

TRANSMISSION

Transfer Case - MP 1622G (NQ7) - Canyon, Colorado

SPECIFICATIONS

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
Transfer Case - MP 1622G (NQ7)		
DEXRON®VI	1.9 liters	2.0 quarts

FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Transfer Case Bolts (Qty: 18)	24 N.m	18 lb ft
Transfer Case Adapter Bolt/Screw	58 N.m	43 lb ft
Transfer Case Front Output Flange Nut	176 - 271 N.m	130 - 200 lb ft
Transfer Case Oil Drain Plug	25 N.m	18 lb ft
Transfer Case Oil Fill Plug	25 N.m	18 lb ft
Transfer Case Shield Bolt	32 N.m	24 lb ft
Transfer Case Shift Detent Plunger Plug	24 N.m	18 lb ft
Transfer Case Shift Fork Shaft Guide Screw	5 N.m	44 lb in
Transfer Case 2/4 Wheel Drive Actuator Bolt/Screw (Qty: 3)	19 N.m	14 lb ft
Vehicle Speed Sensor Bolt/Screw	8 N.m	69 lb in

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Transfer Case	DEXRON®VI	88861037	19264717
Transfer Case Input Shaft Splines and Input Shaft O-ring	Grease	88900330	992694
Transfer Case Oil Drain Plug	Sealant	12346004	10953480
Transfer Case Oil Fill Plug	Sealant	12346004	10953480
Transfer Case Rear Case Half-to-Transfer Case Front Half	Sealant	12378521	88901148
Transfer Case Shift Fork Service Pin	Threadlocker	19332211	10953488
Transfer Case Shift Fork Shaft Guide Screw	Threadlocker	19332211	10953488
Transfer Case Shift Detent Screw/Plug O-ring Seal	DEXRON®VI	88861037	19264717
Transfer Case Vent	Sealant	12377901	10953504
Vehicle Speed Sensor O-ring Seal	DEXRON®VI	88861037	19264717
Vehicle Speed Sensor Bolt	Threadlocker	89021297	10953488

SCHEMATIC WIRING DIAGRAMS

Power, Ground and Shift Controls

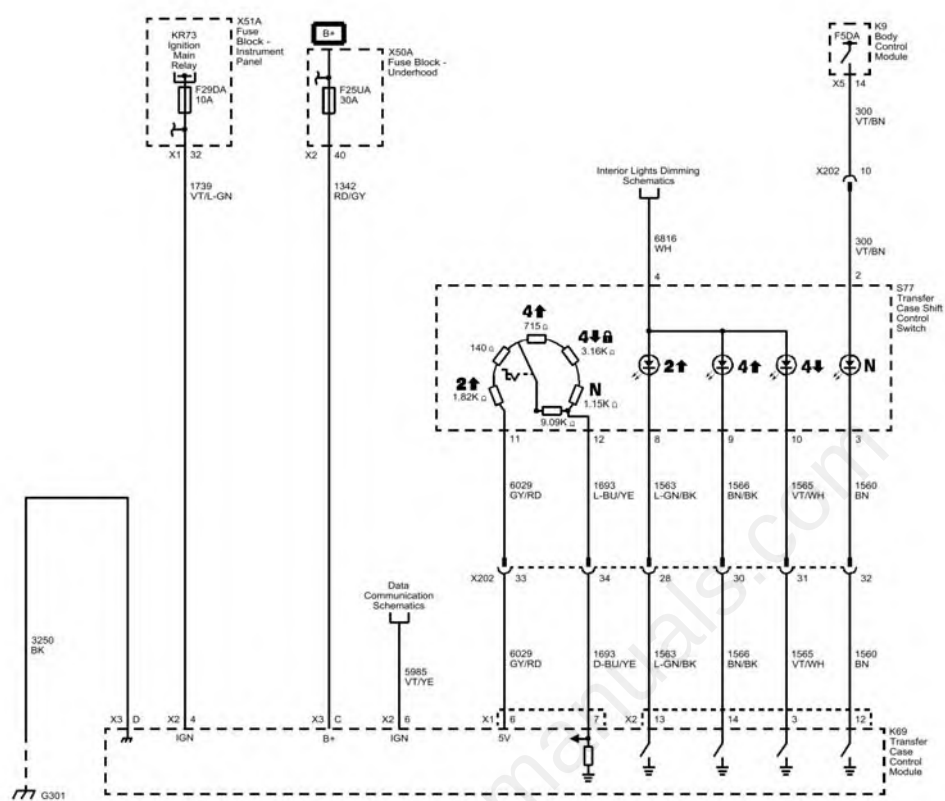


Fig. 1: Power, Ground and Shift Controls
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Controls

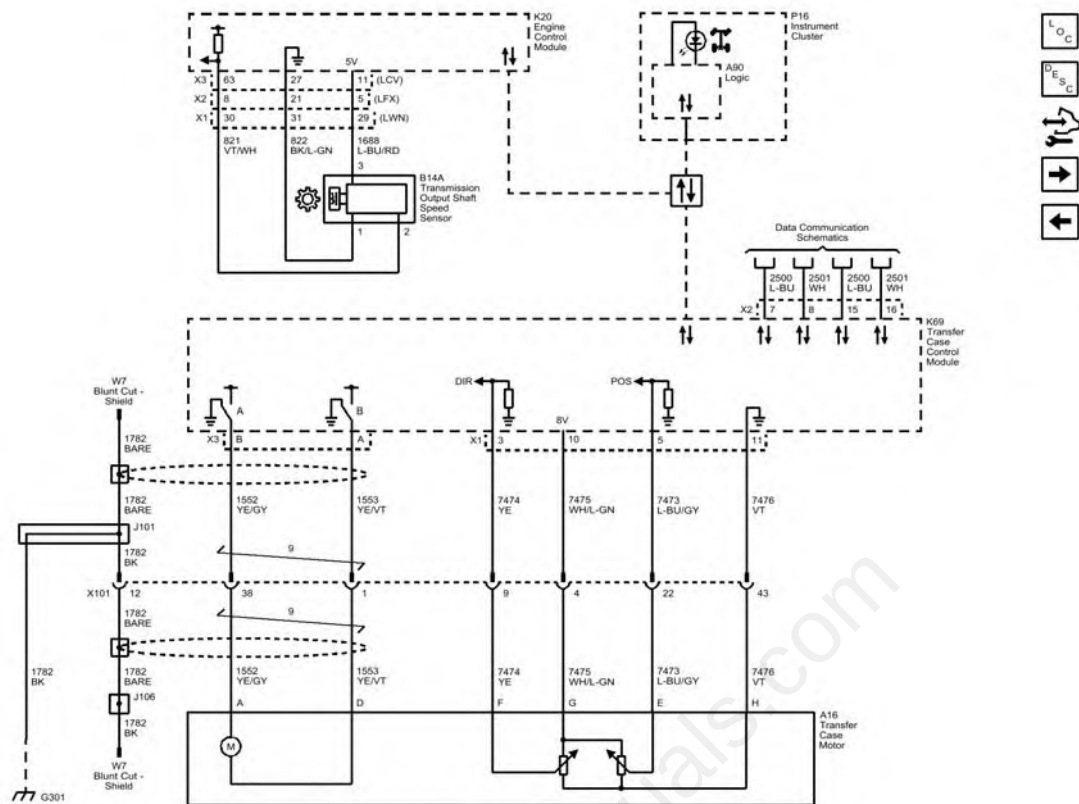


Fig. 2: Transfer Case Controls
 Courtesy of GENERAL MOTORS COMPANY

Front Axle Controls

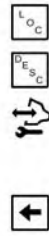
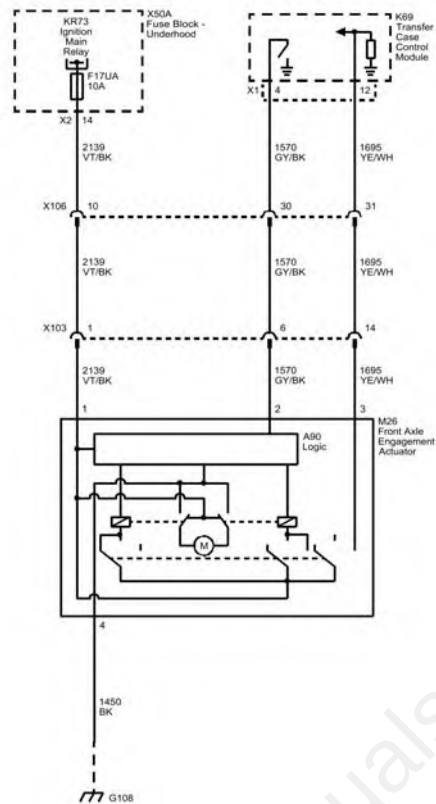


Fig. 3: Front Axle Controls

Courtesy of GENERAL MOTORS COMPANY

COMPONENT LOCATOR

TRANSFER CASE DISASSEMBLED VIEW

Case Half Components

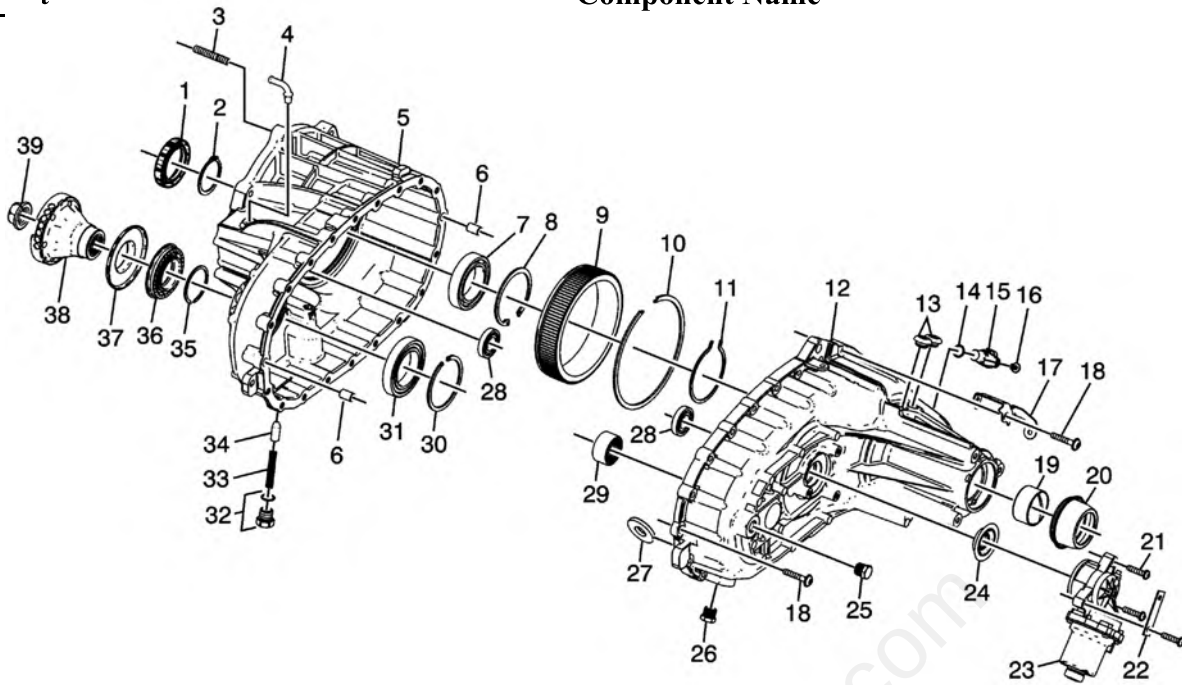


Fig. 4: Case Half Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transfer Case Input Shaft Seal
2	Transfer Case Input Shaft Inner Retaining Ring
3	Transfer Case Stud (Qty: 7)
4	Transfer Case Vent
5	Transfer Case (Front Half)
6	Transfer Case Half Locating Pin (Qty: 2)
7	Transfer Case Input Shaft Bearing
8	Transfer Case Input Gear Bearing Retaining Ring
9	Transfer Case High/Low Internal Gear
10	Transfer Case High/Low Internal Gear Retaining Ring
11	Transfer Case Rear Output Shaft Rear Bearing Outer Retaining Ring
12	Transfer Case Rear Extension (Rear Half)
13	Transfer Case Access Hole Plugs (Qty: 2)
14	Vehicle Speed Sensor O-ring Seal
15	Vehicle Speed Sensor
16	Transfer Case Rear Output Shaft Speed Sensor Bolt
17	Transfer Case Harness Bracket
18	Transfer Case Half Bolt/Screw (Qty: 18)
19	Transfer Case Rear Output Shaft Bushing
20	Transfer Case Rear Output Shaft Seal
21	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty: 3)
22	Transfer Case Actuator Harness Bracket
23	Transfer Case Four Wheel Drive Actuator
24	Transfer Case Two/Four Wheel Drive Actuator Seal

Count	Component Name
25	Transfer Case Oil Fill Plug
26	Transfer Case Oil Drain Plug
27	Transfer Case Chip Collector Magnet
28	Transfer Case Shift Cam Bearings (Qty: 2)
29	Transfer Case Front Output Shaft Rear Bearing
30	Transfer Case Front Output Shaft Bearing Retaining Ring
31	Transfer Case Front Output Shaft Front Bearing
32	Transfer Case Shift Detent Plunger Plug and Seal
33	Transfer Case Shift Detent Plunger Spring
34	Transfer Case Shift Detent Plunger
35	Transfer Case Front Output Shaft Retaining Ring
36	Transfer Case Front Output Shaft Seal
37	Transfer Case Front Output Flange Slinger
38	Transfer Case Front Output Flange
39	Transfer Case Front Output Flange Nut

Internal Components

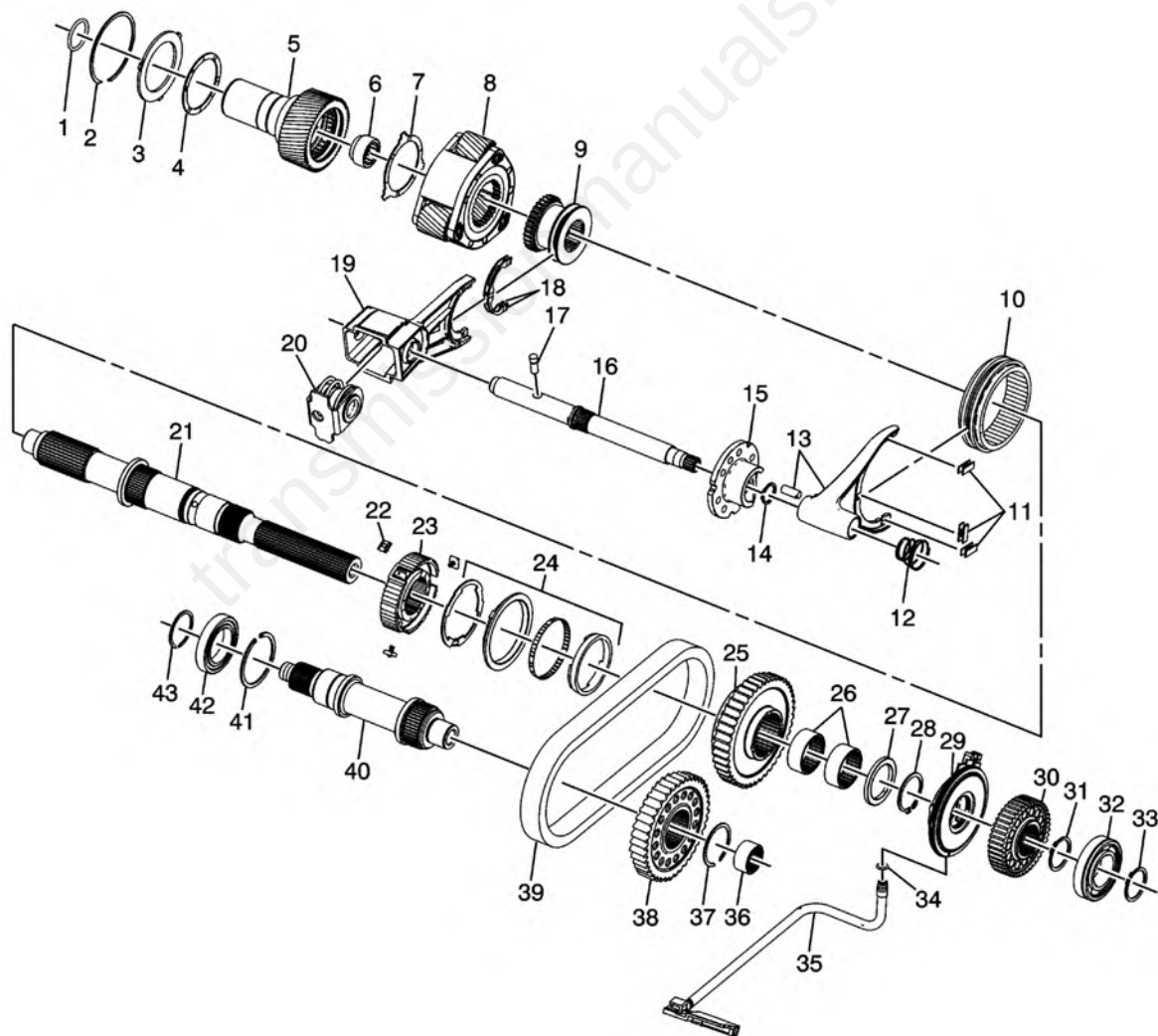


Fig. 5: Internal Components

Courtesy of GENERAL MOTORS COMPANY

Canout	Component Name
1	Transfer Case Input Shaft Seal
2	Transfer Case Input Shaft Retaining Ring
3	Transfer Case High/Low Locking Plate
4	Transfer Case Input Shaft Washer
5	Transfer Case Input Shaft
6	Transfer Case Input Shaft Pilot Bearing
7	Transfer Case Planetary Carrier Sun Gear Thrust Washer
8	Transfer Case High/Low Planetary Carrier
9	Transfer Case High/Low Clutch
10	Transfer Case Two/Four Wheel Drive Synchronizer Sleeve
11	Transfer Case Two/Four Wheel Drive Shift Fork Inserts (Qty: 3)
12	Transfer Case Shift Fork Spring
13	Transfer Case Two/Four Wheel Drive Shift Fork
14	Transfer Case Two/Four Wheel Drive Actuator Cam Retaining Ring
15	Transfer Case Two/Four Wheel Drive Actuator Cam
16	Transfer Case High/Low Shift Fork Shaft
17	Transfer Case High/Low Shift Fork Pin
18	Transfer Case High/Low Shift Fork Inserts (Qty: 2)
19	Transfer Case High/Low Shift Fork
20	Transfer Case High/Low Shift Fork Spring
21	Transfer Case Rear Output Shaft
22	Transfer Case Two/Four Wheel Drive Synchronizer Inserts (Qty: 3)
23	Transfer Case Two/Four Wheel Drive Synchronizer Hub
24	Transfer Case Two/Four Wheel Drive Synchronizer
25	Transfer Case Front Output Shaft Drive Sprocket
26	Transfer Case Front Output Shaft Drive Sprocket Bearings (Qty: 2)
27	Transfer Case Front Output Shaft Drive Sprocket Spacer
28	Transfer Case Front Output Shaft Drive Sprocket Retaining Ring
29	Transfer Case Oil Pump Assembly
30	Transfer Case Rear Output Shaft Reluctor Wheel
31	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
32	Transfer Case Rear Output Shaft Rear Bearing
33	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
34	Transfer Case Oil Pump Suction Pipe Seal
35	Transfer Case Oil Pump Suction Pipe
36	Transfer Case Front Output Shaft Rear Bearing
37	Transfer Case Front Output Shaft Driven Sprocket Retaining Ring
38	Transfer Case Front Output Shaft Driven Sprocket
39	Transfer Case Front Output Shaft Drive Chain Assembly
40	Transfer Case Front Output Shaft
41	Transfer Case Front Output Shaft Bearing Retaining Ring
42	Transfer Case Front Output Shaft Bearing
43	Transfer Case Front Output Shaft Bearing Retaining Ring

DIAGNOSTIC INFORMATION AND PROCEDURES

Diagnostic Instructions

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

DTC Descriptor**DTC B0775 01**

4 High Indicator Circuit Short to Battery

DTC B0775 06

4 High Indicator Circuit Short to Ground or Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Indicator Dimming Control	B0770 06, B0775 06, B0780 06, & B0785 06	B0770 06, B0775 06, B0780 06, & B0785 06	-
4 High Indicator Control Circuit	B0775 06	B0775 06	B0775 01

Circuit/System Description

The 4 High indicator circuit consists of a light emitting diode (LED), a LED feed circuit and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies voltage to the 2 High, 4 High and 4 Low LEDs. When the 4 High mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 4 High indicator control circuit illuminating the LED. The TCCM tests the 4 High indicator circuit for unexpected voltage, by monitoring the B+ supplied by the BCM on the indicator dimming control circuit, by grounding the 4 High indicator control circuit for 2 seconds during the bulb test at key ON.

Conditions for Running the DTC**B0775 01**

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 4 High indicator is commanded ON.

B0775 06

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 4 High indicator is commanded OFF.

Conditions for Setting the DTC

The TCCM detects 3.4 V or greater on the 4 High indicator control circuit when the 4 High indicator is commanded ON.

B0775 06

The TCCM detects 1.6 V or less for 1.5 seconds on the 4 High indicator control circuit when the 4 High indicator is commanded OFF.

Action Taken When the DTC Sets

Normal operation, the SERVICE 4WD indicator is not commanded ON. Driver is informed of fault via bulb check.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the condition for setting the DTC is no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- A TRUE B+ has enough current to light a test light.
- A DIAGNOSTIC B+ is a low current circuit that DOES NOT have enough current to light a test light.
- A short to ground on the 4 High indicator control circuit will cause the 4 High indicator to remain ON at all times.
- An open or high resistance on the 4 High indicator control circuit will cause the 4 High indicator to be inoperative during the 2 second bulb check.
- An open in the indicator dimming control circuit will cause the 2 High, 4 High and 4 Low mode indicators to be inoperative during the 2 second bulb check.
- The **EL-49741** Harness is a good source for 9 V.
- The **EL-49742** Harness is a good source for B+ and ground.
- With key REMOVED - opening a door puts a true B+ on the indicator dimming control circuit, TCSCS X1 pin 4. Other possible voltages are listed below:
 - Door open, key removed - indicator dimming control circuit voltage = true B+
 - Door open, key in, key OFF - indicator dimming control circuit voltage = true B+.
 - Door open, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - All doors closed, key OFF - indicator dimming control circuit voltage = B+ (high current - enough to light a test light).
 - All doors closed, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - Key ON, engine OFF. Place a shop light on the DRL sensor. When the DRL sensor commands the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

Key ON, engine OFF. The TCCM runs a 2 second bulb test on all indicators of the TCSCS at key ON.

Circuit/System Testing

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

1. Remove key. Disconnect the X1 connector at the transfer case shift control switch (TCSCS).
2. Door open, key ON, engine OFF. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4 and a good ground, such as the ground terminal of the EL-49742 Harness, black terminal.
 - If the voltage is less than the specified range, test the affected circuit for an open/high resistance, short to ground or short to voltage. If all circuits and connections test normal, test the body control module (BCM) for proper operation.
3. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4, and the 4 High indicator control circuit, TSCSC X1 pin 9.
 - If the voltage is less than the specified range, test the 4 High indicator control circuit for an open/high resistance or short to power. If all circuits and connections test normal, test the TCCM for proper operation.
4. Key OFF. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the indicator dimming control circuit, TCSCS X1 pin 4 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
5. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the 4 High indicator control circuit, TCSCS X1 pin 9 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
6. Test the TCSCS for proper operation.

Component Testing

Mode	2 High	4 High	4 Low	N
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1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Using the L-BU probe J-35616-64B, connect a test light between the indicator dimming control circuit, TCSCS harness X1 pin 4, and a good ground.
3. Key ON, engine OFF. The test light should be dull or OFF
 - If the test light is bright, test the indicator dimming control circuit for a short to voltage condition. If all circuits and connections test normal, replace the BCM.

NOTE: When the DRL sensor turns the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

4. Place a shop light on the DRL sensor. When the headlights go out, the test light should illuminate brightly.
 - If the test light is dull or OFF, test the indicator dimming control circuit for an open/high resistance or short to ground condition. If all circuits and connections test normal, replace the BCM.

TCCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Key ON, engine OFF.
3. Using the L-BU probe J-35616-64B, test for 4.5-5.5 V between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground.
 - If the voltage is greater than the specified range, test the 5-volt reference circuit for a short to voltage. If all circuits and connections test normal, replace the TCCM.
 - If the voltage is less than the specified range, test the 5-volt reference circuit for an open/high resistance or short to ground. If all circuits and connections test normal, replace the TCCM.
4. Using the L-BU probe J-35616-64B, connect a test light between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground. The test light should illuminate dimly.
 - If the test light does not illuminate, obtain a different test light and repeat step 4.
5. Key OFF. Wait 30 seconds for the TCCM to shut down.

NOTE: The TCCM must see the added resistance of the test light on the control circuit at key ON or the TCCM will shut the control circuit drivers off. Volt meters will not work for this test.

6. Using the L-BU probe J-35616-64B, connect a test light between the TCSCS harness as specified below for the LED control circuit being tested.
7. Key ON, engine OFF.
8. Using the special function ability of the scan tool, command the affected LED ON and OFF. The test light should turn ON and OFF as commanded.
 - If the test light remains illuminated when commanded OFF, test the affected control circuit for a short to ground. If all circuits and connections test normal, replace the TCCM.
 - If the test light remains OFF when commanded ON, test the affected control circuit for an open/high resistance or short to voltage. If all circuits and connections test normal, replace the TCCM.

Mode	2 High	4 High	4 Low	N
5-V Reference (pin)	11	11	11	11
indicator Control Circuit (pin)	7	9	10	3

9741 Wire Color**2 High Ground****4 High Resistance****4 Low Short to Voltage**

- Using the L-BU probe J-35616-65B, connect the 9 V power source EL-49741 Harness to the TCSCS as specified below for the LED being tested. Connecting the harness to the opposite pins will not illuminate the LED.
- Connect a 9 V battery to the 9 V power source EL-49741 Harness.
- Verify that only the indicator being tested illuminates.
 - If the indicator does not illuminate when tested or the incorrect indicator illuminates, replace the TCSCS.

EL49741 Wire Color	2 High	4 High	4 Low	N
Red - pin	4	4	4	2
Black - pin	7	9	10	3

Repair Instructions

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

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for TCSCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(NQ7\)](#)

DTC B0780: 4 LOW INDICATOR**Diagnostic Instructions**

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor**DTC B0780 01**

4 Low Indicator Circuit Short to Battery

DTC B0780 06

4 Low Indicator Circuit Short to Ground or Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Indicator Dimming Control	B0770 06, B0775 06, B0780 06, & B0785 06	B0770 06, B0775 06, B0780 06, & B0785 06	-
4 High Indicator Control Circuit	B0780 06	B0780 06	B0780 01

Circuit/System Description

The 4 low indicator circuit consists of a light emitting diode (LED), a LED feed circuit and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies voltage to the 2 High, 4 High and 4 Low LEDs. When the 4 Low mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 4 Low indicator control circuit illuminating the LED. The TCCM tests the 4

circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the 4 Low indicator control circuit for 2 seconds during the bulb test at key ON.

Conditions for Running the DTC

B0780 01

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 4 Low indicator is commanded ON.

B0780 06

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 4 Low indicator is commanded OFF.

Conditions for Setting the DTC

B0780 01

The TCCM detects 3.4 V or greater on the 4 Low indicator control circuit when the 4 Low indicator is commanded ON.

B0780 06

The TCCM detects 1.6 V or less for 1.5 seconds on the 4 Low indicator control circuit when the 4 Low indicator is commanded OFF.

Action Taken When the DTC Sets

Normal operation, the SERVICE 4WD indicator is not commanded ON. Driver is informed of fault via bulb check.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the condition for setting the DTC is no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- A TRUE B+ has enough current to light a test light.
- A DIAGNOSTIC B+ is a low current circuit that DOES NOT have enough current to light a test light.
- A short to ground on the 4 Low indicator control circuit will cause the 4 Low indicator to remain ON at all times.
- An open or high resistance on the 4 Low indicator to be inoperative during the 2 second bulb check.
- An open in the indicator dimming control circuit will cause the 2 High, 4 High and 4 Low mode indicators to be inoperative during the 2 second bulb check.
- The **EL-49741** Harness is a good source for 9 V.

49742 Harness is a good source for B+ and ground.

- With key REMOVED - opening a door puts a true B+ on the indicator dimming control circuit, TCSCS X1 pin 4. Other possible voltages are listed below:
 - Door open, key removed - indicator dimming control circuit voltage = true B+.
 - Door open, key in, key OFF - indicator dimming control circuit voltage = true B+.
 - Door open, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - All doors closed, key OFF - indicator dimming control circuit voltage = B+ (high current - enough to light a test light).
 - All doors closed, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - Key ON, engine OFF. Place a shop light on the DRL sensor. When the DRL sensor commands the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

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- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

Scan Tool Reference

Control Module References for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

Key ON, engine OFF. The TCCM runs a 2 second bulb test on all indicators of the TCSCS at key ON.

Circuit/System Testing

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

1. Remove key. Disconnect the X1 connector at the transfer case shift control switch (TCSCS).
2. Door open, key ON, engine OFF. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4 and a good ground, such as the ground

of the EL-49742 Harness, black terminal.

- If the voltage is less than the specified range, test the affected circuit for an open/high resistance, short to ground or short to voltage. If all circuits and connections test normal, test the body control module (BCM) for proper operation.
3. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4 and the 4 Low indicator control circuit, TSCSC X1 pin 10.
 - If the voltage is less than the specified range, test the 4 Low indicator control circuit for an open/high resistance or short to power. If all circuits and connections test normal, test the TCCM for proper operation.
 4. Key OFF. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the indicator dimming control circuit, TCSCS X1 pin 4 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
 5. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the 4 Low indicator control circuit, TCSCS X1 pin 10 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
 6. Test the TCSCS for proper operation.

Component Testing

BCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Using the L-BU probe J-35616-64B, connect a test light between the indicator dimming control circuit, TCSCS harness X1 pin 4 and a good ground.
3. Key ON, engine OFF. The test light should be dull or off.
 - If the test light is bright, test the indicator dimming control circuit for a short to voltage condition. If all circuits and connections test normal, replace the BCM.

NOTE: When the DRL sensor turns the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

4. Place a shop light on the DRL sensor. When the headlights go out the test light should illuminate brightly.
 - If the test light is dull or OFF, test the indicator dimming control circuit for an open/high resistance or short to ground condition. If all circuits and connections test normal, replace the BCM.

TCCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Key ON, engine OFF.
3. Using the L-BU probe J-35616-64B, test for 4.5-5.5 V between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground.
 - If the voltage is greater than the specified range, test the 5-volt reference circuit for a short to voltage. If all circuits and connections test normal, replace the TCCM.
 - If the voltage is less than the specified range, test the 5-volt reference circuit for an open/high resistance or short to ground. If all circuits and connections test normal, replace the TCCM.
4. Using the L-BU probe J-35616-64B, connect a test light between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground. The test light should illuminate dimly.

5. Key OFF. Wait 30 seconds for the TCCM to shut down.

NOTE: The TCCM must see the added resistance of the test light on the control circuit at key ON or the TCCM will shut the control circuit drivers OFF. Volt meters will not work for this test.

6. Using the L-BU probe J-35616-64B, connect a test light between the TCSCS harness as specified below for the LED control circuit being tested.

7. Key ON, engine OFF.

8. Using the special function ability of the scan tool, command the affected LED ON and OFF. The test light should turn ON and OFF as commanded.

- If the test light remains illuminated when commanded OFF, test the affected control circuit for a short to ground. If all circuits and connections test normal, replace the TCCM.
- If the test light remains OFF when commanded ON, test the affected control circuit for an open/high resistance or short to voltage. If all circuits and connections test normal, replace the TCCM.

Mode	2 High	4 High	4 Low	N
5-V Reference (pin)	11	11	11	11
Indicator Control Circuit (pin)	7	9	10	3

TCSCS

1. Using the L-BU probe J-35616-65B, connect the 9 V power source EL-49741 Harness to the TCSCS as specified below for the LED being tested. Connecting the harness to the opposite pins will not illuminate the LED.

2. Connect a 9 V battery to the 9 V power source EL49741 Harness.

3. Verify that only the indicator being tested illuminates.

- If the indicator does not illuminate when tested or the incorrect indicator illuminates, replace the TCSCS.

EL49741 Wire Color	2 High	4 High	4 Low	N
Red - pin	4	4	4	2
Black - pin	7	9	10	3

Repair Instructions

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

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for TCSCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(N07\)](#)

DTC B0785: 2 HIGH INDICATOR

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

1 Circuit**Short to Ground****Open/High Resistance****Short to Voltage**

2 High Indicator Circuit Short to Battery

DTC B0785 06

2 High Indicator Circuit Short to Ground or Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Indicator Dimming Control	B0770 06, B0775 06, B0780 06, & B0785 06	B0770 06, B0775 06, B0780 06, & B0785 06	-
2 High Indicator Control Circuit	B0785 06	B0785 06	B0785 01

Circuit/System Description

The 2 high indicator circuit consists of a light emitting diode (LED), a LED feed circuit and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies voltage to the 2 High, 4 High and 4 Low LEDs. When the 2 High mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 2 high indicator control circuit illuminating the LED. The TCCM tests the 2 High indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the 2 High indicator control circuit for 2 seconds during the bulb test at key ON.

Conditions for Running the DTC**B0785 01**

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 2 High indicator is commanded ON.

B0785 06

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the 2 High indicator is commanded OFF.

Conditions for Setting the DTC**B0785 01**

The TCCM detects 3.4 V or greater on the 2 High indicator control circuit when the 2 High indicator is commanded ON.

B0785 06

The TCCM detects 1.6 V or less for 1.5 seconds on the 2 High indicator control circuit when the 2 High indicator is commanded OFF.

When the DTC Sets

Normal operation, the SERVICE 4WD indicator is not commanded ON. Driver is informed of fault via bulb check.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the condition for setting the DTC is no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- A TRUE B+ has enough current to light a test light.
- A DIAGNOSTIC B+ is a low current circuit that DOES NOT have enough current to light a test light.
- A short to ground on the 2 High indicator control circuit will cause the 2 High indicator to remain ON at all times.
- An open or high resistance will cause the 2 High indicator to be inoperative during the 2 second bulb check.
- An open in the indicator dimming control circuit will cause the 2 High, 4 High and 4 Low mode indicators to be inoperative during the 2 second bulb check.
- The **EL-49741** Harness is a good source for 9 V.
- The **EL-49742** Harness is a good source for B+ and ground.
- With key REMOVED - opening a door puts a true B+ on the indicator dimming control circuit, TCSCS X1 pin 4. Other possible voltages are listed below:
 - Door open, key removed - indicator dimming control circuit voltage = true B+.
 - Door open, key in, key OFF - indicator dimming control circuit voltage = true B+.
 - Door open, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - All doors closed, key OFF - indicator dimming control circuit voltage = B+ (high current - enough to light a test light).
 - All doors closed, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - Key ON, engine OFF. Place a shop light on the DRL sensor. When the DRL sensor commands the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[File References](#) for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

Key ON, engine OFF. The TCCM runs a 2 second bulb test on all indicators of the TCSCS at key ON.

Circuit/System Testing

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

1. Remove key. Disconnect the X1 connector at the transfer case shift control switch (TCSCS).
2. Door open, key ON, engine OFF. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4 and a good ground, such as the ground terminal of the EL-49742 Harness, black terminal.
 - If the voltage is less than the specified range, test the affected circuit for an open/high resistance, short to ground or short to voltage. If all circuits and connections test normal, test the body control module (BCM) for proper operation.
3. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the indicator dimming control circuit, TCSCS X1 pin 4 and the 2 High indicator control circuit, TSCSC X1 pin 7.
 - If the voltage is less than the specified range, test the 2 High indicator control circuit for an open/high resistance or short to power. If all circuits and connections test normal, test the TCCM for proper operation.
4. Key OFF. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the indicator dimming control circuit, TCSCS X1 pin 4 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
5. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the 2 High indicator control circuit, TCSCS X1 pin 7 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.
6. Test the TCSCS for proper operation.

Component Testing

BCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Using the L-BU probe J-35616-64B, connect a test light between the indicator dimming control circuit, TCSCS harness X1 pin 4 and a good ground.
3. Key ON, engine OFF. The test light should be dull or OFF.
 - If the test light is bright, test the indicator dimming control circuit for a short to voltage condition. If all circuits and connections test normal, replace the BCM.

NOTE:

9741 Wire Color When the DRL sensor turns the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

4. Place a shop light on the DRL sensor. When the headlights go out the test light should illuminate brightly.
 - If the test light is dull or OFF, test the indicator dimming control circuit for an open/high resistance or short to ground condition. If all circuits and connections test normal, replace the BCM.

TCCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Key ON, engine OFF.
3. Using the L-BU probe J-35616-64B, test for 4.5-5.5 V between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground.
 - If the voltage is greater than the specified range, test the 5-volt reference circuit for a short to voltage. If all circuits and connections test normal, replace the TCCM.
 - If the voltage is less than the specified range, test the 5-volt reference circuit for an open/high resistance or short to ground. If all circuits and connections test normal, replace the TCCM.
4. Using the L-BU probe J-35616-64B, connect a test light between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground. The test light should illuminate dimly.
 - If the test light does not illuminate, obtain a different test light and repeat step 4.
5. Key OFF. Wait 30 seconds for the TCCM to shut down.

NOTE: The TCCM must see the added resistance of the test light on the control circuit at key ON or the TCCM will shut the control circuit drivers OFF. Volt meters will not work for this test.

6. Using the L-BU probe J-35616-64B, connect a test light between the TCSCS harness as specified below for the LED control circuit being tested.
7. Key ON, engine OFF.
8. Using the special function ability of the scan tool, command the affected LED ON and OFF. The test light should turn ON and OFF as commanded.
 - If the test light remains illuminated when commanded OFF, test the affected control circuit for a short to ground. If all circuits and connections test normal, replace the TCCM.
 - If the test light remains OFF when commanded ON, test the affected control circuit for an open/high resistance or short to voltage. If all circuits and connections test normal, replace the TCCM.

EL49741 Wire Color	2 High	4 High	4 Low	N
Red - pin	4	4	4	2
Black - pin	7	9	10	3

TCSCS

1. Using the L-BU probe J-35616-65B, connect the 9 V power source EL-49741 Harness to the TCSCS as specified below for the LED being tested. Connecting the harness to the opposite pins will not illuminate the LED.
2. Connect a 9 V battery to the 9 V power source EL-49741 Harness.
3. Verify that only the indicator being tested illuminates.
 - If the indicator does not illuminate when tested or the incorrect indicator illuminates, replace the TCSCS.

Wire Color	Short to High	Open/High Resistance	Low Short to Voltage
Red - pin	4	4	4
Black - pin	7	9	10

Repair Instructions

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

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for TCSCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(N07\)](#)

DTC B0790: NEUTRAL INDICATOR

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B0790 01

Neutral Indicator Circuit Short to Battery

DTC B0790 06

Neutral Indicator Circuit Short to Ground or Open

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Ignition 1 Voltage	B0790 06	B0790 06	-
Neutral Indicator Circuit	B0790 06	B0790 06	B0790 01

Circuit/System Description

The neutral indicator circuit consists of a light emitting diode (LED), a LED feed circuit and a LED control circuit. The ignition 1 voltage circuit is the LED feed circuit and continuously supplies voltage to the Neutral LED. When the Neutral mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the neutral indicator control circuit illuminating the LED. The TCCM tests the neutral indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the ignition 1 voltage circuit by grounding the neutral indicator control circuit for 2 seconds during the bulb test at key ON.

Conditions for Running the DTC

B0790 01

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the neutral indicator is commanded ON.

- Ignition ON.
- System voltage 10-18 V.
- Instrument panel lights not dimmed.
- Daylight running lights MUST be commanded ON.
- Circuit tested when the neutral indicator is commanded OFF.

Conditions for Setting the DTC

B0790 01

The TCCM detects 3.4 V or greater on the AWD indicator control circuit when the neutral indicator is commanded ON.

B0790 06

The TCCM detects 1.6 V or less for 1.5 seconds on the AWD indicator control circuit when the neutral indicator is commanded OFF.

Action Taken When the DTC Sets

Normal operation, the SERVICE 4WD indicator is commanded ON for the remainder of the ignition cycle. Driver is also informed of fault via bulb check.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the condition for setting the DTC no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- A TRUE B+ has enough current to light a test light.
- A DIAGNOSTIC B+ is a low current circuit that DOES NOT have enough current to light a test light.
- A short to ground on the neutral indicator control circuit will cause the neutral indicator to remain ON at all times.
- An open or high resistance will cause the neutral indicator to be inoperative during the 2 second bulb check.
- The **EL-49741** Harness is a good source for 9 V.
- The **EL-49742** Harness is a good source for B+ and ground.
- With key REMOVED - opening a door puts a true B+ on the indicator dimming control circuit, TCSCS X1 pin 4. Other possible voltages are listed below:
 - Door open, key removed - indicator dimming control circuit voltage = true B+.
 - Door open, key in, key OFF - indicator dimming control circuit voltage = true B+.
 - Door open, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - All doors closed, key OFF - indicator dimming control circuit voltage = B+ (high current - enough to light a test light).
 - All doors closed, key ON, engine OFF - indicator dimming control circuit voltage = diagnostic B+.
 - Key ON, engine OFF. Place a shop light on the DRL sensor. When the DRL sensor commands the headlights OFF, the indicator dimming control circuit voltage, TCSCS X1 pin 4, will go from a diagnostic B+ to a true B+.

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage (B+) and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

Key ON, engine OFF. The TCCM runs a 2 second bulb test on all indicators of the TCSCS at key ON.

Circuit/System Testing

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

1. Remove key. Disconnect the X1 connector at the transfer case shift control switch (TCSCS).
2. Key removed. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the ignition 1 voltage circuit, TCSCS X1 pin 2 and a good ground, such as the ground terminal of the EL-49742 Harness, black terminal.
 - If the voltage is less than the specified range, test the affected circuit for an open/high resistance or short to ground. If all circuits and connections test normal, test the body control module (BCM) for proper operation.
3. Using the L-BU probe J-35616-64B, test for a diagnostic B+ (+0.0/-1.0 V) between the ignition 1 voltage circuit, TCSCS X1 pin 2 and the neutral indicator control circuit, TSCSC X1 pin 3.
 - If the voltage is less than the specified range, test the neutral indicator control circuit for an open/high resistance or short to power. If all circuits and connections test normal, test the TCCM for proper operation.
4. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the ignition 1 voltage circuit, TCSCS X1 pin 2 and all other pins of the TCSCS X1.
 - If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.

e L-BU probe J-35616-64B, test for greater than 10 Ω between the neutral indicator control circuit, TCSCS X1 pin 3 and all other pins of the TCSCS X1.

- If the resistance is less than the specified range, test the affected circuits for a shorted together condition. If all circuits and connections test normal, test the TCCM for proper operation.

6. Test the TCSCS for proper operation.

Component Testing

BCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Using the L-BU probe J-35616-64B, connect a test light between the ignition 1 voltage circuit, TCSCS harness X1 pin 2 and a good ground. The test light should be OFF. Tested OFF.
 - If the test light is ON, test the ignition 1 voltage circuit for a short to voltage condition. If all circuits and connections test normal, replace the BCM.
3. Key ON, engine OFF. The test light should illuminate brightly. Tested bright.
 - If the test light is dull or OFF, test the ignition 1 voltage circuit for an open/high resistance or short to ground condition. If all circuits and connections test normal, replace the BCM.

TCCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.
2. Key ON, engine OFF.
3. Using the L-BU probe J-35616-64B, test for 4.5-5.5 V between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground.
 - If the voltage is greater than the specified range, test the 5-volt reference circuit for a short to voltage. If all circuits and connections test normal, replace the TCCM.
 - If the voltage is less than the specified range, test the 5-volt reference circuit for an open/high resistance or short to ground. If all circuits and connections test normal, replace the TCCM.
4. Using the L-BU probe J-35616-64B, connect a test light between the 5-volt reference circuit, TCSCS harness X1 pin 11 and a good ground. The test light should illuminate dimly.
 - If the test light does not illuminate, obtain a different test light and repeat step 4.
5. Key OFF. Wait 30 seconds for the TCCM to shut down.

NOTE: The TCCM must see the added resistance of the test light on the control circuit at key ON or the TCCM will shut the control circuit drivers OFF. Volt meters will not work for this test.

6. Using the L-BU probe J-35616-64B, connect a test light between the TCSCS harness as specified below for the LED control circuit being tested.
7. Key ON, engine OFF.
8. Using the special function ability of the scan tool, command the affected LED ON and OFF. The test light should turn ON and OFF as commanded.
 - If the test light remains illuminated when commanded OFF, test the affected control circuit for a short to ground. If all circuits and connections test normal, replace the TCCM.
 - If the test light remains OFF when commanded ON, test the affected control circuit for an open/high resistance or short to voltage. If all circuits and connections test normal, replace the TCCM.

Mode	2 High	4 High	4 Low	N
5-V Reference (pin)	11	11	11	11

9741 Wire Color	2 High	4 High	4 Low	N
Indicator Control Circuit (pin)	7	9	10	3

TCSCS

- Using the L-BU probe J-35616-65B, connect the 9 V power source EL-49741 Harness to the TCSCS as specified below for the LED being tested. Connecting the harness in the opposite pins will not illuminate the LED.
- Connect a 9 V battery to the 9 V power source EL-49741 Harness.
- Verify that only the indicator being tested illuminates.
 - If the indicator does not illuminate when tested or the incorrect indicator illuminates, replace the TCSCS.

EL49741 Wire Color	2 High	4 High	4 Low	N
Red - pin	4	4	4	2
Black - pin	7	9	10	3

Repair Instructions

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

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for TCSCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(NQ7\)](#)

DTC B2725, P0698, OR P0699: TRANSFER CASE RANGE SELECTION SWITCH/5V REFERENCE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B2725 03

Transfer Case Range Selection Switch Circuit Low Voltage

DTC B2725 07

Transfer Case Range Selection Switch Circuit High Voltage

DTC B2725 08

Transfer Case Range Selection Switch Circuit Performance - Signal Invalid

DTC P0698

5V Reference 3 Circuit Low Voltage

DTC P0699

5V Reference 3 Circuit High Voltage

Information Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
5-Volt Reference	B2725 03, B2725 08, or P0698	B2725 03, B2725 08, or P0698	B2725 07, B2725 08, or P0699	B2725 08, P0698, or P0699
Four Wheel Drive	B2725 03 or B2725 08	B2725 03 or B2725 08	B2725 07 or B2725 08	B2725 08

Circuit/System Description

The transfer case shift control switch allows the driver to select between 5 ranges. The transfer case control module supplies a regulated 5 volts to the switch through the 5-volt reference circuit. The current travels through the specific resistor of the currently selected range - each range has its own resistor. The current is then returned to the transfer case control module through the four wheel drive switch signal circuit.

The transfer case control module continuously monitors the switch signal circuit to determine whether a range change has been requested by the driver.

The NQH transfer case has the following 5 ranges:

- 2WD
- 4WD/AWD Automatic
- 4WD High/Locked
- 4WD Low
- Neutral

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No DTC P0562 or P0563.

Conditions for Setting the DTC

The transfer case control module monitors the voltage on 5V reference and 4WD switch signal circuits every 10 ms.

B2725 03

When the low side driver is ON, the transfer case control module measures less than 0.3 volts on the Four Wheel Drive Switch Signal circuit.

B2725 07

When the low side driver is ON, the transfer case control module measures greater than 4.65 volts on the Four Wheel Drive Switch Signal circuit.

B2725 08

When the low side driver is ON, the transfer case control module measures an invalid voltage on the Four Wheel Drive Switch Signal circuit.

P0698

ion is ON, the transfer case control module measures less than 4.75 volts on the Transfer Case Sensor Reference Voltage 3 circuit.

P0698

When the ignition is ON, the transfer case control module measures greater than 5.25 volts on the Transfer Case Sensor Reference Voltage 3 circuit.

Action Taken When the DTC Sets

- DTC P0698 and P0699 are type A DTC's.
- All shifting is disabled.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- DTC P0698 and P0699 are type A DTC's.
- The transfer case control module clears the DTC once the condition for setting the DTC is no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

EL-49742 harness is a good source for B+ and ground.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Special Tools

- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J 35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify that all range selections of the S77 transfer case shift control switch match the following parameters in the Data Display feature of the scan tool:

Transfer Case Range	Transfer Case Range Selection Switch States	Transfer Case Range Selection Switch (V)	Range Actuator Position Sensor (Â°)
Transfer Case Range	Transfer Case Range Selection Switch States	Range	Nominal

- The corresponding Range Indicator light
- ***If NOT all of the parameters match the S77 transfer case shift control switch position***

Refer to Circuit/System Testing.

- ***If ALL of the parameters match the S77 transfer case shift control switch position***

2. Verify that the sensor reference voltage 3 and transfer case range selection switch voltage fall within the below ranges for all range selections of the S77 transfer case shift control switch.

- ***If NOT all voltages match the specified ranges***

Refer to Circuit/System Testing.

- ***If ALL voltages match the specified ranges***

3. Verify DTC B2725, P0698, or P0699 is only set as a history DTC.

- ***If any of the DTCs are set as current***

Refer to Circuit/System Testing.

- ***If any of the DTCs are only set as history***

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

- Visually inspect each connector terminal of the K69 transfer case control module X1 connector and the S77 transfer case shift control switch connector for damage or corrosion. Repair as necessary.
- Clear DTC 2725, P0698, or P0699 from history.
- Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- ***If any of the DTCs are set***

Refer to Circuit/System Testing.

- ***If none of the DTCs set***

7. All OK.

Transfer Case Range	Transfer Case Sensor Reference Voltage 3	Transfer Case Range Selection Switch (V)		Range Actuator Position Sensor (Â°)	
		Range	Nominal	Range	Nominal
2WD	4.7-5.3 V	1.8-2.2 V	2.0 V	33-43Â°	38Â°
4WD/AWD Automatic	4.7-5.3 V	4.10-4.59 V	4.38 V	87-204Â°	146Â°
4WD High/Locked	4.7-5.3 V	2.8-3.2 V	3.0 V	110-204Â°	146Â°
4WD Low	4.7-5.3 V	1.3-1.7 V	1.5 V	-69Â° to -140Â°	-90Â°
Neutral	4.7-5.3 V	2.3-2.7 V	2.5 V Held 1.5 V Released	-5Â° to +5Â°	0Â°

Circuit/System Testing

OFF, disconnect the harness connector at the S77 transfer case shift control switch.

2. ON, engine OFF.

NOTE:

- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J 35616 GM terminal test kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 3-5 is performed on the S77 transfer case shift control switch harness connector using the L-BU probes J 35616-64B.**

3. Test for 4.75-5.25 V between the 5-Volt reference circuit, terminal 11 and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

• ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.

2. Test for less than 10 Ω in the 5-Volt reference circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between 5-Volt reference circuit terminal 11 and a good ground.

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

4. Test for greater than 10 Ω between the 5-Volt reference circuit terminal 11 and all other terminals of the S77 transfer case shift control switch harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

• ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.

2. Test for less than 1 V between the 5-Volt reference circuit terminal 11 and a good ground.

- If 1 V or greater, repair the short to voltage in the circuit.
- If less than 1 V

3. Test for greater than 10 Ω between the 5-Volt reference circuit, terminal 11 and all other terminals of the S77 transfer case shift control switch harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

• ***If within the specified range***

4. 5-Volt reference circuit and K69 transfer case control module OK.

5. Test for 4.75-5.25 V between the 5-Volt reference circuit, terminal 11, and the switch signal circuit, terminal 12.

• ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.

2. Test for less than 10 Ω in the switch signal circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between switch signal circuit and a good ground.

If less than infinite resistance, repair the short to ground in the circuit. **Nominal**

- If infinite resistance

4. Test for greater than 10 Ω between the switch signal circuit, terminal 12 and all other terminals of the S77 transfer case shift control switch harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

• ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.

2. Test for less than 1 V between the switch signal circuit, terminal 12 and a good ground.

- If 1 V or greater, repair the short to voltage in the circuit.
- If less than 1 V

3. Test for greater than 10 Ω between the switch signal circuit, terminal 12 and all other terminals of the S77 transfer case shift control switch harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

• ***If within the specified range***

6. Switch signal circuit and K69 transfer case control module OK.

Component Testing

S77 Transfer Case Shift Control Switch

1. Ignition OFF. Remove the S77 transfer case shift control switch.

NOTE: Testing for Step 2 is performed on the component using the L-BU probe J 35616-65B.

2. Measure the resistance for each of the range positions of the S77 transfer case shift control switch between the 5-volt reference circuit, terminal 11, and the switch signal circuit terminal 12.

- ***If the resistance is outside the specified ranges***

Replace the S77 transfer case shift control switch.

- ***If the resistance is within the specified ranges***

3. S77 transfer case shift control switch OK.

S77 Transfer Case Range Selection Switch	Range	Nominal
2WD	1475-1550 Ω	1515 Ω
4WD/AWD Automatic	110-175 Ω	140 Ω
4WD High/Locked	625-700 Ω	665 Ω
4WD Low	2230-2400 Ω	2345 Ω
Neutral	990-1050 Ω	1020 Ω

Repair Instructions

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

DTC C0306 OR C0381: RANGE ACTUATOR CONTROL

Diagnostic Instructions

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

DTC Descriptors

DTC C0306 01

Range Actuator Control Circuit Short to Battery

DTC C0306 02

Range Actuator Control Circuit Short to Ground

DTC C0306 04

Range Actuator Control Circuit Short to Open

DTC C0306 54

Range Actuator Control Circuit High Temperature

DTC C0381 54

Range Actuator System Performance High Temperature

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance
Transfer Case Motor Clockwise Control	C0306 02	C0306 04	C0306 01	C0306 54 or C0381 54
Transfer Case Motor Counter-Clockwise Control	C0306 02	C0306 04	C0306 01	C0306 54 or C0381 54

Circuit/System Description

The A16 Transfer Case Motor, also known as the transfer case range actuator, is a bi-directional, permanent magnet, DC motor. When energized, through the transfer case clockwise circuit or transfer case counter-clockwise circuit, the ground is provided by the opposing motor control circuit which becomes grounded through the transfer case control module ground circuit. The transfer case range actuator, through a series of gears, rotates the transfer case control actuator shaft which moves the transfer case two/four wheel drive actuator cam and transfer case high/low shift fork in order to shift the transfer case between the following modes or ranges:

- 2WD
- 4WD/AWD Automatic
- 4WD High/Locked

- Neutral

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No DTC P0562 or P0563.
- Transfer case range actuator not performing a requested range change (C0306 01, C0306 02, and C0306 04 only).
- DTC C0306 and C0381 run continuously within the enabling conditions.

Conditions for Setting the DTC

C0306 01

Voltage on the transfer case clockwise circuit or the transfer case counter-clockwise circuit is greater than 5.60 V.

C0306 02

Voltage on the transfer case clockwise circuit or the transfer case counter-clockwise circuit is less than 1.9 V.

C0306 04

Voltage on the transfer case clockwise circuit is 2.7-4.5 V, and the voltage on the transfer case counter-clockwise circuit is 0.5-4.5 V.

C0306 54

The calculated temperature of the transfer case range actuator H-bridge in the transfer case control module is greater than a predetermined value.

C0381 54

The calculated temperature of the transfer case range actuator is greater than a predetermined value.

Action Taken When the DTC Sets

- All shifting disabled.
- Front axle disengages if thermal model exceeded.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case control module clears the DTC once the conditions for setting the DTC are no longer present.
- A history DTC clears after 40 consecutive warm-up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- It is possible to have windings inside the motor shorted to the case resulting in a short to ground causing this DTC to set.
- The default actions for C0321 may set C0306.

41 harness is a good source for 9 V.

- **EL-49742** harness is a good source for B+ and ground.
- The transfer case drain plug is a good source for ground.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify DTC C0321 in NOT set.

- **If DTC C0321 is set**

diagnose it first. Refer to [DTC C0321 or C0326](#) .

- ***If DTC C0321 is NOT set***

2. Verify that all of the following scan tool parameters display OK.

- Range Actuator Control Circuit High Voltage Test Status
- Range Actuator Control Circuit Low Voltage Test Status
- Range Actuator Control Circuit Open Voltage Test Status
- Range Actuator Control Circuit Shorted Test Status
- ***If any of the parameters do NOT display OK***

Refer to Circuit/System Testing.

- ***If all of the parameters display OK***

3. Verify that for all range selections of the S77 transfer case shift control switch, the Range Actuator Current parameter increases or decreases during the shift and then returns to 0.0 A after shifting.

- ***If the Range Actuator Current parameter does NOT perform as described***

Refer to Circuit/System Testing.

- ***If the Range Actuator Current parameter DOES perform as described***

4. Verify DTC C0306 or C0381 is only set as a history DTC.

- **If C0306 or C0381 is set as current**

Refer to Circuit/System Testing.

- **If C0306 or C0381 is only set as history**

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

5. Visually inspect each connector terminal of the K69 transfer case control module X3 connector and the A16 transfer case motor connector for damage or corrosion. Repair as necessary.

6. Clear DTC C0306 or C0381 from history.

7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- **If DTC C0306 or C0381 sets**

Refer to Circuit/System Testing.

- **If DTC C0306 or C0381 does not set**

8. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the A16 transfer case motor, also known as the transfer case range actuator.

2. Ignition ON, engine OFF.

- NOTE:**
- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
 - **Testing for steps 3-5 is performed on the A16 transfer case motor harness connector using the PU probes J-35616-4A.**

3. Test for 1.0-2.5 V between the transfer case motor counter-clockwise control circuit terminal D and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

- ***If less than the specified range***

1. Ignition OFF, disconnect the X3 harness connector at the K69 transfer case control module.

2. Test for less than 10 Ω in the transfer case motor counter-clockwise control circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between transfer case motor counter-clockwise control circuit terminal D and a good ground.

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

Test for greater than 10 Ω between the transfer case motor counter-clockwise control circuit terminal D and all other terminals of the A16 transfer case motor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#)

- ***If greater than the specified range***

1. Ignition OFF, disconnect the X3 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the transfer case motor counter-clockwise control circuit terminal D and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
3. Test for greater than 10 Ω between the transfer case motor counter-clockwise control circuit, terminal D and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If within the specified range***

4. Transfer case motor counter-clockwise control circuit and K69 transfer case control module OK.
5. Test for 3.0-4.5 V between the transfer case motor clockwise control circuit terminal A, and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

- ***If less than the specified range***

1. Ignition OFF, disconnect the X3 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the transfer case motor clockwise control circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between transfer case motor clockwise control circuit terminal A and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for greater than 10 Ω between the transfer case motor clockwise control circuit terminal A and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10, replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If greater than the specified range***

1. Ignition OFF, disconnect the X3 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the transfer case motor clockwise control circuit terminal A and a good ground.

- If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
3. Test for greater than 10 Ω between the transfer case motor clockwise control circuit, terminal A and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#).

- **If within the specified range**

6. Transfer case motor counter-clockwise control circuit, transfer case motor clockwise control circuit and K69 transfer case control module OK.

Component Testing

A16 Transfer Case Motor (Transfer Case Range Actuator)

1. Remove the A16 transfer case motor from transfer case. Using a paint pen or marker, place indexing marks on the A16 transfer case motor drive gear and the mounting surface of the A16 transfer case motor.

NOTE:

- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 2-11 is performed on the A16 transfer case motor harness connector using the PU probes J-35616-5.**

2. Attach the red lead from one of the **EL-49741** harnesses to the battery positive voltage terminal of the A16 transfer case motor, terminal B.
3. Attach the black lead from this same jumper harness to the transfer case lock solenoid control terminal of the A16 transfer case motor, terminal C.
4. Attach a 9-volt battery to this harness (not included). You should hear the A16 transfer case motor unlock.

- ***If you do NOT hear the A16 transfer case motor unlock***

replace the A16 transfer case motor and perform the Range Actuator Learn procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If you DO hear the A16 transfer case motor unlock***

5. Attach the red lead from the other **EL-49741** jumper harness to the transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A.
6. Attach the black lead from this same jumper harness to the transfer case motor counter-clockwise control circuit of the A16 transfer case motor, terminal D.
7. Touch the battery terminals of the 9-volt battery to the battery terminals of the jumper harness. This should rotate the A16 transfer case motor drive gear in either a clockwise or counter-clockwise rotation depending on battery orientation.

- **If the A16 transfer case motor drive gear does not perform as described**

replace the A16 transfer case motor and perform the Range Actuator Learn Procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If The A16 transfer case motor drive gear performs as described***

8. Test for 0.3-40 Ω resistance between the transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A and the transfer case motor counter-clockwise control circuit of the A16 transfer case motor, terminal D.

- ***If NOT 0.3-40 Ω***

replace the A16 transfer case motor and perform the Range Actuator Learn Procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If 0.3-40 Ω***

9. Test for infinite resistance between the following circuits and the A16 transfer case motor case:

- Transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A
- Transfer case motor counter-clockwise control circuit of the A16 transfer case motor, terminal D
- ***If less than infinite resistance***

replace the A16 transfer case motor and perform the Range Actuator Learn Procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If infinite resistance***

10. Test for infinite resistance between the transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A and all other terminals on the A16 transfer case motor harness X1 except the transfer case motor counter-clockwise control circuit of the A16 transfer case motor, terminal D.

- ***If less than infinite resistance***

replace the A16 transfer case motor and perform the Range Actuator Learn Procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If infinite resistance***

11. Test for infinite resistance between the transfer case motor counter-clockwise control circuit of the A16 Transfer Case Motor, terminal D. and all other terminals on the TCEM harness X1 except the transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A.

- ***If less than infinite resistance***

replace the A16 transfer case motor and perform the Range Actuator Learn Procedure. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If infinite resistance***

12. A16 transfer case motor OK.

Repair Instructions

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

- [Control Module References](#) for K69 transfer case control module replacement, setup, and programming
- [Transfer Case Four Wheel Drive Actuator Replacement](#)

DTC C0321: RANGE ACTUATOR LOCK CONTROL

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance
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Range Actuator Lock Control Circuit Short to Battery

DTC C0321 02

Range Actuator Lock Control Circuit Short to Ground

DTC C0321 04

Range Actuator Lock Control Circuit Open

DTC C0326 58

Range Actuator Lock Control System Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance
Battery Positive Voltage	-	DTC C0321 04	-	-
Transfer Case Lock Solenoid Control	DTC C0321 02	DTC C0321 04	DTC C0321 01	DTC C0326 58

Circuit/System Description

The transfer case range actuator is also known as the transfer case motor, transfer case encoder motor, or transfer case two/four wheel drive actuator assembly.

The transfer case range actuator lock solenoid is part of the transfer case range actuator and cannot be serviced separately.

The transfer case control module controls the transfer case range actuator lock solenoid. The transfer case range actuator lock solenoid is released by being energized. This is accomplished by grounding the transfer case lock solenoid control circuit during range changes, and 4WD/AWD Automatic mode. Locking action is applied when power or ground are taken away from the lock solenoid, preventing the transfer case range actuator from moving. The system is capable of providing 2WD, 4WD High/Locked, 4WD Low, and Neutral without the need of additional vehicle power to hold the transfer case in these positions.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- A state change from lock solenoid engaged to lock solenoid disengaged, or lock solenoid disengaged to lock solenoid engaged, has occurred more than 10 times - DTC C0321 only.
- DTC C0321 and C0326 run continuously within the enabling conditions.

Conditions for Setting the DTC

C0321 01

When the low side driver is ON, the transfer case control module measures greater than 8.5 volts on the Transfer Case Lock Solenoid Control circuit.

When the low side driver is OFF, the transfer case control module measures less than 2.0 volts on the Transfer Case Lock Solenoid Control circuit.

C0321 04

When the low side driver is OFF, the transfer case control module measures between 2.5-5.5 volts on the Transfer Case Lock Solenoid Control circuit.

C0326 58

Transfer case range actuator position correction after a brake slipping event was unsuccessful 10 times. A slipping event is defined as a torque error between the torque requested and the actual torque calculated from motor position being greater than a predetermined amount.

Action Taken When the DTC Sets

C0321

- Lock does not disengage.
- All shifting disabled.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

C0326 58

- Normal operation/slip correction unless thermal limits of transfer case four wheel drive clutch, transmission control module or transfer case range actuator have been exceeded.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case control module clears the DTC once the conditions for setting the DTC are no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- The underhood fuse block supplies B+ on the battery positive voltage circuit and reads the voltage back on the transfer case lock solenoid control circuit.
- The system tests the transfer case lock solenoid circuits by checking for unwanted voltage. If the transfer case control module detects a low voltage return when a high voltage is expected, or a high voltage return when a low voltage is expected, the DTC is logged.
- The default actions for C0321 may set C0306.
- **EL-49741** harness is a good source for 9 V.
- **EL-49742** harness is a good source for B+ and ground.
- The transfer case drain plug is a good source for ground.

Reference Information

Schematic Reference

Transfer Case Control Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify that all of the following scan tool parameters display OK.
 - Range Actuator Lock Control Circuit High Voltage Test Status
 - Range Actuator Lock Control Circuit Low Voltage Test Status
 - Range Actuator Lock Control Circuit Open Test Status
 - ***If any of the parameters do NOT display OK***
Refer to Circuit/System Testing.
 - ***If all of the parameters display OK***
2. Using the transfer case Range Actuator Lock function of the Control Functions feature of the scan tool, command the transfer case range actuator lock ON and OFF. You should be able to hear the range actuator lock engage and disengage.
 - ***If you are unable to hear the range actuator lock engaging and disengaging***
Refer to Circuit/System Testing.
 - ***If you are able to hear the range actuator lock engaging and disengaging***
3. Verify DTC P0321 or P0326 is only set as a history DTC.
 - ***If any of the DTCs are set as current***
Refer to Circuit/System Testing.
 - ***If any of the DTCs are only set as history***

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

4. Visually inspect each connector terminal of the K69 transfer case control module X1 connector and the A16 transfer case motor connector for damage or corrosion. Repair as necessary.

FC P0321 or P0326 from history.

6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- ***If any of the DTCs are set***

Refer to Circuit/System Testing.

- ***If none of the DTCs set***

7. All OK.

Circuit/System Testing

1. Verify that the 4WD TREC fuse, X50A Fuse Block - Underhood fuse 6, and the Accessory/Run Crank fuse, X51L Fuse Block - Instrument Panel Left - fuse 31, are not open.

- ***If the 4WD TREC fuse is open***

Test the battery positive voltage, K69 transfer case control module harness X3 terminal C, for a short to ground.

- ***If the Accessory/Run Crank fuse is open***

Test the Accessory/Run Crank voltage circuit, K69 transfer case control module harness X2 terminal 4, for a short to ground.

- ***If neither fuse is open***

2. Ignition ON, engine OFF.

3. Disconnect the harness connector at the A16 transfer case range actuator.

NOTE:

- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 3-5 is performed on the A16 transfer case motor harness connector using the PU probes J-35616-4A.**

4. Test for B+ (+0.0/-1.0 V) between the battery positive voltage circuit, A16 transfer case range actuator harness terminal B, and a good ground.

- ***If the voltage is less than B+ (+0.0/-1.0 V)***

1. Ignition OFF, disconnect the X2 harness connector at the X50A Fuse Block - Underhood.

2. Test for less than 10 Ω in battery positive voltage circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.

- ***If less than 10 Ω***

3. Test for infinite resistance between battery positive voltage circuit and a good ground.

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

4. Test for infinite resistance between the battery positive voltage circuit, A16 transfer case motor harness terminal B, and all other terminals of the A16 transfer case motor harness connector.

- If less than infinite resistance, repair the shorted together condition in the affected circuits.
- If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer

Case High/Low Clutch Reset procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If the voltage is B+ (+0.0/-1.0 V)***

5. Test for a 4.0-5.0 V diagnostic voltage between the transfer case lock solenoid control circuit, A16 Transfer Case Motor terminal C, and a good ground.

- ***If the voltage is greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Ignition ON, engine OFF.
3. Test for less than 1 V between the transfer case lock solenoid control circuit and a good ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
4. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness connector terminal C and all other terminals of the A16 transfer case motor harness connector.
 - If less than infinite resistance, repair the shorted together condition in the affected circuits.
 - If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If the voltage is less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the transfer case lock solenoid control circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance transfer case lock solenoid control circuit, A16 transfer case motor harness connector terminal C and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness connector terminal C and all other terminals of the A16 transfer case motor harness connector.
 - If less than infinite resistance, repair the shorted together condition in the affected circuits.
 - If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If the voltage is within the specified range***

6. Battery Positive Voltage circuit and Transfer Case Lock Solenoid Control circuit OK.

Component Testing

A16 Transfer Case Motor (Transfer Case Range Actuator)

NOTE: **Circuit/System Testing must be performed first.**

the A16 transfer case motor from transfer case. Using a paint pen or marker, place indexing marks on the A16 transfer case motor drive gear and the mounting surface of the A16 transfer case motor.

2. Install the **EL-49742** harness.
3. Using a PU probe J-35616-5, attach the red lead of the **EL-49742** jumper harness to the transfer case motor clockwise control circuit of the A16 transfer case motor, terminal A. The transfer case motor clockwise control circuit is also known as the motor control A circuit.
4. Using a PU probe J-35616-5, touch the black lead of the **EL-49742** jumper harness to the transfer case motor counter clockwise control circuit of the A16 transfer case motor, terminal D. The transfer case motor counter clockwise control circuit is also known as the motor control B circuit. The A16 transfer case motor drive gear should not rotate.

- *If the A16 transfer case motor drive gear rotates*

Replace the A1 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If the A16 transfer case motor drive gear does NOT rotate*

5. Using a PU probe J-35616-5, attach the red lead of the **EL-49741** harness to the battery positive voltage terminal of the A16 transfer case motor, terminal B.
6. Using a PU probe J-35616-5, attach the black lead of the **EL-49741** jumper harness to the transfer case lock solenoid control terminal of the A16 transfer case motor, terminal C.
7. Attach a 9-volt battery to the **EL-49741** harness (not included). You should hear the A16 transfer case motor unlock.

- *If you do not hear the A16 transfer case motor unlock*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If you do hear the A16 transfer case motor unlock*

8. Touch the black lead of the **EL-49742** jumper harness to the transfer case motor counter clockwise control circuit of the A16 transfer case motor, terminal D. The A16 transfer case motor drive gear should rotate.

- *If the A16 transfer case motor drive gear does NOT rotate*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If the A16 transfer case motor drive gear does rotate*

9. Using the PU probes J-35616-5, test for between 10-30 Ω between the battery positive voltage circuit A16 transfer case motor, terminal B and the transfer case lock solenoid control circuit A16 transfer case motor terminal C.

- *If outside the specified range*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If within the specified range*

10. Using the PU probes J-35616-5, test for infinite resistance between the following circuits and the A16 transfer case motor case.

- Battery positive voltage circuit A16 transfer case motor, terminal B.
- Transfer case lock solenoid control circuit A16 transfer case motor, terminal C.
- *If less than infinite resistance*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If infinite resistance*

11. Using the PU probes J-35616-5, test for infinite resistance between the battery positive voltage circuit A16 transfer case motor, terminal B and all other terminals on the A16 transfer case motor except the transfer case lock solenoid control circuit, terminal C.

- *If less than the infinite resistance*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If infinite resistance*

12. Using the PU probes J-35616-5, test for infinite resistance between the transfer case lock solenoid control circuit A16 transfer case motor, terminal C and all other terminals of the TCEM X1 except the battery positive voltage circuit A16 transfer case motor, terminal B.

- *If less than infinite resistance*

Replace the A16 transfer case motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- *If infinite resistance*

13. A16 transfer case motor OK.

K69 Transfer Case Control Module

NOTE:

- **Circuit/System Testing must be performed first.**
- **Transfer case control module's need to be programmed when replaced. If after programming the K69 transfer case control module comes back as "NO COMM", try reprogramming again. (Internet/vehicle bandwidth load may cause the programming activity to fail.)**

1. Ignition OFF. Disconnect the harness connector at the A16 transfer case motor.
2. Ignition ON, engine OFF. Install **EL-49742** harness.
3. Block wheels. Parking brake engaged. Transmission in Neutral.
4. Using the PU probes J-35616-4A, connect a test lamp between the battery positive voltage circuit, A16 transfer case motor harness terminal B and the ground terminal of **EL-49742** harness, black terminal. The test light should illuminate.

- *If the test light does not illuminate*

1. Ignition OFF, disconnect the X2 harness connector at the X50A Fuse Block - Underhood.
2. Test for less than 10 Ω in battery positive voltage circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between battery positive voltage circuit, A16 transfer case motor harness terminal B, and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for infinite resistance between the battery positive voltage circuit, A16 transfer case motor harness terminal B, and all other terminals of the A16 transfer case motor harness connector.

- If less than infinite resistance, repair the shorted together condition in the affected circuits.
- If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure. Refer to [Transfer Case Control Module Replacement](#).

• ***If the test light does illuminate***

5. Using the PU probes J-35616-4A, connect a test lamp between the battery positive voltage circuit, A16 transfer case motor harness terminal B and the transfer case lock solenoid control circuit, A16 transfer case motor harness terminal C. The test light should not illuminate.

• ***If the test light illuminates***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness terminal C, and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
3. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness terminal C, and all other terminals of the A16 transfer case motor harness connector.
 - If less than infinite resistance, repair the shorted together condition in the affected circuits.
 - If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure. Refer to [Transfer Case Control Module Replacement](#).

• ***If the test light does not illuminate***

6. Using the Transfer Case Lock function of the Control Function feature of the scan tool, command the transfer case lock ON and OFF. When the lock is commanded ON, release solenoid de-energized, the test light should not illuminate. When the lock is commanded OFF, release solenoid energized, the test light should illuminate.

• ***If the test light stays ON when the lock is commanded ON***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness terminal C, and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
3. Test for infinite resistance between the transfer case lock solenoid control circuit, A16 transfer case motor harness terminal C, and all other terminals of the A16 transfer case motor harness connector.
 - If less than infinite resistance, repair the shorted together condition in the affected circuits.
 - If infinite resistance, replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure. Refer to [Transfer Case Control Module Replacement](#).

• ***If the test light does not illuminate when the lock is commanded OFF***

1. Ignition OFF, disconnect the X harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the transfer case lock solenoid control circuit, end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure. The Range Actuator Learn procedure is also known as the Transfer Case High/Low Clutch Reset procedure. Refer to [Transfer Case Control Module Replacement](#).

• ***If the test light illuminates when the lock is commanded OFF and turns OFF when the lock is commanded ON***

7. K69 transfer case motor OK.

ions		Open/High Resistance	Short to Voltage	Signal Invalid
Circuit	Short to Ground			

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Control Module References for transfer case control module replacement, setup, and programming.
- Transfer Case High/Low Clutch Reset for Range Actuator Learn procedure.
- Transfer Case Four Wheel Drive Actuator Replacement for transfer case motor/transfer case range actuator replacement.

DTC C0364 OR C0379: FRONT AXLE SYSTEM

Diagnostic Instructions

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

DTC Descriptors

DTC C0364 01

Front Axle System Short to Battery

DTC C0364 02

Front Axle System Short to Ground

DTC C0364 04

Front Axle System Open Circuit

DTC C0379 08

Front Axle Switch Circuit Signal Invalid

DTC C0379 58

Front Axle Switch Circuit System Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Run/Crank Ignition 1 Voltage	Trans Ign 1 fuse, underhood fuse block - Open	C0364 04 if set when in 2WD High or C0379 08 if set when in 4WD High	-	C0379 58
Four Wheel Drive Wheel Lock Indicator	C0379 08 or C0379 58	C0364 04, C0379 08, or C0379 58	C0379 58	C0379 58
Front Axle Actuator Control	C0364 02	C0364 04 if set when in 2WD High or C0379 08 if set when in 4WD High	C0364 01	C0379 58

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Ground	-	C0364 04 if set when in 2WD High or C0379 08 if set when in 4WD High	-	C0379 58

Circuit/System Description

The front axle control circuit consists of an electric motor actuator which engages and disengages the front axle. The front axle engagement actuator consists of a permanent magnetic motor, a worm gear controlled plunger, a front axle switch and an electronic control circuit within the actuator assembly.

The front axle engagement actuator contains the following circuits:

- A Run/Crank Ignition 1 Voltage circuit
- A Four Wheel Drive Wheel Lock Indicator circuit
- An Front Axle Actuator Control circuit
- A ground circuit

When a shift to 4WD Auto, 4WD High, or 4WD Low is requested, the transfer case control module engages the front axle by grounding the front axle actuator control circuit through a current limiting driver.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No DTC P0562 or P0563.
- DTC C0364 and C0379 run continuously within the enabling conditions.

Conditions for Setting the DTC

C0364 01

Voltage on the front axle actuator control circuit is greater than 8.5 V.

C0364 02

Voltage on the front axle actuator control circuit is less than 0.2 V.

C0364 04

Voltage on the front axle actuator control circuit is between 2.5-5.5 V.

C0379 08

The transfer case control module detects a change in voltage on the four wheel drive wheel lock indicator circuit and no change in voltage on the front axle actuator control circuit.

C0379 58

5 s after a range change, the transfer case control module compares the commanded state of the front axle (Front Axle Engagement Actuator Command parameter) to the monitored state of the front axle (Front Axle Feedback

ter). If the command state differs from the monitored state for more than a predetermined amount of time, the DTC sets.

Action Taken When the DTC Sets

C0364 01 and C0364 04

- The front axle remains disengaged at all times.
- Transfer case normal operation.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- The range indicator for the current range shall illuminate.

C0364 02

- The front axle remains engaged at all times.
- Transfer case normal operation.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- The range indicator for the current range shall illuminate.

C0379 08

- The front axle remains in current mode.
- Transfer case normal operation.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- The range indicator for the current range shall illuminate.

C0379 58

- The front axle remains in current mode.
- Transfer case normal operation.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- The range indicator for the current range shall illuminate.

Conditions for Clearing the DTC

- The K69 transfer case control module clears the DTC once the conditions for setting the DTC are no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- Other failures on the run/crank ignition 1 voltage circuit may cause erratic behavior on the front axle control signal circuit.
- The transfer case fill/drain plugs are good sources for ground.
- A TRUE B+ carries enough current to light a test light.
- A DIAGNOSTIC B+ is a low current circuit that DOES NOT carry.

Reference Information

Schematic Reference

Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify that the F40UA, TCCM/HDLP fuse is NOT open (X50A underhood fuse block).

- ***If the F40UA TCCM/HDLP fuse is OPEN***

Refer to Circuit/System Testing.

- ***If the F40UA TCCM/HDLP fuse is NOT OPEN***

2. Verify that the following parameters match each other for all range selections of the S77 transfer case shift control switch. You should also be able to hear the M26 front axle engagement actuator engaging and disengaging.

- Front Axle Engagement Actuator Command
- Front Axle Feedback Switch
- ***If the parameters do NOT match each other***

Refer to Circuit/System Testing.

- ***If the parameters DO match each other***

3. Verify that all of the following scan tool parameters display OK.

- Front Axle Engagement Actuator Control Circuit High Voltage Test Status
- Front Axle Engagement Actuator Control Circuit Low Voltage Test Status
- Front Axle Engagement Actuator Control Circuit Open Voltage Test Status
- ***If any of the parameters do NOT display OK***

Refer to Circuit/System Testing.

- ***If all of the parameters display OK***

4. Verify that for all range selections of the S77 transfer case shift control switch, the Range Actuator Current parameter increases or decreases during the shift and then returns to 0.0 A after shifting.

the Range Actuator Current parameter does NOT perform as described

Refer to Circuit/System Testing.

- *If the Range Actuator Current parameter DOES perform as described*

5. Verify DTC C0364 or C0379 is only set as a history DTC.

- *If DTC C0364 or C0379 is as current*

Refer to Circuit/System Testing.

- *If DTC C0364 or C0379 is only set as history*

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

6. Visually inspect each connector terminal of the K69 transfer case control module X1 connector and the M26 front axle engagement actuator connector for damage or corrosion. Repair as necessary.

7. Clear DTC C0364 or C0379 from history.

8. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- *If DTC C0364 or C0379 sets*

Refer to Circuit/System Testing.

- *If DTC C0364 or C0379 does not set*

9. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the M26 front axle engagement actuator.

2. Ignition ON, engine OFF.

NOTE:

- When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.
- Testing for steps 3-11 is performed on the M26 front axle engagement actuator harness connector using the GY probes J-35616-2A.

3. Test for a True B+ (+0.0/-1.0 V) between the ignition 1 voltage circuit terminal 1 and a good ground, such as the ground terminal of the EL-49742 harness, black terminal.

- *If less than B+ (+0.0/-1.0 V)*

1. Ignition OFF, remove the F40UA fuse, X50A fuse block - underhood.

or

Disconnect the X2 harness connector at the X50A fuse block - underhood.

2. Test for less than 10 Ω in the run/crank ignition 1 voltage circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

Test for infinite resistance between the run/crank ignition 1 voltage circuit, terminal 1 and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

- If less than infinite resistance, repair the short to ground condition in the circuit.
- If greater than 10 Ω

4. Test for greater than 10 Ω between run/crank ignition 1 voltage circuit, terminal 1 and all other terminals of the M26 front axle engagement actuator.

- If 10 Ω or less, repair the short together condition in the affected circuits.
- If greater than 10 Ω

5. Ignition ON.

6. Test for a less than 1.0 V between the run/crank ignition 1 voltage circuit, terminal 1, and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.

- If 1.0 V or greater, repair the short to voltage in the circuit.
- If less than 1 V, replace the KR73 ignition main relay. Refer to X50A fuse block - underhood label.

- ***If B+(+0.0/-1.0 V)***

4. Ignition 1 voltage circuit OK.

5. Test for a true B+ (+0.0/-1.0 V) between the ground circuit, terminal 4, and the run/crank ignition 1 voltage circuit, terminal 1 or the B+ terminal of the **EL-49742** harness, red terminal.

- ***If less than the B+ (+0.0/-1.0 V)***

1. Ignition OFF, disconnect the grounding bolt G110. Refer to [Ground Views](#).

2. Test for less than 10 Ω in the ground circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between the ground circuit, terminal 4 and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.

- If 10 Ω or less, repair the short to ground condition in the circuit.
- If greater than 10 Ω

4. Test for infinite resistance between ground circuit, terminal 4 and all other terminals of the M26 front axle engagement actuator harness connector.

- If 1 Ω or less, repair the short together condition in the affected circuits.
- If greater than 1 Ω

5. Ignition ON.

6. Test for a less than 1.0 V between the ground circuit, terminal 4, and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.

- If 1.0 V or greater, repair the short to voltage in the circuit.
- If less than 1 V, clean the G110 grounding surface. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

- ***If B+***

6. Ground circuit OK.

7. Test for a diagnostic B+ (+0.0/-1.0 V) between the four wheel drive wheel lock indicator circuit, terminal 3, and the run/crank ignition 1 voltage circuit, terminal 1 or the B+ terminal of the **EL-49742** harness, red terminal.

- ***If less than B+ (+0.0/-1.0 V)***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in four wheel drive wheel lock indicator circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between the four wheel drive wheel lock indicator circuit, terminal 3 and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.
 - If less than infinite resistance, repair the short to ground condition in the circuit.
 - If greater than 10 Ω
 4. Test for infinite resistance between four wheel drive wheel lock indicator circuit, terminal 3 and all other terminals of the M26 front axle engagement actuator harness connector.
 - If less than infinite resistance, repair the short together condition in the affected circuits.
 - If greater than 10 Ω
 5. Ignition ON.
 6. Test for a less than 1.0 V between the four wheel drive wheel lock indicator circuit, terminal 3, and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.
 - If 1.0 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K69 transfer case control module. Refer to [Transfer Case Control Module Replacement](#).
- **If B+**
8. Four wheel drive wheel lock indicator circuit OK.
 9. Test for a diagnostic B+ (+0.0/-1.0 V) if in 2WD or, a true B+ (+0.0/-1.0 V) if in 4WD, between the front axle actuator control circuit, terminal 2, and the run/crank ignition 1 voltage circuit, terminal 1 or the B+ terminal of the **EL-49742** harness, red terminal.
 - **If less than B+ (+0.0/-1.0 V)**
 1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
 2. Test for less than 10 Ω in front axle actuator control circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
 3. Test for greater than 10 Ω between the front axle actuator control circuit, terminal 2 and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.
 - If 10 Ω or less, repair the short to ground condition in the circuit.
 - If greater than 10 Ω
 4. Test for greater than 1 Ω between front axle actuator control circuit, terminal 2 and all other terminals of the M26 front axle engagement actuator harness connector.
 - If 1 Ω or less, repair the short together condition in the affected circuits.
 - If greater than 1 Ω
 5. Ignition ON.
 6. Test for a less than 1.0 V between the front axle actuator control circuit, terminal 2, and a good ground such as the ground terminal of the **EL-49742** harness, black terminal.
 - If 1.0 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K69 transfer case control module. Refer to [Transfer Case Control Module Replacement](#).
- **If B+**
10. Connect a test light between the Ignition 1 voltage circuit, terminal 1 and the front axle control circuit, terminal 2. Using the Front Axle Engagement Actuator control function of the scan tool, command the front axle to engage and disengage. When commanded to engage, the test light should illuminate. When commanded to disengage, the test light should turn OFF.
 - **If the test light does NOT perform as described**

place the K69 transfer case control module.

- *If the test light performs as described*

11. The run/crank ignition 1 voltage circuit, the front axle switch signal circuit, the front axle control circuit, the ground circuit, and the K69 transfer case control module are OK.

Component Testing

M26 Front Axle Engagement Actuator

NOTE:

- **Circuit/System Testing must be performed before Component Testing.**
- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 3-4 is performed on the M26 front axle engagement actuator harness connector using the PU probes J-35616-4A.**

1. Ignition OFF. Disconnect the connector at the front axle engagement actuator.
2. Remove the M26 front axle engagement actuator.
3. Connect the M26 front axle engagement actuator connector. Position the M26 front axle engagement actuator so that it is visible from the side of the vehicle.
4. Using the Front Axle Engagement Actuator control function of the scan tool, command the front axle to engage and disengage. When commanded to engage, the plunger on the M26 front axle engagement actuator should extend. When commanded to disengage, the plunger should retract.

- *If the M26 front axle engagement actuator does NOT perform as described*

replace the M26 front axle engagement actuator. Refer to [Front Drive Axle Actuator Replacement](#) .

- *If the M26 front axle engagement actuator DOES perform as described*

5. Refer to [Front Axle Will Not Engage](#), or [Front Axle Will Not Disengage](#).

Repair Instructions

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

- [Control Module References](#) for transfer case control module replacement, setup, and programming
- [Front Axle Will Not Engage](#)
- [Front Axle Will Not Disengage](#)
- [Front Drive Axle Actuator Replacement](#)

DTC C0387: UNABLE TO COMPLETE SHIFT CIRCUIT

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0387 59

Unable to Complete Shift Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Circuit/Component Timeout
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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Circuit/Component Timeout
Unable to Complete Shift	-	-	-	DTC C0387 59
Motor Control A	DTC C0306 02	DTC C0306 05	DTC C0306 05	-
Motor Control B	DTC C0306 02	DTC C0306 05	DTC C0306 05	-

Circuit/System Description

The transfer case encoder motor (TCEM) is a bi-directional, permanent magnet, DC motor. When energized, through motor control A or motor control B, the ground is provided by the opposing motor control circuit and then grounded through the transfer case shift control module (TCCM) ground circuit, the TCEM, through a series of gears, rotates the transfer case control actuator shaft which moves the transfer case two/four wheel drive actuator cam and transfer case high/low shift fork to shift the transfer case between the following modes or ranges:

- 2WD HI
- 4WD HI
- 4WD LO
- Neutral

The transfer case control module monitors actuator current and incremental sensor output in order to shift the transfer case and verify that the proper position has been obtained. Deviations in current and position from expected values will cause this DTC to set.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.

Conditions for Setting the DTC

A shift request was received but could not be completed within 15 seconds.

Action Taken When the DTC Sets

- All shifting disabled.
- The mode light shall flash upon a requested mode change and then return to the current mode.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- DTC C0569 4B is set.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the conditions for setting the DTC no longer exist.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- An incomplete shift is one that cannot reach the desired mode or range and cannot return to the original mode or range.
- Intermittent motor control A shorting to motor control B could cause this DTC to set.

sible to have windings inside the motor shorted to the case, resulting in a short to ground, causing this DTC to set.

- If the shift lever detent shaft were to bind, or there was a mechanical failure, or motor A control and motor B control were shorted together, the shift would not be completed. This will cause the DTC to set in order to protect the system components from damage.
- The NQF transfer case uses a detent plunger that can bind, causing the shift shaft not to move. This can be corrected without removing or disassembling the transfer case.
- A faulty transfer case shift control module can cause incorrect incremental sensor or motor current measurements which would also result in this DTC setting.
- The default actions for C0321 may set C0306.
- **EL-49741** Harness is a good source for 9 V.
- **EL-49742** Harness is a good source for B+ and ground.
- The transfer case fill and drain plugs are a good source for ground.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify that the TREC fuse, and the Miscellaneous IGN fuse, underhood fuse block, are NOT open.
 - **If the TREC fuse is OPEN**

Test the battery positive voltage circuit, TCCM harness X3 pin C, for a short to ground.
 - **If the Miscellaneous IGN fuse is OPEN**

Test the Ignition 1 voltage circuit, TCCM harness X2 pin 6, for a short to ground.
 - **If the TREC fuse, and the Miscellaneous IGN fuse are NOT open**

ON, engine OFF.

3. With a scan tool, check DTC's. If any other DTC's are set, diagnose them first.

4. Verify DTC C0387 is only set as a history DTC.

- **If the DTC is set as current**

Refer to Circuit/System Testing.

- **If the DTC is set as history**

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

5. Visually inspect each connector terminal of the transfer case encoder motor connector and the transfer case control module for damage or corrosion. Repair as necessary.

6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

1. Disconnect the X1 harness connector at the transfer case encoder motor (TCEM).

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

2. Using the purple probe J-35616-4A, test for a 1.0-2.5 V diagnostic voltage between the motor B circuit, TCEM X1 pin D, and a good ground.

- If the voltage is greater than the specified range, test the motor B circuit for a short to voltage. If all circuits and connections test normal, test the TCCM.
- If the voltage is less than the specified range, test the motor B circuit for an open/high resistance or short to ground. If all circuits and connections test normal, test the TCCM.

3. Using the purple probes J-35616-4A, test for a diagnostic B+ (+0.0/-1.0 V) between the motor A circuit, TCEM harness X1 pin A, and a good ground.

- If the voltage is less than the specified range, test the motor A circuit for an open/high resistance, short to ground or short together condition. If all circuits and connections test normal, test the TCCM.

4. Remove the encoder motor from transfer case. Using a paint pen or marker, place indexing marks on the encoder motor output gear and the mounting surface of the encoder motor.

5. Connect the X1 connector at the transfer case encoder motor (TCEM). Position the TCEM so that the indexing marks are visible from the side of the vehicle.

6. Remove key. Wait 30 seconds. Key ON, engine OFF. Clear codes.

7. Block wheels. Parking brake engaged. Transmission in Neutral. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the encoder motor forward and reverse. When commanded forward, the encoder motor drive gear should rotate in one direction. When commanded reverse, the encoder motor drive gear should rotate in the opposite direction.

the encoder motor drive gear is unable to rotate, test the TCEM.

8. Remove the transfer case shift detent plunger plug, spring and plunger. Ensure that the shift detent plunger is not binding or damaged.
9. Verify that the shift shaft is not binding.
10. Inspect the transfer case actuator shaft gear for a binding condition. If binding, remove the transfer case and repair the binding condition.
11. Test the TCEM.

Component Testing

Transfer Case Encoder Motor (TCEM) - Actuator Lock, Motor A and Motor B

1. Remove the encoder motor from transfer case. Using a paint pen or marker, place indexing marks on the encoder motor drive gear and the mounting surface of the encoder motor.
2. Using a purple probe J-35616-5, attach the red lead from the other **EL-49741** jumper harness to the motor control A terminal of the TCEM, pin A.
3. Using a purple probe J-35616-5, attach the black lead from this same jumper harness to the motor control B terminal of the TCEM, pin D.
4. Touch the battery terminals of the 9 volt battery to the battery terminals of the jumper harness. This should rotate the encoder motor drive gear in either a clockwise or counter-clockwise rotation depending on battery orientation.
 - If the encoder motor drive gear does not rotate, replace the encoder motor.
5. Using the purple probes J-35616-5, test for between 0.3-40 Ω between the motor control A circuit TCEM X1 pin A and the motor control B circuit TCEM X1 pin D.
 - If greater than the specified range, replace the encoder motor.
 - If less than the specified range, replace the encoder motor.
6. Using the purple probes J-35616-5, test for greater than 10 Ω between the following circuits and the encoder motor case:
 - Motor control A, TCEM harness X1 pin A.
 - Motor control B, TCEM harness X1 pin D.
 - If outside the specified range, replace the encoder motor.
7. Using the purple probes J-35616-5, test for greater than 1 M Ω between the motor control A circuit, TCEM X1 pin A and all other pins on the TCEM harness X1 except the motor control B, TCEM X1 pin D.
 - If outside the specified range, replace the encoder motor.
8. Using the purple probes J-35616-5, test for greater than 1 M Ω between the motor control B circuit, TCEM X1 pin D. and all other pins on the TCEM harness X1 except the motor control A circuit, TCEM X1 pin A.
 - If outside the specified range, replace the encoder motor.
9. Test the TCCM.

TCCM

1. Ignition OFF. Disconnect the X1 harness connector at the TCEM.
2. Ignition ON, engine OFF. Install **EL-49742** harness.
3. Using the purple probes J-35616-4A, connect a test lamp between the motor control A circuit, TCEM X1 pin A and the ground terminal of **EL-49742** harness, black terminal.
4. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded forward, the test light should illuminate for 10 seconds and turn OFF. When commanded reverse, the test light should turn OFF.

the test light stays ON when commanded OFF, test the motor control A circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.

- If the test light does not illuminate when commanded ON, test the motor control A circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
5. Using the purple probes J-35616-4A, connect a test lamp between the motor control B circuit, TCEM X1 pin D and the ground terminal of **EL-49742** harness, black terminal.
 6. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded forward, the test light should turn OFF. When commanded reverse, the test light should illuminate for 10 seconds and turn OFF.
 - If the test light stays ON when commanded OFF, test the motor control B circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 - If the test light does not illuminate when commanded ON, test the motor control B circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 7. Using the purple probes J-35616-4A, connect a test lamp between the motor control A circuit, TCEM X1 pin A and a good ground.
 8. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded Forward/Counter CW, the test light should illuminate dimly for 10 seconds and turn OFF. When commanded Reverse/Clockwise, the test light should turn OFF.
 - If the test light stays ON after the 10 seconds, test the motor control A circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 - If the test light does not illuminate at all, test the motor control A circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 9. Using the purple probes J-35616-4A, connect a test lamp between the motor control B circuit, TCEM X1 pin D and a good ground.
 10. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded Forward/Counter CW, the test light should turn OFF. When commanded Reverse/Clockwise, the test light should illuminate dimly for 10 seconds and turn OFF.
 - If the test light stays ON after the 10 seconds, test the motor control B circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 - If the test light does not illuminate at all, test the motor control B circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 11. Using the purple probes J-35616-4A, connect a test lamp between the motor control A circuit, TCEM X1 pin A and the B+ terminal of **EL-49742** harness, red terminal.
 12. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded Forward/Counter CW, the test light should illuminate dimly for 10 seconds and turn OFF. When commanded Reverse/Clockwise, the test light should illuminate brightly for 10 seconds and turn OFF.
 - If the test light stays ON after the 10 seconds, test the motor control A circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 - If the test light does not illuminate at all, test the motor control A circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the

TCCM.

13. Using the purple probes J-35616-4A, connect a test lamp between the motor control B circuit, TCEM X1 pin D and the B+ terminal of **EL-49742** harness, red terminal.
14. Using the Transfer Case Motor Control function of the Special Function feature of the scan tool, command the motor forward and reverse. When commanded Forward/Counter CW, the test light should illuminate brightly for 10 seconds and turn OFF. When commanded Reverse/Clockwise, the test light should illuminate dimly for 10 seconds and turn OFF.
 - If the test light stays ON after the 10 seconds, test the motor control B circuit for a short to voltage. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
 - If the test light does not illuminate at all, test the motor control B circuit for an open or short to ground. If all circuits and connections test normal, reprogram the TCCM. If the DTC continues to set replace the TCCM.
15. Test the TCEM.

Repair Instructions

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

- [Control Module References](#) for TCCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(N07\)](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#)
- [Transfer Case Disassemble](#)
- [Transfer Case Assemble](#)
- [Transfer Case Oil Pump Cleaning and Inspection](#)
- [Rear Output Shaft Cleaning and Inspection](#)
- [Front Output Shaft and Input Shaft Cleaning and Inspection](#)
- [Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection](#)
- [Two/Four Wheel Drive Shift Components Cleaning and Inspection](#)
- [Transfer Case Front Half Cleaning and Inspection](#)
- [Transfer Case Rear Half Cleaning and Inspection](#)

DTC C038D: RANGE ACTUATOR - POSITION NOT LEARNED

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C038D 00

Range Actuator - Position Not Learned

Circuit/System Description

- This is an internal programming fault detection of the transfer case control module. No external circuits are involved.
- This DTC is set anytime a transfer case control module is replaced or reprogrammed.

ge Actuator Learn procedure must be performed in order for the transfer case control module to learn current clutch tolerance based on clutch stackup and accumulated clutch wear.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- DTC C038D runs at Engine ON.

Conditions for Setting the DTC

The Range Actuator Learn procedure for a new or reprogrammed transfer case control module has not been performed.

Action Taken When the DTC Sets

- All shifting disabled until the Range Actuator Learn procedure has been performed.
- The SERVICE 4WD indicator illuminates.
- No mode position LED's illuminated.

Conditions for Clearing the DTC

The transfer case control module only clears the DTC once the Range Actuator Learn procedure has been successfully performed.

Diagnostic Aids

The default actions for other transfer case DTC's can cause C038D to set.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Transfer Case Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

[ile References](#) for scan tool information.

Circuit/System Verification

1. Engine ON. Let engine run for at least 1 minute.
2. Ignition OFF for at least 30 seconds to allow for the complete shutdown of the K69 Transfer Case Control Module.
3. Engine ON.
4. Verify that no other transfer case DTC's are set.

- *If any other transfer case DTC's are set*

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

- *If no other transfer case DTC's are set*

5. Verify that DTC C038D is not set.

- *If DTC C038D is set*

Perform the Range Actuator Learn procedure.

- *If DTC C038D is NOT set*

6. All OK.

Repair Instructions

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

Refer to Transfer Case High/Low Clutch Reset for Range Actuator Learn Procedure

DTC C0396, C039E, P0652, OR P0653: RANGE ACTUATOR POSITION SENSOR/5V REFERENCE 2

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC C0396 03

Range Actuator Position Sensor Circuit Low Voltage

DTC C0396 07

Range Actuator Position Sensor Circuit High Voltage

DTC C039E 03

Range Actuator Position Sensor Direction Signal Circuit Low Voltage

DTC C039E 07

Range Actuator Position Sensor Direction Signal Circuit High Voltage

DTC P0652

rence 2 Circuit Low Voltage Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
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DTC P0653

5V Reference 2 Circuit Low Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Incremental Encoder Sensor (8 V) Supply	P0652	C0387 58 or C038D 00 (C0398 when shifting between ranges)	P0653	-
Incremental Encoder Impulse Signal	C0396 03	C0396 07	C0396 07	-
Incremental Encoder Direction Signal	C039E 03	C039E 07	C039E 07	-
Incremental Encoder Sensor Return/Low Reference	-	C0396 03	-	-

Circuit/System Description

The transfer case control module receives input from the range actuator position sensor and the transfer case range position sensor. Both sensors send this information as voltage signals which are converted to degrees and rotational direction by the transfer case control module software. If the two sensors disagree by greater than a predetermined amount the DTC will set.

The range actuator position sensor receives an 8 volt reference signal from the transfer case control module. In return the range actuator position sensor sends the transfer case control module a variable pulse width modulated signal indicating the position of the transfer case and a range actuator position direction signal. The range actuator position sensor, inside the A16 transfer case motor, also known as the transfer case range actuator, works in conjunction with the range position sensor to confirm transfer case position. The range actuator position sensor is more sensitive than the transfer case range position sensor and is able to indicate to the transfer case control module the exact position of the transfer case between range changes. It is also able to show how much clutch activation is being commanded at any time.

The transfer case range position sensor, also known as the transfer case two/four wheel drive actuator position sensor, receives a 5 volt reference signal from the K69 transfer case control module and sends back a continuously variable pulse width modulated signal to the K69 transfer case control module. This continuously variable signal indicates the position of the transfer case actuator.

The range actuator position sensor is more sensitive than the transfer case range position sensor, but needs to reference the transfer case range position sensor value at ignition ON and mode changes. The transfer case range position sensor is an absolute sensor. The K69 transfer case control module synchronizes the range actuator position sensor with the transfer case range position sensor at ignition ON and mode changes.

The range actuator position sensor is an integral part of the A16 Transfer Case Motor and cannot be replaced independently.

The transfer case range position sensor, also known as the B227 gear position sensor, is an independently replaceable part.

Conditions for Running the DTC

- Ignition ON.

voltage 10.5-18 V.

- No DTC P0562 or P0563.
- DTC C0396, C039e, P0652 and P0653 run continuously within the enabling conditions.

Conditions for Setting the DTC

C0396 03

Voltage on the sensor reference voltage 2 circuit, also known as the incremental encoder sensor (8 V) supply circuit, is 7.2-8.5 V, and voltage received by incremental encoder impulse signal circuit less than 0.35 V.

C0396 07

Voltage on the sensor reference voltage 2 circuit is 7.2-8.5 V, and voltage on incremental encoder impulse signal circuit greater than 4.6 V.

C039E 03

Voltage on the sensor reference voltage 2 circuit is 1.5-9.0 V, and voltage received by incremental encoder direction signal circuit less than 0.35 V.

C039E 07

Voltage on the sensor reference voltage 2 circuit is 1.5-9.0 V, and voltage on incremental encoder direction circuit greater than 4.5 V.

P0652

Voltage on sensor reference voltage 2 circuit less than 7.2 V.

P0653

Voltage on sensor reference voltage 2 circuit greater than 8.5 V.

Action Taken When the DTC Sets

The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

C0396 03 and C039E 03

- All shifting disabled.
- Clutch torque increased to maximum torque capacity during range shift from AWD, 4WD Low, and 4WD High only.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

C0396 07 and C039E 07

- All shifting disabled.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- Sensor reference voltage 2 circuit shut OFF.

P0652

- All shifting disabled.

torque increased to maximum torque capacity during range shift from AWD, 4WD Low, and 4WD High only.

- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

P0653

- All shifting disabled.
- Clutch torque increased to maximum torque capacity during range shift from AWD, 4WD Low, and 4WD High only.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The transfer case shift control module clears the DTC once the conditions for setting the DTC are no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- The range actuator position sensor and the transfer case range position sensor both show position in degrees, and should track each other. Monitor these sensors for erratic or unreasonable readings.
- If the range actuator position sensor is determined to be bad, the entire transfer case range actuator (transfer case motor) will have to be replaced as the range actuator position sensor is part of the transfer case range actuator and cannot be replaced independently.
- The transfer case fill and drain plugs are good sources for ground.
- Typical Gear Position Sensor parameter values:
 - 2WD = 33-43°
 - 4WD/AWD Automatic = 87-204°
 - 4WD High/Locked = 110-204°
 - 4WD Low = -140° to -69°
 - Neutral = -5° to +5°

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[File References](#) for scan tool information.

Special Tools

- **EL-49741** 9 V+ Power Source Harness
- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Verify that all range selections of the S77 transfer case shift control switch match the following parameters in the Data Display feature of the scan tool:

- Range Actuator Position
- Transfer Case Commanded Position
- Transfer Case Range
- ***If NOT all of the parameters match the S77 transfer case shift control switch position***

Refer to Circuit/System Testing.

- ***If ALL of the parameters match the S77 transfer case shift control switch position***

2. Verify that for all range selections of the S77 transfer case shift control switch, the Transfer Case Range Position Sensor parameter and the Range Actuator Position Sensor parameter track within 5 degrees of each other.

- ***If the parameters do NOT track within 5 degrees of each other***

Refer to Circuit/System Testing.

- ***If the parameters DO track within 5 degrees of each other***

3. Verify DTC C0396, C039E, P0652, or P0653 is only set as a history DTC.

- ***If any of the DTCs are set as current***

Refer to Circuit/System Testing.

- ***If any of the DTCs are only set as history***

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

4. Visually inspect each connector terminal of the K69 transfer case control module X1 connector and the A16 transfer case motor connector for damage or corrosion. Repair as necessary.

5. Clear DTC C0396, C039E, P0652, or P0653 from history.

6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.

- ***If any of the DTCs are set***

Refer to Circuit/System Testing.

- ***If none of the DTCs set***

7. All OK.

Circuit/System Testing

OFF, disconnect the harness connector at the A16 transfer case motor, also known as the transfer case range actuator.

2. Ignition ON, engine OFF.

NOTE:

- **When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 3-9 is performed on the A16 transfer case motor harness connector using the PU probes J-35616-4A.**

3. Test for 7.2-8.5 V between the incremental encoder sensor (8 V) supply circuit terminal G and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

- ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the incremental encoder sensor (8 V) supply circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between incremental encoder sensor (8 V) supply circuit terminal G and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for greater than 10 Ω between the incremental encoder sensor (8 V) supply circuit terminal G and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the incremental encoder sensor (8 V) supply circuit terminal G and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
3. Test for greater than 10 Ω between the incremental encoder sensor (8 V) supply circuit, terminal G and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#)

- ***If within the specified range***

4. Incremental encoder sensor (8 V) supply circuit and K69 transfer case control module OK.

7.2-8.5 V between the incremental encoder sensor (8 V) supply circuit, terminal G, and the low reference circuit, terminal H.

- ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the low reference circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between low reference circuit terminal H and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for greater than 10 Ω between the low reference circuit, terminal H and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the low reference circuit, terminal H and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
3. Test for greater than 10 Ω between the low reference circuit, terminal H and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

- ***If within the specified range***

6. Low reference circuit and K69 transfer case control module OK.
7. Test for 6.0-7.0 V between the incremental encoder impulse signal circuit, terminal E and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

- ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the incremental encoder impulse signal circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between incremental encoder impulse signal circuit terminal E and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for greater than 10 Ω between the incremental encoder impulse signal circuit terminal E and all other terminals of the A16 transfer case motor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#)

• ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the incremental encoder impulse signal circuit terminal E and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
3. Test for greater than 10 Ω between the incremental encoder impulse signal circuit terminal E and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

• ***If within the specified range***

8. Incremental encoder impulse signal circuit and K69 transfer case control module OK.
9. Test for 6.0-7.0 V between the incremental direction signal circuit, terminal F and a good ground, such as the ground terminal of the **EL-49742** harness, black terminal.

• ***If less than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module.
2. Test for less than 10 Ω in the incremental direction impulse signal circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
3. Test for infinite resistance between incremental encoder direction signal circuit terminal F and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
4. Test for greater than 10 Ω between the incremental encoder direction signal circuit terminal F and all other terminals of the A16 transfer case motor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#) .

• ***If greater than the specified range***

1. Ignition OFF, disconnect the X1 harness connector at the K69 transfer case control module. Ignition ON, Engine OFF.
2. Test for less than 1 V between the incremental encoder direction signal circuit terminal F and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.

Circuit If less than 1 V

Watchdog/Safety Failure

Internal Electronic Failure

3. Test for greater than 10 Ω between the incremental encoder direction signal circuit terminal F and all other terminals of the A16 transfer case motor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K69 transfer case control module and perform the Range Actuator Learn procedure.

Refer to [Transfer Case Control Module Replacement](#).

- *If within the specified range*

10. Incremental encoder direction signal circuit and K69 transfer case control module OK.

11. Replace the A16 transfer case motor.

Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

Repair Instructions

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

- [Control Module References](#) for K69 transfer case control module replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#) for A16 transfer case motor replacement

DTC C0550: ELECTRONIC CONTROL UNIT

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0550 37

Electronic Control Unit (ECU) Performance Watchdog Failure

DTC C0550 39

Electronic Control Unit (ECU) Internal Electronic Failure

Diagnostic Fault Information

Circuit	Watchdog/Safety Failure	Internal Electronic Failure
Electronic Control Unit Malfunction	DTC C0550 37	DTC C0550 39

Circuit/System Description

This is an internal fault detection of the transfer case shift control module (TCCM). This fault is handled inside the TCCM. No external circuits are involved.

At each power-up, the TCCM runs a self-test on the following:

- EEPROM Checksum

checksum

- RAM Checksum
- RAM Malfunction

Conditions for Running the DTC

- The TCCM runs the program to detect an internal condition at key ON. The only requirements are voltage and ground.
- Ignition ON.
- System voltage 10.5-18 V.

Conditions for Setting the DTC

- The random access memory (RAM) of the TCCM has failed an operational test indicating that some portions of RAM are not functional.
- The read only memory (ROM), or the masked ROM, of the TCCM has failed the Checksum test indicating that the data is not currently valid.
- The critical operational parameters stored in the EEPROM of the TCCM have failed the Checksum test indicating invalid data.

Action Taken When the DTC Sets

- The encoder motor will be deactivated for the remainder of the current ignition cycle.
- The transfer case shift control switch will illuminate the current mode position LED.
- No further mode changes shall be allowed.
- The TCCM will store freeze frame data.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

- The TCCM will clear the DTC once the conditions for setting the DTC no longer exist.
- A history DTC will clear after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- DTC P0550 detects the wrong copy of non-volatile memory in RAM or a RAM read/write failure.
- DTC P0550 detects a non-volatile memory write error.
- DTC P0550 detects a corruption of the EPROM/Flash memory.
- When attempting to set TCCM internal DTCs, let the engine run for at least 1 minute and then shut the engine OFF for 30 seconds. Following this procedure will allow for a complete TCCM shutdown. Reprogram the TCCM and retest the DTC to see if the DTC resets.
- A low voltage condition can sometimes falsely set this DTC. Attempt to clear this DTC and retest.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Transfer Case Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Engine running. Let the engine run for at least 1 minute.
2. Ignition OFF for at least 30 seconds to allow for the complete shutdown of the TCCM.
3. Ignition ON. Verify that DTC C0550 is not set.
 - If DTC C0550 sets, reprogram the TCCM. If the DTC resets, replace the TCCM. Perform the ATC motor learn procedure.

Repair Instructions

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

- **Control Module References** for TCSCM replacement, setup, and programming
- **Transfer Case High/Low Clutch Reset (NQ7)**

DTC C0569: SYSTEM CONFIGURATION ERROR CALIBRATION NOT LEARNED

Diagnostic Instructions

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

DTC Descriptor

DTC C0569 4B

System Configuration Error Calibration Not Learned

Circuit/System Description

- This is an internal fault detection of the transfer case control module. No external circuits are involved.
- This DTC is set anytime a transfer case control module is replaced or reprogrammed.
- The automatic transfer case (ATC) Motor Learn procedure must be performed in order for the transfer case control module to learn current clutch tolerance based on clutch stack-up and accumulated clutch wear.

Conditions for Running the DTC

- Ignition ON.

voltage 10.5-18 V.

Conditions for Setting the DTC

The ATC Motor Learn procedure for a new or reprogrammed transfer case control module has not been performed.

Action Taken When the DTC Sets

- Range shifting is disabled until the ATC Motor Learn procedure has been performed.
- The SERVICE 4WD indicator illuminates.
- No Range position LED's illuminated.

Conditions for Clearing the DTC

The transfer case control module clears the DTC once the ATC Motor Learn procedure has been successfully performed.

Diagnostic Aids

The default actions for C0306, C0321, C0387, C0392, C0396, C0397 or C0398 may cause C0569 to set.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Circuit/System Verification

1. Ignition ON, engine ON. Let engine run for at least 1 minute.
2. Ignition OFF for at least 30 seconds to allow for the complete shutdown of the K69 Transfer Case Control Module.
3. Ignition ON, engine OFF.
4. Verify that no other transfer case DTC's are set.
 - *If any other transfer case DTC's are set*
diagnose them first.
 - *If no other transfer case DTC's are set*
5. Verify that DTC C0569 is not set.

DTC C0569 is set

perform the ATC Motor Learn procedure. Refer to [Transfer Case High/Low Clutch Reset \(NQ7\)](#).

- ***If DTC C0569 is not set***

6. All OK.

Repair Instructions

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

[Transfer Case High/Low Clutch Reset \(NQ7\)](#)

DTC C0896: DEVICE VOLTAGE RANGE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC C0896 03

Device Voltage Range Below Threshold

DTC C0896 07

Device Voltage Range Above Threshold

Circuit/System Description

The transfer case shift control module (TCCM) monitors the battery voltage feed to the TCCM. This DTC detects if the battery voltage is out of range. This could indicate a vehicle wide issue, in which all electrical components would be affected, or it could be TCCM specific due to poor power or ground connections.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18.5 V.

Conditions for Setting the DTC

System voltage above 18.5 V, or below 10.5 V, and a mode shift is requested.

Action Taken When the DTC Sets

- Shifting is disabled until the voltages change to be within the specifications.
- The SERVICE 4WD will illuminate for the remainder for the ignition cycle.

Conditions for Clearing the DTC

- The TCCM clears the DTC once the conditions for setting the DTC are no longer present.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

- Any mode shift requested when the battery voltage is below 12 V may set this DTC.
- Improperly connecting the cables during a jump start can cause C0896 07 to set.
- The [Transfer Case High/Low Clutch Reset \(NQ7\)](#) procedure may need to be performed after repair.
- **EL-49742** harness is a good source for B+ and ground.
- A key OFF, key ON cycle may be needed to enable mode shifting.

Reference Information

Schematic Reference

[Transfer Case Control Schematics](#)

Connector End View Reference

[COMPONENT CONNECTOR END VIEWS - INDEX](#)

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Special Tools

EL-49742 Battery Voltage (B+) and Ground Source Harness

Circuit/System Verification

1. Verify that the TREC fuse, and the Miscellaneous IGN fuse, underhood fuse block, are NOT open.
 - If the TREC fuse is open, test the battery positive voltage circuit, TCCM Harness X3 pin C, for a short to ground.
 - If the Miscellaneous IGN fuse is open, test the ignition 1 voltage circuit, TCCM Harness X2 pin 6, for a short to ground.
2. Ignition ON, engine OFF.
3. Using the Freeze Frame feature of the scan tool, review the Battery Voltage parameter when the DTC set. The voltage should be above 12.0 V.
 - If the voltage is above 18.5 V, this is likely a vehicle issue, such as an alternator problem, or the vehicle has been hooked up improperly during a jump start. Refer to [Symptoms - Engine Electrical](#).
4. Using the Transfer Case Data display feature of the scan tool, monitor the Battery Voltage parameter. The voltage should be above 12.0 V.
 - If the voltage is below 12.0 V, ensure that the battery is fully charged and working properly. Refer to [Battery Inspection/Test](#), & [Battery Electrical Drain/Parasitic Load Test](#)
5. While monitoring the Battery Voltage parameter, start the engine. Rev the engine to greater than 3000 RPM. The voltage should remain stable and below 18.5 V.

the voltage is unstable or is greater than 18.5 V, ensure that the charging system is working properly. Refer to [Charging System Test](#).

Circuit/System Testing

NOTE: When test probing harness terminals, it is imperative to use the proper test probe from the most current version of the J-35616 GM-Approved Terminal Test Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.

1. Key OFF. Disconnect the X3 harness connector at the TCCM.
2. Measure the voltage at the battery. The voltage should be above 12.0 V.
 - If the voltage is below 12.0 V, ensure that the battery is fully charged and working properly. Refer to [Battery Inspection/Test](#), & [Battery Electrical Drain/Parasitic Load Test](#)
3. Install **EL-49742** harness. Test for B+ (+0.0/-0.5 V) between the 12 volt terminal (red) and the ground terminal (black) of **EL-49742** harness.
 - If the voltage is less than the specified value, a vehicle wide issue is indicated. Inspect the battery positive circuit wire routing for chafed wires or damaged inline harness connectors that could cause unexpected voltage drops.
4. Using the purple probe J-35616-4A, test for B+ (+0.0/-0.5 V) between the battery positive voltage circuit, TCCM X3 pin C, and the ground terminal of **EL-49742** harness, black terminal.
 - If the voltage is less than the specified range, test the battery positive voltage circuit for an open/high resistance or short to ground.
5. Using the purple probe J 35616-4A, test for B+ (+0.0/-0.5 V) between the battery positive voltage circuit, TCCM X3 pin C, and the ground circuit TCCM X3 pin D.
 - If the voltage is less than the specified range, test the ground circuit for an open/high resistance, short to ground or short together condition.

Repair Instructions

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

- [Transfer Case High/Low Clutch Reset \(NO7\)](#)
- [Battery Inspection/Test](#)
- [Battery Electrical Drain/Parasitic Load Test](#)
- [Charging System Test](#)

DTC P0601, P0602, P0604, P0606, P062F, OR P064F: CONTROL MODULE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P0601

Control Module Read Only Memory Performance

DTC P0602

DTC P0604

Control Module Random Access Memory Performance

DTC P0606 00

Control Module Processor Performance

DTC P0606 37 (if equipped)

Control Module Processor Performance Software Malfunction

DTC P062F

Control Module Long Term Memory Performance

DTC P064F

Control Module Long Term Memory Performance

Circuit/System Description

This is an internal fault detection of the transfer case control module. This fault is handled inside the transfer case control module. No external circuits are involved.

At each power-up, the transfer case control module runs a self-test on the following:

- EEPROM Checksum
- ROM Checksum
- RAM Checksum
- RAM Malfunction
- Missing, incorrect or invalid software

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18.0 V
- Diagnostic runs continuously

Conditions for Setting the DTC

The transmission control module has detected an internal malfunction.

P0601

The read only memory (ROM), or the masked ROM, of the transfer case control module has failed the Checksum test indicating that the data is not currently valid.

P0602

No application/calibration software found or calibration incompatible with application.

P0604

ccess memory (RAM) of the transfer case control module has failed an operational test indicating that some portions of RAM are non-functional.

P0606 00

The transfer case control module has failed an operational test indicating a processor performance failure.

P0606 37 (if equipped)

The transfer case control module has detected a software malfunction (Watchdog Failure).

P062F

The critical operational parameters stored in the EEPROM of the transfer case control module have failed the Checksum test indicating invalid data.

P064F

The transfer case control module has detected an invalid calibration.

Action Taken When the DTC Sets

- The encoder motor will be deactivated for the remainder of the current ignition cycle.
- The transfer case shift control switch will illuminate the current mode position LED.
- No further mode changes shall be allowed.
- The transfer case control module will store freeze frame data.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- The SERVICE AWD indicator will not illuminate - P062F only.
- Default Long Term Memory Values will be used - P062F only.

Conditions for Clearing the DTC

- DTCs P0601, P0602, P0604, P0606, P062F and P064F are Type C DTCs.
- The transfer case control module will clear the DTC once the conditions for setting the DTC no longer exist.
- A history DTC will clear after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.

Diagnostic Aids

- DTC P0601 detects a non-volatile memory write error (ROM).
- DTC P0602 indicates that the transmission control module is not programmed.
- DTC P0604 detects the wrong copy of non-volatile memory in RAM or a RAM read/write failure.
- DTC P0606 00 detects a processor performance failure.
- DTC P0606 37 detects a software malfunction.
- DTC P062F detects a corruption of the EPROM/Flash memory.
- DTC P064F detects an invalid calibration.
- Low voltage or a momentary loss of power or ground to the transfer case control module may cause a DTC to set. Verify the following:
 - The battery cables are clean and tight, and the battery is fully charged. Refer to [**Battery Inspection/Test**](#).
 - The transfer case control module ground circuits do not have an open or high resistance.

ie transfer case control module power circuits do not have an open, short to ground, or high resistance.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Transfer Case Description and Operation

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Circuit/System Verification

1. Ignition OFF for at least 1 minute to allow for the complete shutdown of the K69 transfer case control module. Engine ON.
2. Verify that DTC P0601, DTC P0602, DTC P0604, DTC P0606, DTC P062F or DTC P064F is only set as a history DTC.
 - *If any of the DTC's are set as current*
 1. Program the K69 transfer case control module. Refer to [Control Module References](#) .
 2. Verify none of the DTC's reset.
 - If any of the DTC's reset, replace the K69 transfer case control module. Refer to [Control Module References](#) .
 - If none of the DTC's reset
 - 3. All OK.
 - *If any of the DTC's are set as history*

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

3. Visually inspect each connector terminal of the K69 transfer case control module connector for damage or corrosion. Repair as necessary.
4. Clear DTC P0601, DTC P0602, DTC P0604, DTC P0606, DTC P062F, or DTC P064F from history.
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. The DTC should not set.
 - *If any of the DTC's set*

replace the K69 Transfer Case Control Module and perform the Range Actuator Learn procedure. Refer to [Transfer Case Control Module Replacement](#)

- *If none of the DTC's set*

6. All OK.

Repair Instructions

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

- [Control Module References](#) for K69 transfer case control module replacement, setup, and programming

DTC P185F OR P279A-P279C: TRANSFER CASE SHIFT PENDING SIGNAL NOT PLAUSIBLE/FOUR WHEEL DRIVE (4WD) (NQ6, NQ7)

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

NOTE: This procedure may also diagnose malfunctions that are not detected by a DTC.

DTC P185F

Transfer Case Shift Pending Signal Not Plausible - If equipped

DTC P279A

Four Wheel Drive (4WD) High Range Performance

DTC P279B

Four Wheel Drive (4WD) Low Range Performance
-If equipped

DTC P279c

Four Wheel Drive (4WD) Neutral Range Performance
- If equipped

Circuit/System Description

The ECM uses the following two ways to determine if the transfer case is in 4WD Low, 4WD High or Neutral.

1. The first way is to compare the transmission output speed sensor to the transfer case output speed sensor in order to calculate transfer case range.
2. The second way is to use a LAN message sent by the transfer case shift control module to the ECM.

The ECM uses this message to determine motor torque required and transmission shifting.

The internal fault detection is handled inside the control module. No external circuit diagnosis is involved.

Running the DTC

- Engine running - For greater than 5 s.
- Vehicle Speed.- Between 10 and 200 km/h (6 and 124 MPH)

DTCs run continuously when the above condition is met.

Conditions for Setting the DTC

- If the first way and second way of determining transfer case range do not match while in 4WD Low, 4WD High or Neutral, then the DTC is set.
- The ECM has detected 32 fail counts out of 400 samples.

Actions Taken When the DTC Sets

DTCs P185F, P279A, P279B, P279C are Type B DTCs.

Conditions for Clearing the DTC

DTCs P185F, P279A, P279B, P279C are Type B DTCs.

Diagnostic Aids

- Misalignment, debris or poor connections on the transmission output speed sensor or the transfer case vehicle speed sensor can cause this DTC to set.
- Verify that the following scan tool data can be obtained and is functioning properly while Operating the vehicle within the Conditions for Running the DTC. Data that is questionable may indicate a concern.

Refer to: [Control Module References](#) for typical data values.

- Transmission OSS
- Transmission Gear
- Vehicle Speed Sensor
- The Actions Taken for P279A may set DTC P16F3.
- DTC P279A, P279B, or P279C may set before P0502, P0503, P0721, P0722, P0723, P077C, P077D, P2160, P2161.
- When attempting to set ECM internal DTCs, run the engine for at least 1 min, and then shut the engine off for 2 min. Following this procedure will allow for a complete ECM shutdown. Program the ECM with the latest software version and retest the DTC to see if the DTC resets.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition On, engine Off/Vehicle in Service Mode.
2. Verify DTC P0502, P0503, P0721, P0722, P0723, P077C, P077D, P2160, P2161 is not set.
 - If any of the DTCs are set. Refer to: Diagnostic Trouble Code (DTC) List - Vehicle
 - If none of the DTCs are set
3. Ignition On - Engine Running - Greater than 1 min

NOTE: It may take up to 2 min for all vehicle systems to power down.

4. Ignition/Vehicle Off, key out of the ignition/keyless start transmitter 1 m (3 ft) from the vehicle, and all vehicle systems Off.
 - Greater than 2 min
5. Ignition On, engine Off/Vehicle in Service Mode.
6. Verify DTC P185F, P279A, P279B, P279C is only set as a history DTC.
 - If any of the DTCs are set as current. Refer to: Circuit/System Testing
 - If any of the DTCs are only set as history. Refer to Diagnostic Aids before proceeding with Circuit/System Testing.
 - If none of the DTCs are set
7. Clear All Vehicle DTCs
8. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
9. Verify DTC P185F, P279A, P279B, P279C is not set.
 - **If the DTC is set**

Refer to: Circuit/System Testing
 - **If the DTC is not set**
10. All OK.

Circuit/System Testing

1. Monitor the scan tool parameter:4WD Low Signal - ECM Data List
2. Operate the component:S77 Transfer Case Shift Control Switch - 4WD Low
3. Verify the scan tool parameter:4WD Low Signal =Enabled
 - If the parameter does not display the following:Enabled

Repair or replace the component: Transfer Case Assembly

Refer to: Transfer Case Assembly Replacement

the parameter displays the following: Enabled

4. Operate the component: S77 Transfer Case Shift Control Switch-2WD

5. Verify the scan tool parameter: 4WD Low Signal=Disabled

- If the parameter does not display the following: Disabled

Repair or replace the component: Transfer Case Assembly

Refer to: [Transfer Case Assembly Replacement](#) .

- If the parameter displays the following: Disabled

6. Program the ECM.

7. Operate the component: S77 Transfer Case Shift Control Switch - 4WD High/Locked

8. Operate the vehicle within the Conditions for Running the DTC.

9. Verify the DTC does not set.

- If the DTC sets

Replace the component: K20 Engine Control Module

- If the DTC does not set

10. Operate the component: S77 Transfer Case Shift Control Switch - 4WD Low

11. Operate the vehicle within the Conditions for Running the DTC.

12. Verify the DTC does not set.

- If the DTC sets

Replace the component: K20 Engine Control Module

- If the DTC does not set

13. All OK.

Repair Instructions

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

For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P2160 OR P2161: VEHICLE SPEED SENSOR (VSS) 2 (2-WIRE)

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC P2160

Vehicle Speed Sensor (VSS) 2 Circuit Low Voltage

DTC P2161

Vehicle Speed Sensor (VSS) 2 Circuit Intermittent

It Information Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
VSS Supply Voltage	P2160, P2161	P2160, P2161	P2160, P2161	P2161
VSS Signal	P2160, P2161	P2160, P2161	P2160, P2161	P2161

Circuit/System Description

The vehicle speed sensor (VSS) provides vehicle speed information to the engine control module (ECM). The VSS is a permanent magnet generator. The sensor is mounted in the transfer case facing the rear internal gear which is splined to the output shaft assembly. As the output shaft and internal gear rotate, the toothed rotor of the internal gear produces AC voltage as the rotor teeth pass through the magnetic field of the sensor. The AC voltage level and the number of pulses increase as the speed of the vehicle increases. The ECM converts the voltage to vehicle speed. The ECM uses the output shaft speed signal to determine shift timing and torque converter clutch (TCC) scheduling, as well as transfer case range.

Conditions for Running the DTC

P2160

- No input speed sensor (ISS) DTCs P0716 or P0717.
- No output speed sensor (OSS) DTCs P0722 or P0723.
- No vehicle speed sensor (VSS) DTCs P2160 or P2161.
- No engine torque, throttle position, and turbine speed DTCs.
- The transmission is not in Reverse Inhibit state.
- The transmission is not in PARK or NEUTRAL.
- Transmission fluid temperature (TFT) is between -40°C to $+150^{\circ}\text{C}$ (-40°F to $+302^{\circ}\text{F}$).
- The throttle position is greater than 5 percent and less than 99 percent.
- The engine torque is greater than 50 N.m (37 lb ft) and less than 8192 N.m (6042 lb ft).
- The input speed is greater than 1, 500 RPM and less than 7500 RPM.
- The TCC slip speed is at least -20 RPM.

P2161

- No 1-2 Shift Solenoid Electrical DTC P0974.
- No ISS DTCs P0716 or P0717.
- No crank sensor or P2160 DTCs.
- The transmission is not performing garage shifting.
- The transmission is not in Reverse Inhibit state.
- The transmission is not in PARK or NEUTRAL.
- The transmission output speed is greater than 1, 400 RPM for 2 seconds or greater.
- One of the following conditions exist:
 - The transmission input shaft speed has changed less than 500 RPM for at least 2 seconds.
 - The transmission output shaft speed has not increased at least 500 RPM for at least 2 seconds.

Conditions for Setting the DTC

P2160

ise output shaft speed is 50 RPM or less for 4.5 seconds.

P2161

The transfer case output shaft speed drops 1, 200 RPM or greater for at least 3.25 seconds.

Action Taken When the DTC Sets

- DTCs P2160 and P2161 are Type B DTCs.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM calculates vehicle speed from the automatic transmission input shaft speed sensor and commanded gear.

Conditions for Clearing the DTC

DTCs P2160 and P2161 are Type B DTCs.

Diagnostic Aids

- The transfer case drain plug provides a good ground point.
- The EL-49742 harness provides a good source for 12 V and ground.
- Inspect the rear internal gear teeth for damage.
- Visually inspect the VSS for cracks or damage.
- Ensure the VSS is properly torqued to the transfer case housing.
- This diagnostic relates to the VSS located in the transfer case and not the OSS located within the transmission.
- The Actions Taken for DTC P2160 or P2161 may set DTC P16F3.

Reference Information

Schematic Reference

- [Transfer Case Control Schematics](#)
- [Engine Controls Schematics](#) 2.5L (LCV)
- [Engine Controls Schematics](#) 3.6L (LFX)

Connector End View Reference

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Description and Operation

Transfer Case Description and Operation

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

DTC Type Reference

Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- **EL-49742** Battery Voltage B+ and Ground Source Harness
- **J-35616** GM-Approved Terminal Test Kit

Circuit/System Verification

1. Raise and support the drive wheels.
2. Start and idle the engine.
3. Place the transmission in DRIVE.
4. Monitor VSS on the scan tool under engine data.
5. The VSS on the scan tool should be greater than 100 RPM.

Circuit/System Testing

1. Key OFF. Let sit for 2 minutes to ensure that the ECM shuts down.
2. Disconnect the X1 connector from the VSS. Using the J-35616-2A GY probes, test for less than 0.1 V between the following circuits and a good ground.
 - VSS high signal circuit, VSS harness X1 pin A.
 - VSS low signal circuit, VSS harness X1 pin B.
 - If the voltage is greater than the specified value, test the affected circuit for a short to voltage. If all circuits and connections test normal, test the ECM for proper operation.
3. Key ON, engine OFF. Test for a diagnostic 2-3 V (low current) between the following circuits and a good ground.
 - VSS high signal circuit, VSS harness X1 pin A.
 - VSS low signal circuit, VSS harness X1 pin B.
 - If the voltage is less than the specified value, test the affected circuit for an open/high resistance, short to ground or short together. If all circuits and connections test normal, test the ECM for proper operation.
 - If the voltage is greater than the specified value, test the affected circuit for a short to voltage. If all circuits and connections test normal, test the ECM for proper operation.
4. Test the VSS for proper operation.

Component Testing

VSS

1. Key OFF.
2. Disconnect the X1 connector from the VSS. Using the J-35616-3 GY probes, test for 1200-2140 Ω between the VSS high signal circuit, VSS pin A, and the VSS low signal circuit, VSS pin B.
 - If the resistance is outside the specified value, replace the VSS.
3. Test for greater than 10 M Ω between the following circuits and a good ground.
 - VSS high signal circuit, VSS pin A.
 - VSS low signal circuit, VSS pin B.

- If the resistance is below the specified value, replace the VSS.
4. Block the front wheels. Raise and support the driver's side rear wheel. While rotating the raised wheel by hand, test for greater than 0.4 V AC between the VSS high signal circuit, VSS pin A, and the VSS low signal circuit, VSS harness pin B. The passenger side rear wheel takes more effort to turn. If both drive wheels are raised and unblocked, twice the effort will be required to reach 0.4 V AC. If the vehicle is sufficiently supported to safely place the transmission in neutral, less effort will be required to turn the raised wheel.
 - If the AC voltage is below the specified value, replace the VSS.

ECM

1. Remove key from the ignition. Let sit for 2 minutes to ensure ECM shut down.
2. Disconnect the X1 connector from the ECM. Using the J-35616-64B L-BU probes, test for 1200-2140 Ω between the VSS high signal circuit, ECM X1, pin 71 and the VSS low signal circuit, ECM X1, pin 72.
 - If the resistance is below the specified value, test the affected circuits for being shorted together. If all circuits and connections test normal, test the VSS for proper operation.
 - If the resistance is above the specified value, test the affected circuits for open/high resistance condition. If all circuits and connections test normal, test the VSS for proper operation.
3. Using the J-35616-64B L-BU probes, test for greater than 1 M Ω between the following circuits and a good ground.
 - VSS high signal circuit, ECM harness X1 pin 71.
 - VSS low signal circuit, ECM harness X1 pin 72.
 - If the resistance is below the specified value, test the affected circuit for being shorted to ground. If all circuits and connections test normal, test the VSS for proper operation.
4. Reprogram the ECM. If the DTC continues to set, replace the ECM.

Repair Instructions

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

- Ensure that the VSS is 500 RPM or greater for 3 seconds and does not change more than 500 RPM or greater for 3 seconds.
- [Vehicle Speed Sensor Replacement](#)
- [Control Module References](#) for ECM replacement, setup, and programming.

DTC P2160 OR P2161: VEHICLE SPEED SENSOR (3-WIRE)

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptors

DTC P2160

Vehicle Speed Sensor (VSS) 2 Circuit Low Voltage

DTC P2161

Vehicle Speed Sensor (VSS) 2 Circuit Intermittent

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Vehicle Speed Signal Sensor	P2160, P2161	P2160, P2161	P2160, P2161	P2160, P2161
5 Volt Reference	P2160, P2161	P2160, P2161	P2160, P2161	P2160, P2161
Low Reference	-	P2160, P2161	-	-

Circuit/System Description

The B115 vehicle speed sensor is a three wire hall effect sensor. The B115 vehicle speed sensor provides vehicle speed information to the K20 engine control module. The B115 vehicle speed sensor is mounted on the left rear of the transfer case facing the Rear Output Shaft Speed Sensor Reluctor Wheel which is splined to the output shaft. As the output shaft and rear output shaft speed sensor reluctor wheel rotate, the toothed rotor of the rear output shaft speed sensor reluctor wheel passes through the magnetic field of the B115 vehicle speed sensor and produces an AC voltage. The AC voltage level and the number of pulses increase as the speed of the vehicle increases. The K20 engine control module converts the voltage to vehicle speed. The K20 engine control module uses the output shaft speed signal to determine shift timing, as well as transfer case range. The K20 engine control module supplies a 5 volt reference, a 12 volt signal circuit, and a low reference or ground circuit to the B115 vehicle speed sensor.

Conditions for Running the DTC

P2160

- No input speed sensor (ISS) DTCs P0716 or P0717.
- No output speed sensor (OSS) DTCs P0722 or P0723.
- No vehicle speed sensor (VSS) DTCs P2160 or P2161.
- The throttle position is greater than 8 percent and less than 99 percent.
- The transmission is not in PARK, NEUTRAL or REVERSE.
- The transmission is not performing garage shifting.
- No engine torque, crank sensor, throttle position, or turbine speed DTCs.
- The engine torque is greater than 60 N.m (44 lb ft) and less than 8192 N.m (6042 lb ft).
- The input speed is greater than 1500 RPM and less than 6500 RPM.

P2161

- The transmission is not in PARK, NEUTRAL or REVERSE.
- The transmission is not performing garage shifting.
- The engine speed is 1200 RPM or greater.
- No crank sensor or P2160 DTCs.

Conditions for Setting the DTC

P2160

- Low output speed when vehicle has a large input speed while in Drive range with high torque or no speed signal from the transfer case speed sensor.
- The transfer case output shaft speed is 50 RPM or less for 5 s.

P2161

- Unrealistic change in transfer case output shaft speed or loss of speed signal from the transfer case speed sensor.

peed signal is increasing: current transfer case speed signal - last valid output speed jumps greater than 475 RPM for 4 s.

- Output speed signal is decreasing: current transfer case speed signal - last valid output speed drops less than 255 RPM for 4 s.

Action Taken When the DTC Sets

DTCs P2160 and P2161 are Type B DTCs.

Conditions for Clearing the DTC

DTCs P2160 and P2161 are Type B DTCs.

Diagnostic Aids

- The transfer case drain plug provides a good ground point.
- The **EL-49742** harness provides a good source for 12 V and ground.
- Inspect the rear output shaft speed sensor reluctor wheel teeth for damage.
- Visually inspect the B115 vehicle speed sensor for cracks or damage.
- Ensure the B115 vehicle speed sensor is properly torqued to the transfer case housing.
- This diagnostic relates to the B115 vehicle speed sensor located in the transfer case and not the B14A transmission output shaft speed sensor located within the transmission.
- The Actions Taken for DTC P2160 or P6161 may set DTC P16F3.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)

Description and Operation

Transfer Case Description and Operation

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

[Control Module References](#) for scan tool information

EL-49742 Battery Voltage B+ and Ground Source Harness

Circuit/System Verification

1. Raise and support the drive wheels.
2. Start and idle the engine.
3. Place the transmission in DRIVE.
4. Monitor the vehicle speed sensor parameter on the scan tool under engine data. The vehicle speed sensor parameter should increase as the drive wheel speed increases and decrease as the drive wheel speed decreases.

- **If the vehicle speed sensor parameter does not perform as described**

Refer to Circuit/System Testing.

- **If the vehicle speed sensor parameter does perform as described**

5. Verify DTC P2160 or DTC P2161 is only set as a history DTC.

- **If the DTC is set as current**

Refer to Circuit/System Testing.

- **If the DTC is set as history**

NOTE: After inspection, apply Nyogel lubricant 760G to each connector terminal. Ensure each connector and CPA is correctly seated.

6. Visually inspect each connector terminal of the B115 vehicle speed sensor connector, the K20 engine control module connectors, B115 transfer case shift control switch connector, and the K69 transfer case control module X1 connector for damage or corrosion. Repair as necessary.
7. Operate the vehicle within the Conditions for Running the DTC. The DTC should not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the B115 vehicle speed sensor.
2. Ignition ON, engine OFF.

NOTE: Testing for steps 3-7 is performed on the B115 vehicle speed sensor harness connector using the GY probes J-35616-2A .

3. Test for 4.7-5.3 V between the 5-volt reference circuit, terminal 1 and a good ground, such as the ground terminal of the EL-49742 harness, black terminal.

- **If less than the specified range**

1. Ignition OFF, disconnect the following harness connector at the K20 engine control module.

- Engine RPO LKH/LWN engine control module connector X1
- Engine RPO LFX, engine control module connector X2.
- Engine RPO LCV, engine control module connector X3.

Test for less than 10 Ω in the 5-volt reference circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between 5-volt reference circuit and a good ground.

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

4. Test for greater than 10 Ω between the 5-volt reference circuit, terminal 1 and all other pins of the B115 vehicle speed sensor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K20 engine control module.

• **If greater than the specified range**

1. Ignition OFF, disconnect the following harness connector at the K20 engine control module.

- Engine RPO LKH/LWN engine control module connector X1
- Engine RPO LFX, engine control module connector X2.
- Engine RPO LCV, engine control module connector X3.

2. Test for less than 1 V between the 5-volt reference circuit, terminal 1 and a good ground.

- If 1 V or greater, repair the short to voltage in the circuit.
- If less than 1 V

3. Test for greater than 10 Ω between the 5-volt reference circuit, terminal 1 and all other pins of the B115 vehicle speed sensor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K20 engine control module.

• **If within the specified range**

4. 5-volt reference circuit OK.

5. Test for 4.7-5.3 V between the 5-volt reference circuit, terminal 1, and the low reference circuit, terminal 3.

• **If less than the specified range**

1. Ignition OFF, disconnect the following harness connector at the K20 engine control module.

- Engine RPO LKH/LWN engine control module connector X1
- Engine RPO LFX, engine control module connector X2.
- Engine RPO LCV, engine control module connector X3.

2. Test for less than 10 Ω in the low reference circuit end to end.

- If 10 Ω or greater, repair the open/high resistance in the circuit.
- If less than 10 Ω

3. Test for infinite resistance between low reference circuit, terminal 3 and a good ground.

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

4. Test for greater than 10 Ω between the low reference circuit, terminal 3 and all other pins of the B115 vehicle speed sensor harness connector.

- If 10 Ω or less, repair the shorted together condition in the affected circuits.
- If greater than 10 Ω , replace the K20 engine control module.

• **If greater than the specified range**

1. Ignition OFF, disconnect the following harness connector at the K20 engine control module.

- Engine RPO LKH/LWN engine control module connector X1
- Engine RPO LFX, engine control module connector X2.

- Engine RPO LCV, engine control module connector X3.
2. Test for less than 1 V between the low reference circuit, terminal 1 and a good ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V
 3. Test for greater than 10 Ω between the low reference circuit, terminal 3 and all other pins of the B115 vehicle speed sensor harness connector.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K20 engine control module.
- **If within the specified range**
6. Low Reference circuit OK.
 7. Test for B+ between the vehicle speed signal sensor circuit, terminal 2, and the low reference circuit, terminal 3.
 - **If less than the specified range**
 1. Ignition OFF, disconnect the following harness connector at the K20 engine control module.
 - Engine RPO LKH/LWN engine control module connector X1
 - Engine RPO LFX, engine control module connector X2.
 - Engine RPO LCV, engine control module connector X3.
 2. Test for less than 10 Ω in the vehicle speed signal sensor circuit end to end.
 - If 10 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 10 Ω
 3. Test for infinite resistance between vehicle speed signal sensor circuit, terminal 2 and a good ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance
 4. Test for greater than 10 Ω between the vehicle speed signal sensor circuit, terminal 2 and all other pins of the B115 vehicle speed sensor.
 - If 10 Ω or less, repair the shorted together condition in the affected circuits.
 - If greater than 10 Ω , replace the K20 engine control module.
 - **If within the specified range**
 8. Vehicle speed signal sensor circuit and K20 engine control module OK.
 9. Replace the vehicle speed sensor.

Repair Instructions

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

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

SYMPTOMS - TRANSFER CASE

Procedure

1. Perform the [Diagnostic System Check - Vehicle](#) before using the symptom tables, in order to verify the following conditions are true:
 - There are no diagnostic trouble codes (DTCs) set.
 - The control modules can communicate via the serial data link.

the system operation in order to familiarize yourself with the system functions. Refer to: [Transfer Case Description and Operation](#).

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the automatic transfer case system. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Inspect the automatic transfer case for the proper fluid level.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to: [Testing for Intermittent Conditions and Poor Connections](#)

Symptom List

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

- [Transfer Case Popping Noise](#)
- [Transfer Case Whine or Rumble Noise](#)
- [Transfer Case Growl or Grinding Noise](#)
- [Transfer Case Clunk in 2HI Only](#)
- [Transfer Case Clunk in 4HI](#)
- [Transfer Case Clunk in 4LO](#)
- [Transfer Case Will Not Shift](#)
- [Transfer Case Jumps Out of Gear](#)
- [Transfer Case Leak Diagnosis](#)

FRONT AXLE WILL NOT ENGAGE

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The front axle control circuit consists of an electric motor actuator which engages and disengages the front axle. The front axle actuator motor consists of a permanent magnetic motor, a worm gear controlled plunger, a front axle switch and an electronic control circuit within the actuator assembly.

The front axle actuator consists of the following circuits:

- The front axle control circuit, which is also connected to the transfer case shift control module
- The front axle switch circuit, which is also connected to the transfer case shift control module
- An ignition 3 voltage circuit
- A ground circuit

When a shift to 4HI, or 4LO is requested, the transfer case shift control module engages the front axle by grounding the front axle control circuit through a current limiting driver.

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

1. If this is occurring without DTC C0379 setting it is likely related to a mechanical issue. Refer to Four-Wheel Drive Does Not Engage.
2. If no mechanical issue is found replace the front axle actuator.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Control Module References for TCSCM replacement, setup, and programming
- Transfer Case High/Low Clutch Reset (NQ7)
- Four-Wheel Drive Does Not Engage
- Four-Wheel Drive Does Not Disengage
- Front Drive Axle Actuator Replacement

FRONT AXLE WILL NOT DISENGAGE

Diagnostic Instructions

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

Circuit/System Description

The front axle control circuit consists of an electric motor actuator which engages and disengages the front axle. The front axle actuator motor consists of a permanent magnetic motor, a worm gear controlled plunger, a front axle switch and an electronic control circuit within the actuator assembly.

The front axle actuator consists of the following circuits:

- The front axle control circuit, which is also connected to the transfer case shift control module
- The front axle switch circuit, which is also connected to the transfer case shift control module

ion 3 voltage circuit

- A ground circuit

When a shift to AUTO 4WD, 4HI, or 4LO is requested, the transfer case shift control module engages the front axle by grounding the front axle control circuit through a current limiting driver.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

1. If this is occurring without DTC C0379 setting it is likely related to a mechanical issue. Refer to Four-Wheel Drive Does Not Disengage.
2. If no mechanical issue is found replace the front axle actuator.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Control Module References for TCSCM replacement, setup, and programming
- Transfer Case High/Low Clutch Reset (NQ7)
- Four-Wheel Drive Does Not Engage
- Four-Wheel Drive Does Not Disengage
- Front Drive Axle Actuator Replacement

TRANSFER CASE SHIFT CONTROL SWITCH INOPERATIVE

Diagnostic Instructions

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

Circuit/System Description

The active transfer case mode switch circuit consists of 5 modes. The transfer case shift control module supplies 5 volts to the switch through the 5-volt reference circuit. The current travel through the resistor of the currently active

rent is then returned to the transfer case shift control module through the switch signal circuit.

The transfer case shift control module constantly monitors this signal voltage to determine the condition of the mode switch circuit.

When each of the modes are selected they complete a circuit through their own specific resistor. The transfer case shift control module continuously monitors the switch input to determine whether the Neutral, 2HI, 4HI, or 4LO mode was selected by the driver.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Diagnostic Aids

If the 5-volt reference or the switch signal wire are shorted to ground the scan tool can show up to 7.5 volts.

Circuit/System Testing

1. Review the scan tool data list mode switch selected and select difference mode with the transfer case shift control switch. Does the mode switch selected parameter on the scan tool change as you change modes on the switch?
2. If the modes change according to the scan tool replace the transfer case control module, reprogram, complete the motor learn procedure. If the modes on the scan tool do not change replace the switch.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Transfer Case Selector Switch Replacement
- Control Module References for TCSCM replacement, setup, and programming
- Transfer Case High/Low Clutch Reset (NQ7)

TRANSFER CASE SHIFT CONTROL SWITCH INDICATOR ALWAYS ON - TWO OR MORE

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.

Diagnostic Procedure Instructions provides an overview of each diagnostic category.

Circuit/System Description

The indicator circuits consists of an interior lights dimming circuit and an indicator control circuit. When a mode has been selected, current is supplied to the indicator by the interior lights dimming circuit, traveling through the indicator LED, at which time the transfer case shift control module supplies the ground through the indicator lamp control circuit.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Diagnostic Aids

A short to ground on the indicator control circuit will cause the indicator to remain on at all times.

Circuit/System Testing

1. With the ignition off disconnect connector X1 at the transfer case control module and turn the ignition on. If the affected indicator goes out replace the transfer case control module, program, and perform the motor learn procedure.
2. If the affected indicator did not go out check for a short to ground on the affected indicator control circuit. If this checks as good then replace the transfer case shift control switch.

Repair Instructions

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

- **Transfer Case Selector Switch Replacement**
- **Control Module References** for TCSCM replacement, setup, and programming
- **Transfer Case High/Low Clutch Reset (NQ7)**

TRANSFER CASE SHIFT CONTROL SWITCH INDICATOR INOPERATIVE - ONE OR MORE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

[Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Circuit/System Description

The indicator circuits consists of an interior lights dimming circuit and an indicator control circuit. When a mode has been selected, current is supplied to the indicator by the interior lights dimming circuit, traveling through the indicator LED, at which time the transfer case shift control module supplies the ground through the indicator lamp control circuit.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for scan tool information.

Diagnostic Aids

A short to ground on the indicator control circuit will cause the indicator to remain on at all times.

Circuit/System Testing

1. With in ignition off disconnect connector X1 at the transfer case control module and turn the ignition on. With a jumper wire probe the indicator control circuit of the affected indicator and take the other end of the jumper to ground. If the indicator comes on then replace the transfer case control module, program, and perform the motor learn procedure.
2. If the affected indicator did not come on then check the indicator control circuit for an open or high resistance. If the circuit checks good then replace the transfer case shift control switch.

Repair Instructions

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

- [Transfer Case Selector Switch Replacement](#)
- [Control Module References](#) for TCSCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(NQ7\)](#)

SERVICE INDICATOR ALWAYS ON

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.

Strategy Based Diagnosis for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Circuit/System Description

If the service indicator needs to be turned on the transfer case shift control module sends a signal via LAN to the instrument panel asking the I/P to command the Service 4WD indicator.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Testing

1. If the Service 4WD indicator is on and there are no DTCs check the fuse for the transfer case as this would cause the transfer case control module to drop off the LAN causing a service indicator.
2. If the fuse is good check the module power and grounds for proper connections as this could cause the same thing as a blown fuse.
3. If this checks OK then check all other U codes that may be set against the transfer case shift control module such as I/P, BCM, PCM, and follow the proper U code diagnostic.

Repair Instructions

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

- **Transfer Case Selector Switch Replacement**
- **Control Module References** for TCSCM replacement, setup, and programming
- **Transfer Case High/Low Clutch Reset (NQ7)**

TRANSFER CASE HIGH/LOW CLUTCH RESET (NQ7)

Using a Scan Tool

1. Ignition ON, engine OFF.
2. Select the Module Setup heading on the scan tool, under transfer case control module.
3. Select the Range Actuator Learn procedure.

Cause	Correction
Range Actuator Learn procedure is initiated an audible noise from the A16 Transfer Case Motor should occur, indicating a successful learn procedure.	

Using The Transfer Case Shift Control Switch

NOTE: The Range Actuator Learn procedure is performed with the ignition in the **ACCESSORY** position. The shift to transfer case **NEUTRAL** procedure uses this same procedure, but with the key in the **RUN** position.

1. Ignition OFF for at least 30 s.
2. Engage parking brake.
3. Place transmission in Neutral.
4. Turn the S77 Transfer Case Shift Control Switch to the 2WD High position for at least 5 s. The 2WD High indicator may not illuminate.
5. Turn the S77 Transfer Case Shift Control Switch clockwise past the 4WD Low position to the neutral request position and hold for at least 30 s.
6. An audible noise from the A16 Transfer Case Motor should occur, indicating a successful learn procedure.

TRANSFER CASE POPPING NOISE

Cause	Correction
Definition: A faulty internal transfer case component that causes a light popping noise in the transfer case. A light popping type noise that occurs when shifting, and quits after the shift is completed would be considered normal. When shifting out of 4 HI in a mode shift, there may be a delay and a popping may be heard when the High/Low clutch disengages. 1. Compare the noise to a similar vehicle to see if a normal condition. 2. Identify the source of the noise using chassis ears and refer to the appropriate service manual section. 3. Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). 4. Note if the noise relative to vehicle speed, is noisy on turns, or other specifics. 5. If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Transmission or transfer case mounts loose or damaged	Repair or replace the mounts as required
Propeller shaft universal joints worn	Replace the universal joints as required. Refer to Symptoms - Propeller Shaft .
Suspension components worn	Replace the suspension components as required. Refer to Noise Diagnosis - Front Suspension , or Noise Diagnosis - Rear Suspension .
Front axle actuator shift noise	NOTE: When shifting from 2WD-to-4WD or 4WD-to-2WD, the front axle actuator may be heard engaging or disengaging and the axle internal components shifting. This is to be considered a normal condition. Shift from 2WD-to-4WD and from 4WD-to-2WD to determine if the noise source is the front axle to determine if this is a normal condition.

Cause	Correction
Transfer case drive and driven sprockets worn or a stretched chain causing a chain jump condition	NOTE: - A chain jump condition may cause a banging noise and can only occur with the vehicle in 4WD. - A chain jump condition may be caused by water intrusion into the transfer case and deterioration of the transfer case fluid. Water intrusion conditions may occur in extreme off road conditions or in situations where under-vehicle power washing occurs. - Inspect the oil for water intrusion and/or fluid discoloration and contamination. - Inspect the vent hose for proper routing and connection to the transfer case. - Inspect for damaged internal components. Refer to Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection. - Replace the chain and sprockets as required. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

TRANSFER CASE WHINE OR RUMBLE NOISE

Cause	Correction
DEFINITION: A faulty internal transfer case component that causes a high pitch whine or low pitch rumbling noise in the transfer case. A high pitch whine or rumble noise with the vehicle in 4LO is to be considered normal. NQ7 transfer case applications are noisier by design in 4WD mode than in 2WD mode. Compare the noise to a similar vehicle to see if a normal condition. - Identify the source of the noise using chassis ears and refer to the appropriate service manual section. - Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). - Note if the noise relative to vehicle speed, is noisy on turns, or other specifics. - If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Tire noise	NOTE: A high pitch whine or low pitch rumble noise that increases as vehicle speed increases may be caused by tires that are, unevenly inflated, unevenly worn or have an aggressive tread pattern. Rotate or substitute tires and retest. Refer to Tire and Wheel Inspection .
Propeller shaft universal joints worn	NOTE: A high pitch whine or low pitch rumble noise that increases as vehicle speed increases may be caused by worn universal joints. Replace the universal joints as required. Refer to Symptoms - Propeller Shaft .

Cause	Correction
Front or rear axle bearings worn	NOTE: • A high pitch whine or low pitch rumble noise that increases as vehicle speed increase may be caused by worn axle bearings. • To determine if the noise is front axle related, remove the front propeller shaft and retest. Repair or replace the axle as required. Refer to Symptoms - Front Drive Axle , or Symptoms - Rear Drive Axle .
Transmission rear output shaft bearing worn	NOTE: A high pitch whine or low pitch rumble noise that increases as transmission output shaft speed increases may be caused by a worn transmission output shaft bearing. Repair or replace the transmission as required. Refer to Symptoms - Automatic Transmission .
Transfer case fluid level low	NOTE: A high pitch whine or low pitch rumble noise that increases as transmission output shaft speed increases may be caused by a low transfer case fluid level. Fill the transfer case to the correct fluid level and retest.
Transfer case input shaft bearing worn	NOTE: A high pitch whine or low pitch rumble noise that increases as transmission output shaft speed increases may be caused by a worn transfer case input shaft bearing. Replace the bearing as required. Refer to Transfer Case Disassemble, and Transfer Case Assemble.
Transfer case rear output shaft bushing worn	NOTE: • An excessively worn bushing may be indicated by a leaking rear output shaft seal. • A high pitch whine or low pitch rumble noise that increases as vehicle speed increases may be caused by a worn transfer case rear output shaft bushing. Replace the rear output shaft bushing and propeller shaft slip yoke as required. Refer to Transfer Case Disassemble, and Transfer Case Assemble.
Transfer case front or rear output shaft bearings worn	NOTE: A high pitch whine or low pitch rumble noise that increases with road speed may be caused by the front or rear output shaft bearing. Replace the bearings as required. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

Cause	Correction
Transfer case planetary carrier gears worn	NOTE: • A high pitch whine or low pitch rumble noise that increases in 2HI only may be caused by worn or damaged planetary gears and High/Low internal gear damage. • A whine noise that occurs in either 2HI or 4HI may be caused by worn planetary gear needle bearings or shafts. • A high pitch whine that occurs in 4LO may be caused by worn planetary gears or High/Low internal gear. Repair as required 1. Inspect for the following: • Chipped, bent, or deformed teeth • Planetary gear needle bearings worn • Planetary gear thrust washers cracked or missing • Seized or binding planetary gears 2. Replace the planetary components as required.

TRANSFER CASE GROWL OR GRINDING NOISE

Cause	Correction
DEFINITION: a faulty internal transfer case component that causes a low pitch growl or grinding noise in the transfer case while the vehicle is turning left or right or in a four wheel drive mode. A low pitch growl noise with the vehicle in 4LO or 4HI is to be considered normal. NQ7 transfer case applications are noisier by design in 4HI mode than are in 2WD mode. 1. Compare the noise to a similar vehicle to see if a normal condition. 2. Identify the source of the noise using chassis ears and refer to the appropriate service manual section. 3. Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). 4. Note if the noise relative to vehicle speed, is noisy on turns, or other specifics. 5. If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Tire wear	NOTE: A growl noise that increases as vehicle speed increases may be caused by tires that are unevenly worn, unevenly inflated, or have an aggressive tread pattern. Rotate or substitute tires and retest. Refer to: Tire and Wheel Inspection

Cause	Correction
Propeller shaft universal joints worn	NOTE: A growl or grinding noise that increases as vehicle speed increase may be caused by worn universal joints. Replace the universal joints as required. Refer to: Symptoms - Propeller Shaft
Front or rear axle bearings worn	NOTE: • A growl or grinding noise that increases as vehicle speed increases may be caused by worn axle bearings. • To determine if the noise is front axle related, remove the front propeller shaft and retest. Repair or replace the axle as required. Refer to: Symptoms - Front Drive Axle , or Symptoms - Rear Drive Axle
Transmission rear output shaft bearing worn	NOTE: A growl or grinding noise that increases as transmission output shaft speed increases may be caused by a worn transmission output shaft bearing. Replace transmission components as required. Refer to: Symptoms - Automatic Transmission
Transfer case fluid level low	NOTE: A growl or grinding noise that increases as transmission output shaft speed increases may be caused by a low transfer case fluid level. Fill the transfer case to the correct fluid level and retest.
Transfer case input shaft bearing worn	NOTE: A high pitch whine or low pitch rumble noise that increases as transmission output shaft speed increases may be caused by a worn transfer case input shaft bearing. Replace the bearing as required. Refer to: Transfer Case Disassemble, and Transfer Case Assemble
Transfer case rear output shaft bushing worn	NOTE: • An excessively worn bushing may be indicated by a leaking rear output shaft seal. • A growl or grinding noise that increases as vehicle speed increases may be caused by a worn transfer case rear output shaft bushing. Replace the rear output shaft bushing and propeller shaft slip yoke as required. Refer to: Transfer Case Disassemble, and Transfer Case Assemble

Cause	Correction
Transfer case front or rear output shaft bearings worn	NOTE: A high pitch whine or low pitch rumble noise that increases with road speed may be caused by the front or rear output shaft bearing. Replace the bearings as required. Refer to: Transfer Case Disassemble, and Transfer Case Assemble
Transfer case shift fork inserts broken or missing	A growl, rattle, or grinding noise that occurs when a shift is commanded may be caused by broken or missing shift fork inserts which may lead to incomplete engagement of the synchronizer teeth. Refer to: High/Low Shift Components Cleaning and Inspection Replace the shift forks and inserts as required. Refer to: Transfer Case Disassemble, and Transfer Case Assemble
Transfer case range sleeve or input shaft gears worn	A growl or grinding noise that occurs when a shift is commanded may be caused by worn High/Low clutch gears and incomplete engagement. Repair or replace as required.
Transfer case planetary carrier gears worn	NOTE: • A high pitch whine or low pitch rumble noise that increases in 2HI only may be caused by worn or damaged planetary gears and ring gear damage. • A whine noise that occurs in either 2HI or 4HI may be caused by worn planetary gear needle bearings or shafts. • A high pitch whine that occurs in 4LO may be caused by worn planetary gears or High/Low internal gear. Repair as required 1. Inspect for the following: • Chipped, bent, or deformed teeth • Planetary gear needle bearings worn • Planetary gear thrust washers cracked or missing • Seized or binding planetary gears Refer to: High/Low Planetary Carrier Cleaning and Inspection 2. Replace the planetary components as required.

TRANSFER CASE CLUNK IN 2HI ONLY

Cause	Correction

Cause	Correction
DEFINITION: A faulty internal transfer case component that causes a clunk that is heard or felt during acceleration or deceleration with the transfer case in 2HI mode only. 1. Compare the noise to a similar vehicle to see if a normal condition. 2. Identify the source of the noise using chassis ears and refer to the appropriate service manual section. 3. Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). 4. Note if the noise relative to vehicle speed, is noisy on turns, or other specifics. 5. If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Transmission or transfer case mounts loose or damaged	Repair or replace the mounts as required.
Rear propeller shaft universal joints worn	Replace the universal joints as required. Refer to Symptoms - Propeller Shaft .
Transfer case rear output shaft bushing worn	NOTE: An excessively worn bushing may be indicated by a leaking rear output shaft seal. Replace the rear output shaft bushing and propeller shaft slip yoke as required.
Suspension components worn	Replace the suspension components as required. Refer to Noise Diagnosis - Front Suspension , or Noise Diagnosis - Rear Suspension .
Front axle actuator shift noise	NOTE: When shifting from 2WD-to-4WD or 4WD-to-2WD, the front axle actuator may be heard engaging or disengaging and the axle internal components shifting. This is to be considered a normal condition. Shift from 2WD-to-4WD and from 4WD-to-2WD to determine if the noise source is the front axle to determine if this is a normal condition.
Rear output shaft spline-to-propeller shaft slip yoke spline-excessive clearance	NOTE: A clunk condition in 2WD heard when the vehicle comes to a stop or from a stop-to-acceleration situation may be caused by excessive clearance between of the splines of the rear output shaft and propeller shaft slip yoke. Replace the following components: • Rear output shaft. Refer to Transfer Case Disassemble, and Transfer Case Assemble. • Propeller shaft slip yoke. Refer to Propeller Shaft Slip Yoke Replacement.

Cause	Action
Transfer Case Rear Output Shaft Rear Bearing Retaining Ring Incorrectly Installed	- Inspect for the following: - Improperly installed rear output shaft rear bearing retaining ring. The snap ring is to be installed completely into the OD groove of the bearing. - Excessive wear or damaged retaining ring groove in the rear case half. - Repair or replace the following components as required: - Properly install a new rear output shaft rear bearing outer retaining ring. - Replace the rear case half if the retaining ring groove is excessively worn. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

TRANSFER CASE CLUNK IN 4HI

Cause	Action
DEFINITION: During acceleration or deceleration, a clunk is heard or felt in the transfer case while in the 4HI range only. - Compare the noise to a similar vehicle and see if a normal condition. - Identify the source of the noise using chassis ears and refer to the appropriate service manual section. - Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). - Note if the noise relative to vehicle speed, is noisy on turns, during acceleration, stops, or other specifics. - If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Tire pressure uneven	NOTE: A clunk condition that occurs when performing slow speed turns in 4WD may be caused by low or uneven tire pressure. - Set the tires to the recommended vehicle tire pressure for evaluation to see if the noise goes away. - Upon completion of the test, reset the tire pressure to the correct pressure as recommended on the tire.
Transmission or transfer case mounts loose or damaged	Repair or replace the mounts as required
Propeller shaft universal joints worn	Replace the universal joints as required. Refer to Symptoms - Propeller Shaft

Cause	Action
Front axle actuator shift noise	NOTE: When shifting from 2WD-to-4WD or 4WD-to-2WD, the front axle actuator may be heard engaging or disengaging and the axle internal components shifting. This is to be considered a normal condition. Shift from 2WD-to-4WD and from 4WD-to-2WD to determine if the noise source is the front axle to determine if this is a normal condition.
Suspension components worn	Replace the suspension components as required. Refer to Noise Diagnosis - Front Suspension , or Noise Diagnosis - Rear Suspension .
4WD gear noise	NOTE: A growl or clunk that occurs with vehicle in 4WD at low speed in a tight turning radius situation may be caused by the gears and chain and is to be considered a normal condition and an operating characteristic of a 4WD system. Operated the vehicle in 4WD performing low speed left or right turns to confirm a transfer case gear noise.
Transfer case planetary carrier gears worn	NOTE: • A clunk in 4HI noise that increases in 2HI only may be caused by worn or damaged planetary gears and High/Low internal gear damage. • A clunk in noise that occurs in either 2HI or 4HI may be caused by worn planetary gear needle bearings or shafts. • A clunk that occurs in 4LO may be caused by worn planetary gears or High/Low internal gear. Repair as required. 1. Inspect the following: • Chipped, bent, or deformed teeth • Planetary gear needle bearings worn • Planetary gear thrust washers cracked or missing • Seized or binding planetary gears Refer to High/Low Planetary Carrier Cleaning and Inspection. 2. Replace the planetary components as required.

Cause	Correction
Transfer case rear output shaft rear bearing retaining ring-incorrectly installed	- Inspect for the following: - Improperly installed rear output shaft rear bearing outer retaining ring. The snap ring is to be installed completely into the OD groove of the bearing. - Excessive wear or damaged retaining ring groove in the rear case half - Repair or replace the following components as required: - Properly install a new rear output shaft rear bearing outer retaining ring. - Replace the rear case half if the retaining ring groove is excessively worn. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

TRANSFER CASE CLUNK IN 4LO

Cause	Correction
DEFINITION: During acceleration or deceleration, a clunk is heard or felt in the transfer case while in the 4LO range only. It is typical for the vehicle to exhibit significant engagement noise and bump when shifting between Four-Wheel Drive Low and Four-Wheel Drive High ranges or from transfer case N (Neutral) with the engine running. - Review the correct owner's manual shifting procedures with the customer. - Compare the noise to a similar vehicle and see if a normal condition. - Identify the source of the noise using chassis ears and refer to the appropriate service manual section. - Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). - Note if the noise relative to vehicle speed, is noisy on turns, during acceleration, stops, or other specifics. - If the source of the noise is the transfer case, inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Tire pressure uneven	NOTE: A clunk condition that occurs when performing slow speed turns in 4WD may be caused by low or uneven tire pressure. - Check the tire pressure and adjust as required to the value recommended by the label on the vehicle. - Road test the vehicle
Transmission or transfer case mounts loose or damaged	Repair or replace the mounts as required
Propeller shaft universal joints worn	Replace the universal joints as required. Refer to Symptoms - Propeller Shaft .

Cause	Correction
Front axle actuator shift noise	NOTE: When shifting from 2WD-to-4WD or 4WD-to-2WD, the front axle actuator may be heard engaging or disengaging and the axle internal components shifting. This is to be considered a normal condition. Shift from 2WD-to-4WD and from 4WD-to-2WD to determine if the noise source is the front axle to determine if this is a normal condition.
Suspension components worn	Replace the suspension components as required. Refer to Noise Diagnosis - Front Suspension , or Noise Diagnosis - Rear Suspension .
Tire scuffing noise	NOTE: A growl or clunk that occurs with vehicle in 4WD at low speed in a tight turning radius situation may be caused by a tire scuffing type noise and is to be considered a normal condition and operating characteristic of a part-time 4WD system. Operated the vehicle in 4WD performing low speed left and right turns to confirm a tire scuffing type noise.
Transfer case planetary carrier gears worn	NOTE: • A clunk in 4HI noise that increases in 2HI only may be caused by inspect for worn or damaged planetary gears and High/Low internal gear damage. • A clunk in noise that occurs in either 2HI or 4HI may be caused by worn planetary gear needle bearings or shafts. • A clunk that occurs in 4LO may be caused by worn planetary gears or High/Low internal gear. Repair as required 1. Inspect for the following: • Chipped, bent, or deformed teeth • Planetary gear needle bearings worn • Planetary gear thrust washers cracked or missing • Seized or binding planetary gears Refer to High/Low Planetary Carrier Cleaning and Inspection. 2. Replace the planetary components as required.

TRANSFER CASE WILL NOT SHIFT

Cause	Correction

Cause	Correction
DEFINITION: The transfer case will not shift from 2WD to 4WD or there is a gear clashing when shifting from HI to LO modes. When shifting from 2HI or 4HI to 4LO, the transmission must be in neutral and the vehicle speed below 3mph. 1. Review the correct owners manual shifting procedures with the customer. 2. Inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Front axle actuator	NOTE: A transfer case that will not shift into 4WD may be caused by the front axle actuator. If the symptoms occur during cold temperatures, flush and fill the front axle with synthetic fluid. Refer to: Front Axle Lubricant Level Inspection . 1. Perform the Diagnostic System Check - Vehicle before using the symptom tables, in order to verify the following conditions are true: • There are no diagnostic trouble codes (DTCs) present. • The control modules can communicate via the serial data link. 2. Inspect for an intermittent. Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to: Testing for Intermittent Conditions and Poor Connections , Some symptoms may be caused by loose wiring. Test the system after moving or connecting harnesses, but before replacing parts. Refer to: Four-Wheel Drive Does Not Engage
Electrical system	1. Perform the Diagnostic System Check - Vehicle before using the symptom tables, in order to verify the following conditions are true: • There are no diagnostic trouble codes (DTCs) present. • The control modules can communicate via the serial data link. 2. Inspect for an intermittent. Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to: Testing for Intermittent Conditions and Poor Connections , Some symptoms may be caused by loose wiring. Test the system after moving or connecting harnesses, but before replacing parts. Refer to: Four-Wheel Drive Does Not Engage

Cause	Correction
Cause	Correction
Transfer case synchronizer components worn - RANGE shift clash	NOTE: A range shift clash is defined as gear grinding type noise when shifting the transfer case. If the symptoms occur during cold temperatures, flush and fill the front axle with synthetic fluid. Refer to: Front Axle Lubricant Level Inspection - Inspect for the following: - Worn synchronizer components - Broken or damaged shift fork pads. Refer to: High/Low Shift Components Cleaning and Inspection, and Two/Four Wheel Drive Shift Components Cleaning and Inspection - Worn gear teeth - Replace components as required
Transfer case shift fork inserts broken or missing	NOTE: A growl, rattle, or grinding noise that occurs when a shift is commanded may be caused by broken or missing shift fork inserts which may lead to incomplete engagement of the synchronizer teeth. Refer to: High/Low Shift Components Cleaning and Inspection, and Two/Four Wheel Drive Shift Components Cleaning and Inspection Replace the shift forks and inserts as required. Refer to: Transfer Case Disassemble, and Transfer Case Assemble
Transfer case High/Low clutch - gear tooth damage	NOTE: Excessive gear tooth damage may cause a will not shift or gear clash when shifting condition. - Inspect the gear teeth for excessive damage. Refer to: High/Low Shift Components Cleaning and Inspection - Inspect the splines of the High/Low clutch and rear output shaft to ensure the clutch moves freely on the shaft. - Replace Components as required.
Transfer case High/Low planetary carrier assembly	NOTE: In situations where there is excessive input shaft gear teeth wear, it may not be possible to engage 4LO. - Inspect the planetary gears and High/Low internal gear for wear or damage. Refer to: High/Low Planetary Carrier Cleaning and Inspection - Inspect the input shaft gear teeth for wear or damage. - Replace components as required.

TRANSFER CASE JUMPS OUT OF GEAR

Cause	Correction
DEFINITION: Loss of the transfer case drive torque during deceleration, acceleration or under load or the transfer case jumps out of gear and into a neutral position. Inspect for the correct fluid level. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Transfer case shift fork broken or fork inserts broken or missing	NOTE: A growl, rattle, or grinding noise that occurs when a shift is commanded may be caused by broken or missing shift fork inserts which may lead to incomplete engagement of the synchronizer teeth. Refer to: High/Low Shift Components Cleaning and Inspection , and Two/Four Wheel Drive Shift Components Cleaning and Inspection Replace the shift forks and inserts as required. Refer to: Transfer Case Disassemble , and Transfer Case Assemble

TRANSFER CASE LEAK DIAGNOSIS

Cause	Correction
transmissionmanuals.com	

Cause	Correction
DEFINITION: A visible indication of an external fluid leak from the transfer case. Review the Symptoms - Transfer Case and perform the necessary inspections. See below for suggested diagnostic method(s). Special Tools GE-28431-6 Fluorescent Oil Dye GE-28428-E High Intensity Black Light Kit Refer to: Special Tools Fluorescent Dye Method 1. Add GE-28431-6 Fluorescent dye to the transmission or transfer case to determine the source of the leak. 2. Operate the vehicle. 3. Inspect for the presence of dye within the oil leak using the GE-28428-E High Intensity Black Light Kit. A presence or non-presence of dye within the oil leak will indicate which component is the source of the leak. Powder Method CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings. 1. Thoroughly clean the suspected leak area using a rag. 2. Apply an aerosol type leak tracing powder to the suspected leak area. NOTE: Do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis. 3. Operate the vehicle for 15-20 minutes under city driving conditions until normal operating temperatures are reached. 4. Shut OFF the engine. 5. Inspect the suspected leak area. 6. Trace the leak path through the powder in order to find the source of the leak.	
Transfer case adapter leak	1. Inspect for a restricted vent hose assembly. Repair as required. 2. Add GE-28431-6 Fluorescent Oil Dye to the transmission to determine the source of the leak. 3. Operate the vehicle 4. Inspect the adapter weep hole for a fluid leak and for traces of dye within the oil using the GE-28428-E High Intensity Black Light Kit. 5. If fluorescent dye is present within the fluid leak, replace the transmission rear output shaft seal. 6. If fluorescent dye is not present within the fluid leak, replace the transfer case input shaft oil seal. Refer to: Transfer Case Fluid Replacement

Cause	Correction
Transfer case adapter leak and/or adapter gasket leak	NOTE: A leak at the transmission-to-transfer case adapter weep hole location may caused by either a leaking transmission rear output shaft oil seal or a leaking transfer case input shaft oil seal. Neither the adapter nor the gasket is the source of the leak. Inspect the transfer case for an overfill condition. Refer to: Transfer Case Fluid Replacement
Vent hose leak	1. Inspect the transfer case for an overfill condition. Refer to: Transfer Case Fluid Replacement 2. Inspect for a loose, disconnected, restricted, or damaged vent hose assembly. 3. Replace components as required.
Drain plug or fill plug leak	1. Inspect for the correct amount and type of sealer on the plugs. Refer to: Adhesives, Fluids, Lubricants, and Sealers 2. Install the correct sealer onto the threads of the plugs and tighten to the correct torque value. Refer to Transfer Case Fluid Replacement.
Rear output shaft bearing snap ring access hole plugs leak	Replace the access hole plugs as required.
Vehicle speed sensor (VSS) leak	1. Remove the VSS. Refer to Vehicle Speed Sensor Replacement. 2. Inspect the VSS for a cut or damaged VSS O-ring seal 3. Replace the VSS O-ring seal or sensor as required.
Propeller shaft slip yoke cup plug leak	1. Inspect for a leaking cup plug in the rear of the propeller shaft slip yoke 2. Replace the yoke assembly as required.
Rear output shaft oil seal leak	1. Inspect for a restricted vent hose assembly. Repair as required. 2. Inspect for a transfer case for an overfill condition. 3. Inspect for a leaking rear output shaft oil seal. Refer to: Rear Output Shaft Seal Replacement 4. Inspect the propeller shaft slip yoke sealing surface for excessive wear, rust, or other damage. Minor abrasions may be repaired using very fine emery cloth sandpaper. Refer to: Symptoms - Propeller Shaft 5. Inspect the rear output shaft bushing for excessive wear. Refer to: Transfer Case Disassemble, and Transfer Case Assemble 6. Replace components as required.

Cause	Correction
Front output shaft oil seal leak	1. Inspect for a restricted vent hose assembly. Repair as required. 2. Inspect for a transfer case for an overfill condition. 3. Inspect for a leaking front output shaft oil seal. Refer to: Front Output Shaft Seal Replacement 4. Replace components as required.
Actuator shaft position sensor or O-ring seal leak	1. Inspect the sensor for porosity or a cut or damaged O-ring seal. 2. Replace components as required.
Two/four wheel drive actuator seal leak	1. Inspect for a leaking two/four wheel drive actuator motor seal leak. 2. Replace the motor and seal assembly as required.
Front case half-to-rear case half seam leak	Disassemble the transfer case and reseal the case halves. Refer to: Transfer Case Disassemble , and Transfer Case Assemble
Case leak	1. Inspect for a cracked case half or case porosity. 2. Add GE-28431-6 Fluorescent Oil Dye to the transfer case. 3. Operate the vehicle 4. Inspect the transfer case fluid leak for presence of dye within the oil using the GE-28428-E High Intensity Black Light Kit. Refer to: Transfer Case Disassemble, and Transfer Case Assemble

REPAIR INSTRUCTIONS - ON VEHICLE

TRANSFER CASE SELECTOR SWITCH REPLACEMENT

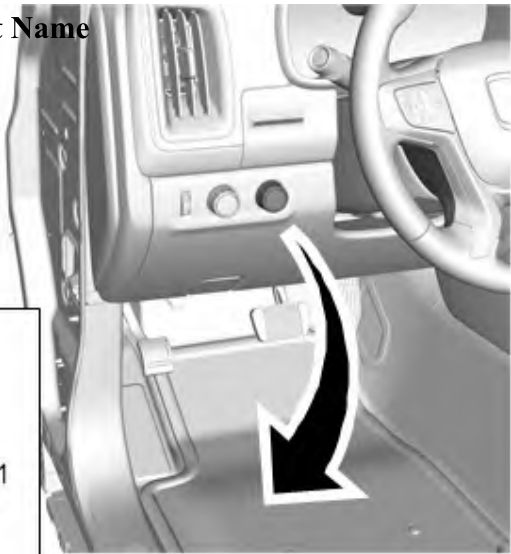
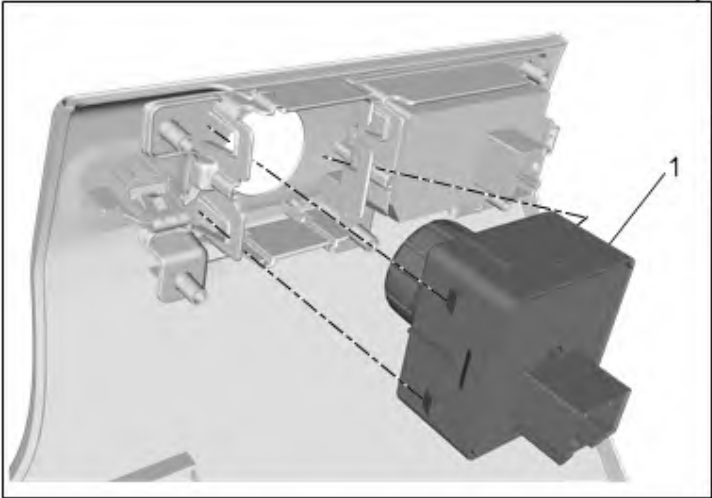


Fig. 6: Transfer Case Selector Switch
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove instrument panel knee bolster. Refer to Instrument Panel Knee Bolster Replacement .	
1	Transfer Case Selector Switch Procedure Using the appropriate tool gently depress tabs to remove the switch assembly from the bezel.

TRANSFER CASE CONTROL MODULE REPLACEMENT

Removal Procedure

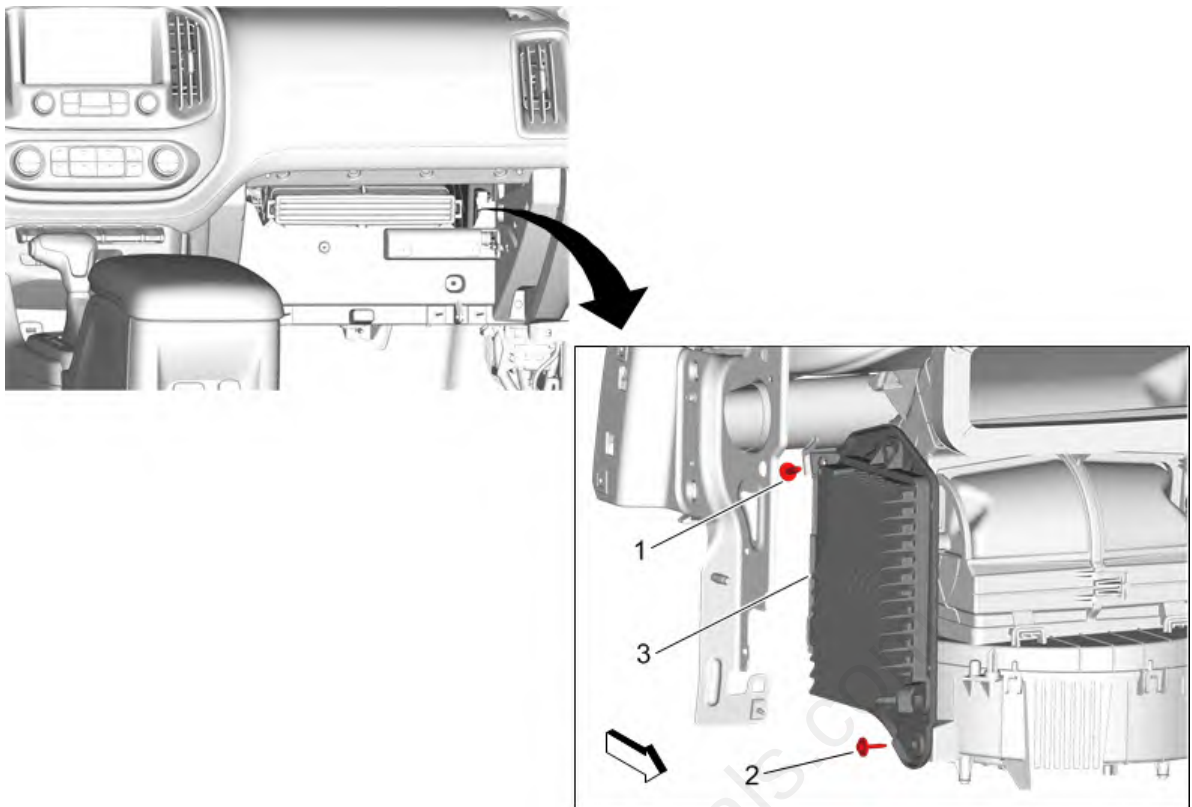


Fig. 7: Radio Speaker Amplifier

Courtesy of GENERAL MOTORS COMPANY

1. Remove the radio speaker amplifier. Refer to [Radio Speaker Amplifier Replacement](#) .

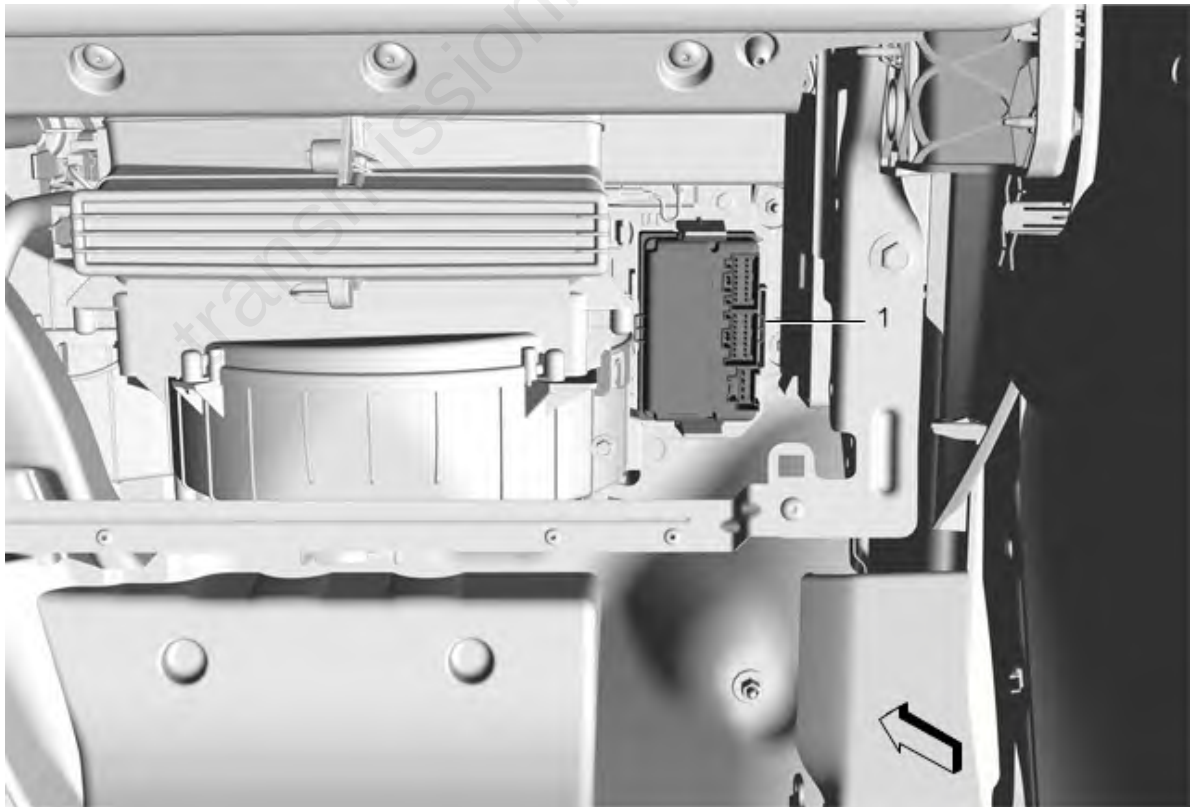


Fig. 8: Transfer Case Control Module

Courtesy of GENERAL MOTORS COMPANY

- ect the (3) electrical connectors from the transfer case control module (1).
3. Remove the module from the module bracket by releasing the retaining tabs.

Installation Procedure

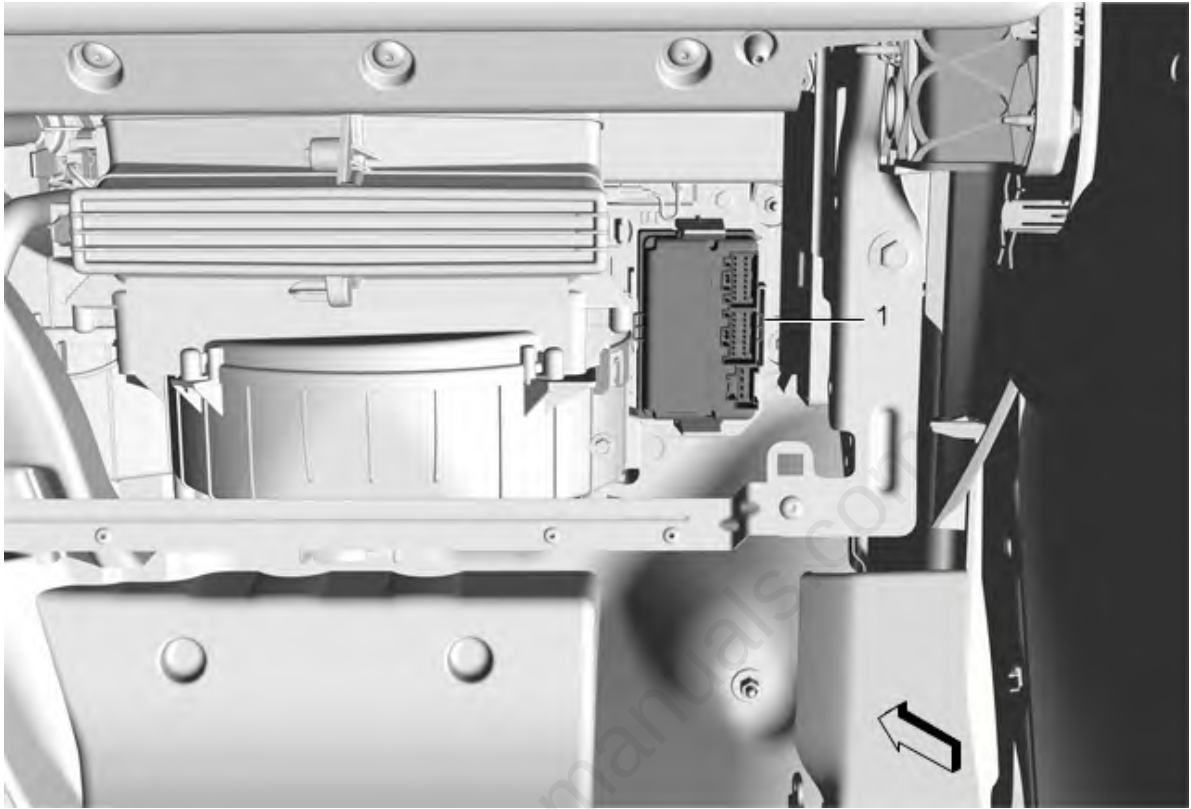


Fig. 9: Transfer Case Control Module

Courtesy of GENERAL MOTORS COMPANY

1. Install the module to the module bracket.
2. Connect the (3) electrical connectors to the transfer case control module (1).

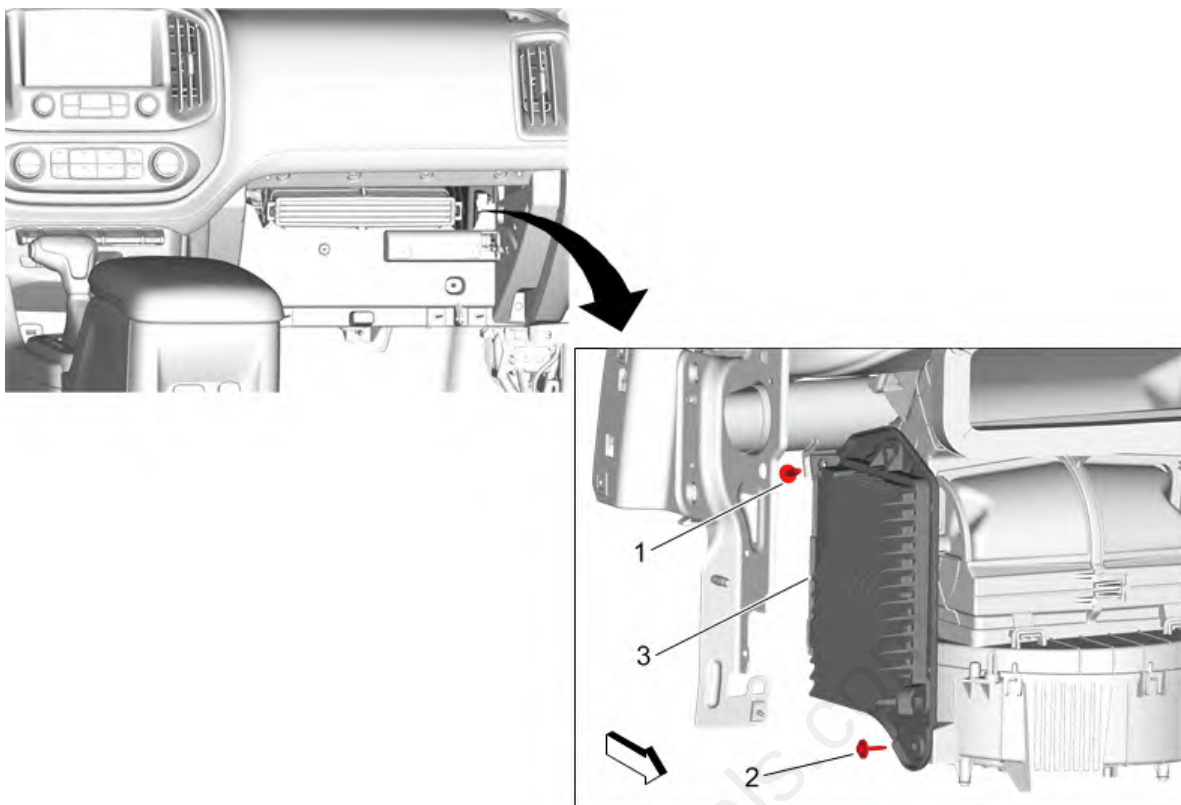


Fig. 10: Radio Speaker Amplifier

Courtesy of GENERAL MOTORS COMPANY

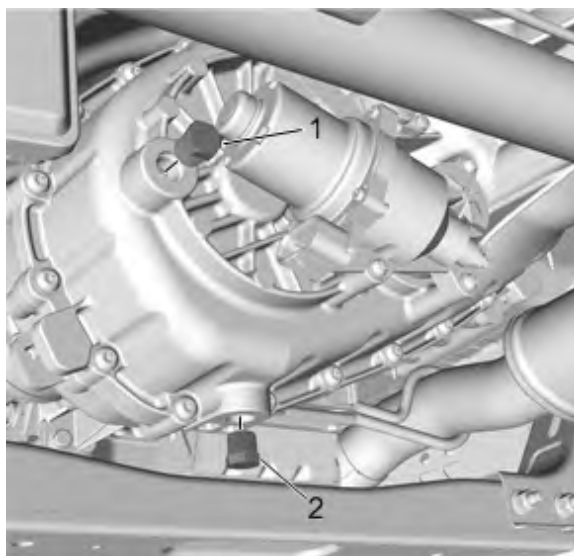
3. Install the radio speaker amplifier. Refer to [Radio Speaker Amplifier Replacement](#) .
4. If installing a new module, perform the transfer case shift control module programming and setup. Refer to [Control Module References](#) .

TRANSFER CASE FLUID REPLACEMENT

Removal Procedure

NOTE: When performing the following service procedures, use only hand tools to remove and install the fill or drain plugs.

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .



Fill Plug And Transfer Case

Courtesy of GENERAL MOTORS COMPANY

2. Remove the fill plug (1) from the transfer case.

NOTE: When draining the transfer case, make sure that an approved drain pan is used.

3. Remove the drain plug (2) from the transfer case.

Installation Procedure

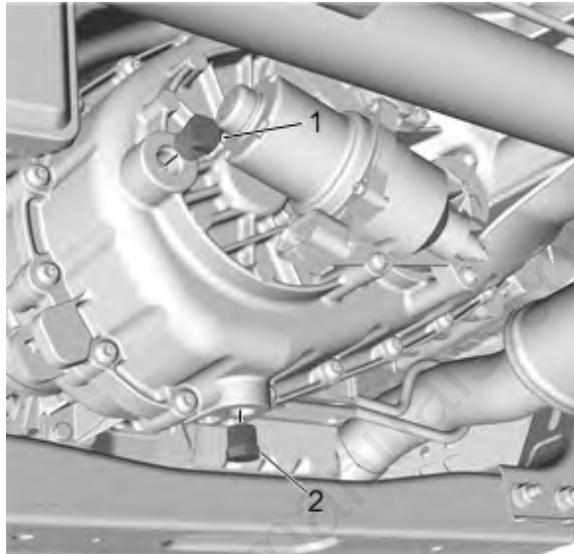


Fig. 12: Fill Plug And Transfer Case

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Component Fastener Tightening Caution .

1. Apply sealant to the threads on the drain plug (2). Refer to Adhesives, Fluids, Lubricants, and Sealers.
2. Install the drain plug in the transfer case and tighten the drain plug to 25 N.m (18 lb ft).
3. Fill the transfer case to the bottom of the fill hole with the proper fluid. Refer to Adhesives, Fluids, Lubricants, and Sealers.
4. Apply sealant to the threads on the fill plug (1). Refer to Adhesives, Fluids, Lubricants, and Sealers.
5. Install the fill plug and tighten to 25 N.m (18 lb ft).
6. Lower the vehicle.

TRANSFER CASE FOUR WHEEL DRIVE ACTUATOR REPLACEMENT

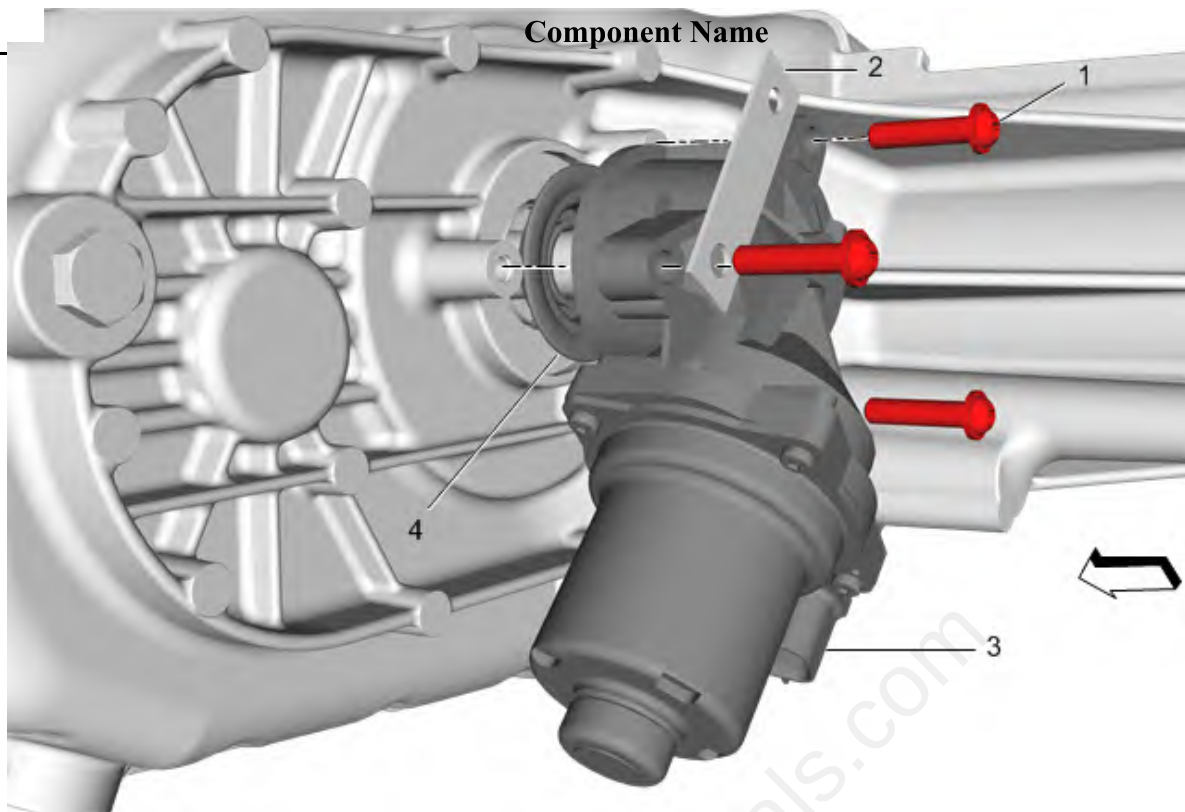


Fig. 13: Transfer Case Four Wheel Drive Actuator
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
1	Two/Four Wheel Drive Actuator Bolt (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 19 N.m (14 lb ft)
2	Identification Tag
3	Two/Four Wheel Drive Actuator
4	Two/Four Wheel Drive Actuator Seal

VEHICLE SPEED SENSOR REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Disconnect the electrical connector from the transfer case vehicle speed sensor.

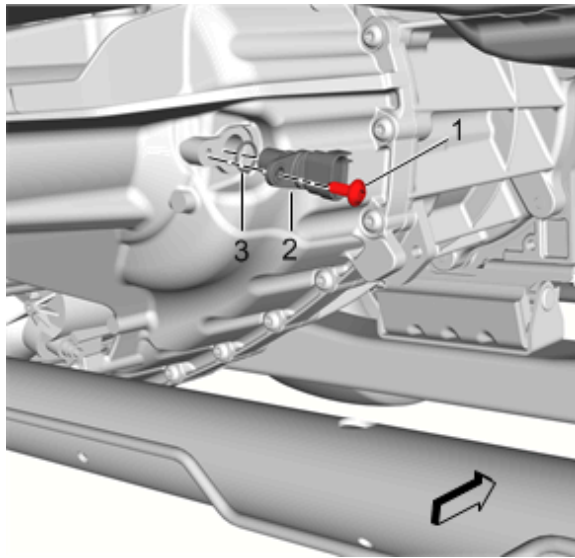


Fig. 14: Transfer Case Vehicle Speed Sensor Fastener And Sensor
Courtesy of GENERAL MOTORS COMPANY

3. Remove the transfer case vehicle speed sensor fastener (1) from the transfer case.
4. Remove the transfer case vehicle speed sensor (2) from the transfer case.
5. If necessary, remove and Discard the transfer case vehicle speed sensor O-ring (3).

Installation Procedure

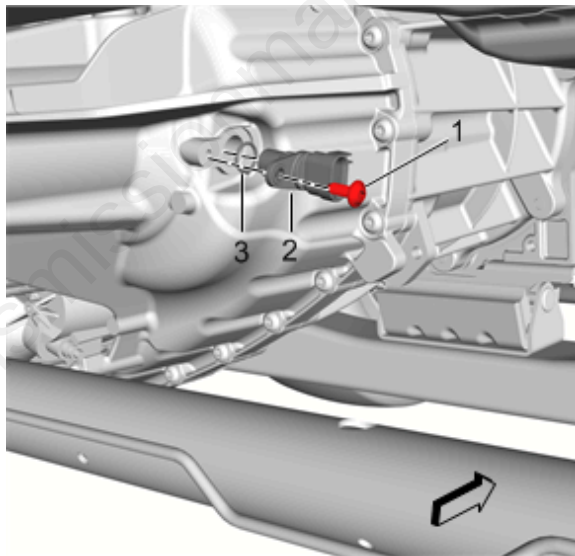


Fig. 15: Transfer Case Vehicle Speed Sensor Fastener And Sensor
Courtesy of GENERAL MOTORS COMPANY

1. If necessary, install a New transfer case vehicle speed sensor O-ring (3).
2. Install the transfer case vehicle speed sensor (2) into the transfer case.

CAUTION: Refer to **Fastener Caution** .

3. Install the transfer case vehicle speed sensor fastener (1) and tighten to 8 N.m (71 lb in).
4. Connect the electrical connector to the transfer case vehicle speed sensor.
5. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** .

PUT SHAFT SEAL REPLACEMENT

Removal Procedure

1. Remove the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .
2. Remove the front output shaft flange seal. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft removal in [Transfer Case Disassemble](#).

NOTE: Remove the front output shaft seal in two pieces using the following procedure.

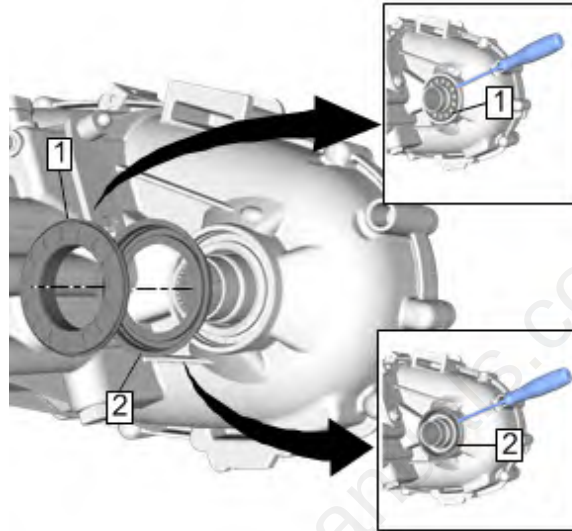


Fig. 16: Front Output Shaft Slinger And Oil Seal
Courtesy of GENERAL MOTORS COMPANY

3. Insert a screwdriver between the metal inner and metal outer portions of the seal.
4. Pry upward in multiple locations working the metal inner portion of the seal off the shaft until removed.
5. Once the inner metal portion is removed, insert a screwdriver between the outer diameter metal flange of the seal and the housing.
6. Drive the screwdriver inward in multiple locations, the outer portion of the seal will be distorted and can easily be removed from the housing.

Installation Procedure

1. Install the front output shaft flange seal. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft installation in [Transfer Case Assemble](#).
2. Install the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .

TRANSFER CASE FRONT OUTPUT SHAFT OIL SLINGER REPLACEMENT

Removal Procedure

1. Remove the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .
2. Remove the transfer case front output shaft oil slinger. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft removal in [Transfer Case Disassemble](#).

Installation Procedure

ie transfer case front output shaft oil slinger. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft installation in [Transfer Case Assemble](#).

2. Install the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .

TRANSFER CASE FRONT OUTPUT SHAFT FLANGE REPLACEMENT

Removal Procedure

1. Remove the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .
2. Remove the transfer case front output shaft flange. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft removal in [Transfer Case Disassemble](#).

Installation Procedure

1. Install the transfer case front output shaft flange. Refer to transfer case front output shaft flange, front output shaft seal and front output shaft installation in [Transfer Case Assemble](#).
2. Install the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .

REAR OUTPUT SHAFT SEAL REPLACEMENT

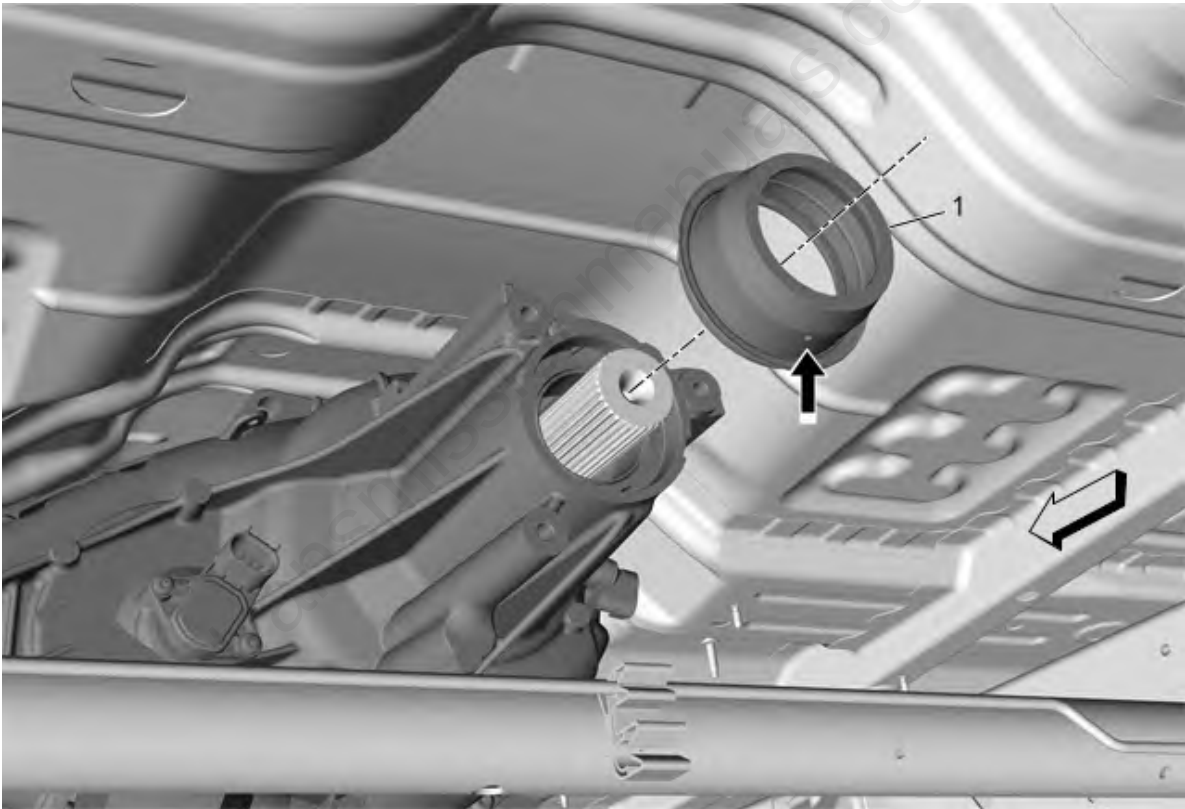


Fig. 17: Rear Output Shaft Seal
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: Do not damage the sealing surfaces of the transfer cases or the shafts when prying the seals for removal. Damaging the sealing surface may cause leakage or require replacement of the damaged component.	
Preliminary Procedure Remove the rear propeller shaft. Refer to Propeller Shaft Replacement (with MYB) Propeller Shaft Replacement (with N8D) .	

Component Name	
1	Transfer Case Output Shaft Seal
	Procedure
	1. Remove the seal using an appropriate tool. 2. Install the seal with the notch at the top and the weep hole at the bottom.
	Special Tools • DT-48210 Seal Installer • J-8092 Drive Handle
For equivalent regional tools, refer to Special Tools .	

TRANSFER CASE ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the propeller shaft. Refer to [Propeller Shaft Replacement \(with MYB\) Propeller Shaft Replacement \(with N8D\)](#) .
2. Remove the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .

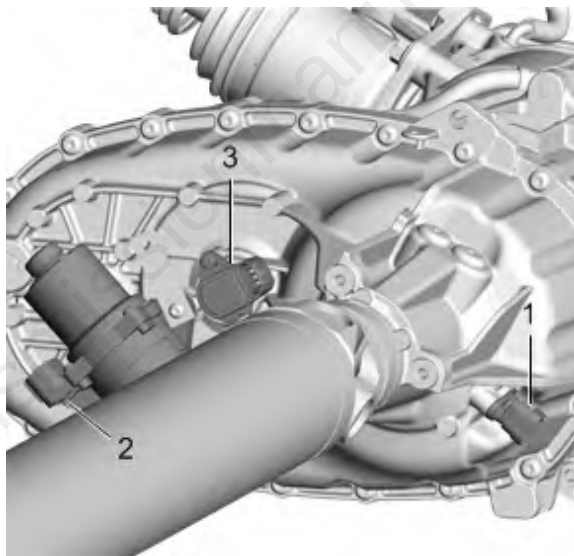


Fig. 18: Wiring Harness Electrical Connectors
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the wiring harness electrical connectors from the following:
 - Vehicle speed sensor (1)
 - Four wheel drive actuator (2)
 - Two/four wheel drive actuator position sensor (3)
4. Position the Transmission wiring harness aside.

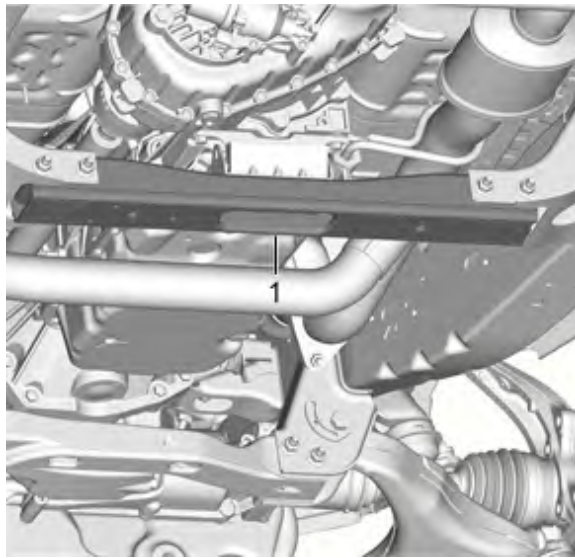


Fig. 19: Transmission Support Crossmember
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission support crossmember (1). Refer to [Transmission Support Crossmember Replacement \(4WD\)](#) [Transmission Support Crossmember Replacement \(2WD\)](#) .
6. Remove the transmission mount. Refer to [Transmission Mount Replacement \(4WD\)](#) [Transmission Mount Replacement \(2WD\)](#) .
7. Using a suitable transmission jack, support the transfer case.
8. Remove the four wheel drive actuator from the transfer case. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#) .

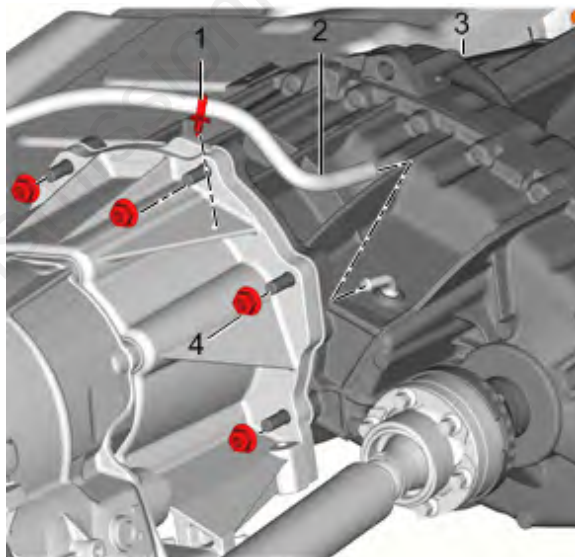


Fig. 20: Vent Hose Retainer And Vent Hose
 Courtesy of GENERAL MOTORS COMPANY

9. Disconnect the vent hose retainer (1) and the vent hose (2) from the transfer case.
10. Lower the transfer case to gain access to the top fasteners and remove the four left upper transfer case fasteners (4) from the transmission extension housing.

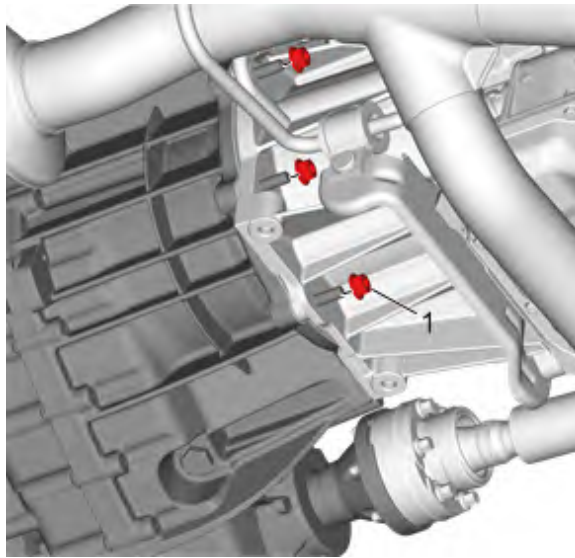


Fig. 21: Three Lower Right Side Fasteners

Courtesy of GENERAL MOTORS COMPANY

11. Remove the three lower right side fasteners (1) from the transmission extension housing.
12. With the aid of an assistant, carefully lower the transfer case from the vehicle.
13. Install the transmission mount. Refer to [Transmission Mount Replacement \(4WD\)](#) [Transmission Mount Replacement \(2WD\)](#) .
14. To support the transmission assembly, install the transmission support crossmember. Refer to [Transmission Support Crossmember Replacement \(4WD\)](#) [Transmission Support Crossmember Replacement \(2WD\)](#) .

Installation Procedure

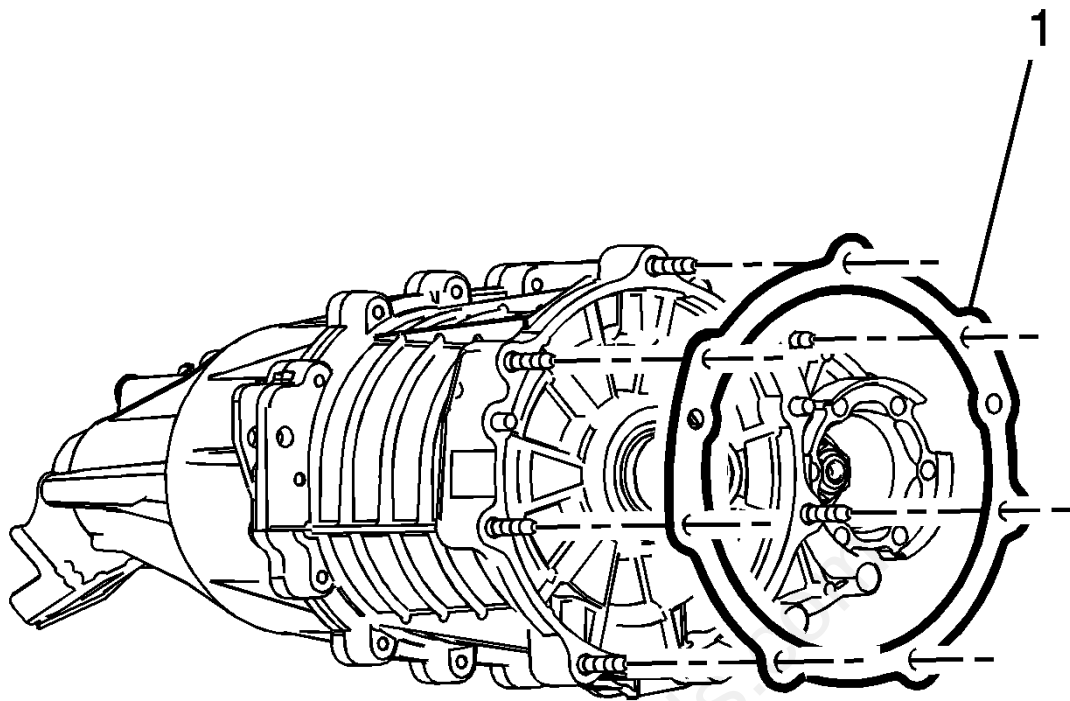


Fig. 22: New Transfer Case Extension Housing Gasket

Courtesy of GENERAL MOTORS COMPANY

1. Install a New transfer case extension housing gasket (1) on the transfer case.
2. With the aid of an assistant, carefully raise the transfer case to the transfer case extension housing, aligning the splines.
3. Install the 7 nuts on the transmission extension housing hand tight.
4. Remove the transmission support crossmember. Refer to [Transmission Support Crossmember Replacement \(4WD\)](#) [Transmission Support Crossmember Replacement \(2WD\)](#) .
5. To gain access to the lower fastener, remove the transmission mount. Refer to [Transmission Mount Replacement \(4WD\)](#) [Transmission Mount Replacement \(2WD\)](#) .

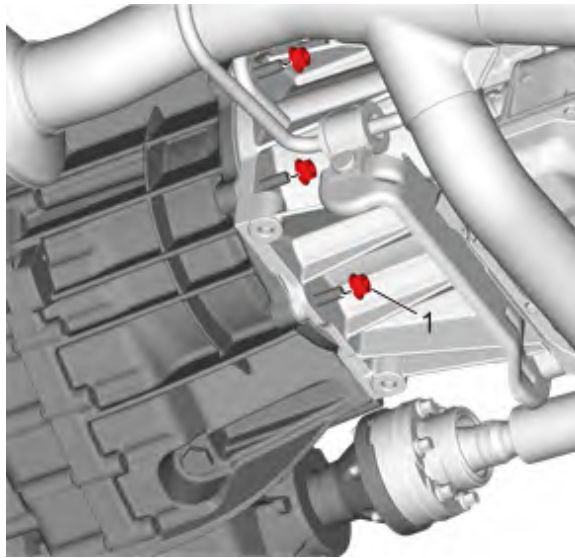


Fig. 23: Three Lower Right Side Fasteners

Courtesy of GENERAL MOTORS COMPANY

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

6. Install the three lower fasteners (1) on the transmission extension housing and tighten to 50 N.m (37 lb ft).

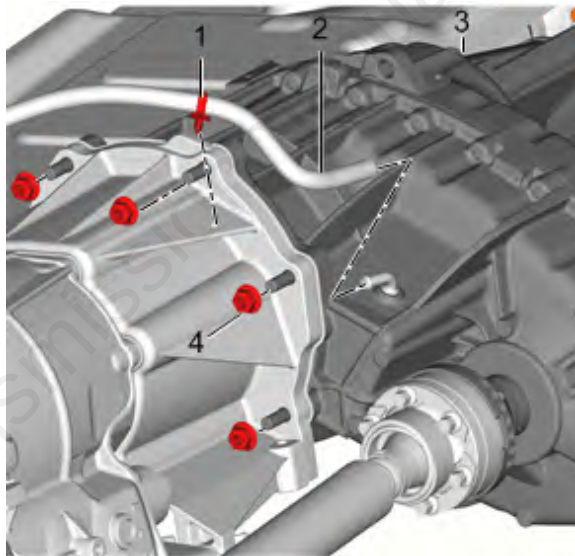


Fig. 24: Vent Hose Retainer And Vent Hose

Courtesy of GENERAL MOTORS COMPANY

7. Install the four upper transfer case fasteners (4) on the transmission extension housing and tighten to 50 N.m (37 lb ft).
8. Connect the vent hose (2) to the transfer case.
9. Connect the vent hose retainer (1) to the transfer case.
10. Install the transmission mount. Refer to [Transmission Mount Replacement \(4WD\)](#) [Transmission Mount Replacement \(2WD\)](#) .

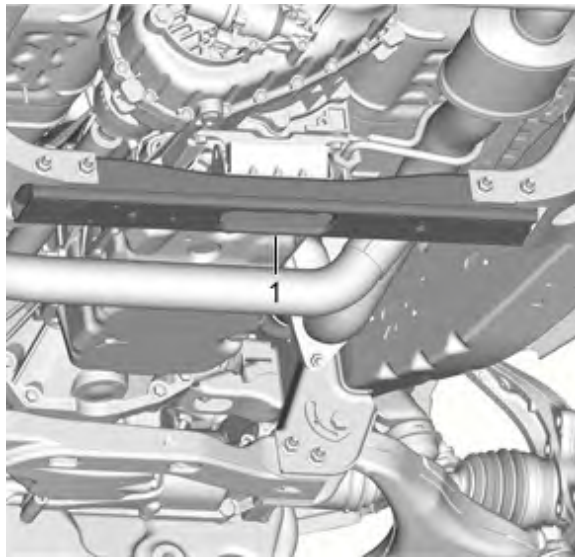


Fig. 25: Transmission Support Crossmember
 Courtesy of GENERAL MOTORS COMPANY

11. Install the transmission support crossmember (1). Refer to [Transmission Support Crossmember Replacement \(4WD\)](#) [Transmission Support Crossmember Replacement \(2WD\)](#) .
12. Install the four wheel drive actuator to the transfer case. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#) .
13. Position the transmission wiring harness to the transfer case assembly.

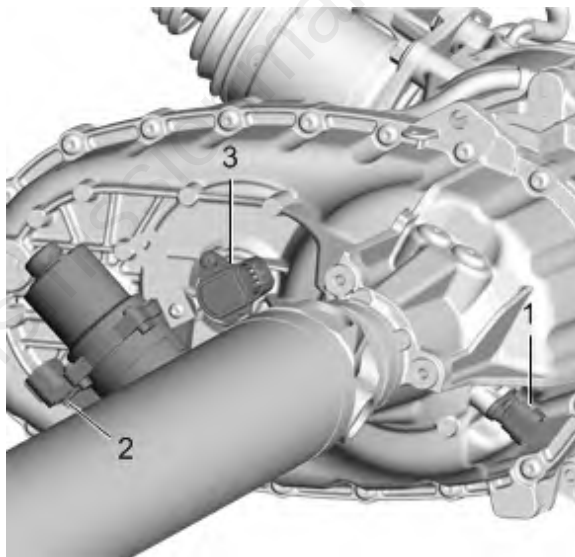


Fig. 26: Wiring Harness Electrical Connectors
 Courtesy of GENERAL MOTORS COMPANY

14. Connect the engine wiring harness electrical connectors to the following:
 - Vehicle speed sensor (1)
 - Four wheel drive actuator (2)
 - Two/four wheel drive actuator position sensor (3)
15. Install the propeller shaft. Refer to [Propeller Shaft Replacement \(with MYB\)](#) [Propeller Shaft Replacement \(with N8D\)](#) .
16. Install the front propeller shaft. Refer to [Front Axle Propeller Shaft Replacement](#) .

transfer case with fluid, if previously drained or lost from component replacement. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

TRANSFER CASE ADAPTER REPLACEMENT (EQUIPPED WITH LWN ENGINE)

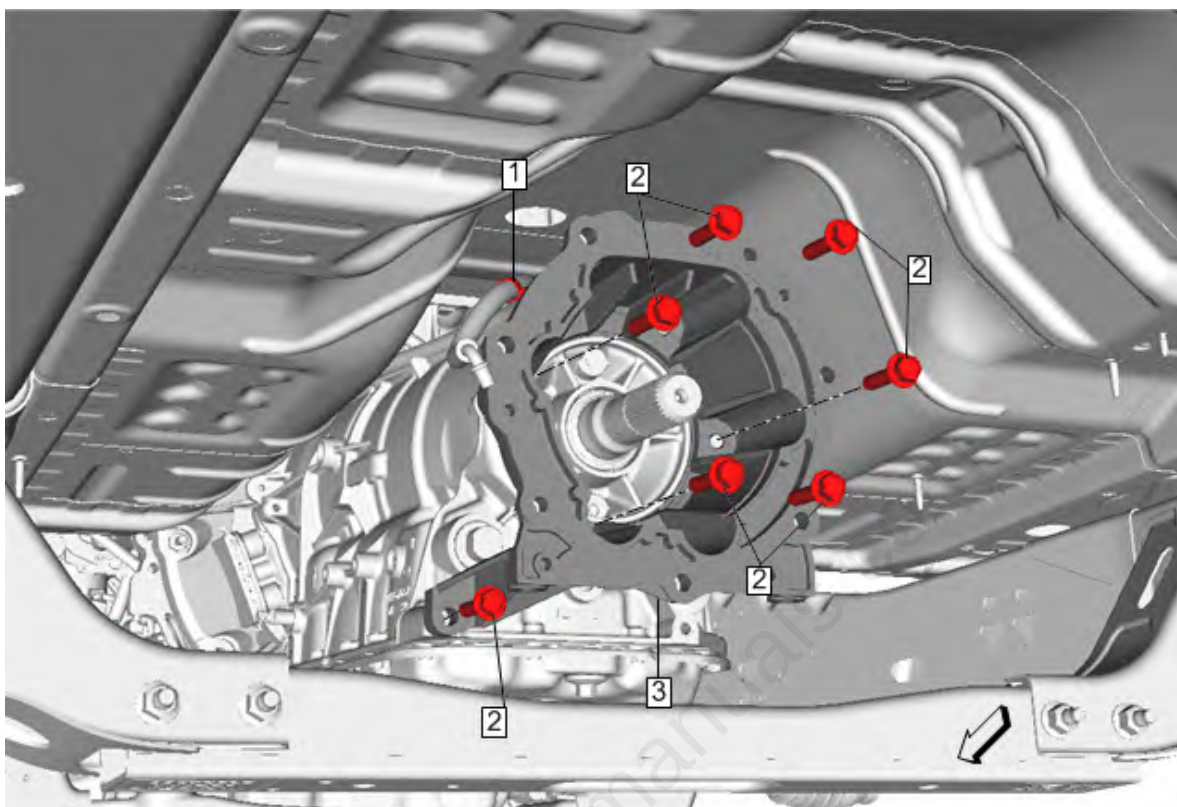


Fig. 27: Transfer Case Adapter

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the transfer case. Refer to Transfer Case Assembly Replacement .	
1	Transfer Case Vent Tube Retainer
2	Transfer Case Adapter Bolt (Qty: 7) CAUTION: Refer to Fastener Caution . Tighten 58 N.m (43 lb ft)
3	Transfer Case Adapter NOTE: Replace the transfer case adapter gasket.

TRANSFER CASE ADAPTER REPLACEMENT (EQUIPPED WITH LCV ENGINE)

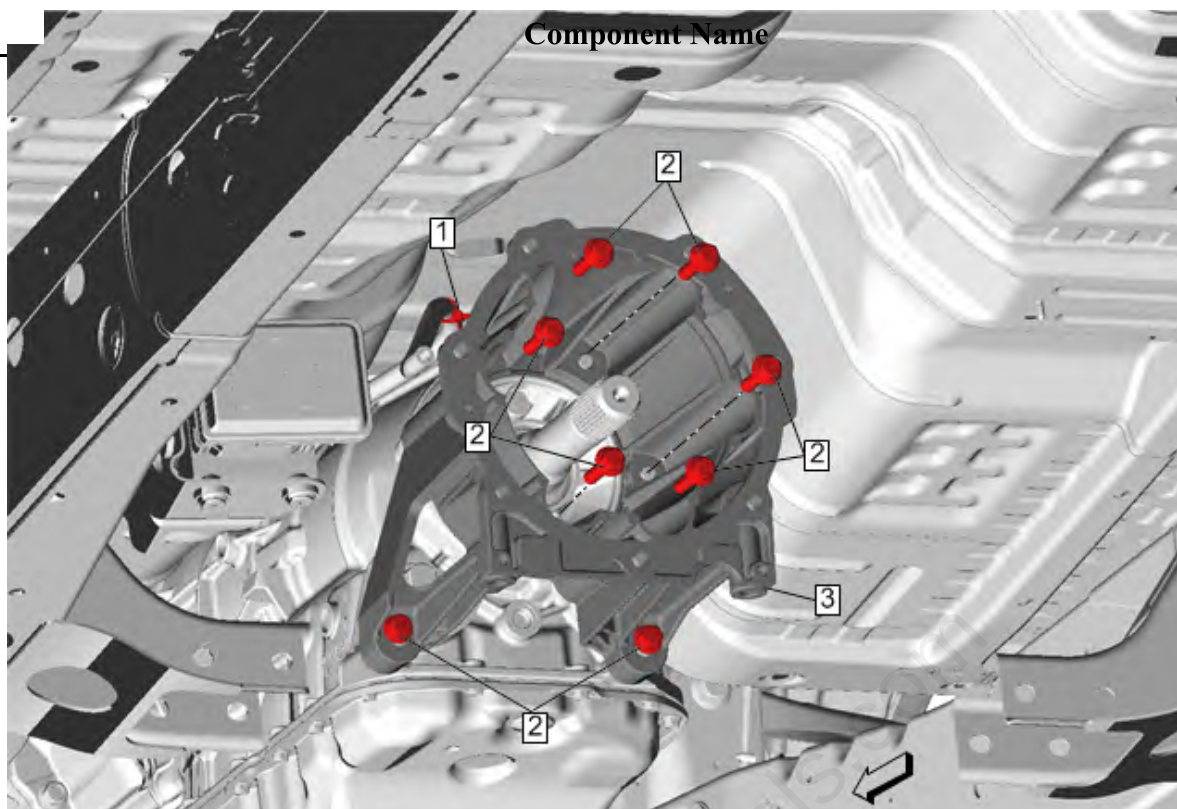


Fig. 28: Transfer Case Adapter (Equipped with LCV Engine)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the transfer case. Refer to Transfer Case Assembly Replacement .	
1	Transfer Case Vent Tube Retainer
2	Transfer Case Adapter Bolt (Qty: 8) CAUTION: Refer to Fastener Caution . Tighten 58 N.m (43 lb ft)
3	Transfer Case Adapter NOTE: Replace the transfer case adapter gasket.

INPUT SHAFT SEAL REPLACEMENT

Removal Procedure

1. Remove the transfer case. Refer to [Transfer Case Assembly Replacement](#).
2. Remove the input shaft seal from the transfer case. Refer to input shaft seal removal in [Transfer Case Disassemble](#).

Installation Procedure

ie input shaft seal. Refer to input shaft seal installation in [Transfer Case Assemble](#).

2. Install the transfer case. Refer to [Transfer Case Assembly Replacement](#).

TRANSFER CASE OIL FILL PLUG REPLACEMENT

Removal Procedure

NOTE: When performing the following service procedures, use only hand tools to remove and install the fill or drain plugs.

1. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).

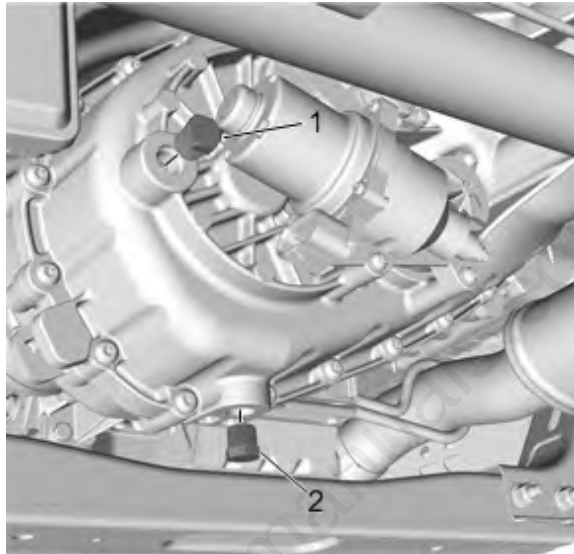


Fig. 29: Fill Plug And Transfer Case
Courtesy of GENERAL MOTORS COMPANY

2. Remove the fill plug (1) from the transfer case.

Installation Procedure

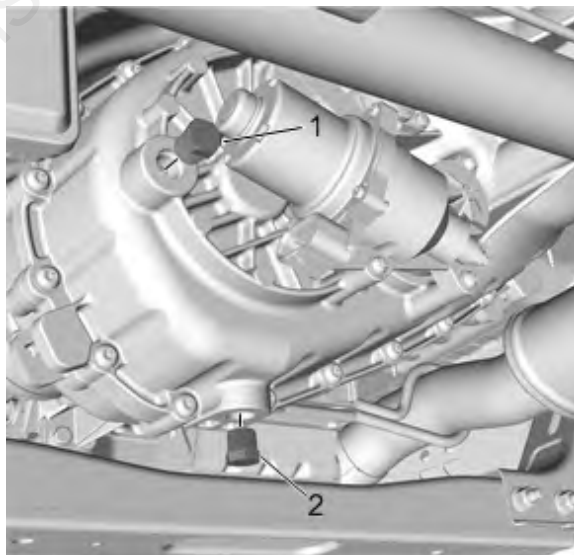


Fig. 30: Fill Plug And Transfer Case
Courtesy of GENERAL MOTORS COMPANY

1. Apply sealant to the threads on the fill plug (1). Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

Component Name Caution .

2. Install the fill plug (1) in the transfer case and tighten to 25 N.m (18 lb ft).
3. Lower the vehicle.

REPAIR INSTRUCTIONS - OFF VEHICLE

TRANSFER CASE DISASSEMBLE

Transfer Case Holding Fixture Installation

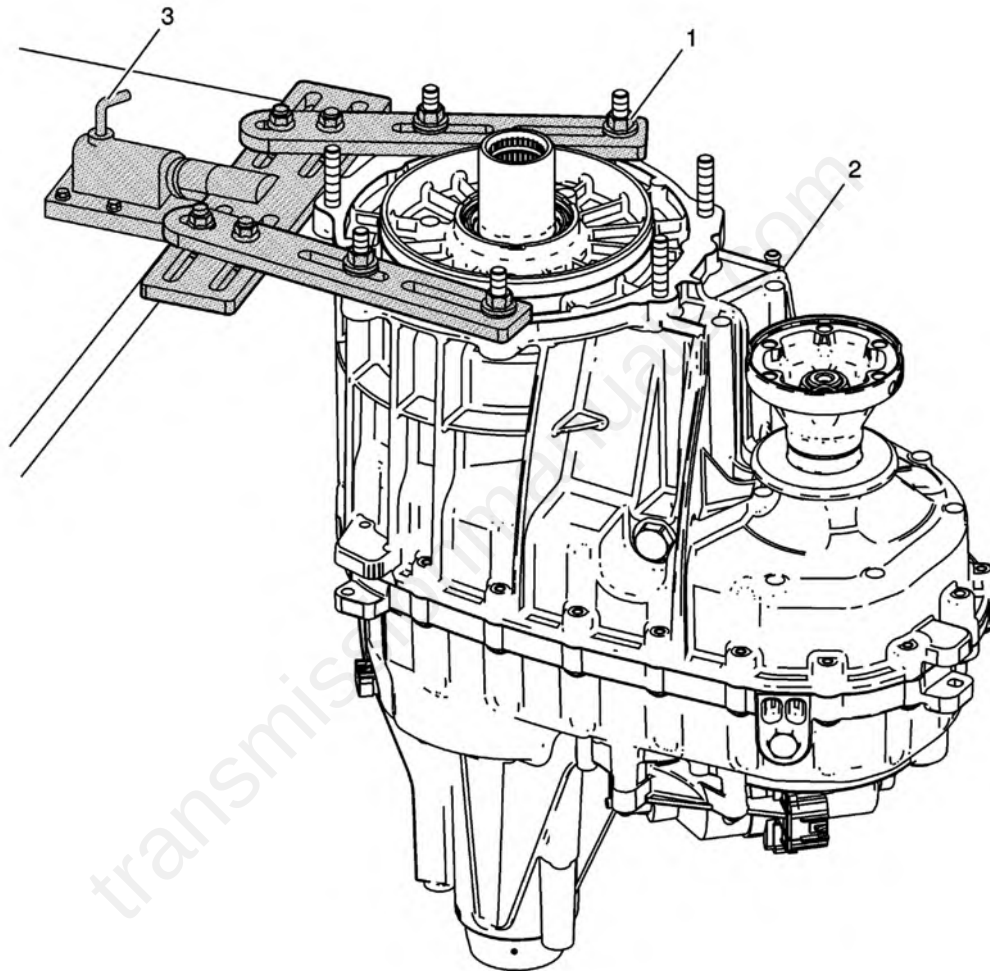


Fig. 31: Transfer Case Holding Fixture

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Holding Fixture Installation

Callout	Component Name

Component Name	
1	Transfer Case Nuts NOTE: Use nuts with M10 x 1.5mm threads. Special Tools DT-36842 Transaxle Holding Fixture Refer to: Special Tools.
2	Transfer Case Special Tools DT-3289-20 Holding Fixture
3	Pivot Pin NOTE: • Always secure with the pivot pin after rotating. • The transfer case can be rotated 360 degrees to facilitate repair.

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 2/4 Wheel Drive Actuator, Actuator Shaft Position Sensor, Transfer Case Shift Detent Plunger Plug, and Vehicle Speed Sensor Removal

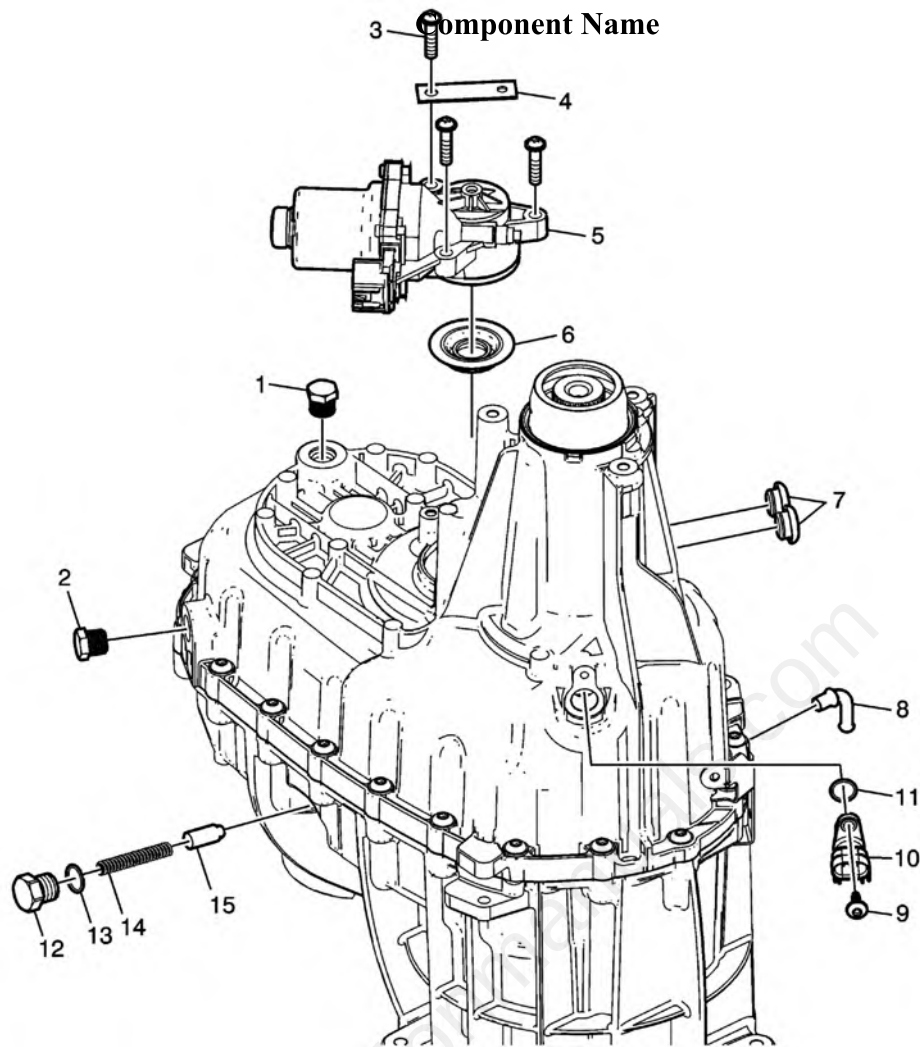


Fig. 32: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 2/4 Wheel Drive Actuator, Actuator Shaft Position Sensor, Transfer Case Shift Detent Plunger Plug, and Vehicle Speed Sensor Removal

Callout	Component Name
1	Transfer Case Oil Fill Plug
2	Transfer Case Oil Drain Plug
3	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty: 3)
4	Transfer Case Actuator Harness Bracket
5	Transfer Case Two/Four Wheel Drive Actuator
6	Transfer Case Two/Four Wheel Drive Actuator Seal
7	Transfer Case Access Hole Plugs (Qty: 2)
8	Transfer Case Vent NOTE: Remove ONLY if the vent pipe is damaged.
9	Vehicle Speed Sensor Bolt
10	Vehicle Speed Sensor

Component Name	
11	Vehicle Speed Sensor O-ring Seal NOTE: Remove and replace only if damaged.
12	Transfer Case Shift Detent Plunger Plug
13	Transfer Case Shift Detent Plunger Plug O-ring Seal NOTE: Remove and replace only if damaged.
14	Transfer Case Shift Detent Plunger Spring
15	Transfer Case Shift Detent Plunger

Transfer Case Rear Output Shaft Seal and Bushing Removal

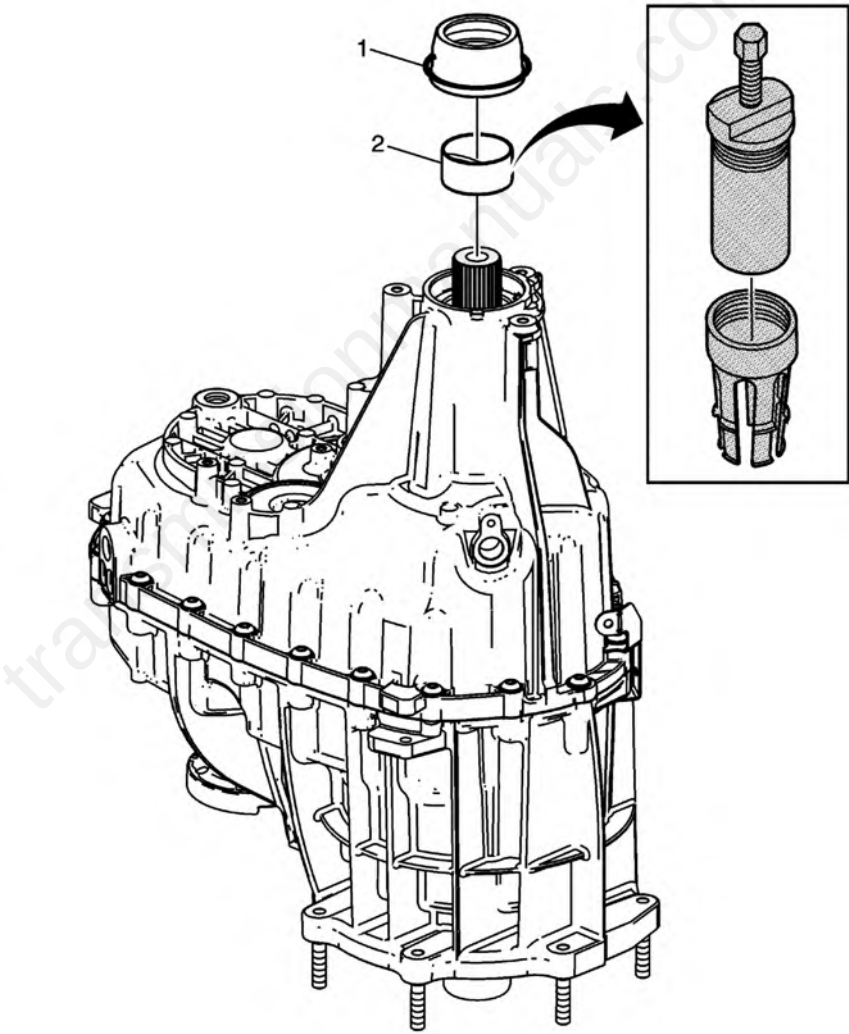


Fig. 33: Transfer Case Rear Output Shaft Seal and Bushing
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Output Shaft Seal and Bushing Removal

Callout	Component Name

Component Name	
1	Transfer Case Rear Output Shaft Seal CAUTION: Refer to Transfer Case Seal Removal Caution .
2	Transfer Case Rear Output Shaft Bushing Follow the steps below for use of the J-45380 remover. Procedure 1. Install the finger section of the J-45380 remover into the bushing. 2. Install the tube and forcing screw assembly into the finger section. Ensure the forcing screw is backed out. 3. Using a wrench on the forcing screw, remove the bushing. NOTE: Only remove the bushing if faulty. Refer to: Transfer Case Rear Half Cleaning and Inspection Special Tools DT-45380 Transfer Case Rear Bushing Remover and Installer Refer to: Special Tools.

Transfer Case Rear Extension (Rear Half) Removal

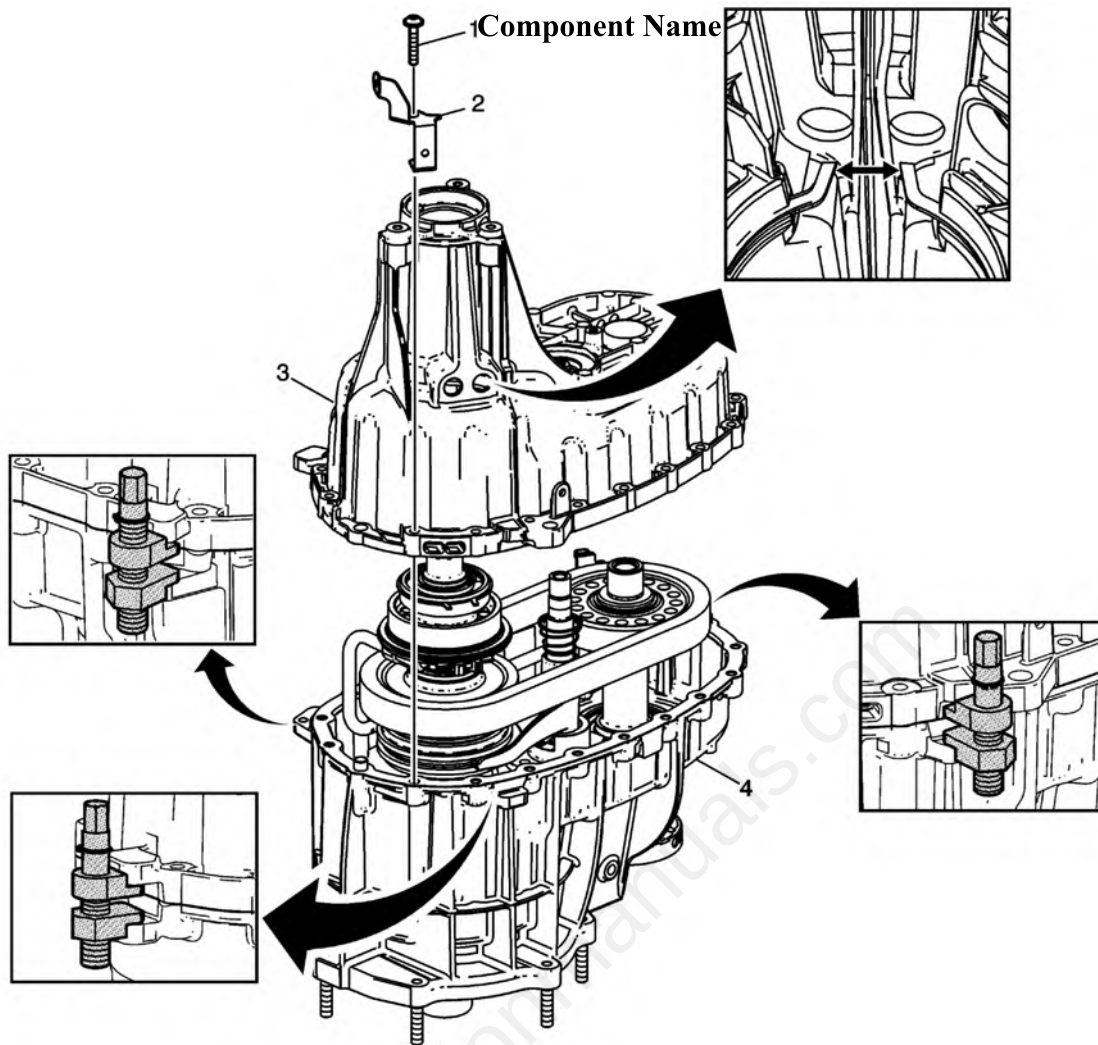


Fig. 34: Transfer Case Rear Extension (Rear Half)

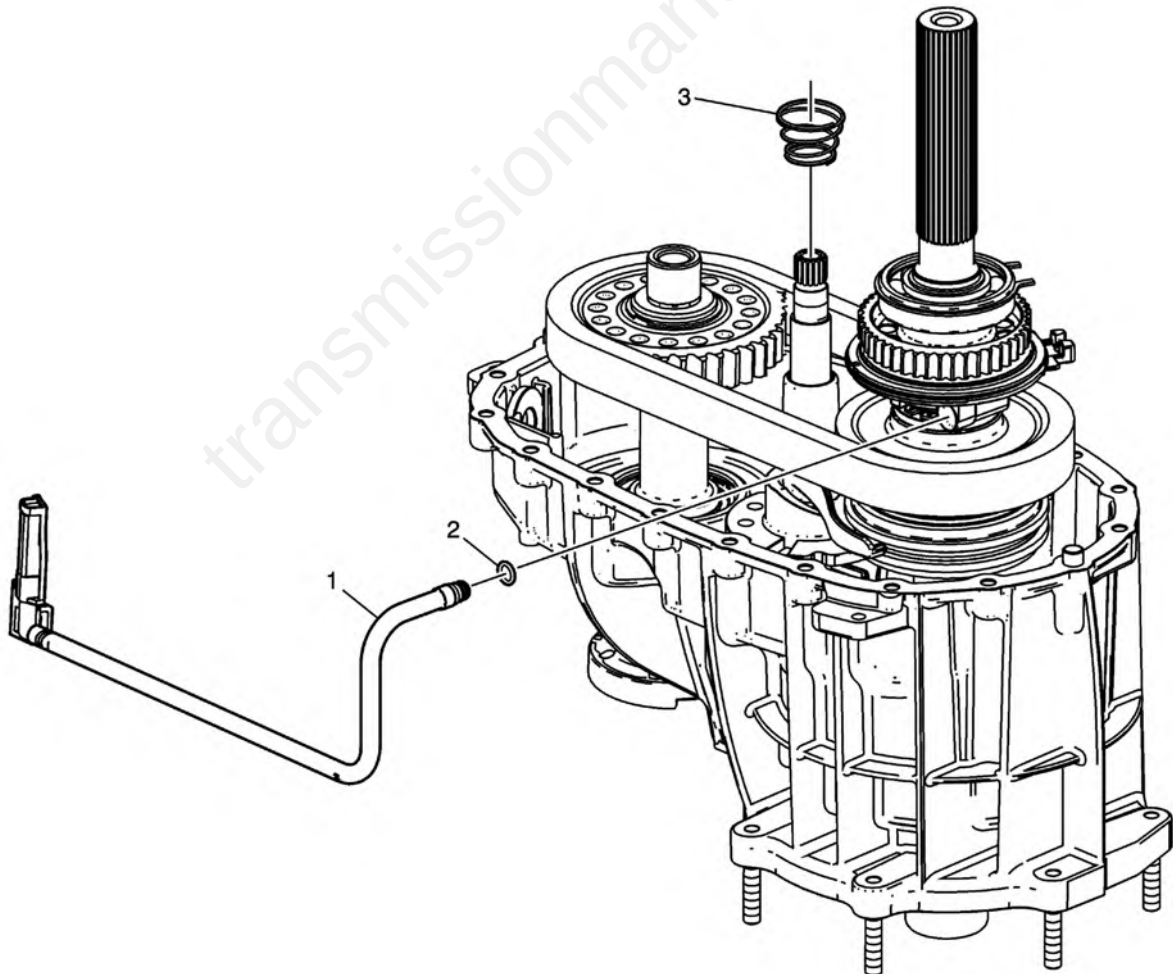
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Extension (Rear Half) Removal

Callout	Component Name
1	Transfer Case Half Bolt/Screw (Qty: 18)
2	Transfer Case Harness Bracket

Component Name	
3	Transfer Case Rear Extension (Rear Half) CAUTION: Refer to Machined Surface Damage Caution . NOTE: • Use DT-50228 Case Splitter to spread the case halves. • Use snap ring pliers to release the transfer case rear output shaft outer retaining ring from the transfer case rear output shaft rear bearing assembly. Special Tools DT-50228 Case Splitter Refer to: Special Tools.
4	Transfer Case (Front Half)

Transfer Case Oil Pump Suction Pipe and Shift Fork Spring Removal



Transfer Case Oil Pump Suction Pipe and Shift Fork Spring

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Oil Pump Suction Pipe and Shift Fork Spring Removal

Callout	Component Name
1	Transfer Case Oil Pump Suction Pipe
2	Transfer Case Oil Pump Suction Pipe Seal
3	Transfer Case Shift Fork Spring

Transfer Case Front Output Shaft Driven Sprocket, High/Low Shift Fork Assembly, Two/Four Wheel Drive Shift Fork, Drive Chain, Chip Collector Magnet, and Rear Output Shaft Assembly Removal

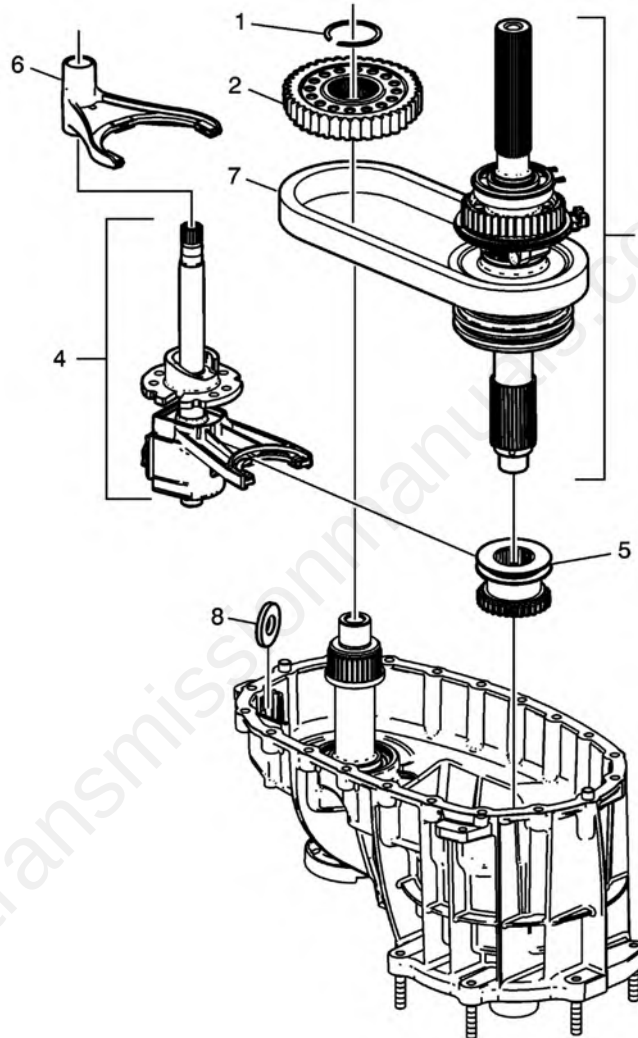


Fig. 36: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft Driven Sprocket, High/Low Shift Fork Assembly, Two/Four Wheel Drive Shift Fork, Drive Chain, Chip Collector Magnet, and Rear Output Shaft Assembly Removal

Callout	Component Name
1	Transfer Case Front Output Shaft Driven Sprocket Retaining Ring

Component Name	
2	Transfer Case Front Output Shaft Driven Sprocket NOTE: Lift upward on the output shaft assembly (3) in order to separate the chain (7) from the driven gear (2).
3	Transfer Case Rear Output Shaft Assembly NOTE: • The shift fork assembly (4) and rear output shaft assembly can be removed at the same time. • Mount the rear output shaft assembly into a soft-jaw vice or holding fixture for disassembly.
4	Transfer Case High/Low Shift Fork Assembly
5	Transfer Case High/Low Clutch
6	Transfer Case Two/Four Wheel Drive Shift Fork
7	Transfer Case Front Output Shaft Drive Chain
8	Transfer Case Chip Collector Magnet

Transfer Case Rear Output Shaft Assembly Disassemble

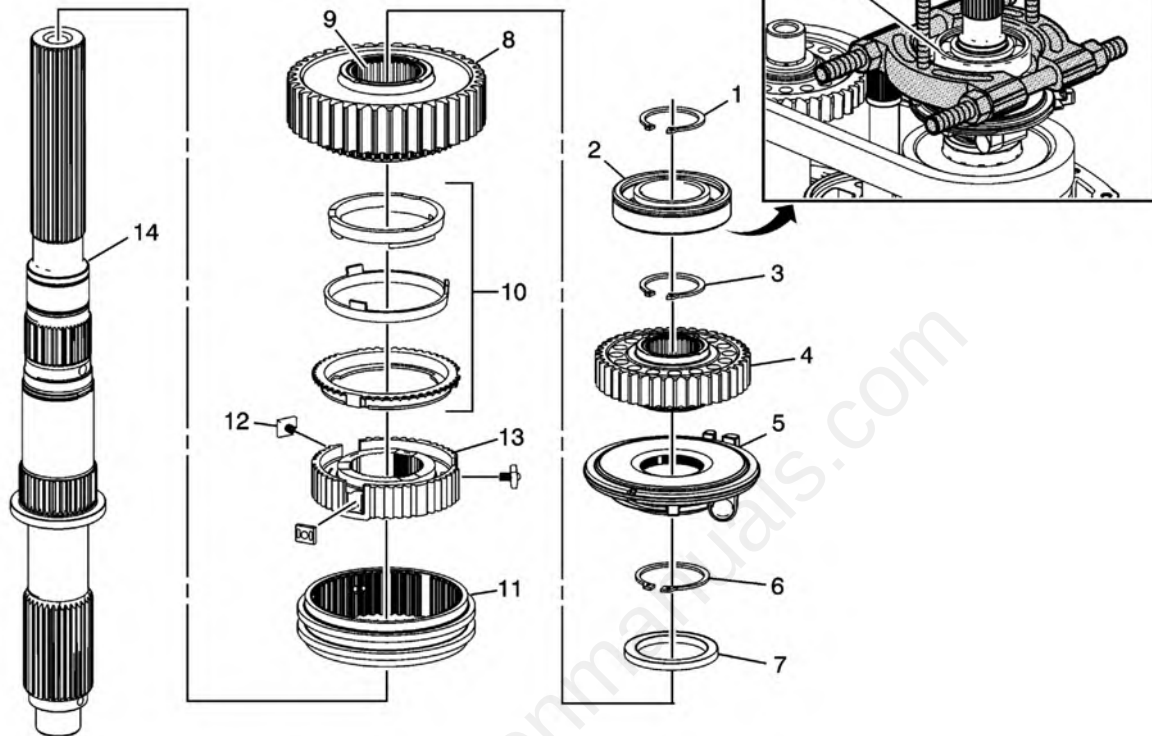


Fig. 37: Transfer Case Rear Output Shaft
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Output Shaft Assembly Disassemble

Callout	Component Name
1	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
2	Transfer Case Rear Output Shaft Rear Bearing NOTE: Use an arbor press or suitable puller to remove the bearing from the rear output shaft. Special Tools • GE-8433 Two Jaw Puller • DT-22912 Split Plate Bearing Puller • DT-50315 Puller Hardware Kit Refer to: Special Tools.
3	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
4	Transfer Case Rear Output Shaft Reluctor Wheel
5	Transfer Case Oil Pump Assembly

Component Name	
1	Transfer Case Input Shaft Seal CAUTION: Refer to Machined Surface Damage Caution . Procedure 1. Drill a pilot hole, as required, and insert a self-tapping screw into the body of the seal. 2. Use a plier or slide hammer type tool to remove the seal from the bore.

Transfer Case Input Shaft and Planetary Assembly Removal

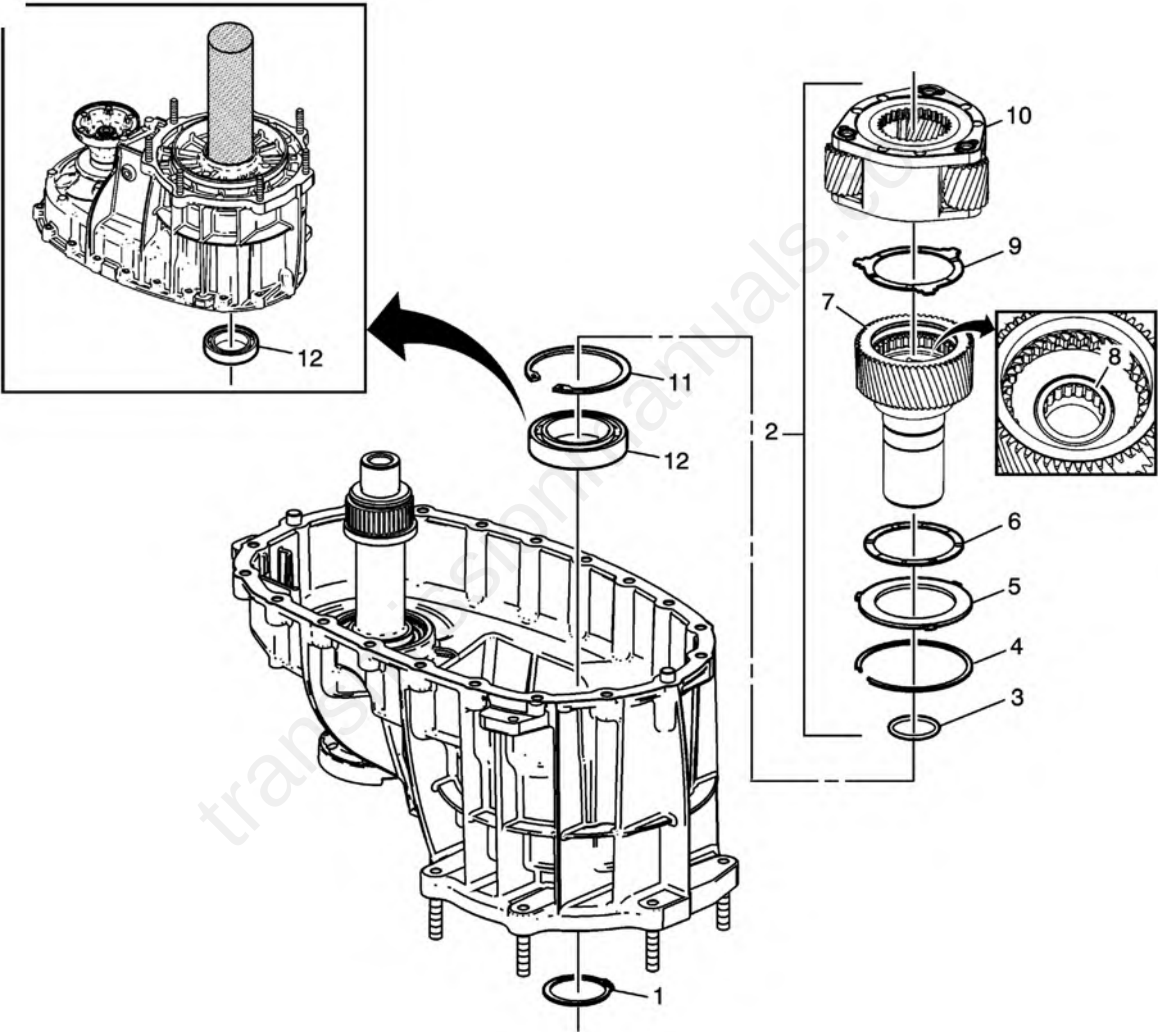


Fig. 39: Transfer Case Input Shaft and Planetary Assembly
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft and Planetary Assembly Removal

Callout	Component Name

Component Name	
1	Transfer Case Input Shaft Inner Retaining Ring WARNING: Do not rotate the transfer case and holding fixture with the retaining ring removed. Rotating may cause the input shaft/planetary assembly to fall from the transfer case, resulting in personal injury.
2	Transfer Case Input Shaft/Planetary Assembly
3	Transfer Case Front Output Shaft Seal
4	Transfer Case Input Shaft Retaining Ring
5	Transfer Case High/Low Locking Plate
6	Transfer Case Input Shaft Washer
7	Transfer Case Input Shaft
8	Transfer Case Input Shaft Pilot Bearing Procedure Only remove the bearing if faulty. Refer to: <u>Front Output Shaft and Input Shaft Cleaning and Inspection</u>
9	Transfer Case Planetary Carrier Sun Gear Thrust Washer
10	Transfer Case High/Low Planetary Carrier
11	Transfer Case Front Output Shaft Bearing Retaining Ring
12	Transfer Case Front Output Shaft Bearing Special Tools J-41736 Press Tube Refer to: <u>Special Tools</u> .

Transfer Case Front Output Flange, Front Output Shaft Seal and Front Output Shaft Removal

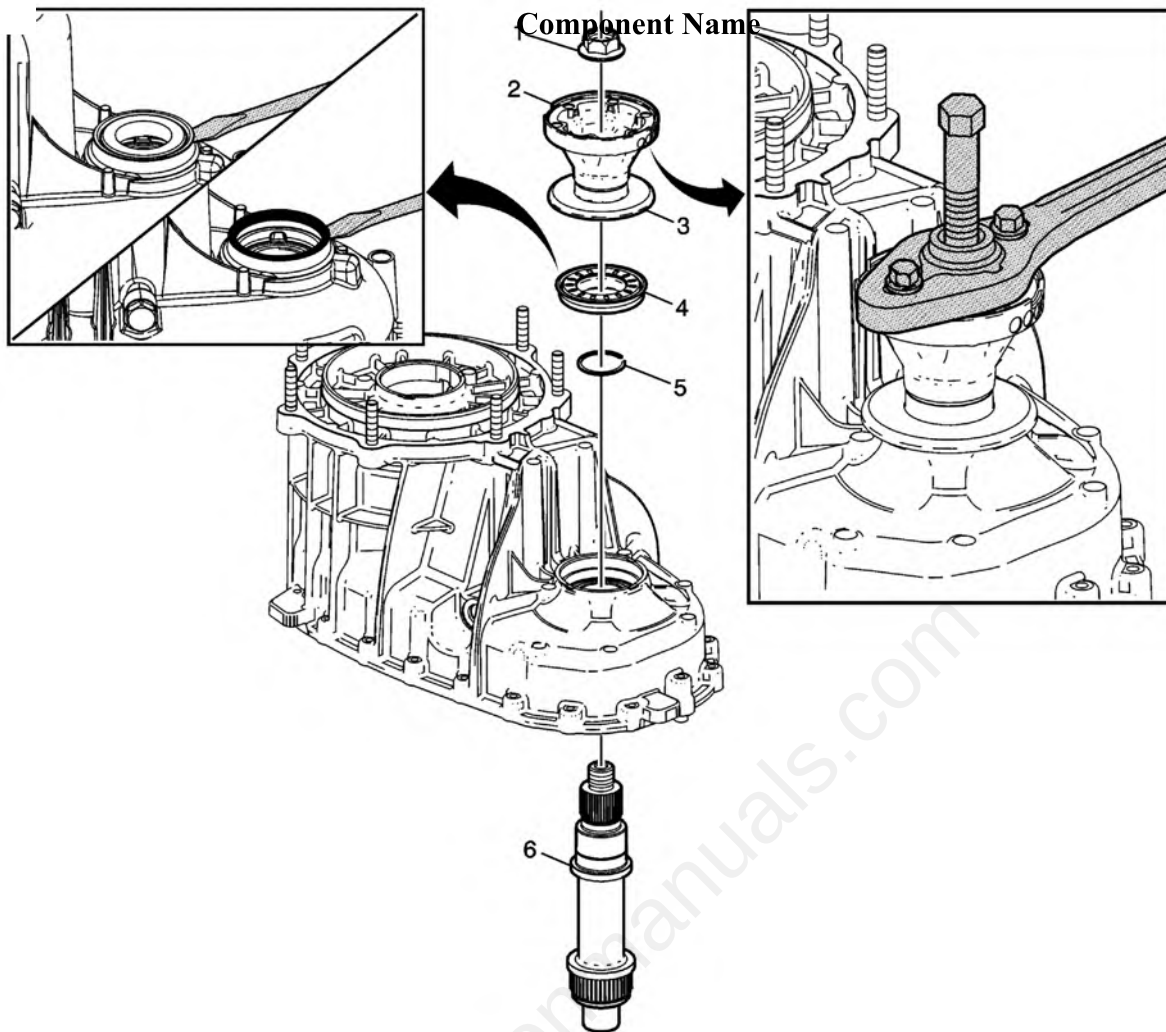


Fig. 40: Transfer Case Front Output Shaft and Flange

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Flange, Front Output Shaft Seal and Front Output Shaft Removal

Callout	Component Name
1	Transfer Case Front Output Flange Nut Procedure Install the J-08614-A Pinion Flange Holder and Remover and J-08614-20 Flange Retaining Bolts to remove output flange nut. Special Tools • DT-08614-A Pinion Flange Holder and Remover • DT-08614-20 Flange Retaining Bolts Refer to: Special Tools.
2	Transfer Case Front Output Flange Procedure 1. Install the DT-081614-20 Flange Retaining Bolts to remove output flange. 2. Remove tools.

Component Name	
3	Transfer Case Front Output Flange Slinger NOTE: Remove the flange slinger as required.
4	Transfer Case Front Output Shaft Seal Procedure 1. Insert a screwdriver between the metal inner and metal outer portions of the seal. 2. Pry upward in multiple locations working the metal inner portion of the seal off the shaft until removed. 3. Once the inner metal portion is removed, insert a screwdriver between the outer diameter metal flange of the seal and the housing. 4. Drive the screwdriver inward in multiple locations, the outer portion of the seal will be distorted and can easily be removed from the housing. NOTE: Removing the front output shaft seal in two pieces.
5	Transfer Case Front Output Shaft Retaining Ring
6	Transfer Case Front Output Shaft

Transfer Case Front Output Shaft Front Bearing Removal

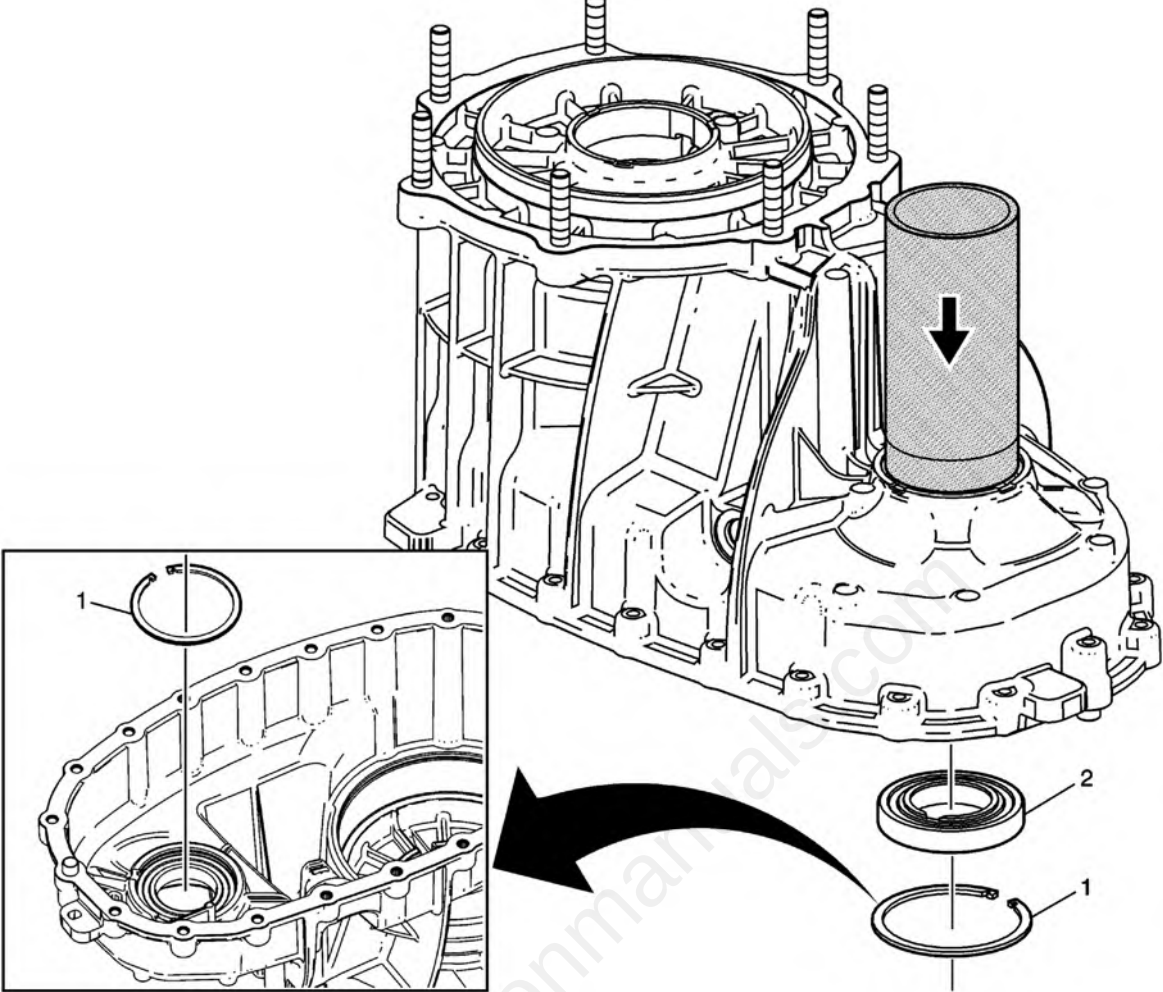


Fig. 41: Transfer Case Front Output Shaft Front Bearing
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft Front Bearing Removal

Callout	Component Name
1	Transfer Case Front Output Shaft Front Bearing Retaining Ring
2	Transfer Case Front Output Shaft Front Bearing
Special Tools J-24433 Pinion Cone and Side Bearing Installer Refer to: Special Tools .	

Transfer Case Front Output Shaft Front Bearing Removal

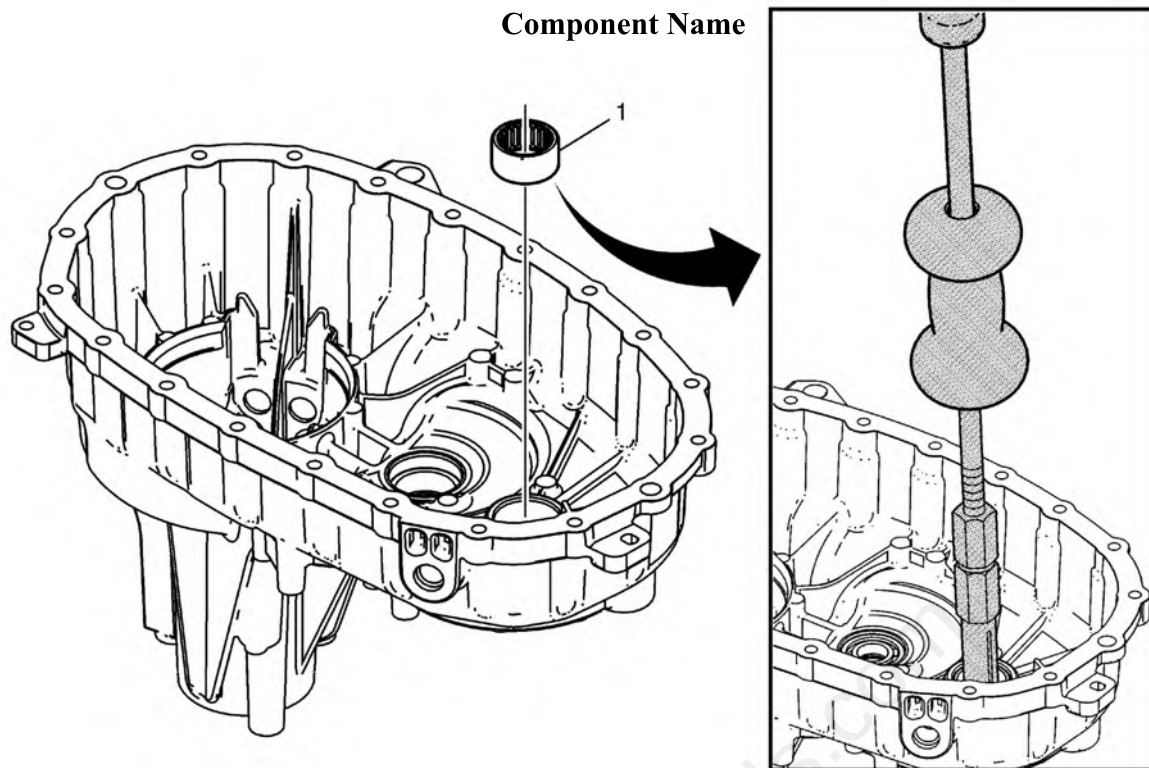


Fig. 42: Transfer Case Front Output Shaft Rear Bearing
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft Rear Bearing Removal

Callout	Component Name
1	Transfer Case Front Output Shaft Rear Bearing Procedure 1. Install the DT-44737 Bearing Remover into the bearing. 2. Install the GE-2619-01 Slide Hammer to the DT-44737 Bearing Remover. 3. Remove and discard the bearing. NOTE: Remove the bearing only if replacement is required. Special Tools • DT-44737 Bearing Remover • GE-2619-01 Slide Hammer Refer to: Special Tools.

Transfer Case Stud Removal

Component Name

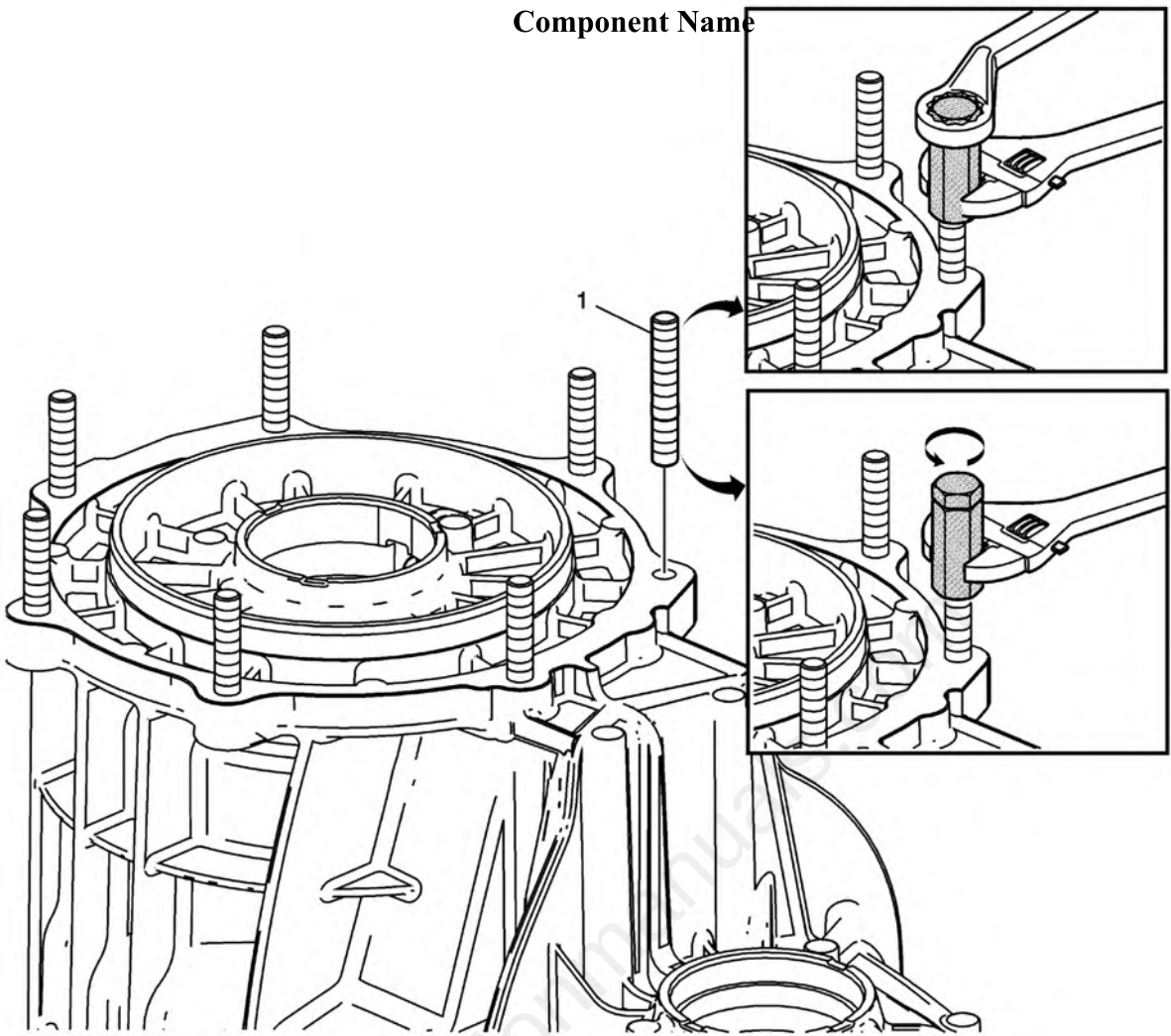


Fig. 43: Transfer Case Stud
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Stud Removal

Callout	Component Name
1	Transfer Case Studs - Transmission Interface NOTE: Remove the studs only if replacement is required. Special Tools DT-49308 Stud Remover and Installer Refer to:Special Tools.

TRANSFER CASE FRONT HALF CLEANING AND INSPECTION

Component Name

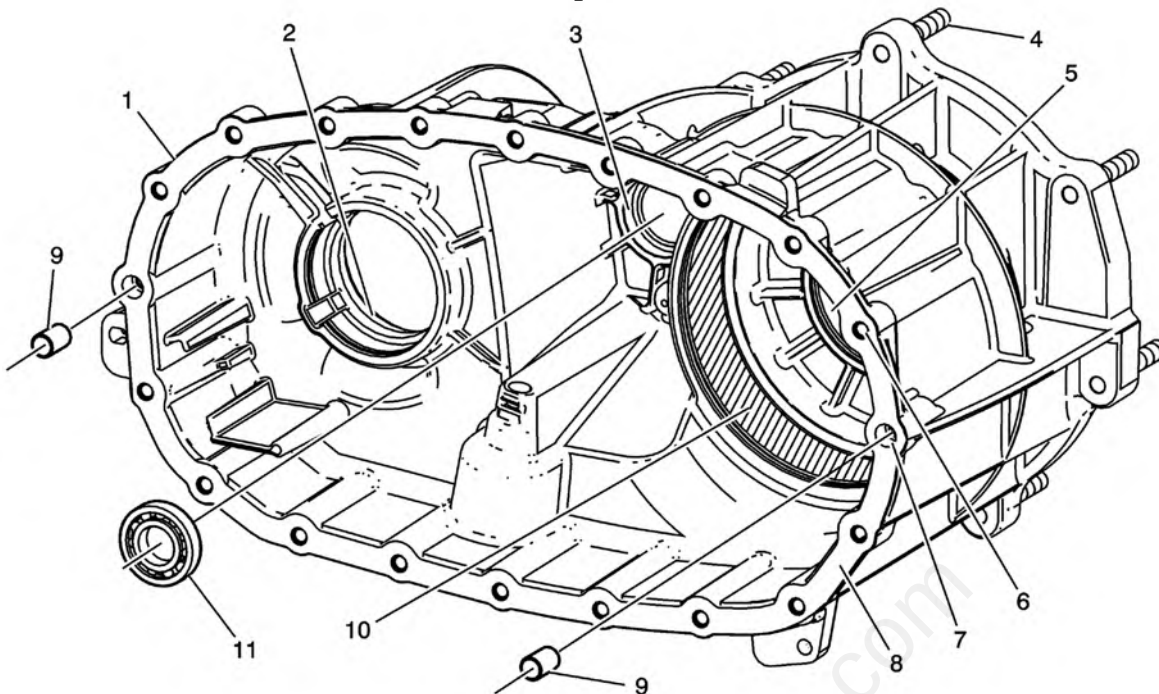


Fig. 44: Transfer Case Front Half

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: Refer to: Machined Surface Damage Caution .	
Preliminary Procedure - Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. - Clean the front case half in cleaning solvent and air dry. - Remove any sealant from the sealing surface.	
1	Transfer Case Front Half Assembly NOTE: Inspect for cracks, broken areas, or other damage. The component must be replaced if damage is found.
2	Transfer Case Front Output Shaft Seal Bore NOTE: Replace the front case half assembly if the seal bore has excessive damage.

Component Name	
3	Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Bore NOTE: Replace the front case half assembly if a bearing has spun or if cracks are detected.
4	Transfer Case Studs (Qty: 7) NOTE: Replace any damaged studs
5	Transfer Case Input Shaft Seal Bore NOTE: Replace the front case half assembly if the seal bore has excessive damage.
6	Transfer Case Threaded Bolt Holes NOTE: Repair any damaged threads.
7	Transfer Case Locating Pin Holes NOTE: Replace the front case half assembly if the locating pin holes are out of round or damaged.
8	Case Sealing Surface NOTE: Repair small scratches or nicks with a soft stone.
9	Transfer Case Locating pins (Qty: 2) NOTE: Repair or replace loose, missing, or damaged locating pins.
10	Transfer Case High/Low Internal Gear NOTE: Replace the front case half assembly if the gear is loose in the case, or if the gear teeth are chipped or embedded with debris.
11	Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Assembly Procedure Replace the bearing if roughness, brinelling, or pitting is detected. Refer to: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Replacement - Front

TRANSFER CASE REAR HALF CLEANING AND INSPECTION

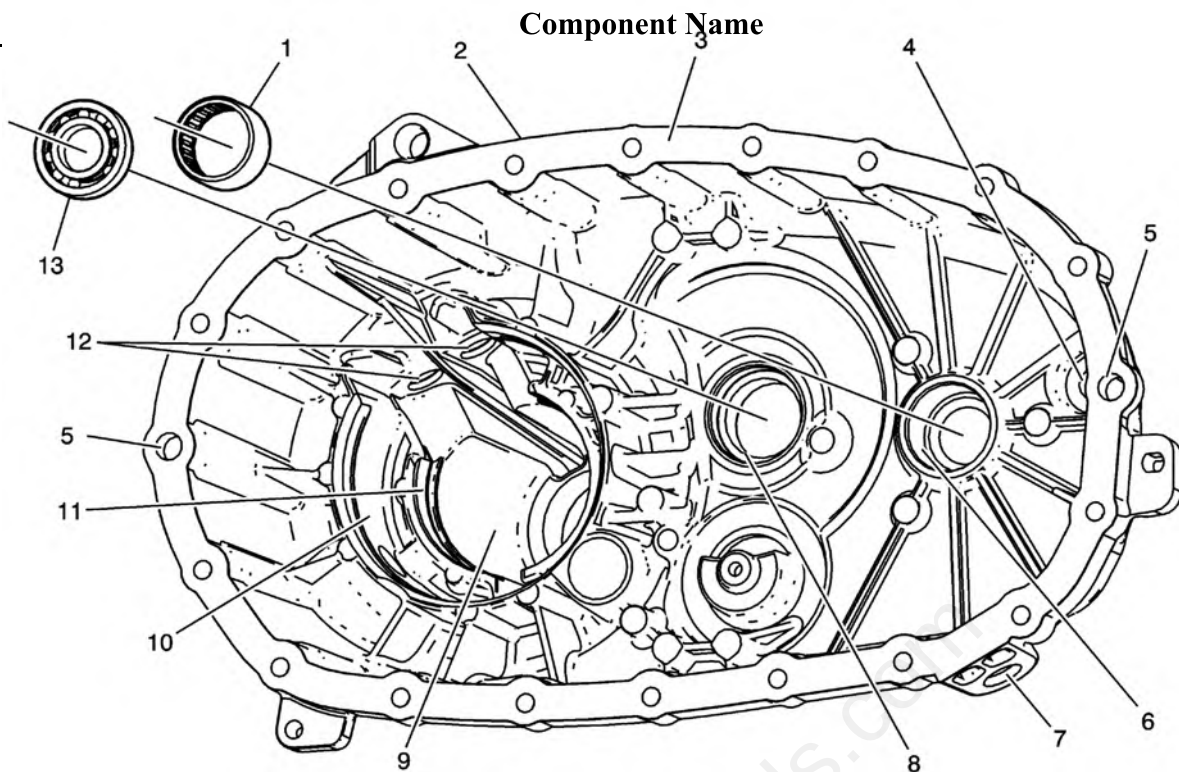


Fig. 45: Transfer Case Rear Half

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: Refer to Machined Surface Damage Caution .	
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean the rear case half in cleaning solvent and air dry. 3. Remove any sealant from the sealing surface.	
1	Transfer Case Front Output Shaft Rear Bearing NOTE: Replace the bearing if damage to the needle rollers or bearing case is detected.
2	Transfer Case Rear Case Half Assembly NOTE: Inspect for cracks, broken areas, or other damage. The component must be replaced if damage is found.

Component Name	
3	Case Sealing Surface NOTE: Repair small scratches or nicks with a soft stone.
4	Transfer Case Fill Hole
5	Transfer Case Locating Pin Holes NOTE: Replace the rear case half assembly if the locating pin holes are out of round or damaged.
6	Transfer Case Front Output Shaft Rear Bearing Bore NOTE: Replace the rear case half assembly if a bearing has spun or if cracks are detected.
7	Transfer Case Drain Hole
8	Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Bore
9	Transfer Case Rear Output Shaft Bushing Procedure • Replace the bushing if it is damaged or worn. • If the bushing is removed, inspect the bushing bore for signs of spinning. Replace the rear case half assembly if the bushing has spun. Refer to: Transfer Case Disassemble , and Transfer Case Assemble
10	Transfer Case Rear Output Shaft Rear Bearing Bore NOTE: Replace the rear case half assembly if a bearing has spun or if cracks are detected.
11	Transfer Case Rear Output Shaft Rear Bearing Outer Retaining Ring Groove NOTE: Replace the rear case half assembly if the groove is worn.
12	Transfer Case Access Holes
13	Transfer Case Four Wheel Drive Actuator Lever Shaft Rear Bearing Procedure Replace the bearing if roughness, brinelling, or pitting is detected. Refer to: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Replacement - Rear

TRANSFER CASE OIL PUMP CLEANING AND INSPECTION

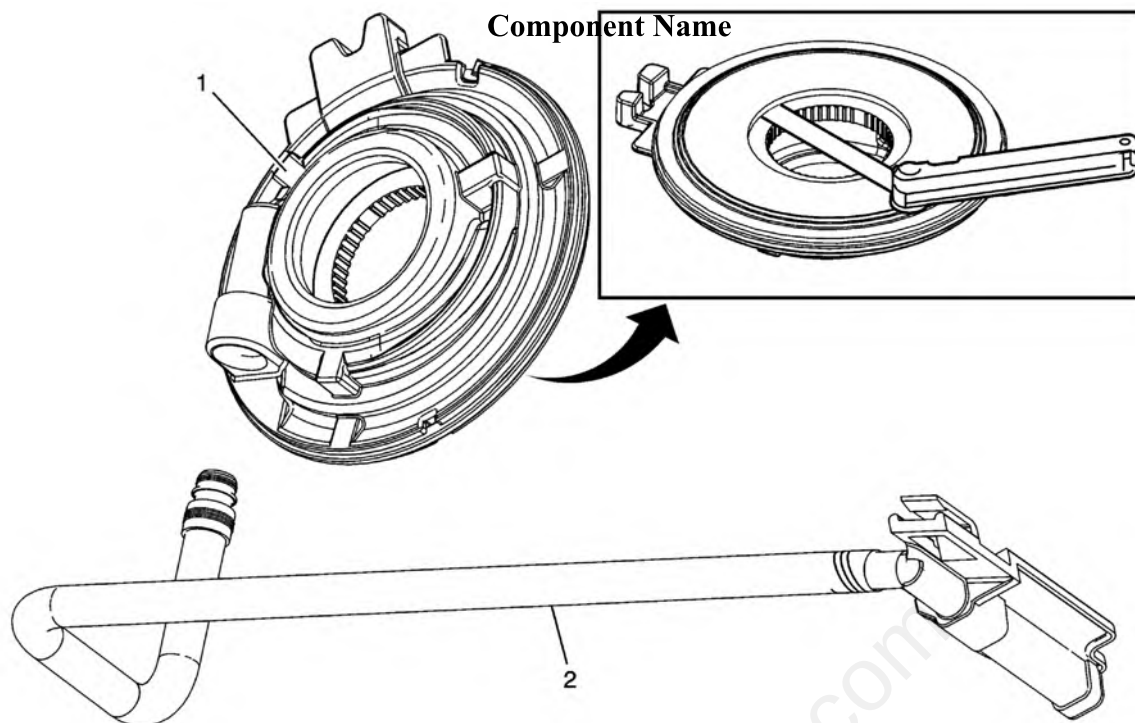


Fig. 46: View Of Transfer Case Oil Pump Assembly & Suction Pipe

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry.	
1	Transfer Case Oil Pump Assembly NOTE: Replace the oil pump assembly if end play is evident or if there is any sign of binding. End play can be measured by inserting a feeler gauge between the outer rotor and housing. If the end play is greater than 0.1 mm (0.004 in), replace the oil pump assembly. Do not disassemble the oil pump. The oil pump is serviced as an assembly.
2	Transfer Case Oil Pump Suction Pipe NOTE: Replace the oil pump suction pipe if the screen is embedded with debris.

REAR OUTPUT SHAFT CLEANING AND INSPECTION

Component Name

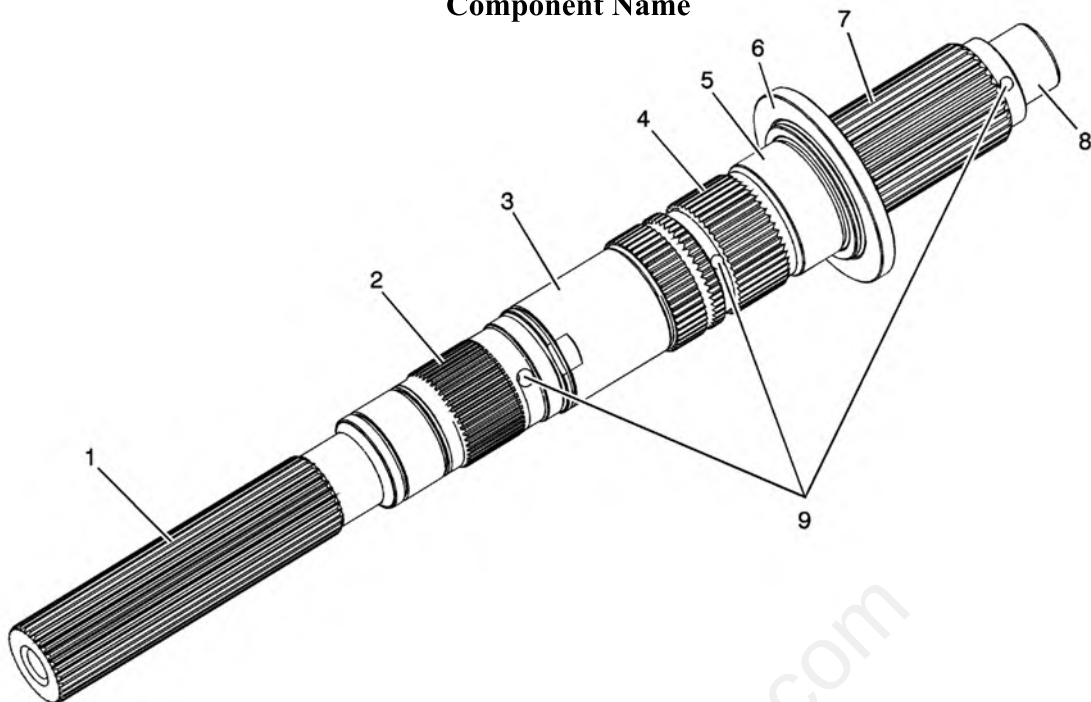


Fig. 47: View Of Rear Output Shaft Inspection Points

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry.	
1	Transfer Case Rear Output Shaft Splines NOTE: Witness marks at the location of the yoke are normal.
2	Transfer Case Oil Pump and Rear Output Shaft Speed Reluctor Wheel Engagement Splines NOTE: Witness marks at the location of the components are normal.
3	Transfer Case Front Output Shaft Drive Sprocket Bearing Surface NOTE: Inspect for scoring, brinelling, pitting, or excessive wear.
4	Transfer Case Two/Four Wheel Drive Clutch Hub Engagement Splines NOTE: Witness marks at the location of the hub is normal.

	Transfer Case Control Actuator Lever Bearing Surface	Component Name
5	NOTE: Inspect for scoring, brinelling, pitting, or excessive wear.	
6	Transfer Case Control Actuator Lever Thrust Bearing Surface NOTE: Inspect for scoring, brinelling, pitting, or excessive wear.	
7	Transfer Case High/Low Clutch Engagement Splines NOTE: Witness marks at the location of the high/low clutch is normal.	
8	Transfer Case Input Shaft Pilot Bearing Surface NOTE: Inspect for scoring, brinelling, pitting, or excessive wear.	
9	Oil Galleries NOTE: Compressed air may be necessary to clean the oil galleries.	

FRONT OUTPUT SHAFT AND INPUT SHAFT CLEANING AND INSPECTION

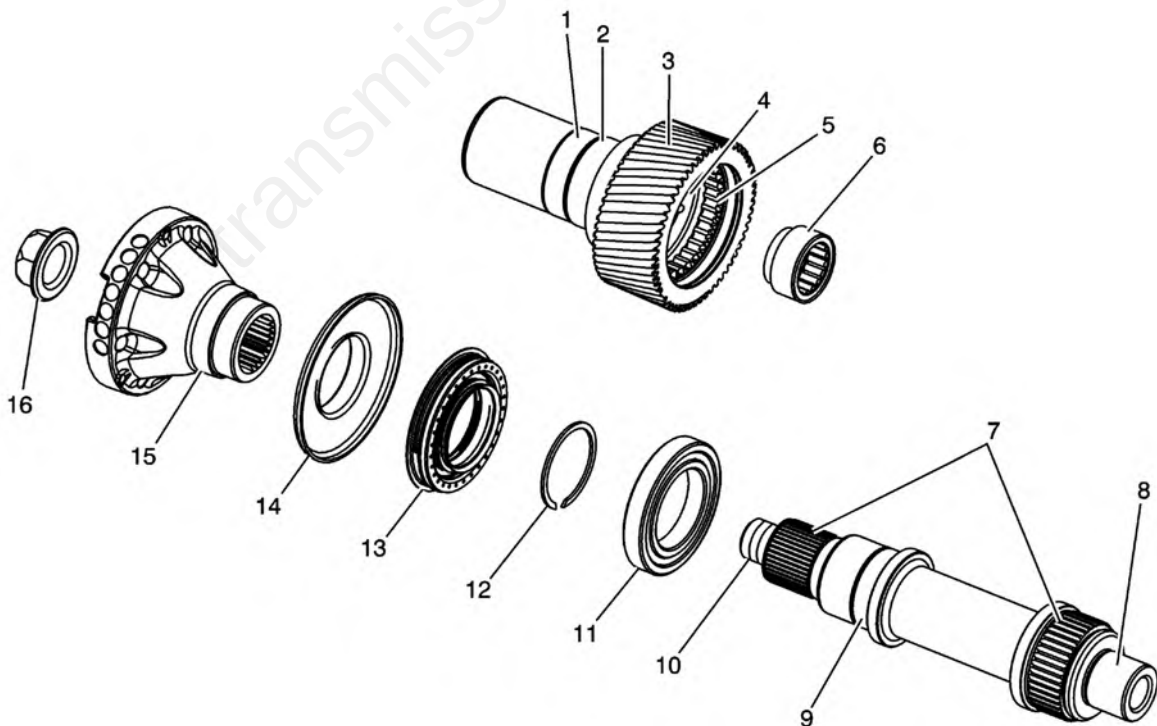


Fig. 48: Front Output Shaft and Input Shaft
Courtesy of GENERAL MOTORS COMPANY

Component Name	
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry.	
1	Transfer Case Input Shaft Seal Surface NOTE: Inspect for pitting, excessive wear, or damage.
2	Transfer Case Input Shaft Bearing Surface NOTE: Inspect for excessive wear, damage, or if the bearing has spun on the shaft.
3	Transfer Case Input Shaft Planetary Teeth NOTE: Inspect for broken, damaged, or debris embedded in the root of the teeth.
4	Transfer Case Input Shaft Pilot Bearing Surface NOTE: If the bearing is removed, inspect for excessive wear, damage, or if the bearing has spun in the bore.
5	Transfer Case High/Low Clutch Engagement Teeth NOTE: Inspect the engagement teeth for chips or excessive wear.
6	Transfer Case Input Shaft Pilot Bearing Assembly Procedure Replace the bearing if roughness, brinelling, or pitting is detected. Refer to Input Shaft Pilot Bearing Replacement .
7	Transfer Case Front Output Splines NOTE: Witness marks at the location of the sprocket are normal.
8	Transfer Case Front Output Shaft Rear Bearing Surface NOTE: If the bearing is removed, inspect for excessive wear, damage, or if the bearing has spun on the shaft.

Component Name	
9	Transfer Case Front Output Shaft Front Bearing Surface NOTE: Inspect for excessive wear or damage to the bearing surface.
10	Transfer Case Front Output Shaft Seal Surface NOTE: Inspect for pitting, excessive wear, or damage.
11	Transfer Case Output Shaft Flange Nut Threads NOTE: If the threads are damaged, replace the shaft.
12	Transfer Case Front Output Shaft Front Bearing Procedure Replace the bearing if roughness, brinelling, or pitting is detected. Refer to <u>Front Output Shaft Drive Sprocket Bearing Replacement</u> .
13	Transfer Case Front Output Shaft Front Bearing Retaining Ring
14	Transfer Case Front Output Flange Slinger NOTE: The slinger is press fit to the flange and should not be removed unless replacement is required.
15	Transfer Case Front Output Flange NOTE: Inspect for damage, replace as required.
16	Transfer Case Front Output Flange Nut NOTE: If the threads are damaged, replace the nut.

DRIVE CHAIN, DRIVE SPROCKET, AND DRIVEN SPROCKET CLEANING AND INSPECTION

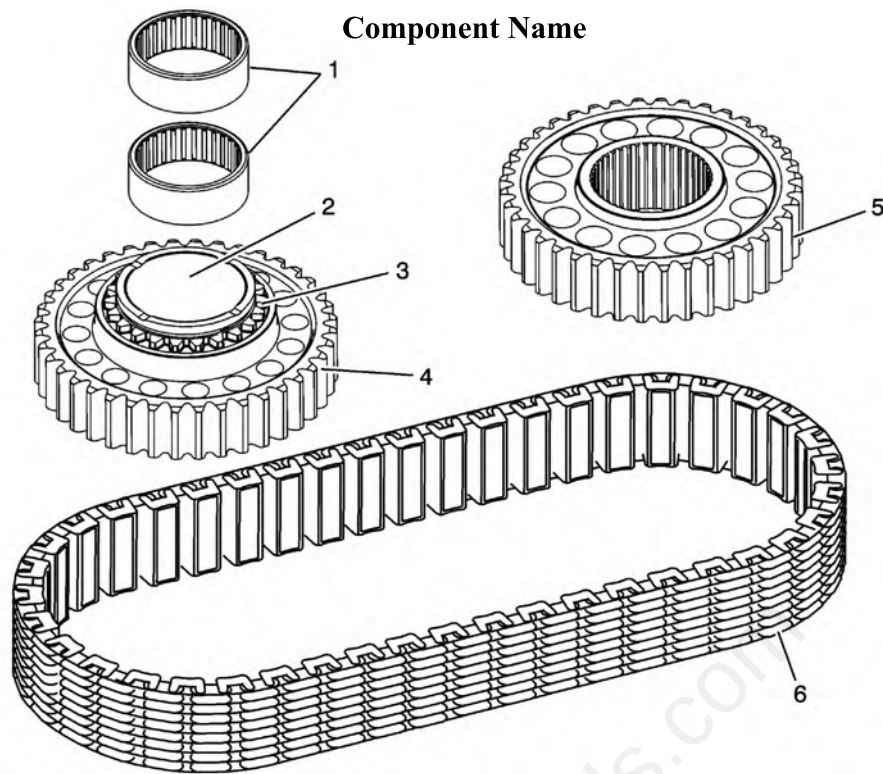


Fig. 49: Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Replace any components if damage is found in this procedure. The sprockets must be replaced as a pair. 3. Clean all components in cleaning solvent and air dry.	
1	Transfer Case Front Output Shaft Drive Sprocket Bearings Procedure Replace the bearings if roughness, brinelling, or pitting is detected. Refer to Front Output Shaft Drive Sprocket Bearing Replacement .
2	Transfer Case Front Output Shaft Drive Sprocket Bearing Bore NOTE: If the bearing is removed, inspect for excessive wear, damage, or if the bearing has spun in the bore.
3	Transfer Case Four Wheel Drive Clutch Housing Engagement Teeth NOTE: Inspect the engagement teeth for chips or excessive wear.

Component Name	
4	Transfer Case Front Output Shaft Drive Sprocket NOTE: • Inspect for chipped teeth, excessively worn gear surfaces, and debris embedded in the root of the teeth. • Witness marks at the location of the chain is normal.
5	Transfer Case Front Output Shaft Driven Sprocket NOTE: • Inspect for chipped teeth, excessively worn gear surfaces, and debris embedded in the root of the teeth. • Witness marks at the location of the chain is normal.
6	Transfer Case Front Output Shaft Drive Chain Assembly NOTE: Inspect for loose link pins, binding or stiff links, debris embedded in the links, or worn teeth surfaces.

HIGH/LOW PLANETARY CARRIER CLEANING AND INSPECTION

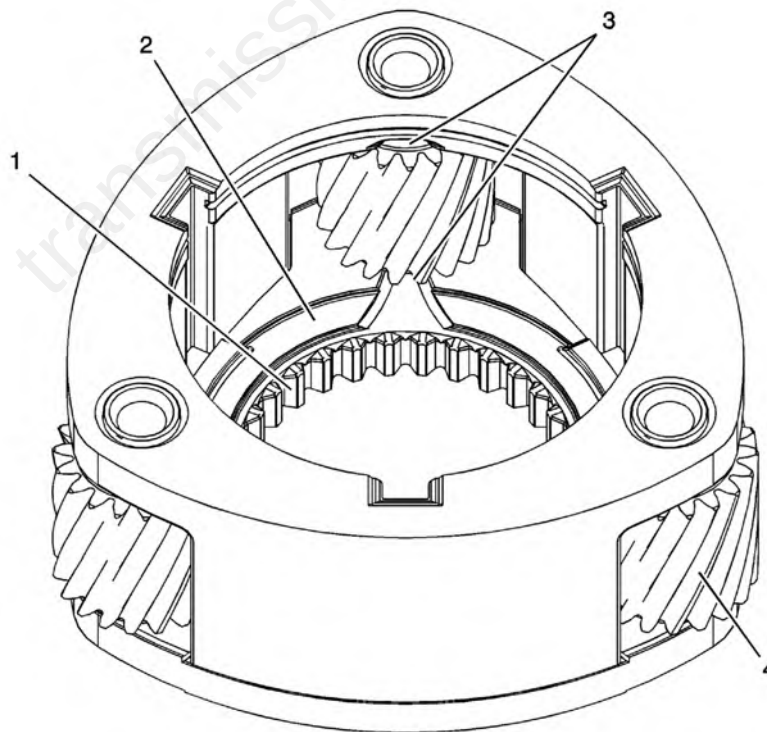


Fig. 50: View Of High/Low Planetary Carrier Inspection Points

Courtesy of GENERAL MOTORS COMPANY

Component Name	
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry. Do not spin the planetary gears with compressed air. 3. The high/low planetary carrier is only serviced as an assembly.	
1	Transfer Case High/Low Clutch Engagement Teeth NOTE: Inspect the engagement teeth for chips or excessive wear.
2	Transfer Case Planetary Carrier Sun Gear Thrust Washer Surface NOTE: Inspect the thrust washer surface for scoring or excessive wear.
3	Transfer Case High/Low Planetary Carrier Pinion Gear Thrust Washer NOTE: Inspect for a thrust washer being on each side of the planetary gears.
4	Transfer Case High/Low Planetary Pinion Gear NOTE: Inspect for broken, damaged, or debris embedded in the root of the teeth.

HIGH/LOW SHIFT COMPONENTS CLEANING AND INSPECTION

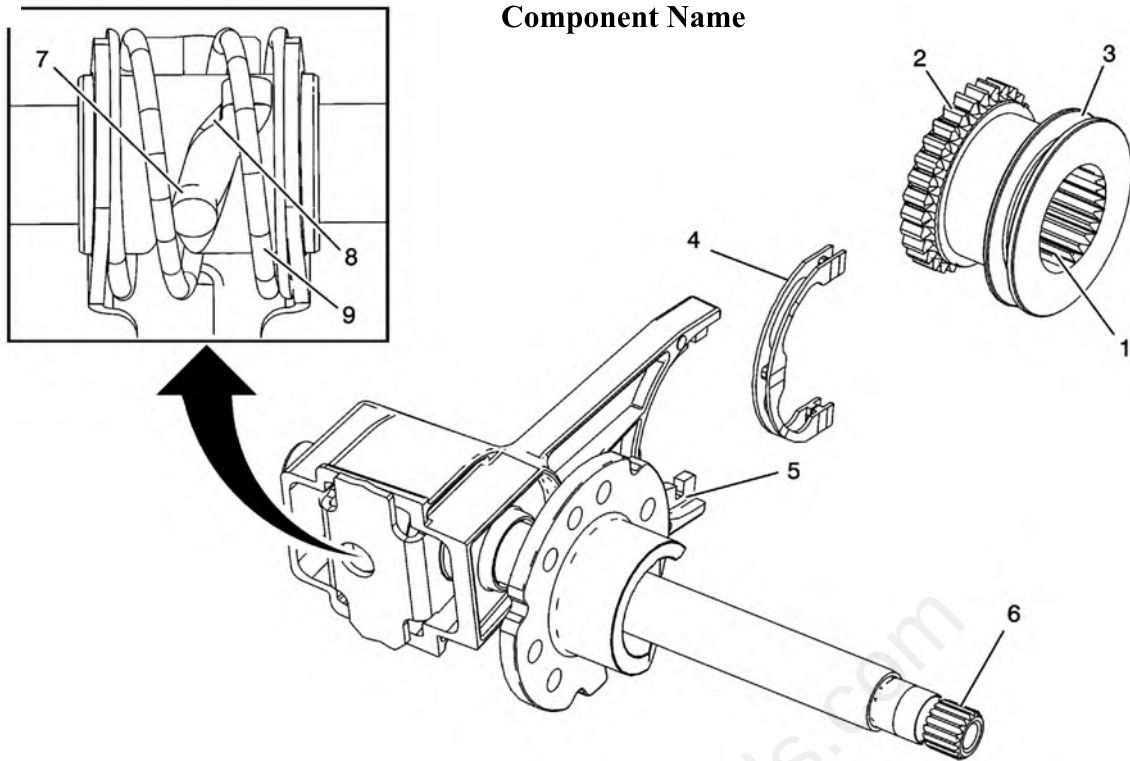


Fig. 51: High/Low Shift Components
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry.	
1	Transfer Case High/Low Clutch Inner Splines NOTE: Inspect the inner splines for excessive looseness on the rear output shaft.
2	Transfer Case High/Low Clutch Teeth NOTE: Inspect the engagement teeth for chips or excessive wear.
3	Transfer Case High/Low Shift Fork Collar NOTE: Inspect the shift fork collar for wear.
4	Transfer Case High/Low Shift Fork Inserts (Qty: 2) NOTE: Inspect the inserts for wear.

	Transfer Case High/Low Shift Fork	Component Name
5	Procedure Inspect for cracks, broken areas, or other damage. The component must be replaced if damage is found. Refer to High/Low Shift Fork Replacement .	
6	NOTE: Witness marks at the location of the splines is normal.	
7	Transfer Case High/Low Shift Fork Pin Procedure Inspect the pin for wear. The component must be replaced if damage is found. Refer to High/Low Shift Fork Replacement .	
8	Transfer Case High/Low Shift Fork Spring Assembly Procedure Inspect the cam lobes for wear or roughness. The component must be replaced if damage is found. Refer to High/Low Shift Fork Replacement .	
9	Transfer Case Shift Fork Spring Procedure Inspect the spring for breakage. The component must be replaced if damage if found. Refer to High/Low Shift Fork Replacement .	

TWO/FOUR WHEEL DRIVE SHIFT COMPONENTS CLEANING AND INSPECTION

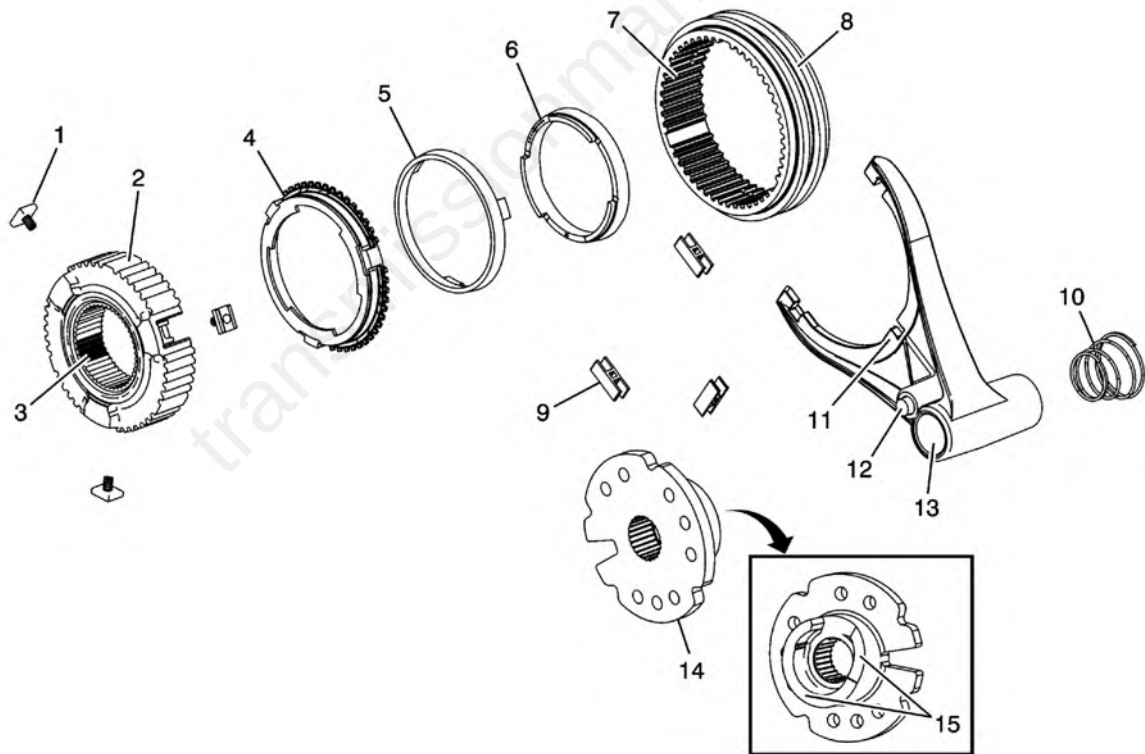


Fig. 52: Two/Four Wheel Drive Shift Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Component Name	
Preliminary Procedure 1. Inspect all components or sub-components and perform any repair procedure necessary to fix the damage. If the damage cannot be repaired, replace the component or sub-component as indicated. 2. Clean all components in cleaning solvent and air dry, except the clutch plates.	
1	Transfer Case Two/Four Wheel Drive Synchronizer Inserts (Qty: 3) NOTE: Inspect the inserts for wear.
2	Transfer Case Two/Four Wheel Drive Synchronizer Hub Engagement Teeth NOTE: Inspect the engagement teeth for wear.
3	Transfer Case Two/Four Wheel Drive Synchronizer Hub Splines NOTE: Inspect the splines for loose fit on the rear output shaft.
4	Transfer Case Two/Four Wheel Drive Synchronizer Assembly NOTE: Inspect the synchronizer for wear or chipped teeth.
5	Transfer Case Two/Four Wheel Drive Synchronizer Blocking Ring - Outer NOTE: Inspect the synchronizer ring for wear, damage, or missing material.
6	Transfer Case Two/Four Wheel Drive Synchronizer Blocking Ring - Inner NOTE: Inspect the synchronizer ring for wear or roughness.
7	Transfer Case Two/Four Wheel Drive Synchronizer Sleeve Engagement Teeth NOTE: Inspect the engagement teeth for wear.
8	Transfer Case Two/Four Wheel Drive Synchronizer Sleeve Collar NOTE: Inspect the collar for wear.

Component Name	
9	Transfer Case Two/Four Wheel Drive Shift Fork Inserts (Qty: 3) NOTE: Inspect the inserts for wear.
10	Transfer Case Shift Fork Spring NOTE: Inspect the spring for breakage.
11	Transfer Case Two/Four Wheel Drive Shift Fork Assembly NOTE: Inspect for cracks, broken areas, or other damage. The component must be replaced if damage is found.
12	Transfer Case Two/Four Wheel Drive Shift Fork Pin NOTE: Replace the shift fork if the pin is worn.
13	Transfer Case Two/Four Wheel Drive Shift Fork Bore NOTE: Replace the shift fork if the bore is worn.
14	Transfer Case Shift Detent Plunger Cam Lobes Procedure Inspect the cam lobes for wear or roughness. The component must be replaced if damage is found. Refer to: High/Low Shift Fork Replacement
15	Transfer Case Two/Four Wheel Drive Mode Cam Lobes Procedure Inspect the cam lobes for wear or roughness. The component must be replaced if damage is found. Refer to: High/Low Shift Fork Replacement

TRANSFER CASE FOUR WHEEL DRIVE ACTUATOR LEVER SHAFT BEARING REPLACEMENT - FRONT

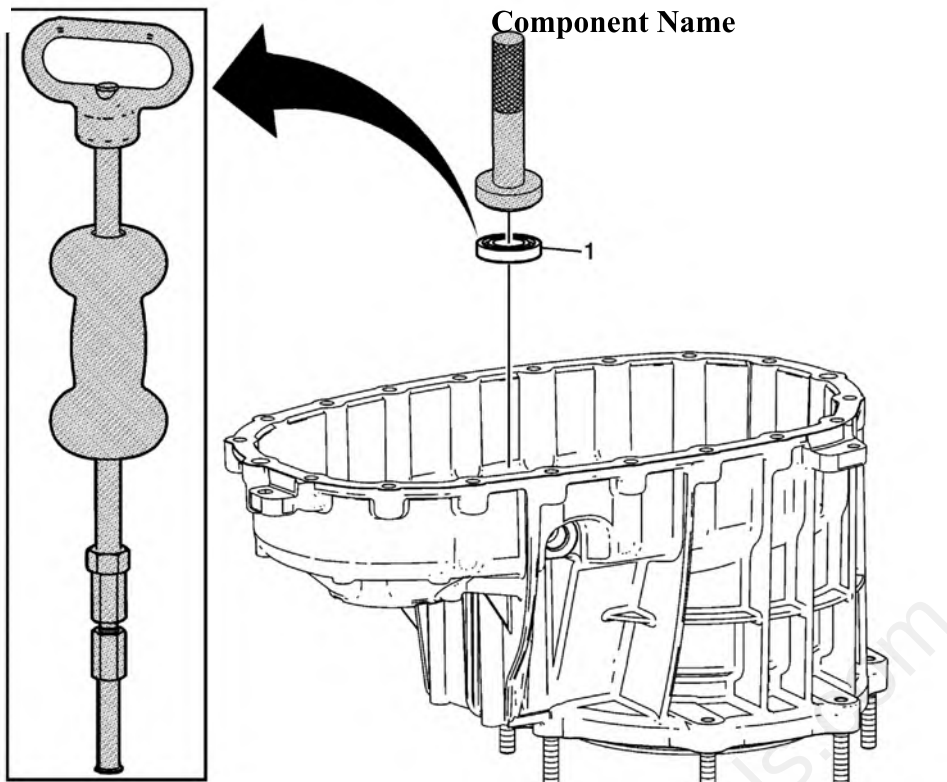


Fig. 53: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing -- Front
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Ensure the bearing is installed squarely into the bearing bore.	
1	Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Front Assembly (Removal) NOTE: Install the bearing until it bottoms in the front case half bore. Special Tools • GE-2619-01 Slide Hammer • DT-44737 Shift Rail Bearing Remover • DT-46496 Bearing Installer Refer to: Special Tools .

TRANSFER CASE FOUR WHEEL DRIVE ACTUATOR LEVER SHAFT BEARING REPLACEMENT - REAR

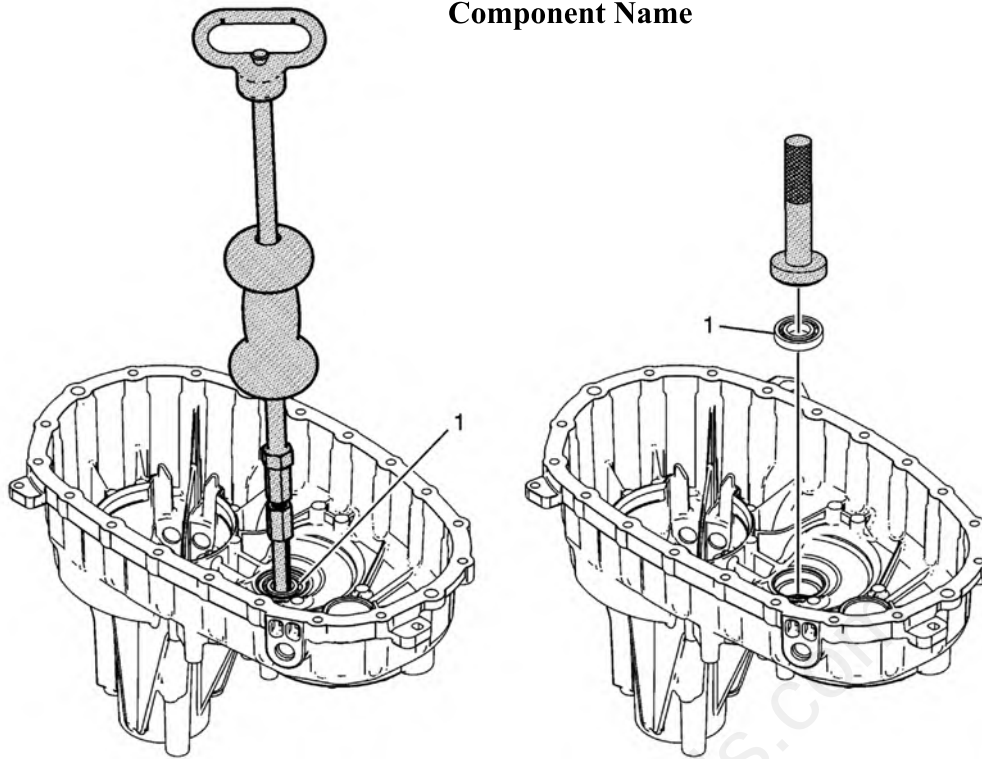


Fig. 54: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing - Rear
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Ensure the bearing is installed squarely into the bearing bore.	
1	Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing Rear Assembly (Removal) NOTE: Install the bearing until it bottoms in the rear case half bore. Special Tools • GE-2619-01 Slide Hammer • DT-44737 Shift Rail Bearing Remover • DT-46496 Bearing Installer Refer to: Special Tools .

INPUT SHAFT PILOT BEARING REPLACEMENT

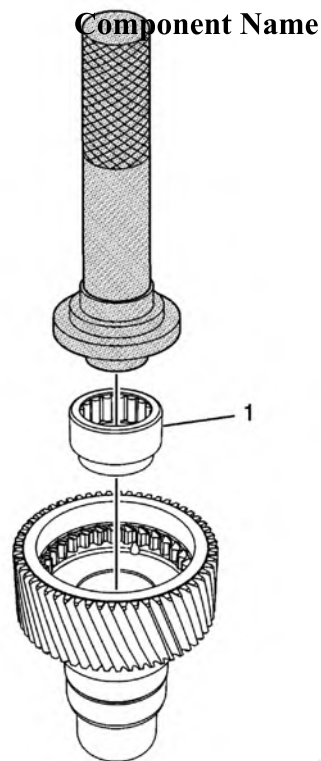


Fig. 55: Input Shaft Pilot Bearing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Ensure the bearing is installed squarely into the input shaft bore.	
1	Transfer Case Input Shaft Pilot Bearing Procedure 1. Using a suitable adapter and an arbor press, remove the input shaft pilot bearing by going through the front of the input gear. 2. Install the bearing using the small side of the DT-48212 bearing installer. 3. Install the bearing until the tool bottoms against the input shaft. Special Tools • J-36372 Input Sun Gear Needle Bearing Installer • GE-8092 Universal Driver For equivalent regional tools, refer to Special Tools .

FRONT OUTPUT SHAFT DRIVE SPROCKET BEARING REPLACEMENT

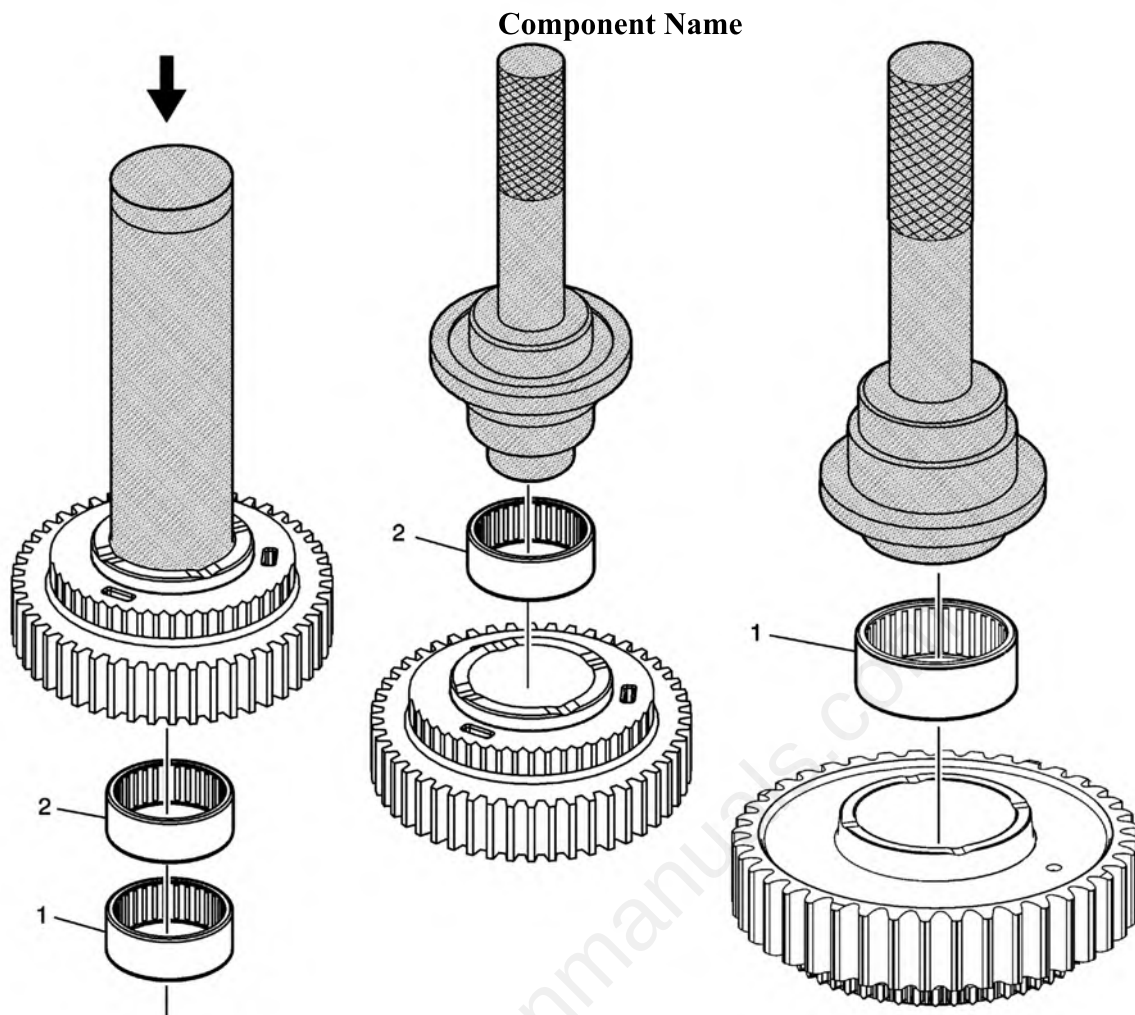


Fig. 56: Front Output Shaft Drive Sprocket Bearing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Using the DT-35512 bearing installer and an arbor press, remove the bearings from the drive sprocket.	

Component Name	
1	Transfer Case Front Output Shaft Drive Sprocket Bearing Assembly - Rear Procedure 1. Install the rear bearing (1) using the short end of the DT-48211 bearing installer. 2. Using an arbor press, install the bearing until the tool bottoms against the drive sprocket. NOTE: Install the bearing with the numbers on the edge of the bearings facing the installer tool. Special Tools • DT-48211 Drive Sprocket Bearing Installer • GE-8092 Universal Driver For equivalent regional tools, refer to Special Tools .
2	Transfer Case Front Output Shaft Drive Sprocket Bearing Assembly - Front Procedure 1. Install the front bearing (2) using the smaller diameter end of the DT-51336 bearing installer. 2. Using an arbor press, install the bearing until the tool bottoms against the drive sprocket. NOTE: Install the bearing with the numbers on the edge of the bearings facing the installer tool. Special Tools • DT-51336 Drive Sprocket Bearing Installer • GE-8092 Universal Driver

HIGH/LOW SHIFT FORK REPLACEMENT

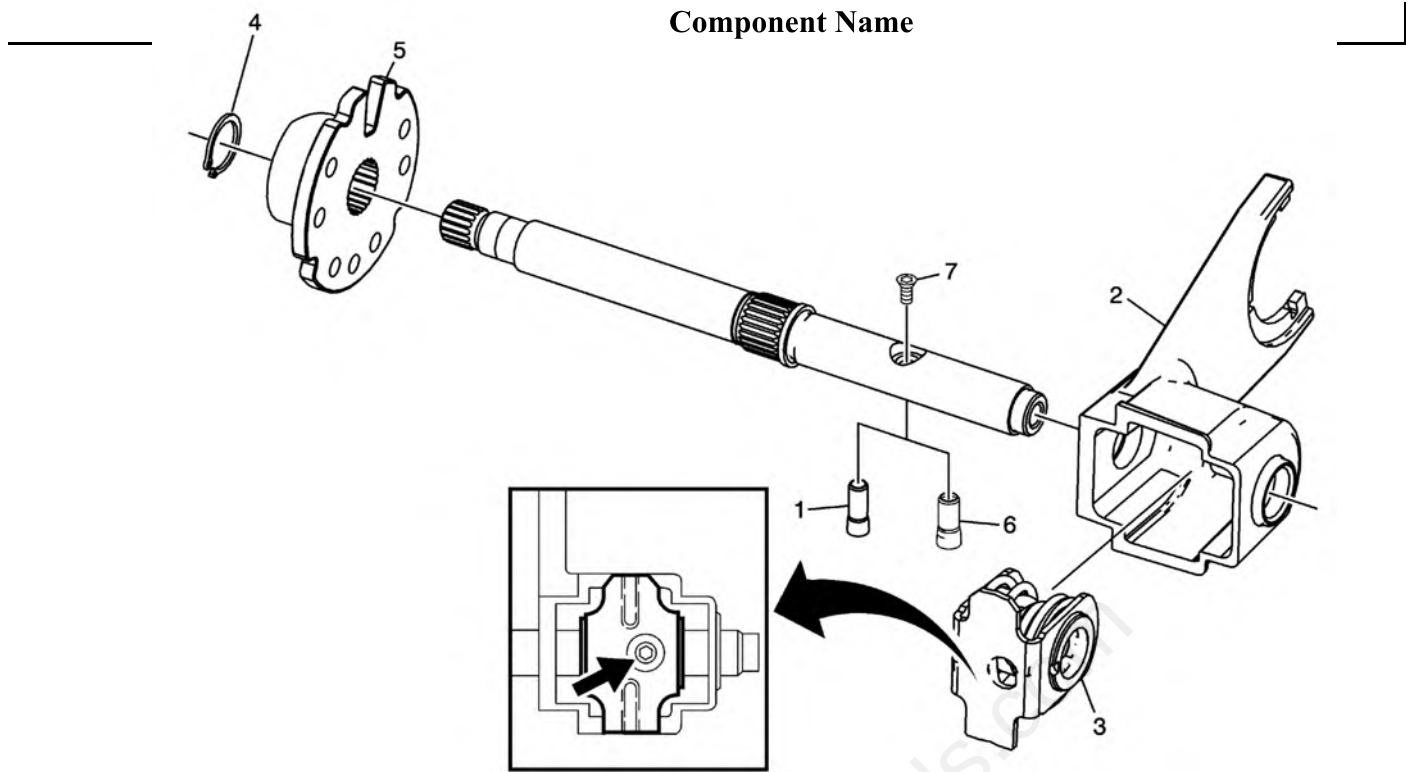


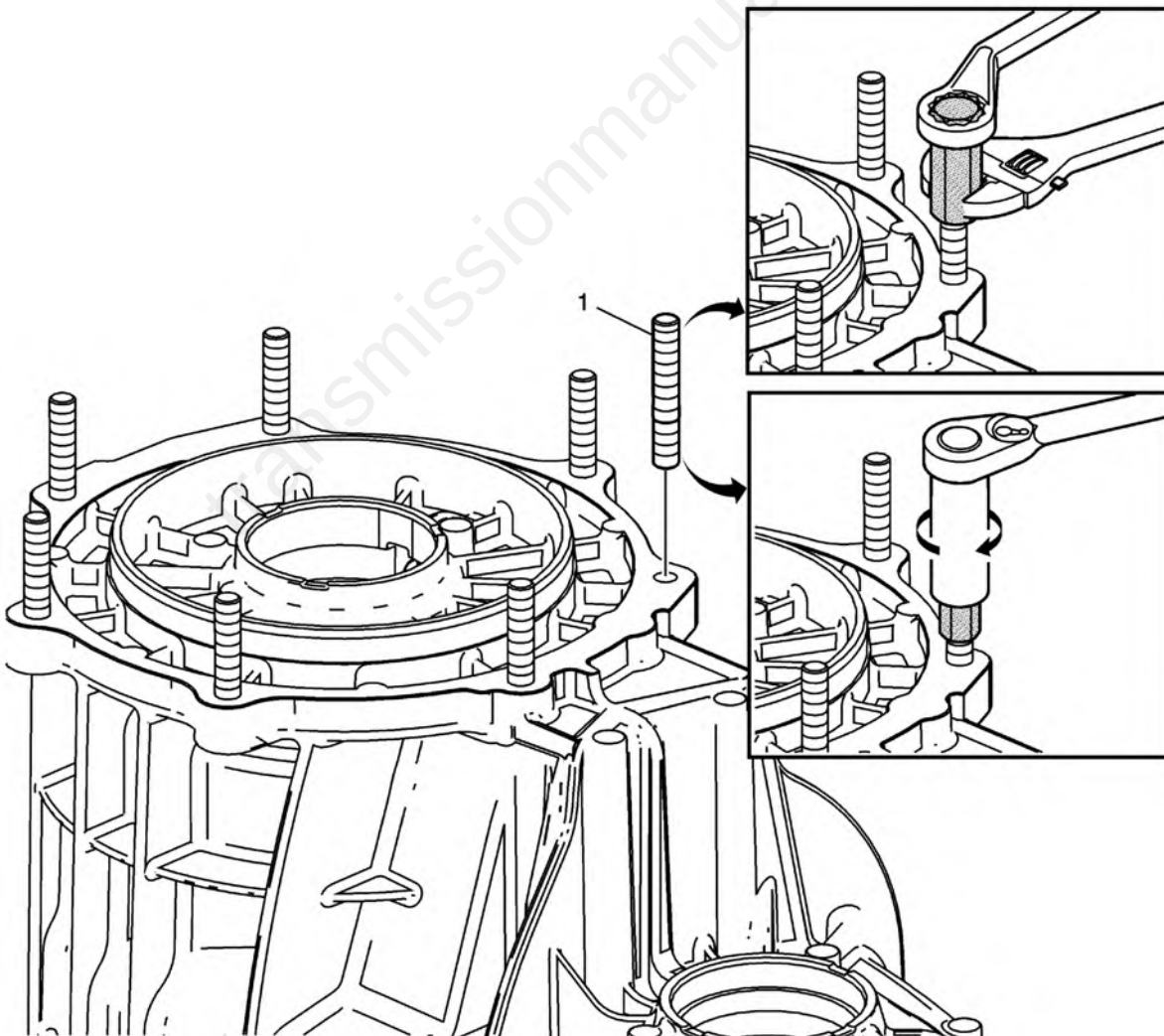
Fig. 57: High/Low Shift Fork
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transfer Case High/Low Shift Fork Pin NOTE: Drive the pin out using a drift punch and hammer. Discard the pin if removed.
2	Transfer Case High/Low Shift Fork NOTE: Inspect for wear or damage in the spring seat locations. The component must be replaced if damage is found.
3	Transfer Case High/Low Shift Fork Spring Assembly NOTE: - When assembling the shift fork spring assembly (3) into the shift fork (2), the opening in the flange of the spring assembly should be positioned facing away from the shift cam (6). - The component must be replaced if the following conditions exist: - The cam lobes are worn or rough - The spring is broken
4	Transfer Case Two/Four Wheel Drive Actuator Cam Retaining Ring
5	Transfer Case Two/Four Wheel Drive Actuator Cam Spacer

Component Name	
6	Transfer Case High/Low Shift Fork - Service - Pin Procedure 1. Apply a small amount of threadlock to the shaft of the pin before installation. 2. Press the pin into the control actuator shaft using a brass drift until bottom.
7	Transfer Case Shift Fork Shaft Guide Screw CAUTION: Refer to Fastener Caution . Procedure Apply a small amount of threadlock to the screw threads. Tighten 5 N.m (44 lb in)

TRANSFER CASE ASSEMBLE

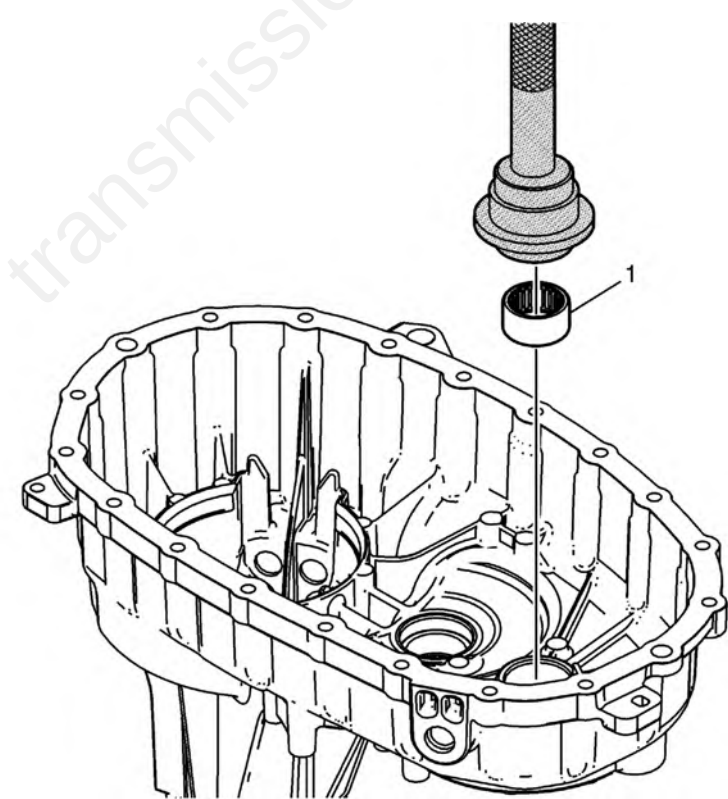
Transfer Case Stud Installation



Transfer Case Stud Installation

Callout	Component Name
1	Transfer Case Studs - Transmission Interface CAUTION: Refer to Fastener Caution . Procedure 1. Apply sealer to the threads of the studs. Refer to:Adhesives, Fluids, Lubricants, and Sealers. 2. Install the DT-49308 Stud Installer onto the stud. 3. Rotate the bolt until it contacts the top of the stud. 4. Install a deep socket over both the head of the bolt and the long nut and tighten the stud to specifications. 5. Loosen the long nut and remove the tool from the stud. 6. Inspect the studs for the proper installation height and a properly installed stud should protrude from the face of the case 40 mm (1.58 in). Special Tools DT-49308 Stud Remover and Installer Refer to:Special Tools.

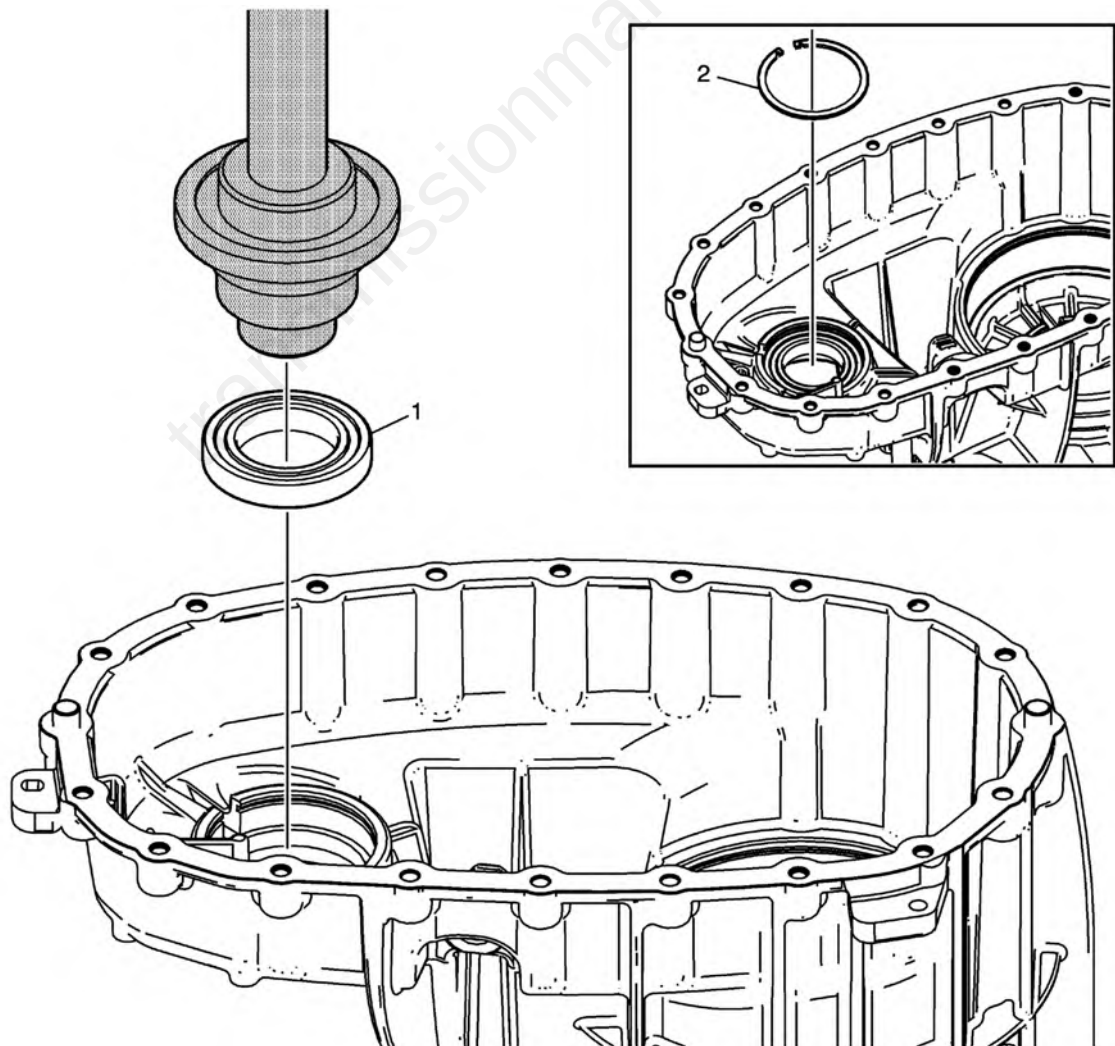
Transfer Case Front Output Shaft Rear Bearing Installation



Transfer Case Front Output Shaft Rear Bearing Installation

Callout	Component Name
1	Transfer Case Front Output Shaft Rear Bearing Procedure 1. Install the bearing with the numbers on the edge of the bearings facing the installer tool. 2. Press the front output shaft rear bearing into rear case using DT-51336 Bearing Installer. NOTE: Install the bearing until the tool bottoms against the case half. Special Tools • DT-51336 Bearing Installer • GE-8092 Driver Handle Refer to:Special Tools.

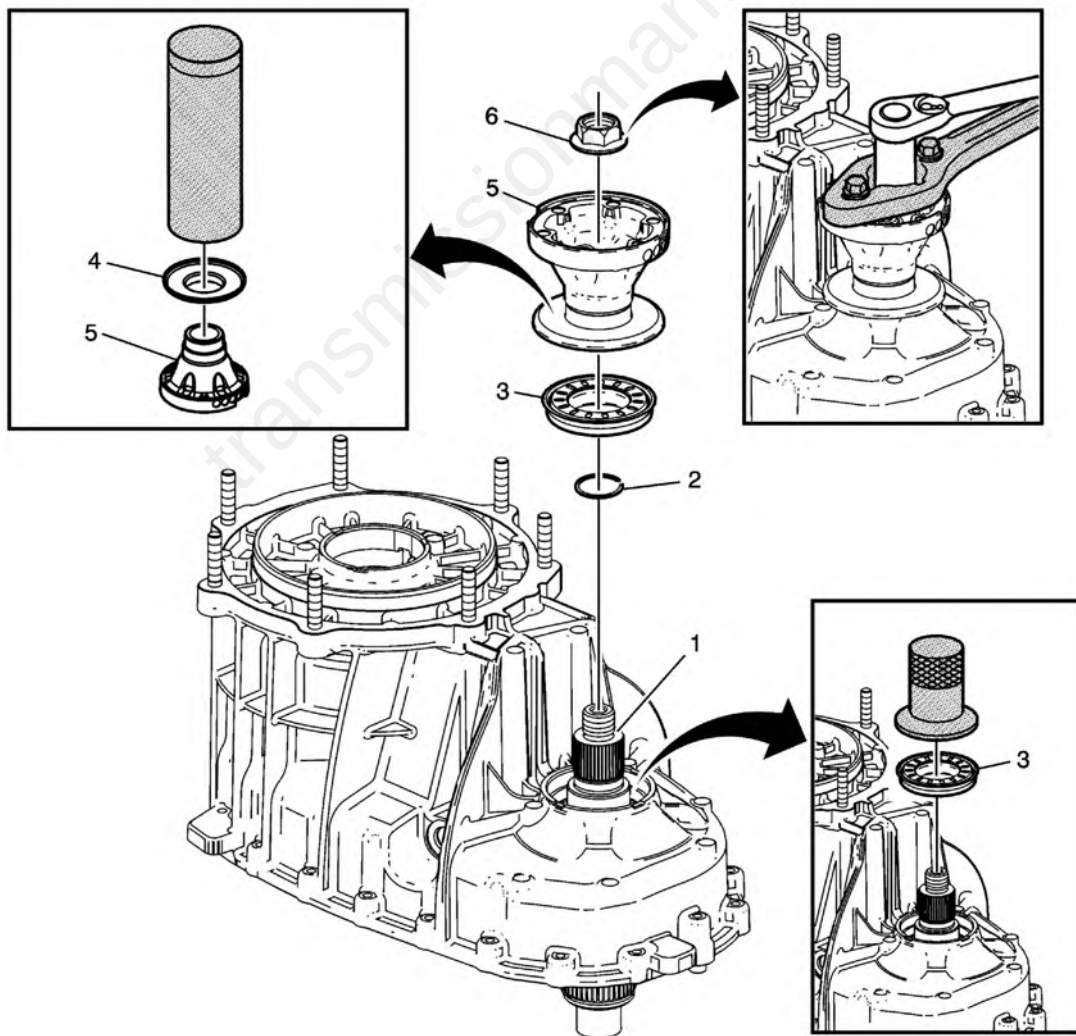
Transfer Case Front Output Shaft Front Bearing Installation



Transfer Case Front Output Shaft Front Bearing Installation

Callout	Component Name
1	Transfer Case Front Output Shaft Front Bearing NOTE: • Use the large diameter end of the tool to install the bearing. • Install the bearing until it bottoms against case half bore. Special Tools • DT-51336 Driver • GE-8092 Driver Handle Refer to:Special Tools.
2	Transfer Case Front Output Shaft Front Bearing Retaining Ring

Transfer Case Front Output Flange, Front Output Shaft Seal and Front Output Shaft Installation



Transfer Case Front Output Flange, Front Output Shaft Seal and Front Output Shaft Installation

Callout	Component Name
1	Transfer Case Front Output Shaft
2	Transfer Case Front Output Shaft Retaining Ring
3	Transfer Case Front Output Shaft Seal NOTE: Use the end of the tool marked "B" to install the seal. Special Tools DT-51592 Installer Refer to: Special Tools.
4	Transfer Case Front Output Flange Slinger Procedure 1. Place the large end of the flange on the press. 2. Install the slinger onto the flange 2 mm (0.78 in) below flush to face with DT-24433 . Special Tools DT-24433 Pinion Cone and Side Bearing Installer
5	Transfer Case Front Output Flange
6	Transfer Case Front Output Flange Nut Procedure Install the DT-08614-A Pinion Flange Holder and Remover and DT-08614-20 Flange Retaining Bolts to install output flange nut. Special Tools • DT-08614-A Pinion Flange Holder and Remover • DT-08614-20 Flange Retaining Bolts Tighten 176 - 271 N.m (130 - 200 lb ft)

Transfer Case Input Shaft and Planetary Assembly Installation

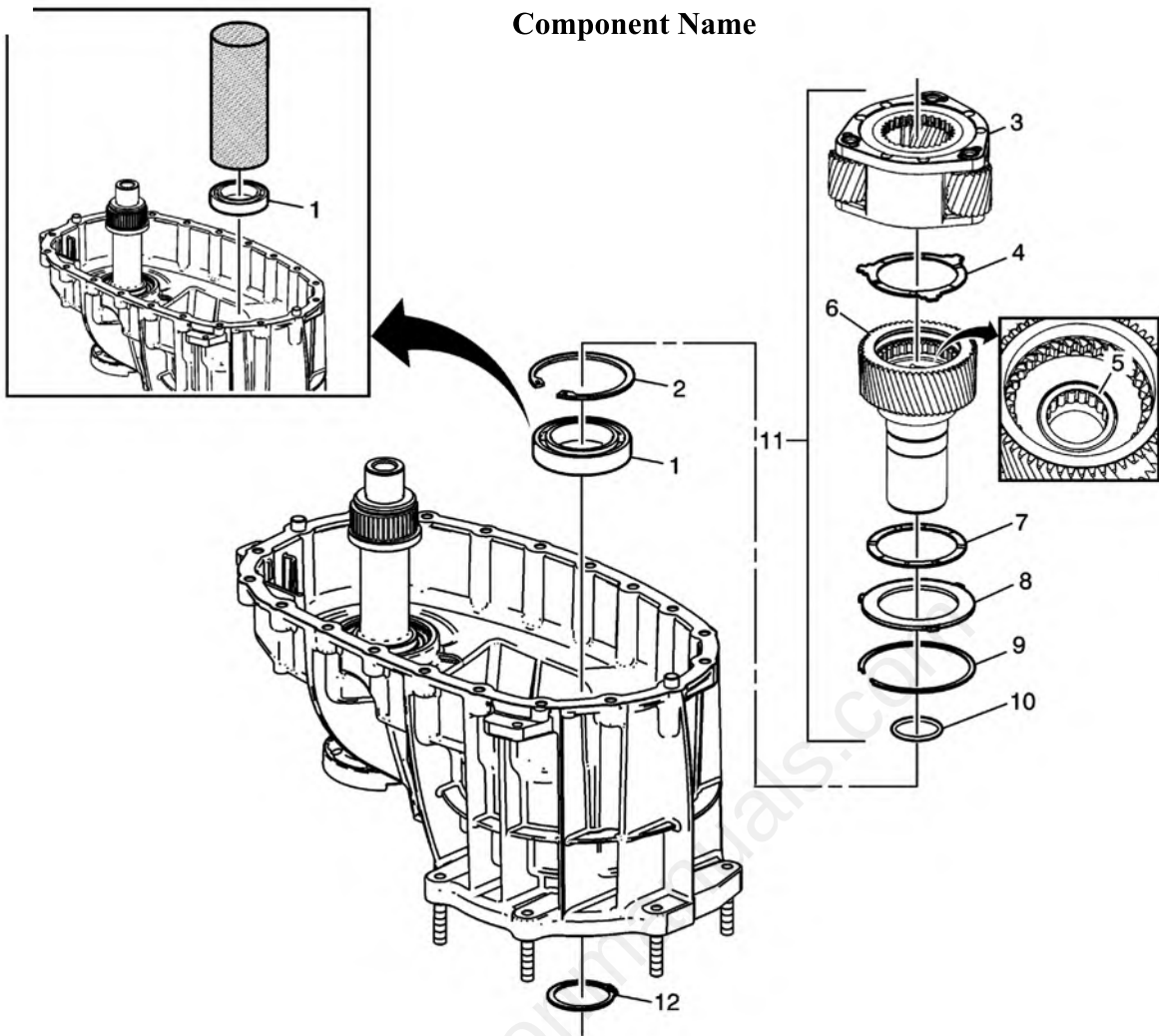


Fig. 62: Transfer Case Input Shaft and Planetary Assembly
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft and Planetary Assembly Installation

Callout	Component Name
1	Transfer Case Front Output Shaft Bearing Special Tools J-36366-A Pinion Oil Seal Installer Refer to: Special Tools .
2	Transfer Case Front Output Shaft Bearing Retaining Ring
3	Transfer Case High/Low Planetary Carrier
4	Transfer Case Planetary Carrier Sun Gear Thrust Washer
5	Transfer Case Input Shaft Pilot Bearing. Refer to: Input Shaft Pilot Bearing Replacement .
6	Transfer Case Input Shaft
7	Transfer Case Input Shaft Washer
8	Transfer Case High/Low Locking Plate
9	Transfer Case Input Shaft Retaining Ring
10	Transfer Case Front Output Shaft Seal - O-ring Procedure Lubricate the seal prior to installation. Refer to: Adhesives, Fluids, Lubricants, and Sealers
11	Transfer Case Input Shaft/Planetary Assembly
12	Transfer Case Input Shaft Inner Retaining Ring

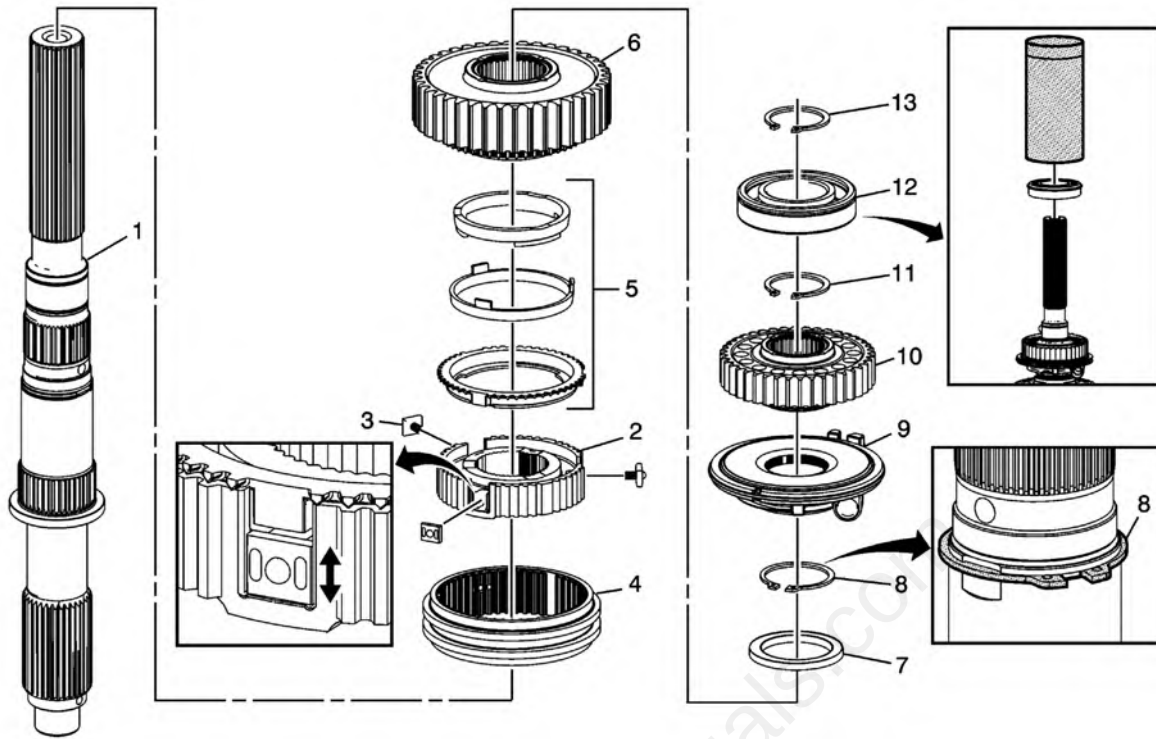


Fig. 63: Transfer Case Rear Output Shaft

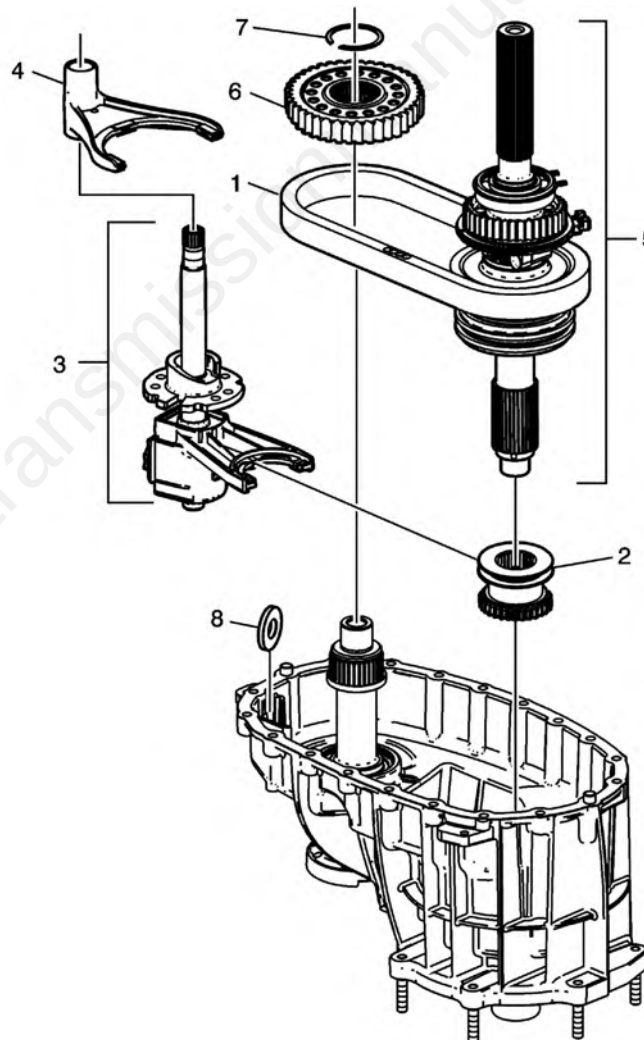
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Output Shaft Assembly

Callout	Component Name
1	Transfer Case Rear Output Shaft
2	Transfer Case Two/Four Wheel Drive Synchronizer Sleeve
3	Transfer Case Two/Four Wheel Drive Synchronizer Insert (Qty:3)
4	Transfer Case Two/Four Wheel Drive Synchronizer Hub
5	Transfer Case Two/Four Wheel Drive Synchronizer
6	Transfer Case Front Output Shaft Drive Sprocket
7	Transfer Case Front Output Shaft Drive Sprocket Spacer
8	Transfer Case Front Output Shaft Drive Sprocket Retaining Ring
	NOTE: Ensure the retaining ring is installed into the correct retaining ring groove on the rear output shaft.
9	Transfer Case Oil Pump Assembly
10	Transfer Case Rear Output Shaft Reluctor Wheel
11	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring

Component Name	
12	Transfer Case Rear Output Shaft Rear Bearing NOTE: • Use an arbor press or suitable installer to install the bearing to the rear output shaft. • Ensure the retaining ring groove in the outer race is positioned toward the rear. • Avoid using excessive press force when installing the bearing. Press the bearing on until light contact with the snap ring (8). DO NOT exceed a press force of 16.75 kPa (350 lb ft) Special Tools DT-24433 Pinion Cone and Side Bearing Installer Refer to: Special Tools.
13	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring

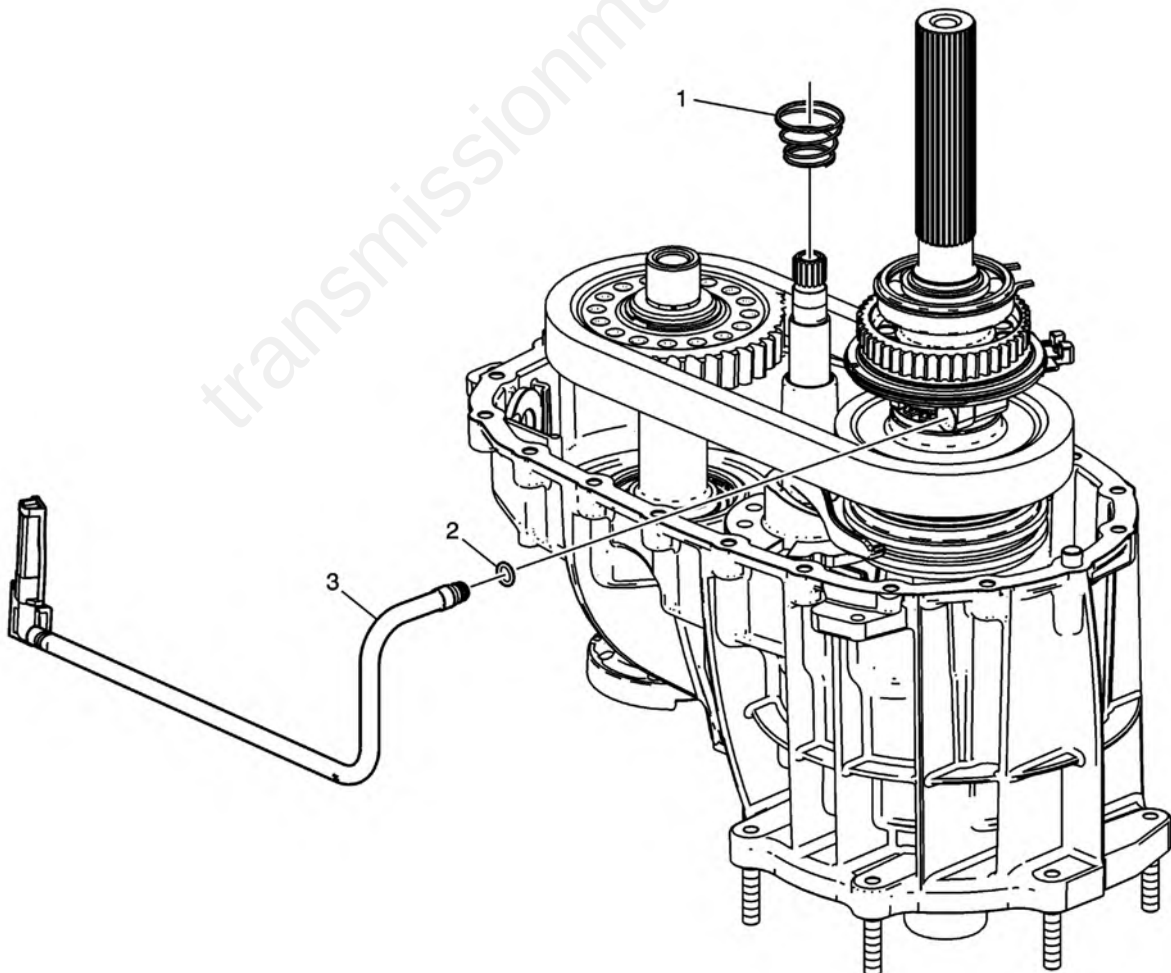
Transfer Case Front Output Shaft Driven Sprocket, High/Low Shift Fork Assembly, Two/Four Wheel Drive Shift Fork, Drive Chain, Chip Collector Magnet, and Rear Output Shaft Assembly Installation



Transfer Case Front Output Shaft Driven Sprocket, High/Low Shift Fork Assembly, Two/Four Wheel Drive Shift Fork, Drive Chain, Chip Collector Magnet, and Rear Output Shaft Assembly Installation

Callout	Component Name
Preliminary Procedures Install components simultaneously.	
1	Transfer Case Front Output Shaft Drive Chain NOTE: Install the chain with the blue color links up and facing away from case half.
2	Transfer Case High/Low Clutch
3	Transfer Case High/Low Shift Fork Assembly
4	Transfer Case Two/Four Wheel Drive Shift Fork
5	Transfer Case Rear Output Shaft Assembly
6	Transfer Case Front Output Shaft Driven Sprocket
7	Transfer Case Front Output Shaft Driven Sprocket Retaining Ring
8	Transfer Case Chip Collector Magnet

Transfer Case Oil Pump Suction Pipe and Shift Fork Spring Installation



Transfer Case Oil Pump Suction Pipe and Shift Fork Spring Installation

Callout	Component Name
1	Transfer Case Shift Fork Spring
2	Transfer Case Oil Pump Suction Pipe Seal Procedure 1. Use a NEW seal. 2. Lubricate the seal to ease installation. 3. Install the seal to the pipe prior to inserting the pipe into the pump. Refer to: Adhesives, Fluids, Lubricants, and Sealers .
3	Transfer Case Oil Pump Suction Pipe

Transfer Case Rear Extension (Rear Half) Installation

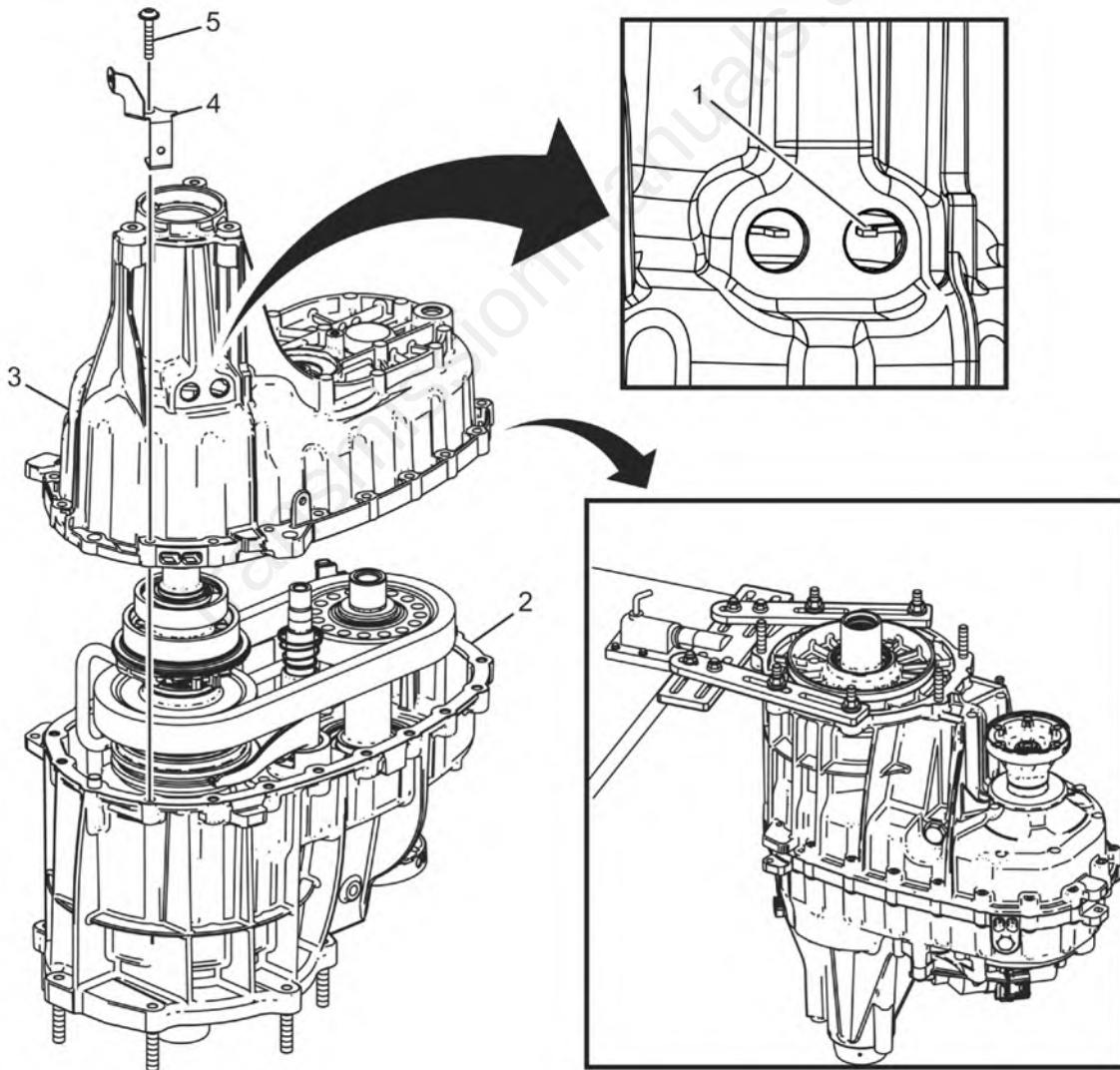


Fig. 66: Transfer Case Rear Extension (Rear Half)

Rear Extension (Rear Half) Installation

Callout	Component Name
1	Transfer Case Rear Output Shaft Rear Bearing Outer Retaining Ring
2	Transfer Case (Front Half) CAUTION: Apply the proper amount of sealant to the transfer case (front half) sealing surface when assembling the transfer case. Excessive amounts of sealant can plug the oil pump screen, resulting in internal component failure. Procedure 1. Ensure the sealing surfaces of both case halves are free of dirt, oil and cleaning solvent. 2. Apply a 2 mm (0.078 in) bead of sealant to the front case half.
3	Transfer Case Rear Extension (Rear Half) Procedure 1. Ensure the transfer case rear output shaft outer retaining ring is in place and aligned prior to mating case halves. 2. Use snap ring pliers to open the transfer case rear output shaft outer retaining ring for installation onto the rear output shaft rear bearing.
4	Transfer Case Harness Bracket
5	Transfer Case Half Bolt/Screw (Qty: 18) CAUTION: Refer to Fastener Caution . Procedure 1. Rotate the transfer case assembly to position the rear extension (rear half) facing downward. In this orientation, the weight of the rear output shaft assembly will assist to position the rear output shaft bearing into the bore of the rear case half and locate the snap ring into the OD groove of the bearing. 2. Inspect the snap ring for installation into the OD groove of the bearing. NOTE: Tighten bolts by hand, do not use an air gun. Tighten 24 N.m (18 lb ft)

Transfer Case Rear Output Shaft Seal and Bushing Installation

Component Name	
1	Transfer Case Rear Output Shaft Bushing Procedure 1. Install the bushing on the finger section of the DT-45380 remover/installer. 2. Install the finger section to the main body of the DT-45380 remover/installer. 3. Position the bushing and tool to the rear case half. 4. Install the bushing until the tool bottoms against the rear case half. NOTE: • If the bushing was removed, a new bushing must be installed. • Ensure the bushing is installed squarely into the bushing bore. Special Tools DT-45380 Transfer Case Rear Bushing Remover and Installer Refer to: Special Tools.
2	Transfer Case Rear Output Shaft Seal Procedure 1. Install the seal with the notched area on the OD of the seal with the case half as seen above. Special Tools • DT-48210 Seal Installer • GE-8092 Driver Handle

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 2/4 Wheel Drive Actuator, Actuator Shaft Position Sensor, Transfer Case Shift Detent Plunger Plug, and Vehicle Speed Sensor Installation

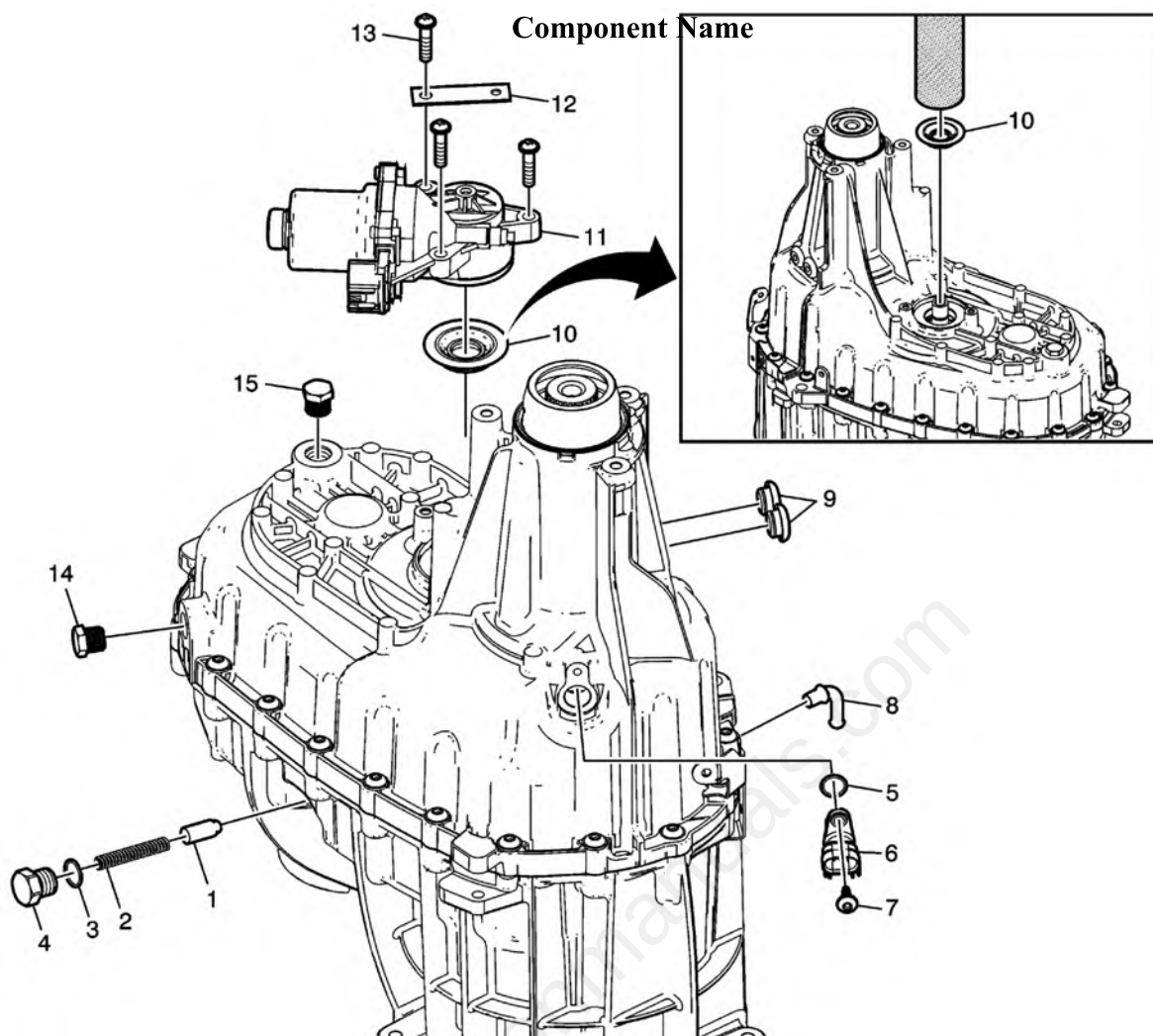


Fig. 68: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 2/4 Wheel Drive Actuator, Actuator Shaft Position Sensor, Transfer Case Shift Detent Plunger Plug, and Vehicle Speed Sensor Installation

Callout	Component Name
1	Transfer Case Shift Detent Plunger
2	Transfer Case Shift Detent Plunger Spring
3	Transfer Case Shift Detent Plunger Plug O-ring Seal Procedure Lubricate the O-ring with clean DEXRON®VI.
4	Transfer Case Shift Detent Plunger Plug Tighten 24 N.m (18 lb ft)
5	Vehicle Speed Sensor O-ring Seal NOTE: Lightly lubricate the O-ring with clean DEXRON®VI.
6	Vehicle Speed Sensor

Component Name	
7	Transfer Case Rear Output Shaft Speed Sensor Bolt Procedure Apply threadlock to the threads of the bolt. Tighten 8 N.m (69 lb in)
8	Transfer Case Vent Procedure Apply retaining compound to the OD of the NEW vent pipe before installation.
9	Transfer Case Access Hole Plug (Qty: 2)
10	Transfer Case Two/Four Wheel Drive Actuator Seal
11	Transfer Case Two/Four Wheel Drive Actuator
12	Transfer Case Actuator Harness Bracket
13	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty: 3) Tighten 19 N.m (14 lb ft)
14	Transfer Case Oil Fill Plug Procedure Apply pipe sealant to the oil fill plug before installation. Tighten 25 N.m (18 lb ft)
15	Transfer Case Oil Drain Plug CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Procedure Apply pipe sealant to the oil drain plug before installation. Tighten 25 N.m (18 lb ft)

Transfer Case Input Shaft Seal Installation and Transfer Case Holding Fixture Removal

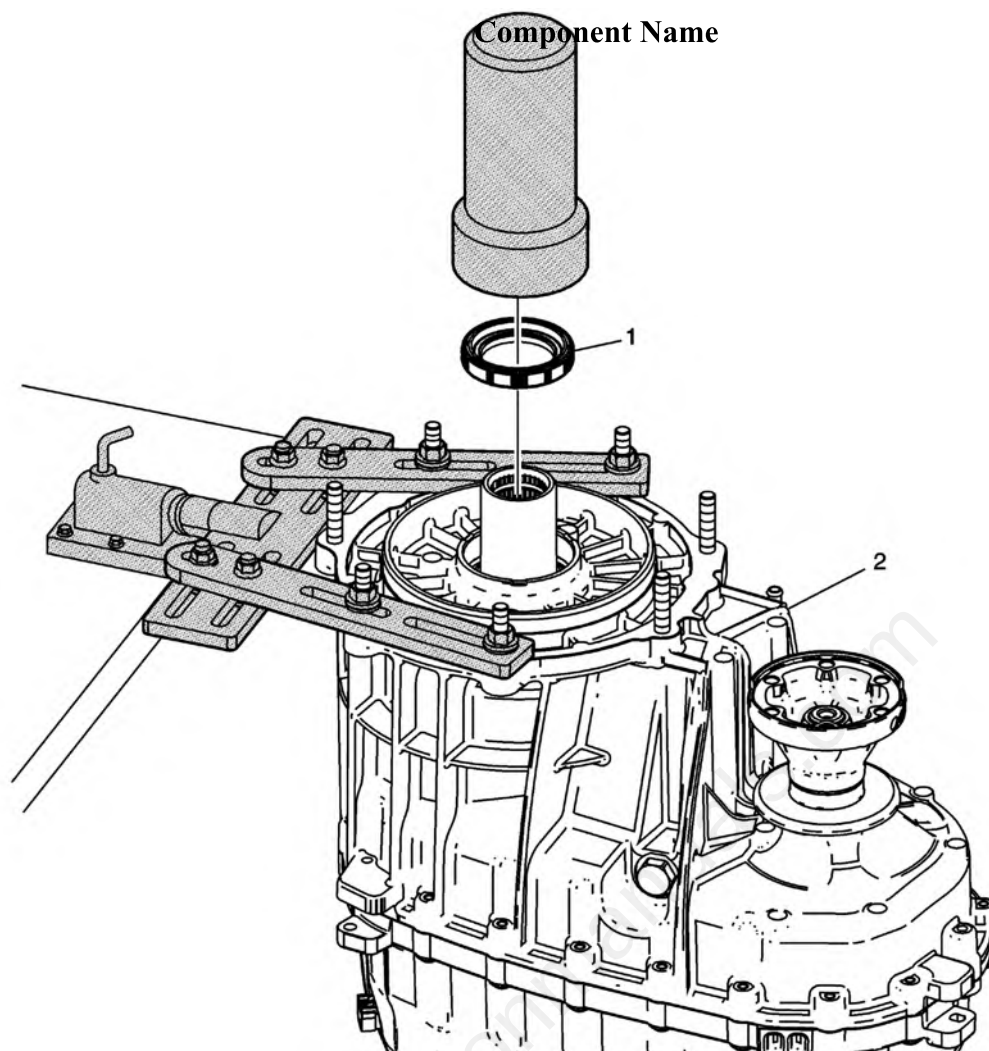


Fig. 69: Transfer Case Input Shaft Seal Installation and Transfer Case Holding Fixture
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft Seal Installation and Transfer Case Holding Fixture Removal

Callout	Component Name
1	Transfer Case Input Shaft Seal NOTE: Ensure the bore of the front case half is free of dirt, oil, and cleaning solvent. Special Tools DT-50648-A Case Seal Installer Refer to: Special Tools.
2	Transfer Case Assembly Procedure Remove the transfer case and DT-36842 from the DT-3289-20 Holding Fixture and remove the DT-36842 from the transfer case. Special Tools • DT-3289-20 Holding Fixture • DT-36842 Transaxle Holding Fixture

DESCRIPTION AND OPERATION

TRANSFER CASE IDENTIFICATION

TRANSFER CASE IDENTIFICATION (MAGNA)

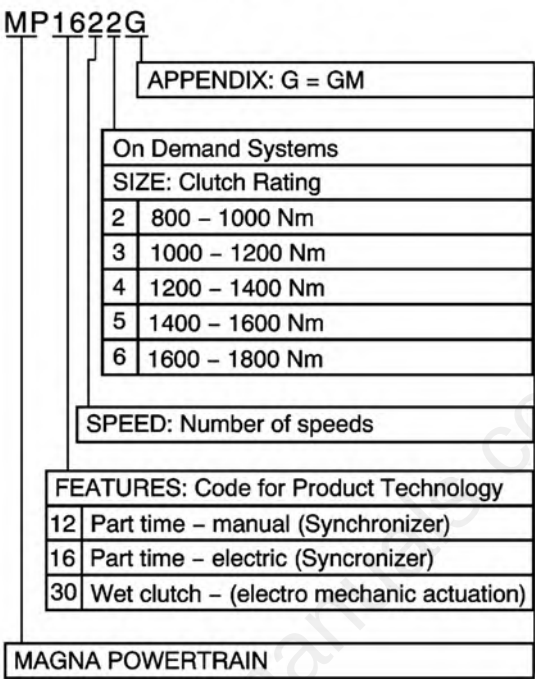


Fig. 70: Transfer Case
Courtesy of GENERAL MOTORS COMPANY

Magna Transfer Case Bar Code Label

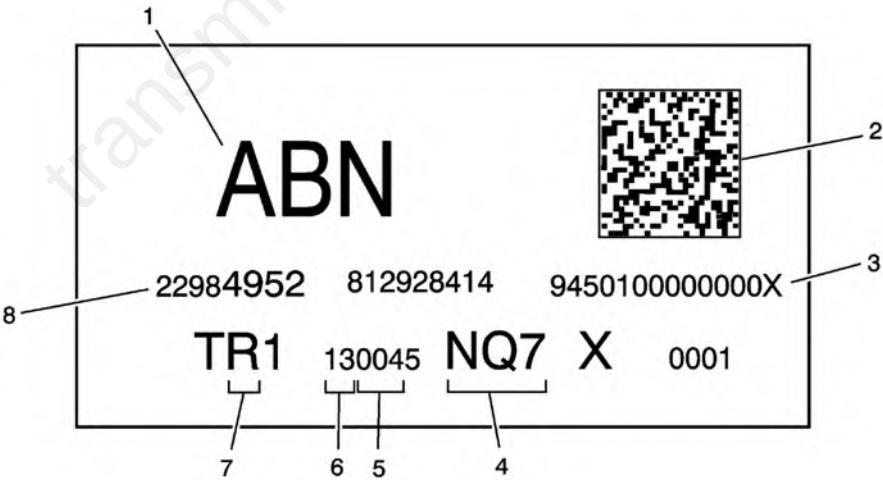


Fig. 71: Magna Transfer Case Bar Code Label
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	GM Broadcast Code
2	2D Bar Code

t	Component Name
3	VPPS Code
4	RPO
5	Julian Date of the Year
6	Calendar Year
7	Build Location - R-Ramos / T-Troy / M-Muncie
8	GM Assembly Part Number

TRANSFER CASE DESCRIPTION AND OPERATION

Transfer Case Shift Control Switch

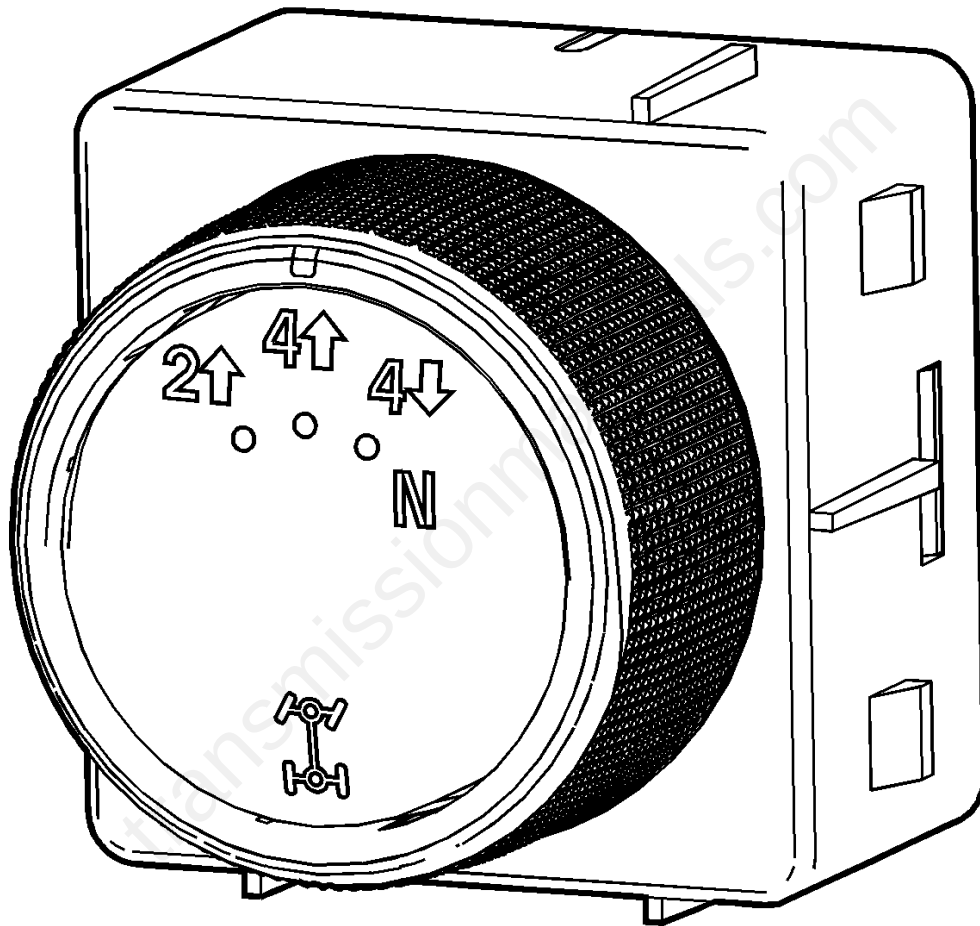


Fig. 72: View Of Transfer Case Shift Control Switch

Courtesy of GENERAL MOTORS COMPANY

The Magna Powertrain (MP) MP-1622G RPO NQ7 transfer case features a 4 mode shift control switch located on the instrument panel. When the ignition is in the RUN position, the transfer case shift control module monitors the transfer case shift control switch to determine if the driver desires a new mode/range position. At a turn of the transfer case shift control switch, the lamp of the new desired position will begin flashing to inform the driver that the transfer case shift control module has received the request for a new mode/range position. The lamp continues to flash until all shifting criteria has been met and the new mode/range position has been engaged. Once the new mode/range position is fully active, the switch indicator for the new position will remain ON constantly. In the event

If the transfer case shift control module cannot or will not complete the shift, the indicator switch flashes and returns to the previously selected position.

The MP-1622G RPO NQ7 transfer case provides the driver with 4 manual mode/range positions:

- 2HI - 2 Wheel Drive high range
- 4HI - 4 Wheel Drive high range
- 4LO - 4 wheel drive low range - 2.72:1 gear ratio reduction.
- NEUTRAL

The driver may choose to select any of these mode/range positions while driving the vehicle. However, the transfer case will not allow a shift into or out of 4LO unless the following criteria have been met:

- The ignition switch is in RUN.
- The automatic transmission is in NEUTRAL.
- The vehicle speed is below 5 km/h (3 mph).

This transfer case also has a NEUTRAL position. A shift to the NEUTRAL position allows the vehicle to be towed without rotating the transmission output shaft. NEUTRAL position may be obtained only if the following criteria have been met:

- The ignition switch is in RUN.
- The automatic transmission is in NEUTRAL.
- The vehicle speed is below 5 km/h (3 mph).
- The transfer case is in 2HI mode.

Once these conditions have been met, turn the rotary switch clockwise past 4 low and hold for 10 seconds. When the system completes the shift to NEUTRAL, the red NEUTRAL lamp will illuminate.

A shift to the NEUTRAL position allows the vehicle to be towed without rotating the transmission output shaft. In the NEUTRAL position, the rear propeller shaft rotates the transfer case rear output shaft, in turn rotating the oil pump, thus providing constant lubrication during towing. This NEUTRAL position is a 4WD NEUTRAL, meaning the front and rear outputs of the transfer case are engaged as though in 4HI. With a disengaged front axle, there is no power flow to the front wheels, thus allowing towing with the front wheels off the ground or flat towing without driveline binding.

2WD Mode Power Flow

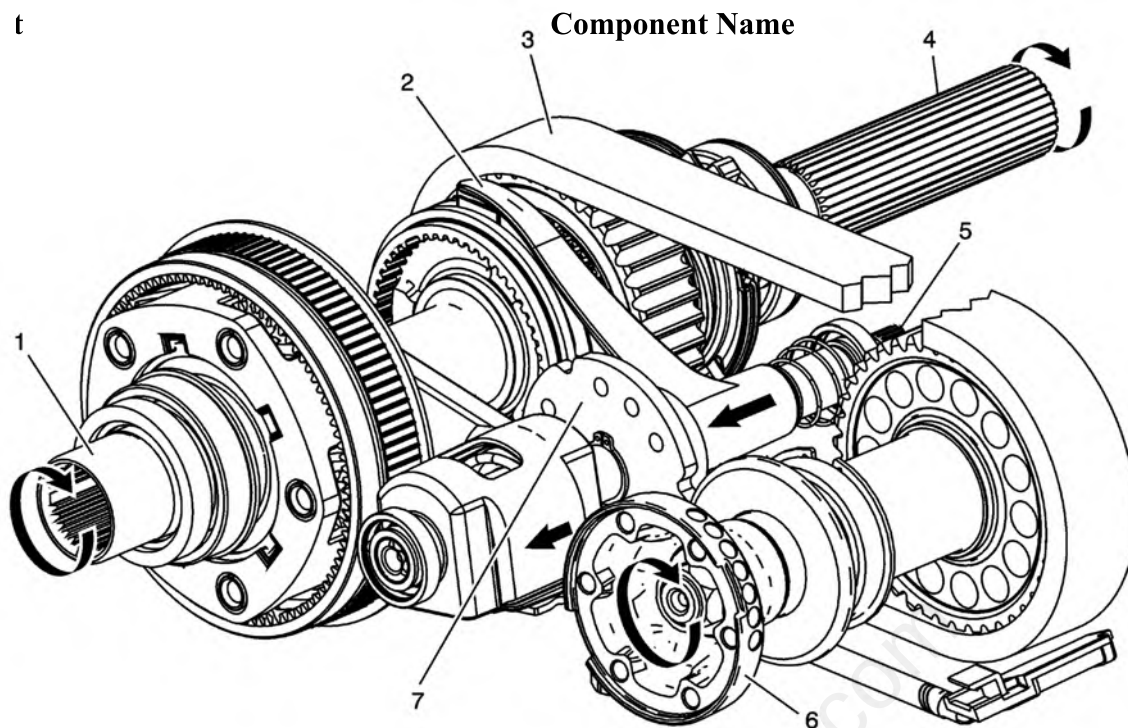


Fig. 73: 2WD Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Two/Four Shift Fork
3	Drive Chain
4	Rear Output Shaft
5	Control Actuator Shaft
6	Front Output Flange/Shaft
7	Drive Actuator Cam

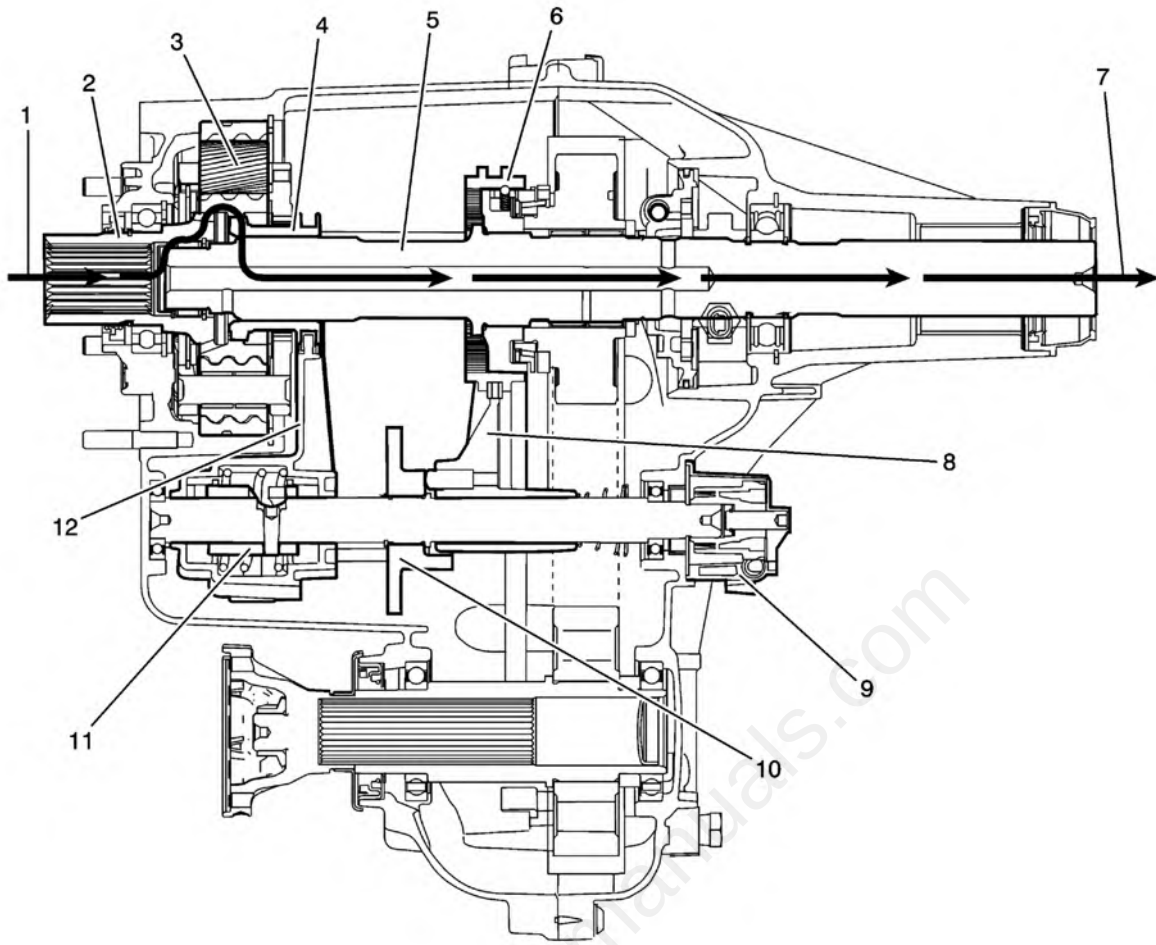


Fig. 74: Actuator Motor, Actuator Cam, High/Low Clutch And Rear Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

The transfer case is shifted by an actuator motor (9) mated to the control actuator shaft. The control actuator shaft rotates the 2/4 wheel drive actuator cam (10) and moves the high/low range shift fork (12) or the 2/4 wheel drive mode shift fork (8). Depending on the selected mode or range, the shift forks move either the high/low clutch (4) for the high/low range planetary assembly (3) or the synchronizer sleeve (6) for the 2/4 wheel drive mode. In 2WD mode, the engine power from the transmission (1) is delivered to the input shaft (2). The engagement teeth on the inside of the input shaft (2) are engaged to the outer teeth on the high/low clutch (4). The high/low clutch (4) is slip splined to rear output shaft (5). The engine power flows from the high/low clutch (4) to the rear output shaft (5) and delivered to rear propeller shaft (7).

4HI Mode Power Flow

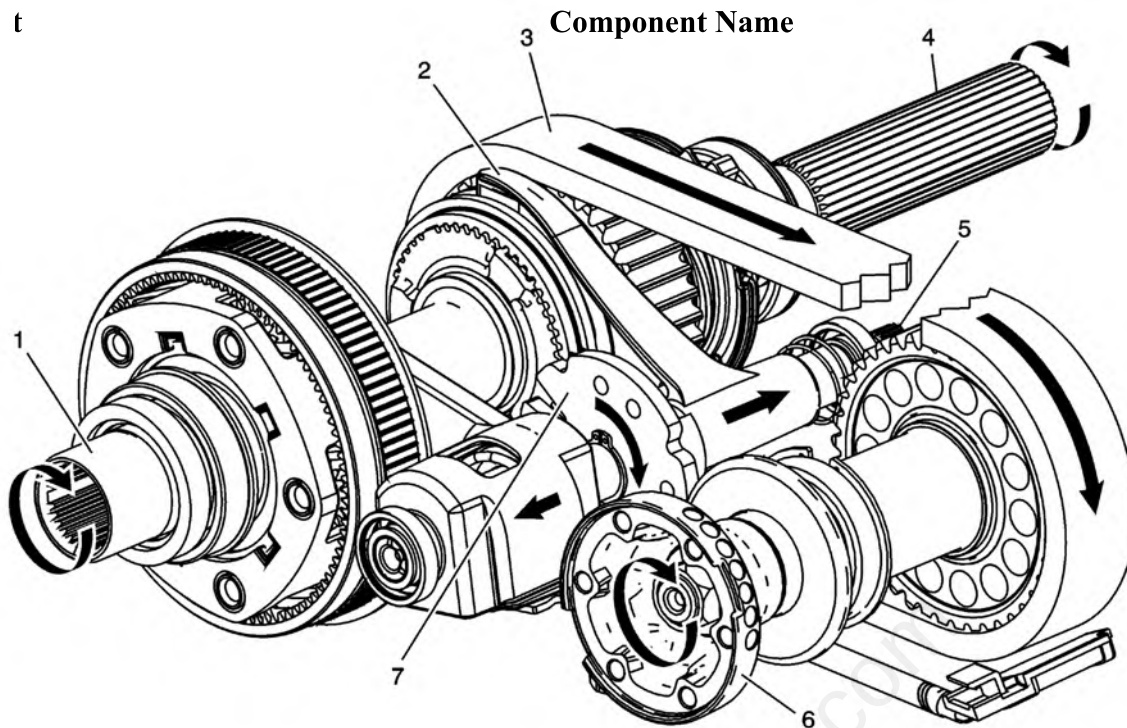


Fig. 75: 4HI Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Two/Four Shift Fork
3	Drive Chain
4	Rear Output Shaft
5	Control Actuator Shaft
6	Front Output Flange/Shaft
7	Drive Actuator Cam

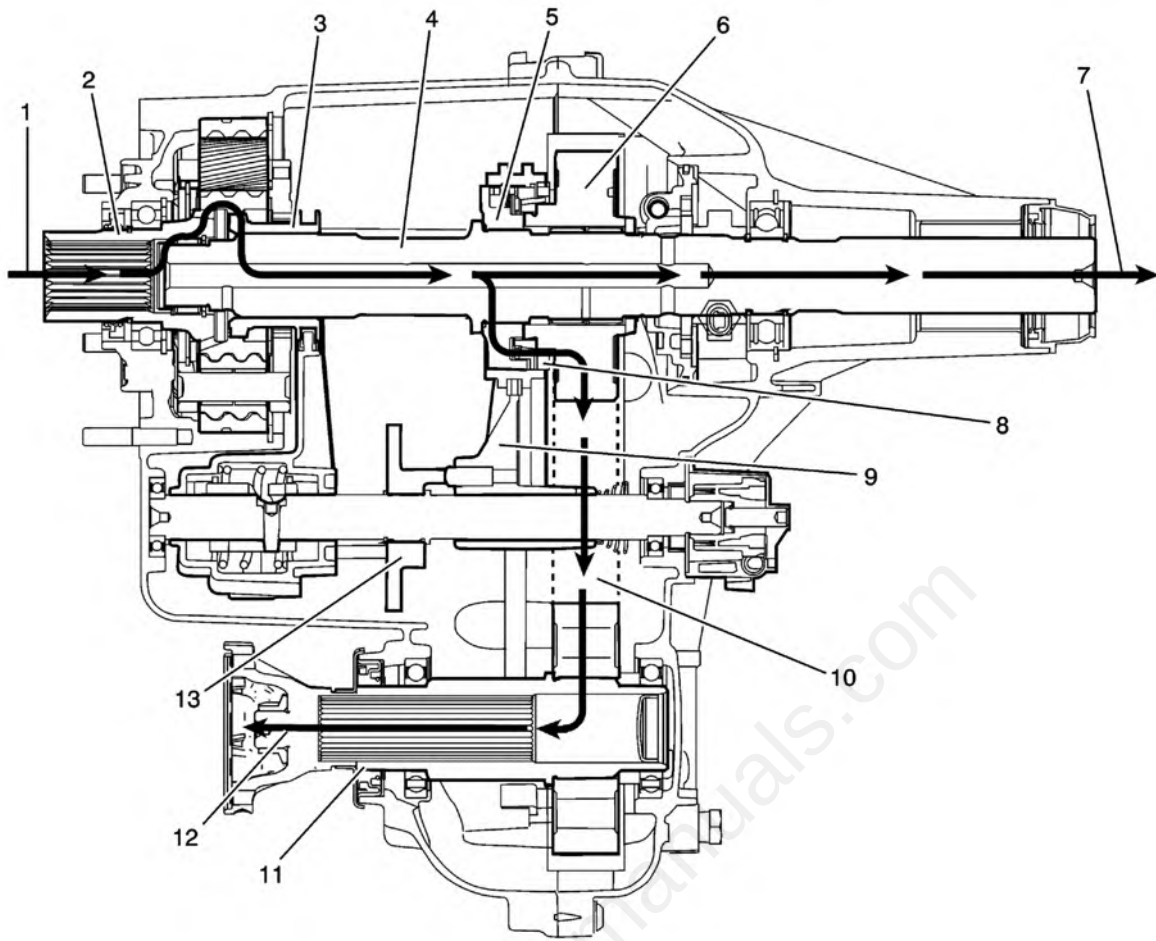


Fig. 76: Transmission, High/Low Clutch, Input Shaft And Front Propeller Shaft
Courtesy of GENERAL MOTORS COMPANY

In 4HI mode, the engine power from the transmission (1) is delivered to the input shaft (2). The engagement teeth on the inside of the input shaft (2) are engaged to the outer teeth on the high/low clutch (3). The high/low clutch (3) is slip splined to the rear output shaft (4). During a shift mode from 2HI to 4HI, the cam profile on the 2/4 wheel drive actuator cam (13) pushes the 2/4 wheel drive mode shift fork (9) and the synchronizer sleeve. The sleeve, engaging the synchronizer (8), equalizes the front propeller shaft (12) and rear propeller shaft (7) speeds. The sleeve then engages to the drive sprocket (6). The engine power flow for driving the front propeller shaft (12), now travels from the rear output shaft (4) to the synchronizer hub (5), which is splined to the rear output shaft (4). The power flows from the synchronizer hub (5) to the sleeve and then to the drive sprocket (6). The power flow is transmitted by a chain (10) to the driven sprocket on the front output flange/shaft (11) and to the front propeller shaft (12). The front and rear propeller shafts are being driven at equal RPM, therefore giving a four wheel drive mode. This mode should only be used for extra traction. Using this mode on dry pavement causes tire scuffing when turning.

4LO Mode Power Flow

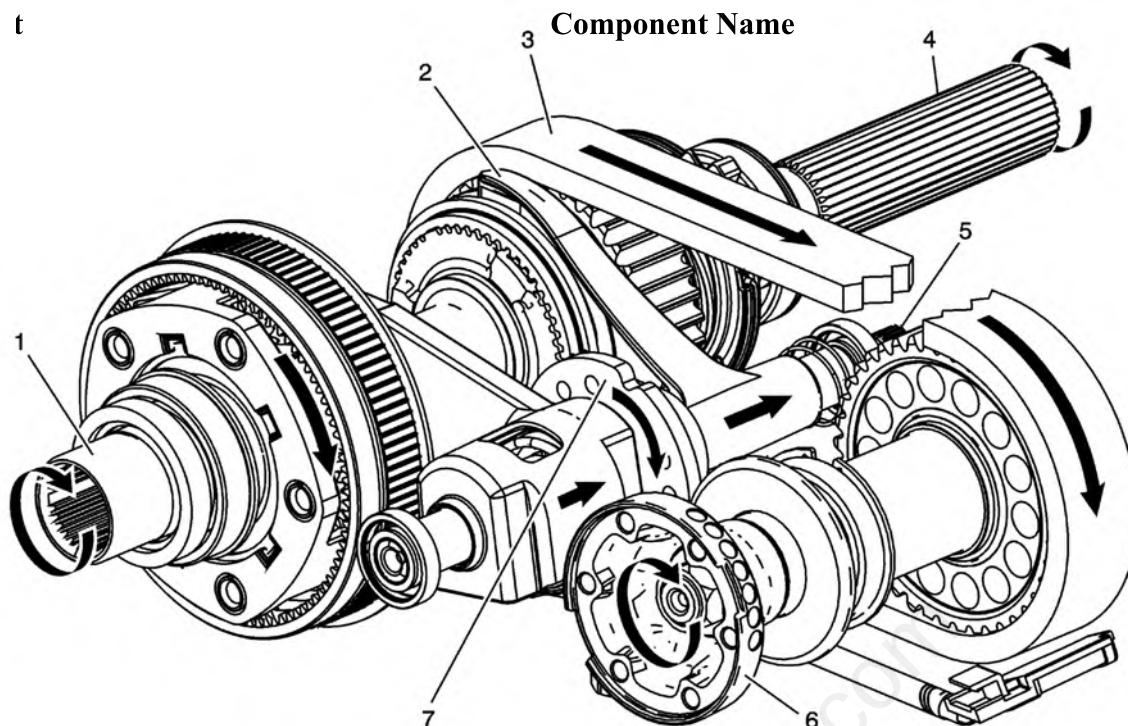


Fig. 77: 4LO Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Two/Four Shift Fork
3	Drive Chain
4	Rear Output Shaft
5	Control Actuator Shaft
6	Front Output Flange/Shaft
7	Drive Actuator Cam

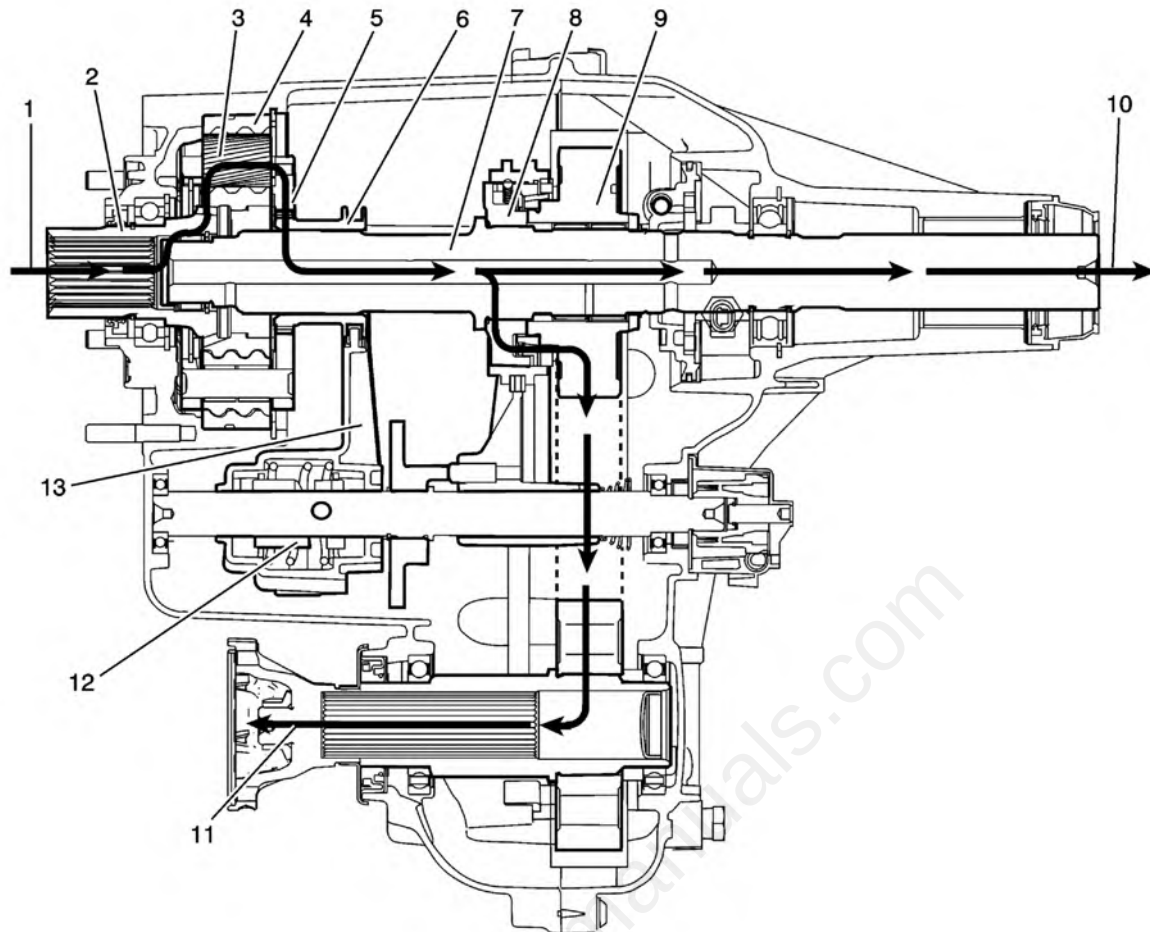


Fig. 78: Transmission, High/Low Clutch, Input Shaft And Front Propeller Shaft

Courtesy of GENERAL MOTORS COMPANY

During a range shift request to 4LO, a separate cam profile, in the high/low shift fork spring assembly (12), moves the high/low shift fork (13). The high/low shift fork (13) moves the high/low clutch (6) rearward. The high/low clutch (6) outer teeth disengage from the input shaft (2) high-speed teeth. The high/low clutch (6) outer teeth then engage in the high/low planetary carrier teeth (5). The power flow is now from the transmission (1) to the planetary teeth on the input shaft (2) to the planetary gears (3) in the high/low planetary carrier assembly (5). Rotating the planetary gears (3), which are engaged in the high/low internal gear (4), rotates the high/low planetary carrier assembly (5). The high/low planetary carrier assembly (5) delivers the power to the high/low clutch (6). The high/low clutch (6) then drives the rear output shaft (7), providing a 2.72:1 gear ratio reduction to the rear output shaft (7). The sleeve is still engaged to drive the drive sprocket (9), as in the 4HI position, providing the engine power to the rear propeller shaft (10) and to the front propeller shaft (11).

NEUTRAL Mode Power Flow

Shifting to the NEUTRAL position, the high/low clutch is centered between the input shaft and the high/low planetary carrier. The high/low clutch is not engaged with either the input shaft or the high/low planetary carrier teeth. The 2/4 wheel drive synchronizer is in the 4HI mode position.

Front Axle Actuator

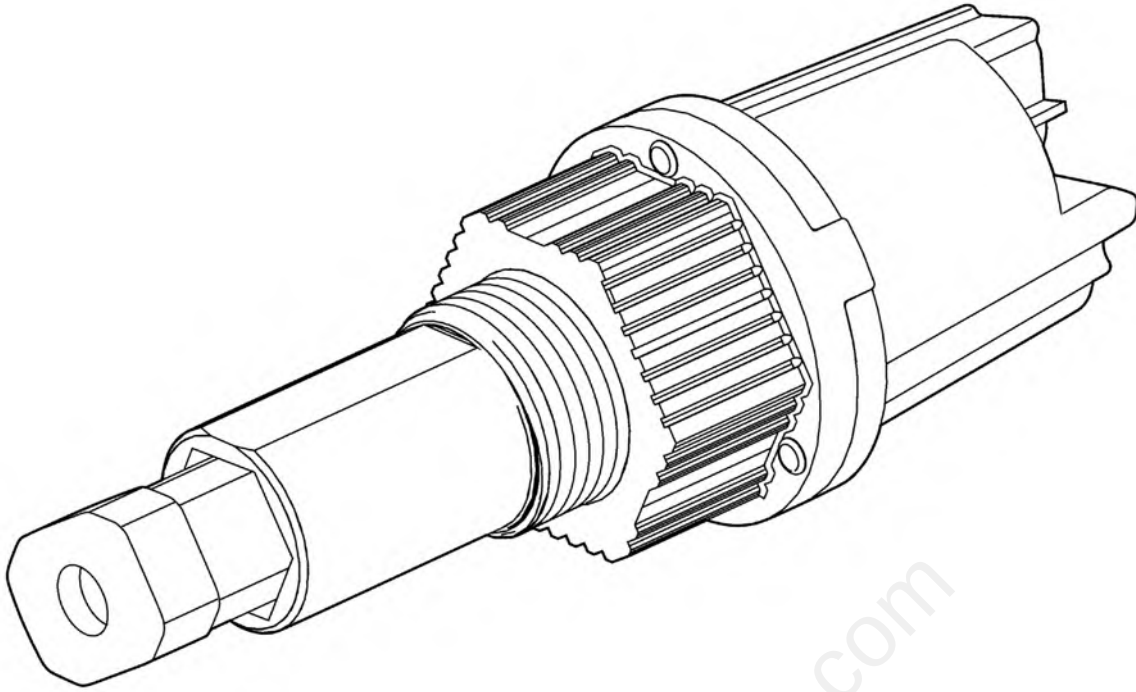


Fig. 79: Identifying Front Axle Actuator

Courtesy of GENERAL MOTORS COMPANY

The front axle actuator engages and disengages the front axle. The front axle actuator consists of a permanent magnetic (PM) motor, a worm gear controlled plunger, a front axle switch and an electronic control circuit. When a range shift to 4HI, or 4LO is requested, the transfer case shift control module requests engagement of the front axle by grounding the axle actuator control circuit through a current limiting driver. The front axle actuator also sends a return signal to the transfer case shift control module indicating when the 4WD is engaged.

Service 4 Wheel Drive Message

The Service 4 Wheel Drive Message is a display within the drivers information center (DIC). This message is used to inform the driver that a transfer case system condition has occurred. The Service 4 Wheel Drive Message is controlled by the transfer case shift control module via GMLAN.

Transfer Case Two/Four Wheel Drive Actuator Assembly

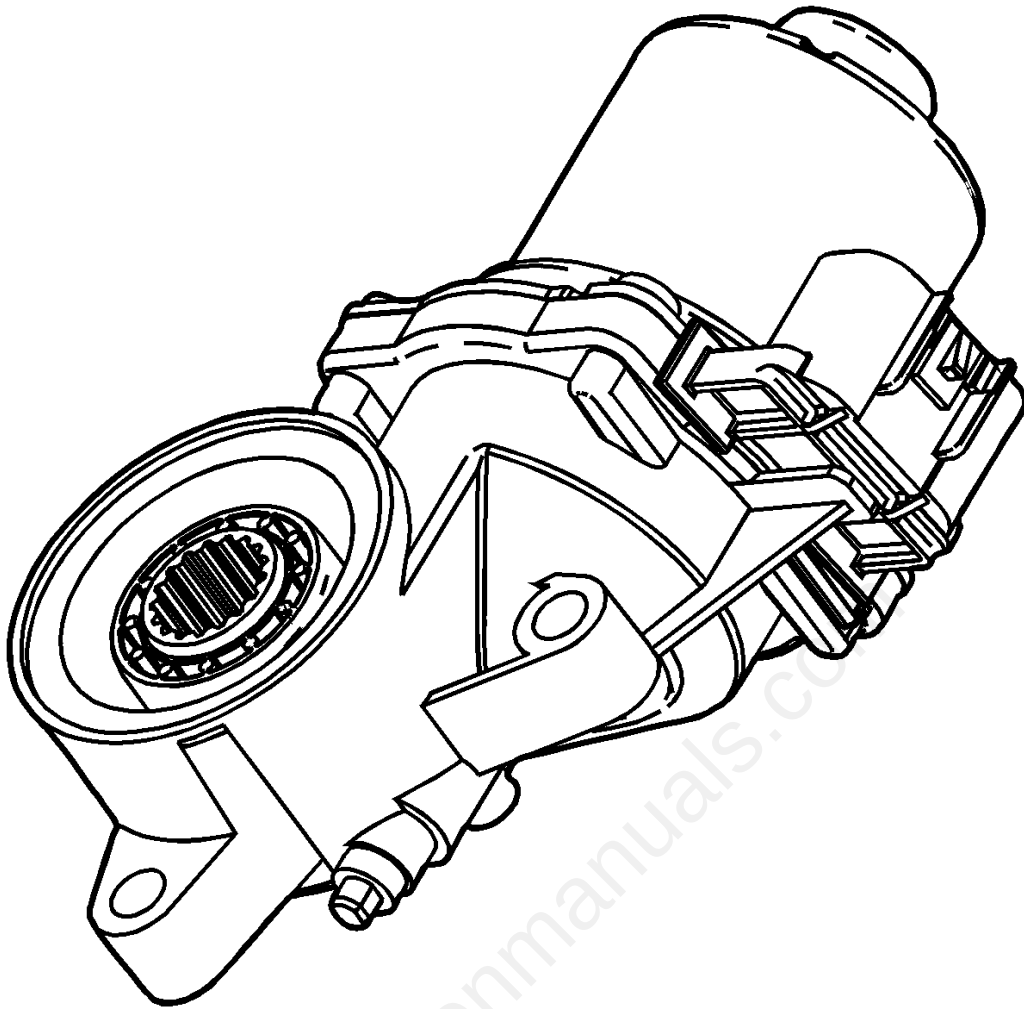


Fig. 80: Transfer Case Two/Four Wheel Drive Actuator Assembly

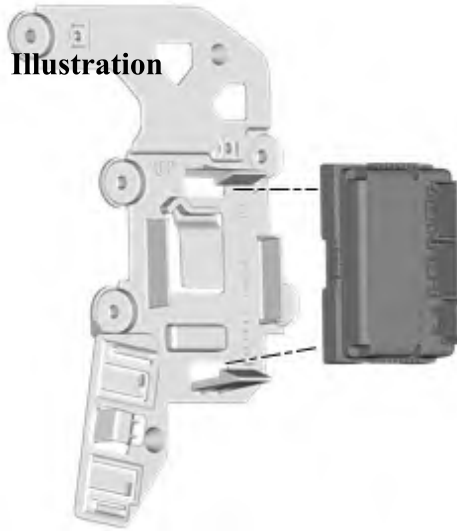
Courtesy of GENERAL MOTORS COMPANY

The transfer case two/four wheel drive actuator motor assembly consists of a PM DC motor and gear reduction assembly. It is located on the rear of the transfer case. When activated, it turns the sector shaft of the transfer case clockwise or counter clockwise to shift the transfer case. The actuator motor is controlled by the transfer case shift control module (TCCM). This circuit consists of a driver on both the motor control A and motor control B circuits. The actuator motor is bi-directional, to allow the motor to shift the transfer case from 2HI or 4HI to NEUTRAL and 4LO positions. The transfer case actuator motor can be fully driven clockwise or counterclockwise using a scan tool. You may also monitor motor control A and B circuits using a scan tool.

The two/four wheel drive actuator motor assembly also has an internal incremental or encoder sensor. This sensor is a linear encoder. The transfer case shift control module sends a 5 volt reference signal to the sensor. The transfer case shift control module reads the return voltage based on the exact position of the sector shaft. The TCCM knows if a shift has been completed or if the shift is in process.

The internal encoder sensor is not serviceable separately and must be serviced by replacing the actuator motor assembly. The actuator motor on the NQ7 transfer case does not have an internal brake.

Transfer Case Shift Control Module



Tool Number/Description

Fig. 81: Transfer Case Shift Control Module

Courtesy of GENERAL MOTORS COMPANY

The transfer case shift control module uses the vehicle identification number (VIN) information for calculations based on axle ratio, transmission, tire size, and engine size. The TCCM shifts the transfer case based on the commands from the shift control switch. In the event the module has been replaced, a reflash of the module software is required.

Vehicle Speed Sensor (VSS)



Fig. 82: Vehicle Speed Sensor (VSS)

Courtesy of GENERAL MOTORS COMPANY

There is a VSS mounted to the transfer case on the rear case half output shaft. The VSS is a PM generator. The PM generator produces an AC voltage. The AC voltage and frequency increases as speed increases. The VSS is an input to the powertrain control module (PCM). The PCM sends this information to the transfer case control module (TCCM) via the GM LAN serial data bus.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

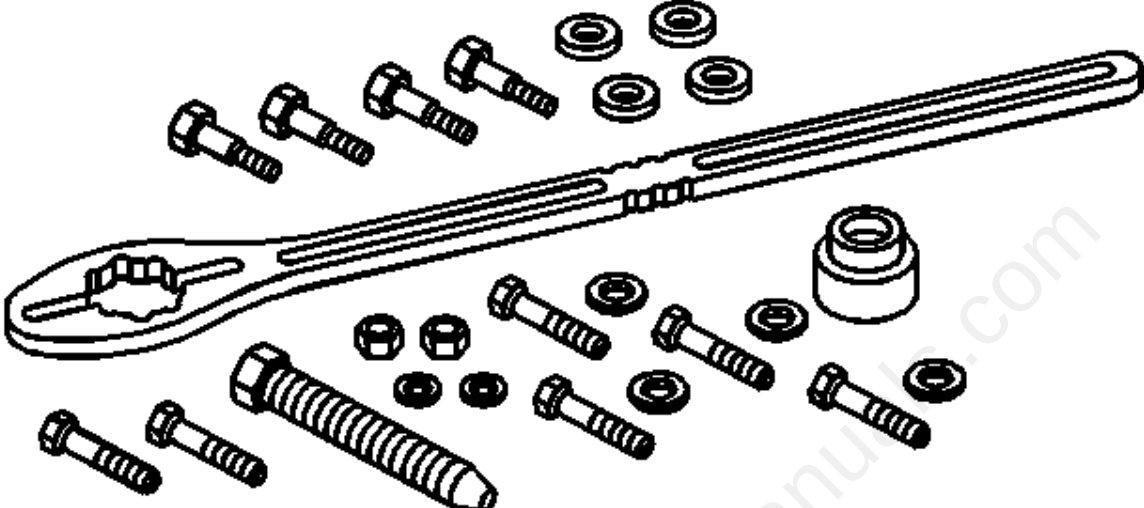
Illustration	Tool Number/Description
	DT-08614-A J-08614-A KM-210-3 7-0004805 Pinion Flange Holder and Remover

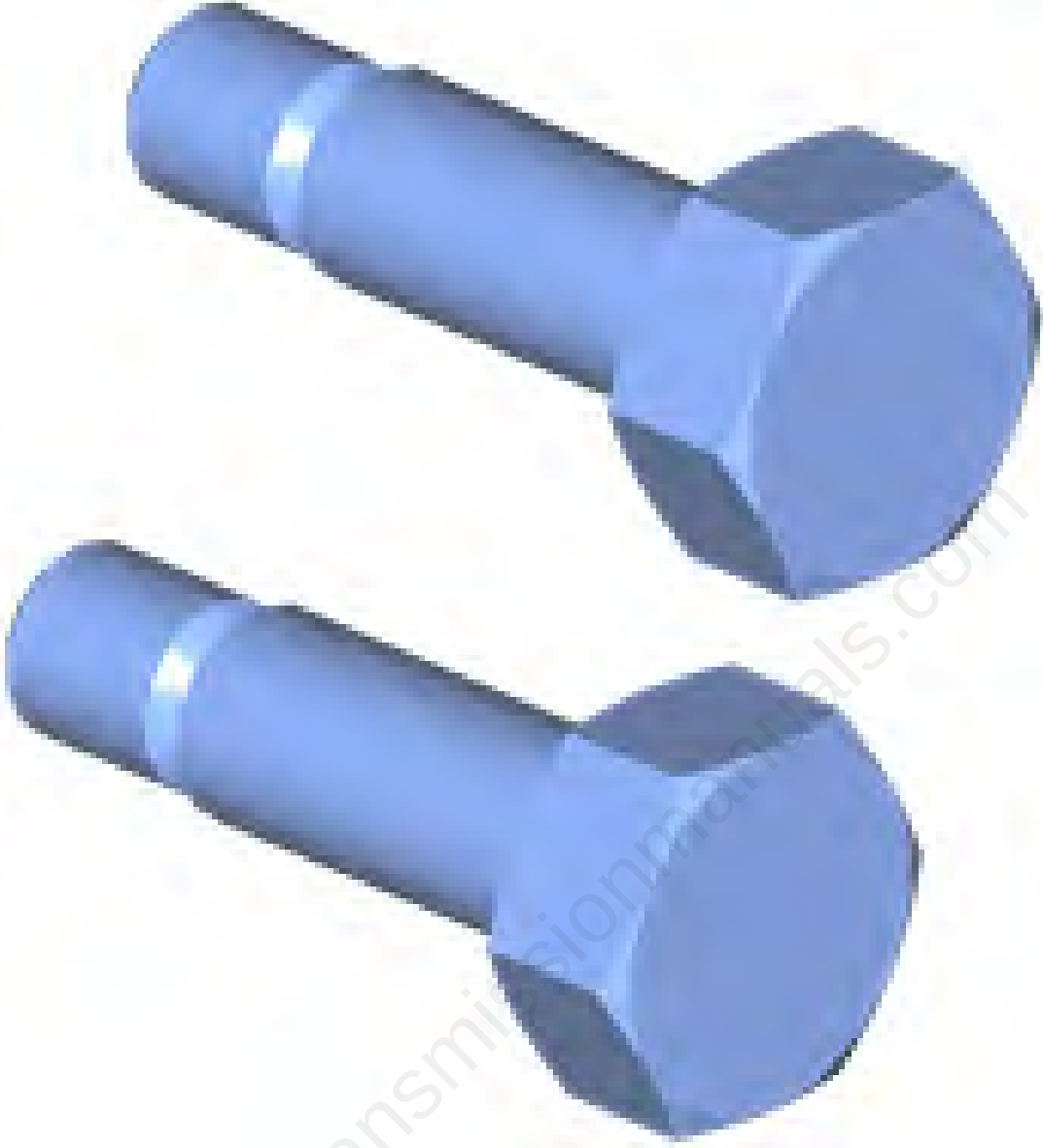
Illustration	Tool Number/Description
	DT-08614-20 J-08614-20 Flange Retaining Bolts

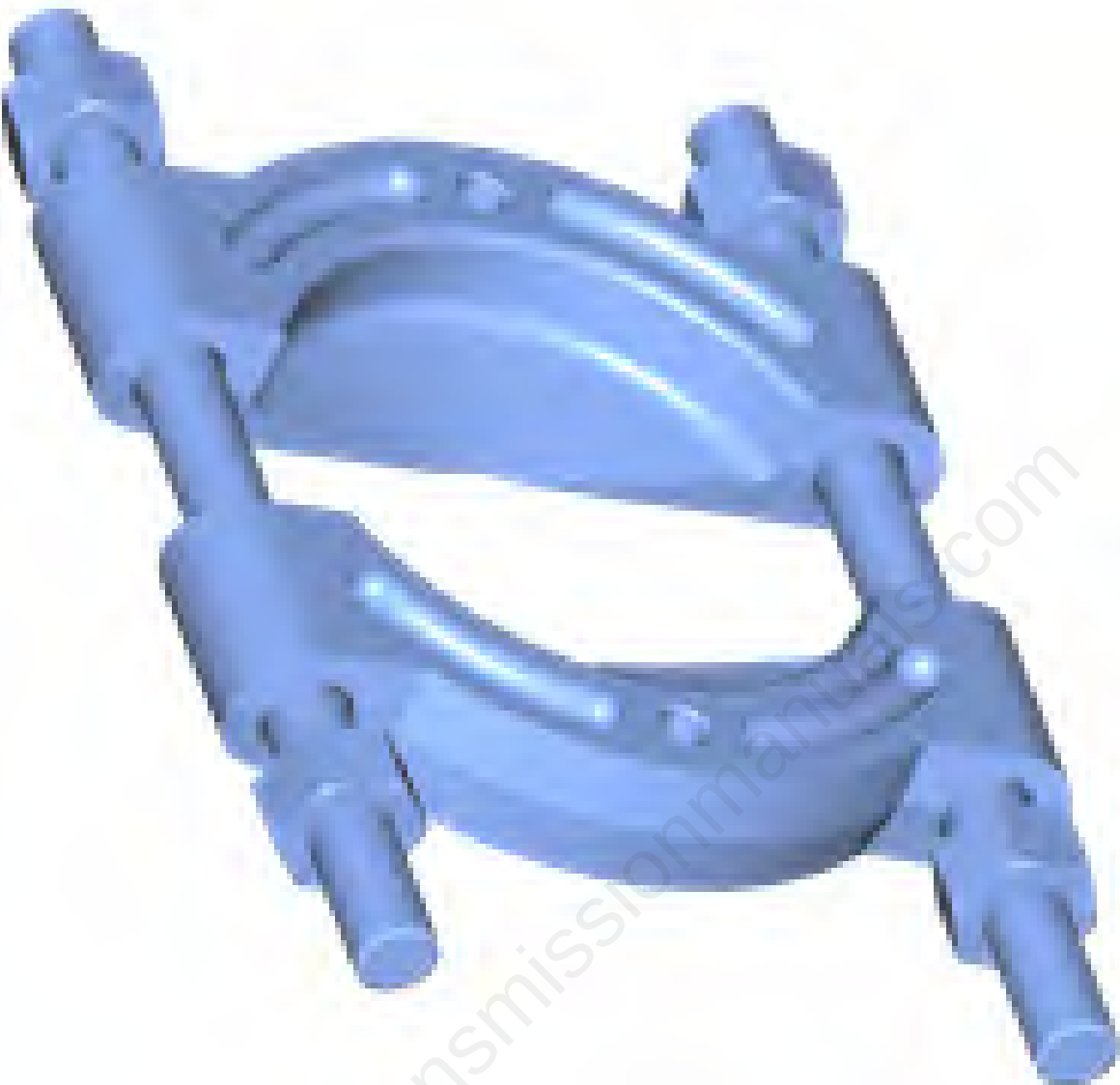
Illustration	Tool Number/Description
	DT-22912-B J-22912-B 6-9607356 Split Plate Bearing Puller

Illustration	Tool Number/Description
	DT-24433 J-24433 Pinion Cone and Side Bearing Installer

Illustration

**Tool
Number/Description**



DT-3289-20
J-3289-20
Holding Fixture

Illustration	Tool Number/Description
 A blue cylindrical tool, likely a pinion bearing installer, shown at an angle. The tool has a hollow interior and a slightly flared end. A faint watermark 'transmissionmanuals.com' is visible across the image.	DT-35512 J-35512 Inner Pinion Bearing Installer

Illustration	Tool Number/Description
	DT-36842 J-36842 Transaxle Holding Fixture

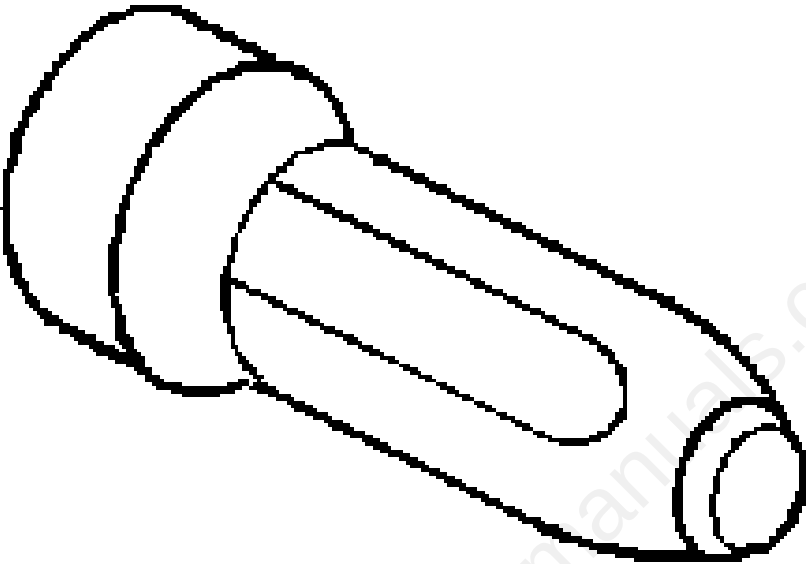
Illustration	Tool Number/Description
	DT-42738 J-42738 Seal Installer

Illustration	Tool Number/Description
	DT-44737 J-44737 Shift Rail Bearing Remover

Illustration	Tool Number/Description
	DT-44907 J-44907 Bearing Installer

Illustration	Tool Number/Description
	DT-45380 J-45380 Transfer Case Rear Bushing Remover and Installer

Illustration	Tool Number/Description
	DT-46496 Bearing Installer

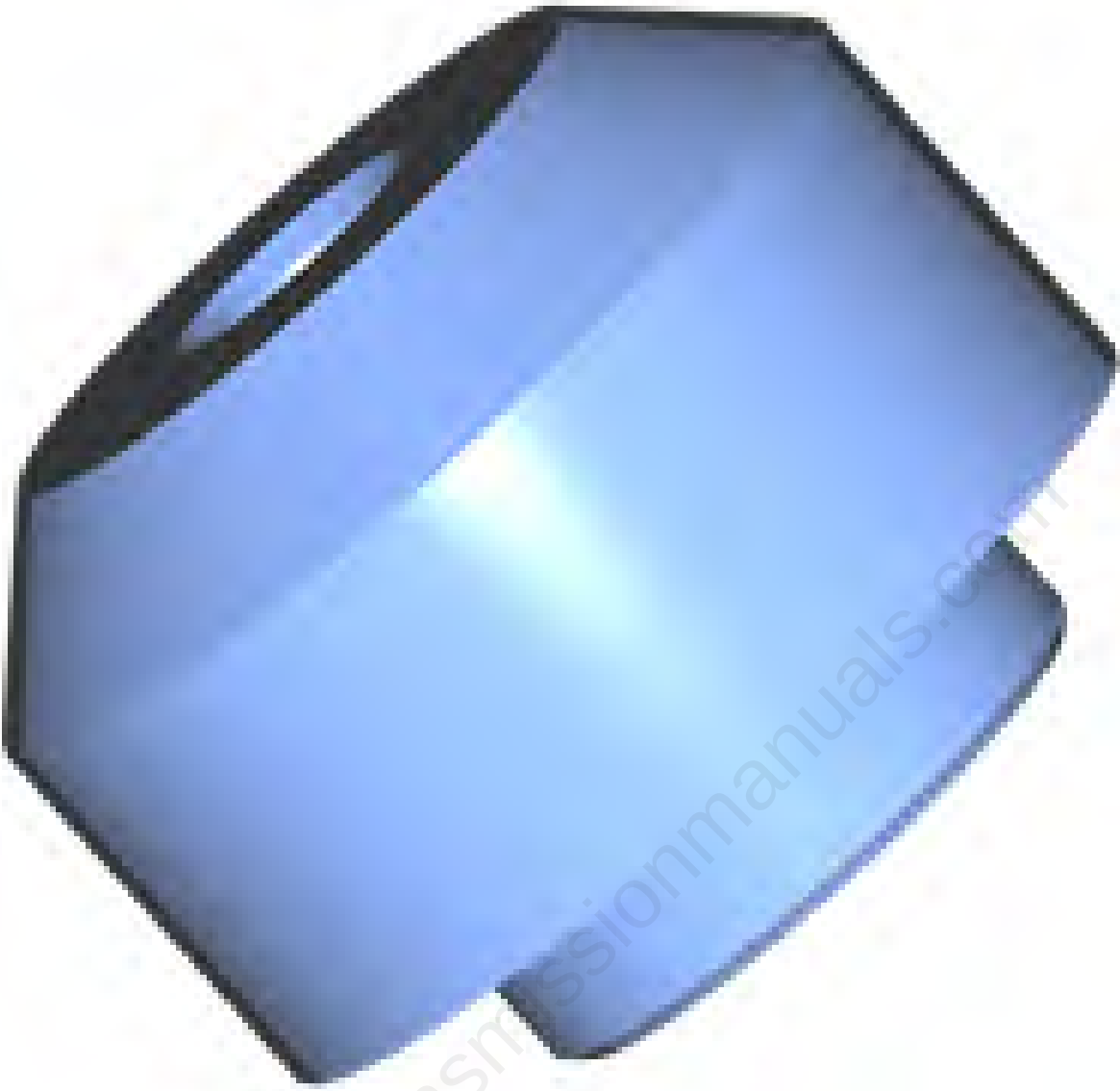
Illustration	Tool Number/Description
	DT-48021 Seal Installer

Illustration	Tool Number/Description
	DT-48022 Output Bushing Installer

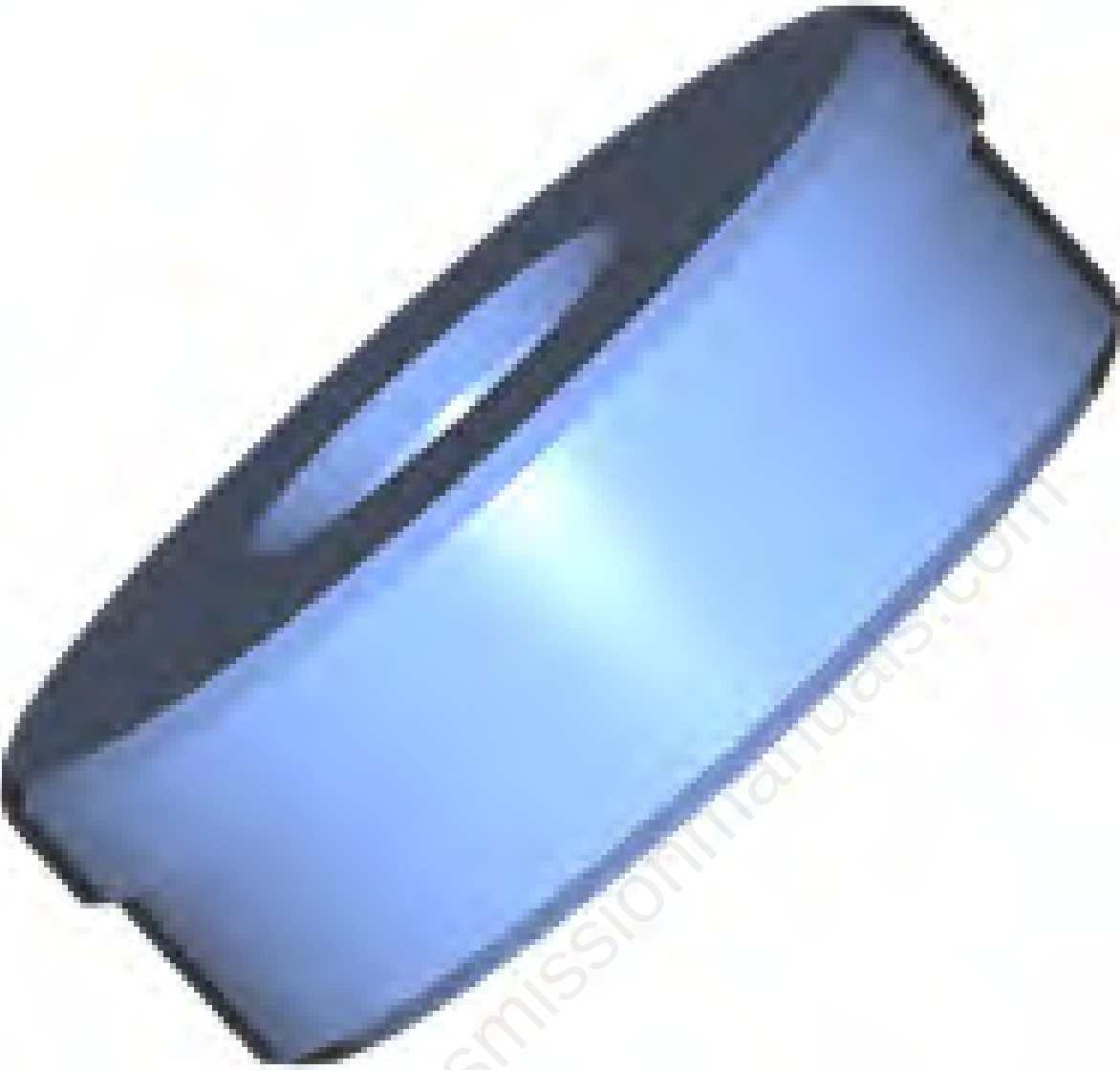
Illustration	Tool Number/Description
	DT-48209 Bushings Remover

Illustration	Tool Number/Description
	DT-48210 Seal Installer

Illustration	Tool Number/Description
	DT-48211 Drive Sprocket Bearing Installer

Illustration	Tool Number/Description
	DT-48212 Input Shaft Pilot Bearing Installer

Illustration	Tool Number/Description
	DT-49299 Input Shaft Pilot Bearing Installer

Illustration	Tool Number/Description
	DT-49308 Stud Remover and Installer

Illustration	Tool Number/Description
 The illustration shows two long, blue cylindrical shafts positioned diagonally. To the left of the shafts are two blue circular washers. To the right of the shafts are two blue hexagonal nuts. A faint watermark 'transmissionmaterials.com' is visible across the image.	DT-50315 Hardware Kit

Illustration	Tool Number/Description
	DT-50228 Transfer Case Housing Seperator

Illustration	Tool Number/Description
	DT-50648 Case Seal Installer

Illustration	Tool Number/Description
	DT-50649 Seal Installer

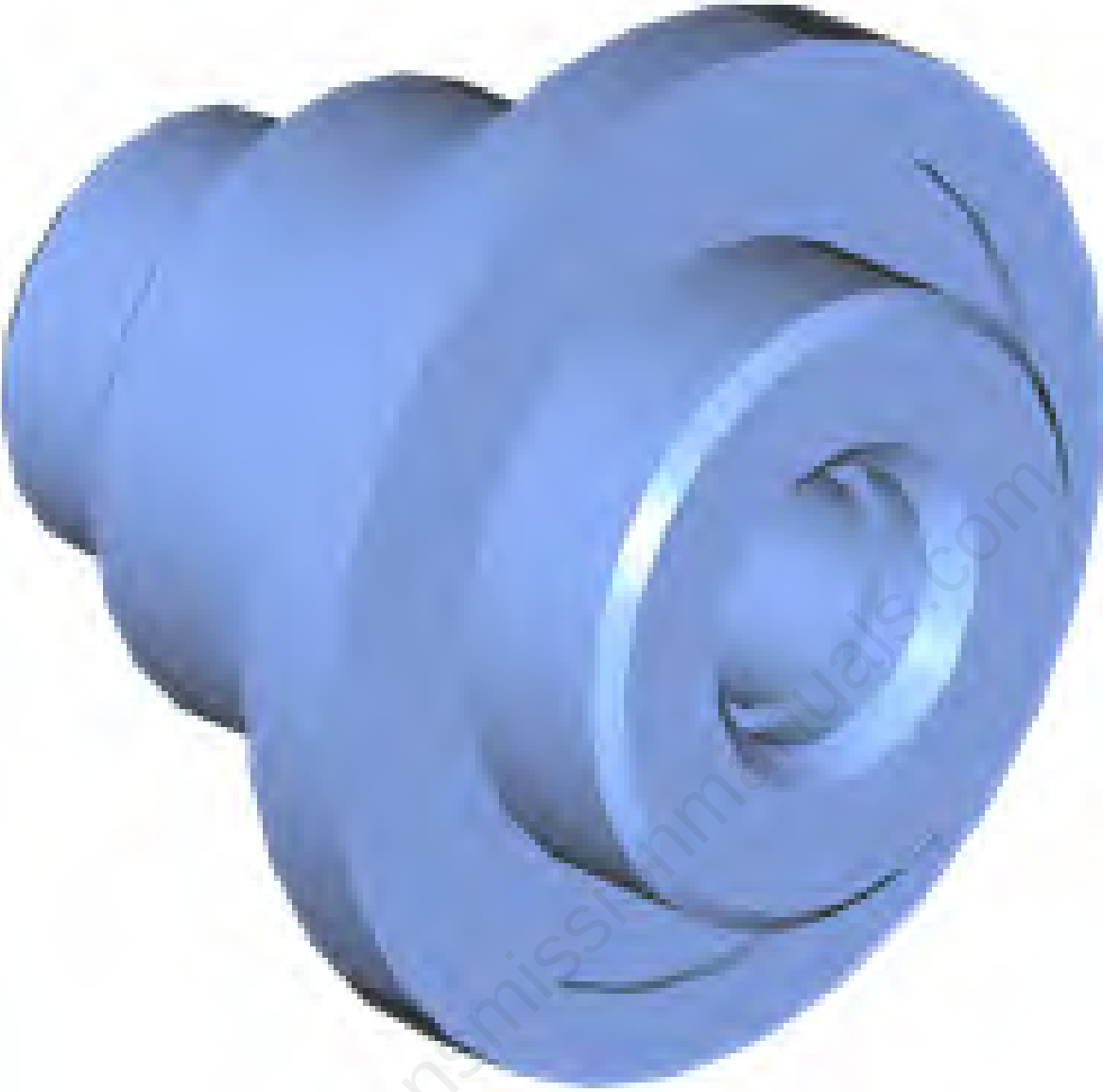
Illustration	Tool Number/Description
	DT-51336 Front Output Shaft Rear Bearing Installer

Illustration	Tool Number/Description
	DT-51592 Front Output Shaft Seal Installer

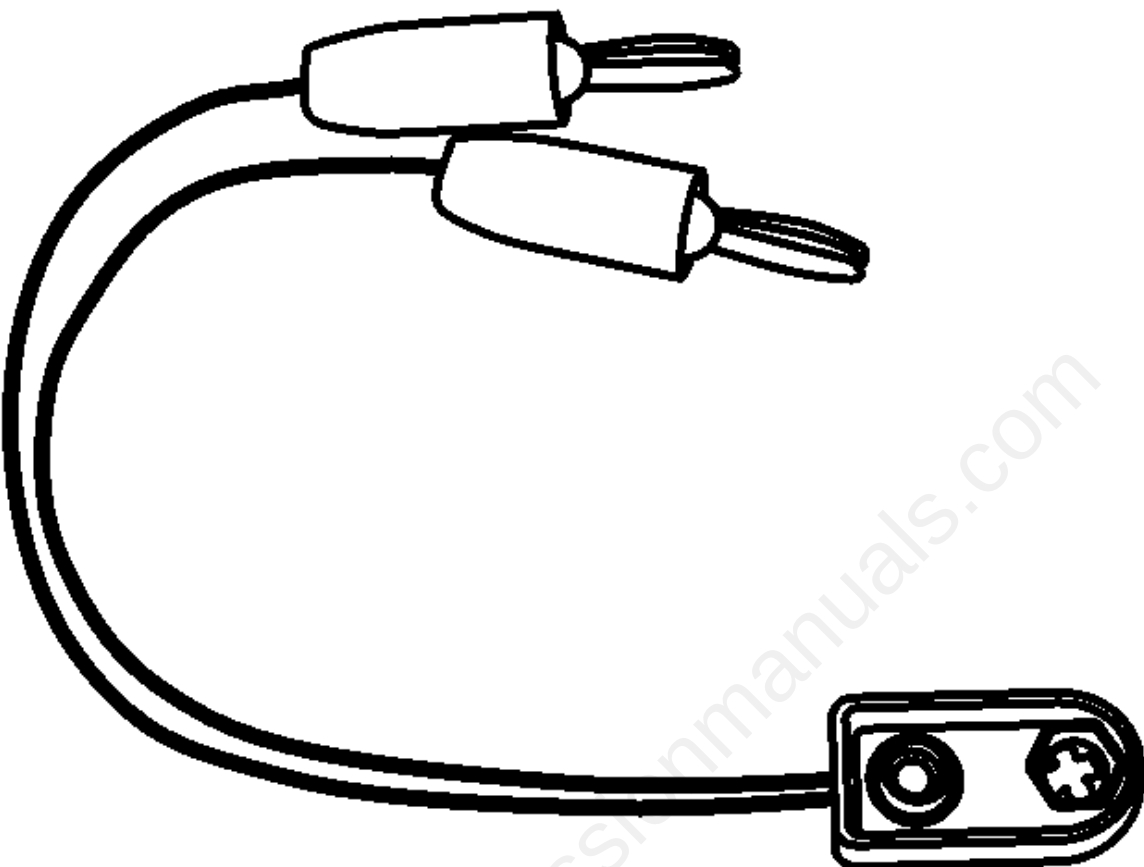
Illustration	Tool Number/Description
	EL-49741 9 V+ Power Source Harness

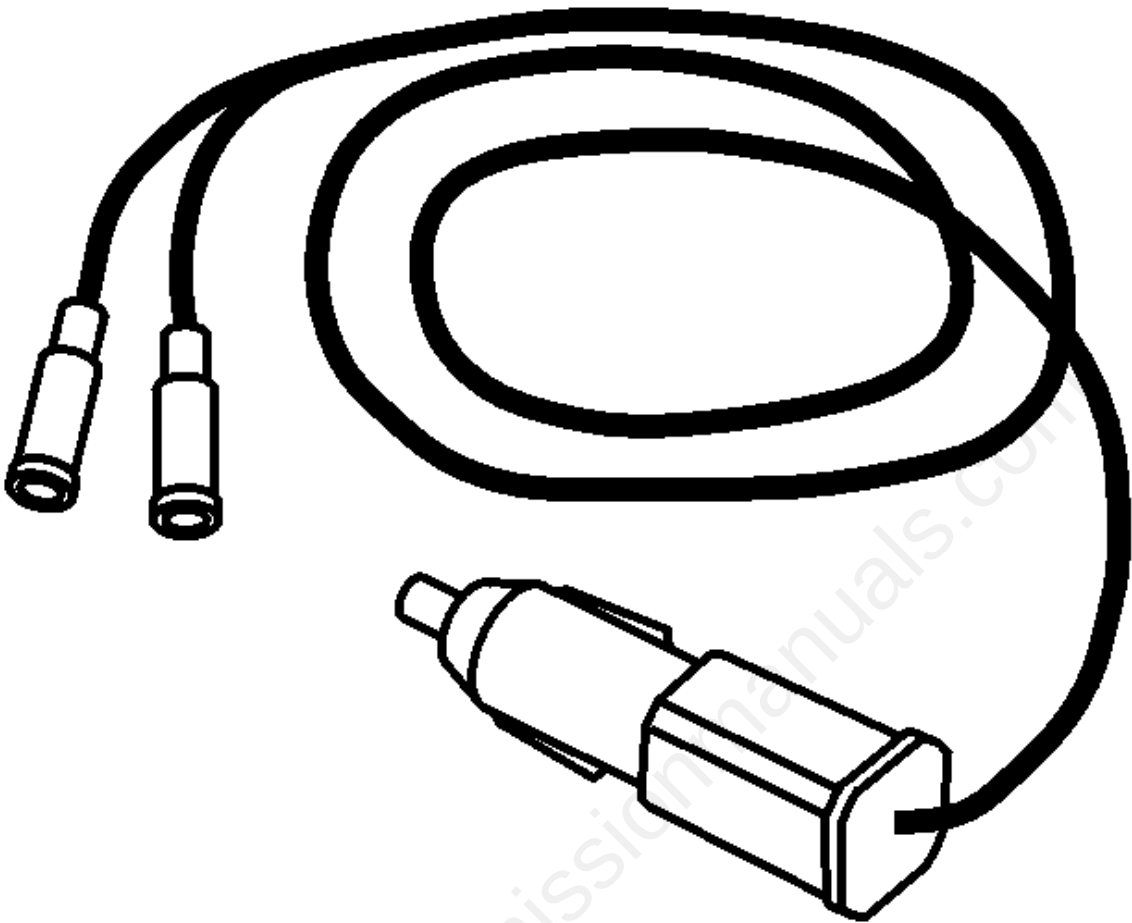
Illustration	Tool Number/Description
	EL-49742 Battery Voltage B+ and Ground Source Harness

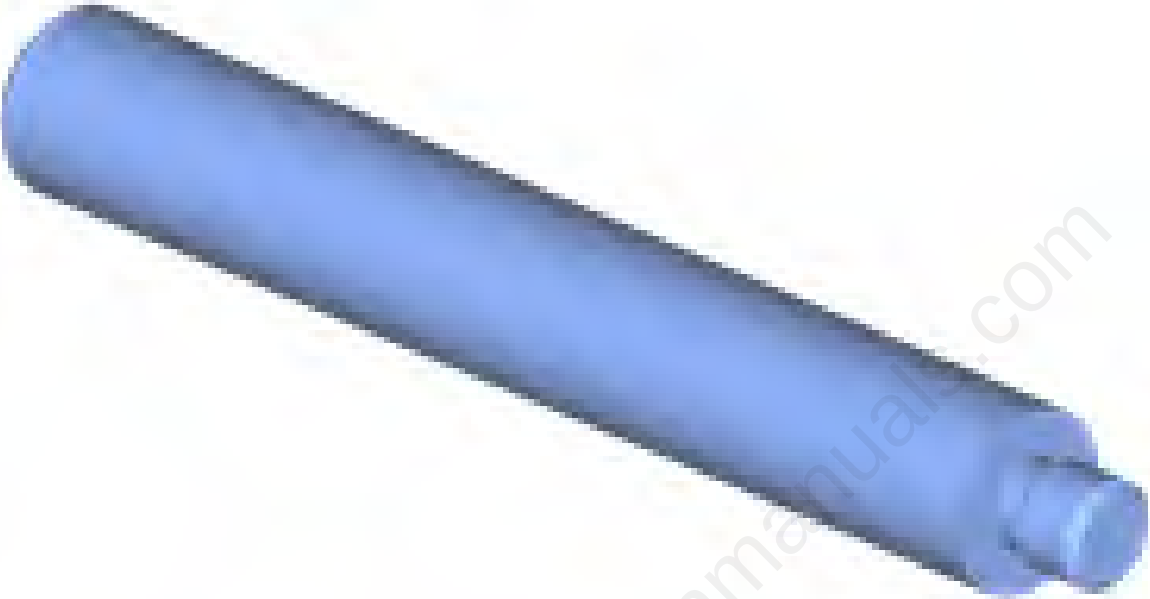
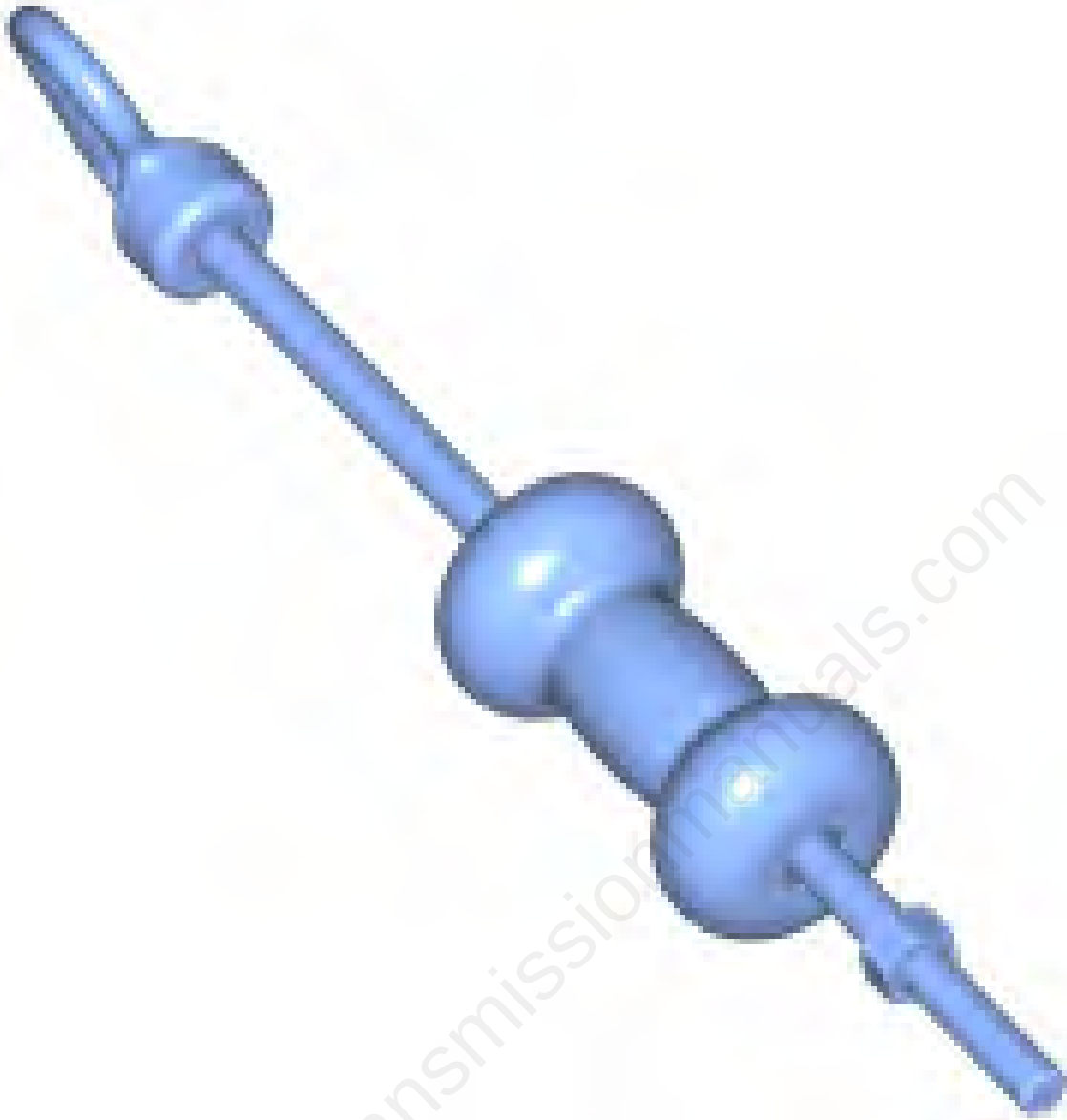
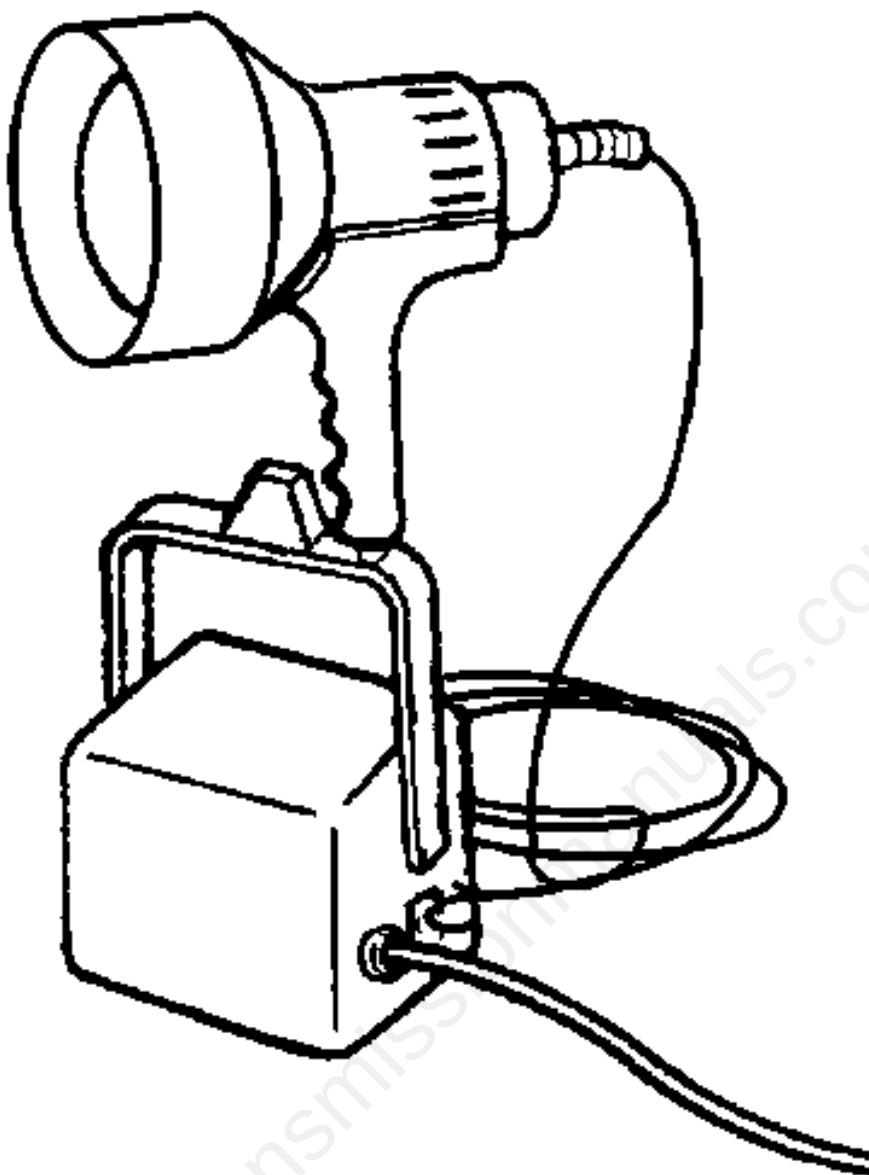
Illustration	Tool Number/Description
 A blue cylindrical driver handle tool, shown at an angle. The tool has a smooth, polished surface and a slightly wider base at one end. A faint watermark 'transmissionmanuals.com' is visible across the image.	GE-8092 J-8092 Driver Handle

Illustration	Tool Number/Description
	GE-8433-1 J-8433 Two Jaw Puller

Illustration	Tool Number/Description
 A blue slide hammer tool, consisting of a long handle with two large spherical weights. The tool is shown diagonally, with the handle pointing towards the top left and the weights towards the bottom right. A watermark 'transmissionmanuals.com' is visible across the image.	GE-02619-01 J-02619-01 Slide Hammer

Illustration



Tool
Number/Description

GE-28428-E
J-28428-E
High Intensity Black
Light Kit

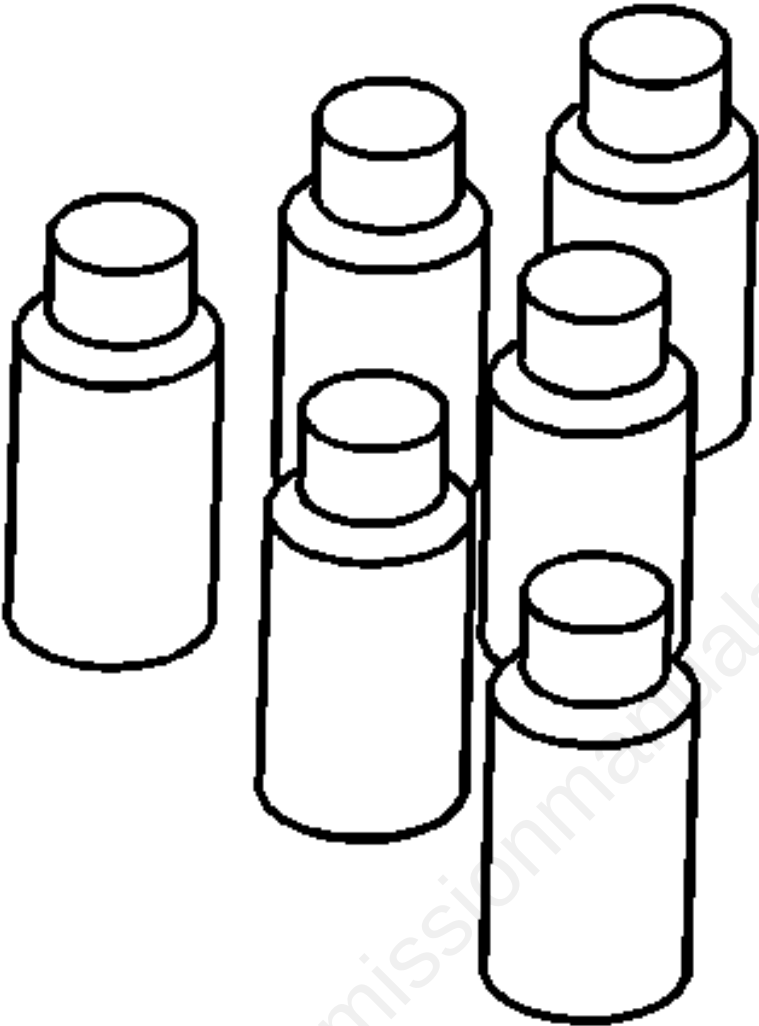
Illustration	Tool Number/Description
 A line drawing of six cylindrical bottles of fluorescent oil dye. The bottles are arranged in a cluster: one on the left, two in the center, and three on the right. They vary in height and width. A diagonal watermark 'transmissionmaterials.com' is visible across the bottles.	GE-28431-6 J-28431-6 Fluorescent Oil Dye

Illustration	Tool Number/Description
	J-36366-A Pinion Oil Seal Installer

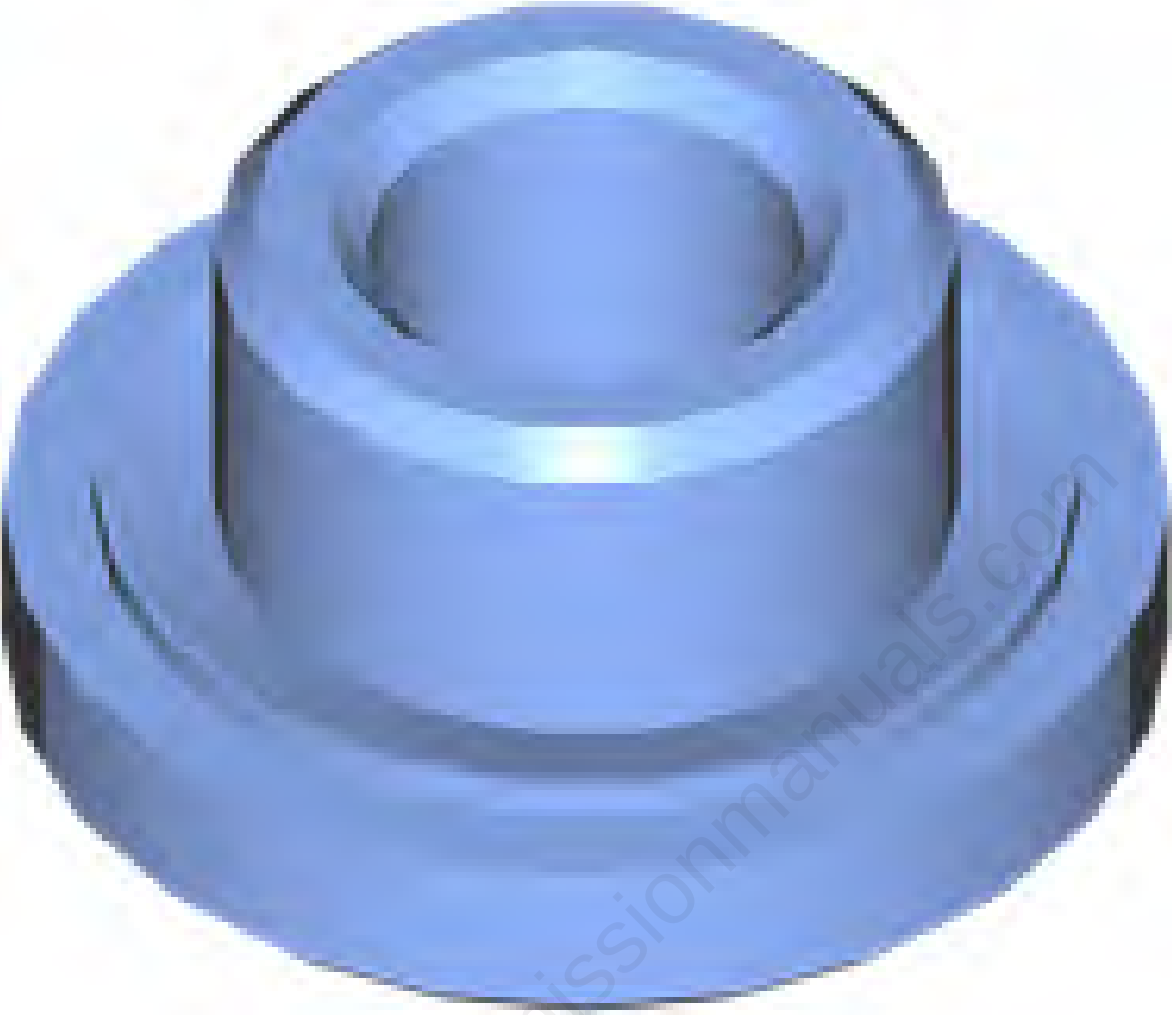
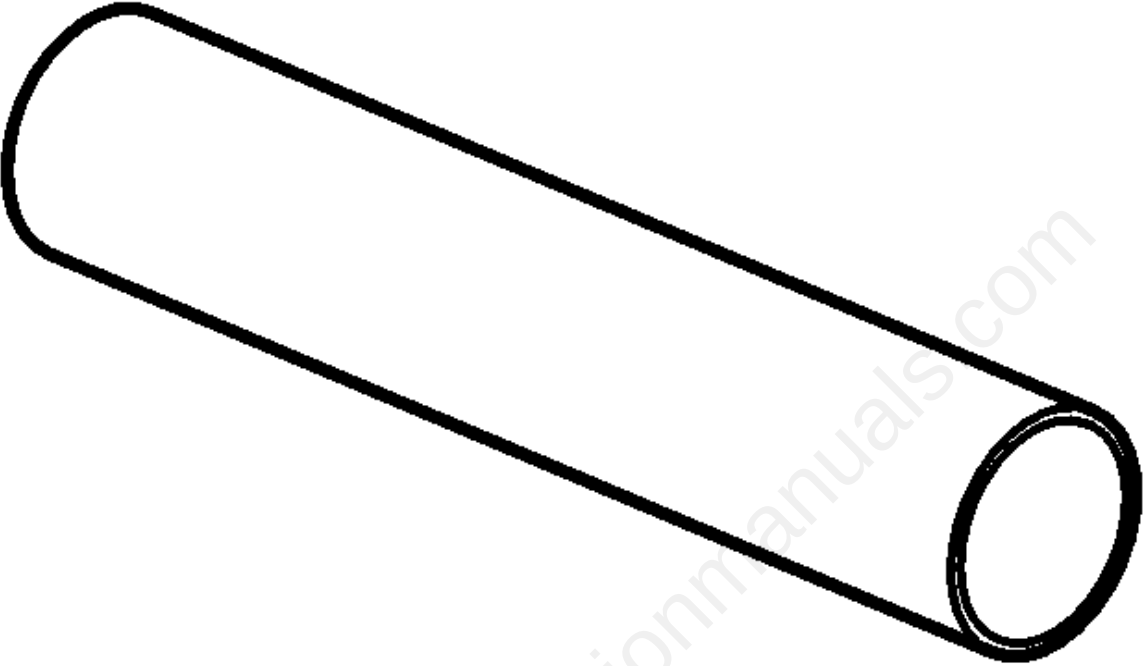
Illustration	Tool Number/Description
 A blue, cylindrical tool with a central hole and a flange, used for installing needle bearings. The tool has a smooth, polished surface and a central bore. A watermark 'transmissionmanuals.com' is visible diagonally across the image.	J-36372 Input Sun Gear Needle Bearing Installer

Illustration	Tool Number/Description
	J-41736 Bearing Installer