2007 Driveline/Axle

Rear Drive Axle - Outlook

SPECIFICATIONS

DIFFERENTIAL CARRIER ASSEMBLY SPECIFICATIONS

Differential Carrier Assembly Specifications

Application	Specification	
	Metric	English
Axle Ratio	3.42	
Differential Lubricant Fill Quantity	1.9 liters	2.1 quarts

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Clutch Pump Check Valve Bolts	10 N.m	106 lb in
Differential-to-Cradle Mount Bolts/Nuts	50 N.m	37 lb ft
Lubricant Drain Plug	32 N.m	23 lb ft
Lubricant Fill Plug	32 N.m	23 lb ft
Pinion Housing-to-Differential Bolts	10 N.m	106 lb in
Torque Tube Bracket-to-Tube Bolt/Nut	64 N.m	47 lb ft
Torque Tube Bracket-to-Body Bolts	55 N.m	41 lb ft
Torque Tube Dampener Bolt	64 N.m	47 lb ft
Torque Tube-to-Differential Bolts	25 N.m	18 lb ft

SEALERS, ADHESIVES AND LUBRICANTS

Sealers, Adhesives and Lubricants

Application	Type of Material	GM Part Number	
		United States	Canada
Differential Lubricant	Synthetic Gear Oil	12378514	88901045

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
DTC C0393	Rear Axle Coupling Solenoid Control Circuit Condition(s)
DTC C0394	Rear Axle Coupling Solenoid Temperature Sensor Circuit Short to Ground or Open
DTC C0550	ROM Checksum Error Or Internal Comm. Error
DTC C0558	Calibration Mismatch
DTC C0561	System Disabled Information Stored
DTC C0899	Device Voltage Low

DIAGNOSTIC STARTING POINT - REAR DIFFERENTIAL CARRIER

Begin the system diagnosis by reviewing the **Rear Drive Axle Description and Operation** and **Transfer Case Description and Operation** . Reviewing the description and operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the description and operation information will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Rear Differential Carrier** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SCAN TOOL OUTPUT CONTROLS

Scan Tool Output Controls

Scan Tool Output Control	Additional Menu Selection(s)	Description
CCM RDS Matching ID	Powertrain.	This 2 digit rank can be found on the connector that plugs into the rear differential clutch control module, from the clutch.

SCAN TOOL DATA LIST

The rear differential clutch control module (CCM) Scan Tool Data Lists contain all the clutch control module system related parameters that are available on the scan tool. The parameters in the list are arranged in alphabetical order. The column, "Data List," indicates the location of the parameter within the scan tool menu selections.

Use the CCM Scan Tool Data Lists as directed by a diagnostic table or in order to supplement the diagnostic procedures. Begin all the diagnostic procedures with the CCM Diagnostic Starting

Point. Use the CCM Scan Tool Data Lists only after the following is determined:

- There is no published DTC procedure nor published symptom procedure for the customer concern.

  OR

- The DTC or symptom diagnostic procedure indicated by the diagnostic system check does not resolve the customer concern.

The Typical Data Values are obtained from a properly operating vehicle under the conditions specified in the first row of the Scan Tool Data List table. Comparison of the parameter values from the suspect vehicle with the Typical Data Values may reveal the source of the customer concern.

The ID Information menu is located on the CCM main screen.

Rear Drive System/CCM Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition is ON, engine OFF and vehicle is stationary			
Accelerator Pedal Position sensor	CCM	A/D	D
Battery Volts	CCM	Volts	B+
Est. RDS clutch Spd. Variation	CCM	RPM	Varies
Estimate clutch Temperature	CCM	°C	Varies
LF Wheel Speed Sensor	CCM	km/h or mph	0
LR Wheel Speed Sensor	CCM	km/h or mph	0
Rear Drive Solenoid Cmd.	CCM	amps	Varies
Rear Drive System Temperature sensor	CCM	°C	Varies
Rear Drive Torque Command	CCM	N.m	0-100%
RF Wheel Speed Sensor	CCM	km/h or mph	0

RR Wheel Speed Sensor	CCM	km/h or mph	0
Vehicle Speed	CCM	km/h	Varies

SCAN TOOL DATA DEFINITIONS

The rear differential clutch control module (CCM) scan tool data definitions contain a brief description of all CCM related parameters available on the scan tool. The parameters available on the scan tool are listed below in alphanumeric order.

Accelerator Pedal Position Sensor

The scan tool displays a percent of pedal opening position. The scan tool displays a range from 0 to 100 %.

Battery Voltage

The scan tool displays volts. The scan tool displays a range from 0 to 25.5 volts.

Est. RDS clutch Spd. Variation

The scan tool displays 1/min. The scan tool indicates a range from -640 to 635 RPMs.

Estimate clutch Temperature

The scan tool displays °C. The scan tool indicates a range from -40 to 215 °C.

LF Wheel Speed Sensor

The scan tool displays 0-160 km/h (0-99.5 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving or is moving at speeds less than or equal to 0 km/h (0 mph).

LR Wheel Speed Sensor

The scan tool displays 0-160 km/h (0-99.5 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving or is moving at speeds less than or equal to 0 km/h (0 mph).

Rear Drive Solenoid Cmd.

The scan tool displays °C. The scan tool indicates a range from -40 to 215 °C.

Rear Drive System Temperature Sensor

The scan tool displays °C. The scan tool indicates a range from -40 to 215 °C.

Rear Drive Torque Command

The scan tool displays N.m. The scan tool displays a range from 0 to 2550 N.m.

RF Wheel Speed Sensor

The scan tool displays 0-160 km/h (0-99.5 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving or is moving at speeds less than or equal to 0 km/h (0 mph).

RR Wheel Speed Sensor

The scan tool displays 0-160 km/h (0-99.5 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving or is moving at speeds less than or equal to 0 km/h (0 mph).

Vehicle Speed

The scan tool displays 0-1024 km/h (0-636 mph). The scan tool displays 0 km/h (0 mph) when the vehicle is not moving.

DTC C0393

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 06

Rear Axle Coupling Solenoid Control Circuit

DTC C0393 0B

Rear Axle Coupling Solenoid Control Circuit Current Above Threshold

Diagnostic Fault Information

DTC C0393

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Clutch Solenoid Control Circuit	C0393 06	C0393 06	C0393 0B	-
Low Clutch Solenoid Control Circuit	C0393 06	C0393 06	C0393 0B	-

Circuit/System Description

The rear differential clutch control module (CCM) provides a power and ground switching circuits to the solenoid. The solenoid receives current from the CCM 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.
- Ignition voltage is greater than 9 volts.

Conditions for Setting the DTC

- An open is detected on the high or low solenoid circuits.
- A short to ground is detected on the high or low solenoid circuit.

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

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List for CCM

Circuit/System Verification

DTC C0393 will set as result of CCM Solenoid or circuit failure, test for power and ground circuits to the CCM.

- Repair the power or ground circuits.

Circuit/System Testing

IMPORTANT: It is recommend that Component Testing is performed before Circuit Testing when diagnosing the clutch control Solenoid.

1. Ignition OFF, disconnect the 5-way harness connector at the CCM.
2. Test the CCM high or low circuits for an open or short to ground.
   - If the circuit tests normal, replace the CCM solenoid.
3. Connect a DMM between the CCM high or low circuit terminal and ground.
4. Test for less than 1.0 volt between the CCM high or low circuit and ground.
   - If the greater than 1.0 volt, test for a short to voltage on the CCM solenoid high or low circuits. If the circuit tests normal, replace the solenoid.
5. Test for less than 5.0 ohm between the CCM high or low circuit to the CCM solenoid.
   - If greater then 5.0 ohm. replace the solenoid.

- If all the circuit tests normal, replace the CCM module.

Repair Procedures

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

Control Module References for CCM 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 Descriptor

DTC C0394 06

Rear Differential Clutch Temperature Sensor Circuit

Diagnostic Fault Information

DTC C0394

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
High Clutch Temperature Sensor Circuit	C0394 06	C0394 06	-	-
Low Clutch Temperature Sensor Circuit	-	C0394 06	-	-

Circuit/System Description

The rear differential clutch control module (CCM) provides a power and ground circuits to the temperature sensor. When the temperature of the module is determined to be beyond its limits, the CCM will temporarily disable the rear drive system.

Conditions for Running the DTC

- The ignition is ON.
- Ignition voltage is greater than 9 volts.

Conditions for Setting the DTC

- An open is detected on the high or low temperature sensor circuits.

- A short to ground is detected on the high temperature sensor circuit.

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

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List for CCM

Circuit/System Verification

DTC C0394 06 will set as result of CCM temperature sensor or circuit failure, review the scan tool data list parameters

Circuit/System Testing

IMPORTANT: It is recommend that Component Testing is performed before

Circuit Testing when diagnosing the clutch control Solenoid.

1. Ignition OFF, disconnect the 5-way harness connector at the CCM.
2. Test for less than 10 ohm of resistance between the ground circuit terminal and ground.
   - If greater than 10 ohm, test the ground circuit for an open/high resistance.
3. Test for an open or short to ground in the signal circuit to the CCM temperature sensor.
   - If the circuit tests normal, replace the CCM temperature sensor.

- If all the circuits tests normal, replace the CCM.

Repair Procedures

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

Control Module References for CCM replacement, setup and programming

DTC C0550

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 C0550 35

Electronic Control Unit (ECU) Checksum Error

DTC C0550 39

Electronic Control Unit (ECU) Internal Electronic Error

Diagnostic Fault Information

DTC C0550

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Electronic Control Unit	-	-	-	C0550 35, 39

(ECU) Performance				

Circuit/System Description

The rear differential clutch control module (CCM) detects an internal malfunction.

Conditions for Running the DTC

The ignition switch is in the ON position.

Conditions for Setting the DTC

An internal CCM malfunction exists.

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

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List for CCM

Circuit/System Verification

DTC C0550 will set as result of internal (CCM) circuit failure.

- Replace the CCM.

Repair Procedures

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

Control Module References for CCM replacement, setup and programming

DTC C0558

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 C0558 4B

Calibration Mismatch

Diagnostic Fault Information

DTC C0558

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Calibration Mismatch	-	-	-	C0558 4B

Circuit/System Description

The rear differential clutch control module (CCM) is required to have the correct calibration data (matching ID) stored in the memory from the AWD coupling control and is part of the programming used to perform all wheel drive functions.

Conditions for Running the DTC

- The ignition switch is in the ON position.
- Ignition voltage is greater than 9 volts.

Conditions for Setting the DTC

The calibration data (matching ID) of the CCM is not programmed or incorrectly programmed.

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

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Verification

With Tech 2, view CCM RDS Matching ID, The 2 digit rank can be found on the connector that plugs into the module from the clutch.

Program the CCM as required.

Repair Procedures

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

Control Module References for CCM 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 71

System Disabled Information Stored Invalid Serial Data Received

Diagnostic Fault Information

DTC C0561

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
System Disabled Information Stored Invalid Serial Data Received	-	-	-	C0561 71

Circuit/System Description

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

Conditions for Running the DTC

- The ignition switch is in the ON position.
- Ignition voltage is greater than 9 volts.

Conditions for Setting the DTC

The CCM receives an invalid message from the PCM, EBCM, modules over GMLAN which causes the CCM 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.

Reference Information

Schematic Reference

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

Scan Tool Data List

Circuit/System Verification

1. Perform Diagnostic System Check - Vehicle.
    - Diagnose any other Vehicle DTCs before attempting diagnosis of C0561.
2. With Tech 2, view Data Display list under ECM or EBCM and review the accelerator pedal signal or the wheel speed signals for proper operation.
    - If there is no DTCs or invalid data in the ECM or EBCM, replace the CCM.

Repair Procedures

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

Control Module References for CCM replacement, setup and programming

DTC C0899

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 C0899 03

Device Voltage Low

Diagnostic Fault Information

DTC C0899

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Battery Positive Voltage Supply Circuit	C0899	C0899	-	-

Circuit/System Description

The rear differential clutch control module (CCM) monitors the voltage level available for system operation. A low voltage condition prevents the system from operating properly.

Conditions for Running the DTC

Ignition is ON.

Conditions for Setting the DTC

This fault will be set if the voltage to CCM is less than 9 volts for 100 msec.

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

All-Wheel Drive Schematics

Connector End View Reference

Transfer Case Control Connector End Views

Electrical Information Reference

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

Scan Tool Reference

- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Testing

1. Measure the voltage at the battery terminals.

2. With scan tool, read the voltage in the CCM data list. Verify that battery terminal voltage and CCM voltage readings do not differ more than 1 volt.
    - If more than 1 volt, test the battery and ground circuit of the CCM for low voltage input or high resistance in the ground circuit. If the circuit test normal, test or replace the CCM.

Repair Procedures

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

Control Module References for CCM replacement, setup and programming

SYMPTOMS - REAR DIFFERENTIAL CARRIER

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **Rear Drive Axle Description and Operation** and **Transfer Case Description and Operation** . All diagnosis on a vehicle should follow a logical process. Strategy based diagnostics is a uniform approach for repairing all systems. The diagnostic flow may always be used in order to resolve a system condition. 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 conditions, which could cause the symptom.
- Check for the correct lubricant level and the proper viscosity.
- Verify the exact operating conditions under which the concern exists. Note factors such as vehicle 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.
- Inspect for all-wheel drive activation and operation. Refer to **All-Wheel Drive (AWD) System Functional Inspection**.
- Factors that may contribute to an inoperative rear differential include:
    - Low gear oil levels
    - Differential inoperative due to antilock brake system (ABS) function

- Inoperative powertrain control module (PCM) and/or wiring system
- A mini-spare or different size tire installed
- A fluid over-temperature condition
- An inoperative or "stuck" clutch pump check valve
- A defective rear differential assembly
- An inoperative transfer case assembly

Intermittent

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

Symptom List

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

- **Diagnostic Starting Point - Vibration Diagnosis and Correction**
- **Diagnostic Starting Point - Wheel Drive Shafts**
- **All-Wheel Drive (AWD) System Functional Inspection**
- **Noisy in Drive**
- **Noisy When Coasting**
- **Intermittent Noise**
- **Constant Noise**
- **Noisy on Turns**
- **Rear Differential Carrier Leak Diagnosis**

ALL-WHEEL DRIVE (AWD) SYSTEM FUNCTIONAL INSPECTION

Functional Inspection 1

Functional Inspection 1 is a mechanical system inspection for both the left and right side gerotor pumps, pistons and clutch packs and will assist in determining if:

- The clutch pump check valve is in the "open" position.
- The left and right side gerotor pumps have the ability to "pull" fluid from the sump and send pressurized fluid to the left and right side clutch pack pistons.
- The left and right side pistons will engage the specific side clutch packs.

- There is a mechanical connection between the rear differential ring and pinion, the propeller shaft, the transfer case and the transmission assembly.

1. Raise the vehicle on a hoist. Lift the vehicle in a manner that will allow all four wheels to rotate during testing.
2. Start the engine.
3. Move the gear shift lever to the NEUTRAL position.
4. Rotate, by hand, a rear wheel in a forward direction. If the All-Wheel Drive (AWD) system mechanical components are functioning properly, the front wheels will rotate at the same speed.
5. Rotate, by hand, the opposite side rear wheel. If the All-Wheel Drive (AWD) system mechanical components are functioning properly, the front wheels will rotate at the same speed. Failure of the front wheels to rotate during this test may indicate a "closed" clutch pump check valve, malfunctioning gerotor pump, piston, clutch pack or valves internal to the unit.

Functional Inspection 2

Functional Inspection 2 is a mechanical system inspection for both the left and right side gerotor pumps, pistons and clutch packs and will assist in determining if:

- The clutch pump check valve is in the "open" position.
- The left and right side gerotor pumps have the ability to "pull" fluid from the sump and send a variable and progressive rate of pressurized fluid to the left and right side clutch pack pistons.
- The left and right side pistons will engage the specific side clutch packs at a progressive rate.
- There is a mechanical connection between the rear differential ring and pinion, the propeller shaft, the transfer case and the transmission assembly.

1. Raise the vehicle on a hoist. Lift the vehicle in a manner that will allow all four wheels to rotate during testing.
2. Start the engine.
3. The gear shift lever should be in the PARK position.
4. Rotate, by hand and in a forward direction, a rear wheel at a slow rate of speed. Rotation of the wheel should be possible.
5. Rotate, by hand and in a forward direction, the opposite side rear wheel at a slow rate of speed. Rotation of the wheel should be possible.

6. Rotate, by hand and in a forward direction, a rear wheel at a fast rate of speed. A properly operating pump, piston and clutch pack will activate and create a progressive increase in wheel rotational resistance.
7. Rotate, by hand and in a forward direction, the opposite side rear wheel at a fast rate of speed. A properly operating pump, piston and clutch pack will activate and create a progressive increase in wheel rotational resistance. Failure to feel a progressive rate of resistance may indicate a "closed" clutch pump check valve, malfunctioning gerotor pump, piston, clutch pack or valves internal to the unit.

Functional Inspection 3

Functional Inspection 3 is a mechanical system inspection for both the left and right side gerotor pumps, pistons and clutch packs and will assist in determining if:

- The clutch pump check valve is in the "open" position.
- The left and right side gerotor pumps have the ability to "pull" fluid from the sump and send a variable and progressive rate of pressurized fluid to the left and right side clutch pack pistons.
- The left and right side pistons will engage the specific side clutch packs at a progressive rate.
- The rear differential has the ability to provide rear wheel torque and override the resistance created by the parking brake assembly.
- There is a mechanical connection between the rear differential ring and pinion, the propeller shaft, the transfer case and the transmission assembly.

1. Raise the vehicle on a hoist. Lift the vehicle in a manner that will allow all four wheels to rotate during testing.
2. Start the engine.
3. Move the gear shift lever to the DRIVE position.
4. Accelerate the vehicle lightly until all four wheels are rotating at an equal slow speed.
5. Depress the parking brake slightly, gradually increasing the parking brake retention to create resistance in the rear wheels. The rear wheels should stop spinning. The front wheels should remain spinning.

IMPORTANT: Do not accelerate the vehicle with the parking brake applied for a period longer than 5-7 seconds.

6. Lightly depress the accelerator pedal, increasing engine RPMs in order to determine if the

rear wheels can provide enough torque to "override" the resistance created by the parking brake assembly. Failure of the rear wheels to rotate during this test may indicate a "closed" clutch pump check valve, malfunctioning gerotor pump, piston, clutch pack or valves internal to the unit.

NOISY IN DRIVE

Noisy in Drive

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to **Lubricant Change**.	
Incorrect type fluid Installation of the incorrect type gear oil may create a "moan" type noise within 7 770-25 900 km (3-10,000 miles). Fluid that is "black" in color is to be considered normal and is darkened by the carbon material in the clutch plates.	Replace the rear differential assembly as required. Fluid replacement will not correct a "moan" condition caused by the use of incorrect oil. Refer to **Differential Replacement**.
Water or contamination within the transmission oil Water or contamination within the transmission fluid, causing excessive torque converter clutch slip rate, may create a "grind, growl or moan" in the rear differential or torque tube under light or steady load conditions.	Replace the transmission fluid and flush the transfer case of the contaminated fluid.
Loose propeller shaft mounting bolts	Tighten the bolts as required. Refer to **Propeller Shaft Replacement** .
Worn propeller shaft constant velocity joints	Replace propeller shaft assembly. Refer to **Propeller Shaft Replacement** .
Worn axle shaft constant velocity joints	Replace the constant velocity joints as required.
Worn, loose or missing differential mounts	Repair or replace the differential mounts as required.
Loose torque tube bracket or a worn bracket bushing	Tighten the bracket bolts or replace the bracket as required.
Worn bearing in the torque tube assembly	Replace the torque tube assembly
Torque tube dampener loose or missing A "moan" or "exhaust leak" type noise at	Tighten the dampener retaining bolt or replace the torque tube assembly as required.

higher engine speeds, approximately 2,000-2,500 RPM, may indicate a loose or missing dampener.	
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. Fill as required. 2. If the noise continues, replace unit as required.
Gear set "whine" noise within the differential assembly A "whine" type noise will increase or decrease relative to the vehicle speed approximately 80-97 km/h (50-60 mph).	1. Check for the proper fluid level. Fill as required. 2. Replace unit as required.

NOISY WHEN COASTING

Noisy When Coasting

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to **Lubricant Change**. A light "clunk" type noise during a downshift is to be considered a normal condition.	
Loose propeller shaft mounting bolts	Tighten the bolts as required. Refer to **Propeller Shaft Replacement** .
Worn propeller shaft constant velocity joints	Replace the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .
Worn axle shaft constant velocity joints	Replace the constant velocity joints as required.
Worn, loose or missing differential mounts	Repair or replace the differential mounts as required.
Loose torque tube bracket or a damaged bracket bushing	Tighten the bracket bolts or replace the bracket as required.
Worn bearing in the torque tube assembly	Replace the torque tube assembly.
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. Fill as required. 2. If the noise continues, replace unit as required.
Gear set "whine" noise within the differential assembly	1. Check for the proper fluid level. Fill as required.

A "whine" type noise will increase or decrease relative to the vehicle speed, approximately 80-97 km/h (50-60 mph).	2. Replace unit as required.

INTERMITTENT NOISE

Intermittent Noise

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to **Lubricant Change**.	
Loose propeller shaft mounting bolts	Tighten the bolts as required. Refer to **Propeller Shaft Replacement** .
Worn, loose or missing differential mounts	Repair or replace the differential mounts as required.
Loose torque tube bracket or a damaged bracket bushing	Tighten the bracket bolts or replace the bracket as required.
Incorrect type fluid Installation of the incorrect type gear oil may create a "moan" type noise within 7 770-25 900 km (3-10,000 miles). Fluid that is "black" in color is to be considered normal and is darkened by the carbon material in the clutch plates.	Replace the rear differential assembly as required. Fluid replacement will not correct a "moan" condition caused by the use of incorrect oil. Refer to **Differential Replacement**.

CONSTANT NOISE

Constant Noise

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to **Lubricant Change**.	
Low gear oil levels	Faulty oil seal or other type external leaks may contribute to lower than required fluid levels. Refer to **Rear Differential Carrier Leak Diagnosis**. Fill to proper level with gear oil GM P/N 12378514 (Canadian P/N 88901045).
Worn, loose or missing differential mounts	Repair or replace the differential mounts as required.

Worn propeller shaft constant velocity joints	Replace the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .
Worn bearing in the torque tube assembly	Replace the torque tube assembly.
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. Fill as required. 2. If the noise continues, replace unit as required.
Gear set "whine" noise within the differential assembly A "whine" type noise will increase or decrease relative to the vehicle speed, approximately 80-97 km/h (50-60 mph).	1. Check for the proper fluid level. Fill as required. 2. Replace unit as required.

NOISY ON TURNS

Noisy on Turns

Cause	Correction
Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to **Lubricant Change**. Operate the vehicle turning in tight circles in both left and right directions. A moan, groan, chatter or a pulsing type concern may indicate a pump, valve or clutch pack malfunction within the differential assembly.	
Worn or loose rear differential mounts	Repair or replace as required.
Loose torque tube bracket or a damaged bracket bushing	Tighten the bracket bolts or replace the bracket 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 type fluid Installation of the incorrect type gear oil may create a "moan" type noise within 7 770-25 900 km (3-10,000 miles). Fluid that is "black" in color is to be considered normal and is darkened by the carbon material in the clutch plates.	Replace the rear differential assembly as required. Fluid replacement will not correct a "moan" condition caused by the use of incorrect oil. Refer to **Differential Replacement**.
Worn clutch pack friction discs	Replace the differential assembly.

REAR DIFFERENTIAL CARRIER LEAK DIAGNOSIS

Rear Differential Carrier Leak Diagnosis

Cause	Correction
GM P/N 12378514 Hypoid Gear Oil has ultraviolet dye already included within the oil. Drain and fill the unit with new oil before using the **J 28428-E** black light, when inspecting for leaks. Ultraviolet dye **J 28431-6** is not approved for use.	
Restricted or damaged ventilation tube assembly	Replace the ventilation tube as required.
Worn, scored or missing drain and/or fill plug sealing washers	Install new sealing washers and tighten the plugs per specifications.
Worn or damaged drive pinion oil seal	1. Inspect the torque tube propeller shaft oil seal surface for excessive wear or damage. 2. Inspect the torque tube propeller shaft bearings for wear or damage. A worn bearing may allow excessive movement of the propeller shaft within the torque tube. 3. Replace the components as required.
Cut or damaged drive pinion housing O-ring seal	Replace the O-ring seal as required.
Worn or damaged axle shaft oil seals	Replace the axle shaft oil seals as required.
Cut or damaged clutch pump check valve O-ring seals	Replace the O-ring seals as required.
Leaking clutch pump check valve	Replace the clutch pump check valve assembly.
Carrier housing porosity or a leaking side cover seal surface	Replace the differential assembly.

REPAIR INSTRUCTIONS

REAR DIFFERENTIAL CLUTCH CONTROL MODULE REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .

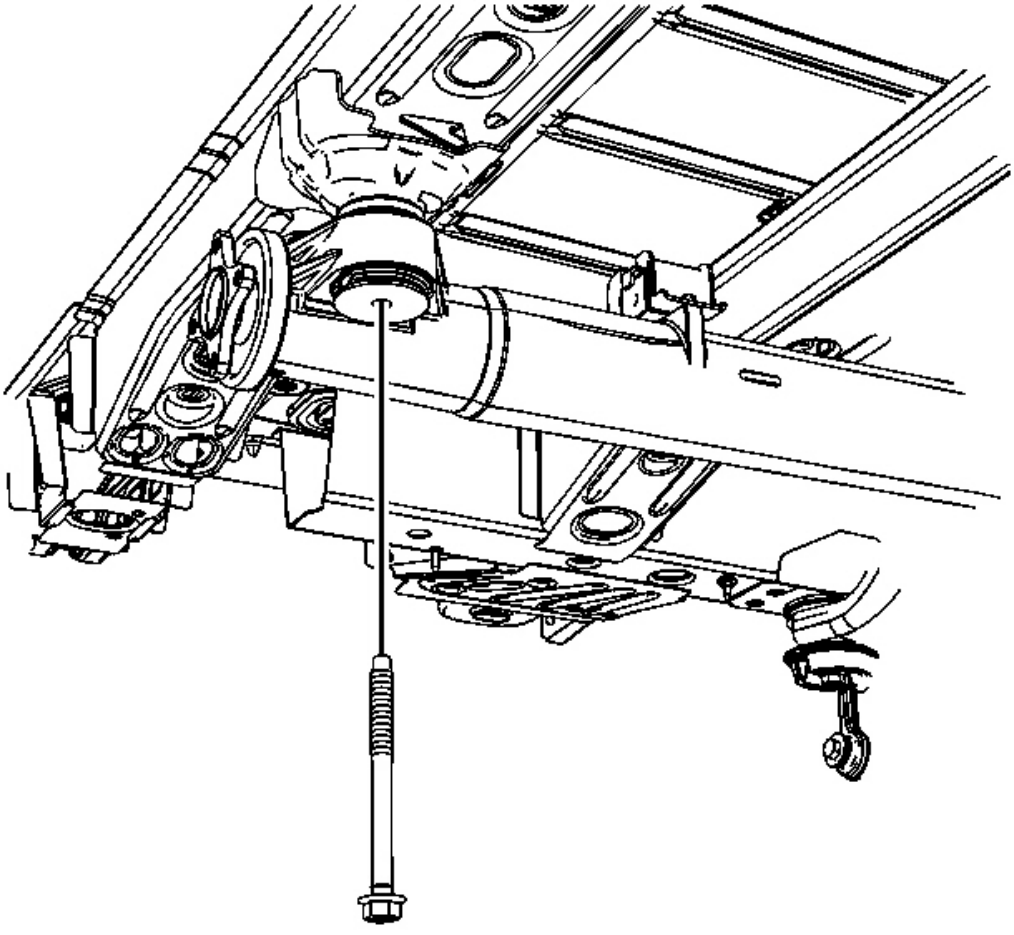


Fig. 1: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the torque tube mounting bolt.

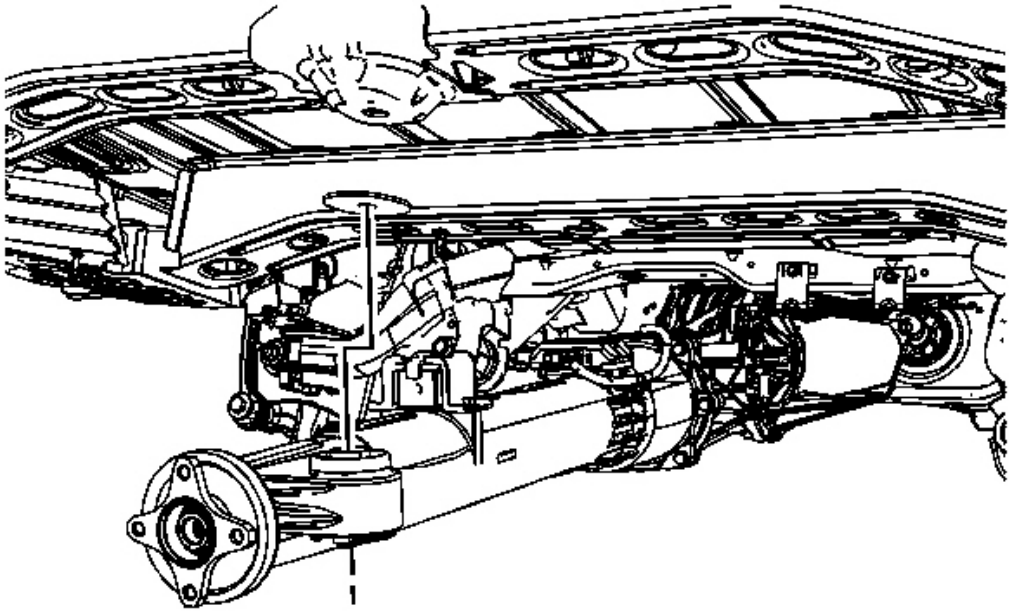


Fig. 2: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: DO NOT allow the torque tube to hang, support with a suit stand.

4. Lower the torque tube to gain access to the clutch control module.

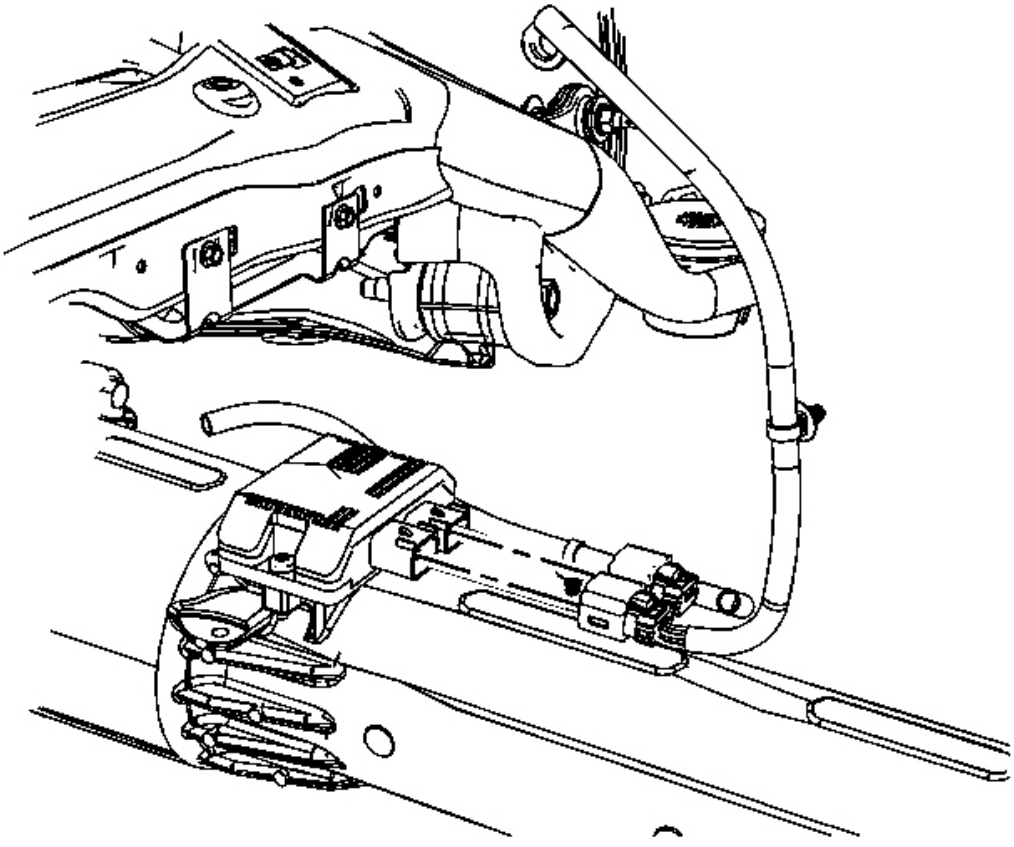


Fig. 3: Identifying Clutch Control Module Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the electrical connectors from the clutch control module.

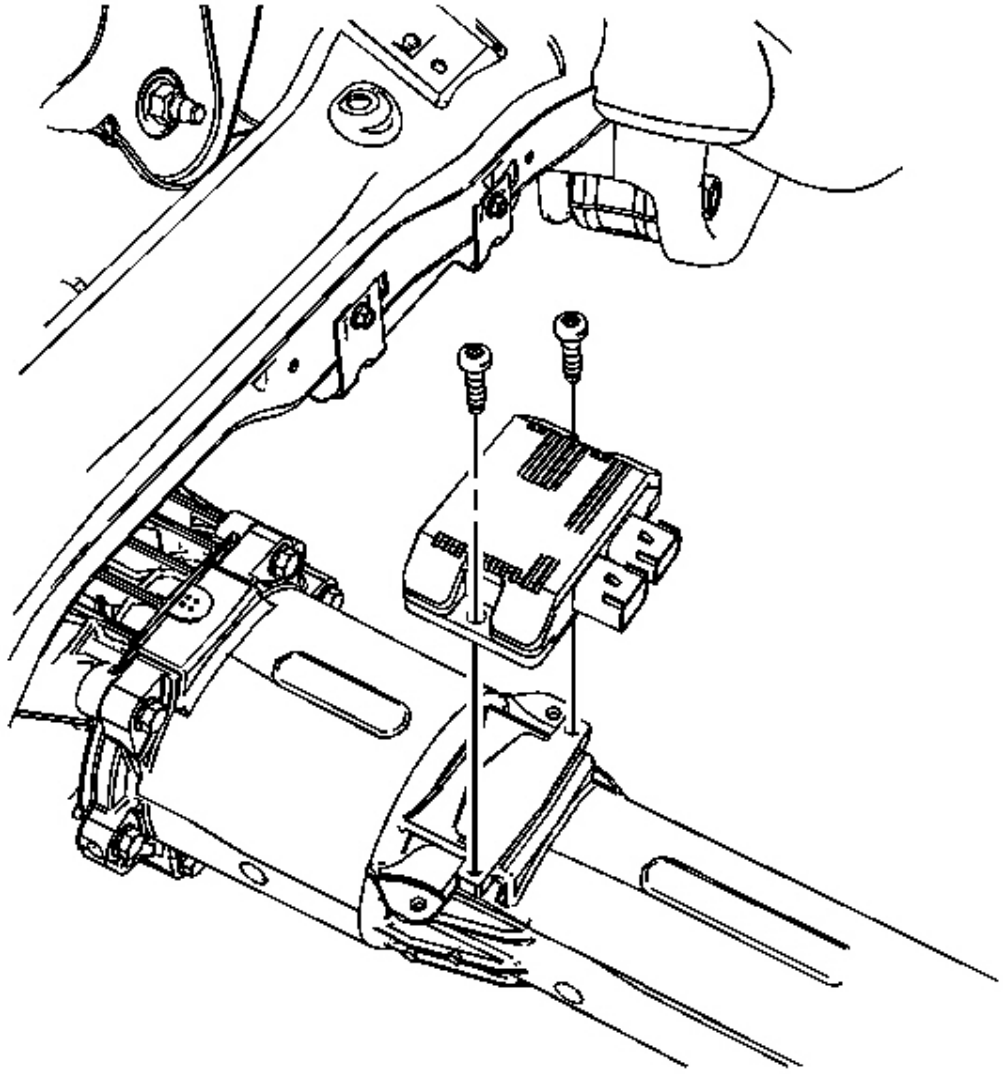


Fig. 4: View Of Clutch Control Module Screws
Courtesy of GENERAL MOTORS CORP.

6. Remove the screws for the clutch control module.
7. Remove the clutch control module from the torque tube.

Installation Procedure

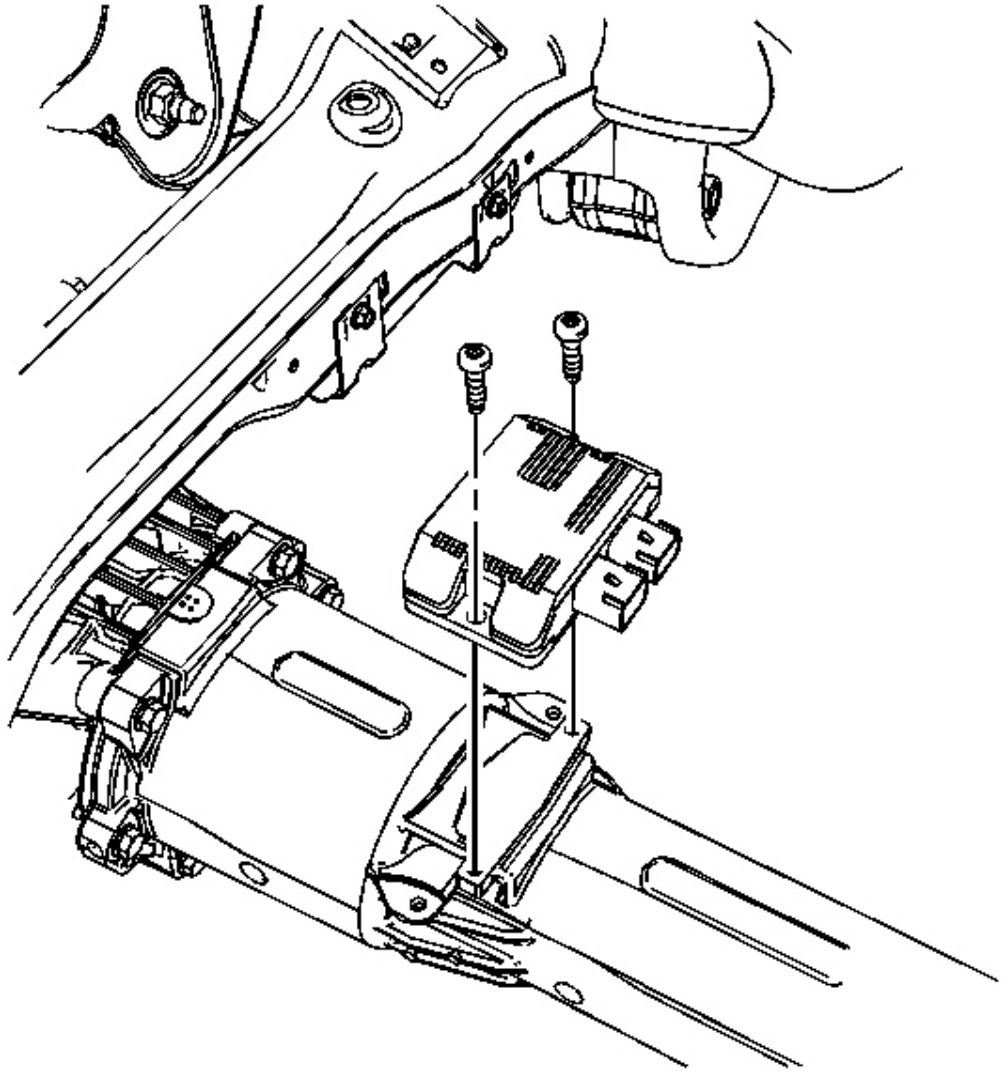


Fig. 5: View Of Clutch Control Module Screws
Courtesy of GENERAL MOTORS CORP.

1. Position the clutch control module on the torque tube.

NOTE: Refer to Fastener Notice .

2. Install the mounting screws for the clutch control module.

Tighten: Tighten the screws to 10 N.m (88 lb in).

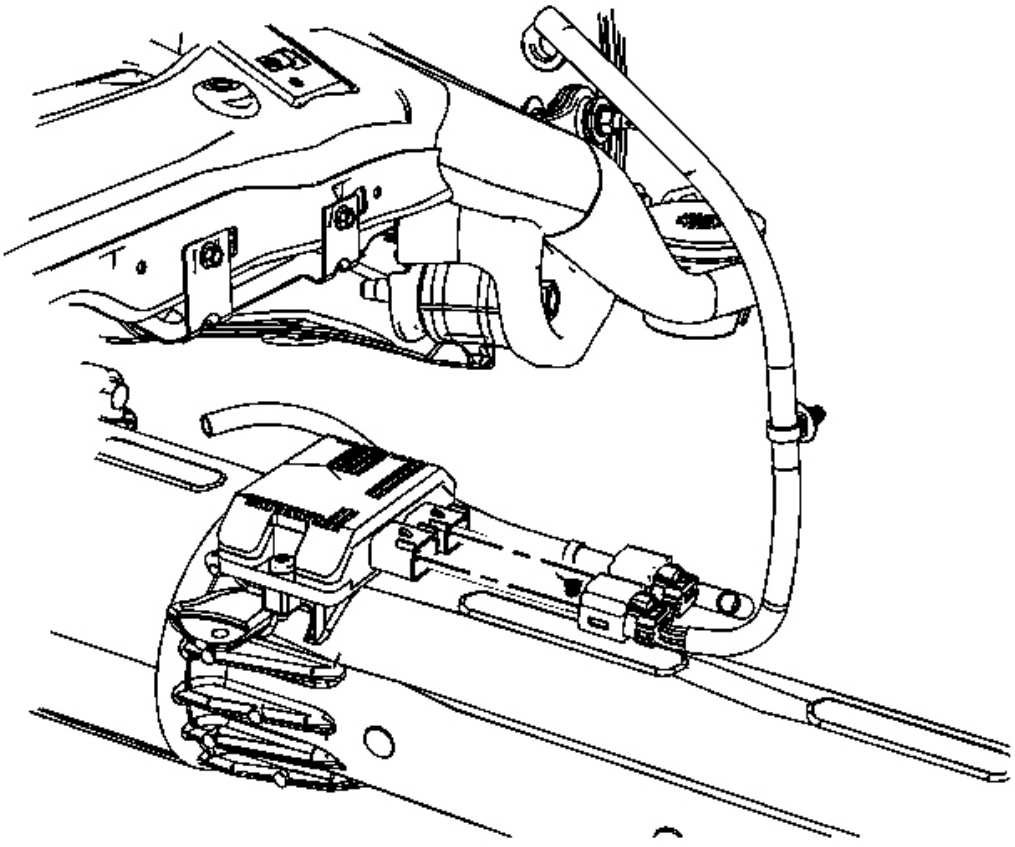


Fig. 6: Identifying Clutch Control Module Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

3. Reconnect the electrical connectors for the clutch control module.

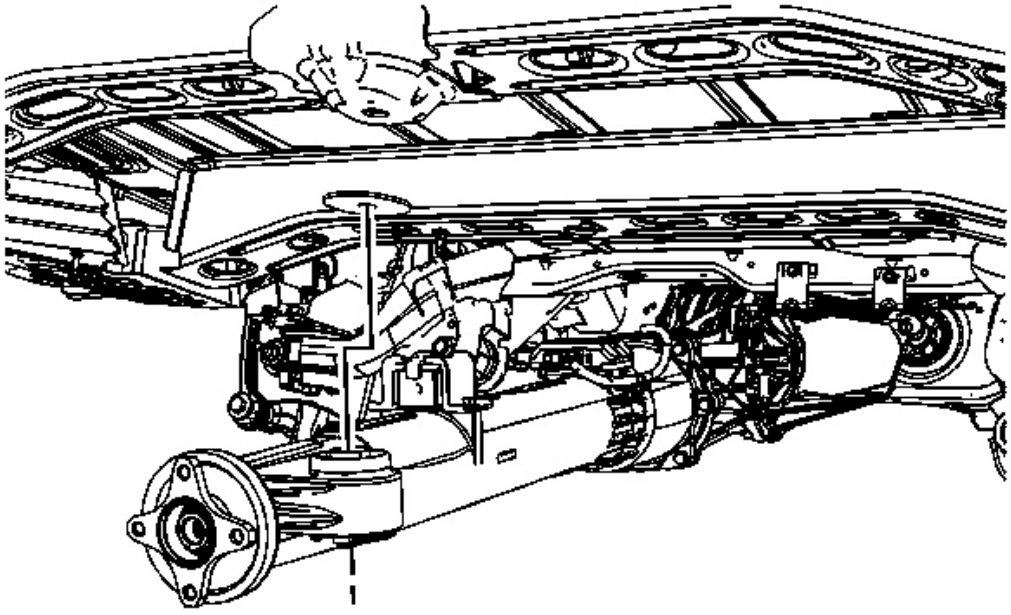


Fig. 7: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

4. Lift the torque back into position.

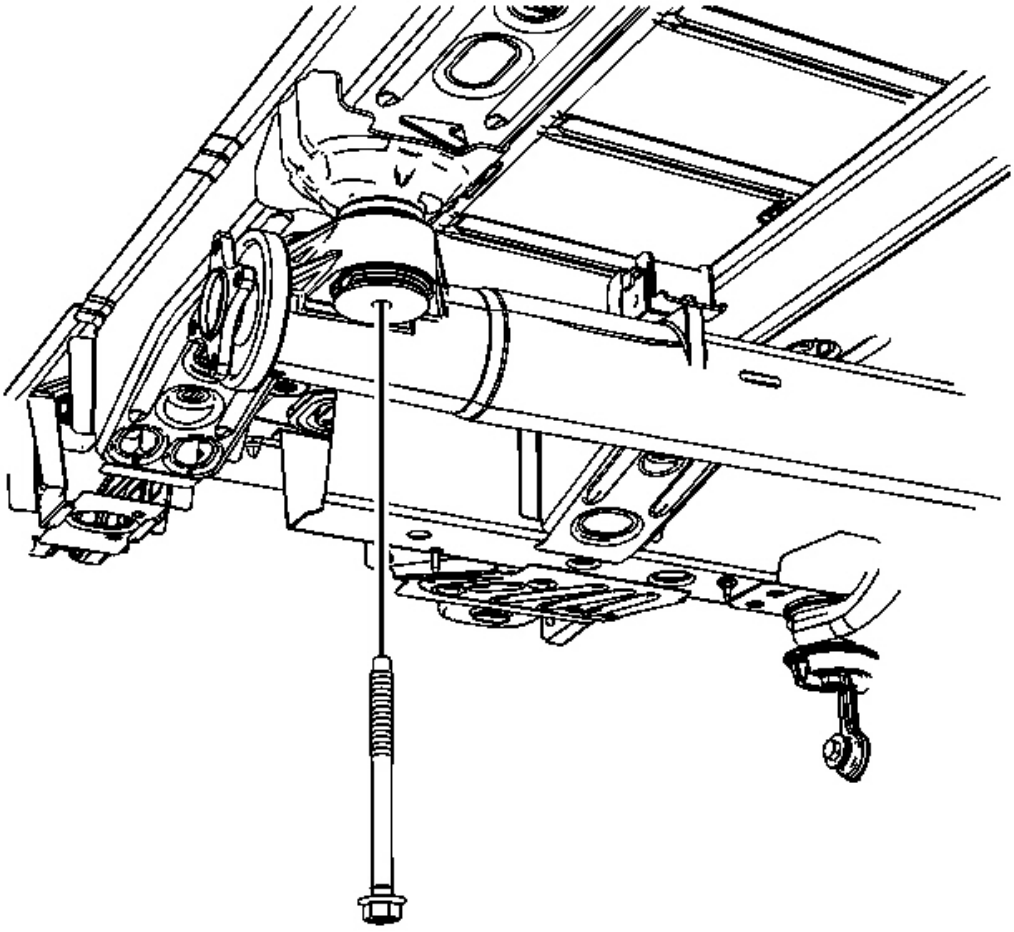


Fig. 8: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

5. Install the torque tube mounting bolt.

   Tighten: Tighten the bolt to 50 N.m (37 lb ft).

6. Install the propeller shaft. Refer to **Propeller Shaft Replacement**
7. Remove the support and lower the vehicle.
8. Reprogram the clutch control module. Refer to **Rear Differential Clutch Control Module Calibration**.

REAR DIFFERENTIAL CLUTCH CONTROL MODULE CALIBRATION

After rear differential clutch control module (CCM) replacement, the following calibration procedure must be performed.

1. Install a scan tool.
2. Turn ON the ignition, with the engine OFF.
3. Select Special Functions, Rear Drive System, CCM RDS Matching ID, follow instruction on the Tech 2. The CCM RDS Matching ID number can be found on the CCM harness connector.
4. Cycle the ignition OFF, then start the engine and allow to run for 1 minute. Verify the rear differential system is functioning properly.
5. After the calibration procedure, clear all DTC and preform the **Diagnostic System Check - Vehicle** .

LUBRICANT CHANGE

Removal Procedure

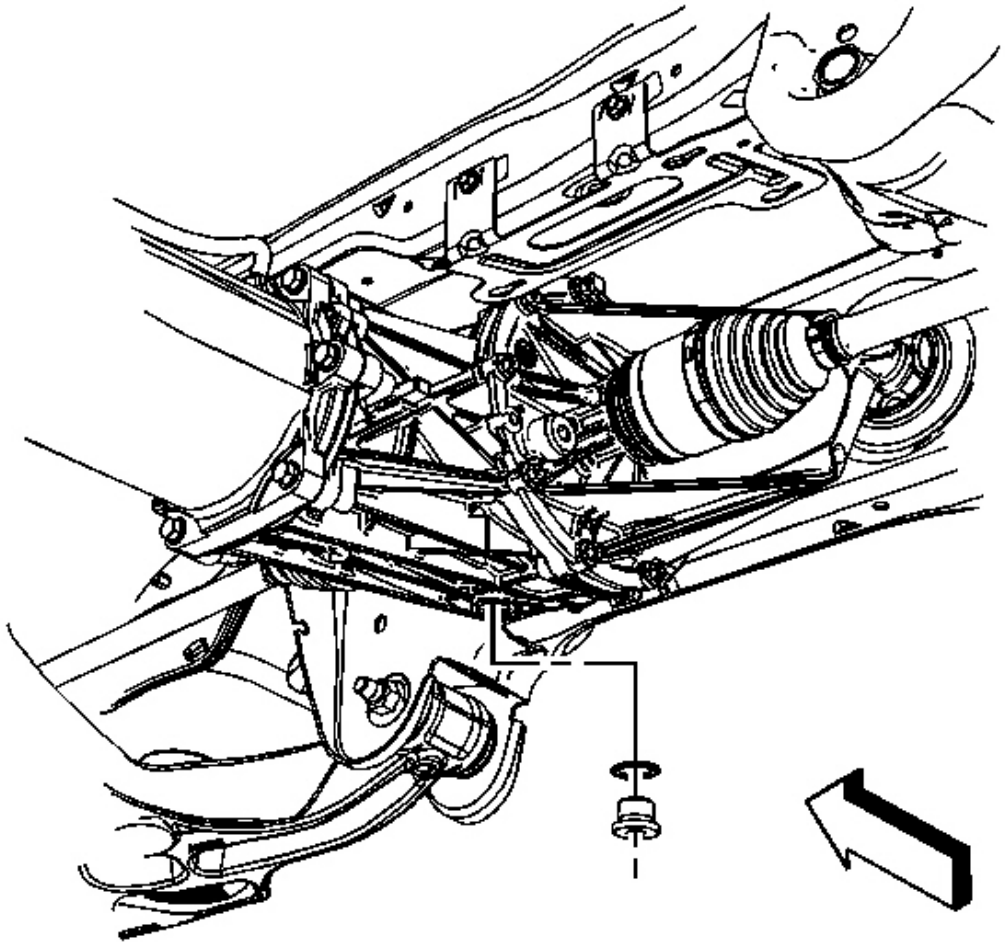


Fig. 9: Identifying Rear Differential Housing Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the drain plug and gasket from the rear differential housing.

Installation Procedure

NOTE: Refer to Fastener Notice .

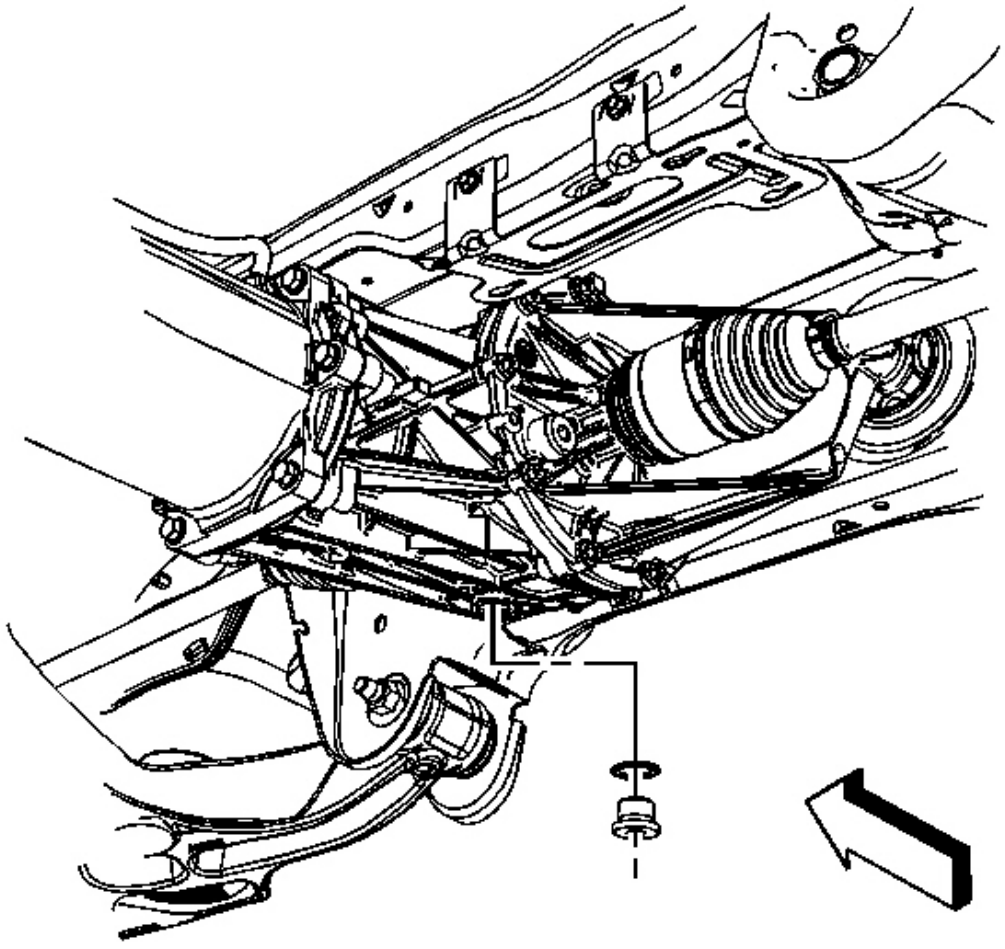


Fig. 10: Identifying Rear Differential Housing Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Install the drain plug and gasket.

   Tighten: Tighten the plug to 32 N.m (23 lb ft).

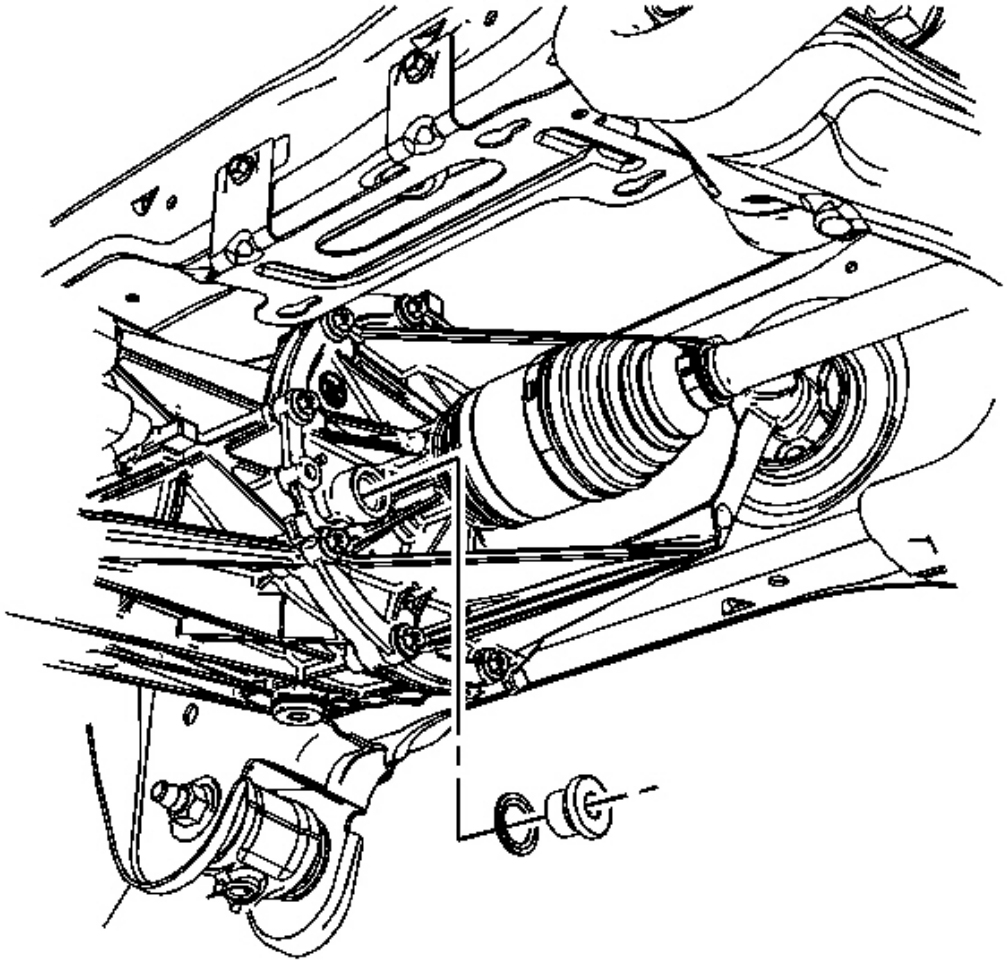


Fig. 11: Locating Rear Differential Fill Plug
Courtesy of GENERAL MOTORS CORP.

2. Remove the fill plug and gasket from the rear differential housing.
3. Fill the rear differential with synthetic gear oil GM P/N 12378514 (Canadian P/N 88901045). Refer to **Approximate Fluid Capacities** .
4. Inspect the gear oil level to ensure it is even with the bottom of the fill plug.
5. Install the fill plug and gasket in the rear differential housing.

Tighten: Tighten the plug to 32 N.m (23 lb ft).

6. Remove the support and lower the vehicle.

REAR AXLE LUBRICANT LEVEL INSPECTION

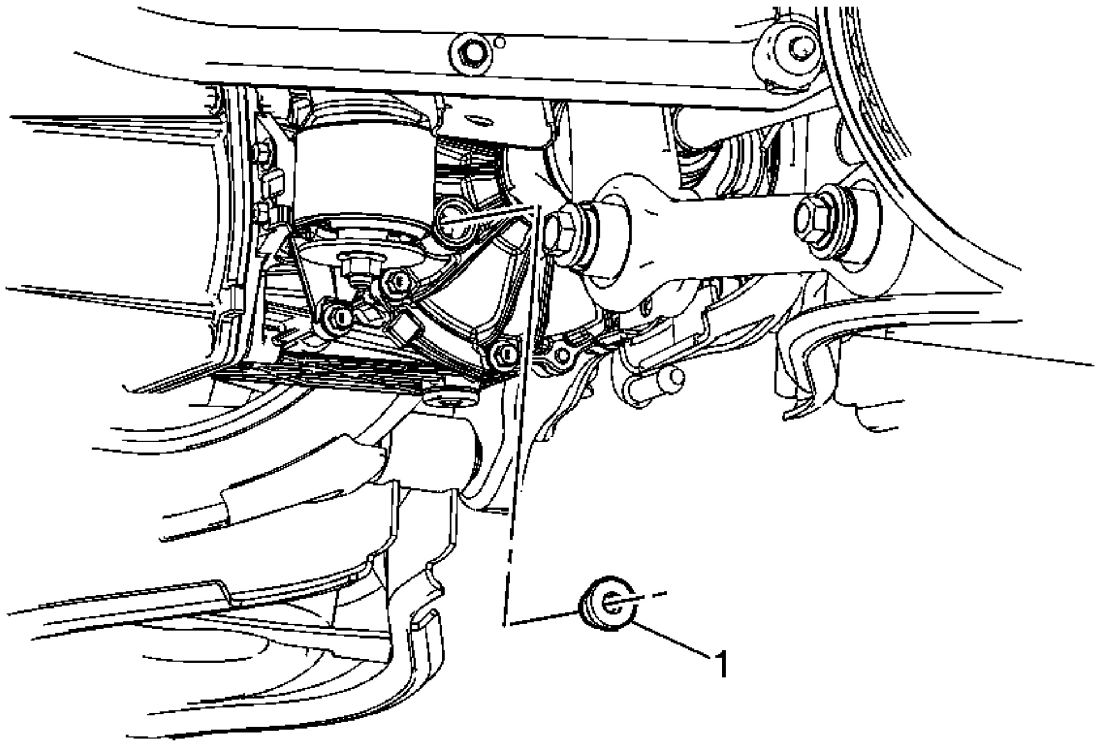


Fig. 12: Locating Rear Differential Fill Plug
Courtesy of GENERAL MOTORS CORP.

Rear Axle Lubricant Level Inspection

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .	
1	Rear Differential Fill Plug **NOTE:** **Refer to Fastener Notice .** **Tip:** The fluid level should be even with the bottom of the threads of the fill hole.

	Tighten: 39 N.m (29 lb ft)

DIFFERENTIAL CLUTCH DRUM ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the torque tube assembly from the vehicle. Refer to **Driveline Torque Tube Replacement**.

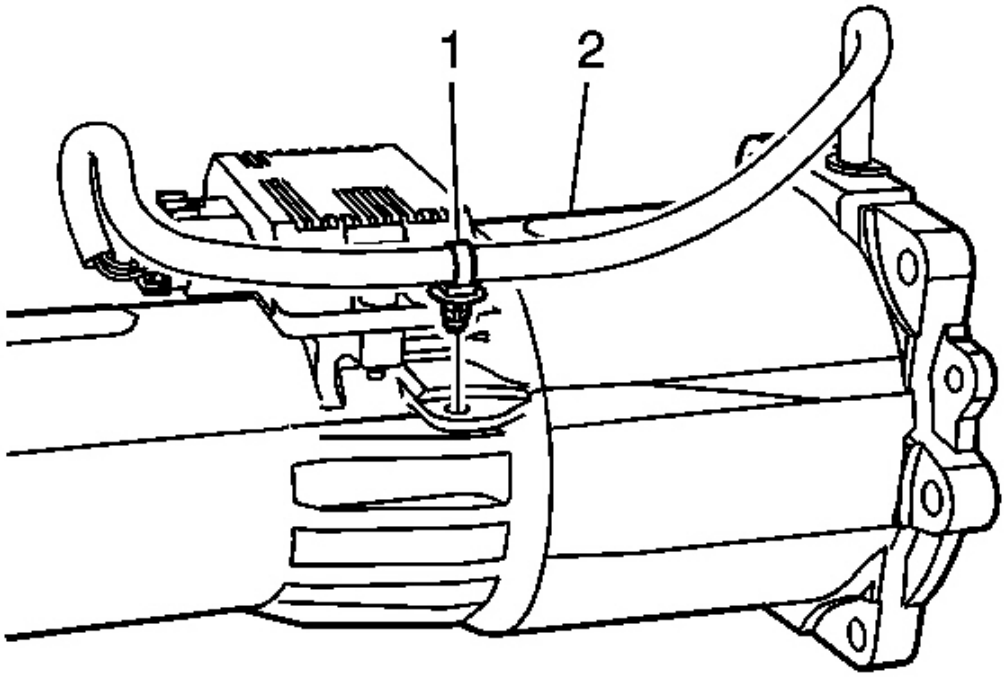


Fig. 13: Identifying Electrical Harness Retainer & Torque Tube
Courtesy of GENERAL MOTORS CORP.

2. Remove the electrical harness retainer (1) from the torque tube (2).

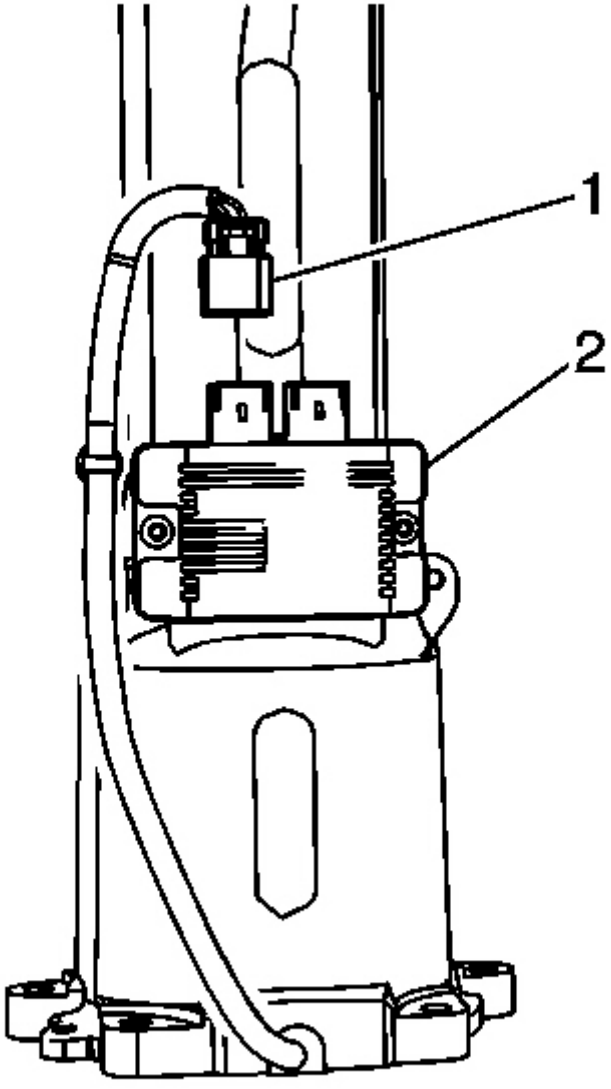


Fig. 14: View Of Clutch Control Module & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the electrical connector (1) for the clutch control module (2).
4. Position 2 pieces of wood along side of the torque tube.

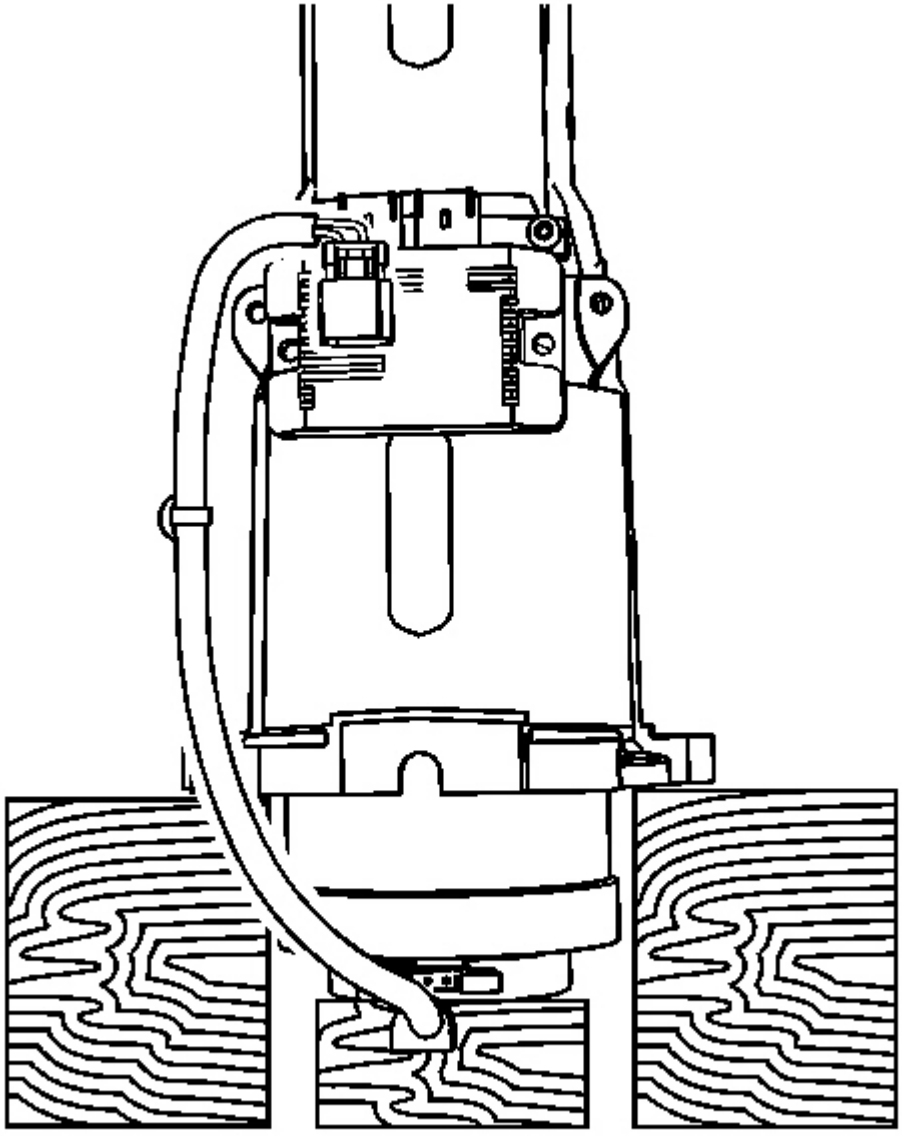


Fig. 15: Identifying Piece Of Wood Under Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: It is important to place a piece of wood under the clutch assembly so as not to damage the clutch assembly when it exits the torque tube.

5. Position a piece of wood under the clutch assembly in the torque tube.
6. Pick up the torque tube and with a quick downward motion, snap the torque tube to release the clutch drum assembly from the input shaft.

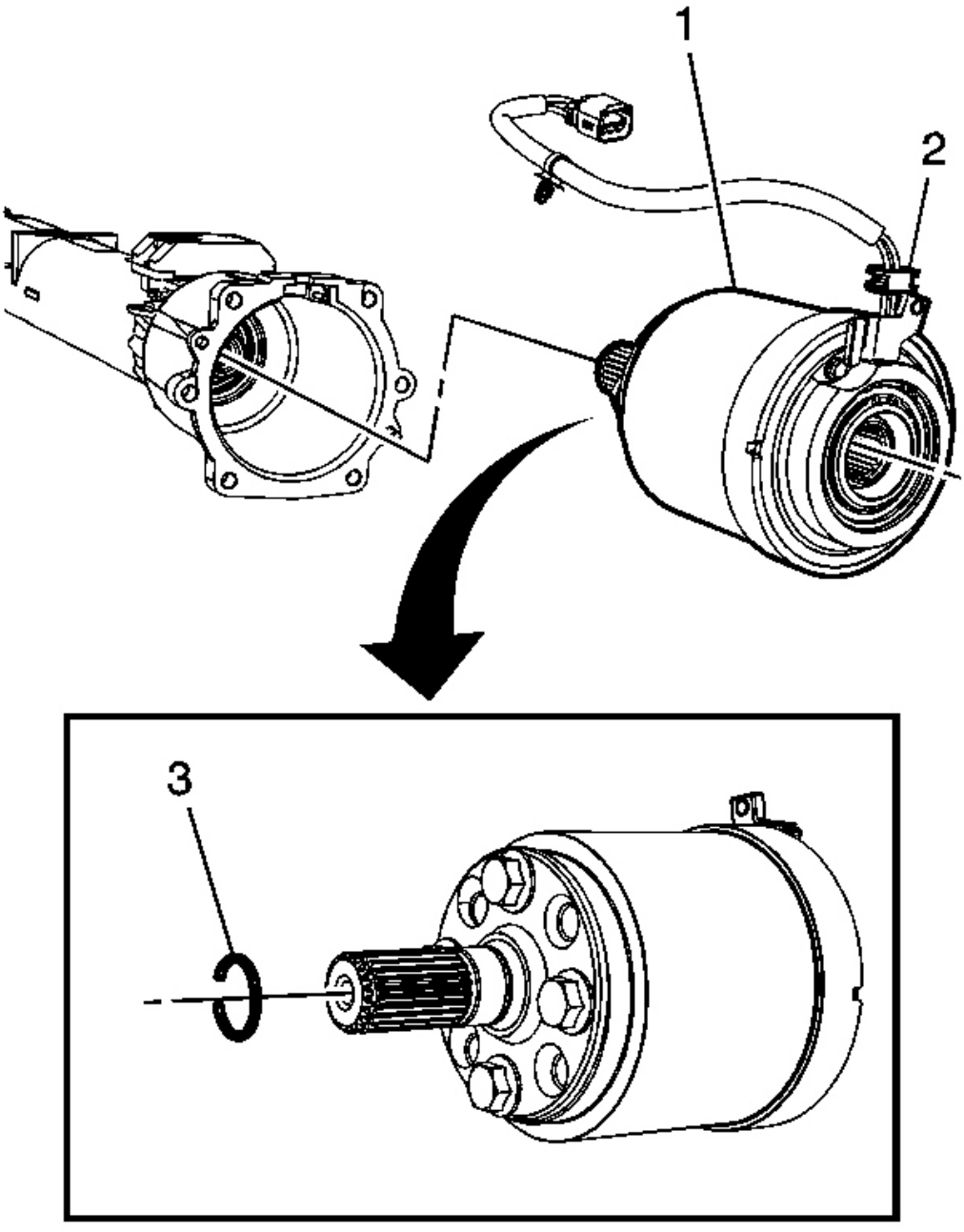


Fig. 16: Locating Clutch Drum, Retaining Clip & Weather Seal
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: DO NOT re-use the retaining clip (1). Discard and use a new retaining clip. If servicing the clutch, a new retaining clip comes with the new clutch assembly.

7. Remove the clutch drum (1) assembly from the torque tube.

IMPORTANT: When removing or install the wiring harness and weather seal (2), ensure that the wiring harness does become damaged. The wiring harness is NOT SERVICED separately.

8. Remove the wiring harness and weather seal (2) from the torque tube.

Installation Procedure

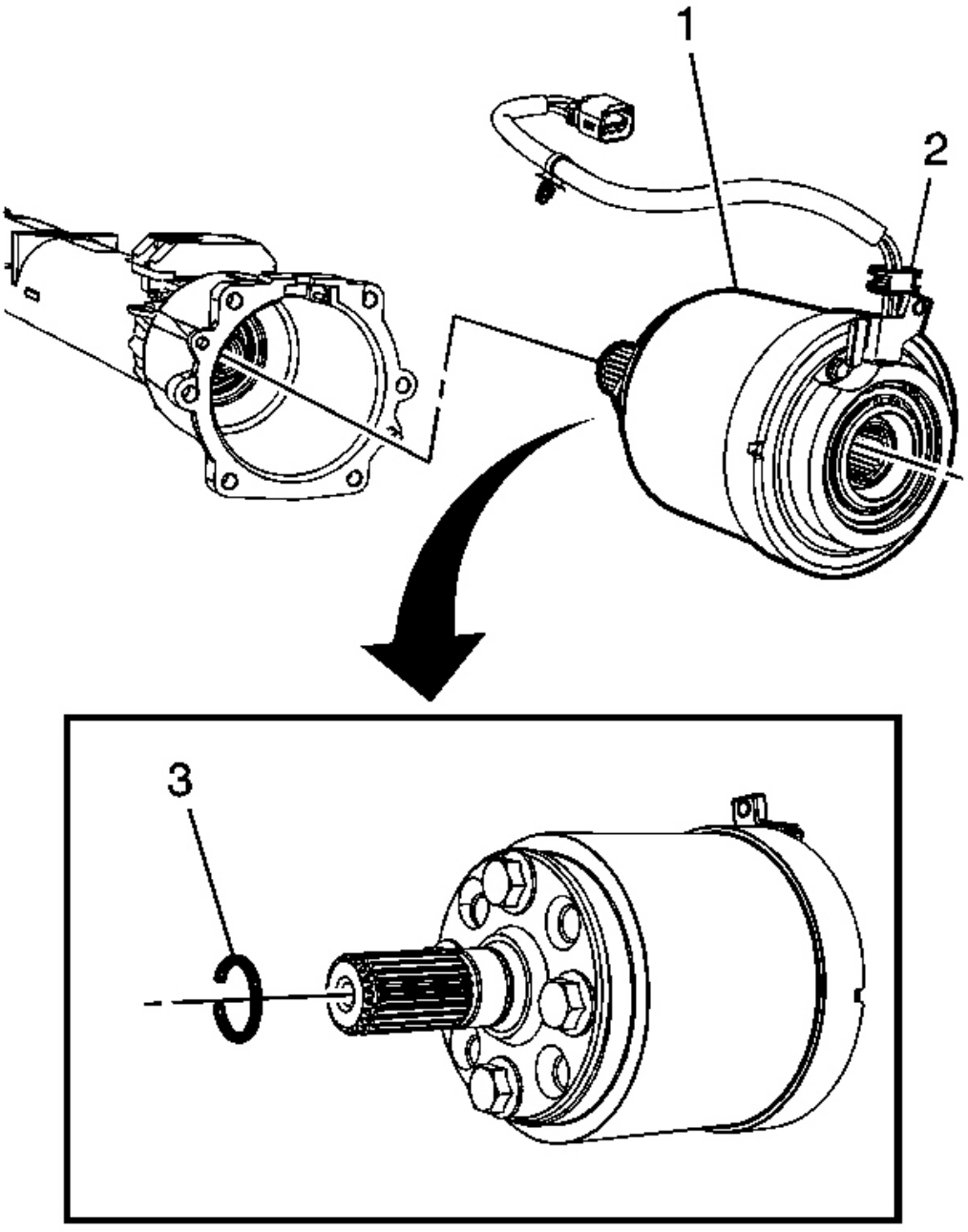


Fig. 17: Locating Clutch Drum, Retaining Clip & Weather Seal
Courtesy of GENERAL MOTORS CORP.

1. Install the new retaining clip (3) on the clutch assembly.

2. Install the clutch assembly (1) in the torque tube.
3. Position the wiring harness and weather seal (2) in the torque tube.

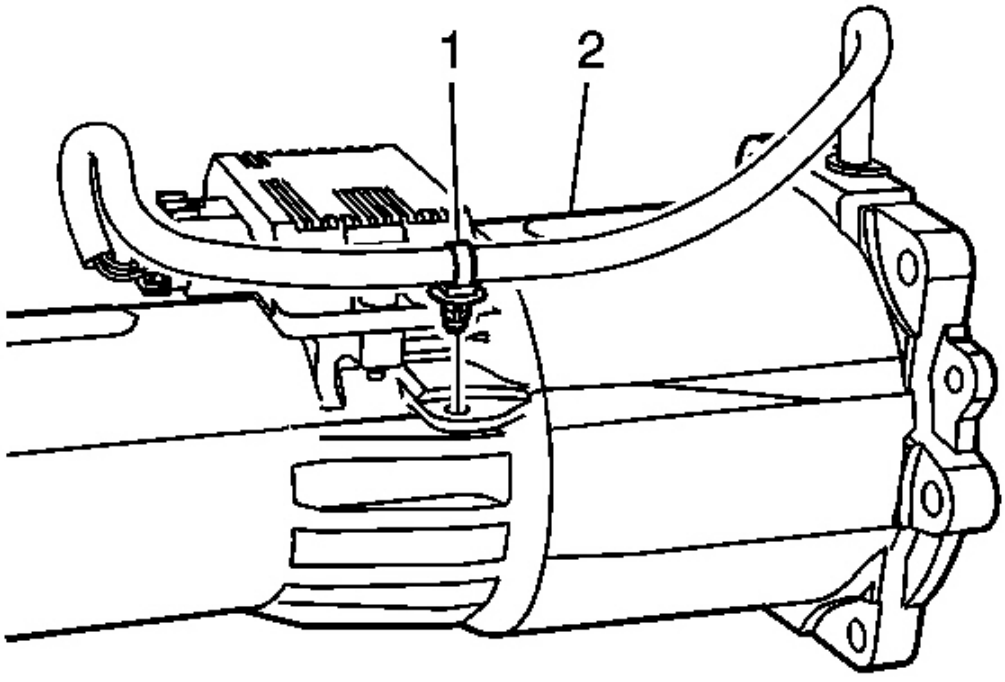


Fig. 18: Identifying Electrical Harness Retainer & Torque Tube
Courtesy of GENERAL MOTORS CORP.

4. Install the electrical harness retaining clip (1) in the torque tube (2).

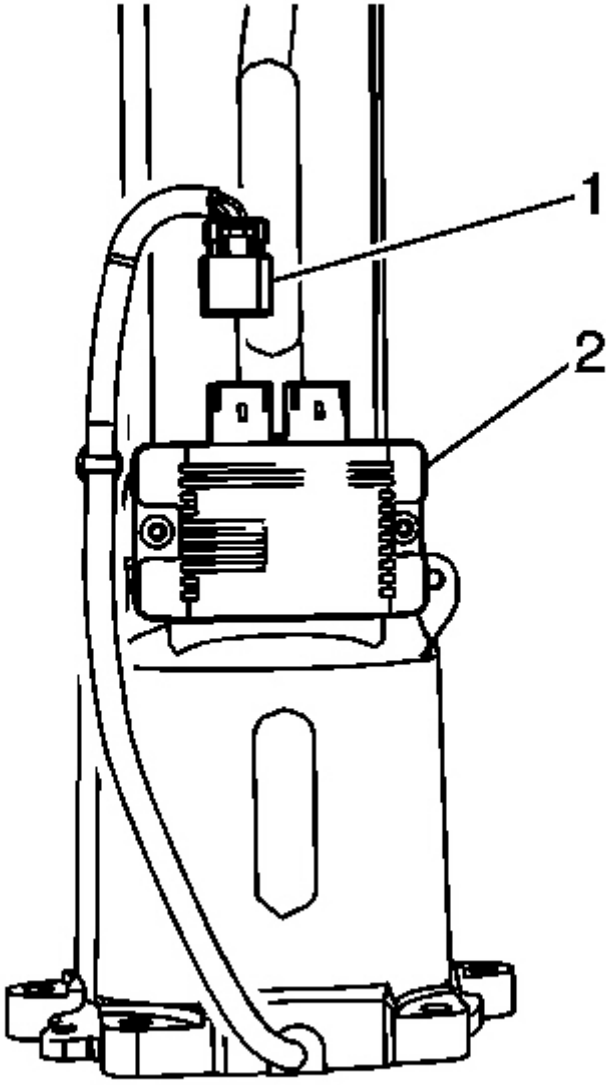


Fig. 19: View Of Clutch Control Module & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Install the electrical connector (1) to the clutch control module (2).
6. Install the torque tube assembly. Refer to **Driveline Torque Tube Replacement**

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - FRONT

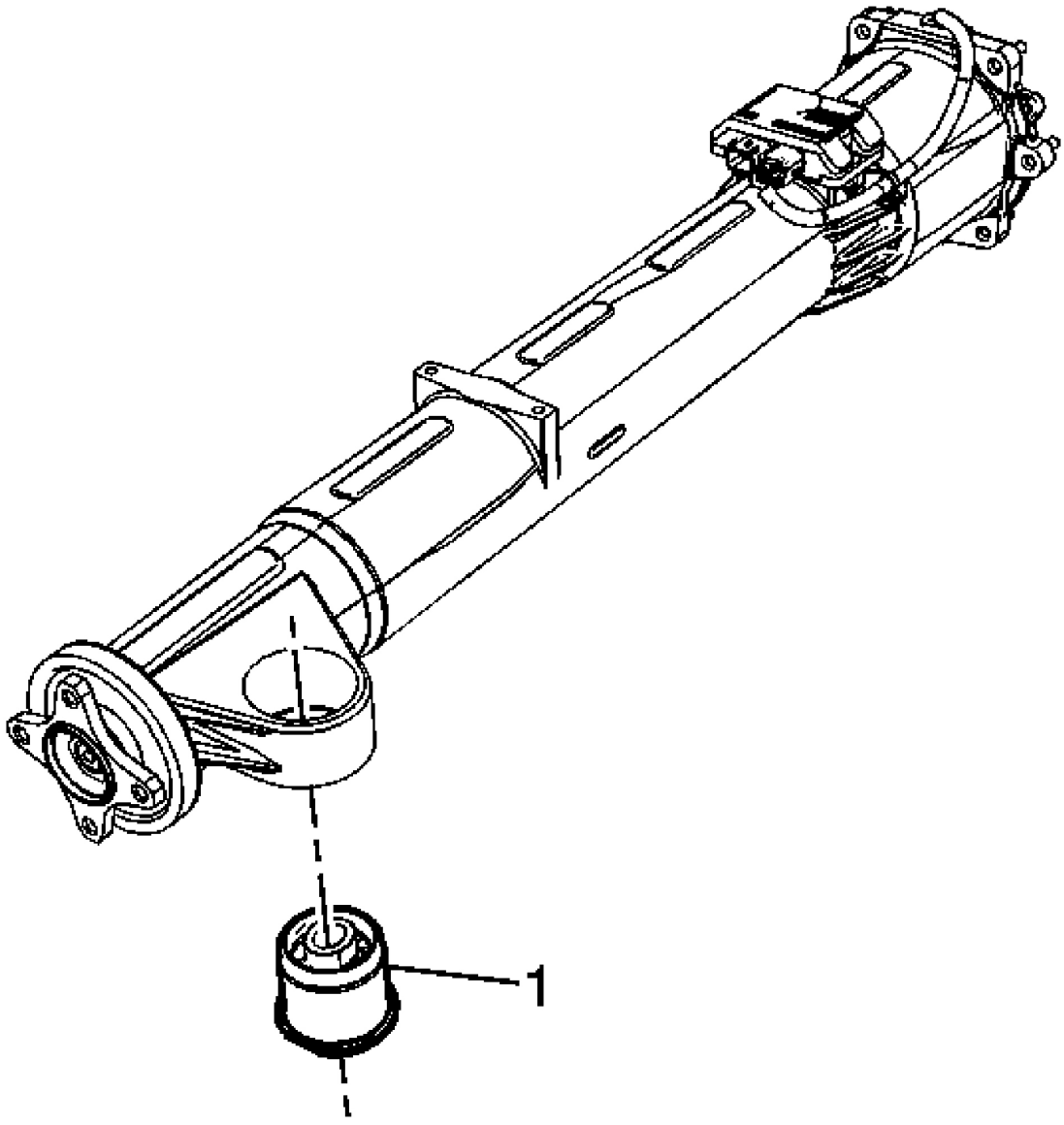


Fig. 20: View Of Front Differential Carrier Bushing
Courtesy of GENERAL MOTORS CORP.

Differential Carrier Bushing Replacement - Front

Callout	Component Name
Preliminary Procedure: Remove the torque tube assembly. Refer to **Driveline Torque Tube Replacement**.	
1	Rear Differential Mount Bushing **Tip:** Use the appropriate tool to remove the bushing.

DIFFERENTIAL CARRIER BUSHING REPLACEMENT - REAR

Tools Required

J-45725 Cradle Bushing Replacer

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**.

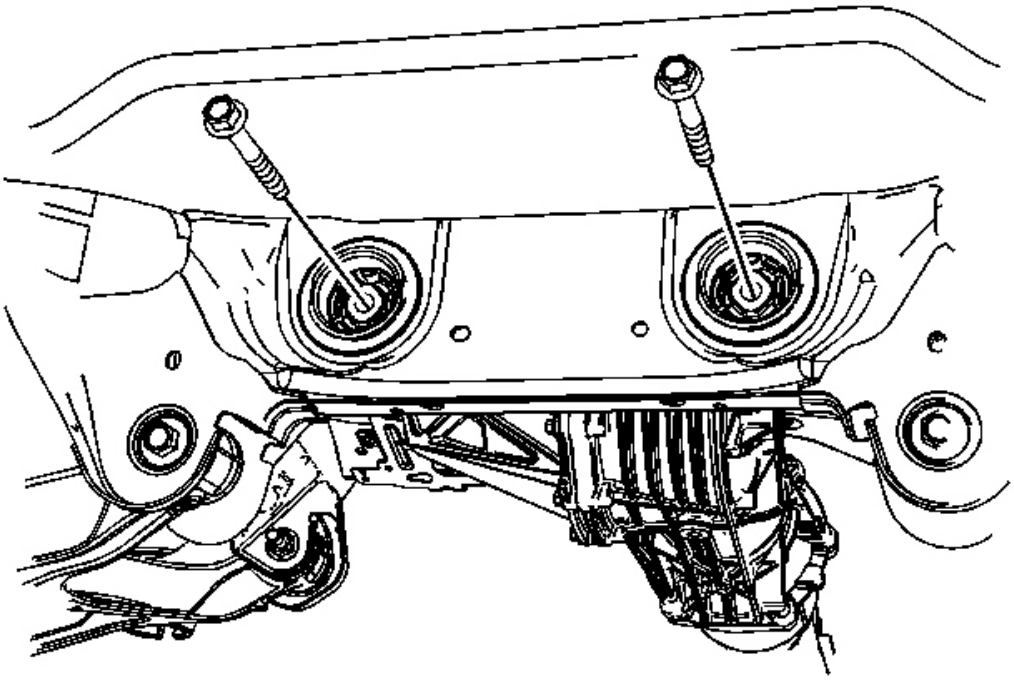


Fig. 21: View Of Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the mounting bolt for the support bushing.

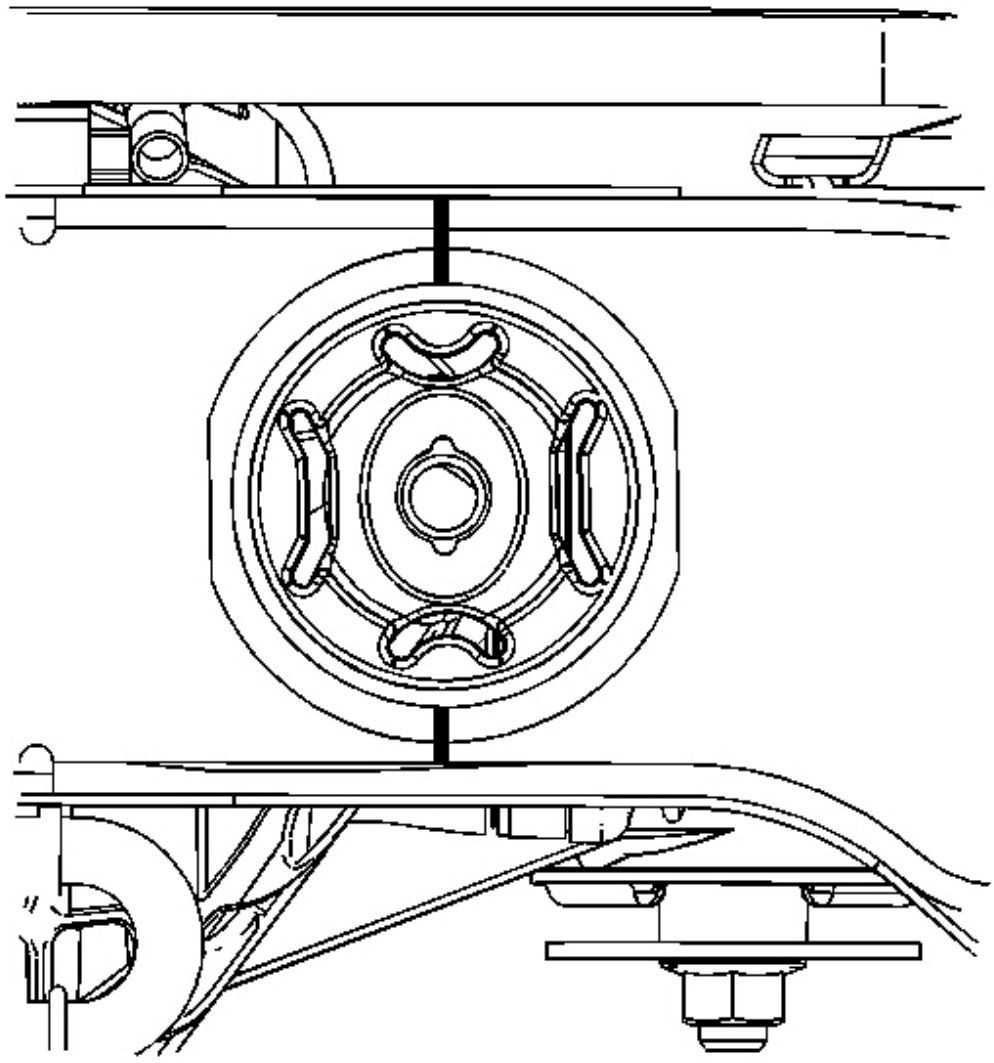


Fig. 22: View Of Reference Points
Courtesy of GENERAL MOTORS CORP.

4. 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.

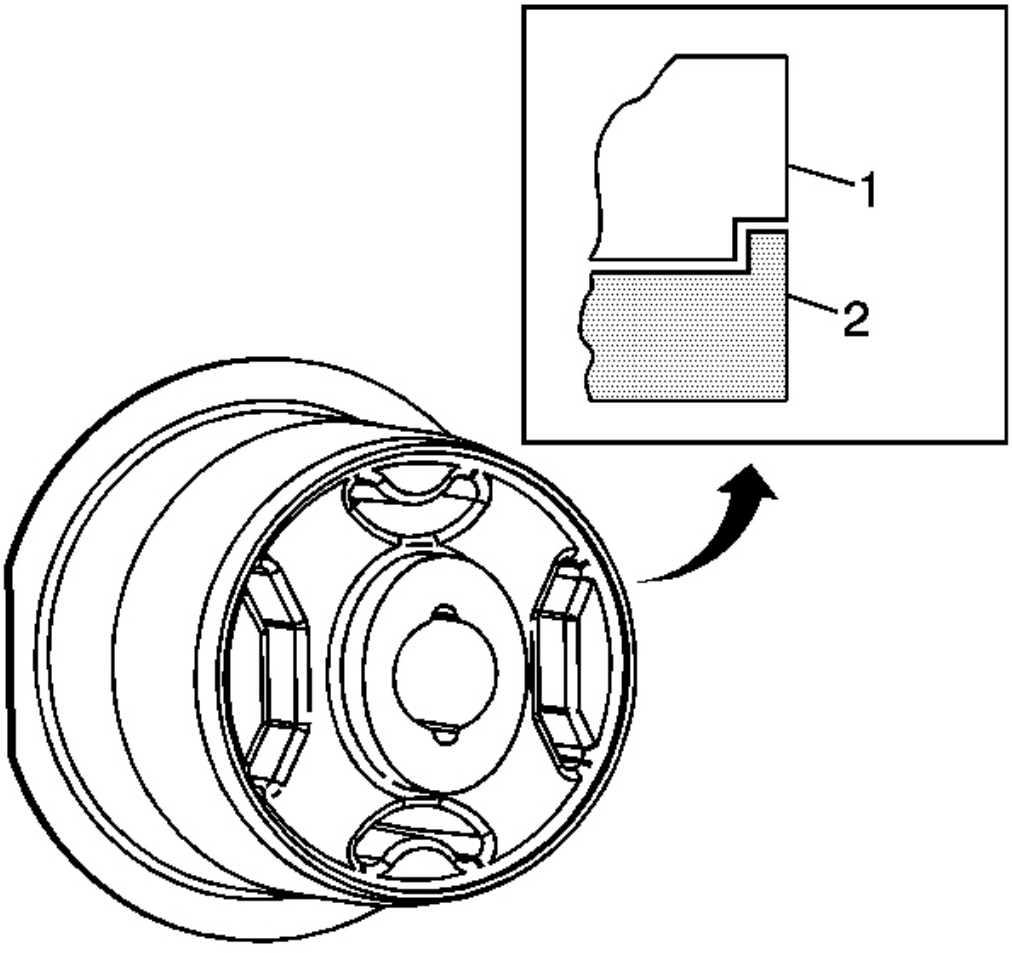


Fig. 23: View Of J-45725-2A & Bushing
Courtesy of GENERAL MOTORS CORP.

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

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

7. Install the threaded rod, bearing and washers.

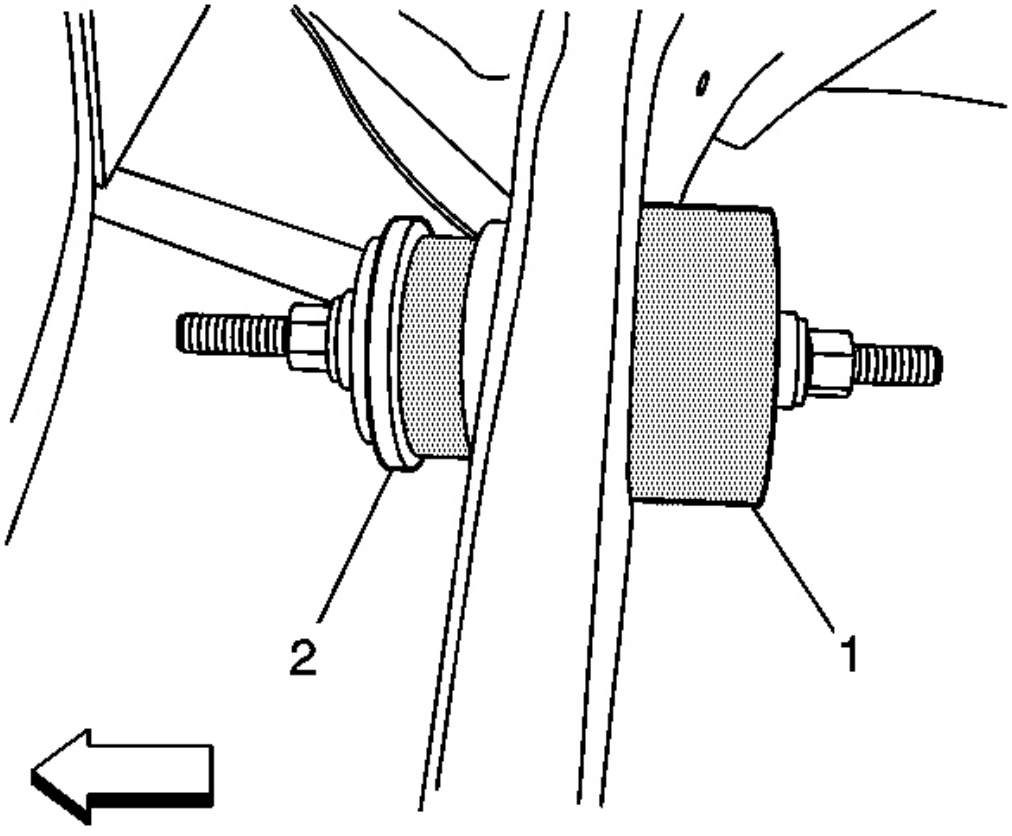


Fig. 24: Identifying J-45725-1A (2) & J-45725-2A
Courtesy of GENERAL MOTORS CORP.

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

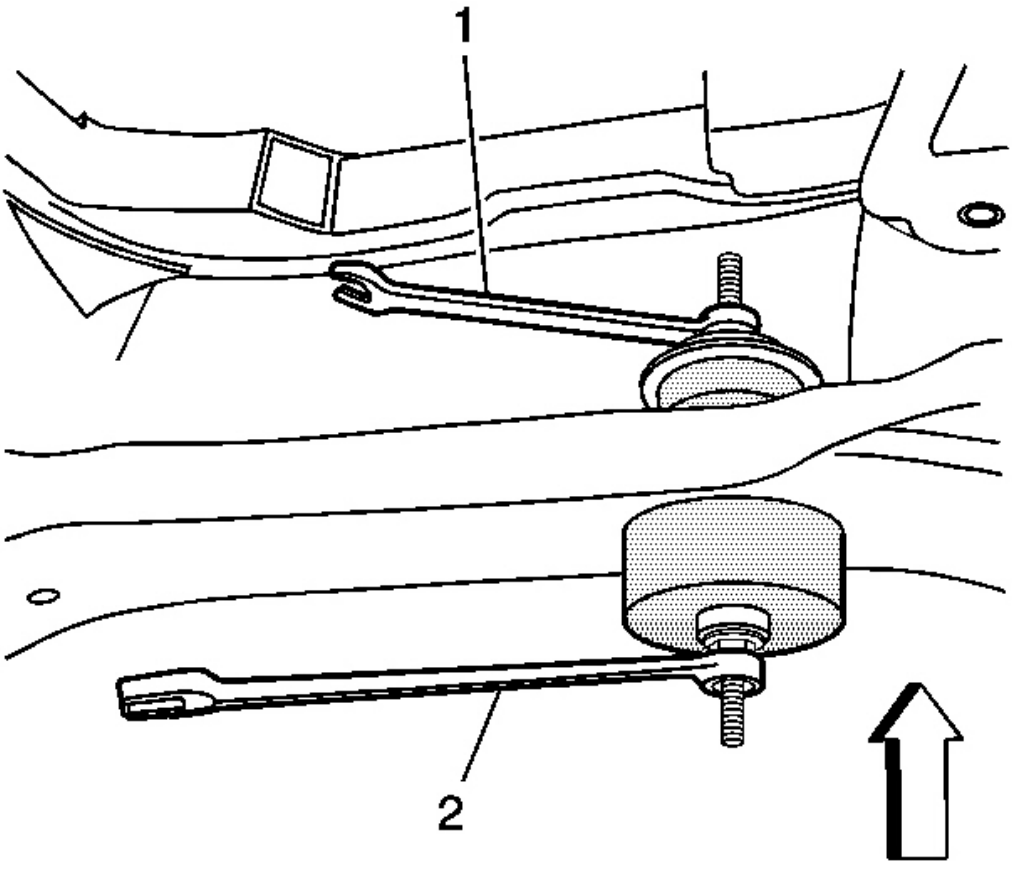


Fig. 25: View Of Attaching Nuts
Courtesy of GENERAL MOTORS CORP.

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

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

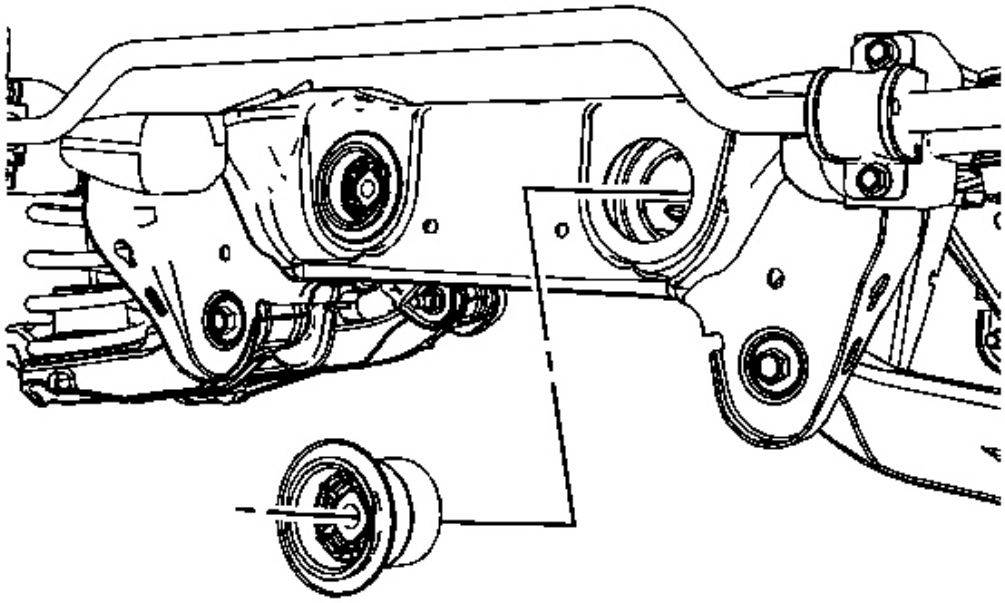


Fig. 26: View Of Frame Bushing
Courtesy of GENERAL MOTORS CORP.

12. Remove the bushing from the frame.

Installation Procedure

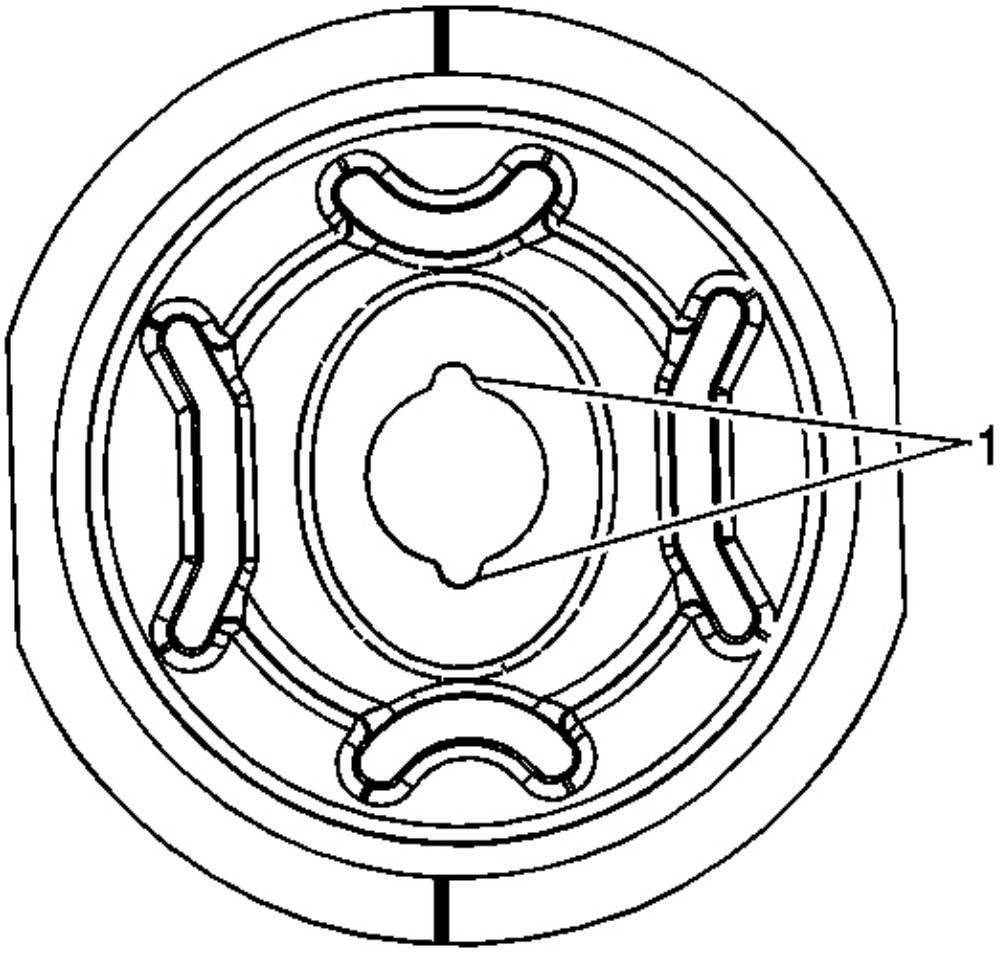


Fig. 27: Identifying Proper Bushing Alignment
Courtesy of GENERAL MOTORS CORP.

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 5 degree 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.

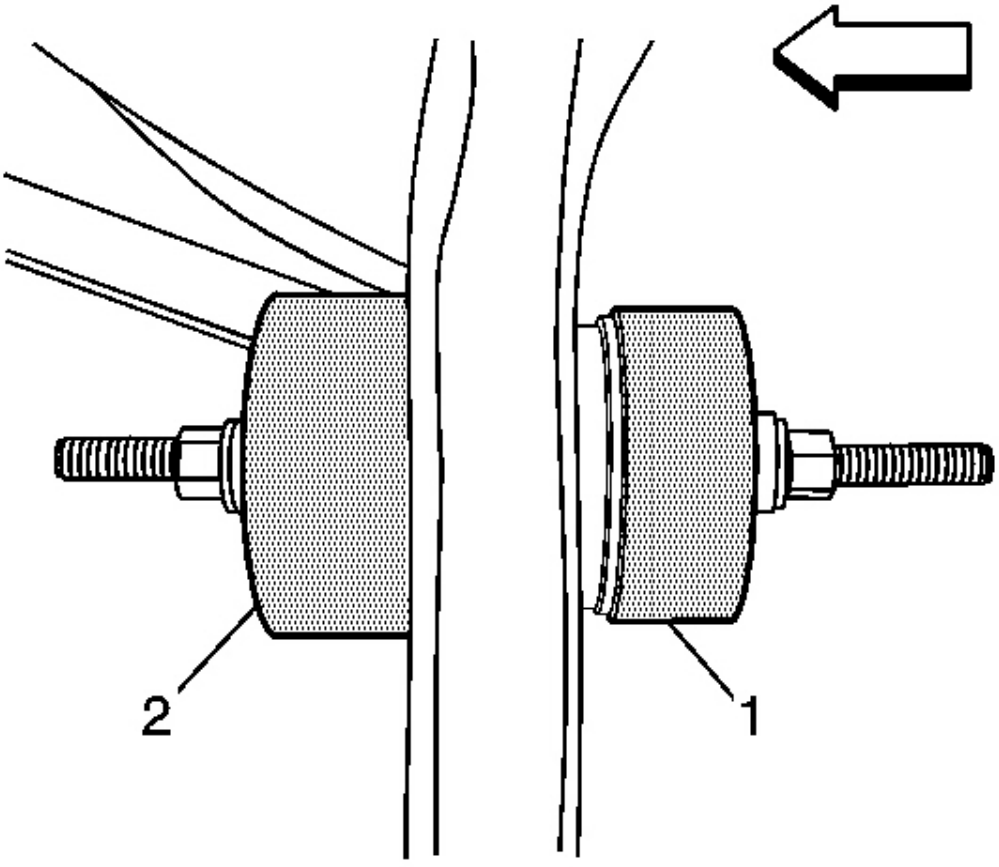


Fig. 28: View Of J-45725-1A (2) & J-45725-2A
Courtesy of GENERAL MOTORS CORP.

5. Position the J-45725-2 (2) on the inside of the frame.
6. Position J-45725-2A (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).

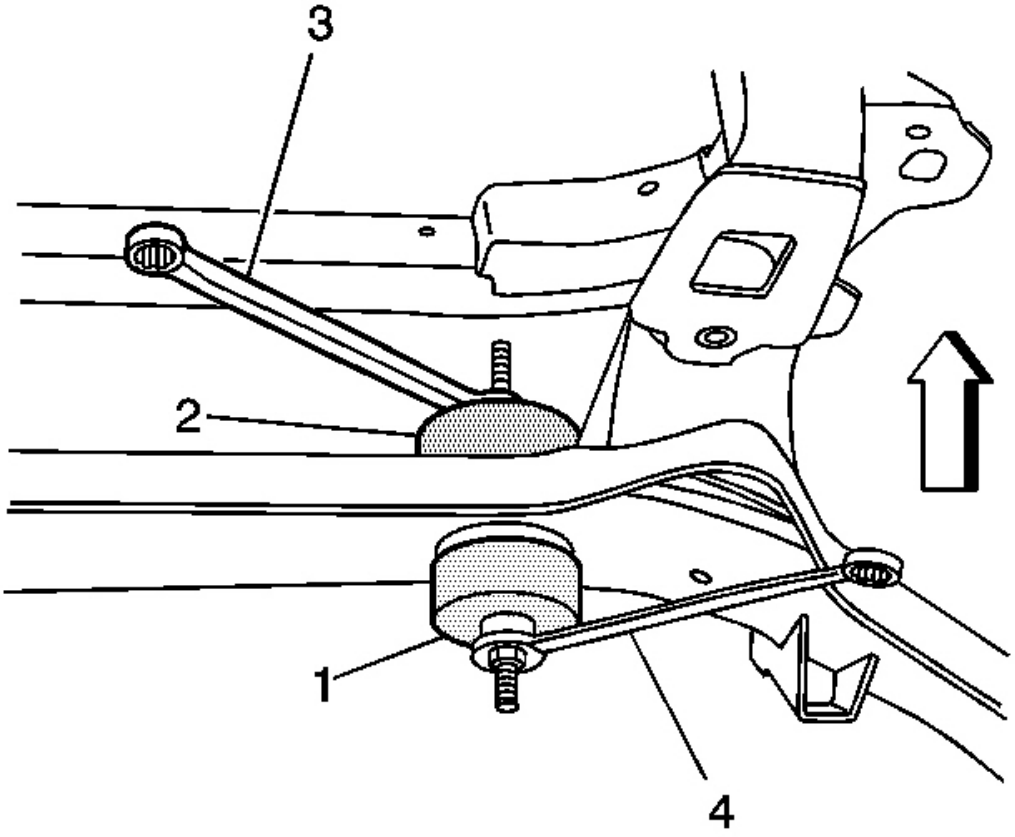


Fig. 29: Identifying Hand Tools - Wrenches
Courtesy of GENERAL MOTORS CORP.

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

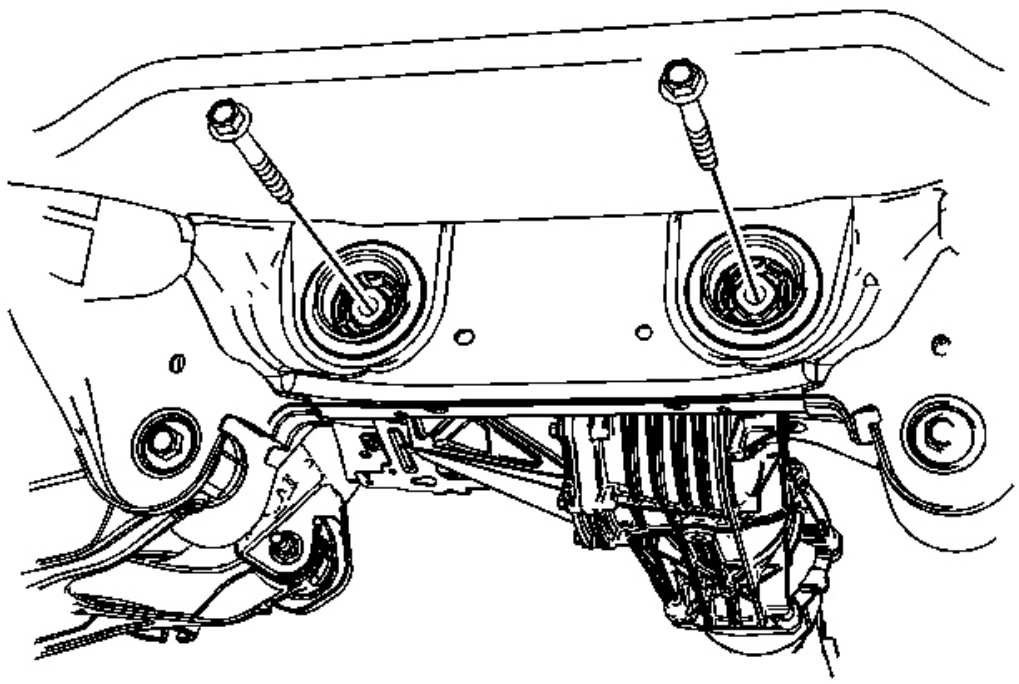


Fig. 30: View Of Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

10. Install the mounting bolt.

    Tighten: Tighten the bolt to 188 N.m (139 lb ft).

11. Install the rear differential assembly. Refer to **Differential Replacement**.
12. Lower the vehicle.

DRIVELINE TORQUE TUBE REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .

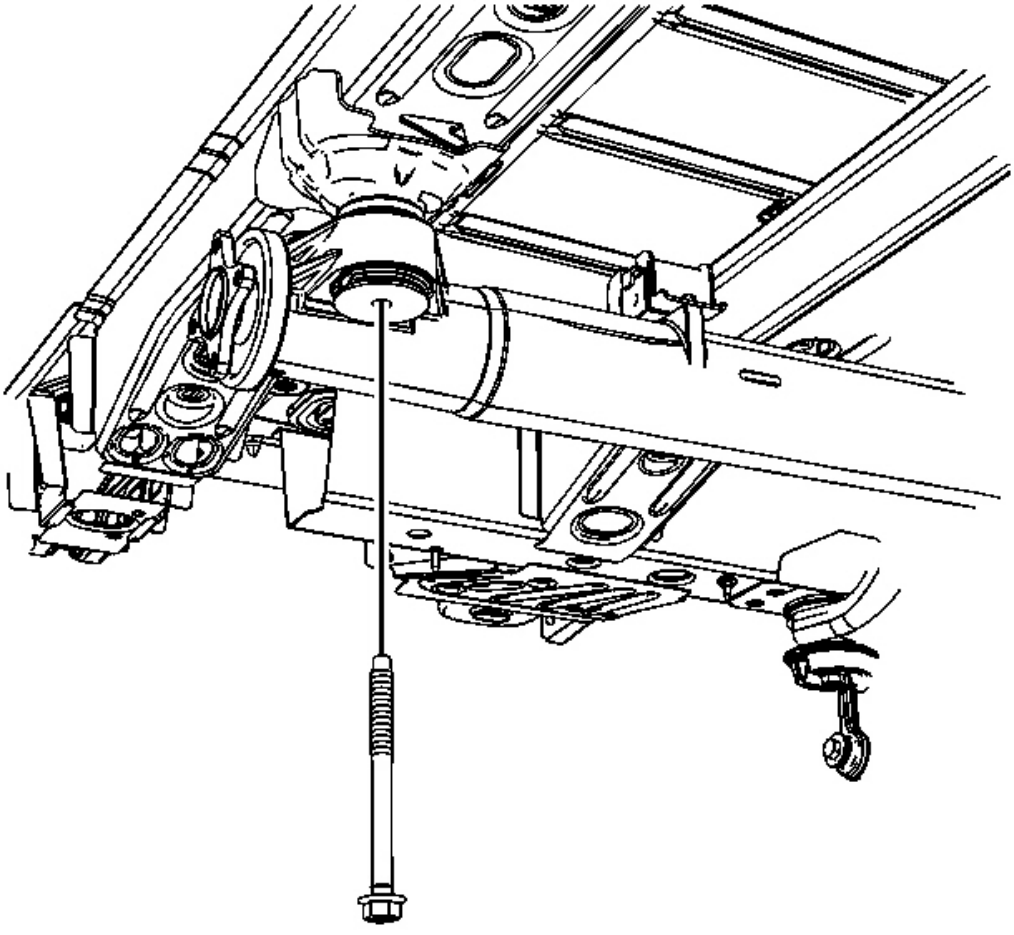


Fig. 31: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the torque tube mounting bolt.

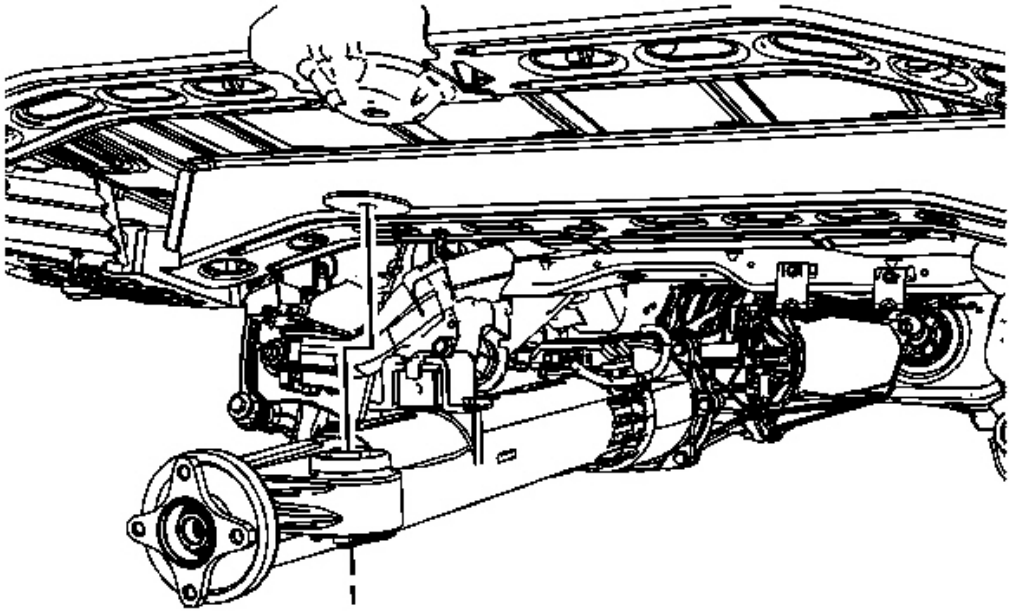


Fig. 32: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

4. Rotate the torque tube down and support with a suitable jack stand.

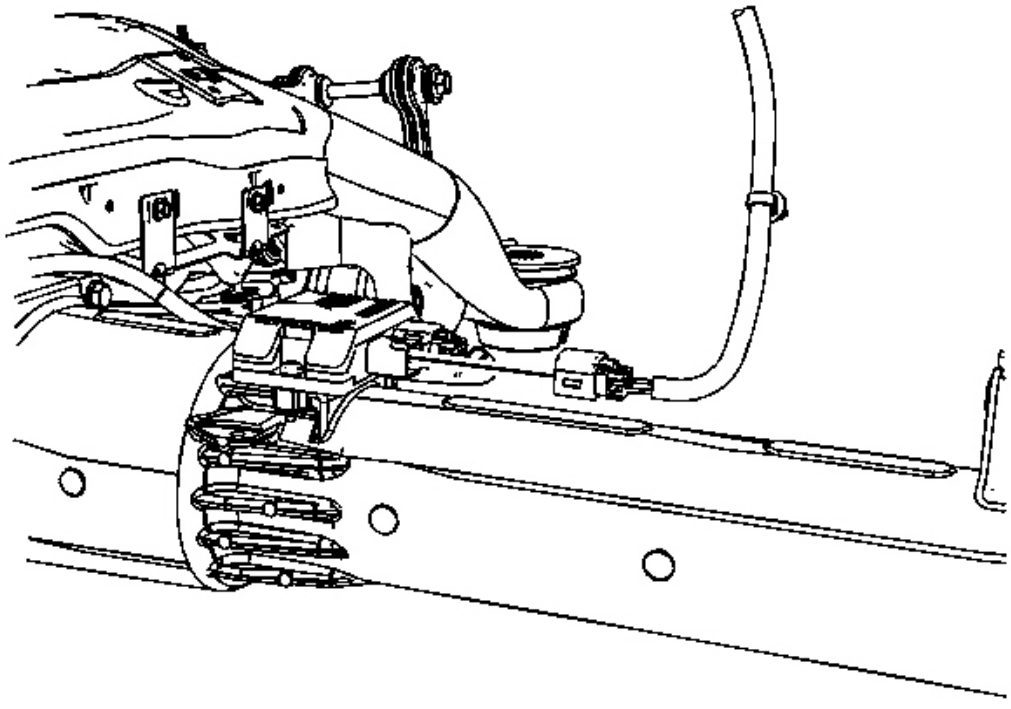


Fig. 33: View Of Clutch Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the electrical connector from the clutch control module.

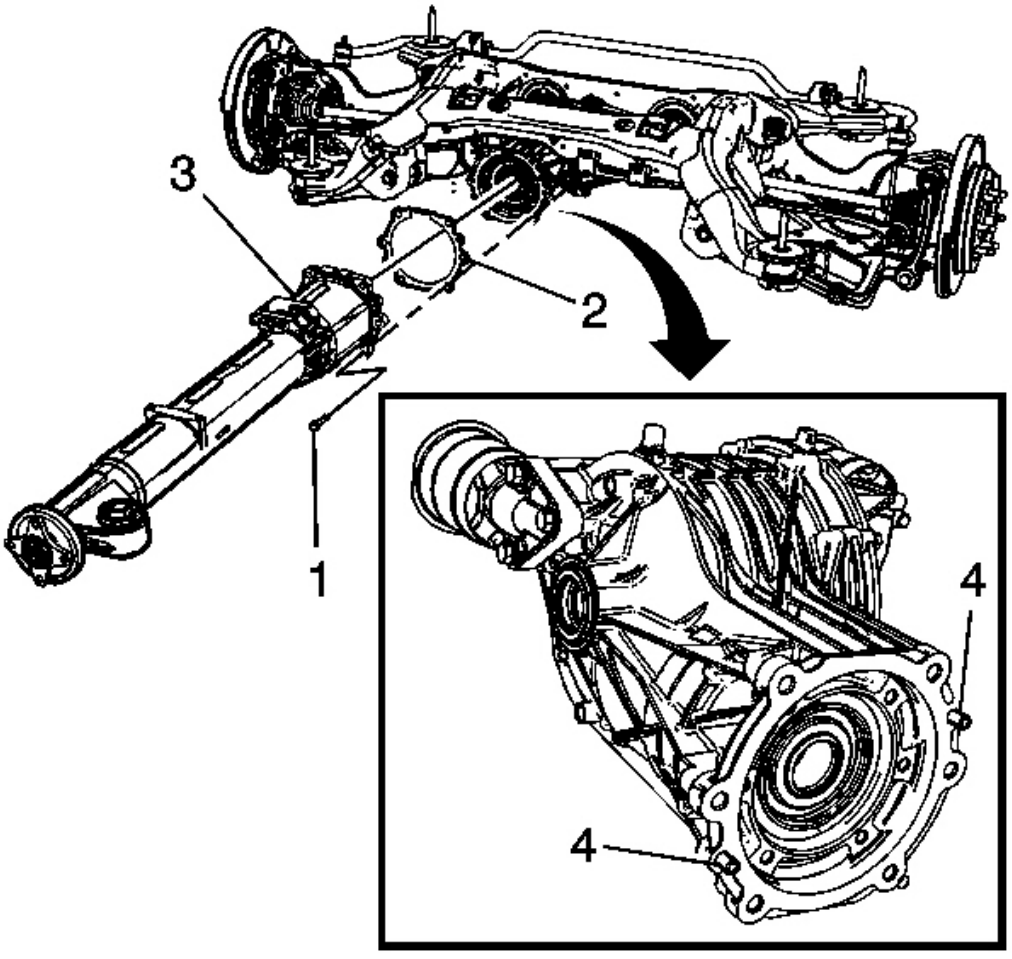


Fig. 34: Locating Torque Tube Mounting Bolts, Torque Tube Gasket, Torque Tube Assembly & Alignment Pins
Courtesy of GENERAL MOTORS CORP.

6. Remove the torque tube mounting bolts (1) from the rear differential.

IMPORTANT: DO NOT re-use the old gasket, discard and use NEW only.

7. Remove the torque tube gasket (2) from the rear differential and the alignment pins (4).
8. Remove the torque tube assembly (3) from the rear differential assembly.

IMPORTANT: If any fluid is found in the torque tube, check the condition of pinion oil seal.

9. Remove the torque tube assembly (3) from the vehicle.

Installation Procedure

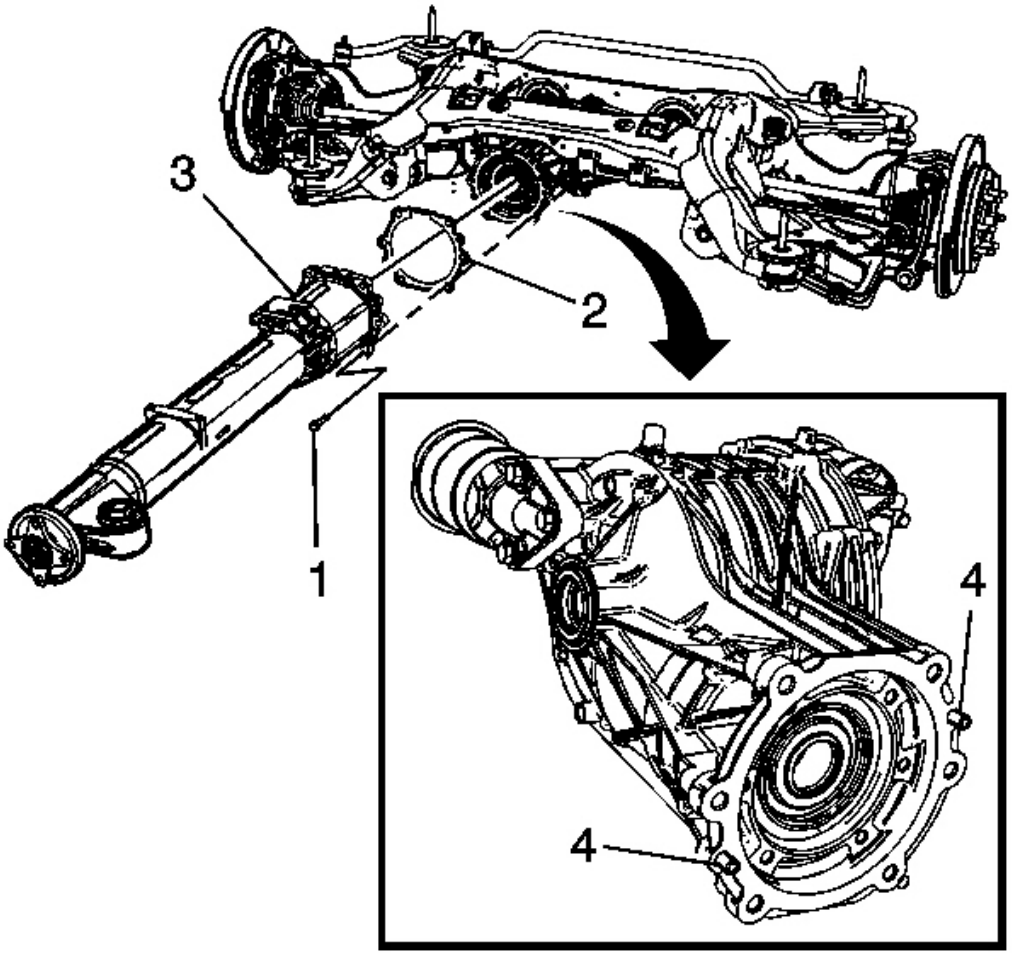


Fig. 35: Locating Torque Tube Mounting Bolts, Torque Tube Gasket, Torque Tube Assembly & Alignment Pins
Courtesy of GENERAL MOTORS CORP.

1. Install the NEW torque tube gasket (2) to the rear differential assembly.

2. Position torque tube (3) on the alignment pins (4) on the rear differential.
3. Using a suitable jack stand support the torque tube assembly.
4. Hand tighten the torque tube mounting bolts (1) before torquing to specifications.

NOTE: Refer to Fastener Notice .

5. Torque the mounting bolts (1) to specifications.

   Tighten: Tighten the bolts to 29 N.m (21 lb ft).

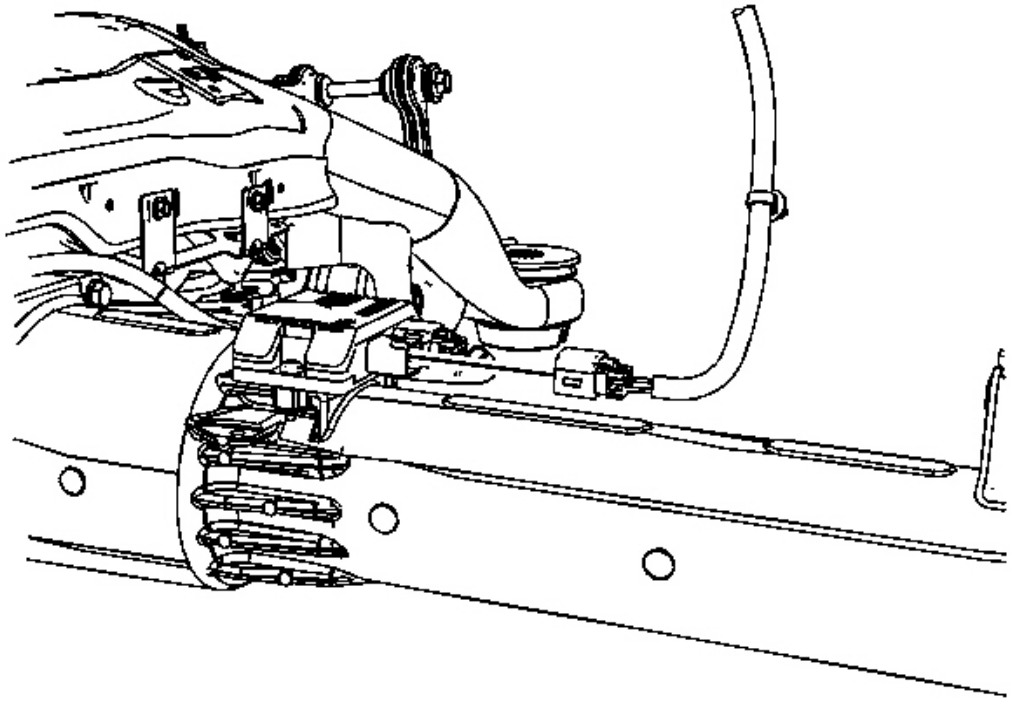


Fig. 36: View Of Clutch Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

6. Install the electrical connector for the clutch control module.

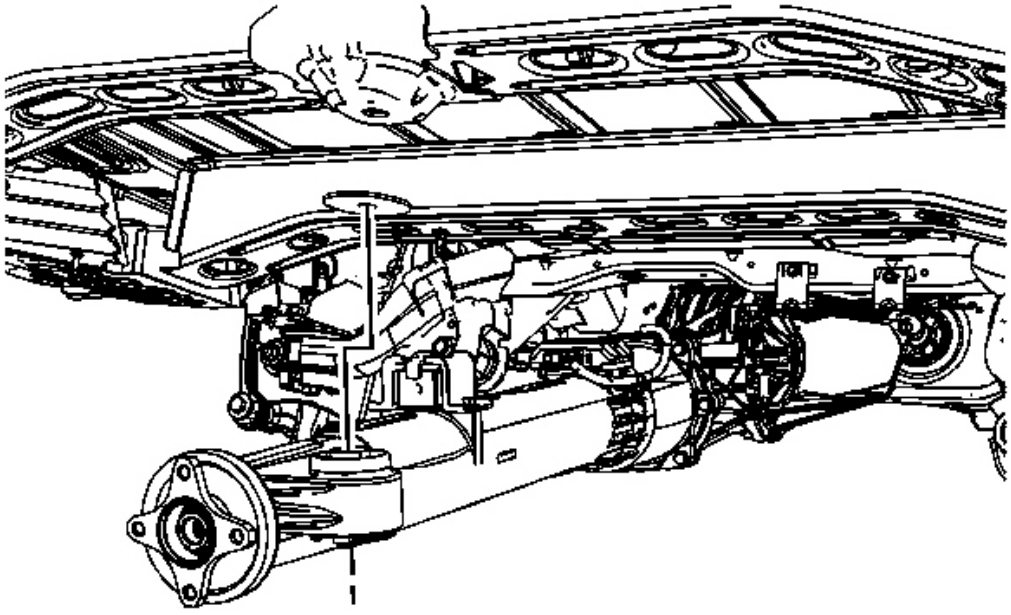


Fig. 37: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

7. Using the jack stand or the aide of an assistant reposition the torque tube to allow installation of the mounting bolt.

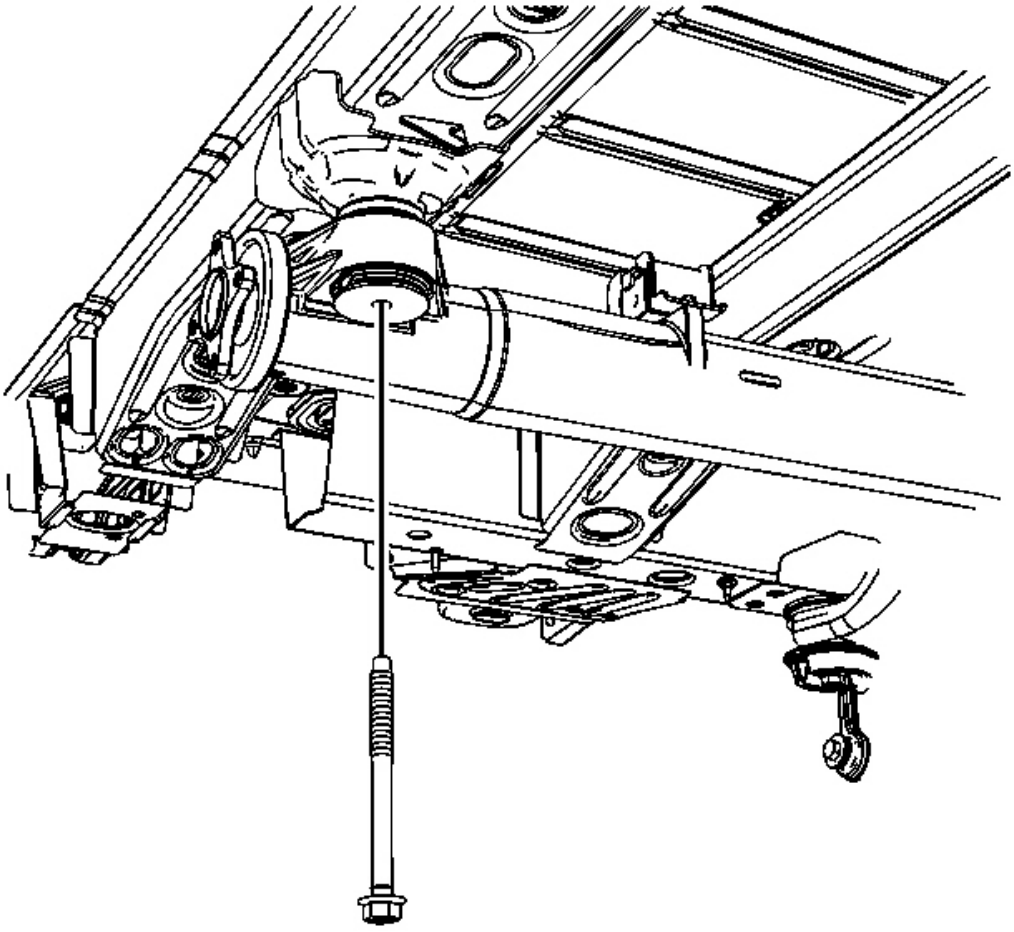


Fig. 38: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

8. Install the torque tube mounting bolt.

   Tighten: Tighten the bolt to 50 N.m (37 lb ft).

9. Install the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .
10. Remove the support and lower the vehicle.

DIFFERENTIAL CARRIER COVER AND SEAL REPLACEMENT - LEFT SIDE

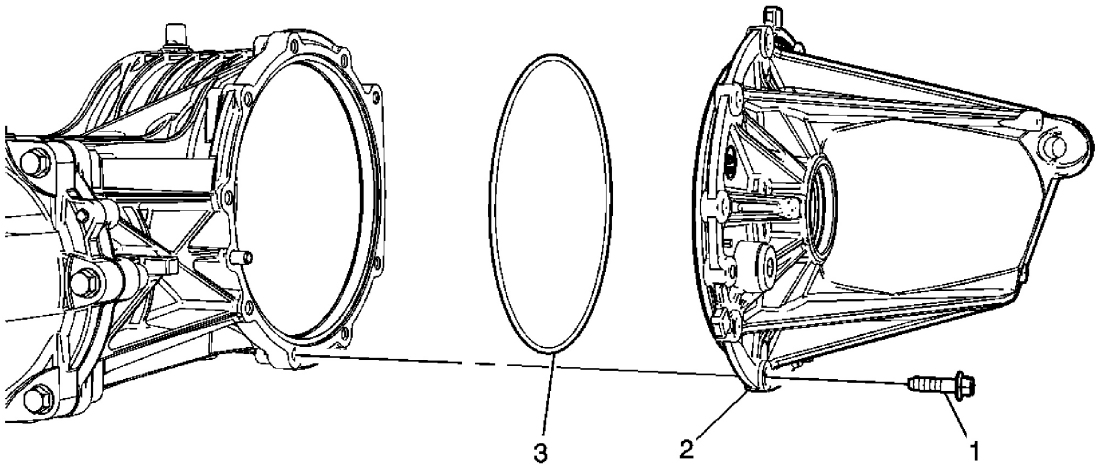


Fig. 39: View Of Left Side Differential Carrier Cover & Seal
Courtesy of GENERAL MOTORS CORP.

Differential Carrier Cover and Seal Replacement - Left Side

Callout	Component Name
Preliminary Procedure: Remove the rear differential assembly. Refer to **Differential Replacement**.	
1	Differential Side Cover Bolt (Qty: 9) **NOTE:** **Refer to Fastener Notice .** **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.
	Differential Side Cover Seal **Tip:**

3	1. 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. 2. Apply a small amount of clean oil to the side cover seal.

DRIVE PINION FLANGE/YOKE AND/OR OIL SEAL REPLACEMENT

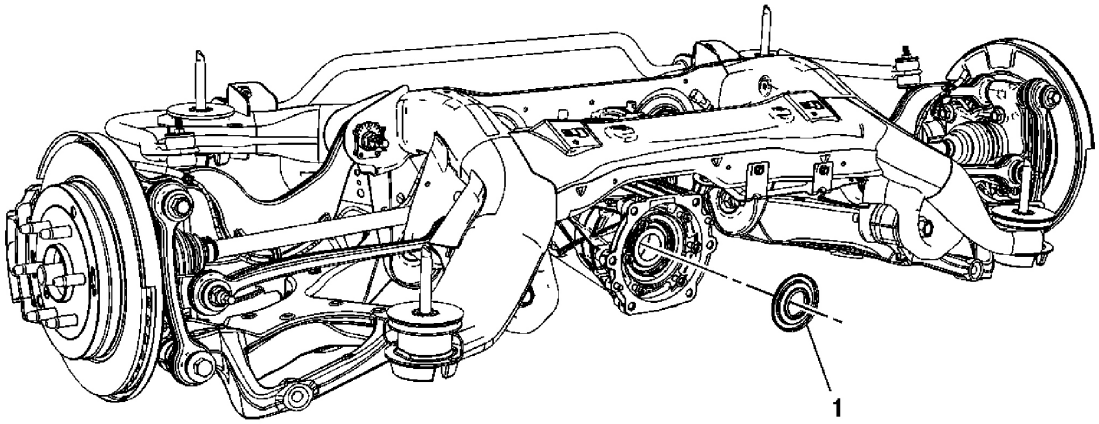


Fig. 40: View Of Differential Pinion Seal
Courtesy of GENERAL MOTORS CORP.

Drive Pinion Flange/Yoke and/or Oil Seal Replacement

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . 2. Remove the torque tube assembly. Refer to **Driveline Torque Tube Replacement**.	
1	Differential Pinion Seal **IMPORTANT:** **The pinion flange, the nut and the dust cover are NOT SERVICED separately. These items are serviced with the torque tube assembly.** **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. Inspect the fluid level. Refer to **Lubricant Change**. **Special Tools:** **J 44636-1** Front Output Shaft Seal Protector. See **Special Tools**.

DIFFERENTIAL REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the tires and wheels. Refer to **Tire and Wheel Removal and Installation** .
3. Drain the rear differential assembly. Refer to **Lubricant Change**.
4. Remove the rear wheel drive shaft. Refer to **Rear Wheel Drive Shaft and Rear Axle Shaft Seal Replacement** .
5. Remove the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .

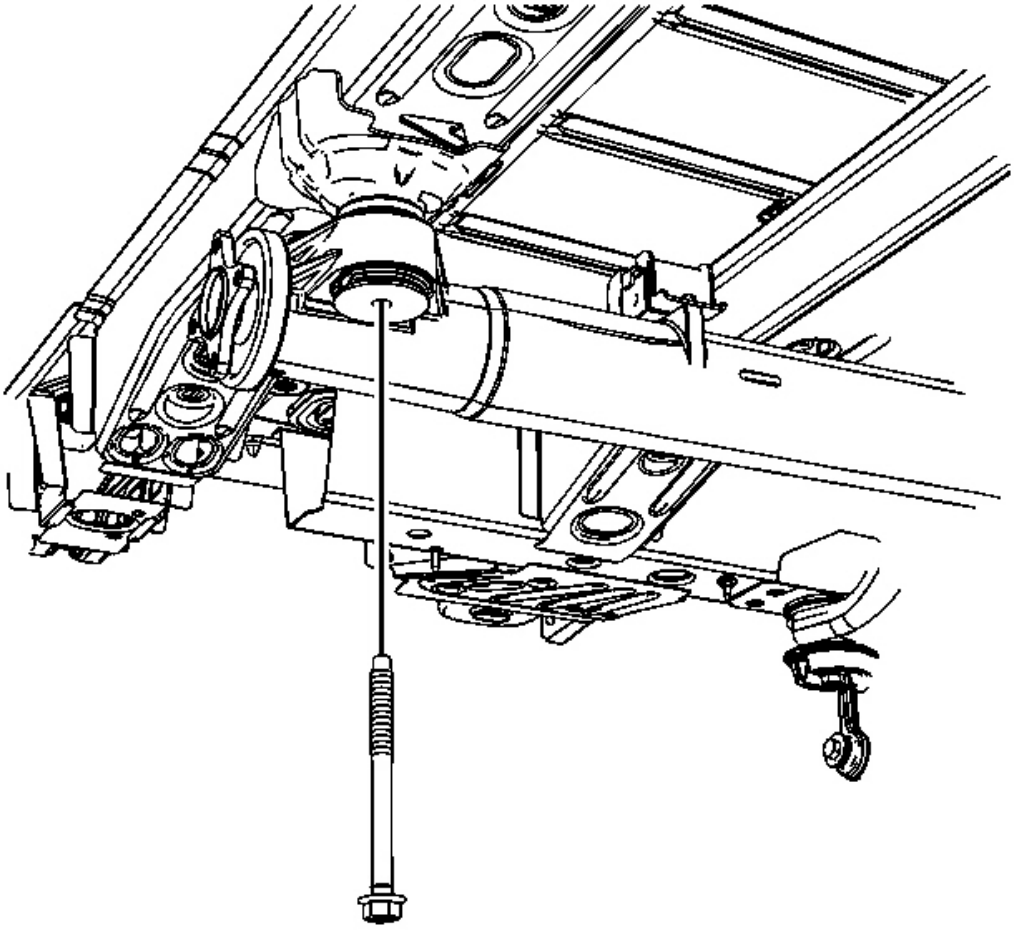


Fig. 41: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

6. Remove the front torque tube mounting bracket bolt.

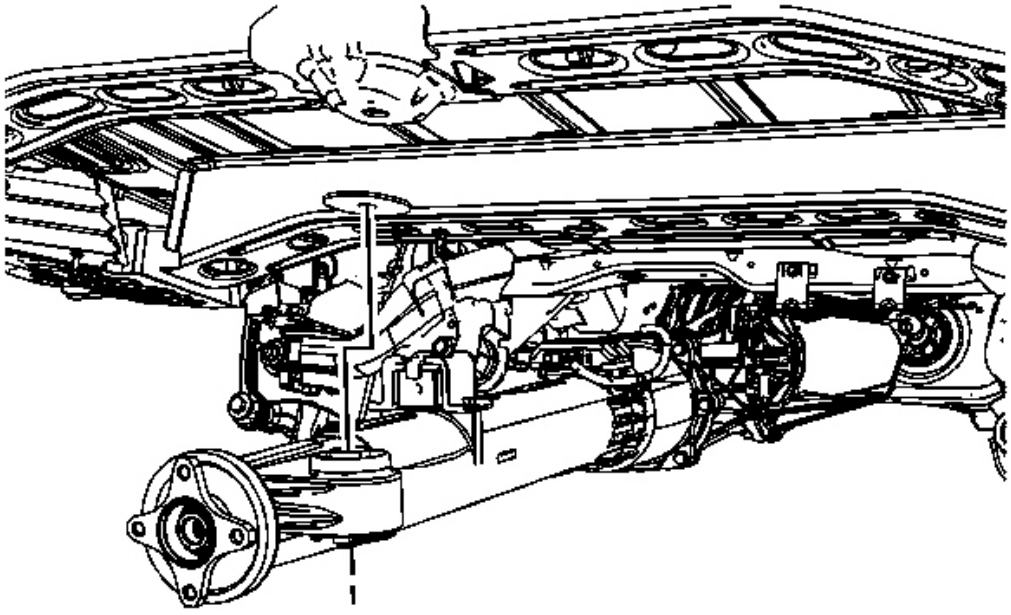


Fig. 42: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

7. Lower the front of the torque tube to gain access to the electronic clutch control module.

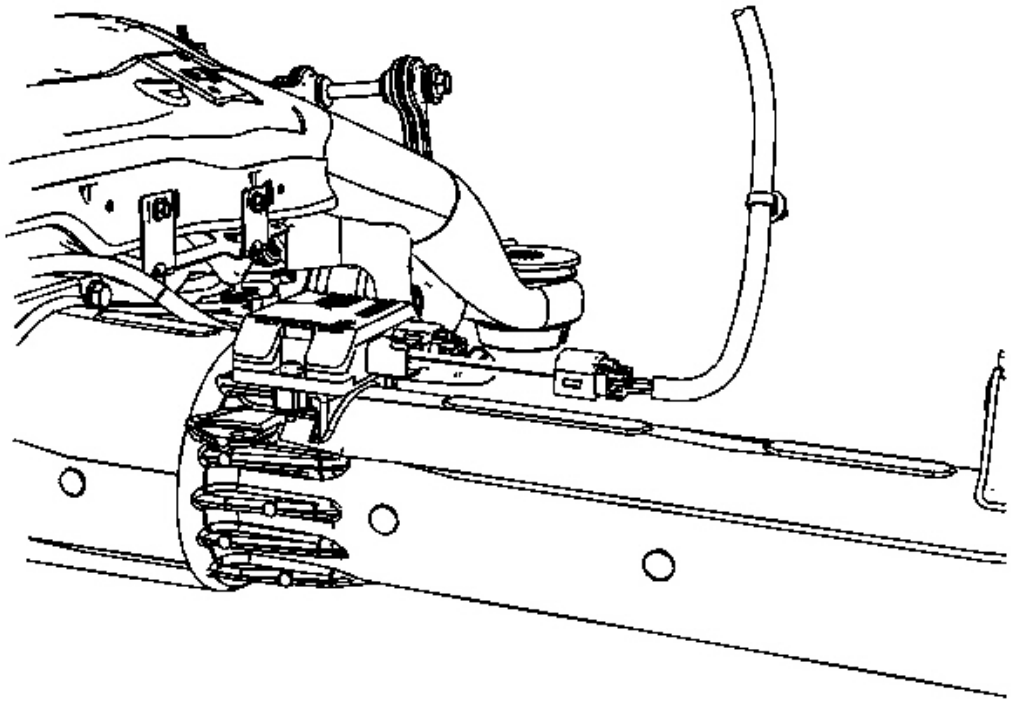


Fig. 43: View Of Clutch Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the electrical connector from the electronic clutch control module.
9. Support the torque tube with a jack stand.
10. Support the rear differential assembly with a transmission jack.

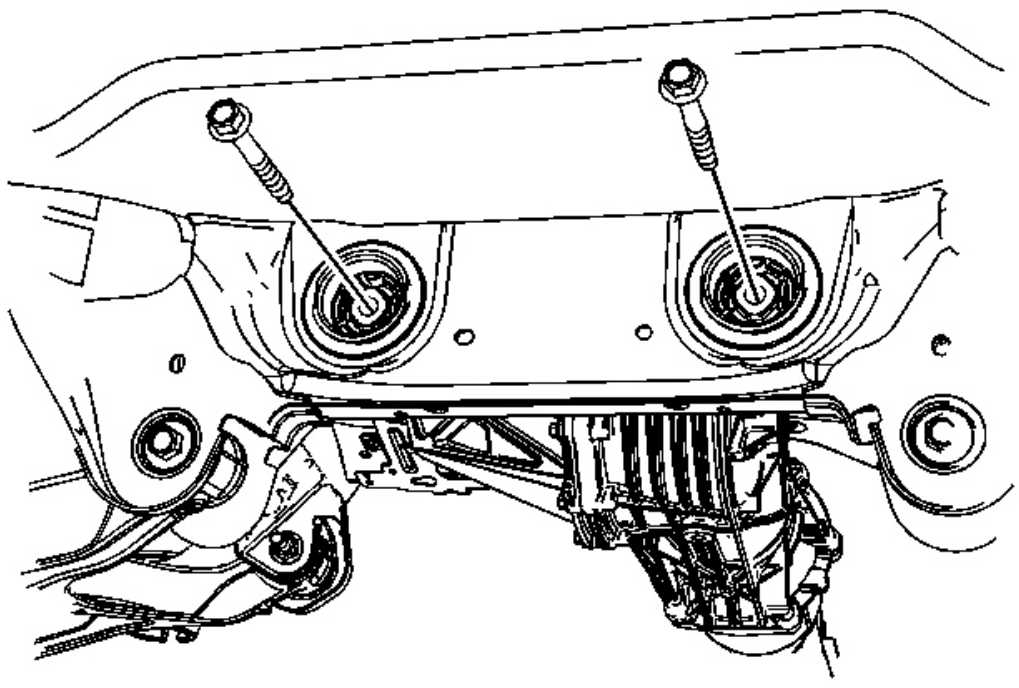


Fig. 44: View Of Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

11. Remove the rear differential drive mounting bolts.

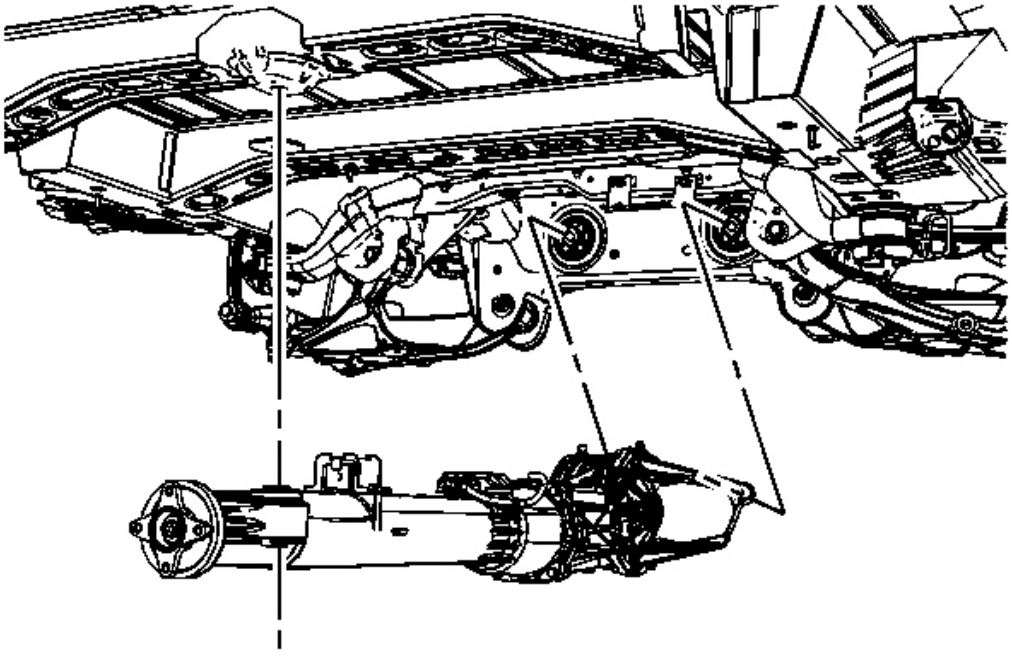


Fig. 45: View Of Rear Differential Assembly
Courtesy of GENERAL MOTORS CORP.

12. With the aide of an assistant, remove the rear differential assembly from the vehicle.

Installation Procedure

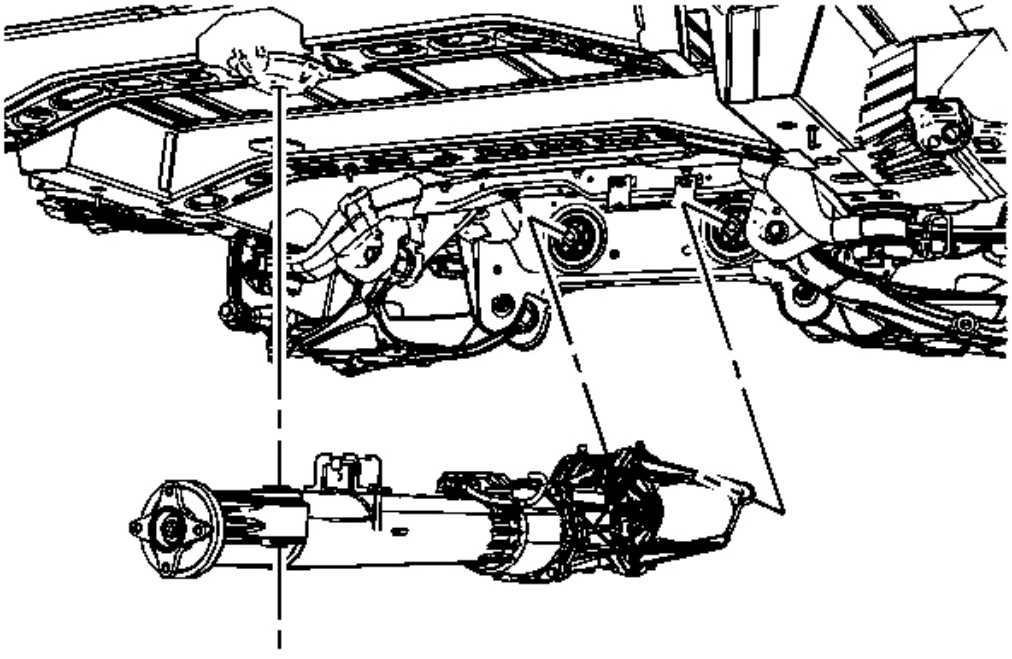


Fig. 46: View Of Rear Differential Assembly
Courtesy of GENERAL MOTORS CORP.

1. Position the rear differential in the vehicle.

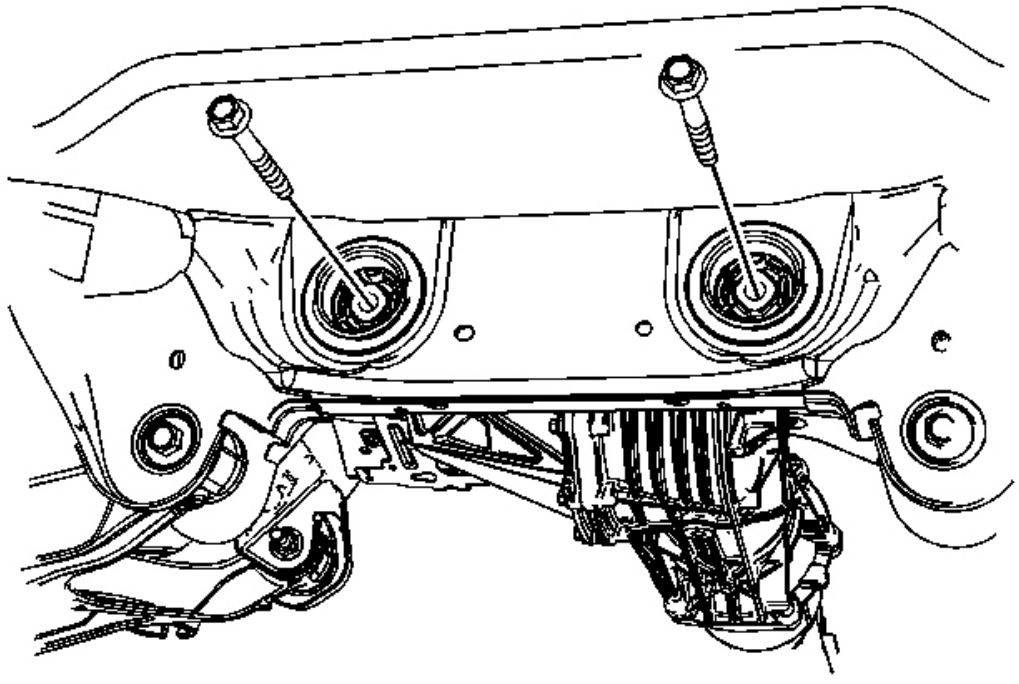


Fig. 47: View Of Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

2. Install the rear differential mounting bolts.

   Tighten: Tighten the bolts to 188 N.m (139 lb ft).

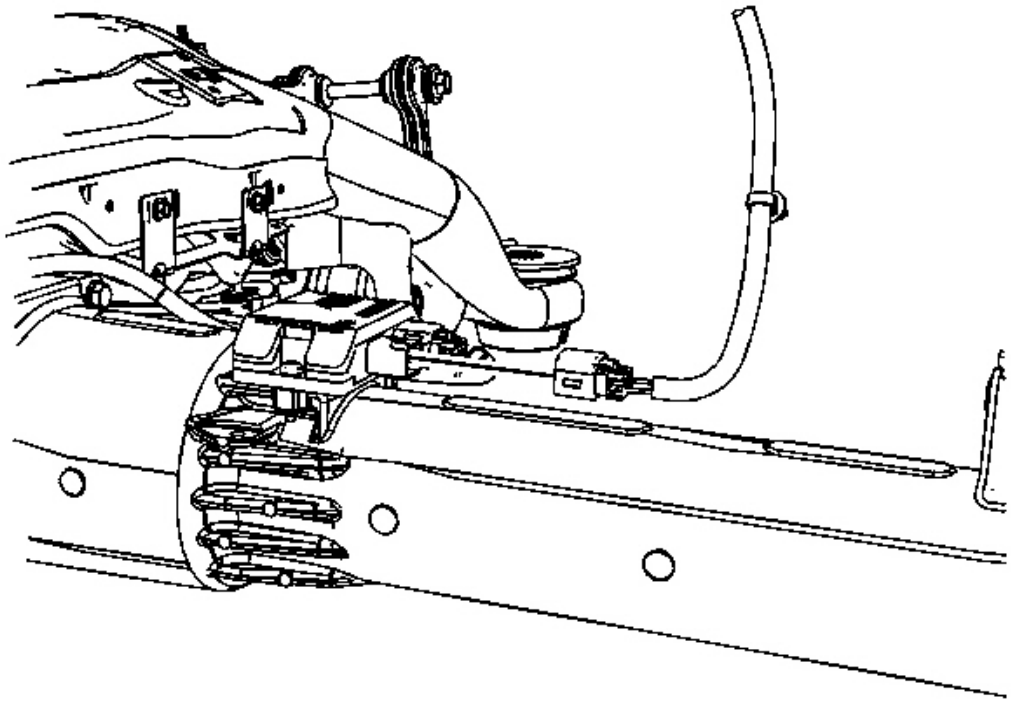


Fig. 48: View Of Clutch Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Reconnect the electrical connector for the electronic clutch control module.

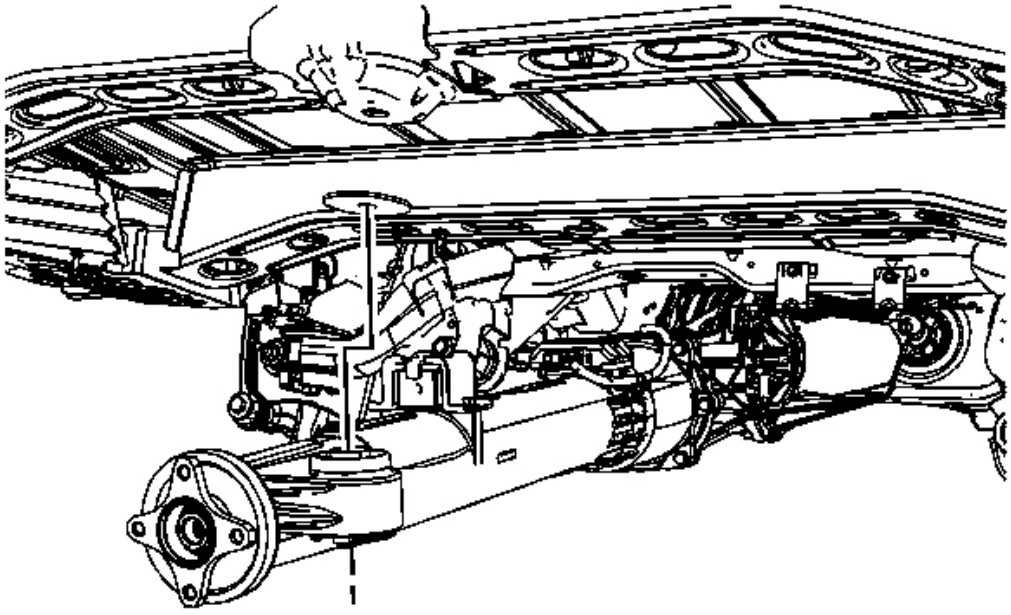


Fig. 49: View Of Torque Tube
Courtesy of GENERAL MOTORS CORP.

4. Lift the torque tube into position.

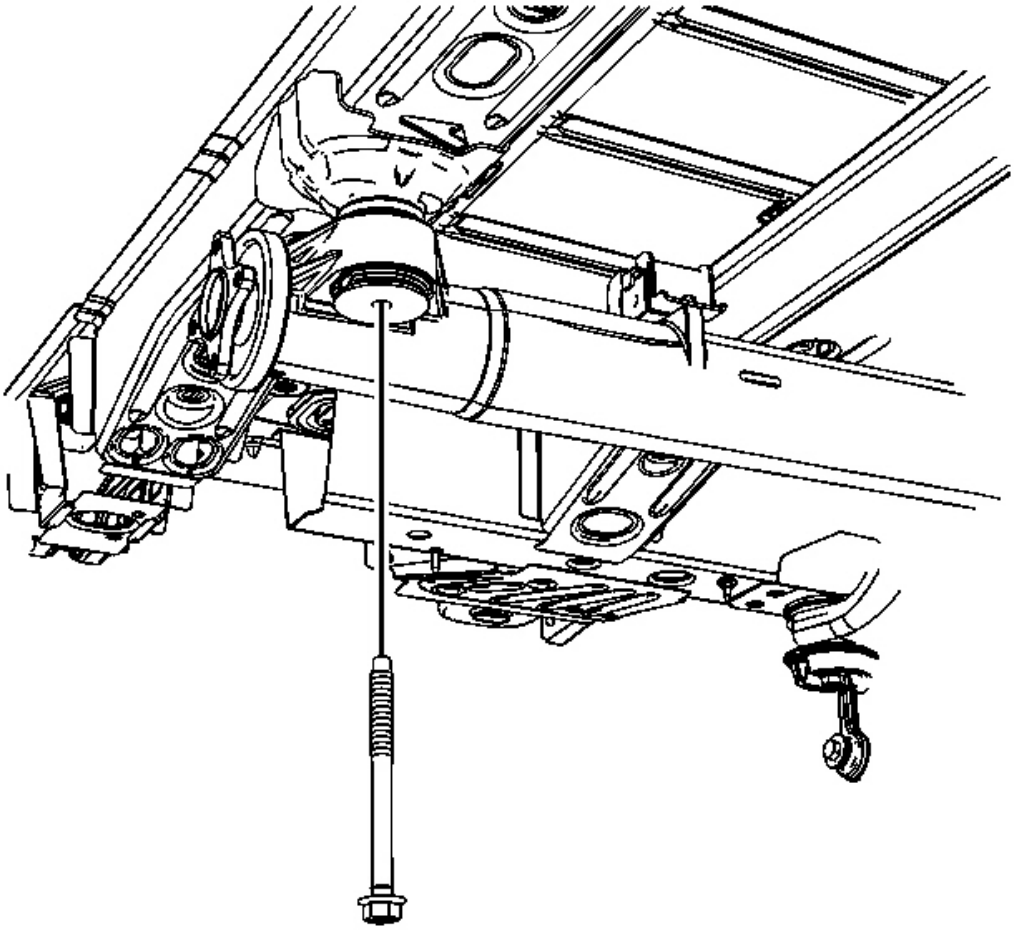


Fig. 50: Identifying Torque Tube Mounting Bolt
Courtesy of GENERAL MOTORS CORP.

5. Install the torque tube bolt.

   Tighten: Tighten the bolt to 50 N.m (37 lb ft).

6. Install the propeller shaft assembly. Refer to **Propeller Shaft Replacement** .
7. Refill the rear differential assembly. Refer to **Lubricant Change**.
8. Install the rear wheel drive shaft. Refer to **Rear Wheel Drive Shaft and Rear Axle Shaft Seal Replacement** .
9. Install the tires and wheels. Refer to **Tire and Wheel Removal and Installation** .

10. Remove the support and lower the vehicle.

TORQUE TUBE ASSEMBLY CLEANING AND INSPECTION

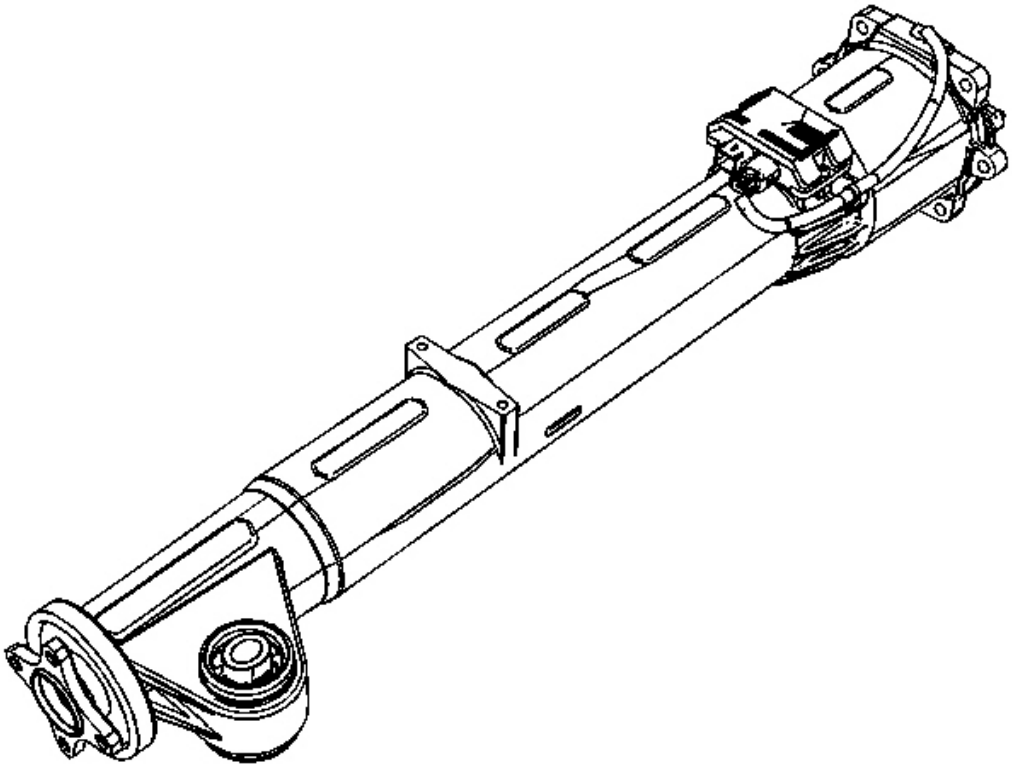


Fig. 51: View Of Torque Tube Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The internal components of the torque tube assembly are not serviced separately. Replace the tube and internal components as an assembly.

1. Check the torque tube for the following conditions:
   - Damage to the driver flange
   - Cracks or dents on the exterior of the torque tube
   - Operation of all bearings

- Machine surfaces for abnormal wear

2. If any of the above conditions are found to be present, replace the torque tube assembly.

DESCRIPTION AND OPERATION

REAR DRIVE AXLE DESCRIPTION AND OPERATION

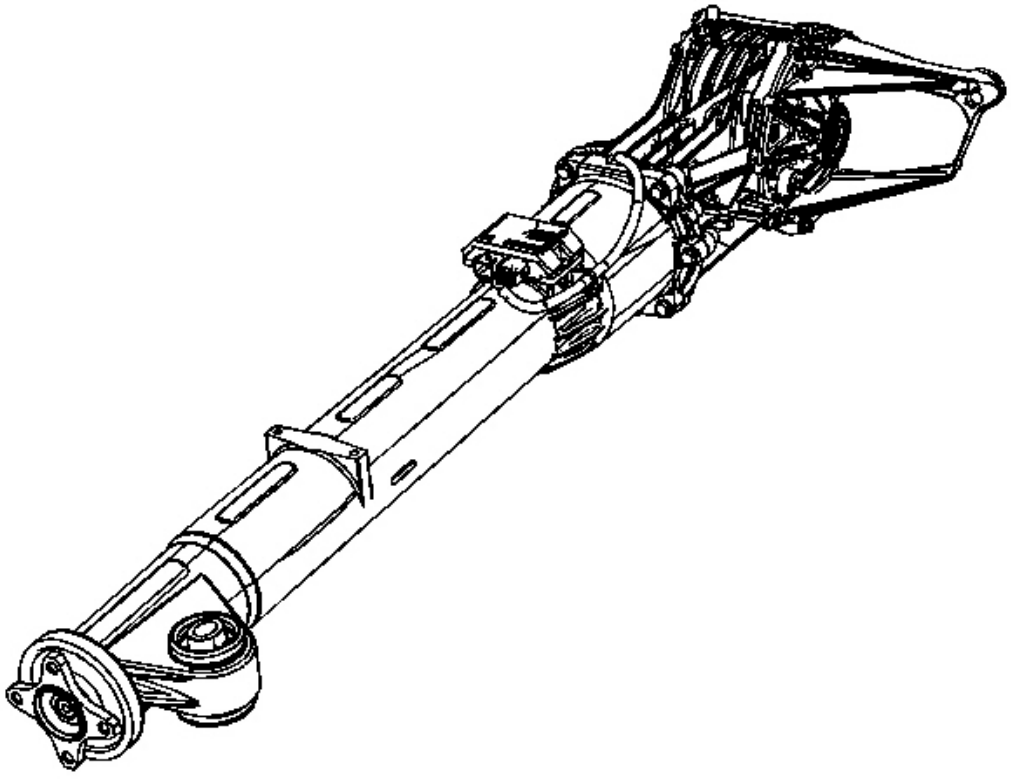


Fig. 52: View Of Rear Drive Axle Assembly
Courtesy of GENERAL MOTORS CORP.

The rear drive axle assembly in this vehicle consists of an aluminum housing which contains a electric clutch which is located in the driveline torque tube (for vehicles equipped with all wheel drive AWD only) and separate from the rear drive. The differential fluid is only contained in the rear drive axle portion of the rear differential assembly.

The clutch assembly for AWD vehicles is serviced separately from the driveline torque tube

assembly. The clutch control module (CCM) is located on the torque tube housing and is serviced separately.

The clutch control module has integrated active clutch control logic.

The clutch can provide torque to the differential portion of the rear drive axle under a wide range of driving conditions. It differs from past on-demand systems as it can preload the clutch during take off to provide a less likelihood of wheel slip.

The clutch control module (CCM) is connected to the vehicle serial data stream via the control area network (CAN).

It uses data stream information from the engine control module (ECM) and the ABS/stability control module. The CCM monitors such signals as individual wheel speeds, ABS/stability control active, throttle position or wheel torque request to determine mode of operation.

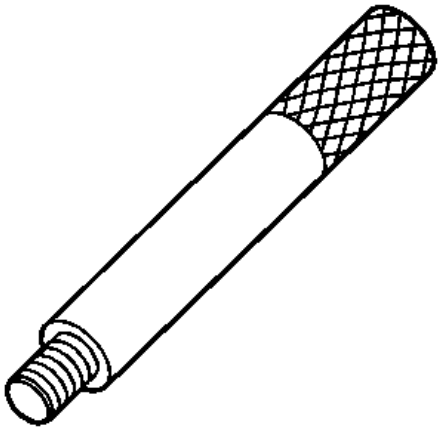
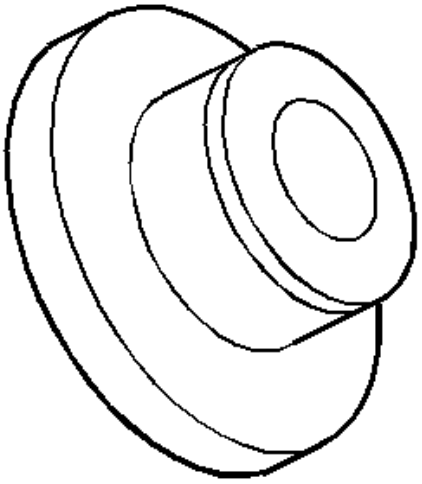
The fluid level range for proper rear drive axle assembly operation is 0.8 liter. New service replacement units will be shipped dry (without fluid). Fill new units with 0.8 liter of GL Synthetic fluid. The minimum fluid level should be even with the bottom of the fill hole.

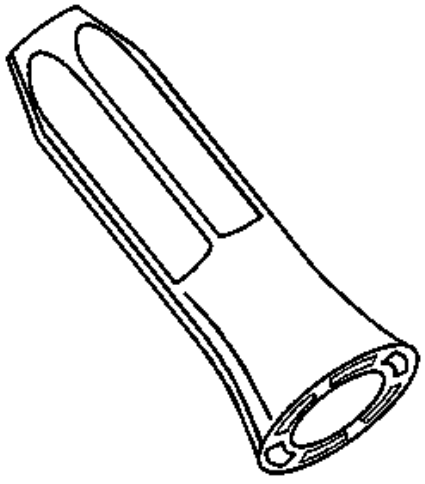
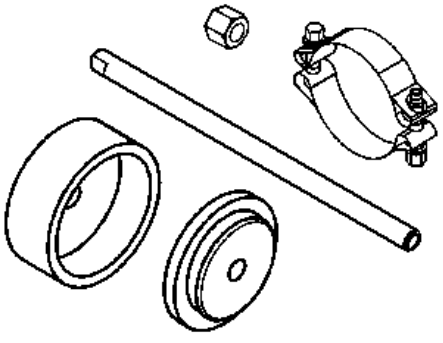
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

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