

DRIVELINE/AXLE Rear

Drive Axle - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Differential Carrier Cover Bolts (195 mm Axle)	52 N.m	38 lb ft
Differential Carrier Cover Bolts (226mm eLSD Axle)	52 N.m	38 lb ft
Differential Carrier Drain Plug (226mm eLSD Axle)	16 N.m	12 lb ft
Differential Carrier Front Mounting Bolts		
• First Pass	50 N.m	37 lb ft
• Final Pass	plus 90 degrees	
Differential Carrier Front Mounting Nuts		
• First Pass	50 N.m	37 lb ft
• Final Pass	plus 90 degrees	
Differential Carrier Rear Mounting Bolt		
• First Pass	220 N.m	162 lb ft
• Final Pass	plus 60 degrees	
Differential Clutch Cover Plug (226mm eLSD Axle)	12 N.m	106 lb in
Differential Clutch Pump Bolts (226mm eLSD Axle)	9 N.m	80 lb in
Differential Drive Pinion Gear Nut	105 N.m	77 lb ft
Differential Oil Cooler Outlet Hose Assembly (226mm eLSD Axle)	28 N.m	21 lb ft
Differential Oil Pump Inlet Hose Assembly (226mm eLSD Axle)	31 N.m	23 lb ft
Differential Temperature Sensor (226mm eLSD Axle)	10 N.m	89 lb in
Drain Plug	33 N.m	24 lb ft
Fill Plug	33 N.m	24 lb ft
Limited Slip Differential Clutch Bolts		
• First Pass	20 N.m	15 lb ft
• Final Pass	plus 34 degrees	
Limited Slip Differential Clutch pipe Connector - Female 16mm (226mm eLSD Axle)	28 N.m	21 lb ft
Limited Slip Differential Clutch pipe Connector - Male 18mm (226mm eLSD Axle)	31 N.m	23 lb ft
Limited Slip Differential Clutch Valve Bolt (226mm eLSD		

Axle)	3 N.m	27 lb in
Rear Axle Lock Control Actuator Nuts (226mm eLSD Axle)	15 N.m	11 lb ft
Rear Axle housing Vent	20 N.m	15 lb ft
Rear Axle Vent (226mm eLSD Axle)	10 N.m	89 lb in
Rear Differential Clutch Control Module Bolt (226mm eLSD Axle)	6 N.m	53 lb in
Transmission Fluid Pressor Sensor (226mm eLSD Axle)	10Y	89 lb in

LUBRICATION SPECIFICATIONS

Lubrication Specifications

Application	Quantity	
	Metric	English
195 mm 3.45 mLSD	0.85 liters	0.9 quarts
195 mm 2.85 mLSD	0.85 liters	0.9 quarts
226 mm 2.85 eLSD	1.20 liters	1.27 quarts
eLSD Clutch System	0.141 liters	0.149 quarts

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number		
		US	Canada	Brazil
Rear Differential Lubricant (195mm Axle)	Dexron Gear 75W90	88863089	88863090	Refer to Owner's Manual and Electronic Parts Catalog.
Rear Differential Lubricant (226mm Axle)	Dexron LS Gear 75w90	88862624	88862625	Refer to Owner's Manual and Electronic Parts Catalog.
Rear Differential Pinion Flange Splines	Sealant	12346004	10953480	Refer to Owner's Manual and Electronic Parts Catalog.

SCHEMATIC WIRING DIAGRAMS

DIFFERENTIAL LOCK WIRING SCHEMATICS

Electronic Limited-Slip Rear Axle (G96)

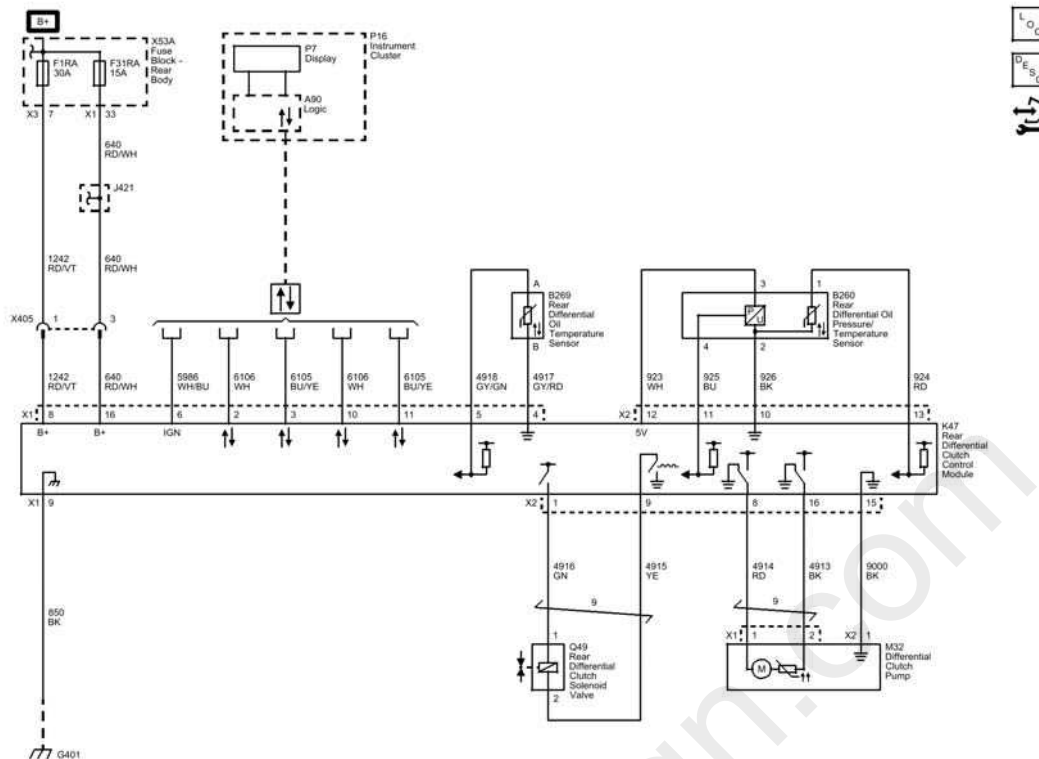


Fig. 1: Electronic Limited-Slip Rear Axle (G96)
 Courtesy of GENERAL MOTORS COMPANY

VISUAL IDENTIFICATION

REAR AXLE IDENTIFICATION

Rear Axle Identification

1	GM 8-Digit Part Number
2	Revision Level
3	Vehicle Partitioning Product Structure (VPPS) Code
4	DUNS Number
5	Trace Code
6	8-Digit Unique Serial Number
7	Julian Date
8	Manufactured/Assembled Date
9	Plant and Shift Identifier
10	Data Identifier
11	2D Bar Code
12	Gear OD/Ratio/Differential Type

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC C0393</u>	DTC C0393 Rear Differential Clutch Solenoid Valve Control Circuit
<u>DTC C0394</u>	DTC C0394 Rear Differential Clutch Temperature Sensor Circuit
<u>DTC C0407</u>	DTC C0407 Differential Oil Pump Motor
<u>DTC C0411</u>	DTC C0411 Rear Differential Pressure Sensor Circuit
<u>DTC C0412</u>	DTC C0412 Rear Differential Sump Temperature Sensor Circuit
<u>DTC C0413</u>	DTC C0413 Rear Differential Hydraulic System Bleed Not Performed
<u>DTC C0414</u>	DTC C0414 Rear Differential Hydraulic System
<u>DTC C0418</u>	DTC C0418 Rear Drive Clutch Classification Not Programmed
<u>DTC C0870</u>	DTC C0870 Control Module Voltage Reference Output Circuit

DTC C0393: REAR DIFFERENTIAL CLUTCH SOLENOID VALVE CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0393

Rear Differential Clutch Solenoid Valve Control Circuit

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1	C0393 02	C0393 04	C0393 01	-
Control - Terminal 2	C0393 02	C0393 04	C0393 01	-

Circuit/System Description

The rear differential clutch solenoid valve is an electro-hydraulic valve used to relieve pressure in the hydraulic system for safety reasons. When the valve is energized, the valve is closed and hydraulic pressure can be accumulated. When the valve is de-energized, the valve is open and it is not possible to build hydraulic pressure.

Conditions for Running the DTC

- The engine is running.
- Battery voltage is between 9-16 V.
- DTC C0800 is not current.

Conditions for Setting the DTC

C0393 01

- At initialization, the rear differential clutch solenoid valve has a duty cycle of 0 for 10 ms.
- The low side voltage monitor signal is greater than 86% of battery voltage.
- The high side voltage monitor signal is greater than 85% of battery voltage.

OR

- The low side of the field-effect transistor current is greater than 18.6 A.

OR

- The low side of the field-effect transistor duty cycle is greater than 20% for 10 ms.
- The low side voltage monitor is greater than 85% of battery voltage.

C0393 02

- At initialization, the rear differential clutch solenoid valve has a duty cycle of 0 for 10 ms.
- The low and high side voltage monitor signal is less than 5% of battery voltage.

OR

- The rear differential clutch solenoid valve has a duty cycle less than 80%.
- The low side voltage monitor signal is less than 15% of battery voltage.
- The high side hardware status voltage monitor signal is greater than 4.76 V.
- The duty cycle is stable for 10 ms.

C0393 04

- The rear differential clutch solenoid valve has a constant duty cycle of 20-80% for 10 ms.
- The low side voltage monitor signal is less than 15% of battery voltage.
- The high side status signal is less than 0.30 V.
- The solenoid valve current is less than 0.423 A.

C0393 61

- A stuck solenoid valve is detected.

Action Taken When the DTC Sets

One or more of the following actions may occur:

- The electronic limited slip system is disabled for the duration of the key cycle.
- Service Rear Axle will be displayed in the driver information center.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Verify that DTC C0393 61 is not set.
 - **If the DTC is set.**
 1. Verify that DTC C0393 61 is not set.
 - if DTC is set, test or replace the Q49 Rear Differential Clutch Solenoid Valve. Refer to Component Testing.
 - **If the DTC is not set**
 2. All OK.
2. Ignition OFF, disconnect the harness connector at the Q49 Rear Differential Clutch Solenoid Valve.
3. Connect a test lamp between the control circuit terminal 1 and ground, ignition ON.
4. Verify the test lamp turns ON and OFF when commanding the Rear Differential Clutch Solenoid Valve between 0% and 10%.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
 2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K47 Rear Differential Clutch Control Module.
 - **If the test lamp is always OFF**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If the test lamp turns ON and OFF**
5. Connect a test lamp between the control circuit terminal 1 and control circuit terminal 2.
6. Verify the test lamp get progressively brighter when commanding the Rear Differential Clutch Solenoid

Valve between 0% and 100%.

- **If the test lamp does not get progressively brighter**

1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
2. Test for less than 1 V between the control circuit terminal 2 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V.
3. Test for infinite resistance between the control circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
4. Test for less than 2 ohms in the control circuit terminal 2 end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.

- **If the test lamp does get progressively brighter**

7. Replace the Q49 Rear Differential Clutch Solenoid Valve.

Component Testing

1. Ignition OFF, disconnect the harness at the Q49 Rear Differential Clutch Solenoid Valve.
2. Test for 8-10 ohms between the control terminal 1 and the control terminal 2.
 - **If not between 8-10 ohms**

Replace the Q49 Rear Differential Clutch Solenoid Valve.
 - **If between 8-10 ohms**
3. Test for infinite resistance between each terminal and the Q49 Rear Differential Clutch Solenoid Valve case.
 - **If not infinite resistance**

Replace the Q49 Rear Differential Clutch Solenoid Valve.
 - **If infinite resistance**
4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Limited Slip Differential Clutch Valve Replacement (226mm eLSD)**
- **Control Module References** for rear differential clutch control module replacement, programming, and setup

DTC C0394: REAR DIFFERENTIAL CLUTCH SOLENOID VALVE CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0394

Rear Differential Clutch Temperature Sensor Circuit

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	C0394 06	C0394 08	C0394 05	C0394 08
Low Reference	-	C0394 08	-	-

Circuit/System Description

The rear differential oil temperature sensor is a 2-wire negative temperature co-efficient thermistor. The sensor is mounted on the eLSD housing and outputs a voltage that represents the physical temperature of the rear differential fluid. A low reference and signal circuits enable the sensor to operate.

Conditions for Running the DTC

- The engine is running.
- DTC C0870 is not current.

Conditions for Setting the DTC

C0394 05

The rear differential oil temperature sensor signal voltage is greater than or equal to 4.88 V.

C0394 06

The rear differential oil temperature sensor signal voltage is less than or equal to 0.126 V.

C0394 08

The rear differential oil temperature sensor signal voltage is between 4.88-4.28 V.

OR

The rear differential oil temperature sensor signal voltage is between 0.21-0.126 V.

Action Taken When the DTC Sets

The drivers information center may display Service Rear Axle.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B269 Rear Differential Oil Temperature Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal B and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control

Module.

2. Test for less than 2 ohms in the low reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Verify the scan tool Rear Differential Oil Sump Temperature Sensor parameter is greater than 4.0 V.
 - **If 4.0 V or less**
 1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the signal circuit terminal A and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K47 Rear Differential Clutch Control Module.
 - **If greater than 4.0 V**
5. Install a 3 A fused jumper wire between the signal circuit terminal A and the low reference circuit terminal B.
6. Verify the scan tool Rear Differential Oil Sump Temperature Sensor parameter is less than 1.0 V.
 - **If 1.0 V or greater**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF
 4. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If less than 1.0 V**
7. Test or replace the B269 Rear Differential Oil Temperature Sensor.

Component Testing

1. Ignition OFF, disconnect the harness connector at the B269 Rear Differential Oil Temperature Sensor.
2. Test for 12.6K-900 ohms between the signal terminal A and the low reference circuit terminal B.
 - **If not between 12.6K-900 ohms**

Replace the B269 Rear Differential Oil Temperature Sensor.
 - **If between 12.6K-900 ohms**
3. Test for infinite resistance between each terminal and the sensor housing/case.

- **If less than infinite resistance**

Replace the B269 Rear Differential Oil Temperature Sensor.

- **If infinite resistance**

4. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Differential Temperature Sensor Replacement (226mm eLSD)**.
- **Control Module References** for rear differential clutch control module replacement, programming, and setup.

DTC C0407: DIFFERENTIAL OIL PUMP MOTOR

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0407

Differential Oil Pump Motor

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1	C0407 02	C0407 04	C0407 01	-
Control - Terminal 2	C0407 02	C0407 04	C0407 01	-

Circuit/System Description

The pressure in the hydraulic circuit is controlled by the differential clutch pump. The differential clutch pump utilizes a brushed motor and a radial piston pump. The motor in the differential clutch pump is controlled utilizing a bi-directional control that applies power and ground to each control circuit. By reversing the polarity of the motor, the differential clutch pump is able to spin both clockwise and counter-clockwise as a means to increase and decrease pressure in the system. The differential clutch pump is constantly increasing or decreasing the pressure in the system according to the torque request signal as controlled by the rear differential clutch

control module.

Conditions for Running the DTC

C0407 01, C0407 02, C0407 04, C0407 61

- The engine is running.
- Operating temperature range 0-140°C (32-284°F).
- DTC C0800 is not current.
- The differential clutch pump is active.

C0407 54

- The engine is running.
- Operating temperature range 0-140°C (32-284°F).
- DTC C0800 is not current.

Conditions for Setting the DTC

C0407 01

When rotating clockwise, the differential clutch pump current on the high control circuit is excessive and the low control circuit current is less than 50% of the high control current.

OR

When rotating counter-clockwise, the differential clutch pump current on the low control circuit is excessive and the high control circuit current is less than 50% of the low control current.

C0407 02

When rotating clockwise, the differential clutch pump current on the low control circuit is excessive and the high control circuit current is less than 90% of the low control current.

OR

When rotating counter-clockwise, the differential clutch pump current on the high control circuit is excessive and the low control circuit current is less than 90% of the high control current.

C0407 04

The differential clutch pump current is less than 0.207 A.

C0407 54

The differential clutch pump motor calculated temperature is greater than 140°C (284°F).

C0407 61

The rear differential clutch control module determines the differential clutch pump is stuck.

Action Taken When the DTC Sets

- Electronic limited slip is disabled
- Symptom bytes 01, 02, 04, and 61 will display the SERVICE REAR AXLE message in the driver information center.
- Symptom byte 54 will display the REAR AXLE DISABLED message in the driver information center.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.
- The DTC is not detected in 40 consecutive ignition cycles.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify that DTC C0407 with symptom byte 01, 02 or 04 is not set.
 - **If the DTC is set**

Refer to Circuit/System Testing.

- **If the DTC is not set**

2. Verify the differential clutch oil level is correct. Refer to **Differential Clutch Oil Inspection (226mm eLSD)**.

- **If the differential clutch fluid level is below specifications**

1. Verify the rear axle lubricant level is correct. Refer to **Rear Axle Lubricant Level Inspection (226mm eLSD)**, **Rear Axle Lubricant Level Inspection (195mm Axle)**.

NOTE: If the vehicle is unable to complete the rear differential hydraulic system service fill/bleed procedure, the M32 Differential Clutch Pump may have been damaged by the low differential clutch fluid level.

- If the rear axle lubricant level is above specifications, the differential clutch may be leaking differential clutch oil into the rear axle lubricant. Inspect for and correct any internal fluid leaks between the differential clutch oil and the rear axle lubricant. After the repair has been completed, perform the **Rear Differential Hydraulic System Service Fill/Bleed**.
 - If the rear axle lubricant level is below specifications, inspect for fluid leaks and fill as required.
 - If the rear axle lubricant level is correct.
2. Verify there are no external differential clutch oil leaks.
 - If any external differential clutch oil leaks are observed, repair as necessary and perform the **Rear Differential Hydraulic System Service Fill/Bleed**.
 - If there are there are no external differential clutch oil leaks.
 3. Perform the **Rear Differential Hydraulic System Service Fill/Bleed** procedure.
 4. Verify the vehicle is able to complete the rear differential hydraulic system service fill/bleed procedure.
 - If the vehicle is unable to complete the rear differential hydraulic system service fill/bleed procedure, test or replace the M32 Differential Clutch Pump.
 - If the vehicle is able to complete the rear differential hydraulic system service fill/bleed procedure.
 5. Clear all DTCs.
 6. Verify the DTC does not set while operating the vehicle within the conditions for running the DTC.
 - If the DTC sets, test or replace the M32 Differential Clutch Pump.
 - If the DTC does not set.
 7. All OK.
 - **If the differential clutch fluid level is correct**
3. Perform the **Rear Differential Hydraulic System Service Fill/Bleed**.
 4. Verify the vehicle is able to complete the rear differential hydraulic system service fill/bleed procedure.
 - If the vehicle is unable to complete the rear differential hydraulic system service fill/bleed procedure, perform the **Rear Differential Hydraulic System Service Fill/Bleed** two additional

times. If the vehicle is unable to complete the rear differential hydraulic system service fill/bleed procedure after three attempts, replace the M32 Differential Clutch Pump.

- If the vehicle is able to complete the rear differential hydraulic system service fill/bleed procedure.

5. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
2. Test for less than 1 V between each control circuit terminal listed below and ground:
 - Terminal 8
 - Terminal 16
 - **If 1 V or greater**
 1. Ignition OFF, disconnect the X1 harness connector at the M32 Differential Clutch Pump.
 2. Test for less than 1 V between each control circuit terminal listed below and ground:
 - Terminal 8
 - Terminal 16
 - If 1 V or greater, repair the short to voltage on the circuit.
 - **If less than 1 V**
3. Ignition OFF, connect the X2 harness connector at the K47 Rear Differential Clutch Control Module and disconnect the X1 harness connector at the M32 Differential Clutch Pump, ignition ON.
4. Verify a test lamp illuminates between each control circuit terminal listed below and ground:
 - Terminal 1
 - Terminal 2
 - **If the test lamp does not illuminate**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms on the control circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance on the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If the test lamp illuminates**
5. Connect a test lamp between the control circuit terminal 1 and the control circuit terminal 2.
6. Verify the test lamp increases in brightness when commanding the Pump Motor from 0% to 100% with a scan tool.
 - **If the test lamp does not increase in brightness**

Replace the K47 Rear Differential Clutch Control Module.

- If the test lamp increases in brightness
7. Test or replace the M32 Differential Clutch Pump.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Differential Clutch Pump Replacement (226mm eLSD)**
- **Control Module References** for rear differential clutch control module replacement, programming and setup.

DTC C0411: REAR DIFFERENTIAL CLUTCH SOLENOID VALVE CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0411

Rear Differential Pressure Sensor Circuit

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	C0870 03	C0411 08	C0870 07	-
Signal	C0411 06	C0411 08	C0411 05	C0411 08
Low Reference	-	C0411 08, C0412 08	-	-

Circuit/System Description

The rear differential pressure sensor is used for closed-loop control of the hydraulic pressure. The sensor is a three wire circuit that consists of a 5 V reference, low reference, and signal low circuit and outputs a voltage that represents the physical pressure within the hydraulic circuit piston cavity. It also includes an integrated temperature sensor.

Conditions for Running the DTC

- The engine is running.

- DTC C0870 is not current, except for DTC C0411 05

Conditions for Setting the DTC

C0411 05

The rear differential pressure sensor signal voltage is greater than or equal to 4.884 V.

C0411 06

The rear differential pressure sensor signal voltage is less than or equal to 0.122 V.

C0411 08

An invalid signal is detected on the rear differential pressure sensor if the signal voltage is greater than or equal to 4.731 V and less than 4.884 V.

OR

An open signal is detected on the rear differential pressure sensor if the signal voltage is greater than 0.122 V and less than or equal to 0.431 V.

OR

An open low reference is detected on the rear differential pressure sensor if the signal voltage is between 4.352-4.73 V.

C0411 5A

A plausibility error is detected on the pressure sensor signals.

Action Taken When the DTC Sets

No indicator light or driver information center message. System will operate as normal.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Diagnostic Aids

DTC C0411 will not set for too low or high differential pressure.

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Rear Differential Oil Pressure Sensor parameter is 0.405-0.72 V
 - **If not between 0.405-0.72 V.**

Refer to Circuit/System Testing.
 - **If between 0.405-0.72 V.**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B260 Rear Differential Oil Pressure/Temperature Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 2 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for less than 2 ohms in the low reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.

- **If less than 10 ohms**
- 3. Ignition ON.
- 4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 3 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X2 harness connector at the 47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 ohms in the 5 V reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
 2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K47 Rear Differential Clutch Control Module.
 - **If between 4.8-5.2 V**
- 5. Verify the scan tool Rear Differential Oil Pressure Sensor parameter is greater than 4.0 V.
 - **If 4.0 V or less**
 1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the signal circuit terminal 4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K47 Rear Differential Clutch Control Module.
 - **If greater than 4.0 V**
- 6. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the low reference circuit terminal 2.
- 7. Verify the scan tool Rear Differential Oil Pressure Sensor parameter is less than 1.0 V.
 - **If 1.0 V or greater**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit terminal 4 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF
 4. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
- 8. Test or replace the B260 Rear Differential Oil Pressure/Temperature sensor.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Transmission Fluid Pressure Sensor Replacement (226mm eLSD)**
- **Control Module References** for rear differential clutch control module replacement, programming, and setup.

DTC C0412: REAR DIFFERENTIAL SUMP TEMPERATURE SENSOR CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0412

Rear Differential Sump Temperature Sensor Circuit

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	C0412 06	C0412 08	C0412 05	C0412 08
Low Reference	-	C0411 08, C0412 08	-	-

Circuit/System Description

The rear differential clutch hydraulic temperature sensor outputs a voltage that represents the physical temperature of the rear differential clutch hydraulic fluid.

Conditions for Running the DTC

- The engine is running.
- DTC C0870 is not current.

Conditions for Setting the DTC

C0412 05

The rear differential oil pressure/temperature sensor signal voltage is greater than or equal to 4.88 V.

C0412 06

The rear differential oil pressure/temperature sensor signal voltage is less than or equal to 0.123 V.

C0412 08

The rear differential oil pressure/temperature sensor signal voltage is greater than to 1.89 V and less than 4.88 V.

OR

The rear differential oil pressure/temperature sensor signal voltage is greater than to 0.123 V and less than 0.66 V.

Action Taken When the DTC Sets

No indicator light or driver information center message. System will operate as normal.

Conditions for Clearing the DTC

- The condition for the DTC is no longer present.
- The DTC is not detected in 40 consecutive drive cycles.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**

- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B260 Rear Differential Oil Pressure/Temperature Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 2 and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for less than 2 ohms in the low reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Verify the scan tool Rear Differential Pump Temperature Sensor parameter is greater than 4.0 V.
 - **If 4.0 V or less**
 1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K47 Rear Differential Clutch Control Module.
 - **If greater than 4.0 V**
5. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the low reference circuit terminal 2.
6. Verify the scan tool Rear Differential Pump Temperature Sensor parameter is less than 1.0 V.
 - **If 1.0 V or greater**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 - 3. Ignition OFF
 - 4. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.

- **If less than 1.0 V**

7. Test or replace the B260 Rear Differential Oil Pressure/Temperature Sensor.

Component Testing

1. Ignition OFF, disconnect the harness at the B260 Rear Differential Oil Pressure/Temperature sensor.
2. Test for 1.44K-2.43K ohms between the signal circuit terminal 1 and the low reference circuit terminal 2.
 - **If not between 1.44K-2.43K ohms**

Replace the B260 Rear Differential Oil Pressure/Temperature sensor.

- **If between 1.44K-2.43K ohms**

3. Test for infinite resistance between each control circuit terminal listed below and the sensor housing/case:
 - Terminal 1
 - Terminal 2
 - **If not infinite resistance**

Replace the B260 Rear Differential Oil Pressure/Temperature sensor.

- **If infinite resistance**

4. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Transmission Fluid Pressure Sensor Replacement (226mm eLSD)**.
- **Control Module References** for rear differential clutch control module replacement, programming, and setup.

DTC C0413: REAR DIFFERENTIAL HYDRAULIC SYSTEM BLEED NOT PERFORMED

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptors

DTC C0413

Rear Differential Hydraulic System Bleed Not Performed

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

The rear differential clutch control module detects if the initial bleed routine has not been performed correctly. No external circuit diagnosis is involved.

Conditions for Running the DTC

- The engine is running.
- DTC C0800 is not current.

Conditions for Setting the DTC

- The rear differential clutch control module detects that the service bleed has not been performed.

OR

- A re-flash of the rear differential clutch control module has been performed.

OR

- The service bleed has not been performed after a new rear differential clutch control module was installed.

Action Taken When the DTC Sets

- The electronic limited slip control is disabled.
- REAR AXLE DISABLED will be displayed in the driver information center.

Conditions for Clearing the DTC

- The rear differential clutch control module clears the history DTC when a current DTC is not detected in 40 ignition cycles.
- The condition for the DTC is no longer present.

Reference Information

Schematic Reference

Differential Lock Schematics.

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN .

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation

(RPO G96).

Electrical Information Reference

- **Circuit Testing** .
- **Testing for Intermittent Conditions and Poor Connections** .
- **Wiring Repairs** .
- **Connector Repairs**

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0413 is not set.
 - **If the DTC is set**
 1. Perform the Rear Differential Hydraulic System Service Bleed procedure with a scan tool. Refer to **Rear Differential Hydraulic System Service Fill/Bleed**.

NOTE: **The Rear Differential Clutch Control Module can run this procedure up to 3 attempts to get a Pass.**

- 2.
3. Verify DTC C0413 is not set.
 - If the DTC is set, verify there are no internal/external leaks or mechanical damages and that all differential fluid levels are at the proper levels. Refer to **Rear Axle Lubricant Level Inspection (226mm eLSD)**, **Rear Axle Lubricant Level Inspection (195mm Axle)**, and **Differential Clutch Oil Inspection (226mm eLSD)**.
 - If no internal/external leaks or mechanical damage is found, replace the K4 7Rear Differential Clutch Control Module.
 - If the DTC is not set
4. All OK.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair

- **Control Module References** for rear differential clutch control module replacement, programming, and setup.

DTC C0414: REAR DIFFERENTIAL HYDRAULIC SYSTEM

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0414

Rear Differential Hydraulic System

For symptom byte information, refer to **Symptom Byte List**

Circuit/System Description

The rear differential clutch control module monitors the amount of torque transferred through the rear axle. If there is a mechanical malfunction that inhibits the torque transfer process the module will then set DTC C0414.

Conditions for Running the DTC

- The engine is running.
- DTC C0800 is not current.

Conditions for Setting the DTC

A mechanical malfunction exists that inhibits the torque transfer process.

Action Taken When the DTC Sets

One or more of the following actions may occur:

Electronic limited slip is disabled.

C0414 54

The REAR AXLE DISABLED message is displayed in the drivers information center.

C0414 58

The SERVICE REAR AXLE message is displayed in the drivers information center.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present.

- The DTC is not detected in 40 consecutive ignition cycles.

Diagnostic Aids

Excessive differentiation (wheel/tire slip) can cause high temperatures in the rear drive axle and DTC C0414 may set.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Engine running and vehicle stationary.
2. Verify the scan tool Rear Differential Clutch Status parameter is not Temporarily Limited.
 - **If Temporarily Limited**
 1. Verify that DTC C0393, C0403, C0407, or C0411 is not set.
 - If any of the DTCs are set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - If none of the DTCs are set
 2. Verify there are no internal/external leaks or mechanical damage and that all differential fluid levels are at the proper levels. Refer to **Rear Axle Lubricant Level Inspection (226mm eLSD)**, **Rear Axle Lubricant Level Inspection (195mm Axle)**, and **Differential Clutch Oil Inspection (226mm eLSD)**.

- If internal/external leaks or mechanical damage is found, repair as necessary.
- If no internal/external leaks or mechanical damage is found.
- 3. Clear DTCs and road test the vehicle.
- 4. Verify that DTC C0414 is not set.
 - If the DTC is set, replace the rear differential assembly.
 - If the DTC is not set
- 5. All OK.
 - **If not Temporarily Limited**
- 3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

Limited Slip Differential Clutch Replacement (226mm eLSD)

DTC C0418: REAR DRIVE CLUTCH CLASSIFICATION NOT PROGRAMMED

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provide an overview of each diagnostic category.

DTC Descriptors

DTC C0418

Rear Drive Clutch Classification Not Programmed

For symptom byte information, refer to **Symptom Byte List** .

Circuit/System Description

The rear differential clutch control module detects if the initial clutch classification calibration procedure has not been performed or has not been performed correctly. No external circuit diagnosis is involved.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

The rear differential clutch control module detects that the clutch classification has not been programmed.

Action Taken When the DTC Sets

- The electronic limited slip control is disabled.
- Service Rear Axle will be displayed in the driver information center.

Conditions for Clearing the DTC

- The rear differential clutch control module clears the history DTC when a current DTC is not detected in 40 ignition cycles.
- The condition for the DTC is no longer present.

Reference Information

Schematic Reference

Differential Lock Schematics.

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN .

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96).

Electrical Information Reference

- Circuit Testing .
- Testing for Intermittent Conditions and Poor Connections .
- Wiring Repairs .
- Connector Repairs

Scan Tool Reference

Control Module References for scan tool information.

Diagnostic Aids

- The clutch service calibration will be the last two alphanumeric characters of the supplier assigned unique serial number found etched/stamped on the clutch pack housing. The characters must be entered exactly how it appears etched/stamped on the clutch pack housing.

NOTE: When entering the two alphanumeric characters into the scan tool, be sure to enter the characters in uppercase.

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Circuit/System Verification

1. Ignition ON.
2. Verify that DTC C0418 is not set.
 - **If the DTC is set**
 1. Perform the rear differential clutch classification calibration procedure. Refer to **Rear Differential Clutch Control Module Calibration**.
 2. Verify the Rear Differential Clutch Factory Calibration parameter has stored the value used during the Rear Differential Clutch Service Calibration Setup.
 3. Perform key cycle, ignition OFF then ON.
 - If the Rear Differential Clutch Factory Calibration parameter has not stored the value used during the Rear Differential Clutch Service Calibration Setup, replace the K47 Rear Differential Clutch Control Module.
 - If the Rear Differential Clutch Factory Calibration parameter has stored the value used during the Rear Differential Clutch Service Calibration Setup.
 4. Verify DTC C0418 is not set.
 - If the DTC is set, replace the K47 Rear Differential Clutch Control Module.
 - If the DTC is not set
 5. All OK.
 - **If the DTC is not set**
3. All OK.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair

Control Module References for rear differential clutch control module replacement, programming, and setup.

DTC C0870: CONTROL MODULE VOLTAGE REFERENCE OUTPUT CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC C0870

Control Module Voltage Reference Output Circuit

For symptom byte information, refer to **Symptom Byte List**

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	C0870 03	C0411 08	C0870 07	-
Signal	C0411 06	C0411 08	C0411 05	C0411 08
Low Reference	-	C0394 08, C0411 08	-	-

Circuit/System Description

The rear differential clutch control module provides a common regulated 5 volt reference to the rear differential oil pressure/temperature sensor. The rear differential clutch control module monitors this power supply for a malfunction that could prevent it from correctly regulating the supply voltage.

Conditions for Running the DTC

- The engine is running
- DTC C0800 is not set

Conditions for Setting the DTC

C0870 03

5 volt reference circuit is less than 4.75 V.

C0870 07

5 volt reference circuit is greater than 5.25 V.

Action Taken When the DTC Sets

- The electronic limited slip differential becomes inoperative.
- The rear differential clutch control module sends a message to the instrument cluster to display SERVICE REAR AXLE message.

Conditions for Clearing the DTC

- A history DTC will clear after 40 consecutive ignition cycles if the condition for the malfunction is no longer present.
- The rear differential clutch control module senses the correct sensor supply voltage.

Reference Information

Schematic Reference

Differential Lock Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

Control Module References scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool 5 V Reference parameter is 4.8-5.2 V.
 - **If not between 4.8-5.2 V.**

Refer to Circuit/System Testing

- **If between 4.8-5.2 V.**
3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at B260 Rear Differential Oil Pressure/Temperature Sensor. Ignition ON.
2. Test for 4.8-5.2 V between the 5 V reference circuit terminal 3 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X2 harness connector at the K47 Rear Differential Clutch Control Module.
 2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance

3. Test to less than 2 ohms in the 5 V reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K47 Rear Differential Clutch Control Module.
 - **If greater than 5.2 V**
1. Ignition OFF, disconnect the harness connector at the K47 Rear Differential Clutch Control Module, ignition ON.
2. Test for less than 1 V between the 5 V reference circuit and ground
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K47 Rear Differential Clutch Control Module.
 - **If between 4.8-5.2 V**
3. Test or replace the B260 Rear Differential Oil Pressure/Temperature sensor.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Transmission Fluid Pressure Sensor Replacement (226mm eLSD)**
- **Control Module References** for rear differential clutch control module replacement, programming and setup.

SYMPTOMS - LOCKING/LIMITED SLIP REAR AXLE

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **Limited Slip Differential Description and Operation**, **Limited Slip Differential Description and Operation (RPO G96)**.

Visual/Physical Inspection

- Inspect the system for the following:
 - Loose or missing fasteners
 - Obvious damage or conditions which may cause the symptom
- Check the system for proper operation. Refer to **Limited Slip Differential Diagnosis**.

Symptom List

Refer to the following diagnostic procedure **Limited Slip Differential Chatters in Turns**.

SYMPTOMS - REAR DRIVE AXLE

Review the system and operation in order to familiarize yourself with the system functions. Refer to **Differential Carrier Assembly Description**.

Rear Axle Noise

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

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

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

Driveline noises may confuse even the best technician. Vehicle noises coming from tires, transmission, propeller shaft, universal joints, and front or rear wheel bearings are often mistaken for axle noise.

Visual/Physical Inspection

- Inspect the system for loose or missing fasteners.
- Inspect the system for leaking components.
- Inspect the system for obvious damage or conditions which may cause the symptom.

Symptom List

Refer to a system diagnostic procedure from the following list in order to diagnose the symptom:

- **Rear Drive Axle Noises**
- **Noisy in Drive**
- **Noisy When Coasting**
- **Intermittent Noise**
- **Constant Noise**
- **Noisy on Turns**
- **Rear Axle Lubricant Leak Diagnosis**

REAR DRIVE AXLE NOISES

Gear Noise

Gear noise or whine is audible from 32-89 km/h (20-55 mph) under 4 driving conditions:

- Drive- Acceleration or heavy pull
- Road Load-Vehicle driving load or constant speed
- Float-Using enough throttle to keep the vehicle from driving the engine, the vehicle slows down gradually but the engine still pulls slightly

- Coast-Throttle is closed and the vehicle is in gear

Gear noise most frequently has periods where the noise is more prominent, usually between 48-64 km/h (30-40 mph) and 80-85 km/h (50-53 mph). Gear whine is corrected by either ring and pinion gear replacement or adjustment, depending on the mileage of the gearset.

Bearing Noise

Faulty bearings produce a rough growl or grating sound, rather than the whine typical of gear noise. Bearing noise/hum will pulsate at a constant vehicle speed. This indicates a bad pinion or a bad rear axle side bearing. This noise can be confused with rear wheel bearing noise. Inspect and replace the bearings and the affected components as required.

Rear Wheel Bearing Noise

A rough rear wheel bearing produces a noise which continues with the car coasting at low speed and the transmission in neutral. The noise may diminish some when the brakes are gently applied. The noise may also change when performing side-to-side maneuvers with the vehicle.

A rough/noisy rear wheel bearing can be heard by spinning the rear wheels by hand and listening at the hubs for the noise. Inspect and replace the bearings and the affected components as needed.

Knock at Low Speeds

A low speed knock can be caused by a differential case side gear bore that has worn oversize. Inspect the side gears and differential case and replace the components as necessary.

Backlash Clunk

Excessive backlash clunk under acceleration or deceleration can be caused by any of the following:

- Worn differential pinion shaft
- Worn differential pinion and/or side gear teeth
- Worn thrust washers
- Excessive clearance between the side gears and the axle shafts
- Excessive clearance between differential side gears and the bore in the case
- Excessive drive pinion and ring gear backlash

Inspect, adjust or replace the affected components as necessary.

NOISY IN DRIVE

Noisy in Drive

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> , <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u> .	

Transmission noise	Repair or replace as required. Refer to <u>Transmission Replacement (LTG)</u> , <u>Transmission Replacement (LFX)</u> , or <u>Transmission Replacement</u> .
Worn axle shaft constant velocity joints	NOTE: The outer joint is serviceable. If the inner joint is worn or damaged the entire wheel drive shaft must be replaced. Replace the constant velocity joints as required. Refer to <u>Rear Wheel Drive Shaft Outer Joint and Boot Replacement</u> , for the outer joint or <u>Rear Wheel Drive Shaft Replacement (LFX,LF3)</u> , <u>Rear Wheel Drive Shaft Replacement (LTG)</u> for the inner joint
Worn, loose, or damaged axle mount and/or bracket	Repair or replace the axle mount and/or bracket as required.
Bearing noise within the differential assembly	A grinding or roar type noise will increase or decrease relative to the vehicle speed. 1. Check for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. 2. If the noise continues, replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>, <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.
Gear set whine noise within the differential assembly	A whine type noise will increase or decrease relative to the vehicle speed, approximately 80-96 km/h (50-60 mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth. 1. Check for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. 2. If the noise continues, replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>, <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.

NOISY WHEN COASTING

Noisy When Coasting

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Cause	Correction
IMPORTANT: Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>.	
Worn axle shaft constant velocity joints	NOTE: The outer joint is servicable. If the inner joint is worn or damaged the entire wheel drive shaft must be replaced. Replace the constant velocity joints as required. Refer to <u>Rear Wheel Drive Shaft Outer Joint and Boot Replacement</u> , for the outer joint or <u>Rear Wheel Drive Shaft Replacement (LFX,LF3)</u> , <u>Rear Wheel Drive Shaft Replacement (LTG)</u> for the inner joint
Worn, loose, or damaged axle mount and/or bracket	Repair or replace the axle mount and/or bracket as required.
Bearing noise within the differential assembly	A grinding or roar type noise will increase or decrease relative to the vehicle speed. 1. Check for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. 2. If the noise continues, replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>, <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.
Gear set whine noise within the differential assembly	A whine type noise will increase or decrease relative to the vehicle speed, approximately 80-96 km/h (50-60 mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth. 1. Check for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. 2. If the noise continues, replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>, <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.

INTERMITTENT NOISE

Intermittent Noise

Cause	Correction
IMPORTANT: Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> , <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u> .	
Worn, loose, or damaged axle mount and/or bracket	Repair or replace the axle mount and/or bracket as required.
Incorrect gear oil	Replace with the correct gear oil and friction modifier additive. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> .

CONSTANT NOISE

Constant Noise

Cause	Correction
IMPORTANT: Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> , <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u> .	
DEFINITION: A noise heard in the rear axle during all driving conditions. This noise may increase or decrease in volume based on different driving maneuvers and speeds.	
Low gear oil levels	Faulty oil seals or other type leaks may contribute to lower than required fluid levels. Refer to <u>Rear Axle Lubricant Leak Diagnosis</u> . Fill to the proper level with the correct gear oil and friction modifier additive. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> , and <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> , <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u> .
Worn, loose, or damaged axle mount and/or bracket	Repair or replace the axle mount and/or bracket as required.
Bearing noise within the differential assembly	A grinding or roar type noise will increase or decrease relative to the vehicle speed. 1. Check for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. 2. If the noise continues, replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>, <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.
Gear set whine noise within the differential assembly	A whine type noise will increase or decrease relative to the vehicle speed, approximately 80-96 km/h (50-60

mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth.

1. Check for the proper fluid level. Refer to **Rear Axle Lubricant Level Inspection (226mm eLSD)**, **Rear Axle Lubricant Level Inspection (195mm Axle)**.
2. If the noise continues, replace the differential carrier assembly. Refer to **Differential Carrier Assembly Replacement (226mm eLSD)**, **Differential Carrier Assembly Replacement (195mm Axle)**.

NOISY ON TURNS

Noisy on Turns

Cause	Correction
IMPORTANT: • Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>, <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. • Operate the vehicle turning in tight circles in both left and right directions. A chatter type concern may indicate an incorrect type gear oil, lack of the friction modifier additive, or worn friction discs and/or plates.	
DEFINITION: A noise is present only when the vehicle turns.	
Worn or loose rear axle mount and/or bracket	Repair or replace as required.
Worn axle shaft constant velocity joints	Replace the constant velocity joints as required.
Worn wheel bearings	Replace the wheel bearings as required.
Incorrect gear oil	Fill to the proper level with the correct gear oil and friction modifier additive. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> , and <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> , <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u> .

REAR AXLE LUBRICANT LEAK DIAGNOSIS

Rear axle lubricant leaks can occur at the following locations:

- Axle tube to differential carrier housing joint
- Axle shaft oil seal
- Axle housing porosity
- Differential housing cover gasket
- Drain plug

- Fill plug
- Pinion yoke oil seal
- Vent tube

Determining the Cause

While most rear axle leaks may be easy to find, determining the cause may not be. A thorough inspection of the area around the leak may assist in determining the cause of the leak.

Oil Seals

Lubricant leaks from a oil seal may be caused by any of the following:

- An improperly installed seal
- A distorted seal
- A worn seal
- A worn shaft
- A brittle seal lip
- A hardened seal lip

To determine the actual cause of the leak, clean the area around the leak. Observe the area of the leak and determine if the seal or another component is causing the leak. A worn seal surface will cause a leak at the sealing lip while a misaligned seal or a seal installed into a housing with an excessive bore will cause the seal to leak at the outside surface of the seal. Hardened or cracked seal lips usually indicate the axle is operating beyond the normal temperature limits for the axle. A seal whose sealing surface has been nicked or cut may indicate that the shaft has a rough, burred, or gouged surface and will need to be inspected before the seal can be replaced.

Gaskets

A leak at a gasket is usually caused by a poor fit of the components on each side of the gasket surface. Inspect each component for distortion and for nicks or gouges that may prohibit the gasket from sealing properly.

Rear Axle Housing

Rear axle housing lubricant leaks usually occur at the following locations:

- Drain Plug
- Fill Plug

Drain and fill plug leaks are usually caused by a loose plug. These leaks can be repaired by either tightening the plug or by using an approved sealer on the threads on the plug.

Other leaks such as axle tube to differential carrier housing or porosity leaks require the replacement of the rear axle housing.

LIMITED SLIP DIFFERENTIAL DIAGNOSIS

Limited Slip Differential Diagnosis

Step	Action	Values	Yes	No
1	Did you review the general description and perform the necessary inspections?	-	Go to Step 2	Go to <u>Limited Slip Differential Description and Operation, Limited Slip Differential Description and Operation (RPO G96)</u> , and <u>Symptoms - Locking/Limited Slip Rear Axle</u>
2	Measure the rotational force of the axle using the following procedure: 1. Block the front wheels. 2. Place the transmission in Neutral with the parking brake released. 3. Raise the right rear tire off the ground. Confirm the left rear tire remains on the ground. Refer to <u>Lifting and Jacking the Vehicle</u>. 4. Remove the tire and wheel. Refer to <u>Tire and Wheel Removal and Installation</u>. 5. Using the CH-49400 Remover and a digital torque wrench, slowly turn the wheel in the drive direction to obtain a peak measurement of the rotational force of the axle. Check in 90 degree increments for two wheel revolutions to obtain a peak measurement. 6. Repeat the procedure for the other wheel drive shaft. Does the force measure outside the specified range?	218 mm Axle 60-160 (44-118 lb ft)	Go to Step 3	System OK
3	Repair the rear axle. Did you complete the repair?	-	Go to Step 4	-
4	Operate the system in order to verify the repair. Did you correct the condition?	-	System OK	Go to Step 2

LIMITED SLIP DIFFERENTIAL CHATTERS IN TURNS

Limited Slip Differential Chatters in Turns

Checks	Action
Lubricant is contaminated	Drain and flush the axle housing thoroughly. Refill with the correct lubricant. Refer to <u>Differential Oil Replacement (195mm Axle)</u> .
The clutch plates are deteriorated	Replace the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u> , <u>Differential Carrier Assembly Replacement (195mm Axle)</u> .

REPAIR INSTRUCTIONS

REAR DIFFERENTIAL CLUTCH CONTROL MODULE REPLACEMENT (226MM ELSD)

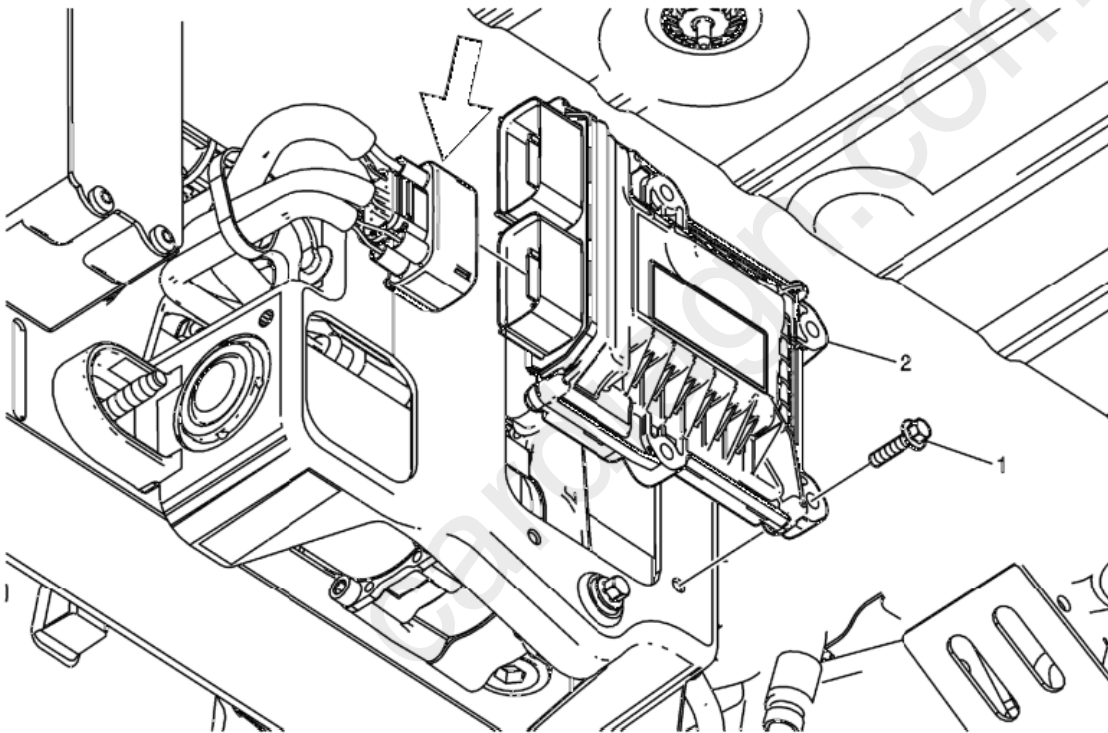


Fig. 3: Rear Differential Clutch Control Module (226mm eLSD)
Courtesy of GENERAL MOTORS COMPANY

Rear Differential Clutch Control Module Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Lift and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Disconnect the wiring harness connector before removal.	
	Rear Differential Clutch Control Module Bolt (Qty: 4)

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten 6 (53 lb in)
2	Rear Differential Clutch Control Module Procedure After the rear differential clutch control module has been replaced it must to be programmed. Refer to <u>Control Module References</u> .

REAR AXLE LUBRICANT LEVEL INSPECTION (226MM ELSD)

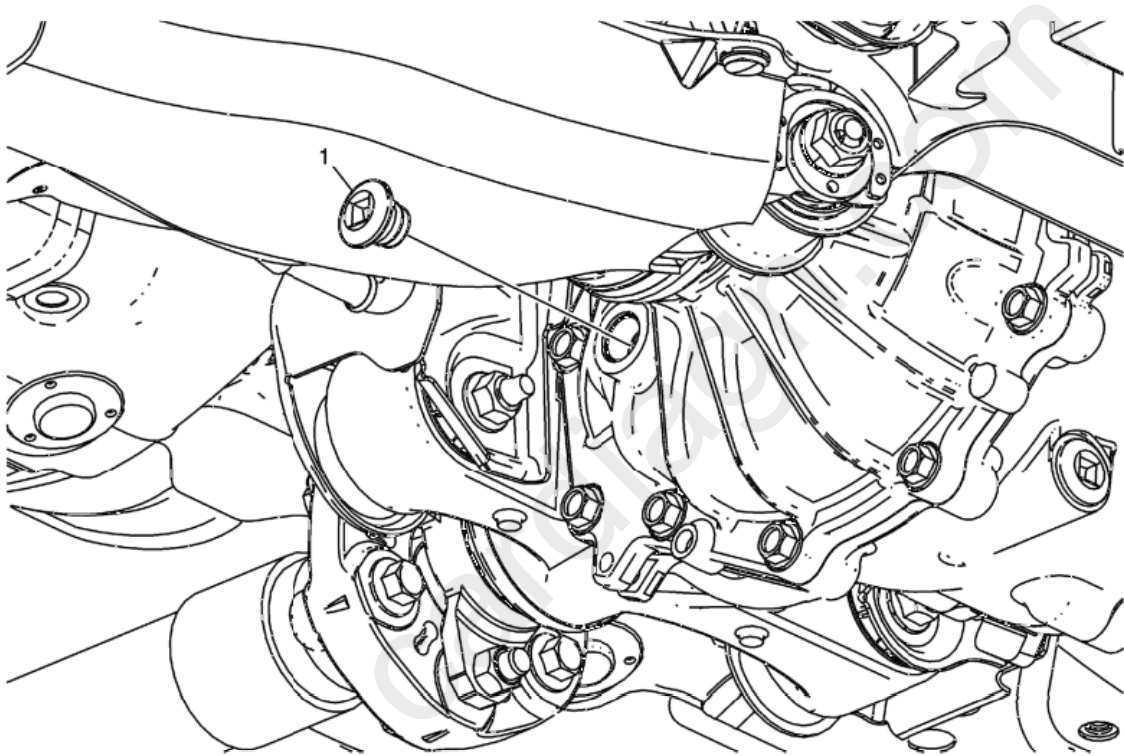


Fig. 4: Rear Axle Lubricant Level Inspection (226mm eLSD)
Courtesy of GENERAL MOTORS COMPANY

Rear Axle Lubricant Level Inspection (226mm eLSD)

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
	Differential Carrier Fill Plug CAUTION: Refer to <u>Fastener Caution</u> .

1	Procedure 1. Clean any dirt from around the differential fill plug. 2. Remove the fill plug (1) from the differential. 3. Check the differential fluid level. it should be even with the bottom of the fill plug hole to no lower than 6 mm (0.25 in) below the opening. 4. Add new fluid if necessary. For the recommended fluid, refer to <u>Lubrication Specifications</u>. 5. Install the fill plug (1) to the differential. 6. Lower the vehicle. Tighten 33 (24 lb ft)
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REAR AXLE LUBRICANT LEVEL INSPECTION (195MM AXLE)

Inspection Procedure

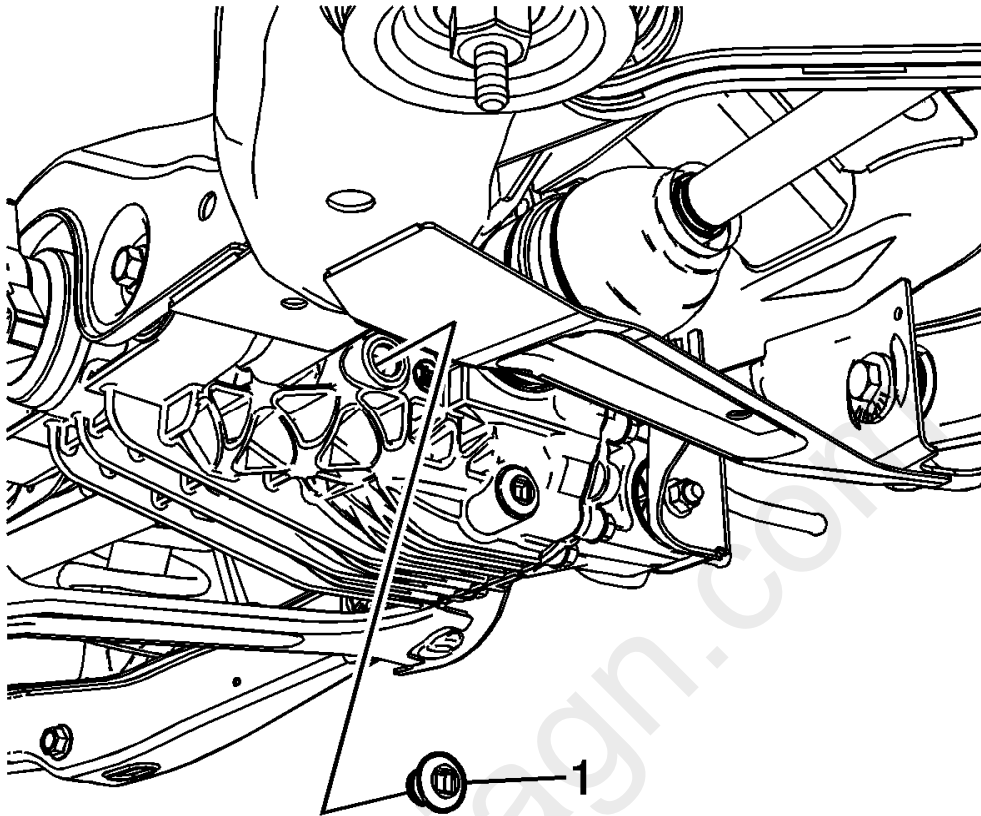


Fig. 5: Differential Fill Plug

Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Clean any dirt from around the differential fill plug (1).
3. Remove the fill plug (1) from the differential.
4. Check the differential fluid level, it should be even with the bottom of the fill plug hole to no lower than 2 mm (0.08 in) below the opening.
5. Add new fluid if necessary. Refer to Adhesives, Fluids, Lubricants, and Sealers.

CAUTION: Refer to Fastener Caution .

6. Install the differential fill plug (1) to the differential and tighten to 33 N.m (24 lb ft).
7. Remove the support and lower the vehicle.

REAR AXLE LUBRICANT REPLACEMENT (226MM ELSD)

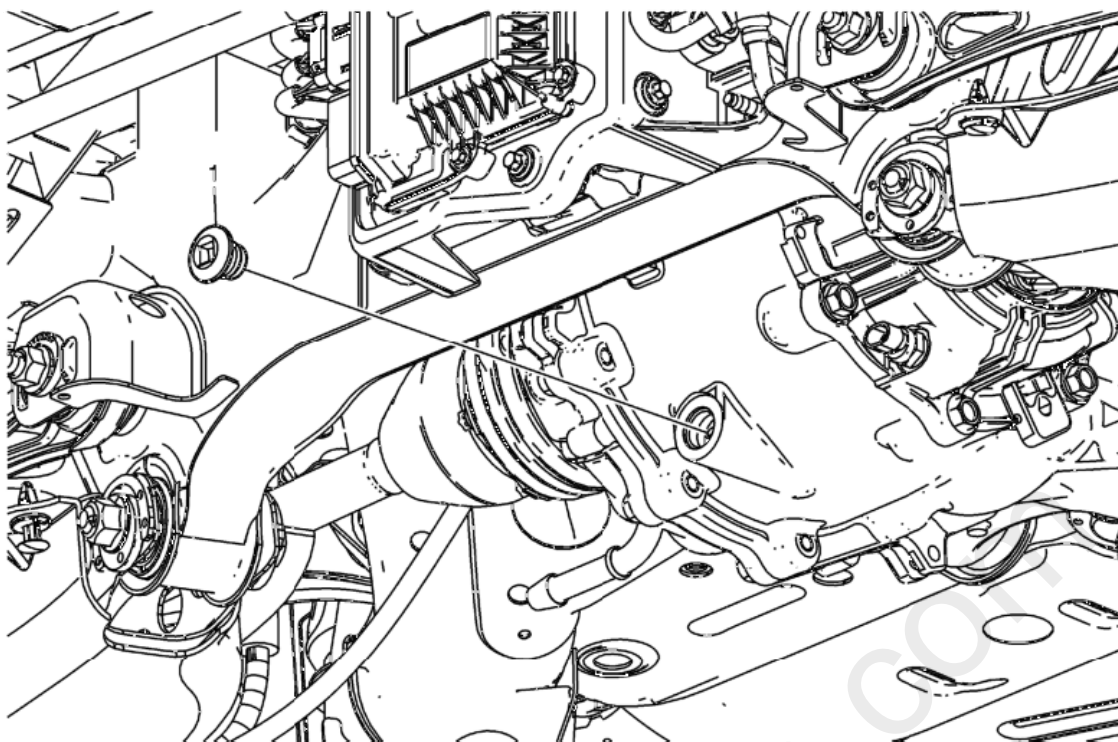


Fig. 6: Rear Axle Lubricant (226mm eLSD)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Lubricant Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Differential Carrier Drain Plug CAUTION: Refer to <u>Fastener Caution</u> . Draining Procedure 1. Clean any dirt from around the differential drain plug. 2. Remove the drain plug (1) from the differential. Filling Procedure 1. Install the drain plug (1). 2. Fill the differential with axle lubricant. Refer to <u>Lubrication Specifications</u> . 3. Check the fluid level in the differential. Add fluid until the recommended level is reached. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u> . 4. Lower the vehicle.

Tighten
33 (24 lb ft)

DIFFERENTIAL CLUTCH OIL INSPECTION (226MM ELSD)

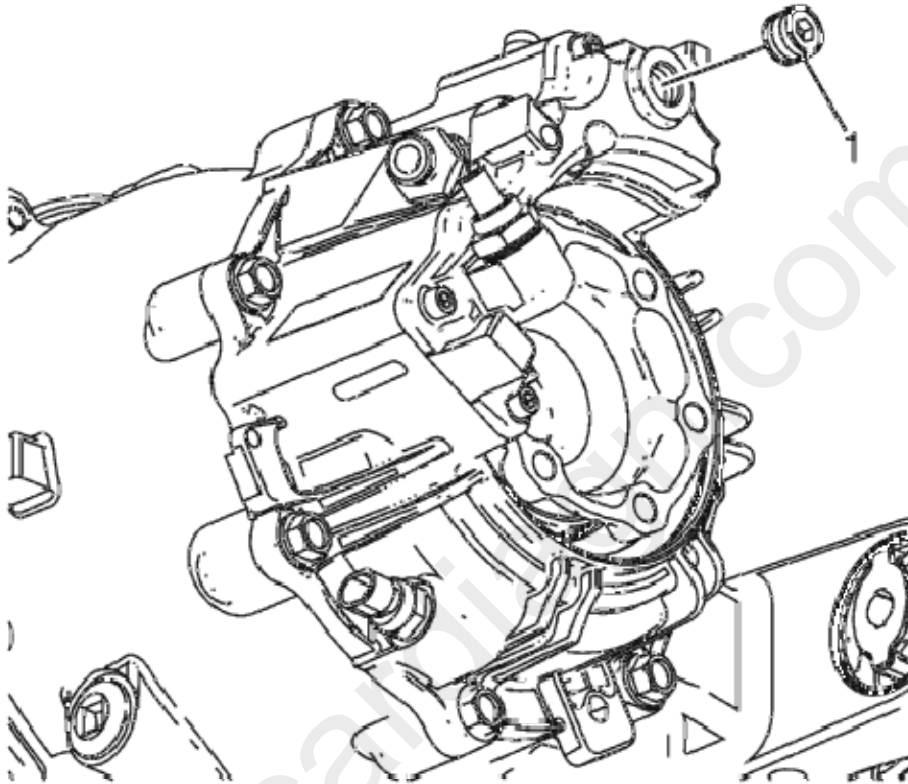


Fig. 7: Differential Clutch Cover Plug
Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Clean any dirt from around the differential clutch cover plug.
3. Remove the differential clutch cover plug (1) from the differential clutch cover.
4. Check the differential clutch fluid level. it should be even with the bottom of the plug hole to no lower than 6 mm (0.25 in) below the opening.
5. Add new fluid if necessary. For the recommended fluid, refer to **Lubrication Specifications**.

CAUTION: Refer to Fastener Caution .

6. Install the differential clutch cover plug (1) to the differential clutch cover . Tighten to 12 N.m (106 lb in).

7. Perform the Rear Differential Hydraulic System Service Fill/Bleed Procedure. Refer to **Rear Differential Hydraulic System Service Fill/Bleed**.
8. Lower the vehicle.

DIFFERENTIAL OIL REPLACEMENT (195MM AXLE)

Removal Procedure

1. Raise and support the vehicle. **Lifting and Jacking the Vehicle** .

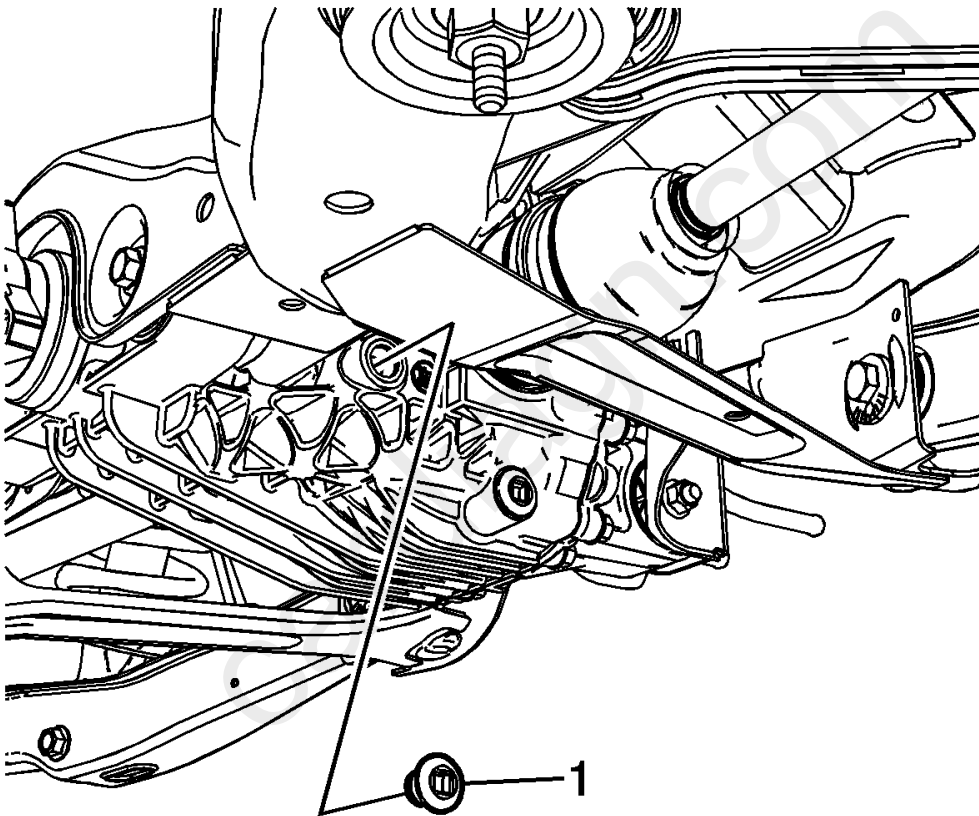


Fig. 8: Differential Fill Plug

Courtesy of GENERAL MOTORS COMPANY

2. Remove the fill plug (1).

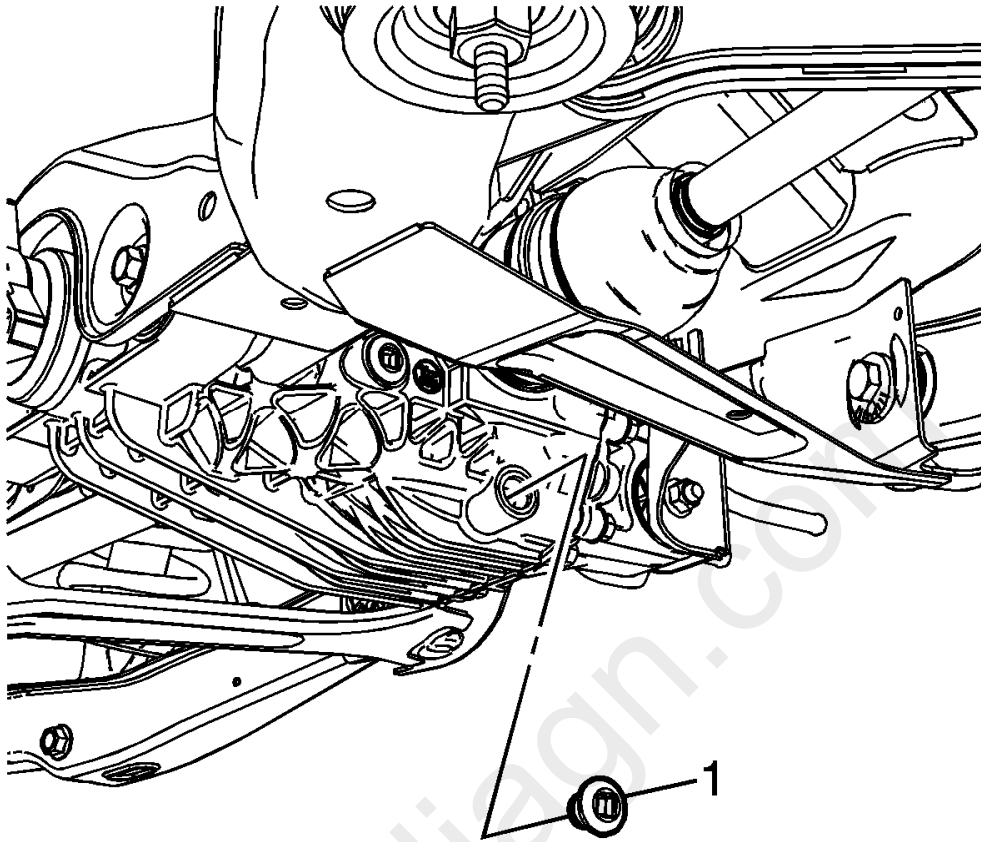


Fig. 9: Drain Plug

Courtesy of GENERAL MOTORS COMPANY

3. Place a drain pan under the vehicle.
4. Remove the drain plug (1).
5. Allow the differential to drain completely.

Installation Procedure

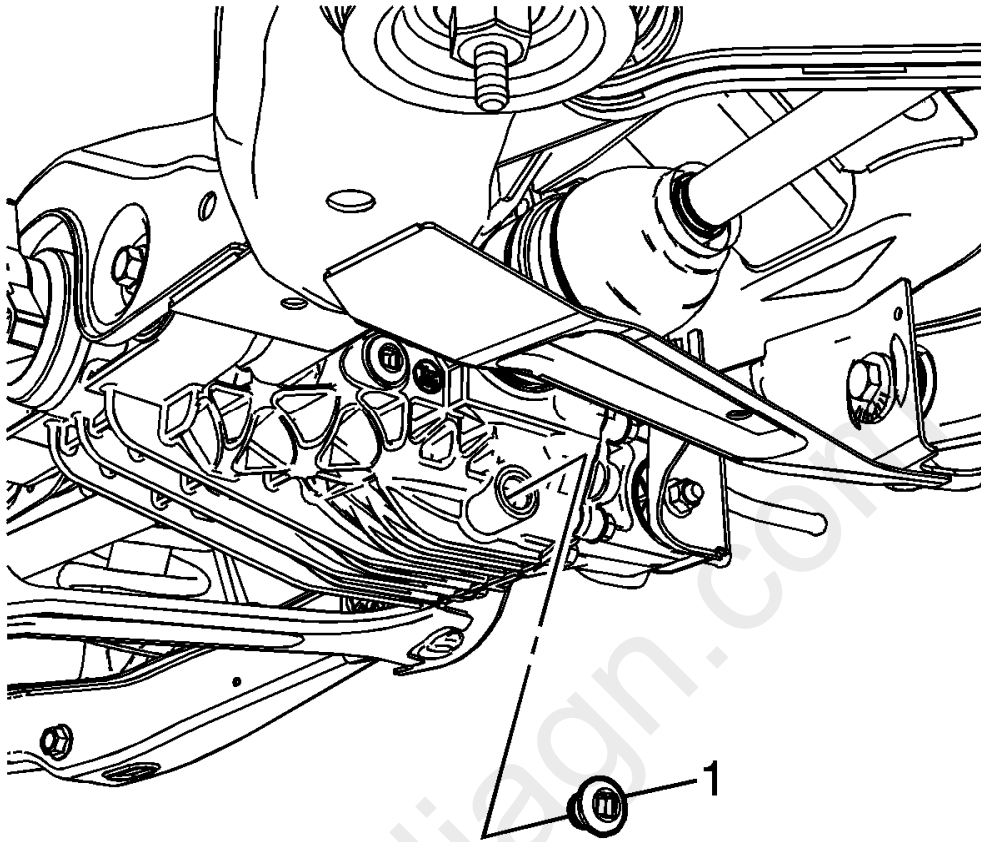


Fig. 10: Drain Plug

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the drain plug (1) and tighten to 33 N.m (24 lb ft).
2. Fill the rear differential to the proper level with the proper fluid. Refer to Rear Axle Lubricant Level Inspection (195mm Axle), and Adhesives, Fluids, Lubricants, and Sealers.

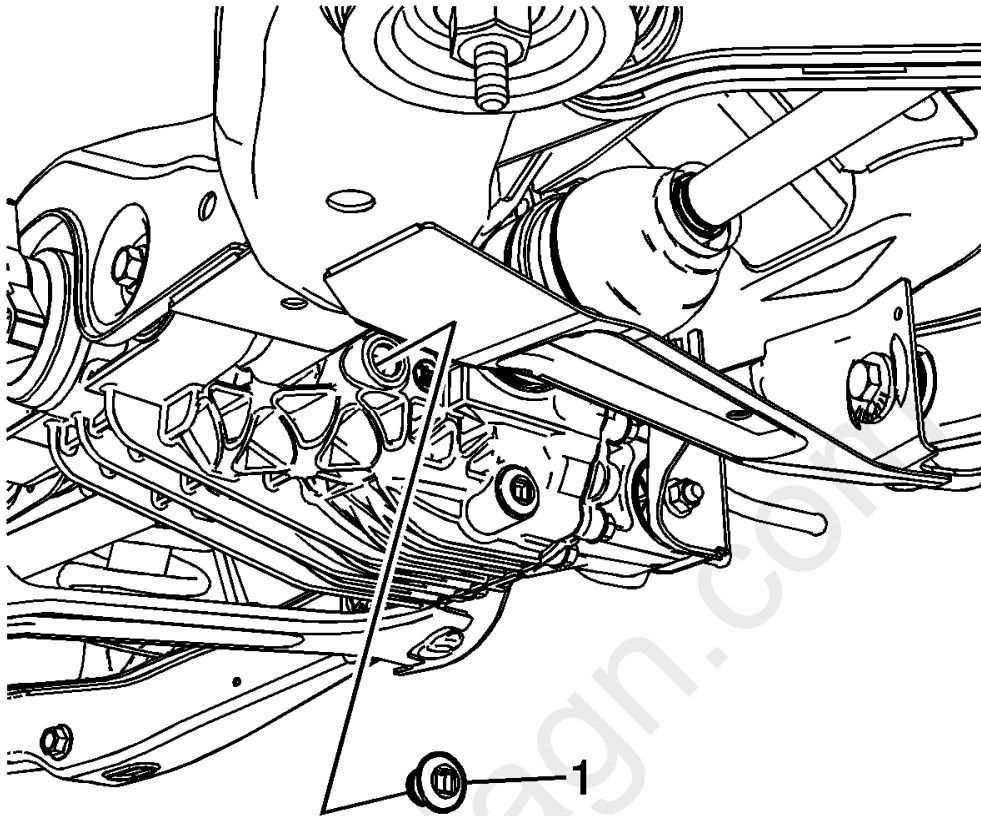


Fig. 11: Differential Fill Plug

Courtesy of GENERAL MOTORS COMPANY

3. Install the rear differential fill plug (1) and tighten to 33 N.m (24 lb ft).
4. Remove the support and lower the vehicle.

DIFFERENTIAL OIL COOLER OUTLET HOSE REPLACEMENT (226MM ELSD)

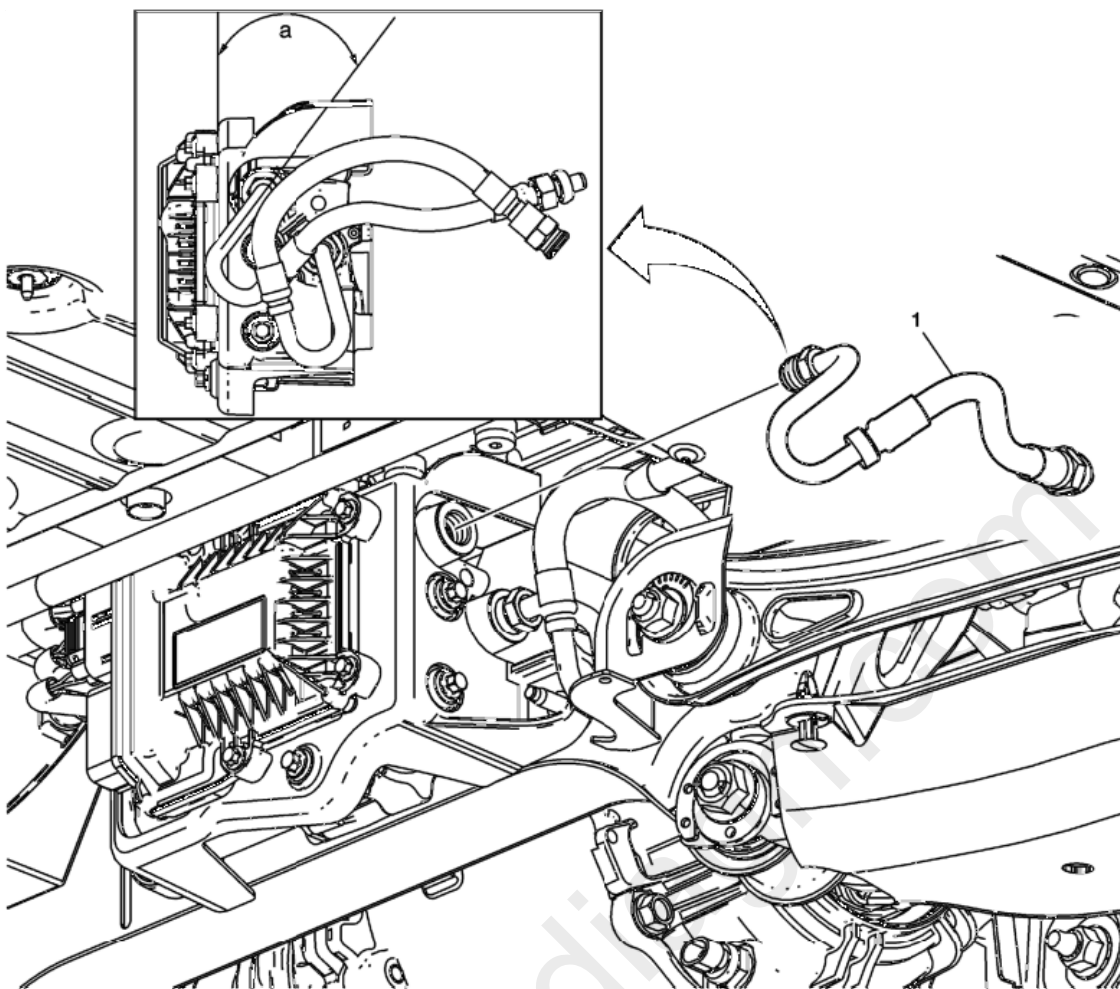


Fig. 12: Differential Oil Cooler Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

Differential Oil Cooler Outlet Hose Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Install a drain pan under the vehicle.	
1	Differential Oil Cooler Outlet Hose Assembly Procedure 1. Remove the differential oil cooler outlet hose assembly. Refer to <u>Limited Slip Differential Clutch Pipe Connector Disconnection and Connection</u>. 2. Install the NEW differential oil cooler outlet hose assembly. The hose must be installed at an angle of 37° (a) before tightening. 3. Fill the differential clutch fluid. Refer to <u>Rear Differential Hydraulic System</u>

Service Fill/Bleed.

Tighten
28 (21 lb ft)

DIFFERENTIAL OIL PUMP INLET HOSE REPLACEMENT (226MM ELSD)

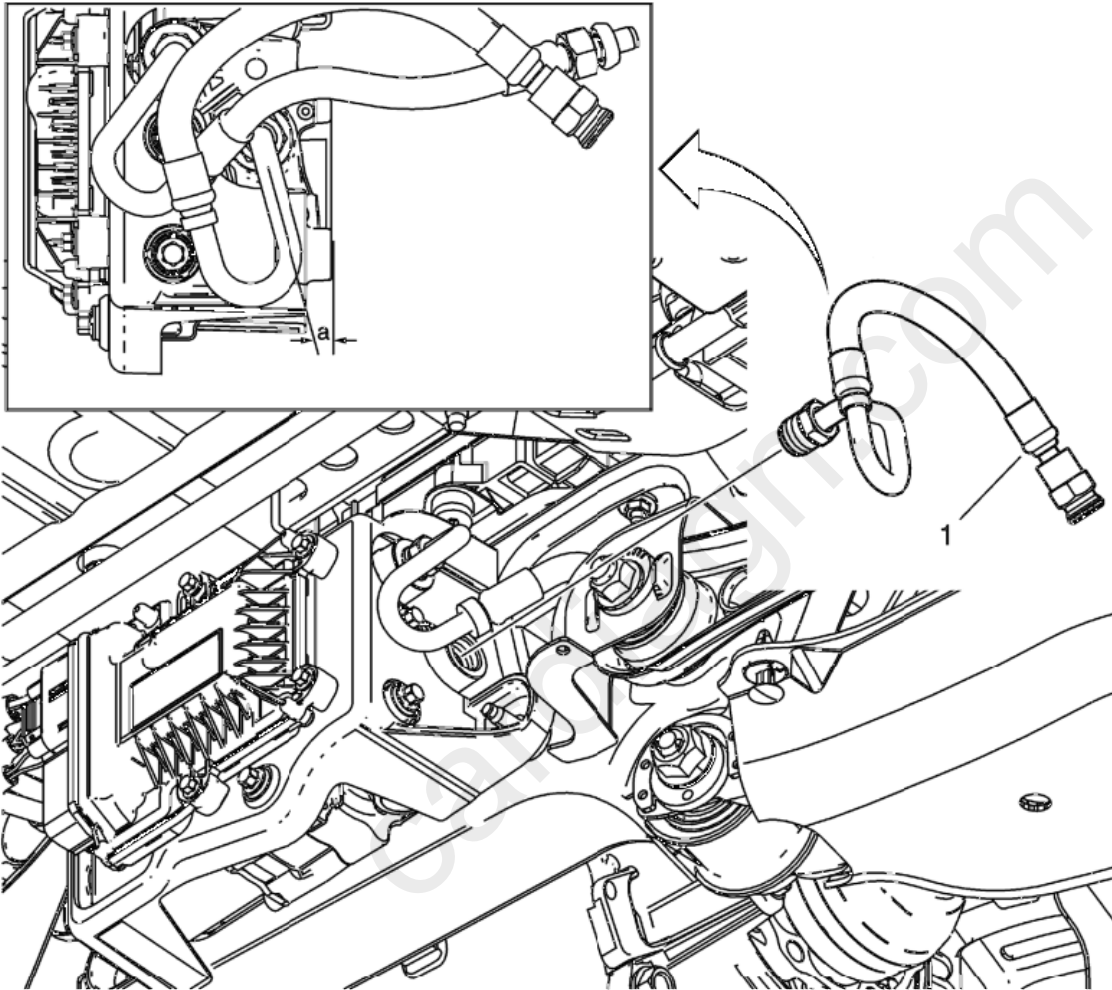


Fig. 13: Differential Oil Pump Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

Differential Oil Pump Inlet Hose Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Install a drain pan under the vehicle.	
	Differential Oil Pump Inlet Hose Assembly

Procedure

1

1. Remove the differential oil pump inlet hose assembly. Refer to **Limited Slip Differential Clutch Pipe Connector Disconnection and Connection.**
2. Install the NEW differential oil cooler outlet hose assembly. The hose must be installed at an angle of 15.3° (a) before tightening.
3. Fill the differential clutch fluid. Refer to **Rear Differential Hydraulic System Service Fill/Bleed.**

Tighten

31 (23 lb ft)

DIFFERENTIAL TEMPERATURE SENSOR REPLACEMENT (226MM ELSD)

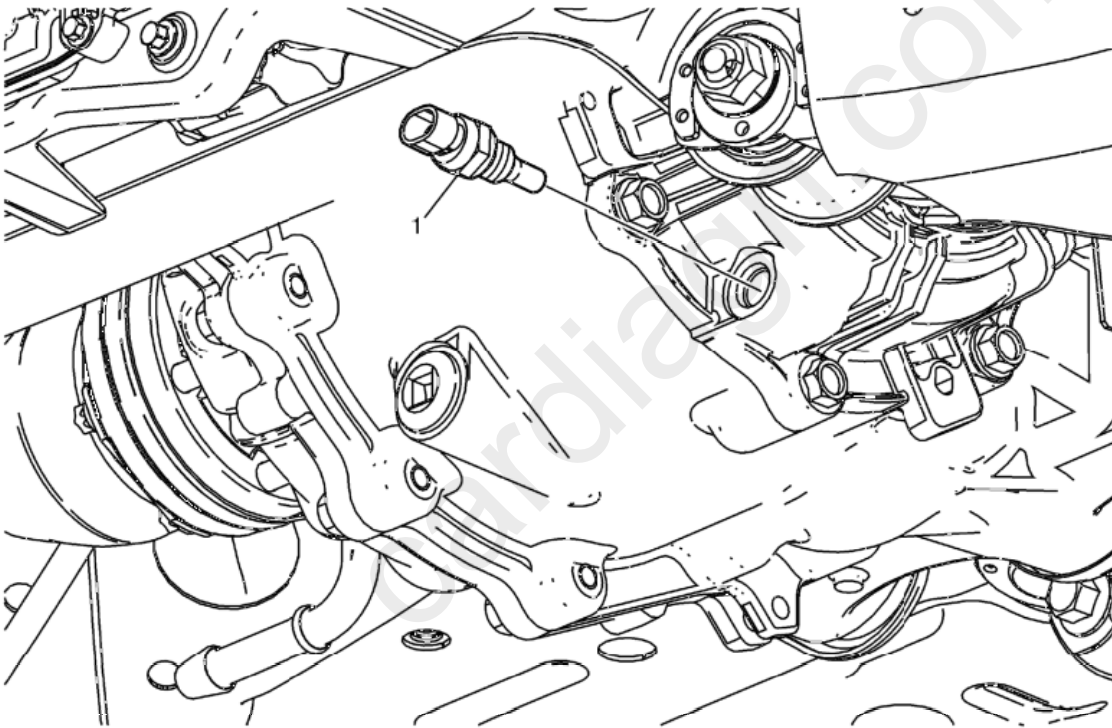


Fig. 14: Differential Temperature Sensor (226mm eLSD)

Courtesy of GENERAL MOTORS COMPANY

Differential Temperature Sensor Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Install a Drain Pan under the vehicle. 3. Drain the differential oil. Refer to <u>Rear Axle Lubricant Replacement (226mm eLSD).</u>	

Differential Temperature Sensor

CAUTION:

Refer to Fastener Caution .

Procedure

1

1. Clean any dirt from around the differential temperature sensor.
2. Remove the temperature sensor and replace with the NEW one.
3. Fill the differential with oil. Refer to Lubrication Specifications.

Tighten

10 (89 lb in)

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - FRONT (LEFT FRONT - 195MM AXLE)

Special Tools

DT-50806 Bushing Remover/Installer

Removal Procedure

WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

WARNING: Refer to Safety Glasses Warning .

NOTE: All three bushings of the differential are different although they appear the same. Make sure that the correct part number is used. Mount orientation is critical for noise and vibration performance.

NOTE: The left differential carrier bushing has to be pressed in the opposite direction to the right due to clearance.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheel assemblies. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel drive shaft assemblies. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .
4. Remove the differential assembly. Refer to Differential Carrier Assembly Replacement (195mm

Axle).

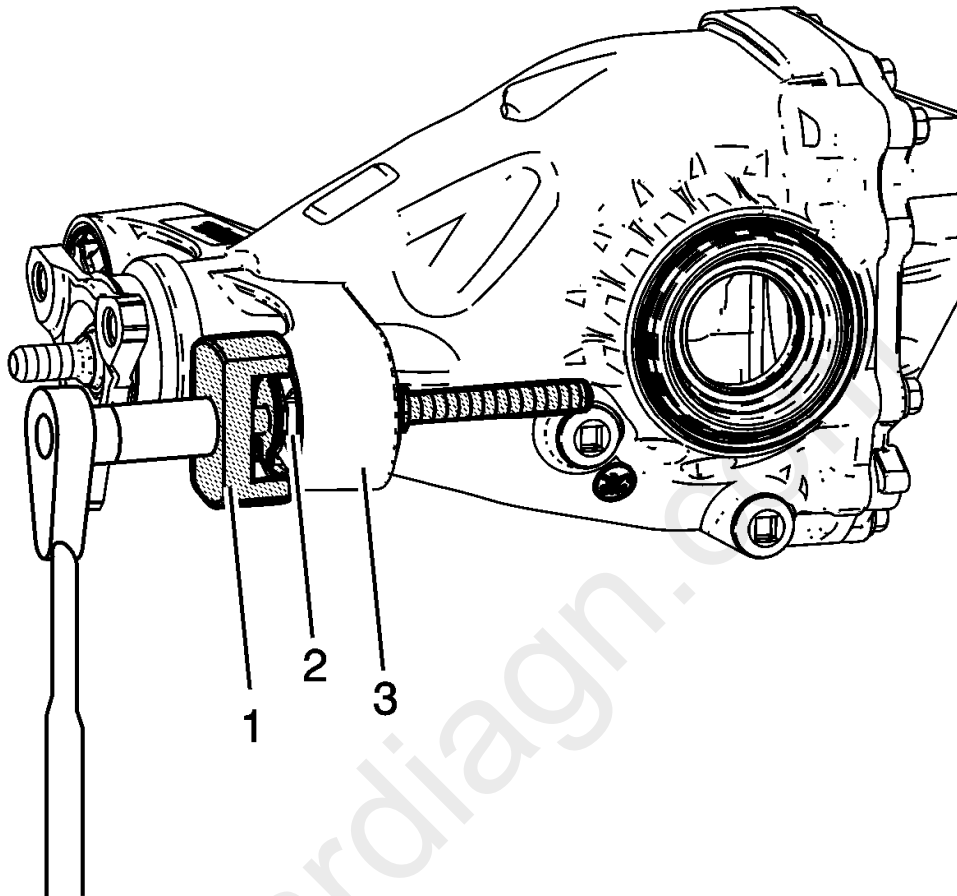


Fig. 15: Left Front Differential Bushing & Special Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: Observe and mark the orientation of the bushing with reference to the original position. This will minimise the potential of incorrect bushing installation.

NOTE: The left front bushing is a single use part and must be discarded after use.

5. Remove the left front bushing (2) from the differential (3) using **DT-50806** bushing remover/installer (1).

Discard the bushing.

Installation Procedure

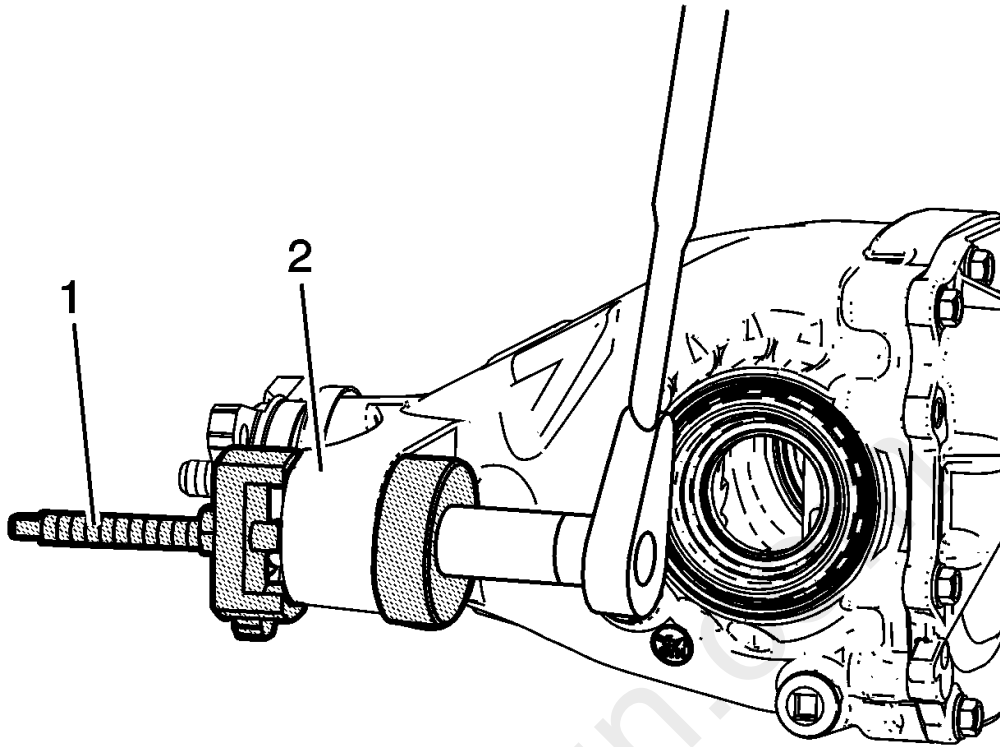


Fig. 16: Left Front Differential Bushing & Special Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before installing, the bushing must be correctly aligned and oriented. Mount orientation is critical for noise and vibration performance.

1. Pull the left front bushing into the differential (2) using **DT-50806** bushing remover/installer (1).
2. Pull the left front bushing until it is flush fitted.
3. Install the differential assembly. Refer to **Differential Carrier Assembly Replacement (195mm Axle)**.
4. Install the wheel drive shaft assemblies. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the rear wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
6. Remove the safety stands.
7. Lower the vehicle to the ground.

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - FRONT (RIGHT FRONT - 195MM AXLE)

Special Tools

DT-50806 Bushing Remover/Installer

Removal Procedure

WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

WARNING: Refer to Safety Glasses Warning .

NOTE: All three bushings of the differential are different although they appear the same. Make sure that the correct part number is used. Mount orientation is critical for noise and vibration performance.

NOTE: The left differential carrier bushing has to be pressed in the opposite direction to the right due to clearance.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheel assemblies. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel drive shaft assemblies. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .
4. Remove the differential assembly. Refer to Differential Carrier Assembly Replacement (195mm Axle).

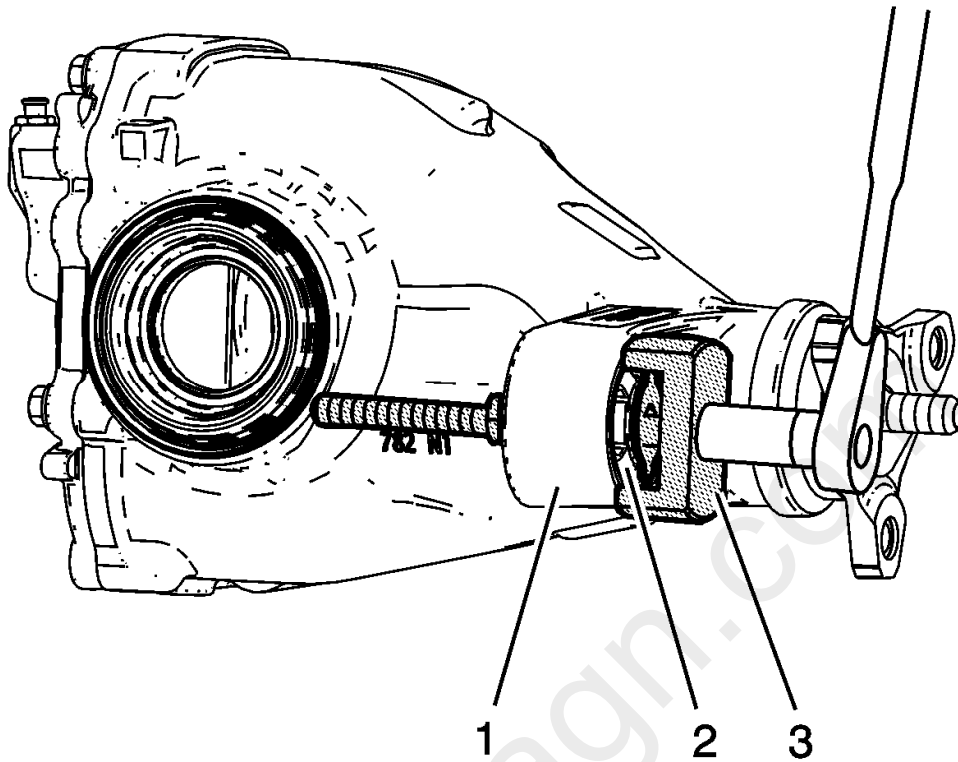


Fig. 17: Differential Bushing & Special Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: Observe and mark the orientation of the bushing with reference to the original position. This will minimise the potential of incorrect bushing installation.

NOTE: The left front bushing is a single use part and must be discarded after use.

5. Remove the left front bushing (2) from the differential (1) using **DT-50806** bushing remover/installer (3).

Discard the bushing.

Installation Procedure

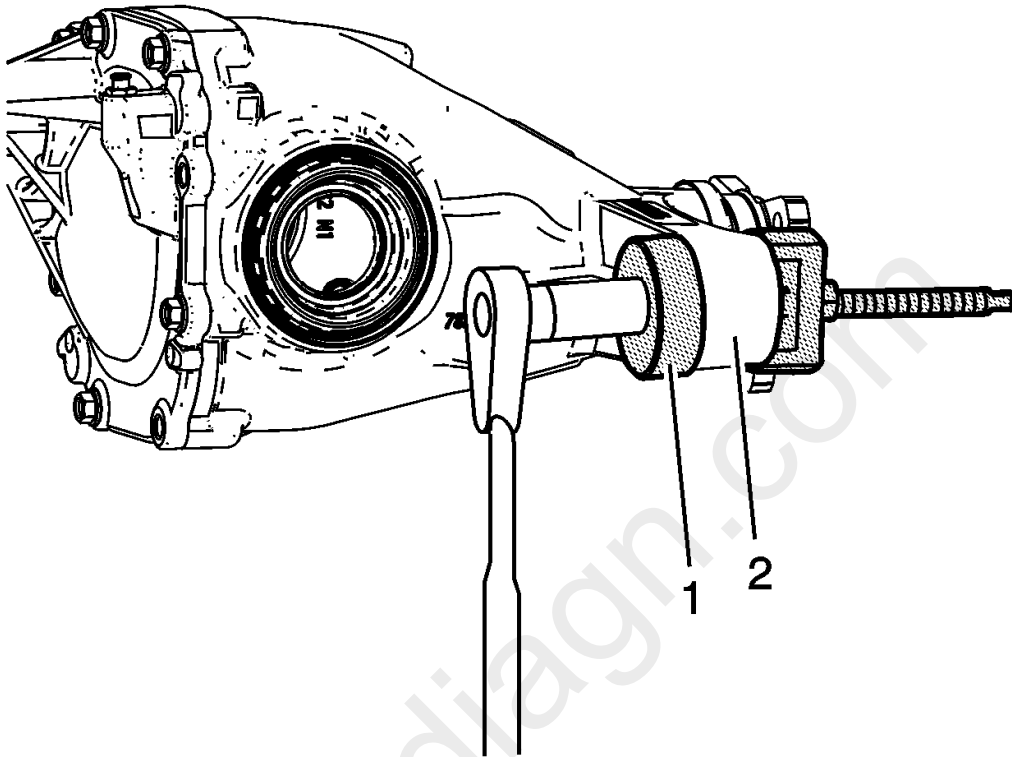


Fig. 18: Differential Bushing & Special Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before installing, the bushing must be correctly aligned and oriented. Mount orientation is critical for noise and vibration performance.

1. Pull the left front bushing into the differential (2) using **DT-50806** bushing remover/installer (1).
2. Pull the left front bushing until it is flush fitted.
3. Install the differential assembly. Refer to **Differential Carrier Assembly Replacement (195mm Axle)**.
4. Install the wheel drive shaft assemblies. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the rear wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
6. Remove the safety stands.
7. Lower the vehicle to the ground.

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - FRONT (LEFT FRONT - 226MM ELSD)

Special Tools

DT-50806 Bushing Remover/Installer

Removal Procedure

WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

WARNING: Refer to Safety Glasses Warning .

NOTE: All three bushings of the differential are different although they appear the same. Make sure that the correct part number is used. Mount orientation is critical for noise and vibration performance.

NOTE: The left differential carrier bushing has to be pressed in the opposite direction to the right due to clearance.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheel assemblies. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel drive shaft assemblies. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .
4. Remove the differential assembly. Refer to Differential Carrier Assembly Replacement (226mm eLSD).

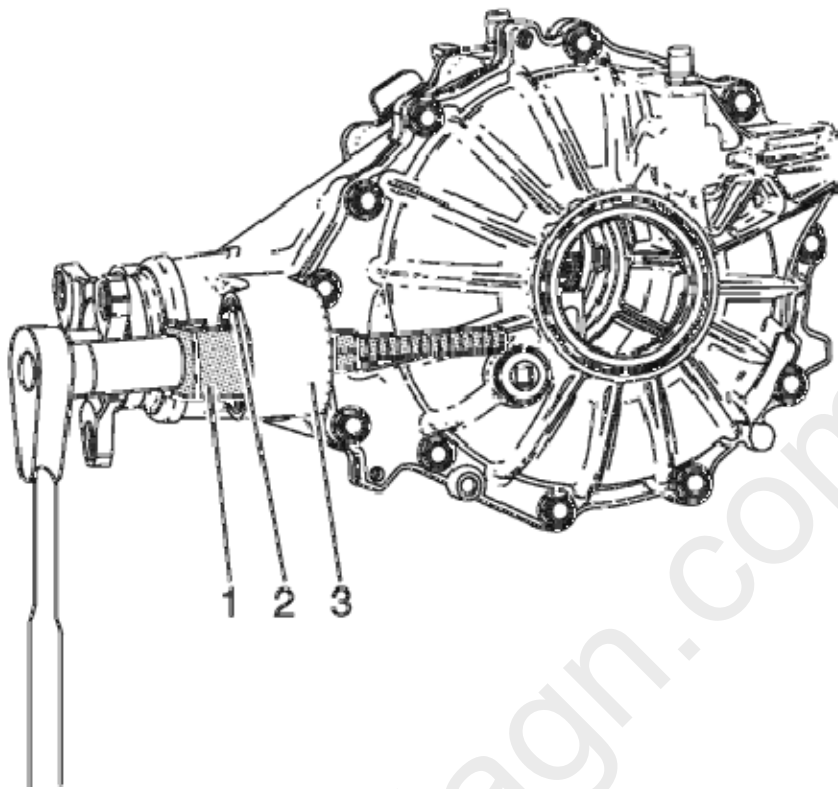


Fig. 19: Bushing Remover/Installer
Courtesy of GENERAL MOTORS COMPANY

NOTE: Observe and mark the orientation of the bushing with reference to the original position. This will minimise the potential of incorrect bushing installation.

NOTE: The left front bushing is a single use part and must be discarded after use.

5. Remove the left front bushing (2) from the differential (3) using **DT-50806** bushing remover/installer (1).

Discard the bushing.

Installation Procedure

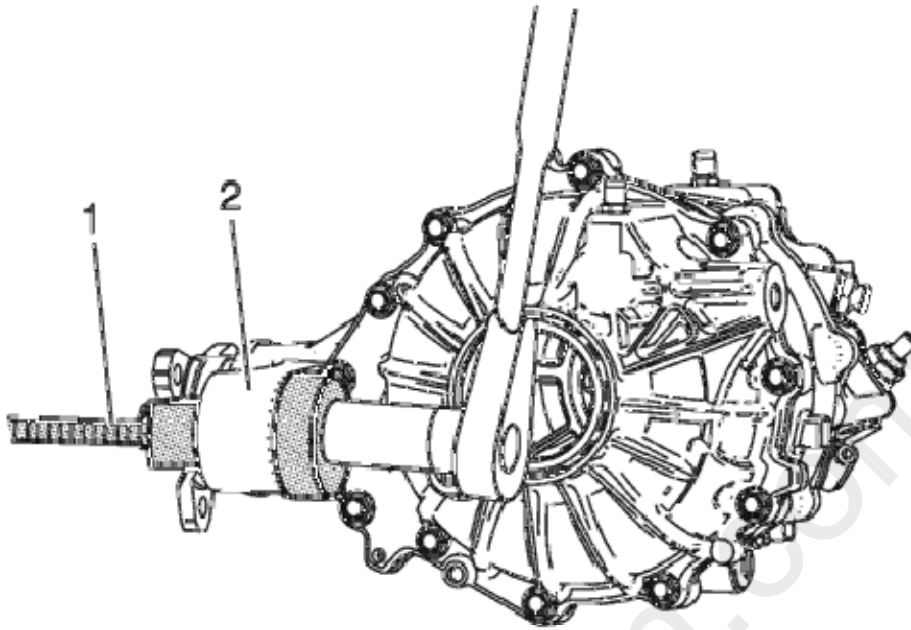


Fig. 20: Bushing Remover/Installer
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before installing, the bushing must be correctly aligned and oriented. Mount orientation is critical for noise and vibration performance.

1. Pull the left front bushing into the differential (2) using DT-50806 bushing remover/installer (1).
2. Pull the left front bushing until it is flush fitted.
3. Install the differential assembly. Refer to **Differential Carrier Assembly Replacement (226mm eLSD)**.
4. Install the wheel drive shaft assemblies. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the rear wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
6. Remove the safety stands.
7. Lower the vehicle to the ground.

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - FRONT (RIGHT FRONT - 226MM ELSD)

Special Tools

DT-50806 Bushing Remover/Installer

Removal Procedure

WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

WARNING: Refer to Safety Glasses Warning .

NOTE: All three bushings of the differential are different although they appear the same. Make sure that the correct part number is used. Mount orientation is critical for noise and vibration performance.

NOTE: The left differential carrier bushing has to be pressed in the opposite direction to the right due to clearance.

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the rear wheel assemblies. Refer to Tire and Wheel Removal and Installation .
3. Remove the wheel drive shaft assemblies. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .
4. Remove the differential assembly. Refer to Differential Carrier Assembly Replacement (226mm eLSD).

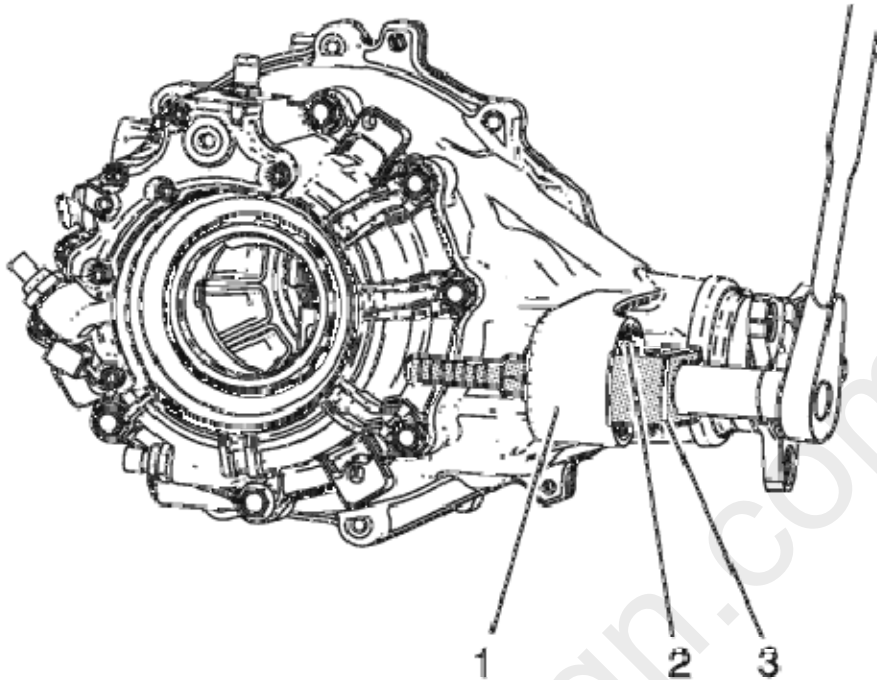


Fig. 21: Bushing Remover/Installer
Courtesy of GENERAL MOTORS COMPANY

NOTE: Observe and mark the orientation of the bushing with reference to the original position. This will minimise the potential of incorrect bushing installation.

NOTE: The left front bushing is a single use part and must be discarded after use.

5. Remove the left front bushing (2) from the differential (1) using **DT-50806** bushing remover/installer (3).

Discard the bushing.

Installation Procedure

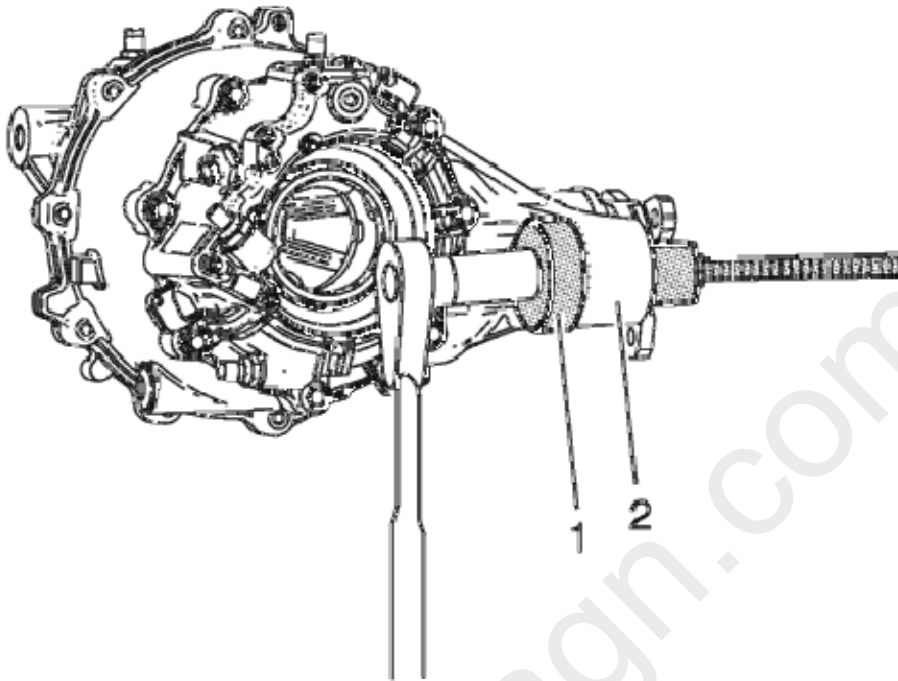


Fig. 22: Bushing Remover/Installer
Courtesy of GENERAL MOTORS COMPANY

NOTE: Before installing, the bushing must be correctly aligned and oriented. Mount orientation is critical for noise and vibration performance.

1. Pull the left front bushing into the differential (2) using DT-50806 bushing remover/installer (1).
2. Pull the left front bushing until it is flush fitted.
3. Install the differential assembly. Refer to **Differential Carrier Assembly Replacement (226mm eLSD)**.
4. Install the wheel drive shaft assemblies. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the rear wheel assemblies. Refer to **Tire and Wheel Removal and Installation** .
6. Remove the safety stands.
7. Lower the vehicle to the ground.

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - REAR

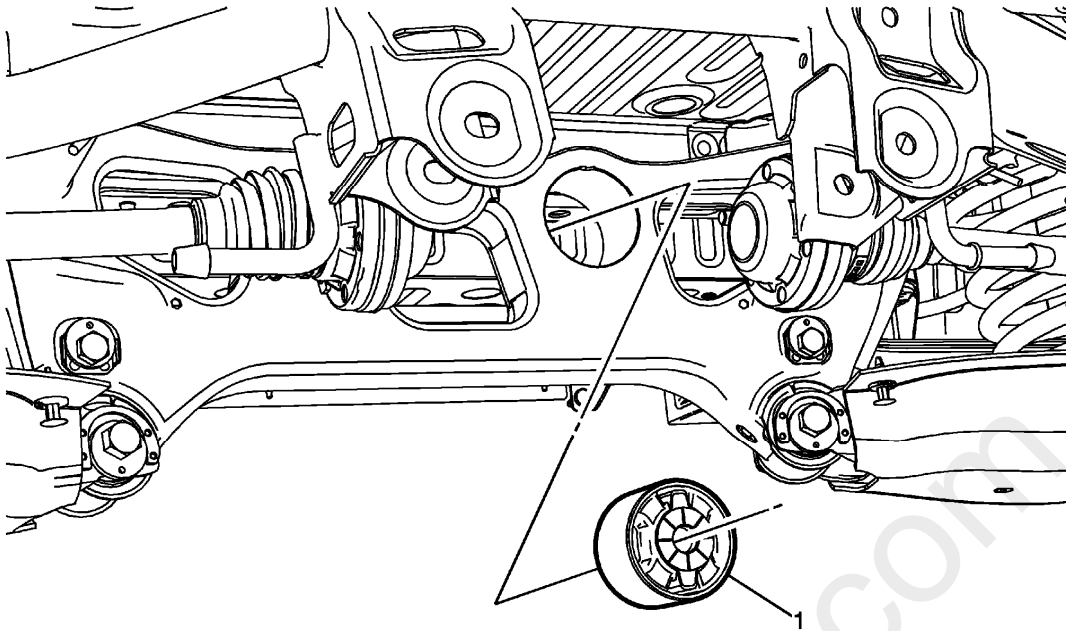


Fig. 23: Differential Carrier Bushing - Rear
 Courtesy of GENERAL MOTORS COMPANY

Differential Carrier Bushing Replacement - Rear

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 2. Removal the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u> , <u>Differential Carrier Assembly Replacement (195mm Axle)</u>	
1	Differential Housing Support Bushing Rear Procedure 1. Mark the orientation of the bushing in the rear cradle assembly on both sides of the cradle and on the new bushing. 2. Measure the depth of the installed bushing prior to removal. 3. Mark the new bushing keeping the same orientation. 4. Using the DT-50806-5 installer and remover and DT-50806-3 installer and remover , remove and install the support bushing to the same orientation and depth. Special Tools DT-50806 Bushing Replacer

For regional equivalent tools, refer to **Special Tools**.

TRANSMISSION FLUID PRESSURE SENSOR REPLACEMENT (226MM ELSD)

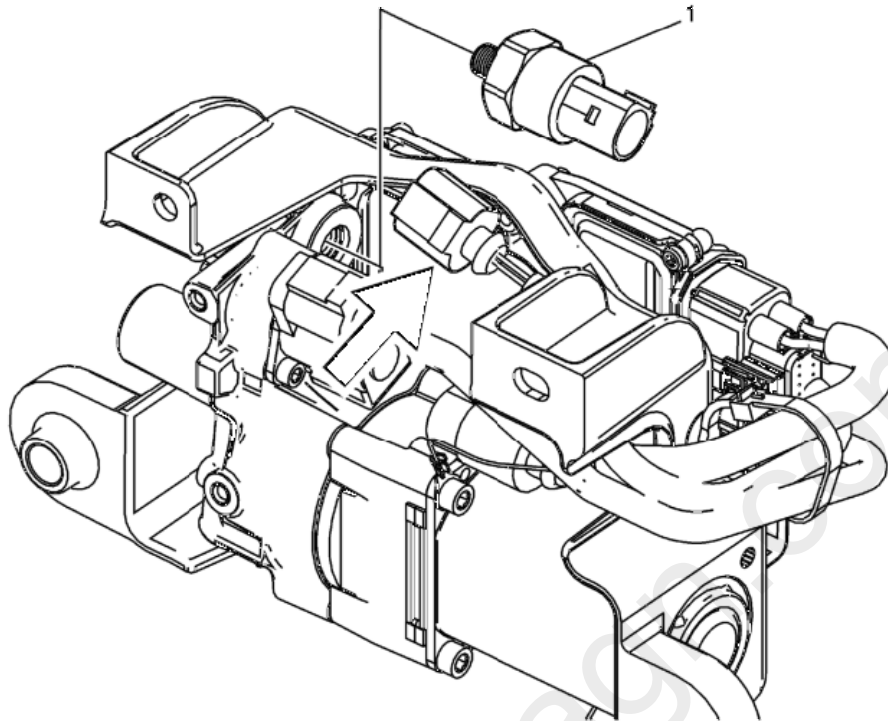


Fig. 24: Transmission Fluid Pressure Sensor (226mm eLSD)
Courtesy of GENERAL MOTORS COMPANY

Transmission Fluid Pressure Sensor Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the differential clutch pump bracket bolts to gain access to back side of the rear axle differential lock control actuator assembly. It is not necessary to disconnect the differential oil hoses. Refer to Differential Clutch Pump Replacement (226mm eLSD). 3. Disconnect the wiring harness connector from the transmission fluid pressure sensor.	
1	Transmission Fluid Pressure Sensor Procedure 1. Remove the transmission fluid pressure sensor. 2. Install the NEW transmission fluid pressure sensor. 3. Fill the differential clutch fluid. Refer to Lubrication Specifications. 4. Perform the Rear Hydraulic System Service Fill/Bleed. Refer to Rear Differential

Hydraulic System Service Fill/Bleed.

Tighten
10 (89 lb in)

REAR AXLE VENT REPLACEMENT (226MM ELSD)

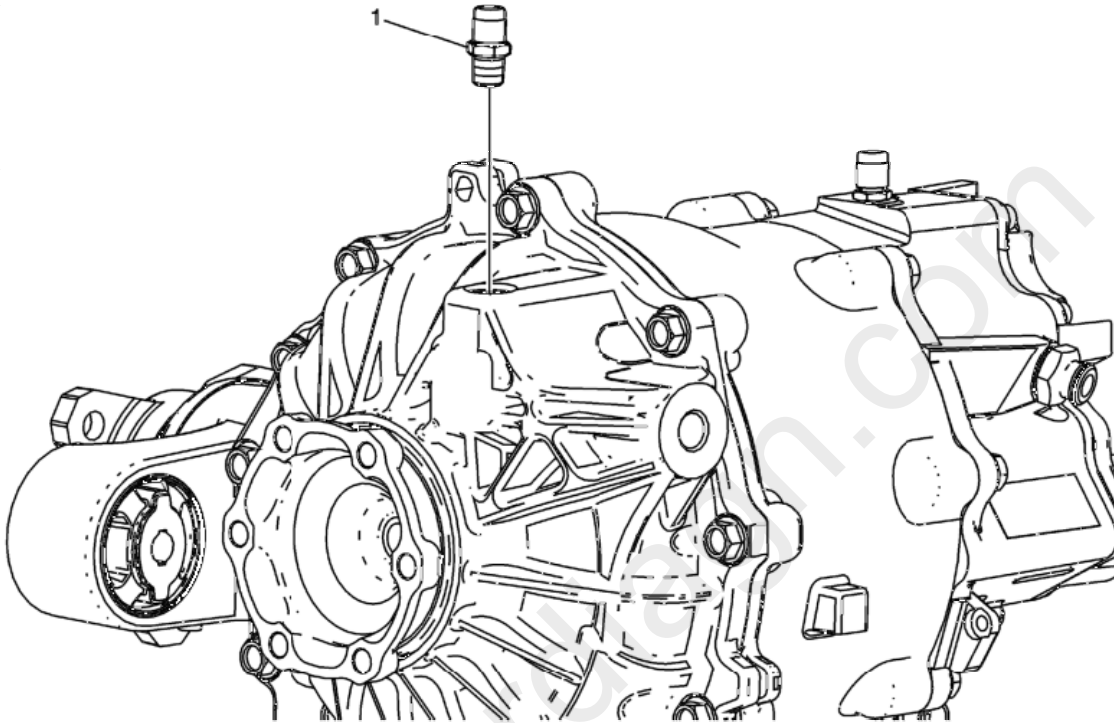


Fig. 25: Rear Axle Vent (226mm eLSD)
Courtesy of GENERAL MOTORS COMPANY

Rear Axle Vent Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Rear Axle Vent CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Tighten 10 (89 lb in)

REAR AXLE VENT REPLACEMENT (195MM AXLE)

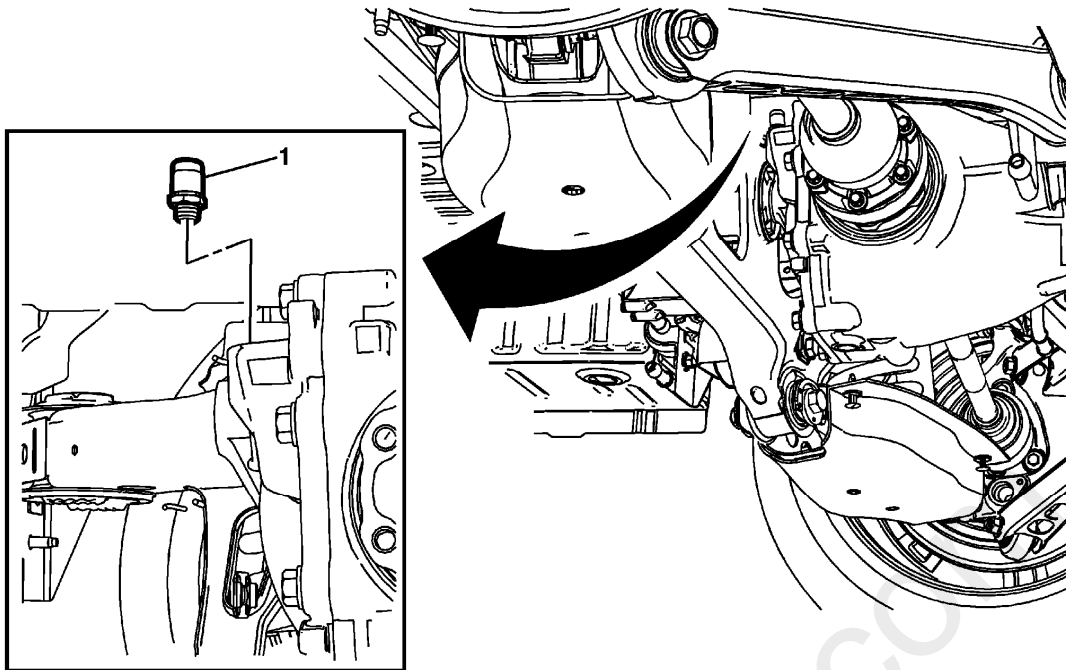


Fig. 26: Rear Axle Vent (195mm Axle)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Vent Replacement (195mm Axle)

Callout	Component Name
Preliminary Procedure	
Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Rear Axle Vent CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Tighten 20 (15 lb ft)

DIFFERENTIAL CARRIER COVER AND SEAL REPLACEMENT (195MM AXLE)

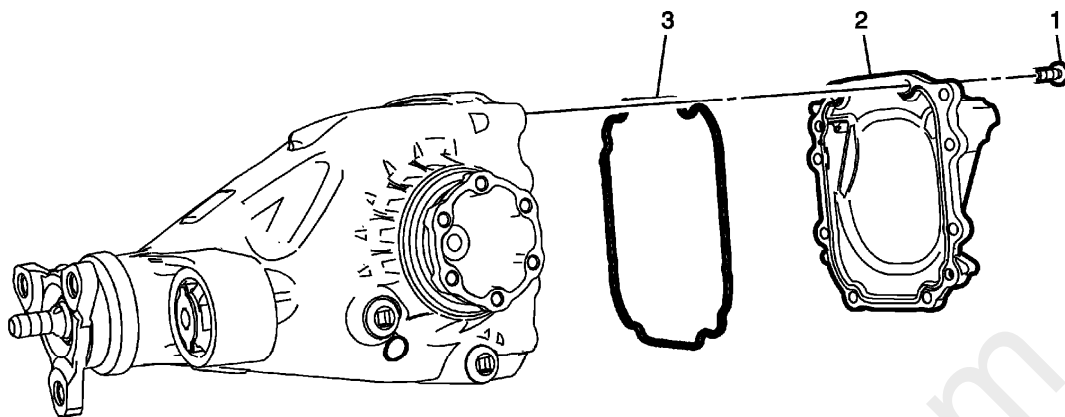


Fig. 27: Differential Carrier Cover & Seal (195mm Axle)
 Courtesy of GENERAL MOTORS COMPANY

Differential Carrier Cover and Seal Replacement (195mm Axle)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the differential carrier assembly. Refer to <u>Differential Carrier Assembly Replacement (195mm Axle)</u>.	
1	Differential Carrier Cover Bolt (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 52 (38 lb ft)
2	Differential Carrier Cover
3	Differential Carrier Cover Seal

DIFFERENTIAL CARRIER COVER AND SEAL REPLACEMENT - LEFT SIDE (226MM ELSD)

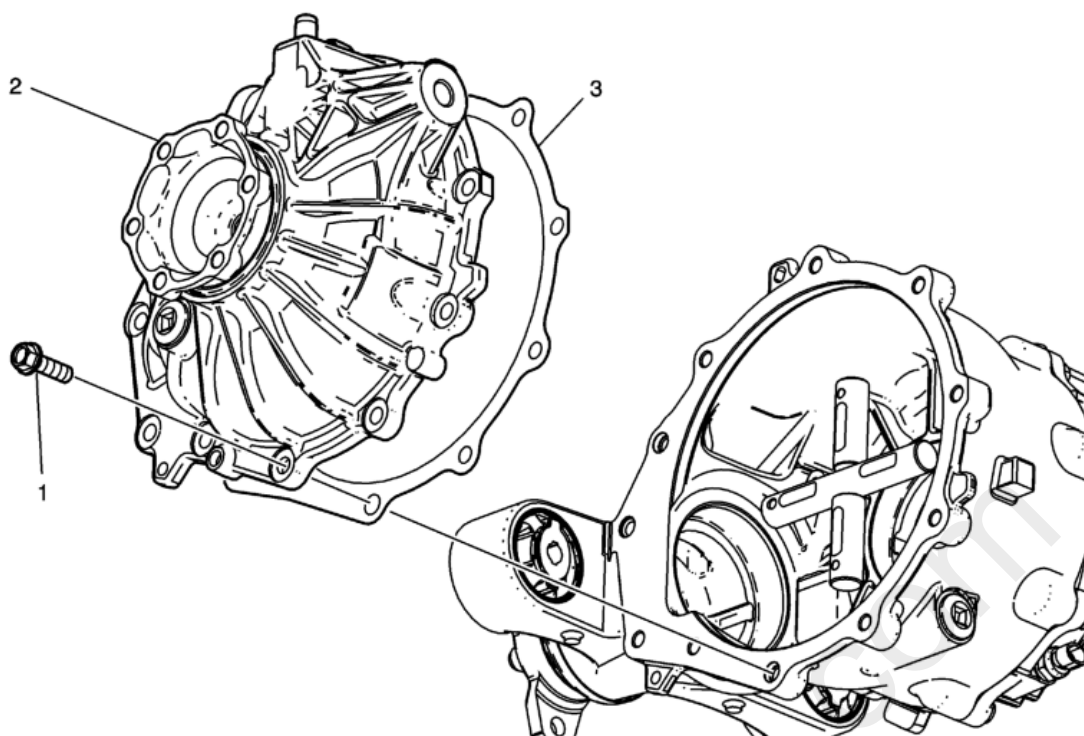


Fig. 28: Differential Carrier Cover and Seal - Left Side (226mm eLSD)
 Courtesy of GENERAL MOTORS COMPANY

Differential Carrier Cover and Seal Replacement - Left Side (226mm eLSD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Drain the differential. Refer to <u>Rear Axle Lubricant Replacement (226mm eLSD)</u>. 3. Remove the differential assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>.	
1	Differential Carrier Cover Bolt (Qty 11) Tighten 52 (38 lb ft)
2	Differential Carrier Cover Procedure 1. Remove the differential carrier cover. 2. Install the NEW differential carrier cover. 3. Install the differential assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>. 4. Fill the differential clutch fluid. Refer to <u>Lubrication Specifications</u>. 5. Perform the Rear Hydraulic System Service Fill/Bleed. Refer to <u>Rear Differential</u>

	<u>Hydraulic System Service Fill/Bleed.</u>
3	Differential Carrier Cover Gasket NOTE: Must use a new gasket.

REAR AXLE SHAFT REPLACEMENT (195MM AXLE)

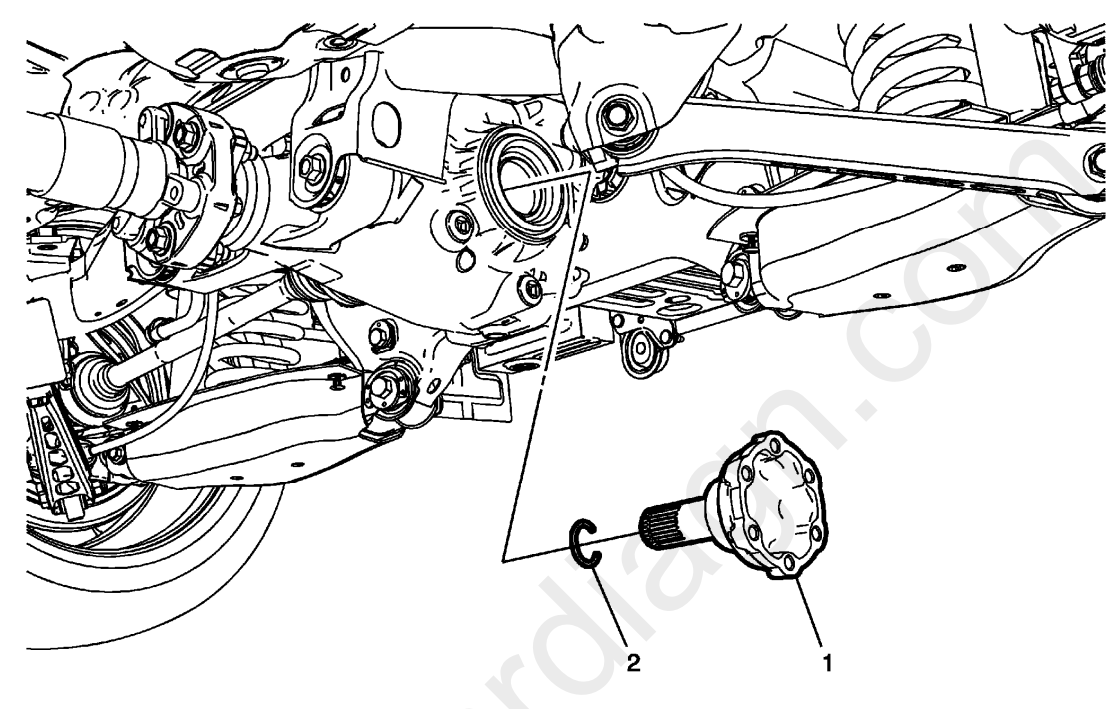


Fig. 29: Rear Axle Shaft (195mm Axle)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Replacement (195mm Axle)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the rear wheel drive shaft. Refer to <u>Rear Wheel Drive Shaft Replacement (LFX,LF3)</u> , <u>Rear Wheel Drive Shaft Replacement (LTG)</u> .	
	Rear Axle Shaft Procedure 1. Using the J-2619-01 Slide Hammer and the EN-24420-C Crankshaft Balancer Puller , remove the rear axle shaft.

	2. Using the appropriate tool, install the rear axle shaft
1	Special Tools • J-2619-01 Slide Hammer • EN-24420-C Crankshaft Balancer Puller For regional equivalent tool, refer to Special Tools.
2	Rear Axle Shaft Retaining Clip Procedure Remove and discard the retaining clip. Replace with NEW only.

REAR AXLE SHAFT REPLACEMENT (226MM ELSD - LEFT)

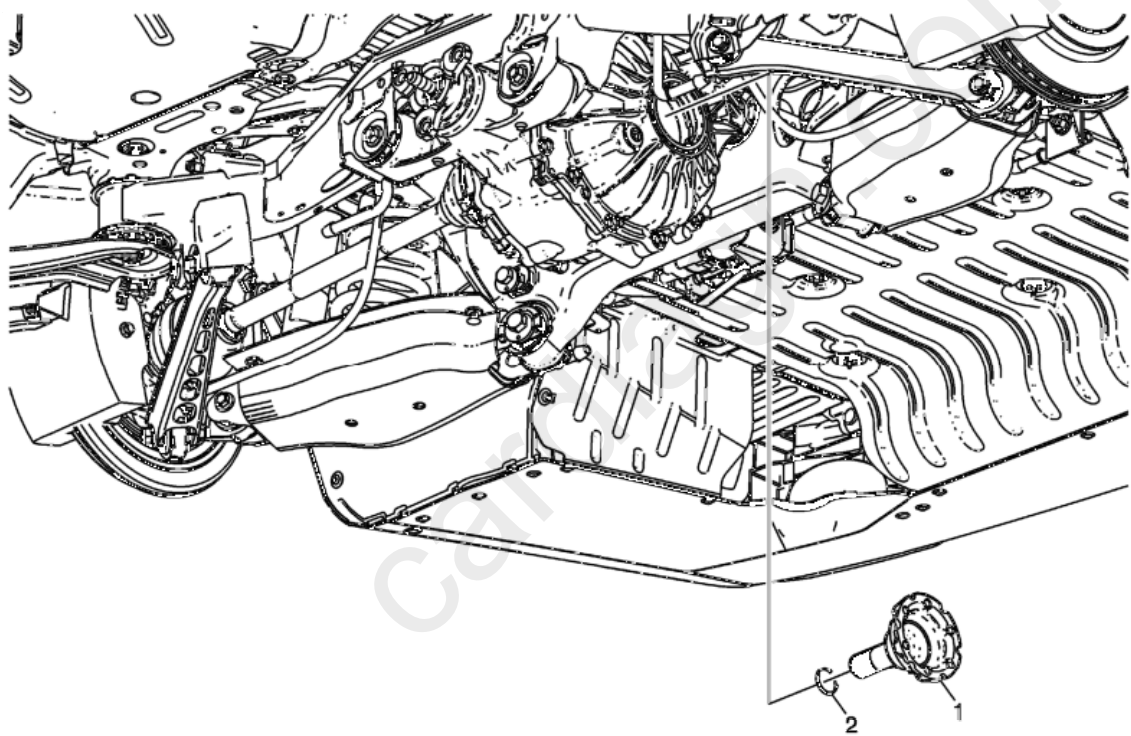


Fig. 30: Rear Axle Shaft (226mm eLSD - Left)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Replacement (226mm eLSD - Left)

Callout	Component Name
Preliminary Procedure	
1.	Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2.	Remove the rear wheel drive shaft. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .

1	Rear Axle Shaft Procedure - Using the J-2619-01 Slide Hammer and the EN-24420-C Crankshaft Balancer Puller , remove the rear axle shaft. - Using the appropriate tool, install the rear axle shaft Special Tools J-2619-01 Slide Hammer EN-24420-C Crankshaft Balancer Puller For regional equivalent tool, refer to Special Tools.
2	Rear Axle Shaft Retaining Clip Procedure Remove and discard the retaining clip. Replace with NEW only.

REAR AXLE SHAFT REPLACEMENT (226MM ELSD - RIGHT)

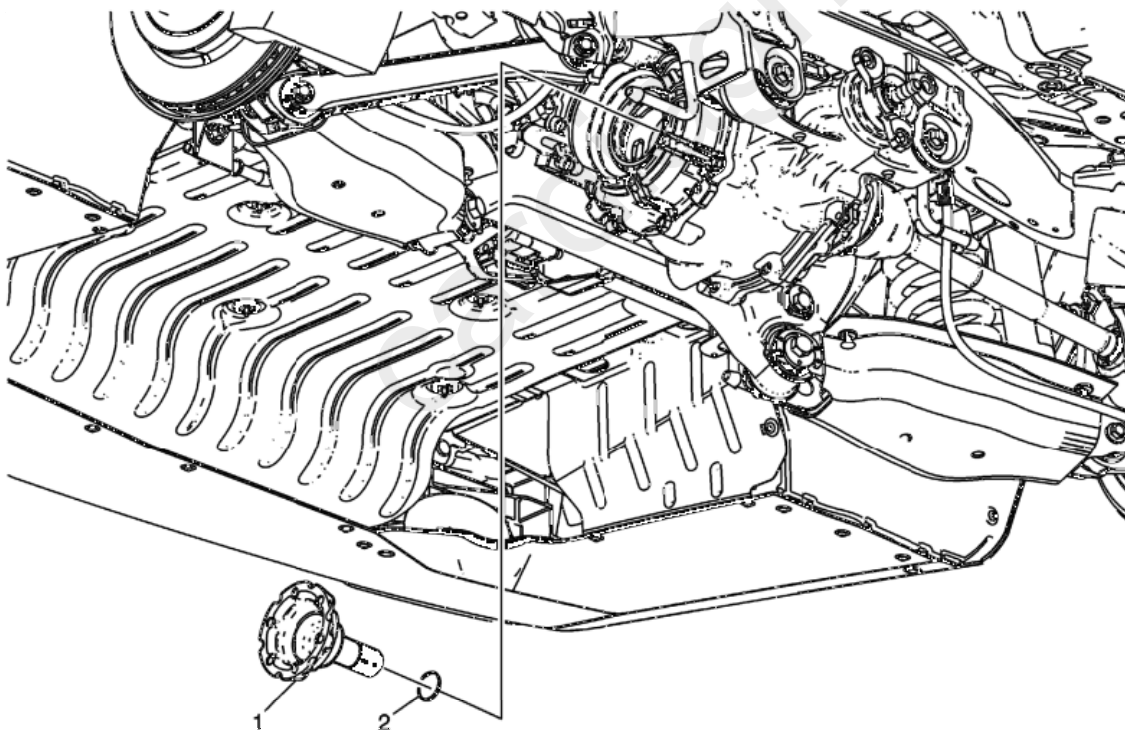


Fig. 31: Rear Axle Shaft (226mm eLSD - Right)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Replacement (226mm eLSD - Right)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the rear wheel drive shaft. Refer to <u>Rear Wheel Drive Shaft Replacement (LFX,LF3)</u> , <u>Rear Wheel Drive Shaft Replacement (LTG)</u> .	
1	Rear Axle Shaft Procedure 1. Using the J-2619-01 Slide Hammer and the EN-24420-C Crankshaft Balancer Puller , remove the rear axle shaft. 2. Using the appropriate tool, install the rear axle shaft Special Tools • J-2619-01 Slide Hammer • EN-24420-C Crankshaft Balancer Puller For regional equivalent tool, refer to <u>Special Tools</u> .
2	Rear Axle Shaft Retaining Clip Procedure Remove and discard the retaining clip. Replace with NEW only.

REAR AXLE SHAFT SEAL REPLACEMENT (195MM AXLE)

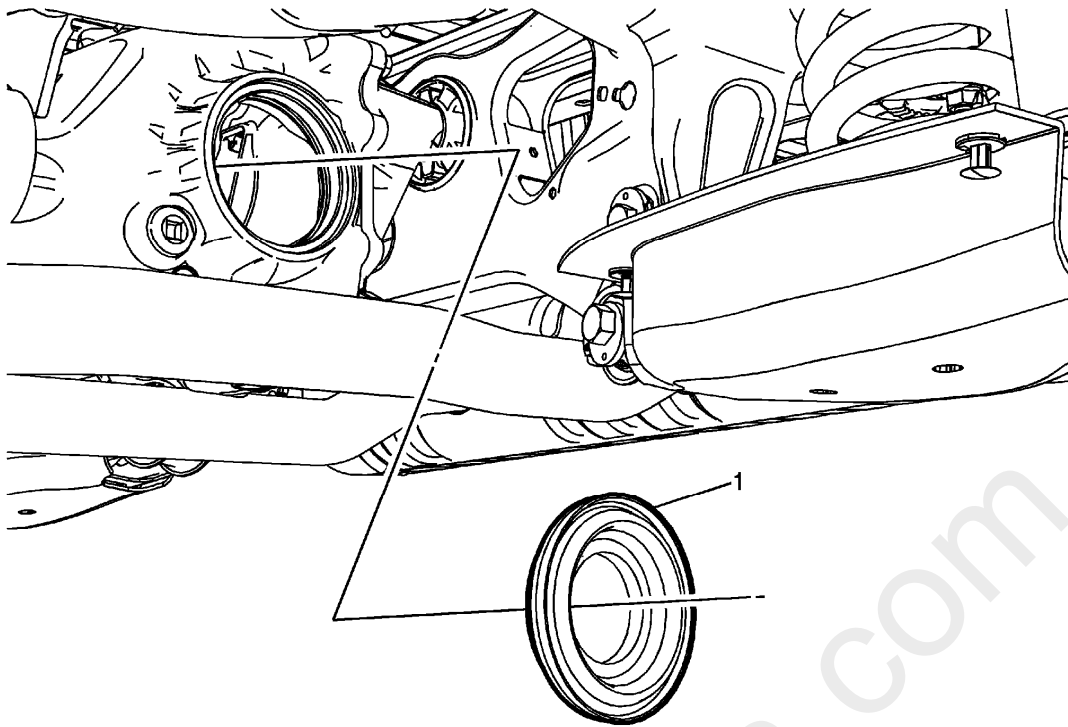


Fig. 32: Rear Axle Shaft Seal (195mm Axle)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Seal Replacement (195mm Axle)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the rear axle shaft. Remove to <u>Rear Axle Shaft Replacement (195mm Axle)</u> .	
1	Rear Axle Shaft Seal Procedure - Using a suitable tool, remove the rear axle shaft seal. - Using the DT-50871 installer , install the rear axle shaft seal. - Check the differential carrier for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (195mm Axle)</u>. Special Tools DT-50871 Pinion Seal Installer For regional equivalent tools, refer to <u>Special Tools</u>.

REAR AXLE SHAFT SEAL REPLACEMENT (226MM ELSD - LEFT)

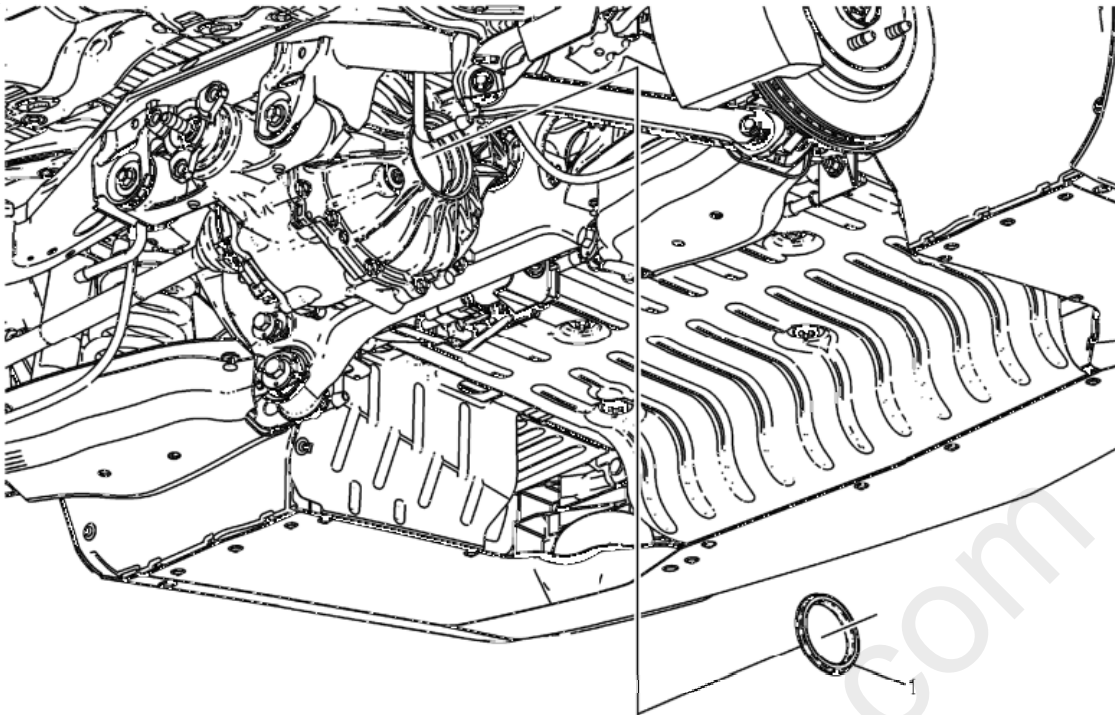


Fig. 33: Rear Axle Shaft Seal (226mm eLSD - Left)
 Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Seal Replacement (226mm eLSD - Left)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the rear axle shaft. Remove to <u>Rear Axle Shaft Replacement (226mm eLSD - Left)</u>, <u>Rear Axle Shaft Replacement (226mm eLSD - Right)</u>.	
1	Rear Axle Shaft Seal Procedure 1. Using a suitable tool, remove the rear axle shaft seal. 2. Using the DT-48021 installer , install the rear axle shaft seal. 3. Check the differential carrier for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>. Special Tools DT-48021 Pinion Seal Installer For regional equivalent tools, refer to <u>Special Tools</u> .

REAR AXLE SHAFT SEAL REPLACEMENT (226MM ELSD - RIGHT)

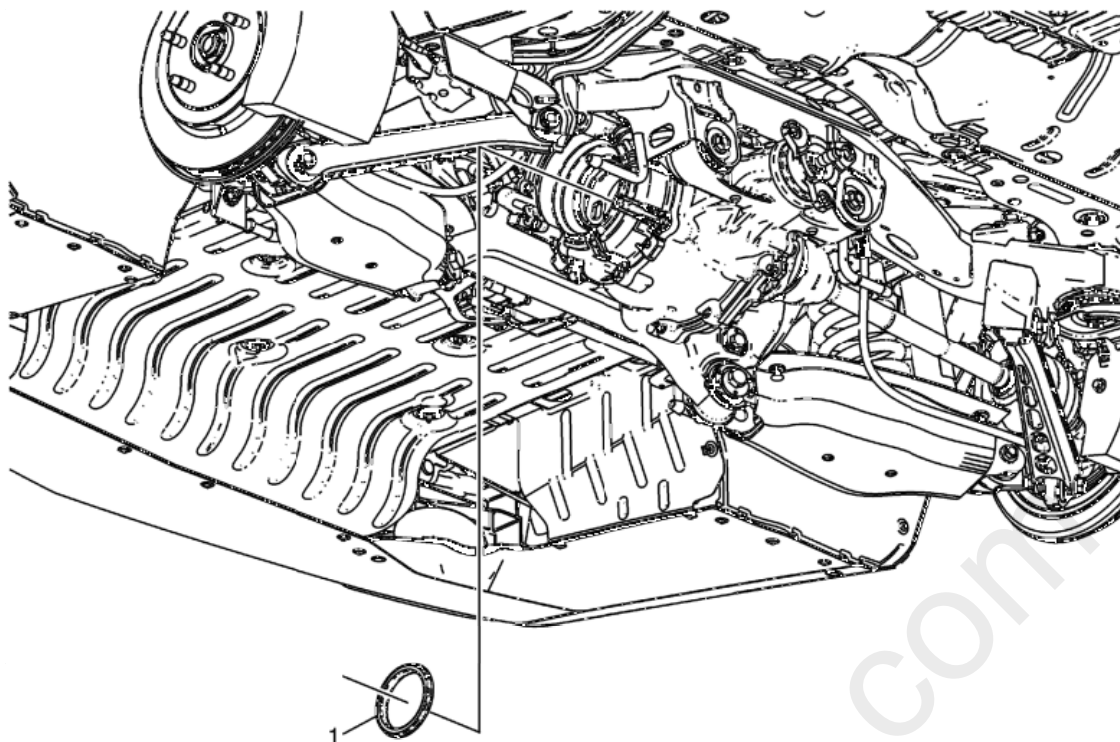


Fig. 34: Rear Axle Shaft Seal (226mm eLSD - Right)

Courtesy of GENERAL MOTORS COMPANY

Rear Axle Shaft Seal Replacement (226mm eLSD - Right)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the rear axle shaft. Remove to <u>Rear Axle Shaft Replacement (226mm eLSD - Left)</u>, <u>Rear Axle Shaft Replacement (226mm eLSD - Right)</u>.	
1	Rear Axle Shaft Seal Procedure 1. Using a suitable tool, remove the rear axle shaft seal. 2. Using the DT-48021 installer , install the rear axle shaft seal. 3. Check the differential carrier for the proper fluid level. Refer to <u>Rear Axle Lubricant Level Inspection (226mm eLSD)</u>. Special Tools DT-48021 Pinion Seal Installer For regional equivalent tools, refer to <u>Special Tools</u>.

REAR WHEEL DRIVE SHAFT FLANGE REPLACEMENT (195MM AXLE)

Special Tools

- EN 24420-A Crankshaft Balancer Puller
- DT 45012 Holding Fixture

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the propeller shaft assembly. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .

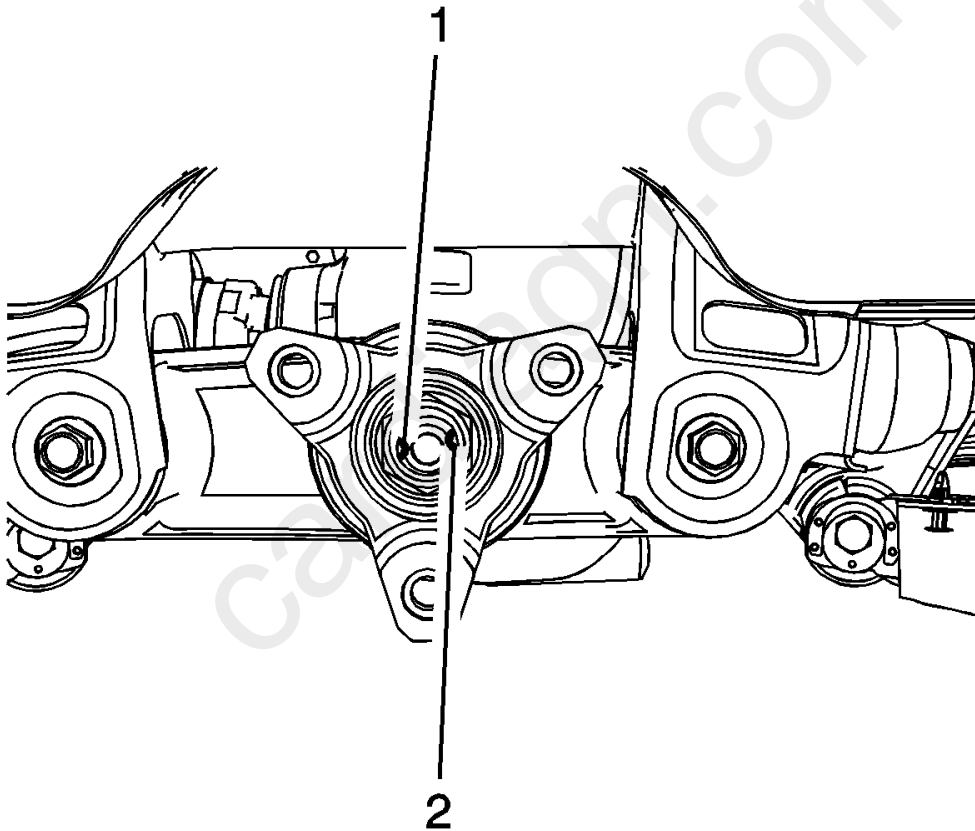


Fig. 35: Rear Wheel Drive Shaft Flange Nut Stakes
Courtesy of GENERAL MOTORS COMPANY

3. Using the appropriate tools, remove the stakes (1) and (2) from the rear wheel drive shaft flange nut.

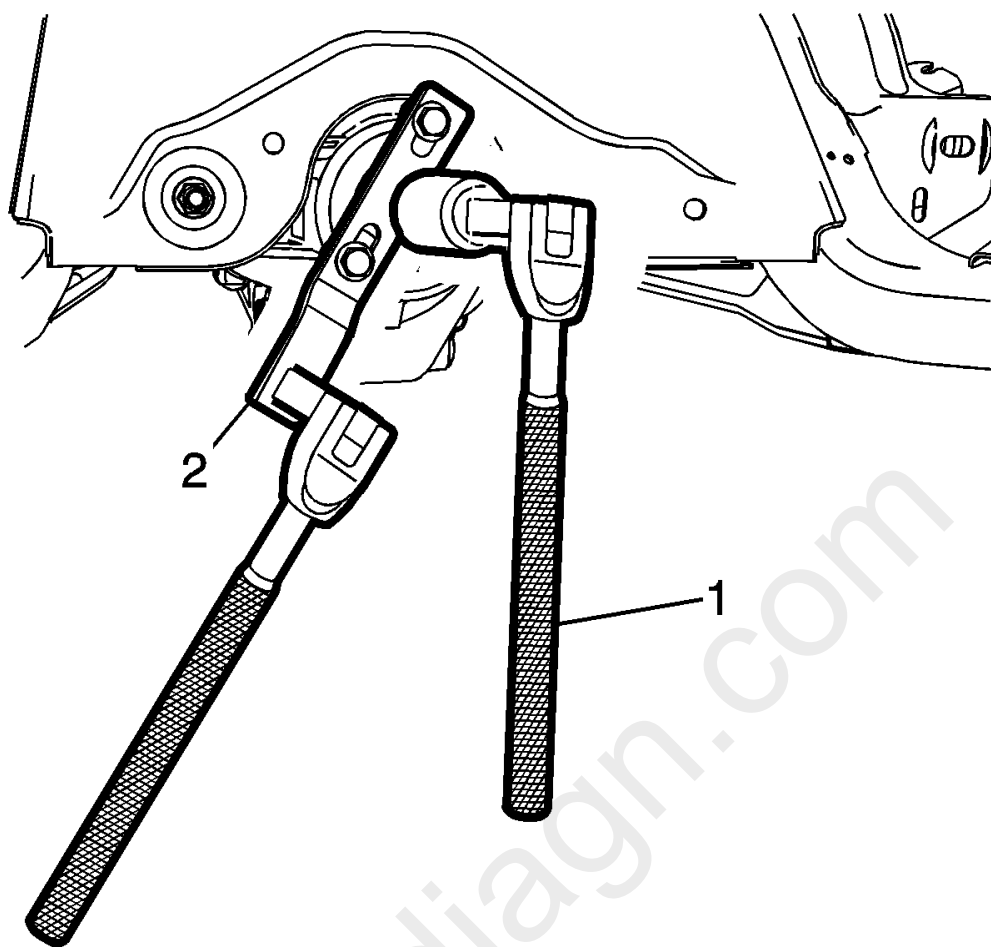


Fig. 36: Holding Fixture & Breaker Bar
Courtesy of GENERAL MOTORS COMPANY

4. Using the **DT 45012** fixture with a breaker bar (2), hold the rear wheel drive shaft flange.
5. Using the proper size socket and the breaker bar (1), loosen the rear wheel drive shaft flange nut.

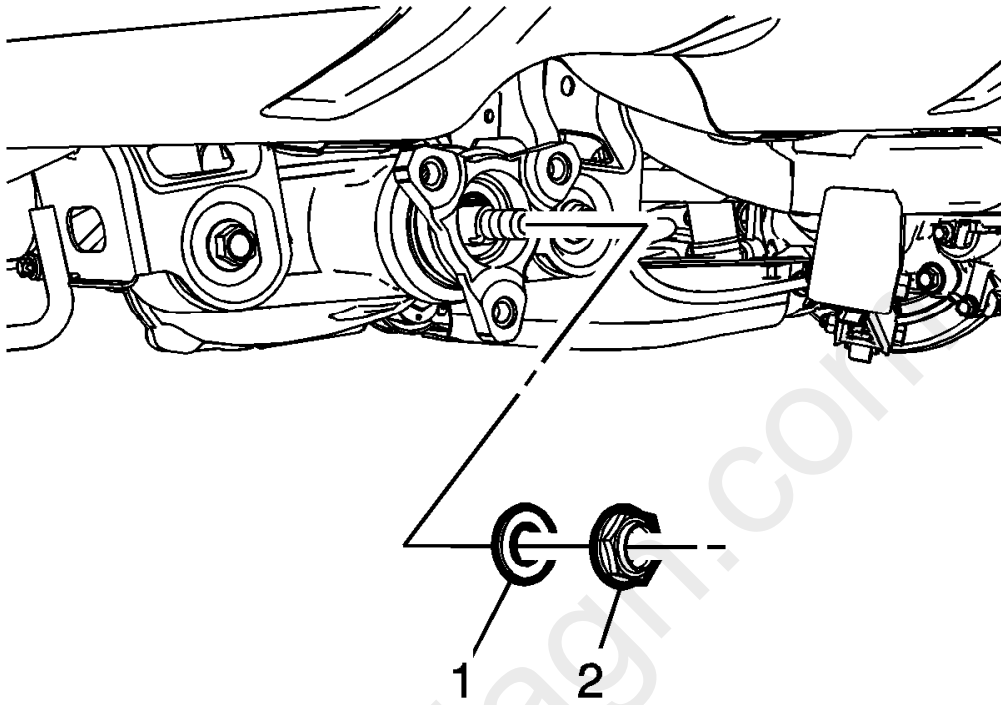


Fig. 37: Rear Wheel Drive Shaft Flange Nut & Washer
Courtesy of GENERAL MOTORS COMPANY

6. Remove the rear wheel drive shaft flange nut (2) and the washer (1).
7. Discard the rear wheel drive shaft flange nut (2). Replace with NEW only.

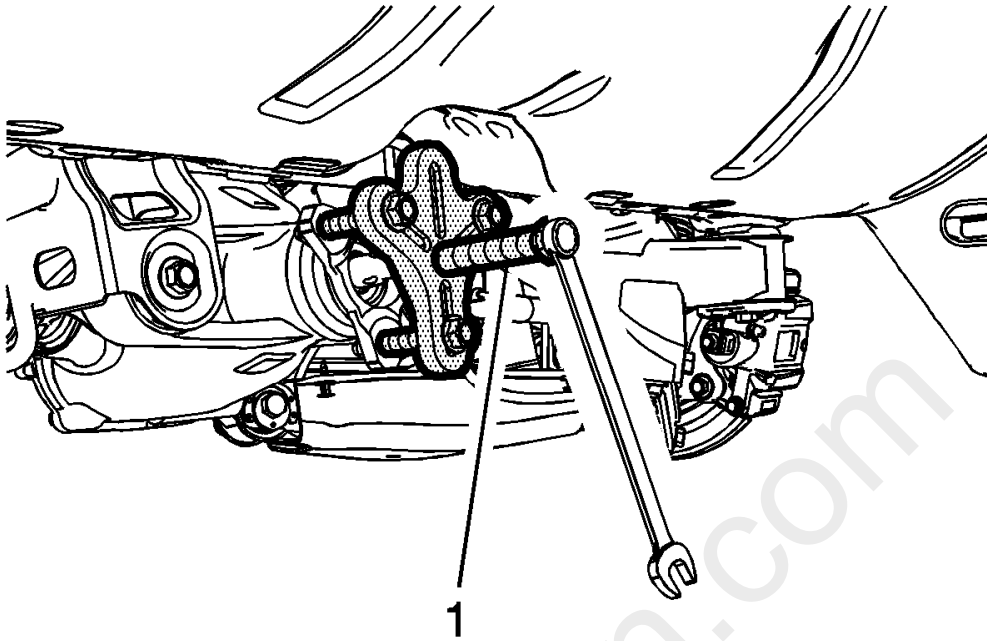


Fig. 38: Rear Wheel Drive Shaft Flange Puller
Courtesy of GENERAL MOTORS COMPANY

8. Using the **EN 24420-A** puller (1) , remove the rear wheel drive shaft flange.

Installation Procedure

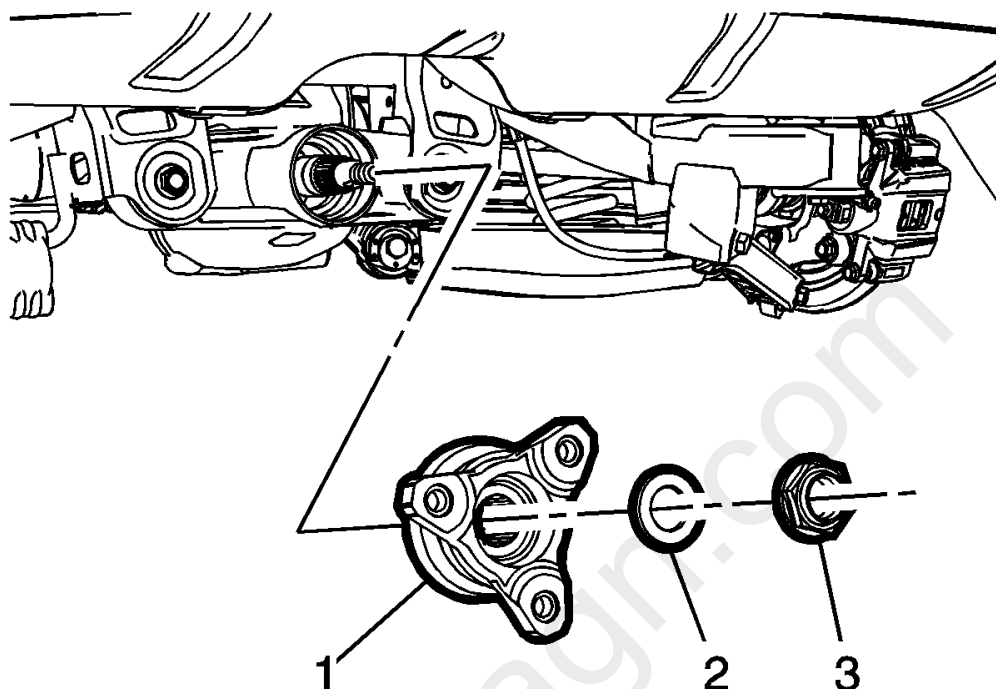


Fig. 39: Rear Wheel Drive Shaft Flange, Washer & Nut
Courtesy of GENERAL MOTORS COMPANY

1. Position the rear wheel drive shaft flange (1)) on the pinion shaft.

NOTE: Install the drive pinion flange on the drive pinion shaft so that there are 3 to 4 threads showing.

2. Using a brass hammer, tap the flange (1) on the drive pinion shaft.
3. Apply a small amount of silicone sealant to the splines of the flange, Refer to **Adhesives, Fluids, Lubricants, and Sealers.**
4. Install washer (2) and hand start the NEW rear wheel drive shaft flange nut (3).

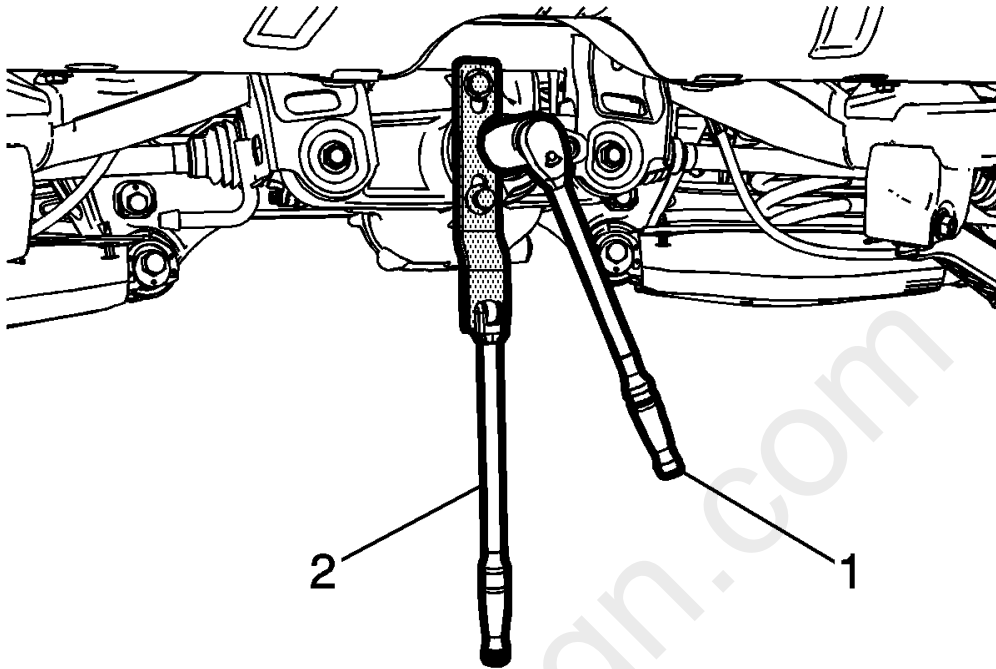


Fig. 40: Rear Wheel Drive Shaft Flange Nut Special Tools
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Using the **DT 45012** fixture and breaker bar (2) with the proper size socket ratchet (1), tighten the NEW rear wheel drive shaft flange nut to 105 N.m (77 lb ft) until the pinion end play is just taken up.

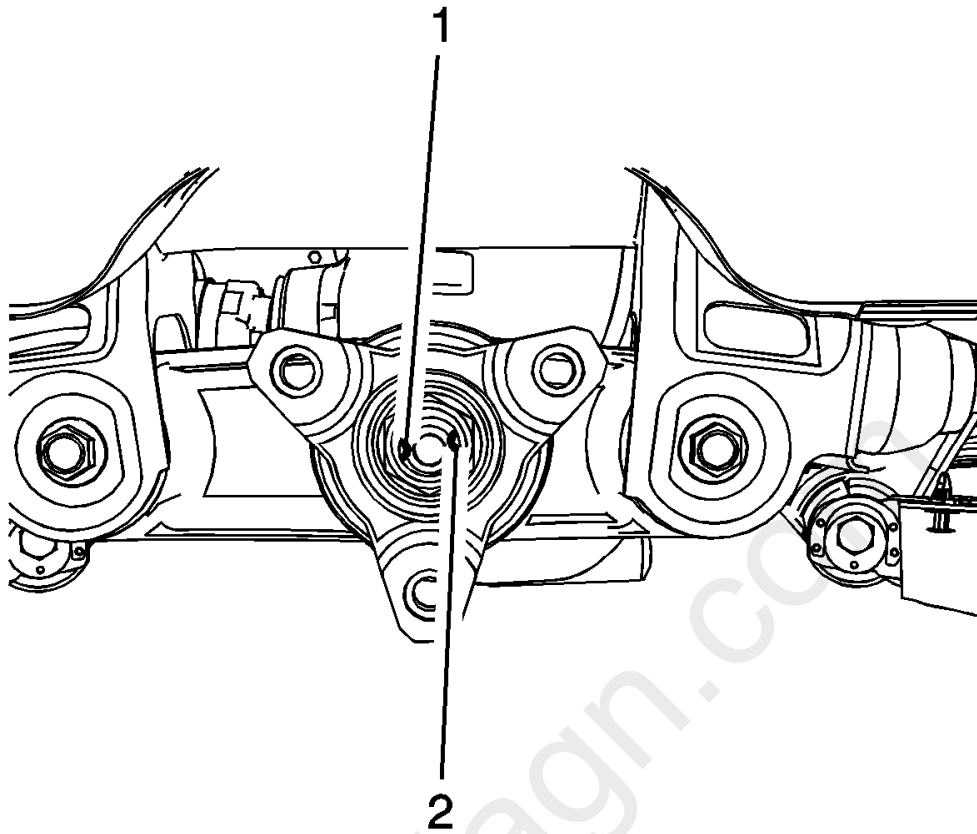


Fig. 41: Rear Wheel Drive Shaft Flange Nut Stakes
Courtesy of GENERAL MOTORS COMPANY

6. Using a hammer and a punch, stake two sides (1) and (2) of the rear wheel drive shaft flange nut to the grooves in the drive pinion gear.
7. Check the fluid level of the rear drive axle. Refer to **Rear Axle Lubricant Level Inspection (195mm Axle)**.
8. Install the propeller shaft assembly. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)**
9. Remove the support and lower the vehicle.

REAR WHEEL DRIVE SHAFT FLANGE REPLACEMENT (226MM ELSD)

Special Tools

- EN 24420-A Crankshaft Balancer Puller
- DT 45012 Holding Fixture

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the propeller shaft assembly. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .

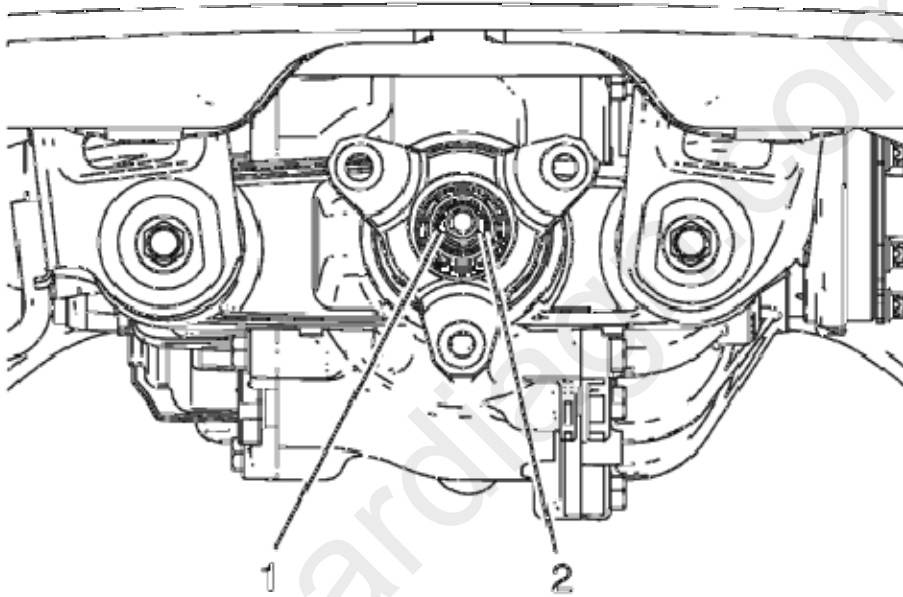


Fig. 42: Rear Wheel Drive Shaft Flange Nut Stake Points
Courtesy of GENERAL MOTORS COMPANY

3. Using the appropriate tools, remove the stakes (1) and (2) from the rear wheel drive shaft flange nut.

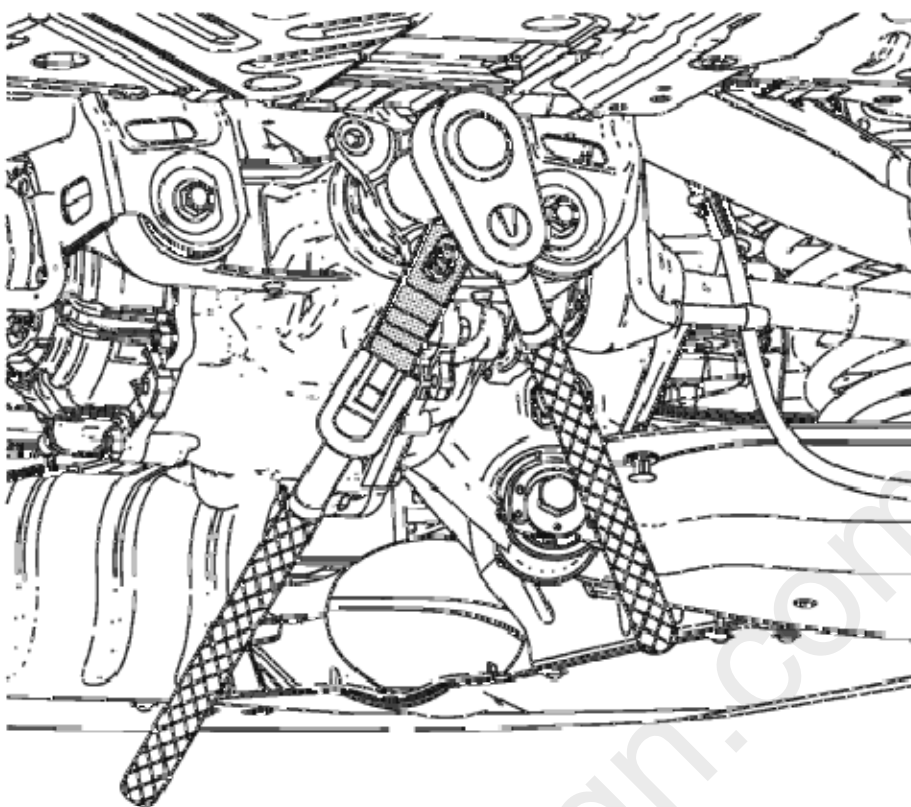


Fig. 43: Holding Rear Wheel Drive Shaft Flange
Courtesy of GENERAL MOTORS COMPANY

4. Using the **DT 45012** fixture with a breaker bar, hold the rear wheel drive shaft flange.
5. Using the proper size socket and the breaker bar (1), loosen the rear wheel drive shaft flange nut.

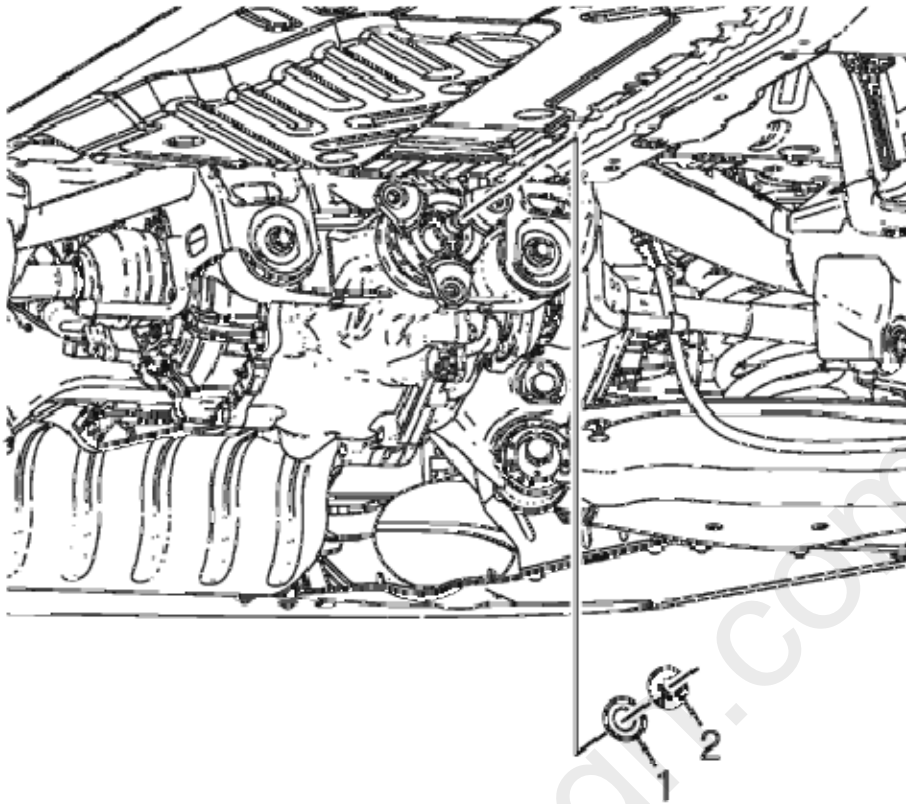


Fig. 44: Rear Wheel Drive Shaft Flange Nut And Washer
Courtesy of GENERAL MOTORS COMPANY

6. Remove the rear wheel drive shaft flange nut (2) and the washer (1).
7. Discard the rear wheel drive shaft flange nut (2). Replace with NEW only.

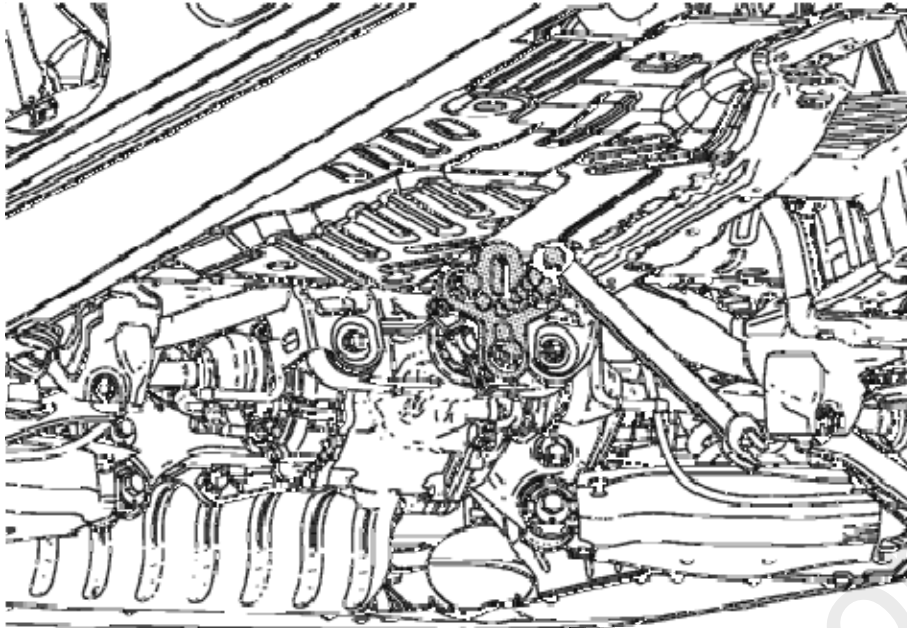


Fig. 45: Removing Rear Wheel Drive Shaft Flange
Courtesy of GENERAL MOTORS COMPANY

8. Using the EN 24420-A puller , remove the rear wheel drive shaft flange.

Installation Procedure

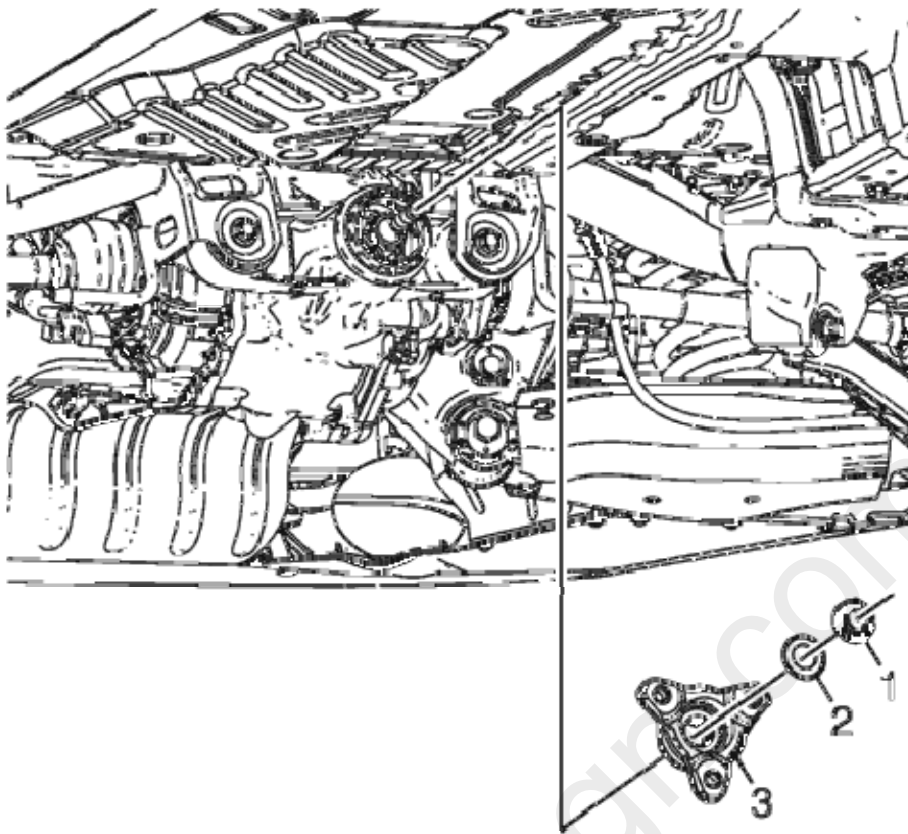


Fig. 46: Rear Wheel Drive Shaft Flange
Courtesy of GENERAL MOTORS COMPANY

1. Position the rear wheel drive shaft flange (3) on the pinion shaft.

NOTE: Install the rear wheel drive shaft flange on the drive pinion shaft so that there are 3 to 4 threads showing.

2. Using a brass hammer, tap the flange (3) on the drive pinion shaft.
3. Apply a small amount of silicone sealant to the splines of the rear wheel drive shaft flange, Refer to **Adhesives, Fluids, Lubricants, and Sealers**.
4. Install washer (2) and hand start the NEW rear wheel drive shaft flange nut (1).

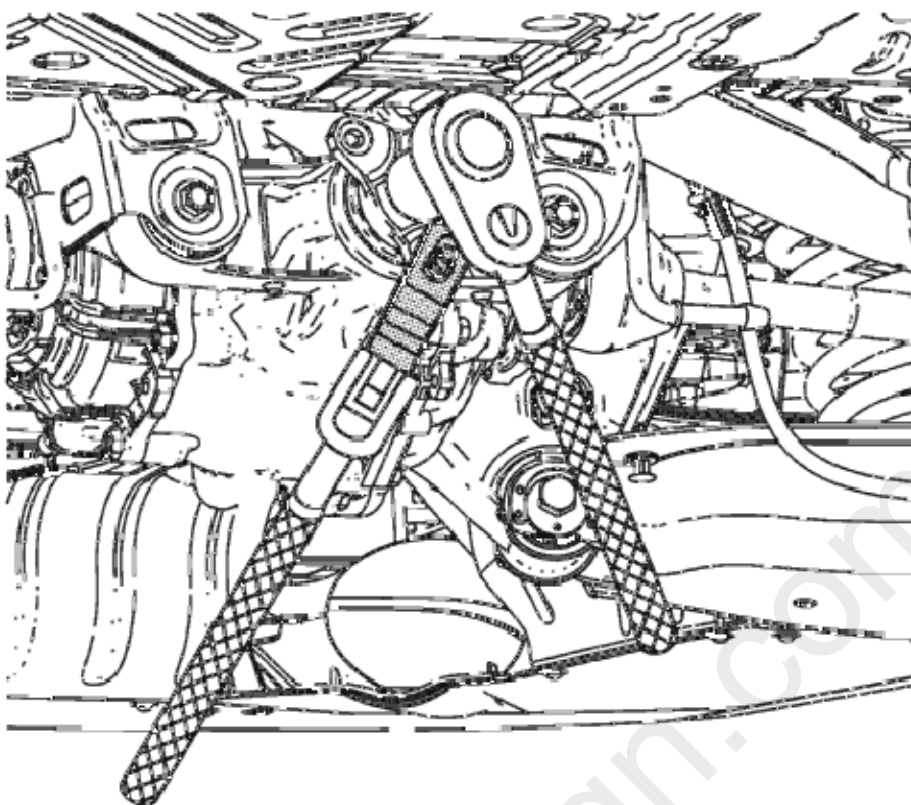


Fig. 47: Holding Rear Wheel Drive Shaft Flange
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

5. Using the **DT 45012** fixture and breaker bar with the proper size socket, tighten the NEW rear wheel drive shaft flange nut to 105 N.m (77 lb ft) until the pinion end play is just taken up.

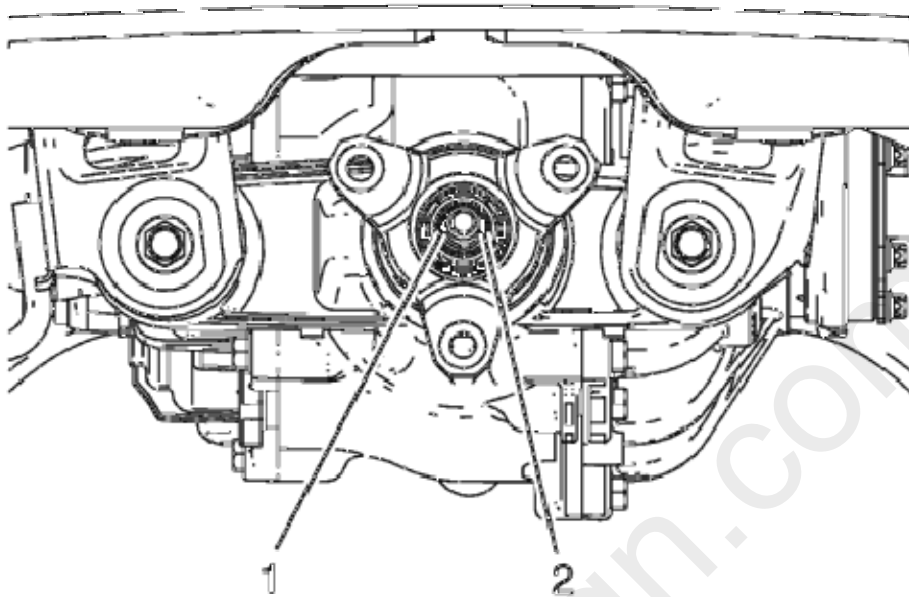


Fig. 48: Rear Wheel Drive Shaft Flange Nut Stake Points
Courtesy of GENERAL MOTORS COMPANY

6. Using a hammer and a punch, stake two sides (1) and (2) of the rear wheel drive shaft flange nut to the grooves in the drive pinion gear.
7. Check the fluid level of the rear drive axle. Refer to **Rear Axle Lubricant Level Inspection (226mm eLSD)**.
8. Install the propeller shaft assembly. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)**
9. Remove the support and lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY REPLACEMENT (226MM ELSD)

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drain the rear differential carrier assembly. Refer to **Rear Axle Lubricant Replacement (226mm eLSD)**.
3. Disconnect the differential oil cooler outlet hose. Refer to **Differential Oil Cooler Outlet Hose Replacement (226mm eLSD)**.

4. Disconnect the differential oil pump inlet hose. Refer to Differential Oil Pump Inlet Hose Replacement (226mm eLSD).
5. Remove the propeller shaft. Refer to Two-Piece Propeller Shaft Replacement (LFX, LF3) , Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW) .

NOTE: It is not necessary to completely remove the wheel drive axles from the vehicle. Only separate the rear wheel drive shafts from the differential carrier assembly and not from the wheel bearing and hub assembly.

6. Separate the rear wheel drive shafts from the differential carrier assembly. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .

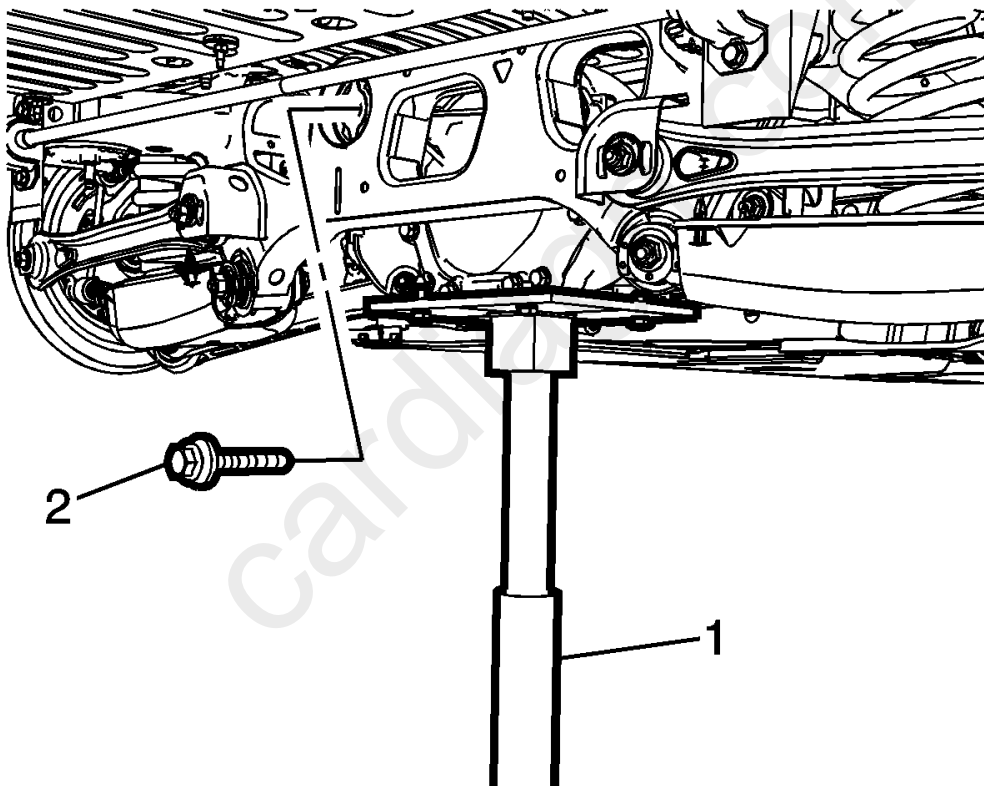


Fig. 49: Differential Carrier Rear Bolt & Washer
Courtesy of GENERAL MOTORS COMPANY

7. Support the differential carrier assembly with a suitable hydraulic jack stand (1).
8. Remove the differential carrier rear bolt and washer (2).

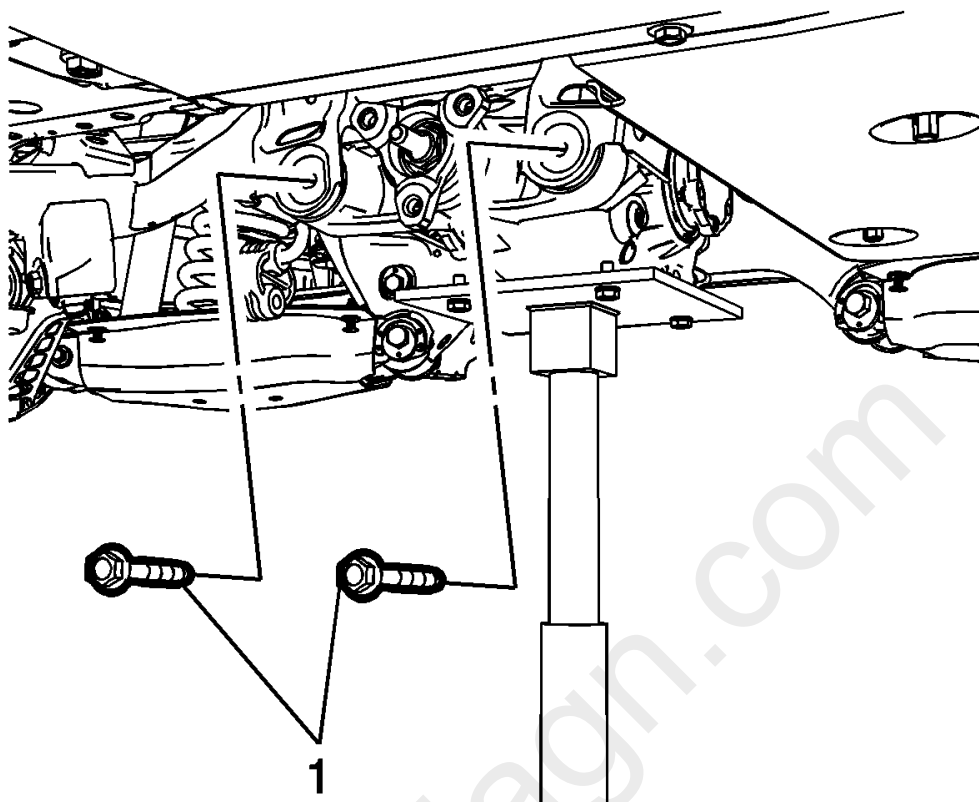


Fig. 50: Differential Carrier Front Bolts
Courtesy of GENERAL MOTORS COMPANY

9. Remove the 2 differential carrier front bolts (1).

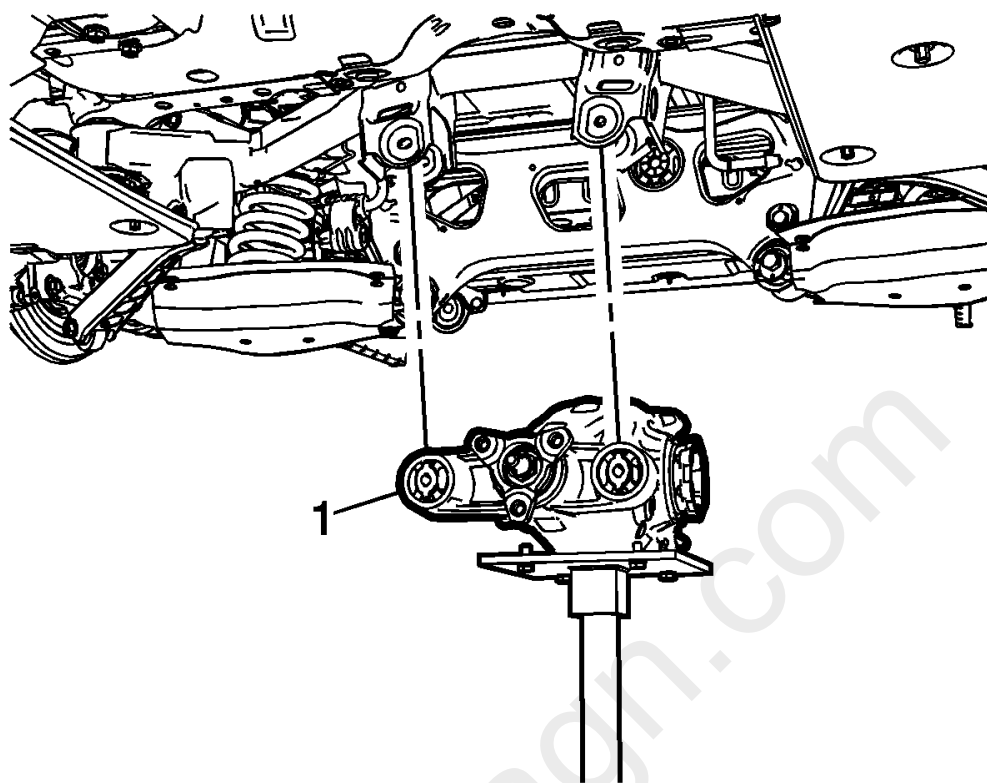


Fig. 51: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

10. Using the hydraulic jack stand, lower and remove the differential carrier assembly (1).

Installation Procedure

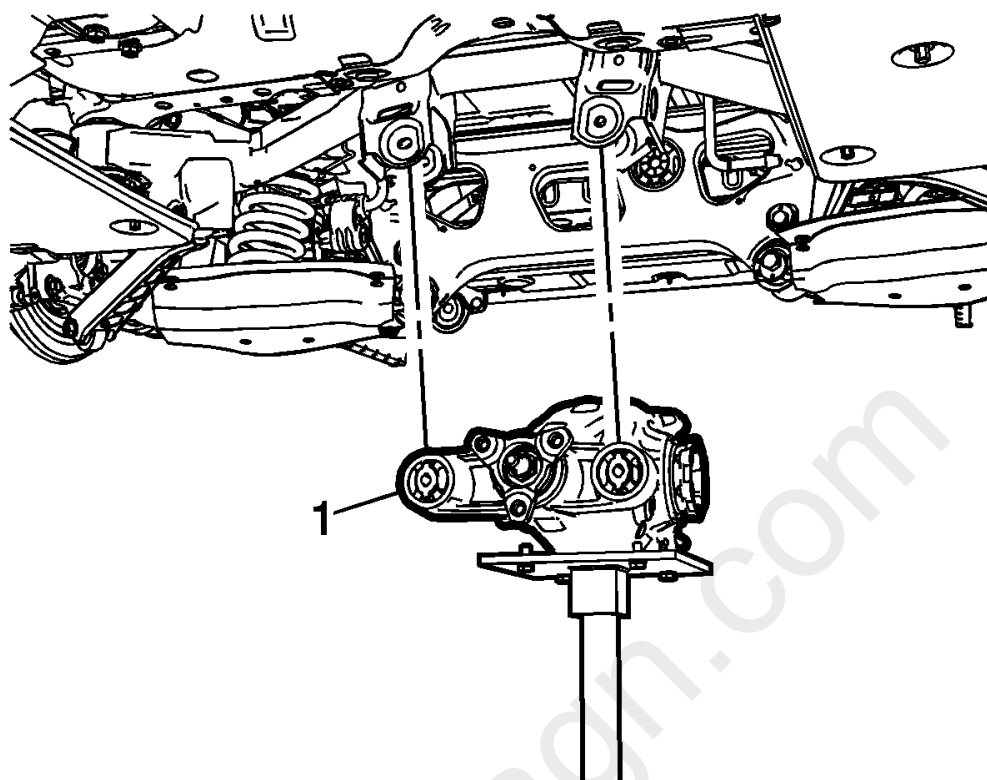


Fig. 52: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Raise the differential carrier assembly (1) into position.

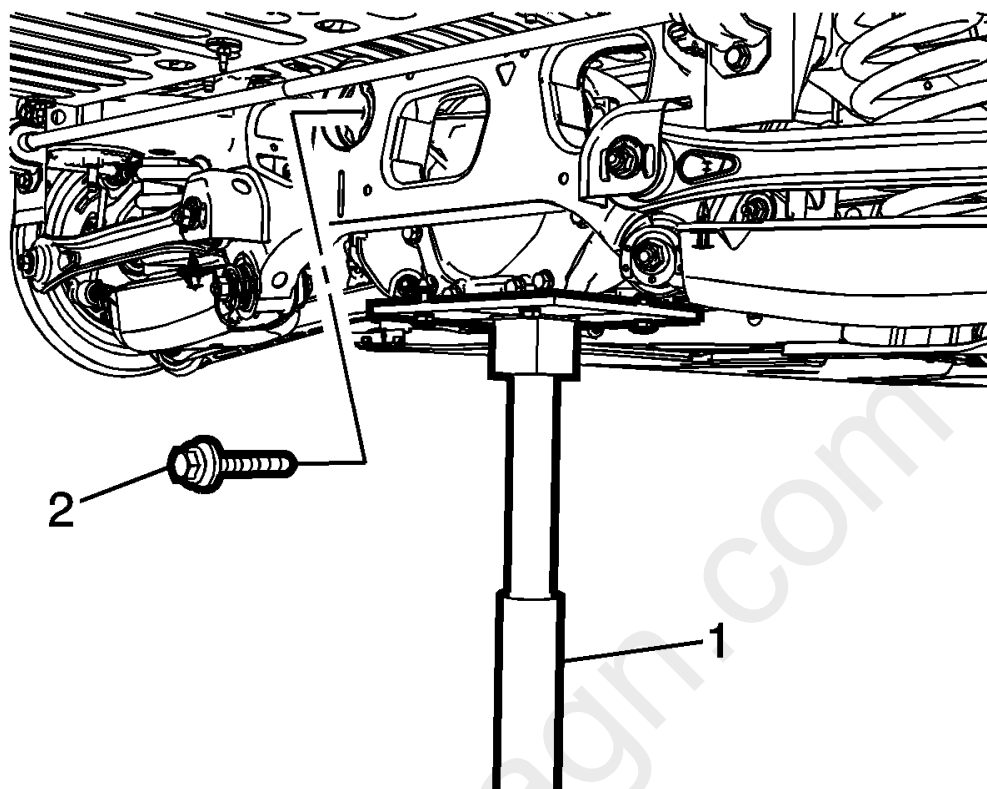


Fig. 53: Differential Carrier Rear Bolt & Washer
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the differential carrier rear bolt (1) and tighten to:
 - First Pass: 220 (162 lb ft)
 - Final Pass: plus 60 degrees

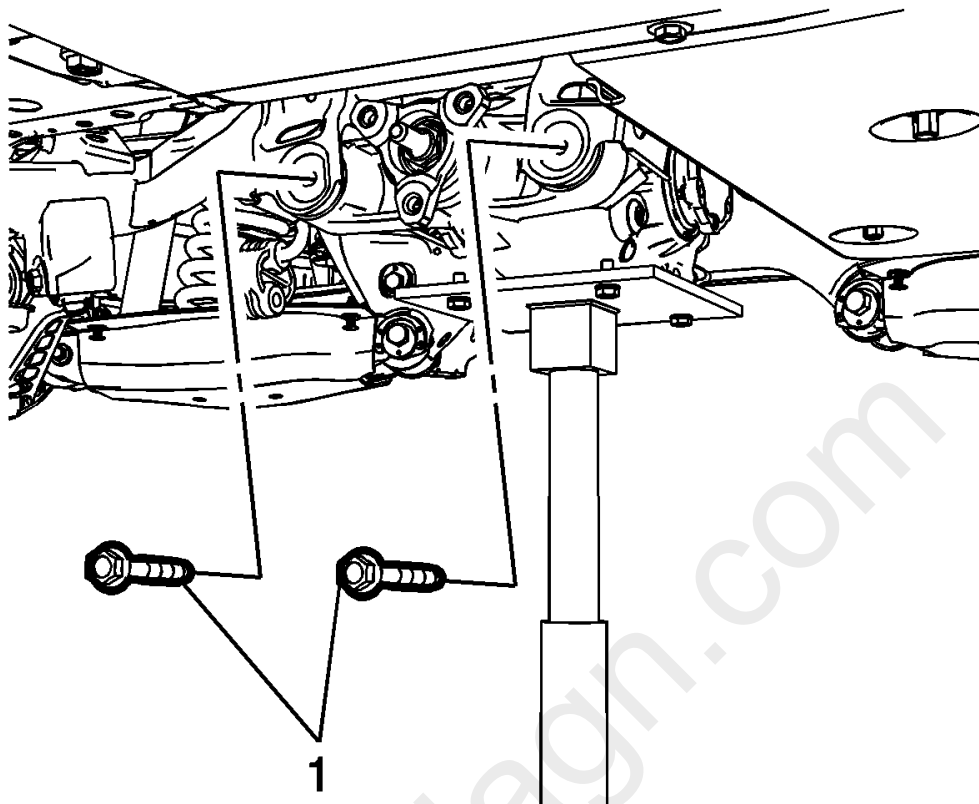


Fig. 54: Differential Carrier Front Bolts
 Courtesy of GENERAL MOTORS COMPANY

3. Install the 2 differential carrier front bolts (1) and tighten to:
 - First Pass: 50 (37 lb ft).
 - Final Pass: plus 90 degrees
4. Install the rear wheel drive shafts to the differential carrier assembly. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
6. Connect the differential oil cooler outlet hose. Refer to **Differential Oil Cooler Outlet Hose Replacement (226mm eLSD)**.
7. Connect the differential oil pump inlet hose. Refer to **Differential Oil Pump Inlet Hose Replacement (226mm eLSD)**.
8. Fill the differential with the proper fluid. Refer to **Rear Axle Lubricant Replacement (226mm eLSD)**.
9. Fill the differential clutch system. Refer to **Rear Differential Hydraulic System Service Fill/Bleed**.
10. Remove the supports and lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY REPLACEMENT (195MM AXLE)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Drain the rear differential carrier assembly. Refer to Differential Oil Replacement (195mm Axle).
3. Remove the propeller shaft. Refer to Two-Piece Propeller Shaft Replacement (LFX, LF3) , Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW) .

NOTE: It is not necessary to completely remove the wheel drive axles from the vehicle. Only separate the rear wheel drive shafts from the differential carrier assembly and not from the wheel bearing and hub assembly.

4. Separate the rear wheel drive shafts from the differential carrier assembly. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3) , Rear Wheel Drive Shaft Replacement (LTG) .

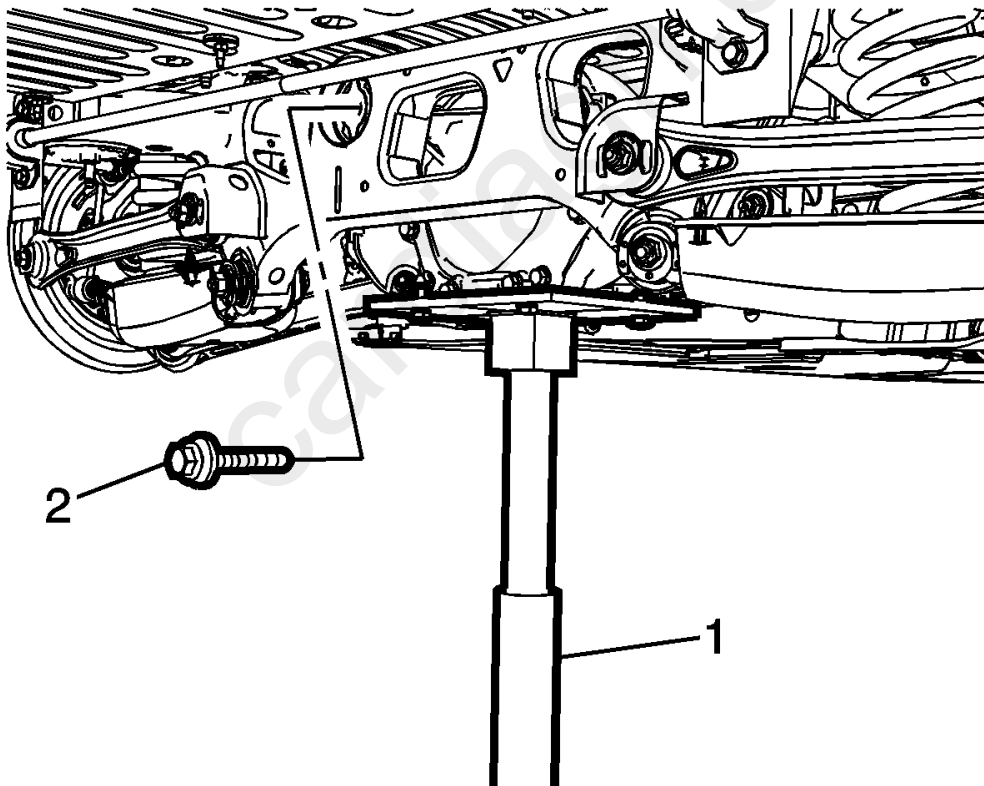


Fig. 55: Differential Carrier Rear Bolt & Washer
Courtesy of GENERAL MOTORS COMPANY

5. Support the differential carrier assembly with a suitable hydraulic jack stand (1).
6. Remove the differential carrier rear bolt and washer (2).

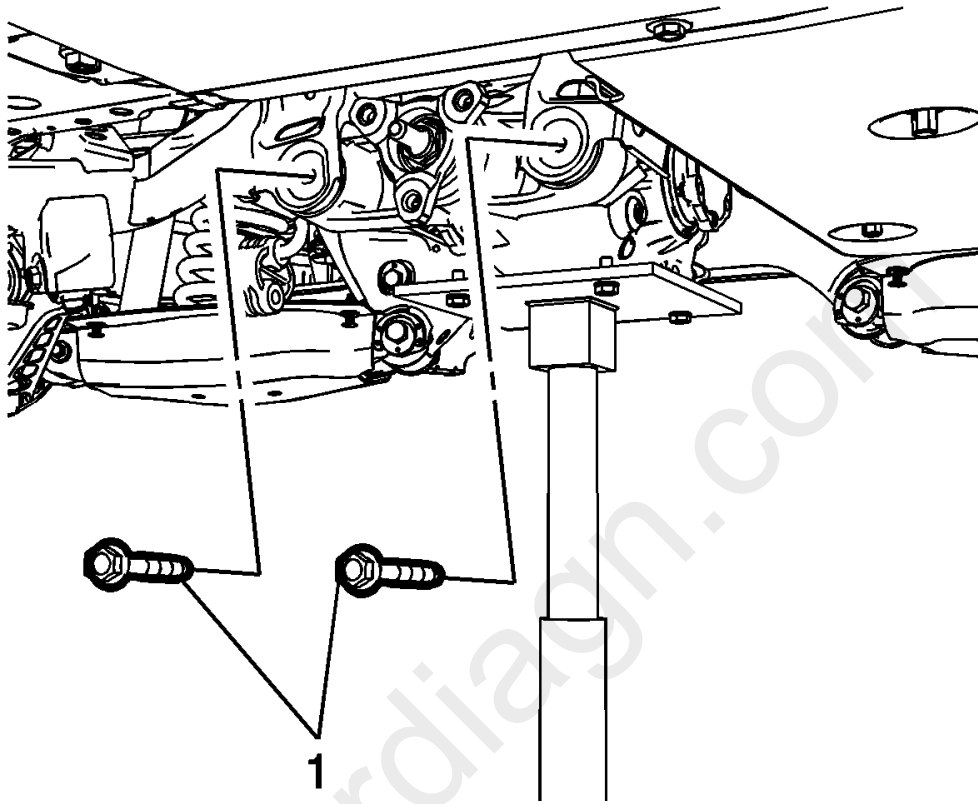


Fig. 56: Differential Carrier Front Bolts
Courtesy of GENERAL MOTORS COMPANY

7. Remove the 2 differential carrier front bolts (1).

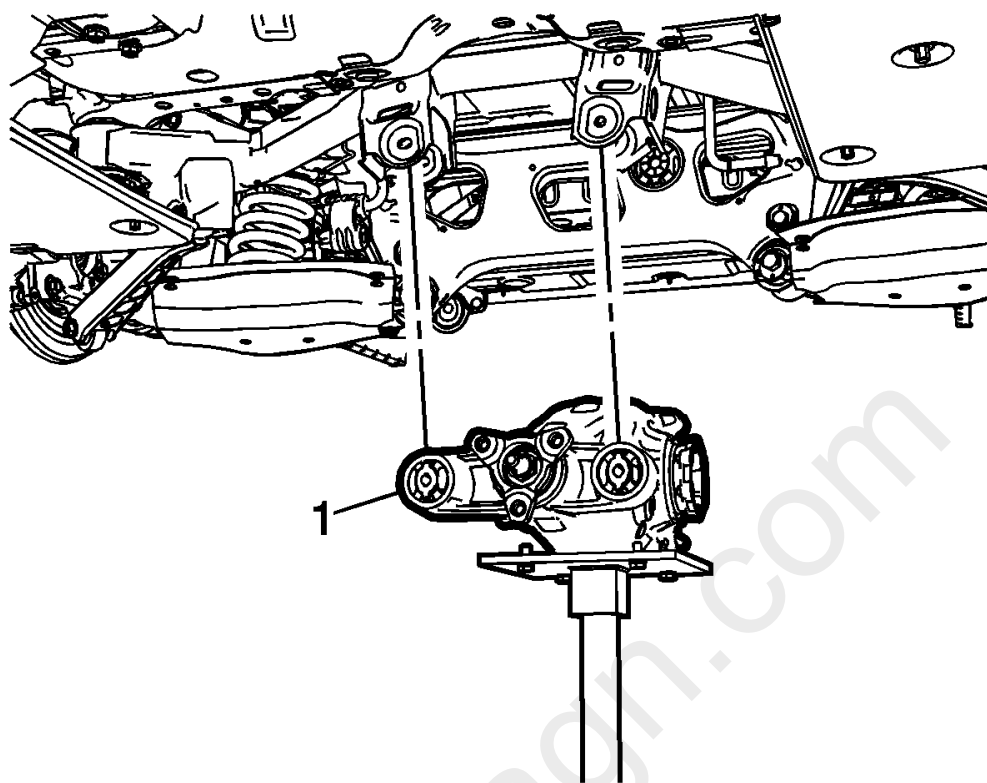


Fig. 57: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

8. Using the hydraulic jack stand, lower and remove the differential carrier assembly (1).

Installation Procedure

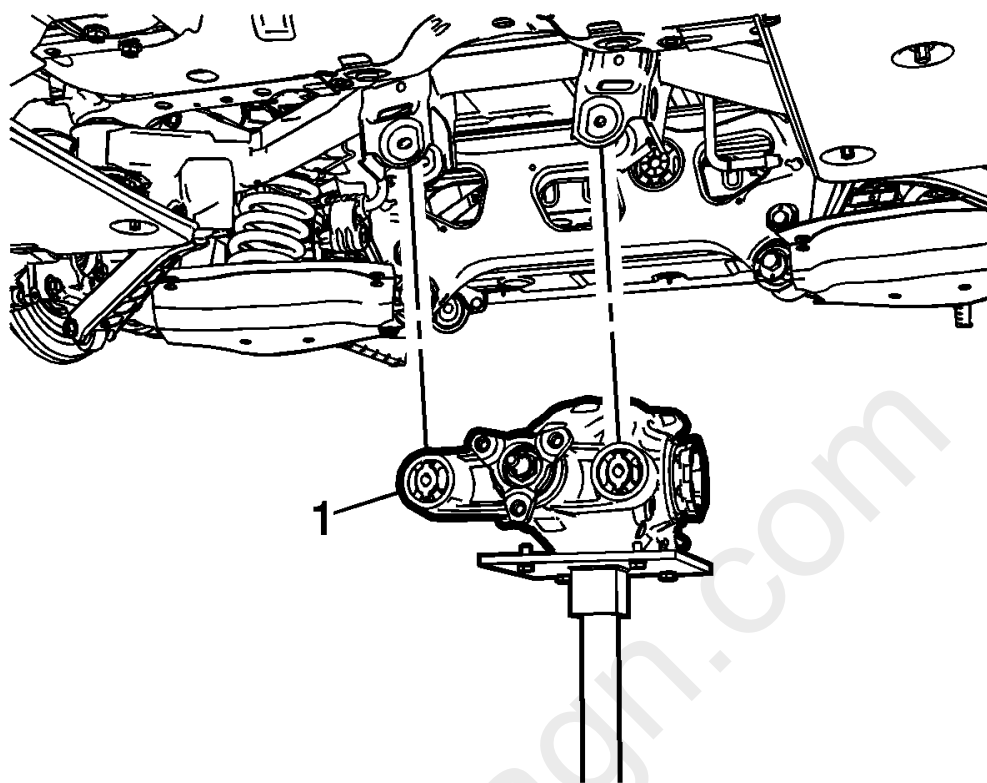


Fig. 58: Differential Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Raise the differential carrier assembly (1) into position.

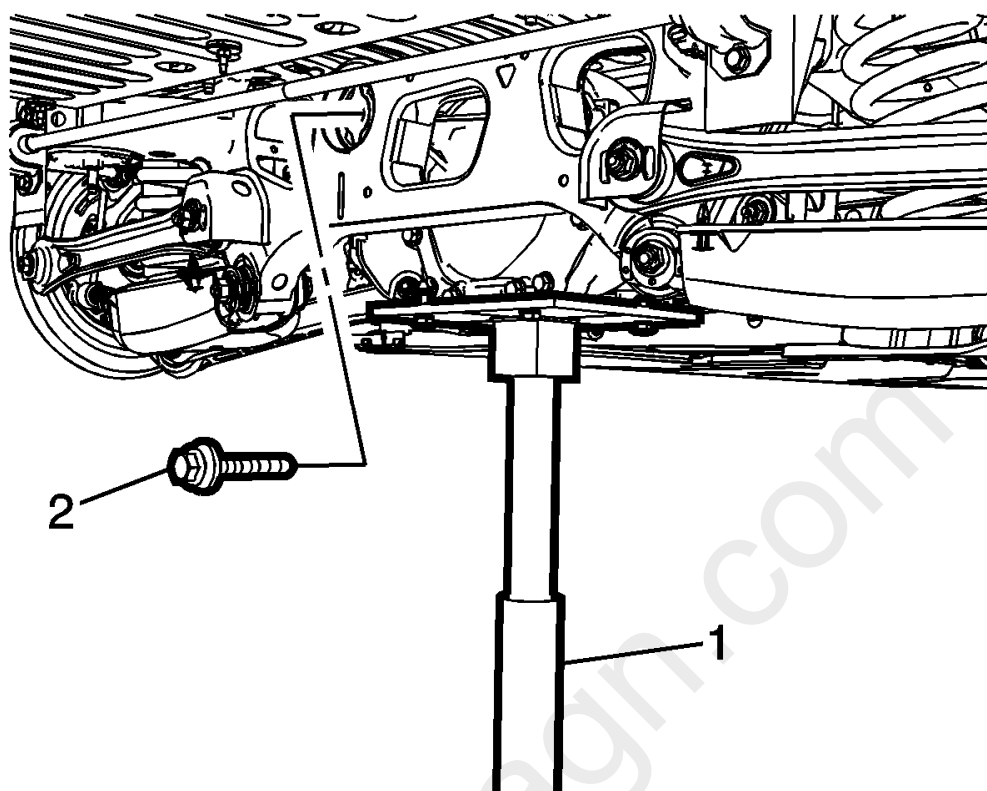


Fig. 59: Differential Carrier Rear Bolt & Washer
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

2. Install the differential carrier rear bolt (1) and tighten to:
 - First Pass: 220 (162 lb ft)
 - Final Pass: plus 60 degrees

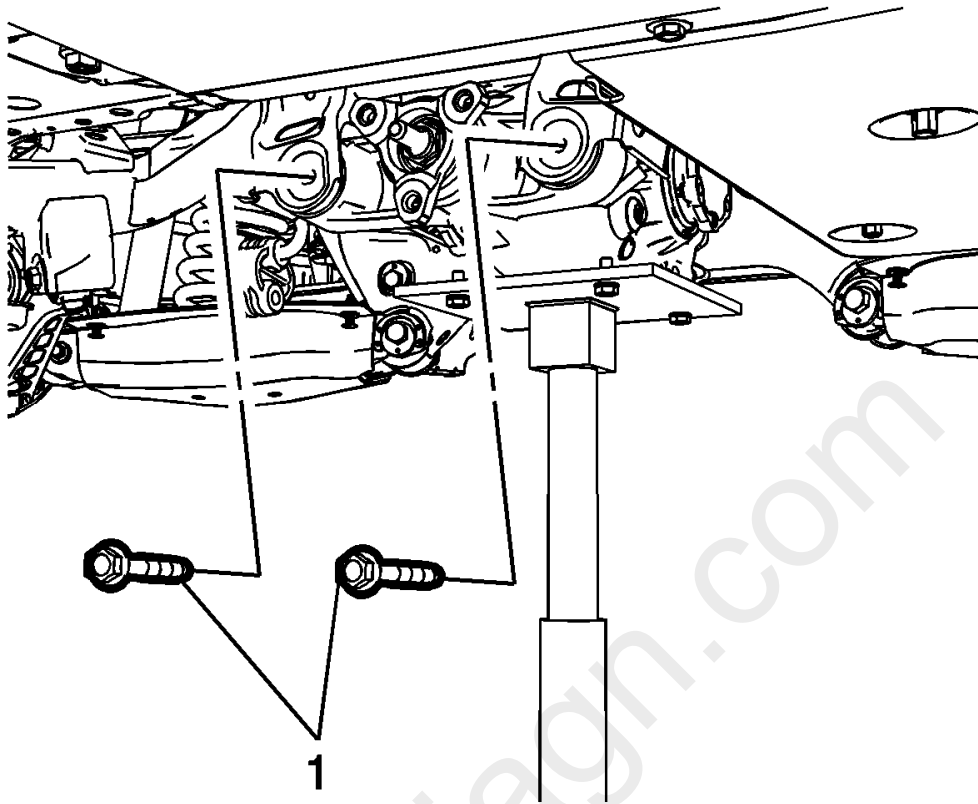


Fig. 60: Differential Carrier Front Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Install the 2 differential carrier front bolts (1) and tighten to:
 - First Pass: 50 (37 lb ft).
 - Final Pass: plus 90 degrees
4. Install the rear wheel drive shafts to the differential carrier assembly. Refer to **Rear Wheel Drive Shaft Replacement (LFX,LF3)** , **Rear Wheel Drive Shaft Replacement (LTG)** .
5. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
6. Fill the differential with the proper fluid. Refer to **Differential Oil Replacement (195mm Axle)**.
7. Remove the supports and lower the vehicle.

WIRING HARNESS CONNECTOR REPLACEMENT (226MM ELSD)

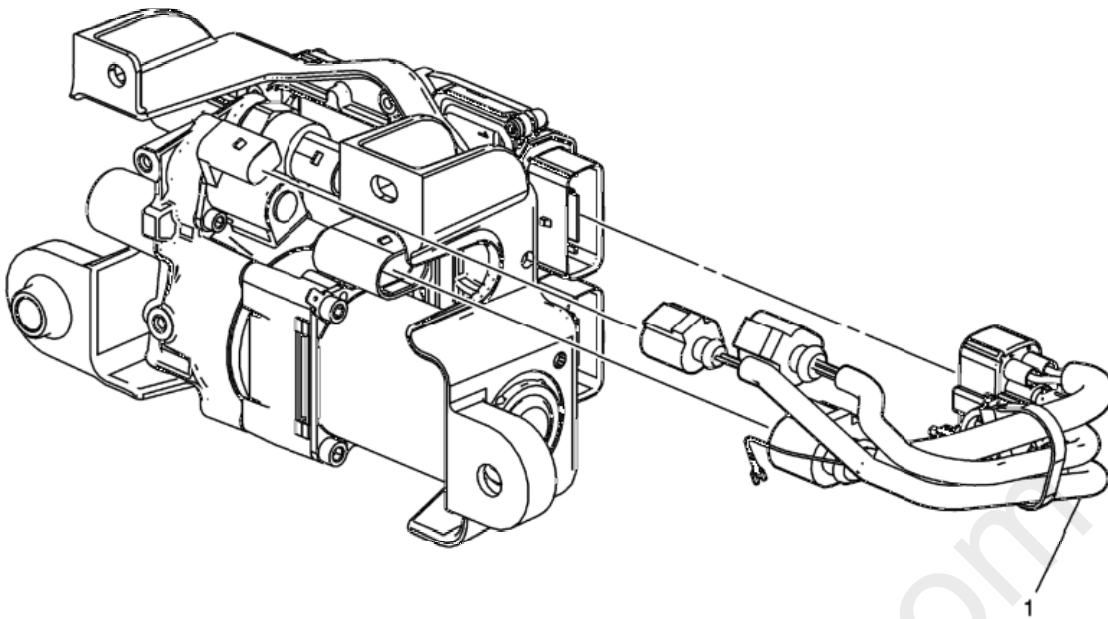


Fig. 61: Differential Clutch Pump Wiring Harness Connector Assembly
 Courtesy of GENERAL MOTORS COMPANY

Wiring Harness Connector Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure Remove the differential clutch pump bracket bolts to gain access to back side of the rear axle differential lock control actuator assembly. It is not necessary to disconnect the differential oil hoses. Refer to <u>Differential Clutch Pump Replacement (226mm eLSD)</u> .	
1	Wiring Harness Connector Assembly

LIMITED SLIP DIFFERENTIAL CLUTCH PIPE CONNECTOR REPLACEMENT (226MM ELSD)

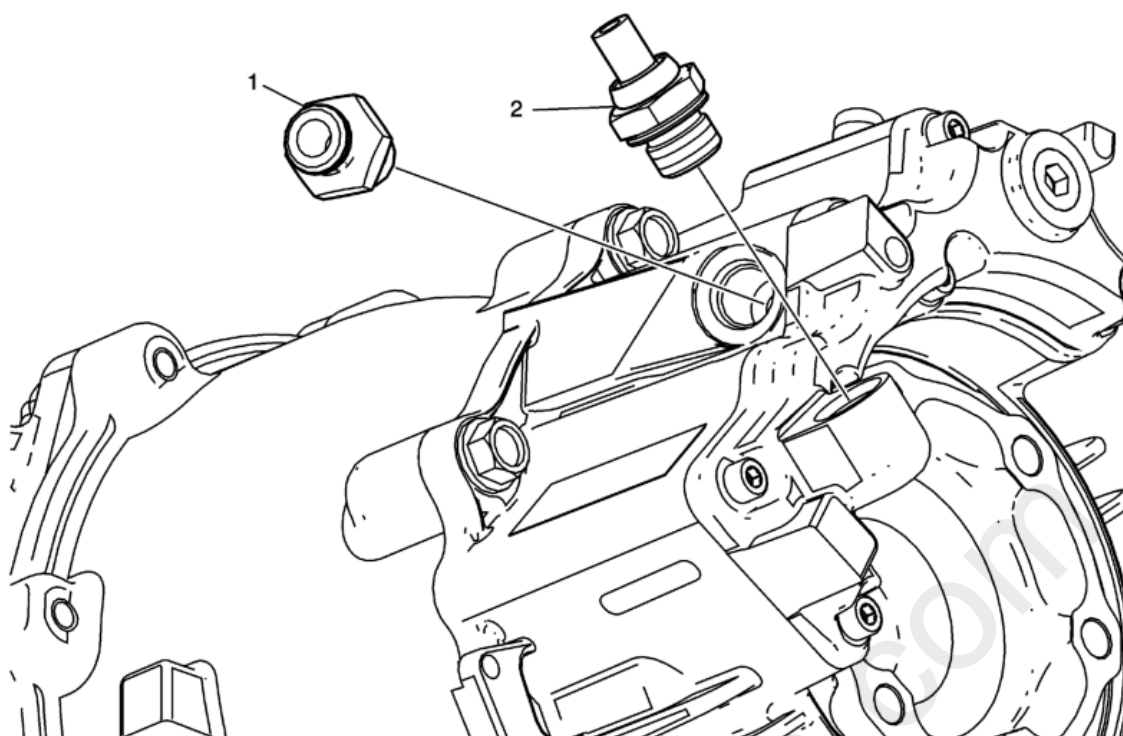


Fig. 62: Limited Slip Differential Clutch Pipe Connector (226mm eLSD)

Courtesy of GENERAL MOTORS COMPANY

Limited Slip Differential Clutch Pipe Connector Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Disconnect the differential oil cooler outlet hose. Refer to <u>Limited Slip Differential Clutch Pipe Connector Disconnection and Connection</u>. 3. Disconnect the differential oil pump inlet hose. Refer to <u>Limited Slip Differential Clutch Pipe Connector Disconnection and Connection</u>.	
1	Limited Slip Differential Clutch Pipe Connector (Female 16 mm) Procedure 1. Remove the limited slip differential clutch pipe connector. 2. Install the NEW limited slip differential clutch pipe connector. 3. Fill the differential clutch system. Refer to <u>Rear Differential Hydraulic System Service Fill/Bleed</u>. Tighten 28 (21 lb ft)
	Limited Slip Differential Clutch Pipe Connector (Male 18 mm)

2	Procedure 1. Remove the limited slip differential clutch pipe connector. 2. Install the NEW limited slip differential clutch pipe connector. 3. Fill the differential clutch system. Refer to <u>Rear Differential Hydraulic System Service Fill/Bleed.</u> Tighten 31 (23 lb ft)
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LIMITED SLIP DIFFERENTIAL CLUTCH PIPE CONNECTOR DISCONNECTION AND CONNECTION

Special Tools

J-45666 Air Line Release Tool

For equivalent or regional tools. Refer to **Special Tools.**

Removal Procedure

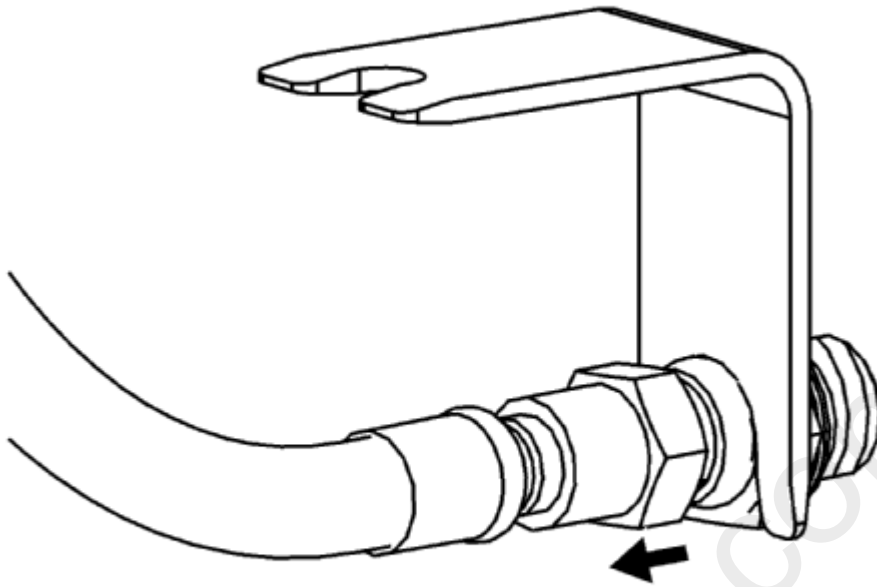


Fig. 63: Air Line Release Tool

Courtesy of GENERAL MOTORS COMPANY

1. Install the **J-45666** air line release tool onto the differential oil cooler or differential oil pump pipe.

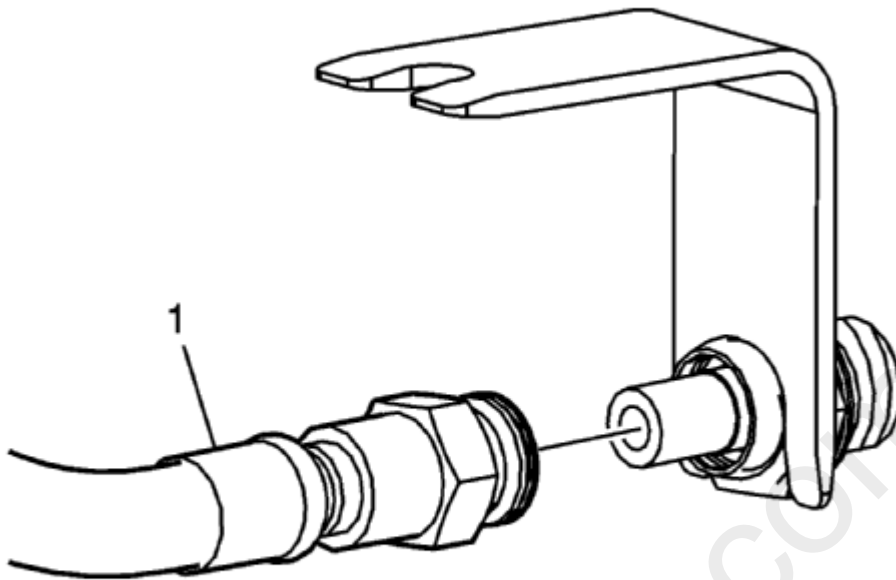


Fig. 64: Disconnected Pipe Fitting
Courtesy of GENERAL MOTORS COMPANY

NOTE: Do not use the tool to pry the hose away from the fitting.

2. Pull rearward on the pipe (1) to disconnect from the pipe fitting.
3. Remove **J-45666** air line release tool from the pipe fitting.

Installation Procedure

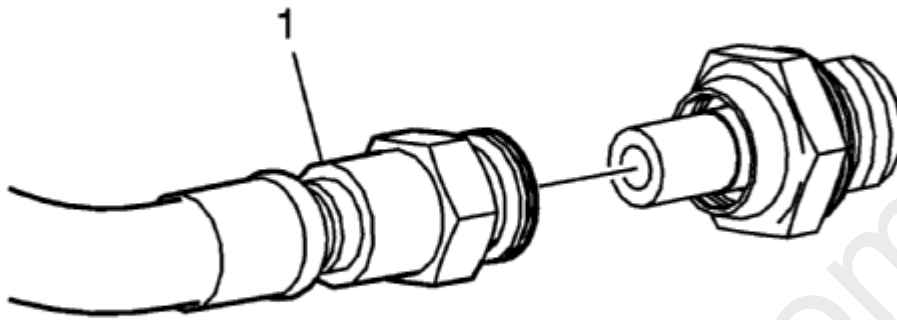


Fig. 65: Disconnected Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

IMPORTANT: Inspect the pipe fitting and retaining clip for signs of wear or damage.
Replace the components if necessary.

1. Install the pipe (1) by pressing the pipe onto the pipe fitting.

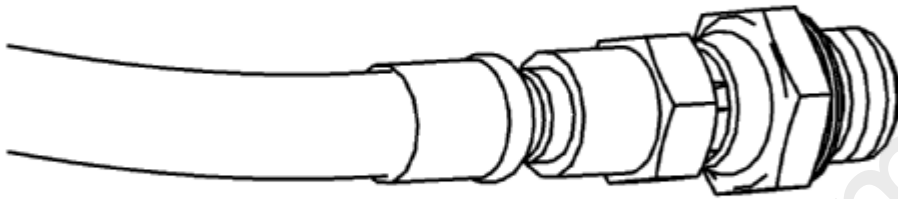


Fig. 66: Assembled Pipe Fitting

Courtesy of GENERAL MOTORS COMPANY

2. A distinct snap should be heard or felt when assembling the pipe to the fitting.
3. To ensure the cooler line is properly installed, give the cooler pipe a gentle pull.

LIMITED SLIP DIFFERENTIAL CLUTCH VALVE REPLACEMENT (226MM ELSD)

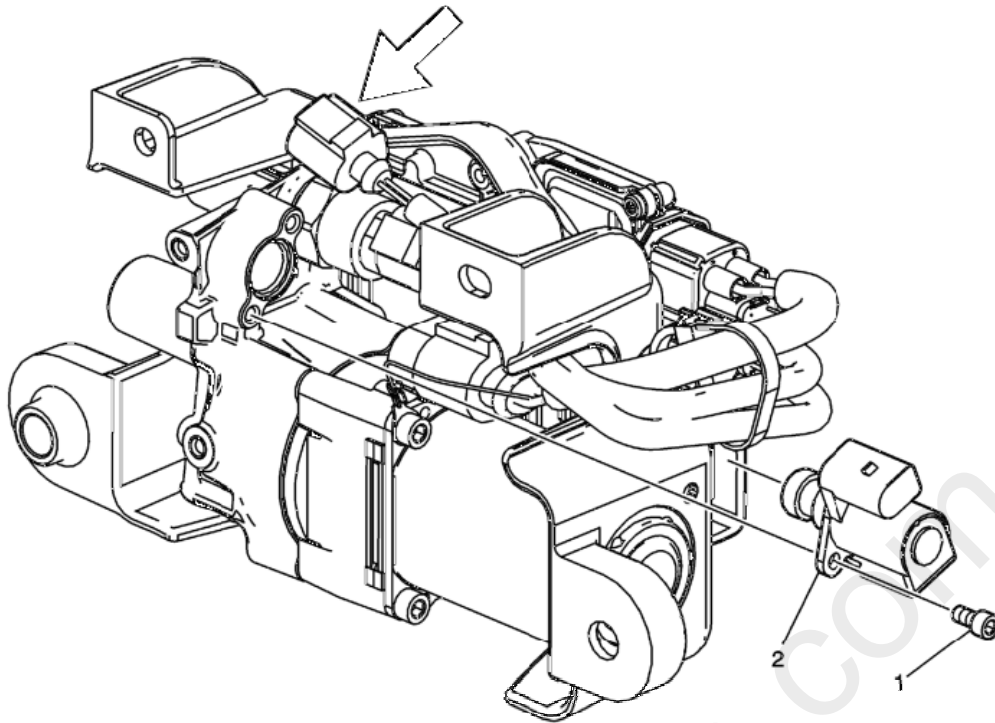


Fig. 67: Limited Slip Differential Clutch Valve (226mm eLSD)
 Courtesy of GENERAL MOTORS COMPANY

Limited Slip Differential Clutch Valve Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the differential clutch pump bracket bolts to gain access to back side of the rear axle differential lock control actuator assembly. It is not necessary to disconnect the differential oil hoses. Refer to <u>Differential Clutch Pump Replacement (226mm eLSD)</u>. 3. Disconnect the wiring harness connector from the limited slip differential clutch valve.	
1	Limited Slip Differential Clutch Valve Bolt Tighten 3 (27 lb in)
2	Limited Slip Differential Clutch Valve Procedure 1. Remove the limited slip differential clutch valve. 2. Install the NEW limited slip differential clutch valve. 3. Fill the differential clutch fluid. Refer to <u>Lubrication Specifications</u>. 4. Perform the Rear Hydraulic System Service Fill/Bleed. Refer to <u>Rear Differential Hydraulic System Service Fill/Bleed</u>.

LIMITED SLIP DIFFERENTIAL CLUTCH REPLACEMENT (226MM ELSD)

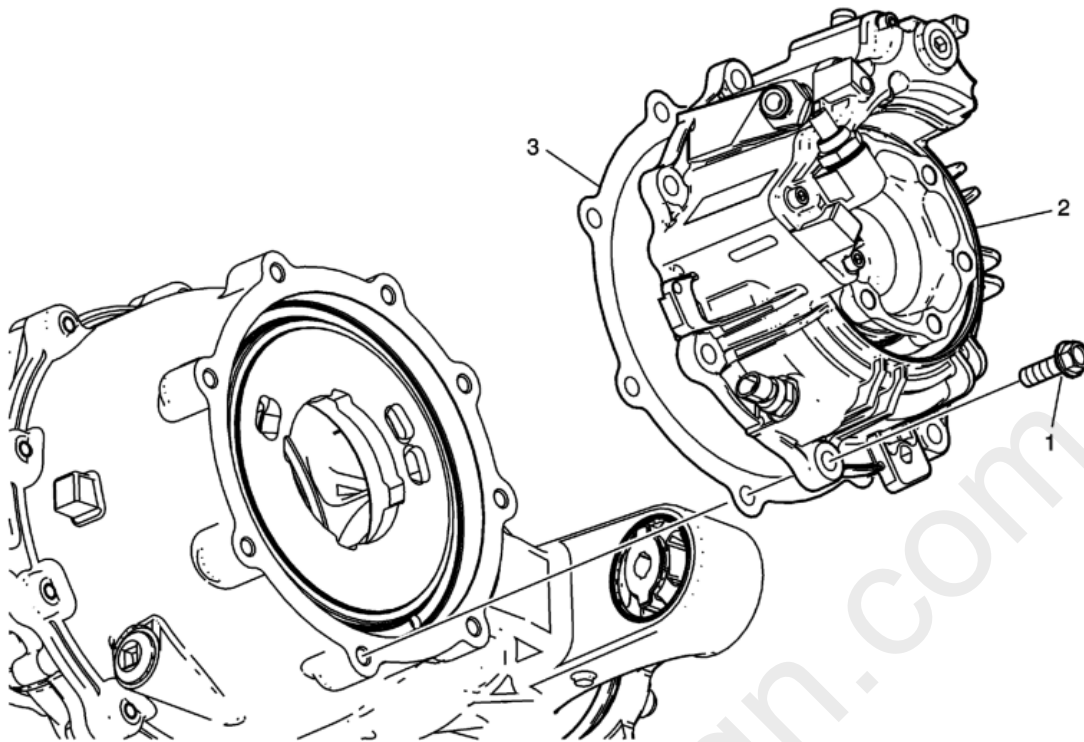


Fig. 68: Limited Slip Differential Clutch (226mm eLSD)

Courtesy of GENERAL MOTORS COMPANY

Limited Slip Differential Clutch Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Drain the differential. Refer to <u>Rear Axle Lubricant Replacement (226mm eLSD)</u>. 3. Remove the differential assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>.	
1	Limited Slip Differential Clutch Bolt (Qty 8) Tighten 20 (15 lb ft) + 34°
2	Limited Slip Differential Clutch Procedure 1. Remove the limited slip differential clutch.. 2. Install the NEW limited slip differential clutch. 3. Install the differential assembly. Refer to <u>Differential Carrier Assembly Replacement (226mm eLSD)</u>. 4. Fill the differential clutch fluid. Refer to <u>Lubrication Specifications</u>.

	5. Perform the Rear Hydraulic System Service Fill/Bleed. Refer to <u>Rear Differential Hydraulic System Service Fill/Bleed.</u>
3	Limited Slip Differential Clutch Gasket NOTE: Must use a new gasket.

DIFFERENTIAL DRIVE PINION GEAR SEAL REPLACEMENT (195MM AXLE)

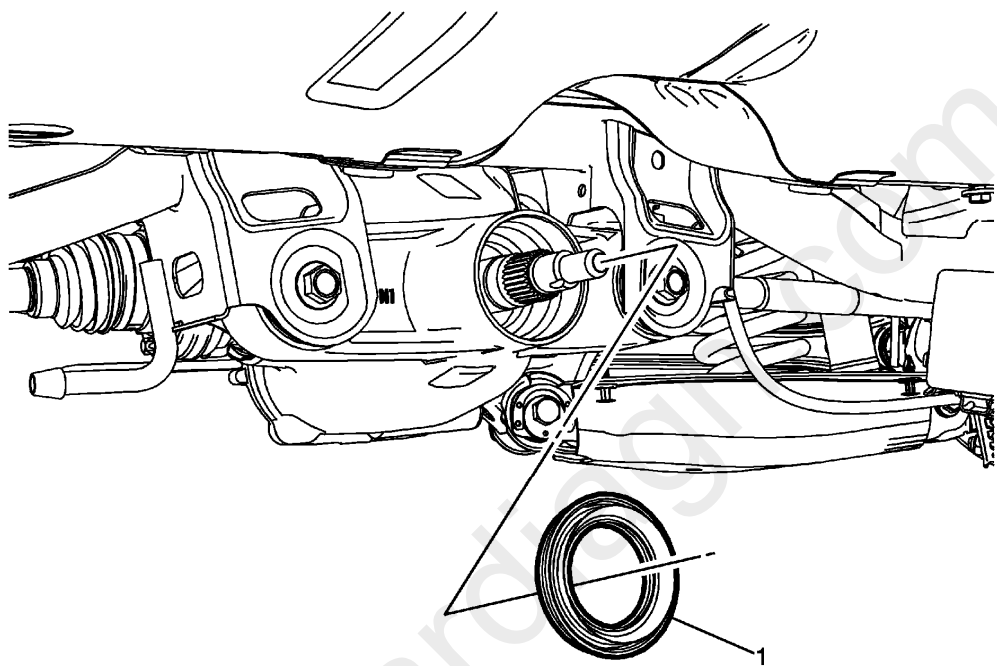


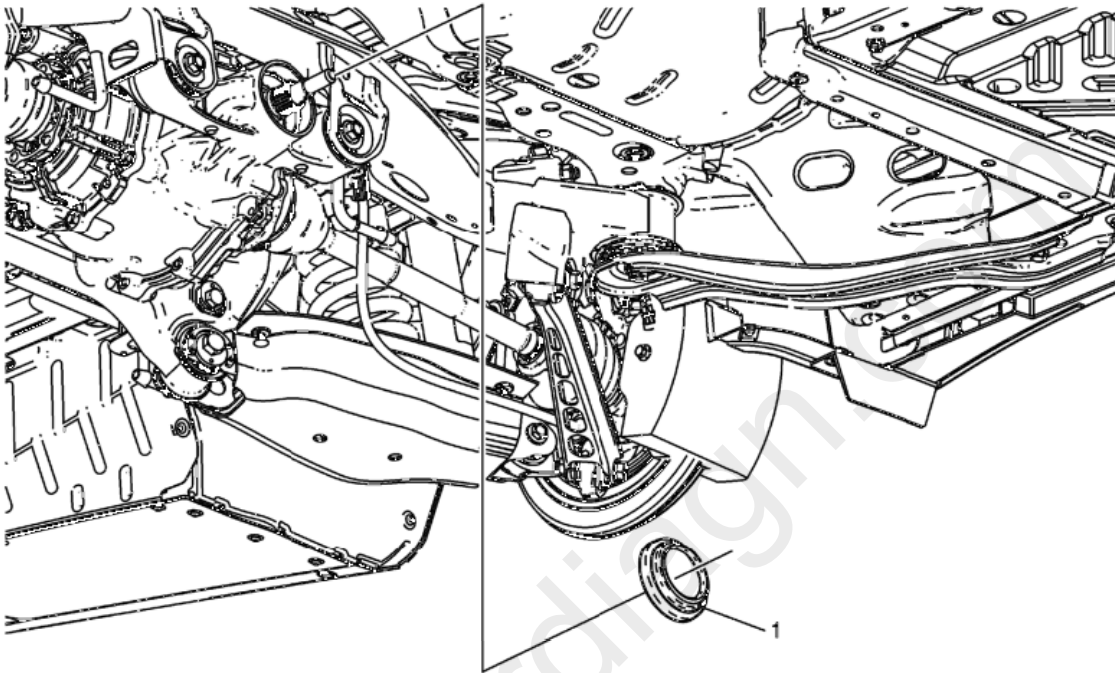
Fig. 69: Differential Drive Pinion Gear Seal (195mm Axle)
 Courtesy of GENERAL MOTORS COMPANY

Differential Drive Pinion Gear Seal Replacement (195mm Axle)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> 2. Remove the rear wheel drive shaft flange. Refer to <u>Rear Wheel Drive Shaft Flange Replacement (195mm Axle).</u>	
	Differential Drive Pinion Gear Seal
Procedure	
1. Using the appropriate tool, remove the differential drive pinion gear seal.	

1

2. Using the **DT-49861** installer , install the differential drive pinion gear seal.

Special Tools**DT-49861** Seal InstallerFor regional equivalent tools, refer to **Special Tools**.**DIFFERENTIAL DRIVE PINION GEAR SEAL REPLACEMENT (226MM ELSD)****Fig. 70: Differential Drive Pinion Gear Seal (226mm eLSD)**

Courtesy of GENERAL MOTORS COMPANY

Differential Drive Pinion Gear Seal Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle 2. Remove the rear wheel drive shaft flange. Refer to Rear Wheel Drive Shaft Flange Replacement (226mm eLSD).	
1	Differential Drive Pinion Gear Seal Procedure 1. Using the appropriate tool, remove the differential drive pinion gear seal. 2. Using the J-38694 installer , install the differential drive pinion gear seal.

Special Tools

J-38694 Pinion Seal Installer

For regional equivalent tools, refer to Special Tools.

DIFFERENTIAL CLUTCH PUMP REPLACEMENT (226MM ELSD)

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Install a drain pan under the vehicle.

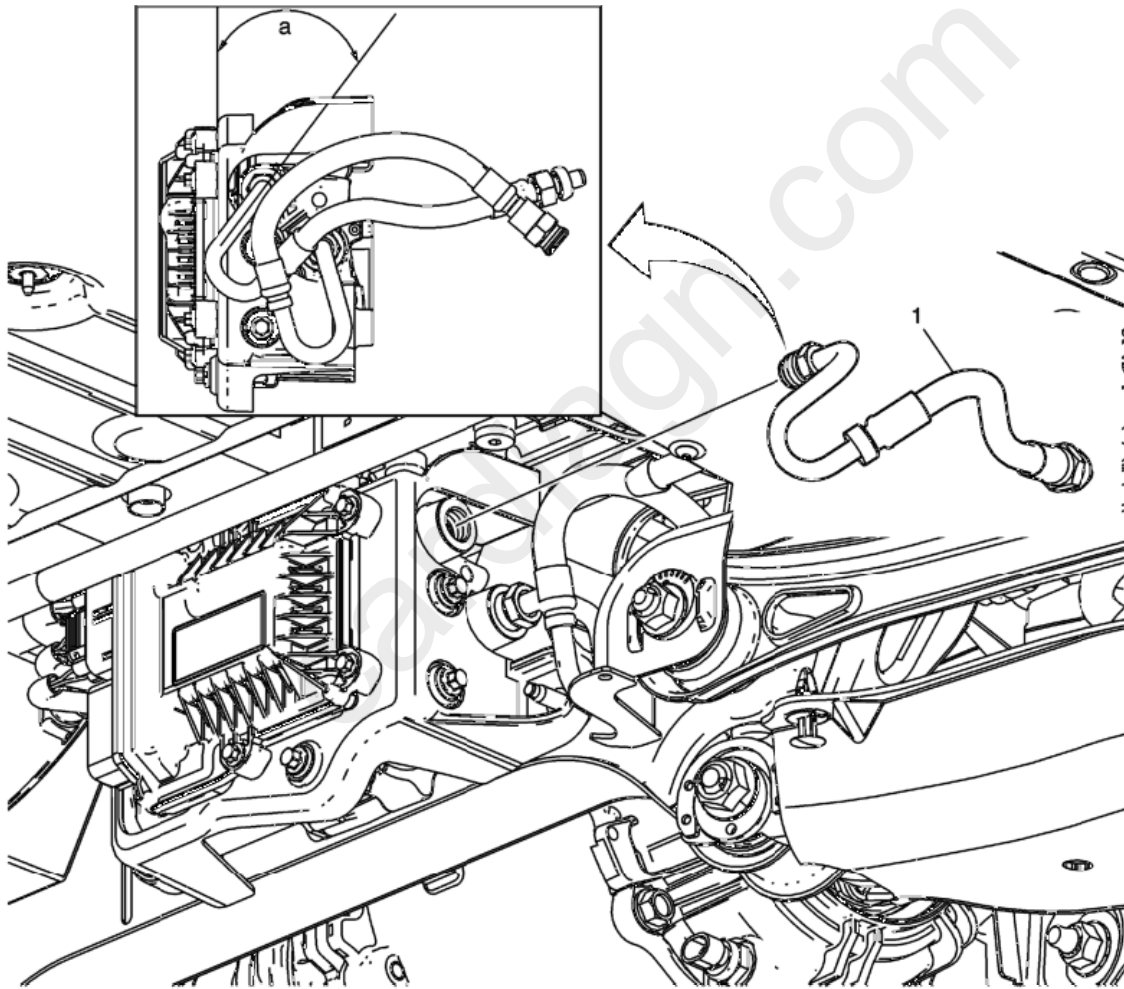


Fig. 71: Differential Oil Cooler Outlet Hose
Courtesy of GENERAL MOTORS COMPANY

3. Remove the differential oil cooler outlet hose (1). Refer to Differential Oil Cooler Outlet Hose Replacement (226mm eLSD).

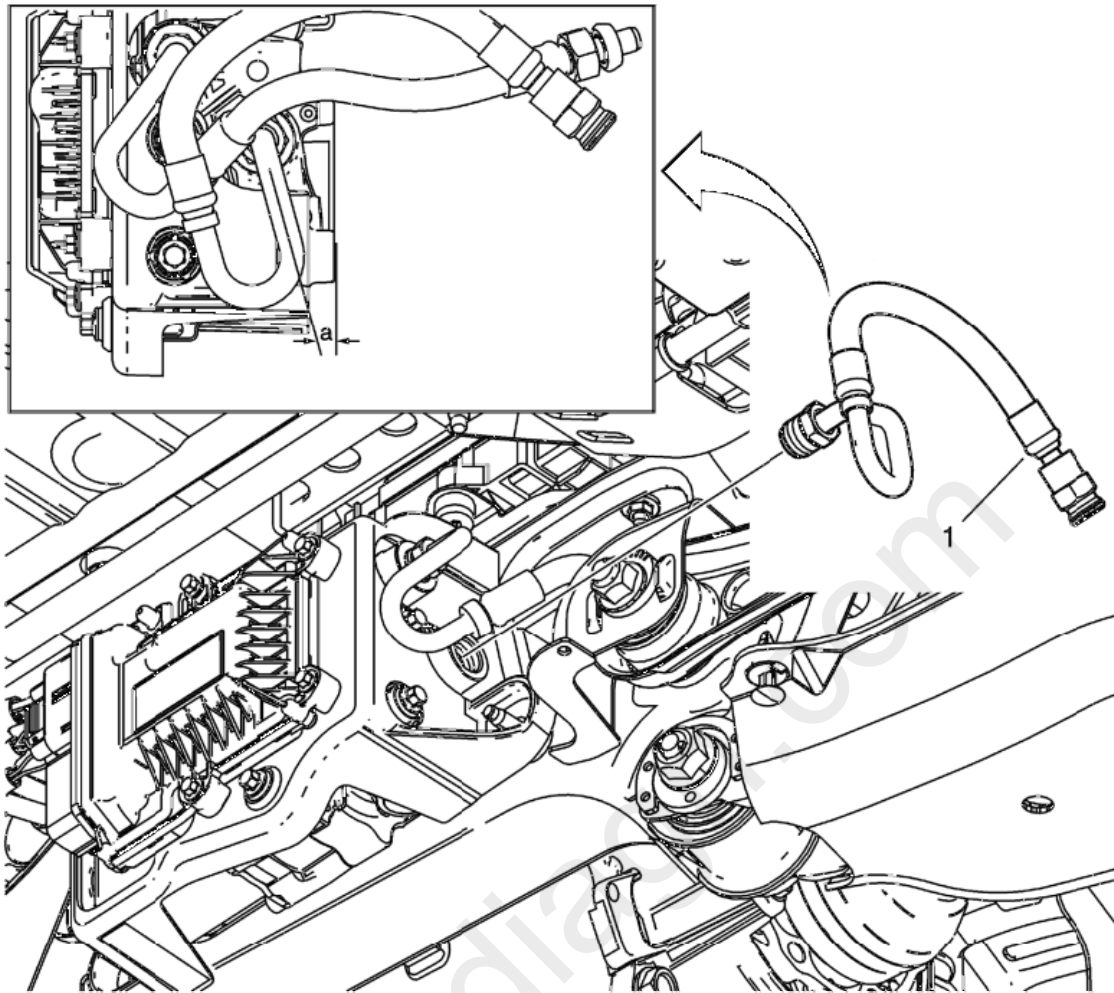


Fig. 72: Differential Oil Pump Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

4. Remove the differential oil pump inlet hose (1). Refer to **Differential Oil Pump Inlet Hose Replacement (226mm eLSD)**.

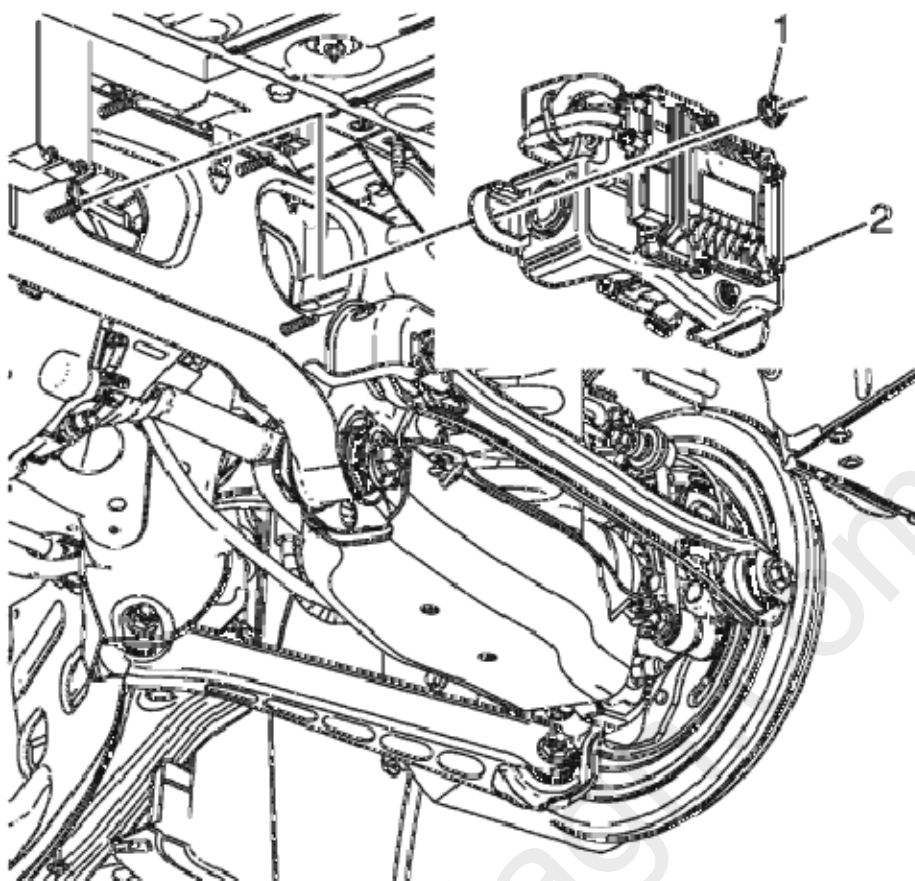


Fig. 73: Differential Clutch Pump Bracket Nuts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the differential clutch pump bracket nuts (1) and the rear axle differential lock control actuator assembly (2).

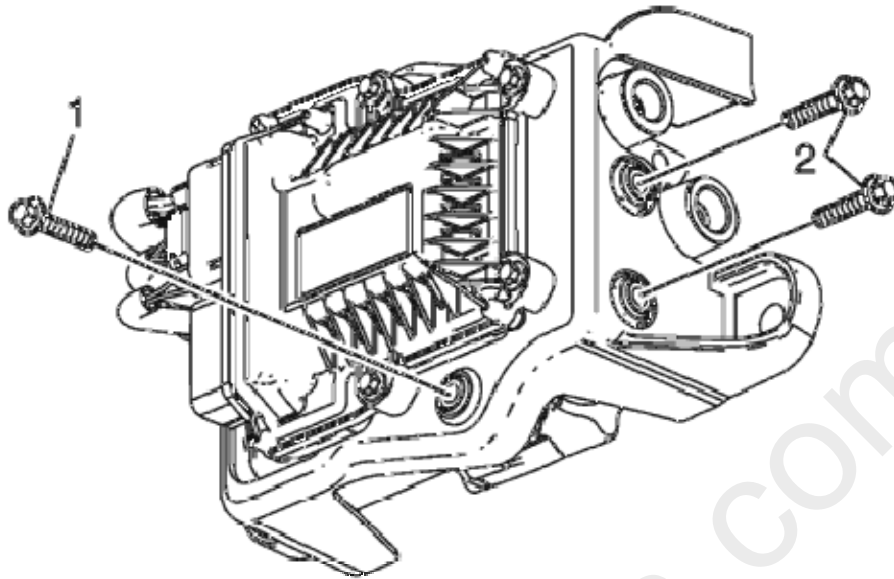


Fig. 74: Differential Clutch Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

6. Remove the differential clutch pump bolts (1 and 2).

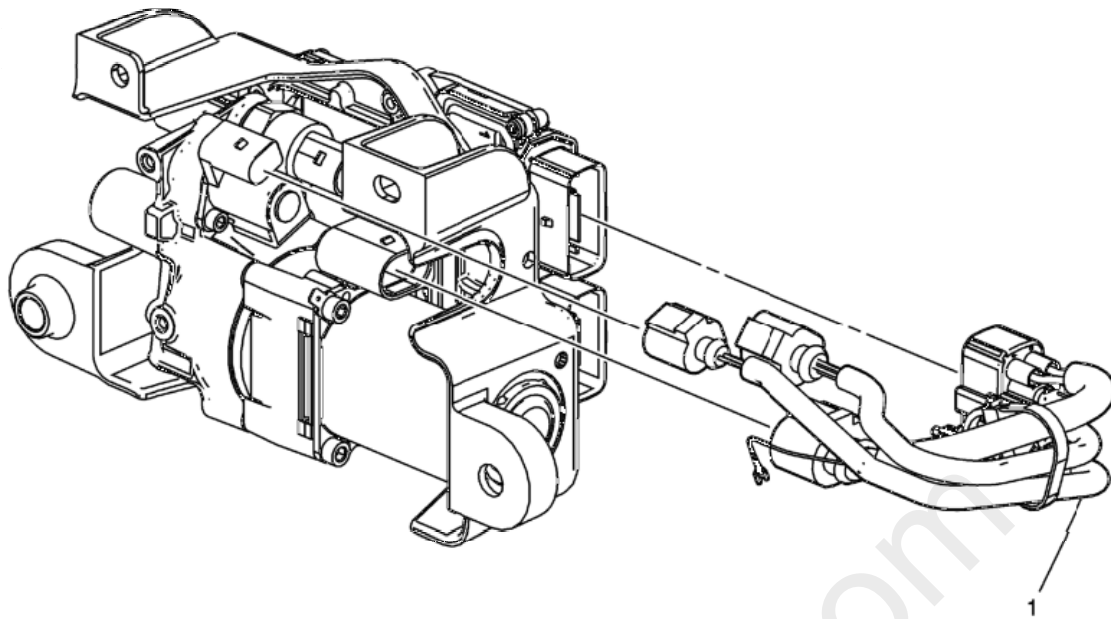


Fig. 75: Differential Clutch Pump Wiring Harness Connector Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Remove the wiring harness connector assembly (1). Refer to **Wiring Harness Connector Replacement (226mm eLSD)**.

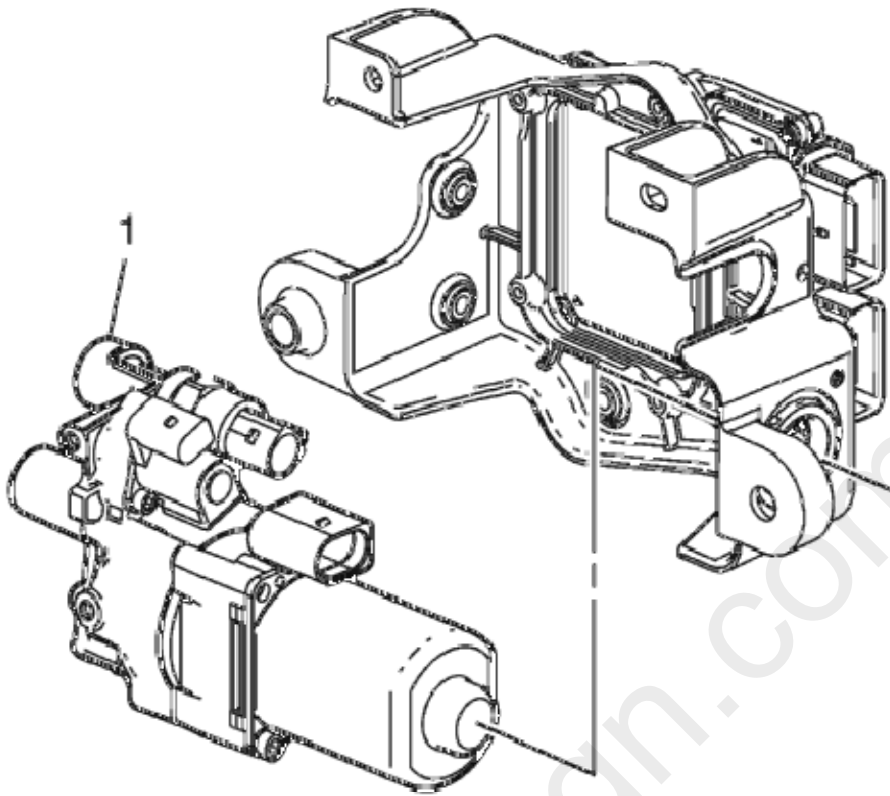


Fig. 76: Differential Clutch Pump And Bracket
Courtesy of GENERAL MOTORS COMPANY

8. Remove the differential clutch pump (1) from the bracket.

Installation Procedure

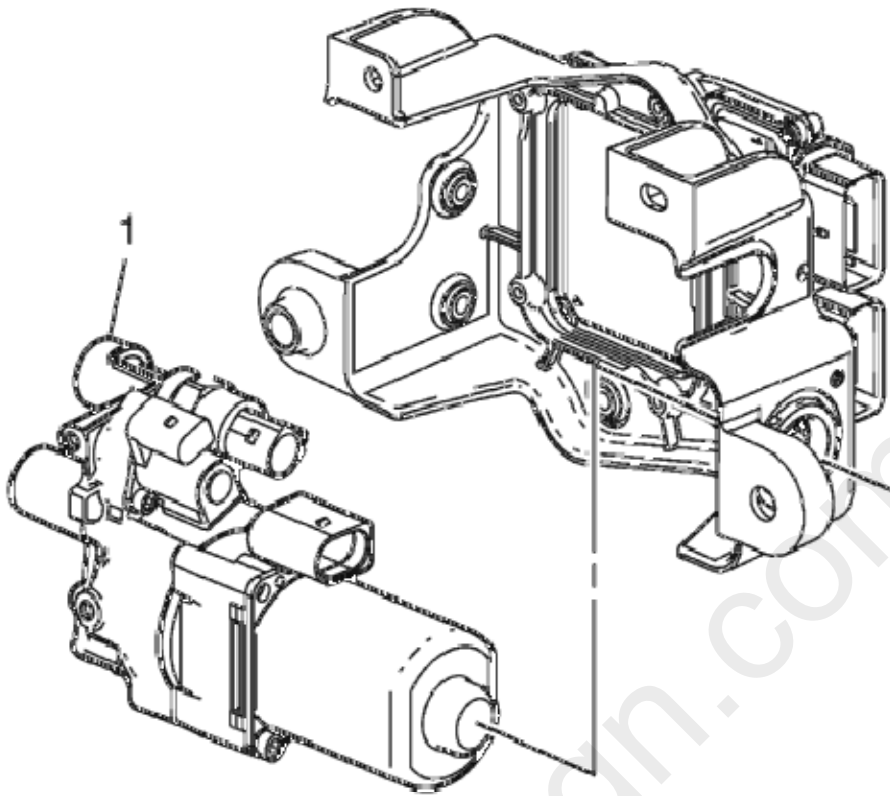


Fig. 77: Differential Clutch Pump And Bracket
Courtesy of GENERAL MOTORS COMPANY

1. Install the differential clutch pump into the bracket (1).

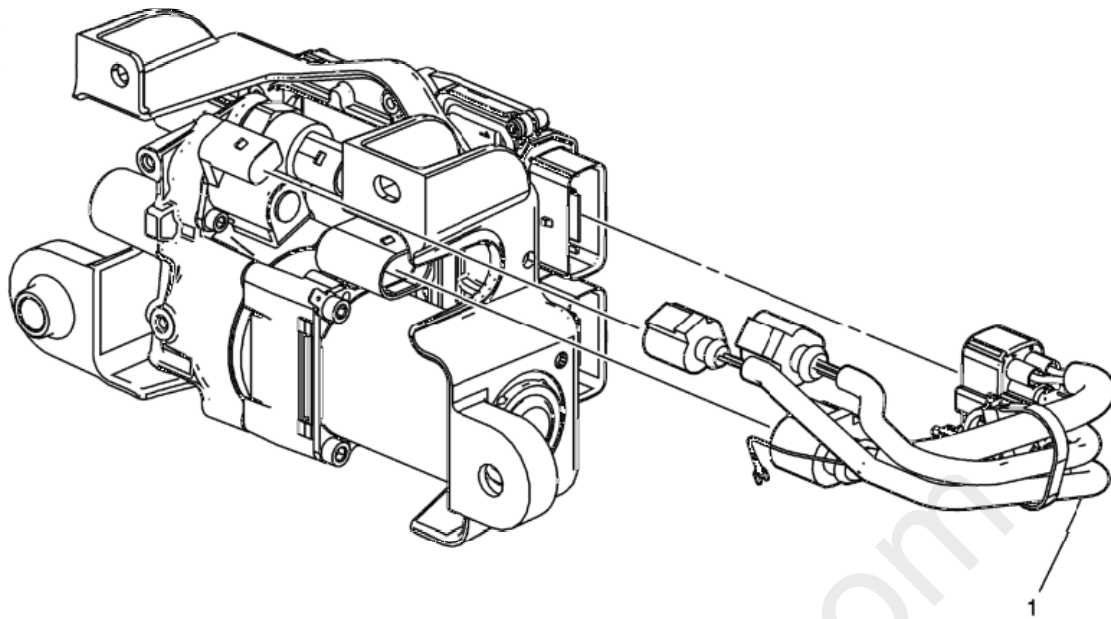


Fig. 78: Differential Clutch Pump Wiring Harness Connector Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Install the wiring harness connector assembly (1). Refer to **Wiring Harness Connector Replacement (226mm eLSD)**.

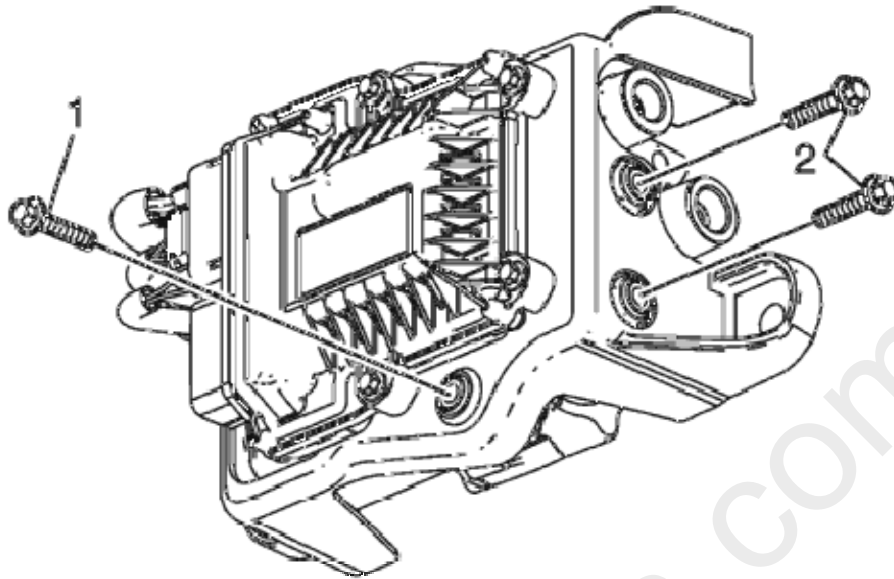


Fig. 79: Differential Clutch Pump Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Install the differential clutch pump bolts (1 and 2). Tighten to 9 N.m (80 lb in).

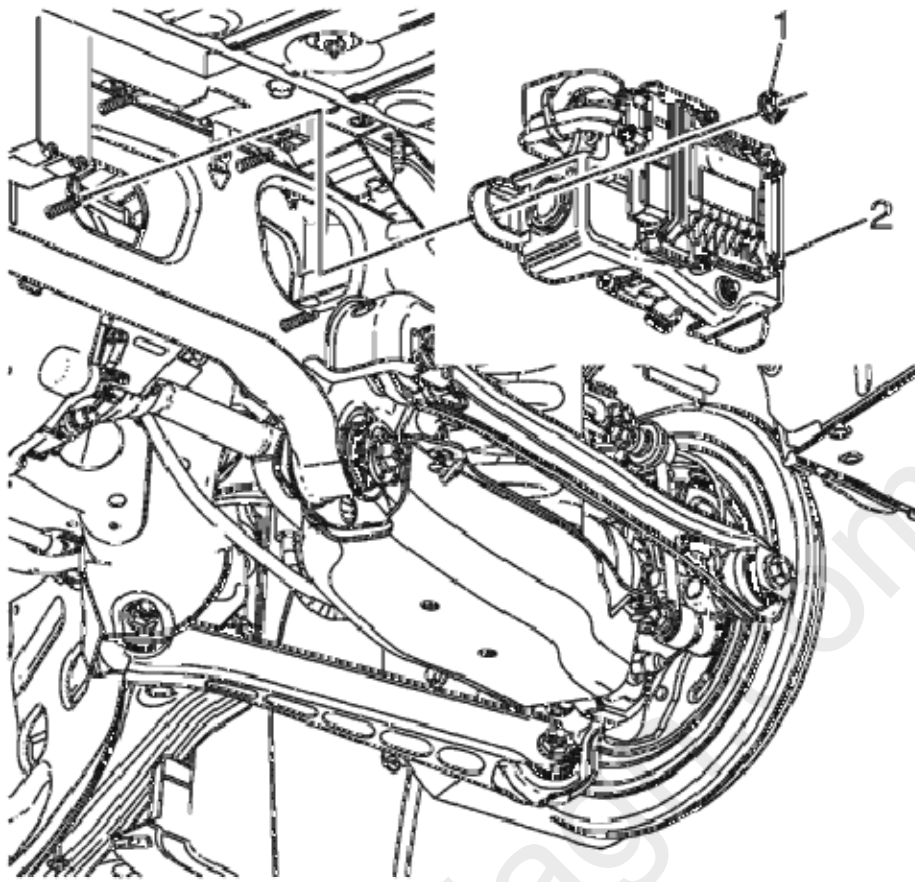


Fig. 80: Differential Clutch Pump Bracket Nuts
Courtesy of GENERAL MOTORS COMPANY

4. Install the rear axle differential lock control actuator assembly (2) and nuts (1). Tighten the nuts (1) to 15 N.m (11 lb ft).

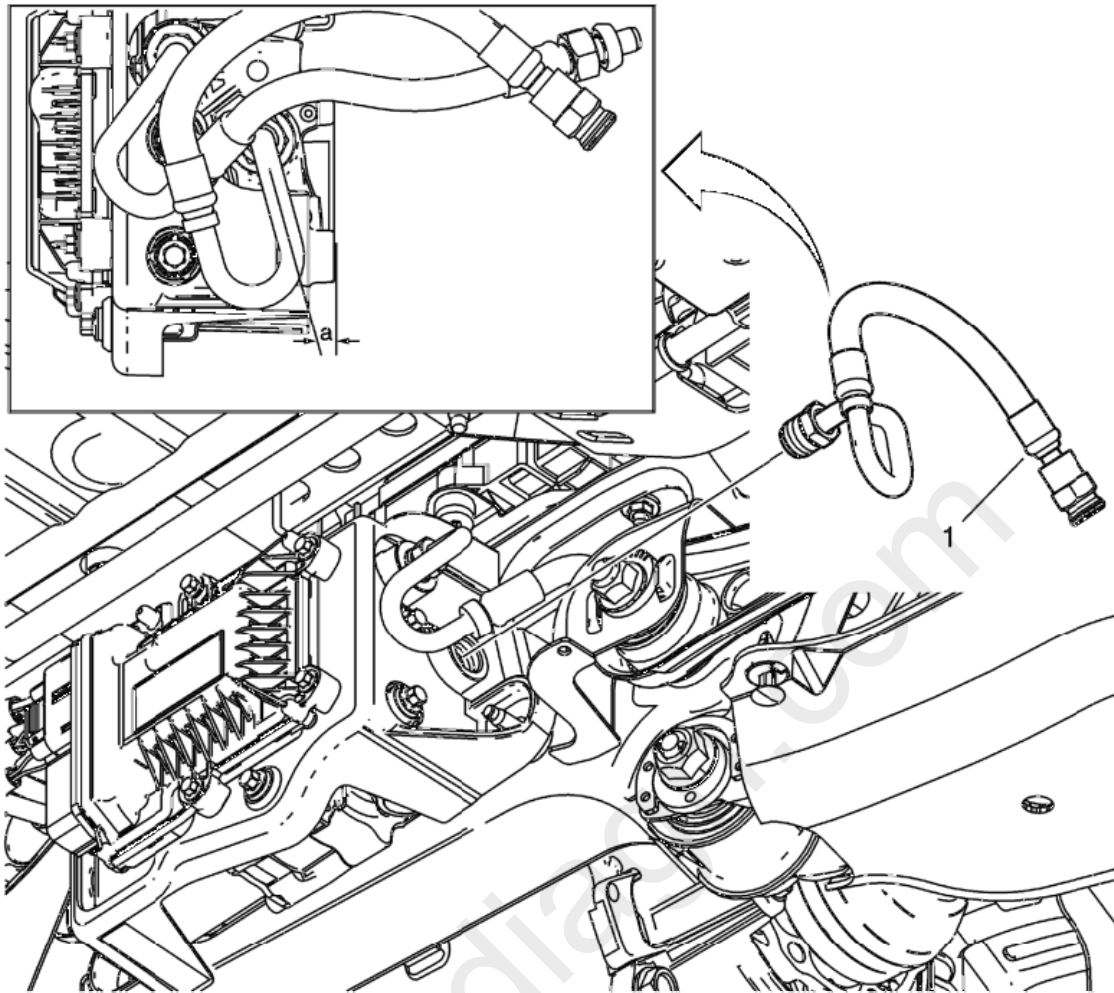


Fig. 81: Differential Oil Pump Inlet Hose
Courtesy of GENERAL MOTORS COMPANY

5. Install the differential oil pump inlet hose assembly (1). Refer to **Differential Oil Pump Inlet Hose Replacement (226mm eLSD)**

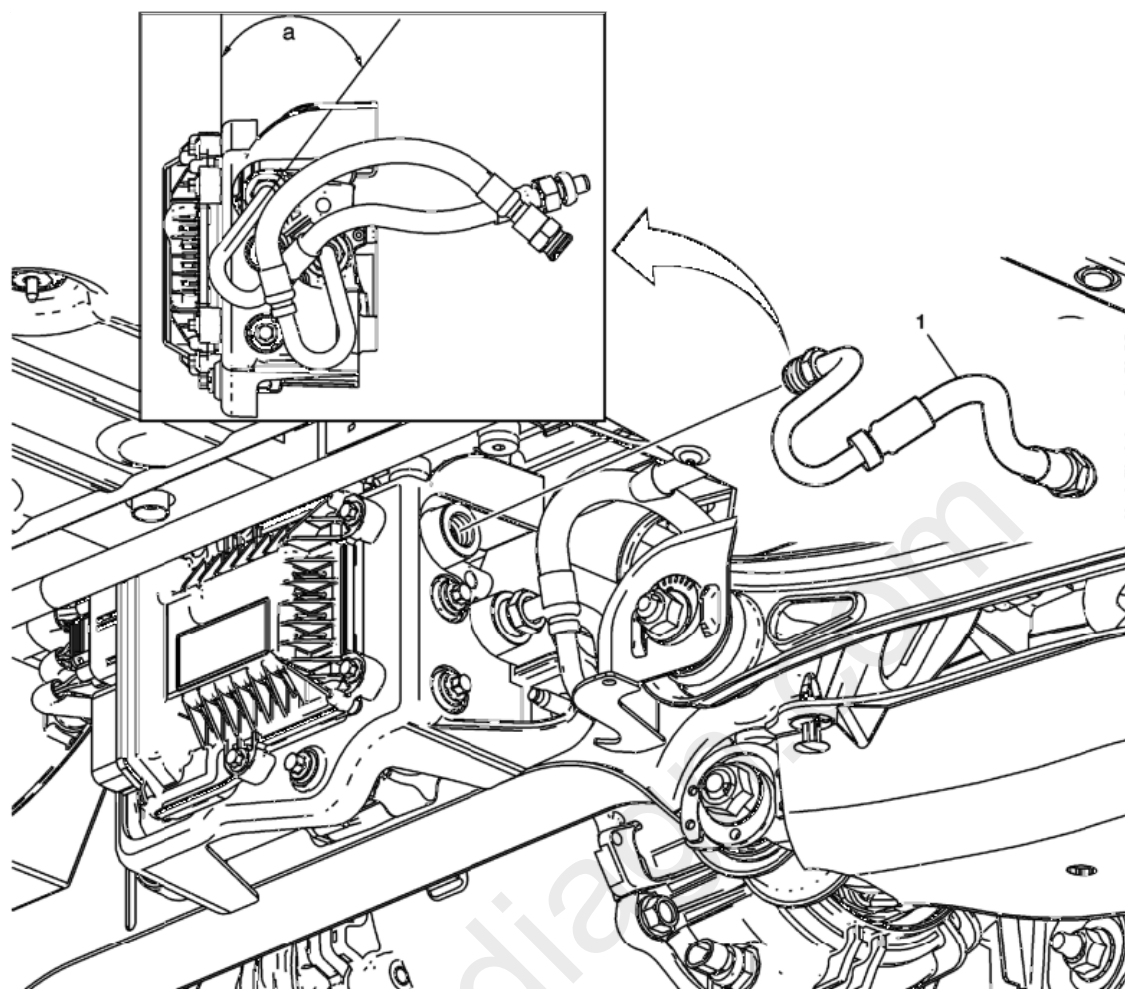


Fig. 82: Differential Oil Cooler Outlet Hose
 Courtesy of GENERAL MOTORS COMPANY

6. Install the differential oil cooler outlet hose assembly (1). Refer to **Differential Oil Cooler Outlet Hose Replacement (226mm eLSD)**.
7. Fill the differential clutch fluid. Refer to **Rear Differential Hydraulic System Service Fill/Bleed**.
8. Remove the drain pan from under the vehicle.
9. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle**.

DIFFERENTIAL CLUTCH OIL FILTER REPLACEMENT (226MM ELSD)

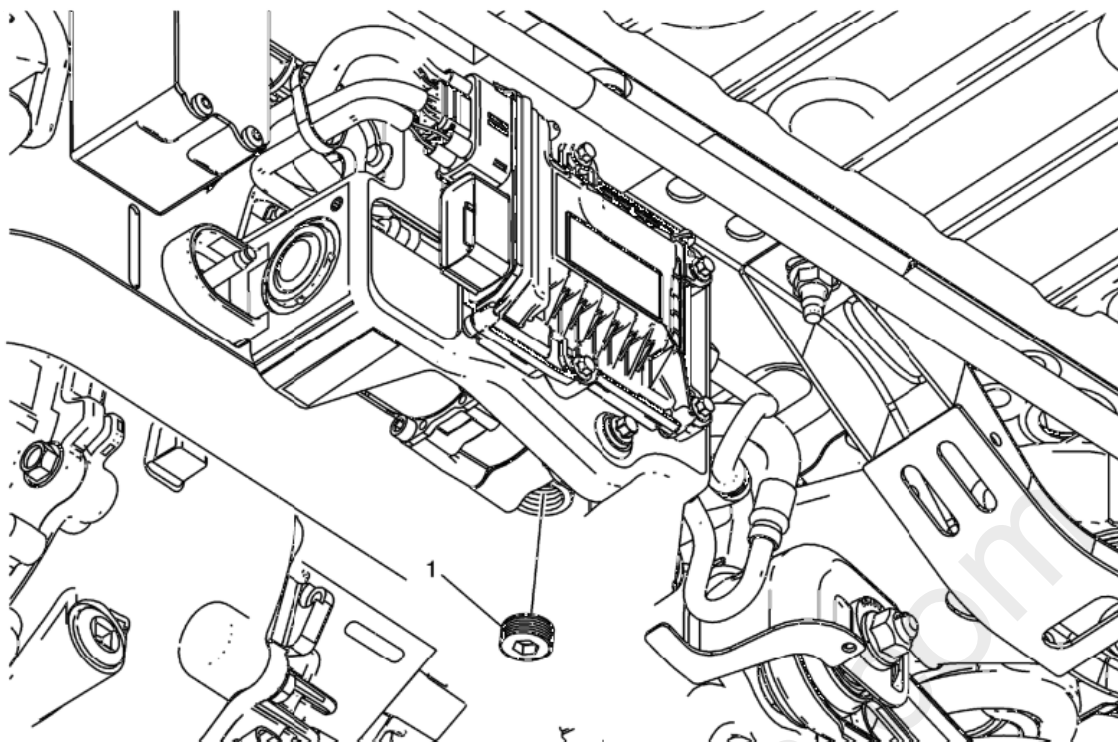


Fig. 83: Differential Clutch Oil Filter (226mm eLSD)

Courtesy of GENERAL MOTORS COMPANY

Differential Clutch Oil Filter Replacement (226mm eLSD)

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Install a drain pan under the vehicle.	
	Differential Carrier Drain Plug CAUTION: Refer to <u>Fastener Caution</u> .
	Procedure
1	1. Remove the differential carrier drain plug. 2. Remove the differential clutch oil filter. 3. Install the NEW differential clutch oil filter. 4. Install the differential carrier drain plug. 5. Fill the differential clutch system. Refer to <u>Rear Differential Hydraulic System Service Fill/Bleed</u>.

Tighten 16 (12 lb ft)

REAR DIFFERENTIAL CLUTCH CONTROL MODULE CALIBRATION

Configuring the Rear Differential Clutch Control Module with the clutch classification value is required after certain service procedures are performed. The clutch classification value is based on the pressure-to-torque performance of the individual clutch pack. The clutch classification helps to improve vehicle performance by adjusting software parameters to suit the mechanical hardware.

Procedures that will require configuration of the Rear Differential Clutch Control Module are:

- Rear differential (with eLSD) replacement
- eLSD clutch assembly replacement
- Actuator assembly replacement
- Rear differential clutch control module replacement

Calibrate Control Module

To calibrate control module, perform the following procedure:

1. Install a scan tool.
2. Ignition ON.
3. Select Rear Differential Clutch Service Calibration Setup in the Rear Differential Clutch Control Module Configuration/Reset Function List.
4. Follow the scan tool directions to complete the calibration procedure.

NOTE: **The clutch service calibration will be the last two alphanumeric characters of the supplier assigned unique serial number. The characters must be entered exactly how it appears matching the uppercase. It will be found etched (1) on clutch pack housing.**

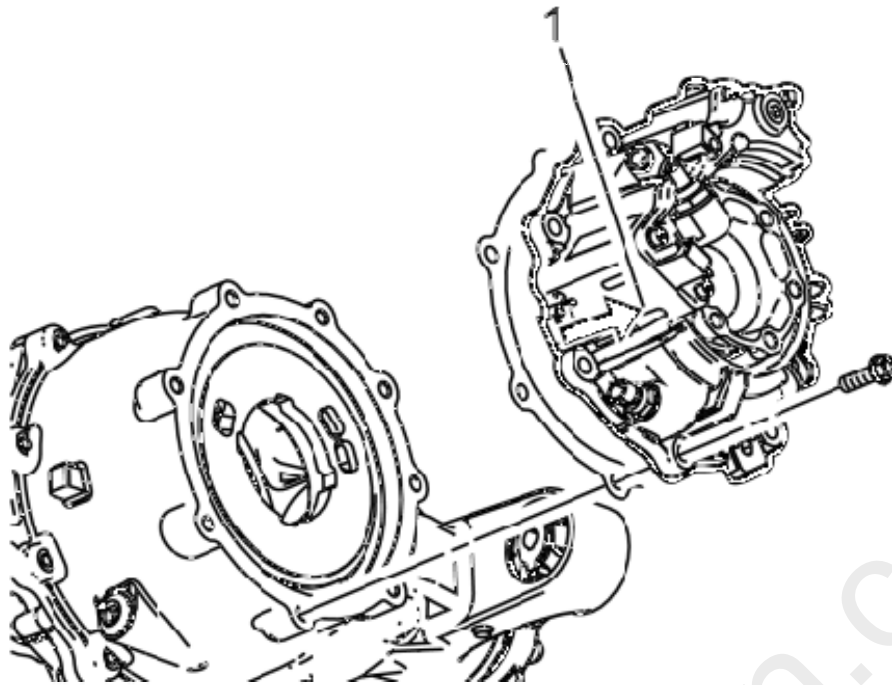


Fig. 84: Clutch Service Calibration Etched Area
Courtesy of GENERAL MOTORS COMPANY

REAR DIFFERENTIAL HYDRAULIC SYSTEM SERVICE FILL/BLEED

Rear Differential Hydraulic System Service Fill/Bleed Procedure

The rear differential hydraulic system service bleed is used to remove air from the system, check for proper system and solenoid function, and determine if full pressure can be achieved at the apply piston. Any time a rear differential hydraulic line is disconnected or any repairs are made, this procedure must be performed.

Special Tools

DT-51381 ELSD Air Bleed Adapter

1. Connect scan tool and check the rear differential clutch control module for any DTCs and perform repairs as necessary. The scan tool may not allow the hydraulic system service fill/bleed if certain DTCs are present.
2. Raise vehicle. Refer to **Lifting and Jacking the Vehicle**.
3. Remove the right rear tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation**.

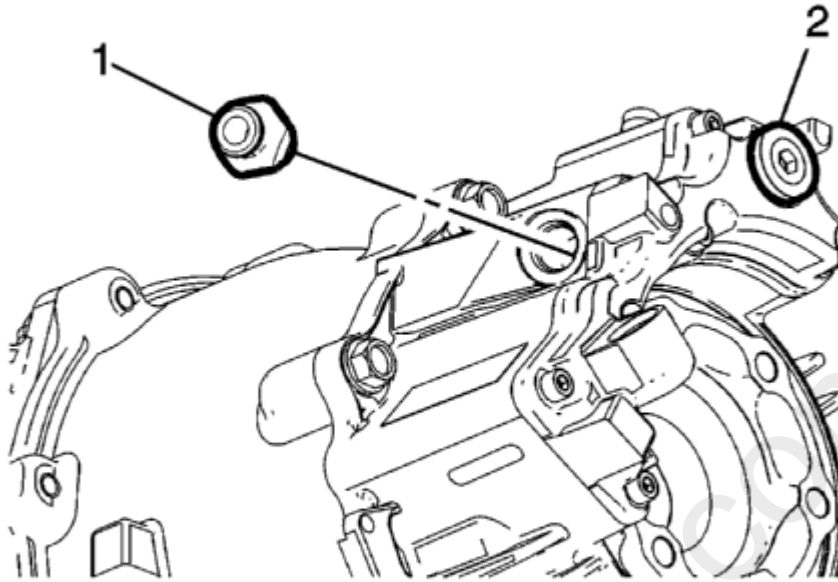


Fig. 85: Fill Plug

Courtesy of GENERAL MOTORS COMPANY

4. Disconnect high pressure line on the clutch pack (1). Refer to **Limited Slip Differential Clutch Pipe Connector Disconnection and Connection**
5. Attach DT-51381 to the high pressure line. Lead the high pressure line to a drain pan.
6. Remove the fill plug). Refer to **Differential Clutch Oil Inspection (226mm eLSD)**
7. Top off Rear Drive Clutch fill hole with the appropriate fluid. Refer to **Adhesives, Fluids, Lubricants, and Sealers**

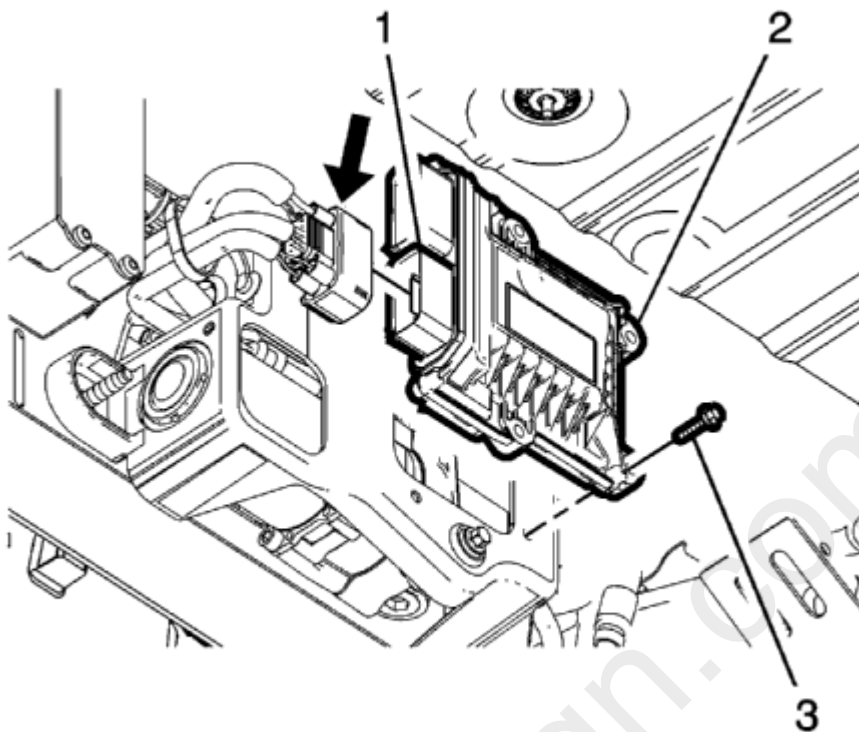


Fig. 86: Rear Differential Clutch Control Module
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the X1 connector at the Rear Differential Clutch Control Module (1).

WARNING: While engine is operating, the exhaust system will become extremely hot. To prevent burns avoid contacting a hot exhaust system.

9. Start engine.
10. Reconnect the X1 connector at the Rear Differential Clutch Control Module.
11. From the scan tool menu, select Rear Differential Clutch Control Module, then select Control Functions, then Rear Differential Hydraulic Line Fill.
12. Verify that fluid comes out of the high pressure line through the DT-51381 three times during the Rear Differential Hydraulic Line Fill procedure.

NOTE: This is a visual check that will tell if the procedure was done correctly. If fluid does not come out of the high pressure line three times, verify there are no internal/external leaks, valve stuck, or the motor seized before proceeding to the next step.

- 13.
14. Top off Rear Drive Clutch fill hole again with appropriate fluid and repeat Rear Differential Hydraulic Line Fill with scan tool once more.
15. Turn engine off.
16. Remove DT-51381. Reattach high pressure line to clutch pack.
17. Top off Rear Drive Clutch fill hole again with appropriate fluid. Install fill plug
18. Install the left rear tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation**
19. Lower vehicle back down.
20. Restart engine.
21. From the scan tool menu, select Rear Differential Clutch Control Module, then select Control Functions, then Rear Differential Hydraulic System Service Bleed.

NOTE: **The Rear Differential Clutch Control Module can run this procedure up to 3 attempts to get a Pass. If this step does not pass, repeat procedure from step 2.**

NOTE: **Status will change to "Complete" when done.**

DESCRIPTION AND OPERATION

DIFFERENTIAL CARRIER ASSEMBLY DESCRIPTION

The rear axle for this vehicle consist of the following components:

- Cast iron Differential Carrier Housing
- Aluminum Differential Carrier Housing Cover
- Differential Case Assembly (Open or Locking)
- Ring Gear and Drive Pinion Shaft
- Fill Plug
- Drain Plug

The 195mm rear axle can be identified by the rear axle housing cover. The 195mm will have 3 bolts across the top of the rear axle housing cover and a total of 9 bolts in the rear axle housing cover.

The rear axle receives power from the propeller shaft and transfers it to the drive pinion through the universal joint and the pinion yoke, which is attached to the drive pinion. The drive pinion transfers the power to the ring gear which is splined to the drive pinion at a 90 degree angle. The ring gear is attached to the differential case which contains four gears inside of it. Two of the gears are side gears and two are pinion gears. Each side gear is splined to an axle shaft so each axle shaft turns when its side gear rotates. The pinion gears are mounted on a differential pinion shaft, and the pinion gears are free to rotate on this shaft. The pinion shaft is fitted into a bore in the differential case and is at right angles to the axle shafts. Power is transmitted through the differential as follows: the drive pinion rotates the ring gear. The ring gear rotates the differential case. The ring gear, as it rotates with the differential case, forces the pinion gears against the side gears. The side gears rotate the axle

shafts to which the wheels are attached to. When both wheels have an equal amount of traction, the pinion gears do not rotate on the pinion shaft because of input force on the pinion gears is equally divided between the two side gears. Therefore, the pinion gears revolve with the pinion shaft, but do not rotate around the shaft itself. The addition of the two pinion gears and the two side gears are needed to allow the wheel drive shafts to turn at different speeds. When the vehicle turns a corner, the inner wheel turns slower than the outer wheel. The amount slower the inner wheel spins is equal to the same amount the outer wheel spins faster, as compared to the straight line speed. When this happens, the pinion gears rotate around the pinion shaft and allow the wheels to spin at different speeds.

LIMITED SLIP DIFFERENTIAL DESCRIPTION AND OPERATION

Limited Slip Differential

The locking differential consists of the following components:

- Cast Iron Differential Carrier Housing
- Aluminum Differential Carrier Housing Cover
- Pinion gear shaft
- Differential pinion gear shaft lock pin
- Limited Slip Differential Clutch Disc Splined (Friction material on disc and splines on the inside of disc)
- Limited Slip Differential Clutch Disc Eared (Disc without friction material and ears to the outside of the disc)
- Differential side gears
- Differential clutch disc thrust washer
- Differential pinion gears
- Differential pinion gear thrust washers

The 218mm rear axle can be identified by the rear axle housing cover. The 218mm will have 2 bolts across the top of the rear axle housing cover and a total of 10 bolts in the rear axle housing cover.

In a conventional differential, if one wheel spins, the opposite wheel will generate only as much torque as the wheel with the least amount of traction. In a limited slip differential, part of the ring gear torque is transmitted through clutch packs which contain multiple discs. In operation, two forces engage the limited slip differential's clutches. The first is the pre-load force within the clutch packs. The second is the separating forces generated by the side gears as torque is applied through the ring gear. The limited slip design provides the action needed for turning corners and for driving in a straight line when traction is uneven. When one wheel loses traction, the clutch packs transfer additional torque to the wheel having the most traction. Limited slip differential resist wheel spin on bumpy roads and provides greater pulling power when one wheel loses traction. If both wheels slip due to unequal traction, limited slip operation is normal. Also in extreme case of unequal traction, the wheel with the least amount of traction may spin.

LIMITED SLIP DIFFERENTIAL DESCRIPTION AND OPERATION (RPO G96)

Rear Drive Axle Block Diagram

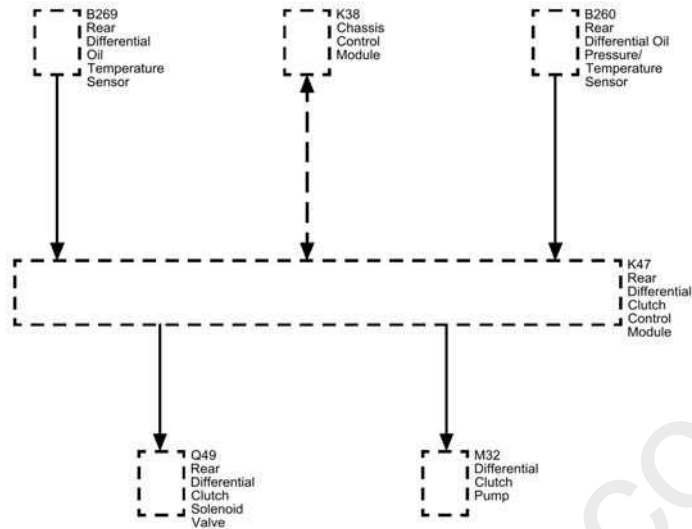


Fig. 87: Rear Drive Axle Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
DD	Serial Data - GMLAN High Speed
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
HW	Hard-Wired
B269	Rear Differential Oil Temperature Sensor
B260	Rear Differential Oil Pressure/Temperature Sensor
K47	K47 Rear Differential Clutch Control Module
Q49	Q49 Rear Differential Clutch Solenoid Valve
M32	M32 Differential Clutch Pump
K38	K38 Chassis Control Module

The rear differential clutch control modules function is to control the electronic limited slip differential. The rear differential control module receives a torque command signal from the chassis control module (CCM) according to the driving situation to achieve vehicle dynamics and traction.

The electronic limited slip differential system contains the following main components:

- The rear differential clutch control module
- The rear differential oil pressure/temperature sensor
- The differential clutch pump
- The rear differential clutch solenoid valve
- The rear differential oil temperature sensor

When the torque signal is received, the rear differential control module actuates the following components:

- Differential clutch pump (bi-directional rotary piston pump)
- Rear differential clutch solenoid valve (fail-safe pressure relief)

The electro-hydraulic piston actuation engages the limited slip clutch to allow active variable locking torque transfer to the left and right half shafts.

The rear differential clutch control module monitors voltage levels, hydraulic and clutch sump temperatures, over-current, and circuit failures.

Whenever a hydraulic line to the electronic limited slip differential system is opened, a service bleed procedure with a scan tool needs to be performed to remove any air from the system.

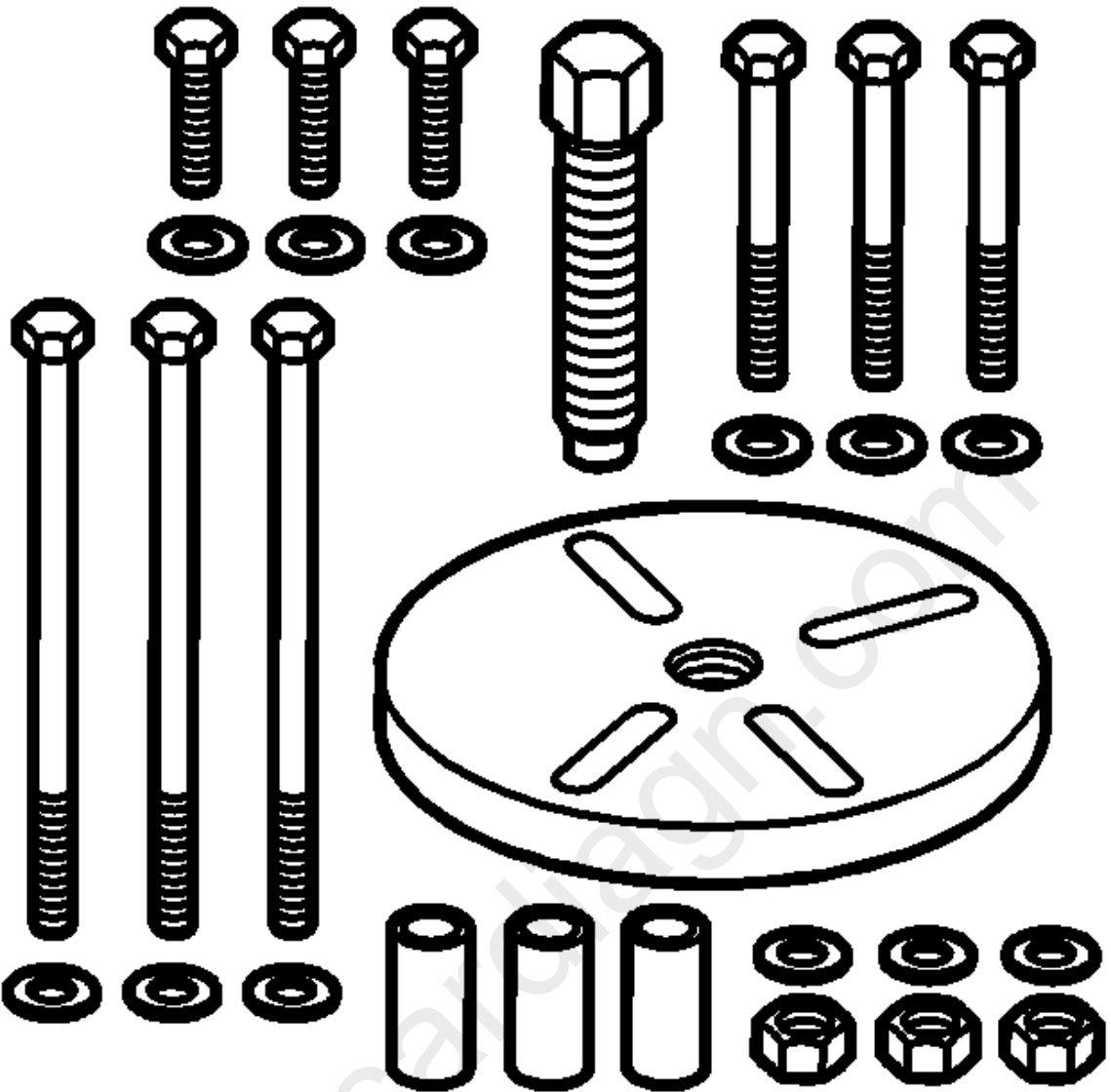
If replacing the rear differential clutch control module, the module needs to be programmed/configured with a rear differential clutch service calibration value. The clutch calibration service value is an alphanumeric value that is stored in the rear differential clutch control module and stamped on the rear differential clutch pack housing. The clutch classification value is based on the pressure-to-torque performance of the individual clutch pack. The clutch classification helps to improve vehicle performance by adjusting software parameters to suit the mechanical hardware.

Configuring the rear differential clutch control module with the clutch classification value might be required after certain service procedures are performed. A two digit value will be used during the programming of the rear differential clutch control module using the scan tool.

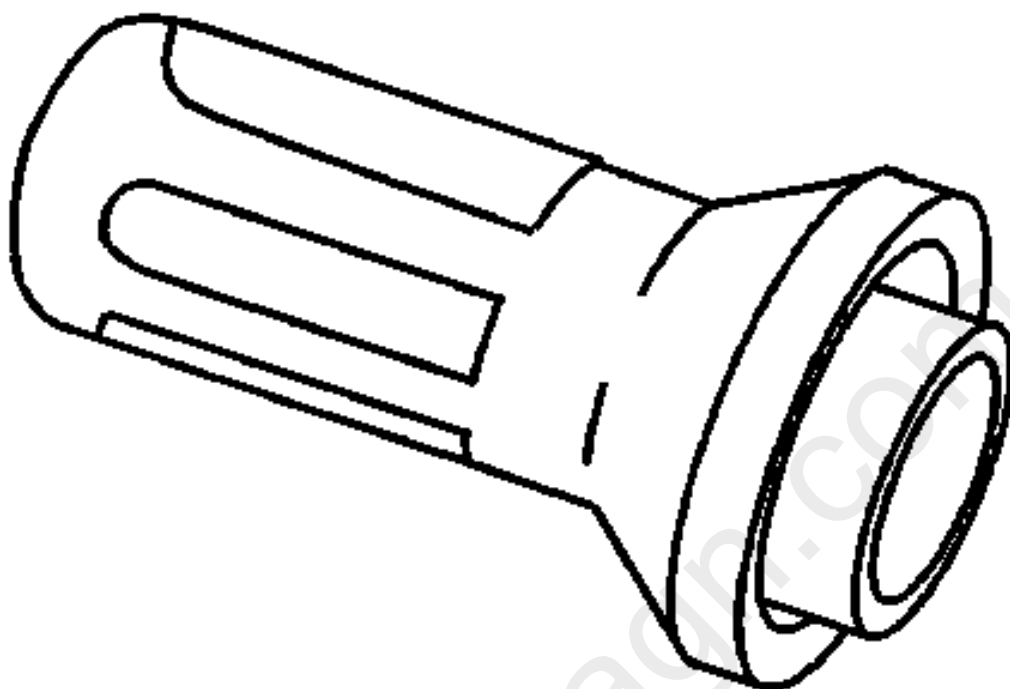
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

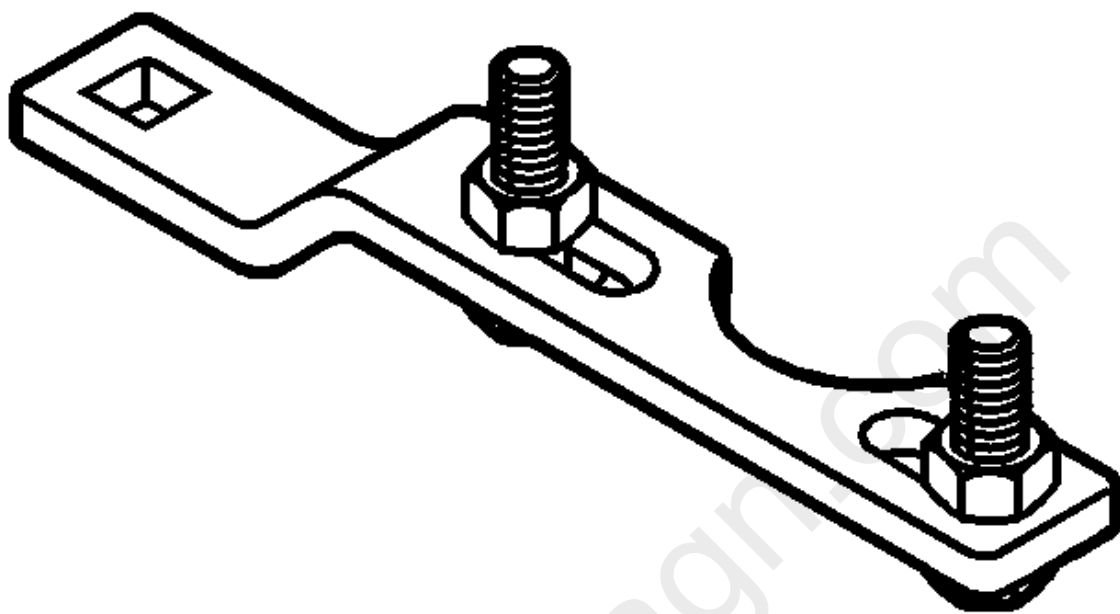
Illustration	Tool Number/Description



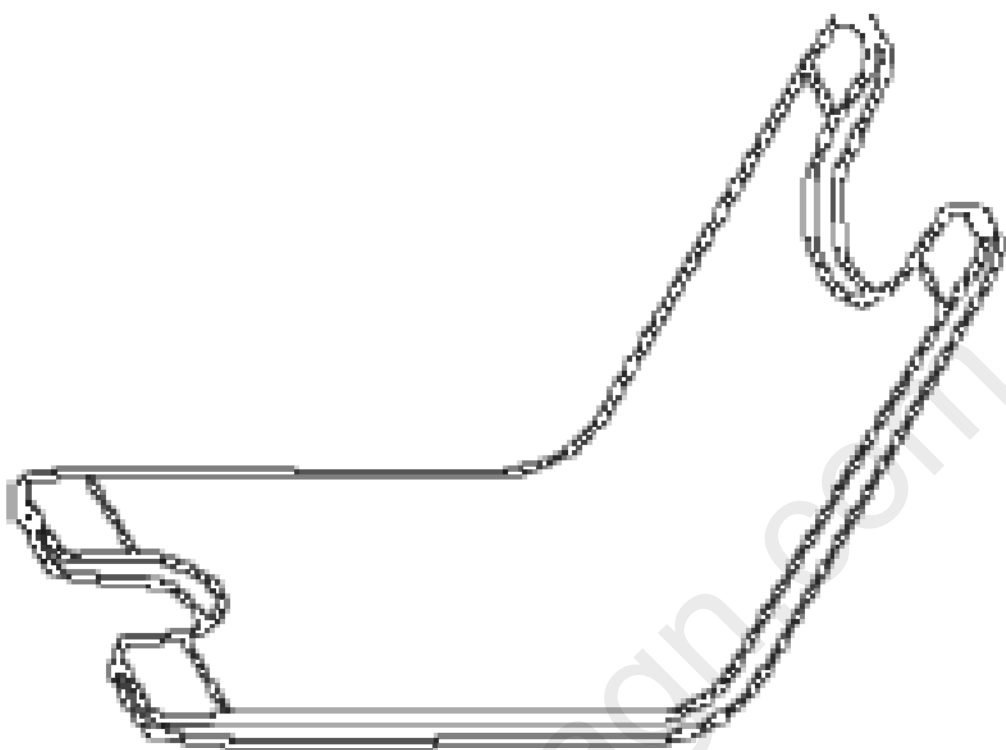
J 2619-01
Slide Hammer



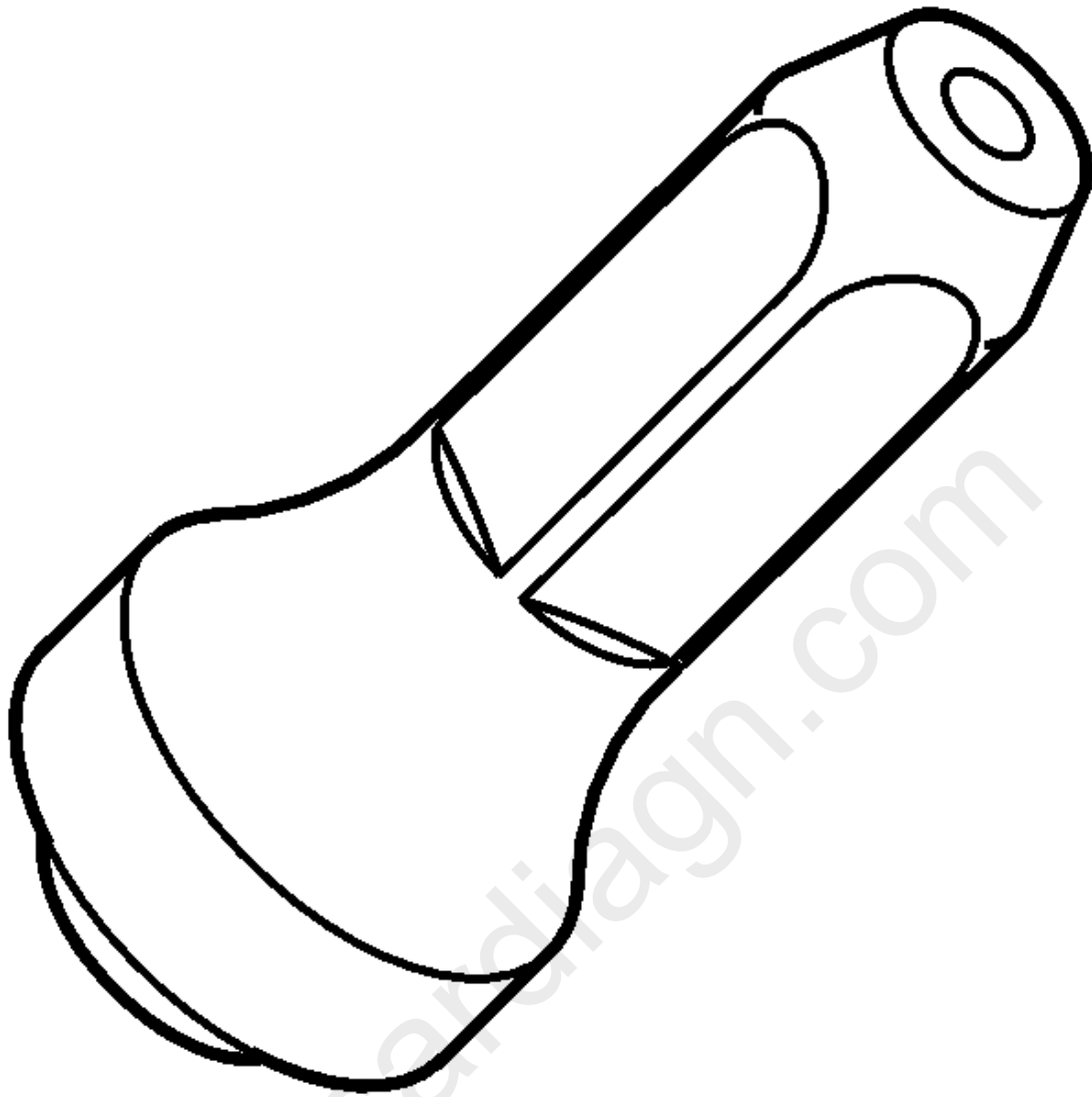
DT 36366-A
J 36366-A
Seal Installer



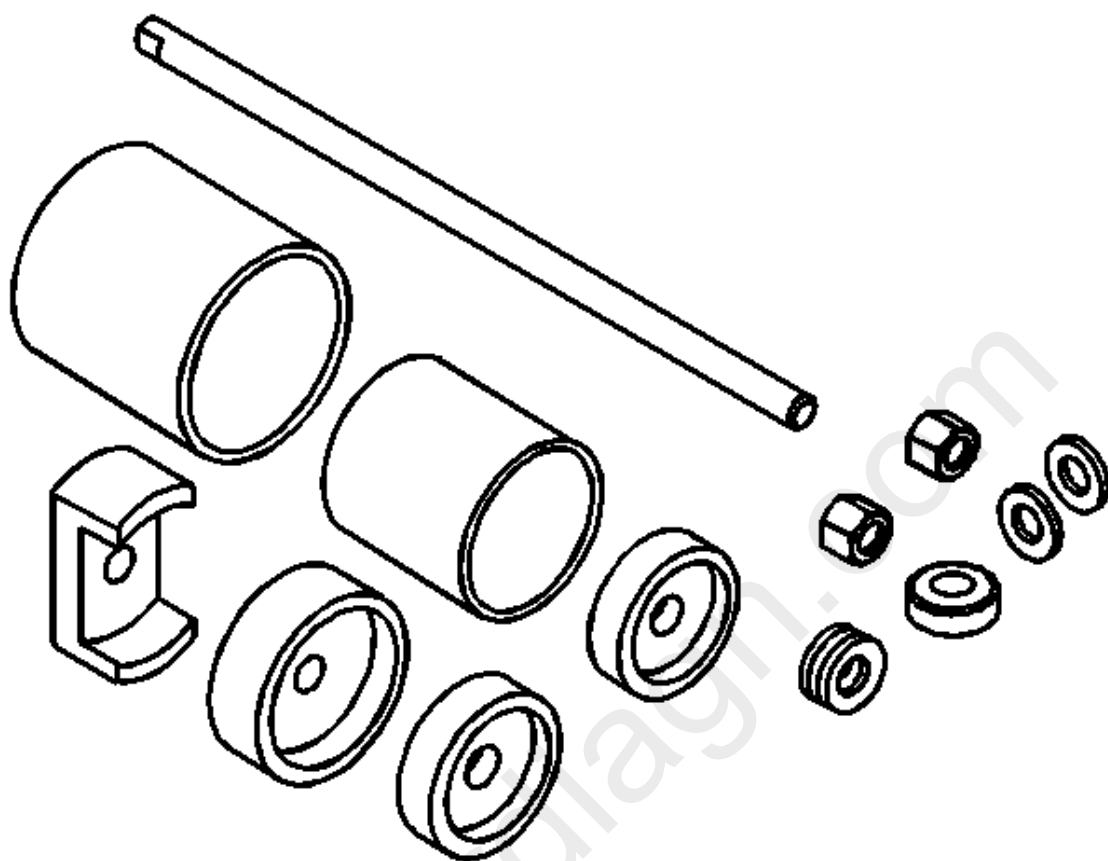
DT 45012
J 45012
Holder Fixture



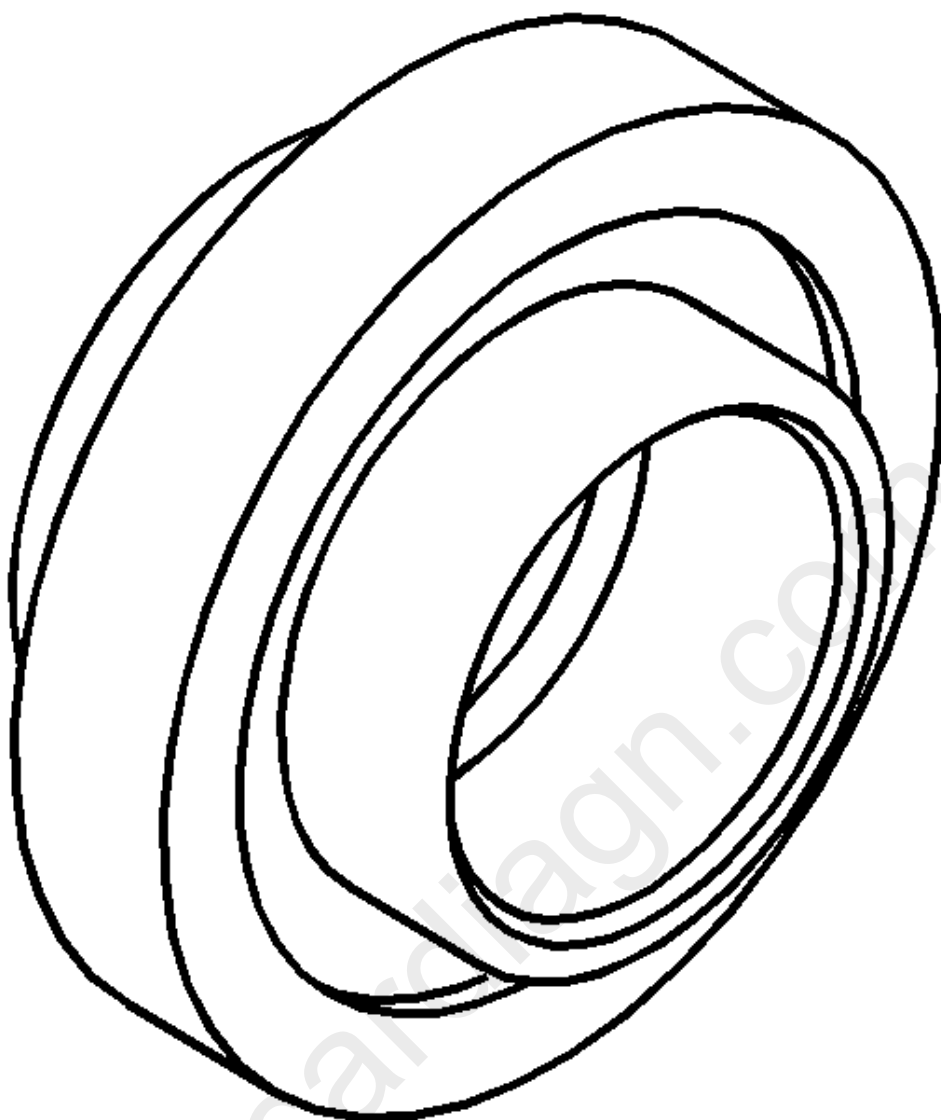
J-45666
Air Line Release
Tool



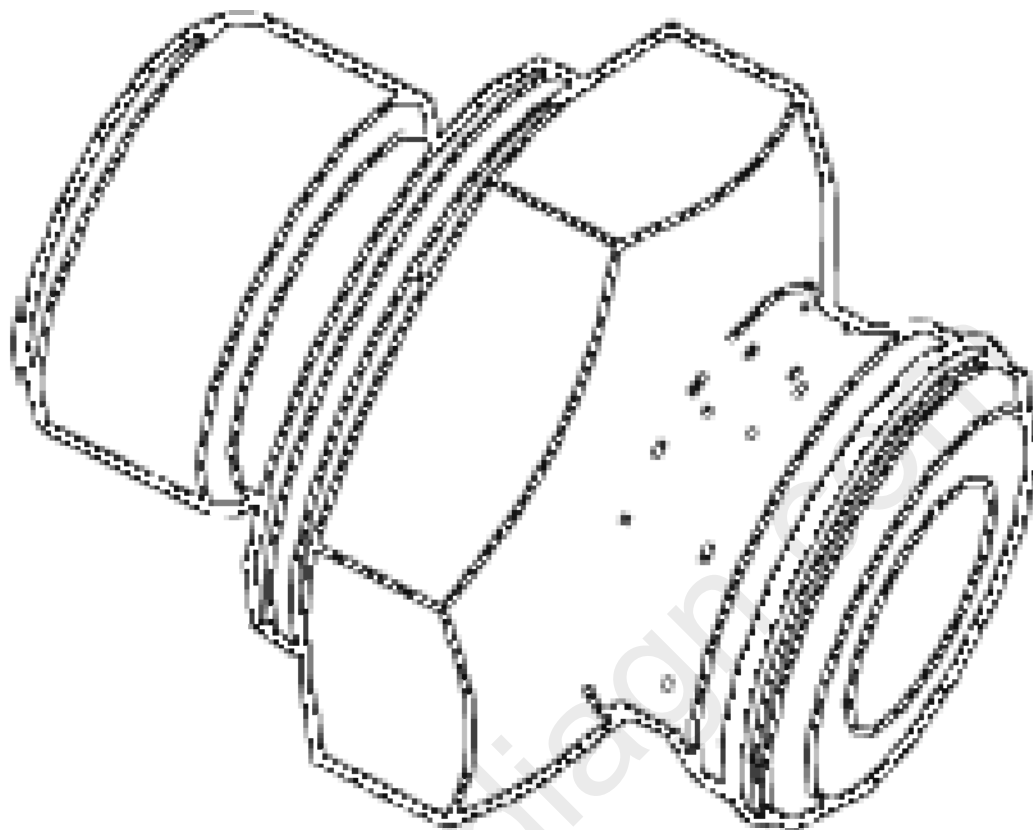
DT 49861
Seal Installer



DT 50806
Bushings Replacer



DT 50871
Pinion Seal Install



DT-51381
Limited Slip
Differential Clutch
Pipe Connector