Manual Transmission - M20/M32 (MR5, MZ4)

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backup Lamp Switch	35 N•m	26 lb ft
Front Differential Carrier Flange Bolt		
First Pass	20 N•m (1)	15 lb ft (1)
Final Pass	45 degrees	
Oil Drain Plug	20 N•m	15 lb ft
Oil Filler Plug	30 N•m	22 lb ft
Shift Control Lever Bracket Bolt	20 N•m	15 lb ft
Shift Control Housing – to Transmission	20 N•m	15 lb ft
Transmission Control – to Chassis	8 N•m	71 lb in
Transmission Front and Rear Bolt (M12)	60 N•m	44 lb ft
Transmission Front Mount Bolt – to Front Suspension Frame	100 N•m	74 lb ft
Transmission Front Mount Bolt – to Transmission	100 N•m	74 lb ft
Transmission Lower Bolt (M10)	40 N•m	30 lb ft
Transmission Mount Bracket Bolt – Left Side – to Transmission	100 N•m	74 lb ft
Transmission Mount Bolt – Left Side – to Chassis	62 N•m	46 lb ft
Transmission Mount Nut – Left Side – to Chassis	62 N•m	46 lb ft
Transmission Mount Bolt – Left Side – to Bracket		
First Pass	50 N•m (1)	37 lb ft (1)
Final Pass	60 to 75 degrees	
Transmission Mount Bracket – Rear Bolt – to Transmission	100 N•m	74 lb ft
Transmission Mount – Rear Bolt – to Front Suspension Frame	110 N•m	81 lb ft
Transmission Mount – Rear Bolt – to Mount Bracket	100 N•m	74 lb ft
Transmission Nut and Bolt (M10)	40 N•m	30 lb ft
Transmission Upper Bolt (M12)	60 N•m	44 lb ft
1 = Use NEW Fastener.		

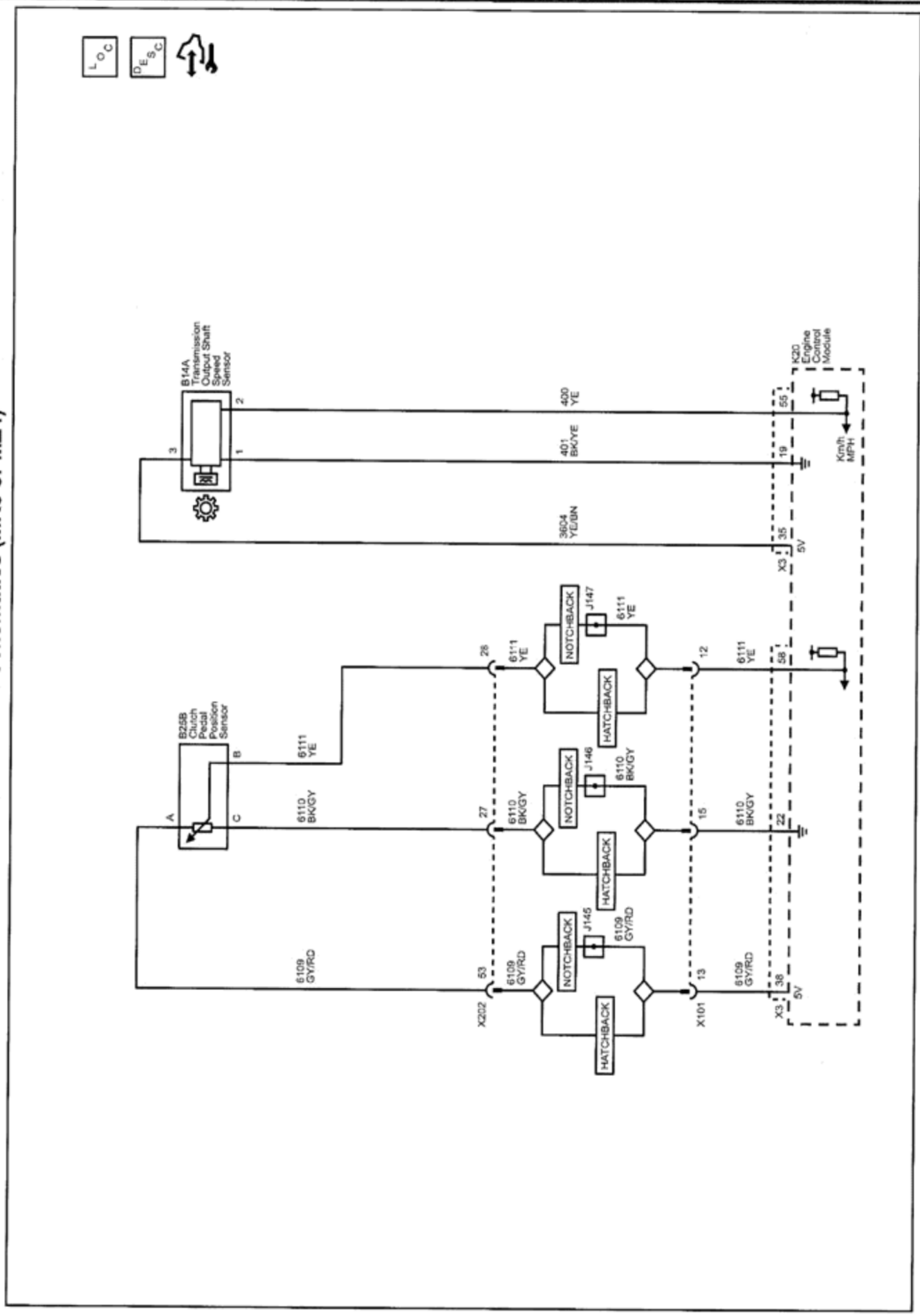
Manual Transmission Specifications

Application	Specification	
Transmission Type	M32-6	
Production Location	GMPT Europe	
Transmission Drive	Transverse Mounted — Front Wheel Drive	
Maximum Engine Torque	320 N•m (236 lb ft)	
Transmission RPO Codes	MR5	MZ4
Engine RPO Code	LUV (U14NFT)	
1st Gear Ratio	4.273	3.818
2nd Gear Ratio	2.353	2.053
3rd Gear Ratio	1.475	1.302
4th Gear Ratio	1.067	0.959
5th Gear Ratio	0.875	0.744

Application	Specification	
6th Gear Ratio	0.744	0.614
Reverse Gear Ratio	3.818	3.545
Final Drive RPO Codes	FV2	FXB
Final Drive Ratio	4.176	3.650
Transmission Fluid Type	Refer to Electronic Parts Catalog	
Fluid Capacity Total	1.9 Liters (2.0 quarts)	
Fluid Capacity Refill	1.8 Liters (1.9 quarts)	
Transmission Weight Dry (Approximate)	53.5 - 55.5 kg	

Schematic and Routing Diagrams

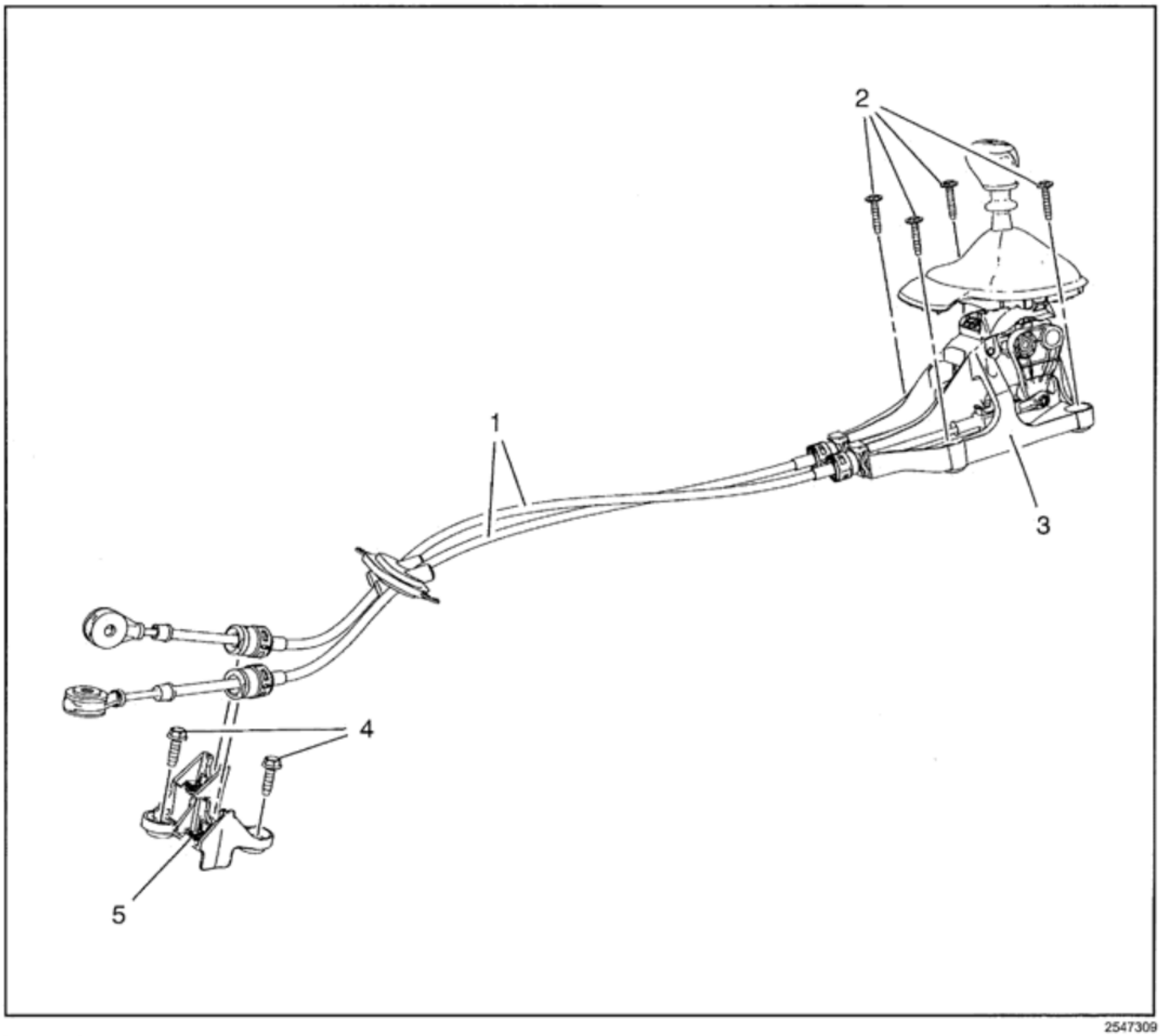
Manual Transmission Schematics (MR5 or MZ4)



Component Locator

Manual Transmission Component Views

Shift Control and Shift Lever/Selector Lever Cable Components

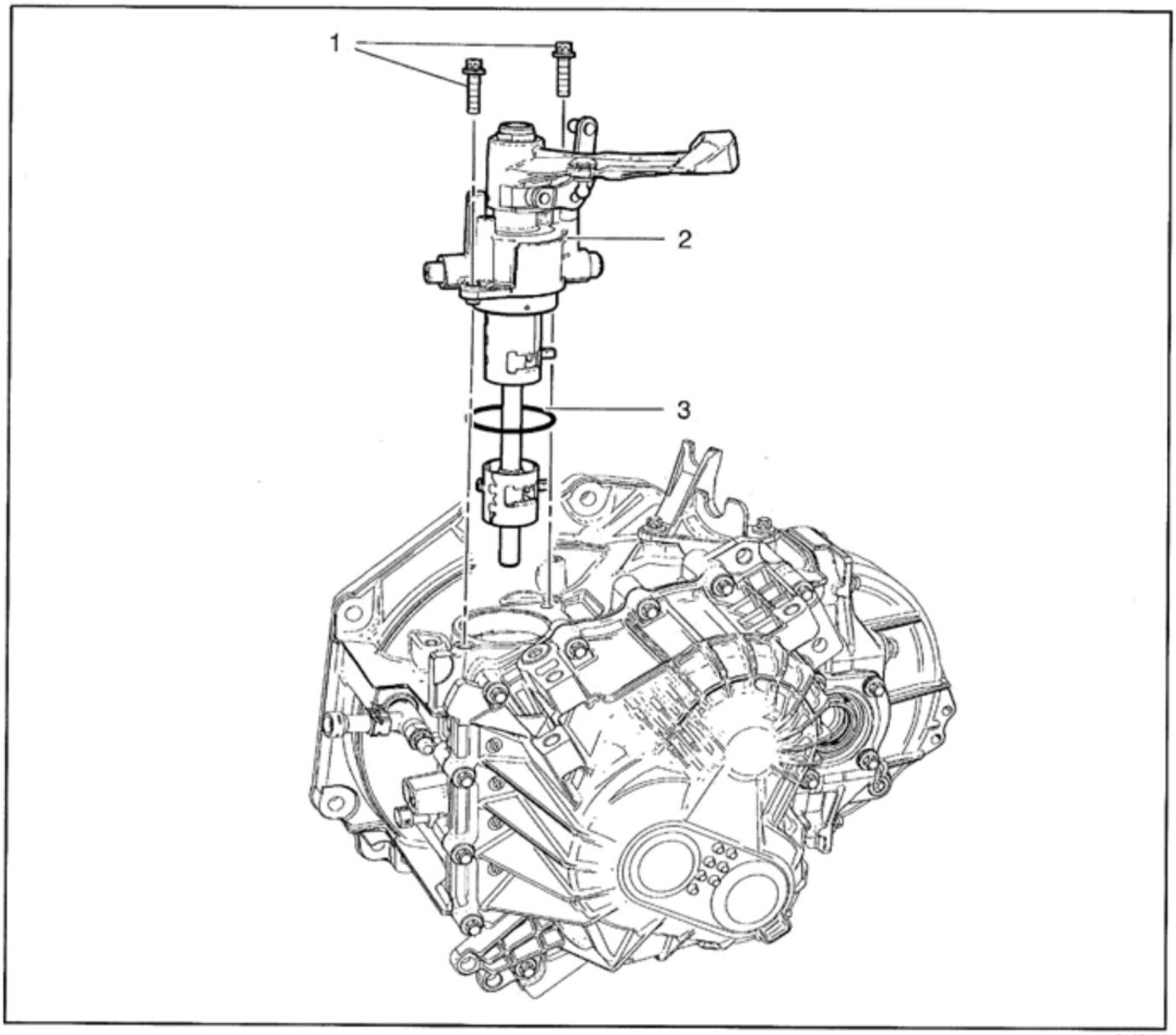


2547309

Legend

(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

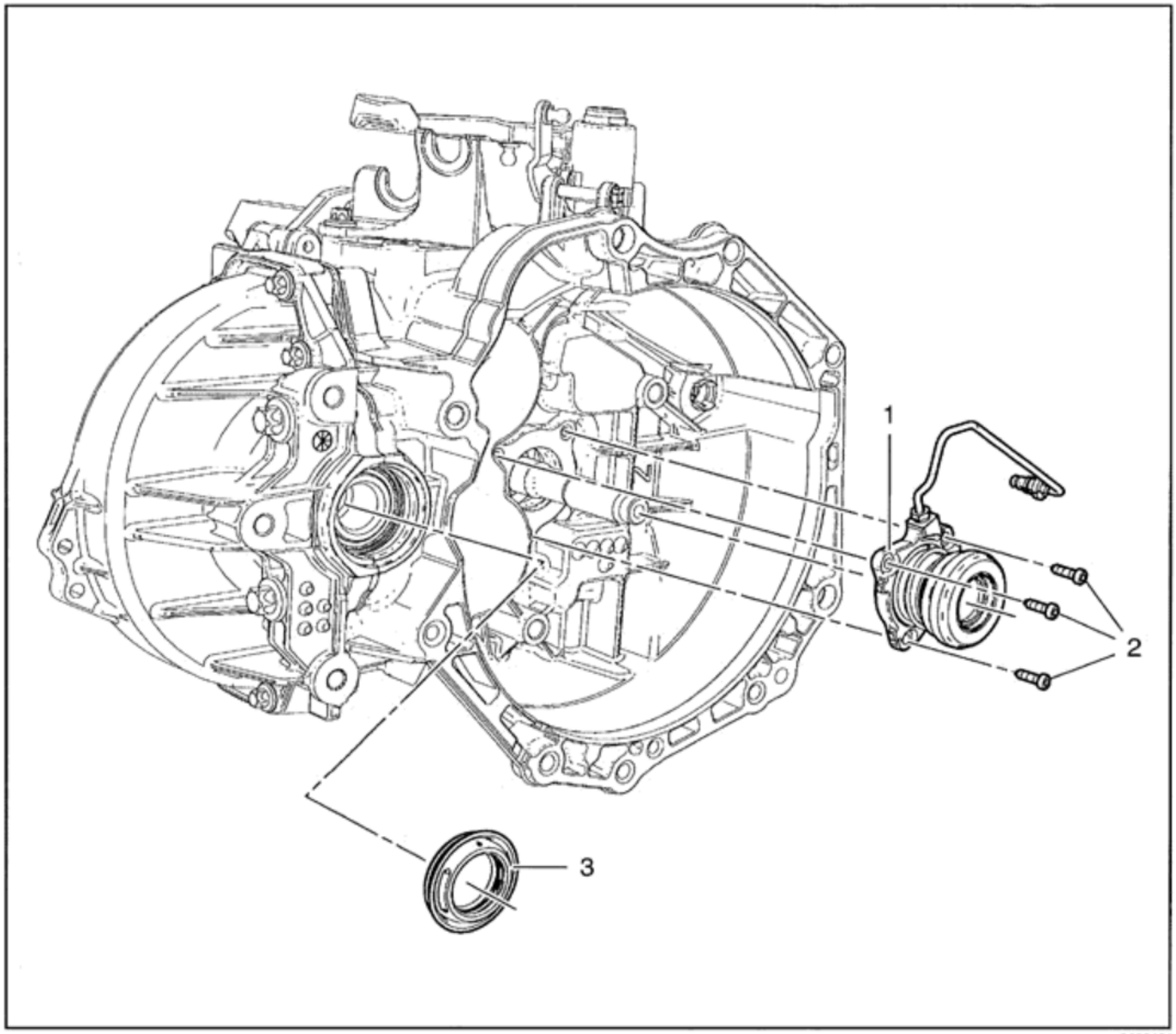


2190480

Legend

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

Clutch Housing Components – Right Hand View

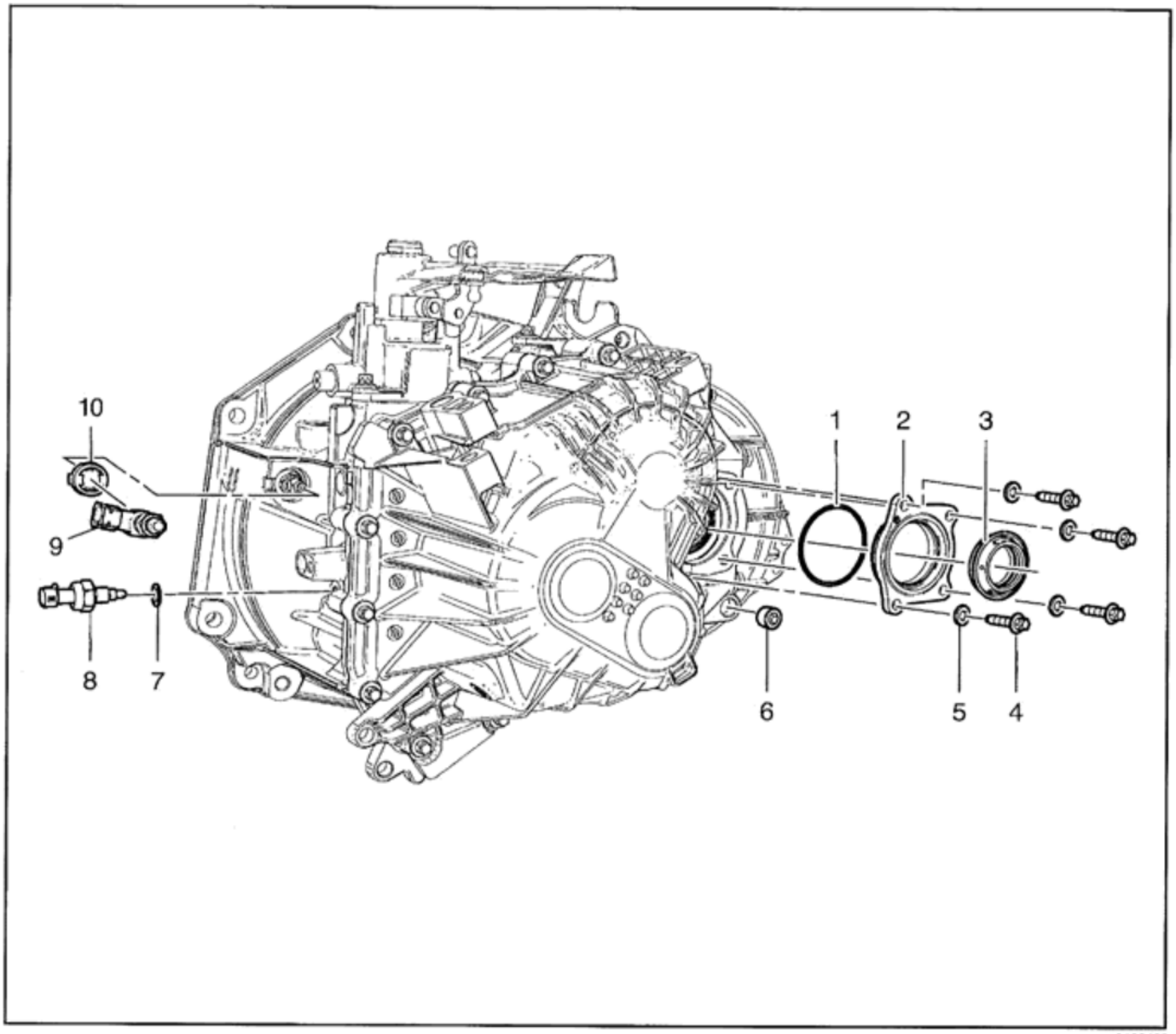


2190481

Legend

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

Clutch Housing Components– Left Hand View

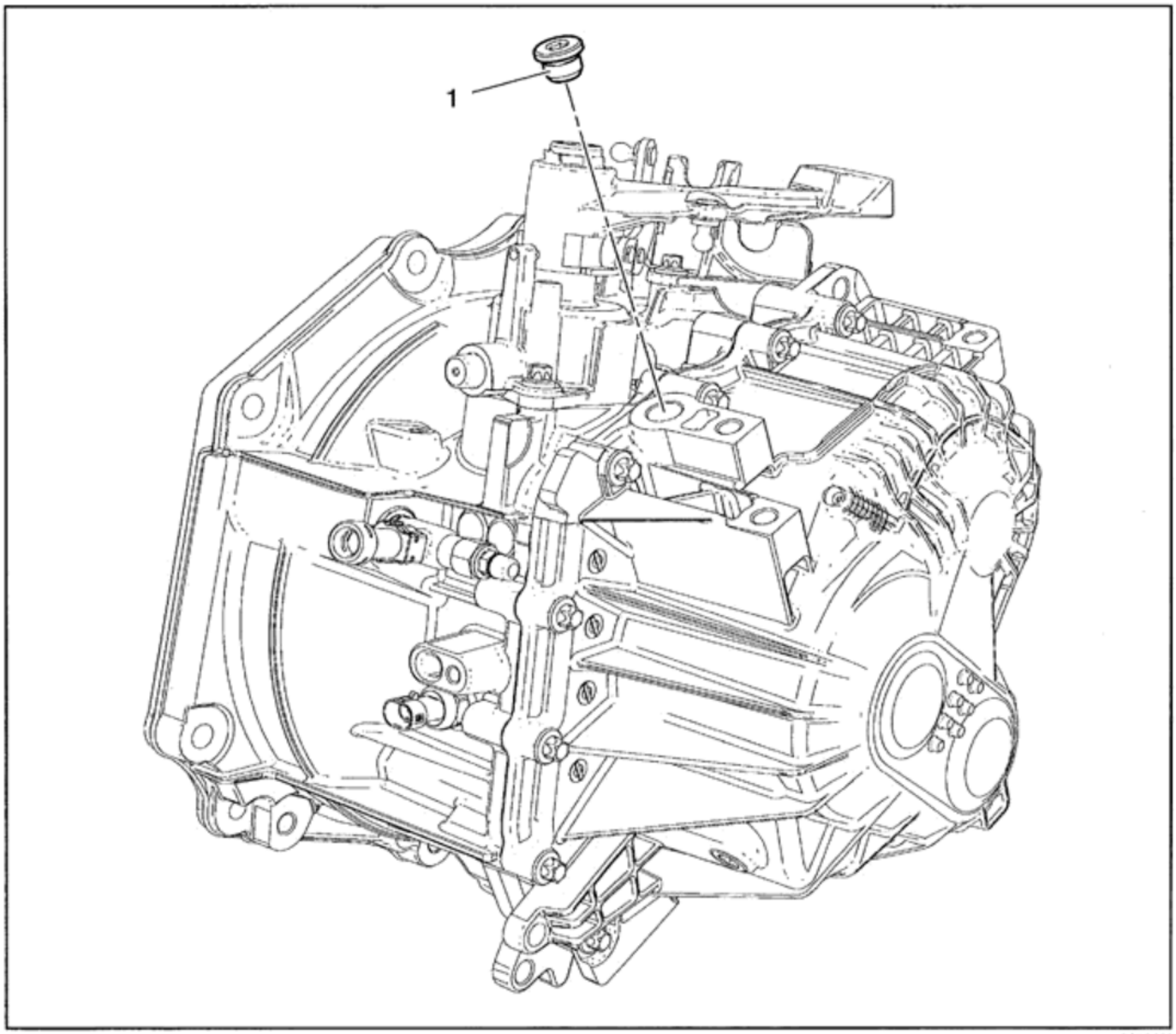


2190482

Legend

(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

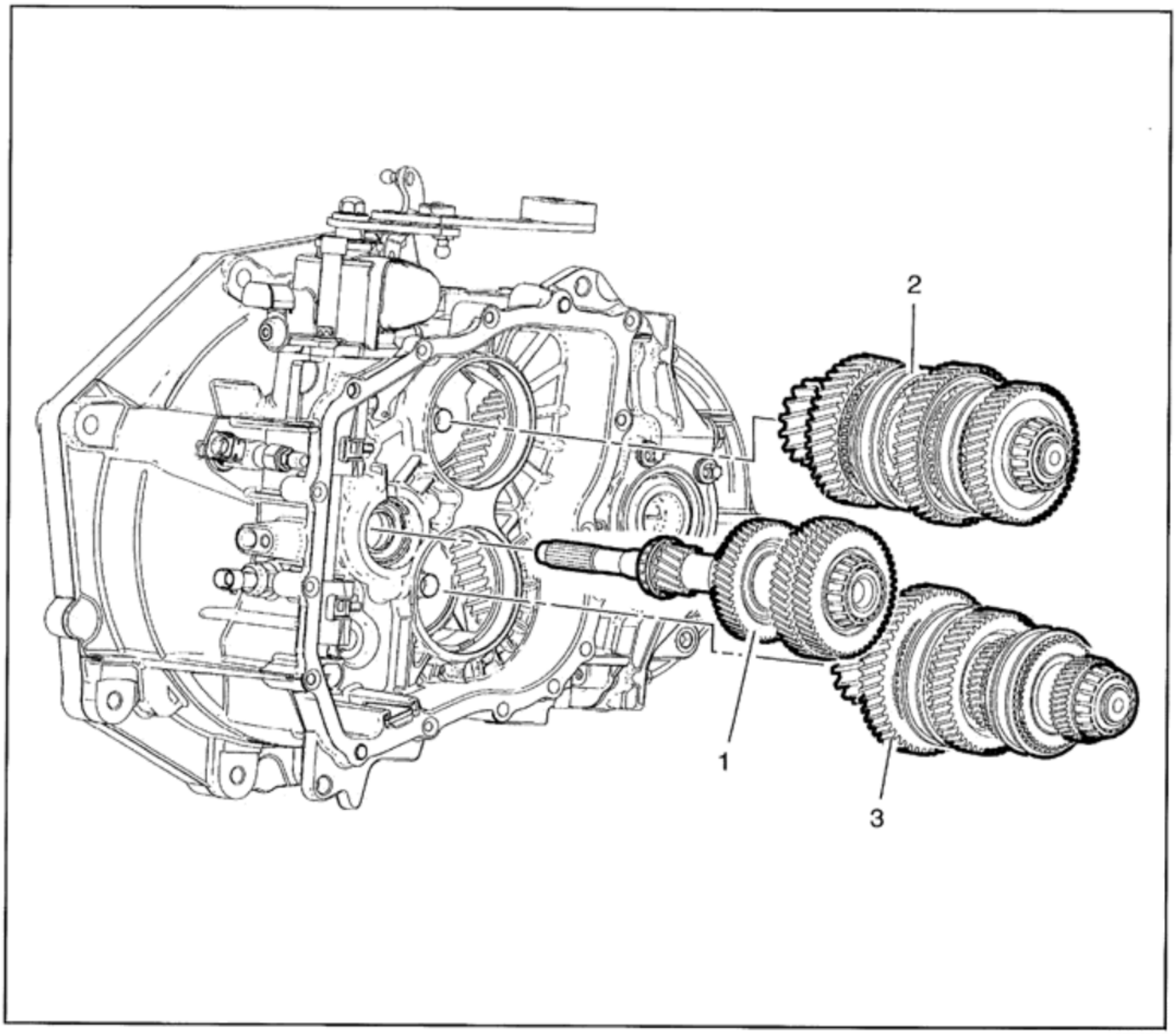


2190483

Legend

(1) Transmission Oil Filler Plug

Transmission Shafts Overview

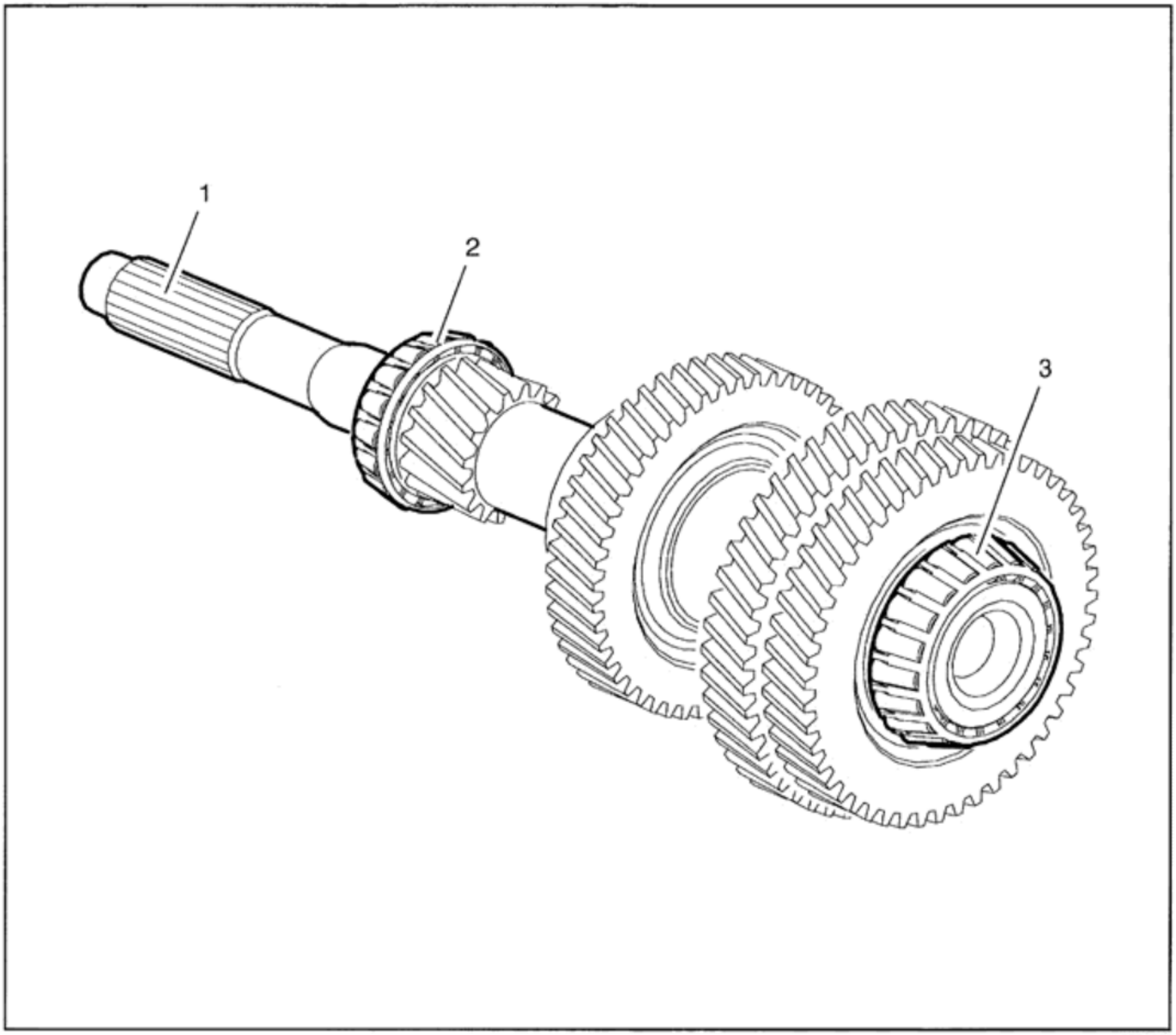


2791267

Legend

(1) Input Shaft
(2) Upper Main Shaft
(3) Lower Main Shaft

Input Shaft

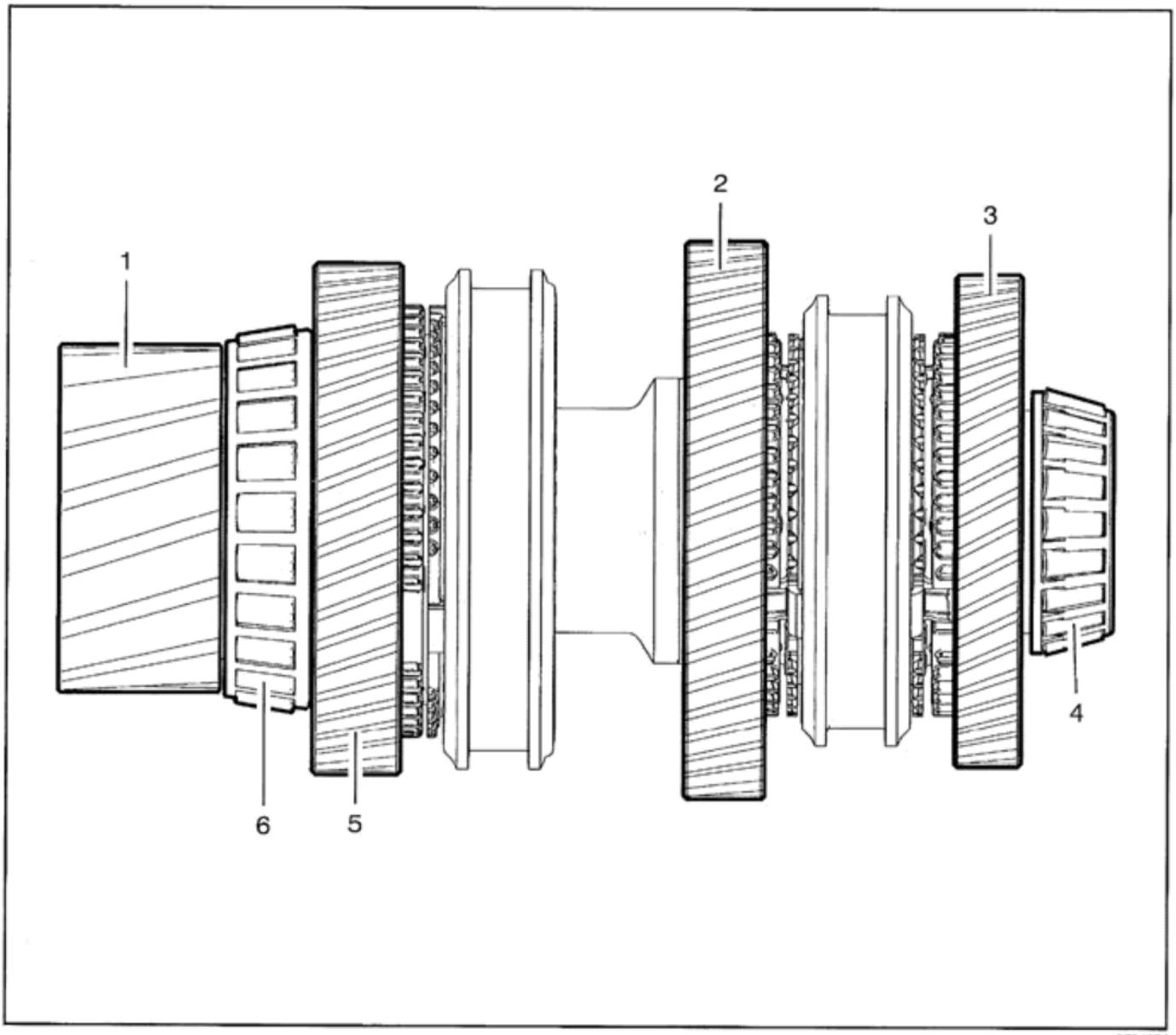


2791269

Legend

(1) Input Shaft
(2) Inner Bearing
(3) Outer Bearing

Upper Main Shaft

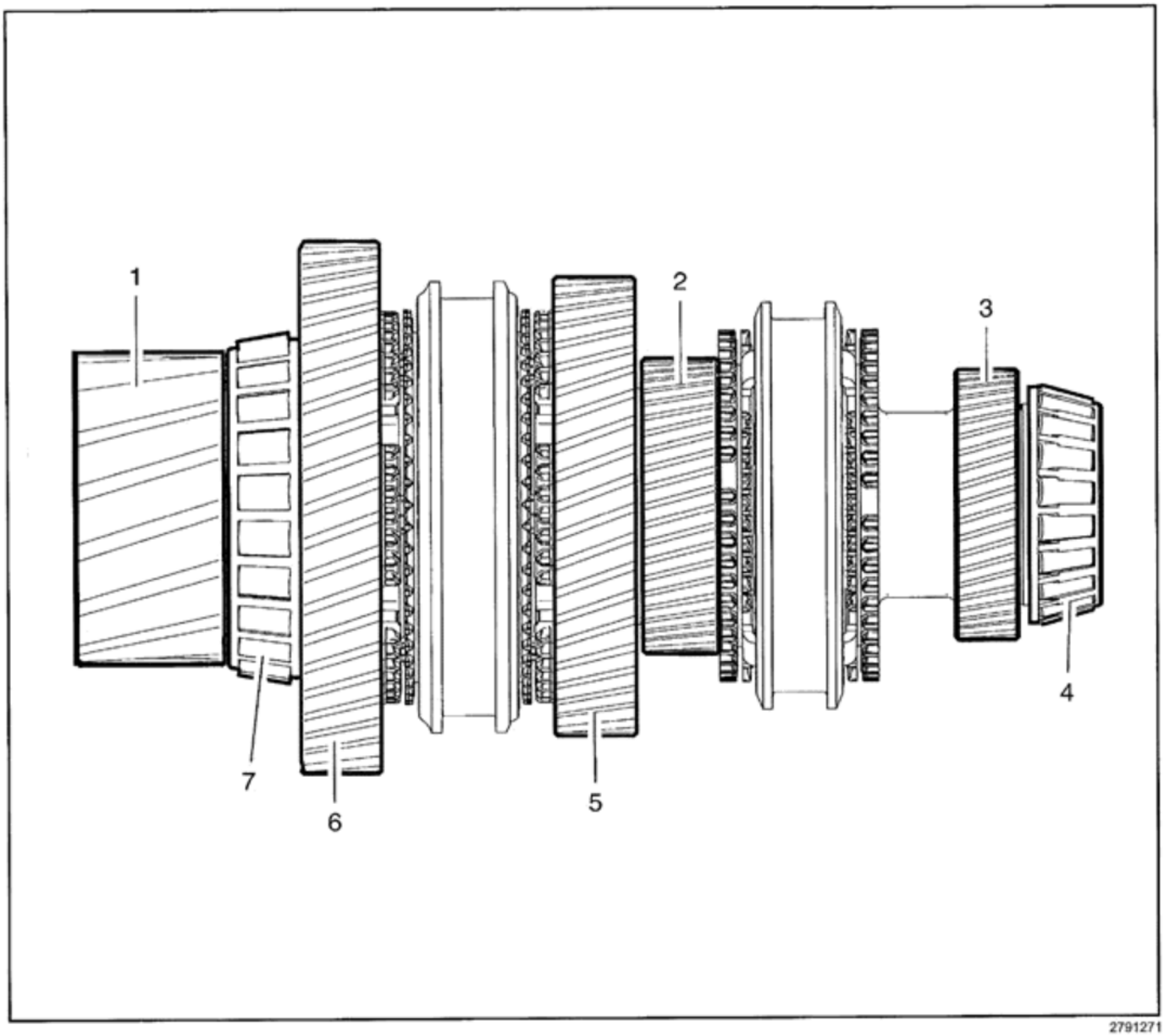


2791270

Legend

(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

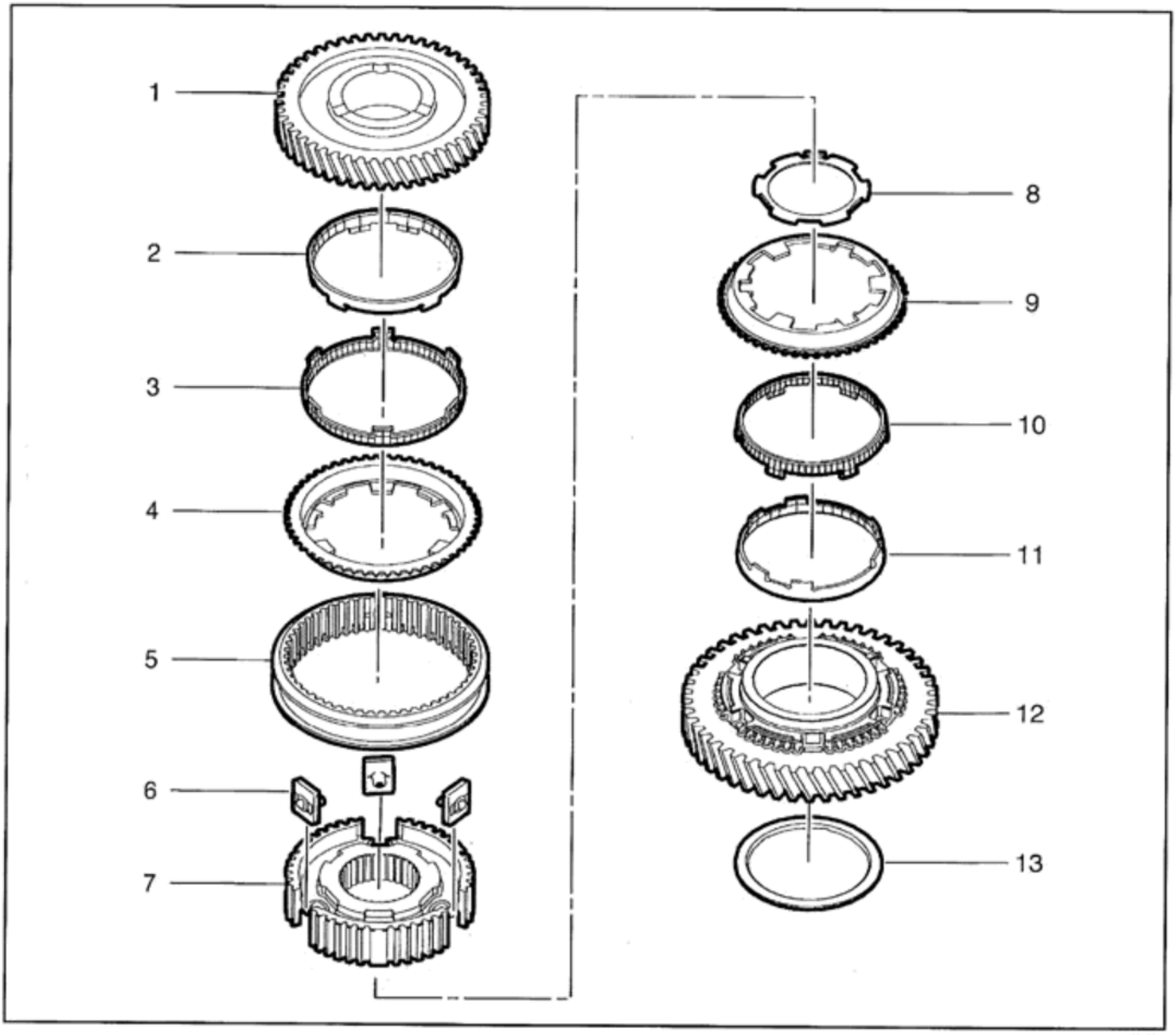


2791271

Legend

(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

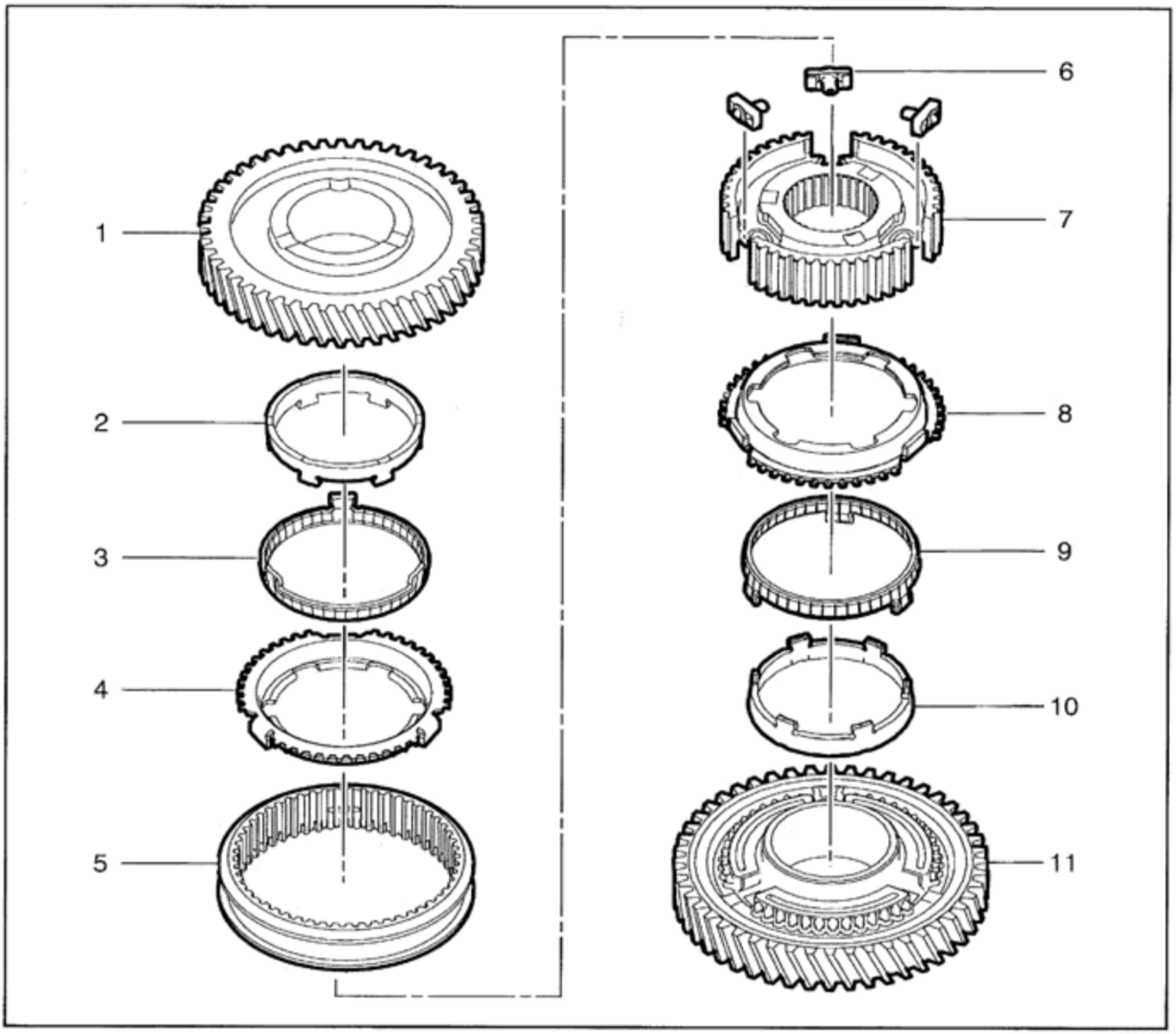


2791272

Legend

(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

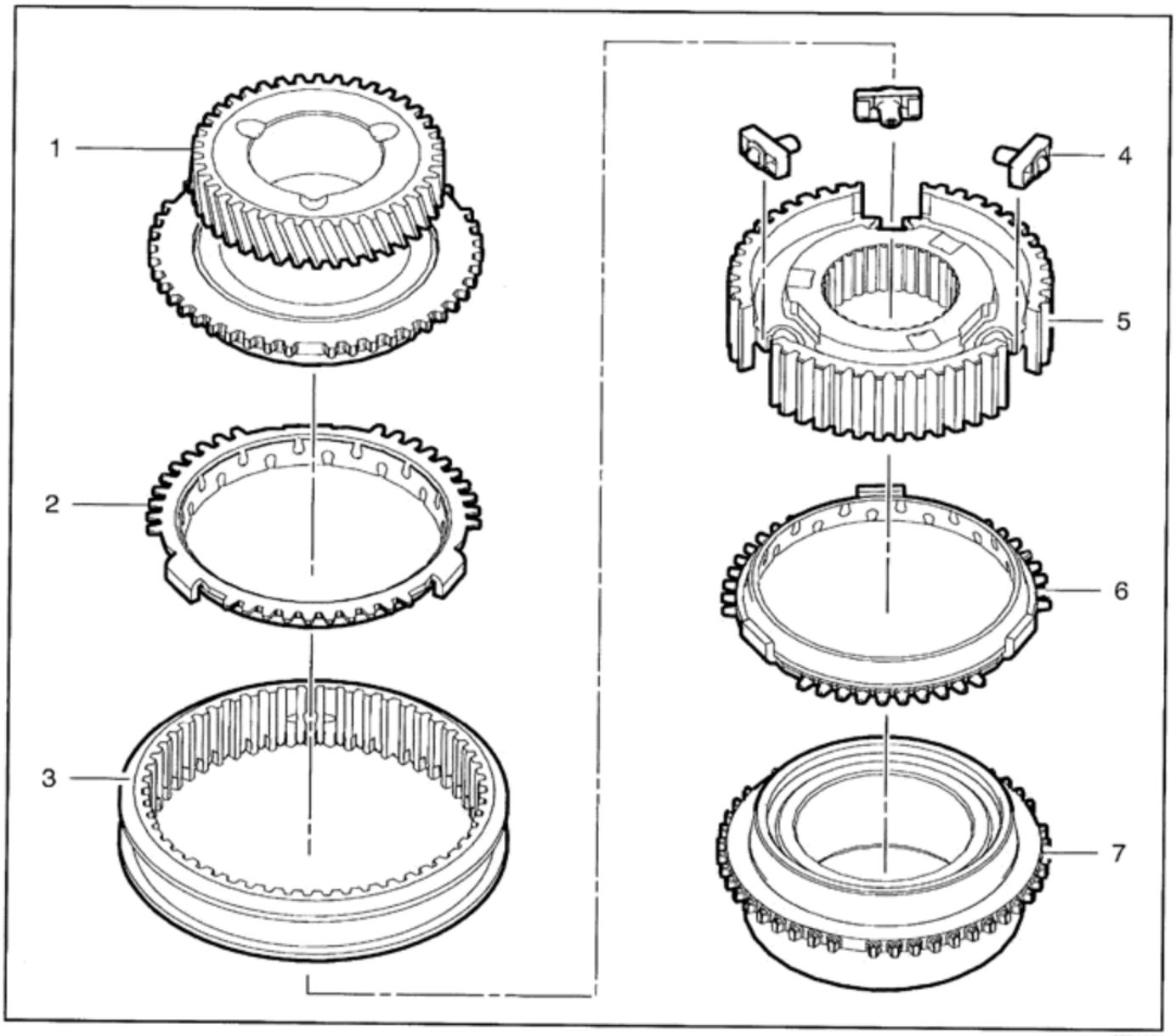


2791273

Legend

(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

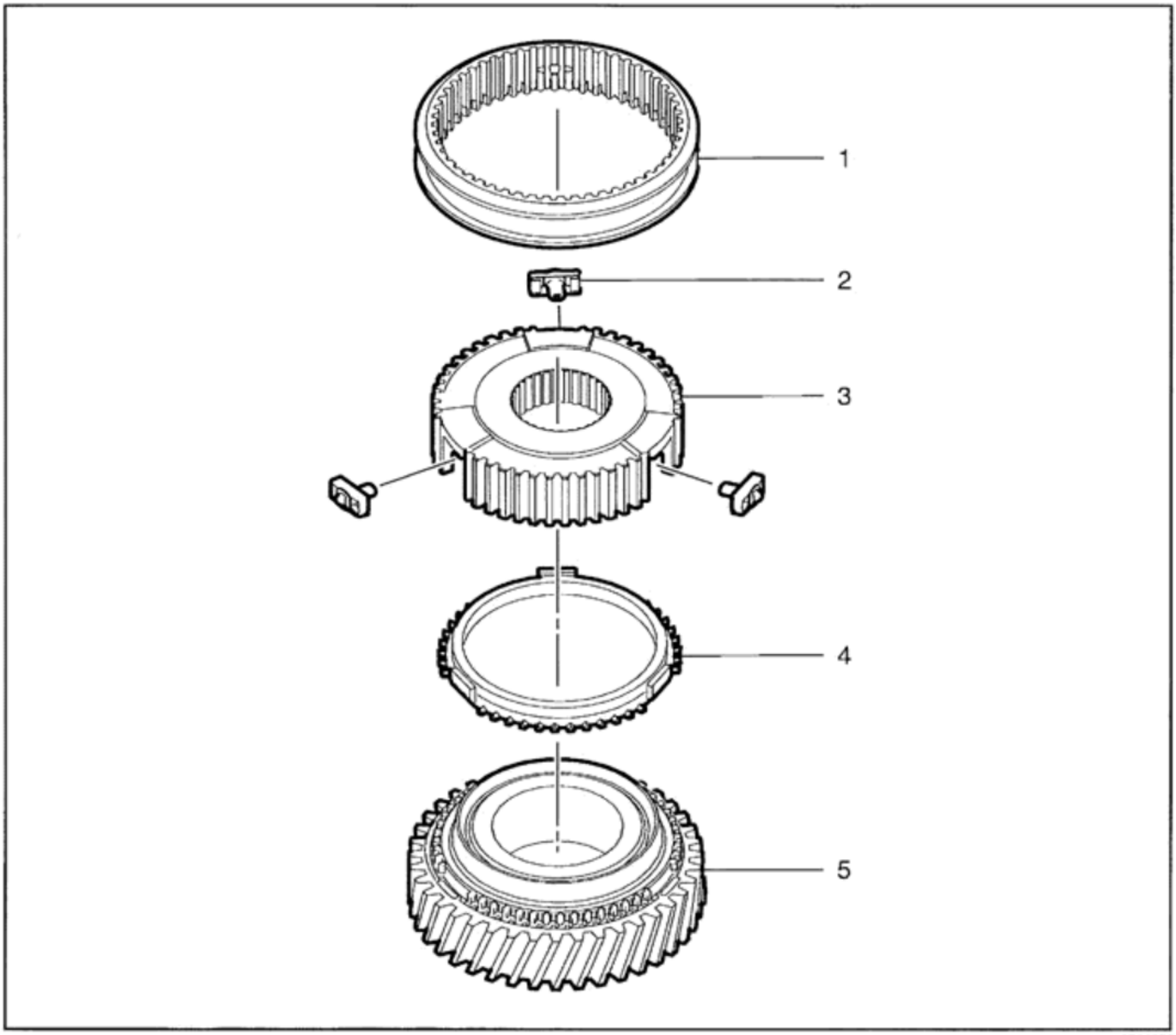


2791274

Legend

(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



2791275

Legend

(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

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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
Operating Conditions: Engine Running, drive wheels turning.				
VSS High Signal	P0502, P0503	P0502, P0503	P0502, P0503	P0503
VSS Low Signal	—	P0502, P0503	—	—

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine Running, drive wheels turning.				
VSS High Signal	0 km/h (0 MPH)	0 km/h (0 MPH)	0 km/h (0 MPH)	—
VSS Low Signal	—	0 km/h (0 MPH)	—	—

Circuit/System Description

The vehicle speed sensor is provided to the engine control module by the vehicle speed sensor (VSS). The ECM provides a 5 V circuit, a low reference circuit, and a signal circuit to the VSS. The VSS provides a frequency signal that is proportional to an increase in vehicle speed.

Conditions for Running the DTC

P0502

The ignition is ON.

P0503

- Ignition voltage is between 11–18 V.
- Engine speed is between 1 500–6 500 RPMs.
- VSS signal is between 150–200 RPMs for 2 s.

Conditions for Setting the DTC

P0502

VSS signal is less than 60 RPMs for 4.5 s.

P0503

VSS signal is greater than 350 RPMs for 3.25 s.

Action Taken When the DTC Sets

P0502 and P0503 are Type B DTCs.

Conditions for Clearing the DTC

P0502 and P0503 are Type B DTCs.

Diagnostic Aids

The battery must be fully charged. Refer to *Battery Inspection/Test on page 9-702.*

Reference Information

Schematic Reference

Manual Transmission Schematics on page 17-541

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-589

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*

- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Engine Control Module Scan Tool Information on page 6-33

Circuit/System Verification

1. Operate the vehicle on the road at various speeds up to 64 km/h (40 MPH).
2. Verify with a scan tool that the B14A Transmission Output Shaft Speed Sensor parameter and the speedometer display on the instrument cluster match.

⇒ **If the parameter does not match**

Refer to Circuit/System Testing.

⇓ **If the parameter matches**

3. Operate the vehicle within the conditions for running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records.

⇒ **If the DTC resets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not reset**

4. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the B14A Transmission Output Shaft Speed Sensor harness connector.
2. Test for less than 5 Ω between the low reference circuit terminal 2 and ground.

⇒ **If 5 Ω or greater**

2.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

2.2. 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 greater than 4.8–5.2 V between the 5 V reference circuit terminal 1 and ground.

⇒ **If less than 4.8 V**

4.1. 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

4.1.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

4.1.2. 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**

4.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

4.2. Test for less than 0.3 V between the 5 V reference circuit terminal 35 and ground.

⇒ If 0.3 V or greater, repair the short to voltage on the circuit.

⇒ If less than 0.3 V, replace the K20 Engine Control Module.

⇓ **If between 4.8–5.2 V**

5. Ignition OFF.
6. Test for less than 1 V between the signal circuit terminal 3 and ground.

⇒ **If 1 V or greater**

6.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

6.2. Test for less then 0.3 V between the signal circuit terminal 55 and ground.

⇒ If 0.3 V or greater, repair the short to voltage on the circuit.

⇒ If less than 0.3 V, replace the K20 Engine Control Module.

⇓ **If less than 1 V**

7. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.
8. Test for less than 2 Ω between the signal circuit terminal 55 at the K20 Engine Control Module and the signal circuit terminal 3 at the B14A Transmission Output Shaft Speed Sensor.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

9. Test for infinite resistance between the signal circuit terminal 3 at the B14A Transmission Output Shaft Speed Sensor.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

10. Replace the B14A Transmission Output Shaft Speed Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Vehicle Speed Sensor Replacement on page 17-575*
- *Control Module References on page 6-3* for ECM replacement, programming and setup.

DTC P0806-P0808

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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
5V Reference	P0642, P0807	P0807	P0642, P0808	—
Signal	P0807	P0807	P0808	P0806
Low Reference	—	P0808	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:** 0 V with clutch pedal applied to 5 V when clutch pedal is released.			
5V Reference	0 V	0 V	5 V
Signal	0 V	0 V	5 V
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.			
5V Reference	100%	100%	0–100%
Signal	100%	100%	100%
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 less than or equal to 5 V when the clutch pedal is released, to a voltage less than or equal to 1.5 V when the clutch pedal is applied.

Conditions for Running the DTC

P0806, P0807 and P0808

- DTCs P0642, P0643, P0335, P0336, P0607 or P080A are not set.
- The system voltage is more than 9 V.
- The ignition is in the RUN position.

Conditions for Setting the DTC

P0806

The CPP sensor is stuck in range.

P0807

The CPP sensor voltage is less than 0.1 V for more than 1 s.

P0808

The CPP sensor voltage is more than 5.2 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 on page 17-541

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-589

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Engine Control Module Scan Tool Information on page 6-33 for scan tool information

Circuit/System Verification

1. If DTC P0642, P0643, P0335, P0336, P0607 or P080A is set, refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.
2. Ignition ON.
3. Observe the scan tool CPP sensor percent parameter. The percentage should vary 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**

Refer to Circuit/System Testing.

⇓ **If the percentage varies**

4. Perform the CPP learn procedure. Refer to *Clutch Pedal Position Sensor Learn on page 17-562*.
5. Operate the vehicle within the conditions for running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

⇒ **If the DTC resets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not reset**

6. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector of the B25B Clutch Pedal Position Sensor.
2. Test for less than 5 Ω between the low reference circuit terminal C (for LHD) or terminal A (for RHD) and ground:

⇒ **If 5 Ω or greater**

2.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

2.2. 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 greater than 4.8–5.2 V between the 5 V reference circuit terminal A (for LHD) or terminal C (for RHD) and ground:

⇒ **If less than 4.8 V**

4.1. 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

4.1.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

4.1.2. 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**

4.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

4.2. Test for less than 0.3 V between the 5 V reference circuit terminal 38 and ground.

⇒ If 0.3 V or greater, repair the short to voltage on the circuit.

⇒ If less than 0.3 V, replace the K20 Engine Control Module.

⇓ **If between 4.8–5.2 V**

5. Ignition OFF.

6. Test for less than 1 V between the signal circuit terminal B and ground.

⇒ **If 1 V or greater**

6.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

6.2. Test for less then 0.3 V between the signal circuit terminal 58 and ground.

⇒ If 0.3 V or greater, repair the short to voltage on the circuit.

⇒ If less than 0.3 V, replace the K20 Engine Control Module.

⇓ **If less than 1 V**

7. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.
8. Test for less than 2 Ω between the signal circuit terminal 58 at the K20 Engine Control Module and the signal circuit terminal B at the B25B Clutch Pedal Position Sensor.

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

9. Test for infinite resistance between the signal circuit terminal B at the B25B Clutch Pedal Position Sensor.

⇒ **If less than infinite resistance**

Repair the short to ground on the circuit.

⇓ **If infinite resistance**

10. 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 (for LHD) or terminal A (for RHD) 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 on page 6-92* after completing the repair.

- *Clutch Pedal Position Sensor Replacement on page 17-415*
- *Control Module References on page 6-3* for ECM replacement, programming and setup.

DTC P080A

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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) 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 less than or equal to 5 V when the clutch pedal is released to a voltage less than or equal to 1.5 V when the clutch pedal is applied.

Conditions for Running the DTC

Clutch pedal fully applied.

Conditions for Setting the DTC

Clutch pedal position not learned.

Action Taken When the DTC Sets

P080A is a Type B DTC.

Conditions for Clearing the DTC

P080A is a Type B DTC.

Reference Information

Schematic Reference

Manual Transmission Schematics on page 17-541

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-589

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Engine Control Module Scan Tool Information on page 6-33 for scan tool information

Circuit/System Verification

Perform the clutch pedal position sensor learn procedure. Refer to *Clutch Pedal Position Sensor Learn on page 17-562*.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Clutch Pedal Position Sensor Learn on page 17-562*
- *Control Module References on page 6-3*

DTC P0812

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptor

DTC P0812 00: Reverse Position Switch Circuit -- Malfunction

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Reverse Switch Signal	P0812 00	1	P0812 00	—
Ground	—	1	1	—
1. Backup Lamps Malfunction				

Circuit/System Description

The reverse gear switch is a normally open switch that closes with the reverse gear engagement. When the switch is open the engine control module should detect a high signal voltage input. When the switch is closed the ECM should detect a low signal voltage input.

Conditions for Running the DTC

- No vehicle speed sensor faults exist.
- Reverse switch is ON.

Conditions for Setting the DTC

The ECM detects circuit malfunction of the reverse input switch.

Action Taken When the DTC Sets

DTC P0812 00 is Type C DTC.

Conditions for Clearing the DTC

DTC P0812 00 is Type C DTC.

Reference Information

Schematic Reference

Manual Transmission Schematics on page 17-541

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-589

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Observe the scan tool Reverse Switch parameter. The reading should be Off and change to On when the transmission is shifted into reverse.

⇒ **If the parameter does not change from Off to On**

Refer to Circuit/System Testing.

⇓ **If the parameter changes from Off to On**

3. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B16 Backup Lamp Switch.
2. Test for less than 5 Ω between the ground circuit terminal 2 and ground.

⇒ **If 5 Ω or greater**

2.1. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 5 Ω**

3. Ignition ON, transmission in neutral position.

4. Verify the scan tool Reverse Switch parameter is Off.

⇒ **If the parameter is not OFF**

4.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

4.2. Test for infinite resistance between the signal circuit terminal 1 and ground.

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

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If the parameter is OFF**

5. Ignition ON, install a 3 A fused jumper wire between the signal circuit terminal 1 at the B16 Backup Lamp Switch harness connector and ground.
6. Verify the scan tool Reverse Switch parameter is On.

⇒ **If the parameter is Off**

6.1. Disconnect the X3 harness connector at the K20 Engine Control Module.

6.2. 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 parameter is On**

7. Test or replace the B16 Backup Lamp Switch.

Component Testing

1. Ignition OFF, disconnect the harness connector at the B16 Backup Lamp Switch.
2. Test for less then 5 Ω between the signal circuit terminal 1 and the ground circuit terminal 2 at the B16 Backup Lamp Switch.

⇒ **If 5 Ω or greater**

Replace the B16 Backup Lamp Switch.

⇓ **If less than 5 Ω**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Control Module References on page 6-3 for ECM replacement, programming and setup.

Clutch Pedal Position Sensor 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. 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 on page 6-69* for the applicable DTC that set.
3. With a scan tool, select Clutch Pedal Position Learn under Module Setup in Manual Transmission, and perform the following instructions displayed on the scan tool screen.

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. The scan tool will display under CPP Learn Status: Not Learned, In Process, Complete, Fail – Low Volt, Fail – High Volt, or Fail Moving. The scan tool will display under CPP Learn Status Complete if the process was successful.
5. 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 on page 17-560*. If any other DTC is set, refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69* for the applicable DTC.
6. 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.

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.
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.

Symptoms - Manual Transmission (cont'd)

Complaint/Condition	Possible Cause	correction
		• 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.
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.

Symptoms - Manual Transmission (cont'd)

Complaint/Condition	Possible Cause	correction
Slips Out of Gear While Accelerating	• Missing or misadjusted first gear thrust bearing or washer • Worn or damaged fist gear spline lock on 1st/2nd synchronizer • Worn of 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.

Transmission Shifts Hard

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 on page 17-562* and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Manual Transmission on page 17-562*

Transmission Shifts Hard (cont'd)

Step	Action	Yes	No
2	Inspect the clutch system for proper operation. Refer to *Clutch System Description and Operation on page 17-425.* 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 on page 2-61.* 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 on page 17-574.* 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*
7	Inspect the transmission for the correct fluid level and type of the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 17-567.* 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 on page 17-567.* Did you find and repair the condition?	Go to *Step 12*	Go to *Step 9*
9	1. Remove the transmission. Refer to *Transmission Replacement on page 17-586.* 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) on page 17-416* or *Clutch Pressure and Driven Plate Replacement (1.8L) on page 17-419.* Did you find and repair the condition?	Go to *Step 12*	Go to *Step 11*
11	Replace the Transmission. Refer to *Transmission Replacement on page 17-586.* 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.

Transmission Gear Clash When Shifting Gears

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 on page 17-562* and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Manual Transmission on page 17-562*
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 on page 17-425.* Does the clutch operate properly?	Go to *Step 5*	Go to *Step 4*
4	Repair the clutch system. Refer to *Symptoms - Clutch on page 17-401.* 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 on page 17-567.* 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 on page 2-61.* Inspect for the following: • Loose mounting • Foreign debris Did you find and repair the condition?	Go to *Step 12*	Go to *Step 10*

Transmission Gear Clash When Shifting Gears (cont'd)

Step	Action	Yes	No
9	Inspect for proper shift cable adjustment. Refer to *Manual Transmission Shift Lever and Selector Lever Cable Adjustment on page 17-574.* Did you find and repair the condition?	Go to *Step 12*	Go to *Step 10*
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 on page 17-564*	Go to *Step 11*
11	Replace the transmission Refer to *Transmission Replacement on page 17-586.* 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*

Repair Instructions - On Vehicle

Transmission Fluid Drain and Fill

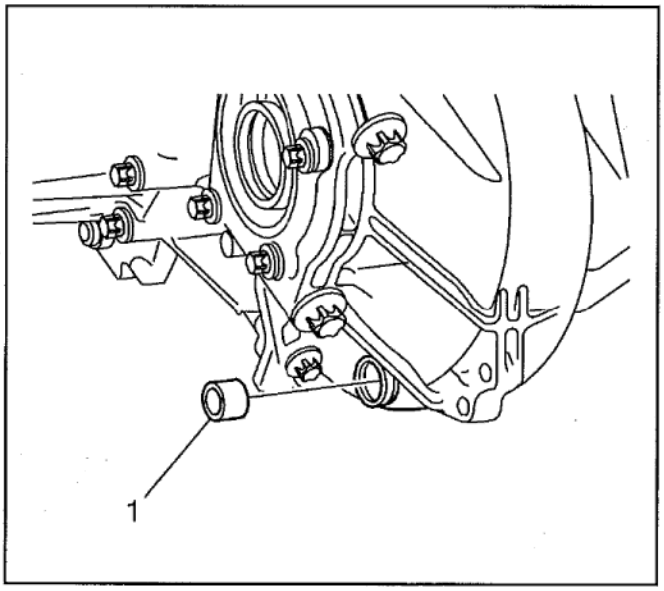
Draining Procedure

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 on page 1-31.*
2. Remove the drivetrain and front suspension frame skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143.*



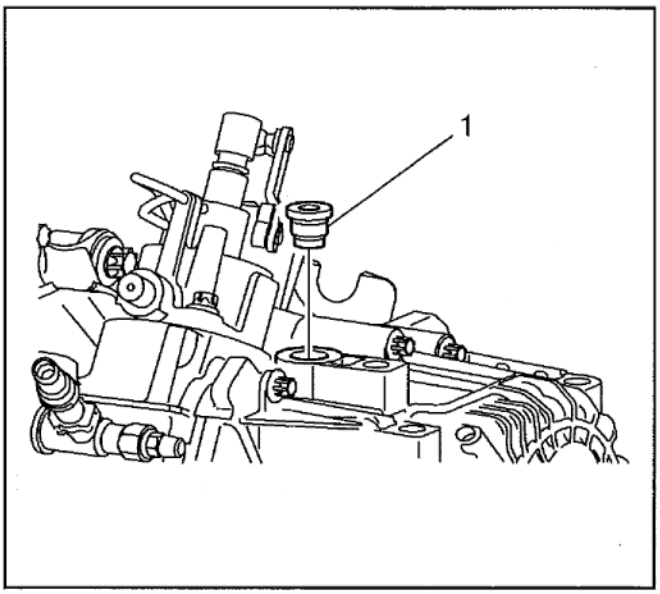
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3. Clean away all dirt and debris from the transmission fluid drain fastener area.
4. Position an appropriate container under the transmission.
5. Remove the transmission fluid drain fastener (1).
6. Allow the transmission fluid to drain into the container.

Caution: Refer to *Fastener Caution on page 0-8.*

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 drivetrain and front suspension frame skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143.*

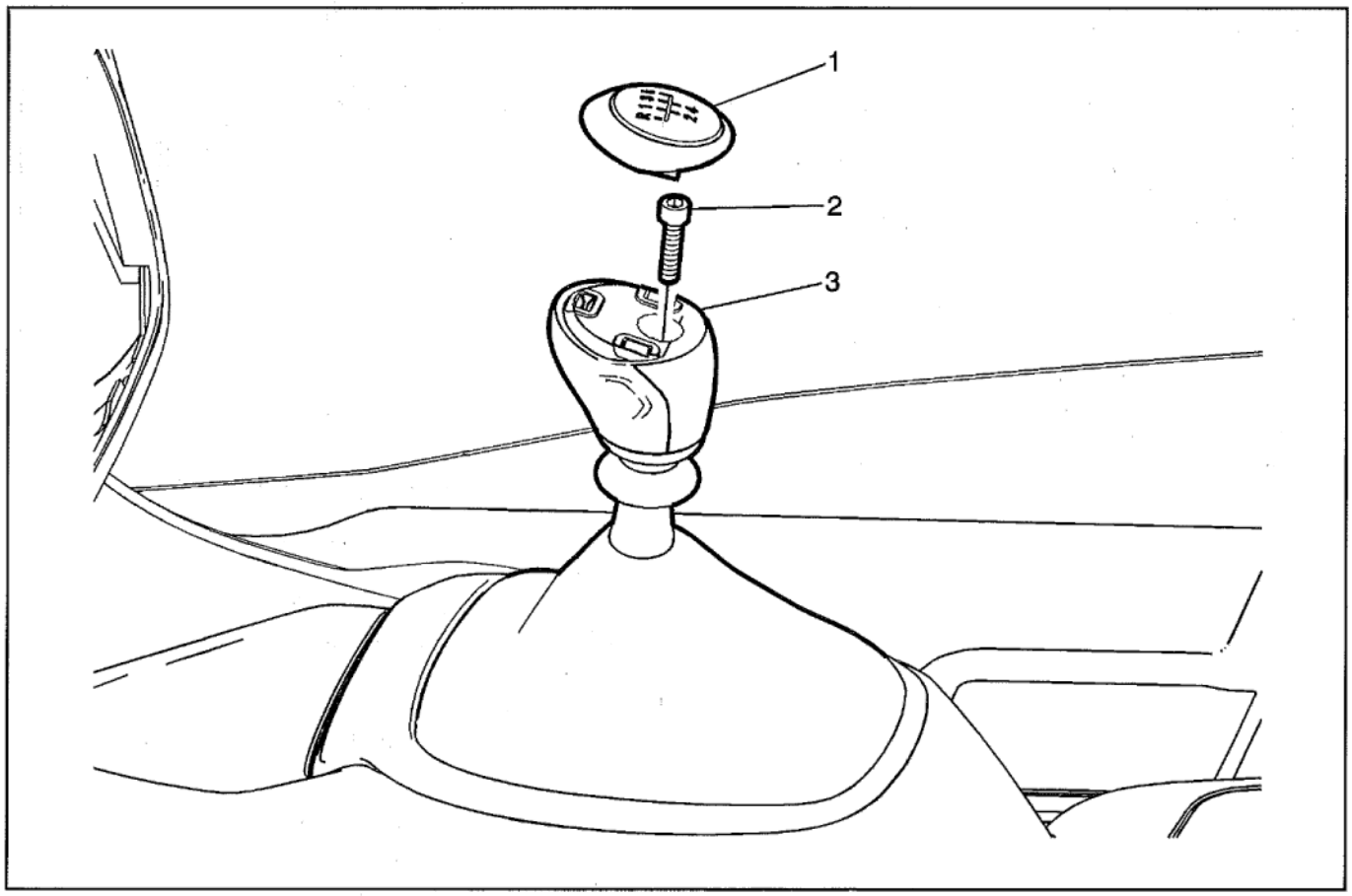
Filling Procedure



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1. Lower the vehicle.
2. Remove the engine control module with the bracket from the battery tray. Refer to *Engine Control Module Replacement on page 9-242* for the 1.2L or 1.4L engine, or *Engine Control Module Replacement on page 9-531* for the 1.6L or 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 *Fluid and Lubricant Recommendations on page 1-35* and *Manual Transmission Specifications on page 17-539*.
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 on page 9-242* for the 1.2L or 1.4L engine, or *Engine Control Module Replacement on page 9-531* for the 1.6L or 1.8L engine.

Transmission Control Lever Boot Replacement



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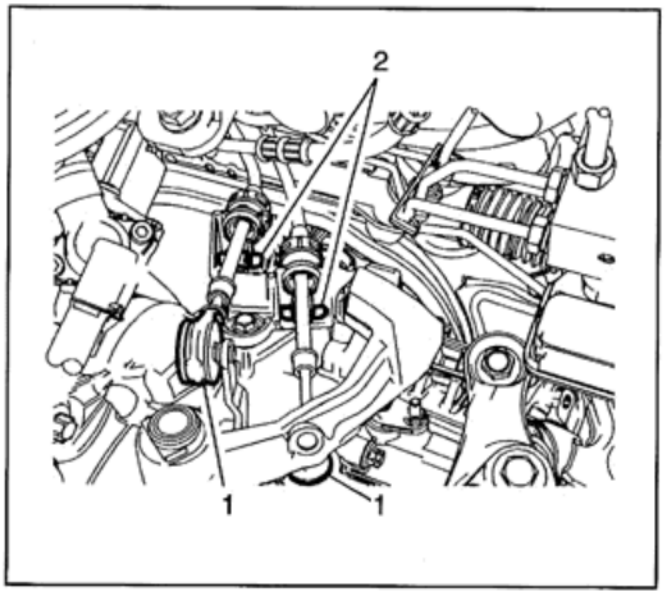
Transmission Control Lever Boot Replacement

Callout	Component Name
Preliminary Procedure Remove the front floor console. Refer to *Front Floor Console Replacement on page 2-61*.	
1	Shift Control Lever Knob Cover **Procedure** Using a flat-bladed tool, remove the shift knob cover.
2	Fastener
3	Shift Control Lever Knob and Boot Assembly

Manual Transmission Shift Lever and Selector Lever Cable Replacement

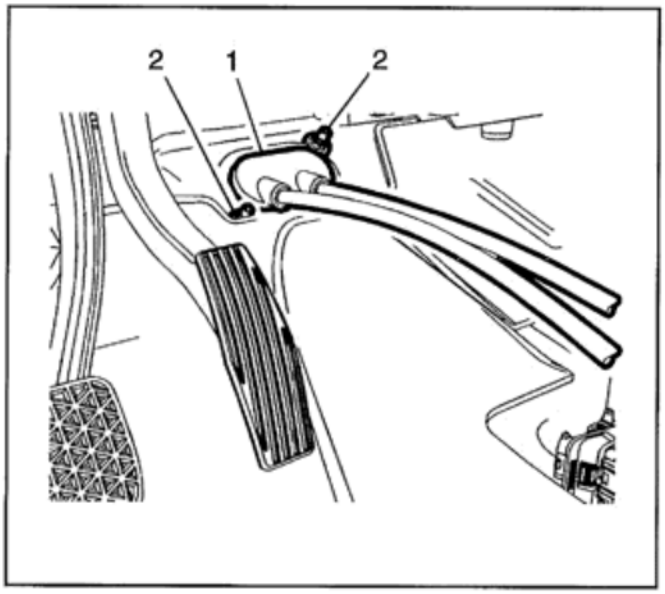
Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.



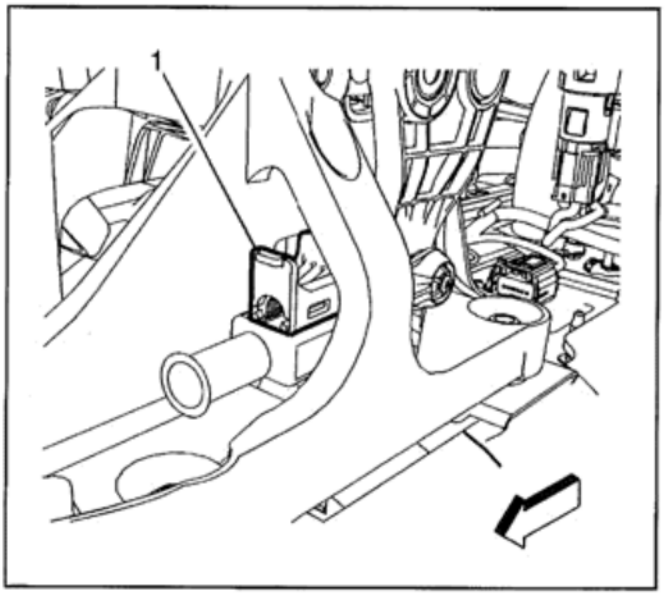
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2. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.
3. Pull the cable retainers (2) to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
4. Disconnect the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
5. Remove the floor console. Refer to *Front Floor Console Replacement on page 2-61*.



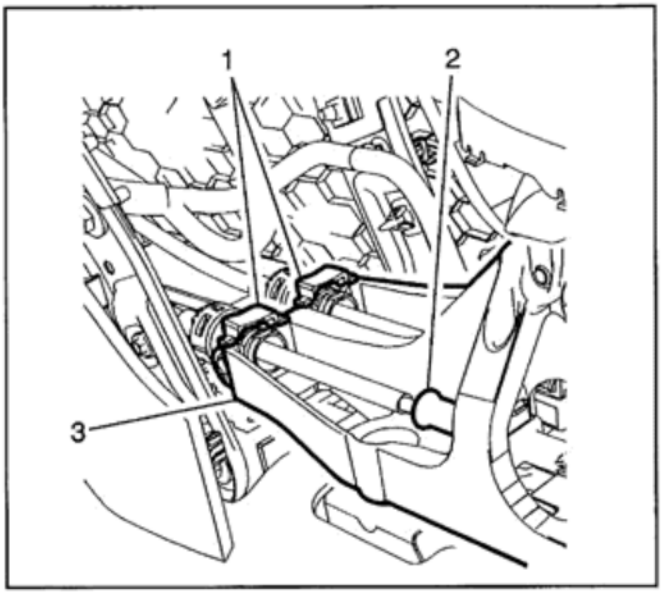
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6. Move the floor carpet in order to get access to the shift lever and selector lever cable grommet (1).
7. Remove the grommet fasteners (2).



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8. Lift both cable adjustment retainers (1), one for each cable, to release the shift lever and selector lever cable.

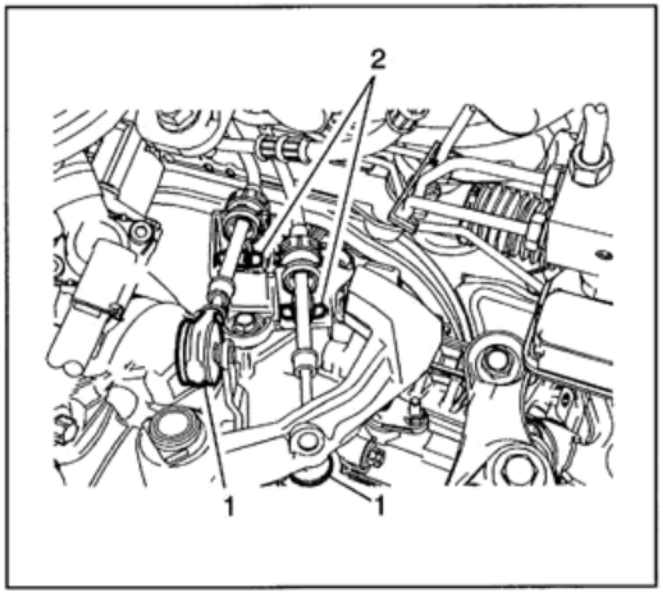


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9. Pull the shift lever and the selector lever cable retainers (1) from the transmission control assembly (3), then remove the shift lever and selector lever cable from the shift and selector control.
10. Pull the shift lever and the selector lever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

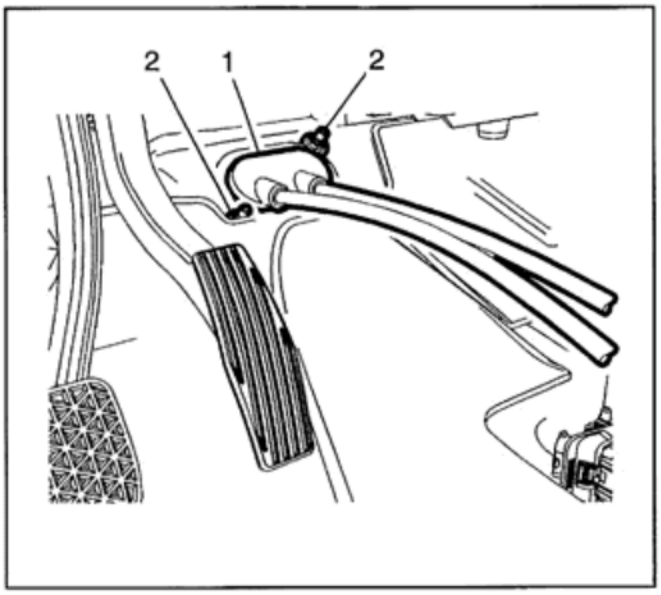
Installation Procedure

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.



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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.

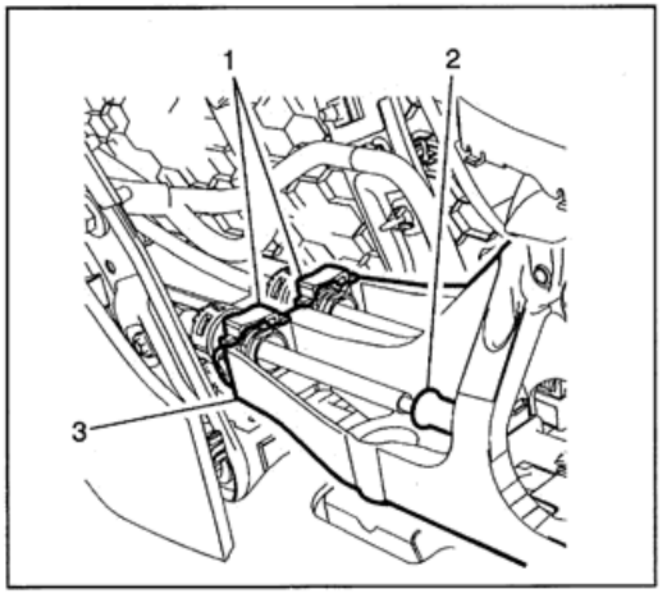


2510324

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

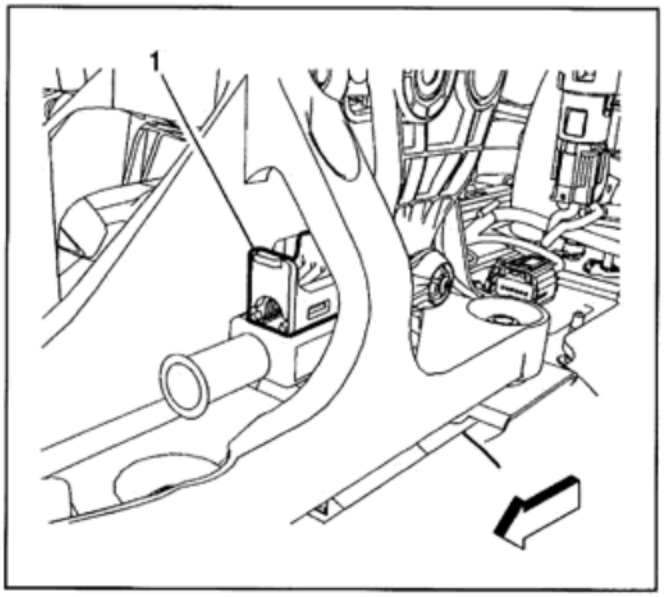
Caution: Refer to *Fastener Caution on page 0-8.*

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



2504879

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).



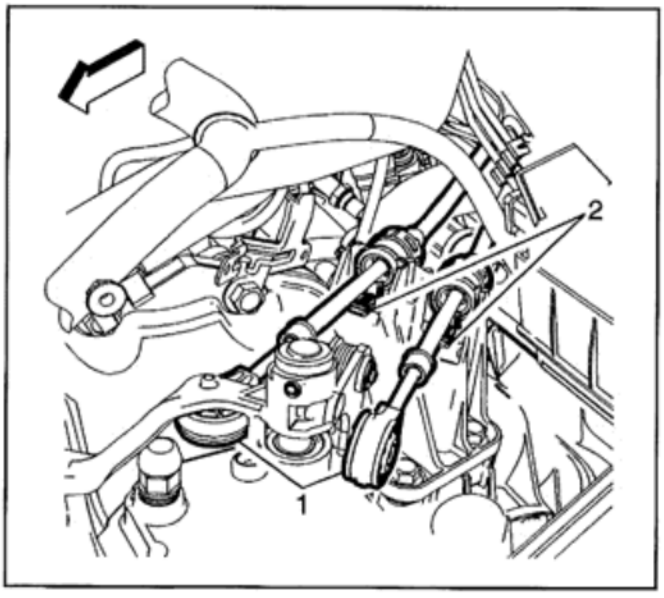
2505111

9. Press down and lock both cable adjustment retainers (1), one for each cable, to adjust 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 on page 17-574*.
11. Install the floor console. Refer to *Front Floor Console Replacement on page 2-61*.
12. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
13. Verify correct operation of the transmission control assembly.

Selector and Shift Lever Cable Bracket Replacement

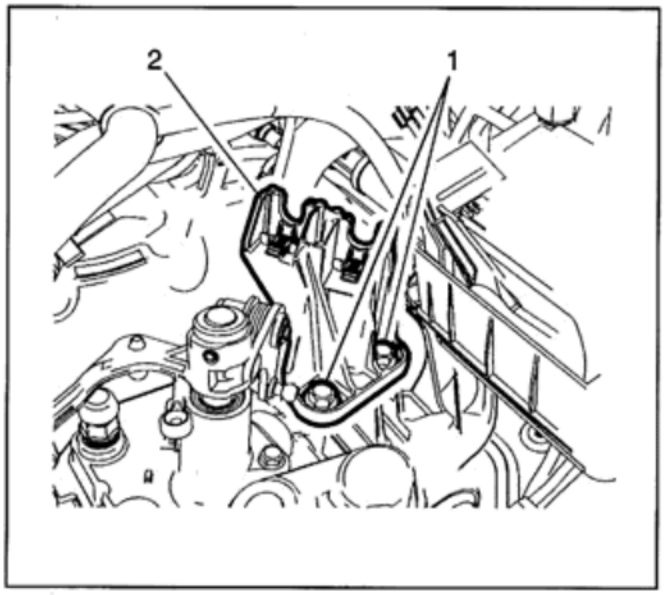
Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.



2504804

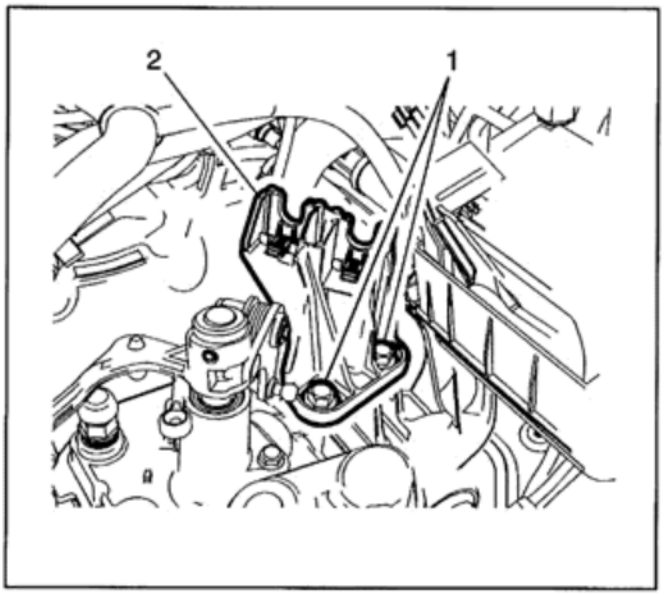
2. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.
3. Pull the cable retainers (2) to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
4. Disconnect the shift lever and selector lever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



2504838

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

Installation Procedure

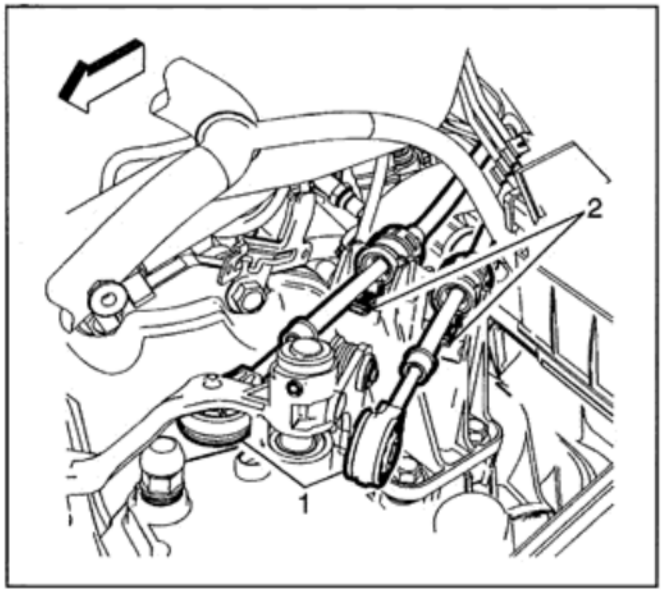


2504838

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

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the 2 shift lever and selector lever cable bracket fasteners (1) and tighten to **58 N•m (43 lb ft)**.



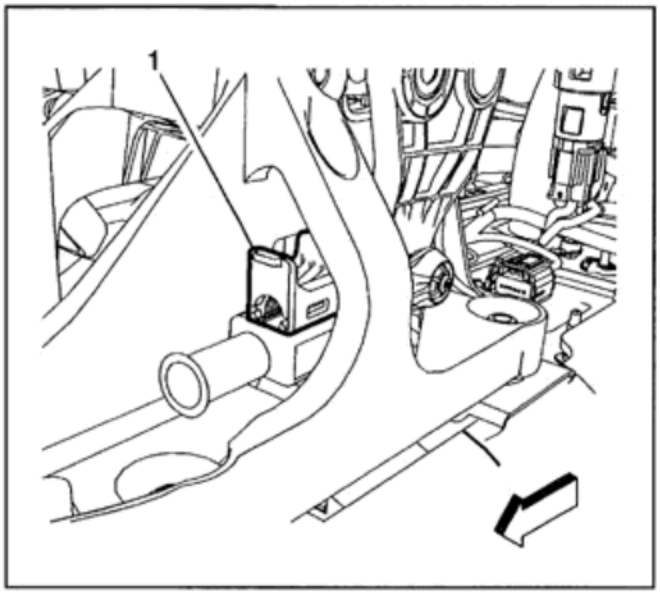
2504804

3. Connect the shift lever and selector lever cable ends (1) to the transmission shift lever and selector lever.
4. Pull the cable retainers (2), then position the shift lever and selector lever cable in the shift lever and selector lever cable bracket.
5. Release the cable retainers (2) to connect the shift lever and selector lever cable to the shift lever and selector lever cable bracket.
6. Adjust the shift lever and selector lever cables. Refer to *Manual Transmission Shift Lever and Selector Lever Cable Adjustment on page 17-574*.
7. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
8. Verify correct operation of the transmission control assembly.

Transmission Control Replacement

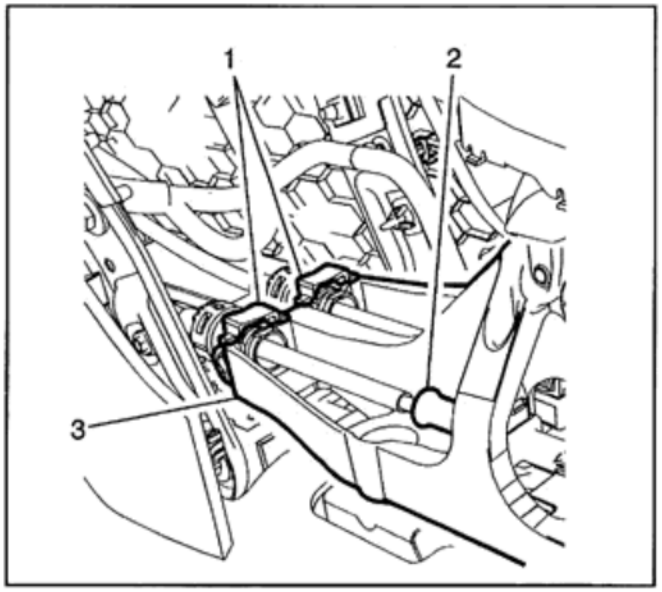
Removal Procedure

1. Remove the floor console. Refer to *Front Floor Console Replacement on page 2-61*.



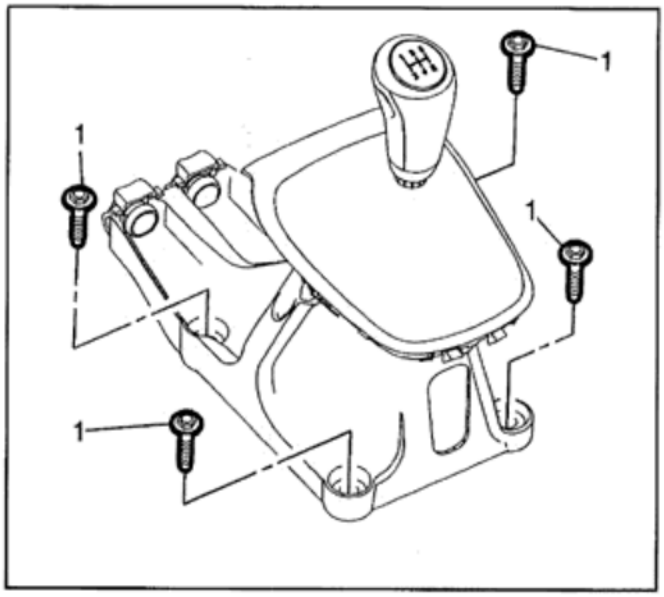
2505111

2. Lift both cable adjustment retainers (1), one for each cable, to release the shift lever and selector lever cable.



2504879

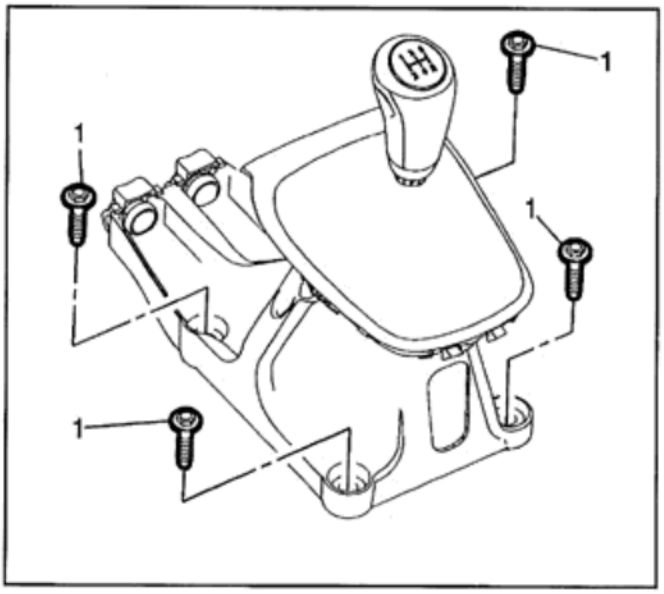
3. Pull the shift lever and selector lever cable retainers (1) from the transmission control assembly (3).
4. Remove the shift lever and selector cable from the shift and selector control



2531689

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

Installation Procedure

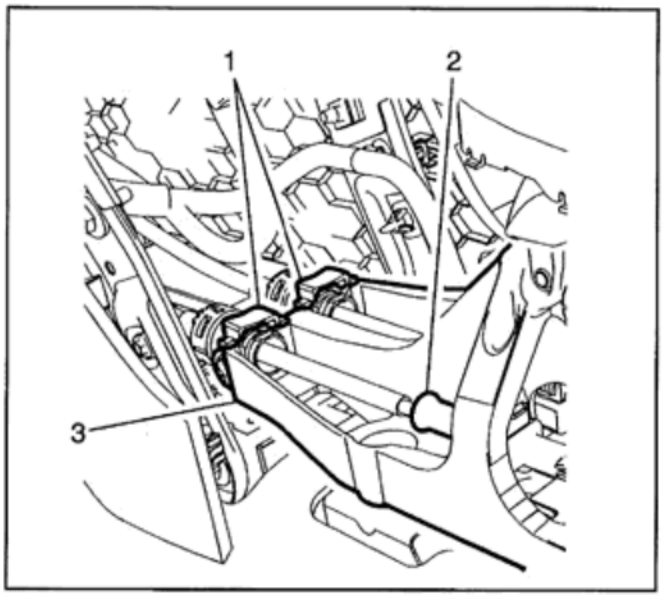


2531689

1. Position the transmission control in the vehicle.

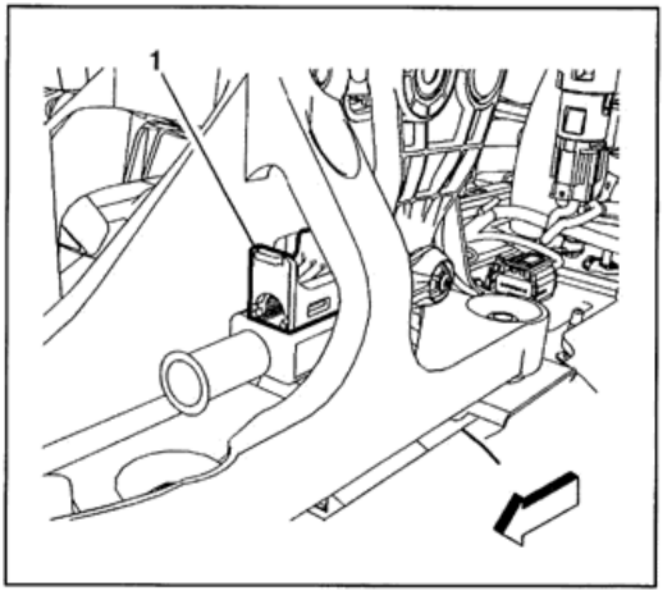
Caution: Refer to *Fastener Caution on page 0-8*.

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



2504879

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)

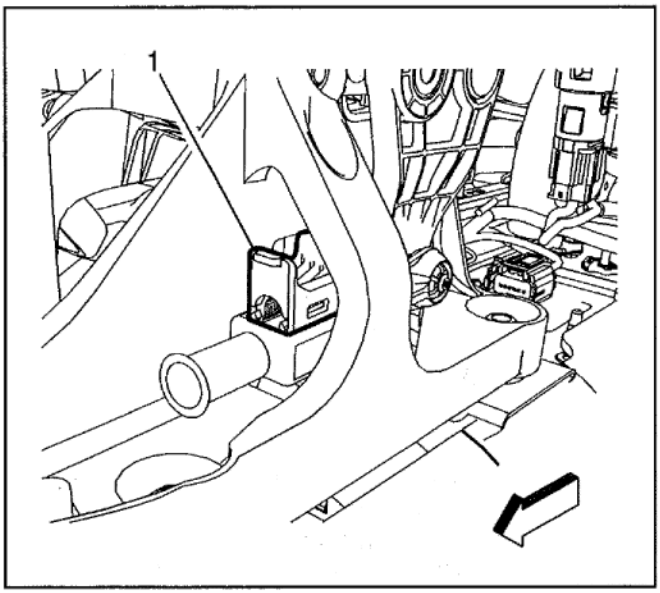


2505111

5. Press down and lock both cable adjustment retainers (1), one for each cable, to adjust 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 on page 17-574*.
7. Install the floor console. Refer to *Front Floor Console Replacement on page 2-61*.
8. Verify the correct operation of the transmission control assembly.

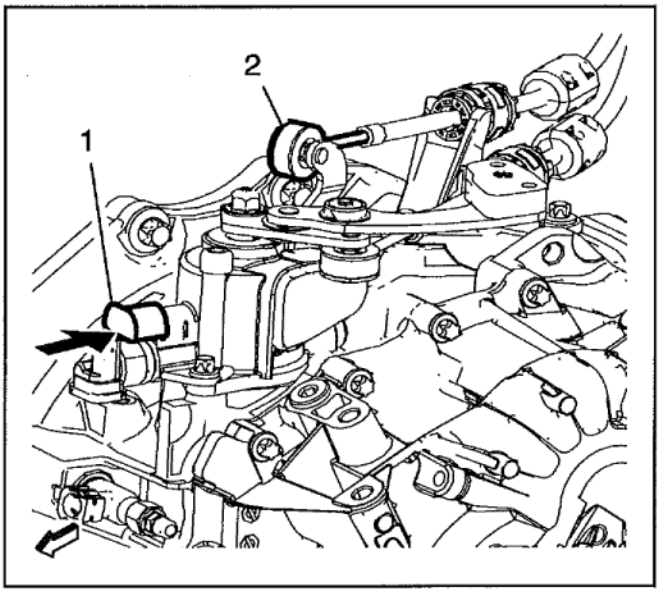
Manual Transmission Shift Lever and Selector Lever Cable Adjustment

1. Remove the floor console. Refer to *Front Floor Console Replacement on page 2-61.*



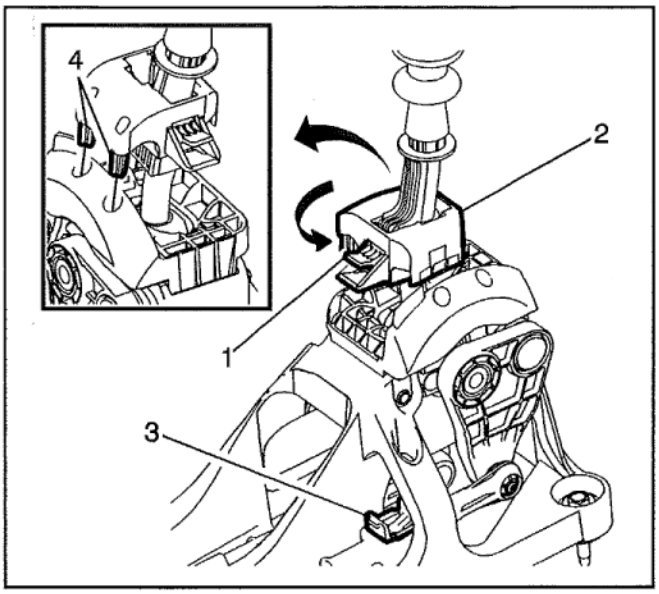
2505111

2. Lift upward and disengage (do not remove) both cable lock adjusters (1) to release the internal cable assembly, one for each side.



2859276

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



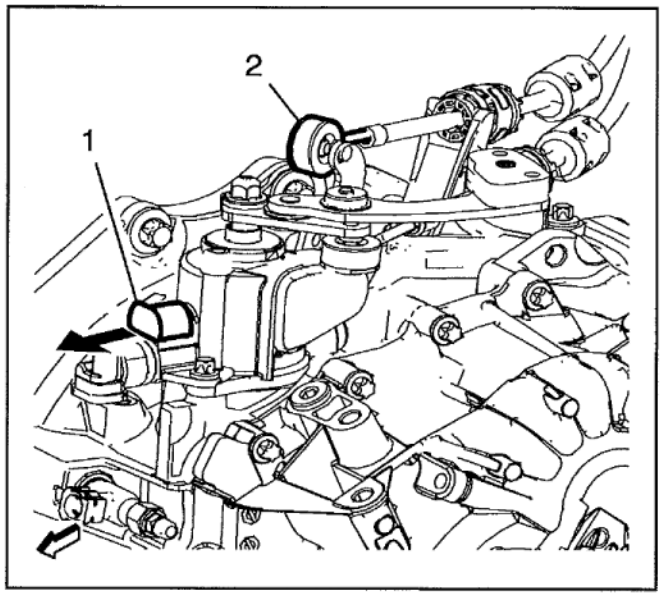
2726170

Note: The hole of the transmission gear control (2) must be aligned to the hole in the base so the pin (1) can pass thru both. The transmission gear control will be locked in the 1–2 neutral position.

4. lock the position of the shift control lever by rotating the reverse lockout device with the following instructions:
   - 4.1. Push down on tab (1) and pull up on device (2) to release from installed position.
   - 4.2. Rotate device 180 degrees so tab (1) is in the rear of the shift control assembly.
   - 4.3. Secure integral pins (4) in holes located on shifter base by pushing down device (2).
5. Secure adjuster locks (3) by pushing down until locked. One for each cable.

Note: During this procedure DO NOT touch or preload the fixed shift lever as this may cause mis-adjustment to the shift system.

6. Reposition the reverse lockout device with the following instructions:
   - 6.1. Push down on tab (1) and pull up on device (2) to release from installed position.
   - 6.2. Rotate device (2) 180 degrees so tab (1) is in the front of the shift control assembly.
   - 6.3. Push downward on the reverse lockout device (2) until tab (1) snaps into detent.

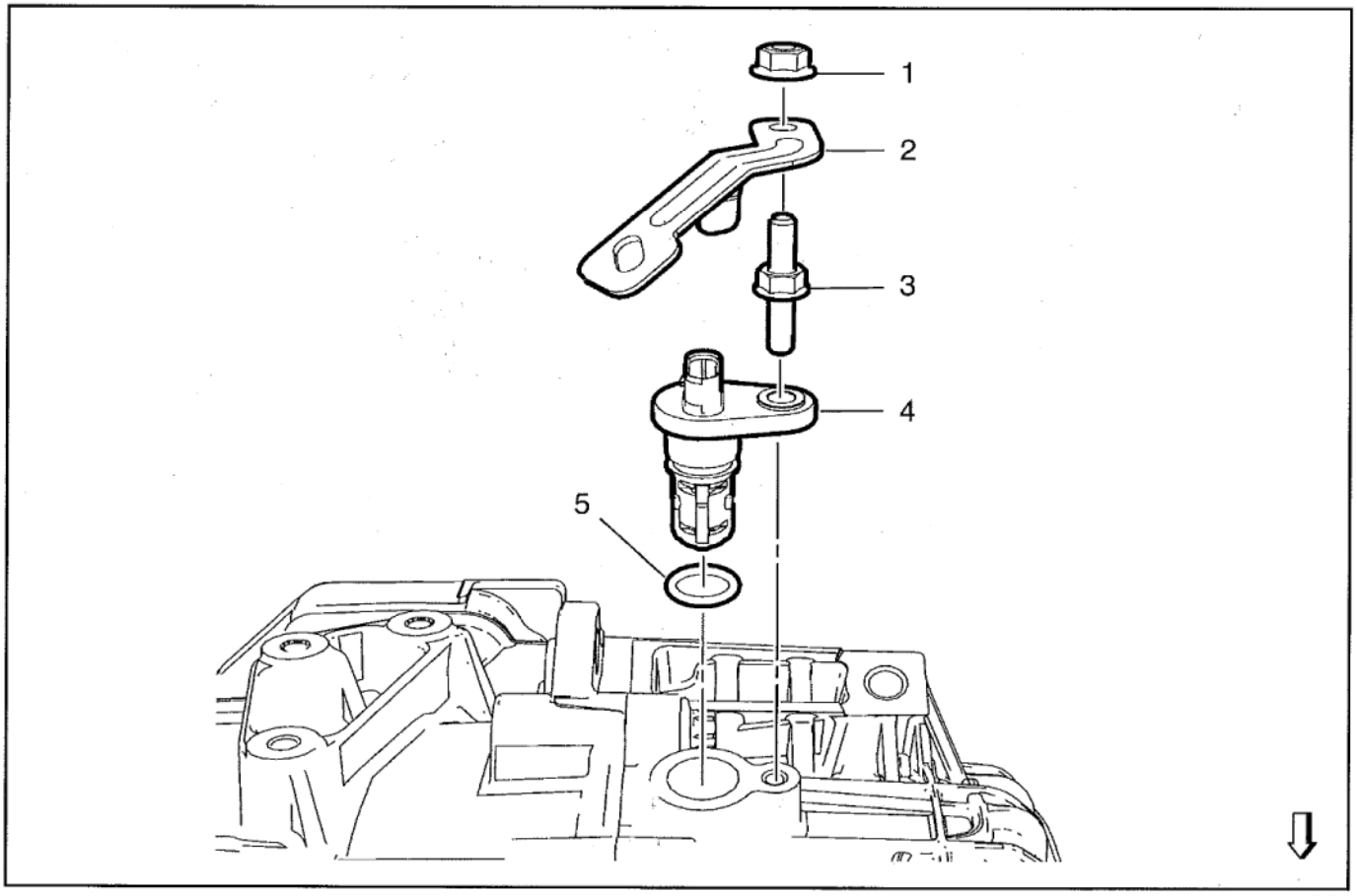


2859277

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 on page 2-61*.
9. Verify correct operation of the transmission control assembly.

Vehicle Speed Sensor Replacement



2372722

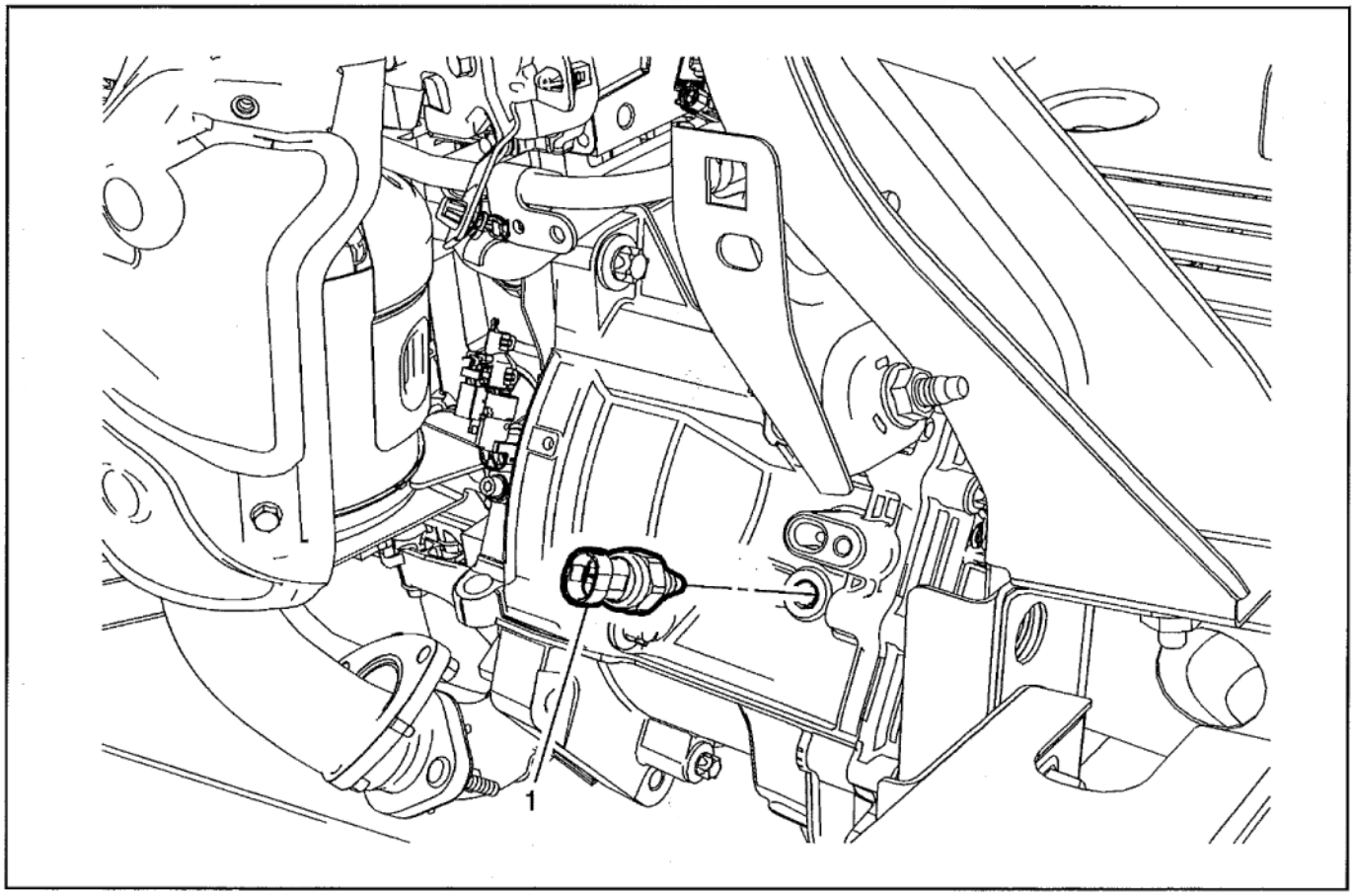
Vehicle Speed Sensor Replacement

Callout	Component Name
1	Engine Wiring Harness Bracket Nut **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)

Vehicle Speed Sensor Replacement (cont'd)

Callout	Component Name
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



2548852

Backup Lamp Switch Replacement

Callout	Component Name
Preliminary Procedure 1. Disconnect the negative battery cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-713.* 2. Without draining the coolant or removing the hoses, remove and position aside the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630.*	
1	Backup Lamp Switch **Caution:** Refer to *Component Fastener Tightening Caution on page 0-8.* **Procedure** Disconnect the electrical connector.

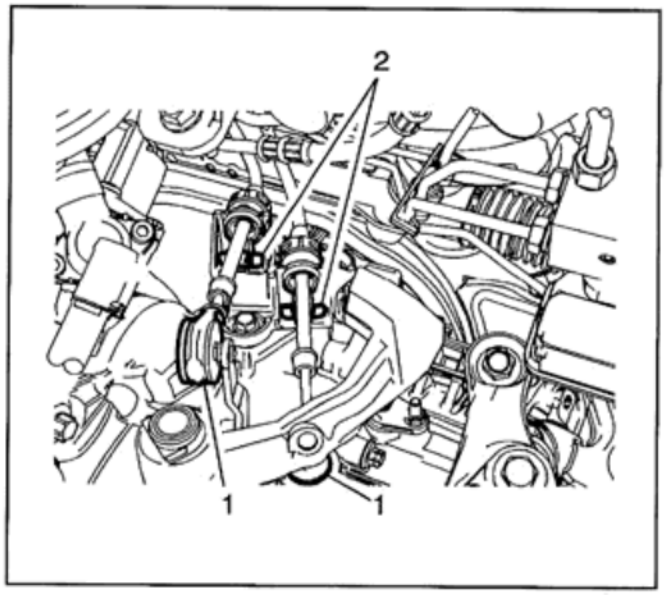
Backup Lamp Switch Replacement (cont'd)

Callout	Component Name
	Tighten 20 N•m (15 lb ft)
2	Backup Lamp Switch Washer **Procedure** DISCARD the washer and install a NEW washer.

Shift Control Housing Replacement

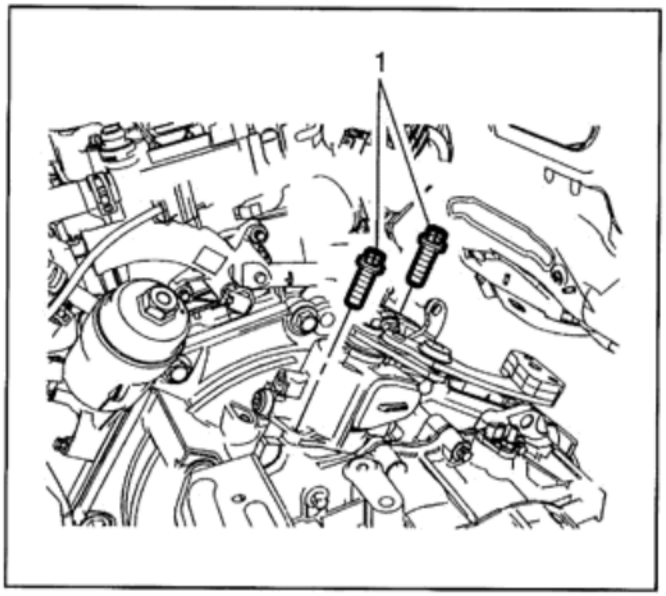
Removal Procedure

1. Set the parking brake.
2. Shift the transmission to the Neutral position.
3. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
4. Remove the brake master cylinder assembly from the power brake booster. Refer to *Master Cylinder Replacement on page 5-147*.



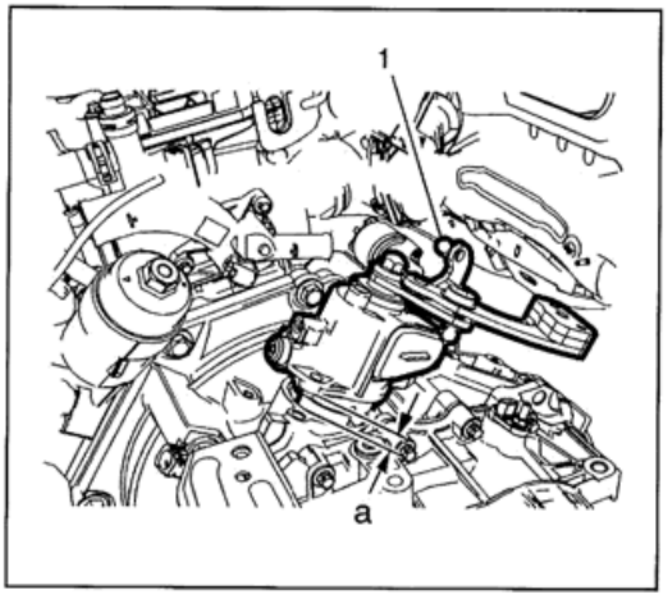
2551785

5. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.
6. Pull the cable retainers (2) to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
7. Disconnect the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
8. Disconnect the electrical connector from the shift control housing assembly.
9. Remove the backup lamp switch. Refer to *Backup Lamp Switch Replacement on page 17-576*.



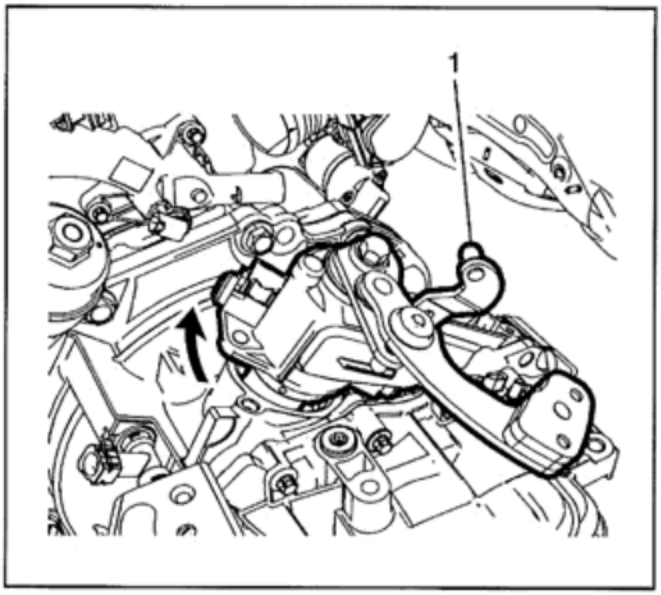
2909635

10. Remove the two shift control housing assembly fasteners (1).



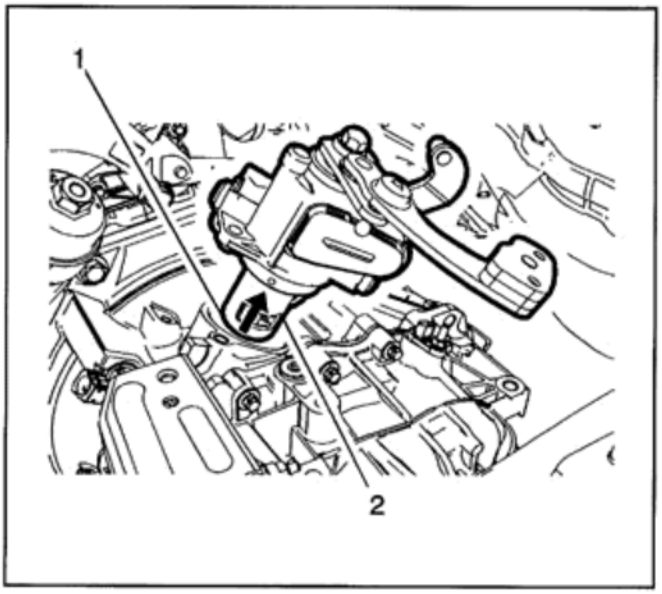
2909710

11. Slowly and Carefully lift the shift control housing assembly (1) no farther than 3 cm (1 inch) shown by dimension (A).



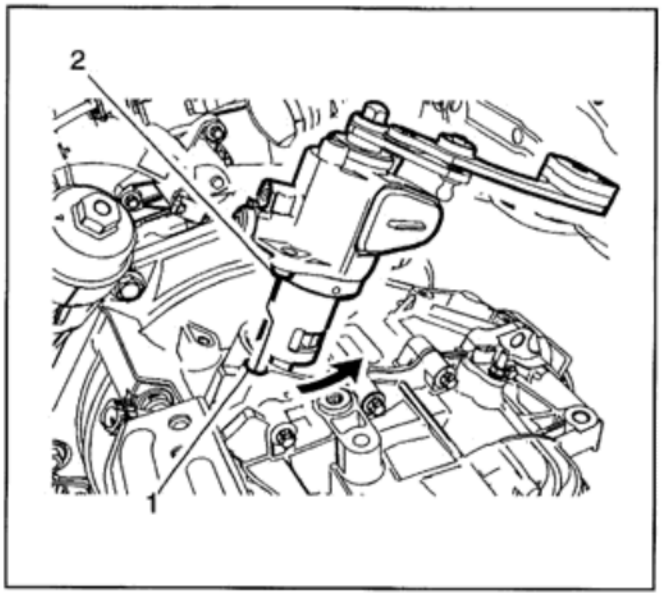
2909737

12. Holding the shift control housing assembly (1) at the specified height, rotate the assembly clockwise approximately 30–45 degrees.



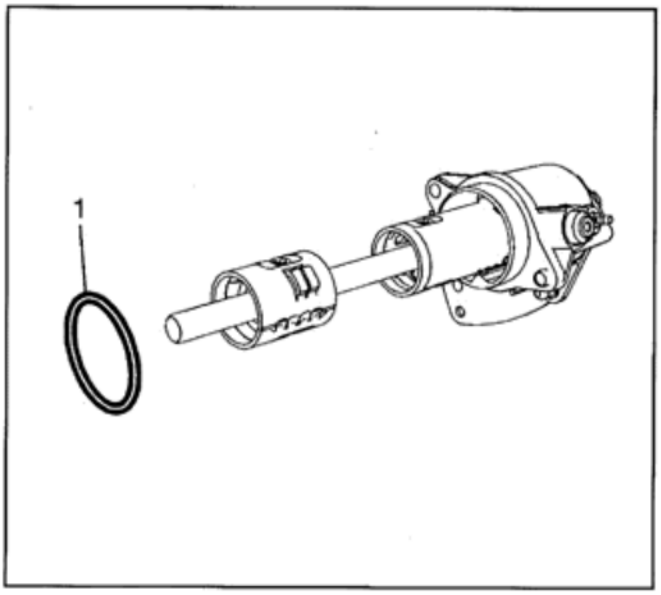
2910373

13. Slowly and Carefully lift the shift control housing assembly (2) until the lower edge of the upper shift finger (1) is even with the transmission case.



2910384

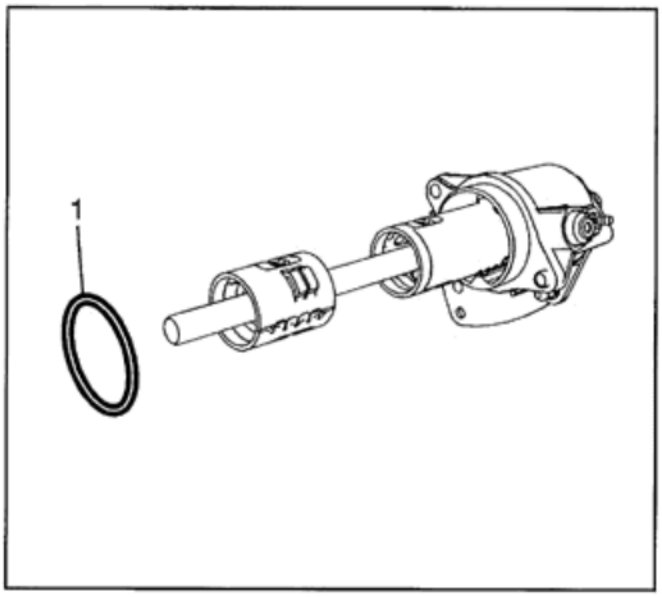
14. Turn the shift control housing assembly counterclockwise approximately 30–45 degrees until the guide peg (2) is in line with the threaded hole (1).
15. Slowly and Carefully remove the shift control housing assembly from the transmission.



2910428

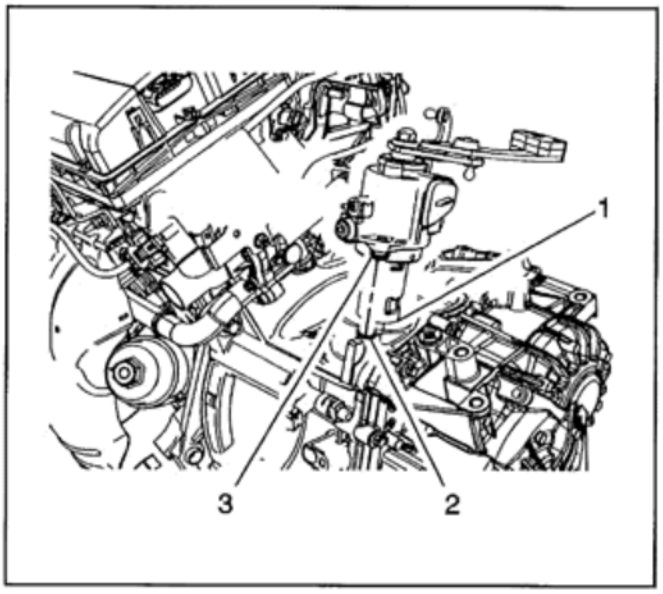
16. If reinstalling the shift control housing assembly, remove and discard the O-ring (1).

Installation Procedure



2910428

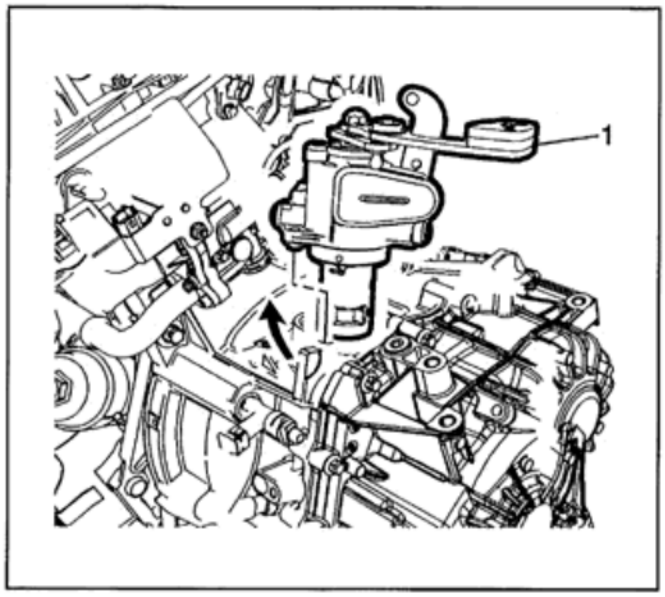
1. If reinstalling the shift control housing assembly, install a New O-ring (1).



2910532

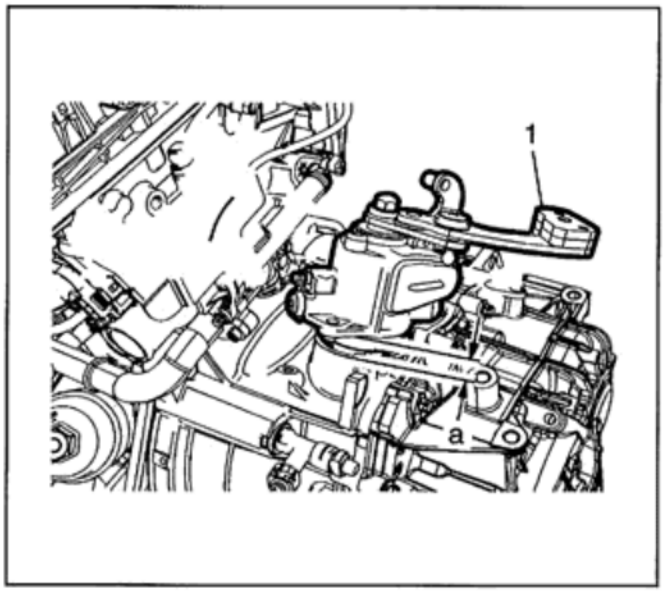
Note: Only insert the shift control housing assembly until the lower edge of the upper shift finger (1) is even with the transmission case.

2. Align the guide peg (3) in line with the threaded hole (2), then Slowly and Carefully insert the shift control housing assembly in the transmission case, STOP when the lower edge of the upper shift finger (1) is even with the transmission case.



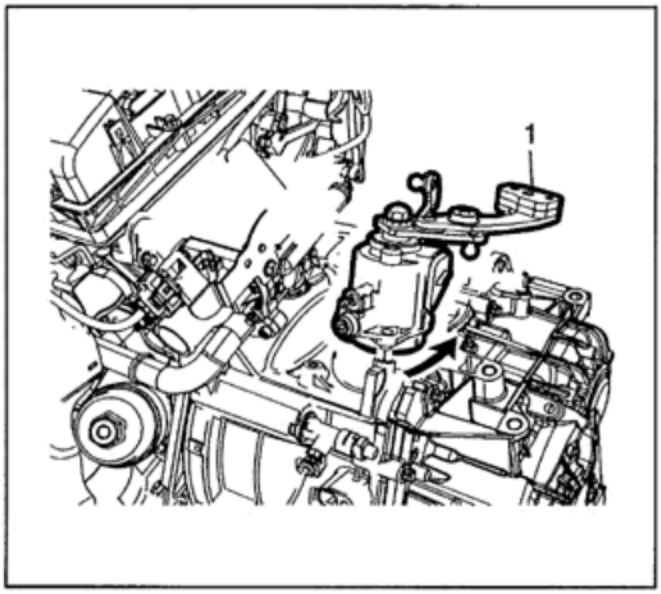
2910528

3. Turn the shift control housing assembly clockwise approximately 30–45 degrees.



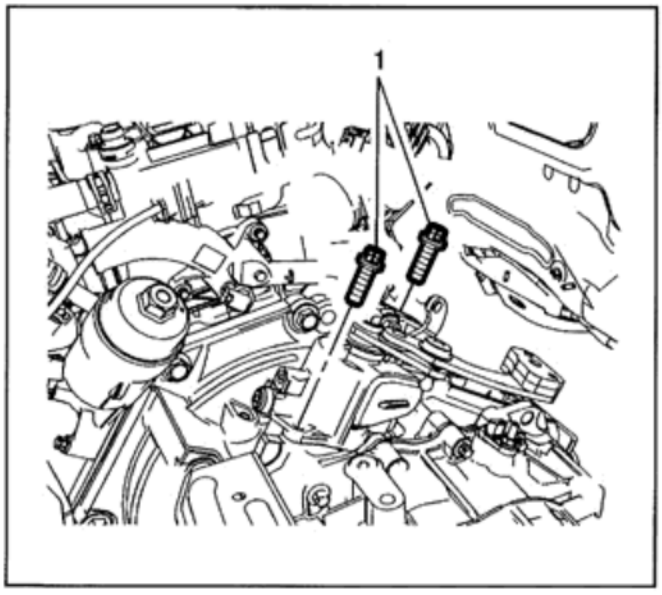
2910535

4. Lower the shift control housing assembly (1) no farther than 3 cm (1 inch) from the transmission case shown by dimension (A).



2910537

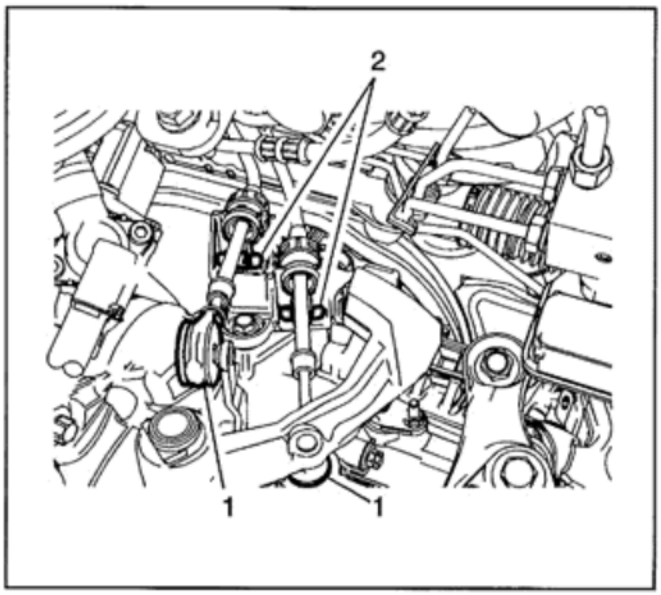
5. Holding the shift control housing assembly (1) at the specified height, rotate the assembly counterclockwise approximately 30–45 degrees to align the guide peg with the threaded hole.
6. Slowly and Carefully lower the shift control housing until seated in the transmission case.



2909635

Caution: Refer to *Fastener Caution on page 0-8*.

7. Install the two shift control housing assembly fasteners (1) and tighten to **20** N•m **(16 lb ft)**.



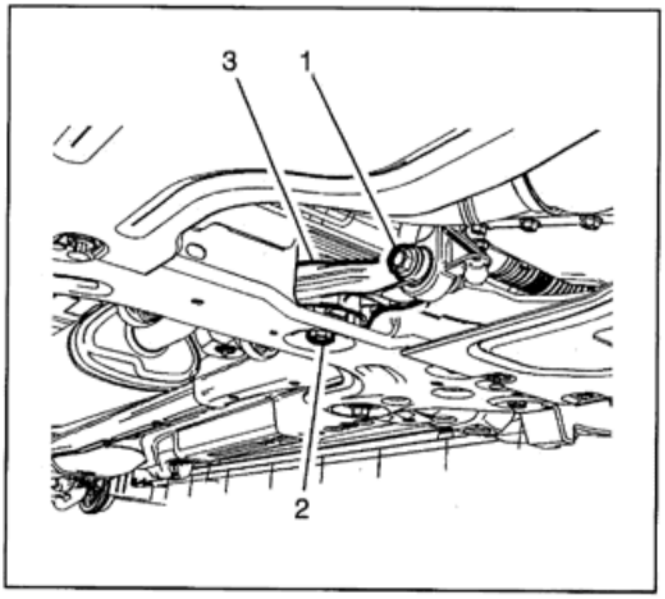
2551785

8. Connect the shift lever and the selector lever cable ends (1) to the transmission shift lever and the selector lever.
9. Install the brake master cylinder assembly to the power brake booster. Refer to *Master Cylinder Replacement on page 5-147*.
10. Install the backup lamp switch. Refer to *Backup Lamp Switch Replacement on page 17-576*.
11. Connect the electrical connector to the shift control housing assembly.
12. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
13. Verify correct operation of the transmission control assembly.

Transmission Rear Mount Replacement

Removal Procedure

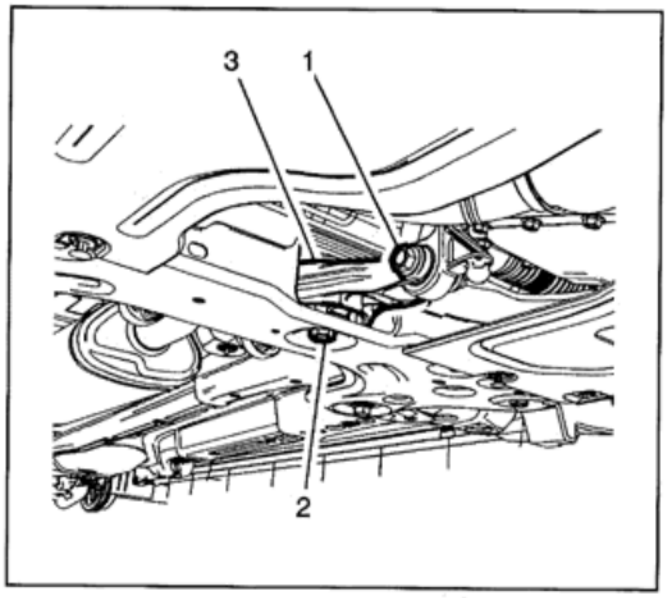
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.



2503662

2. Remove and DISCARD the transmission rear mount to bracket through bolt (1).
3. Remove the transmission rear mount bolt (2).
4. Push and hold the powertrain assembly forward and then remove the transmission rear mount (3).

Installation Procedure



2503662

1. Push and hold the powertrain assembly forward and then install the transmission rear mount (3).

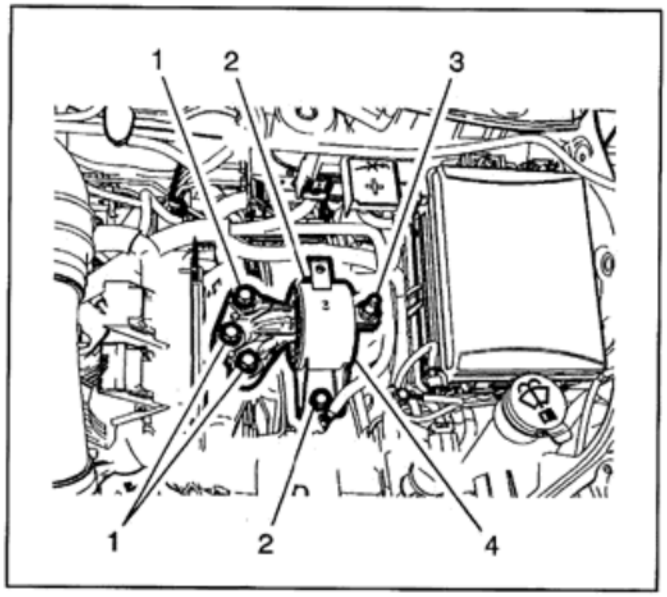
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the transmission rear mount bolt (2) and tighten to **100** N•m **(74 lb ft)**.
3. Install the NEW transmission rear mount to bracket through bolt (1) and tighten to **80** N•m **(59 lb ft) plus 45–60 degrees**.
4. Lower the vehicle.

Transmission Mount Replacement - Left Side

Removal Procedure

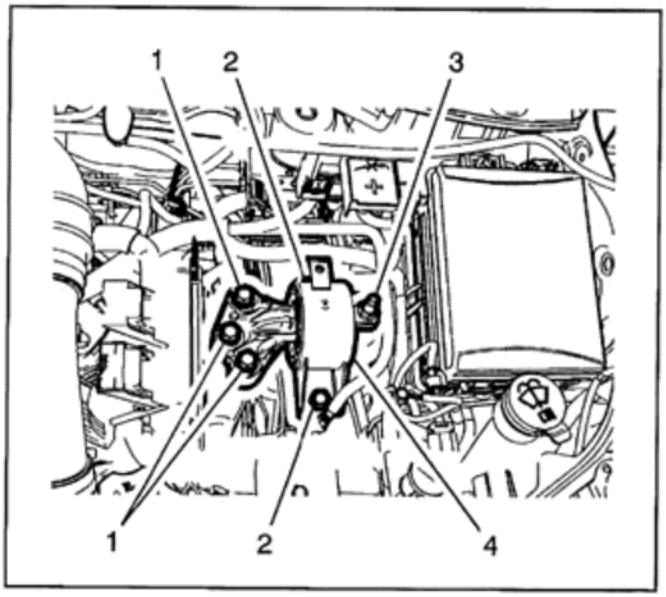
1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Install the engine support fixture. Refer to *Engine Support Fixture on page 9-1060*.



2503695

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



2503695

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

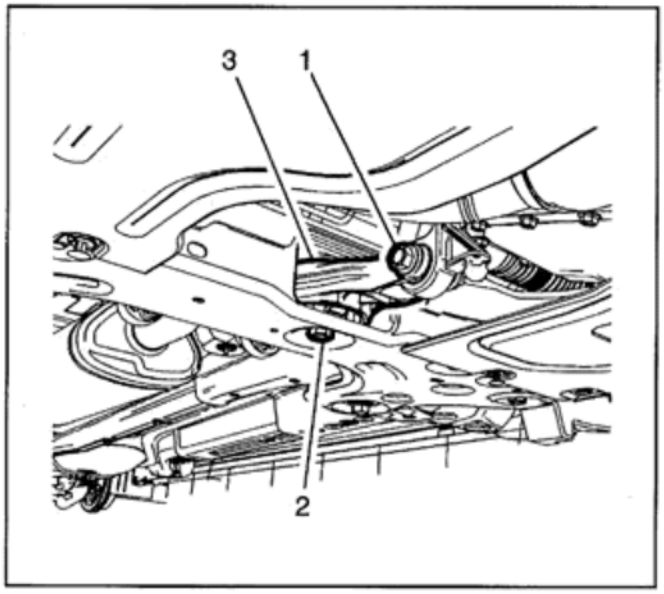
Caution: Refer to *Fastener Caution on page 0-8*.

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 on page 9-1060*.
6. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.

Transmission Mount Bracket Replacement - Rear

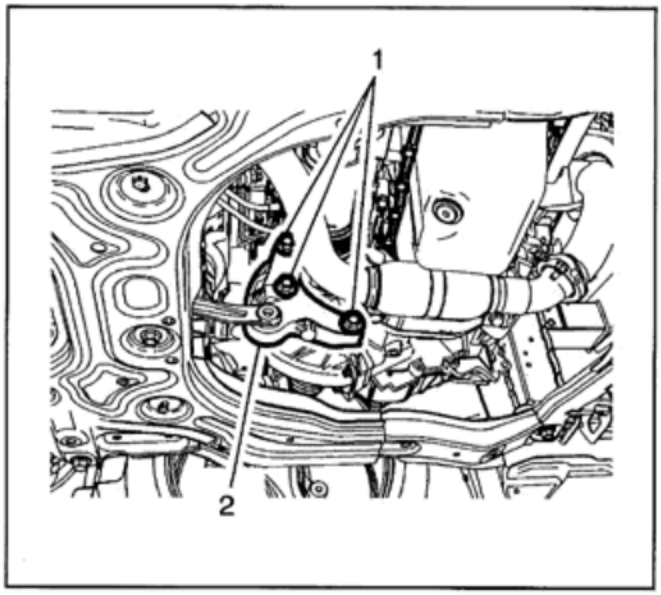
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
2. Remove the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
3. Using a suitable jack stand, support the rear of the powertrain.



2503662

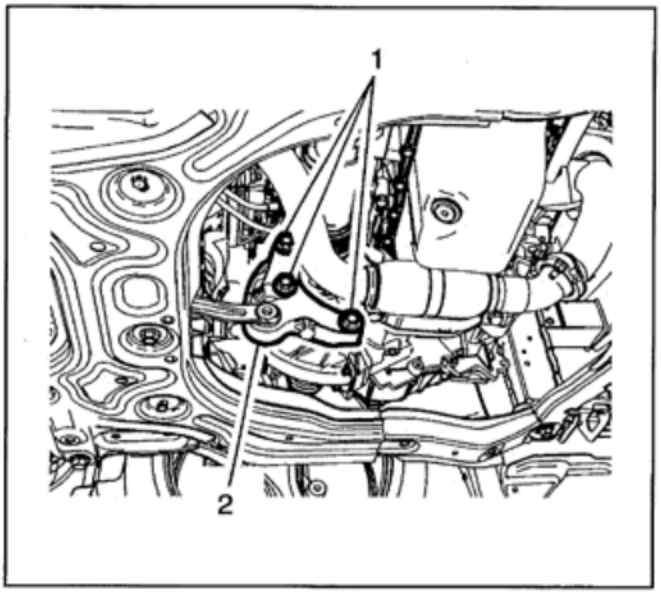
4. Remove and DISCARD the transmission rear mount to bracket through bolt (1).



2549089

5. Remove and DISCARD the transmission rear mount bracket bolts (1).
6. Remove the transmission rear mount bracket (2).

Installation Procedure

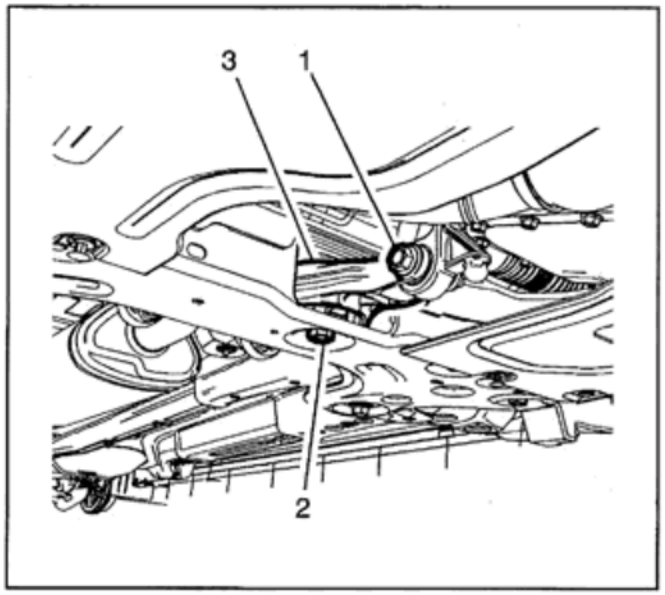


2549089

1. Install the transmission rear mount bracket (2).

Caution: Refer to *Fastener Caution on page 0-8*.

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



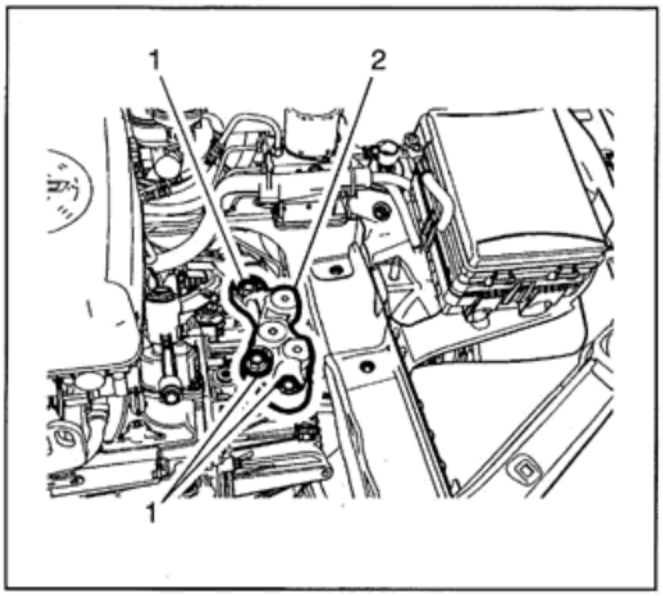
2503662

3. Install the NEW transmission rear mount to bracket through bolt (1) and tighten to **80 N•m (59 lb ft) plus 45–60 degrees**.
4. Remove the jack stand.
5. Install the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
6. Lower the vehicle.

Transmission Mount Bracket Replacement - Left Side

Removal Procedure

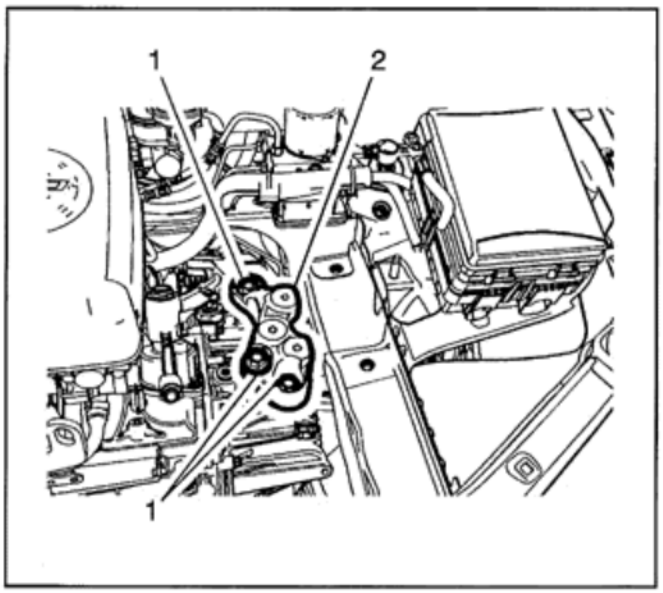
1. Remove the left transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 17-581*.



2548969

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

Installation Procedure



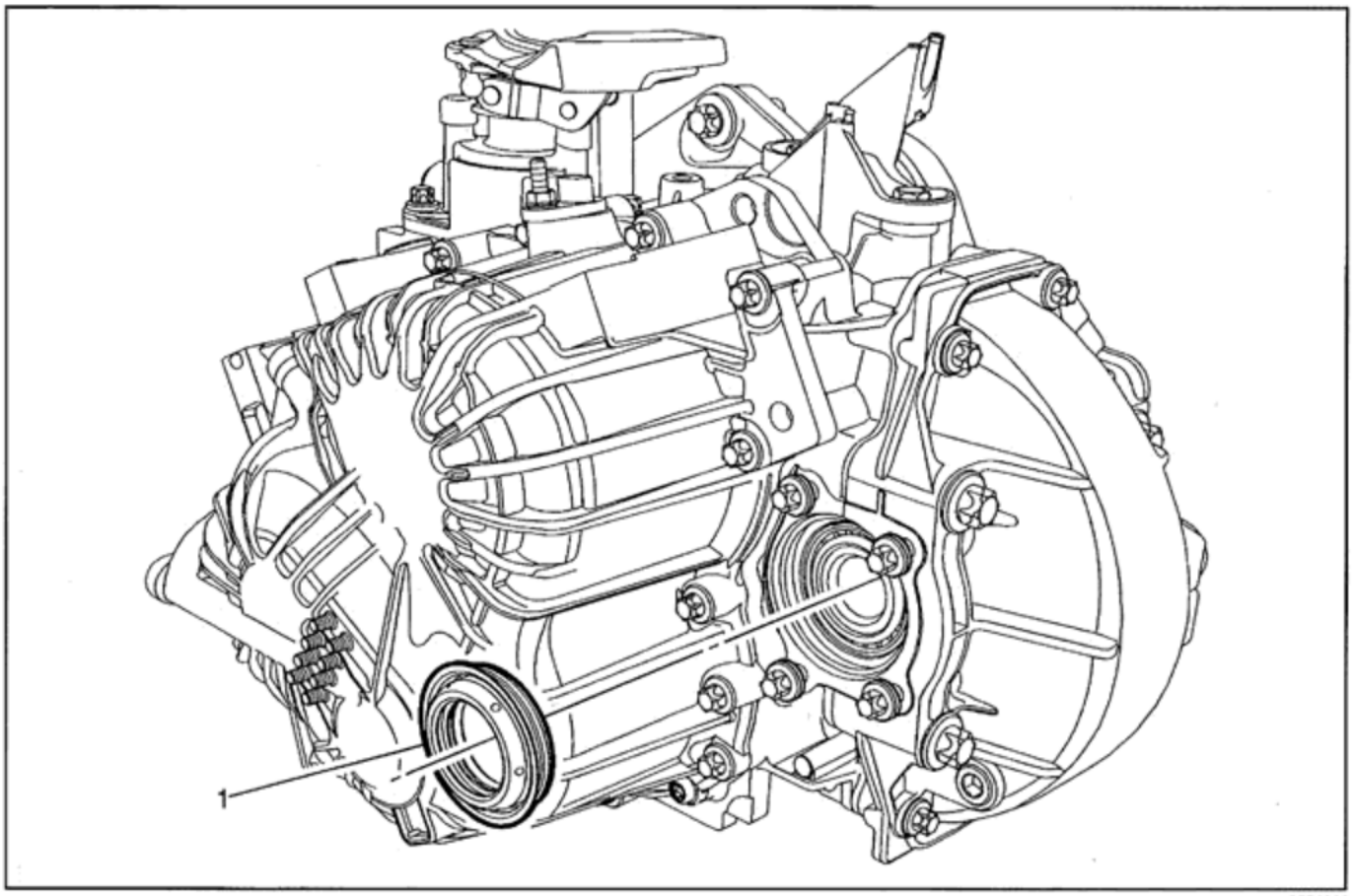
2548969

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

Caution: Refer to *Fastener Caution on page 0-8*.

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 on page 17-581*.

Front Wheel Drive Shaft Seal Replacement - Left Side

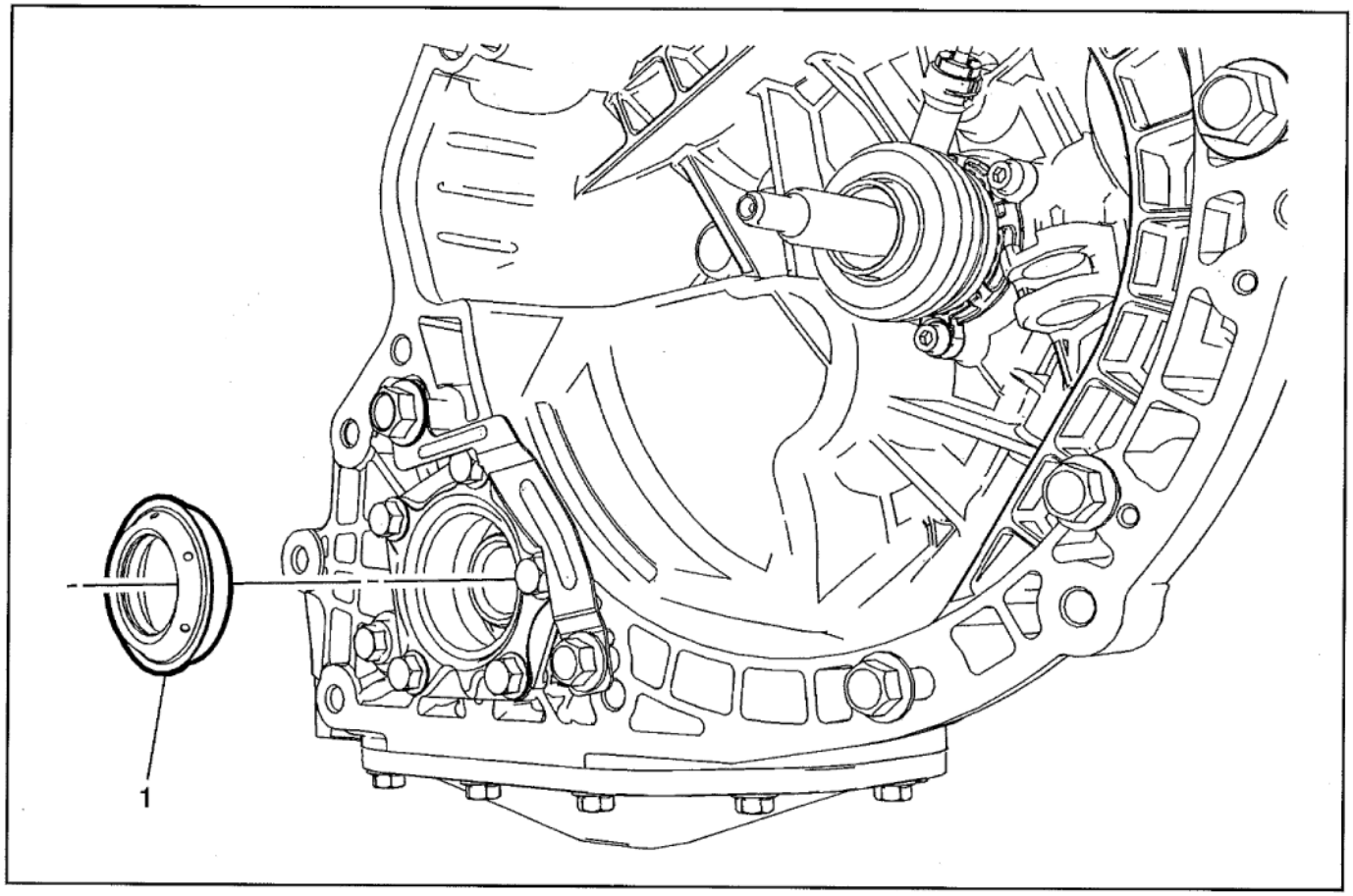


2551806

Front Wheel Drive Shaft Seal Replacement - Left Side

Callout	Component Name
Preliminary Procedure 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*. 2. Remove the front wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.	
1	Left Front Wheel Drive Shaft Oil Seal **Procedure** 1. Remove the left front wheel drive shaft oil seal using the *DT-7004* hammer and the *DT-23129* universal seal remover. 2. Coat the NEW left front wheel drive shaft oil seal with transmission fluid. 3. Install the NEW left 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-23129* Universal Seal Remover • *DT-7004* Slide Hammer For equivalent regional tools, refer to *Special Tools on page 17-593*.

Front Wheel Drive Shaft Seal Replacement - Right Side



2531406

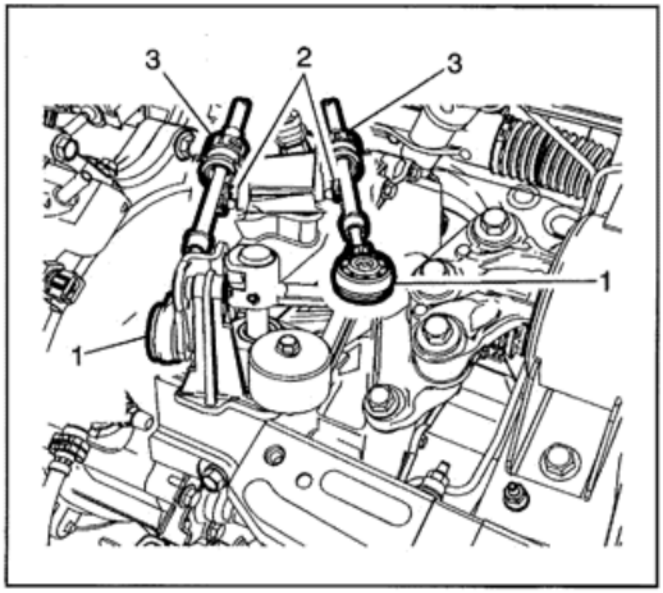
Front Wheel Drive Shaft Seal Replacement - Right Side

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*. 2. Remove the front wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.	
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* universal seal 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 on page 17-593*.

Transmission Replacement

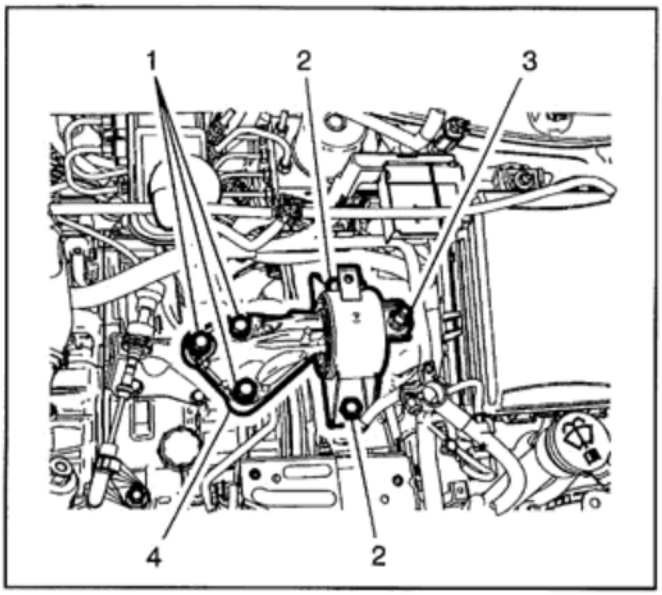
Removal Procedure

1. Remove the battery and battery tray. Refer to *Battery Tray Replacement on page 9-721*.



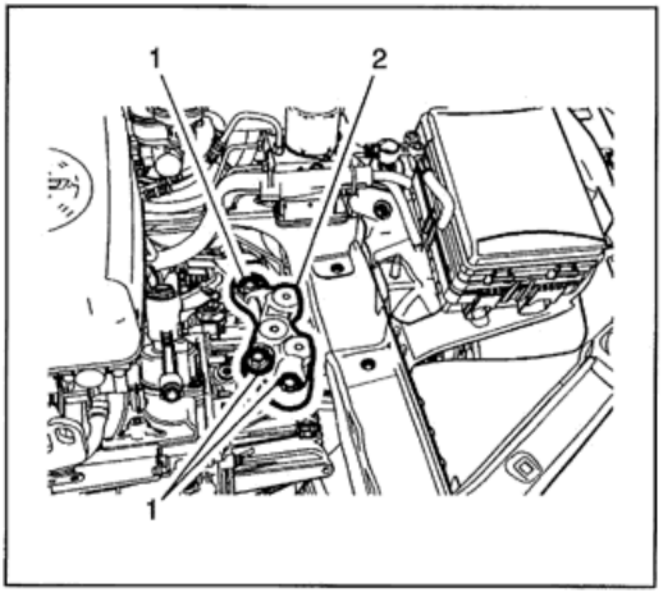
2511540

2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual pin.
3. Press the locking tab forward in order to release the transmission range selector lever cable (2) from the cable bracket.
4. Disconnect the vehicle speed sensor and back-up light switch.
5. Remove the wiring harness clips from the transmission.
6. Remove the clutch actuator feed line clip.
7. Remove the line from the clutch actuator cylinder pipe elbow.
8. Install the engine support fixture. Refer to *Engine Support Fixture on page 9-854*.



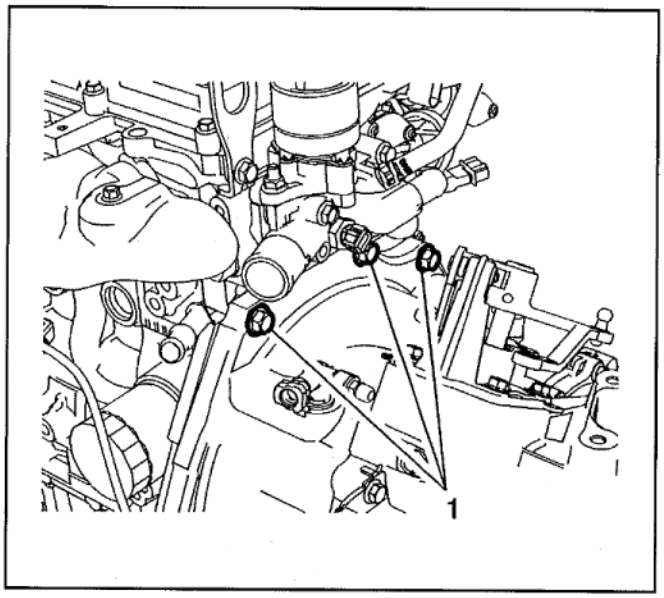
2492638

9. Remove the transmission mount to body bolts (2) and nut (3).

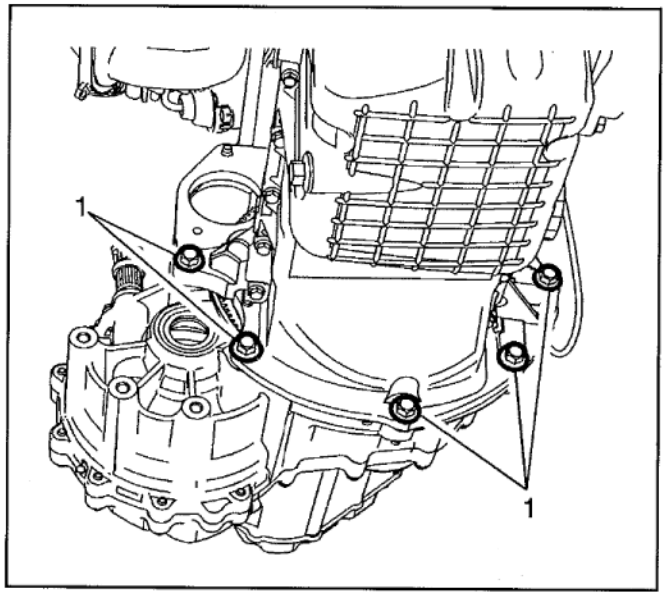


2548969

10. Remove the transmission mount bracket to transmission bolts (1) and remove transmission mount and bracket assembly.



2514158



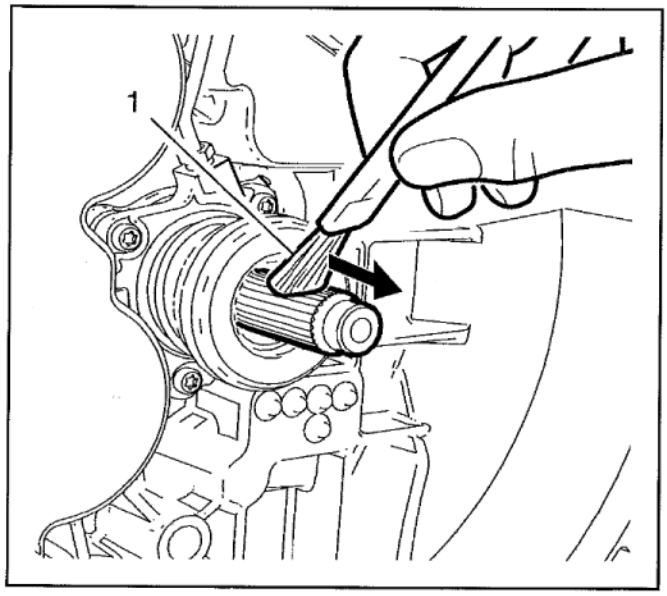
2514159

11. Remove the 3 transmission to engine bolts (1).
12. Disconnect the intermediate steering shaft from the steering gear. Refer to *Intermediate Steering Shaft Replacement on page 15-27*.
13. Support the CRFM from the top.
14. Raise the vehicle on a hoist. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
15. Remove the skid plate from the front frame, if equipped.
16. Remove the left and right front wheelhouse liner inner front extensions. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*.
17. Disconnect the hydraulic power steering hoses from the front frame, if equipped.
18. Disconnect the exhaust isolators from the front suspension frame.
19. Remove the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.
20. Remove the wheel drive shafts from the transmission and intermediate shaft and support.
21. Remove the wheel drive intermediate shaft. Refer to *Front Wheel Drive Intermediate Shaft Replacement on page 7-4*.
22. Support the transmission with a suitable jack.
23. Remove the lower oil pan to transmission bolts (1).
24. Separate the transmission from the engine and lower the transmission from the vehicle.

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.

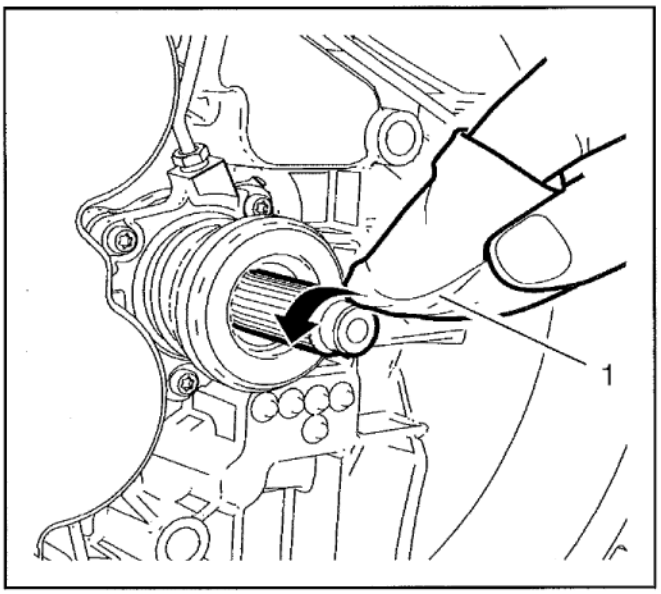
1. Clean the clutch hub and the input shaft from any debris and contaminates with a lint-free towel.



2665890

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.

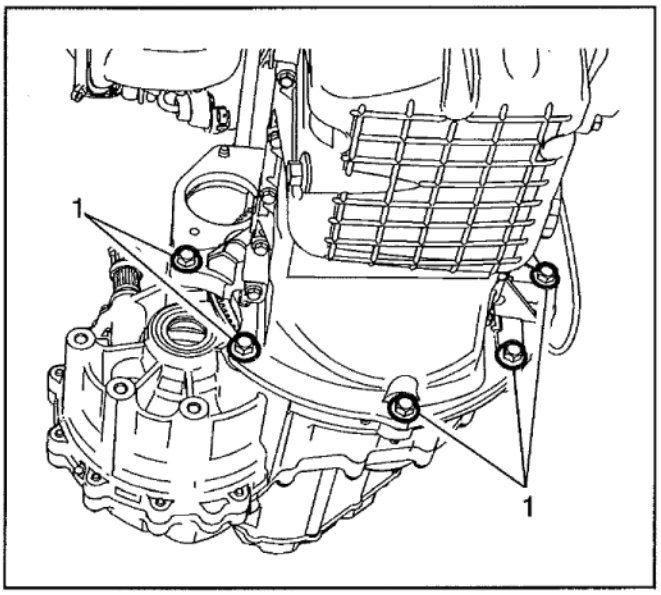
2. Use a clean flat brush (1) to apply very light coating of multi-purpose grease to input shaft until the metal is only shiny . No visible clumps of grease are permissible regardless of size. Smear away from the transmission in direction of the shown arrow.



2665891

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.

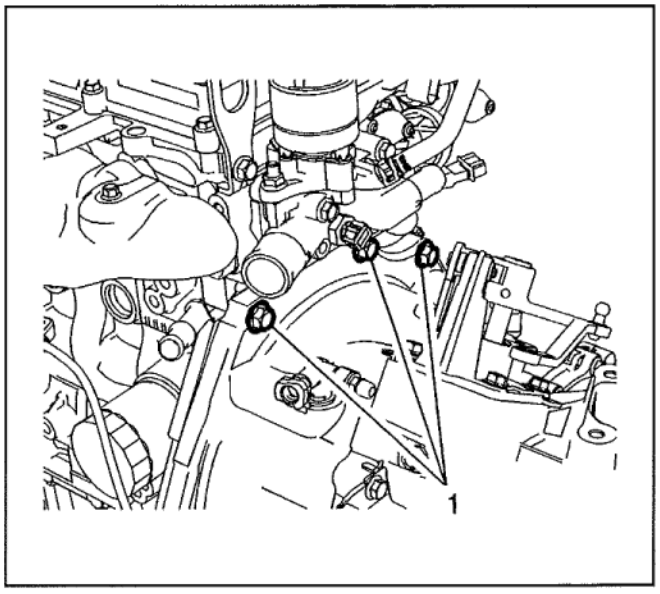
3. Clean the entire lead surface of the input shaft with a NEW, lint-free towel (1).
4. Raise the transmission into the vehicle and install the transmission to the engine.



2514159

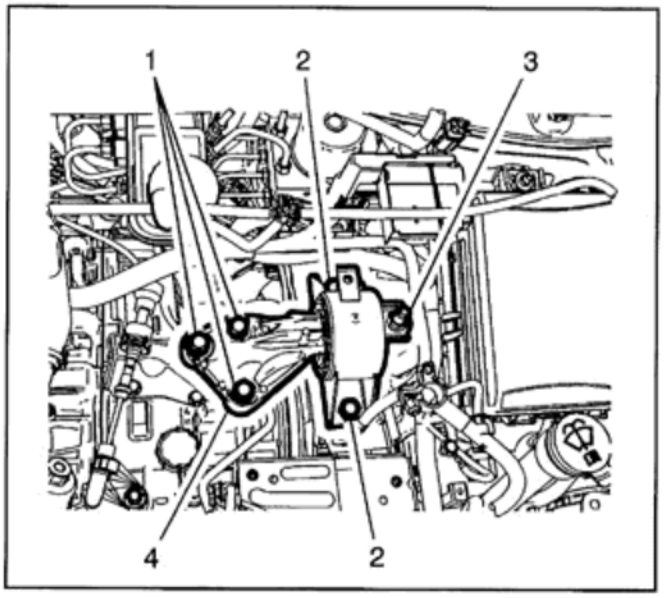
Caution: Refer to *Fastener Caution on page 0-8*

5. Install the lower oil pan to transmission bolts (1) and tighten to **40** N•m **(30 lb ft)**.
6. Remove the transmission jack.
7. Install the wheel drive intermediate shaft. Refer to *Front Wheel Drive Intermediate Shaft Replacement on page 7-4*.
8. Install the front wheel drive shafts to the transmission and intermediate shaft.
9. Install the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.
10. Connect the hydraulic power steering hoses to the front frame, if equipped.
11. Install the rear transmission mount to the transmission. Refer to *Transmission Rear Mount Replacement on page 17-580*.
12. Connect the exhaust isolators to the front suspension frame.
13. Install the left and right front wheelhouse liner inner front extensions. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left SIde) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right SIde, LWE, LUW) on page 3-149*
14. Install the skid plate and fasteners to the front frame, if equipped. Tighten the skid plate fasteners to **22** N•m **(16 lb ft)**.
15. Lower the vehicle.
16. Connect the intermediate steering shaft to steering gear.



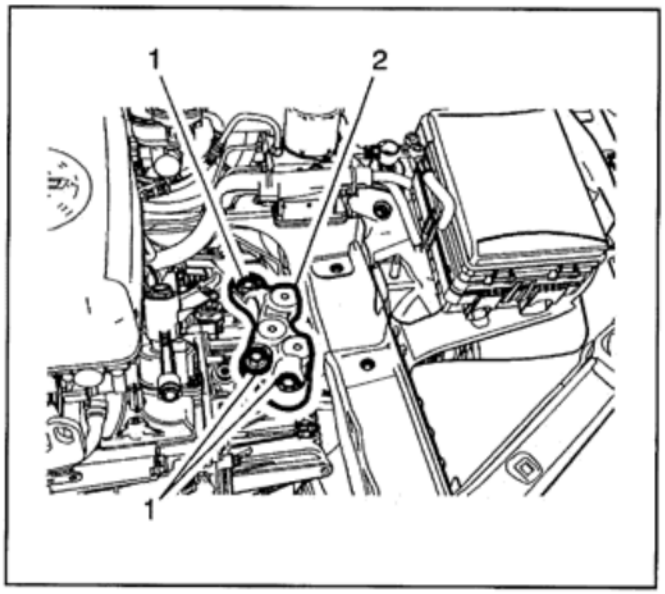
2514158

17. Install the upper transmission to engine bolts (1) and tighten to **60** N•m **(44 lb ft)**.



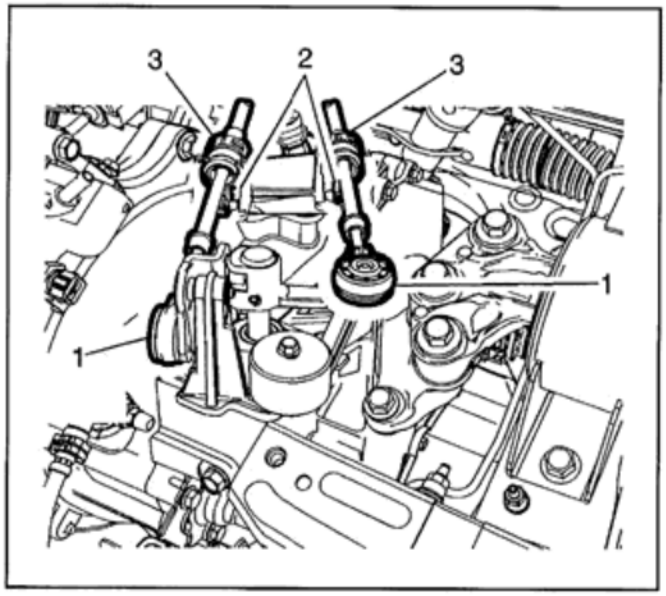
2492638

18. Install transmission bracket and mount assembly and install mount to body bolts (2) and nut (3). Tighten the bolts and nut to **58** N•m **(43 lb ft)**.



2548969

19. Install the transmission bracket bolts (1) and tighten to **100** N•m **(74 lb ft)**.
20. Remove the engine support fixture.
21. Install the feed line to clutch actuator cylinder pipe elbow.
22. Install the wire harness clips to the transmission.
23. Connect the backup light switch and vehicle speed sensor.



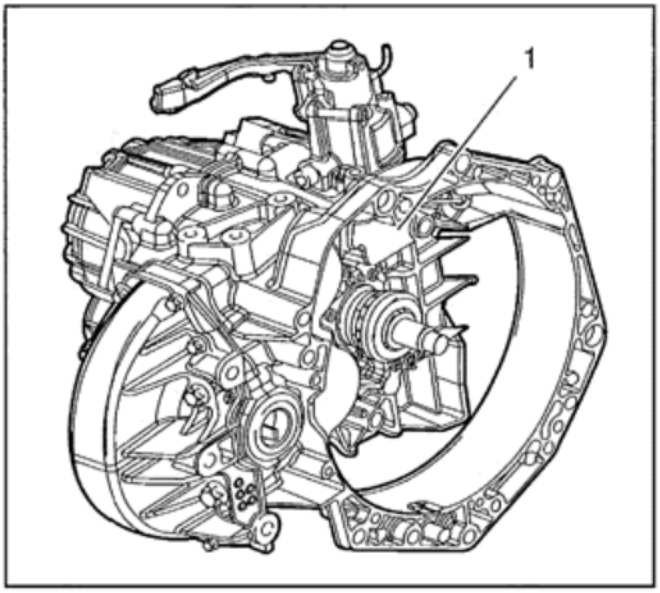
2511540

24. Press the locking tab rearward in order to lock the transmission range selector lever cable (2) to the cable bracket.
25. Connect the transmission range selector lever cable terminals (1) to the transmission manual pins.
26. Install the battery and battery tray. Refer to *Battery Tray Replacement on page 9-721*
27. Connect the negative battery cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-713*.
28. Bleed the clutch system. Refer to *Hydraulic Clutch System Bleeding on page 17-415*.

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.



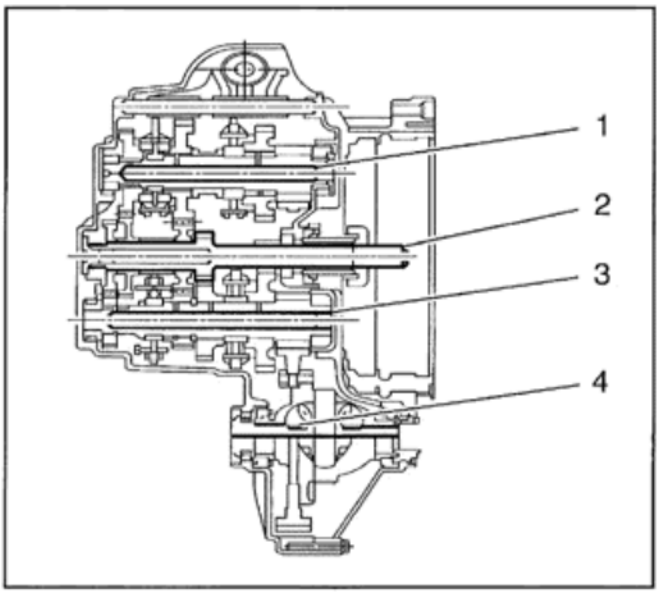
2189355

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.



2189356

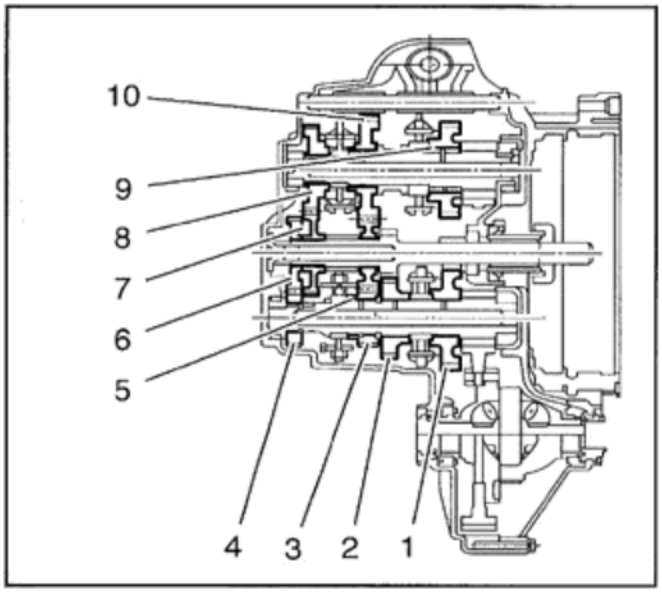
Legend

(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.



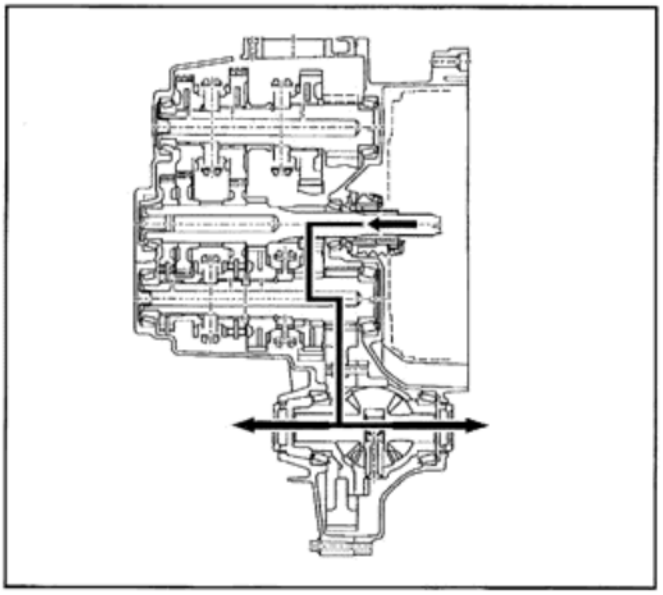
2189357

Legend

(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

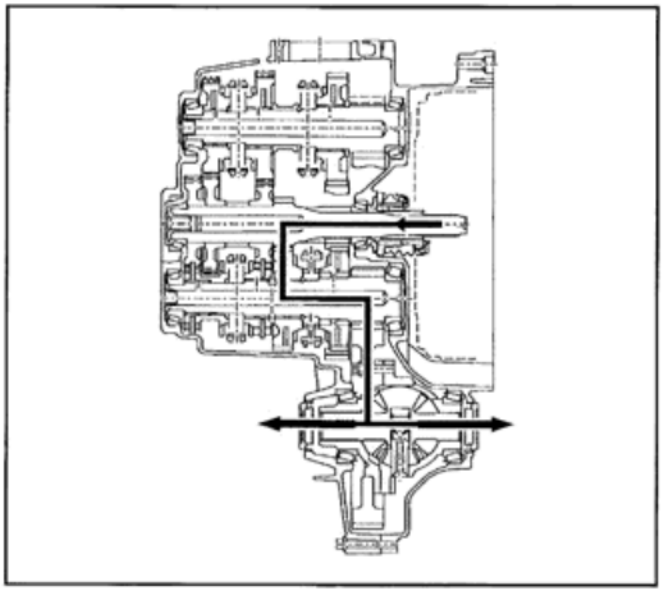
Power Flow in the Individual Gears

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



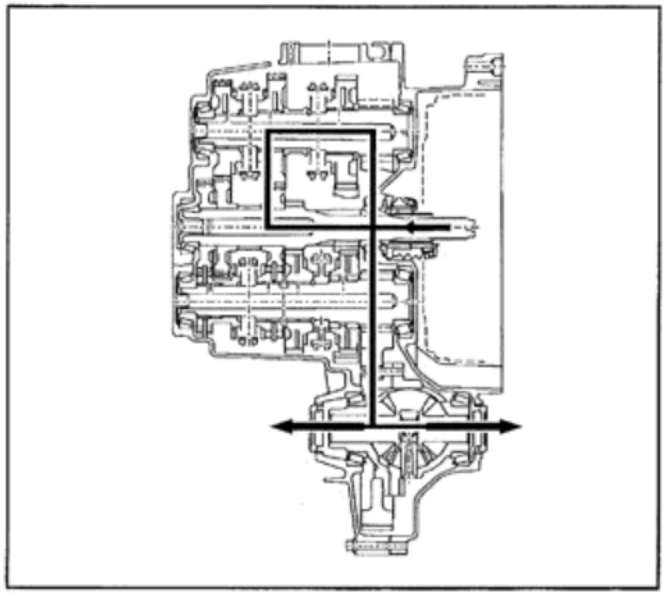
2189358

1st gear



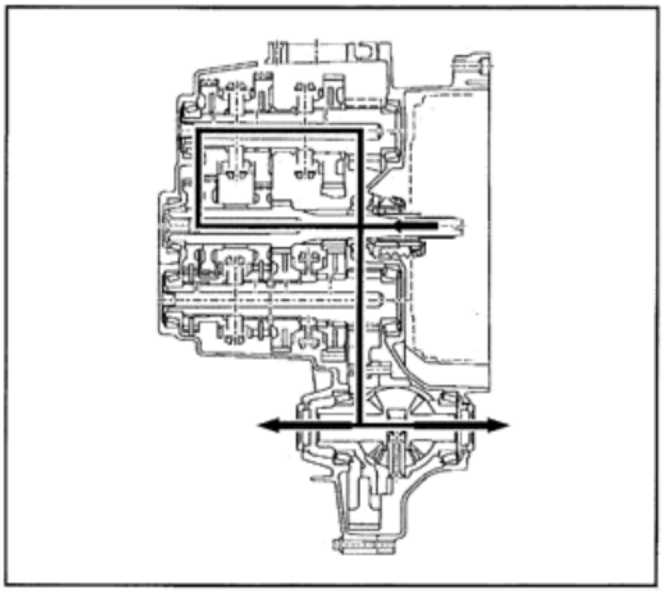
2189359

2nd gear



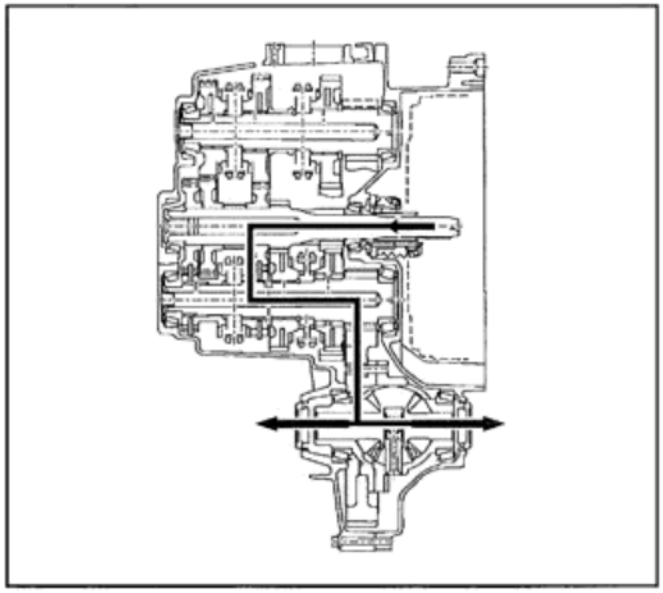
2189360

3rd gear



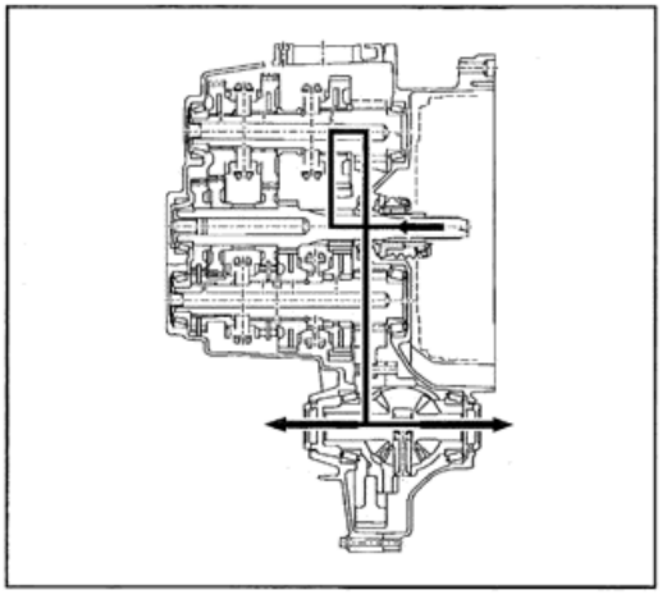
2189361

4th gear



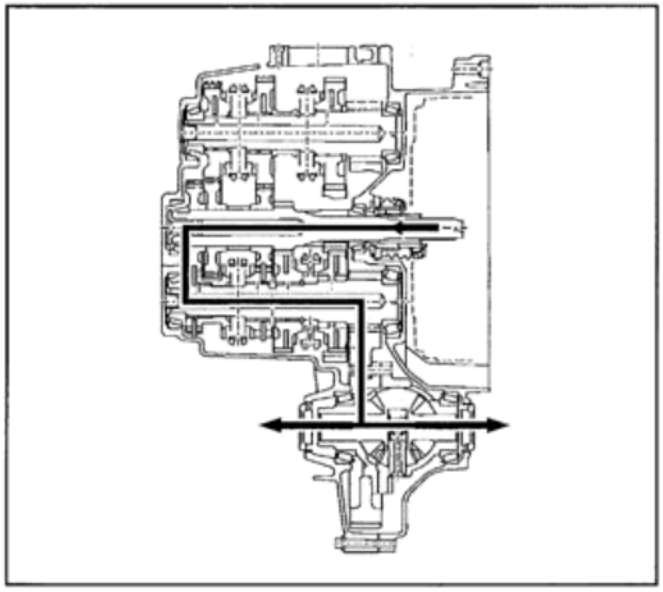
2189362

5th gear



2189364

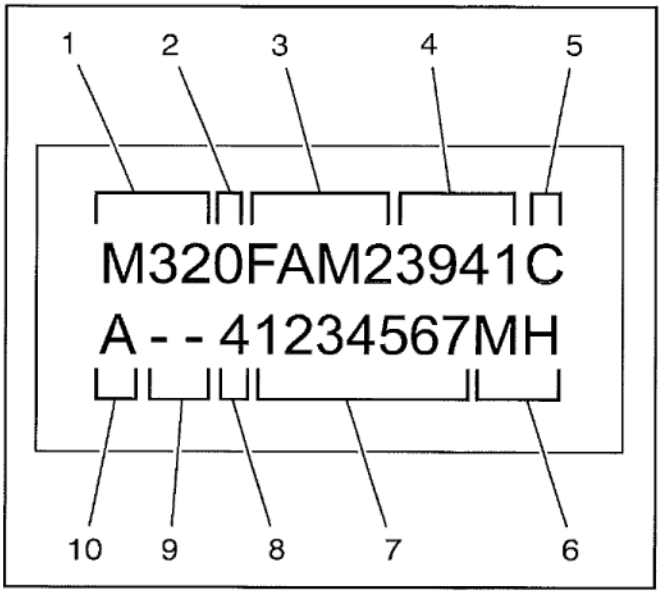
Reverse gear



2189363

6th gear

Transmission Identification Information

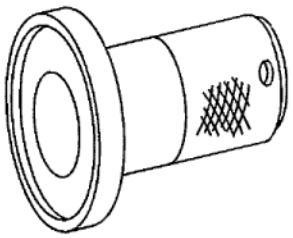
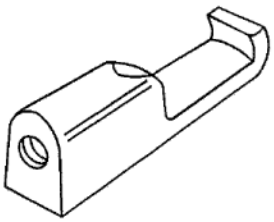
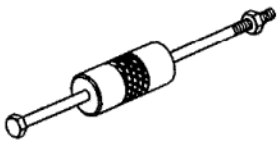


2189365

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

Illustration	Tool Number/Description
 1282400	DT-519 KM-519 J-44385 Oil Seal / Ring Installer
 1938572	DT-586 KM-586 J-23129 Remover Hook
 1938239	DT-7004 Slide Hammer