

2010 DRIVELINE/AXLE

Rear Drive Axle - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Specification	
	Metric	English
Clutch Drum Cover Bolts	29 N.m	21 lb ft
Differential Clutch Control Module Screws	15 N.m	11 lb ft
Differential Drain Plug	39 N.m	29 lb ft
Differential Fill Plug	39 N.m	29 lb ft
Differential Front Mounting Nuts	122 N.m	90 lb ft
Differential Rear Housing Support Bushing Bolts	188 N.m	139 lb ft
Differential Side Cover Bolts	29 N.m	21 lb ft
Left Rear Differential Mounting Bolts	29 N.m	21 lb ft

REAR AXLE SPECIFICATIONS

Application	Specification	
	Metric	English
Gear Ratio 3.4L LNJ	2.53	2.53
Rear Differential Fill Quantity	500 ml	16.9oz

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number
Fill or Drain Plug	Sealant	12346004 (Canadian P/N 10953480)
GM Differential Lubricant	Synthetic Gear Oil 75W-90	12378514 (Canadian P/N 88901045)
Propeller Shaft Mounting Bolts	Threadlocker	88861429 (Canadian P/N 88861430)

SCHEMATIC AND ROUTING DIAGRAMS

REAR AXLE SCHEMATICS

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 C0393 02

Rear Differential Clutch Control Coil Circuit Short to Ground

DTC C0393 04

Rear Differential Clutch Control Coil Circuit Open

DTC C0393 0B

Rear Differential Clutch Control Coil Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
AWD Supply Voltage	C0393 02	C0393 04	C0393 0B	-
Low Reference	-	C0393 04	C0393 0B	-

Circuit/System Description

The rear differential clutch control module provides a power and ground switching circuits to the rear wheel drive clutch coil. The coil receives current from the rear differential clutch control module through PWM low side driver, and converts that signal into torque through the clutch to the rear tires when all wheel drive (AWD) is requested.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

- An open is detected on the high or low coil control circuits.
- A short to ground is detected on the high or low coil control circuits.
- A short to voltage is detected on the high or low coil control circuits.

Action Taken When the DTC Sets

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One or more of the following actions may occur:

- All Wheel Drive Off (AWD Disabled).
- Service All Wheel Drive (Service AWD).

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

Rear Axle Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Rear Drive Axle Description and Operation

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, disconnect the X2 harness connector at the rear differential clutch control module.
2. Ignition ON, verify a test lamp does not illuminate between the following circuits and ground:
 - Low reference terminal 3
 - Voltage terminal 5
 - If the test lamp illuminates, test the appropriate circuit for a short to voltage.
3. Ignition OFF, test for infinite resistance between the following circuit terminals and ground:
 - Low reference terminal 3

- Voltage terminal 5
 - If less than the specified value, test the appropriate circuit for a short to ground.
- 4. Test for less than 5.0 ohms between the low reference circuit terminal 3 and the voltage supply terminal 5.
 - If greater than the specified range, test the appropriate circuit for an open/high resistance. If the circuits test normal, replace the rear wheel drive clutch.
- 5. If all circuits test normal, replace the rear differential clutch control module.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Rear Wheel Drive Module Clutch Housing Replacement**.
- **Control Module References** for rear differential clutch control module replacement, setup, and programming.

DTC C0394

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 02

Rear Differential Clutch Temperature Sensor Circuit Short to Ground

DTC C0394 04

Rear Differential Clutch Temperature Sensor Circuit Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Temperature Sensor Signal	C0394 02	C0394 04	-	-
Low Reference	-	C0394 04	-	-

Circuit/System Description

The rear differential clutch control module provides a power and ground circuits to the temperature sensor. When the temperature of the module is determined to be beyond its limits, the rear differential clutch control

module will temporarily disable the rear drive system.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

An open or short to ground is detected on the temperature sensor circuits.

Action Taken When the DTC Sets

One or more of the following actions may occur:

- All Wheel Drive Off (AWD Disabled).
- Service All Wheel Drive (Service AWD).

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

Rear Axle Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Rear Drive Axle Description and Operation

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, disconnect the X2 harness connector at the rear differential clutch control module.
2. Ignition ON, verify a test lamp does not illuminate between the following circuits and ground:
 - low reference terminal 2
 - signal terminal 4
 - If the test lamp illuminates, test the appropriate circuit for a short to voltage.
3. Ignition OFF, test for infinite resistance between the following circuit terminals and ground:
 - low reference terminal 2
 - signal terminal 4
 - If less than the specified value, test the appropriate circuit for a short to ground.
4. Test for 310-113 k ohms between the low reference circuit terminal 2 and the signal circuit terminal 4.
 - If greater than the specified range, test the appropriate circuit for an open/high resistance. If the circuits test normal, replace the rear wheel drive clutch.
5. If all circuits test normal, replace the rear differential clutch control module.

Repair Procedures

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Rear Wheel Drive Module Clutch Housing Replacement**
- **Control Module References** for rear differential clutch control module replacement, setup, and programming

DTC C0561

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 C0561 00

System Disabled Information Stored

Circuit/System Description

The rear differential clutch control module receives messages from other modules over serial data which are needed to perform all wheel drive (AWD) functions.

Conditions for Running the DTC

The ignition is ON.

Conditions for Setting the DTC

The rear differential clutch control module receives an invalid message from the electronic brake control module (EBCM) over the serial data circuit which causes the rear differential clutch control module to deactivate.

Action Taken When the DTC Sets

One or more of the following actions may occur:

- All Wheel Drive Off (AWD Disabled).
- Service All Wheel Drive (Service AWD).

Conditions for Clearing the DTC

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

Diagnostic Aids

DTC C0561 is an indicator that the rear differential clutch control module receives an invalid message from the EBCM and does not necessarily indicate a fault is present with the rear differential clutch control module. This DTC should not be used as a fault indicator but rather as a symptom to assist in the diagnosis of these other systems. The EBCM should be checked for possible faults.

The scan tool System Disabled Information Stored parameters may be used during diagnosis to determine which specific system component is causing the concern.

Reference Information

Schematic Reference

Rear Axle Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Rear Drive Axle Description and Operation

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

Verify that no DTCs are set in the EBCM.

- If DTCs are set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

SYMPTOMS - REAR DRIVE AXLE

Strategy Based Diagnostics

Review the system in order to familiarize yourself with the system functions. Refer to **Rear Drive Axle Description and Operation** and **Transfer Case Description and Operation** for the NVG 900 transfer case. All diagnosis on a vehicle should follow a logical process. Strategy based diagnostics is a uniform approach for repairing all systems. The diagnostics flow may always be used in order to resolve a system problem. The diagnostic flow is the place to start when repairs are necessary. For a detailed explanation, refer to **Strategy Based Diagnosis** .

Visual/Physical Inspection

- Inspect for aftermarket devices, which could affect the operation of the vehicle. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or a condition which could cause the symptom.
- Check for correct lubricant level and proper viscosity.
- Verify the exact operating conditions under which the concerns exist. Note factors such as speed, road conditions, ambient temperature, and other specifics.
- Compare the driving characteristics or sounds, if applicable, to a known good vehicle and make sure you are not trying to correct a normal condition.

CAUTION: Do not exceed more than 5 seconds of parking brake application. RDM damage may result.

- Rear axle activation and operation may be checked by positioning the four wheels off the ground, starting the vehicle, and selecting the drive position. A properly operating rear axle and transfer case will rotate all four wheels at equal RPM. Fully apply the parking brake, the rear will stop turning. Apply the throttle while watching the rear wheels. They will rotate slightly as the driveline winds-up. This indicates the all wheel drive (AWD) is functioning.

- Factors that may contribute to an inoperative rear axle include:
 - A low gear oil level
 - A mini spare or different size tires
 - A fluid over-temperature condition
 - A defective rear axle assembly
 - An inoperative transfer case assembly
 - The wrong fluid type

Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

Noise Acceptability

A gear driven unit will produce a certain amount of noise. Some noise is acceptable and audible at certain speeds, or under various driving conditions, such as a newly-paved blacktop road. Slight noise is not detrimental to the operation of the axle and is considered normal.

Symptom List

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

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

NOISY IN DRIVE

Cause	Correction
Inspect for proper gear oil levels prior to performing system diagnosis.	
Loose propeller shaft mounting bolts	Tighten the bolts as required. Refer to <u>Fastener Tightening Specifications</u> .
Worn propeller shaft constant velocity joint	Replace the propeller shaft assembly. Refer to <u>Propeller Shaft Replacement</u> . A worn propeller shaft constant velocity joint may create a clicking, grinding, or snapping type noise.
Worn or loose center bearing assembly	Replace the center bearing assembly as required. A worn center bearing may cause vehicle vibration or a grinding, squealing type of noise. Refer to <u>Propeller Shaft Replacement</u> .

Worn universal joints	Replace the universal joints as required. A worn universal joint may create a clicking or snapping type of noise. Refer to <u>Propeller Shaft Replacement</u> .
Worn axle shaft constant velocity joints	Replace/repair the constant velocity joints as required. A worn axle shaft constant velocity joint may create a clicking, grinding, or snapping type of noise. Refer to <u>Symptoms - Rear Drive Axle</u> .
Transfer case noise	For the NVG 900 Transfer Case, or the Getrag 760 Transfer case, refer to <u>Symptoms - Transfer Case</u> .
Worn or damaged axle mounting bushings (side)	Replace bushings as required. A worn bushing may create a clunk type of noise during acceleration or deceleration. Refer to <u>Differential Housing Support Bushing Replacement (Front)</u> or <u>Differential Housing Support Bushing Replacement (Rear)</u> .
Worn or damaged axle mounting bushing (rear)	Replace bushings as required. A worn bushing may create a clunk type of noise during acceleration or deceleration. Check bushing orientation; the tuning slots must be in proper position.
Loose rear mounting bracket	Tighten the bracket bolts as required. Refer to <u>Fastener Tightening Specifications</u> .
Loose or damaged prop guard	Repair or replace as required. A loose dust shield may contact the propeller shaft assembly and create a scraping or grinding type of noise.
Bearing noise within axle assembly	A grinding roar type of noise will increase or decrease relative to the vehicle speed. 1. Check for proper fluid level. Refer to <u>Differential Oil Replacement</u>. 2. If the noise continues, repair or replace the unit as required.
Gear set whine noise within axle assembly	A whine type of noise will increase or decrease relative to the vehicle speed, approximately 80-90 km/h (50-56 mph). 1. Check for the proper fluid level. Refer to <u>Differential Oil Replacement</u>. 2. Repair or replace the unit as required.
Shutter or moan at slow speeds or slow turns	A shutter or moan type of noise in slow sharp turns. 1. RDM could be contaminated with the wrong fluid type/water. 2. Replace the fluid; fill as required and retest under conditions. Refer to <u>Differential Oil Replacement</u>. 3. Replace the drum.

NOISY WHEN COASTING

Cause	Correction
Inspect for proper gear oil levels prior to performing system diagnosis.	
Loose propeller shaft mounting bolts	Tighten the bolts as required. Refer to <u>Fastener Tightening Specifications</u> .
Worn propeller shaft constant velocity joint.	Replace the propeller shaft assembly. Refer to <u>Propeller Shaft Replacement</u> . A worn propeller shaft constant velocity joint may create a clicking, grinding, or snapping type of noise.
Worn or loose center bearing assembly	Replace the center bearing assembly as required. A worn center bearing assembly may cause vehicle vibration or a grinding or squealing type of noise.
Worn universal joints	Replace the universal joints as required. A worn universal joint may create a clicking or a snapping type of noise. Refer to <u>Propeller Shaft Replacement</u> .
Worn axle shaft constant velocity joints.	Replace or repair the constant velocity joints as required. A worn axle shaft constant velocity joint may create a clicking, grinding, or snapping type of noise. Refer to <u>Symptoms - Rear Drive Axle</u> .
Transfer case noise	Refer to <u>Symptoms - Transfer Case</u> .
Worn or damaged axle mounting bushings (Side)	Check the bushing position and replace the bushings as required. A worn bushing may create a clunk type of noise during acceleration or deceleration or wrong orientation. Refer to <u>Differential Housing Support Bushing Replacement (Front)</u> or <u>Differential Housing Support Bushing Replacement (Rear)</u> .
Worn or damaged axle mounting bushings (Rear)	Replace the bushings as required. A worn bushing may create a clunk type of noise during acceleration or deceleration. Refer to <u>Differential Housing Support Bushing Replacement (Front)</u> or <u>Differential Housing Support Bushing Replacement (Rear)</u> .
Loose rear mounting bracket	Tighten the bracket bolts as required. Refer to <u>Fastener Tightening Specifications</u> .
Loose or damaged prop guard	Repair or replace as required. A loose dust shield may contact the propeller shaft assembly and create a scraping or grinding type of noise.
Bearing noise within axle assembly	A grinding or roar type of noise will increase or decrease relative to vehicle speed. 1. Check for the proper fluid level. Refer to <u>Differential Oil Replacement</u> . 2. If the noise continues, repair or replace the unit as required.
Gear set whine noise within axle assembly created by incorrect gear	A whine type of noise will increase or decrease relative to vehicle speed.

backlash	1. Check for the proper fluid level. Refer to <u>Differential Oil Replacement</u>. 2. Repair or replace the unit as required.
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INTERMITTENT NOISE

Cause	Correction
Inspect for proper gear oil levels prior to performing system diagnosis.	
Low gear oil levels	Fill axle to the recommended level. Refer to <u>Differential Oil Replacement</u> . A low level may create intermittent or incomplete clutch park engagement.
Incorrect gear oil	Replace with gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> . Refer to <u>Differential Oil Replacement</u> . Incorrect gear oil may create improper clutch pack engagement or a slippage condition.
Worn clutch pack oil pump	Replace the clutch pack assembly.
Worn clutch pack friction discs	Replace the clutch pack assembly.

CONSTANT NOISE

Cause	Correction
Inspect for proper gear oil levels prior to performing system diagnosis.	
Low gear oil levels	Faulty oil seal or other types of leaks may contribute to lower than required fluid levels. Refer to <u>Rear Axle Lubricant Leak Diagnosis</u> . Fill to the proper level with gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> . Refer to <u>Differential Oil Replacement</u> .
Worn or loose axle mounts	Repair or replace axle mounts as required. Refer to <u>Differential Housing Support Bushing Replacement (Front)</u> or <u>Differential Housing Support Bushing Replacement (Rear)</u> .
Worn propeller shaft constant velocity or universal joints	Replace the universal joints as required. Refer to <u>Propeller Shaft Replacement</u> . If constant velocity joint is damaged, replace the propeller shaft. Refer to <u>Propeller Shaft Replacement</u> .
Worn propeller shaft center bearing assembly	Replace the center bearing assembly. Refer to <u>Propeller Shaft Replacement</u> .
Bearing noise within axle assembly	This type of noise will decrease or increase relative to the vehicle speed. 1. Check for the proper fluid level. Refer to <u>Differential Oil Replacement</u>.

	2. Repair or replace the unit as required.
Gear set whine noise within the carrier assembly caused by incorrect backlash	A whine type of noise will increase or decrease relative to the vehicle speed. 1. Check for the proper fluid level. Refer to <u>Differential Oil Replacement</u> . 2. Repair or replace the unit as required.

NOISY ON TURNS

Cause	Correction
Inspect for proper gear oil levels prior to performing system diagnosis. Operate the vehicle turning in tight circles, in both left and right directions. Moan, groan, chatter, or a pulsing type concern may indicate a pump or clutch park problem within the axle assembly.	
Worn or loose rear axle mounts	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	Replace with correct gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> . Refer to <u>Differential Oil Replacement</u> .
Worn differential side and/or idler gears and worn cross-pin	Replace gears and pin as required.
Worn clutch plates	Replace clutch drum.

REAR AXLE LUBRICANT LEAK DIAGNOSIS

Cause	Correction
Restricted or damaged ventilation tube assembly	Replace the ventilation tube as required.
Leaking fill or drain plug	Install sealant onto the threads of the plugs and tighten. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> and <u>Fastener Tightening Specifications</u> .
Leaking input flange seal	1. Inspect the input flange surface for excessive wear or damage. 2. Inspect the front bearing for wear or damage. A worn bearing may allow excessive movement of the clutch pack input shaft. 3. Replace the components as required.
Leaks at the housing sealing surfaces	Disassemble the axle and reseal the sealing surfaces as required - clutch drum cover only. Refer to <u>Rear Wheel Drive Module Clutch Housing Replacement</u> .

Worn or damaged axle shaft oil seals	Replace the axle shaft oil seals as required.
Axle housing porosity	Replace the housing(s) as required. Refer to <u>Rear Axle Shaft Seal Replacement - Left Side</u> and <u>Rear Axle Shaft Seal Replacement - Right Side</u> .

REPAIR INSTRUCTIONS

REAR DIFFERENTIAL CLUTCH CONTROL MODULE REPLACEMENT

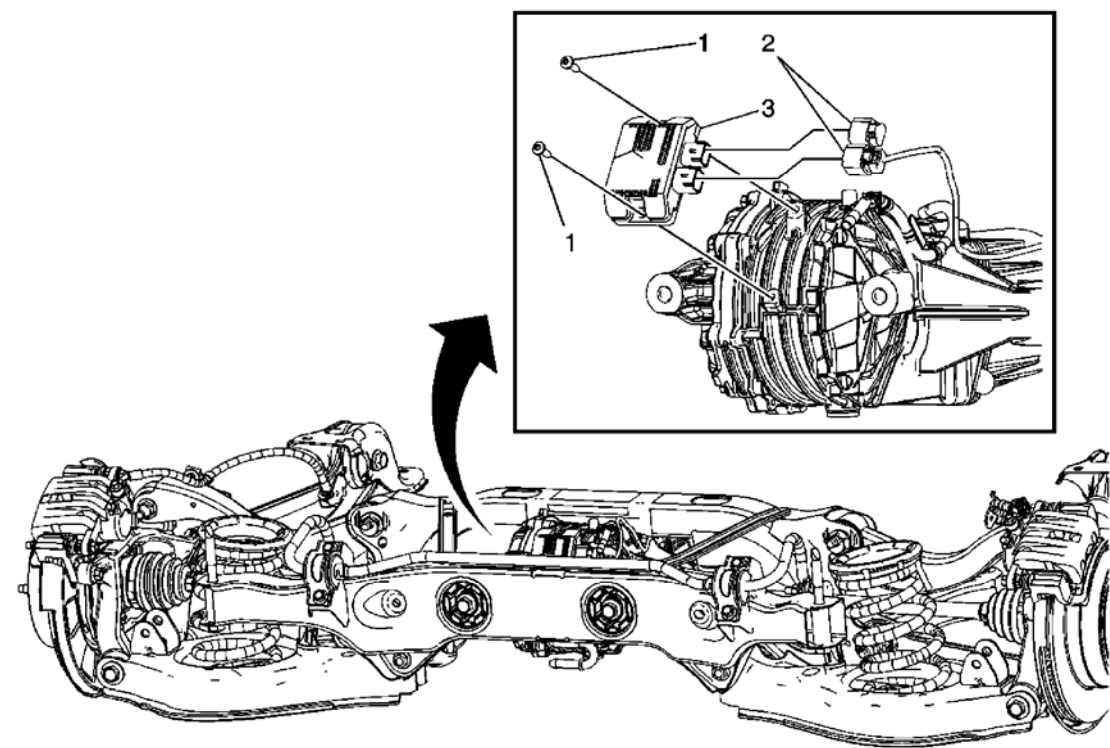


Fig. 2: Rear Differential Clutch Control Module
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the spare tire. 3. Remove the exhaust system. Refer to <u>Exhaust Muffler Replacement</u> . 4. Remove the rear differential assembly. Refer to <u>Differential Replacement</u>.	
1	Clutch Drum Control Module Screw (Qty: 2) CAUTION:

	Refer to <u>Fastener Caution</u> .
	Tighten: 15 N.m (133 lb in)
2	Clutch Drum Control Module Connector
3	Clutch Drum Control Module Procedure: Program the control module. Refer to <u>Control Module References</u> .

REAR AXLE LUBRICANT LEVEL INSPECTION

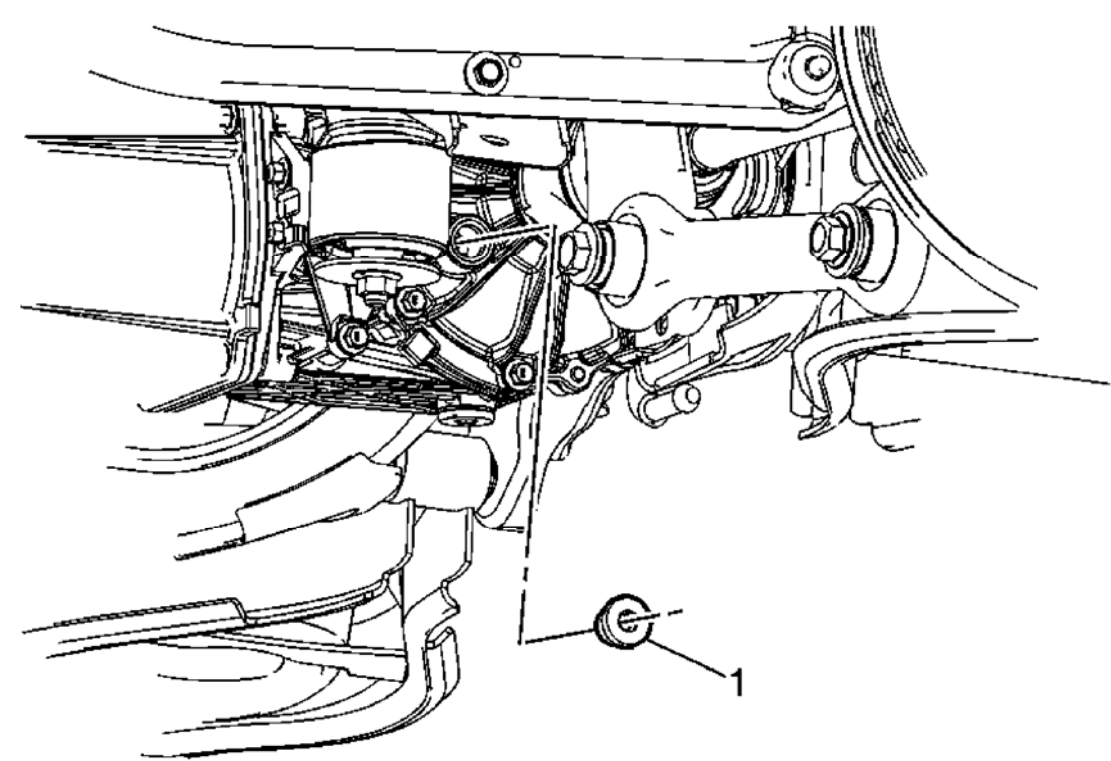


Fig. 3: Rear Axle Lubricant Level
Courtesy of GENERAL MOTORS CORP.

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

- The fluid level should be level with the bottom of the threads of the fill hole.
- If the fluid level is low, refer to **Differential Oil Replacement** for the proper fill instructions and type of fluid.

Tighten: 39 N.m (29 lb ft)

DIFFERENTIAL OIL REPLACEMENT

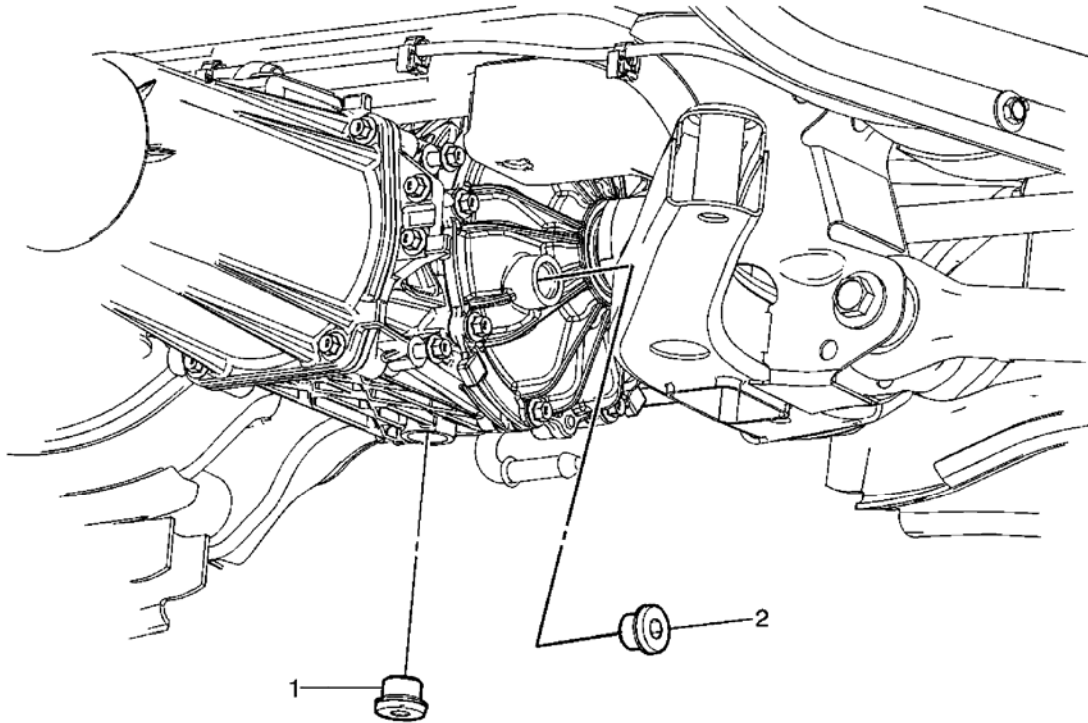


Fig. 4: Identifying Differential Fill & Drain Plugs

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Plug Differential Drain Plug CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Tighten: 39 N.m (29 lb ft)
	Differential Fill Plug Procedure: Fill the differential with the proper lubricant. Refer to <u>Adhesives, Fluids, Lubricants, and</u>

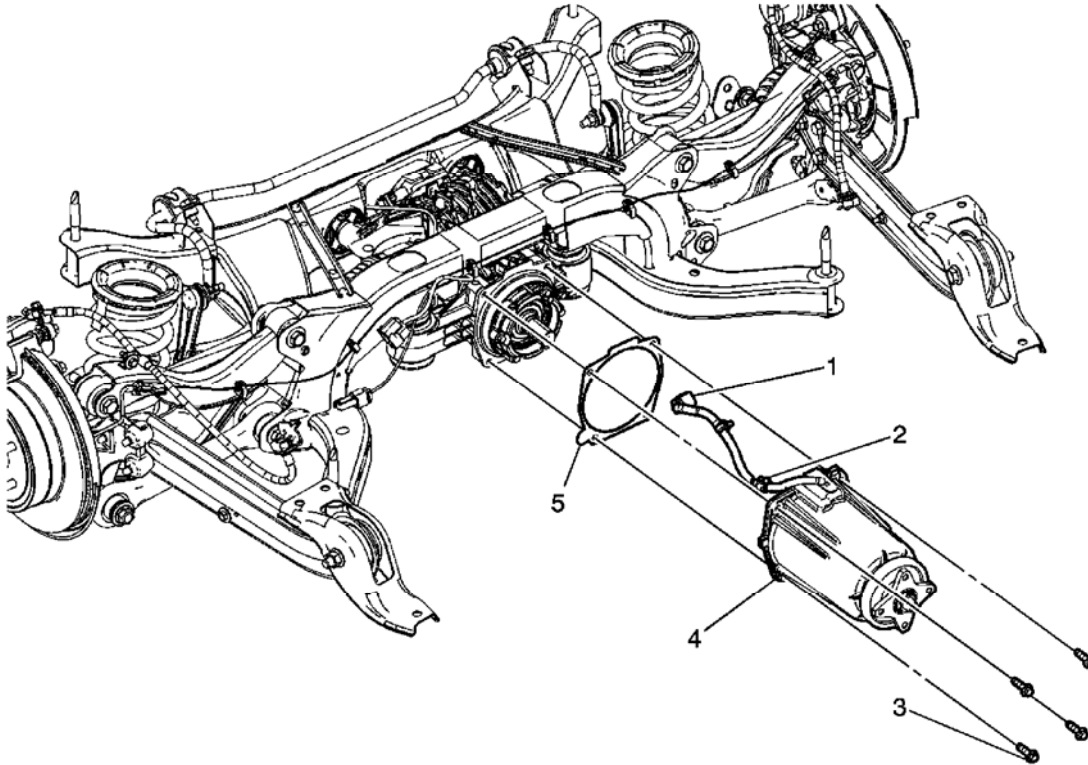
REAR WHEEL DRIVE MODULE CLUTCH HOUSING REPLACEMENT

Fig. 5: Rear Wheel Drive Module Clutch Housing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Remove the propeller shaft from the differential clutch drum assembly. Refer to <u>Propeller Shaft Replacement</u> .	
1	Electrical Clutch Control Connector
2	Retaining Clip (Qty: 2)
3	Differential Clutch Drum Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> .

	Tip: Relocate the rear portion of the propeller shaft to the side and support it with mechanics wire or equivalent. Tighten: 29 N.m (21 lb ft)
4	Differential Clutch Drum Procedure: Rear differential clutch control module recalibration, refer to <u>Control Module References</u>. Tip: The pinion flange, dust cover and pinion nut are serviced with the differential clutch drum assembly.
5	Differential Clutch Drum Gasket Tip: Apply a small amount of grease to the gasket to hold it in place.

DIFFERENTIAL CARRIER ASSEMBLY MOUNT REPLACEMENT

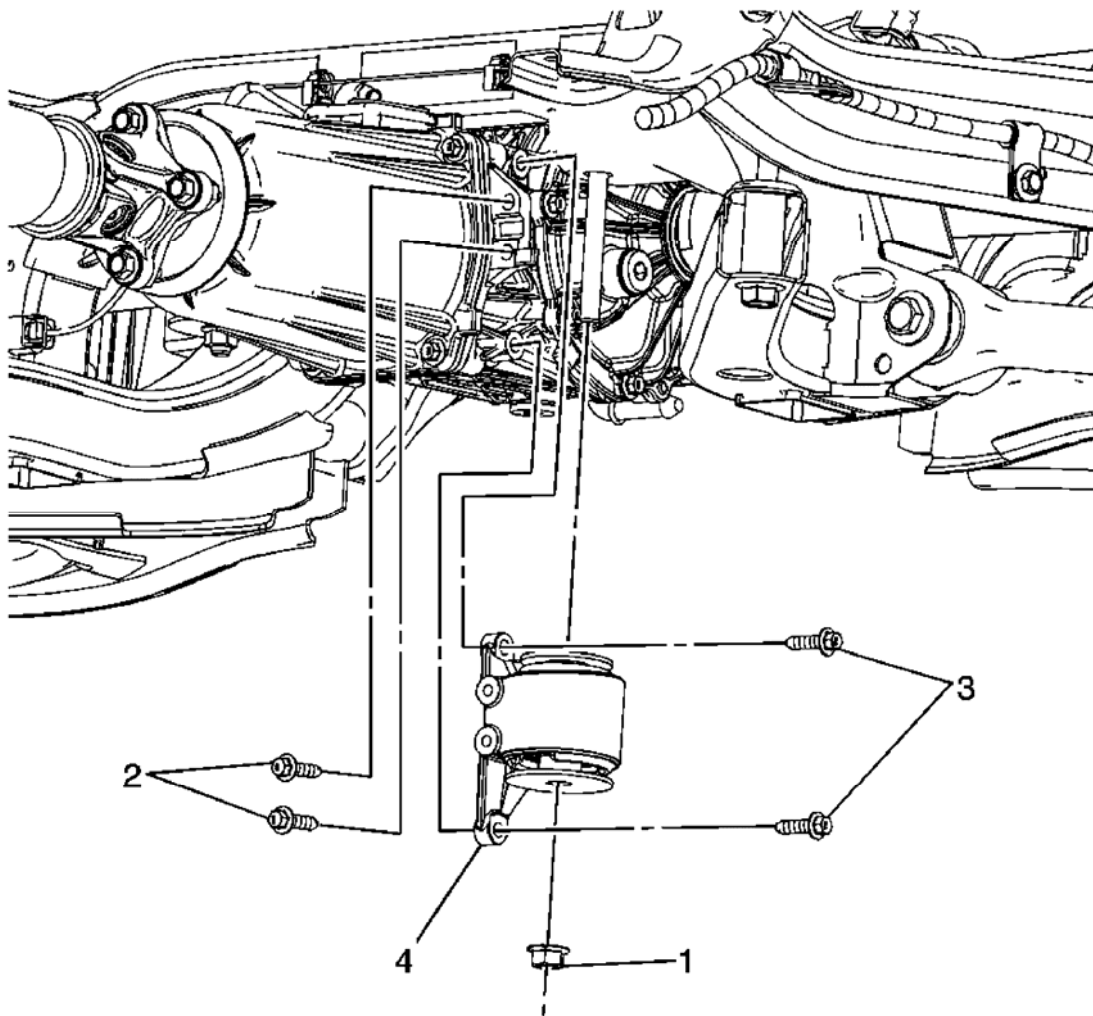


Fig. 6: Differential Carrier Assembly Mount
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Left Rear Differential Mount Nut CAUTION: Refer to <u>Fastener Caution</u> . Tip: Support the rear differential with a jack stand. Tighten: 122 N.m (90 lb ft)
2	Left Rear Differential Mount Bolt (Qty: 2) Tighten: 29 N.m (21 lb ft)
3	Left Rear Differential Mount Bolt (Qty: 2) Tighten: 29 N.m (21 lb ft)
4	Left Rear Differential Mount

REAR AXLE VENT REPLACEMENT

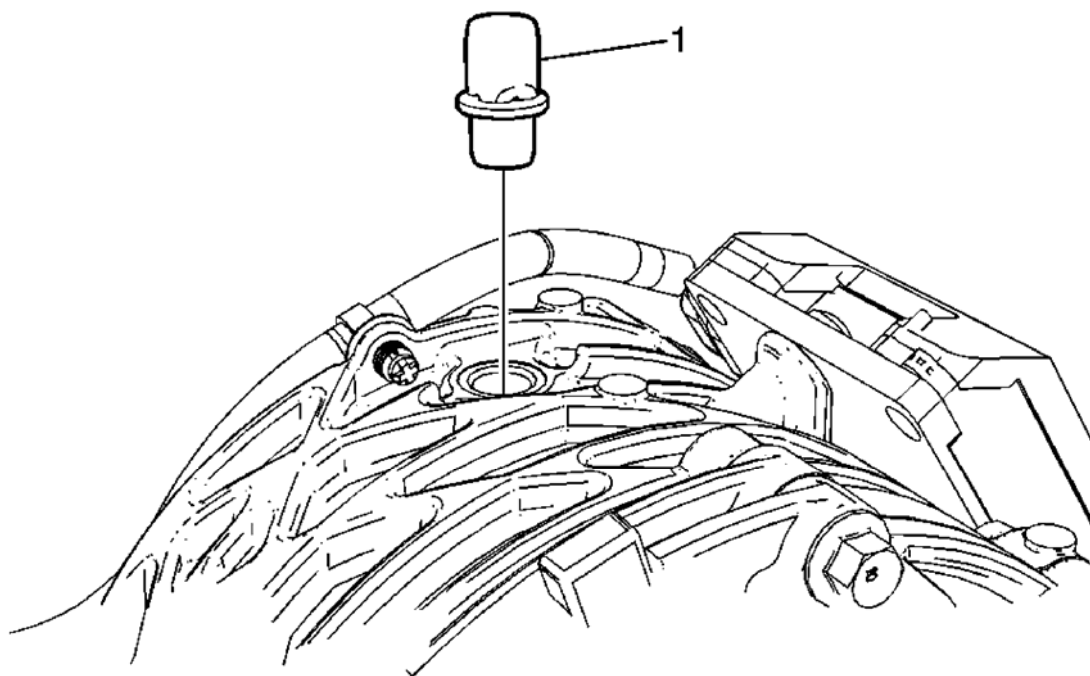


Fig. 7: Rear Axle Vent
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the rear differential assembly from the vehicle. Refer to <u>Differential Replacement</u> .	
1	Rear Differential Vent Procedure 1. Remove any dirt or debris from the vent area. 2. Using an appropriate pair of pliers, remove the vent from the rear differential housing. Tip: • The rear differential does not have to be removed from the jack stand to perform this procedure. • When installing the vent, use a deep well socket that fits on the flange of the vent and gently tap the vent into place.

DIFFERENTIAL CARRIER COVER AND SEAL REPLACEMENT - LEFT SIDE

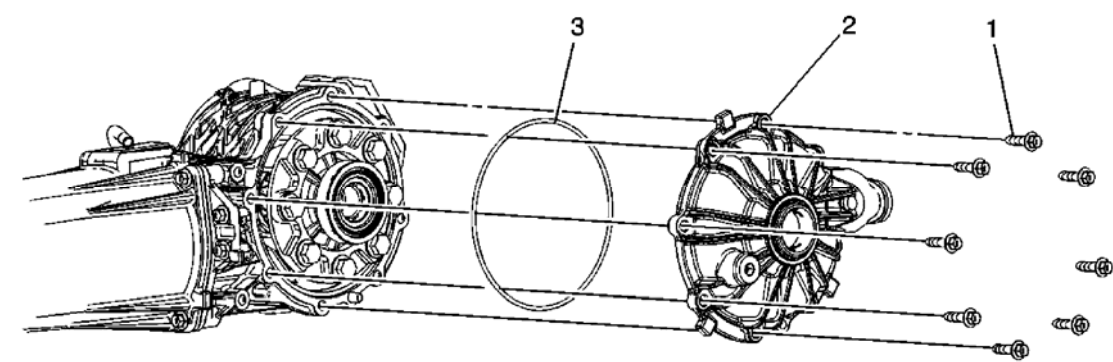


Fig. 8: Differential Carrier Cover & Seal - Left Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the rear differential assembly. Refer to <u>Differential Replacement</u> .	
1	Differential Side Cover Bolt (Qty: 8) CAUTION: Refer to <u>Fastener Caution</u> .

	Tip: • Finger tighten the bolts before torquing to specification. • Tighten the bolts in a criss cross pattern. Tighten: 29 N.m (21 lb ft).
2	Differential Side Cover Tip: Inspect the differential side cover for any damage. If the side cover is damaged, replace the differential assembly. The side cover is not serviced separately.
3	Differential Side Cover Seal Tip: • Before installing the side cover seal, ensure that the groove for the side cover seal is free of dirt and debris. This will ensure that the seal seat properly in the differential housing. • Apply a small amount of clean oil to the side cover seal.

REAR AXLE SHAFT SEAL REPLACEMENT - LEFT SIDE

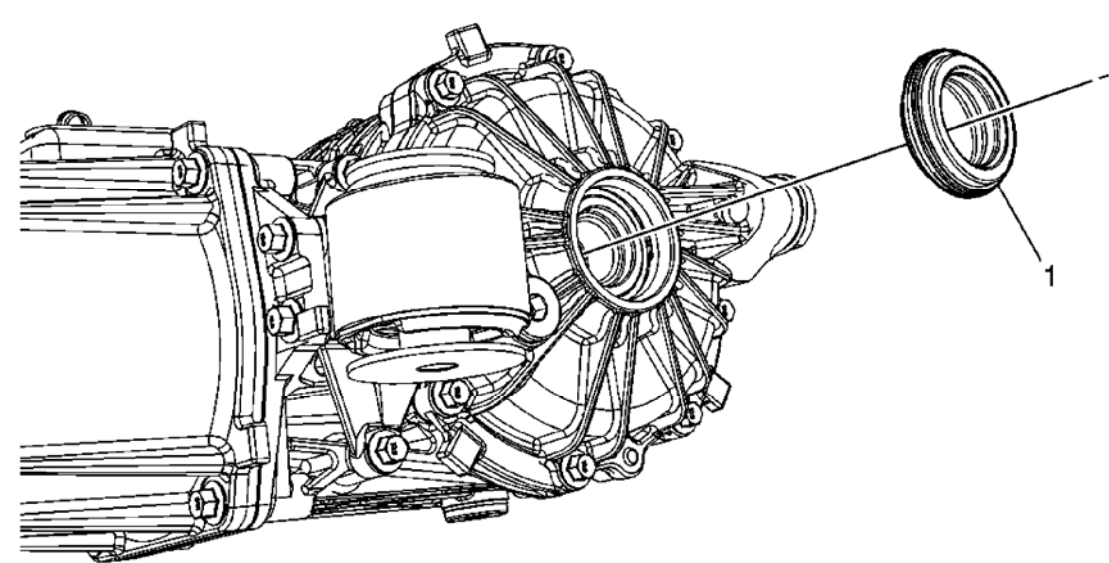


Fig. 9: Rear Axle Shaft Seal - Left Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the rear differential assembly. Refer to Differential Replacement	
	Rear Axle Shaft Seal Procedure

1. Using the appropriate tool, remove the rear axle seal.
2. Using the **J 8092:** handle and the **J 33832:** installer, install the rear axle shaft.

Special Tools

1

- **J 8092:** Driver Handle
- **J 33832:** Rear Bearing Installer

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

REAR AXLE SHAFT SEAL REPLACEMENT - RIGHT SIDE

Special Tools

- **J 8092:** Driver Handle
- **J 33832:** Rear Bearing Installer

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drain the rear differential. Refer to **Differential Oil Replacement**.
3. Remove the exhaust system. Refer to **Exhaust Muffler Replacement** .
4. Remove the spare tire.

IMPORTANT: In the following service procedure, it is not necessary to completely remove the propeller shaft. Relocate the propeller shaft to the side and secure with mechanics wire or equivalent.

5. Remove the propeller shaft. Refer to **Propeller Shaft Replacement** .
6. Remove the right rear wheel drive shaft. Refer to **Rear Wheel Drive Shaft Replacement** .
7. Support rear differential with a transmission jack stand.

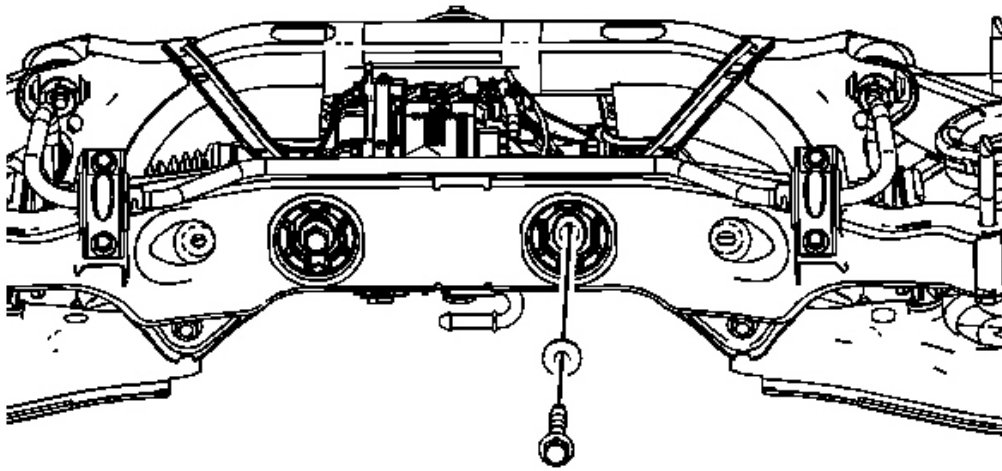


Fig. 10: View Of Right Rear Differential Support Bushing Bolt
Courtesy of GENERAL MOTORS CORP.

8. Remove the right rear differential support bushing bolt. Refer to **Differential Housing Support Bushing Replacement (Front)** or **Differential Housing Support Bushing Replacement (Rear)**.

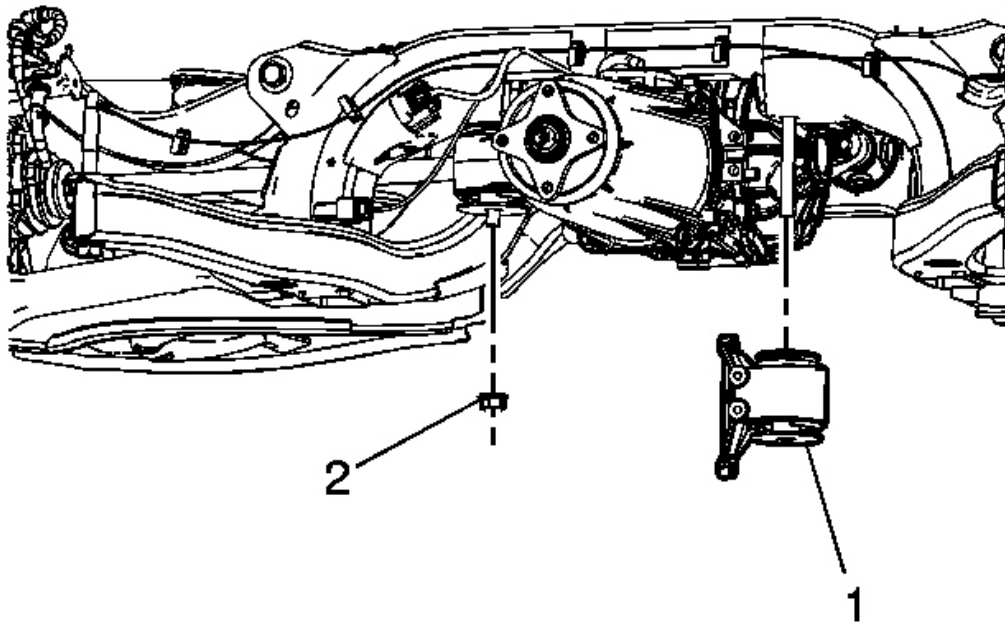


Fig. 11: Left Differential Mount & Right Differential Support Bushing Nut
Courtesy of GENERAL MOTORS CORP.

9. Remove the left differential mount (1).
10. Remove the right differential support bushing nut (2). Refer to **Differential Housing Support Bushing Replacement (Front)** or **Differential Housing Support Bushing Replacement (Rear)**.
11. Lower the differential to gain access to the axle shaft seal.

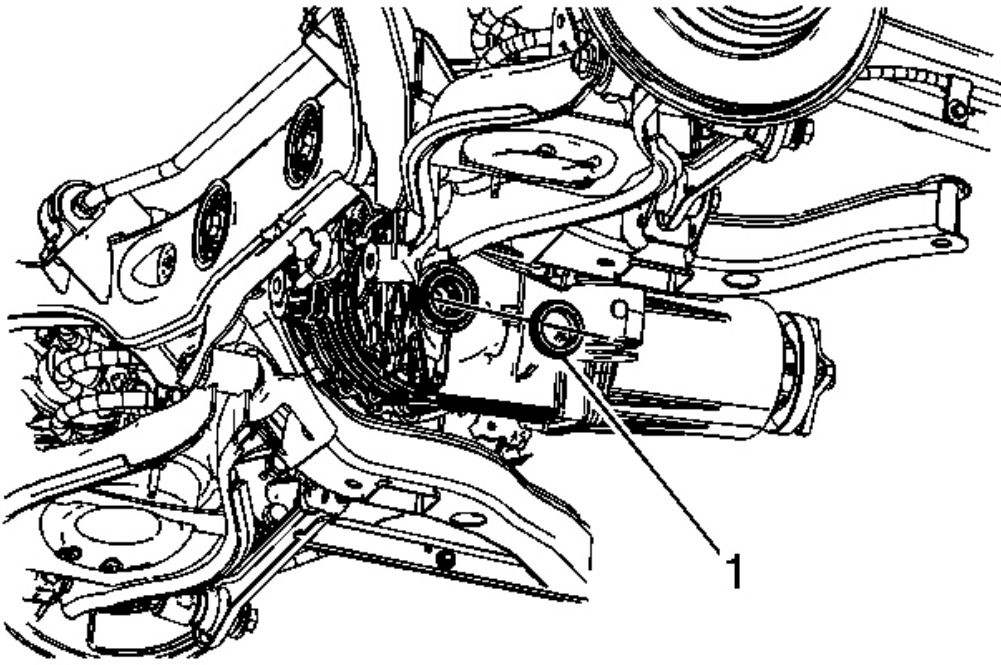


Fig. 12: Identifying Axle Shaft Seal
Courtesy of GENERAL MOTORS CORP.

12. Using the appropriate tool, remove the axle shaft seal (1).

Installation Procedure

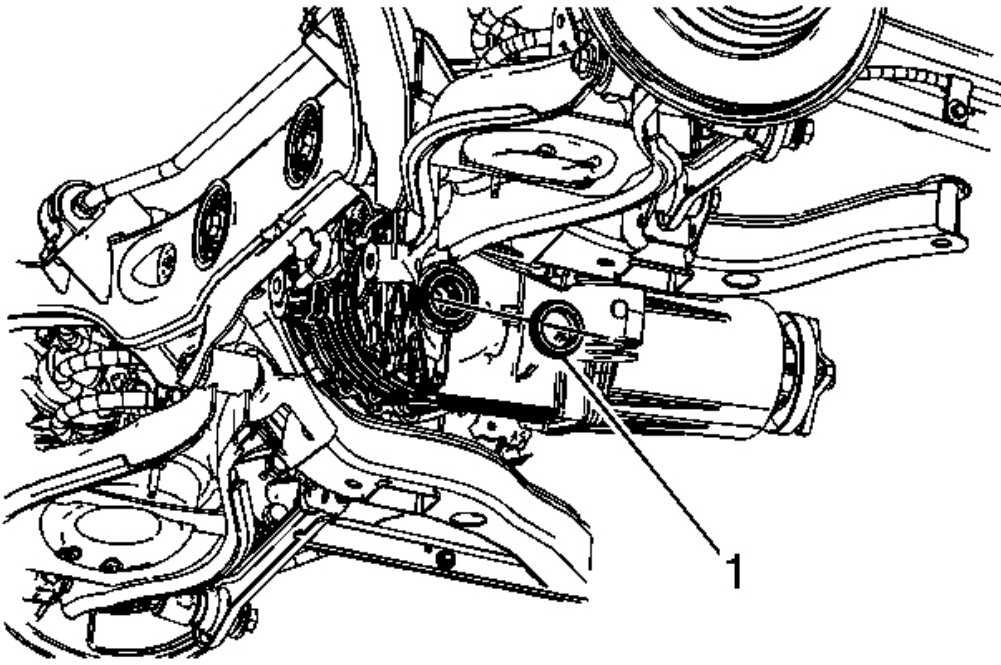


Fig. 13: Identifying Axle Shaft Seal
Courtesy of GENERAL MOTORS CORP.

1. Using the **J 8092:** handle and the **J 33832:** installer, install the axle shaft seal (1).
2. Lift and position the differential in the rear cradle.

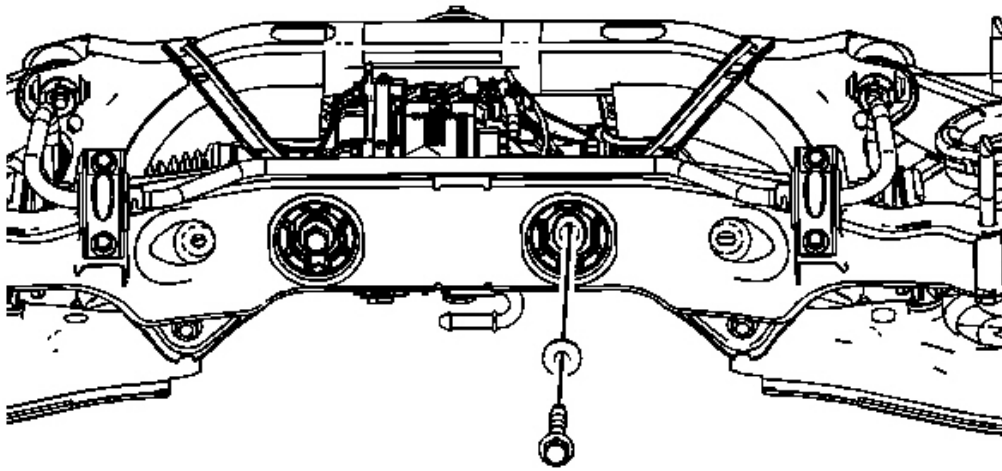


Fig. 14: Left Rear Support Bolt
Courtesy of GENERAL MOTORS CORP.

3. Install the left rear support bolt.

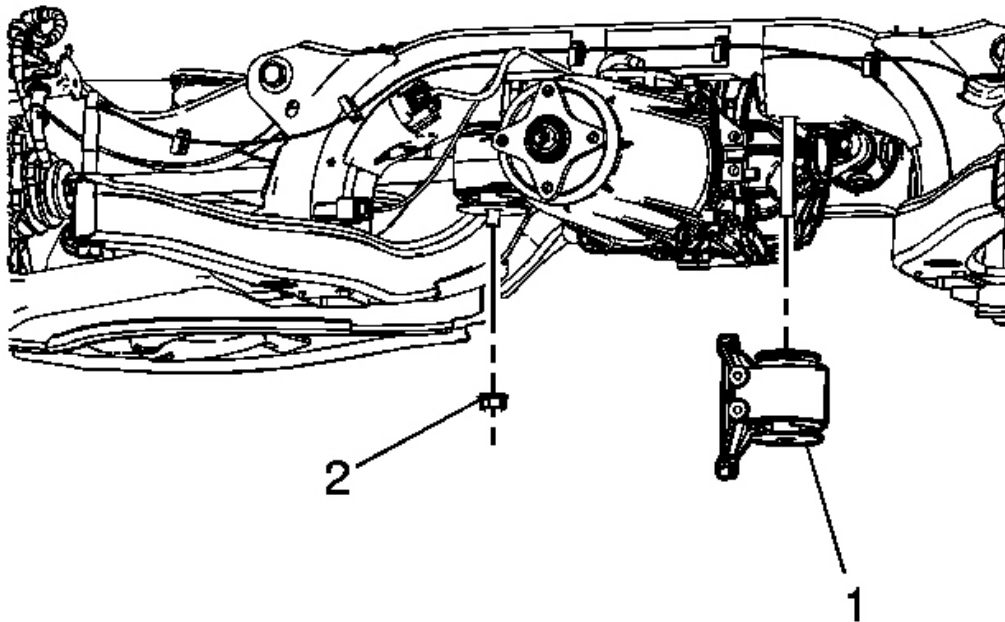


Fig. 15: Left Differential Mount & Right Differential Support Bushing Nut
Courtesy of GENERAL MOTORS CORP.

4. Install right differential support bushing nut (2). Refer to **Differential Housing Support Bushing Replacement (Front)** or **Differential Housing Support Bushing Replacement (Rear)**.
5. Install the left differential mount (1). Refer to **Differential Housing Support Bushing Replacement (Front)** or **Differential Housing Support Bushing Replacement (Rear)**.
6. Remove the transmission jack stand.
7. Install the right rear wheel drive shaft. Refer to **Rear Wheel Drive Shaft Replacement**
8. Install the propeller shaft. Refer to **Propeller Shaft Replacement** .
9. Install the exhaust system. Refer to **Exhaust Muffler Replacement**
10. Remove the spare tire.
11. Fill the rear differential with fluid. Refer to **Differential Oil Replacement**

DRIVE PINION FLANGE/YOKE AND/OR OIL SEAL REPLACEMENT

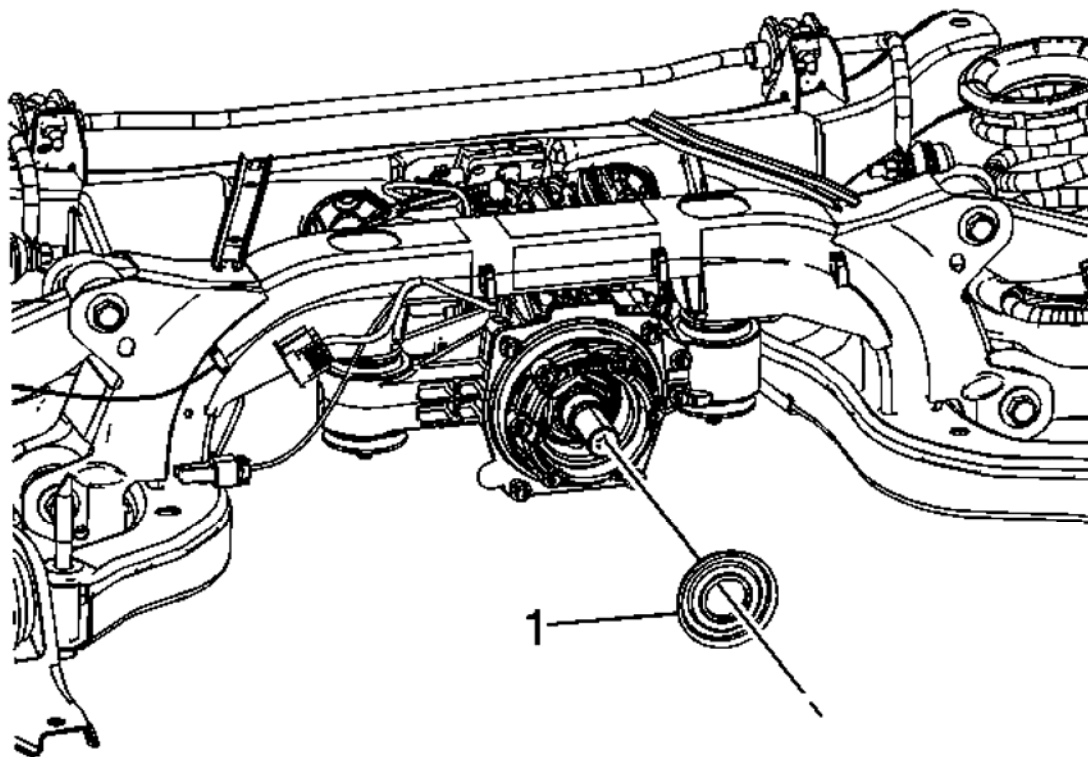


Fig. 16: Drive Pinion Flange/Yoke And/Or Oil Seal
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the differential clutch drum assembly. Refer to <u>Rear Wheel Drive Module Clutch Housing Replacement</u>.	
1	Differential Pinion Seal Procedure 1. Install a sheet metal screw into the seal. 2. Attach a pair of pliers or a slider hammer to the screw and remove the seal. 3. Using the slide hammer or pliers, remove the seal. 4. Using the J 44636-1, install the pinion seal. 5. Inspect the fluid level. Refer to <u>Rear Axle Lubricant Level Inspection</u>. Tip: The pinion flange, the nut and the dust cover are NOT SERVICED separately. These items are serviced with the differential clutch drum assembly.

Special Tools:

J 44636-1 Front Output Shaft Seal Installer. See **Special Tools**.

DIFFERENTIAL REPLACEMENT**Removal Procedure**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drain the rear differential, if needed. Refer to **Differential Oil Replacement**.
3. Remove the spare tire.
4. Remove the exhaust system. Refer to **Exhaust Muffler Replacement** .
5. Remove the rear wheel drive shafts. Refer to **Rear Wheel Drive Shaft Replacement** .
6. Remove the propeller shaft from the vehicle. Refer to **Propeller Shaft Replacement** .
7. Support the rear differential with a transmission jack stand.

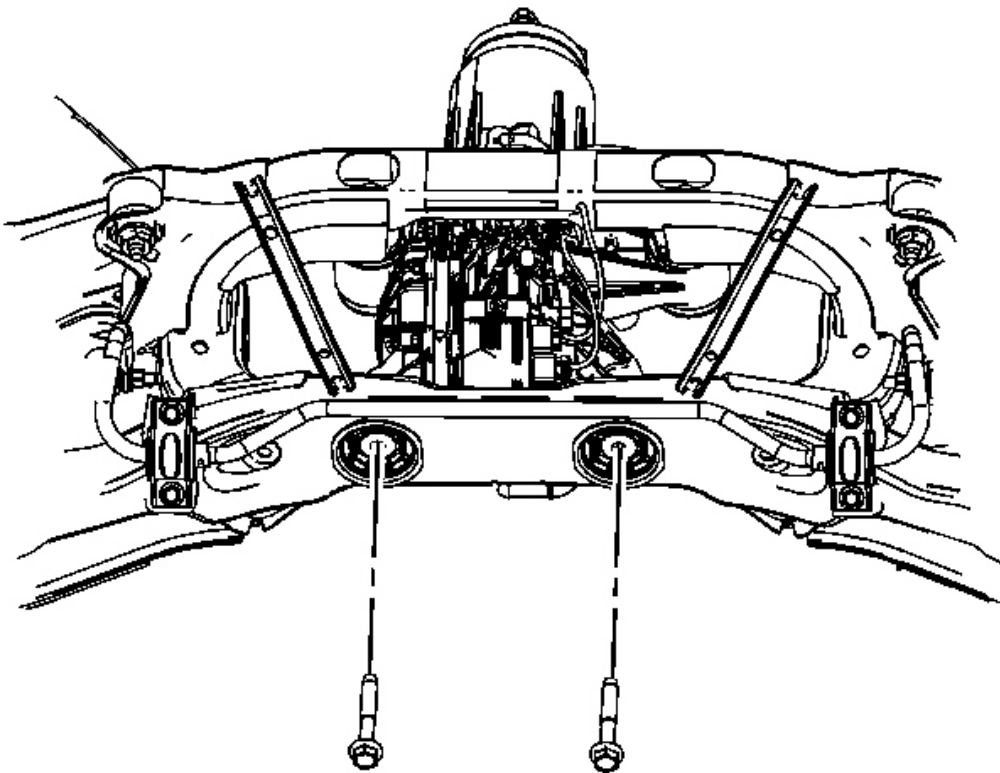


Fig. 17: Identifying Rear Differential Support Bushing Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear differential support bushing bolts.

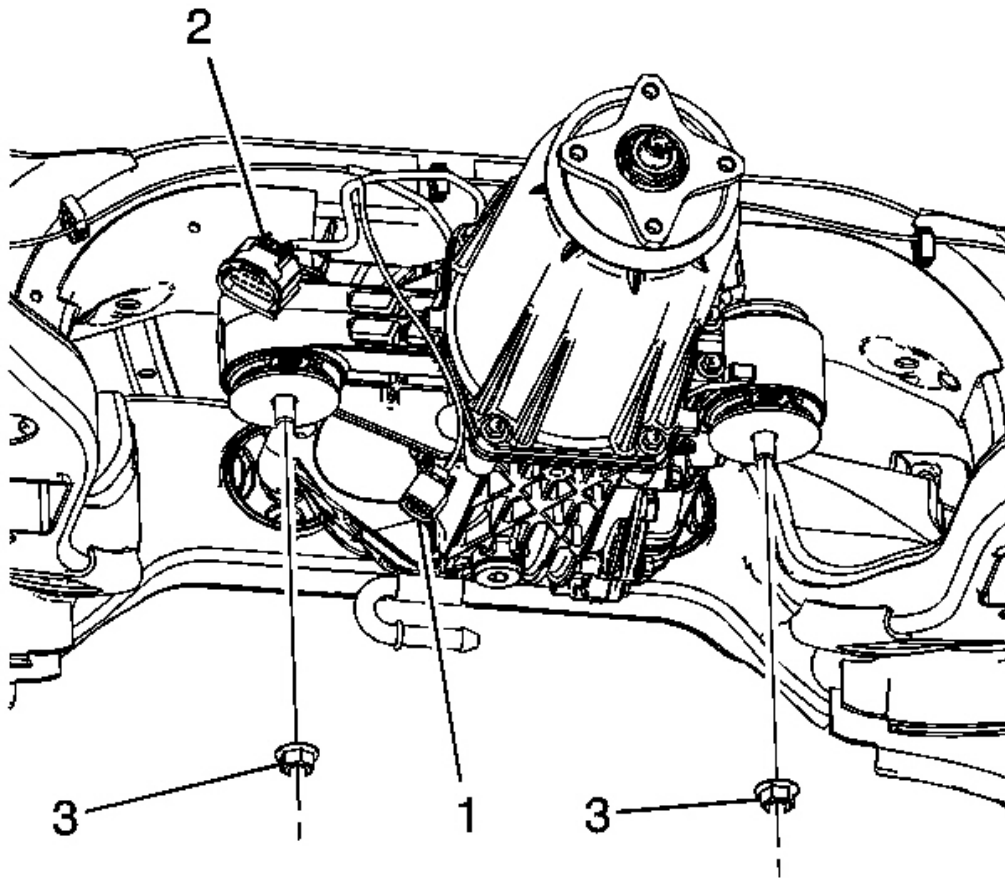


Fig. 18: Control Module Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the front mounting nuts for the rear differential (3).
10. Lower the rear differential to gain access rear differential clutch control module.
11. Remove the small electrical connector from the control module (1).
12. Remove the large electrical connector from the control module (2).

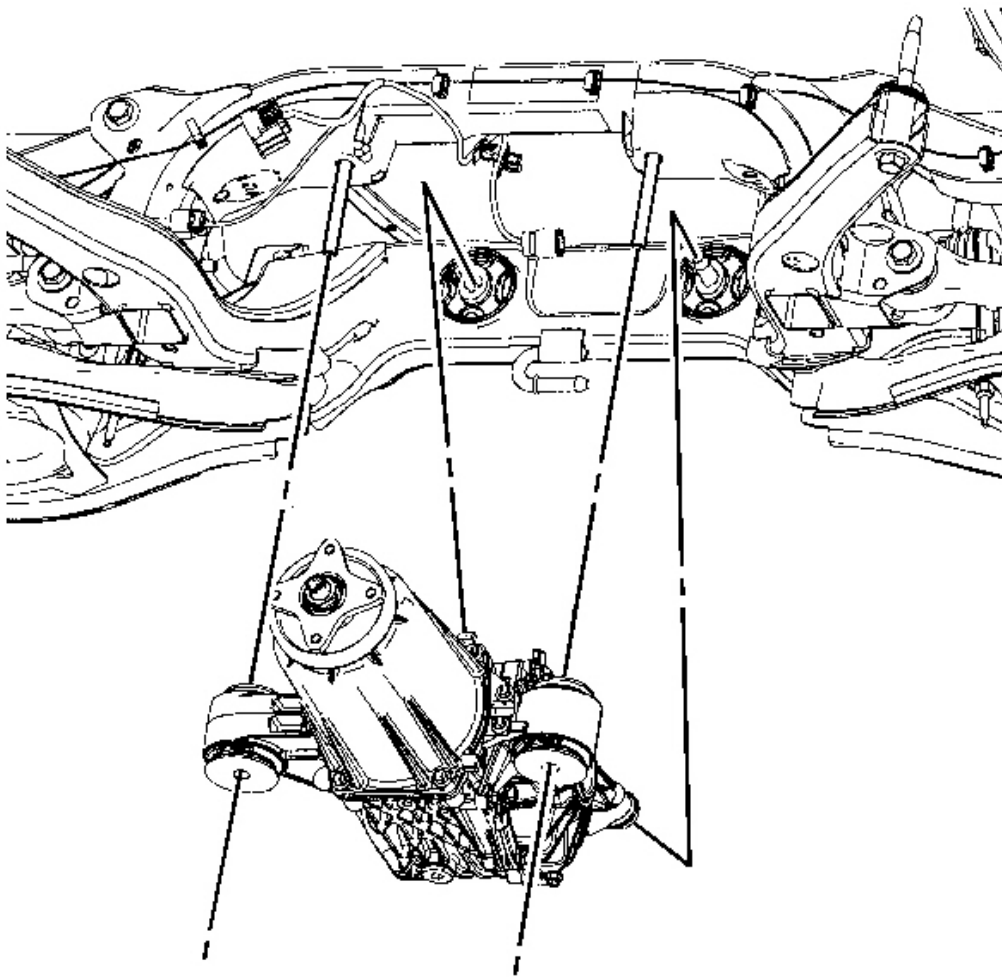


Fig. 19: View Of Differential Assembly
Courtesy of GENERAL MOTORS CORP.

13. Remove the rear differential assembly from the vehicle.

Installation Procedure

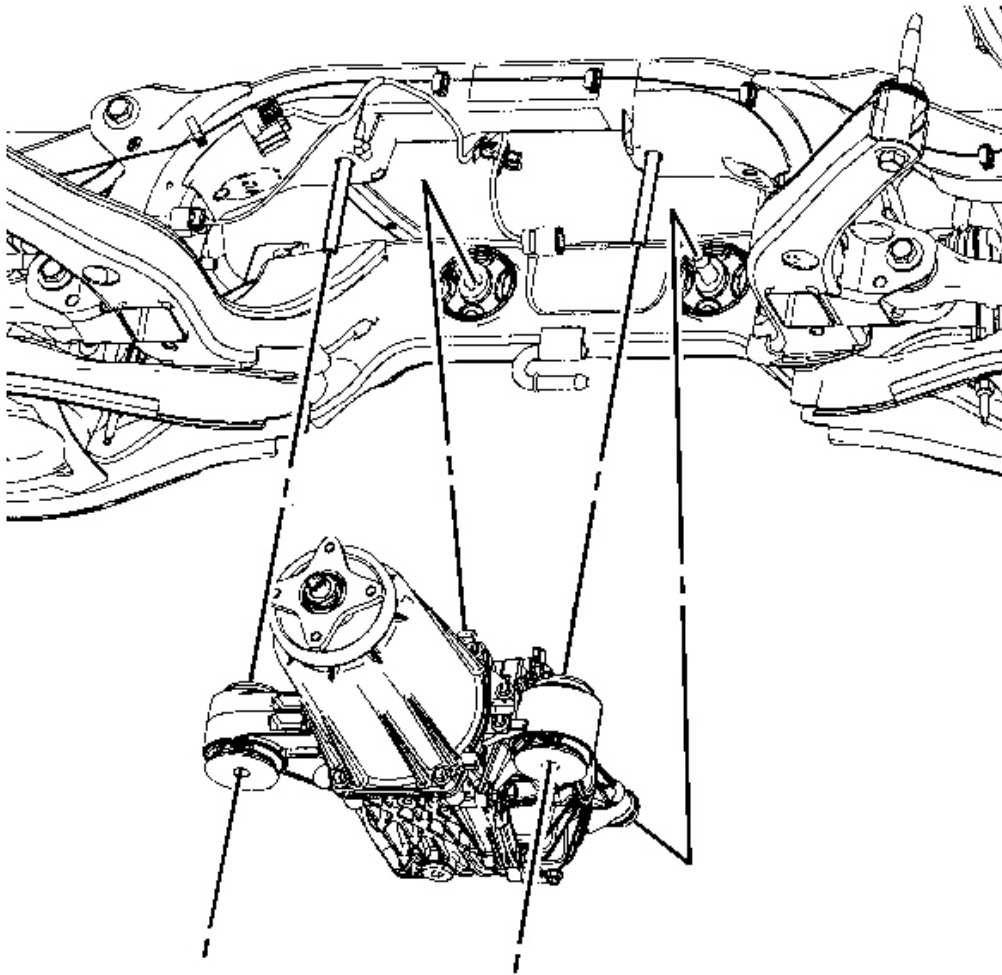


Fig. 20: View Of Differential Assembly
Courtesy of GENERAL MOTORS CORP.

NOTE: When positioning the rear differential assembly in the rear cradle, leave enough room to access the clutch control module.

1. If replacing the clutch control module, the new module must be programmed. Refer to **Control Module References** .
2. Position the rear differential assembly in the rear cradle.

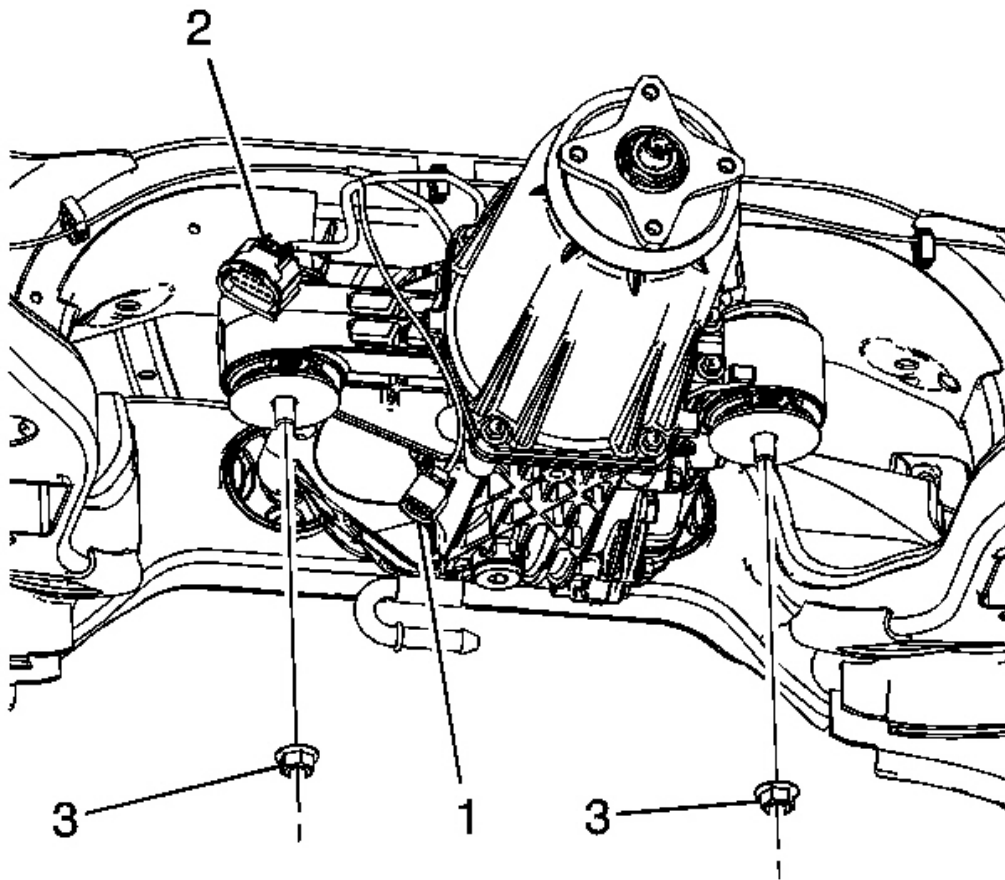


Fig. 21: Control Module Components
Courtesy of GENERAL MOTORS CORP.

3. Install the small electrical connector (1).
4. Install the large electrical connector (2).

NOTE: When installing the front mounting bolts tighten by hand.

5. Install the front mounting nuts (3).

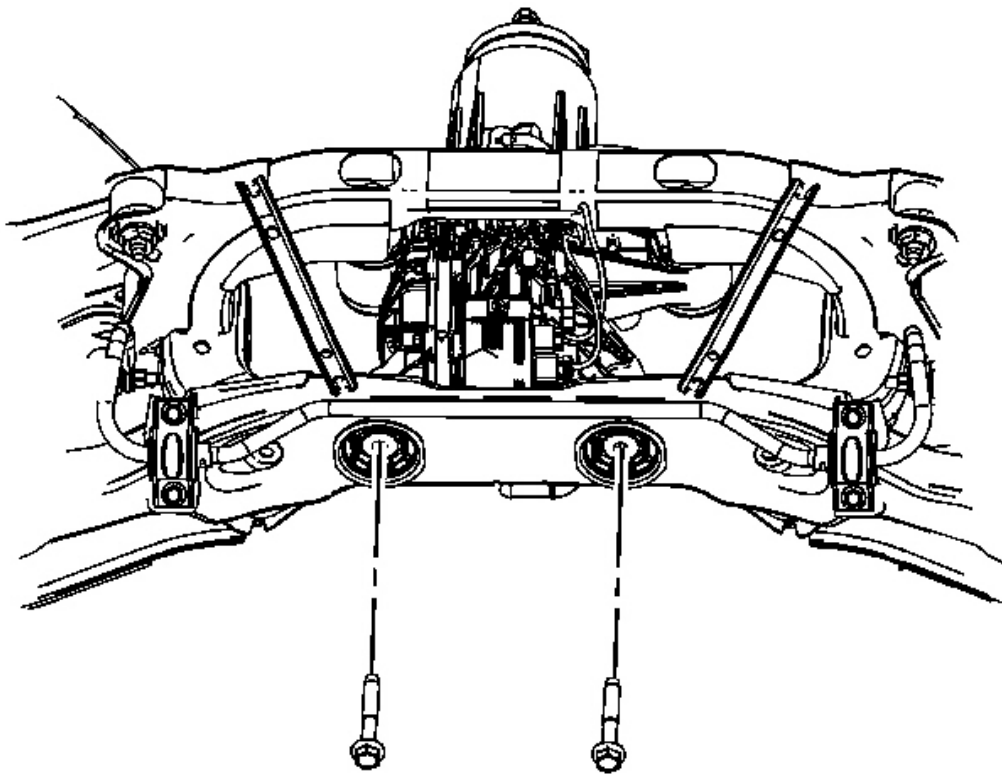


Fig. 22: Identifying Rear Differential Support Bushing Bolts
Courtesy of GENERAL MOTORS CORP.

6. Install the rear differential support bushing bolts.
7. Raise the rear differential assembly into place.

CAUTION: Refer to Fastener Caution .

8. Tighten the front mounting nuts to 122 N.m (90 lb ft)..
9. Tighten the rear differential support bushing bolts to 188 N.m (139 lb ft).
10. Remove the transmission jack stand.
11. Install the propeller shaft. Refer to **Propeller Shaft Replacement** .
12. Install the rear wheel drive shafts. Refer to **Rear Wheel Drive Shaft Replacement** .
13. Install the exhaust system. Refer to **Exhaust Muffler Replacement** .
14. Install the spare tire.

- 15. Fill the rear differential assembly with fluid, if drained. Refer to **Differential Oil Replacement**.
- 16. Lower the vehicle.

DIFFERENTIAL HOUSING SUPPORT BUSHING REPLACEMENT (FRONT)

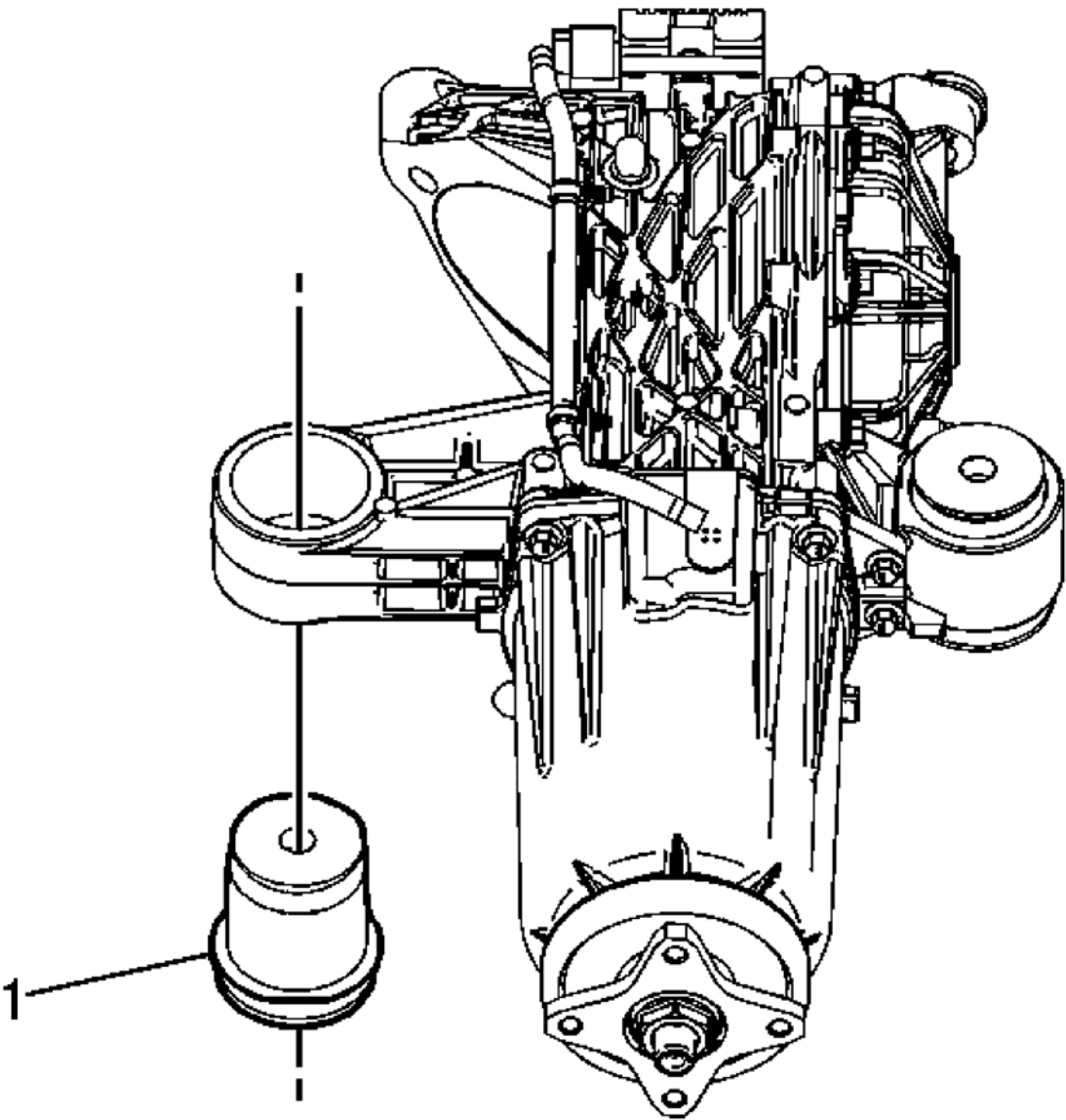


Fig. 23: Front Differential Housing Support Bushing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the Rear Differential Module. Refer to Differential Housing Support Bushing Replacement (Front) or Differential Housing Support Bushing Replacement (Rear) .	

1

Rear Differential Mount Bushing

Tip: Use the appropriate tool to remove the bushing.

DIFFERENTIAL HOUSING SUPPORT BUSHING REPLACEMENT (REAR)

Tools Required

J-45725 Cradle Bushing Replacer. See **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the rear differential assembly. Refer to **Differential Replacement**.

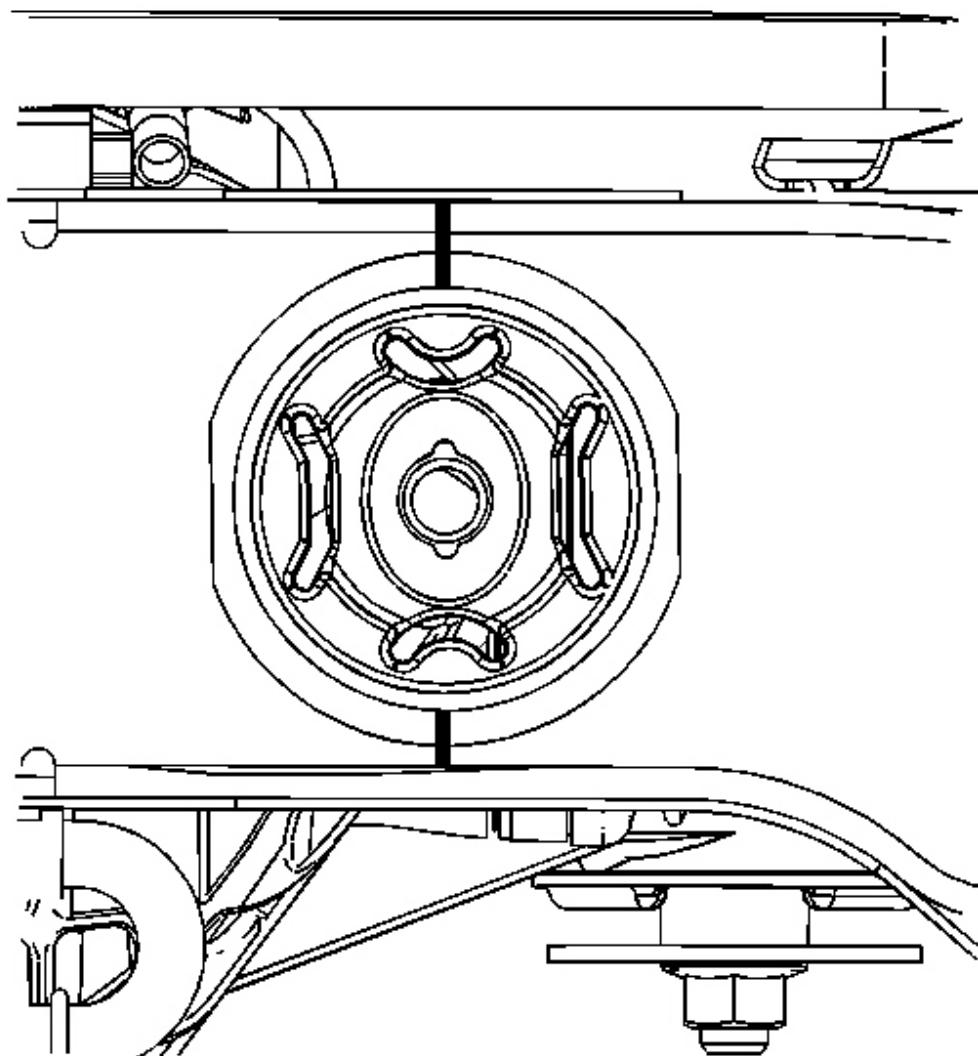


Fig. 24: Identifying Reference Point On Frame
Courtesy of GENERAL MOTORS CORP.

3. Mark a reference point on the frame and old bushing at the 12 and 6 o'clock position to use to alignment the new bushing.

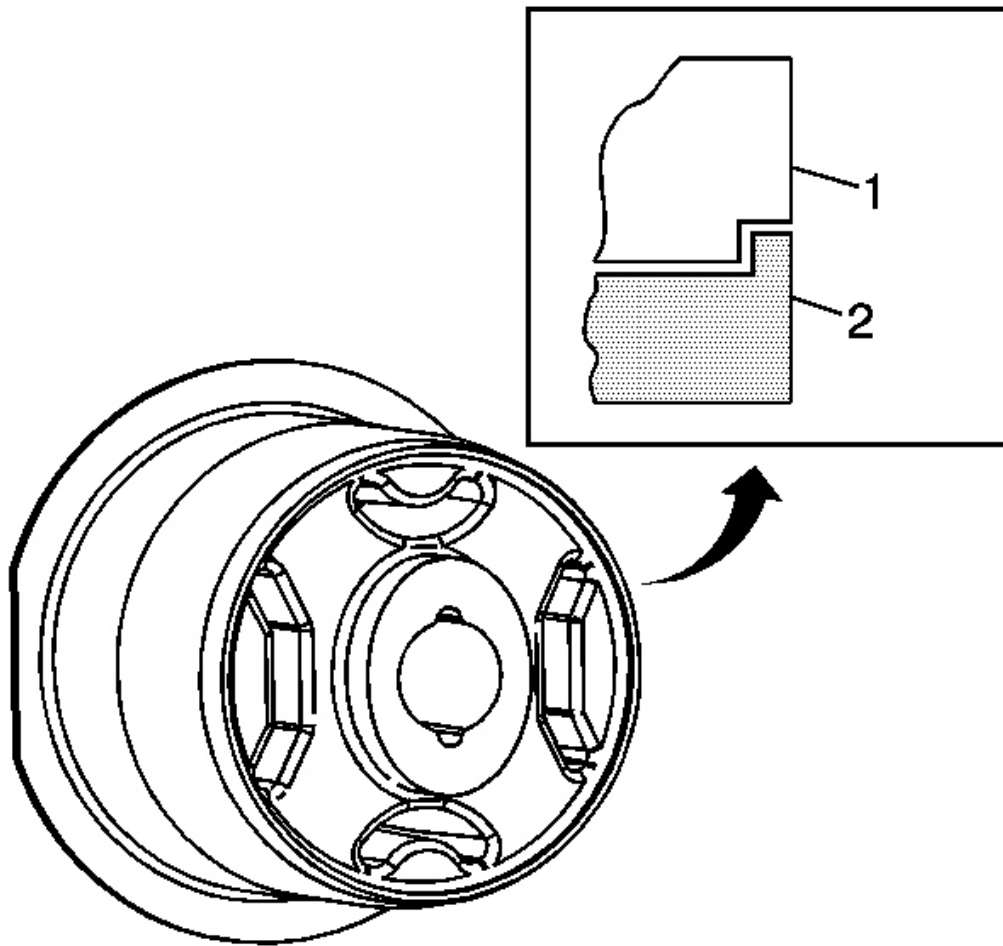


Fig. 25: View Of J-45725-2A & Bushing
Courtesy of GENERAL MOTORS CORP.

4. Position the J-45725-1A (1) on the bushing (2).
5. Position the J-45725-2A (1) on the frame.

IMPORTANT: Apply a small amount of grease on the threaded rod to lubricate the nuts when turning the nuts.

6. Install the threaded rod, bearing and washers.

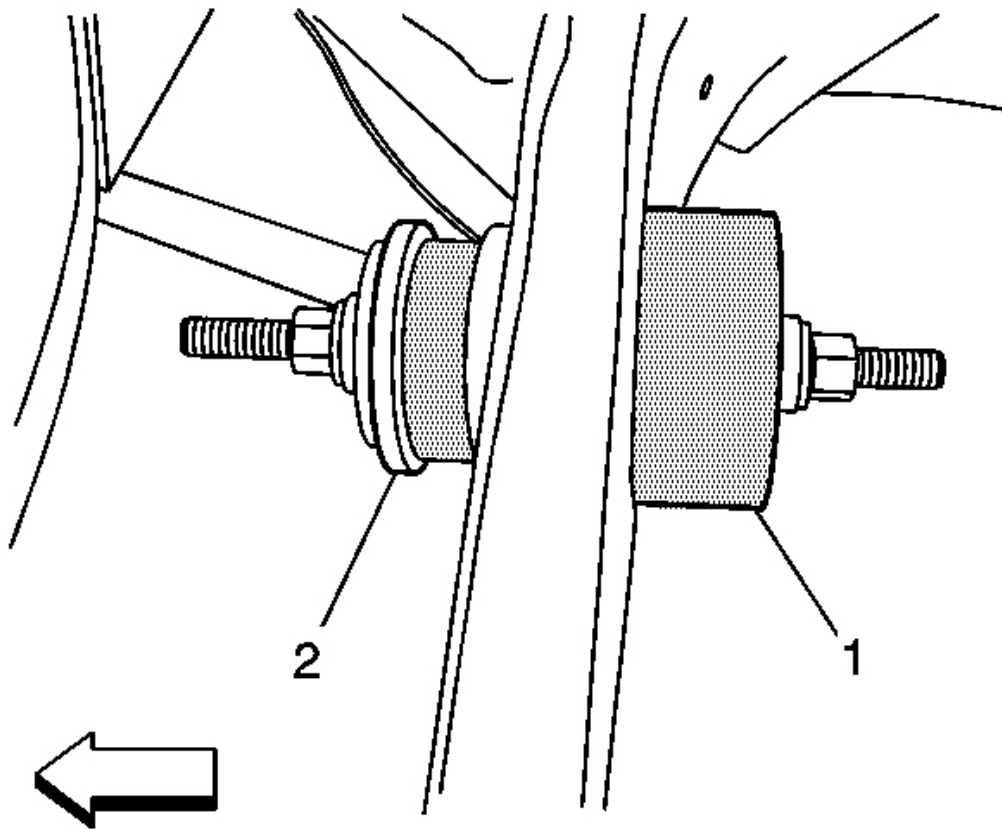


Fig. 26: Identifying Special Tools - J-45725-1A And J-45725-2A
Courtesy of GENERAL MOTORS CORP.

7. Adjust the nuts so that they are touching the J-45725-1A (2) and the J-45725-2A (1).
8. Install the proper size wrenches on the nuts.

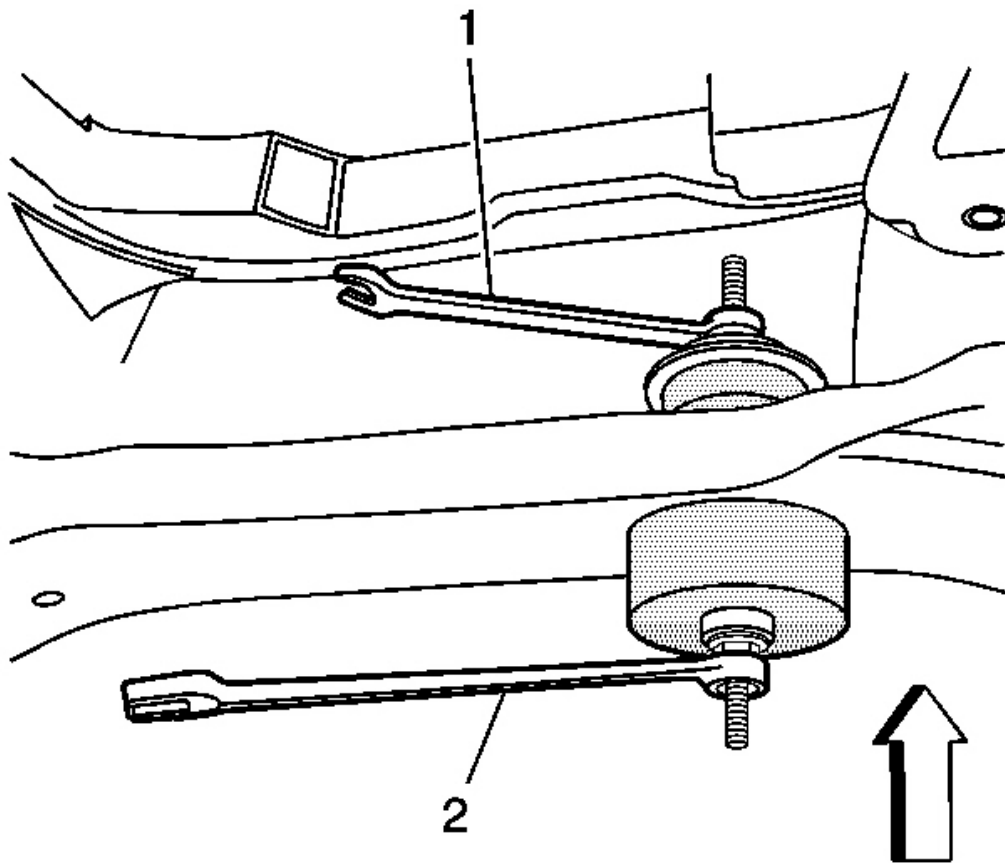


Fig. 27: Removing Busing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: In the following service procedure, use only **HAND TOOLS** when using the **J-45725**.

9. While holding the front wrench (1) rotate the rear wrench (2) to remove the bushing.
10. Remove the special tools.

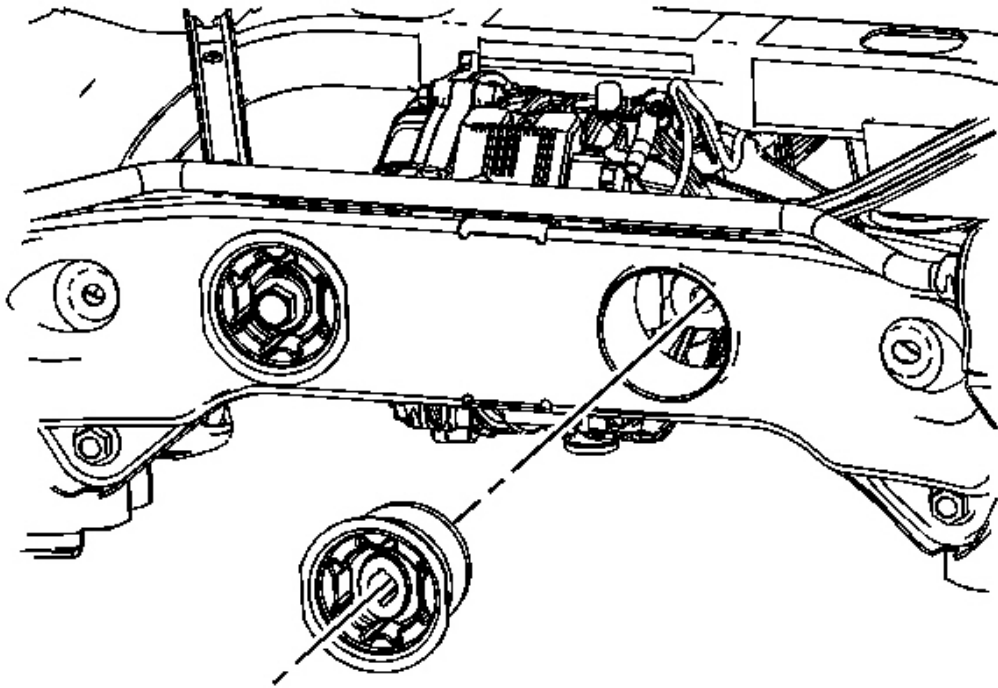


Fig. 28: Vire Of Bushing & Frame
Courtesy of GENERAL MOTORS CORP.

11. Remove the bushing from the frame.

Installation Procedure

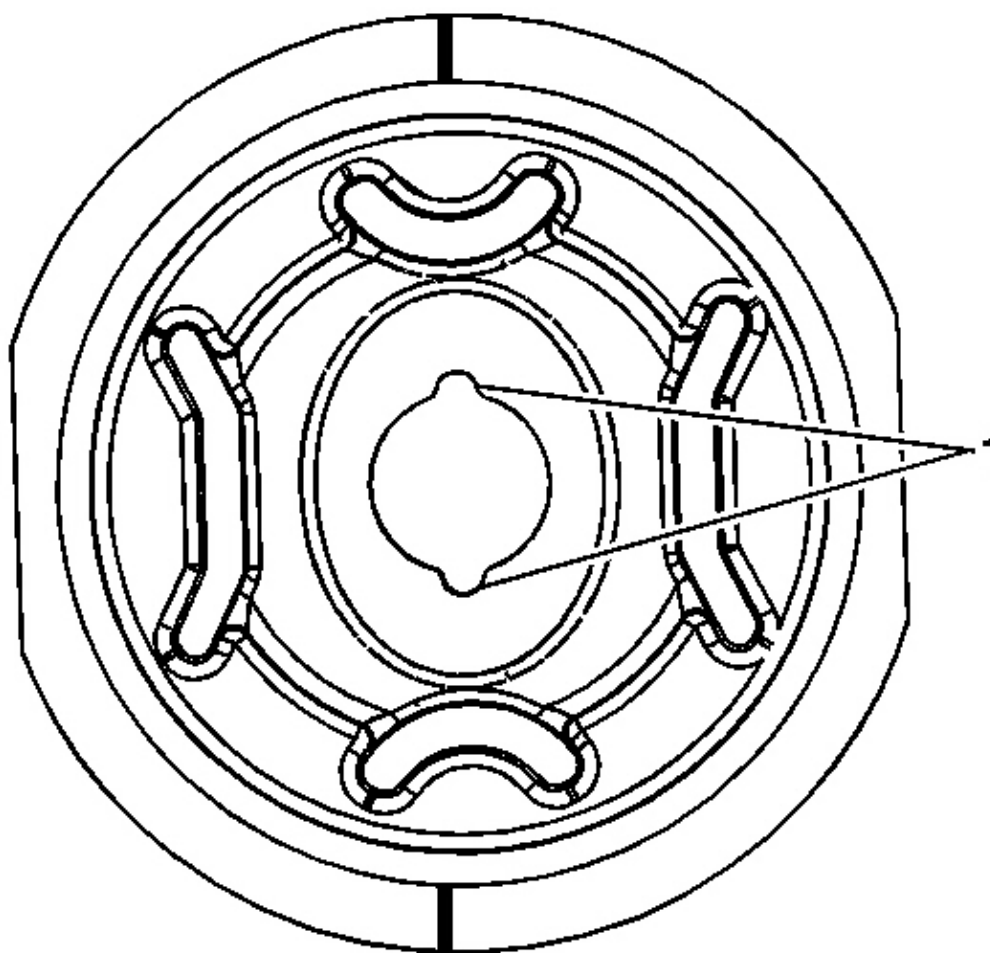


Fig. 29: Identifying Proper Bushing Alignment
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Failure to perform the following service procedure prior to the installation of the new bushing, could cause premature failure of the bushing.

1. Before the installation of the new bushing, use a straight edge draw a line on the new bushing at the 12 and 6 o'clock positions. Ensure that the grooves (1) are at the 12 and 6 o'clock positions.
2. Position the new bushing so that the reference marks on the frame and the bushing are in alignment. This will ensure that the new bushing will be within the $\pm 5^\circ$ specification required for the proper alignment of the bushing.

IMPORTANT: The following procedure is to temporarily hold the new bushing in place so that the special tools can be installed for the proper installation. This is **NOT** to be used to install the bushing.

3. Using a block of wood and a hammer, slightly tap the bushing into the frame.
4. Assemble the threaded rod, bearings and washers as indicated in step 7 in the removal procedure.

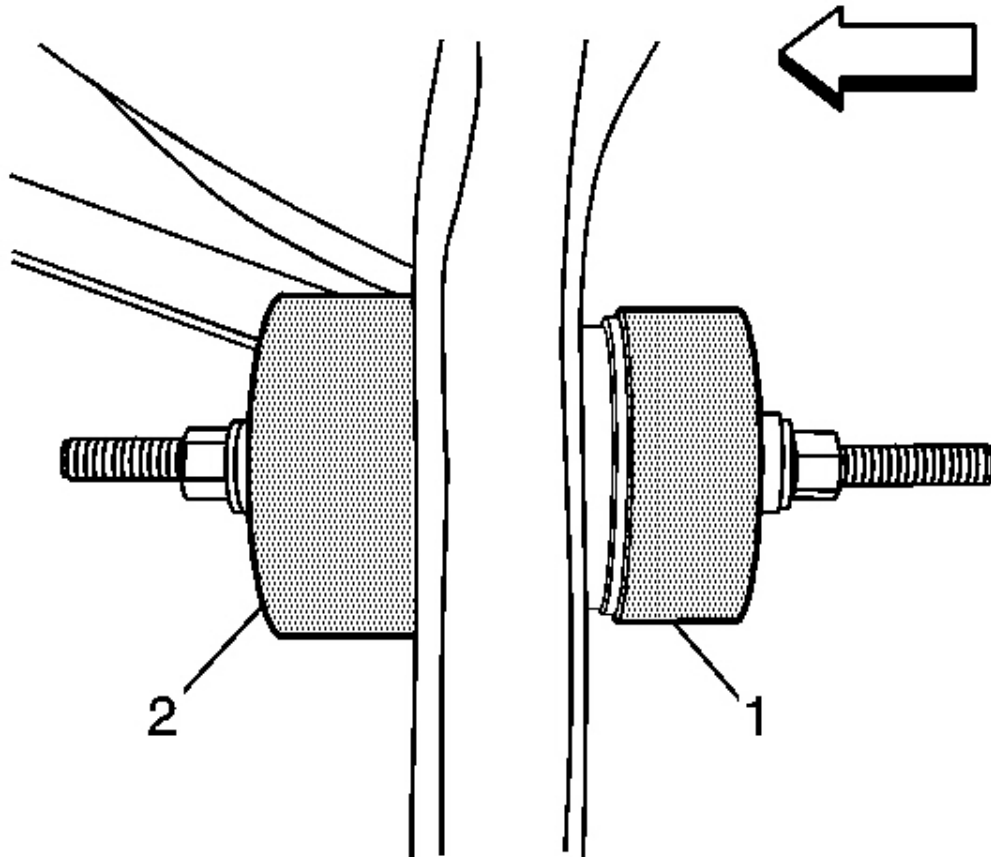


Fig. 30: Identifying Special Tools - J-45725-2 And J-45725-2A
Courtesy of GENERAL MOTORS CORP.

5. Position the J-45725-4 (2) on the inside of the frame.
6. Position J-45725-1A (1) on the outside of the frame.
7. Adjust the nuts so that they are touching the J-45725-2 (1) and the J-45725-2A (2).

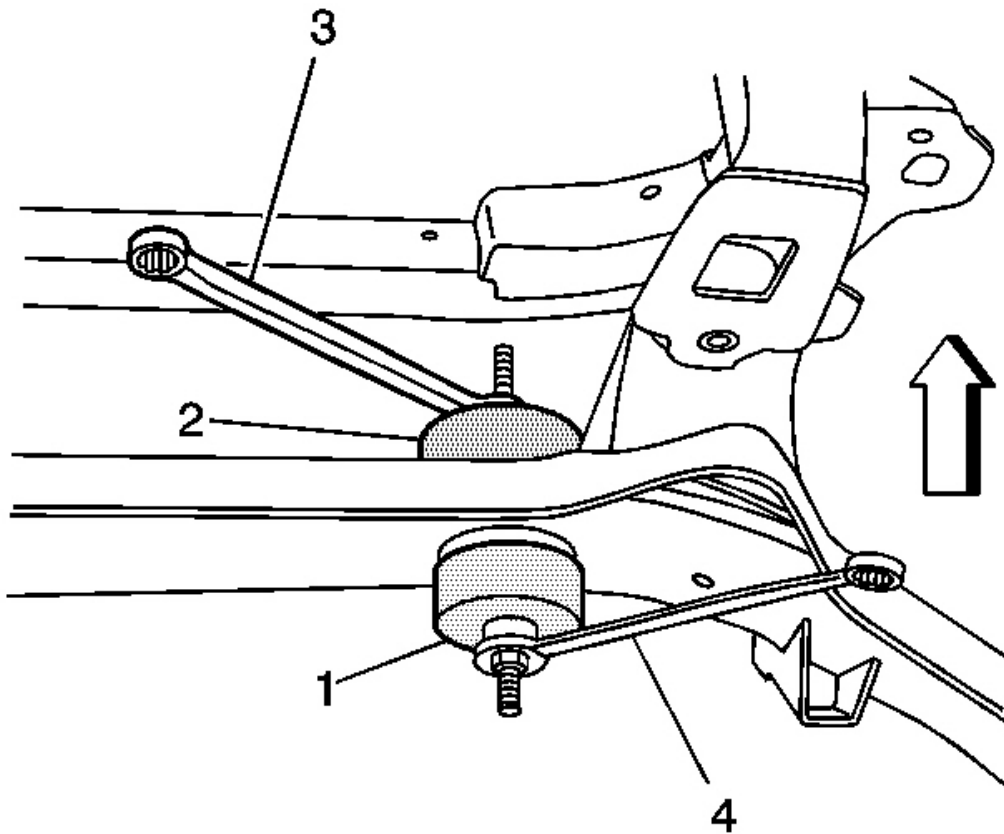


Fig. 31: Installing Bushing
Courtesy of GENERAL MOTORS CORP.

8. While holding the front wrench (2) rotate the rear wrench (1) to install the bushing.
9. Remove the special tools.
10. Install the rear differential assembly. Refer to **Differential Replacement**.
11. Lower the vehicle.

DESCRIPTION AND OPERATION

REAR DRIVE AXLE DESCRIPTION AND OPERATION

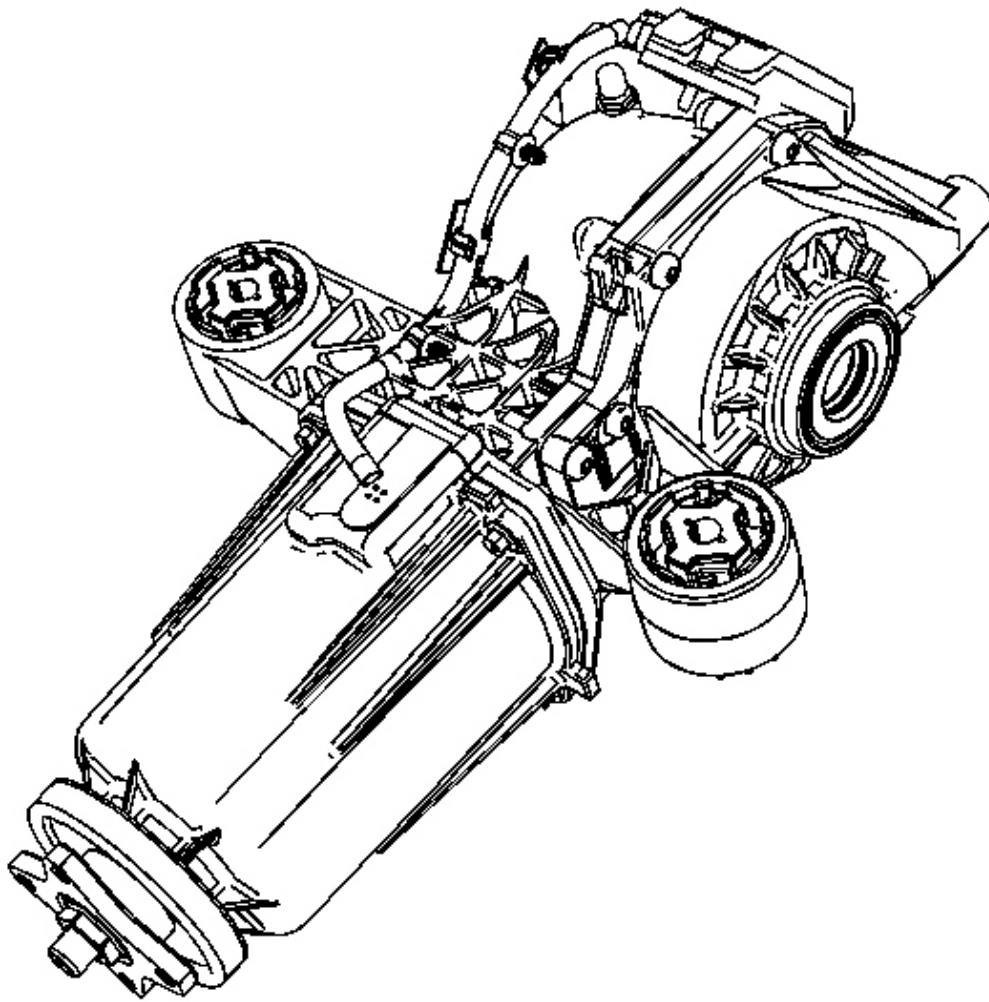


Fig. 32: View Of Rear Drive Axle
Courtesy of GENERAL MOTORS CORP.

The rear differential assembly in this vehicle consists of an aluminum housing which contains a electric clutch/coupler and a differential. The differential fluid is only contained in the differential housing portion.

The clutch and clutch housing are serviced as an assembly. The fluid level range for proper rear differential assembly operation is 500 ml. New service replacement units will be shipped dry (without fluid). Fill new units with 500 ml of GL Synthetic fluid.

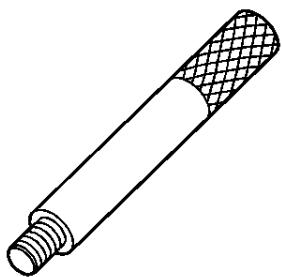
The rear drive axle system operates as follows:

- System distributes torque evenly between the 2 rear wheels.
- The system distributes torque to the rear wheels to enhance traction and improve vehicle handling performance.
- The rear differential clutch control assembly contains a main clutch, pilot clutch, electromagnetic coil, rear wheel shaft, main cam, pilot cam.
- The rear differential clutch control module operates by utilizing a clutch pack for transferring torque. The engagement mechanism consists of an electromagnetic coil and armature which modulates torque through a pilot clutch and thrust amplification device.
- The rear differential has a micro computer which receives information from the rear differential clutch control module.
- The rear differential clutch control module has an internal temperature sensor, which will maintain consistent and continuous temperature compensation for torque transfer from -40°C to +120°C. When the temperature of the module is determined to be beyond its limits, the rear differential clutch control module will temporarily disable the rear drive system and turn on the AWD Disabled message. When the temperature of the module is back within the limits, the rear differential clutch control module will enable the rear drive system. The temperature sensor and coil are internal to the rear differential, and is replaced as an assembly.
- If the vehicle is being driven very aggressively or an unexpected tire size has been used, the AWD disabled message will be turned on. This should not result in the replacement of rear differential clutch control module.
- The AWD disable message will be turned on if the mini-spare tire or a very small sized tire has been installed. This should not result in the replacement of rear differential clutch control module.
- The rear wheel drive clutch coil receives current from the rear differential clutch control module which is used to modulate torque through the use of the engagement mechanism. The greater the current, the greater the torque. The safe current range is between 0.1-3.0 A. If the current range is not within those values DTCs are set and the Service AWD message will appear. The temperature sensor and rear wheel drive clutch coil are internal to the differential and are replaced as an assembly.
- The module uses vehicle speed, steering angle, wheel slip, thermal compensation, and chassis control intervention to determine current. These are serial data messages received from other modules.
- If replacing the rear differential clutch control module, the module needs to be configured for the clutch control calibrations. The connector for the rear wheel drive clutch that connects to the rear differential clutch control module will have a 2 digit code on it. Use that 2 digit code to program the rear differential clutch control module using the scan tool.
- Voltage to the module is between 9-16 V. The module will set a low voltage DTC and a high voltage DTC to indicate voltage value out of range.
- The driver information center can display a Service All Wheel Drive message. The instrument panel cluster Amber AWD icon will illuminate when the system is disabled.

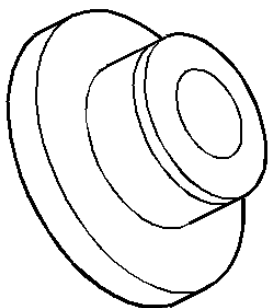
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

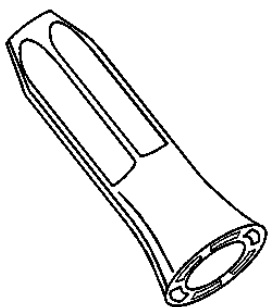
Illustration	Tool Number/Description



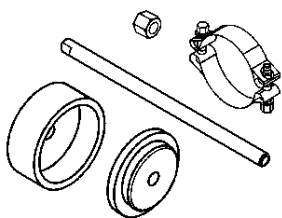
J-8092
Driver Handle



J-33832
Output Shaft Seal Installer



J-44636-1
Pinion Seal Installer



J-45725-A
Frame Bushing Installer