

## SECTION 7D

# TRANSFER CASE

**CAUTION:** On vehicles equipped with Supplemental Inflatable Restraint (SIR), refer to CAUTIONS in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location view in Section 9J before performing service on or around SIR components or wiring. Failure to follow CAUTIONS could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

**NOTICE:** Always use the correct fastener in the correct location. Use the correct fastener part number to replace a fastener. If the correct fastener part number is not available, a fastener of equal size and strength may be used. Do not use a fastener that is stronger when the correct fastener part number is not available in the following applications:

- Some bolts are designed to permanently stretch, and if a stronger fastener is used, the part will not be tightened correctly. These permanently stretching bolts will be called out. The correct part number fasteners must be used to replace this type of fastener because there is no available equivalent.
- Other bolts are designed to break if over tightened to prevent part damage. If a stronger fastener is used part damage may occur.

Fasteners that need to be replaced when removed will be called out. Fasteners that require thread lockers or thread sealant will be called out. The correct tightening specification and sequence must be used when installing fasteners. Part or system damage may occur if the above instructions are not followed.

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# GENERAL DESCRIPTION

The transfer case is used to provide power flow from the transmission to the front axle. The transfer case also provides a way of disconnecting the front axle to provide better fuel economy and quieter operation when the vehicle is driven on roads where four wheel drive is not required. The transfer case provides an additional gear reduction when placed in low range. This is useful when difficult off-road conditions are encountered.

The New Process Model 241 transfer case is used on all four wheel drive vehicles under 9200 lbs. GVW. The K30 Models with single or dual rear wheels (RPO-R05) will use the Borg-Warner Models 4401 or 4470 transfer case.

All three models are aluminum case, chain driven units with four modes of operation: neutral, two wheel drive high range, four wheel drive high range, and four wheel drive low range. Gear reduction for low range is provided by a planetary gear set.

A floor mounted shift lever is used to select the operating range. Indicator lamps on the floor console show the current mode of operation. When four wheel drive has been selected, the four wheel drive indicator lamp is designed to come on whenever the front axle has engaged. A slight delay for the front axle indicator lamp to come on is normal.

## OPERATION

### TWO-WHEEL DRIVE OPERATION

When the transfer case is in "2 WHEEL" range, torque flows from the input gear to the range shift hub and main shaft, through the propeller shaft, to the rear axle.

### FOUR-WHEEL DRIVE HIGH RANGE OPERATION

Shifting into the "4 HI" range causes the following to happen:

1. The front axle indicator lamp does not come on until the front axle engages.
2. Torque flows from the input gear to the mainshaft the same as in the "2 WHEEL" position. The shift linkage moves the mode synchronizer sleeve into engagement with the clutch teeth of the drive sprocket. This locks the drive sprocket to the mainshaft through the synchronizer sleeve.
3. Torque is transmitted through the drive sprocket and drive chain to the driven sprocket and output shaft. Torque then flows through the front propeller shaft to the front axle.
4. The shift mechanism in the transfer case closes the transfer case switch. Current is then applied to the front axle thermal actuator and front axle switch. In the K30 vehicles power is also supplied by the transfer case relay to the transfer case synchronizer.
5. The thermal actuator contains a heating element, a gas charge, and a piston. When current is applied, the heating element heats the gas. The gas

expands, pushing the piston out after a delay of a few seconds. The piston actuates the shift fork in the front axle. This connects the right axle output shaft to the front axle differential. Torque is then available at the front wheels.

6. The front axle shift mechanism, when fully engaged, closes a switch, causing the front axle indicator lamp to come on. For more information on the front axle shift mechanism and actuator, refer to SECTION 4C.
7. If the shift lever is moved back to the "2 WHEEL" position, the operations in the preceding steps is reversed. The current to the thermal actuator is turned off. The gas cools, and the piston retracts, allowing the shift fork in the front axle to return to the two-wheel drive position.

### FOUR-WHEEL DRIVE LOW RANGE OPERATION

1. When the transfer case is shifted into the "4 LO" position, torque flow and operation is similar to the "4 HI" range, except that the range shift hub engages the planetary carrier. The planetary gear set then provides a gear reduction to the front and rear axles.

### ELECTRONIC SYNCHRONIZER OPERATION (MODELS 4401 and 4470 ONLY)

The electronic synchronizer is used in model 4401 and 4470 transfer cases to provide smoother shifting. The system requires no maintenance or service.

The system consists of a relay and a clutch coil (electromagnet) inside the transfer case. The clutch coil replaces the conventional blocker ring. When energized, the clutch coil provides synchronization, resulting in a smooth shift. When the transfer case lever is moved to "4 HI" or "4 LO" position, current is supplied to the normally closed relay. Current flows through the relay to the clutch coil. When the front axle engages, the axle switch energizes the relay coil. The relay switch then opens, and current to the clutch coil is interrupted. Refer to the electrical section of the Driveability, Emissions, and Electrical Diagnosis Manual GMT/95-CK-2 for a wiring schematic on the four wheel drive system.

## IDENTIFICATION

### NEW PROCESS MODEL 241

An identification tag is attached to the rear case half. The tag provides the transfer case model number, low range reduction ratio, and assembly part number.

### BORG-WARNER MODELS 4401 and 4470

An identification tag is attached to an extension housing bolt. The tag provides the transfer case model number, serial number, build date, and low range reduction ratio.

**DIAGNOSIS OF TRANSFER CASE**

PROBLEM	POSSIBLE CAUSE	CORRECTION
<b>Four Wheel Drive Does Not Engage</b>	<ol style="list-style-type: none"> <li>1. Blown A/C-HTR fuse.</li> <li>2. Faulty transfer case switch.</li> <li>3. Transfer case linkage improperly adjusted or disconnected.</li> <li>4. Faulty transfer case: Drive chain broken, range selector ring broken, etc.</li> <li>5. Faulty front axle actuator.</li> <li>6. Faulty wiring (K30, Borg-Warner Models 4401 and 4470).</li> <li>7. Open transfer case relay (K30, Borg-Warner Models 4401 and 4470).</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> <li>2. Replace.</li> <li>3. Adjust or repair.</li> <li>4. Repair. Refer to the Light Duty Truck Unit Repair Manual.</li> <li>5. Refer to SECTION 3C.</li> <li>6. Repair.</li> <li>7. Replace.</li> </ol>
<b>Four Wheel Drive Engages But Indicator Lamp Will Not Light</b>	<ol style="list-style-type: none"> <li>1. Blown bulb.</li> <li>2. A/C-HTR fuse blown.</li> <li>3. Faulty front axle switch.</li> <li>4. Faulty wiring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace.</li> <li>2. Replace.</li> <li>3. Replace.</li> <li>4. Repair open in wiring.</li> </ol>
<b>Four Wheel Drive Indicator Lamp Will Not Turn Off (4WD Disengages Properly)</b>	Faulty front axle switch and faulty transfer case switch..	Replace both.
<b>Four Wheel Drive Will Not Disengage</b>	<ol style="list-style-type: none"> <li>1. Transfer case linkage binding or improperly adjusted.</li> <li>2. Faulty front axle shift mechanism.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or replace.</li> <li>2. Refer to Section 3C.</li> </ol>
<b>Jumps Out of Four Wheel Drive</b>	<ol style="list-style-type: none"> <li>1. Transfer case linkage binding or improperly adjusted.</li> <li>2. Worn or damaged engine or transmission mountings.</li> <li>3. Transfer case mounting bolts loose.</li> <li>4. Drive shaft slip splines dry or loose.</li> <li>5. Transfer case or front axle internal problem.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust or repair.</li> <li>2. Replace.</li> <li>3. Tighten.</li> <li>4. Lubricate or replace.</li> <li>5. Refer to the Light Duty Truck Unit Repair Manual.</li> </ol>
<b>Transfer Case Shift Lever Difficult To Shift or Will Not Shift into 4 LOW or NEUTRAL (Vehicle Moving)</b>	Vehicle in motion when attempting to shift. Stop the vehicle when shifting into or out of 4 LOW or NEUTRAL.	None required.
<b>Transfer Case Difficult to Shift or Makes Noise While Shifting</b>	<ol style="list-style-type: none"> <li>1. In extremely cold weather, it may be necessary to reduce vehicle speed or stop before shifting from 2 WHEEL to 4 HIGH.</li> <li>2. If the vehicle has been operated for an extended period in 4 HIGH mode on dry pavement, difficult shifting may result due to driveline torque lock. Stop the vehicle, shift transmission to neutral and shift transfer case into desired mode.</li> <li>3. Transfer case linkage binding.</li> <li>4. Low transfer case lubricant level, or improper lubricant used.</li> <li>5. Internal transfer case problem.</li> </ol>	<ol style="list-style-type: none"> <li>1. None required.</li> <li>2. Operate the vehicle in 2 WHEEL mode on dry pavement. Oversize under-inflated tires may also cause torque lock.</li> <li>3. Adjust or repair.</li> <li>4. Fill with proper lubricant.</li> <li>5. Repair.</li> </ol>

## 7D-4 TRANSFER CASE

### DIAGNOSIS OF TRANSFER CASE (cont'd)

PROBLEM	POSSIBLE CAUSE	CORRECTION
Transfer Case Noisy in All Modes	1. Low lube level or improper lubricant used. 2. Worn, under-inflated, or oversize tires. 3. Internal transfer case problem.	1. Fill with proper lubricant. 2. Replace or inflate. 3. Refer to the Light Duty Truck Unit Repair Manual or replace with new service cam.
Noisy In Or Jumps Out Of 4 LOW Range	1. Transfer case not completely engaged in 4 LOW range. Stop vehicle, shift into NEUTRAL, then back to 4 LOW. 2. Shift linkage loose or binding. 3. Transfer case internal shift mechanism faulty.	1. None required. 2. Repair. 3. Refer to the Light Duty Truck Unit Repair Manual.
Lubricant Leaking From Transfer Case Vent	1. Transfer case overfilled.	1. Drain lubricant to proper level.
Lubricant Leak At Output Shaft Seals	1. Transfer case overfilled. 2. Vent hose plugged or kinked. 3. Output shaft seals damaged or incorrectly installed.	1. Drain lubricant to proper level. 2. Repair. 3. Replace.
Abnormal Front Tire Wear	1. Front end needs alignment. 2. Extended operation on hard, dry surfaces in 4 HIGH mode.	1. Align to specifications. Refer to Section 3A. 2. Operate vehicle in 2 WHEEL mode on hard, dry surfaces.
4 Wheel Drive Will Only Engage at Vehicle Speeds Less Than 5 MPH (K30, Borg-Warner Models 4401 and 4470)	1. Transfer case relay faulty. 2. Transfer case switch faulty. 3. Faulty wiring.	1. Replace. 2. Replace. 3. Repair.
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### ELECTRONIC SYNCHRONIZER SYSTEM CHECK (MODELS 4401 AND 4470 ONLY)

1. Place the ignition switch in the RUN position with 4WD engaged. It may be necessary to rotate the front tires slightly for the front axle to fully engage.
2. Make sure the 4WD indicator lamp is on. Disconnect the front axle switch connector at the front axle. The 4WD indicator lamp should stay on. This indicates that the transfer case switch and the front axle switch is good.

3. Disconnect the electronic synchronizer connector at the transfer case. Connect a test lamp from the wiring harness connector to a ground. The test lamp should light if not, check the transfer case relay.
4. If the test lamp does not light, check the circuit for opens. If none are found, replace the clutch coil relay. Refer to "Clutch Coil Relay Replacement."
5. If the test lamp lights in step 3, check the synchronizer coil for continuity. If the coil is open, replace it as outlined in the Light Duty Truck Unit Repair Manual. If the synchronizer coil has continuity, it is probably OK. Recheck fluid levels, linkage adjustments, etc. before presuming the synchronizer to be faulty.

## ON-VEHICLE SERVICE

### TRANSFER CASE OIL CHANGE

#### Remove or Disconnect

- Raise the vehicle and support with safety stands.
  - Place a drain pan under the drain plug.
1. Drain plug. Allow the oil to drain.
  2. Fill plug.

#### Install or Connect

1. Drain plug.



#### Tighten

- Drain plug to 25 N·m (18 lbs. ft.).
2. Oil as described in SECTION 0B. Fill the transfer case until the oil level is at the bottom of the filler plug hole.
  3. Fill plug.



#### Tighten

- Fill plug to 25 N·m (18 lbs. ft.).
- Lower the vehicle.

### TRANSFER CASE LINKAGE ADJUSTMENT

Refer to figures 1 and 2.

1. Place the shift lever in the "4 HI" position.
2. Raise the vehicle and support with safety stands.
3. Disconnect the linkage rod from the console shift lever.
4. Shift the transfer case into "4 HI" position (transfer case shift lever in full forward detent). You should hear a click sound to indicate that the transfer case lever is all the way back.
5. Adjust the swivel to align with the notch in the console shift lever.
6. Lower the vehicle.

### SKID PLATE REPLACEMENT

#### Remove or Disconnect (Figure 3)

- Raise the vehicle and support with safety stands.
1. Skid plate to the frame nuts and bolts.
  2. Skid plate from the frame.

#### Install or Connect (Figure 3)

1. Skid plate to the frame.
2. Skid plate to the frame nuts and bolts.



#### Tighten

- Bolts to 63 N·m (46 lbs. ft.).
- Lower the vehicle.

### SHIFT LEVER REPLACEMENT

#### Remove or Disconnect (Figures 1, 2, 4, and 5)

1. Shift knobs from the transfer case and transmission shift levers.
2. Console to the floor screws.
3. Console.
4. Indicator lamp harness from the console.
5. Shift lever to the floor bolts.
- Raise the vehicle and support with safety stands.
6. Swivel from the shift lever.
7. Shift lever from vehicle.

#### Install or Connect (Figures 1, 2, 4, and 5)

1. Shift lever to the vehicle.
2. Swivel to the shift lever.

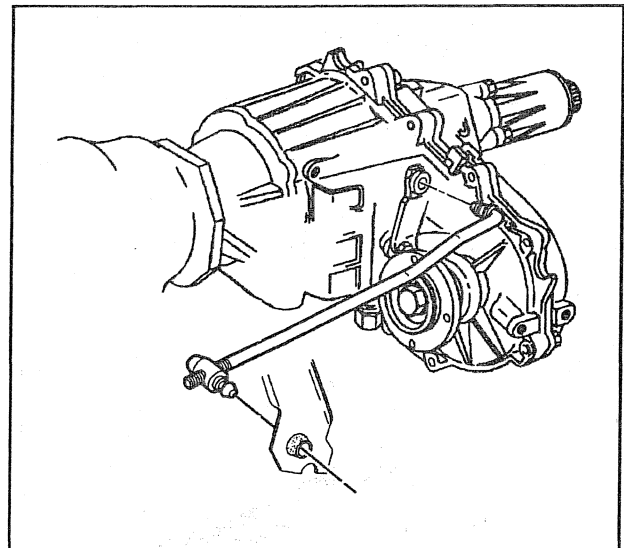


Figure 1—Transfer Case Linkage

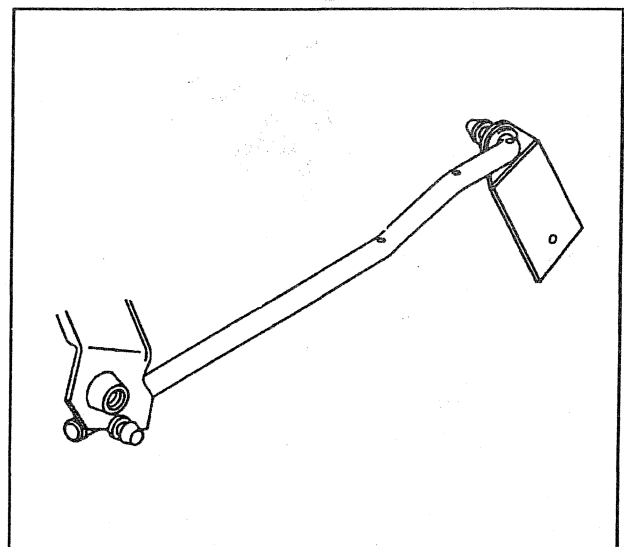


Figure 2—Transfer Case Linkage Adjustment

## 7D-6 TRANSFER CASE

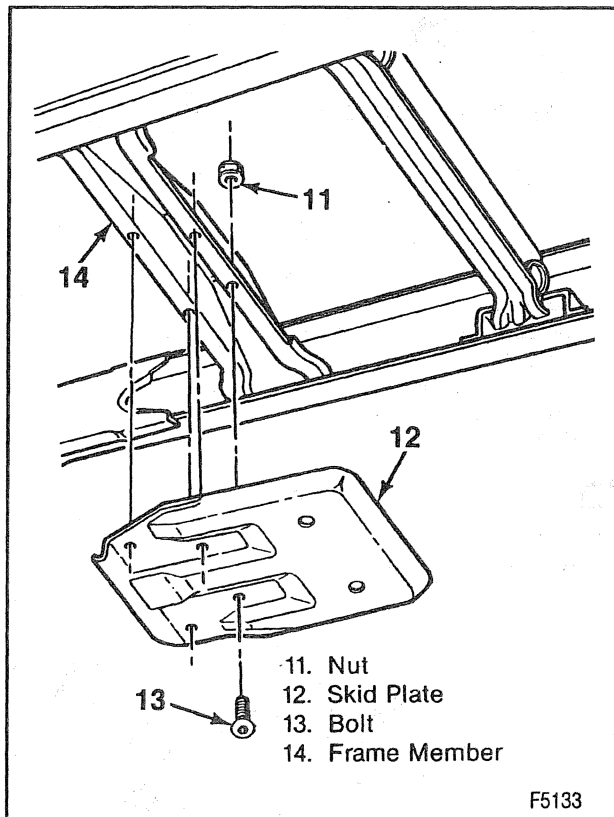


Figure 3—Skid Plate Replacement

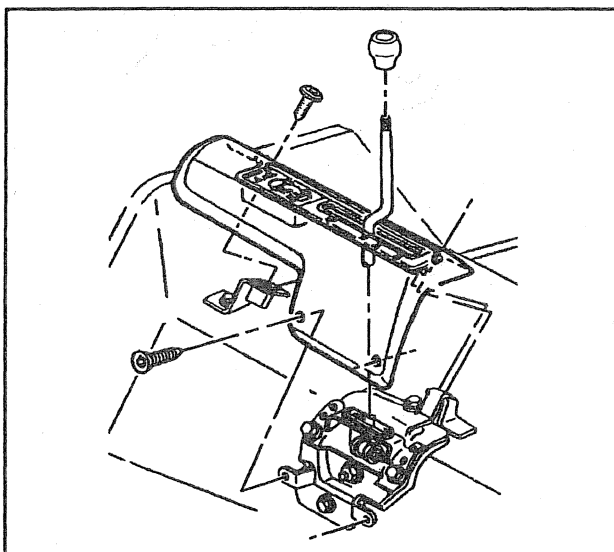


Figure 4—Transfer Case Shift Lever Bezel

- Lower the vehicle.

3. Shift lever to the floor bolts.



**Tighten**

- Shift lever to the floor bolts to 11 N.m (97 lbs. in.).

4. Console.
5. Indicator lamp harness to the console.
6. Console to the floor screws.

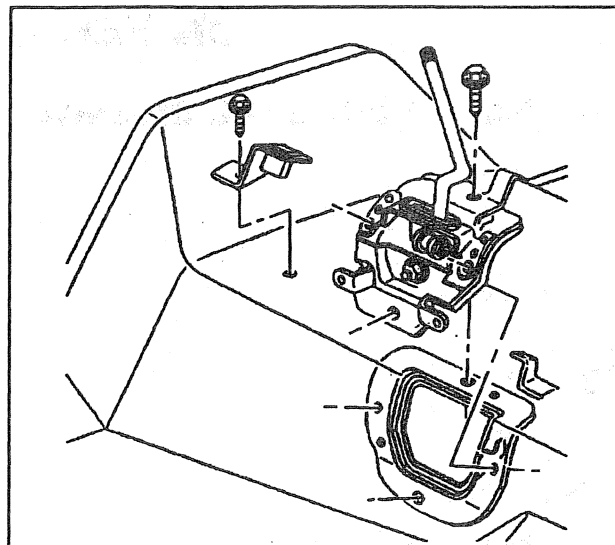


Figure 5—Shift Lever Assembly



**Tighten**

- Console to the floor screws to 1.4 N.m (12 lbs. in.).

7. Shift knobs to the shift levers.

## CLUTCH COIL RELAY REPLACEMENT

The relay is mounted to the cowl, under the hood.



**Remove or Disconnect (Figure 6)**

1. Wiring harness retainer.
2. Wiring harness connector.
3. Relay screws.
4. Clutch coil relay.



**Install or Connect (Figure 6)**

1. Clutch coil relay.
2. Relay screws.



**Tighten**

- Relay screws to 2.8 N.m (25 lbs. in.).

3. Wiring harness connector.
4. Wiring harness retainer.

## TRANSFER CASE SWITCH REPLACEMENT

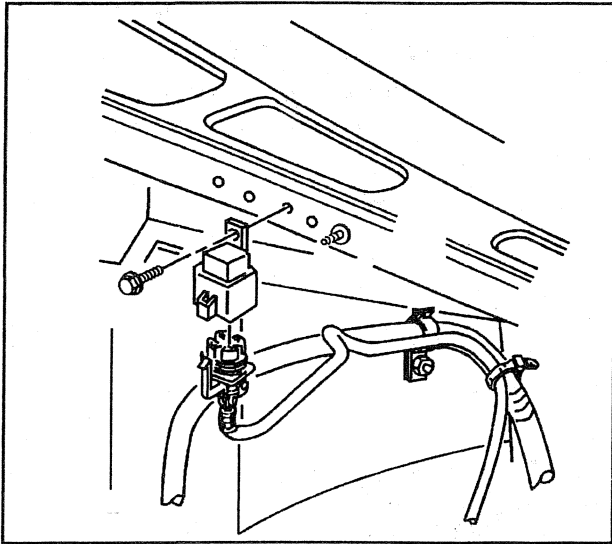
The switch is located on the left upper side of the transfer case.



**Remove or Disconnect**

- Raise the vehicle and support with safety stands.

1. Wiring harness connector from the switch.
2. Switch from the transfer case.



**Figure 6—Clutch Coil Relay**



**Install or Connect**

1. Switch to the transfer case. Coat the threads with thread sealant.
2. Wiring harness connector.
  - Lower the vehicle.

**VENT HOSE REPLACEMENT**

When replacing the vent hose, be sure to route it as shown in figures 7 and 8. The installed hose must be free of kinks.

**TRANSFER CASE OUTPUT SHAFT SEAL REPLACEMENT**

This applies to front and rear output shaft seals.



**Remove or Disconnect (Figures 9 through 11)**

- Raise the vehicle and support with safety stands.
1. Front or rear propeller shaft.
  2. Propeller shaft yoke nut and flat washers (not used at rear on some models).
  3. Propeller shaft yoke.
  4. Shield (if used).
  5. Seal. Pry out with a screwdriver. Use care not to damage the sealing bore.



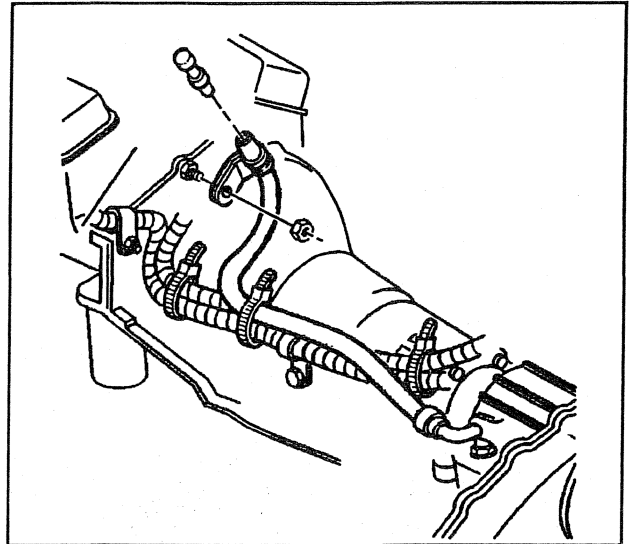
**Install or Connect (Figures 9 through 11)**

Tools Required:

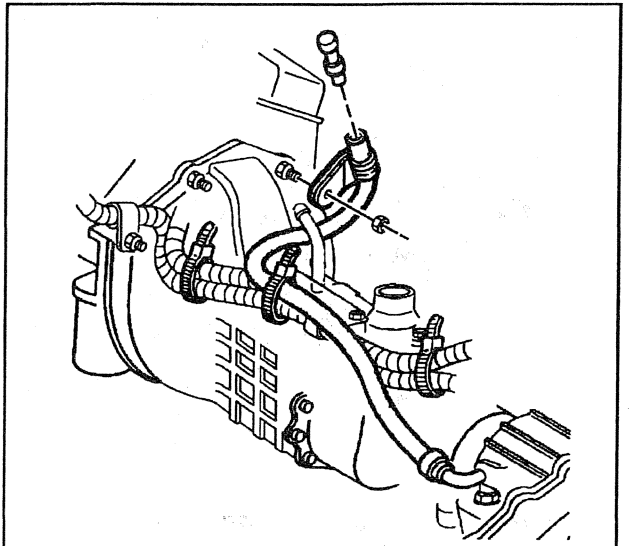
J 29162 Rear Output Shaft Seal Installer (NP 241 Transfer Case)

J 37668-A Output Shaft Seal Installer (B-W 4401 and 4470 Transfer Cases)

1. Seal.
  - A. Lubricate the seal lips with ATF or petroleum jelly.
  - B. Install the seal using the proper tool (figure 11).
  - C. NP 241 transfer case (all vehicles except K30 with dual rear wheels): Use J 29162 for front seal and rear seal.
  - D. B-W 4401 and 4470 transfer cases (K30 with dual rear wheels): Use J 37668-A.



**Figure 7—Vent Hose Routing (Automatic Transmission)**



**Figure 8—Vent Hose Routing (Manual Transmission)**

2. Shield (if used).
3. Propeller shaft yoke.
4. Flat washers and nut (if used).



**Tighten**

- Nut to specifications.
  - NP 241 transfer case: 149 N·m (110 lbs. ft.).
  - B-W 4401 and 4470 transfer case (front nut): 225 N·m (165 lbs. ft.).
  - B-W 4401 and 4470 transfer case (rear nut): 170 N·m (125 lbs. ft.).
5. Propeller shaft.
    - Check the transfer case lubricant level and add as necessary.
    - Lower the vehicle.

## 7D-8 TRANSFER CASE

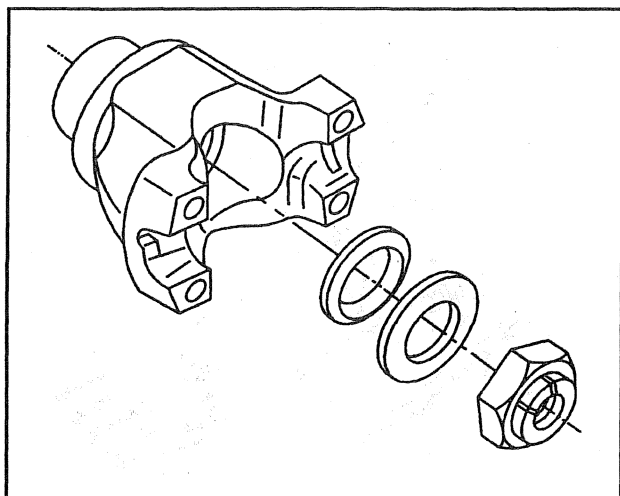


Figure 9—NP 241 Transfer Case Yoke, Nut, and Washers

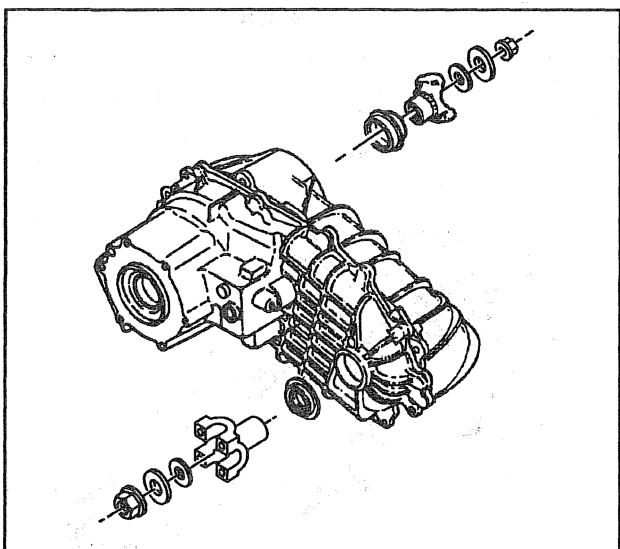


Figure 10—BW 4401 and 4470 Transfer Case Components

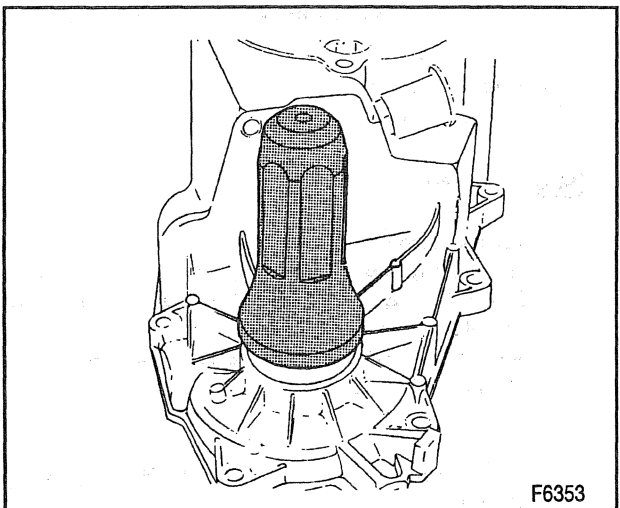


Figure 11—Installing the Output Shaft Oil Seal

### REAR EXTENSION AND REAR RETAINER HOUSINGS REPLACEMENT (NP 241 TRANSFER CASE)

#### ↔ Remove or Disconnect (Figures 12 through 14)

- Raise the vehicle and support with safety stands.
- 1. Rear propeller shaft and yoke.
- 2. Rear extension housing to rear retainer housing bolts.
- 3. Rear extension housing from the rear housing.
  - Tap the extension housing with a rubber mallet to free housing from sealant.
- 4. Snap ring.
- 5. Rear retainer housing bolts.
- 6. Rear retainer housing.
- 7. Seal. Pry out with a screwdriver. Use care not to damage the sealing bore.

#### 🧼 Clean

- Gasket surfaces with a suitable solvent.

#### ↔ Install or Connect (Figures 12 through 14)

Tool Required:

J 29162 Rear Output Shaft Seal Installer

1. Rear retainer housing.
  - A. Make sure the gasket surfaces are clean and free of grease and oil.
  - B. Apply RTV sealer GM P/N 12345739 to the rear retainer housing sealing surfaces.
2. Rear retainer housing bolts.
  - Apply (GM P/N 12345382) or equivalent to the threads of the bolts.

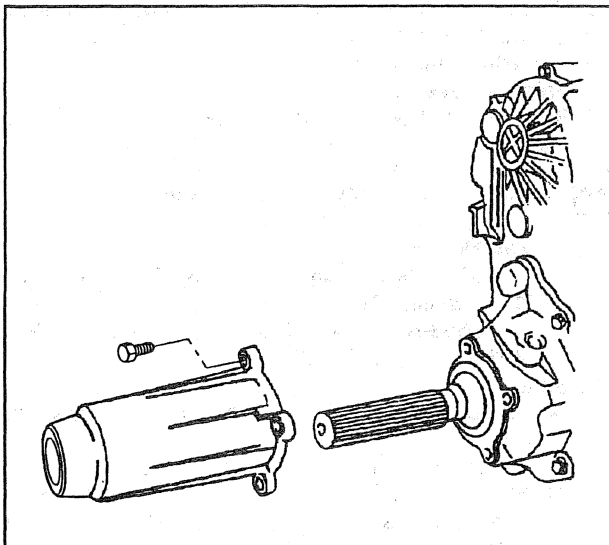
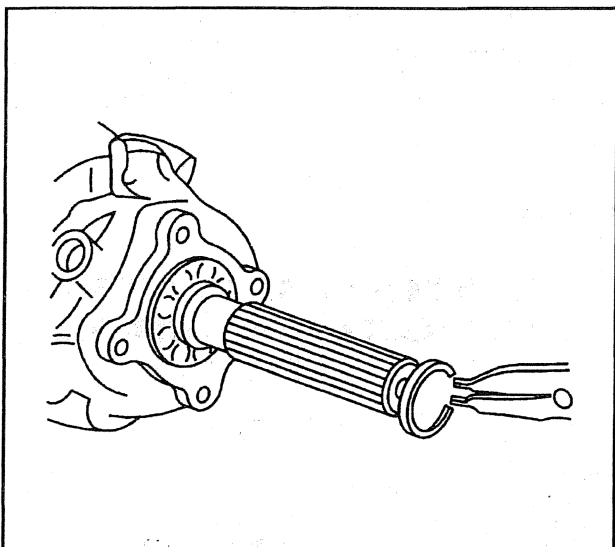
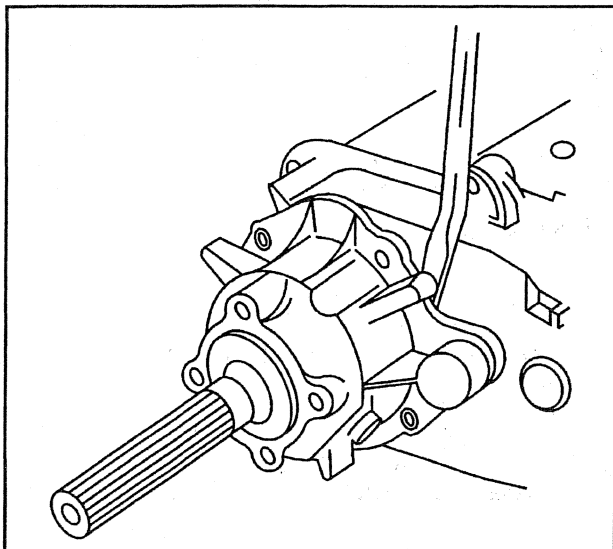


Figure 12—NP 241 Transfer Case Rear Extension Housing





**Figure 13—NP 241 Transfer Case Rear Bearing Snap Ring**



**Figure 14—NP 241 Transfer Case Rear Retainer Housing**



**Tighten**

- Bolts to 40 N.m (30 lbs. ft.).
- 3. Snap ring.
- 4. Rear extension housing to the transfer case.
  - A. Make sure the gasket surfaces are clean and free of grease and oil.
  - B. Apply RTV sealer GM P/N 12345739 to the rear extension housing sealing surfaces.
- 5. Rear extension housing bolts.
  - Apply (GM P/N 12345382) or equivalent to the threads of the bolts.



**Tighten**

- Bolts to 31 N.m (23 lbs. ft.).
- 6. Seal.
  - A. Lubricate the seal lips with ATF or petroleum jelly.

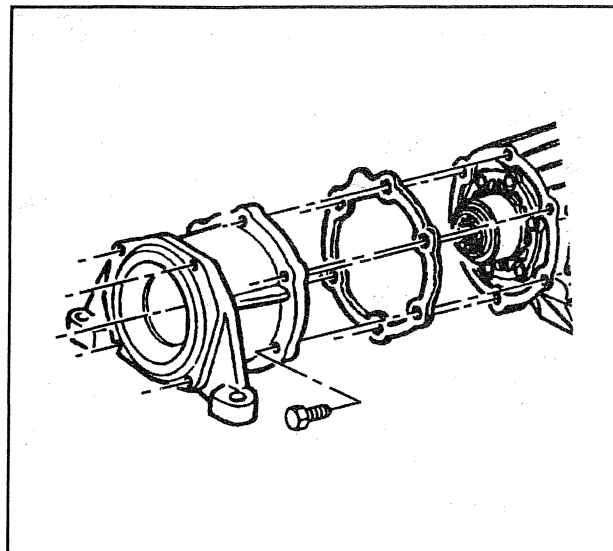
- B. Install using J 29162 (figure 9).
- 7. Rear propeller shaft and yoke.
  - Fill the transfer case with the proper lubricant. Refer to SECTION 0B.
  - Lower the vehicle.

## TRANSFER CASE REPLACEMENT

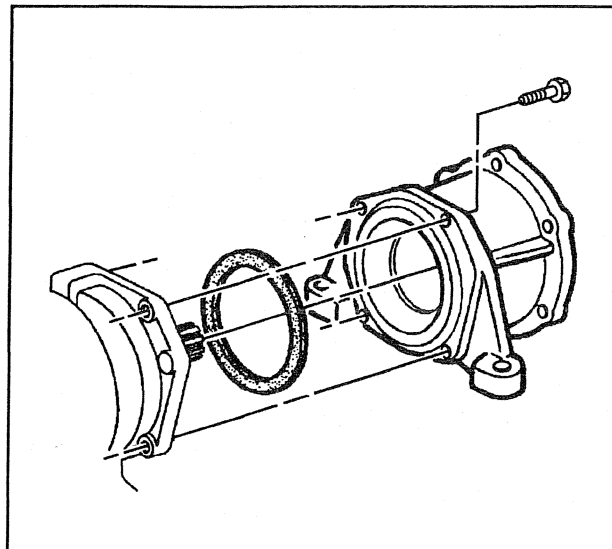


**Remove or Disconnect (Figures 15 through 17)**

1. Negative battery cable. Refer to SECTION 0A.
  - Raise the vehicle and support with safety stands.
2. Skid plate (if equipped). Refer to "Skid Plate Replacement."
- Drain the oil from the transfer case.
3. Front propeller shaft. Refer to SECTION 4A.



**Figure 15—Automatic Transmission Adapter to Transfer case**



**Figure 16—Automatic Transmission Adapter to Transmission**

## 7D-10 TRANSFER CASE

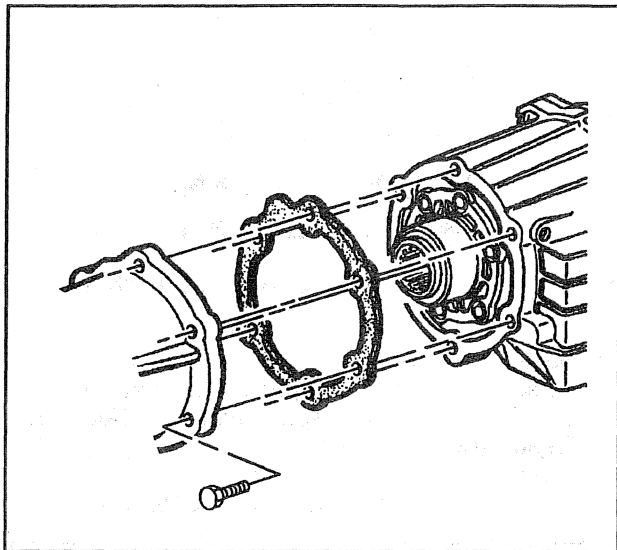


Figure 17—Manual Transmission to Transfer Case

4. Rear propeller shaft. Refer to SECTION 4A.
5. Electrical connections at the transfer case.
6. Transfer case shift linkage at the transfer case.
  - Support the transfer case with a jack.
7. Transfer case to the transmission bolts and spring washers (if used).
8. Gasket.

### Install or Connect (Figures 15 through 17)

1. New gasket to the transmission. Use gasket sealer to hold it in place.
2. Transfer case to the vehicle.
3. Transfer case to the transmission bolts and spring washers (if used).

### Tighten

- Bolts to 45 N·m (33 lbs. ft.).
  - Remove the jack from the transfer case.
4. Transfer case shift linkage at the transfer case.

5. Electrical connections to the transfer case.
6. Rear propeller shaft. Refer to SECTION 4A.
7. Front propeller shaft. Refer to SECTION 4A.
8. Skid plate (if equipped). Refer to "Skid Plate Replacement."
- Fill the transfer case with the proper lubricant. Refer to SECTION 0B.
- Lower the vehicle.
9. Negative battery cable.

## TRANSFER CASE ADAPTER REPLACEMENT (AUTOMATIC TRANSMISSIONS)

### Remove or Disconnect (Figures 15 and 16)

1. Transfer case. Refer to "Transfer Case Replacement."
2. Transmission mount to the adapter bolts.
  - Raise the rear of the transmission slightly.
3. Adapter to the transmission bolts.
4. Adapter from the transmission.
5. Seal.

### Install or Connect (Figures 15 and 16)

1. Seal.
2. Adapter to the transmission.
3. Adapter to the transmission bolts.

### Tighten

- Adapter bolts to 45 N·m (33 lbs. ft.).
  - Lower the rear of the transmission.
4. Transmission mount to the adapter bolts.

### Tighten

- Bolts to 47 N·m (35 lbs. ft.).
5. Transfer case. Refer to "Transfer Case Replacement."

## SPECIFICATIONS

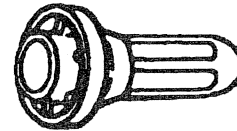
### FASTENER TIGHTENING SPECIFICATIONS

Item	N-m	Lbs. Ft.	Lbs. In.
Adapter to Transfer Case Bolts (Automatic Trans.) .....	45	33	—
Adapter to Transmission Bolts (Automatic Trans.) .....	45	33	—
Console Screws .....	1.4	—	12
Clutch Coil Relay Screws .....	2.8	—	25
Drain and Fill Plugs .....	25	18	—
Extension Housing Bolts (NP 241).....	31	23	—
Front Propeller Shaft Yoke Nut (B-W 4401 and 4470) .....	225	165	—
Mounting to Transfer Case Bolts (Automatic Trans.) .....	47	35	—
Propeller Shaft Yoke Nut (NP 241) .....	149	110	—
Pump Retainer Housing Bolts (NP 241) .....	40	30	—
Rear Propeller Shaft Yoke Nut (B-W 4401 and 4470) .....	170	125	—
Shift Lever to the Floor Bolts .....	11	—	97
Transfer Case to Transmission Bolts (Manual Trans.) .....	33	24	—

T2148

## SPECIAL TOOLS

- |    |  |             |
|----|--|-------------|
| 1. |  | J 29162     |
| 2. |  | J 29162     |
| 3. |  | J 37668 - A |



1. FRONT OUTPUT SHAFT SEAL INSTALLER  
(NP 241 TRANSFER CASE)
2. REAR OUTPUT SHAFT SEAL INSTALLER  
(NP 241 TRANSFER CASE)
3. OUTPUT SHAFT SEAL INSTALLER  
(BW 4401 AND 4470 TRANSFER CASE)

# 7D-12 TRANSFER CASE

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## NOTES

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