/cage. See **Fig. 31** . Use the Bearing and Race Installer (J 42170) and a hydraulic press in order to install the selected shims and bearing race to the differential housing.
9. Use the Differential Lifting Tool (J 42155) in order to install the differential case into the differential housing. Install the right side bearing race, and the Side Bearing Shim Selector (J 42168-15) onto the differential. Install the right cover and Spacers (J 42168-16) bolts and spacers to the differential. Position the J 42168-16 bolts and spacers evenly apart. Tighten the bolts to 18 ft. lb. (25 N.m).
10. Insert a feeler gauge into the J 42168-15 and measure the gap. See **Fig. 39** . The measured dimension is the right side differential bearing shim size.

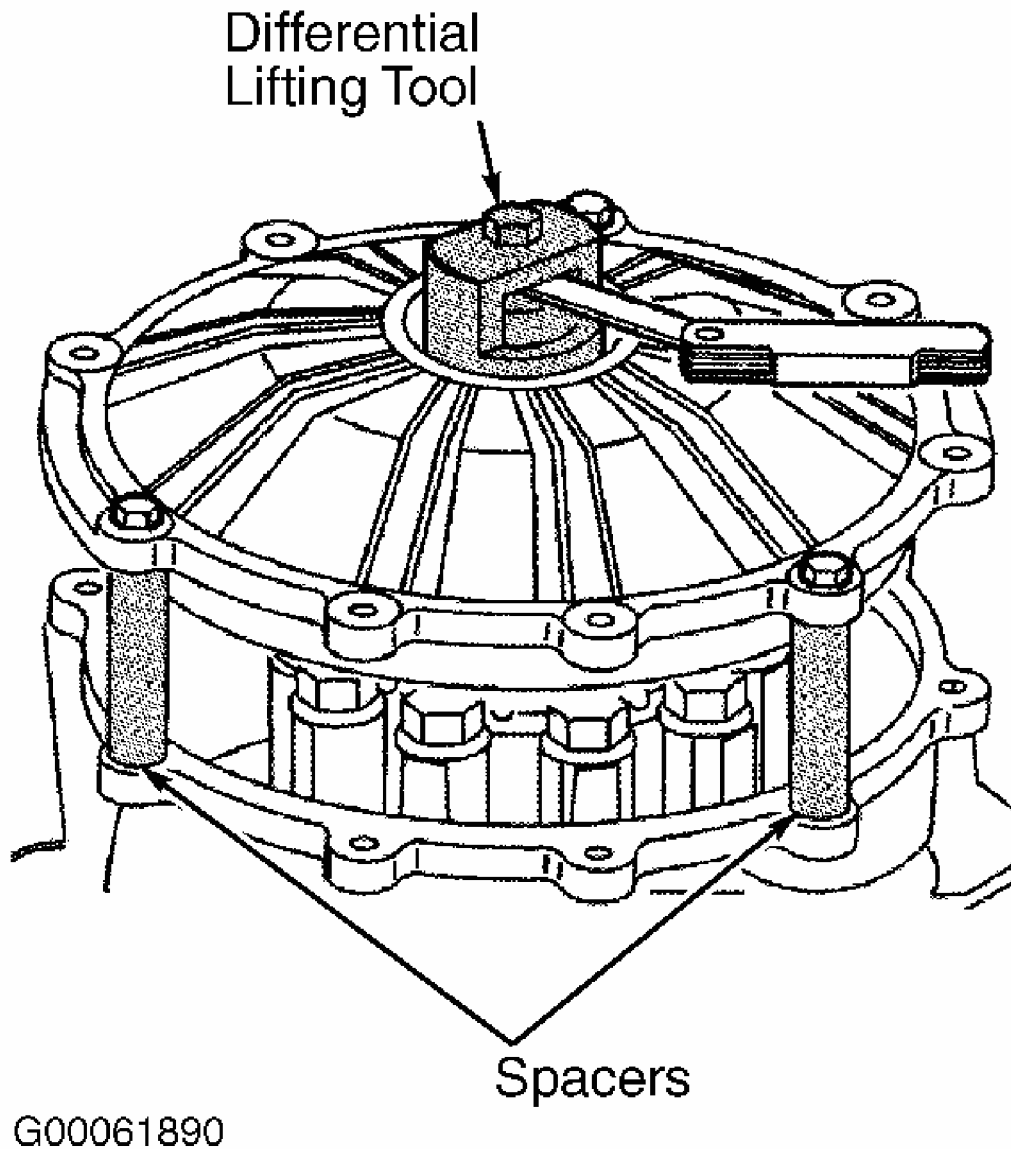


Fig. 39: Measuring Right Differential Bearing Shim Size
Courtesy of GENERAL MOTORS CORP.

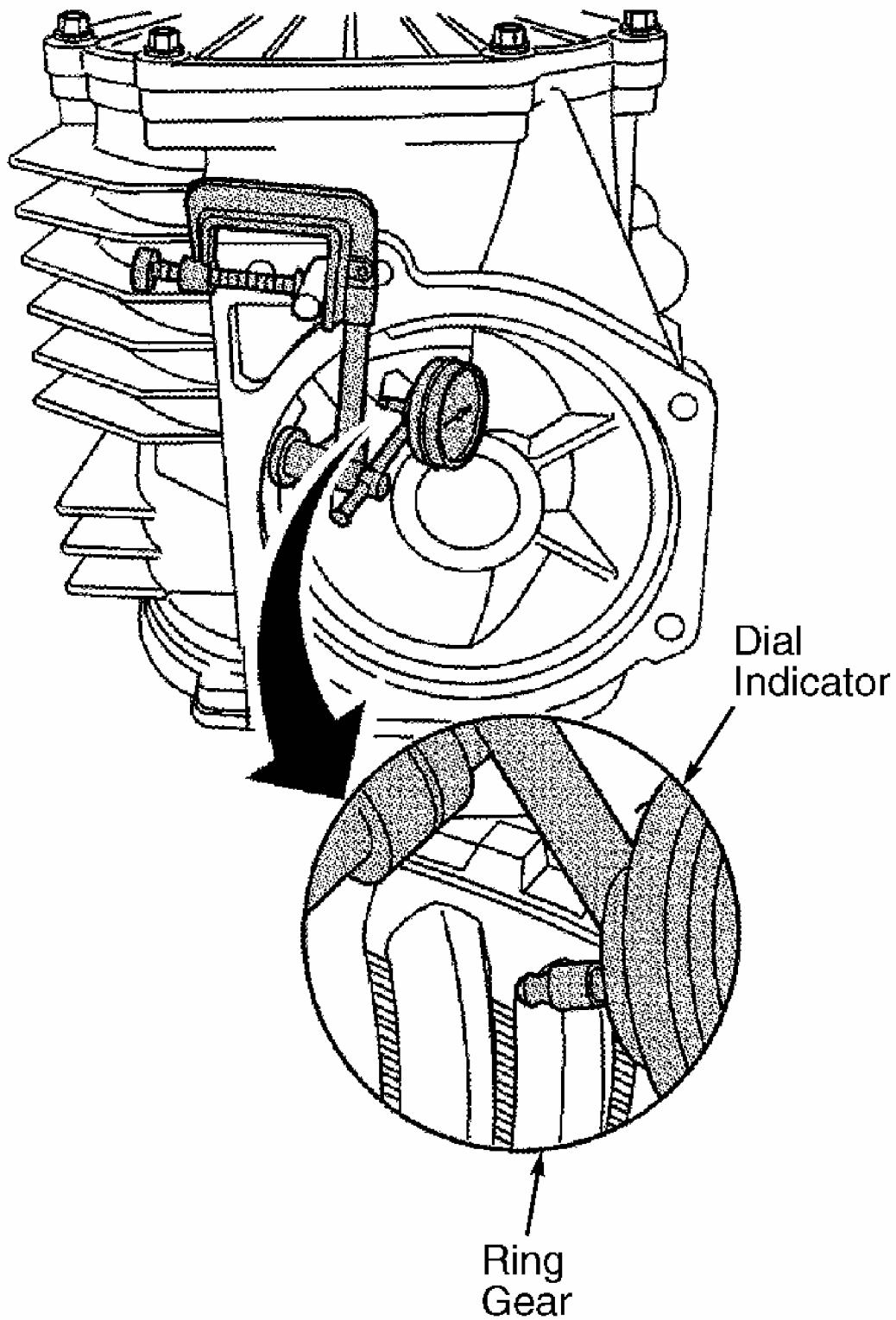
11. Remove the bolts, cover, and tools. Remove the bolts, cover, and tools. Install the shim or shims and bearing race into the right cover using the Bearing and Race Installer (J 42170) and a hydraulic press.

Reassembling Differential

NOTE: If the pinion assembly components have not been replaced, reuse the original pinion housing shims. If the pinion assembly

components have been replaced, see SELECTING DRIVE PINION SHIM for selection of the proper size shims.

1. Assemble the drive pinion prior to rear axle assembly. See **INSTALLING DRIVE PINION** . Using the Installer (J 42157) and a hydraulic press, install the bearing into left cover.
2. Install the oil seal into the left cover using the Installer (J 36797). Install the oil seal into the right cover using the J 36797.
3. Install the pinion housing assembly and the selected shim or shims to the differential housing. See **SELECTING DRIVE PINION SHIM** . The use of M8 x 1.25 dowels or long bolts will ease in pinion housing/cage and shim installation and alignment.
4. Install the pinion housing/cage bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Install the "C" clip into the groove of the output shaft. See **Fig. 28** . Apply Threadlocker(R) (1052942), or equivalent to the threads of the bolts and stud. Apply Threadlocker(R) only to the end of the stud that installs into the transmission mount. Install the transmission mount and bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** . Install 2 M10 x 1.5 nuts onto the transmission stud. Install the stud into the mount. Tighten the stud to specification.
6. Install the "O" ring to the groove of the right cover. Install the right cover and bolts. Tighten the bolts to specification. See **TORQUE SPECIFICATIONS** .
7. Install the Dial Indicator Set (J 8001) onto the transmission stud. Position the tip of the dial indicator against the center of the ring gear tooth surface. See **Fig. 40** . Install the Pinion Gear Holder (J 42164) into the splines of the pinion. J 42164 will retain the pinion in order to properly measure backlash. Move the right output shaft in both directions in order to measure the gear backlash. Measure the backlash in two to three locations. Measured backlash should be .0067-.0082 in. (.13-.21 mm).



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Fig. 40: Measuring Backlash

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8. Install the cover - rear, bolts, bolt/stud, and "O" ring. Tighten the bolts and bolt/stud to specification. See **TORQUE SPECIFICATIONS** .
9. Remove the bolts and the differential assembly from the J 42173.
10. Install the "O" ring into the groove of the left cover. Install the magnet to the carrier. Install the left cover and bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
11. Install the vehicle speed sensor and bolt. Tighten the bolt to specification. See **TORQUE SPECIFICATIONS** . Install the drain plug and washer. Tighten the drain plug to specification. Install the fill plug, lubricant tag, and washer. Install the transmission mount and bolts. Tighten the bolts to specification.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Axle Damper Bolt	18 (24)
Battery Cable Bolt (At Battery)	11 (15)
Bearing Housing Assembly-To-Propeller Shaft Coupling Bolts	
Automatic Transmission	52 (70)
Manual Transmission	66 (90)
Differential Case Bolt	41 (55)
Differential Drain & Fill Plug	26 (35)
Differential Side Cover Bolts	18 (25)
Differential-To-Transmission Lower Nut	37 (50)
Drive Axle Spindle Nut	118 (160)
Driveline Support Assembly Plastic Plugs	37 (50)
Driveline Support Assembly-To-Engine Flywheel Housing Bolts/Studs	37 (50)
Exhaust Muffler Bolts	37 (50)
Exhaust Pipe Brace Bolts	37 (50)
Exhaust Pipe-To-Exhaust Manifold Nuts	15 (20)
Flexplate Spindle Nut	66 (90)
Flexplate-To-Flexplate Spindle Bolts (A/T)	37 (50)
Flexplate-To-Torque Converter Bolts	47 (63)
Lower Control Arm Ball Joint Stud Nut	
Step 1	15 (20)
Step 2	(1)
Step 3	

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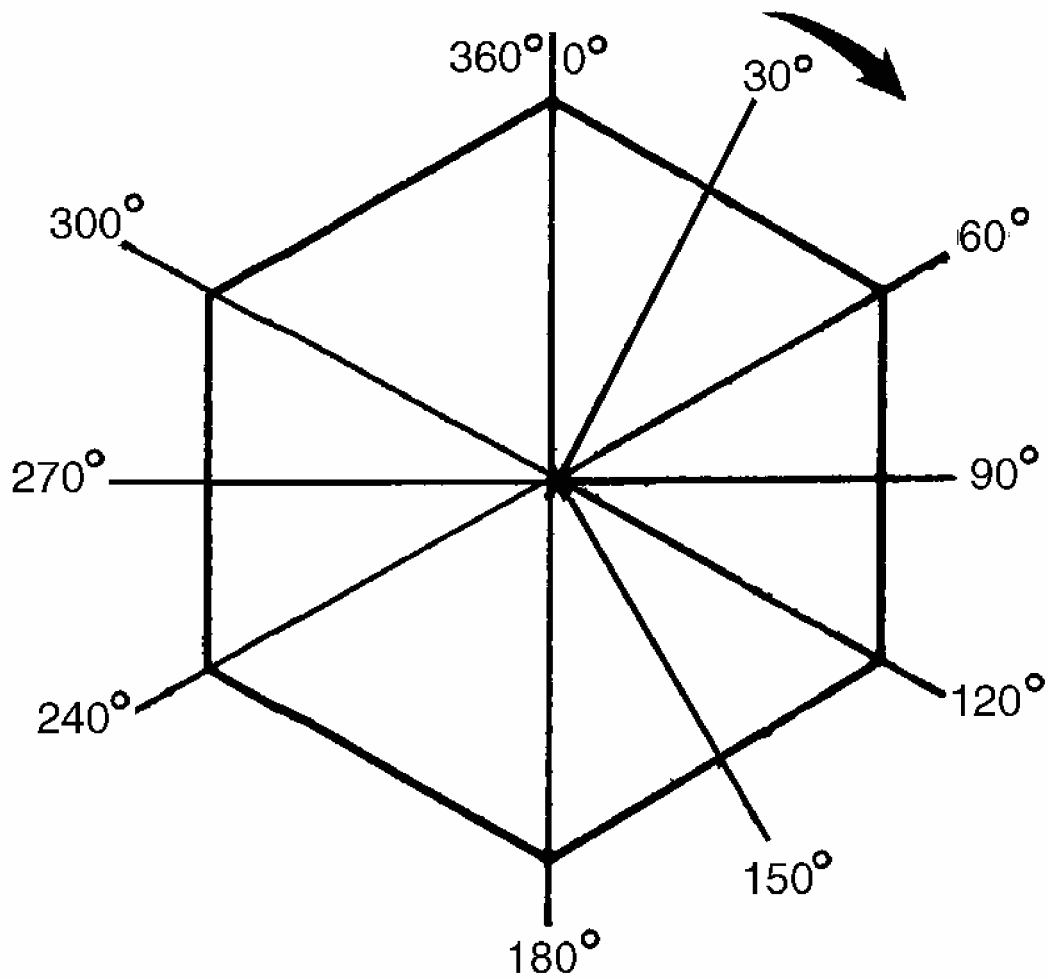
	(2)
Outer Tie Rod End Nut	
Step 1	15 (20)
Step 2	(3)
Step 3	(4)
Oxygen Sensors	30 (42)
Pinion Housing Cage Bolt	18 (25)
Pinion Shaft Retaining Nut	370 (500)
Propeller Input Shaft Bearing Positioning Bolt	26 (35)
Propeller Shaft Hub Clamp Bolt	93 (125)
Propeller Shaft Front & Rear Coupling Bolts	
Automatic Transmission	52 (70)
Manual Transmission	66 (90)
Propeller Shaft Coupling-To-Input Shaft Bolts	
Automatic Transmission	52 (70)
Manual Transmission	66 (90)
Rear Exhaust Hanger Mounting Bolts	37 (50)
Rear Suspension Crossmember Mounting Nut	81 (110)
Rear Shock Absorber Lower Mounting Bolt	162 (220)
Rear Stabilizer Shaft Bracket Bolts	49 (65)
Rear Stabilizer Shaft Bracket Nuts	70 (95)
Rear Stabilizer Shaft Link Nuts	53 (72)
Rear Transverse Spring Mounting Bracket Bolts	46 (62)
Ring Gear Bolt	144 (195)
Shift Control Mounting Bolt	22 (30)
Shift Control Rod Clamp Bolt	22 (30)
Starter Bolts	37 (50)
Transmission Mount Bracket-To-Differential Bolt	37 (50)
Transmission Mount-To-Bracket Nut	43 (58)
Transmission Oil Cooler Pipe Fittings	30 (40)
Transmission Oil Cooler Pipe-To-Junction Fittings	20 (27)
Transmission Shift Cable Bracket Nuts	15 (20)
Transmission Stud-To-Mount	31 (42)
Transmission-To-Driveline Support Assembly Bolt/Stud	37 (50)
Transmission Mount-To-Rear Suspension Crossmember Nut	37 (50)
Wheel Lug Nuts	100 (140)
INCH Lbs. (N.m)	

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Clutch Actuator Cylinder Mounting Bolts	106 (12)
Differential Rear Cover Bolt/Stud	89 (10)
Driveline Tunnel Closeout Panel Bolts	89 (10)
Shift Control Closeout Boot Nut	106 (12)
Starter Solenoid Positive Terminal Nut	71 (8)
Starter Solenoid "S" Terminal Nut	35 (4)
Transmission Oil Cooler Pipe Front & Rear Clamp Bolts	106 (12)
Transmission Stud Mount Bolts	89 (10)
Transmission Wiring Harness-To-Left Side Transmission Case Retaining Bolt	22 (2.5)
Vehicle Speed Sensor (VSS) Bolt	89 (10)

- (1) Tighten an additional 3 1/2 flats. See **Fig. 41** .
- (2) Check for a minimum torque of 41 Ft. lbs. (55 N.m).
- (3) Tighten an additional 160 degrees. See **Fig. 41** .
- (4) Check for a minimum torque of 33 Ft. lbs. (45 N.m).



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Fig. 41: View Of Torque Angles
Courtesy of GENERAL MOTORS CORP.