

TRANSMISSION

Transfer Case - MP 3025G (NQ6) - Canyon, Colorado

SPECIFICATIONS

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
Transfer Case - MP 3025G (NQ6)		
DEXRON®VI	1.9 liters	2.0 quarts

FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Transfer Case Actuator Shaft Position Sensor Bolt/Screw	10 N.m	88 lb in
Transfer Case Adapter Bolt/Screw	58 N.m	43 lb ft
Transfer Case Bolts (Qty: 18)	24 N.m	18 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

CASE CONTROL WIRING SCHEMATICS

Power, Ground and Shift Controls

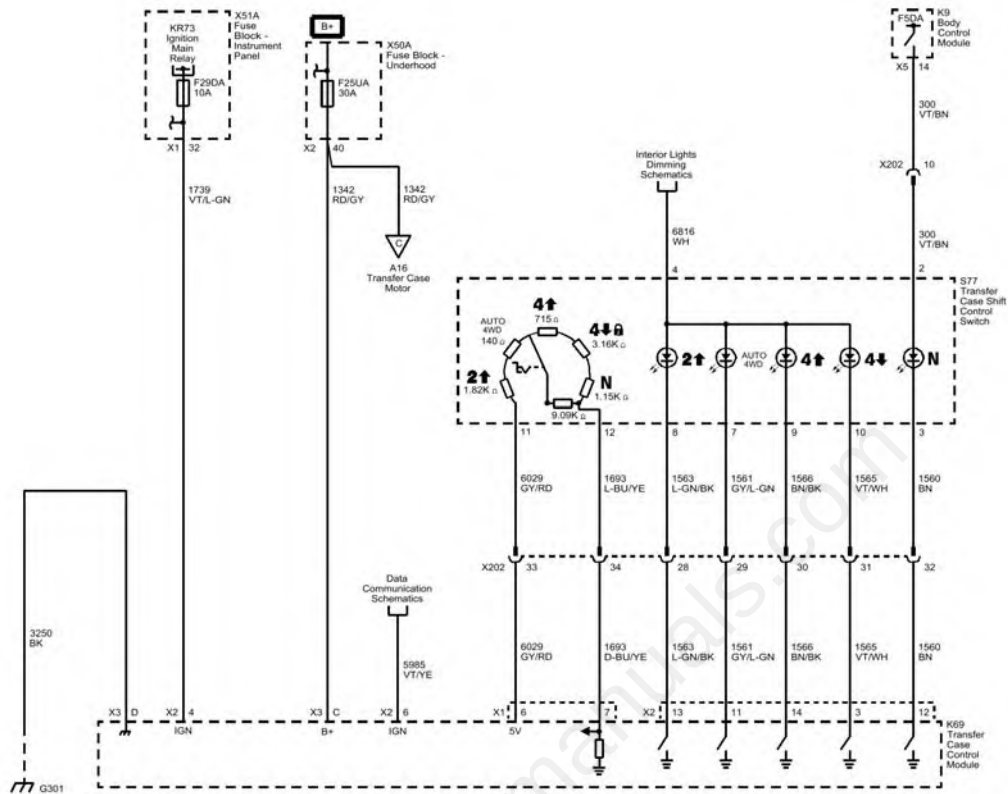


Fig. 1: Power, Ground and Shift Controls
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Controls

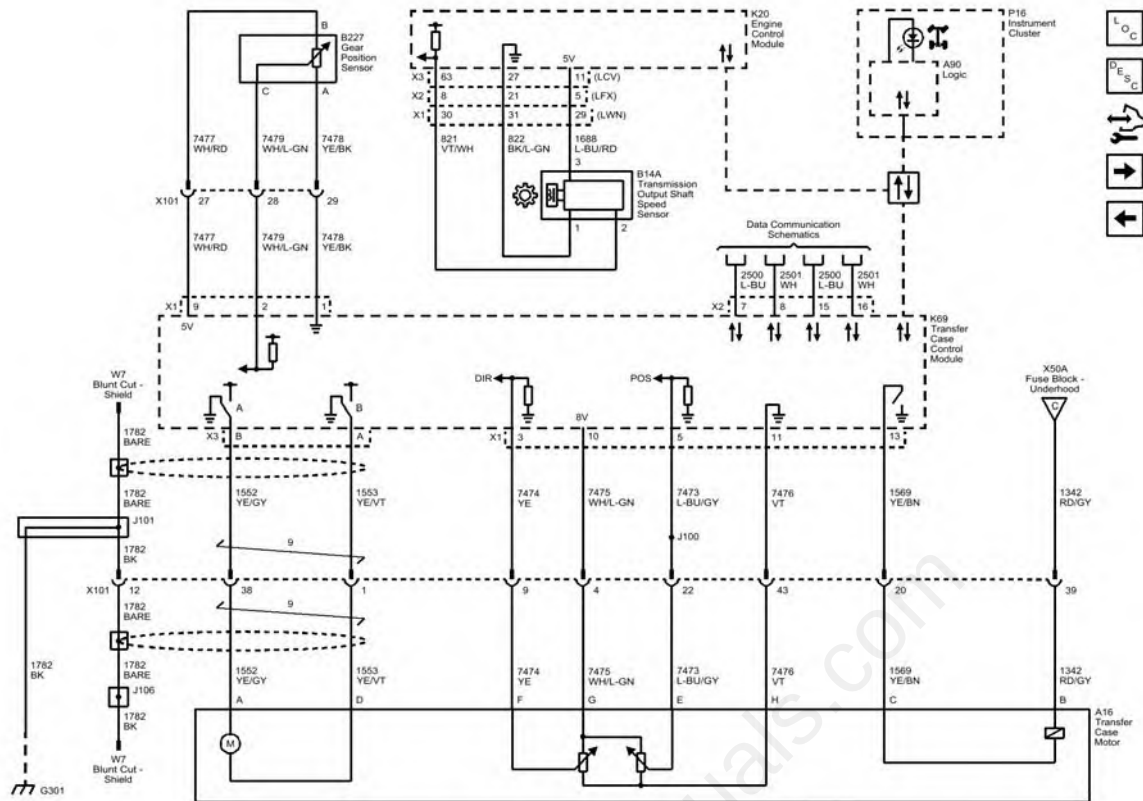


Fig. 2: Transfer Case Controls
 Courtesy of GENERAL MOTORS COMPANY

Front Axle Controls

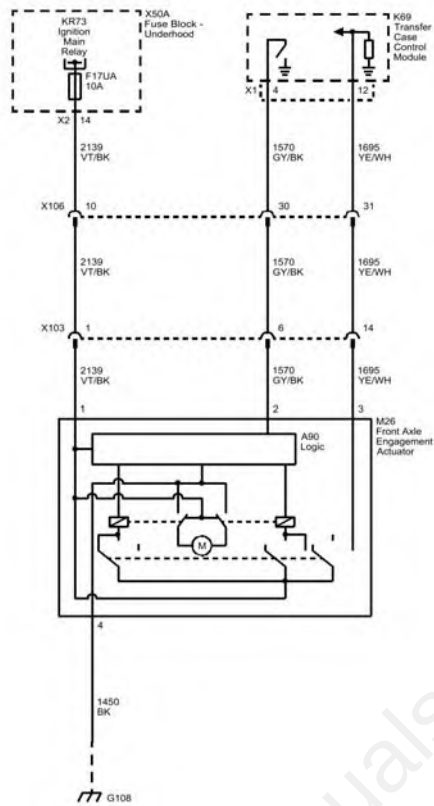


Fig. 3: Front Axle Controls

Courtesy of GENERAL MOTORS COMPANY

COMPONENT LOCATOR

TRANSFER CASE DISASSEMBLED VIEW

Case Half Components

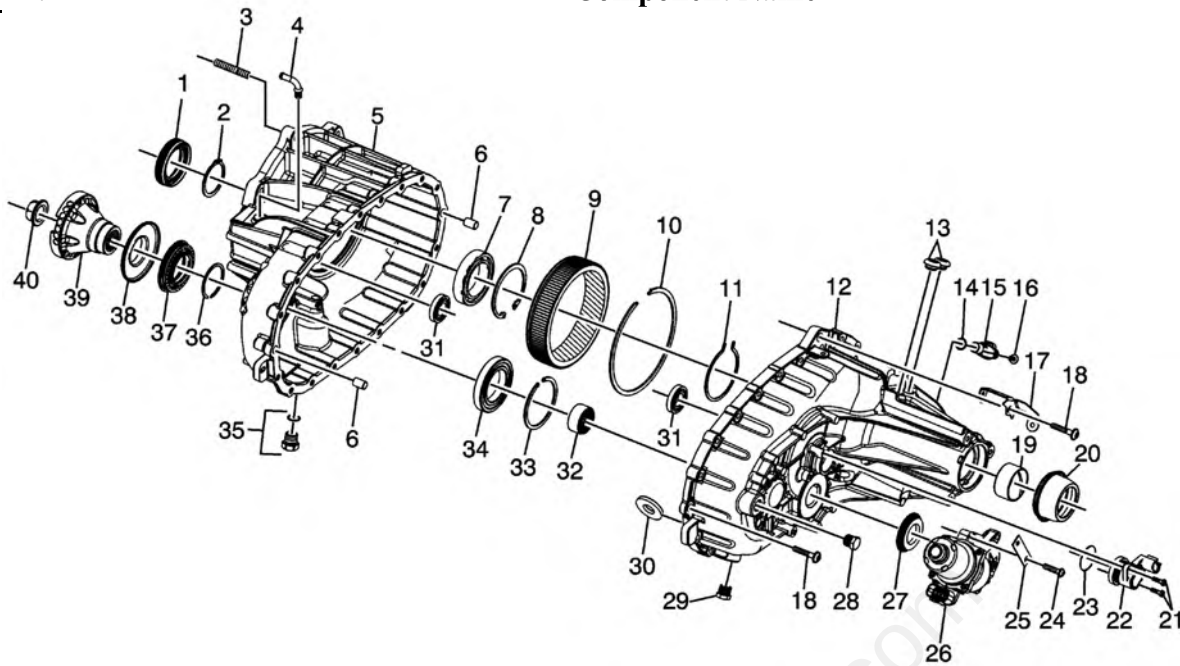


Fig. 4: Case Half Components

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 Plug (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 Position Sensor Bolt/Screw (Qty: 2)
22	Transfer Case Two/Four Wheel Drive Actuator Position Sensor
23	Transfer Case Two/Four Wheel Drive Actuator Position Sensor Seal
24	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty: 3)

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

Internal Components

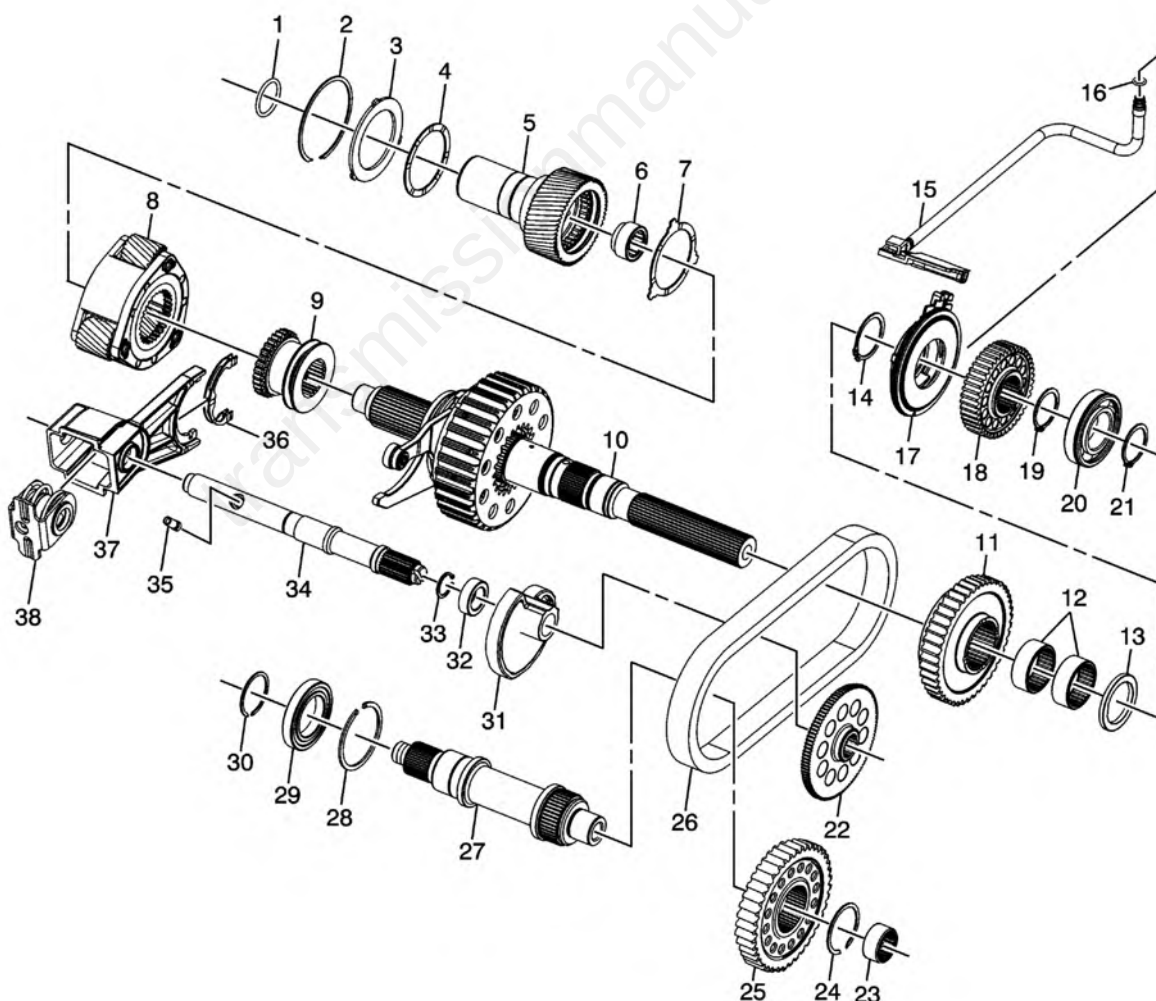


Fig. 5: Internal Components

Courtesy of GENERAL MOTORS COMPANY

t	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 Rear Output Shaft and Clutch Assembly
11	Transfer Case Front Output Shaft Drive Sprocket
12	Transfer Case Front Output Shaft Drive Sprocket Bearings (Qty: 2)
13	Transfer Case Front Output Shaft Drive Sprocket Spacer
14	Transfer Case Front Output Shaft Drive Sprocket Retaining Ring
15	Transfer Case Oil Pump Suction Pipe
16	Transfer Case Oil Pump Suction Pipe Seal
17	Transfer Case Oil Pump Assembly
18	Transfer Case Rear Output Shaft Speed Reluctor Wheel
19	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
20	Transfer Case Rear Output Shaft Rear Bearing
21	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
22	Transfer Case Actuator Shaft Gear
23	Transfer Case Front Output Shaft Rear Bearing
24	Transfer Case Front Output Shaft Driven Sprocket Retaining Ring
25	Transfer Case Front Output Shaft Driven Sprocket
26	Transfer Case Front Output Shaft Drive Chain Assembly
27	Transfer Case Front Output Shaft
28	Transfer Case Front Output Shaft Bearing Retaining Ring
29	Transfer Case Front Output Shaft Front Bearing
30	Transfer Case Front Output Shaft Bearing Retaining Ring
31	Transfer Case Two/Four Wheel Drive Actuator Cam
32	Transfer Case Two/Four Wheel Drive Actuator Cam Spacer
33	Transfer Case Two/Four Wheel Drive Actuator Cam Retaining Ring
34	Transfer Case High/Low Shift Fork Shaft
35	Transfer Case High/Low Shift Fork Pin
36	Transfer Case High/Low Shift Fork Insert (Qty: 2)
37	Transfer Case High/Low Shift Fork
38	Transfer Case High/Low Shift Fork Spring

Clutch Components

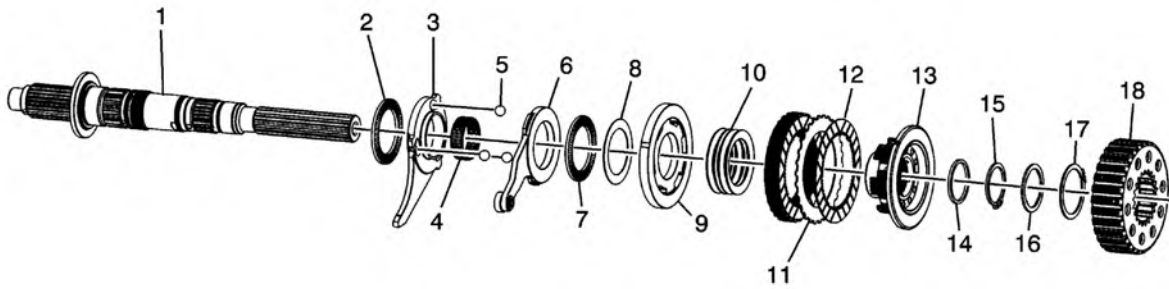


Fig. 6: Clutch Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transfer Case Rear Output Shaft
2	Transfer Case Scissor Mechanism Thrust Bearing
3	Transfer Case Scissor Mechanism Lever
4	Transfer Case Scissor Mechanism Lever Bearing
5	Transfer Case Scissor Mechanism Lever Ball (Qty: 3)
6	Transfer Case Scissor Mechanism Lever
7	Transfer Case Scissor Mechanism Thrust Bearing
8	Transfer Case Control Actuator Lever Washer
9	Transfer Case Four Wheel Drive Clutch Pressure- Apply- Plate
10	Transfer Case Four Wheel Drive Clutch Pressure Plate Spring (Qty: 4)
11	Transfer Case Four Wheel Drive Clutch Pressure- Steel- Plate (Qty: 7)
12	Transfer Case Four Wheel Drive Clutch Friction Plate (Qty: 8)
13	Transfer Case Four Wheel Drive Clutch Hub
14	Transfer Case Four Wheel Drive Clutch Shim
15	Transfer Case Two/Four Wheel Drive Clutch Retaining Ring
16	Transfer Case Rear Output Shaft Bearing Spacer
17	Transfer Case Four Wheel Drive Clutch Housing Retaining Ring
18	Transfer Case Four Wheel Drive Clutch Housing

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B0770: AWD 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 Descriptors

DTC B0770 01

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
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DTC B0770 06

AWD 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	-
AWD Indicator Control Circuit	B0770 06	B0770 06	B0770 01

Circuit/System Description

The all wheel drive (AWD/4WD Auto) indicator circuit consists of a light emitting diode (LED) feed circuit, a LED and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies B+ to the 2WD HI, 4WD Auto, 4WD HI, and 4WD LO LEDs. When the AWD mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the AWD indicator control circuit illuminating the LED.

The TCCM tests the AWD indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the AWD indicator control circuit for 2 seconds during the Bulb Test at key ON.

Conditions for Running the DTC

B0770 01

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

B0770 06

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

Conditions for Setting the DTC

B0770 01

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

B0770 06

The TCCM detects 1.6 V or less for 1.5 seconds on the AWD indicator control circuit when the AWD 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 inspection.

Conditions for Clearing the DTC

- The transfer case shift 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

- 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 AWD indicator control circuit will cause the AWD indicator to remain ON at all times.
- An open or high resistance on the AWD indicator control circuit will cause the AWD indicator to be inoperative during the 2 second bulb inspection.
- An open in the indicator dimming control circuit will cause the 2WD HI, AWD, 4WD HI and 4WD LO mode indicators to be inoperative during the 2 second bulb inspection.
- **EL-49741** harness is a good source for 9 V.
- **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

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 GM terminal test 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.
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 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.
4. Using the L-BU probes 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 AWD indicator control circuit, TSCSC X1 pin 7.
 - If the voltage is less than the specified range, test the AWD 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.
5. 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.
6. Using the L-BU probe J-35616-64B, test for greater than 10 Ω between the 4WD HI 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.
7. Test the TCSCS for proper operation.

Component Testing

BCM

1. Key OFF. Disconnect the X1 connector at the TCSCS.

Mode 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 probes 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 probes 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 OFF and ON 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	2WD HI	4WD Auto	4WD HI	4WD LO	N
5-V Reference (pin)	11	11	11	11	11
Indicator Control Circuit (pin)	8	7	9	10	3

TCSCS

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

4WD HI to Ground	4WD Auto	4WD HI	4WD LO	4WD Short to Voltage
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2. Connect a 9 V battery to the 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.

EL49741 Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
Red (pin)	4	4	4	4	2
Black (pin)	8	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 TCCM replacement, setup, and programming
- [Transfer Case High/Low Clutch Reset \(NQ6\)](#)

DTC B0775: 4WD HI 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 Descriptors

DTC B0775 01

4WD HI Indicator Circuit Short to Battery

DTC B0775 06

4WD HI 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	-
4WD HI Indicator Control Circuit	B0775 06	B0775 06	B0775 01

Circuit/System Description

The 4WD HI indicator circuit consists of a light emitting diode (LED) feed circuit, a LED and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies B+ to the 2WD HI, 4WD Auto, 4WD HI and 4WD LO LEDs. When the 4WD HI mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 4 HI indicator control circuit illuminating the LED.

The TCCM tests the 4WD HI indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the 4WD HI indicator control circuit for 2 seconds during the Bulb Test at key ON.

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 4WD HI 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 4WD HI indicator is commanded OFF.

Conditions for Setting the DTC

B0775 01

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

B0775 06

The TCCM detects 1.6 V or less for 1.5 seconds on the 4WD HI indicator control circuit when the 4WD HI 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 inspection.

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 4WD HI indicator control circuit will cause the 4WD HI indicator to remain ON at all times.
- An open or high resistance on the 4WD HI indicator control circuit will cause the 4WD HI indicator to be inoperative during the 2 second bulb inspection.
- An open in the indicator dimming control circuit will cause the 2WD HI, 4WD Auto, 4WD HI and 4WD LO mode indicators to be inoperative during the 2 second bulb inspection.
- **EL-49741** harness is a good source for 9 V.

42 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+.
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 - 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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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 terminal test 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).

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 probes 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 4WD HI indicator control circuit, TSCSC X1 pin 9.
 - If the voltage is less than the specified range, test the 4WD HI 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 4WD HI 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

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 probes 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 probes 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 OFF and ON 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	2WD HI	4WD Auto	4WD HI	4WD LO	N
5-V Reference (pin)	11	11	11	11	11
Indicator Control Circuit (pin)	8	7	9	10	3

TCSCS

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

2. Connect a 9 V battery to the **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.

EL49741 Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
Red (pin)	4	4	4	4	2
Black (pin)	8	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 \(NQ6\)](#)

DTC B0780: 4WD LO 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.

s Circuit	Short to Ground	Open/High Resistance	Short to Voltage
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DTC B0780 01

4WD LO Indicator Circuit Short to Battery

DTC B0780 06

4WD LO 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	-
4WD LO Indicator Control Circuit	B0780 06	B0780 06	B0780 01

Circuit/System Description

The 4WD LO indicator circuit consists of a light emitting diode (LED) feed circuit, a LED and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies B+ to the 2WD HI, 4WD Auto, 4WD HI and 4WD LO LEDs. When the 4WD LO mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 4WD LO indicator control circuit illuminating the LED.

The TCCM tests the 4WD LO indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the 4WD LO 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 4WD LO 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 4WD LO indicator is commanded OFF.

Conditions for Setting the DTC

B0780 01

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

The TCCM detects 1.6 V or less for 1.5 seconds on the 4WD LO indicator control circuit when the 4WD LO 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 inspection.

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 4WD LO indicator control circuit will cause the 4WD LO indicator to remain ON at all times.
- An open or high resistance will cause the 4WD LO indicator to be inoperative during the 2 second bulb inspection.
- An open in the indicator dimming control circuit will cause the 2WD HI, 4WD Auto, 4WD HI and 4WD LO mode indicators to be inoperative during the 2 second bulb inspection.
- **EL-49741** harness is a good source for 9 V.
- **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

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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 GM terminal test 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 probes 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 4WD LO indicator control circuit, TSCSC X1 pin 10.
 - If the voltage is less than the specified range, test the 4WD LO 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 4WD LO 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.

Mode 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 probes 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 probes 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 OFF and ON 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	2WD HI	4WD Auto	4WD HI	4WD LO	N
5-V Reference (pin)	11	11	11	11	11
Indicator Control Circuit (pin)	8	7	9	10	3

TCSCS

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

4WD HI Wire Color	2WD HI to Ground	4WD Auto to Ground	Open/High Resistance	4WD LO to Voltage
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2. Connect a 9 V battery to the 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.

EL49741 Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
Red (pin)	4	4	4	4	2
Black (pin)	7	9	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 \(NQ6\)](#)

DTC B0785: 2WD HI 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 Descriptors

DTC B0785 01

2WD HI Indicator Circuit Short to Battery

DTC B0785 06

2WD HI 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	-
2WD HI Indicator Control Circuit	B0785 06	B0785 06	B0785 01

Circuit/System Description

The 2WD HI indicator circuit consists of a light emitting diode (LED) feed circuit, a LED and a LED control circuit. The indicator dimming control circuit is the LED feed circuit and continuously supplies B+ to the 2WD HI, 4WD Auto, 4WD HI and 4WD LO LEDs. When the 2WD HI mode has been selected by the driver, the transfer case shift control module (TCCM) provides a ground through the 2WD HI indicator control circuit illuminating the LED.

The TCCM tests the 2WD HI indicator circuit for unexpected voltage by monitoring the B+ supplied by the BCM on the indicator dimming control circuit by grounding the 2WD HI indicator control circuit for 2 seconds during the Bulb Test at key ON.

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 2WD HI 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 2WD HI indicator is commanded OFF.

Conditions for Setting the DTC

B0785 01

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

B0785 06

The TCCM detects 1.6 V or less for 1.5 seconds on the 2WD HI indicator control circuit when the 2WD HI 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 inspection.

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 2WD HI indicator control circuit will cause the 2WD HI indicator to remain ON at all times.
- An open or high resistance will cause the 2WD HI indicator to be inoperative during the 2 second bulb inspection.
- An open in the indicator dimming control circuit will cause the 2WD HI, 4WD Auto, 4WD HI and 4WD LO mode indicators to be inoperative during the 2 second bulb inspection.
- **EL-49741** harness is a good source for 9 V.

42 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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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 GM terminal test 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).

en, 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 probes 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 2WD HI indicator control circuit, TSCSC X1 pin 8.
 - If the voltage is less than the specified range, test the 2WD HI 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 2WD HI indicator control circuit, TCSCS X1 pin 8 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 probes 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 probes 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 OFF and ON 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	2WD HI	4WD Auto	4WD HI	4WD LO	N
5-V Reference (pin)	11	11	11	11	11
Indicator Control Circuit (pin)	8	7	9	10	3

TCSCS

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

2. Connect a 9 V battery to the **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.

EL49741 Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
Red (pin)	4	4	4	4	2
Black (pin)	8	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 \(NQ6\)](#)

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.

⚡ Circuit	Short to Ground	Open/High Resistance	Short to Voltage
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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 Control Circuit	B0790 06	B0790 06	B0790 01

Circuit/System Description

The Neutral indicator circuit consists of a light emitting diode (LED) feed circuit, a LED and a LED control circuit. The Ignition 1 voltage circuit is the LED feed circuit and continuously supplies B+ 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.

B0790 06

- 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/4WD Auto indicator control circuit when the Neutral indicator is commanded ON.

B0790 06

tests 1.6 V or less for 1.5 seconds on the AWD/4WD Auto 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 inspection.

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 inspection.
- **EL-49741** harness is a good source for 9 V.
- **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+.

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Transfer Case Control Schematics

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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 GM terminal test 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 (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 probes 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.
5. Using the 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 lamp between the Ignition 1 voltage circuit, TCSCS harness X1 pin 2 and a good ground. The test light should be 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.

4WD HI Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
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- 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 probes 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 probes 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	2WD HI	4WD Auto	4WD HI	4WD LO	N
5-V Reference (pin)	11	11	11	11	11
Indicator Control Circuit (pin)	8	7	9	10	3

TCSCS

1. Using the L-BU probes J 35616-65B, connect the **EL-49741** 9 V+ power source harness to the TCSCS as specified below for the LED being tested. Connecting the harness in the opposite pins will not illuminate the LED.
2. Connect a 9 V battery to the **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.

EL49741 Wire Color	2WD HI	4WD Auto	4WD HI	4WD LO	N
Red (pin)	4	4	4	4	2
Black (pin)	8	7	9	10	3

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

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 (NQ6)

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

Diagnostic Fault Information

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.

ise 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

When the ignition 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.

sfer 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 Commanded Position
- Transfer Case Range
- Transfer Case Range Selection Switch State
- 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***

Transfer Case Range	Transfer Case Sensor Reference Voltage 3	Transfer Case Range Selection Switch (V)		Range Actuator Position Sensor (Â°)	
		Range	Nominal	Range	Nominal

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 S77 transfer case shift control switch connector for damage or corrosion. Repair as necessary.
5. Clear DTC 2725, P0698, or P0699 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.

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

1. Ignition 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.
 - 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

st 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.

- [Transfer Case Selector Switch Replacement](#) for S77 transfer case shift control switch replacement
- [Transfer Case High/Low Clutch Reset \(NQ6\)](#) for Range Actuator Learn procedure
- [Control Module References](#) for K69 transfer case control module replacement, setup, and programming

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

Actuator Control Circuit Short to Battery	Short to Ground	Open/High Resistance	Short to Voltage	Performance
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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
- 4WD Low
- 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

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.
- **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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

- **Circuit Testing**

for 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.

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
4. 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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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

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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **If within the specified range**

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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

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

8. Verify 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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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 High/Low Clutch Reset \(NQ6\)](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#)

DTC C0321 OR C0326: 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.

DTC Descriptors

DTC C0321 01

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance
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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.

C0321 02

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.

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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

- [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.
5. Clear DTC 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)***

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.**

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.
2. Install the **EL-49742** harness.

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*

e 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](#).

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.

Repair Instructions

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

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

r Case High/Low Clutch Reset (NO6) for Range Actuator Learn Procedure.

- **Transfer Case Four Wheel Drive Actuator Replacement** for transfer case motor/transmission case range actuator replacement.

DTC C0364 OR C0379: FRONT AXLE SWITCH

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
Ground	-	C0364 04 if set when in 2WD High or C0379 08 if set when in 4WD High	-	C0379 58

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 Switch parameter). 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.

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

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

- **Circuit Testing**

for 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.

- *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*

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
3. 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

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***

replace 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.

ting Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
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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 [Four-Wheel Drive Does Not Engage](#), or [Four-Wheel Drive Does Not Disengage](#).

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](#)
- [Transfer Case High/Low Clutch Reset \(NQ6\)](#)
- [Four-Wheel Drive Does Not Engage](#)
- [Four-Wheel Drive Does Not Disengage](#)
- [Front Drive Axle Actuator Replacement](#)

DTC C0374: GENERAL SYSTEM PERFORMANCE TEMPERATURE HIGH

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 C0374 54

General System Performance Temperature High

Diagnostic Fault Information

Transfer Case Encoder Motor Brake

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Battery Positive Voltage Pin B	-	C0321 04	-	-
Lock Solenoid Control Pin C	C0321 02	C0321 04	C0321 01	C0321 08

Wheel Speed Sensors

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Left Front Wheel Speed Sensor 12 Volt Reference	C0035 00	C0035 00	-	C0035 5A
Left Front Wheel Speed Sensor Signal	C0035 00	C0035 00	C0035 00	C0035 5A
Right Front Wheel Speed Sensor 12 Volt Reference	C0040 00	C0040 00	-	C0040 5A
Right Front Wheel Speed Sensor Signal	C0040 00	C0040 00	C0040 00	C0040 5A
Left Rear Wheel Speed Sensor 12 Volt Reference	C0045 00	C0045 00	-	C0045 5A
Left Rear Wheel Speed Sensor Signal	C0045 00	C0045 00	C0045 00	C0045 5A
Right Rear Wheel Speed Sensor 12 Volt Reference	C0050 00	C0050 00	-	C0050 5A
Right Rear Wheel Speed Sensor Signal	C0050 00	C0050 00	C0050 00	C0050 5A

Circuit/System Description

The general system performance DTC sets based on a thermal module within the transfer case shift control module (TCCM) software. The components included in this thermal model are the motor driver within the TCCM, the transfer case shift motor, and the clutch inside the transfer case.

This fault occurs when one of the three components included in the thermal model surpass the upper limits of this model indicating possible damage to the transfer case or other driveline components. This DTC detects an over temperature condition base on a thermal model.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- DTC C0379 is not set.
- Vehicle speed > 5 kph (3 mph)

Conditions for Setting the DTC

This DTC sets if one of three components: motor driver inside the TCCM, transfer case clutch, or the shift motor, exceed the thermal model within the software for the module.

Action Taken When the DTC Sets

- All range and mode changes disabled until thermal model indicates temperature acceptable.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

Conditions for Clearing the DTC

TCM 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 and current DTCs can be cleared using a scan tool.

Diagnostic Aids

- The TCCM provides a reference voltage of 1.25-3.75 V on the motor B circuit for diagnostic purposes.
- It is possible to have windings inside the motor short to the case resulting in a short to ground.
- A problem where the front axle actuator is unable to mechanically engage can cause this DTC to set.
- A worn transfer case clutch can cause this DTC to set.
- A motor brake not holding can cause this DTC to set.
- Faulty wheel speed sensors can cause this DTC to set. When driving at a steady speed, the scan tool should display the same values for the following data parameters in the electronic brake control module (EBCM):
 - Left and right front wheel speed sensors
 - Left and right rear wheel speed sensors

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 ON, engine OFF.
2. Install a scan tool.
3. Ensure no other ECBM or TCCM codes are set.
 - If any other EBCM or TCCM DTC's are set, diagnose them first.

Circuit/System Testing

1. Engage parking brake.
2. Block rear wheels.

4. Key On, Ignition OFF. Inspect the front wheel.	Short to Ground	Open/High Resistance	Short to Voltage	Circuit/Component Timeout
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5. Transfer case in 2WD HI. Transmission in Neutral.
6. Mechanical binding. - Using the Special Functions capability of the scan tool, engage the front axle. While holding one front tire stationary, spin the other tire. The front propshaft should turn.
 - If the front propshaft does not turn, inspect the front axle clutch fork for mechanical binding.
7. Wheel speed sensors. - Take the vehicle on a short test drive on a smooth and level road. Using the Data Display function of the ECBM feature of the scan tool, verify that the front and rear wheel speeds sensors display do not vary or become intermittent.
 - If while driving at a steady speed the RPM values vary or becomes intermittent, check the EBCM for wheel speed DTC's. Wheel speed DTC's diagnostics are in antilock brake systems.
8. Transfer case encoder motor brake. - Using a scan tool, clear DTC's. Shift the vehicle to 2WD HI. Monitor the transfer case motor amperage parameter in the Data Display feature of the scan tool. Using the transfer case shift control switch, command the transfer case to the 4WD HI mode. The transfer case motor amperage should increase while the motor is shifting and then return to 0 amps within 5 seconds or less.
 - If the amperage stays high longer than 5 seconds, this indicates the brake is not holding. Replace the transfer case motor.
9. Transfer case clutch integrity. - Shift the vehicle into 4WD HI and take it for a test drive. Clear the DTC if possible. Monitor front and rear wheel speeds using the EBCM data display. Under heavy acceleration the front and rear wheel speeds should be similar.
 - If the front wheel speeds are much lower, this indicates a weak clutch and a transfer case tear down and inspection will be required.
10. If all prior evaluations test normal, reprogram the TCCM and perform the ATC Motor Learn procedure in the Special Functions feature of the scan tool or the **Transfer Case High/Low Clutch Reset (NQ6)** procedure in the service manual.

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 (NQ6)** for Motor Learn Procedure
- **Four-Wheel Drive Does Not Engage**
- **Front Drive Axle Clutch Fork Inspection**
- **Transfer Case Assembly Replacement**

DTC C0387: UNABLE TO COMPLETE SHIFT

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 00

Unable to Complete Shift

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Circuit/Component Timeout
Unable to Complete Shift	-	-	-	C0387 00
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
- 4WD Low
- Neutral

If the shift lever detent shaft were to bind, or there was a mechanical failure, or the transfer case clockwise circuit and the transfer case counter-clockwise circuit were shorted together, the shift would not be completed. This will cause the DTC to set in order to protect system components from damage.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No DTC P0562 or P0563.
- DTC C0387 runs continuously.

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 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 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

sfer case clockwise circuit shorting to the transfer case counter-clockwise circuit could cause this DTC to set.

- It is possible to have windings inside the transfer case motor shorted to the case resulting in a short to ground causing this DTC to set.
- The default actions for C0321 may set C0387.
- **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, K69 transfer case control module harness X3, terminal C, for a short to ground. Refer to [Testing for Short to Ground](#) .

- **If the Miscellaneous IGN fuse is OPEN**

Test the ignition 1 voltage circuit, K69 transfer case control module harness X2, terminal 6, for a short to ground. Refer to [Testing for Short to Ground](#) .

- **If the TREC fuse and the Miscellaneous IGN fuse are NOT open**

2. Ignition ON, engine OFF.

3. Verify no other DTC's are set. If any other DTC's are set, diagnose them first.

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

DTC C0387 is set as current

Refer to Circuit/System Testing.

- **If DTC C0387 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 K69 transfer case control module and the A16 transfer case motor connector for damage or corrosion. Repair as necessary.
6. Clear DTC C0387 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 C0387 sets**

Refer to Circuit/System Testing.

- **If DTC C0387 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
 4. 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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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

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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

The A16 transfer case motor drive gear performs as described

8. Verify 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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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 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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **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 transfer case range actuator harness 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](#) , and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- **If infinite resistance**

12. A16 transfer case motor OK.

13. Inspect the transfer case shift detent lever shaft for a binding condition.

- **If binding**

Remove the transfer case and repair the binding condition. Refer to [Transfer Case Shudder or Binding](#).

- **If not binding**

14. Refer to [Symptoms - Transfer Case](#), and [Transfer Case Will Not Shift](#).

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

- [Transfer Case Four Wheel Drive Actuator Replacement](#)
- [Transfer Case Disassemble](#)

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.
- The Range 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

[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

[Control Module 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. Refer to [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *If DTC C038D is NOT set*

6. All OK.

[Repair Instructions](#)

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

[Transfer Case High/Low Clutch Reset \(NQ6\)](#) for Range Actuator Learn Procedure

DTC C0392, P0642, OR P0643: TRANSFER CASE RANGE POSITION SENSOR/5V REFERENCE 1

[Diagnostic Instructions](#)

the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

- | | | | | |
|---|-----------------|----------------------|------------------|----------------|
| • Review Circuit Based Diagnosis for an overview of the diagnostic approach. | Short to Ground | Open/High Resistance | Short to Voltage | Signal Invalid |
|---|-----------------|----------------------|------------------|----------------|
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC C0392 08

Transfer Case Range Position Sensor Circuit Performance - Signal Invalid

DTC C0392 28

Transfer Case Range Position Sensor Circuit - Incorrect Frequency

DTC P0642 00

5V Reference 1 Low Voltage

DTC P0643 00

5V Reference 1 High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
Rotational Position Sensor Circuit (Rotary Position Sensor Signal)	C0392 08	C0392 08	C0392 08	C0392 08 or C0392 28
5-Volt Reference (Rotary Position Sensor Supply 5V/Sensor Reference Voltage 1)	P0642	P0643	P0643	C0392 08 or C0392 28
Low Reference (Rotary Position Sensor Return)	-	C0392 08	-	C0392 08 or C0392 28

Circuit/System Description

The transfer case control module receives input from the transfer case B227 Gear Position Sensor, also known as the range position sensor or the rotational position sensor. The gear position sensor receives a 5-volt reference signal from the transfer case control module. In return the gear position sensor sends the transfer case control module a variable pulse width modulated signal indicating the position of the transfer case. The gear position sensor works in conjunction with the range actuator position sensor, inside the A16 Transfer Case Motor, also known as the transfer case range actuator, to confirm transfer case position. The gear position sensor is more sensitive than the range actuator 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.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No DTC P0562 or P0563.
- No DTC P0652, P0653, or C0397 - C0392 only.
- DTC C0392, P0642 and P0643 run continuously within the enabling conditions.

Conditions for Setting the DTC

- The transfer case control module detects a transfer case range position sensor voltage that does not constantly change, but remains low, <0.25 V, indicating a short to ground.

Or

- The transfer case control module detects a gear position sensor voltage that does not constantly change, but remains high, >6.0 V, indicating a short to voltage.

C0392 28

The transfer case control module does not receive a sensor reference voltage 1 circuit, also known as the 5V reference 1 circuit, of 4.8-5.2 volts.

P0642

The transfer case control module detects less than 4.8 V on the transfer case reference voltage 1 circuit, also known as the 5V reference 1 circuit.

P0643

The transfer case control module detects greater than 5.2 V on the transfer case sensor reference voltage 1 circuit, also known as the 5V reference 1 circuit.

Action Taken When the DTC Sets

- DTC C398 disabled.
- All shifting disabled.
- Clutch torque increased to maximum torque.
- 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

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

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 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 C0392, P0642, or P0643 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.

inspect each connector terminal of the K69 transfer case control module X1 connector and the B227 gear position sensor connector for damage or corrosion. Repair as necessary.

5. Clear DTC C0392, P0642, or P0643 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. Ignition OFF, disconnect the harness connector at the B227 gear position sensor, also known as the rotational position sensor.

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 Kit. Use of an improper test probe may deform the terminal, resulting in intermittent open conditions.**
- **Testing for steps 3-7 is performed on the B227 gear position sensor harness connector using the GY probes J 35616-2A.**

3. Test for 4.8-5.2 V between the 5-Volt reference circuit, terminal B 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 B 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 B and all other terminals of the B227 gear position sensor 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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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 B 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 B and all other terminals of the B227 gear position sensor 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 Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *If within the specified range*

4. 5-Volt reference circuit and K69 transfer case control module OK.
5. Test for 4.8-5.2 V between the 5-Volt reference circuit, terminal B, and the low reference circuit, terminal A.

- *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 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 A and all other terminals of the B227 gear position sensor 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 Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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 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 switch signal circuit, terminal A and all other terminals of the B227 gear position sensor 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 Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *If within the specified range*

6. Low reference circuit and K69 transfer case control module OK.

4.8-5.2 V between the rotational position sensor circuit, terminal C 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 rotational position 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 rotational position sensor circuit 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 greater than 10 Ω between the rotational position sensor circuit terminal C and all other terminals of the B227 gear position sensor 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 Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NO6\)](#).

- ***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 rotational position sensor circuit terminal C 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 rotational position sensor circuit, terminal C and all other terminals of the B227 gear position sensor 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 Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NO6\)](#).

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

8. Rotational position sensor circuit and K69 transfer case control module OK.

Component Testing

B227 Gear Position Sensor

1. Key OFF. Disconnect the connector at the B227 gear position sensor.
2. Remove the B227 gear position sensor from the transfer case.
3. Connect the B227 gear position sensor.
4. Verify that the Transfer Case Range Position Sensor parameter sweeps between -146° and 204° while rotating the center locating tab of the B227 gear position sensor.
 - ***If the Transfer Case Range Position Sensor parameter does NOT sweep between -146° and 204°***

Replace the B227 gear position sensor. Refer to Transfer Case Four Wheel Drive Actuator Replacement .	Short to Ground	Open/High Resistance	Short to Voltage	Signal Invalid
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- If the Transfer Case Range Position Sensor parameter DOES sweep between -146° and 204°
5. B227 gear position sensor 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 High/Low Clutch Reset \(NO6\)](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#)

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

5V Reference 2 Circuit Low Voltage

DTC P0653

5V Reference 2 Circuit Low Voltage

Diagnostic Fault 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
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.
- System 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

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.
- 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.

P0653

- All shifting disabled.
- Clutch torque increased to maximum torque capacity during range shift from AWD, 4WD Low, and 4WD High only.

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

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

at 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

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 3-9 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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

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

4. Incremental encoder sensor (8 V) supply circuit and K69 transfer case control module OK.
5. Test for 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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

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

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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- ***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.
 - If less than 1 V
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.	Short to Ground	Open/High Resistance	Short to Voltage	Performance
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Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NQ6\)](#).

- *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 \(NQ6\)](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#) for A16 transfer case motor replacement

DTC C0397: TRANSFER CASE

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 C0397 54

Transfer Case Clutch High Temperature

DTC C0397 58

Transfer Case Clutch Performance

DTC C0397 4B (if equipped)

Transfer Case Clutch Calibration Not Learned

DTC C0397 F3

Transfer Case Clutch Worn Out Clutch

DTC C0397 F4

Transfer Case Range Position Sensor Over Travel

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Performance
Transfer Case Clutch Performance	-	-	-	C0397 54, C0397 58, C0397 4B, C0397 F3, or C0397 F4

Circuit/System Description

In 4WD/AWD Automatic range, the transfer case control module monitors the front and rear wheel speed sensors for slip. If the transfer case control module detects slip, and is unable to correct for a difference between the front and rear speed sensors, it will command the transfer case to apply the clutch. In addition, the transfer case control module tests for clutch pack wear by performing a high side kiss point check at power down and comparing it to the transfer case range actuator position sensor reading.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-8 V.
- No DTC P0562 or P0563.

C0397 54

- No C0379 01, C0379 04 or C0379 08 for thermal model.
- Vehicle speed greater than 5 km/h (3 MPH) and all wheel speeds at same speed.
- DTC C0397 54 runs continuously.

C0397 58

- Transfer case control module is NOT in shutdown mode due to thermal protection.
- DTC C0397 58 runs continuously.

C0397 4B

- Transfer case range: must begin in 4WD High/Locked and then be requested to shift to 4WD/AWD Automatic or 2WD.
- Only run during power down kiss point learn request.

C0397 F3

Only run during power down kiss point learn request.

C0397 F4

Only run during power down kiss point learn request.

Conditions for Setting the DTC

C0397 54

The transfer case control module has determined that the transfer case calculated clutch temperature model has exceeded the maximum allowable temperature for the second time.

C0397 58

ise control module has detected that the transfer case clutch has failed to reach the desired output torque after three attempts.

C0397 4B

The transfer case control module has determined that the power down kiss point learn has failed 20 times in a row.

C0397 F3

The transfer case control module has determined that the maximum clutch wear out limit has been exceeded.

C0397 F4

The transfer case control module has detected that the transfer case range actuator position sensor, or the transfer case range position sensor has exceeded the upper/lower over travel limits.

Action Taken When the DTC Sets

- Shifting is still possible but in a reduced capacity which may cause undesirable slip correction events.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.

C0397 54

Front axle disengaged.

C0397 58

Shifting disabled.

C0397 4B

- Max torque commanded for 4WD/AWD Automatic.
- The default actions for C0397 4B will cause DCT C038D to set.

C0397 F3

- Shifting disabled.
- Front axle disengaged.

C0397 F4

- Shifting disabled.
- Front axle disengaged.

Conditions for Clearing the DTC

- The transfer case control module clears the DTC once the condition for setting the DTC no longer exists.
- A history DTC clears after 40 consecutive warm up cycles without a fault present.
- History DTCs can be cleared using a scan tool.
- Only cleared by a successful kiss point learn. (DTC C0397 F3).
- Only cleared by the successful execution of the Transfer Case High/Low Clutch Reset (NO6) procedure. (DTC C0397 F4).

Diagnostic Aids

transfer case motor lock can cause C0397 58 to set.

- Faulty wheel speed sensors can cause DTC C0397 58 or C0397 F3 to set. When driving at a steady speed, the scan tool should display the same values for the following data parameters in the electronic brake control module:
 - Left and right front wheel speed sensors
 - Left and right rear wheel speed sensors

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 OFF.
2. Install a scan tool.
3. Verify no other K17 Electronic Brake Control Module or K69 Transfer Case Control Module DTCs are set.
 - ***If any other K17 Electronic Brake Control Module Or K69 Transfer Case Control Module DTC's are set***
diagnose them first.
 - ***If no other K17 Electronic Brake Control Module Or K69 Transfer Case Control Module DTC's are set***
4. Verify DTC C0397 is only set as a history DTC.
 - ***If DTC C0397 is set as current***
refer to Circuit/System Testing.
 - ***If DTC C0397 is set as history***
5. Clear DTC C0397 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 DTC C0397 sets***

Refer to Circuit/System Testing.

DTC C0397 does not set

7. All OK.

Circuit/System Testing

1. Install scan tool.

2. Wheel speed sensors:

1. Take the vehicle on a short test drive on a smooth and level road.
2. Verify that, when at a steady speed, all of the front and rear speed sensors parameters do not vary or become intermittent.

- ***If while driving at a steady speed the RPM values vary or become intermittent***

check the K17 Electronic Brake Control Module for wheel speed DTC's. Wheel speed DTC diagnostics are in antilock brake systems.

- ***If all of the front and rear speed sensors parameters do not vary or become intermittent***

3. Transfer case clutch integrity:

1. Shift the vehicle into 4WD High/Locked and take it for a test drive. Clear the DTC if possible.
2. Verify that while under heavy acceleration that the front and rear wheel speeds are similar.

- ***If the front wheel speeds are much lower***

this indicates a weak clutch and a transfer case disassembly and inspection will be required. Refer to [Transfer Case Disassemble](#).

- ***If the front and rear wheel speeds are similar***

4. A16 transfer case motor - brake/lock:

1. Clear DTC's. Using the S77 Transfer Case Shift Control Switch function of the scan tool, shift the vehicle to 2WD range.
2. Monitor the Transfer Case Motor Amperage parameter in the Data Display feature of the scan tool.
3. Using the S77 Transfer Case Shift Control Switch function of the scan tool, command the transfer case to the 4WD High/Locked range.
4. Verify that the Transfer Case Motor Amperage parameter increases while the motor is shifting, and then returns to 0 amps within 5 seconds or less.

- ***If the amperage stays high longer than 5 seconds***

this indicates the brake is not holding. Replace the A16 Transfer Case Motor. Refer to [Transfer Case Four Wheel Drive Actuator Replacement](#).

- ***If the amperage increases while the motor is shifting, and then return to 0 amps within 5 seconds or less***

5. Mechanical binding:

1. Engage parking brake.
2. Block rear wheels.
3. Lift front wheels.
4. Ignition ON, engine OFF. Install scan tool.
5. Transfer case in 2WD. Transmission in Neutral.
6. Using the Front Axle Engagement Actuator control function, engage the front axle.
7. Verify that the front prop shaft turns while holding one front tire stationary and spinning the other tire.

- ***If the front prop shaft does not turn***

Range/Parameter	2WD	4WD/AWD Automatic	4WD High/Locked	4WD Low	Four-Wheel Drive Does Not Engage
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- *If the front prop shaft turns*

6. If all prior evaluations test normal:

1. Reprogram the K69 Transfer Case Control Module. Refer to [Control Module References](#).
2. Perform the Range Actuator Learn procedure in the Control Functions feature of the scan tool. Refer to [Transfer Case High/Low Clutch Reset \(NO6\)](#).

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 C0397 sets*

replace the K69 Transfer Case Control Module and perform the Range Actuator Learn procedure. Refer to [Transfer Case Control Module Replacement](#), and [Transfer Case High/Low Clutch Reset \(NO6\)](#).

- *If DTC C0397 does not set*

8. 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
- [Transfer Case High/Low Clutch Reset \(NO6\)](#) for Range Actuator Learn Procedure
- [Four-Wheel Drive Does Not Engage](#)

DTC C0398: RANGE ACTUATOR POSITION - RANGE POSITION CORRELATION

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 C0398 00

Range Actuator Position - Range Position Correlation

Typical Scan Tool Data

Range/Parameter	2WD	4WD/AWD Automatic	4WD High/Locked	4WD Low	Neutral
Range Actuator Position Sensor (Â°)	33Â° to 43Â°	87Â° to 204Â°	110Â° to 204Â°	-69Â° to -140Â°	-5Â° to +5Â°
Sensor Reference Voltage 2 (V)	7.75-8.25 V	7.75-8.25 V	7.75-8.25 V	7.75-8.25 V	7.75-8.25 V
Range Actuator Position Sensor (V)	0.6-0.8 V or 3.7-4.1 V	0.6-0.8 V or 3.7-4.1 V	3.7-4.1 V	3.7-4.1 V	0.6-0.8 V or 3.7-4.1 V
Transfer Case Range Position Sensor (Â°)	33Â° to 43Â°	87Â° to 204Â°	110Â° to 204Â°	-69Â° to -140Â°	-5Â° to +5Â°

Description

The transfer case range actuator position sensor is also known as the incremental position sensor. The transfer case range actuator position sensor is an integral part of the A16 Transfer Case Motor and cannot be replaced independently. The A16 Transfer Case Motor is also known as the transfer case range actuator.

The B227 Gear Position Sensor is also known as the transfer case range position sensor, the two/four wheel drive actuator position sensor, or the rotational position sensor. The B227 Gear Position Sensor is an absolute sensor and is an independently replaceable part.

Both sensors send transfer case range position information to the transfer case control module as voltage signals, which is then converted to degrees 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 is more sensitive than the B227 Gear Position Sensor, but needs to reference the B227 Gear Position Sensor value at ignition ON and range changes.

Conditions for Running the DTC

- Ignition ON.
- System voltage 10.5-18 V.
- No P0562 or P0563.
- DTC C0398 runs continuously.

Conditions for Setting the DTC

The range actuator position sensor and the range position sensor are both showing valid positions, but differ by greater than a predetermined amount when NO range change is in progress.

Action Taken When the DTC Sets

- Shifting disabled.
- The SERVICE 4WD indicator remains illuminated for the remainder of the current ignition cycle.
- Maximum clutch torque commanded when in 4WD High/Locked, 4WD/AWD Automatic, or 4WD Low, and during range shifts.

Conditions for Clearing the DTC

DTC 0398 can only be cleared by using a scan tool to clear codes twice consecutively.

Diagnostic Aids

- The range actuator position sensor and the range position sensor both show position in degrees. Monitor these parameters for erratic or unreasonable readings.
- An ignition ON, engine OFF sequence with transfer case motor removed, but still attached to the harness, may cause C0398 00 to set.
- Repeatedly commanding the transfer case range actuator forward or reverse without pressing the exit button between commands, to return to the "none" state, can result in incorrect readings.
- DTC C0398 is a latching DTC. This means that it stays current even with cycling the ignition ON & OFF. DTC 0398 can only be cleared by using a scan tool to clear codes twice consecutively. The first command to clear codes unlatches the DTC. The second command to clear codes clears the DTC.

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.

Circuit/System Verification

1. Ignition ON, engine OFF.
2. Connect a scan tool.
3. Monitor the Range Actuator Position Sensor and Range Position Sensor parameters on the scan tool. Using the S77 Transfer Case Shift Control Switch, shift the transfer case into all ranges. The Range Actuator Position Sensor parameter and Range Position Sensor parameter should track each other.
 - *If the Range Actuator Position Sensor parameter and Range Position Sensor parameter do NOT track each other within 7 degrees*

Refer to Circuit/System Testing.
 - *If the Range Actuator Position Sensor parameter and Range Position Sensor parameter DO track each other within 7 degrees*
4. All OK.

Circuit/System Testing

1. Verify DTC C0392, P0642, P0643 (B227 Gear Position Sensor, also known as range position sensor), or C0396, C039E, P0652, P0653 (range actuator position sensor) is not set.
 - *If any of the DTCs are set*

Refer to DTC C0392, P0642, or P0643, or DTC C0396, C039E, P0652, or P0653
 - *If none of the DTCs are set*
2. Go to Component Testing.

Component Testing

NOTE: Order of component testing is important.

1. B227 Gear Position Sensor (also known as Range Position Sensor)
 1. Ignition OFF. Disconnect the B227 Gear Position Sensor connector. Remove the B227 Gear Position Sensor. Inspect the mating surface for damage. Replace if damage is found.
 2. Rotate the B227 Gear Position Sensor tab to the lock position. Reconnect the B227 Gear Position Sensor.

Ignition ON, engine OFF.

4. While monitoring the Range Position Sensor parameter on the scan tool, push in the locking tab and rotate the B227 Gear Position Sensor tab. In the lock position the Range Position Sensor parameter should read 33-43°. Upon rotating the range position sensor tab, the Range Position Sensor parameter should display a sweep from -146 to +204 degrees.

- If the Range Position Sensor parameter does not display as described, replace the B227 Gear Position Sensor.

Refer to [Transfer Case Two/Four Wheel Drive Actuator Position Sensor Replacement](#).

- If the Range Position Sensor parameter does display as described

5. Using a wide, flat blade screwdriver in the B227 Gear Position Sensor mounting slot, attempt to rotate the transfer case control actuator shaft. The shaft should not turn.

- If the shaft can be turned, then internal damage has occurred to the transfer case control actuator shaft or mating gears. Refer to [Transfer Case Disassemble](#) and inspect and repair as necessary.
- If the shaft can not be turned

6. B227 Gear Position Sensor OK.

2. A16 Transfer Case Motor - Range Actuator Position Sensor

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.
2. Attach the A16 Transfer Case Motor to the A16 Transfer Case Motor connector.
3. Ignition ON, engine OFF.

NOTE:

Pressing the exit button on the scan tool between commanding the Transfer Case Motor Control forward and reverse is critical to proper diagnosis. Pressing the exit button changes the commanded state to NONE. If you DO NOT press the exit button between changing directions, the Range Actuator Position Sensor parameter may not update. When this happens you have to command the new direction a second time in order for the scan tool to update. Repeatedly changing directions may cause the Range Actuator Position Sensor parameter to flip between the extremes, -150° and +360° or -360° and +360. Depending on software level the lower extreme is either -150° or -360°.

4. While monitoring the Range Actuator Position Sensor parameter, command the transfer case range actuator forward using the Transfer Case Motor Control function of the scan tool. After 10 seconds the Range Actuator Position Sensor parameter should read -150°, -360° or +360°. Push the exit button on the scan tool once to return the commanded state to NONE. Command the transfer case range actuator reverse. After 10 seconds the Range Actuator Position Sensor parameter should read +360°, -360° or -150°.
 - If the Range Actuator Position Sensor parameter does not display as described, repeat step 2. If the Range Actuator Position Sensor parameter continues to not display as described, replace the A16 Transfer Case Motor.
 - If the Range Actuator Position Sensor parameter displays as described
5. Ignition OFF for at least 3 minutes. Install the A16 Transfer Case Motor.
6. Ignition ON, engine OFF. The K69 Transfer Case Control Module should relearn the transfer case range actuator position, and the Transfer Case Position parameter should display a valid range.
 - If the Transfer Case Position parameter displays Invalid, perform the Range Actuator Learn procedure. Refer to [Transfer Case High/Low Clutch Reset \(N06\)](#).

7. A16 Transfer Case Motor - Range Actuator Position Sensor OK.

Repair Instructions

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

- [Transfer Case Disassemble](#)
- [Transfer Case Four Wheel Drive Actuator Replacement](#)
- [Transfer Case Two/Four Wheel Drive Actuator Position Sensor Replacement](#)
- [Transfer Case High/Low Clutch Reset \(NQ6\)](#) for Range Actuator Learn Procedure

DTC C0550: ELECTRONIC CONTROL UNIT (ECU)

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 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
- ROM Checksum
- RAM Checksum
- RAM Malfunction

Conditions for Running the DTC

- The TCM runs the program to detect an internal condition at key ON. The only requirements are voltage and ground.
- Ignition ON.
- System voltage 10.5-18.0 V

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

Description and Operation

Transfer Case Description and Operation

Electrical Information Reference

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

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 (NQ6)**

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 Range Actuator 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.
- System voltage 10.5-18 V.

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

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

Clearing the DTC

The transfer case control module clears the DTC once the Range Actuator 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

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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.
 - *If DTC C0569 is set*
perform the Range Actuator Learn procedure. Refer to [Transfer Case High/Low Clutch Reset \(NQ6\)](#).
 - *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 (NQ6)

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

Control Module Not Programed

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

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

The random access 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).

602 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.
 - The 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

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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.

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](#), and [Transfer Case High/Low Clutch Reset \(NO6\)](#)

- *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
- [Transfer Case High/Low Clutch Reset \(NO6\)](#) for Range Actuator Learn Procedure

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 Descriptors

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

≥ above 18.5 V or below 10.5 V and a mode shift is requested.

Action Taken When the DTC Sets

- Shifting disabled until battery voltage is within specification.
- Mode indicator will illuminate current mode.

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.

Diagnostic Aids

- 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 (NO6) 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.

e Freeze Frame feature of the scan tool, review the Battery Voltage parameter when the DTC sets. 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.
 - If 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 probes 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 \(NQ6\)](#)
- [Battery Inspection/Test](#)
- [Battery Electrical Drain/Parasitic Load Test](#)
- [Charging System Test](#)

DTC P185F OR P279A-P279C: TRANSFER CASE SHIFT PENDING SIGNAL /FOUR WHEEL DRIVE (4WD) (NQ6, NQ7)

Diagnostic Instructions

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.

Conditions for 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.

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](#)
- [Wiring 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

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](#)

- If 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.

the DTC sets Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
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 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
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, as well as transfer case range.

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 5 percent and less than 99 percent.
- The transmission is not in Reverse Inhibit state.
- The transmission is not in PARK or NEUTRAL.
- The transmission is not performing garage shifting.
- No engine torque, throttle position, and 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 1000 RPM and less than 7500 RPM.

P2161

- The transmission is not performing garage shifting.
- The transmission is not in Reverse Inhibit state.
- The transmission is not in PARK or NEUTRAL.
- The engine speed is 1000 RPM or greater.
- No crank sensor or P2160 DTCs.

Conditions for Setting the DTC

P2160

- No speed signal from the transfer case speed sensor.
- The transfer case output shaft speed is 50 RPM or less.

P2161

- Loss of speed signal from the transfer case speed sensor.
- Output speed signal is increasing: current transfer case speed signal - last valid output speed greater than 475 RPM.
- Output speed signal is decreasing: current transfer case speed signal - last valid output speed less than 255 RPM.

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

sfer 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 P6161 may set DTC P16F3.

Reference Information

Schematic Reference

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

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

[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

F. 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.

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
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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 (VSS) 2 (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

t 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.
- Output speed 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.

ions 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

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

Special Tools

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.
 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 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

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 B115 Vehicle Speed Sensor.

Repair Instructions

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

- Refer to: [Vehicle Speed Sensor Replacement](#)
- Refer to: [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.
2. Review 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 Grating Noise](#)

Transfer Case Clunk in 2HI Only

- Transfer Case Clunk in 4HI
- Transfer Case Clunk in 4LO
- Transfer Case Clunk During Acceleration and Deceleration
- Transfer Case Shudder or Binding
- 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 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.

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 \(NQ6\)](#)
- [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
- An ignition 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](#)

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 (NQ6)
- 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 mode. The current 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, AWD, 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

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 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 (NQ6)

NO CORRECTION FOR SLIP IN ALL-WHEEL DRIVE MODE

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

When transfer case is in auto 4WD mode the transfer case control module monitors the front wheel speeds and the rear wheel speeds. When a noticeable difference between the front and rear is seen the transfer case control module sends a PWM voltage to the motor so it can apply the clutch in order to correct a slip condition. The slip conditions is the difference in speed between the front and rear axles. The module has a thermal model based system so when the slip correction can not be made when a large percentage PWM signal has been sent, it will disable the system to prevent damage to the clutches.

Reference Information

Schematic Reference

Transfer Case Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

Erratic wheel speed sensors can cause this condition to occur. Monitor the wheel speeds using the EBCM scan tool data list.

Circuit/System Testing

1. Monitor the wheel speed sensors using the EBCM scan tool data list. If the wheel speeds are erratic or there is a large difference between front and rear then diagnose and repair as necessary. Check for EBCM DTCs as they have likely set for wheel speed performance.
2. If nothing is found with wheel speed performance then the clutches may be excessively worn. Refer to [Transfer Case Disassembled View](#).

Repair Instructions

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

[Transfer Case Disassembled View](#)

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

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. 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 (NQ6)

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

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 (NQ6)

SERVICE INDICATOR ALWAYS ON

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

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

- **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.

- **Control Module References** for TCSCM replacement, setup, and programming
- **Transfer Case High/Low Clutch Reset (NQ6)**

TRANSFER CASE HIGH/LOW CLUTCH RESET (NQ6)

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.
4. When the 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

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.
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. 1. Inspect the oil for water intrusion and/or fluid discoloration and contamination. 2. Inspect the vent hose for proper routing and connection to the transfer case. 3. Inspect for damaged internal components. Refer to Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection. 4. 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. NQ6 transfer case applications are noisier by design in 4WD mode than they are in 2WD mode. Compare the noise to a similar vehicle to see if a normal condition. 1. Identify the source of the noise using chassis ears and refer to the appropriate service manual section. 2. Note specifics such as when the noise is present (2HI, 4HI, OR 4LO). 3. Note if the noise relative to vehicle speed, is noisy on turns, or other specifics. 4. 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	Replace the universal joints as required. Refer to Symptoms - Propeller Shaft .
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.

Cause	Correction
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. To Transfer Case Disassemble, and Transfer Case Assemble.
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. NQ6 transfer case applications are noisier by design in 4WD mode than they 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 .
Propeller shaft universal joints worn	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.

Cause	Correction
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.
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.

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 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 GRATING NOISE

Cause	Correction
DEFINITION: A faulty internal transfer case component that causes a grating noise in the transfer case while in the AWD, 4HI, or 4LO mode. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Broken clutch apply plate	1. Inspect for a broken clutch apply plate. Refer to Transfer Case Disassemble, and Transfer Case Assemble. 2. Replace the apply plate and the transfer case components that are damaged. Refer to Transfer Case Disassemble, and Transfer Case Assemble.
Faulty scissor mechanism lever thrust bearings	1. Inspect for faulty scissor mechanism lever thrust bearings. Refer to Two/Four Wheel Drive Shift Components Cleaning and Inspection. 2. Recondition the transfer case components that are damaged from debris. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

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 ring 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 2. Replace the planetary components as required.

TRANSFER CASE CLUNK DURING ACCELERATION AND DECELERATION

Cause	Correction
DEFINITION: During acceleration or deceleration, a clunk is heard or felt in the transfer case when it is in AWD mode. Review the Symptoms - Transfer Case and perform the necessary inspections.	

Cause	Correction
Incorrect fluid level or incorrect fluid	1. Inspect the transfer case for the correct fluid level. 2. Inspect the transfer case for the correct type of fluid. Refer to Approximate Fluid Capacities. 3. Flush the transfer case and fill with the correct fluid, if required. Refer to Transfer Case Fluid Replacement.
Excessive clearance between the slip yoke and the rear output shaft	1. Inspect for the following conditions: • Worn slip yoke splines • Worn rear output shaft splines 2. Repair or replace the following components if faulty: • Replace the slip yoke, if required. Refer to Propeller Shaft Slip Yoke Replacement. • Replace the rear output shaft, if required. Refer to Transfer Case Disassemble, and Transfer Case Assemble.
Excessive clearance between the slip yoke and the rear bushing	1. Inspect for the following conditions: • Worn rear bushing • Worn slip yoke bushing journal 2. Repair or replace the following components if faulty: • Replace the slip yoke, if required. Refer to Propeller Shaft Slip Yoke Replacement. • Replace the rear bushing if worn. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

TRANSFER CASE SHUDDER OR BINDING

Cause	Correction
DEFINITION: When in the AWD mode, a shudder is felt during acceleration or a crow-hop or binding while turning, which may cause tire scuffing. Review the Symptoms - Transfer Case and perform the necessary inspections.	
Oil breakdown or contamination	Flush the transfer case and fill with the correct fluid. Refer to Transfer Case Fluid Replacement .
Incorrect transfer case fluid	Flush the transfer case and fill with the correct fluid. Refer to Transfer Case Fluid Replacement .
Burrs on the clutch hub slots	1. Inspect the clutch disc tab slots in the clutch hub for burrs or notches. Refer to Two/Four Wheel Drive Shift Components Cleaning and Inspection. 2. De-burr the hub slots. If the hub slots are excessively notched, replace the clutch hub. Refer to Transfer Case Disassemble, and Transfer Case Assemble.

TRANSFER CASE WILL NOT SHIFT

Cause	Correction
DEFINITION: The transfer case will not shift from 2 wheel drive to 4 wheel drive 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 3 mph.	Correction:
1. Review the correct owner's 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
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 high/low clutch 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

Cause	Correction
Cause	Correction
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. 1. Inspect the gear teeth for excessive damage. Refer to: Transfer Case Fluid Replacement 2. Inspect the splines of the high/low clutch and rear output shaft to ensure the clutch moves freely on the shaft. 3. Replace components as required.
Clutch pack	A worn clutch pack may set a DTC and disable shifting. Refer to: Diagnostic System Check - Vehicle
Rear output shaft snap ring broken or out of position	NOTE: A broken or mis-positioned rear output shaft snap ring may lead to a will not shift condition. Inspect for a broken or mis-positioned rear output shaft snap ring.
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. 1. Inspect the planetary gears and high/low internal gear for wear or damage. Refer to: High/Low Planetary Carrier Cleaning and Inspection 2. Inspect the input shaft gear teeth for wear or damage 3. 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 scissor mechanism lever bearing	Inspect for a worn or damaged scissor mechanism lever and/or bearing Replace components as required.
Transfer case Actuator motor brake	NOTE: • The actuator motor brake may lead to a will not shift or jumps out of gear condition • If the condition is caused by a brake electrical condition, a DTC will be set. • If the condition is caused by a brake electrical condition, a DTC will be set. Inspect the electrical system for a properly operating actuator motor.

Cause	Correction
Rear output shaft snap ring broken or out of position	NOTE: A broken or out-of-positioned rear output shaft snap ring may lead to a will-not-shift or jumps-out-of-gear condition. Inspect for a broken or out-of-position rear output shaft snap ring.
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 high/low clutch 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 LEAK DIAGNOSIS

Cause	Correction
transmissionmanuals.com	

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.

Cause	Correction
Transfer case adapter leak	NOTE: A leak at the transmission-to-transfer case adapter weep hole location may be 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. 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: <u>Transfer Case Fluid Replacement</u>
Vent hose leak	1. Inspect the transfer case for an overfill condition. Refer to: <u>Transfer Case Fluid Replacement</u> 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: <u>Adhesives, Fluids, Lubricants, and Sealers</u> 2. Install the correct sealer onto the threads of the plugs and tighten to the correct torque value. Refer to: <u>Transfer Case Fluid Replacement</u>
Rear output shaft bearing snap ring access hole plugs leak	Replace the access hole plugs to lower case front.
Vehicle speed sensor (VSS) leak	1. Remove the VSS. Refer to: <u>Vehicle Speed Sensor Replacement</u> 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.

Cause	Correction
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.
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

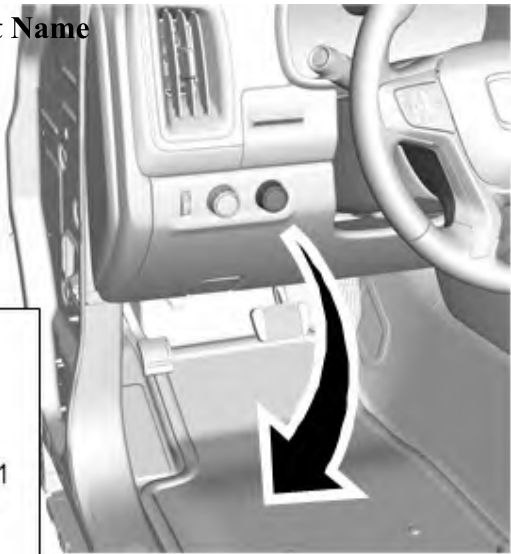
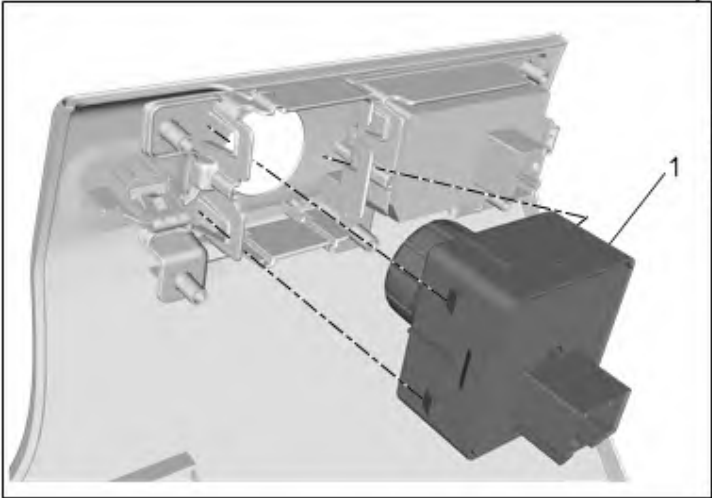


Fig. 7: Transfer Case Selector Switch
Courtesy of GENERAL MOTORS COMPANY

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

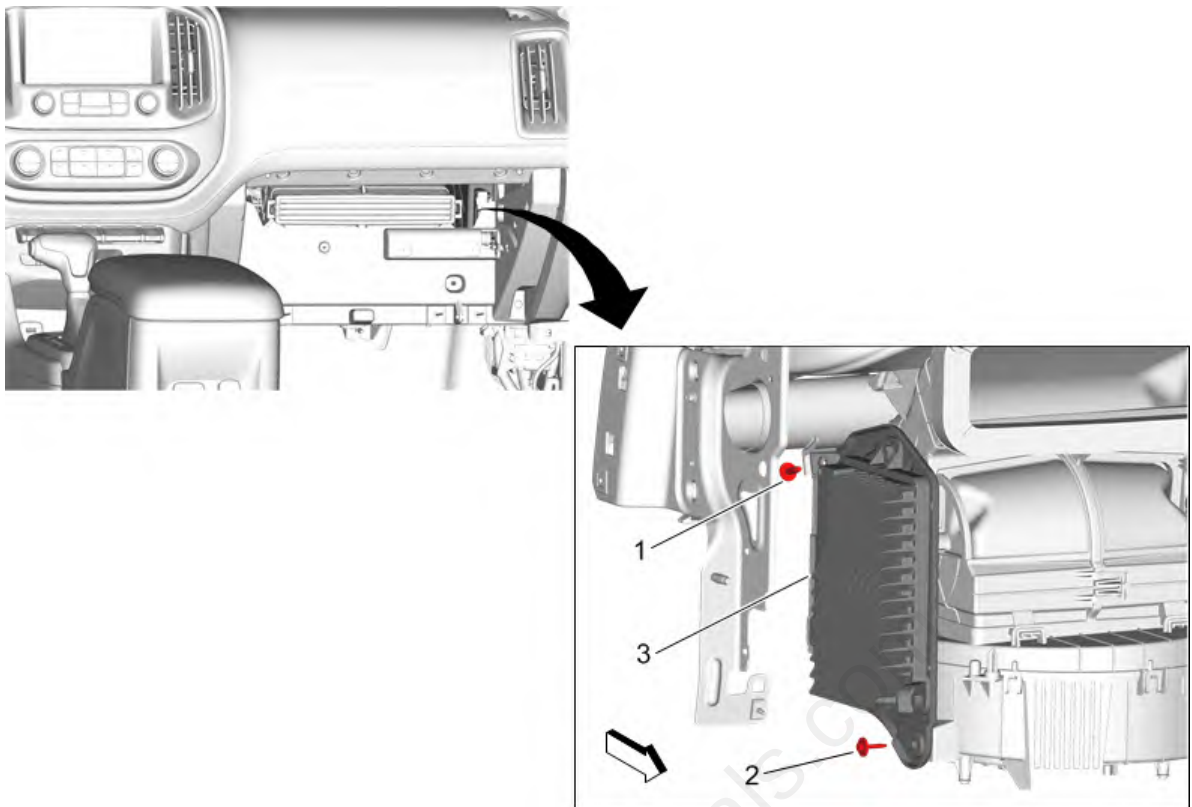


Fig. 8: Radio Speaker Amplifier

Courtesy of GENERAL MOTORS COMPANY

1. Remove the radio speaker amplifier. Refer to [Radio Speaker Amplifier Replacement](#) .

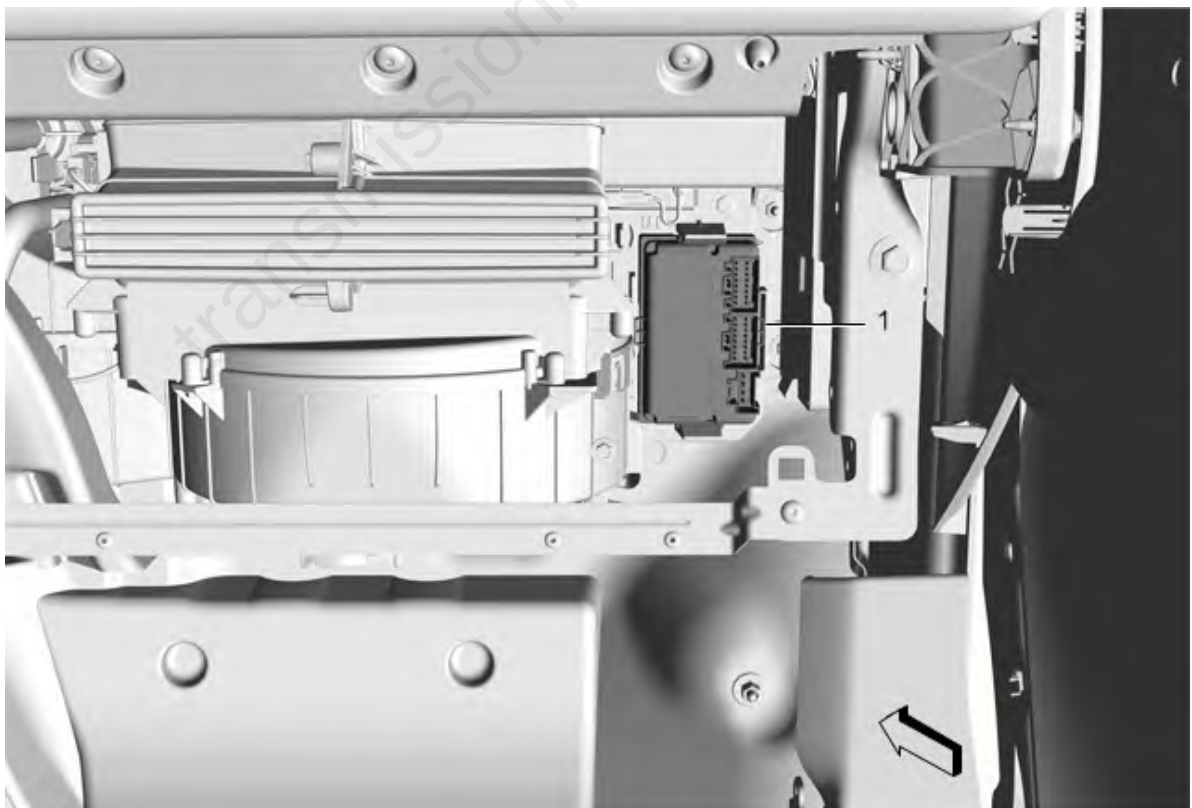


Fig. 9: Transfer Case Control Module

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

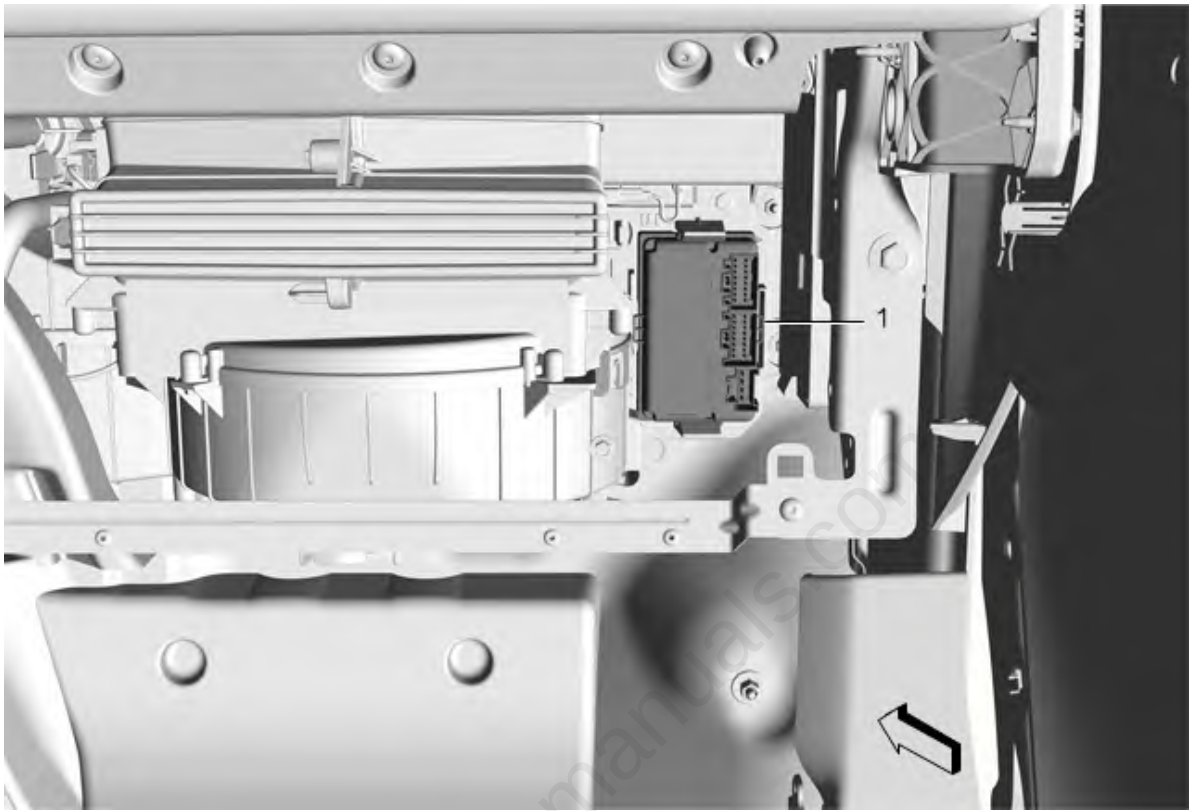


Fig. 10: Transfer Case Control Module

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).

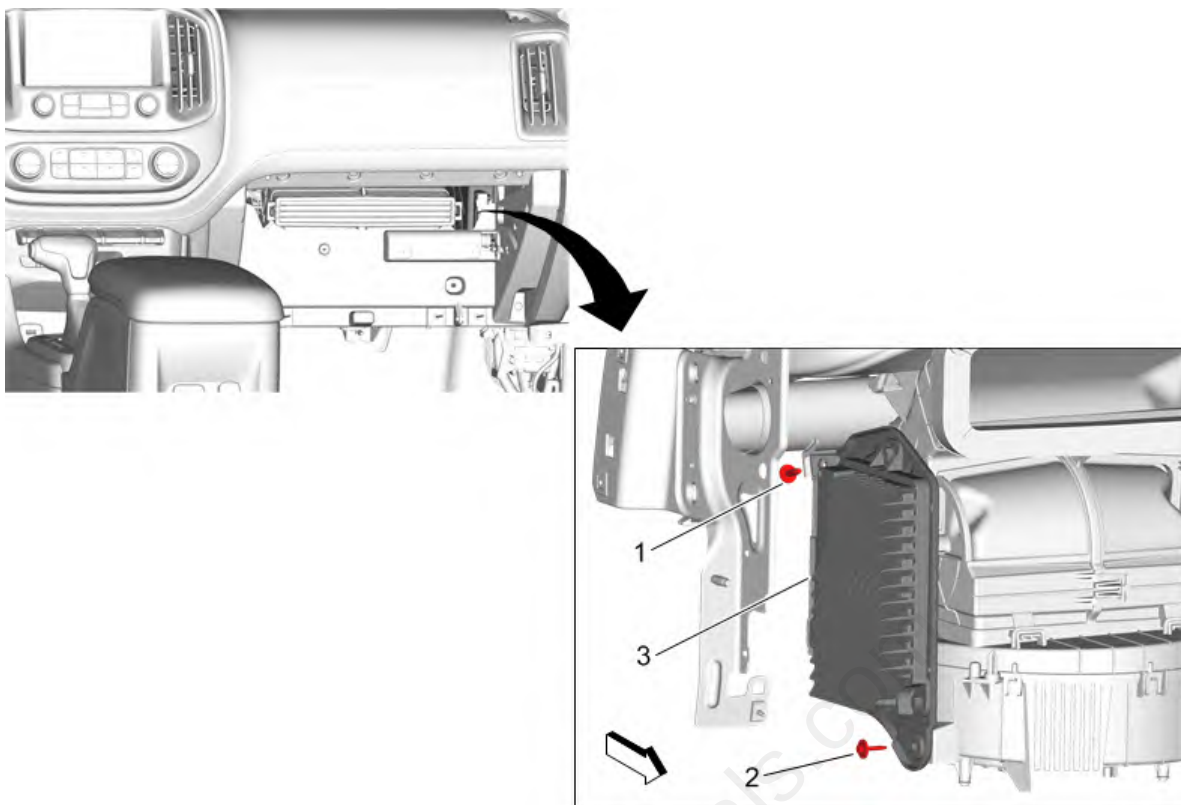


Fig. 11: Radio Speaker Amplifier

Courtesy of GENERAL MOTORS COMPANY

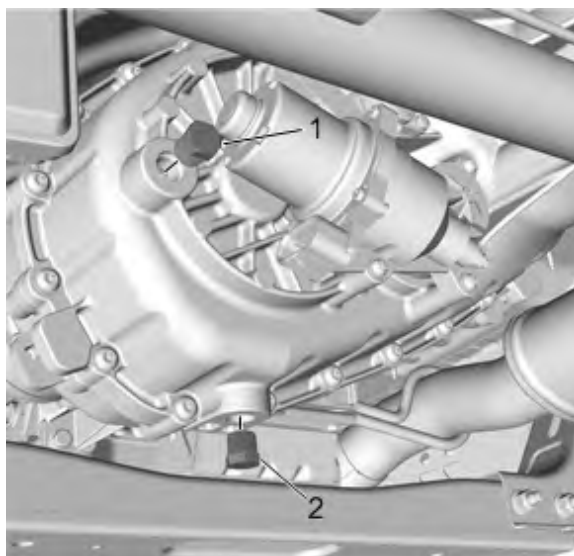
3. Install the radio speaker amplifier. Refer to [Radio Speaker Amplifier Replacement](#) .
4. If installing a new module, perform the transfer case shift control module programing and setup. Refer to [Control Module References](#) .

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

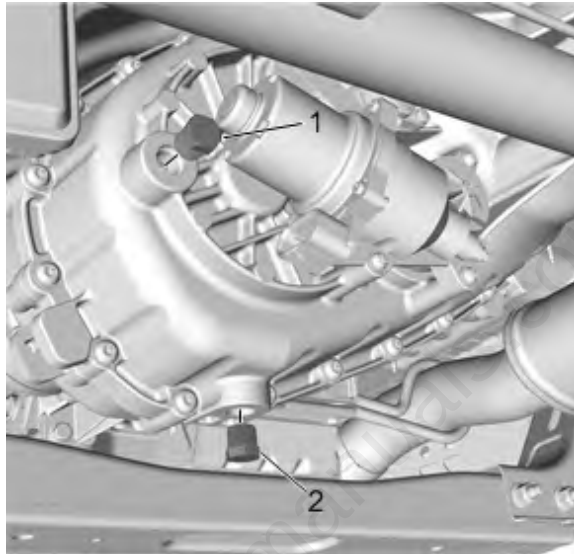


Fig. 13: Fill Plug And Transfer Case

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 TWO/FOUR WHEEL DRIVE ACTUATOR POSITION SENSOR REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Disconnect the electrical connector from the transfer case two/four wheel drive actuator position sensor.

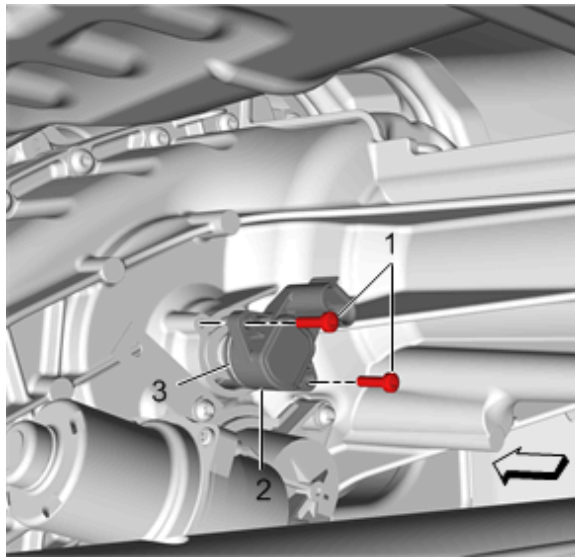


Fig. 14: Transfer Case Two/Four Wheel Drive Actuator Position Sensor Fasteners And Sensor
Courtesy of GENERAL MOTORS COMPANY

3. Remove the transfer case two/four wheel drive actuator position sensor fasteners (1) from the transfer case.
4. Remove the transfer case two/four wheel drive actuator position sensor (2) from the transfer case.
5. If necessary, remove and Discard the transfer case two/four wheel drive actuator position sensor O-ring from the sensor (3).

Installation Procedure

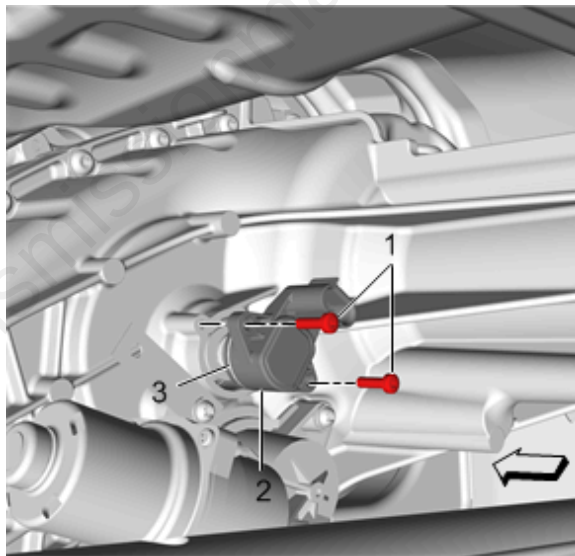


Fig. 15: Transfer Case Two/Four Wheel Drive Actuator Position Sensor Fasteners And Sensor
Courtesy of GENERAL MOTORS COMPANY

1. If necessary, install a New transfer case two/four wheel drive actuator position sensor O-ring (3) on the sensor (2).
2. Install the transfer case two/four wheel drive actuator position sensor (2) into the transfer case.

CAUTION: Refer to **Fastener Caution** .

3. Install the transfer case two/four wheel drive actuator position sensor fasteners (1) and tighten to 8 N.m (71 lb in).

the electrical connector to the transfer case two/four wheel drive actuator position sensor.

5. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

TRANSFER CASE FOUR WHEEL DRIVE ACTUATOR REPLACEMENT

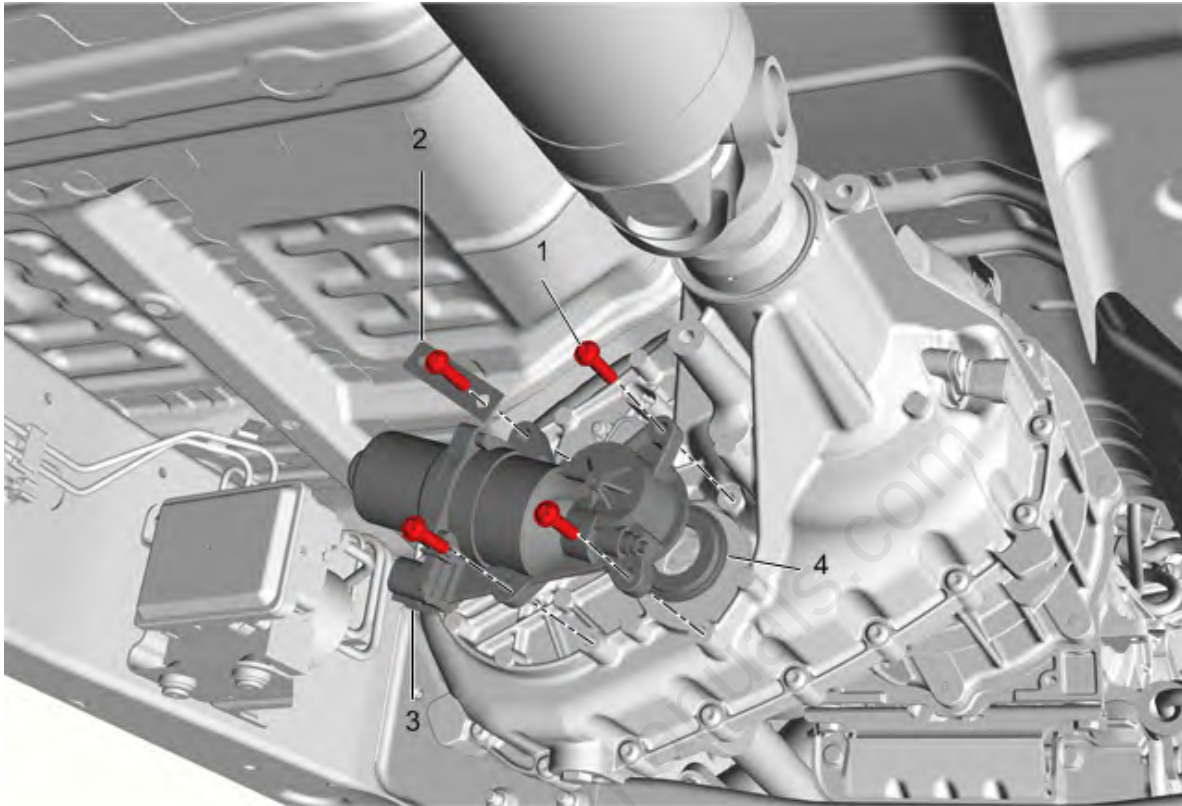


Fig. 16: Transfer Case Four Wheel Drive Actuator

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Disconnect the electrical connector. 3. Place a drain pan beneath the area of the actuator. 4. Fill the transfer case as required after replacing the actuator. Refer to Transfer Case Fluid Replacement .	
1	Two/Four Wheel Drive Actuator Bolt (Qty: 4) CAUTION: Refer to Fastener Caution . Tighten 19 N.m (14 lb ft)
2	Wire Harness Retainer Bracket
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.

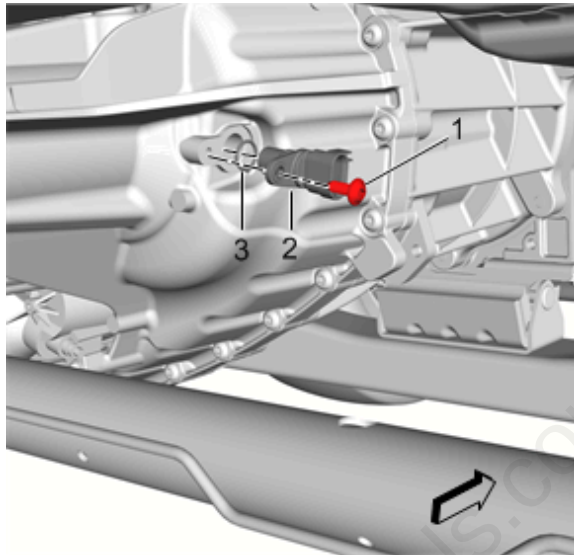


Fig. 17: Transfer Case Vehicle Speed Sensor Fastener And Sensor
Courtesy of GENERAL MOTORS COMPANY

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

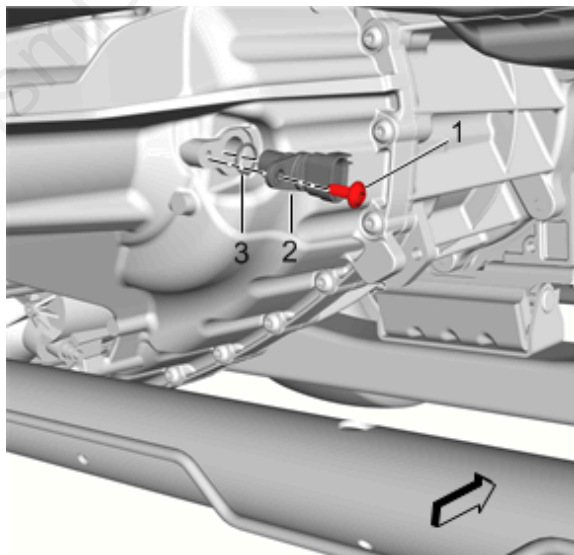


Fig. 18: Transfer Case Vehicle Speed Sensor Fastener And Sensor
Courtesy of GENERAL MOTORS COMPANY

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.

ON: 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](#) .

FRONT OUTPUT 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.

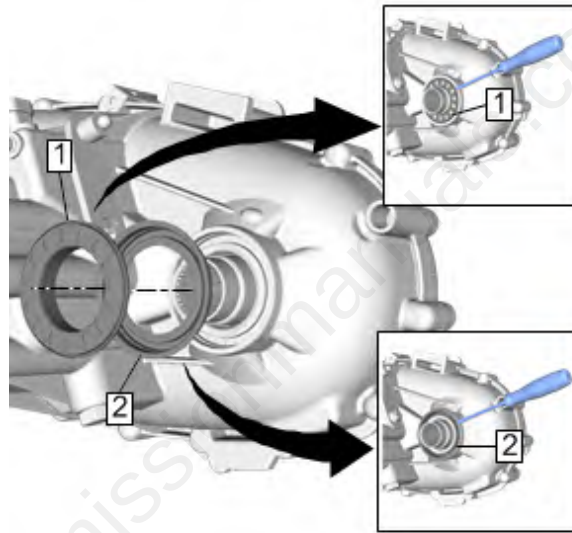


Fig. 19: Front Output Shaft Slinger And Oil Seal
Courtesy of GENERAL MOTORS COMPANY

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

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

1. Install the 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

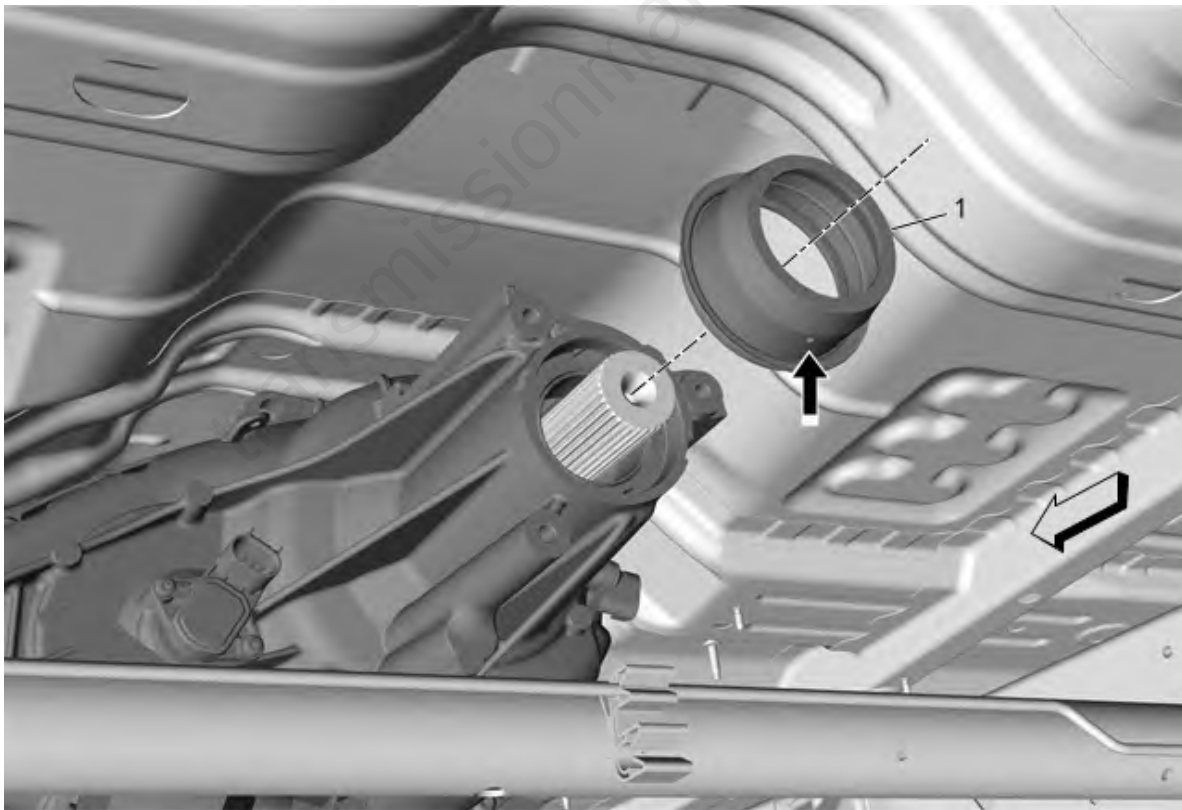


Fig. 20: Rear Output Shaft Seal

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 \(with N8D\)](#) .

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 .
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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](#) .

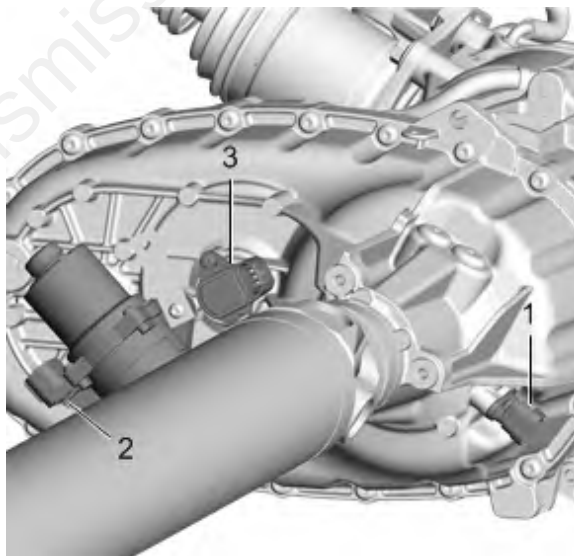


Fig. 21: Wiring Harness Electrical Connectors
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the wiring harness electrical connectors from the following:
 - Vehicle speed sensor (1)
 - Four wheel drive actuator (2)

vo/four wheel drive actuator position sensor (3)

4. Position the Transmission wiring harness aside.

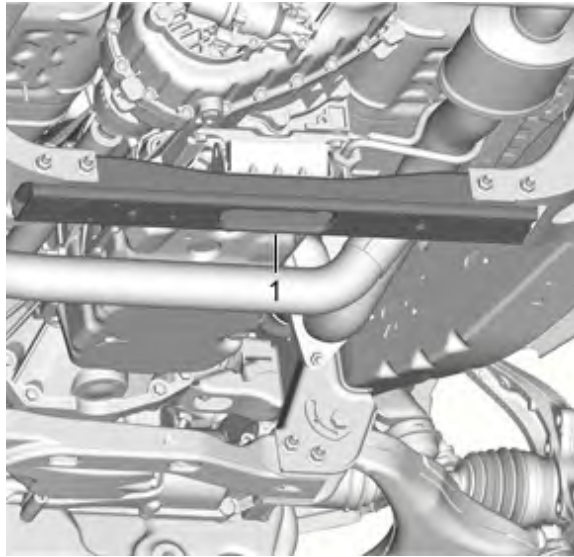


Fig. 22: Transmission Support Crossmember
Courtesy of GENERAL MOTORS COMPANY

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](#).

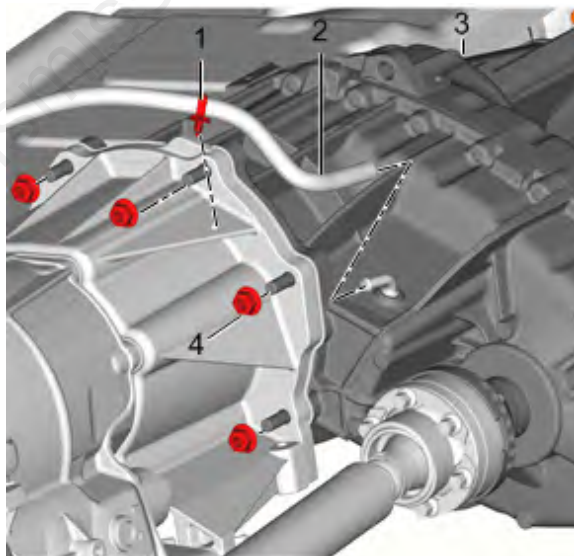


Fig. 23: Vent Hose Retainer And Vent Hose
Courtesy of GENERAL MOTORS COMPANY

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.

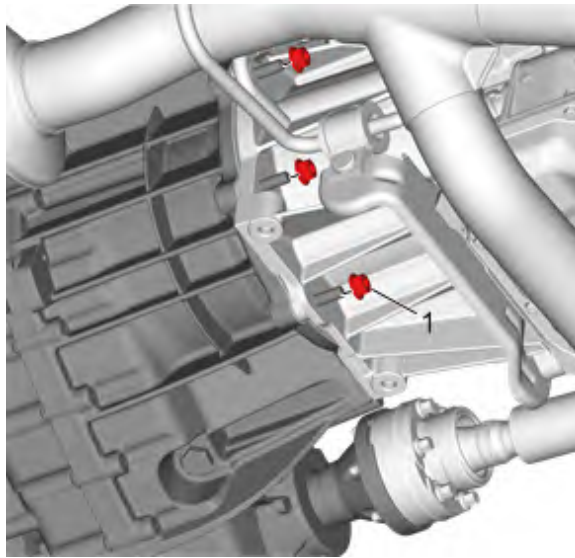


Fig. 24: Three Lower Right Side Fasteners

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

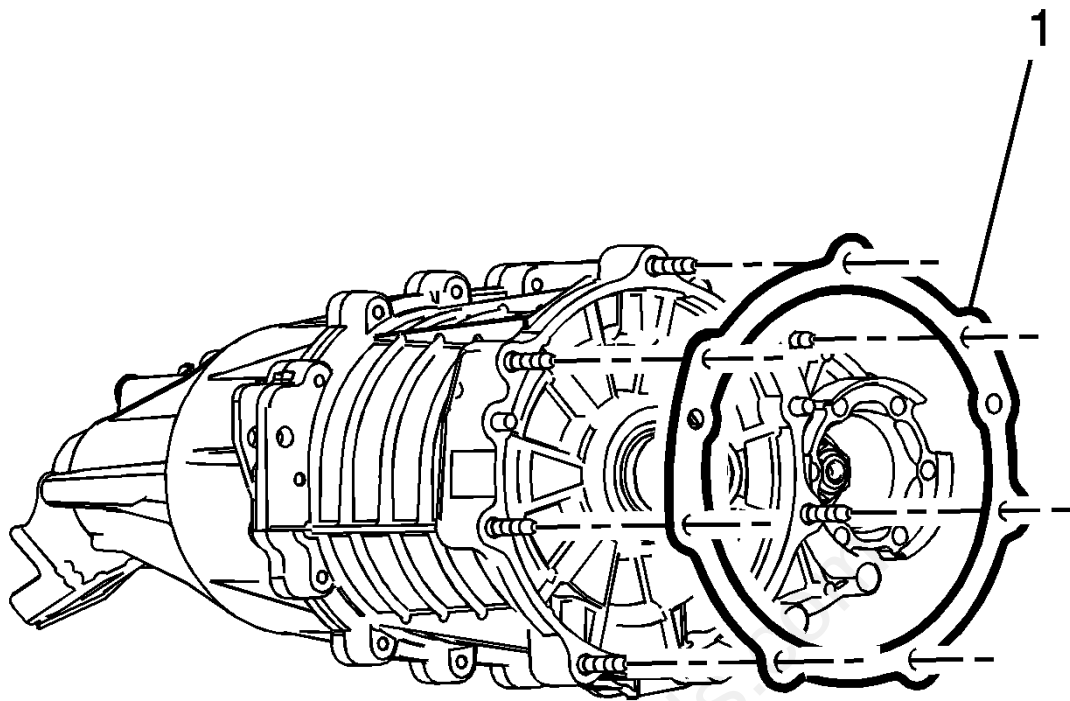


Fig. 25: New Transfer Case Extension Housing Gasket

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 \(2WD\)](#) .

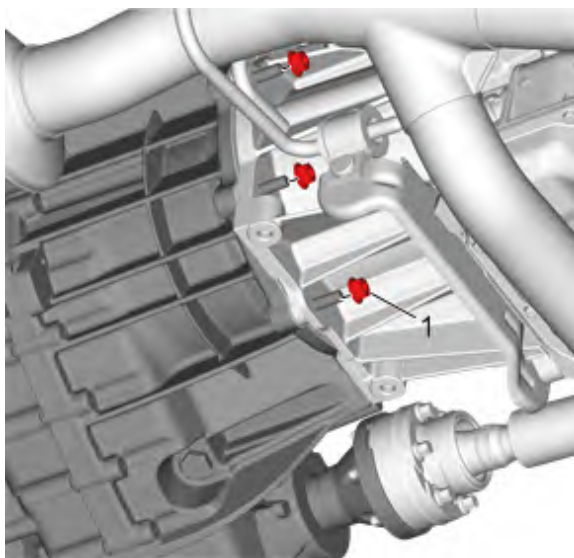


Fig. 26: Three Lower Right Side Fasteners

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).

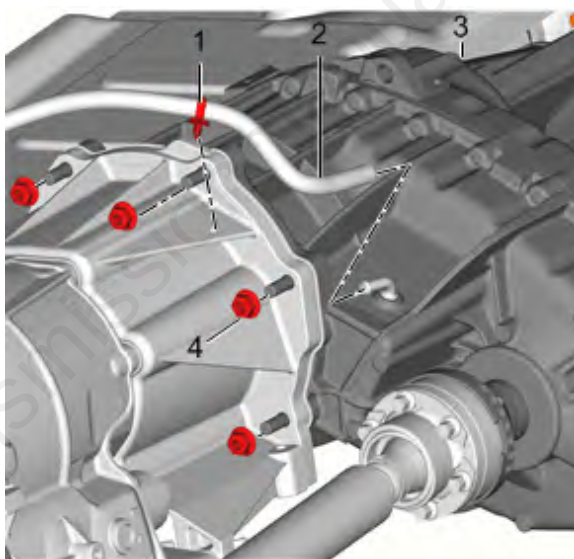


Fig. 27: Vent Hose Retainer And Vent Hose

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 \(2WD\)](#) .

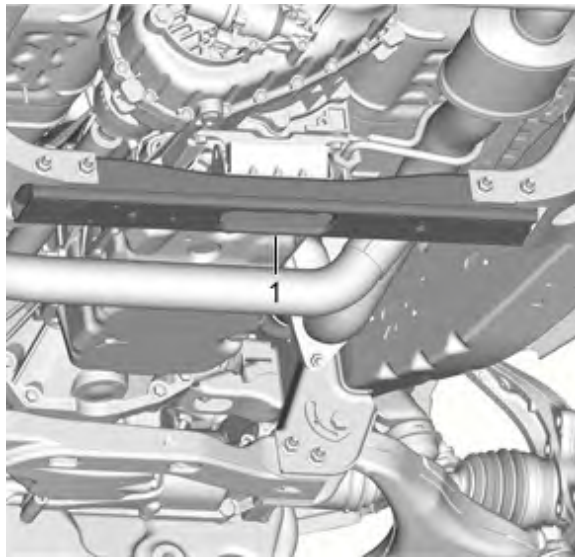


Fig. 28: Transmission Support Crossmember
 Courtesy of GENERAL MOTORS COMPANY

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.

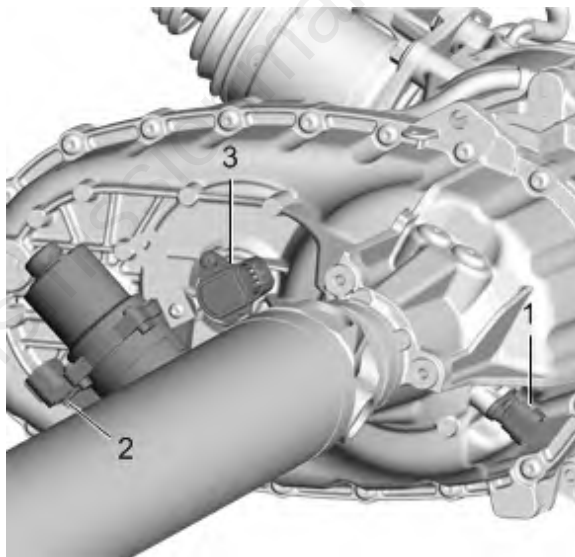


Fig. 29: Wiring Harness Electrical Connectors
 Courtesy of GENERAL MOTORS COMPANY

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)

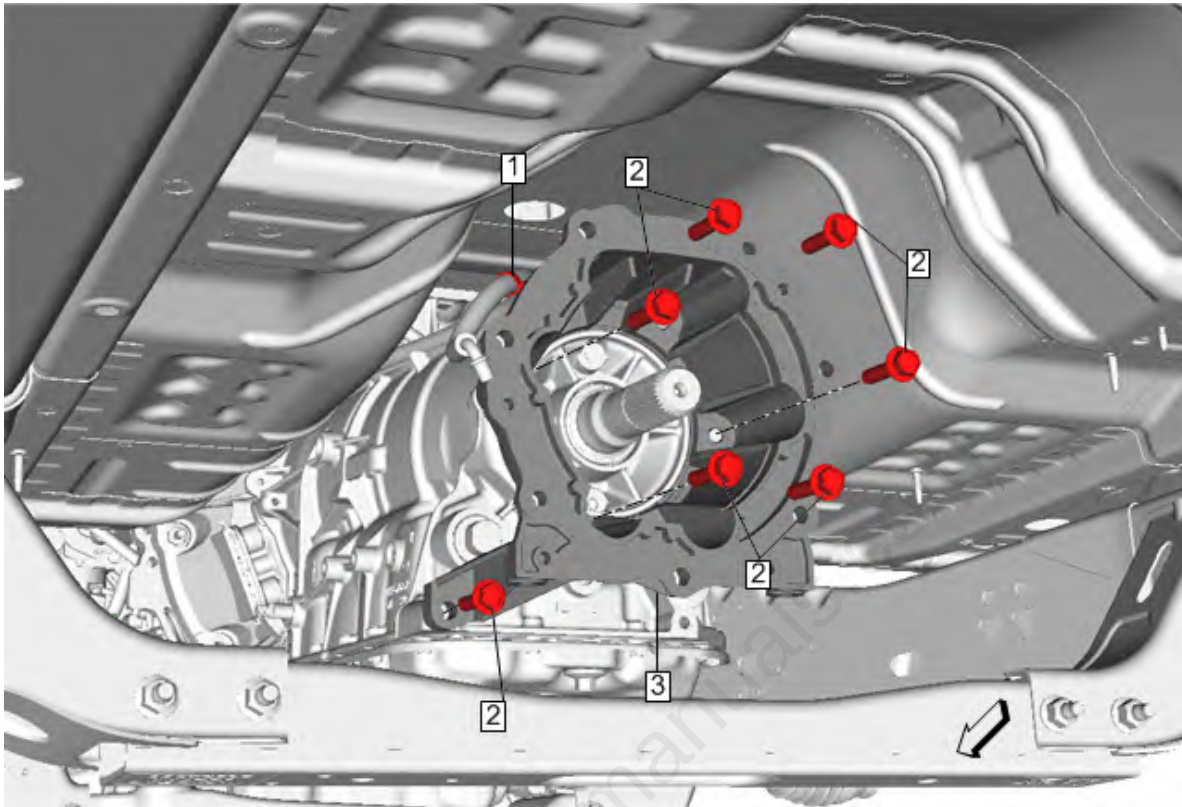


Fig. 30: Transfer Case Adapter

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)

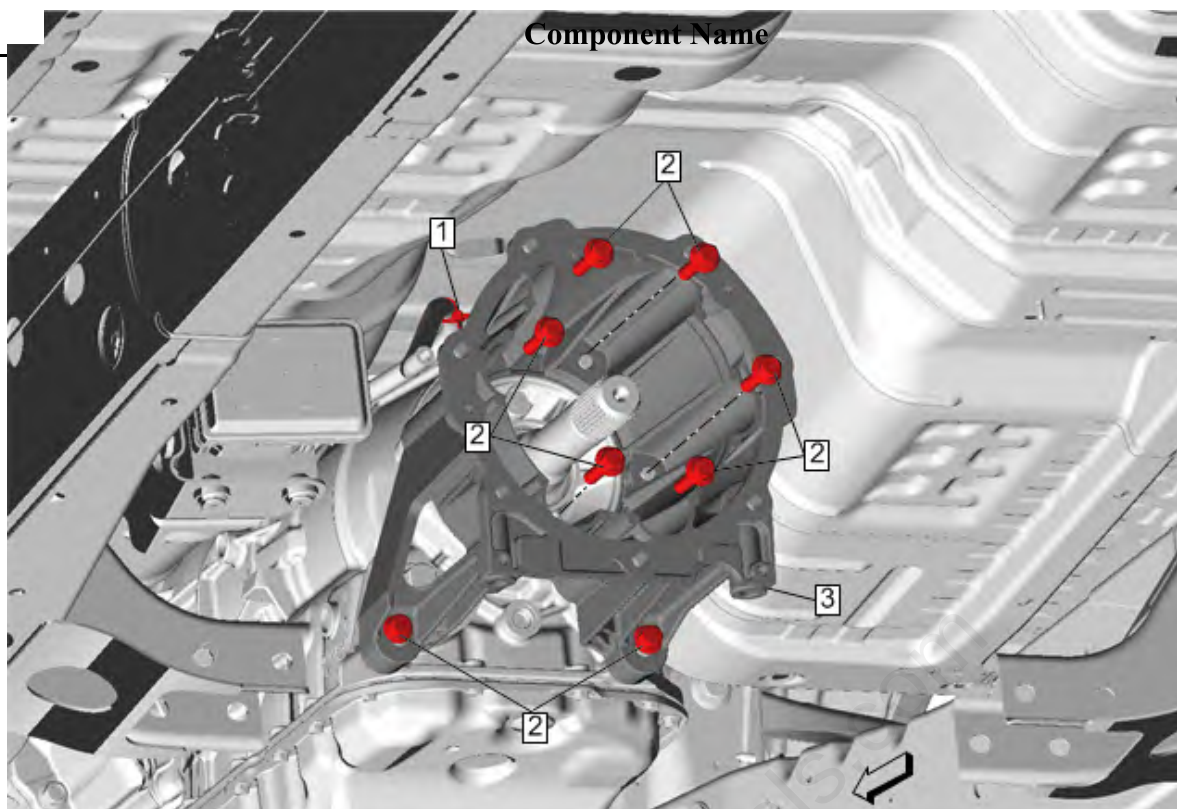


Fig. 31: Transfer Case Adapter (Equipped with LCV Engine)

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](#) .

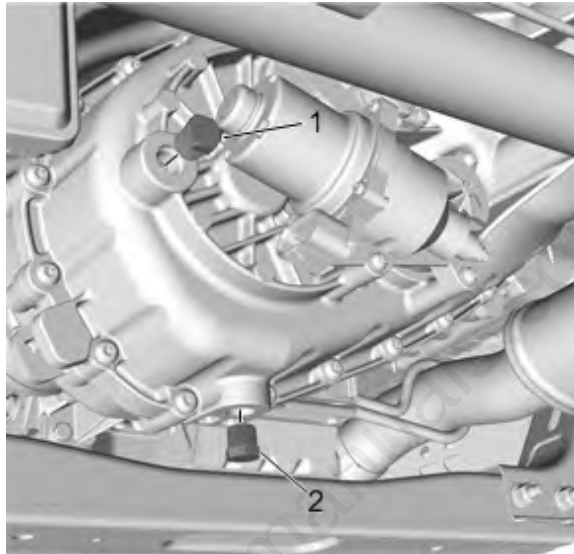


Fig. 32: Fill Plug And Transfer Case
Courtesy of GENERAL MOTORS COMPANY

2. Remove the fill plug (1) from the transfer case.

Installation Procedure

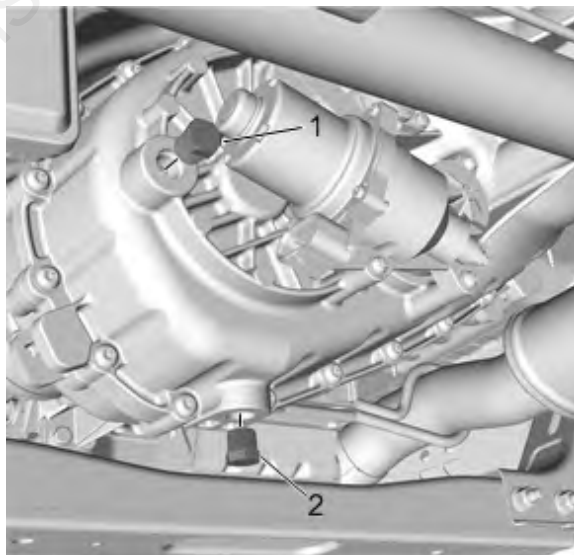


Fig. 33: Fill Plug And Transfer Case
Courtesy of GENERAL MOTORS COMPANY

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

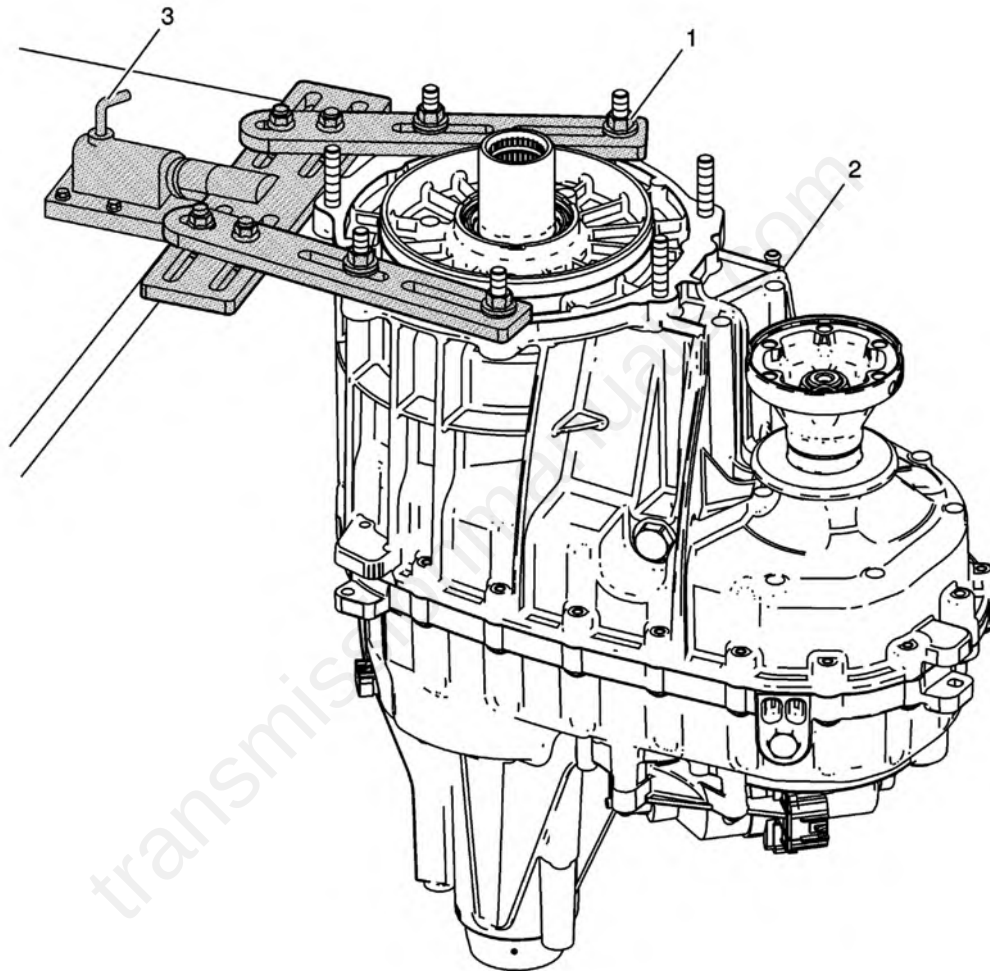


Fig. 34: Transfer Case Holding Fixture

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 1.5 mm threads. Special Tools DT-36842 Transaxle Holding Fixture For equivalent regional tools, 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, 4 Wheel Drive Actuator, 2/4 Wheel Drive Actuator Position Sensor, Shift Detent Plunger Plug, and Vehicle Speed Sensor Removal

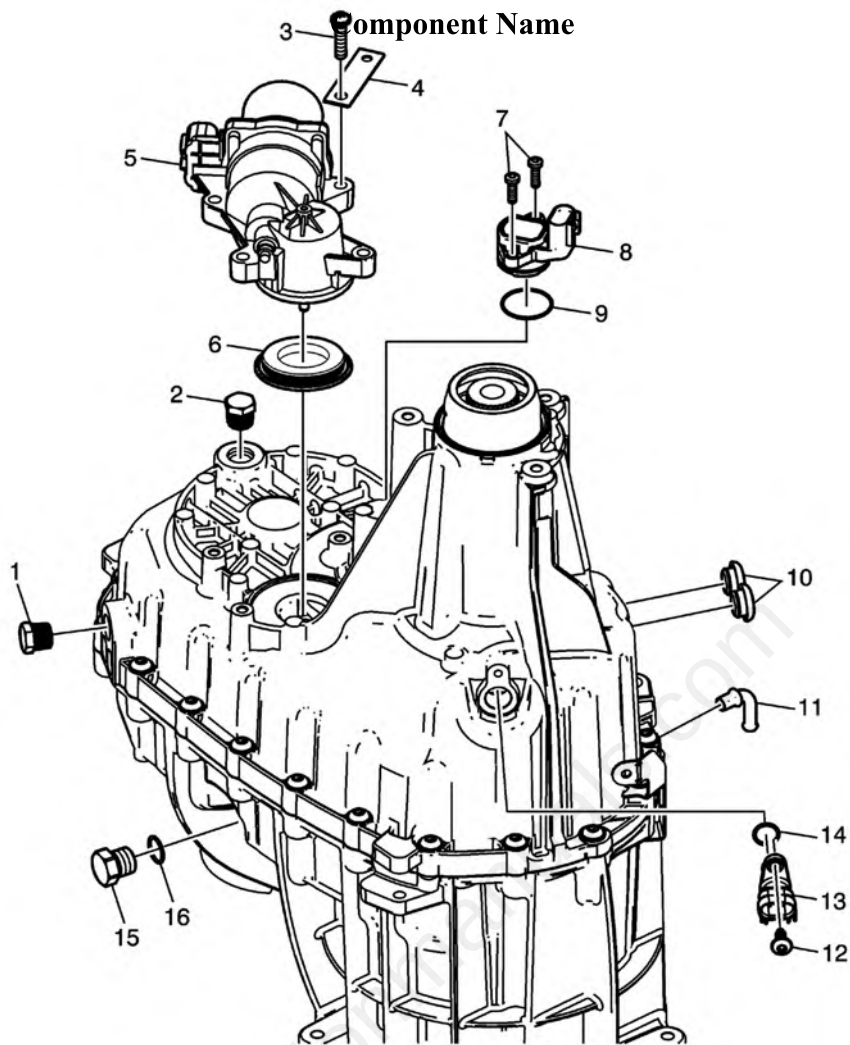


Fig. 35: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 4 Wheel Drive Actuator, 2/4 Wheel Drive Actuator Position Sensor, Shift Detent Plunger Plug, and Vehicle Speed Sensor Removal

Callout	Component Name
1	Transfer Case Oil Drain Plug
2	Transfer Case Oil Fill Plug
3	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty:3)
4	Transfer Case Actuator Harness Bracket
5	Transfer Case Four Wheel Drive Actuator
6	Transfer Case Two/Four Wheel Drive Actuator Seal
7	Transfer Case Two/Four Wheel Drive Actuator Position Sensor Bolt/Screw (Qty:2)
8	Transfer Case Two/Four Wheel Drive Actuator Position Sensor
9	Transfer Case Two/Four Wheel Drive Actuator Position Sensor Seal
10	Transfer Case Access Hole Plugs (Qty: 2)
11	Transfer Case Vent NOTE: Remove ONLY if the vent pipe is damaged.
12	Vehicle Speed Sensor Bolt

Component Name	
13	Vehicle Speed Sensor
14	Vehicle Speed Sensor O-ring Seal NOTE: Remove and replace only if damaged.
15	Shift Detent Plunger Plug
16	Shift Detent Plunger Plug Seal NOTE: Remove and replace only if damaged.

Transfer Case Rear Output Shaft Seal and Bushing Removal

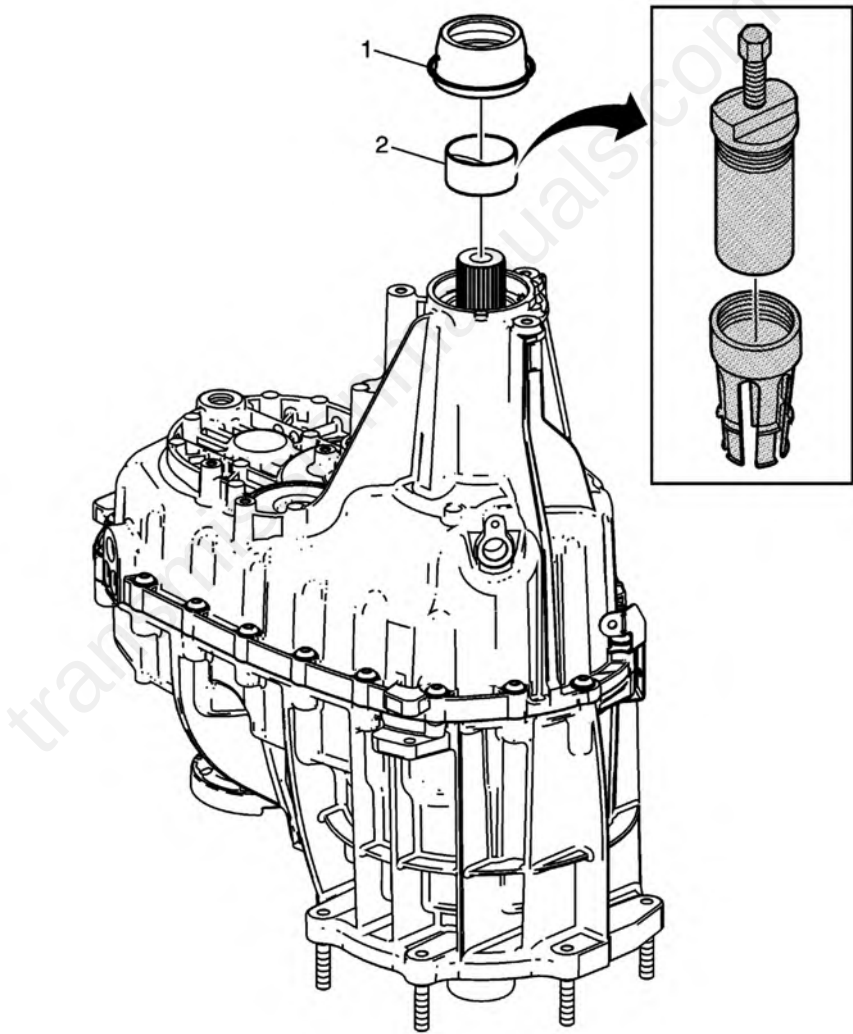


Fig. 36: Transfer Case Rear Output Shaft Seal and Bushing
 Courtesy of GENERAL MOTORS COMPANY

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 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 For equivalent regional tools, refer to Special Tools.

Transfer Case Rear Extension Removal

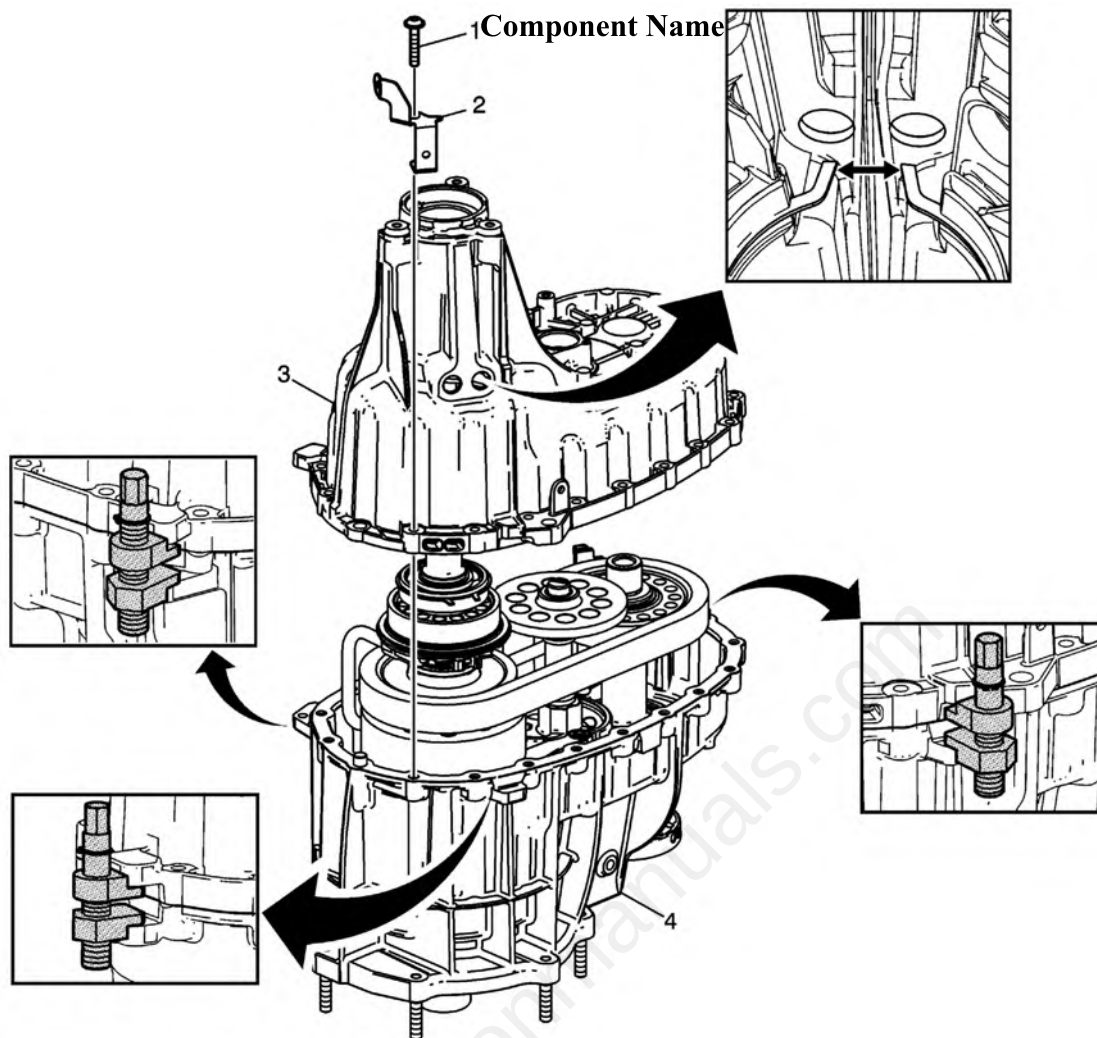


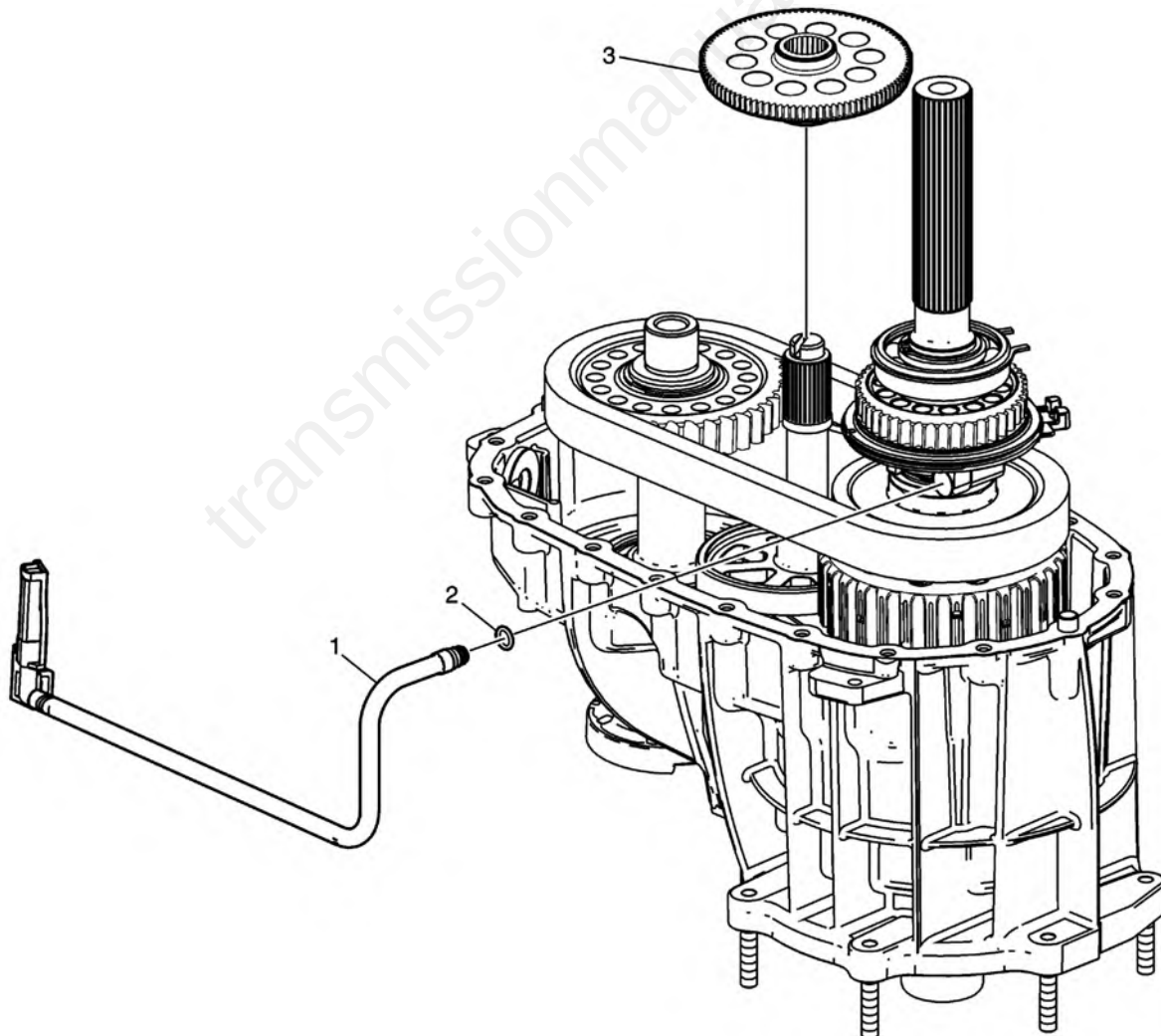
Fig. 37: Transfer Case Rear Extension
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Extension Removal

Callout	Component Name
1	Transfer Case Half Bolts/Screws (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 For equivalent regional tools, refer to Special Tools.
4	Transfer Case (Front Half)

Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear Removal



Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear Removal

Callout	Component Name
1	Transfer Case Oil Pump Suction Pipe
2	Transfer Case Oil Pump Suction Pipe Seal
3	Transfer Case Actuator Shaft Gear

Transfer Case Front Output Shaft Driven Sprocket, Clutch Assembly, Drive Chain, High/Low Shift Fork Assembly, High/Low Clutch and Chip Collector Magnet Removal

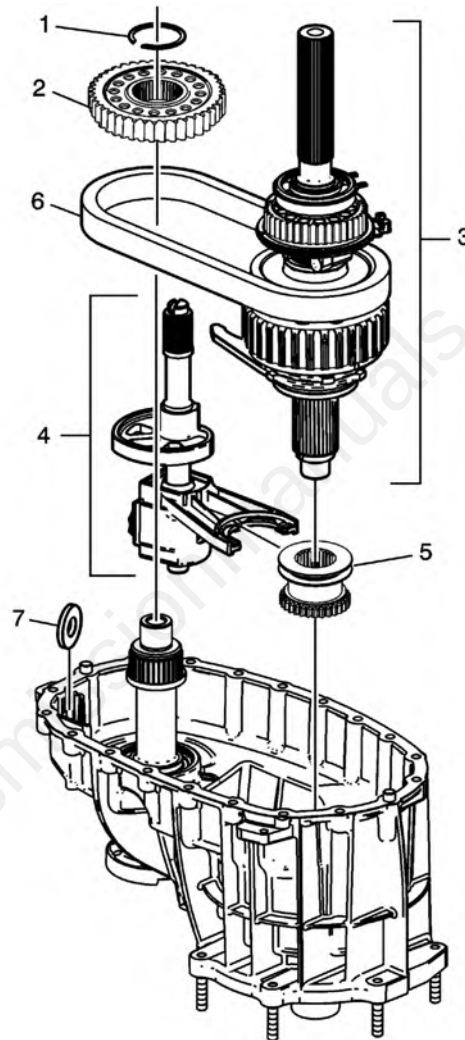


Fig. 39: Transfer Case

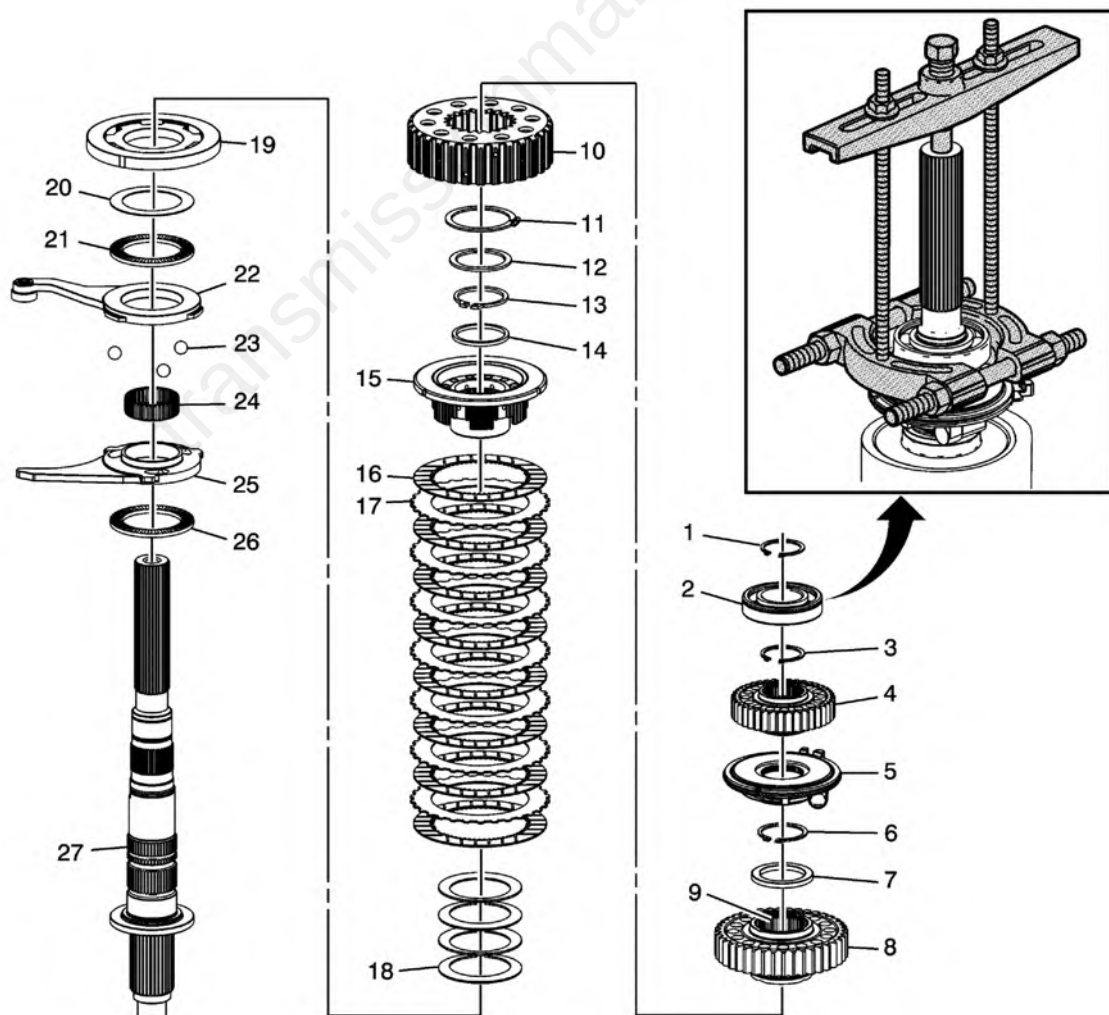
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft Driven Sprocket, Clutch Assembly, Drive Chain, High/Low Shift Fork Assembly, High/Low Clutch and Chip Collector Magnet 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 (6) from the driven gear (2).
3	Transfer Case Clutch 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 Front Output Shaft Drive Chain
7	Transfer Case Chip Collector Magnet

Transfer Case Clutch Assembly Disassemble



Transfer Case Clutch 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 For equivalent regional tools, refer to Special Tools .
3	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
4	Transfer Case Rear Output Shaft Speed Reluctor Wheel
5	Transfer Case Oil Pump Assembly
6	Transfer Case Front Output Shaft Drive Sprocket Retaining Ring
7	Transfer Case Front Output Shaft Drive Sprocket Spacer - Rear
8	Transfer Case Front Output Shaft Drive Sprocket
9	Transfer Case Front Output Shaft Drive Sprocket Bearing Assembly (Qty: 2) NOTE: Only remove the bearings if faulty. Refer to: Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection
10	Transfer Case Four Wheel Drive Clutch Housing
11	Transfer Case Four Wheel Drive Clutch Housing Retaining Ring
12	Transfer Case Front Output Shaft Drive Sprocket Spacer - Front
13	Transfer Case Two/Four Wheel Drive Clutch Retaining Ring
14	Transfer Case Four Wheel Drive Clutch Shim
15	Transfer Case Four Wheel Drive Clutch Hub
16	Transfer Case Four Wheel Drive Clutch Pressure - Friction - Plate (Qty: 8)
17	Transfer Case Four Wheel Drive Clutch Pressure - Steel - Plate (Qty: 7)
18	Transfer Case Four Wheel Drive Clutch Pressure Plate Spring (Qty: 4)
19	Transfer Case Four Wheel Drive Clutch Pressure - Apply - Plate
20	Transfer Case Control Actuator Lever Washer
21	Transfer Case Scissor Mechanism Thrust Bearing
22	Transfer Case Scissor Mechanism Lever
23	Transfer Case Scissor Mechanism Lever Ball (Qty: 3)
24	Transfer Case Scissor Lever Bearing Assembly
25	Transfer Case Scissor Lever

Component Name	
26	Transfer Case Scissor Mechanism Lever Thrust Bearing
27	Transfer Case Rear Output Shaft

Transfer Case Input Shaft Oil Seal Removal

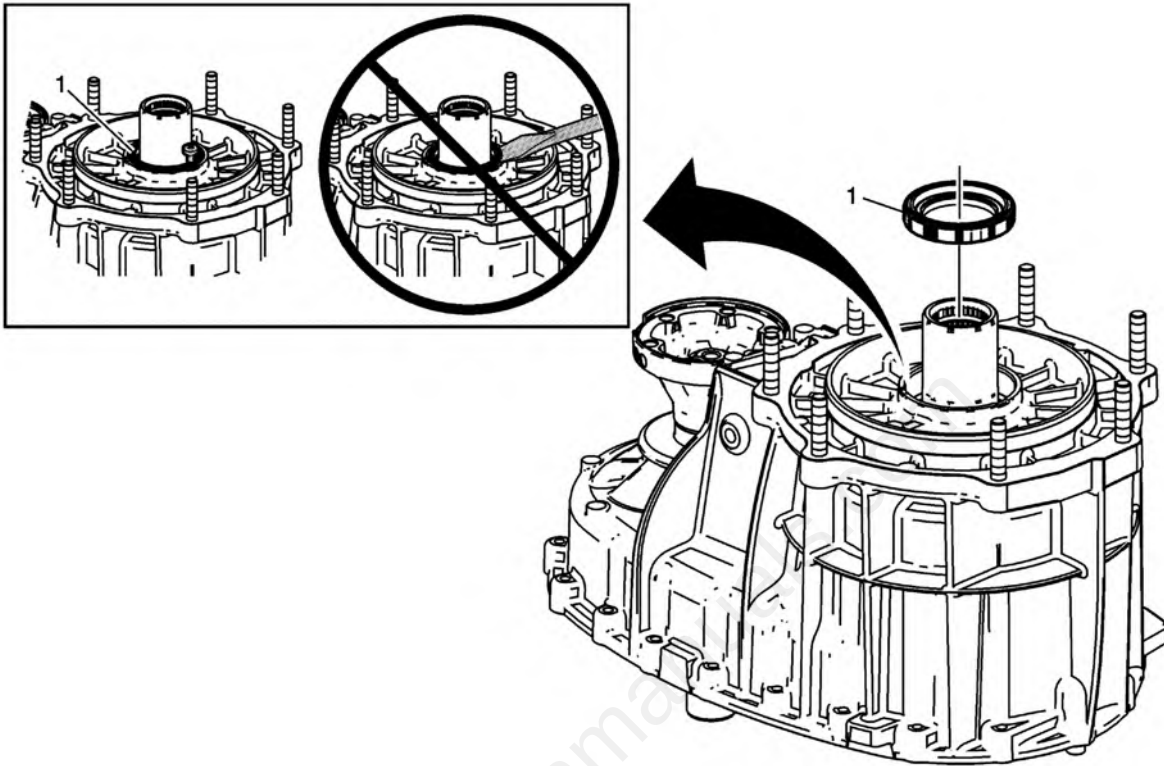


Fig. 41: Transfer Case Input Shaft Seal
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft Oil Seal Removal

Callout	Component Name
1	Transfer Case Input Shaft Oil 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 High/Low Planetary Assembly Removal

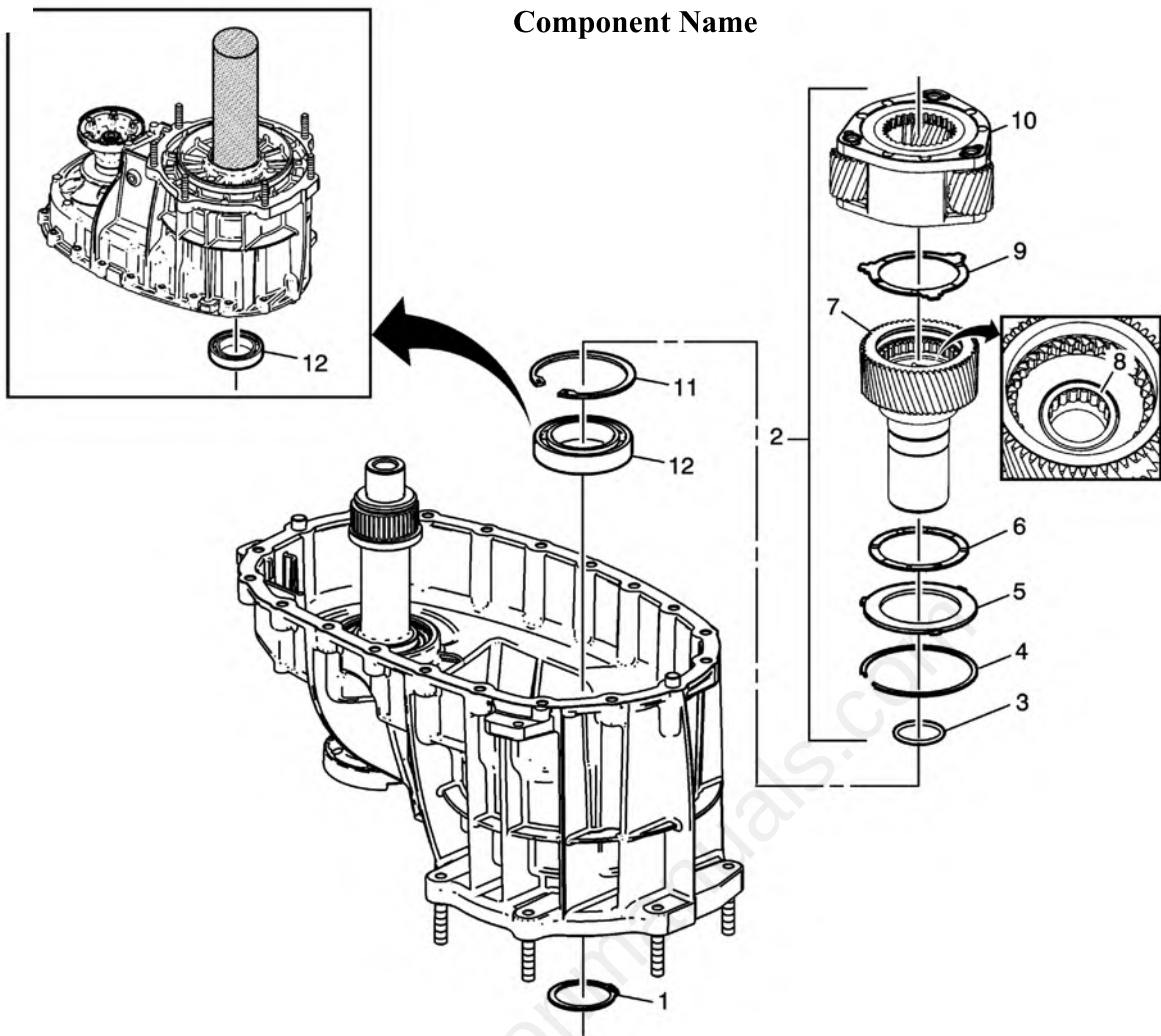


Fig. 42: Transfer Case Input Shaft and Planetary Assembly
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft and High/Low Planetary Assembly Removal

Callout	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 High/Low Planetary Assembly
3	Transfer Case Input Shaft Retaining Ring
4	Transfer Case High/Low Locking Plate
5	Transfer Case Input Shaft Washer
6	Transfer Case Input Shaft Seal
7	Transfer Case Input Shaft

Component Name	
8	Transfer Case Input Shaft Pilot Bearing NOTE: Only remove the bearing if faulty. Refer to: Front Output Shaft and Input Shaft Cleaning and Inspection
9	Transfer Case Planetary Carrier Sun Gear Thrust Washer
10	Transfer Case High/Low Planetary Carrier
11	Transfer Case Input Shaft Bearing Retaining Ring
12	Transfer Case Input Shaft Bearing Special Tools J-41736 Press Tube For equivalent regional tools, refer to Special Tools .

Transfer Case Front Output Shaft and Flange Removal

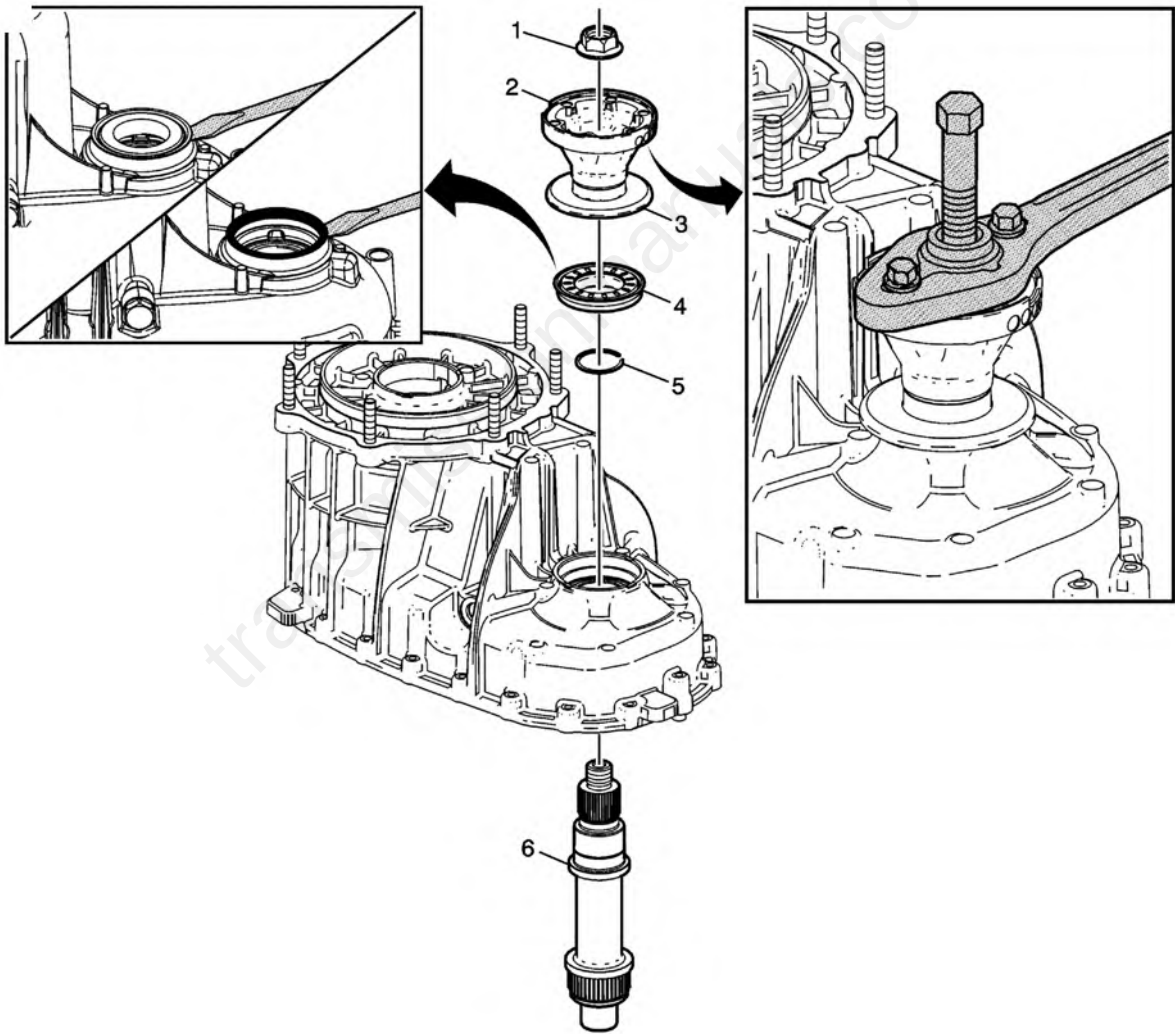


Fig. 43: Transfer Case Front Output Shaft and Flange
Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft and Flange Removal

Callout	Component Name
---------	----------------

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.
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

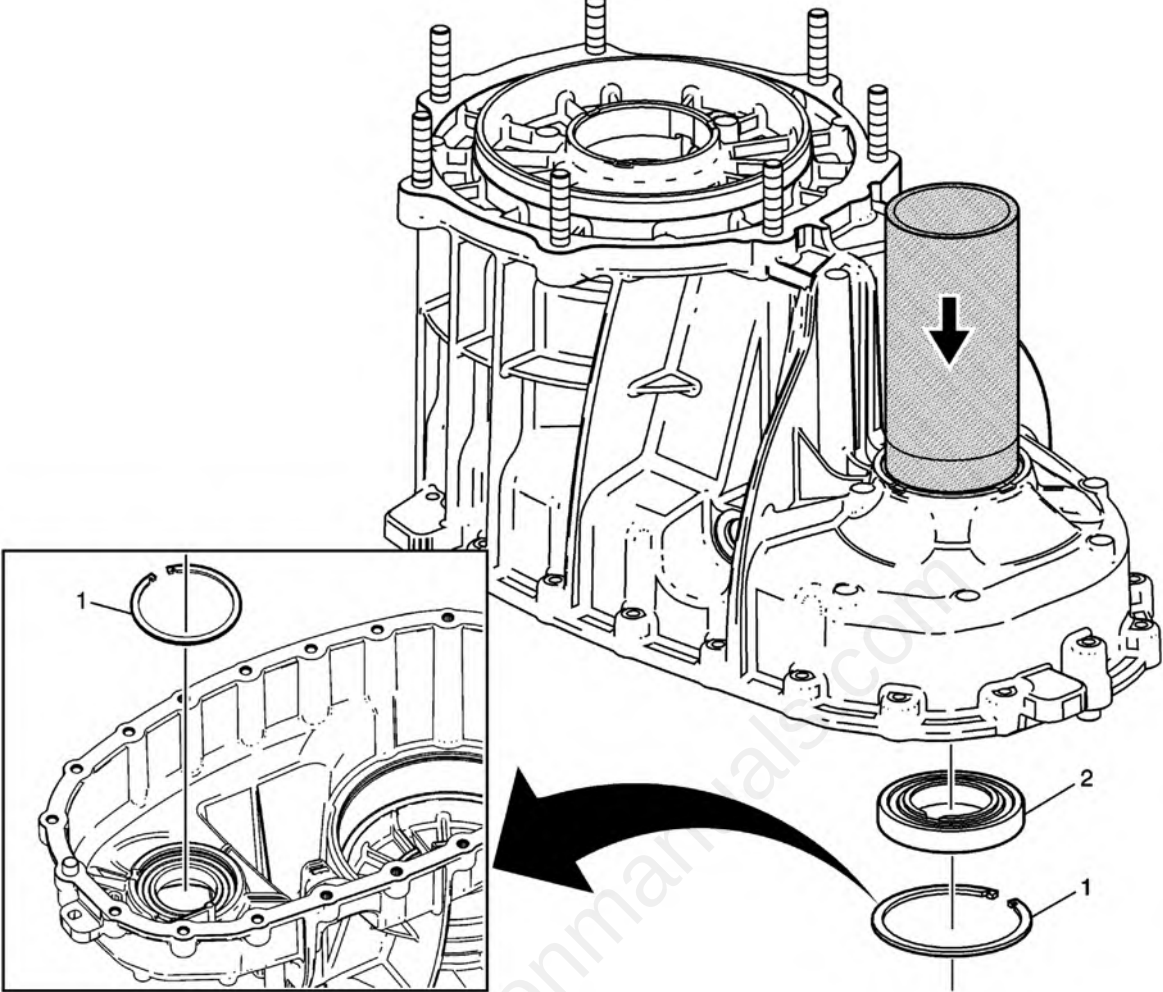


Fig. 44: Transfer Case Front Output Shaft Front Bearing
Courtesy of GENERAL MOTORS COMPANY

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 Rear Bearing Removal

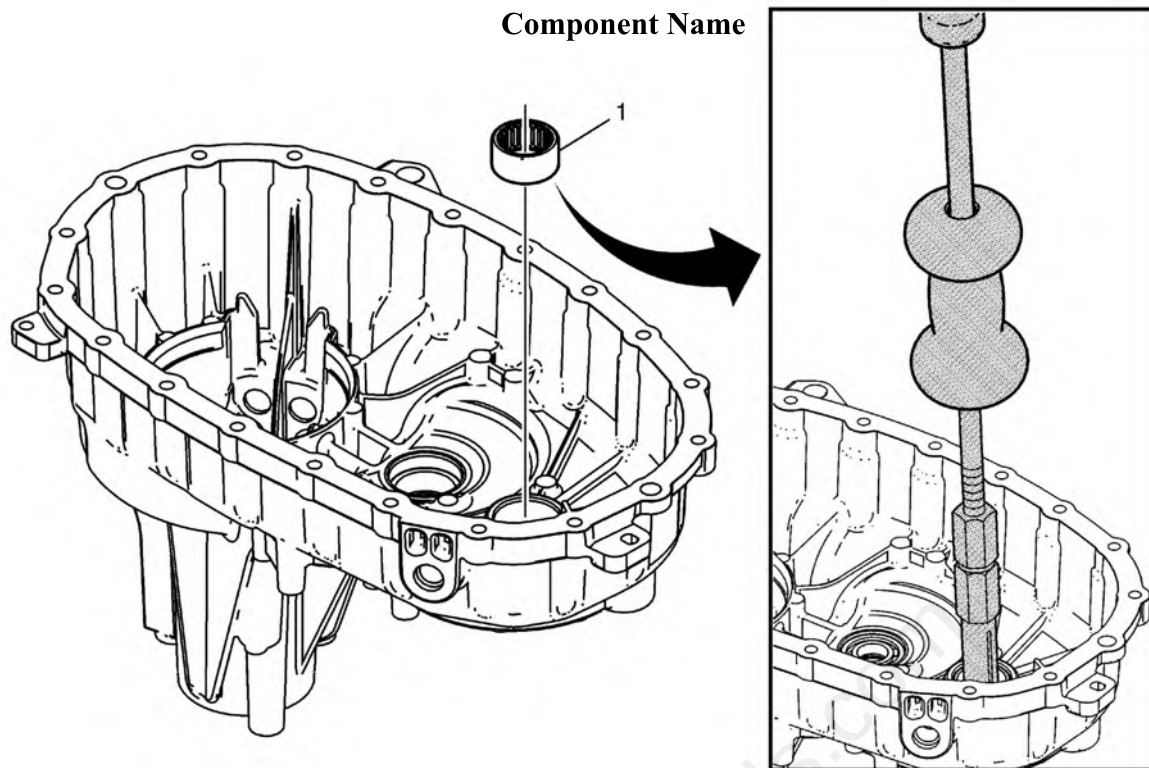


Fig. 45: Transfer Case Front Output Shaft Rear Bearing
 Courtesy of GENERAL MOTORS COMPANY

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

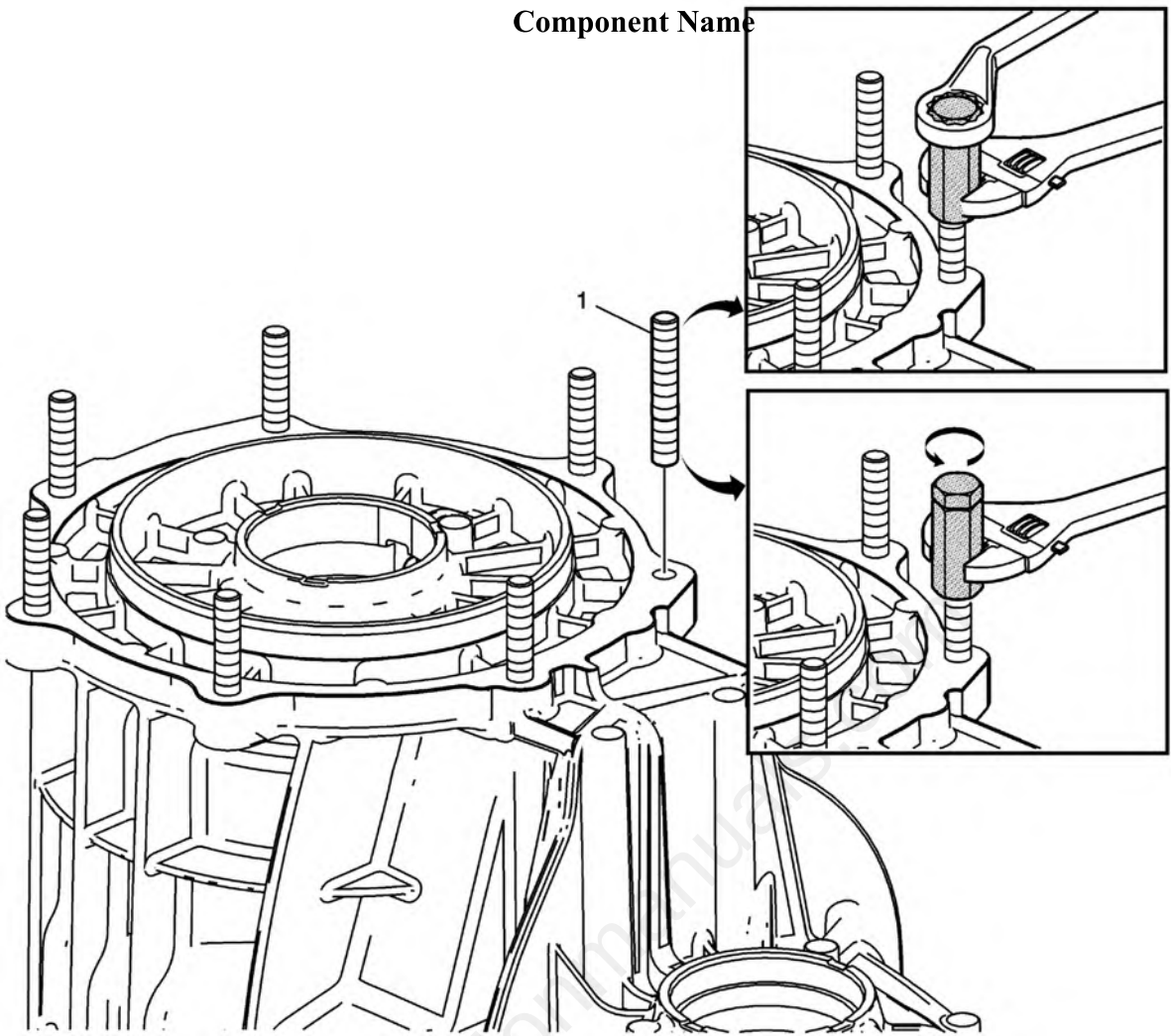


Fig. 46: Transfer Case Stud
Courtesy of GENERAL MOTORS COMPANY

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

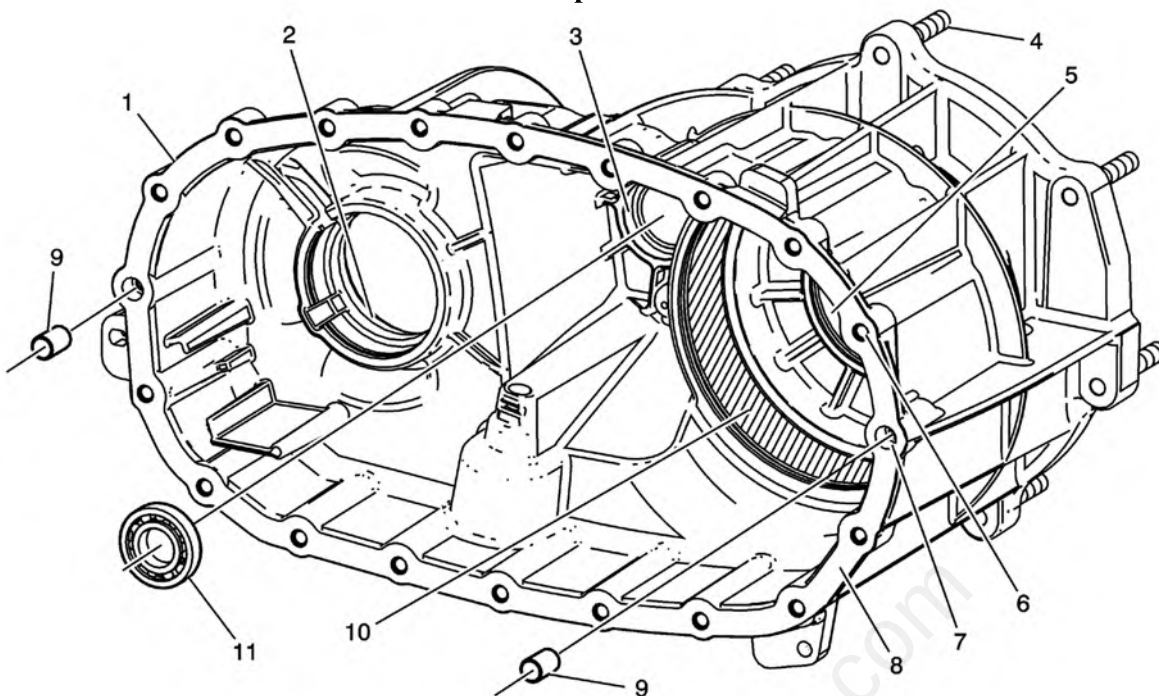


Fig. 47: Transfer Case Front Half

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

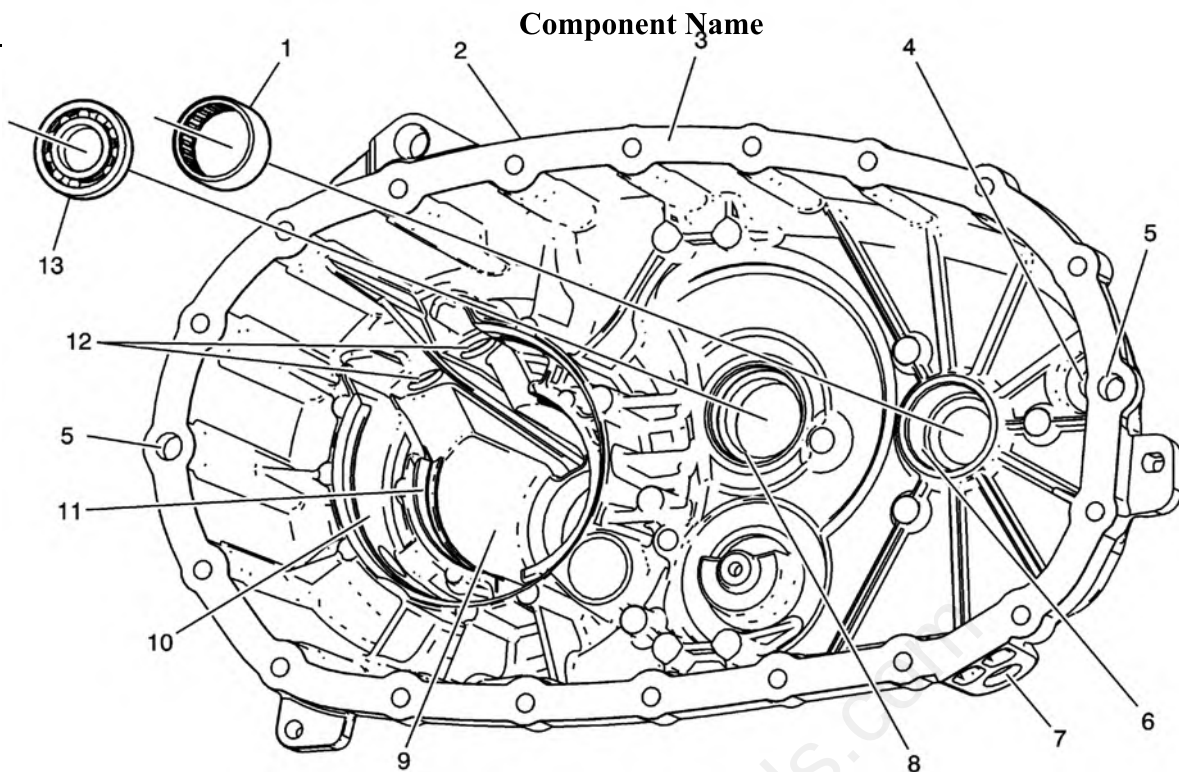


Fig. 48: Transfer Case Rear Half

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

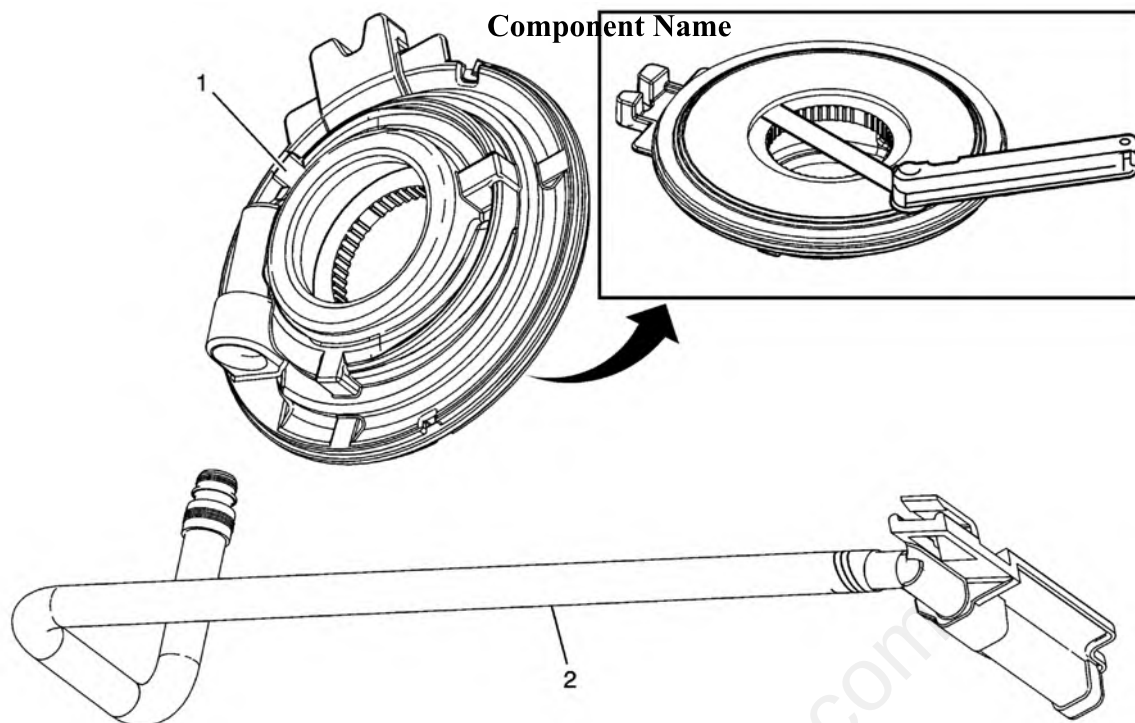


Fig. 49: View Of Transfer Case Oil Pump Assembly & Suction Pipe

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

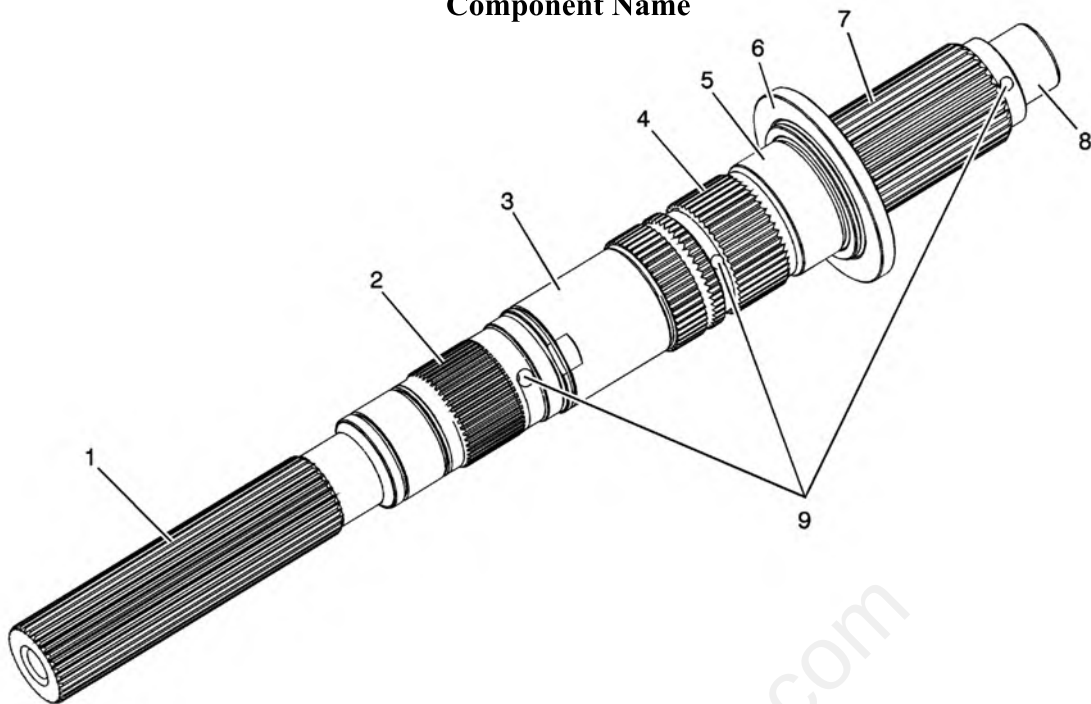


Fig. 50: View Of Rear Output Shaft Inspection Points

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

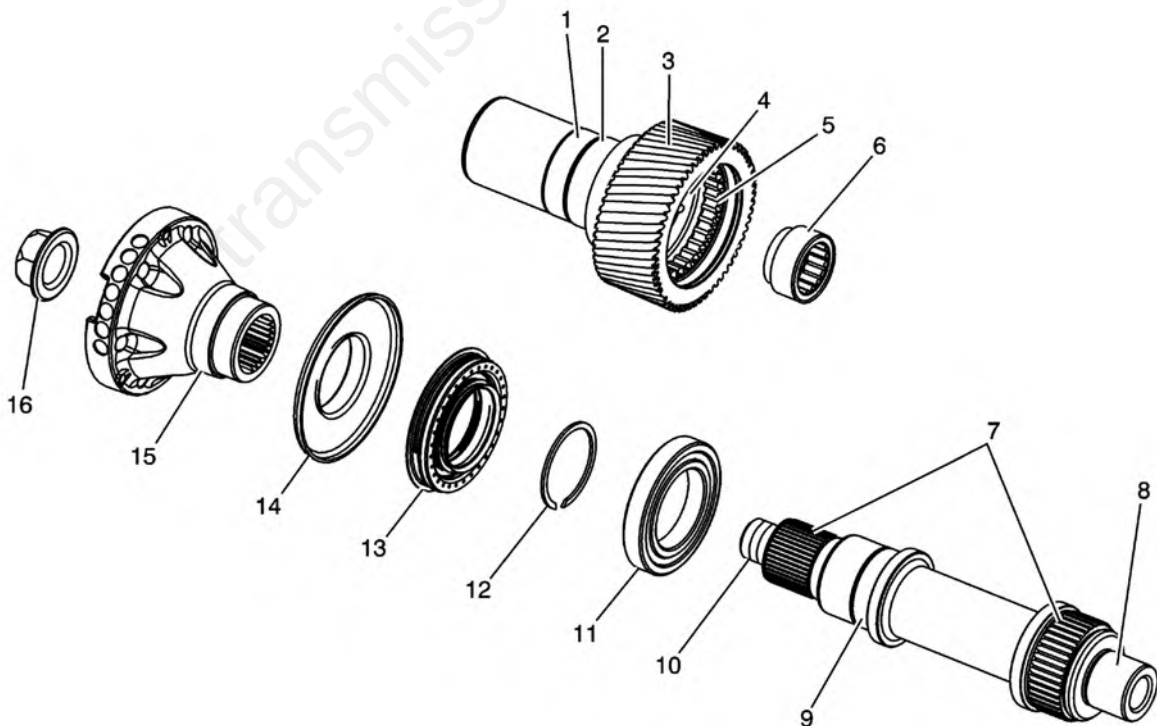


Fig. 51: Front Output Shaft and Input Shaft
Courtesy of GENERAL MOTORS COMPANY

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

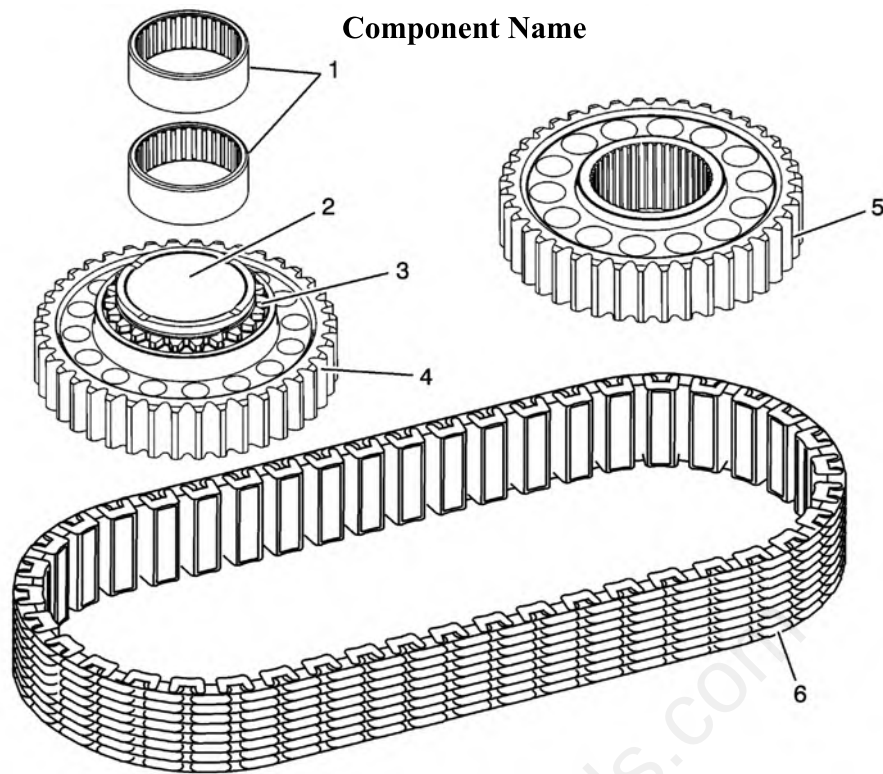


Fig. 52: Drive Chain, Drive Sprocket, and Driven Sprocket Cleaning and Inspection
 Courtesy of GENERAL MOTORS COMPANY

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

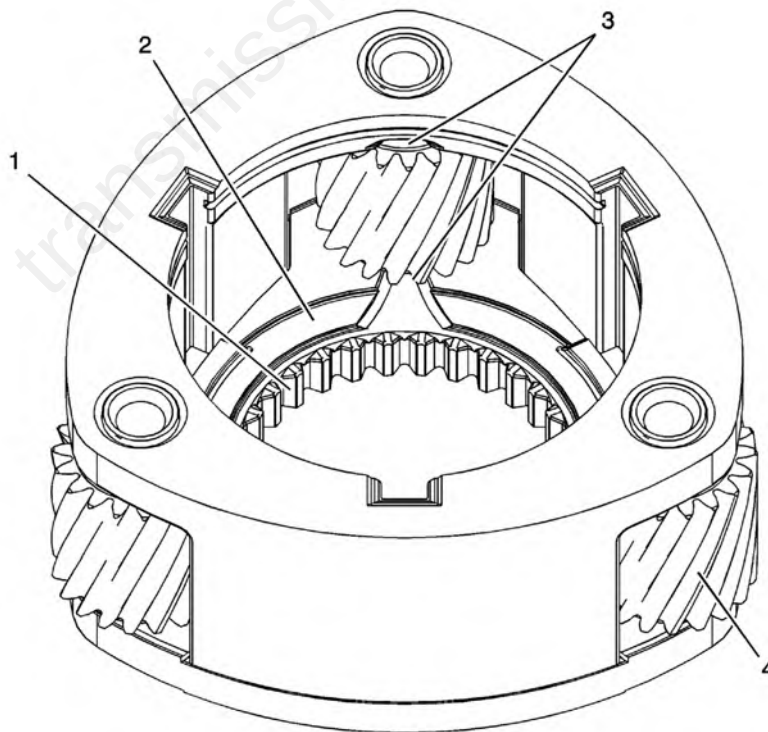


Fig. 53: View Of High/Low Planetary Carrier Inspection Points

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

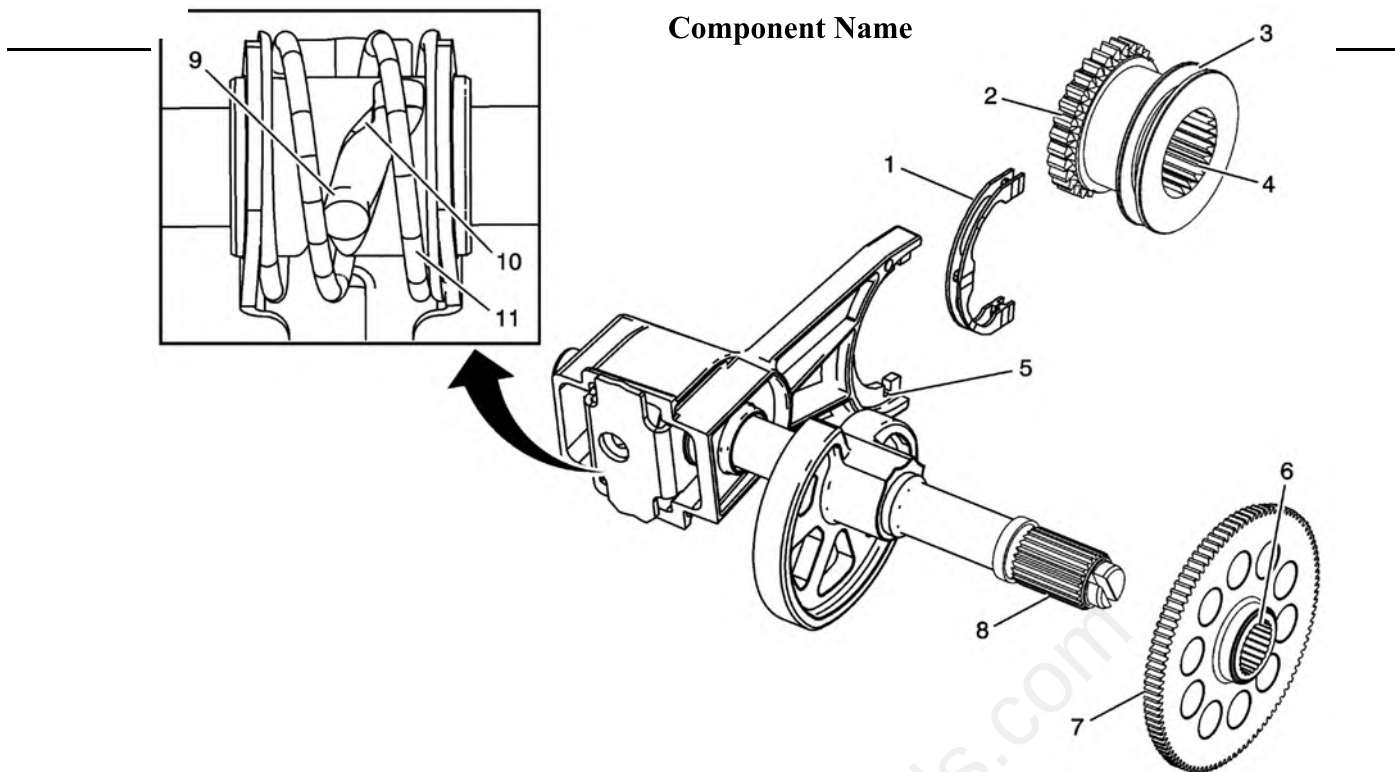


Fig. 54: High/Low Shift Components
 Courtesy of GENERAL MOTORS COMPANY

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 Shift Fork Inserts (Qty: 2) NOTE: Inspect the inserts for wear.
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 Clutch Inner Splines NOTE: Inspect the inner splines for excessive looseness on the rear output shaft.

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	Transfer Case Actuator Shaft Gear Splines NOTE: Witness marks at the location of the splines is normal.
7	Transfer Case Actuator Shaft Gear Teeth NOTE: Inspect for chipped teeth, excessively worn gear surfaces, and debris embedded in the root of the teeth.
8	Transfer Case Control Actuator Shaft Procedure Inspect the shaft splines for excessive wear. The component must be replaced if damage is found. Refer to High/Low Shift Fork Replacement .
9	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 .
10	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 .
11	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

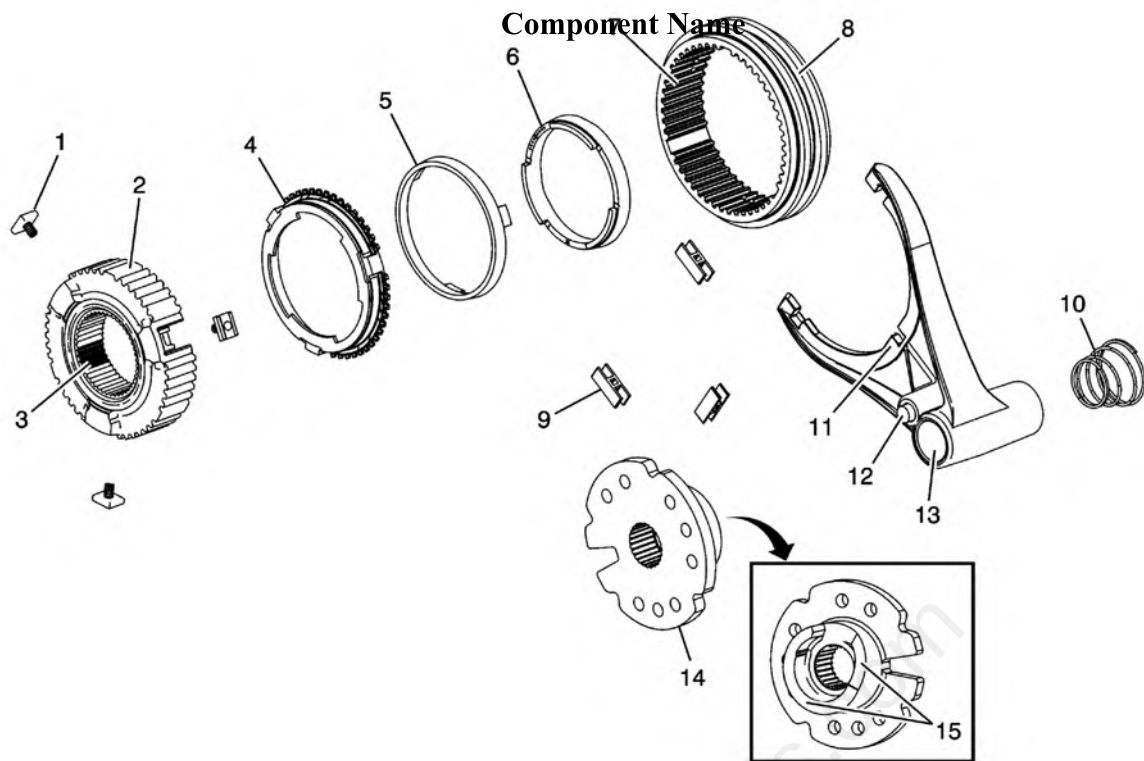


Fig. 55: Two/Four Wheel Drive Shift Components

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, 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	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.
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

Component Name	
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

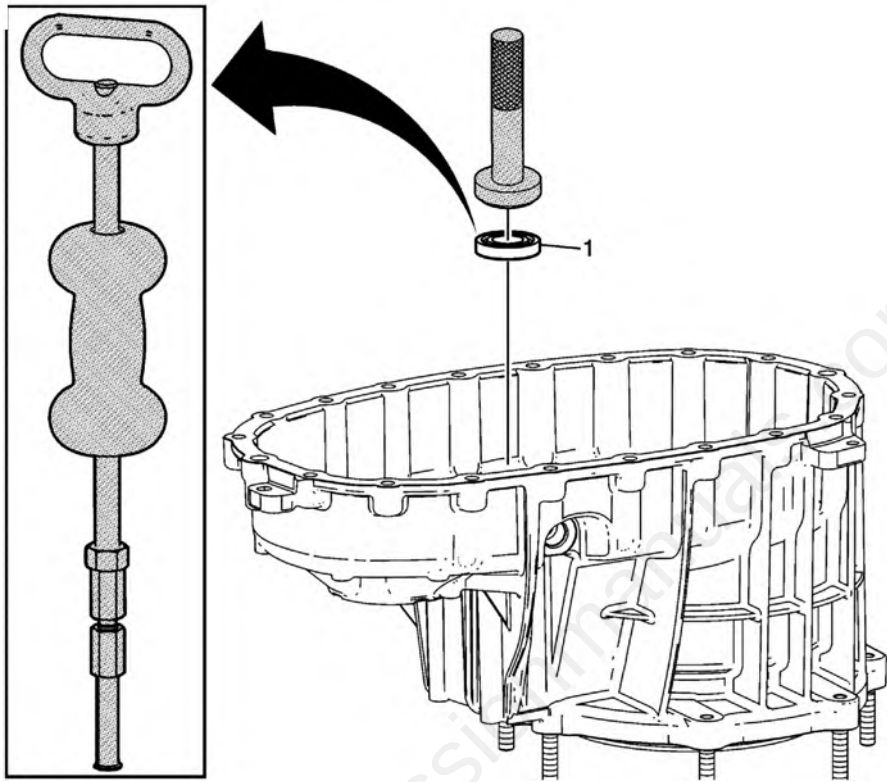


Fig. 56: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing -- Front
 Courtesy of GENERAL MOTORS COMPANY

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 .

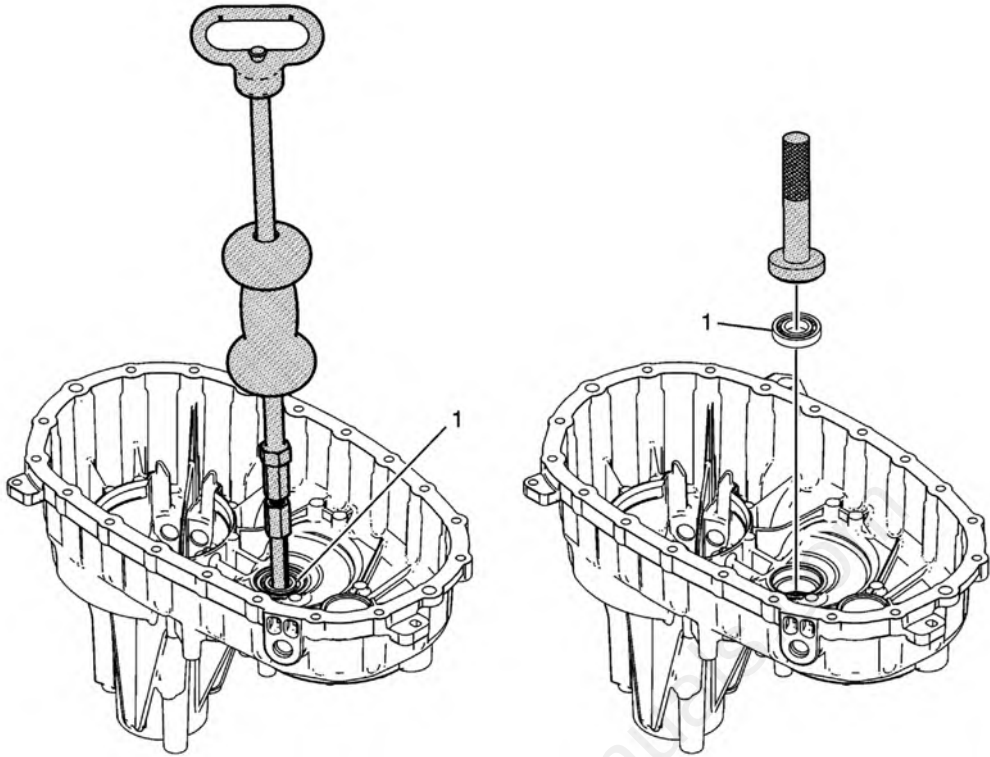


Fig. 57: Transfer Case Four Wheel Drive Actuator Lever Shaft Bearing - Rear
 Courtesy of GENERAL MOTORS COMPANY

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

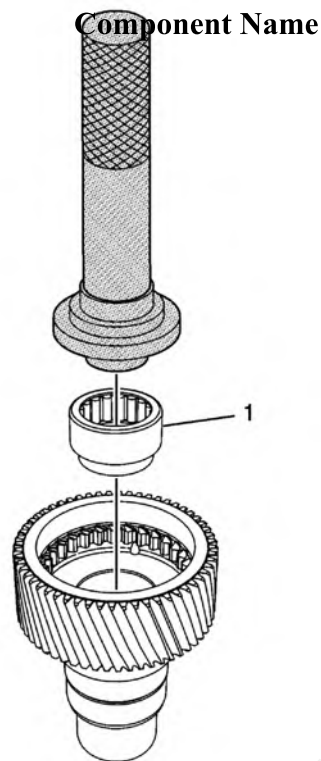


Fig. 58: Input Shaft Pilot Bearing
 Courtesy of GENERAL MOTORS COMPANY

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

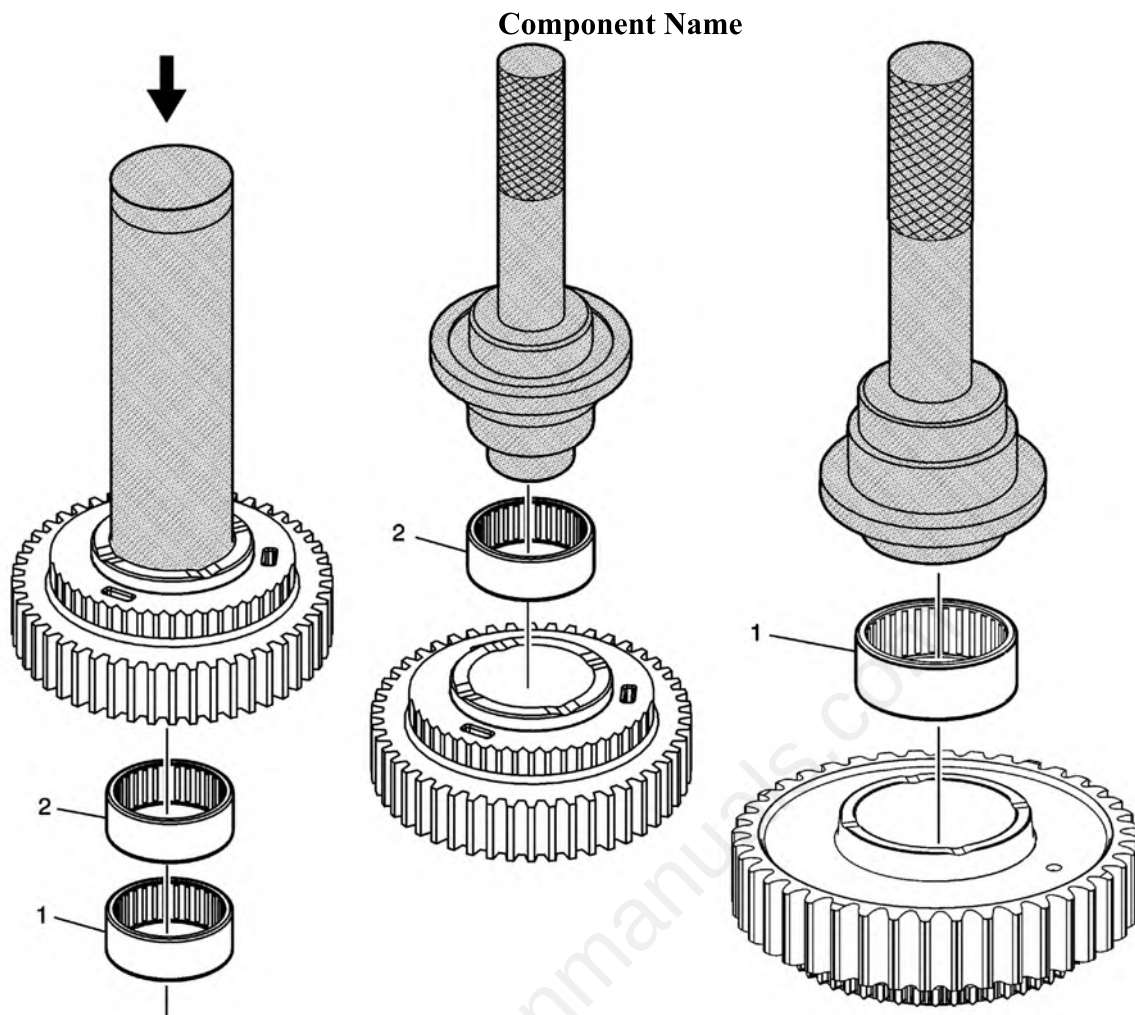


Fig. 59: Front Output Shaft Drive Sprocket Bearing
 Courtesy of GENERAL MOTORS COMPANY

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

Component Name

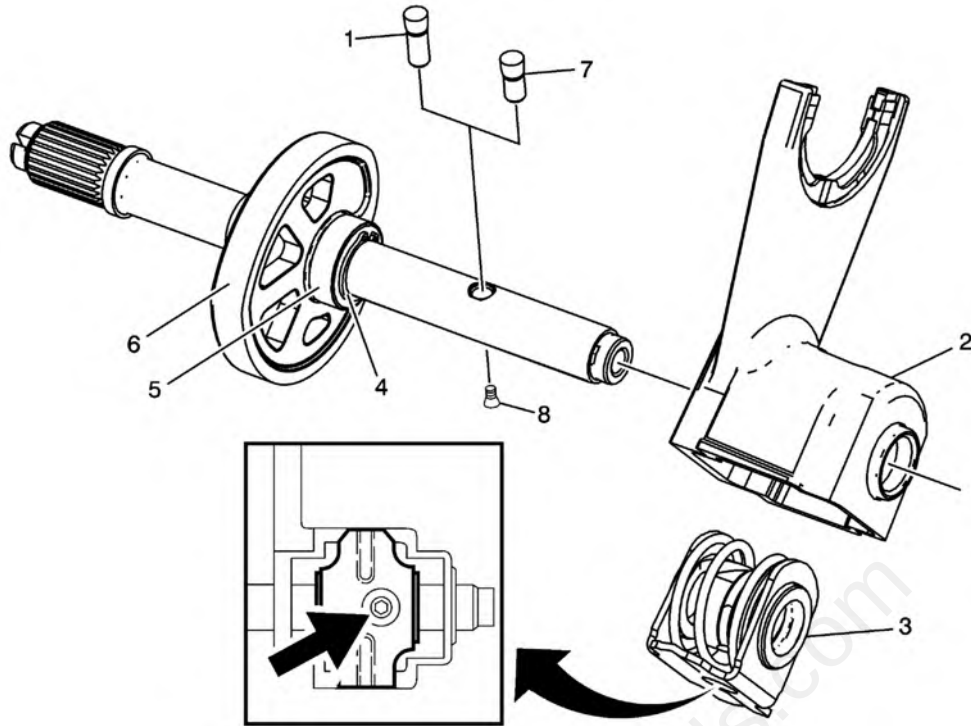


Fig. 60: High/Low Shift Fork

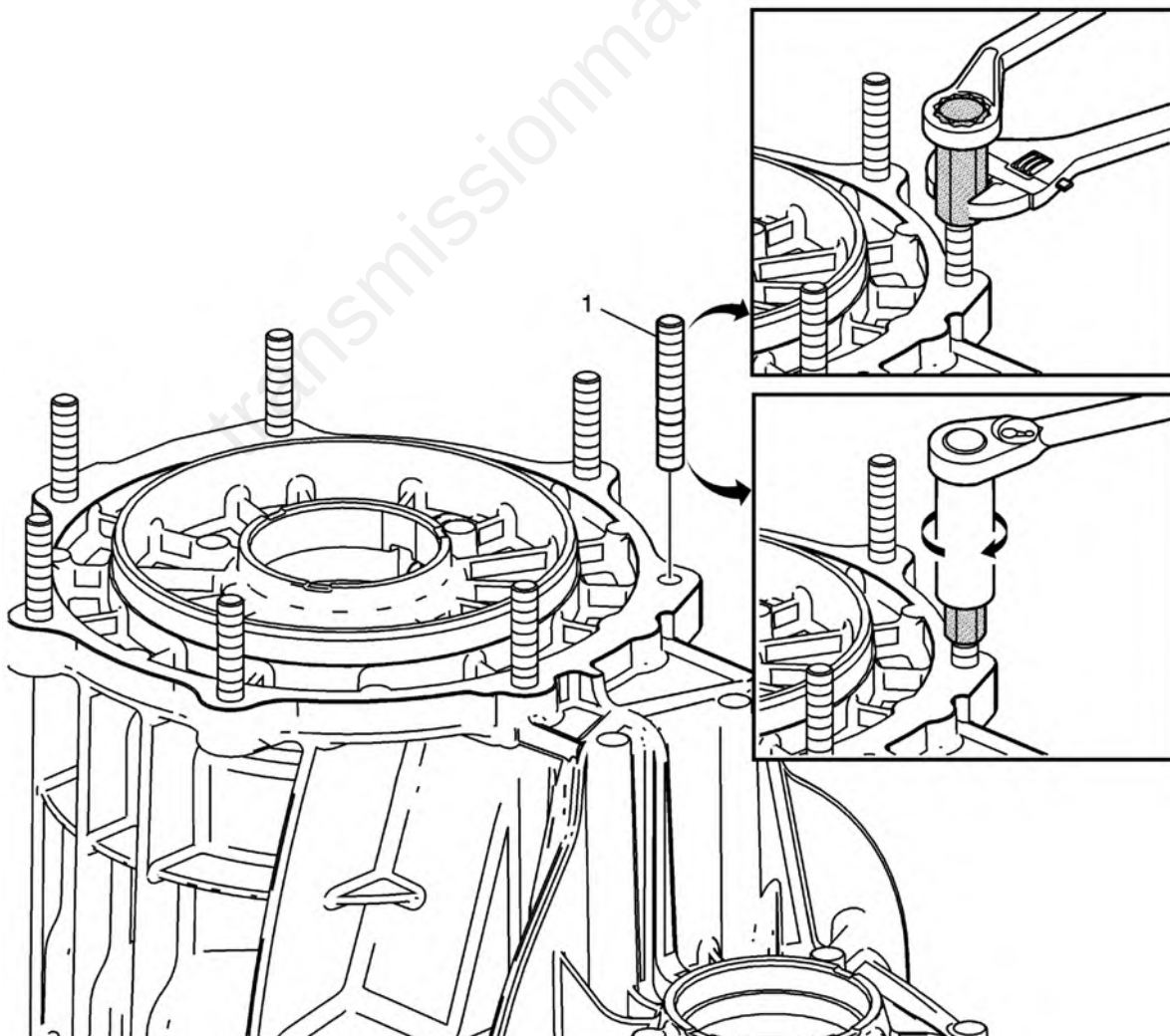
Courtesy of GENERAL MOTORS COMPANY

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 Procedure 1. 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). NOTE: 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

Component Name	
5	Transfer Case Two/Four Wheel Drive Actuator Cam Spacer
6	Transfer Case Two/Four Wheel Drive Actuator Cam
7	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.
8	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

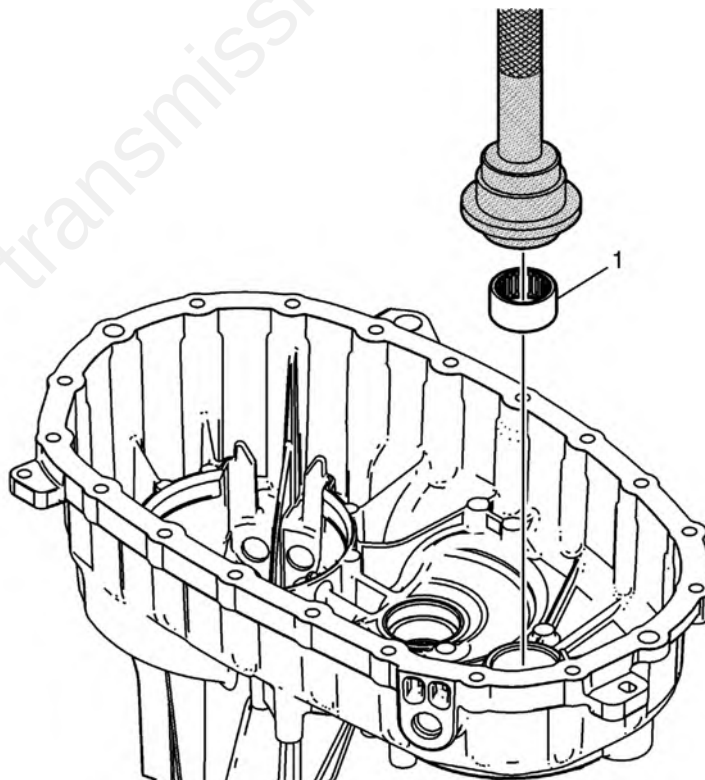
Transfer Case Stud Installation



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 stud. 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 For equivalent regional tools, refer to Special Tools.

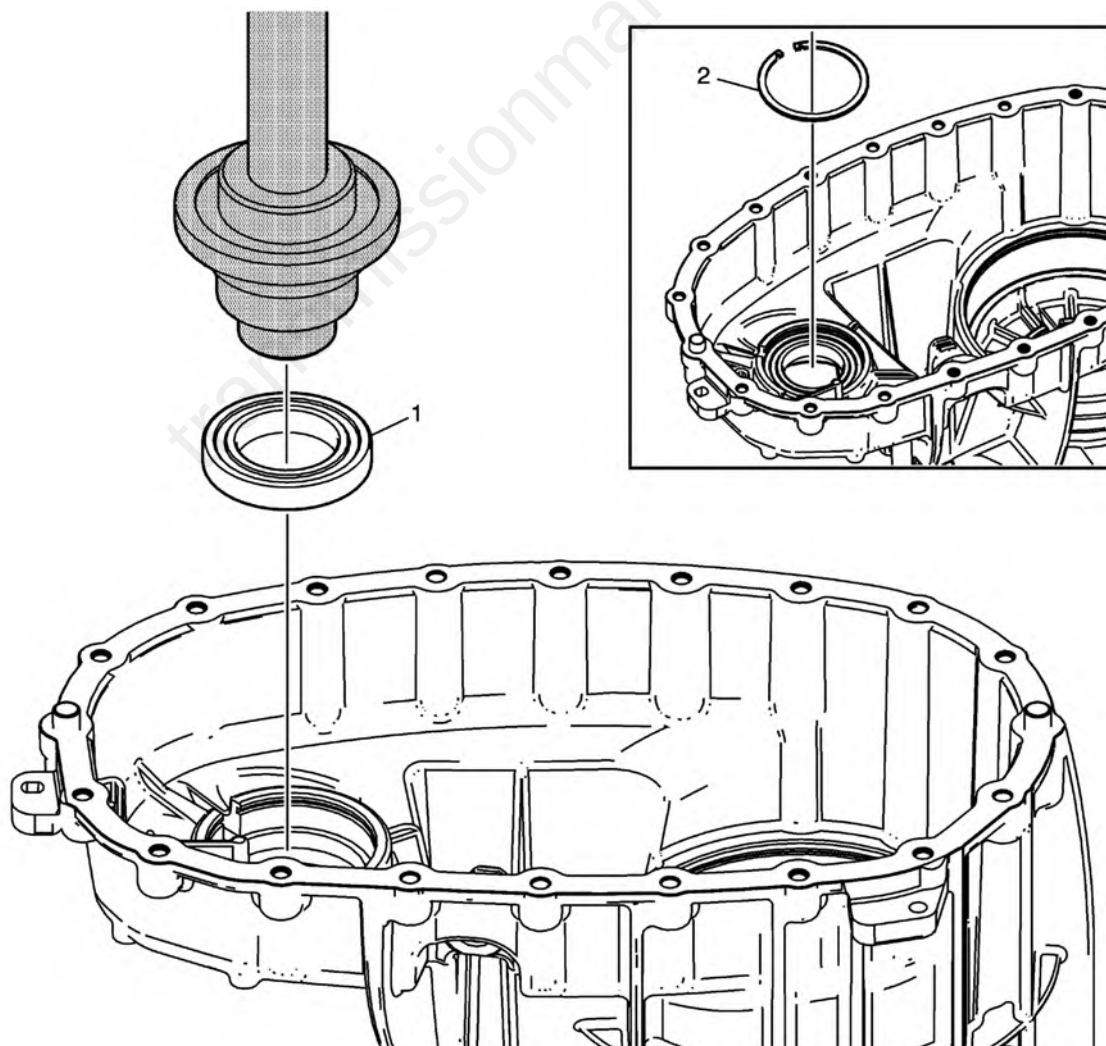
Transfer Case Front Output Shaft Rear Bearing Installation



Transfer Case Front Output Shaft Rear Bearing Installation

Callout	Component Name
	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: 1 Install the bearing until the tool bottoms against the case half. Special Tools • DT-51336 Bearing Installer • GE-8092 Driver Handle For equivalent regional tools, refer to <u>Special Tools</u>.

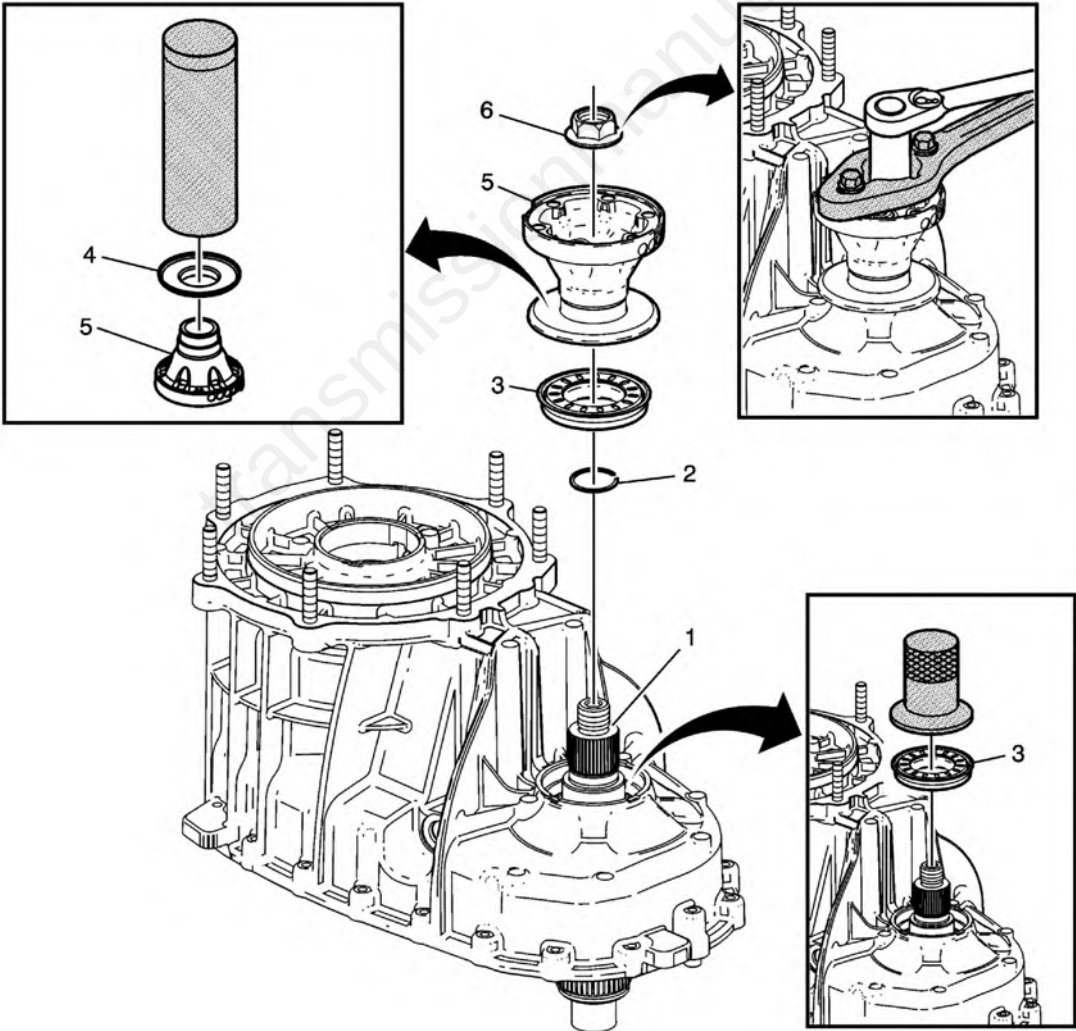
Transfer Case Front Output Shaft Front Bearing Installation



Transfer Case Front Output Shaft Front Bearing Installation

Callout	Component Name
1	Transfer Case Front Output Shaft Front Bearing Procedure 1. Use the larger diameter end of the tool to install the bearing. 2. Install the bearing until it bottoms against case half bore. Special Tools • DT-51336 Driver • GE-8092 Driver Handle For equivalent regional tools, refer to Special Tools.
2	Transfer Case Front Output Shaft Front Bearing Retaining Ring

Transfer Case Front Output Shaft and Flange Installation



Transfer Case Front Output Shaft and Flange 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 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 High/Low Planetary Assembly Installation

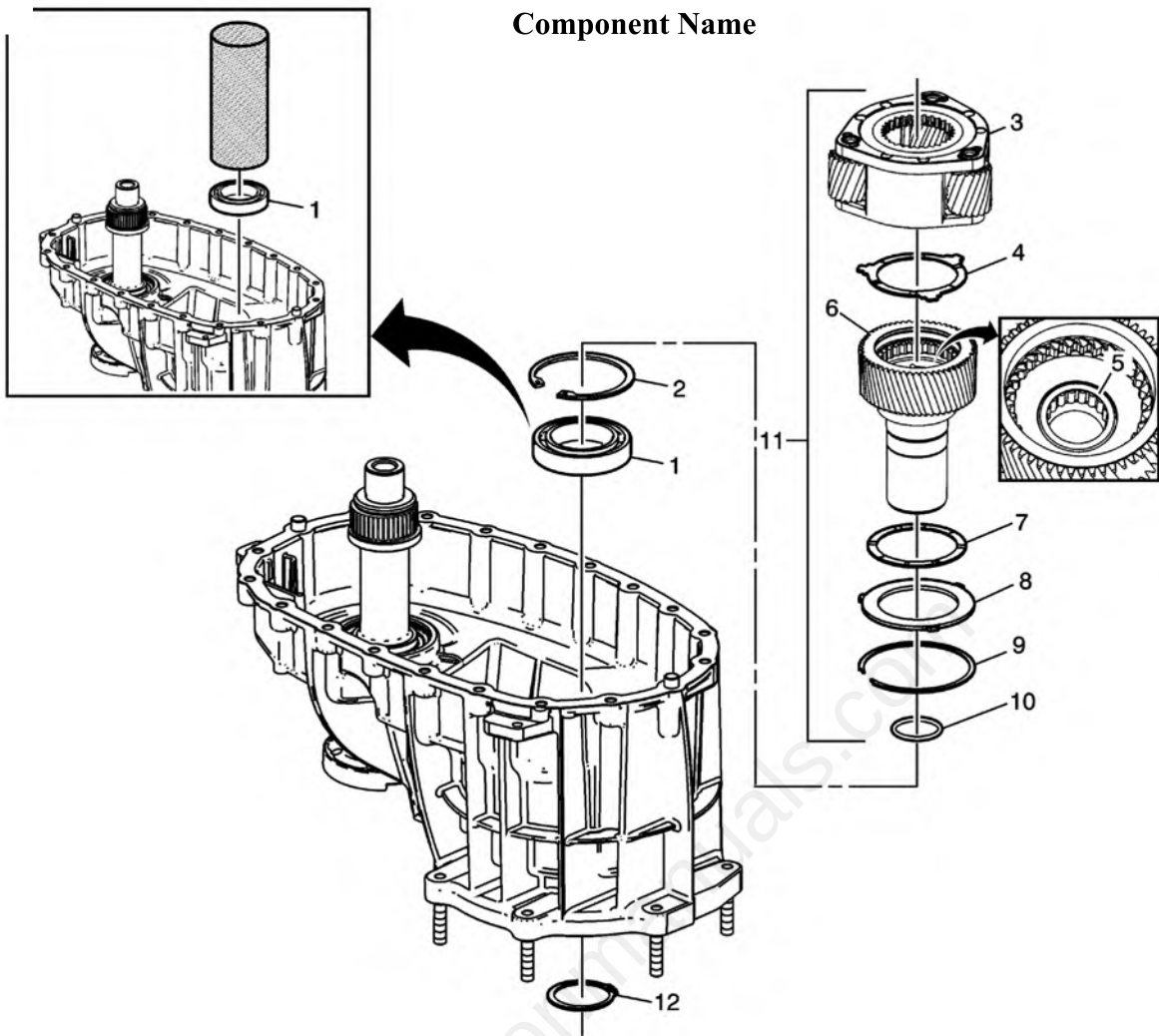


Fig. 65: Transfer Case Input Shaft and Planetary Assembly
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Input Shaft and High/Low Planetary Assembly Installation

Callout	Component Name
1	Transfer Case Input Shaft Bearing Special Tools J-36366-A Pinion Oil Seal Installer For equivalent regional tools, refer to Special Tools .
2	Transfer Case Input 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 Input Shaft Seal-O-ring Procedure Lubricate the O-ring prior to installation. Refer to: Adhesives, Fluids, Lubricants, and Sealers .

Component Name	
11	Transfer Case High/Low Planetary Assembly
12	Transfer Case Input Shaft Inner Retaining Ring

Measuring Clutch Pack Height

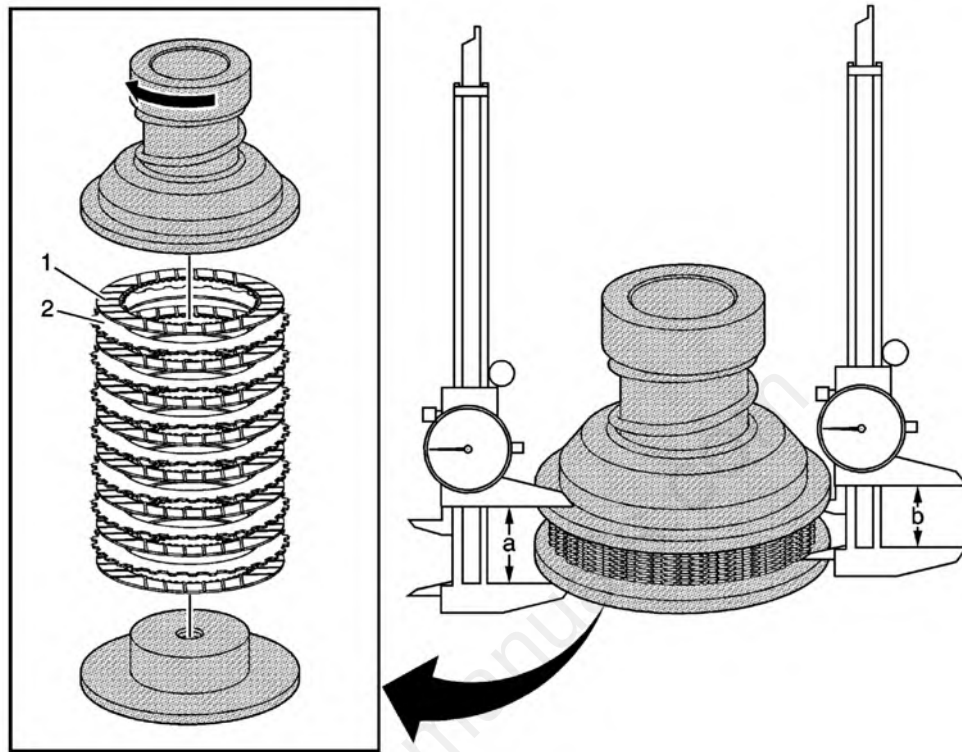


Fig. 66: Measuring Clutch Pack Height
 Courtesy of GENERAL MOTORS COMPANY

Measuring Clutch Pack Height

Callout	Component Name
Preliminary Procedure - The DT-48213 gauge applies a predetermined amount of pressure to the clutch pack in order to properly measure the clutch pack height. Do not use any other method than what is outlined below. - Micrometers or depth gauges may also be used in conjunction with the DT-48213 gauge to measure the clutch pack height. - Two variations are available to measure clutch pack height, outside measurement or inside measurement. Either variation will determine the correct height.	
1	Transfer Case Four Wheel Drive Clutch Pressure - Friction - Plate (Qty: 8) NOTE: Install the friction and steel clutch plates into the DT-48213 gauge, alternating until 8 friction plates and 7 steel plates are installed. Special Tools DT-48213 Clutch Pack Height Gauge For equivalent regional tools, refer to Special Tools .

	Component Name
2	Transfer Case Four Wheel Drive Clutch Pressure - Steel - Plate (Qty: 7) Procedure 1 - Outside Measurement: 1. Tighten the DT-48213 gauge until the upper portion of the tool contacts the lower portion of the tool. The screw will be flush with the bottom surface of the tool to indicate the tool has fully compressed the clutch plates. 2. Using an outside caliper, measure the total combined height of the clutch pack and the DT-48213 gauge, dimension a. Subtract the thickness of both the upper and lower portion of the DT-48213 gauge, 14 mm (0.551 in), and record the results. 3. Repeat the process in 2 additional locations, 120 degrees from each other. 4. The average of the 3 measurements is the clutch pack height. Procedure 2 - Inside Measurement: 1. Tighten the DT-48213 gauge until the upper portion of the tool contacts the lower portion of the tool. The screw will be flush with the bottom surface of the tool to indicate the tool has fully compressed the clutch plates. 2. Using an inside caliper, measure the height of the clutch pack, dimension b, and record the results. 3. Repeat the process in 2 additional locations, 120 degrees from each other. 4. The average of the 3 measurements is the clutch pack height. NOTE: Install the friction and steel clutch plates into the DT-48213 gauge, alternating until 8 friction plates and 7 steel plates are installed. Special Tools DT-48213 Clutch Pack Height Gauge

Clutch Assembly Installation

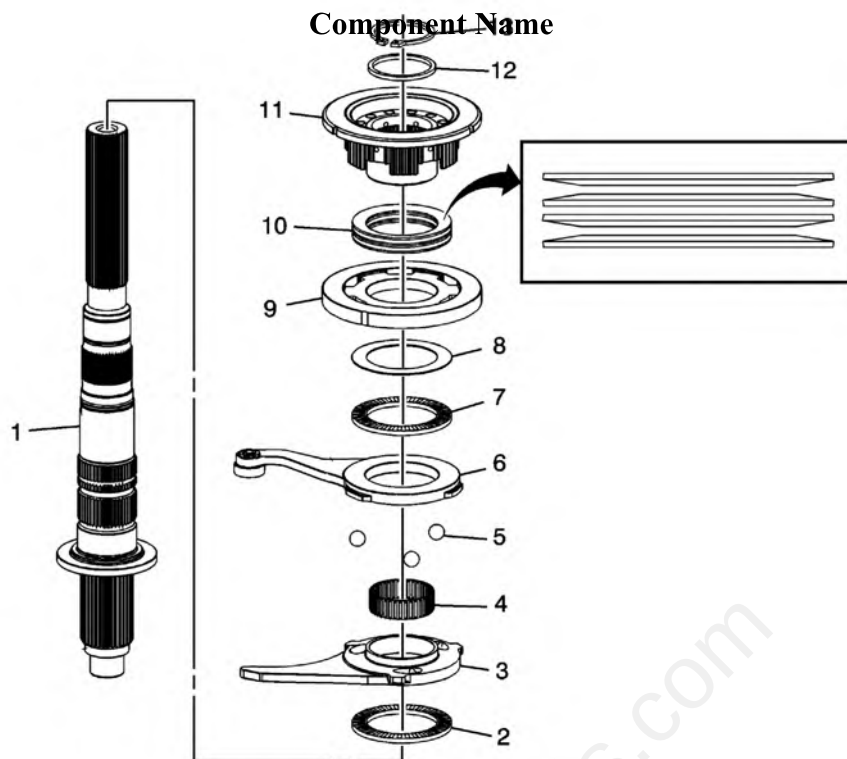


Fig. 67: View Of Clutch Components

Courtesy of GENERAL MOTORS COMPANY

Clutch Assembly Installation

Callout	Component Name
1	Transfer Case Rear Output Shaft
2	Transfer Case Scissor Mechanism Lever Thrust Bearing
3	Transfer Case Scissor Mechanism Lever
4	Transfer Case Scissor Mechanism Lever Bearing Assembly
5	Transfer Case Scissor Mechanism Lever Ball (Qty: 3)
6	Transfer Case Scissor Mechanism Lever
7	Transfer Case Scissor Mechanism Thrust Bearing
8	Transfer Case Scissor Mechanism Lever Washer
9	Transfer Case Four Wheel Drive Clutch Pressure - Apply - Plate NOTE: Ensure the scissor mechanism lever washer is seated into the apply plate groove.
10	Transfer Case Four Wheel Drive Clutch Pressure Plate Spring (Qty: 4)
11	Transfer Case Four Wheel Drive Clutch Hub

Component Name	
12	Transfer Case Four Wheel Drive Clutch Shim NOTE: • Use a 3 mm (0.118 in) shim as a base to do the initial measurements with, this shim may be changed in the following steps depending on the results of the stack clearance. • Use the original shim if reassembling a transfer case. This shim may be changed in the following steps depending on the results of the stack clearance.
13	Transfer Case Two/Four Wheel Drive Clutch Retaining Ring NOTE: If the clutch shim is not seated against the retaining ring, replace the clutch pressure plate springs.

Measuring/Adjusting Clutch Assembly Height

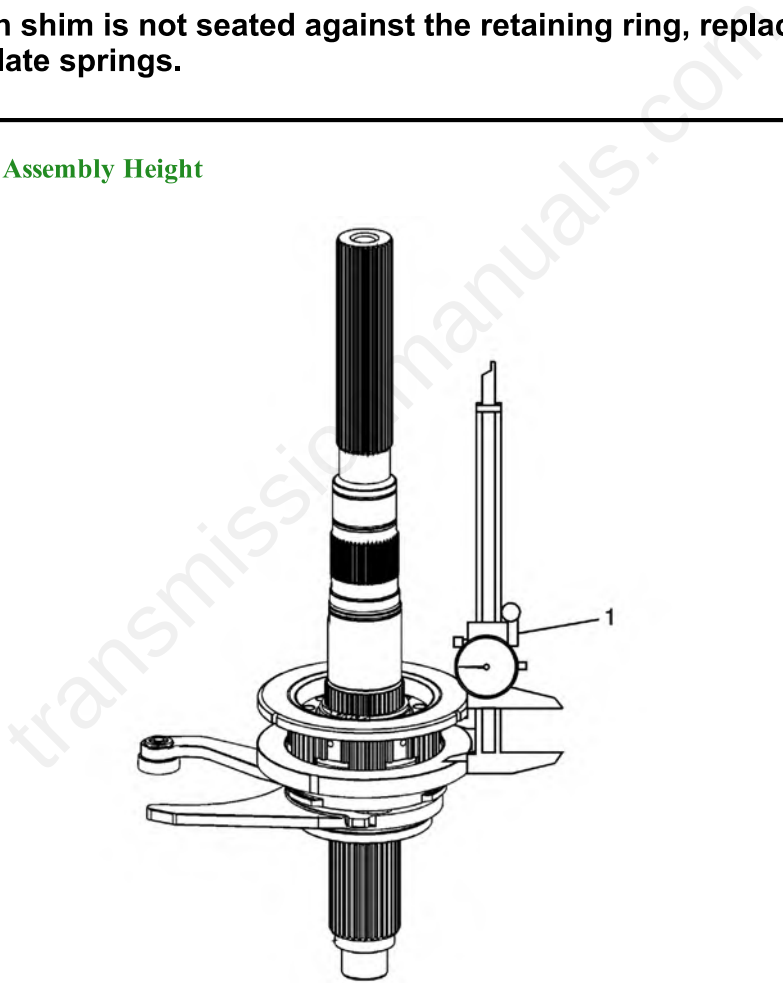


Fig. 68: Measuring/Adjusting Clutch Assembly Height
 Courtesy of GENERAL MOTORS COMPANY

Measuring/Adjusting Clutch Assembly Height

Callout	Component Name

Component Name	
1	Clutch Assembly Procedure: 1. Using an inside caliper, measure the height of the clutch assembly in the location shown and record the results. 2. Repeat the process in 2 additional locations, 120 degrees from each other. 3. The average of the 3 measurements is the clutch assembly height. 4. A 3.1 mm (0.122 in) clearance +/- 0.1 mm (0.004 in) is necessary between the clutch pack height and the assembly height. It may be necessary to replace the clutch shim with a thicker shim or a thinner shim, to achieve the proper clearance in the clutch. 5. Subtract the clutch pack height from the clutch assembly height. The difference should be between 3.0 mm (0.118 in) and 3.2 mm (0.126 in) clearance. NOTE: • A variety of shims are available to properly adjust the clearance height of the clutch assembly. • An inside micrometer may also be used to measure the clutch assembly height.

Clutch Pressure Plate Installation

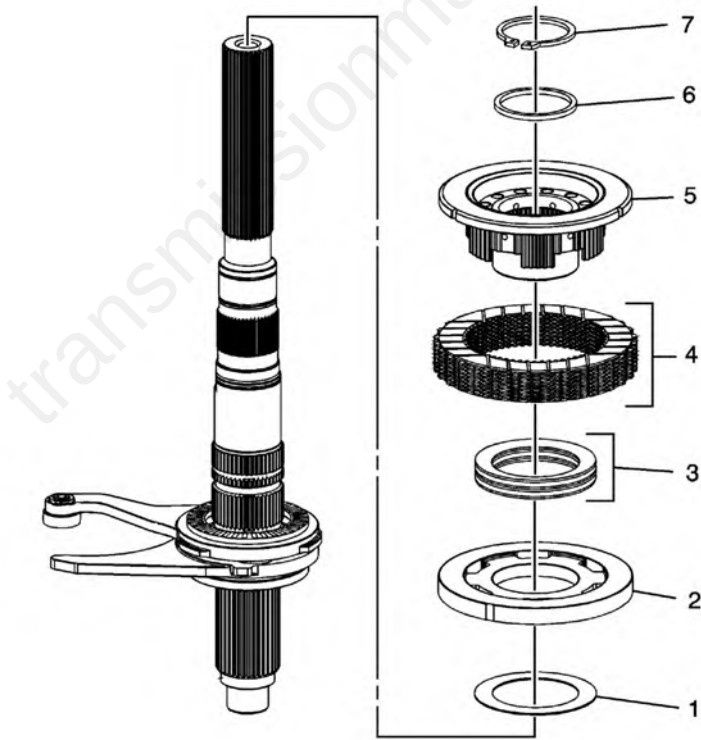


Fig. 69: View Of Clutch Pressure Plates & Components
Courtesy of GENERAL MOTORS COMPANY

Clutch Pressure Plate Installation

Callout	Component Name

Component Name	
1	Transfer Case Control Actuator Lever Washer
2	Transfer Case Four Wheel Drive Clutch Pressure - Apply - Plate
3	Transfer Case Four Wheel Drive Clutch Pressure Plate Spring (Qty: 4)
4	Transfer Case Four Wheel Drive Clutch Pressure Plates-Friction and Steel
5	Transfer Case Four Wheel Drive Clutch Hub
6	Transfer Case Four Wheel Drive Clutch Shim
7	Transfer Case Two/Four Wheel Drive Clutch Retaining Ring
Procedure The Transfer Case High/Low Clutch Reset (NQ6) must be performed after the transfer case is installed in the vehicle.	

Transfer Case Rear Output Shaft Assembly

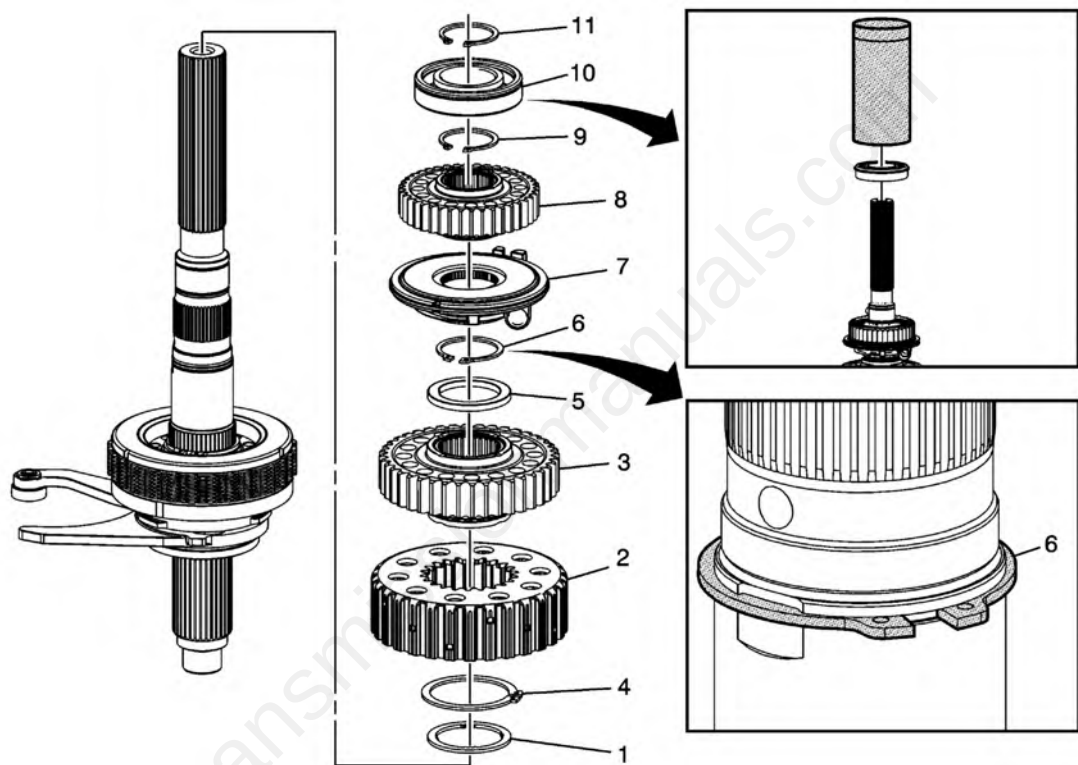


Fig. 70: Transfer Case Rear Output Shaft Assembly
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Output Shaft Assembly

Callout	Component Name
1	Transfer Case Front Output Shaft Drive Sprocket Spacer - Front
2	Transfer Case Four Wheel Drive Clutch Housing
3	Transfer Case Front Output Shaft Drive Sprocket
4	Transfer Case Four Wheel Drive Clutch Housing Retaining Ring
5	Transfer Case Front Output Shaft Drive Sprocket Spacer - Rear

Component Name	
6	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.
7	Transfer Case Oil Pump Assembly
8	Transfer Case Rear Output Shaft Speed Reluctor Wheel
9	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring
10	Transfer Case Rear Output Shaft Rear Bearing Assembly Procedure 1. Use an arbor press or suitable installer to install the bearing to the rear output shaft. 2. Ensure the retaining ring groove in the outer race is positioned toward the rear. 3. 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 For equivalent regional tools, refer to Special Tools .
11	Transfer Case Rear Output Shaft Rear Bearing Retaining Ring

Transfer Case Front Output Shaft Driven Sprocket, Clutch Assembly, Drive Chain, High/Low Shift Fork Assembly, High/Low Clutch and Chip Collector Magnet Installation

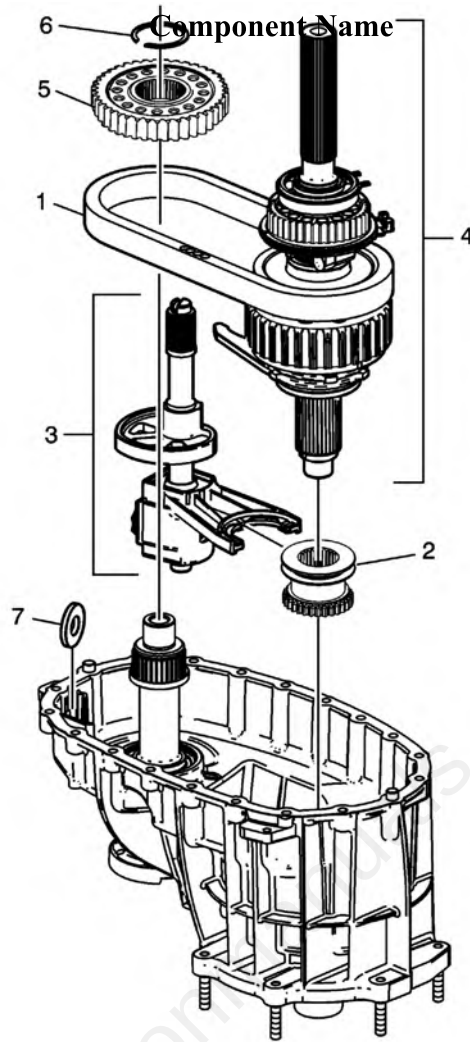


Fig. 71: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Front Output Shaft Driven Sprocket, Clutch Assembly, Drive Chain, High/Low Shift Fork Assembly, High/Low Clutch and Chip Collector Magnet Installation

Callout	Component Name
Preliminary Procedures Install components simultaneously.	
1	Transfer Case Front Output Shaft Drive Chain Assembly 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 Clutch Assembly
5	Transfer Case Front Output Shaft Driven Sprocket NOTE: Align the ID splines of the drive sprocket and the OD splines of the front output shaft.

Component Name	
6	Transfer Case Front Output Shaft Driven Sprocket Retaining Ring
7	Transfer Case Chip Collector Magnet

Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear Installation

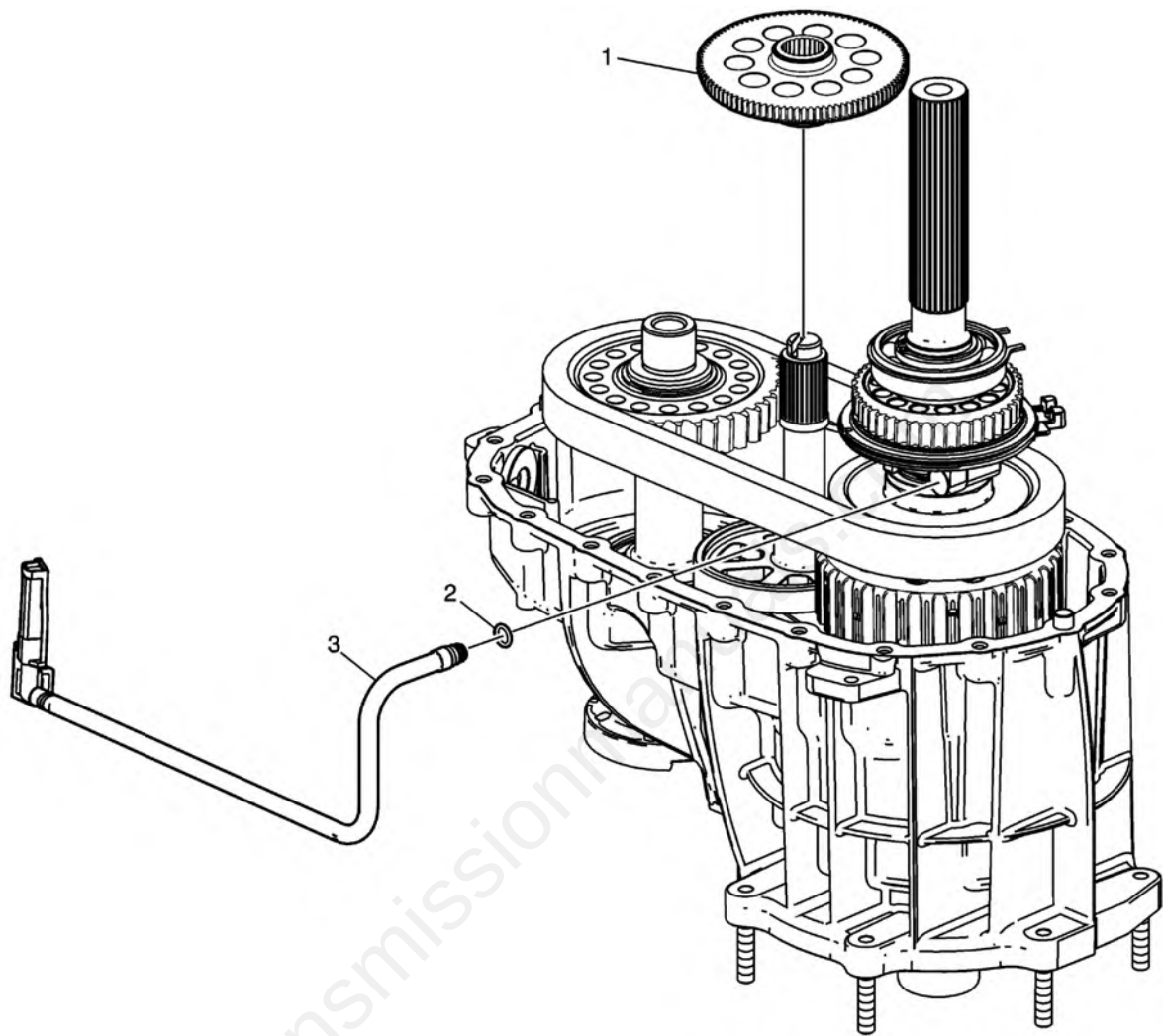
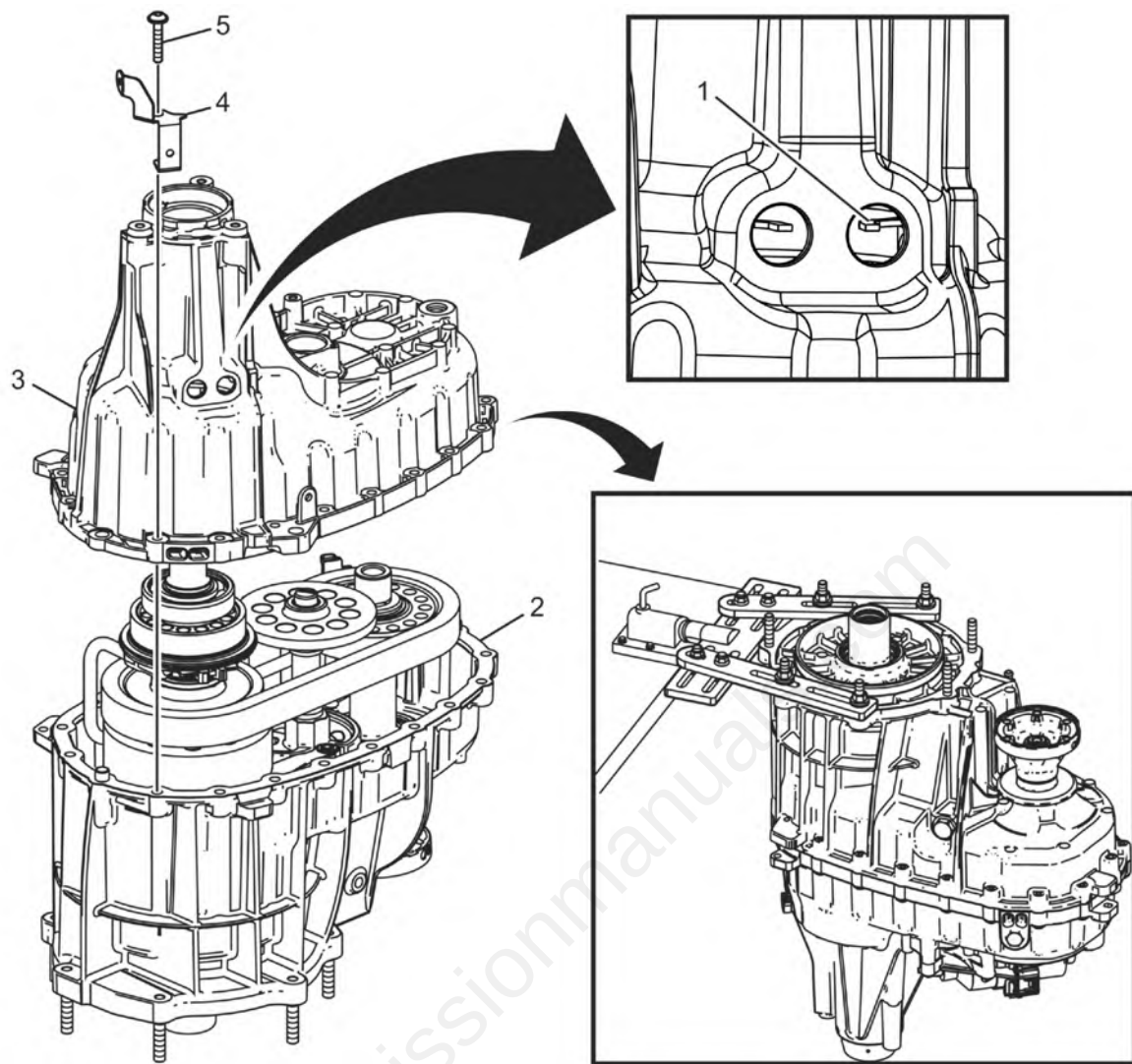


Fig. 72: Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear
 Courtesy of GENERAL MOTORS COMPANY

Transfer Case Oil Pump Suction Pipe and Actuator Shaft Gear Installation

Callout	Component Name
1	Transfer Case Actuator Shaft Gear
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

**Fig. 73: Transfer Case Rear Extension**

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Rear Extension 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 the front and rear 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. Refer to Adhesives, Fluids, Lubricants, and Sealers.

Component Name	
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 Bolts/Screws (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 For equivalent regional tools, refer to Special Tools.
2	Transfer Case Rear Output Shaft Seal NOTE: 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, 4 Wheel Drive Actuator, 2/4 Wheel Drive Actuator Position Sensor, Shift Detent Plunger Plug, and Vehicle Speed Sensor Installation

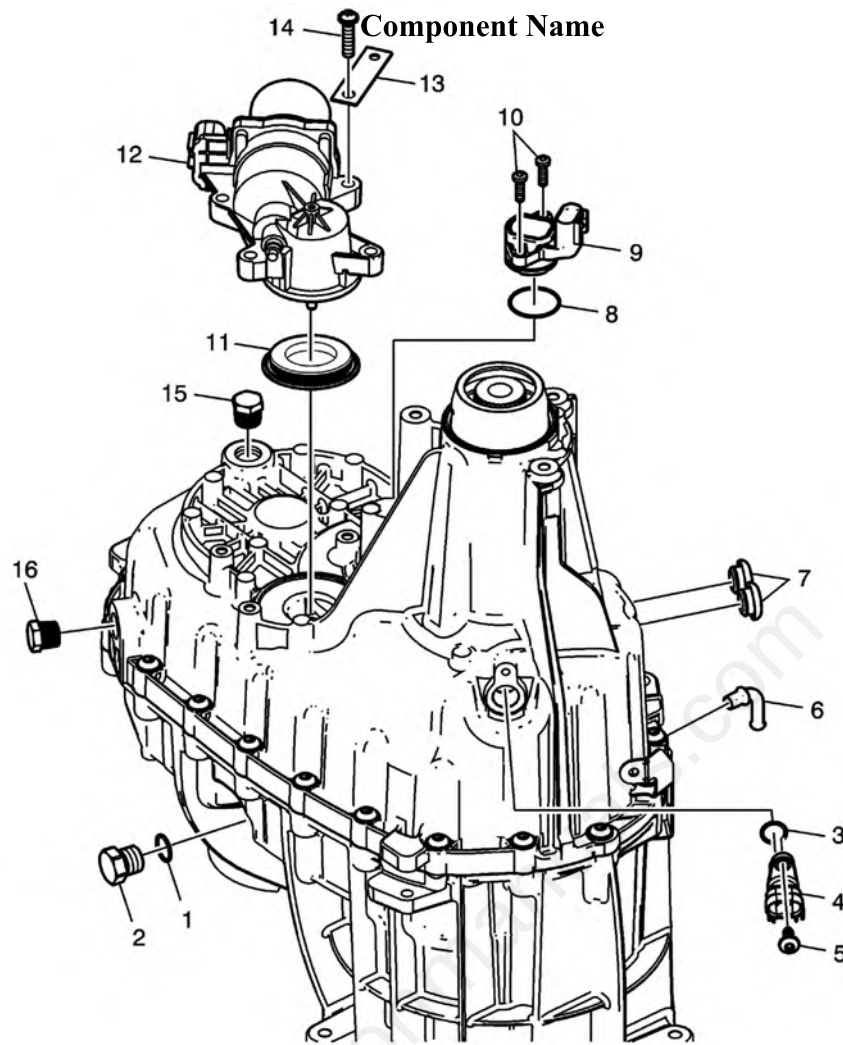


Fig. 75: Transfer Case

Courtesy of GENERAL MOTORS COMPANY

Transfer Case Access Hole Plugs, Fill and Drain Plug, Vent, 4 Wheel Drive Actuator, 2/4 Wheel Drive Actuator Position Sensor, Shift Detent Plunger Plug, and Vehicle Speed Sensor Installation

Callout	Component Name
1	Shift Detent Plunger Plug Seal NOTE: Lubricate the O-ring with clean DEXRON®VI.
2	Shift Detent Plunger Plug Tighten 24 N.m (18 lb ft)
3	Vehicle Speed Sensor O-ring Seal NOTE: Lightly lubricate the O-ring with clean DEXRON®VI.
4	Vehicle Speed Sensor

Component Name	
5	Vehicle Speed Sensor Bolt NOTE: Apply threadlock to the threads of the bolt. Tighten 8 N.m (69 lb in)
6	Transfer Case Vent NOTE: Apply retaining compound to OD of the NEW vent pipe before installation.
7	Transfer Case Access Hole Plug (Qty: 2)
8	Transfer Case Two/Four Wheel Drive Actuator Position Sensor Seal NOTE: Lightly lubricate the O-ring with clean DEXRON®VI.
9	Transfer Case Two/Four Wheel Drive Actuator Position Sensor
10	Transfer Case Two/Four Wheel Drive Actuator Position Sensor Bolt/Screw (Qty: 2) Tighten 10 N.m (89 lb in)
11	Transfer Case Two/Four Wheel Drive Actuator Seal
12	Transfer Case Four Wheel Drive Actuator
13	Transfer Case Actuator Harness Bracket
14	Transfer Case Two/Four Wheel Drive Actuator Bolt/Screw (Qty: 3) Tighten 19 N.m (14 lb ft)
15	Transfer Case Oil Fill Plug NOTE: Apply pipe sealant to the oil fill plug before installation. Tighten 25 N.m (18 lb ft)
16	Transfer Case Oil Drain Plug CAUTION: Refer to Component Fastener Tightening Caution . NOTE: Apply pipe sealant to the oil drain plug before installation. Tighten 25N.m (18 lb ft)

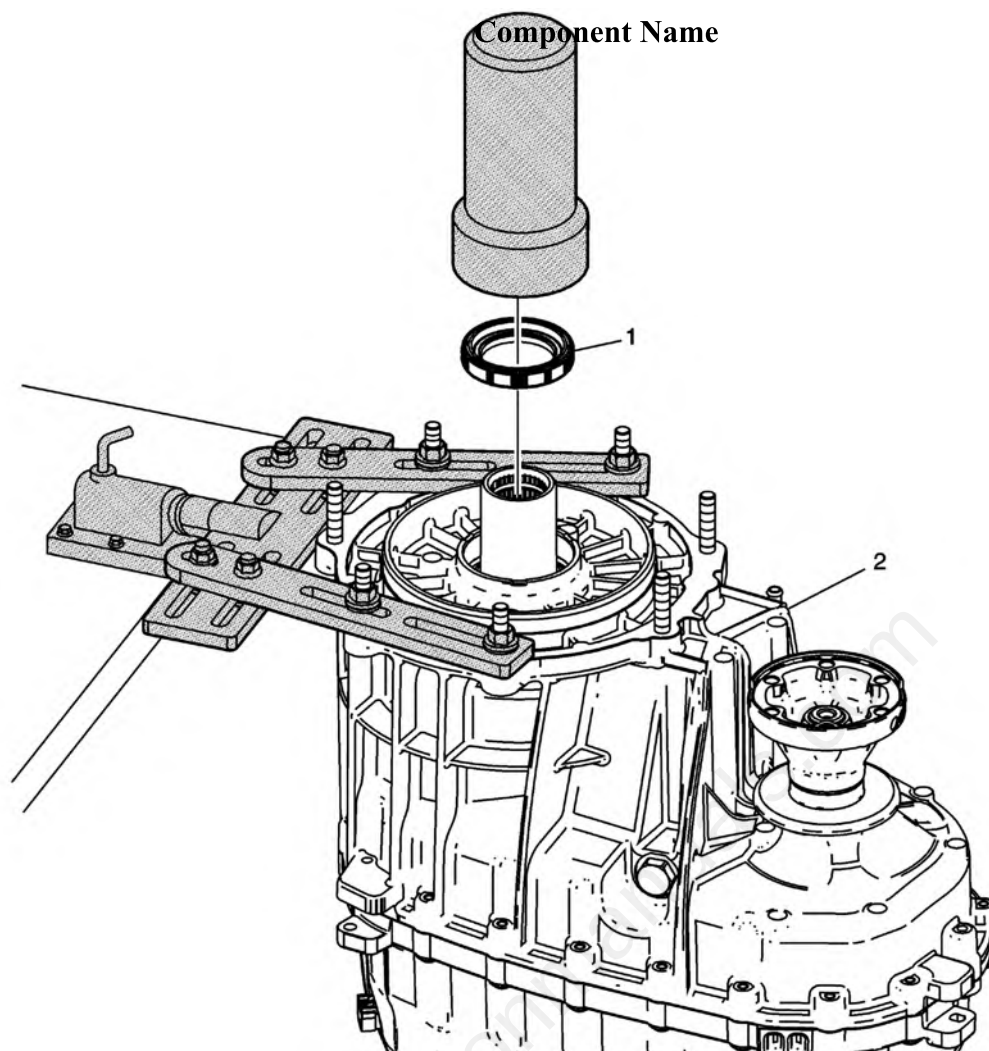


Fig. 76: Transfer Case Input Shaft Seal Installation and Transfer Case Holding Fixture
 Courtesy of GENERAL MOTORS COMPANY

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 For equivalent regional tools, 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)

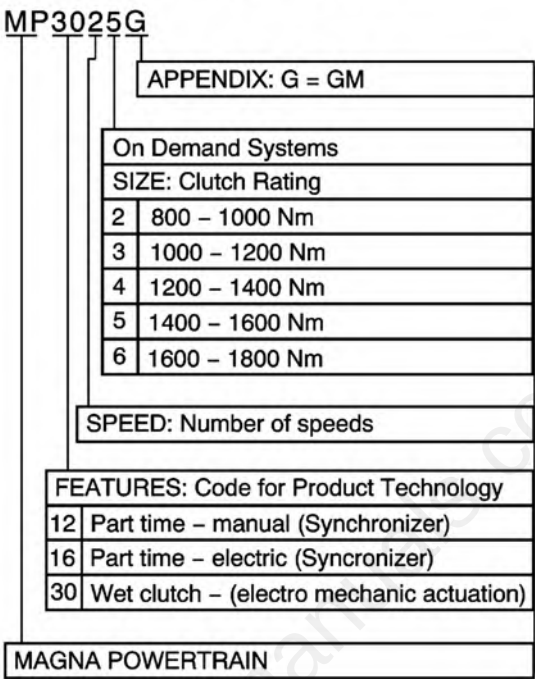


Fig. 77: Transfer Case
Courtesy of GENERAL MOTORS COMPANY

Magna Transfer Case Bar Code Label

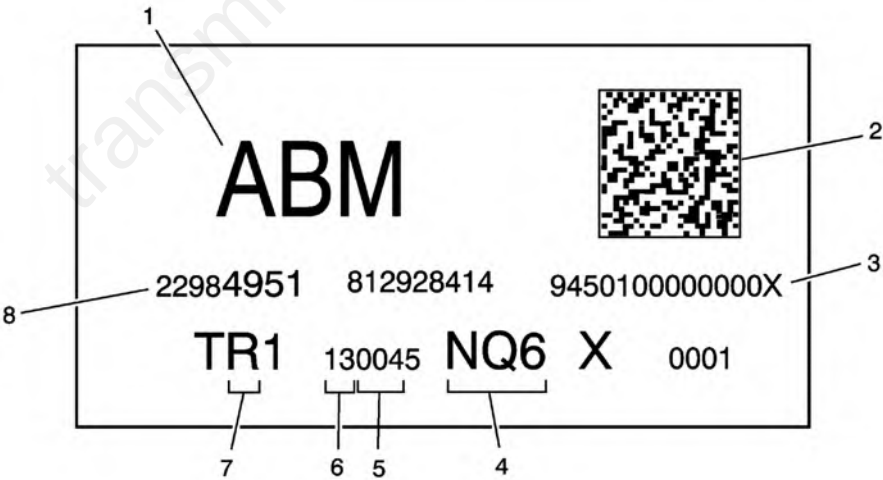


Fig. 78: Magna Transfer Case Bar Code Label
Courtesy of GENERAL MOTORS COMPANY

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

The Magna Powertrain (MP) model MP-3025G RPO-NQ6 transfer case is a 2 speed automatic, active transfer case (ATC). The MP 3025G RPO-NQ6 ATC provides 5 modes, Auto 4WD, 4HI, 4LO, 2HI and NEUTRAL. The Auto 4WD position allows the capability of an active transfer case, which provides the benefits of on-demand torque biasing wet clutch and easy vehicle tuning through software calibrations. The software calibrations allow more features such as flexible adapt ready position and clutch preload torque levels. The technology allows for vehicle speed dependent clutch torque levels to enhance the performance of the system. For example, the system is calibrated to provide 0-6.78 N.m (0-5 lb ft) of clutch torque during low speed, low engine torque operation, and predetermined higher torque for 40 km/h (25 mph) and greater. This prevents crow-hop and binding at low speeds and provides higher torque biases at higher vehicle speeds, in order to enhance stability.

Transfer Case Shift Control Switch

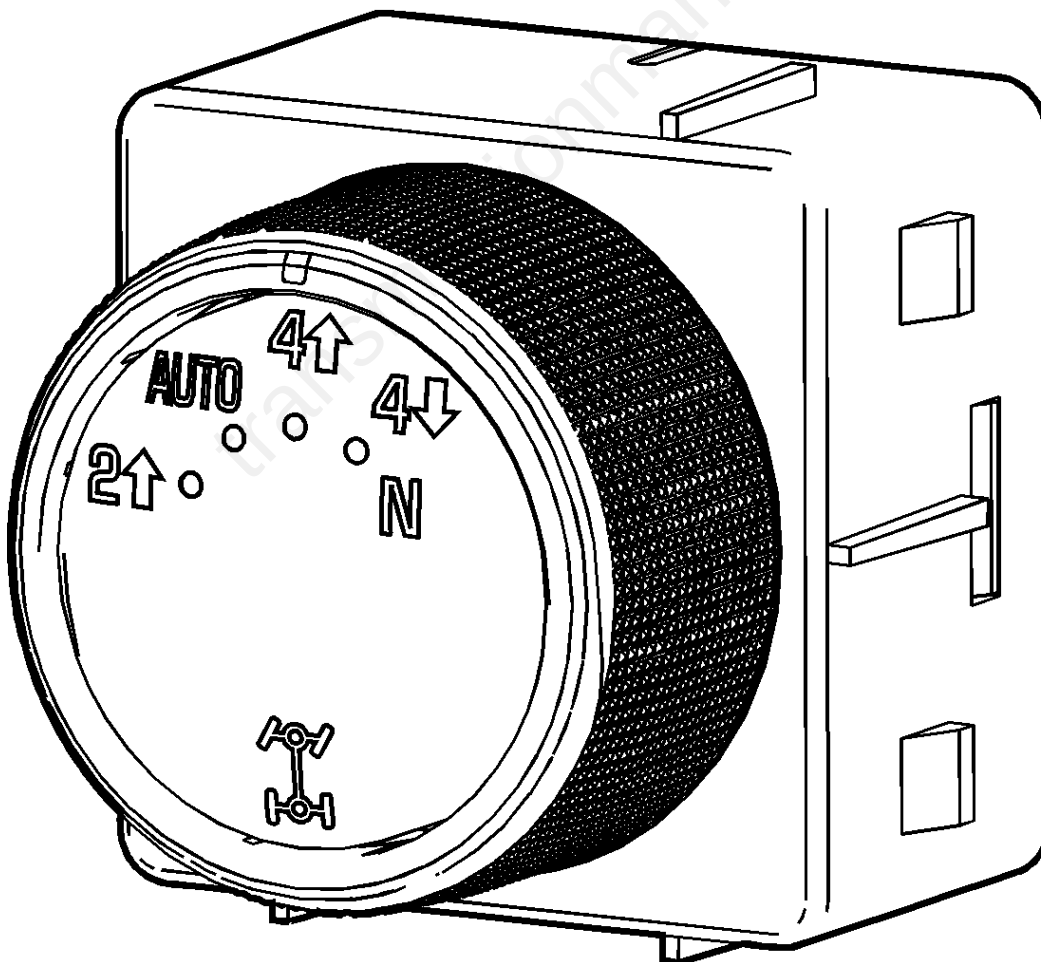


Fig. 79: Transfer Case Shift Control Switch

Courtesy of GENERAL MOTORS COMPANY

3 ATC transfer case RPO-NQ6 features a 5 mode shift control switch located on the instrument panel. When the ignition key 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 reached, or has been engaged. Once the new mode/range position is fully active, the switch indicator lamp for the new position will remain ON constantly.

During normal driving situations, the transfer case can operate in the Auto 4WD mode. In the Auto 4WD mode, the transfer case shift control module monitors rear wheel slip speed, based on the inputs from the wheel speed sensors and/or vehicle speed sensor. When the vehicle experiences a rear wheel slip condition, the transfer case shift control module sends a pulse width modulated (PWM) signal to an electronic motor, which is the transfer case 2/4 wheel drive actuator assembly. This actuator rotates the transfer case control actuator shaft, applying a clutch. The clutch is designed to deliver a variable amount of torque, normally delivered to the rear wheels, and transfers it to the front wheels. Torque is ramped up to the front wheels until the front wheel speed sensor signal matches that of the rear wheel speed sensors and/or vehicle speed sensor. Torque is ramped down to the front wheels. The process would repeat if rear wheel slip is detected again.

The MP 3025G transfer case RPO-NQ6 has the added feature of also providing the driver with 4 manual mode/range positions:

- 4HI - 4 Wheel Drive high range
- 2HI - 2 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. 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. 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.

2WD Mode Power Flow

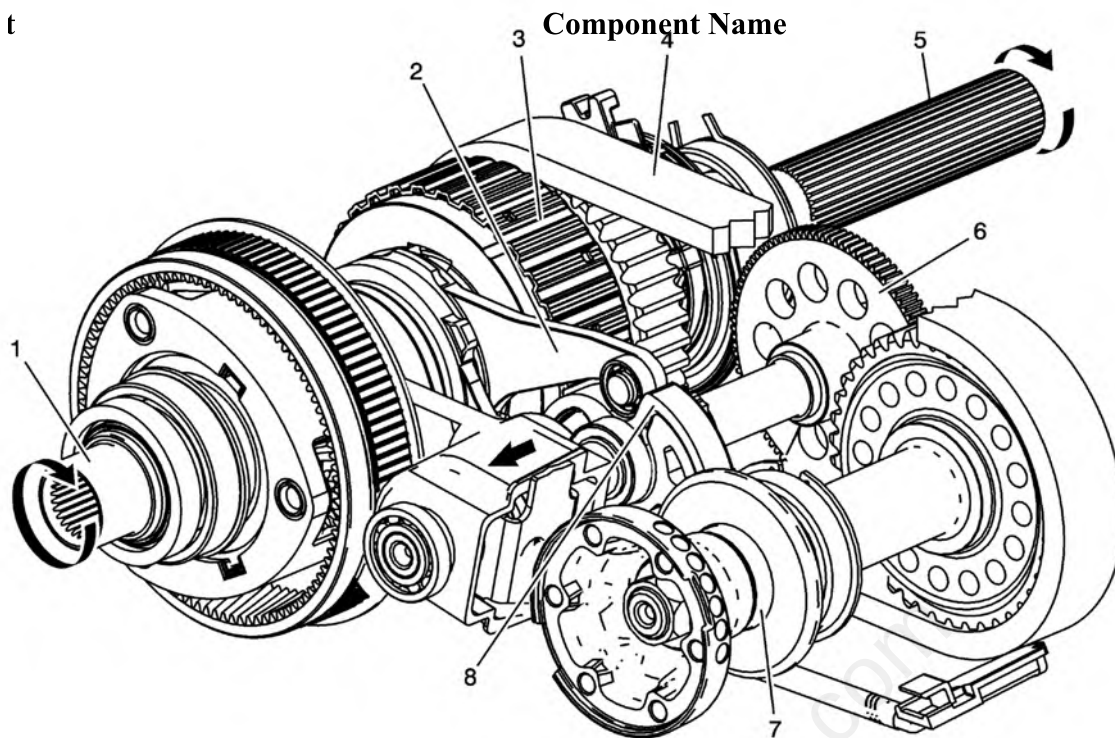


Fig. 80: 2WD Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Scissor Mechanism Lever
3	Clutch Pack
4	Drive Chain
5	Rear Output Shaft
6	Actuator Shaft Gear
7	Front Output Flange/Shaft
8	Actuator Cam

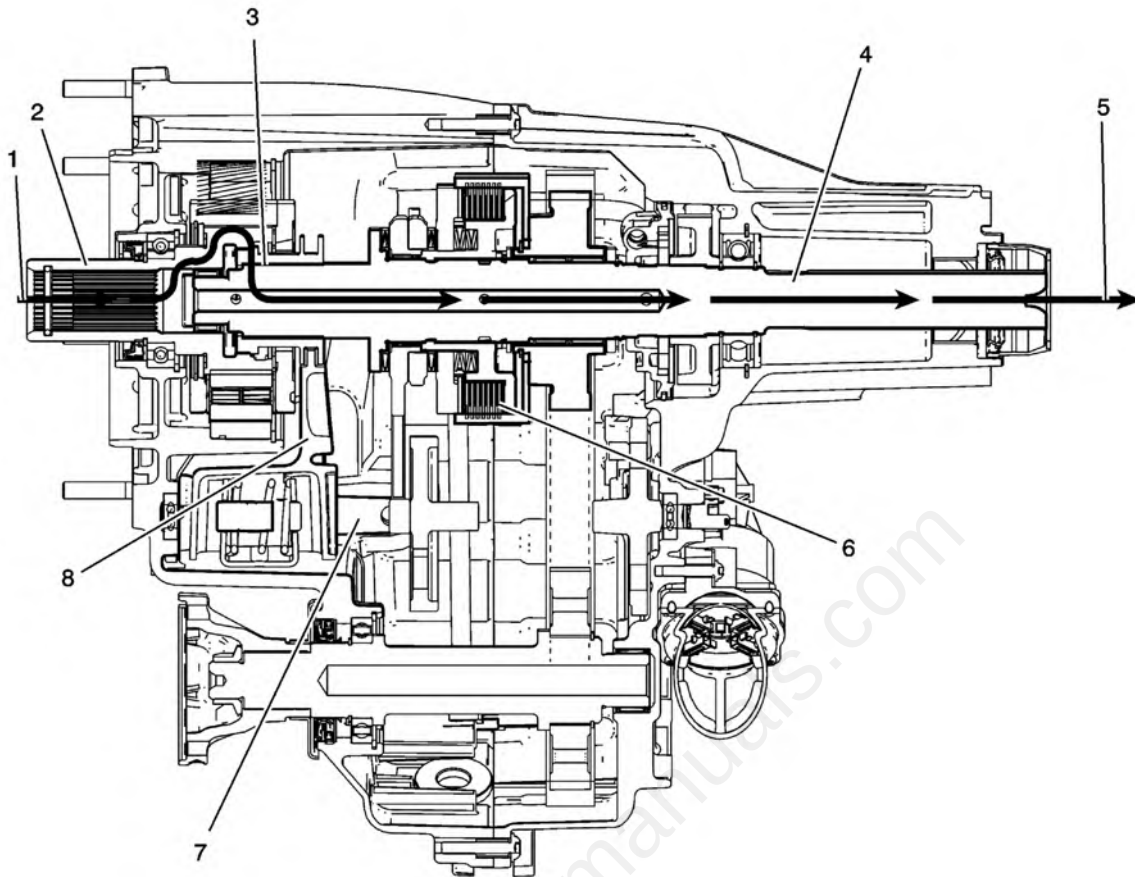


Fig. 81: 2WD Mode

Courtesy of GENERAL MOTORS COMPANY

When the MP 3025G transfer case RPO-NQ6 is in the 2WD mode, the power flows from the transmission (1) to the input shaft (2). The input shaft (2) is connected to the rear output shaft (4) by the high/low clutch (3). The high/low clutch (3) outer teeth are engaged with the input shaft (2) inner, high-speed position teeth. At the same time the high/low clutch is slip splined to the rear output shaft (4). The rear output shaft (4) delivers the power flow to the rear propshaft (5). The position of the control actuator shaft (7) allows no clutch (6) engagement. The high/low range shift fork (8), is in the high-speed position on the control actuator shaft (7).

4HI Mode Power Flow

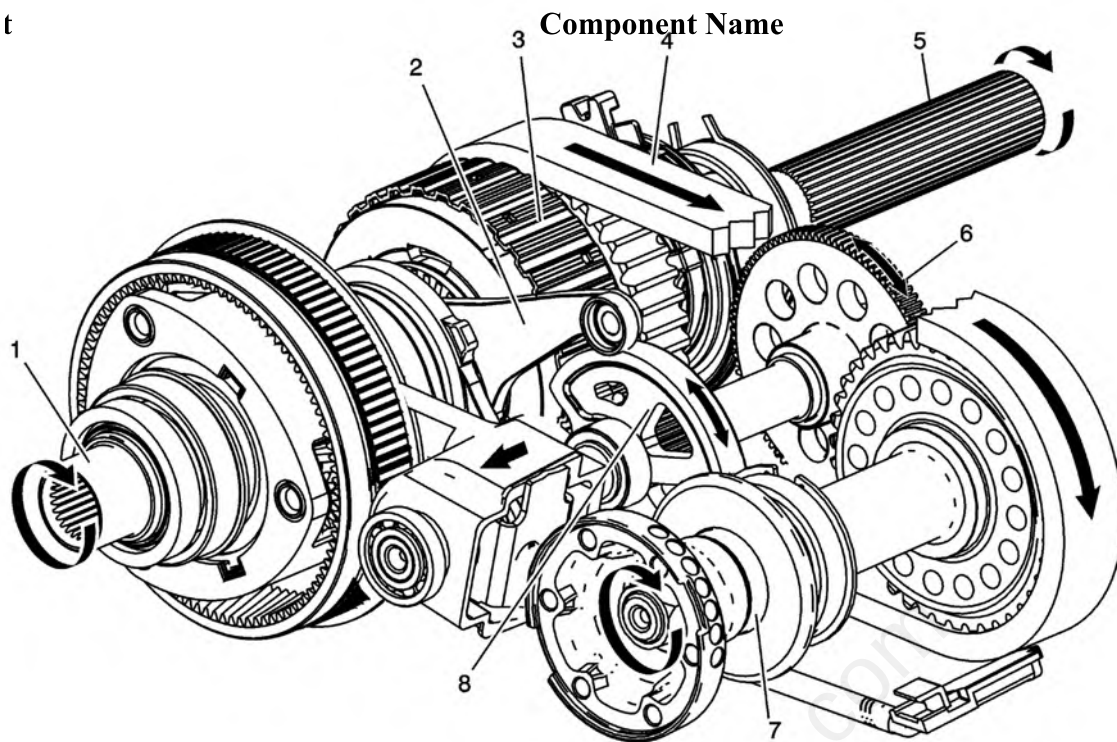


Fig. 82: 4HI Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Scissor Mechanism Lever
3	Clutch Pack
4	Drive Chain
5	Rear Output Shaft
6	Actuator Shaft Gear
7	Front Output Flange/Shaft
8	Actuator Cam

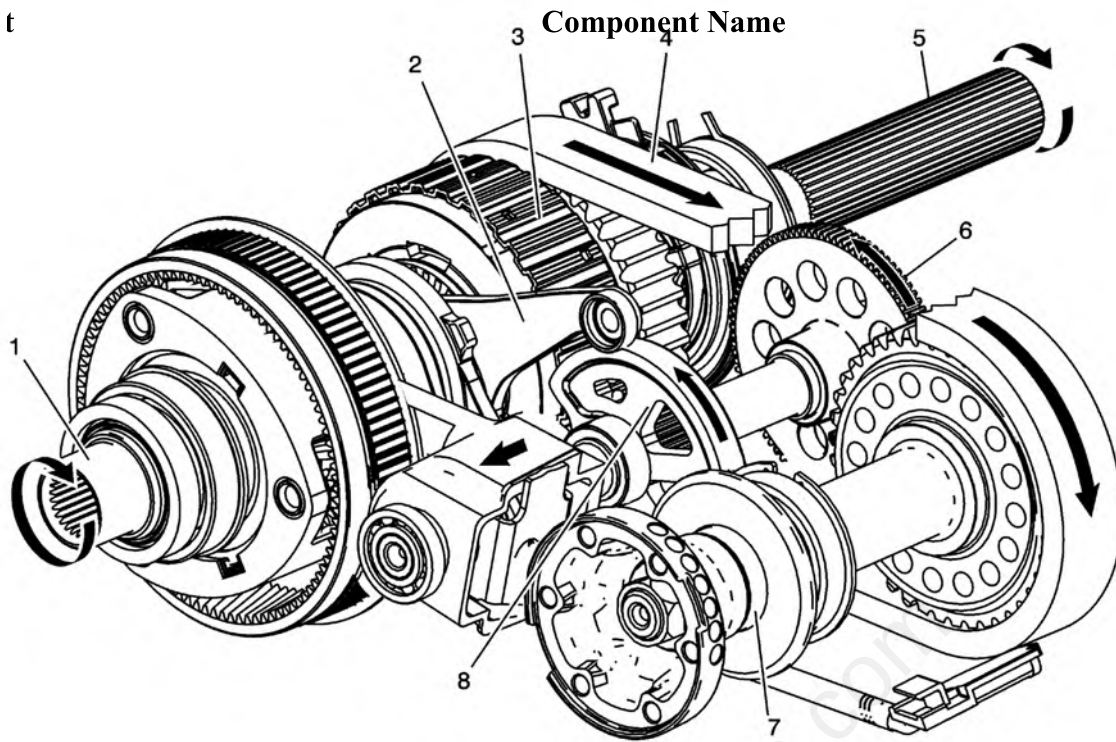


Fig. 84: 4HI Mode Active Power Flow
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Scissor Mechanism Lever
3	Clutch Pack
4	Drive Chain
5	Rear Output Shaft
6	Actuator Shaft Gear
7	Front Output Flange/Shaft
8	Actuator Cam

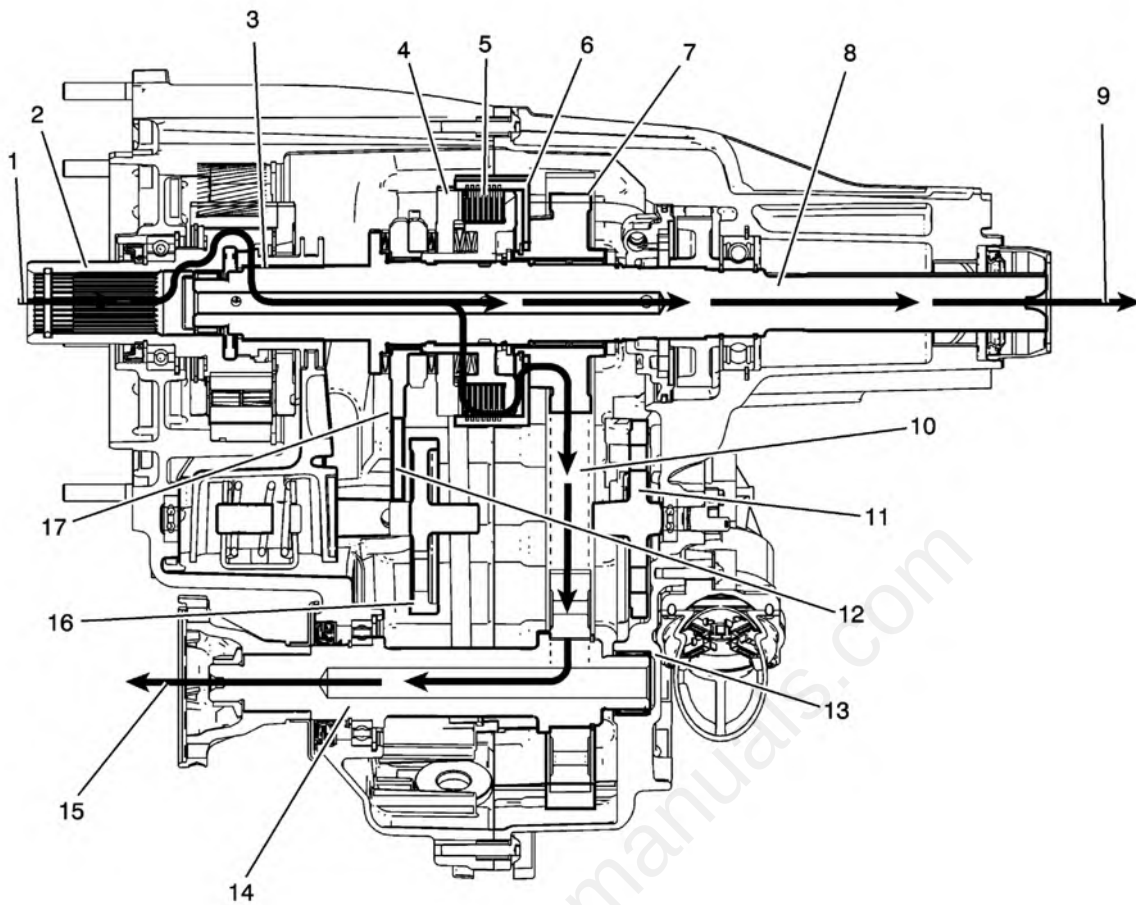


Fig. 85: Auto 4WD Mode

Courtesy of GENERAL MOTORS COMPANY

During the Auto 4WD mode, the power flow is the same as it is in the 4HI mode. Except, during the Auto 4WD mode, the 2/4 wheel drive actuator assembly (13) rotates the control actuator shaft to the correct torque level positions. Rotating the control actuator shaft to the various positions changes the clutch torque level. When a difference of front wheel speed to rear wheel speed is recognized, the transfer case control module commands for more or less clutch torque.

4LO Mode Power Flow

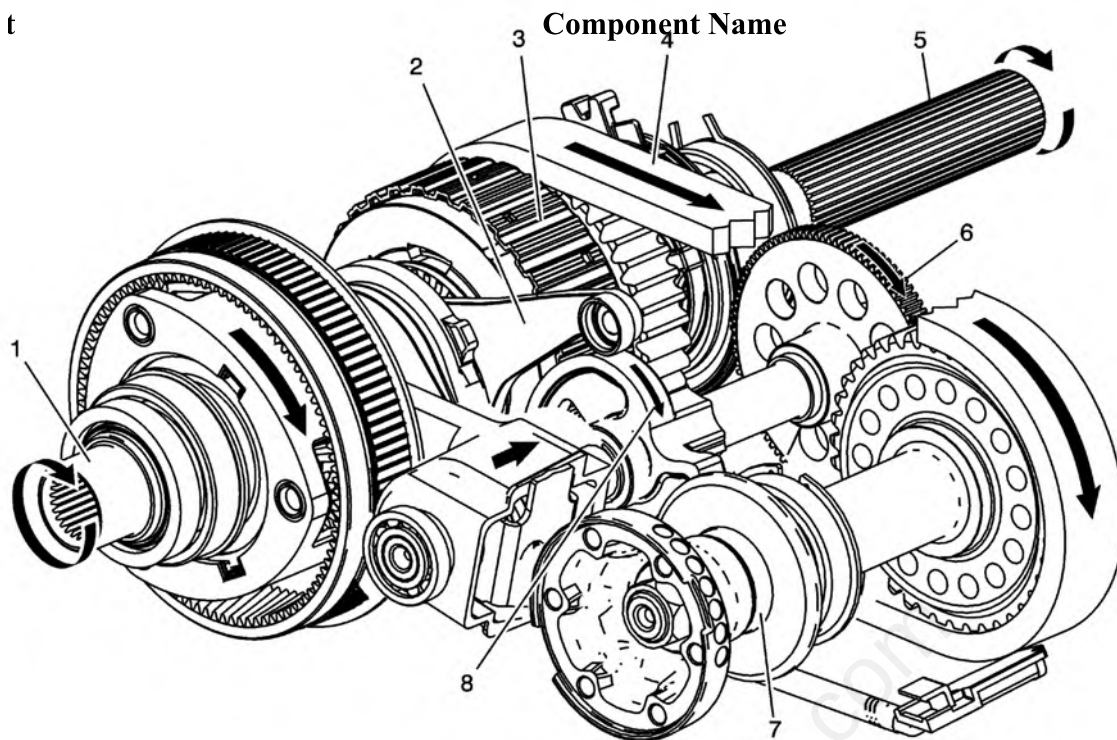


Fig. 86: 4LO Mode Power Flow

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Shaft
2	Scissor Mechanism Lever
3	Clutch Pack
4	Drive Chain
5	Rear Output Shaft
6	Actuator Shaft Gear
7	Front Output Flange/Shaft
8	Actuator Cam

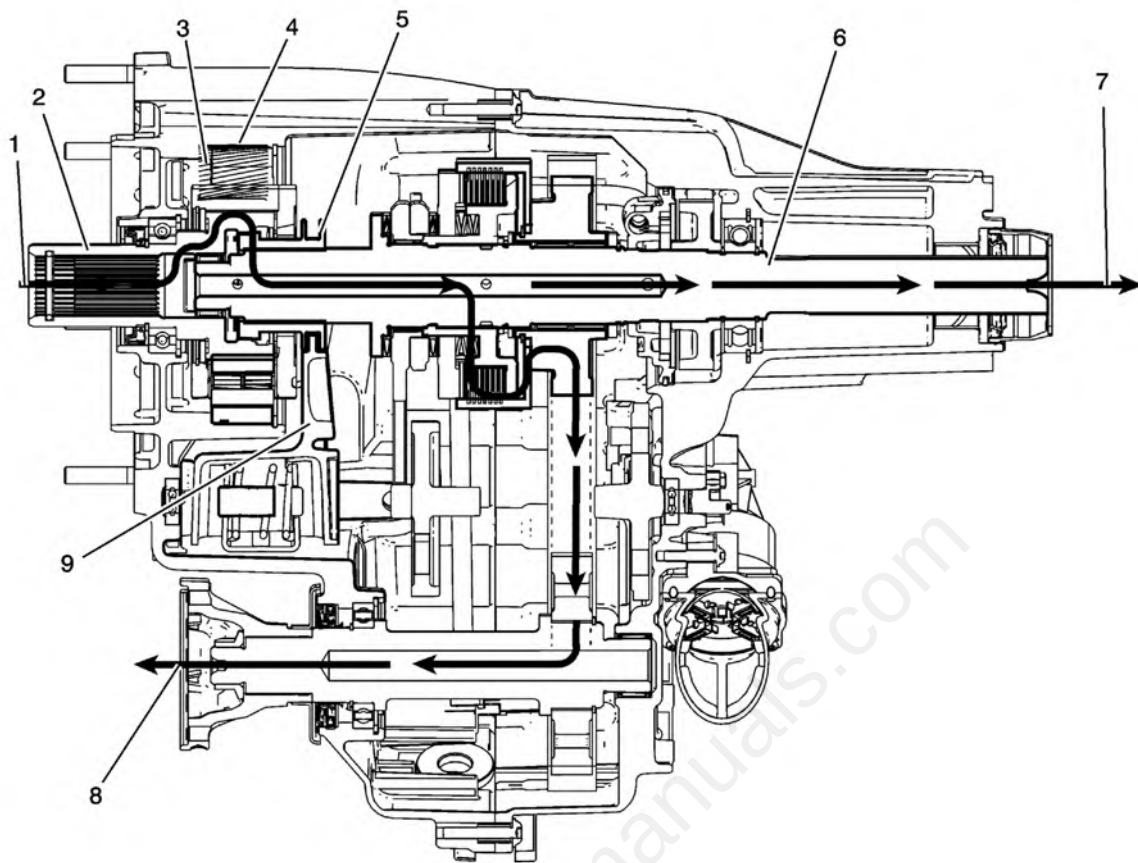


Fig. 87: 4LO Mode

Courtesy of GENERAL MOTORS COMPANY

When shifting the transfer case to the 4LO mode, it commands the 2/4 wheel drive actuator assembly to turn the control actuator shaft, to move the high/low shift fork (9). The shift fork (9) moves the high/low clutch (5), which is slip splined on the rear output shaft (6) toward the rear of the transfer case. The high/low clutch (5) outer teeth disengage from the input shaft (2) inner teeth. The high/low clutch (5) outer teeth then engage in the planetary carrier teeth. The power flow is now from the input shaft (2) planetary teeth to the planetary gears (3) in the carrier. Rotating the planetary gears (3), which are engaged in the high/low internal gear (4), the planetary carrier rotates. The planetary carrier engaged to the high/low clutch (5), drives the rear output shaft (6), providing a 2.72:1 reduction to the speed of the rear output shaft (6). The power flow to the front propshaft (8) is the same as it is in the 4HI.

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.

Front Axle Actuator

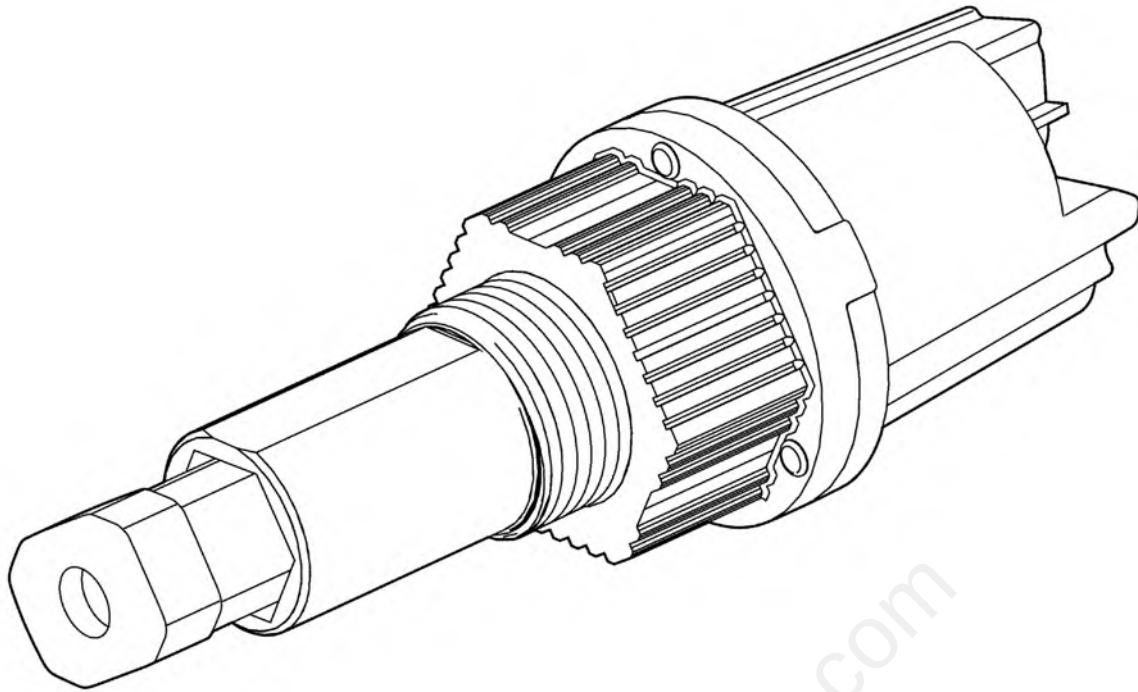


Fig. 88: Identifying Front Axle Actuator

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 malfunction 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

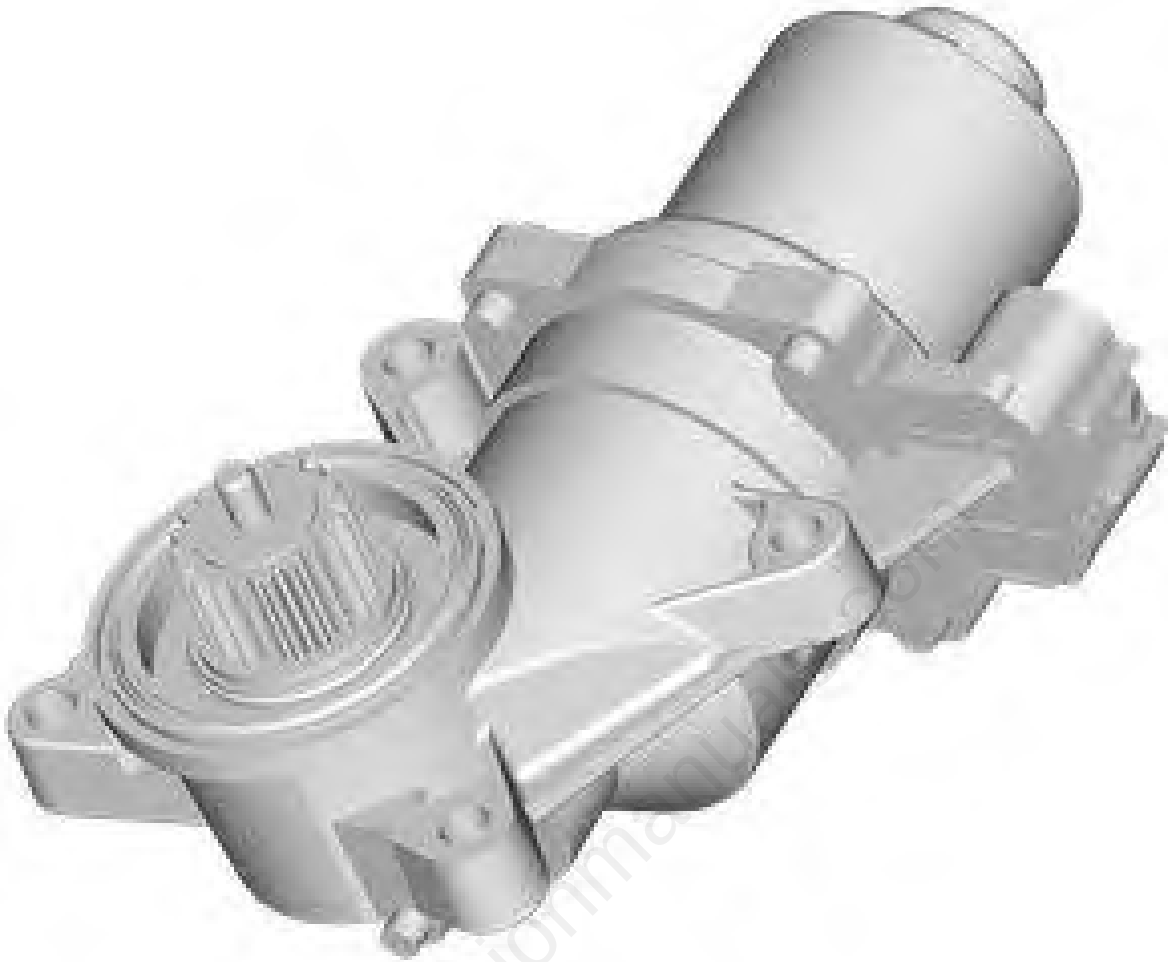


Fig. 89: Transfer Case Two/Four Wheel Drive Actuator Assembly
Courtesy of GENERAL MOTORS COMPANY

The transfer case two/four wheel drive actuator assembly consists of a permanent magnet DC motor and gear reduction assembly. It is located on the left hand side, driver's side, of the transfer case. When activated, it turns the shift detent lever shaft of the transfer case, clockwise or counterclockwise, to shift the transfer case. The motor/encoder is controlled with a PWM signal by the transfer case shift control module. This circuit consists of a driver on both the Motor A and Motor B circuits. The encoder motor is bi-directional in order to allow the motor to shift the transfer case from 2HI or 4HI to NEUTRAL and 4LO positions. Within the motor assembly are the Incremental Sensor and the Actuator Motor Lock.

Transfer Case Two/Four Wheel Drive Incremental Sensor

The incremental sensor is mounted within the transfer case actuator and is replaced with the actuator as an assembly. The incremental sensor converts the shift detent lever shaft position, representing a mode or range, into an electrical signal input to the transfer case shift control module. The module detects what position the transfer case is in by monitoring the voltage returned on the incremental encoder impulse signal circuit. This voltage translates into AUTO 4WD, 2HI, 4HI, NEUTRAL, and 4LO or in transition between gears.

Transfer Case Actuator Motor Lock

The motor lock is mounted within the transfer case actuator and is replaced with the actuator as an assembly. The transfer case motor lock is used to provide a 2HI, 4HI, and 4LO lock-up feature. When the lock circuit is energized,

se encoder motor is allowed to turn. When the transfer case is placed 2HI, 4HI, or 4LO the motor lock circuit is de-energized and the lock is applied. This assures that the transfer case remains in the current gear position until a new gear position is requested. When AUTO 4WD is selected, the motor lock remains applied until an adaptive mode, torque being applied to the front propshaft, is required. During an adaptive mode the motor lock circuit is energized and the motor lock is released, enabling the encoder motor to turn and apply or release torque at the front propshaft.

Transfer Case Actuator Shaft Position Sensor Assembly



Fig. 90: Transfer Case Actuator Shaft Position Sensor Assembly
Courtesy of GENERAL MOTORS COMPANY

The actuator shaft position sensor works in conjunction with the actuator motor incremental sensor and provides transfer case position (in degrees) to the TCCM.

Transfer Case Shift Control Module

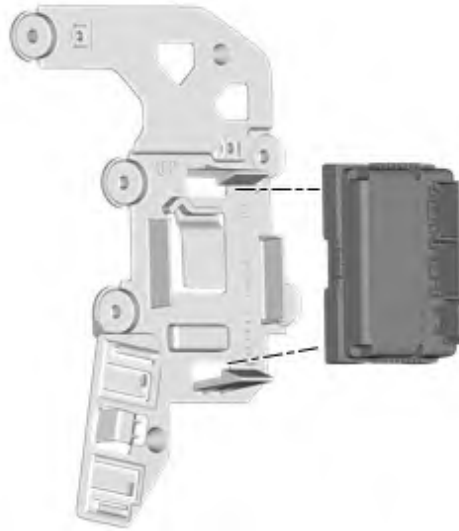


Fig. 91: Transfer Case Shift Control Module

Courtesy of GENERAL MOTORS COMPANY

The transfer case shift control module (TCCM) uses the vehicle identification number (VIN) information for calculations based on axle ratio, transmission, tire size, and engine size. For StabiliTrak applications, when the vehicle is in the AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the four wheel speed sensors in order to detect wheel slippage. For non-StabiliTrak applications, when the vehicle is in the AUTO 4WD mode, the transfer case shift control module monitors the wheel speed via the two front wheel speed sensors and the vehicle speed sensor in order to detect wheel slippage. When wheel slippage is detected, the module applies a clutch pack contained inside the transfer case. This clutch pack is used to lock-in and apply the front propshaft, transferring torque to the front wheels. The clutch pack is applied by a motor/encoder assembly. When slip is no longer detected by the transfer case shift control module, the clutch is no longer applied.

Vehicle Speed Sensor (VSS)



Fig. 92: Vehicle Speed Sensor (VSS)

Courtesy of GENERAL MOTORS COMPANY

There is a VSS mounted to the transfer case on the rear case half. 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 via the GM LAN serial data bus.

TOOLS AND EQUIPMENT

Illustration

Tool
Number/Description

SPECIAL TOOLS

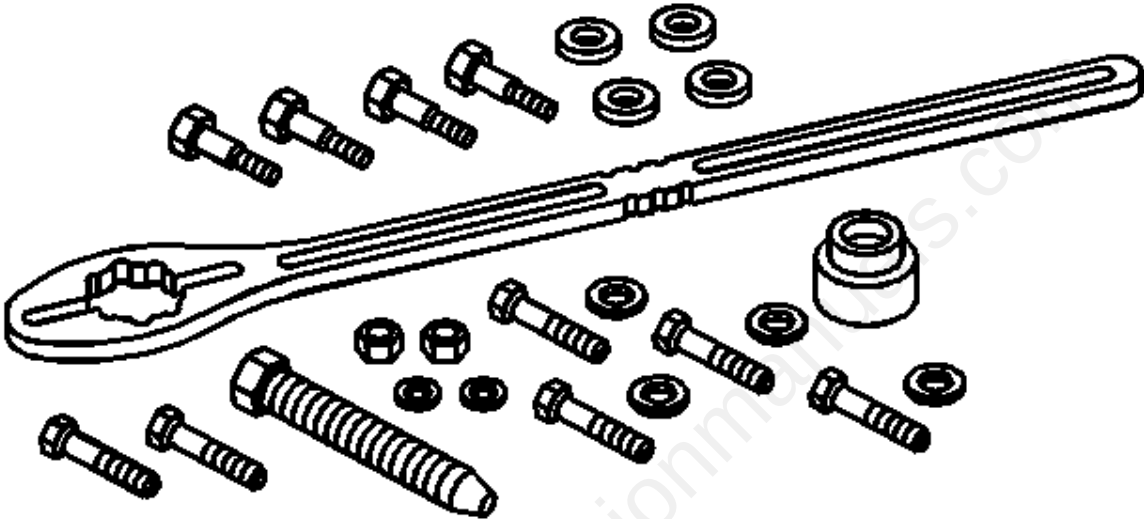
Illustration	Tool Number/Description
	DT-08614-A J-08614-A KM-210-3 7-0004805 Pinion Flange Holder and Remover

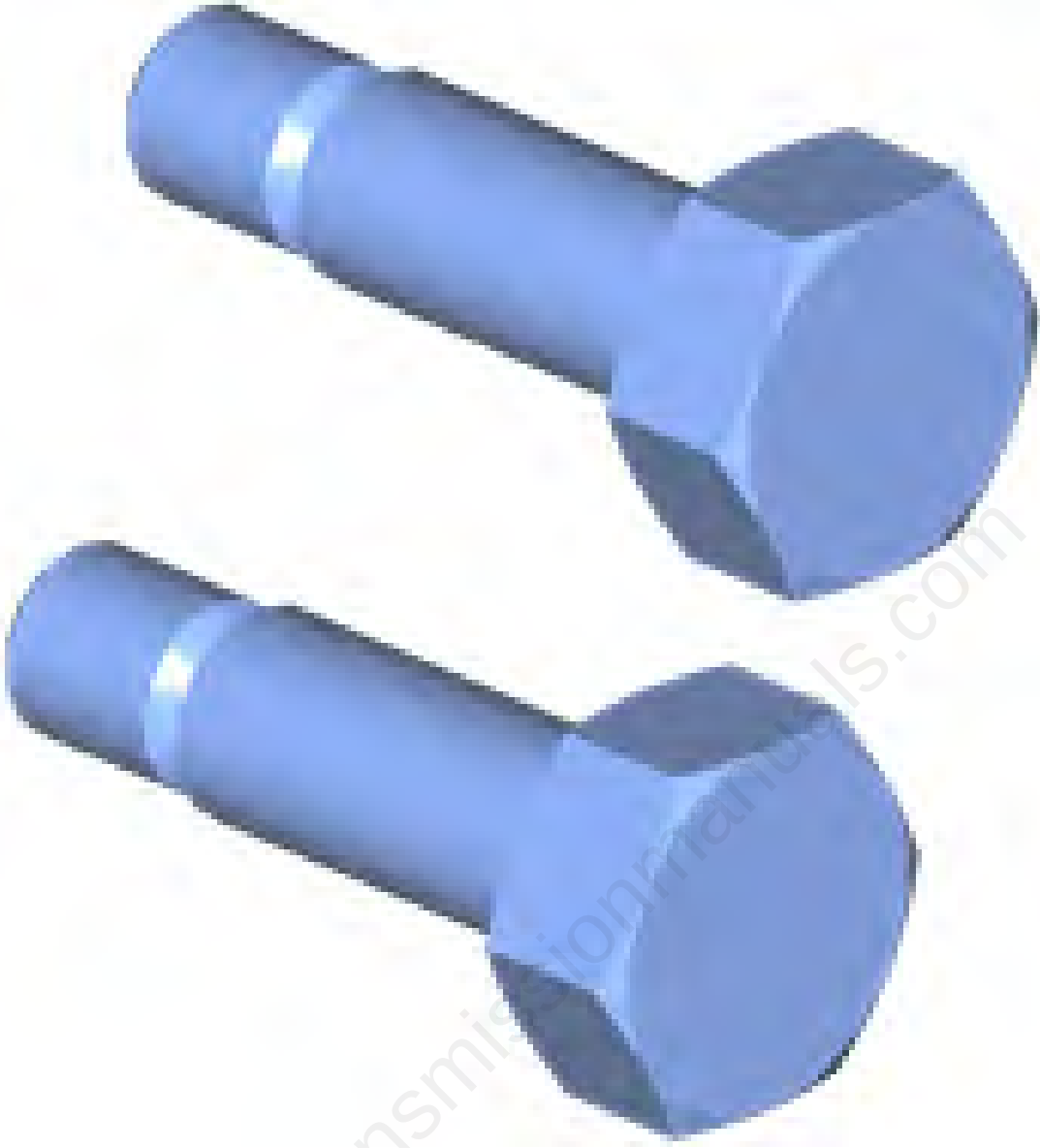
Illustration	Tool Number/Description
	DT-08614-20 J-08614-20 Flange Retaining Bolts

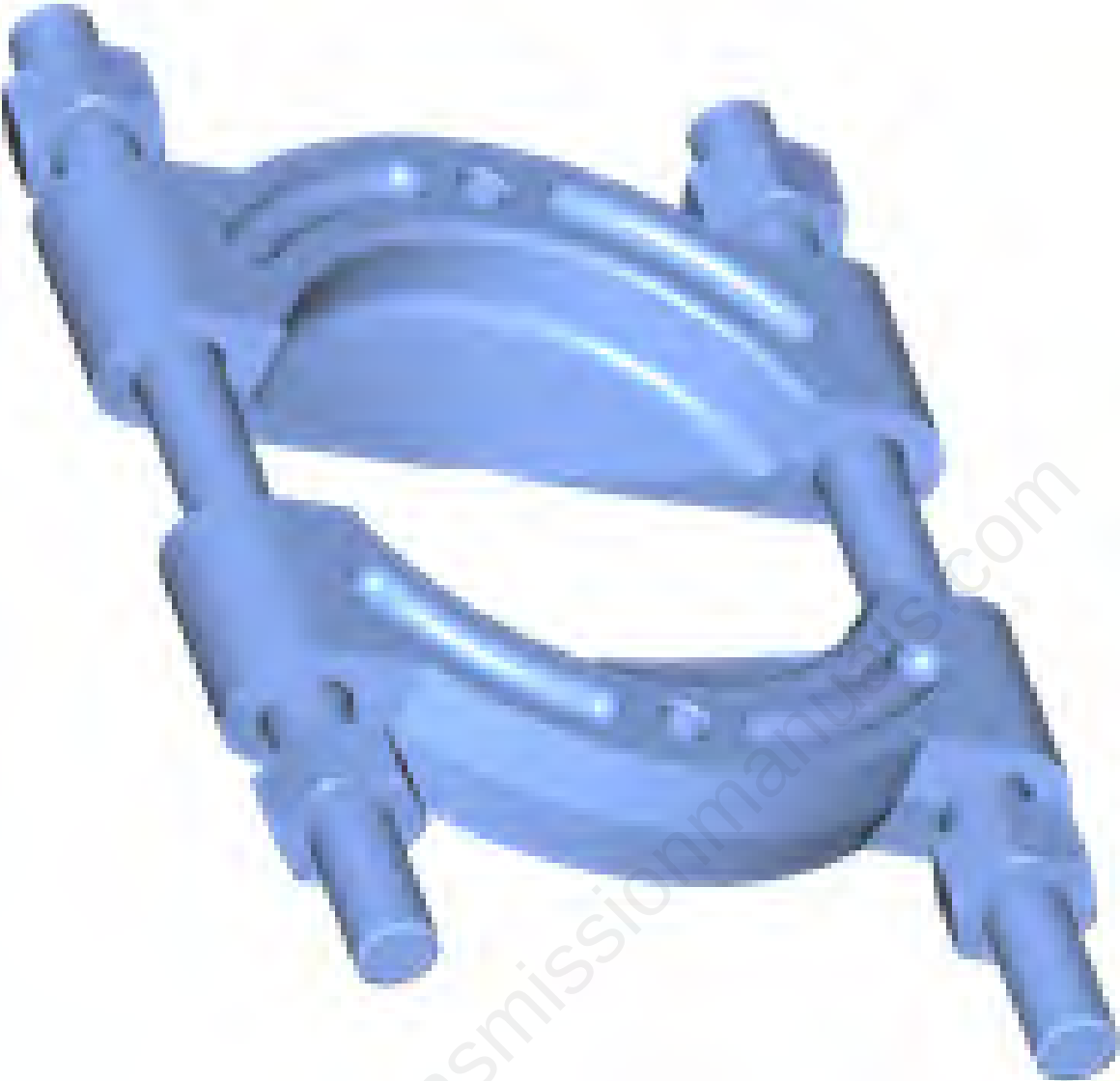
Illustration	Tool Number/Description
	DT-22912-B J-22912-B 6-9607356 Split Plate Bearing Puller

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 is a solid blue cylinder with a slightly flared end. A diagonal watermark 'transmissionmanuals.com' is visible across the image.	DT-35512 J-35512 Inner Pinion Bearing Installer

Illustration

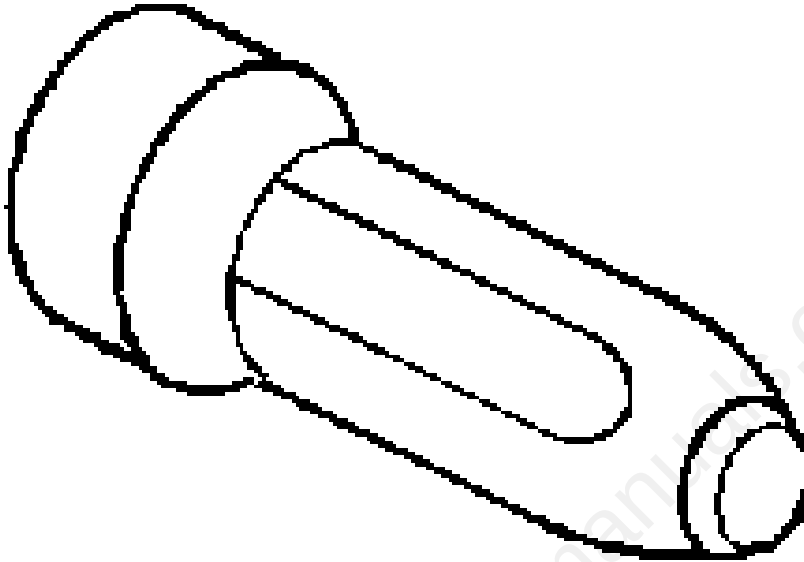
**Tool
Number/Description**

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
 A blue cylindrical bearing installer tool, shown at an angle, with a hollow interior. The tool is a simple tube with a slightly flared end. A watermark 'transmissionmanuals.com' is visible diagonally across the image.	DT-46496 Bearing Installer

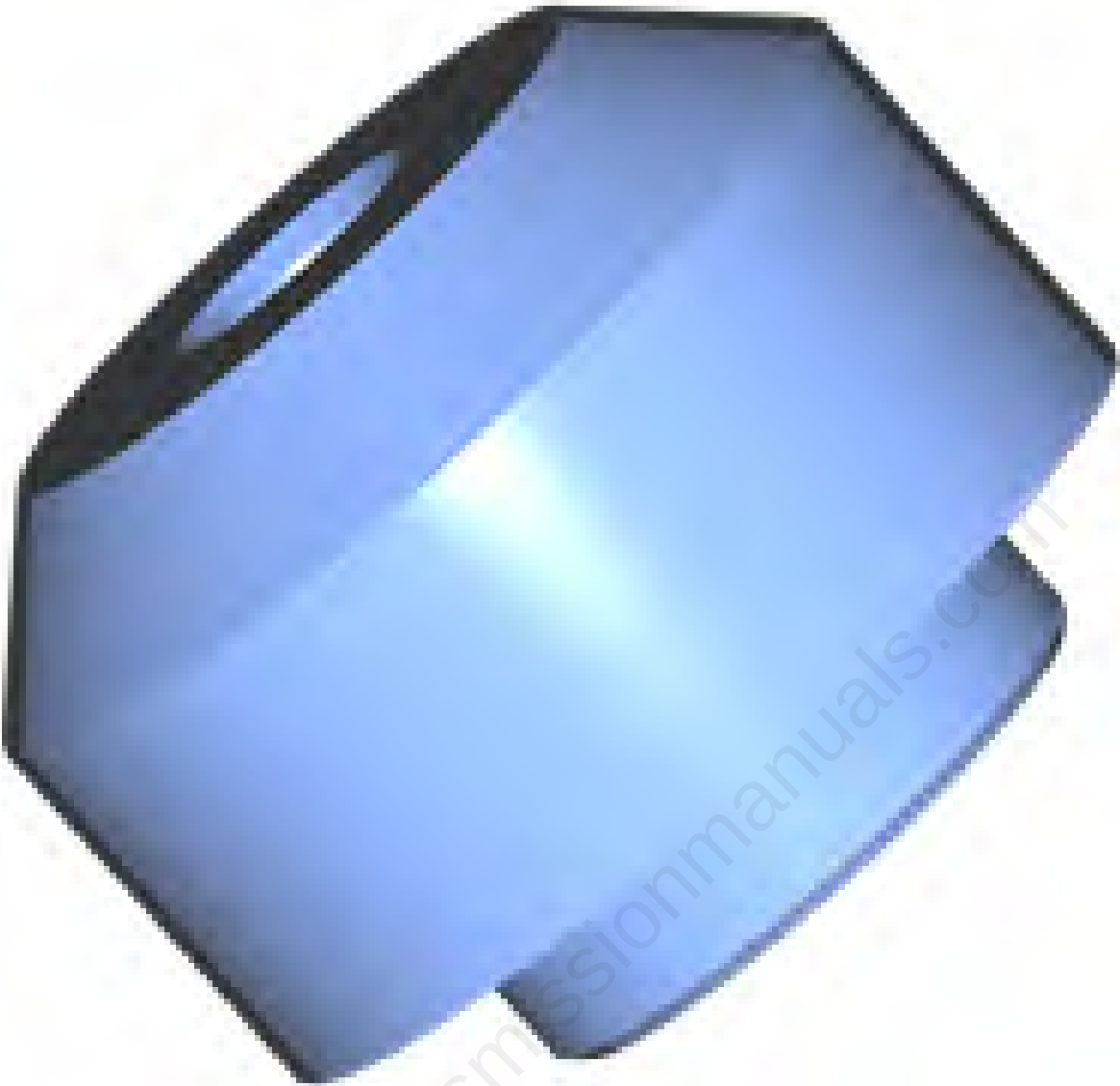
Illustration	Tool Number/Description
	DT-48021 Seal Installer

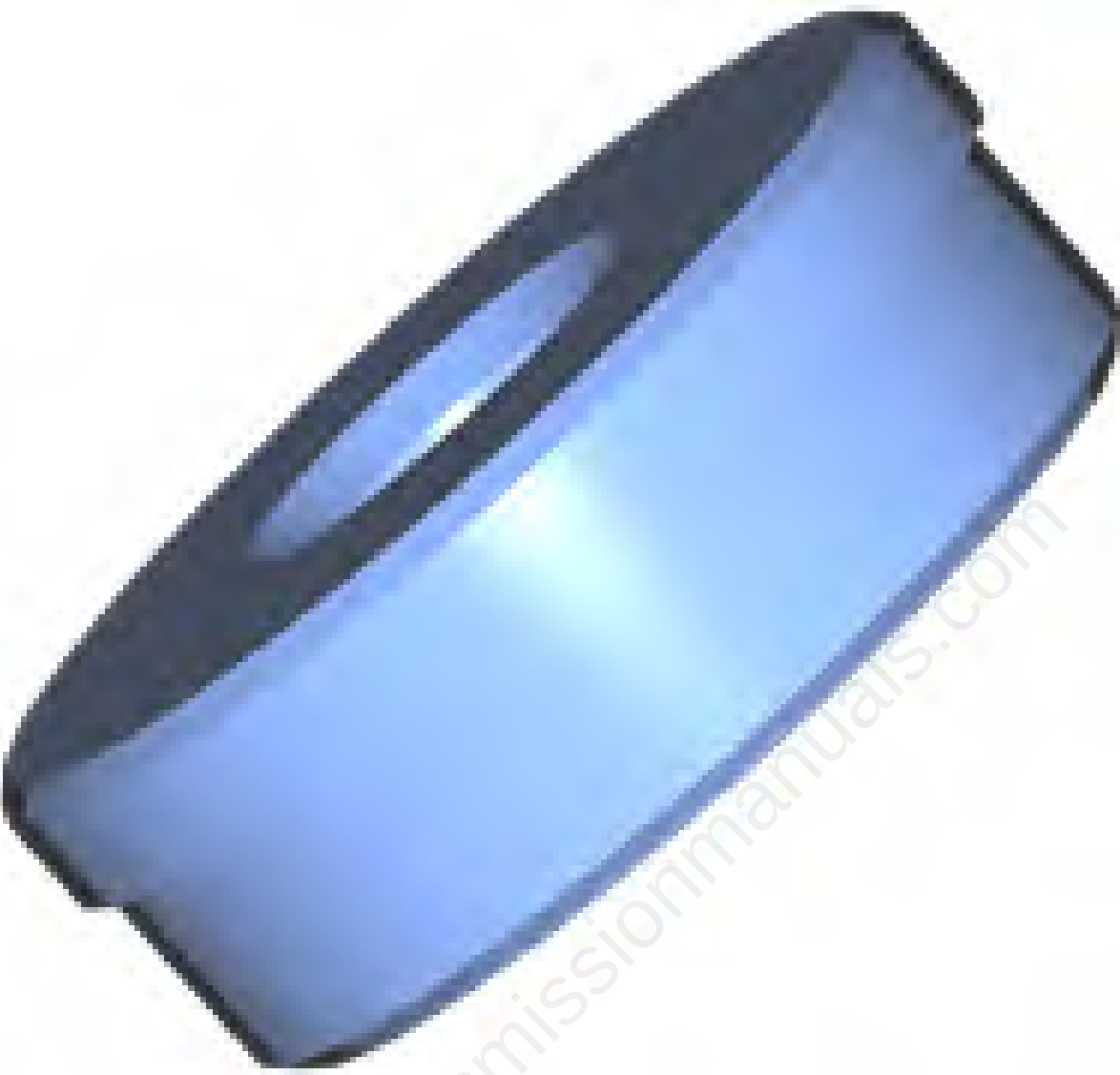
Illustration	Tool Number/Description
 A blue, L-shaped metal tool, identified as a bushing remover. It has a long, flat rectangular body with a perpendicular flange at one end. The tool is shown at an angle, highlighting its L-shape. A faint watermark 'transmissionmanuals.com' is visible across the image.	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-48213 Clutch Pack Height Gauge

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 'transmissionparts.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-A Case Seal Installer

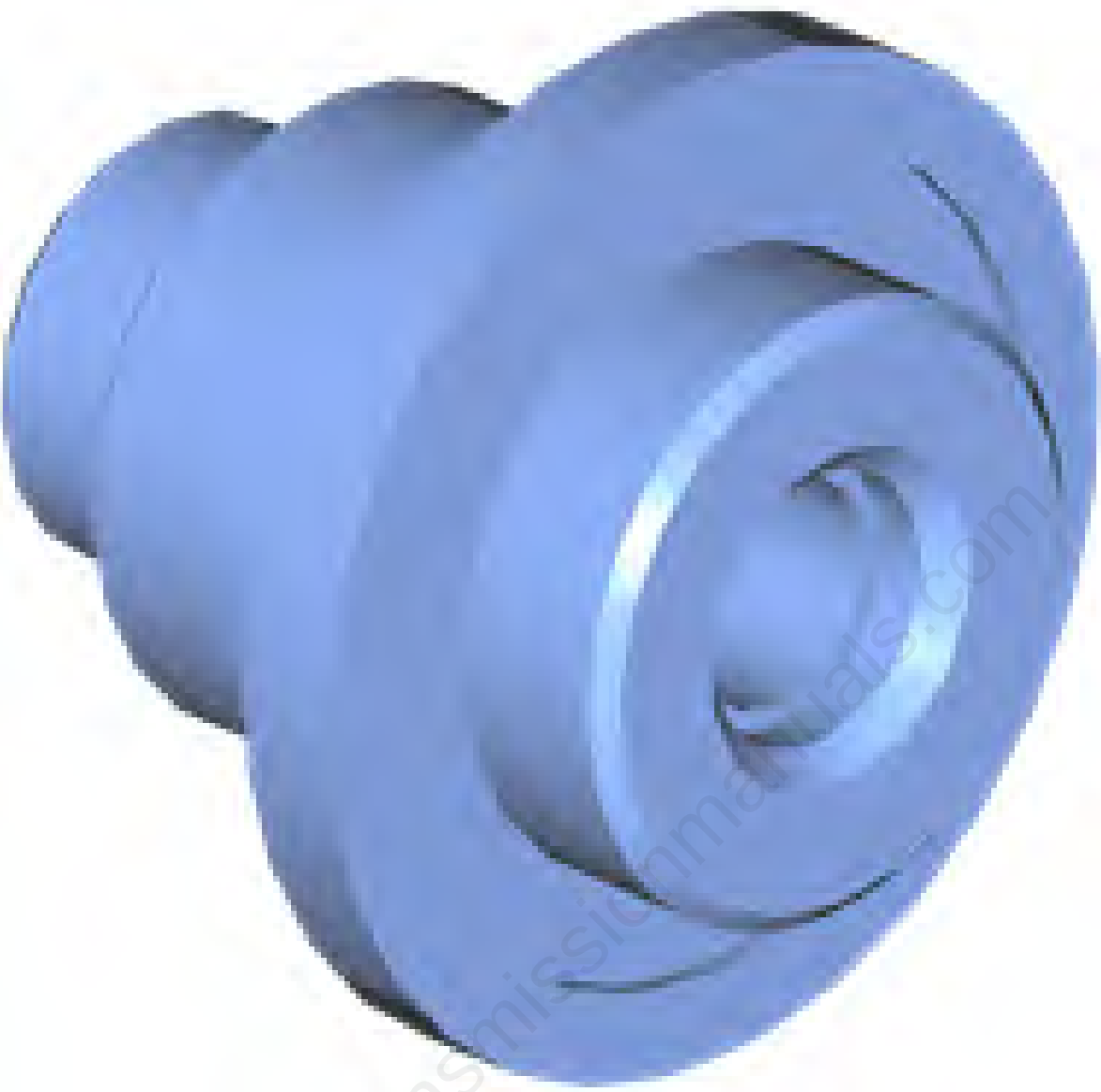
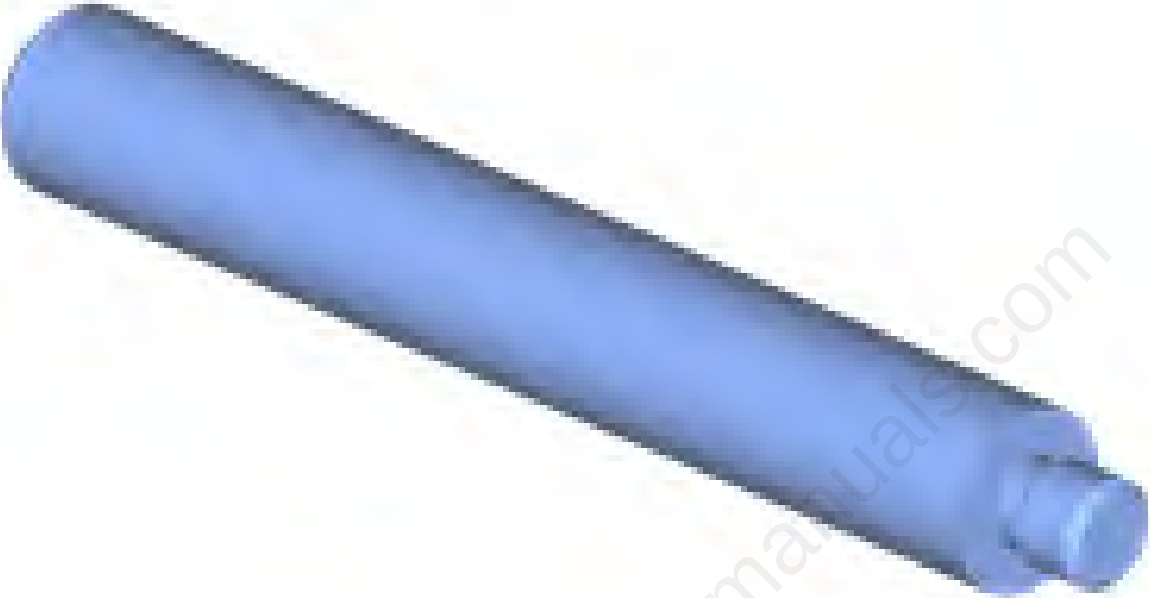
Illustration	Tool Number/Description
	DT-51336 Front Output Shaft Rear Bearing Installer

Illustration	Tool Number/Description
	DT-51592 Front Output Shaft Seal Installer

Illustration	Tool Number/Description
 A blue cylindrical driver handle tool, shown at an angle. The tool has a smooth, polished surface and a slightly wider, flanged end on the right side. A faint watermark 'transmissionmanuals.com' is visible diagonally across the image.	GE-8092 J-8092 Driver Handle

Illustration

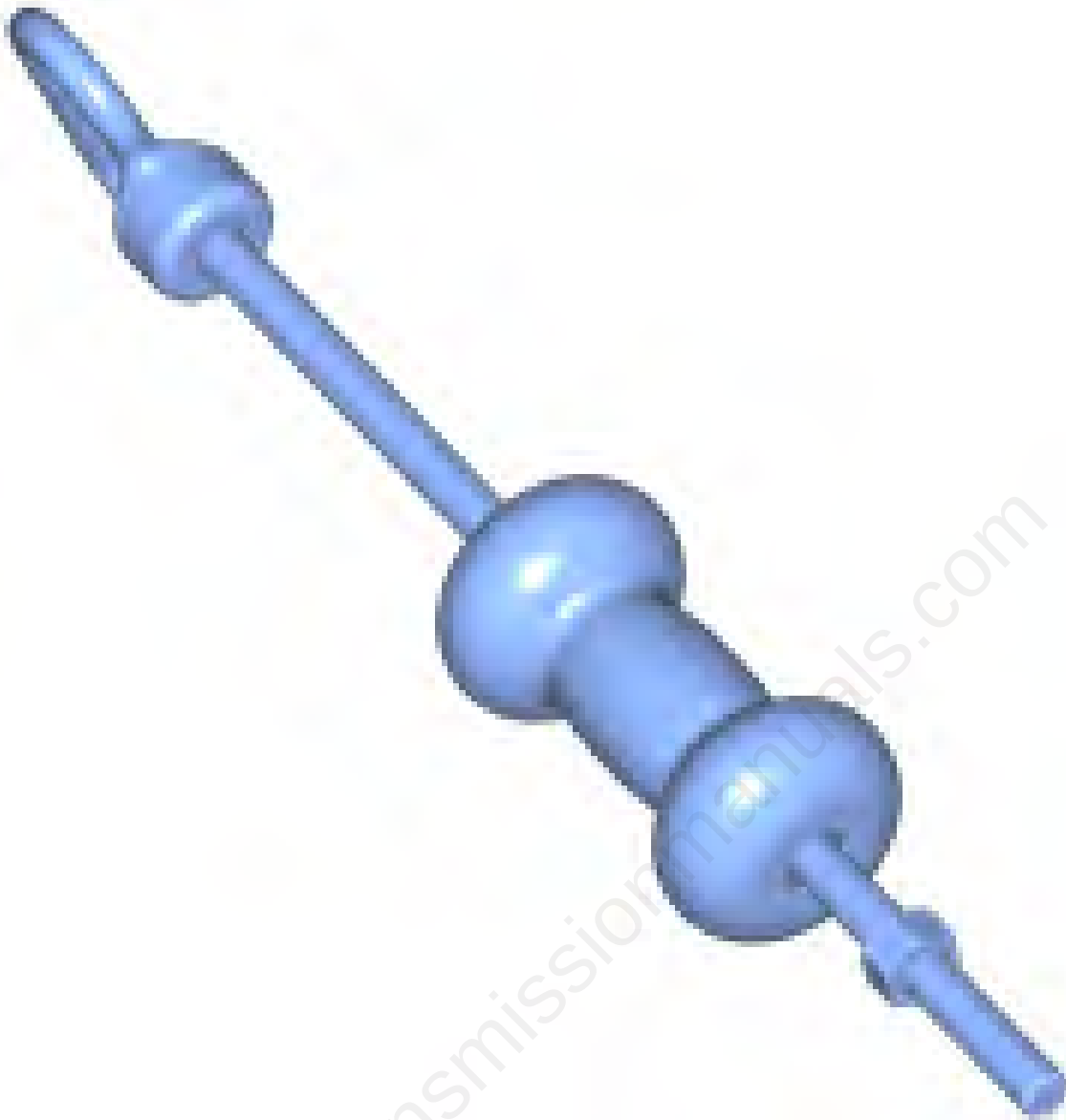
**Tool
Number/Description**



GE-8433-1
J-8433
Two Jaw Puller

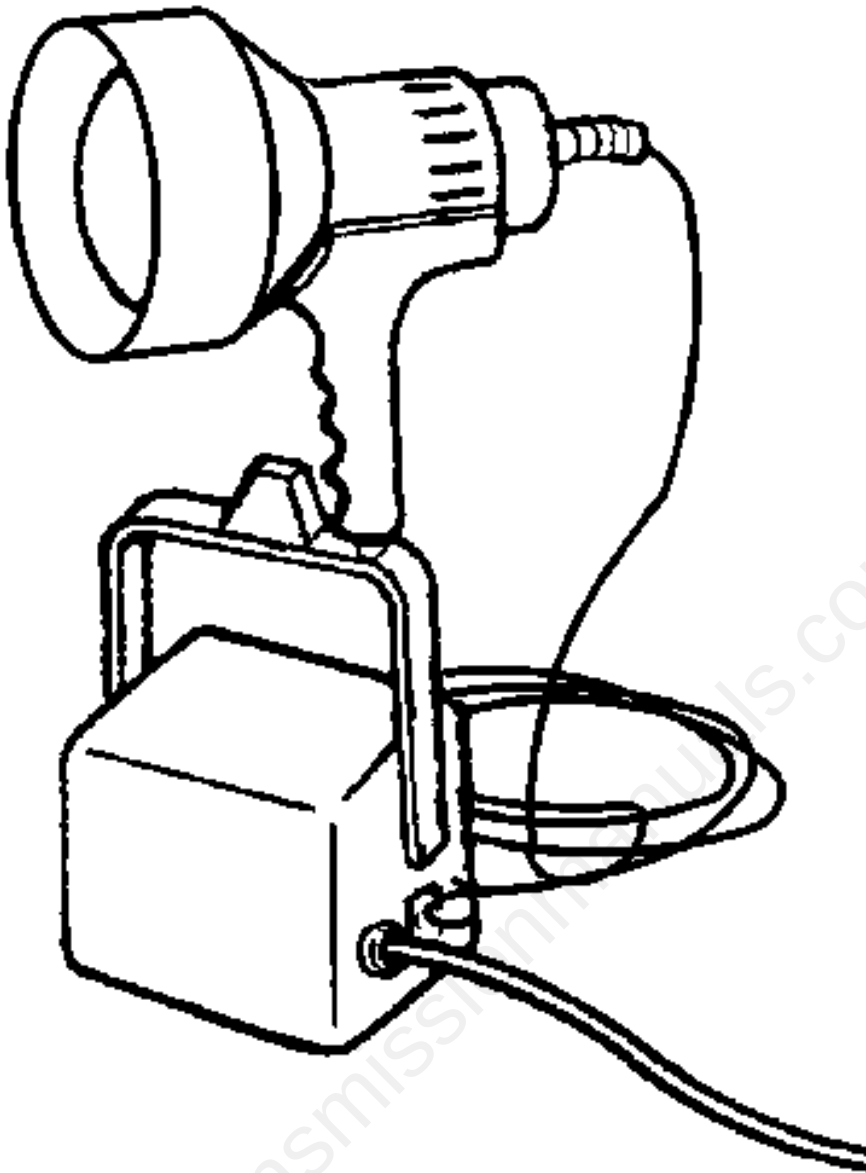
Illustration

**Tool
Number/Description**



GE-02619-01
J-02619-01
Slide Hammer

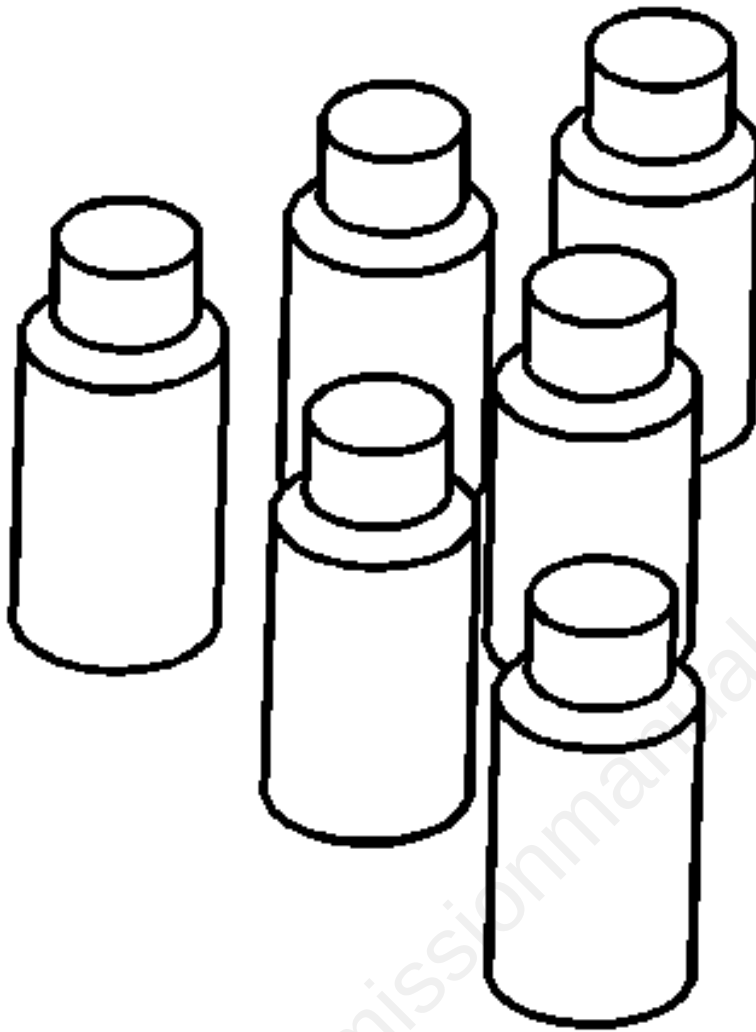
Illustration



Tool
Number/Description

GE-28428-E
J-28428-E
High Intensity Black
Light Kit

Illustration



Tool
Number/Description

GE-28431-6
J-28431-6
Fluorescent Oil Dye

Illustration	Tool Number/Description
	J-36366-A Pinion Oil Seal Installer

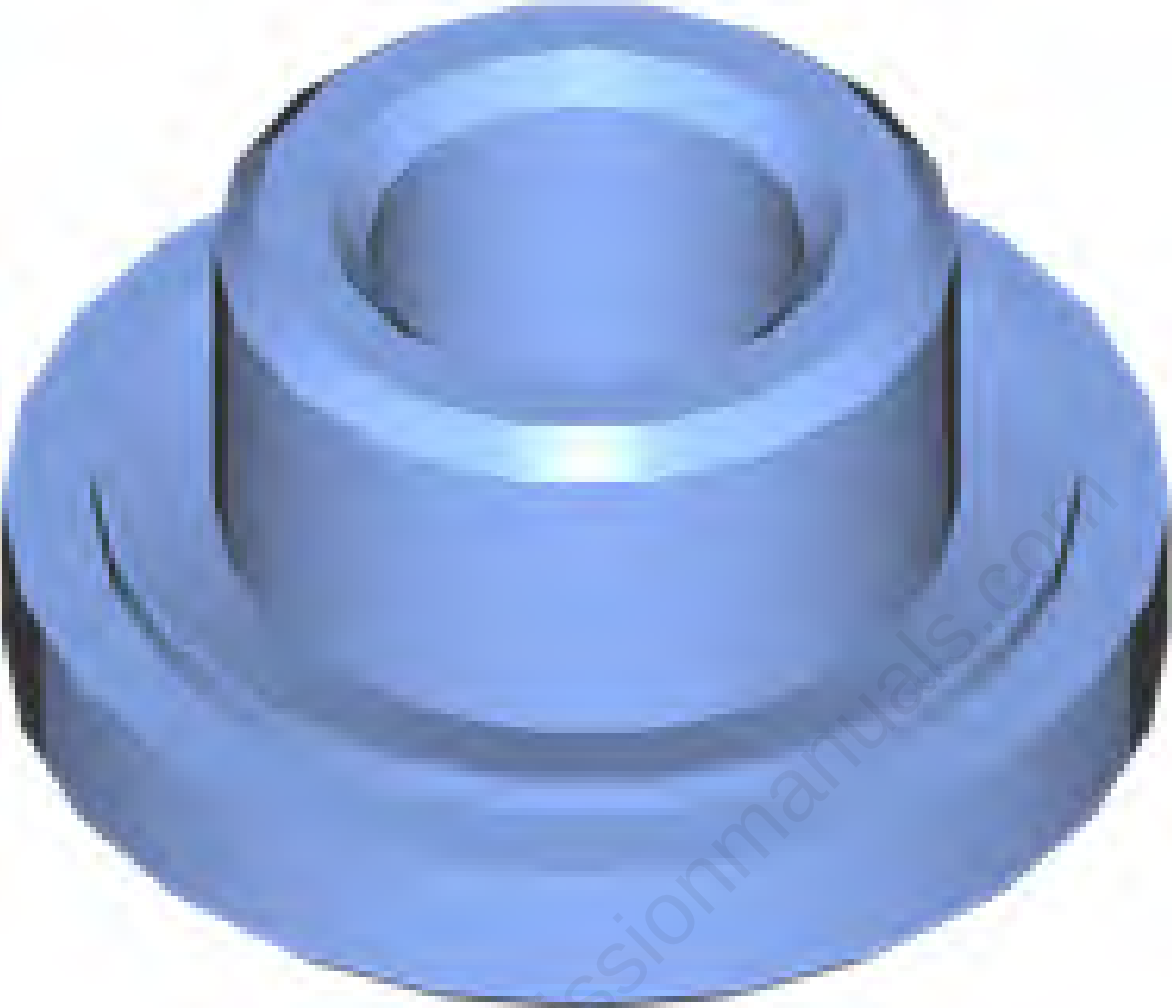
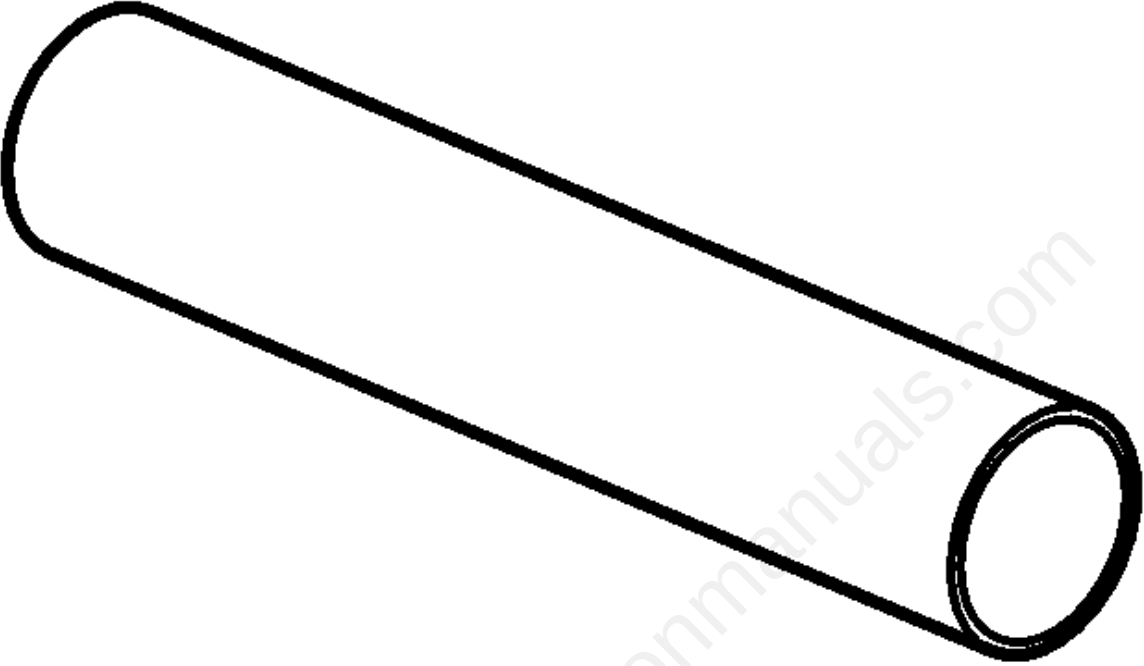
Illustration	Tool Number/Description
	J-36372 Input Sun Gear Needle Bearing Installer

Illustration	Tool Number/Description
	J-41736 Bearing Installer