

2017 TRANSMISSION**Manual Transmission - M20/M32 (MR5) - Encore, Trax****SPECIFICATIONS****FASTENER SPECIFICATIONS****Single Use Non-Threaded Fasteners/Components**

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>
Application
Front Differential Carrier Flange Seal
Vehicle Speed Sensor O-Ring

Single Use Threaded Fastener/Component Tightening Specifications

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	Specification
	Metric (English)
Front Differential Carrier Flange Bolt	
• First Pass:	20 N.m (15 lb ft)
• Final Pass:	45 Degrees
Transmission Fluid Drain Plug	20 N.m (15 lb ft)
Transmission Fluid Filler Plug	30 N.m (22 lb ft)
Transmission Mount Bolt - Left Side - to Bracket	
• First Pass:	50 N.m (37 lb ft)
• Final Pass:	60 - 75 Degrees
Transmission Rear Mount Bolt - to Front Suspension Frame	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	90 - 105 Degrees
Transmission Rear Mount Bracket Bolt - (FWD)	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	30 - 45 Degrees
Transmission Rear Mount Bracket Bolt - (AWD)	

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application	Specification
	Metric (English)
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	30 - 40 Degrees
Transmission Rear Mount to Bracket Through Bolt	
• First Pass:	80 N.m (59 lb ft)
• Final Pass:	45 - 60 Degrees

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Backup Lamp Switch	25 N.m (18 lb ft)
Engine Wiring Harness Bracket Nut	9 N.m (80 lb in)
Shift Control Lever Knob Bolt	16 N.m (12 lb ft)
Shift Lever and Selector Lever Cable Bracket Bolt	22 N.m (16 lb ft)
Shift Lever and Selector Lever Cable Grommet Fastener	9 N.m (80 lb in)
Transmission Control Fastener	9 N.m (80 lb in)
Transmission Lower Bolt and Nut	58 N.m (43 lb ft)
Transmission Lower Bolt	58 N.m (43 lb ft)
Transmission Mount Bolt - Left Side - to Body	58 N.m (43 lb ft)
Transmission Mount Bracket Bolt - Left Side - to Transmission	100 N.m (74 lb ft)
Transmission Mount Nut - Left Side - to Body	58 N.m (43 lb ft)
Transmission Upper Bolt	58 N.m (43 lb ft)
Vehicle Speed Sensor Bolt	9 N.m (80 lb in)

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
Fluid Capacity - Repaired / Dry Transmission	1.87 liters	1.98 quarts
Fluid Capacity - Refill	1.76 liters	1.86 quarts
Fluid Capacity - New Transmission	1.30 liters	1.37 quarts

MANUAL TRANSMISSION SPECIFICATIONS

Name	Specification
Transmission Type	M32-6
Transmission Manufacturer	GMPT Europe
Transmission Drive	Transverse Mounted Front Wheel Drive

Name	Specification
Maximum Engine Torque	320 N.m (236 lb ft)
Transmission Content	Fully Synchronized with Final Drive Gear and Differential
Transmission RPO Code	MR5
Engine RPO Code	LUV (U14NFT)
1st Gear	4.273
2nd Gear	2.353
3rd Gear	1.475
4th Gear	1.067
5th Gear	0.875
6th Gear	0.744
Reverse	3.818
Transmission Fluid Type	Refer to Electronic Parts Catalog
Transmission Fluid Capacities	Approximate Fluid Capacities
Transmission Weight Dry (Approximate)	53.5-55.5 kg (118-122 lb)

SCHEMATIC WIRING DIAGRAMS

MANUAL TRANSMISSION WIRING SCHEMATICS (MANUAL TRANSMISSION (CHEVROLET WITH LUV AND MM3))

Manual Transmission (Chevrolet with LUV and MM3)

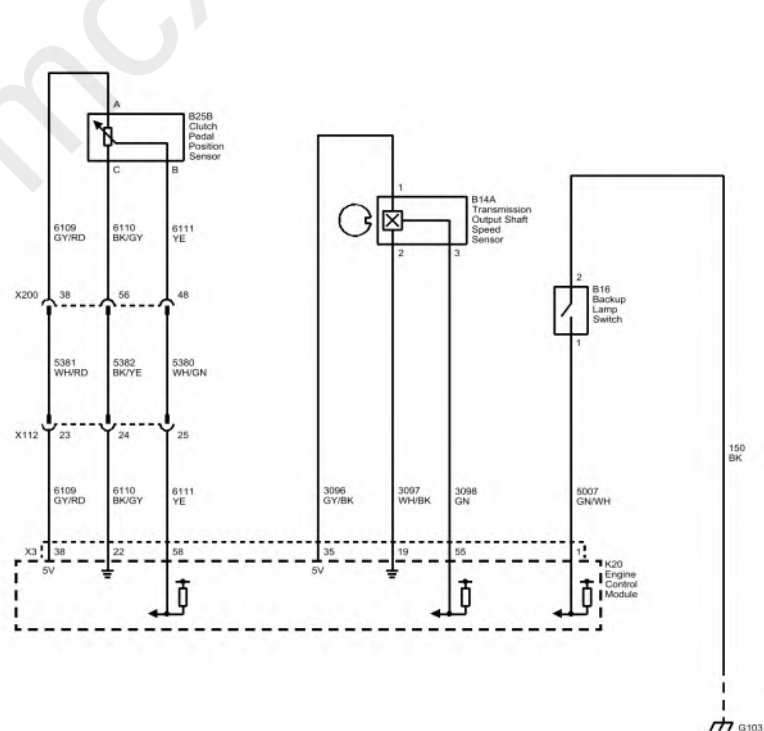


Fig. 1: Manual Transmission (Chevrolet with LUV and MM3)
Courtesy of GENERAL MOTORS COMPANY

COMPONENT LOCATOR

MANUAL TRANSMISSION COMPONENT VIEWS

Shift Control and Shift Lever/Selector Lever Cable Components

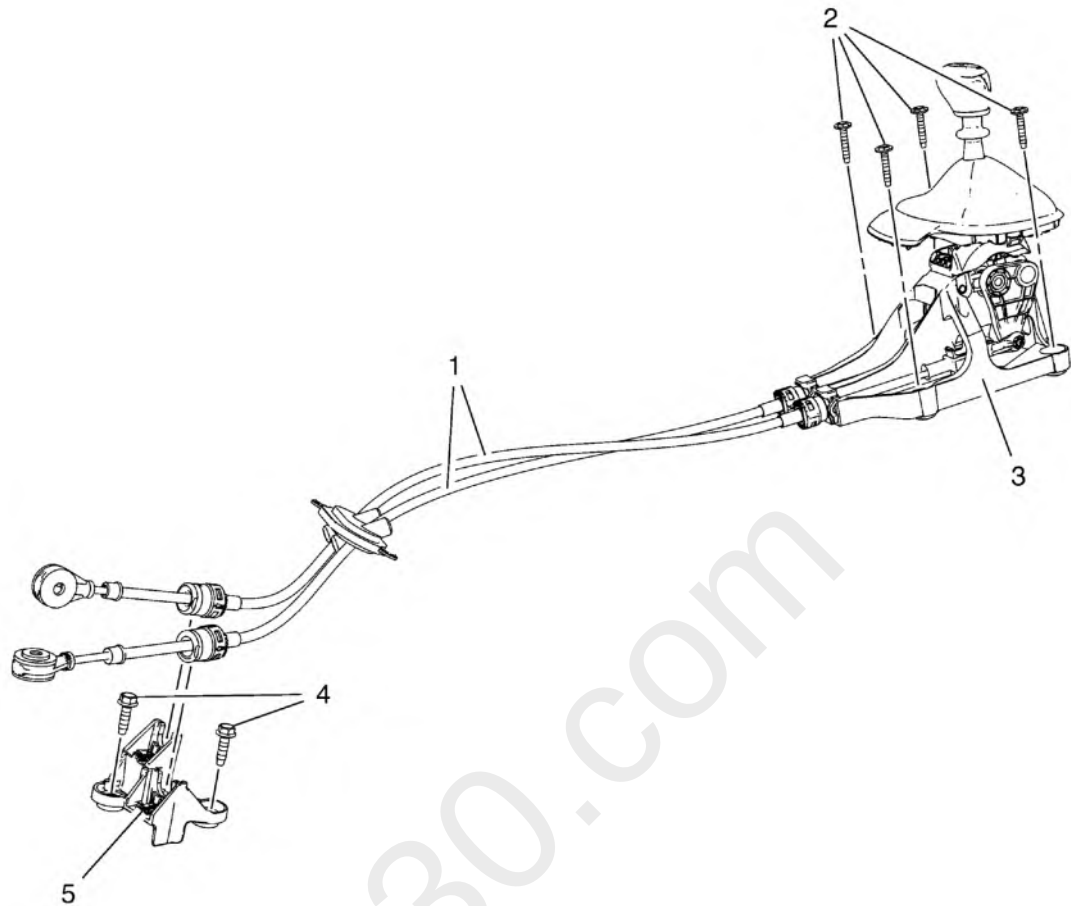


Fig. 2: Shift Control and Shift Lever/Selector Lever Cable Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Transmission Shift Lever and Selector Lever Cable
2	Shift Control Housing Bolts (Qty: 4)
3	Shift Control Housing
4	Manual Transmission Selector and Shift Lever Cable Bracket Bolts (Qty: 2)
5	Manual Transmission Selector and Shift Lever Cable Bracket

Shift Shaft Components

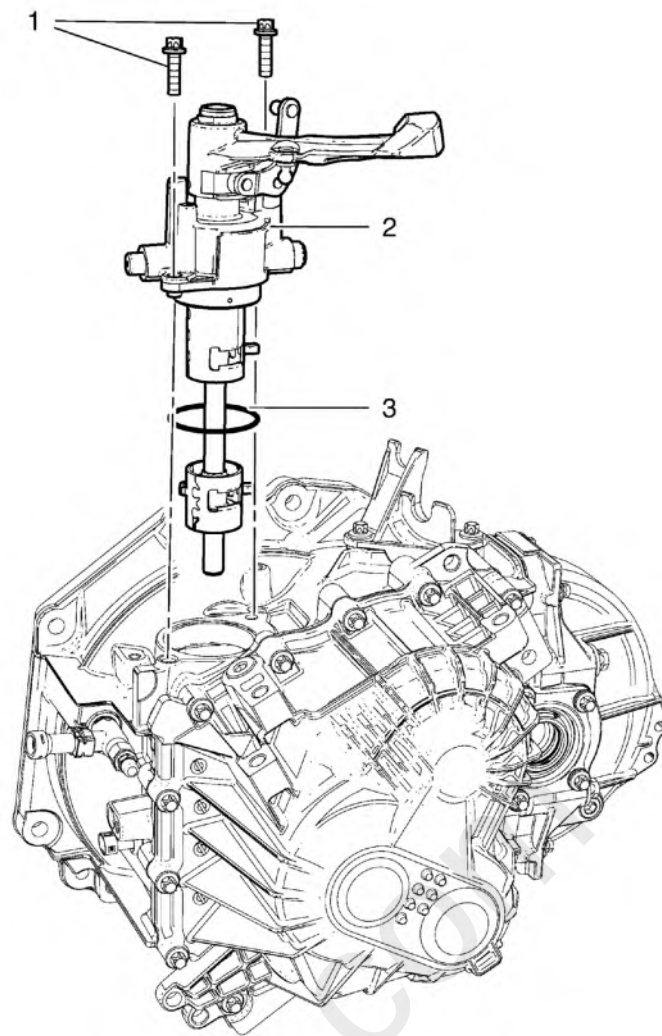


Fig. 3: Shift Shaft Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Shift Shaft Bolts (Qty: 2)
2	Shift Shaft
3	Shift Shaft O-Ring

Clutch Housing Components - Right Hand View

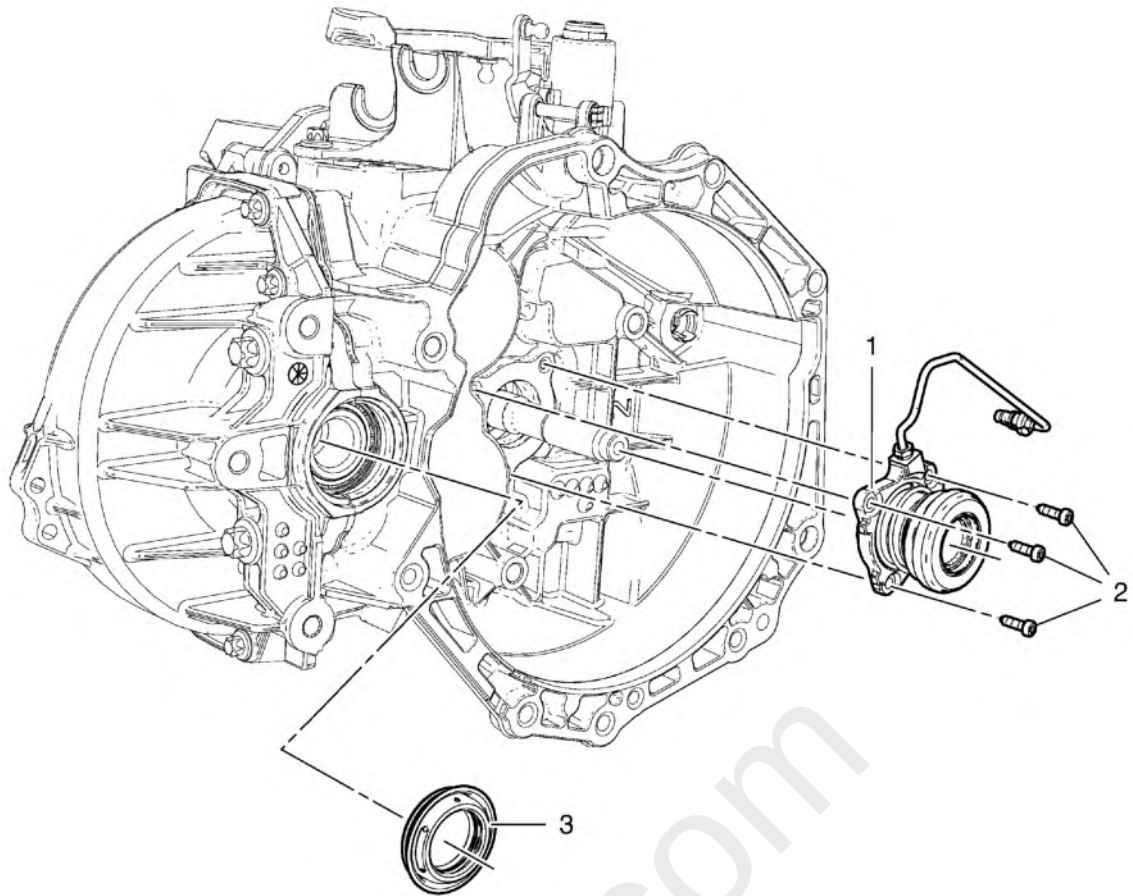


Fig. 4: Clutch Housing Components - Right Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Clutch Actuator Cylinder
2	Clutch Actuator Cylinder Bolts (Qty: 3)
3	Front Wheel Drive Shaft Oil Seal

Clutch Housing Components- Left Hand View

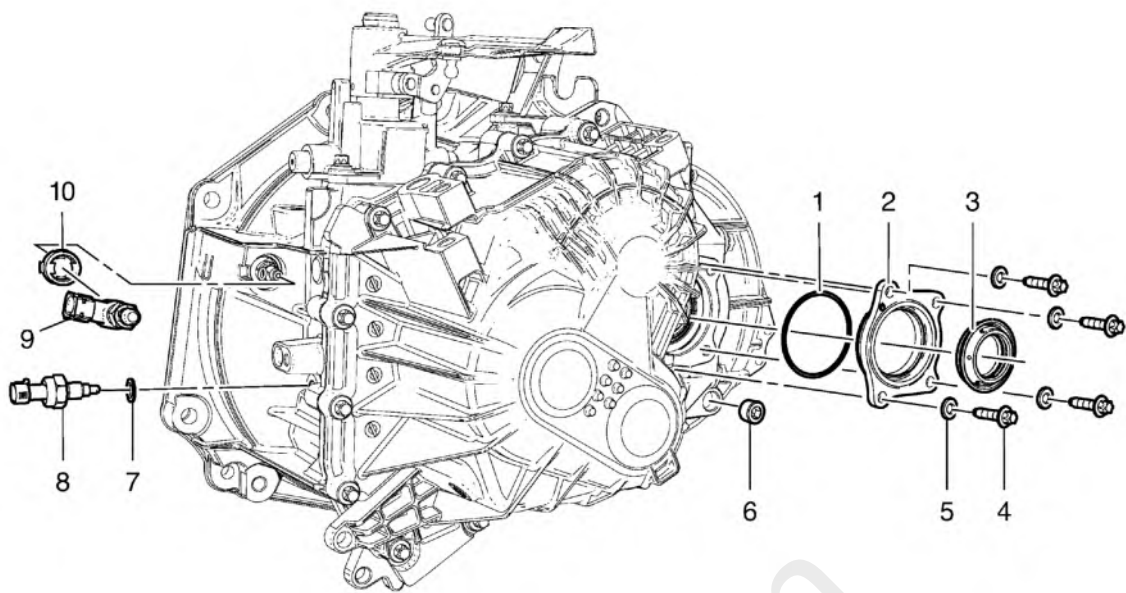


Fig. 5: Locating Clutch Housing Components - Left Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier Flange Seal
2	Front Differential Carrier Flange
3	Front Wheel Drive Shaft Oil Seal
4	Front Differential Carrier Flange Bolts (Qty: 4)
5	Front Differential Carrier Flange Bolt Washers (Qty: 4)
6	Transmission Oil Drain Plug
7	Backup Lamp Switch Washer
8	Backup Lamp Switch
9	Clutch Actuator Cylinder Pipe Elbow
10	Clutch Actuator Cylinder Pipe Sleeve

Transmission Housing Components

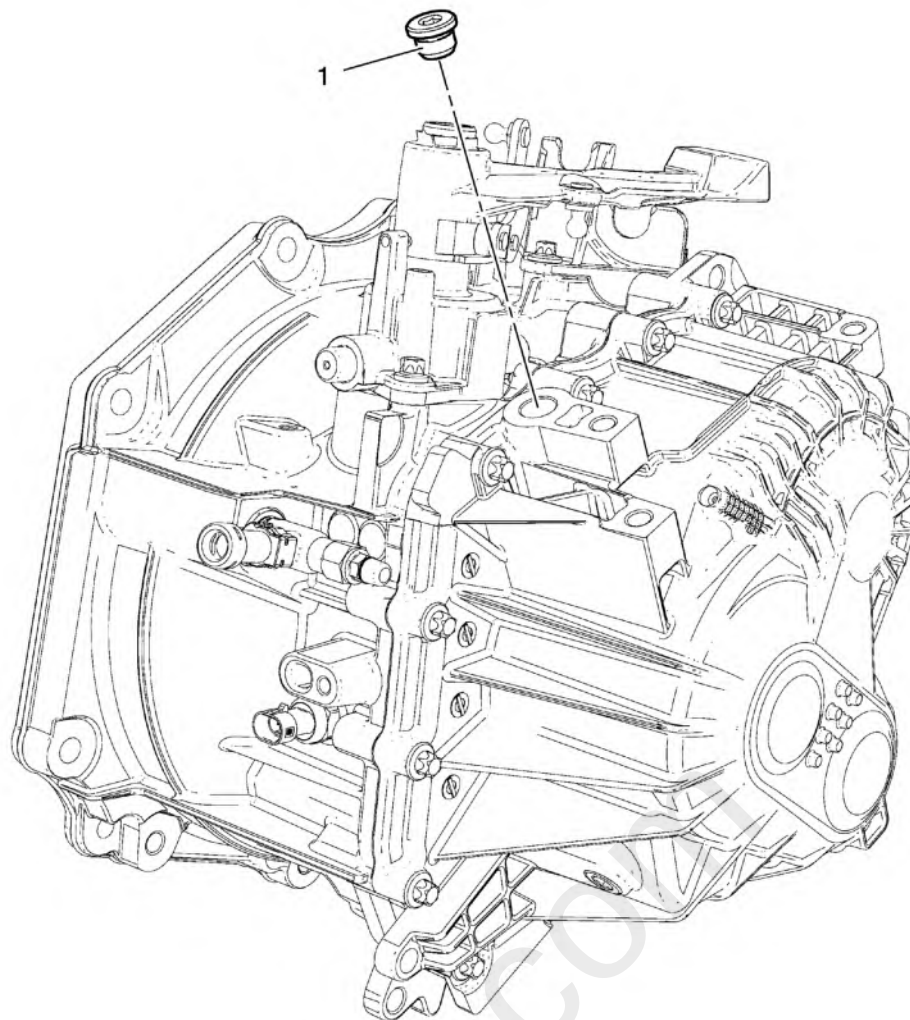


Fig. 6: Transmission Housing Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transmission Oil Filler Plug

Transmission Shafts Overview

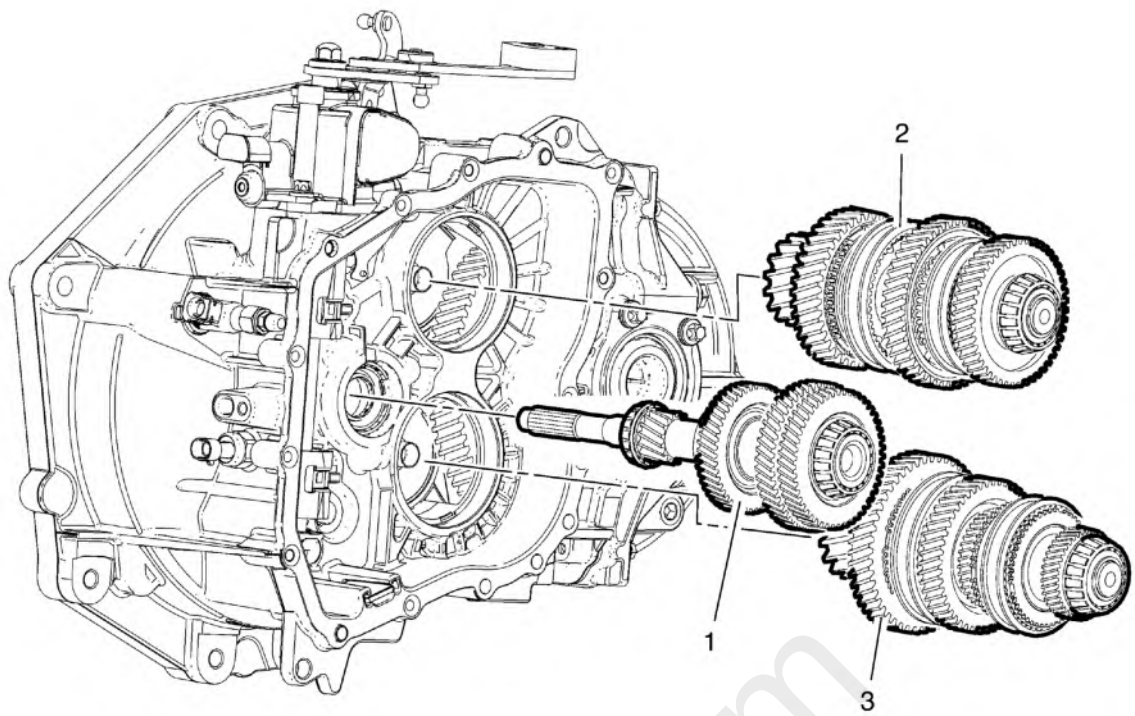


Fig. 7: Transmission Shafts

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Upper Main Shaft
3	Lower Main Shaft

Input Shaft

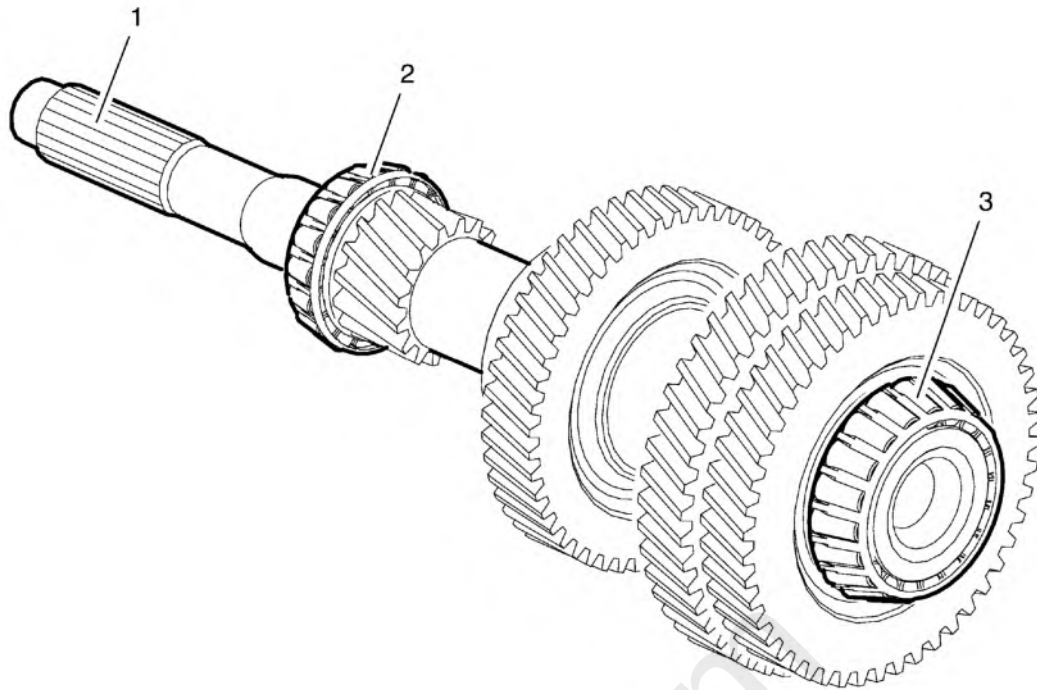


Fig. 8: Input Shaft

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Inner Bearing
3	Outer Bearing

Upper Main Shaft

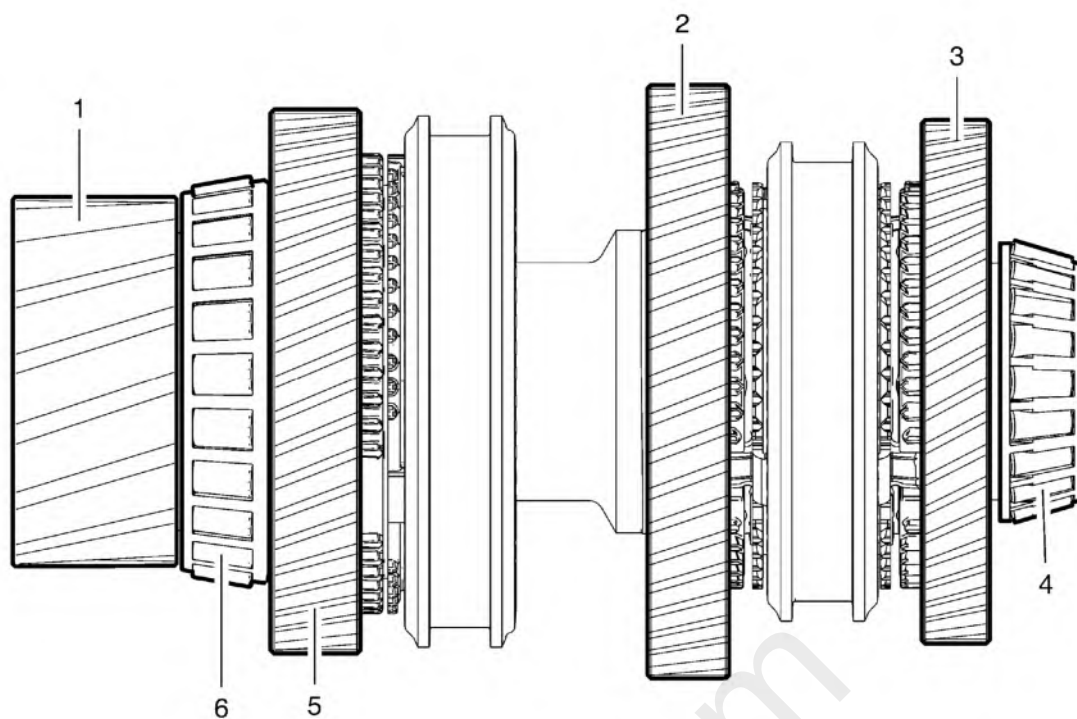


Fig. 9: Upper Main Shaft

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Upper Main Shaft
2	3rd Gear Gearwheel
3	4th Gear Gearwheel
4	Outer Bearing
5	Reverse Gear Gearwheel
6	Inner Bearing

Lower Main Shaft

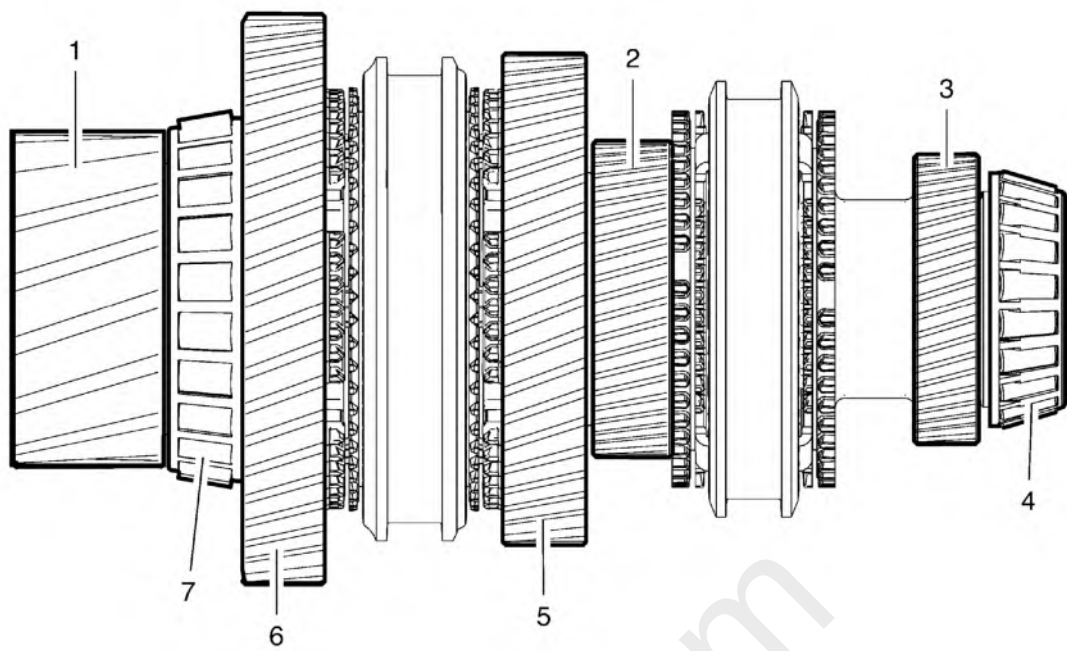


Fig. 10: Lower Main Shaft

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Lower Main Shaft
2	5th Gear Gearwheel
3	6th Gear Gearwheel
4	Outer Bearing
5	2nd Gear Gearwheel
6	1st Gear Gearwheel
7	Inner Bearing

1st / 2nd Gear Synchronizer

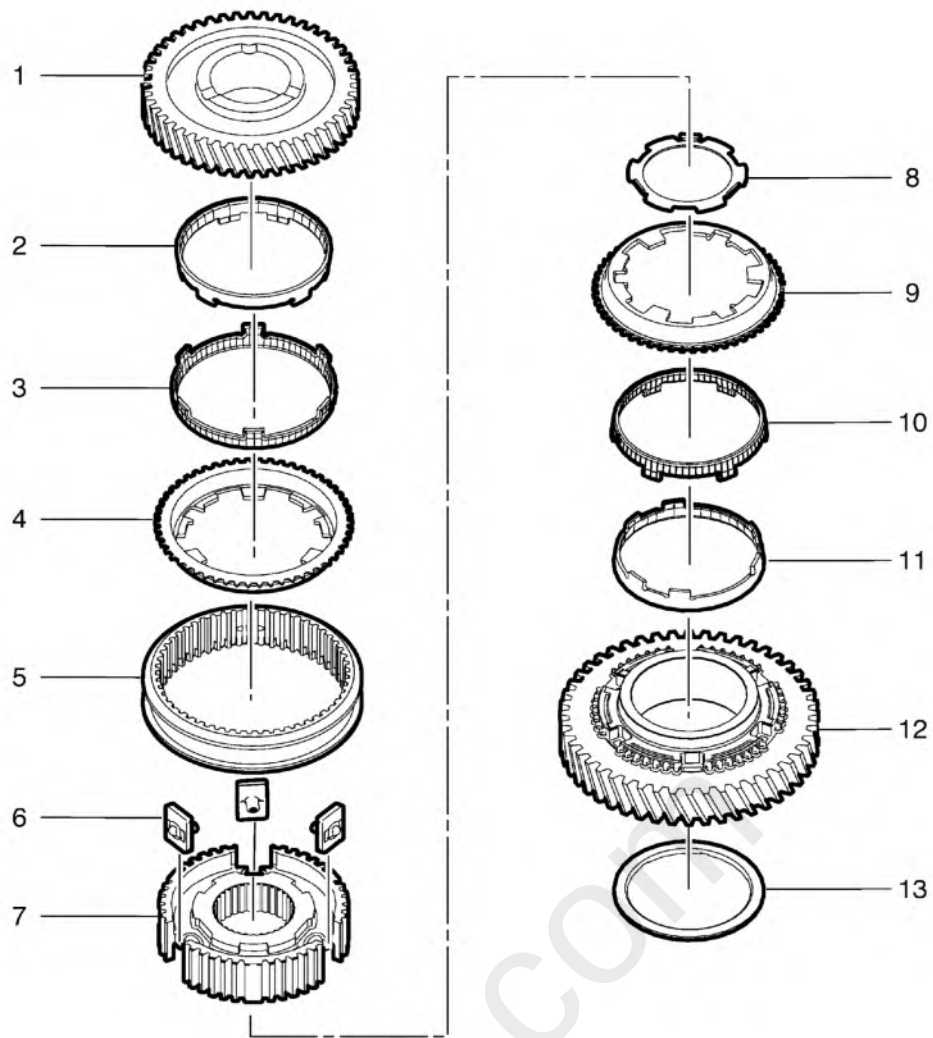


Fig. 11: 1st/2nd Gear Synchronizer

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2nd Gear Gearwheel
2	2nd Gear Inner Synchronizer Ring
3	2nd Gear Middle Synchronizer Ring
4	2nd Gear Outer Synchronizer Ring
5	1st/2nd Gear Selector Sleeve
6	Spring Catches
7	1st/2nd Gear Sleeve Carrier
8	Spacer
9	1st Gear Outer Synchronizer Ring
10	1st Gear Middle Synchronizer Ring
11	1st Gear Inner Synchronizer Ring
12	1st Gear Gearwheel
13	1st Gear Axial Needle Bearing

3rd/4th Gear Synchronizer

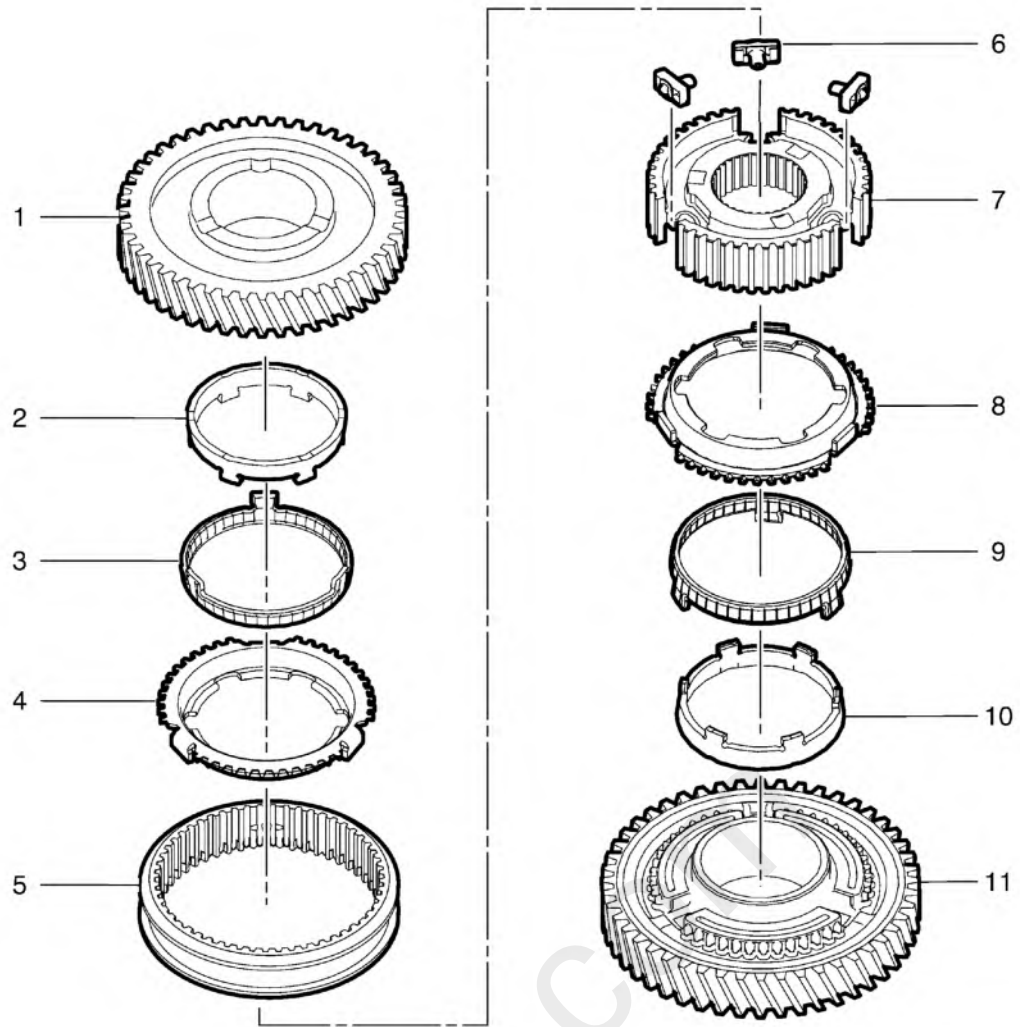


Fig. 12: 3rd/4th Gear Synchronizer
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	4th Gear Gearwheel
2	4th Gear Inner Synchronizer Ring
3	4th Gear Middle Synchronizer Ring
4	4th Gear Outer Synchronizer Ring
5	3rd/4th Gear Selector Sleeve
6	Spring Catches
7	3rd/4th Gear Sleeve Carrier
8	3rd Gear Outer Synchronizer Ring
9	3rd Gear Middle Synchronizer Ring
10	3rd Gear Inner Synchronizer Ring
11	3rd Gear Gearwheel

5th / 6th Gear Synchronizer

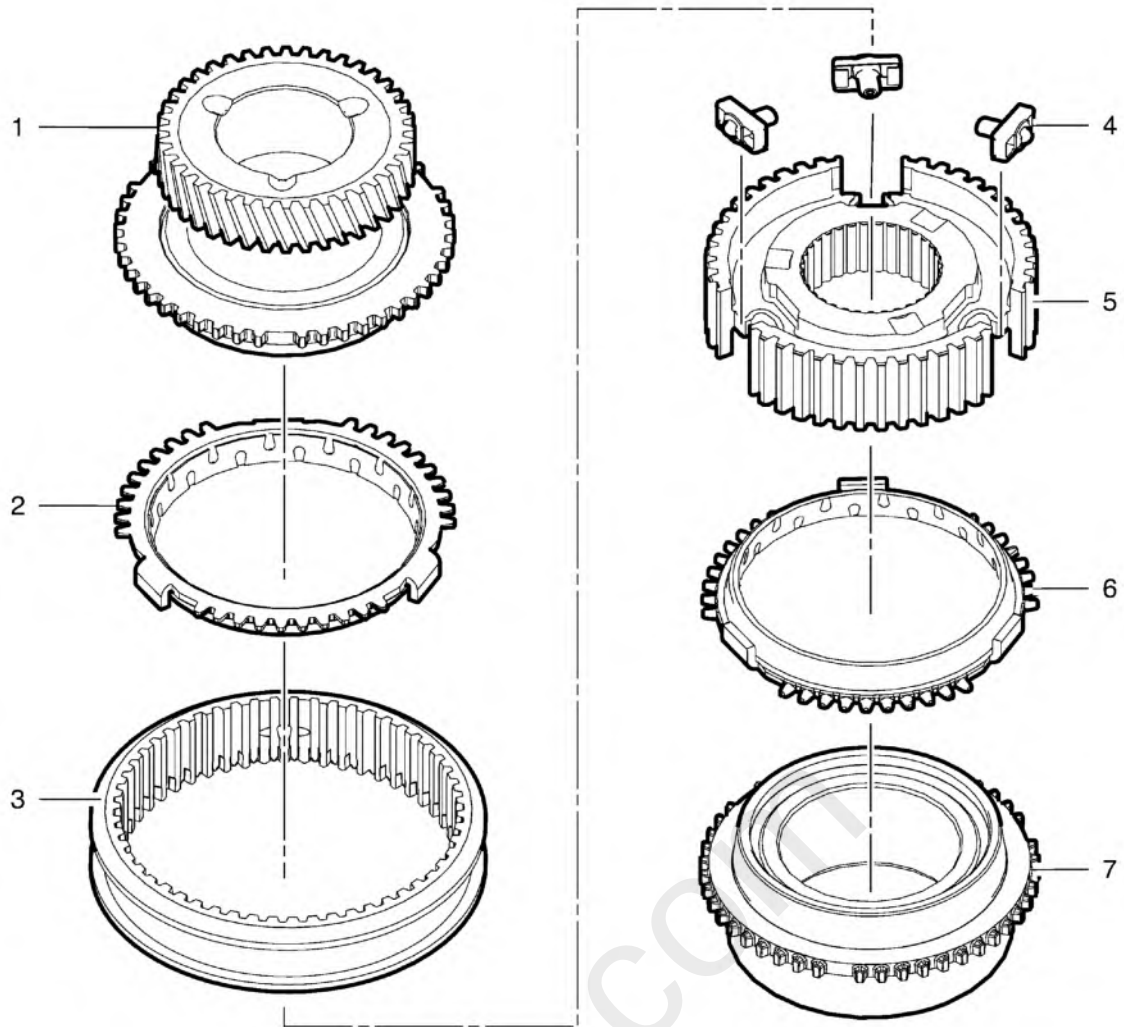


Fig. 13: 5th/6th Gear Synchronizer

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	6th Gear Gearwheel
2	6th Gear Synchronizer Ring
3	5th/6th Gear Selector Sleeve
4	Spring Catches
5	5th/6th Gear Sleeve Carrier
6	5th Gear Synchronizer Ring
7	5th Gear Gearwheel

Reverse Gear Synchronizer

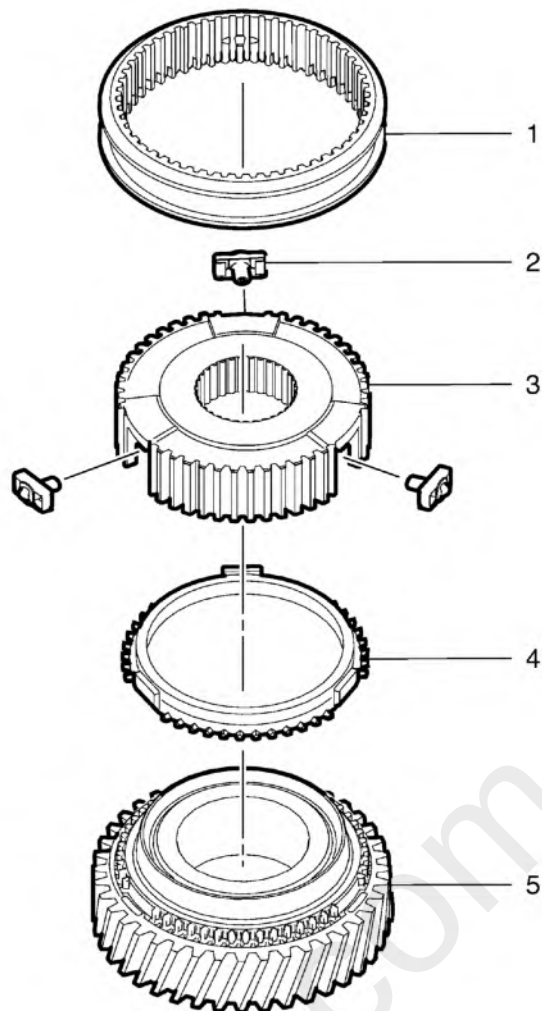


Fig. 14: Reverse Gear Synchronizer

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Reverse Gear Selector Sleeve
2	Spring Catches
3	Reverse Gear Sleeve Carrier
4	Reverse Gear Synchronizer Ring
5	Reverse Gear Gearwheel

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0502 OR P0503: VEHICLE SPEED SENSOR

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 P0502

Vehicle Speed Sensor (VSS) Circuit Low Voltage

DTC P0503

Vehicle Speed Sensor (VSS) Circuit Intermittent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0651, P0502	P0502	P0651, P0502	-
Signal	P0502	P0502	P0502	P0503
Low Reference	-	P0502	-	-

Typical Scan Tool Data

Vehicle Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle driving.			
Vehicle Speed Sensor Parameter Normal Range: Between 1 kmh (0.6 mph)-254 kmh (158 mph).			
5 V Reference	0 kmh (0 mph)	0 kmh (0 mph)	0 kmh (0 mph)
Signal	0 kmh (0 mph)	0 kmh (0 mph)	0 kmh (0 mph)
Low Reference	-	0 kmh (0 mph)	-

Circuit/System Description

The vehicle speed sensor (VSS) is a 3 wire sensor. The engine control module (ECM) provides a 5 volt reference circuit, low reference circuit and a signal circuit to the VSS. The VSS is a Hall Effect type sensor that produces a square wave output signal to the ECM. As vehicle speed increases, the output frequency of the VSS signal increases. The ECM converts the square wave output signal into vehicle speed shown as km/h (MPH). The ECM supplies the VSS signal to other control modules on the vehicle through the serial data communications circuit.

Conditions for Running the DTC

P0502

- DTC P0503 is not set.
- Accelerator pedal position is more than 8%.
- Engine is running.
- System voltage is 9-32 V.
- Engine speed is 1, 500-6, 500 RPM.
- Engine torque is greater than 54 Nm (40 lb ft).
- DTC runs continuously when the above conditions are met.

P0503

- System voltage is 9-32 V.
- Engine speed is 200-7, 500 RPM.
- Transmission output speed is at least 292 RPM for 5 s.
- Transmission output shaft speed change is less than 124 RPM for 5 s.
- DTC runs continuously when the above conditions are met.

Conditions for Setting the DTC

P0502

The transmission output shaft speed is 60 RPM or less for 4.5 s.

P0503

The transmission output shaft speed drops 350 RPM in less than 3 s.

Action Taken When the DTC Sets

- {Model year 14 and older} DTCs P0502, P0503 are Type B DTCs.
- {Model year 15 and newer} DTCs P0502, P0503 are Type A DTCs.

Conditions for Clearing the DTC

- {Model year 14 and older} DTCs P0502, P0503 are Type B DTCs.
- {Model year 15 and newer} DTCs P0502, P0503 are Type A DTCs.

Diagnostic Aids

- The battery must be fully charged. Refer to [Battery Inspection/Test](#).
- Remove and inspect the B115 Vehicle Speed Sensor for metal debris on the output shaft facing end of the sensor.
- Inspect the transmission output shaft target wheel teeth for damage.
- Visually inspect the B115 Vehicle Speed Sensor for cracks or damage.
- Ensure the B115 Vehicle Speed Sensor is not loose and is properly torqued to the transmission.
- When a speed sensor fault is present, the scan tool Output Shaft Speed Sensor parameter may show a defaulted processed speed, based on another source such as Antilock Brake System (ABS) wheel speed. Use of this parameter is not recommended for fault diagnosis.

Reference Information

Schematic Reference

Manual Transmission Schematics (Manual Transmission (Chevrolet with LUV and MM3))

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE) COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Transmission System Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

K20 Engine Control Module: Scan Tool Information

Special Tools

J-38522-A Vehicle Signal Generator

For equivalent regional tools, refer to [Special Tools](#).

Circuit/System Verification

1. Ignition ON.
2. Verify DTC P0651 is not set
 - If DTC P0651 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

- If DTC P0651 is not set

CAUTION:

Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the

3. Raise and support the drive wheels in a horizontal position.
4. Start and idle the engine.
5. Place the transmission in second gear and release the clutch pedal.
6. Verify the scan tool Vehicle Speed Sensor parameter increases as the drive wheel speed increases.
 - **If the Vehicle Speed Sensor parameter does not increase**

Refer to Circuit/System Testing.

- **If the Vehicle Speed Sensor parameter does increase**
7. Operate the vehicle within the conditions for running the DTC to verify the DTC does not set. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B115 Vehicle Speed Sensor. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Disconnect the X3 harness connector at the K20 Engine Control Module.
 2. Test for less than 2 Ω in the circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 1 and ground.
 - **If less than 4.8 V**
 1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the 5 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If greater than 5.2 V**
 1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module, Ignition ON.
 2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K20 Engine Control Module.
 - **If between 4.8-5.2 V**
5. Ignition OFF, connect the test leads of the J-38522-A vehicle signal generator as follows:
 - Red test lead to the signal circuit terminal 3 at the B115 Vehicle Speed Sensor wire harness connector.
 - Black test lead to ground at the transmission case.
 - Double black power and ground lead wire to B+ and ground.
6. Set and adjust the J-38522-A vehicle signal generator to the following switch positions:
 - Signal switch to 5 V.
 - Frequency switch to 600 Hz.

- Duty cycle switch to 50% or normal position.

7. Ignition ON.

8. Verify the scan tool Vehicle Speed Sensor parameter displays between 41-51 km/h (25-31 mph).

• **If the vehicle speed sensor parameter is not within the specified range**

1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the signal circuit terminal 3 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω in the signal circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the K20 Engine Control Module.

• **If the vehicle speed sensor parameter is within the specified range**

9. Replace the B115 Vehicle Speed Sensor.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Vehicle Speed Sensor Replacement](#)
- [Control Module References](#) for ECM replacement, programming and setup.

DTC P0806-P0808: CLUTCH PEDAL POSITION (CPP) SENSOR

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 P0806

Clutch Pedal Position (CPP) Sensor Performance

DTC P0807

Clutch Pedal Position (CPP) Sensor Circuit Low Voltage

DTC P0808

Clutch Pedal Position (CPP) Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0651, P0807	P0807	P0651, P0808	-
Signal	P0807	P0807	P0808	P0806
Low Reference	-	P0808	-	-

Typical Scan Tool Data

CPP Sensor Voltage

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON. CPP Sensor Voltage Parameter Normal Range: 1 V with clutch pedal applied to 4 V when clutch pedal is released.			
5 V Reference	0 V	0 V	5 V
Signal	0 V	0 V	5 V

Circuit	Short to Ground	Open	Short to Voltage
Low Reference	-	5 V	-

CPP Sensor Percentage

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON. CPP Sensor Percent Parameter Normal Range: 0% with clutch pedal released to 100% when clutch pedal is applied.			
5 V Reference	100%	100%	0%
Signal	100%	100%	0%
Low Reference	-	0%	-

Circuit/System Description

The clutch pedal position (CPP) sensor is a three wire sensor, connected to a 5 V reference circuit, a low reference circuit, and a signal circuit. The engine control module supplies 5 V to the CPP sensor, and also provides a sensor ground path on the low reference circuit. The CPP sensor sends a voltage signal to the ECM on the signal circuit. The voltage on the signal circuit will vary from a voltage near 4 V when the clutch pedal is released, to a voltage near 1 V when the clutch pedal is applied.

Conditions for Running the DTC

P0806

- DTC P0335, P0336, P0502, P0503, P0807, or P0808 is not set.
- The engine is running with transmission in gear.
- The vehicle speed is greater than 1.9 kmh (1.2 mph).

P0807 and P0808

- The ignition is ON.
- The system voltage is more than 10 V.

Conditions for Setting the DTC

P0806

The CPP sensor is stuck in range.

P0807

The CPP sensor voltage is less than 0.2 V for more than 1 s.

P0808

The CPP sensor voltage is more than 4.8 V for more than 1 s.

Action Taken When the DTC Sets

DTC P0806 - P0808 are Type A DTCs.

Conditions for Clearing the DTC

DTC P0806 - P0808 are Type A DTCs.

Reference Information

Schematic Reference

Manual Transmission Schematics (Manual Transmission (Chevrolet with LUV and MM3))

Connector End View Reference

Description and Operation

Transmission System Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

K20 Engine Control Module: Scan Tool Information for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC P0651 or P080A is not set
 - **If DTC P0651 or P080A is set**
Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**.
 - **If DTC P0651 or P080A is not set**
3. Verify the scan tool CPP Sensor percent parameter varies from 0% when the clutch pedal is released, to 100% when the clutch pedal is in the apply position.
 - **If the percentage does not vary from 0% to 100%**
Refer to Circuit/System Testing.
 - **If the percentage varies from 0% to 100%**
4. Operate the vehicle within the conditions for running the DTC to verify the DTC does not set. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
 - **If the DTC sets**
Refer to Circuit/System Testing.
 - **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the B25B Clutch Pedal Position Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the low reference circuit terminal C and ground.
 - **If 5 Ω or greater**
 1. Disconnect the X3 harness connector at the K20 Engine Control Module.
 2. Test for less than 2 Ω in the circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If less than 5 Ω**
3. Ignition ON.
4. Test for 4.8-5.2 V between the 5 V reference circuit terminal A and ground.

- **If less than 4.8 V**

1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.
2. Test for infinite resistance between the 5 V reference circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the 5 V reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.

- **If greater than 5.2 V**

1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module, Ignition ON.
2. Test for less than 1 V between the 5 V reference circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K20 Engine Control Module.

- **If between 4.8-5.2 V**

5. Verify the scan tool CPP Sensor voltage parameter is less than 0.1 V.

- **If 0.1 V or greater**

1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module, Ignition ON.
2. Test for less than 1 V between the signal circuit terminal B and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K20 Engine Control Module.

- **If less than 0.1 V**

6. Install a 3 A fused jumper wire between the signal circuit terminal B and the 5 V reference circuit terminal A.
7. Verify the scan tool CPP Sensor voltage parameter is greater than 4.9 V.

- **If 4.9 V or less**

1. Ignition OFF, remove the jumper wire, disconnect the X3 harness connector at the K20 Engine Control Module.
2. Test for infinite resistance between the signal circuit terminal B and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.

- **If greater than 4.9 V**

8. Test or replace the B25B Clutch Pedal Position Sensor.

Component Testing

Static Test

1. Ignition OFF, disconnect the harness connector of the B25B Clutch Pedal Position Sensor.
2. Measure the resistance between the signal terminal B and the low reference terminal C at the B25B Clutch Pedal Position Sensor. Depress the clutch pedal through the entire range. The resistance should vary from low to high and vice versa without any spikes or dropouts.

- **If the resistance is erratic with spikes or dropouts**

Replace the B25B Clutch Pedal Position Sensor.

- **If the resistance is not erratic without spikes or dropouts**

3. All OK.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- **[Clutch Pedal Position Sensor Replacement](#)**

- [Control Module References](#) for ECM replacement, programming and setup.

DTC P080A: CLUTCH PEDAL POSITION (CPP) NOT LEARNED

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 P080A

Clutch Pedal Position (CPP) Not Learned

Circuit/System Description

The clutch pedal position (CPP) is a 3-wire sensor, connected to a 5 V reference circuit, a low reference circuit, and a signal circuit. The engine control module supplies 5 V to the CPP sensor, and also provides a sensor ground path on the low reference circuit. The CPP sensor sends a voltage signal to the ECM on the signal circuit. The voltage on the signal circuit will vary from a voltage near 4 V when the clutch pedal is released to a voltage near 1 V when the clutch pedal is applied.

Conditions for Running the DTC

Ignition is ON.

Conditions for Setting the DTC

CPP sensor learned apply position not learned.

Action Taken When the DTC Sets

P080A is a Type A DTC.

Conditions for Clearing the DTC

P080A is a Type A DTC.

Reference Information

Schematic Reference

Manual Transmission Schematics (Manual Transmission (Chevrolet with LUV and MM3))

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX (ENCORE). COMPONENT CONNECTOR END VIEWS - INDEX (TRAX)

Description and Operation

Transmission System Description and Operation

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

K20 Engine Control Module: Scan Tool Information

Circuit/System Verification

1. Ignition ON.
2. Verify DTC P0651, P0806, P0807, or P0808 is not set.

- **If DTC P0651, P0806, P0807, or P0808 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- **If DTC P0651, P0806, P0807, or P0808 is not set**

3. Perform the clutch pedal position sensor learn procedure.

- **If the clutch pedal position sensor learn was not successful**

Refer to Circuit/System Testing.

- **If the clutch pedal position sensor learn was successful**

4. Ignition ON.

5. Verify DTC P080A ran and passed this ignition cycle. Operate the vehicle within the conditions for running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records.

- **If the scan tool indicates DTC P080A failed**

Refer to Circuit/System Testing.

- **If the scan tool indicates DTC P080A ran and passed this ignition cycle**

6. All OK.

Circuit/System Testing

1. Verify the clutch pedal is not loose and is properly torqued. Refer to [Clutch Pedal Replacement](#) .

- **If a condition is found with the clutch pedal**

Repair or replace as necessary.

- **If no condition is found with the clutch pedal**

2. Replace the K20 Engine Control Module.

Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the repair.

- [Clutch Pedal Position Learn](#)
- [Control Module References](#) for replacement, programming and setup.

SYMPTOMS - MANUAL TRANSMISSION

Complaint/Condition	Possible Cause	correction
Knock at Low Speeds	• Worn drive axle joint • Worn side gear or pinion gear bores	• Inspect drive axle joint and replace if necessary. • Inspect differential case and replace if necessary.
Noisy Around Turns	Worn differential gears	Inspect differential gears and replace if necessary.

Complaint/Condition	Possible Cause	correction
Clunk or Acceleration or Deceleration	- Loose engine mounts - Worn inboard drive axle joint - Worn differential pinion shaft - Worn side gear hub counterbore	- Inspect engine mounts and tighten if necessary. - Inspect inboard drive axle joint and replace if necessary. - Inspect differential pinion shaft and replace if necessary. - Inspect side gear hub counterbore and replace if necessary.
Click Noise On Turns	Worn outboard drive axle C/V joint	Inspect C/V joint and replace if necessary.
Noisy in Neutral With Engine Running	- Worn input gear bearing - Worn speed gear bearing - Worn bearing races	- Inspect bearing and replace if necessary. - Inspect bearing and replace if necessary. - Inspect bearing race and replace if necessary.
Noisy in First Gear Only	- Worn, chipped, or scored 1st speed constant-mesh gears - Worn, shipped, or scored 1st/2nd synchronizer	- Inspect gears and replace if necessary. - Inspect synchronizer and replace if necessary.
Noisy in Second Gear Only	- Worn, chipped, or scored 2nd speed constant-mesh gears - Worn, chipped, or scored 1st/2nd synchronizer	- Inspect gears and replace if necessary. - Inspect synchronizer and replace if necessary.
Noisy in Third Gear Only	- Worn, chipped, or scored 3rd speed constant-mesh gears - Worn, chipped, or scored 3rd/4th synchronizer	- Inspect gears and replace if necessary. - Inspect synchronizer and replace if necessary.
Noisy in Fourth Gear Only	- Worn, chipped, or scored 4th speed constant-mesh gears - Worn, chipped, or scored 3rd/4th synchronizer - Worn, chipped, or scored output gear - Worn, chipped, or scored output gear	- Inspect gears and replace if necessary. - Inspect synchronizer and replace if necessary. - Inspect gear and replace if necessary. - Inspect gear and replace if necessary.

Complaint/Condition	Possible Cause	correction
Noisy in Fifth Gear Only	- Worn, chipped, or scored 5th speed constant-mesh gears - Worn, chipped, or scored 5th synchronizer - Worn, chipped, or scored output gear	- Inspect gears and replace if necessary. - Inspect synchronizer and replace if necessary. - Inspect gear and replace if necessary.
Noisy in Reverse Only	- Worn, chipped, or scored reverse speed constant-mesh gears - Worn or damaged output gear	- Inspect gear and replace if necessary. - Inspect gear and replace if necessary.
Noisy in All Gears	- Fluid level low - Worn or damaged wheel bearings - Worn, chipped, or scored input/output shaft gear - Worn output gear bearing - Loose shift rail guide bolt - Worn, chipped, or scored 1st, 2nd, 3rd, 4rd, 5th, or Reverse gears.	- Add fluid to proper level. - Inspect wheel bearing and replace if necessary. - Inspect gear and replace if necessary. - Inspect output gear bearing and replace if necessary. - Tighten shift rail guide bolt. - Inspect components and replace as necessary.
Slips Out of Gear	- Loose transaxle mounts - Bent or worn cables - Broken or loose input gear bearing retainer - Worn or bent shift fork - Dirty clutch housing and engine - Stiff shift lever seal - Manual transaxle internal shift mechanism malfunction	- Tighten or replace mounts. - Inspect cables and replace if necessary. - Inspect shift fork and replace if necessary. - Inspect shift fork and replace if necessary. - Clean clutch housing and engine. - Inspect seal and replace if necessary. - Disassemble transaxle, repair as necessary.

Complaint/Condition	Possible Cause	correction
Slips Out of Gear While Accelerating	• Missing or misadjusted first gear thrust bearing or washer • Worn or damaged first gear spline lock on 1st/2nd synchronizer • Worn or damaged second gear spline lock on 1st/2nd synchronizer • Worn or damaged third gear spline lock on 3rd/4th synchronizer • Worn or damaged fourth gear spline lock on 3rd/4th synchronizer • Worn or damaged 5th gear spline lock on the 5th/Reverse synchronizer • Worn or damaged Reverse gear spline lock on the 5th/Reverse synchronizer • Worn or damaged 1st, 2nd, 3rd, 4th, 5th or reverse gear spline lock • Manual transaxle internal shift mechanism malfunction	• Inspect bearing and washer and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Inspect spline lock and replace if necessary. • Disassemble transaxle, repair as necessary.
Slips Out of Gear While Coasting	• Damaged, worn, or missing shift rails • Manual transaxle internal shift mechanism malfunction	• Inspect shift rails and replace if necessary. • Disassemble transaxle, repair as necessary.
Fluid Leakage	• Fluid level high • Damaged axle shaft seals • Vent cap plugged • Poor sealing on shift cover • Poor sealing between case and clutch housing • Poor sealing on rear cover • Poor sealing or loose back-up lamp switch • Poor sealing or loose vehicle speed sensor	• Drain excess fluid. • Inspect axle shaft seals and replace if necessary. • Clear or replace vent cap. • Replace sealer on shift cover. • Replace sealer between case and clutch housing and tighten. • Replace sealant on rear cover and tighten. • Tighten switch or replace sealant as needed. • Tighten sensor or replace sealant as needed.

TRANSMISSION SHIFTS HARD

Diagnostic Aids

An intermittent hard shift may be caused by an intermittent clutch condition.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

3

A static shift test is performed by shifting into all of the gear positions with the engine not operating. While performing the test one should note how the shift lever movement is felt. Also while shifting from one gear to the other feel for binding in the shift rails. You should be able to feel the detent plungers operating when coming out of a gear and going into a gear.

6

A dynamic shift test is performed by shifting into the gear positions with the engine operating. Test for the correct mesh of the synchronizers and for the clutch releasing correctly. When shifting into and out of a gear, feel for the shift detent plungers and for the synchronizers sleeve for moving freely.

8

The transmission uses a synthetic transmission fluid that allows proper synchronizer operation. The incorrect fluid may cause hard shifting by varnish build-up, or not enough lubrication for proper synchronizer operation.

Step	Action	Yes	No
DEFINITION: The transmission does not shift smoothly, or without difficulty, from one gear to the other.			
1	Did you review the Symptoms - Manual Transmission and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Manual Transmission
2	Inspect the clutch system for proper operation. Refer to Clutch System Description and Operation . Did you find or repair the condition?	Go to Step 12	Go to Step 3
3	1. Perform a static shift test on the transmission. 2. Test for the following: • Blockage preventing full shift lever movement • Excessive movement in the shift lever • Binding in the shift lever • Detent plungers or shift rails binding • Shift cable binding • Shift cable proper adjustment Are you able to shift into all gears?	Go to Step 6	Go to Step 4
4	1. Remove the floor console. Refer to Front Floor Console Replacement (Buick) Front Floor Console Replacement (Chevrolet) . 2. Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to Step 12	Go to Step 5
5	Inspect for proper shift cable adjustment. Refer to Manual Transmission Shift Lever and Selector Lever Cable Adjustment . Did you find and repair the condition?	Go to Step 12	Go to Step 6
6	1. Perform a dynamic shift test on the transmission. 2. Test for the following: • Detent plungers or shift rails binding • Synchronizer sleeve binding • Gear clash into only one gear • Gear clash into all gears Did the transmission shift hard into all gears?	Go to Step 7	Go to Step 11

Step	Action	Yes	No
7	Inspect the transmission for the correct fluid level and type of the transmission fluid. Refer to Transmission Fluid Drain and Fill . Is the transmission at the correct level and the proper fluid being used?	Go to Step 9	Go to Step 8
8	Drain and refill the transmission with the correct type fluid. Refer to Transmission Fluid Drain and Fill . Did you find and repair the condition?	Go to Step 12	Go to Step 9
9	1. Remove the transmission. Refer to Transmission Replacement . 2. Inspect the clutch pressure plate and/or clutch driven plate. Is the clutch pressure plate and/or clutch driven plate worn or faulty?	Go to Step 10	Go to Step 11
10	Replace the clutch assembly. Refer to Clutch Pressure and Driven Plate Replacement (1.4L) , Clutch Pressure and Driven Plate Replacement (1.6L and 1.8L) . Did you find and repair the condition?	Go to Step 12	Go to Step 11
11	Replace the Transmission. Refer to Transmission Replacement . Did you find and repair the condition?	Go to Step 12	Go to Diagnostic Aids
12	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 1

TRANSMISSION GEAR CLASH WHEN SHIFTING GEARS

Diagnostic Aids

Gear clashing may be caused by shifting at too high of an engine RPM or by rushing the shift. If gear clashing is occurring in more than one gear, the clutch may not be releasing properly for proper synchronizer operation.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

2

This step tests for the proper releasing of the clutch. If the clutch reserve is not proper, the mainshaft gears may still be turning causing the gear clashing.

5

This step inspects for the proper transaxle fluid. A special fluid is required for the correct lubrication of the synchronizers.

7

A static shift test is performed by shifting into all of the gear positions with the engine not operating. While performing the test, you should note how the shift lever movement is felt. Also, while shifting from one gear to another, feel for binding in the shift rails. You should be able to feel the detent plungers operating when coming out of a gear and going into a gear. Excessive play in the gear shift lever may prevent the shift forks from fully engaging the synchronizer.

10

A dynamic shift test is performed by shifting into all of the gear positions with the engine operating. Test for the correct mesh of the synchronizers, and for the clutch releasing correctly. Move the shift lever and feel for the synchronizer sleeve to just release from the gear, then let up on the clutch pedal. Depress the clutch pedal and move the shift lever to engage that gear again. If it shifts back into the gear without clashing, the clutch is releasing correctly and the synchronizer is working. If clashing occurs, test on another gear. If all gears clash, the clutch is not releasing correctly.

Step	Action	Yes	No
DEFINITION: Noise from the transaxle when shifting gears. A grinding or grating sound, when the synchronizer sleeve is engaging with the selector teeth on the speed gear. A suspected internal transaxle condition, if the noise only occurs in one gear.			
1	Did you review the Symptoms - Manual Transmission and perform the necessary inspections?	Go to Step 2	Go to Symptoms - Manual Transmission
2	With the engine operating, does the transaxle shift from neutral to any gear, without the vehicle lurching or gear clashing?	Go to Step 5	Go to Step 3
3	Inspect for proper clutch operation. Refer to Clutch System Description and Operation . Does the clutch operate properly?	Go to Step 5	Go to Step 4
4	Repair the clutch system. Refer to Symptoms - Clutch . Did you find and repair the condition?	Go to Step 11	Go to Step 5
5	Inspect for the correct transaxle fluid level and the proper fluid. Refer to Transmission Fluid Drain and Fill . Is the transaxle fluid level correct and at the proper level?	Go to Step 7	Go to Step 6
6	Fill the transaxle to the correct level, or change the transaxle fluid if it is not the correct type. Does the transaxle still have gear clash?	Go to Step 7	Go to Step 11
7	1. Perform a static shift test on the transaxle. 2. Test for the following: • Blockage preventing full shift lever movement • Excessive movement in the shift lever • Binding in the shift lever • Detent plungers or shift rails binding • Shift cable binding • Shift cable proper adjustment Did the transaxle shift smoothly into the gear that is clashing?	Go to Step 10	Go to Step 8
8	Remove the floor console. Refer to Front Floor Console Replacement (Buick) Front Floor Console Replacement (Chevrolet) . Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to Step 12	Go to Step 10
9	Inspect for proper shift cable adjustment. Refer to Manual Transmission Shift Lever and Selector Lever Cable Adjustment . Did you find and repair the condition?	Go to Step 12	Go to Step 10

Step	Action	Yes	No
10	1. Perform a dynamic shift test on the transaxle. 2. Test for the following: • Detent plungers or shift rails binding • Synchronizer sleeve binding • Gear clashing in more than the suspected gear Is the transaxle hard to shift into all gears?	Go to Transmission Shifts Hard	Go to Step 11
11	Replace the transmission Refer to Transmission Replacement . Did you replace the transmission?	Go to Step 12	Go to Diagnostic Aids
12	Operate the system and verify the repair. Did you correct the condition?	System OK	Go to Step 1

CLUTCH PEDAL POSITION LEARN

NOTE: The clutch pedal position (CPP) sensor learn procedure is required when the following service procedures have been performed regardless of whether DTC P080A is set:

- An engine control module (ECM) replacement
- A CPP sensor replacement
- Any repairs which affect the CPP sensor relationship

1. Install a scan tool.
2. Ignition On.
3. Monitor the ECM for DTCs with a scan tool. If other DTCs are set, except DTC P080A, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC that set.

NOTE: The CPP sensor learn procedure cannot be performed more than once per ignition cycle. The clutch pedal needs to be fully depressed and held steady throughout this procedure in order to perform a correct learning.

4. Select:Module Diagnostics
5. Select:Engine Control Module
6. Select:Configuration/Reset Functions
7. Select:Learn Functions
8. Select:Clutch Pedal Position Learn
9. Follow the instructions on the scan tool.
10. The scan tool will display under CPP Learn Status: Not Learned, In Process, Complete / Performed Successfully, Fail - Low Volt, Fail - High Volt, or Fail Moving. The scan tool will display under CPP Learn Status: Complete / Performed Successfully, if the process was successful.
11. If the scan tool indicates that DTC P080A ran and passed this ignition the CPP sensor learn procedure is complete. If the scan tool indicates DTC P080A failed or did not run this ignition, refer to [DTC P080A](#). If any other DTC is set, refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) for the applicable DTC.
12. Turn OFF the ignition for 30 s after the learn procedure has successfully completed in order to store the CPP sensor variation values in ECM history.

REPAIR INSTRUCTIONS - ON VEHICLE

TRANSMISSION FLUID DRAIN AND FILL

Draining Procedure

NOTE:

- The fluid check bolt at the front of the transmission may not be opened.

- The transmission fluid drained out during the pre-delivery inspection may be re-used. New transmission fluid must be used during servicing work.

The transmission fluid must be brought up to operating temperature before draining.

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the front compartment front center insulator, if equipped. Refer to [Front Compartment Front Center Insulator Replacement](#) .

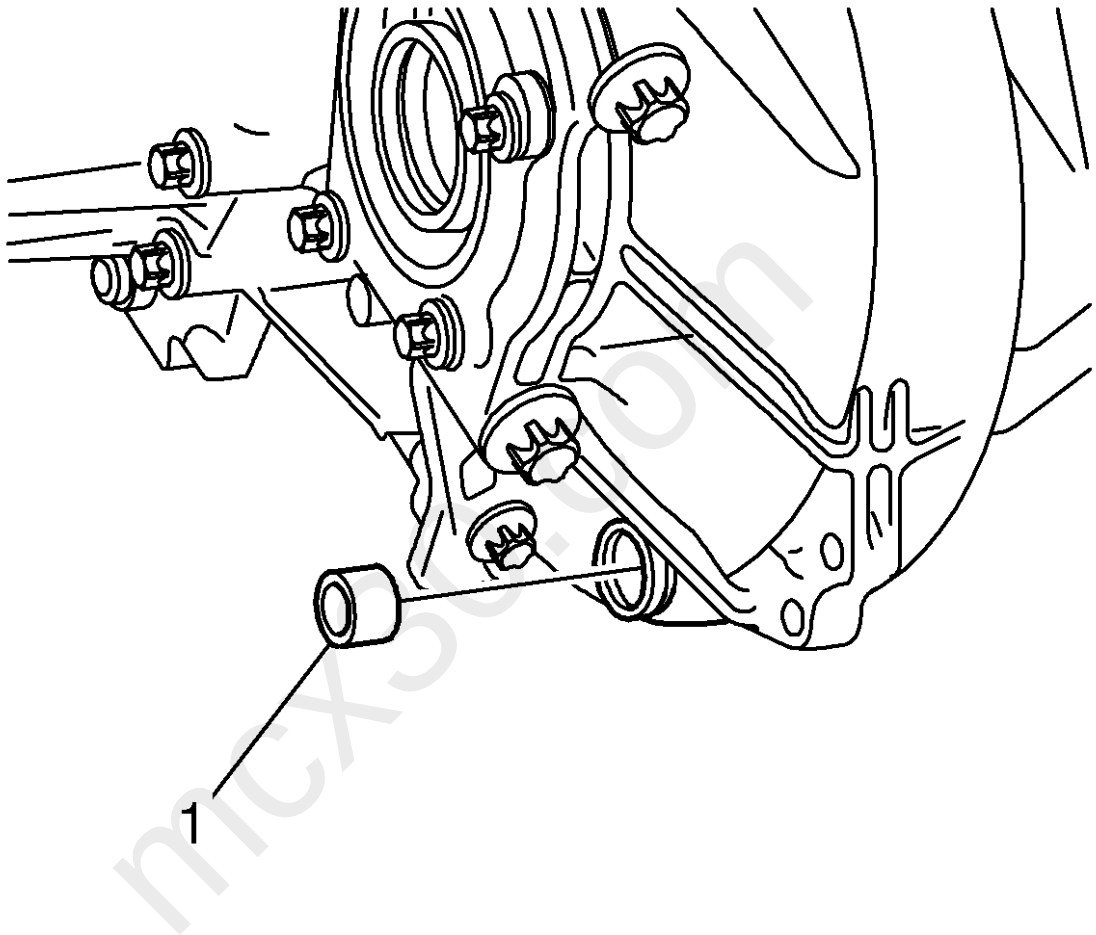


Fig. 15: Transmission Fluid Drain Fastener
Courtesy of GENERAL MOTORS COMPANY

3. Clean away all dirt and debris from the transmission fluid drain fastener area.
4. Position an appropriate container under the transmission.
5. Remove the transmission fluid drain fastener (1).
6. Allow the transmission fluid to drain into the container.

CAUTION: Refer to [Fastener Caution](#) .

7. Install a new transmission fluid drain fastener and tighten to 20 N.m (15 lb ft).
8. Remove the container used to catch the used transmission fluid from under the vehicle.
9. Install the front compartment front center insulator, if equipped. Refer to [Front Compartment Front Center Insulator Replacement](#) .

Filling Procedure

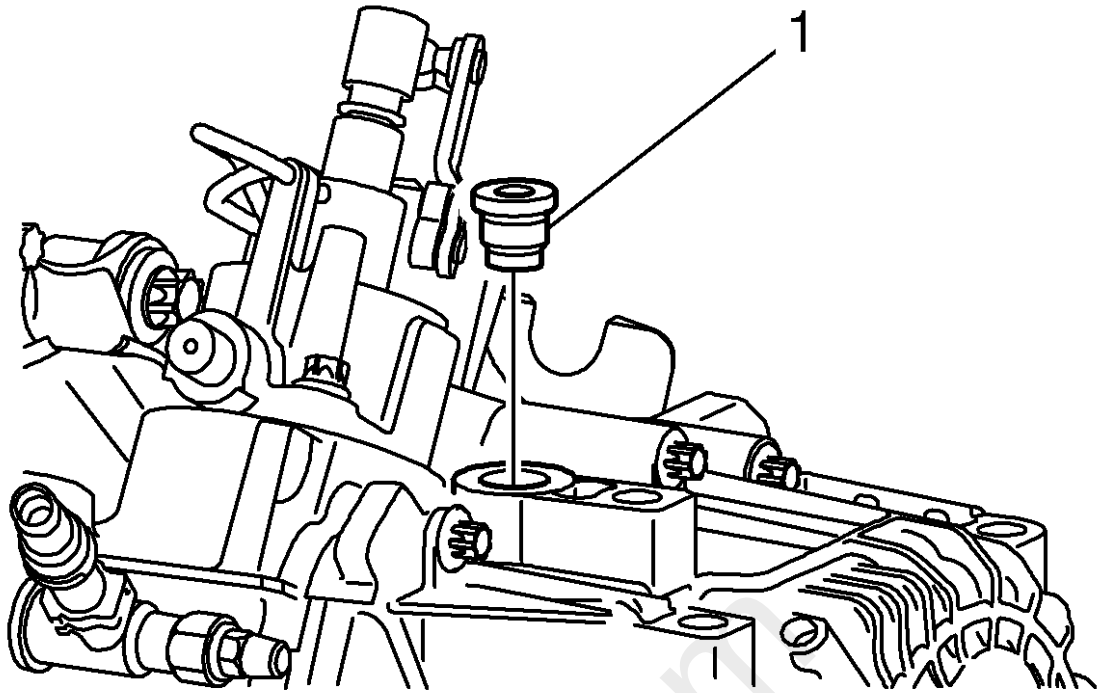


Fig. 16: Transmission Fluid Fill Fastener
Courtesy of GENERAL MOTORS COMPANY

1. Lower the vehicle.
2. Remove the engine control module with the bracket from the battery tray. Refer to [Engine Control Module Replacement](#) , for the 1.2L or 1.4L engine, or [Engine Control Module Replacement](#) for the 1.8L engine.
3. Clean away all dirt and debris from the transmission fluid fill fastener area.
4. Remove the transmission fluid fill fastener (1).
5. Fill the transmission with the appropriate amount of fluid. Refer to [Manual Transmission Specifications](#).
6. Install a new transmission fluid fill fastener and tighten to 30 N.m (22 lb ft).
7. Install the engine control module with the bracket to the battery tray. Refer to [Engine Control Module Replacement](#) , for the 1.2L or 1.4L engine, or [Engine Control Module Replacement](#) for the 1.8L engine.

TRANSMISSION CONTROL LEVER BOOT REPLACEMENT

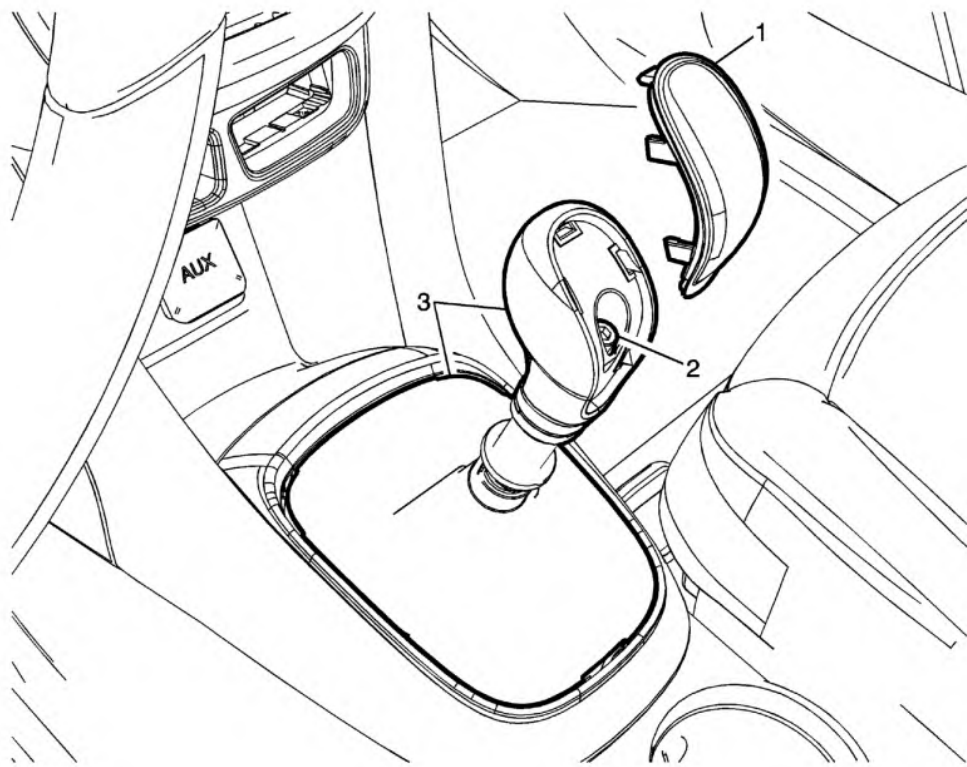


Fig. 17: Transmission Control Lever Knob
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Shift Control Lever Knob Cover Procedure Using a flat-bladed tool, remove the shift knob cover.
2	Fastener CAUTION: Refer to <u>Fastener Caution</u> . Tighten 16 N.m (12 lb ft)
3	Shift Control Lever Knob and Boot Assembly Procedure Using a flat-bladed tool, remove the boot retainer from the console.

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

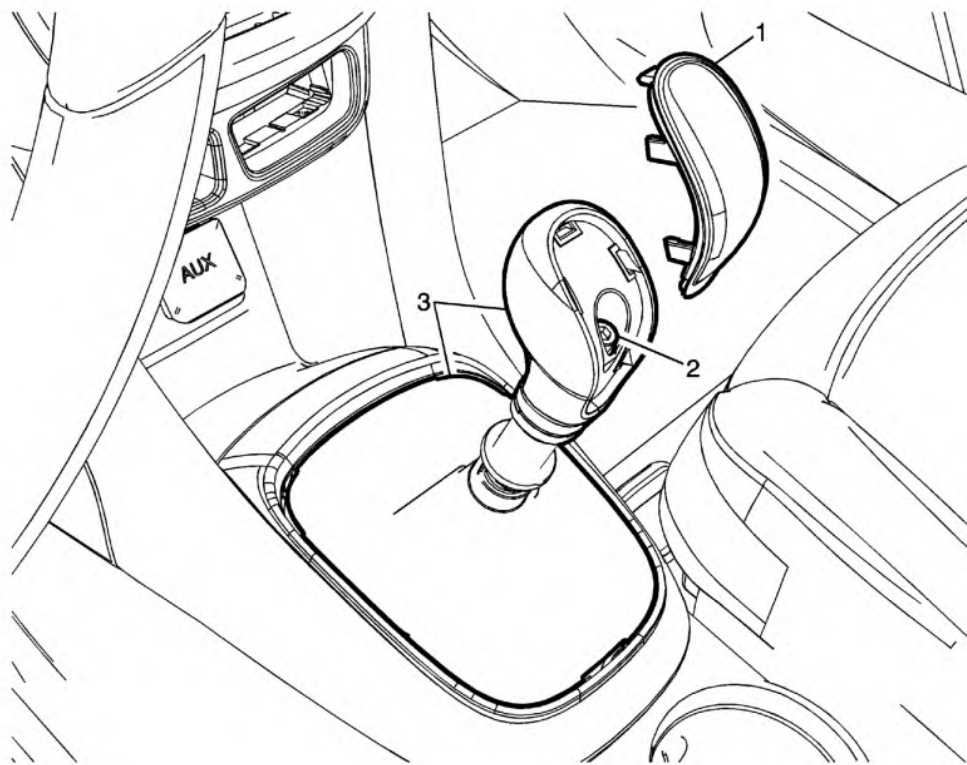


Fig. 18: Transmission Control Lever Knob
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Shift Control Lever Knob Cover Procedure Using a flat-bladed tool, remove the shift knob cover.
2	Fastener CAUTION: Refer to Fastener Caution . Tighten 16 N.m (12 lb ft)
3	Shift Control Lever Knob and Boot Assembly Procedure Using a flat-bladed tool, remove the boot retainer from the console.

MANUAL TRANSMISSION SHIFT LEVER AND SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement** .

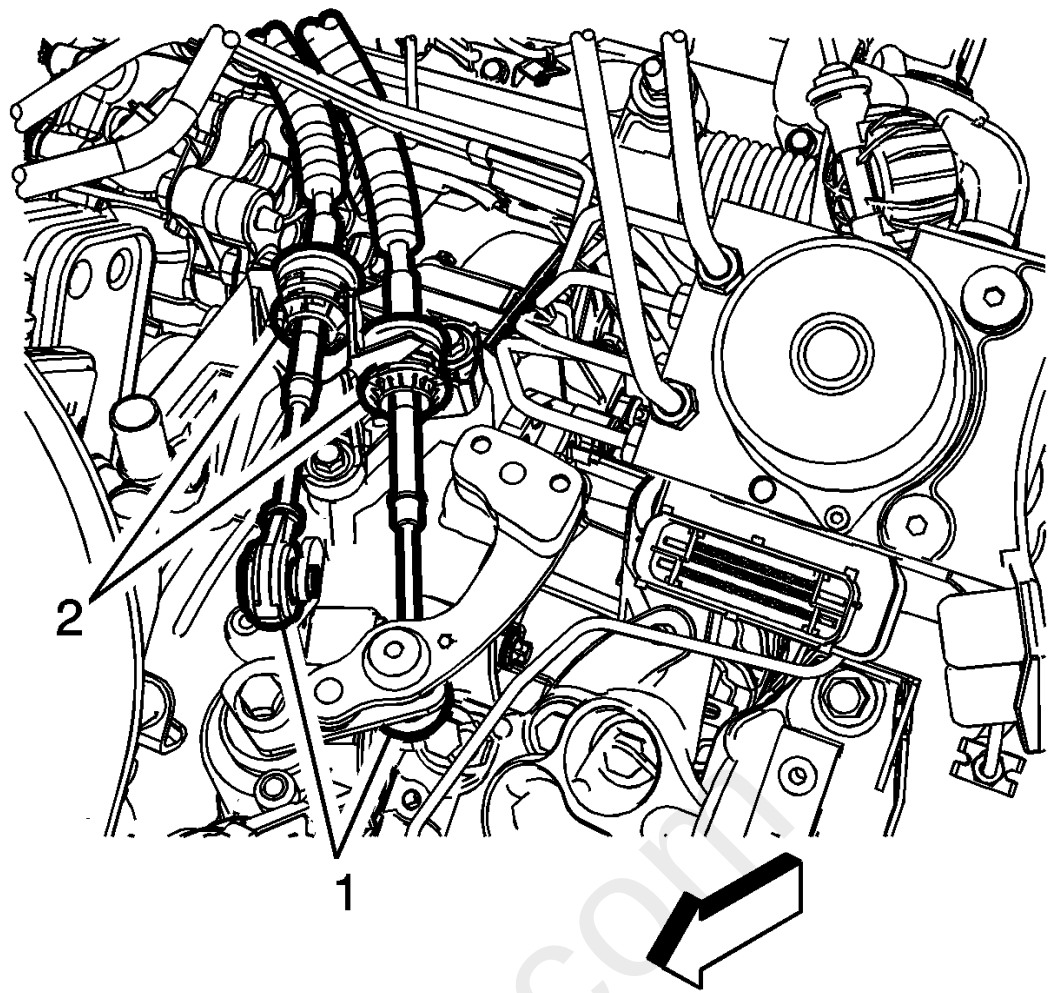


Fig. 19: Shift Lever And Selector Lever Cable End
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.
3. Pull the cable retainers (2) up while pushing the cable retainers rearward to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
4. Remove the floor console. Refer to [**Front Floor Console Replacement \(Buick\)**](#) [**Front Floor Console Replacement \(Chevrolet\)**](#).

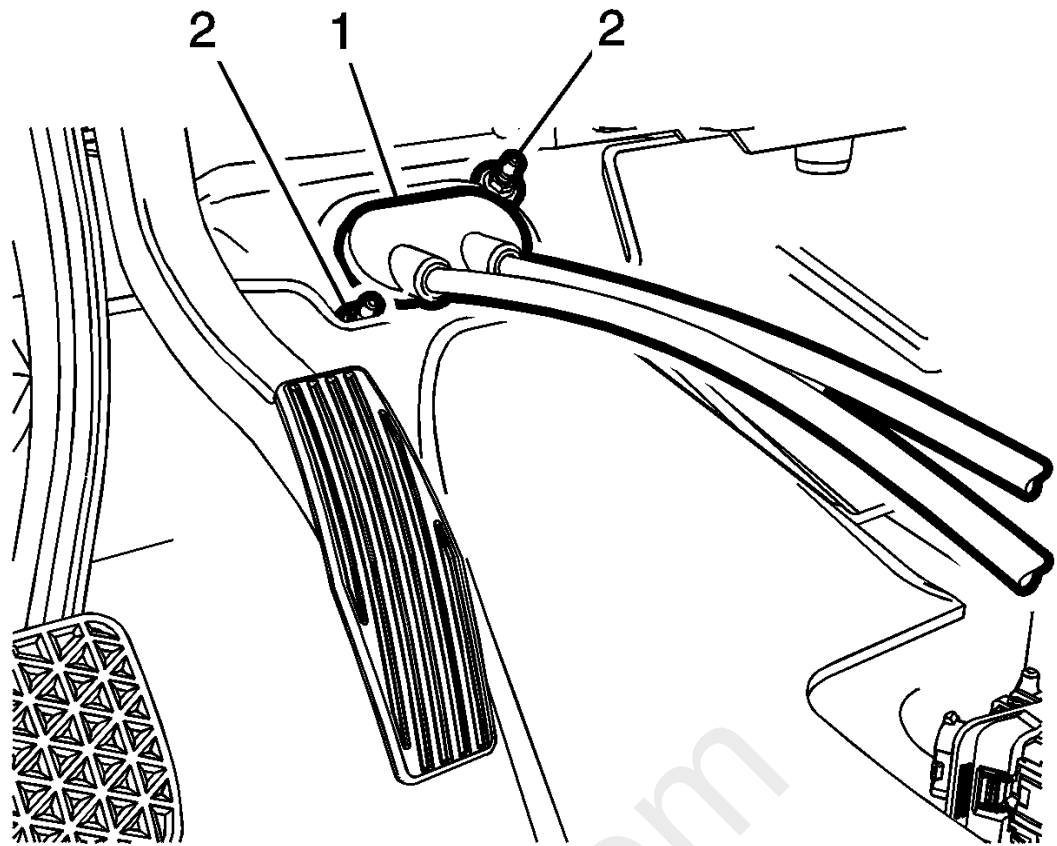


Fig. 20: Shift Lever & Selector Lever Cable Grommet & Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Move the floor carpet in order to get access to the shift lever and selector lever cable grommet (1).
6. Remove the grommet fasteners (2).

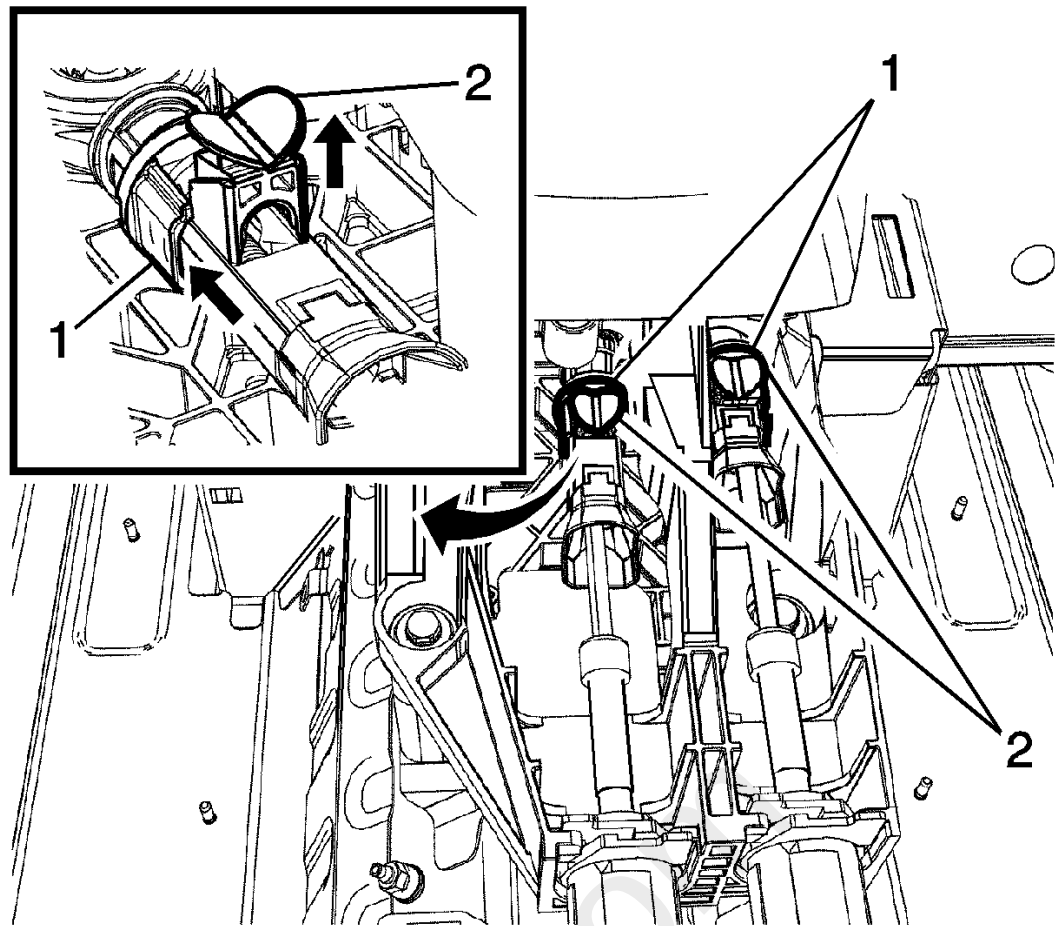


Fig. 21: Shift Lever And Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

7. Lift the adjustment locks (2) up while pushing the adjustment retainers (1) rearward, one for each cable, to release the shift lever and selector lever cable.

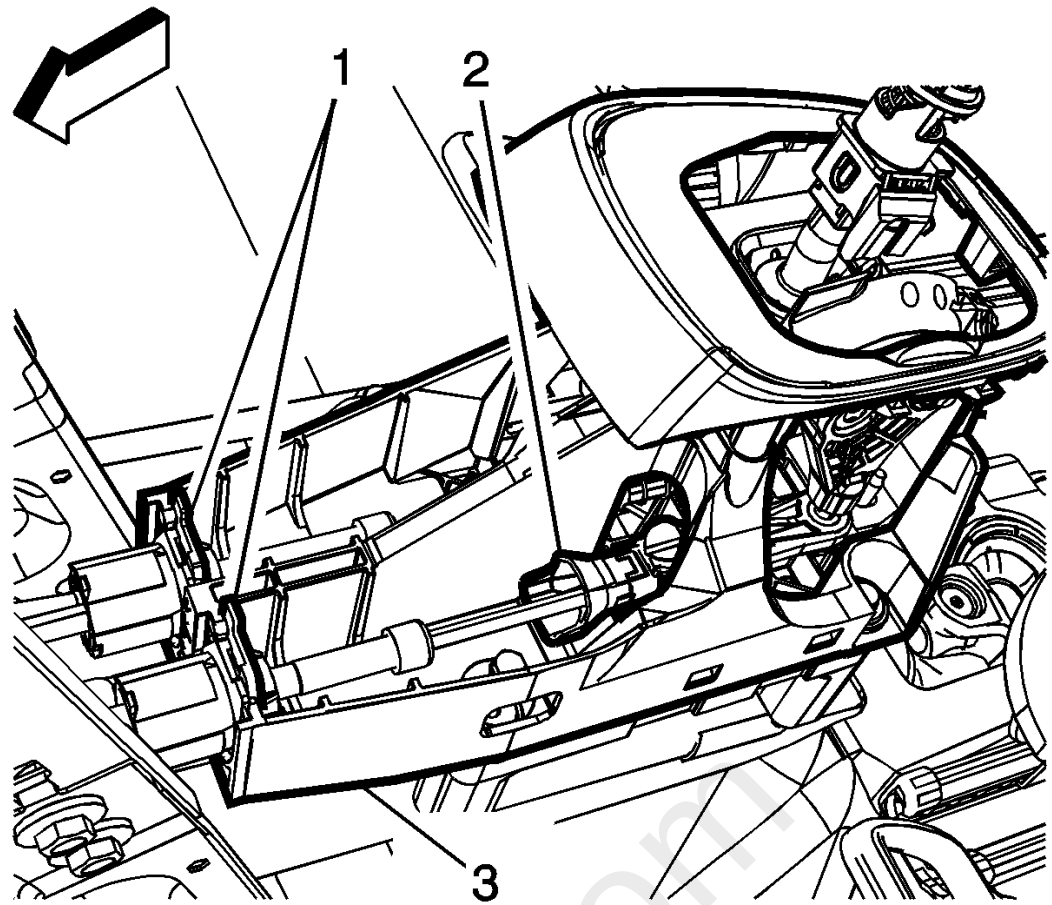


Fig. 22: Transmission Control Assembly

Courtesy of GENERAL MOTORS COMPANY

8. Squeeze the shift lever and the selector lever cable retainers (1) then lift up from the transmission control assembly (3), then remove the shift lever and selector lever cable from the shift and selector control.
9. Pull the shift lever and the selector lever cable assembly through the cowl into the passenger compartment.
10. Remove the shift lever and the selector lever cable assembly from the vehicle.

Installation Procedure

1. Position the shift lever and the selector lever cable assembly in the vehicle.
2. Gently pull the shift lever and the selector lever cable assembly through the cowl into the engine compartment.

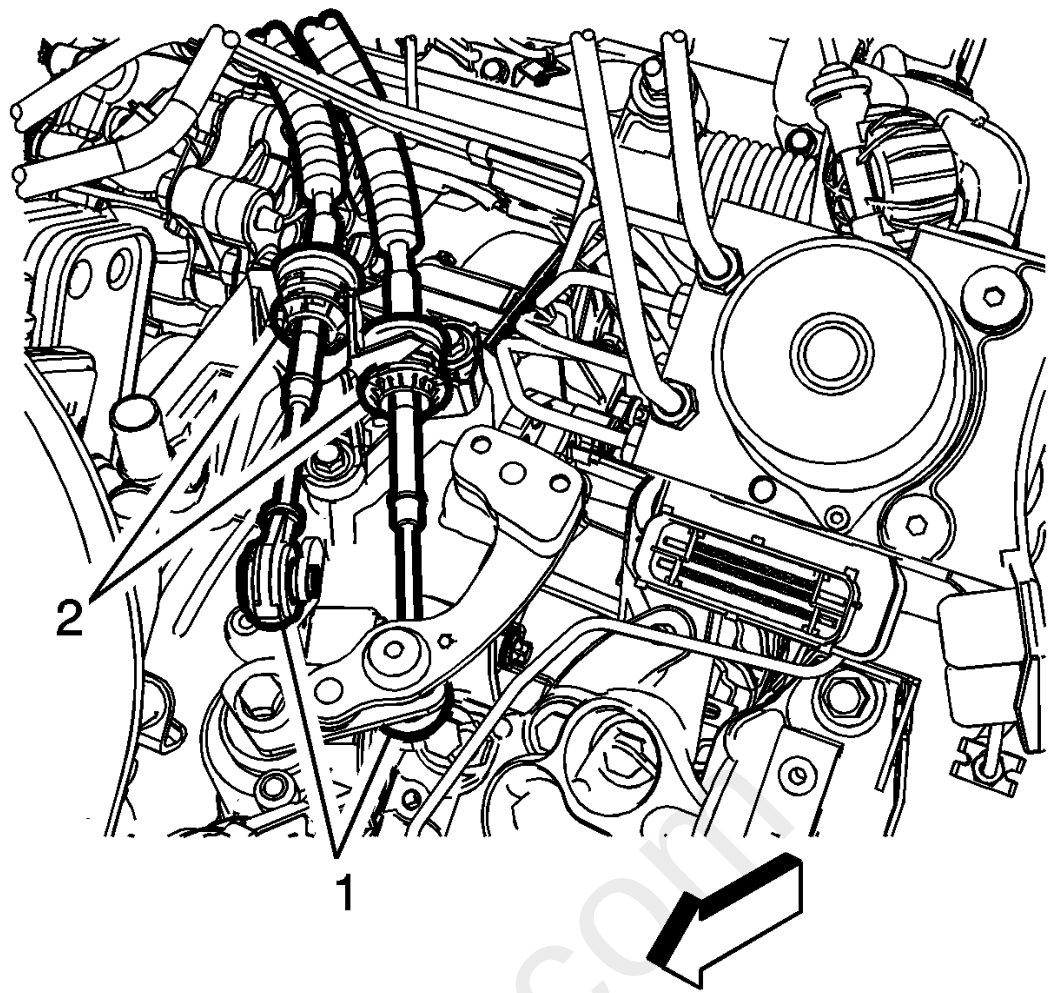


Fig. 23: Shift Lever And Selector Lever Cable End
Courtesy of GENERAL MOTORS COMPANY

3. Connect the shift lever and the selector lever cable ends (1) to the transmission shift lever and the selector lever.
4. Install the shift lever and the selector lever cable to the shift lever and the selector lever cable bracket.

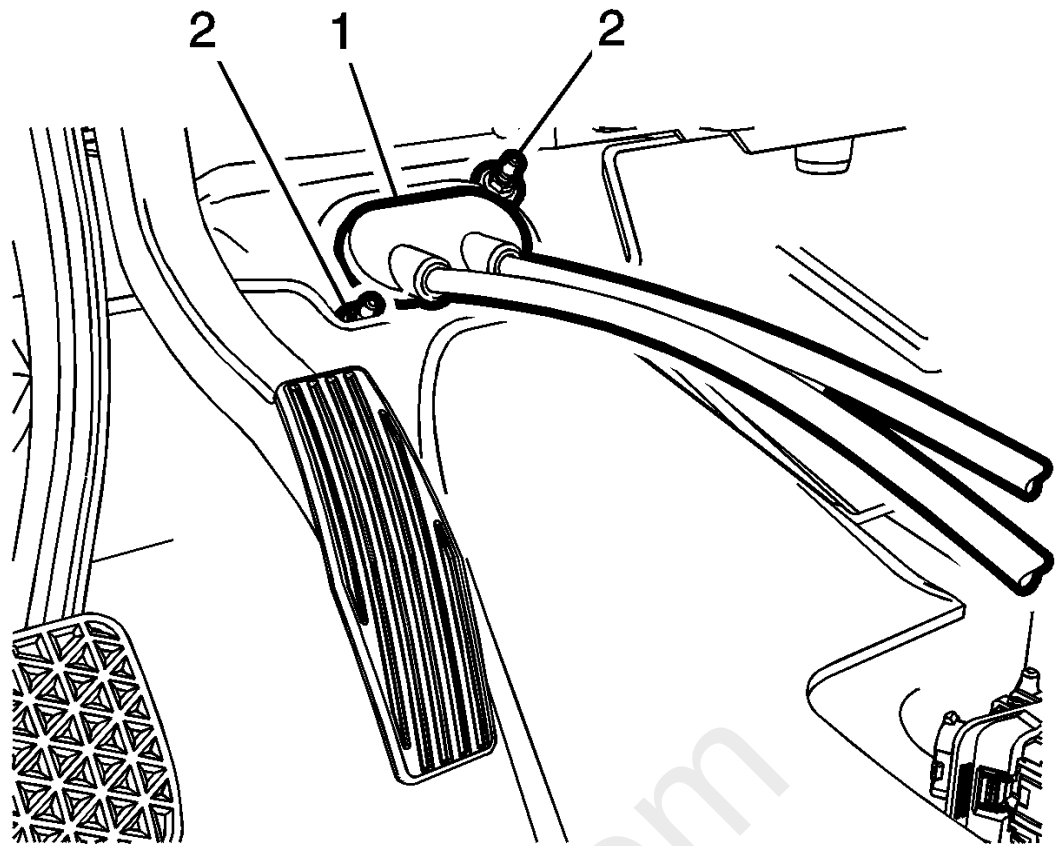


Fig. 24: Shift Lever & Selector Lever Cable Grommet & Fasteners
Courtesy of GENERAL MOTORS COMPANY

5. Move the floor carpet in order to get access to the shift lever and selector lever cable grommet (1).

CAUTION: Refer to [Fastener Caution](#) .

6. Install the grommet fasteners (2) and tighten to 9 N.m (80 lb in).

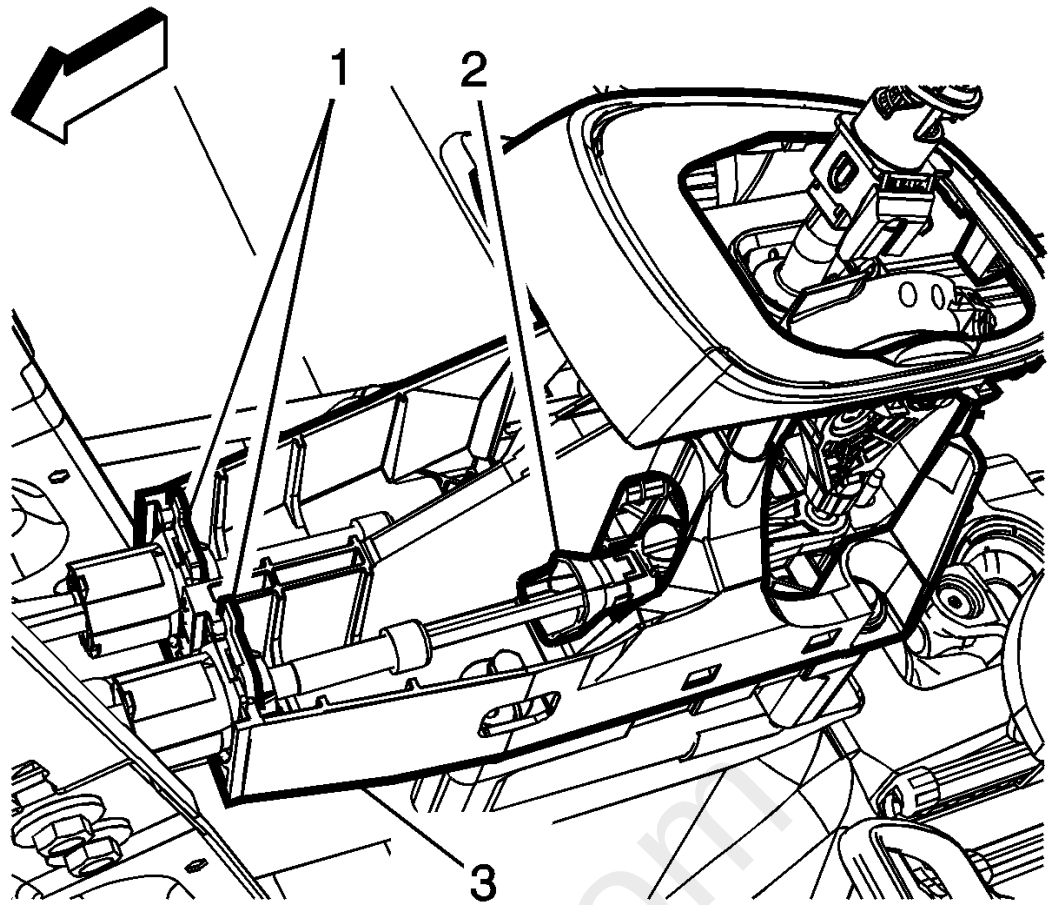


Fig. 25: Transmission Control Assembly
Courtesy of GENERAL MOTORS COMPANY

7. Connect the shift lever and selector lever cables to the shift and selector control adjusters (2).
8. Install the shift lever and selector lever cable retainers (1) to the transmission control (3).

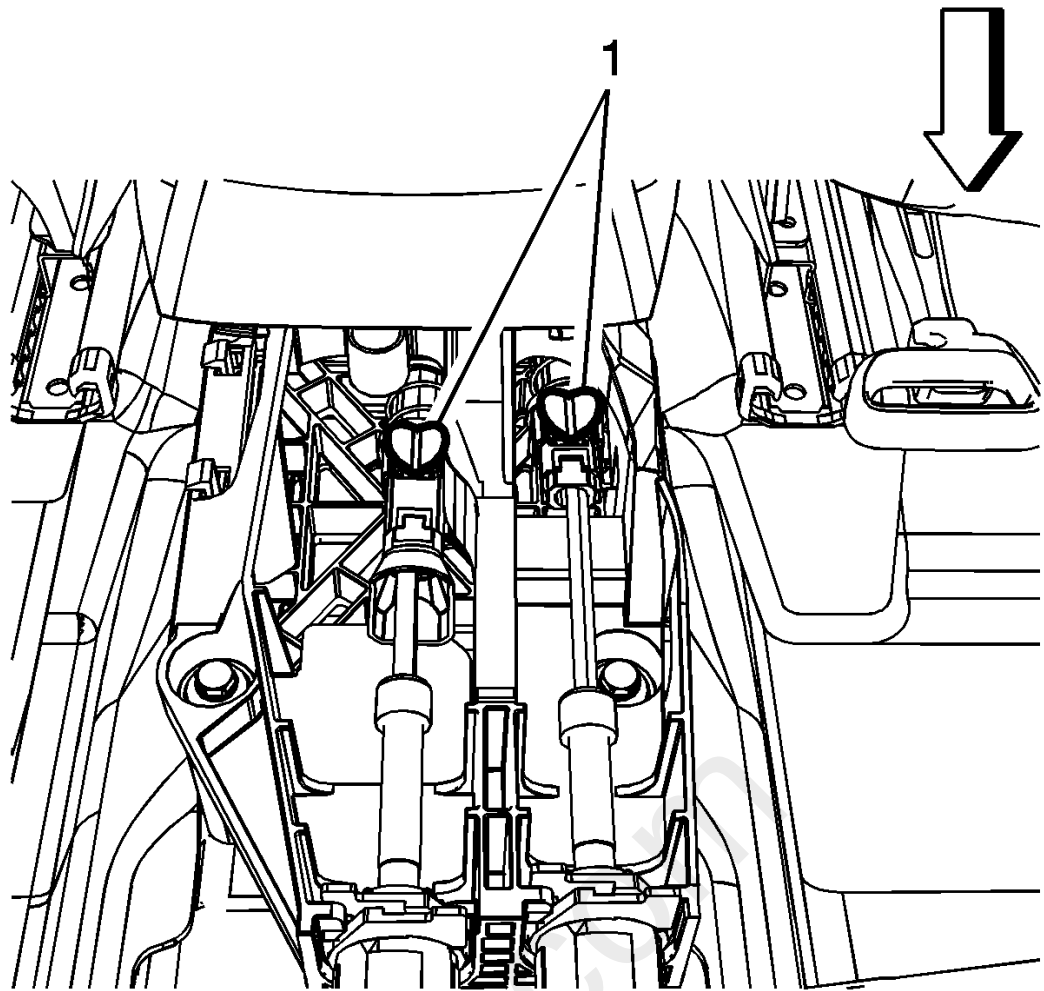


Fig. 26: Cable Adjustment Locks

Courtesy of GENERAL MOTORS COMPANY

9. Press down and lock both cable adjustment locks (1), one for each cable, to lock the shift lever and selector lever cable.
10. Adjust the shift lever and selector lever cables. Refer to [Manual Transmission Shift Lever and Selector Lever Cable Adjustment](#).
11. Install the floor console. Refer to [Front Floor Console Replacement \(Buick\)](#) [Front Floor Console Replacement \(Chevrolet\)](#).
12. Install the battery tray. Refer to [Battery Tray Replacement](#).
13. Verify correct operation of the transmission control assembly.

MANUAL TRANSMISSION SHIFT LEVER AND SELECTOR LEVER CABLE MOVEMENT INSPECTION

1. Remove the shift lever and the selector lever cable. [Manual Transmission Shift Lever and Selector Lever Cable Replacement](#)
2. Move the shift cable to insure freedom of movement within the cable sleeve.
3. Move the select cable to insure freedom of movement within the cable sleeve.
4. If there is no problem with the shift and select cables go to [Manual Transmission Shift Lever and Selector Lever Cable Adjustment](#)
5. If a problem is detected replace both cables before proceeding. [Manual Transmission Shift Lever and Selector Lever Cable Replacement](#)

SELECTOR AND SHIFT LEVER CABLE BRACKET REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#).

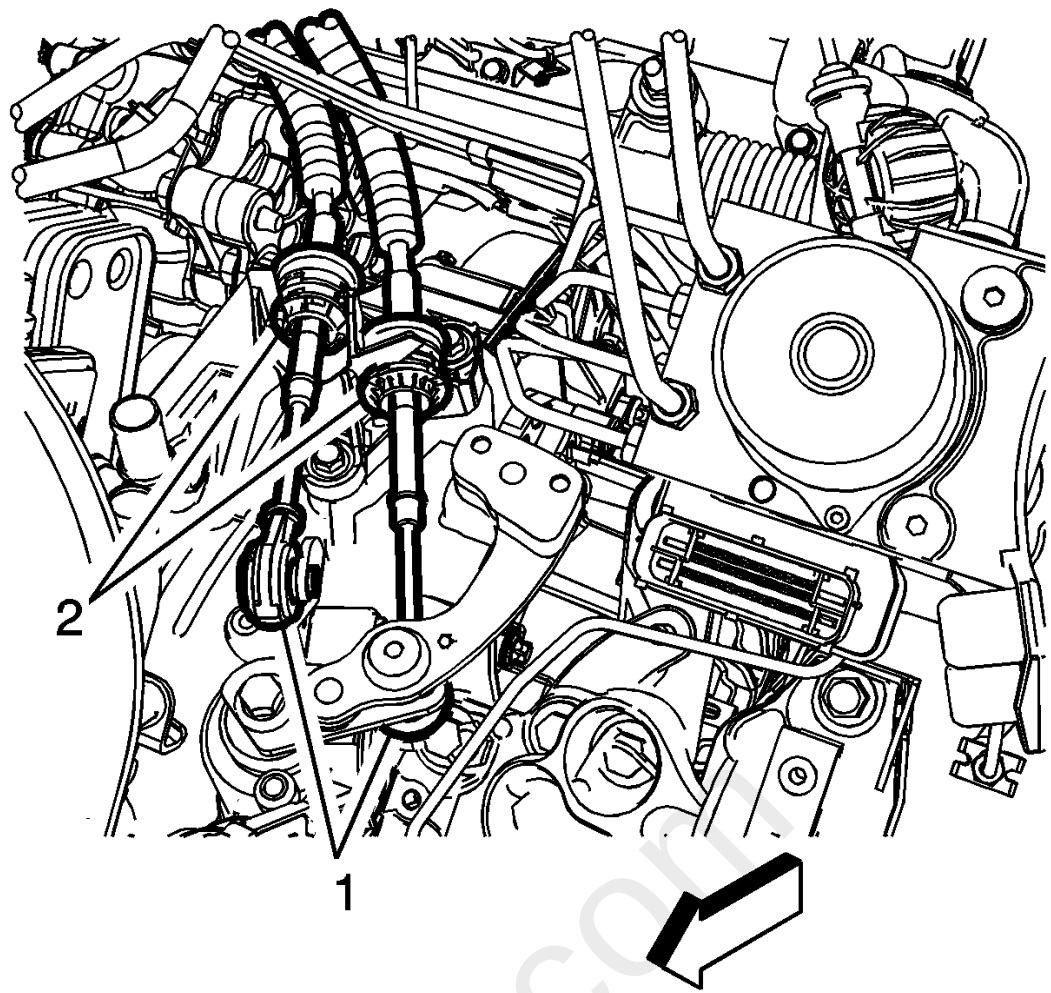


Fig. 27: Shift Lever And Selector Lever Cable End
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.
3. Pull the cable retainers (2) up while pushing the cable retainers rearward to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.

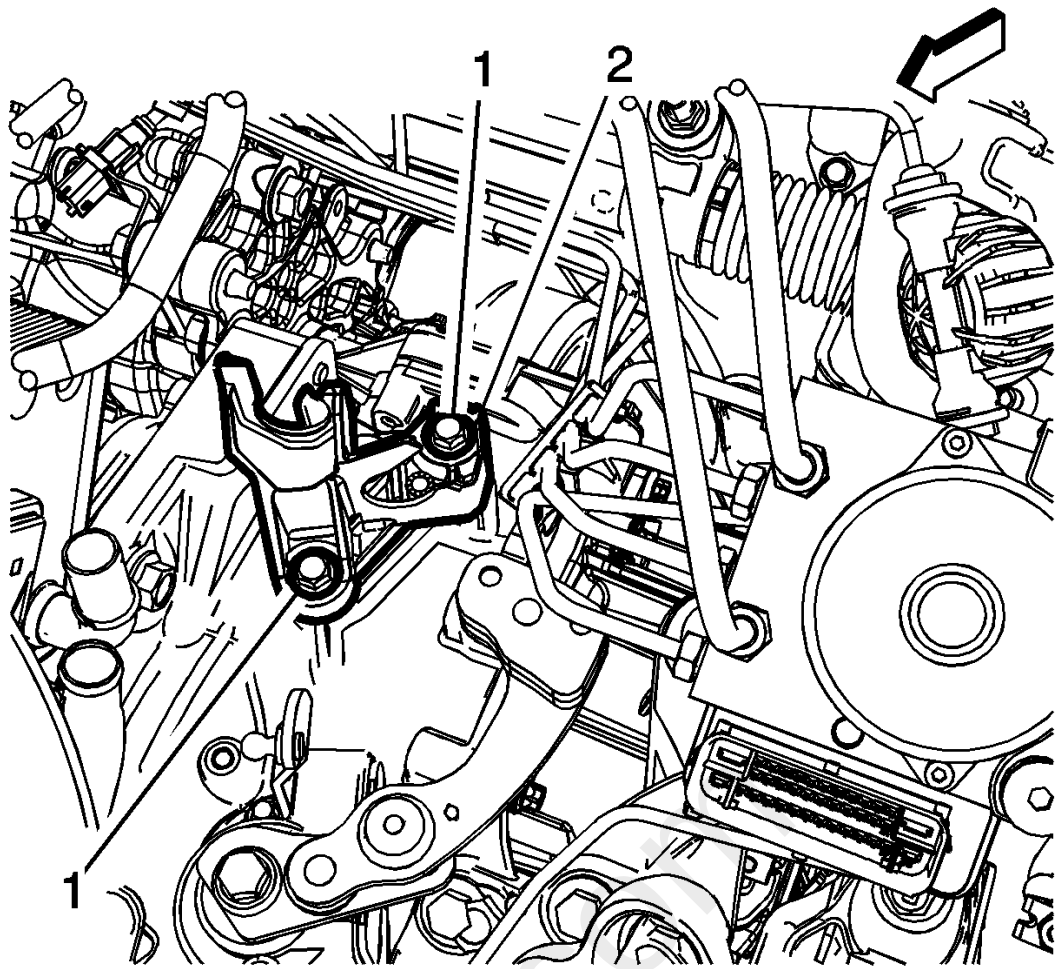


Fig. 28: Shift Lever And Selector Lever Cable Bracket
Courtesy of GENERAL MOTORS COMPANY

4. Remove the 2 shift lever and selector lever cable bracket fasteners (1).
5. Remove the shift lever and selector lever cable bracket (2) from the transmission.

Installation Procedure

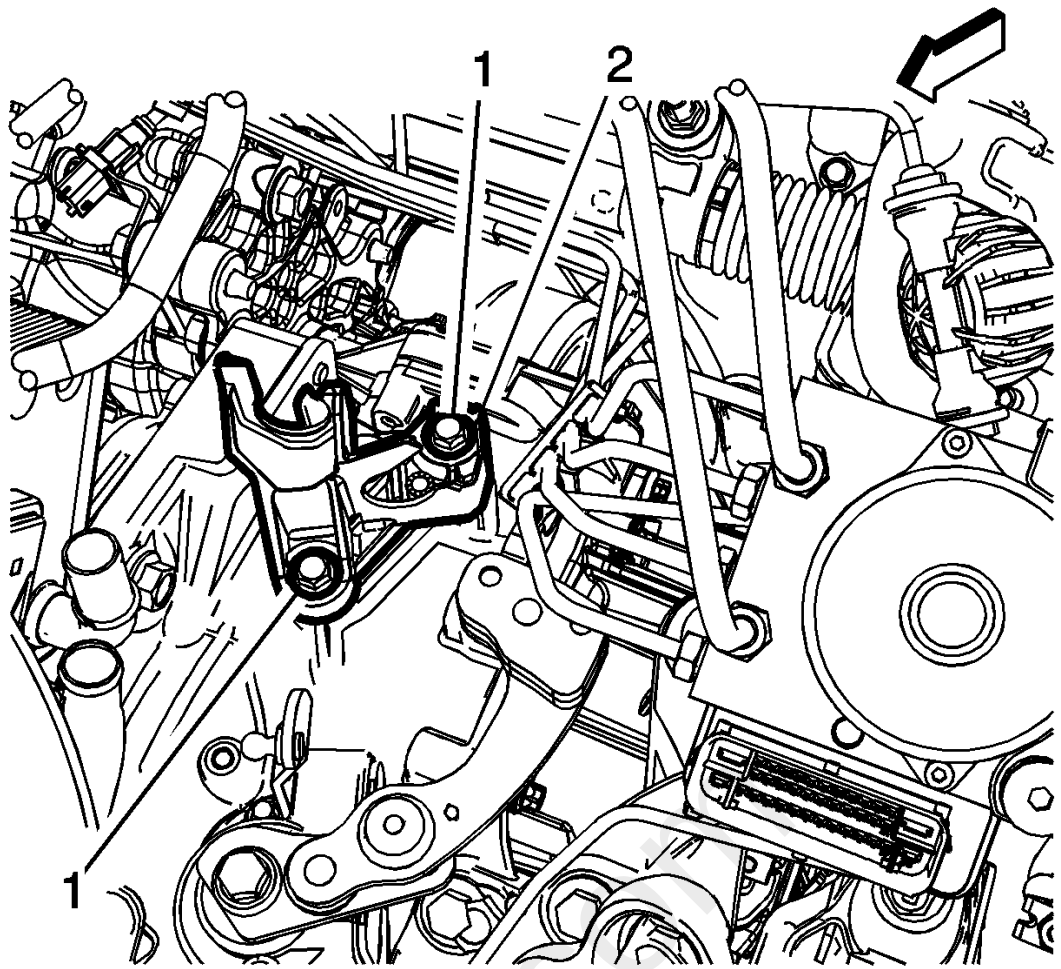


Fig. 29: Shift Lever And Selector Lever Cable Bracket

Courtesy of GENERAL MOTORS COMPANY

1. Position the shift lever and selector lever cable bracket (2) on the transmission.

CAUTION: Refer to **Fastener Caution** .

2. Install the 2 shift lever and selector lever cable bracket fasteners (1) and tighten to 22 N.m (16 lb ft).

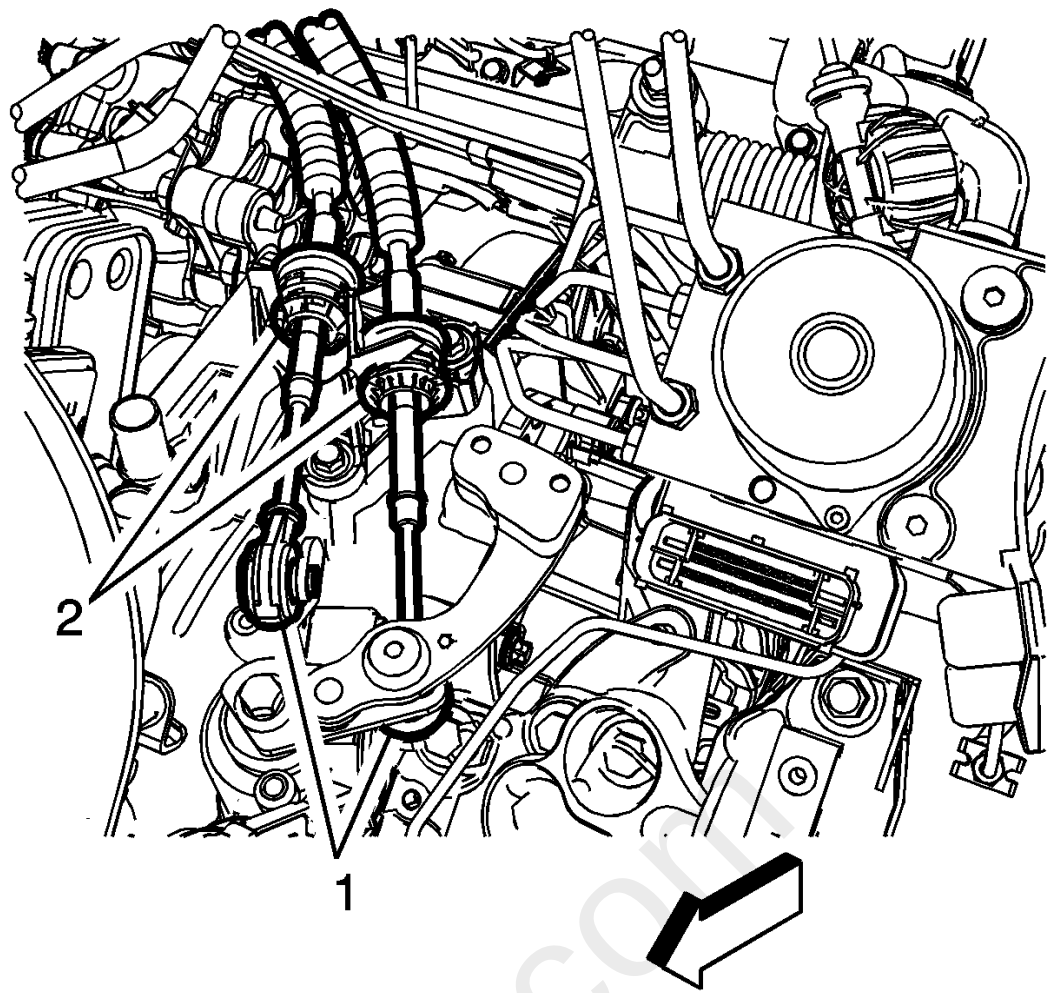


Fig. 30: Shift Lever And Selector Lever Cable End
Courtesy of GENERAL MOTORS COMPANY

3. Connect the shift lever and selector lever cable ends (1) to the transmission shift lever and selector lever.
4. Install the shift lever and selector lever cable retainers (2) to the shift lever and selector lever cable bracket.
5. Adjust the shift lever and selector lever cables. Refer to [Manual Transmission Shift Lever and Selector Lever Cable Adjustment](#).
6. Install the battery tray. Refer to [Battery Tray Replacement](#).
7. Verify correct operation of the transmission control assembly.

TRANSMISSION CONTROL REPLACEMENT

Removal Procedure

1. Remove the floor console. Refer to [Front Floor Console Replacement \(Buick\)](#) [Front Floor Console Replacement \(Chevrolet\)](#).

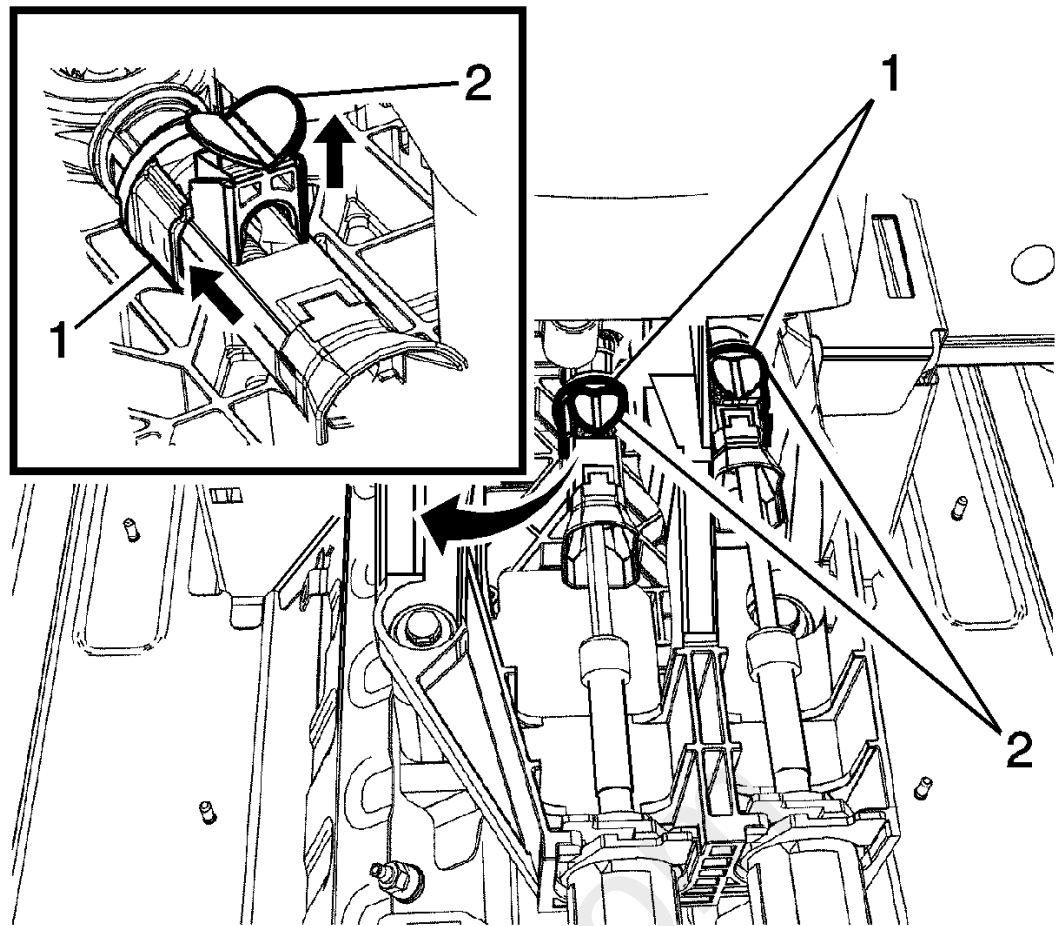


Fig. 31: Shift Lever And Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

2. Lift the adjustment locks (2) up while pushing the adjustment retainers (1) rearward, one for each cable, to release the shift lever and selector lever cable.

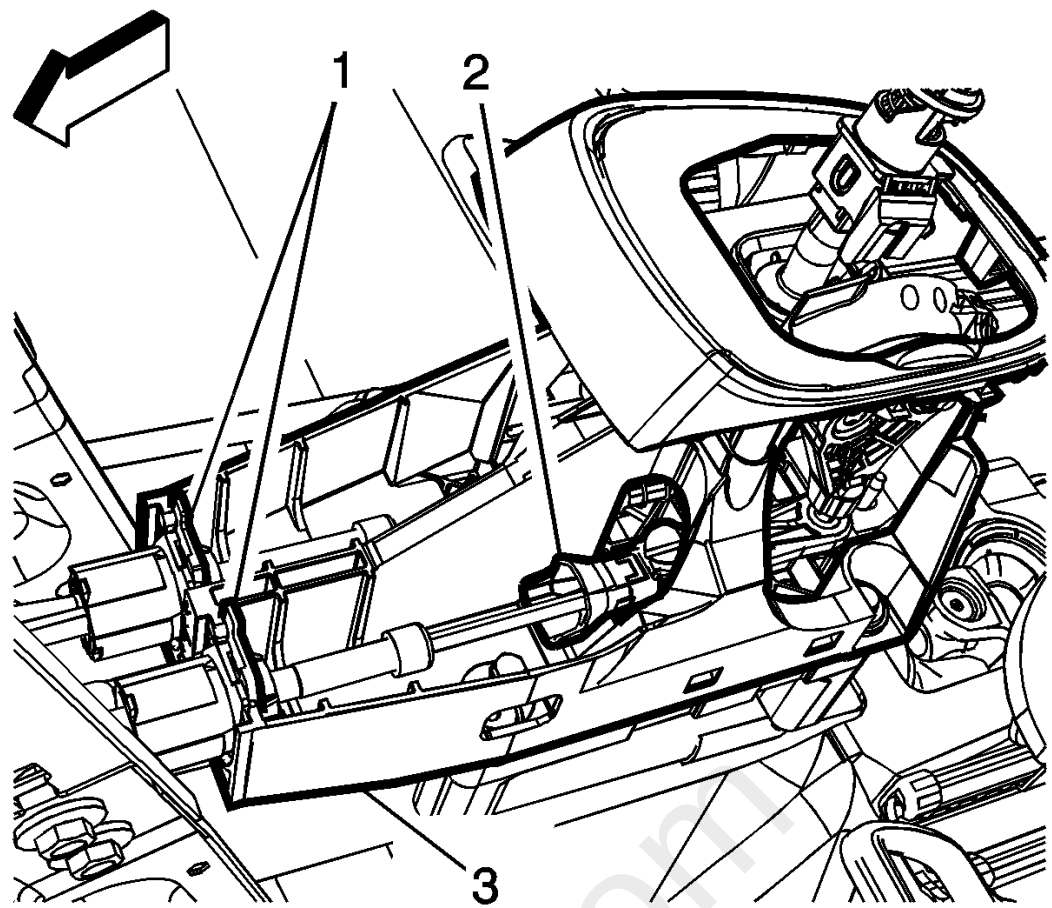


Fig. 32: Transmission Control Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Squeeze the shift lever and selector lever cable retainers (1) then lift up on the transmission control assembly (3).
4. Remove the shift lever and selector lever cables from the shift and selector control.

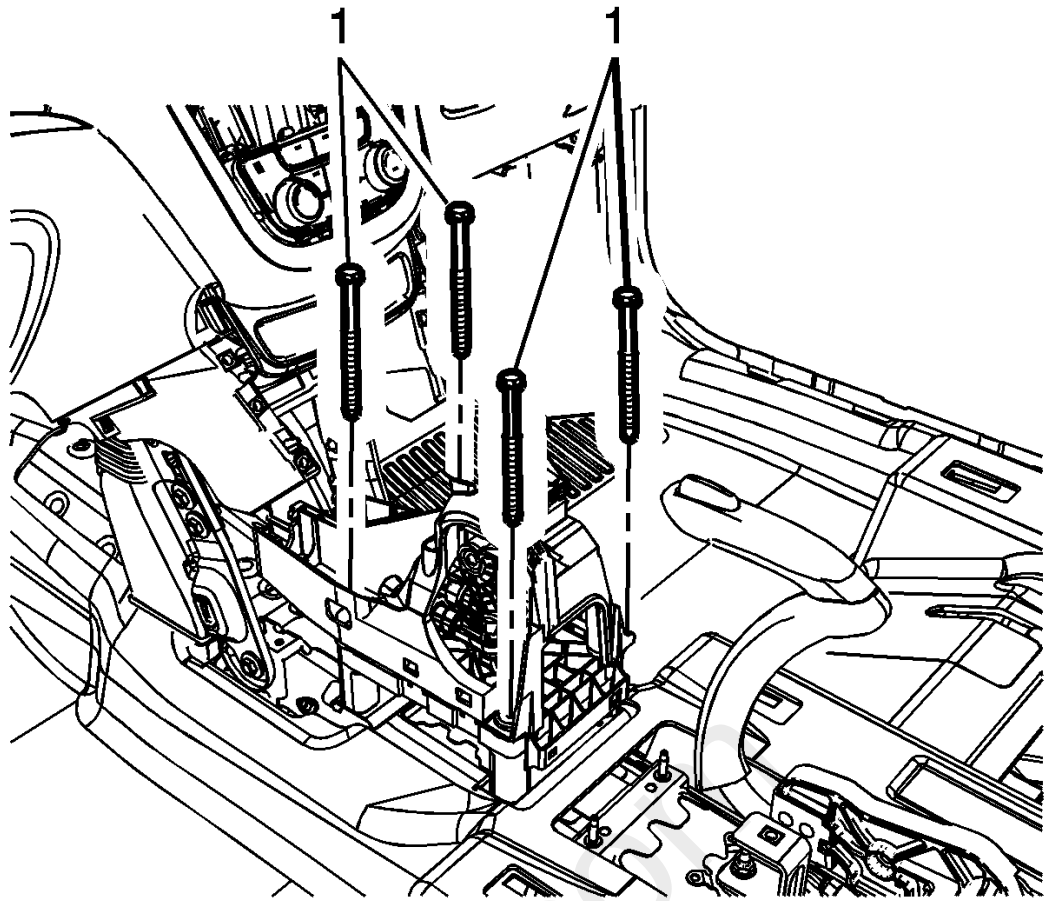


Fig. 33: Transmission Control Bolts

Courtesy of GENERAL MOTORS COMPANY

5. Remove the 4 transmission control bolts (1).
6. Remove the transmission control from the vehicle.

Installation Procedure

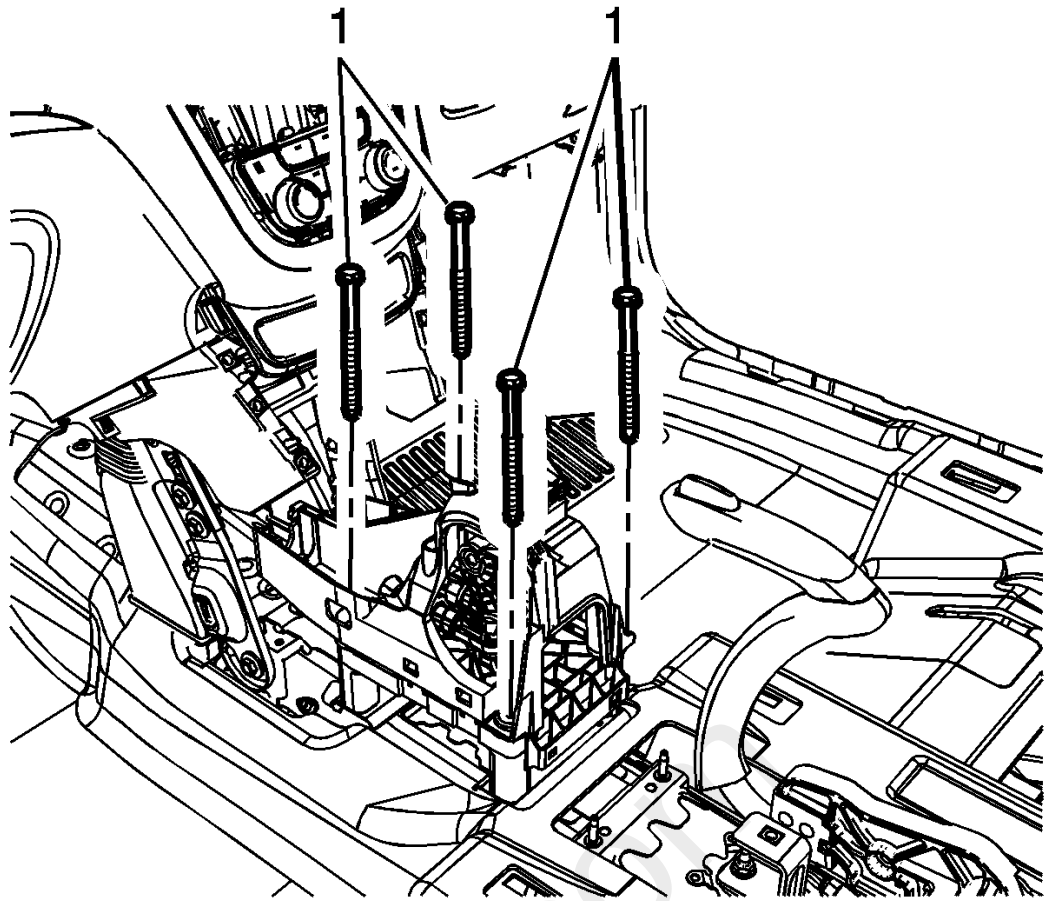


Fig. 34: Transmission Control Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Position the transmission control in the vehicle.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the 4 transmission control bolts (1) and tighten to 9 N.m (80 lb in).

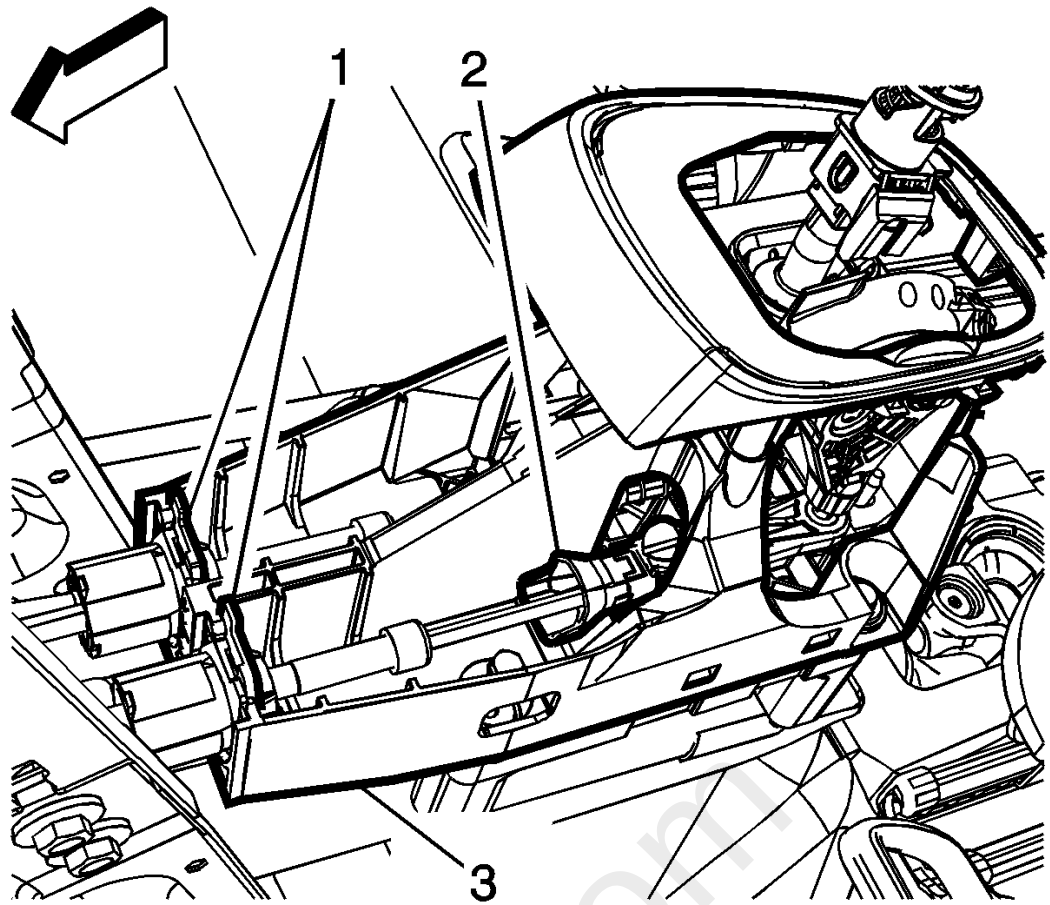


Fig. 35: Transmission Control Assembly

Courtesy of GENERAL MOTORS COMPANY

3. Connect the shift lever and selector lever cables to the shift and selector control adjusters (2).
4. Install the shift lever and selector lever cable retainers (1) to the transmission control (3).

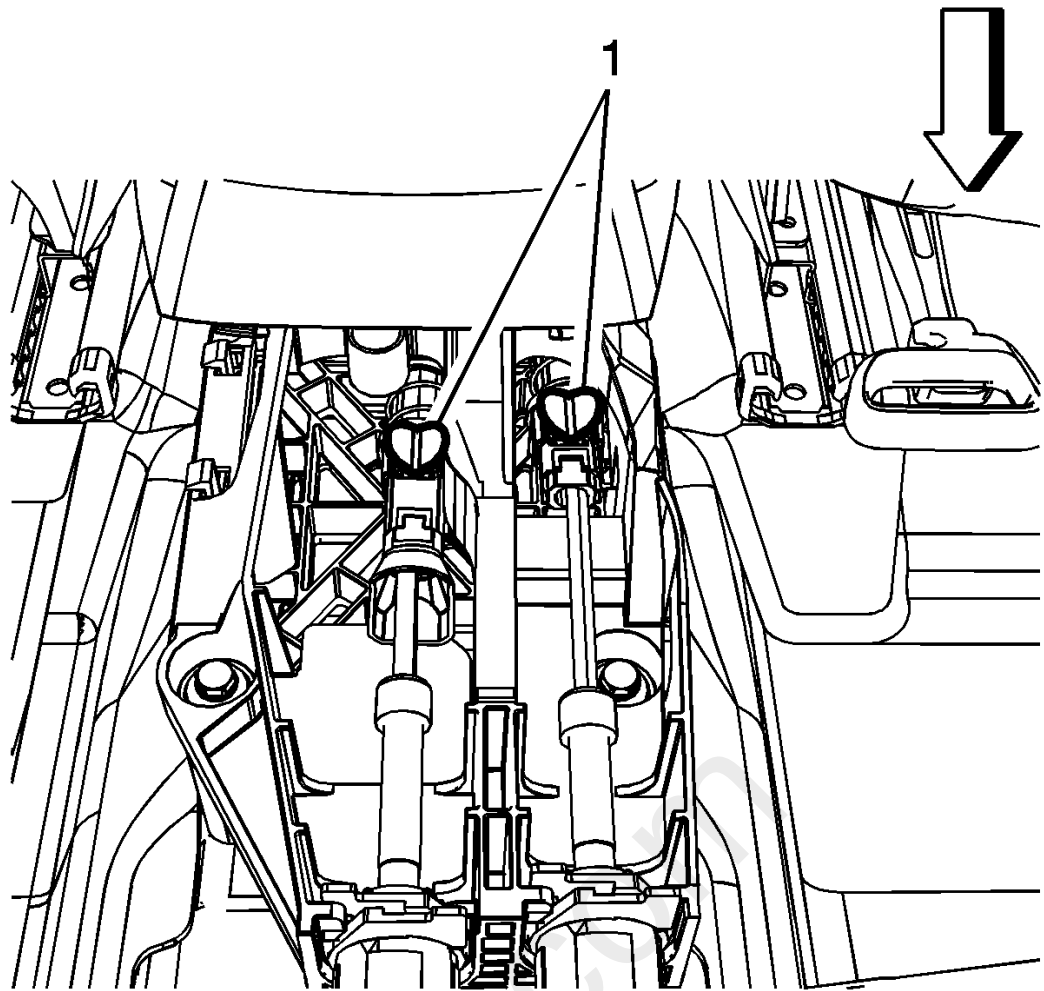


Fig. 36: Cable Adjustment Locks

Courtesy of GENERAL MOTORS COMPANY

WARNING: After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to shift into PARK causing potential vehicle damage and bodily injury.

5. Press down and lock both cable adjustment locks (1), one for each cable, to lock the shift lever and selector lever cable.
6. Adjust the shift lever and selector level cables. Refer to [Manual Transmission Shift Lever and Selector Lever Cable Adjustment](#).
7. Install the floor console. Refer to [Front Floor Console Replacement \(Buick\)](#) [Front Floor Console Replacement \(Chevrolet\)](#).
8. Verify the correct operation of the transmission control assembly.

MANUAL TRANSMISSION SHIFT LEVER AND SELECTOR LEVER CABLE ADJUSTMENT

1. Remove the floor console. Refer to [Front Floor Console Replacement \(Buick\)](#) [Front Floor Console Replacement \(Chevrolet\)](#).

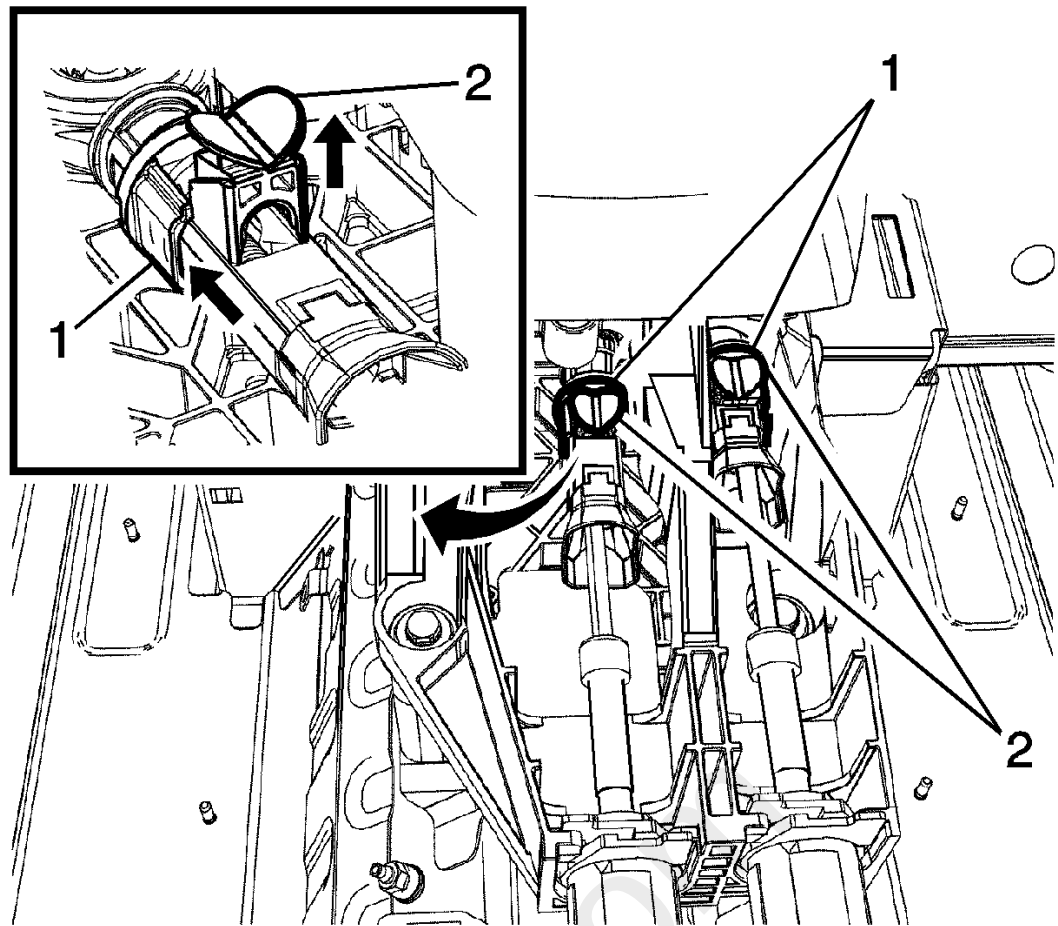


Fig. 37: Shift Lever And Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

2. Lift the adjustments locks (2) up while pushing the adjustment retainers (1) rearward, one for each cable, to release the shift lever and selector lever cable.

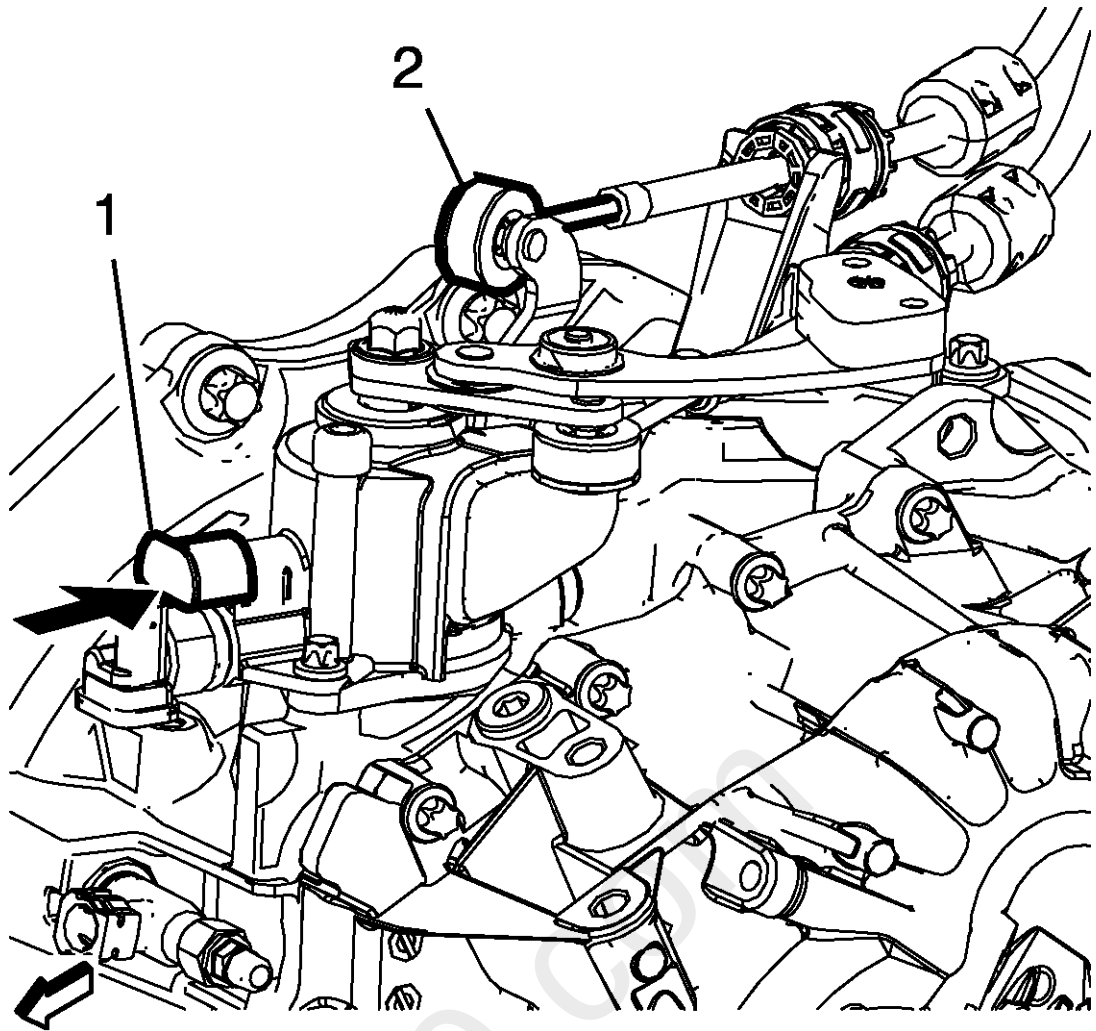


Fig. 38: Selector Lever

Courtesy of GENERAL MOTORS COMPANY

3. Block the shift control housing, push the selector lever (2) backwards and push (arrow) the blocking device (1) towards the shift control housing.

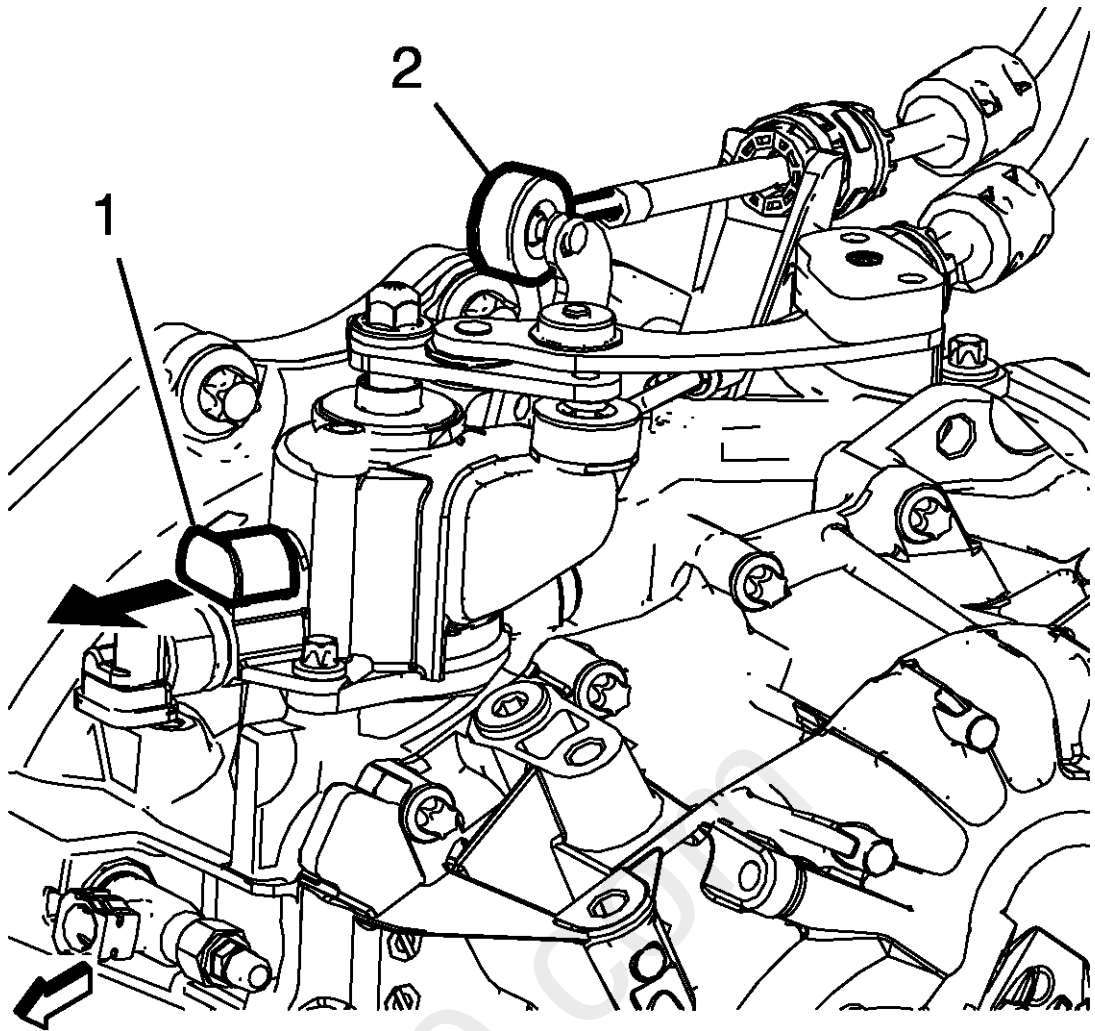


Fig. 40: Blocking Device

Courtesy of GENERAL MOTORS COMPANY

NOTE: When unblocking the blocking device (1) a defined snap noise should be audible, a snap effect should be felt.

7. Unblock the shift control housing, push slightly the selector lever (2) backwards and pull (arrow) the blocking device away from the shift control housing.
8. Install the floor console. Refer to [Front Floor Console Replacement \(Buick\)](#) [Front Floor Console Replacement \(Chevrolet\)](#).
9. Verify correct operation of the transmission control assembly.

VEHICLE SPEED SENSOR REPLACEMENT

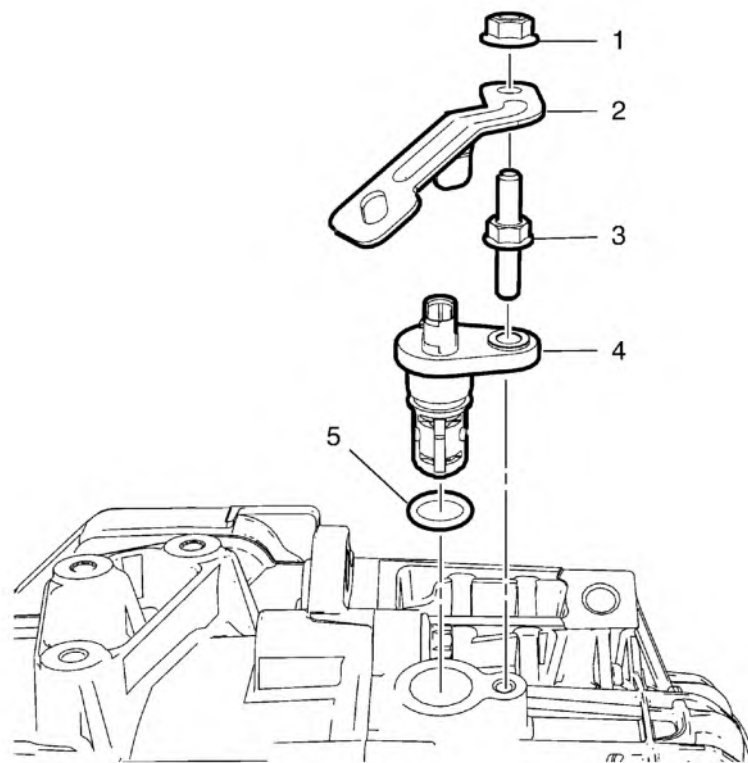


Fig. 41: Vehicle Speed Sensor & Mounting Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Engine Wiring Harness Bracket Nut CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Engine Wiring Harness Bracket
3	Vehicle Speed Sensor Bolt Tighten 9 N.m (80 lb in)
4	Vehicle Speed Sensor Procedure Disconnect wiring harness connector.
5	Vehicle Speed Sensor O-Ring Procedure DISCARD the seal and install NEW seal.

BACKUP LAMP SWITCH REPLACEMENT

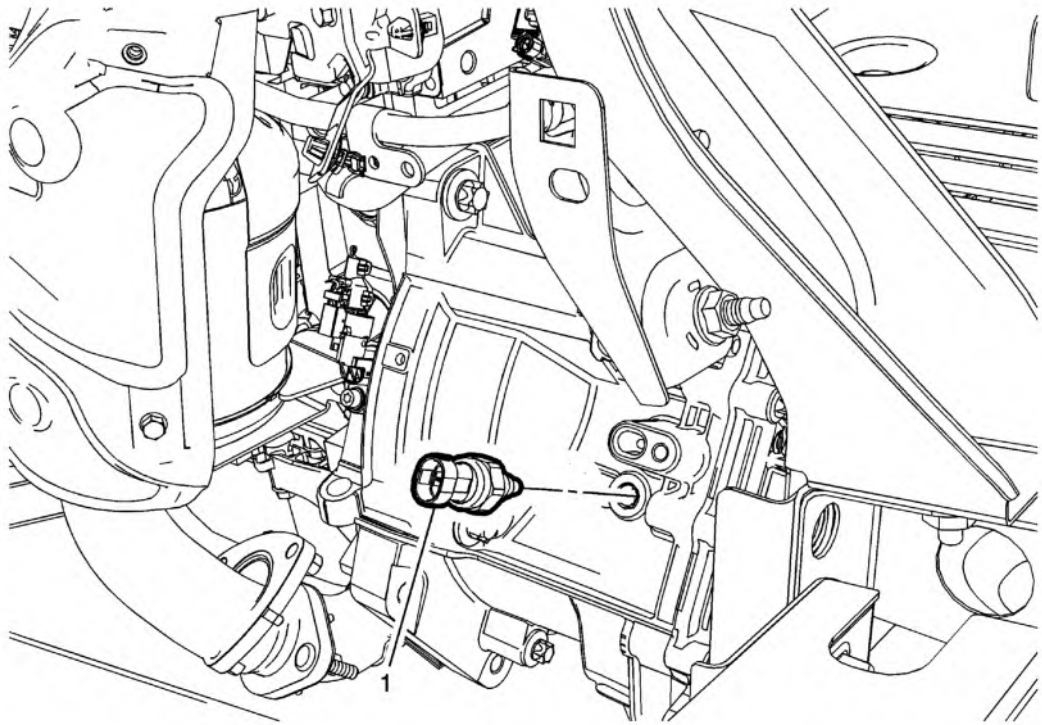


Fig. 42: Backup Lamp Switch

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Disconnect the negative battery cable. Battery Negative Cable Disconnection and Connection (without KL9) Battery Negative Cable Disconnection and Connection (with KL9) 2. Raise and support the vehicle. Lifting and Jacking the Vehicle	
1	Backup Lamp Switch CAUTION: Refer to Component Fastener Tightening Caution . Procedure Disconnect the electrical connector. Tighten 25 N.m (18 lb ft)

TRANSMISSION REAR MOUNT REPLACEMENT (FWD)

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#) [Exhaust Front Pipe Replacement \(2H0\)](#) [Exhaust Front Pipe Replacement \(LE2\)](#) .
3. Using a suitable jack stand, support the rear of the powertrain.

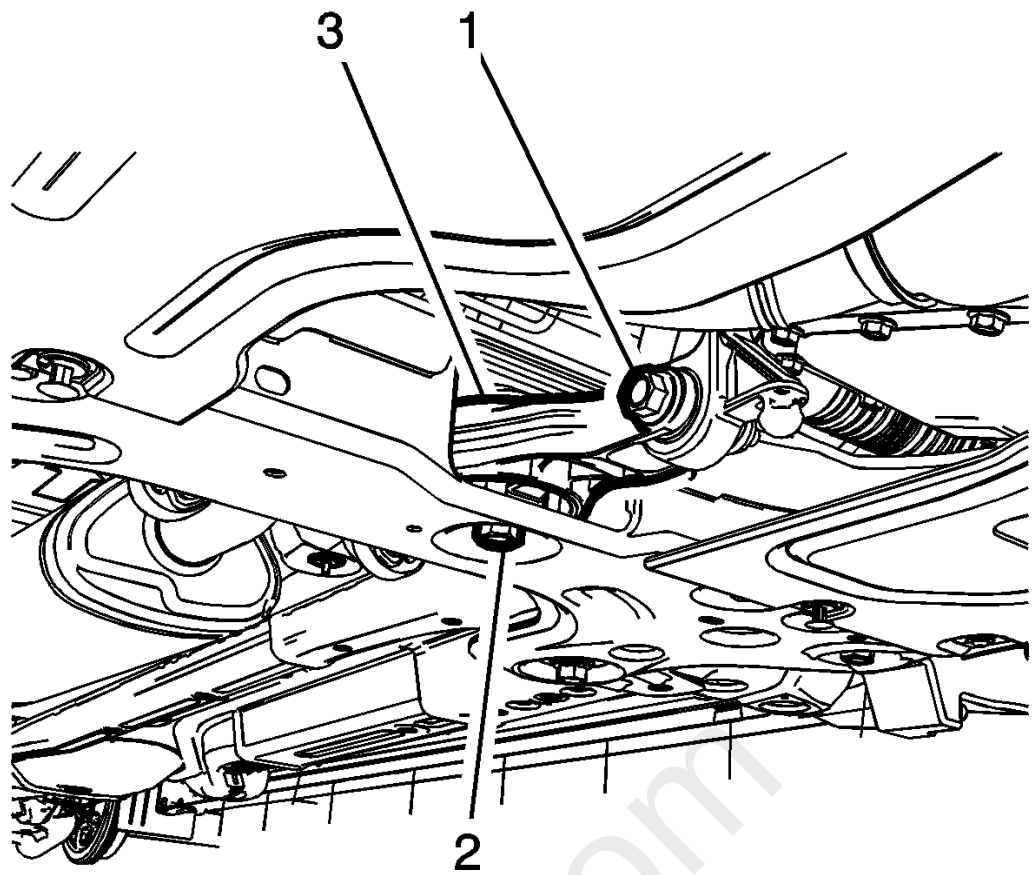


Fig. 43: Transmission Rear Mount Bracket Through Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD the transmission rear mount to bracket through bolt (1).
5. Remove and DISCARD the transmission rear mount bolt (2).

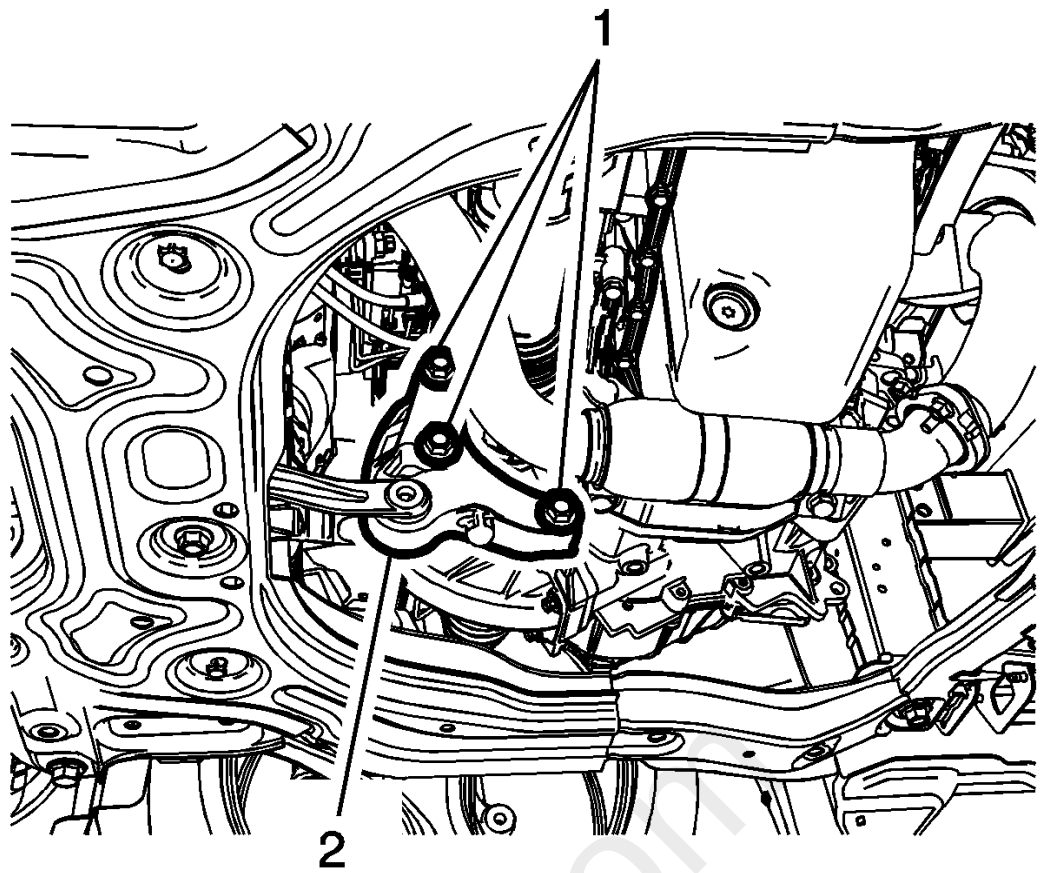


Fig. 44: Transmission Rear Mount Bracket & Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the transmission rear mount bracket fasteners (1).
7. Remove the transmission rear mount and the transmission rear mount bracket.

Installation Procedure

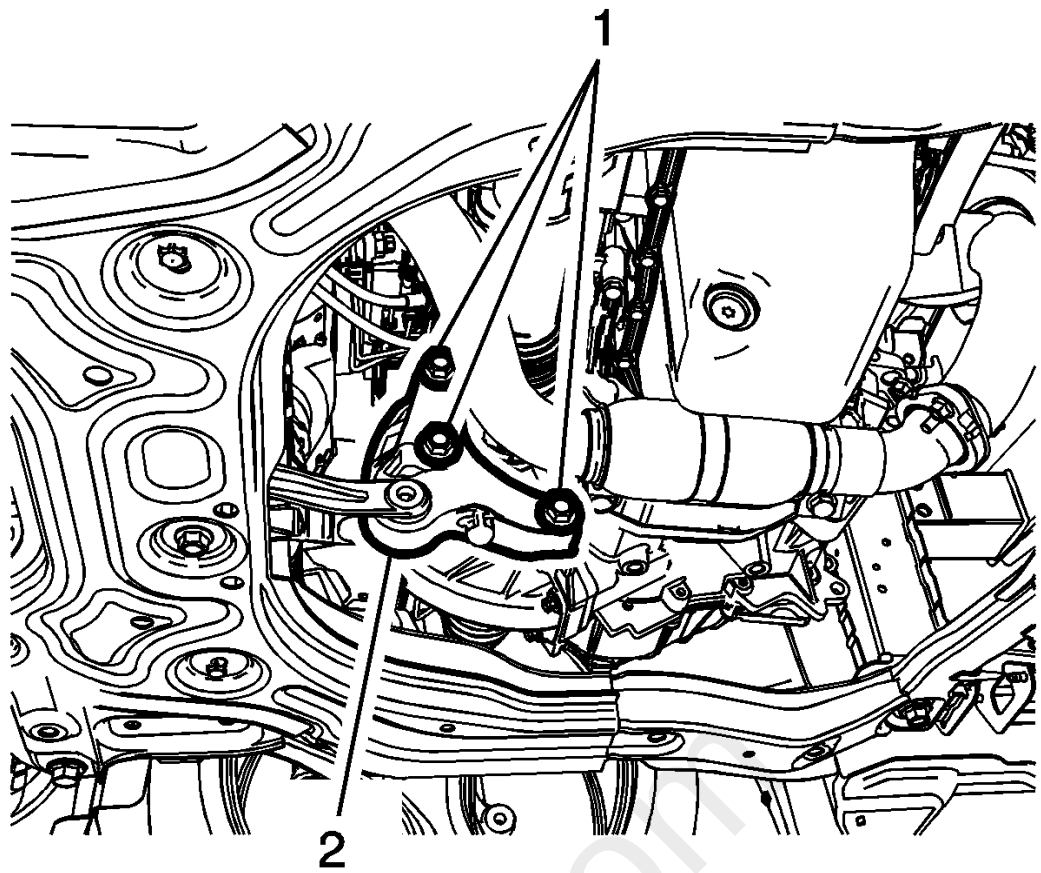


Fig. 45: Transmission Rear Mount Bracket & Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission rear mount and the transmission rear mount bracket.

CAUTION: Refer to **Fastener Caution** .

2. Install the NEW transmission rear mount bracket fasteners (1) and tighten to 100 N.m (74 lb ft) plus 30-45 degrees.

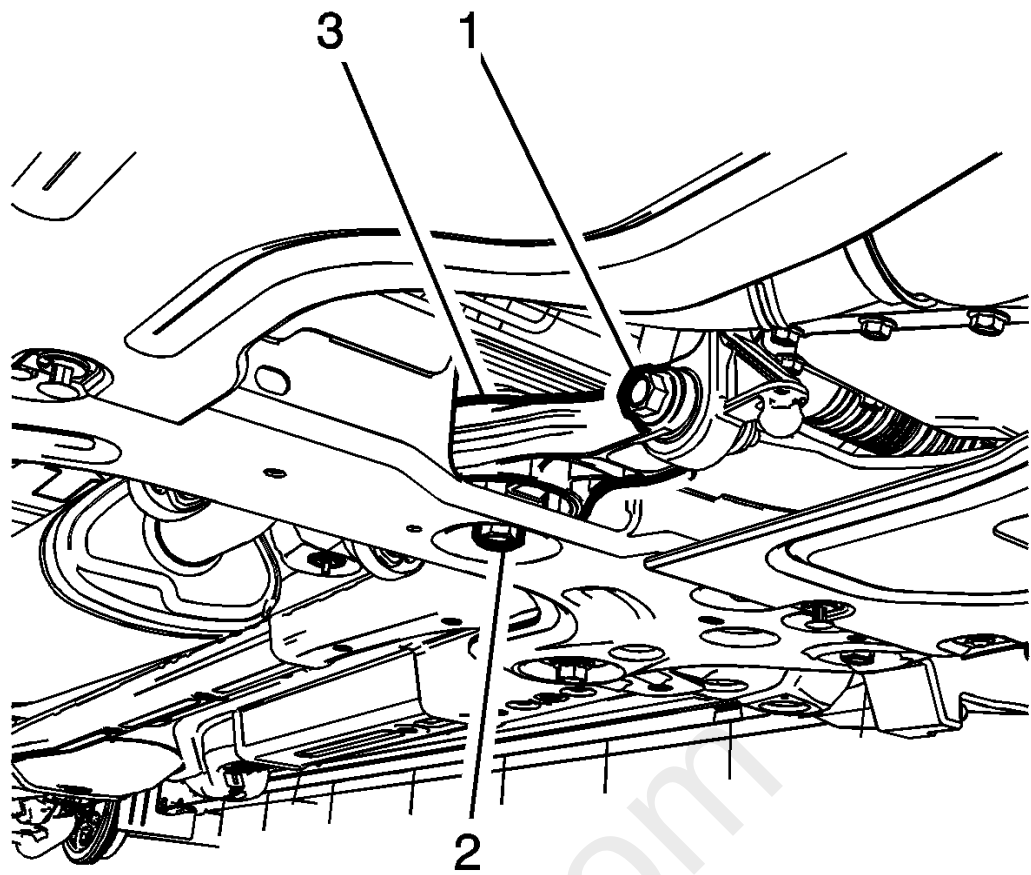


Fig. 46: Transmission Rear Mount Bracket Through Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install the NEW transmission rear mount bolt (2) and tighten to 100 N.m (74 lb ft) plus 90 - 105 degrees.
4. Install the NEW transmission rear mount to bracket through bolt (1) and tighten to 80 N.m (59 lb ft) plus 45-60 degrees.
5. Remove the jack stand.
6. Install the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#), [Exhaust Front Pipe Replacement \(2H0\)](#), [Exhaust Front Pipe Replacement \(LE2\)](#) .
7. Lower the vehicle.

TRANSMISSION REAR MOUNT REPLACEMENT (AWD)

Removal Procedure

1. Remove the transfer case. Refer to [Transfer Case Replacement](#) .

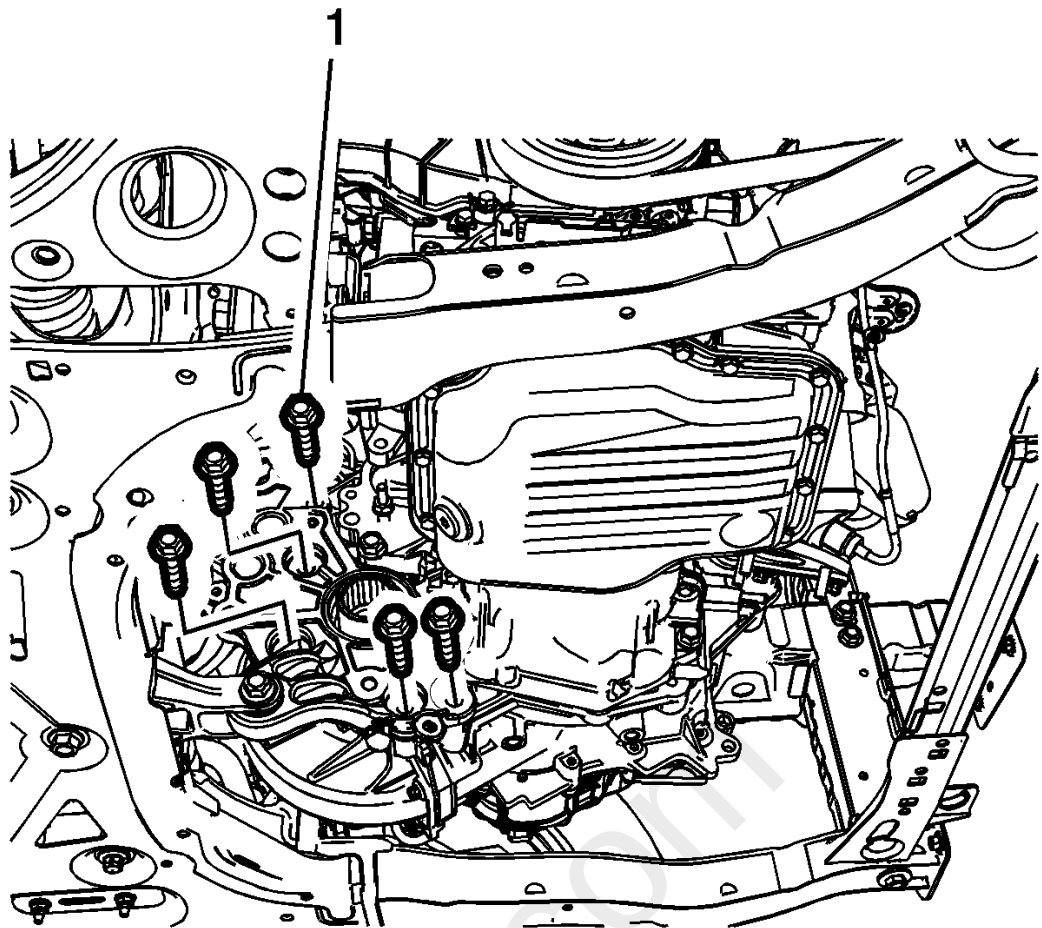


Fig. 47: Transmission Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Remove and DISCARD the five transmission bracket bolts (1).

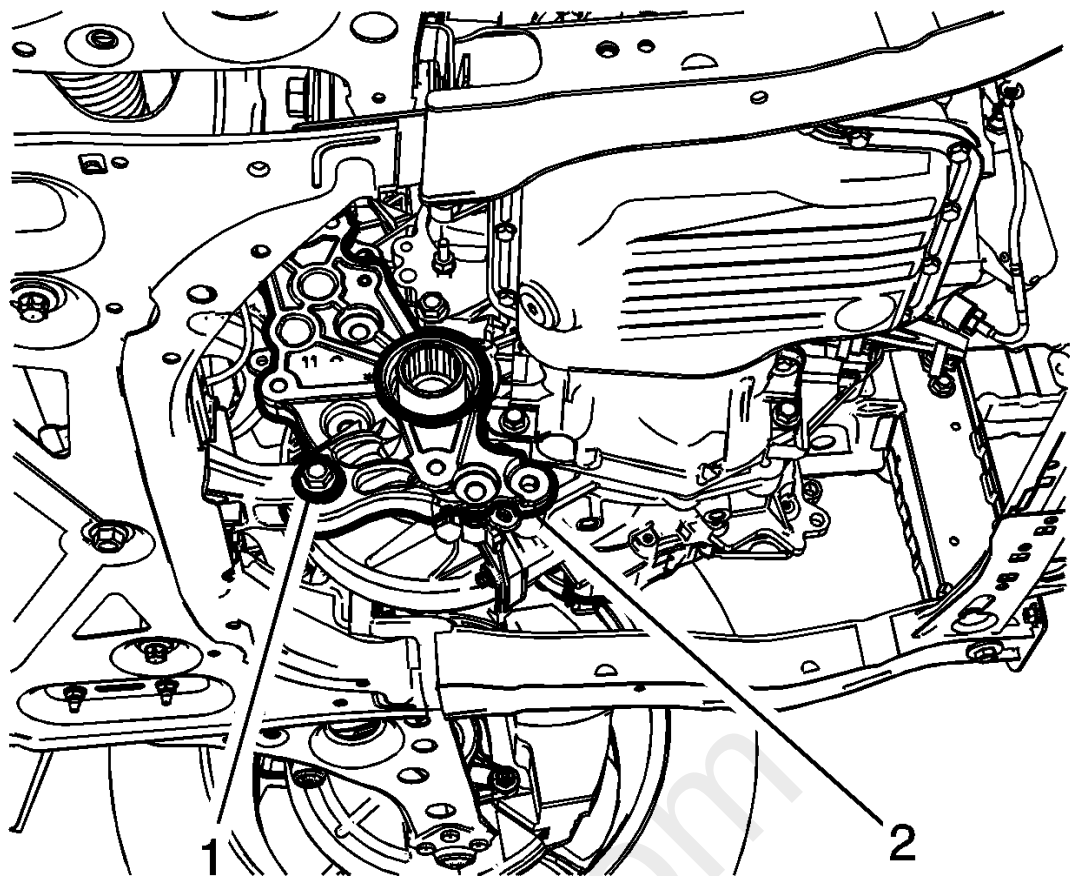


Fig. 48: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

3. Remove and DISCARD the transmission rear mount through bolt (1).
4. Remove the transmission bracket (2) from the transmission.

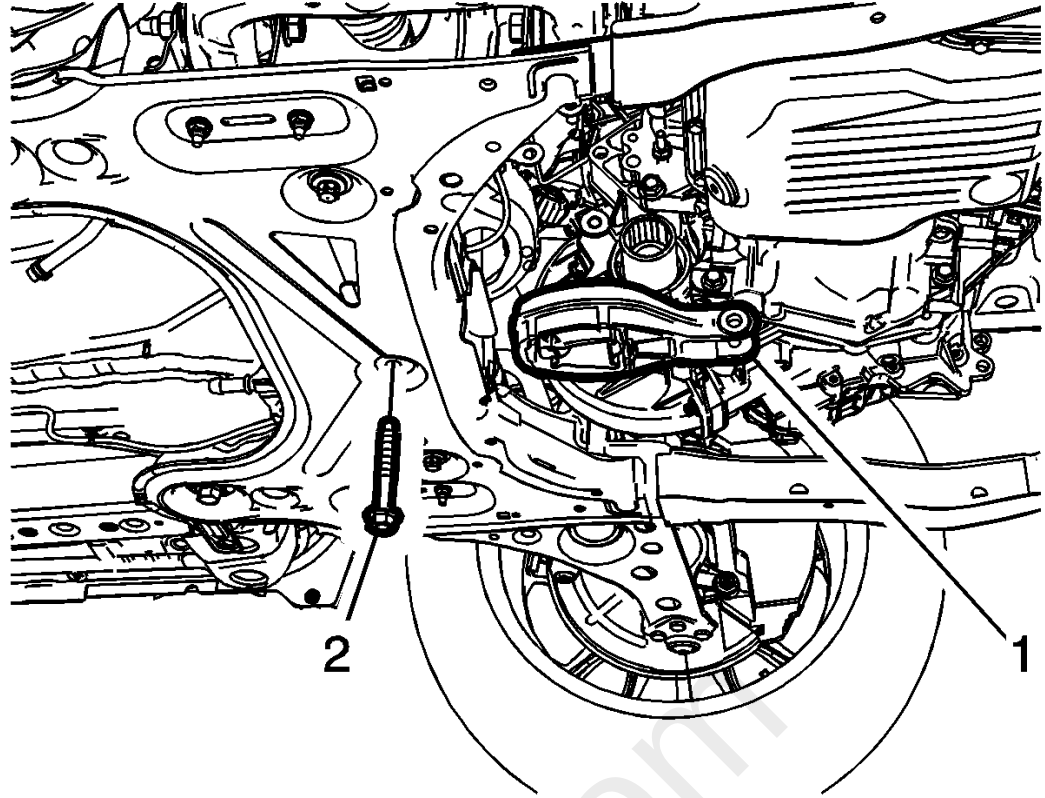


Fig. 49: Transmission Rear Mount

Courtesy of GENERAL MOTORS COMPANY

5. Remove and DISCARD the transmission rear mount fastener (2).
6. Remove the transmission rear mount (1) from the vehicle.

Installation Procedure

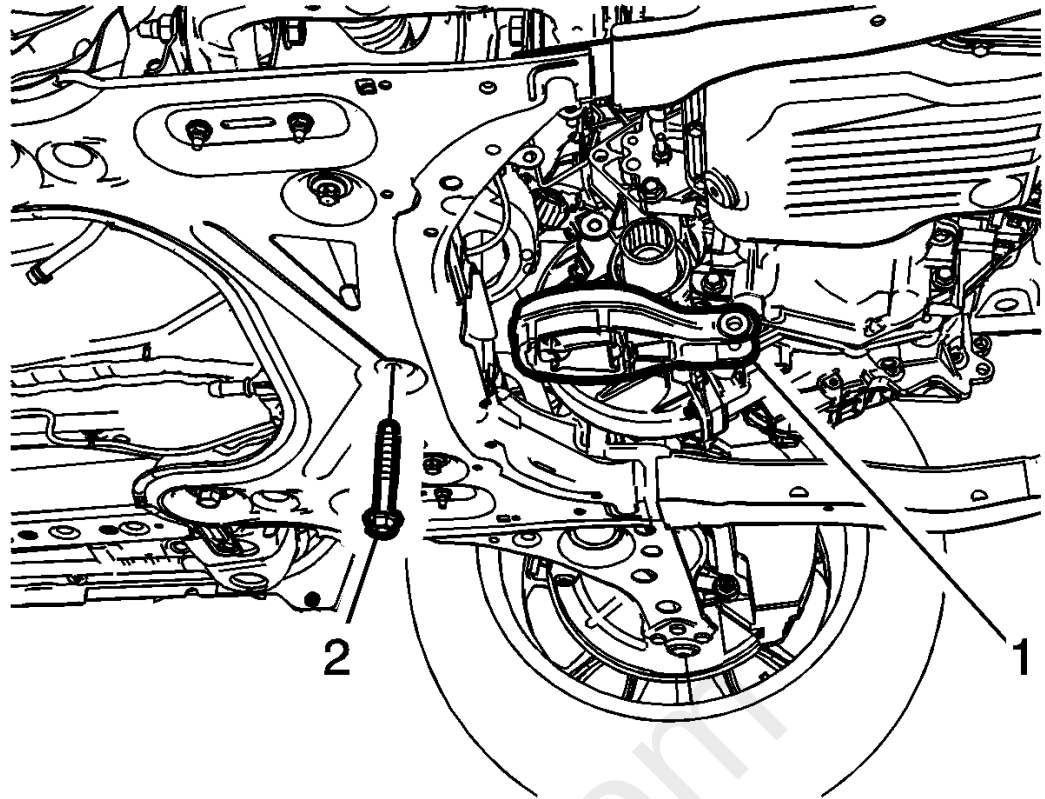


Fig. 50: Transmission Rear Mount

Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission rear mount (1) to the vehicle.

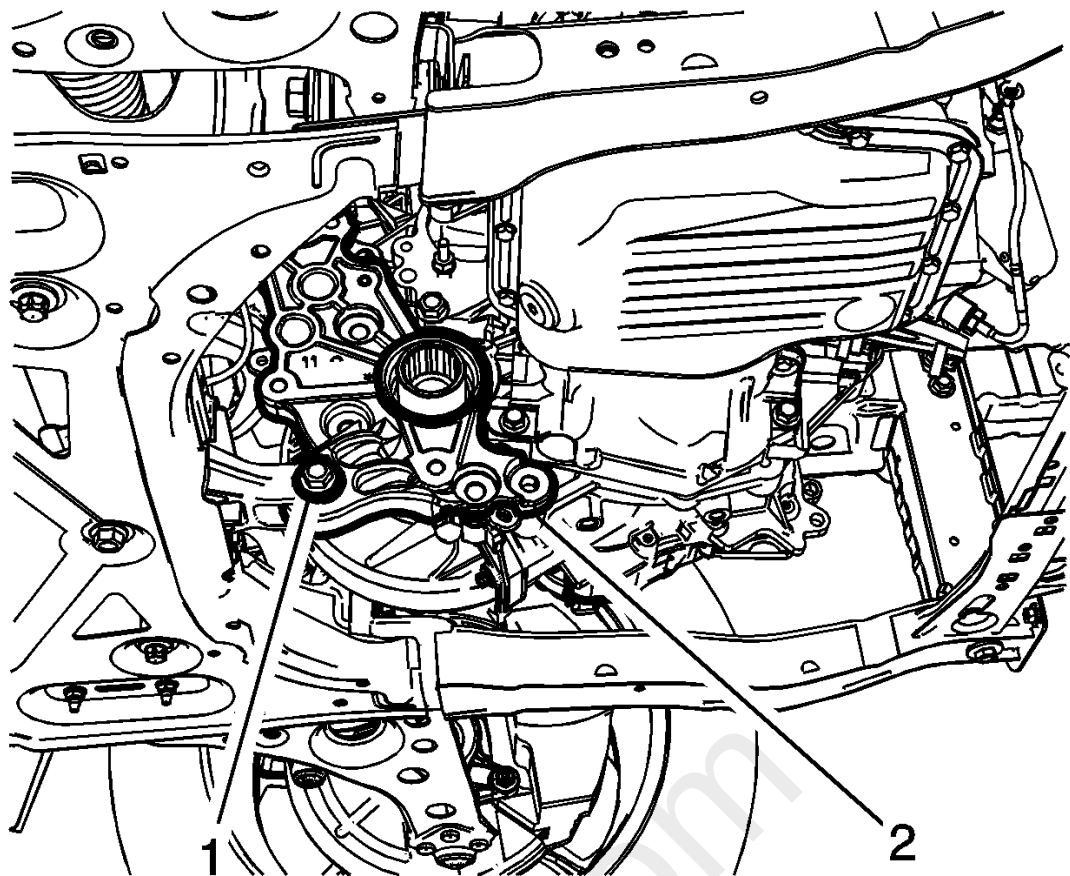


Fig. 51: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

2. Install the transmission bracket (2) to the transmission.

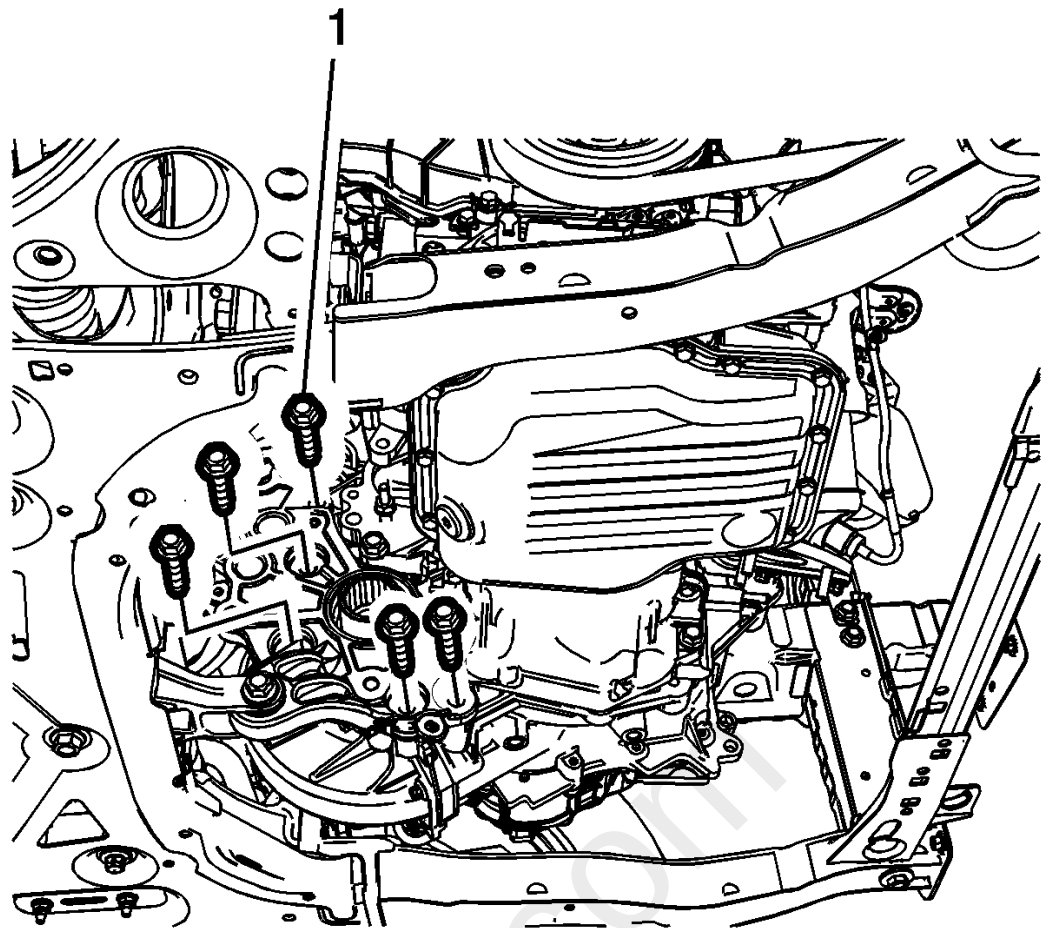


Fig. 52: Transmission Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

3. Install the NEW transmission bracket to transmission bolts (1) and tighten to 100 N.m (74 lb ft) plus 30-40 degrees.

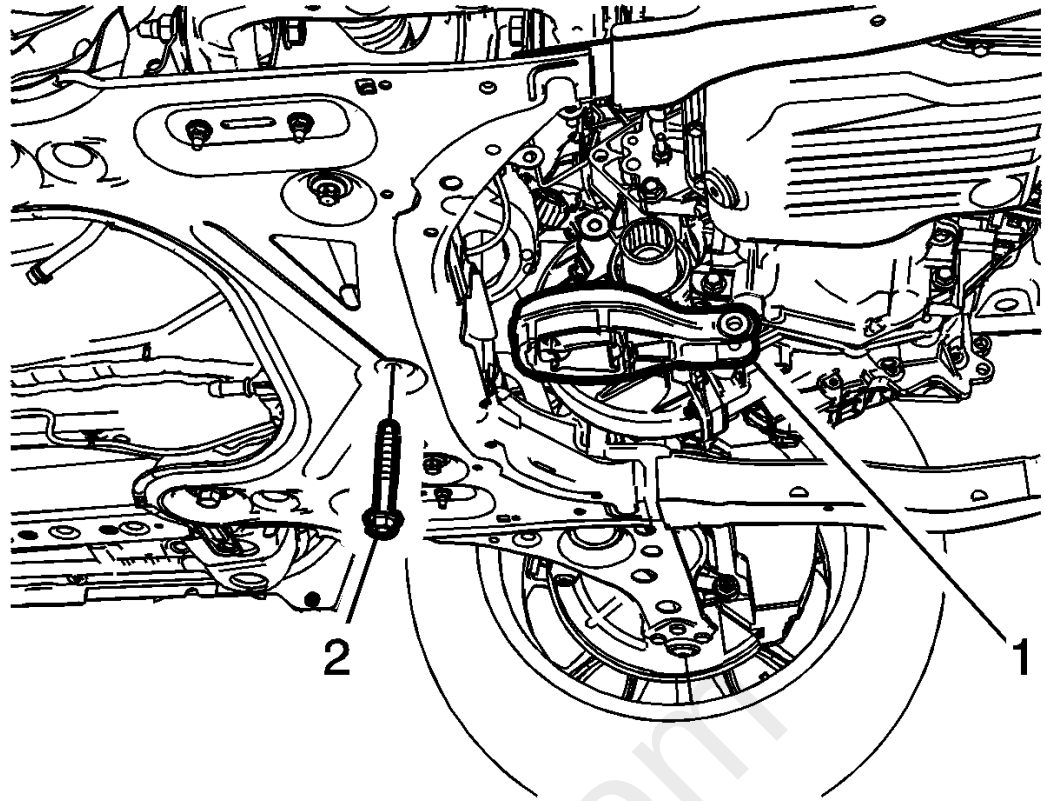


Fig. 53: Transmission Rear Mount

Courtesy of GENERAL MOTORS COMPANY

4. Install the NEW transmission rear mount fastener (2) and tighten to 100 N.m (74 lb ft) plus 90-105 degrees.

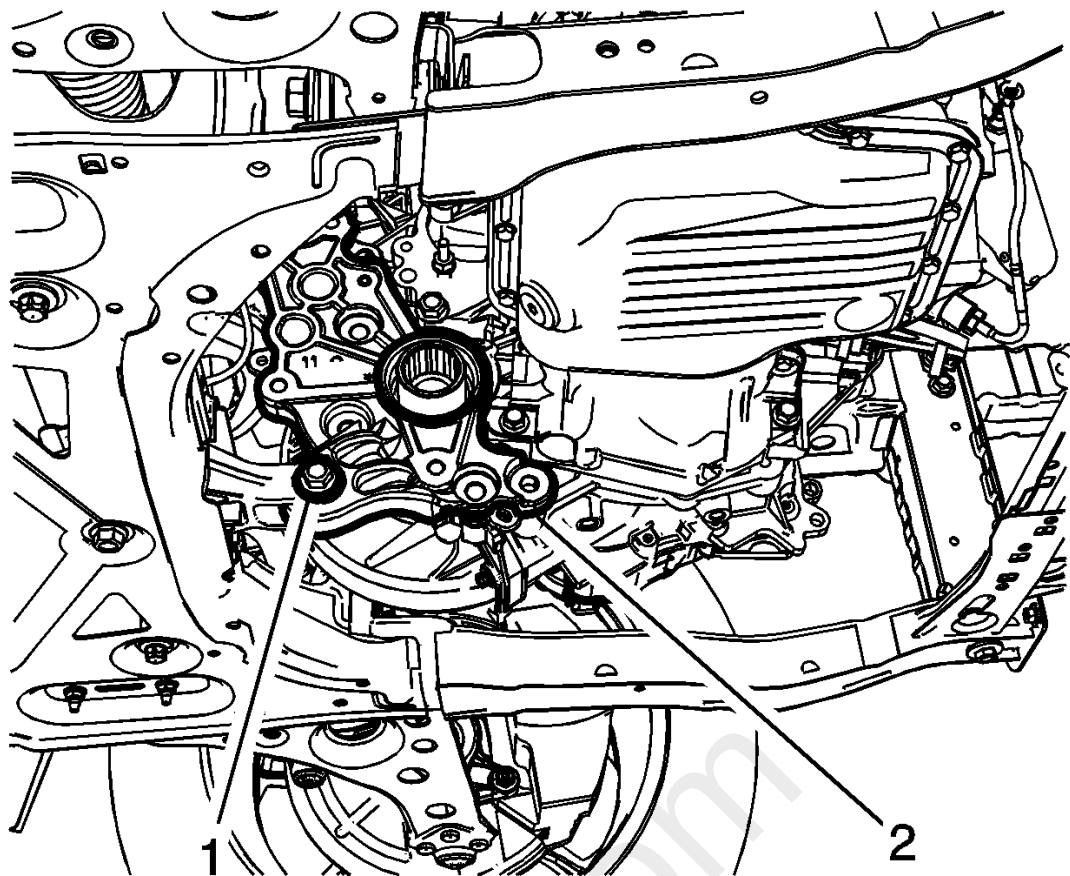


Fig. 54: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

5. Install the NEW transmission rear mount through bolt (1) and tighten to 80 N.m (59 lb ft) plus 45-60 degrees.
6. Install the transfer case. Refer to [Transfer Case Replacement](#) .

TRANSMISSION MOUNT REPLACEMENT - LEFT SIDE

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#) .
2. Install the engine support fixture. Refer to [Engine Support Fixture](#) .

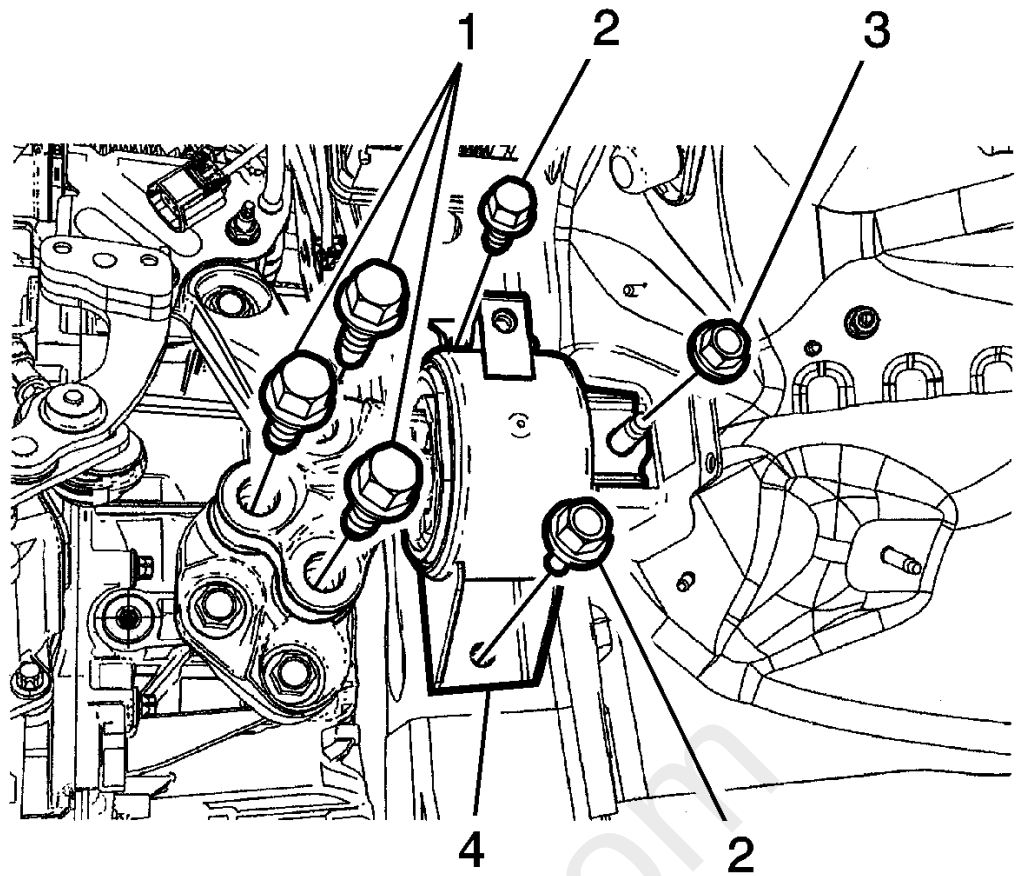


Fig. 55: Left Transmission Mount

Courtesy of GENERAL MOTORS COMPANY

3. Remove and DISCARD the left transmission mount to bracket bolts (1).
4. Remove the left transmission mount to body bolts (2).
5. Remove the left transmission mount to body nut (3).
6. Remove the left transmission mount (4) from the vehicle.

Installation Procedure

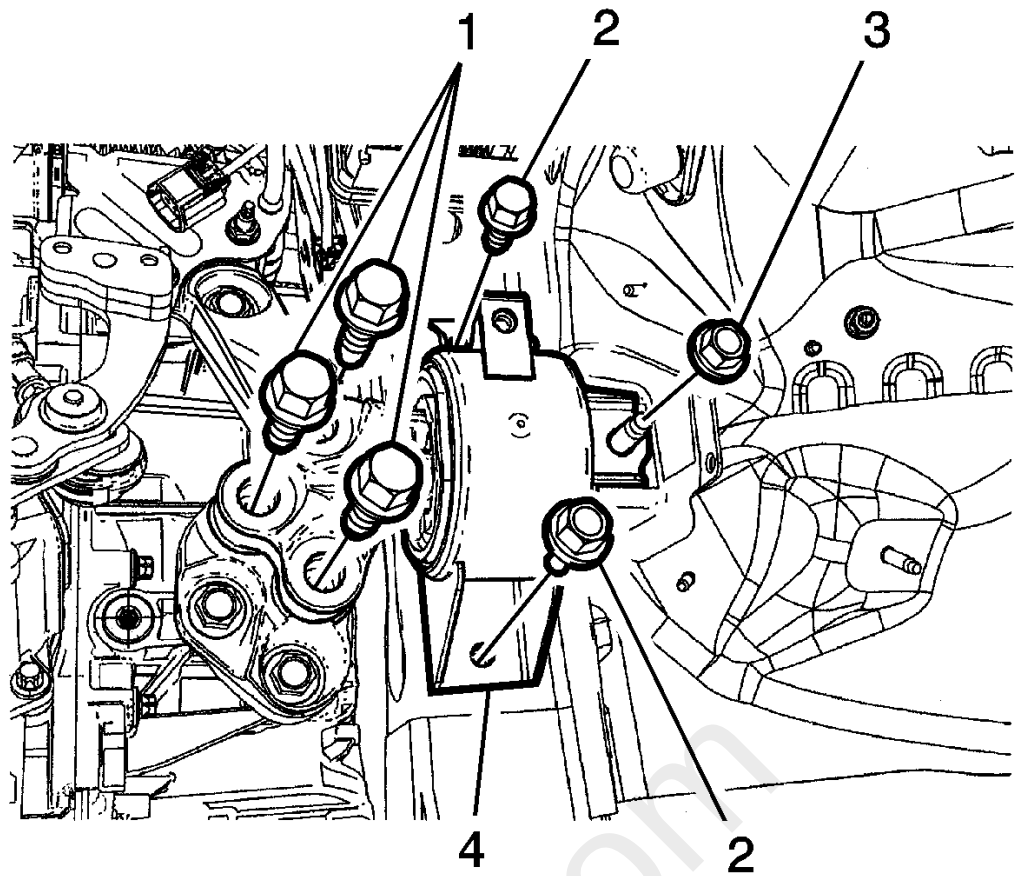


Fig. 56: Left Transmission Mount

Courtesy of GENERAL MOTORS COMPANY

1. Install the left transmission mount (4) to the vehicle.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the left transmission mount to body bolts (2) and tighten to 58 N.m (43 lb ft).
3. Install the left transmission mount to body nut (3) and tighten to 58 N.m (43 lb ft).
4. Install the NEW left transmission mount to transmission bolts (1) and tighten to 50 N.m (37 lb ft) plus 60-75 degrees.
5. Remove the engine support fixture. Refer to [Engine Support Fixture](#) .
6. Install the battery tray. Refer to [Battery Tray Replacement](#) .

TRANSMISSION MOUNT BRACKET REPLACEMENT - REAR (FWD)

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#) [Exhaust Front Pipe Replacement \(2H0\)](#) [Exhaust Front Pipe Replacement \(LE2\)](#) .
3. Using a suitable jack stand, support the rear of the powertrain.

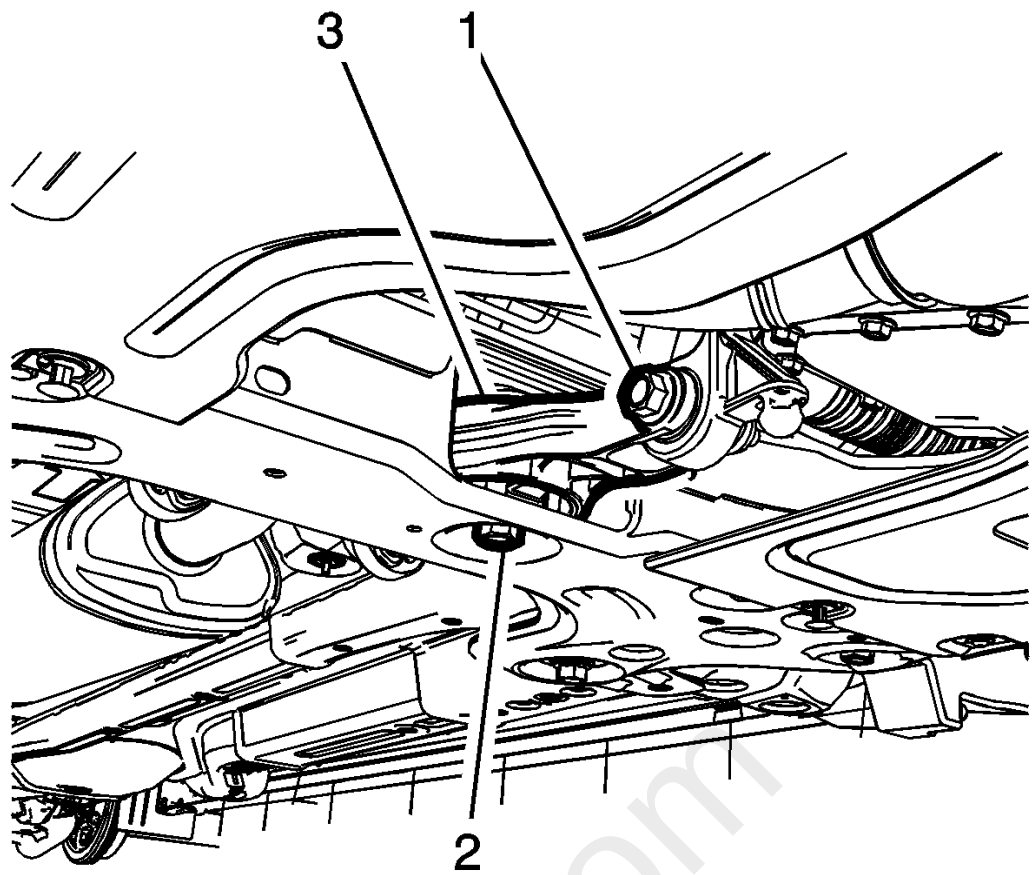


Fig. 57: Transmission Rear Mount Bracket Through Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD the transmission rear mount to bracket through fastener (1).
5. Remove and DISCARD the transmission rear mount fastener (2).

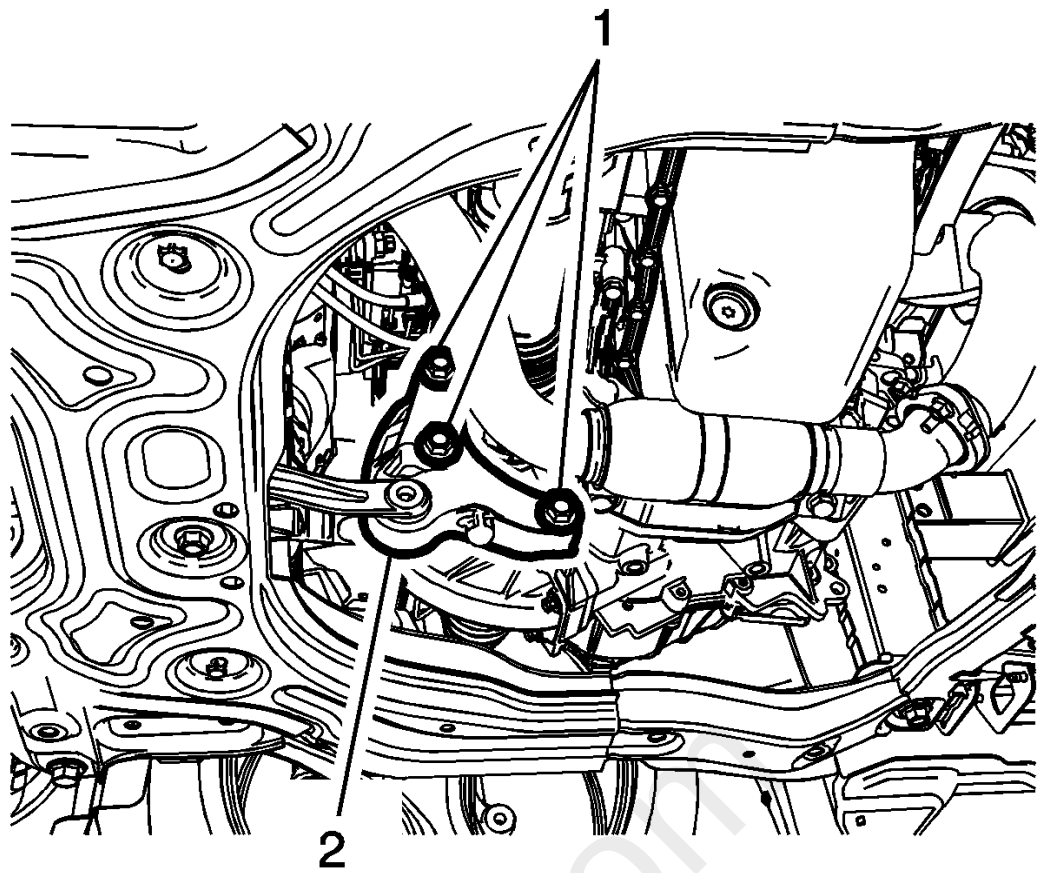


Fig. 58: Transmission Rear Mount Bracket & Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the transmission rear mount bracket fasteners (1).
7. Remove the transmission rear mount and mount bracket.

Installation Procedure

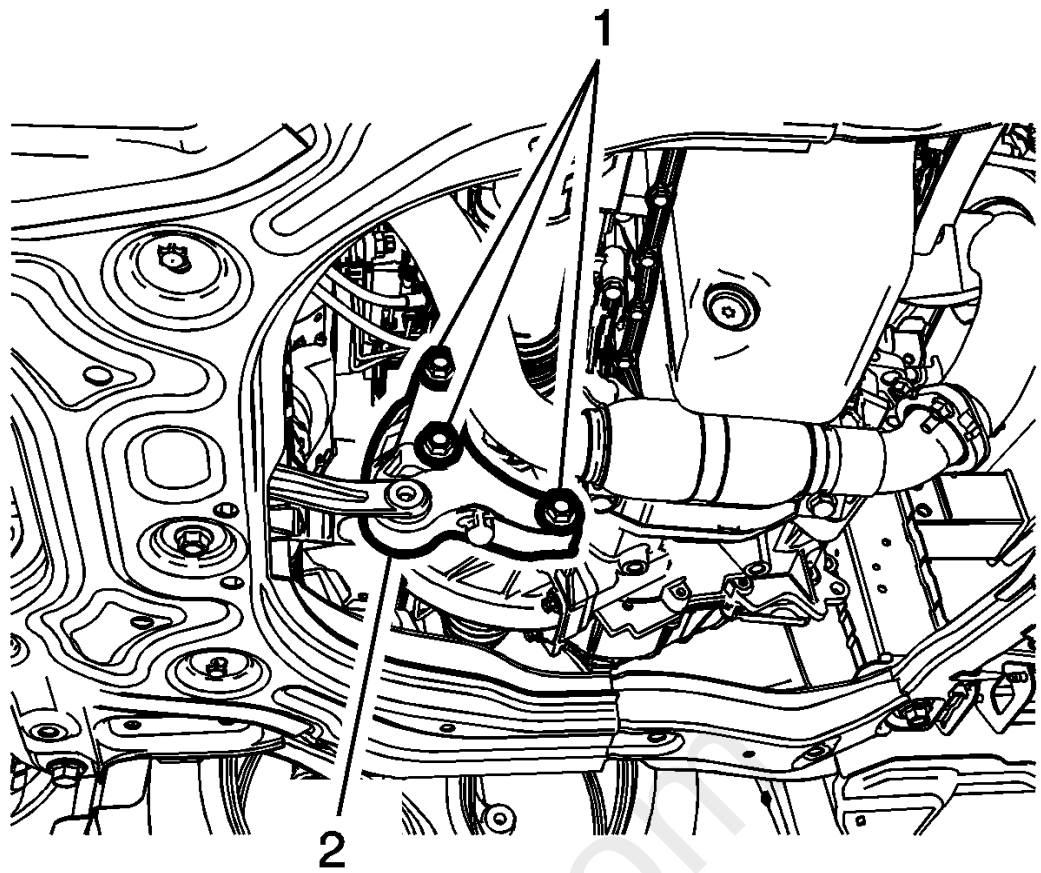


Fig. 59: Transmission Rear Mount Bracket & Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission rear mount and mount bracket.

CAUTION: Refer to **Fastener Caution** .

2. Install the NEW transmission rear mount bracket fasteners (1) and tighten to 100 N.m (74 lb ft) plus 30-45 degrees.

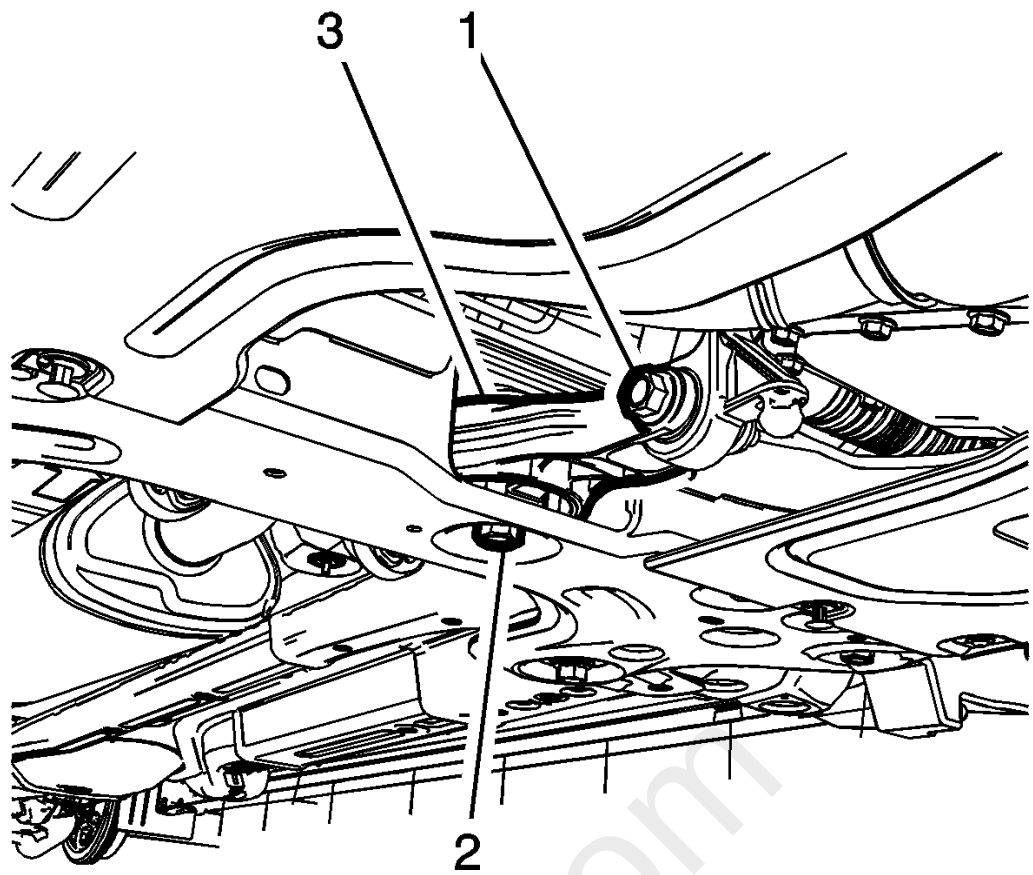


Fig. 60: Transmission Rear Mount Bracket Through Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install the NEW transmission rear mount fastener (2) and tighten to 100 N.m (74 lb ft) plus 90 - 105 degrees.
4. Install the NEW transmission rear mount to bracket through fastener (1) and tighten to 80 N.m (59 lb ft) plus 45-60 degrees.
5. Remove the jack stand.
6. Install the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#), [Exhaust Front Pipe Replacement \(2H0\)](#), [Exhaust Front Pipe Replacement \(LE2\)](#) .
7. Lower the vehicle.

TRANSMISSION MOUNT BRACKET REPLACEMENT - REAR (AWD)

Removal Procedure

1. Remove the transfer case. Refer to [Transfer Case Replacement](#) .

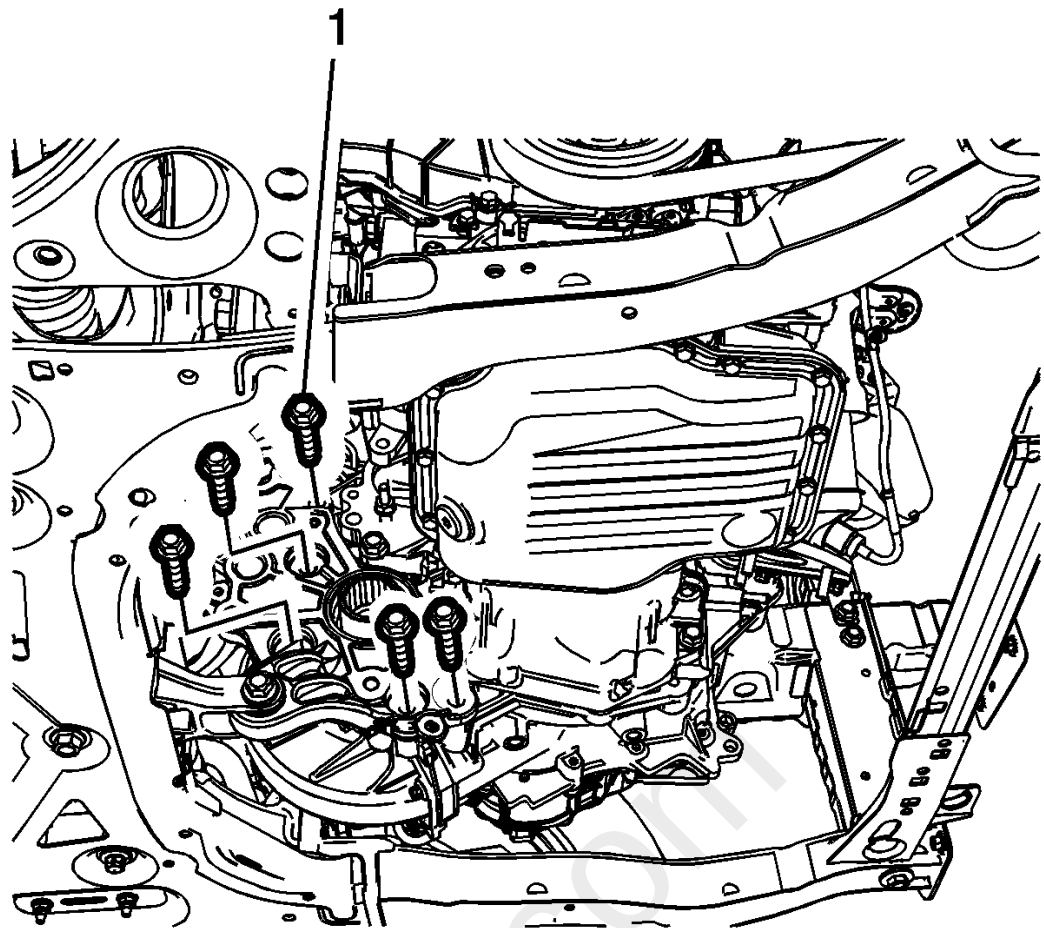


Fig. 61: Transmission Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Remove and DISCARD the five transmission bracket bolts (1).

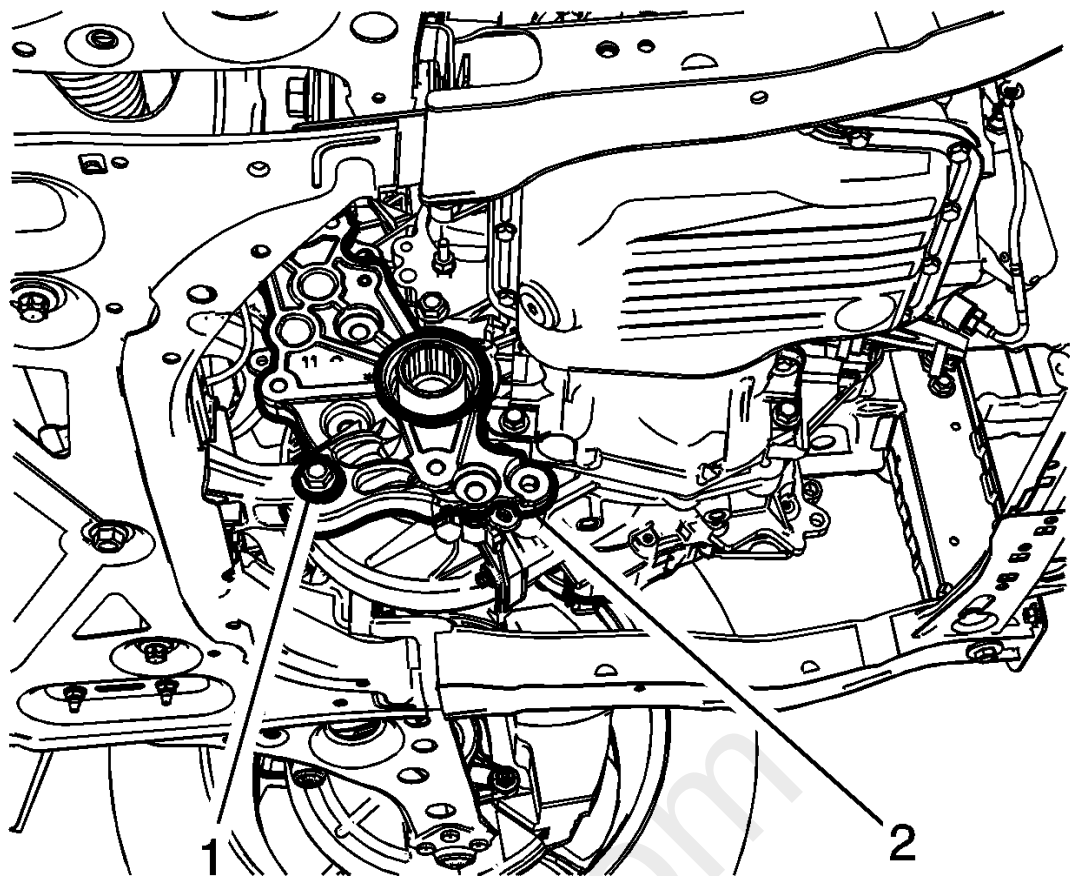


Fig. 62: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

3. Remove and DISCARD the transmission rear mount through bolt (1).
4. Remove the transmission bracket (2) from the transmission.

Installation Procedure

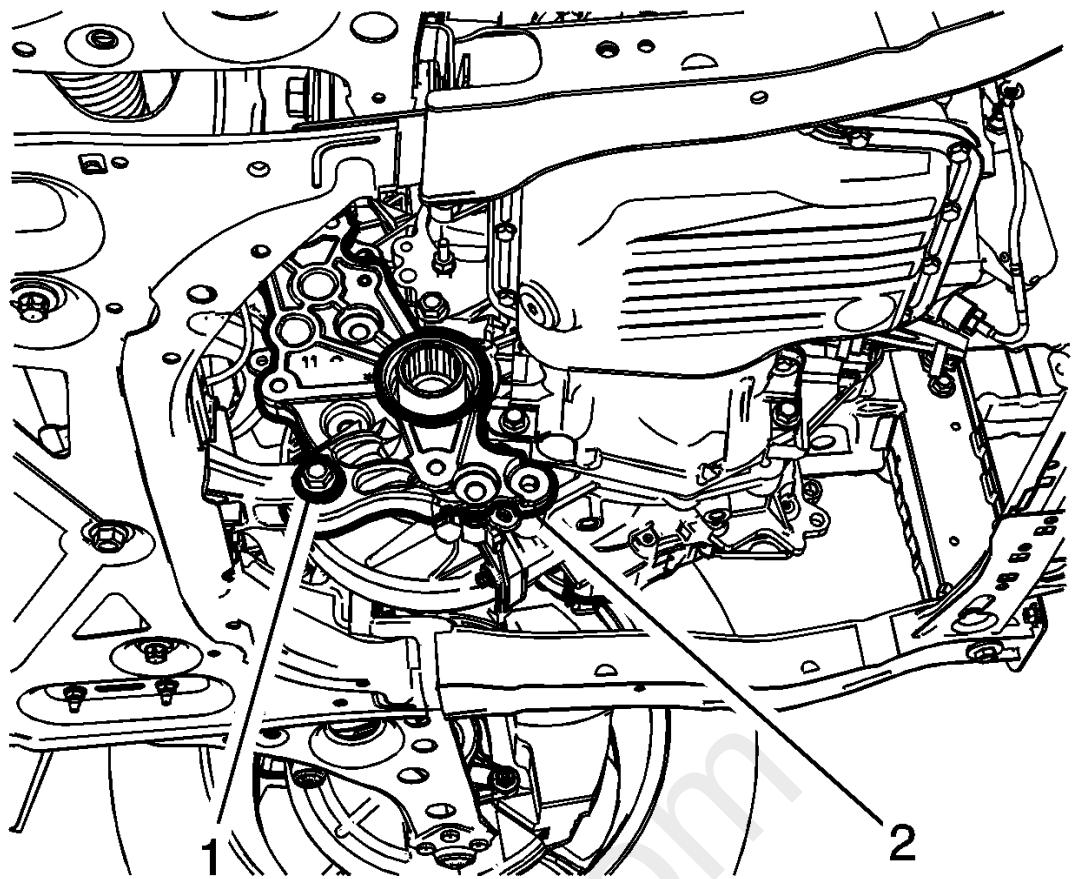


Fig. 63: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission bracket (2) to the transmission.

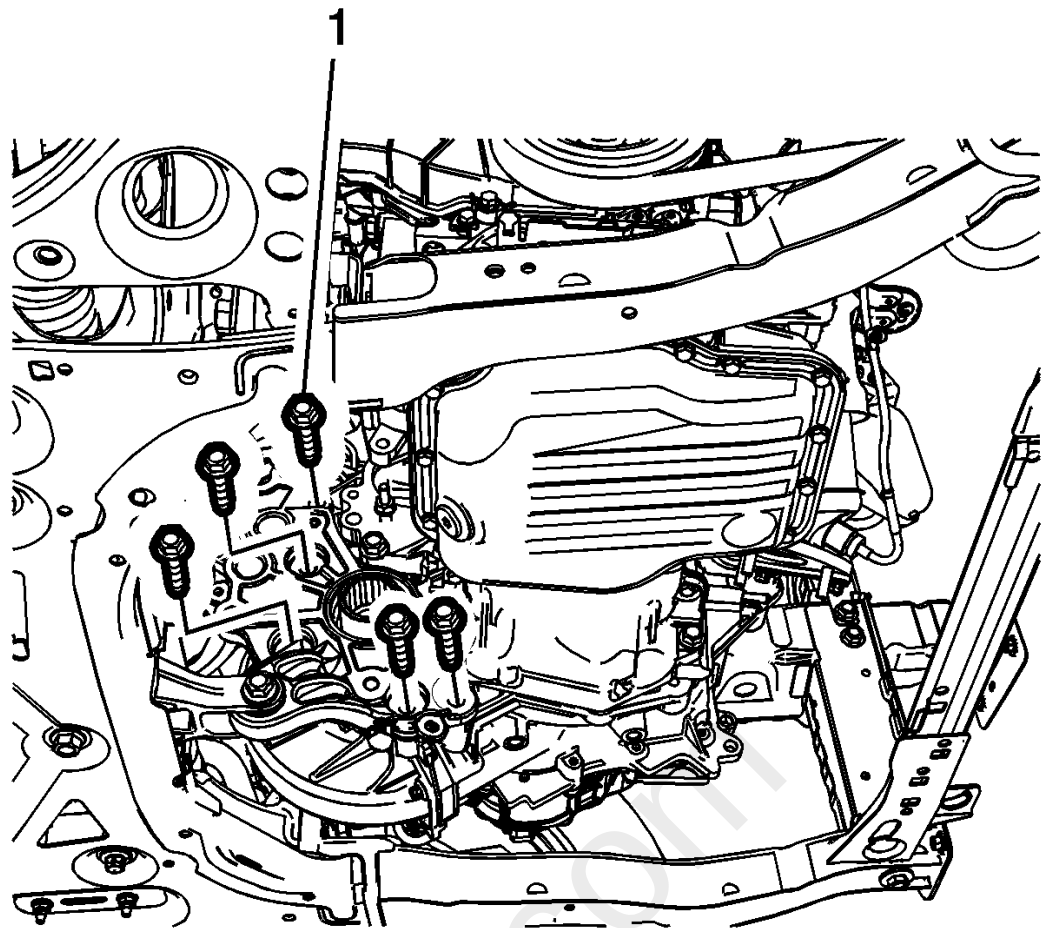


Fig. 64: Transmission Bracket Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install the NEW transmission bracket to transmission bolts (1) and tighten to 100 N.m (74 lb ft) plus 30-40 degrees.

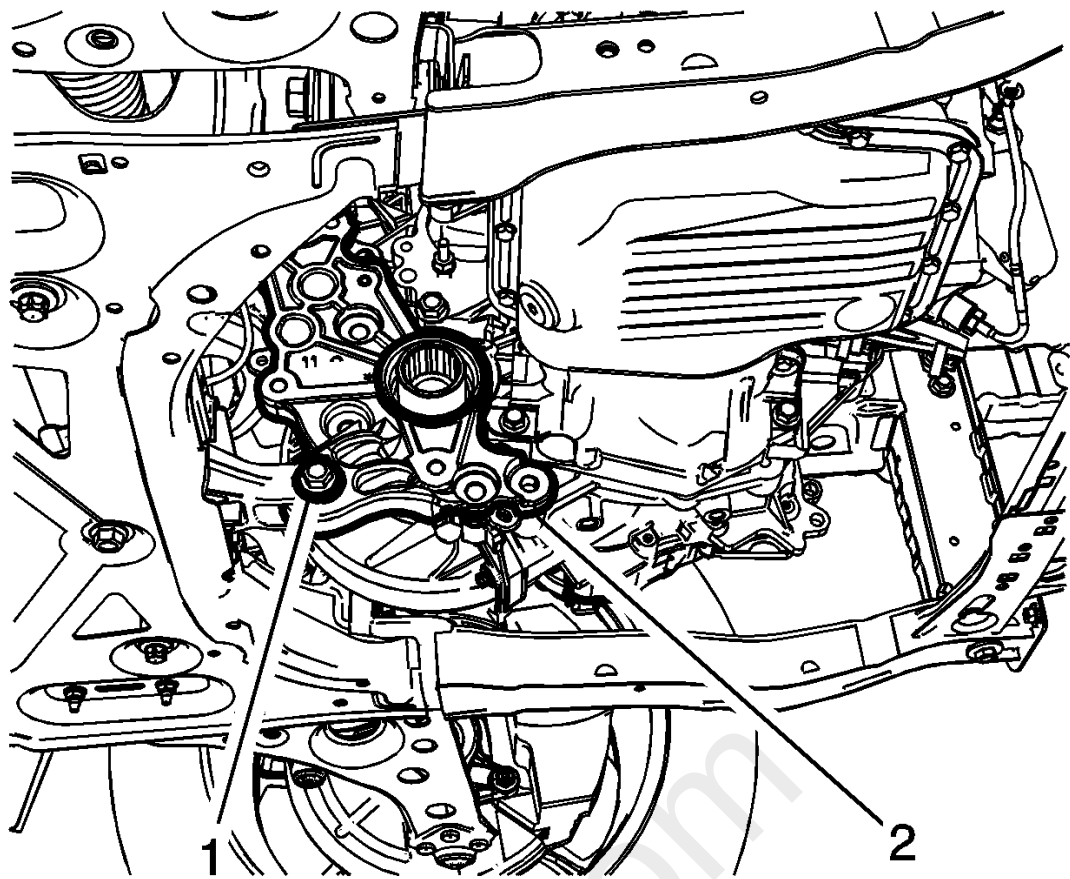


Fig. 65: Transmission Bracket

Courtesy of GENERAL MOTORS COMPANY

3. Install the NEW transmission rear mount through bolt (1) and tighten to 80 N.m (59 lb ft) plus 45-60 degrees.
4. Install the transfer case. Refer to [Transfer Case Replacement](#) .

TRANSMISSION MOUNT BRACKET REPLACEMENT - LEFT SIDE

Removal Procedure

1. Remove the battery tray from the vehicle. Refer to [Battery Tray Replacement](#) .
2. Remove the power brake booster pump assembly from left transmission mount bracket, if equipped. Refer to [Power Brake Booster Pump Replacement](#) .
3. Remove the left transmission mount. Refer to [Transmission Mount Replacement - Left Side](#).

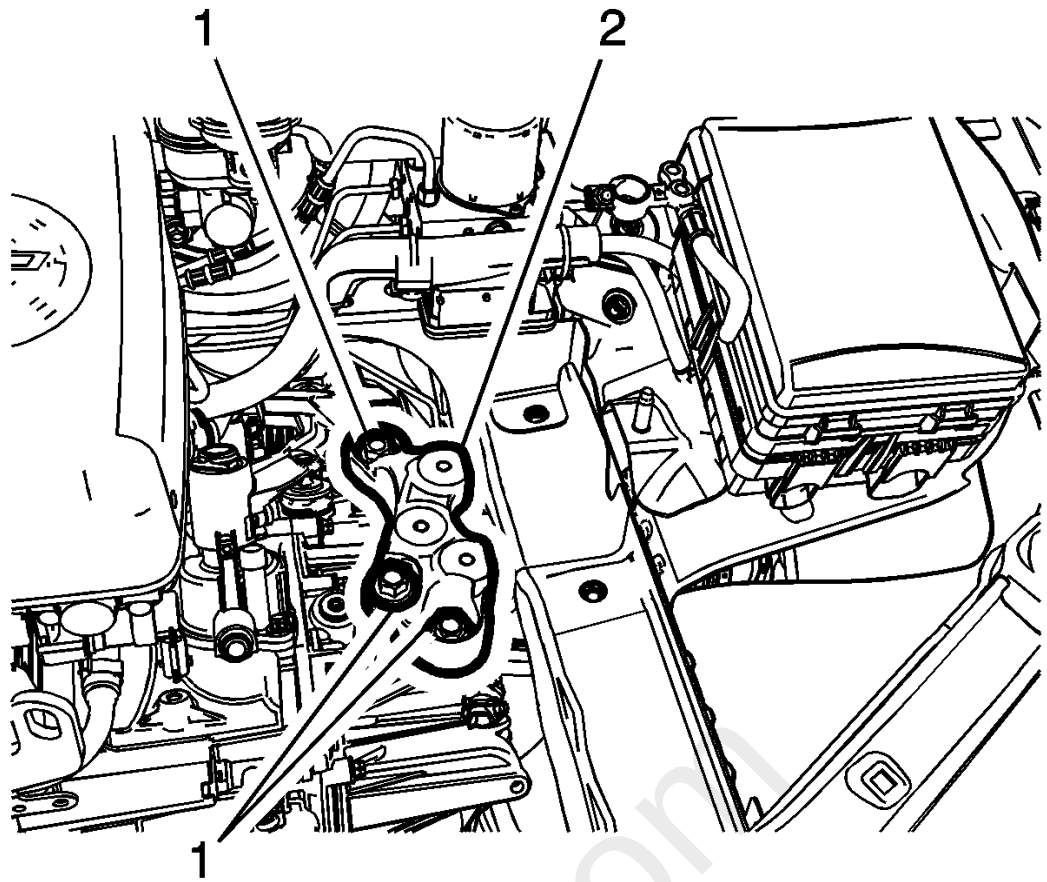


Fig. 66: Left Transmission Mount Bracket & Bolts
Courtesy of GENERAL MOTORS COMPANY

4. Remove the 3 left transmission mount bracket to transmission bolts (1).
5. Remove the left transmission mount bracket (2) from the transmission.

Installation Procedure

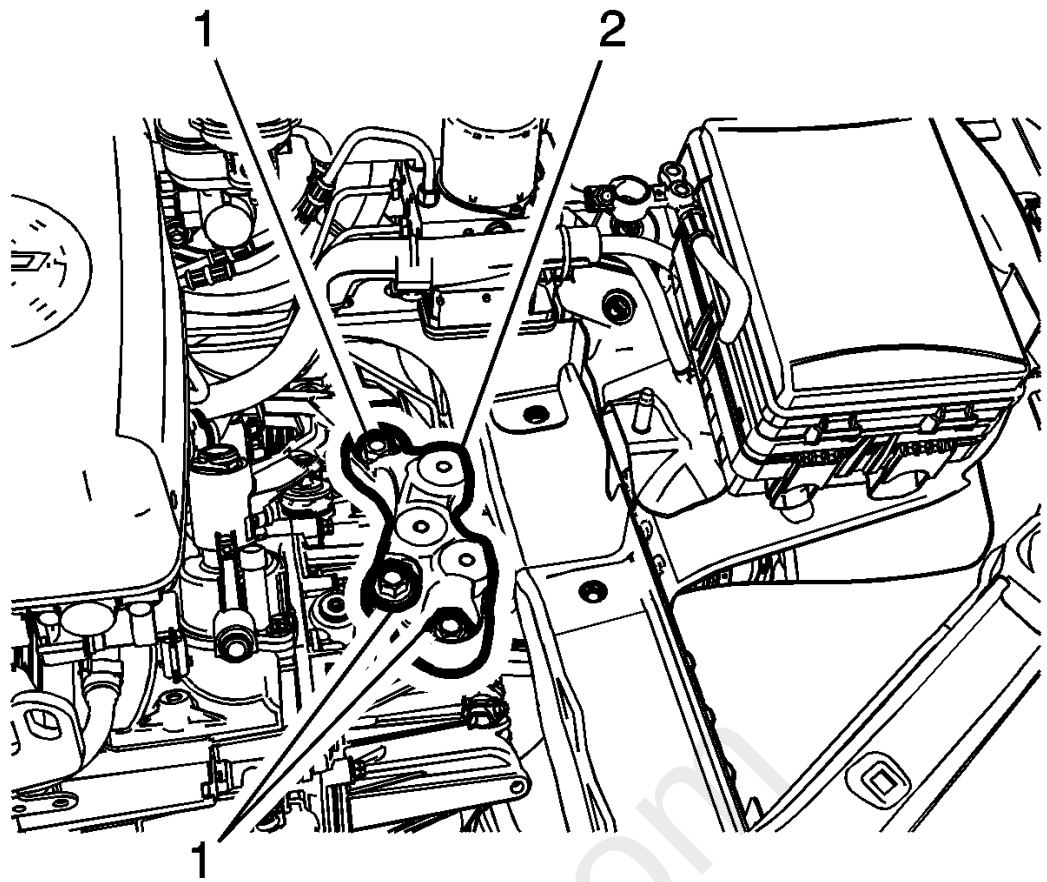


Fig. 67: Left Transmission Mount Bracket & Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the left transmission mount bracket (2) to the transmission.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the left transmission mount bracket to transmission bolts (1) and tighten to 100 N.m (74 lb ft).
3. Install the left transmission mount. Refer to [Transmission Mount Replacement - Left Side](#).
4. Install the power brake booster pump assembly to left transmission mount bracket, if equipped. Refer to [Power Brake Booster Pump Replacement](#) .
5. Install the battery tray to the vehicle. Refer to [Battery Tray Replacement](#) .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE

Special Tools

- CH-466-A Gear, Bearing Remover/Installer
- DT-519 Installer Drift
- DT-523 Remover/Installer

For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

1. Remove the left front wheel drive shaft. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#) .

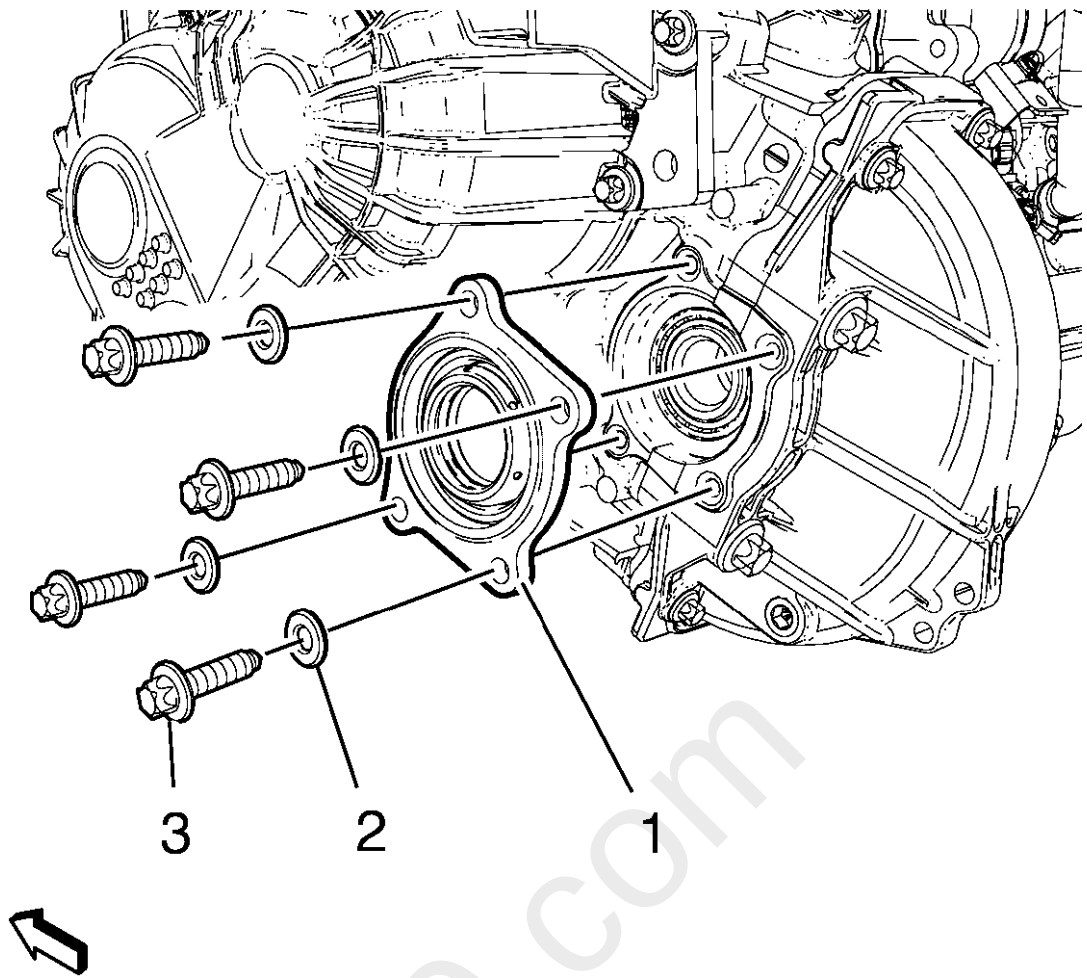


Fig. 68: Front Differential Carrier Flange, Bolts And Washers
Courtesy of GENERAL MOTORS COMPANY

2. Remove and DISCARD the 4 front differential carrier flange bolts (3) and 4 washers (2).
3. Remove the front differential carrier flange (1) from the transmission.

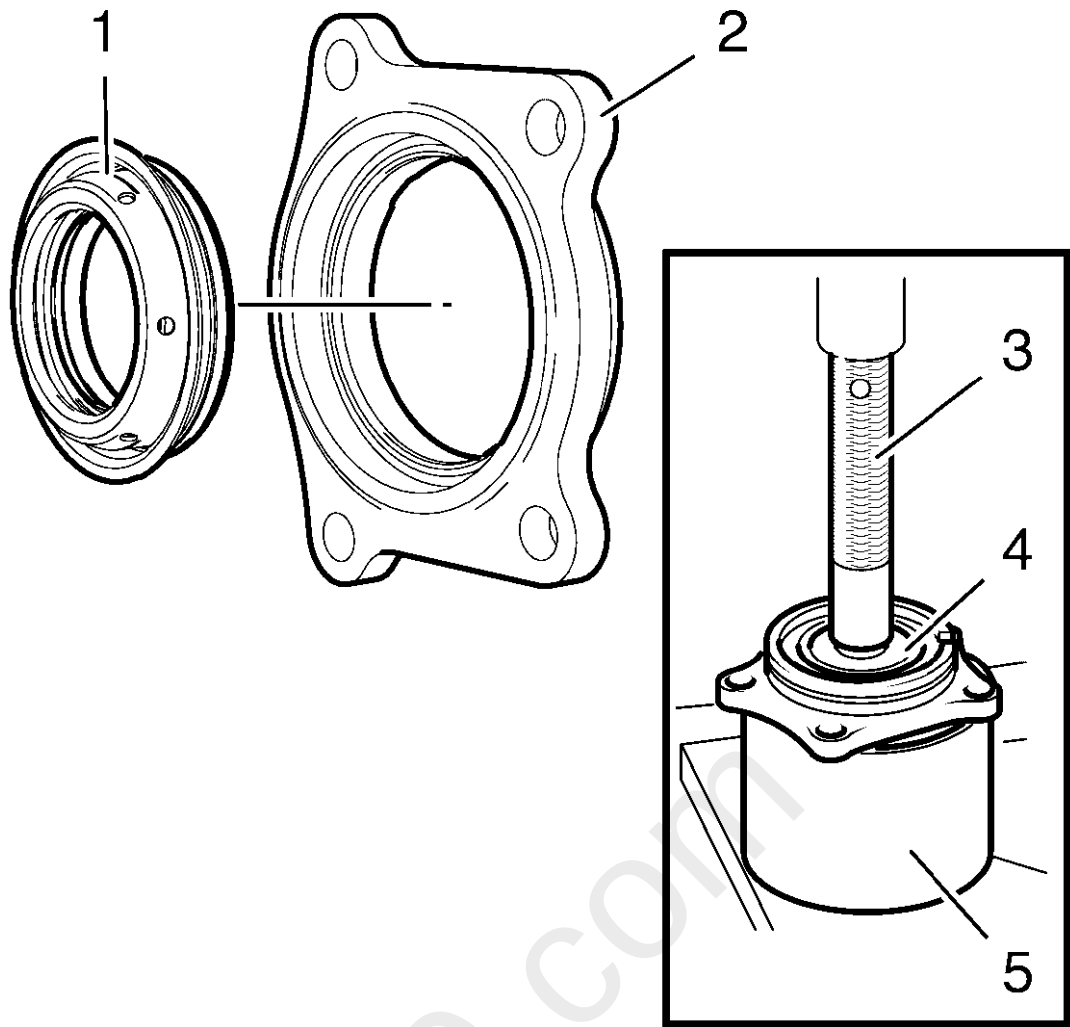


Fig. 69: Front Wheel Drive Shaft Oil Seal, Front Differential Carrier Flange And Remover/Installer
Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD the front wheel drive shaft oil seal (1) from front differential carrier flange (2).
5. Put front differential carrier flange on **CH-466-A** gear, bearing remover/installer (5) and press front wheel drive shaft oil seal out of front differential carrier flange using **DT-523-1** remover/installer (3) in conjunction with **DT-523-3** remover/installer (4).

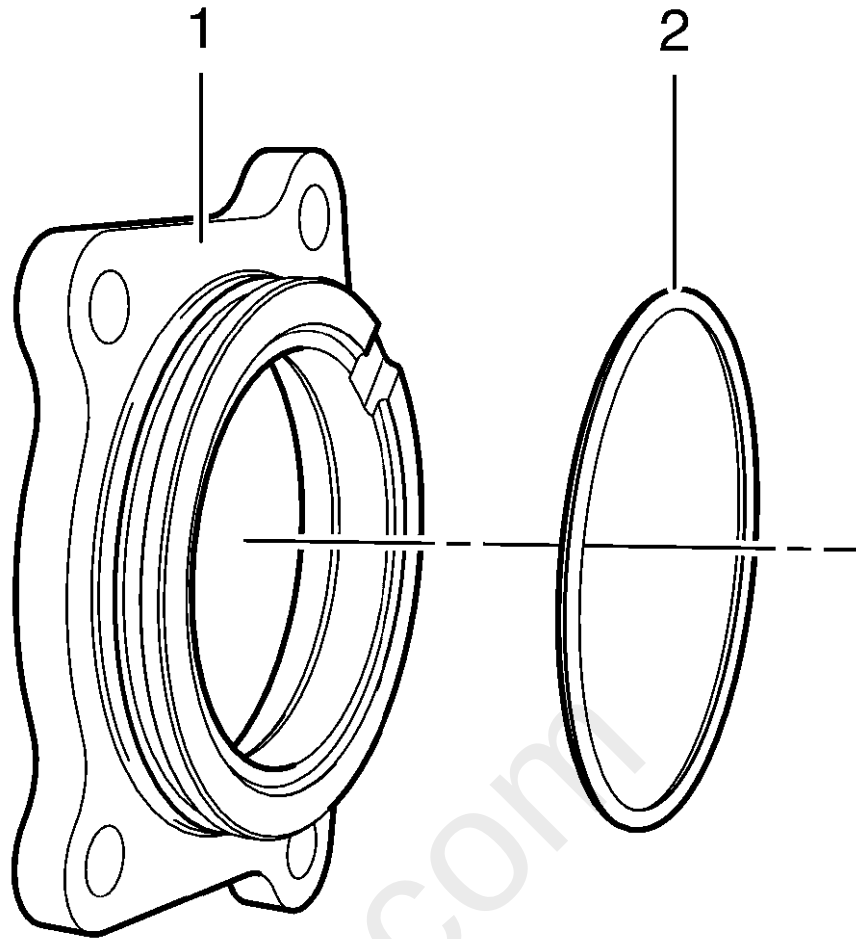


Fig. 70: Front Differential Carrier Flange And Seal
Courtesy of GENERAL MOTORS COMPANY

6. Remove and DISCARD the front differential carrier flange seal (2) from front differential carrier flange (1).

Installation Procedure

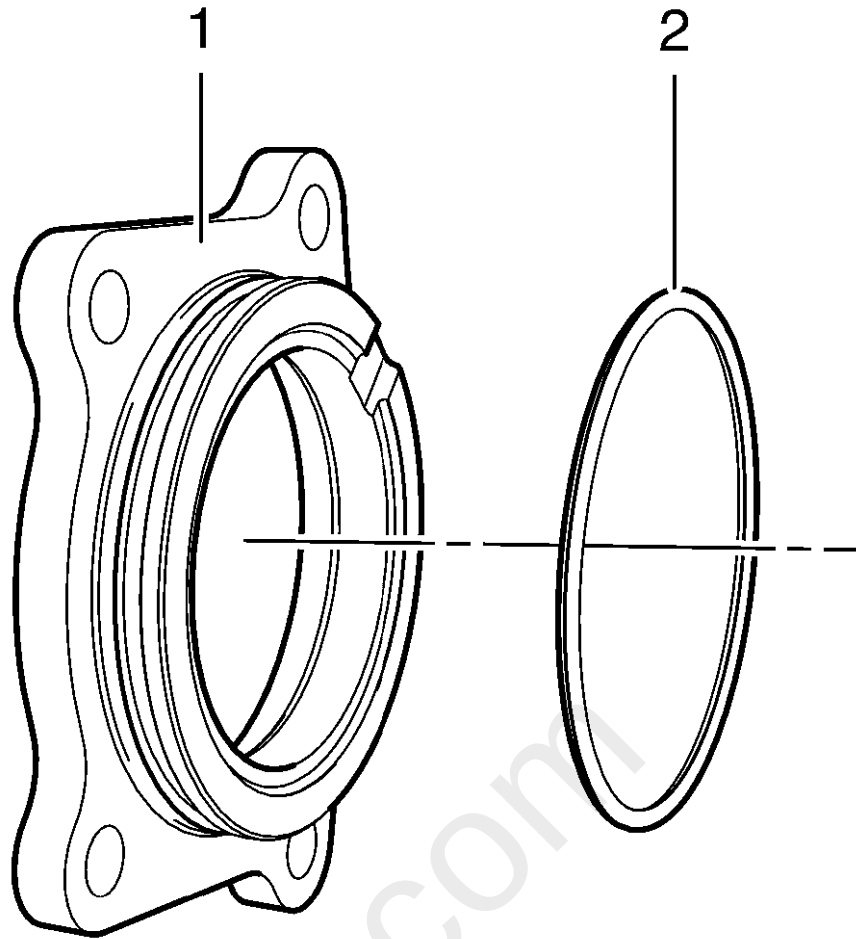


Fig. 71: Front Differential Carrier Flange And Seal
Courtesy of GENERAL MOTORS COMPANY

NOTE: Coat the front differential carrier flange seal with **NEW** transmission fluid.

1. Install the NEW front differential carrier flange seal (2) to front differential carrier flange (1).

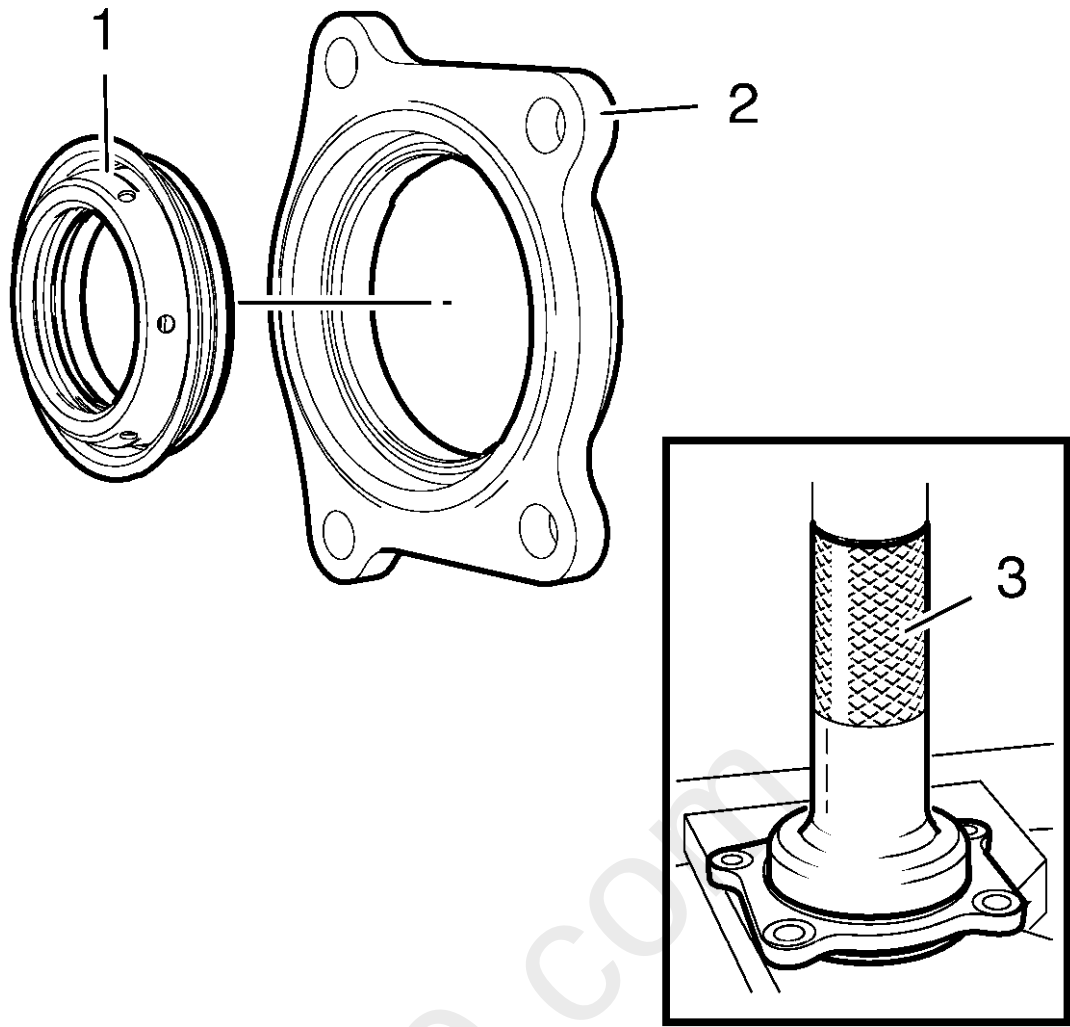


Fig. 72: Front Differential Carrier Flange, Front Wheel Drive Shaft Oil Seal And Installer Drift
Courtesy of GENERAL MOTORS COMPANY

NOTE: Coat the front wheel drive shaft oil seal with NEW transmission fluid.

2. Install the NEW front wheel drive shaft oil seal (1) to front differential carrier flange (2) using **DT-519** installer drift (3).

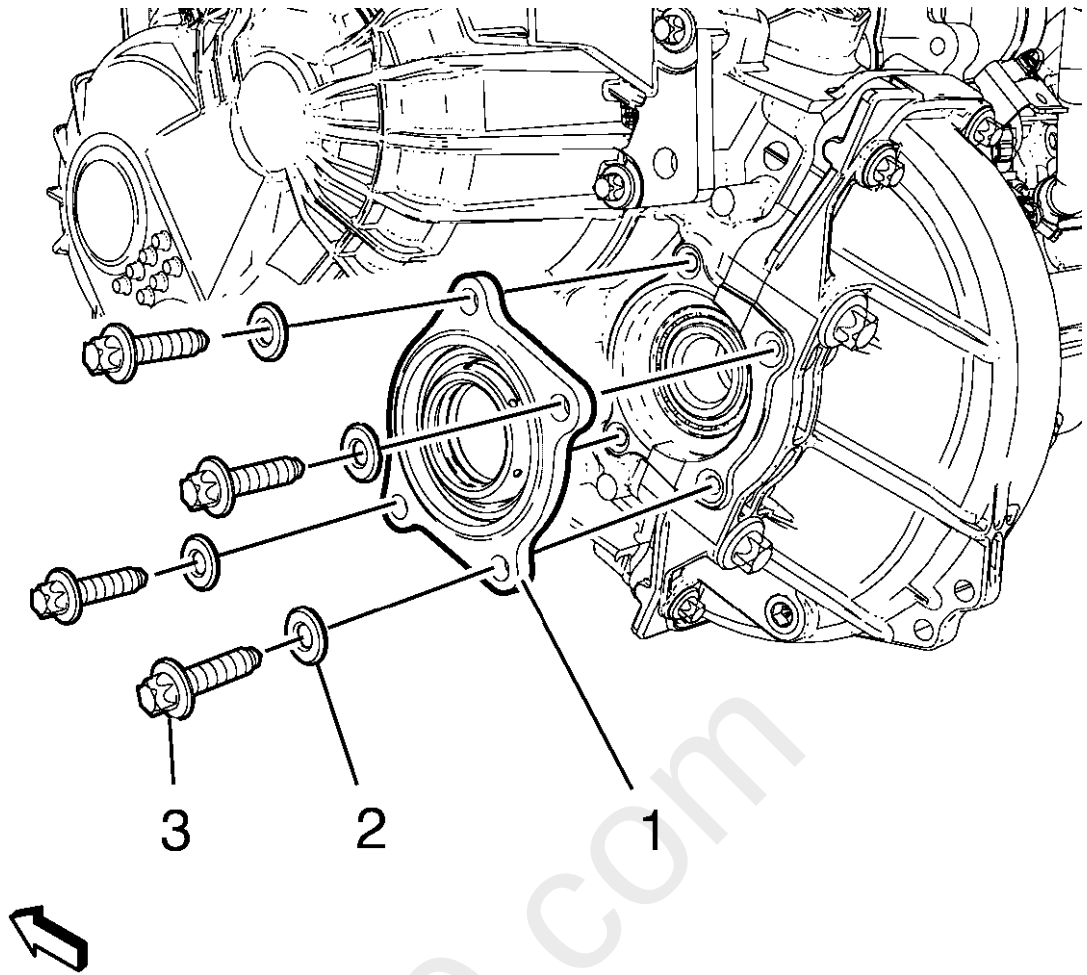


Fig. 73: Front Differential Carrier Flange, Bolts And Washers
Courtesy of GENERAL MOTORS COMPANY

3. Install the front differential carrier flange (1) to transmission.

CAUTION: Refer to [Fastener Caution](#) .

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

4. Install the 4 washers (2) and 4 NEW front differential carrier flange bolts (3) and tighten to 20 N.m (15 lb ft) plus 45 degrees.
5. Install the left front wheel drive shaft. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#) .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE (AWD)

Removal Procedure

1. Remove the transfer case. Refer to [Transfer Case Replacement](#) .

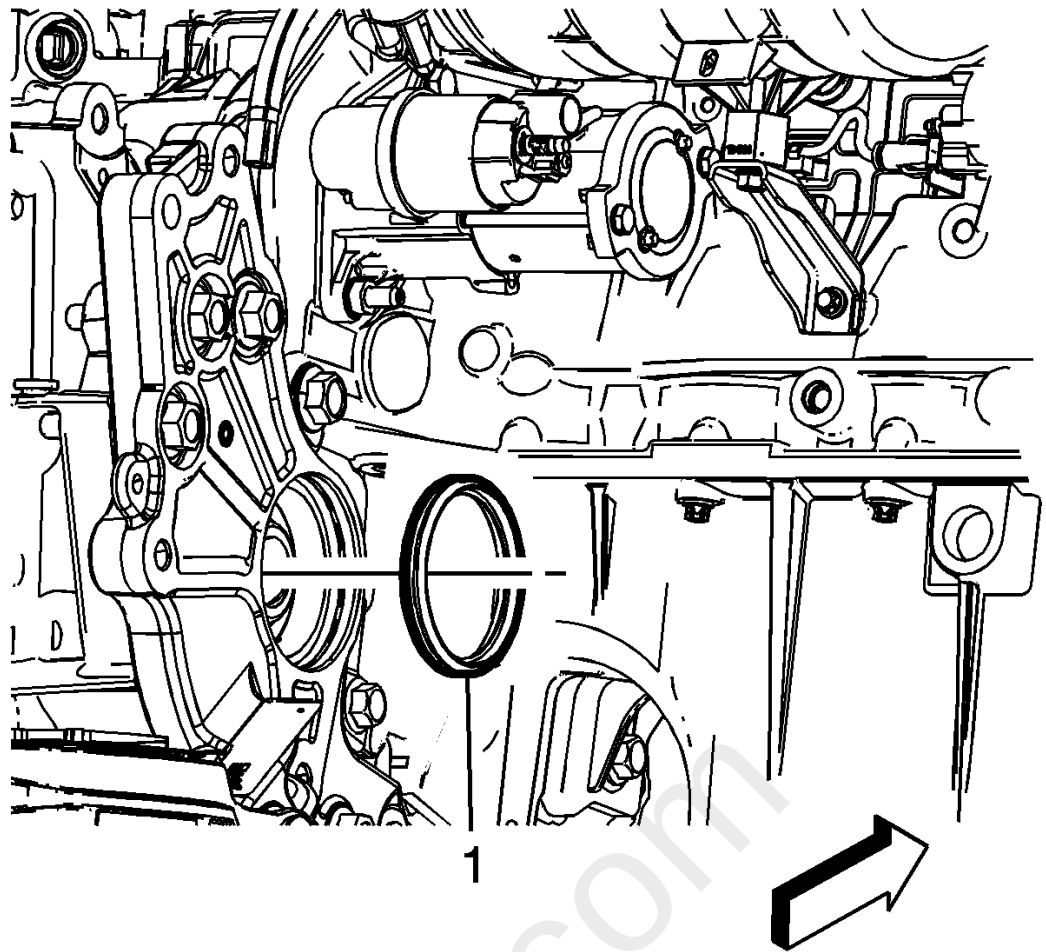


Fig. 74: Transfer Case-To-Transfer Case Bracket Seal
Courtesy of GENERAL MOTORS COMPANY

2. Remove and discard the transfer case adapter seal (1).

Installation Procedure

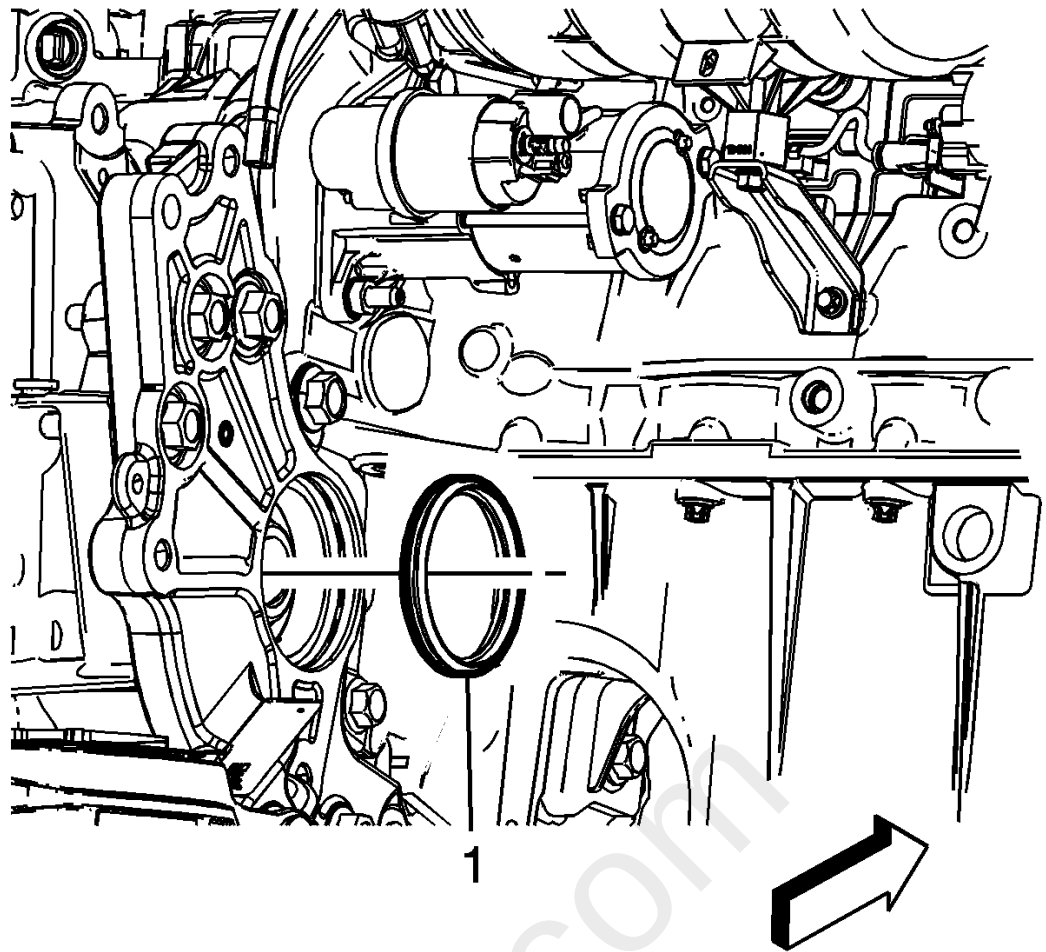


Fig. 75: Transfer Case-To-Transfer Case Bracket Seal

Courtesy of GENERAL MOTORS COMPANY

1. Clean the contact surfaces of the transmission, transfer case adapter bracket, and PTU.
2. Lightly lubricate the adapter seal with transmission oil prior to installation.

NOTE: Install the OD groove of the seal onto the raised area in the adapter seal bore. A properly installed seal will be installed 2.66 mm (0.10 in) below the machined surface when measured from the PTU side of bracket.

3. Install a new transfer case adapter seal (1). Refer to [Transfer Case Assemble](#) .
4. Install the transfer case. Refer to [Transfer Case Replacement](#) .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE (FWD)

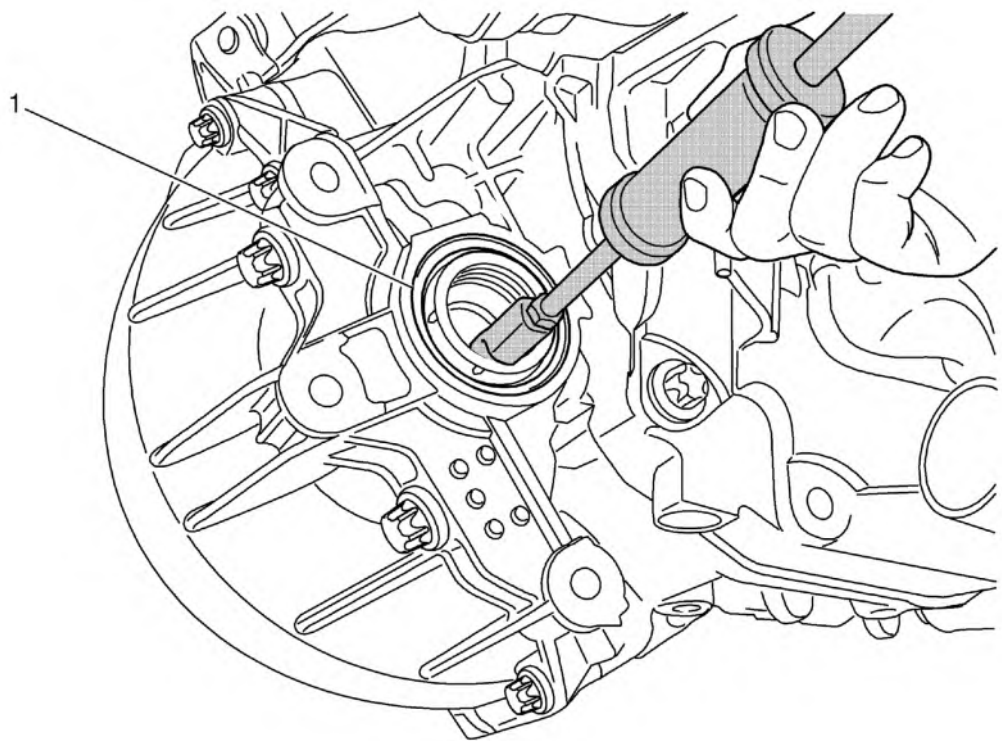


Fig. 76: Front Wheel Drive Shaft Seal - Right Side (FWD)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the front wheel drive shaft from the transmission. Refer to Front Wheel Drive Shaft Replacement - Right Side . 3. Remove the front wheel drive intermediate shaft. Refer to Front Wheel Drive Intermediate Shaft Replacement (LE2 with MNH) Front Wheel Drive Intermediate Shaft Replacement (LUV with MR5) .	
1	Right Front Wheel Drive Shaft Oil Seal Procedure 1. Remove the right front wheel drive shaft oil seal using the DT-7004 hammer and the DT-23129 remover. 2. Coat the NEW right front wheel drive shaft oil seal with transmission fluid. 3. Install the NEW right front wheel drive shaft oil seal using the DT-519 drift and hammer. NOTE: Do not reuse the wheel drive shaft oil seal. Special Tools • DT-519 Installer Drift • DT-7004 Slide Hammer • DT-23129 Universal Seal Remover For equivalent regional tools, refer to Special Tools.

TRANSMISSION REPLACEMENT

Removal Procedure

1. Remove the battery and battery tray. Refer to [Battery Tray Replacement](#) .
2. Remove front bumper fascia opening upper cover. Refer to [Front Bumper Fascia Opening Upper Cover Replacement](#) .
3. Without draining the coolant or removing the hoses, remove and position aside the radiator surge tank. Refer to [Radiator Surge Tank Replacement \(LUV, 2H0\)](#) [Radiator Surge Tank Replacement \(LE2\)](#) .
4. Remove the power brake booster pump assembly from left transmission mount bracket, if equipped. Refer to [Power Brake Booster Pump Bracket Replacement](#) .

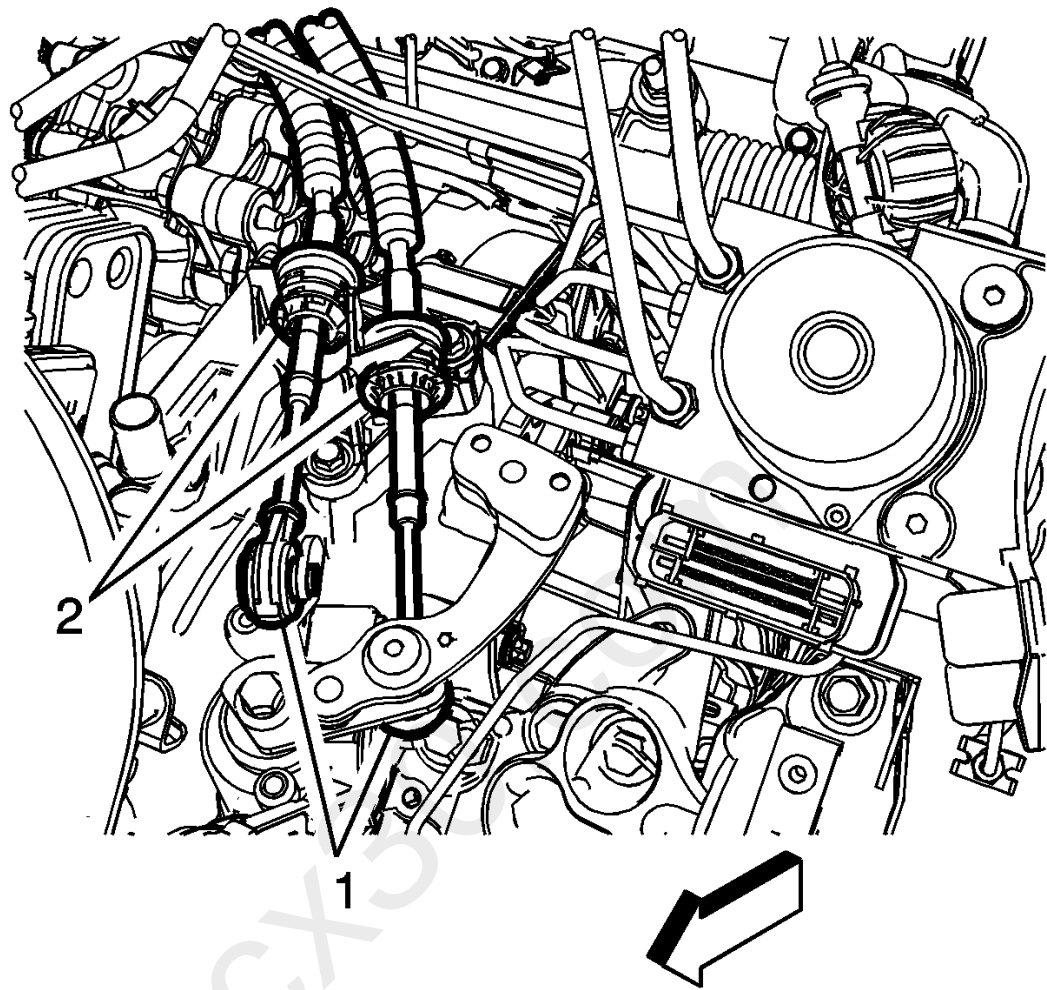


Fig. 77: Shift Lever And Selector Lever Cable End
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the shift lever and selector lever cable ends (1) from the transmission shift lever and selector lever.
6. Pull the cable retainers (2) up while pushing the cable retainers rearward to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
7. Disconnect the wiring harness clips from the transmission.
8. Disconnect the electrical connector from the neutral position sensor.

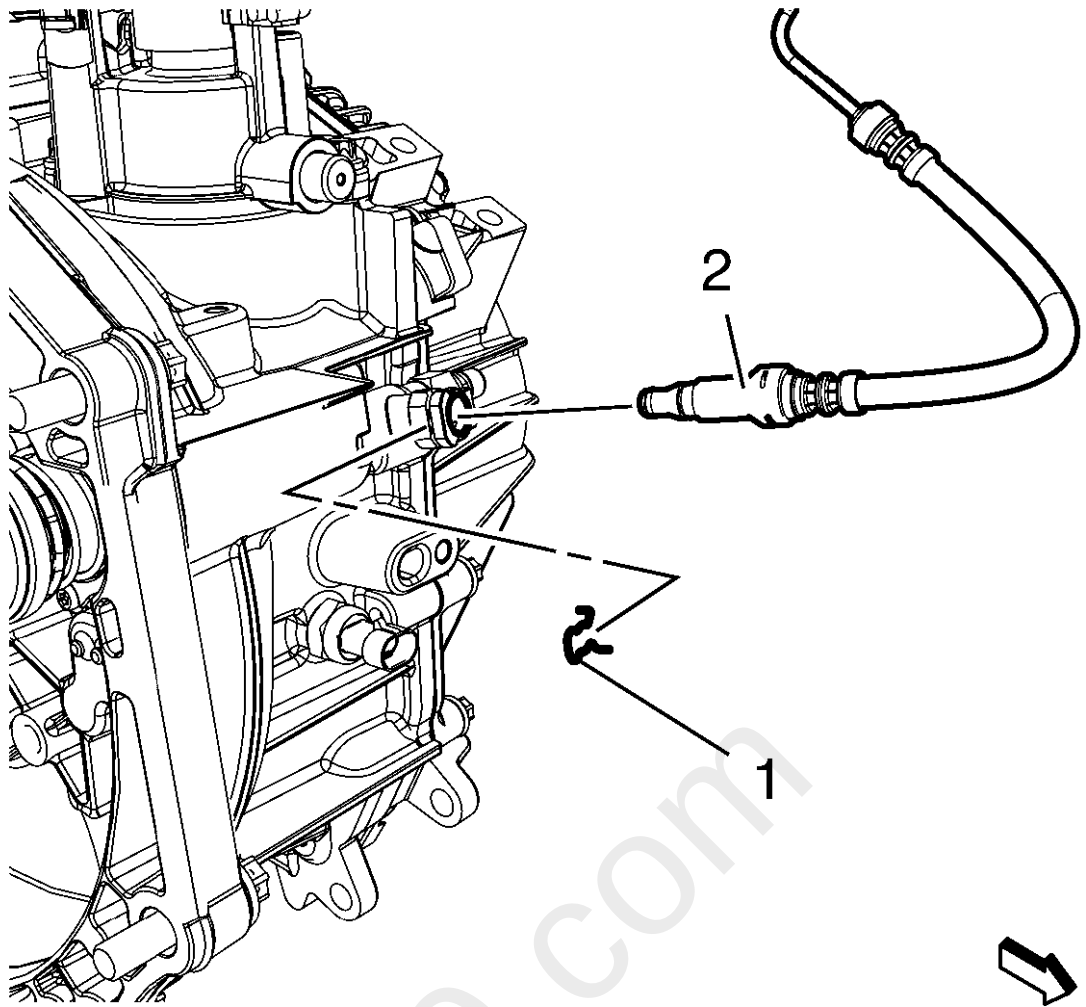


Fig. 78: Clutch Actuator Cylinder Front Pipe And Retainer

Courtesy of GENERAL MOTORS COMPANY

NOTE: Before disconnecting the clutch actuator cylinder front pipe, remove the clutch/brake fluid from the reservoir tank.

9. Remove the clutch actuator cylinder front pipe retaining clip (1).
10. Disconnect the clutch actuator cylinder front pipe (2) from the clutch actuator cylinder pipe elbow.

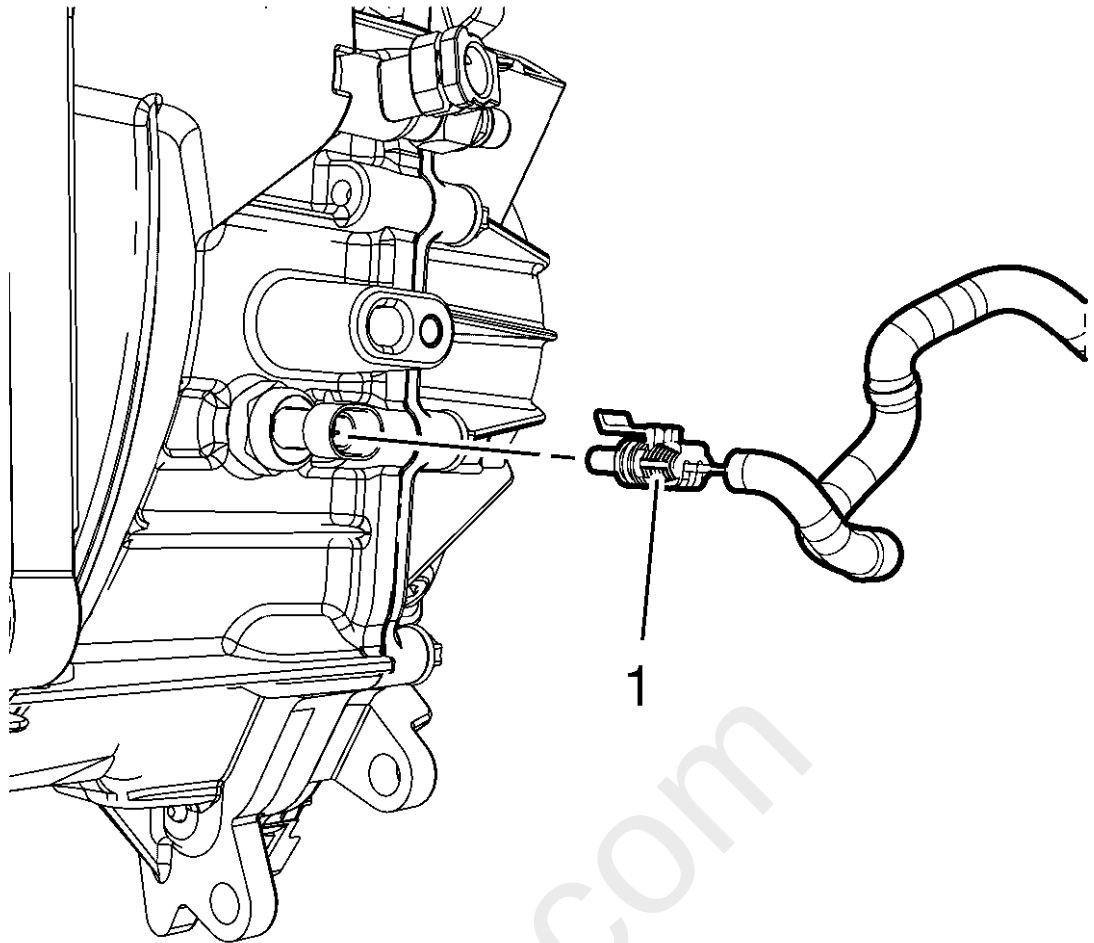


Fig. 79: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

11. Disconnect the electrical connector (1) from the backup lamp switch.

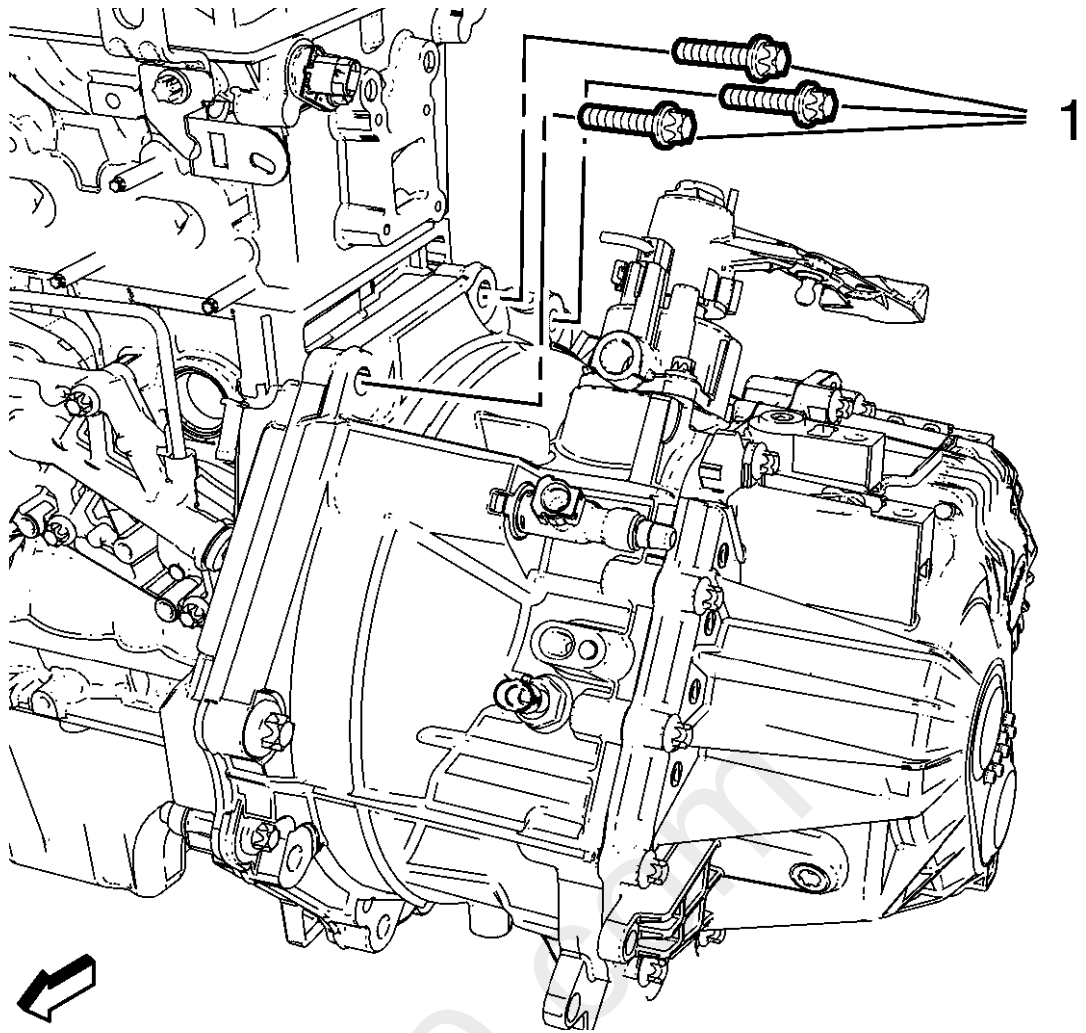


Fig. 80: Upper Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

12. Remove the 3 transmission upper bolts (1) from the transmission.
13. Support the CRFM from the top.
14. Install the engine support fixture. Refer to [Engine Support Fixture](#) .
15. Remove the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#) [Exhaust Front Pipe Replacement \(2H0\)](#) [Exhaust Front Pipe Replacement \(LE2\)](#) .
16. On AWD vehicles, remove the propeller shaft. Refer to [Two-Piece Propeller Shaft Replacement](#) .
17. Remove the drivetrain and front suspension frame. Refer to [Drivetrain and Front Suspension Frame Replacement \(Long Cradle\)](#) [Drivetrain and Front Suspension Frame Replacement \(Short Cradle\)](#) [Drivetrain and Front Suspension Frame Replacement \(Long Cradle - V50\)](#) .
18. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#).

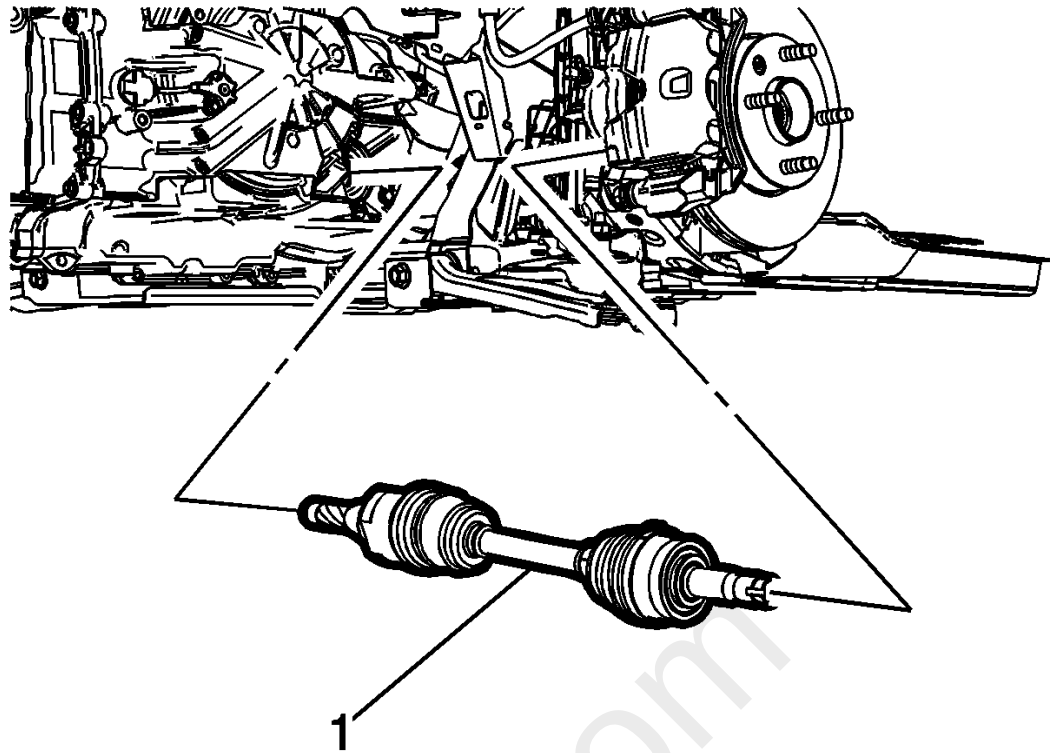


Fig. 81: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

19. Remove the both front wheel drive shafts (1) from the transmission. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#) , and [Front Wheel Drive Shaft Replacement - Right Side](#) .
20. On FWD vehicles, remove the intermediate shaft. Refer to [Front Wheel Drive Intermediate Shaft Replacement \(LE2 with MNH\)](#) [Front Wheel Drive Intermediate Shaft Replacement \(LUV with MR5\)](#) .
21. On AWD vehicles, remove the transfer case. Refer to [Transfer Case Replacement](#) .
22. Remove the transmission rear mount bracket. Refer to [Transmission Mount Bracket Replacement - Rear \(FWD\)](#)[Transmission Mount Bracket Replacement - Rear \(AWD\)](#) .

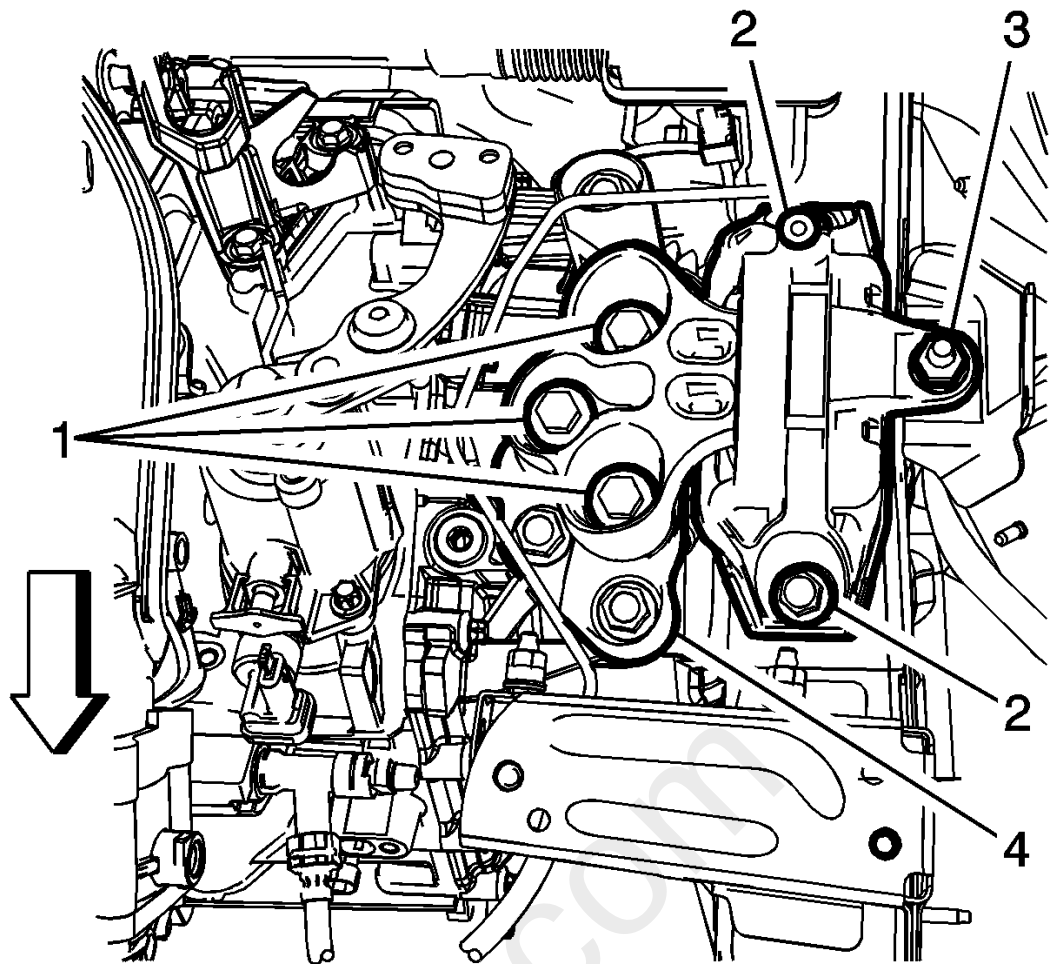


Fig. 82: Left Transmission Mount

Courtesy of GENERAL MOTORS COMPANY

23. Remove the left transmission mount. Refer to [Transmission Mount Replacement - Left Side](#).
24. Remove the left transmission mount bracket (4). Refer to [Transmission Mount Bracket Replacement - Left Side](#).
25. Support the transmission with a suitable jack.

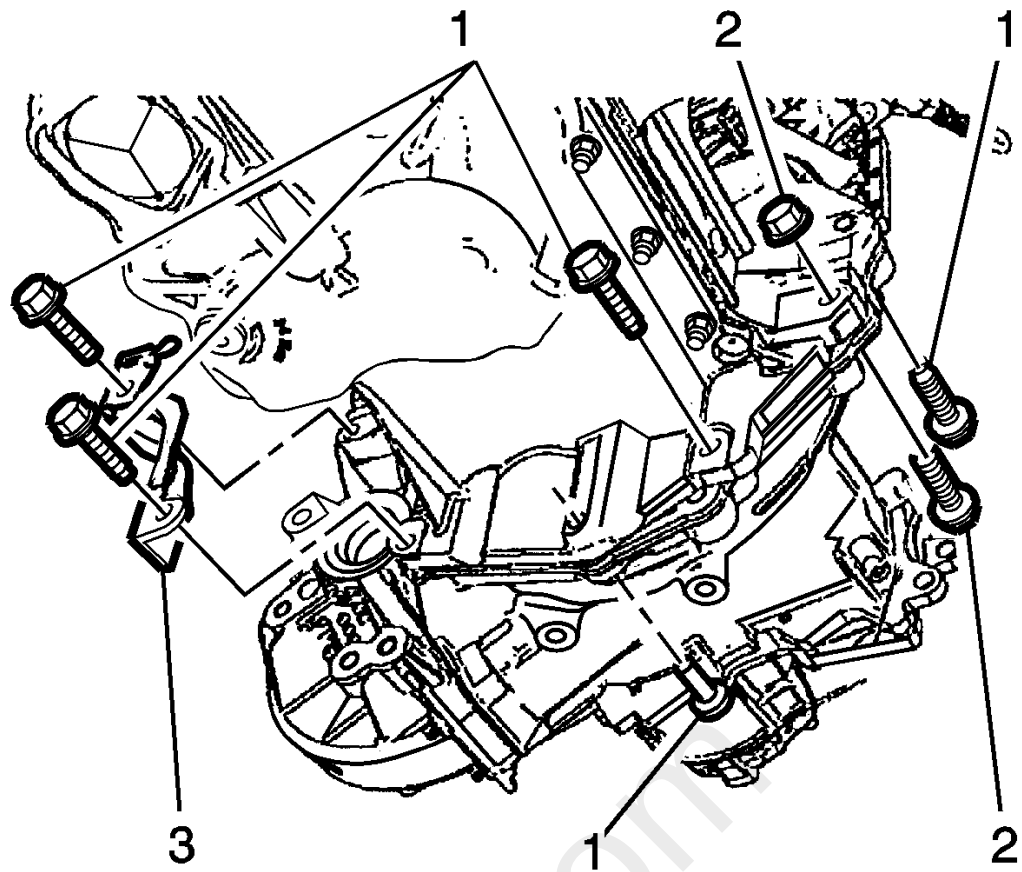


Fig. 83: Transmission Side Cover, Lower Transmission Bolts And Nut
Courtesy of GENERAL MOTORS COMPANY

26. Remove the lower transmission bolts (1).
27. Remove the lower transmission bolt and nut (2).
28. On FWD vehicles, remove the transmission side cover (3).
29. Separate the transmission from the engine.
30. Lower the transmission with the transmission jack far enough to remove the transmission.

Installation Procedure

WARNING: Use care when cleaning the clutch hub. The clutch hub may have sharp edges and can cause personal injury if contact is made. Wear protective gloves to avoid personal injury.

1. Clean the clutch hub and the input shaft from any debris and contaminants with a lint-free towel.

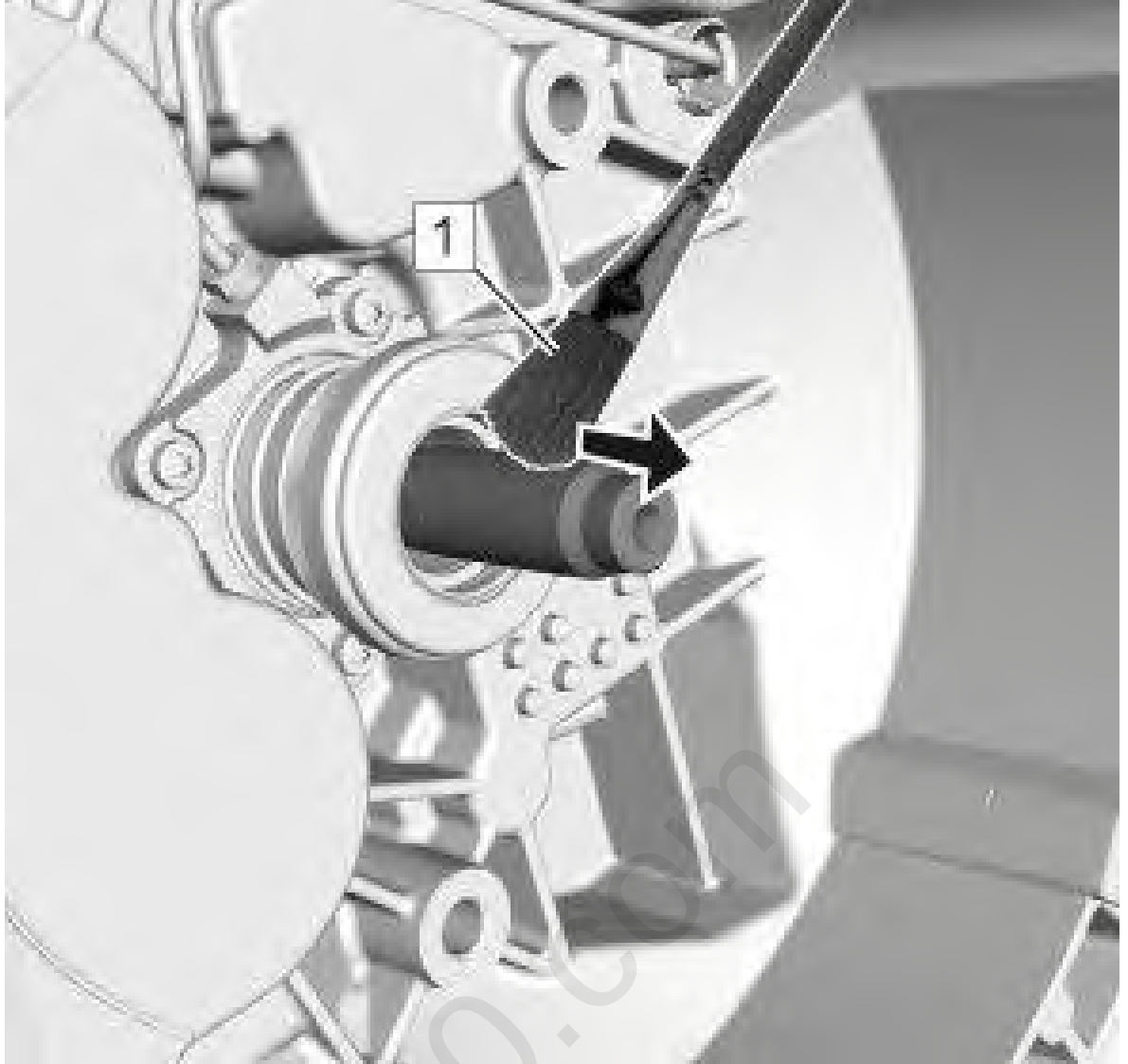


Fig. 84: Using Flat Brush To Apply Light Coating Of Multi-Purpose Grease
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Applying too much or the wrong type of grease on the transmission input shaft may cause damage, clutch slippage or failure. Always apply the correct type of grease. Never apply more grease than is necessary to coat the transmission input shaft with a very thin film of grease.

2. Use a clean flat brush (1) to apply very light coating of multi-purpose grease to input shaft until the metal is only shiny. No visible clumps of grease are permissible regardless of size. Smear away from the transmission in direction of the shown arrow.

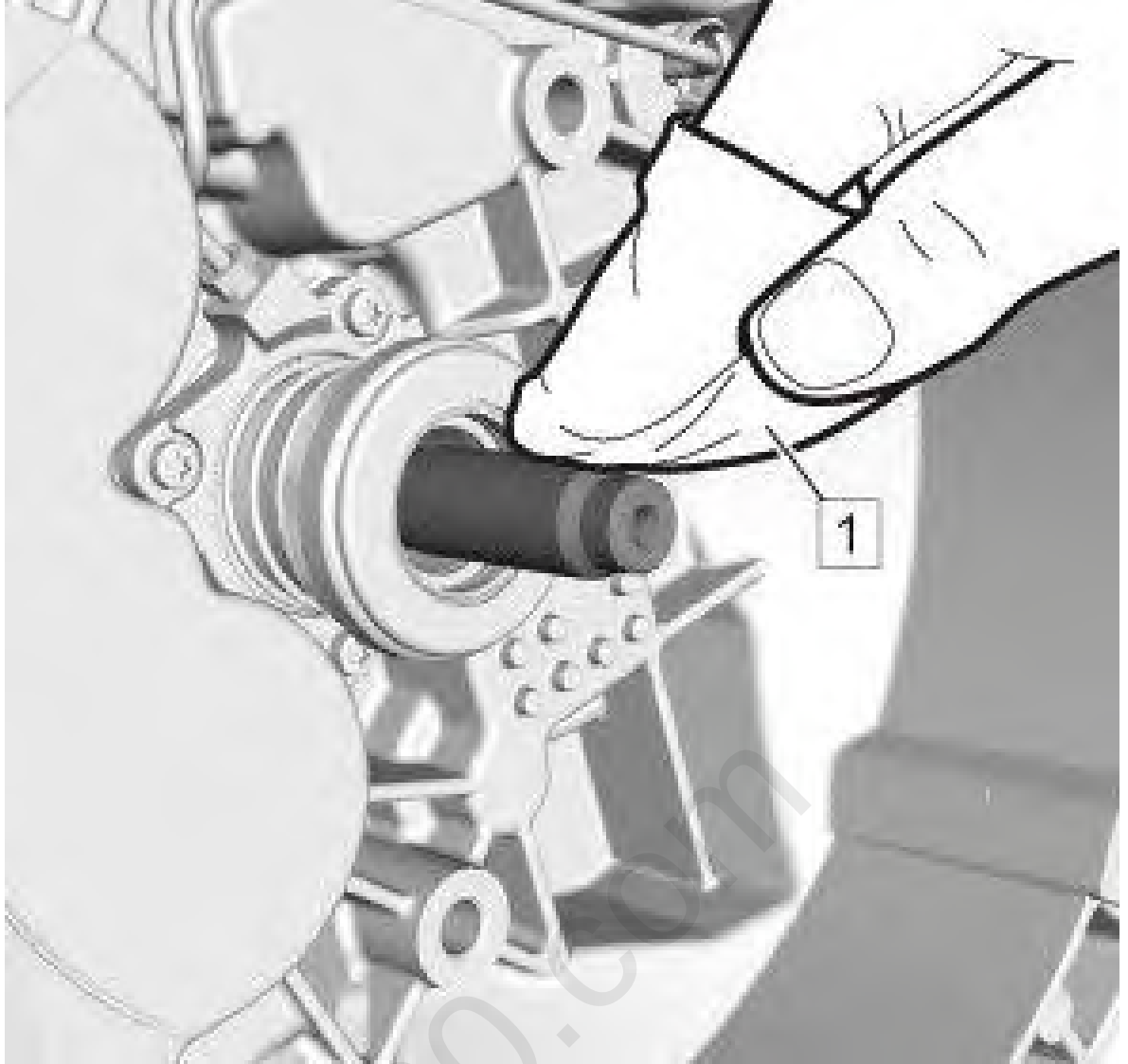


Fig. 85: Cleaning Lead Surface Of Input Shaft With Lint-Free Towel
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Ensure that no grease remains on the lead surface of the transmission input shaft. Clean the lead surface of the transmission input shaft prior to the assembly of the transmission to the engine. Failure to maintain a clean surface may cause clutch slippage or failure.

3. Clean the entire lead surface of the input shaft with a NEW, lint-free towel (1).
4. Raise the transmission with the transmission jack and position the transmission to the engine.

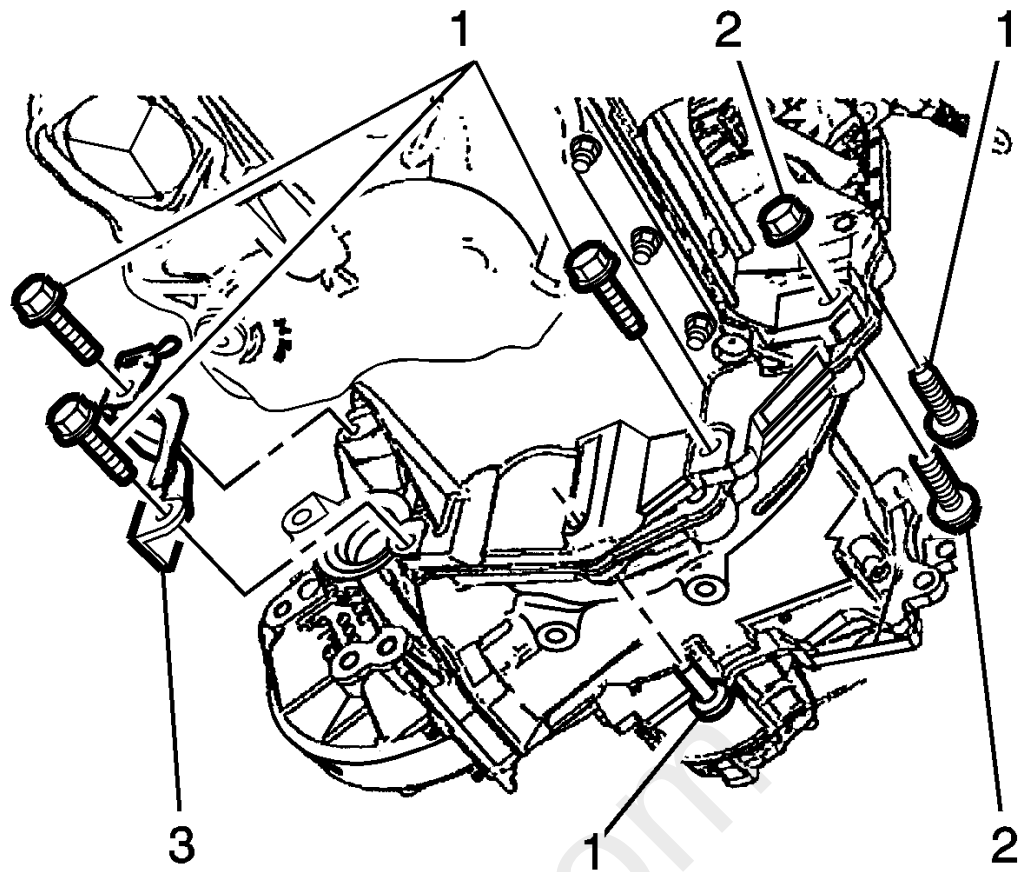


Fig. 86: Transmission Side Cover, Lower Transmission Bolts And Nut
Courtesy of GENERAL MOTORS COMPANY

5. On FWD vehicles, install the transmission side cover (3).

CAUTION: Refer to **Fastener Caution** .

6. Install the lower transmission bolts (1) and tighten to 58 N.m (43 lb ft).
7. Install the lower transmission bolt and nut (2) and tighten to 58 N.m (43 lb ft).
8. Remove the transmission jack.

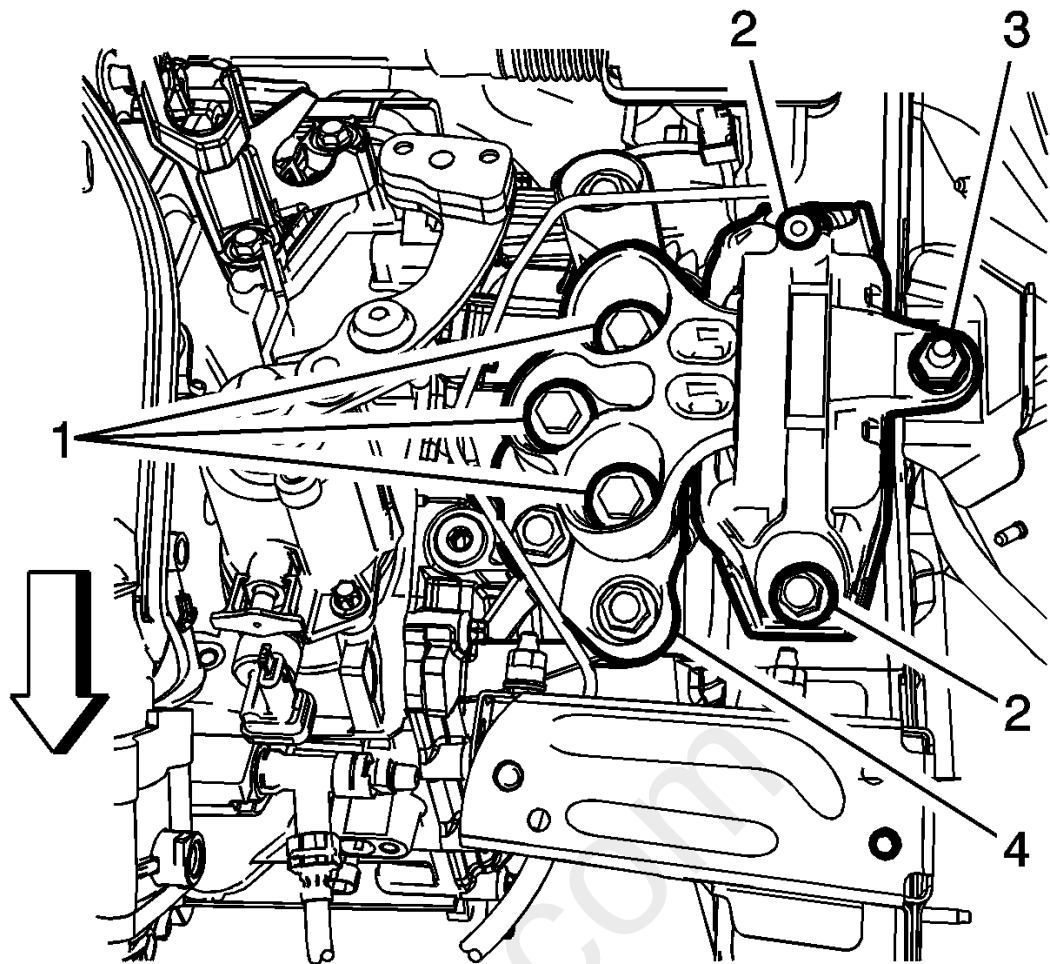


Fig. 87: Left Transmission Mount

Courtesy of GENERAL MOTORS COMPANY

9. Install the left transmission mount bracket (4). Refer to [Transmission Mount Bracket Replacement - Left Side](#).
10. Install the left transmission mount. Refer to [Transmission Mount Replacement - Left Side](#).
11. Install the transmission rear mount bracket. Refer to [Transmission Mount Bracket Replacement - Rear \(FWD\)](#) [Transmission Mount Bracket Replacement - Rear \(AWD\)](#).
12. On AWD vehicles, install the transfer case. Refer to [Transfer Case Replacement](#).
13. On FWD vehicles, install the intermediate shaft. Refer to [Front Wheel Drive Intermediate Shaft Replacement \(LE2 with MNH\)](#) [Front Wheel Drive Intermediate Shaft Replacement \(LUV with MR5\)](#).

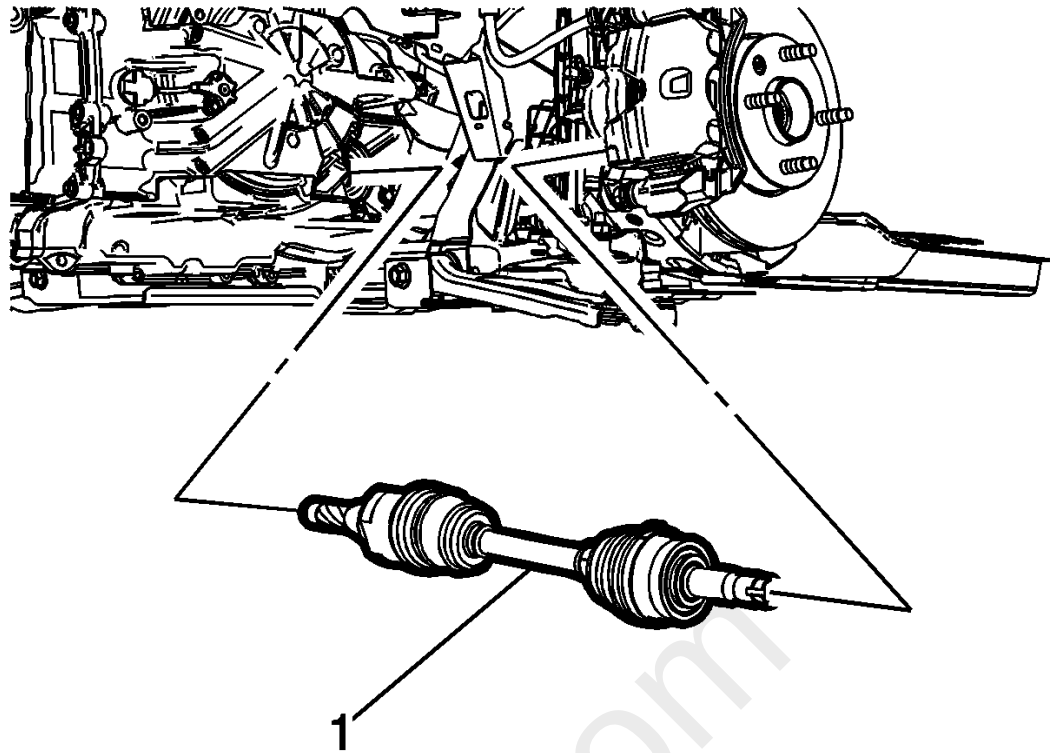


Fig. 88: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

14. Install both front wheel drive shafts (1) to the transmission. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#) , and [Front Wheel Drive Shaft Replacement - Right Side](#) .
15. Install the drivetrain and front suspension frame. Refer to [Drivetrain and Front Suspension Frame Replacement \(Long Cradle\)](#), [Drivetrain and Front Suspension Frame Replacement \(Short Cradle\)](#), [Drivetrain and Front Suspension Frame Replacement \(Long Cradle - V50\)](#) .
16. On AWD vehicles, install the propeller shaft. Refer to [Two-Piece Propeller Shaft Replacement](#) .
17. Install the exhaust front pipe. Refer to [Exhaust Front Pipe Replacement \(LUV\)](#), [Exhaust Front Pipe Replacement \(2H0\)](#), [Exhaust Front Pipe Replacement \(LE2\)](#) .
18. Remove the engine support fixture. Refer to [Engine Support Fixture](#) .

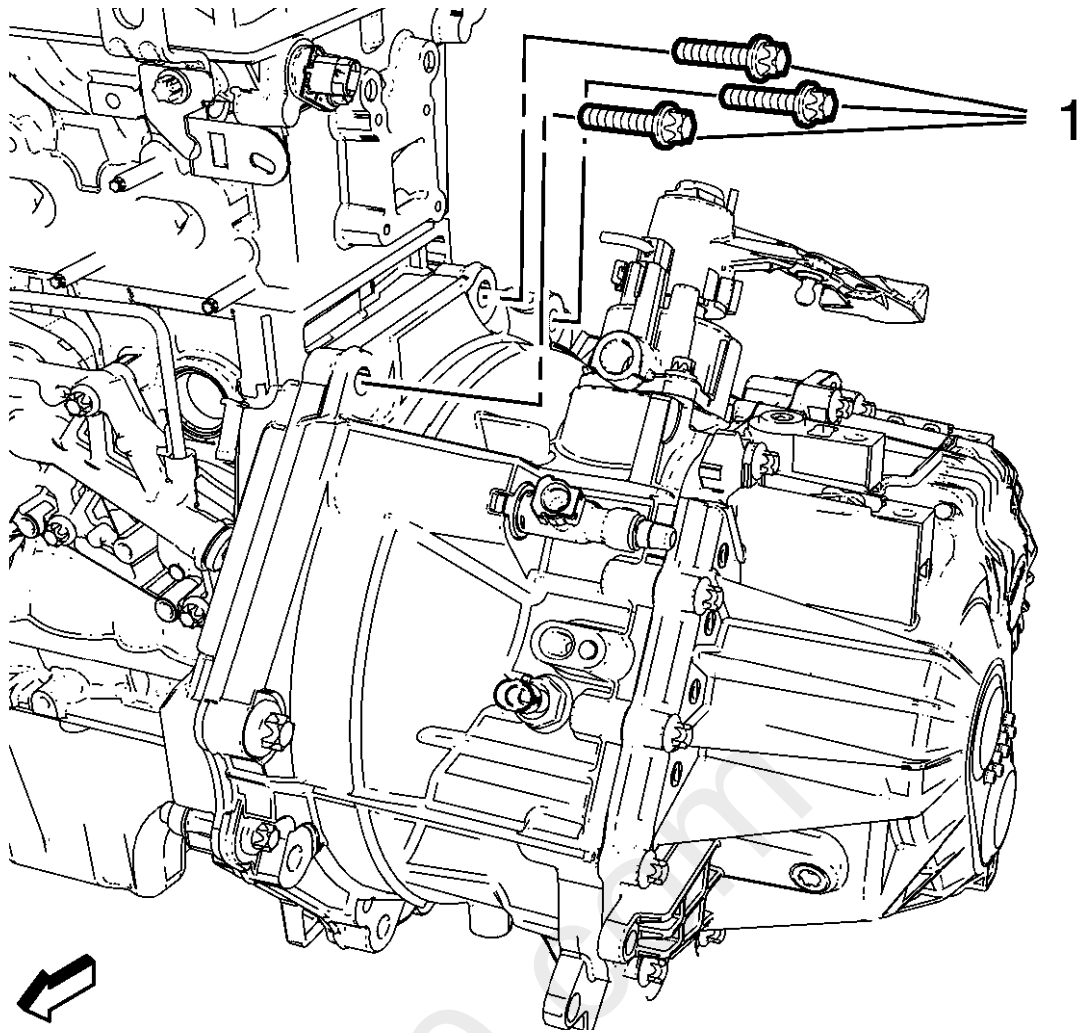


Fig. 89: Upper Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

19. Install the upper transmission bolts (1) and tighten to 58 N.m (43 lb ft).

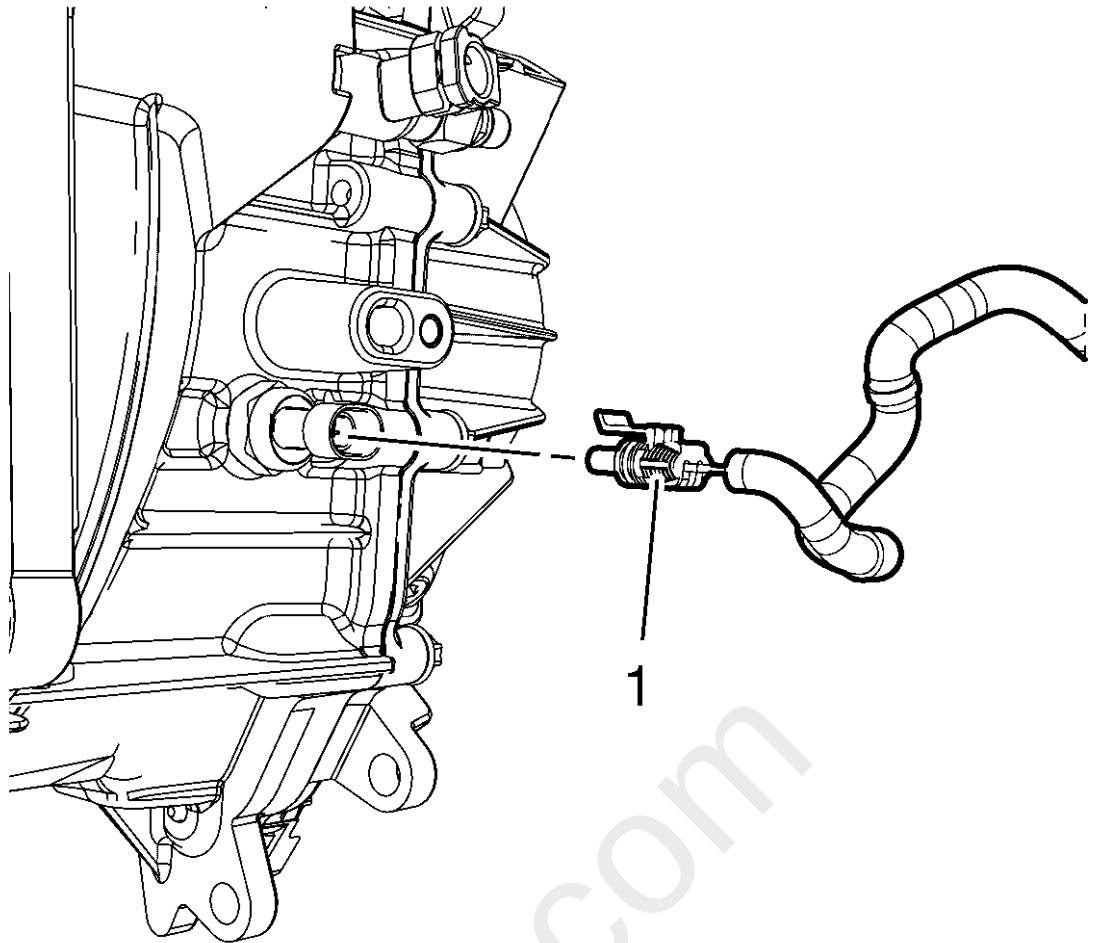


Fig. 90: Backup Lamp Switch Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

20. Connect the electrical connector (1) to the backup lamp switch.

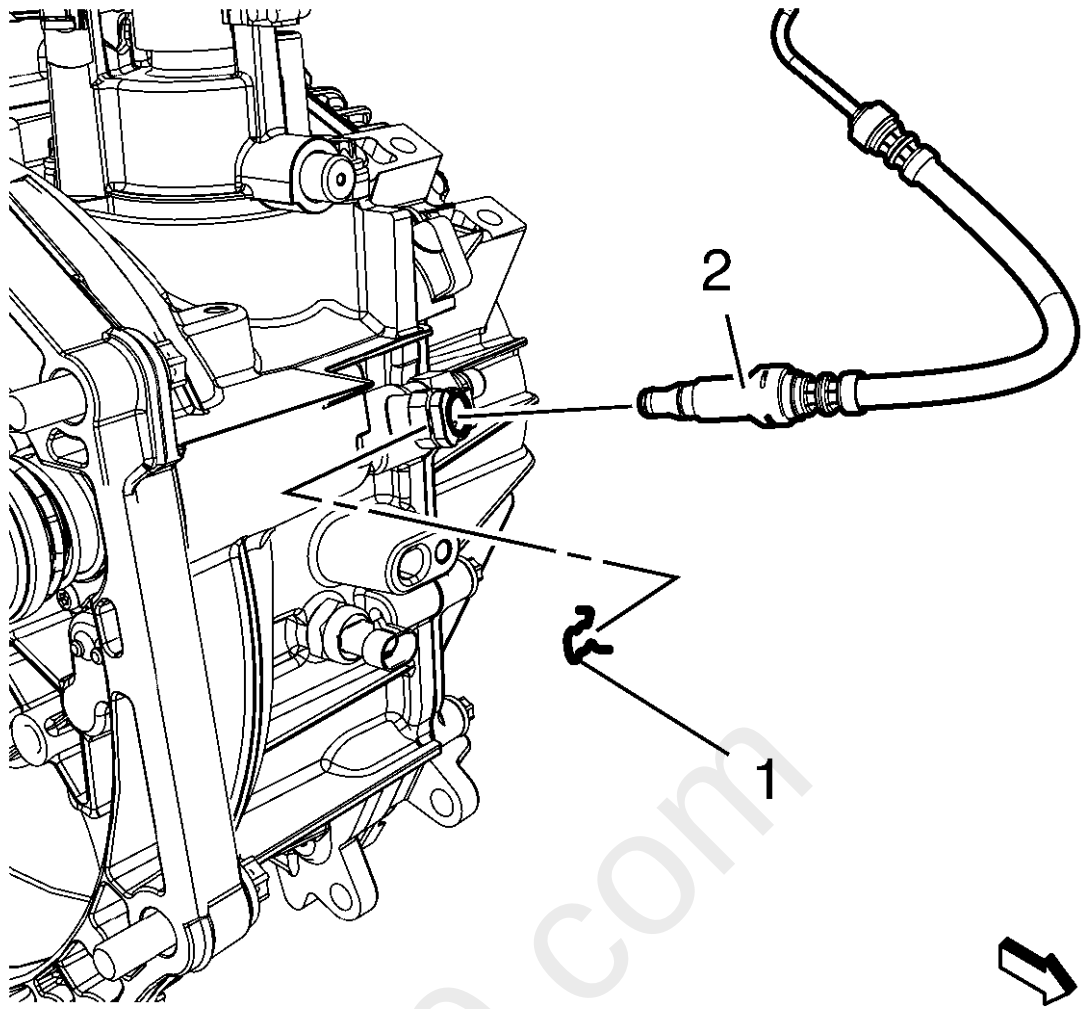


Fig. 91: Clutch Actuator Cylinder Front Pipe And Retainer
Courtesy of GENERAL MOTORS COMPANY

21. Connect the clutch actuator cylinder front pipe (2) to the clutch actuator cylinder pipe elbow.
22. Install the clutch actuator front pipe clip (1).
23. Connect the electrical connector to the neutral position sensor.
24. Connect the wire harness clips to the transmission.

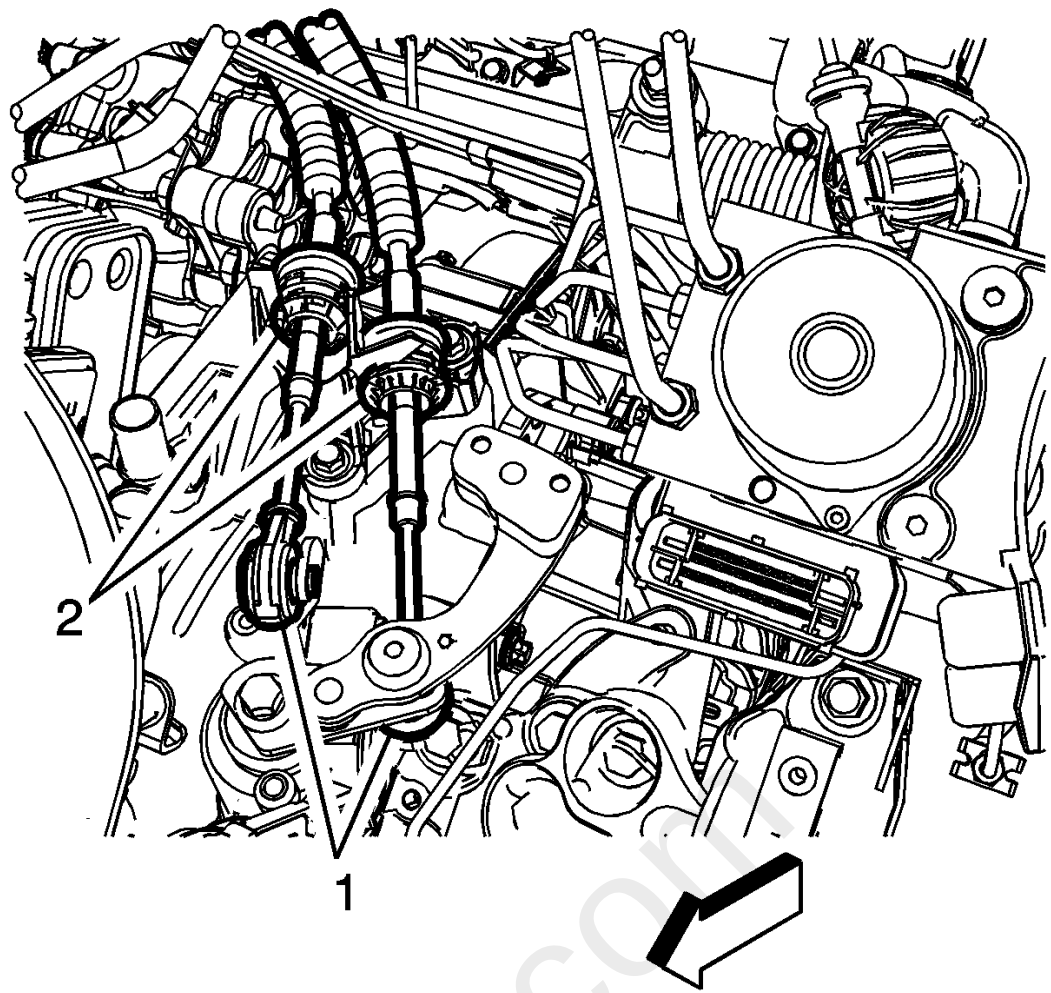


Fig. 92: Shift Lever And Selector Lever Cable End
 Courtesy of GENERAL MOTORS COMPANY

25. Install the shift lever and selector lever cable (2) to the shift lever and selector lever cable bracket.
26. Connect the transmission range selector lever cable terminals (1) to the transmission manual pins.
27. Adjust the shift lever and selector lever cables. Refer to [Manual Transmission Shift Lever and Selector Lever Cable Adjustment](#).
28. Bleed the clutch hydraulic system. Refer to [Hydraulic Clutch System Bleeding](#).
29. Fill the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#).
30. Install the power brake booster pump assembly to left transmission mount bracket, if equipped. Refer to [Power Brake Booster Pump Bracket Replacement](#).
31. Install the radiator surge tank. Refer to [Radiator Surge Tank Replacement \(LUV, 2H0\)](#) [Radiator Surge Tank Replacement \(LE2\)](#).
32. Install front bumper fascia opening upper cover. Refer to [Front Bumper Fascia Opening Upper Cover Replacement](#).
33. Install the battery and battery tray. Refer to [Battery Tray Replacement](#).

DESCRIPTION AND OPERATION

TRANSMISSION SYSTEM DESCRIPTION AND OPERATION

The M32-6 is a 6-speed manual transmission. This manual transmission is an all-synchromesh 3-shaft transmission.

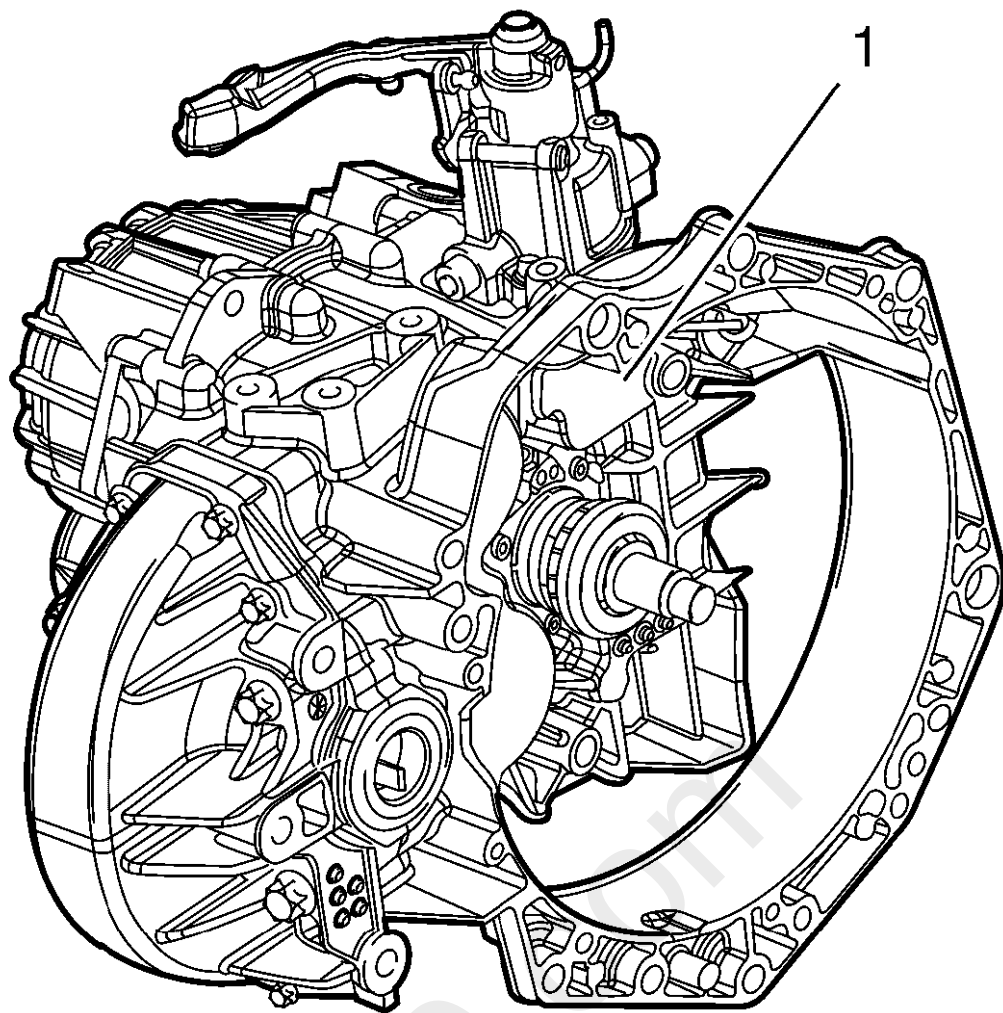


Fig. 93: 3 Shaft Transmission

Courtesy of GENERAL MOTORS COMPANY

This 3-shaft transmission (1) has the following advantages:

- Compact construction
- Improved smooth-running performance
- Better shift quality
- High torque transmission
- Low weight

Location of the Shafts

The following cross-sectional diagram shows the location of the respective shafts in the M32-6 transmission, as per the 3-shaft principle.

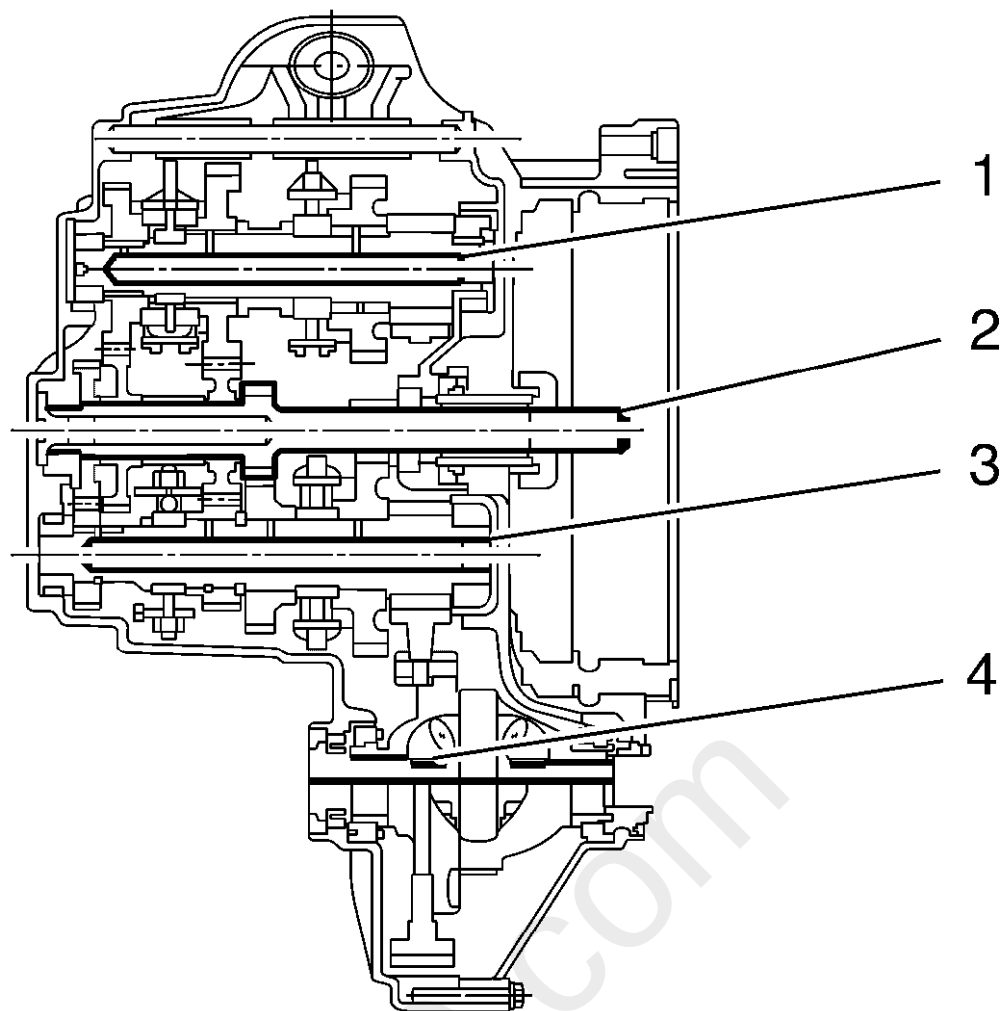


Fig. 94: Shaft Locations

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Upper Main Shaft
2	Input Shaft
3	Lower Main Shaft
4	Differential Gear

In this transmission angular cone bearings are used for all shafts. These bearings require a certain amount of play and pretension. The required amount of bearing play and pretension is achieved at the production stage by using shims under the angular cone bearing in the transmission housing.

Location of Gearwheels

This diagram shows the location of the gearwheels on the respective shaft.

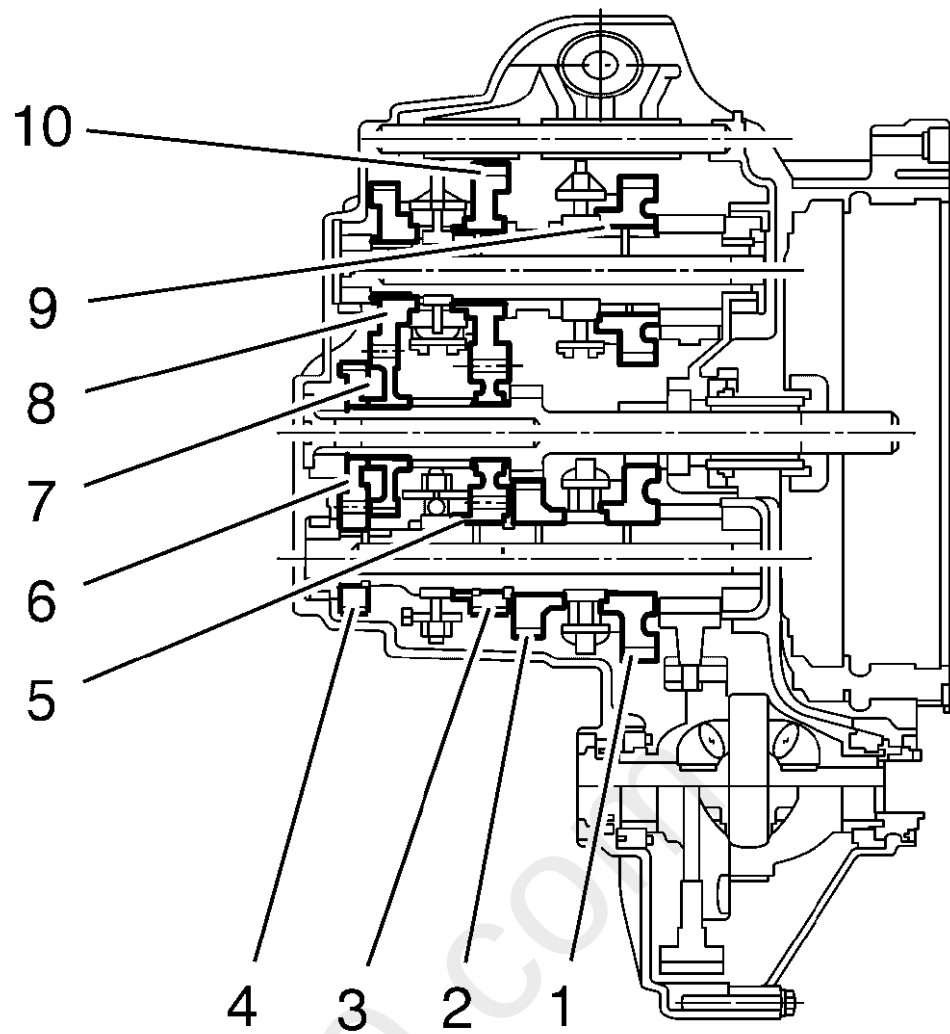


Fig. 95: Gearwheel Locations

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1st Gear Gearwheel
2	2nd Gear Gearwheel
3	5th Gear Gearwheel
4	6th Gear Gearwheel
5	3rd/5th Gear Gearwheel
6	6th Gear Gearwheel
7	4th Gear Gearwheel
8	4th Gear Gearwheel
9	Reverse Gear Gearwheel
10	3rd Gear Gearwheel

Power Flow in the Individual Gears

The following diagrams show the flow of power in the individual gears.

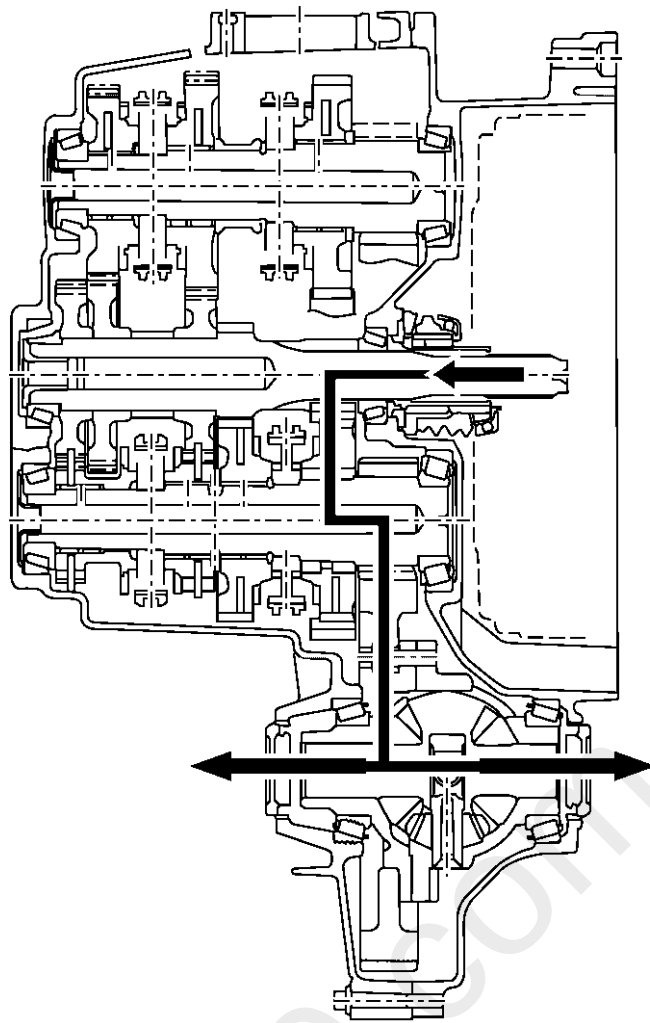


Fig. 96: Transmission 1st Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

1st gear

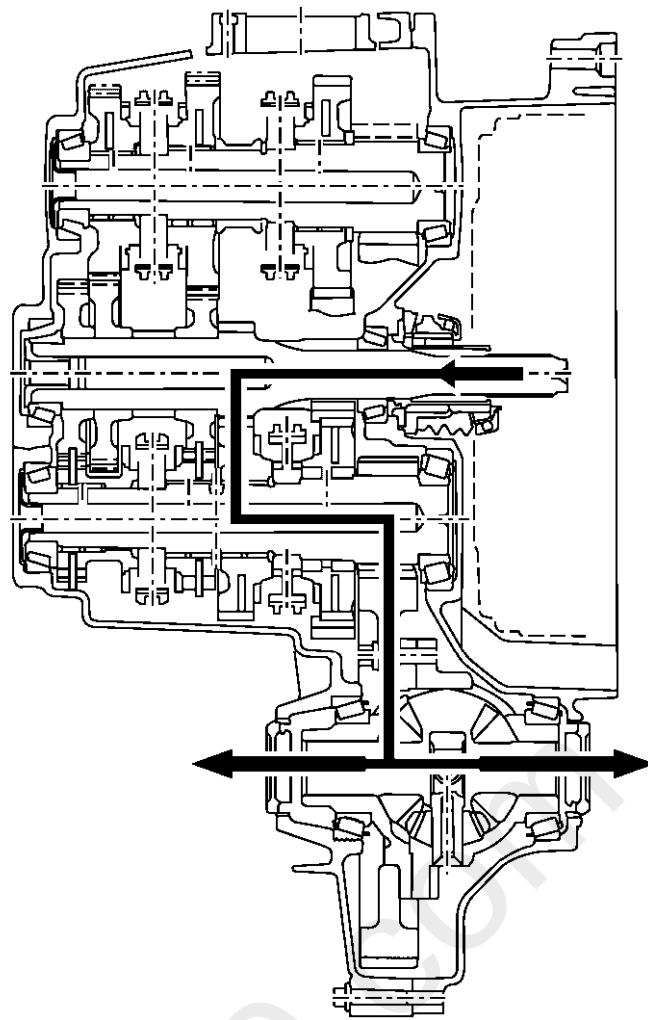


Fig. 97: Transmission 2nd Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

2nd gear

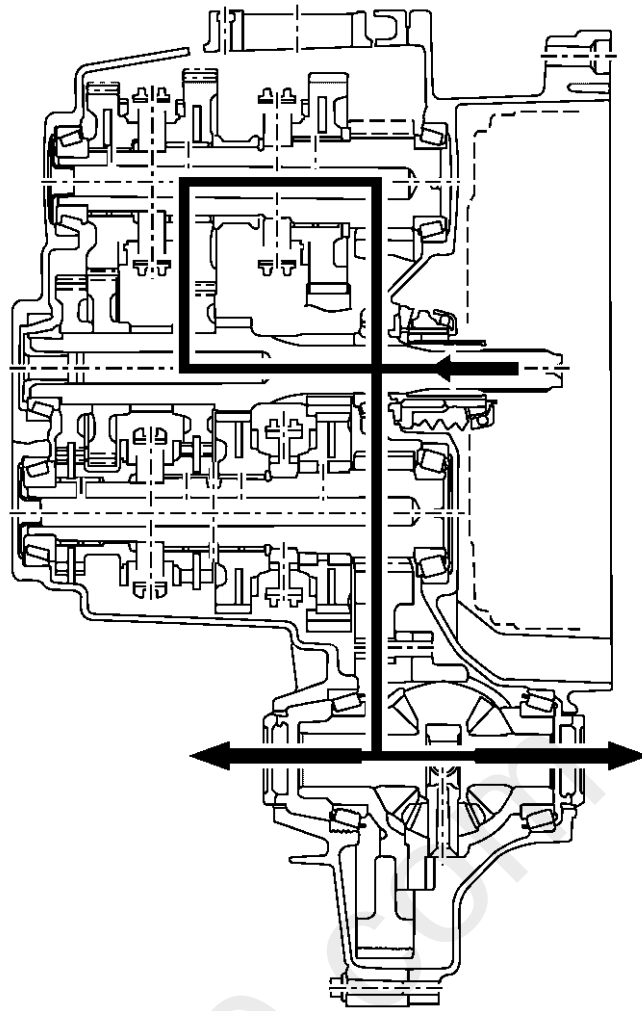


Fig. 98: Transmission 3rd Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

3rd gear

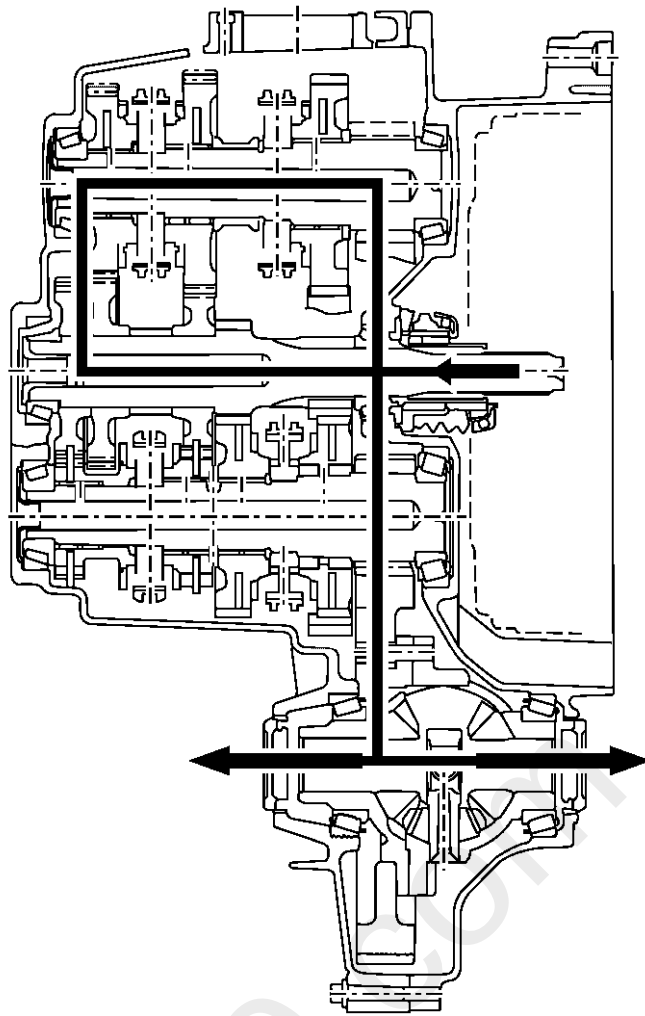


Fig. 99: Transmission 4th Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

4th gear

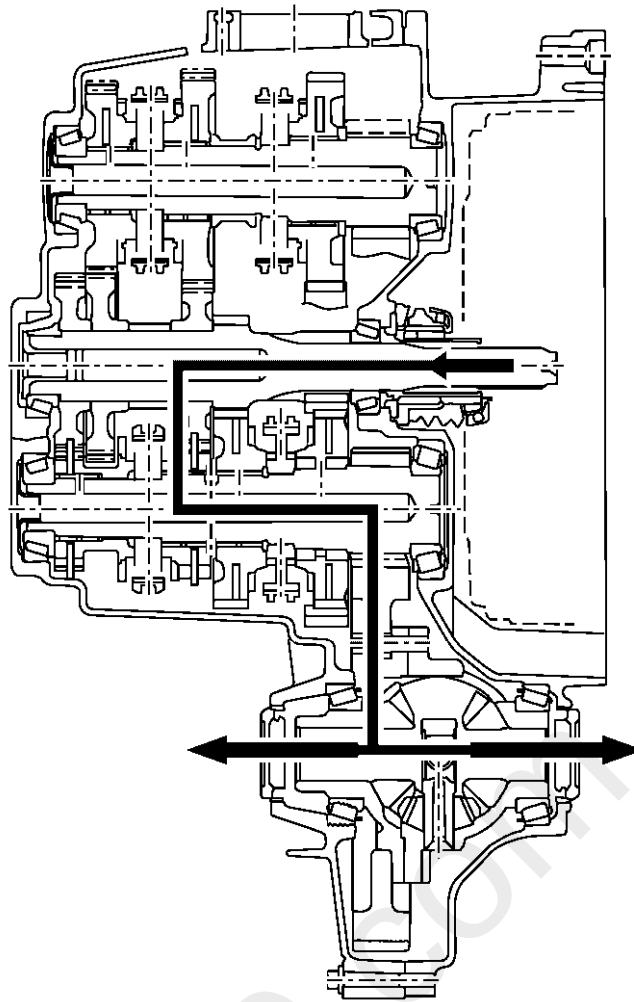


Fig. 100: Transmission 5th Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

5th gear

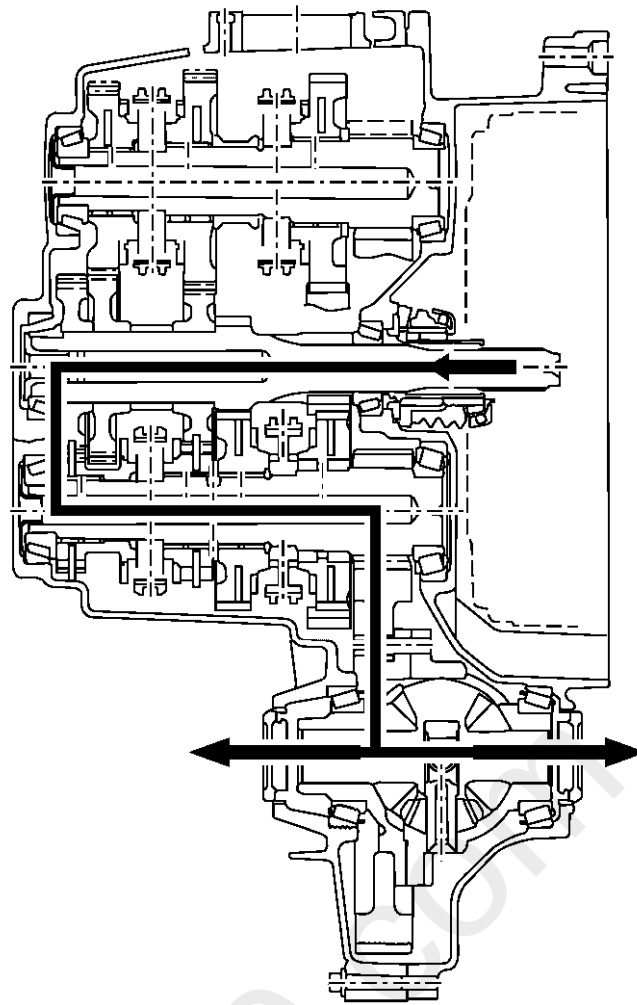


Fig. 101: Transmission 6th Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

6th gear

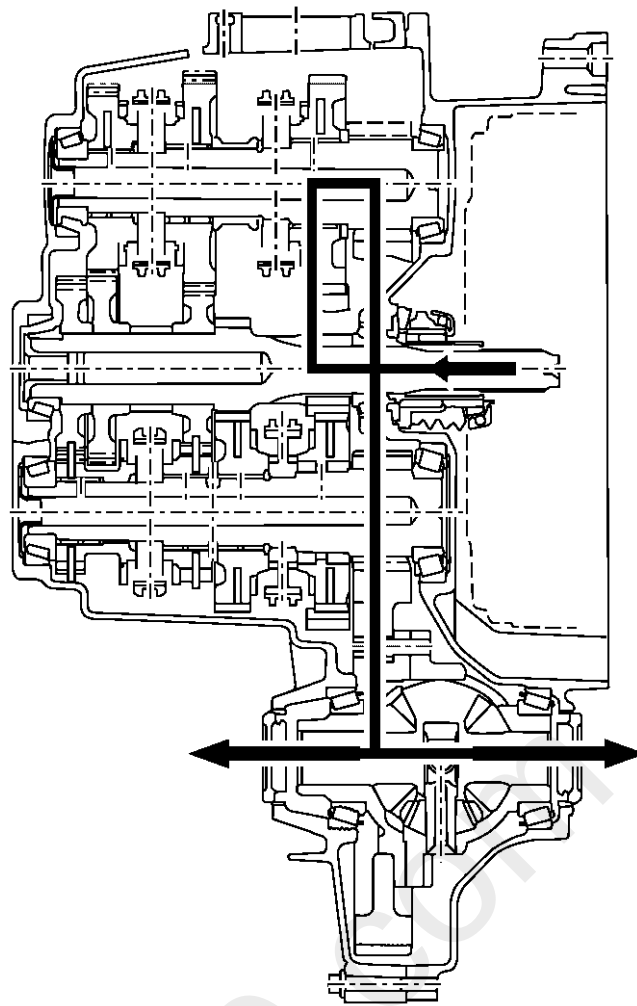


Fig. 102: Transmission Reverse Gear Power Flow
Courtesy of GENERAL MOTORS COMPANY

Reverse gear

TRANSMISSION IDENTIFICATION INFORMATION

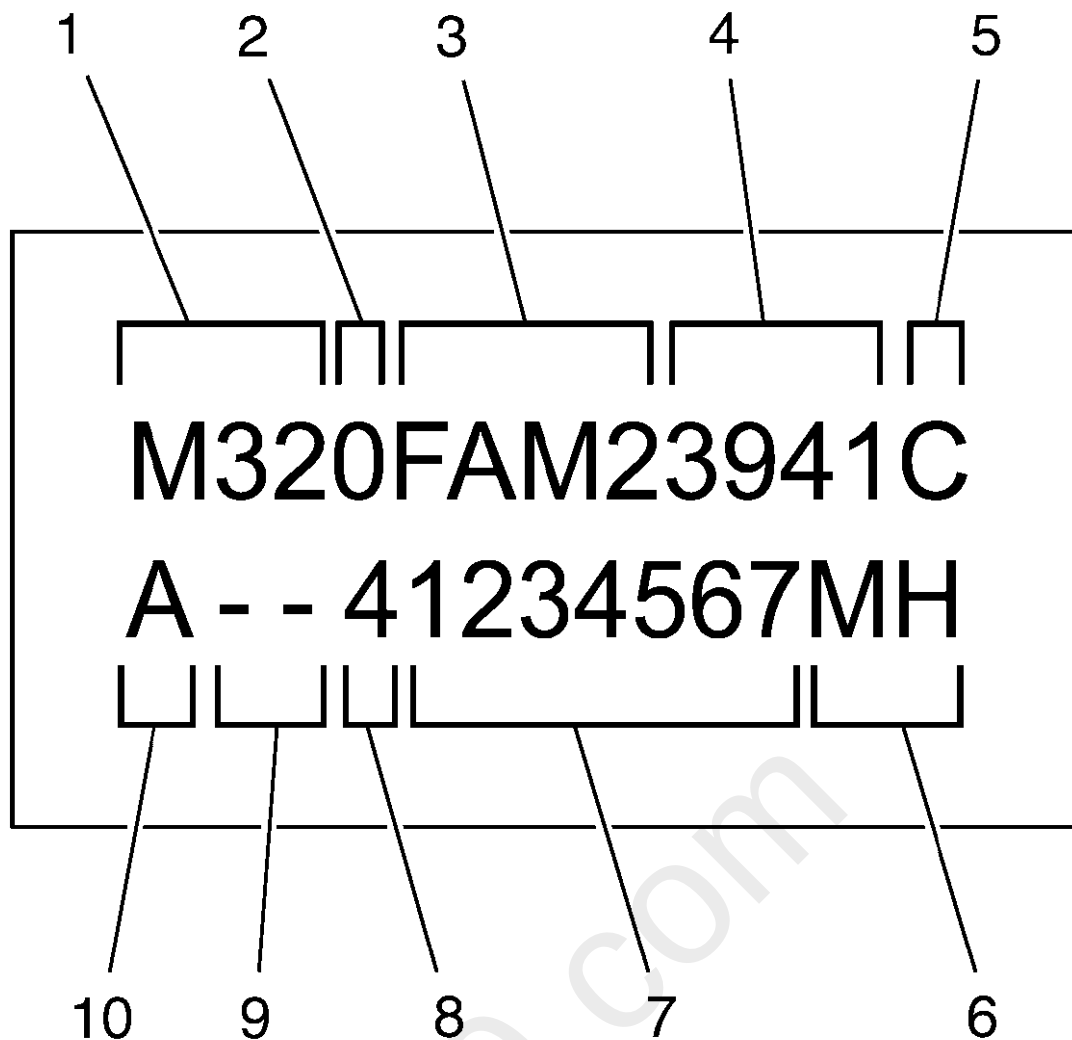


Fig. 103: Transmission Code Plate

Courtesy of GENERAL MOTORS COMPANY

The code for the M32-6 transmission will be found on the back of the transmission housing, above the axle shaft. In addition, an Alphacode sticker will be placed on the cover of the differential.

- Transmission type (M32) (1)
- Design (2)
- Engine family (3)
- Output ratio (3.941) (4)
- Gear set (C) (5)
- Alpha Code (MH) (6)
- Serial number (7 digit) (7)
- Last digit of year (4 = 2004) (8)
- 2 blanks (9)
- Manufacturing plant (A = Aspern) (10)

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description

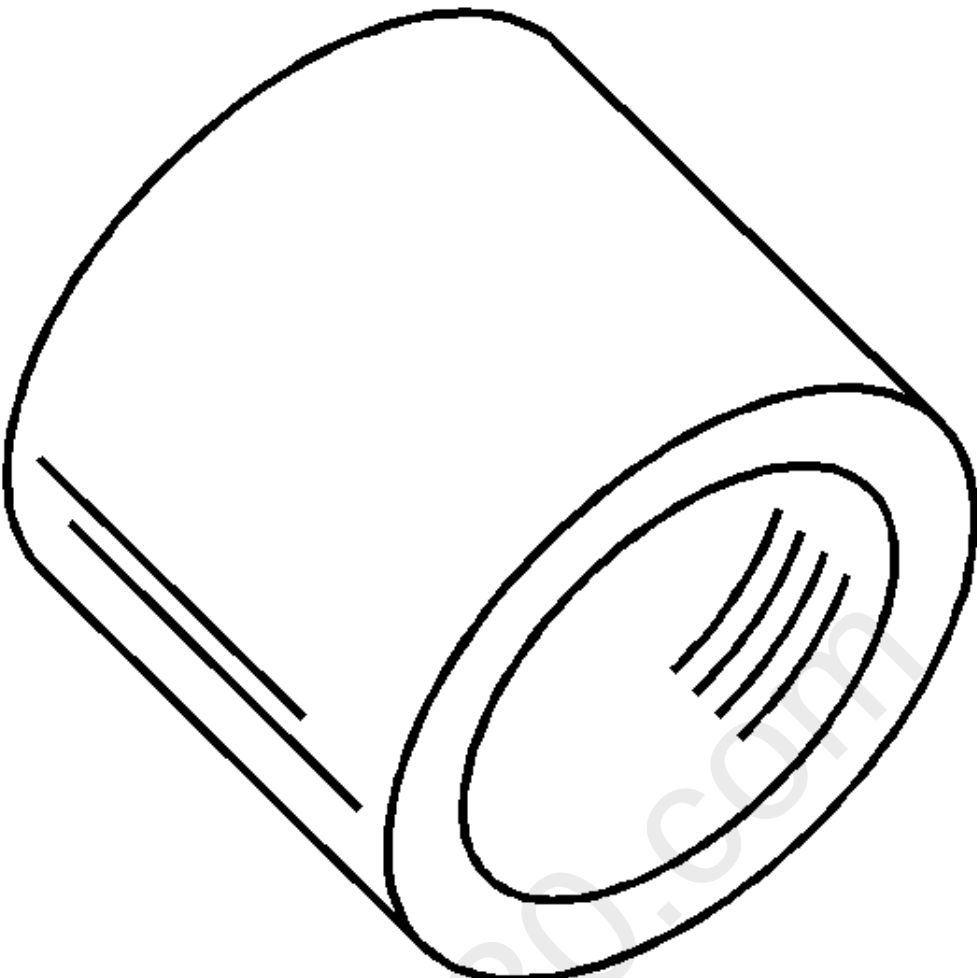
Illustration	Tool Number/Description
	CH-466-A KM-466-A Remover / Installer

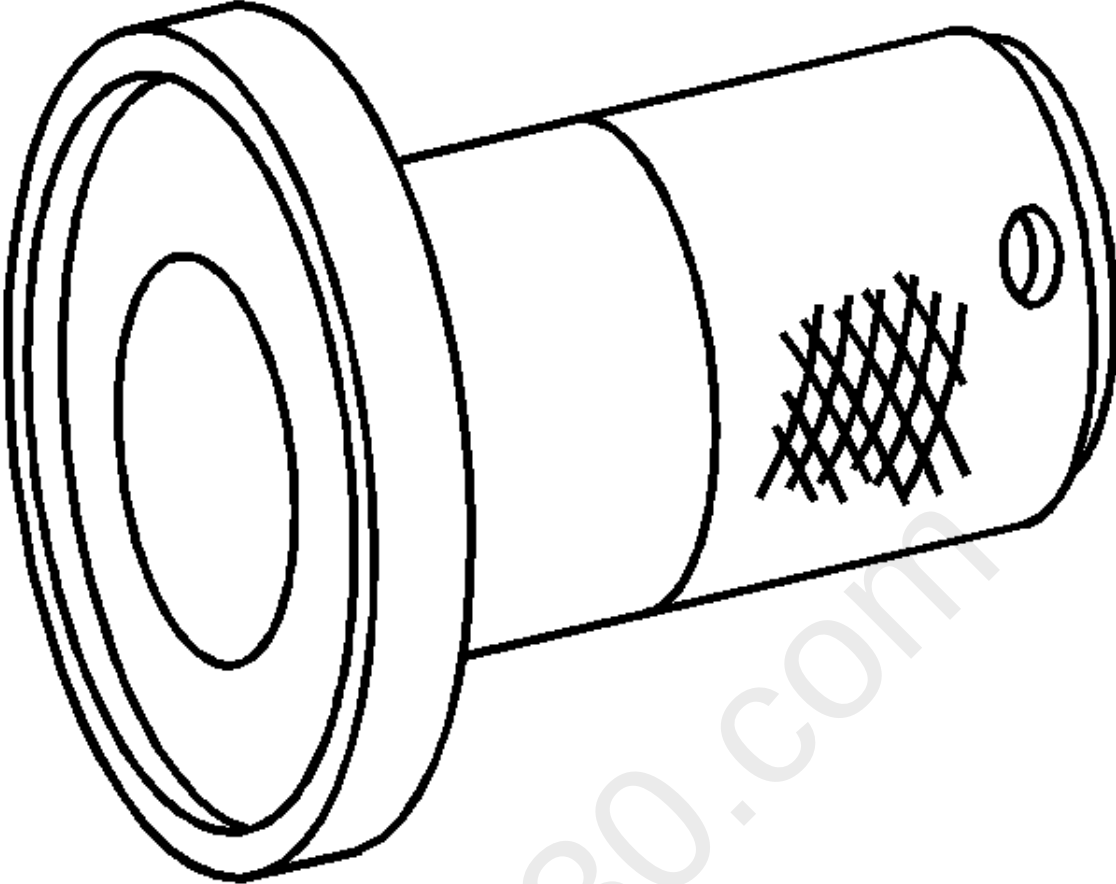
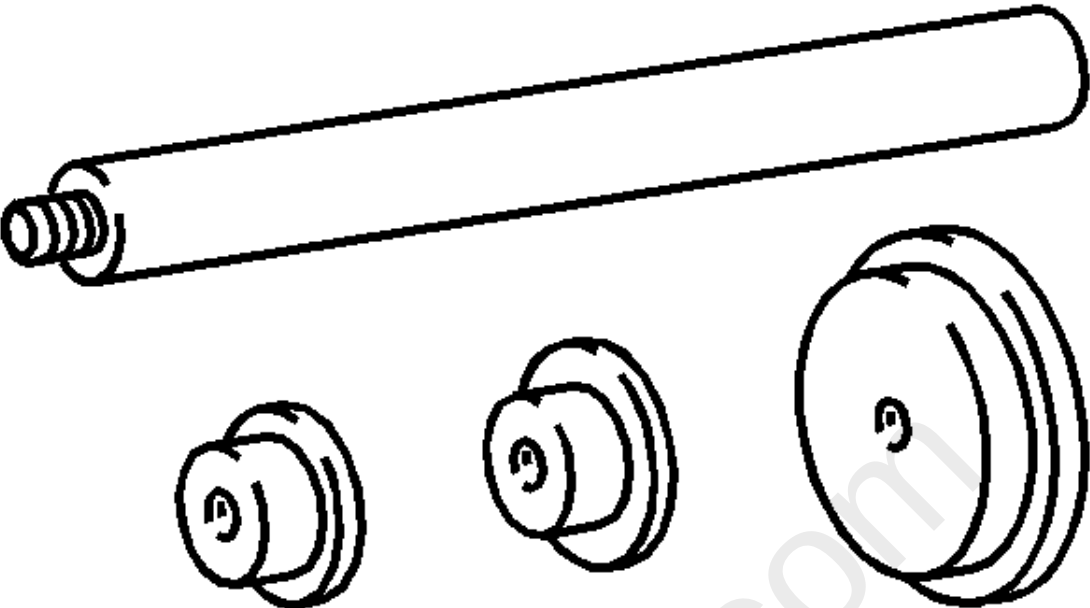
Illustration	Tool Number/Description
	DT-519 KM-519 J-44385 Oil Seal / Ring Installer

Illustration	Tool Number/Description
 A technical line drawing of a long threaded rod with a hexagonal head at one end. Below the rod are three washers of increasing size, each with a central hole. A large, faint watermark 'mcx30.com' is diagonally across the entire illustration area.	DT-523 KM-523 Remover / Installer

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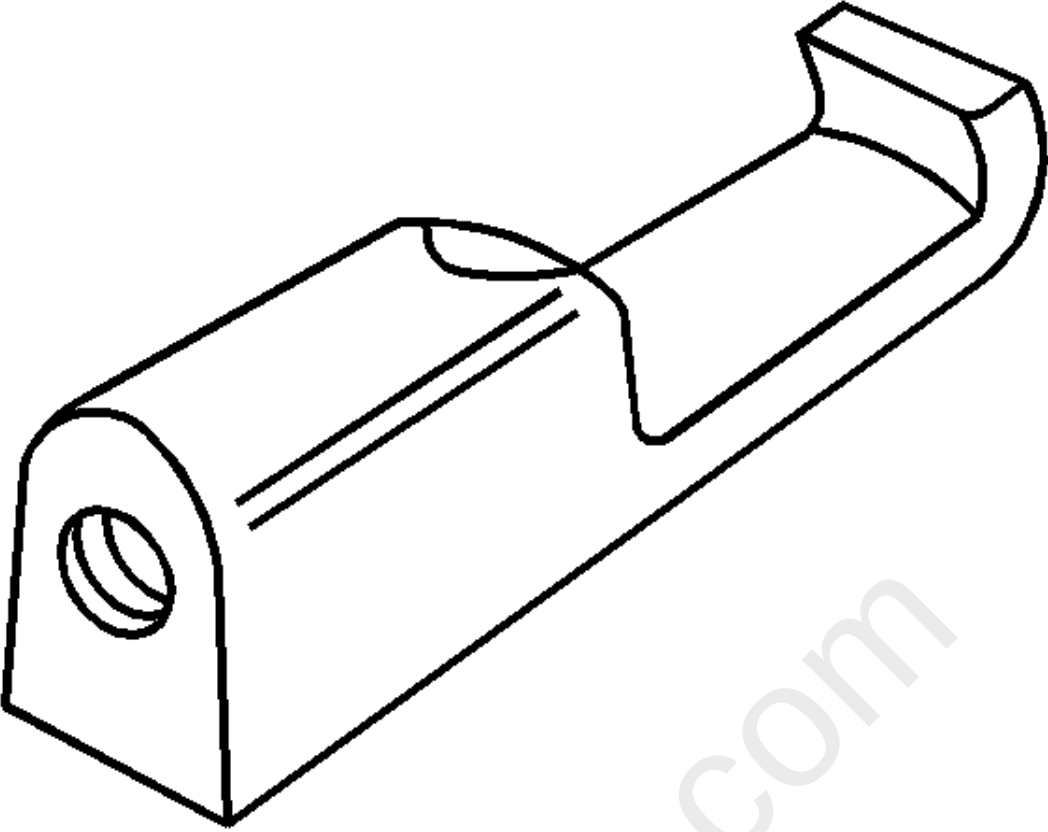
Illustration	Tool Number/Description
	DT-586 KM-586 J-23129 Remover Hook

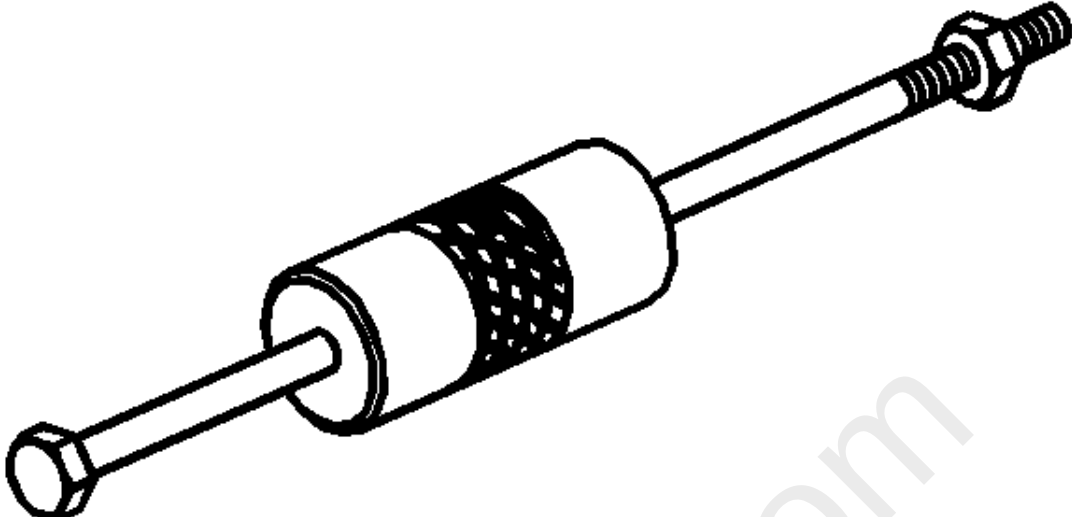
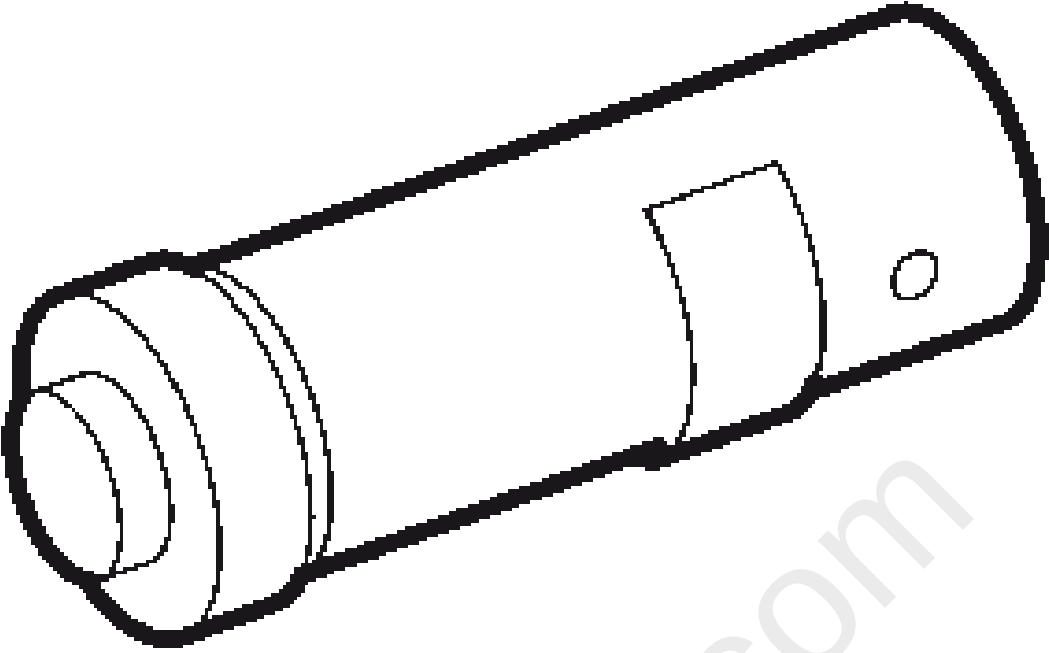
Illustration	Tool Number/Description
	DT-7004 KM-J-7004 J-6125-1B Slide Hammer

Illustration	Tool Number/Description
	DT-60000-190 Shaft Ring Installer