Manual Transmission - F13-5/F15-5/F17-5 (M26)

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
5th Speed Connecting Claw Support Bolts	9 N•m	80 lb in
5th Speed Fork Bolts	22 N•m	16 lb ft
5th Speed Fork Support Bolts	22 N•m	16 lb ft
Adjusting Sleeve Retaining Plate Bolt	9 N•m	80 lb in
Backup Lamp Switch	40 N•m	30 lb ft
Bar Bolts at Control Arm Pivot Area	100 N•m	74 lb ft
Bearing Cover and Retaining Plate Bolts – M8	20 N•m	15 lb ft
Brake Booster Hose Connection at Intake Manifold	18 N•m	13 lb ft
Clutch Bearing Guide-to-Transmission Bolts	5 N•m	44 lb in
Clutch Cover Bolts	15 N•m	11 lb ft
Clutch Fork Bolt	35 N•m	26 lb ft
Clutch Housing Cover Bolts	6 N•m	53 lb in
Clutch Housing Cover Plate Bolts	6 N•m	53 lb in
Clutch Line Bracket Bolts	25 N•m	18 lb ft
Clutch Release Cylinder Bolts	12 N•m	106 lb in
Compressor Bolts	45.5 N•m	34 lb ft
Connecting Bridge Bolts	7 N•m	62 lb in
Control Lever Housing Bolts	12 N•m	106 lb in
Coupling Clamp Bolt	31.5 N•m	23 lb ft
Damping Weight-to-Linkage Bolt	20 N•m	15 lb ft
Differential Case Bearing Adjusting Sleeve Lock Bolt	9 N•m	80 lb in
Differential Cover-to-Transmission Bolts		
Light Alloy Version	18 N•m	13 lb ft
Sheet Metal Version	30 N•m	22 lb ft
Differential Cover Bolts	7 N•m	62 lb in
Drain Plug	39 N•m	29 lb ft
Engine Mount and Rear Engine Mount Bracket Bolts	67.5 N•m	50 lb ft
Engine Rear Bracket-to-Engine Mount Bolt	62.5 N•m	46 lb ft
Fill Plug	39 N•m	29 lb ft
Front Shift Lever Ball Stud Retainer	12.5 N•m	111 lb in
Front Suspension Steering Knuckle Pivot – Ball Joint, Bolt	31.5 N•m	23 lb ft
Front Suspension Tension Bar Nut	90 N•m	66 lb ft
Front Transmission Mount Bolts	68 N•m	50 lb ft
Guide Bolts	5 N•m	44 lb in
Ground Cable Bolts	13 N•m	115 lb in
Inspection Plug	4 N•m+ 45° + 90°	35 lb in + 45° + 90°
Left Engine Bracket Bolts – All	62.5 N•m	46 lb ft
Left Engine Mount Bracket and Engine Mount Bolts	67.5 N•m	50 lb ft
Left Transaxle Mount Bracket Bolts	52 N•m	38 lb ft
Left Transaxle Mount Bolts	52 N•m	38 lb ft

Fastener Tightening Specifications (cont'd)

Application	Specification	
	Metric	English
Left Transaxle Mount Through Bolt	80 N•m	59 lb ft
Linkage Clamp-to-Shift Control Guide Bolt	26.5 N•m	20 lb ft
Linkage-to-Shift Control Guide Coupling Clamp Bolt	31.5 N•m	23 lb ft
Lock Ball Assembly	29 N•m	22 lb ft
Lock Pin Bridge Bolts	7 N•m	62 lb in
Lower Transmission to Engine Bolts		
#1 Bolts	64 N•m	47 lb ft
#2 Bolts	47 N•m	35 lb ft
#3 Bolts	23 N•m	17 lb ft
Output Speed Sensor	24 N•m	18 lb ft
Pedal Shaft Nut	20 N•m	15 lb ft
Pedal Support-to-Dash Panel Nut	20 N•m	15 lb ft
Pedal Support with Brake Booster Support-to-Dash Panel Nuts	20 N•m	15 lb ft
Pivot-to-Steering Knuckle Bolt	31.5 N•m	23 lb ft
Rear Transmission Mount Bolts	68 N•m	50 lb ft
Retaining Plate Bolts	22 N•m	16 lb ft
Retaining Plate Cover Bolts – M7	15 N•m	11 lb ft
Reverse/Backup Lamp Switch	20 N•m	15 lb ft
Reverse Lamp Switch at Transmission	20 N•m	15 lb ft
Right Engine Mount-to-Engine Bracket Bolt and Nut	62.5 N•m	46 lb ft
Ring Gear Bolts	90 N•m	66 lb ft
Shift Control Cover-to-Transmission Bolts	15 N•m	11 lb ft
Shift Lever Bracket-to-Floor Panel Tunnel Bolt	6 N•m	53 lb in
Shift Lever Shaft Assembly	19 N•m	14 lb ft
Speedometer Sensor Bolt	5 N•m	44 lb in
Starter Wire Nut	10 N•m	87 lb in
Starter Motor Retaining Bolts	37 N•m	28 lb ft
Tension Bar Bolts-to-Front Suspension Control Arm	100 N•m	74 lb ft
Tie Rod End Nuts-to-Front Suspension Steering Knuckle	34 N•m	25 lb ft
Transmission Bolts – Plate	22 N•m	16 lb ft
Transmission Bracket Bolts	72.5 N•m	53 lb ft
Transmission Cover Bolts – Short	8 N•m	71 lb in
Transmission Cover Bolts – Long	24 N•m	18 lb ft
Transmission-to-Engine Bolts – All	70 N•m	52 lb ft
Wheel Bolts	110 N•m	81 lb ft

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material
Assembling Shift Lever Support Set	Silicone Grease
Clutch Bearing Guide	Lubricating Grease
Clutch/Brake Pedal Shaft	No. 2 Lithium Soap Based Grease with Glycerol
Clutch Cable End, at Pedal	No. 2 Lithium Soap Based Grease
Clutch Lever Housing Bushing	Lubricating Grease

Adhesives, Fluids, Lubricants, and Sealers (cont'd)

Application	Type of Material
Control Guide Lock-Pin	Silicone Grease
Control Guide Rod	Silicone Grease
Fifth Gear Fork Bracket Attaching Bolt	Chemical Locking Compound – Loctite – 271, High Torque
Fifth Gear Fork Connecting Bridge Attaching Bolt	Chemical Locking Compound – Loctite – 271, High Torque
Fifth Gear Fork Connecting Claw Bracket Attaching Bolt	Chemical Locking Compound – Loctite – 271, High Torque
Input Shaft Seal	No. 2 Lithium Soap Based Grease
Input Shaft Spline at Clutch Disc Housing Area	No. 2 Lithium Soap Based Grease
Output Speed Sensor	Thread Locking Compound – Loctite – 516
Shift Lever Assembly	Silicone Grease
Shift Lever Seal	No. 2 Lithium Soap Based Grease
Shift Lever-to-Control Guide Lock Pin – Companion Joint	Silicone Grease
Transmission Assembly	Lubricant Oil, as per SAE 75W85 SAE 75W85 – used for helical gear (red coloration)

Lubrication Specifications

Transmission Fluid

Transmission	Filling Quantity	GM Part Number	Canadian
F15	Approx. 1.60 L (1.69 qt)	88862472	88862473
Transmission Fluid Level: All transmissions, after a transmission repair, should be filled as far as the lower edge of the inspection aperture. The transmission fluid is supplied by weight in production. There is no need to correct it during scheduled servicing if no leaks are found.			

Transmission Gear Ratio

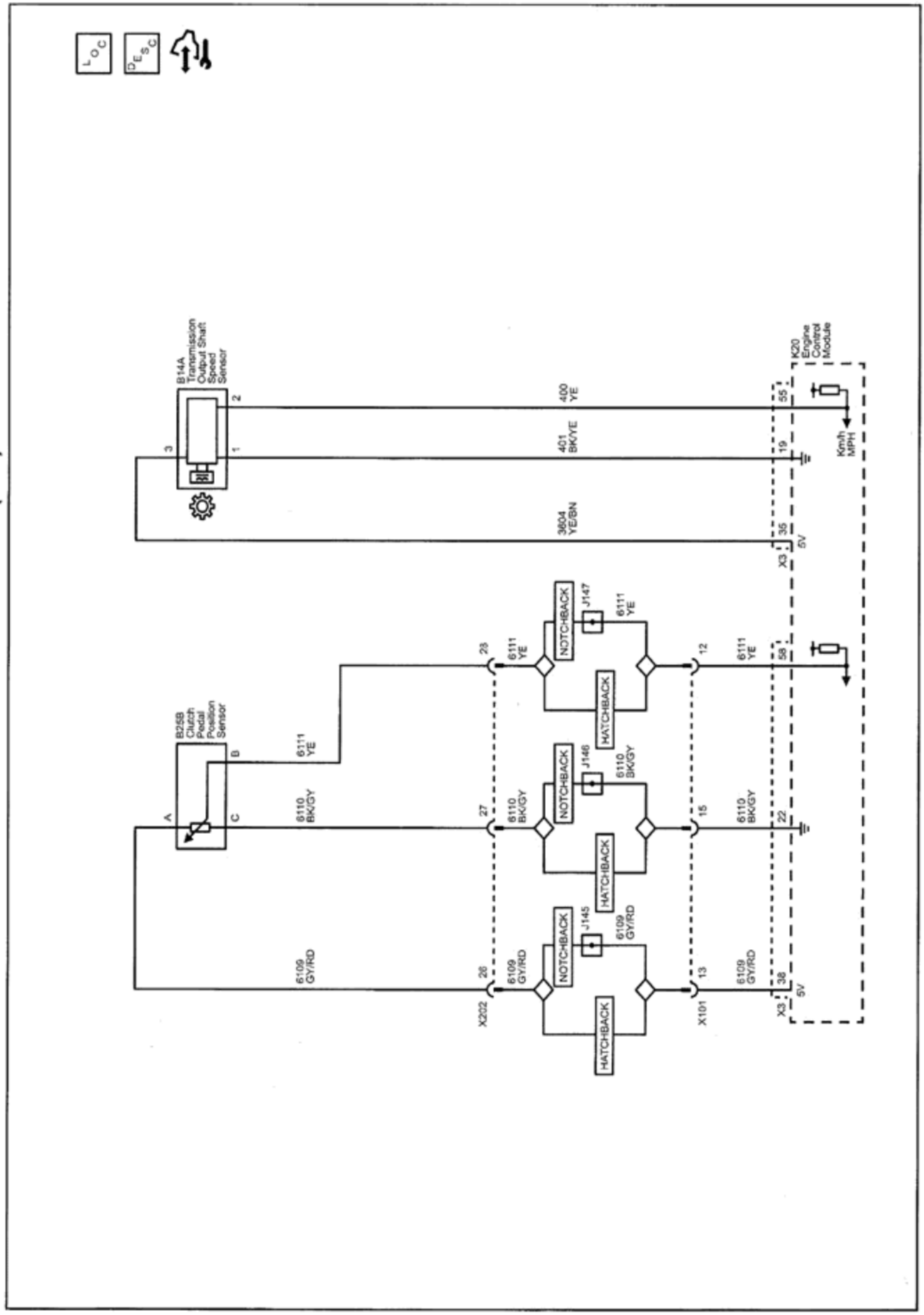
	Transmission Type	
	F-17 M25	F-17-5 M26
Range	CR	WR
1st Gear	3.73	3.73
2nd Gear	2.14	1.96
3rd Gear	1.41	1.32
4th Gear	1.12	0.95

Transmission Gear Ratio (cont'd)

	Transmission Type	
	F-17 M25	F-17-5 M26
Range	CR	WR
5th Gear	0.89	0.76
Reverse	3.31	3.31
CR = Close Ratio (close ratio gear set) WR = Wide Ratio (wide ratio gear set)		

Schematic and Routing Diagrams

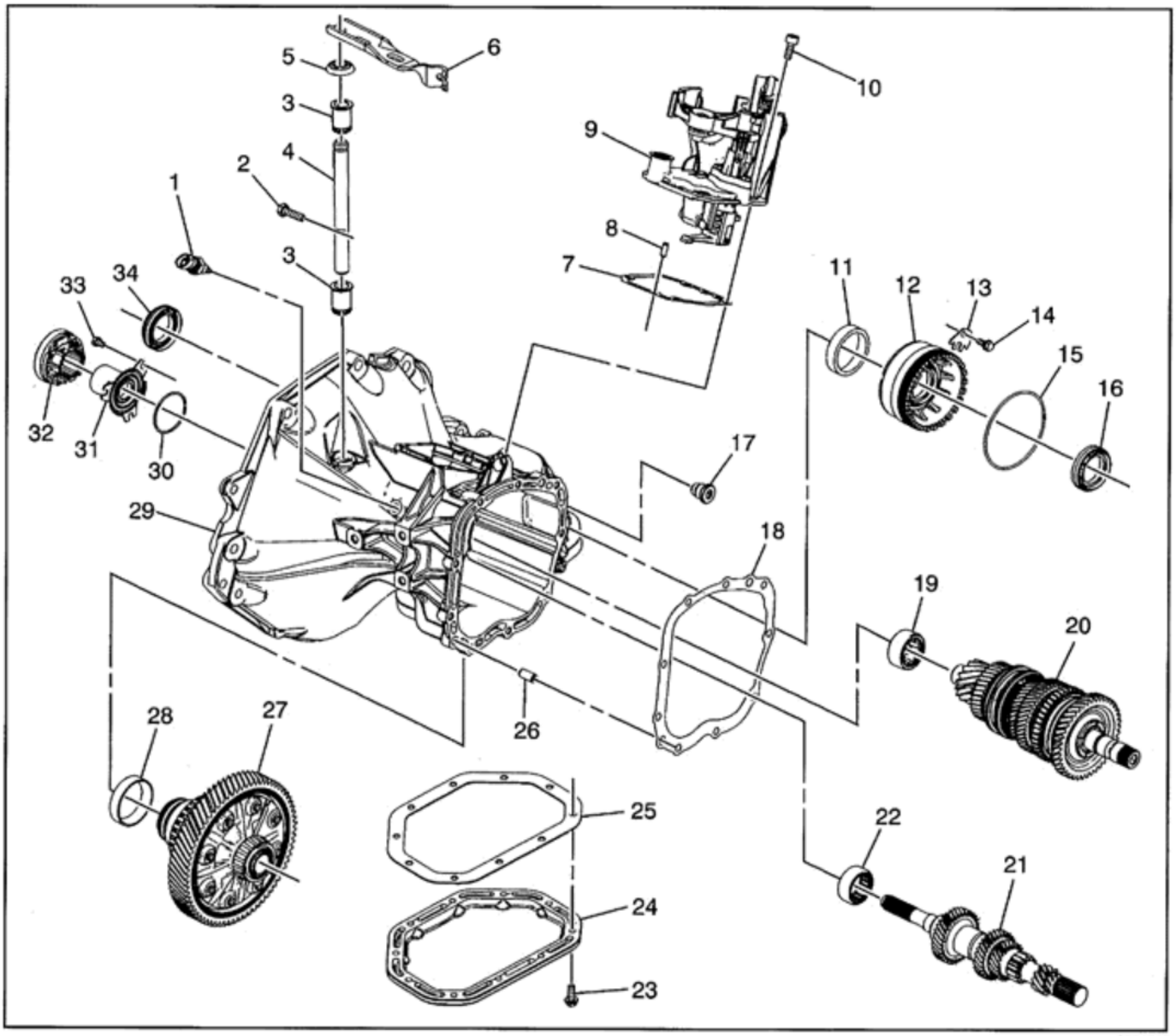
Manual Transmission Schematics (M26)



Component Locator

Disassembled Views

Case Components (1 of 2)



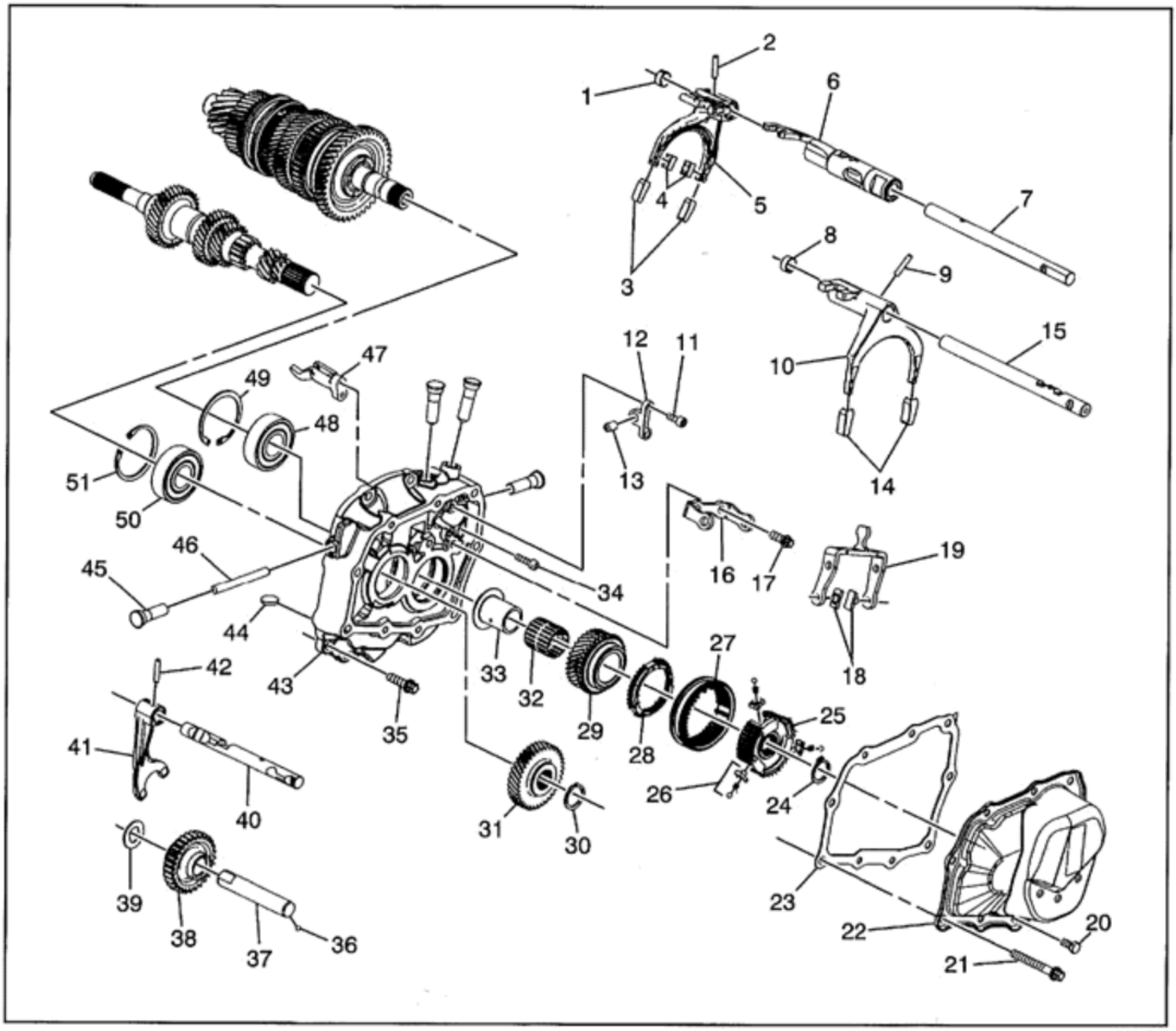
2264743

Legend

(1) Back Up Lamp Switch Assembly
(2) Clutch Yoke Shaft Retaining Bolt
(3) Clutch Yoke Shaft Bushing
(4) Clutch Yoke Shaft
(5) Clutch Yoke Shaft Seal
(6) Clutch Lever Assembly Brace
(7) Vehicle Speed Sensor Bolt
(8) Vehicle Speed Sensor Assembly
(9) Shift Control Housing Cover Gasket
(10) Shift Control Housing Locating Pin
(11) M/Trans Control Lever Housing Assembly
(12) Shift Control Housing Bolt
(13) Front Differential Bearing Race
(14) Front Differential Bearing Adjuster
(15) Front Differential Bearing Adjuster Lock
(16) Front Differential Bearing Adjuster Lock Bolt
(17) Front Differential Bearing Retainer O-ring Seal
(18) Front Wheel Drive Shaft Oil Seal Assembly
(19) Transmission Inspection Plug/Magnet
(20) Transmission Case Gasket
(21) Main Shaft Front Bearing Assembly
(22) Main Shaft Assembly
(23) Input Shaft
(24) Input Shaft Front Bearing Assembly
(25) Clutch and Differential Housing Cover Bolt
(26) Front Differential Carrier Cover

(27) Front Differential Carrier Cover Gasket
(28) Transmission Case Locating Pin
(29) Front Differential Assembly
(30) Front Differential Bearing Race
(31) Clutch and Differential Housing
(32) Clutch Release Bearing Collar O-ring Seal
(33) Clutch Release Bearing Collar
(34) Clutch Release Bearing
(35) Clutch Release Bearing Collar Bolt
(36) Front Wheel Drive Shaft Oil Seal Assembly

Case Components (2 of 2) (Gen 1)



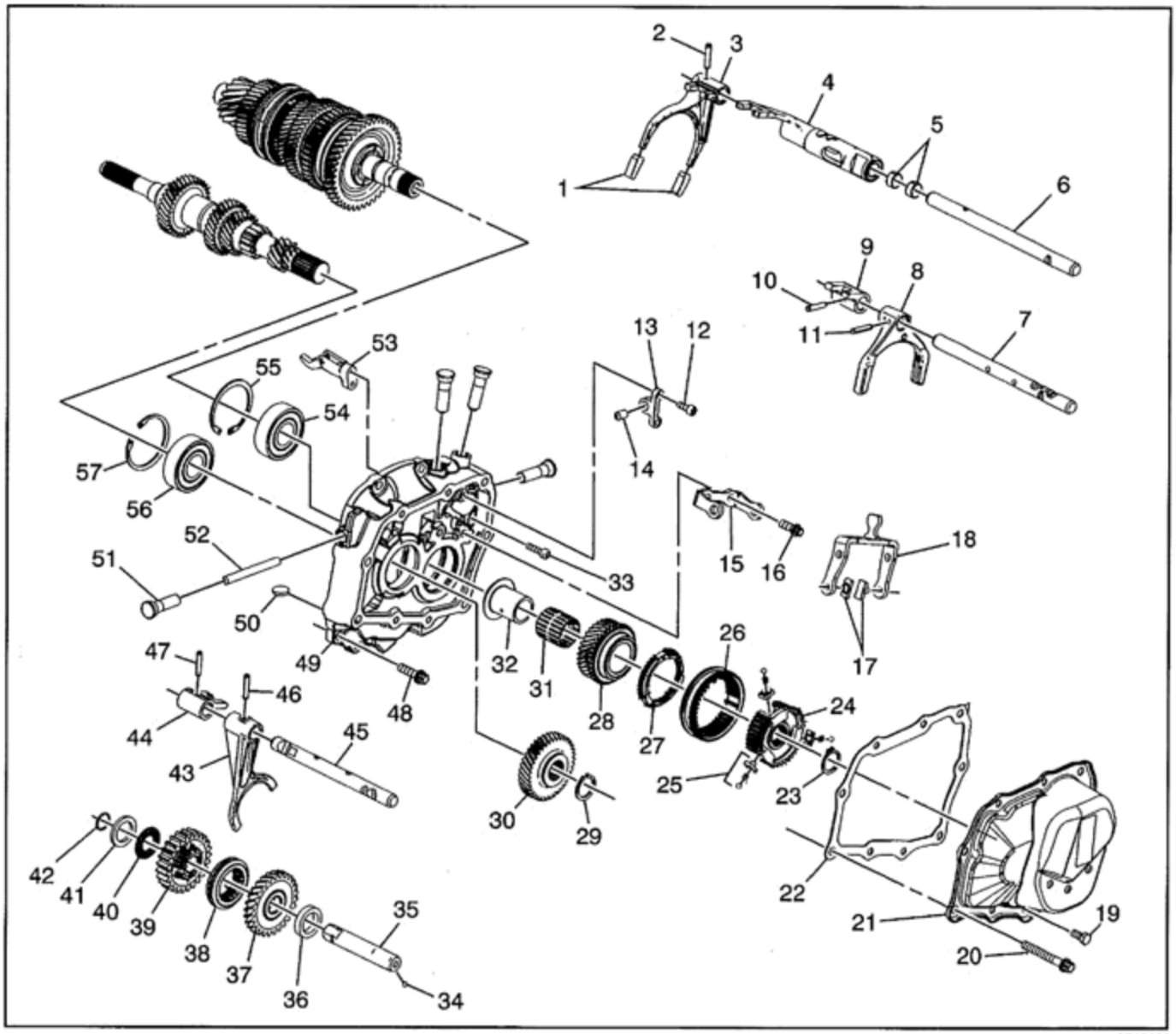
2264746

Legend

(1) 3rd and 4th Shift Shaft Bushing
(2) 3rd and 4th Shift Fork Pin
(3) 3rd and 4th Shift Fork Pad
(4) 3rd and 4th Shift Fork Shoe
(5) 3rd and 4th Shift Fork Assembly
(6) 5th Shift Blocking Guide
(7) 3rd and 4th Shift Shaft
(8) 1st and 2nd Shift Shaft Bushing
(9) 1st and 2nd Shift Fork Pin
(10) 1st and 2nd Shift Fork Assembly
(11) Shift Shaft Interlock Pin Connector Bolt
(12) Shift Shaft Interlock Pin Connector
(13) 5th Shift Blocking Pin
(14) 1st and 2nd Shift Fork Pad
(15) 1st and 2nd Shift Shaft
(16) 5th Shift Fork Bracket
(17) 5th Shift Fork Bracket Bolt
(18) 5th Shift Fork Shoe
(19) 5th Shift Fork Assembly
(20) Transmission Cover Bolt
(21) Transmission Case Bolt
(22) Transmission Cover Assembly
(23) Transmission Cover Gasket
(24) 5th Gear Synchronizer Hub Retaining Ring

(25) 5th Gear Synchronizer Hub
(26) 5th Gear Synchronizer Insert Assembly
(27) 5th Gear Synchronizer Sleeve
(28) 5th Gear Blocking Ring
(29) 5th Gear Assembly – Driven
(30) 5th Gear Retaining Ring
(31) 5th Gear – Driving
(32) 5th Gear Bearing Assembly
(33) 5th Gear Bearing Race
(34) Parking Pawl Bolt
(35) Transmission Case Bolt
(36) Reverse Idler Gear Shaft Ball
(37) Reverse Idler Gear Shaft
(38) Reverse Idler Gear Assembly
(39) Reverse Shift Fork Pin Washer
(40) Reverse Shift Shaft
(41) Reverse Shift Fork Assembly
(42) Reverse Shift Fork Pin
(43) Transmission Case
(44) Transmission Magnet
(45) Shift Shaft Detent Sleeve
(46) Gearshift Rod
(47) Parking Pawl
(48) Main Shaft Rear Bearing Assembly
(49) Main Shaft Rear Bearing Retaining Ring
(50) Input Shaft Rear Bearing Assembly
(51) Input Shaft Rear Bearing Retaining Ring

Case Components (2 of 2) (Gen 2)



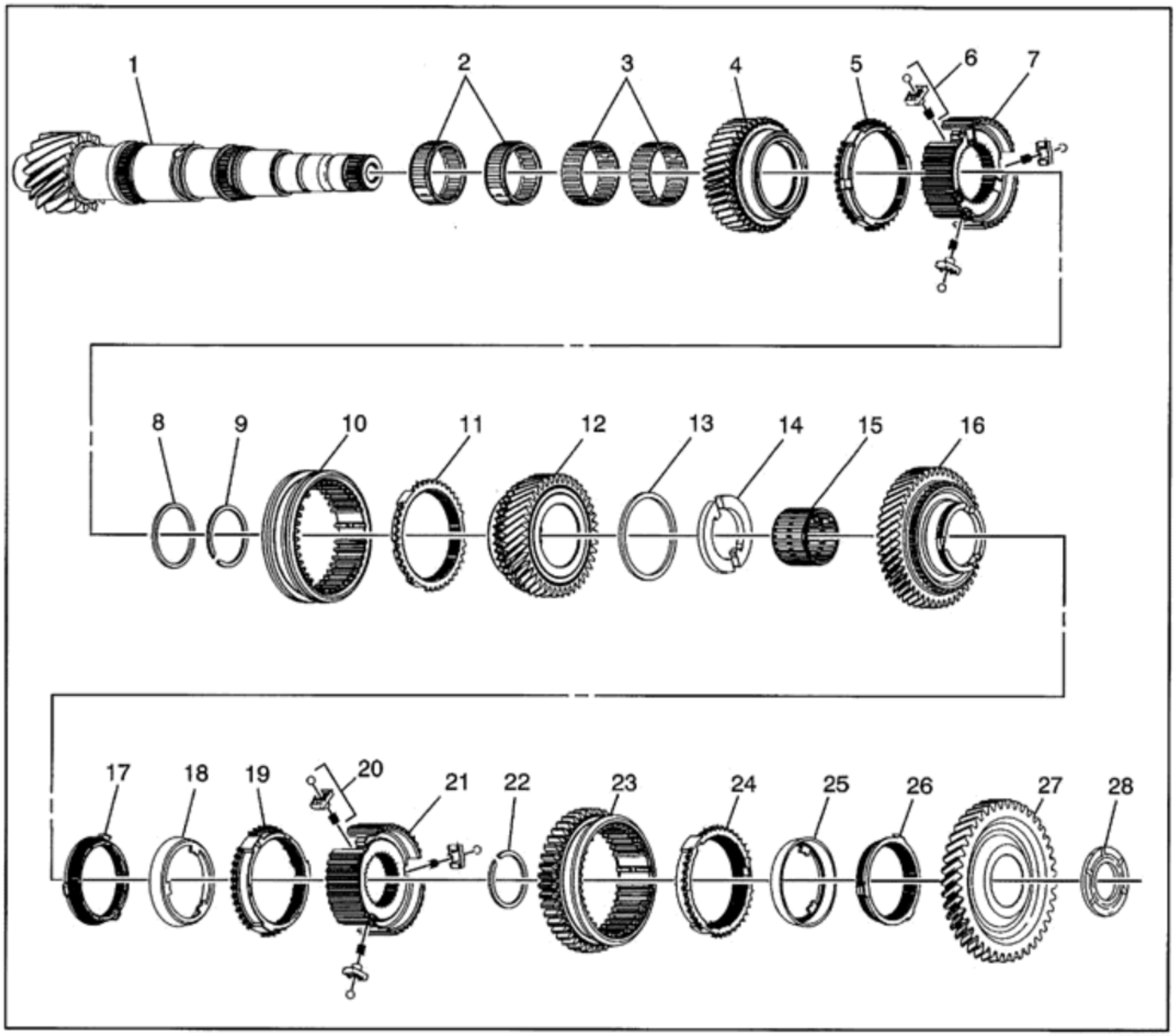
2749168

Legend

(1) 3rd and 4th Shift Fork Pad
(2) 3rd and 4th Shift Fork Pin
(3) 3rd and 4th Shift Fork
(4) 5th Shift Blocking Guide
(5) 5th Shift Blocking Guide Bushing
(6) 3rd and 4th Shift Shaft

(7) 1st and 2nd Shift Shaft
(8) 1st and 2nd Shift Fork
(9) 1st and 2nd Shaft Block
(10) 1st and 2nd Shaft Block Pin
(11) 1st and 2nd Shift Fork Pin
(12) Shift Shaft Interlock Pin Connector Bolt
(13) Shift Shaft Interlock Pin Connector
(14) 5th Shift Blocking Pin
(15) 5th Shift Fork Bracket
(16) 5th Shift Fork Bracket Bolt
(17) 5th Shift Fork Shoe
(18) 5th Shift Fork Assembly
(19) Transmission Cover Bolt
(20) Transmission Case Bolt
(21) Transmission Cover Assembly
(22) Transmission Cover Gasket
(23) 5th Gear Synchronizer Hub Retaining Ring
(24) 5th Gear Synchronizer Hub
(25) 5th Gear Synchronizer Insert Assembly
(26) 5th Gear Synchronizer Sleeve
(27) 5th Gear Blocking Ring
(28) 5th Gear Assembly – Driven
(29) 5th Gear Retaining Ring
(30) 5th Gear – Driving
(31) 5th Gear Bearing Assembly
(32) 5th Gear Bearing Race
(33) Parking Pawl Bolt
(34) Reverse Idler Gear Shaft Ball
(35) Reverse Idler Gear Shaft
(36) Reverse Helical Gear Washer
(37) Reverse Helical Gear
(38) Reverse Synchro Assembly
(39) Reverse Spur Gear
(40) Reverse Spur Gear Bearing
(41) Reverse Spur Gear Washer
(42) Reverse Gear Shaft Snap Ring
(43) Reverse Shift Fork
(44) Reverse Fork Block
(45) Reverse Shift Shaft
(46) Reverse Shift Shaft Pin
(47) Reverse Fork Block Pin
(48) Transmission Case Bolt
(49) Transmission Case
(50) Transmission Magnet
(51) Shift Shaft Detent Sleeve
(52) Gearshift Rod
(53) Parking Pawl
(54) Main Shaft Rear Bearing Assembly
(55) Main Shaft Rear Bearing Retaining Ring
(56) Input Shaft Rear Bearing Assembly
(57) Input Shaft Rear Bearing Retaining Ring

Main Shaft Components (Gen 1)

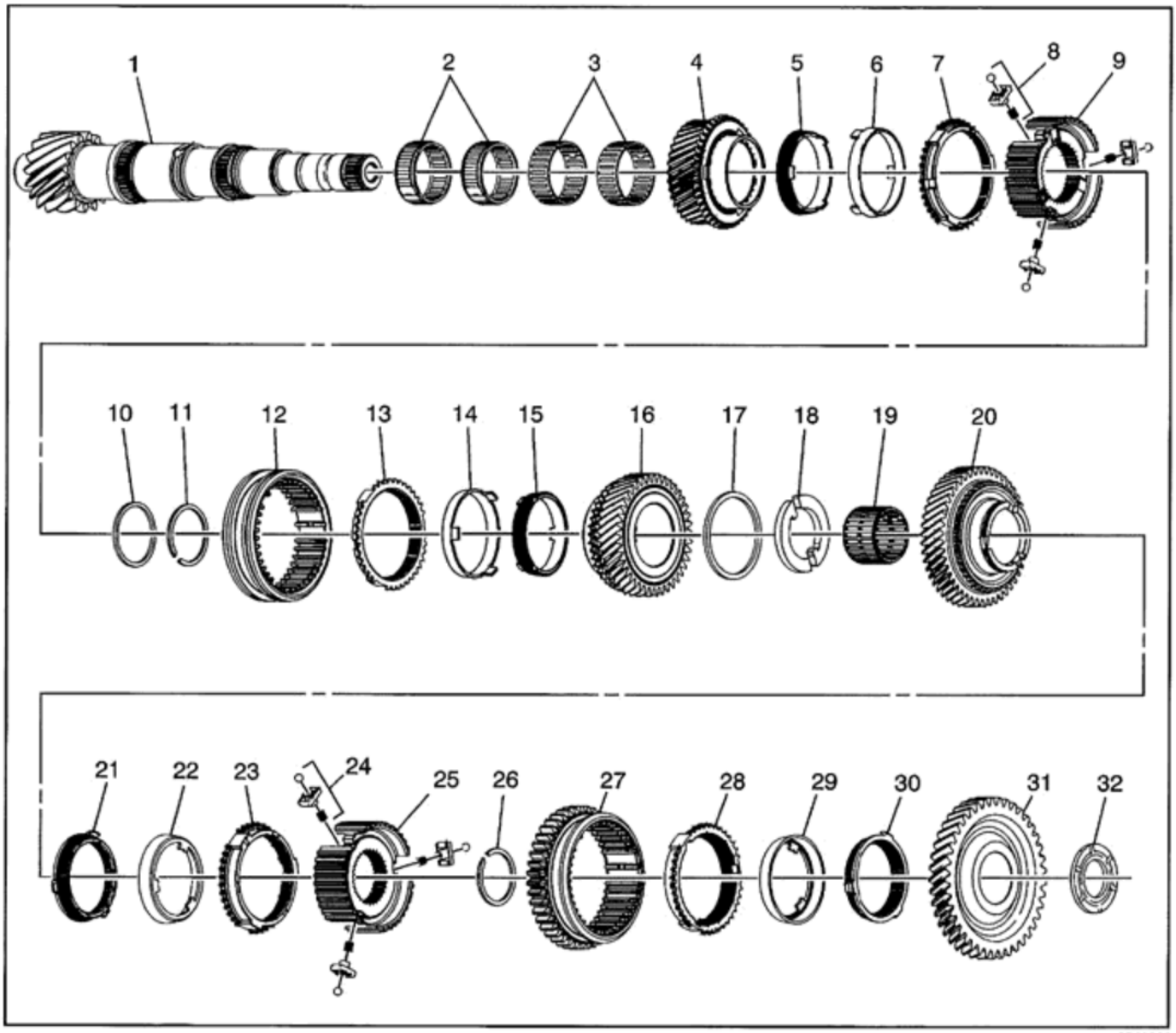


2264749

Legend

(1) Main Shaft
(2) 4th Gear Bearing Assembly
(3) 3rd Gear Bearing Assembly
(4) 4th Gear Assembly
(5) 3rd Gear Blocking Ring
(6) 3rd and 4th Gear Synchronizer Insert
(7) 3rd and 4th Gear Synchronizer Hub
(8) 3rd Gear Thrust Washer
(9) 3rd and 4th Gear Synchronizer Hub Retaining Ring
(10) 3rd and 4th Gear Synchronizer Sleeve
(11) 3rd Gear Blocking Ring
(12) 3rd Gear Assembly
(13) 2nd and 3rd Gear Thrust Washer Retaining Ring
(14) 2nd and 3rd Gear Thrust Washer
(15) 2nd Gear Bearing Assembly
(16) 2nd Gear
(17) 1st Gear Inner Blocking Ring
(18) 1st Gear Intermediate Ring
(19) 1st Gear Outer Blocking Ring
(20) 1st and 2nd Gear Synchronizer Insert Assembly
(21) 1st and 2nd Gear Synchronizer Hub
(22) 1st and 2nd Gear Synchronizer Hub Retaining Ring
(23) 1st and 2nd Gear Synchronizer Sleeve
(24) 1st Gear Outer Blocking Ring
(25) 1st Gear Intermediate Ring
(26) 1st Gear Inner Blocking Ring
(27) 1st Gear
(28) 1st Gear Thrust Washer

Main Shaft Components (Gen 2)



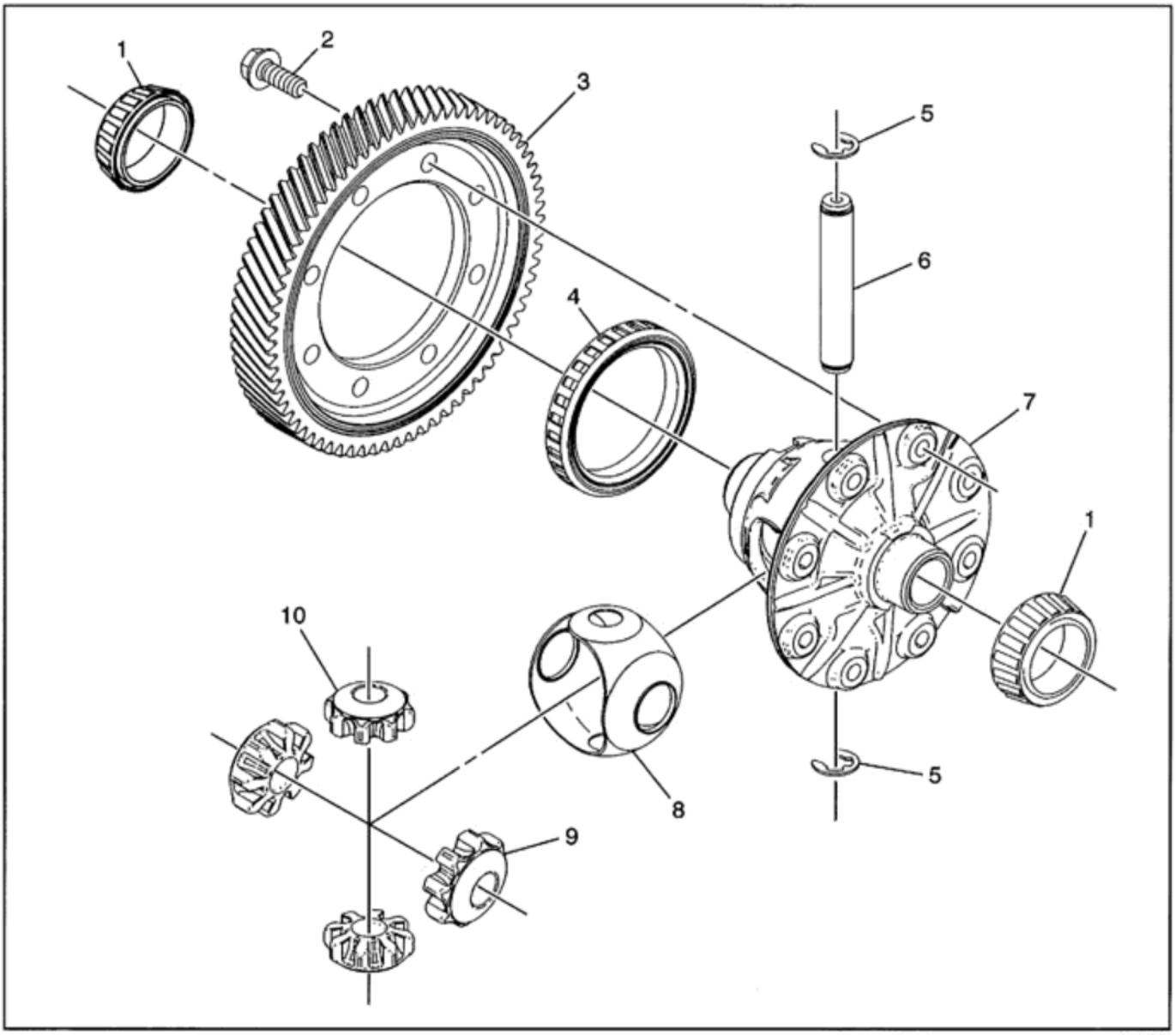
2749066

Legend

(1) Main Shaft
(2) 4th Gear Bearing Assembly
(3) 3rd Gear Bearing Assembly
(4) 4th Gear Assembly
(5) 4th Gear Inner Blocking Ring
(6) 4th Gear Intermediate Blocking Ring
(7) 4th Gear Outer Blocking Ring
(8) 3rd and 4th Gear Synchronizer Insert
(9) 3rd and 4th Gear Synchronizer Hub
(10) 3rd Gear Thrust Washer
(11) 3rd and 4th Gear Synchronizer Hub Retaining Ring
(12) 3rd and 4th Gear Synchronizer Sleeve
(13) 3rd Gear Outer Blocking Ring
(14) 3rd Gear Intermediate Blocking Ring
(15) 3rd Gear Inner Blocking Ring
(16) 3rd Gear Assembly
(17) 2nd and 3rd Gear Thrust Washer Retaining Ring
(18) 2nd and 3rd Gear Thrust Washer
(19) 2nd Gear Bearing Assembly
(20) 2nd Gear
(21) 1st Gear Inner Blocking Ring
(22) 1st Gear Intermediate Ring
(23) 1st Gear Outer Blocking Ring
(24) 1st and 2nd Gear Synchronizer Insert Assembly
(25) 1st and 2nd Gear Synchronizer Hub
(26) 1st and 2nd Gear Synchronizer Hub Retaining Ring
(27) 1st and 2nd Gear Synchronizer Sleeve
(28) 1st Gear Outer Blocking Ring
(29) 1st Gear Intermediate Ring
(30) 1st Gear Inner Blocking Ring
(31) 1st Gear

(32) 1st Gear Thrust Washer

Differential Components

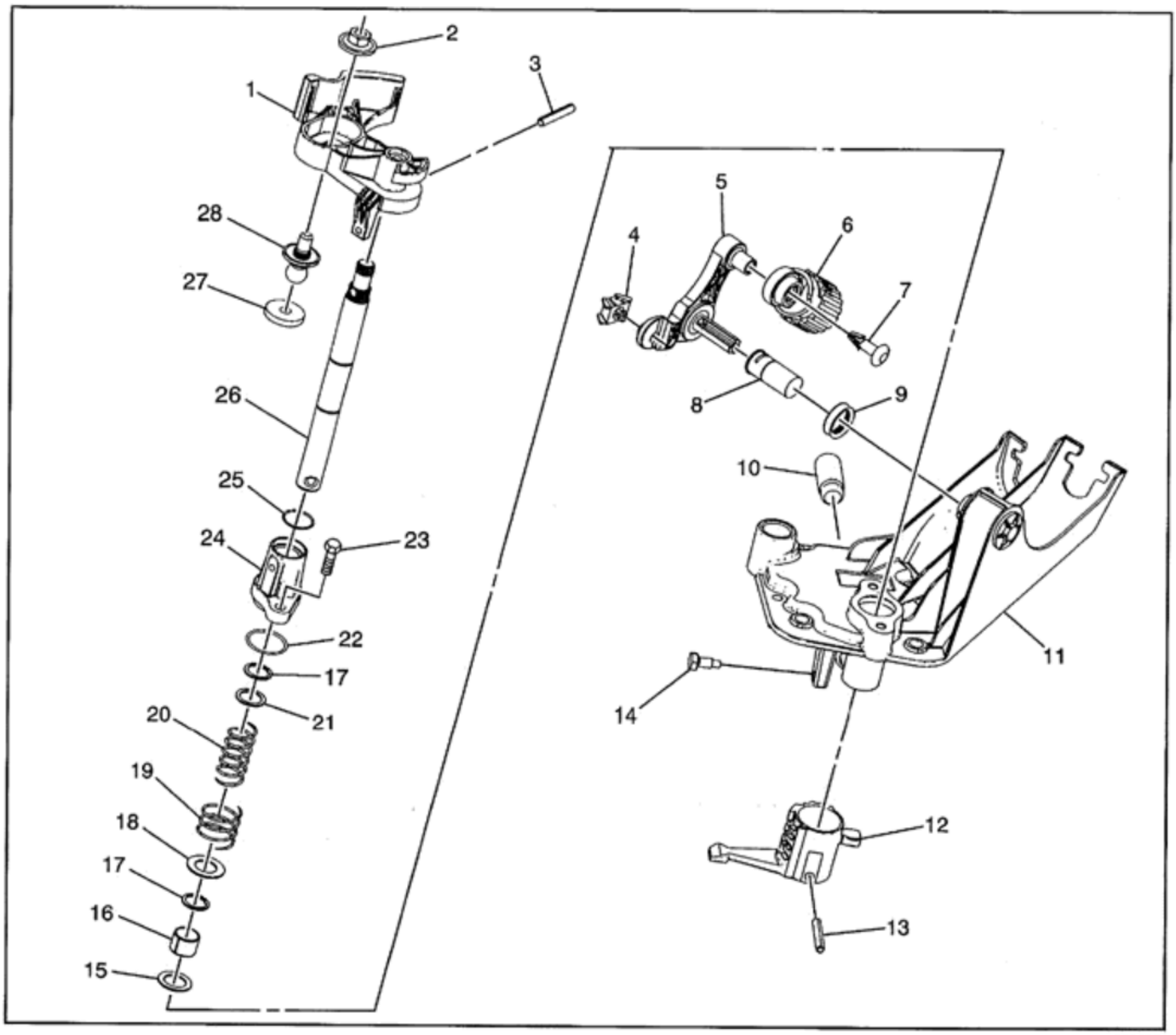


2264750

Legend

(1) Front Differential Bearing Assembly
(2) Front Differential Ring Gear Bolt
(3) Front Differential Ring Gear
(4) Front Wheel Speed Sensor Reluctor Wheel
(5) Pinion Gear Shaft Retaining Washer
(6) Front Differential Pinion Gear Shaft
(7) Front Differential Housing
(8) Front Differential Pinion/Side Gear Thrust Washer
(9) Front Differential Side Gear
(10) Front Differential Pinion Gear

Shifter Components



2264751

Legend

(1) M/Trans Control Lever Assembly
(2) M/Trans Control Front Shift Lever Ball Stud Retainer
(3) Control Lever Pin
(4) Selection Lever Slider
(5) Selection Lever
(6) Quick Adjuster Assembly
(7) Quick Adjuster Assembly Pin
(8) Selection Lever Sleeve
(9) Selection Lever Bushing
(10) Positioner
(11) M/Trans Control Lever Housing Assembly
(12) Intermediate Shift lever
(13) Intermediate Shift Lever Pin
(14) Intermediate Shift Lever Guide Pin
(15) Control Lever Washer
(16) M/Trans Control Lever Pivot Pin Bushing
(17) Control Lever Stop Spring Retaining Ring
(18) Control Lever Stop Spring Spacer
(19) Control Lever Stop Spring – Outer
(20) Control Lever Stop Spring – Inner
(21) Control Lever Stop Spring Spacer
(22) Upper Bearing Assembly O-ring Seal
(23) Upper Bearing Assembly Bolt
(24) Upper Bearing Assembly
(25) Upper Bearing Assembly Seal
(26) Control Lever Shaft
(27) M/Trans Control Front Shift Lever Ball Stud Washer
(28) M/Trans Control Front Shift Lever Ball Stud

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 17-429

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-534

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 17-461*
- *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 17-429

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-534

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 17-445*.
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 17-429

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-534

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 17-445*.

Repair Instructions

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

- *Clutch Pedal Position Sensor Learn on page 17-445*
- *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 17-429

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Transmission System Description and Operation on page 17-534

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 17-443*. 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

Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to *Transmission System Description and Operation on page 17-534*.

Visual/Physical Inspection

- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the manual transaxle for the correct fluid level.
- Inspect the manual transaxle for fluid leaks.
- Inspect the manual transaxle for broken or loose transaxle mounts.

Intermittent

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

Transmission Fluid Leak Diagnosis

Diagnostic Aids

Using the incorrect type of transaxle fluid may affect the sealing ability of the seals. Ensure the use of the correct type of transaxle fluid. The incorrect type of sealer may not be compatible with the transaxle fluid or may not have the correct characteristics for sealing the affected components. Ensure the use of the correct type of sealers. Refer to *Adhesives, Fluids, Lubricants, and Sealers on page 17-427*.

Test Description

The number below refers to the step number on the diagnostic table.

5. Use an approved method to clean the transaxle to ensure the leak location is correctly identified. If using a powder method or dye method, ensure the products are compatible with the transaxle fluid.

Transmission Fluid Leak Diagnosis

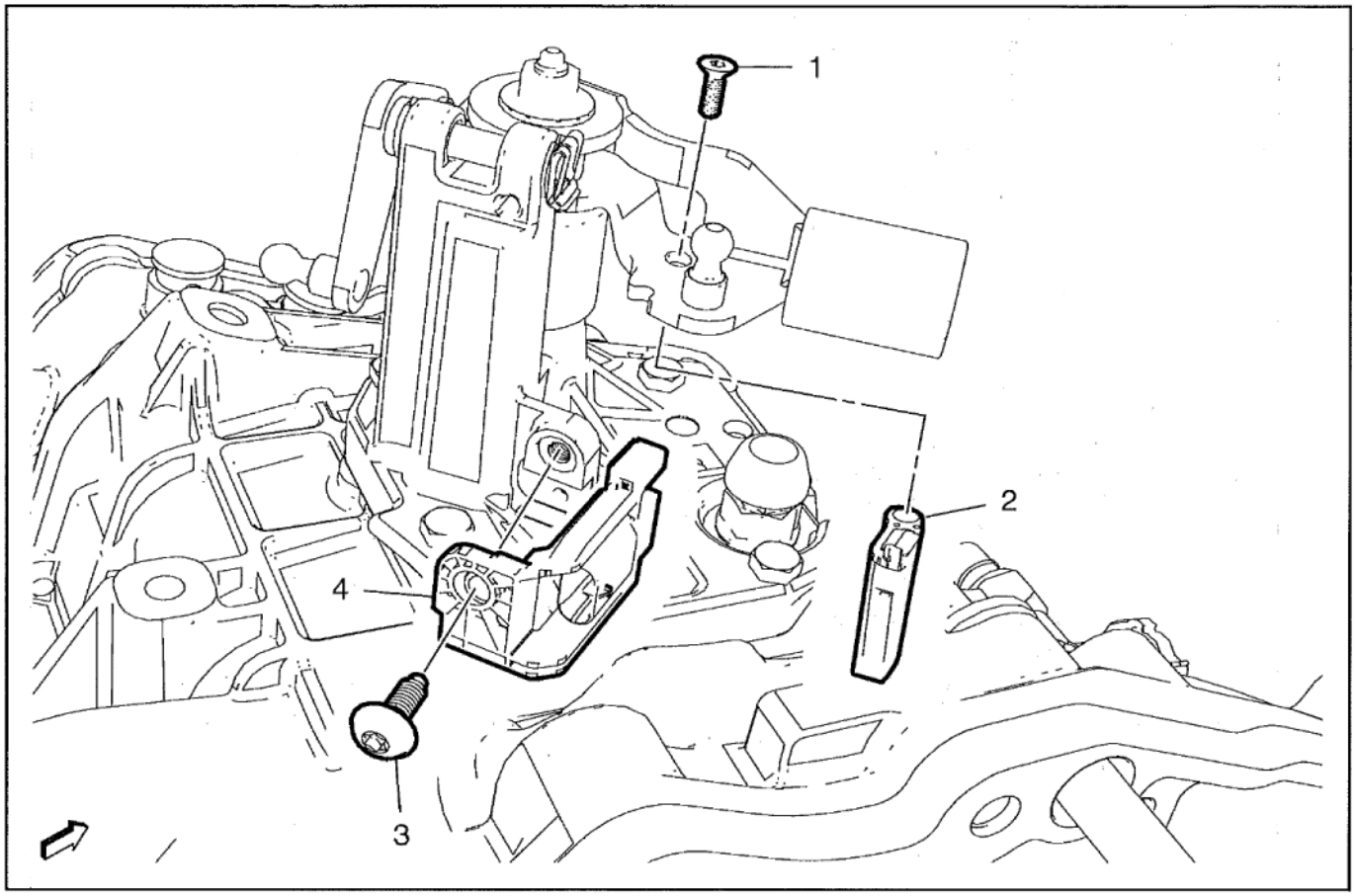
Step	Action	Yes	No
DEFINITION: Visible sign of the transaxle fluid leaking from the transaxle.			
1	Did you review the *Symptoms - Manual Transmission on page 17-445* and perform the necessary inspections?	Go to *Step 2*	Go to *Symptoms - Manual Transmission on page 17-445*
2	1. Inspect for the transaxle fluid level higher than the recommended level. Refer to *Lubrication Specifications on page 17-428*. 2. Adjust the transaxle level if incorrect. Was the transaxle fluid level too high?	Go to *Step 21*	Go to *Step 3*
3	Inspect the transaxle vent for a blockage. Is the transaxle vent blocked?	Go to *Step 4*	Go to *Step 5*
4	Repair or replace the transaxle vent. Did you find and repair the condition?	Go to *Step 21*	Go to *Step 5*
5	Verify the location of the leak. 1. Clean the transaxle assembly. 2. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached. 3. Visual inspect or use the powder method or dye and black light method to locate the leak. Is the leak occurring at the drain or fill plug?	Go to *Step 6*	Go to *Step 7*
6	Replace the drain or fill plug. Refer to *Lubrication Specifications on page 17-428*. Did you find and repair the condition?	Go to *Step 21*	Go to Diagnostic Aids
7	Is the leak at the transaxle output shaft seal?	Go to *Step 8*	Go to *Step 9*
8	Remove the output shaft seal and inspect for the following. Refer to *Front Wheel Drive Shaft Seal Replacement - Left Side on page 17-458*. • Damaged or worn seal • Damaged seal bore • Improper installation • Cracks in the component • Loose or worn bearing causing excessive seal wear Did you find and repair the condition?	Go to *Step 21*	Go to Diagnostic Aids
9	Is the leak at the shift lever area?	Go to *Step 10*	Go to *Step 11*
10	1. Inspect the shift control lever lower boot for damage. 2. Inspect for loose shift control lever mounting bolts. 3. Remove the shift control lever. Refer to *Transmission Control Replacement on page 17-459*. 4. Replace the shift control lever lower boot if damaged. 5. Inspect the shift control lever sealing surfaces for scratched, nicked or damaged. Did you find and repair the condition?	Go to *Step 21*	Go to Diagnostic Aids
11	Is the leak at the front of the transaxle?	Go to *Step 12*	Go to *Step 15*

Transmission Fluid Leak Diagnosis (cont'd)

Step	Action	Yes	No
12	1. Remove the transaxle. Refer to *Transmission Replacement on page 17-463.* 2. Inspect the input shaft retainer for leaking. 3. Remove the input shaft bearing retainer. Refer to *Front Wheel Drive Shaft Seal Replacement - Left Side on page 17-458* and *Front Wheel Drive Shaft Seal Replacement - Right Side on page 17-459*. Replace the seal. Did you find and repair the condition?	Go to *Step 21*	Go to *Step 13*
13	1. Inspect for the leak at the input shaft seal. 2. Inspect for the following if the input shaft seal is leaking: • Damaged or worn seal • Damaged seal bore • Improper installation • Cracks in the component • Input shaft sealing surface is scratched, nicked, damaged or worn • Loose or worn bearing causing excessive seal wear 3. Replace the input shaft seal if leaking. Refer to *Front Wheel Drive Shaft Seal Replacement - Left Side on page 17-458* and *Front Wheel Drive Shaft Seal Replacement - Right Side on page 17-459.* Did you find and repair the condition?	Go to *Step 21*	Go to *Step 14*
14	1. Inspect the case for cracks or porosity. 2. Replace the transaxle case or clutch housing if it is faulty. Did you find and repair the condition?	Go to *Step 21*	Go to Diagnostic Aids
15	Is the leak at the backup light switch?	Go to *Step 16*	Go to *Step 17*
16	1. Remove the backup light switch. Refer to *Backup Lamp Switch Replacement on page 17-463.* 2. Inspect for the following: • Cross threaded or damaged threads • Insufficient sealant • Leaking switch • Improper installation Did you find and repair the condition?	Go to *Step 21*	Go to *Step 1*
17	Is the leak at the sealing flanges of the transaxle case?	Go to *Step 18*	Go to *Step 19*
18	1. Remove the transaxle. Refer to *Transmission Replacement on page 17-463.* 2. Disassemble the transaxle. Refer to *Transmission Case Disassemble (Gen 1) on page 17-472* or *Transmission Case Disassemble (Gen 2) on page 17-478.* 3. Inspect the sealing surfaces. Did you find and repair the condition?	Go to *Step 21*	Go to *Step 19*
19	Is the leak coming from a crack or porosity in the transaxle case?	Go to *Step 20*	Go to Diagnostic Aids
20	1. Remove the transaxle. Refer to *Transmission Replacement on page 17-463.* 2. Disassemble the transaxle. 3. Replace the faulty transaxle case or clutch housing. Refer to *Transmission Case Assemble (Gen 1) on page 17-518* or *Transmission Case Assemble (Gen 2) on page 17-524.* Did you find and repair the condition?	Go to *Step 21*	Go to Diagnostic Aids
21	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to *Step 1*

Repair Instructions - On Vehicle

Gear Position Sensor Replacement



2512735

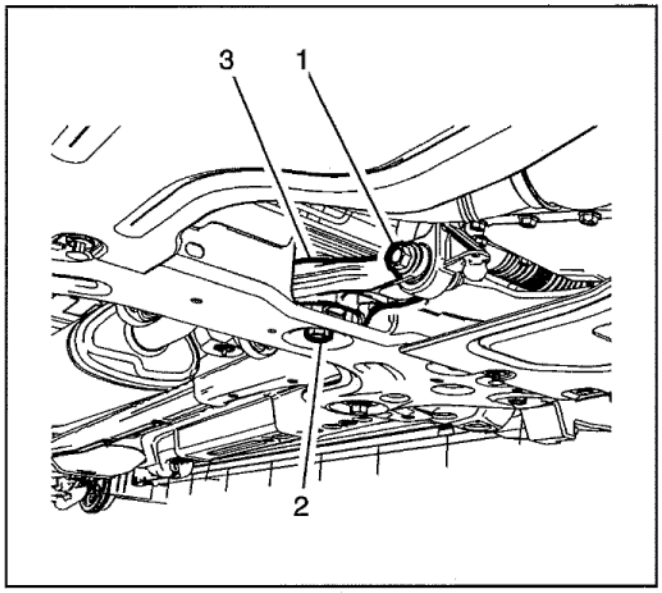
Gear Position Sensor Replacement

Callout	Component Name
Preliminary Procedure Unclip the engine control module (ECM) and bracket from the battery tray.	
1	Gear Position Sensor Magnet Bolt **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 8 N•m (71 lb ft)
2	Gear Position Sensor Magnet
3	Gear Position Sensor Bolt **Tighten** 8 N•m (71 lb ft)
4	Gear Position Sensor **Procedure** 1. Disconnect electrical connector 2. After installation is complete, learn neutral gear sensor. Refer to *Control Module References on page 6-3.*

Transmission Rear Mount Replacement

Removal Procedure

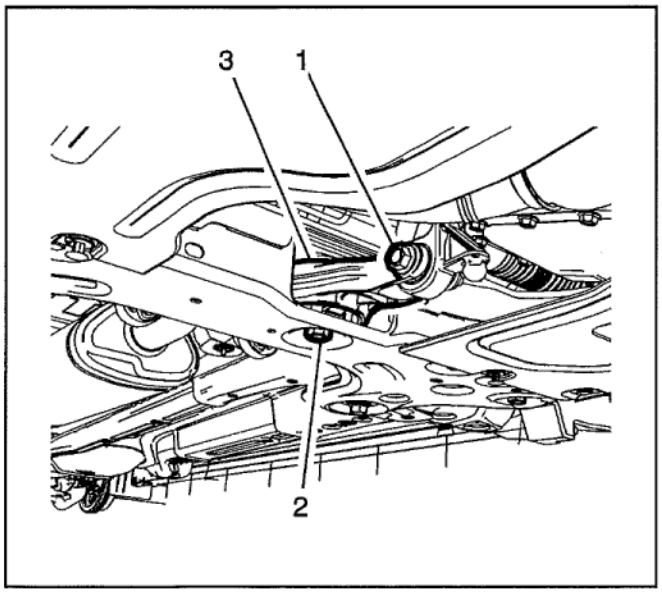
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
2. Using a suitable jack stand, support the rear of the powertrain.



2503662

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

Installation Procedure



2503662

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

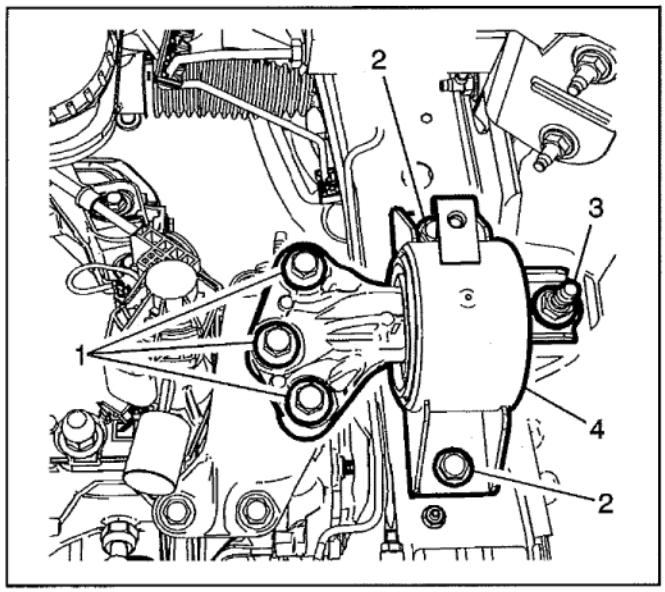
Caution: Refer to *Fastener Caution on page 0-8*.

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

Transmission Mount Replacement - Left Side

Removal Procedure

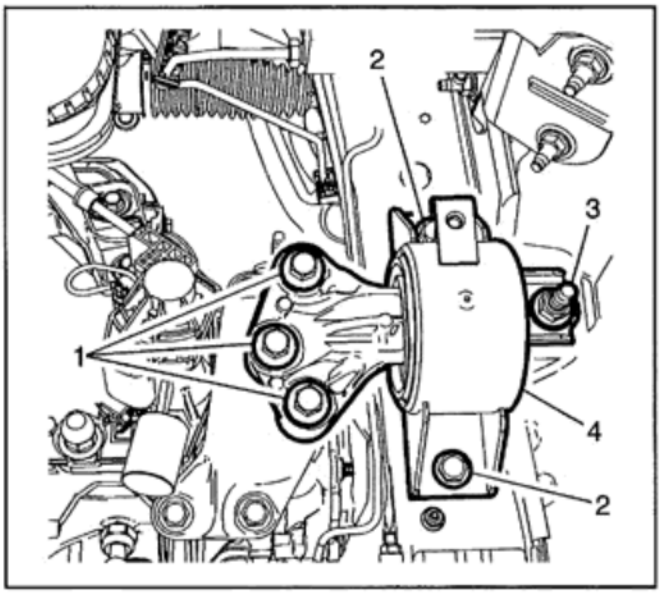
1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Install the engine support fixture. Refer to *Engine Support Fixture on page 9-1060*.



2512886

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



2512886

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

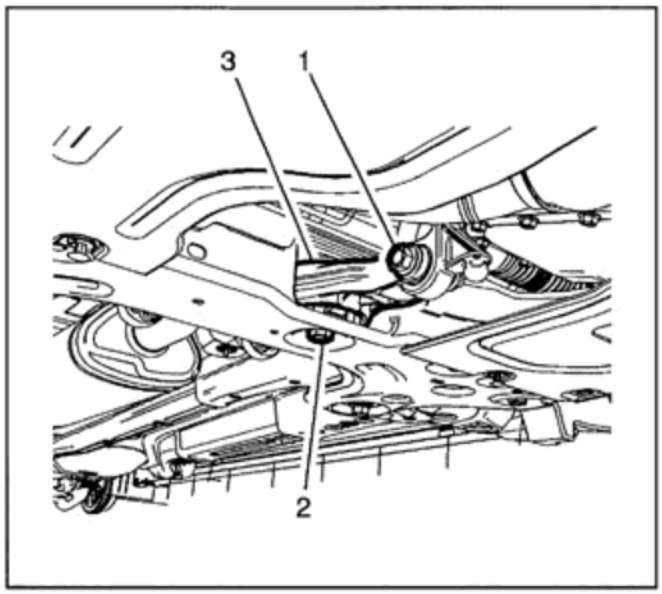
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the 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 Rear Mount Bracket Replacement

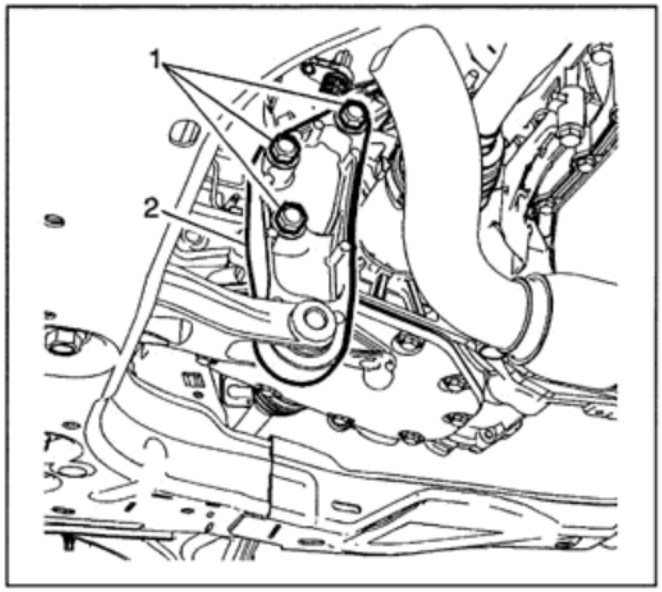
Removal Procedure

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

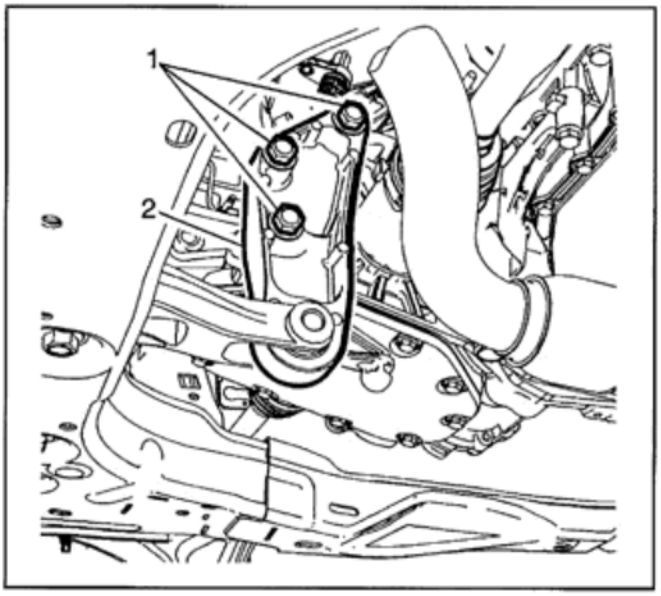
4. Remove and DISCARD the transmission mount to bracket through bolt (1).



2512927

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

Installation Procedure

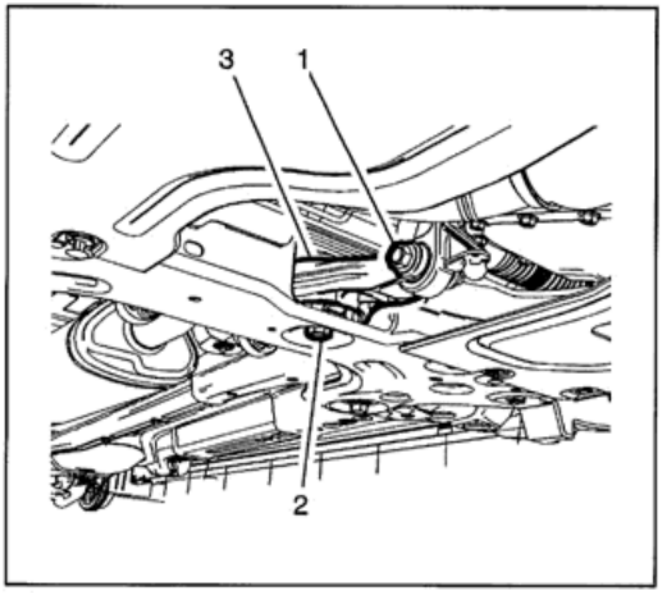


2512927

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

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

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



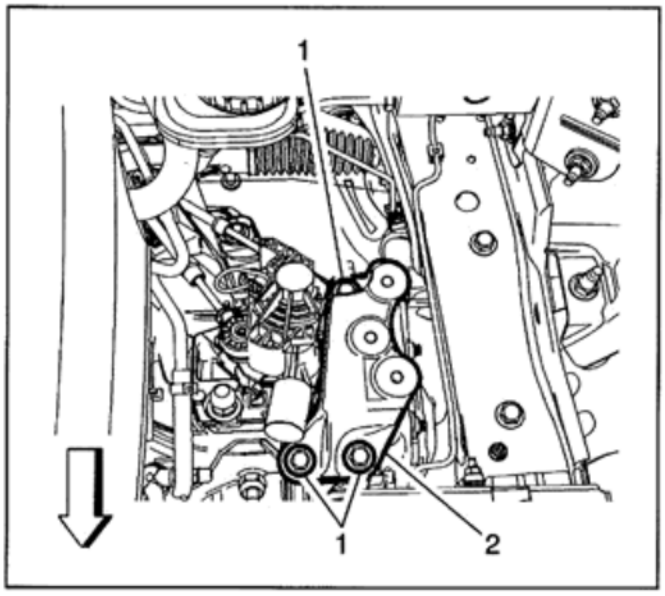
2503662

3. Install the NEW transmission mount to bracket through bolt (1) and tighten nut 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

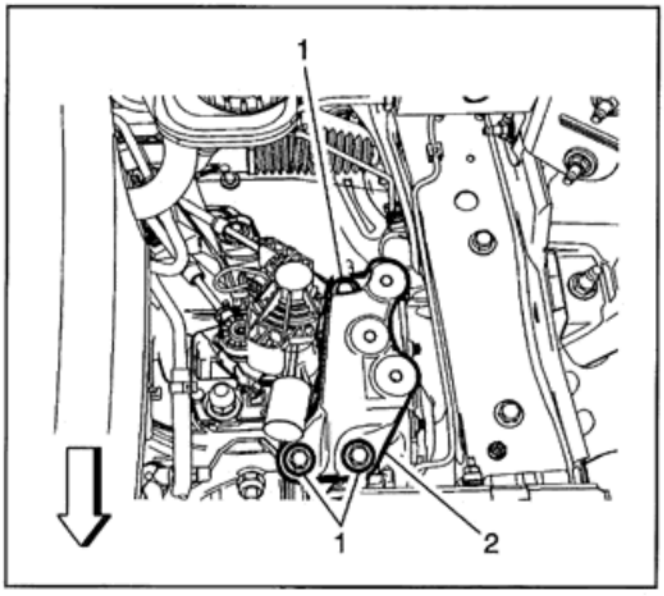
1. Remove the left transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 17-449.*



2512906

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

Installation Procedure



2512906

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

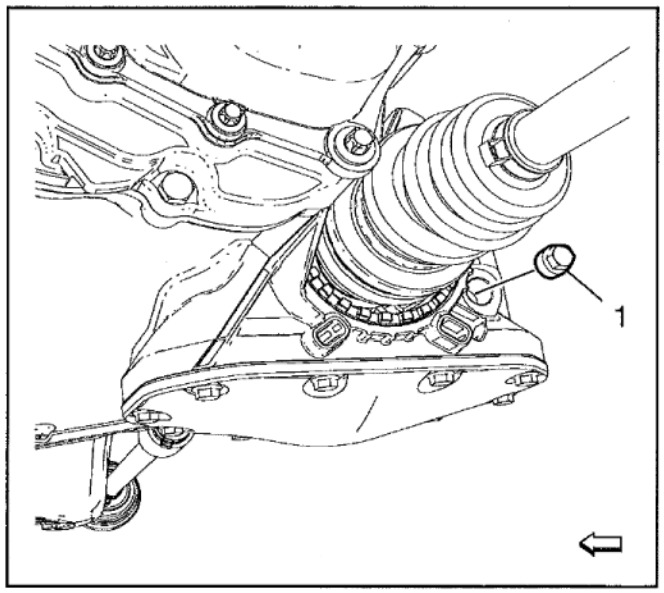
Caution: Refer to *Fastener Caution on page 0-8.*

2. Install the left transmission mount bracket to transmission bolts (1) and tighten to **62 N•m (46 lb ft)**.
3. Install the left transmission mount. Refer to *Transmission Mount Replacement - Left Side on page 17-449*.

Transmission Fluid Level and Condition Check

Removal Procedure

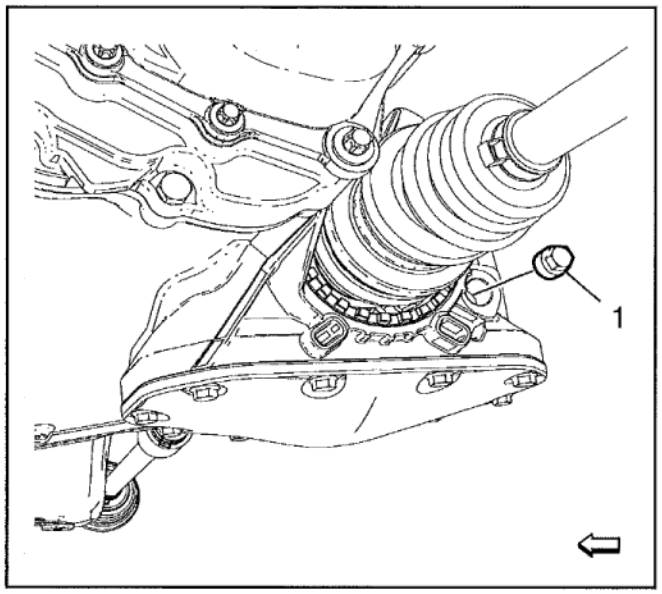
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*
2. Remove the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*
3. Place a basin underneath the vehicle.
4. Clean away all dirt and debris from the transmission case plug.



2191523

5. Remove the transmission case plug (1). DISCARD the case plug.
6. Add transmission fluid until it seeps out of the plug hole.

Installation Procedure



2191523

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

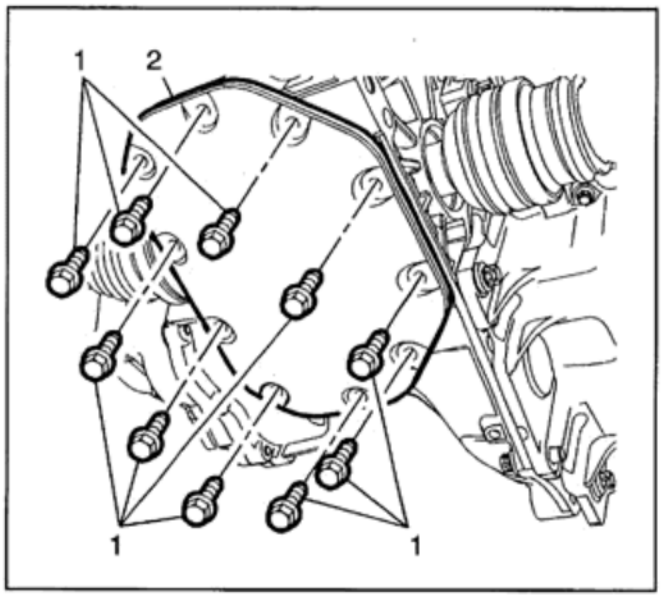
1. Install a NEW case plug (1) and tighten to **4N•m (35 lb in) plus 45-135 degrees**.
2. Install the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*
3. Lower the vehicle.

Transmission Fluid Drain and Fill

Removal Procedure

Warning: The transmission fluid is hot. Caution must be taken to prevent personal injury when the transmission fluid drains from the transmission.

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. Place basin underneath.
4. Clean away all dirt and debris from transmission case plug area.

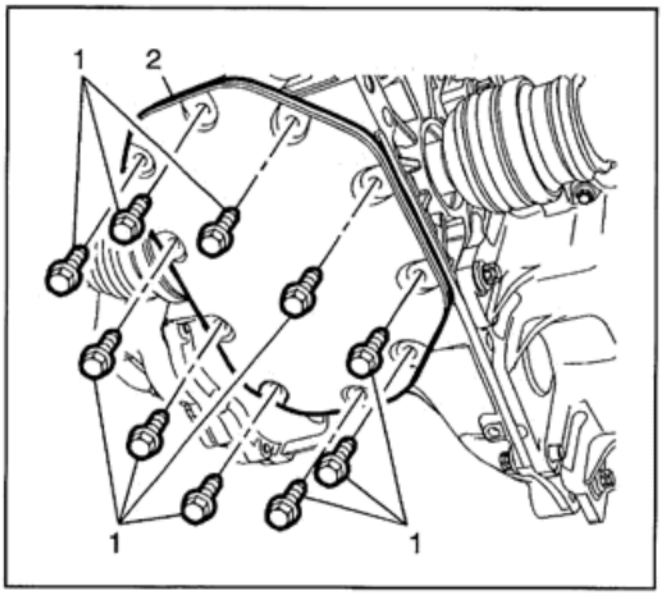


2566682

Note: If the front differential carrier cover is removed, the transmission fluid is discharged.

5. Remove the clutch and differential housing cover bolts (1).
6. Remove the clutch and differential housing cover (2) and allow the transmission to drain completely.
7. Remove and DISCARD the clutch and differential housing cover gasket.

Installation Procedure

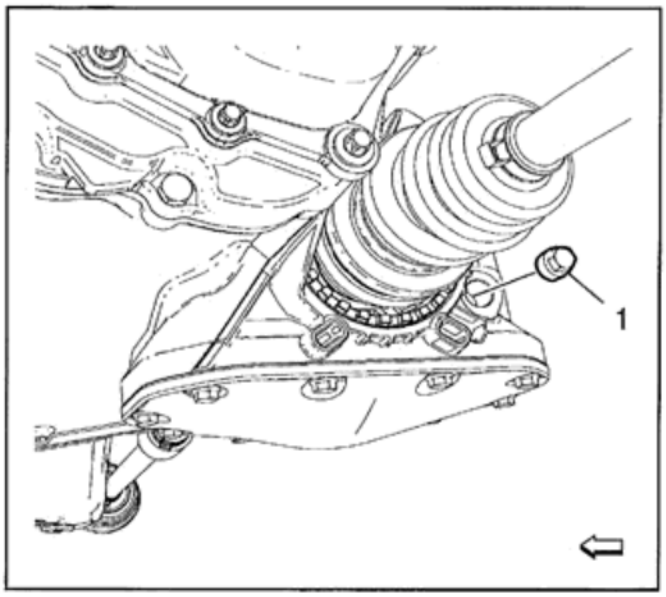


2566682

1. Install the NEW clutch and differential housing cover gasket.
2. Install the clutch and differential housing cover (2).

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

3. Install the clutch and differential housing cover bolts (1) and tighten to **18 N•m (13 lb ft)**.



2191523

Warning: Use care when working around exhaust heat shields. The heat shields may have sharp edges and can cause personal injury if contact is made. Always install a temporary cover to the heat shield to reduce the risk of injury.

4. Remove and DISCARD the transmission case plug (1).
5. Add transmission fluid until it seeps out of plug hole.
6. Install the NEW transmission case plug (1) and tighten to **4 N•m (35 lb in) plus 45–135 degrees**.
7. Install the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
8. Lower the vehicle.

Manual Transmission Shift Lever Cable Adjustment

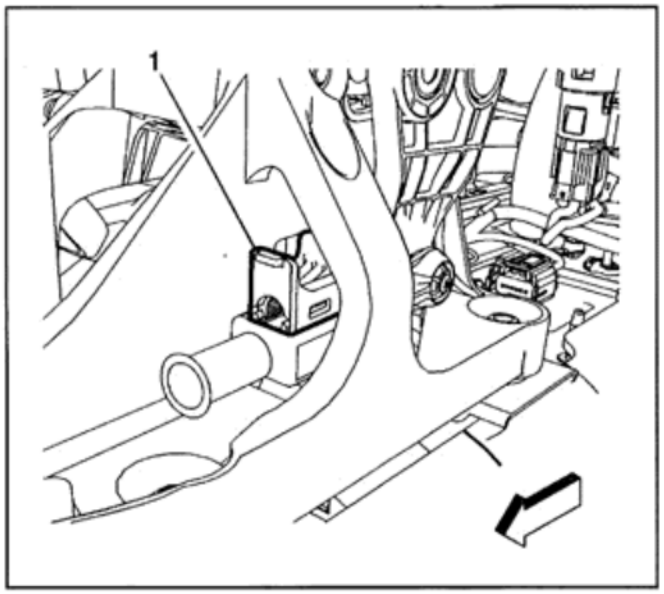
Special Tools

DT-527-A Adjuster or 5mm drill bit

For equivalent regional tools, refer to *Special Tools on page 17-535*.

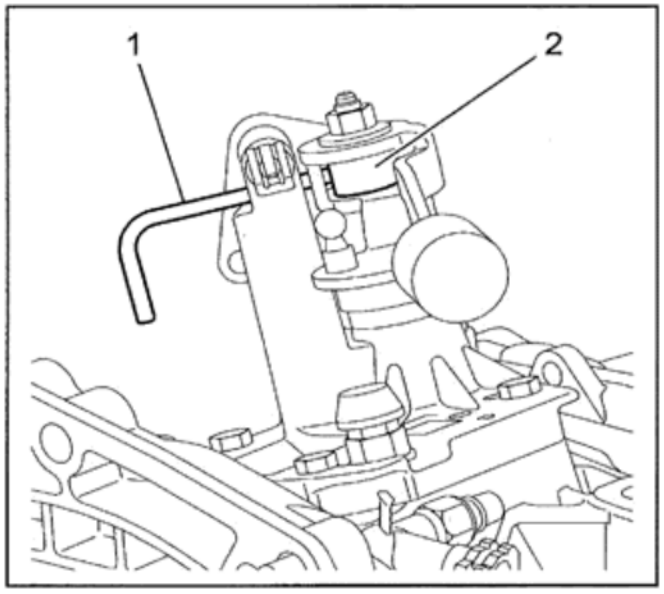
Note: Not using the specified tools may lead to shift system mis-adjustment.

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



2505111

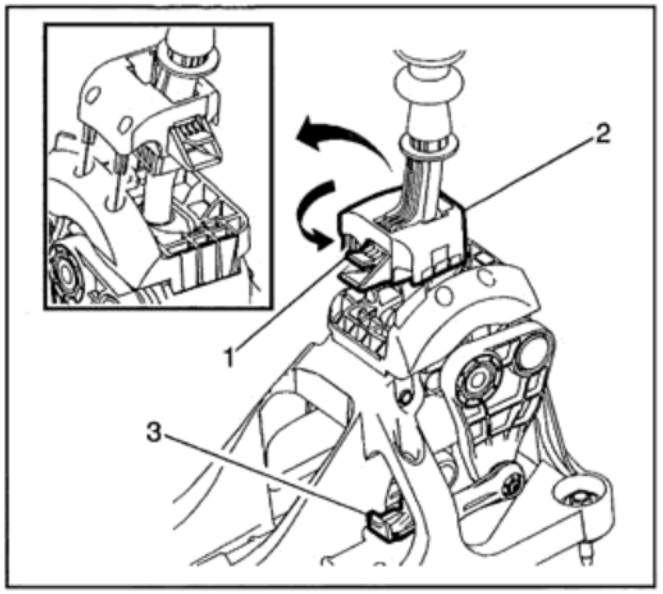
2. Lift upward and disengage (do not remove) cable lock adjuster (1) to release the internal cable assembly, one for each cable.



2342591

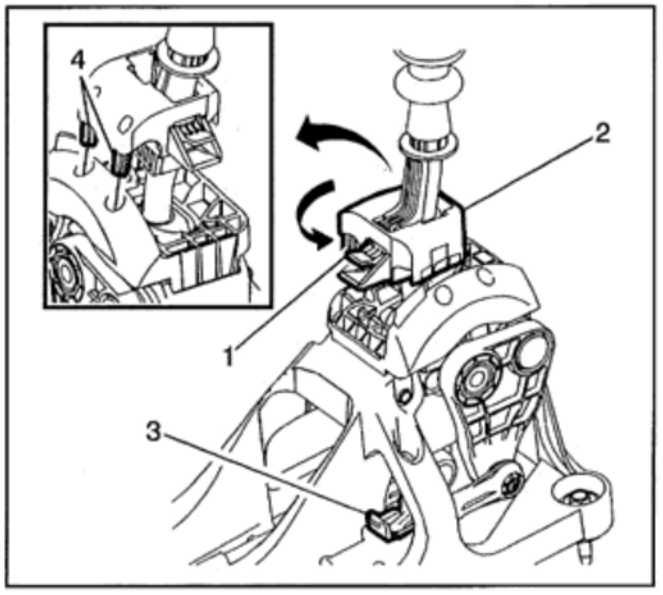
Note: The hole of the transmission gear control (2) must be aligned to the hole in the base so the pin (1) can pass thru both. The transmission gear control will be locked in the 1–2 neutral position.

3. Lock the transmission gear control with DT-527-A pin (1) or 5mm drill bit.



2526642

4. Lock the position of the shifter 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 in holes located on shifter base by pushing down device (2) until seated.



2726170

5. Secure adjuster locks (3) by pushing down until locked. One for each cable.

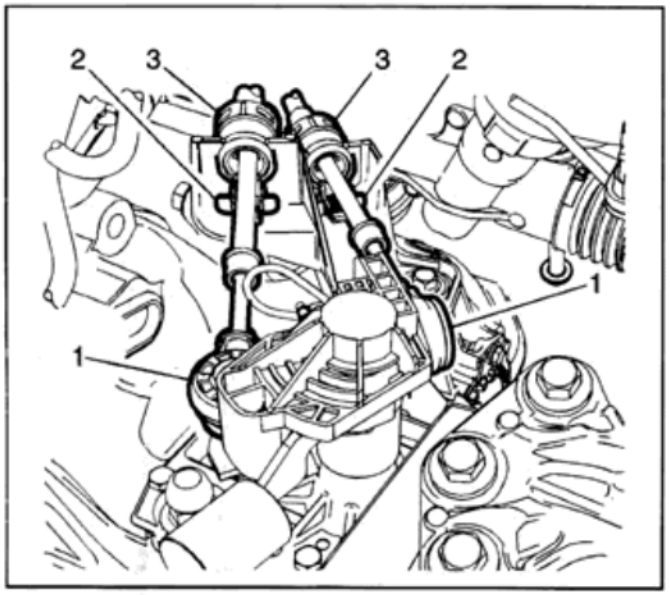
Note: During this procedure DO NOT touch or preload the fixed shift lever as this may cause mis-adjustment to the shift system.

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.
7. Remove the DT-527-A lock pin or drill bit from the transmission gear control.
8. Install the floor console. Refer to *Front Floor Console Replacement on page 2-61*.
9. Verify correct operation of the transmission control assembly.

Manual Transmission Shift Lever and Selector Lever Cable Replacement

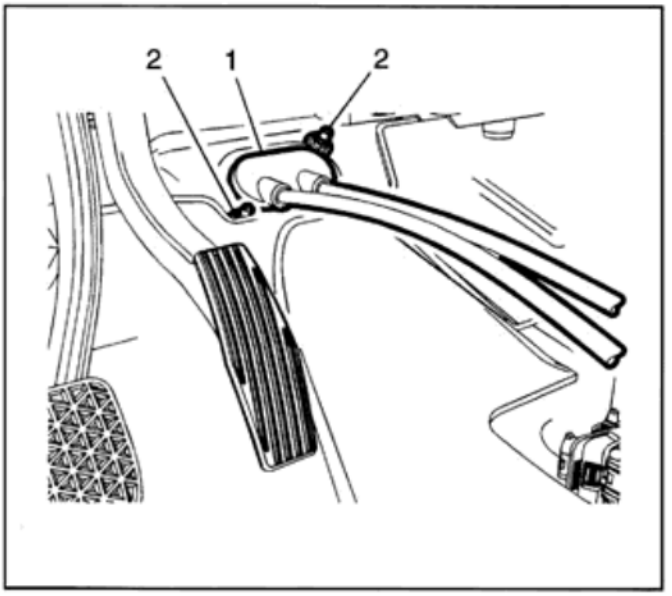
Removal Procedure

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



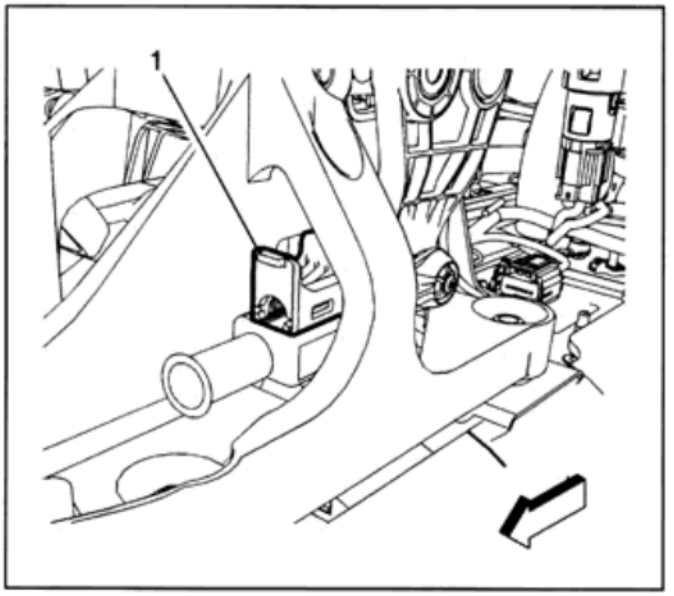
2512882

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



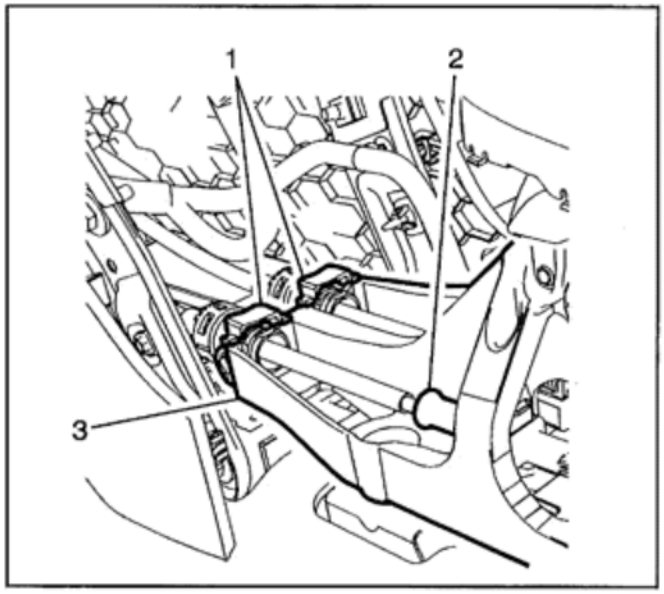
2510324

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



2505111

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

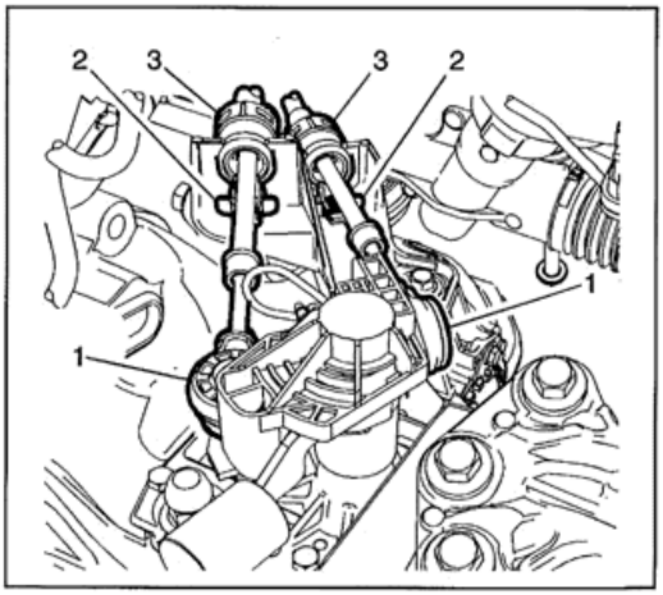


2504879

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

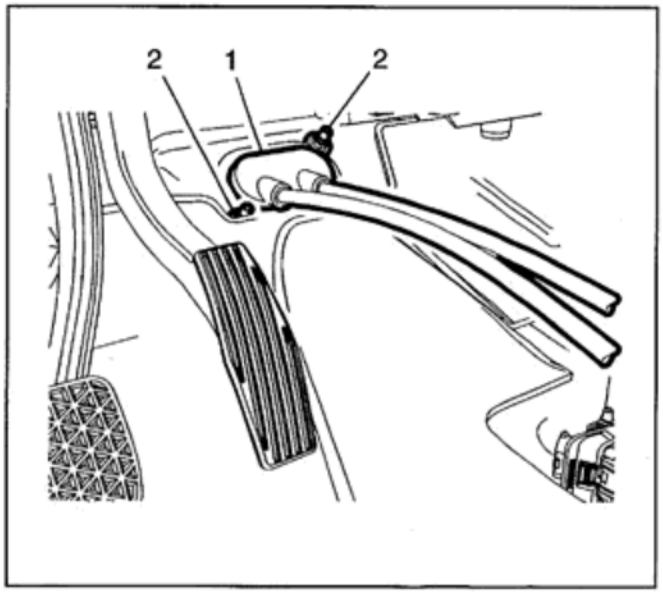
Installation Procedure

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



2512882

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

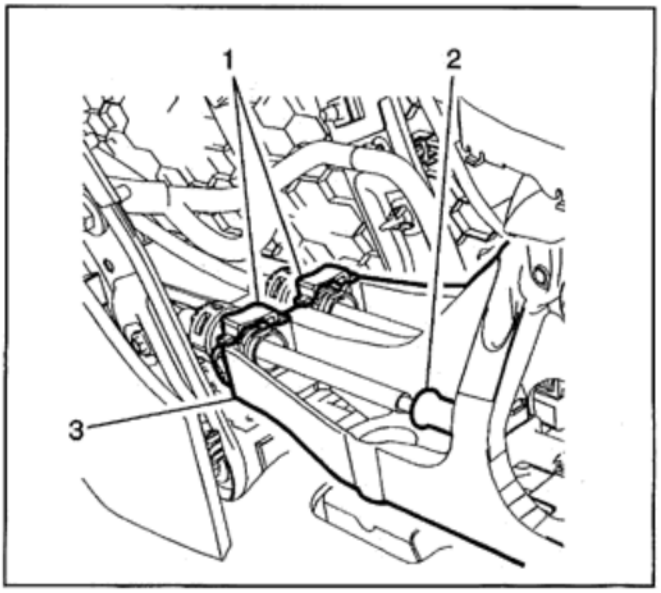


2510324

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

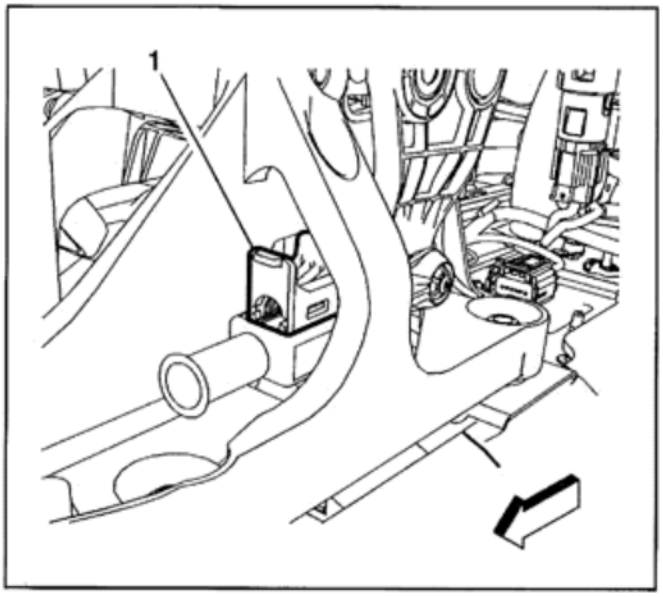
Caution: Refer to *Component Fastener Tightening Caution on page 0-8*.

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



2504879

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



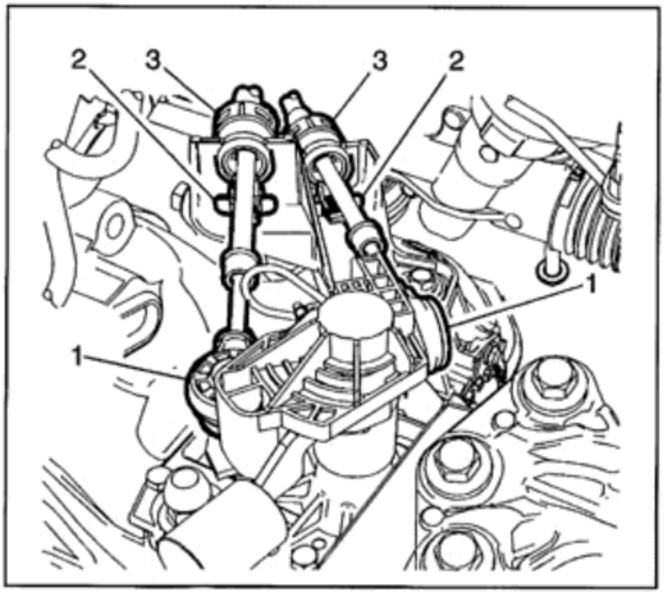
2505111

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 Cable Adjustment on page 17-453*.
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

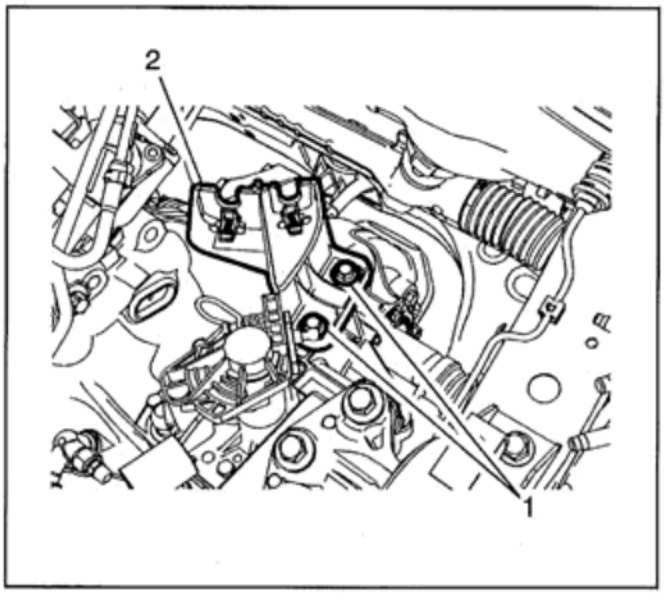
Removal Procedure

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



2512882

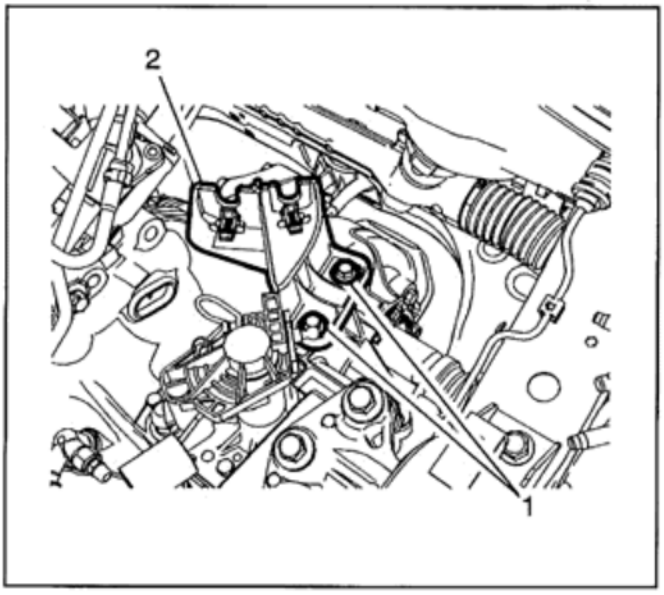
2. Disconnect the shift cable and selector cable ends (1) from the transmission shift lever and selector levers.
3. Pull the cable retainers (2) to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
4. Disconnect the shift lever and selector lever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



2512931

5. Remove the two 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

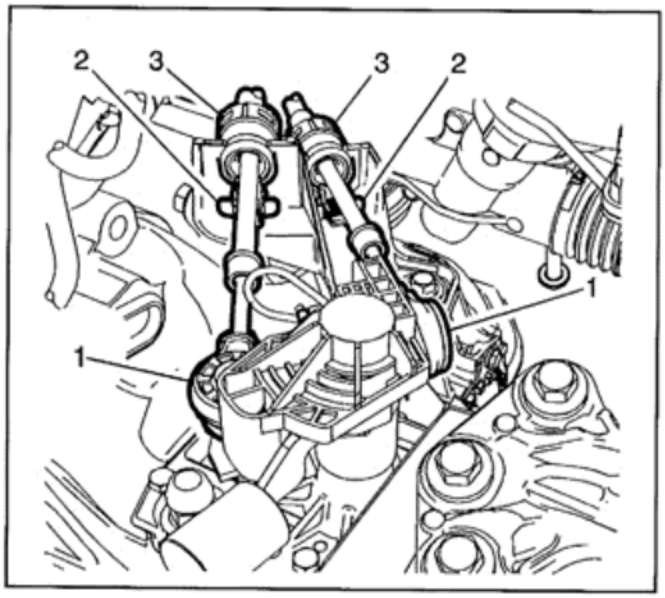


2512931

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 two shift lever and selector lever cable bracket fasteners (1) and tighten to **22** N•m **(16 lb ft)**.



2512882

3. Connect the shift lever and selector lever cable ends (1) to the transmission shift levers.
4. Install the shift lever and selector lever cable (3), to the shift lever and selector lever cable bracket.
5. Adjust the shift lever and selector lever cables. Refer to *Manual Transmission Shift Lever Cable Adjustment on page 17-453*.
6. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
7. Verify correct operation of the transmission control assembly.

Front Wheel Drive Shaft Seal Replacement - Left Side

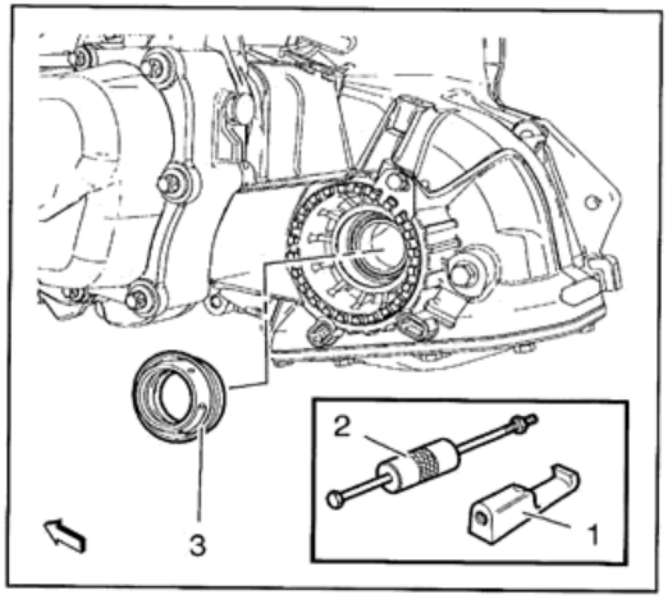
Special Tools

- *DT-446* Installer Drift
- *DT-7004* Slide Hammer
- *DT-23129* Universal Seal Remover

For equivalent regional tools, refer to *Special Tools on page 17-535*.

Removal Procedure

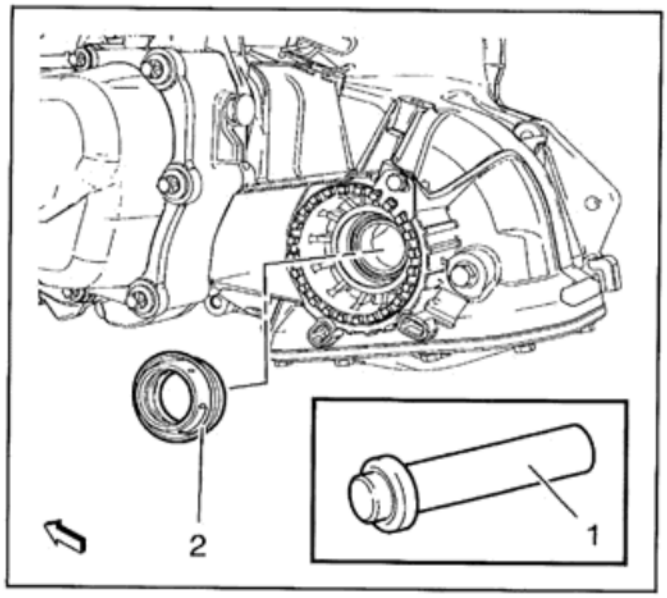
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
2. Remove the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
3. Remove the left wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.



2191375

4. Remove the left front wheel drive shaft oil seal (3) using the *DT-7004* hammer and the *DT-23129* remover (1).

Installation Procedure



2191376

1. Coat the NEW left front wheel drive shaft oil seal (2) with transmission fluid.
2. Install the NEW left front wheel drive shaft oil seal (2) using the *DT-446* drift and hammer (1).
3. Install the left wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
4. Install the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
5. Lower the vehicle.

Front Wheel Drive Shaft Seal Replacement - Right Side

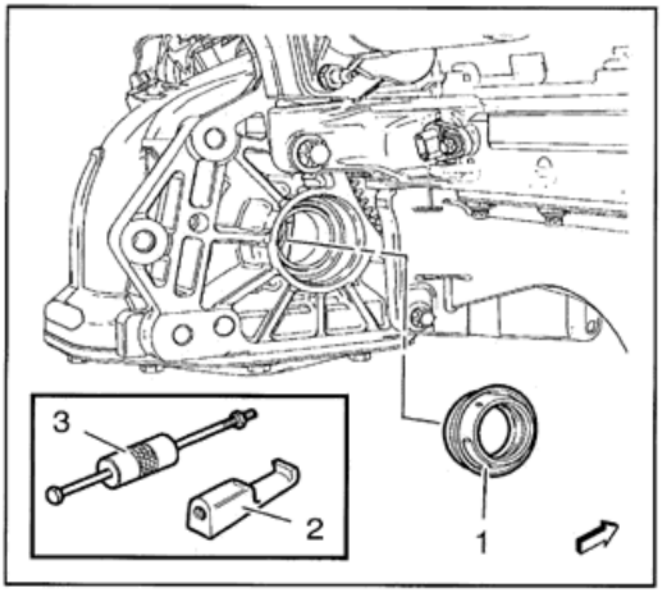
Special Tools

- *DT-446* Installer Drift
- *DT-7004* Slide Hammer
- *DT-23129* Universal Seal Remover

For equivalent regional tools, refer to *Special Tools on page 17-535*.

Removal Procedure

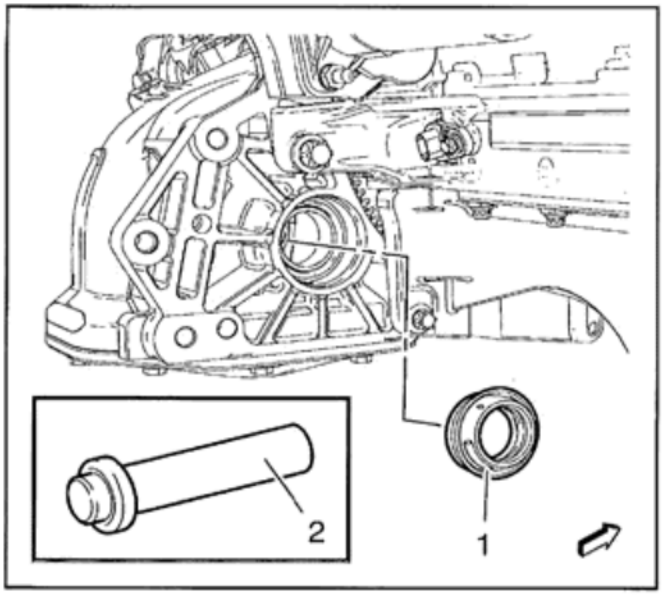
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
2. Remove the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
3. Remove the right wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.



2191373

4. Remove the right front wheel drive shaft oil seal (1) using the *DT-7004* hammer and the *DT-23129* remover (2).

Installation Procedure



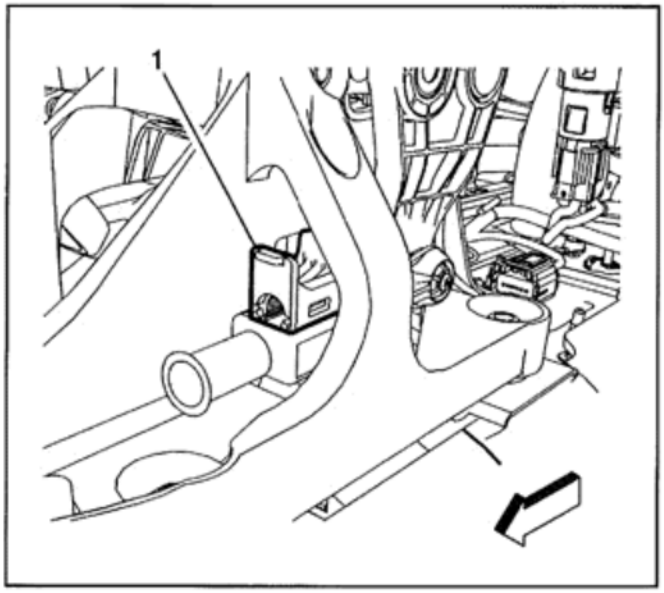
2191374

1. Coat the NEW right front wheel drive shaft oil seal (1) with transmission fluid.
2. Install the NEW right front wheel drive shaft oil seal (1) using the *DT-446* drift and hammer (2).
3. Install the wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
4. Install the front suspension skid plate, if equipped. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143*.
5. Lower the vehicle.

Transmission Control Replacement

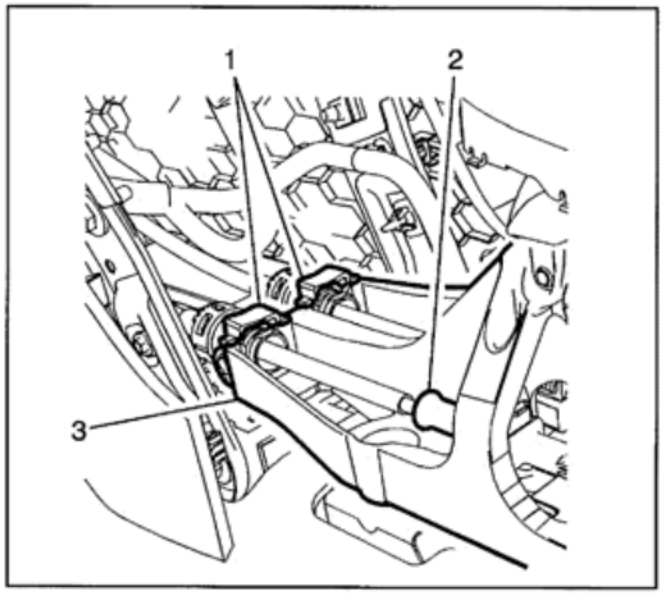
Removal Procedure

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



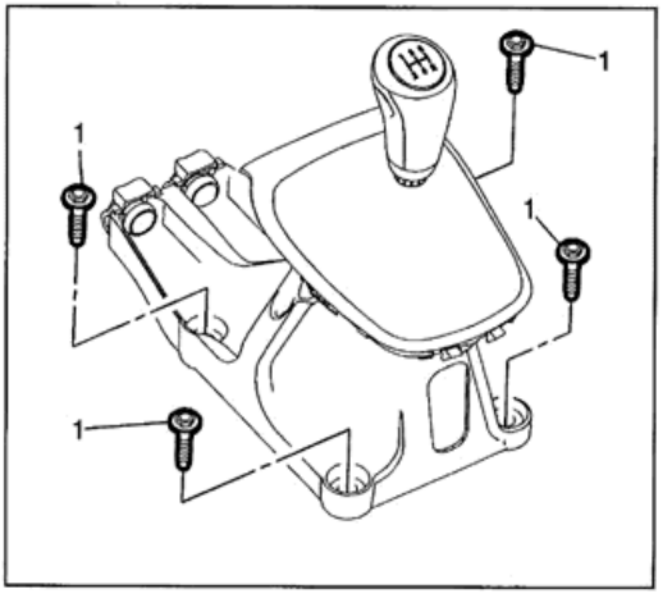
2505111

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



2504879

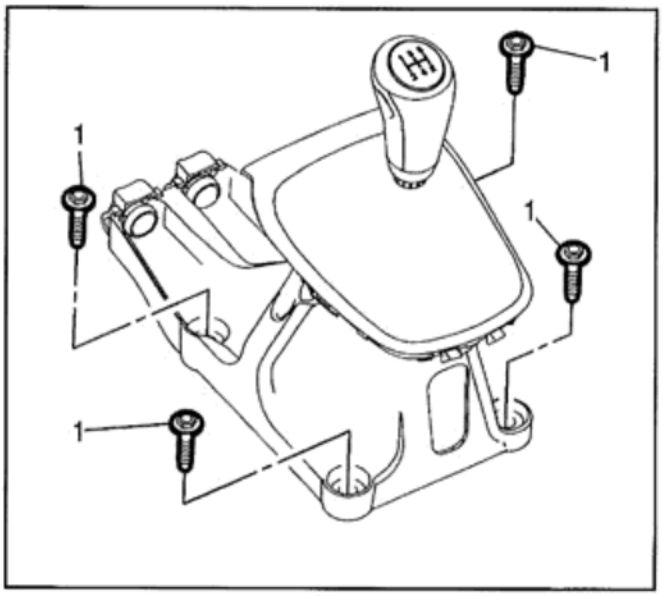
3. Pull the shift lever and selector lever cable retainers (1) from the transmission control assembly (3).
4. Remove the shift lever and selector cable from the shift and selector control



2531689

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

Installation Procedure

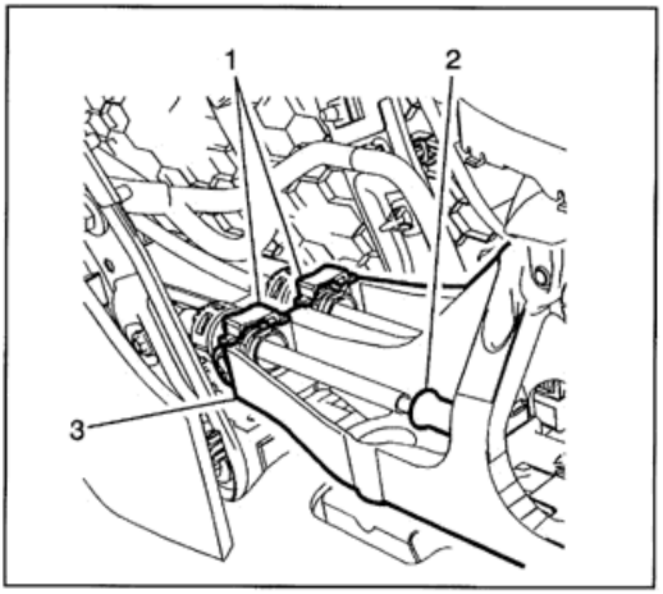


2531689

1. Position the transmission control in the vehicle.

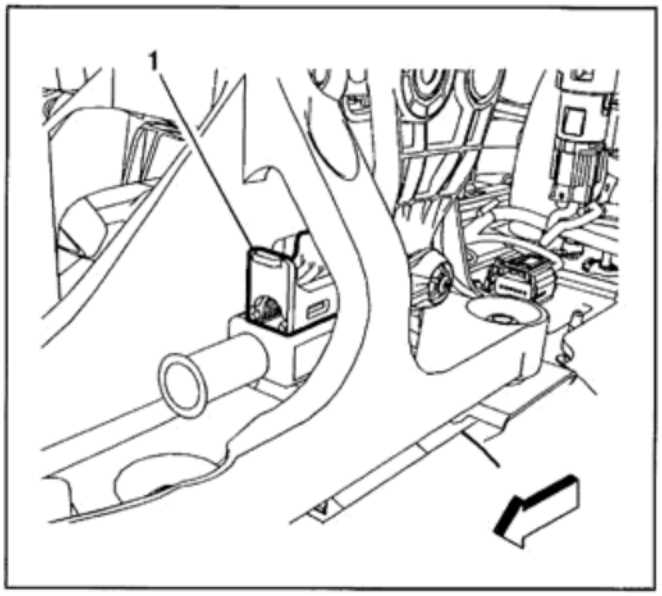
Caution: Refer to *Fastener Caution on page 0-8.*

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)



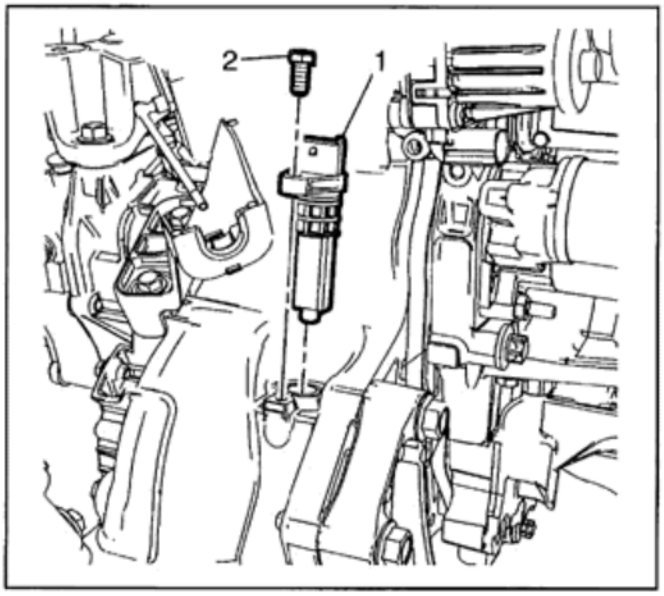
2505111

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 Cable Adjustment on page 17-453*.
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.

Vehicle Speed Sensor Replacement

Removal Procedure

1. Disconnect the speedometer speed sensor electrical connector.

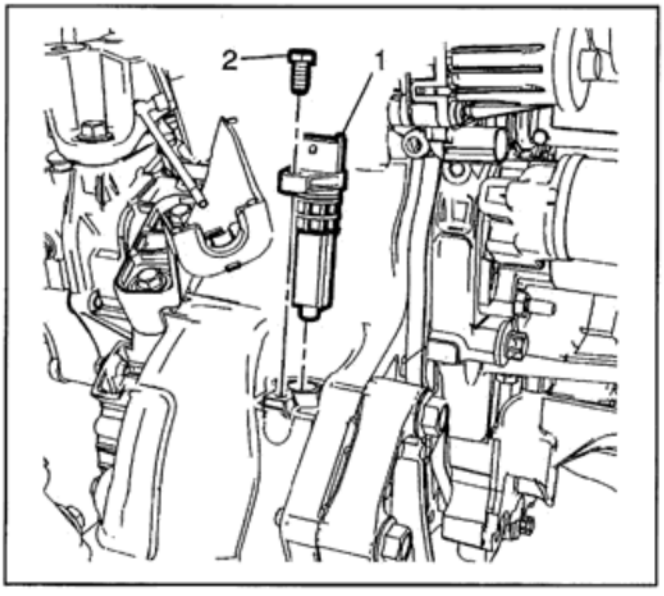


2512921

2. Remove the speedometer housing retaining bolt (2).
3. Remove the speedometer-driven gear (1).

Installation Procedure

1. Coat the O-ring with transmission fluid.



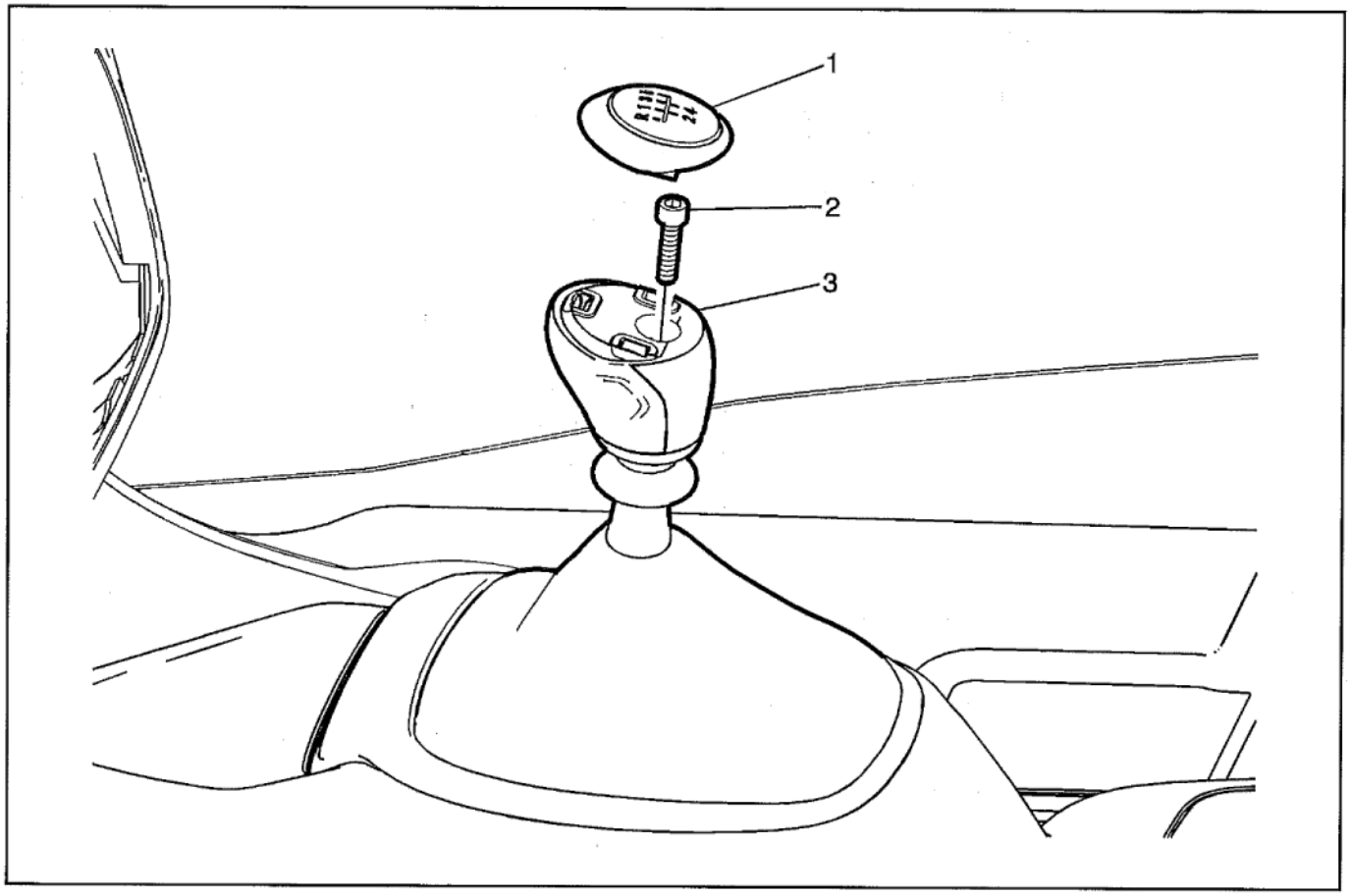
2512921

2. Install the speedometer-driven gear (1).

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

3. Install the speedometer housing retaining bolt (2) and tighten to **4 N•m (35 lb in)**.
4. Connect the speedometer speed sensor electrical connector.

Transmission Control Lever Boot Replacement



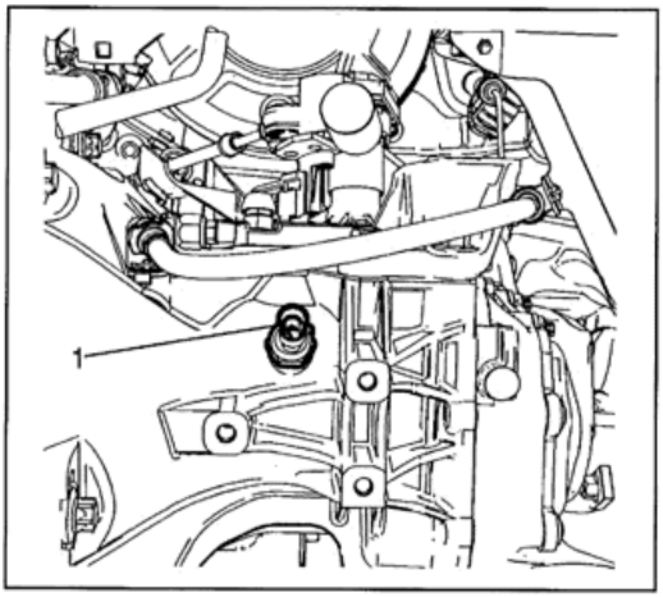
2595753

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

Backup Lamp Switch Replacement

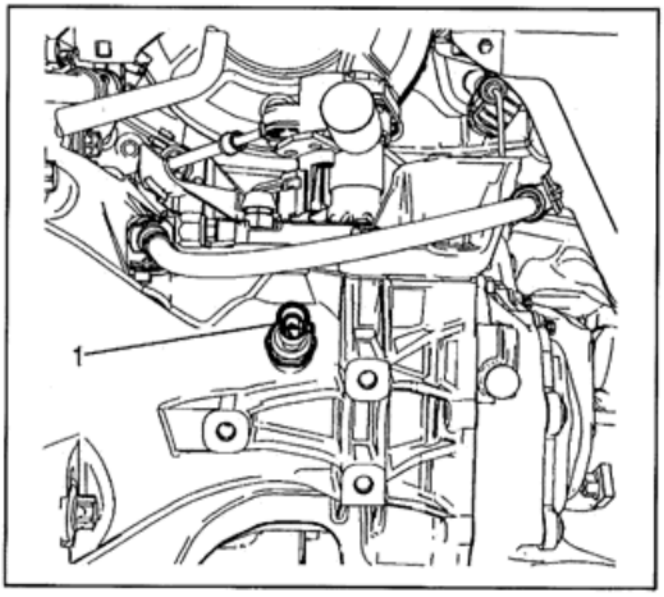
Removal Procedure



2512913

1. Disconnect the electrical connector from the backup lamp switch (1).
2. Remove the backup lamp switch (1) from the transmission.
3. Remove and DISCARD the backup lamp switch washer from the backup lamp switch.

Installation Procedure



2512913

1. Install a NEW backup lamp switch washer on the backup lamp switch (1).

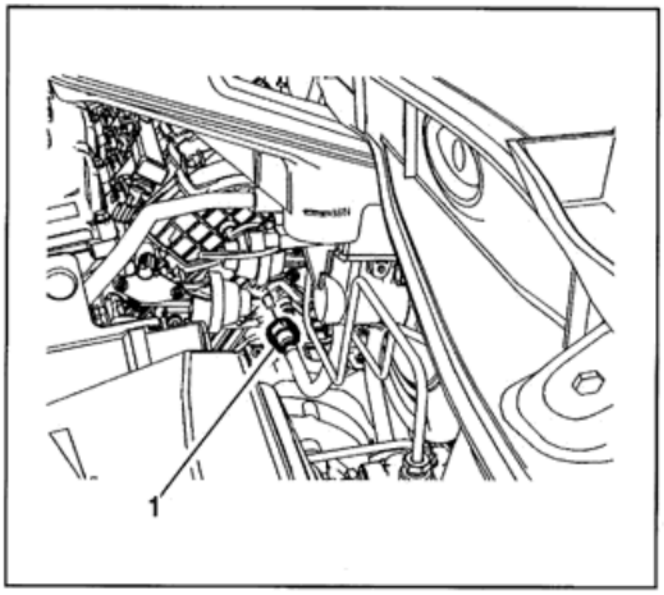
Caution: Refer to *Component Fastener Tightening Caution on page 0-8.*

2. Install the backup lamp switch (1) into the transmission case, and tighten to **20** N•m **(15 lb ft).**
3. Connect the electrical connector to the backup lamp switch (1).

Transmission Replacement

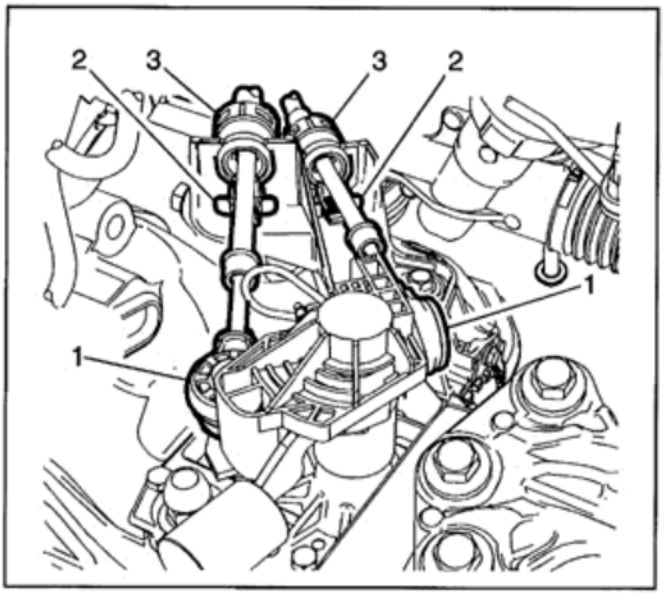
Removal Procedure

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



2511350

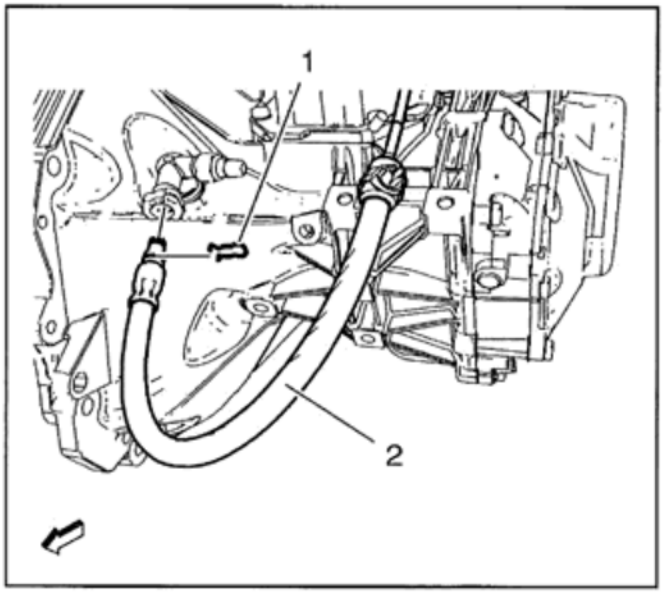
3. Disconnect the brake booster vacuum hose (1) from the engine intake manifold.



2512882

4. Disconnect the shift lever and selector lever cable end (1) from the transmission shift lever and selector lever.

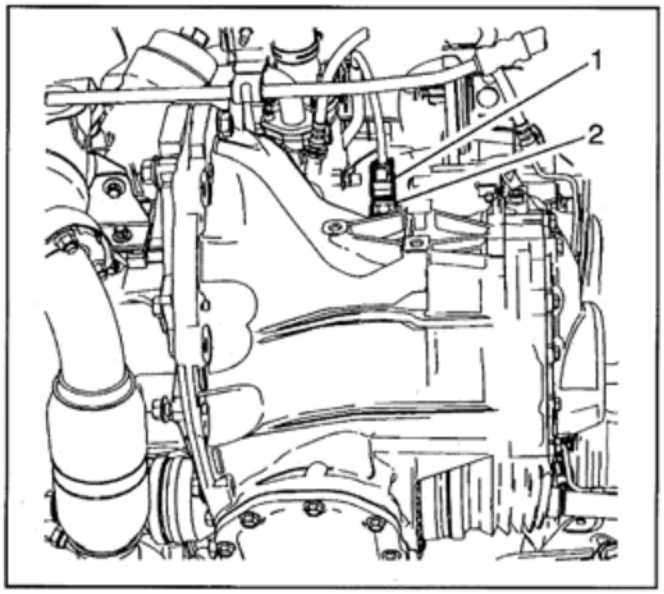
5. Pull the cable retainers (2) to release the shift lever and selector lever cable from the shift lever and selector lever cable bracket.
6. Disconnect the shift lever and selector lever cable from the shift lever and selector lever cable bracket.



2028287

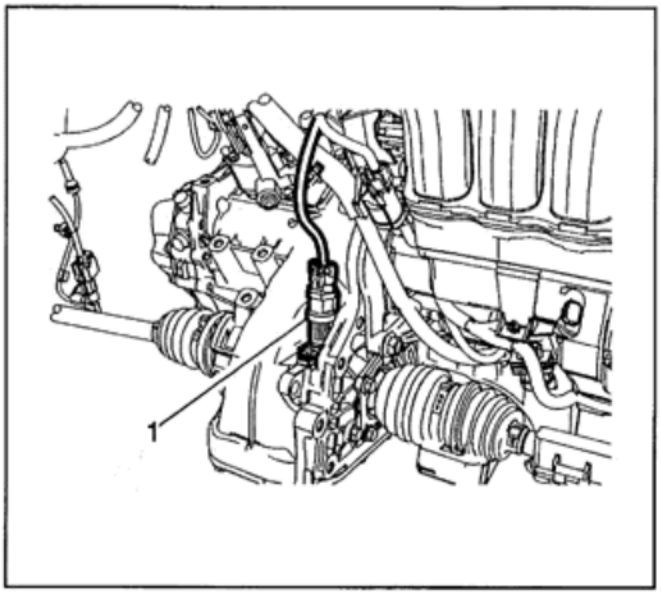
Note: Before disconnecting the clutch actuator cylinder front pipe, remove the clutch/brake fluid from the reservoir tank.

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



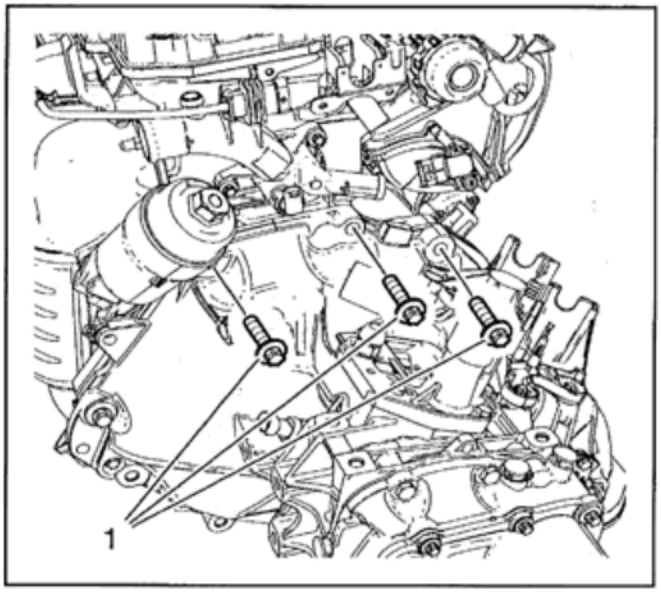
2505611

9. Disconnect the electrical connector (1) from the backup lamp switch (2).



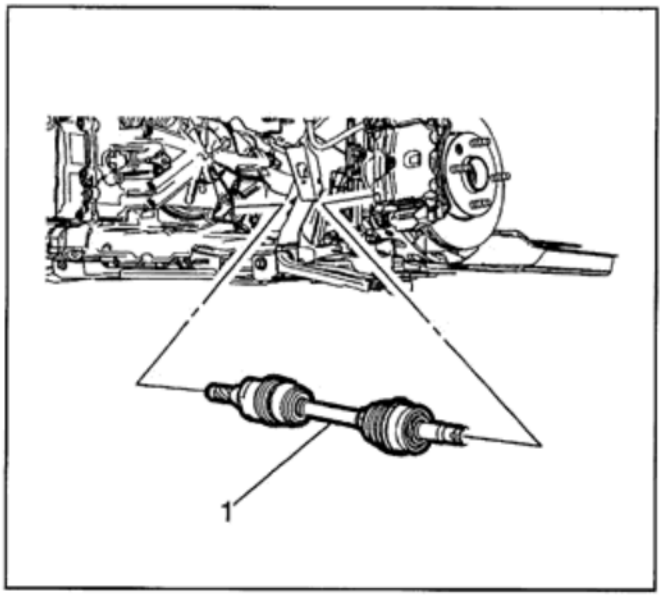
2511276

10. Disconnect the speedometer driven gear electrical connector (1).



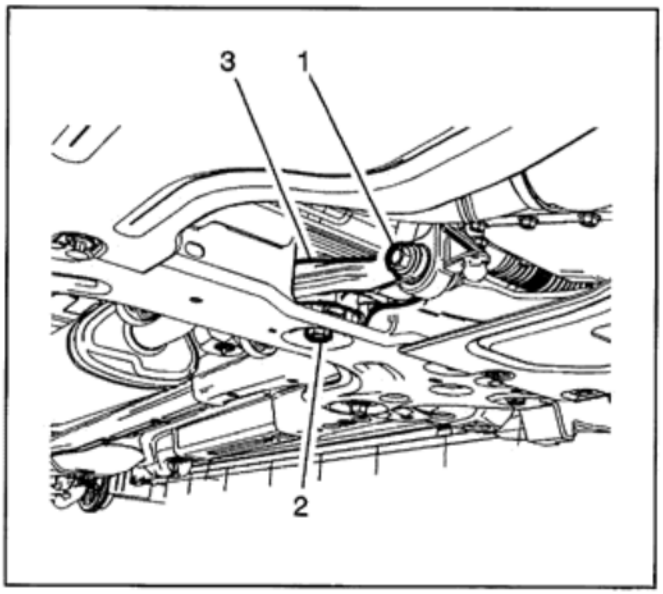
2191679

11. Remove the upper transmission bolts (1).
12. Install the engine support fixture. Refer to *Engine Support Fixture on page 9-854*.
13. Drain the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 17-452*.
14. Remove the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.



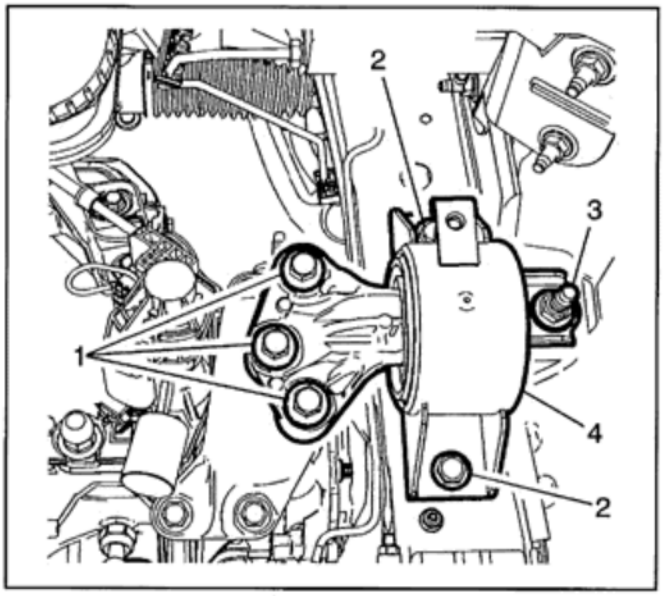
2508569

15. Remove the right front wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
16. Remove the left front wheel drive shaft from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.



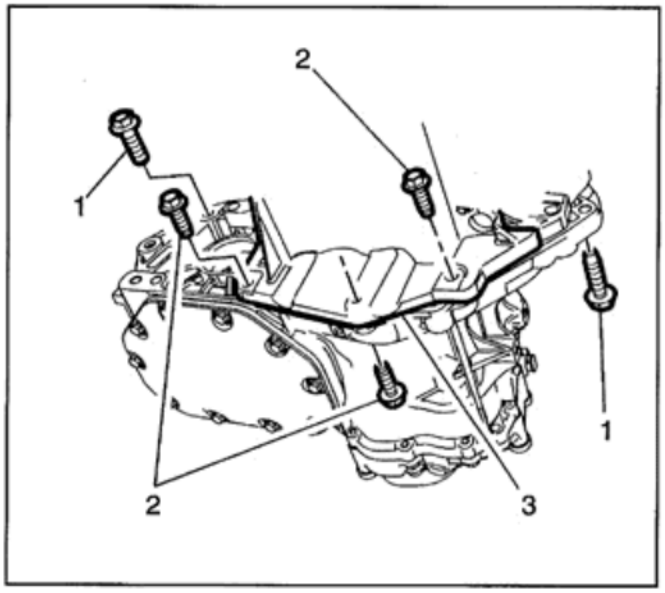
2503662

17. Remove the rear transmission mount (3). Refer to *Transmission Rear Mount Replacement on page 17-449*.
18. Remove the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.



2512886

19. Remove the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-449*.
20. Remove the left transmission mount bracket. Refer to *Transmission Mount Bracket Replacement - Left Side on page 17-451*.
21. Use a transmission jack in order to support the transmission.



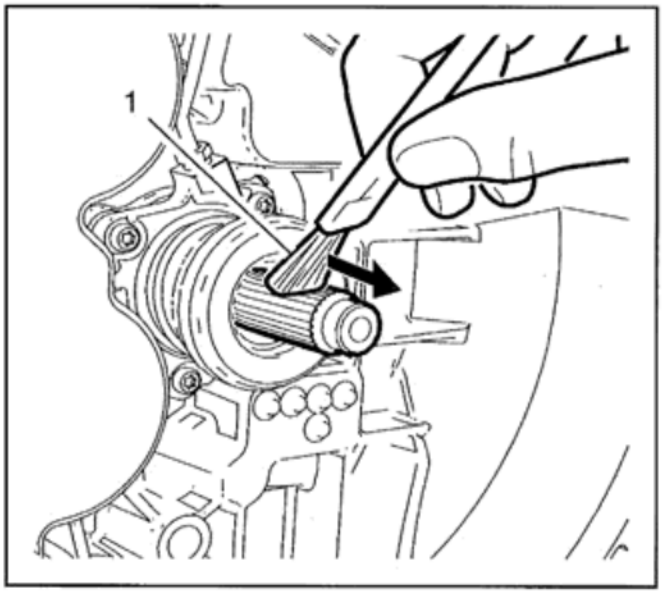
2566444

22. Remove the lower transmission bolt (3) and nut (4).
23. Remove the lower transmission bolts (1, 2)
24. Separate the transmission from the engine.
25. Lower the transmission with the transmission jack far enough to remove the transmission.

Installation Procedure

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

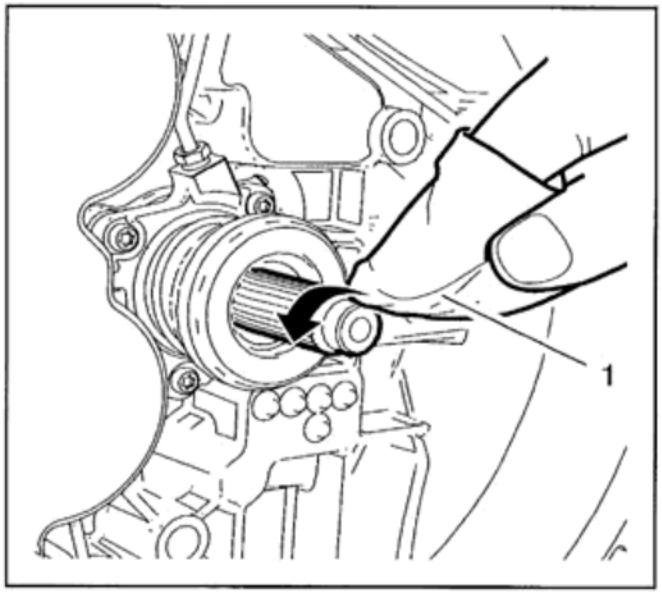
1. Clean the clutch hub and the input shaft from any debris and contaminates with a lint-free towel.



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.

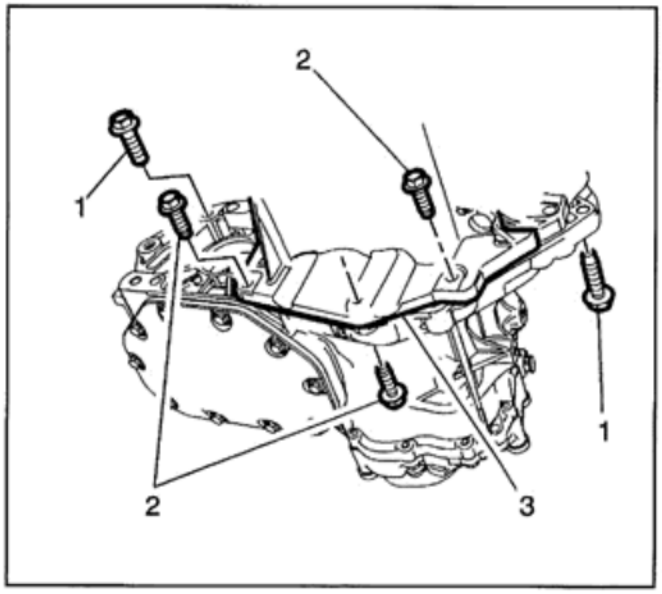
2. Use a clean flat brush (1) to apply very light coating of multi-purpose grease to input shaft until the metal is only shiny . No visible clumps of grease are permissible regardless of size. Smear away from the transmission in direction of the shown arrow.



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 with the transmission jack and position the transmission to the engine.

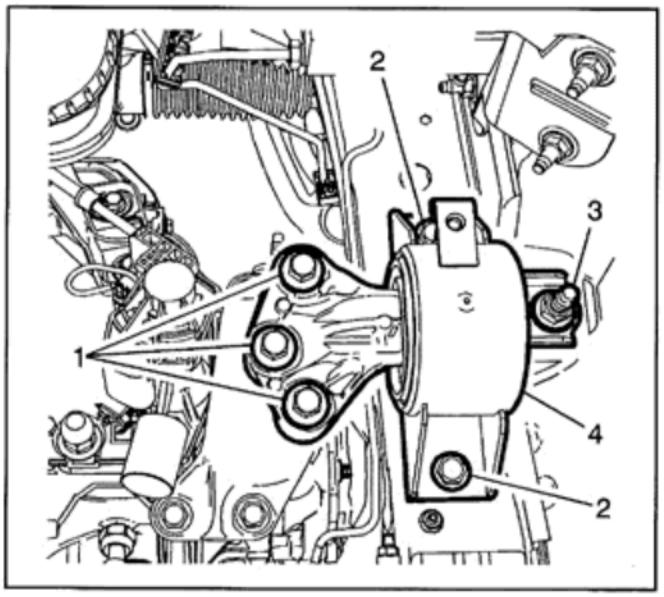


2566444

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

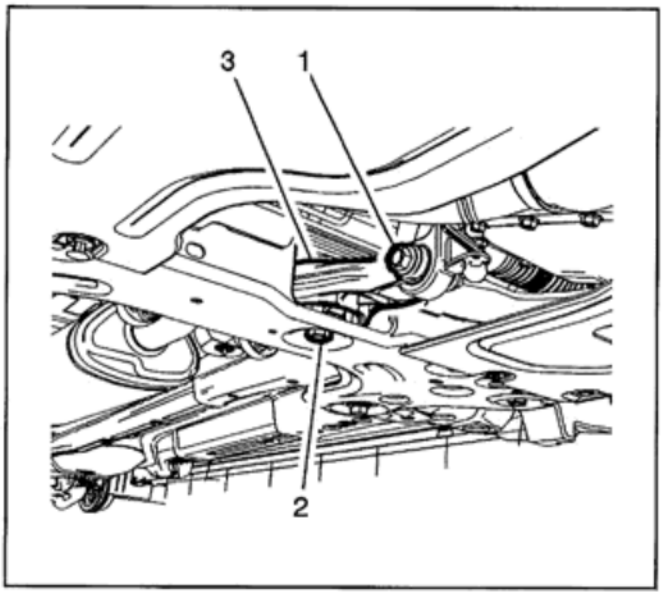
5. Install the lower transmission bolts (1) and tighten to **60** N•m **(44 lb ft)**.
6. Install the lower transmission bolts (2) and tighten to **40** N•m **(32 lb ft)**.
7. Install the lower transmission bolt (3) and nut (4) and tighten to **40** N•m **(32 lb ft)**.
8. Remove the transmission jack.

9. Install the left transmission mount bracket. Refer to *Transmission Mount Bracket Replacement - Left Side on page 17-451*.



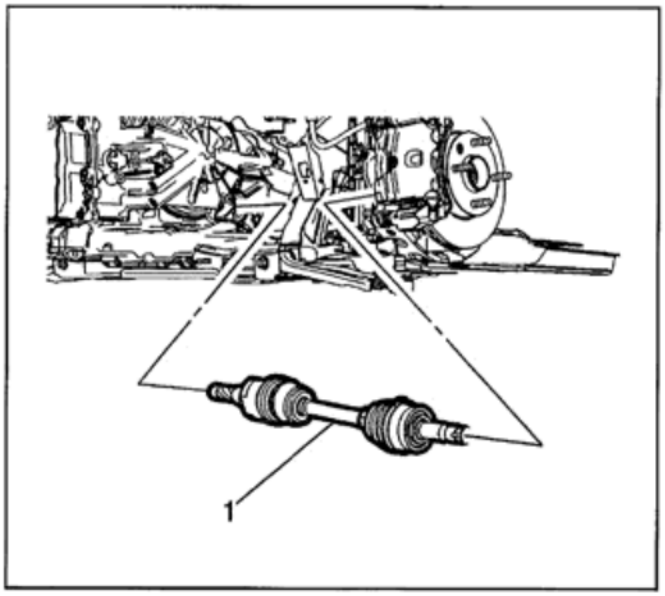
2512886

10. Install the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-449*.
11. Install the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.



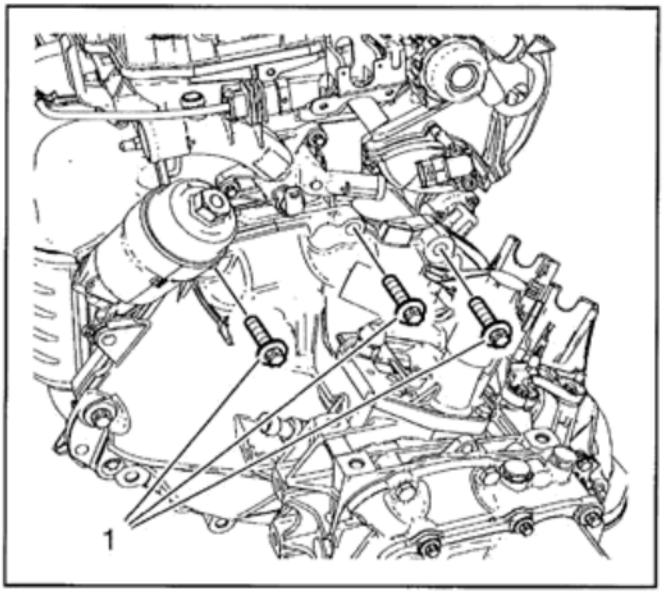
2503662

12. Install the rear transmission mount (3). Refer to *Transmission Rear Mount Replacement on page 17-449*.



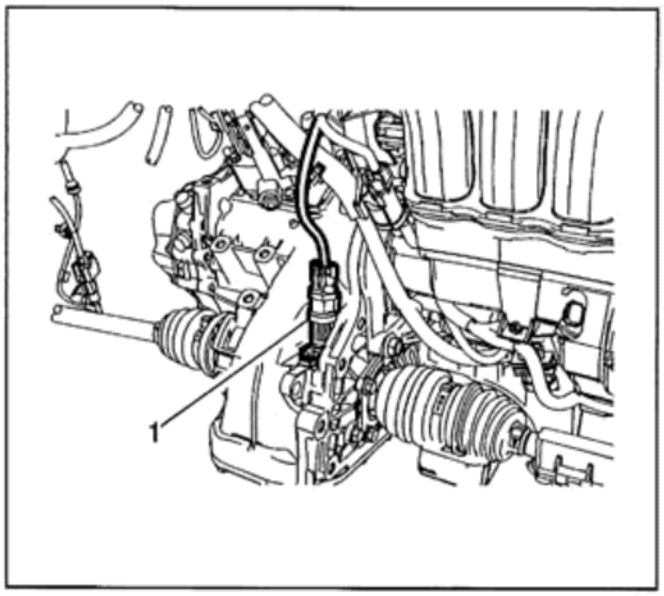
2508569

13. Install the left front wheel drive shaft to the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
14. Install the right front wheel drive shaft to the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
15. Install the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.



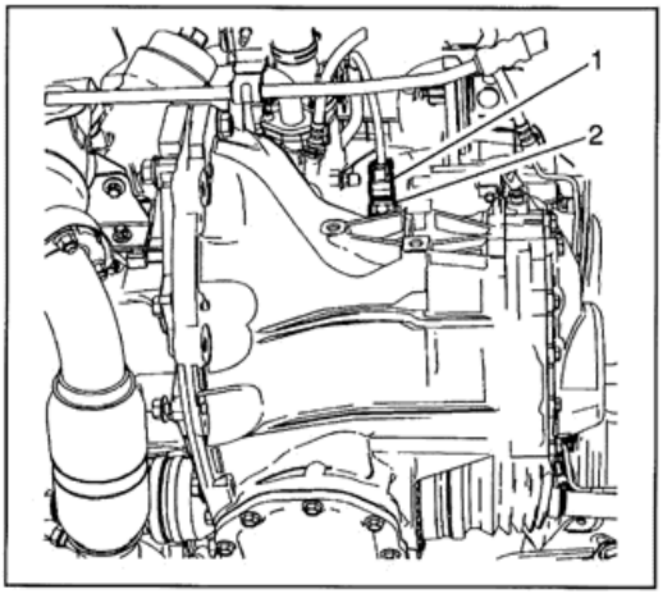
2191679

16. Remove the engine support fixture. Refer to *Engine Support Fixture on page 9-854*.
17. Install the upper transmission to engine bolts (1) and tighten to **60 N•m (44 lb ft)**.



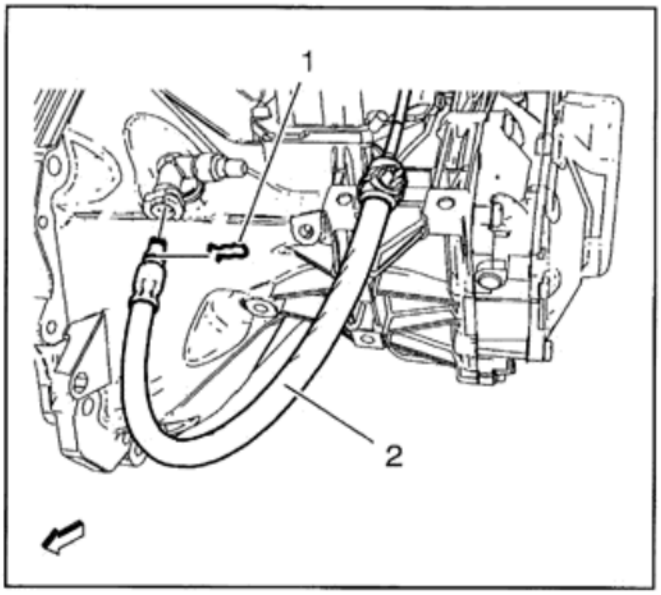
2511276

18. Connect the speedometer driven gear electrical connector (1).



2505611

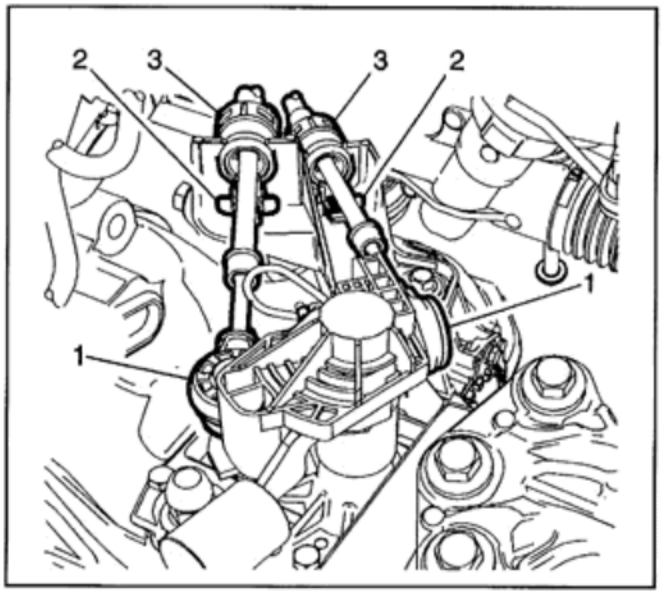
19. Connect the electrical connector (1) to the backup lamp switch (2).
20. Connect the wiring harness clamp to the transmission.



2028267

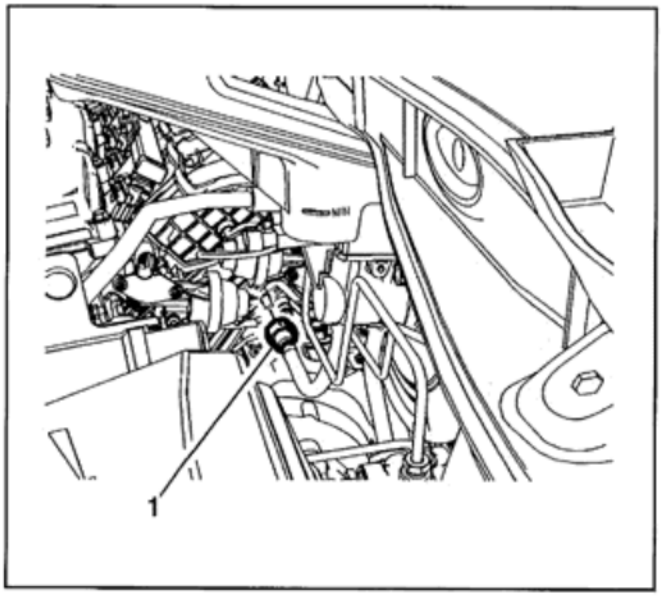
Note: The clutch actuator cylinder front pipe must engage noticeably.

21. Connect the clutch actuator cylinder front pipe (2) to the clutch actuator cylinder pipe elbow.
22. Lock the clutch actuator cylinder front pipe retaining clip (1).



2512882

23. Connect the shift lever and selector lever cable ends (1) to the transmission shift lever and selector lever.
24. Install the shift lever and the selector lever cable (3) to the shift lever and the selector lever cable bracket.
25. Adjust the shift lever and selector lever cables. Refer to *Manual Transmission Shift Lever and Selector Lever Cable Adjustment on page 17-574*.



2511350

26. Connect the brake booster vacuum hose (1)to the engine intake manifold.
27. Fill the transmission with fluid. Refer to *Transmission Fluid Drain and Fill on page 17-452*.
28. Install the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630*.
29. Install the battery and battery tray. Refer to *Battery Tray Replacement on page 9-721*.
30. Bleed the clutch hydraulic system. Refer to *Hydraulic Clutch System Bleeding on page 17-415*.
31. Road test the vehicle.

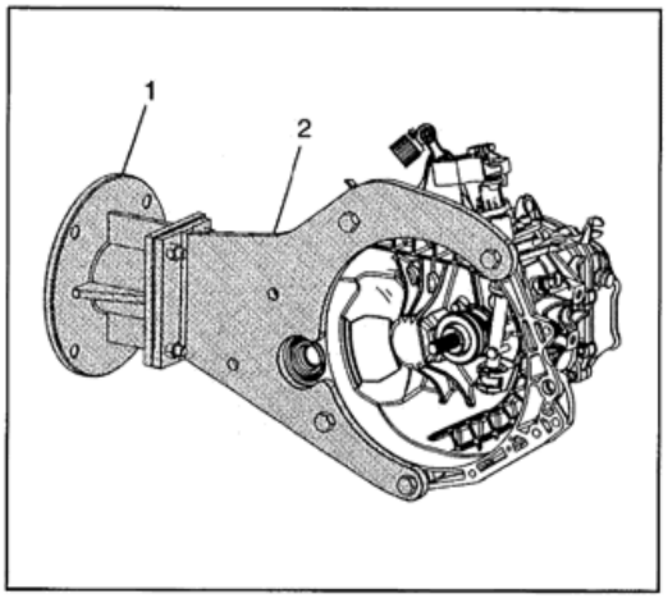
Repair Instructions - Off Vehicle

Transmission Disassemble

Special Tools

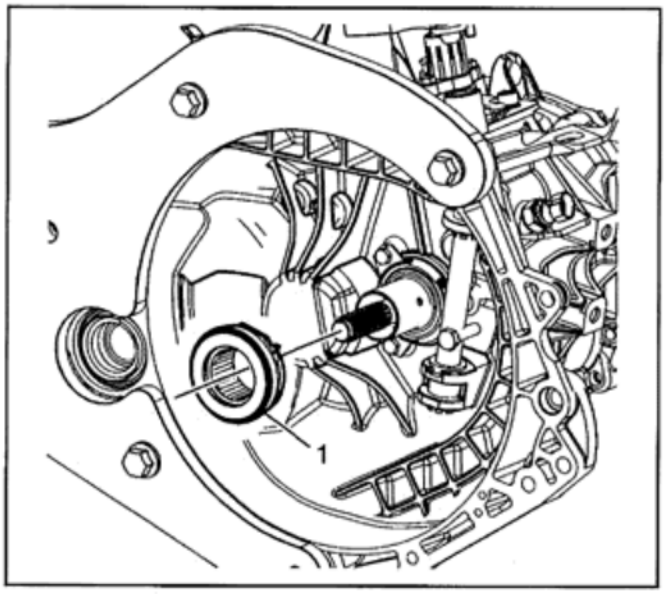
- *3-9506289* Universal Adapter
- *R-0007758* Holding Fixture
- *S-9407198* Differential Bearing Race Wrench

For equivalent regional tools, refer to *Special Tools on page 17-535*.



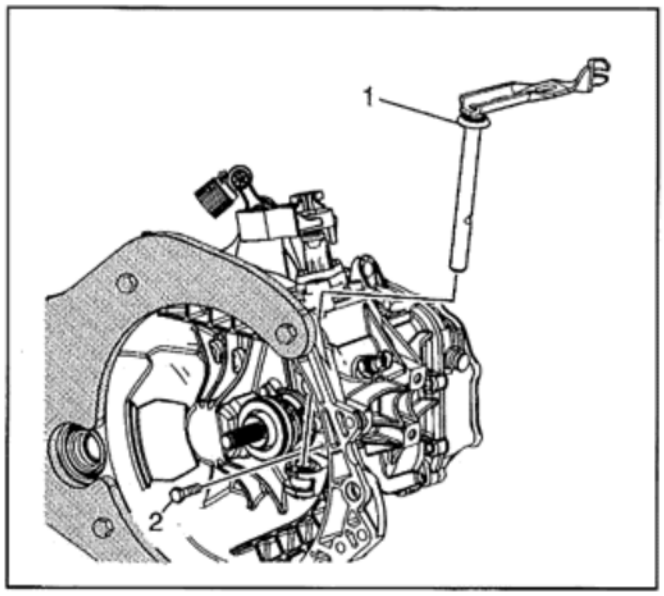
2262246

1. Attach *R-0007758* holding fixture (2) to the transmission.
2. Attach *R-0007758* holding fixture (2) with transmission to the *3-9506289* Universal Adapter (1).



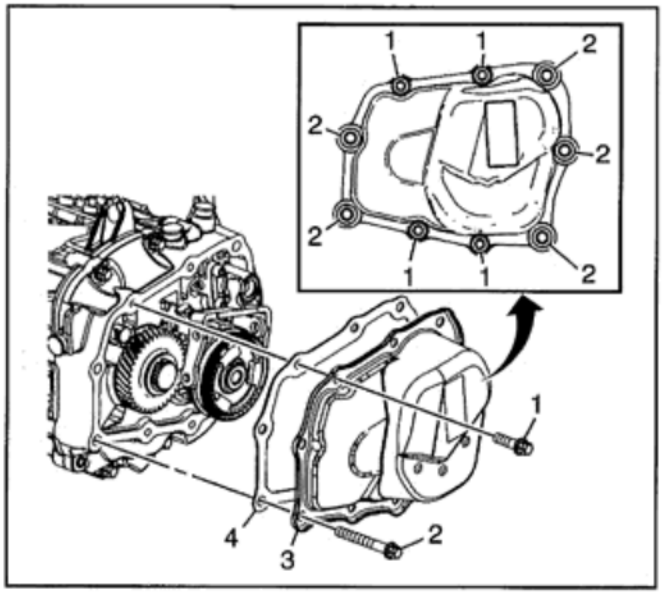
2276933

3. Remove the clutch release bearing (1).



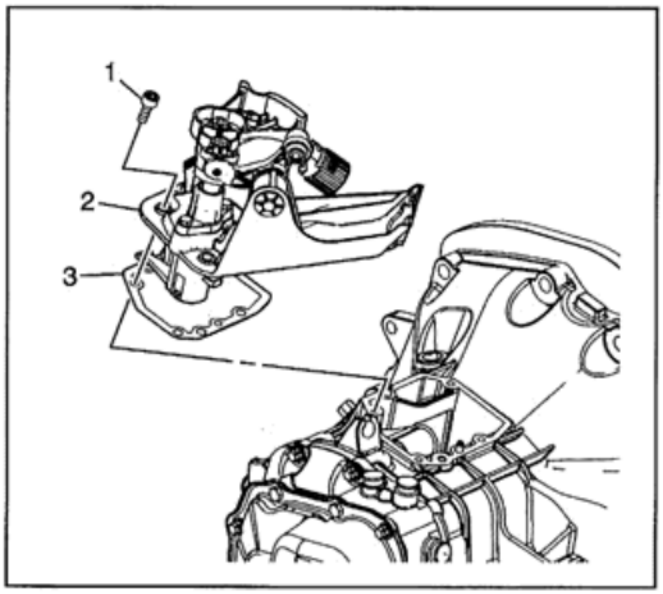
2262247

4. Remove the clutch fork shaft retaining bolt (2).
5. Remove the clutch fork shaft (1).



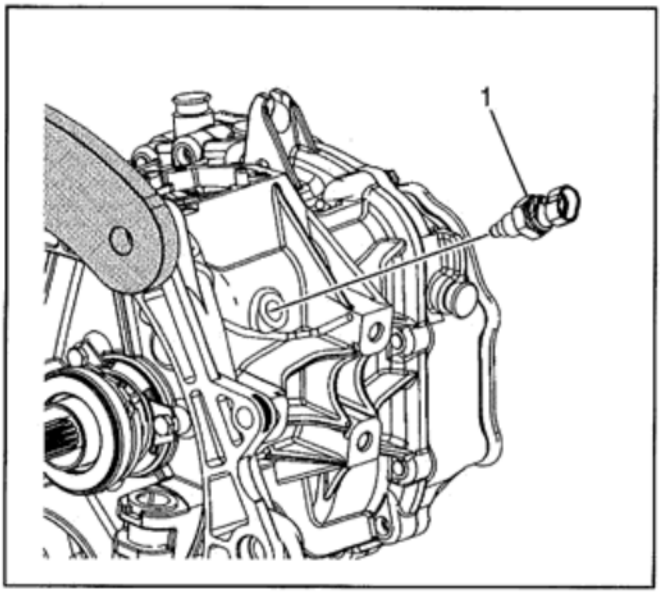
2262250

8. Remove the transmission cover bolts (3).
9. Remove the transmission cover (2) and gasket (1).



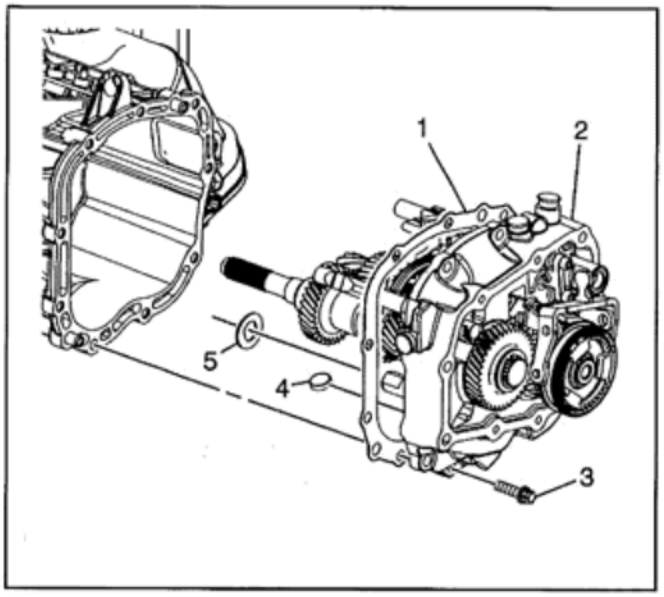
2262248

6. Remove the transmission control lever housing bolts (1).
7. Remove the control lever housing (2) and gasket (3).



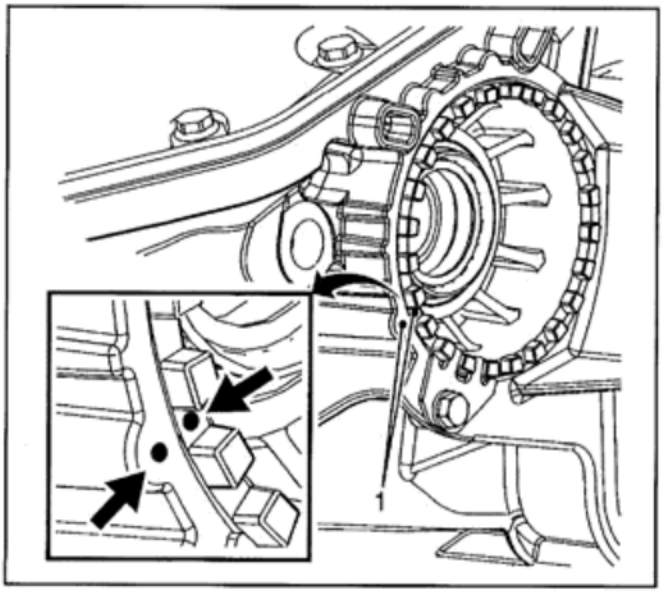
2262253

10. Remove the back up lamp switch (1).



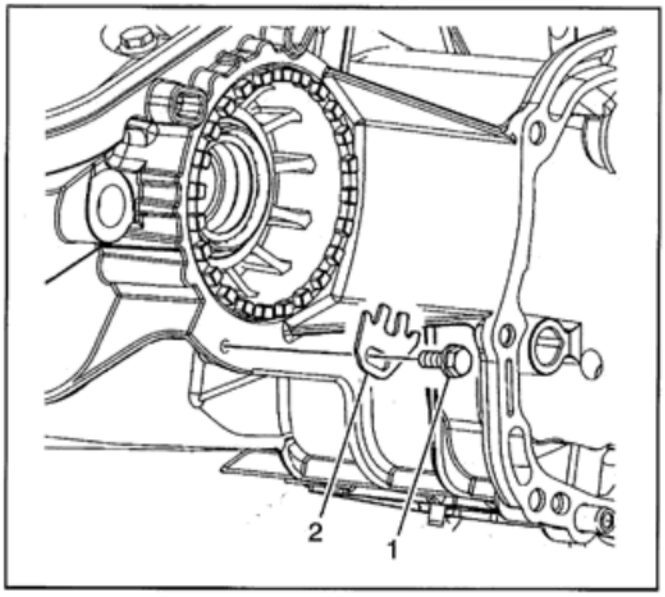
2262252

11. Remove the transmission case bolts (3).
12. Remove the transmission case (2) and gasket (1).
13. Remove the case magnet (4), may stay with case.
14. Remove the reverse idler gear washer (5), may stay on the reverse idler gear shaft.



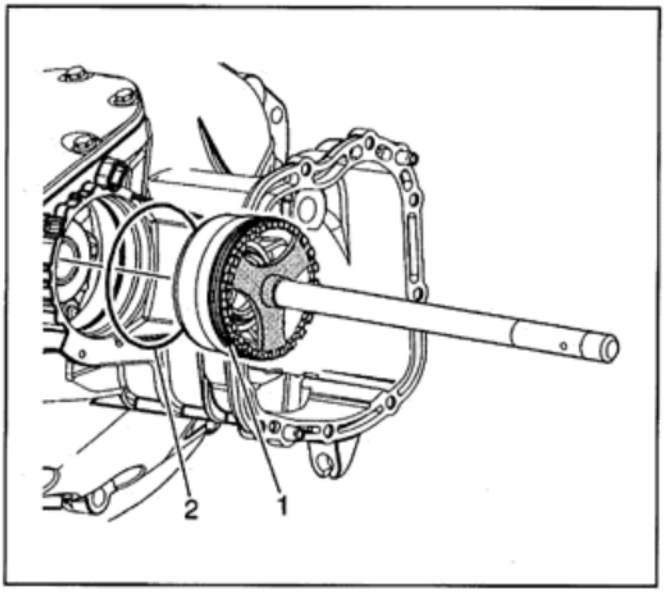
2262255

15. Mark the differential bearing adjuster and case (1) before removal.



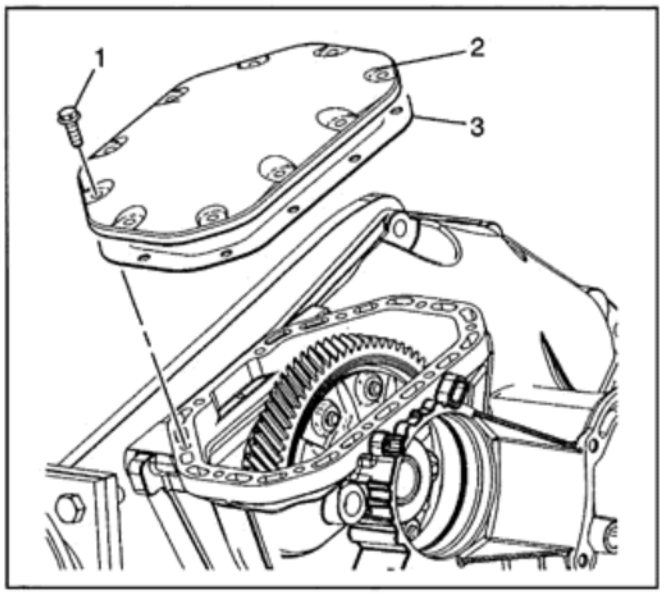
2262256

16. Remove the differential bearing adjuster lock bolt (1).
17. Remove the differential bearing adjuster lock (2).



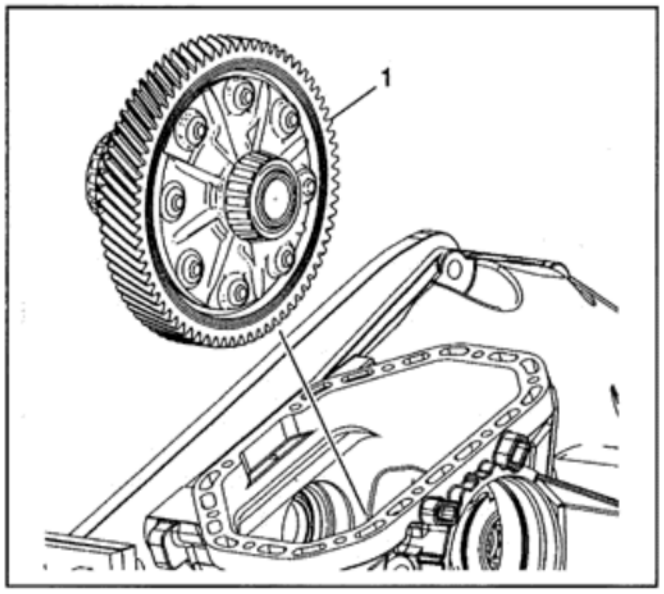
2262258

18. Using *S-9407198* differential bearing race wrench remove the front differential bearing adjuster (1).
19. Remove the front differential bearing retainer O-ring seal (2).



2262259

20. Remove the front differential carrier cover bolts (1).
21. Remove the differential carrier cover (2) and gasket (3).



2262280

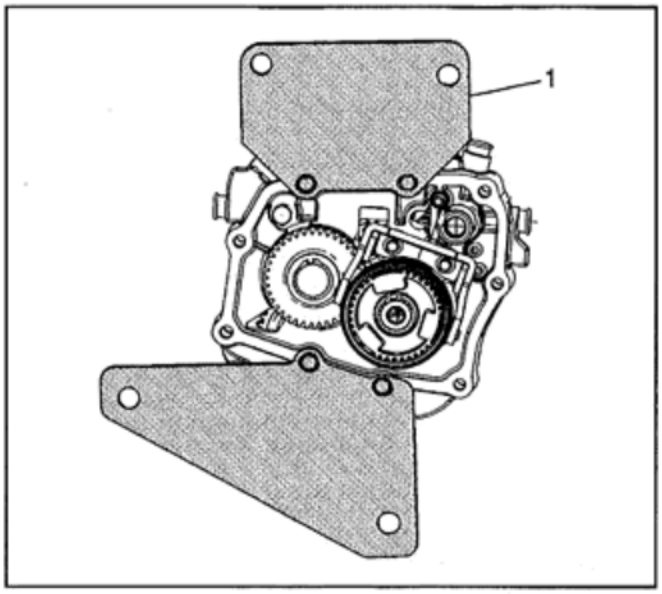
22. Remove the front differential carrier (1).

Transmission Case Disassemble (Gen 1)

Special Tools

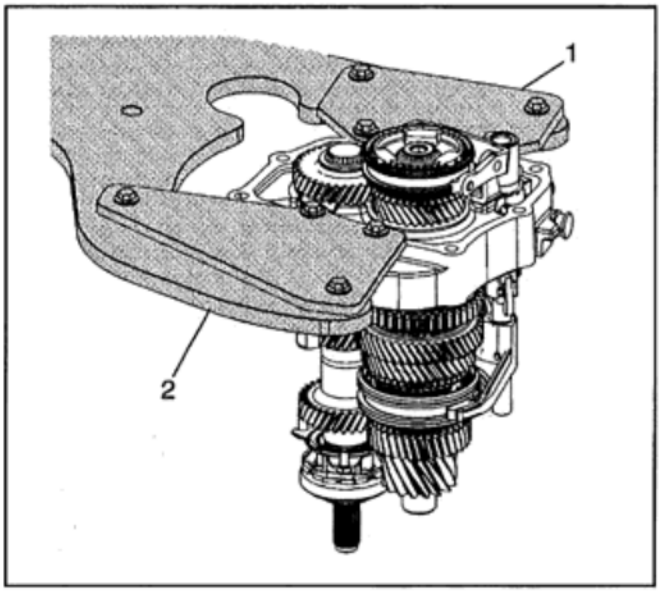
- *3-9506289* Universal Adapter
- *J-810700* Mainshaft Bearing Remover
- *J-810704* Center Bar Puller
- *M-680770* Universal Sliding Mallet
- *R-0007758* Holding Fixture
- *R-0007770* Holding Fixture Adapter Plates
- *T-0307000* Extractor and Driver Fixture
- *T-9807671* Slide Hammer

For equivalent regional tools, refer to *Special Tools on page 17-535*.



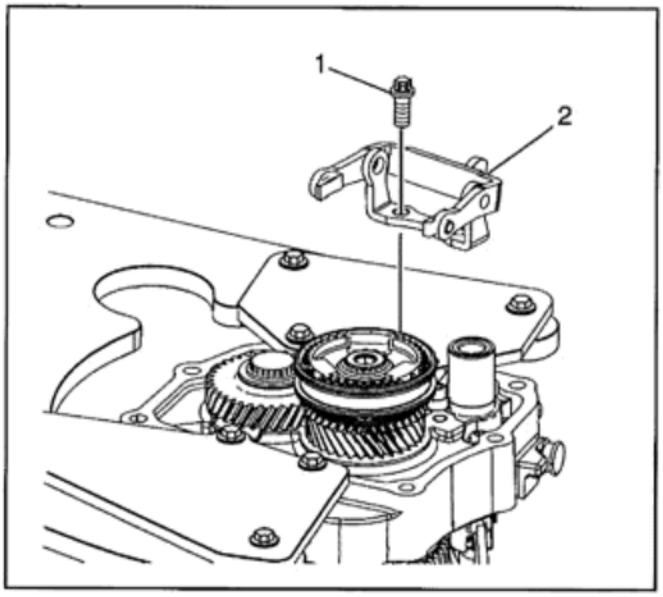
2263763

1. Install both plates of the *R-0007770* holding fixture adapter plates to the transmission case assembly (1).



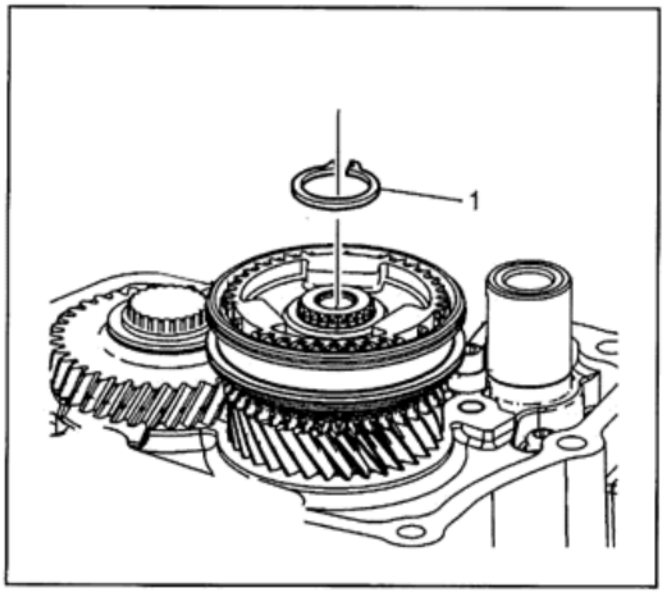
2263765

2. Install the transmission case, with the *R-0007770* holding fixture adapter plates (1) to the *R-0007758* holding fixture (2) and *3-9506289* universal adapter.



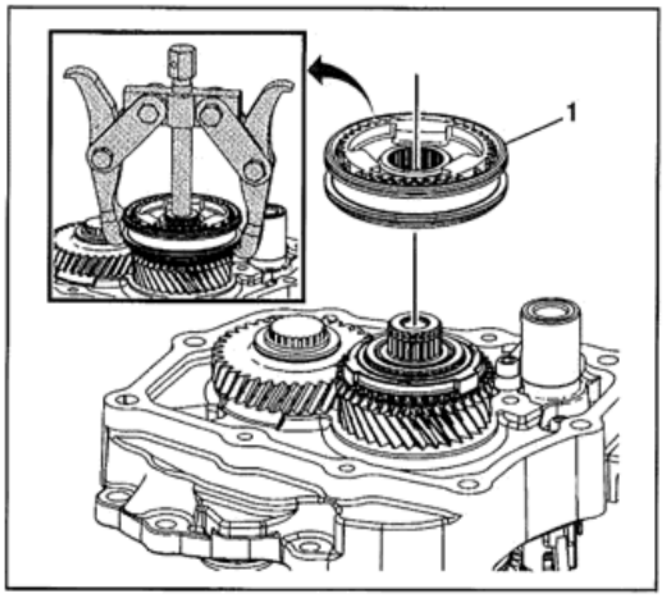
2263766

3. Remove the 5th shift fork bracket retaining bolts (1).
4. Remove the 5th shift fork bracket assembly (2).



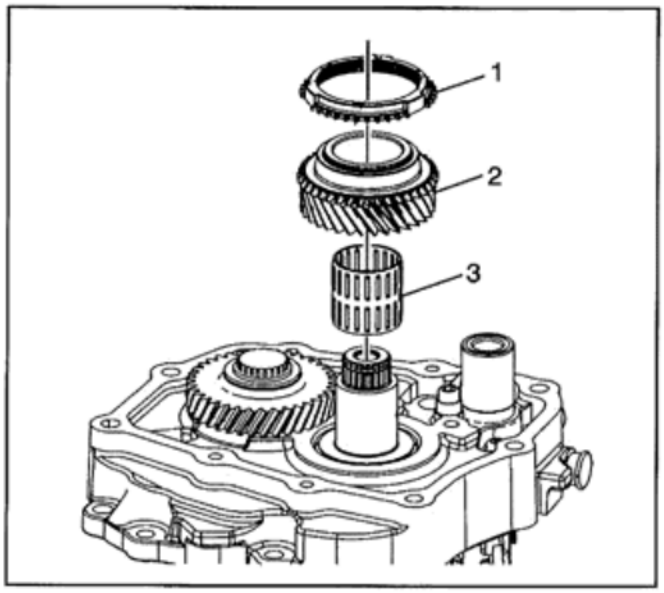
2263767

5. Remove the 5th gear synchronizing hub retaining ring (1).



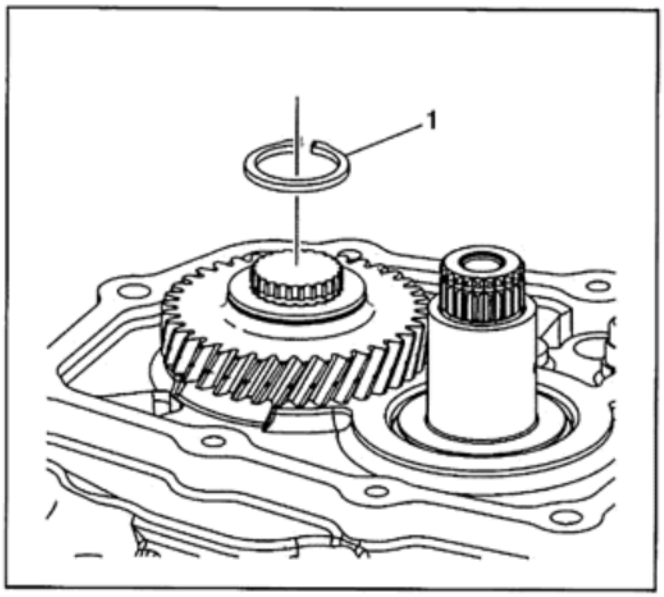
2263770

6. Using the *J-810704* puller, remove the 5th gear synchronizer assembly (1).



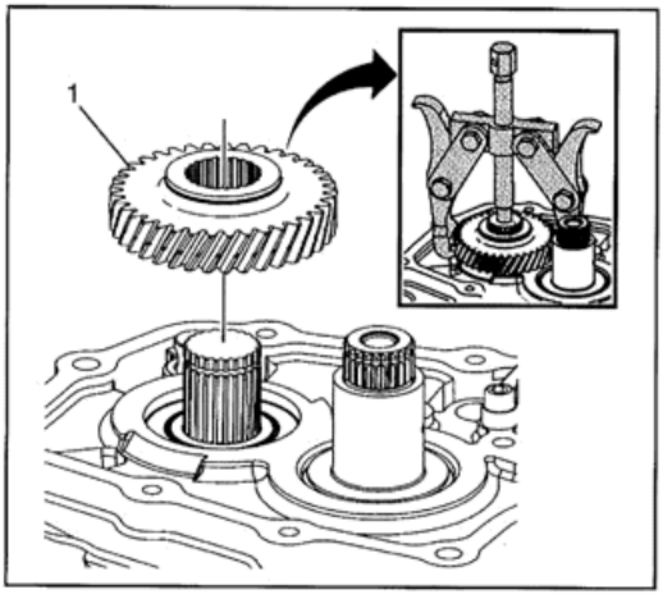
2263772

7. Remove the 5th gear blocking ring (1).
8. Remove the 5th gear assembly, driven (2).
9. Remove the 5th gear bearing assembly (3).



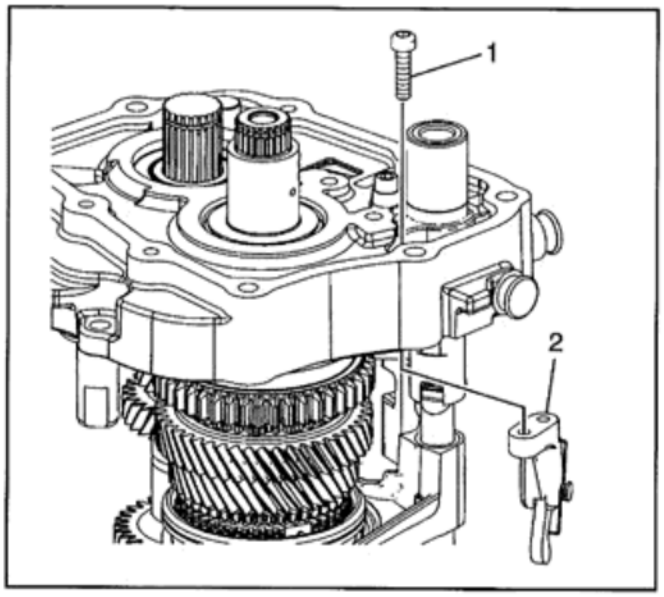
2263774

10. Remove the 5th gear retaining ring (1).



2263775

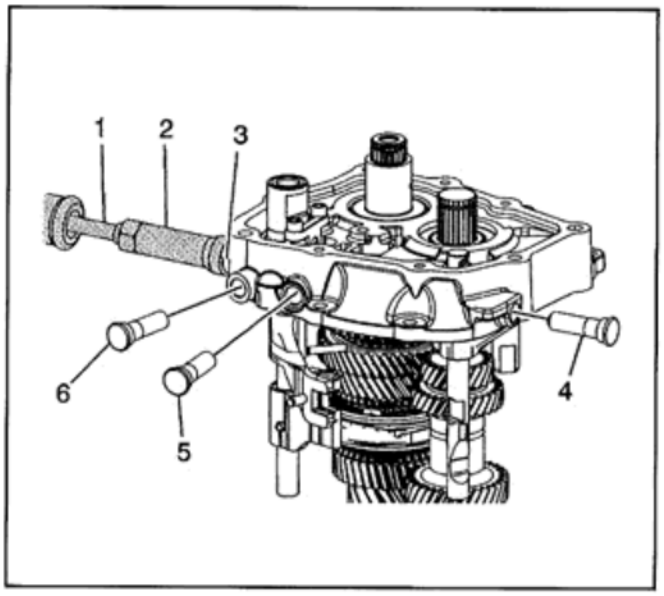
11. Using the *J-810704* puller, remove the 5th gear, driving (1).



2263781

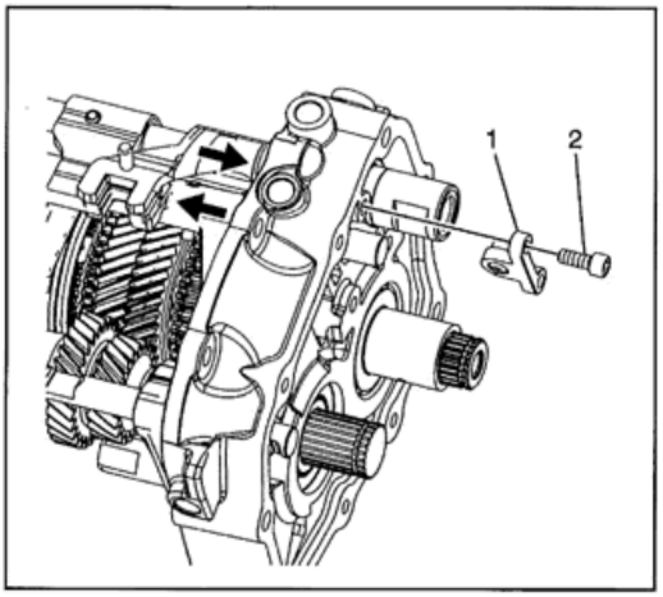
Note: The parking pawl bolts are micro-encapsulated and may require that the transmission case be heated to 80°C (176°F) with a heat gun.

12. Remove the parking pawl retaining bolts (1).
13. Remove the parking pawl (2).



2263784

14. Using the *M-680770* sliding mallet adapter (2) and the *T-9807671* slide hammer (1), remove the 4 shift shaft detent sleeves (3–6) from the transmission case.

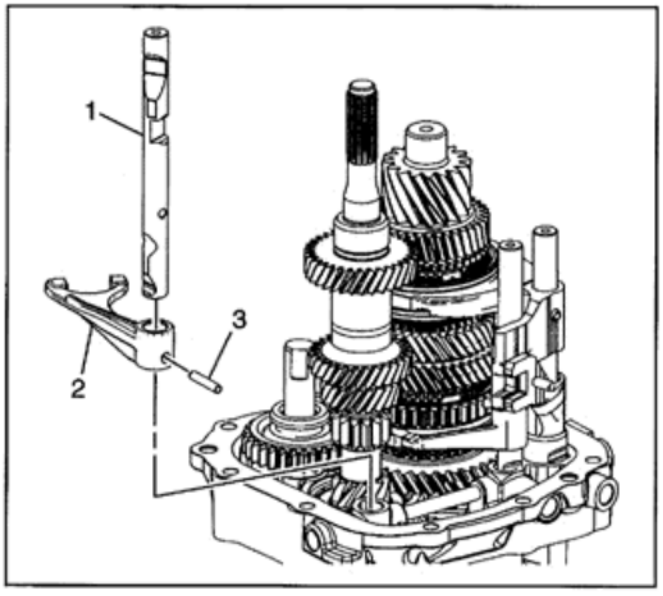


2263785

Note:

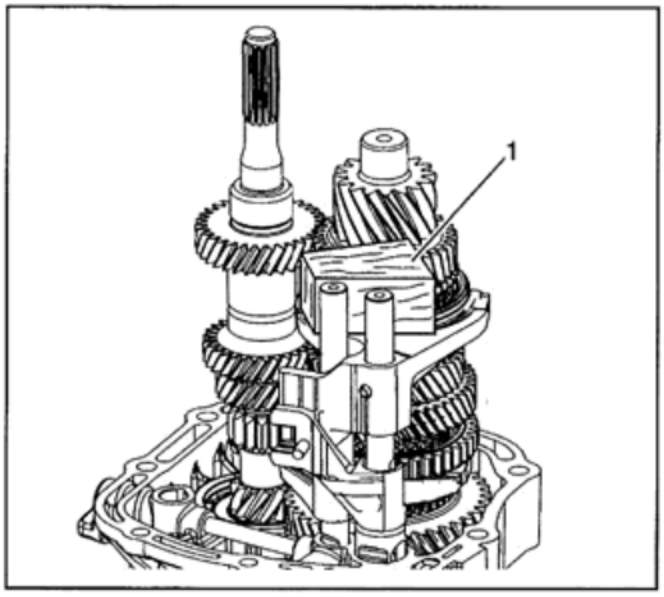
- The bolts are micro-encapsulated and may require that the transmission case be heated to 80°C (176°F) with a heat gun.
- Engage the shift shafts into 3rd gear and 5th gear as indicated with arrows to remove the interlock pin connector.

15. Remove the shift shaft interlock pin connector bolts (2).
16. Remove the shift shaft interlock pin connector (1).



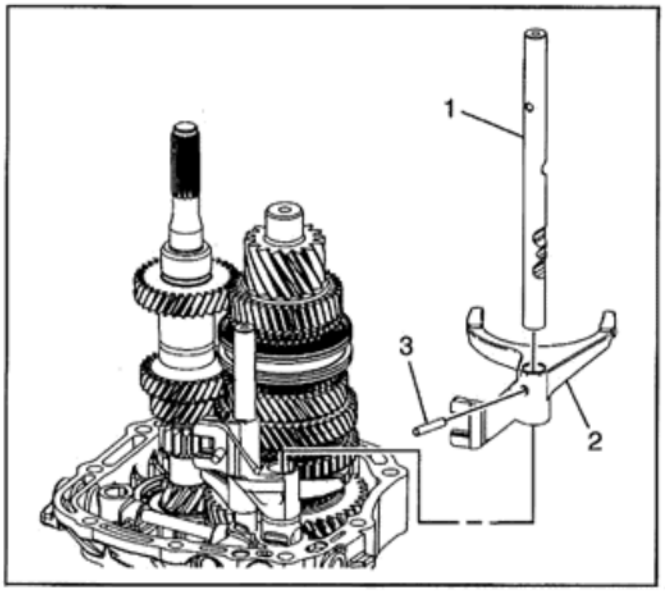
2263811

17. Remove the reverse shift fork pin (3).
18. Remove the reverse shift shaft (1).
19. Remove the reverse shift fork (2).



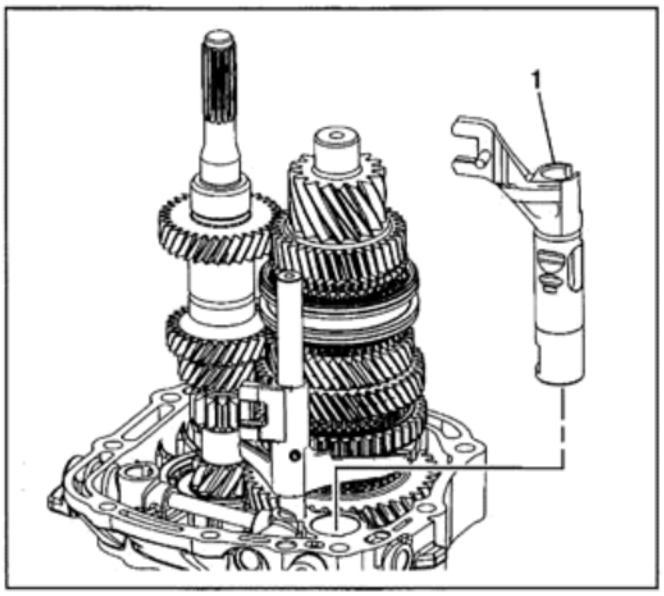
2263812

20. Use a block of wood (1) to relieve the pressure on the gearshift rod guides.



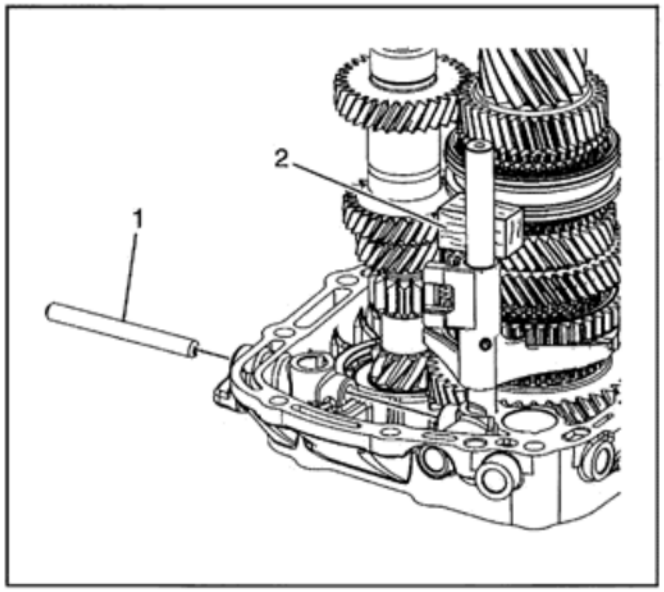
2263813

21. Remove the 3rd and 4th shift fork pin (3).
22. Remove the 3rd and 4th shift shaft (1).
23. Remove the 3rd and 4th shift fork (2).



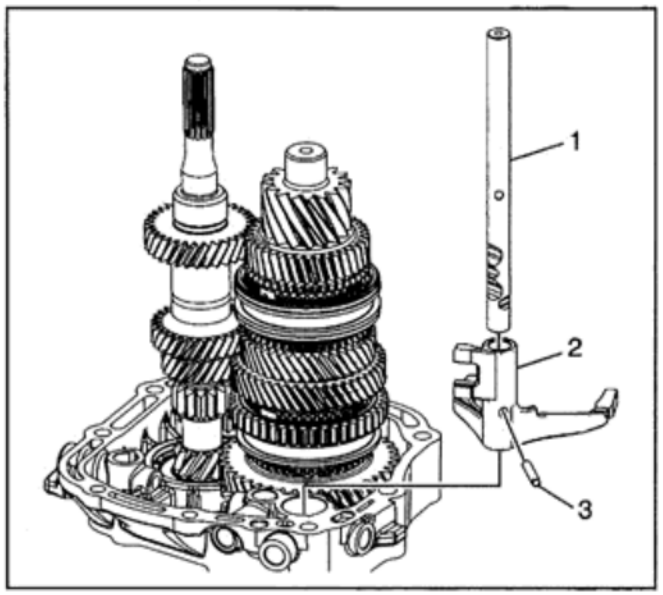
2263787

24. Remove the 5th shift blocking guide (1) from the transmission case.



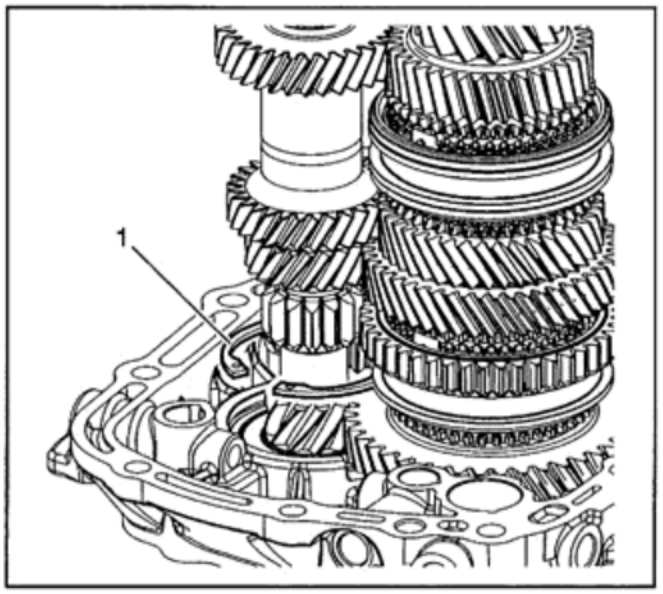
2263788

25. Remove the gearshift rod (1) from the transmission case.
26. Insert a block of wood (2) to relieve pressure on the gearshift rod guides.



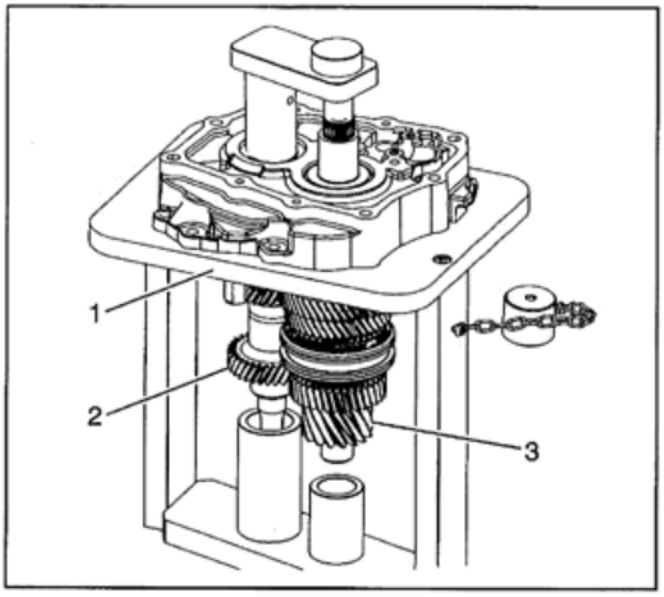
2263789

27. Remove the 1st and 2nd shift fork pin (3).
28. Remove the 1st and 2nd shift shaft (1).
29. Remove the 1st and 2nd shift fork (2).



2263804

30. Remove the input shaft bearing retaining ring (1) from the bore, and leave it on the shaft.

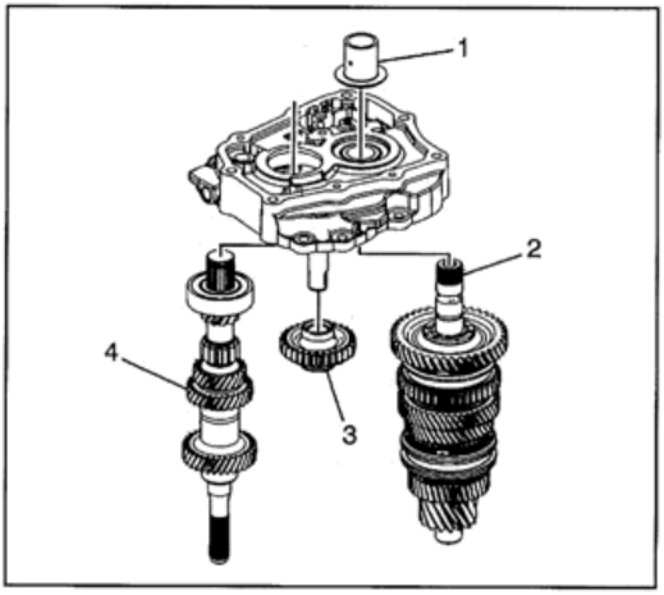


2263805

31. Remove the transmission case from *R-0007770* adapter plates and install onto the *T-0307000* fixture.

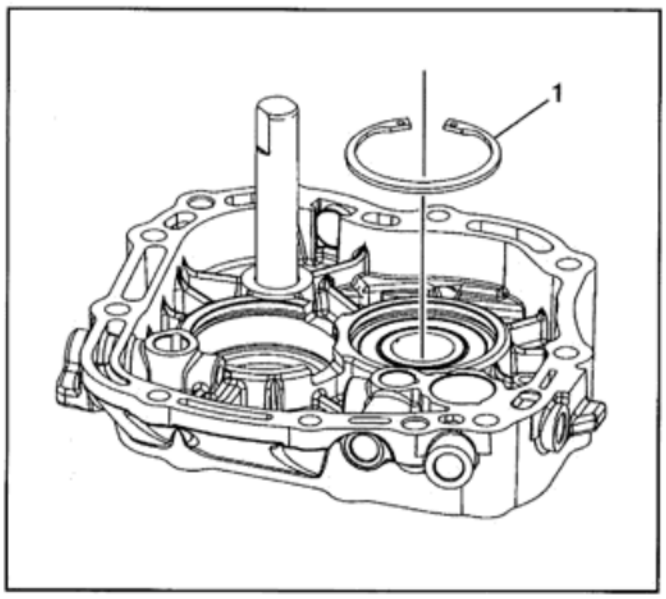
Note: Be prepared to support the reverse idler gear, input shaft and mainshaft as they are pressed from the case.

32. Support the mainshaft (3), input shaft (2) and reverse idler gear (1) while pressing the shafts from the case.



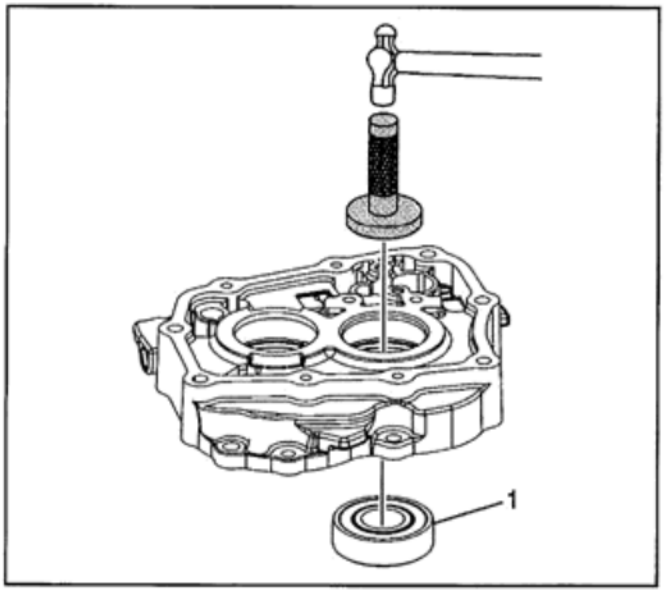
2263806

33. Remove the input shaft (4), reverse idler gear (3) and mainshaft (2) from the *T-0307000* fixture.
34. Remove the 5th gear bearing race (1) from the transmission case.



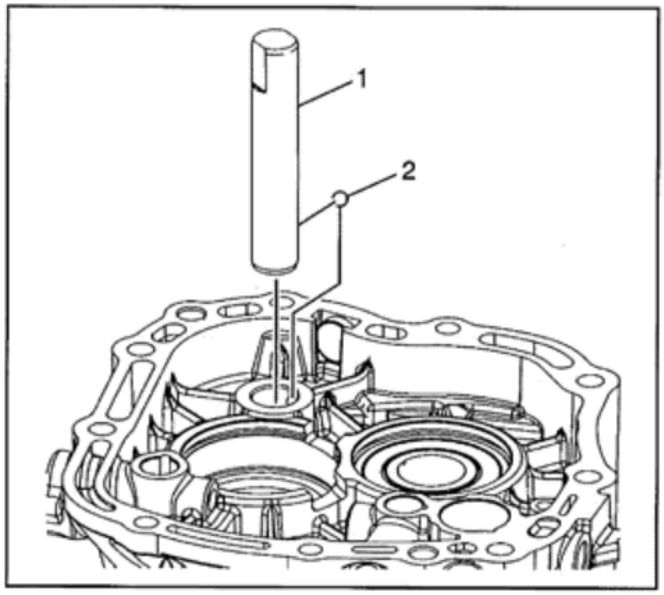
2263807

35. Remove the mainshaft bearing retaining ring (1).



2263808

36. Using *J-810700* mainshaft bearing remover, remove the mainshaft bearing (1) from the case.



2263810

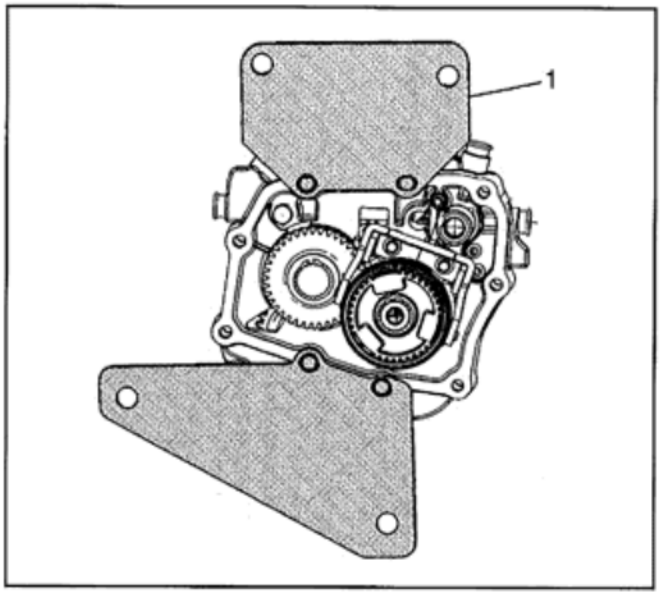
37. Remove the reverse idler gear shaft (1) from the case.
38. Remove the reverse idler gear shaft retaining ball (2).

Transmission Case Disassemble (Gen 2)

Special Tools

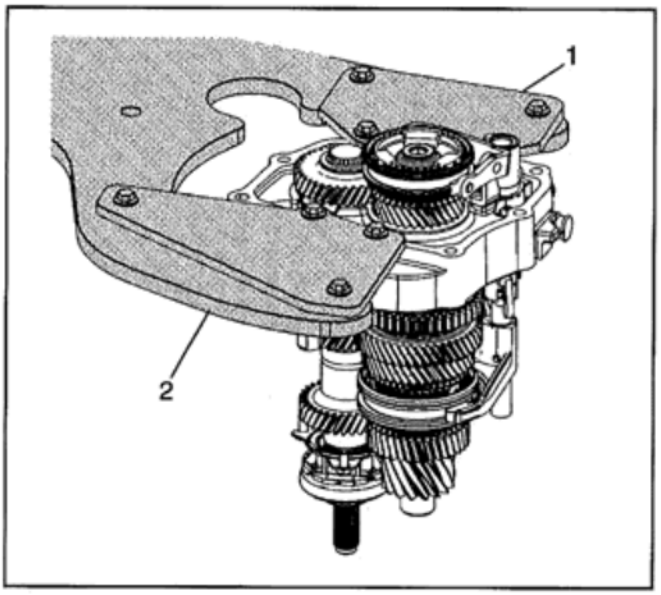
- *3-9506289* Universal Adapter
- *J-810700* Mainshaft Bearing Remover
- *J-810704* Center Bar Puller
- *M-680770* Universal Sliding Mallet
- *R-0007758* Holding Fixture
- *R-0007770* Holding Fixture Adapter Plates
- *T-0307000* Extractor and Driver Fixture
- *T-9807671* Slide Hammer

For equivalent regional tools, refer to *Special Tools on page 17-535*.



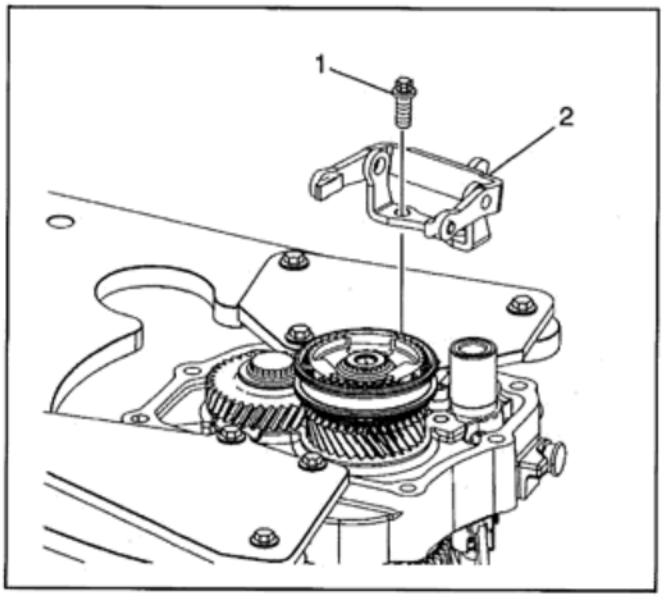
2263763

1. Install both plates of the *R-0007770* holding fixture adapter plates to the transmission case assembly (1).



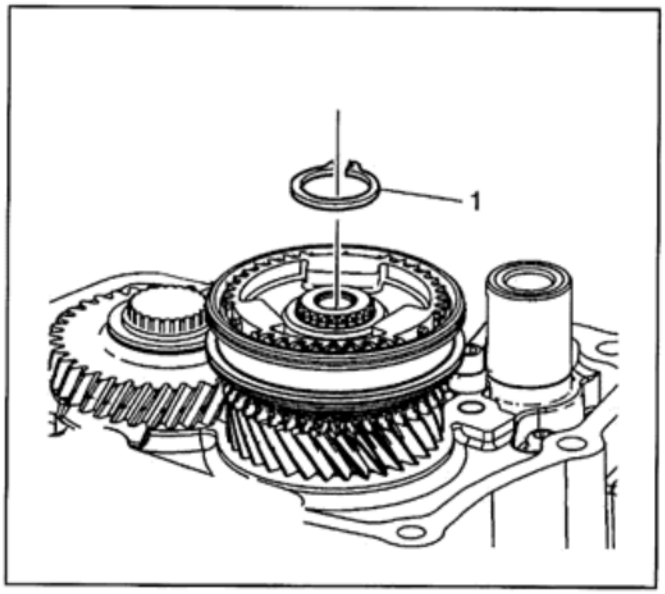
2263765

2. Install the transmission case, with the *R-0007770* holding fixture adapter plates (1) to the *R-0007758* holding fixture (2) and *3-9506289* universal adapter.



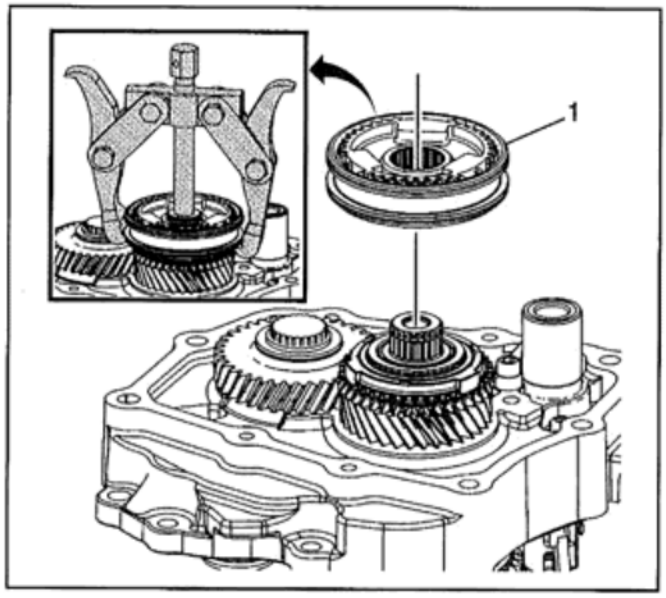
2263766

3. Remove the 5th shift fork bracket retaining bolts (1).
4. Remove the 5th shift fork bracket assembly (2).



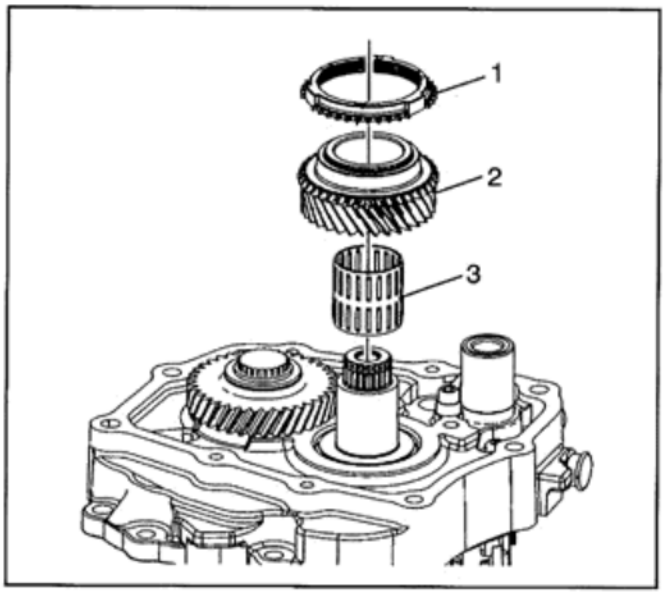
2263767

5. Remove the 5th gear synchronizing hub retaining ring (1).



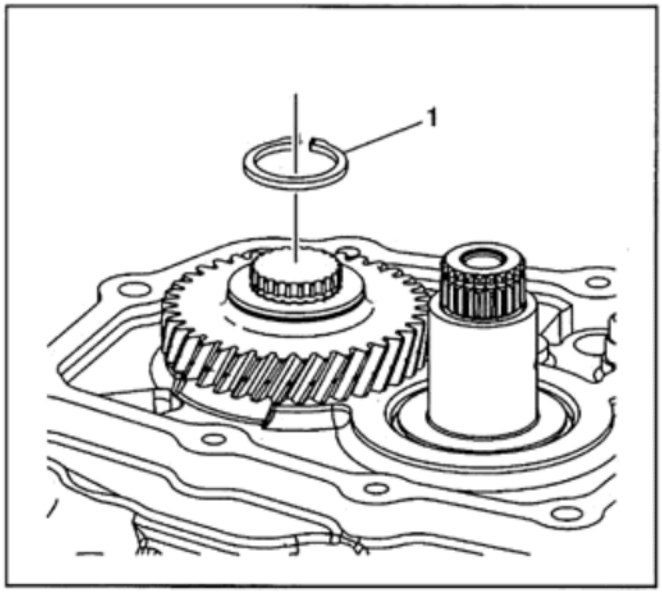
2263770

6. Using the *J-810704* puller, remove the 5th gear synchronizer assembly (1).



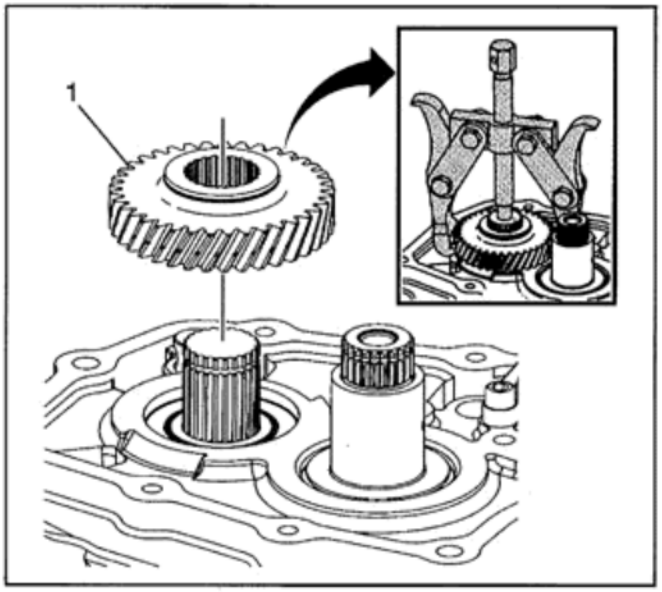
2263772

7. Remove the 5th gear blocking ring (1).
8. Remove the 5th gear assembly, driven (2).
9. Remove the 5th gear bearing assembly (3).



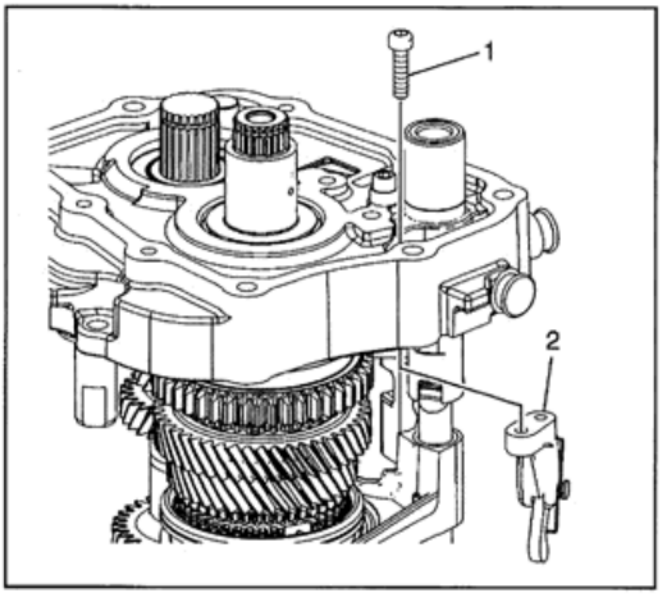
2263774

10. Remove the 5th gear retaining ring (1).



2263775

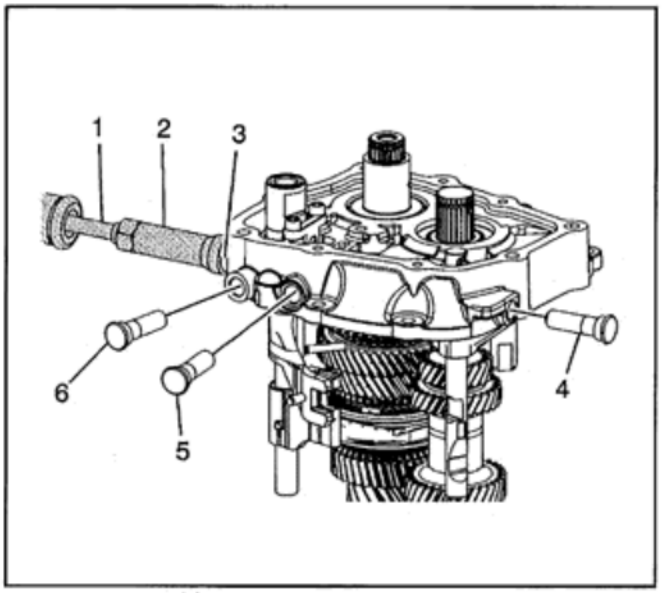
11. Using the *J-810704* puller, remove the 5th gear, driving (1).



2263781

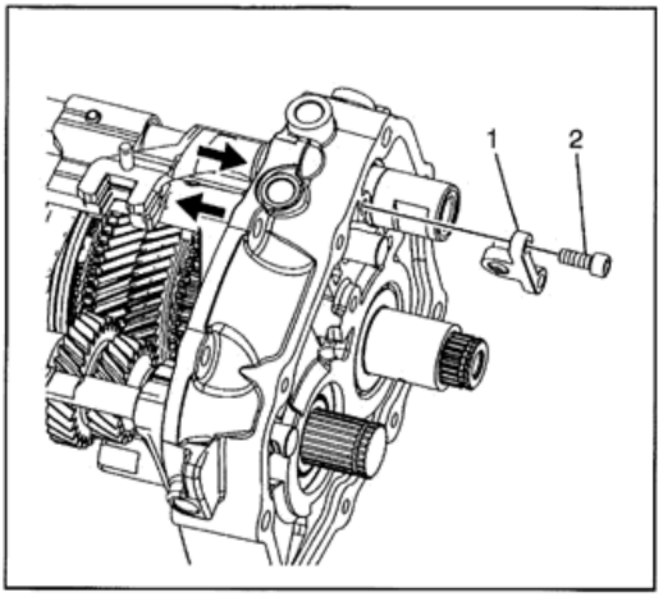
Note: The parking pawl bolts are micro-encapsulated and may require that the transmission case be heated to 80°C (176°F) with a heat gun.

12. Remove the parking pawl retaining bolts (1).
13. Remove the parking pawl (2).



2263784

14. Using the *M-680770* sliding mallet adapter (2) and the *T-9807671* slide hammer (1), remove the 4 shift shaft detent sleeves (3–6) from the transmission case.

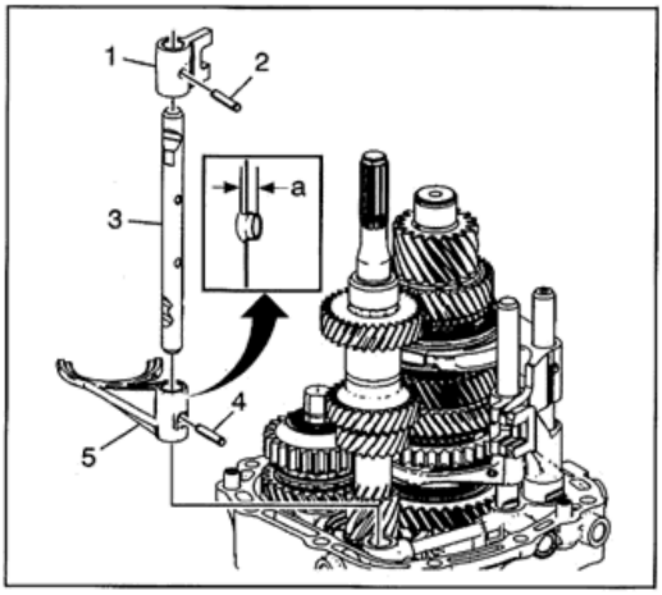


2263785

Note:

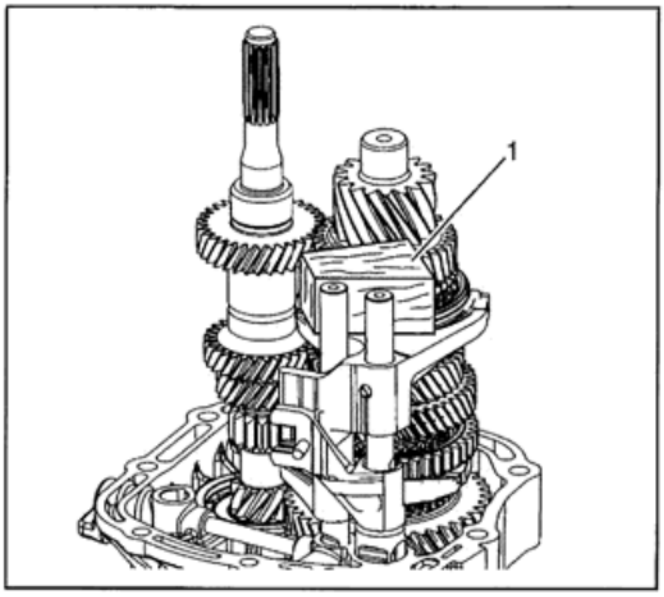
- The bolts are micro-encapsulated and may require that the transmission case be heated to 80°C (176°F) with a heat gun.
- Engage the shift shafts into 2nd gear, 5th gear, and 3rd gear as indicated with arrows to remove the interlock pin connector.

15. Remove the shift shaft interlock pin connector bolts (2).
16. Remove the shift shaft interlock pin connector (1).



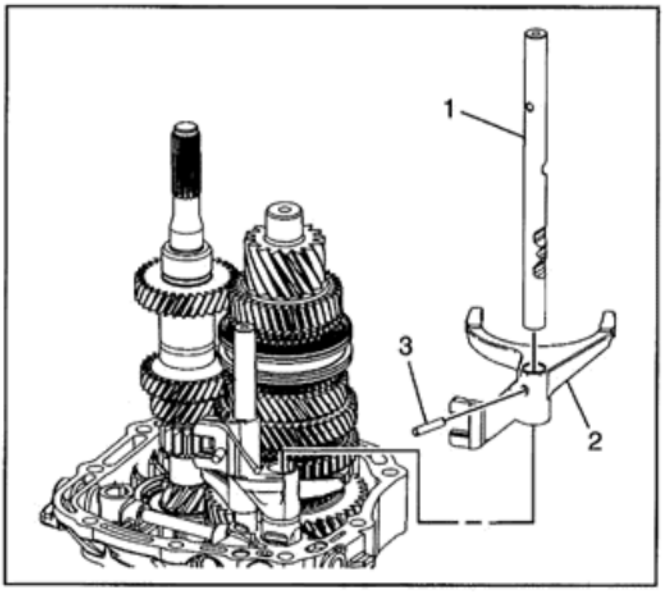
2748405

17. Remove the reverse shift fork pin (4).
18. Remove the reverse shift shaft (3).
19. Remove the reverse shift fork (5).
20. Remove the reverse fork block pin (2).
21. Remove the reverse fork block (1).



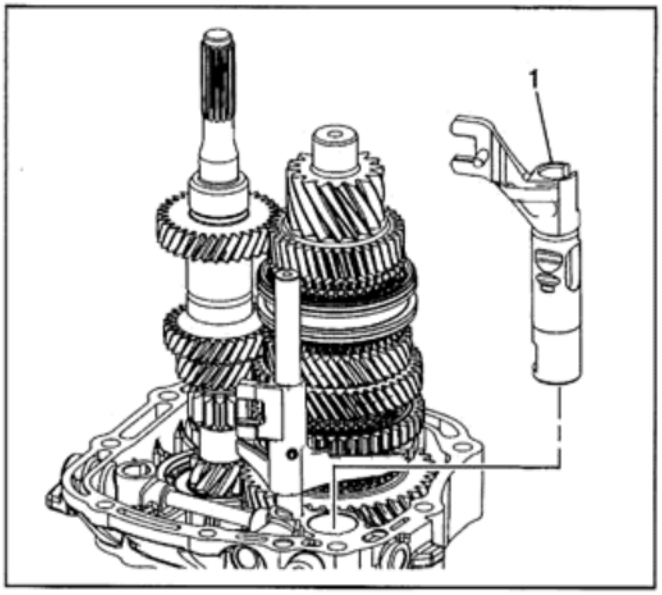
2263812

22. Use a block of wood (1) to relieve the pressure on the gearshift rod guides.



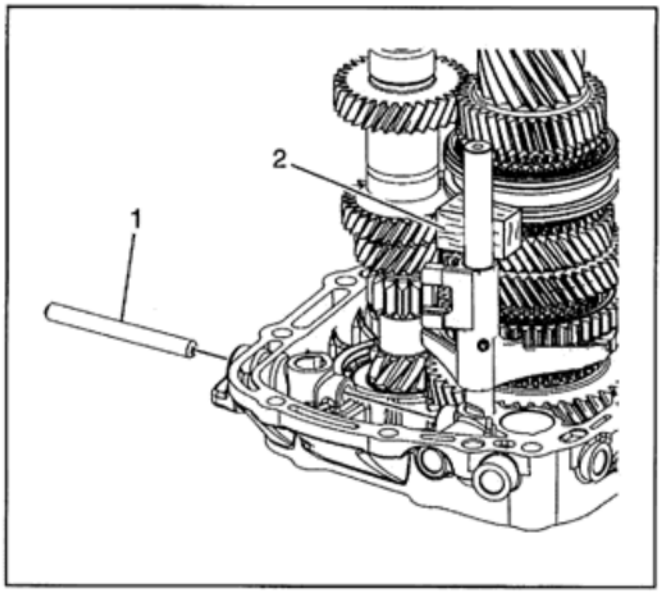
2263813

23. Remove the 3rd and 4th shift fork pin (3).
24. Remove the 3rd and 4th shift shaft (1).
25. Remove the 3rd and 4th shift fork (2).



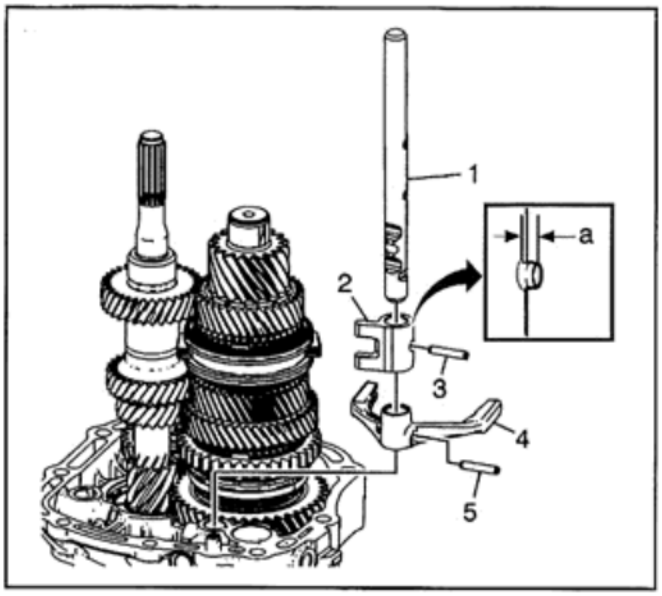
2263787

26. Remove the 5th shift blocking guide (1) from the transmission case.



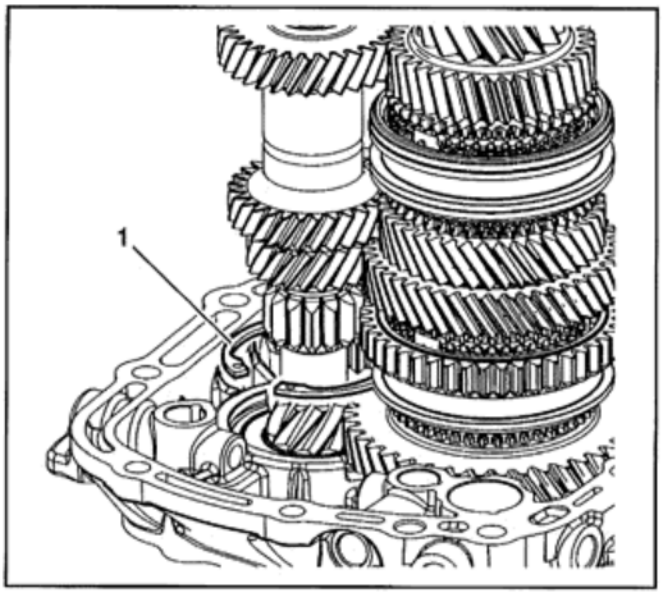
2263788

27. Remove the gearshift rod (1) from the transmission case.
28. Insert a block of wood (2) to relieve pressure on the gearshift rod guides.



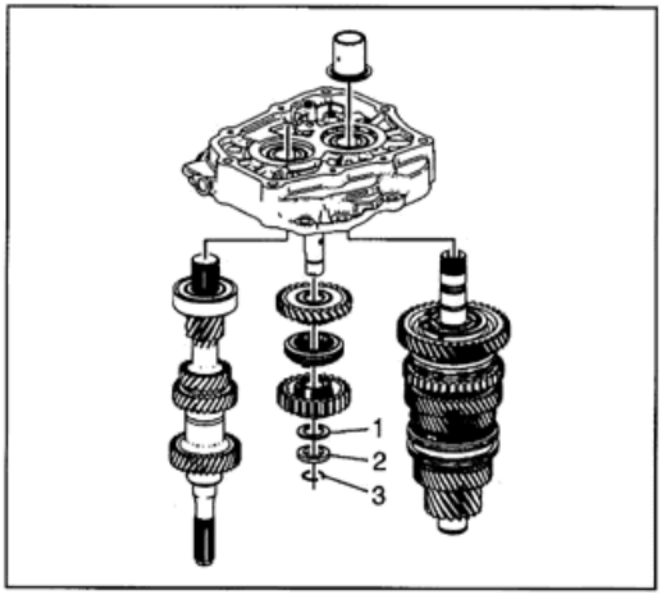
2748407

29. Remove the 1st and 2nd shift fork pin (5).
30. Remove the 1st and 2nd shift shaft (1).
31. Remove the 1st and 2nd shift fork (4).
32. Remove the 1st and 2nd shaft block pin (3).
33. Remove the 1st and 2nd shaft block (2).



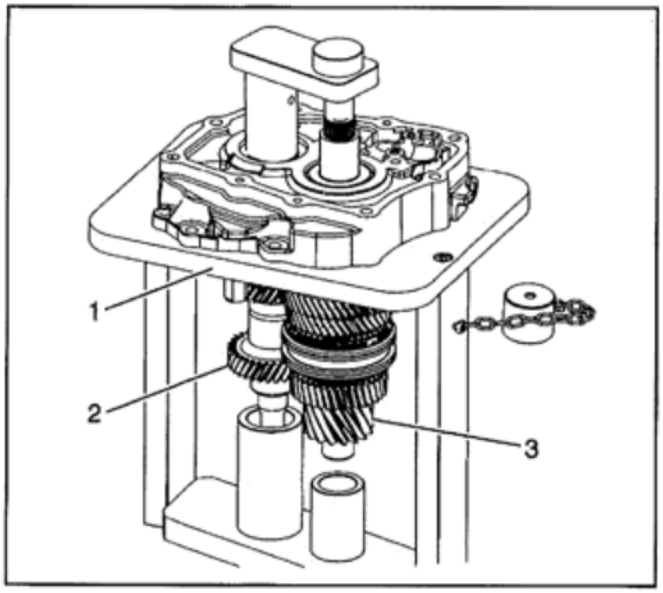
2263804

34. Remove the input shaft bearing retaining ring (1) from the bore, and leave it on the shaft.



2748409

35. Remove the reverse gear shaft snap ring (3), reverse spur gear washer (2), and reverse spur gear bearing (1).

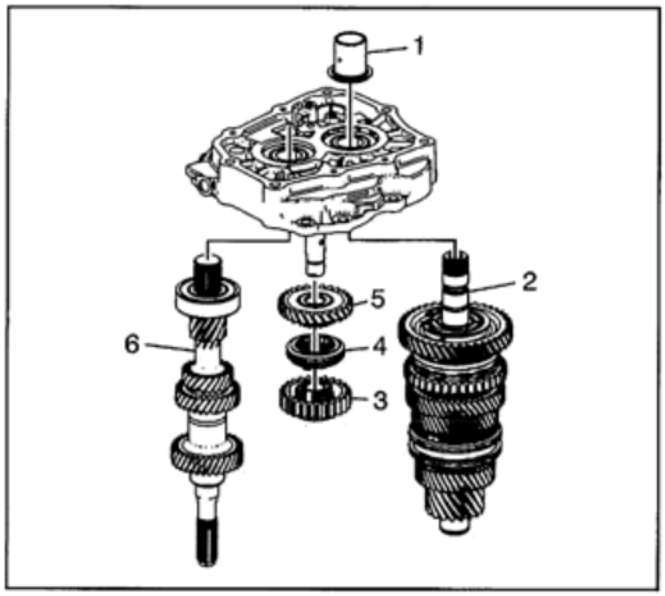


2263805

36. Remove the transmission case from *R-0007770* adapter plates and install onto the *T-0307000* fixture.

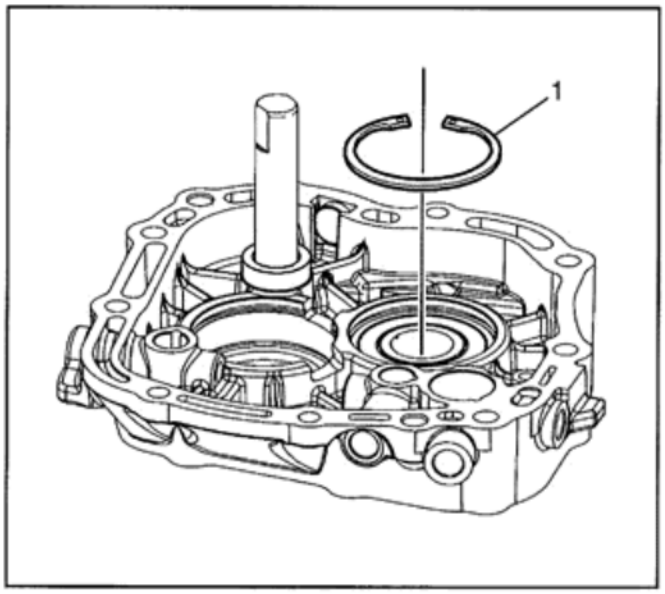
Note: Be prepared to support the reverse idler gear, input shaft and mainshaft as they are pressed from the case.

37. Support the mainshaft (3), input shaft (2) and reverse idler gear (1) while pressing the shafts from the case.



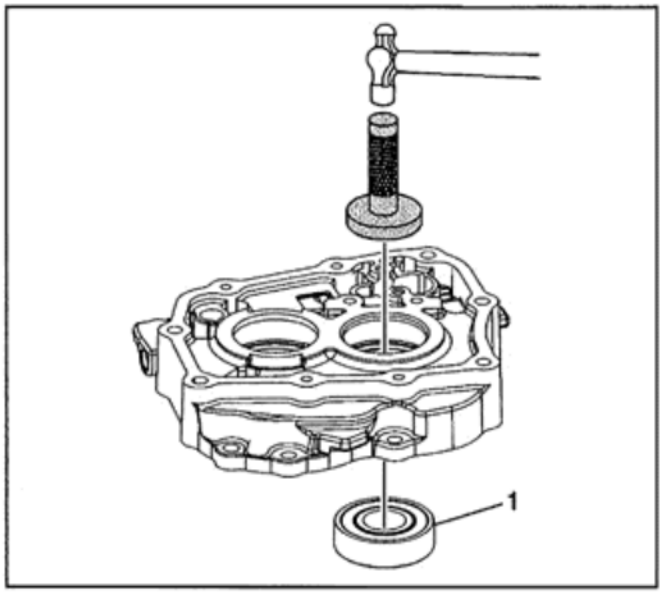
2845574

38. Remove the following components from the *T-0307000* fixture.
    - Main shaft (2)
    - Reverse spur gear (3)
    - Reverse synchro assembly (4)
    - Reverse helical gear (5)
    - Input Shaft (6)
39. Remove the 5th gear bearing race (1) from the transmission case.



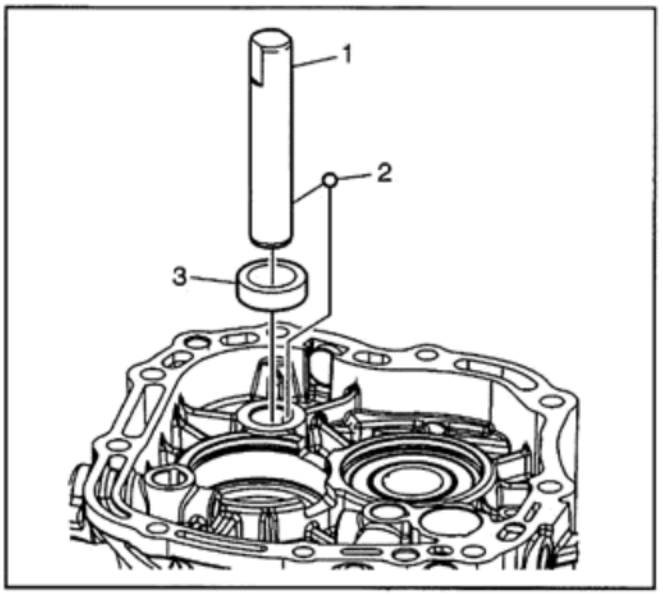
2845580

40. Remove the mainshaft bearing retaining ring (1).



2263808

41. Using *J-810700* mainshaft bearing remover, remove the mainshaft bearing (1) from the case.

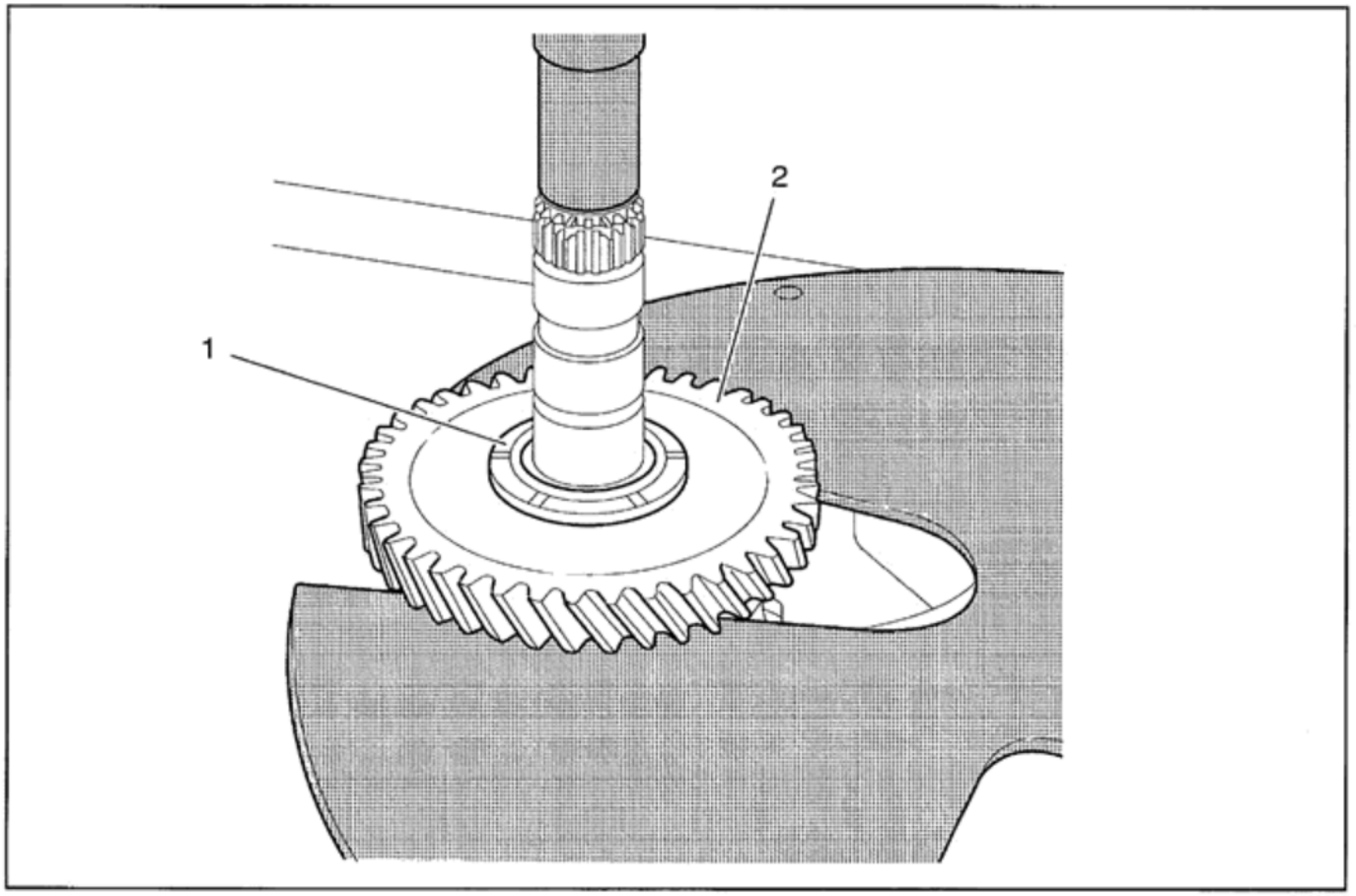


2845581

42. Remove the reverse idler gear shaft (1) from the case.
43. Remove the reverse idler gear shaft retaining ball (2).
44. Remove the reverse helical gear washer (3).

Main Shaft Disassemble (Gen 1)

1st Gear Removal

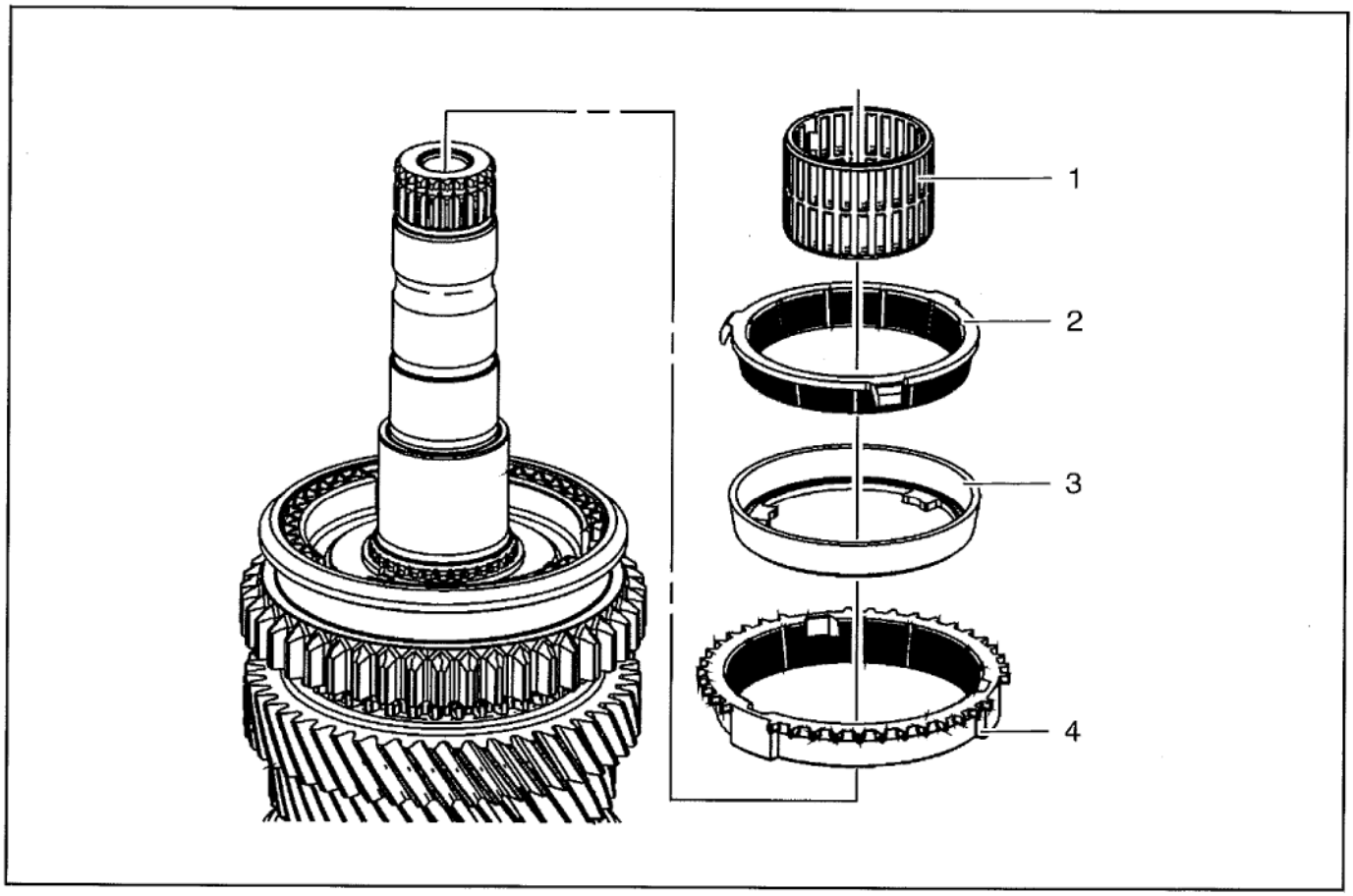


2192590

1st Gear Removal

Callout	Component Name
Preliminary Procedure A hydraulic press is required to complete procedure. Prepare hydraulic press for procedure.	
1	1st Gear Thrust Washer **Special Tools** • *DT-307-B* Remover Plate • *DT-736* Clutch Arbor
2	1st Gear

1st Gear Blocking Rings Removal

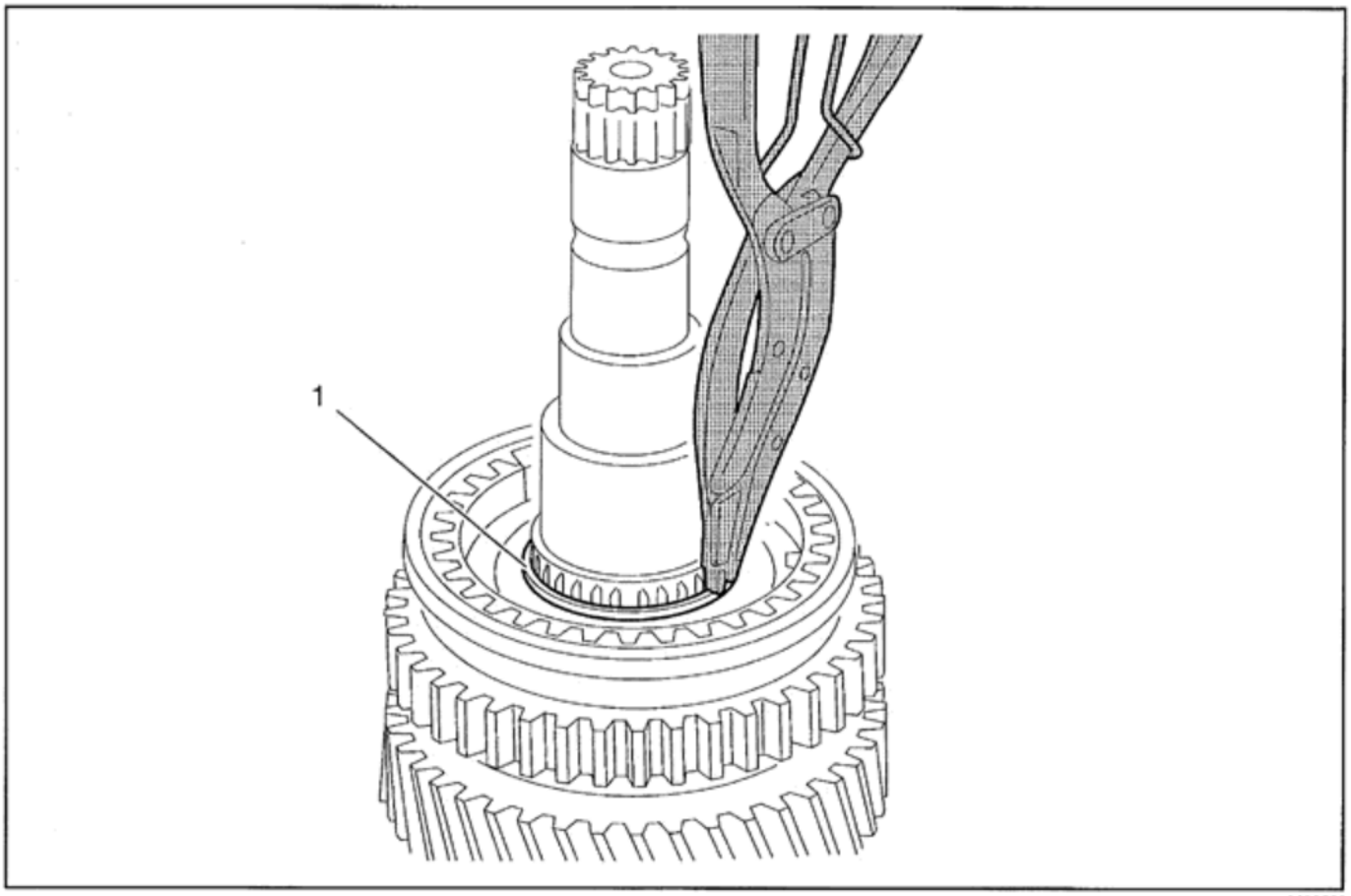


2371631

1st Gear Blocking Rings Removal

Callout	Component Name
1	1st Gear Bearing
2	1st Gear Inner Blocking Ring
3	1st Gear Intermediate Blocking Ring
4	1st Gear Outer Blocking Ring

1st and 2nd Gear Synchronizer Hub Retaining Ring Removal

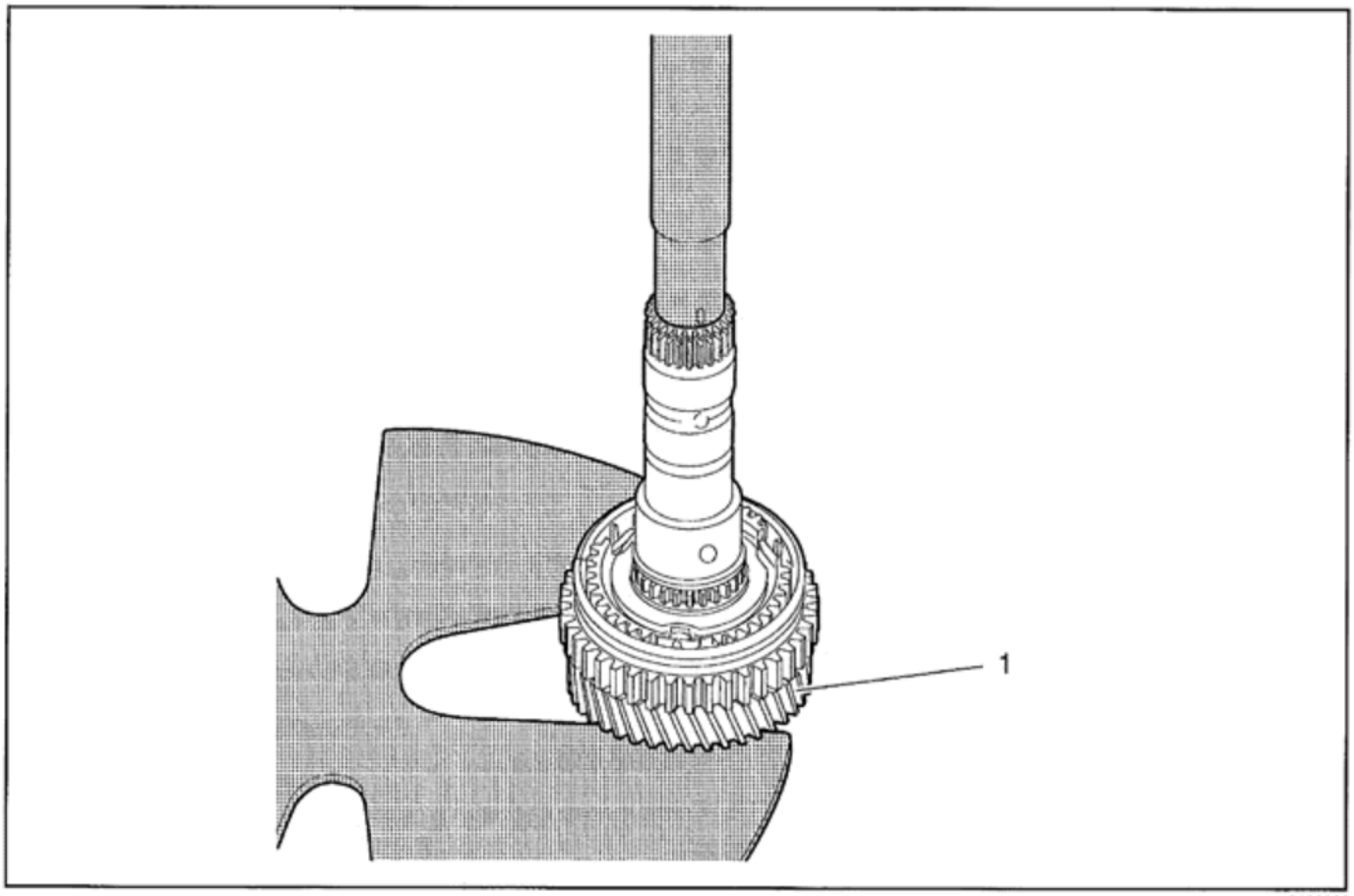


2192598

1st and 2nd Gear Synchronizer Hub Retaining Ring Removal

Callout	Component Name
1	1st and 2nd Gear Synchronizer Hub Retaining Ring **Special Tools** *GE-8059* Snap Ring Pliers

1st and 2nd Gear Synchronizer Hub and 2nd Gear Removal

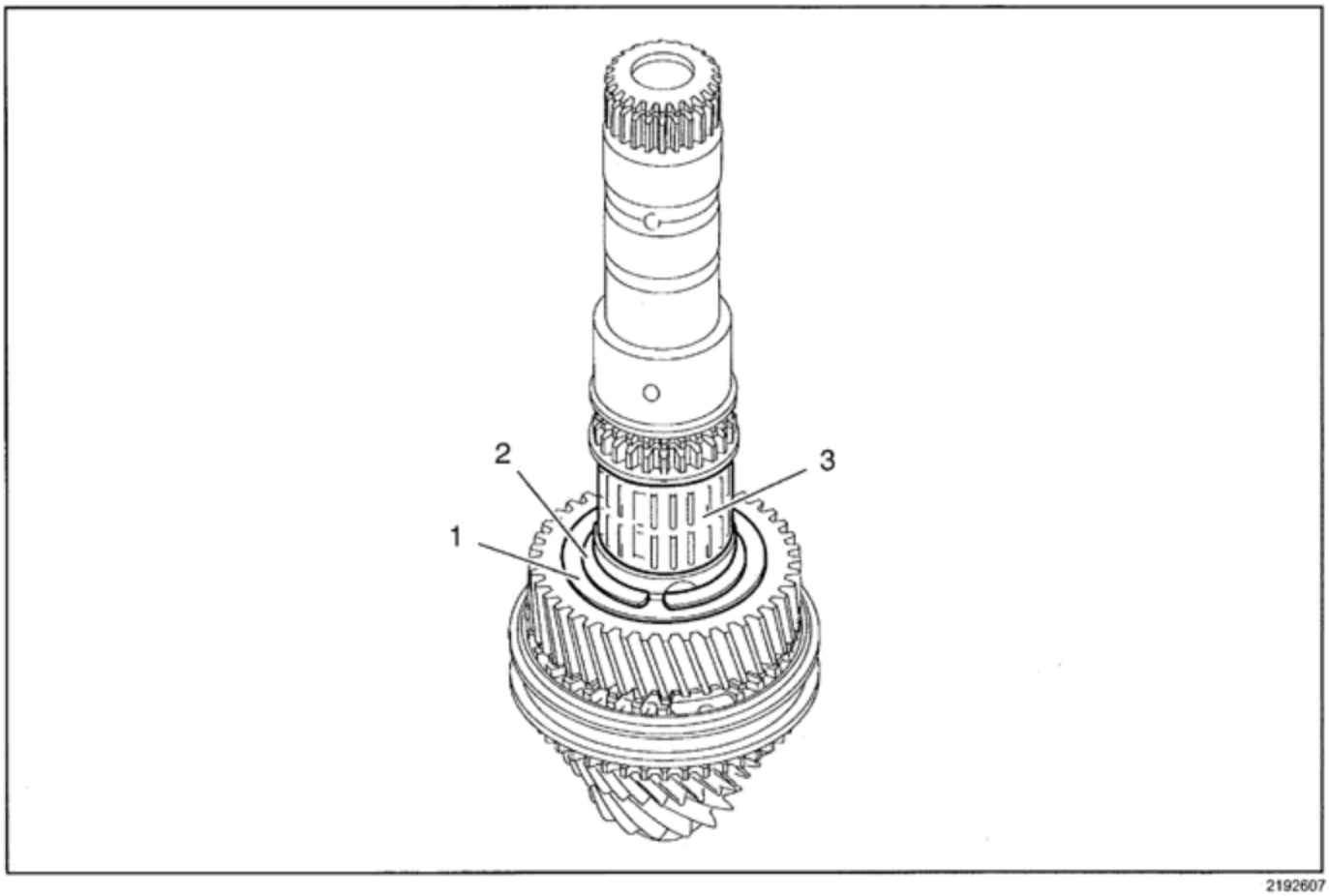


2192606

1st and 2nd Gear Synchronizer Hub and 2nd Gear Removal

Callout	Component Name
Preliminary Procedure A hydraulic press is required to complete procedure. Prepare hydraulic press for procedure.	
1	2nd Gear **Special Tools** • *DT-307-B* Remover Plate • *DT-736* Clutch Arbor

2nd Gear Bearing Removal

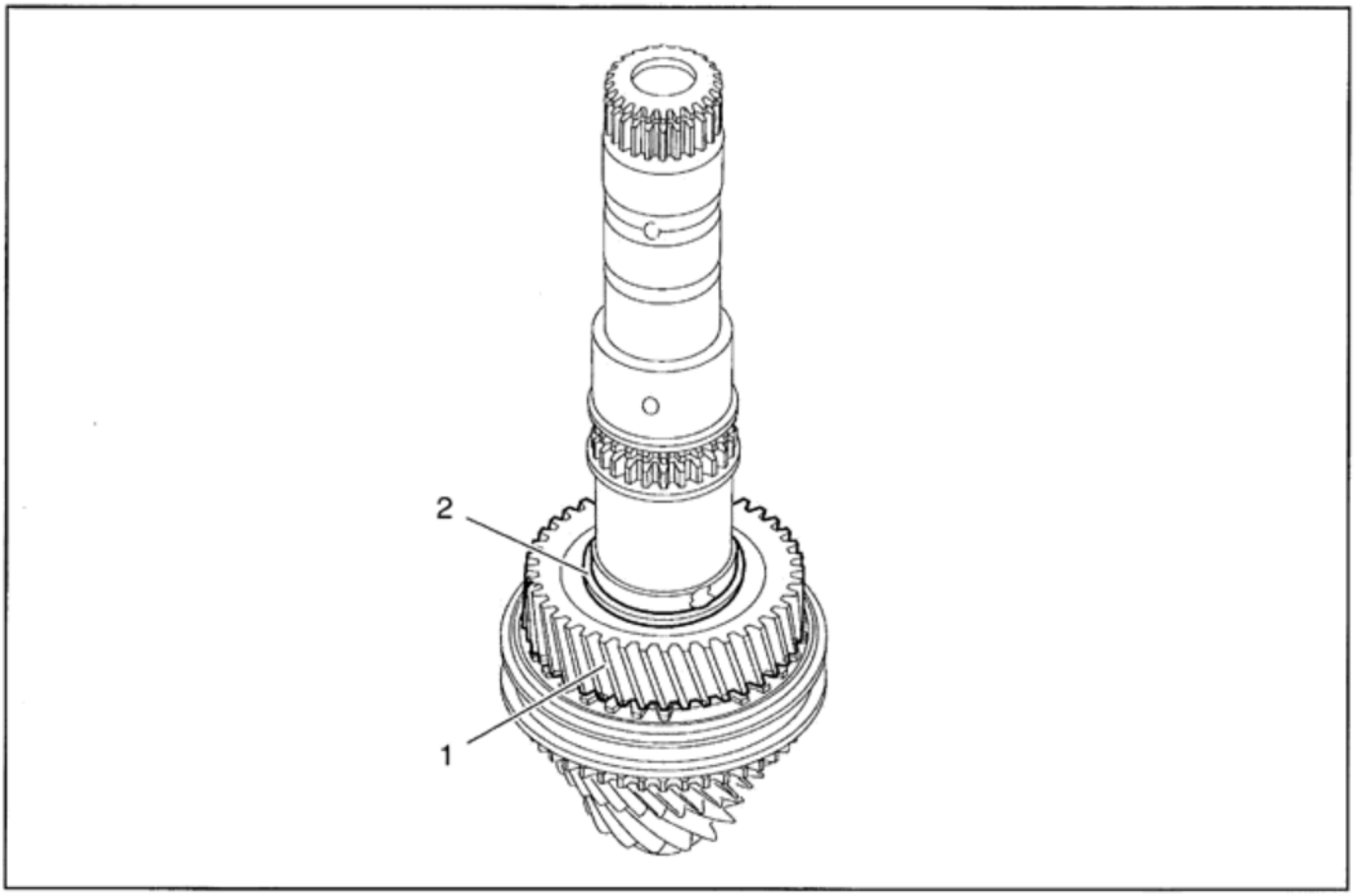


2192607

2nd Gear Bearing Removal

Callout	Component Name
1	1st and 2nd Gear Synchronizer Hub Retaining Ring
2	2nd and 3rd Gear Thrust Washer
3	2nd Gear Bearing

3rd Gear Removal

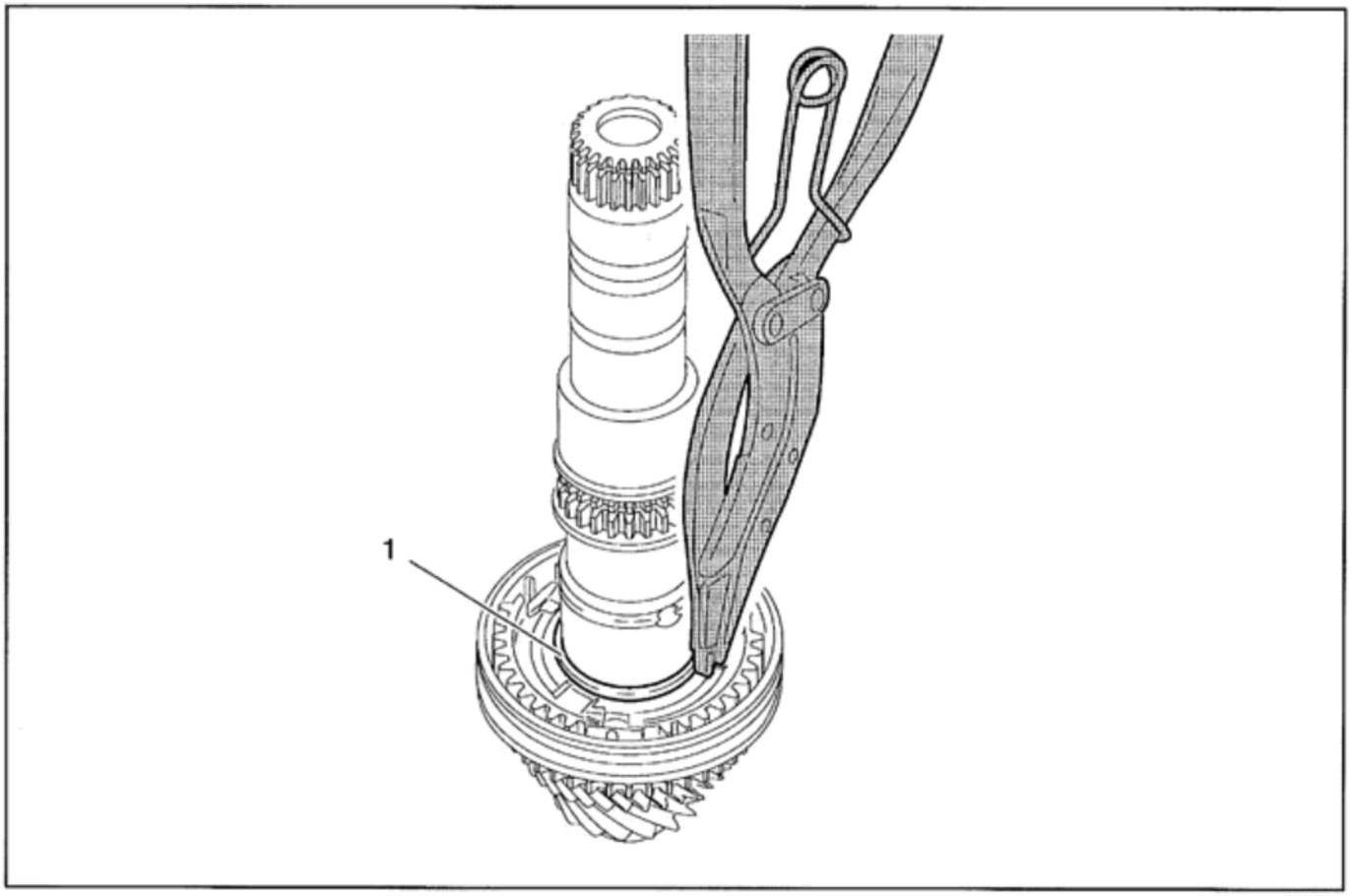


2192608

3rd Gear Removal

Callout	Component Name
1	3rd Gear
2	3rd Gear Bearing

3rd and 4th Gear Synchronizer Hub Retaining Ring Removal

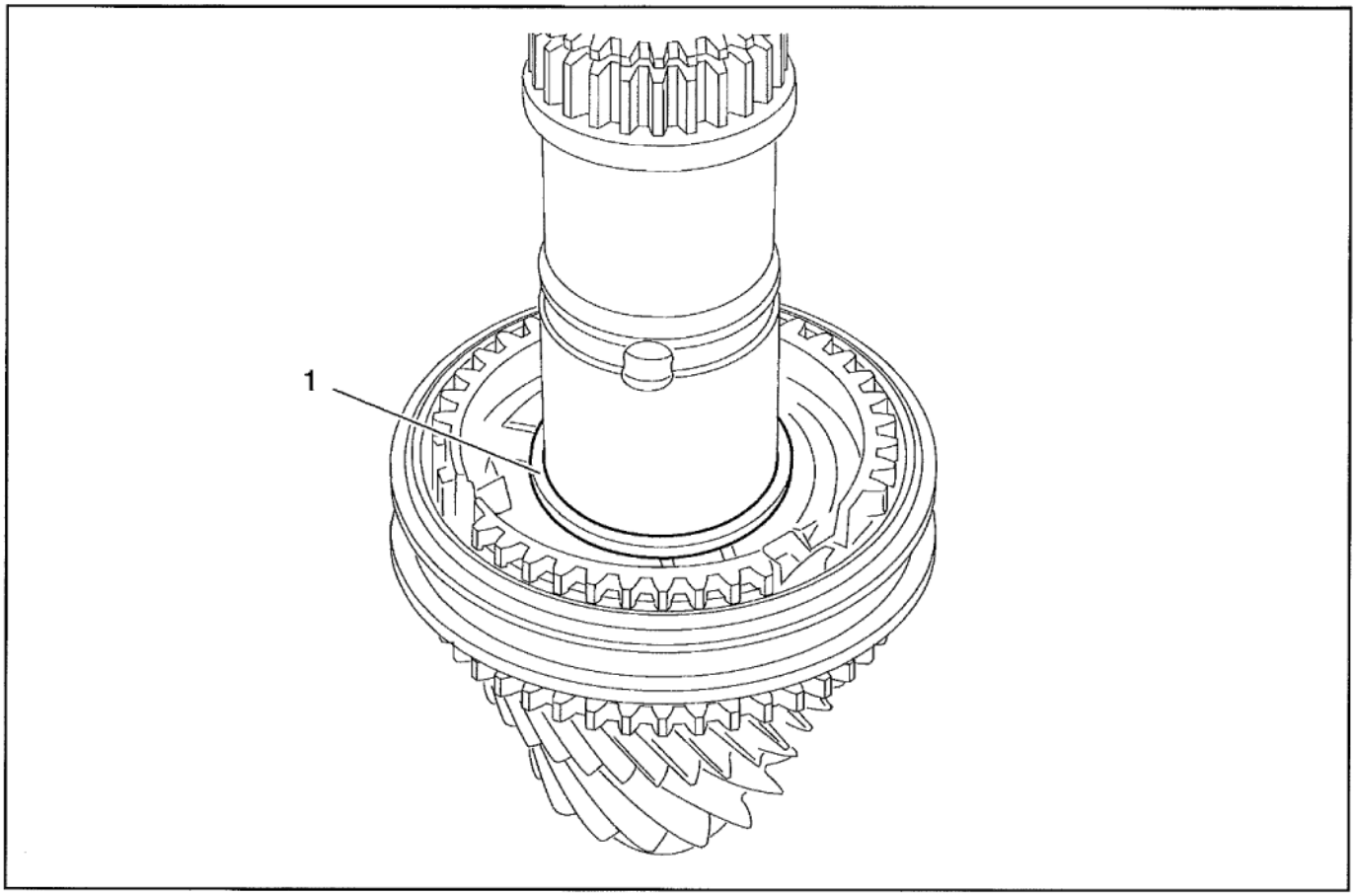


2192610

3rd and 4th Gear Synchronizer Hub Retaining Ring Removal

Callout	Component Name
1	3rd and 4th Gear Synchronizer Hub Retaining **Special Tools** *GE-8059* Snap Ring Pliers

3rd and 4th Gear Thrust Washer Removal

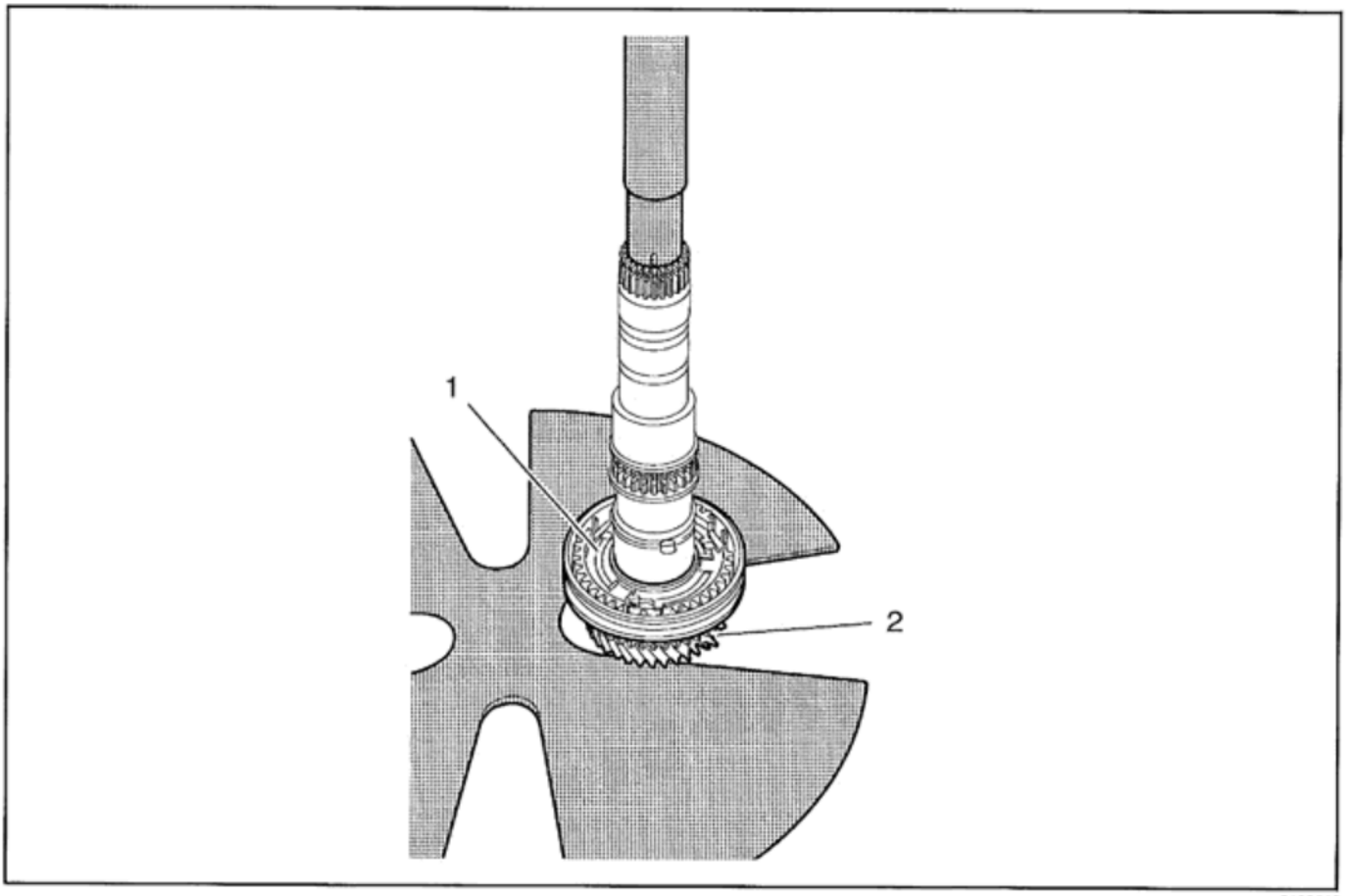


2192611

3rd and 4th Gear Thrust Washer Removal

Callout	Component Name
1	3rd and 4th Gear Synchronizer Hub Retaining Ring **Special Tools** *GE-8059* Snap Ring Pliers

3rd and 4th Gear Synchronizer Hub and 4th Gear Removal

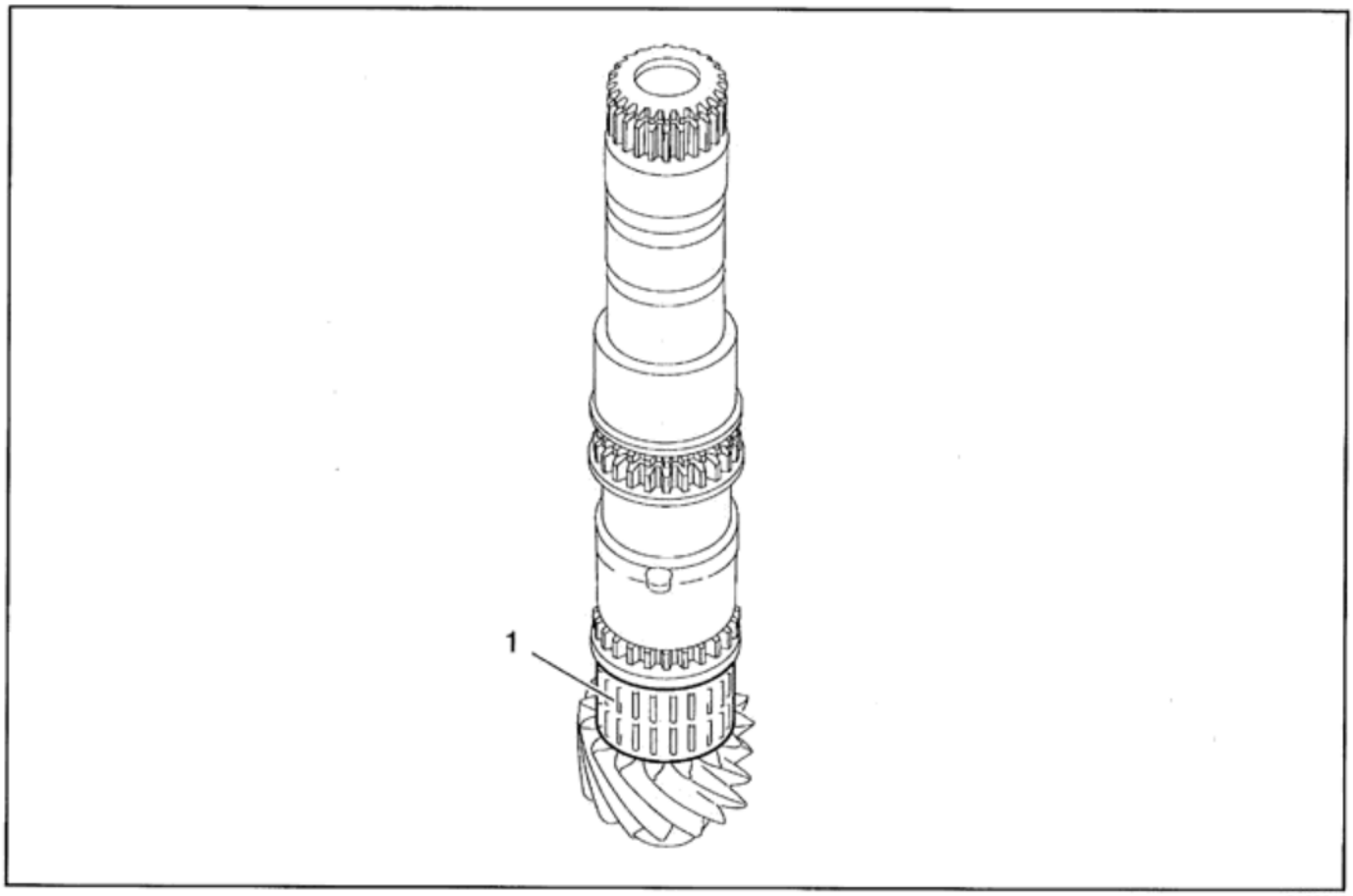


2192612

3rd and 4th Gear Synchronizer Hub and 4th Gear Removal

Callout	Component Name
Preliminary Procedure A hydraulic press is required to complete procedure. Prepare hydraulic press for procedure.	
1	3rd and 4th Gear Synchronizer Hub **Special Tools** • *DT-307-B* Remover Plate • *DT-736* Clutch Arbor
2	4th Gear

4th Gear Bearing Removal



2192613

4th Gear Bearing Removal

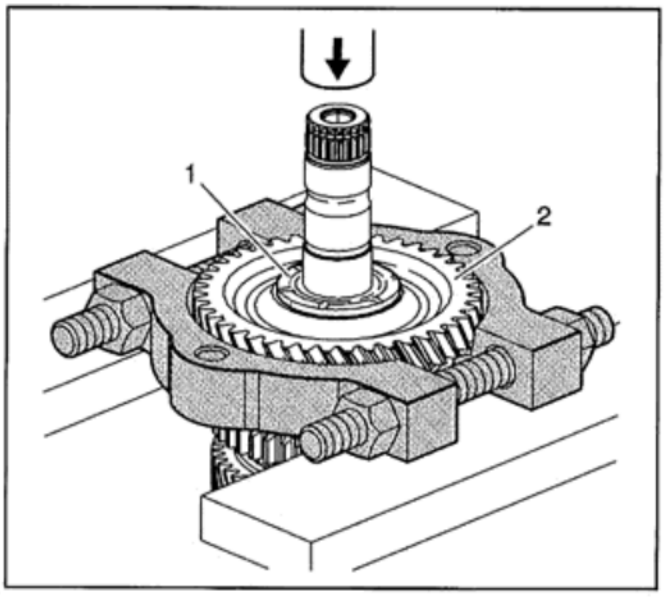
Callout	Component Name
1	4th Gear Bearing

Main Shaft Disassemble (Gen 2)

Special Tools

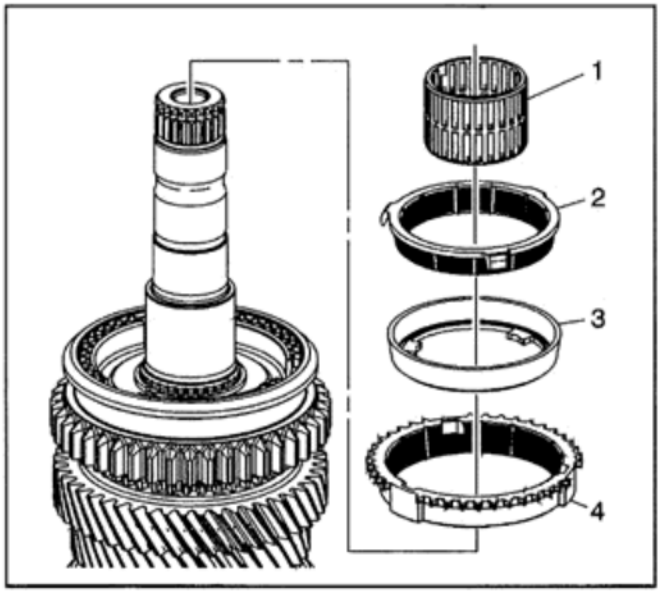
69604356 Gear Pullers

For equivalent regional tools, refer to *Special Tools on page 17-535*.



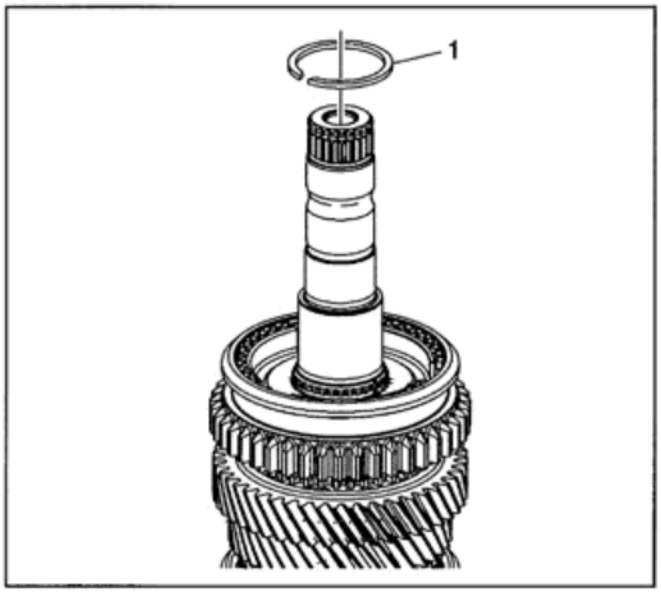
2262542

1. Remove the 1st gear thrust washer (1) and the 1st gear (2) using *69604356* pullers and a hydraulic press.



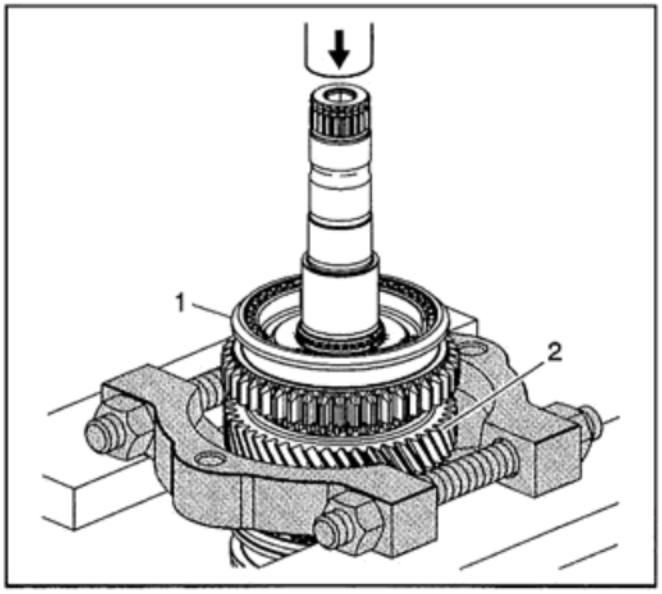
2262544

2. Remove the following components:
   - 1st gear bearing assembly (1)
   - 1st/2nd gear inner blocking ring (2)
   - 1st/2nd gear intermediate cone ring (3)
   - 1st/2nd gear outer blocking ring (4)



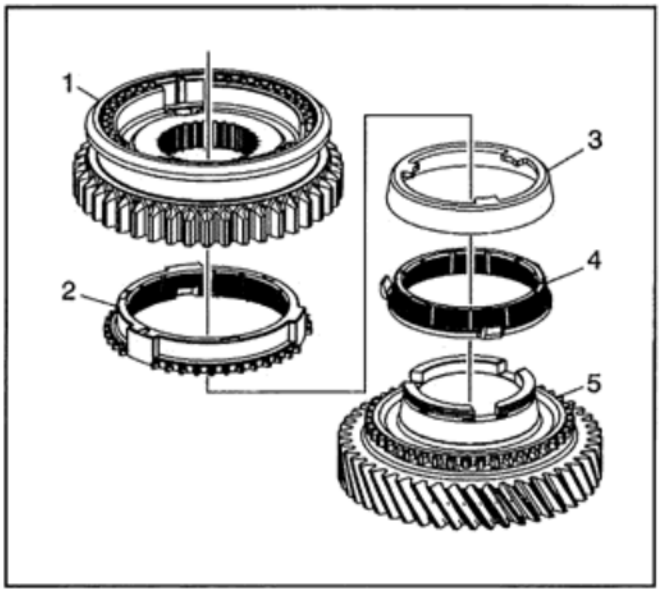
2262547

3. Remove and discard the 1st/2nd gear synchronizer assembly retaining ring (1).



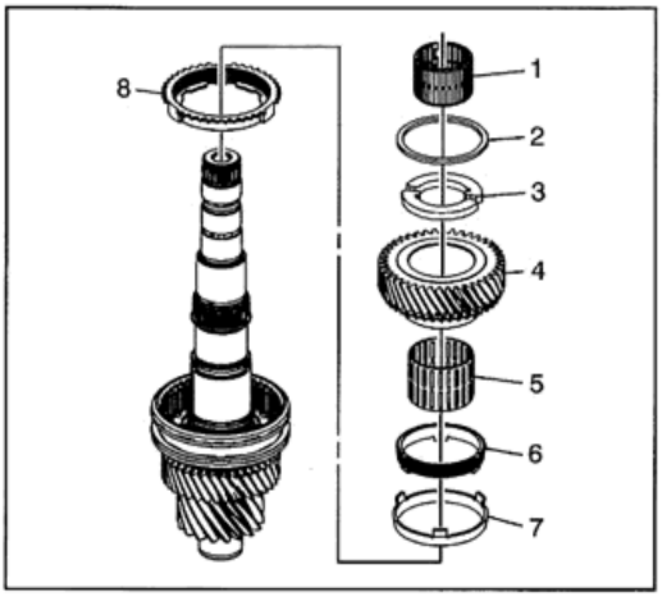
2262548

4. Remove the 1st/2nd gear synchronizer assembly (1) and 2nd gear assembly (2) as a unit using *69604356* pullers and a hydraulic press.



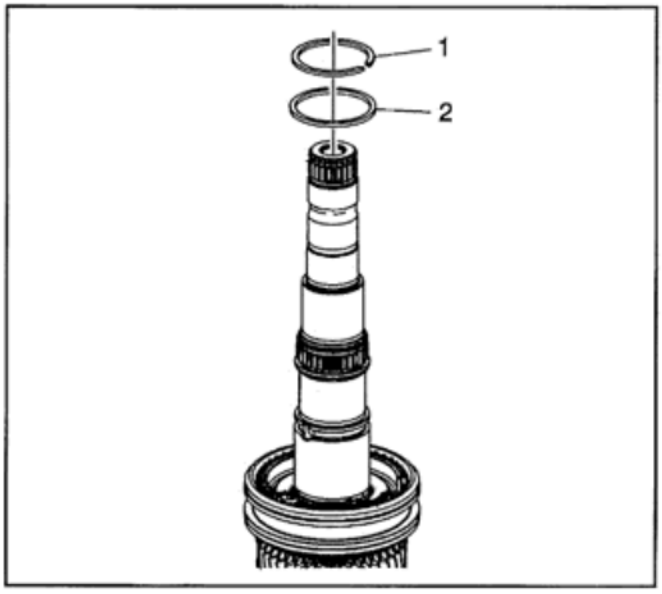
2262549

5. Separate the following components:
   - 1st/2nd gear synchronizer assembly (1)
   - 1st/2nd gear outer blocking ring (2)
   - 1st/2nd gear intermediate cone ring (3)
   - 1st/2nd gear inner blocking ring (4)
   - 2nd gear assembly (5)



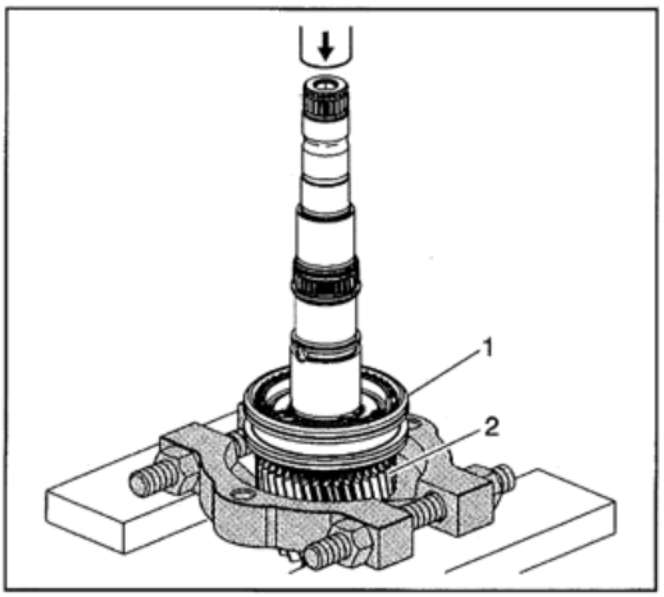
2748476

6. Remove the following components:
   - 2nd gear bearing assembly (1)
   - 3rd gear thrust washer retaining ring (2)
   - 3rd gear thrust washer (3)
   - 3rd gear assembly (4)
   - 3rd gear bearing assembly (5)
   - 3rd gear inner blocking ring (6)
   - 3rd gear intermediate blocking ring (7)
   - 3rd gear outer blocking ring (8)



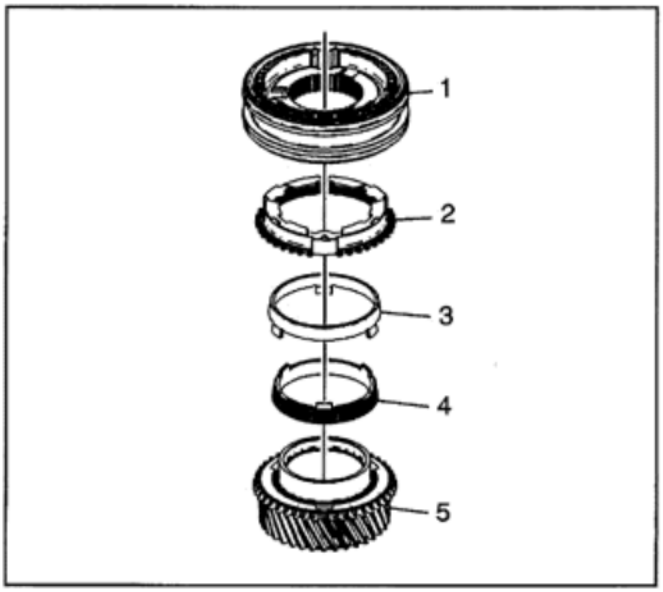
2262552

7. Remove and discard the 3rd/4th gear synchronizer assembly retaining ring (1) and the 3rd/4th gear synchronizer assembly thrust washer (2).



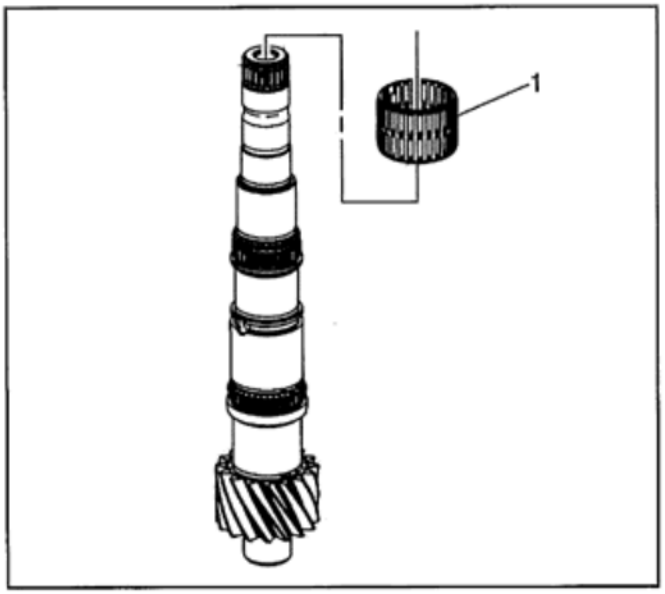
2262553

8. Remove the 3rd/4th gear synchronizer assembly (1) and the 4th gear assembly (2) as a unit using *69604356* pullers and a hydraulic press.



2748477

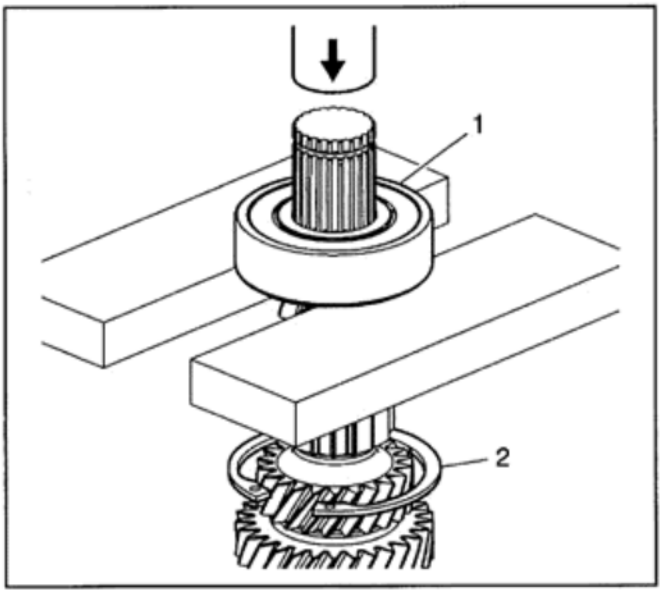
9. Separate the following components:
   - 3rd/4th gear synchronizer assembly (1)
   - 4th gear outer blocking ring (2)
   - 4th gear intermediate blocking ring (3)
   - 4th gear inner blocking ring (4)
   - 4th gear assembly (5)



2262558

10. Remove the 4th gear bearing assembly (1).

Input Shaft Disassemble



2264238

Note: The input shaft rear bearing retaining ring (2) remains loose on the shaft.

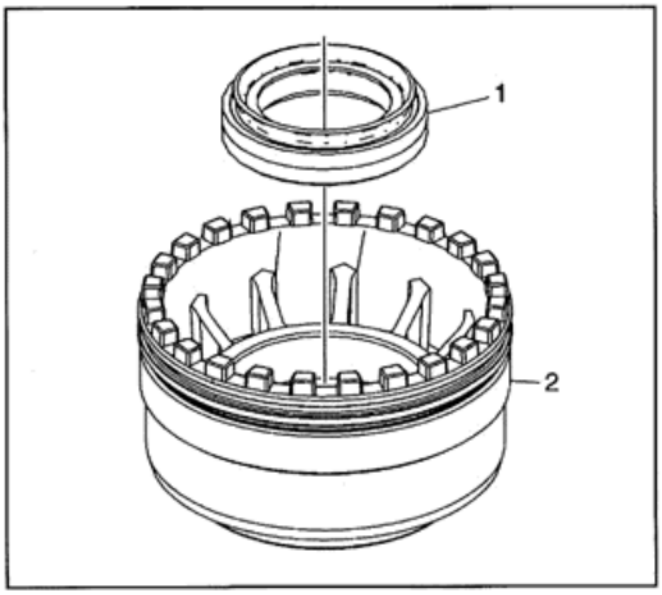
1. Remove the input shaft rear bearing assembly (1) using a hydraulic press.
2. Remove the retaining ring (2).

Differential Case Disassemble

Special Tools

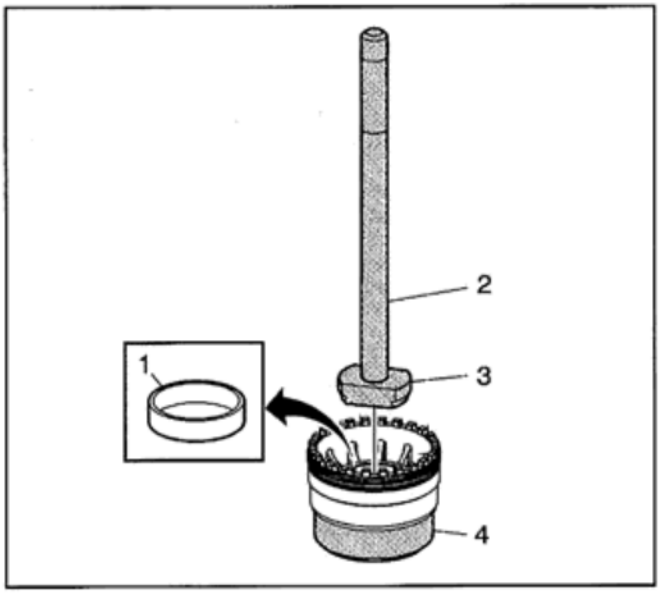
- *6-9607346* Sensor Ring Gear Puller
- *J-810704* Steering Column Center Bar Puller
- *J-810721* Axle Shaft Seal Remover Support Base
- *R-0006749* Support Base
- *R-0407011* Bearing Race Remover
- *R-0007761* Universal Handle for Pullers and Installers
- *S-9407195* Pinion Gear Case Bearing Installer
- *T-9804678* Speed Sensor Reluctor Wheel Remover

For equivalent regional tools, refer to *Special Tools on page 17-535.*



2265930

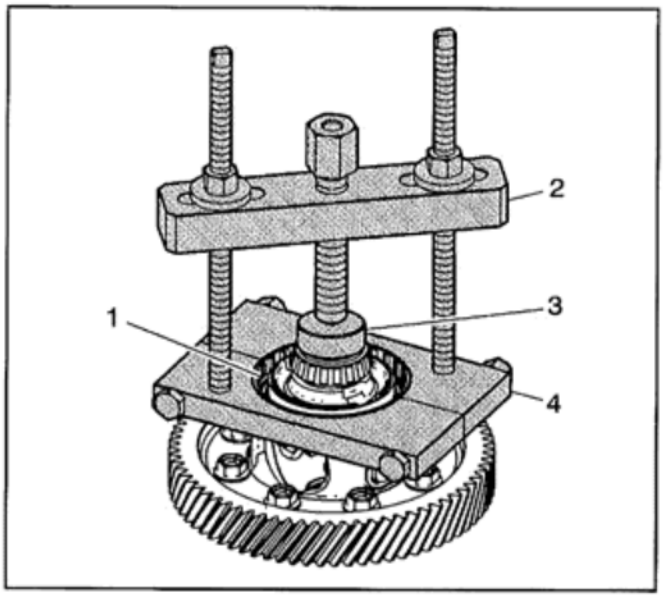
1. Remove the front wheel drive shaft oil seal (1) from the front differential bearing adjuster (2).



2265938

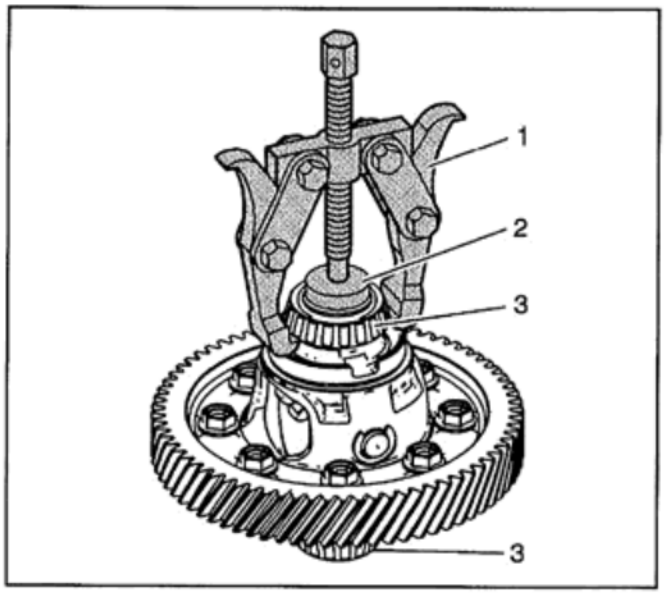
Note: Do not interchange outer and inner races respectively when re-using tapered roller bearings.

2. Remove the front differential bearing race (1) from the front differential bearing adjuster using the *R-0007761* handle (2), *R-0407011* remover (3), and the *J-810721* support base (4).



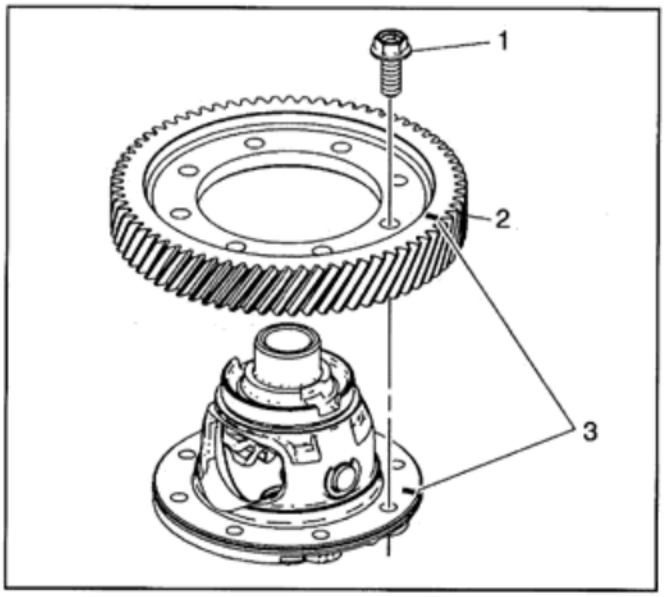
2265943

3. Remove the ring front wheel speed sensor reluctor wheel (1) using the *6-9607346* puller (2), *S-9407195* installer (3), and the *T-9804678* remover (4).



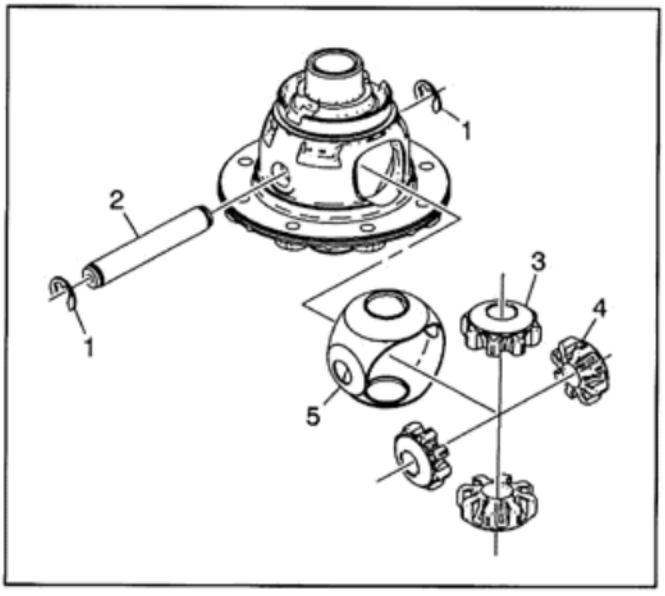
2265947

4. Remove the front differential bearing assemblies (3) using the *J-810704* puller (1) and *R-0006749* support base (2).



2265951

5. Place a mark (3) on the differential and the differential ring gear for realigning parts during assembly in case both components are reused.
6. Remove the front differential ring gear bolts (1) and the front differential ring gear (2).



2265956

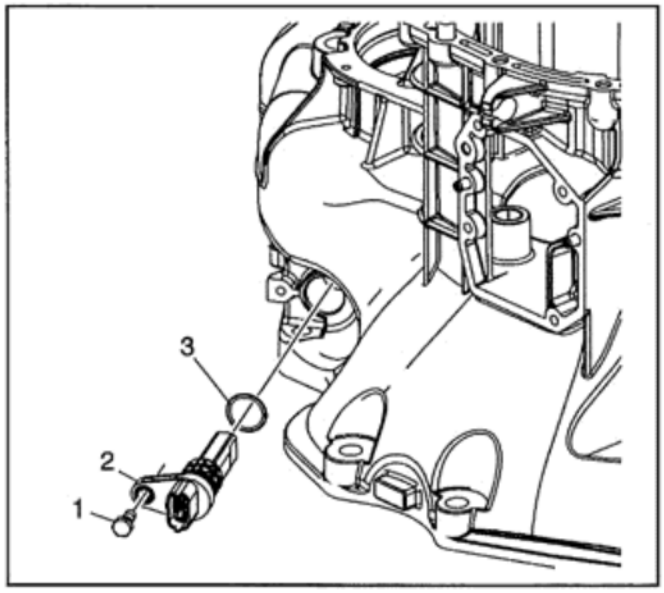
7. Remove the pinion gear shaft retaining washers (1) and the front differential pinion gear shaft (2).
8. Remove the front differential pinion gears (3) and side gears (4).
9. Remove the front differential pinion and side gear thrust washer (5).

Clutch and Differential Housing Disassemble

Special Tools

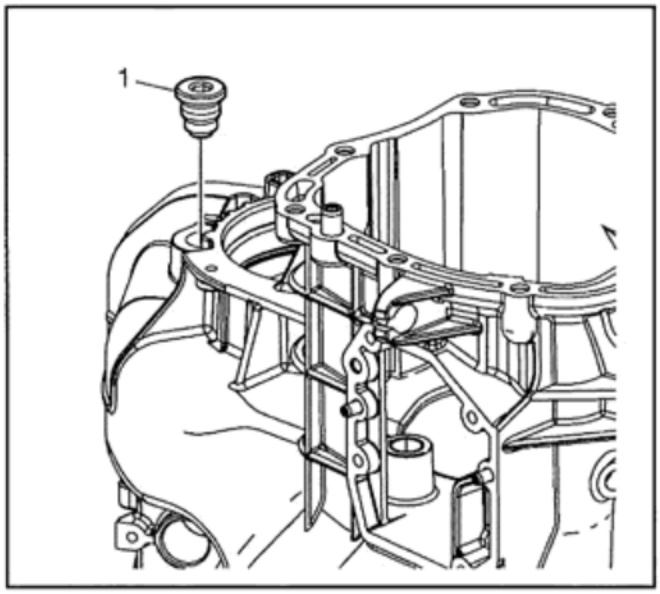
- *M-680770* Universal Sliding Mallet
- *R-0007758* Holding Fixture
- *R-0407008* Counter Shaft Bearing Remover
- *R-0407010* Input Shaft Needle Bearing Puller and Driver
- *R-0407013* Gearshift Device Bushing Puller
- *R-0007761* Universal Handle for Pullers and Installers
- *T-0207928* Retainer Remover

For equivalent regional tools, refer to *Special Tools on page 17-535*.



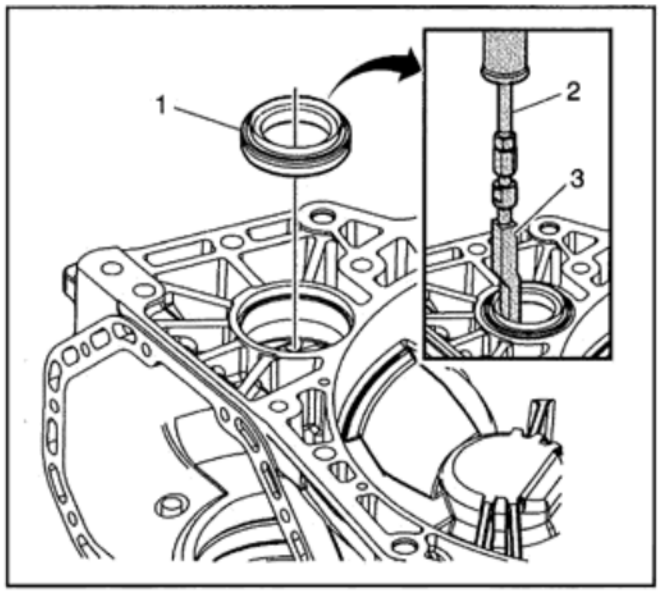
2264225

1. Remove the vehicle speed sensor bolt (1) and vehicle speed sensor assembly (2).
2. Remove and discard the vehicle speed sensor O-ring seal (3).



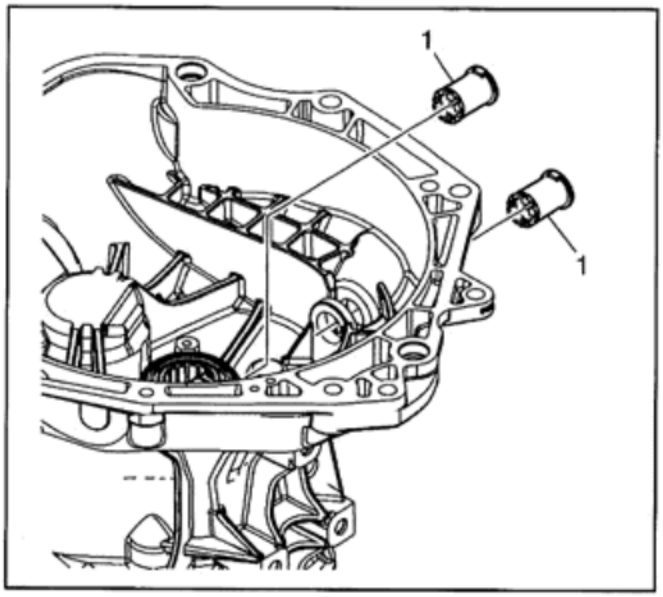
2264226

3. Remove the transmission magnet (1).



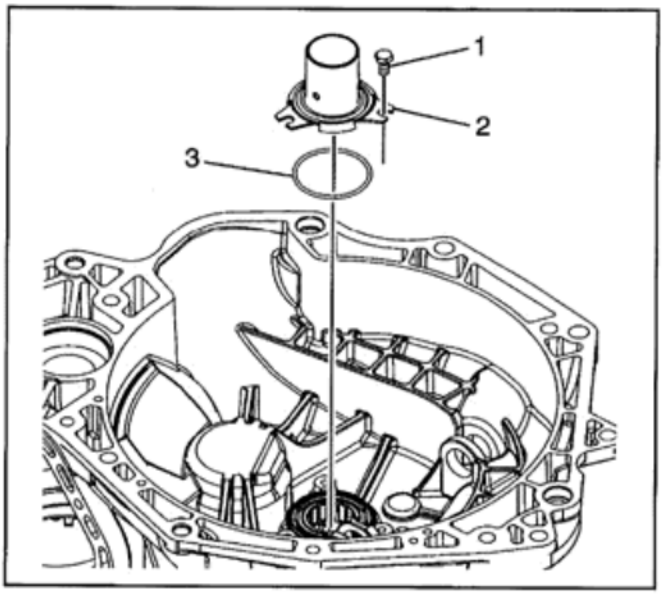
2264227

4. Using the *T-0207928* retainer remover (3) with the *M-680770* sliding mallet (2) remove the front wheel drive shaft oil seal assembly (1).



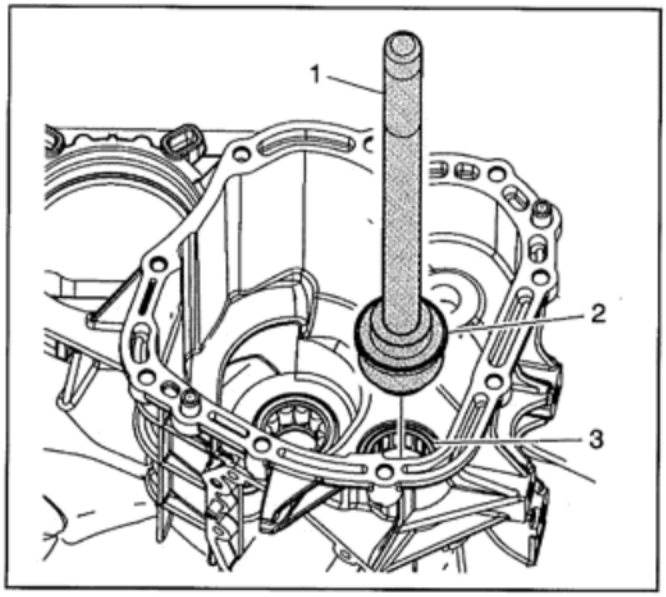
2264228

5. Remove the clutch yoke shaft bushings (1).



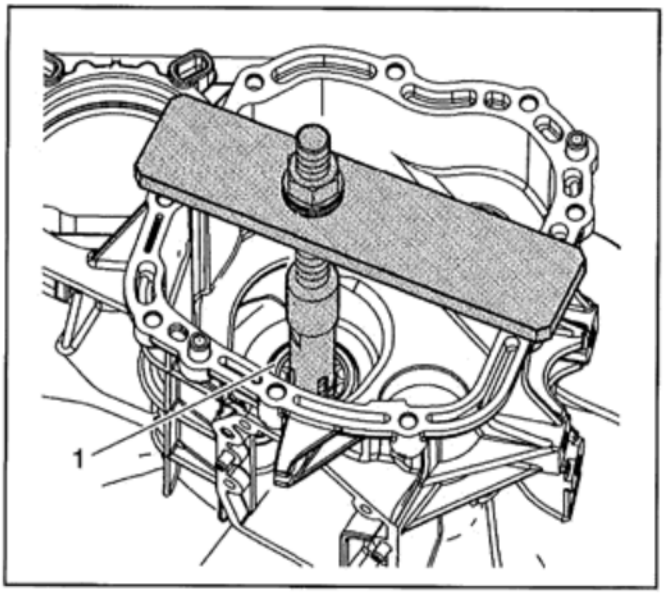
2276938

6. Remove the clutch release bearing collar bolt (1).
7. Remove the clutch release bearing collar (2).
8. Remove the clutch release bearing collar O-ring seal (3).



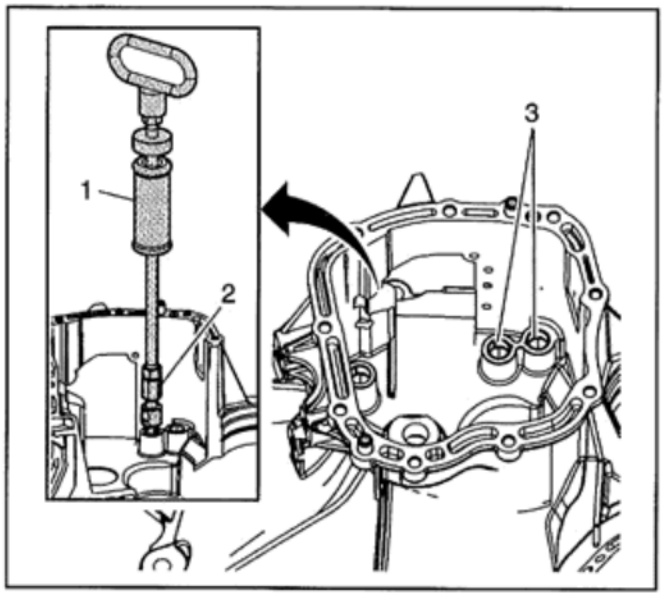
2264229

9. Remove the input shaft front bearing assembly (3) using the *R-0407010* driver (2) and the *R-0007761* handle (1).



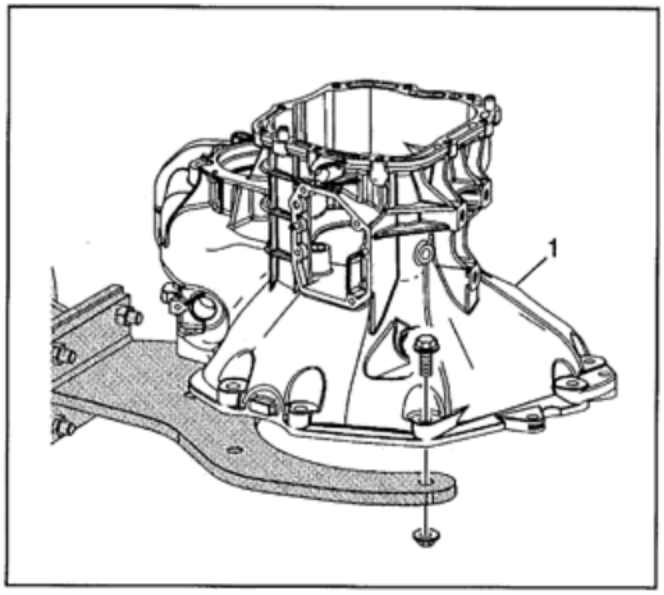
2264230

10. Remove the main shaft front bearing assembly (1) using the *R-0407008* remover.



2264232

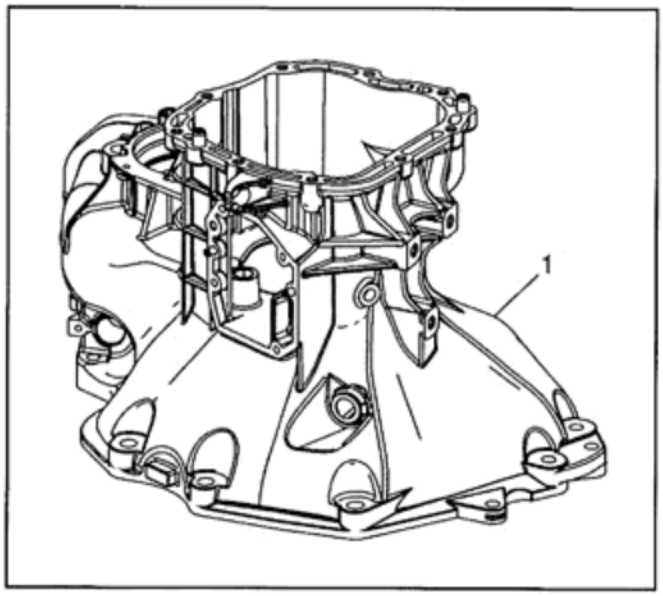
11. Remove the shift shaft bushings (3) using the *R-0407013* puller (2) and the *M-680770* mallet (1).



2276940

12. Remove the clutch and differential housing (1) from the *R-0007758* holding fixture.

Clutch and Differential Housing Cleaning and Inspection



2264233

Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

1. Clean the clutch housing (1) with a suitable solvent. Air dry all the parts.
2. Inspect the clutch housing for the following conditions:
   - Cracks

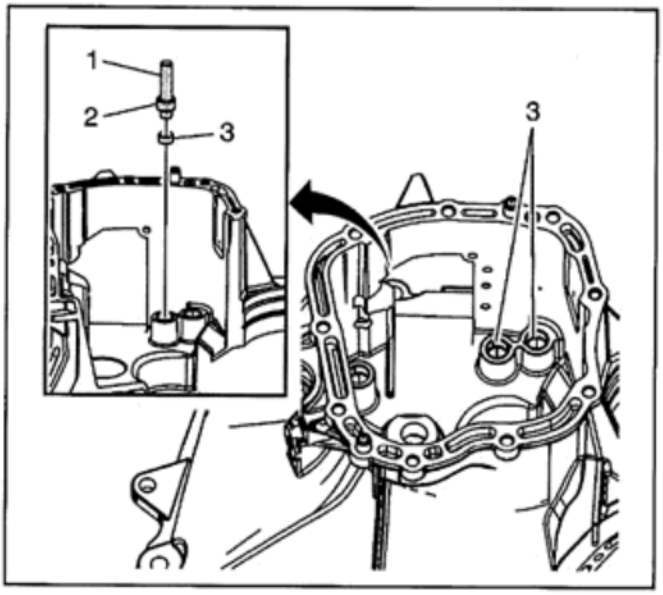
     Replace the clutch housing if cracks are found.
   - Scratches
   - Burrs
   - Nicked mounting surfaces
   - Damaged sealing surfaces
   - Damaged front or rear bearing bores
   - Damaged alignment pins
3. Inspect the machined mating surfaces for flatness. Check the mating surfaces with a straight edge.
4. Inspect the bearing bores for wear, scratches or grooves.
5. Inspect the bushings for excessive wear. Replace worn bushings.
6. Use a fine mill file to dress minor scratches or burrs.
7. If scratches, or grooves or scoring cannot be removed by hand with a soft stone or crocus cloth, replace the component.

Clutch and Differential Housing Assemble

Special Tools

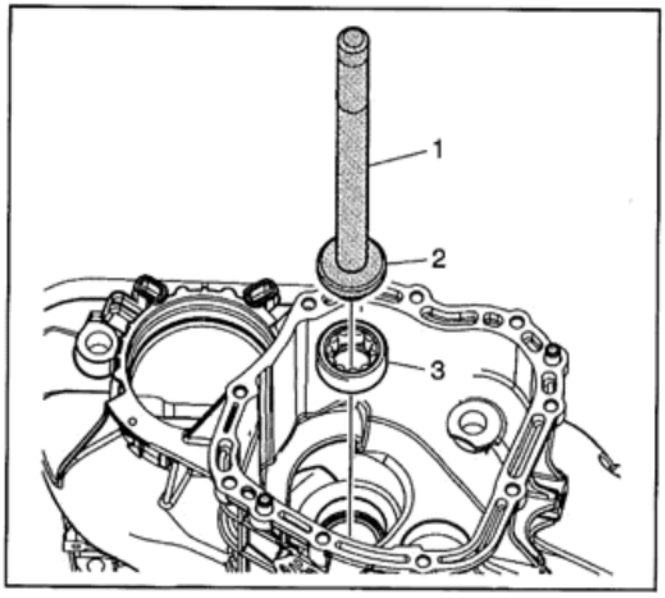
- *R-0007761* Universal Handle for Pullers and Installers
- *R-0407009* Countershaft Front Bearing Driver
- *R-0407010* Input Shaft Needle Bearing Puller and Driver
- *R-0407014* Gearshift Device Bushing Driver – Use with R-0007761
- *S-9707500* Axle Shaft Seal Installer

For equivalent regional tools, refer to *Special Tools on page 17-535*.



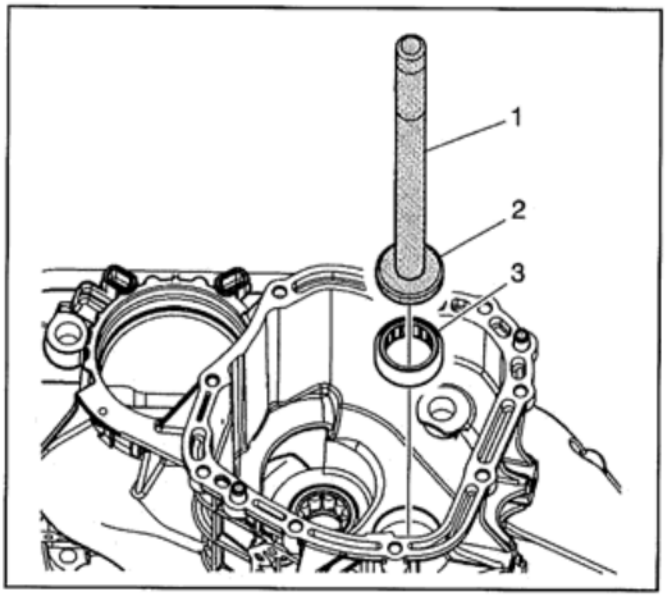
2264234

1. Install the shift shaft bushings (3) using the *R-0407014* bushing driver (2) and *R-0007761* handle (1).



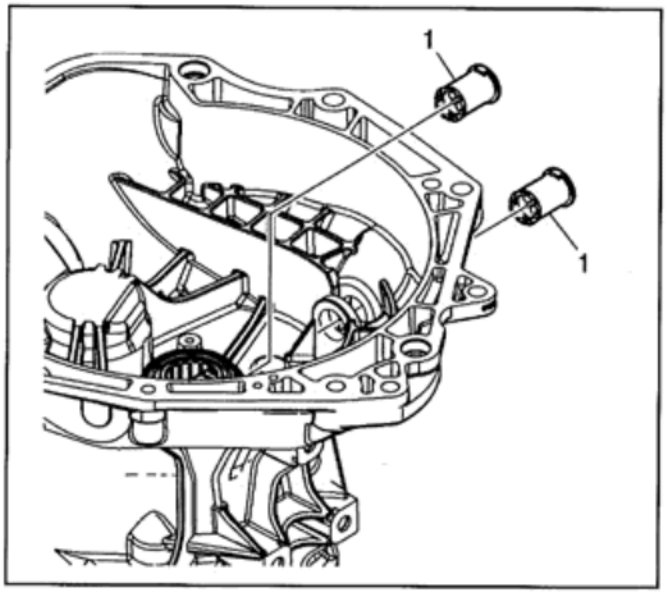
2264235

2. Install the main shaft front bearing assembly (3) using the *R-0407009* driver (2) and the *R-0007761* handle (1).



2264236

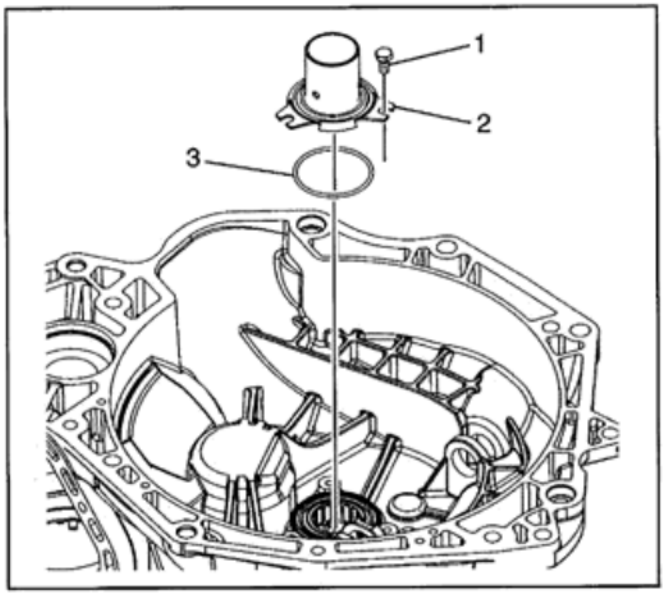
3. Install the input shaft front bearing assembly (3) using the *R-0407010* driver (2) and the *R-0007761* handle (1).



2264228

Note: Align the tabs on the clutch yoke shaft bushings to the slots in the clutch and differential housing.

4. Install the clutch yoke shaft bushings (1).

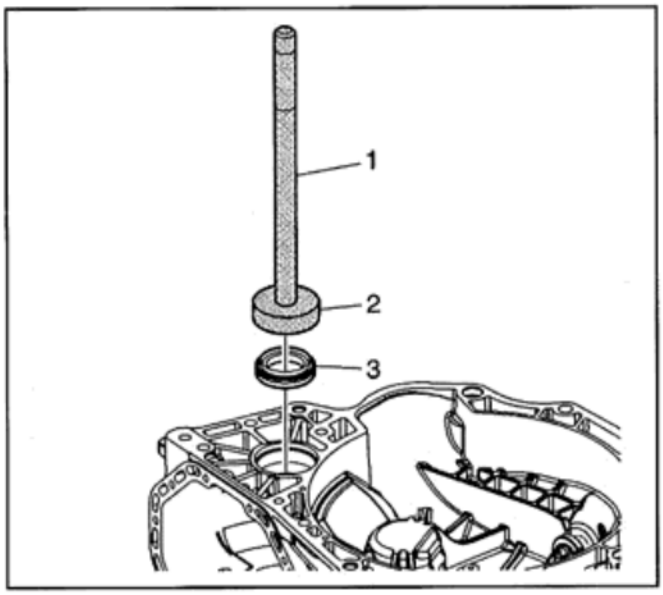


2276938

5. Install the clutch release bearing collar seal (3).
6. Install the clutch release bearing collar (2).

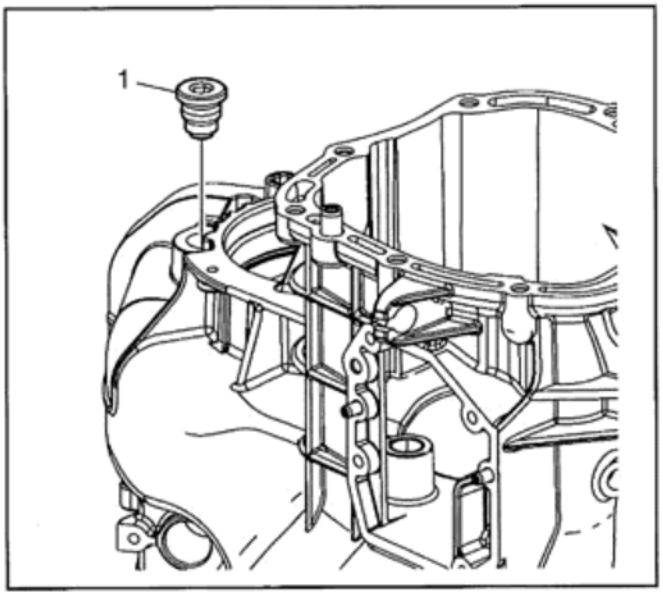
Caution: Refer to *Fastener Caution on page 0-8*.

7. Install the clutch release bearing collar bolt (1) and tighten to **5 N•m (44.3 lb in)**.



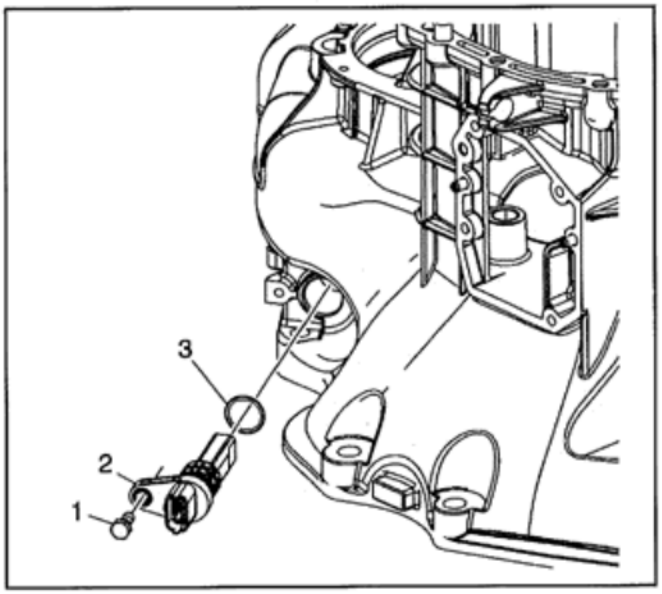
2264237

8. Install the front wheel drive shaft oil seal assembly (3) using the *S-9707500* seal installer (2) and the *R-0007761* handle (1).



2264226

9. Install the transmission magnet (1). Tighten to **4 N•m (35.4 lb in) plus 45° plus an additional 90°**.

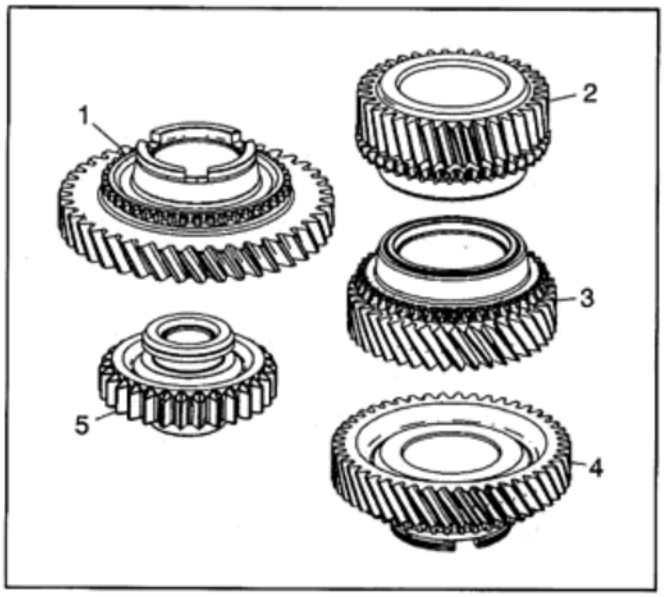


2264225

10. Install the NEW vehicle speed sensor O-ring seal (3).
11. Install the vehicle speed sensor assembly (2).
12. Install the vehicle speed sensor bolt (1). Tighten to **5 N•m (44 lb in)**.

Gears Cleaning and Inspection (Gen 1)

Gears

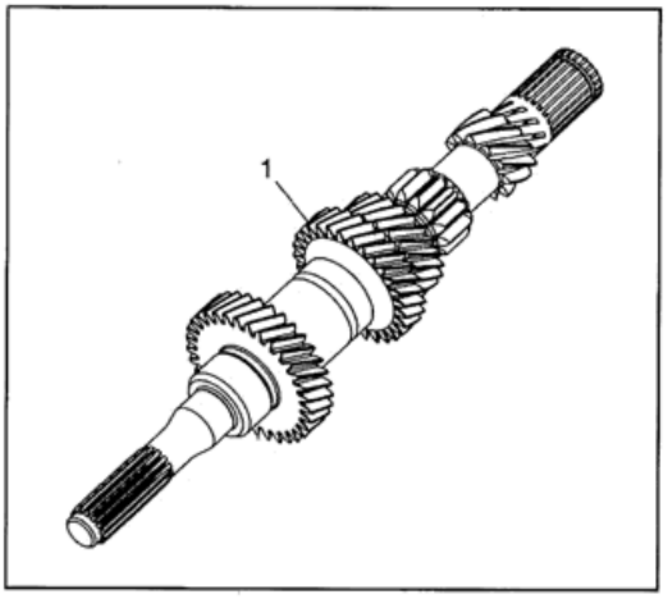


2262529

Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

1. Clean the following gears in a suitable solvent and air dry all the parts.
   - 1st gear (1)
   - 2nd gear assembly (4)
   - 3rd gear assembly (3)
   - 4th gear assembly (2)
   - Reverse idler gear (5)
2. Inspect the gear tooth surfaces on all the gears for the following conditions:
   - Cracks
   - Pitting
   - Nicks
   - Chipped gear teeth
   - High spots — small shiny spots on the gear teeth mating surfaces

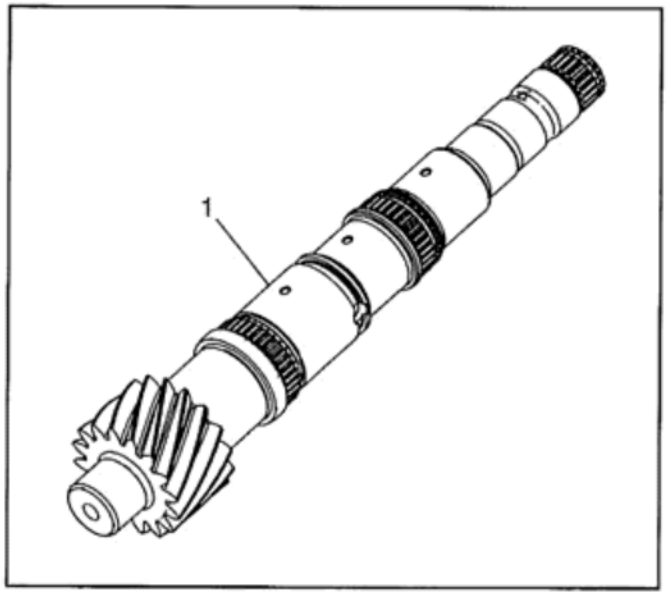
Input Shaft



2262531

1. Clean the input shaft (1) in a suitable solvent.
2. Clean and air dry the oil gallery.
3. Inspect the input shaft bearing surfaces for the following conditions:
   - Wear
   - Lack of lubricant
   - Debris embedded in the oil grooves
   - Brinelling
4. Inspect the input shaft splines for wear or damage.
5. Replace the input shaft if any of the above conditions are found.

Main Shaft

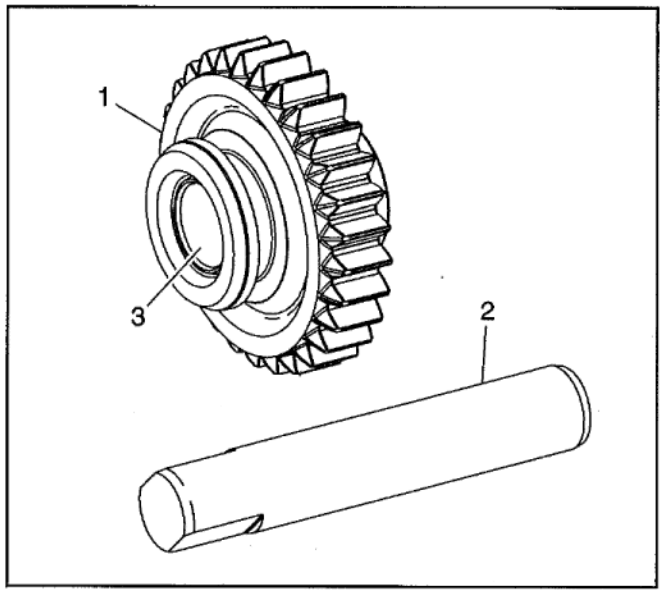


2262537

1. Clean the main shaft (1) in a suitable solvent.
2. Clean and air dry the oil gallery.

3. Inspect the main shaft bearing surfaces for the following conditions:
   - Wear
   - Lack of lubricant
   - Debris embedded in the oil grooves
   - Brinelling
4. Inspect the main shaft splines for wear or damage.
5. Replace the main shaft if any of the above conditions are found.

Reverse Idler Gear and Shaft

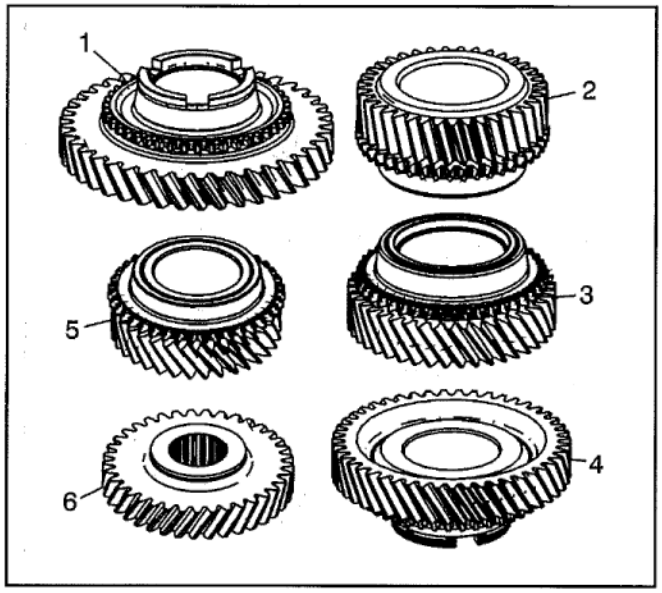


2262540

1. Clean the reverse idler gear (1) and shaft (2) in a suitable solvent and air dry all the parts.
2. Inspect the reverse idler gear bushing (3) for the following conditions:
   - Excessive wear
   - Scoring
   - Pitting
3. Replace the reverse idler gear if the bushing is faulty.
4. Inspect the reverse idler gear shaft for the following conditions:
   - Excessive wear
   - Scoring
   - Pitting
5. Replace the reverse idler gear shaft if it is faulty.

Gears Cleaning and Inspection (Gen 2)

Gears

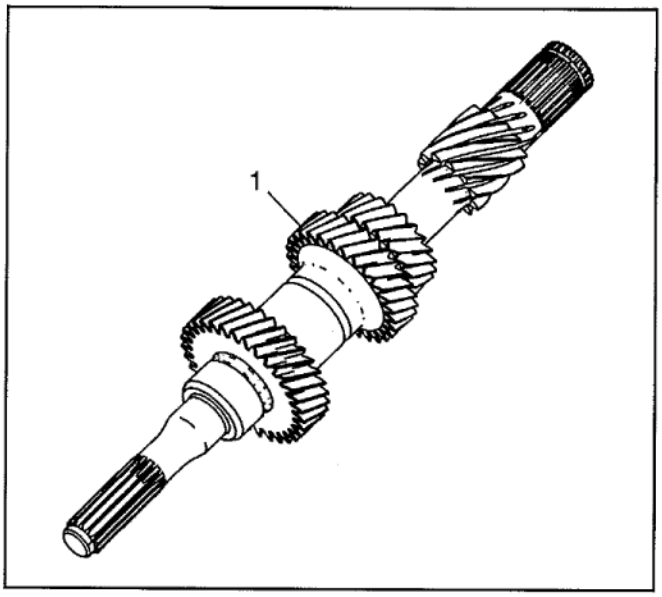


2845551

Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

1. Clean the following gears in a suitable solvent and air dry all the parts.
   - 1st Gear (1)
   - 2nd Gear Assembly (4)
   - 3rd Gear Assembly (3)
   - 4th Gear Assembly (2)
   - 5th Gear Assembly - Driven (5)
   - 5th Gear - Driving (6)
2. Inspect the gear tooth surfaces on all the gears for the following conditions:
   - Cracks
   - Pitting
   - Nicks
   - Chipped gear teeth
   - High spots — small shiny spots on the gear teeth mating surfaces

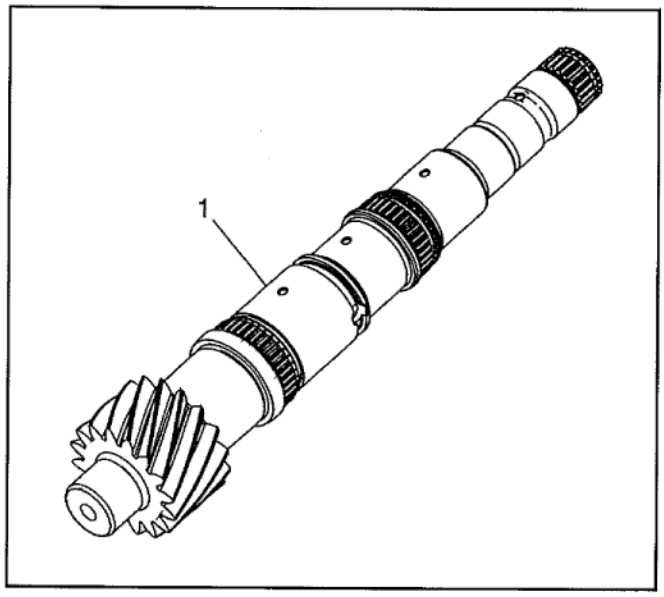
Input Shaft



2748673

1. Clean the input shaft (1) in a suitable solvent.
2. Clean and air dry the oil gallery.
3. Inspect the input shaft bearing surfaces for the following conditions:
   - Wear
   - Lack of lubricant
   - Debris embedded in the oil grooves
   - Brinelling
4. Inspect the input shaft splines for wear or damage.
5. Replace the input shaft if any of the above conditions are found.

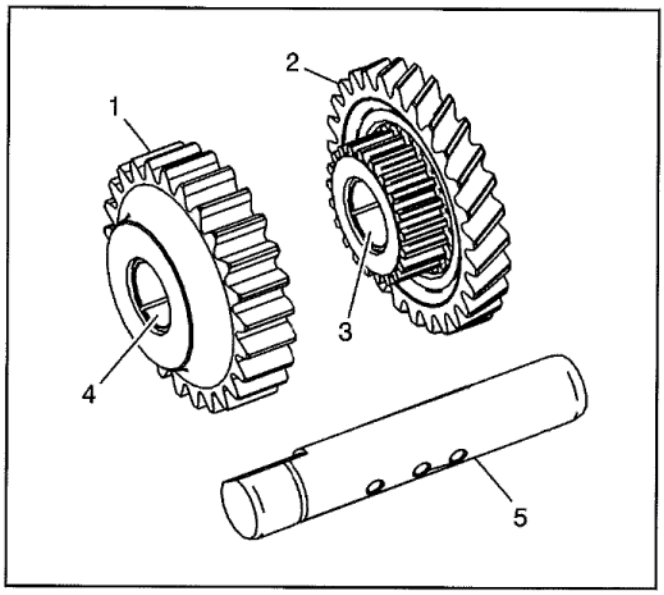
Main Shaft



2262537

1. Clean the main shaft (1) in a suitable solvent.
2. Clean and air dry the oil gallery.
3. Inspect the main shaft bearing surfaces for the following conditions:
   - Wear
   - Lack of lubricant
   - Debris embedded in the oil grooves
   - Brinelling
4. Inspect the main shaft splines for wear or damage.
5. Replace the main shaft if any of the above conditions are found.

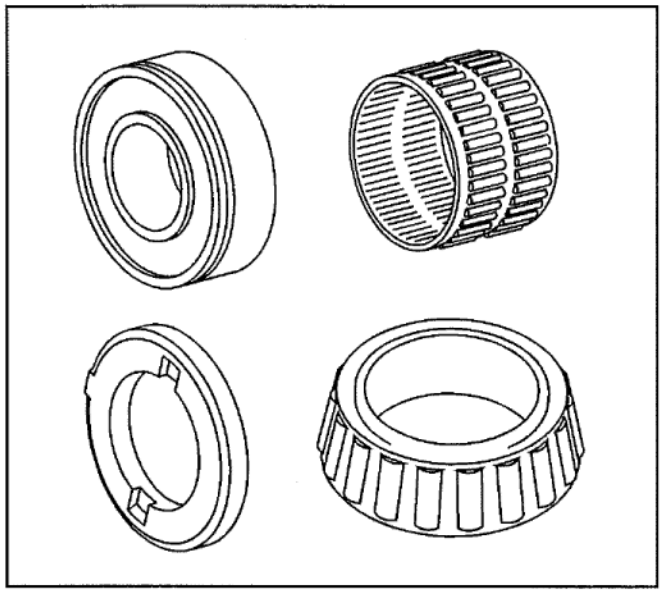
Reverse Gears and Shaft



2748674

1. Clean the reverse spur gear (1), reverse helical gear (2), and shaft (5) in a suitable solvent and air dry all the parts.
2. Inspect the reverse spur gear bushings (4) and reverse helical gear bushings (3) for the following conditions:
   - Excessive wear
   - Scoring
   - Pitting
3. Replace the reverse gears if the bushings are faulty.
4. Inspect the reverse gear shaft for the following conditions:
   - Excessive wear
   - Scoring
   - Pitting
5. Replace the reverse gear shaft if it is faulty.

Thrust Washer and Bearing Cleaning and Inspection



1485489

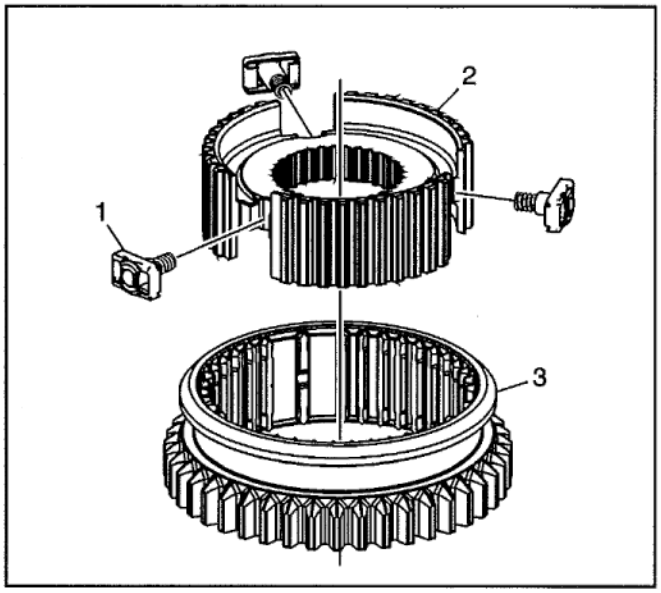
Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

Caution: Do not allow the bearings to spin. Turn them slowly by hand. Spinning the bearings may damage the race and the rollers.

1. Mark or tag the bearings in order to ensure they are properly installed in the correct location.
2. Clean all of the roller bearings, needle bearings, and ball bearings in a suitable solvent and air dry all the parts.
3. Inspect the bearings and races for the following conditions:
   - Roughness
   - Brinelling
   - Pitting
4. Inspect the cage bearings for being bent or for having damaged cages.
5. Replace the bearings with any of the above conditions.
6. Replace mated bearing parts when only one part is damaged.
7. Inspect the thrust washers for scoring or wear.
8. Replace any faulty thrust washers.
9. Do not file surfaces which have been hardened and precision ground.

Synchronizers Disassemble

1st/2nd Gear Synchronizer

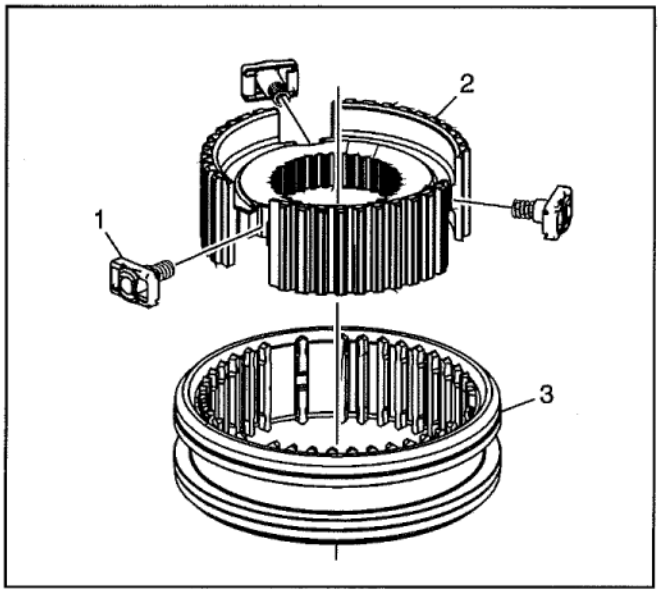


2262605

Note: When servicing the synchronizers, retain them in the same order that they are removed. Keep the synchronizer components together and mark them to identify correct location.

1. Remove the 1st/2nd gear synchronizer hub (2) from the 1st/2nd gear synchronizer sleeve (3).
2. Remove the synchronizer inserts (1) from the 1st/2nd gear synchronizer hub (2).

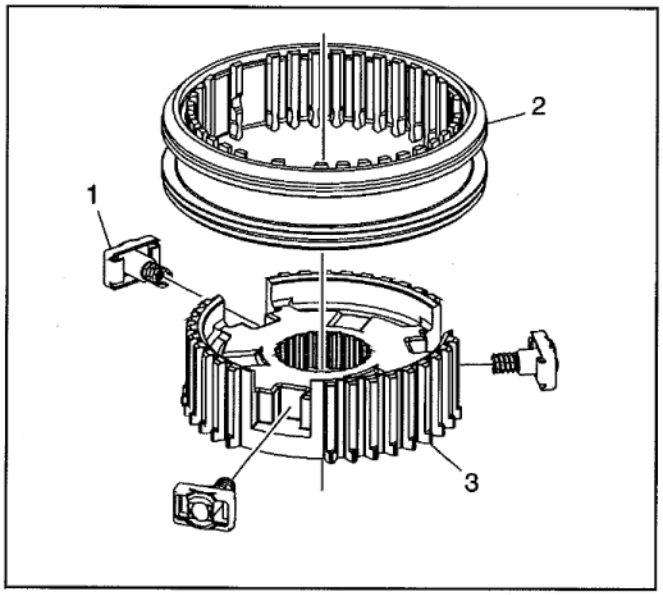
3rd/4th Gear Synchronizer



2262606

1. Remove the 3rd/4th gear synchronizer hub (2) from the 3rd/4th gear synchronizer sleeve (3).
2. Remove the synchronizer inserts (1) from the 3rd/4th gear synchronizer hub (2).

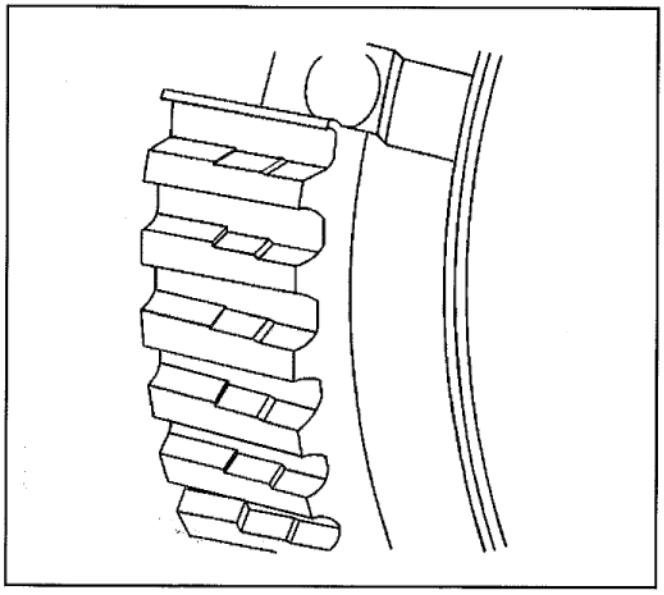
5th Gear Synchronizer



2262607

1. Remove the 5th gear synchronizer hub (3) from the 5th gear synchronizer sleeve (2).
2. Remove the synchronizer inserts (1) from the 5th gear synchronizer hub (3).

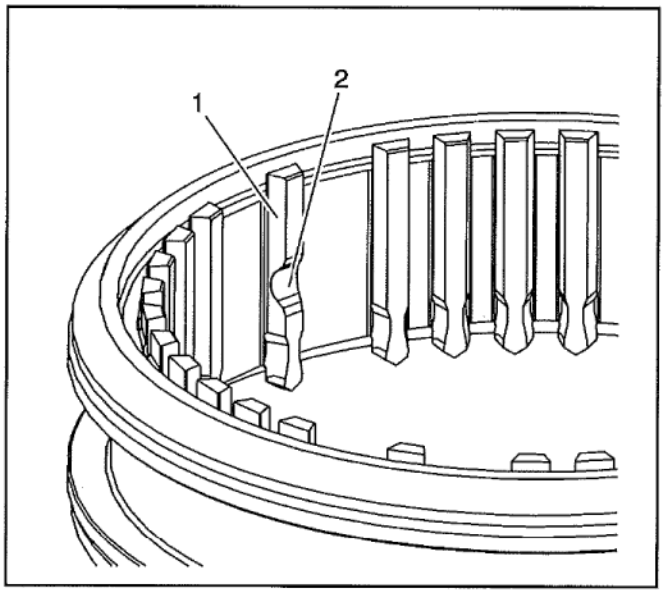
Synchronizers Cleaning and Inspection



648209

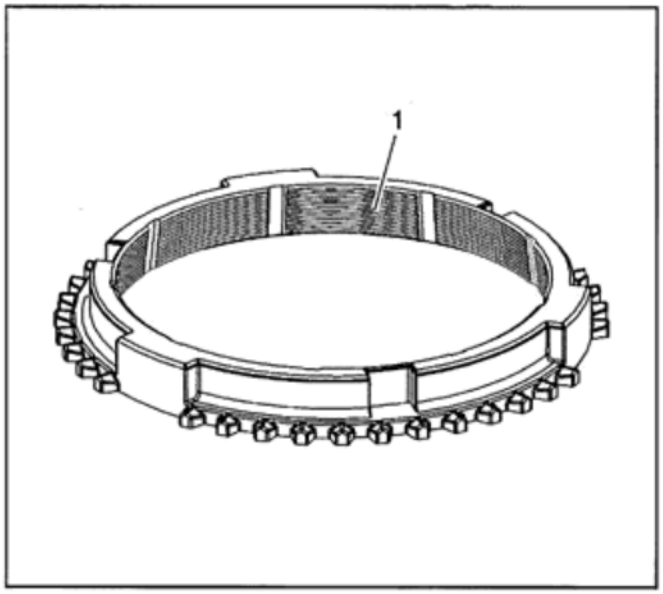
Note: When servicing the synchronizers, retain them in the order that they are removed. Mark the parts to ensure the correct position for inspection and assembly.

1. Clean all the synchronizer parts in a suitable cleaning solvent and air dry all the parts.
2. Inspect the 1st/2nd gear, 3rd/4th gear, and 5th gear synchronizer hubs for a force fit on the main shaft.
3. Replace synchronizer hubs that do not require a force fit.
4. Inspect the synchronizer hubs for wear on the external splines. A stepped effect on the teeth, due to wear, may cause shift concerns.
5. Replace a worn hub.
6. Correct the cause, such as, but not limited to the following conditions:
   - Engine related vibrations
   - Driving at a low speed in a high gear
   - Defective vibration damper or crankshaft



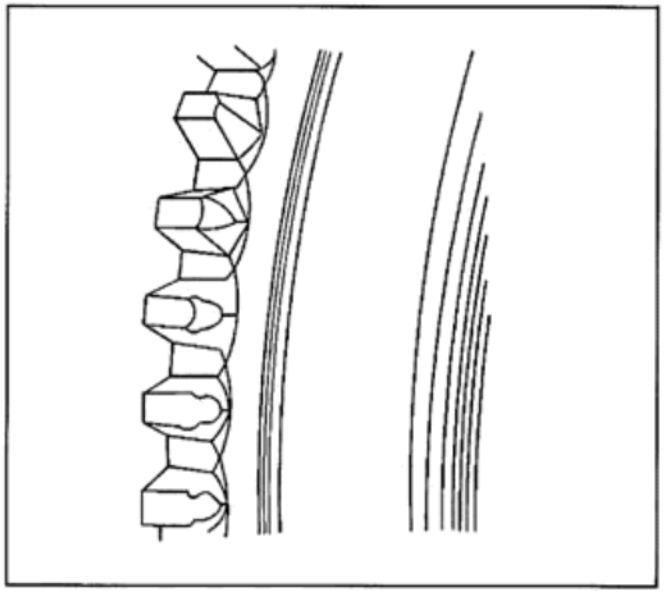
2262608

7. Inspect the synchronizer sleeve teeth (1) for the following conditions, which may cause shift concerns:
   - Grated teeth
   - Chipped off teeth
   - Blunted teeth
8. Inspect the synchronizer sleeve detent stops (2) for wear or for being chipped off.
9. Replace the synchronizer assembly if the teeth or stops show the above conditions.



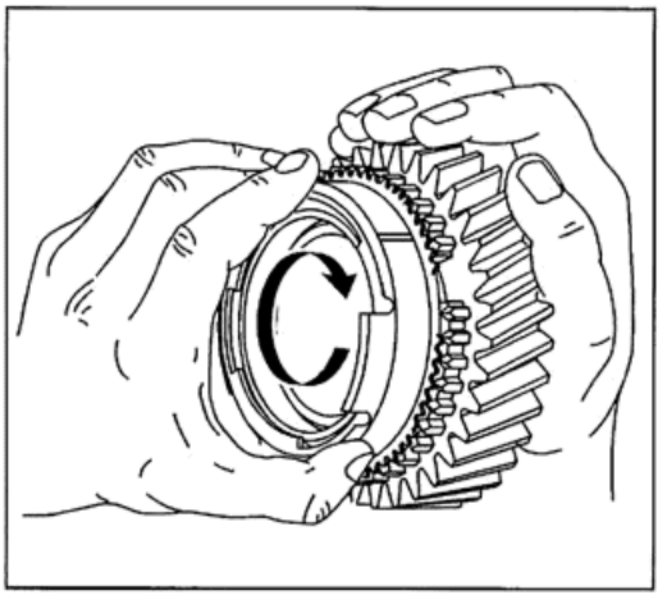
2262609

10. Inspect the synchronizer blocker rings for worn away grooves (1).
11. Replace the blocker ring assembly if the blocker ring grooves are worn.



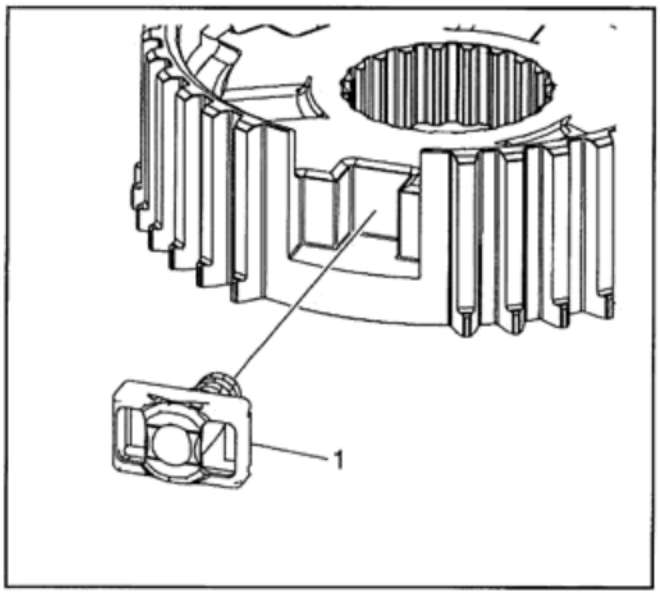
648208

12. Inspect the synchronizer blocker rings for worn shift teeth.
13. Inspect the internal ring for being warped or damaged.
14. Inspect the outer ring for worn grooves.
15. Replace the synchronizer assembly for any of the above conditions.



881125

16. Install the synchronizer blocking rings to the correct speed gear.
17. Inspect the braking effect of the blocking ring. Turn the blocking ring in one direction while pushing to the gear cone. Ensure the ring locks.
18. If the ring does not lock, replace the synchronizer assembly.

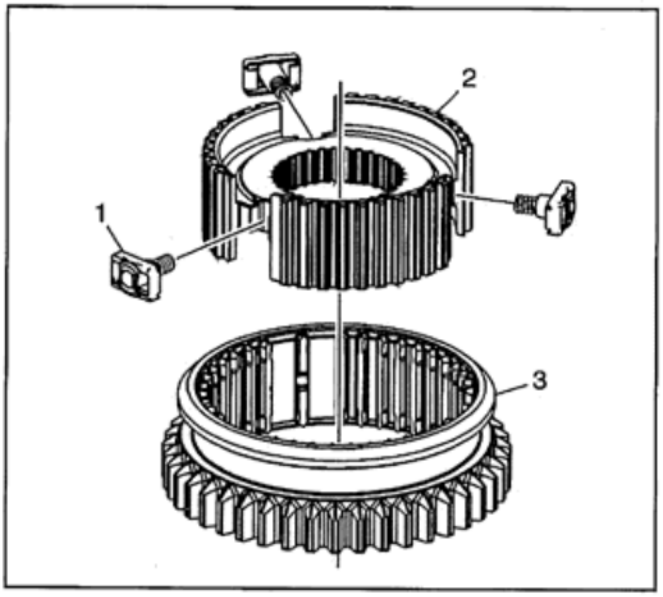


2262610

19. Inspect the pressure pieces (1) for wear or damage.
20. Replace the worn pressure pieces.

Synchronizers Assemble

1st/2nd Gear Synchronizer

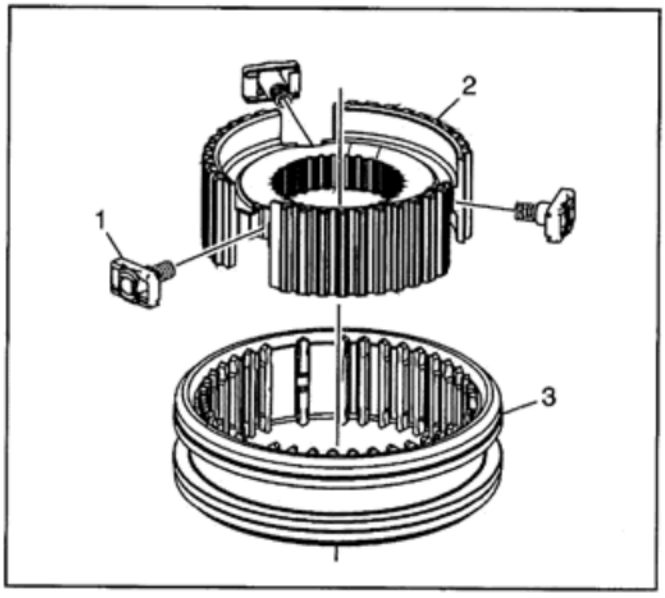


2262605

Note: When servicing the synchronizers, retain them in the same order that they are removed. Keep the synchronizer components together and mark them to identify correct location.

1. Install the synchronizer inserts (1) into the 1st/2nd gear synchronizer hub (2).
2. Install the 1st/2nd gear synchronizer hub (2) into the 1st/2nd gear synchronizer sleeve (3).

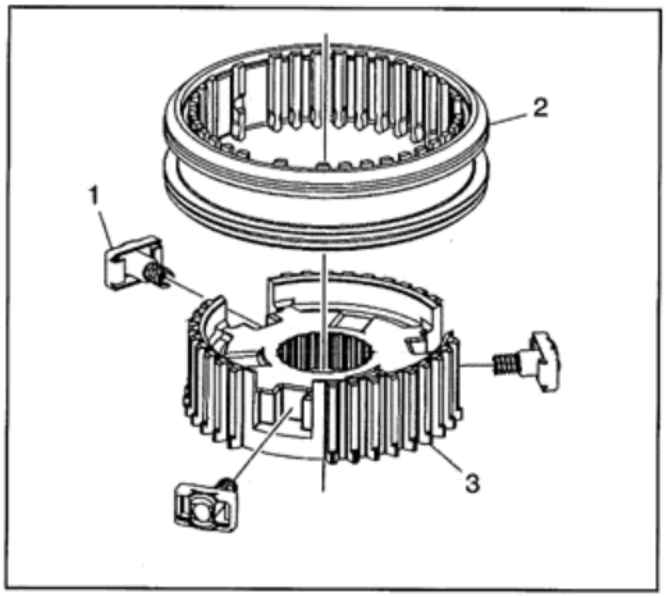
3rd/4th Gear Synchronizer



2262606

1. Install the synchronizer inserts (1) into the 3rd/4th gear synchronizer hub (2).
2. Install the 3rd/4th gear synchronizer hub (2) into the 3rd/4th gear synchronizer sleeve (3).

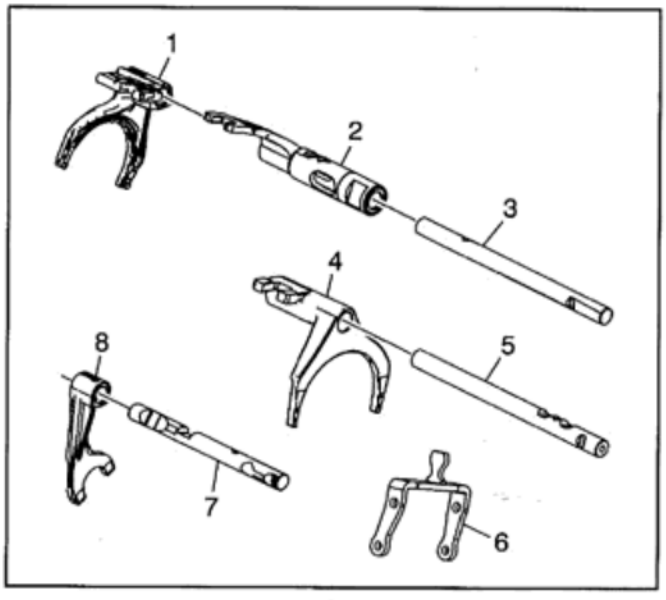
5th Gear Synchronizer



2262607

1. Install the synchronizer inserts (1) into the 5th gear synchronizer hub (3).
2. Install the 5th gear synchronizer hub (3) into the 5th gear synchronizer sleeve (2).

Shift Fork Cleaning and Inspection (Gen 1)

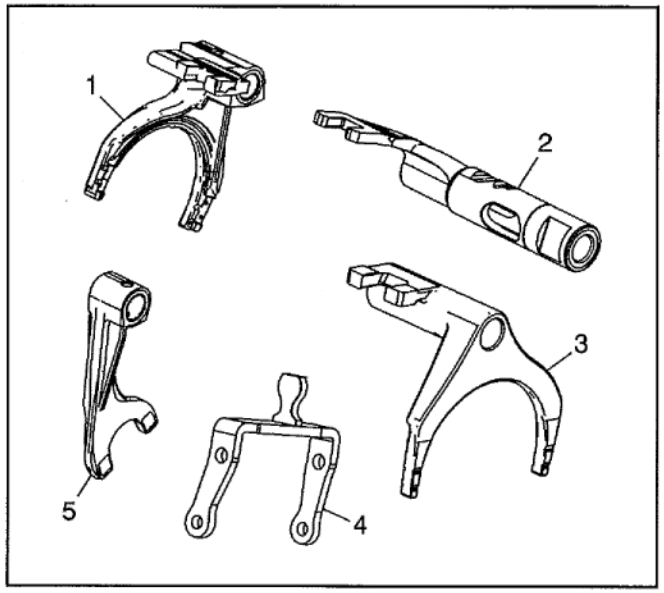


2265960

Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

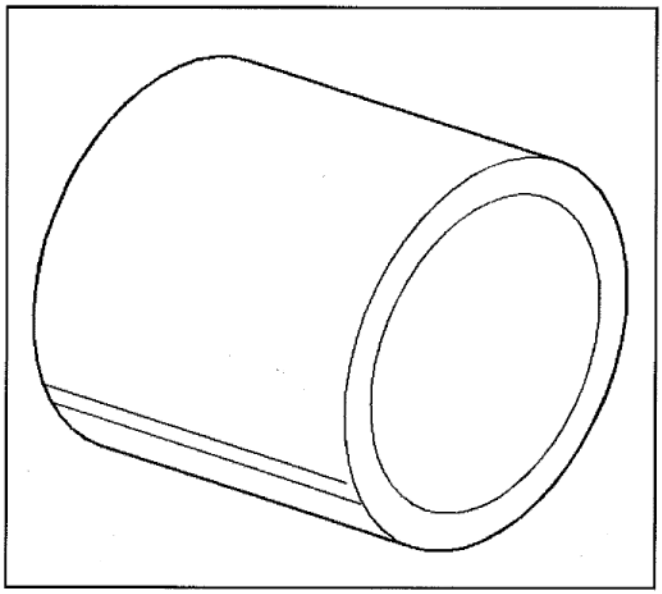
1. Clean the following components with a suitable solvent. Air dry all the parts.
   - 3rd and 4th shift fork assembly (1)
   - 5th shift blocking guide (2)
   - 3rd and 4th shift shaft (3)

- 1st and 2nd shift fork assembly (4)
- 1st and 2nd shift shaft (5)
- 5th shift fork assembly (6)
- Reverse shift shaft (7)
- Reverse shift fork assembly (8)



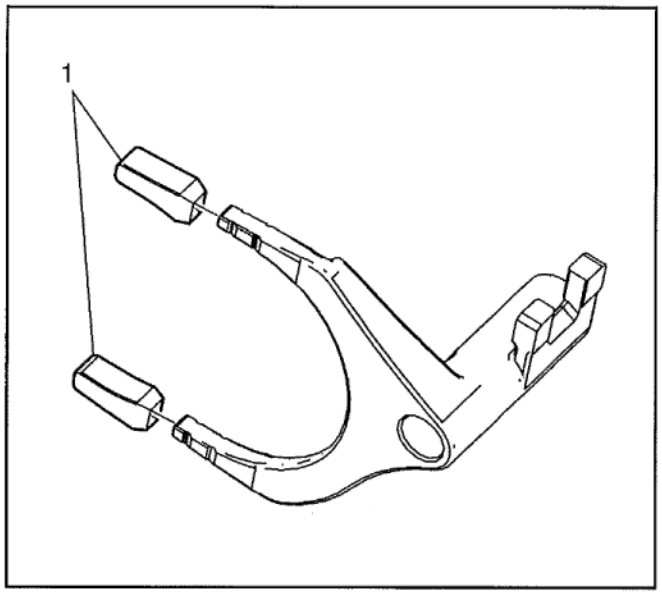
2265968

2. Inspect the following components for excessive wear, fractures or distortion.
   - 3rd and 4th shift fork assembly (1)
   - 5th shift blocking guide (2)
   - 1st and 2nd shift fork assembly (3)
   - 5th shift fork assembly (4)
   - Reverse shift fork assembly (5)



463422

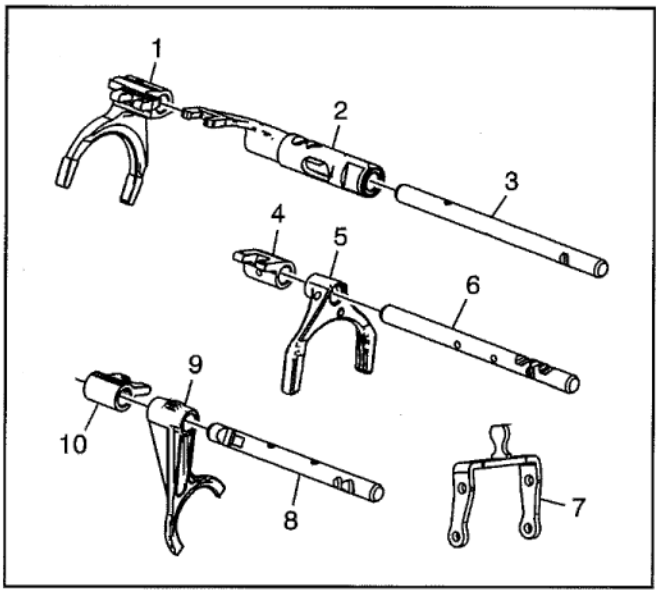
3. Inspect the shift shaft lever bushings for excessive wear.



2265973

4. Inspect the shift fork nylon inserts (1) for wear.
5. Replace parts that are fractured, excessively worn, or distorted.
6. Replace an excessively worn or burred shift shaft.

Shift Fork Cleaning and Inspection (Gen 2)

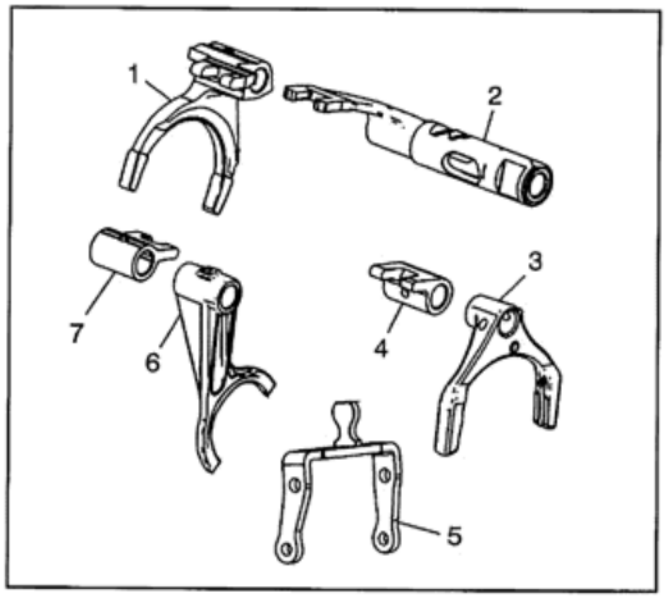


2748675

Warning: Wear safety glasses to avoid injury when using compressed air or any cleaning solvent. Bodily injury may occur if fumes are inhaled or if skin is exposed to chemicals.

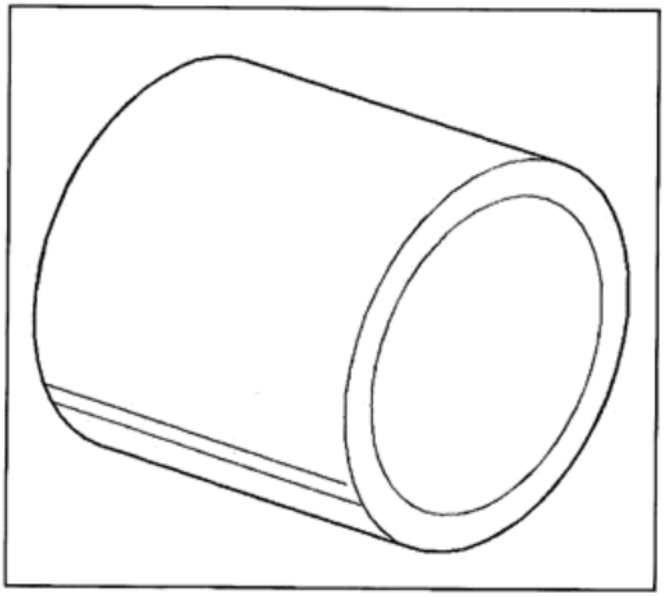
1. Clean the following components with a suitable solvent. Air dry all the parts.
   - 3rd and 4th shift fork assembly (1)
   - 5th shift blocking guide (2)
   - 3rd and 4th shift shaft (3)
   - 1st and 2nd shaft block (4)

- 1st and 2nd shift fork assembly (5)
- 1st and 2nd shift shaft (6)
- 5th shift fork assembly (7)
- Reverse shift shaft (8)
- Reverse shift fork assembly (9)
- Reverse fork block (10)



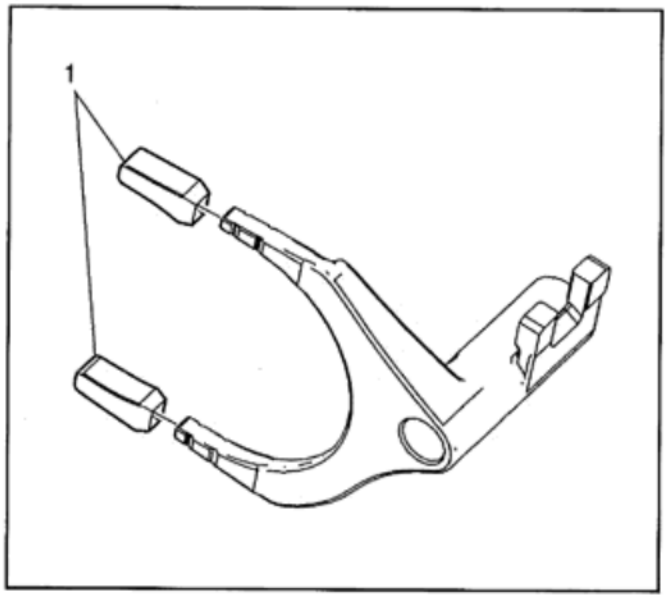
2748676

2. Inspect the following components for excessive wear, fractures or distortion.
   - 3rd and 4th shift fork assembly (1)
   - 5th shift blocking guide (2)
   - 1st and 2nd shift fork assembly (3)
   - 1st and 2nd shaft block (4)
   - 5th shift fork assembly (5)
   - Reverse shift fork assembly (6)
   - Reverse fork block (7)



463422

3. Inspect the shift shaft lever bushings for excessive wear.



2265973

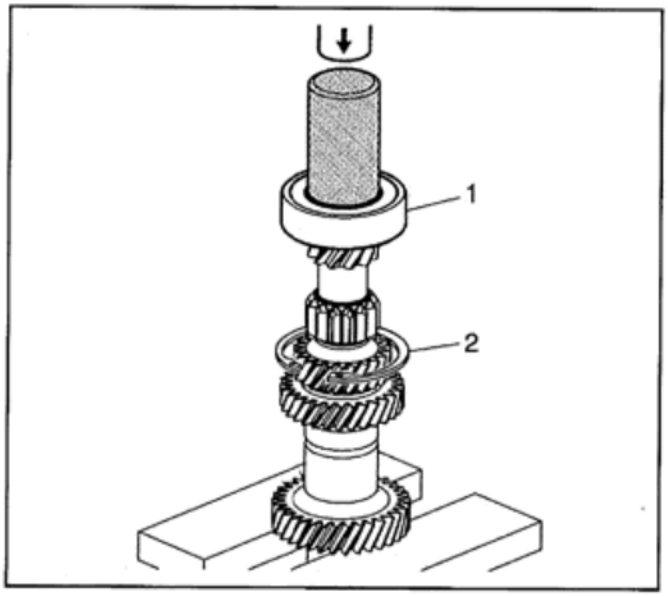
4. Inspect the shift fork nylon inserts (1) for wear.
5. Replace parts that are fractured, excessively worn, or distorted.
6. Replace an excessively worn or burred shift shaft.

Input Shaft Assemble

Special Tools

J-840733 Driver

For equivalent regional tools, refer to *Special Tools on page 17-535.*



2264239

Note: Ensure the input shaft rear bearing retaining ring (2) is placed on the input shaft before installing the input shaft rear bearing assembly (1).

1. Place the input shaft rear bearing retaining ring (2) on the input shaft.

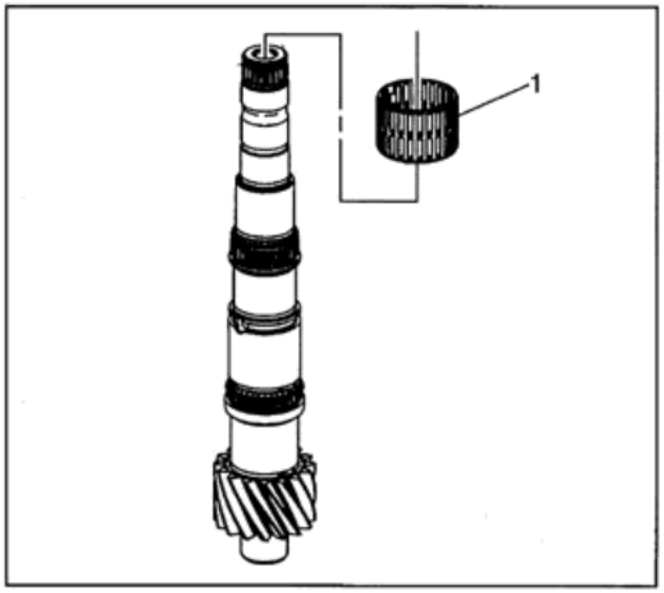
2. Install the input shaft rear bearing assembly (1) using the *J-840733* driver and a hydraulic press.

Main Shaft Assemble (Gen 1)

Special Tools

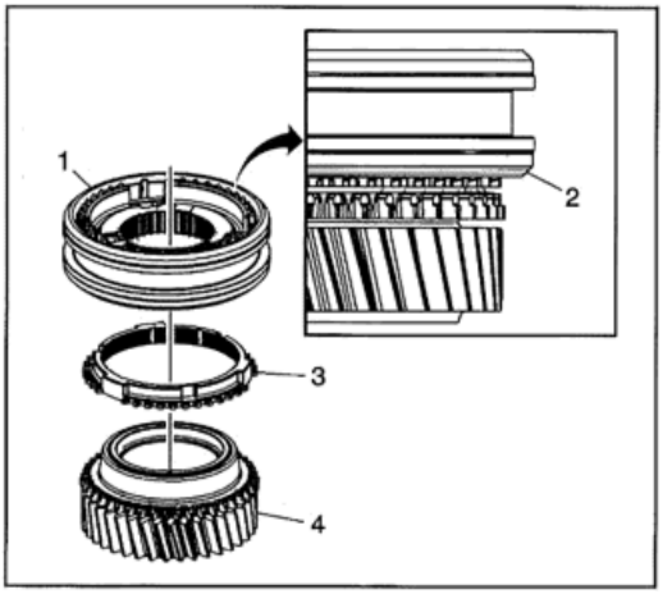
3-0207944 Main Shaft Tapered Bearing Insert Tool

For equivalent regional tools, refer to *Special Tools on page 17-535*.



2262558

1. Install the 4th gear bearing assembly (1).

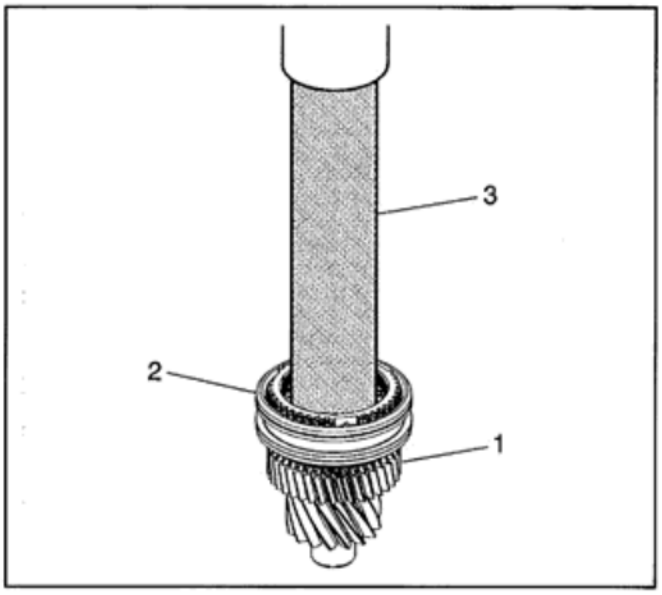


2262600

Note: The 3rd gear blocking ring lugs must be aligned with the 3rd/4th gear synchronizer assembly grooves.

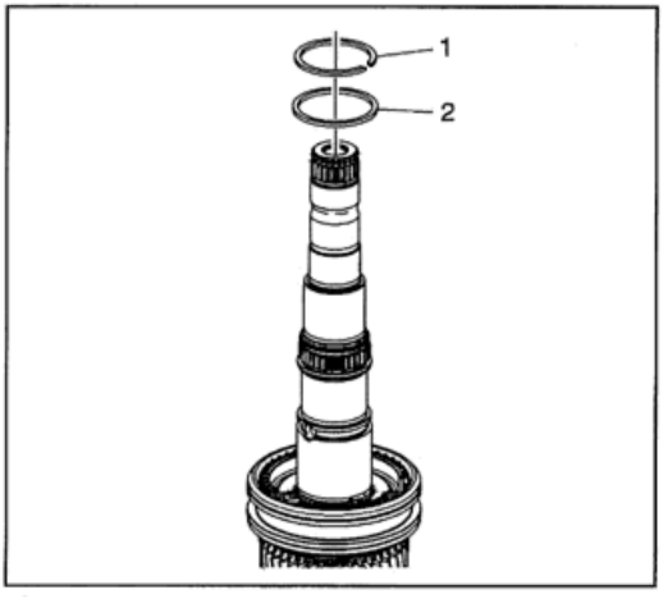
Note: The groove on the 3rd/4th gear synchronizer assembly (2) should point toward the 4th gear assembly.

2. Assemble the following components:
   - 3rd/4th gear synchronizer assembly (1)
   - 3rd gear blocking ring (3)
   - 4th gear assembly (4)



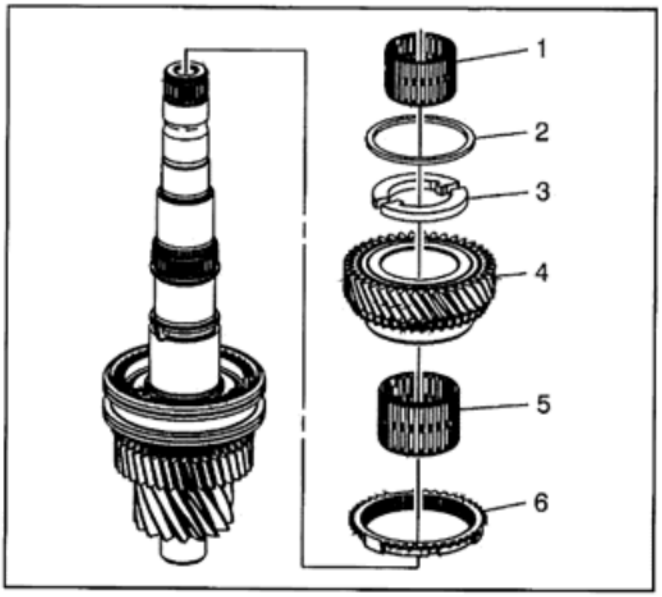
2488846

3. Install the 3rd/4th gear synchronizer assembly (2) and the 4th gear assembly (1) as a unit using *3-0207944* bearing insert tool (3) and a hydraulic press.



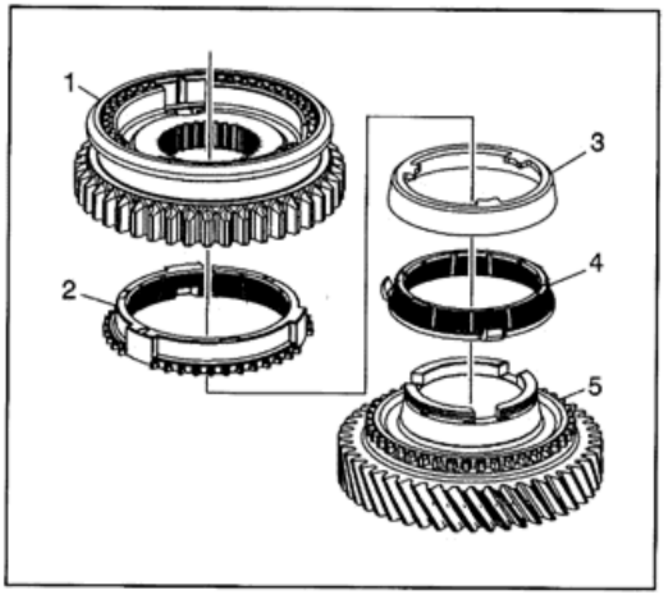
2262552

4. Install the 3rd/4th gear synchronizer assembly thrust washer (2) and the NEW 3rd/4th gear synchronizer assembly retaining ring (1).



2262551

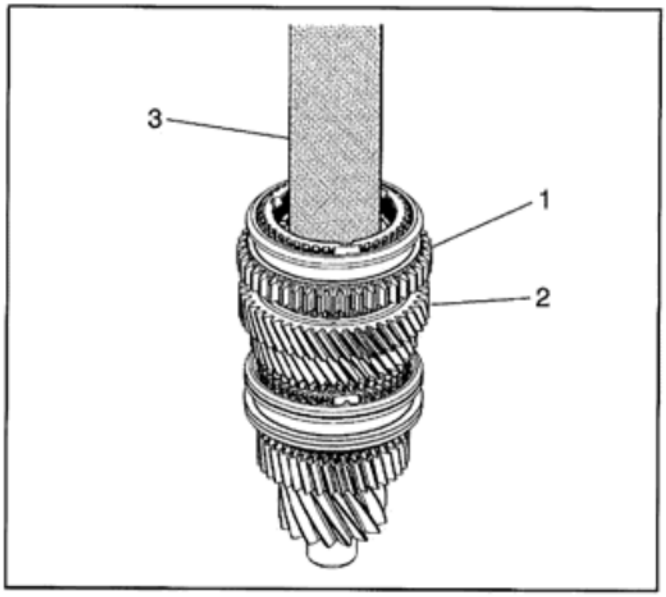
5. Install the following components:
   - 3rd gear blocking ring (6)
   - 3rd gear bearing assembly (5)
   - 3rd gear assembly (4)
   - 3rd gear thrust washer (3)
   - 3rd gear thrust washer retaining ring (2)
   - 2nd gear bearing assembly (1)



2262549

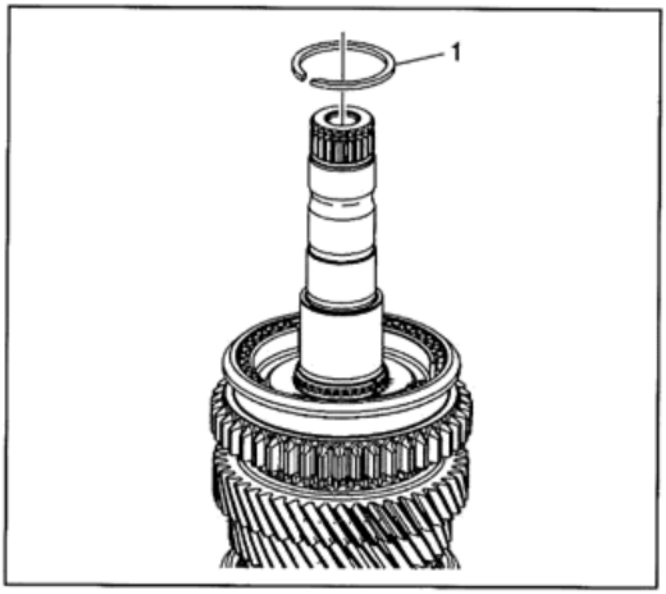
Note: The lugs on the blocking rings must be aligned with the 2nd gear assembly and the 1st/2nd gear synchronizer assembly.

6. Assemble the following components:
   - 1st/2nd gear synchronizer assembly (1)
   - 1st/2nd gear outer blocking ring (2)
   - 1st/2nd gear intermediate cone ring (3)
   - 1st/2nd gear inner blocking ring (4)
   - 2nd gear assembly (5)



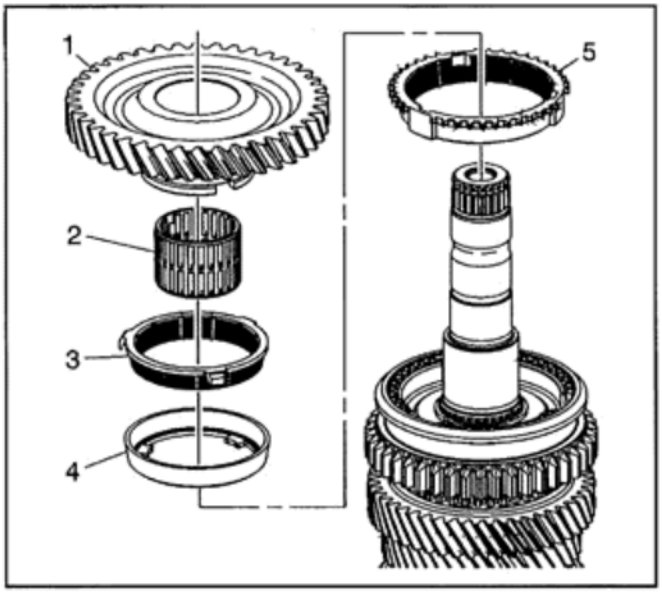
2488850

7. Install the 1st/2nd gear synchronizer assembly (2) and the 2nd gear assembly (1) as a unit using *3-0207944* bearing insert tool (3) and a hydraulic press.



2262547

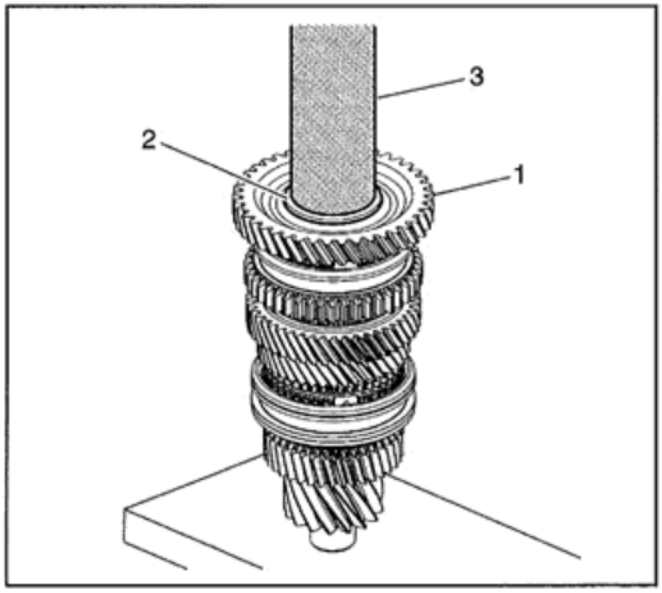
8. Install the NEW 1st/2nd gear synchronizer assembly retaining ring (1).



2262603

Note: The lugs on the blocking rings must be aligned with the 1st/2nd gear synchronizer assembly grooves.

9. Install the following components:
   - 1st/2nd gear outer blocking ring (5)
   - 1st/2nd gear intermediate cone ring (4)
   - 1st/2nd gear inner blocking ring (3)
   - 1st gear bearing assembly (2)
   - 1st gear (1)



2488856

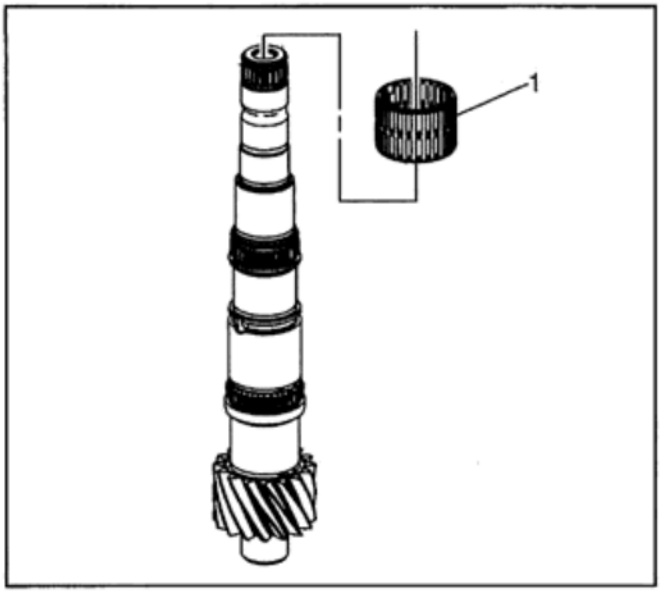
10. Install the 1st gear thrust washer (1) and the thrust washer (2) in the 1st/2nd gear synchronizer assembly using a suitable tube (3) and a hydraulic press.

Main Shaft Assemble (Gen 2)

Special Tools

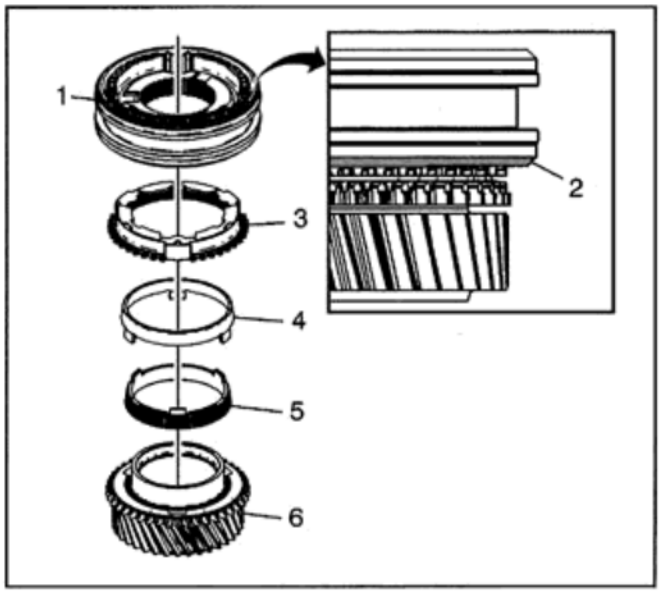
3-0207944 Main Shaft Tapered Bearing Insert Tool

For equivalent regional tools, refer to *Special Tools on page 17-535*.



2262558

1. Install the 4th gear bearing assembly (1).



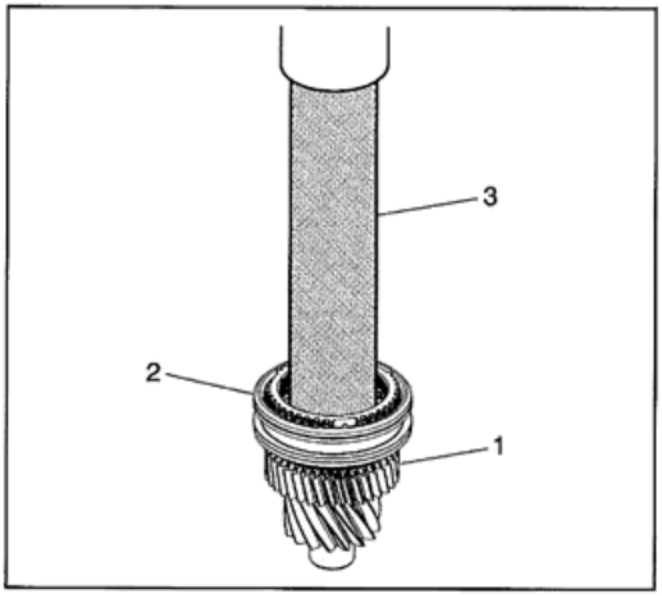
2748497

Note: The 3rd gear blocking ring lugs must be aligned with the 3rd/4th gear synchronizer assembly grooves.

Note: The groove on the 3rd/4th gear synchronizer assembly (2) should point toward the 4th gear assembly.

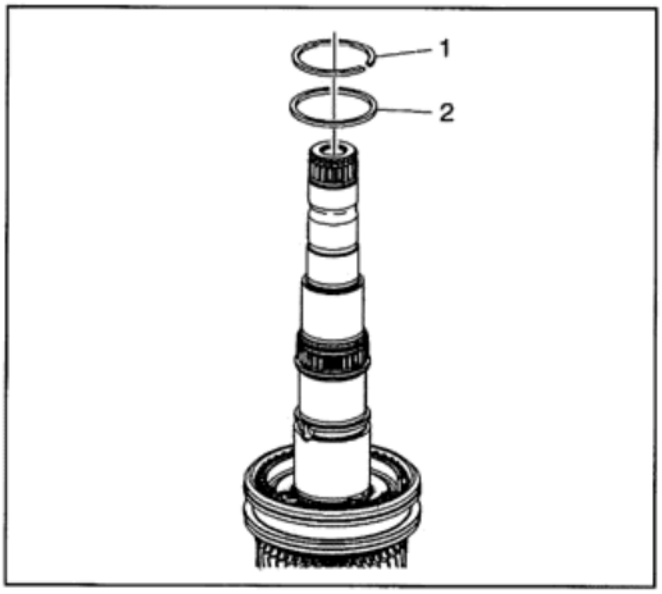
2. Assemble the following components:
   - 3rd/4th gear synchronizer assembly (1)
   - 4th gear outer blocking ring (3)
   - 4th gear intermediate blocking ring (4)

- 4th gear inner blocking ring (5)
- 4th gear assembly (6)



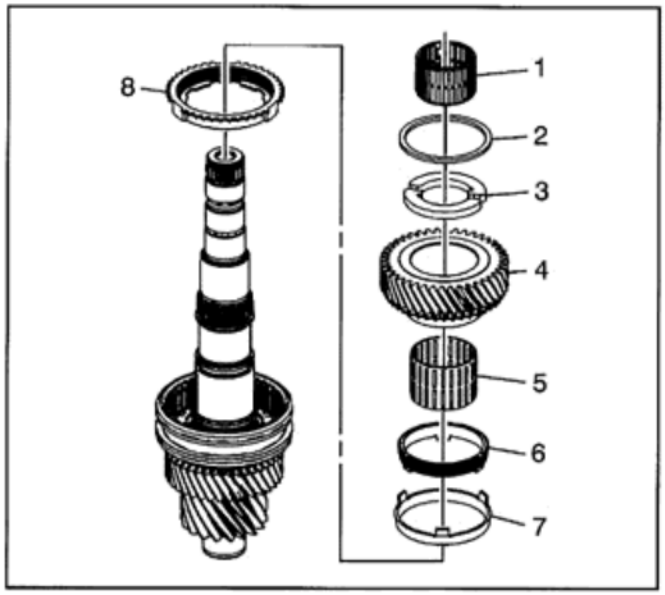
2488846

3. Install the 3rd/4th gear synchronizer assembly (2) and the 4th gear assembly (1) as a unit using *3-0207944* bearing insert tool (3) and a hydraulic press.



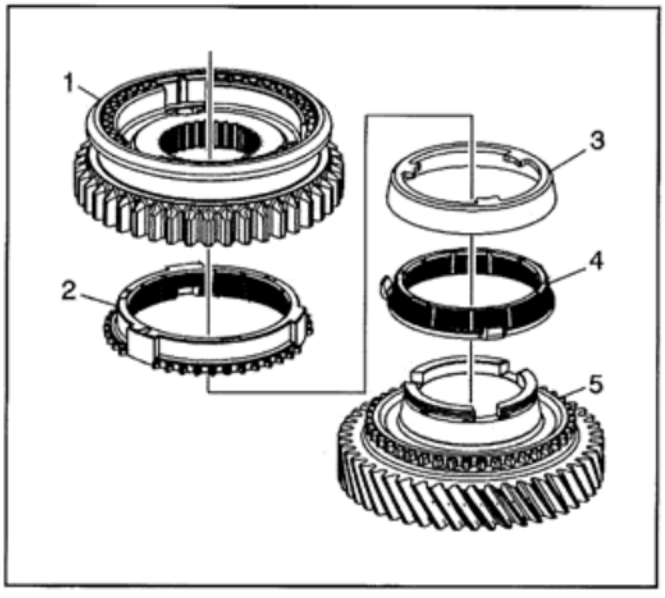
2262552

4. Install the 3rd/4th gear synchronizer assembly thrust washer (2) and the NEW 3rd/4th gear synchronizer assembly retaining ring (1).



2748476

5. Install the following components:
   - 3rd gear outer blocking ring (8)
   - 3rd gear intermediate blocking ring (7)
   - 3rd gear inner blocking ring (6)
   - 3rd gear bearing assembly (5)
   - 3rd gear assembly (4)
   - 3rd gear thrust washer (3)
   - 3rd gear thrust washer retaining ring (2)
   - 2nd gear bearing assembly (1)

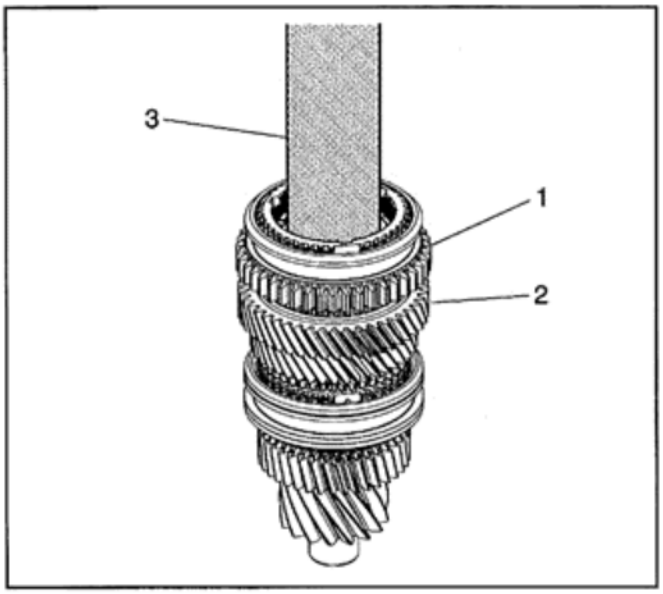


2262549

Note: The lugs on the blocking rings must be aligned with the 2nd gear assembly and the 1st/2nd gear synchronizer assembly.

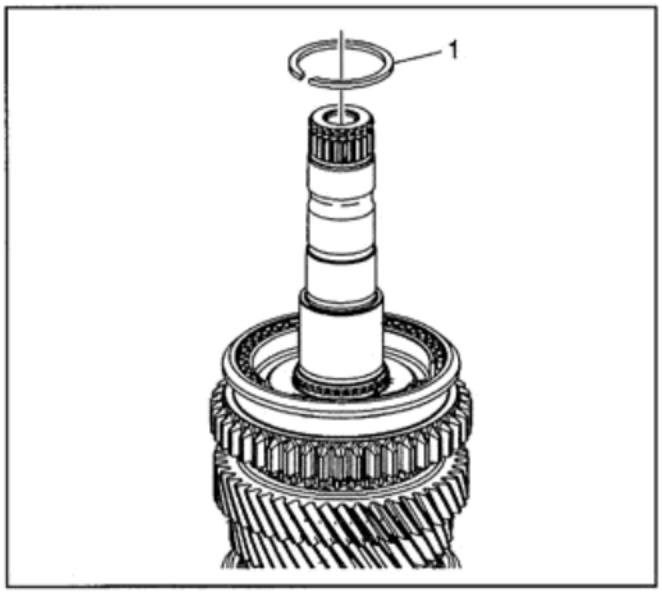
6. Assemble the following components:
   - 1st/2nd gear synchronizer assembly (1)
   - 1st/2nd gear outer blocking ring (2)
   - 1st/2nd gear intermediate cone ring (3)

- 1st/2nd gear inner blocking ring (4)
- 2nd gear assembly (5)



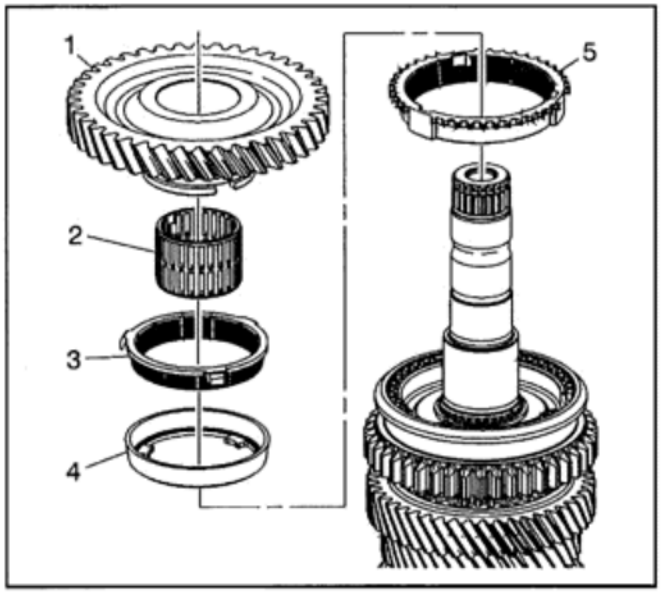
2488850

7. Install the 1st/2nd gear synchronizer assembly (2) and the 2nd gear assembly (1) as a unit using *3-0207944* bearing insert tool (3) and a hydraulic press.



2262547

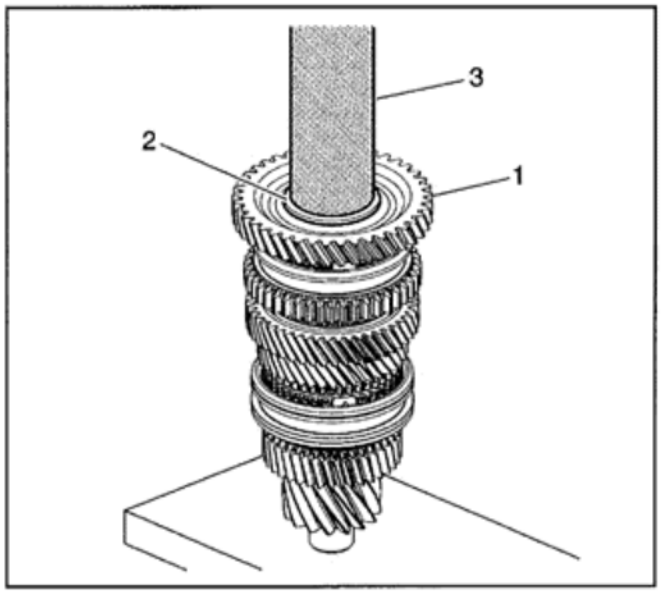
8. Install the NEW 1st/2nd gear synchronizer assembly retaining ring (1).



2262603

Note: The lugs on the blocking rings must be aligned with the 1st/2nd gear synchronizer assembly grooves.

9. Install the following components:
   - 1st/2nd gear outer blocking ring (5)
   - 1st/2nd gear intermediate cone ring (4)
   - 1st/2nd gear inner blocking ring (3)
   - 1st gear bearing assembly (2)
   - 1st gear (1)



2488856

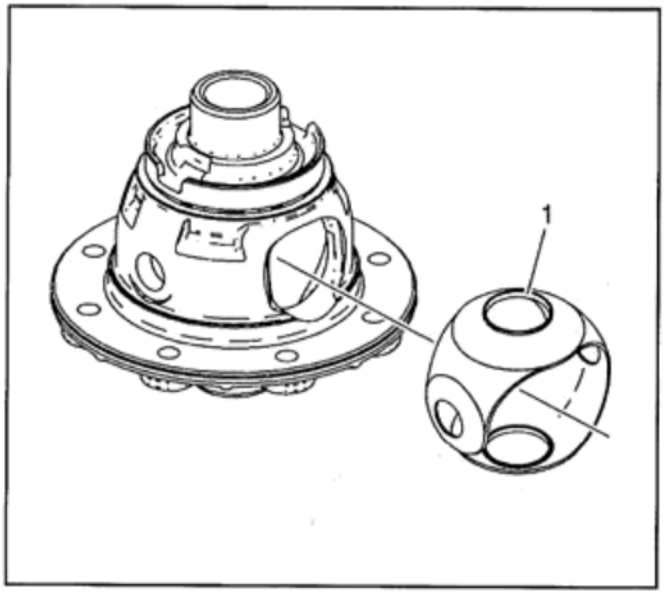
10. Install the 1st gear thrust washer (1) and the thrust washer (2) in the 1st/2nd gear synchronizer assembly using a suitable tube (3) and a hydraulic press.

Differential Case Assemble

Special Tools

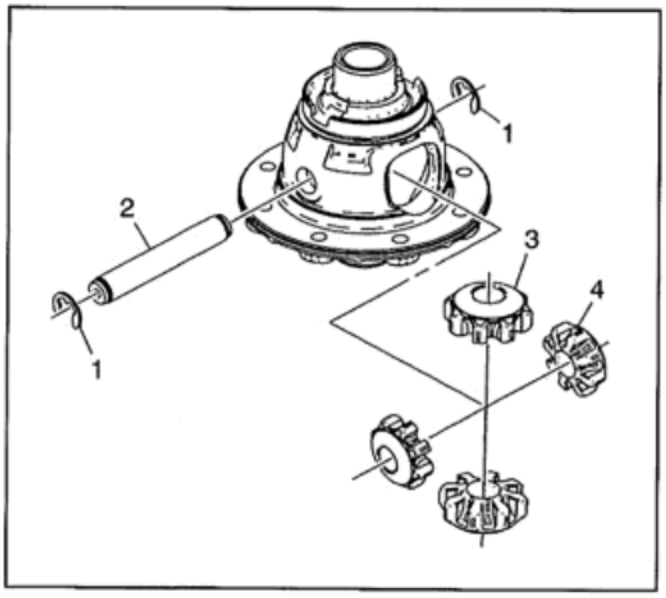
- *J-810721* Axle Shaft Seal Remover Support Base
- *R-0407011* Bearing Race Remover
- *R-0407012* Differential Carrier Cone Bearing Cap Driver
- *R-0007761* Universal Handle for Pullers and Installers
- *S-9407194* Speed Sensor Impeller Ring Installer
- *S-9407195* Pinion Gear Case Bearing Installer
- *S-9707500* Seal Installer

For equivalent regional tools, refer to *Special Tools on page 17-535.*



2265978

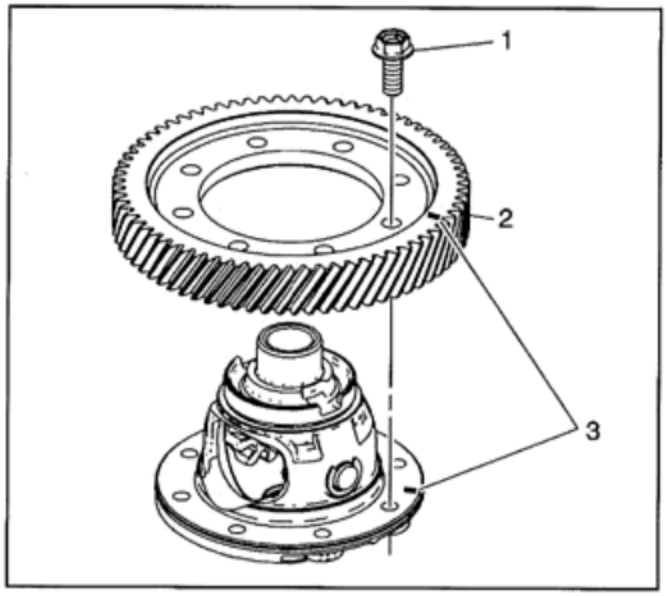
1. Install the front differential pinion and side gear thrust washer. It must be possible to insert the collar (1) of the thrust washer into the guide for the pinion gears in the housing.



2265981

Note: Lubricate rotating parts on their bearing, running, seating, and pressure surfaces using transmission fluid.

2. Install the front differential pinion gears (3) and side gears (4).
3. Install the front differential pinion gear shaft (2) and the pinion gear shaft retaining washers (1).

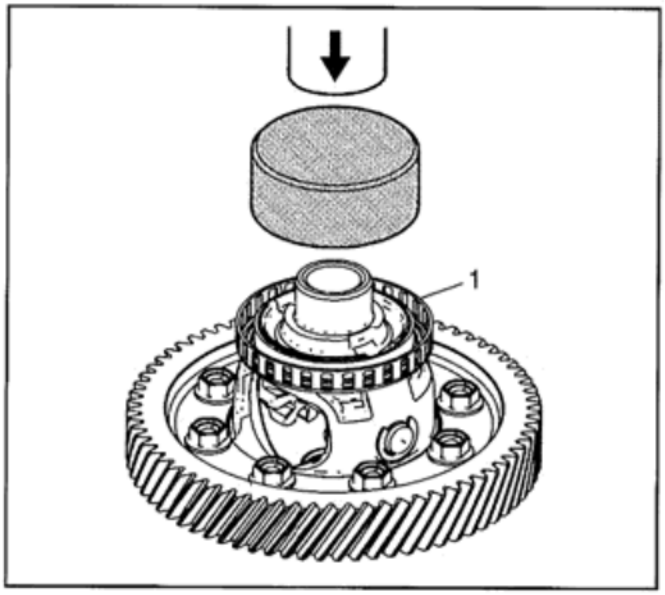


2265951

4. If both components are reused align the assembly marks (3).
5. Install the front differential ring gear (2).

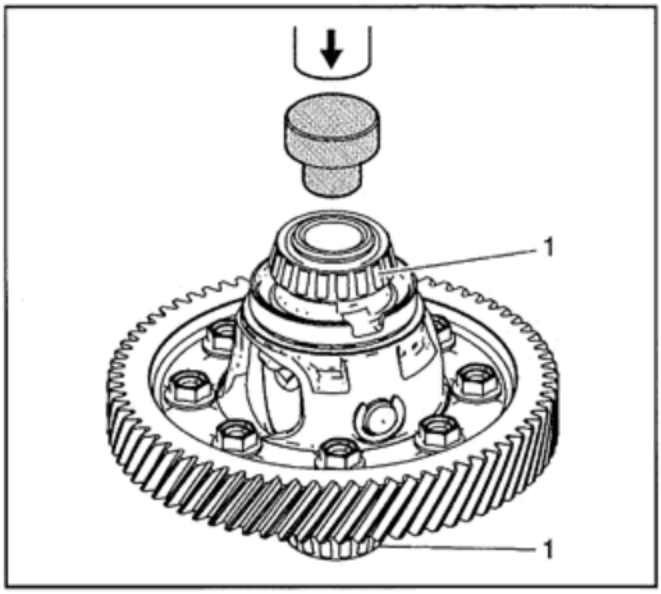
Warning: Refer to Safety Glasses Warning on page 0-5.

6. Install the front differential ring gear bolts (1). Tighten to **90 N•m (66.4 lb ft)**.



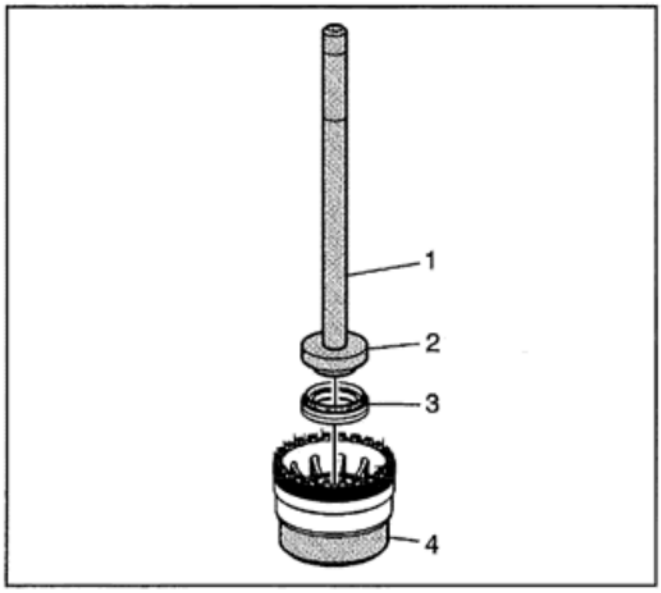
2265983

7. Install the ring front wheel speed sensor reluctor wheel (1) using the *S-9407194* installer and a hydraulic press.



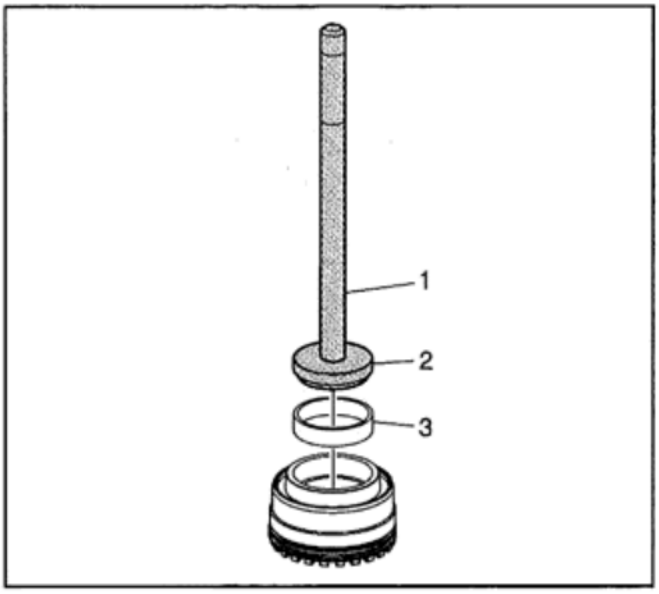
2265986

8. Install the front differential bearing assemblies (1) using the *S-9407195* installer and a hydraulic press.



2265988

9. Install the front wheel drive shaft oil seal (3) using the *R-0007761* handle (1), *S-9707500* seal installer (2), and the *J-810721* support base (4).



2265989

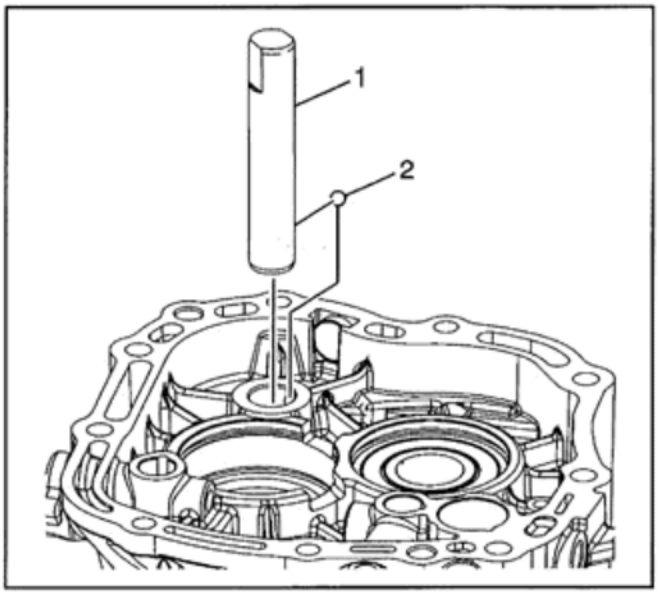
10. Install the front differential bearing race (3) using the *R-0007761* handle (1) and the *R-0407012* driver (2).

Transmission Case Assemble (Gen 1)

Special Tools

- *3-9506289* Universal Adapter
- *J-840733* Driver
- *R-0007758* Holding Fixture
- *R-0007761* Universal Handle
- *R-0007770* Holding Fixture Adapter Plates
- *T-9804669* Seal Installer
- *T-0307000* Extractor and Driver Fixture

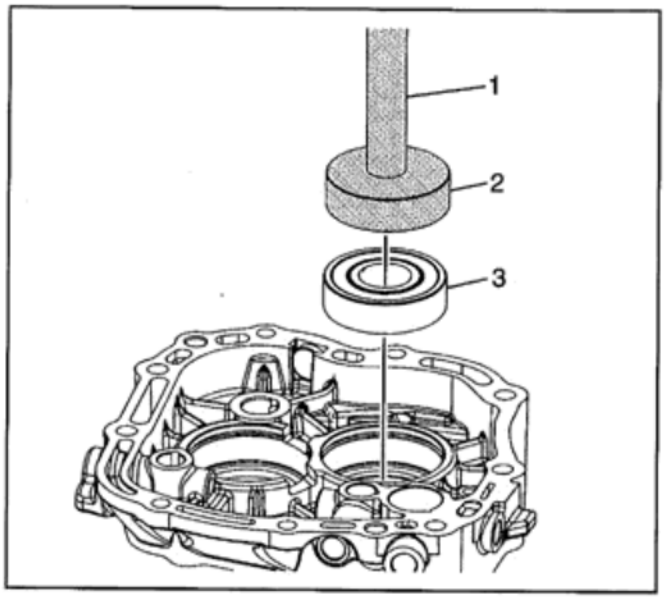
For equivalent regional tools, refer to *Special Tools on page 17-535*.



2263810

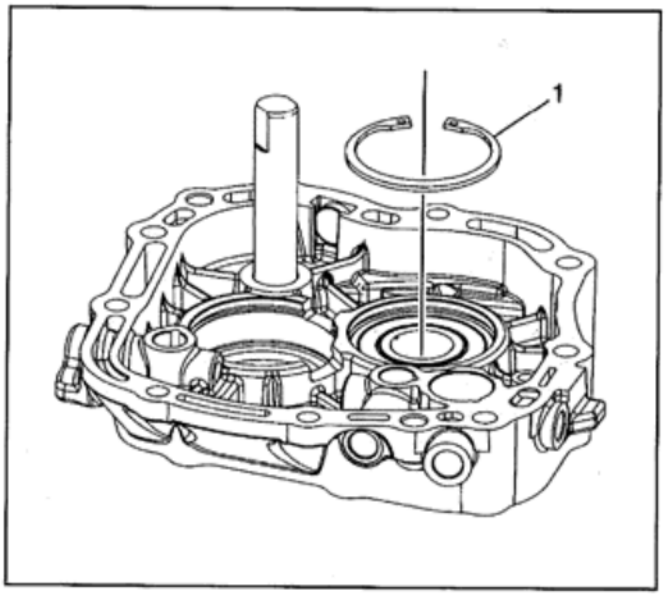
1. Install the reverse idler gear shaft retaining ball (2).

2. Install the reverse idler gear shaft (1).



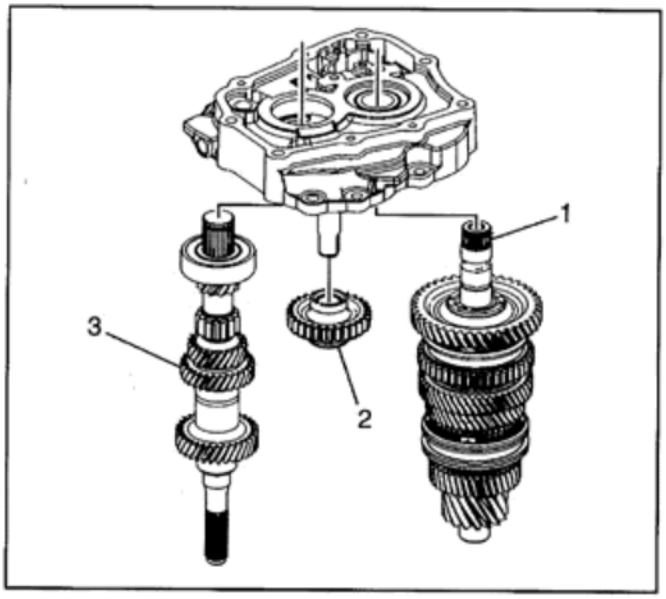
2264063

3. Using *T-9804669* seal installer (2) and *R-0007761* handle (1), install the mainshaft bearing (3) into the case.



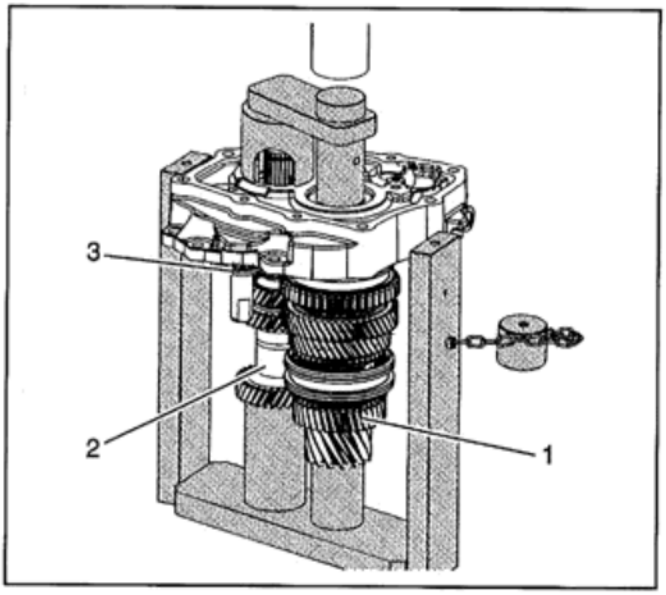
2263807

4. Install the mainshaft bearing retaining ring (1).



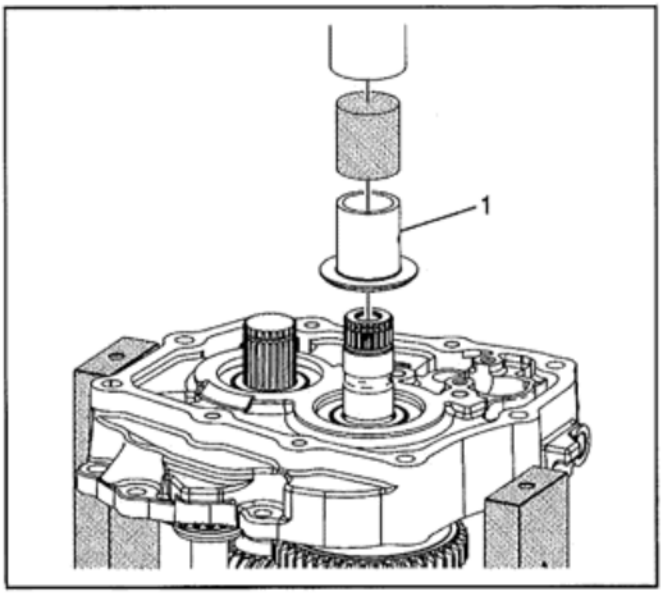
2264066

5. Install the input shaft (3), reverse idler gear (2) and mainshaft (1) onto the *T-0307000* driver fixture with top plate removed.



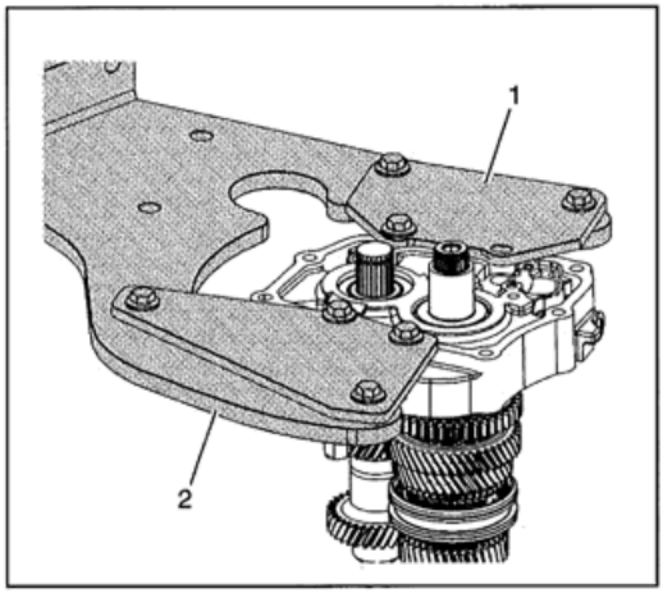
2264070

6. Guide the shafts (1–2) into the bores, and support the reverse idler gear (3) while pressing into the case.



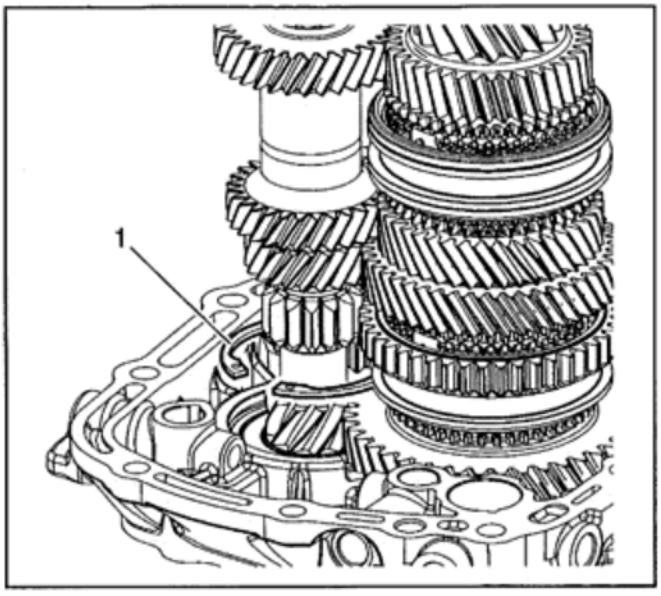
2264072

7. Using the *T-0307000* driver fixture, press the 5th gear bearing race (1) onto the mainshaft.



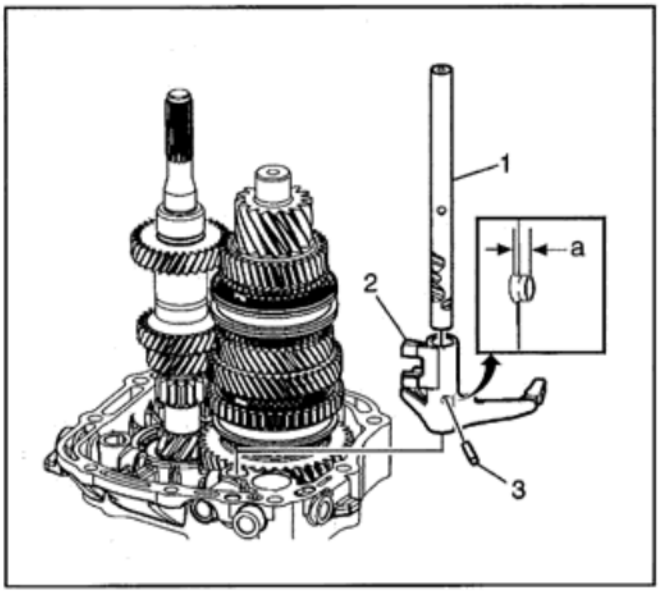
2264074

8. Install the case and shafts assembly onto the *R-0007770* adapter plates (1) and *R-0007758* holding fixture (2).



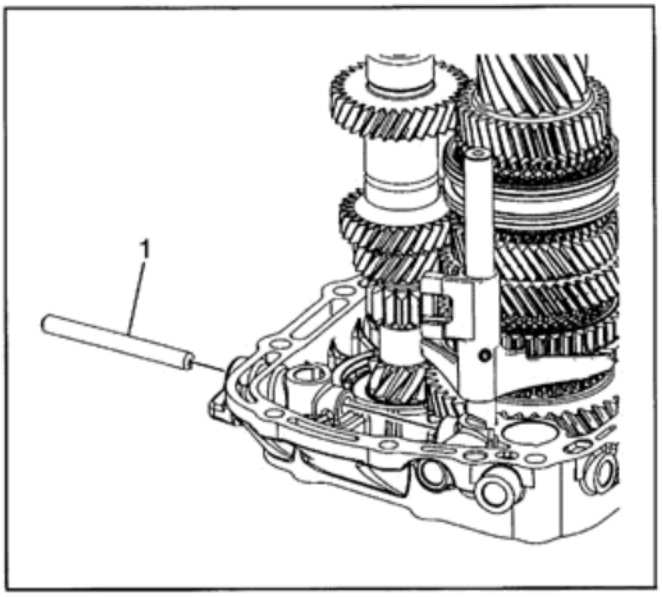
2263804

9. Install the input shaft bearing retaining ring (1).



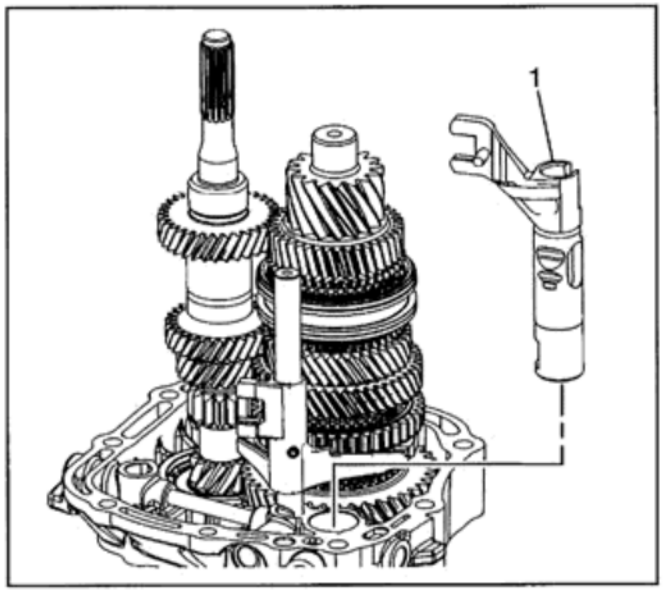
2264075

10. Install the 1st and 2nd shift fork (2).
11. Install the 1st and 2nd shift shaft (1).
12. Install the 1st and 2nd shift fork pin (3) to the dimension "a" depth of **2 mm (0.80 in)**.



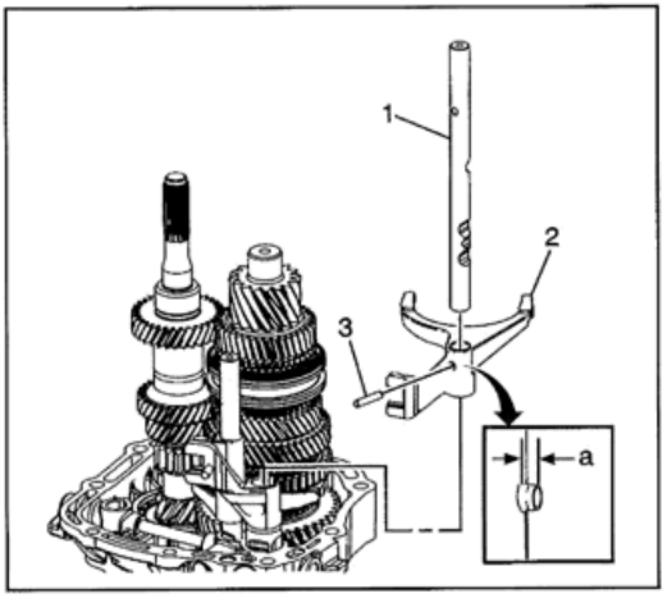
2264076

13. Install the gearshift rod (1) into the transmission case.



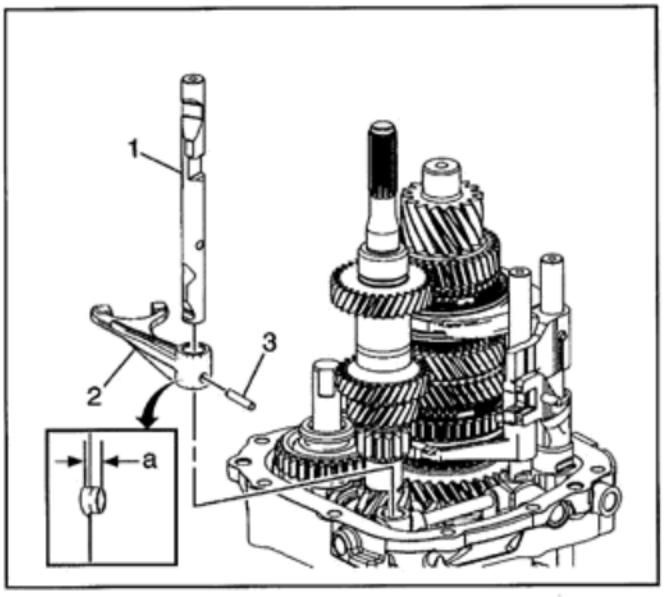
2263787

14. Install the 5th shift blocking guide (1) into the transmission case.



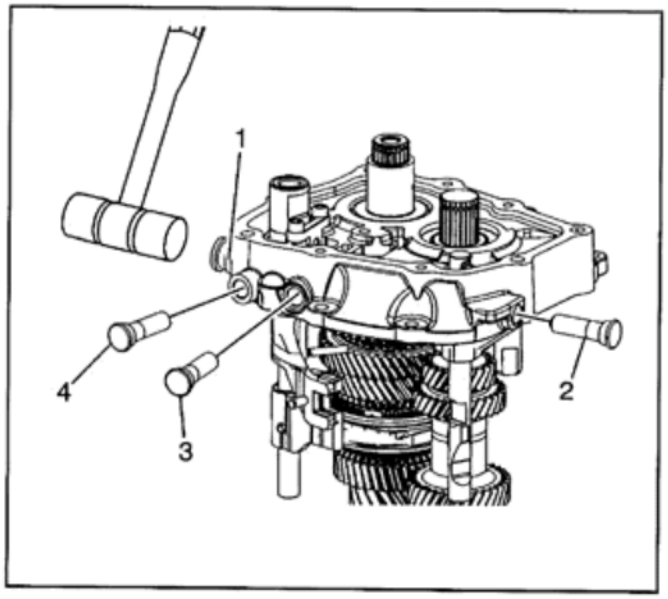
2264079

15. Install the 3rd and 4th shift fork (2).
16. Install the 3rd and 4th shift shaft (1).
17. Install the 3rd and 4th shift fork pin (3) to the dimension "a" depth of **2 mm (0.80 in)**.



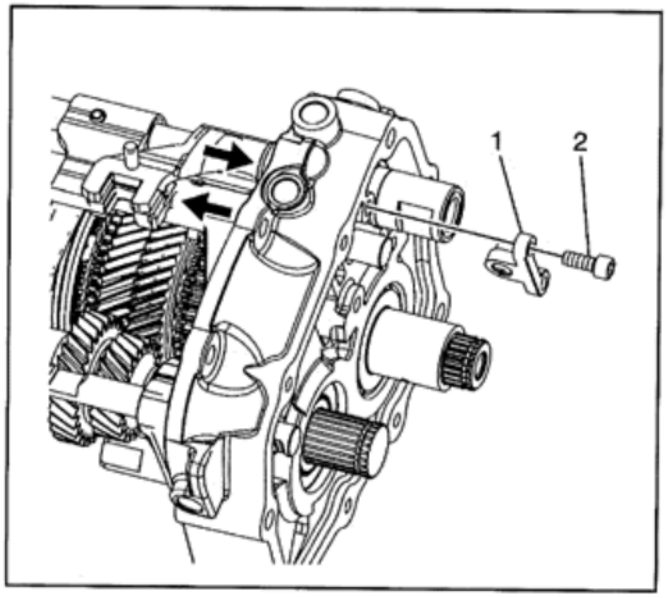
2264082

18. Install the reverse shift fork (2).
19. Install the reverse shift shaft (1).
20. Install the reverse shift fork pin (3) to the dimension "a" depth of **2 mm (0.80 in)**.



2264087

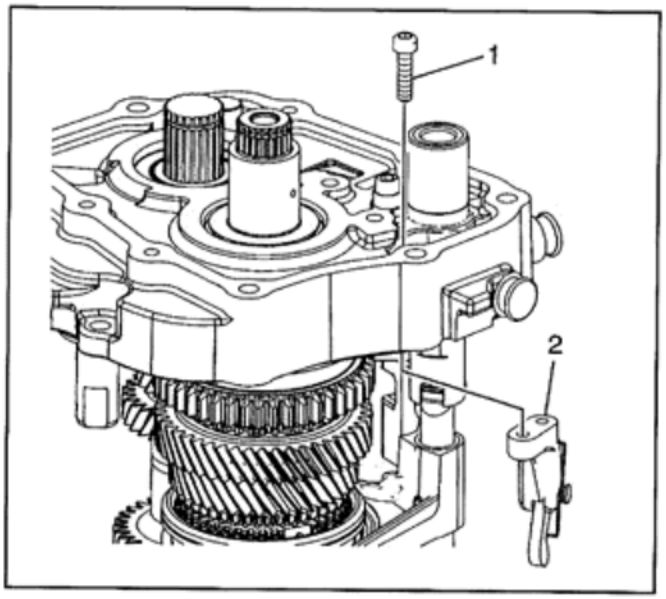
21. Using a plastic hammer or equivalent install the 4 shift shaft detent sleeves (1–4) into the transmission case until they stop.



2263785

Note: Engage the shift shafts into 3rd gear and 5th gear as indicated with arrows to install the interlock pin connector.

22. Install the shift shaft interlock pin connector (1).
23. Using thread locking compound install the shift shaft interlock pin connector bolts (2) and tighten to **7 N•m (62 lb in)**.



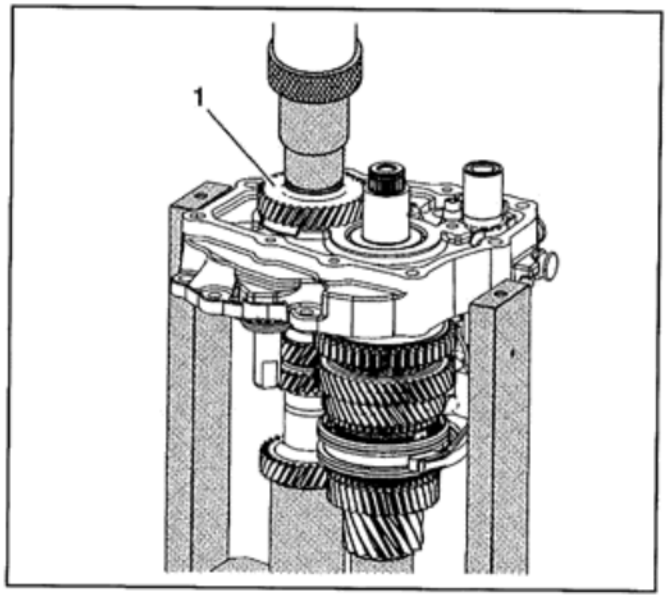
2263781

Note: Move shift forks into neutral position.

24. Install the parking pawl (2).

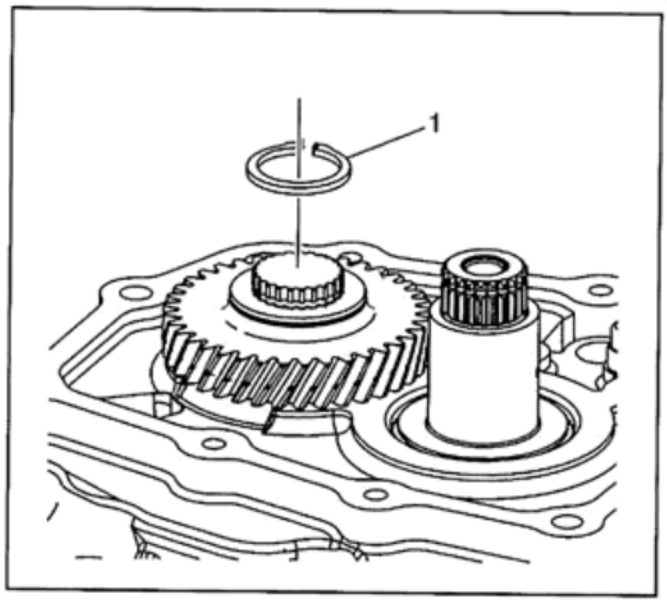
Caution: Refer to *Fastener Caution on page 0-8.*

25. Using thread locking compound install the parking pawl retaining bolts (1) and tighten to **7 N•m (62 lb in)**.



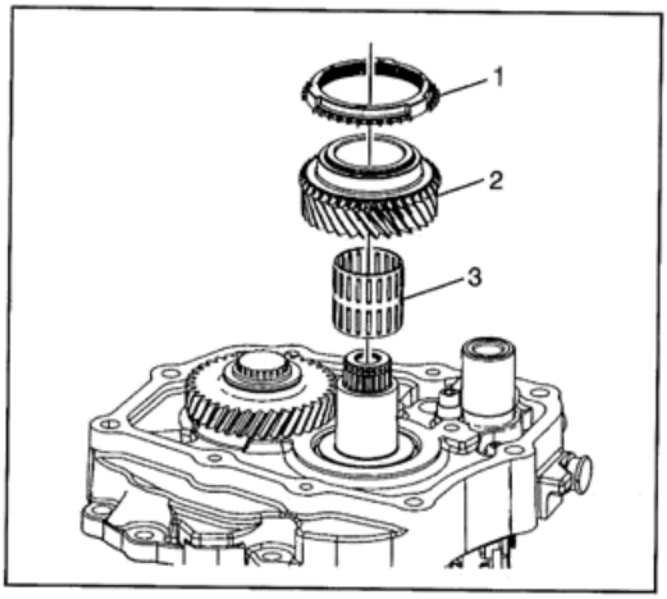
2264088

26. Remove case and shafts assembly from *R-0007770* adapter plates and install onto *T-0307000* driver fixture.
27. Using *J-840733* driver, press the 5th gear, driving (1) onto the input shaft.



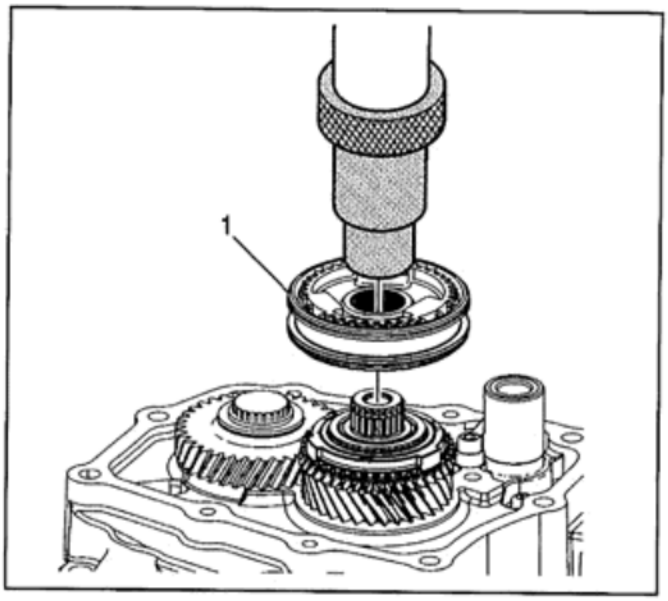
2263774

28. Install a NEW 5th gear retaining ring (1).



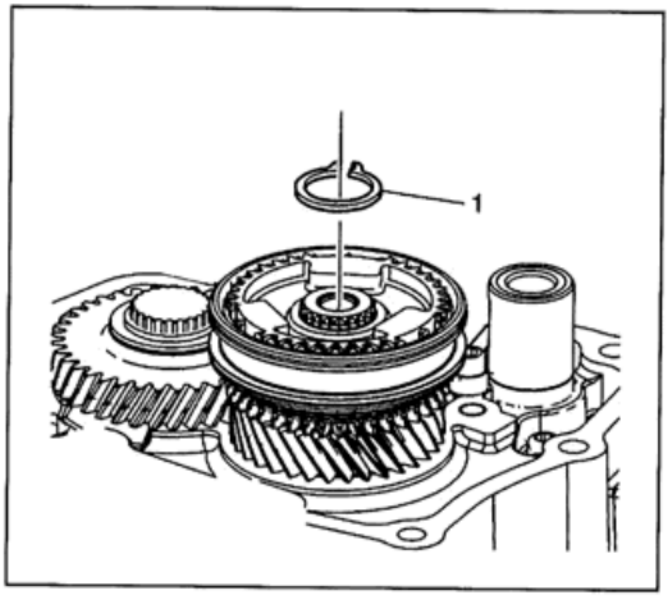
2263772

29. Install the 5th gear bearing assembly (3).
30. Install the 5th gear assembly, driven (2).
31. Install the 5th gear blocking ring (1).



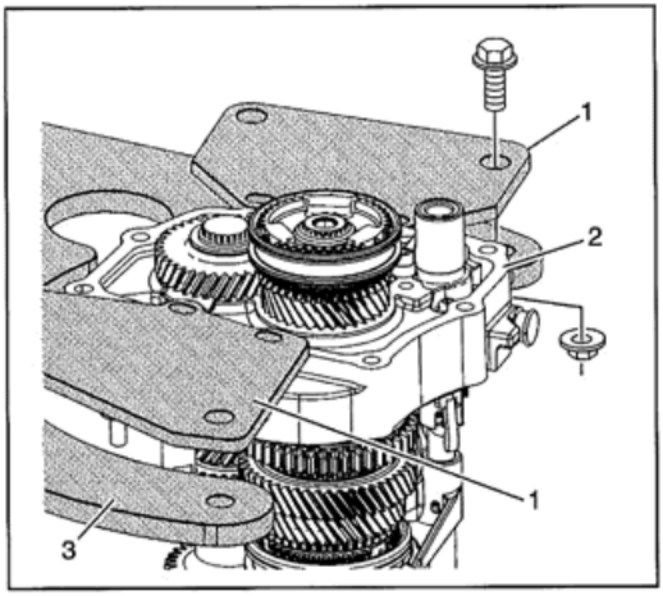
2264089

32. Ensure that the synchronizer assembly (1) is functioning properly, refer to *Synchronizers Cleaning and Inspection on page 17-507* and *Synchronizers Assemble on page 17-509*.
33. Using the *J-840733* driver and a press, install the 5th gear synchronizer assembly (1).



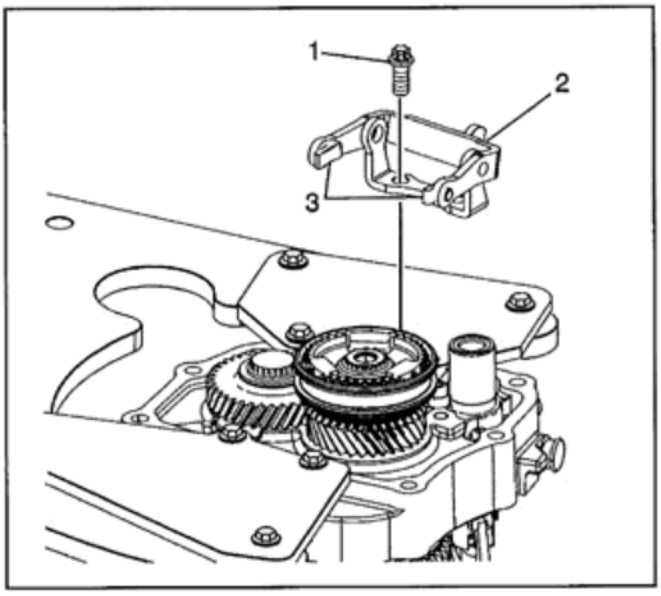
2263767

34. Install the 5th gear sychronizing hub retaining ring (1).



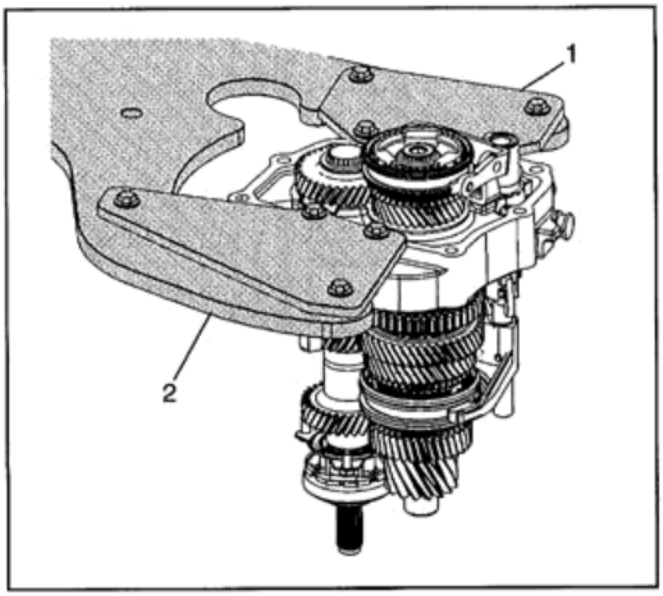
2276942

35. Remove the case and shafts assembly from the *T-0307000* driver fixture.
36. Install *R-0007770* adapter plates (1) onto case (2) and then attach to *R-0007758* holding fixture (3).



2284090

37. Install the 5th shift fork shoes (3).
38. Install the 5th shift fork bracket assembly (2).
39. Using thread locking compound install the 5th shift fork bracket bolts (1) and tighten to **22** N•m **(16 lb ft)**.



2263765

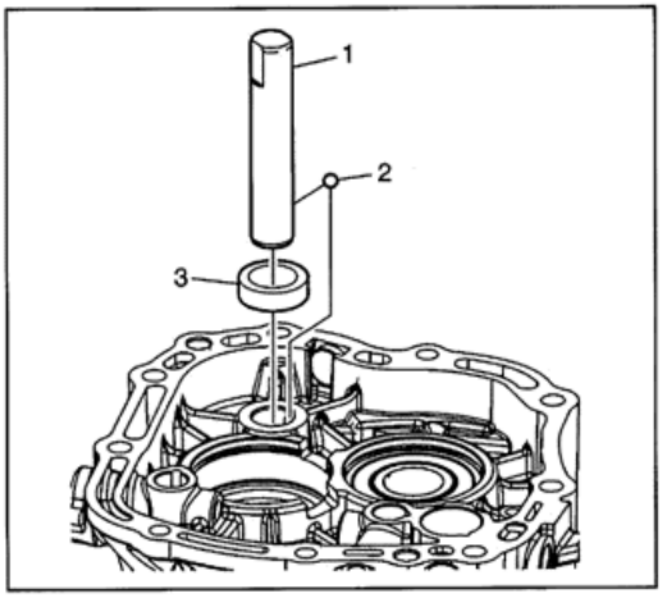
40. Remove the transmission case, from the *R-0007770* adapter plates (1) the *R-0007758* holding fixture and *3-9506289* adapter.

Transmission Case Assemble (Gen 2)

Special Tools

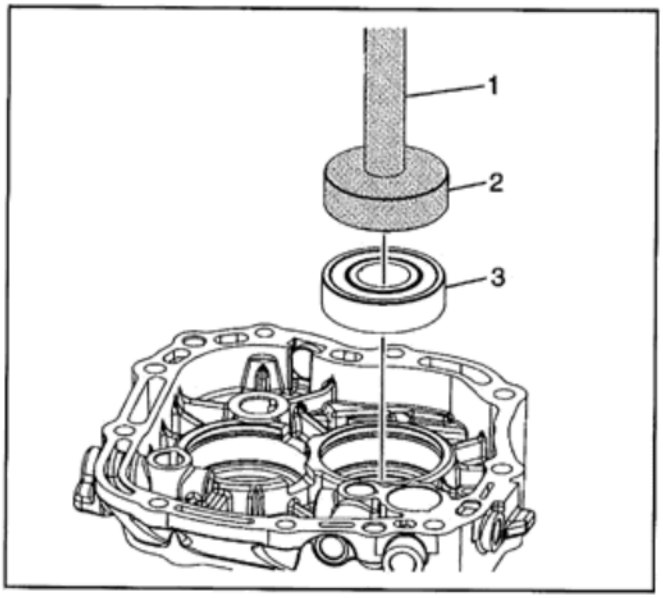
- *3-9506289* Universal Adapter
- *J-840733* Driver
- *R-0007758* Holding Fixture
- *R-0007761* Universal Handle
- *R-0007770* Holding Fixture Adapter Plates
- *T-9804669* Seal Installer
- *T-0307000* Extractor and Driver Fixture

For equivalent regional tools, refer to *Special Tools on page 17-535*.



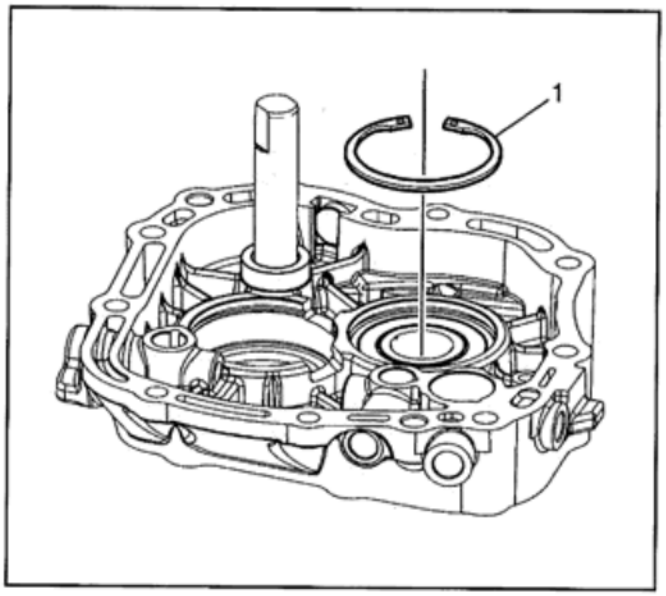
2845581

1. Install the reverse helical gear washer (3) onto the reverse idler gear shaft.
2. Install the reverse idler gear shaft retaining ball (2).
3. Install the reverse idler gear shaft (1).



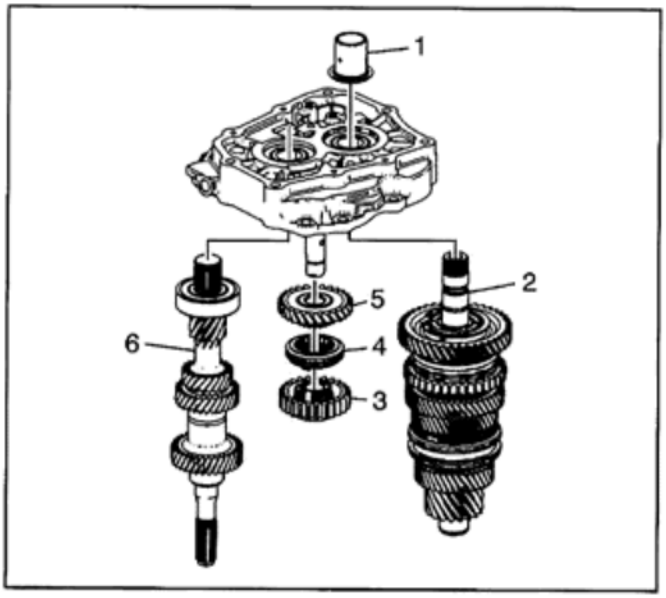
2264063

4. Using *T-9804669* seal installer (2) and *R-0007761* handle (1), install the mainshaft bearing (3) into the case.



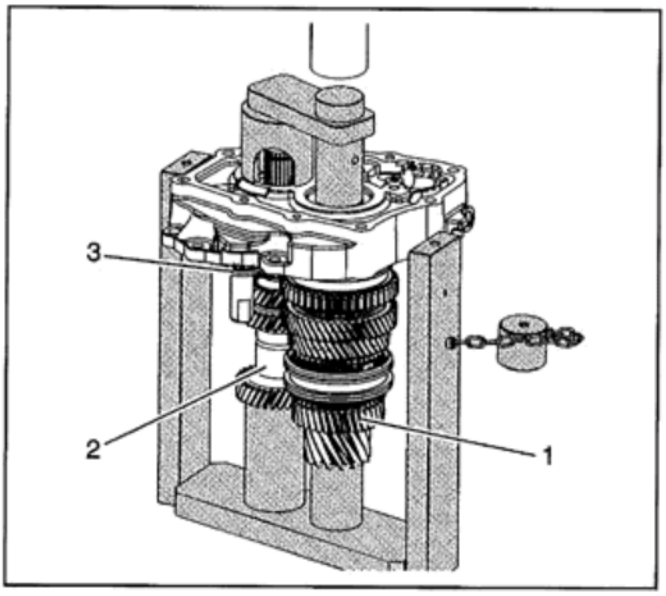
2845580

5. Install the mainshaft bearing retaining ring (1).



2845574

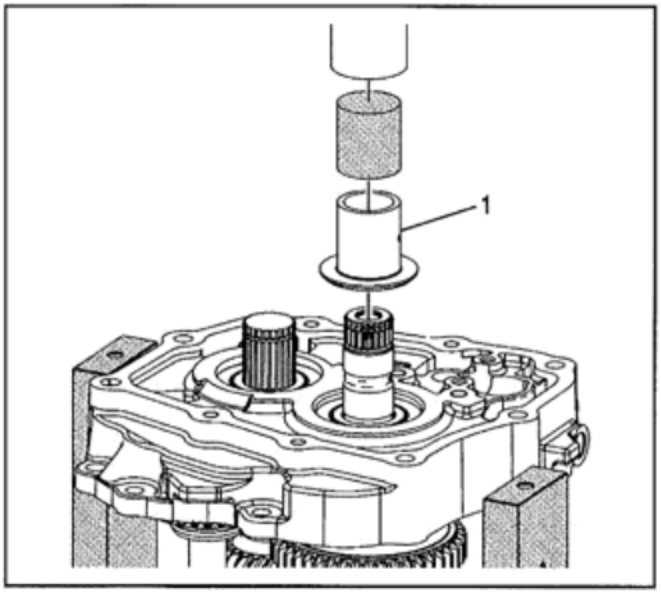
6. Install the following components onto the *T-0307000* driver fixture with top plate removed.
   - Main shaft (2)
   - Reverse helical gear (5)
   - Reverse synchro assembly (4)
   - Reverse spur gear (3)
   - Input Shaft (6)



2264070

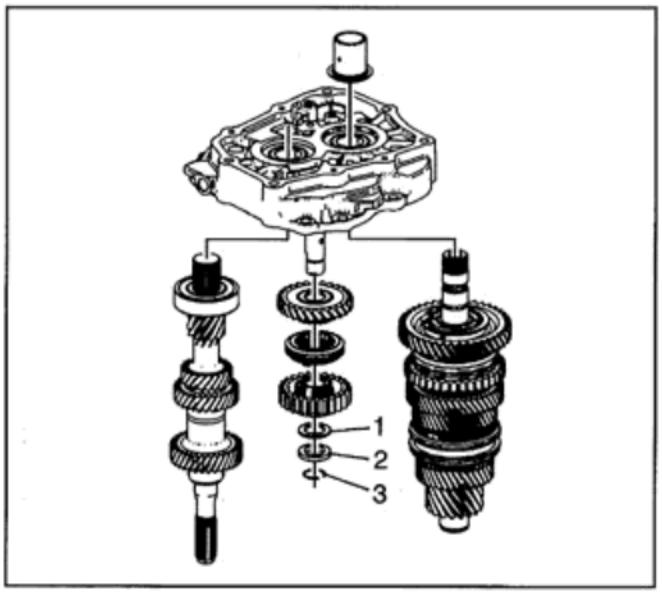
Note: While pressing, pay attention to the input shaft bearing retaining ring, because it can be pressed into the first gear.

7. Guide the shafts (1–2) into the bores, and support the reverse idler gear (3) while pressing into the case.



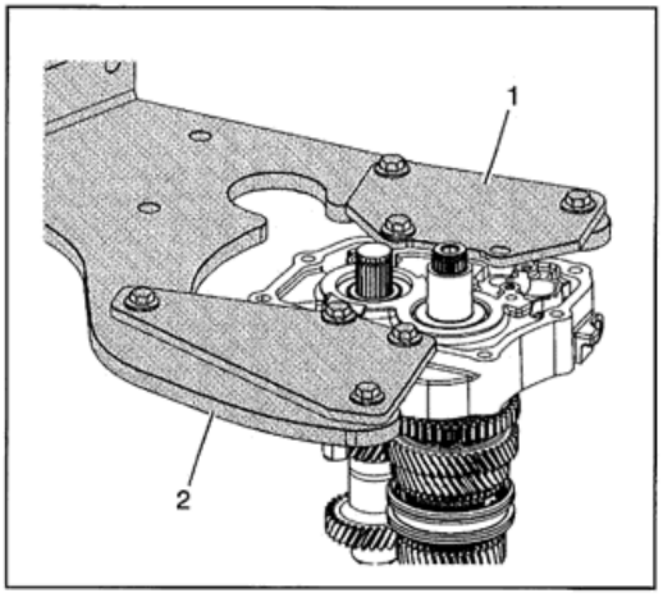
2264072

8. Using the *T-0307000* driver fixture, press the 5th gear bearing race (1) onto the mainshaft.



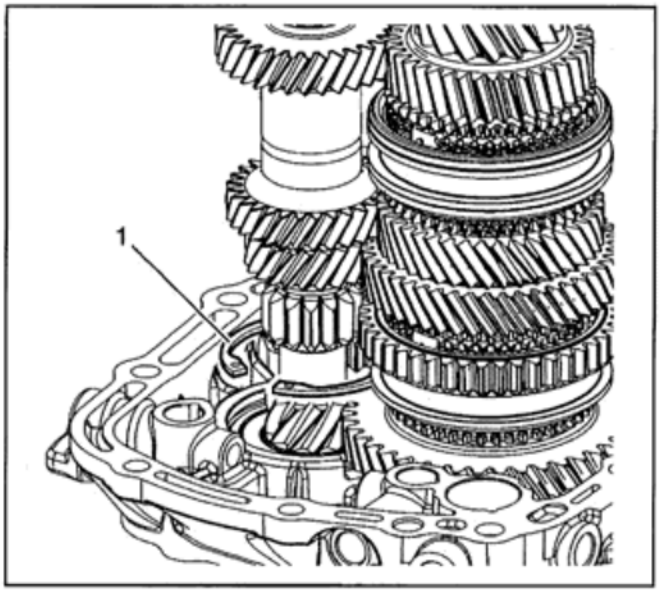
2746409

9. Install the reverse spur gear bearing (1), reverse spur gear washer (2), and reverse gear shaft snap ring (3).



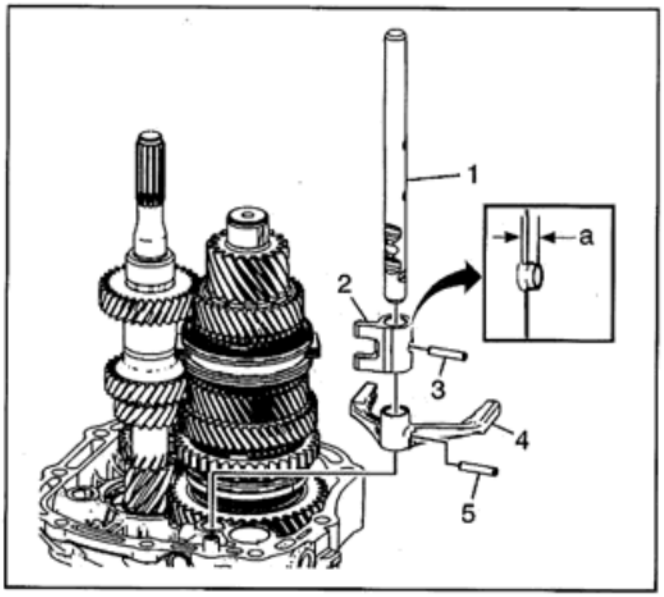
2264074

10. Install the case and shafts assembly onto the *R-0007770* adapter plates (1) and *R-0007758* holding fixture (2).



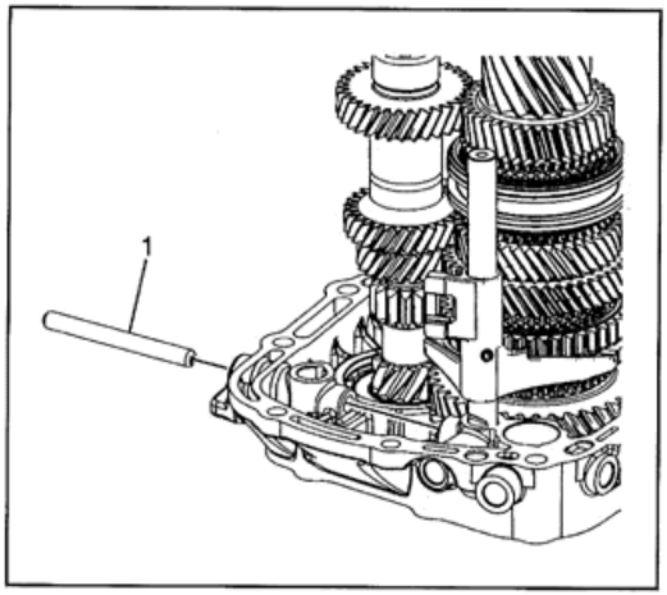
2263804

11. Install the input shaft bearing retaining ring (1).



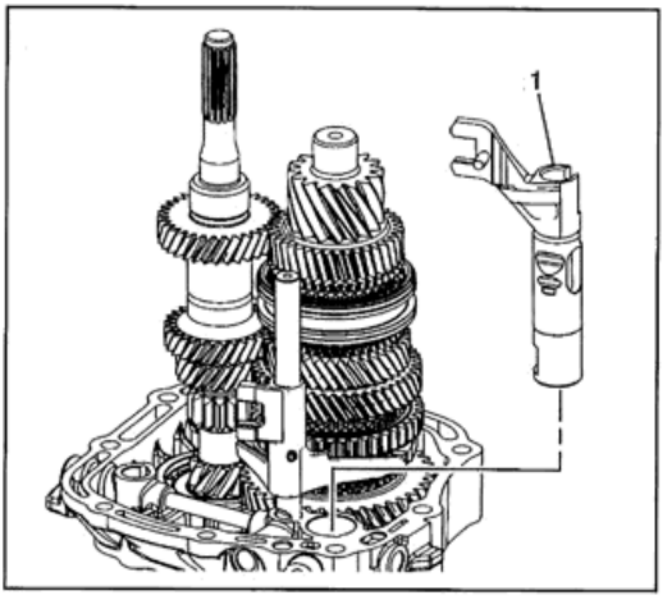
2748407

12. Install the 1st and 2nd shaft block (2).
13. Install the 1st and 2nd shaft block pin (3) to the dimension "a" depth of **2 mm (0.80 in)**.
14. Install the 1st and 2nd shift fork (4).
15. Install the 1st and 2nd shift shaft (1).
16. Install the 1st and 2nd shift fork pin (5) to the dimension "a" depth of **2 mm (0.80 in)**.



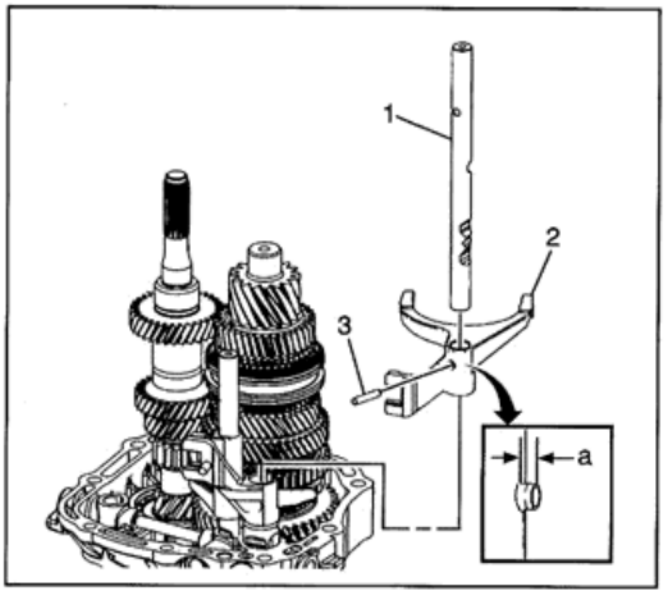
2264076

17. Install the gearshift rod (1) into the transmission case.



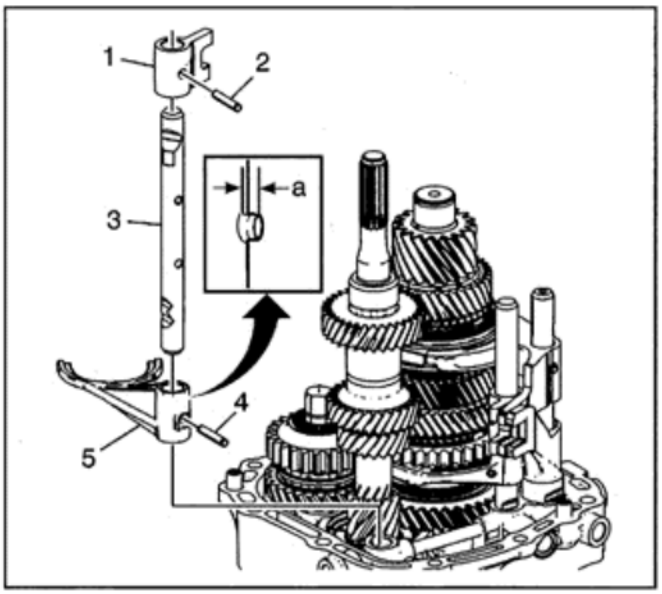
2263787

18. Install the 5th shift blocking guide (1) into the transmission case.



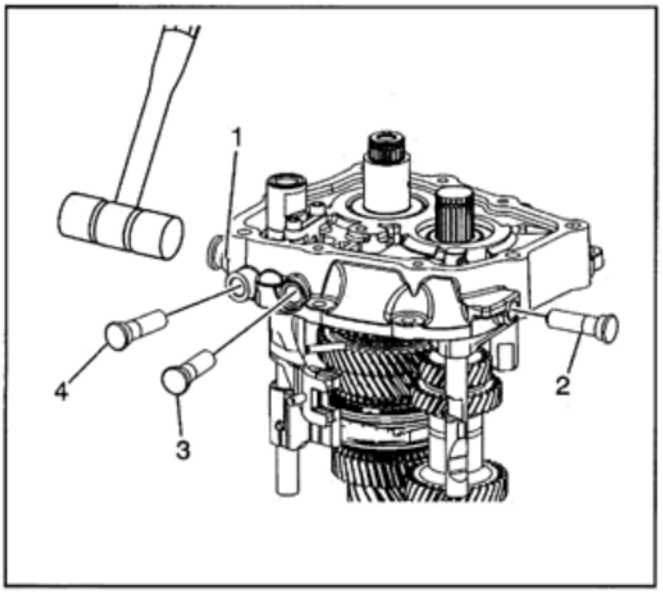
2264079

19. Install the 3rd and 4th shift fork (2).
20. Install the 3rd and 4th shift shaft (1).
21. Install the 3rd and 4th shift fork pin (3) to the dimension "a" depth of **2 mm (0.80 in)**.



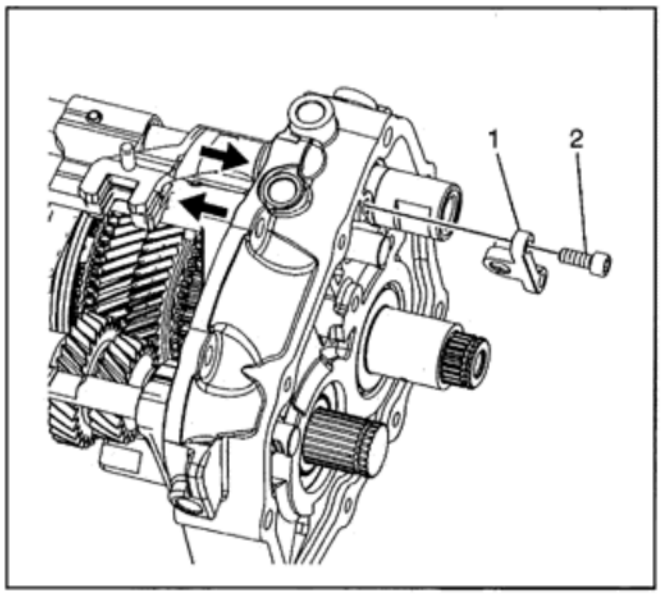
2748405

22. Install the reverse fork block (1).
23. Install the reverse fork block pin (2) to the dimension "a" depth of **2 mm (0.80 in)**.
24. Install the reverse shift fork (5).
25. Install the reverse shift shaft (3).
26. Install the reverse shift fork pin (4) to the dimension "a" depth of **2 mm (0.80 in)**.



2264087

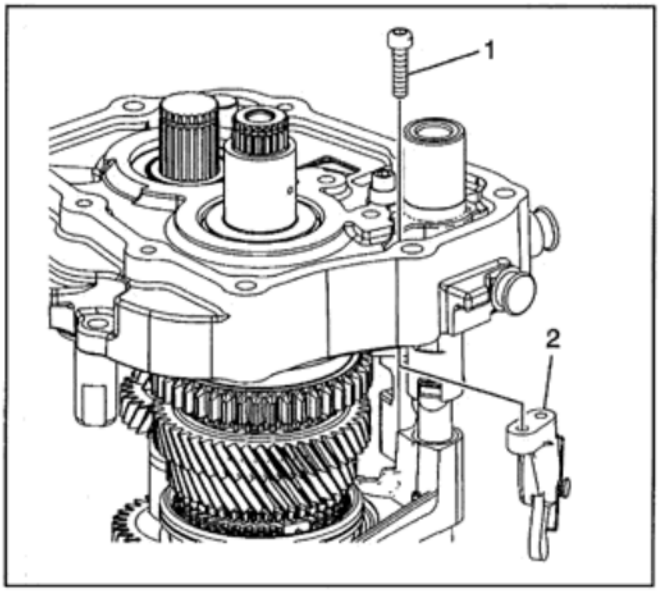
27. Using a plastic hammer or equivalent install the 4 shift shaft detent sleeves (1–4) into the transmission case until they stop.



2263785

Note: Engage the shift shafts into 2nd gear, 5th gear, and 3rd gear as indicated with arrows to install the interlock pin connector.

28. Install the shift shaft interlock pin connector (1).
29. Using thread locking compound install the shift shaft interlock pin connector bolts (2) and tighten to **7 N•m (62 lb in)**.



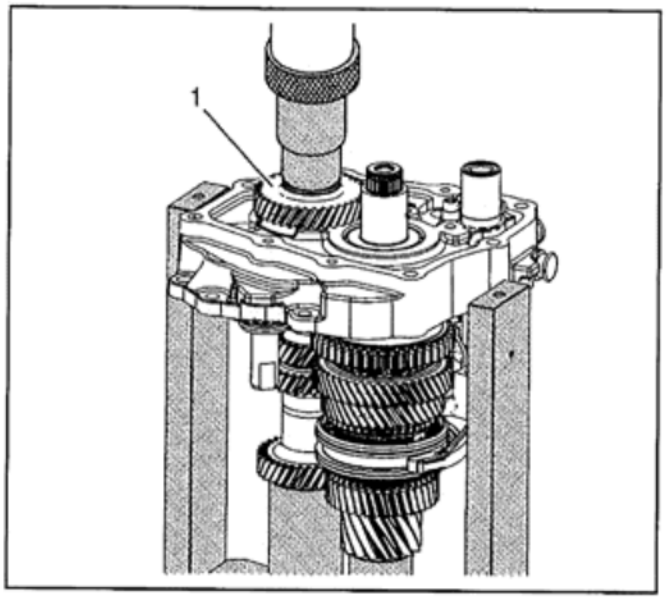
2263781

Note: Move shift forks into neutral position.

30. Install the parking pawl (2).

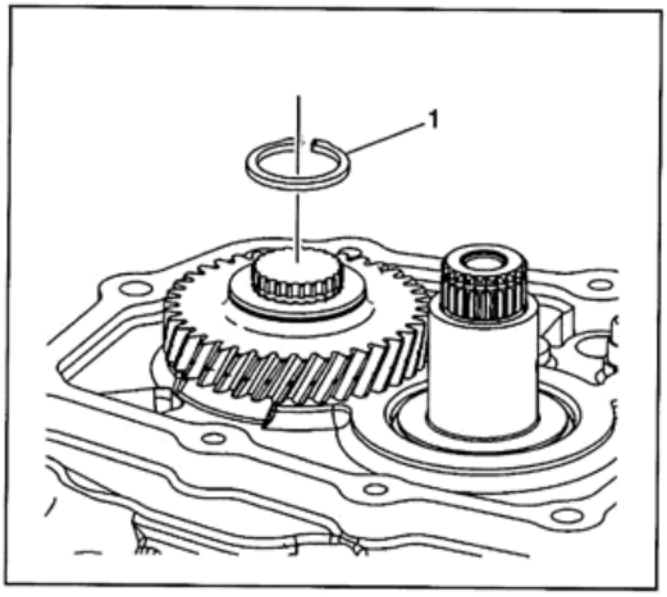
Caution: Refer to *Fastener Caution on page 0-8*.

31. Using thread locking compound install the parking pawl retaining bolts (1) and tighten to **7 N•m (62 lb in)**.



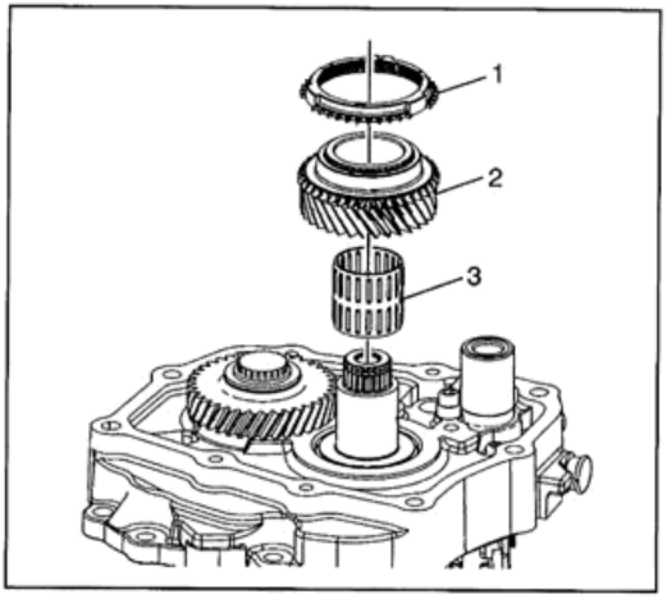
2264088

32. Remove case and shafts assembly from *R-0007770* adapter plates and install onto *T-0307000* driver fixture.
33. Using *J-840733* driver, press the 5th gear, driving (1) onto the input shaft.



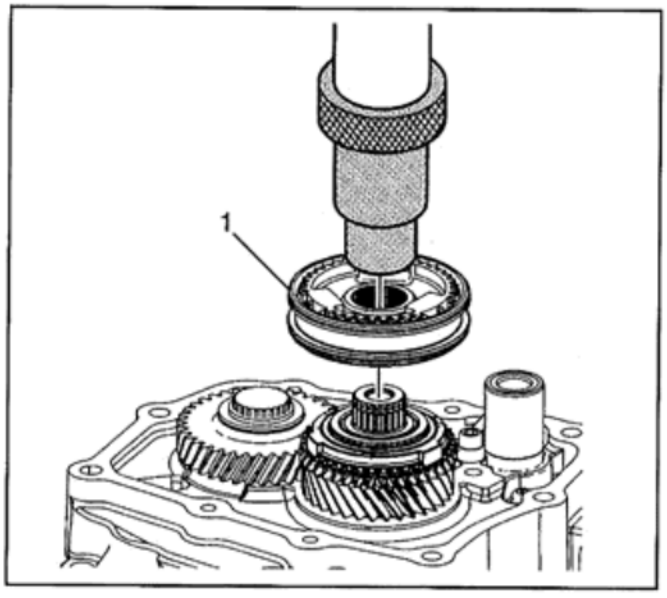
2263774

34. Install a NEW 5th gear retaining ring (1).



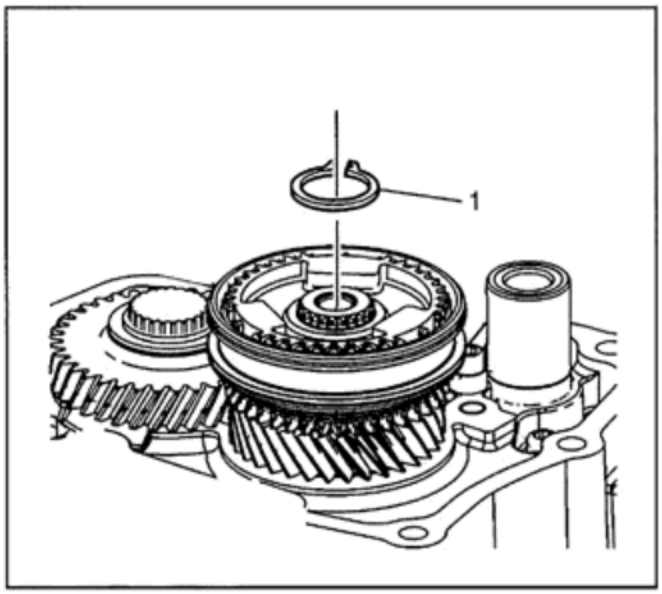
2263772

35. Install the 5th gear bearing assembly (3).
36. Install the 5th gear assembly, driven (2).
37. Install the 5th gear blocking ring (1).



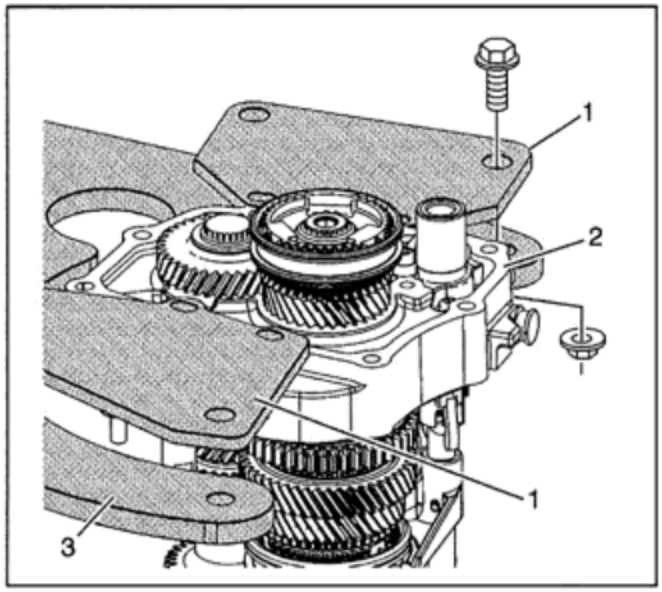
2264089

38. Ensure that the synchronizer assembly (1) is functioning properly, refer to *Synchronizers Cleaning and Inspection on page 17-507* and *Synchronizers Assemble on page 17-509*.
39. Using the *J-840733* driver and a press, install the 5th gear synchronizer assembly (1).



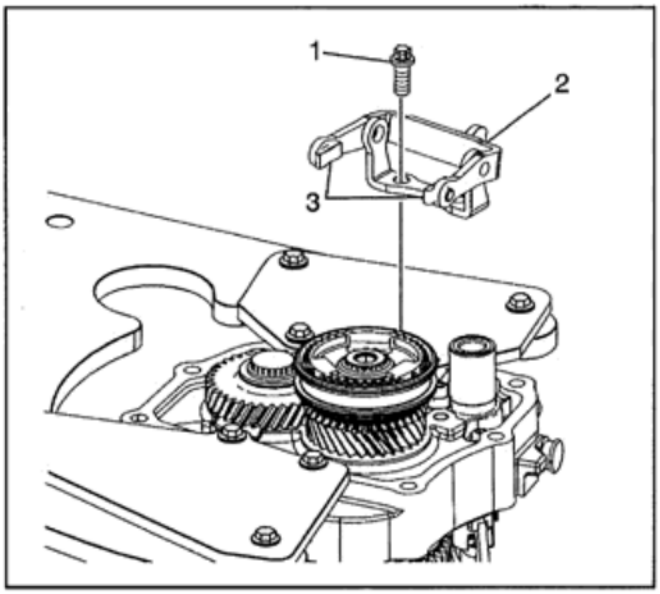
2263767

40. Install the 5th gear sychronizing hub retaining ring (1).



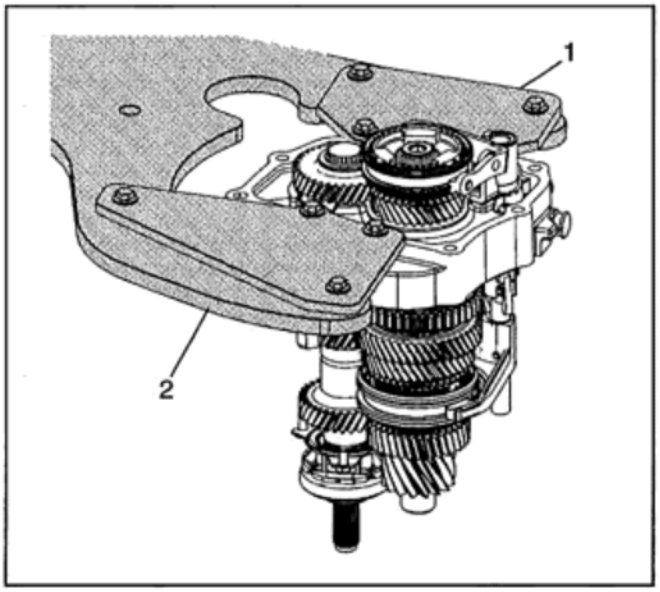
2276942

41. Remove the case and shafts assembly from the *T-0307000* driver fixture.
42. Install *R-0007770* adapter plates (1) onto case (2) and then attach to *R-0007758* holding fixture (3).



2264090

43. Install the 5th shift fork shoes (3).
44. Install the 5th shift fork bracket assembly (2).
45. Using thread locking compound install the 5th shift fork bracket bolts (1) and tighten to **22** N•m **(16 lb ft)**.



2263765

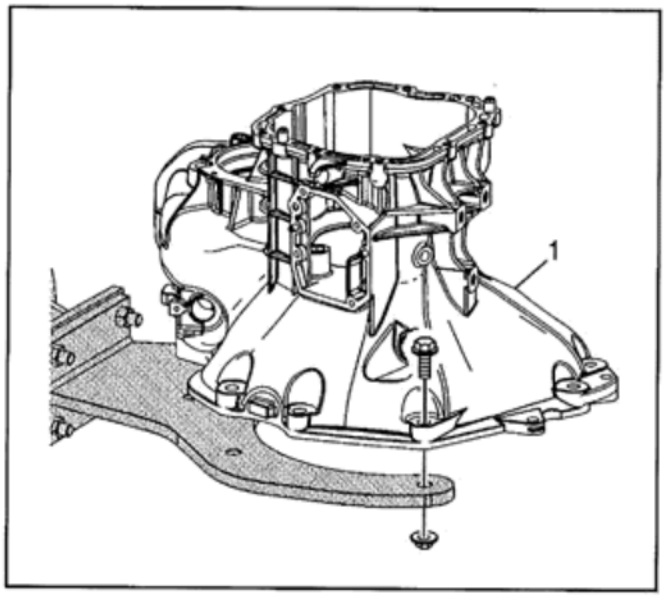
46. Remove the transmission case, from the *R-0007770* adapter plates (1) the *R-0007758* holding fixture and *3-9506289* adapter.

Transmission Assemble

Special Tools

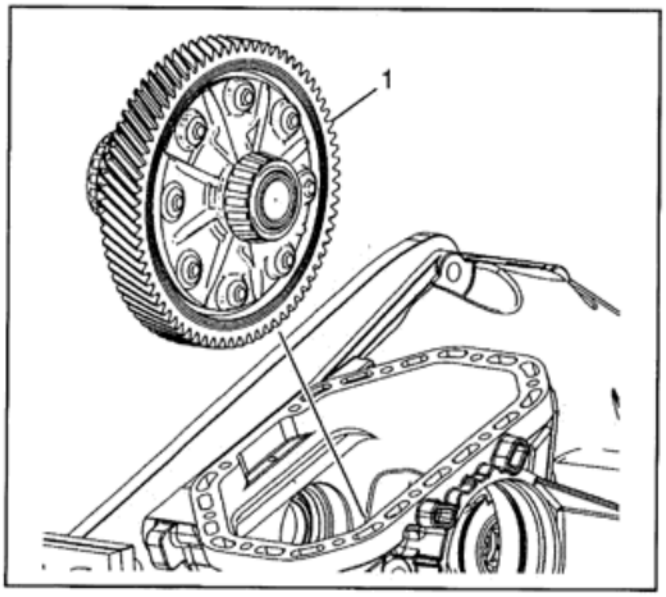
- *3-9506289* Universal Adapter
- *R-0007758* Holding Fixture
- *S-9407197* Differential Rotating Tool
- *S-9407198* Differential Bearing Race Wrench

For equivalent regional tools, refer to *Special Tools on page 17-535*.



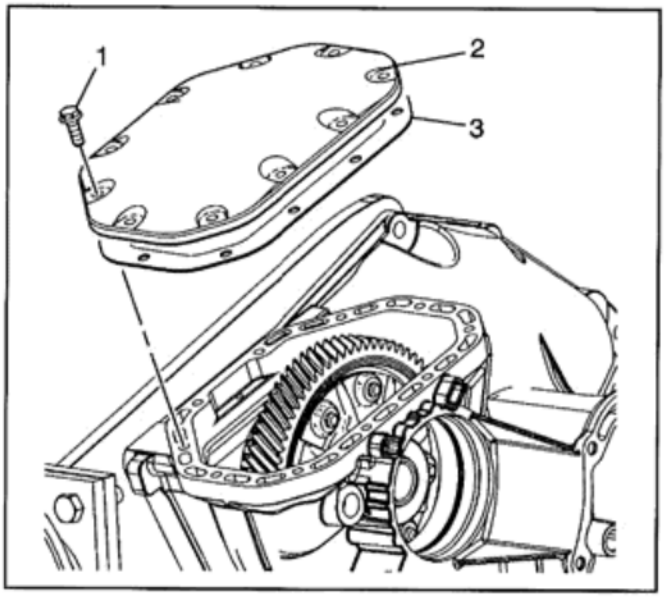
2276940

1. Install the clutch and differential housing assembly (1) onto the *R-0007758* holding fixture.



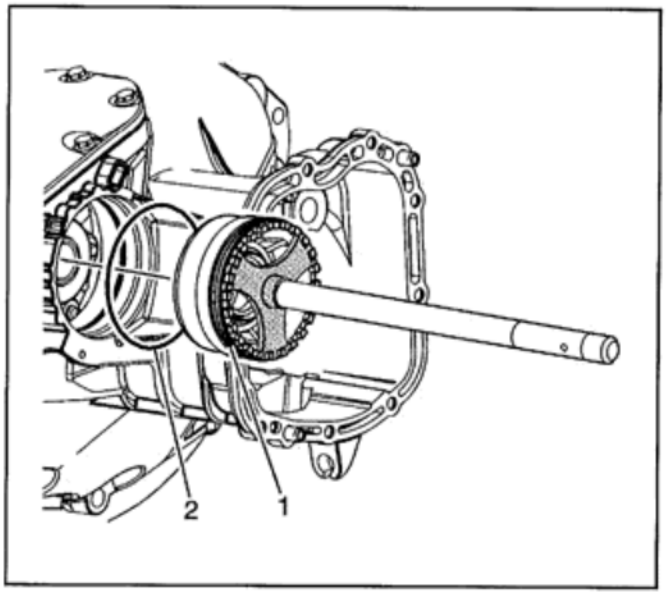
2262260

2. Install the front differential carrier (1).



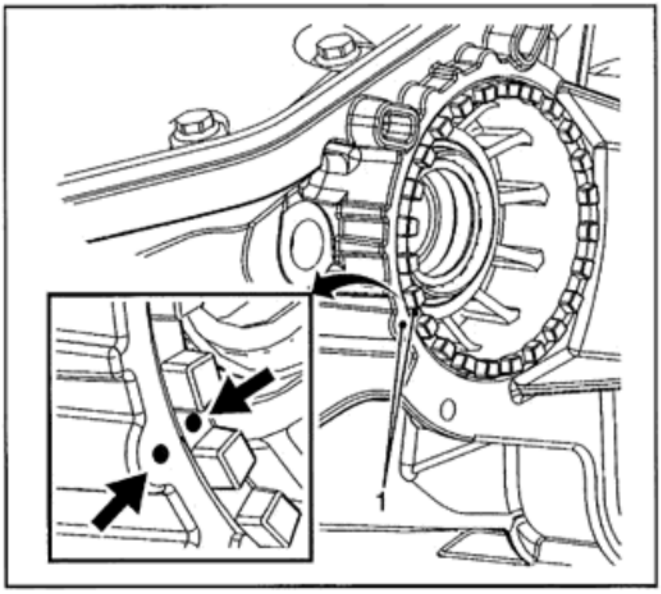
2262259

3. Install the gasket (3) and differential carrier cover (2).
4. Install the front differential carrier cover bolts (1). Tighten to **7 N•m (61.96 lb in)**.



2262258

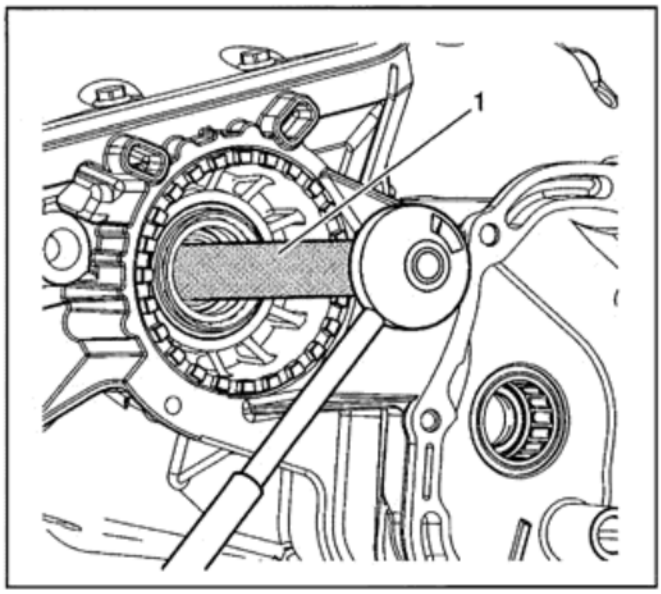
5. Lubricate the O-ring seal (2) with multipurpose grease and install onto the differential bearing adjuster (1).
6. Lubricate the threads on the differential bearing adjuster with multipurpose grease.
7. Using *S-9407198* differential bearing race wrench install the front differential bearing adjuster (1).



2276943

Note: If all the components are re-used align adjuster to marks. If any component was replaced go to the next step.

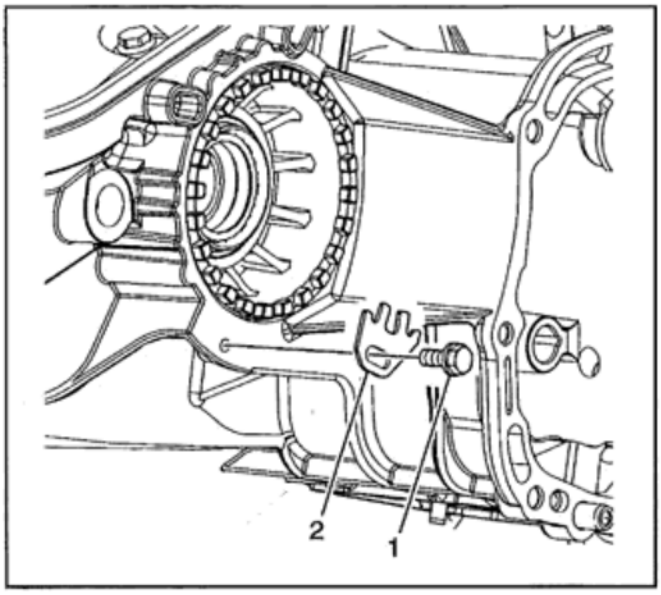
8. Align marks on the differential bearing adjuster and case (1).



2264220

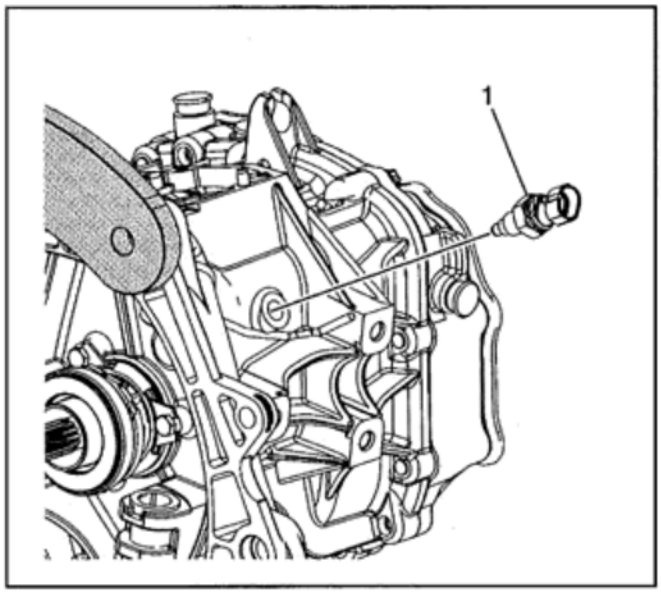
Note: If no components were replaced, the bearing adjuster can be aligned to the marks. If any component was replaced, the following procedure must be performed.

9. Using the *S-9407197* differential rotating tool and a torque wrench, rotate the differential (1) 1 revolution per second.
10. The breakaway bearing torque should be:
    - Re-use bearing – 60–100 Ncm
    - New Bearing – 150–210 Ncm
11. Using the *S-9407198* bearing race wrench and the *R-0007761* handle, adjust the breakaway torque by tightening or loosing the differential bearing adjuster.



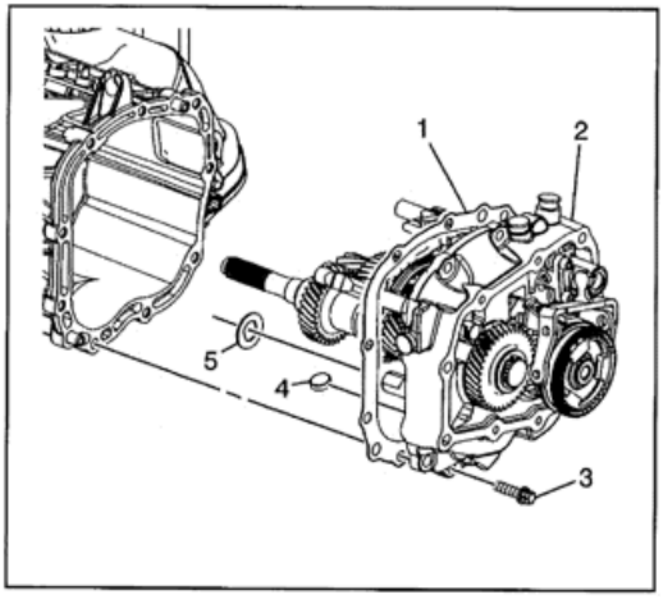
2262256

12. Install the differential bearing adjuster lock (2).
13. Apply thread locking compound and install the differential bearing adjuster lock bolt (1). Tighten to **9** N•m **(79.66 lb in)**.



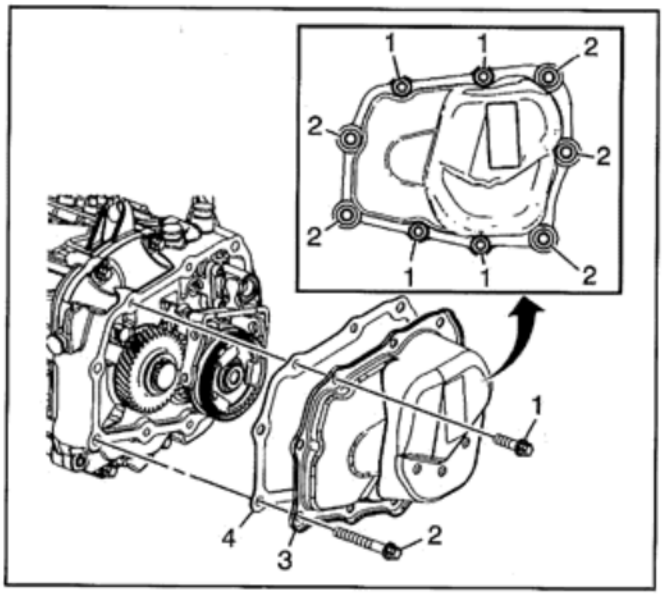
2262253

14. Install the back up lamp switch (1). Tighten to **20** N•m **(14.75 lb ft)**.



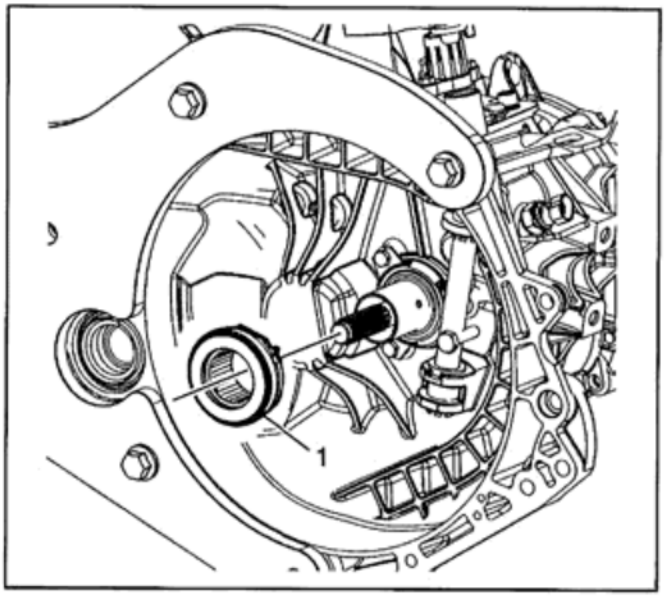
2262252

15. Install the reverse idler gear washer (5).
16. Verify fork alignment before installation.
17. Install the case .
18. Install the gasket (1) and transmission case (2).
19. Install the transmission case bolts (3). Tighten to **15** N•m **(11 lb ft)**.



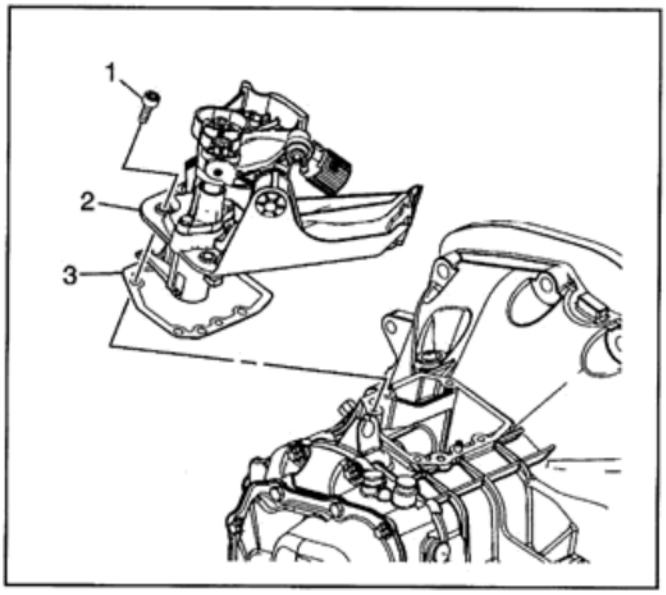
2262250

20. Install the gasket (4) and transmission cover (3).
21. Install the long transmission cover bolts (2). Tighten to **24** N•m **(18 lb ft)**.
22. Install the short transmission cover bolts (1). Tighten to **8** N•m **(71 lb in)**.



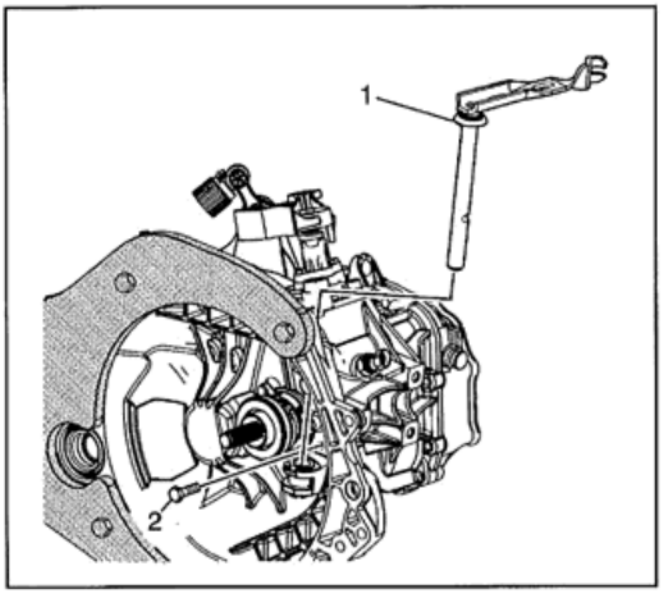
2276933

23. Install the clutch release bearing (1).



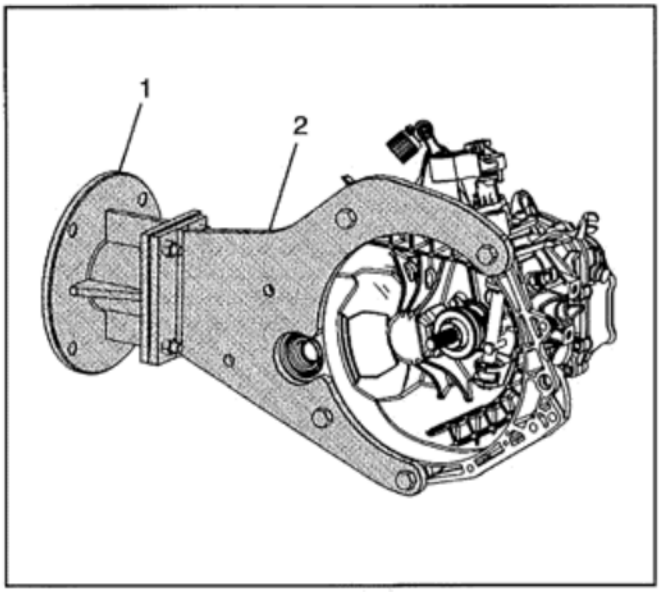
2262248

24. Install the gasket (3) and control lever housing (2).
25. Install the transmission control lever housing bolts (1). Tighten to **12** N•m **(106 lb in)**.



2262247

26. Install the clutch fork shaft (1).
27. Install the clutch fork shaft retaining bolt (2). Tighten to **35** N•m **(26 lb ft)**.

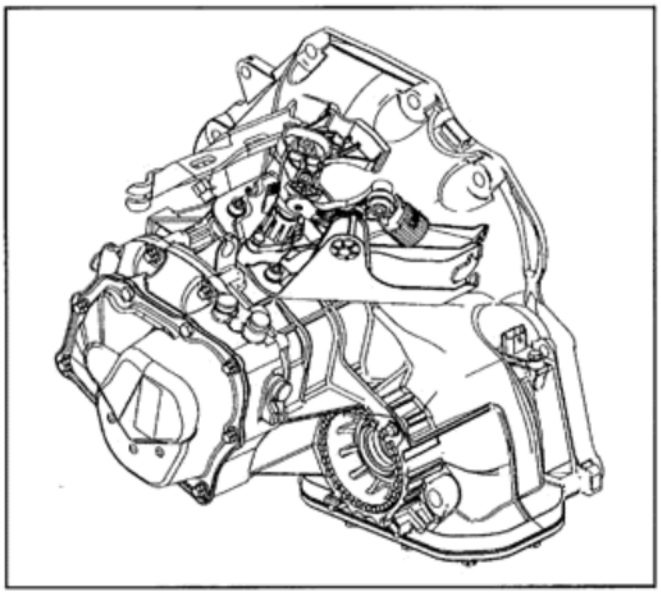


2262246

28. Remove the *R-0007758* holding fixture (2) and the *3-9506289* Universal Adapter (1).

Description and Operation

Transmission System Description and Operation



2487582

The F17 is a 5 speed manual transmission assembly.

Note: Use only transmission fluid listed within the *Adhesives, Fluids, Lubricants, and Sealers on page 17-427* for this manual transmission assembly. Other lubricants or additives may affect the shift performance.

The F17 (Gen 1) 5 Speed manual transmission has the following features:

- First and second gear double coned synchronizer
- Third, fourth, and fifth gear single coned synchronizer
- Two shaft design consisting of an input shaft, and main shaft
- Reverse inhibit feature
- One piece clutch actuator – no bleed screw
- Transmission venting system is part of the fill cap
- Vehicle speed sensor (VSS)

The F17 (Gen 2) 5 Speed manual transmission has the following features:

- First, second, third, and fourth gear double coned synchronizer
- Fifth gear single coned synchronizer
- Two shaft design consisting of an input shaft, and main shaft
- Synchronized Reverse Gear
- One piece clutch actuator – no bleed screw
- Transmission venting system is part of the fill cap
- Vehicle speed sensor (VSS)

The manual transmission shift cables must be adjusted for proper shifter performance.

Special Tools and Equipment

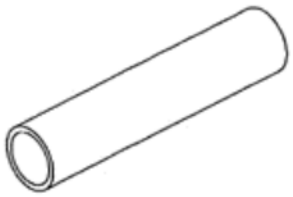
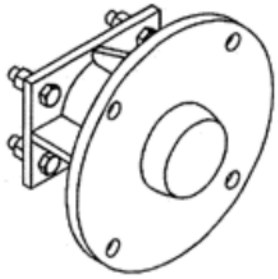
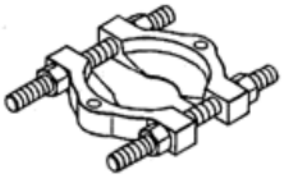
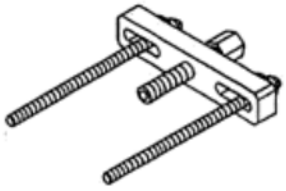
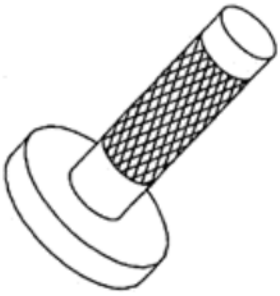
Illustration	Tool Number/Description
 2488551	3-0207944 Main Shaft Tapered Bearing Insert Tool
 2259430	39506289 Universal Adapter, 2.5L HST Engine
 2259786	69604356 Gear Pullers
 2259791	69607346 Speed Sensor Impeller Ring Puller
 2269799	J 810700 Center Bar Puller

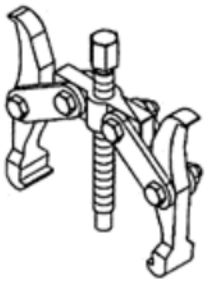
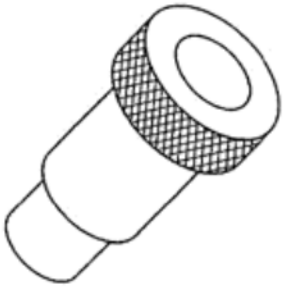
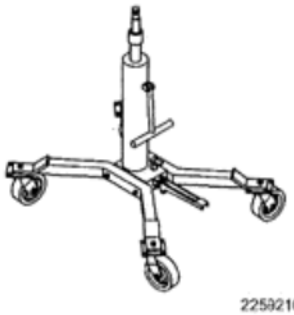
Illustration	Tool Number/Description
 2259802	J 810704 Steering Column Center Bar Puller
 2259812	J 810721 Support Base
 2269801	J 840733 Driver
 2259210	J 9703392 Hydraulic Jack
 2259215	M 680770 Universal Sliding Mallet

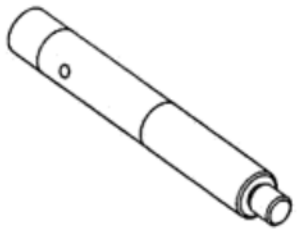
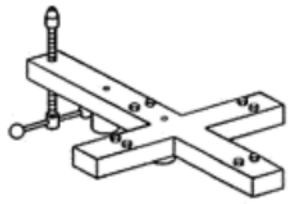
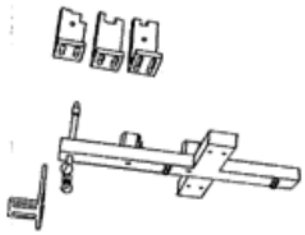
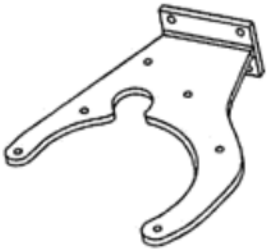
Illustration	Tool Number/Description
 2259220	M 840911 Universal Handle for Pullers and Installers
 2259558	R 0006747-1 Engine and Transmission Removal and Installation Device Crossmember
 2259818	R 0006747-5 Transmission Support, Attach to R 0006747-1
 2259224	R 0006749 Support Base for Universal Pullers
 2259820	R 0007758 Device to Attach the Transmission

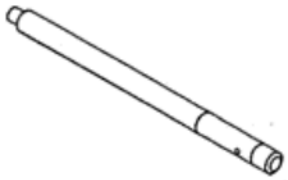
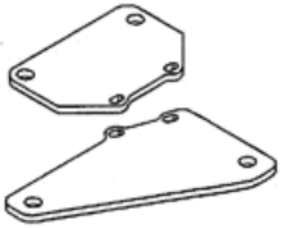
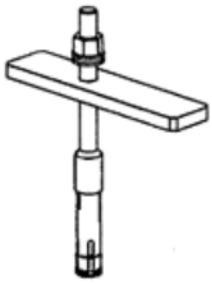
Illustration	Tool Number/Description
 2259825	R 0007761 Universal Handle 300 mm for Pullers and Installers
 2259835	R 0007770 Support to Assemble and Disassemble the Gear Assembly
 2259839	R 0407008 Device for Removing the Countershaft Bearing, Use with R 0007761
 2259841	R 0407009 Driver Countershaft Front Bearing, Use with R 0007761
 2259887	R 0407010 Puller and Driver – Input Shaft Needle Bearing, Use with R 0007761

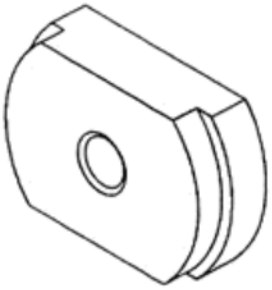
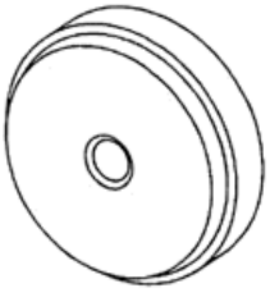
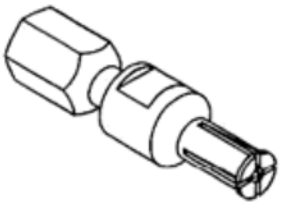
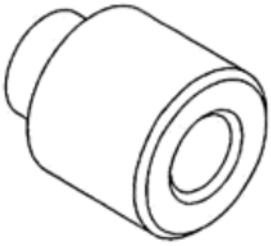
Illustration	Tool Number/Description
 2259888	R 0407011 Puller Differential Carrier Taper Bearing Cap, Use with R 0007761
 2259889	R 0407012 Driver Differential Carrier Cone Bearing Cap, Use with R 0007761
 2259890	R 0407013 Gearshift Device Bushing Puller, Use with M 6807770
 2259892	R 0407014 Gearshift Device Bushing Driver, Use with M 6807770
 2259893	R 0407015 Device for Removing the Speed Gear Engaging Cable

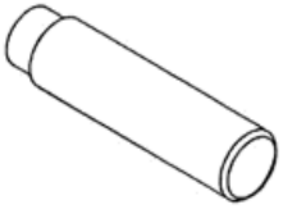
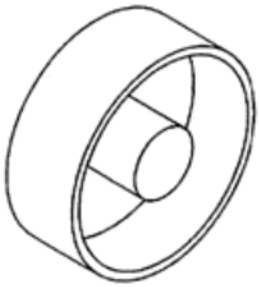
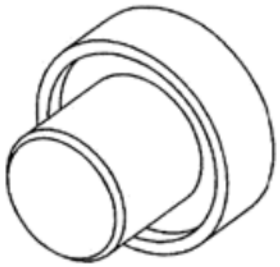
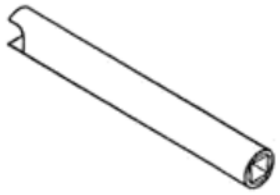
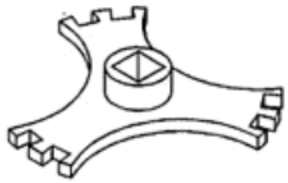
Illustration	Tool Number/Description
 2259571	S-9406190 Shift Rod Guide Bushing Installer
 2259901	S-9407194 Speed Sensor Impeller Ring Installer
 2259902	S-9407195 Pinion Gear Case Bearing Installer
 2259904	S-9407197 Device to Measure the Pinion Gear Case Bearings Preload, F13/15
 2259905	S-9407198 Wrench to Loosen and Tighten the Differential Bearing Race, F13/15

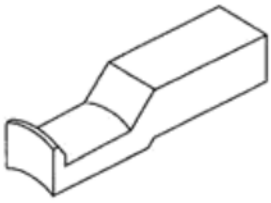
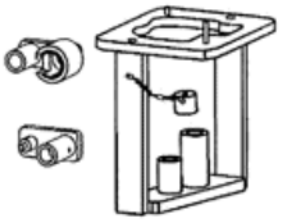
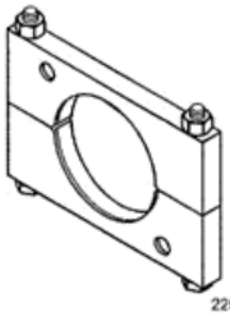
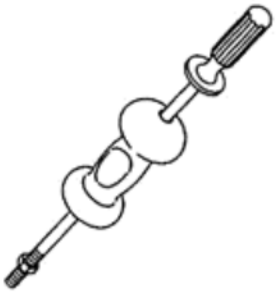
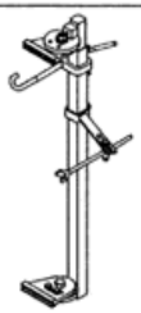
Illustration	Tool Number/Description
 2259912	S-9707500 Axle Shaft Seal Installer
 2488552	T-0207928 Retainer Remover
 2259940	T-0307000 Extractor and Driver F17 Plus Transmission Assembly
 2259945	T-9804669 Axle Shaft Seal Installer

Illustration	Tool Number/Description
 2259948	T-9804678 F23 RPM Sensor Ring Gear Puller. Remove in the Press 69607346 Optional
 2269800	T-9807671 Slide Hammer
 2259335	X-0206951 Front Suspension Bushing Puller and Installer