

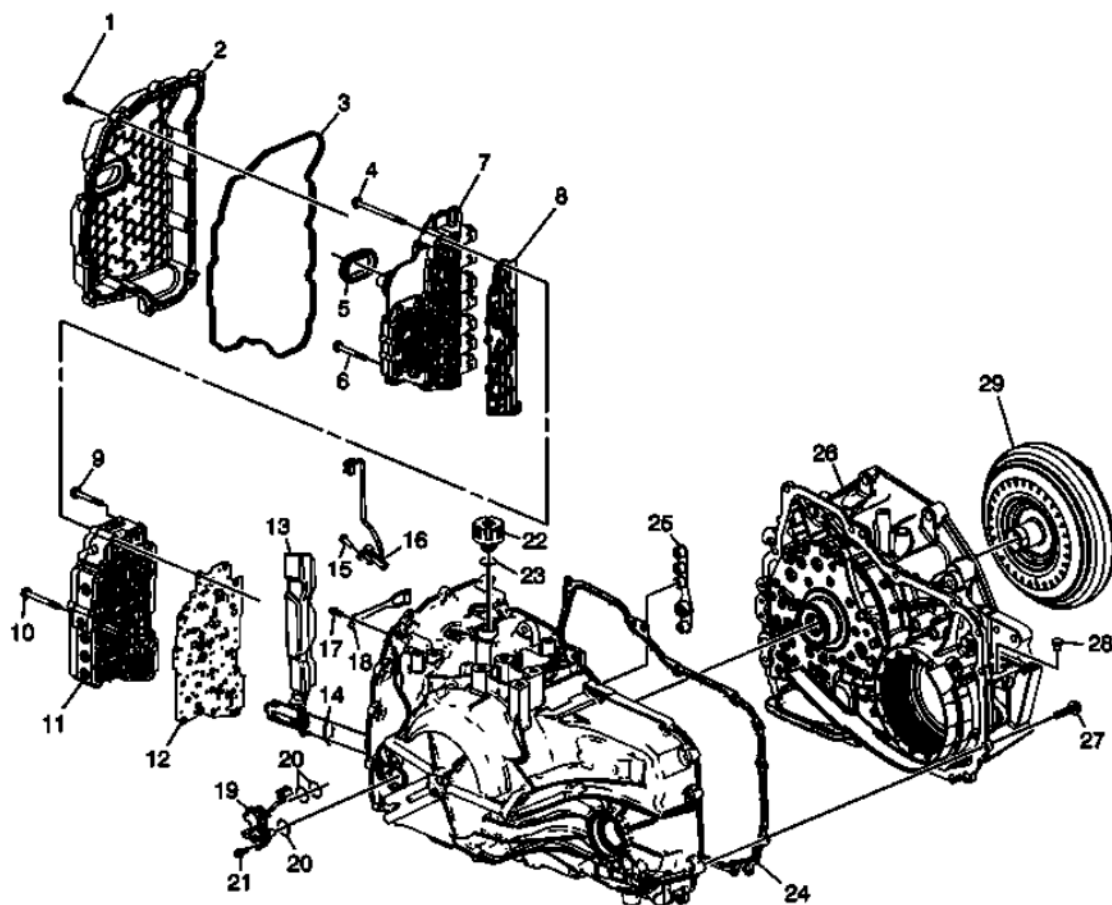
## 2013 TRANSMISSION

Automatic Transmission - 6T40 (MH8, MHH) - Component Locator - Malibu

### COMPONENT LOCATOR

#### DISASSEMBLED VIEWS

##### Case and Associated Parts



**Fig. 1: Disassembled View Of Case & Associated Parts**

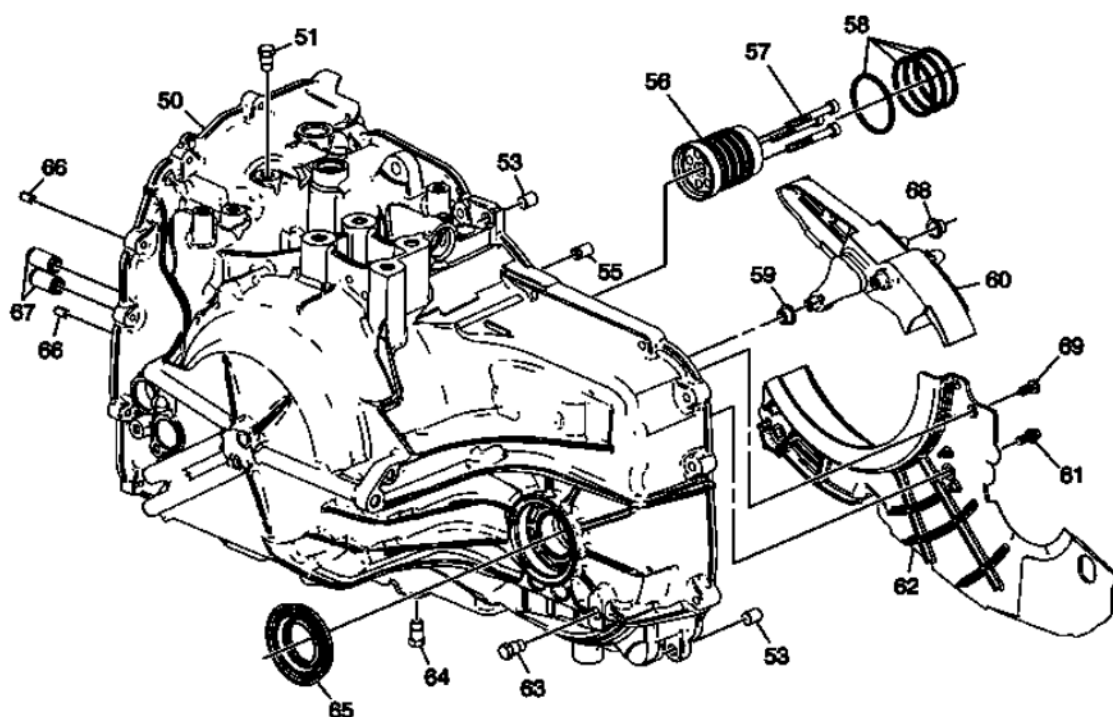
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                    |
|---------|-----------------------------------|
| 1       | Control Valve Body Cover Bolt     |
| 2       | Control Valve Body Cover Assembly |
| 3       | Control Valve Body Cover Gasket   |
| 4       | Control Valve Body Bolt           |
|         |                                   |

|    |                                                   |
|----|---------------------------------------------------|
| 5  | Control Valve Body Cover Hole Seal                |
| 6  | Control Solenoid Valve Heat Sink Bolt             |
| 7  | Control Solenoid (w/Body and TCM) Valve Assembly  |
| 8  | Control Valve Body Filter Plate Assembly          |
| 9  | Control Valve Body Bolt                           |
| 10 | Control Valve Body Bolt                           |
| 11 | Control Valve Body Assembly                       |
| 12 | Control Valve Body Spacer Plate Assembly          |
| 13 | A/Trans Fluid Level Control Valve                 |
| 14 | A/Trans Fluid Level Control Valve Gasket          |
| 15 | A/Trans Output Speed Sensor Bolt                  |
| 16 | A/Trans Output Speed Sensor Assembly              |
| 17 | Manual Shaft Detent Spring Bolt                   |
| 18 | Manual Shaft Detent Lever Spring Assembly         |
| 19 | A/Trans Input Speed Sensor Assembly               |
| 20 | A/Trans Input Speed Sensor Assembly O-Ring Seal   |
| 21 | A/Trans Input Speed Sensor Bolt                   |
| 22 | Fill Cap                                          |
| 23 | Fill Cap Seal                                     |
| 24 | Torque Converter Housing Gasket                   |
| 25 | A/Trans Fluid Pump Seal Assembly                  |
| 26 | Torque Converter with Fluid Pump Housing Assembly |
| 27 | Torque Converter and Differential Housing Bolt    |
| 28 | A/Trans Fluid Fill Tube Plug Assembly             |
| 29 | Torque Converter Assembly                         |

#### Transmission Case Assembly - 6T30 - Gen 1

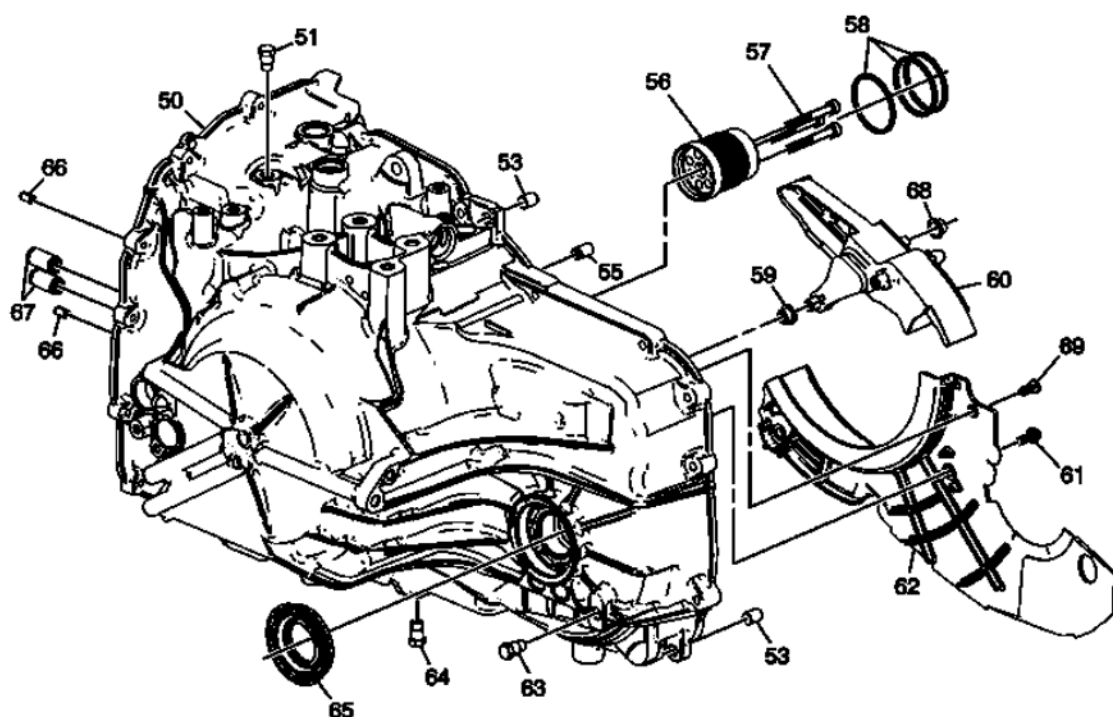




**Fig. 2: Transmission Case Assembly -- 6T30 -- Gen 1**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 50      | A/Trans Case Assembly                             |
| 51      | A/Trans Fluid Pressure Test Hole Plug             |
| 53      | Transmission Case Cover Locator Pin               |
| 55      | A/Trans Fluid Check Ball                          |
| 56      | Input Shaft Support                               |
| 57      | Input Shaft Support Bolt                          |
| 58      | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring      |
| 59      | Drive Link Lube Fluid Seal                        |
| 60      | Drive Link Lube Scoop                             |
| 61      | Front Differential Carrier Baffle Bolt            |
| 62      | Front Differential Carrier Baffle                 |
| 63      | Oil Level Plug                                    |
| 64      | Drain Plug                                        |
| 65      | Drive Shaft Oil Seal Assembly                     |
| 66      | Control Valve Body Locator Pin                    |
| 67      | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 68      | Drive Link Lube Fluid Seal                        |
| 69      | Baffle Retainer                                   |

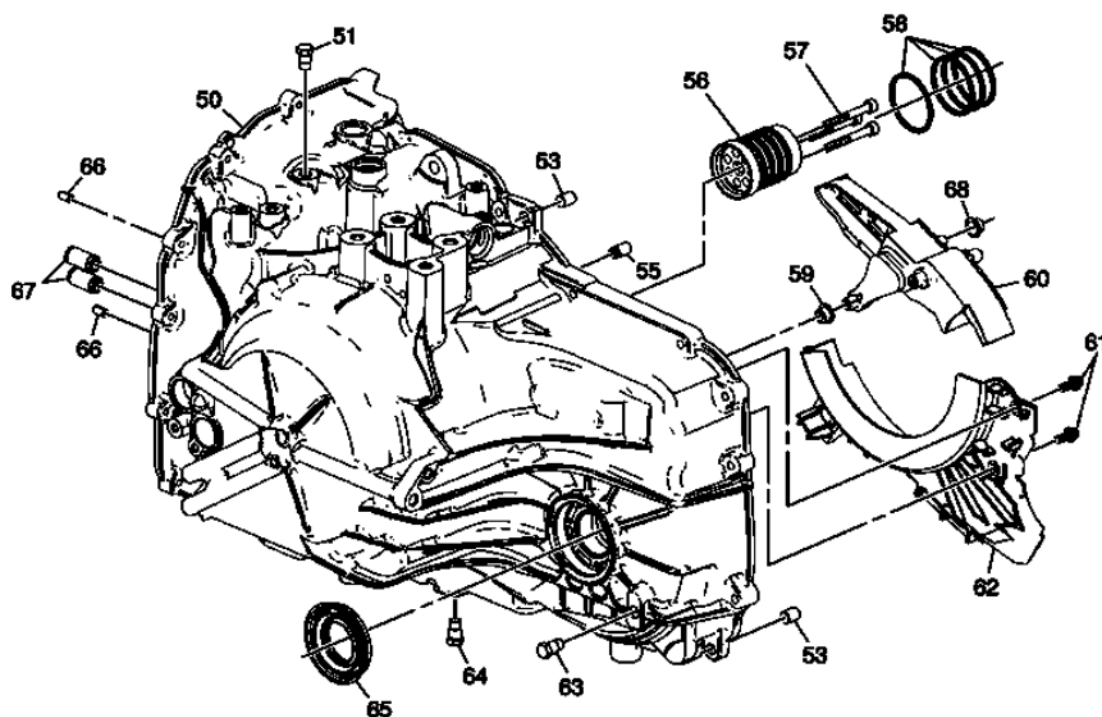
**Transmission Case Assembly - 6T30 - Gen 2**



**Fig. 3: Transmission Case Assembly -- 6T30 -- Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 50      | A/Trans Case Assembly                             |
| 51      | A/Trans Fluid Pressure Test Hole Plug             |
| 53      | Transmission Case Cover Locator Pin               |
| 55      | A/Trans Fluid Check Ball                          |
| 56      | Input Shaft Support                               |
| 57      | Input Shaft Support Bolt                          |
| 58      | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring      |
| 59      | Drive Link Lube Fluid Seal                        |
| 60      | Drive Link Lube Scoop                             |
| 61      | Front Differential Carrier Baffle Bolt            |
| 62      | Front Differential Carrier Baffle                 |
| 63      | Oil Level Plug                                    |
| 64      | Drain Plug                                        |
| 65      | Drive Shaft Oil Seal Assembly                     |
| 66      | Control Valve Body Locator Pin                    |
| 67      | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 68      | Drive Link Lube Fluid Seal                        |
| 69      | Baffle Retainer                                   |

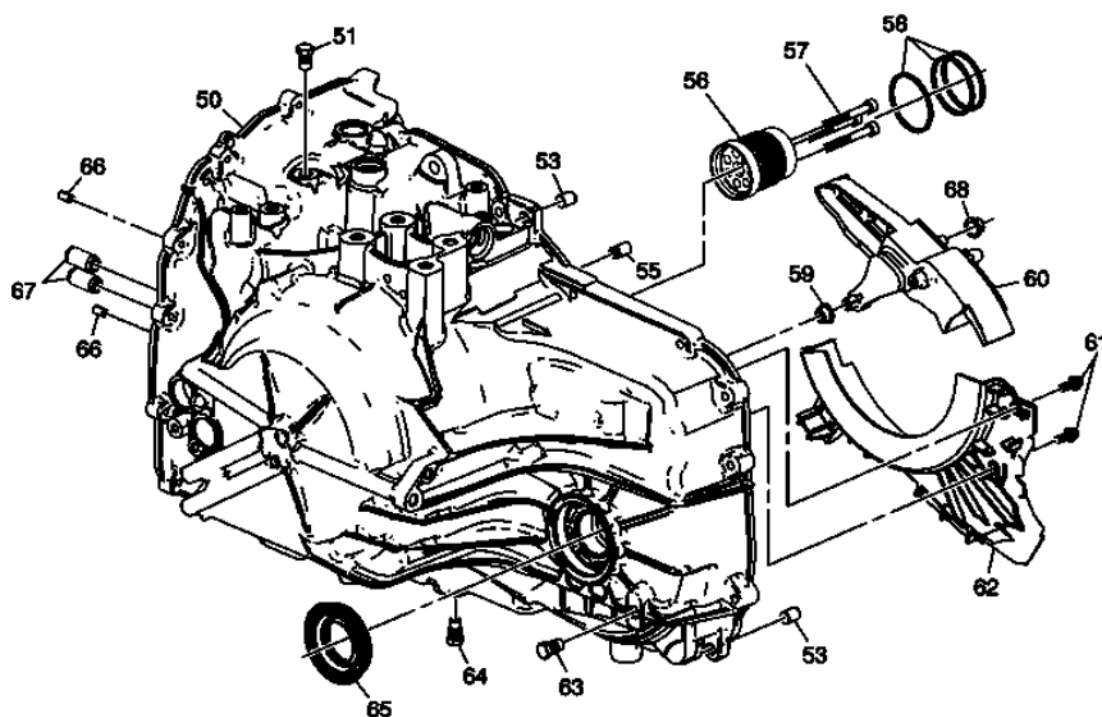
Transmission Case Assembly - 6T40/6T45/6T50 - Gen 1



**Fig. 4: View Of Transmission Case Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 50      | A/Trans Case Assembly                             |
| 51      | A/Trans Fluid Pressure Test Hole Plug             |
| 53      | Transmission Case Cover Locator Pin               |
| 55      | A/Trans Fluid Check Ball                          |
| 56      | Input Shaft Support                               |
| 57      | Input Shaft Support Bolt                          |
| 58      | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring      |
| 59      | Drive Link Lube Fluid Seal                        |
| 60      | Drive Link Lube Scoop                             |
| 61      | Front Differential Carrier Baffle Bolt            |
| 62      | Front Differential Carrier Baffle                 |
| 63      | Oil Level Plug                                    |
| 64      | Drain Plug                                        |
| 65      | Drive Shaft Oil Seal Assembly                     |
| 66      | Control Valve Body Locator Pin                    |
| 67      | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 68      | Drive Link Lube Fluid Seal                        |

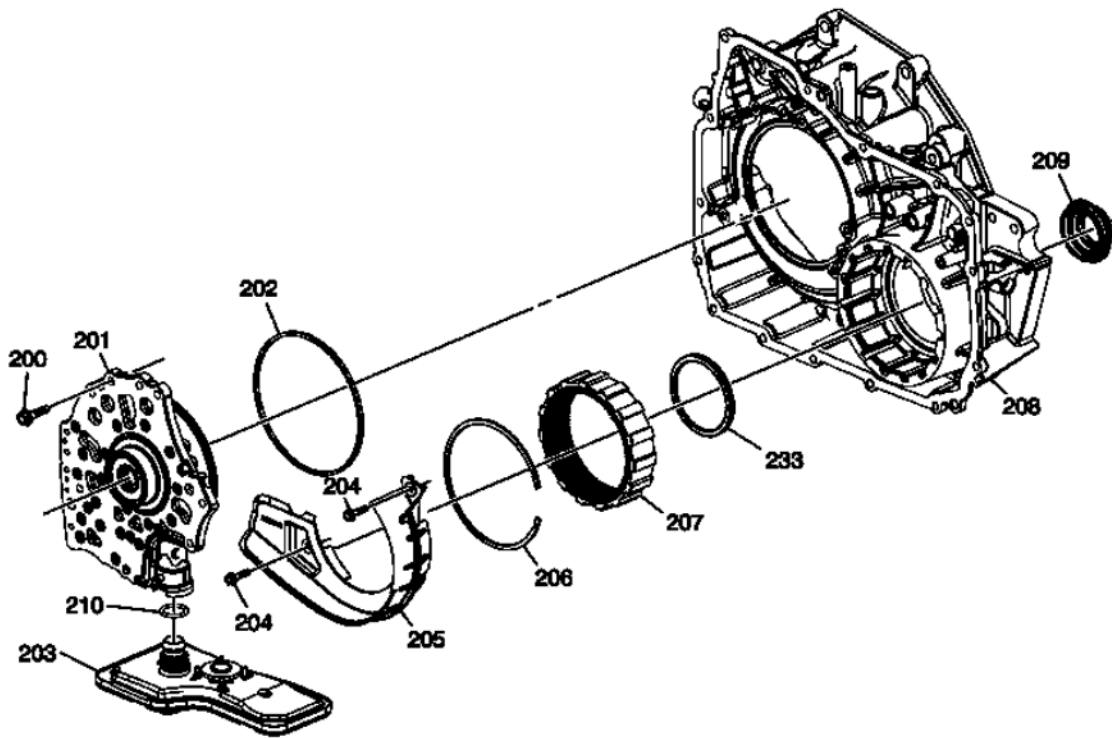
Transmission Case Assembly - 6T40/6T45/6T50 - Gen 2



**Fig. 5: Transmission Case Assembly -- 6T45/6T50 -- Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                        |
|---------|-------------------------------------------------------|
| 50      | A/Trans Case Assembly                                 |
| 51      | A/Trans Fluid Pressure Test Hole Plug                 |
| 53      | Transmission Case Cover Locator Pin                   |
| 55      | A/Trans Fluid Check Ball                              |
| 56      | Input Shaft Support                                   |
| 57      | Input Shaft Support Bolt                              |
| 58      | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring (Qty: 3) |
| 59      | Drive Link Lube Fluid Seal                            |
| 60      | Drive Link Lube Scoop                                 |
| 61      | Front Differential Carrier Baffle Bolt                |
| 62      | Front Differential Carrier Baffle                     |
| 63      | Oil Level Plug                                        |
| 64      | Drain Plug                                            |
| 65      | Drive Shaft Oil Seal Assembly                         |
| 66      | Control Valve Body Locator Pin                        |
| 67      | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal     |
| 68      | Drive Link Lube Fluid Seal                            |

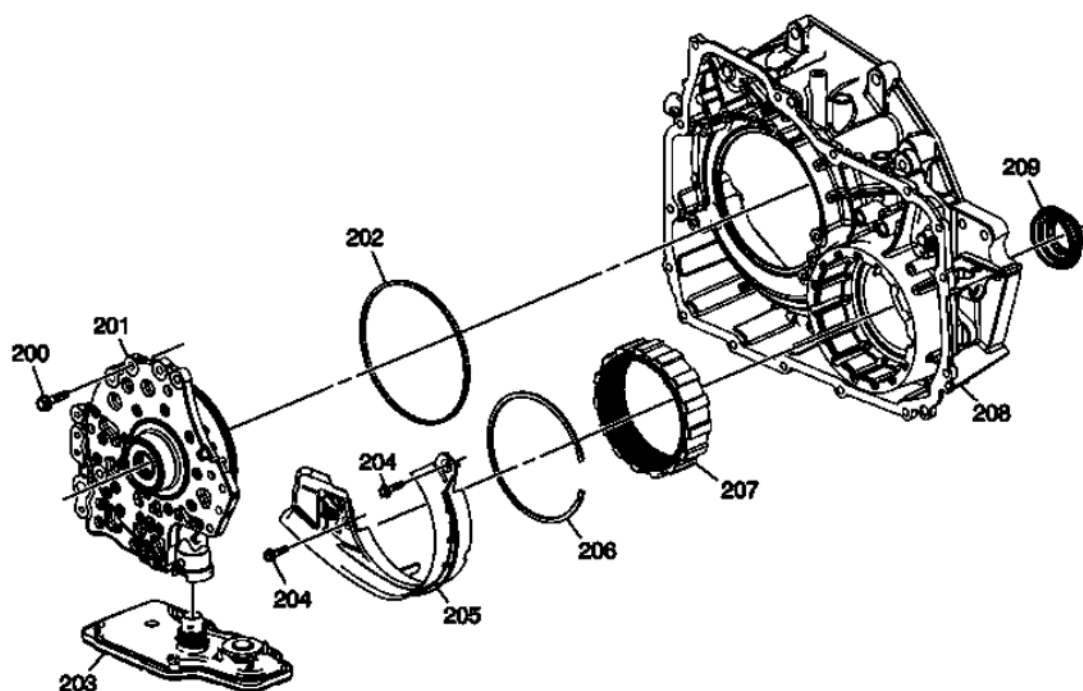
#### Torque Converter and Fluid Pump Housing Assembly- 6T30



**Fig. 6: Torque Converter and Fluid Pump Housing Assembly -- 6T30**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                 |
|---------|------------------------------------------------|
| 200     | A/Trans Fluid Pump Bolt                        |
| 201     | A/Trans Fluid Pump Assembly                    |
| 202     | Torque Converter and Differential Housing Seal |
| 203     | A/Trans Fluid Filter Assembly                  |
| 204     | Front Differential Carrier Baffle Bolt         |
| 205     | Front Differential Carrier Baffle              |
| 206     | Front Differential Ring Gear Retainer          |
| 207     | Front Differential Ring Gear                   |
| 208     | Torque Converter and Differential Housing      |
| 209     | Front Wheel Drive Shaft Oil Seal Assembly      |
| 210     | A/Trans Fluid Filter Seal                      |
| 233     | Front Differential Carrier Bearing Assembly    |

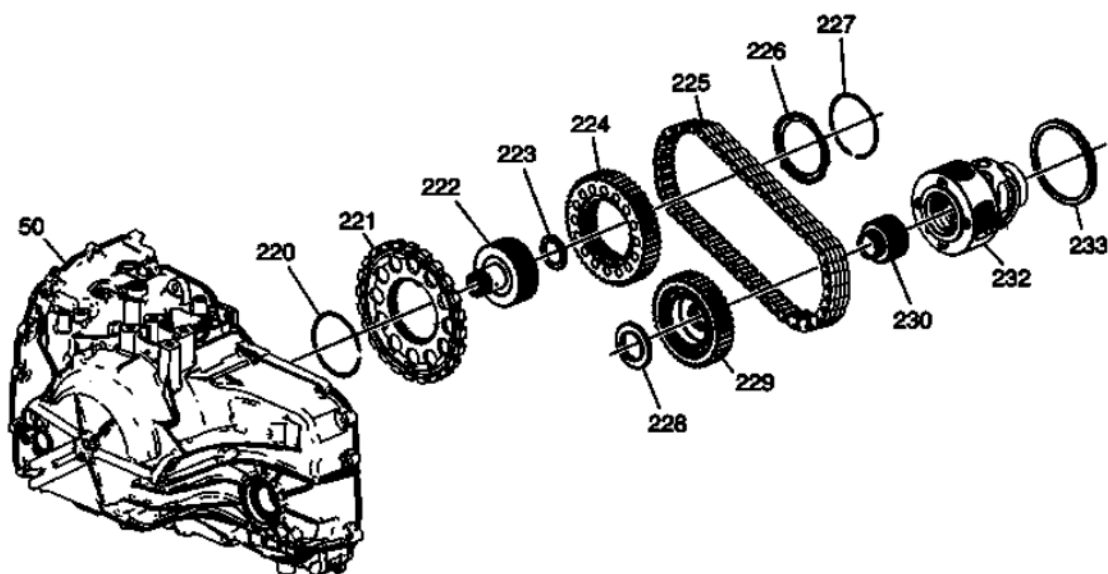
**Torque Converter and Fluid Pump Housing Assembly- 6T40/6T45/6T50**



**Fig. 7: Torque Converter and Fluid Pump Housing Assembly -- 6T45/6T50**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                 |
|---------|------------------------------------------------|
| 200     | A/Trans Fluid Pump Bolt                        |
| 201     | A/Trans Fluid Pump Assembly                    |
| 202     | Torque Converter and Differential Housing Seal |
| 203     | A/Trans Fluid Filter Assembly                  |
| 204     | Front Differential Carrier Baffle Bolt         |
| 205     | Front Differential Carrier Baffle              |
| 206     | Front Differential Ring Gear Retainer          |
| 207     | Front Differential Ring Gear                   |
| 208     | Torque Converter and Differential Housing      |
| 209     | Front Wheel Drive Shaft Oil Seal Assembly      |

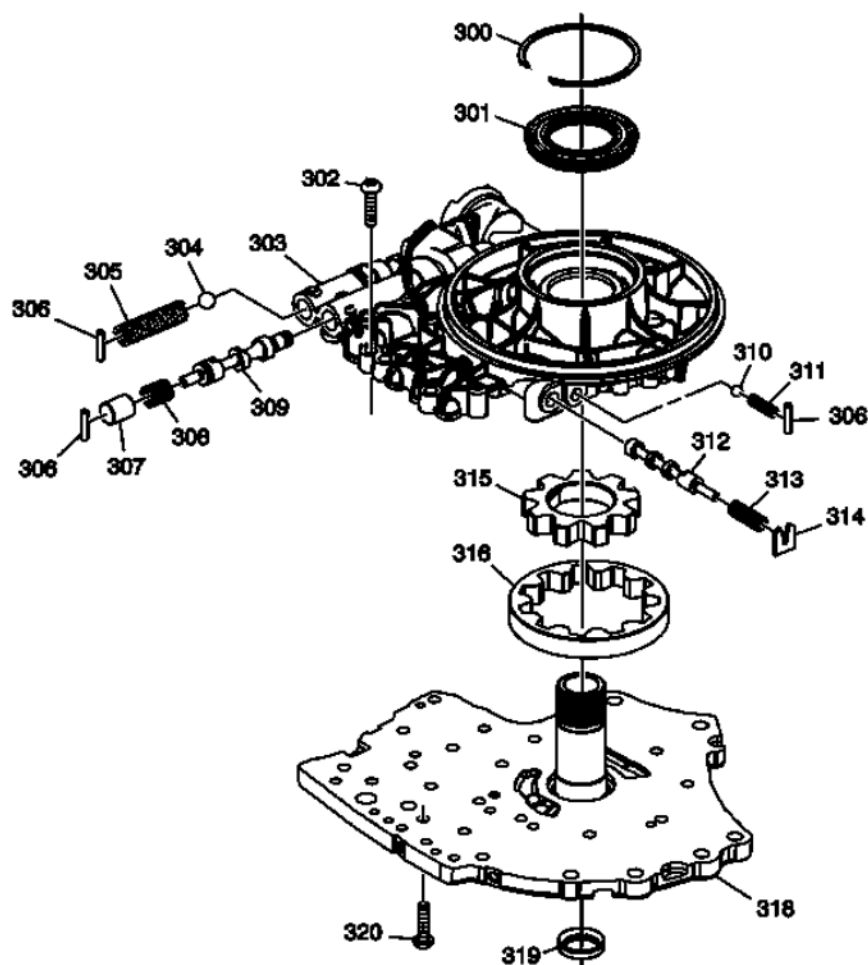
#### Drive Link Assembly



**Fig. 8: Disassembled View Of Drive Link Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                              |
|---------|---------------------------------------------|
| 50      | A/Trans Case                                |
| 220     | Park Gear Retainer Ring                     |
| 221     | Park Gear                                   |
| 222     | Output Carrier Transfer Drive Gear Hub      |
| 223     | Drive Sprocket Bearing Assembly             |
| 224     | Drive Sprocket                              |
| 225     | Drive Link Assembly                         |
| 226     | Drive Sprocket Thrust Washer                |
| 227     | Drive Sprocket Retainer Ring                |
| 228     | Driven Sprocket Bearing Assembly            |
| 229     | Driven Sprocket                             |
| 230     | Final Drive Sun Gear                        |
| 232     | Differential Carrier Assembly               |
| 233     | Front Differential Carrier Bearing Assembly |

#### Oil Pump Assembly- 6T30



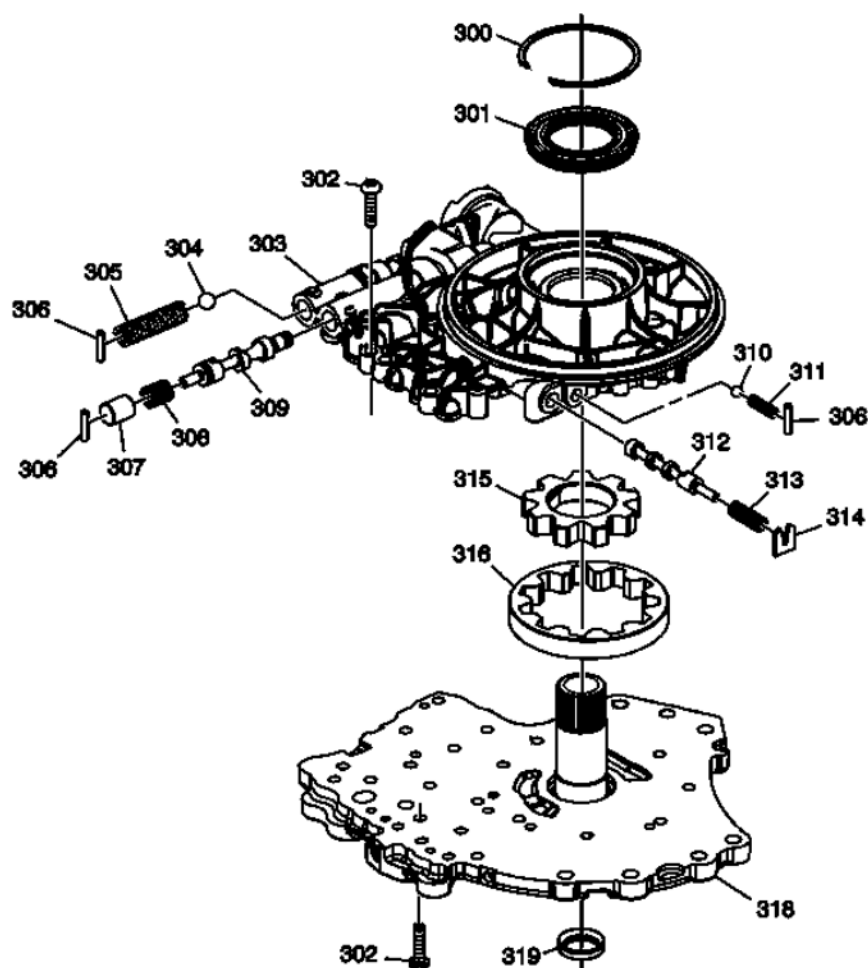
**Fig. 9: Oil Pump Assembly -- 6T30**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 300     | Torque Converter Fluid Seal Retainer              |
| 301     | Torque Converter Fluid Seal Assembly              |
| 302     | A/Trans Fluid Pump Cover Bolt                     |
| 303     | A/Trans Fluid Pump Body                           |
| 304     | Pump Blowoff Ball Valve                           |
| 305     | Pump Blowoff Valve Spring                         |
| 306     | Pressure Regulator Valve Bore Plug Retainer       |
| 307     | Pressure Regulator Valve Bore Plug                |
| 308     | Pressure Regulator Valve Spring                   |
| 309     | Pressure Regulator Valve                          |
| 310     | Torque Converter Clutch Blowoff Ball Valve        |
| 311     | Torque Converter Clutch Blowoff Ball Valve Spring |
| 312     | Torque Converter Clutch Control Valve             |



|     |                                                       |
|-----|-------------------------------------------------------|
| 313 | Torque Converter Clutch Control Valve Spring          |
| 314 | Torque Converter Clutch Control Valve Spring Retainer |
| 315 | A/Trans Fluid Pump Drive Gear                         |
| 316 | A/Trans Fluid Pump Driven Gear                        |
| 318 | A/Trans Fluid Pump Cover Assembly                     |
| 319 | Torque Converter Fluid Seal Assembly                  |
| 320 | A/Trans Fluid Pump Cover Bolt                         |

#### Oil Pump Assembly- 6T40/6T45/6T50- Gen 1

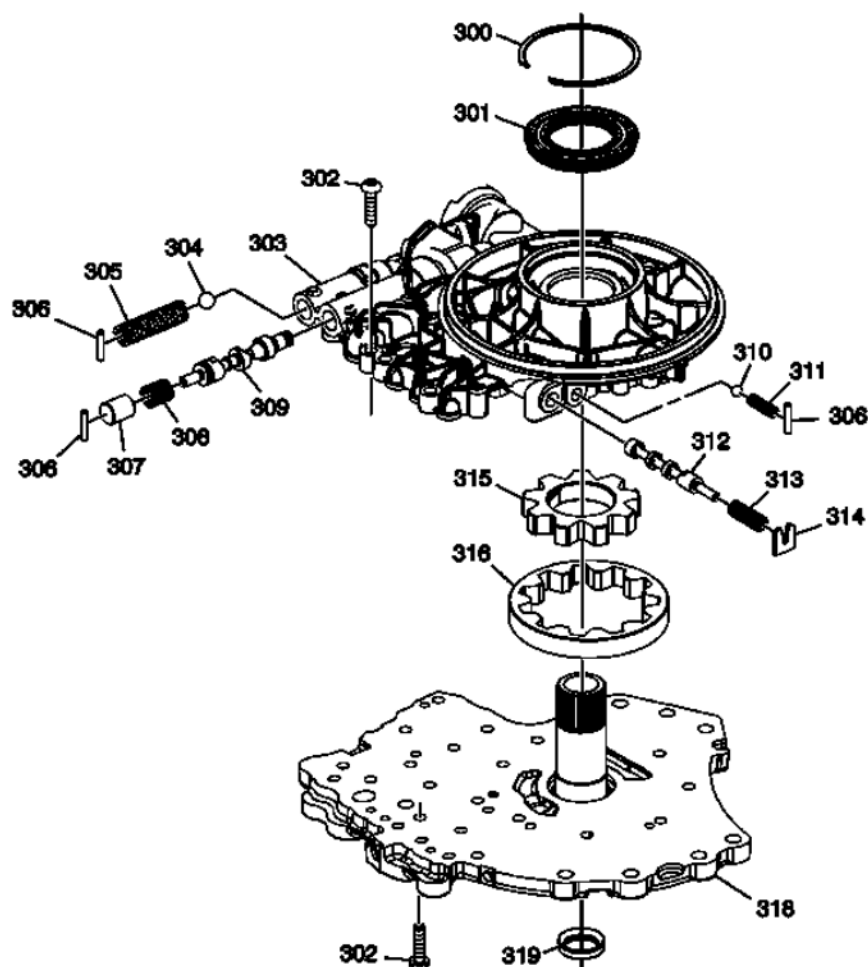


**Fig. 10: Disassembled View Of Oil Pump Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                       |
|---------|--------------------------------------|
| 300     | Torque Converter Fluid Seal Retainer |
| 301     | Torque Converter Fluid Seal Assembly |
| 302     | A/Trans Fluid Pump Cover Bolt        |

|     |                                                       |
|-----|-------------------------------------------------------|
| 303 | A/Trans Fluid Pump Body                               |
| 304 | Pump Blowoff Ball Valve                               |
| 305 | Pump Blowoff Valve Spring                             |
| 306 | Pressure Regulator Valve Bore Plug Retainer           |
| 307 | Pressure Regulator Valve Bore Plug                    |
| 308 | Pressure Regulator Valve Spring                       |
| 309 | Pressure Regulator Valve                              |
| 310 | Torque Converter Clutch Blowoff Ball Valve            |
| 311 | Torque Converter Clutch Blowoff Ball Valve Spring     |
| 312 | Torque Converter Clutch Control Valve                 |
| 313 | Torque Converter Clutch Control Valve Spring          |
| 314 | Torque Converter Clutch Control Valve Spring Retainer |
| 315 | A/Trans Fluid Pump Drive Gear                         |
| 316 | A/Trans Fluid Pump Driven Gear                        |
| 318 | A/Trans Fluid Pump Cover Assembly                     |
| 319 | Torque Converter Fluid Seal Assembly                  |

**Oil Pump Assembly- 6T40/6T45/6T50- Gen 2**

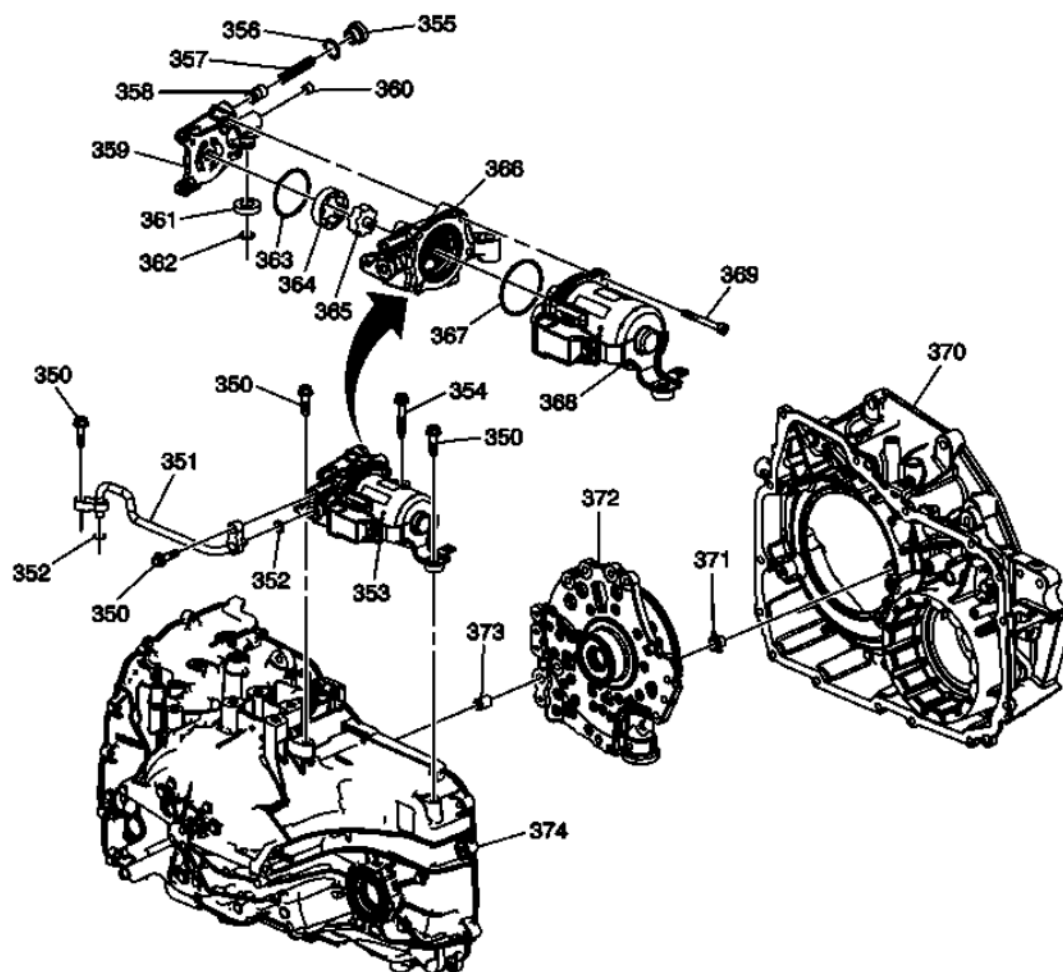


**Fig. 11: Oil Pump Assembly -- 6T45/6T50 -- Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 300     | Torque Converter Fluid Seal Retainer              |
| 301     | Torque Converter Fluid Seal Assembly              |
| 302     | A/Trans Fluid Pump Cover Bolt                     |
| 303     | A/Trans Fluid Pump Body                           |
| 304     | Pump Blowoff Ball Valve                           |
| 305     | Pump Blowoff Valve Spring                         |
| 306     | Pressure Regulator Valve Bore Plug Retainer       |
| 307     | Pressure Regulator Valve Bore Plug                |
| 308     | Pressure Regulator Valve Spring                   |
| 309     | Pressure Regulator Valve                          |
| 310     | Torque Converter Clutch Blowoff Ball Valve        |
| 311     | Torque Converter Clutch Blowoff Ball Valve Spring |
| 312     | Torque Converter Clutch Control Valve             |

|     |                                                       |
|-----|-------------------------------------------------------|
| 313 | Torque Converter Clutch Control Valve Spring          |
| 314 | Torque Converter Clutch Control Valve Spring Retainer |
| 315 | A/Trans Fluid Pump Drive Gear                         |
| 316 | A/Trans Fluid Pump Driven Gear                        |
| 318 | A/Trans Fluid Pump Cover Assembly                     |
| 319 | Torque Converter Fluid Seal Assembly                  |

#### Auxiliary Fluid Pump and Hybrid Components - Hybrid Models

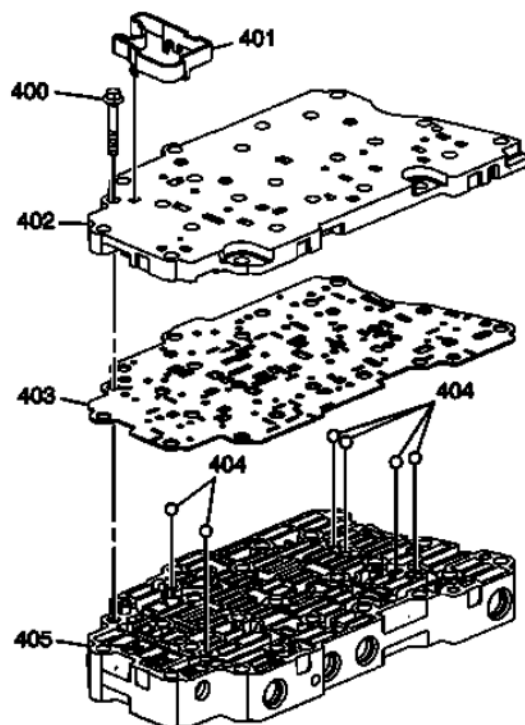


**Fig. 12: Auxiliary Fluid Pump and Hybrid Components -- Hybrid Models**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                         |
|---------|--------------------------------------------------------|
| 350     | A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 4)      |
| 351     | A/Trans Auxiliary Fluid Pump Outlet Pipe Assembly      |
| 352     | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly |
| 353     | A/Trans Auxiliary Fluid Pump Assembly                  |

|     |                                                            |
|-----|------------------------------------------------------------|
| 354 | A/Trans Auxiliary Fluid Pump Bolt                          |
| 355 | Pressure Regulator Valve Spring Retainer                   |
| 356 | Pressure Regulator Valve Spring Spacer                     |
| 357 | Pressure Regulator Valve Spring                            |
| 358 | Pressure Regulator Valve                                   |
| 359 | A/Trans Auxiliary Fluid Pump Cover                         |
| 360 | A/Trans Auxiliary Fluid Pump Cover Hole Plug               |
| 361 | A/Trans Auxiliary Fluid Pump Gasket                        |
| 362 | A/Trans Auxiliary Fluid Pump Seal                          |
| 363 | A/Trans Auxiliary Fluid Pump Cover Seal                    |
| 364 | A/Trans Auxiliary Fluid Pump Outer Rotor                   |
| 365 | A/Trans Auxiliary Fluid Pump Inner Rotor                   |
| 366 | A/Trans Auxiliary Fluid Pump Body                          |
| 367 | A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-ring     |
| 368 | A/Trans Auxiliary Fluid Pump Motor Assembly                |
| 369 | A/Trans Auxiliary Fluid Pump (Pump to Motor) Bolt (Qty: 4) |
| 370 | Torque Converter and Differential Housing                  |
| 371 | A/Trans Auxiliary Fluid Inlet Pump Seal                    |
| 372 | A/Trans Fluid Pump Assembly                                |
| 373 | A/Trans Fluid Trough Check Ball                            |
| 374 | A/Trans Case                                               |

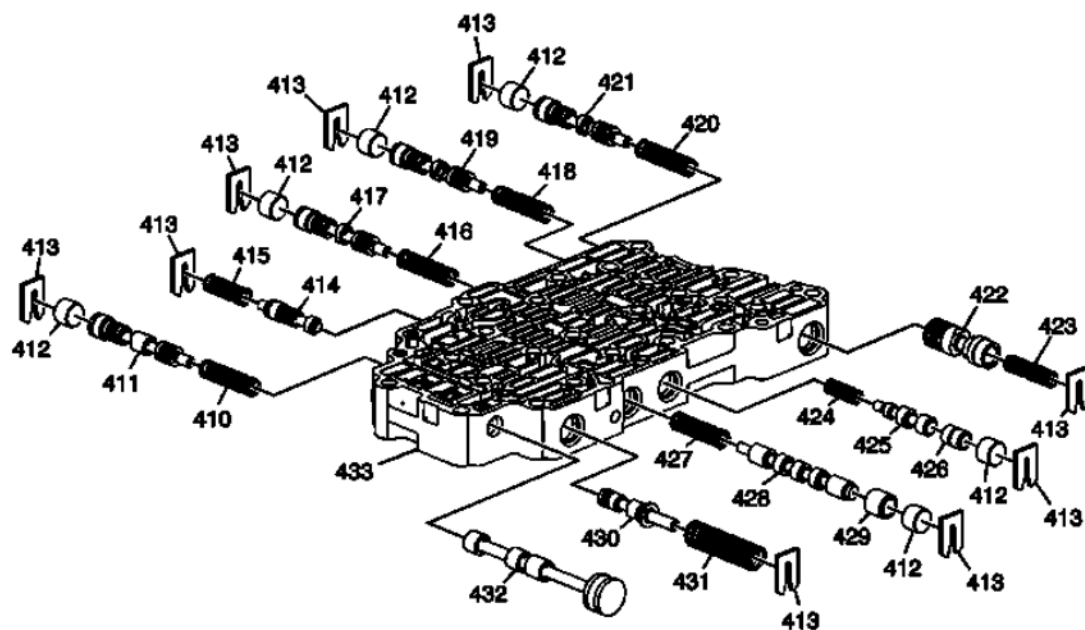
#### Control Valve Body Assembly (1 of 2 - Gen 1)



**Fig. 13: View Of Control Valve Body Assembly (1 Of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 400     | Control Valve Body Bolt                           |
| 401     | Control Solenoid Valve Support                    |
| 402     | Valve Channel Plate                               |
| 403     | Channel Plate to Valve Body Spacer Plate Assembly |
| 404     | Control Valve Body Ball Check Valve               |
| 405     | Control Valve Body Assembly                       |

**Control Valve Body Assembly (2 of 2 - Gen 1)**

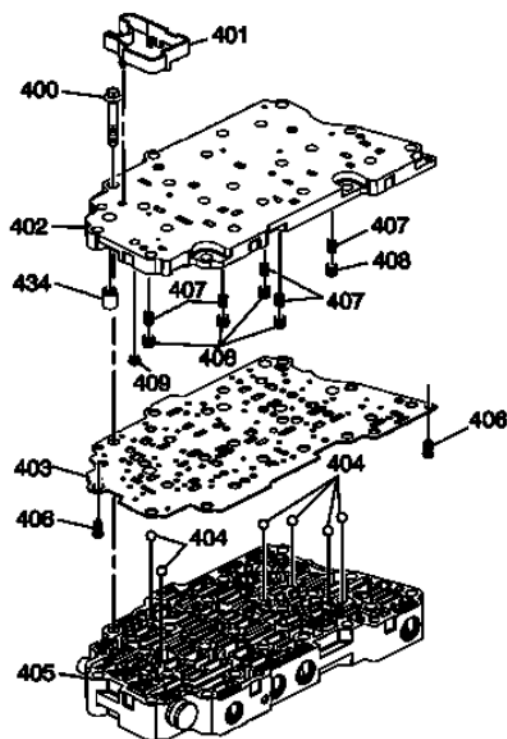


**Fig. 14: View Of Control Valve Body Assembly (2 Of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 410     | Reverse and 4-5-6 Clutch Regulator Valve Spring |
| 411     | Reverse and 4-5-6 Clutch Regulator Valve        |
| 412     | Clutch Valve Bore Plug                          |
| 413     | Valve Spring Retainer                           |
| 414     | 1-2-3-4 Clutch Boost Valve                      |
| 415     | 1-2-3-4 Clutch Boost Valve Spring               |
| 416     | 1-2-3-4 Clutch Regulator Valve Spring           |

|     |                                                       |
|-----|-------------------------------------------------------|
| 417 | 1-2-3-4 Clutch Regulator Valve                        |
| 418 | 2-6 Clutch Regulator Valve Spring                     |
| 419 | 2-6 Clutch Regulator Valve                            |
| 420 | 3-5-Reverse Clutch Regulator Valve Spring             |
| 421 | 3-5-Reverse Clutch Regulator Valve                    |
| 422 | Clutch Piston Dam Feed Regulator Valve                |
| 423 | Clutch Piston Dam Feed Regulator Valve Spring         |
| 424 | Torque Converter Clutch Regulator Apply Valve Spring  |
| 425 | Torque Converter Clutch Regulator Apply Valve         |
| 426 | Torque Converter Clutch Regulator Apply Shuttle Valve |
| 427 | Clutch Select Valve Spring                            |
| 428 | Clutch Select Valve                                   |
| 429 | Default Override Shuttle Valve                        |
| 430 | Actuator Feed Limit Valve                             |
| 431 | Actuator Feed Limit Valve Spring                      |
| 432 | Manual Valve                                          |
| 433 | Control Valve Body Assembly                           |

**Control Valve Body Assembly (1 of 2 - Gen 2)**

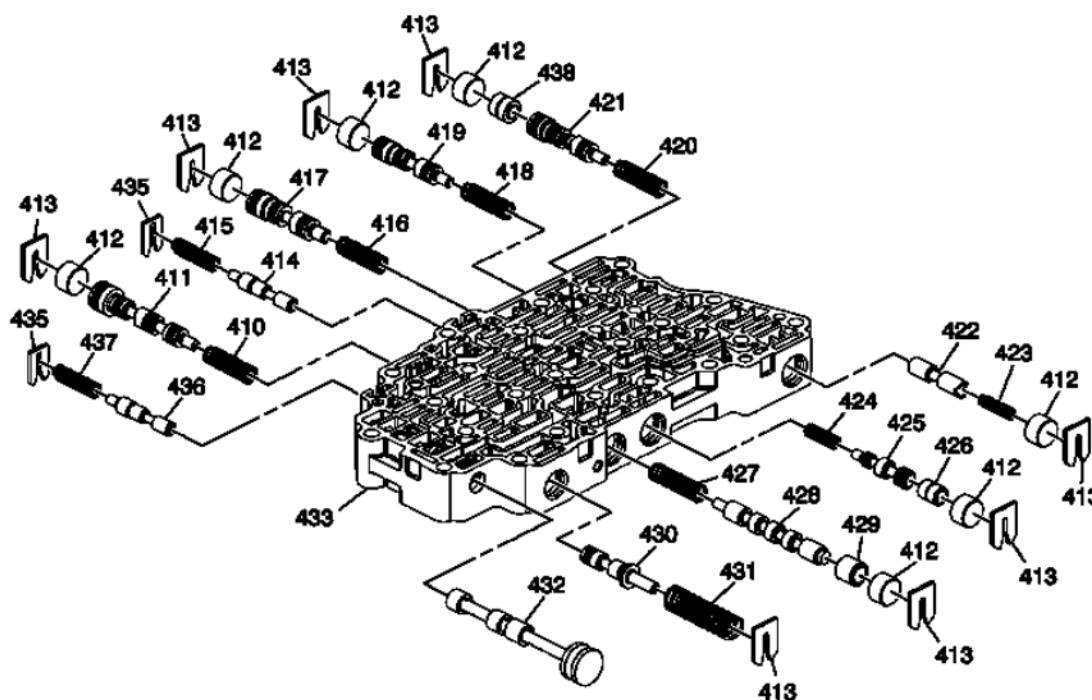


**Fig. 15: Control Valve Body Assembly -- Gen 2 (1 Of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

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

|     |                                                   |
|-----|---------------------------------------------------|
| 400 | Control Valve Body Bolt                           |
| 401 | Control Solenoid Valve Support                    |
| 402 | Valve Channel Plate                               |
| 403 | Channel Plate to Valve Body Spacer Plate Assembly |
| 404 | Control Valve Body Ball Check Valve (Qty:6)       |
| 405 | Control Valve Body Assembly                       |
| 406 | Control Valve Body Spacer Plate Retainer (Qty: 2) |
| 407 | Actuator Feed Accumulator Spring (Qty: 5)         |
| 408 | Actuator Feed Accumulator Piston (Qty: 5)         |
| 409 | Variable Hi and 2-3-4 Clutch Housing Valve Ball   |
| 434 | Control Valve Channel Plate Ball Spring Assembly  |

#### Control Valve Body Assembly (2 of 2 - Gen 2)



**Fig. 16: Control Valve Body Assembly -- Gen 2 (2 Of 2)**

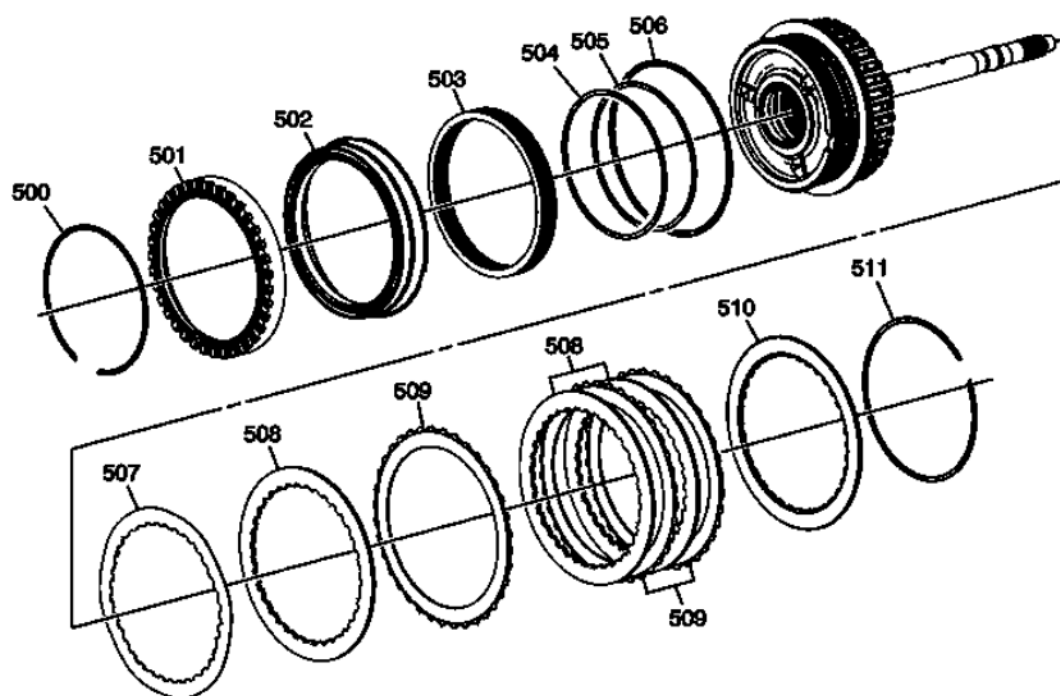
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                      |
|---------|-----------------------------------------------------|
| 410     | Low-Reverse and 4-5-6 Clutch Regulator Valve Spring |
| 411     | Low-Reverse and 4-5-6 Clutch Regulator Valve        |
| 412     | Clutch Valve Bore Plug                              |
| 413     | Valve Spring Retainer                               |
| 414     | 1-2-3-4 Clutch Boost Valve                          |
| 415     | 1-2-3-4 Clutch Boost Valve Spring                   |



|     |                                                       |
|-----|-------------------------------------------------------|
| 416 | 1-2-3-4 Clutch Regulator Valve Spring                 |
| 417 | 1-2-3-4 Clutch Regulator Valve                        |
| 418 | 2-6 Clutch Regulator Valve Spring                     |
| 419 | 2-6 Clutch Regulator Valve                            |
| 420 | 3-5-Reverse Clutch Regulator Valve Spring             |
| 421 | 3-5-Reverse Clutch Regulator Valve                    |
| 422 | Default Override Valve                                |
| 423 | Default Override Valve Spring                         |
| 424 | Torque Converter Clutch Regulator Apply Valve Spring  |
| 425 | Torque Converter Clutch Regulator Apply Valve         |
| 426 | Torque Converter Clutch Regulator Apply Shuttle Valve |
| 427 | Clutch Select Valve Spring                            |
| 428 | Clutch Select Valve                                   |
| 429 | Clutch Select (Shuttle) Valve                         |
| 430 | Actuator Feed Limit Valve                             |
| 431 | Actuator Feed Limit Valve Spring                      |
| 432 | Manual Valve                                          |
| 433 | Control Valve Body Assembly                           |
| 435 | Control Valve Body Bore Plug Retainer                 |
| 436 | Low-Reverse and 4-5-6 Clutch Boost Valve              |
| 437 | Low-Reverse and 4-5-6 Clutch Boost Valve Spring       |
| 438 | 3-5 Reverse Clutch Regulator (Shuttle) Valve          |

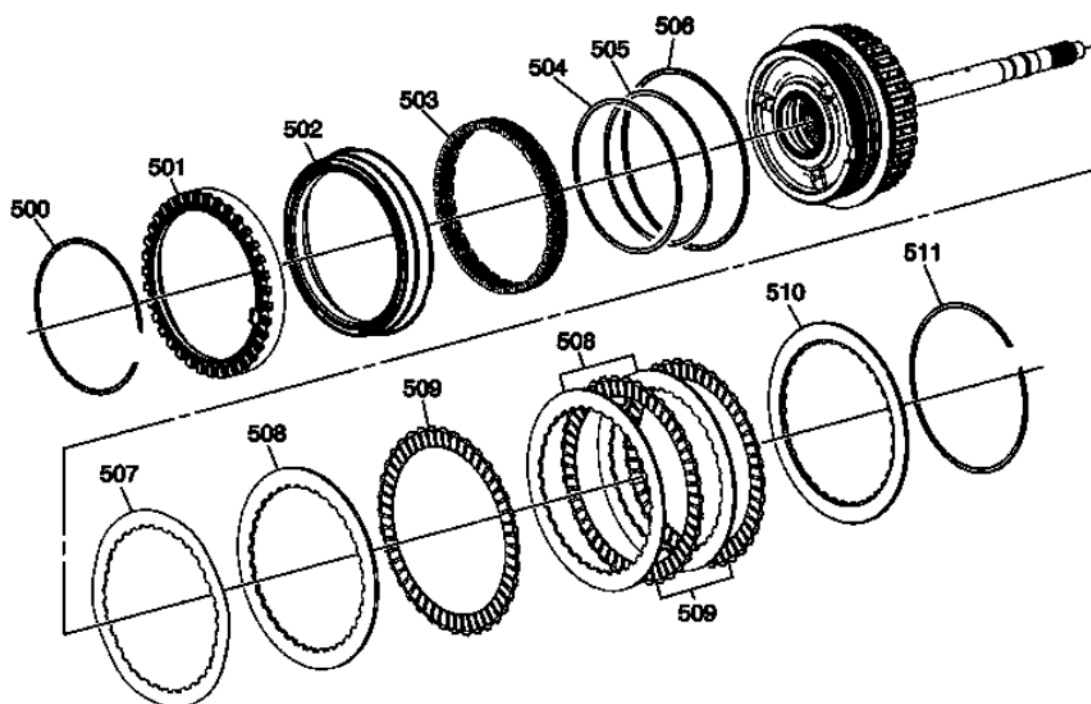
### 3-5 Reverse Clutch Assembly - Gen 1



**Fig. 17: View Of 3-5 Reverse Clutch Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                |
|---------|---------------------------------------------------------------|
| 500     | A/Trans Input Shaft Speed Sensor Reluctor Wheel Retainer Ring |
| 501     | A/Trans Input Shaft Speed Sensor Reluctor Wheel               |
| 502     | 3-5-Reverse Clutch Piston                                     |
| 503     | 3-5-Reverse Clutch Piston Return Spring Assembly              |
| 504     | 3-5-Reverse Clutch Piston Inner Seal                          |
| 505     | 3-5-Reverse Clutch Piston Inner Seal                          |
| 506     | 3-5-Reverse Clutch Piston Dam Seal                            |
| 507     | 3-5-Reverse Clutch Apply Plate                                |
| 508     | 3-5-Reverse Clutch Plate                                      |
| 509     | 3-5-Reverse Clutch (w/Friction Material) Plate Assembly       |
| 510     | 3-5-Reverse Clutch Backing Plate                              |
| 511     | 3-5-Reverse Clutch Backing Plate Retainer Ring                |

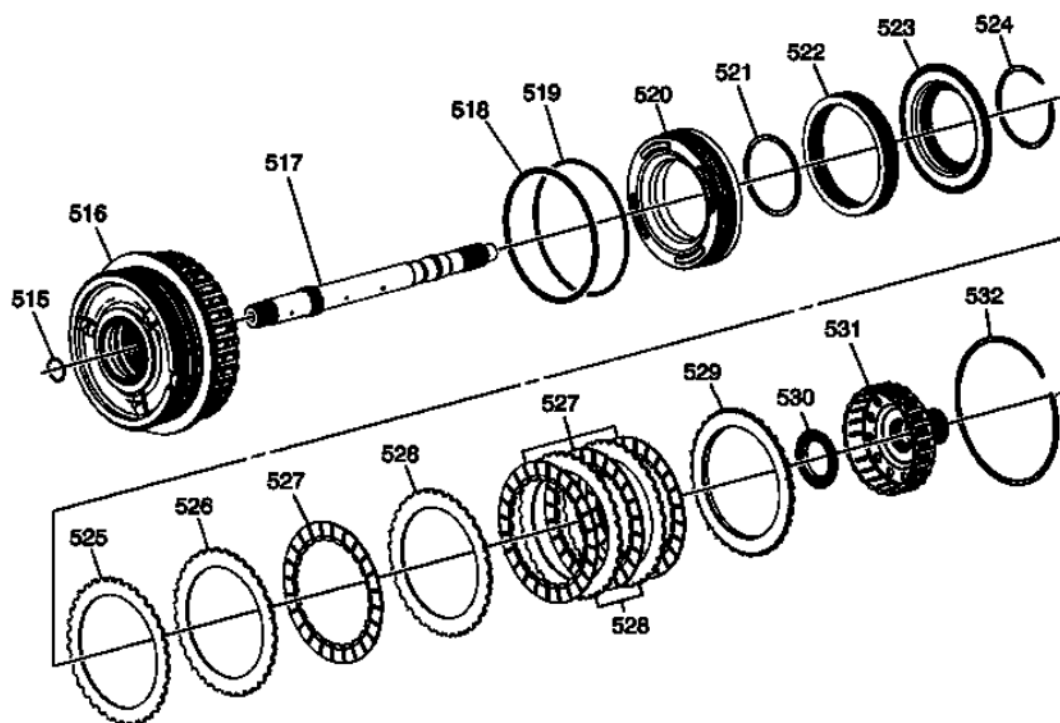
### 3-5 Reverse Clutch Assembly - Gen 2



**Fig. 18: 3-5 Reverse Clutch Assembly - Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                |
|---------|---------------------------------------------------------------|
| 500     | A/Trans Input Shaft Speed Sensor Reluctor Wheel Retainer Ring |
| 501     | A/Trans Input Shaft Speed Sensor Reluctor Wheel               |
| 502     | 3-5-Reverse Clutch Piston                                     |
| 503     | 3-5-Reverse Clutch Piston Return Spring Assembly              |
| 504     | 3-5-Reverse Clutch Piston Inner Seal                          |
| 505     | 3-5-Reverse Clutch Piston Inner Seal                          |
| 506     | 3-5-Reverse Clutch Piston Dam Seal                            |
| 507     | 3-5-Reverse Clutch Apply Plate                                |
| 508     | 3-5-Reverse Clutch Plate                                      |
| 509     | 3-5-Reverse Clutch (w/Friction Material) Plate Assembly       |
| 510     | 3-5-Reverse Clutch Backing Plate                              |
| 511     | 3-5-Reverse Clutch Backing Plate Retainer Ring                |

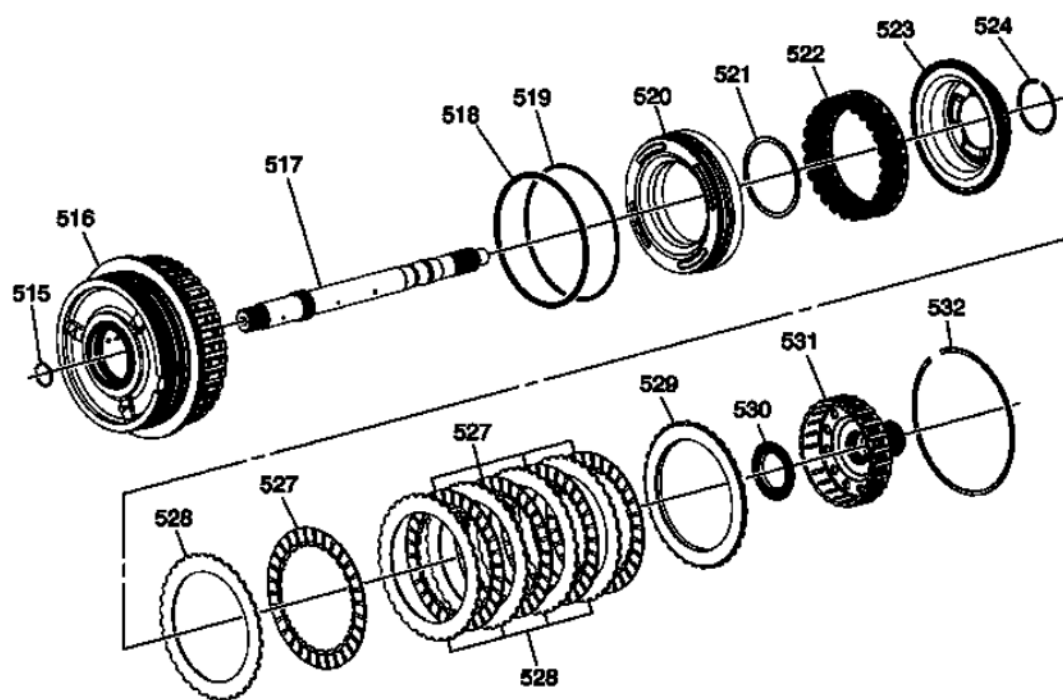
#### 4-5-6 Clutch Assembly - Gen 1



**Fig. 19: View Of 4-5-6 Clutch Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
| 515     | Turbine Shaft Retainer Ring                       |
| 516     | 3-5-Reverse and 4-5-6 Clutch Housing Assembly     |
| 517     | Turbine Shaft                                     |
| 518     | 4-5-6 Clutch Piston Outer Seal                    |
| 519     | 4-5-6 Clutch Piston Outer Seal                    |
| 520     | 4-5-6 Clutch Piston                               |
| 521     | 4-5-6 Clutch Piston Inner Seal                    |
| 522     | 4-5-6 Clutch Piston Return Spring Assembly        |
| 523     | 4-5-6 Clutch Piston Fluid Dam Assembly            |
| 524     | 4-5-6 Clutch Piston Fluid Dam Retainer Ring       |
| 525     | 4-5-6 Clutch (Waved) Plate                        |
| 526     | 4-5-6 Clutch Apply Plate                          |
| 527     | 4-5-6 Clutch (w/Friction Material) Plate Assembly |
| 528     | 4-5-6 Clutch Plate                                |
| 529     | 4-5-6 Clutch Backing Plate                        |
| 530     | Reaction Carrier Hub Thrust Bearing Assembly      |
| 531     | Reaction Carrier Hub Assembly                     |
| 532     | 4-5-6 Clutch Backing Plate Retainer Ring          |

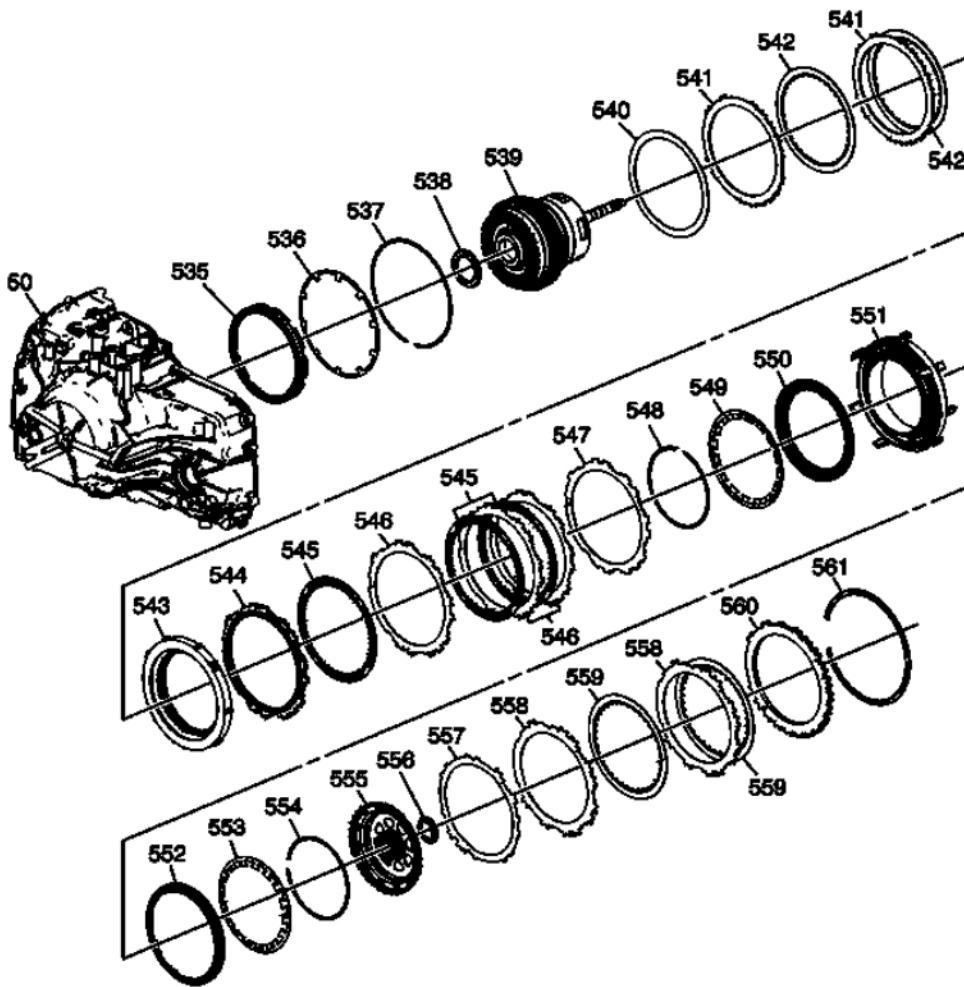
#### 4-5-6 Clutch Assembly - Gen 2



**Fig. 20: 4-5-6 Clutch Assembly -- Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                   |
|---------|----------------------------------------------------------------------------------|
| 515     | Turbine Shaft Retainer Ring                                                      |
| 516     | 3-5-Reverse and 4-5-6 Clutch Housing Assembly                                    |
| 517     | Turbine Shaft                                                                    |
| 518     | 4-5-6 Clutch Piston Outer Seal                                                   |
| 519     | 4-5-6 Clutch Piston Outer Seal                                                   |
| 520     | 4-5-6 Clutch Piston                                                              |
| 521     | 4-5-6 Clutch Piston Inner Seal                                                   |
| 522     | 4-5-6 Clutch Piston Return Spring Assembly                                       |
| 523     | 4-5-6 Clutch Piston Fluid Dam Assembly                                           |
| 524     | 4-5-6 Clutch Piston Fluid Dam Retainer Ring                                      |
| 527     | 4-5-6 Clutch (w/Friction Material) Plate Assembly Gen 1 (Qty: 4), Gen 2 (Qty: 5) |
| 528     | 4-5-6 Clutch Plate - Gen 1 (Qty: 3), Gen 2 (Qty: 5)                              |
| 529     | 4-5-6 Clutch Backing Plate                                                       |
| 530     | Reaction Carrier Hub Thrust Bearing Assembly                                     |
| 531     | Reaction Carrier Hub Assembly                                                    |
| 532     | 4-5-6 Clutch Backing Plate Retainer Ring                                         |

**2-6, Low and Reverse and 1-2-3-4 Clutch Plate Assemblies - Gen 1**

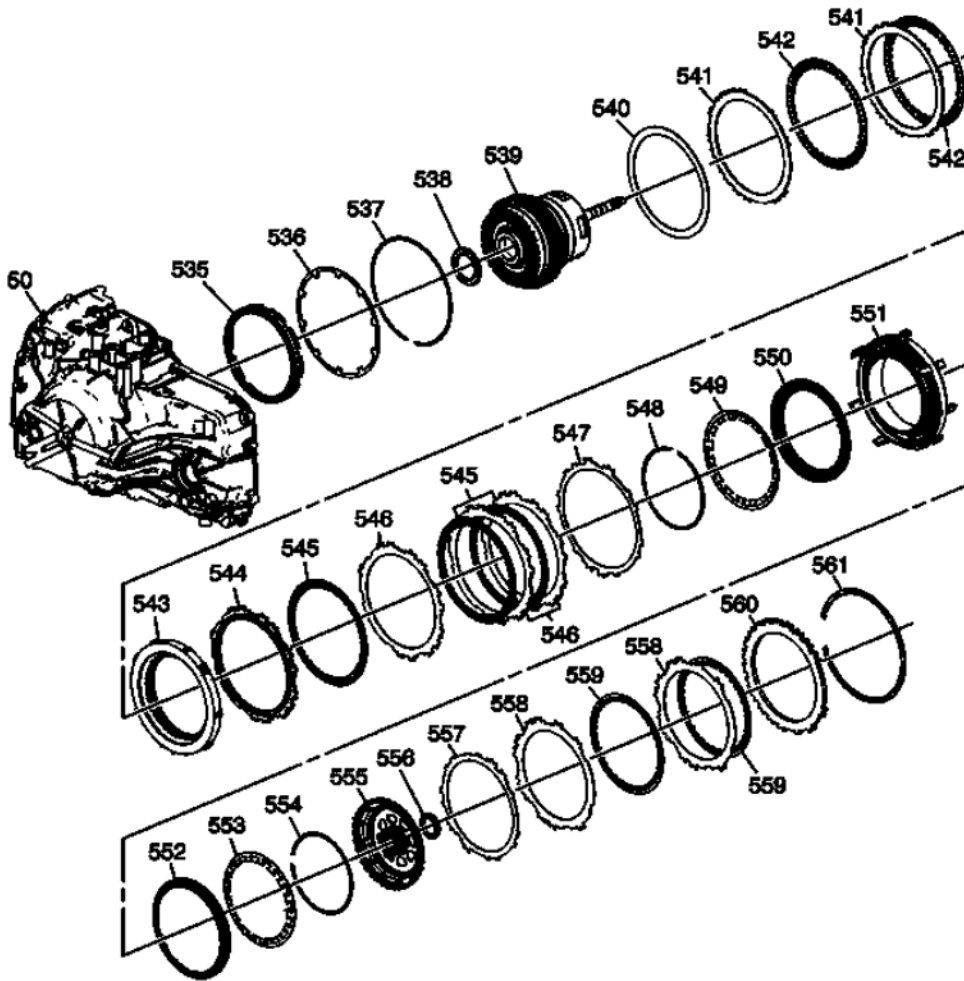


**Fig. 21: Disassembled View Of 2-6, Low 7 Reverse & 1-2-3-4 Clutch Plate Assemblies**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                              |
|---------|-------------------------------------------------------------|
| 50      | A/Trans Case                                                |
| 535     | 2-6 Clutch Piston Assembly                                  |
| 536     | 2-6 Clutch Spring                                           |
| 537     | 2-6 Clutch Spring Retainer Ring                             |
| 538     | 3-5-Reverse and 4-5-6 Clutch Housing Thrust Bearing         |
| 539     | 3-5-Reverse and 4-5-6 Clutch Housing Assembly               |
| 540     | 2-6 Clutch Apply (Waved) Plate                              |
| 541     | 2-6 Clutch Plate                                            |
| 542     | 2-6 Clutch (w/Friction Material) Plate Assembly             |
| 543     | Low and Reverse Clutch Assembly                             |
| 544     | Low and Reverse Clutch Backing Plate                        |
| 545     | Low and Reverse Clutch (w/Friction Material) Plate Assembly |
| 546     | Low and Reverse Clutch Plate                                |

|     |                                                     |
|-----|-----------------------------------------------------|
| 547 | Low and Reverse Clutch Apply (Waved) Plate          |
| 548 | Low and Reverse Clutch Spring Retainer              |
| 549 | Low and Reverse Clutch Spring                       |
| 550 | Low and Reverse Clutch Piston                       |
| 551 | Low and Reverse and 1-2-3-4 Clutch Housing          |
| 552 | 1-2-3-4 Clutch Piston                               |
| 553 | 1-2-3-4 Clutch Spring                               |
| 554 | 1-2-3-4 Clutch Piston Retainer                      |
| 555 | Output Sun Gear Assembly                            |
| 556 | Output Sun Thrust Bearing Assembly                  |
| 557 | 1-2-3-4 Clutch (Waved) Plate                        |
| 558 | 1-2-3-4 Clutch Plate                                |
| 559 | 1-2-3-4 Clutch (w/Friction Material) Plate Assembly |
| 560 | 1-2-3-4 Clutch Backing Plate                        |
| 561 | 1-2-3-4 Clutch Backing Plate Retainer Ring          |

**2-6, Low and Reverse and 1-2-3-4 Clutch Plate Assemblies - Gen 2**



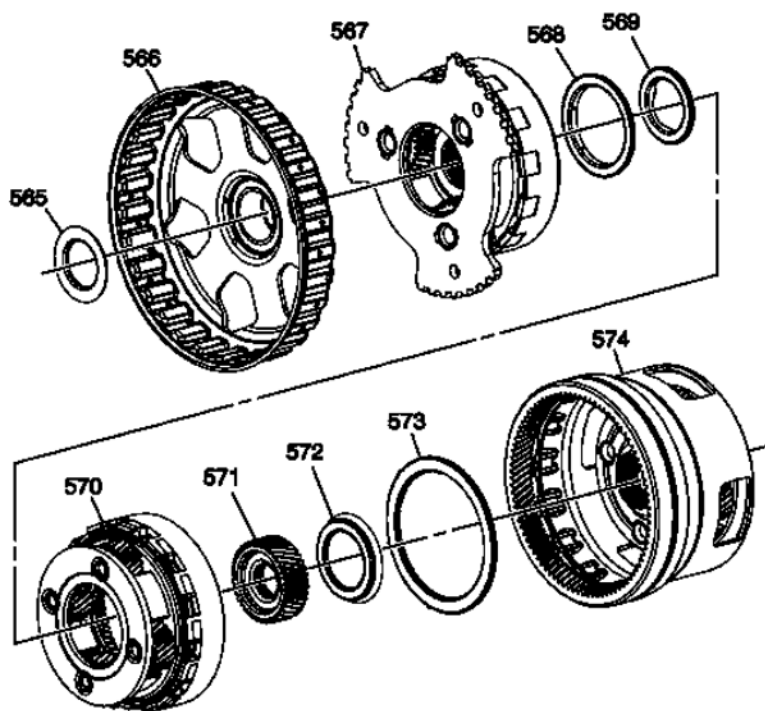
**Fig. 22: 2-6, Low, Reverse And 1-2-3-4 Clutch Plate Assemblies - Gen 2**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                             |
|---------|----------------------------------------------------------------------------|
| 50      | A/Trans Case                                                               |
| 535     | 2-6 Clutch Piston Assembly                                                 |
| 536     | 2-6 Clutch Spring                                                          |
| 537     | 2-6 Clutch Spring Retainer Ring                                            |
| 538     | 3-5-Reverse and 4-5-6 Clutch Housing Thrust Bearing                        |
| 539     | 3-5-Reverse and 4-5-6 Clutch Housing Assembly                              |
| 540     | 2-6 Clutch Apply (Waved) Plate                                             |
| 541     | 2-6 Clutch Plate (Qty: 2)                                                  |
| 542     | 2-6 Clutch (w/Friction Material) Plate Assembly (Qty: 2) - Model Dependent |
| 543     | Low and Reverse Clutch Assembly                                            |
| 544     | Low and Reverse Clutch Backing Plate                                       |
| 545     | Low and Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 2)       |



|     |                                                              |
|-----|--------------------------------------------------------------|
|     | 3)                                                           |
| 546 | Low and Reverse Clutch Plate (Qty: 3)                        |
| 547 | Low and Reverse Clutch Apply (Waved) Plate                   |
| 548 | Low and Reverse Clutch Spring Retainer                       |
| 549 | Low and Reverse Clutch Spring                                |
| 550 | Low and Reverse Clutch Piston                                |
| 551 | Low and Reverse and 1-2-3-4 Clutch Housing                   |
| 552 | 1-2-3-4 Clutch Piston                                        |
| 553 | 1-2-3-4 Clutch Spring                                        |
| 554 | 1-2-3-4 Clutch Piston Retainer                               |
| 555 | Output Sun Gear Assembly                                     |
| 556 | Output Sun Thrust Bearing Assembly                           |
| 557 | 1-2-3-4 Clutch (Waved) Plate                                 |
| 558 | 1-2-3-4 Clutch Plate (Qty: 2)                                |
| 559 | 1-2-3-4 Clutch (w/Friction Material) Plate Assembly (Qty: 2) |
| 560 | 1-2-3-4 Clutch Backing Plate                                 |
| 561 | 1-2-3-4 Clutch Backing Plate Retainer Ring                   |

#### Input, Output and Reaction Gearsets- 6T30/6T40

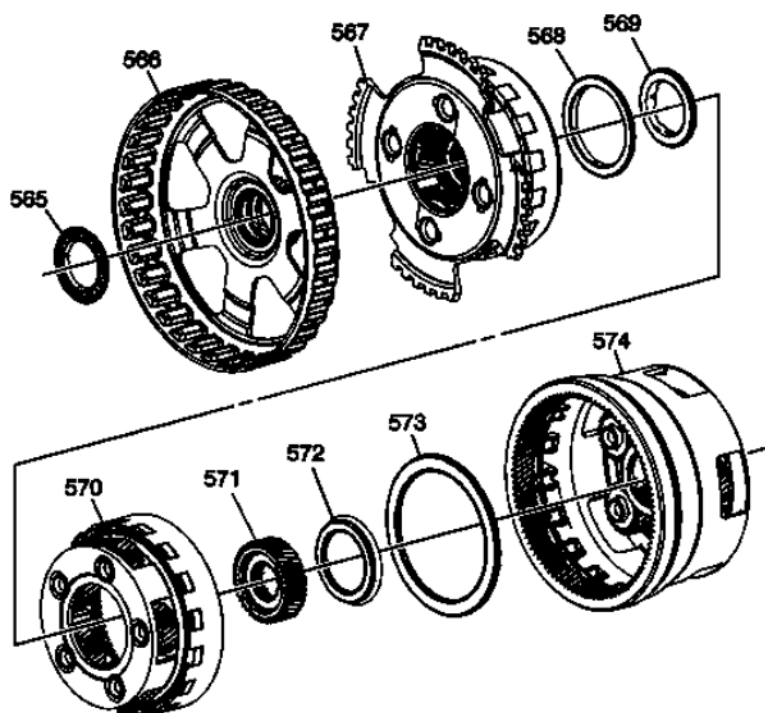


**Fig. 23: Input, Output and Reaction Gearsets -- 6T30/6T40**  
 Courtesy of GENERAL MOTORS COMPANY

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

|     |                                           |
|-----|-------------------------------------------|
| 565 | Reaction Sun Gear Thrust Bearing Assembly |
| 566 | Reaction Sun Gear Assembly                |
| 567 | Reaction Carrier Assembly                 |
| 568 | Input Carrier Thrust Bearing Assembly     |
| 569 | Input Sun Gear Thrust Bearing Assembly    |
| 570 | Input Carrier Assembly                    |
| 571 | Input Sun Gear                            |
| 572 | Input Sun Gear Thrust Bearing Assembly    |
| 573 | Output Carrier Thrust Bearing Assembly    |
| 574 | Output Carrier Assembly                   |

#### Input, Output and Reaction Gearsets- 6T45/6T50

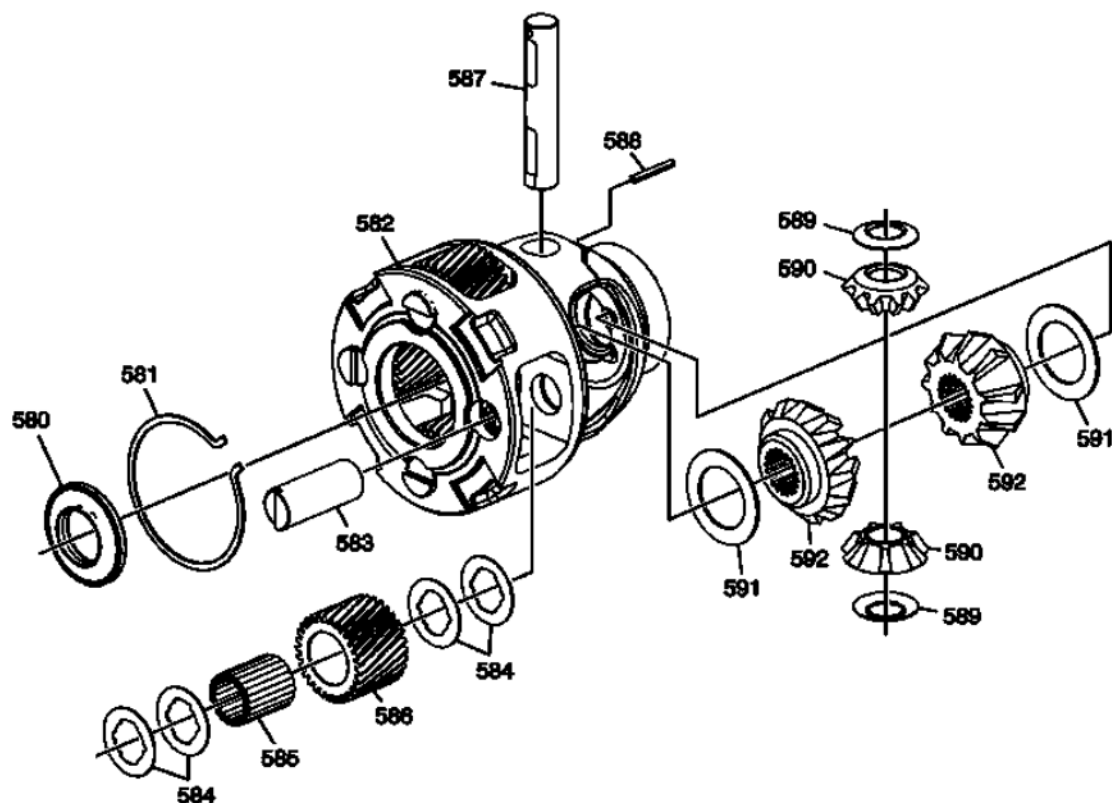


**Fig. 24: View Of Input, Output & Reaction Gearsets**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                            |
|---------|-------------------------------------------|
| 565     | Reaction Sun Gear Thrust Bearing Assembly |
| 566     | Reaction Sun Gear Assembly                |
| 567     | Reaction Carrier Assembly                 |
| 568     | Input Carrier Thrust Bearing Assembly     |
| 569     | Input Sun Gear Thrust Bearing Assembly    |
| 570     | Input Carrier Assembly                    |
| 571     | Input Sun Gear                            |

|     |                                        |
|-----|----------------------------------------|
| 572 | Input Sun Gear Thrust Bearing Assembly |
| 573 | Output Carrier Thrust Bearing Assembly |
| 574 | Output Carrier Assembly                |

#### Front Differential Carrier Assembly (2 Pinion)

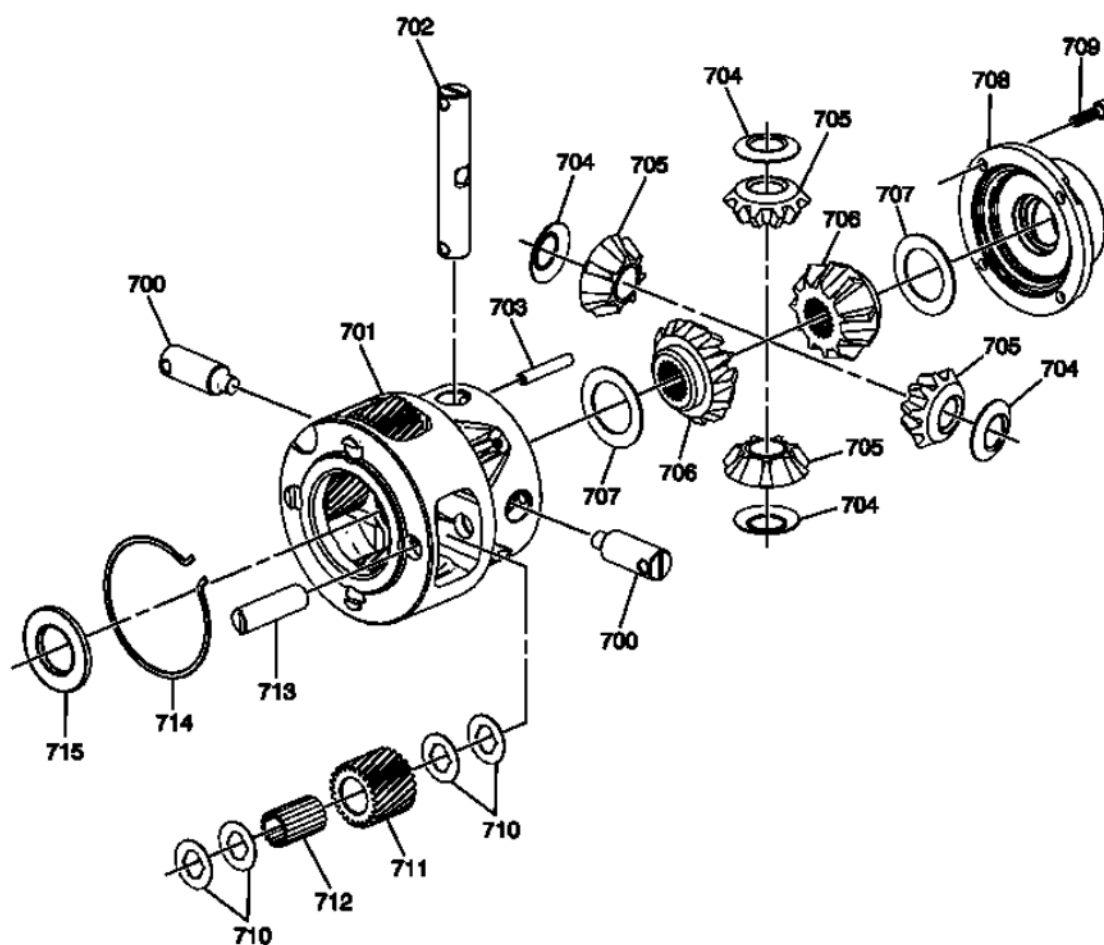


**Fig. 25: Disassembled View Of Front Differential Carrier Assembly**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                 |
|---------|----------------------------------------------------------------|
| 580     | Differential Sun Gear to Differential Housing Bearing Assembly |
| 581     | Final Drive Retainer                                           |
| 582     | Differential Carrier Assembly                                  |
| 583     | Final Drive Pinion Pin                                         |
| 584     | Final Drive Inner and Outer Washer                             |
| 585     | Final Drive Roller                                             |
| 586     | Pinion Final Drive Gear                                        |

|     |                                              |
|-----|----------------------------------------------|
| 587 | Front Differential Pinion Gear Shaft         |
| 588 | Front Differential Pinion Gear Shaft Pin     |
| 589 | Front Differential Pinion Gear Thrust Washer |
| 590 | Front Differential Pinion Gear               |
| 591 | Front Differential Side Gear Thrust Washer   |
| 592 | Front Differential Side Gear                 |

#### Front Differential Carrier Assembly (4 Pinion)

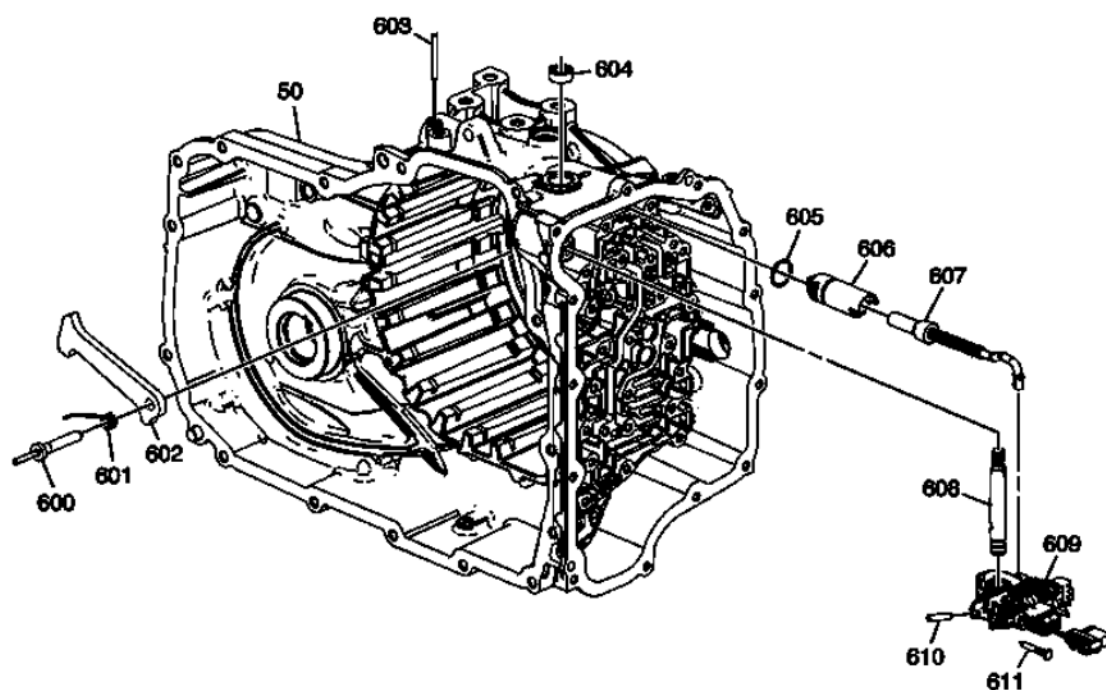


**Fig. 26: Front Differential Carrier Assembly Components (4 Pinion)**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                          |
|---------|-----------------------------------------|
| 700     | Front Differential Pinion Gear Shaft    |
| 701     | Differential Carrier Assembly           |
| 702     | Front Differential Pinion Gear Shaft    |
| 703     | Front Differential Pinion Gear Shaft    |
| 704     | Front Differential Pinion Thrust Washer |

|     |                                                        |
|-----|--------------------------------------------------------|
| 705 | Front Differential Pinion Gear                         |
| 706 | Front Differential Side Gear                           |
| 707 | Front Differential Side Gear Thrust Washer             |
| 708 | Front Differential Carrier Cover                       |
| 709 | Front Differential Carrier Cover Bolts                 |
| 710 | Front Differential Pinion Gear Shaft Washer            |
| 711 | Front Differential Drive Pinion Gear                   |
| 712 | Front Differential Carrier Pinion Gear Bearing Rollers |
| 713 | Front Differential Pinion Gear Shaft Pin               |
| 714 | Front Differential Pinion Gear Shaft Retainer          |
| 715 | Front Differential Bearing                             |

### Park System Components

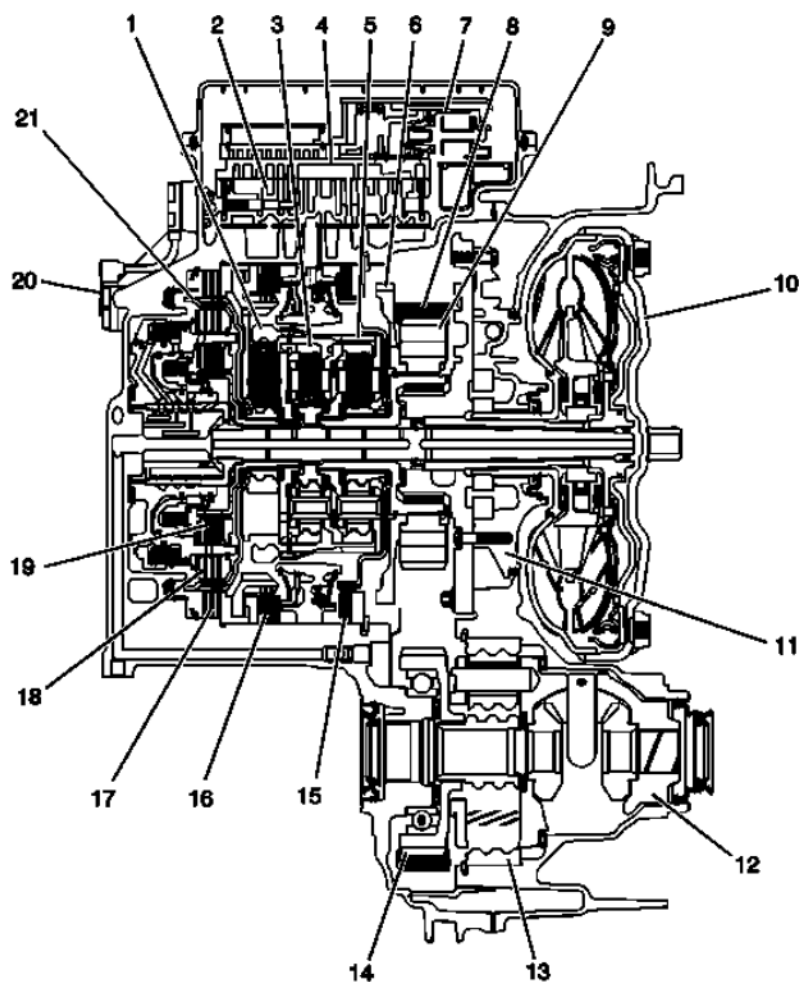


**Fig. 27: View Of Park System Components**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name               |
|---------|------------------------------|
| 50      | A/Trans Case                 |
| 600     | Park Pawl Shaft              |
| 601     | Park Pawl Spring             |
| 602     | Park Pawl                    |
| 603     | Park Pawl Actuator Guide Pin |
| 604     | Manual Shift Shaft Seal      |

|     |                                                              |
|-----|--------------------------------------------------------------|
| 605 | Park Pawl Actuator Guide Seal                                |
| 606 | Park Pawl Actuator Guide                                     |
| 607 | Park Pawl Actuator Assembly                                  |
| 608 | Manual Shift Detent Lever Shaft                              |
| 609 | Manual Shift Detent (w/Shaft Position Switch) Lever Assembly |
| 610 | Manual Shift Detent Lever Pin                                |
| 611 | Manual Shift Shaft Pin                                       |

## COMPONENT LOCATION



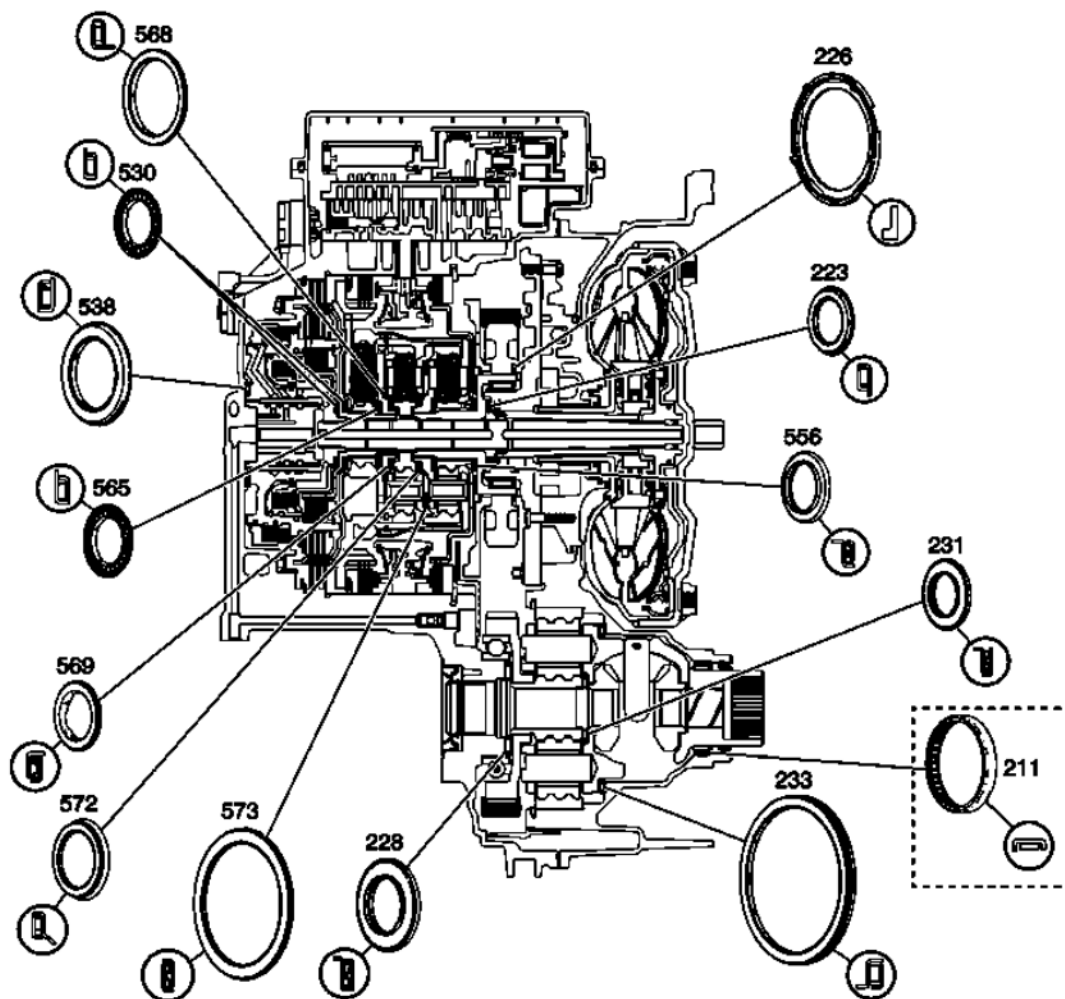
**Fig. 28: Identifying Component Location**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name              |
|---------|-----------------------------|
| 1       | Reaction Carrier Assembly   |
| 2       | Control Valve Body Assembly |
| 3       | Input Carrier Assembly      |

|    |                                                  |
|----|--------------------------------------------------|
| 4  | Valve Channel Plate                              |
| 5  | Output Carrier Assembly                          |
| 6  | Park Gear                                        |
| 7  | Control Solenoid (w/Body and TCM) Valve Assembly |
| 8  | Drive Link Assembly                              |
| 9  | Drive Sprocket                                   |
| 10 | Torque Converter Assembly                        |
| 11 | A/Trans Fluid Pump Assembly                      |
| 12 | Differential Carrier Assembly                    |
| 13 | Front Differential Ring Gear                     |
| 14 | Driven Sprocket                                  |
| 15 | 1-2-3-4 Clutch Assembly                          |
| 16 | Low and Reverse Clutch Assembly                  |
| 17 | 2-6 Clutch Assembly                              |
| 18 | 3-5 Reverse Clutch Assembly                      |
| 19 | 4-5-6 Clutch Assembly                            |
| 20 | A/Trans Input Speed Sensor Assembly              |
| 21 | Reaction Sun Gear Assembly                       |

## **BUSHING, BEARING, AND WASHER LOCATIONS (GEN 2/HYBRID)**

**NO TITLE**



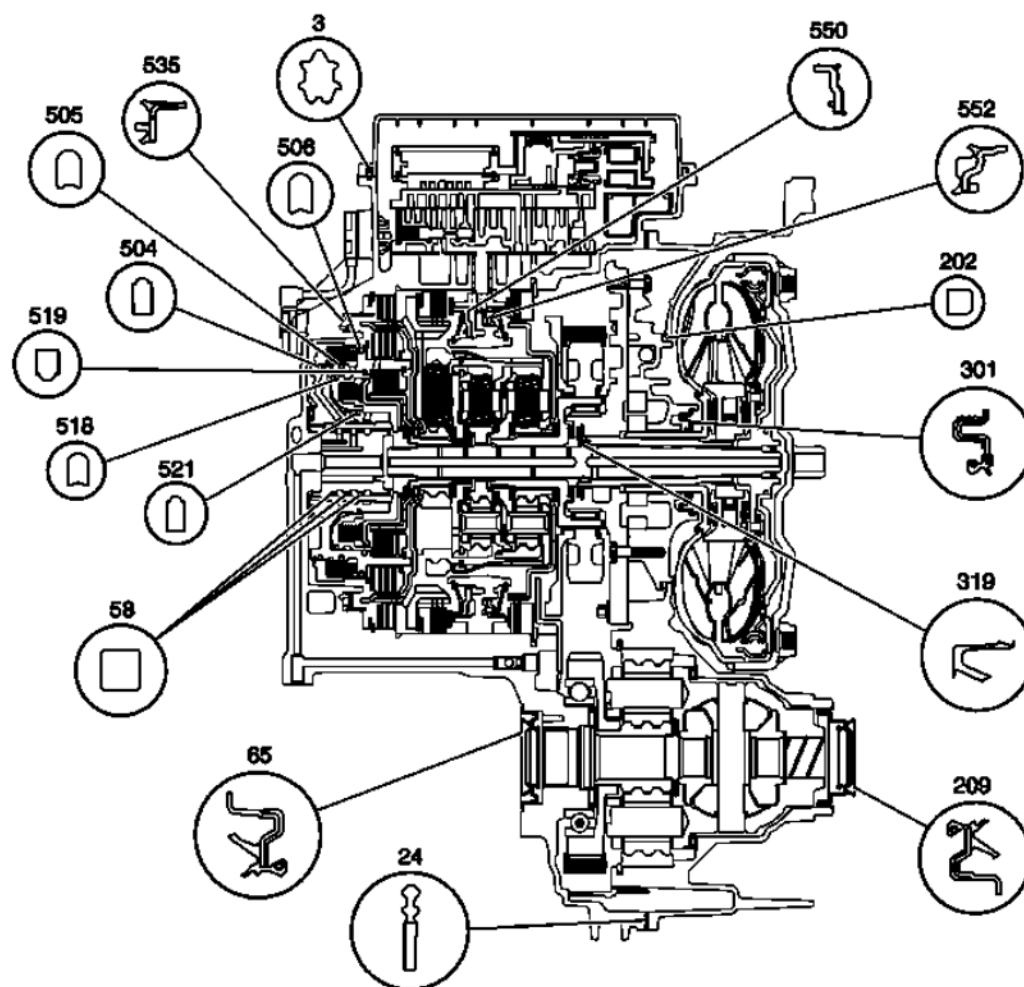
**Fig. 29: Bushing, Bearing, and Washer Locations (Gen 2/Hybrid)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                 |
|---------|----------------------------------------------------------------|
| 211     | Front Differential Carrier Bearing Assembly - AWD Models       |
| 223     | Drive Spocket Bearing Assembly                                 |
| 226     | Drive Spocket Thrust Washer                                    |
| 228     | Drive Spocket Bearing Assembly                                 |
| 231     | Differential Sun Gear to Differential Housing Bearing Assembly |
| 233     | Front Differential Carrier Bearing Assembly                    |
| 530     | Reaction Carrier Hub Thrust Bearing Assembly                   |
| 538     | 3-5-Reverse and 4-5-6 Clutch Housing Thrust Bearing            |
| 556     | Output Sun Thrust Bearing Assembly                             |
| 565     | Reaction Sun Gear Thrust Bearing Assembly                      |
| 568     | Input Carrier Thrust Bearing Assembly                          |
| 569     | Input Sun Gear Thrust Bearing Assembly                         |
| 572     | Input Sun Gear Thrust Bearing Assembly                         |



**SEAL LOCATIONS (GEN 2/HYBRID)**

Seal Locations (1 of 2)

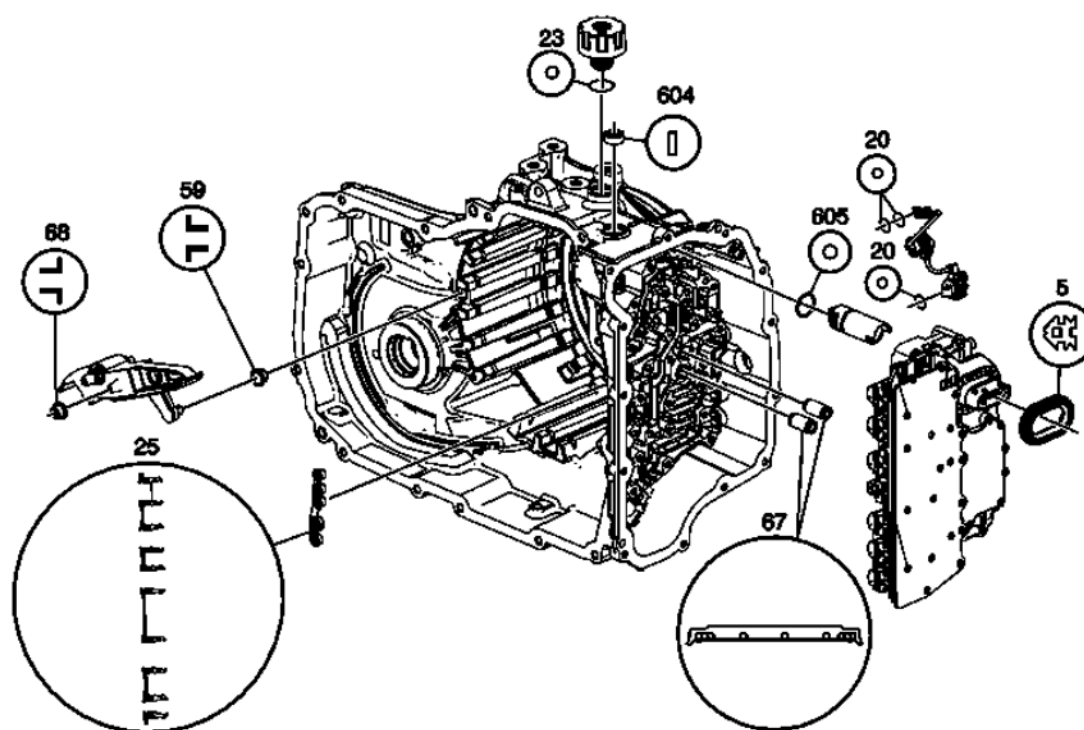


**Fig. 30: Seal Locations (Gen 2/Hybrid)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                        |
|---------|-------------------------------------------------------|
| 3       | Control Valve Body Cover Gasket                       |
| 24      | Torque Converter Housing Gasket                       |
| 58      | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring (Qty: 3) |
| 65      | Drive Shaft Oil Seal Assembly                         |
| 202     | Torque Converter and Differential Housing Seal        |
| 209     | Front Wheel Drive Shaft Oil Seal Assembly             |
| 301     | Torque Converter Fluid Seal Assembly                  |
| 319     | Torque Converter Fluid Seal Assembly                  |

|     |                                      |
|-----|--------------------------------------|
| 504 | 3-5-Reverse Clutch Piston Inner Seal |
| 505 | 3-5-Reverse Clutch Piston Inner Seal |
| 506 | 3-5-Reverse Clutch Piston Dam Seal   |
| 518 | 4-5-6 Clutch Piston Outer Seal       |
| 519 | 4-5-6 Clutch Piston Outer Seal       |
| 521 | 4-5-6 Clutch Piston Inner Seal       |
| 535 | 2-6 Clutch Piston Assembly           |
| 550 | Low and Reverse Clutch Piston        |
| 552 | 1-2-3-4 Clutch Piston                |

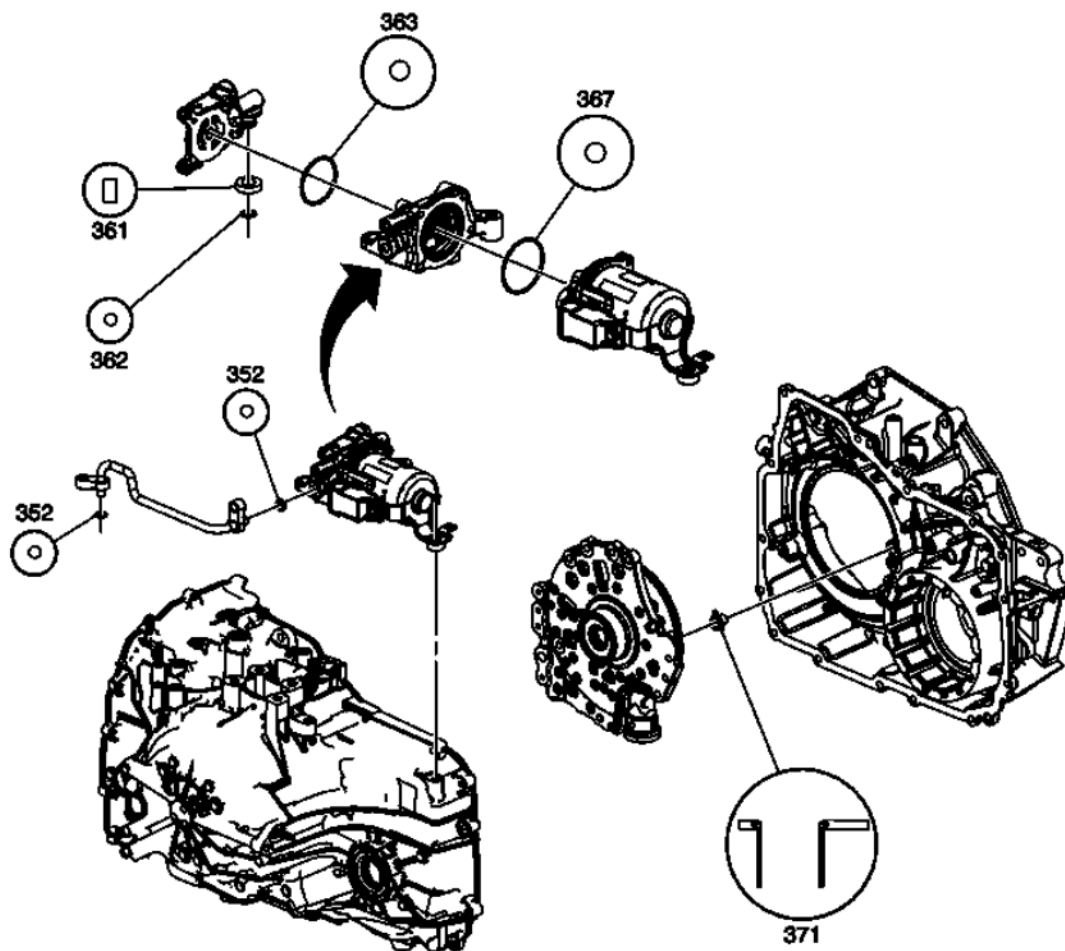
#### Seal Locations (2 of 2)



**Fig. 31: Seal Locations (Gen 2/Hybrid)**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 5       | Control Valve Body Cover Hole Seal              |
| 20      | A/Trans Input Speed Sensor Assembly O-Ring Seal |
| 23      | Fill Cap Seal                                   |
| 25      | A/Trans Fluid Pump Seal Assembly                |
| 59      | Drive Link Lube Fluid Seal                      |
| 67      | 1-2-3-4 and Low Reverse Clutch Fluid Passage    |
| 68      | Drive Link Lube Fluid Seal                      |
| 604     | Manual Shift Shaft Seal                         |

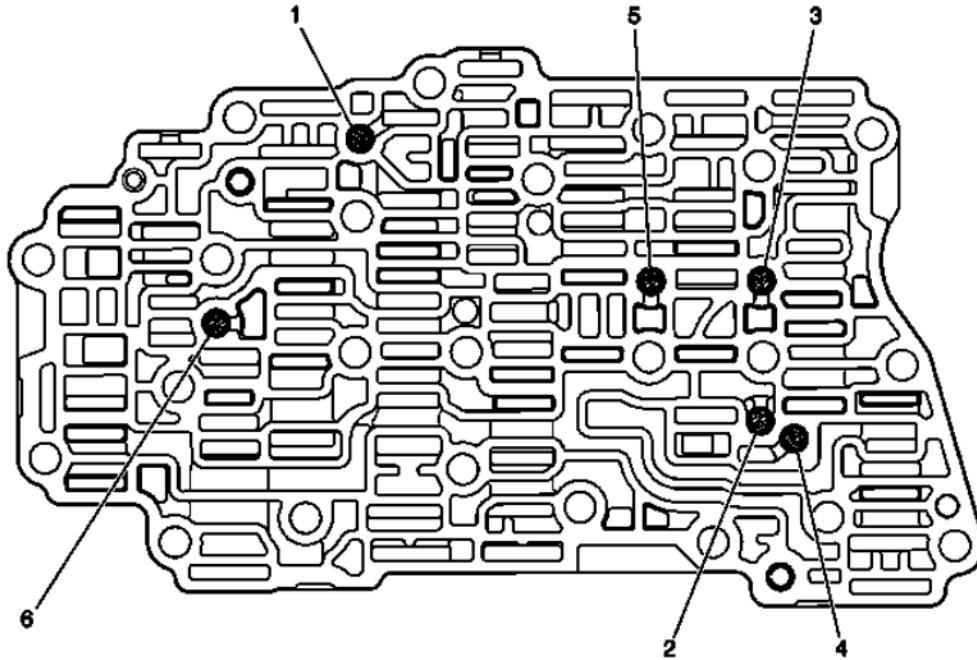
### Auxiliary Fluid Pump and Hybrid Seals - Hybrid Models



**Fig. 32: Auxiliary Fluid Pump and Hybrid Seals -- Hybrid Models**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                         |
|---------|--------------------------------------------------------|
| 352     | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly |
| 361     | A/Trans Auxiliary Fluid Pump Gasket                    |
| 362     | A/Trans Auxiliary Fluid Pump Seal                      |
| 363     | A/Trans Auxiliary Fluid Pump Cover Seal                |
| 367     | A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-ring |
| 371     | A/Trans Auxiliary Fluid Inlet Pump Seal                |

### BALL CHECK VALVE LOCATIONS (GEN 2/HYBRID)



**Fig. 33: Ball Check Valve Locations (Gen 2/Hybrid)**  
 Courtesy of GENERAL MOTORS COMPANY

**Ball Check Valve Locations (Gen 2/Hybrid)**

| I.D. | Input Oil              | Input Oil      | Output Oil             |
|------|------------------------|----------------|------------------------|
| 1    | Latch                  | 456 CL         | Latch                  |
| 2    | 35 Rev CL FD           | Drive 1-6      | 35 Rev CL FD/Drive 1-6 |
| 3    | 35 Rev CL FD/Drive 1-6 | -              | 35 Rev CL FD/Drive 1-6 |
| 4    | Act FD LM              | -              | 35 Rev CL              |
| 5    | Drive                  | -              | Drive                  |
| 6    | Line                   | Auxiliary Line | Line                   |

## 2013 TRANSMISSION

### Automatic Transmission - 6T40 (MH8, MHH) - Description and Operation - Malibu

## DESCRIPTION AND OPERATION

### DEFINITIONS AND ABBREVIATIONS

#### Throttle Positions

#### Engine Braking

A condition where the engine is used to slow the vehicle by manually downshifting during a zero throttle coastdown.

#### Full Throttle Downshift

A quick apply of the accelerator pedal to its full travel, forcing a downshift.

#### Heavy Throttle

Approximately 3/4 of accelerator pedal travel, 75 percent throttle position.

#### Light Throttle

Approximately 1/4 of accelerator pedal travel, 25 percent throttle position.

#### Medium Throttle

Approximately 1/2 of accelerator pedal travel, 50 percent throttle position.

#### Minimum Throttle

The least amount of throttle opening required for an upshift.

#### Wide Open Throttle (WOT)

Full travel of the accelerator pedal, 100 percent throttle position.

#### Zero Throttle Coastdown

A full release of the accelerator pedal while the vehicle is in motion and in drive range.

#### Shift Condition Definitions

#### Bump

A sudden and forceful apply of a clutch or a band.

### **Chuggle**

A bucking or jerking. This condition may be most noticeable when the converter clutch is engaged. It is similar to the feel of towing a trailer.

### **Delayed**

A condition where a shift is expected but does not occur for a period of time. This could be described as a clutch or band engagement that does not occur as quickly as expected during a part throttle or wide open throttle apply of the accelerator, or during manual downshifting to a lower range. This term is also defined as LATE or EXTENDED.

### **Double Bump - Double Feel**

Two sudden and forceful applies of a clutch or a band.

### **Early**

A condition where the shift occurs before the car has reached proper speed. This condition tends to labor the engine after the upshift.

### **End Bump**

A firmer feel at the end of a shift than at the start of the shift. This is also defined as END FEEL or SLIP BUMP.

### **Firm**

A noticeably quick apply of a clutch or band that is considered normal with a medium to heavy throttle. This apply should not be confused with HARSH or ROUGH.

### **Flare**

A quick increase in engine RPM along with a momentary loss of torque. This most generally occurs during a shift. This condition is also defined as SLIPPING.

### **Harsh - Rough**

A more noticeable apply of a clutch or band than FIRM. This condition is considered undesirable at any throttle position.

### **Hunting**

A repeating quick series of upshifts and downshifts that causes a noticeable change in engine RPM, such as a 4-3-4 shift pattern. This condition is also defined as BUSYNESS.

## **Initial Feel**

A distinctly firmer feel at the start of a shift than at the finish of the shift.

## **Late**

A shift that occurs when the engine RPM is higher than normal for a given amount of throttle.

## **Shudder**

A repeating jerking condition similar to CHUGGLE but more severe and rapid. This condition may be most noticeable during certain ranges of vehicle speed.

## **Slipping**

A noticeable increase in engine RPM without a vehicle speed increase. A slip usually occurs during or after initial clutch or band apply.

## **Soft**

A slow, almost unnoticeable clutch or band apply with very little shift feel.

## **Surge**

A repeating engine related condition of acceleration and deceleration that is less intense than CHUGGLE.

## **Tie-Up**

A condition where two opposing clutch and/or bands are attempting to apply at the same time causing the engine to labor with a noticeable loss of engine RPM.

## **Noise Conditions**

### **Drive Link Noise**

A whine or growl that increases or fades with vehicle speed, and is most noticeable under a light throttle acceleration. It may also be noticeable in PARK or NEUTRAL operating ranges with the vehicle stationary.

### **Final Drive Noise**

A hum related to vehicle speed which is most noticeable under a light throttle acceleration.

### **Planetary Gear Noise**

A whine related to vehicle speed, which is most noticeable in FIRST gear, SECOND gear, FOURTH gear or REVERSE. The condition may become less noticeable, or go away, after an upshift.

## **Pump Noise**

A high pitched whine that increases in intensity with engine RPM. This condition may also be noticeable in all operating ranges with the vehicle stationary or moving.

## **Torque Converter Noise**

A whine usually noticed when a vehicle is stopped, and the transmission is in DRIVE or REVERSE. The noise will increase with engine RPM.

## **Driver Shift Control**

Driver shift control (DSC) allows the driver to change gears similar to a manual transmission. Refer to the vehicle owner's manual for specific DSC operating instructions.

## **Transmission Abbreviations**

### **A/C**

Air Conditioning

### **AC**

Alternating Current

### **AT**

Automatic Transmission

### **CC**

Climate Control

### **DC**

Direct Current

### **DIC**

Driver Information Center

### **DLC**

Diagnostic Link Connector

### **DMM**



Digital Multimeter

**DSC**

Driver Shift Control

**DTC**

Diagnostic Trouble Code

**EBTCM**

Electronic Brake/Traction Control Module

**ECCC**

Electronically-Controlled Capacity Clutch

**ECT**

Engine Coolant Temperature

**EMI**

Electromagnetic Interference

**IAT**

Intake Air Temperature

**IGN**

Ignition

**IMS**

Internal Mode Switch

**ISS**

Input Speed Sensor

**MAP**

Manifold Absolute Pressure

**MIL**

Malfunction Indicator Lamp

**NC**

Normally Closed

**NO**

Normally Open

**OBD**

On Board Diagnostic

**OSS**

Output Speed Sensor

**PC**

Pressure Control

**PCM**

Powertrain Control Module

**PCS**

Pressure Control Solenoid

**PS**

Pressure Switch

**PWM**

Pulse Width Modulation

**RPM**

Revolutions Per Minute

**SS**

Shift Solenoid

**STL**

Service Transmission Lamp

**TAP**

Transmission Adaptive Pressure

**TCC**

Torque Converter Clutch

**TFP**

Transmission Fluid Pressure

**TFT**

Transmission Fluid Temperature

**TP**

Throttle Position

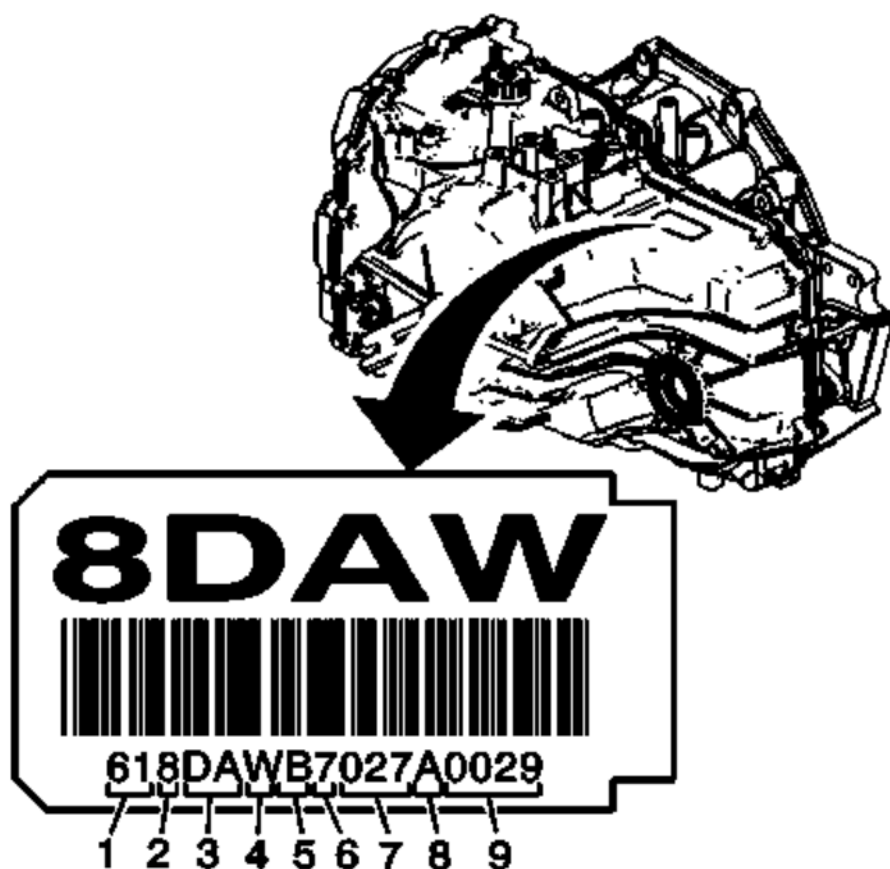
**VSS**

Vehicle Speed Sensor

**WOT**

Wide Open Throttle

**TRANSMISSION IDENTIFICATION INFORMATION**



**Fig. 1: Identifying Transmission Identification Information Plate**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                        |
|---------|-------------------------------------------------------|
| 1       | Code for Automatic Transmission                       |
| 2       | Model Year                                            |
| 3       | Model for Transmission                                |
| 4       | Transmission Family                                   |
| 5       | Source Code for Plant                                 |
| 6       | Calender Year                                         |
| 7       | Julian Date                                           |
| 8       | Shift/Line (A/B)                                      |
| 9       | Numeric sequence starting at 0001 @ 12:01 AM each day |

#### Source Code for Plant

- 4 - Ramos Arizpe, Mexico
- H - N.mpsilanti, Michigan
- J - Windsor, Ontario

- S - Strasbourg, France
- W - Warren, Michigan
- Y - Toledo, Ohio
- R - Boryeong, Korea
- M - N.man Tai, Shan Dong, China
- P - San Luis Potosi, Mexico

## TRANSMISSION GENERAL DESCRIPTION

The Hydra-matic 6T40/45/50 is a fully automatic, 6-speed, front-wheel drive, electronic-controlled transmission. It consists primarily of a 4-element torque converter, a compound planetary gear set, friction and mechanical clutch assemblies, and a hydraulic pressurization and control system. There are 2 variants of the transmission, based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

The 4-element torque converter contains a pump, a turbine, a pressure plate splined to the turbine, and a stator assembly. The torque converter acts as a fluid coupling to smoothly transmit power from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical direct drive coupling of the engine to the transmission.

The planetary gear sets provide the 6 forward gear ratios and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a transmission control module (TCM) located inside the transmission. The TCM receives and monitors various electronic sensor inputs and uses this information to shift the transmission at the optimum time.

The TCM commands shift solenoids and variable bleed pressure control solenoids to control shift timing and feel. The TCM also controls the apply and release of the torque converter clutch which allows the engine to deliver the maximum fuel efficiency without sacrificing vehicle performance. All the solenoids, including the TCM, are packaged into a self-contained control solenoid valve assembly.

The hydraulic system primarily consists of a gear-type pump, a control valve body assembly and case. The pump maintains the working pressures needed to stroke the clutch pistons that apply or release the friction components. These friction components, when applied or released, support the automatic shifting qualities of the transmission.

The friction components used in this transmission consist of 5 multiple disc clutches. The multiple disc clutches combine with one way clutch to deliver 7 different gear ratios, 6 forward and one reverse, through the gear sets. The gear sets then transfer torque through the transfer drive gear, transfer driven gear and differential assembly.

The transmission may be operated in any of the following gear ranges:

### PARK (P)

This position locks the front wheels and prevents the vehicle from rolling either forward or backward. PARK is the best position to use when starting the vehicle. Because the transmission utilizes a shift lock control system, it is necessary to fully depress the brake pedal before shifting out of PARK. For safety

reasons, use the parking brake in addition to the PARK position.

## **REVERSE (R)**

This position allows the vehicle to be operated in a rearward direction.

## **NEUTRAL (N)**

This position allows the engine to be started and operated while driving the vehicle. If necessary, you may select this position in order to restart the engine with the vehicle moving. This position should also be used when towing the vehicle.

## **DRIVE (D)**

Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the 6 forward gear ratios. Downshifts to a lower gear, or higher gear ratio, are available for safe passing by depressing the accelerator or by manually selecting a lower gear in the manual mode range.

## **Driver Shift Control (DSC) or Electronic Range Selection (ERS)**

This position (M-Manual / L-Low) allows the driver to utilize the DSC/ERS system. When the shift selector lever is moved to this position, the driver may select upshifts or downshifts by using the paddle switches located on the steering wheel/shifter. An upshift is requested by pushing either + button. Refer to the vehicle owner's manual for more specific DSC/ERS information.

## **TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION**

The mechanical components of the 6T40/45/50 are as follows:

- A torque converter with an electronically controlled capacity clutch (ECCC)
- Gear-type fluid pump assembly
- 1-2-3-4 and low and reverse clutch housing assembly
- 4-5-6 and 3-5 reverse clutch housing assembly
- 2-6 clutch assembly
- Low and reverse clutch (one way clutch) assembly
- Control valve body assembly
- Drive sprocket, driven sprocket and link assembly
- Front differential carrier assembly
- Input Carrier Assembly
- Reaction Carrier Assembly
- Output Carrier Assembly

The electrical components of the 6T40/45/50 are as follows:

- Output speed sensor assembly
- Input speed sensor assembly
- Manual shift shaft with internal mode switch
- Control solenoid valve assembly, which contains the following components:
  - Transmission control module (TCM)
  - 5 variable bleed line pressure control (PC) solenoids
  - Transmission fluid pressure (TFP) switch assembly
  - Torque converter clutch (TCC) pressure control solenoid
  - shift solenoid
  - Transmission fluid temperature sensor

For more information, refer to **Electronic Component Description**.

## **TRANSMISSION ADAPTIVE FUNCTIONS**

The 6T30/40/45/50 transmission utilizes a line pressure control system during upshifts to compensate for the normal wear of transmission components. As the apply components within the transmission wear or change over time, shift time (the time required to apply a clutch) increase or decreases. In order to compensate for these changes, the transmission control module (TCM) adjusts the pressure commands to the various PC solenoids, to maintain the originally calibrated shift timing. The automatic adjusting process is referred to as "adaptive learning" and it is used to ensure consistent shift feel plus increase transmission durability. The TCM monitors the A/T input speed sensor (ISS) and the A/T output speed sensor (OSS) during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the corresponding pressure control (PC) solenoid signal to maintain the set shift feel.

The purpose of the adapt function is to automatically compensate the shift quality for the various vehicle shift control systems. The adapt function is a continuous process that will help to maintain optimal shift quality throughout the life of the vehicle.

## **TRANSMISSION INDICATORS AND MESSAGES**

The following transmission-related indicators and messages may be displayed on the Instrument Panel Cluster (IPC). For a complete listing and description of all vehicle indicators and messages, refer to **Indicator/Warning Message Description and Operation**.

### **"TRANSMISSION HOT IDLE ENGINE"**

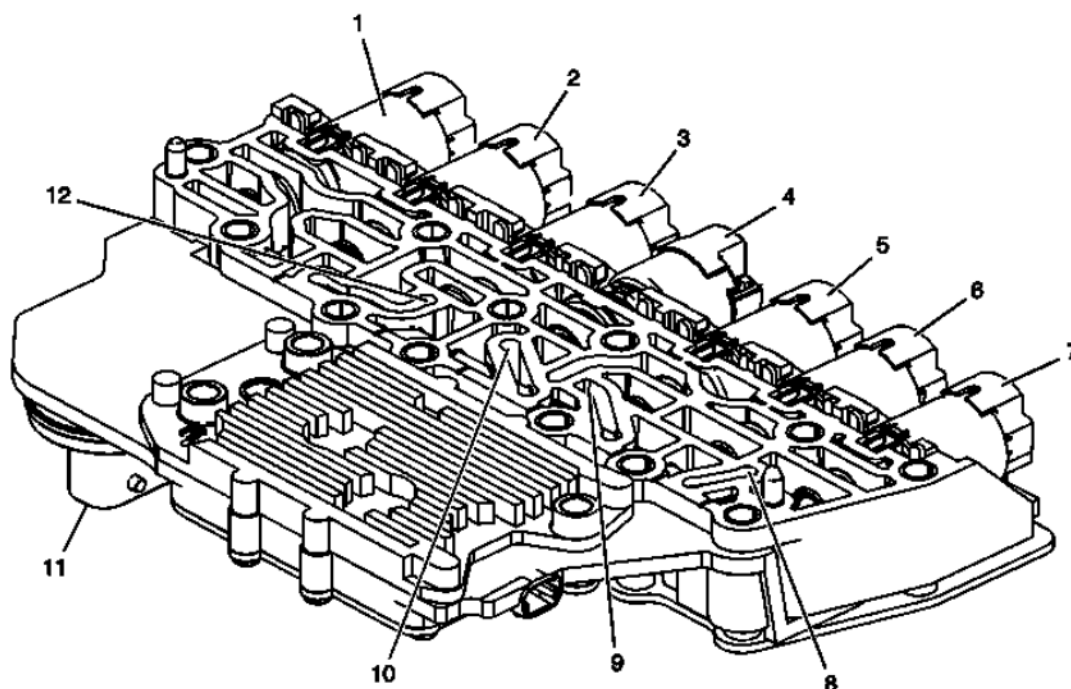
This message is displayed when the TCM detects a transmission fluid temperature (TFT) equal to or greater than 132°C (270°F) for 5 seconds.

### **"SERVICE TRANSMISSION"**

This message displays when there is a problem with the transmission.

## **ELECTRONIC COMPONENT DESCRIPTION**

## Control Solenoid Valve Assembly

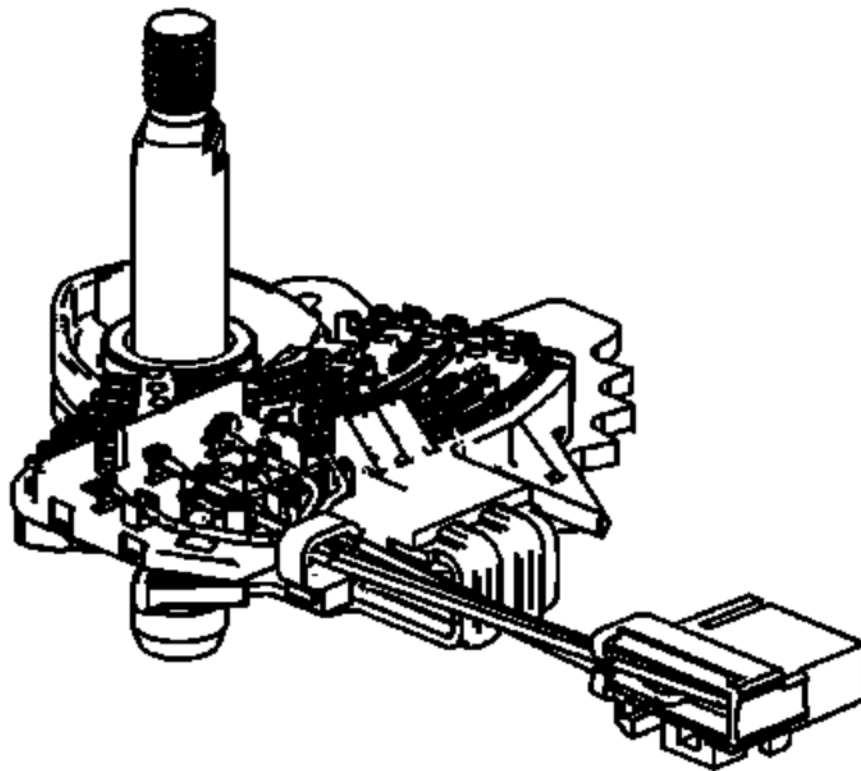


**Fig. 2: View Of Control Solenoid (W/Body & TCM) Valve Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                 |
|---------|----------------------------------------------------------------|
| 1       | Pressure Control Solenoid 3 (R-1/4-5-6)                        |
| 2       | (GEN 1) Pressure Control Solenoid 2 (3-5-R)                    |
| 2       | (GEN 2) Pressure Control Solenoid 5 (1-2-3-4)                  |
| 3       | Torque Converter Clutch (TCC) Pressure Control Solenoid        |
| 4       | Shift Solenoid 1 (On/Off)                                      |
| 5       | (GEN 1) Pressure Control Solenoid 5 (1-2-3-4)                  |
| 5       | (GEN 2) Pressure Control Solenoid 2 (3-5-R)                    |
| 6       | Pressure Control Solenoid 4 (2-6)                              |
| 7       | Line Pressure Control Solenoid                                 |
| 8       | (GEN 1) Transmission Fluid Pressure (TFP) Switch 1 (3-5-R)     |
| 9       | (GEN 1) Transmission Fluid Pressure (TFP) Switch 3 (2-6)       |
| 10      | (GEN 1) Transmission Fluid Pressure (TFP) Switch 4 (1-2-3-4)   |
| 11      | Pass Through Connector                                         |
| 12      | (GEN 1) Transmission Fluid Pressure (TFP) Switch 5 (4-5-6/R-1) |

## Manual Shift Detent Lever with Shaft Position Switch Assembly

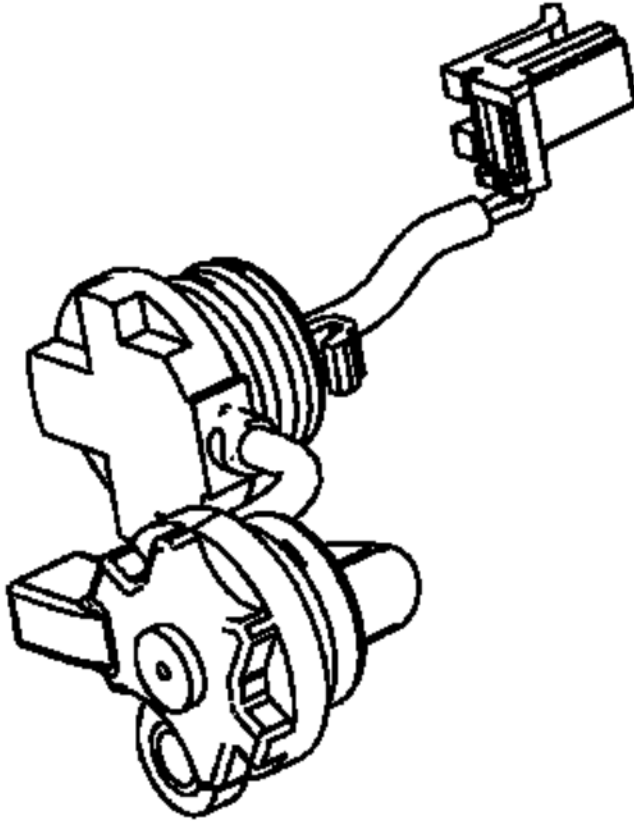




**Fig. 3: View Of Manual Shift Detent Lever W/ Shaft Position Switch Assembly**  
Courtesy of GENERAL MOTORS COMPANY

The transmission shaft position switch assembly is a sliding contact switch attached to the manual shaft detent lever assembly inside the transmission case. The five inputs to the TCM from the transmission manual shift shaft switch assembly indicate the transmission gear selector lever position. This information is used for engine controls as well as determining the transmission shift patterns. The state of each input is available for display on the scan tool. The five input parameters represented are Signal A, Signal B, Signal C, Signal P (Parity) and Signal N (P/N Start).

#### **Input Speed Sensor (ISS)**

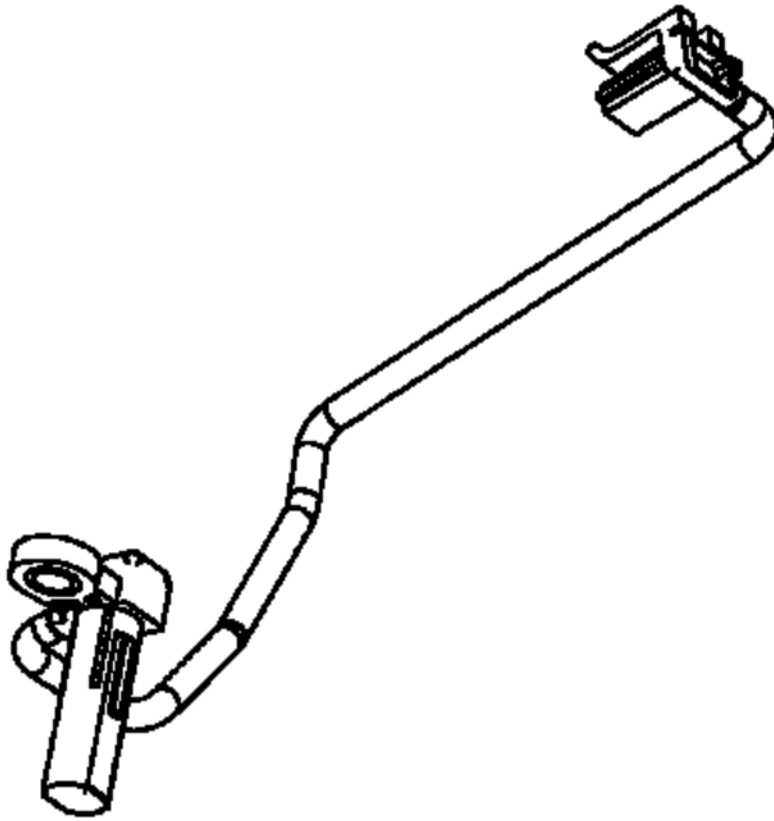


**Fig. 4: View Of Input Speed Sensor (ISS)**

**Courtesy of GENERAL MOTORS COMPANY**

The input speed sensor (ISS) is a hall-effect type sensor. The ISS mounts to the transmission case assembly and connects to the control solenoid (w/body and TCM) valve assembly through a wire harness and connector. The sensor faces the 3-5-R clutch piston housing machined teeth surface. The sensor receives 8.3-9.3 volts on the ISS/OSS Supply Voltage circuit from the TCM. As the 3-5-R/4-5-6 clutch piston housing rotates, the sensor produces a signal frequency based on the machined surface of the 3-5-R/4-5-6 clutch piston housing. This signal is transmitted through the ISS signal circuit to the control solenoid (w/body and TCM) valve assembly. The TCM uses the ISS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

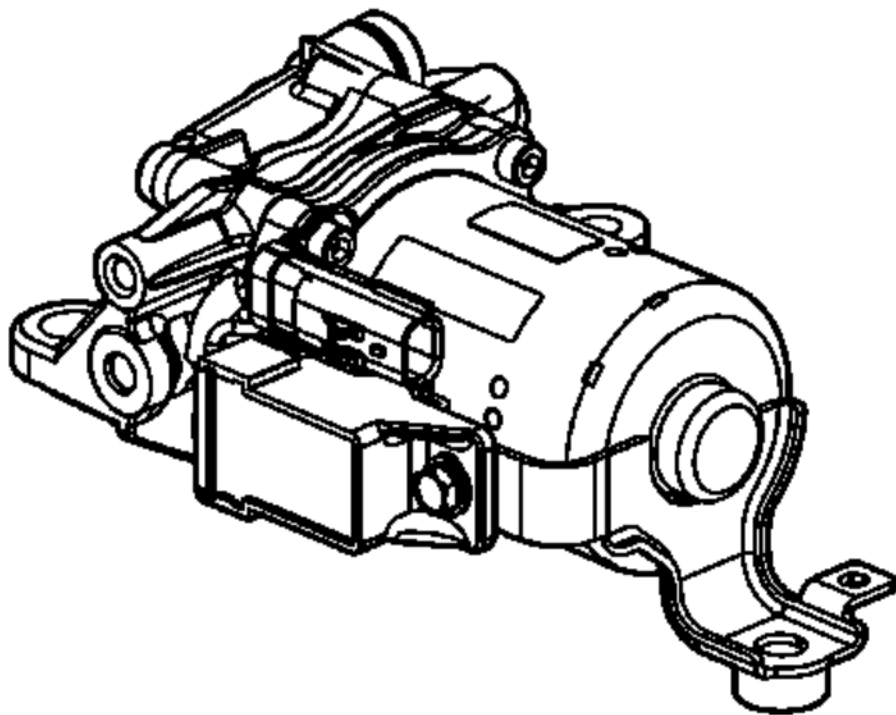
#### **Output Speed Sensor (OSS)**



**Fig. 5: View Of Output Speed Sensor (OSS)**  
**Courtesy of GENERAL MOTORS COMPANY**

The output speed sensor (OSS) is a hall-effect type sensor. The OSS mounts to the transmission case below the control valve body assembly and connects to the control solenoid (w/body and TCM) valve assembly through a wire harness and connector. The sensor faces the Park gear machined teeth surface. The sensor receives 8.3-9.3 volts on the ISS/OSS supply voltage circuit from the TCM. As the front differential transfer drive gear assembly rotates, the sensor produces a signal frequency based on the machined surface of the Park gear. This signal is transmitted through the OSS signal circuit to the TCM. The TCM uses the OSS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

#### **Transmission Fluid Pump- Auxiliary**



**Fig. 6: Transmission Fluid Pump - Auxiliary**  
Courtesy of GENERAL MOTORS COMPANY

The transmission fluid pump- auxiliary is a hydraulic pump driven by an electric motor. The transmission fluid pump- auxiliary attaches to the transmission case assembly. The transmission fluid pump relay- auxiliary receives voltage through the battery positive voltage circuit. The hybrid powertrain control module controls the auxiliary pump by providing the ground path on the transmission pump relay- auxiliary coil control circuit. When the control circuit is grounded, battery positive voltage is directed to the transmission fluid pump- auxiliary. Under certain conditions, the hybrid vehicle's engine will shut off and the transmission fluid pump- auxiliary will start running to keep the transmission hydraulic circuits pressurized and ready for the engine restart. This engine off condition is a fuel economy feature.

### **NON-SHIFTING CLUTCH FUNCTION VERIFICATION DESCRIPTION**

The 6T30/40/45/50 transmission uses a pressure control system to apply and release clutches during shifts. The transmission control module (TCM) controls pressure commands to the pressure control solenoids.

As normal wear of the transmission clutches occur, the TCM performs a clutch function verification. The TCM momentarily commands a clutch on at a low pressure. The clutch function verification is conducted on smooth roads when the transmission is not shifting and engine torque is consistent and positive.

When a clutch function verification is occurring, a slight bump or drag may be detected momentarily. The

clutch function verification will occur a few times over several minutes and will not repeat again for a thousand or more miles. This is a normal condition and no repair attempts should be performed.

The clutch function verification will be performed sooner for a particular clutch if the TCM detects it is producing frequent poor shift control.

## **AUTOMATIC TRANSMISSION HYDRAULIC DIAGRAMS**

### **Park - Engine Running (Gen 2/Hybrid)**

When the gear selector lever is in the Park (P) position, fluid is drawn into the pump through the transmission fluid filter assembly. Line pressure is then directed to the following valves:

#### **Fluid Pressure Directed in Preparation for a Shift**

##### **Manual Valve**

Mechanically controlled by the gear selector lever, the manual valve is in the Park (P) position and prevents line pressure from the pressure regulator valve from entering the reverse and drive fluid circuits.

##### **Actuator Feed Limit Valve**

Line pressure is regulated through the valve into the actuator feed limit circuit. Actuator feed limit fluid passes through orifice #10 to a differential area to move the valve against actuator feed limit valve spring pressure. Actuator feed limit fluid is routed to the pressure control solenoids, the shift solenoid, and to the #4 ball check valve.

##### **TCC Regulated Apply Valve**

Shift solenoid fluid is routed to the TCC regulated apply valve and moves the valve against TCC regulated apply valve spring force.

##### **Default Override Valve**

Shift solenoid fluid is routed to the default override valve and moves the valve against default override valve spring force.

#### **Low and Reverse Clutch Applies**

##### **R1/456 Pressure Control (PC) Solenoid**

The R1/456 PC solenoid is energized (ON) allowing actuator feed limit fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is then routed through orifice #11 to the R1/4-5-6 clutch regulator valve, and through orifice #34 to the R1/4-5-6 clutch boost valve.

##### **R1/4-5-6 Clutch Regulator Valve**

PCS R1/456 clutch fluid at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator spring force

and orificed R1/456 clutch feedback fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is routed to the R1/4-5-6 clutch boost valve and to the clutch select valve.

### **R1/4-5-6 Clutch Boost Valve**

PCS R1/456 clutch fluid pressure acts on a differential area, moving the R1/4-5-6 clutch boost valve against R1/4-5-6 clutch boost valve spring force, to regulate R1/456 clutch feed fluid into the R1/456 clutch feedback circuit. As PCS R1/456 clutch fluid pressure is increased to a given value, the R1/4-5-6 clutch boost valve opens the R1/456 clutch feedback circuit to exhaust backfill. This results in the R1/4-5-6 clutch regulator valve moving to the full feed position, sending full R1/456 clutch feed pressure (full line pressure) to the low and reverse clutch.

### **Shift Solenoid**

The shift solenoid is energized (ON) allowing actuator feed limit fluid to enter the shift solenoid circuit. Shift solenoid fluid is routed to the clutch select valve through orifice #13, to the TCC regulated apply valve through orifice #14, and through orifice #44 to the default override valve.

### **Clutch Select Valve**

Shift solenoid fluid is routed to the clutch select valve and moves the valve against clutch select valve spring force. This allows R1/456 clutch feed fluid to pass through the valve and enter the R1 circuit. R1 fluid is then routed through orifice #42 to the low and reverse clutch assembly in preparation for a shift into low or reverse gear.

### **Low and Reverse Clutch**

R1/456 fluid enters the transmission case assembly and moves the low and reverse clutch piston against spring force to apply the low and reverse clutch plates. In Park range, the low and reverse clutch has no effect. However, when Reverse or a forward range is selected, only one apply device has to be energized, which helps create a smooth starting motion.

### **Accumulator**

PCS R1/456 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS R1/456 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **Park - Engine Running - Gen 2/Hybrid**



3-5 reverse fluid seats the #2 ball check valve against the drive 1-6 fluid passage, and enters the 35 reverse/drive 1-6 circuit. 35 reverse/drive 1-6 fluid is routed to the #3 ball check valve.

### **#3 Ball Check Valve**

35 reverse/drive 1-6 fluid unseats the #3 ball check valve and is routed to the 3-5-reverse clutch regulator valve.

### **35R Pressure Control (PC) Solenoid**

The 35R PC solenoid is energized (ON), allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is then routed through orifice #26 to the 3-5-reverse clutch regulator valve.

### **3-5-Reverse Clutch Regulator Valve**

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and orificed 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. 35 reverse clutch fluid is then routed through orifice #25 to the 3-5-reverse clutch, and through orifice #33 to the #4 ball check valve.

### **3-5-Reverse Clutch**

35 reverse clutch fluid enters the 3-5-reverse and 4-5-6 clutch housing assembly to move the 3-5-reverse clutch piston against spring force to apply the 3-5-reverse clutch plates.

### **#4 Ball Check Valve**

35 reverse clutch feed fluid unseats the #4 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **Accumulator**

PCS 35 reverse clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 35 reverse clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **Fluid Pressure Directed in Preparation for a Possible Default Action**

Reverse fluid is directed to the default override valve in preparation for Reverse (R) range operation in the event of a transmission default action. If a transmission electrical component malfunction occurs, all solenoids will default to their normal state. The shift solenoid will default to its normally-closed state (OFF), and shift solenoid fluid will exhaust, allowing default override valve spring force to move the default override valve to the released position. With the default override valve in the released position, reverse fluid pressure passes through the valve into the default circuit and is routed to the 3-5-reverse clutch regulator shuttle valve. Default fluid pressure replaces exhausting PCS 35 reverse clutch fluid pressure to keep the 3-5-reverse clutch regulator valve in the applied position, and allow continued Reverse (R) range operation. Refer to Drive Range- Fourth Gear Default for a complete description of the default actions that occur during an electrical component malfunction.



[illegible]

### Neutral - Engine Running (Gen 2/Hybrid)

### 3-5 Reverse Clutch Releases

The manual valve is moved to the Neutral position and blocks line pressure from entering the reverse fluid circuit. Reverse fluid, from the 3-5-reverse clutch regulator valve, the clutch select valve, and the default override valve is opened to an exhaust passage at the manual valve.

The 35R PC solenoid is commanded OFF allowing PCS 35 reverse clutch fluid from the 3-5-reverse clutch regulator valve to exhaust.

Tuesday, June 06, 2017 6:44:44 PM

PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows exhausting 35 reverse clutch fluid pressure to pass into the exhaust backfill circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch.

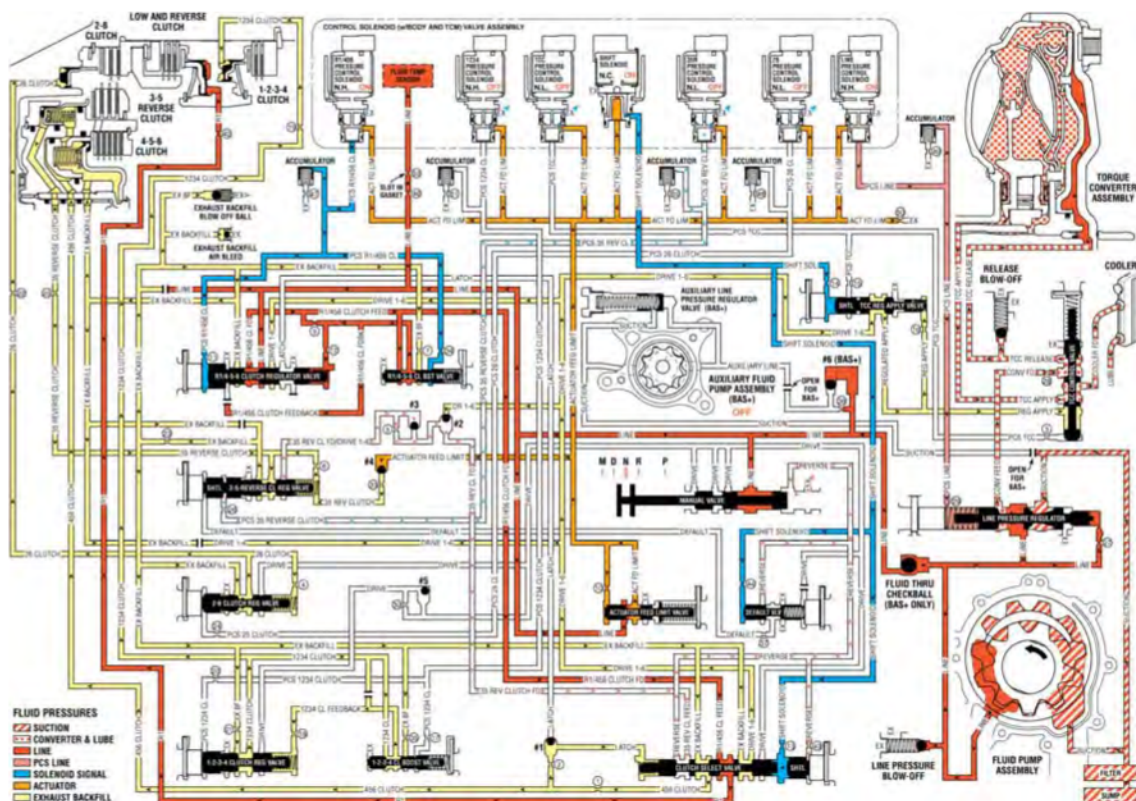
### 3-5-Reverse Clutch

3-5-reverse clutch spring force, assisted by exhaust backfill pressure, moves the 3-5-reverse clutch piston to release the 3-5-reverse clutch plates and force 35 reverse clutch fluid to exhaust from the 3-5-reverse and 4-5-6 clutch housing assembly. The exhausting 35 reverse clutch fluid pressure is routed to the 3-5-reverse clutch regulator valve where it enters the exhaust backfill circuit.

### Clutch Select Valve

When reverse fluid exhausts from the clutch select shuttle valve, shift solenoid fluid continues to hold the clutch select valve against clutch select valve spring force allowing 35 reverse clutch feed fluid to exhaust into the reverse circuit.

### Neutral - Engine Running - Gen 2/Hybrid



**Fig. 9: Neutral -- Engine Running Fluid Flow Diagram**  
Courtesy of GENERAL MOTORS COMPANY

### Drive Range, First Gear Engine Braking (Gen 2/Hybrid)

Note: Some models of the 6T30/40/45/50 automatic transmission are equipped with an electric auxiliary fluid

pump for use in hybrid vehicles (BAS+). Hybrid vehicles do not require internal combustion engine (ICE) operation at all times. After a successful engine start, the hybrid powertrain control module (HPCM) may turn OFF the engine (Auto Stop) when not required for the current vehicle conditions. The engine will remain OFF while in Auto Stop mode, until such time that vehicle conditions require the engine to run. During Auto Stop mode the main fluid pump is no longer driven by the engine, and the auxiliary fluid pump is commanded ON to provide hydraulic fluid pressure to operate the transmission. This functional description of Drive Range- First Gear (Engine Braking), and its accompanying hydraulic circuit, is written for a non-hybrid transmission. For a hybrid (BAS+) transmission, the description and illustration are the same, with the exception that, when the engine is OFF, the main fluid pump is not operating and the auxiliary fluid pump is ON.

When the gear selector lever is moved to the Drive (D) range from the Neutral (N) position, the transmission will provide engine braking. In this operating range, the normally-high 1234 pressure control solenoid is commanded ON and, in the engine braking mode, the following changes occur within the hydraulic circuits.

#### **1-2-3-4 Clutch Applies**

##### **Manual Valve**

The manual valve is moved to the Drive (D) position and allows line fluid pressure to enter the drive fluid circuit. Drive fluid is then routed to the clutch select valve, the #5 ball check valve, and to the 2-6 clutch regulator valve.

##### **#5 Ball Check Valve**

Drive fluid unseats the #5 ball check valve and is routed to the 1-2-3-4 clutch regulator valve.

##### **1234 Pressure Control (PC) Solenoid**

The 1234 PC solenoid is commanded ON allowing actuator feed limit fluid to enter the PCS 1234 clutch fluid circuit. PCS 1234 clutch fluid is then routed through orifice #20 to the 1-2-3-4 clutch regulator valve, and through orifice #17 to the 1-2-3-4 clutch boost valve.

##### **1-2-3-4 Clutch Regulator Valve**

PCS 1234 clutch fluid, at the 1-2-3-4 clutch regulator valve, opposes 1-2-3-4 clutch regulator valve spring force and 1234 clutch feedback fluid pressure to regulate drive fluid pressure into the 1234 clutch fluid circuit. The 1234 clutch fluid is then routed to the 1-2-3-4 clutch boost valve and through orifice #19 to the 1-2-3-4 clutch.

##### **1-2-3-4 Clutch Boost Valve**

PCS 1234 clutch fluid pressure acts on a differential area, moving the 1-2-3-4 clutch boost valve against 1-2-3-4 clutch boost valve spring force, to regulate 1234 clutch fluid into the 1234 clutch feedback circuit. As PCS 1234 clutch fluid pressure is increased to a given value, the 1-2-3-4 clutch boost valve opens the 1234 clutch feedback circuit to exhaust backfill. This results in the 1-2-3-4 clutch regulator valve moving to the full feed position, sending full 1234 clutch feed pressure (full line pressure) to the 1-2-3-4 clutch.

##### **1-2-3-4 Clutch**



The 1234 clutch fluid enters the transmission case assembly and moves the 1-2-3-4 clutch piston against spring force to apply the 1-2-3-4 clutch plates.

## Accumulator

PCS 1234 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 1234 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

## Low and Reverse Clutch Remains Applied to Provide Engine Braking

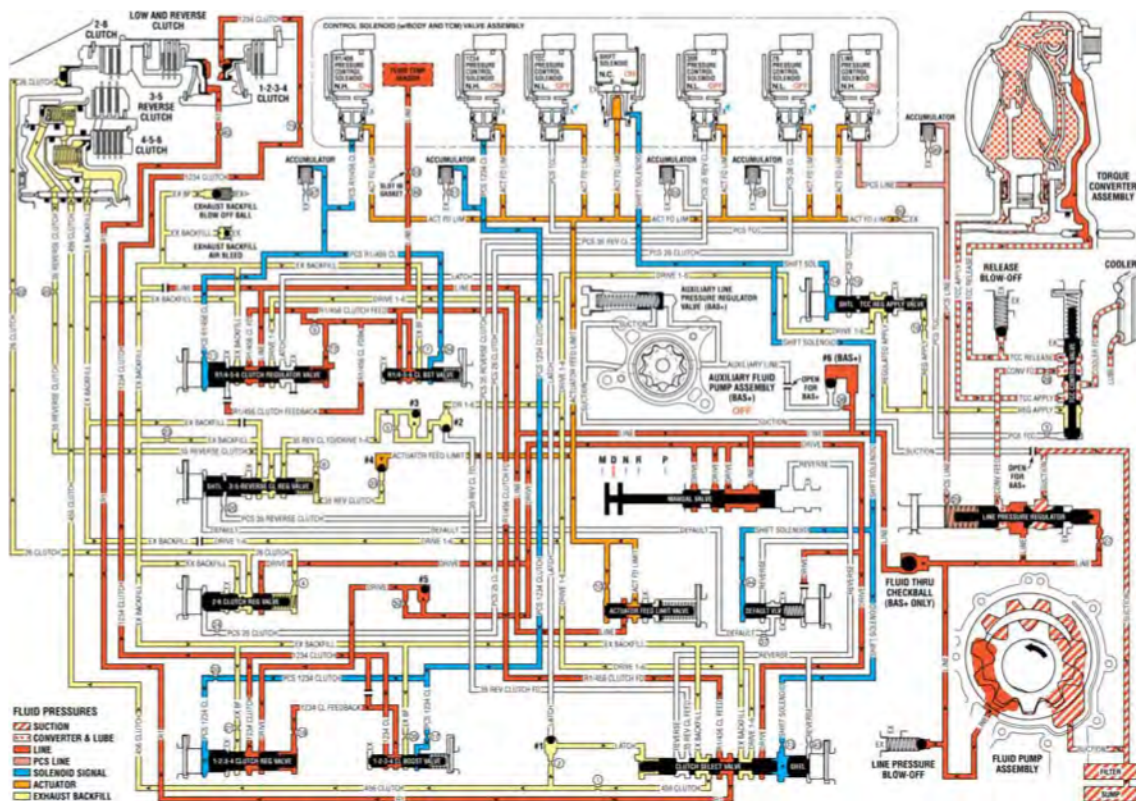
## Clutch Select Valve

Shift solenoid fluid, present at the valve from Park position, continues to hold the clutch select valve against clutch select valve spring force. R1/456 clutch feed fluid, also present at the valve from Park position, continues to pass into the R1 circuit to feed the low and reverse clutch. Drive fluid is present at the valve in preparation for a change of gears.

## Low and Reverse Clutch

The low and reverse clutch remains applied until just before the 1-2 shift in order to provide engine braking.

## Drive Range, First Gear Engine Braking - Gen 2/Hybrid



**Fig. 10: Drive Range, First Gear Engine Braking Fluid Flow Diagram**  
Courtesy of GENERAL MOTORS COMPANY

## **Drive Range, First Gear (Gen 2/Hybrid)**

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, throttle position sensor and other vehicle sensors to determine the precise moment to de-energize or "turn OFF" the shift solenoid, and to command OFF the normally-high R1/456 pressure control solenoid.

### **Low & Reverse Clutch Releases**

#### **Shift Solenoid**

The shift solenoid is commanded OFF allowing shift solenoid fluid pressure to exhaust from the clutch select valve, the default override valve, and the TCC regulator apply valve.

#### **Clutch Select Valve**

Shift solenoid fluid is exhausted from the clutch select valve and clutch select valve spring force moves the valve to the released position. This allows R1 fluid pressure to pass through the valve into the exhaust backfill circuit. Drive fluid from the manual valve passes through the clutch select valve and enters the drive 1-6 fluid circuit. Drive 1-6 fluid is routed to the R1/4-5-6 clutch regulator valve, the 3-5-reverse clutch regulator valve, and the TCC regulator apply valve.

#### **Low and Reverse Clutch**

Low and reverse clutch spring force moves the low and reverse clutch piston to release the low and reverse clutch plates and force R1 fluid to exhaust from the case assembly. The exhausting R1 fluid is routed to the clutch select valve where it enters the exhaust backfill circuit.

### **Fluid Pressure Directed in Preparation for a Shift**

#### **R1/456 Pressure Control (PC) Solenoid**

The R1/456 PC solenoid is commanded OFF allowing PCS R1/456 clutch fluid to exhaust from the R1/4-5-6 clutch regulator valve and the R1/4-5-6 clutch boost valve.

#### **R1/4-5-6 Clutch Regulator Valve**

R1/4-5-6 clutch regulator valve spring force moves the valve to the released position, allowing R1/456 clutch feed fluid to enter the exhaust backfill circuit, and drive 1-6 fluid to enter the latch fluid circuit. Latch fluid is routed to the #1 ball check valve.

#### **#1 Ball Check Valve**

Latch fluid pressure seats the #1 ball check valve against the 456 clutch fluid circuit. Latch fluid is then directed to the clutch select valve. Latch fluid combines with clutch select valve spring force and holds the valve in this position during all six forward gear ranges.

#### **#2 Ball Check Valve**

Drive 1-6 fluid pressure seats the #2 ball check valve against the 35 reverse clutch feed fluid passage, and is directed into the 35 reverse clutch feed/drive 1-6 circuit. 35 reverse clutch feed/drive 1-6 fluid is routed to the #3 ball check valve.

### #3 Ball Check Valve

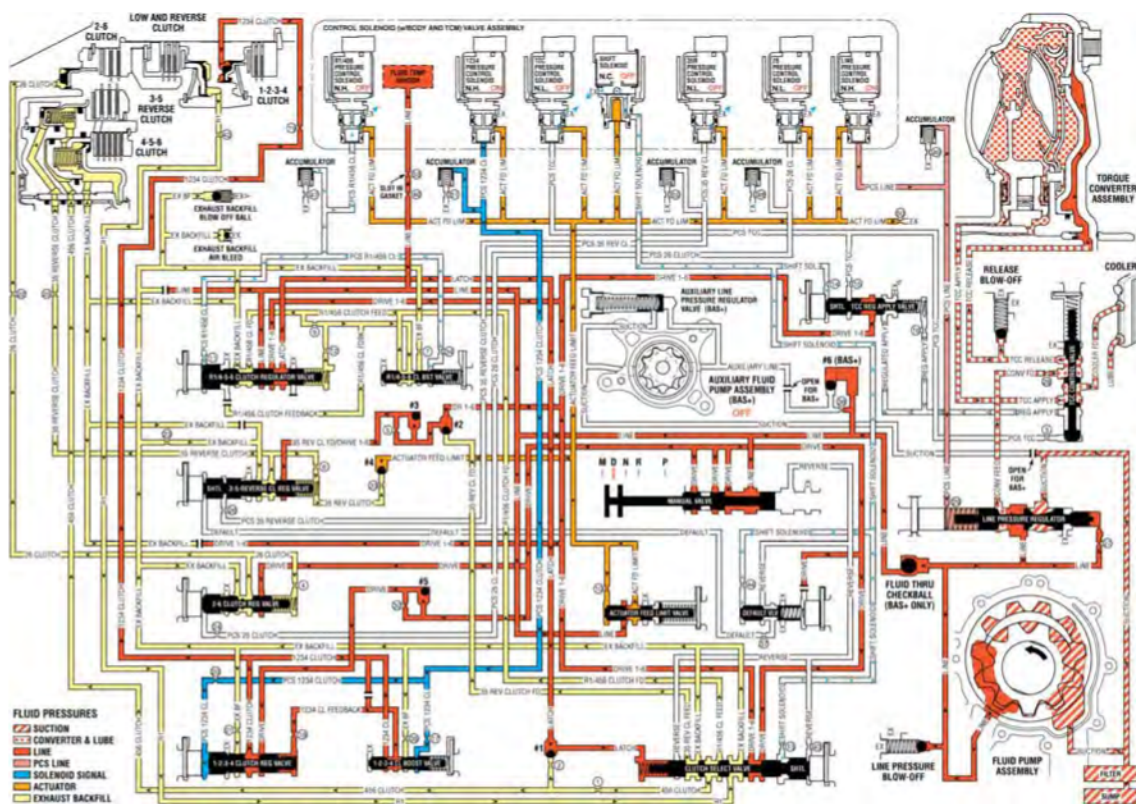
35 reverse clutch feed/drive 1-6 fluid pressure unseats the #3 ball check valve and is directed to the 3-5-reverse clutch regulator valve.

Fluid Pressure Directed in Preparation for Torque Converter Clutch (TCC) Apply

### TCC Regulator Apply Valve

Drive 1-6 fluid is routed to the TCC regulator apply valve in preparation for TCC apply.

### Drive Range, First Gear - Gen 2/Hybrid



**Fig. 11: Drive Range, First Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
Courtesy of GENERAL MOTORS COMPANY

### Drive Range, Second Gear (Gen 2/Hybrid)

As vehicle speed increases and operating conditions become appropriate, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low 26 pressure control solenoid and shift the transmission into Second gear. The manual valve remains in the Drive

(D) position and line pressure continues to feed the drive fluid circuit.

#### **2-6 Clutch Applies**

### **26 Pressure Control (PC) Solenoid**

The 26 PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #24 to the 2-6 clutch regulator valve.

### **2-6 Clutch Regulator Valve**

PCS 26 clutch fluid, at the 2-6 clutch regulator valve, opposes 2-6 clutch regulator valve spring force and orificed 26 clutch fluid pressure to regulate drive fluid pressure into the 26 clutch circuit. 26 clutch fluid is then routed through orifice #22 to the 2-6 clutch assembly in the transmission case, and through orifice #4 to the spring end of the 2-6 clutch regulator valve.

### **2-6 Clutch**

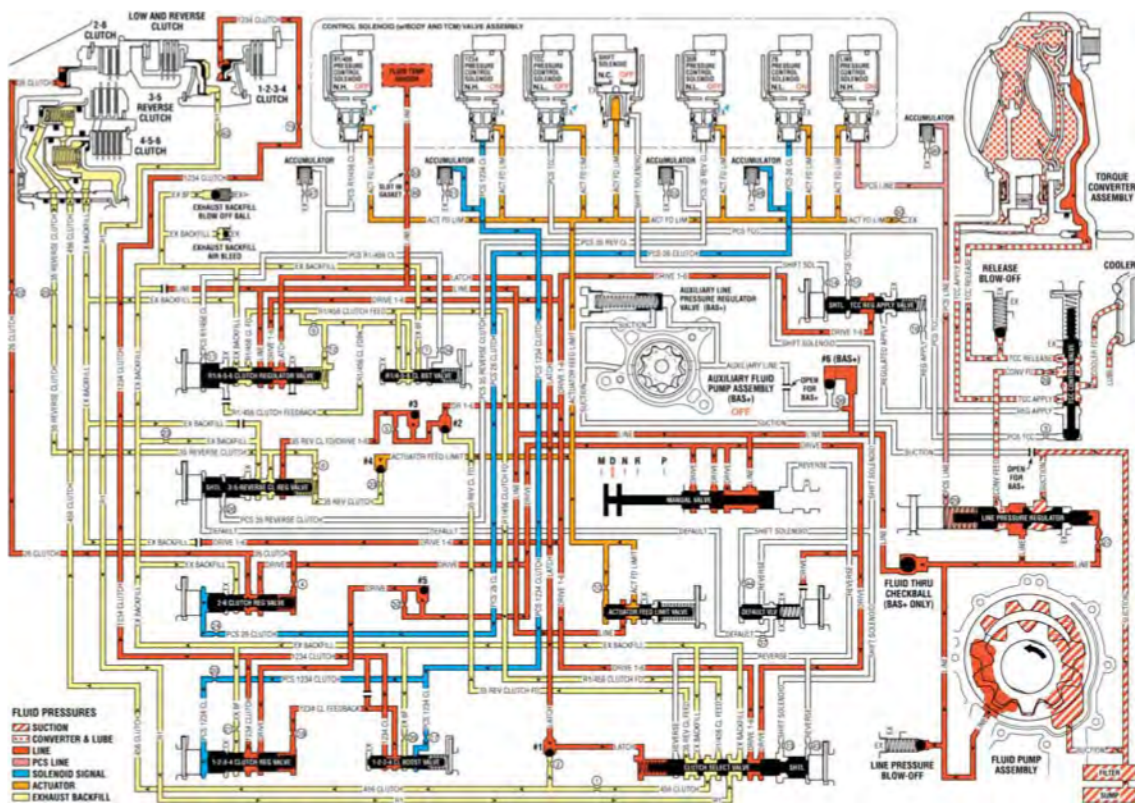
The 26 clutch fluid from the 2-6 clutch regulator valve is routed through the transmission case to the 2-6 clutch piston assembly. The 26 clutch fluid pressure moves the piston against 2-6 clutch spring force to apply the 2-6 clutch plates.

### **Accumulator**

PCS 26 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 26 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

#### **Drive Range, Second Gear - Gen 2/Hybrid**





**Fig. 12: Drive Range, Second Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
 Courtesy of GENERAL MOTORS COMPANY

### Drive Range, Third Gear (Gen 2/Hybrid)

As vehicle speed increases and operating conditions become appropriate, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-low 26 pressure control solenoid. At the same time the 35R pressure control solenoid is also commanded ON to regulate 3-5 clutch apply, and the transmission shifts into Third gear. The manual valve remains in the Drive (D) position and line pressure continues to feed the drive fluid circuit.

#### 3-5-Reverse Clutch Applies

#### 35R Pressure Control (PC) Solenoid

The 35R PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #26 to the 3-5-reverse clutch regulator valve.

#### 3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed through orifice #25 to the 3-5-reverse clutch assembly, through orifice #6 to the spring end of the 3-5-reverse clutch regulator valve and through orifice #33 to the #4 ball check valve.



### **3-5-Reverse Clutch**

35 reverse clutch fluid enters the 3-5-reverse and 4-5-6 clutch housing assembly to move the 3-5-reverse clutch piston against spring force and exhaust backfill fluid pressure to apply the 3-5-reverse clutch plates.

### **#4 Ball Check Valve**

35 reverse clutch feed fluid unseats the #4 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **Accumulator**

PCS 35 reverse clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 35 reverse clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **2-6 Clutch Releases**

### **26 Pressure Control (PC) Solenoid**

The 26 PC solenoid is commanded OFF, allowing PCS 26 clutch fluid to exhaust from the 2-6 clutch regulator valve.

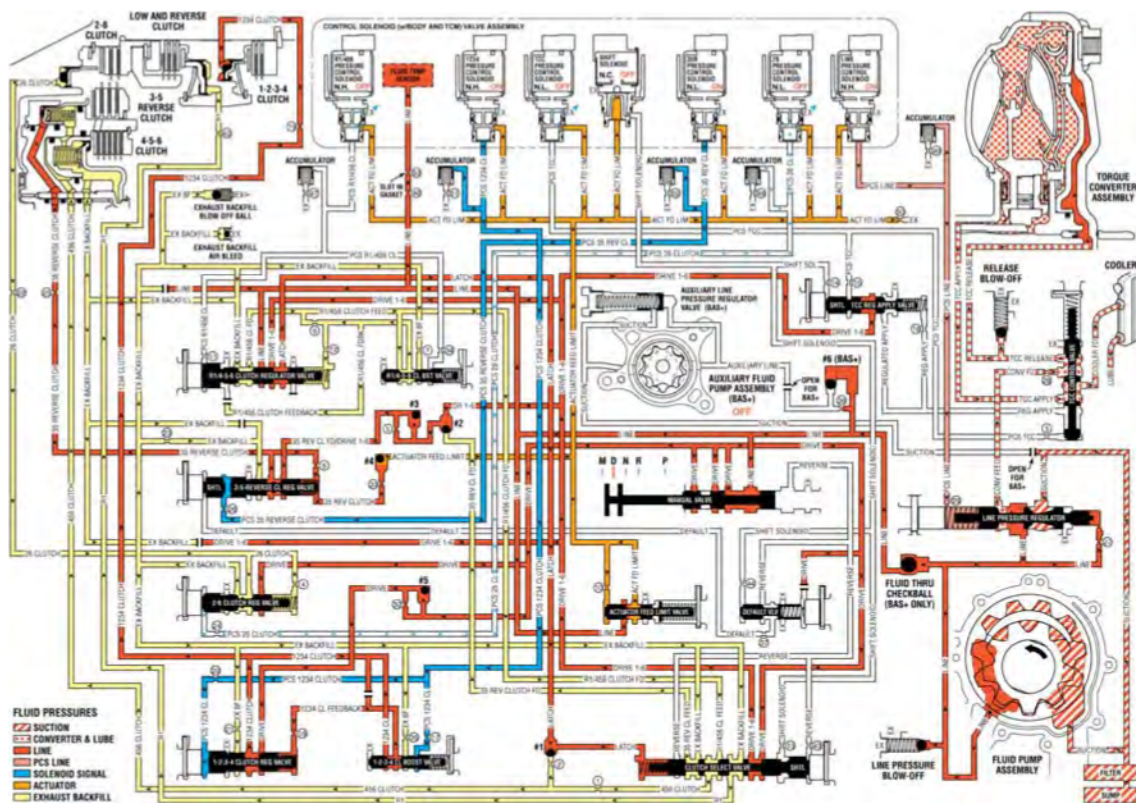
### **2-6 Clutch Regulator Valve**

2-6 clutch regulator valve spring force moves the valve to the released position, allowing 26 clutch fluid from the 2-6 clutch to pass through the valve and enter the exhaust backfill fluid circuit.

### **2-6 Clutch**

2-6 clutch spring force moves the 2-6 clutch piston to release the 2-6 clutch plates and force 26 clutch fluid to exhaust from the transmission case assembly. The exhausting 26 clutch fluid pressure is routed to the 2-6 clutch regulator valve where it enters the exhaust backfill fluid circuit.

### **Drive Range, Third Gear - Gen 2/Hybrid**



**Fig. 13: Drive Range, Third Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
 Courtesy of GENERAL MOTORS COMPANY

### Drive Range - Fourth Gear (Gen 2/Hybrid)

As vehicle speed increases, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-low 35R pressure control solenoid. At the same time, the normally-high R1/456 pressure control solenoid is commanded ON to regulate 4-5-6 clutch apply and the transmission shifts into Fourth gear.

#### 4-5-6 Clutch Applies

#### R1/456 Pressure Control (PC) Solenoid

The R1/456 PC solenoid is commanded ON allowing actuator feed limit fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is routed through orifice #11 to the R1/4-5-6 clutch regulator valve, and through orifice #34 to the R1/4-5-6 clutch boost valve.

#### R1/4-5-6 Clutch Regulator Valve

PCS R1/456 clutch fluid, at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator valve spring force and orificed R1/456 clutch feed fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is then routed to the clutch select valve, the R1/4-5-6 clutch boost valve, and through orifices #9 and #12 to the spring end of the R1/4-5-6 clutch regulator valve. When the R1/4-5-6 clutch regulator valve is in this position, latch fluid exhausts through the valve allowing 456 clutch fluid to shuttle the #1 ball

check valve.

### **R1/4-5-6 Clutch Boost Valve**

PCS R1/456 clutch fluid pressure acts on a differential area, moving the R1/4-5-6 clutch boost valve against R1/4-5-6 clutch boost valve spring force, to regulate R1/456 feed clutch fluid into the R1/456 clutch feedback circuit. As PCS R1/456 clutch fluid pressure is increased to a given value, the R1/4-5-6 clutch boost valve opens the R1/456 clutch feedback circuit to exhaust backfill. This results in the R1/4-5-6 clutch regulator valve moving to the full feed position, sending full R1/456 clutch feed pressure (full line pressure) to the 4-5-6 clutch.

### **#1 Ball Check Valve**

Orificed 456 clutch fluid pressure seats the #1 ball check valve against the exhausting latch fluid passage. 456 clutch fluid is then directed into the latch circuit to replace the exhausting latch pressure and is routed to the clutch select valve. Latch fluid combines with clutch select valve spring force and holds the valve in this position during all six forward gear ranges.

### **Clutch Select Valve**

R1/456 clutch feed fluid passes through the clutch select valve and enters the 456 clutch circuit. 456 clutch fluid is routed to the 4-5-6 clutch assembly, and through orifice #2 to the #1 ball check valve.

### **4-5-6 Clutch**

456 clutch fluid enters the 3-5-reverse and 4-5-6 clutch housing assembly, and moves the 4-5-6 clutch piston against spring force and exhaust backfill pressure to apply the 4-5-6 clutch plates.

### **Accumulator**

PCS R1/456 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS R1/456 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **3-5-Reverse Clutch Releases**

### **35R Pressure Control (PC) Solenoid**

The 35R PC solenoid is commanded OFF allowing PCS 35 reverse clutch fluid from the 3-5-reverse clutch regulator valve to exhaust.

### **3-5-Reverse Clutch Regulator Valve**

PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows exhausting 35 reverse clutch fluid pressure to pass into the exhaust backfill circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch.

### **3-5-Reverse Clutch**

3-5-reverse clutch spring force, assisted by exhaust backfill pressure, moves the 3-5-reverse clutch piston to release the 3-5-reverse clutch plates and force 35 reverse clutch fluid to exhaust from the 3-5-reverse and 4-5-6 clutch housing assembly. The exhausting 35 reverse clutch fluid pressure is routed to the 3-5-reverse clutch regulator valve where it enters the exhaust backfill feed circuit.

#### **Torque Converter Clutch (TCC) Applies**

#### **Torque Converter Clutch (TCC) Pressure Control (PC) Solenoid**

The TCC PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS TCC fluid circuit. PCS TCC fluid is routed through orifice #15 to the TCC regulator apply valve and through orifice #3 to the TCC control valve.

#### **TCC Regulator Apply Valve**

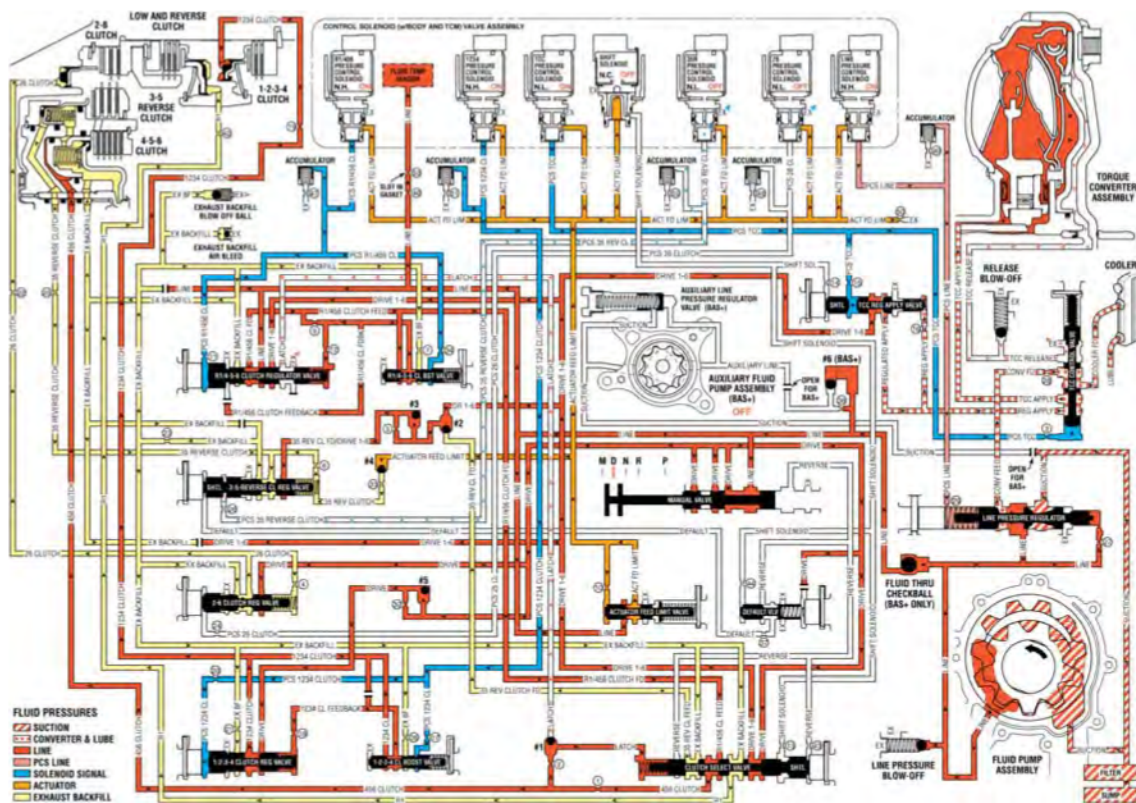
PCS TCC fluid, at the TCC regulator apply valve, opposes TCC regulator apply valve spring force and orificed regulated apply fluid pressure to regulate drive 1-6 fluid into the regulated apply circuit. Regulated apply fluid is routed to the TCC control valve and through orifice #16 to the spring end of the TCC regulator apply valve.

#### **TCC Control Valve**

PCS TCC fluid moves the TCC control valve against TCC control valve spring force, allowing regulated apply fluid to pass through the valve into the TCC apply fluid circuit and apply the torque converter clutch. Converter feed fluid passes through orifice #28 to the TCC control valve, replacing TCC apply fluid, to supply the cooler feed circuit. TCC release fluid passes through the TCC control valve and is exhausted.

#### **Drive Range, Fourth Gear - Gen 2/Hybrid**





**Fig. 14: Drive Range, Fourth Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
 Courtesy of GENERAL MOTORS COMPANY

### Drive Range - Fourth Gear Default (Gen 2/Hybrid)

If the transmission encounters an electrical component malfunction, the transmission will default to Fourth gear. All solenoids will default to their normal state. If the torque converter clutch is applied, it will release. The transmission will remain in Drive Range- Fourth Gear Default until the condition is corrected. Reverse (R) range can also still be selected. This default action enables the vehicle to be safely driven to a service center.

#### 1-2-3-4 Clutch Applies or Remains Applied

#### 1234 Pressure Control (PC) Solenoid

The 1234 PC solenoid defaults to its normally-high state (ON), allowing actuator feed limit fluid to enter the PCS 1234 clutch fluid circuit. PCS 1234 clutch fluid is routed through orifice #20 to the 1-2-3-4 clutch regulator valve, and through orifice #17 to the 1-2-3-4 clutch boost valve. If the transmission is operating in Fifth or Sixth gear when an electrical malfunction occurs, the 1-2-3-4 clutch will apply. If the transmission is operating in First, Second, Third or Fourth gear when the electrical malfunction occurs, the 1-2-3-4 clutch remains applied.

#### 1-2-3-4 Clutch Boost Valve

PCS 1234 clutch fluid pressure acts on a differential area, moving the 1-2-3-4 clutch boost valve against 1-2-3-4 clutch boost valve spring force, to block 1234 clutch fluid from entering the 1234 clutch feedback circuit, and opening the 1234 clutch feedback circuit to exhaust backfill. This results in the 1-2-3-4 clutch regulator valve

moving to the full feed position, sending full 1234 clutch feed pressure (full line pressure) to the 1-2-3-4 clutch.

### **1-2-3-4 Clutch Regulator Valve**

PCS 1234 clutch fluid moves the 1-2-3-4 clutch regulator valve, against 1-2-3-4 clutch regulator valve spring force, to the applied position. This allows drive fluid pressure to pass through the valve into the 1234 clutch fluid circuit. The 1234 clutch fluid is then routed to the 1-2-3-4 clutch boost valve and through orifice #19 to the 1-2-3-4 clutch.

### **1-2-3-4 Clutch**

1234 clutch fluid enters the transmission case assembly and moves the 1-2-3-4 clutch piston against spring force to apply the 1-2-3-4 clutch plates.

### **Accumulator**

PCS 1234 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 1234 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **4-5-6 Clutch Applies or Remains Applied**

### **R1/456 Pressure Control (PC) Solenoid**

The R1/456 PC solenoid defaults to its normally-high state (ON), allowing actuator feed limit fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is routed through orifice #11 to the R1/4-5-6 clutch regulator valve, and through orifice #34 to the R1/4-5-6 clutch boost valve. If the transmission is operating in First, Second or Third gear when an electrical malfunction occurs, the 4-5-6 clutch will apply. If the transmission is operating in Fourth, Fifth or Sixth gear when the electrical malfunction occurs, the 4-5-6 clutch remains applied.

### **R1/4-5-6 Clutch Boost Valve**

PCS R1/456 clutch fluid pressure acts on a differential area, moving the R1/4-5-6 clutch boost valve against R1/4-5-6 clutch boost valve spring force, to block R1/456 clutch feed fluid from entering the R1/456 clutch feedback circuit, and opening the R1/456 clutch feedback circuit to exhaust backfill. This results in the R1/4-5-6 clutch regulator valve moving to the full feed position, sending full R1/456 clutch feed pressure (full line pressure) to the 4-5-6 clutch.

### **R1/4-5-6 Clutch Regulator Valve**

PCS R1/456 clutch fluid moves the R1/4-5-6 clutch regulator valve, against R1/4-5-6 clutch regulator valve spring force, to the applied position. This allows line fluid pressure to pass through the valve into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is then routed to the clutch select valve, the R1/4-5-6 clutch boost valve, and through orifices #9 and #12 to the spring end of the R1/4-5-6 clutch regulator valve. When the R1/4-5-6 clutch regulator valve is in this position, latch fluid exhausts through the valve allowing 456 clutch fluid to shuttle the #1 ball check valve.

## **#1 Ball Check Valve**

Orificed 456 clutch fluid pressure seats the #1 ball check valve against the exhausting latch fluid passage. 456 clutch fluid is then directed into the latch circuit to replace the exhausting latch pressure and is routed to the clutch select valve. Latch fluid combines with clutch select valve spring force and holds the valve in this position during all six forward gear ranges.

## **Clutch Select Valve**

R1/456 clutch feed fluid passes through the clutch select valve and enters the 456 clutch circuit. 456 clutch fluid is routed to the 4-5-6 clutch assembly, and through orifice #2 to the #1 ball check valve.

## **4-5-6 Clutch**

456 clutch fluid enters the 3-5-reverse and 4-5-6 clutch housing assembly, and moves the 4-5-6 clutch piston against spring force and exhaust backfill pressure to apply the 4-5-6 clutch plates.

## **Accumulator**

PCS R1/456 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS R1/456 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

## **3-5-Reverse Clutch Releases**

## **35R Pressure Control (PC) Solenoid**

If the transmission is in Third or Fifth gear when an electrical condition commands a protection mode, the 35R PC solenoid defaults to its normally-low state (OFF), allowing PCS 35R clutch fluid pressure to exhaust and the 3-5-reverse clutch to release. See Drive Range- Fourth Gear for a complete description of 3-5-reverse clutch release.

## **2-6 Clutch Releases**

## **26 Pressure Control (PC) Solenoid**

If the transmission is in Second or Sixth gear when an electrical condition commands a protection mode, the 26 PC solenoid defaults to its normally-low state (OFF), allowing PCS 26 clutch fluid pressure to exhaust and the 2-6 clutch to release. See Drive Range- Third Gear for a complete description of 2-6 clutch release.

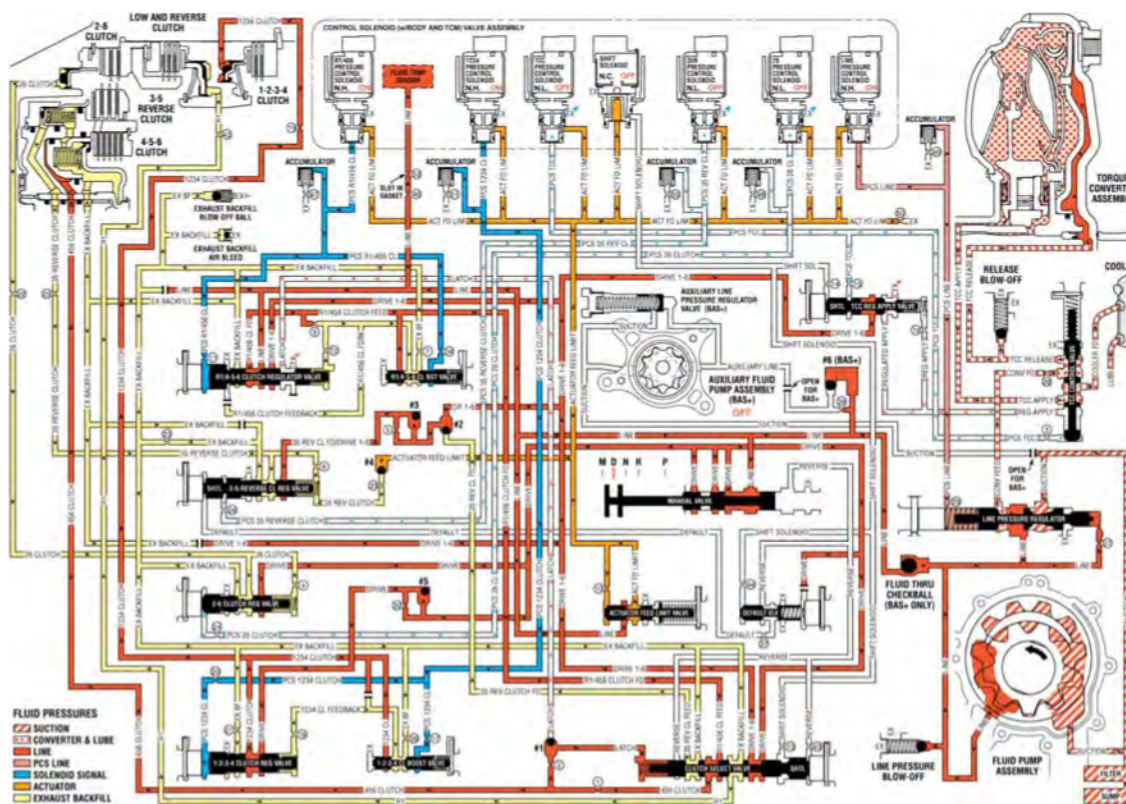
## **Torque Converter Clutch (TCC) Releases**

## **Torque Converter Clutch (TCC) Pressure Control (PC) Solenoid**

If the TCC is applied when an electrical condition commands a protection mode, the TCC PC solenoid defaults to its normally-low state (OFF), allowing PCS TCC fluid to exhaust and the TCC to release. See Drive Range- Sixth Gear for a complete description of TCC release.



## Drive Range, Fourth Gear Default - Gen 2/Hybrid



**Fig. 15: Drive Range, Fourth Gear Default -- Gen 2/Hybrid Fluid Flow Diagram**  
Courtesy of GENERAL MOTORS COMPANY

## Drive Range, Fifth Gear (Gen 2/Hybrid)

As vehicle speed increases, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low 35R pressure control solenoid. At the same time, the normally-high 1234 pressure control solenoid is commanded OFF and the transmission shifts into Fifth gear.

### 3-5-Reverse Clutch Applies

### 35R Pressure Control (PC) Solenoid

The 35R PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #26 to the 3-5-reverse clutch regulator valve.

### 3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed through orifice #25 to the 3-5-reverse clutch assembly, through orifice #6 to the spring end of the 3-5-reverse clutch regulator valve and through orifice #33 to the #4 ball check valve.



### **3-5-Reverse Clutch**

35 reverse clutch fluid enters the 3-5-reverse and 4-5-6 clutch housing assembly to move the 3-5-reverse clutch piston against spring force and exhaust backfill fluid pressure to apply the 3-5-reverse clutch plates.

### **#4 Ball Check Valve**

35 reverse clutch feed fluid unseats the #4 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **Accumulator**

PCS 35 reverse clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 35 reverse clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **1-2-3-4 Clutch Releases**

#### **1234 Pressure Control (PC) Solenoid**

The 1234 PC solenoid is commanded OFF, allowing PCS 1234 clutch fluid to exhaust from the 1-2-3-4 clutch regulator valve and the 1-2-3-4 clutch boost valve.

#### **1-2-3-4 Clutch Regulator Valve**

1-2-3-4 clutch regulator valve spring force moves the valve to the released position, allowing 1234 clutch fluid pressure from the 1-2-3-4 clutch to pass through the valve and enter the exhaust backfill circuit. The exhausting 1234 clutch fluid pressure is routed through orifice #21 in order to help control the release of the 1-2-3-4 clutch.

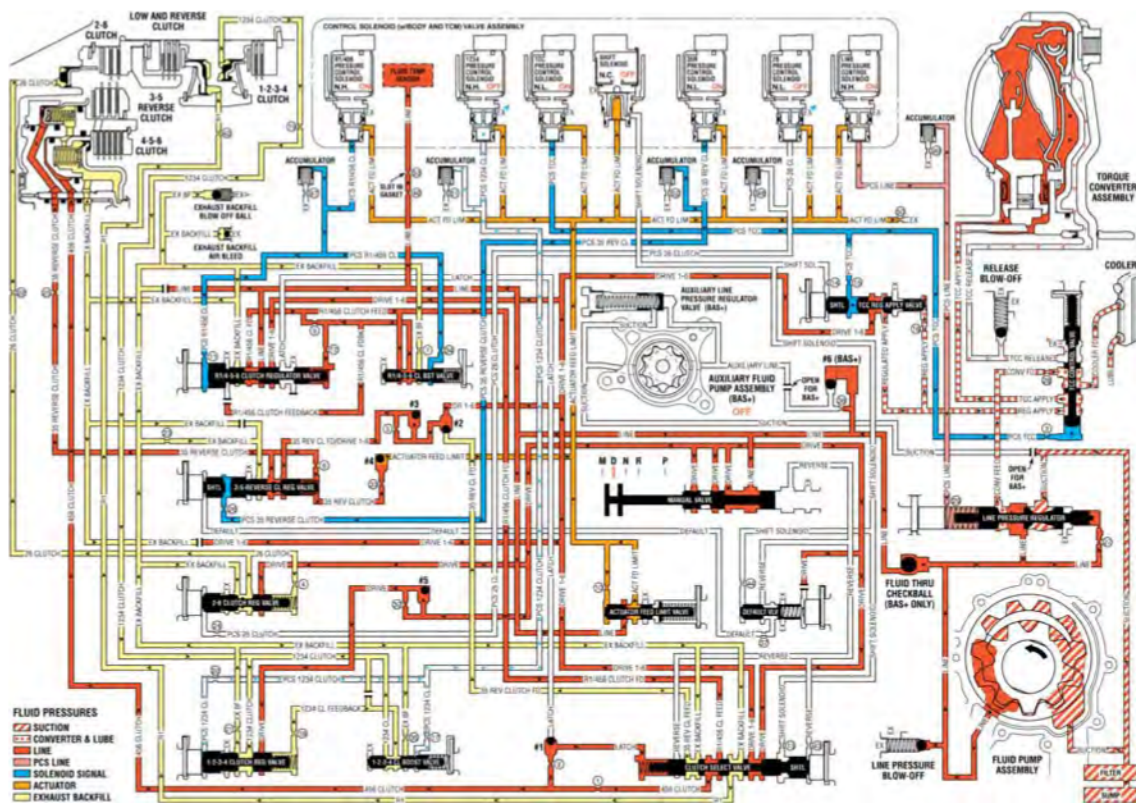
#### **1-2-3-4 Clutch Boost Valve**

1-2-3-4 clutch boost valve spring force moves the 1-2-3-4 clutch boost valve to the released position, allowing 1234 clutch feedback fluid pressure to exhaust from the 1-2-3-4 clutch regulator valve into the 1234 clutch circuit.

#### **1-2-3-4 Clutch**

1-2-3-4 clutch spring force moves the 1-2-3-4 clutch piston to release the 1-2-3-4 clutch plates and force 1234 clutch fluid to exhaust from the transmission case assembly. The exhausting 1234 clutch fluid is routed to the 1-2-3-4 clutch regulator valve where it enters the exhaust backfill circuit.

### **Drive Range, Fifth Gear - Gen 2/Hybrid**



**Fig. 16: Drive Range, Fifth Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
 Courtesy of GENERAL MOTORS COMPANY

### Drive Range, Sixth Gear (Gen 2/Hybrid)

As vehicle speed increases, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low 26 pressure control solenoid. At the same time, the normally-low 35R pressure control solenoid is commanded OFF and the transmission shifts into Sixth gear.

#### 2-6 Clutch Applies

#### 26 Pressure Control (PC) Solenoid

The 26 PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #24 to the 2-6 clutch regulator valve.

#### 2-6 Clutch Regulator Valve

PCS 26 clutch fluid, at the 2-6 clutch regulator valve, opposes 2-6 clutch regulator valve spring force and orificed 26 clutch fluid pressure to regulate drive fluid pressure into the 26 clutch circuit. 26 clutch fluid is then routed through orifice #22 to the 2-6 clutch assembly in the transmission case, and through orifice #4 to the spring end of the 2-6 clutch regulator valve.

#### 2-6 Clutch

The 26 clutch fluid from the 2-6 clutch regulator valve is routed through the transmission case to the 2-6 clutch piston assembly. The 26 clutch fluid pressure moves the piston against 2-6 clutch spring force to apply the 2-6 clutch plates.

### **Accumulator**

PCS 26 clutch fluid is also routed to an accumulator valve. The accumulator valve is used to dampen any pressure irregularities occurring in the PCS 26 clutch fluid circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

### **3-5 Reverse Clutch Releases**

### **35R Pressure Control (PC) Solenoid**

The 35R PC solenoid is commanded OFF allowing PCS 35 reverse clutch fluid from the 3-5-reverse clutch regulator valve to exhaust.

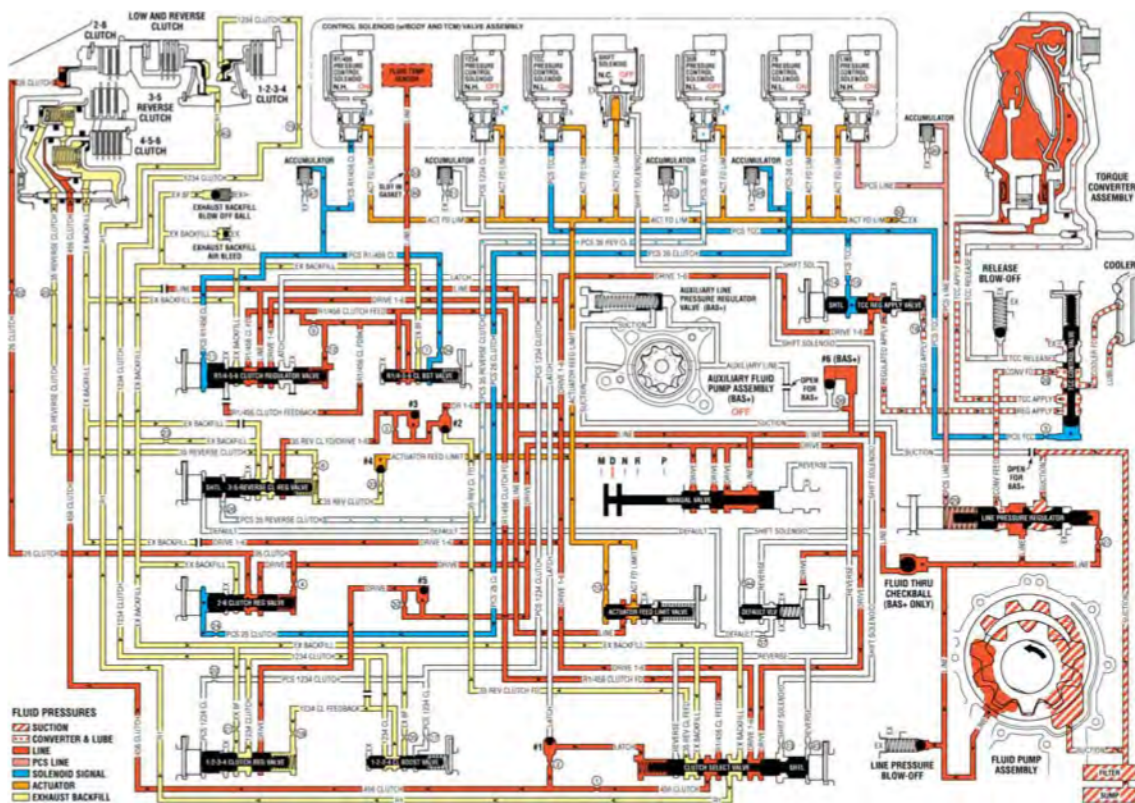
### **3-5-Reverse Clutch Regulator Valve**

PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows exhausting 35 reverse clutch fluid pressure to pass into the exhaust backfill circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch.

### **3-5-Reverse Clutch**

3-5-reverse clutch spring force, assisted by exhaust backfill pressure, moves the 3-5-reverse clutch piston to release the 3-5-reverse clutch plates and force 35 reverse clutch fluid to exhaust from the 3-5-reverse and 4-5-6 clutch housing assembly. The exhausting 35 reverse clutch fluid pressure is routed to the 3-5-reverse clutch regulator valve where it enters the exhaust backfill circuit.

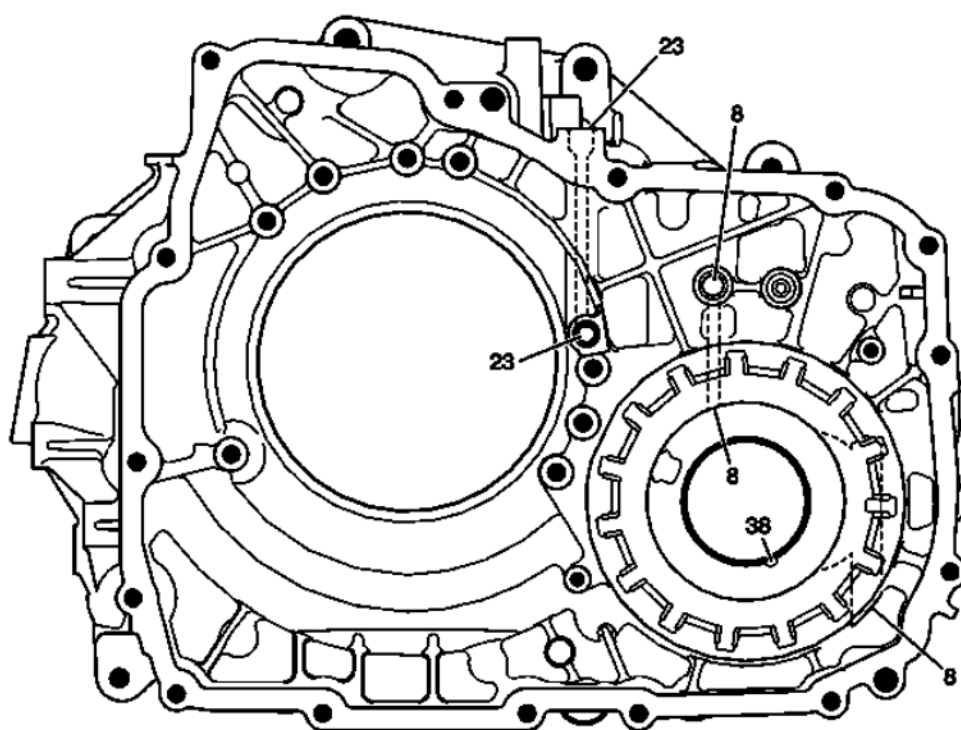
### **Drive Range, Sixth Gear - Gen 2/Hybrid**



**Fig. 17: Drive Range, Sixth Gear -- Gen 2/Hybrid Fluid Flow Diagram**  
 Courtesy of GENERAL MOTORS COMPANY

## FLUID PASSAGES (GEN 2/HYBRID)

Torque Converter and Differential Housing - Case Side

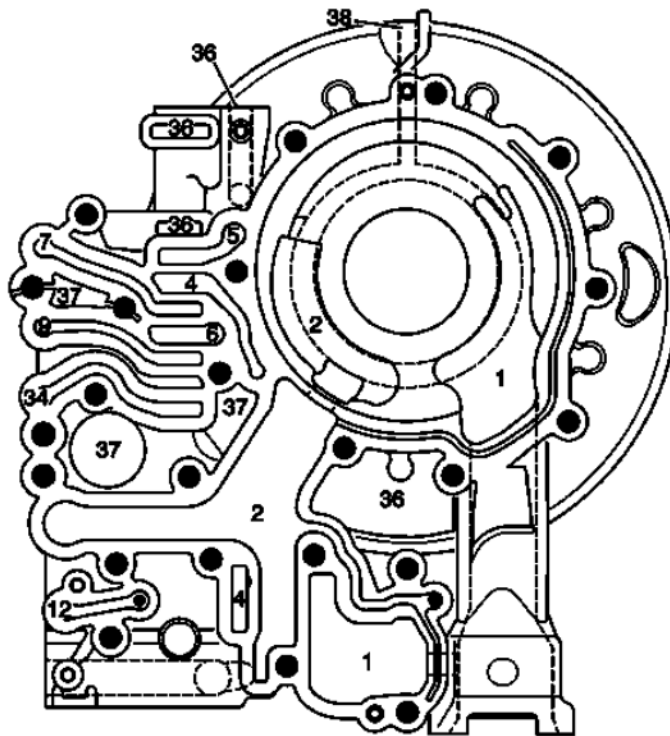


**Fig. 18: Torque Converter and Differential Housing -- Case Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                |
|---------|-------------------------------|
| 8       | Lube                          |
| 23      | Auxiliary Suction (BAS+ Only) |
| 38      | Seal Drainback                |

Fluid Pump Body - Fluid Pump Cover Side

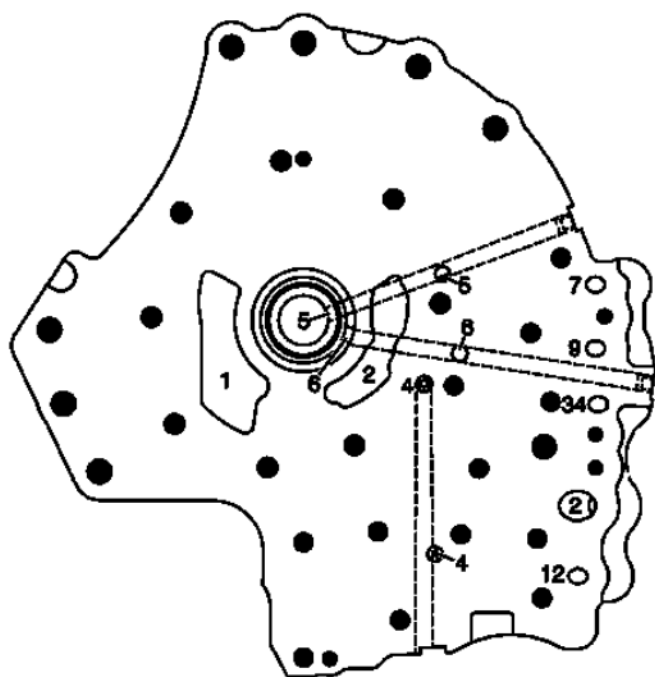




**Fig. 19: Fluid Pump Body -- Fluid Pump Cover Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name  |
|---------|-----------------|
| 1       | Suction         |
| 2       | Line            |
| 4       | Converter Feed  |
| 5       | TCC Release     |
| 6       | TCC Apply       |
| 7       | Cooler Feed     |
| 9       | Regulated Apply |
| 12      | PCS Line        |
| 34      | PCS TCC         |
| 36      | Exhaust         |
| 37      | Void            |
| 38      | Seal Drainback  |

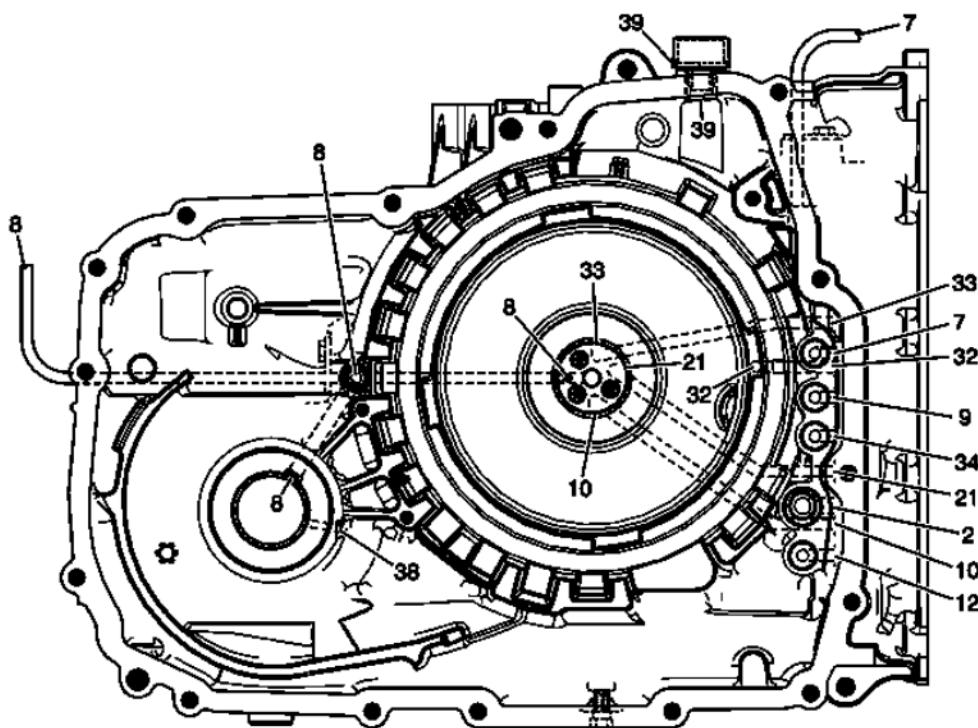
**Fluid Pump Cover - Fluid Pump Body Side**



**Fig. 20: Fluid Pump Cover -- Fluid Pump Body Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name  |
|---------|-----------------|
| 1       | Suction         |
| 2       | Line            |
| 4       | Converter Feed  |
| 5       | TCC Release     |
| 6       | TCC Apply       |
| 7       | Cooler Feed     |
| 9       | Regulated Apply |
| 12      | PCS Line        |
| 34      | PCS TCC         |

Case - Torque Converter and Differential Housing Side

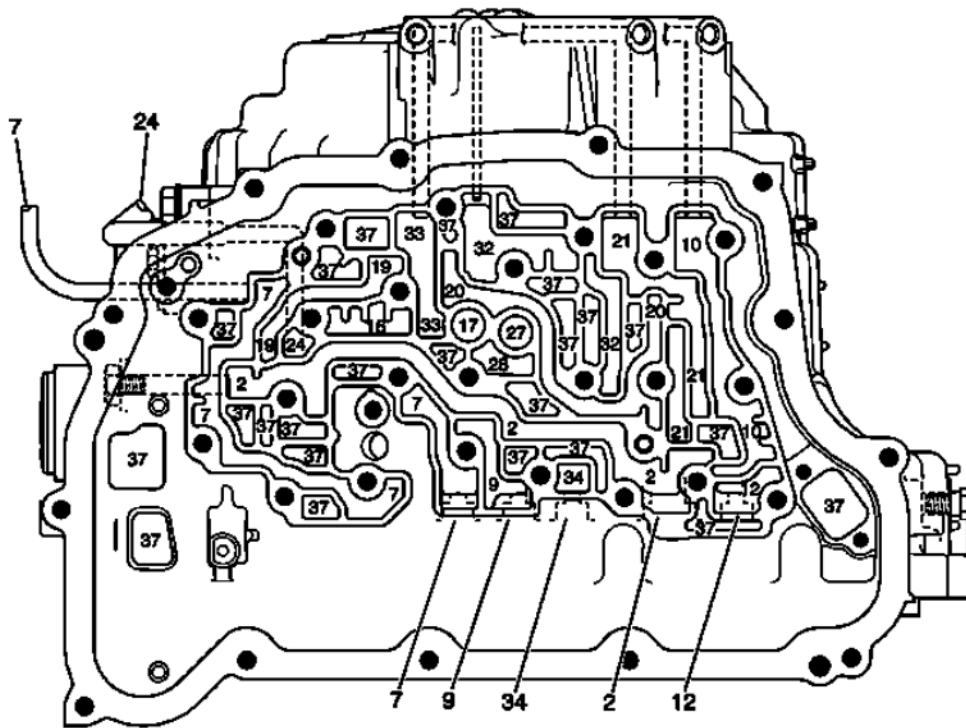


**Fig. 21: Case -- Torque Converter and Differential Housing Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name    |
|---------|-------------------|
| 2       | Line              |
| 7       | Cooler Feed       |
| 8       | Lube              |
| 9       | Regulated Apply   |
| 10      | Exhaust Backfill  |
| 12      | PCS Line          |
| 21      | 35 Reverse Clutch |
| 32      | 26 Clutch         |
| 33      | 456 Clutch        |
| 34      | PCS TCC           |
| 38      | Seal Drainback    |
| 39      | Vent              |

**Case - Control Valve Body Side**

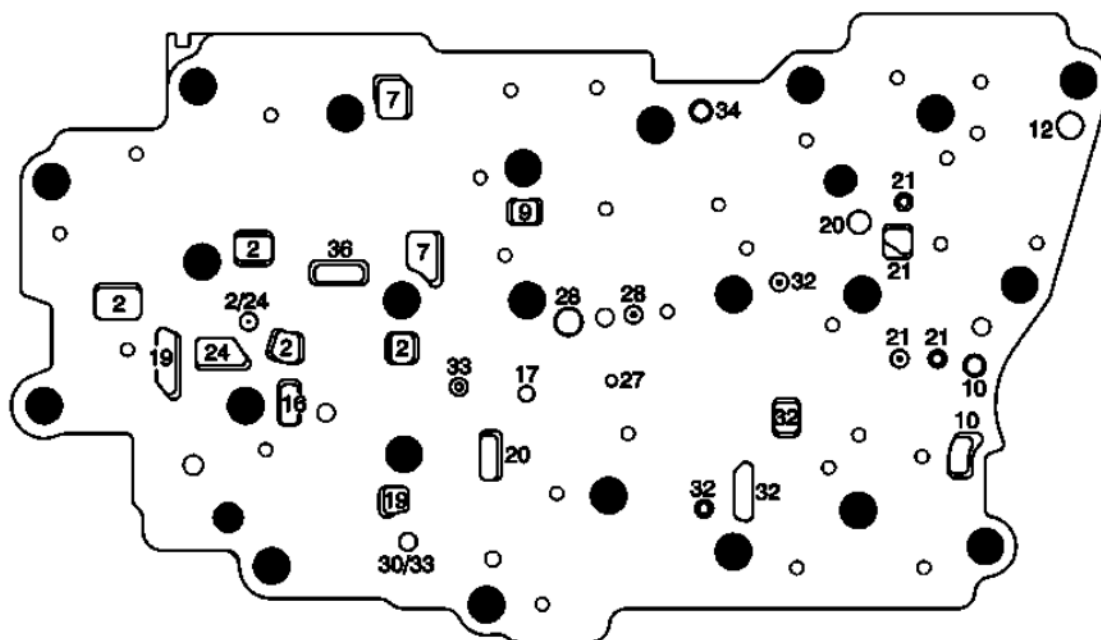




**Fig. 22: Case -- Control Valve Body Side Components Name**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name             |
|---------|----------------------------|
| 2       | Line                       |
| 7       | Cooler Feed                |
| 9       | Regulated Apply            |
| 10      | Exhaust Backfill           |
| 12      | PCS Line                   |
| 16      | R1/456 Clutch Feedback     |
| 17      | R1                         |
| 19      | Reverse                    |
| 20      | 35 Reverse Clutch Feed     |
| 21      | 35 Reverse Clutch          |
| 24      | Auxiliary Line (BAS+ Only) |
| 27      | 1234 Clutch                |
| 28      | 1234 Clutch Feedback       |
| 32      | 26 Clutch                  |
| 33      | 456 Clutch                 |
| 34      | PCS TCC                    |
| 37      | Void                       |

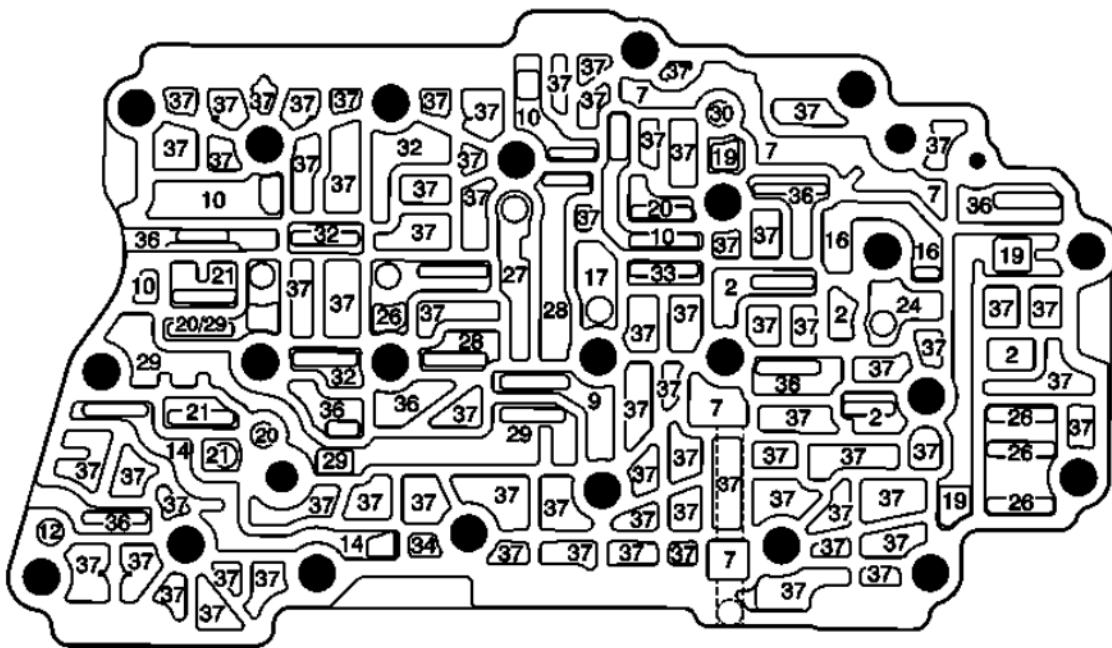
#### Control Valve Body Spacer Plate Assembly - Case Side



**Fig. 23: Control Valve Body Spacer Plate Assembly -- Case Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name             |
|---------|----------------------------|
| 2       | Line                       |
| 7       | Cooler Feed                |
| 9       | Regulated Apply            |
| 10      | Exhaust Backfill           |
| 12      | PCS Line                   |
| 16      | R1/456 Clutch Feedback     |
| 17      | R1                         |
| 19      | Reverse                    |
| 20      | 35 Reverse Clutch Feed     |
| 21      | 35 Reverse Clutch          |
| 24      | Auxiliary Line (BAS+ Only) |
| 27      | 1234 Clutch                |
| 28      | 1234 Clutch Feedback       |
| 30      | Latch                      |
| 32      | 26 Clutch                  |
| 33      | 456 Clutch                 |
| 34      | PCS TCC                    |
| 36      | Exhaust                    |

**Control Valve Body - Case Side**

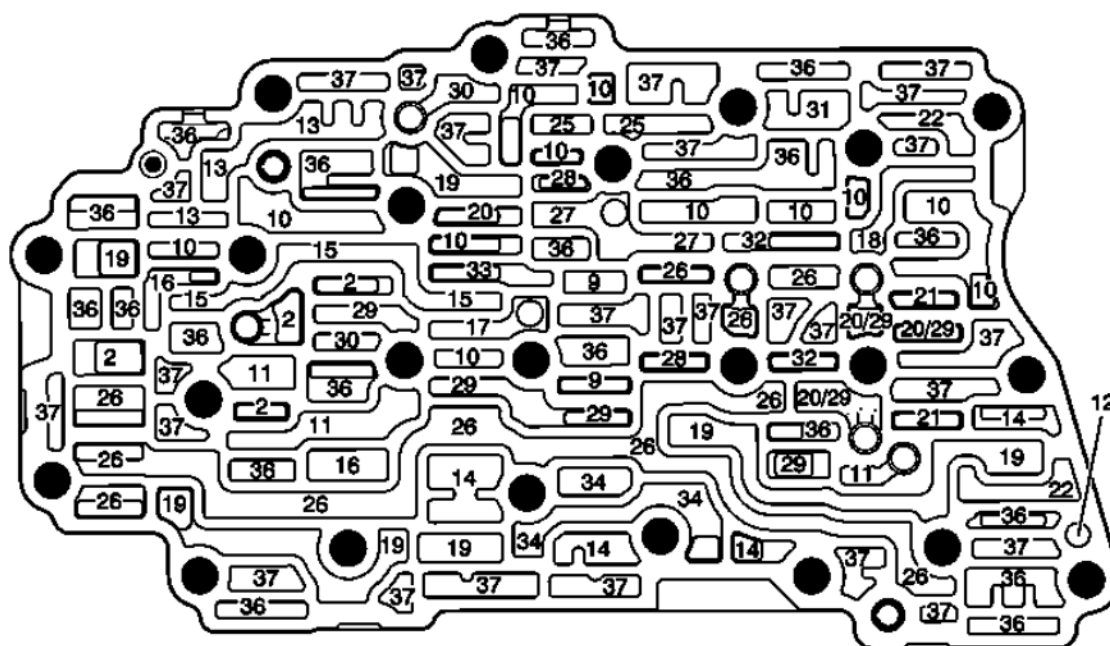


**Fig. 24: Control Valve Body -- Case Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name             |
|---------|----------------------------|
| 2       | Line                       |
| 7       | Cooler Feed                |
| 9       | Regulated Apply            |
| 10      | Exhaust Backfill           |
| 12      | PCS Line                   |
| 14      | Shift Solenoid             |
| 16      | R1/456 Clutch Feedback     |
| 17      | R1                         |
| 19      | Reverse                    |
| 20      | 35 Reverse Clutch Feed     |
| 21      | 35 Reverse Clutch          |
| 24      | Auxiliary Line (BAS+ Only) |
| 26      | Drive                      |
| 27      | 1234 Clutch                |
| 28      | 1234 Clutch Feedback       |
| 29      | Drive 1-6                  |
| 30      | Latch                      |
| 32      | 26 Clutch                  |
| 33      | 456 Clutch                 |

|    |         |
|----|---------|
| 34 | PCS TCC |
| 36 | Exhaust |
| 37 | Void    |

#### Control Valve Body - Channel Plate Side



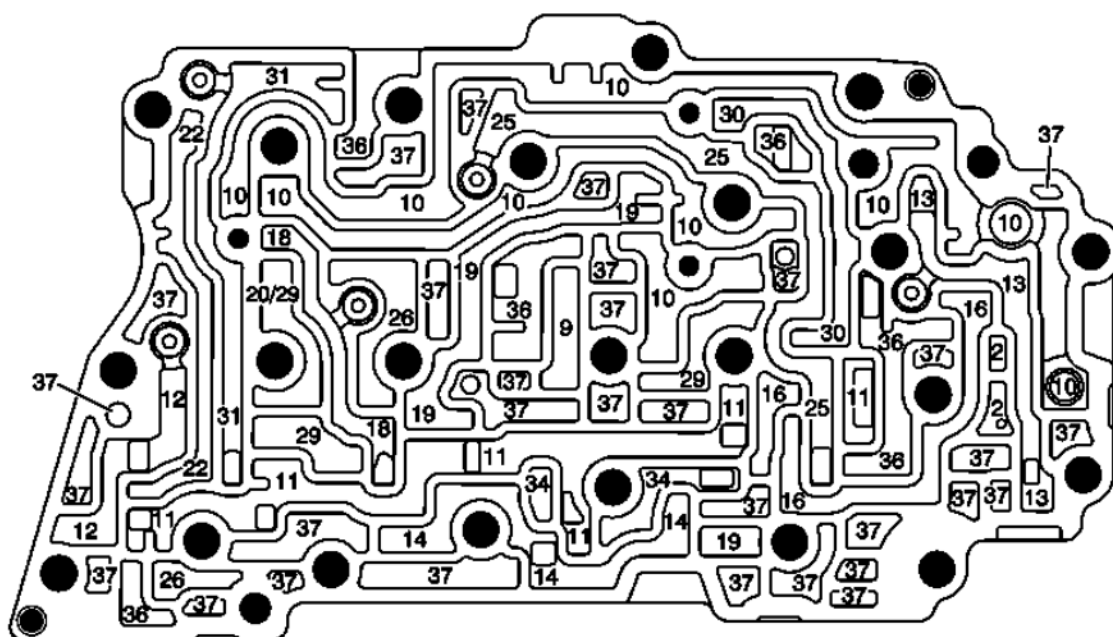
**Fig. 25: Control Valve Body -- Channel Plate Side**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name         |
|---------|------------------------|
| 2       | Line                   |
| 9       | Regulated Apply        |
| 10      | Exhaust Backfill       |
| 11      | Actuator Feed Limit    |
| 12      | PCS Line               |
| 13      | PCS R1/456 Clutch      |
| 14      | Shift Solenoid         |
| 15      | R1/456 Clutch Feed     |
| 16      | R1/456 Clutch Feedback |
| 17      | R1                     |
| 18      | PCS 35 Reverse Clutch  |
| 19      | Reverse                |
| 20      | 35 Reverse Clutch Feed |
| 21      | 35 Reverse Clutch      |



|    |                        |
|----|------------------------|
| 12 | PCS Line               |
| 13 | PCS R1/456 Clutch      |
| 14 | Shift Solenoid         |
| 15 | R1/456 Clutch Feed     |
| 16 | R1/456 Clutch Feedback |
| 18 | PCS 35 Reverse Clutch  |
| 19 | Reverse                |
| 20 | 35 Reverse Clutch Feed |
| 22 | Default                |
| 25 | PCS 1234 Clutch        |
| 26 | Drive                  |
| 29 | Drive 1-6              |
| 30 | Latch                  |
| 31 | PCS 26 Clutch          |
| 34 | PCS TCC                |
| 36 | Exhaust                |

Channel Plate - Control Valve Body Side

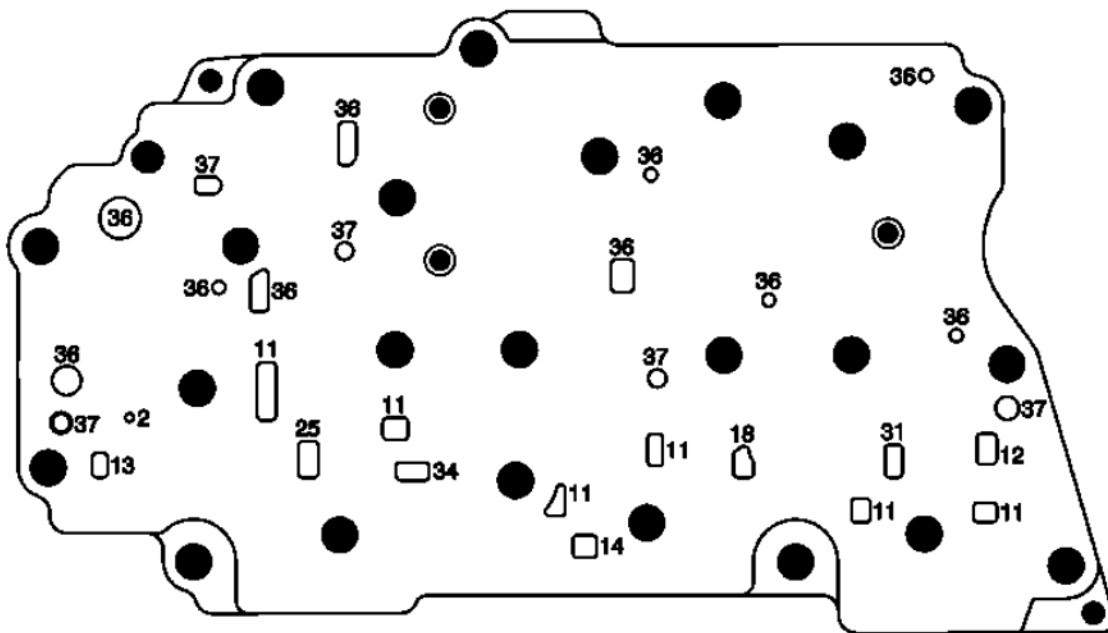


**Fig. 27: Channel Plate -- Control Valve Body Side**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name |
|---------|----------------|
| 2       | Line           |

|    |                        |
|----|------------------------|
| 9  | Regulated Apply        |
| 10 | Exhaust Backfill       |
| 11 | Actuator Feed Limit    |
| 12 | PCS Line               |
| 13 | PCS R1/456 Clutch      |
| 14 | Shift Solenoid         |
| 16 | R1/456 Clutch Feedback |
| 18 | PCS 35 Reverse Clutch  |
| 19 | Reverse                |
| 20 | 35 Reverse Clutch Feed |
| 22 | Default                |
| 25 | PCS 1234 Clutch        |
| 26 | Drive                  |
| 29 | Drive 1-6              |
| 30 | Latch                  |
| 31 | PCS 26 Clutch          |
| 34 | PCS TCC                |
| 36 | Exhaust                |
| 37 | Void                   |

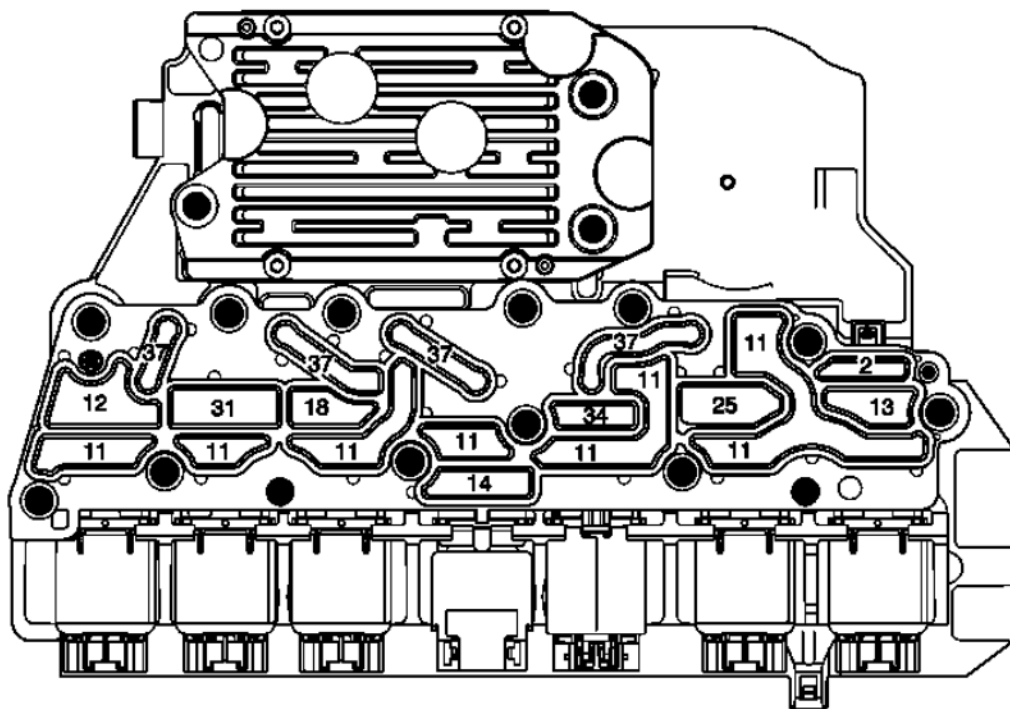
Channel Plate - Control Solenoid (w/Body and TCM) Valve Assembly Side



**Fig. 28: Channel Plate -- Control Solenoid (w/Body and TCM) Valve Assembly Side**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name        |
|---------|-----------------------|
| 2       | Line                  |
| 11      | Actuator Feed Limit   |
| 12      | PCS Line              |
| 13      | PCS R1/456 Clutch     |
| 14      | Shift Solenoid        |
| 18      | PCS 35 Reverse Clutch |
| 25      | PCS 1234 Clutch       |
| 31      | PCS 26 Clutch         |
| 34      | PCS TCC               |
| 36      | Exhaust               |
| 37      | Void                  |

**Control Solenoid (w/Body and TCM) Valve Assembly - Channel Plate Side**



**Fig. 29: Control Solenoid (w/Body and TCM) Valve Assembly -- Channel Plate Side**  
**Courtesy of GENERAL MOTORS COMPANY**

| Callout | Component Name      |
|---------|---------------------|
| 2       | Line                |
| 11      | Actuator Feed Limit |
| 12      | PCS Line            |
| 13      | PCS R1/456 Clutch   |



|    |                       |
|----|-----------------------|
| 14 | Shift Solenoid        |
| 18 | PCS 35 Reverse Clutch |
| 25 | PCS 1234 Clutch       |
| 31 | PCS 26 Clutch         |
| 34 | PCS TCC               |
| 37 | Void                  |

## 2013 TRANSMISSION

Automatic Transmission - 6T40 (MH8, MHH) - Malibu

### DIAGNOSTIC CODE INDEX

#### DIAGNOSTIC CODE INDEX

| DTC                                      | Description                                                                                                                                                                                                                    |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>DTC P057B-P057D</u>                   | DTC P057B Brake Pedal Position Sensor Performance<br>DTC P057C Brake Pedal Position Sensor Circuit Low Voltage<br>DTC P057D Brake Pedal Position Sensor Circuit High Voltage                                                   |
| <u>DTC P0601, P0603, P0604, or P062F</u> | DTC P0601 Control Module Read Only Memory Performance<br>DTC P0603 Control Module Long Term Memory Reset<br>DTC P0604 Control Module Random Access Memory Performance<br>DTC P062F Control Module Long Term Memory Performance |
| <u>DTC P0634</u>                         | DTC P0634 Control Module Overtemperature                                                                                                                                                                                       |
| <u>DTC P0658 or P0659</u>                | DTC P0658 Actuator High Control Circuit Group 1 Low Voltage<br>DTC P0659 Actuator High Control Circuit Group 1 High Voltage                                                                                                    |
| <u>DTC P0667, P0668, or P0669</u>        | DTC P0667 Control Module Temperature Sensor Performance<br>DTC P0668 Control Module Temperature Sensor Circuit Low Voltage<br>DTC P0669 Control Module Temperature Sensor Circuit High Voltage                                 |
| <u>DTC P06AC, P06AD, or P06AE</u>        | DTC P06AC Control Module Power Up Temperature Sensor Performance<br>DTC P06AD Control Module Power Up Temperature Sensor Circuit Low Voltage<br>DTC P06AE Control Module Power Up Temperature Sensor Circuit High Voltage      |
| <u>DTC P0711-P0713</u>                   | DTC P0711 Transmission Fluid Temperature Sensor Performance<br>DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Voltage<br>DTC P0713 Transmission Fluid Temperature Sensor Circuit High Voltage                     |
| <u>DTC P0716, P0717, P07BF, or P07C0</u> | DTC P0716 Input Speed Sensor Performance<br>DTC P0717 Input Speed Sensor Circuit No Signal<br>DTC P07BF Input Speed Sensor Circuit Low Voltage                                                                                 |

|                                                 |                                                                                                                                                                                                                         |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                 | DTC P07C0 Input Speed Sensor Circuit High Voltage                                                                                                                                                                       |
| <b><u>DTC P0722, P0723, P077C, or P077D</u></b> | DTC P0722 Output Speed Sensor Circuit No Signal<br>DTC P0723 Output Speed Sensor Circuit Intermittent<br>DTC P077C Output Speed Sensor Circuit Low Voltage<br>DTC P077D Output Speed Sensor Circuit High Voltage        |
| <b><u>DTC P0741 or P0742</u></b>                | DTC P0741 Torque Converter Clutch (TCC) System Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P0742 Torque Converter Clutch (TCC) System Stuck On - Transmission Hydraulic/Mechanical Performance     |
| <b><u>DTC P0751 or P0752</u></b>                | DTC P0751 Shift Solenoid Valve 1 Performance - Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P0752 Shift Solenoid Valve 1 Performance - Stuck On - Transmission Hydraulic/Mechanical Performance     |
| <b><u>DTC P0776 or P0777 (Gen 2)</u></b>        | DTC P0776 Pressure Control Solenoid Valve 2 Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P0777 Pressure Control Solenoid Valve 2 Stuck On - Transmission Hydraulic/Mechanical Performance           |
| <b><u>DTC P0796 or P0797 (Gen 2)</u></b>        | DTC P0796 Pressure Control Solenoid Valve 3 Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P0797 Pressure Control Solenoid Valve 3 Stuck On - Transmission Hydraulic/Mechanical Performance           |
| <b><u>DTC P0815, P0816, or P0826</u></b>        | DTC P0815 Upshift Switch Circuit<br>DTC P0816 Downshift Switch Circuit<br>DTC P0826 Up and Down Shift Switch Circuit                                                                                                    |
| <b><u>DTC P0850-P0852</u></b>                   | DTC P0850 Park/Neutral Position Switch Circuit<br>DTC P0851 Park/Neutral Position Switch Circuit Low Voltage<br>DTC P0852 Park/Neutral Position Switch Circuit High Voltage                                             |
| <b><u>DTC P0961-P0963</u></b>                   | DTC P0961 Line Pressure Control Solenoid Valve Performance<br>DTC P0962 Line Pressure Control Solenoid Valve Control Circuit Low Voltage<br>DTC P0963 Line Pressure Control Solenoid Valve Control Circuit High Voltage |
| <b><u>DTC P0965-P0967</u></b>                   | DTC P0965 Pressure Control Solenoid Valve 2 Performance<br>DTC P0966 Pressure Control Solenoid Valve 2 Control Circuit Low Voltage<br>DTC P0967 Pressure Control Solenoid Valve 2 Control Circuit High Voltage          |
| <b><u>DTC P0969-P0971</u></b>                   | DTC P0969 Pressure Control Solenoid Valve 3 Performance<br>DTC P0970 Pressure Control Solenoid Valve 3 Control Circuit Low Voltage<br>DTC P0971 Pressure Control Solenoid Valve 3 Control Circuit High Voltage          |
|                                                 | DTC P0973 Shift Solenoid Valve 1 Control Circuit Low                                                                                                                                                                    |

|                                          |                                                                                                                                                                                                                                                                                                    |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><u>DTC P0973 or P0974</u></b>         | Voltage<br>DTC P0974 Shift Solenoid Valve 1 Control Circuit High Voltage                                                                                                                                                                                                                           |
| <b><u>DTC P1761</u></b>                  | DTC P1761 Up and Down Shift Switch Signal Message Counter Incorrect                                                                                                                                                                                                                                |
| <b><u>DTC P182E or P1915</u></b>         | DTC P182E Internal Mode Switch Indicates Invalid Range<br>DTC P1915 Internal Mode Switch Does Not Indicate Park/Neutral During Start                                                                                                                                                               |
| <b><u>DTC P1876</u></b>                  | DTC P1876 Up and Down Shift Enable Switch Circuit Low Voltage                                                                                                                                                                                                                                      |
| <b><u>DTC P2714 or P2715 (Gen 2)</u></b> | DTC P2714 Pressure Control Solenoid Valve 4 Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P2715 Pressure Control Solenoid Valve 4 Stuck On - Transmission Hydraulic/Mechanical Performance                                                                                      |
| <b><u>DTC P2719-P2721</u></b>            | DTC P2719 Pressure Control Solenoid Valve 4 Performance<br>DTC P2720 Pressure Control Solenoid Valve 4 Control Circuit Low Voltage<br>DTC P2721 Pressure Control Solenoid Valve 4 Control Circuit High Voltage                                                                                     |
| <b><u>DTC P2723 or P2724 (Gen 2)</u></b> | DTC P2723 Pressure Control Solenoid Valve 5 Stuck Off - Transmission Hydraulic/Mechanical Performance<br>DTC P2724 Pressure Control Solenoid Valve 5 Stuck On - Transmission Hydraulic/Mechanical Performance                                                                                      |
| <b><u>DTC P2728-P2730</u></b>            | DTC P2728 Pressure Control Solenoid Valve 5 Performance<br>DTC P2729 Pressure Control Solenoid Valve 5 Control Circuit Low Voltage<br>DTC P2730 Pressure Control Solenoid Valve 5 Control Circuit High Voltage                                                                                     |
| <b><u>DTC P2762, P2763, or P2764</u></b> | DTC P2762 Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Performance<br>DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit High Voltage<br>DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit Low Voltage |

## 2013 TRANSMISSION

### Automatic Transmission - 6T40 (MH8, MHH) - Diagnostic Information and Procedures - Malibu

## DIAGNOSTIC INFORMATION AND PROCEDURES

### DTC P057B-P057D

#### 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 P057B

Brake Pedal Position Sensor Performance

#### DTC P057C

Brake Pedal Position Sensor Circuit Low Voltage

#### DTC P057D

Brake Pedal Position Sensor Circuit High Voltage

#### Diagnostic Fault Information

| Circuit       | Short to Ground | Open/High Resistance | Short to Voltage | Signal Performance |
|---------------|-----------------|----------------------|------------------|--------------------|
| Signal        | P057C           | P057C                | P057D            | P057B              |
| 5 V Reference | P057C<br>P0651  | P057C                | P0651            | -                  |
| Low Reference | -               | P057D                | P057D            | -                  |

#### Typical Scan Tool Data

#### Brake Pedal Position Sensor

| Circuit                                                                                                             | Short to Ground | Open | Short to Voltage |
|---------------------------------------------------------------------------------------------------------------------|-----------------|------|------------------|
| <b>Operating Conditions:</b> Ignition ON.<br><b>Brake Pedal Position Sensor Parameter Normal Range:</b> 0.25-4.75 V |                 |      |                  |
| 5 V Reference                                                                                                       | 0 V             | 0 V  | -                |
| Signal                                                                                                              | 0 V             | 0 V  | 5 V              |
|                                                                                                                     |                 |      |                  |

|               |   |     |   |
|---------------|---|-----|---|
| Low Reference | - | 5 V | - |
|---------------|---|-----|---|

### Circuit/System Description

The brake pedal position (BPP) sensor is part of the engine brake pedal override feature. The engine control module (ECM) continuously monitors the vehicle speed and the position of the brake pedal. These two main inputs, along with other ECM inputs are used to determine if the vehicle is decelerating at the proper speed and rate with the brake pedal applied. When the engine brake pedal override system is active, the ECM reduces engine torque to assist in reducing vehicle speed.

The BPP sensor is a three wire sensor, and is part of a dual brake position sensor. The ECM supplies a 5 V reference circuit, low reference circuit, and signal circuit to the BPP sensor. The BPP sensor sends a voltage signal to the ECM on the signal circuit. The voltage on the signal circuit will vary from a voltage greater than 0.25 V when the brake pedal is released to a voltage less than 4.75 V when the brake pedal is fully applied.

### Conditions for Running the DTC

Ignition voltage is greater than 10 V.

### Conditions for Setting the DTC

#### P057B

ECM detects that the BPP sensor signal is stuck in a range.

#### P057C

BPP sensor voltage is less than 0.25 V for 1 s.

#### P057D

BPP sensor voltage is greater than 4.75 V for 1 s.

### Action Taken When the DTC Sets

- DTCs P057B, P057C, and P057D are Type A DTCs
- Engine torque is reduced to 50 percent of available engine torque during torque management.
- Brake torque management is active at 25 kPa (3.7 PSI) of brake apply pressure.

### Conditions for Clearing the DTC

DTCs P057B, P057C, and P057D are Type A DTCs

### Reference Information

Schematic Reference

- **Automatic Transmission Controls Schematics**
- **Exterior Lights Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Transmission General Description**
- **Transmission Component and System Description**
- **Electronic Component Description**

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. Ignition ON, engine OFF, transmission in Park, service brake pedal released.
2. Verify the scan tool Brake Pedal Position Sensor parameter in the ECM Automatic Transmission Data list displays greater than 0.25 V.
  - **If 0.25 V or less**

Refer to Circuit/System Testing below.

- **If greater than 0.25 V**
3. Verify the scan tool Brake Pedal Position Sensor parameter changes as the brake pedal is applied and displays less than 4.75 V when the brake pedal is fully applied.
  - **If 4.75 V or greater, or the parameter does not change**

Refer to Circuit/System Testing below.

- **If less than 4.75 V and parameter changes**
- 4. Verify the scan tool Brake Pedal Position Sensor Learned Home Position parameter is within 0.1 V of the Brake Pedal Position Sensor parameter when the brake pedal is fully released.
  - **If difference is greater than 0.1 V**

Command the **Brake Pedal Position Sensor Learn (With 2.5L LCV)** with a scan tool.

- **If difference is 0.1 V or less**
- 5. Verify the Brake Pedal Position Sensor parameter transitions smoothly without any spikes or dropouts when slowly applying and releasing the brake.
  - **If parameter does not transition smoothly or has spikes or dropouts**

Refer to Circuit/System Testing below.

- **If parameter transitions smoothly and there are no spikes or dropouts**
- 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.
- 7. Verify the DTC does not set.
  - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**
- 8. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B22 Brake Pedal Position Sensor. It may take up to 2 minutes for all vehicle systems to power down.

**NOTE:** All terminal references are for the vehicle harness brake pedal position sensor connector.

2. Test for less than 10 ohms between the low reference circuit terminal 5 and ground.
  - **If 10 ohms or greater**
    1. Disconnect the harness connector at the K20 Engine Control Module.
    2. Test for less than 2 ohms in the low reference circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, replace the K20 Engine Control Module.
  - **If less than 10 ohms**
3. Ignition ON.



4. Test for 4.8-5.2 V between the 5 V reference circuit terminal 6 and ground.
  - **If less than 4.8 V**
    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.
    2. Test for infinite resistance between the 5 V reference circuit and ground.
      - If less than infinite resistance, repair the short to ground on the circuit.
      - If infinite resistance.
    3. Test for less than 2 ohms in the 5 V reference circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, replace the K20 Engine Control Module.
  - **If greater than 5.2 V**
    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
    2. Test for less than 1 V between the 5 V reference circuit and ground.
      - If 1 V or greater, repair the short to voltage on the circuit.
      - If less than 1 V, replace the K20 Engine Control Module.
  - **If between 4.8-5.2 V**
5. Verify the scan tool Brake Pedal Position Sensor parameter is less than 0.25 V.
  - **If 0.25 V or greater**
    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.
    2. Test for less than 0.25 V between the signal circuit terminal 4 and ground.
      - If 0.25 V or greater, repair the short to voltage on the circuit.
      - If less than 0.25 V, replace the K20 Engine Control Module.
  - **If less than 0.25 V**
6. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the 5 V reference circuit terminal 6.
7. Verify the scan tool Brake Pedal Position Sensor parameter is between 4.8-5.2 V.
  - **If not 4.8-5.2 V**
    1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, and remove the fused jumper wire.
    2. Test for infinite resistance between the signal circuit terminal 4 and ground.
      - If less than infinite resistance, repair the short to ground on the circuit.
      - If infinite resistance.
    3. Test for less than 2 ohms in the signal circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, replace the K20 Engine Control Module.
  - **If 4.8-5.2 V**
8. Replace the B22 Brake Pedal Position Sensor.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Brake Pedal Position Sensor Replacement**
- Perform the **Brake Pedal Position Sensor Learn (With 2.5L LCV)** following the replacement of the ECM or BPP sensor, or any repair that effects the BPP sensor alignment.
- **Control Module References** for Engine Control Module replacement, programming and setup.

## **DTC P0601, P0603, P0604, OR P062F**

### **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**

**NOTE:** DTCs P0601, P0603, P0604 or P062F could set in other control modules. Verify the DTCs are set in the transmission control module (TCM).

#### **DTC P0601**

Control Module Read Only Memory Performance

#### **DTC P0603**

Control Module Long Term Memory Reset

#### **DTC P0604**

Control Module Random Access Memory Performance

#### **DTC P062F**

Control Module Long Term Memory Performance

### **Circuit/System Description**

This is an internal fault detection of the control solenoid valve assembly. This fault is handled inside the control solenoid valve assembly and no external circuits are involved.

### **Conditions for Running the DTC**

#### **P0601 or P0604**

Runs continuously when TCM is powered up.

## **P0603**

One time at TCM power up.

## **P062F**

One time at TCM power down.

### **Conditions for Setting the DTC**

## **P0601**

TCM has detected a read only memory (ROM) checksum error 5 times.

## **P0603**

TCM has detected a non-volatile memory checksum error at TCM powerup.

## **P0604**

TCM has detected a random access memory (RAM) test error 5 times.

## **P062F**

TCM has detected a non-volatile memory error during power-down.

### **Action Taken When the DTC Sets**

- P0601, P0603, P0604, and P062F are Type A DTCs.
- TCM commands maximum line pressure.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM inhibits TCC engagement.
- TCM freezes transmission adaptive functions.
- TCM commands the high side driver OFF.
- TCM defaults the transmission to 4th gear and reverse.
- Torque management is enabled.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.

### **Conditions for Clearing the DTC**

P0601, P0603, P0604, and P062F are Type A DTCs.

### **Reference Information**

Schematic Reference

**Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**CAUTION:** Before programming a control module, the following must be observed, or control module damage may occur:

- The TIS terminal, MDI, and/or scan tool must have the latest software.
- The vehicle battery must be fully charged. The battery voltage should be between 12-14 volts.
- The TIS terminal, MDI, and/or scan tool connections must be secure.
- A battery charger must NOT be connected to the battery when programming a control module.

1. Ignition OFF and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power

down.

2. Ignition ON.
3. Verify that DTC P0601, P0603, P0604, or P062F is not set.
  - **If any of the DTCs are set**

Replace the Q8 Control Solenoid Valve Assembly.

- **If none of the DTCs are set**
4. 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.
  5. Verify the DTC does not set.
    - **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the DTC does not set**
6. All OK.

#### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

#### DTC P0634

##### 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 P0634

Control Module Overtemperature

##### Circuit/System Description

The transmission control module (TCM) temperature sensor is located inside of the control solenoid valve assembly which has no serviceable components. The TCM monitors the TCM temperature sensor for over temperature protection.

### Conditions for Running the DTC

- DTC P0634 is not set.
- TCM temperature is between 0-240°C (32-464°F) for 0.25 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when above conditions are met.

### Conditions for Setting the DTC

#### Condition 1

TCM has detected an internal temperature condition of 144°C (291°F) or greater for 5 s.

#### Condition 2

Ignition voltage is 18 V or greater and the TCM temperature is 50°C (122°F) or greater for 2 s.

### Action Taken When the DTC Sets

- P0634 is a Type A DTC.
- TCM limits the transmission to 4th gear and reverse.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.
- TCM shuts down.
- TCM commands maximum line pressure.

### Conditions for Clearing the DTC

P0634 is a Type A DTC.

### Diagnostic Aids

During a road test, the TCM temperature should steadily increase to a normal operating temperature, and then stabilize.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**

- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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. Ignition ON.
2. Verify the scan tool Engine Coolant Temperature parameter was less than 125°C (257°F) when DTC set by reviewing the scan tool Freeze Frame/Failure Records.
  - **If 125°C (257°F) or greater**  
  
Refer to **Engine Overheating** .
  - **If less than 125°C (257°F)**
3. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
  - **If the transmission fluid level and condition is not correct**  
  
Repair as necessary.
  - **If the transmission fluid level and condition is correct**
4. Clear the TCM DTCs with a scan tool.
5. Operate the vehicle until normal engine temperature is reached.
6. Verify the scan tool Transmission Fluid Temperature parameter is less than 140°C (284°F).
  - **If 140°C (284°F) or greater**

1. Ignition OFF.
2. Verify the conditions listed below do not exist:
  - Obstructions to the airflow to the radiator or transmission
  - Radiator damage
  - Transmission cooler damage
  - Transmission cooler pipe kinked or damaged
    - If a condition exists, repair or replace as necessary.
    - If none of the conditions exist, refer to **Transmission Fluid Cooler Flushing and Flow Test**.
  - **If less than 140°C (284°F)**
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.
8. Verify the DTC does not set.
  - **If the DTC sets**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If the DTC does not set**
9. All OK.

#### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection**
- **Transmission Fluid Cooler Inlet Pipe Replacement (LUK)** , **Transmission Fluid Cooler Inlet Pipe Replacement (LCV)**
- **Transmission Fluid Cooler Outlet Pipe Replacement (LUK)** , **Transmission Fluid Cooler Outlet Pipe Replacement (LCV)**
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

#### DTC P0658 OR P0659

##### 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 P0658



## Actuator High Control Circuit Group 1 Low Voltage

### DTC P0659

## Actuator High Control Circuit Group 1 High Voltage

### Circuit/System Description

The transmission control module (TCM) high side driver 1 is located inside the control solenoid valve assembly which has no serviceable components. The high side driver 1 provides power to the TCM pressure control solenoids and shift solenoids.

### Conditions for Running the DTC

#### P0658

- DTC P0658 is not set.
- High side driver 1 is enabled.
- Runs continuously when above conditions are met.

#### P0659

- DTC P0659 is not set.
- Runs one time when ignition transitions from OFF to ON.

### Conditions for Setting the DTC

#### P0658

TCM detects an internal open or short to ground in the high side driver 1 circuit for 1 s.

#### P0659

TCM detects an internal short to voltage on the high side driver 1 circuit for 1 s.

### Action Taken When the DTC Sets

#### P0658

- P0658 is a Type A DTC.
- TCM turns the high side driver OFF.
- TCM commands all solenoids OFF.
- TCM commands the TCC OFF.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.

- TCM inhibits neutral idle.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM defaults the transmission to 4th gear and reverse.
- TCM enables torque management.

## **P0659**

P0659 is a Type C DTC.

### **Conditions for Clearing the DTC**

- P0658 is a Type A DTC.
- P0659 is a Type C DTC.

### **Reference Information**

Schematic Reference

### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

### **DT-48616-10** Adapter Harness

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

## Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool High Side Driver 1 parameter displays ON.
  - **If ON is not displayed**

Refer to Circuit/System Testing below.

- **If ON is displayed**
3. Engine Running and the gear selector lever in the Park position.
  4. Verify the scan tool parameters listed below do not display Malfunction:
    - High Side Driver 1 Circuit Low Voltage Test Status
    - High Side Driver 1 Circuit Open Test Status
    - High Side Driver 1 Circuit High Voltage Test Status
    - **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**
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.
  6. Verify the DTC does not set.
    - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**
7. All OK.

## Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector, and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
  - High Side Driver 1 Circuit Low Voltage Test Status
  - High Side Driver 1 Circuit Open Test Status
  - High Side Driver 1 Circuit High Voltage Test Status

- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P0667, P0668, OR P0669

### 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 P0667**

Control Module Temperature Sensor Performance

## **DTC P0668**

Control Module Temperature Sensor Circuit Low Voltage

## **DTC P0669**

Control Module Temperature Sensor Circuit High Voltage

### **Circuit/System Description**

The transmission control module (TCM) temperature sensor is located inside of the Control Solenoid Valve Assembly which has no serviceable components. The TCM temperature sensor provides the temperature of the TCM. This temperature reading is used in various shifting and diagnostic routines in the TCM software. This fault is handled inside the TCM and no external circuits are involved.

### **Conditions for Running the DTC**

#### **P0667**

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0667, P0668, P0669, P06AD, P06AE, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.
- Engine torque signal is valid.
- Ignition voltage is 9-32 V.
- Engine speed is 400-7, 500 RPM for 5 s.
- Throttle position signal is valid.
- Runs continuously when above conditions are met.

#### **P0668**

- DTC P0668 is not set.
- Ignition voltage is 9-32 V.
- Engine speed is 400-7, 500 RPM for 5 s.
- Runs continuously when above conditions are met.

#### **P0669**

- DTC P0669, P0716, P0717, P0722, or P0723 is not set.
- Ignition voltage is 9-32 V.

- Engine speed is 400-7, 500 RPM for 5 s.
- Runs continuously when above conditions are met.

#### **Conditions for Setting the DTC**

##### **P0667**

- TCM detects a 20-50°C (36-90°F) or greater difference between the transmission fluid temperature and TCM substrate temperature, which depends on the average of the transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.
- TCM detects a 8-10°C (14-18°F) or greater difference between the TCM power up temperature and TCM substrate temperature, which depends on the average of the transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.
- Above conditions have to be met for 5 min within a 6 min period.

##### **P0668**

TCM internal temperature is 254°C (489°F) or greater for 1 min.

##### **P0669**

TCM internal temperature is -254°C (-425°F) or less for 1 min.

#### **Action Taken When the DTC Sets**

- P0667, P0668, and P0669 are Type B DTCs.
- TCM defaults the TCM substrate temperature to a calculated temperature based on the TCM power up temperature.

#### **Conditions for Clearing the DTC**

P0667, P0668, and P0669 are Type B DTCs.

#### **Diagnostic Aids**

The TCM temperature sensor is located inside of the Control Solenoid Valve Assembly and its output should resemble that of the transmission fluid temperature sensor output. During a road test, the TCM temperature should steadily increase to a normal operating temperature, and then stabilize.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

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- **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. Ignition ON.
2. Verify the scan tool TCM Temperature parameter is between -254 and +254°C (-425 and +489°F).
  - **If not between -254 and +254°C (-425 and +489°F)**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If between -254 and +254°C (-425 and +489°F)**
3. Verify the scan tool TCM Temperature parameter increases greater than 2°C (3.6°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.
  - **If the temperature does not increase greater than 2°C (3.6°F)**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If the temperature increases greater than 2°C (3.6°F)**
4. Verify the scan tool Transmission Fluid Temperature and TCM Temperature parameters are within 20°C (36°F) of each other.
  - **If the temperatures are not within 20°C (36°F)**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the temperatures are within 20°C (36°F)**

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.
6. Verify the DTC does not set.
  - **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the DTC does not set**

7. All OK.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

### DTC P06AC, P06AD, OR P06AE

#### 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 P06AC

Control Module Power Up Temperature Sensor Performance

##### DTC P06AD

Control Module Power Up Temperature Sensor Circuit Low Voltage

##### DTC P06AE

Control Module Power Up Temperature Sensor Circuit High Voltage

#### Circuit/System Description

The transmission control module (TCM) power up temperature sensor is located inside of the Control Solenoid



Valve Assembly which has no serviceable components. The TCM power up temperature sensor provides the temperature of the TCM when the TCM power is on. This temperature reading is used in various shifting and diagnostic routines in the TCM software. This fault is handled inside the TCM and no external circuits are involved.

#### **Conditions for Running the DTC**

##### **P06AC**

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0668, P0669, P06AC, P06AD, P06AE, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.
- Throttle position signal is valid.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Engine torque signal is valid.
- DTC runs continuously when the above conditions are met.

##### **P06AD**

- DTC P06AD, P0716, P0717, P0722, or P0723 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when the above conditions are met.

##### **P06AE**

- DTC P06AE is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when the above conditions are met.

#### **Conditions for Setting the DTC**

##### **P06AC**

- TCM detects a 20-50°C (36-90°F), or greater difference between the transmission fluid temperature and TCM power up temperature, which depends on the average of transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.
- TCM detects an 8-10°C (14-18°F), or greater difference between the TCM substrate temperature and TCM power up temperature, which depends on the average of the transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.

- Above conditions have to be met for 5 min within a 6 min period.

#### **P06AD**

TCM power up temperature is -254°C (-425°F) or less for 1 min.

#### **P06AE**

TCM power up temperature is 254°C (489°F) or greater for 1 min.

#### **Action Taken When the DTC Sets**

- P06AC, P06AD, and P06AE are Type B DTCs.
- TCM defaults the TCM power up temperature to a calculated temperature based on the TCM substrate temperature.

#### **Conditions for Clearing the DTC**

P06AC, P06AD, and P06AE are Type B DTCs.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
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- **Transmission General Description**

Electrical Information Reference

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- **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. Ignition ON, clear the DTCs with a scan tool.
2. Operate the vehicle at 64 km/h (40 mph) for 10 min.
3. Verify DTC P06AC, P06AD, or P06AE is not set.
  - **If any of the DTCs are set**

Replace the Q8 Control Solenoid Valve Assembly.

- **If none of the DTCs are set**
4. 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.
5. Verify the DTC does not set.
  - **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the DTC does not set**
6. All OK.

### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## **DTC P0711-P0713**

### **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 P0711**

## Transmission Fluid Temperature Sensor Performance

### DTC P0712

#### Transmission Fluid Temperature Sensor Circuit Low Voltage

### DTC P0713

#### Transmission Fluid Temperature Sensor Circuit High Voltage

#### Circuit/System Description

The transmission fluid temperature sensor is located inside of the transmission Control Solenoid Valve Assembly which has no serviceable components. The transmission fluid temperature sensor provides transmission fluid temperature to the transmission control module (TCM). This fault is handled inside the TCM and no external circuits are involved.

#### Conditions for Running the DTC

##### P0711

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0668, P0669, P06AD, P06AE, P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Accelerator position signal is valid.
- Engine torque signal is valid.
- Brake torque is not active.
- DTC runs continuously when above conditions are met.

##### P0712

- DTC P0712, P0716, P0717, P0722, or P0723 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when above conditions are met.

##### P0713

- DTC P0713, P0716, P0717, P0722, or P0723 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.

- DTC runs continuously when above conditions are met.

#### Conditions for Setting the DTC

##### P0711

- TCM detects a 20-50°C (36-90°F) or greater difference between the transmission fluid temperature and the TCM substrate temperature, which depends on the average of the transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.
- TCM detects a 20-50°C (36-90°F) or greater difference between the transmission fluid temperature and the TCM power up temperature, which depends on the average of the transmission fluid temperature, TCM substrate temperature, and TCM power up temperature.
- Above conditions have to be met for 5 min within a 6 min period.

##### P0712

Transmission fluid temperature is 254°C (489°F) or greater for 1 min.

##### P0713

Transmission fluid temperature is -254°C (-425°F) or less for 1 min.

#### Action Taken When the DTC Sets

- P0711, P0712, and P0713 are Type B DTCs.
- TCM defaults to a calculated transmission fluid temperature based on the TCM temperature.

#### Conditions for Clearing the DTC

P0711, P0712, and P0713 are Type B DTCs.

#### Diagnostics Aids

The TCM temperature sensor is located inside of the Control Solenoid Valve Assembly and its output should resemble that of the transmission fluid temperature sensor's output. During a road test, the transmission fluid temperature should steadily increase to a normal operating temperature, and then stabilize.

#### Reference Information

Schematic Reference

#### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
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## Description and Operation

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- **Transmission General Description**

## Electrical Information Reference

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- **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 idling at the normal operating temperature.
2. Verify the scan tool Transmission Fluid Temperature parameter is between -254 and +254°C (-425 and +489°F).
  - **If not between -254 and +254°C (-425 and +489°F)**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If between -254 and +254°C (-425 and +489°F)**
3. Verify the scan tool Transmission Fluid Temperature parameter increases greater than 2°C (3.6°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.
  - **If the temperature does not increase greater than 2°C (3.6°F)**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If the temperature increases greater than 2°C (3.6°F)**
4. Verify the scan tool Transmission Fluid Temperature and the TCM Temperature parameters are within 20°C (36°F).
  - **If the temperatures are not within 20°C (36°F)**  
  
Replace the Q8 Control Solenoid Valve Assembly.

- **If the temperatures are within 20°C (36°F)**
- 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.
- 6. Verify the DTC does not set.
  - **If the DTC sets**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If the DTC does not set**
- 7. All OK.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

### DTC P0716, P0717, P07BF, OR P07C0

#### 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 P0716

Input Speed Sensor Performance

##### DTC P0717

Input Speed Sensor Circuit No Signal

##### DTC P07BF

Input Speed Sensor Circuit Low Voltage

##### DTC P07C0

Input Speed Sensor Circuit High Voltage

#### Diagnostic Fault Information

| Circuit | Short to Ground     | Open/High Resistance | Short to Voltage    | Signal Performance |
|---------|---------------------|----------------------|---------------------|--------------------|
| 12 V    | P0716, P0717, P07BF | P0716, P0717, P07BF  | -                   | P0716              |
| Signal  | P0716, P0717        | P0716, P0717, P07BF  | P0716, P0717, P07C0 | P0716              |

#### Typical Scan Tool Data

#### Transmission ISS

| Circuit                                                                                                                                          | Short to Ground | Open  | Short to Voltage |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------|------------------|
| <b>Operating Conditions:</b> Engine running, normal operating temperature, transmission in PARK<br><b>Parameter Normal Range:</b> 500-5, 800 RPM |                 |       |                  |
| 12 V                                                                                                                                             | 0 RPM           | 0 RPM | -                |
| Signal                                                                                                                                           | 0 RPM           | 0 RPM | 0 RPM            |

#### ISS/OSS Supply Voltage

| Circuit                                                                                                                              | Short to Ground | Open | Short to Voltage |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------------------|
| <b>Operating Conditions:</b> Key ON, Engine OFF or Engine running, normal operating temperature<br><b>Parameter Normal Range:</b> OK |                 |      |                  |
| Signal                                                                                                                               | OK              | OK   | OK               |
| 12 V                                                                                                                                 | Out of Range    | OK   | OK               |

#### Circuit/System Description

The input shaft speed (ISS) sensor is a hall-effect type sensor. The ISS sensor mounts to the inside of the automatic transmission case assembly and connects to the control solenoid valve assembly through a 2-wire harness and connector. The sensor faces a reluctor wheel, which is attached to the 4-5-6 clutch and 3-5-R clutch housing assembly. The sensor receives battery voltage on the ISS sensor Supply Voltage circuit from the transmission control module (TCM). As the 4-5-6 clutch and 3-5-R clutch housing rotates, the sensor produces a signal frequency based on the teeth of the reluctor wheel. This signal is transmitted through the ISS sensor signal circuit to the TCM. The TCM uses the ISS sensor signal to calculate input shaft speed to determine commanded line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

#### Conditions for Running the DTC

##### P0716

- DTC P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0752, P0973, or P0974 is not set.
- Vehicle speed is 10 km/h (6 mph) or greater.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Engine torque signal is valid.
- Throttle position signal is valid.



- DTC runs continuously when above conditions are met.

#### **P0717**

- DTC P0717, P0722, or P0723 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Vehicle speed is 16 km/h (10 mph) or greater.
- Engine torque is 50 N.m (37 lb ft) or greater.
- DTC runs continuously when above conditions are met.

#### **P07BF or P07C0**

- Ignition voltage is 9-32 V.
- DTC runs continuously when above condition is met.

#### **Conditions for Setting the DTC**

#### **P0716**

TCM detects the transmission input shaft speed signal dropped greater than 1, 350 RPM for 1 s.

#### **P0717 - Condition 1**

TCM detects the transmission input shaft speed signal is less than 33 RPM for 5 s.

#### **P0717 - Condition 2**

The TCM detects that P0722 set and the Transmission input speed is less than 1, 000 RPM for 5 s.

#### **P07BF**

Transmission ISS sensor analog signal voltage is 0.25 V or less for 4 s.

#### **P07C0**

Transmission ISS sensor analog signal voltage is 4.75 volts or greater for 4 s.

#### **Action Taken When the DTC Sets**

- P0716, P0717, P07BF, and P07C0 are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM forces TCC OFF.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.

- TCM commands maximum line pressure.
- TCM enables torque management.
- TCM limits the transmission to reverse and 4th gear.
- TCM commands the high side driver off - P0716 only.

#### **Conditions for Clearing the DTC**

P0716, P0717, P07BF, and P07C0 are Type A DTCs.

#### **Diagnostic Aids**

- Inspect the ISS sensor harness and connector for metallic debris and the reluctor wheel for damage or misalignment.
- If the scan tool ISS/OSS Supply Voltage indicates out of range, the fault could also be caused by the transmission output shaft speed sensor.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

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- **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

### **DT-48616-10** Adapter Harness

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

## Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool ISS/OSS Supply Voltage parameter displays OK.
  - **If OK is not displayed**

Refer to Circuit/System Testing below.

- **If OK is displayed**
3. Engine idling, transmission in Park.
  4. Verify the scan tool Transmission ISS parameter changes without spikes or dropouts, while varying the engine speed.
    - **If the Transmission ISS does not change with engine speed or has spikes or dropouts**

Refer to Circuit/System Testing below.

- **If the Transmission ISS changes with engine speed and there are no spikes or dropouts**
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.
  6. Verify the DTC does not set.
    - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**
7. All OK.

## Circuit/System Testing

**NOTE:**      **You must perform the Circuit/System Verification first.**

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
3. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
4. Test for 11-13 V between the ISS 12 V circuit terminal B on the Q8 Control Solenoid Valve Assembly

X3 connector and ground.

- **If not between 11-13 V**

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 11-13 V**

5. Verify the scan tool Transmission ISS parameter is between 495-505 RPM when performing the input shaft speed test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test**.

- **If not between 495-505 RPM**

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 495-505 RPM**

6. Verify there is no damage to the reluctor, which is attached to the 4-5-6 clutch and 3-5-R clutch housing assembly, or misalignment between the B14C Transmission Input Shaft Speed Sensor and reluctor.

- **If the reluctor is damaged or misaligned**

Repair or replace as necessary.

- **If the reluctor is not damaged or misaligned**

7. Replace the B14C Transmission Input Shaft Speed Sensor.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Input and Output Speed Sensor Installation**
- **Input and Output Speed Sensor Removal**
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P0722, P0723, P077C, OR P077D

### 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 P0722

Output Speed Sensor Circuit No Signal

### DTC P0723

Output Speed Sensor Circuit Intermittent

### DTC P077C

Output Speed Sensor Circuit Low Voltage

### DTC P077D

Output Speed Sensor Circuit High Voltage

### Diagnostic Fault Information

| Circuit | Short to Ground     | Open/High Resistance | Short to Voltage    | Signal Performance |
|---------|---------------------|----------------------|---------------------|--------------------|
| Signal  | P0722, P0723, P077C | P0722, P0723, P077C  | P0722, P0723, P077D | P0723              |
| 12 V    | P0722, P0723, P077C | P0722, P0723, P077C  | -                   | P0723              |

### Typical Scan Tool Data

#### Transmission OSS

| Circuit                                                                                                                 | Short to Ground | Open  | Short to Voltage |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|-------|------------------|
| <b>Operating Conditions:</b> Drive vehicle, normal operating temperature<br><b>Parameter Normal Range:</b> 0-7, 000 RPM |                 |       |                  |
| 12 V                                                                                                                    | 0 RPM           | 0 RPM | 0-7000 RPM       |
| Signal                                                                                                                  | 0 RPM           | 0 RPM | 0 RPM            |

#### ISS/OSS Supply Voltage

| Circuit                                                                                                                              | Short to Ground | Open | Short to Voltage |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|------------------|
| <b>Operating Conditions:</b> Key ON, Engine OFF or Engine running, normal operating temperature<br><b>Parameter Normal Range:</b> OK |                 |      |                  |
| Output Speed Sensor Signal                                                                                                           | OK              | OK   | OK               |
| Output Speed Sensor Supply Voltage                                                                                                   | Out of Range    | OK   | Out of Range     |

### Circuit/System Description

The output shaft speed (OSS) sensor is a hall-effect type sensor. The OSS sensor mounts to the automatic transmission case assembly and connects to the control solenoid valve assembly through a 2-wire harness and connector. The sensor faces the park gear teeth. The sensor receives battery voltage on the OSS sensor supply voltage circuit from the transmission control module (TCM). As the output shaft rotates, the sensor produces a signal frequency based on the park gear teeth. This signal is transmitted through the OSS sensor signal circuit to

the TCM. The TCM uses the OSS sensor signal to calculate output shaft speed to determine commanded line pressure, transmission shift patterns, vehicle speed and gear ratio.

#### **Conditions for Running the DTC**

##### **P0722**

- DTC P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0722, or P0723 is not set.
- Ignition voltage is 9-32 V.
- Engine speed is 400-7, 500 RPM for 5 s.
- Engine torque signal is valid.
- Throttle position signal is valid.
- Transmission input speed is between 1, 000-8, 191 RPM.
- Calculated throttle position is 8% or greater.
- Engine torque is 30 N.m (22 lb ft) or greater.
- Transmission fluid temperature is -40°C (-40°F) or greater.
- DTC runs continuously when the above conditions are met.

##### **P0723**

- DTC P0101, P0102, P0103, P0121, P0122, P0123, P0723, P0973, P0974, P0976, or P0977 is not set.
- Ignition voltage is 9-32 V.
- Greater than 5 s since last transmission upshift or downshift.
- Engine speed is 400-7, 500 RPM for 5 s.
- DTC runs continuously when the above conditions are met.

##### **P077C**

- DTC P077D is not set.
- Ignition voltage is 9-32 V.
- DTC runs continuously when the above conditions are met.

##### **P077D**

- DTC P077C is not set.
- Ignition voltage is 9-32 V.
- DTC runs continuously when the above conditions are met.

#### **Conditions for Setting the DTC**

##### **P0722**

Transmission output speed is 35 RPM or less for 5 s.

## **P0723**

- Transmission output speed is 105 RPM or greater.
- TCM detects the transmission output shaft speed dropped greater than 1, 000 RPM for 3 s.

## **P077C**

Transmission OSS sensor analog signal voltage is 0.25 V or less for 4 s.

## **P077D**

Transmission OSS sensor analog signal voltage is 4.75 V or greater for 4 s.

### **Action Taken When the DTC Sets**

## **P0722**

- P0722 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM Enables torque management.
- TCM limits the transmission to reverse and 2nd gear.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM commands 2nd gear when in a forward range and the output speed is less than 700 RPM, or neutral if the output speed is 700 RPM or greater.

## **P0723, P077C or P077D**

- P0723, P077C, and P077D are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM forces TCC OFF.
- TCM commands the high side driver OFF.
- TCM commands maximum line pressure.
- TCM enables torque management.
- TCM limits the transmission to reverse and 4th gear.
- TCM inhibits neutral idle.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.

- TCM inhibits auto grade braking.

#### **Conditions for Clearing the DIC/DTC**

P0722, P0723, P077C, and P077D are Type A DTCs.

#### **Diagnostic Aids**

- Inspect the OSS sensor, harness, and connector for metallic debris.
- Proper torque of the OSS sensor mounting bolt is critical to proper OSS sensor operation.
- If the scan tool ISS/OSS Supply Voltage indicates out of range, the fault could also be caused by the transmission input shaft speed sensor.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

### DT-48616-10 Adapter Harness

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

### Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool ISS/OSS Supply Voltage parameter displays OK.

- **If OK is not displayed**

Refer to Circuit/System Testing below.

- **If OK is displayed**

3. Verify the scan tool Transmission OSS parameter changes with vehicle speed or does not drop out, while operating the vehicle at 16-32 km/h (10-20 mph).

- **If the Transmission OSS does not vary with vehicle speed or drops out**

Refer to Circuit/System Testing below.

- **If the Transmission OSS varies with vehicle speed and does not drop out**

4. 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.
5. Verify the DTC does not set.

- **If the DTC sets**

Circuit/System Testing below.

- **If the DTC does not set**

6. All OK.

### Circuit/System Testing

**NOTE:**      **You must perform the Circuit/System Verification first.**

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector.
3. Ignition ON.
4. Test for 11-13 V between the OSS sensor voltage circuit terminal B at the Q8 Control Solenoid Valve Assembly X4 connector and ground.
  - **If not between 11-13 V**

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 11-13 V**

5. Verify the scan tool Transmission OSS parameter is between 745-825 RPM when performing the output shaft speed test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test**.

- **If not between 745-825 RPM**

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 745-825 RPM**

6. Verify there is no damage to the park gear, or misalignment between the B14A Transmission Output Shaft Speed Sensor and the park gear.
  - **If the park gear is damaged or misaligned**

Repair or replace as necessary.

- **If the park gear is not damaged or misaligned**

7. Replace the B14A Transmission Output Shaft Speed Sensor.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Input and Output Speed Sensor Installation** .
- **Input and Output Speed Sensor Removal** .
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P0741 OR P0742

### 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

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the Circuit/System Verification and Circuit/System Testing to identify the cause.

## DTC P0741

## Torque Converter Clutch (TCC) System Stuck Off - Transmission Hydraulic/Mechanical Performance

### DTC P0742

## Torque Converter Clutch (TCC) System Stuck On - Transmission Hydraulic/Mechanical Performance

### Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid is part of the control solenoid valve assembly which has no serviceable components. The TCC pressure control solenoid is a normally low pressure control solenoid. The TCC pressure control solenoid regulates transmission fluid pressure to the TCC regulator valve in the lower valve body and the TCC control valve in the fluid pump assembly. When vehicle operating conditions are appropriate to apply the torque converter clutch, the transmission control module (TCM) will increase TCC pressure control solenoid current flow thereby increasing pressure to move the TCC control valve into the apply position. When the TCC is fully applied, the engine is coupled directly to the transmission. TCC release is accomplished by the TCM decreasing current flow, dropping the apply pressure thereby allowing the TCC control valve to move to the release position. The TCM calculates torque converter slip speed based on the speed signal from the input shaft speed (ISS) sensor and engine RPM provided by the engine control module (ECM).

### Conditions for Running the DTC

#### P0741

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P0741, P0742, P2763, or P2764 is not set.
- Engine speed is 400-7, 500 RPM or greater for 5 s.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is between -6.7 to +130°C (+20 to +266°F).
- Throttle position is 8% or greater.
- Engine torque is 50 N.m (36 lb ft) or greater.
- Engine torque signal is valid.
- Throttle position signal is valid.
- TCM detects the transmission gear ratios listed below for the commanded gear when TCC is commanded ON:
  - 2nd gear ratio is between 2.75-3.17.
  - 3rd gear ratio is between 1.78-2.04.
  - 4th gear ratio is between 1.35-1.55.
  - 5th gear ratio is between 0.93-1.07.
  - 6th gear ratio is between 0.70-0.80.
- DTC runs continuously when the above conditions are met.

#### P0742

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P0741, P0742, P2763, or P2764 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is between 15-130°C (59-266°F).
- Calculated throttle position was 10% or greater and has not dropped below 2%.
- Engine torque signal is valid.
- Throttle position signal is valid.
- Engine torque is 60 N.m (44 lb ft) or greater.
- Vehicle speed greater than 1 km/h (0.6 mph).
- TCC is commanded OFF.
- Engine torque signal is valid.
- Throttle position signal is valid.
- DTC runs continuously when the above conditions are met.

#### Conditions for Setting the DTC

##### P0741

- TCC pressure command is 500 kPa (73 PSI) or greater for 2 s.
- TCM detects TCC slip is 130 RPM or greater for 5 s.
- The above conditions must occur 2 times.

##### P0742

TCM detects the TCC slip is between -50 and +13 RPM for 1 s when TCC is commanded OFF. This condition must occur 8 times.

#### Action Taken When the DTC Sets

##### P0741

- P0741 is a Type B DTC.
- TCM inhibits 6th gear.
- TCM initiates Hot Mode shift pattern.
- TCM commands the TCC OFF.

##### P0742

- P0742 is a Type A DTC.
- TCM initiates Hot Mode shift pattern.

- TCM freezes transmission adaptive functions.
- TCM commands the TCC ON.
- TCM inhibits neutral idle.

#### **Conditions for Clearing the DIC/DTC**

- P0741 is a Type B DTC.
- P0742 is a Type A DTC.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**DT-48616** Solenoid Assembly Test Kit & Adapter Harness

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

#### **Circuit/System Verification**

1. Ignition ON, engine OFF.
2. Verify DTC P0716, P0717, P07BF, or P07C0 was not set by reviewing the scan tool TCM Failure Records.

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

Refer to **DTC P0716, P0717, P07BF, or P07C0.**

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

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check.**

- **If the transmission fluid level and condition is not correct**

Repair as necessary.

- **If the transmission fluid level and condition is correct**

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0741 or P0742 does not set while performing a road test. Refer to **Road Test.**

- **If DTC P0741 or P0742 sets**

Refer to Circuit/System Testing below.

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- **If DTC P0741 or P0742 does not set**

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.
8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

9. All OK.

#### **Circuit/System Testing**

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to **Line Pressure Check,** and **Solenoid Valve Pressure (Gen 1) , Solenoid Valve Pressure (Gen 2) .**

- If the pressures are not within range

Refer to **Fluid Pressure High or Low.**

- If the pressures are within range

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.**

- If the pressure does not change

Replace the Q8 Control Solenoid Valve Assembly.

- If the pressure changes

5. Verify the mechanical conditions listed below do not exist. Repair or replace as necessary.

#### **P0741 Upper Valve Body**

Release exhaust port/orifice plugged or blocked.

#### **P0741 or P0742 - Upper Valve Body**

Torque converter clutch regulator valve stuck/sticking - debris, binding, damaged valve, or scored bore.

#### **P0741 - Channel Plate and Spacer Plate**

Oil channels or orifices blocked by debris.

#### **P0741 or P0742 - Fluid Pump Assembly**

Torque converter clutch control valve stuck/sticking - debris, binding, damaged valve, or scored bore.

#### **P0741 - Torque Converter**

- Torque converter clutch delamination or material worn off.
- Converter bolts too long damaging the clutch apply surface.
- Damaged seal.

#### **P0741 - Support**

Damaged seal.

#### **P0741 or P0742 - A/Trans Case Cover (403)**

- Pressure release blow-off not seating/sealing.
- Damaged spring.

## P0741 - Turbine Shaft O-ring Seal

Cut or damaged.

## P0741 or P0742 - Q8 Control Solenoid Valve Assembly

- Torque converter clutch pressure control solenoid stuck OFF or leaking.
- Torque converter clutch pressure control solenoid stuck ON.
- Control signal fluid supply leak due to valve body filter plate assembly cracked, or damaged gasket seal.

### Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

- Perform the Transmission Adaptive Values Learn following all transmission repairs.
- Control Valve Body Assembly Removal
- Control Module References for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P0751 OR P0752

### 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

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the Circuit/System Verification and Circuit/System Testing to identify the cause.

### DTC P0751

Shift Solenoid Valve 1 Performance - Stuck Off - Transmission Hydraulic/Mechanical Performance

### DTC P0752

Shift Solenoid Valve 1 Performance - Stuck On - Transmission Hydraulic/Mechanical Performance

### Circuit/System Description

Shift solenoid valve 1 is part of the control solenoid valve assembly, which has no serviceable components. The solenoid operates by the transmission control module (TCM) turning the low side driver ON or OFF. When the shift solenoid valve 1 is commanded OFF, the plunger forces the metering ball against the actuator feed limit



seat, blocking the flow and any existing pressure is exhausted through the exhaust port. When the shift solenoid valve 1 is commanded ON, the internal plunger moves, allowing the metering valve to move away from the actuator feed limit seat and against the exhaust seat, creating signal fluid pressure. The signal fluid pressure acts against the clutch select valve 2 to overcome the valve spring force, moving the valve to the apply position. Fluid pressure from the R1/4-5-6 regulator valve flows through clutch select valve 2 and is directed to either the low and reverse clutch or the 4-5-6 clutch, depending on the position of clutch select valve 2.

#### Conditions for Running the DTC

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Transmission fluid temperature is -6.6°C (20°F) or greater.
- Engine speed is between 400-7, 500 RPM for 5 s.
- Output shaft speed is 100 RPM or greater, or the throttle position is 0.5% or greater.
- Ignition voltage is 9-32 V.
- Shift is complete.
- Engine torque signal is valid.
- Throttle position signal is valid.
- High-Side driver is enabled.
- DTC runs continuously when above conditions are met.

#### Conditions for Setting the DTC

##### P0751

- Commanded gear is 1st.
- TCM detects gear ratio 1.37-1.52.
- Gearbox slip is 400 RPM or greater for 2 s.
- Conditions listed above have to occur 8 times.

##### P0752

- Commanded gear is 3rd.
- Transmission has achieved 1st or 2nd.
- Gear slip is 400 RPM or greater for 1.5 s.
- TCM commands 4th gear if above conditions exist and detects a gear ratio of 4.35-4.81 for 1.5 s.
- Conditions listed above have to occur 5 times.

#### Action Taken When the DTC Sets

##### P0751

- P0751 is a type B DTC.

- TCM inhibits 1st gear.
- TCM inhibits Neutral idle.

## **P0752**

- P0752 is a type A DTC.
- TCM limits the transmission to 2nd range and reverse.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits auto grade braking.
- TCM disables neutral idle.
- TCM freezes adapts.
- TCM commands maximum line pressure.
- TCM commands 2nd gear if transmission is in a forward range and the output speed is less than 1350 RPM, or neutral if the output speed is 1350 RPM or greater.

### **Conditions for Clearing the DTC**

- P0751 is a type B DTC.
- P0752 is a type A DTC.

### **Reference Information**

Schematic Reference

### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Drive Range, First Gear Engine Braking (Gen 2/Hybrid)**
- **Drive Range, Third Gear (Gen 2/Hybrid)**
- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

DTC Type Reference

### **Powertrain Diagnostic Trouble Code (DTC) Type Definitions**

## Scan Tool Reference

**Control Module References** for scan tool information

## Circuit/System Verification

**NOTE:** If other DTCs are set, diagnose those DTCs first.

1. Ignition ON, engine OFF.
2. Verify no other TCM DTCs are set using a scan tool.
  - o **If another DTC is set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

- o **If no other DTCs are set**
3. Engine idling at the normal operating temperature, transmission in Park, with parking brake applied and drive wheels chocked.
  4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
    - o **If the transmission fluid level and condition is not correct**

Repair as necessary.

- o **If the transmission fluid level and condition is correct**
5. Ignition ON, clear the TCM DTCs with a scan tool.
  6. From a stop, accelerate to 72 km/h (45 mph) with the calculated throttle position greater than 15%. Perform this test 8 times.
  7. Verify DTC P0751 or P0752 did not set.
    - o **If DTC P0751 or P0752 sets**

Refer to Circuit/System Testing below.

- o **If DTC P0751 or P0752 does not set**
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 the DTC does not set.
    - o **If the DTC sets**

Refer to Circuit/System Testing below.

- o **If the DTC does not set**
10. All OK.

## Circuit/System Testing

**WARNING:** Refer to Parking Brake and Drive Wheels Warning .

**NOTE:** You must perform the Circuit/System Verification first.

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to Line Pressure Check, and Solenoid Valve Pressure (Gen 1) , Solenoid Valve Pressure (Gen 2) .

- If the pressures are not within range

Refer to Fluid Pressure High or Low.

- If the pressures are within range

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.

- If the pressure does not change

Replace the Q8 Control Solenoid Valve Assembly.

- If the pressure changes

5. Verify the mechanical conditions listed below do not exist. Repair or replace as necessary.

#### **P0751 - Control Valve Body**

- Clutch select valve bore plug undersized. Plug should be a valve fit in the bore.
- Check ball #1 missing, damaged/malformed.
- Seat for check ball #1 damaged or leaking.

#### **P0751 or P0752 - Control Valve Body**

- Clutch select valve stuck from debris, sediment, binding, or a scored bore.
- Low and reverse and 4-5-6 clutch regulator valve stuck or sticking from debris, sediment, binding, or a scored bore.

#### **P0751 or P0752 - Channel Plate and Spacer Plate**

Oil channels or orifices blocked by debris.

#### **P0751 or P0752 - Q8 Control Solenoid Valve Assembly**

- Not pressurizing due to shift solenoid valve 1 being stuck OFF or leaking.
- Pressure not exhausting due to shift solenoid valve 1 being stuck ON.

- Control signal fluid supply leak due to valve body filter plate assembly cracked, blocked, or damaged gasket seal.

## **P0752 Output Carrier Assembly**

Output carrier pinion pins too high or too low.

### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## **DTC P0776 OR P0777 (GEN 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**

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the Circuit/System Verification and Circuit/System Testing to identify the cause.

### **DTC P0776**

Pressure Control Solenoid Valve 2 Stuck Off - Transmission Hydraulic/Mechanical Performance

### **DTC P0777**

Pressure Control Solenoid Valve 2 Stuck On - Transmission Hydraulic/Mechanical Performance

### **Circuit/System Description**

Pressure control solenoid valve 2 is part of the control solenoid valve assembly, which has no serviceable components. Pressure control solenoid valve 2 regulates transmission fluid pressure to the 3-5-R regulator valve, which controls pressure to the 3-5-R clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

### **Conditions for Running the DTC**

## P0776

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is -6.7°C (20°F) or greater.
- Transmission output speed is 100 RPM or greater, or the throttle position is 0.5% or greater.
- Throttle position signal is valid.
- High side driver is enabled.
- Commanded range is reverse, 3rd gear or 5th gear.
- DTC runs continuously when the above conditions are met.

## P0777

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is -6.7°C (20°F) or greater.
- Transmission output shaft speed is 100 RPM or greater, or the throttle position is 0.5% or greater.
- Throttle position signal is valid.
- High side driver is enabled.
- Throttle position is 10% or greater and the engine torque is 45 N.m (33 lb ft) or greater.
- DTC runs continuously during shift when the 3-5-R clutch is commanded OFF, until commanded range is attained.

### Conditions for Setting the DTC

#### P0776 - Condition 1

- Commanded gear is 3rd.
- Gearbox slip of 400 RPM or greater is detected for 2.5 s.
- TCM commands 4th gear if the above conditions exist and detects a gear ratio of 1.37-1.52 for 3 s.
- Conditions listed above have to occur 2 times.

#### P0776 - Condition 2

- Commanded gear is 5th.
- Gearbox slip of 400 RPM or greater is detected for 3 s.

- TCM commands 6th gear if the above conditions exist and detects 6th gear ratio for 3.5 s.
- Conditions listed above have to occur 3 times.

#### **P0777**

- The TCM detects an incorrect off-going clutch gear ratio, or tie-up, when the 3-5-R clutch is commanded OFF for 1 s.
- The transmission input shaft speed is 400 RPM or less from the anticipated input shaft speed.
- The conditions listed above must occur 3 times.

#### **Action Taken When the DTC Sets**

#### **P0776**

- P0776 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.
- TCM inhibits neutral idle.
- TCM commands 2nd gear if the transmission is in a forward gear and the output speed is less than 700 RPM.
- TCM commands neutral if the output speed is 700 RPM or greater.

#### **P0777**

- P0777 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM limits the transmission to reverse and 3rd gear.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits neutral idle.
- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.

#### **Conditions for Clearing the DTC**

P0776 and P0777 are Type A DTCs.

## Diagnostic Aids

Before performing a road test, configure and setup the scan tool for snapshot mode. This will allow you to display, monitor, and verify multiple transmission data parameters at one time, after the road test.

## Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- COMPONENT CONNECTOR END VIEWS - INDEX
- INLINE HARNESS CONNECTOR END VIEWS - INDEX

Description and Operation

- Drive Range, Third Gear (Gen 2/Hybrid)
- Drive Range - Fourth Gear (Gen 2/Hybrid)
- Drive Range, Fifth Gear (Gen 2/Hybrid)
- Electronic Component Description
- Transmission Component and System Description
- Transmission General Description

DTC Type Reference

### Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

**WARNING:** Refer to Parking Brake and Drive Wheels Warning .

**NOTE:** If other DTCs are set, diagnose those DTCs first.

1. Ignition ON.
2. Verify DTC P0716, P0717, P0722, P0723, P077C, P077D, P07BF, or P07C0 was not set by reviewing the scan tool Freeze Frame/Failure Records data.
  - o If any of the DTCs were set



Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

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

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.

- **If the transmission fluid level and condition is not correct**

Repair as necessary.

- **If the transmission fluid level and condition is correct**

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0776 or P0777 does not set while performing a road test. Refer to **Road Test**.

- **If DTC P0776 or P0777 sets**

Refer to Circuit/System Testing below.

- **If DTC P0776 or P0777 does not set**

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.
8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

9. All OK.

#### **Circuit/System Testing**

**NOTE:** You must perform the Circuit/System Verification first.

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to **Line Pressure Check**, and **Solenoid Valve Pressure (Gen 1)** , **Solenoid Valve Pressure (Gen 2)** .

- **If the pressures are not within range**

Refer to **Fluid Pressure High or Low**.

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test**.

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

5. Verify the mechanical conditions listed below do not exist. Repair or replace as necessary.

#### **DTC P0776 or P0777 - Control Valve Body Assembly**

- Actuator feed limit circuit supply fluid to solenoids restricted or not available - debris or sediment blockage.
- 3-5-R Regulator Valve stuck/sticking - debris, binding, damaged valve, or scored bore.
- Control valve body ball check valve not seating correctly - debris.

#### **DTC P0776 - 3-5-R and 4-5-6 Clutch Housing Assembly**

3-5-R clutch backing plate retaining ring not seated, causing clutch pack over-travel.

#### **DTC P0776 or P0777 - Torque Converter (w/Fluid Pump) Housing Assembly**

Fluid pump housing/gear damaged/scored.

#### **DTC P0776 - Channel Plate and Spacer Plate**

Oil channels or orifices blocked by debris.

#### **DTC P0776 or P0777 - Q8 Control Solenoid Valve Assembly**

- Clutch Pressure Control Solenoid 2 stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damaged gasket seal.

#### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

#### **DTC P0796 OR P0797 (GEN 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

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the Circuit/System Verification and Circuit/System Testing to identify the cause.

### DTC P0796

Pressure Control Solenoid Valve 3 Stuck Off - Transmission Hydraulic/Mechanical Performance

### DTC P0797

Pressure Control Solenoid Valve 3 Stuck On - Transmission Hydraulic/Mechanical Performance

## Circuit/System Description

Pressure control solenoid 3 is part of the control solenoid valve assembly, which has no serviceable components. Pressure control solenoid 3 regulates transmission fluid pressure to the R1/4-5-6 regulator valve which controls pressure to the reverse and low clutch and the 4-5-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the automatic transmission input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

## Conditions for Running the DTC

### P0796

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Transmission output speed is 100 RPM or greater or the throttle position is 0.5% or greater.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is -6.7°C (20°F) or greater.
- High side driver is enabled.
- Throttle position signal is valid.

### P0797

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is 400-7, 500 RPM for 5 s.

- Transmission output speed is 100 RPM or greater or the throttle position is 0.5% or greater.
- Throttle position signal is valid.
- Ignition voltage is 9-32 V.
- Transmission fluid temperature is -6.7°C (20°F) or greater.
- High side driver is enabled.
- The throttle position is 10% or greater and the engine torque is 45 N.m (33 lb ft) or greater if attained gear is 1st free wheel.
- DTC runs continuously during shift when the 4-5-6 clutch is commanded OFF, until commanded range is attained.

#### **Conditions for Setting the DTC**

##### **P0796**

The TCM detects an incorrect gear ratio when the 4-5-6 clutch is commanded ON. This condition must occur 3 times.

##### **P0797**

The TCM detects an incorrect gear ratio change when the 4-5-6 clutch is commanded OFF during a shift. This must occur 3 times.

#### **Action Taken When the DTC Sets**

- P0796 and P0797 are Type A DTCs.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 3rd gear - DTC P0796 only.
- TCM limits the transmission to reverse and 4th gear - DTC P0797 only.

#### **Conditions for Clearing the DIC/DTC**

P0796 and P0797 are Type A DTCs.

#### **Diagnostic Aids**

Before performing a road test, configure and setup the scan tool for snapshot mode. This allows you to monitor, display, and verify multiple transmission data parameters at one time, after the road test.

## Reference Information

### Schematic Reference

#### Automatic Transmission Controls Schematics

### Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

### Description and Operation

- **Drive Range - Fourth Gear (Gen 2/Hybrid)**
- **Drive Range, Fifth Gear (Gen 2/Hybrid)**
- **Drive Range, Sixth Gear (Gen 2/Hybrid)**
- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

### 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

**WARNING:** Refer to **Parking Brake and Drive Wheels Warning** .

1. Ignition ON.
2. Verify DTC P0716, P0717, P0722, P0723, P077C, P077D, P07BF, or P07C0 was not set by reviewing the scan tool Freeze Frame/Failure Records data.
  - If any of the DTCs were set

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

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

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.

- **If the transmission fluid level and condition is not correct**

Repair as necessary.

- **If the transmission fluid level and condition is correct**

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0796 or P0797 does not set while performing a road test. Refer to **Road Test**.

- **If DTC P0796 or P0797 sets**

Refer to Circuit/System Testing below.

- **If DTC P0796 or P0797 does not set**

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.
8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

9. All OK.

#### **Circuit/System Testing**

**NOTE:**      **You must perform the Circuit/System Verification first.**

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to **Line Pressure Check**, and **Solenoid Valve Pressure (Gen 1)** , **Solenoid Valve Pressure (Gen 2)** .

- **If the pressures are not within range**

Refer to **Fluid Pressure High or Low**.

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test**.

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

5. Verify the mechanical conditions listed below do not exist. Repair or replace as necessary.

#### **P0796 or P0797 - Control Valve Body Assembly**

4-5-6 Regulator Valve stuck/sticking - debris, binding, damaged valve, or scored bore.

#### **P0796 - Transmission Cooling/Lubrication**

- Restriction/leak in OAC, oil to air, cooler/radiator.
- Restricted/leaking/kinked/damaged transmission oil cooler lines.
- Restriction/leak in transmission fluid pump assembly.

#### **P0796 - Automatic Transmission Fluid Filter Assembly**

Oil filter or filter seal loose or damaged.

#### **P0796 - Input Shaft Support**

Input shaft tower seals damaged or leaking.

#### **P0796 - 4-5-6 Clutch Housing Assembly**

4-5-6 Clutch Piston Assembly damaged/leaking.

#### **P0796 - Torque Converter (w/Fluid Pump) Housing Assembly**

- Fluid pump housing vanes/rotor/slide damaged/scored.
- Fluid pump or torque converter overstressed due to high temperature.

#### **P0796 - 4-5-6 Reaction Carrier Hub Assembly**

4-5-6 Reaction Carrier Hub/Shaft - broken hub weld.

#### **P0796 - 3-5-R and 4-5-6 Clutch Housing Assembly**

4-5-6 Clutch Backing Plate Retaining Ring not seated/oriented, causing clutch pack/piston overtravel.

#### **P0796 Output Carrier Assembly**

Output carrier pinion pins too high or too low.

## P0796 or P0797 - Q8 Control Solenoid Valve Assembly

- Clutch Pressure Control Solenoid 3 stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damaged gasket seal.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P0815, P0816, OR P0826

### 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 P0815

Upshift Switch Circuit

#### DTC P0816

Downshift Switch Circuit

#### DTC P0826

Up and Down Shift Switch Circuit

### Diagnostic Fault Information

| Circuit | Short to Ground | Open/High Resistance | Short to Voltage | Signal Performance |
|---------|-----------------|----------------------|------------------|--------------------|
| Signal  | P0826           | -                    | P0826            | -                  |
| Ground  | -               | -                    | -                | -                  |

### Typical Scan Tool Data

#### Driver Shift Request



| Circuit | Short to Ground | Open | Short to Voltage |
|---------|-----------------|------|------------------|
| Signal  | Invalid         | None | Invalid/None     |
| Ground  | -               | None | -                |

#### Circuit/System Description

When the shift lever is placed in manual mode (M), the driver shift request, also known as the tap shift function is activated. The driver shift request allows the vehicle operator to shift gears by pushing the plus (+) button for an upshift or minus (-) button for a downshift. The body control module (BCM) supplies a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. When the lever is in the M position, a voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to perform the upshift or downshift.

The TCM will not allow shifting to the next higher gear if the vehicle speed or engine RPM is too low. The transmission will not allow shifting to the next lower gear if the vehicle speed or engine RPM is too high.

#### Conditions for Running the DTC

##### P0815 or P0816

- P0815, P0816, P0826, P1761, P182E, P1876, P1877, or P1915 is not set.
- Engine speed is 400 RPM or greater for 5 s.
- Ignition voltage is 9-32 V.
- Time since the last transmission upshift or downshift is 1 s or greater.
- Runs continuously when above conditions are met.

##### P0826

- P0826 or P1761 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Runs continuously when above conditions are met.

#### Conditions for Setting the DTC

##### P0815 - Condition 1

TCM detects an upshift request for 1 s with the shift lever in Park or Neutral.

##### P0815 - Condition 2

TCM detects an upshift request for 10 min with the shift lever in a forward range.

##### P0816 - Condition 1

TCM detects a downshift request for 1 s with the shift lever in Park or Neutral.

#### **P0816 - Condition 2**

TCM detects a downshift request for 10 min with the shift lever in a forward range.

#### **P0826**

TCM detects an invalid voltage on the Tap Up/Down signal circuit for 1 min.

#### **Action Taken When the DTC Sets**

- P0815, P0816, and P0826 are Type C DTCs.
- TCM inhibits Tap Up/Down function.

#### **Conditions for Clearing the DTC**

P0815, P0816, and P0826 are Type C DTCs.

#### **Diagnostic Aids**

A high resistance in the signal circuit may not set a DTC. Symptoms could include an inoperative manual mode Tap Up/Down, or a Tap Down shift when the Tap/Up button is pressed.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**WARNING:** Refer to **Parking Brake and Drive Wheels Warning** .

1. Ignition ON.
2. Verify DTC P182E or P1915 was not set by reviewing the scan tool Freeze Frame/Failure Records.
  - If DTC P182E or P1915 was set

Refer to **DTC P182E or P1915**.

- If DTC P182E or P1915 was not set

**NOTE:** The engine may have to be started to move the shift lever out of the Park position. Once out of the Park position, the engine can be turned OFF.

3. Ignition ON, engine OFF, S3 Transmission Shift Lever in the M or manual mode position.
4. Verify the scan tool Up and Down Shift Switch or TCM Driver Shift Request parameter displays Upshift when pressing the plus (+) switch, Downshift when pressing the minus (-) switch, and None when neither switch is pressed.
  - If the parameter does not display the correct values

Refer to Circuit/System Testing below.

- If the parameter displays the correct values

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.
6. Verify the DTC does not set.
  - If the DTC sets

Refer to Circuit/System Testing below.

- If the DTC does not set

7. All OK.

## Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the vehicle harness connector terminal 2 and ground.
  - **If 10 ohms or greater**
    1. Ignition OFF, disconnect the vehicle harness at the ground connection.
    2. Test for less than 2 ohms in the ground circuit end to end.
      - If greater than 2 ohms, repair the open/high resistance in the circuit.
      - If less than 2 ohms, repair the ground connection.
  - **If less than 10 ohms**
3. Ignition ON.
4. Test for 11-13 V at the vehicle harness connector between signal circuit terminal 3 and ground.
  - **If not between 11-13 V**
    1. Ignition OFF, disconnect the connector at the BCM.
    2. Test for infinite resistance between the signal circuit and ground.
      - If less than infinite resistance, repair the short to ground in the circuit.
      - If infinite resistance.
    3. Test for less than 2 ohms in the signal circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, replace the BCM.
  - **If between 11-13 V**
5. Ignition OFF, connect the harness connector at the S3 Transmission Shift Lever.
6. Ignition ON, S3 Transmission Shift Lever in the M or manual mode position.
7. Test for voltage between the S3 Transmission Shift Lever connector signal circuit terminal 3 and ground, by back probing the connector, for the conditions listed below.
  - 2.0-4.6 V - Plus button pressed
  - 5.1-7.3 V - Minus button pressed
  - 8.0-10.6 V - Neither button pressed
  - **If voltage values are not correct**

Replace the S3 Transmission Shift Lever.
  - **If voltage values are correct**
8. Replace the K9 Body Control Module.

## Repair Instructions

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

- Refer to **Transmission Control Replacement** for Transmission Shift Lever replacement.

- Refer to **Control Module References** for Body Control Module replacement, programming and setup.

## DTC P0850-P0852

### 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 P0850

Park/Neutral Position Switch Circuit

#### DTC P0851

Park/Neutral Position Switch Circuit Low Voltage

#### DTC P0852

Park/Neutral Position Switch Circuit High Voltage

### Diagnostic Fault Information

| Circuit | Short to Ground | Open/High Resistance | Short to Voltage | Signal Performance |
|---------|-----------------|----------------------|------------------|--------------------|
| Signal  | P0850, P0851    | P0850, P0852         | P0850, P0852     | -                  |

### Typical Scan Tool Data

#### Park/Neutral Position Switch

| Circuit                                                                                                                                          | Short to Ground | Open/High Resistance | Short to Voltage |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|------------------|
| <b>Operating Conditions:</b> Engine running, transmission in park at normal operating temperature<br><b>Parameter Normal Range:</b> Park/Neutral |                 |                      |                  |
| Signal                                                                                                                                           | Park/Neutral    | In-Gear              | In-Gear          |

### Circuit/System Description

The transmission manual shift shaft switch assembly, also known as the internal mode switch (IMS), is a sliding contact switch attached to the manual shift shaft inside the transmission case. The park/neutral position switch is integrated into the IMS and connects to the transmission control module (TCM) lead-frame through a short wire harness. The park/neutral signal circuit uses the TCM as a pass-through connector only. The TCM provides the low reference circuit to the PNP switch.

The Park/Neutral Signal is sent from the park/neutral switch directly to the Engine Control Module (ECM) and is used for engine start enable.

#### **Conditions for Running the DTC**

- Ignition voltage is between 8-18 V.
- Engine speed is 1000 RPM or greater.

#### **Conditions for Setting the DTC**

#### **P0850 and P0851**

- ECM detects the Park/Neutral switch signal equals 0 volts (Park/Neutral) when the IMS reports a Drive range.
- Throttle position is 10 percent or greater.
- Engine torque is 75 (55 lb ft) or greater.
- Vehicle speed is 10 km/h (6 mph) or greater.
- Above conditions must be met for .2 seconds.

#### **P0852**

ECM detects the Park/Neutral switch signal equals 12 volts (In-Gear) when the IMS reports a Park/Neutral range for 0.2 second.

#### **Action Taken When the DTC Sets**

- DTCs P0850, P0851, and P0852 are Type C DTCs.
- ECM uses IMS position, which is determined by the transmission control module and broadcast over GMLAN, for engine start-up.

#### **Conditions for Clearing the DTC**

DTCs P0850, P0851, and P0852 are Type C DTCs.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Transmission General Description**
- **Electronic Component Description**
- **Transmission Component and System Description**

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

**DT-48616-10** Adapter Harness

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

**Circuit/System Verification**

1. Ignition ON.
2. Verify that DTC P182E or P1915 is not set.
  - **If any of the DTCs are set**

Refer to **DTC P182E or P1915**.

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

3. Verify the range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment** .

- **If the cable adjustment is not OK**

Adjust, repair or replace as necessary.

- **If the cable adjustment is OK**

4. Ignition ON.
5. Verify the scan tool transmission control module Internal Mode Switch parameter matches the gear shift lever position while slowly moving the gear shift lever from Park through all gear ranges.

- **If any gear shift lever position does not match**

Refer to **DTC P182E or P1915**.

- **If all gear positions match**

6. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral when in Park or Neutral and In-Gear when in Reverse or Drive.

- **If Park/Neutral or In Gear is not displayed**

Refer to Circuit/System Testing below.

- **If Park/Neutral and In Gear is displayed**

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.
8. Verify the DTC does not set.

- **If a DTC sets**

Refer to Circuit/System Testing below.

- **If a DTC does not set**

9. All OK

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, disconnect the X1 Q8 Control Solenoid Valve Assembly harness connector at the automatic transmission.
2. Install the **DT-48616-10** adapter harness to the vehicle harness connector.

**NOTE:** All testing in steps 3 through 5 will be performed at the **DT-48616-10** adapter harness connector.

3. Test for less than 5 ohms between the ground circuit terminal 2 and ground.
  - **If 5 ohms or greater**
    1. Ignition OFF.
    2. Test for less than 2 ohms in the ground circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, repair the open/high resistance in the ground connection.
  - **If less than 5 ohms**
4. Ignition ON.
5. Test for 11-13 V between signal circuit terminal 3 and ground.



- **If not between 11-13 V**
  1. Ignition OFF, remove the harness connector at the K20 Engine Control Module.
  2. Test for infinite resistance between signal circuit terminal 3 and ground.
    - If less than infinite resistance, repair the short to ground in the circuit.
    - If infinite resistance.
  3. Test for less than 2 ohms in the signal circuit end to end.
    - If 2 ohms or greater, repair the open/high resistance in the circuit.
    - If less than 2 ohms, replace the K20 Engine Control Module.
- **If between 11-13 V**
  6. Ignition OFF, disconnect the **DT-48616-10** adapter harness from the vehicle wire harness.
  7. Remove the transmission control valve body cover.
  8. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
  9. Disconnect the B15 Transmission Internal Mode Switch electrical connector from the Q8 Control Solenoid Valve Assembly.
  10. Ignition ON.
  11. Verify the scan tool ECM Park/Neutral Position Switch parameter displays In Gear.
    - **If In Gear is not displayed**
      1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.
      2. Install the **DT-48616-10** adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.
      3. Test for infinite resistance between the **DT-48616-10** adapter harness connector terminals 2 and 3.
        - If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.
        - If infinite resistance, replace the K20 Engine Control Module.
      - **If In Gear is displayed**
  12. Connect a 3A fused jumper between the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A and ground.
  13. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral.
    - **If Park/Neutral is not displayed**
      1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.
      2. Install the **DT-48616-10** adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.
      3. Test for less than 2 ohms between adapter harness connector terminal 3 and the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A.
        - If 2 ohms or greater, replace the Q8 Control Solenoid Valve Assembly.
        - If less than 2 ohms, replace the K20 Engine Control Module.
      - **If Park/Neutral is displayed**
  14. Replace the B15 Transmission Internal Mode Switch.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Range Selector Lever Cable Adjustment**
- **Control Valve Body Cover Replacement**
- **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**
- **Control Valve Body Cover Replacement**
- **Control Module References** for ECM or control solenoid valve assembly replacement, programming and setup

## DTC P0961-P0963

### 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 P0961

Line Pressure Control Solenoid Valve Performance

#### DTC P0962

Line Pressure Control Solenoid Valve Control Circuit Low Voltage

#### DTC P0963

Line Pressure Control Solenoid Valve Control Circuit High Voltage

### Circuit/System Description

The line pressure control solenoid is part of the control solenoid valve assembly which has no serviceable components. The normally high line pressure control solenoid regulates and directs the line pressure control solenoid oil pressure to the pressure regulator valve. Increasing line pressure control solenoid pressure increases transmission line pressure. The transmission control module (TCM) varies the current to the line pressure control solenoid by controlling the amount of time the low side driver is ON and OFF. Decreasing the ON time, decreases the current to the line pressure control solenoid, which increases line pressure control solenoid oil pressure by closing OFF the solenoid exhaust port. Increasing the current to the line pressure control solenoid decreases line pressure control oil pressure by opening the solenoid exhaust port. Line pressure control solenoid power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

### Conditions for Running the DTC

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Runs continuously when above conditions are met.

### Conditions for Setting the DTC

#### P0961

TCM detects an internal electrical malfunction of the line pressure control solenoid circuit where the measured line pressure control solenoid current does not equal the commanded line pressure control solenoid current for 5 s.

#### P0962

TCM detects a short to ground on the line pressure control solenoid control circuit for 2 s.

#### P0963

TCM detects an open circuit or short to voltage on the line pressure control solenoid control circuit for 5 s.

### Action Taken When the DTC Sets

#### P0961 or P0963

- P0961 and P0963 are Type B DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.

#### P0962

- P0962 is a Type A DTC.
- TCM limits the transmission to 4th gear and reverse.
- TCM inhibits the torque converter clutch (TCC).
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM turns the high side driver OFF.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.

### Conditions for Clearing the DTC

- P0961 and P0963 are Type B DTCs.
- P0962 is a Type A DTC.

#### Reference Information

##### Schematic Reference

#### Automatic Transmission Controls Schematics

##### Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

##### Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

##### 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

#### **DT-48616-10** Adapter Harness

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

##### Circuit/System Verification

**WARNING:** Refer to **Parking Brake and Drive Wheels Warning** .

1. Engine idling, transmission in Park, with service brake applied. Move the S3 Transmission Shift Lever into each gear position for 2-3 s and back into the Park position.
2. Verify the scan tool parameters listed below do not display Malfunction:
  - Line Pressure Control Solenoid Valve Performance Test Status
  - Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
  - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**  
  
Refer to Circuit/System Testing below.
  - **If Malfunction is not displayed**
3. 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.
4. Verify the DTC does not set.
  - **If the DTC sets**  
  
Refer to Circuit/System Testing below.
  - **If the DTC does not set**
5. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
  - **If contaminated**  
  
Repair as necessary.
  - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
  - **If the resistance is not within range**  
  
Replace the Q8 Control Solenoid Valve Assembly.
  - **If the resistance is within range**
4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

6. Verify the scan tool parameters listed below do not display Malfunction:
  - Line Pressure Control Solenoid Valve Performance Test Status
  - Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
  - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

### DTC P0965-P0967

#### 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 P0965

Pressure Control Solenoid Valve 2 Performance

##### DTC P0966

Pressure Control Solenoid Valve 2 Control Circuit Low Voltage

##### DTC P0967

Pressure Control Solenoid Valve 2 Control Circuit High Voltage

#### Circuit/System Description

Pressure control solenoid 2 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid 2 regulates and directs the pressure control solenoid 2 oil pressure to the 3-5 reverse clutch regulator valve. Increasing pressure control solenoid 2 pressure increases pressure to

the 3-5 reverse clutch. The transmission control module (TCM) varies the current to the pressure control solenoid 2 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to the pressure control solenoid 2 increases pressure control solenoid 2 oil pressure by closing OFF the solenoid exhaust port. Decreasing the current to the pressure control solenoid 2 decreases clutch pressure control solenoid 2 oil pressure by opening the solenoid exhaust port. Power to pressure control solenoid 2 is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

#### **Conditions for Running the DTC**

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Runs continuously when above conditions are met.

#### **Conditions for Setting the DTC**

##### **P0965**

TCM detects an internal electrical performance malfunction of the pressure control solenoid 2 control circuit where the measured pressure control solenoid 2 current does not equal the commanded pressure control solenoid 2 current for 5 s.

##### **P0966**

TCM detects a short to ground on the pressure control solenoid 2 control circuit for 1 s.

##### **P0967**

TCM detects an open or short to voltage on the pressure control solenoid 2 control circuit for 1 s.

#### **Action Taken When the DTC Sets**

##### **P0965**

- P0965 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 3-5 Reverse clutch.

##### **P0966 or P0967**

- P0966 and P0967 are Type A DTCs.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM forces the high side driver OFF.

- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.

#### **Conditions for Clearing the DTC**

- P0965 is a Type C DTC.
- P0966 and P0967 are Type A DTCs.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**DT-48616-10** Adapter Harness



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

#### **Circuit/System Verification**

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle with the transmission in Park for 5 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
  - Pressure Control Solenoid Valve 2 Performance Test Status
  - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
  - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**
4. 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.
  5. Verify the DTC does not set.
    - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**
6. All OK.

#### **Circuit/System Testing**

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
  - **If contaminated**

Repair as necessary.

- **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
    - **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

○ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
  - Pressure Control Solenoid Valve 2 Performance Test Status
  - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
  - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

○ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

○ **If Malfunction is not displayed**

7. All OK.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

### DTC P0969-P0971

#### 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 P0969

Pressure Control Solenoid Valve 3 Performance

##### DTC P0970

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage

##### DTC P0971

Pressure Control Solenoid Valve 3 Control Circuit High Voltage

## Circuit/System Description

Pressure control solenoid 3 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid 3 regulates and directs oil pressure to the R1/4-5-6 regulator valve. Increasing pressure control solenoid 3 pressure increases pressure to the low and reverse clutch or 4-5-6 clutch, depending on the position of the clutch select valve. The transmission control module (TCM) varies current to pressure control Solenoid 3 by controlling the time the low side driver is ON and OFF. Decreasing the current to pressure control solenoid 3 increases oil pressure by closing off the solenoid exhaust port. Increasing the current to the pressure control solenoid 3 decreases oil pressure by opening the exhaust port. Power is supplied to the pressure control solenoid 3 by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

## Conditions for Running the DTC

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Runs continuously when above conditions are met.

## Conditions for Setting the DTC

### P0969

TCM detects an internal electrical performance malfunction of the pressure control solenoid 3 control circuit where the measured pressure control solenoid 3 currents does not equal the commanded clutch pressure control solenoid 3 current for 5 s.

### P0970

TCM detects a short to ground on the pressure control solenoid 3 control circuit for 1 s.

### P0971

TCM detects an open or short to voltage on the pressure control solenoid 3 control circuit for 1 s.

## Action Taken When the DTC Sets

### P0969

- P0969 is a Type C DTC.
- TCM freezes transmission adaptive functions on the low and reverse clutch and the 4-5-6 clutch.

### P0970 or P0971

- P0970 and P0971 are Type A DTCs.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.

- TCM freezes transmission adaptive functions.
- TCM enables torque management.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits auto grade braking.
- TCM forces the high side driver OFF - P0970 only.
- TCM forces the torque converter clutch (TCC) OFF - P0970 only.

#### **Conditions for Clearing the DTC**

- P0969 is a Type C DTC.
- P0970 and P0971 are Type A DTCs.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

### DT-48616-10 Adapter Harness

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

### Circuit/System Verification

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle with the transmission in Park for 5 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:

- Pressure Control Solenoid Valve 3 Performance Test Status
- Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
- Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status

- **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**

4. 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.
5. Verify the DTC does not set.
  - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

6. All OK.

### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
  - **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
  5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
  6. Verify the scan tool parameters listed below do not display Malfunction:
    - Pressure Control Solenoid Valve 2 Performance Test Status
    - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
    - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

#### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

#### **DTC P0973 OR P0974**

##### **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 P0973**

Shift Solenoid Valve 1 Control Circuit Low Voltage

##### **DTC P0974**

Shift Solenoid Valve 1 Control Circuit High Voltage

## Circuit/System Description

The shift solenoid valve 1 is part of the control solenoid valve assembly which has no serviceable components. Shift solenoid valve 1 is a normally closed ON/OFF solenoid and is controlled by the transmission control module (TCM) through a low side driver. When the shift solenoid valve 1 is energized (ON), fluid pressure is directed to the clutch select valve. Power to shift solenoid 1 is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

## Conditions for Running the DTC

- Engine speed is 400-7500 RPM for 5 s.
- Ignition voltage is 9-32 V.

## Conditions for Setting the DTC

### P0973

TCM detects a short to ground on the shift solenoid valve 1 control circuit for 2 s.

### P0974

TCM detects an open or short to voltage on the shift solenoid valve 1 control circuit for 2 s.

## Action Taken When the DTC Sets

### P0973

- DTC P0973 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM limits the transmission to neutral or 2nd gear and reverse.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.

### P0974

- DTC P0974 is a Type B DTC.
- TCM inhibits 1st gear.
- TCM inhibits neutral idle.

## Conditions for Clearing the DIC/DTC

- DTC P0973 is a Type A DTC.
- DTC P0974 is a Type B DTC.

#### Reference Information

##### Schematic Reference

#### Automatic Transmission Controls Schematics

##### Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

##### Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

##### 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

#### **DT-48616-10** Adapter Harness

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

#### Circuit/System Verification

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Place the gear selector in Reverse for 5 seconds and then idle vehicle for 5 s.



3. Verify the scan tool parameters listed below do not display Malfunction:

- Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status
- Shift Solenoid Valve 1 Control Circuit Open Test Status
- Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**

4. 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.

5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

6. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.

5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

6. Verify the scan tool parameters listed below do not display Malfunction:

- Shift Solenoid Valve 1 Control Circuit Low Voltage Test

- Shift Solenoid Valve 1 Control Circuit Open Test
- Shift Solenoid Valve 1 Control Circuit High Voltage Test
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

### DTC P1761

#### 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 P1761

Up and Down Shift Switch Signal Message Counter Incorrect

#### Circuit/System Description

When the shift lever is placed in the M position, electronic range select or manual mode, which allows for the selection of the range of gears available, is activated. This is also known as the tap shift function. The manual mode allows the vehicle operator to increase the highest range attainable by pressing the plus (+) button or decrease the highest attainable range by pressing the minus (-) button. The body control module (BCM) supplies a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. A voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to increase or decrease the available gear ranges. The BCM internal counter increments each time the tap shift signal status is sent and the BCM sends the rolling count with the tap shift signal status. The TCM counter increments each time the tap shift signal status is received. The DTC will set if the rolling count value of the TCM does not match the rolling count sent from the BCM.

#### Conditions for Running the DTC

- Engine speed is 400-7, 500 RPM for 5 s.
- Runs continuously when above condition is met.

#### Conditions for Setting the DTC

TCM detects the internal rolling count value does not match the expected BCM count value, 3 times within 10 s.

#### Action Taken When the DTC Sets

- P1761 is a Type C DTC.
- TCM inhibits the Tap Up Tap Down function.
- TCM inhibits manual shifting of forward gears.

#### Conditions for Clearing the DTC

P1761 is a Type C DTC.

#### Reference Information

##### Schematic Reference

- [Automatic Transmission Controls Schematics](#)
- [Data Communication Schematics](#)
- [Body Control System Schematics](#)

##### Connector End View Reference

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

##### Description and Operation

- [Transmission General Description](#)
- [Transmission Component and System Description](#)
- [Electronic Component Description](#)

##### 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

### **NOTE:**

- DTC P1761 is an informational DTC.
- Diagnose all other body control module DTCs prior to DTC P1761.

1. Verify there are no other body control module or communication DTCs set.

○ If a DTC is set

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

○ If a DTC is not set

2. Complete the diagnosis by looking for a GMLAN circuit fault. Refer to **Scan Tool Does Not Communicate with High Speed GMLAN Device** .

○ If a GMLAN circuit fault is found

Repair as necessary.

○ If a GMLAN circuit fault is not found

3. All OK.

## **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Body Control Module and Control Solenoid Valve Assembly replacement, programming and setup.

## **DTC P182E OR P1915**

### **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 P182E**

Internal Mode Switch Indicates Invalid Range

## DTC P1915

Internal Mode Switch Does Not Indicate Park/Neutral During Start

### Diagnostic Fault Information

| Circuit  | Short to Ground | Open/High Resistance | Short to Voltage | Signal Performance |
|----------|-----------------|----------------------|------------------|--------------------|
| Signal A | P182E           | P1915                | P1915            | P182E, P1915       |
| Signal B | P1915           | P182E                | P182E            | P182E, P1915       |
| Signal C | P1915           | P182E                | P182E            | P182E, P1915       |
| Signal P | P182E           | P1915                | P1915            | P182E, P1915       |
| Ground   | -               | P182E                | P182E            | P182E, P1915       |

### Typical Scan Tool Data

#### Internal Mode Switch A/B/C/P

| Circuit                                                          | Short to Ground | Open | Short to Voltage |
|------------------------------------------------------------------|-----------------|------|------------------|
| <b>Operating Conditions:</b> Ignition ON, range selector in Park |                 |      |                  |
| <b>Parameter Normal Range:</b> Low High High Low                 |                 |      |                  |
| Switch Signal A                                                  | Low             | High | High             |
| Switch Signal B                                                  | Low             | High | High             |
| Switch Signal C                                                  | Low             | High | High             |
| Switch Signal P                                                  | Low             | High | High             |
| High = 12 volts<br>Low = 0 volts                                 |                 |      |                  |

### Circuit/System Description

The manual shift detent lever with shaft position switch assembly, also known as the transmission internal mode switch assembly, is a sliding contact switch attached to the manual shift detent lever shaft inside the transmission. The 4 inputs to the transmission control module (TCM) from the switch indicate which position is selected by the transmission manual shaft. The input voltage at the TCM is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as Internal Mode Switch A/B/C/P parameter. The internal mode switch input parameters represented are transmission range Signal A, Signal B, Signal C, and Signal P. The park/neutral position switch is integrated into the transmission internal mode switch. The circuit uses the TCM as a pass-through connector only.

The park/neutral signal is sent from the park/neutral switch directly to the engine control module (ECM) and is used for engine start enable.

### Conditions for Running the DTC

#### P182E

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P07C0, P07BF, P077C, OR P077D is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Engine torque signal is valid.
- DTC runs continuously when the above conditions are met.

## **P1915**

- DTC P0722, P0723, or P1915 is not set.
- Transmission output shaft speed is 90 RPM or less.
- Ignition voltage is 6-32 V.
- DTC runs when conditions above are met during engine start sequence.

### **Conditions for Setting the DTC**

## **P182E**

Internal mode switch does not indicate a valid Park, Reverse, Neutral, or Drive Range position for 7 s.

## **P1915**

Internal mode switch does not indicate Park or Neutral during the following sequence:

- Engine speed is less than 50 RPM for greater than 0.10 s.
- Engine speed is 50-480 RPM for greater than 0.07 s.
- Engine speed is greater than 500 RPM and the transmission input speed is greater than 100 RPM for greater than 1.25 s.

### **Action Taken When the DTC Sets**

- P182E and P1915 are Type A DTCs.
- TCM commands maximum line pressure.
- TCM turns OFF all solenoids.
- TCM freezes transmission adaptive functions.
- TCM limits the transmission to reverse and 5th gear.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM inhibits neutral idle.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM turns the high side driver OFF.

- TCM enables torque management.

#### **Conditions for Clearing the DTC**

P182E and P1915 are Type A DTCs.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Transmission General Description**
- **Transmission Component and System Description**
- **Electronic Component Description**

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

**DT-48616-10** Adapter Harness

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

**Circuit/System Verification**

1. Verify the range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.
  - **If cable adjustment is not OK**  
Repair as necessary.
  - **If cable adjustment is OK**
2. Ignition ON.
3. Verify the scan tool TCM Internal Mode Switch A/B/C/P parameter matches the **Transmission Internal Mode Switch Logic** table for each transmission shift lever position.
  - **If the parameter does not match**  
Refer to Circuit/System Testing below.
  - **If the parameter matches**
4. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral with the gear shift lever in Park or Neutral and In Gear in Reverse or Drive.
  - **If Park/Neutral or In Gear is not displayed**  
Refer to Circuit/System Testing below.
  - **If Park/Neutral and In Gear is displayed**
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.
6. Verify the DTC does not set.
  - **If the DTC sets**  
Refer to Circuit/System Testing below.
  - **If the DTC does not set**
7. All OK.

#### Circuit/System Testing

**NOTE:** You must perform Circuit/System Verification first.

1. Ignition OFF, remove the control valve body cover.
2. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
3. Disconnect the B15 Transmission Internal Mode Switch connector at the Q8 Control Solenoid Valve Assembly.
4. Ignition ON.
5. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays In Gear.
  - **If In Gear is not displayed**



1. Ignition OFF, disconnect the vehicle harness X1 connector at the Q8 Control Solenoid Valve Assembly.
2. Install the **DT-48616-10** adapter harness to the X1 connector at Q8 Control Solenoid Valve Assembly.
3. Test for infinite resistance between the **DT-48616-10** adapter harness connector terminals 2 and 3.
  - If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.
  - If infinite resistance.
4. Disconnect the harness connector at the K20 Engine Control Module.
5. Test for infinite resistance between the signal circuit and ground at the vehicle harness K20 Engine Control Module connector.
  - If less than infinite resistance, repair the short to ground on the circuit.
  - If infinite resistance, replace the K20 Engine Control Module.
  - **If In Gear is displayed**
6. Verify the scan tool transmission control module Internal Mode Switch A/B/C/P parameter displays High High High High.
  - **If High High High High is not displayed**  
  
Replace the Q8 Control Solenoid Valve Assembly.
    - **If High High High High is displayed**
7. Install a 3 A fused jumper wire between the low reference circuit terminal F and each signal circuit listed below one at a time at the Q8 Control Solenoid Valve Assembly.
  - Signal A - terminal B
  - Signal B - terminal C
  - Signal C - terminal D
  - Signal P - terminal E
8. Verify the scan tool transmission control module A/B/C/P displays 1 Low and 3 High when a signal circuit is grounded.
  - **If 1 Low and 3 High is not displayed**  
  
Replace the Q8 Control Solenoid Valve Assembly.
    - **If 1 Low and 3 High is displayed**
9. Connect a 3-amp fused jumper wire between terminal A and terminal F.
10. Verify the engine control module Park/Neutral Position Switch parameter displays Park/Neutral.
  - **If Park/Neutral is not displayed**
    1. Ignition OFF, remove the jumper wire and disconnect the X1 connector at the Q8 Control Solenoid Valve Assembly.
    2. Install the **DT-48616-10** adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.
    3. Test for less than 2 ohms between the adapter harness terminal 2 and the X2 connector terminal F

at the Q8 Control Solenoid Valve Assembly.

- If greater than 2 ohms, replace the Q8 Control Solenoid Valve Assembly.
- If less than 2 ohms.

4. Disconnect the connector at the K20 Engine Control Module.
5. Test for less than 2 ohms in the vehicle harness park/neutral signal circuit, end to end.
  - If 2 ohms or greater, repair the open/high resistance in the circuit.
  - If less than 2 ohms, replace the K20 Engine Control Module.
  - **If Park/Neutral is displayed**

11. Replace the B15 Transmission Internal Mode Switch.

### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- **Control Valve Body Cover Replacement**
- **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

### DTC P1876

#### 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 P1876

Up and Down Shift Enable Switch Circuit Low Voltage

#### Circuit/System Description

When the shift lever is placed in manual mode (M), the driver shift request, also known as the tap shift function, is activated. The driver shift request allows the vehicle operator to shift gears by pushing the plus (+) button for an upshift or minus (-) button for a downshift. The body control module (BCM) supplies a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. When the lever is in the M position, a voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to perform the upshift or downshift. The TCM will not allow shifting to the next higher gear if the vehicle speed or engine RPM is too low. The transmission will not allow shifting to the next lower gear if the vehicle speed or engine RPM is too high.

### Conditions for Running the DTC

- DTC P0815, P0816, P0826, P1761, P1825, P1876, P1877, P1915, or U0100 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- Runs continuously when above conditions are met.

### Conditions for Setting the DTC

Transmission control module (TCM) detects a Tap Enable Switch request for 3 s when the shift lever is in Park, Reverse, or Neutral, a total of 5 times.

### Action Taken When the DTC Sets

- P1876 is a Type C DTC.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.

### Conditions for Clearing the DTC

P1876 is a Type C DTC.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**WARNING: Refer to Parking Brake and Drive Wheels Warning .**

1. Verify DTC P182E or P1915 was not set by reviewing the scan tool Freeze Frame/Failure Records.
  - o **If DTC P182E or P1915 was set**

Refer to **DTC P182E or P1915**.

- o **If DTC P182E or P1915 was not set**
2. Ignition ON.

**NOTE:**        **The engine may have to be started to move the shift lever out of the Park position. Once out of the Park position, the engine can be turned OFF.**

3. Verify the gear shift lever position matches the scan tool TCM Internal Mode Switch parameter while slowly moving the gear shift lever from Park through all ranges.
  - o **If the specified values are not correct**

Refer to **Range Selector Lever Cable Adjustment** .

- o **If the specified values are correct**
4. Shift lever in the M position.
  5. Verify the scan tool Driver Shift Request parameter changes from None to Upshift when the plus button is pressed, and from None to Downshift when the minus button is pressed.
    - o **If the Driver Shift Request parameter does not display the correct values**

Refer to Circuit/System Testing below.

- o **If the Driver Shift Request parameter displays the correct values**
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.
  7. Verify the DTC does not set.
    - o **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

8. All OK.

#### Circuit/System Testing

**NOTE:** You must perform Circuit/System Verification first.

1. Ignition OFF, disconnect the harness connector at the S3 Transmission Shift Lever.
2. Test for less than 10 ohms between the vehicle harness connector terminal 2 and ground.
  - **If 10 ohms or greater**
    1. Ignition OFF, disconnect the vehicle harness at the ground connection.
    2. Test for less than 2 ohms in the ground circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit
      - If less than 2 ohms, repair the open/high resistance in the ground connection.
  - **If less than 10 ohms**
3. Ignition ON.
4. Test for 11-13 V at the vehicle harness connector between signal circuit terminal 3 and ground.
  - **If not between 11-13 V**
    1. Ignition OFF, disconnect the connector at the BCM.
    2. Test for infinite resistance between the signal circuit and ground.
      - If less than infinite resistance, repair the short to ground in the circuit.
      - If infinite resistance.
    3. Test for less than 2 ohms in the signal circuit end to end.
      - If 2 ohms or greater, repair the open/high resistance in the circuit.
      - If less than 2 ohms, replace the BCM.
  - **If between 11-13 V**
5. Ignition OFF, connect the harness connector at the S3 Transmission Shift Lever.
6. Test for voltage between the S3 Transmission Shift Lever connector signal circuit terminal 3 and ground, by back probing the connector, for the conditions listed below.
  - 2.0-4.6 V - Plus button pressed
  - 5.1-7.3 V - Minus button pressed
  - 8.0-10.6 V - Neither button pressed
  - **If voltage values are not correct**

Replace the S3 Transmission Shift Lever.
  - **If voltage values are correct**
7. Replace the K9 Body Control Module.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- **Transmission Control Replacement** for Transmission Shift Lever replacement.
- **Control Module References** for Body Control Module replacement, programming and setup.

## DTC P2714 OR P2715 (GEN 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

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the **Circuit/System Verification** and **Circuit/System Testing** to identify the cause.

### DTC P2714

Pressure Control Solenoid Valve 4 Stuck Off - Transmission Hydraulic/Mechanical Performance

### DTC P2715

Pressure Control Solenoid Valve 4 Stuck On - Transmission Hydraulic/Mechanical Performance

### Circuit/System Description

Pressure control solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. Pressure control solenoid 4 regulates transmission fluid pressure to the 2-6 regulator valve which controls pressure to the 2-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

### Conditions for Running the DTC

#### P2714

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- High side driver is enabled.
- Throttle position signal is valid.

- Ignition voltage is 9-32 V.
- Transmission fluid temperature is -6.6°C (20°F) or greater.
- Engine speed is 400-7, 500 RPM for 5 s.
- Pressure control solenoid 4 is commanded ON, applying the 2-6 clutch.
- Output speed is 100 RPM or greater, or the throttle position is greater than 0.5%.
- Runs continuously when above conditions are met.

## **P2715**

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Ignition voltage is 9-32 V.
- Transmission output shaft speed is 100 RPM or greater, or throttle position is 0.5% or greater.
- Pressure control solenoid 4 is commanded OFF, releasing the 2-6 clutch.
- Transmission fluid temperature is -6.6°C (20°F) or greater.
- Engine speed is 400-7, 500 RPM for 5 s.
- Engine torque is 45 N.m (33 lb ft) or greater.
- The attained range is not 1st gear.
- High side driver is enabled.
- Runs continuously when above conditions are met.

### **Conditions for Setting the DTC**

## **P2714**

TCM detects an incorrect on-coming clutch gear ratio, or shift flare. This condition must occur 3 times.

## **P2715**

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up. This condition must occur 3 times.

### **Action Taken When the DTC Sets**

## **P2714**

- P2714 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM limits the transmission to reverse and 3rd gear.

- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.

## **P2715**

- P2715 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.
- TCM inhibits neutral idle.
- TCM commands 2nd gear if the output speed is less than 700 RPM.
- TCM commands neutral if the output speed is 700 RPM or greater.

### **Conditions for Clearing the DTC**

P2714 and P2715 are Type A DTCs.

### **Reference Information**

Schematic Reference

### **Automatic Transmission Controls Schematics**

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Description and Operation

- **Drive Range, Second Gear (Gen 2/Hybrid)**
- **Drive Range, Sixth Gear (Gen 2/Hybrid)**
- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

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

**DT-48616** Solenoid Assembly Test Kit & Adapter Harness

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

Circuit/System Verification

**WARNING:** Refer to **Parking Brake and Drive Wheels Warning** .

**NOTE:** If other DTCs are set, diagnose those DTCs first.

1. Ignition ON.
2. Verify DTC P0716, P0717, P0722, P0723, P077C, P077D, P07BF, or P07C0 was not set by reviewing the scan tool Freeze Frame/Failure Records data.
  - **If any of the DTCs were set**

Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .

- **If none of the DTCs were set**
3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
  4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.

- **If the transmission fluid level and condition is not correct**

Repair as necessary.

- **If the transmission fluid level and condition is correct**
5. Ignition ON, clear the TCM DTCs with a scan tool.
  6. Verify DTC P2714 or P2715 does not set while performing a road test. Refer to **Road Test**.

- **If DTC P2714 or P2715 sets**

Refer to Circuit/System Testing below.

- **If DTC P2714 or P2715 does not set**

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.
8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

9. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to Line Pressure Check, and Solenoid Valve Pressure (Gen 1) , Solenoid Valve Pressure (Gen 2) .

- **If the pressures are not within range**

Refer to Fluid Pressure High or Low.

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

5. Verify the conditions listed below do not exist. Repair or replace as necessary.

#### **P2714 Channel Plate and Spacer Plate**

Oil channels or orifices blocked by debris.

#### **P2714 or P2715 Control Valve Body Assembly**

2-6 clutch regulator valve stuck/sticking, debris, binding, damaged valve, or scored bore.

### **P2714 Automatic Transmission Fluid Filter Assembly**

Oil filter or filter seal loose or damaged.

### **P2714 Torque Converter (w/fluid pump) Housing Assembly**

Fluid pump housing/gear damaged/scored.

### **P2714 Trans case and 1-2-3-4 clutch backing plate retainer ring**

1-2-3-4 clutch backing plate retaining ring not seated/oriented correctly at trans case groove.

### **P2714 or P2715 Transmission case, 2-6 clutch piston, spring retaining ring, reaction sun gear**

- 2-6 clutch return spring retaining ring not seated in groove
- 2-6 clutch piston assembly - seal damaged or leaking
- 2-6 clutch plates worn or damaged
- 2-6 clutch plates will not slide over the reaction sun gear shell freely

### **P2714 or P2715 Q8 Control Solenoid Valve Assembly**

- Pressure Control Solenoid Valve 4 Stuck ON/OFF.
- Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal.
- O-ring seals leaking.

### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

### **DTC P2719-P2721**

#### **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 P2719**

## Pressure Control Solenoid Valve 4 Performance

### DTC P2720

#### Pressure Control Solenoid Valve 4 Control Circuit Low Voltage

### DTC P2721

#### Pressure Control Solenoid Valve 4 Control Circuit High Voltage

#### Circuit/System Description

Pressure control solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid 4 regulates and directs oil pressure to the 2-6 clutch regulator valve. Increasing pressure control solenoid 4 pressure increases pressure to the 2-6 clutch. The transmission control module (TCM) varies current to the pressure control solenoid 4 by controlling the amount of time the low side driver is ON and OFF. Increasing the ON time increases current to the clutch PC solenoid 4. Increasing current to pressure control solenoid 4 increases oil pressure by closing off the solenoid exhaust port. Decreasing the current to the pressure control solenoid 4 decreases oil pressure by opening the exhaust port. Pressure control solenoid 4 power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

#### Conditions for Running the DTC

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when above conditions are met.

#### Conditions for Setting the DTC

#### P2719

TCM detects an internal electrical performance malfunction on the clutch pressure solenoid 4 control circuit where the measured clutch pressure control solenoid 4 current does not equal the commanded clutch pressure control solenoid 4 current for 5 s.

#### P2720

TCM detects a short to ground on the clutch pressure control solenoid 4 control circuit for 1 s.

#### P2721

TCM detects an open or short to voltage on the clutch pressure control solenoid 4 control circuit for 1 s.

#### Action Taken When the DTC Sets

## P2719

- P2719 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 2-6 clutch.

## P2720

- P2720 is a Type A DTC.
- TCM limits the transmission to 2nd gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM commands 2nd gear if the transmission is in a forward gear and the output speed is less than 700 RPM, or neutral if the output speed is 700 RPM or greater.

## P2721

- P2721 is a Type A DTC.
- TCM limits the transmission to 3rd gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.

### Conditions for Clearing the DTC

- P2719 is a Type C DTC.
- P2720 and P2721 are Type A DTCs.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

## Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

## 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

### **DT-48616-10 Adapter Harness**

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

## Circuit/System Verification

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Ignition ON.
4. Verify the scan tool parameters listed below do not display Malfunction:
  - Pressure Control Solenoid Valve 4 Performance Test Status
  - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
  - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**
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.
  6. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

7. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:

- Pressure Control Solenoid Valve 2 Performance Test Status
- Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
- Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

#### Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## DTC P2723 OR P2724 (GEN 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

**NOTE:** The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform the Circuit/System Verification and Circuit/System Testing to identify the cause.

### DTC P2723

Pressure Control Solenoid Valve 5 Stuck Off - Transmission Hydraulic/Mechanical Performance

### DTC P2724

Pressure Control Solenoid Valve 5 Stuck On - Transmission Hydraulic/Mechanical Performance

### Circuit/System Description

Pressure control solenoid 5 is part of the control solenoid valve assembly, which has no serviceable components. The pressure control solenoid 5 regulates transmission fluid pressure to the 1-2-3-4 regulator valve which controls pressure to the 1-2-3-4 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

### Conditions for Running the DTC

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Ignition voltage is 9-32 V.
- Throttle position signal is valid.
- Engine speed is 400-7, 500 RPM for 5 s.
- High side driver is enabled.
- Transmission fluid temperature is -6.6°C (20°F) or greater.
- Transmission output speed is 100 RPM or greater or the throttle position is 0.5% or greater.



- DTC runs continuously when above conditions are met.

### Conditions for Setting the DTC

#### P2723

TCM detects an incorrect on-coming clutch gear ratio, or shift flare when the 1-2-3-4 clutch is commanded ON. This condition must occur 3 times.

#### P2724

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up when the 1-2-3-4 clutch is commanded OFF. This condition must occur 3 times.

### Action Taken When the DTC Sets

- P2723 and P2724 are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits Manual Up/Manual Down with the gear selector.
- Torque management is enabled.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 5th range - P2723 only.
- TCM limits the transmission to reverse and 3rd range - P2724 only.

### Conditions for Clearing the DIC/DTC

P2723 and P2724 are Type A DTCs.

### Diagnostic Aids

Before performing a road test, configure and setup the scan tool for snapshot mode. This will allow you to display, monitor, and verify multiple transmission data parameters at one time, after the road test.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

#### Description and Operation

- **Drive Range, First Gear (Gen 2/Hybrid)**
- **Drive Range, Second Gear (Gen 2/Hybrid)**
- **Drive Range, Third Gear (Gen 2/Hybrid)**
- **Drive Range - Fourth Gear (Gen 2/Hybrid)**
- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

#### 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

**WARNING:** Refer to **Parking Brake and Drive Wheels Warning** .

**NOTE:** If other DTCs are set, diagnose those DTCs first.

1. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
  - If the transmission fluid level and condition is not correct  
Repair as necessary.
  - If the transmission fluid level and condition is correct

3. Ignition ON, clear the TCM DTCs with a scan tool.
4. Verify DTC P2723 or P2724 does not set while performing a road test. Refer to **Road Test**.
  - o **If DTC P2723 or P2724 sets**

Refer to Circuit/System Testing below.

- o **If DTC P2723 or P2724 does not set**
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.
  6. Verify the DTC does not set.
    - o **If the DTC sets**

Refer to Circuit/System Testing below.

- o **If the DTC does not set**
7. All OK.

#### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification first.

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to **Line Pressure Check**, and **Solenoid Valve Pressure (Gen 1)** , **Solenoid Valve Pressure (Gen 2)** .

- o **If the pressures are not within range**

Refer to **Fluid Pressure High or Low**.

- o **If the pressures are within range**
3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
  4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test**.

- o **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- o **If the pressure changes**
5. Verify the mechanical conditions listed below do not exist. Repair or replace as necessary.

#### **P2723 or P2724 - Control Valve Body Assembly**

1-2-3-4 clutch regulator valve stuck/sticking - debris, binding, damaged valve, or scored bore.

#### **P2723 - Automatic Transmission Fluid Filter Assembly**

Oil filter or filter seal loose or damaged.

#### **P2723 - Torque Converter (w/Fluid Pump) Housing Assembly**

- Fluid pump housing/gear damaged/scored.
- Fluid pump or torque converter overstressed due to high temperatures.

#### **P2723 - Trans Case and 1-2-3-4 Clutch Backing Plate Retaining Ring**

1-2-3-4 clutch backing plate retaining ring not seated/oriented, causing clutch pack/piston over travel.

#### **P2723 - Output Sun Gear Assembly**

Housing/hub weld cracked/leaking.

#### **P2723 - Lo and Reverse and 1-2-3-4 Clutch Housing Assembly**

1-2-3-4 clutch piston cracked/damaged/leaking.

#### **P2723 - Channel Plate and Spacer Plate**

Oil channels or orifices blocked by debris.

#### **P2723 or P2724 - Q8 Control Solenoid Valve Assembly**

- Pressure Control Solenoid Valve 5 Stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damage gasket seal.

#### **Repair Instructions**

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

#### **DTC P2728-P2730**

#### **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 P2728**

Pressure Control Solenoid Valve 5 Performance

## **DTC P2729**

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage

## **DTC P2730**

Pressure Control Solenoid Valve 5 Control Circuit High Voltage

### **Circuit/System Description**

Pressure control solenoid 5 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid 5 regulates and directs oil pressure to the 1-2-3-4 clutch regulator valve. Increasing pressure control solenoid 5 pressure increases pressure to the 1-2-3-4 clutch. The transmission control module (TCM) varies the current to the pressure control solenoid 5 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to pressure control solenoid 5 decreases pressure control solenoid 5 oil pressure by opening the solenoid exhaust port. Decreasing the current to pressure control solenoid 5 increases pressure control solenoid 5 oil pressure by closing OFF the solenoid exhaust port. Pressure control solenoid 5 power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

### **Conditions for Running the DTC**

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when above conditions are met.

### **Conditions for Setting the DTC**

#### **P2728**

TCM detects an internal electrical performance malfunction of the pressure control solenoid 5 control circuit where the measured clutch pressure control solenoid 5 current does not equal the commanded clutch pressure control solenoid 5 current for 5 s.

#### **P2729**

TCM detects a short to ground on the clutch pressure control solenoid 5 control circuit for 1 s.

#### **P2730**

TCM detects an open or short to voltage on the clutch pressure control solenoid 5 control circuit for 1 s.

## Action Taken When the DTC Sets

### P2728

- P2728 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 1-2-3-4 clutch.

### P2729

- P2729 is a Type A DTC.
- TCM commands the high side driver OFF.
- TCM forces the torque converter clutch OFF.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits manual up, manual down with the shift selector.
- TCM inhibits neutral idle.
- TCM inhibits powertrain braking.

### P2730

- P2730 is a Type A DTC.
- TCM limits the transmission to reverse and 4th gear.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.

## Conditions for Clearing the DTC

- P2728 is a Type C DTC.
- P2729 and P2730 are Type A DTCs.

## Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

#### Description and Operation

- **Transmission General Description**
- **Transmission Component and System Description**
- **Electronic Component Description**

#### 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

#### **DT-48616-10** Adapter Harness

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

#### **Circuit/System Verification**

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
  - Pressure Control Solenoid Valve 5 Performance Test Status
  - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
  - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**

4. 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.

5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**

6. All OK.

#### **Circuit/System Testing**

**NOTE:** You must perform the Circuit/System Verification first.

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
  - Pressure Control Solenoid Valve 5 Performance Test Status
  - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
  - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

#### **Repair Instructions**



Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## **DTC P2762, P2763, OR P2764**

### **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 P2762**

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Performance

#### **DTC P2763**

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit High Voltage

#### **DTC P2764**

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit Low Voltage

### **Circuit/System Description**

The torque converter clutch (TCC) pressure control solenoid is part of the control solenoid valve assembly which has no serviceable components. The normally low TCC pressure control solenoid regulates oil pressure to the TCC regulator valve and TCC control valve. Increasing TCC pressure control solenoid oil pressure increases oil pressure to the torque converter to apply the clutch. The transmission control module (TCM) varies the current to the TCC pressure control solenoid by controlling the amount of time the low side driver is ON and OFF. Increasing current to the TCC pressure control solenoid increases oil pressure by closing OFF the solenoid exhaust port. Decreasing current to the TCC pressure control solenoid decreases oil pressure by opening up the solenoid exhaust port. TCC pressure control solenoid power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

### **Conditions for Running the DTC**

#### **P2762**

- P2762 is not set.

- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- DTC runs continuously when above conditions are met.

#### **P2763 or P2764**

- P0658 or P0659 is not set.
- Engine speed is 400-7, 500 RPM for 5 s.
- Ignition voltage is 9-32 V.
- High side driver is enabled.
- DTC runs continuously when above conditions are met.

#### **Conditions for Setting the DTC**

##### **P2762**

TCM detects an internal electrical performance malfunction on the TCC pressure control solenoid control circuit where the measured TCC pressure control solenoid current does not equal the commanded TCC pressure control solenoid current for 5 s.

##### **P2763**

TCM detects an open/high resistance or short to voltage on the TCC pressure control solenoid control circuit for 5 s.

##### **P2764**

TCM detects a short to ground on the TCC pressure control solenoid control circuit for 5 s.

#### **Action Taken When the DTC Sets**

##### **P2762**

P2762 is a Type C DTC.

##### **P2763**

- P2763 is a Type B DTC.
- TCM inhibits 6th gear.
- TCM forces TCC OFF.
- TCM changes to a Hot Mode shift pattern.

##### **P2764**

- P2764 is a Type A DTC.

- TCM inhibits TCC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM defaults the transmission to 4th gear and reverse.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM forces the high side driver OFF.
- TCM enables torque management.
- TCM inhibits auto grade braking.
- TCM inhibits powertrain braking.

#### **Conditions for Clearing the DIC/DTC**

- P2762 is a Type C DTC.
- P2763 is a Type B DTC.
- P2764 is a Type A DTC.

#### **Reference Information**

##### Schematic Reference

#### **Automatic Transmission Controls Schematics**

##### Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

##### Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

##### 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

**DT-48616-10** Adapter Harness

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

### **Circuit/System Verification**

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Operate the vehicle in drive range and ensure TCC is commanded ON for 1 min.
3. Verify the scan tool parameters listed below do not display Malfunction:
  - TCC Pressure Control Solenoid Valve Performance Test Status
  - TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
  - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
  - **If Malfunction is displayed**

Refer to Circuit/System Testing below.

- **If Malfunction is not displayed**
4. 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.
  5. Verify the DTC does not set.
    - **If the DTC sets**

Refer to Circuit/System Testing below.

- **If the DTC does not set**
6. All OK.

### **Circuit/System Testing**

**NOTE:**      **You must perform the Circuit/System Verification first.**

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
  - **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

- **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
  - TCC Pressure Control Solenoid Valve Performance Test Status
  - TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
  - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

## Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the repair.

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup.

## SYMPTOMS - AUTOMATIC TRANSMISSION

**NOTE:** Use the symptom tables only if the following conditions are met:

- Refer to **Diagnostic Starting Point - Vehicle** .
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to **Transmission General Description** , and **Transmission Component and System Description** .

## Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

### **Intermittent**

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections**.

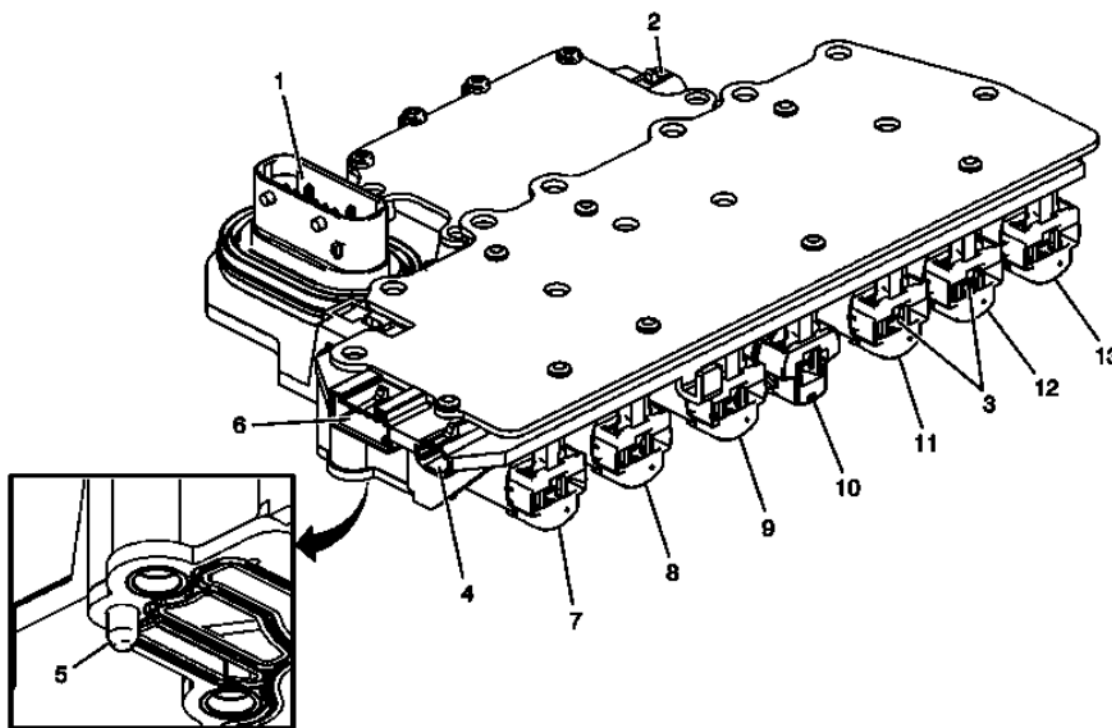
### **Symptom List**

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

- Fluid Diagnosis
  - **Transmission Fluid Level and Condition Check**
  - **Fluid Pressure High or Low**
  - **Automatic Transmission Fluid Leaks**
  - **Fluid Leak Diagnosis (Non Hybrid), Fluid Leak Diagnosis (Hybrid)**
- Noise and Vibration Diagnosis
  - **Whine/Growl Noise**
  - **Noise and Vibration Analysis**
  - **Torque Converter Diagnosis**
  - **Non-Shifting Clutch Function Verification Description** for bump
- Range Performance Diagnosis
  - **No Park**
  - **No Drive in All Ranges**
  - **No Reverse Gear**
- Shift Quality Feel Diagnosis
  - **Harsh Garage Shift**
  - **Harsh or Late First, Second, Third, and Fourth Shift**
  - **Harsh First and Reverse Shift**
  - **Harsh or Late Second and Sixth Shift**
  - **Harsh or Late Third, Fifth, and Reverse Shift**
  - **Harsh Fourth, Fifth, and Sixth Shift**
  - **Non-Shifting Clutch Function Verification Description** for bump
- Shift Pattern
  - **No First and Reverse Gears**
  - **No First, Second, Third, and Fourth Gear**
  - **No Second and Sixth Gear**
  - **No Fourth, Fifth, and Sixth Gear**
  - **No Third, Fifth, and Reverse Gear**

- Torque Converter Diagnosis
  - Torque Converter Diagnosis
  - No Torque Converter Clutch Apply
  - No Torque Converter Clutch Release
- Symptom Not Found or No Symptom Detected
  - Transmission Fluid Level and Condition Check
  - Road Test
  - Line Pressure Check
  - Non-Shifting Clutch Function Verification Description for bump

## CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INSPECTION



**Fig. 1: View Of Control Solenoid Valve & Transmission Control Module Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

1. Verify the conditions listed below do not exist. Carefully inspect the control solenoid valve assembly connectors and pins (1, 2, 4, 6) for the condition. Repair or replace as necessary.
  - Damage
  - Bent pins
  - Debris
  - Broken retaining tab
  - Contamination

2. Verify there is no metallic debris inside the connectors near the terminal pins. Clean as necessary.
3. Verify the control solenoid valve assembly solenoid leads (3) do not have contamination or metallic debris. Clean as necessary.
4. Verify the resistance between the leads of each solenoid is within the range in the table below, with the solenoids at room temperature. If the resistance of any solenoid is not within range, replace the Control Valve Body Assembly.
5. Inspect the 2 control solenoid valve assembly filter plate retaining tabs (5) for cracks and ensure proper tension when filter plate is attached.

**NOTE:** The connector on the TCC pressure control solenoid valve (8) will be either clear/transparent or yellow. The clear/transparent connector will have a color contrast when compared to the connectors on pressure control solenoid 2 (11) and pressure control solenoid 4 (12).

#### Solenoid Resistance

| Solenoid Name                        | Illustration Number | Expected Resistance ohms                                            |
|--------------------------------------|---------------------|---------------------------------------------------------------------|
| Pressure Control Solenoid 3          | 7                   | 4.55-5.75                                                           |
| Pressure Control Solenoid 5          | 8                   | 4.55-5.75                                                           |
| TCC Pressure Control Solenoid Valve  | 9                   | 3.42-4.18 Clear/transparent Connector<br>4.55-5.75 Yellow Connector |
| Shift Solenoid Valve 1               | 10                  | 16.2-19.8                                                           |
| Pressure Control Solenoid 2          | 11                  | 4.55-5.75                                                           |
| Pressure Control Solenoid 4          | 12                  | 4.55-5.75                                                           |
| Line Pressure Control Solenoid Valve | 13                  | 4.55-5.75                                                           |

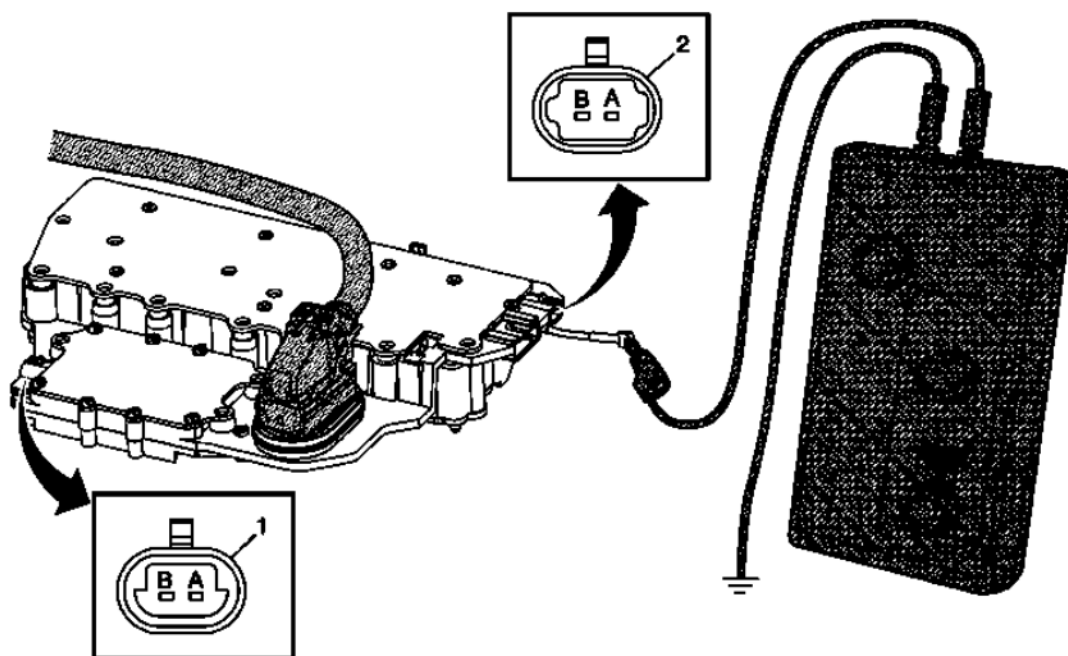
#### CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INPUT SHAFT SPEED/OUTPUT SHAFT SPEED INPUT TEST

##### Special Tools

- EL 35616 GM-Approved Terminal Test Kit
- EL 38522 Variable Signal Generator

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





**Fig. 2: View Of Special Tool & Control Solenoid Valve and Transmission Control Module Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

The purpose of this test is to provide a simulated input/output speed sensor (ISS/OSS) signal to the control solenoid valve assembly ISS/OSS input circuits.

### Transmission Input Speed Sensor

1. Ignition OFF, disconnect the ISS wiring harness connector X3 (1) from the control solenoid valve assembly.
2. Ignition ON, test for 11-14 volts at terminal B.
  - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement**.
3. Ignition OFF, using the **EL 35616** terminal test kit, connect the **EL 38522** variable signal generator red lead to the ISS signal circuit terminal A on the TCM.
4. Connect the black lead from the **EL 38522** variable signal generator to ground.
5. Set the **EL 38522** variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission ISS parameter is between 495-505 RPM.
  - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement**.

### Transmission Output Speed Sensor

1. Ignition OFF, disconnect the OSS wiring harness connector X4 (2) from the control solenoid valve

assembly.

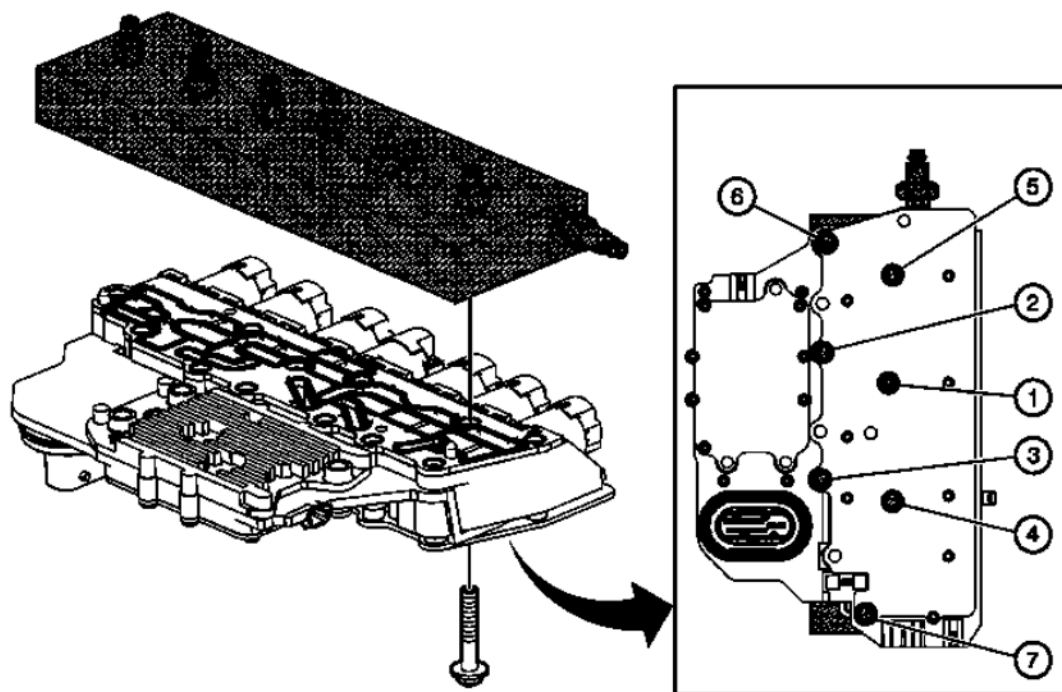
2. Ignition ON, test for 11-14 volts at terminal B.
  - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Ignition OFF, using the **EL 35616** terminal test kit, connect the **EL 38522** variable signal generator red lead to the OSS signal circuit terminal A on the TCM.
4. Connect the black lead from the **EL 38522** variable signal generator to ground.
5. Set the **EL 38522** variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission OSS parameter is between 745-825 RPM.
  - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .

## CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY SOLENOID PERFORMANCE TEST

### Special Tools

**DT-48616** Solenoid Assembly Test Kit & Adapter Harness

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



**Fig. 3: Identifying Control Solenoid (W/Body & TCM) Valve Assembly Test Points**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Air inlet may be installed at either end of the DT-48616-1 test plate.

The purpose of this procedure is to test the functionality of the control solenoid valve assembly solenoids for a gross stuck open or stuck closed condition. **DT-48616** test plate is bolted to the control solenoid valve assembly on the valve body mounting surface. Pressurized air is passed into the aluminum test block, through the control solenoid valve assembly solenoid passage and back to a pressure gauge on the test block. The pressure gauge indicates open if air pressure is passed through the solenoid, or closed if the solenoid is unable to pass air through. A scan tool is used to command the solenoids ON and OFF. While watching the pressure gauge, one can determine the valve functionality.

**NOTE:** The scan tool output control will not work on Gen 1 transmissions, thus the Q8 Control Solenoid Valve Assembly performance test cannot be performed on these models. Gen 2 and later transmissions do not contain transmission fluid pressure switches. As a result, Gen 2 and later transmissions cannot have a valid Transmission Fluid Pressure Switch DTC. Steps 1 and 2 in the test procedure will determine if you are working with a Gen 1 or Gen 2 and later transmission.

1. Ignition ON, use a scan tool to check for Specific DTC P0842.
2. Verify that DTC P0842 shows invalid.
  - If parameter does not indicate Invalid
    1. Do not attempt to complete the performance test as it will not work on a Gen 1 Q8 Control Solenoid Valve Assembly.
    2. Verify the vehicle model year, engine, and options to make certain the correct diagnostic is selected.
  - If parameter indicates Invalid
3. Remove the control solenoid valve assembly and filter plate from the transmission. Refer to Control Solenoid Valve and Transmission Control Module Assembly Replacement.

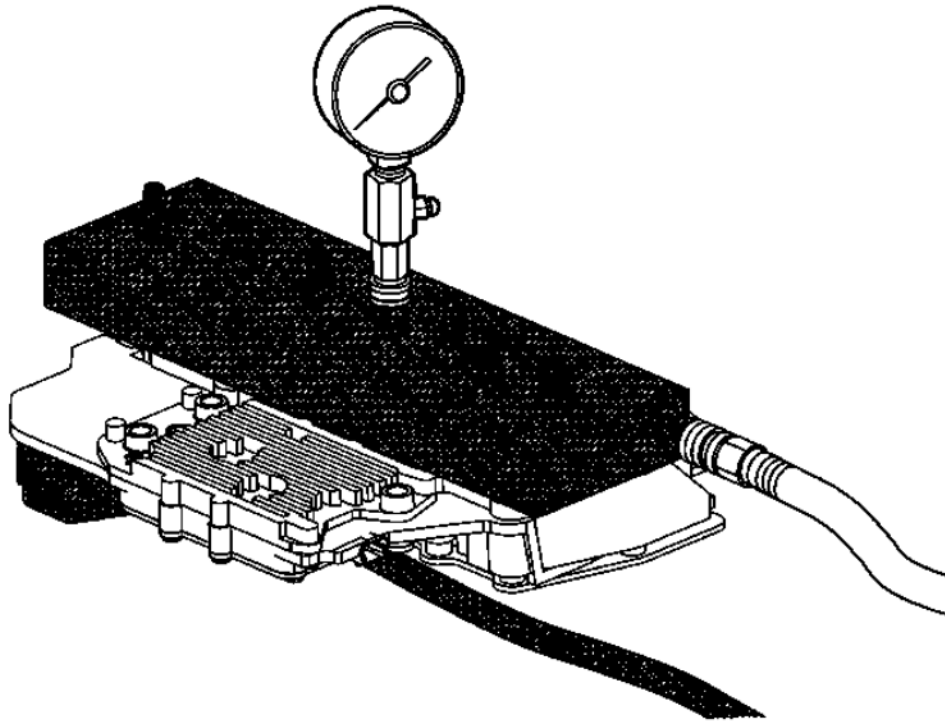
**CAUTION:** Refer to Fastener Caution.

**NOTE:** Drain the TCM of excess transmission fluid before attaching to test block and use caution when attaching air to test block air inlet.

4. Bolt the **DT-48616-1** test plate to the filter plate, and control solenoid valve assembly. Use the bolts and washers supplied with the tool to attach the test block. Tighten the bolts to 5 N.m (44 lb in) using a center out alternating torque sequence.
5. Install the pressure gauge to the affected solenoid air port. Reference the Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification for test plate port identification.

**NOTE:** If air pressure greater than 345 kpa (50 psi) is applied, an accurate test of the shift solenoid cannot be performed.

6. Regulate the shop air pressure to 310-345 kpa (45-50 psi) and connect the line to the **DT-48616-1** test plate air inlet port.
7. Connect the **DT-48616-10** harness to the vehicle harness and the control solenoid valve assembly.



**Fig. 4: Valve Pressure Test**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The TCM limits the time the solenoids are commanded on to prevent overheating of the solenoids. Once the time limit is reached, the TCM prevents the test from being continued for 5 minutes. The ignition must remain ON during the 5 minute countdown period.

8. Ignition ON.

**NOTE:**

- Release the air pressure in the gauge between pressurization tests.
- If the solenoid valve is stuck, no pressure change will occur.

9. Verify the pressure gauge changes when commanding the appropriate solenoid ON and OFF with a scan tool. Repeat test as necessary.
  - If the pressure gauge does not change

Replace the Q8 Control Solenoid Valve Assembly.

- If the pressure gauge changes

10. Solenoids are not grossly stuck.

#### Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification

| Component                      | Port On Test Plate | Commanded State                                    |                                                         |
|--------------------------------|--------------------|----------------------------------------------------|---------------------------------------------------------|
|                                |                    | ON                                                 | OFF                                                     |
| PC Solenoid 2, 35R             | GEN 2 - C          | Full pressure to gauge                             | No pressure to gauge                                    |
| PC Solenoid 3, R1/456          | G                  | Full pressure to gauge                             | No pressure to gauge                                    |
| PC Solenoid 4, 2-6             | B                  | Full pressure to gauge                             | No pressure to gauge                                    |
| PC Solenoid 5, 1234            | GEN 2 - F          | Full pressure to gauge                             | No pressure to gauge                                    |
| Shift Solenoid                 | D                  | Full pressure to gauge                             | Below full pressure to gauge                            |
| Line Pressure Control Solenoid | A                  | Command to highest setting, full pressure to gauge | Command to lowest setting, below full pressure to gauge |
| TCC PC Solenoid                | E                  | Full pressure to gauge                             | No pressure to gauge                                    |

**NOTE:**

With the key on engine off (KOEO), the TCM will normally cycle some of the transmission solenoids On and Off to facilitate keeping the ports and solenoids clean and free of debris. This dither function is a normal activity and will cause the valves to cycle open and closed quickly when the TCM is powered up. This can cause the psi gauge to flicker high and low as the valves open and close. This may cause some air to exit the ports where the psi gauge is not connected as those solenoids cycle on and off.

#### TRANSMISSION ADAPTIVE VALUES LEARN

Transmission Adaptive Values Learn is a procedure for 6 speed automatic transmissions in which a series of tests are run to allow the transmission control module (TCM) to learn individual clutch characteristics. Once the clutch data is learned, Transmission Adaptive Values Learn translates it into the adaptive data cells, which the TCM uses for clutch control during shifts. The scan tool provides initiation of the Transmission Adaptive Values Learn procedure. This procedure is to be used following transmission repair.

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

**NOTE:** Ensure the following conditions are met before performing the Transmission Adaptive Values Learn procedure:

- Drive wheels are blocked

- Parking brake is applied
- Service brake is applied
- Zero percent throttle and no external engine RPM control
- Transmission fluid temperature is between values listed below, if you attempt to run the test above or below these temperatures, the test will not start:
  - MY 2011 and prior 70-95°C (158-203°F)
  - MY 2012 Gen 1 70-95°C (158-203°F)
  - MY 2012 Gen 2 64-95°C (147-203°F)
  - MY 2013 Gen 1 70-95°C (158-203°F)
  - MY 2013 Gen 2 64-76°C (147-169°F)
  - MY 2014 and later 64-76°C (147-169°F)
- Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches.
- Transmission Adaptive Values Learn will abort if the transmission fluid temperature increases to the values listed below:
  - MY 2011 and prior 110°C (230°F)
  - MY 2012 Gen 1 110°C (230°F)
  - MY 2012 Gen 2 100°C (212°F)
  - MY 2013 Gen 1 110°C (230°F)
  - MY 2013 Gen 2 86°C (187°F)
  - MY 2014 and later 86°C (187°F)

**NOTE:** If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn Adapts may abort and the process may need to be started again from the beginning. If this occurs, the transmission will be left in a neutral state until the controller is shut down, key OFF and remove the scan tool and wait for more than 30 seconds prior to re-try procedure. If the procedure repeatedly fails, a limit that engineering set is being exceeded and there is possibly a transmission hardware issue.

1. Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:
  1. Module Diagnostics
  2. Transmission Control Module
  3. Configurations/Reset Functions
  4. Transmission Adaptive Values Learn

**NOTE:** If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn may abort and the process may need to be started again from the beginning.

2. Use the scan tool to perform the Transmission Adaptive Values Learn procedure. As the procedure is being performed, the scan tool data display will provide operator instructions. Follow the scan tool instructions, as required.
3. Once the procedure is complete, shut OFF the engine and power down the TCM. You will lose communication to the scan tool.

**NOTE:** When the Transmission Adaptive Values Learn procedure is completed, the transmission will remain in a neutral state until the controller shuts down. If after 1-2 minutes of sitting, with the key OFF and scan tool removed, the vehicle remains in a neutral state, disconnect the battery and wait 5-10 minutes and then hook the battery back up. Reverse and drive should return.

4. Restart the engine. This will complete the Transmission Adaptive Values Learn procedure.

### Troubleshooting

If the Transmission Adaptive Values Learn will not run and the above stated conditions have been met, ensure the following:

**NOTE:** The generation of transmission can be determined by using a scan tool to check for Specific DTC P0842. If DTC does not show Invalid, the transmission is Gen 1. If DTC shows Invalid, transmission is Gen 2.

- Determine if transmission is Gen 1 or Gen 2.
- Verify vehicle model year.
- Verify transmission fluid temperature is between the temperatures listed above for the vehicle model year and generation of transmission.
- Brakes and brake switch are functioning properly
- No active DTCs
- Closed throttle and engine RPM increases above 1, 500 RPM while at entrance of the test
- Park/Neutral position switch is properly adjusted and functioning
- Line pressure control is able to provide 1, 000 kPa and is within specifications
- Vehicle is not moving or vibrating excessively
- Clutches are properly assembled

### BRAKE PEDAL POSITION SENSOR LEARN (WITH 2.5L LCV)

Brake Pedal Position Sensor Learn is a procedure for the ECM to determine the position of the brake pedal position sensor when the brake pedal is in the released position.

**NOTE:** The Brake Pedal Position Sensor Learn procedure is required when the following service procedures have been performed:

- An Engine Control Module Replacement
  - A BPP Sensor Replacement
  - Any repair procedure that effects the brake pedal position sensor alignment
1. Install a scan tool.
  2. Monitor the ECM for DTCs with a scan tool. If other DTCs are set, refer to **Diagnostic Trouble Code (DTC) List - Vehicle** for the applicable DTC that set.
  3. Navigate to the scan tool Brake Pedal Position Sensor Learn command by selecting the following:
    1. Module Diagnosis
    2. Engine Control Module
    3. Configuration/Reset Functions
    4. Learn Functions
    5. Brake Pedal Position Sensor Learn
  4. Ignition ON, Engine OFF, transmission in Park, brake pedal in the fully released position, select Learn.
  5. Verify Brake Pedal Position Sensor and Brake Pedal Position Sensor Learned Home Position are within 1.1 Volts.
  6. Select Exit.
  7. Perform the body control module (BCM) brake pedal position sensor calibration. Refer to **Brake Pedal Position Sensor Calibration**.

## TRANSMISSION FLUID LEVEL AND CONDITION CHECK

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself.

**CAUTION: Use Dexron VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.**

**NOTE:** Ensure the transmission has enough fluid in it to safely start the vehicle without damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20-25°C (68-77°F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

### Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500-800 rpm for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

**NOTE:** If the TFT reading is not at the required temperature, allow the vehicle to



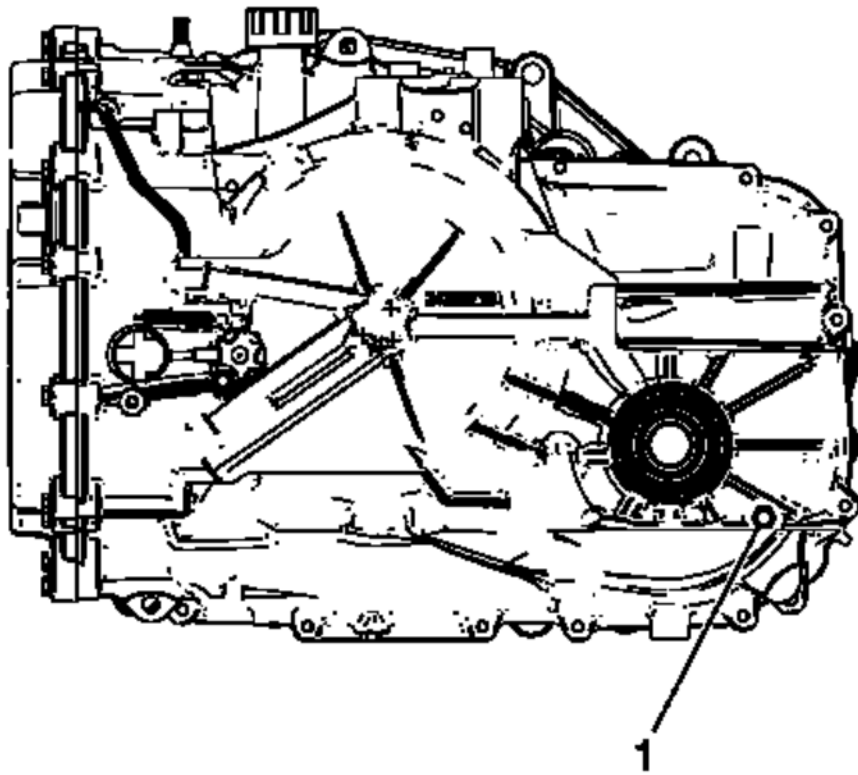
cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.

**Drive the vehicle in second gear until the fluid temperature is at the specified temperature.**

4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

**CAUTION:** The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85-95°C (185-203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.



**Fig. 5: View of Oil Level Plug**

Courtesy of GENERAL MOTORS COMPANY

6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.

#### **Oil Level Plug (1)**

- If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
  - If no fluid comes out, add fluid until fluid drips out.
7. Inspect the fluid color. The fluid should be red or dark brown.
    - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
    - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to **Engine Coolant/Water in Transmission**.
  8. Inspect for external leaks. Refer to **Fluid Leak Diagnosis (Non Hybrid)**, **Fluid Leak Diagnosis (Hybrid)**.
  9. If the fluid was changed, reset the transmission oil life monitor if applicable.

### Dipstick Level Checking Procedure (If equipped)

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P). Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500-800 rpm for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.
4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

**CAUTION:** The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85-95°C (185-203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

**NOTE:**

- If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
- Check the transmission fluid level when the TFT is at between 85-95° C (185-203°F). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is at the specified temperature.

**Drive the vehicle in second gear until the fluid temperature is at the specified temperature.**

5. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. Remove the dipstick and wipe it with a clean rag or paper towel.
7. Inspect the fluid color. The fluid should be red or dark brown.
  - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
  - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to **Engine Coolant/Water in Transmission**.

8. Install the dipstick. Wait three seconds and then remove it again.

**NOTE:** Always check the fluid level at least twice. Consistent readings are important to maintaining proper fluid level. If inconsistent readings are noted, inspect the transmission vent cap to ensure it is clean and unclogged.

**NOTE:** It is not necessary to get the fluid level all the way up to the MAX mark. Anywhere within the crosshatch band is acceptable.

9. Check both sides of the dipstick and read the lower level.
10. Install and remove the dipstick again to verify the reading.

**NOTE:** Do not add more than one half pint (0.25L) at a time without rechecking the level. Once the oil is on the dipstick bullet, it will not take much more fluid to raise the fluid level into the crosshatch band. Do not overfill. Also, if the fluid level is low, inspect the transmission for leaks. Refer to Fluid Leak Diagnosis (Non Hybrid), Fluid Leak Diagnosis (Hybrid).

11. If the fluid level is not within the crosshatch band, and the transmission temperature is at 90°C (194°F), add or drain fluid as necessary to bring the level into the crosshatch band. If the fluid level is low, add only enough fluid to bring the level into the crosshatch band.
12. If the fluid level is in the acceptable range, install the dipstick.
13. If the fluid was changed, reset the transmission oil life monitor if applicable.

### Fluid Condition Inspection

- Inspect the fluid color. The fluid should be red in color. The fluid may also turn brown from normal use, and does not always indicate contamination.

**NOTE:** Fluid that is very dark or black and has a burnt odor usually indicates contamination or overheating.

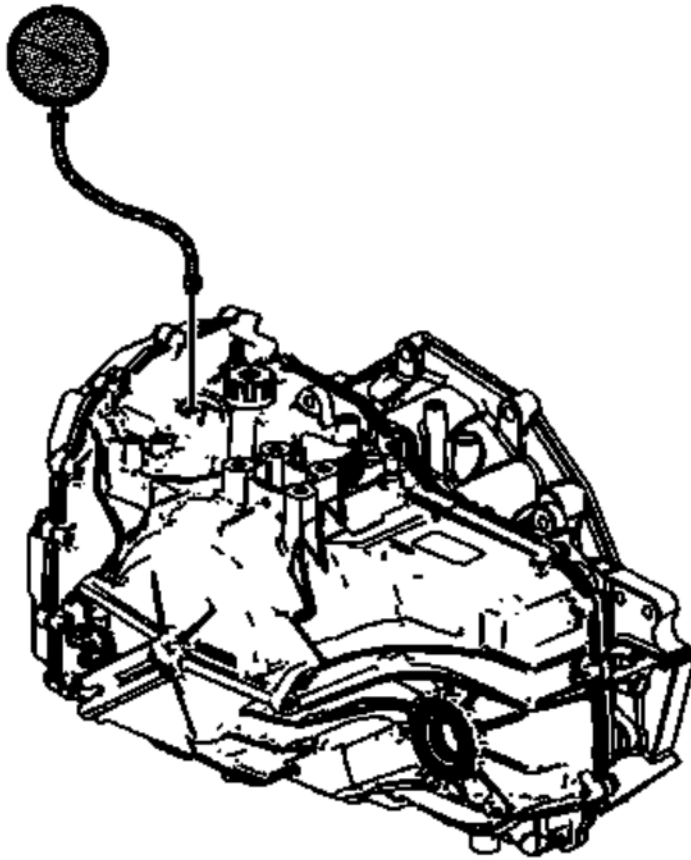
- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission damage. Refer to Road Test to verify transmission operation. Change the transmission fluid if no other conditions are found.
- Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to Engine Coolant/Water in Transmission.

### LINE PRESSURE CHECK

#### Special Tools

GE-21867-A Oil Pressure Gauge Kit

For equivalent regional tools, refer to Special Tools .



**Fig. 6: Illustrating Line Pressure Checking**  
Courtesy of GENERAL MOTORS COMPANY

**WARNING:** Keep the brakes applied at all times in order to prevent unexpected vehicle motion. Personal injury may result if the vehicle moves unexpectedly.

1. Install a scan tool.
2. Start the engine.
3. Inspect the transmission for the proper fluid level. Refer to Transmission Fluid Level and Condition Check.
4. Use the scan tool to inspect for any active or stored diagnostic trouble codes.
5. Inspect the manual linkage at the transmission for proper function.
6. Turn the engine OFF.
7. Remove the line pressure test hole plug.
8. Install the **GE-21867-A** pressure gauge.
9. Access the Scan Tool Transmission Output Controls for the Line PC Solenoid.

10. Start the engine.

**NOTE:**

- In order to achieve accurate line pressure readings, the following procedure must be performed at least 3 times in order to gather uniform pressure readings.
- The scan tool is only able to control the line PC solenoid in PARK and NEUTRAL with engine speeds below 1500 RPM. This protects the clutches from extreme high or low line pressures.

11. Use the scan tool to increase and decrease the Line PC Solenoid in increments of approximately 100 KPa (15 psi). The scan tool commands the increment values automatically.
12. Allow the pressure to stabilize between increments.
13. Compare the pressure readings on the scan tool to those indicated on the **GE-21867-A** pressure gauge. Refer to **Solenoid Valve Pressure (Gen 1)** , **Solenoid Valve Pressure (Gen 2)** .
14. If the pressure readings vary greatly, refer to **Fluid Pressure High or Low**.
15. Turn the engine OFF.
16. Remove the **GE-21867-A** pressure gauge.

**CAUTION:** Refer to **Fastener Caution** .

17. Install the line pressure test hole plug. Tighten the pressure test hole plug to 12 N.m (106 lb in).

## ROAD TEST

**NOTE:**        **The Road Test Procedure should be performed only as part of the Symptom Diagnosis.**

Perform the road test in conjunction with the symptom diagnosis. Refer to **Symptoms - Automatic Transmission**.

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Step-In Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
  - REVERSE
  - Driver Shift Control

**NOTE:** Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to **Transmission Fluid Level and Condition Check**.
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.
- Ensure the transmission fluid temperature is at least 90°C (194°F).

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to **Transmission Fluid Level and Condition Check**.
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to **Fluid Leak Diagnosis (Non Hybrid)**, **Fluid Leak Diagnosis (Hybrid)**.

#### **Electrical Function Check**

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.

Refer to **Control Module References** for typical data values. Data that is questionable may indicate a concern.

- Engine Speed
- Transmission ISS

- Transmission OSS
- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Line PC Sol. Pressure Cmd.
- Brake Switch
- ECT, Engine Data List
- Trans. Fluid Temp.
- TCM Temperature
- Calc. Throttle Position
- Ignition Voltage
- TFP Switch 1
- TFP Switch 3
- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1
- Shift Solenoid 2
- TCC PC Sol. Duty Cycle
- TCC Slip Speed

5. Check the garage shifts.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through the following ranges:
  1. PARK to REVERSE
  2. REVERSE to NEUTRAL
  3. NEUTRAL to DRIVE
  4. DRIVE to REVERSE
  5. REVERSE to DRIVE
3. Pause 2 to 3 seconds in each gear position.
4. Verify the gear engagements are immediate (less than 2 seconds to complete if transmission fluid temperature is above 20°C (68°C) and not harsh. Note that these shifts may be almost imperceptible in some applications. Using the scan tool to monitor Transmission ISS achieving 0 rpm can be used to check delay in these cases.



**NOTE:** Harsh engagement may be caused by any of the following conditions:

- High engine idle speed-Compare engine idle speed to desired idle speed.
- Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.
- A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.
- Incomplete adapting or incorrect adapting-Repeat maneuver multiple times to see if shift quality improves. If it does not, refer to the service procedures for Harsh Garage Shift.

**NOTE:** Delayed engagement may be caused by any of the following conditions:

- Low idle speed-Compare engine idle speed to desired idle speed.
- Low fluid level
- Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.
- Cold transmission fluid temperature (TFT)-Use the scan tool to determine TFT.
- Selector linkage-Inspect and adjust as necessary.
- Incomplete adapting or incorrect adapting-Repeat maneuver multiple times to see if delay improves. If it does not, refer to the service procedures for Harsh First and Reverse Shift.

6. Monitor transmission range on the scan tool, transmission data list.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through all ranges.
3. Pause 2 to 3 seconds in each range.
4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.

7. Check throttle position input.

1. Apply the brake pedal and ensure the parking brake is set.
2. Ensure the gear selector is in PARK.
3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

**Upshift Control and Torque Converter Clutch (TCC) Apply**

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:

- Calc. Throttle Position
- Vehicle Speed
- Engine Speed
- Transmission ISS
- Transmission OSS
- Commanded Gear
- TCC PC Sol. Pressure Cmd.
- TCC Slip Speed
- TFP Switch 1
- TFP Switch 3
- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1 and 2

2. Place the gear selector in the DRIVE position.

3. Accelerate the vehicle using a steady throttle position between 15 and 20 percent. Hold the throttle steady.

4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.

5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

**NOTE:** This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Full lockup

**is available at highway speeds on some applications.**

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

- Check for DTCs.
- Refer to **Torque Converter Diagnosis**.

#### **Part Throttle Step-In Downshifts**

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle at light throttle (5-15 percent) until 3rd gear is just achieved.
3. Quickly increase throttle angle until commanded gear indicates that a downshift to 2nd gear is commanded.
4. Verify that the transmission downshifts within 2 seconds of the throttle movement.
5. Repeat steps 2 to 4 at higher speed to achieve 4th gear and then step in to command a 4th gear to 3rd gear downshift.
6. Repeat steps 2 to 4 at higher speed to achieve 5th gear and then step in to command a 5th to 4th gear downshift.
7. Repeat steps 2 to 4 at higher speed to achieve 6th gear and then step in to command a 6th gear to 5th gear downshift.
8. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

#### **Manual Downshifts**

Manual downshift testing is not required since all vehicles equipped are also equipped with some form of Driver Shift Control(DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

#### **Coasting Downshifts**

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 6th gear with the TCC applied.
3. Release the throttle and apply the brakes
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

#### **Manual Gear Range Selection**

This application does not utilize manual forward gear ranges.

## Reverse

Perform the following test using a 10-15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

## Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will upshift automatically when maximum engine speed is achieved and will protect from any downshift which may cause excessive engine RPMs.

## TORQUE CONVERTER DIAGNOSIS

### Torque Converter Stator

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

### Poor Acceleration at Low Speed - Stator Roller Clutch Freewheels at All Times

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48-55 km/h (30-34 mph). At speeds above 48-55 km/h (30-34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

### Poor Acceleration at High Speed - Stator Roller Clutch is Locked Up at All Times

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48-55 km/h (30-34 mph). Visual examination of the converter may reveal a blue color from overheating.

### Torque Converter Bearing Noise

**NOTE:** Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE.

This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.

**CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.**

3. Depress the accelerator to approximately 1, 200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

### **Torque Converter Clutch**

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

### **Torque Converter Clutch Shudder**

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release, or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

### **If Shudder Occurs During TCC Apply, Release, and ECCC**

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

### **If Shudder Occurs After TCC has Locked**

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

Refer to **Symptoms - Engine Controls** in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

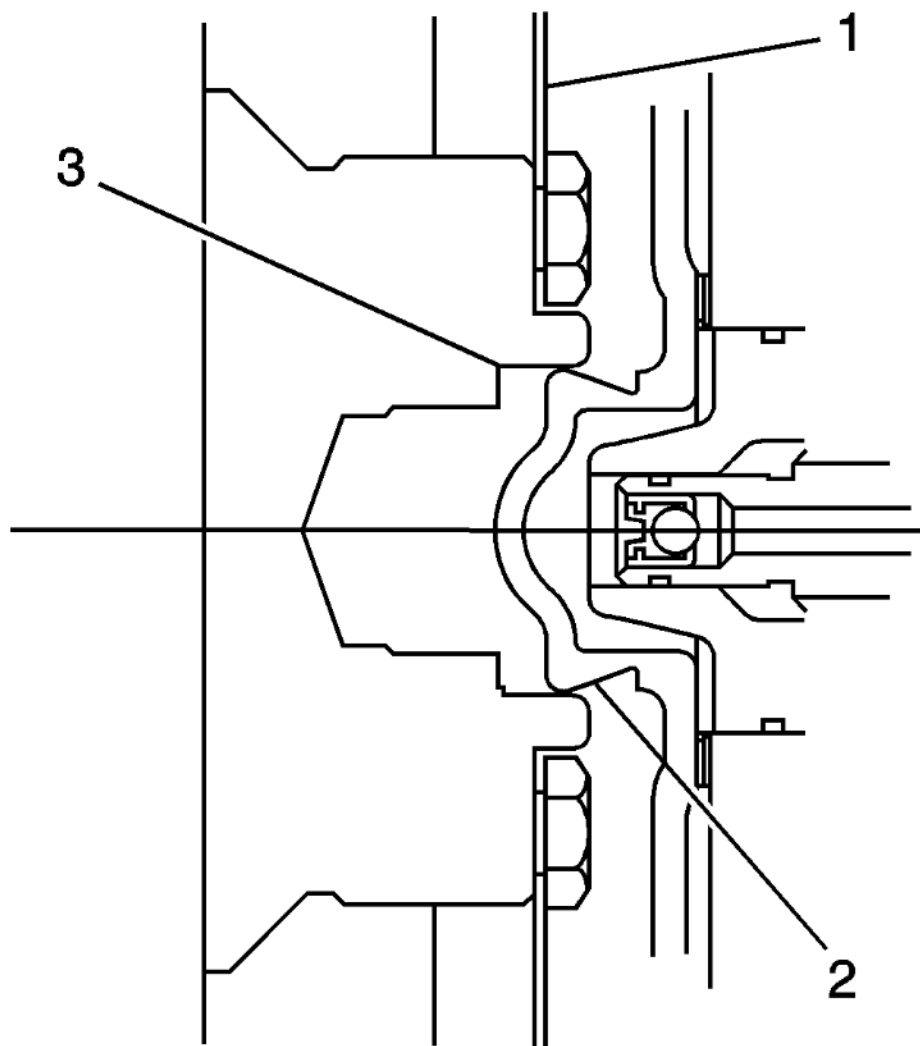
### **Torque Converter Vibration Test**

The **Noise and Vibration Analysis** procedure should be performed prior to performing this test.

### **Indexing Torque Converter**

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.



**Fig. 7: View Of Torque Converter Hub In Engine Crankshaft**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** When installing the torque converter to the flexplate, make sure to use specified bolts. DO NOT use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.

**CAUTION:** Refer to Fastener Caution .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to Fastener Tightening Specifications (On Vehicle) , Fastener Tightening Specifications (Off Vehicle) .
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to **Fastener Tightening Specifications (On Vehicle)** , **Fastener Tightening Specifications (Off Vehicle)** .

### Torque Converter Replacement Guide

| Condition                                                                                                               | Action                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Transmission Fluid Oxidized/Discolored</li> <li>Clutch Fiber Material</li> </ul> | Do not replace the torque converter. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b> .                                                                                                                                                                  |
| Transmission Fluid Contaminated with Metal Particles                                                                    | Do not replace the torque converter for clutch system or gearset component damage. Fine metallic debris or clutch plate material that is suspended in the fluid will not cause damage to the internal torque converter components nor any internal transmission components. |
| Harsh Gear Shifts                                                                                                       | Do not replace the torque converter. Refer to <b><u>Symptoms - Automatic Transmission</u></b> .                                                                                                                                                                             |
| Noise-Whine                                                                                                             | <ul style="list-style-type: none"> <li>Refer to <b><u>Symptoms - Automatic Transmission</u></b>.</li> <li>Do not replace the torque converter if noise is present in Neutral/Park. Refer to <b><u>Symptoms - Engine Mechanical</u></b> .</li> </ul>                         |
| Vibration-Out of Balance                                                                                                | Refer to Torque Converter Vibration Test in this procedure.                                                                                                                                                                                                                 |
| No Drive/Slips in Drive                                                                                                 | Do not replace the torque converter until completing all engine and transmission diagnostics.                                                                                                                                                                               |
| Idle Surge/Rough Idle                                                                                                   | Do not replace the torque converter. Refer to <b><u>Symptoms - Engine Controls</u></b>                                                                                                                                                                                      |
| TCC Apply/Release Shudder                                                                                               | Do not replace the torque converter. Refer to Torque Converter Clutch Shudder in this procedure.                                                                                                                                                                            |
| TCC Chuggle                                                                                                             | Do not replace the torque converter. Refer to <b><u>Symptoms - Engine Controls</u></b> .                                                                                                                                                                                    |
| DTC P0741-TCC Stuck OFF/High Slip-Intermittent Only                                                                     | Do not replace the torque converter. Refer to <b><u>DTC P0741 or P0742</u></b> diagnostic table.                                                                                                                                                                            |
| DTC P0741-TCC Stuck OFF/High Slip                                                                                       | Do not replace the torque converter. Refer to <b><u>DTC P0741 or P0742</u></b> diagnostic table.                                                                                                                                                                            |
| DTC P0742-TCC Stuck ON                                                                                                  | Do not replace the torque converter. Refer to <b><u>DTC P0741 or P0742</u></b> diagnostic table.                                                                                                                                                                            |



|                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transmission Fluid Contaminated with Sludge/Metal Particles as a result of: <ul style="list-style-type: none"> <li>• Engine Coolant/Oil</li> <li>• Pump damage</li> <li>• Drive sprocket support damage</li> <li>• Turbine/stator shaft damage</li> <li>• Internal converter damage with no damage found in the transmission</li> </ul> | Replace the torque converter.                                                                                                                                                                                                                                        |
| Poor Acceleration above 48 km/h (30 mph) - Good Launch                                                                                                                                                                                                                                                                                  | Do not replace the torque converter until completing all engine and transmission diagnostics. <ul style="list-style-type: none"> <li>• Refer to Torque Converter Stator in this procedure.</li> <li>• Refer to <b><u>Symptoms - Engine Controls</u></b> .</li> </ul> |
| Poor Launch - Good Acceleration above 48 km/h (30 mph)                                                                                                                                                                                                                                                                                  | Do not replace the torque converter until completing all engine and transmission diagnostics. <ul style="list-style-type: none"> <li>• Refer to Torque Converter Stator in this procedure.</li> <li>• Refer to <b><u>Symptoms - Engine Controls</u></b> .</li> </ul> |
| Stripped Converter Bolt Holes                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Replace the torque converter.</li> <li>• Inspect flexplate and refer to <b><u>Lower Engine Noise, Regardless of Engine Speed</u></b> .</li> </ul>                                                                           |
| Torque Converter Pilot Damaged                                                                                                                                                                                                                                                                                                          | Replace the torque converter.                                                                                                                                                                                                                                        |
| Torque Converter Hub surface is damaged - scored, raised/transferred metal.                                                                                                                                                                                                                                                             | Replace the torque converter.                                                                                                                                                                                                                                        |
| External Leaks in the weld areas - hub, lug or closure weld.                                                                                                                                                                                                                                                                            | Replace the torque converter.                                                                                                                                                                                                                                        |
| Broken/Cracked Flexplate                                                                                                                                                                                                                                                                                                                | Replace the torque converter.                                                                                                                                                                                                                                        |
| Torque Converter Discolored/Overheated                                                                                                                                                                                                                                                                                                  | Replace the torque converter.                                                                                                                                                                                                                                        |

## CLUTCH PLATE DIAGNOSIS

### Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting

- Flaking
- Delamination-splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

### Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

### Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
  - The valve body face is not flat.
  - Porosity in between channels.
  - The valve train retainers are improperly installed.
  - The checkballs are misplaced.
  - Malfunctioning valves.
- The Teflon® seal rings are worn or damaged.

### ENGINE COOLANT/WATER IN TRANSMISSION

**CAUTION: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.**

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.

2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts - washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to **Transmission Fluid Cooler Flushing and Flow Test**.

## **FLUID LEAK DIAGNOSIS (NON HYBRID)**

### **General Method**

1. Verify that the leak is transmission fluid.

**CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.**

2. Thoroughly clean the suspected leak area using a rag.

**NOTE: Do not idle vehicle, this will not actuate transmission systems, and 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. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

### **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 idle vehicle, this will not actuate transmission systems, and 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.
7. Make the necessary repairs.

### **Dye and Black Light Method**

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

### **Find the Cause of the Leak**

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

### **Gaskets**

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

### **Seals**

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore

- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

#### **Possible Points of Fluid Leaks**

#### **Transmission Valve Body Cover**

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

#### **Case Leak**

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

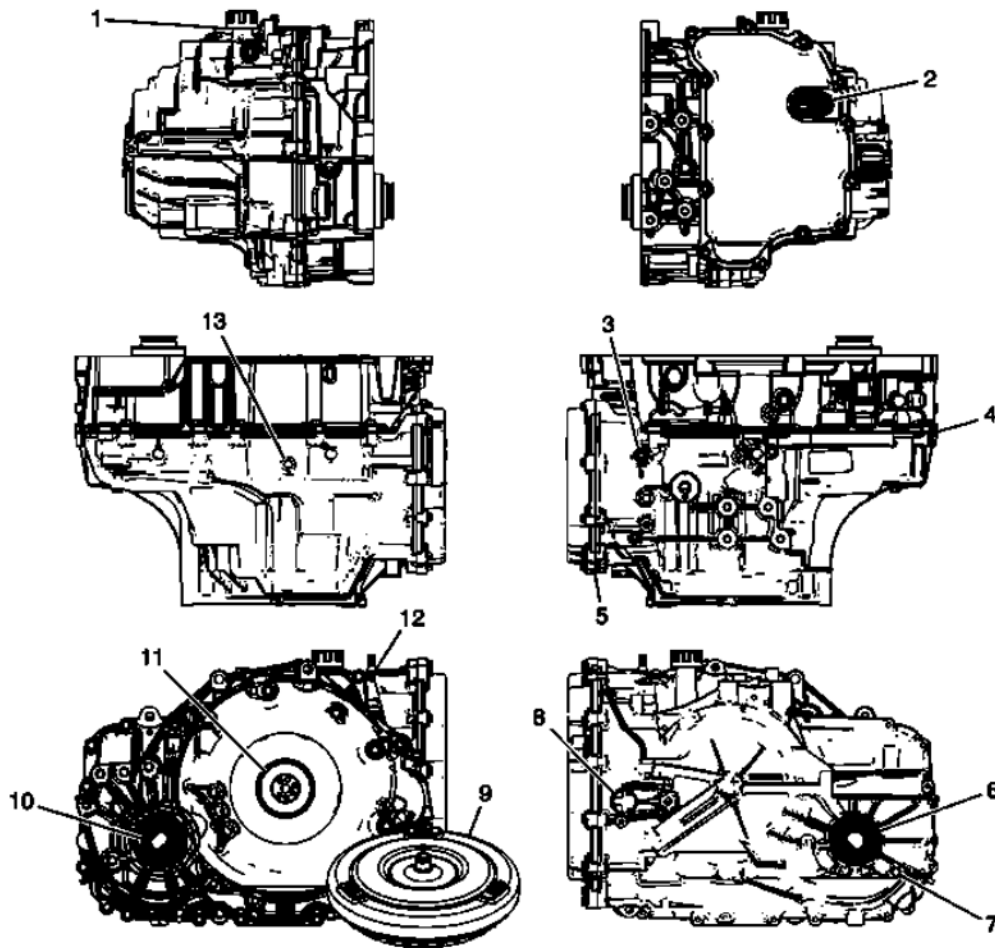
#### **Leak at the Torque Converter End**

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

#### **Leak at the Vent**

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

## Leak Inspection Points



**Fig. 8: Identifying Leak Inspection Points**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 1       | Fill Cap Seal                                   |
| 2       | Control Valve Body Cover Hole Seal              |
| 3       | Line Pressure Tap Plug                          |
| 4       | Converter Housing to Case Joint                 |
| 5       | Control Valve Body Cover Gasket                 |
| 6       | Drive Shaft Oil Seal Assembly                   |
| 7       | Oil Level Plug                                  |
| 8       | A/Trans Input Speed Sensor Assembly O-Ring Seal |
| 9       | Torque Converter Assembly                       |
| 10      | Front Wheel Drive Shaft Oil Seal Assembly       |
| 11      | Torque Converter Fluid Seal Assembly            |
|         |                                                 |

|    |                         |
|----|-------------------------|
| 12 | Manual Shift Shaft Seal |
| 13 | Drain Plug              |

## FLUID LEAK DIAGNOSIS (HYBRID)

### General Method

1. Verify that the leak is transmission fluid.

**CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.**

2. Thoroughly clean the suspected leak area using a rag.

**NOTE: Do not idle vehicle, this will not actuate transmission systems, and 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. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

### 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 idle vehicle, this will not actuate transmission systems, and 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.
7. Make the necessary repairs.

## **Dye and Black Light Method**

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

## **Find the Cause of the Leak**

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

### **Gaskets**

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

### **Seals**

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

## **Possible Points of Fluid Leaks**

### **Transmission Valve Body Cover**



- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

#### **Case Leak**

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

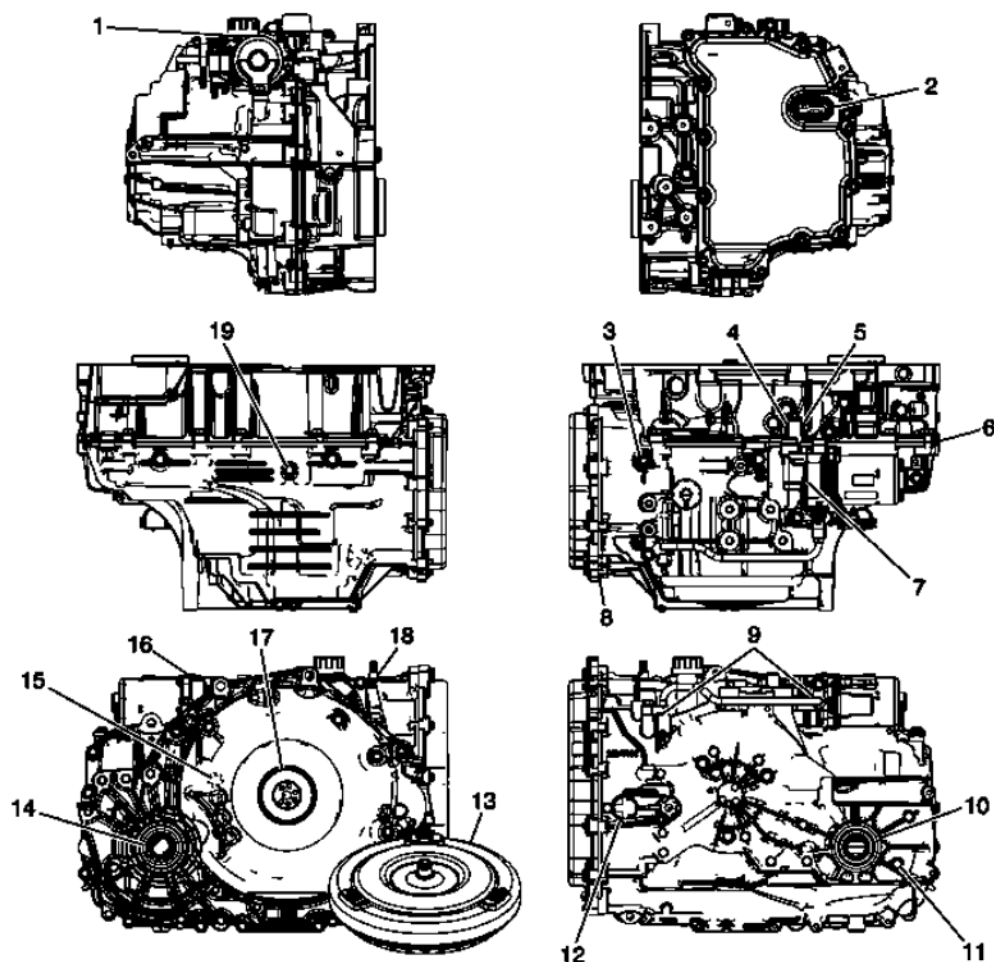
#### **Leak at the Torque Converter End**

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

#### **Leak at the Vent**

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

#### **Leak Inspection Points - Hybrid**



**Fig. 9: Leak Inspection Points -- Hybrid**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                         |
|---------|--------------------------------------------------------|
| 1       | Fill Cap Seal                                          |
| 2       | Control Valve Body Cover Hole Seal                     |
| 3       | Line Pressure Tap Plug                                 |
| 4       | A/Trans Auxiliary Fluid Pump Gasket                    |
| 5       | A/Trans Auxiliary Fluid Pump Seal                      |
| 6       | Converter Housing to Case Joint                        |
| 7       | A/Trans Auxiliary Fluid Pump Cover Seal                |
| 8       | Control Valve Body Cover Gasket                        |
| 9       | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly |
| 10      | Drive Shaft Oil Seal Assembly                          |
| 11      | Oil Level Plug                                         |
| 12      | A/Trans Input Speed Sensor Assembly O-Ring Seal        |
| 13      | Torque Converter Assembly                              |

|    |                                                        |
|----|--------------------------------------------------------|
| 14 | Front Wheel Drive Shaft Oil Seal Assembly              |
| 15 | A/Trans Auxiliary Fluid Inlet Pump Seal                |
| 16 | A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-Ring |
| 17 | Torque Converter Fluid Seal Assembly                   |
| 18 | Manual Shift Shaft Seal                                |
| 19 | Drain Plug                                             |

## CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

**WARNING: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.**

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. Apply the epoxy. A clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before assembling the components.
5. Repeat the fluid leak diagnosis procedures.

## TRANSMISSION FLUID COOLER FLUSHING AND FLOW TEST

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission failure. Many repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

**NOTE: Use the DT-45096 flush and flow test tool or equivalent to flush and flow test the transmission oil cooler and the oil cooler pipes after the transaxle is removed for repairs.**

Only GM Goodwrench DEXRON®VI automatic transmission fluid should be used when doing a repair on a GM transmission.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing and flow testing are as follows:

### Cooler Flow Check and Flushing Steps

1. Machine Set-up

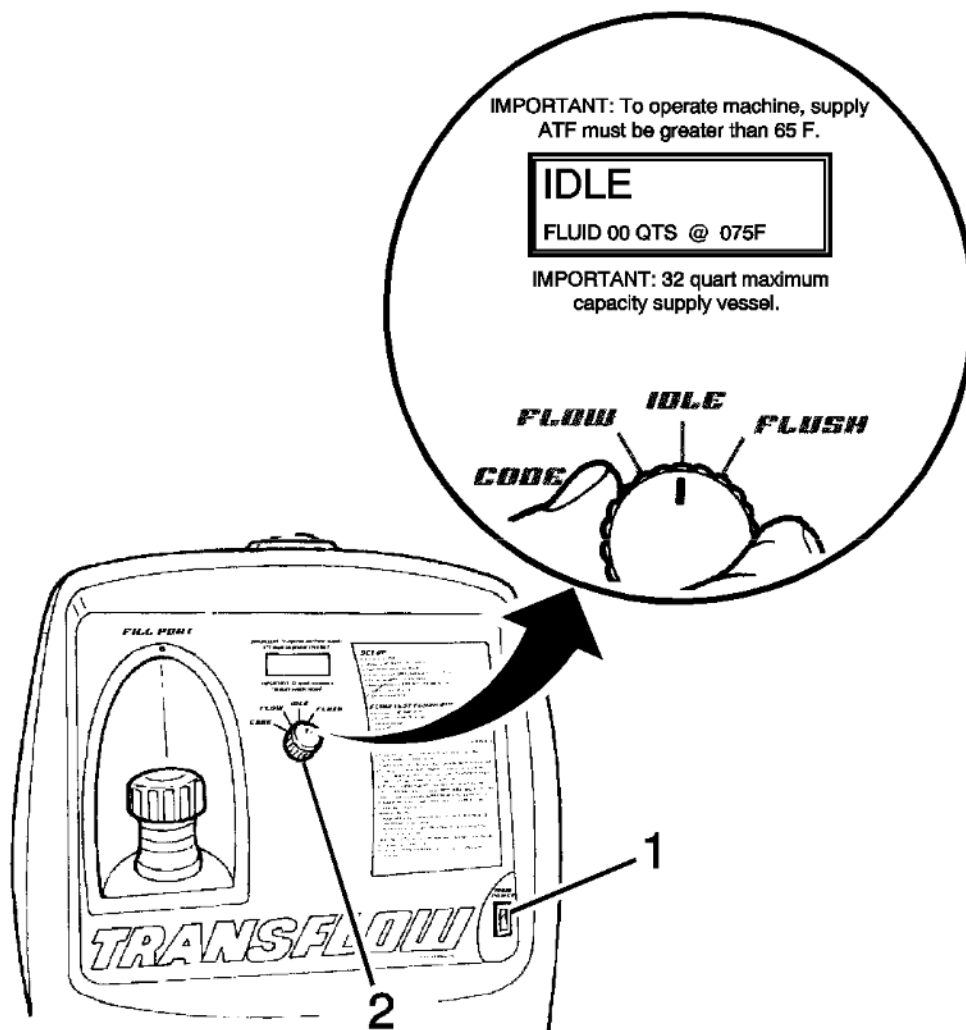
2. Determine Minimum Flow Rate
3. Back Flush
4. Forward Flush
5. Flow Test
6. Code Recording Procedure
7. Clean-up

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

#### **Special Tools**

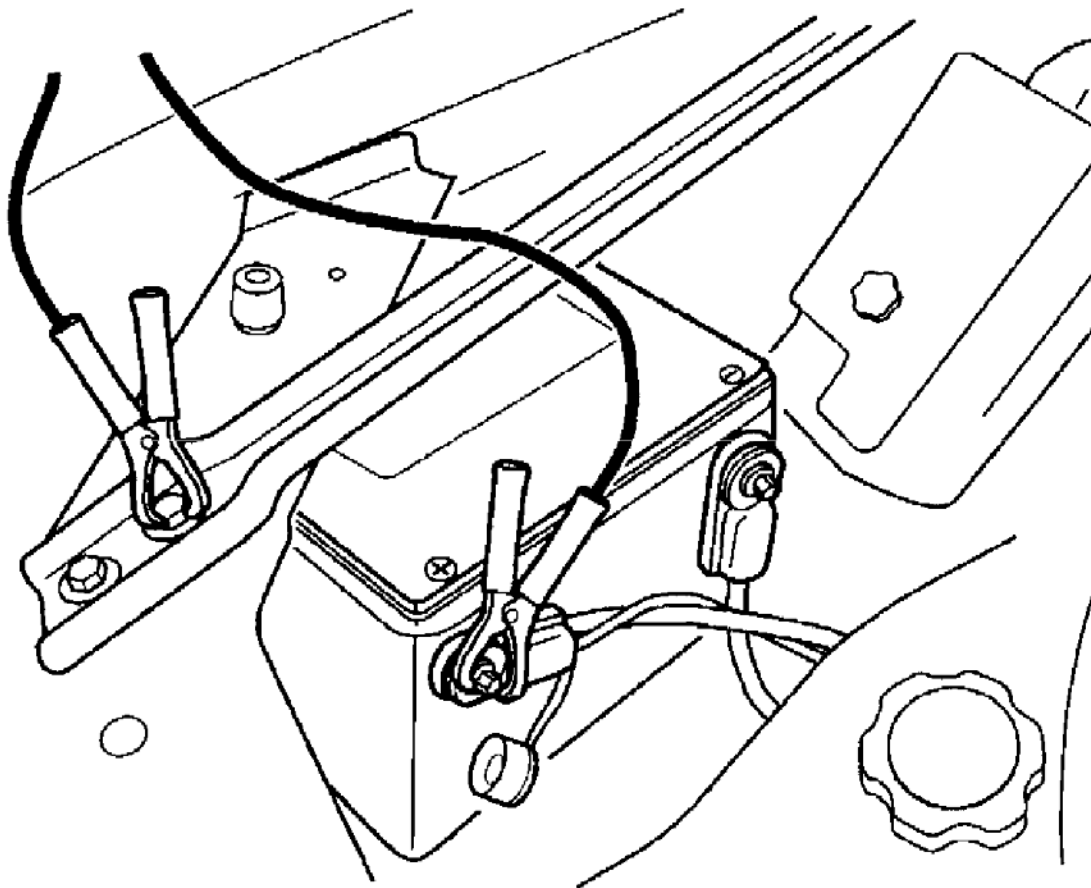
- **DT-45096** Transmission Oil Cooling System Flush and Flow Test Tool
- **DT-45096-50** Transmission Cooler Flush Adapter
- Shop air supply with water/oil filters, regulator and pressure gauge - minimum 90 psi
- Eye protection
- Rubber gloves

#### **Machine Set-up**



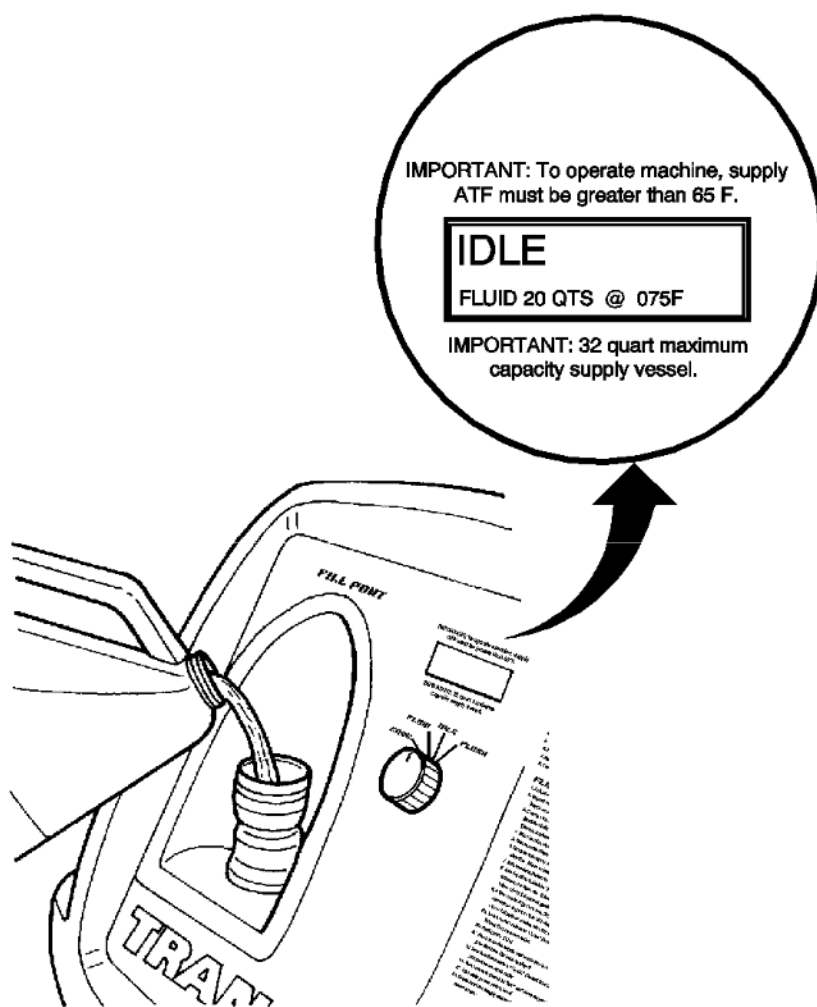
**Fig. 10: View Of Main Power Switch & Main Function Switch**  
Courtesy of GENERAL MOTORS COMPANY

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.



**Fig. 11: Connecting To 12V DC Power Source**  
Courtesy of GENERAL MOTORS COMPANY

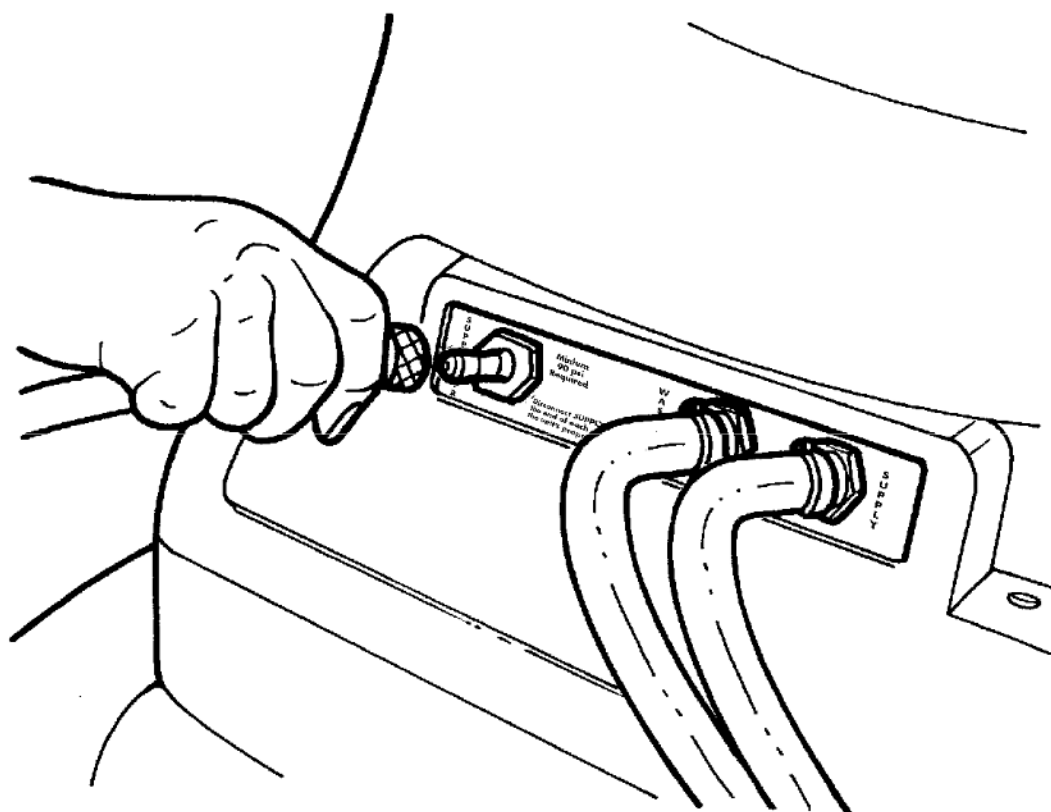
3. Connect **DT-45096** flush and flow test tool to the vehicle 12V DC power source by connecting the red battery clip to the positive, +, battery post on the vehicle and connect the negative lead to a known good chassis ground.
4. Turn the main power switch to the ON position.



**Fig. 12: Filling Supply Tank With Transmission Fluid**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Do not overfill the supply vessel. Damage to the unit may result. To verify the fluid level, view the LCD screen display while filling the unit, to ensure the fluid level does not exceed 30 L (32 qt).

5. Fill the supply tank with Dexron®VI through the fill port.
6. Reinstall and tighten the fill cap.

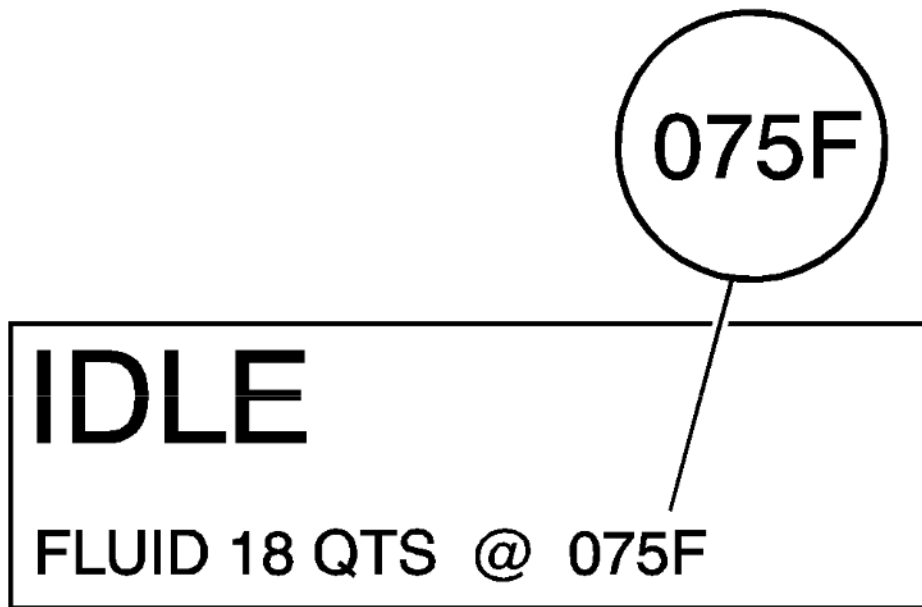


**Fig. 13: Applying Shop Air Supply Hose To Quick-Disconnect**  
Courtesy of GENERAL MOTORS COMPANY

7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

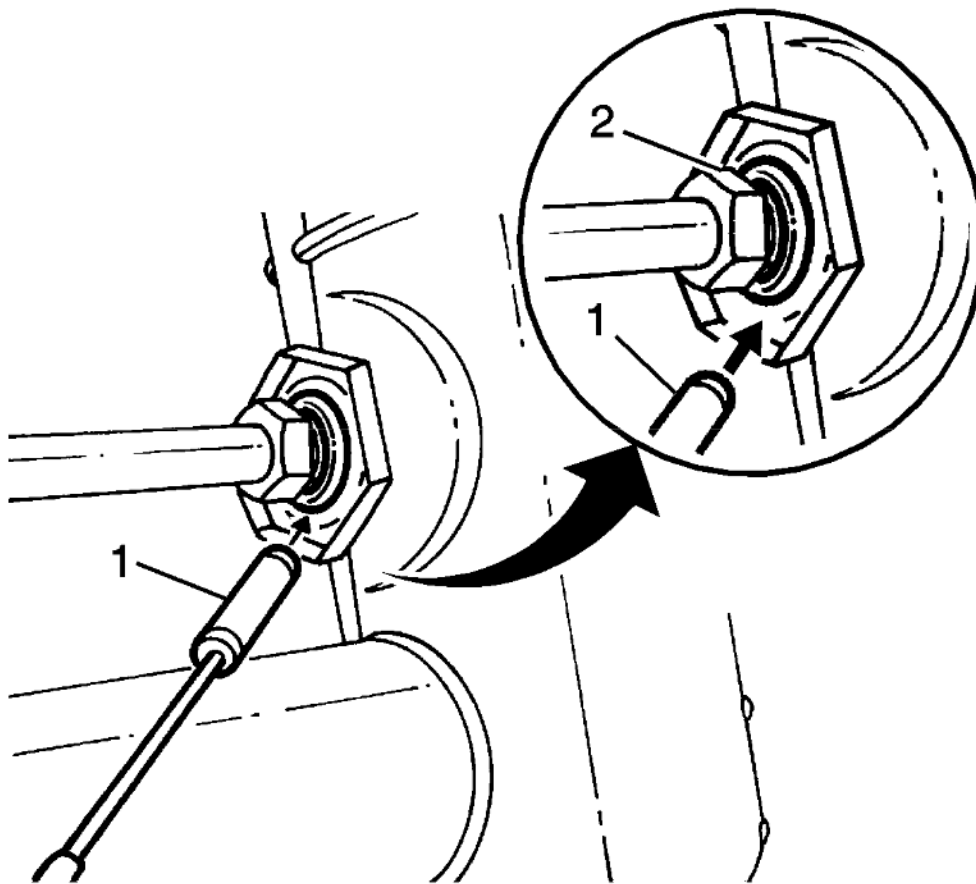
**Determine Minimum Flow Rate**





**Fig. 14: Identifying Machine Display Of Automatic Transmission Fluid Temperature**  
Courtesy of GENERAL MOTORS COMPANY

1. From the machine display, identify the temperature of the automatic transmission fluid that is stored in the supply vessel of **DT-45096** flush and flow test tool.



**Fig. 15: Identifying Transmission Oil Cooler Metal Composition**  
Courtesy of GENERAL MOTORS COMPANY

2. Determine whether the transmission oil cooler is steel or aluminum by using a magnet (1) at the cooler flange (2) at the radiator.
3. Refer to the table below. Using the temperature from step 1, locate on either the Steel MINIMUM Flow Rate table or the Aluminum MINIMUM Flow Rate table the minimum flow rate in gallons per minutes (GPM). Record the minimum flow rate in GPMs and the supply fluid temperature for further reference.

#### Example

- Fluid temperature: 75°F
- Cooler type: Steel

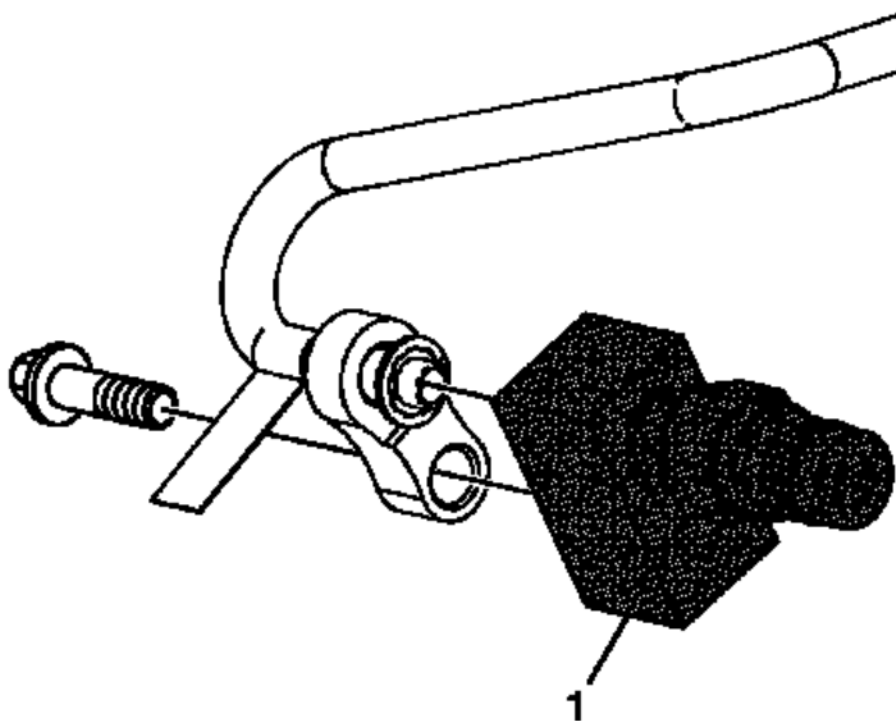
The MINIMUM flow rate for this example would be 0.8 GPM.

4. Inspect transmission oil cooler lines for damage or kinks that could cause restricted oil flow. Repair as needed and refer to the appropriate GM service manual procedures.

#### Minimum Flow Rate in Gallons Per Minute (gpm)

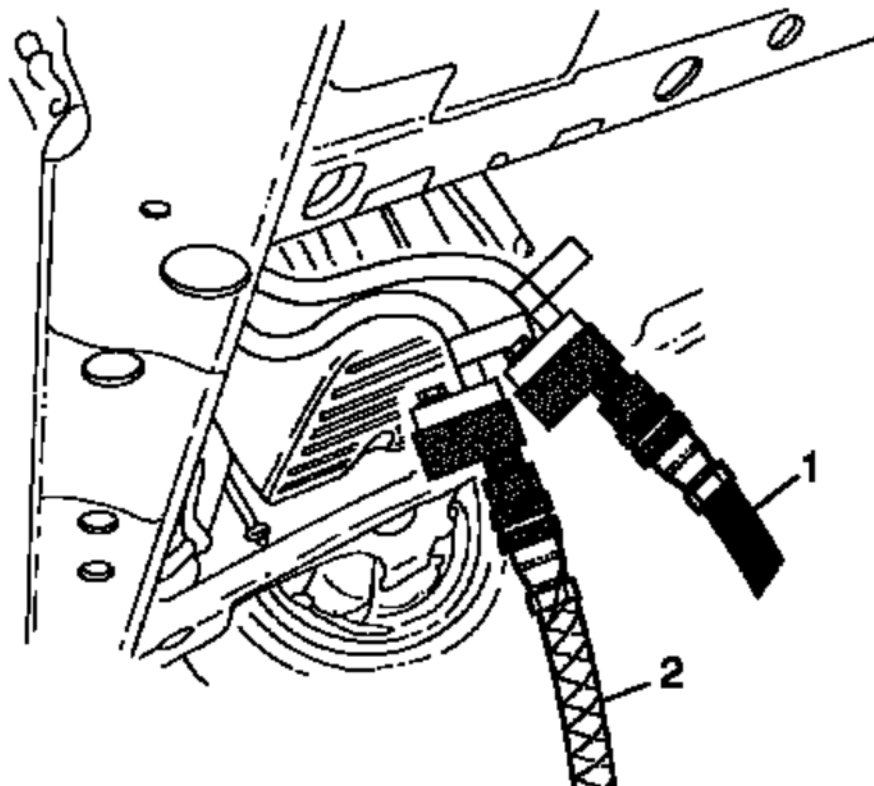
| Temperature Range | Steel   | Aluminum |
|-------------------|---------|----------|
| 65 - 66°F         | 0.6 gpm | 0.5 gpm  |
| 67 - 70°F         | 0.7 gpm | 0.6 gpm  |
| 71 - 75°F         | 0.8 gpm | 0.7 gpm  |
| 76 - 80°F         | 0.9 gpm | 0.8 gpm  |
| 81 - 84°F         | 1.0 gpm | 0.9 gpm  |
| 85 - 89°F         | 1.1 gpm | 1.0 gpm  |
| 90 - 94°F         | 1.2 gpm | 1.1 gpm  |
| 95 - 98°F         | 1.3 gpm | 1.2 gpm  |
| 99 - 103°F        | 1.4 gpm | 1.3 gpm  |
| 104 - 108°F       | 1.5 gpm | 1.4 gpm  |
| 109 - 112°F       | 1.6 gpm | 1.5 gpm  |
| 113 - 117°F       | 1.7 gpm | 1.6 gpm  |
| 118 - 120°F       | 1.8 gpm | 1.7 gpm  |

#### Back Flush Procedure



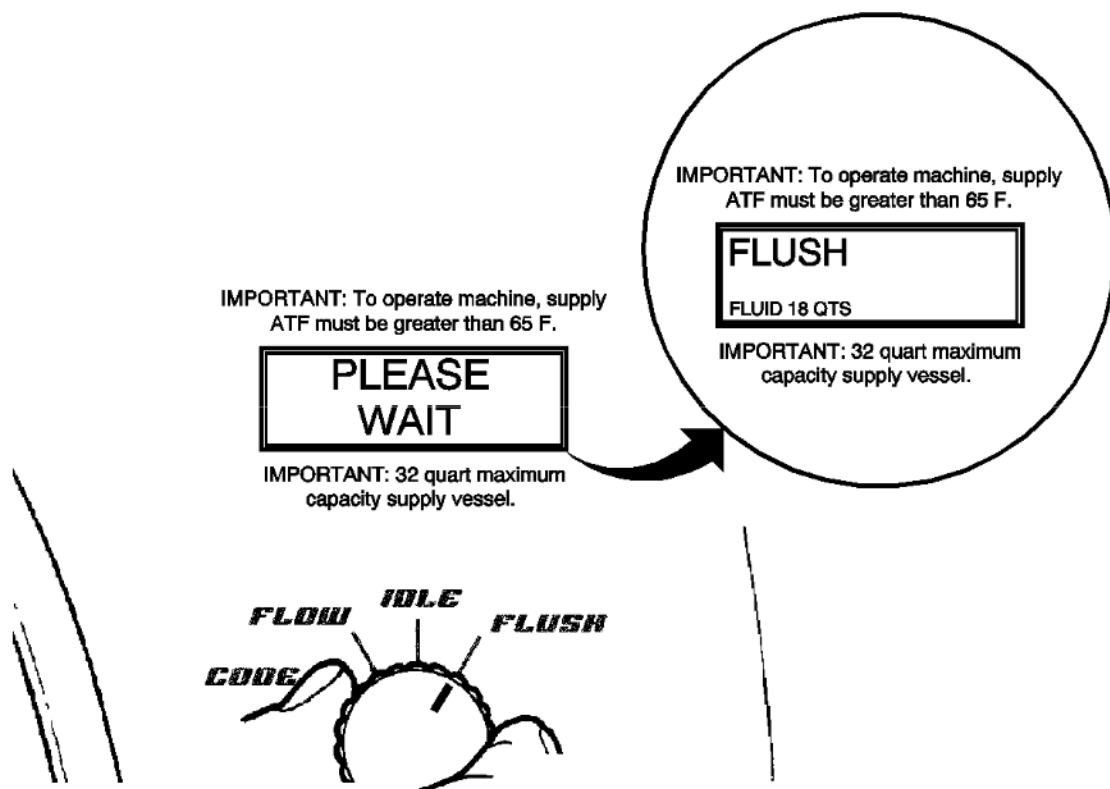
**Fig. 16: Identifying Special Tool - J 45096-50**  
Courtesy of GENERAL MOTORS COMPANY

1. Connect the **DT-45096-50** cooler flush adapter (1) to the vehicle transmission oil cooler supply and return lines at the transmission.



**Fig. 17: View Of Black Supply Hose And Clear Waste Hose**  
Courtesy of GENERAL MOTORS COMPANY

2. Connect the black supply hose (1) to the return line, top connector of the transmission, and the clear waste hose (2) to the feed line, bottom connector of the transmission, to the vehicle cooler lines. This is the reverse flow - backflush direction.



**Fig. 18: View Of Main Function Switch FLUSH Position**  
Courtesy of GENERAL MOTORS COMPANY

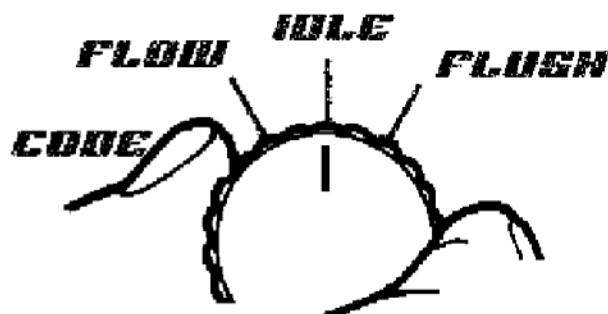
3. Turn the main function switch to the FLUSH position. Allow the machine to operate for 30 seconds.

IMPORTANT: To operate machine, supply  
ATF must be greater than 65 F.

**IDLE**

FLUID 16 QTS @ 075F

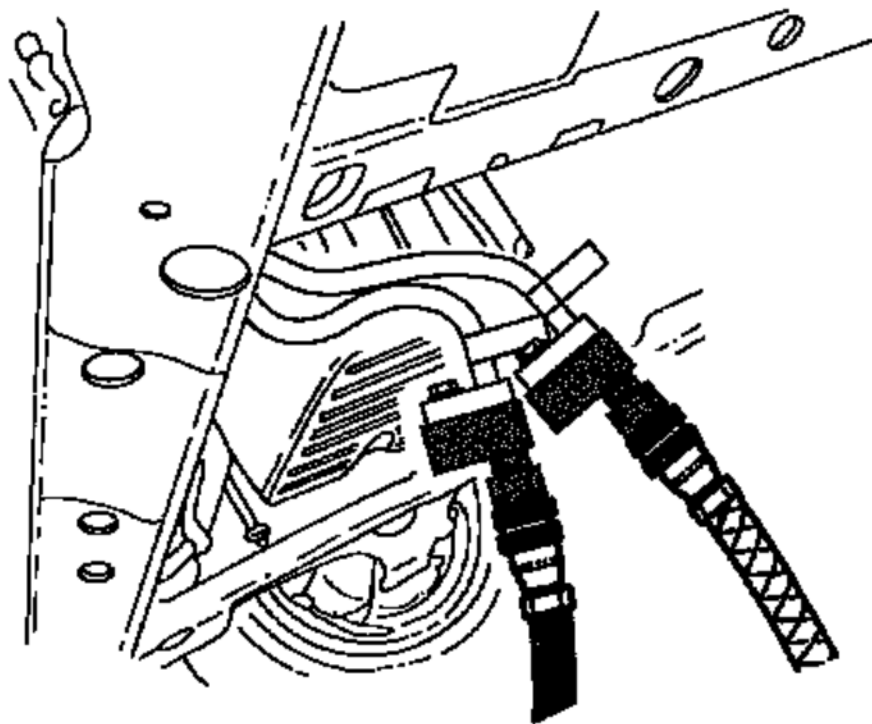
IMPORTANT: 32 quart maximum  
capacity supply vessel.



**Fig. 19: View Of Main Function Switch IDLE Position**  
Courtesy of GENERAL MOTORS COMPANY

4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

**Forward Flush**



**Fig. 20: Identifying Supply And Waste Hoses**  
Courtesy of GENERAL MOTORS COMPANY

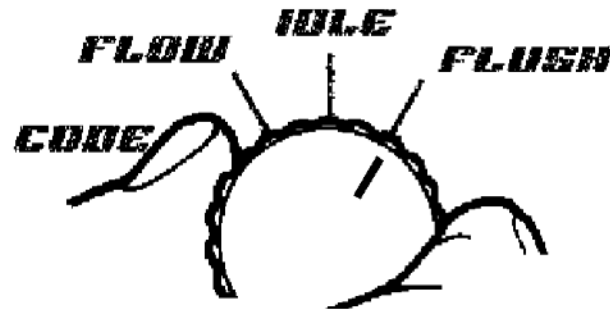
1. Disconnect the supply and waste hoses from the vehicle cooler lines. Reverse the supply and waste hoses to provide a normal flow direction.

IMPORTANT: To operate machine, supply  
ATF must be greater than 65 F.

**FLUSH**

FLUID 18 QTS

IMPORTANT: 32 quart maximum  
capacity supply vessel.

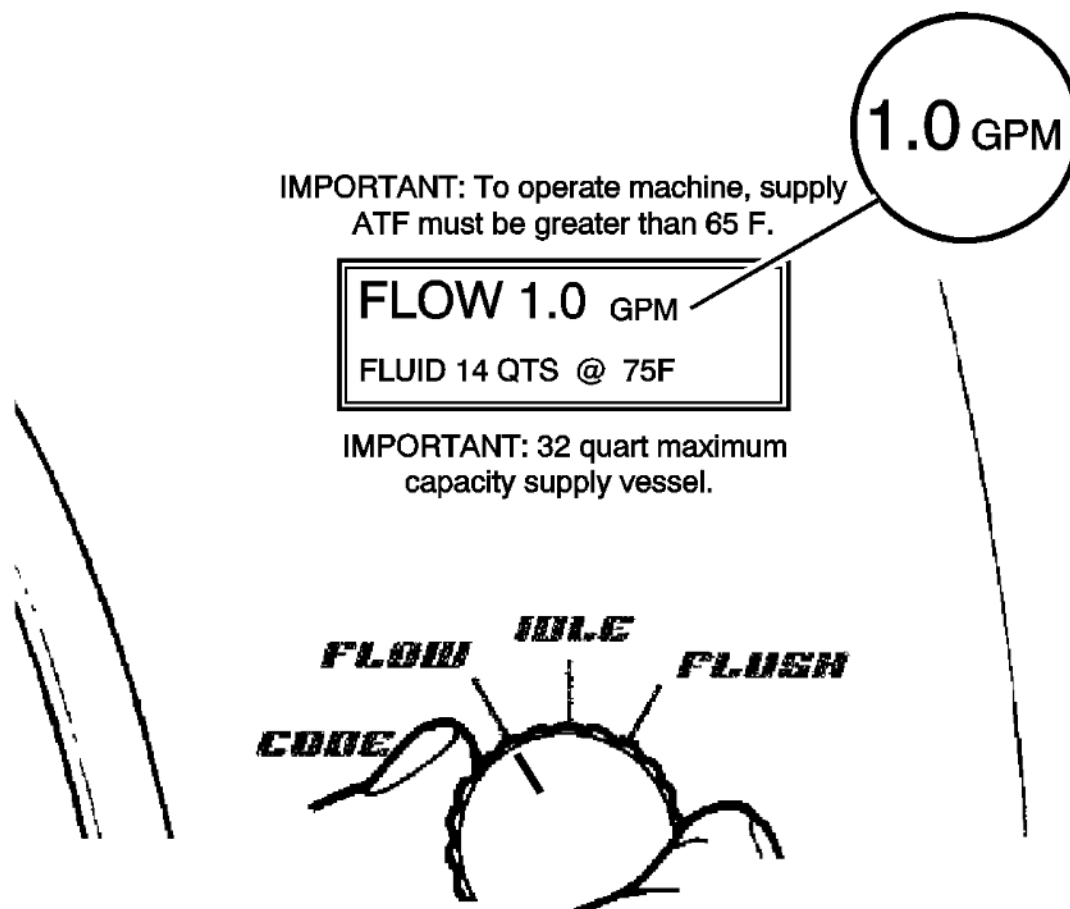


**Fig. 21: View Of Main Function Switch FLUSH Position**  
Courtesy of GENERAL MOTORS COMPANY

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

Flow Test





**Fig. 22: View Of Main Function Switch FLOW Position**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** If the flow rate is less than 0.5 gpm, the LCD displays an error message. Refer to the Troubleshooting section of the operation manual.

1. Turn the main function switch to the FLOW position and allow the oil to flow for 15 seconds. Observe and note the flow rate; this is the TESTED flow rate.
2. Compare the TESTED flow rate to the MINIMUM flow rate information previously recorded.
  - If the TESTED flow rate is equal to or greater than the MINIMUM flow rate recorded, the oil cooling system is functioning properly. Perform Code Recording Procedure.
  - If the TESTED flow rate is less than the MINIMUM flow rate previously recorded, repeat the back flush and forward flush procedures.
3. If the TESTED flow rate is less than the MINIMUM flow rate after the second test, perform Code Recording Procedure.

1. Replace the transmission oil cooler.
2. Reconnect supply and waste hoses to the cooler lines in the normal flow direction. Perform Flow Test.
3. Perform Code Recording Procedure.

#### Code Recording Procedure

**IMPORTANT:** To operate machine, supply  
ATF must be greater than 65 F.

FLOW 1.0 @ 75F CYCLE 6  
**A10DFB2**

**IMPORTANT:** 32 quart maximum  
capacity supply vessel.



**Fig. 23: View Of Main Function Switch CODE Position**  
Courtesy of GENERAL MOTORS COMPANY

1. Turn the main function switch to the CODE position.

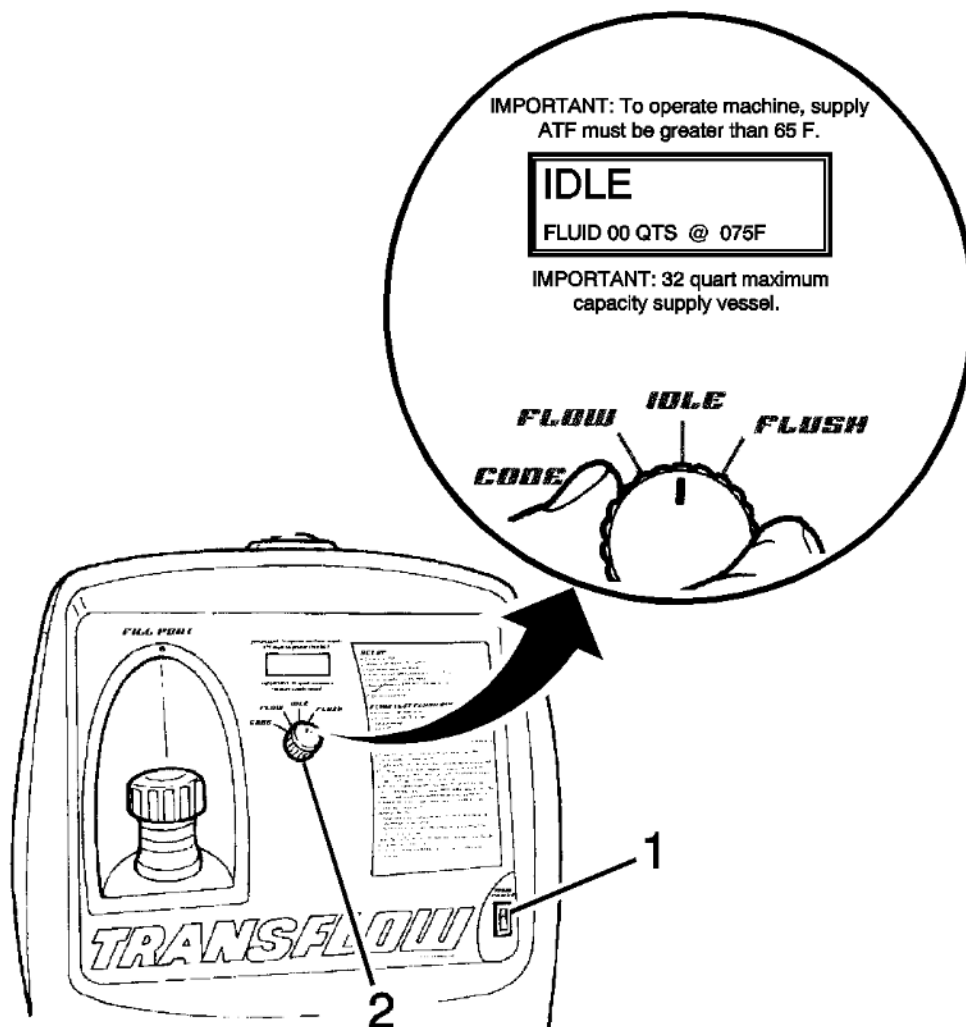
**NOTE:**

- If power is interrupted prior to the recording of the seven-character code, the code will be lost and the flow rate test will need to be repeated.

- The flow test must run for a minimum of 8-10 seconds and be above 0.5 GPM for a code to be generated.

2. Record TESTED flow rate, temperature, cycle and seven-character flow code information on repair order.

#### Clean-up



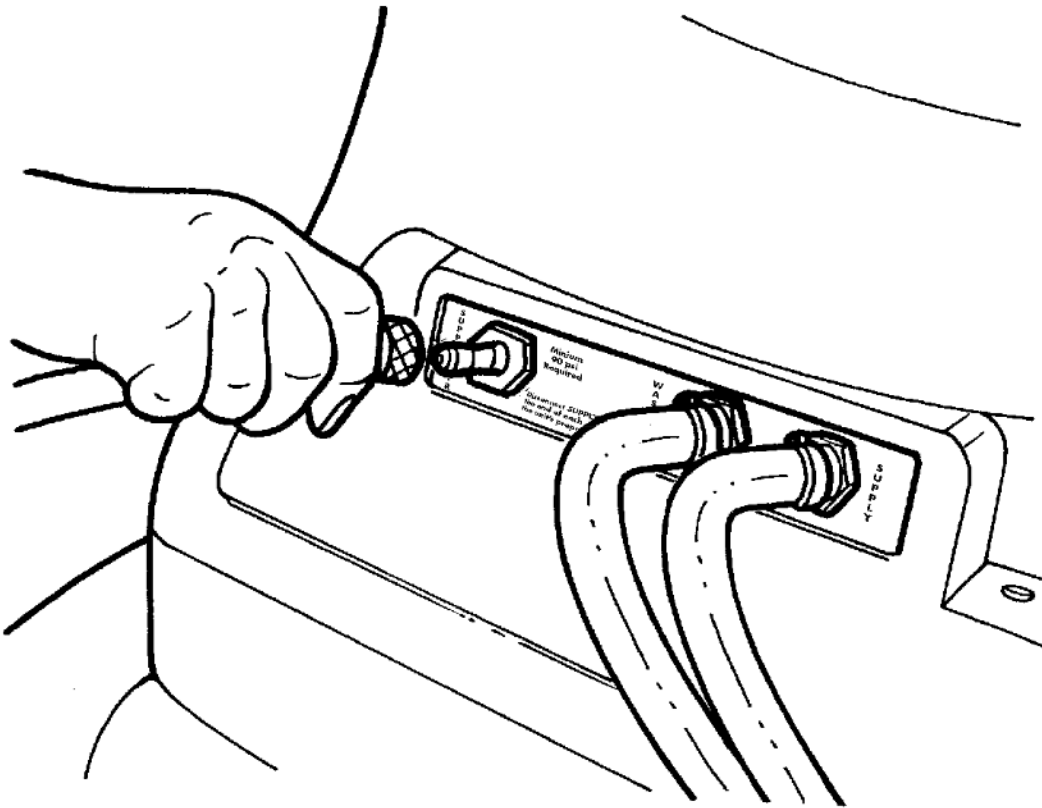
**Fig. 24: View Of Main Power Switch & Main Function Switch**  
 Courtesy of GENERAL MOTORS COMPANY

1. Turn the main function switch (2) to the IDLE position and allow the supply vessel pressure to dissipate.
2. Turn the main power switch (1) to the OFF position.

**NOTE:** A small amount of water may drain from the bottom of the unit when the air supply is disconnected. This is a normal operation of the built-in water

separator.

3. Disconnect the supply and waste hoses and the 12-volt power source from the vehicle.



**Fig. 25: Applying Shop Air Supply Hose To Quick-Disconnect**  
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the air supply hose from **DT-45096** flush and flow test tool.
5. Dispose of the waste ATF in accordance with all applicable federal, state, and local requirements.

## BUSHING AND MATING SHAFT INSPECTION

**NOTE:** Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

## NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the vibration may be a result of poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
  - Missing bolts, nuts, and studs
  - Stripped threads
  - Cracks
- Inspect the flywheel for the following conditions:
  - Missing or loose bolts
  - Cracks
  - Imbalance
- Inspect the torque converter for the following conditions:
  - Missing or loose bolts or lugs
  - Missing or loose balance weights
  - Imbalance caused by heat distortion or fluid contamination
- If the noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is more noticeable as RPM increases, the vibration may be an engine imbalance or a transmission imbalance. Refer to **Torque Converter Diagnosis**.

## WHINE/GROWL NOISE

### Whine/Growl Noise

| Checks                         | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Differential Assembly (232)    | <ul style="list-style-type: none"><li>• Inspect for worn wheel bearings or axles.</li><li>• Inspect for worn or damaged Side Gear Thrust Washer) or Pinion Gear Thrust Washer</li><li>• Inspect for loose or worn Side Gear Axle Splines</li><li>• Inspect for damaged or worn Side Gear</li><li>• Inspect for worn or damaged Final Drive Inner and Outer Washers (584)</li><li>• Inspect for loose, damaged or worn Front Differential Carrier Thrust Bearings, (228, 231, 233)</li><li>• Inspect for broken, worn or disengaged Final Drive Pinion Pin Retainer (581)</li><li>• Inspect for damaged or worn Pinion Gears</li></ul> |
| Drive Link Assembly (225)      | <ul style="list-style-type: none"><li>• Inspect for worn, loose or damaged links</li><li>• Inspect for broken, worn or loose Drive Link Lube Scoop (60)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Drive Sprocket Assembly (224)  | <ul style="list-style-type: none"><li>• Inspect for improper Drive Sprocket (224) tooth surface finish</li><li>• Inspect for broken or damaged Drive Sprocket (224) teeth</li><li>• Inspect for worn or damaged Drive Sprocket Thrust Bearings (223, 556)</li><li>• Inspect for worn or damaged Output Carrier Transfer Drive Gear Hub Assembly splines (222)</li><li>• Inspect for loose, worn or damaged Output Carrier Transfer Drive Gear Hub Assembly bushing</li></ul>                                                                                                                                                          |
| Driven Sprocket Assembly (229) | <ul style="list-style-type: none"><li>• Inspect for worn, binding or damaged Driven Sprocket Bearing Assembly (228)</li><li>• Inspect for worn or damaged Driven Sprocket Ball Bearing Assembly</li><li>• Inspect for improper Driven Sprocket (229) tooth surface finish</li><li>• Inspect for broken or damaged Driven Sprocket (229) teeth</li></ul>                                                                                                                                                                                                                                                                               |
| Input Carrier Assembly (570)   | <ul style="list-style-type: none"><li>• Inspect for pitted/spalled Pinion Gear teeth</li><li>• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings</li><li>• Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings</li><li>• Inspect for loose or broken Hub and Ring Gear</li></ul>                                                                                                                                                                                                                                                                                                                      |

|                                  |                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                  | <ul style="list-style-type: none"> <li>• Inspect for loose or broken Output Internal Gear Retainer</li> <li>• Inspect for loose or worn Sun Gear Thrust Bearings (569, 572)</li> </ul>                                                                                                                                            |
| Output Carrier Assembly (574)    | <ul style="list-style-type: none"> <li>• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings</li> <li>• Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings</li> <li>• Inspect for loose Hub and Ring Gear</li> </ul>                                                                               |
| Output Sun Gear Assembly (555)   | <ul style="list-style-type: none"> <li>• Inspect for worn or damaged Output Sun Gear Thrust Bearing (556)</li> <li>• Inspect for loose, worn or damaged Output Sun Gear bushing</li> <li>• Inspect for worn or damaged Output Sun Gear teeth</li> </ul>                                                                           |
| Reaction Carrier Assembly (567)  | <ul style="list-style-type: none"> <li>• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings</li> <li>• Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings</li> <li>• Inspect for loose hub and Ring Gear</li> <li>• Inspect for worn or damaged Reaction Carrier Thrust Bearings (565)</li> </ul> |
| Reaction Sun Gear Assembly (566) | Inspect for loose, worn or damaged Reaction Sun Gear Assembly bushing                                                                                                                                                                                                                                                             |
| Fluid Pump Assembly (201)        | <ol style="list-style-type: none"> <li>1. Inspect for proper fluid level</li> <li>2. Inspect for leaking Pump Fluid Outlet Seal Assembly (24) or Filter Seal</li> </ol>                                                                                                                                                           |
| 3-5-Reverse Clutch Assembly      | <ul style="list-style-type: none"> <li>• Inspect for inadequate Clutch Plate Clearance</li> <li>• Inspect for stripped or sheared Clutch Plate Splines (508-510)</li> <li>• Inspect for loose or worn Backing Plate Retainer (511)</li> <li>• Inspect for loose Speed Sensor Reluctor Wheel (501) or Retainer (500)</li> </ul>    |
| 4-5-6 Clutch Assembly            | <ul style="list-style-type: none"> <li>• Inspect for inadequate Clutch Plate Clearance</li> <li>• Inspect for stripped or sheared Clutch Plate Splines (425-428)</li> <li>• Inspect for loose or worn Clutch Dam Retainer (524)</li> <li>• Inspect for loose or worn 3-5-Reverse/4-5-6 Clutch Housing Bushing</li> </ul>          |
| 1-2-3-4 Clutch Assembly          | <ul style="list-style-type: none"> <li>• Inspect for inadequate Clutch Plate Clearance</li> <li>• Inspect for stripped or sheared Clutch Plate Splines (557-559)</li> </ul>                                                                                                                                                       |

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                             | <ul style="list-style-type: none"> <li>• Inspect for loose or worn Clutch Spring Retainer (561)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Low and Reverse Clutch Assembly (OWC) (543) | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared Low and Reverse Clutch Assembly (543) splines</li> <li>• Inspect for non-rotating Low and Reverse Clutch Assembly (543)</li> </ul>                                                                                                                                                                                                                                                                                                                                                     |
| Low and Reverse Clutch                      | <ul style="list-style-type: none"> <li>• Inspect for inadequate Clutch Plate Clearance</li> <li>• Inspect for stripped or sheared Clutch Plate Splines (545-547)</li> <li>• Inspect for loose or worn Clutch Spring Retainer (548)</li> </ul>                                                                                                                                                                                                                                                                                                                   |
| 2-6 Clutch Assembly                         | <ul style="list-style-type: none"> <li>• Inspect for inadequate Clutch Plate Clearance</li> <li>• Inspect for stripped or sheared Clutch Plate Splines (540-542)</li> <li>• Inspect for loose or worn Clutch Spring Retainer (537)</li> </ul>                                                                                                                                                                                                                                                                                                                   |
| Case Assembly (50)                          | <ul style="list-style-type: none"> <li>• Inspect for loose or broken Transmission Mount Bolts</li> <li>• Inspect for loose Torque Converter and Differential Housing Bolts (26)</li> <li>• Inspect for loose, worn or damaged differential bushing</li> <li>• Inspect for loose or broken Input Shaft Support Bolts (57)</li> <li>• Inspect for loose or broken Front Differential Carrier Baffle Bolts (61)</li> <li>• Inspect for stripped or sheared splines</li> <li>• Inspect for loose, worn or damaged bushing</li> </ul>                                |
| Torque Converter Housing Assembly (208)     | <ul style="list-style-type: none"> <li>• Inspect for loose or broken Front Differential Ring Gear Retainer (206)</li> <li>• Inspect for loose, worn or damaged differential bushing</li> <li>• Inspect for loose or broken Pinion Gear Shaft Retainer Pin</li> <li>• Inspect for loose or broken Front Differential Carrier Baffle Bolts (204)</li> <li>• Inspect for loose or broken Fluid Pump Bolts (200)</li> <li>• Inspect for loose Torque Converter and Differential Housing Bolts (26)</li> <li>• Inspect for loose, worn or damaged bushing</li> </ul> |
| Control Valve Body Cover Assembly (2)       | Inspect for loose, missing or broken Valve Body Cover Bolts (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Torque Converter (28)                       | <ul style="list-style-type: none"> <li>• Inspect for improper alignment of Torque Converter to the Crankshaft</li> <li>• Inspect for ballooning of the Torque Converter</li> </ul>                                                                                                                                                                                                                                                                                                                                                                              |
|                                             | <ul style="list-style-type: none"> <li>• Inspect for worn or damaged Differential Carrier (582)</li> <li>• Inspect for worn or damaged Pinion Pins (583)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             |



|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Differential Carrier Assembly (232) | <ul style="list-style-type: none"> <li>• Inspect for broken, worn or damaged Differential Sun Gear Bearing (231) or Driven Sprocket Bearing (228)</li> <li>• Inspect for worn or damaged Differential Side Gear teeth, Final Drive Pinion Gear (586) teeth or Final Drive Sun Gear (230) teeth</li> <li>• Inspect for worn or damaged Differential Side Gear Thrust Washers or Final Drive Inner and Outer Washers (584)</li> <li>• Inspect for worn or damaged Final Drive Rollers (585)</li> <li>• Inspect for broken or damaged Differential Pinion Gear Shaft Retainer</li> </ul> |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## AUTOMATIC TRANSMISSION FLUID LEAKS

### Automatic Transmission Fluid Leaks

| Checks                                  | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Torque Converter (28)                   | Inspect for damage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Case Assembly (50)                      | <ul style="list-style-type: none"> <li>• Inspect for cracked or broken Case (50)</li> <li>• Inspect for porosity or damage on the sealing surfaces</li> <li>• Inspect for loose Oil Cooler Line Bolts or damaged Oil Cooler Line Seals</li> <li>• Inspect for damaged Manual Shift Shaft Seal (604)</li> <li>• Inspect for damaged or worn Axle Seal (65) or Axle Seal Slinger on the axle shafts</li> <li>• Inspect for plugged Vent Cap (52)</li> <li>• Inspect for loose Pressure Test Plug (51), Drain Plug (64) and Fluid Level Plug (63)</li> <li>• Inspect for damaged Park Pawl Actuator Guide Seal (605)</li> <li>• Inspect for damaged or worn Input Speed Sensor Seals (19)</li> </ul> |
| Torque Converter Housing Assembly (208) | <ul style="list-style-type: none"> <li>• Inspect for damaged Torque Converter Housing Assembly (208)</li> <li>• Inspect for porosity or damage on the sealing surfaces</li> <li>• Inspect for damaged Torque Converter Housing Seal (23)</li> <li>• Inspect for damaged or worn Torque Converter Fluid Seal (301)</li> <li>• Inspect for loose Torque Converter and Differential Housing Bolts (26)</li> <li>• Inspect for damaged or worn Axle Seal (209) or Axle Seal Slings on the axle shafts</li> <li>• Inspect for loose, missing or damaged Fluid Fill Tube Plug Assembly (27)</li> <li>• Inspect for damaged Torque Converter and Differential</li> </ul>                                 |

|                               |                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | Housing Seal (202)                                                                                                                                                                                                                                                                                                                             |
| Valve Body Cover Assembly (2) | <ul style="list-style-type: none"> <li>• Inspect for damaged or warped Valve Body Cover Assembly (2)</li> <li>• Inspect for damaged or improperly installed Valve Body Cover Gasket (3)</li> <li>• Inspect for loose Valve Body Cover Bolts (1)</li> <li>• Inspect for damaged or improperly installed Wire Connector Hole Seal (5)</li> </ul> |

## SHIFT INDICATOR INDICATES WRONG GEAR SELECTION

### Shift Indicator Indicates Wrong Gear Selection

| Checks                                                             | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Shift Cable                                                        | <ul style="list-style-type: none"> <li>• Inspect for damage.</li> <li>• Verify proper attachment to shifter.</li> <li>• Verify cable is locked into shifter bracket.</li> <li>• Verify cable is properly attached to the transmission.</li> <li>• Verify that the cable is locked into the transmission bracket.</li> <li>• Verify proper cable adjustment. Refer to <b><u>Range Selector Lever Cable Adjustment</u></b> .</li> </ul> |
| Manual Shaft                                                       | <ul style="list-style-type: none"> <li>• Verify shift lever is properly attached to the manual shaft.</li> <li>• Verify manual shaft is not twisted or damaged.</li> </ul>                                                                                                                                                                                                                                                            |
| Manual Shift Detent Lever with Shaft Position Switch Assembly, IMS | Verify proper operation. Refer to <b><u>Transmission Internal Mode Switch Logic</u></b> .                                                                                                                                                                                                                                                                                                                                             |

## NO PARK

### No Park

| Checks                              | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Differential Carrier Assembly (232) | <ul style="list-style-type: none"> <li>• Inspect for damaged or broken Front Differential Assembly (232).</li> <li>• Inspect for damaged or broken Front Differential Side Gear or Pinion Gear.</li> <li>• Inspect for damaged or broken Front Differential Pinion Gear Shaft.</li> <li>• Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin.</li> <li>• Inspect for worn, stripped or sheared Front Differential Side Gear splines.</li> <li>• Inspect for damaged or broken Final Drive Sun, Pinion</li> </ul> |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                       | <ul style="list-style-type: none"> <li>• or Ring Gear.</li> <li>• Inspect for worn, stripped or sheared Final Drive Sun Gear splines.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Output Carrier Transfer Drive Gear Hub Assembly (222) | <ul style="list-style-type: none"> <li>• Inspect for broken Drive Gear Hub (222).</li> <li>• Inspect for worn, stripped or sheared Drive Gear hub (222) splines.</li> <li>• Inspect for disengaged or broken Park Gear Retainer Ring (220).</li> <li>• Inspect for damaged or broken park Gear (221).</li> <li>• Inspect for disengaged or broken Drive Sprocket Retainer Ring (227).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                  |
| Drive Link Assembly (225)                             | <ul style="list-style-type: none"> <li>• Inspect for broken, worn or damaged Drive Link Assembly (225).</li> <li>• Inspect for broken, worn or damaged Drive Sprocket (224).</li> <li>• Inspect for broken, worn or damaged Driven Sprocket Assembly (229).</li> <li>• Inspect for worn, stripped or sheared Driven Sprocket splines.</li> <li>• Inspect for broken Drive Gear Hub (222).</li> </ul>                                                                                                                                                                                                                                                                                                                                                              |
| Case Assembly (50)                                    | <ul style="list-style-type: none"> <li>• Inspect for broken or damaged Case.</li> <li>• Inspect for broken or bent Park Pawl Shaft (600).</li> <li>• Inspect for broken or missing Park Pawl Actuator Guide Pin (603) or Manual Shaft Pin (611).</li> <li>• Inspect for broken or missing Manual Shaft Detent Lever Pin (610).</li> <li>• Inspect for broken or missing Manual Shift Shaft Pin (611).</li> <li>• Inspect for damaged or broken Manual Shift Detent Lever Shaft (608).</li> <li>• Inspect for loose, damaged or broken Detent Lever Spring Assembly (17).</li> <li>• Inspect for broken, loose or misaligned Park Pawl Actuator Guide (606).</li> <li>• Inspect for binding, bent or broken Park Pawl (602) or Actuator Assembly (607).</li> </ul> |

## HARSH GARAGE SHIFT

### Harsh Garage Shift

| Checks | Causes |
|--------|--------|
|        |        |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Carrier Assembly (570)                 | Inspect for worn or stripped Output Internal Gear Splines.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Low-Reverse and 1-2-3-4 Clutch Housing (551) | <ul style="list-style-type: none"> <li>Inspect for damaged or fatigued 1-2-3-4 Clutch Wave Plate (557) and Low and Reverse Clutch Wave Plate (547). Refer to <b><u>Clutch Plate Diagnosis</u></b>.</li> <li>Inspect for stripped or sheared splines on 1-2-3-4 Clutch Plate (546). Refer to <b><u>Clutch Plate Diagnosis</u></b>.</li> <li>Inspect for improperly positioned or plugged Low Reverse Piston (550) air bleed.</li> <li>Inspect for correct fluid level.</li> </ul> |
| Low and Reverse Clutch Assembly (OWC) (543)  | Inspect for stripped or sheared internal and external splines on Low and Reverse Clutch Assembly (543).                                                                                                                                                                                                                                                                                                                                                                          |

## NO DRIVE IN ALL RANGES

### No Drive in All Ranges

| Checks                         | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Case Assembly (50)             | <ul style="list-style-type: none"> <li>Inspect for cracked or broken Case (50).</li> <li>Inspect for stripped or sheared splines.</li> <li>Inspect for binding Manual Shift Detent Lever Assembly (609).</li> <li>Inspect for missing Manual Shift Shaft Pin (611).</li> <li>Inspect for missing Manual Shaft Lever Pin (610).</li> <li>Inspect for interference or binding Park Pawl Actuator Assembly (607).</li> <li>Inspect for broken or disengaged 1-2-3-4 Clutch Backing Plate Retainer Ring (561).</li> <li>Inspect for loose or damaged case bushing.</li> <li>Inspect A/Trans Fluid Pump Seal Assembly (25) for damage.</li> </ul> |
| Torque Converter (28)          | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared splines on Turbine Shaft.</li> <li>Inspect for missing Torque Converter to Flywheel bolts.</li> <li>Inspect for damaged or disengaged Torque Converter Hub to Oil Pump Drive Gear.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         |
| Torque Converter Housing (208) | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared Differential Ring Gear splines.</li> <li>Inspect for broken or disengaged Differential Ring Gear Retainer (206).</li> <li>Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (26).</li> <li>Inspect for loose, missing or broken Fluid Pump bolts (200).</li> </ul>                                                                                                                                                                                                                                                                 |

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35R/456 Housing Assembly (516)      | <ul style="list-style-type: none"> <li>• Inspect for damaged or broken Input Shaft Thrust Bearing Assembly (538).</li> <li>• Inspect for stripped or sheared splines on the Input Shaft to the 3-5 Reverse/4-5-6 Clutch Housing (516).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Oil Pump Assembly (201)             | <ul style="list-style-type: none"> <li>• Inspect for fluid leaks / improper fluid level.</li> <li>• Inspect for leaking Fluid Outlet Seal Assembly (24).</li> <li>• Inspect for loose or missing Oil Pump Bolts (200).</li> <li>• Inspect for damaged, restricted or improperly installed Oil Filter Assembly (203).</li> <li>• Inspect for damaged or leaking Oil Filter Neck Seal.</li> <li>• Inspect for broken or seized Fluid Pump Drive Gear (315) and Fluid Pump Driven Gear (316).</li> </ul>                                                                                                                                                                                                  |
| Low & Reverse Clutch Assembly (543) | Inspect for stripped or sheared splines to the Reaction Carrier (567).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Input Carrier Assembly (570)        | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared castle splines to ring gear.</li> <li>• Inspect for improperly installed carrier pinion gear pins.</li> <li>• Inspect for damaged or broken Pinion Gears.</li> <li>• Inspect for stripped or sheared splines on the Input Sun Gear (571).</li> <li>• Inspect for damaged or broken Output Internal Gear.</li> <li>• Inspect for broken or disengaged Output Internal Gear Retainer Ring.</li> <li>• Inspect for damaged or broken Input Carrier Thrust Bearing Assembly (568) and Output Carrier Thrust Bearing Assembly (573).</li> <li>• Inspect for damaged or broken Input Carrier Thrust Bearings (569, 572).</li> </ul> |
| Reaction Carrier Assembly (567)     | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared Reaction Carrier Assembly (567) splines.</li> <li>• Inspect for damaged or broken Input Carrier Thrust Bearings (568).</li> <li>• Inspect for damaged or broken Pinion Gear teeth.</li> <li>• Inspect for damaged or broken Reaction Internal Gear teeth.</li> <li>• Inspect for disengaged or broken Reaction Internal Gear retainer ring.</li> </ul>                                                                                                                                                                                                                                                                        |
| Reaction Sun Gear Assembly (566)    | <ul style="list-style-type: none"> <li>• Inspect for damaged or broken weld at Sun Gear.</li> <li>• Inspect for loose or worn Reaction Sun Gear Assembly bushing.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                     | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared splines to reaction internal</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Carrier Assembly (574)                    | <ul style="list-style-type: none"> <li>ring gear.</li> <li>Inspect for damaged or broken Input Sun Gear Thrust Bearings (572).</li> <li>Inspect for damaged or broken Pinion Gear teeth.</li> <li>Inspect for damaged or broken Input Carrier Thrust Bearings (573).</li> <li>Inspect for broken or damaged Output Internal Gear.</li> </ul>                                                                                                                                                                                                                                                         |
| Output Sun Gear Assembly (555)                   | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared Output Sun Gear Assembly (555) splines.</li> <li>Inspect for broken Output Sun Gear Assembly (555) hub or weld.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                    |
| Low-Reverse and 1-2-3-4 Clutch Housing (551)     | Inspect for disengaged or broken 1-2-3-4 Clutch Piston Spring Retainer (554).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Drive Link Assembly (225)                        | <ul style="list-style-type: none"> <li>Inspect for broken, worn or damaged Drive Link Assembly (225).</li> <li>Inspect for broken, worn or damaged Drive Sprocket (224).</li> <li>Inspect for broken, worn or damaged Driven Sprocket Assembly (229).</li> <li>Inspect for broken Drive Gear Hub (222).</li> </ul>                                                                                                                                                                                                                                                                                   |
| Differential Carrier Assembly (232)              | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared splines on Differential Side Gear.</li> <li>Inspect for stripped or sheared splines Final Drive Sun Gear (230).</li> <li>Inspect for stripped or sheared splines Differential Carrier to PTU (AWD only).</li> <li>Inspect for stripped broken or disengaged Final Drive Retainer (581).</li> <li>Inspect for damaged or broken Pinion Gear teeth.</li> <li>Inspect for damaged or broken Final Drive Rollers (585).</li> <li>Inspect for broken, worn or damaged Final Drive Inner and Outer Thrust Washers (584).</li> </ul> |
| Control Solenoid (w/Body and TCM) Valve Assembly | <ul style="list-style-type: none"> <li>Check that the Manual Valve (432) is engaged with Manual Shift Detent Lever Assembly (609).</li> <li>Inspect the Control Solenoid (w/Body and TCM) Valve Assembly (7) and verify that it is functioning properly.</li> </ul>                                                                                                                                                                                                                                                                                                                                  |

## NO FIRST AND REVERSE GEARS

### No First and Reverse Gears

| Checks | Causes |
|--------|--------|
|        |        |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low and Reverse Clutch Assembly (543)        | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared internal or external splines on Low and Reverse Clutch Assembly (543)</li> <li>• Inspect for broken or disengaged retainer ring</li> </ul>                                                                                                                                                                                                                                                                                                                                |
| Low and Reverse Clutch                       | <ul style="list-style-type: none"> <li>• Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545-547)</li> <li>• Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545-547)</li> <li>• Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544)</li> <li>• Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550)</li> <li>• Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)</li> </ul> |
| Low-Reverse and 1-2-3-4 Clutch Housing (551) | <ul style="list-style-type: none"> <li>• Inspect for disengaged or broken Low and Reverse Clutch Piston Spring Retainer (548)</li> <li>• Inspect for broken or deformed Low and Reverse Clutch Piston (550)</li> <li>• Inspect for damaged or improper surface finish in the piston bore</li> </ul>                                                                                                                                                                                                                                                |

## NO FIRST, SECOND, THIRD, AND FOURTH GEAR

### No First, Second, Third, and Fourth Gear

| Checks                                           | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Control Solenoid (w/Body and TCM) Valve Assembly | Check 1234 PC Solenoid 5 for proper operation. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Control Valve Body Assembly                      | Inspect 1-2-3-4 Clutch Regulator Valve (417) and 1-2-3-4 Clutch Boost Valve (414) for debris and stickyness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 1-2-3-4 Clutch Assembly                          | <ul style="list-style-type: none"> <li>• Inspect for damaged, stripped or sheared splines on 1-2-3-4 Clutch Plates (557-559), Backing Plate (560).</li> <li>• Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and Piston Seals damaged, worn or delaminating.</li> <li>• Inspect for broken or fatigued 1-2-3-4 Clutch Piston Return Spring (553).</li> <li>• Inspect for broken or disengaged 1-2-3-4 Clutch Piston Return Spring Retainer (554).</li> <li>• Inspect for broken or fatigued 1-2-3-4 Clutch Waved Plate (557).</li> <li>• Inspect for disengaged or broken 1-2-3-4 Clutch Backing Plate Retainer (561).</li> <li>• Inspect for broken, porous or improper surface finish or</li> </ul> |

|                                 |                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | plugged oil passages of the Low-Reverse/1-2-3-4 Clutch Housing (551). <ul style="list-style-type: none"> <li>Inspect for worn or damaged Low-Reverse/ 1-2-3-4 Clutch Housing (551) splines.</li> </ul>                |
| Output Sun Gear Assembly (555)  | Inspect for stripped or sheared splines on the Output Sun Gear shell.                                                                                                                                                 |
| Reaction Carrier Assembly (567) | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared splines on the Input Ring Gear</li> <li>Inspect for disengaged or broken Input Ring Gear Retainer.</li> </ul>                                  |
| Output Carrier Assembly (574)   | <ul style="list-style-type: none"> <li>Low/Reverse Clutch Assembly (OWC) (543) splines stripped or sheared.</li> <li>Inspect for disengaged or broken Reaction Ring Gear Retainer.</li> </ul>                         |
| Case Assembly (50)              | <ol style="list-style-type: none"> <li>Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67).</li> <li>Inspect for worn or damaged case splines or retainer ring grooves.</li> </ol> |
| Input Sun Gear (571)            | Inspect for damaged gear teeth and damaged splines.                                                                                                                                                                   |
| Turbine Shaft (517)             | Inspect for damaged splines to the Input Shaft Sun Gear.                                                                                                                                                              |

## NO SECOND AND SIXTH GEAR

### No Second and Sixth Gear

| Checks                           | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2-6 Clutch Assembly              | <ul style="list-style-type: none"> <li>Inspect for damaged or worn 2-6 Clutch Plates (540-542).</li> <li>Inspect for damaged, worn, broken, improper surface finish or sheared splines on the Low-Reverse Clutch Assembly (543).</li> <li>Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating.</li> <li>Inspect for broken or binding 2-6 clutch Piston Return Spring (536).</li> </ul> |
| Reaction Carrier Assembly (567)  | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared splines on the Input Ring Gear.</li> <li>Inspect for disengaged or broken Input Ring Gear Retainer.</li> </ul>                                                                                                                                                                                                                                                    |
| Reaction Sun Gear Assembly (566) | <ul style="list-style-type: none"> <li>Inspect for damaged or broken Reaction Sun Gear Assembly hub.</li> <li>Inspect for damaged or broken sun gear weld.</li> <li>Inspect for loose or worn Reaction Sun Gear Assembly bushing.</li> </ul>                                                                                                                                                                                             |
| Case Assembly (50)               | <ul style="list-style-type: none"> <li>Inspect for stripped or sheared splines.</li> <li>Inspect for broken or disengaged 2-6 Clutch Piston Return Spring Retainer (537).</li> <li>Inspect for damaged, worn, or improper surface finish in the piston bore.</li> </ul>                                                                                                                                                                  |



|                                                  |                                                                                                                                                                 |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output Carrier Assembly (574)                    | Inspect for reaction ring gear damage or missing ring gear snap ring.                                                                                           |
| Control Valve Body Assembly                      | Inspect 2-6 Clutch Regulator Valve (419) for debris and stickyness.                                                                                             |
| Control Solenoid (w/Body and TCM) Valve Assembly | Check 2-6 PC Solenoid 4 for proper operation. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.</u></b> |

## HARSH OR LATE FIRST, SECOND, THIRD, AND FOURTH SHIFT

### Harsh or Late First, Second, Third, and Fourth Shift

| Checks                                       | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low-Reverse and 1-2-3-4 Clutch Housing (551) | <ul style="list-style-type: none"> <li>Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and piston seals damaged, worn or leaking.</li> <li>Inspect for fatigued or binding 1-2-3-4 Clutch Piston Return Spring (553).</li> <li>Inspect for improper surface finish on 1-2-3-4 Clutch Plates (557-559). Refer to <b><u>Clutch Plate Diagnosis.</u></b></li> <li>Inspect for broken or fatigued 1-2-3-4 Clutch Waved Plate (557).</li> <li>Inspect for plugged or restricted Low-Reverse and 1-2-3-4 Clutch Piston Housing (551) air bleed.</li> </ul> |
| Case Assembly (50)                           | <ul style="list-style-type: none"> <li>Inspect for leaking or loose fitting Fluid Check Valve (55).</li> <li>Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67).</li> </ul>                                                                                                                                                                                                                                                                                                                                                |

## HARSH FIRST AND REVERSE SHIFT

### Harsh First and Reverse Shift

| Checks                                       | Causes                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low-Reverse and 1-2-3-4 Clutch Housing (551) | Inspect for plugged or restricted Low-Reverse/1-2-3-4 Clutch Piston Housing (551) air bleed                                                                                                                                                                                                                                                                                                                                       |
| Low and Reverse Clutch                       | <ul style="list-style-type: none"> <li>Inspect for improper surface finish on Low and Reverse Clutch Plates (545-547)</li> <li>Inspect for broken or fatigued Low and Reverse Clutch Apply Plate (547)</li> <li>Inspect for damaged or broken Low and Reverse Clutch Piston (550) and piston seals damaged, worn or leaking</li> <li>Inspect for fatigued or binding Low and Reverse Clutch Piston Return Spring (549)</li> </ul> |

## NO THIRD, FIFTH, AND REVERSE GEAR

### No Third, Fifth, and Reverse Gear

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|--|--|
|  |  |
|--|--|

| Checks                           | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3-5 Reverse Clutch Assembly      | <ul style="list-style-type: none"> <li>• Inspect for damaged, stripped or sheared splines on 3-5 Reverse Clutch Plates (507-509), Backing Plate (510)</li> <li>• Inspect for sheared or stripped splines on 3-5 Rev/4-5-6 Housing (516) to Turbine Shaft (517)</li> <li>• Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516)</li> <li>• Inspect for damaged, worn, loose or seized hub bushing in the 3-5 Rev/4-5-6 Housing</li> <li>• Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516)</li> <li>• Inspect for failure of the Input Shaft Thrust Bearing (538)</li> <li>• Inspect for disengaged or broken 3-5 Reverse Clutch Backing Plate (511)</li> <li>• Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504-506)</li> <li>• Inspect for damaged or broken 3-5 Rev/4-5-6 Clutch Housing (516)</li> <li>• Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (502)</li> <li>• Inspect for broken or fatigued 3-5 Reverse Clutch Spring (503)</li> <li>• Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500)</li> <li>• Inspect for worn, broken or damaged Speed Sensor Reluctor Wheel (501)</li> </ul> |
| Reaction Sun Gear Assembly (566) | Inspect for stripped or sheared splines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Reaction Carrier (567)           | <ul style="list-style-type: none"> <li>• Inspect for broken or disengaged Input Internal Gear Retainer</li> <li>• Inspect for stripped or sheared splines on the Input Internal Gear</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Output Carrier (574)             | Inspect for stripped or sheared splines for the Reaction Internal Ring Gear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4-5-6 Clutch Assembly            | <ul style="list-style-type: none"> <li>• Inspect for plugged or missing 4-5-6 Piston Dam Oil Feed hole</li> <li>• Inspect for leaking 4-5-6 Piston Dam</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## HARSH OR LATE SECOND AND SIXTH SHIFT

### Harsh or Late Second and Sixth Shift

| Checks | Causes |
|--------|--------|
|        |        |

|                     |                                                                                                                                                                                                                                                                                                                     |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2-6 Clutch Assembly | <ul style="list-style-type: none"> <li>• Inspect for worn or improper surface finish on the 2-6 Clutch Plates (540-542)</li> <li>• Inspect for fatigued 2-6 Clutch Piston Apply Plate (540)</li> <li>• Inspect for plugged, restricted or incorrect orientation of the 2-6 Clutch Piston (535) air bleed</li> </ul> |
| Case Assembly (50)  | <ul style="list-style-type: none"> <li>• Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating</li> <li>• Inspect for fatigued 2-6 Clutch Piston Return Spring (536)</li> </ul>                                                                                      |

## NO FOURTH, FIFTH, AND SIXTH GEAR

### No Fourth, Fifth, and Sixth Gear

| Checks                      | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4-5-6 Clutch Assembly       | <ul style="list-style-type: none"> <li>• Inspect for damaged, stripped or sheared splines on 4-5-6 Clutch Plates (526-528), Backing Plate (529)</li> <li>• Inspect for broken or fatigued 4-5-6 Clutch Waved Plate (525)</li> <li>• Inspect for damaged or broken 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521)</li> <li>• Inspect for broken or fatigued 4-5-6 Piston Return Spring (522)</li> <li>• Inspect for broken or disengaged 4-5-6 Backing Plate Retainer (532)</li> <li>• Inspect for damaged or broken 4-5-6 Clutch Dam Piston (523) and piston seals damaged, worn or delaminating</li> <li>• Inspect for broken or disengaged 4-5-6 Clutch Dam Retainer (524)</li> <li>• Inspect for stripped or sheared splines on the Reaction Carrier Hub (531)</li> <li>• Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516)</li> <li>• Inspect for loose, worn or damaged 3-5 Rev/4-5-6 Housing Bushing</li> <li>• Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516)</li> </ul> |
| Transmission Case Assembly  | Inspect the input shaft support (56) for missing or damaged fluid ring seals (58).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Control Valve Body Assembly | Inspect the reverse and 4-5-6 regulator valve (411) and ball check valve (404) for debris and stickiness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                             | Check the pressure control solenoid 3 (R1/456) for proper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

Control Solenoid (w/Body and TCM)  
Valve Assembly

operation. Refer to **Control Solenoid Valve and  
Transmission Control Module Assembly Solenoid  
Performance Test.**

## HARSH OR LATE THIRD, FIFTH, AND REVERSE SHIFT

### Harsh or Late Third, Fifth, and Reverse Shift

| Checks                      | Causes                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3-5 Reverse Clutch Assembly | <ul style="list-style-type: none"><li>• Inspect for damaged splines or improper surface finish on 3-5 Reverse Clutch Plates (507-509), Backing Plate (510)</li><li>• Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504-506)</li><li>• Inspect for warped 3-5 Rev/4-5-6 Clutch Housing (516)</li><li>• Inspect for broken or fatigued 3-5 Reverse Clutch Waved Plate (507)</li></ul> |

## HARSH FOURTH, FIFTH, AND SIXTH SHIFT

### Harsh Fourth, Fifth, and Sixth Shift

| Checks                | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4-5-6 Clutch Assembly | <ul style="list-style-type: none"><li>• Inspect for leaking or damaged 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521)</li><li>• Inspect for plugged or restricted 4-5-6 Piston Dam air bleed</li><li>• Inspect for leaking or damaged 4-5-6 Clutch Dam (523)</li><li>• Inspect for plugged or restricted Dam oil feed hole in the 4-5-6 Piston (520)</li><li>• Inspect for fatigued 4-5-6 Clutch Piston Spring (522)</li><li>• Inspect for leaking 4-5-6 Clutch Dam Seals (523)</li><li>• Inspect for improper surface finish on 4-5-6 Clutch Plates (525-528)</li><li>• Inspect for fatigued 4-5-6 Clutch Waved Plate (525)</li><li>• Inspect for porous, improper surface finish, seal groove damage or plugged or restricted oil passages of the 3-5 Rev/4-5-6 Housing (516)</li></ul> |

## NO TORQUE CONVERTER CLUTCH APPLY

### No Torque Converter Clutch Apply

| Checks                         | Causes                                                                                                                          |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Torque Converter Assembly (28) | <ul style="list-style-type: none"><li>• Inspect for damaged Torque Converter Clutch Seal (inside converter assembly).</li></ul> |

|                                        |                                                                                                                                                                                                                   |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | <ul style="list-style-type: none"> <li>• Diagnose Torque Converter Assembly for possible internal damage. Refer to <b><u>Torque Converter Diagnosis</u></b>.</li> </ul>                                           |
| Valve Body Assembly (433)              | Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Inspection</u></b> . |
| Oil Pump Assembly (201)                | Inspect for worn or damaged Torque Converter Fluid Seal Assembly (301).                                                                                                                                           |
| Torque Converter Housing Assembly (29) | Inspect for leaking or damaged Torque Converter Fluid Seal Assembly (301), Torque Converter Fluid Seal Assembly (319) and A/Trans Fluid Pump Assembly (201).                                                      |

## NO TORQUE CONVERTER CLUTCH RELEASE

### No Torque Converter Clutch Release

| Checks                         | Causes                                                                                                               |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Torque Converter Assembly (28) | Diagnose Torque Converter Assembly for possible internal damage. Refer to <b><u>Torque Converter Diagnosis</u></b> . |
| Valve Body Assembly (433)      | Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.        |

## NO REVERSE GEAR

### No Reverse Gear

| Checks                                           | Causes                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Control Solenoid (w/Body and TCM) Valve Assembly | Check the 35R PC Solenoid 2 for proper operation. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u></b> .                                                                                                                                                                                                                        |
| Control Valve Body Assembly                      | <ul style="list-style-type: none"> <li>• Inspect the 3-5-Reverse Clutch Regulator Valve (421) and Control Valve Body Ball Check Valve (404) for debris and stickyness.</li> <li>• Inspect the Clutch Select Valve (428) and the Actuator Feed Limit Valve (430) for debris and stickyness.</li> </ul>                                                                                       |
| Transmission Case Assembly                       | Inspect the Input Shaft Support (56) for missing or damaged Fluid Seal Rings (58).                                                                                                                                                                                                                                                                                                          |
| 3-5 Reverse Clutch Assembly                      | <ul style="list-style-type: none"> <li>• Inspect for damaged, stripped or sheared splines on 3-5 Reverse Clutch Plates (507-509), Backing Plate (510).</li> <li>• Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516).</li> <li>• Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516).</li> </ul> |

- Inspect for damaged, worn, loose or seized hub bushing in the 3-5 Rev/4-5-6 Housing.
- Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516).
- Inspect for failure of the Input Shaft Thrust Bearing (538).
- Inspect for disengaged or broken 3-5 Reverse Clutch Backing Plate Retainer (511).
- Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504-506).
- Inspect for damaged or broken 3-5 Rev/4-5-6 Clutch Housing (516).
- Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (502).
- Inspect for broken or fatigued 3-5 Reverse Clutch Spring (503).
- Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500).
- Inspect for broken Speed Sensor Reluctor Wheel (501).

## FLUID PRESSURE HIGH OR LOW

### Fluid Pressure High or Low

| Checks                         | Causes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fluid Pump Assembly (201)      | <ul style="list-style-type: none"> <li>• Inspect for loose fluid pump bolts (204).</li> <li>• Inspect for leaking or damaged fluid pump outlet seals (24) and oil filter seal.</li> <li>• Inspect for improperly installed, restricted or damaged oil filter (203).</li> <li>• Inspect for sticking line pressure blow off valve (304).</li> <li>• Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308).</li> <li>• Inspect for damaged or restricted oil ports in the oil pump body (303).</li> <li>• Inspect for missing, leaking, or damaged auxiliary fluid inlet pump seal (371) - Hybrid Models.</li> </ul> |
| Torque Converter Housing (208) | <ul style="list-style-type: none"> <li>• Inspect for missing or restricted differential lube oil circuit orifice.</li> <li>• Inspect for missing front differential carrier baffle (205).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

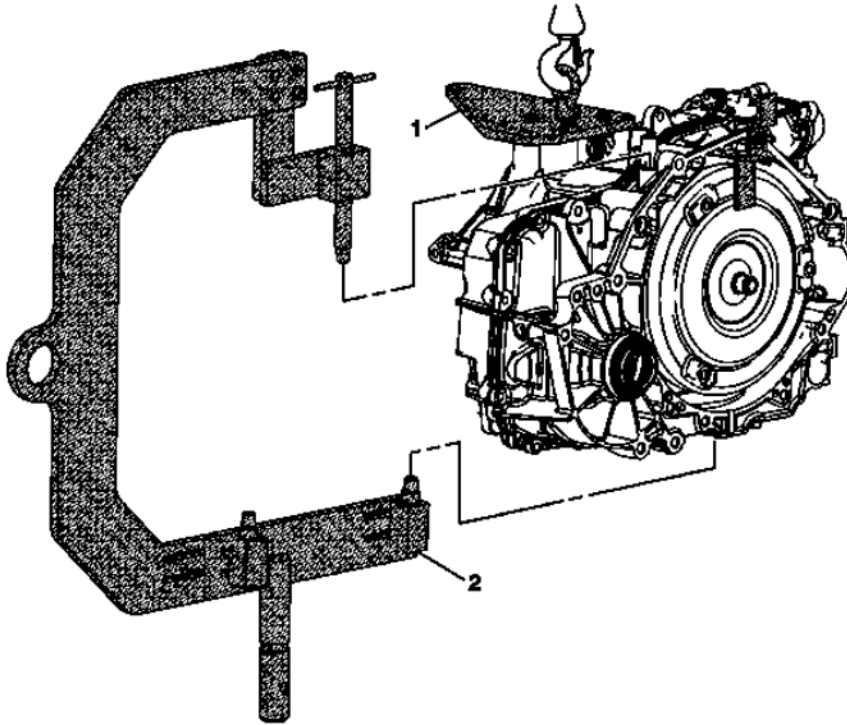
|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Control Solenoid Valve Assembly (w/Body and TCM) (7) | <ul style="list-style-type: none"> <li>• Inspect for leaking or damaged filter plate assembly seals (8).</li> <li>• Verify VBS operation is not stuck high or low.</li> </ul>                                                                                                                                                                                                                                               |
| Case Assembly (50)                                   | <ul style="list-style-type: none"> <li>• Inspect for proper fluid level.</li> <li>• Inspect for missing lube oil circuit orifice or front differential carrier baffle (62).</li> <li>• Inspect for leaking or damaged valve body spacer plate assembly (12).</li> <li>• Inspect for damaged or leaking fluid check valve (55).</li> <li>• Inspect for leaking, damaged or broken fluid level control valve (13).</li> </ul> |
| Torque Converter Assembly (28)                       | <ul style="list-style-type: none"> <li>• Inspect for damaged torque converter clutch seal (inside converter assembly).</li> <li>• Inspect for damaged or disengaged torque converter hub to oil pump drive gear.</li> </ul>                                                                                                                                                                                                 |

## 2013 TRANSMISSION

Automatic Transmission - 6T40 (MH8, MHH) - Repair Instructions - Off Vehicle - Malibu

### REPAIR INSTRUCTIONS - OFF VEHICLE

#### LIFT PLATE AND HOLDING FIXTURE INSTALLATION



**Fig. 1: Identifying Lift Plate & Holding Fixture**  
Courtesy of GENERAL MOTORS COMPANY

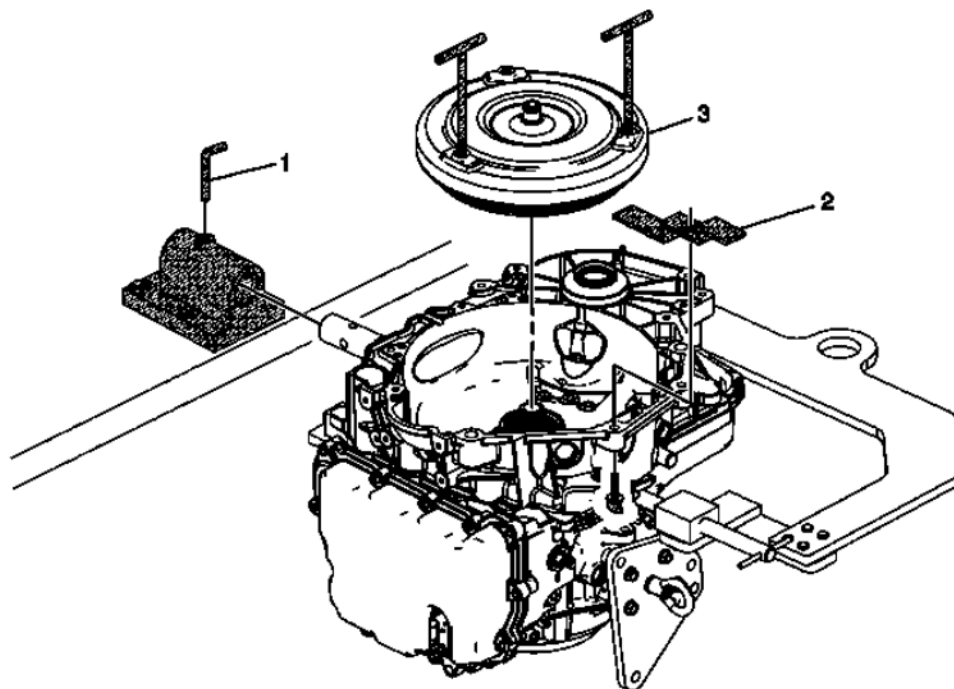
#### Lift Plate and Holding Fixture Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                           |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p><b>DT-47811-A Transmission Lift Plate</b></p> <p><b>WARNING:</b><br/>Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly.</p> <p><b>CAUTION:</b><br/>Refer to <u>Fastener Caution</u> .</p> <p><b>Procedure</b><br/>Tighten bolts and nut.</p> |



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p><b>Tighten</b><br/>12 N.m (106 lb in)</p> <p><b>Special Tools</b><br/><b>DT-47811-A</b> Transmission Lift Plate<br/>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                                                                                                                                                                                                                                                                           |
| 2 | <p><b>DT-46625</b> Transmission Holding Fixture</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Raise the transmission with an overhead hoist.</li> <li>2. Adjust mounting block on fixture to match bosses on case, then tighten bolts.</li> </ol> <p><b>Tighten</b><br/>13 N.m (10 lb ft)</p> <p><b>Special Tools</b><br/><b>DT-46625-10</b> Holding Fixture Adapter<br/>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |

## TORQUE CONVERTER REMOVAL



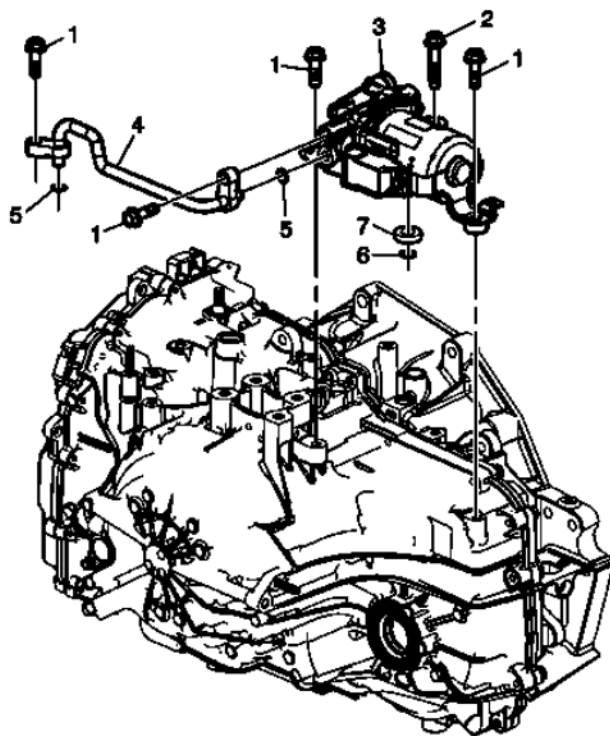
**Fig. 2: View Of Torque Converter**

Courtesy of GENERAL MOTORS COMPANY

## Torque Converter Removal

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Lock Pin</p> <p><b>WARNING:</b><br/>Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury.</p> <p><b>NOTE:</b><br/>Ensure the DT 3289-20 holding fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. DT-39890 holding fixture adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• DT 3289-20 Holding Fixture</li> <li>• DT-39890 Transmission Holding Fixture Adapter</li> </ul> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 2       | <b>DT 21366</b> Torque Converter Holding Strap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 3       | <p>Torque Converter Assembly</p> <p><b>CAUTION:</b><br/>Only install the lift assist handles until it stops. Do not tighten. Over tightening the lift assist handles can cause damage to the torque converter.</p> <p><b>NOTE:</b><br/>Failure to raise the torque converter straight up could damage the torque converter clutch lip seal inside the torque converter clutch assembly.</p> <p><b>Special Tool</b><br/><b>DT 46409</b> Torque Converter Lifting Handles</p> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                                                                                                                                                                                    |

## AUXILIARY FLUID PUMP REMOVAL (HYBRID)



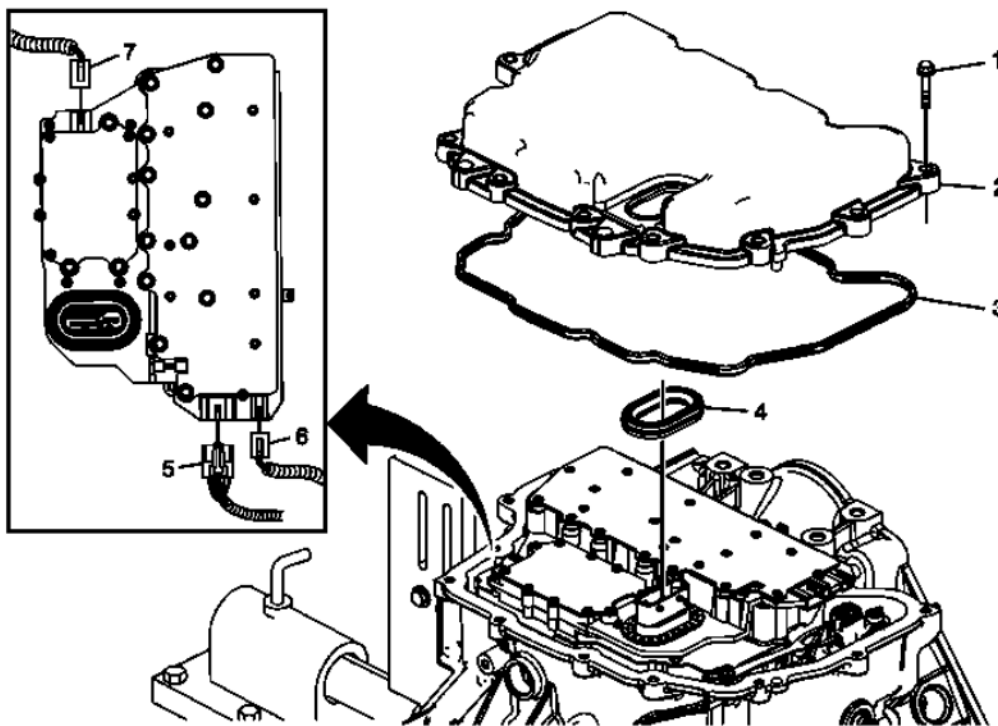
**Fig. 3: Auxiliary Fluid Pump Components (Hybrid)**  
Courtesy of GENERAL MOTORS COMPANY

#### Auxiliary Fluid Pump Removal (Hybrid)

| Callout | Component Name                                         |
|---------|--------------------------------------------------------|
| 1       | A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 4)      |
| 2       | A/Trans Auxiliary Fluid Pump Bolt                      |
| 3       | A/Trans Auxiliary Fluid Pump Assembly                  |
| 4       | A/Trans Auxiliary Fluid Pump Outlet Pipe               |
| 5       | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal (Qty: 2) |
| 6       | A/Trans Auxiliary Fluid Pump Seal                      |
| 7       | A/Trans Auxiliary Fluid Pump Gasket                    |

### CONTROL VALVE BODY ASSEMBLY REMOVAL

#### Control Valve Body Cover Removal

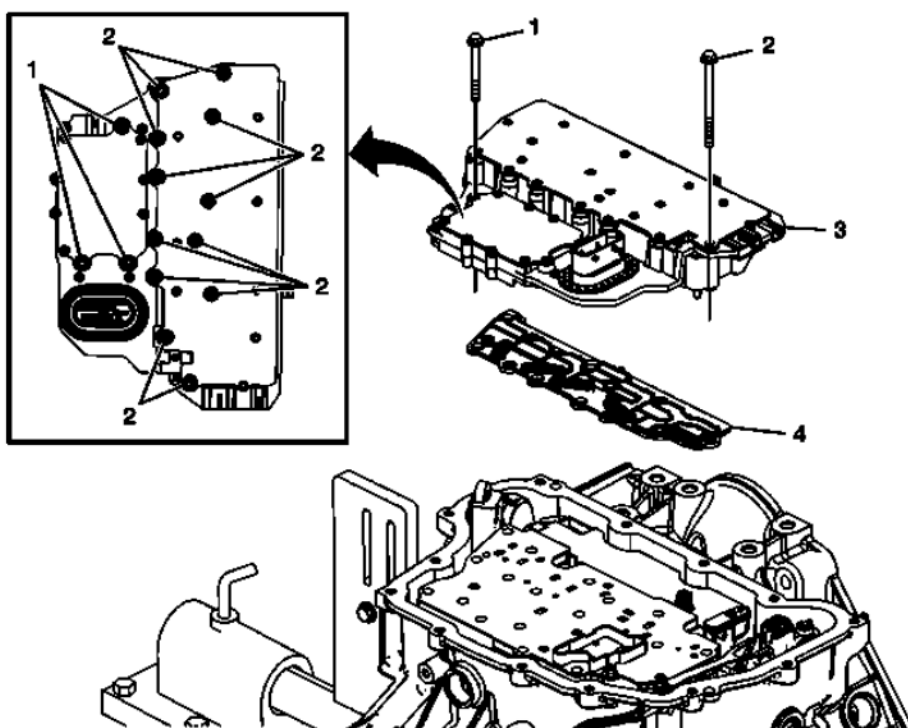


**Fig. 4: View Of Control Valve Body Cover**  
Courtesy of GENERAL MOTORS COMPANY

#### Control Valve Body Cover Removal

| Callout | Component Name                                                                                                                                                                                                                                                                                              |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Control Valve Body Cover Bolts M6 x 30 (Qty: 13)                                                                                                                                                                                                                                                            |
| 2       | Control Valve Body Cover                                                                                                                                                                                                                                                                                    |
| 3       | Control Valve Body Gasket<br><br><b>NOTE:</b><br>Discard the seal. It is not reusable.                                                                                                                                                                                                                      |
| 4       | Control Valve Body Cover Wiring Connector Hole Seal<br><br><b>CAUTION:</b><br>Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections.<br><br><b>NOTE:</b><br>Discard the seal. It is not reusable. |
| 5       | Shift Position Switch Connector                                                                                                                                                                                                                                                                             |
| 6       | Output Speed Sensor Connector                                                                                                                                                                                                                                                                               |
| 7       | Input Speed Sensor Connector                                                                                                                                                                                                                                                                                |

#### Control Solenoid (With Body and TCM) Valve Assembly Removal

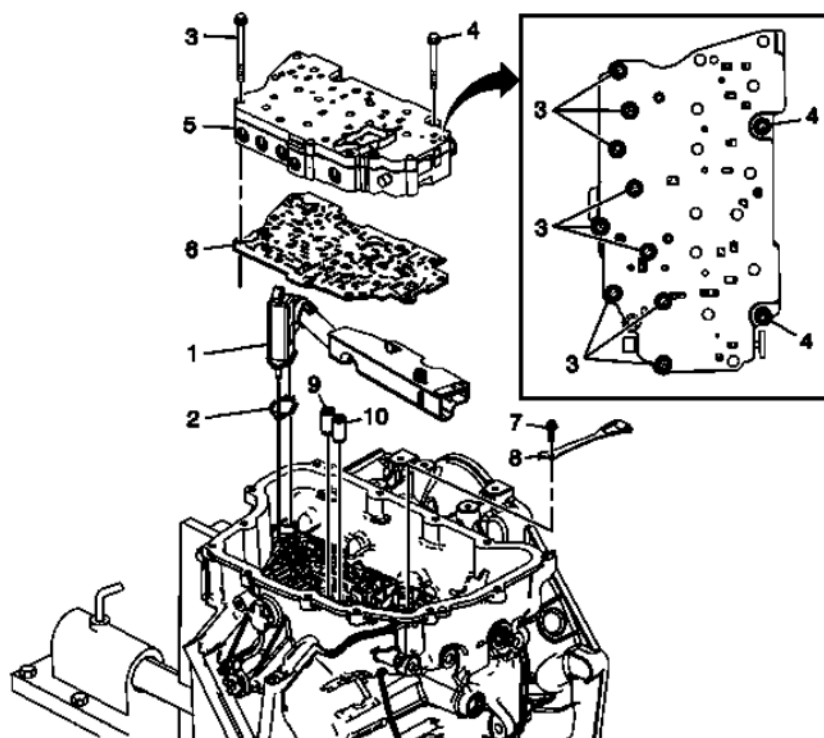


**Fig. 5: View Of Control Solenoid (w/Body & TCM) Valve Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

#### Control Solenoid (With Body and TCM) Valve Assembly Removal

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                  |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Control Valve Body M5 x 40.5 (Qty: 3)                                                                                                                                                                                                                                                                                                                                           |
| 2       | Control Valve Body Bolt M6 x 30 (Qty: 12)                                                                                                                                                                                                                                                                                                                                       |
| 3       | Control Solenoid (with Body and TCM) Valve Assembly                                                                                                                                                                                                                                                                                                                             |
| 4       | Control Solenoid Valve Assembly Filter Plate<br><br><b>CAUTION:</b><br>Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.<br><br><b>NOTE:</b><br>Discard the filter plate. It is not reusable. |

#### Control Valve Body Assembly Removal

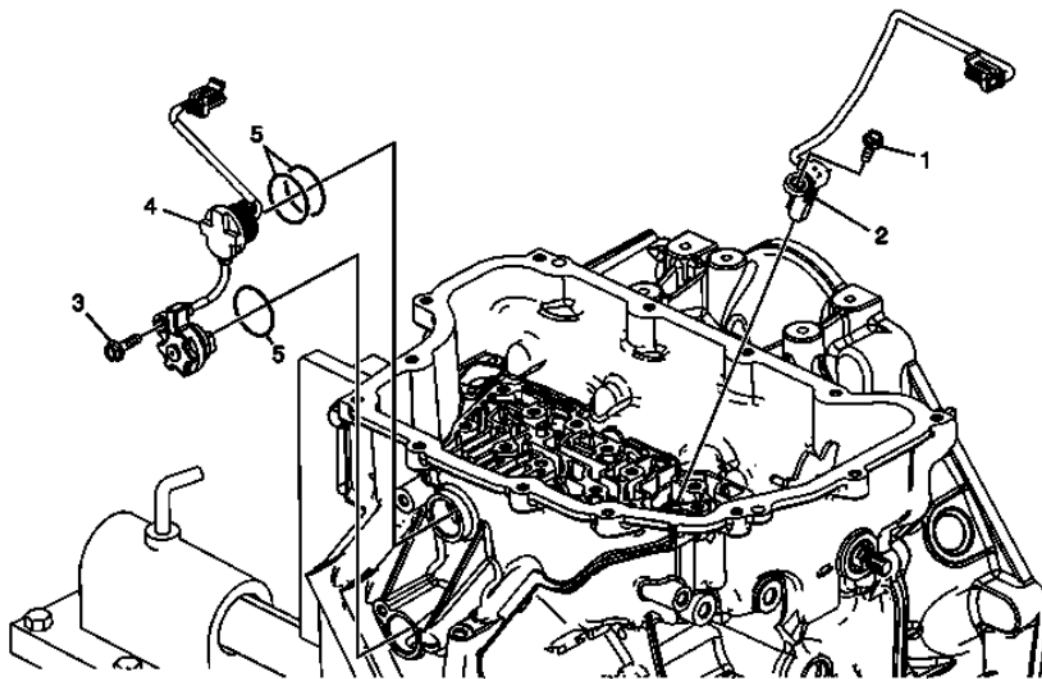


**Fig. 6: View Of Control Valve Body Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

#### Control Valve Body Assembly Removal

| Callout | Component Name                                                                                     |
|---------|----------------------------------------------------------------------------------------------------|
| 1       | Fluid Level Control Valve                                                                          |
| 2       | Fluid Level Control Valve Gasket                                                                   |
| 3       | Control Valve Body Bolt M6 x 60 (Qty: 9)                                                           |
| 4       | Control Valve Body Bolt M6 x 53 (Qty: 2)                                                           |
| 5       | Control Valve Body Assembly                                                                        |
| 6       | Control Valve Body Spacer Plate Assembly                                                           |
| 7       | Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1)                                                   |
| 8       | Manual Shaft Detent Lever Spring Assembly                                                          |
| 9       | 1-2-3-4 Clutch Fluid Passage Seal<br><br><b>NOTE:</b><br>Discard the seal. It is not reusable.     |
| 10      | Low/Reverse Clutch Fluid Passage Seal<br><br><b>NOTE:</b><br>Discard the seal. It is not reusable. |

#### INPUT AND OUTPUT SPEED SENSOR REMOVAL

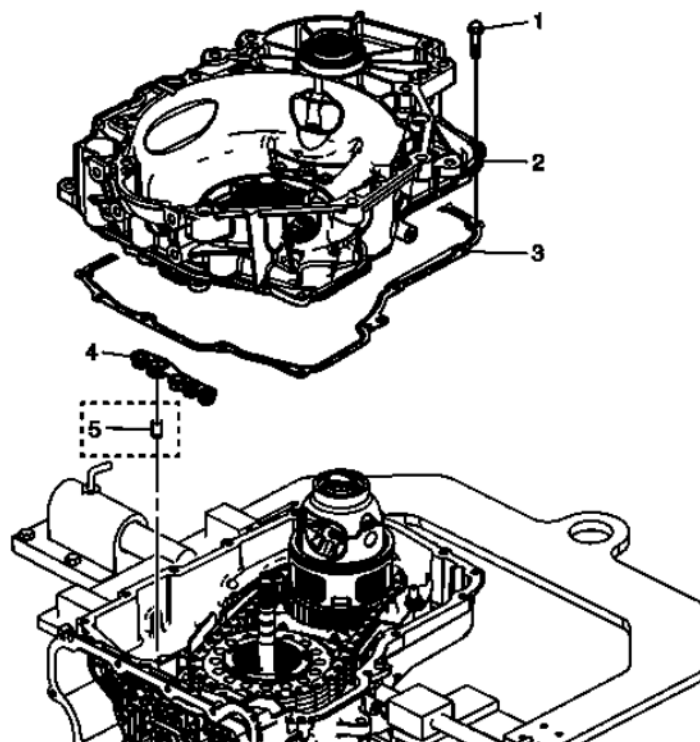


**Fig. 7: View Of Input & Output Speed Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

#### Input and Output Speed Sensor Removal

| Callout | Component Name                                                                                                                                            |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1)                                                                                                         |
| 2       | A/Trans Output Speed Sensor Assembly                                                                                                                      |
| 3       | Input Speed Sensor Bolt M6 x 23 (Qty: 1)                                                                                                                  |
| 4       | Input Speed Sensor Assembly<br><br><b>NOTE:</b><br>Compress the locking tabs on the plug to release it from the case and to avoid damaging the retainers. |
| 5       | Input Speed Sensor Assembly Seals (Qty: 3)<br><br><b>NOTE:</b><br>Discard the seals. They are not reusable.                                               |

#### TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY REMOVAL (HYBRID)



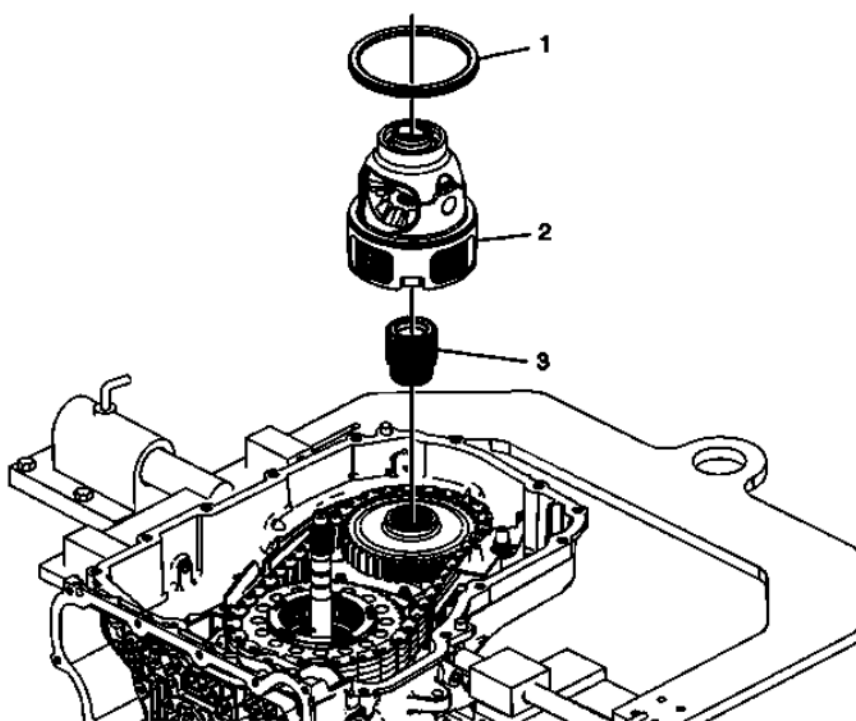
**Fig. 8: Torque Converter Housing with Fluid Pump Assembly**  
Courtesy of GENERAL MOTORS COMPANY

#### Torque Converter Housing with Fluid Pump Assembly Removal (Hybrid)

| Callout | Component Name                                                                           |
|---------|------------------------------------------------------------------------------------------|
| 1       | Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15)                        |
| 2       | Torque Converter with Fluid Pump Housing Assembly                                        |
| 3       | Torque Converter Housing Gasket<br><b>NOTE:</b><br>Discard the seal. It is not reusable. |
| 4       | Fluid Pump Seal Assembly<br><b>NOTE:</b><br>Discard the seal. It is not reusable.        |
| 5       | A/Trans Fluid Trough Check Ball - Hybrid Models                                          |

#### DIFFERENTIAL CARRIER REMOVAL (6T40/45/50)



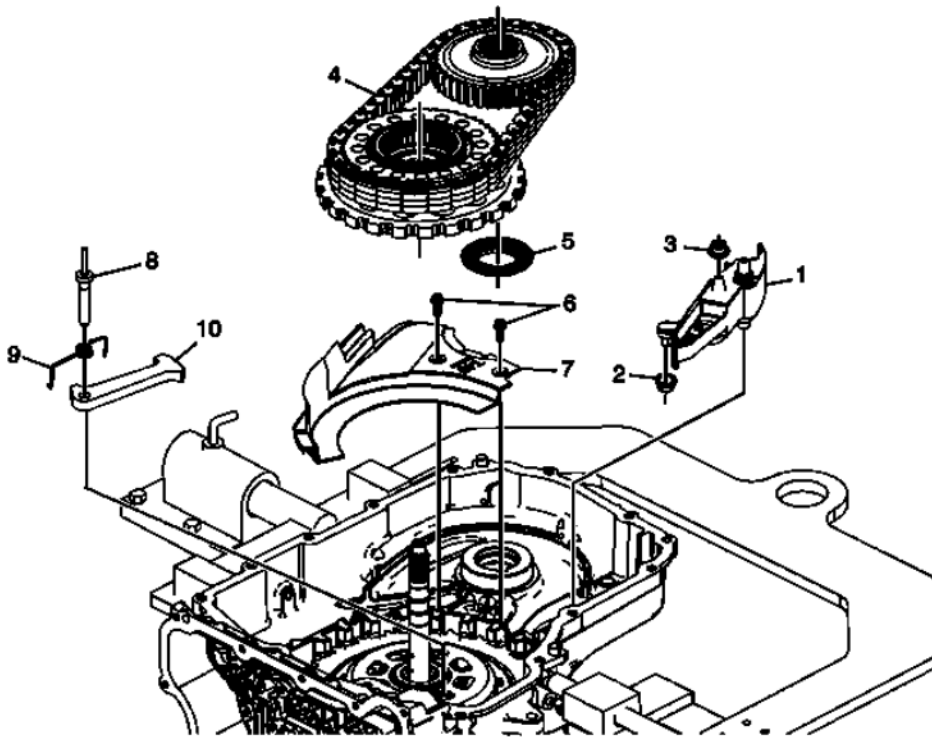


**Fig. 9: View Of Front Differential Carrier Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

**Differential Carrier Removal (6T40/45/50)**

| Callout | Component Name                              |
|---------|---------------------------------------------|
| 1       | Front Differential Carrier Bearing Assembly |
| 2       | Differential Carrier Assembly               |
| 3       | Final Drive Sun Gear                        |

**DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL REMOVAL (6T40/45/50)**



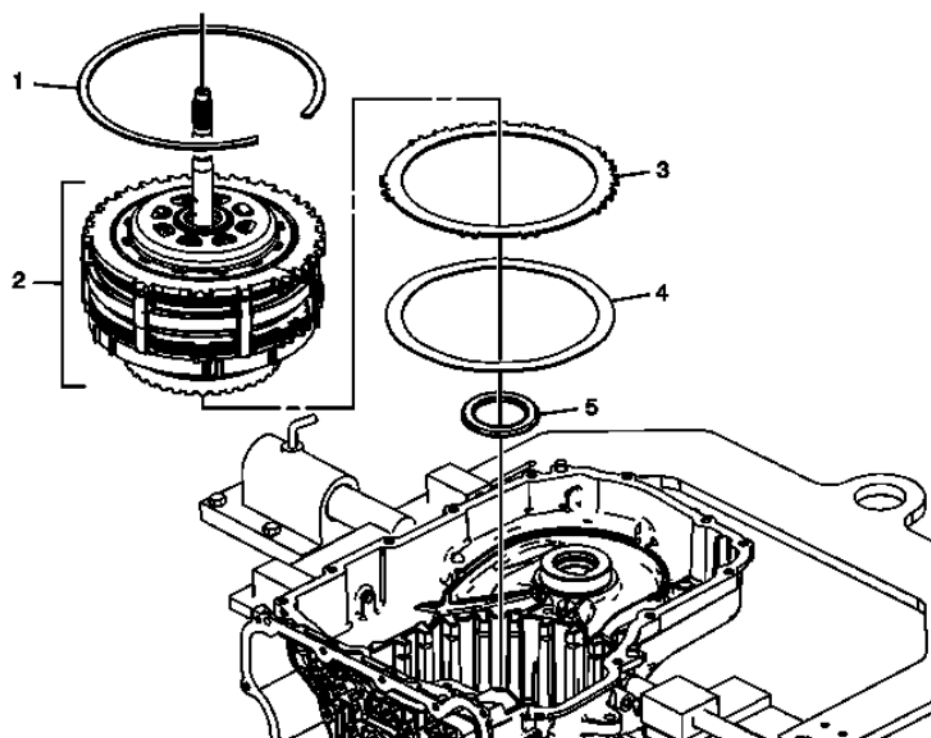
**Fig. 10: View Of Drive and Driven Sprocket, Drive Link & Park Pawl**  
 Courtesy of GENERAL MOTORS COMPANY

**Drive and Driven Sprocket, Drive Link, and Park Pawl Removal (6T40/45/50)**

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                            |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Drive Link Lube Scoop                                                                                                                                                                                                                                                                                                                                                                     |
| 2       | Drive Link Lube Scoop Seals                                                                                                                                                                                                                                                                                                                                                               |
| 3       | Drive Link Lube Fluid Seal                                                                                                                                                                                                                                                                                                                                                                |
| 4       | Driven Sprocket Assembly, Drive Sprocket and Park Gear Assembly and Drive Link<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. The drive link, drive and driven sprocket assemblies must be removed at the same time.</li> <li>2. The driven sprocket ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.</li> </ol> |
| 5       | Driven Sprocket Bearing Assembly<br><br><b>NOTE:</b><br><b>The driven sprocket bearing may be stuck to the driven sprocket.</b>                                                                                                                                                                                                                                                           |
| 6       | Front Differential Carrier Baffle Bolts M6 x 16 (Qty: 2)                                                                                                                                                                                                                                                                                                                                  |
| 7       | Front Differential Carrier Baffle                                                                                                                                                                                                                                                                                                                                                         |
| 8       | Park Pawl Shaft                                                                                                                                                                                                                                                                                                                                                                           |

|    |                  |
|----|------------------|
| 9  | Park Pawl Spring |
| 10 | Park Pawl        |

## INTERNAL COMPONENTS REMOVAL



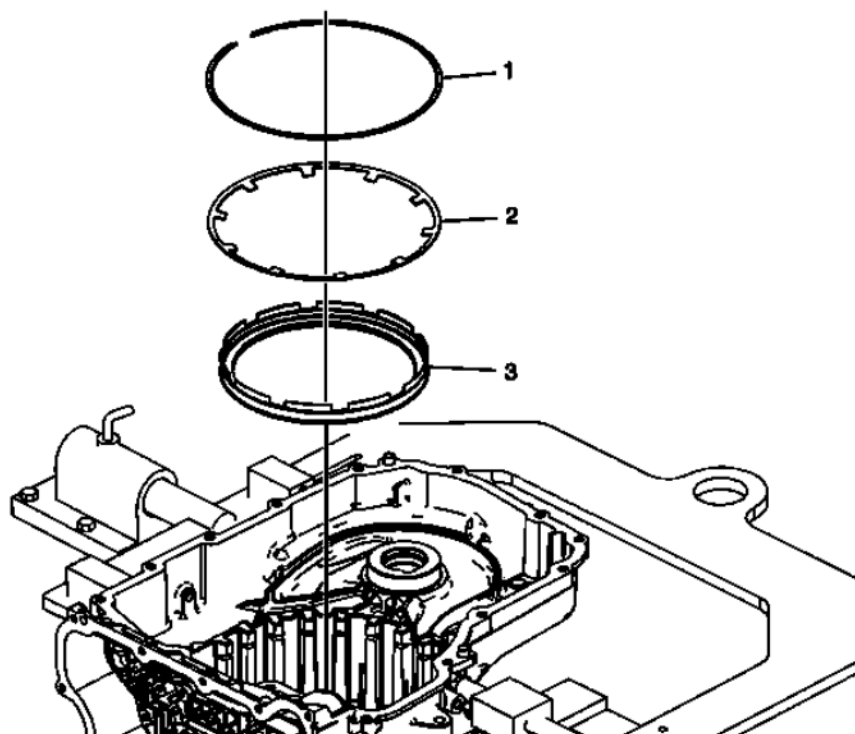
**Fig. 11: View Of Transmission Internal Components**  
Courtesy of GENERAL MOTORS COMPANY

### Internal Components Removal

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>1-2-3-4 Clutch Backing Plate Retainer Ring</p> <p><b>WARNING:</b><br/>The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result.</p> <p><b>CAUTION:</b><br/>Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear.</p> <p><b>NOTE:</b><br/>Remove one end of the retainer using DT-28585 snap ring remover or equivalent and work the retainer out of the case</p> |

|   |                                                                                                                                                                                                           |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | groove.                                                                                                                                                                                                   |
|   | <b>Special Tool</b><br><b>DT-28585</b> Snap Ring Remover or equivalent<br>For equivalent regional tools, refer to <b>Special Tools</b> .                                                                  |
| 2 | 3-5 Reverse and 4-5-6 Clutch Housing Assembly, Gearset, Low-Reverse Clutch Assembly and Low-Reverse and 1-2-3-4 Clutch Housing<br><br><b>NOTE:</b><br><b>This unit is heavy - weighs 40 lbs. (18 Kg).</b> |
| 3 | 2-6 Clutch Plate (Qty: 1)                                                                                                                                                                                 |
| 4 | 2-6 Clutch Apply Plate (Waved)                                                                                                                                                                            |
| 5 | 35R and 456 Clutch Housing Thrust Bearing Assembly                                                                                                                                                        |

## 2-6 CLUTCH PISTON REMOVAL



**Fig. 12: View Of 2-6 Clutch Piston & Attached Components**  
Courtesy of GENERAL MOTORS COMPANY

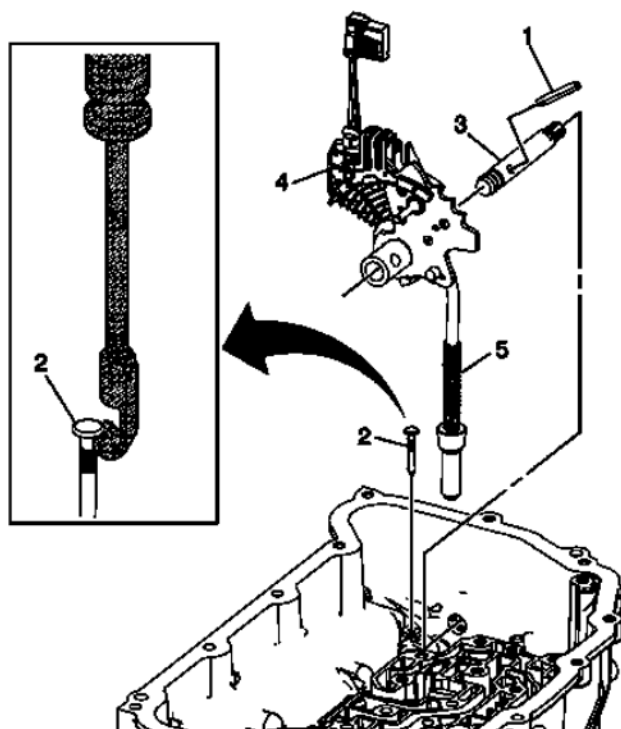
### 2-6 Clutch Piston Removal

| Callout | Component Name                                    |
|---------|---------------------------------------------------|
|         | 2-6 Clutch Spring Retainer<br><b>Special Tool</b> |

|   |                                                                                                                                                                                                                      |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | DT-28585 Snap Ring Remover or equivalent<br>For equivalent regional tools, refer to <b>Special Tools</b> .                                                                                                           |
| 2 | 2-6 Clutch Spring                                                                                                                                                                                                    |
| 3 | 2-6 Clutch Piston Assembly<br><br><b>NOTE:</b> <ul style="list-style-type: none"><li>• Use pliers to remove the piston.</li><li>• Inspect the piston seals for damage and/or wear. The piston is reusable.</li></ul> |

## MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR REMOVAL

### Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal



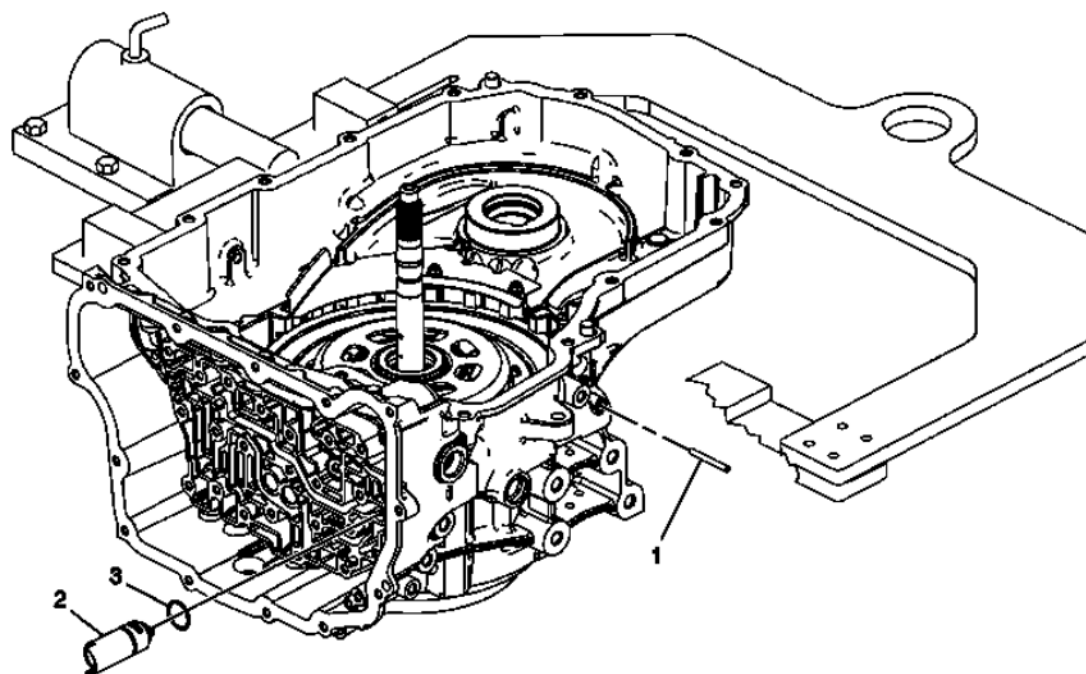
**Fig. 13: Identifying Manual Shaft Detent Lever Assembly**  
Courtesy of GENERAL MOTORS COMPANY

### Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal

| Callout | Component Name                                                                                              |
|---------|-------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shaft Detent Lever Hub Pin<br><br><b>NOTE:</b><br>Use side cutter to remove the pin (1) and discard. |
|         | Manual Shift Shaft Pin                                                                                      |

|   |                                                                                                                                                                                                                                                                                                     |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | <p><b>NOTE:</b><br/>Discard the pin. It is not reusable.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-23129</b> Universal Seal Remover</li> <li>• <b>GE-6125-1B</b> Slide Hammer</li> </ul> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 3 | Manual Shaft                                                                                                                                                                                                                                                                                        |
| 4 | Manual Shaft Detent (w/Shift Position Switch) Lever Assembly                                                                                                                                                                                                                                        |
| 5 | Park Pawl Actuator Assembly                                                                                                                                                                                                                                                                         |

#### Park Pawl Actuator Guide Removal



**Fig. 14: Identifying Park Pawl Actuator Guide Components**

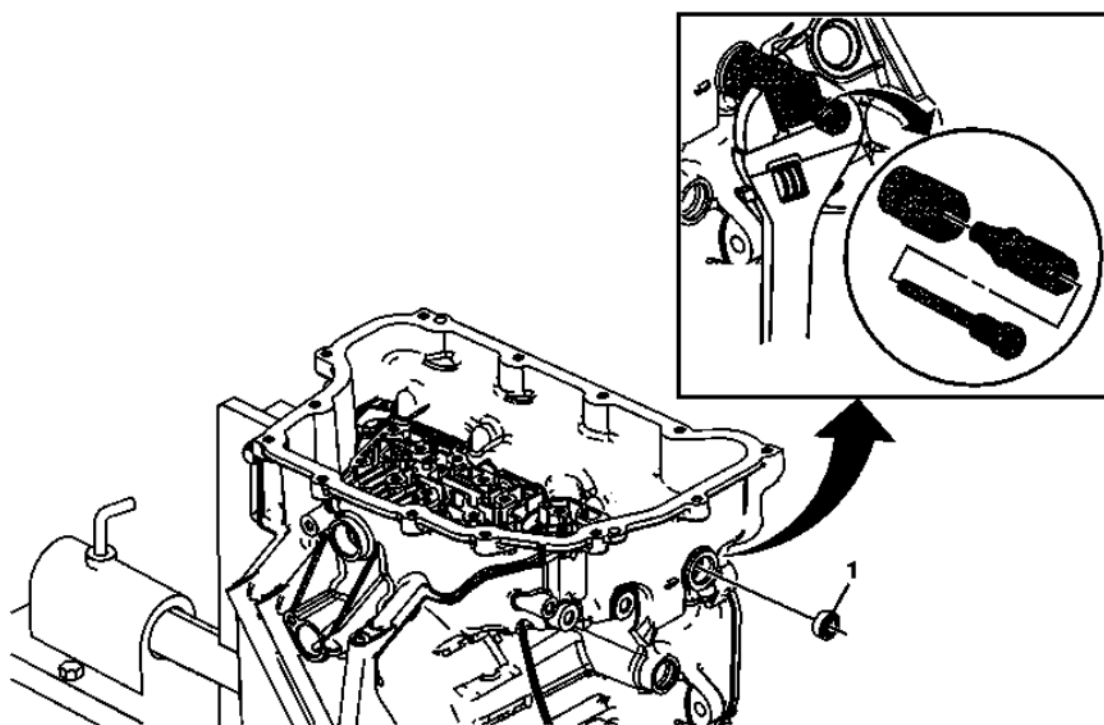
Courtesy of GENERAL MOTORS COMPANY

#### Park Pawl Actuator Guide Removal

| Callout | Component Name                                   |
|---------|--------------------------------------------------|
| 1       | Park Pawl Actuator Guide Pin<br><br><b>NOTE:</b> |

|   |                                                                                                     |
|---|-----------------------------------------------------------------------------------------------------|
|   | Use side cutter to remove the pin (1) and discard.                                                  |
| 2 | Park Pawl Actuator Guide Assembly                                                                   |
| 3 | Park Pawl Actuator Guide Assembly Seal<br><br><b>NOTE:</b><br>Discard the seal. It is not reusable. |

## MANUAL SHIFT SHAFT SEAL REMOVAL

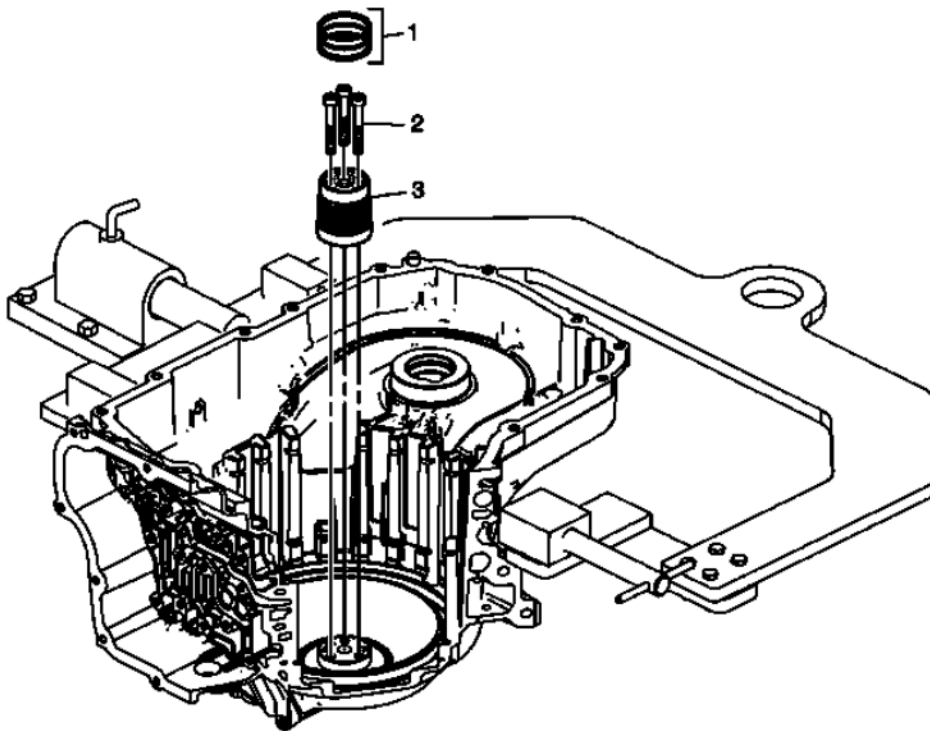


**Fig. 15: identifying Manual Shift Shaft Seal**  
Courtesy of GENERAL MOTORS COMPANY

### Manual Shift Shaft Seal Removal

| Callout | Component Name                                                                                                                                                                                                                                                |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shift Shaft Seal<br><br><b>NOTE:</b><br>Use the DT-45201 seal remover to remove the seal to prevent damage to the case surface.<br><br><b>Special Tools</b><br>DT-45201 Seal Remover<br>For equivalent regional tools, refer to <b>Special Tools</b> . |

## INPUT SHAFT SUPPORT REPLACEMENT (GEN 2)



**Fig. 16: Input Shaft Support (Gen 2)**

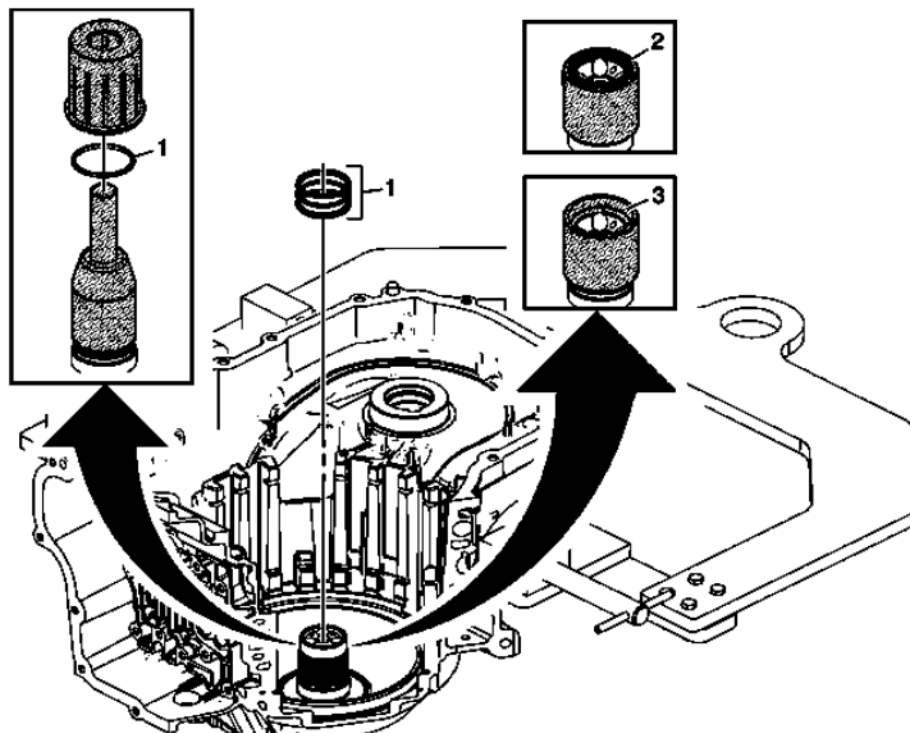
Courtesy of GENERAL MOTORS COMPANY

### Input Shaft Support Replacement (Gen 2)

| Callout | Component Name                                                                                                                                                                                                                                                                |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3)</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>• Discard the fluid seals. They are not reusable.</li> <li>• Refer to <u>3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2)</u>.</li> </ul> |
| 2       | <p>Input Shaft Support Bolts M6 x 50 (Qty: 3)</p> <p><b>CAUTION:</b><br/>Refer to <u>Fastener Caution</u> .</p> <p><b>Tighten</b><br/>12 N.m (106 lb in)</p>                                                                                                                  |
| 3       | <p>Input Shaft Support</p> <p><b>NOTE:</b><br/>Inspect the support for wear, damage or porosity.</p>                                                                                                                                                                          |



### 3-5-REVERSE AND 4-5-6 CLUTCH FLUID SEAL RING REPLACEMENT (GEN 2)



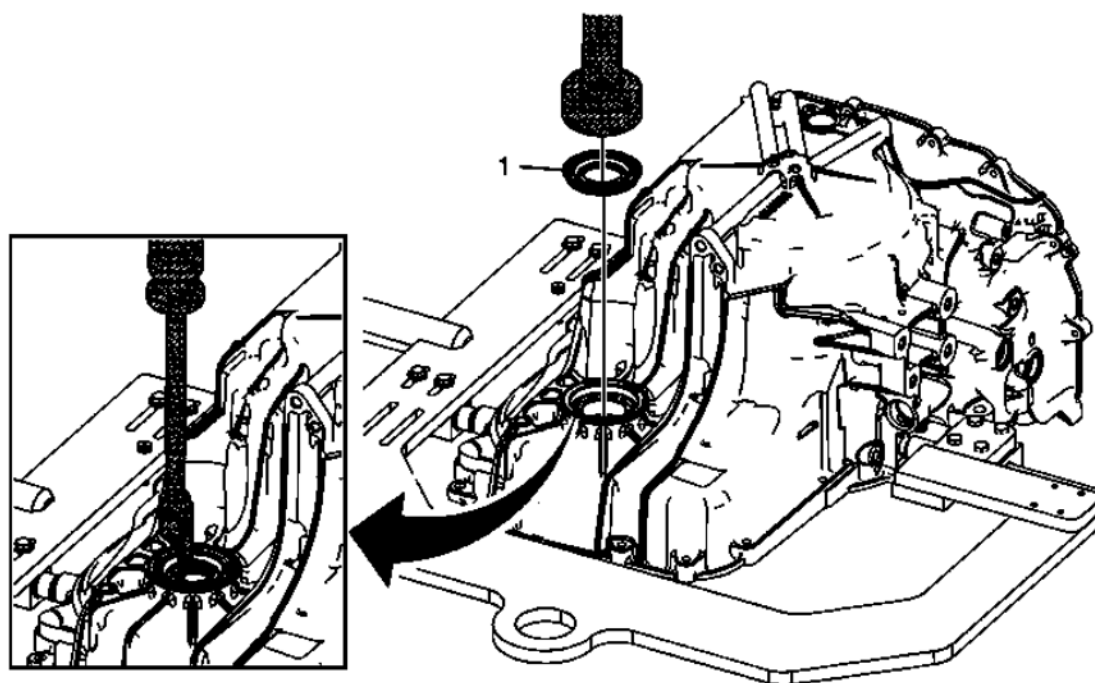
**Fig. 17: 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring (Gen 2)**  
Courtesy of GENERAL MOTORS COMPANY

#### 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2)

| Callout                                                                                                                  | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Special Tools</b><br><b>DT-46620 Seal Installer</b><br>For equivalent regional tools, refer to <b>Special Tools</b> . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1                                                                                                                        | 3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3)<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. Place DT-46620-3 which is part of <b>DT-46620</b> seal installer over the case hub and adjust it so that only the bottom seal ring is exposed.</li> <li>2. Place a NEW fluid seal ring onto DT-46620-3 which is part of <b>DT-46620</b> seal installer.</li> <li>3. Use DT-46620-2 which is part of <b>DT-46620</b> seal installer to push the fluid seal ring down over DT-46620-3 which is part of <b>DT-46620</b> seal installer into the hub ring groove.</li> <li>4. Repeat the above steps to install all 3 seal rings, adjusting DT-46620-3 which is part of <b>DT-46620</b> seal installer to the appropriate ring groove.</li> </ol> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | <p>Small Chamfer Up</p> <p><b>CAUTION:</b><br/>Do not force the seal installer down over the seals as this will roll and damage the seals. The large chamfer is designed to fit over the over stretched seal. Use a hand to help shrink the seal if the seal installer is difficult to install over the seal rings.</p> <p><b>Procedure</b><br/>Install DT-46620-1 which is part of <b>DT-46620</b> seal installer with the large chamfer end down over the fluid seal rings and leave DT-46620-1 which is part of <b>DT-46620</b> seal installer on the seals for at least 60 seconds.</p> |
| 3 | <p>Large Chamfer Up</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Install DT-46620-1 which is part of <b>DT-46620</b> seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring.</li> <li>2. Leaving DT-46620-1 which is part of <b>DT-46620</b> seal installer on the fluid seal rings for an extended period of time could cause a fluid leak on the initial clutch piston circuit until the seal rings warm up and expand to the proper dimension.</li> </ol>                                  |

## FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - CASE SIDE

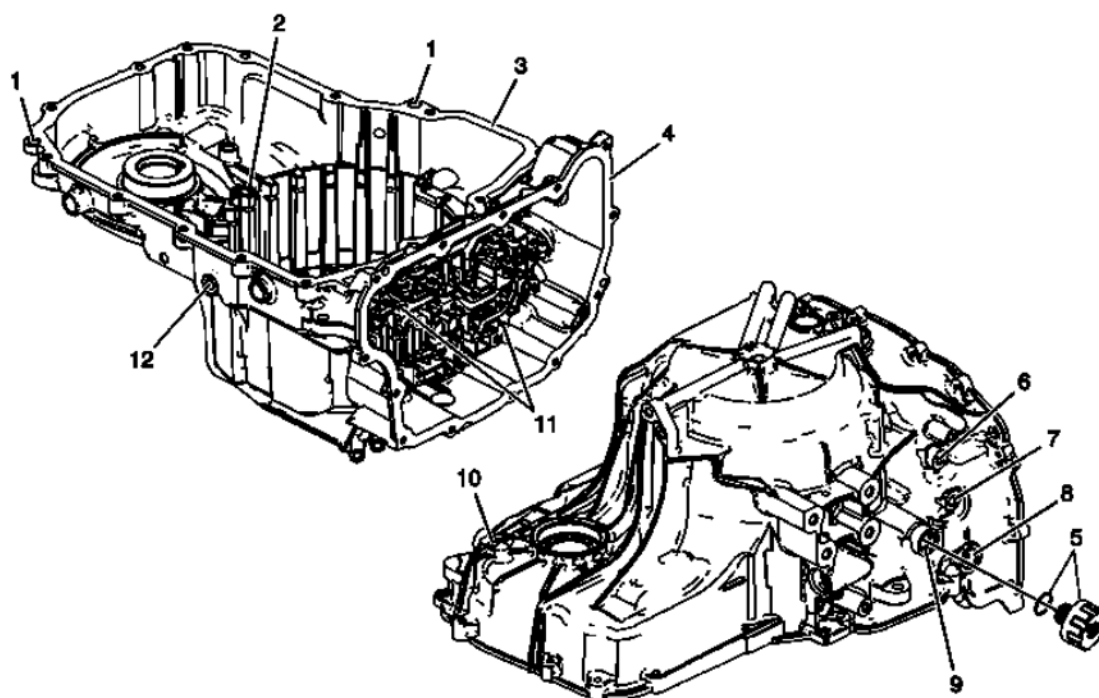


**Fig. 18: View Of Case Side Front Wheel Drive Shaft Seal**  
 Courtesy of GENERAL MOTORS COMPANY

#### Front Wheel Drive Shaft Seal Replacement - Case Side

| Callout | Component Name                                                                                                                                                                                                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal<br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• DT-47790 Seal Installer</li> <li>• GE-6125-1B Slide Hammer</li> <li>• GE-8092 Driver Handle</li> </ul> For equivalent regional tools, refer to <b>Special Tools</b> . |

#### TRANSMISSION CASE CLEANING AND INSPECTION



**Fig. 19: Cleaning & Inspecting Transmission Case**  
 Courtesy of GENERAL MOTORS COMPANY

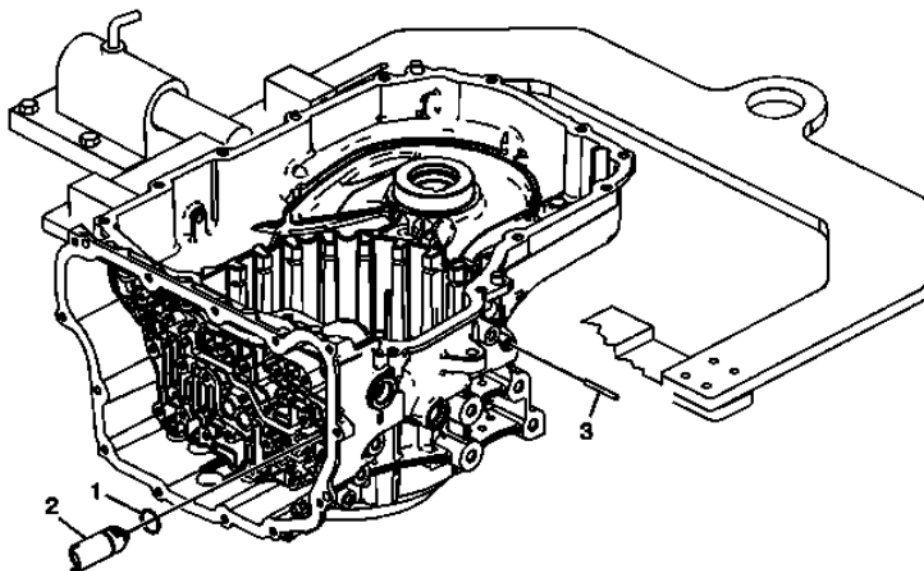
#### Transmission Case Cleaning and Inspection

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Component Name                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <p><b>CAUTION:</b><br/>           Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks.</p> <p><b>CAUTION:</b><br/>           After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.</p> <p><b>CAUTION:</b><br/>           Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.</p> <p><b>Preliminary Procedures</b></p> <ol style="list-style-type: none"> <li>1. Thoroughly clean the transmission case assembly, including case threads, with clean solvent.</li> <li>2. Clean gasket sealing surfaces. Remove all residual gasket material.</li> <li>3. Inspect all threaded holes. If necessary, repair any thread damage.</li> </ol> |                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Torque Converter Housing Locating Pin<br><b>Procedure</b> |

|    |                                                                                                                                                                                  |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <p>Inspect the torque converter housing locating pins.</p> <p><b>NOTE:</b><br/>The locating pins installed height is 7.4 mm (0.29 in).</p>                                       |
| 2  | <p>Fluid Trough Check Ball</p> <p><b>NOTE:</b><br/>The check ball installed depth is 11 mm (0.43 in).</p>                                                                        |
| 3  | Converter Housing Sealing Surface                                                                                                                                                |
| 4  | Control Valve Body Cover Sealing Surface                                                                                                                                         |
| 5  | Fill Cap Seal                                                                                                                                                                    |
| 6  | Transmission Fluid Cooler Pipe Sealing Surface                                                                                                                                   |
| 7  | <p>Fluid Pressure Test Plug</p> <p><b>CAUTION:</b><br/>Refer to <u>Fastener Caution</u> .</p> <p><b>Tighten</b><br/>12 N.m (106 lb in)</p>                                       |
| 8  | Manual Shift Shaft Seal Surface                                                                                                                                                  |
| 9  | Fluid Fill Cap Sealing Surface                                                                                                                                                   |
| 10 | <p>Fluid Level Plug</p> <p><b>Tighten</b><br/>12 N.m (106 lb in)</p>                                                                                                             |
| 11 | <p>Valve Body Locating Pin</p> <p><b>Procedure</b><br/>Inspect the valve body locating pins.</p> <p><b>NOTE:</b><br/>The locating pins installed height is 5.8 mm (0.22 in).</p> |
| 12 | <p>Drain Plug</p> <p><b>Tighten</b><br/>12 N.m (106 lb in)</p>                                                                                                                   |

## MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

### Park Pawl Actuator Guide Installation

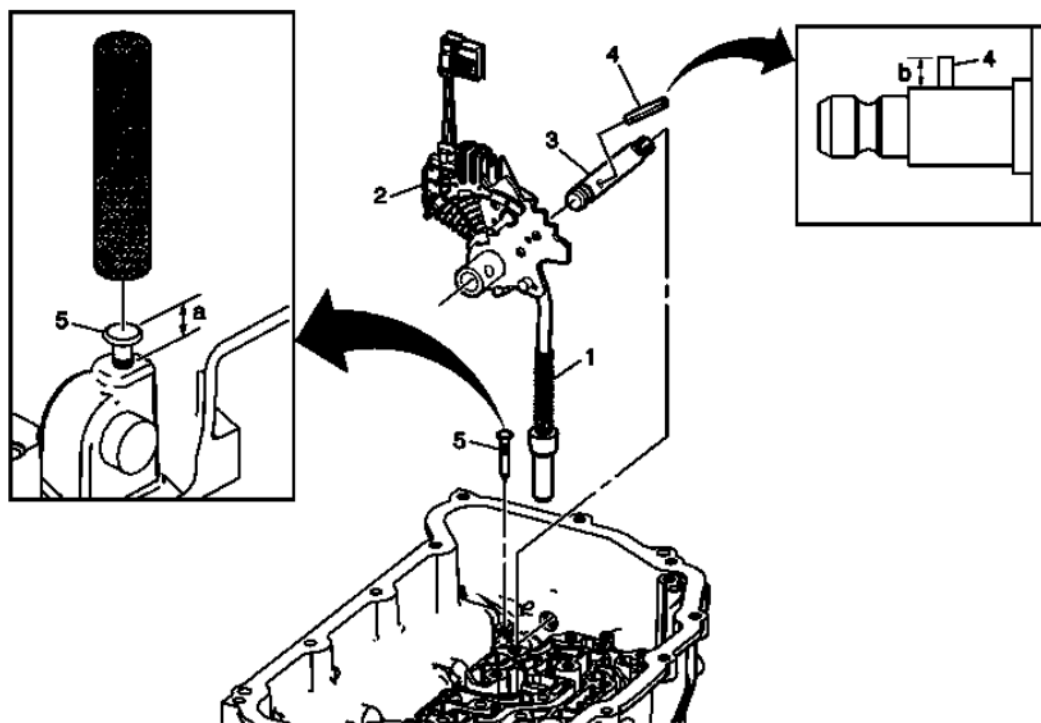


**Fig. 20: View Of Park Pawl Actuator Guide & Seal**  
 Courtesy of GENERAL MOTORS COMPANY

#### Park Pawl Actuator Guide Installation

| Callout | Component Name                                                                                                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Park Pawl Actuator Guide Assembly Seal                                                                                                                                                                                 |
| 2       | Park Pawl Actuator Guide Assembly                                                                                                                                                                                      |
| 3       | Park Pawl Actuator Guide Pin<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Procedure</b><br>Install the park pawl actuator guide pin to correct height.<br><b>Tighten</b><br>7.2 mm (0.28 in) |

#### Park Pawl Actuator Installation



**Fig. 21: Identifying Manual Shift Detent Lever with Shaft Position Switch Assembly & Park Pawl Actuator**

Courtesy of GENERAL MOTORS COMPANY

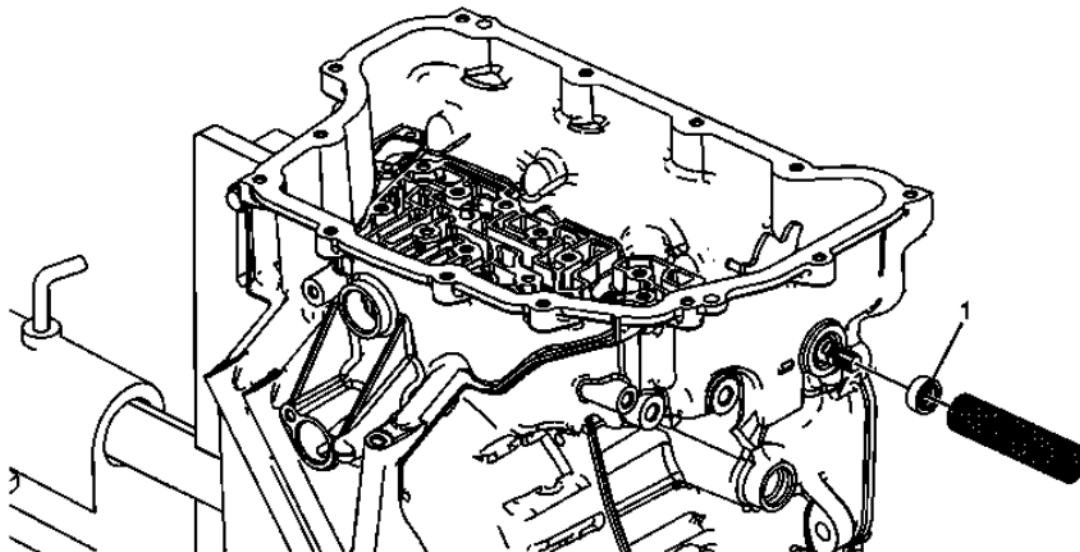
#### Park Pawl Actuator Installation

| Callout | Component Name                                                                                                                                                                                                                                                              |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Park Pawl Actuator Assembly                                                                                                                                                                                                                                                 |
| 2       | Manual Shift Detent (w/Shaft Position Switch) Lever Assembly                                                                                                                                                                                                                |
| 3       | Manual Shaft<br><br><b>NOTE:</b><br>Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.                                                                                                                                      |
| 4       | Manual Shaft Detent Lever Hub Pin<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Procedure</b><br>Install the manual shaft detent lever hub pin to correct height.<br><br><b>NOTE:</b><br>Use a NEW pin to ensure proper engagement with the shaft. |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p><b>Specification</b><br/>7.9 mm (0.38 in) (b)</p> <p><b>Special Tools</b><br/><b>DT-48550</b> Detent Lever Pin Remover<br/>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 5 | <p>Manual Shift Shaft Pin</p> <p><b>CAUTION:</b><br/>Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack.</p> <p><b>Procedure</b><br/>Inspect pin installed height is within specifications.</p> <p><b>NOTE:</b><br/>Use a <b>NEW</b> pin to ensure proper engagement with the case.</p> <p><b>Specification</b><br/>7.2-8.2 mm (0.28-0.32 in) (a)</p> <p><b>Special Tools</b><br/><b>DT-41229</b> Manual Shaft Pin Installer<br/>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |

## MANUAL SHIFT SHAFT SEAL INSTALLATION



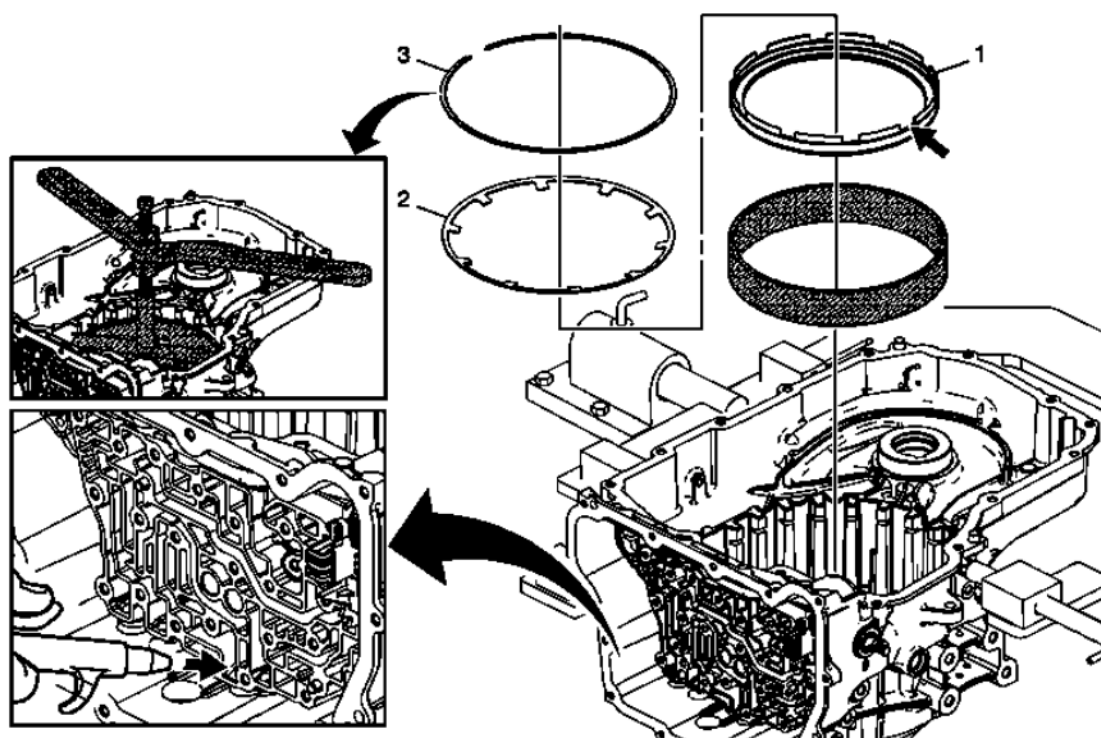


**Fig. 22: Identifying Manual Shift Shaft Seal**  
 Courtesy of GENERAL MOTORS COMPANY

#### Manual Shift Shaft Seal Installation

| Callout | Component Name                                                                                                                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shift Shaft Seal<br><b>Special Tool</b><br><b>DT-49101</b> Seal Installer<br>For equivalent regional tools, refer to <b>Special Tools</b> . |

#### 2-6 CLUTCH PISTON INSTALLATION (6T40/45/50)



**Fig. 23: View Of 2-6 Clutch Piston Assembly**  
Courtesy of GENERAL MOTORS COMPANY

#### 2-6 Clutch Piston Installation (6T40/45/50)

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>2-6 Clutch Piston Assembly</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>Position the 2-6 piston air bleed and large slot toward the top of the case.</li> <li>DT-47796 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the DT-47796 seal protector to ease installation of the piston.</li> </ul> <p><b>Special Tool</b><br/> <b>DT-47796</b> Seal Protector<br/>           For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 2       | 2-6 Clutch Spring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|         | <p>2-6 Clutch Spring Retainer</p> <p><b>CAUTION:</b><br/>           Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals.</p>                                                                                                                                                                                                                                                                                                                          |

3

**NOTE:**

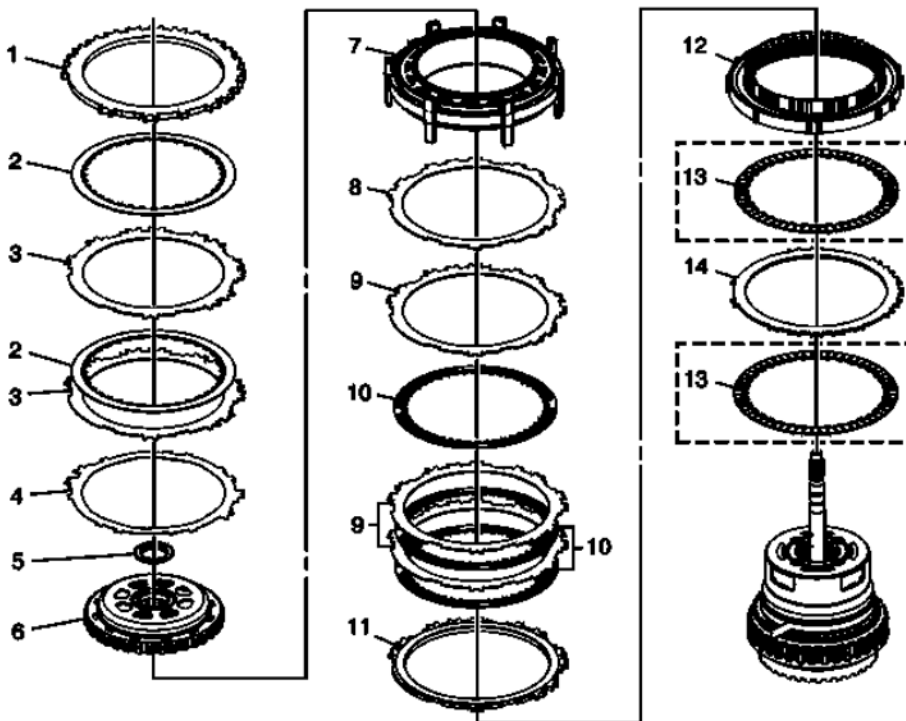
- Place the retainer on the 2-6 clutch spring and align the retainer opening with the largest gap in the case splines toward the bottom of the case. The retainer opening should be supported by a spline tooth of the case.
- Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation.

**Special Tools**

- DT-47797 Spring Installer
- DT-48056 Spring Compressor Bridge

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

**LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING, LOW AND REVERSE CLUTCH ASSEMBLY, OUTPUT SUN GEAR, AND 2-6 CLUTCH PLATE DISASSEMBLE (GEN 2)**



**Fig. 24: 1-2-3-4 Clutch Housing And Clutch Assembly Components**

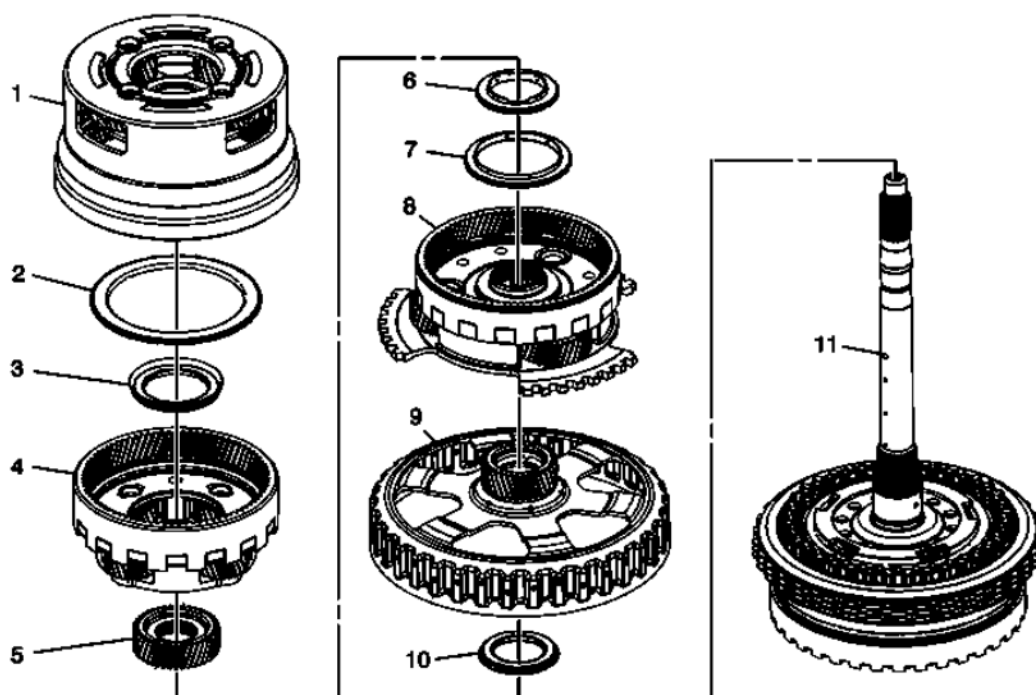
Courtesy of GENERAL MOTORS COMPANY

**Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 2)**

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

|    |                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | 1-2-3-4 Clutch Backing Plate                                                                                                                                              |
| 2  | 1-2-3-4 Clutch Plate Assembly (Qty: 2)                                                                                                                                    |
| 3  | 1-2-3-4 Clutch Plate (Qty: 2)                                                                                                                                             |
| 4  | 1-2-3-4 Clutch Waved Plate                                                                                                                                                |
| 5  | Output Sun Gear Thrust Bearing Assembly<br><br><b>NOTE:</b><br><b>The sun gear thrust bearing may be stuck to the driven sprocket hub.</b>                                |
| 6  | Output Sun Gear Assembly                                                                                                                                                  |
| 7  | Low-Reverse and 1-2-3-4 Clutch Housing Assembly                                                                                                                           |
| 8  | Low and Reverse Clutch Apply Plate                                                                                                                                        |
| 9  | Low and Reverse Clutch Plate (Qty: 3)                                                                                                                                     |
| 10 | Low and Reverse Clutch Plate Assembly (Qty: 3)                                                                                                                            |
| 11 | Low and Reverse Clutch Backing Plate                                                                                                                                      |
| 12 | Low and Reverse Clutch Assembly (OWC)                                                                                                                                     |
| 13 | 2-6 Clutch Plate Assembly (Qty: 2) - Model Dependent<br><br><b>NOTE:</b><br><b>The number of grooves in the clutch plate friction material varies depending on model.</b> |
| 14 | 2-6 Clutch Plate (Qty: 1)                                                                                                                                                 |

#### INPUT, REACTION, AND OUTPUT CARRIER DISASSEMBLE



**Fig. 25: Disassembled View Of Input, Reaction & Output Carrier**  
 Courtesy of GENERAL MOTORS COMPANY

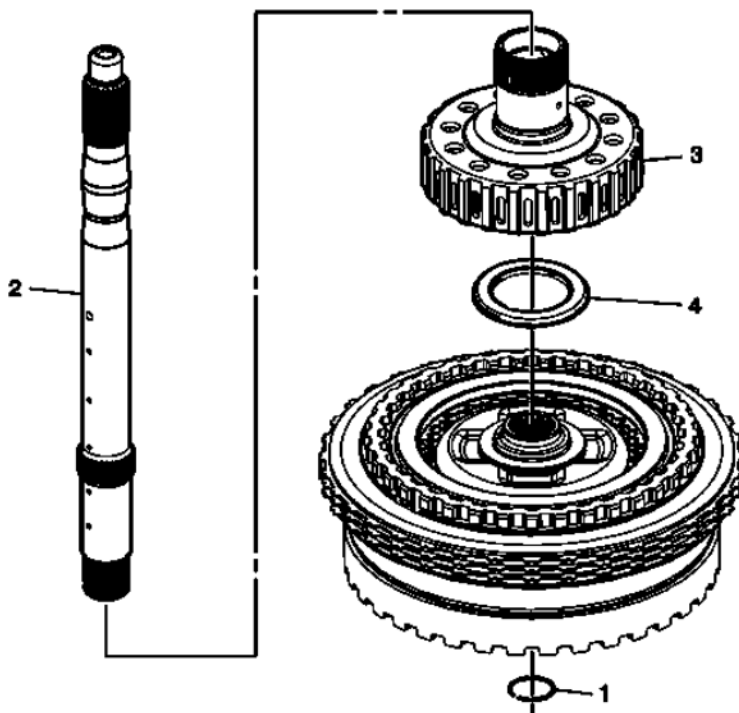
#### Input, Reaction, and Output Carrier Disassemble

| Callout | Component Name                                                                                                                                                                 |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Output Carrier Assembly<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 have 4 pinions.</li> <li>• The 6T45 and 6T50 have 5 pinions.</li> </ul> |
| 2       | Output Carrier Thrust Bearing Assembly                                                                                                                                         |
| 3       | Input Sun Gear Thrust Bearing Assembly                                                                                                                                         |
| 4       | Input Carrier Assembly<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 have 4 pinions.</li> <li>• The 6T45 and 6T50 have 5 pinions.</li> </ul>  |
| 5       | Input Sun Gear                                                                                                                                                                 |
| 6       | Input Sun Gear Thrust Bearing Assembly                                                                                                                                         |
| 7       | Input Carrier Thrust Bearing Assembly                                                                                                                                          |
|         | Reaction Carrier Assembly<br><br><b>NOTE:</b>                                                                                                                                  |

|    |                                                                                                                                                                                                                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8  | <p>Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models.</p> <p><b>Original Configuration:</b></p> <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 had 3 pinions.</li> <li>• The 6T45 and 6T50 had 4 pinions.</li> </ul> |
| 9  | Reaction Carrier Sun Gear Assembly                                                                                                                                                                                                                                                                                            |
| 10 | Reaction Carrier Sun Gear Thrust Bearing                                                                                                                                                                                                                                                                                      |
| 11 | <p><b>NOTE:</b></p> <p>The sun gear thrust bearing may be stuck to the sun gear.</p>                                                                                                                                                                                                                                          |
|    | 3-5 Reverse and 4-5-6 Clutch Housing Assembly                                                                                                                                                                                                                                                                                 |

### 3-5-REVERSE AND 4-5-6 CLUTCH HOUSING DISASSEMBLE (6T40/45/50 - GEN 2)

#### Turbine Shaft, Reluctor Wheel and Piston Removal



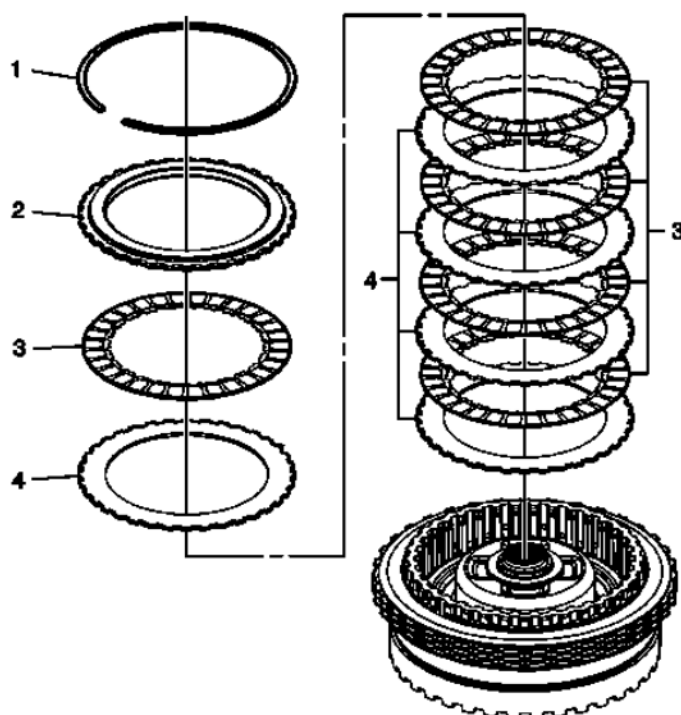
**Fig. 26: Turbine Shaft, Reluctor Wheel And Piston**  
Courtesy of GENERAL MOTORS COMPANY

#### Turbine Shaft, Reluctor Wheel and Piston Removal

| Callout | Component Name              |
|---------|-----------------------------|
|         | Turbine Shaft Retainer Ring |

|   |                                                                                                                                    |
|---|------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>NOTE:</b><br>Discard the retainer ring. It is not re-usable.                                                                    |
|   | <b>Special Tools</b><br>GE 5586-A Snap Ring Pliers or equivalent<br>For equivalent regional tools, refer to <b>Special Tools</b> . |
| 2 | Turbine Shaft                                                                                                                      |
| 3 | Reaction Carrier Hub Assembly                                                                                                      |
| 4 | Reaction Carrier Hub Thrust Bearing Assembly                                                                                       |

#### 4-5-6 Clutch Plate Removal

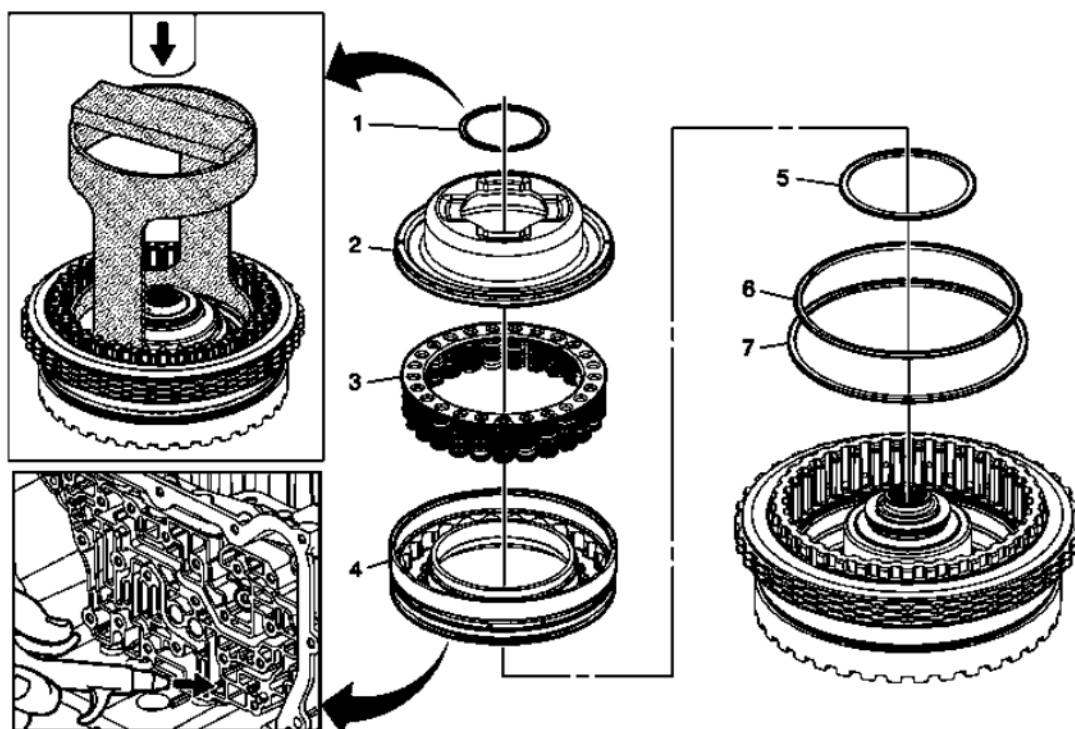


**Fig. 27: 4-5-6 Clutch Plate**  
Courtesy of GENERAL MOTORS COMPANY

#### 4-5-6 Clutch Plate Removal

| Callout | Component Name                            |
|---------|-------------------------------------------|
| 1       | 4-5-6 Clutch Backing Plate Retaining Ring |
| 2       | 4-5-6 Clutch Backing Plate                |
| 3       | 4-5-6 Clutch Plate Assembly (Qty: 5)      |
| 4       | 4-5-6 Clutch Plate (Gen 2 - Qty: 5)       |

#### 4-5-6 Clutch Piston Removal



**Fig. 28: 4-5-6 Clutch Piston**  
Courtesy of GENERAL MOTORS COMPANY

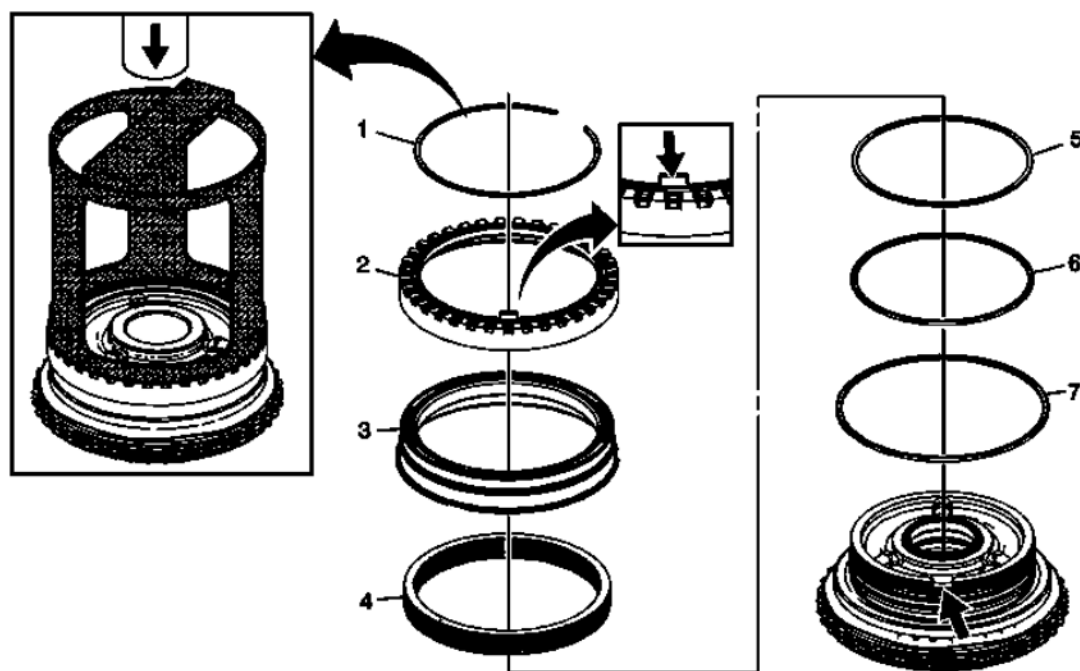
#### 4-5-6 Clutch Piston Removal

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                             |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>4-5-6 Clutch Dam Retaining Ring</p> <p><b>NOTE:</b><br/>The 4-5-6 clutch dam retaining ring is not reusable.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• DT-47951-2 Spring Compressor</li> <li>• GE 5586-A Snap Ring Pliers or equivalent</li> </ul> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 2       | <p>4-5-6 Clutch Piston Fluid Dam Assembly</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Place the 3-5 reverse and 4-5-6 clutch housing onto the support hub in the case.</li> <li>2. Apply shop air to the 4-5-6 clutch feed hole using a rubber tipped air gun to dislodge the dam piston and the 4-5-6 clutch piston</li> </ol>  |



|   |                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | from the clutch housing.                                                                                                                             |
| 3 | 4-5-6 Clutch Piston Return Spring Assembly                                                                                                           |
| 4 | 4-5-6 Clutch Piston<br><br><b>NOTE:</b><br>Apply shop air to the 4-5-6 clutch feed hole using a rubber tipped air gun to dislodge the clutch piston. |
| 5 | 4-5-6 Clutch Piston Inner Seal                                                                                                                       |
| 6 | 4-5-6 Clutch Piston Outer Seal (Dark Blue) (Stepped)                                                                                                 |
| 7 | 4-5-6 Clutch Piston Outer Seal (Large) (Rounded)                                                                                                     |

#### Reluctor Wheel and Piston Removal



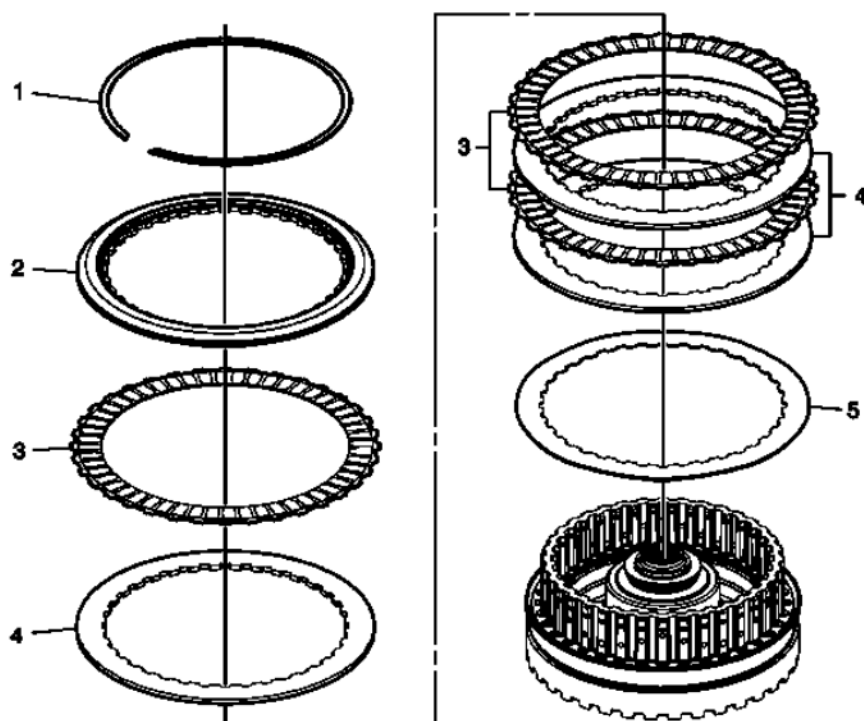
**Fig. 29: Disassembled View Of Reluctor Wheel & Piston**  
Courtesy of GENERAL MOTORS COMPANY

#### Reluctor Wheel and Piston Removal

| Callout | Component Name                                                                                                                                                                                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Input Shaft Speed Sensor Reluctor Ring Retainer Ring<br><br><b>CAUTION:</b><br>Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. |

|   |                                                                                                                                   |
|---|-----------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Special Tool</b><br><b>DT-47694</b> Piston Spring Compressor<br>For equivalent regional tools, refer to <b>Special Tools</b> . |
| 2 | Input Shaft Speed Sensor Reluctor Wheel                                                                                           |
| 3 | 3-5 Reverse Clutch Piston                                                                                                         |
| 4 | 3-5 Reverse Clutch Piston Return Spring Assembly                                                                                  |
| 5 | 3-5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)                                                                          |
| 6 | 3-5 Reverse Clutch Piston Inner Seal                                                                                              |
| 7 | 3-5 Reverse Clutch Piston Dam Seal (Black)                                                                                        |

### 3-5 Reverse Clutch Plate Removal



**Fig. 30: 3-5 Reverse Clutch Plate**  
Courtesy of GENERAL MOTORS COMPANY

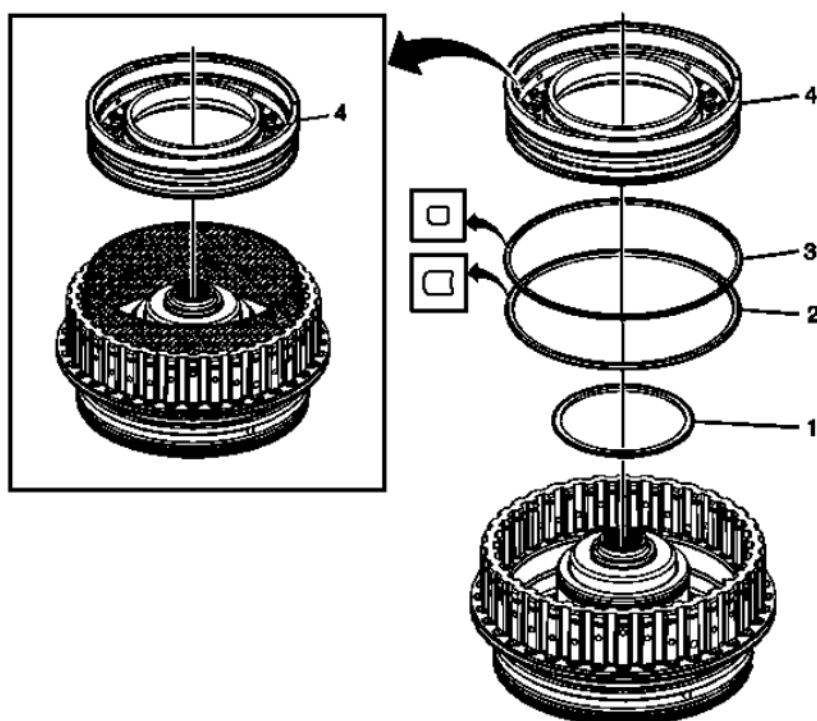
### 3-5 Reverse Clutch Plate Removal

| Callout | Component Name                                                                                                                                                                          |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 3-5 Reverse Clutch Backing Plate Ring Retainer Ring<br><br><b>NOTE:</b><br><b>Gently push down on the backing plate to get enough clearance between the backing plate and retainer.</b> |
| 2       | 3-5 Reverse Clutch Backing Plate                                                                                                                                                        |
| 3       | 3-5 Reverse Clutch Plate Assembly (Qty: 3)                                                                                                                                              |

|   |                                        |
|---|----------------------------------------|
| 4 | 3-5 Reverse Clutch Plate (Qty: 3)      |
| 5 | 3-5 Reverse Clutch Apply Plate (Waved) |

### 3-5-REVERSE AND 4-5-6 CLUTCH HOUSING ASSEMBLE (6T40/45/50 - GEN 2)

#### 4-5-6 Clutch Piston Installation



**Fig. 31: 4-5-6 Clutch Piston**

Courtesy of GENERAL MOTORS COMPANY

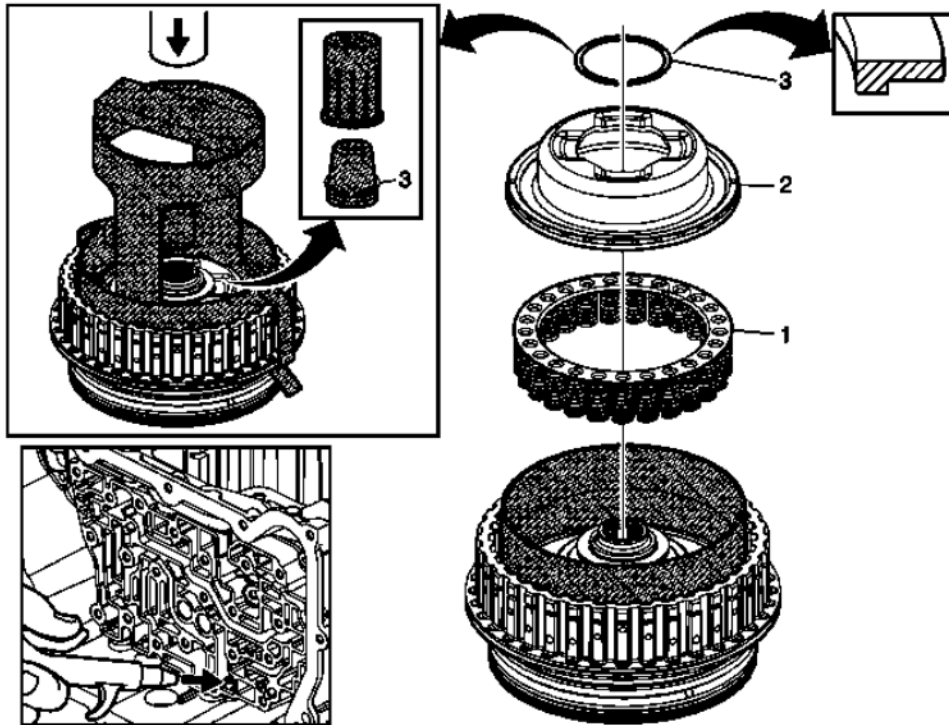
#### 4-5-6 Clutch Piston Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 4-5-6 Clutch Piston Inner Seal                                                                                                                                                                                                                                                                                                                                                                         |
| 2       | 4-5-6 Clutch Piston Outer Seal (Large) (Rounded)                                                                                                                                                                                                                                                                                                                                                       |
| 3       | 4-5-6 Clutch Piston Outer Seal (Dark Blue) (Stepped)                                                                                                                                                                                                                                                                                                                                                   |
| 4       | <p>4-5-6 Clutch Piston</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>DT-47805 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT-47805 seal protector to ease the installation of the piston.</li> <li>DT-47951-2 spring compressor can be used as a pusher if necessary.</li> </ul> <p><b>Special Tools</b></p> |

- DT-47805 Seal Protector
- DT-47951-2 Spring Compressor

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

#### 4-5-6 Clutch Fluid Dam Installation



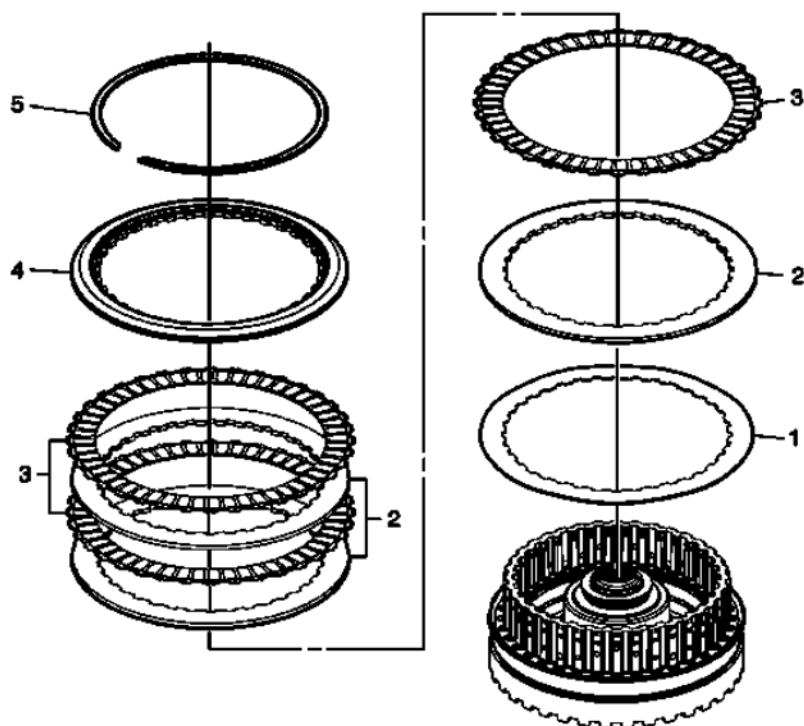
**Fig. 32: 4-5-6 Clutch Fluid Dam**  
Courtesy of GENERAL MOTORS COMPANY

#### 4-5-6 Clutch Fluid Dam Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 4-5-6 Clutch Piston Return Spring Assembly                                                                                                                                                                                                                                                                                                                                                                                              |
| 2       | 4-5-6 Clutch Piston Fluid Dam Assembly<br><br><b>NOTE:</b><br>The seal protector prevents the dam seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the seal protector to ease the installation of the dam.<br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-47951-1 Seal Protector for 6T40/45 applications</li> <li>• DT-50117 Seal Protector for 6T50 applications</li> </ul> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | For equivalent regional tools, refer to <b><u>Special Tools</u></b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3 | <p>4-5-6 Clutch Dam Retaining Ring</p> <p><b>CAUTION:</b><br/>Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals.</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Leave the seal protector on the clutch housing while installing the retaining ring. Install the dam retainer clips <b>DT 50117-1</b> seal protector to hold the seal protector in place.</li> <li>2. Use <b>DT 46620-2</b> retaining clips and <b>DT 50573</b> ring guide to install a NEW 4-5-6 clutch dam retaining ring. Assemble the ring "L" leg facing down, DT 50573 and DT 46620 and insert as an assembly onto the clutch hub to install the ring.</li> <li>3. Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation.</li> </ol> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-47951-2</b> Spring Compressor</li> <li>• <b>DT 46620</b> Seal Installer</li> <li>• <b>DT 50117-1</b> Seal Protector</li> <li>• <b>DT 50117-2</b> Seal Protector Retaining Clips</li> <li>• <b>DT 50573</b> Retaining Ring Installer</li> </ul> <p>For equivalent regional tools, refer to <b><u>Special Tools</u></b> .</p> |

### 3-5 Reverse Clutch Plates Installation

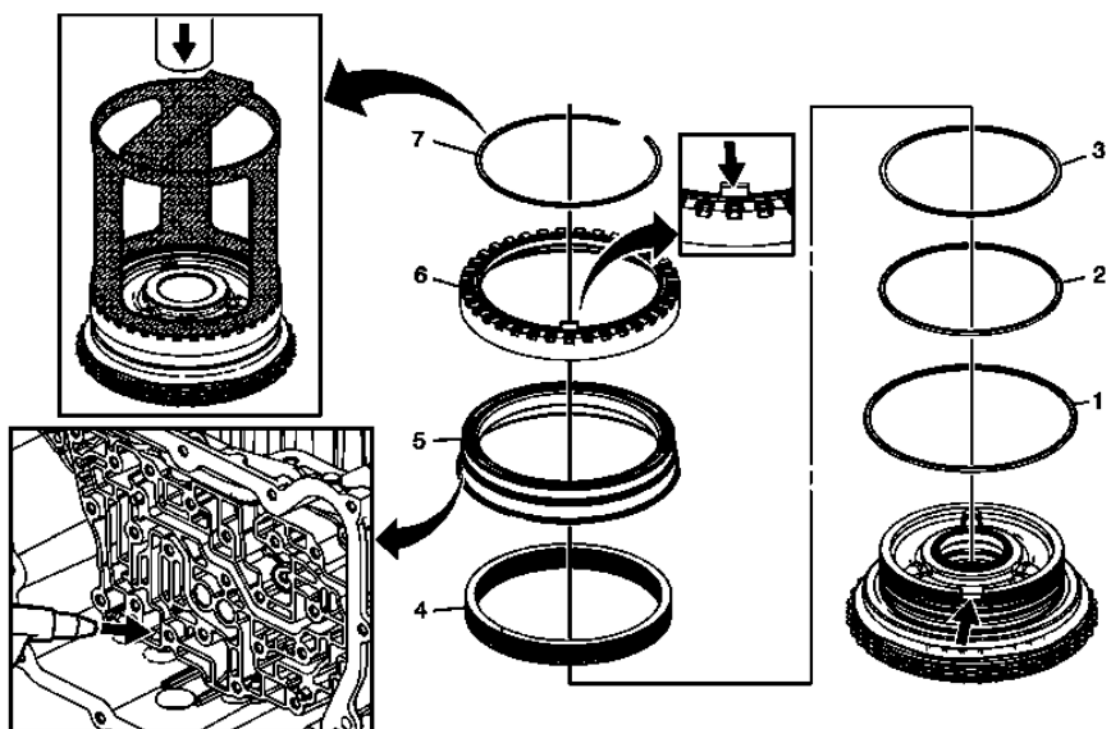


**Fig. 33: 3-5 Reverse Clutch Plates**  
 Courtesy of GENERAL MOTORS COMPANY

### 3-5 Reverse Clutch Plates Installation

| Callout | Component Name                                      |
|---------|-----------------------------------------------------|
| 1       | 3-5 Reverse Clutch Apply Plate (Waved)              |
| 2       | 3-5 Reverse Clutch Plate (Qty: 3)                   |
| 3       | 3-5 Reverse Clutch Plate Assembly (Qty: 3)          |
| 4       | 3-5 Reverse Clutch Backing Plate                    |
| 5       | 3-5 Reverse Clutch Backing Plate Ring Retainer Ring |

### Reluctor Wheel and Piston Installation



**Fig. 34: Exploded View Of Reluctor Wheel & Piston**  
Courtesy of GENERAL MOTORS COMPANY

#### Reluctor Wheel and Piston Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 3-5 Reverse Clutch Piston Dam Seal (Black)                                                                                                                                                                                                                                                                                                                                                                                                |
| 2       | 3-5 Reverse Clutch Piston Inner Seal                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3       | 3-5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)                                                                                                                                                                                                                                                                                                                                                                                  |
| 4       | 3-5 Reverse Clutch Piston Return Spring Assembly                                                                                                                                                                                                                                                                                                                                                                                          |
| 5       | 3-5 Reverse Clutch Piston                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 6       | Input Shaft Speed Sensor Reluctor Wheel                                                                                                                                                                                                                                                                                                                                                                                                   |
| 7       | <p>Input Shaft Speed Sensor Reluctor Ring Retainer Ring</p> <p><b>CAUTION:</b><br/>Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing.</p> <p><b>CAUTION:</b><br/>Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals.</p> <p><b>Procedure</b></p> |

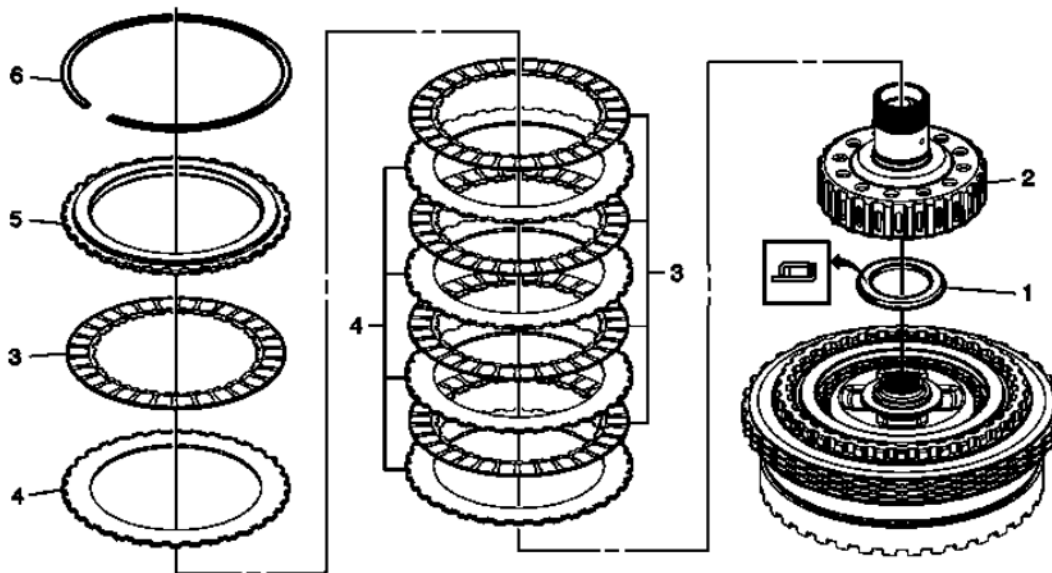
Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation.

**Special Tools**

**DT-47694** Piston Spring Compressor

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

**4-5-6 Clutch Plates Installation**



**Fig. 35: 4-5-6 Clutch Plates**

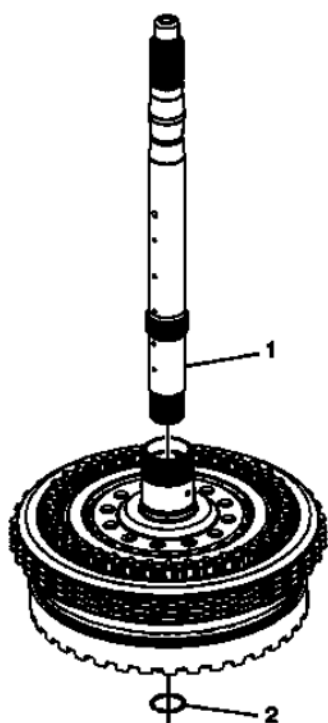
Courtesy of GENERAL MOTORS COMPANY

**4-5-6 Clutch Plates Installation**

| Callout | Component Name                               |
|---------|----------------------------------------------|
| 1       | Reaction Carrier Hub Thrust Bearing Assembly |
| 2       | Reaction Carrier Hub Assembly                |
| 3       | 4-5-6 Clutch Plate Assembly (Qty: 5)         |
| 4       | 4-5-6 Clutch Plate (Qty: 5)                  |
| 5       | 4-5-6 Clutch Backing Plate                   |
| 6       | 4-5-6 Clutch Backing Plate Retaining Ring    |

**Turbine Shaft Installation**



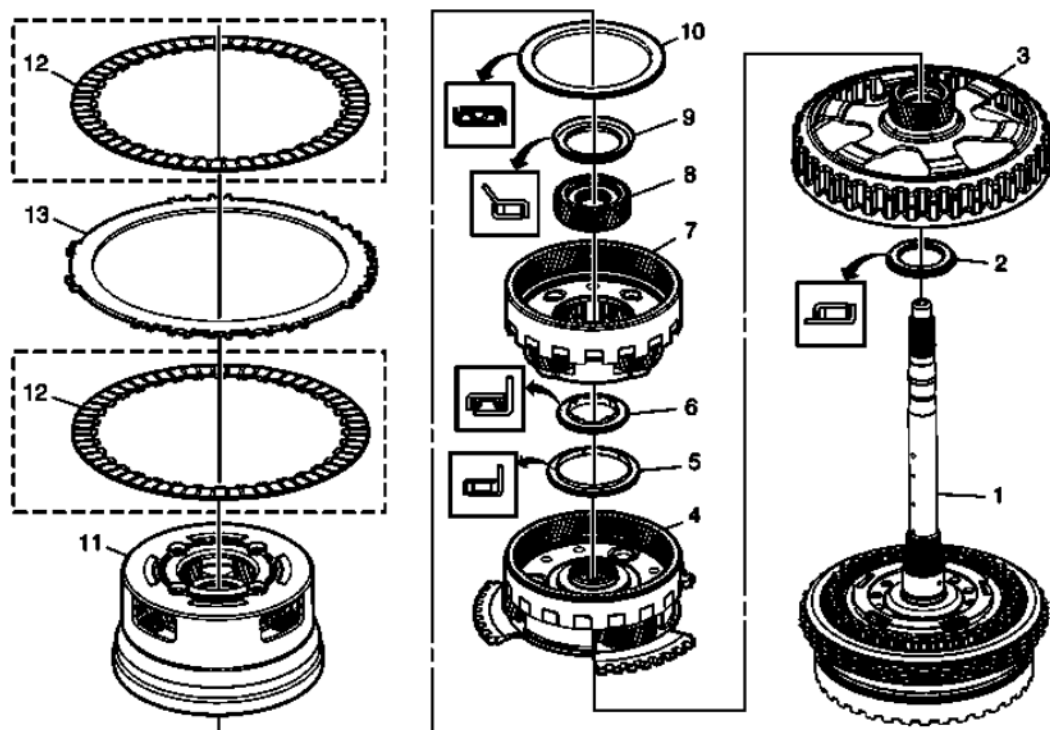


**Fig. 36: View Of Turbine Shaft**  
 Courtesy of GENERAL MOTORS COMPANY

#### Turbine Shaft Installation

| Callout | Component Name                                                                                                                                                                                                                              |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Turbine Shaft                                                                                                                                                                                                                               |
| 2       | Turbine Shaft Retainer Ring<br><br><b>NOTE:</b><br>Do not re-use the turbine shaft retainer ring.<br><br><b>Special Tools</b><br>GE 5586-A Snap Ring Pliers or equivalent<br>For equivalent regional tools, refer to <b>Special Tools</b> . |

#### INPUT, REACTION, AND OUTPUT CARRIER ASSEMBLE (GEN 2)



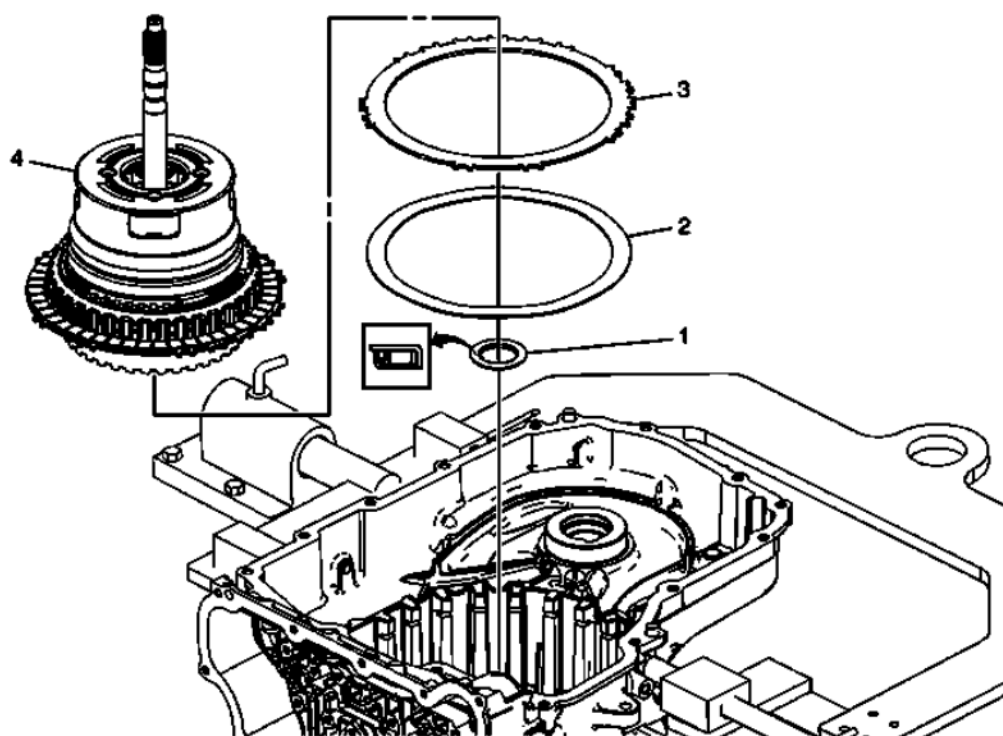
**Fig. 37: Input, Reaction, and Output Carrier Components (Gen 2)**  
 Courtesy of GENERAL MOTORS COMPANY

#### Input, Reaction, and Output Carrier Assemble (Gen 2)

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                          |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 3-5 Reverse and 4-5-6 Clutch Housing Assembly                                                                                                                                                                                                                                                                                                                           |
| 2       | Reaction Carrier Sun Gear Thrust Bearing                                                                                                                                                                                                                                                                                                                                |
| 3       | Reaction Carrier Sun Gear Assembly                                                                                                                                                                                                                                                                                                                                      |
| 4       | Reaction Carrier Assembly<br><br><b>NOTE:</b><br>Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models.<br><br><b>Original Configuration:</b> <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 had 3 pinions.</li> <li>• The 6T45 and 6T50 had 4 pinions.</li> </ul> |
| 5       | Input Carrier Thrust Bearing Assembly                                                                                                                                                                                                                                                                                                                                   |
| 6       | Input Sun Gear Thrust Bearing Assembly                                                                                                                                                                                                                                                                                                                                  |
| 7       | Input Carrier Assembly<br><br><b>NOTE:</b>                                                                                                                                                                                                                                                                                                                              |

|    |                                                                                                                                                                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 have 4 pinions.</li> <li>• The 6T45 and 6T50 have 5 pinions.</li> </ul>                                                                                                                                                                       |
| 8  | Input Sun Gear                                                                                                                                                                                                                                                                                           |
| 9  | Input Sun Gear Thrust Bearing Assembly                                                                                                                                                                                                                                                                   |
| 10 | Output Carrier Thrust Bearing Assembly                                                                                                                                                                                                                                                                   |
| 11 | Output Carrier Assembly<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The 6T30 and 6T40 have 4 pinions.</li> <li>• The 6T45 and 6T50 have 5 pinions.</li> </ul>                                                                                                                           |
| 12 | 2-6 Clutch Plate Assembly (Qty: 2) - Model Dependent<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Begin with the clutch plate assembly and alternate with the clutch plate.</li> <li>• The number of grooves in the clutch plate friction material varies depending on model.</li> </ul> |
| 13 | 2-6 Clutch Plate (Qty: 1)<br><br><b>NOTE:</b><br>Only install one 2-6 Clutch Plate at this time. The remaining clutch plate is installed into the case.                                                                                                                                                  |

### 3-5-REVERSE AND 4-5-6 CLUTCH HOUSING, AND INPUT, REACTION, AND OUTPUT CARRIER INSTALLATION

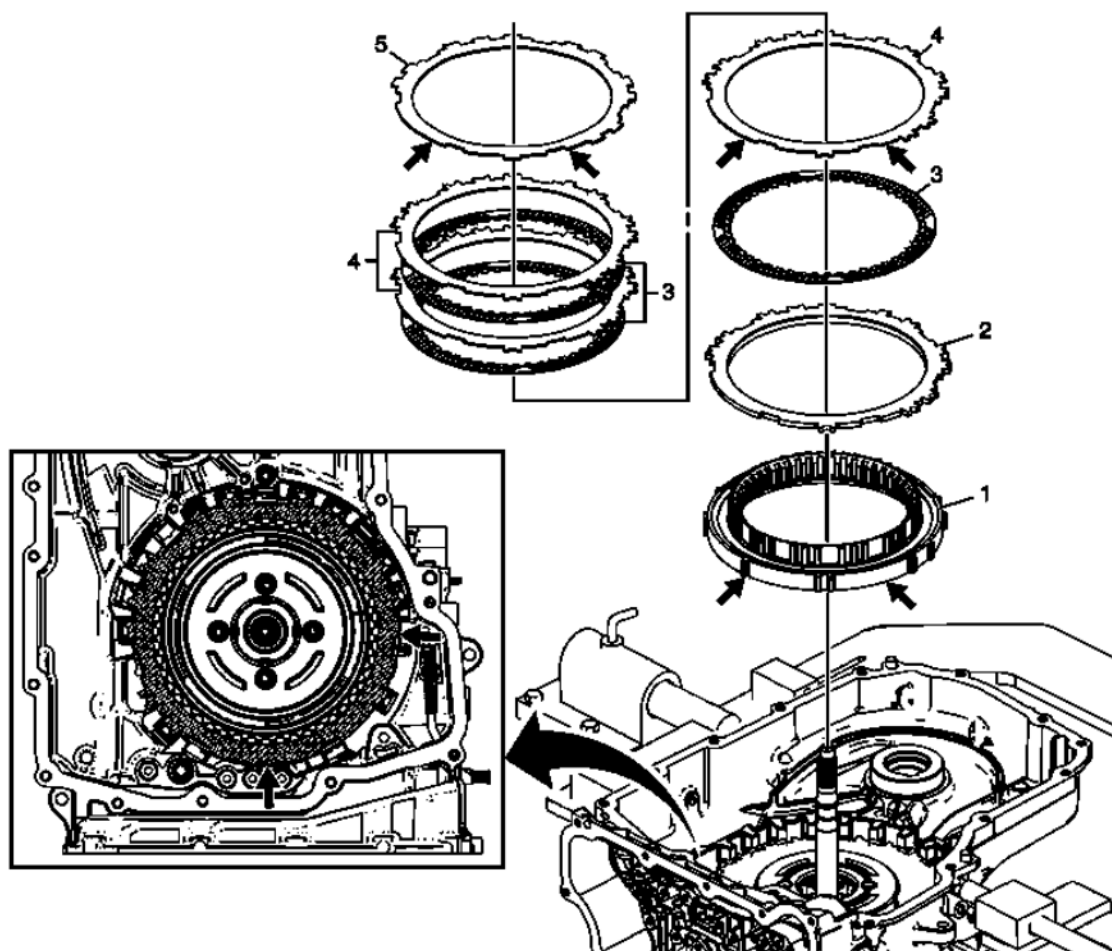


**Fig. 38: View Of 3-5-Reverse, 4-5-6 Clutch Housing, Input, Reaction & Output Carrier Components**  
 Courtesy of GENERAL MOTORS COMPANY

### 3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                       |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 3-5 Reverse and 4-5-6 Clutch Housing Thrust Bearing                                                                                                                                                                                                                                                                                                                                                  |
| 2       | 2-6 Clutch Apply Plate (Waved)                                                                                                                                                                                                                                                                                                                                                                       |
| 3       | 2-6 Clutch Plate (Qty: 1)<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>Only install one 2-6 Clutch Plate. The remaining clutch plate is installed with the gearset assembly.</li> <li>Align the large flat areas with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.</li> </ul> |
| 4       | 3-5 Reverse and 4-5-6 Clutch Housing Assembly and Gearset<br><br><b>NOTE:</b><br>Align the large flat areas of the 2-6 Clutch Plate with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.                                                                                                       |

### LOW AND REVERSE CLUTCH ASSEMBLY AND LOW AND REVERSE CLUTCH PLATE INSTALLATION



**Fig. 39: View Of Low and Reverse Clutch Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

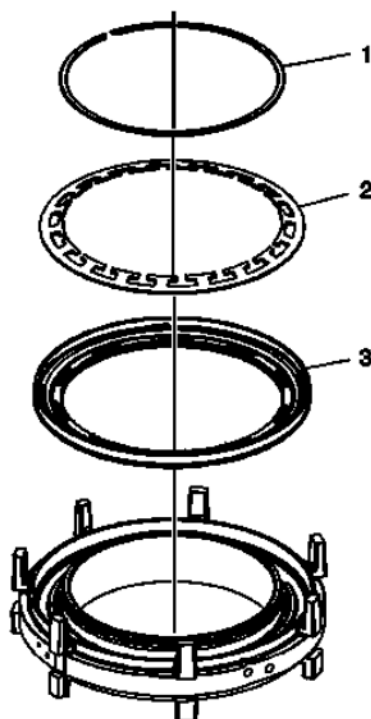
#### Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Low and Reverse Clutch Assembly (OWC)<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The Low and Reverse Clutch Assembly should rotate freely in one direction and lock in the opposite direction.</li> <li>• Align the large flat areas of the Low and Reverse Clutch Assembly with the valve body end of the case.</li> </ul> |
| 2       | Low and Reverse Clutch Backing Plate                                                                                                                                                                                                                                                                                                          |
| 3       | Low and Reverse Clutch Plate Assembly (Qty: 3)                                                                                                                                                                                                                                                                                                |
| 4       | Low and Reverse Clutch Plate (Qty: 3)<br><br><b>NOTE:</b><br>Align the large flat areas of the Low and Reverse Clutch Plate with                                                                                                                                                                                                              |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | the valve body end of the case.                                                                                                                                                                                                                                                                                                                                                                                                           |
| 5 | <p>Low and Reverse Clutch Apply (Waved) Plate</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"> <li>Align the large flat areas of the Low and Reverse Clutch Apply Plate with the valve body end of the case.</li> <li>Ensure the correct waved plate is being installed. The 1-2-3-4 clutch and low and reverse clutch waved plates are visually similar, however the low and reverse clutch waved plate is thicker.</li> </ul> |

## LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING DISASSEMBLE

### Low and Reverse Clutch Piston Removal

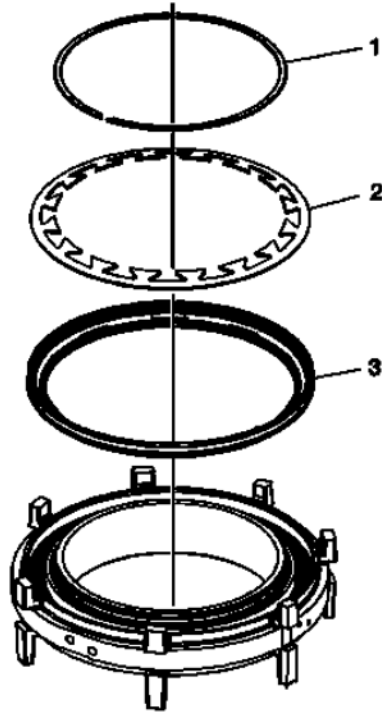


**Fig. 40: View Of Low & Reverse Clutch Piston**  
Courtesy of GENERAL MOTORS COMPANY

### Low and Reverse Clutch Piston Removal

| Callout | Component Name                                                                                                                                                                                   |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Low and Reverse Clutch Spring Retainer</p> <p><b>Special Tool</b><br/> <b>GE-8059</b> Snap Ring Pliers - Parallel Jaw<br/> For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 2       | Low and Reverse Clutch Spring                                                                                                                                                                    |

### 1-2-3-4 Clutch Piston Removal

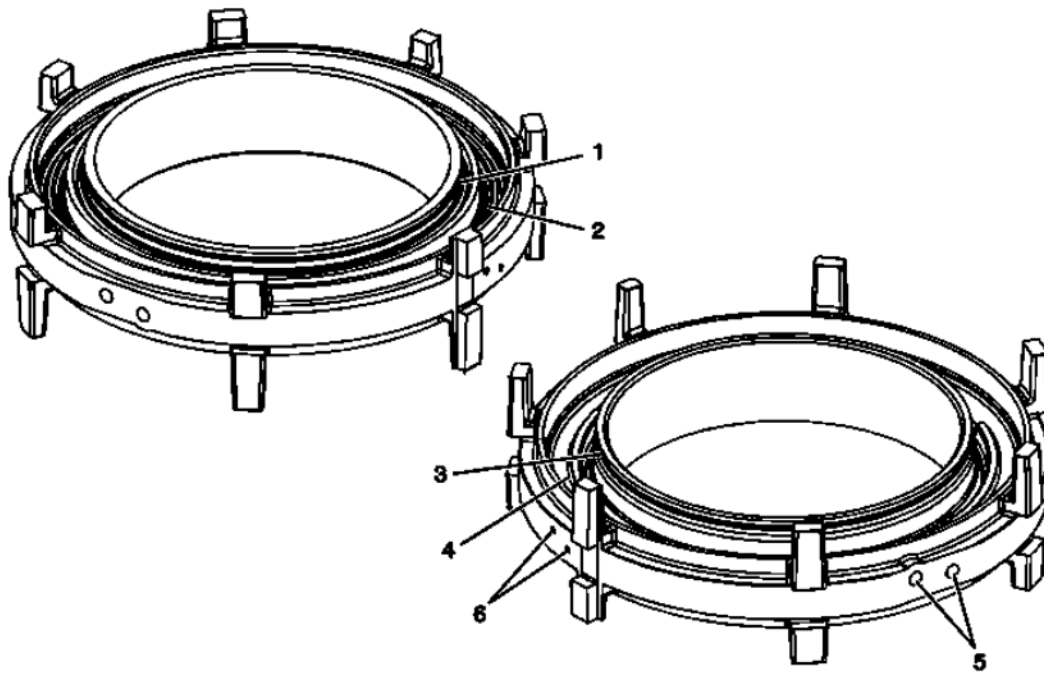


**Fig. 41: View Of 1-2-3-4 Clutch Piston**  
 Courtesy of GENERAL MOTORS COMPANY

### 1-2-3-4 Clutch Piston Removal

| Callout | Component Name                                                                                                                                                            |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | 1-2-3-4 Clutch Spring Retainer<br><b>Special Tool</b><br><b>GE-8059</b> Snap Ring Pliers - Parallel Jaw<br>For equivalent regional tools, refer to <b>Special Tools</b> . |
| 2       | 1-2-3-4 Clutch Spring                                                                                                                                                     |
| 3       | 1-2-3-4 Clutch Piston                                                                                                                                                     |

### LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING CLEANING AND INSPECTION



**Fig. 42: Identifying Low and Reverse & 1-2-3-4 Clutch Housing**  
 Courtesy of GENERAL MOTORS COMPANY

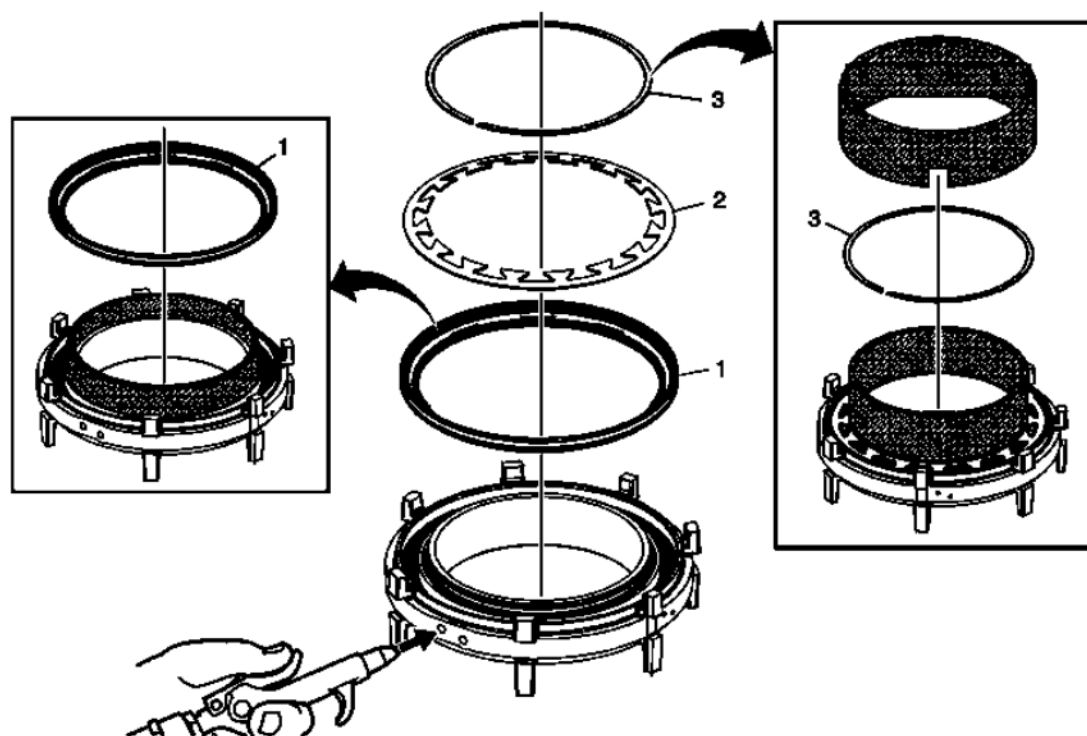
#### Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection

| Callout                                                                                                                                                                                                                          | Component Name                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>CAUTION:</b><br>After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.                 |                                               |
| <b>CAUTION:</b><br>Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.                                                                                                 |                                               |
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Thoroughly clean the housing with clean solvent.</li> <li>2. Inspect the piston bores and retainer ring grooves for wear, damage or porosity.</li> </ol> |                                               |
| 1                                                                                                                                                                                                                                | 1-2-3-4 Clutch Spring Retainer Groove         |
| 2                                                                                                                                                                                                                                | 1-2-3-4 Clutch Piston Bore                    |
| 3                                                                                                                                                                                                                                | Low and Reverse Clutch Spring Retainer Groove |
| 4                                                                                                                                                                                                                                | Low and Reverse Clutch Piston Bore            |
| 5                                                                                                                                                                                                                                | Clutch Oil Passages                           |
| 6                                                                                                                                                                                                                                | Air Bleed Passages                            |

#### LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING ASSEMBLE



## 1-2-3-4 Clutch Piston Installation



**Fig. 43: View Of 1-2-3-4 Clutch Piston**  
Courtesy of GENERAL MOTORS COMPANY

## 1-2-3-4 Clutch Piston Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                 |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>1-2-3-4 Clutch Piston</p> <p><b>NOTE:</b><br/>DT-47798 protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the ID of DT-47798 protector to ease the installation of the piston.</p> <p><b>Special Tools</b><br/>DT-47798 Seal Protector</p> |
| 2       | 1-2-3-4 Clutch Spring                                                                                                                                                                                                                                                                          |
|         | <p>1-2-3-4 Clutch Spring Retainer</p> <p><b>CAUTION:</b><br/>Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals.</p> <p><b>Procedure</b></p>                                                               |

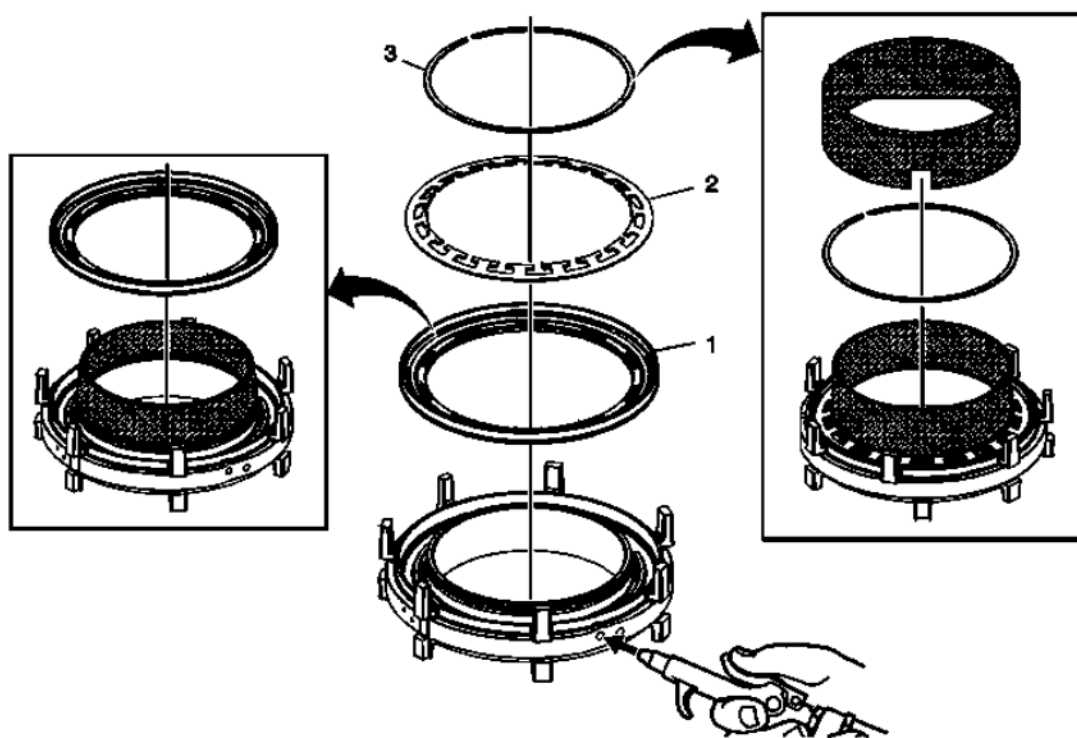
3

1. Place the retainer onto DT-47799-1 which is part of **DT-47799** compressor. Compressing the spring using DT-47799-2 which is part of **DT-47799** compressor, will install the retainer into the retainer groove.
2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation.

#### Special Tools

**DT-47799** Clutch Piston Spring Compressor

#### Low and Reverse Clutch Piston Installation



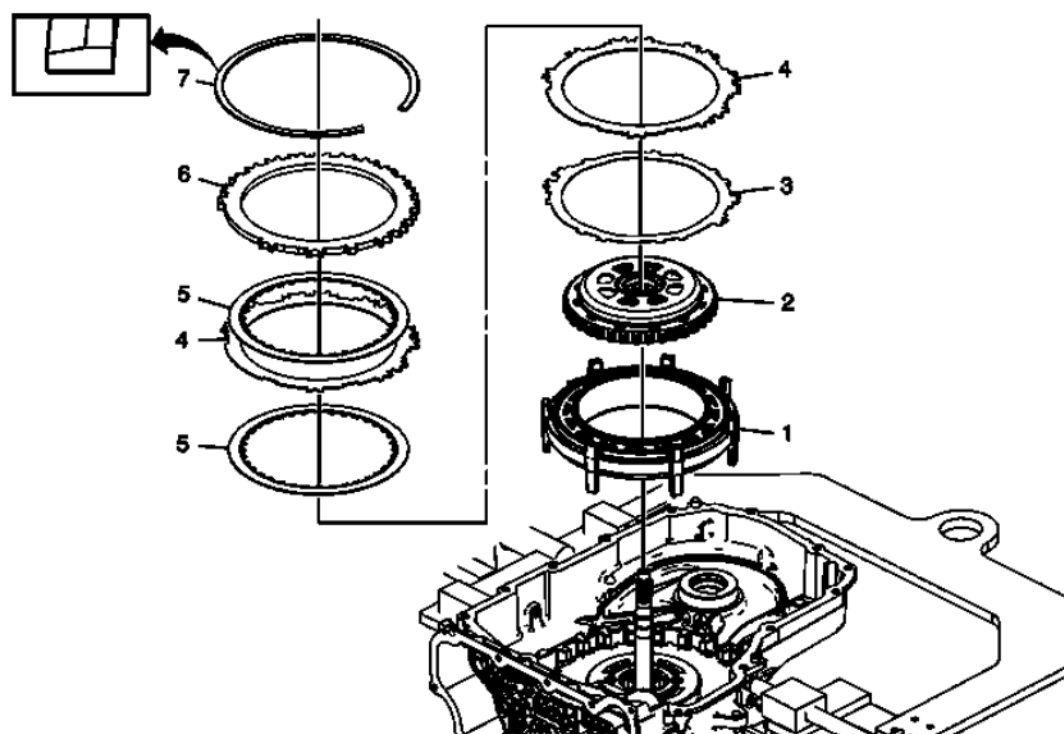
**Fig. 44: View Of Low & Reverse Clutch Piston**  
Courtesy of GENERAL MOTORS COMPANY

#### Low and Reverse Clutch Piston Installation

| Callout | Component Name                                                                                                                                                                                                                                 |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Low and Reverse Clutch Piston</p> <p><b>NOTE:</b><br/>DT-47807 protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the ID of DT-47807 protector to ease the installation of the piston.</p> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Special Tools</b><br><b>DT-47807</b> Clutch Piston Seal Protector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 2 | Low and Reverse Clutch Spring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 3 | Low and Reverse Clutch Spring Retainer<br><br><b>CAUTION:</b><br>Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals.<br><br><b>Procedure</b><br><br><ol style="list-style-type: none"> <li>1. Place the retainer onto DT-47794-1 which is part of <b>DT-47794</b> compressor. Compressing the spring using DT-47794-2 which is part of <b>DT-47794</b> compressor, will install the retainer into the retainer groove.</li> <li>2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation.</li> </ol><br><b>Special Tools</b><br><b>DT-47794</b> Spring Compressor |

## LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING, AND 1-2-3-4 CLUTCH PLATE INSTALLATION (6T40/45/50)



**Fig. 45: View Of Low and Reverse & 1-2-3-4 Clutch Housing & Attached Components**  
 Courtesy of GENERAL MOTORS COMPANY

**Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T40/45/50)**

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Low and Reverse and 1-2-3-4 Clutch Housing<br><br><b>NOTE:</b><br>The longer legs face the bottom of the case and the oil passages face the valve body end of the case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 2       | Output Sun Gear Assembly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3       | 1-2-3-4 Clutch Waved Plate<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>Align the single pair of tabs with the bottom valve body end of the case.</li> <li>Ensure the correct waved plate is being installed. The 1-2-3-4 clutch and low and reverse clutch waved plates are visually similar, however the low and reverse clutch waved plate is thicker.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 4       | 1-2-3-4 Clutch Plate (Qty: 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5       | 1-2-3-4 Clutch Plate Assembly (Qty: 2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 6       | 1-2-3-4 Clutch Backing Plate<br><br><b>NOTE:</b><br>Align the single skinny tab with the case spline facing the top of the case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 7       | 1-2-3-4 Clutch Backing Plate Retainer Ring<br><br><b>WARNING:</b><br>The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result.<br><br><b>CAUTION:</b><br>Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear.<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>Install the retainer with the taper facing away from the backing plate.</li> <li>Align the retainer opening with the largest gap in the case splines toward the bottom of the case.</li> <li>Install one end of the retainer into the retainer ring groove. Use</li> </ul> |

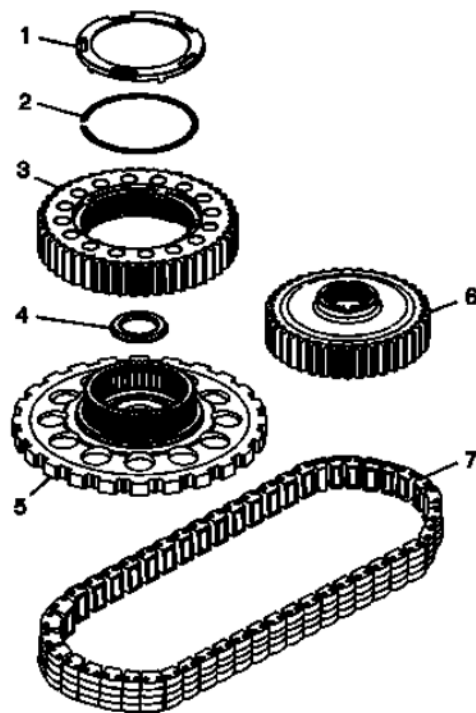
DT-28585 snap ring remover and work the retainer into the case groove. Use a screwdriver to hold the retainer away from the case while pushing down on the retainer with DT-28585 snap ring remover.

**Special Tool**

**DT-28585** Snap Ring Remover or equivalent

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

**DRIVE SPROCKET, DRIVEN SPROCKET, AND DRIVE LINK CLEANING AND INSPECTION**



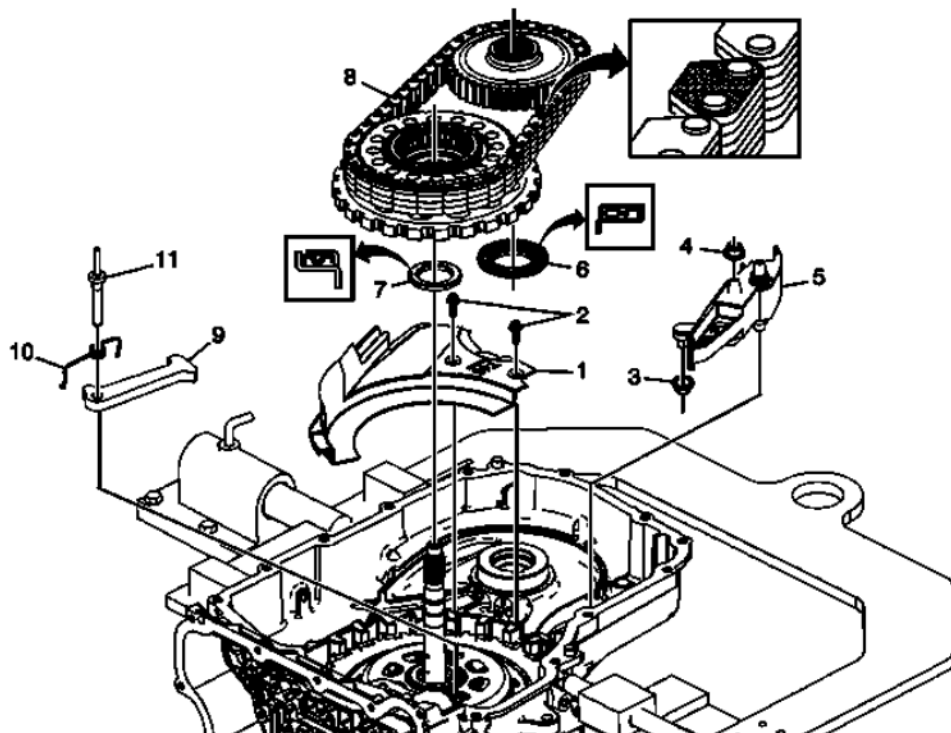
**Fig. 46: View Of Drive Sprocket, Driven Sprocket & Drive Link**

Courtesy of GENERAL MOTORS COMPANY

**Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection**

| Callout | Component Name                  |
|---------|---------------------------------|
| 1       | Drive Sprocket Thrust Washer    |
| 2       | Drive Sprocket Retainer Ring    |
| 3       | Drive Sprocket                  |
| 4       | Drive Sprocket Bearing Assembly |
| 5       | Park Gear                       |
| 6       | Driven Sprocket                 |
| 7       | Drive Link Assembly             |

## DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL INSTALLATION (6T40/45/50)



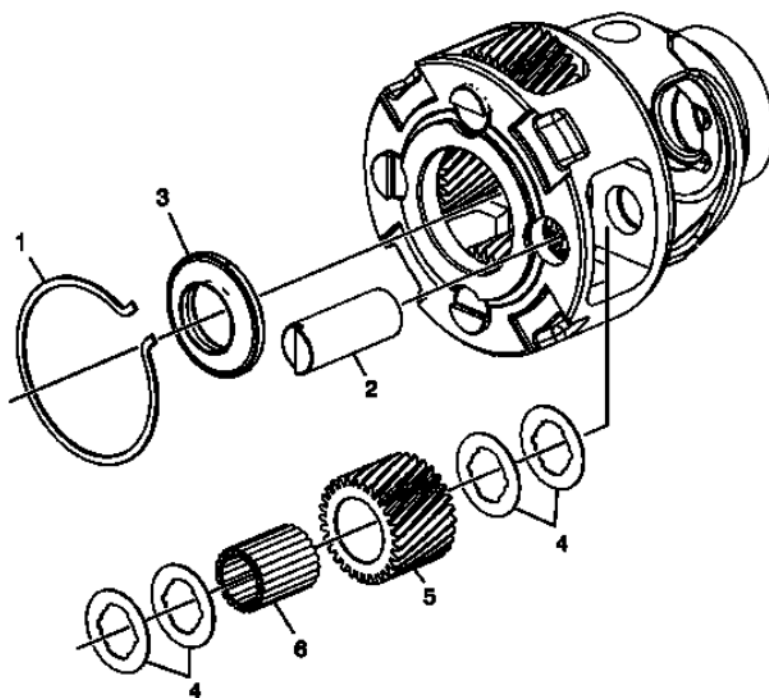
**Fig. 47: View Of Drive Sprocket, Driven Sprocket & Park Pawl**  
Courtesy of GENERAL MOTORS COMPANY

### Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T40/45/50)

| Callout | Component Name                                                                                                                                                   |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Differential Carrier Baffle                                                                                                                                |
| 2       | Front Differential Carrier Baffle Bolt M6 x 16 (Qty: 2)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>12 N.m (106 lb in) |
| 3       | Drive Link Lube Scoop Seal                                                                                                                                       |
| 4       | Drive Link Lube Fluid Seal                                                                                                                                       |
| 5       | Drive Link Lube Scoop                                                                                                                                            |
| 6       | Driven Sprocket Bearing Assembly                                                                                                                                 |
| 7       | Drive Sprocket Bearing Assembly                                                                                                                                  |
|         | Driven Sprocket Assembly, Drive Sprocket Assembly and Drive Link<br><br><b>NOTE:</b>                                                                             |

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8  | <ul style="list-style-type: none"> <li>• Install the drive link with the colored links and/or part number facing up.</li> <li>• The drive link, drive, and driven sprocket assemblies must be installed at the same time.</li> <li>• The ball bearing should spin freely and smoothly.</li> <li>• The driven sprocket ball bearing inner race has a slight interference fit with the case. Tap gently with the palm of a hand or a soft tip hammer to install.</li> </ul> |
| 9  | Park Pawl                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 10 | Park Pawl Spring                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 11 | Park Pawl Shaft<br><br><b>NOTE:</b><br>Check to ensure that the park pawl operates freely and is not binding.                                                                                                                                                                                                                                                                                                                                                             |

## FRONT DIFFERENTIAL CARRIER CLEANING AND INSPECTION



**Fig. 48: View Of Front Differential Carrier**  
 Courtesy of GENERAL MOTORS COMPANY

### Front Differential Carrier Cleaning and Inspection

| Callout                                                                                                              | Component Name |
|----------------------------------------------------------------------------------------------------------------------|----------------|
| <b>CAUTION:</b><br>After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in |                |

order to dry any transmission components. Lint from the towels can cause component failure.

**CAUTION:**

Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.

**CAUTION:**

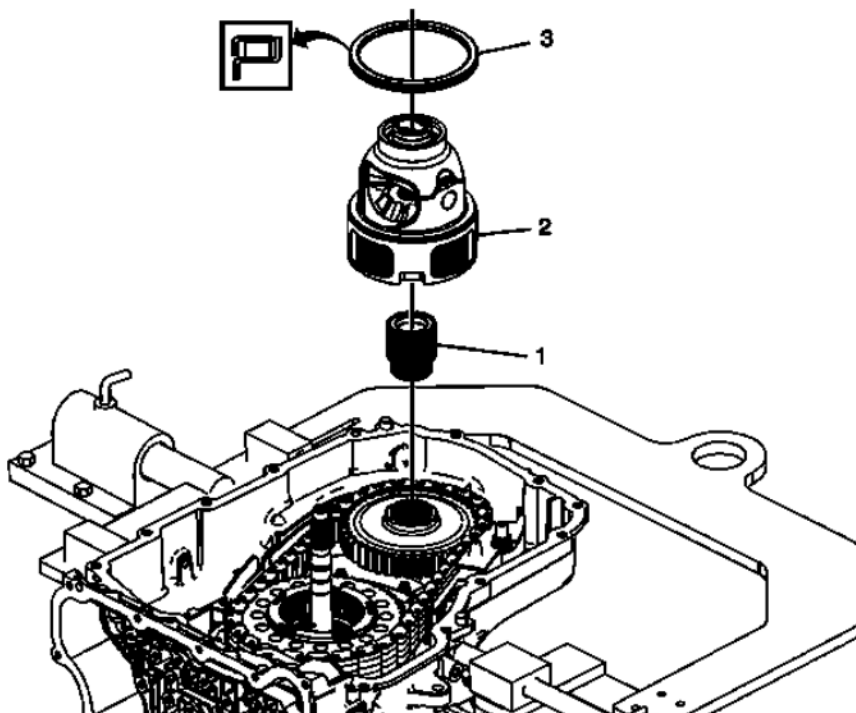
Keep thrust washers with the gear it was matched to. The thrust washers are selective sizes and it is difficult to identify the proper washer thickness. Improper assembly can cause premature failure of the differential assembly.

**Preliminary Procedures**

- Clean and inspect the differential assembly, pinion gears and thrust washers for scoring, wear or damage.
- The differential assembly is only serviced as an assembly.

|   |                                                         |
|---|---------------------------------------------------------|
| 1 | Front Differential Pinion Gear Shaft Retainer           |
| 2 | Front Differential Pinion Gear Pin                      |
| 3 | Sun Gear to Differential Housing Bearing Assembly       |
| 4 | Front Differential Pinion Gear Washer                   |
| 5 | Front Differential Pinion Gear                          |
| 6 | Front Differential Planetary Pinion Gear Bearing Roller |

**FRONT DIFFERENTIAL CARRIER INSTALLATION (6T40/45/50)**



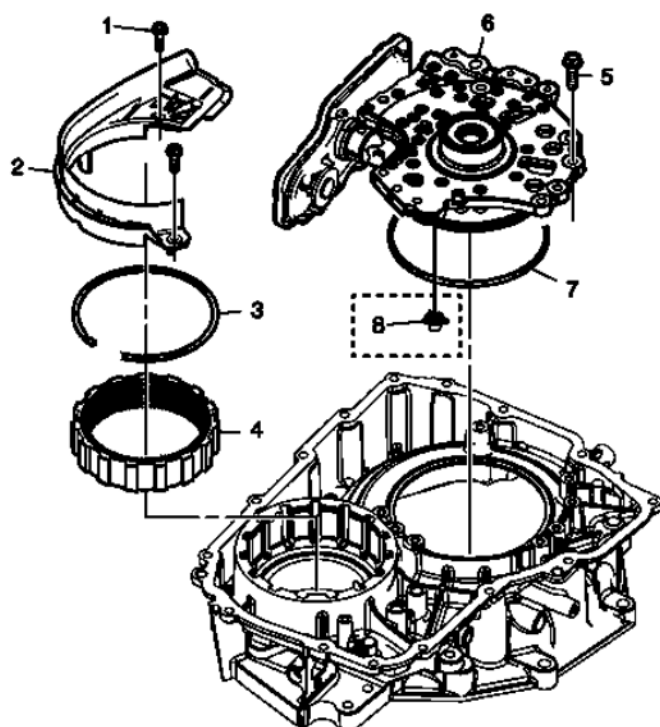


**Fig. 49: View Of Front Differential Carrier Components**  
 Courtesy of GENERAL MOTORS COMPANY

**Front Differential Carrier Installation (6T40/45/50)**

| Callout | Component Name                              |
|---------|---------------------------------------------|
| 1       | Final Drive Sun Gear                        |
| 2       | Differential Carrier Assembly               |
| 3       | Front Differential Carrier Bearing Assembly |

**TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR REMOVAL (6T40/6T45/6T50 HYBRID)**



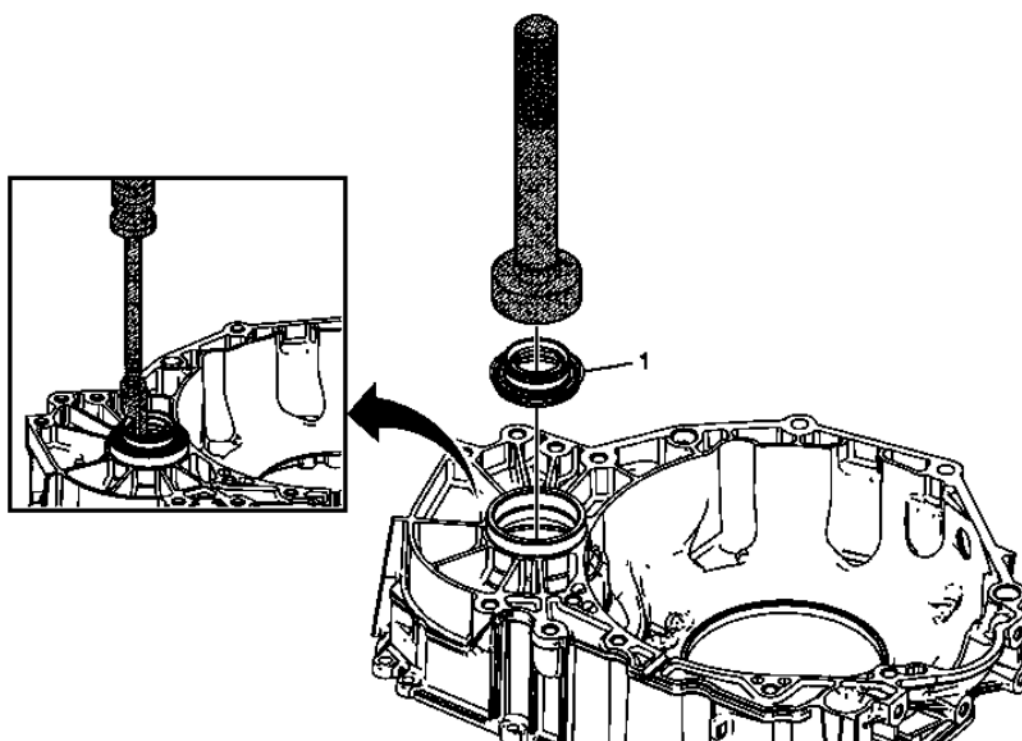
**Fig. 50: Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear**  
 Courtesy of GENERAL MOTORS COMPANY

**Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal (6T40/6T45/6T50 Hybrid)**

| Callout | Component Name                                                                                                                     |
|---------|------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)                                                                           |
| 2       | Front Differential Carrier Baffle                                                                                                  |
| 3       | Front Differential Ring Gear Retainer<br><br><b>NOTE:</b><br><b>Note the direction of the taper to ensure proper installation.</b> |
| 4       | Front Differential Ring Gear                                                                                                       |

|   |                                                         |
|---|---------------------------------------------------------|
| 5 | Fluid Pump Bolts M8 x 33 (Qty: 8)                       |
| 6 | Fluid Pump Assembly                                     |
| 7 | Torque Converter and Differential Housing Seal          |
| 8 | A/Trans Auxiliary Fluid Inlet Pump Seal - Hybrid Models |

## FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - TORQUE CONVERTER HOUSING SIDE

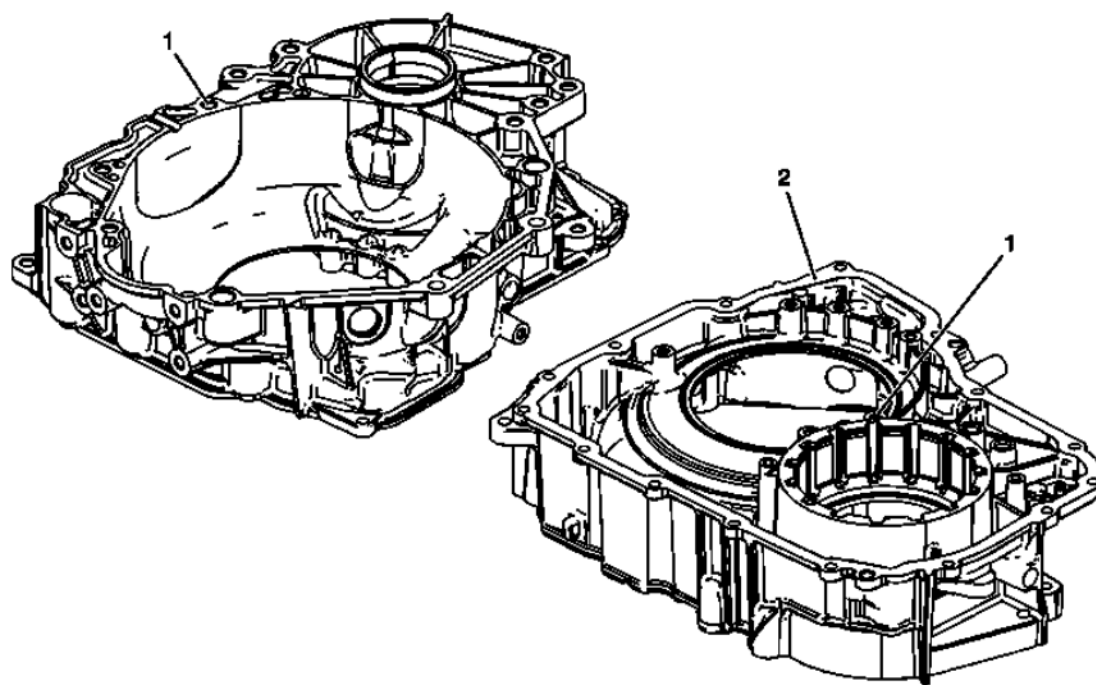


**Fig. 51: View Of Front Wheel Drive Shaft Seal - Torque Converter Housing Side**  
Courtesy of GENERAL MOTORS COMPANY

### Front Wheel Drive Shaft Seal Replacement - Torque Converter Housing Side

| Callout | Component Name                                                                                                                                                                                                  |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal Assembly                                                                                                                                                                       |
|         | <b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• DT-47790 Seal Installer</li> <li>• GE-6125-1B Slide Hammer</li> <li>• GE-8092 Driver Handle</li> </ul> |
|         | For equivalent regional tools, refer to <b>Special Tools</b> .                                                                                                                                                  |

## TORQUE CONVERTER HOUSING CLEANING AND INSPECTION



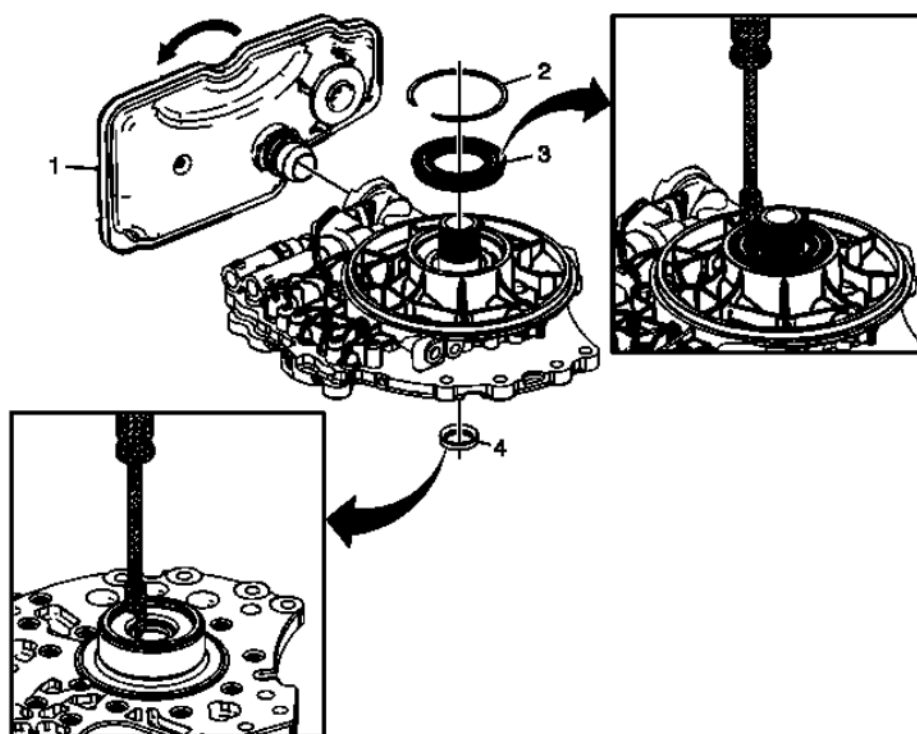
**Fig. 52: Identifying Torque Converter Housing Inspection Areas**  
 Courtesy of GENERAL MOTORS COMPANY

#### Torque Converter Housing Cleaning and Inspection

| Callout                                                                                                                                                                                                                                | Component Name         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>CAUTION:</b><br>After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.                       |                        |
| <b>CAUTION:</b><br>Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.                                                                                                       |                        |
| <b>CAUTION:</b><br>Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks. |                        |
| <b>Preliminary Procedure</b> Thoroughly clean the torque converter housing, including case threads with clean solvent.                                                                                                                 |                        |
| 1                                                                                                                                                                                                                                      | Threaded Hole          |
| 2                                                                                                                                                                                                                                      | Gasket Sealing Surface |

#### TRANSMISSION FLUID PUMP DISASSEMBLE (6T40/45/50)

##### Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble



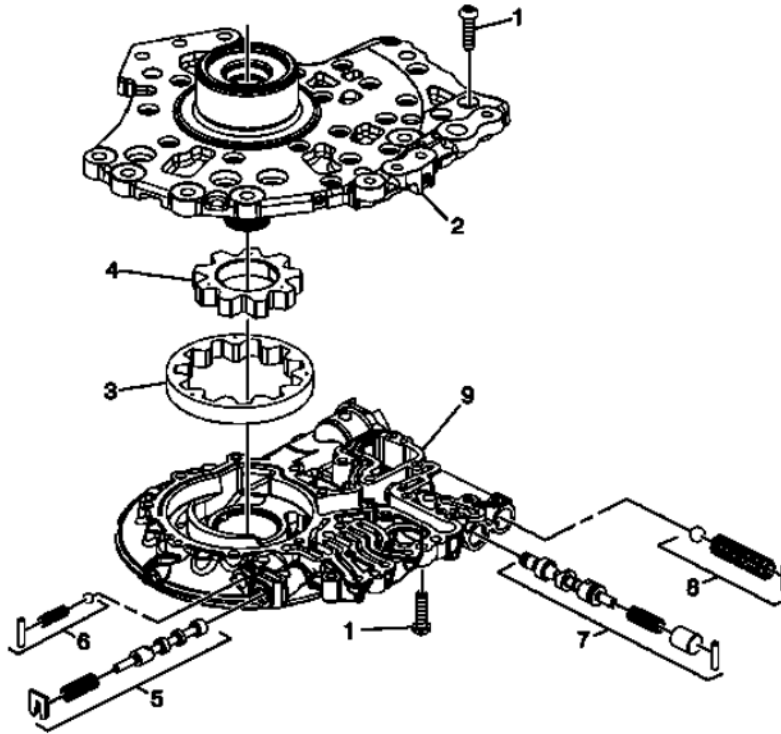
**Fig. 53: View Of Fluid Filter Assembly & Torque Converter Fluid Seal**  
 Courtesy of GENERAL MOTORS COMPANY

#### Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

| Callout | Component Name                                                                                                                                                                                                                                   |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Fluid Filter Assembly<br><br><b>NOTE:</b><br>Rotate filter 90 degrees to disengage locking tangs.                                                                                                                                                |
| 2       | Torque Converter Fluid Seal Retainer                                                                                                                                                                                                             |
| 3       | Torque Converter Fluid Seal<br><br><b>Special Tools</b><br><ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• GE-6125-1B Slide Hammer</li> </ul> For equivalent regional tools, refer to <b>Special Tools</b> . |
| 4       | Torque Converter Fluid Seal Assembly<br><br><b>Special Tools</b><br><ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• GE-6125-1B Slide Hammer</li> </ul>                                                       |

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

## Fluid Pump Disassemble



**Fig. 54: Transmission Fluid Pump & Components**

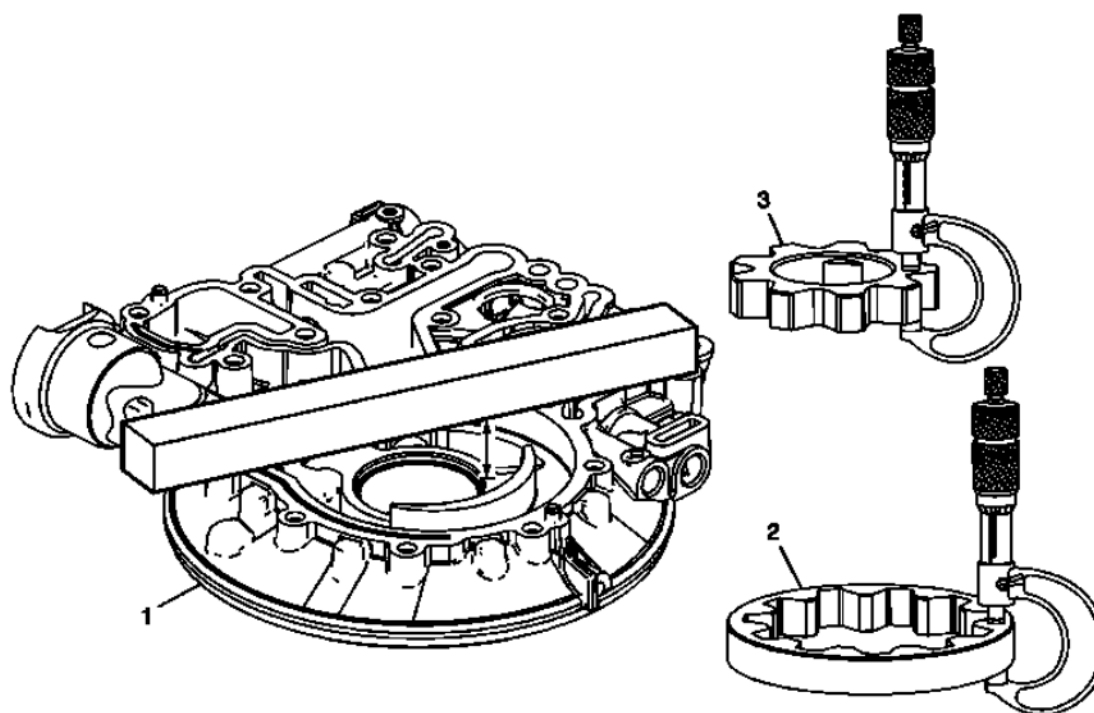
Courtesy of GENERAL MOTORS COMPANY

## Fluid Pump Disassemble

| Callout                                                                                                                                                                                                          | Component Name                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| <b>WARNING:</b><br>Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.                                                                            |                                          |
| <b>CAUTION:</b><br>After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. |                                          |
| <b>CAUTION:</b><br>Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.                                                                                 |                                          |
| <b>Preliminary Procedure</b> Clean and inspect all valve components and the pump body for wear and/or damage.                                                                                                    |                                          |
|                                                                                                                                                                                                                  | Fluid Pump Cover Bolts M6 x 25 (Qty: 23) |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| 1 | <b>NOTE:</b><br>There are 3 bolts on the pump cover side and 20 bolts on the pump body side. |
| 2 | Fluid Pump Cover                                                                             |
| 3 | Fluid Pump Driven Gear                                                                       |
| 4 | Fluid Pump Drive Gear                                                                        |
| 5 | TCC Control Valve Train                                                                      |
| 6 | TCC Blow Off Ball Valve Train                                                                |
| 7 | Pressure Regulator Valve Train                                                               |
| 8 | Fluid Pump Blow Off Ball Valve Train                                                         |
| 9 | A/Trans Fluid Pump Body                                                                      |

## FLUID PUMP SELECTIVE MEASUREMENT



**Fig. 55: Measuring Fluid Pump Components**  
Courtesy of GENERAL MOTORS COMPANY

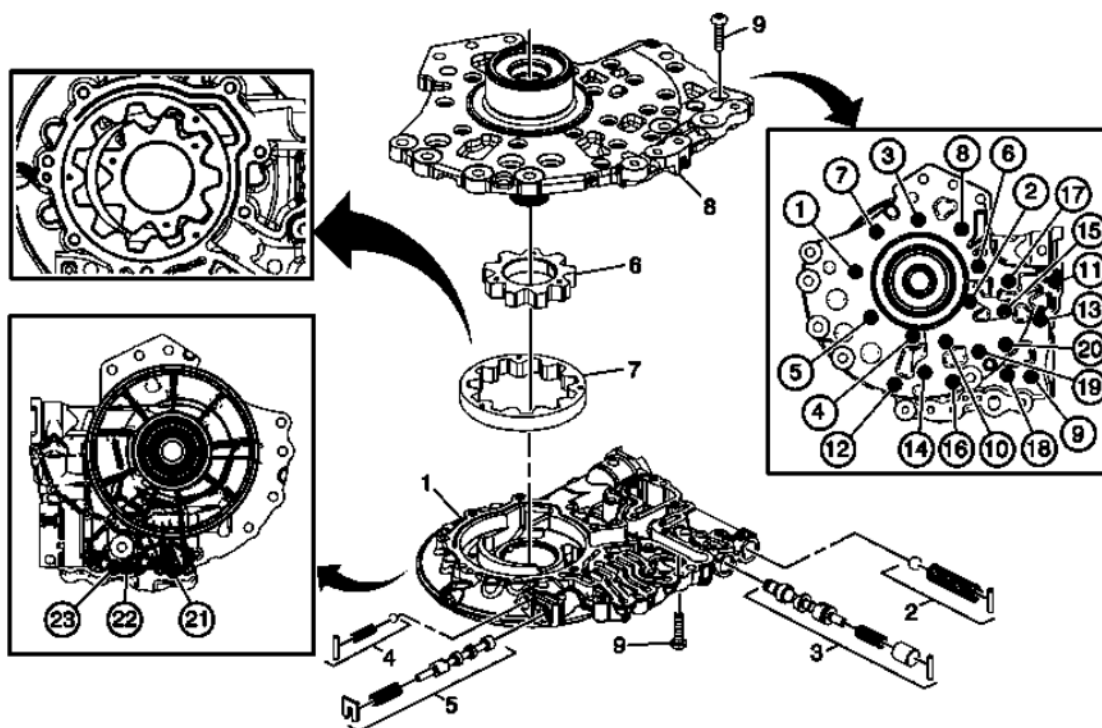
### Fluid Pump Selective Measurement

| Callout | Component Name                                                                                                                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|         | A/Trans Fluid Pump Body                                                                                                                            |
|         | <b>NOTE:</b><br>Measure the distance from the bottom of the gauge bar to the bottom of the pump rotor cavity. Refer to <u>Fluid Pump Selective</u> |

|   |                                                                                                                                       |
|---|---------------------------------------------------------------------------------------------------------------------------------------|
|   | <u>Specifications .</u>                                                                                                               |
| 1 | <b>Special Tool</b><br><b>GE 34673</b> Flat Gauge Bar or equivalent                                                                   |
| 2 | A/Trans Fluid Pump Driven Gear<br><br><b>NOTE:</b><br>Refer to <u>Fluid Pump Selective Specifications</u> to select the correct gear. |
| 3 | A/Trans Fluid Pump Drive Gear<br><br><b>NOTE:</b><br>Refer to <u>Fluid Pump Selective Specifications</u> to select the correct gear.  |

## TRANSMISSION FLUID PUMP ASSEMBLE (6T40/45/50)

### Fluid Pump w/Valve Trains Assemble



**Fig. 56: Fluid Pump W/Valve Trains Assembly**  
Courtesy of GENERAL MOTORS COMPANY

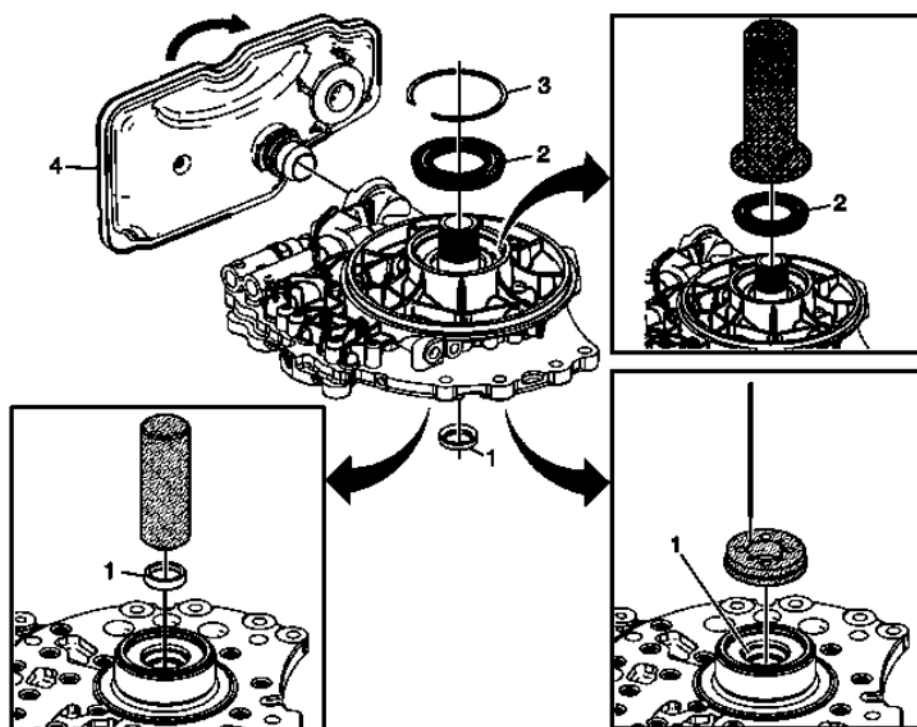
### Fluid Pump w/Valve Trains Assemble

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

|   |                                                                                                                                                                                                                                           |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | A/Trans Fluid Pump Body                                                                                                                                                                                                                   |
| 2 | Fluid Pump Blow Off Ball Valve Train                                                                                                                                                                                                      |
| 3 | Pressure Regulator Valve Train                                                                                                                                                                                                            |
| 4 | TCC Blow Off Ball Valve Train                                                                                                                                                                                                             |
| 5 | TCC Control Valve Train                                                                                                                                                                                                                   |
| 6 | Fluid Pump Drive Gear<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Align ID feature dots with the driven gear as shown above.</li> <li>• The chamfer on the drive gear teeth faces the pump body.</li> </ul>              |
| 7 | Fluid Pump Driven Gear<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• Align ID feature dots with the drive gear as shown above, some models.</li> <li>• The chamfer on the driven gear O.D. faces the pump body.</li> </ul> |
| 8 | Fluid Pump Cover                                                                                                                                                                                                                          |
| 9 | Fluid Pump Cover Bolts M6 x 25 (Qty: 23)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>12 N.m (106 lb in)                                                                                         |

#### Torque Converter Fluid Seal and Fluid Filter Assembly Assemble





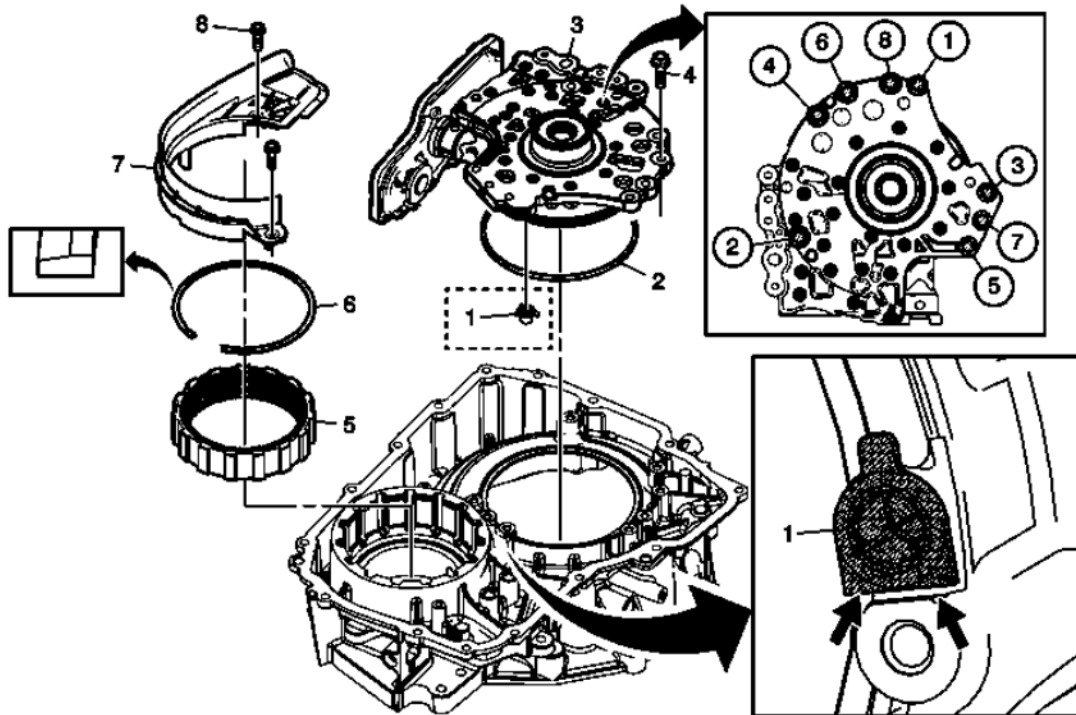
**Fig. 57: View Of Torque Converter Fluid Seal & Fluid Filter Assembly**  
Courtesy of GENERAL MOTORS COMPANY

#### Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Torque Converter Fluid Seal Assembly</p> <p><b>NOTE:</b><br/>The fluid seal assembly must be staked in place using DT-49131 seal staking tool to ensure proper seal retention.</p> <p><b>Special Tool</b></p> <ul style="list-style-type: none"> <li>• DT-47792 Seal Installer</li> <li>• DT-49131 Seal Staking Tool</li> </ul> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 2       | <p>Torque Converter Fluid Seal</p> <p><b>Special Tool</b><br/>DT-47791-A Seal Installer</p> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                                                                                                                                                                                                                                        |
| 3       | Torque Converter Fluid Seal Retainer                                                                                                                                                                                                                                                                                                                                                                     |
| 4       | Fluid Filter Assembly                                                                                                                                                                                                                                                                                                                                                                                    |

**NOTE:**

Rotate filter 90 degrees to engage locking tangs.

**TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR INSTALLATION (6T40/6T45/6T50 HYBRID)**

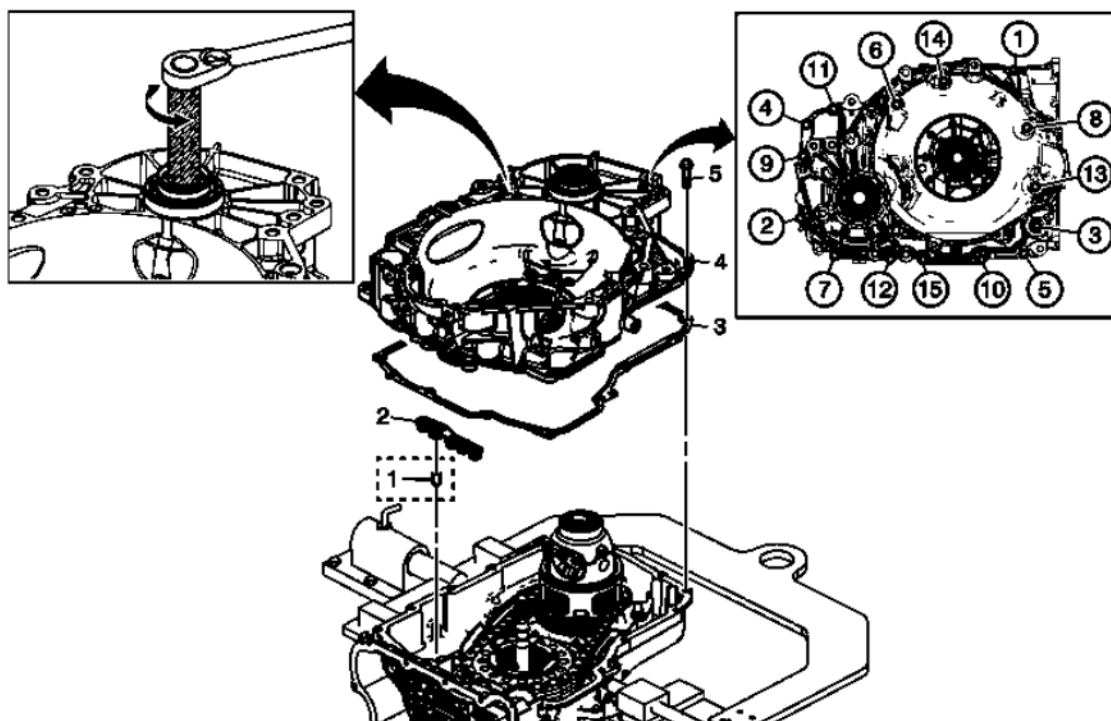
**Fig. 58: Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear**  
Courtesy of GENERAL MOTORS COMPANY

**Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation (6T40/6T45/6T50 Hybrid)**

| Callout | Component Name                                                                                                                        |
|---------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1       | A/Trans Auxiliary Fluid Inlet Pump Seal - Hybrid Models<br><br><b>NOTE:</b><br>Ensure seal is installed with the correct orientation. |
| 2       | Torque Converter and Differential Housing Seal                                                                                        |
| 3       | Fluid Pump Assembly                                                                                                                   |
| 4       | Fluid Pump Bolts M8 x 33 (Qty: 8)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .                                        |

|   |                                                                                                                                                                                                                         |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Tighten</b><br>10 N.m (89 lb in) then rotate the bolt an additional 45 degrees<br><b>Special Tool</b><br><b>EN-45059</b> Angle Meter or equivalent<br>For equivalent regional tools, refer to <b>Special Tools</b> . |
| 5 | Front Differential Ring Gear                                                                                                                                                                                            |
| 6 | Front Differential Ring Gear Retainer<br><br><b>NOTE:</b><br><b>Install the retainer with the taper facing away from the ring gear.</b>                                                                                 |
| 7 | Front Differential Carrier Baffle                                                                                                                                                                                       |
| 8 | Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)<br><b>Tighten</b><br>12 N.m (106.21 lb in)                                                                                                                     |

### TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY INSTALLATION (6T40/6T45/6T50 HYBRID)



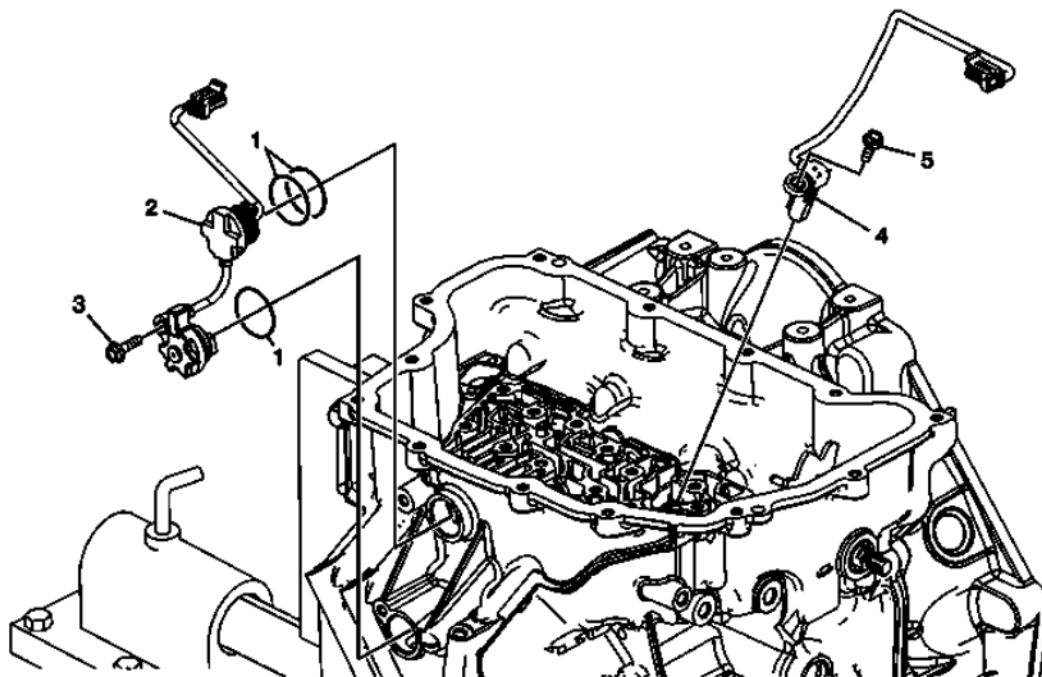
**Fig. 59: Torque Converter Housing with Fluid Pump Assembly**  
Courtesy of GENERAL MOTORS COMPANY

### Torque Converter Housing with Fluid Pump Assembly Installation (6T40/6T45/6T50 Hybrid)

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 1       | A/Trans Fluid Trough Check Ball - Hybrid Models |
| 2       | Fluid Pump Seal Assembly                        |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | Torque Converter Housing Gasket                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4 | <p>Torque Converter (w/Fluid Pump) Housing Assembly</p> <p><b>NOTE:</b><br/>Rotate the differential slightly in each direction using the rotating tool to align the Differential Pinion Gears with the Differential Ring Gear in the Torque Converter Housing.</p> <ul style="list-style-type: none"> <li>• DT-47793 Differential Rotating Tool for 6T40/45 applications</li> <li>• DT-49938 Differential Rotating Tool for 6T50 applications</li> </ul> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• DT-47793 Differential Rotating Tool</li> <li>• DT-49938 Differential Rotating Tool</li> </ul> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p> |
| 5 | <p>Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15)</p> <p><b>CAUTION:</b><br/>Refer to <b>Fastener Caution</b> .</p> <p><b>Procedure</b><br/>Tighten the bolts in sequence shown.</p> <p><b>Tighten</b><br/>10 N.m (89 lb in) then rotate the bolt an additional 50 degrees</p> <p><b>Special Tool</b><br/>EN-45059 Angle Meter or equivalent</p> <p>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                                                                                                                                                                                                                                                         |

## INPUT AND OUTPUT SPEED SENSOR INSTALLATION

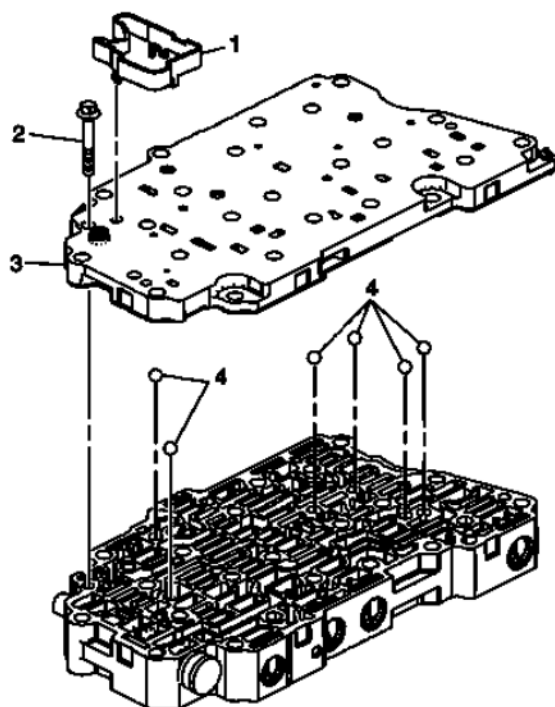


**Fig. 60: Identifying Input & Output Speed Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

#### Input and Output Speed Sensor Installation

| Callout | Component Name                                                                                                                                         |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Input Speed Sensor Assembly Seals                                                                                                                      |
| 2       | Input Speed Sensor Assembly                                                                                                                            |
| 3       | Input Speed Sensor Bolt M6 x 23 (Qty: 1)<br><br><b>CAUTION:</b><br><b>Refer to <u>Fastener Caution</u> .</b><br><br><b>Tighten</b><br>9 N.m (80 lb in) |
| 4       | A/Trans Output Speed Sensor Assembly                                                                                                                   |
| 5       | A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1)<br><b>Tighten</b><br>9 N.m (80 lb in)                                                                |

#### CONTROL VALVE BODY ASSEMBLY DISASSEMBLE (GEN 2)



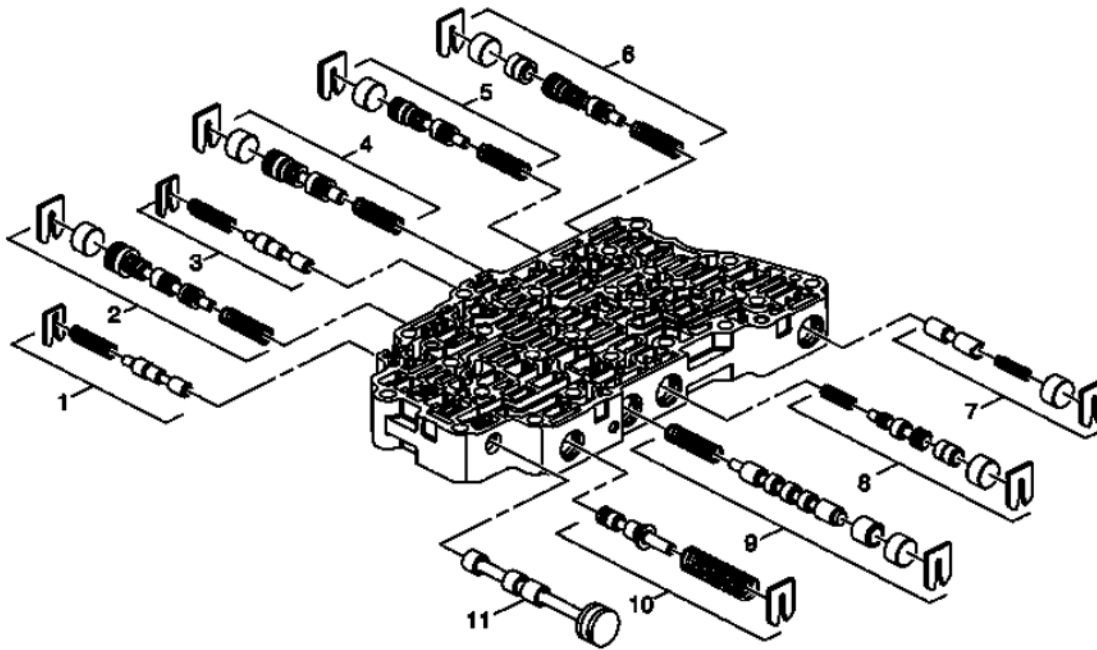
**Fig. 61: Control Valve Body (Gen 2)**

Courtesy of GENERAL MOTORS COMPANY

#### Control Valve Body Assembly Disassemble (Gen 2)

| Callout | Component Name                                                                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Control Solenoid Valve Support                                                                                                                                                                          |
| 2       | Control Valve Body Bolt M5 x 40.5 (Qty: 1)                                                                                                                                                              |
| 3       | Valve Channel Plate<br><br><b>NOTE:</b><br>Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary. |
| 4       | Valve Body Ball Check Valves (Qty: 6)                                                                                                                                                                   |

#### CONTROL VALVE BODY CLEANING AND INSPECTION (GEN 2)



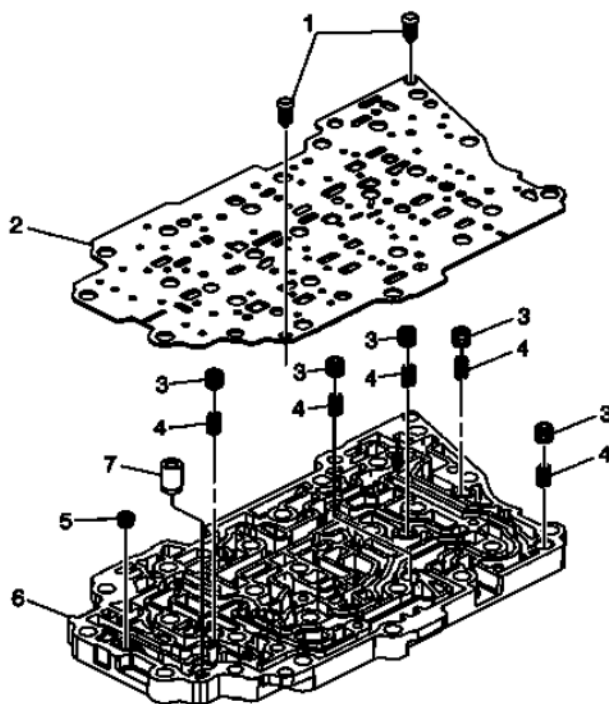
**Fig. 62: Control Valve Body Cleaning and Inspection (Gen 2)**  
Courtesy of GENERAL MOTORS COMPANY

#### Control Valve Body Cleaning and Inspection (Gen 2)

| Callout                                                                                                                                                                                                          | Component Name                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>WARNING:</b><br>Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.                                                                            |                                                    |
| <b>CAUTION:</b><br>After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. |                                                    |
| <b>CAUTION:</b><br>Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.                                                                                 |                                                    |
| <b>Preliminary Procedure</b> Clean and inspect all valve components and the valve body. The control valve body assembly is only replaceable as an assembly.                                                      |                                                    |
| 1                                                                                                                                                                                                                | Low-Reverse and 4-5-6 Clutch Boost Valve Train     |
| 2                                                                                                                                                                                                                | Low-Reverse and 4-5-6 Clutch Regulator Valve Train |
| 3                                                                                                                                                                                                                | 1-2-3-4 Clutch Boost Valve Train                   |
| 4                                                                                                                                                                                                                | 1-2-3-4 Clutch Regulator Valve Train               |
| 5                                                                                                                                                                                                                | 2-6 Clutch Regulator Valve Train                   |
| 6                                                                                                                                                                                                                | 3-5 Reverse Clutch Regulator Valve Train           |

|    |                                 |
|----|---------------------------------|
| 7  | Default Override Valve Train    |
| 8  | TCC Regulator Apply Valve Train |
| 9  | Clutch Select Valve Train       |
| 10 | Actuator Feed Limit Valve Train |
| 11 | Manual Valve                    |

## CONTROL VALVE CHANNEL PLATE CLEANING AND INSPECTION (6T40/45/50 - GEN 2)



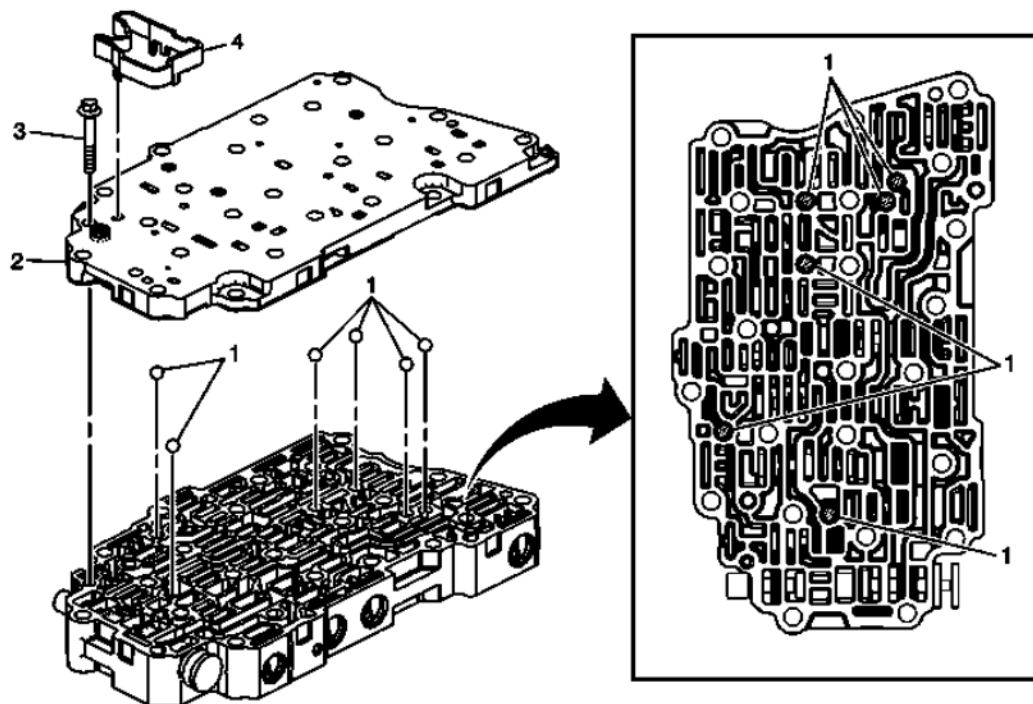
**Fig. 63: Control Valve Channel Plate Cleaning and Inspection**  
Courtesy of GENERAL MOTORS COMPANY

### Control Valve Channel Plate Cleaning and Inspection (6T40/45/50 - Gen 2)

| Callout | Component Name                                                                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Control Valve Body Spacer Plate Retainer                                                                                                                                                                |
| 2       | Channel Plate to Valve Body Spacer Plate Assembly                                                                                                                                                       |
| 3       | Actuator Feed Accumulator Piston (Qty: 5)                                                                                                                                                               |
| 4       | Actuator Feed Accumulator Spring (Qty: 5)                                                                                                                                                               |
| 5       | Variable Hi and 2-3-4 Clutch Housing Valve Ball                                                                                                                                                         |
| 6       | Valve Channel Plate<br><br><b>NOTE:</b><br>Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary. |



## CONTROL VALVE BODY ASSEMBLY ASSEMBLE (GEN 2)

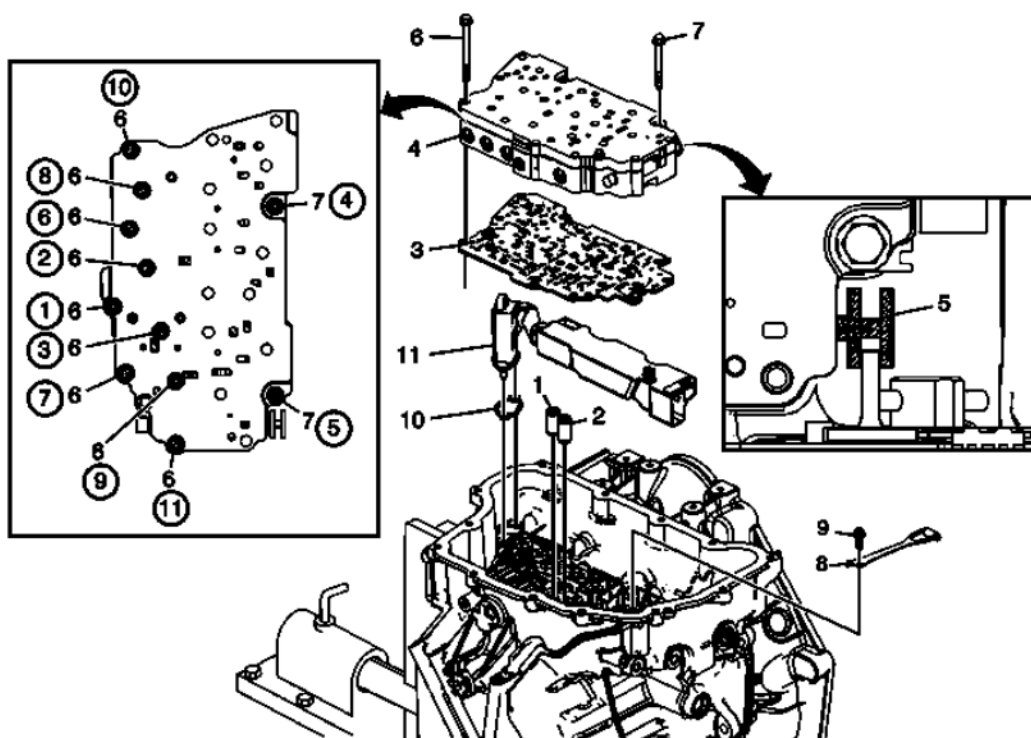


**Fig. 64: Control Valve Body And Components**  
Courtesy of GENERAL MOTORS COMPANY

### Control Valve Body Assembly Assemble (Gen 2)

| Callout | Component Name                                                                                                                                    |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Valve Body Ball Check Valve (Qty: 6)                                                                                                              |
| 2       | Valve Channel Plate                                                                                                                               |
| 3       | Control Valve Body Bolt M5 x 40.5 (Qty: 1)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>7 N.m (62 lb in) |
| 4       | Control Solenoid Valve Support                                                                                                                    |

## CONTROL VALVE BODY ASSEMBLY INSTALLATION



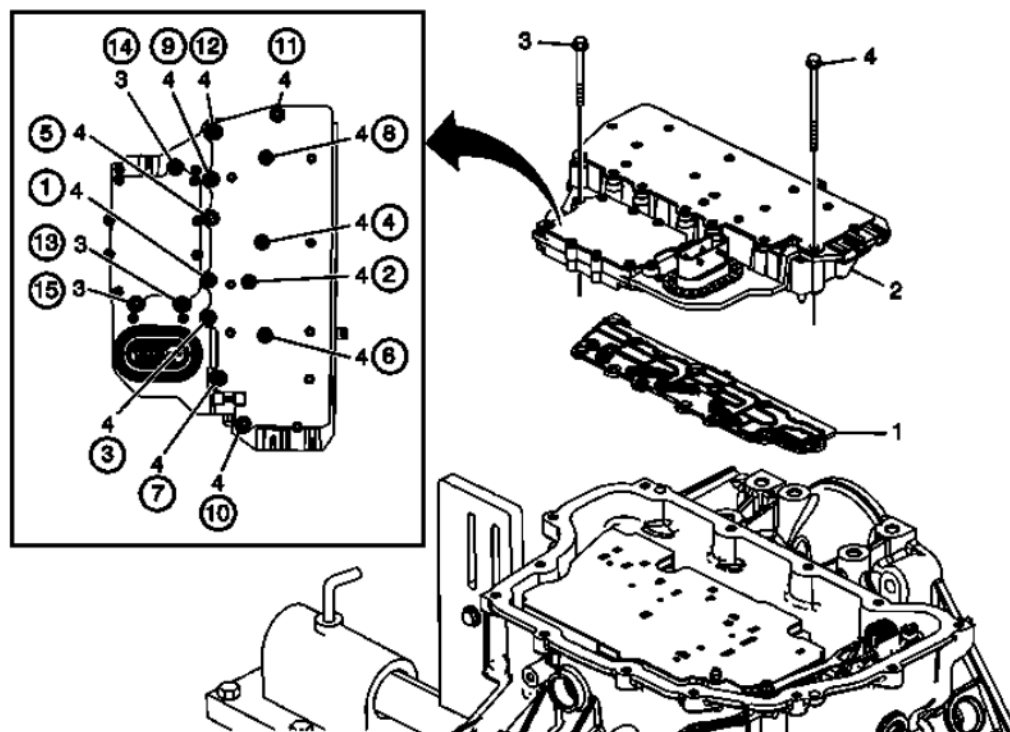
**Fig. 65: View Of Control Valve Body Assembly Attachments**  
 Courtesy of GENERAL MOTORS COMPANY

#### Control Valve Body Assembly Installation

| Callout | Component Name                                                                                                                                   |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Low and Reverse Clutch Fluid Passage Seal                                                                                                        |
| 2       | 1-2-3-4 Clutch Fluid Passage Seal                                                                                                                |
| 3       | Control Valve Body Spacer Plate Assembly                                                                                                         |
| 4       | Control Valve Body Assembly<br><br><b>NOTE:</b><br>Align the manual valve to the rod on the manual shaft.                                        |
| 5       | Control Valve Body Bolt M6 x 60 (Qty: 9)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>11 N.m (97 lb in) |
| 6       | Control Valve Body Bolt M6 x 53 (Qty: 2)<br><b>Tighten</b><br>11 N.m (97 lb in)                                                                  |
| 7       | Manual Shaft Detent Lever Spring Assembly                                                                                                        |
|         | Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1)                                                                                                 |

|    |                                      |
|----|--------------------------------------|
| 8  | <b>Tighten</b><br>12 N.m (106 lb in) |
| 9  | Fluid Level Control Valve Gasket     |
| 10 | Fluid Level Control Valve            |

## CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INSTALLATION



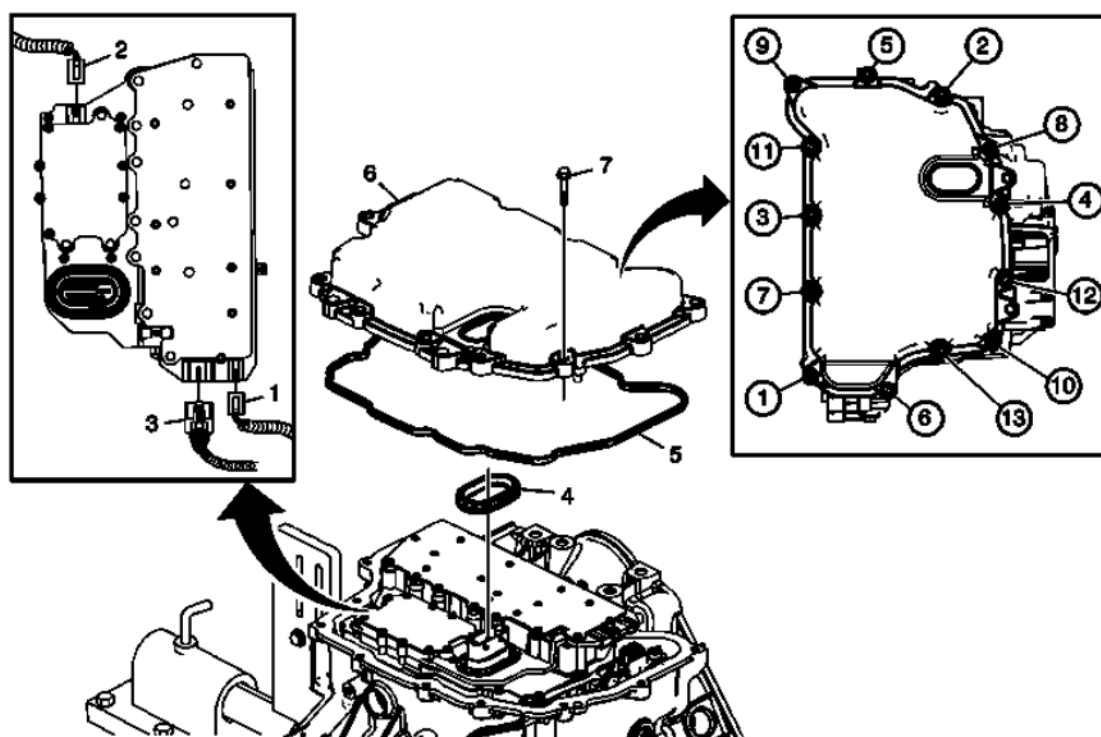
**Fig. 66: Identifying Control Solenoid Valve & TCM Bolt Tightening Sequence**  
Courtesy of GENERAL MOTORS COMPANY

### Control Solenoid Valve and Transmission Control Module Assembly Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Control Solenoid Valve Assembly Filter Plate<br><br><b>CAUTION:</b><br>Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.<br><br><b>NOTE:</b><br>Install a <b>NEW</b> filter plate to prevent fluid leaks past the fluid seals. |
| 2       | Control Solenoid (w/Body and TCM) Valve Assembly                                                                                                                                                                                                                                                                                                                                                                 |
|         | Control Valve Body Bolt M5 x 40.5 (Qty: 3)                                                                                                                                                                                                                                                                                                                                                                       |

|   |                                                                                                 |
|---|-------------------------------------------------------------------------------------------------|
| 3 | <b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>7 N.m (62 lb in) |
| 4 | Control Valve Body Bolt M6 x 97 (Qty: 12)<br><b>Tighten</b><br>10 N.m (89 lb in)                |

## CONTROL VALVE BODY COVER INSTALLATION



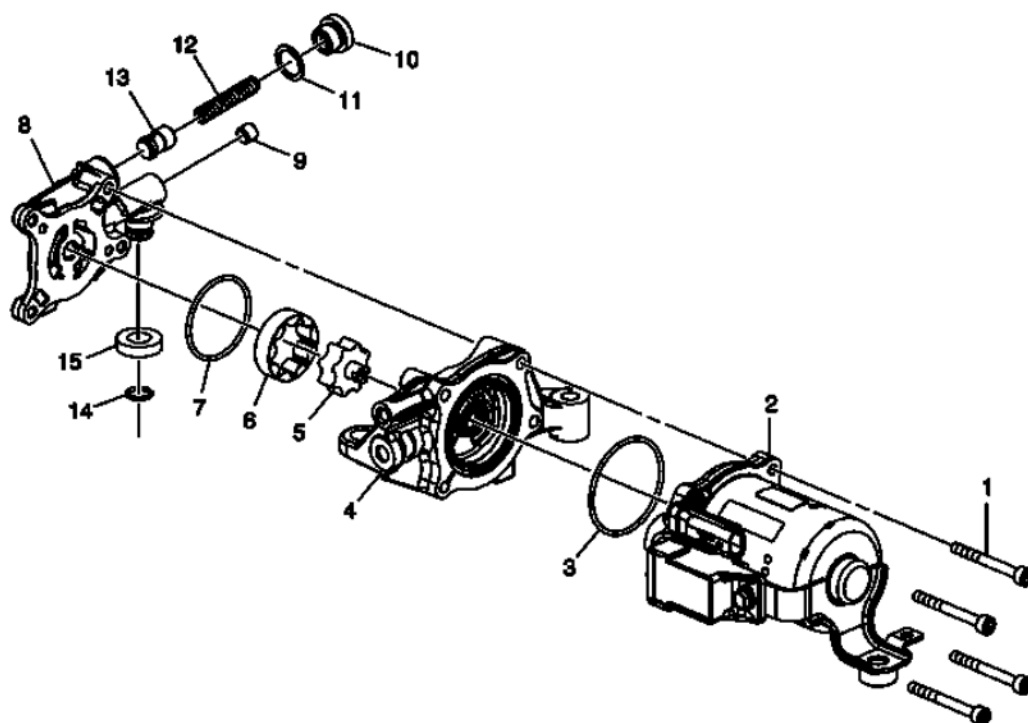
**Fig. 67: Identifying Control Valve Body Cover Bolt Tightening Sequence**  
Courtesy of GENERAL MOTORS COMPANY

### Control Valve Body Cover Installation

| Callout | Component Name                                                                 |
|---------|--------------------------------------------------------------------------------|
| 1       | Input Speed Sensor Connector                                                   |
| 2       | Output Speed Sensor Connector                                                  |
| 3       | Shift Position Switch Connector                                                |
| 4       | Control Valve Body Cover Wiring Connector Hole Seal                            |
|         | <b>NOTE:</b><br>Do not re-use the valve body cover wiring connector hole seal. |

|   |                                                                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Control Valve Body Cover Gasket<br><br><b>NOTE:</b><br><b>Do not re-use the valve body cover gasket.</b>                                                         |
| 6 | Control Valve Body Cover                                                                                                                                         |
| 7 | Control Valve Body Cover Bolts M6 x 30 (Qty: 13)<br><br><b>CAUTION:</b><br><b>Refer to <u>Fastener Caution</u> .</b><br><br><b>Tighten</b><br>12 N.m (106 lb in) |

### AUXILIARY FLUID PUMP CLEANING AND INSPECTION (HYBRID)



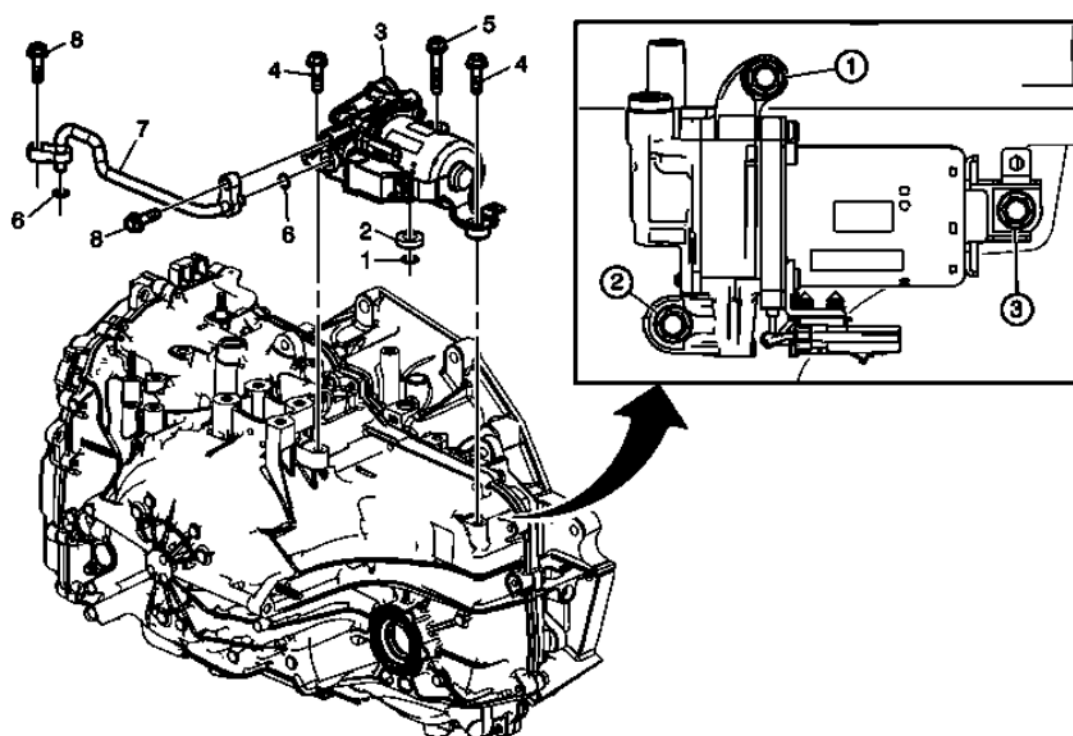
**Fig. 68: Auxiliary Fluid Pump Cleaning and Inspection (Hybrid)**  
Courtesy of GENERAL MOTORS COMPANY

### Auxiliary Fluid Pump Cleaning and Inspection (Hybrid)

| Callout                                                                                                                                                                  | Component Name                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>Preliminary Procedure</b><br>Clean and inspect only the auxiliary fluid pump components shown above. The only serviceable components are listed as serviceable below. |                                                            |
|                                                                                                                                                                          | A/Trans Auxiliary Fluid Pump (Pump to Motor) Bolt (Qty: 4) |

|    |                                                                      |
|----|----------------------------------------------------------------------|
|    | <b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .                |
| 1  | <b>Tighten</b><br>10-12 N.m (88-106 lb in)                           |
| 2  | A/Trans Auxiliary Fluid Pump Motor                                   |
| 3  | A/Trans Auxiliary Fluid Pump Motor Cover Seal (O-ring) - serviceable |
| 4  | A/Trans Auxiliary Fluid Pump Body                                    |
| 5  | A/Trans Auxiliary Fluid Pump Inner Rotor                             |
| 6  | A/Trans Auxiliary Fluid Pump Outer Rotor                             |
| 7  | A/Trans Auxiliary Fluid Pump Cover Seal - serviceable                |
| 8  | A/Trans Auxiliary Fluid Pump Cover                                   |
| 9  | A/Trans Auxiliary Fluid Pump Cover Hole Plug                         |
| 10 | Pressure Regulator Valve Spring Retainer                             |
| 11 | Pressure Regulator Valve Spring Spacer - serviceable                 |
| 12 | Pressure Regulator Valve Spring                                      |
| 13 | Pressure Regulator Valve                                             |
| 14 | A/Trans Auxiliary Fluid Pump Seal - serviceable                      |
| 15 | A/Trans Auxiliary Fluid Pump Gasket - serviceable                    |

## AUXILIARY FLUID PUMP INSTALLATION (HYBRID)

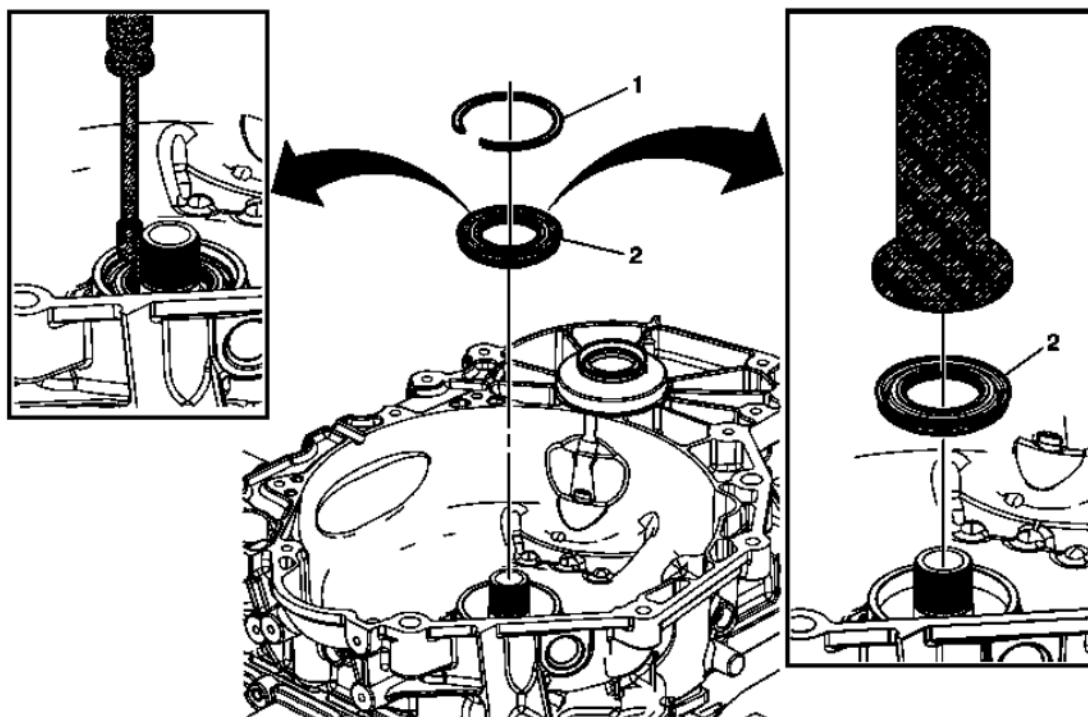


**Fig. 69: Auxiliary Fluid Pump & Components**  
 Courtesy of GENERAL MOTORS COMPANY

**Auxiliary Fluid Pump Installation (Hybrid)**

| Callout | Component Name                                                                                                                                                                                                                                                                          |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | A/Trans Auxiliary Fluid Pump Seal                                                                                                                                                                                                                                                       |
| 2       | A/Trans Auxiliary Fluid Pump Gasket                                                                                                                                                                                                                                                     |
| 3       | A/Trans Auxiliary Fluid Pump Assembly                                                                                                                                                                                                                                                   |
| 4       | <p>A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 2)</p> <p><b>CAUTION:</b><br/>           Refer to <b>Fastener Caution</b> .</p> <p><b>Procedure</b><br/>           Tighten in sequence shown.<br/> <b>Tighten</b><br/>           22 N.m (16 lb ft)</p>                                |
| 5       | <p>A/Trans Auxiliary Fluid Pump Bolt</p> <p><b>Procedure</b><br/>           Tighten in sequence shown.<br/> <b>Tighten</b><br/>           22 N.m (16 lb ft)</p>                                                                                                                         |
| 6       | Trans Auxiliary Fluid Pump Outlet Pipe Seal (Qty: 2)                                                                                                                                                                                                                                    |
| 7       | <p>A/Trans Auxiliary Fluid Pump Outlet Pipe</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Fasten pipe to auxiliary pump and tighten bolt just enough to hold in place.</li> <li>2. Align pipe to case and tighten bolt just enough to hold in place.</li> </ol> |
| 8       | <p>A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 2)</p> <p><b>Tighten</b><br/>           22 N.m (16 lb ft)</p>                                                                                                                                                                         |

**TORQUE CONVERTER FLUID SEAL REPLACEMENT**



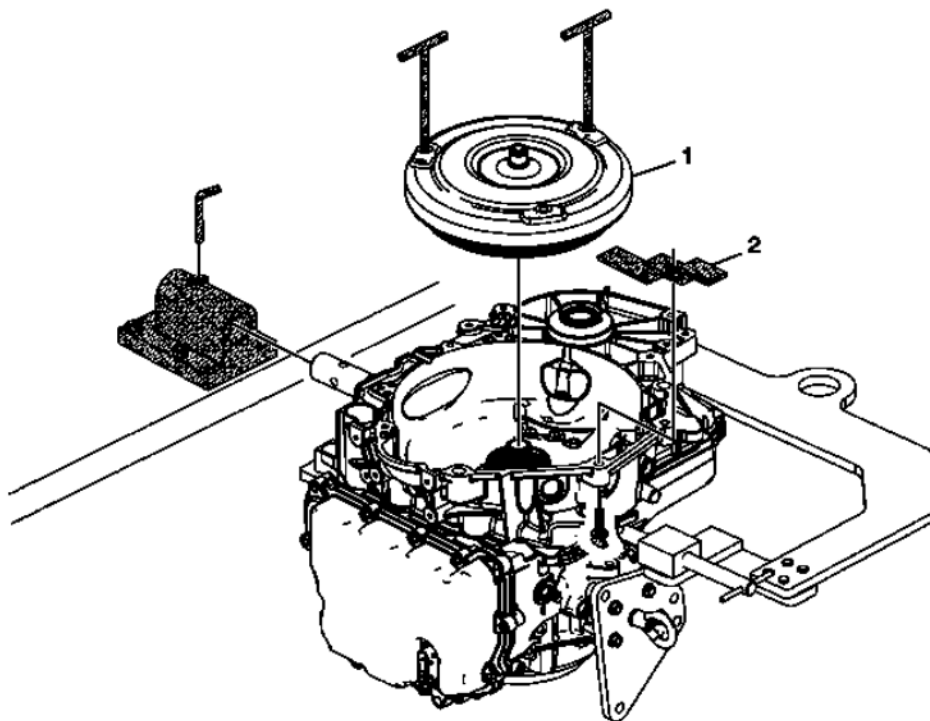
**Fig. 70: View Of Torque Converter Fluid Seal & Retainer**  
 Courtesy of GENERAL MOTORS COMPANY

#### Torque Converter Fluid Seal Replacement

| Callout | Component Name                                                                                                                                                                  |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Torque Converter Fluid Seal Retainer                                                                                                                                            |
| 2       | Torque Converter Fluid Seal                                                                                                                                                     |
|         | <b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-47791-B Seal Installer</li> <li>• DT-6125-B Slide Hammer</li> <li>• EN-23129 Universal Seal Remover</li> </ul> |
|         | For equivalent regional tools, refer to <b>Special Tools</b> .                                                                                                                  |

#### TORQUE CONVERTER INSTALLATION



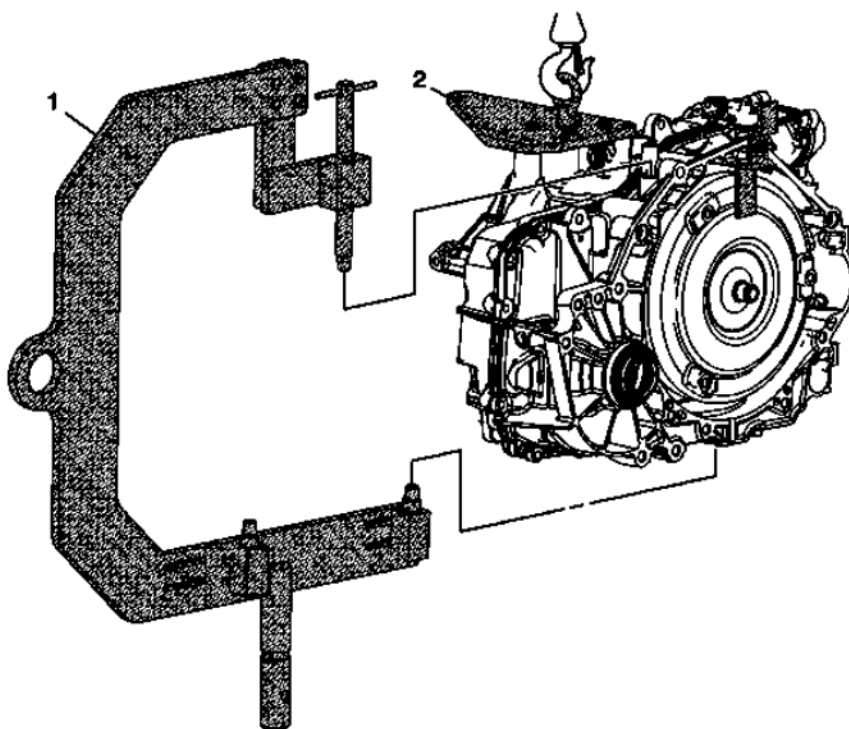


**Fig. 71: View Of Torque Converter**  
Courtesy of GENERAL MOTORS COMPANY

#### Torque Converter Installation

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                       |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Torque Converter Assembly</p> <p><b>NOTE:</b><br/>Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly.</p> <p><b>Special Tool</b><br/>DT-46409 Torque Converter Lifting Handles<br/>For equivalent regional tools, refer to <b>Special Tools</b> .</p>                              |
| 2       | <p>DT-21366 Converter Holding Strap</p> <p><b>WARNING:</b><br/>The torque converter must be held to the torque converter housing by a retaining device such as shipping brackets. Without the retaining device, the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing personal injury and/or property damage.</p> |

#### LIFT PLATE AND HOLDING FIXTURE REMOVAL



**Fig. 72: Identifying Lift Plate & Holding Fixture**  
 Courtesy of GENERAL MOTORS COMPANY

#### Lift Plate and Holding Fixture Removal

| Callout | Component Name                                                                                                                                                                                                                                  |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <b>DT-46625</b> Transmission Holding Fixture<br>For equivalent regional tools, refer to <b><u>Special Tools</u></b> .<br><br><b>NOTE:</b><br><b>Raise the transmission in order to remove the holding fixture.</b>                              |
| 2       | <b>DT-47811-S1</b> Transmission Lift Plate<br>For equivalent regional tools, refer to <b><u>Special Tools</u></b> .<br><br><b>NOTE:</b><br><b>Lower the transmission assembly onto the transmission jack in order to remove the lift plate.</b> |

## 2013 TRANSMISSION

Automatic Transmission - 6T40 (MH8, MHH) - Repair Instructions - On Vehicle - Malibu

### REPAIR INSTRUCTIONS - ON VEHICLE

#### MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY REPLACEMENT

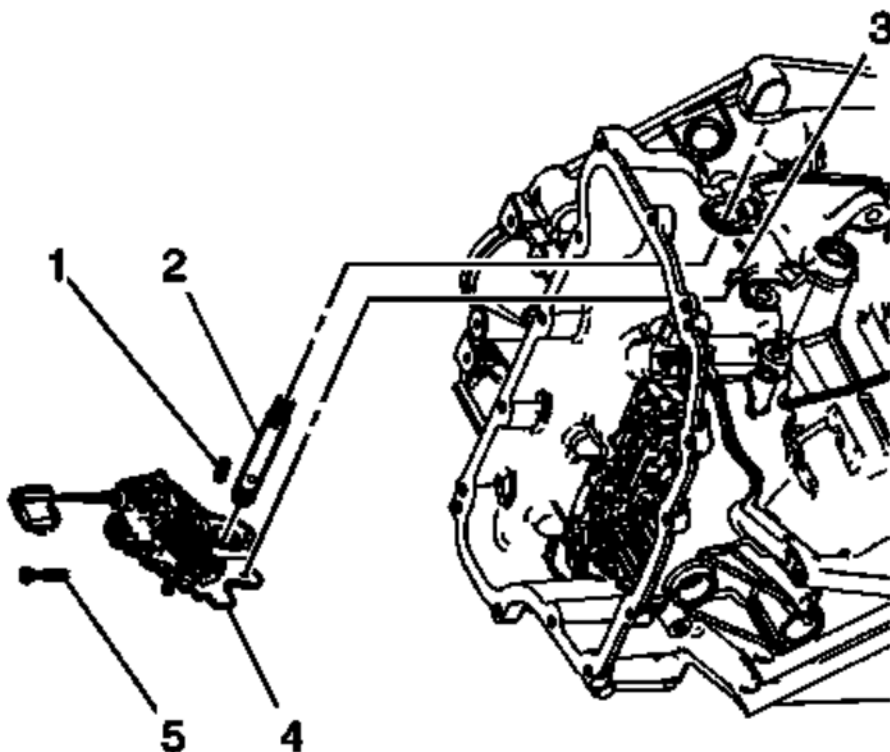
##### Special Tools

- **DT-41229** Manual Shaft Pin Installer
- **DT-48550** Detent Lever Pin Remover

For equivalent regional tools, refer to [Special Tools](#) .

##### Removal Procedure

1. Remove the control valve body cover. Refer to [Control Valve Body Cover Replacement](#).
2. Remove the control valve body. Refer to [Control Valve Body Replacement](#).



**Fig. 1: View Of Manual Shift Detent Lever & Shaft Position Switch Assembly**  
Courtesy of GENERAL MOTORS COMPANY

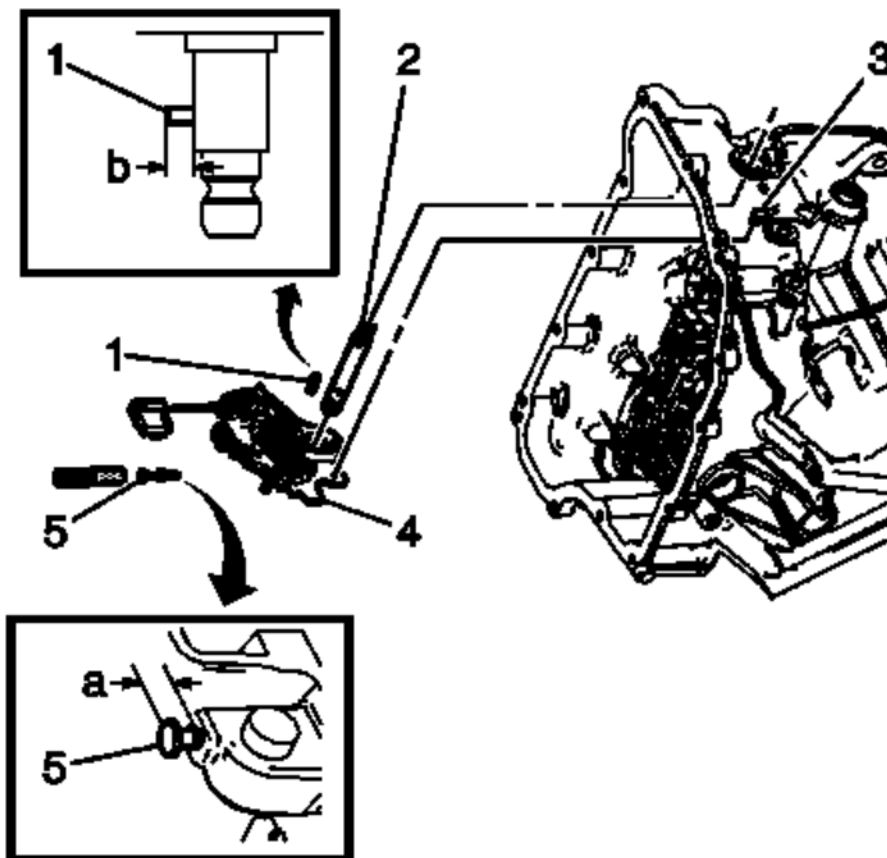
3. Remove the manual shaft detent lever hub pin (1) using **DT-48550** remover.
4. Remove the manual shift shaft pin (5) using diagonal pliers or equivalent tool. Discard the pin.
5. Remove the manual shaft (2).

**NOTE:**

- Disconnect the actuator rod (3) from the detent lever assembly. Do not remove the actuator rod from the transmission case.
- Do not pull the park actuator rod end out beyond the machined oil passage surface in the case. A no park condition will exist if the park pawl actuator assembly is pulled out of the transmission too far and the actuator rod disengages from the park pawl. The transmission assembly will require disassembly to reinstall the actuator rod over the park pawl.

6. Remove the manual shaft detent (w/shift position switch) lever assembly (4).

**Installation Procedure**



**Fig. 2: Identifying Manual Shaft Detent (W/Shift Position Switch) Lever Assembly**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Connect the actuator rod (3) to the detent lever assembly.

1. Install the manual shaft detent (w/shift position switch) lever assembly (4).

**NOTE:** Lubricate the shaft with automatic transmission fluid to prevent damage to the manual shift shaft seal during installation.

2. Install the manual shaft (2).
3. Install the manual shaft detent lever hub pin (1) using **DT-48550** remover.

**Specification**

Install the Manual Shaft Detent Lever Hub Pin to height of (b) 7.9 mm (0.38 in).

**CAUTION:** Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack.

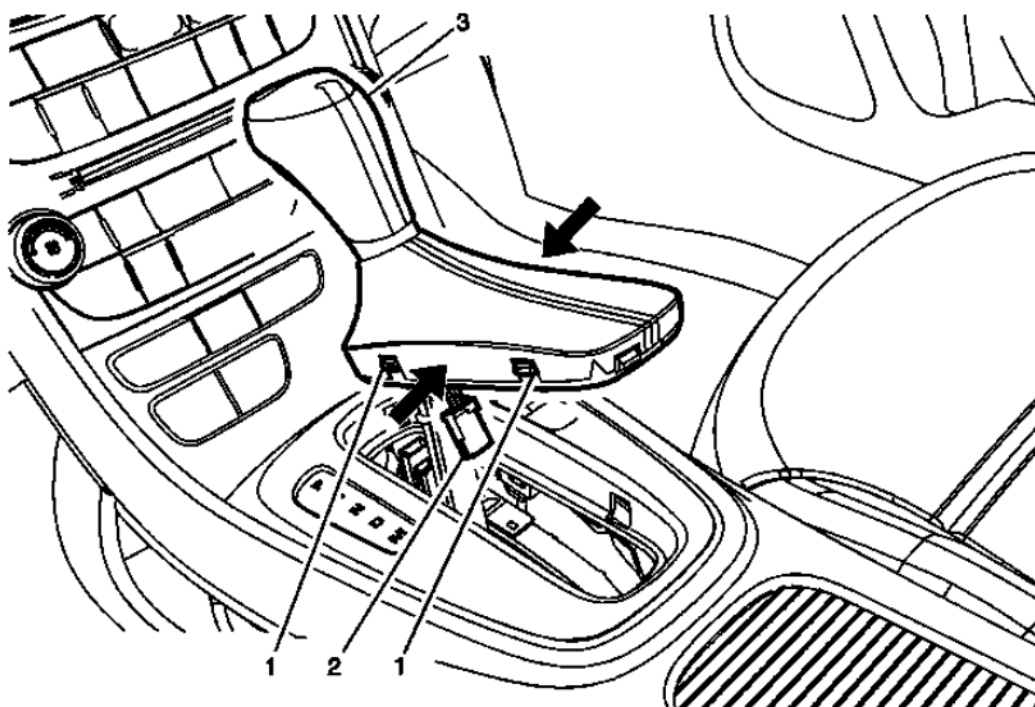
4. Install the NEW manual shift shaft pin (5) using **DT-41229** installer. Use a NEW pin to ensure proper engagement with the case.

**Specification**

Inspect pin installed height is within (a) 7.2-8.2 mm (0.28-0.32 in).

5. Install the control valve body. Refer to **Control Valve Body Replacement**.
6. Install the control valve body cover. Refer to **Control Valve Body Cover Replacement**.
7. Perform the service fast learn adapt procedure.

**TRANSMISSION CONTROL LEVER KNOB REPLACEMENT**

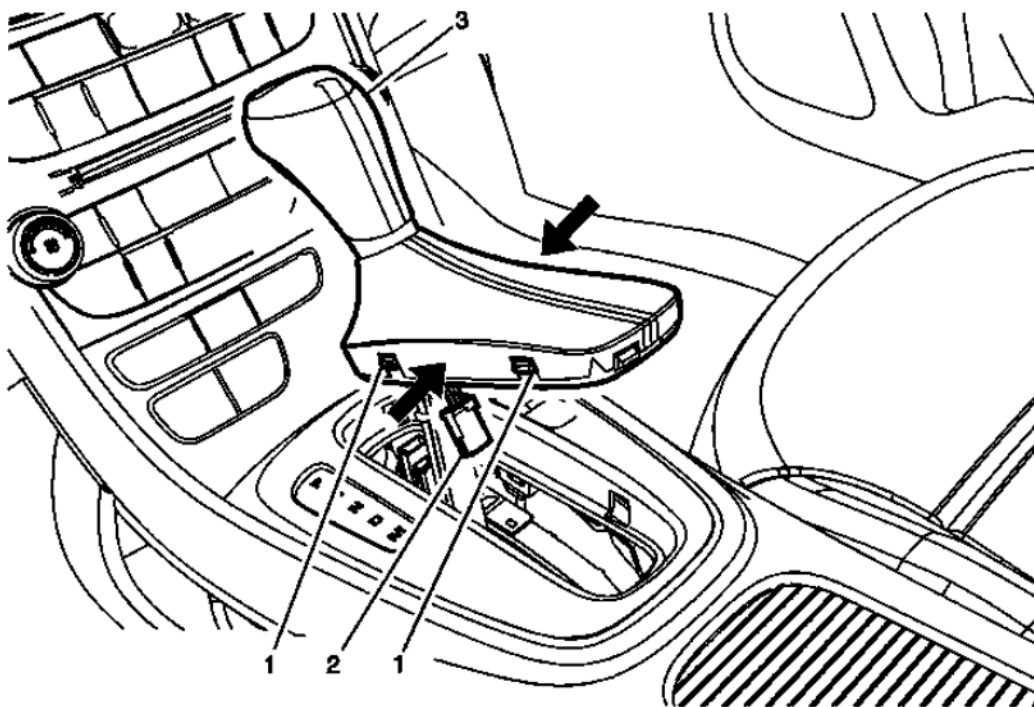


**Fig. 3: Transmission Control Lever Knob**  
Courtesy of GENERAL MOTORS COMPANY

#### Transmission Control Lever Knob Replacement

| Callout | Component Name                                                                                                                                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Transmission Control Lever Knob Retainer (Qty: 6)<br><b>Procedure</b><br>Squeeze the shifter boot at the arrows, then using a flat-bladed plastic trim tool, release the rear retainer clip securing the control lever boot. |
| 2       | Electrical connector                                                                                                                                                                                                         |
| 3       | Transmission Control Lever Knob<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The control lever boot and knob are replaced as an assembly.</li> <li>• To remove the knob, pull upward and twist.</li> </ul>   |

#### TRANSMISSION CONTROL LEVER BOOT REPLACEMENT

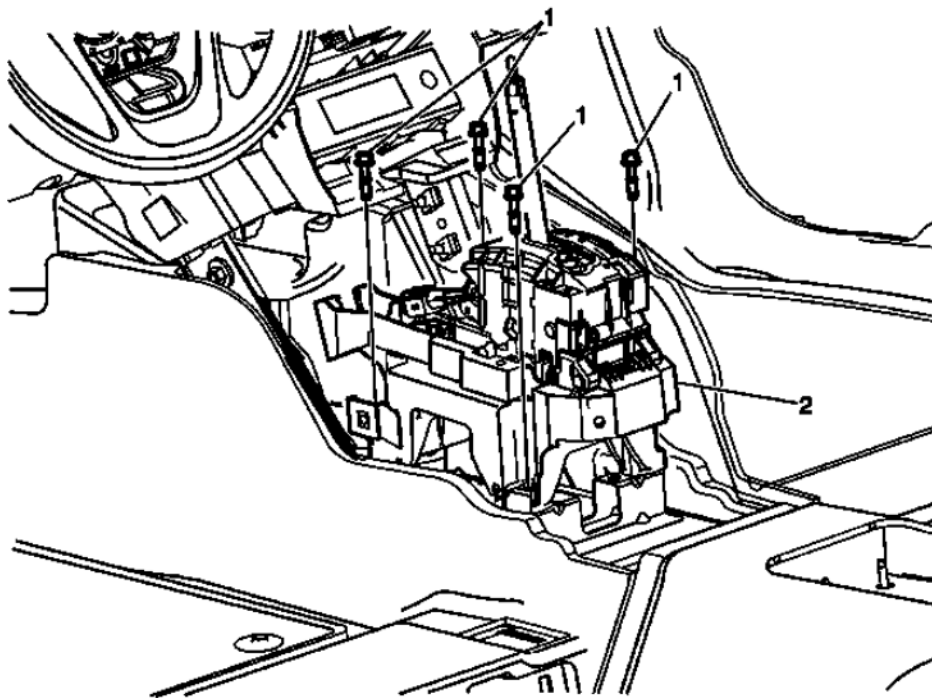


**Fig. 4: Transmission Control Lever Boot**  
Courtesy of GENERAL MOTORS COMPANY

#### Transmission Control Lever Boot Replacement

| Callout | Component Name                                                                                                                                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Transmission Control Lever Knob Retainer (Qty: 6)<br><b>Procedure</b><br>Squeeze the shifter boot at the arrows, then using a flat-bladed plastic trim tool, release the rear retainer clip securing the control lever boot. |
| 2       | Electrical connector                                                                                                                                                                                                         |
| 3       | Transmission Control Lever Knob<br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• The control lever boot and knob are replaced as an assembly.</li> <li>• To remove the knob, pull upward and twist.</li> </ul>       |

#### TRANSMISSION CONTROL REPLACEMENT



**Fig. 5: Transmission Control Module & Fasteners**  
 Courtesy of GENERAL MOTORS COMPANY

#### Transmission Control Replacement

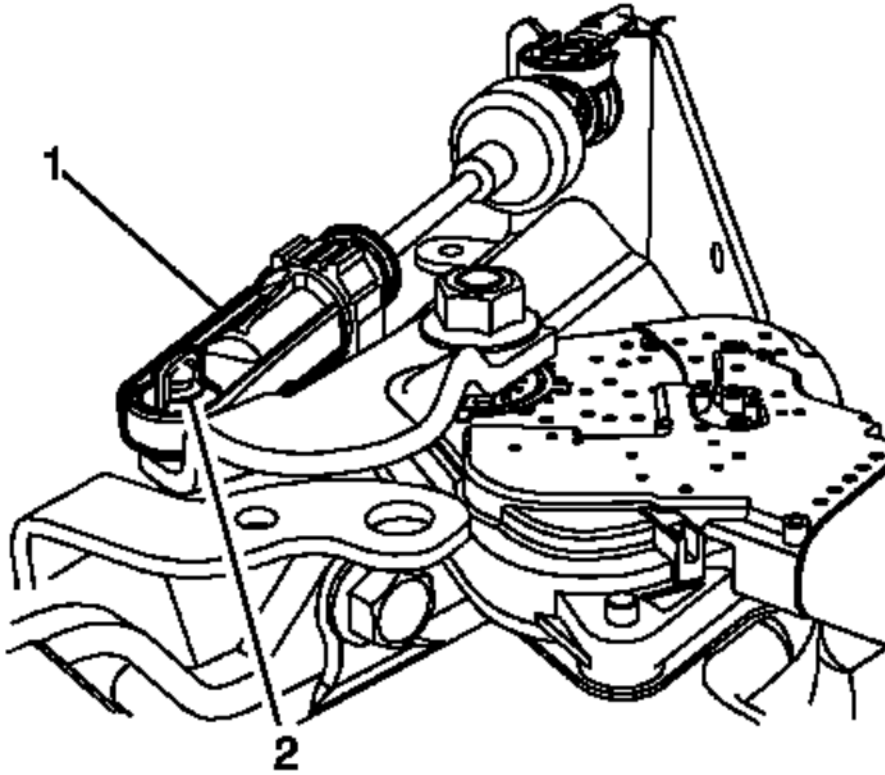
| Callout                                                                                                                                                                                | Component Name                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b>                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                        |
| 1. Remove the control lever boot. Refer to <u>Transmission Control Lever Boot Replacement</u> .<br>2. Remove floor console. Refer to <u>Front Floor Console Assembly Replacement</u> . |                                                                                                                                                                                                                                                                                                                        |
| 1                                                                                                                                                                                      | Transmission Control Fastener (Qty: 4)<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Procedure</b><br><br>1. Remove the clips on the wiring harness and disconnect the shift control electrical connector<br>2. Disconnect the shift control cable.<br><br><b>Tighten</b><br>9 N.m (80 lb in) |
| 2                                                                                                                                                                                      | Transmission Control                                                                                                                                                                                                                                                                                                   |



## RANGE SELECTOR LEVER CABLE REPLACEMENT

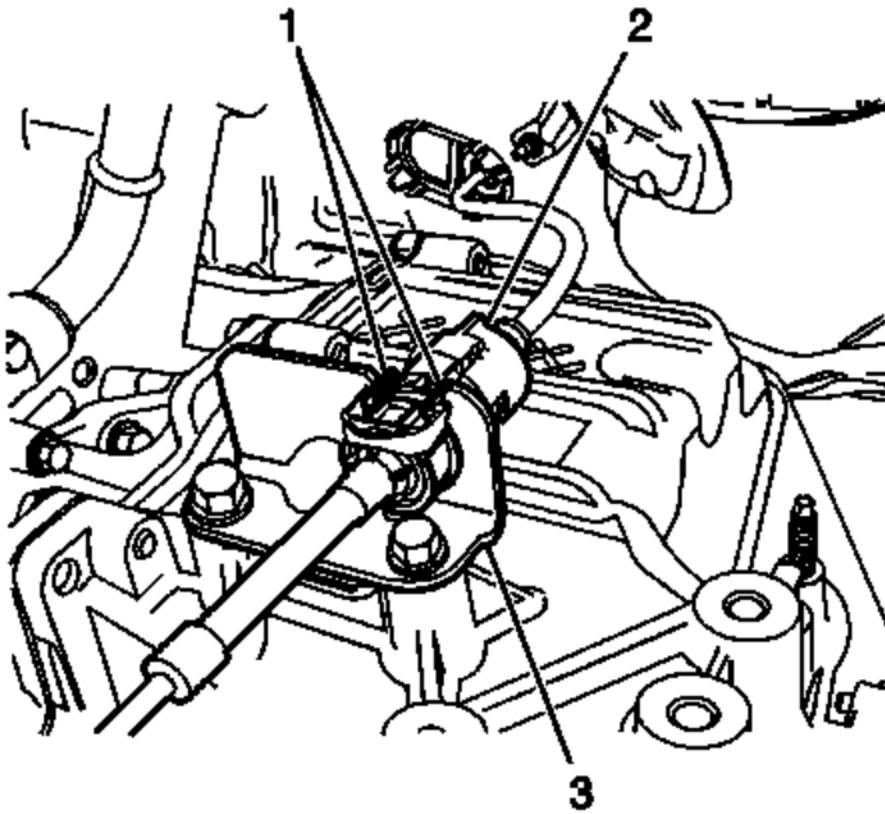
### Removal Procedure

1. Set the park brake and chock the wheels.



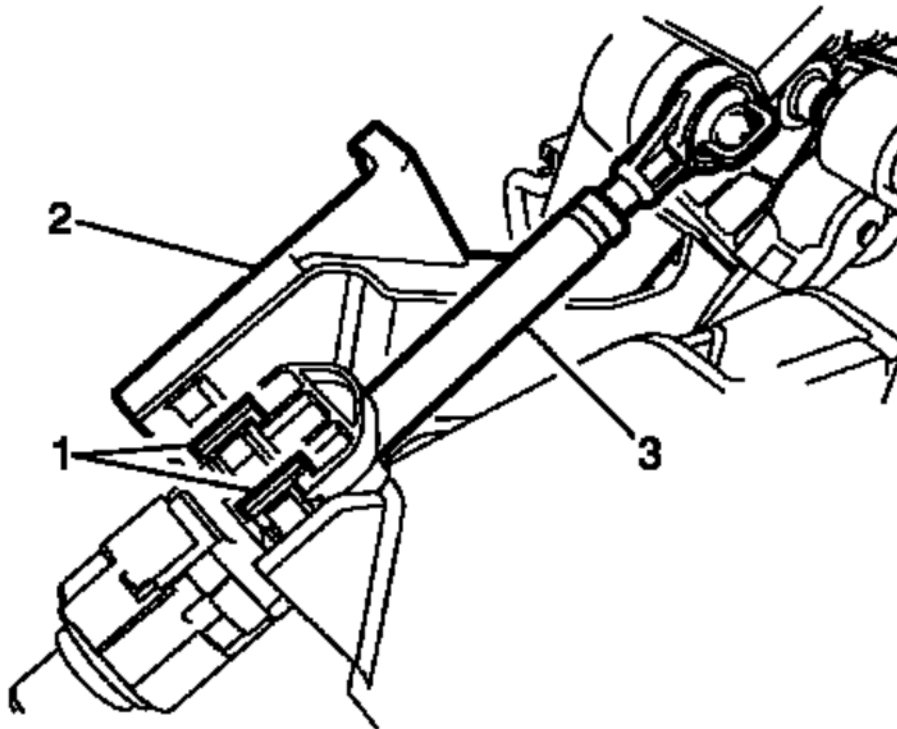
**Fig. 6: Transmission Range Selector Lever Cable Terminal And Lever Pin**  
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (2).



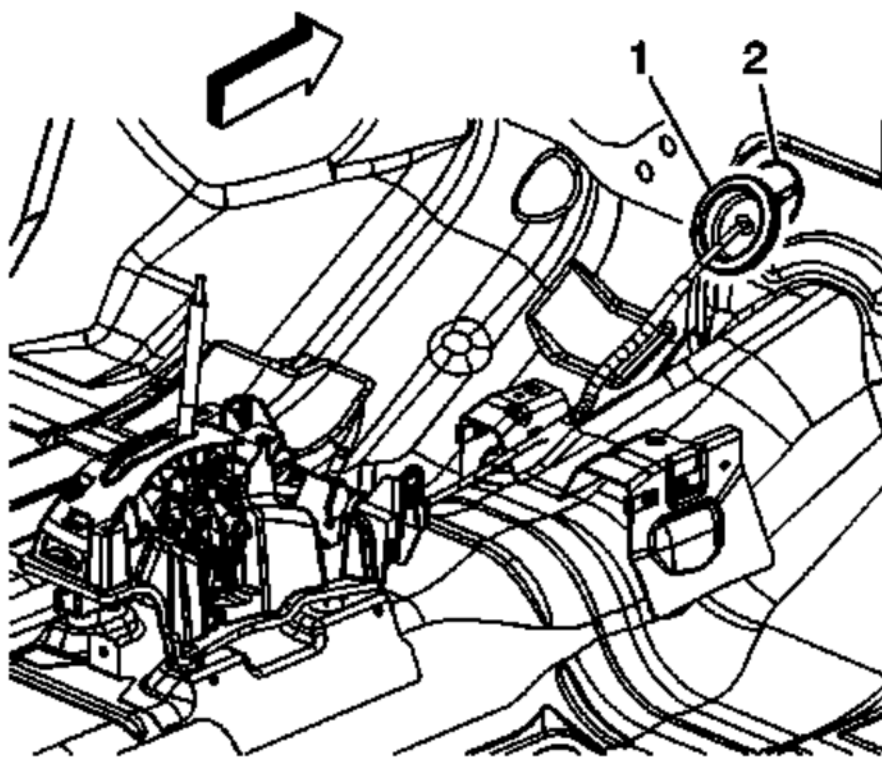
**Fig. 7: Transmission Range Selector Lever Cable & Cable Bracket**  
Courtesy of GENERAL MOTORS COMPANY

3. Press the locking tabs inward (1) in order to release the transmission range selector lever cable (2) from the cable bracket (3).
4. Remove the console. Refer to **Front Floor Console Assembly Replacement** .



**Fig. 8: Transmission Range Selector Lever Cable, Locking Tabs And Cable Bracket**  
Courtesy of GENERAL MOTORS COMPANY

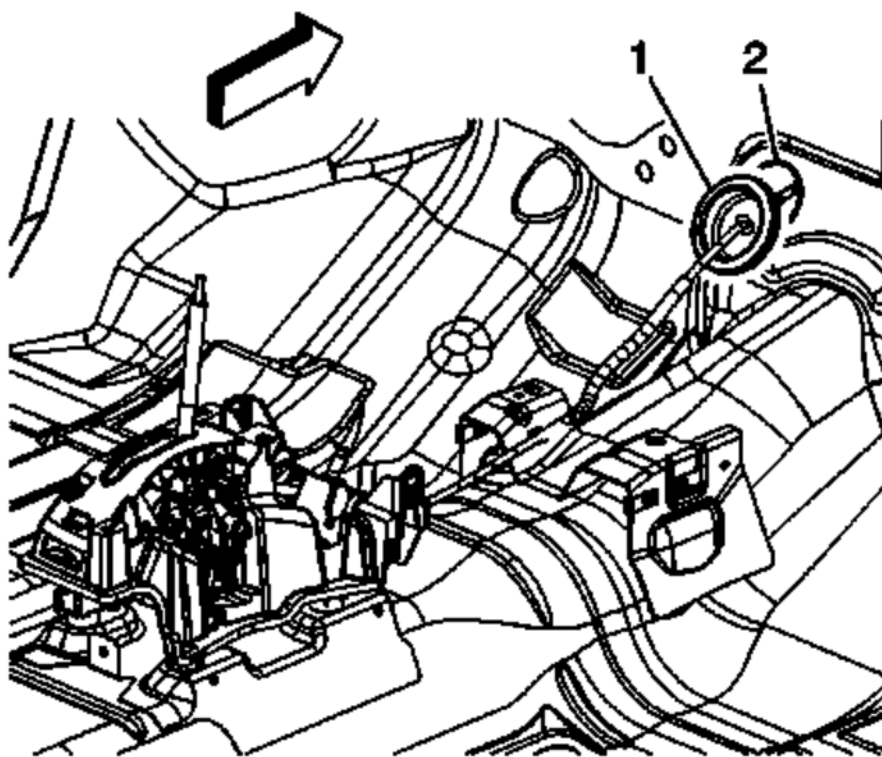
5. Press the locking tabs inward (1) in order to release the transmission range selector lever cable (3) from the cable bracket (2).
6. Release the retainer and then remove the cable end terminal from shifter pin.



**Fig. 9: Identifying Cowl Panel & Selector Lever Cable Grommet**  
Courtesy of GENERAL MOTORS COMPANY

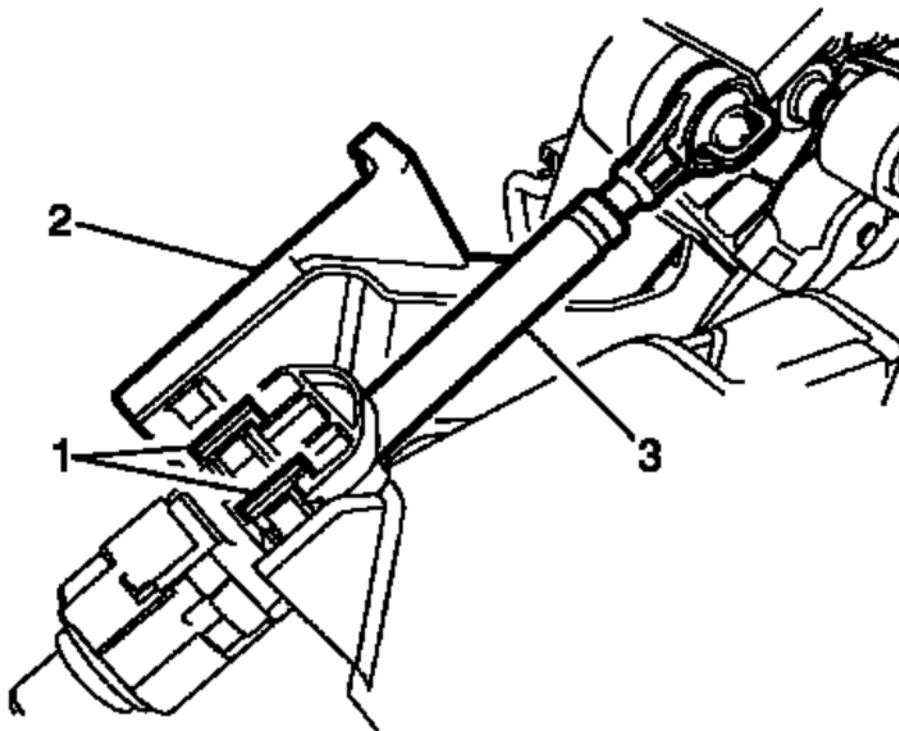
7. Remove the transmission range selector lever cable grommet (1) from the cowl panel.
8. Remove the transmission range selector lever cable from the vehicle.

#### **Installation Procedure**



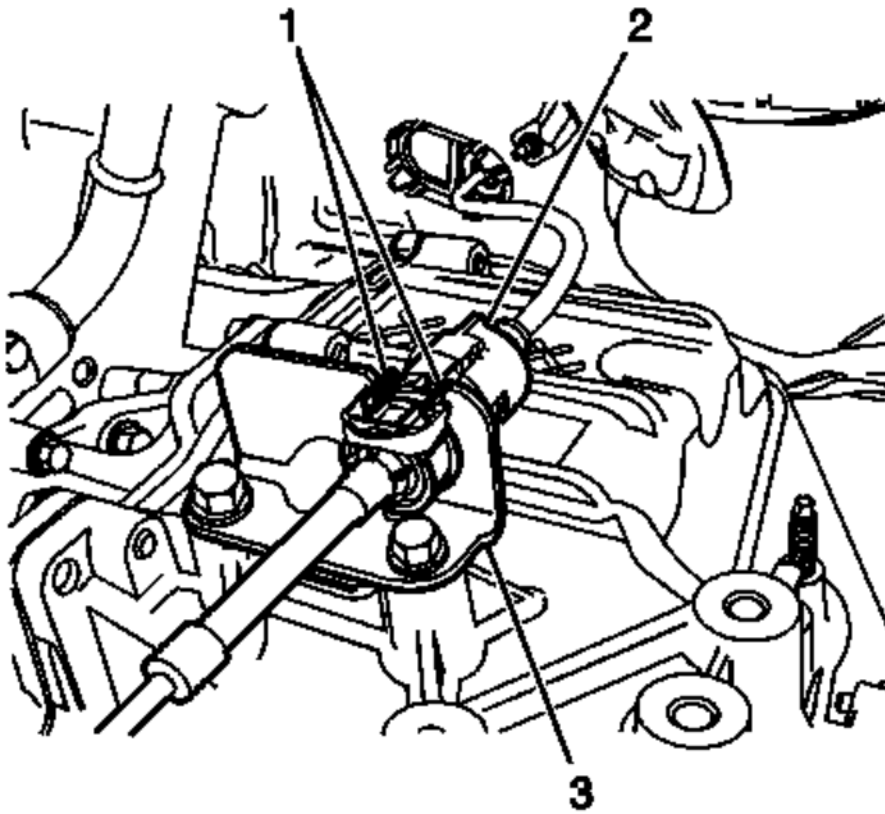
**Fig. 10: Identifying Cowl Panel & Selector Lever Cable Grommet**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission range selector lever cable to the vehicle.
2. Install the transmission range selector lever cable grommet (1) to the cowl panel (2).



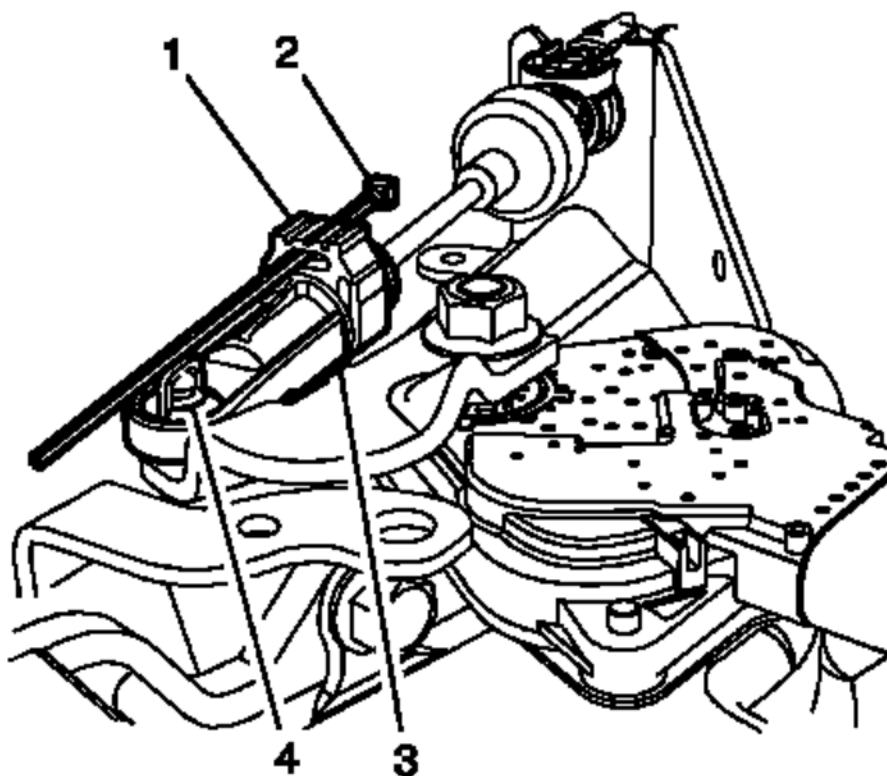
**Fig. 11: Transmission Range Selector Lever Cable, Locking Tabs And Cable Bracket**  
Courtesy of GENERAL MOTORS COMPANY

3. Connect the transmission range selector cable terminal to the shift lever pin.
4. Remove the cable tie and secure the retainer.
5. Install the cable (3) to transmission shifter base (2).
6. Install the console. Refer to **Front Floor Console Assembly Replacement** .



**Fig. 12: Transmission Range Selector Lever Cable & Cable Bracket**  
Courtesy of GENERAL MOTORS COMPANY

7. Install the transmission range selector lever cable (2) to the cable bracket (3).



**Fig. 13: Range Selector Lever Cable Terminal And Transmission Manual Shift Lever Pin**  
Courtesy of GENERAL MOTORS COMPANY

8. Connect the transmission range selector lever cable terminal (4) to the transmission manual shift lever pin.
9. Ensure that the shift lever and the shifter are in the Park position. Secure the shift cable adjustable lock into place. Remove the lock retainer (2). Ensure that the adjustable lock (1) is properly seated.

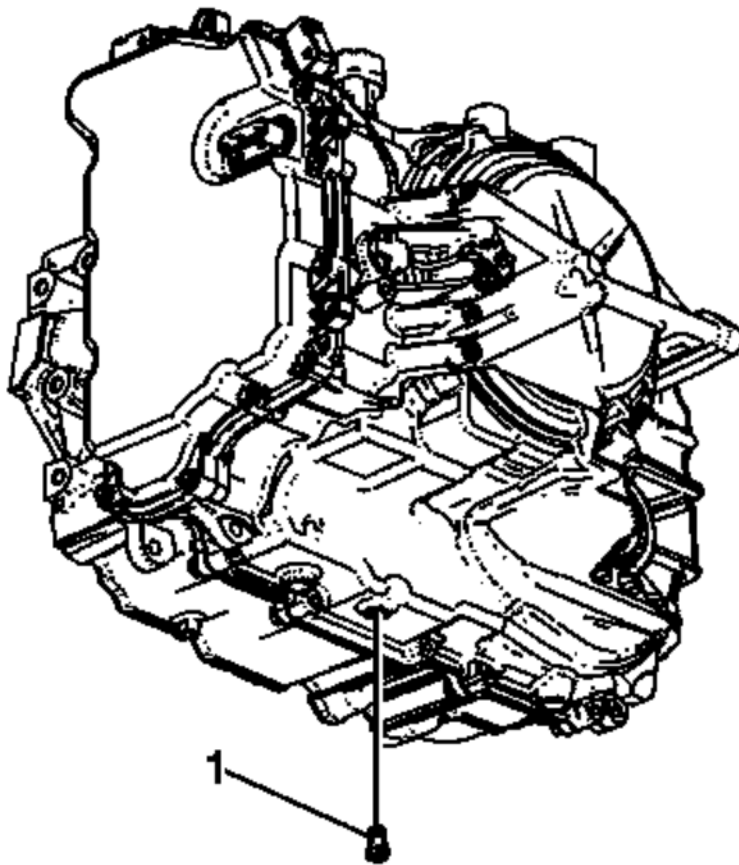
### **RANGE SELECTOR LEVER CABLE ADJUSTMENT**

The shift cable on this vehicle does not require an adjustment.

### **TRANSMISSION FLUID DRAIN AND FILL**

#### **Removal Procedure**





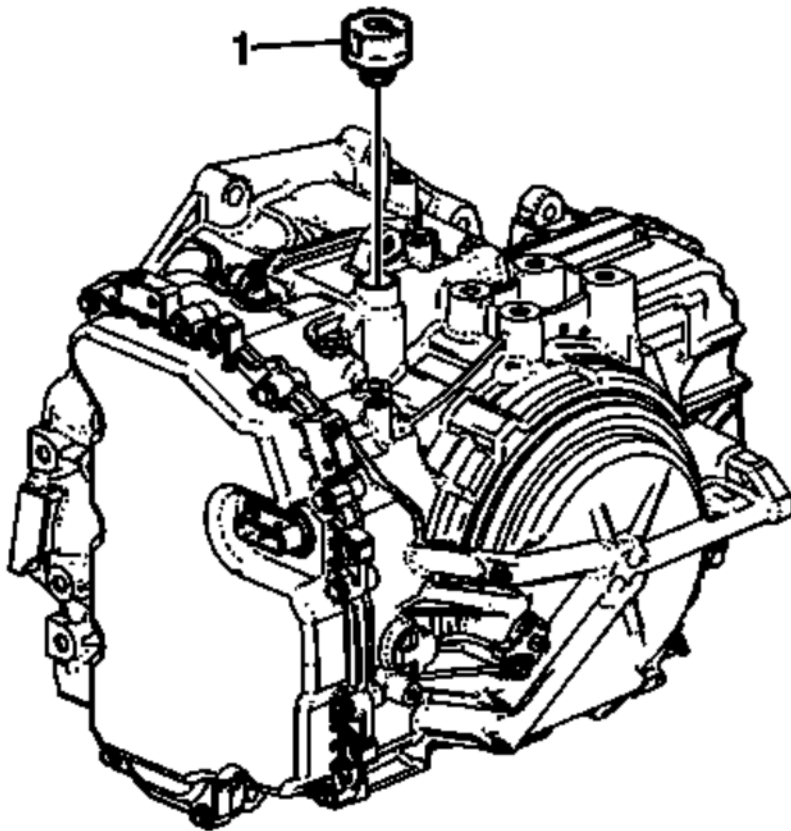
**Fig. 14: Identifying Fluid Level Hole Plug**  
Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the fluid drain plug (1).
3. Drain transmission fluid into a suitable container.

**CAUTION: Refer to Fastener Caution .**

4. Install the fluid drain plug (1) and tighten to 12 N.m (106 lb in).

#### **Installation Procedure**

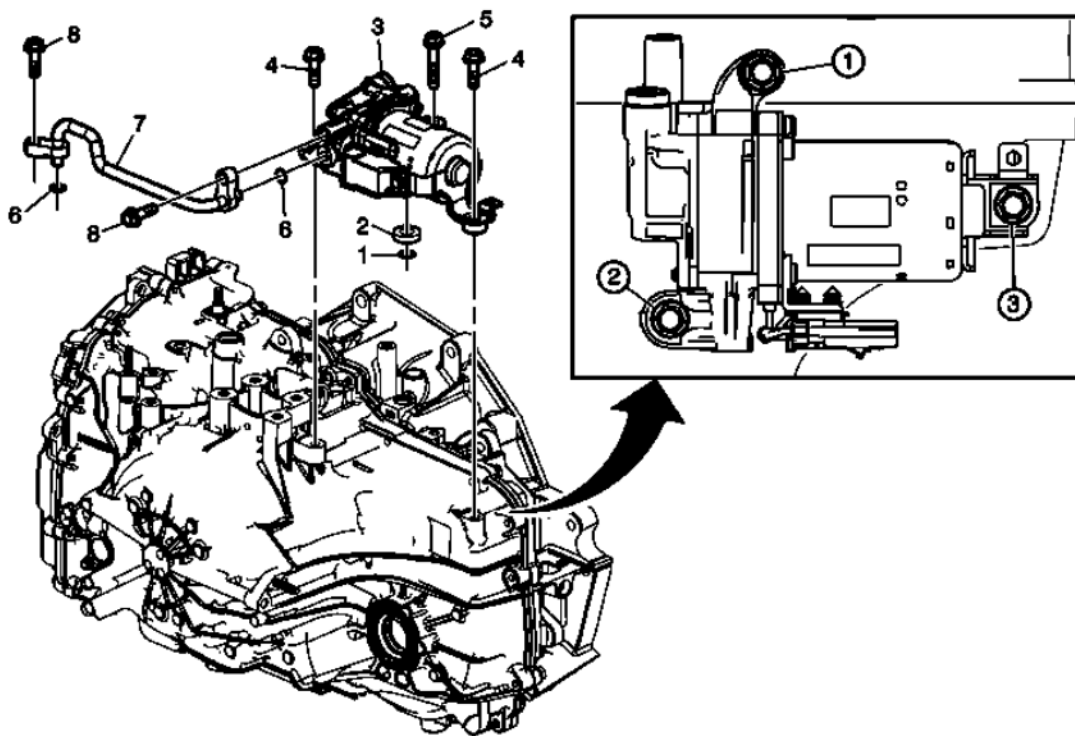


**Fig. 15: Identifying Fluid Fill Cap**

Courtesy of GENERAL MOTORS COMPANY

1. Lower the vehicle.
2. Remove the fluid fill cap (1).
3. Fill the transmission to the proper level with the correct fluid. Refer to **Transmission Fluid Level and Condition Check** , and **Fluid Capacity Specifications (6T40/45/50)** .
4. Install the fluid fill cap (1).

#### **AUXILIARY FLUID PUMP REPLACEMENT (HYBRID)**



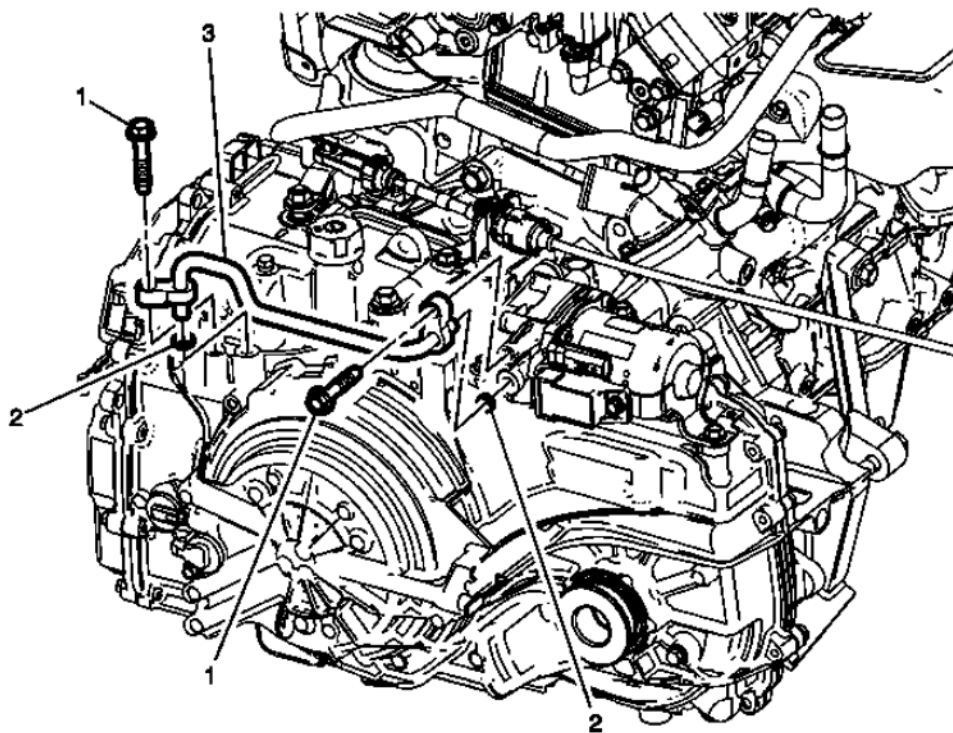
**Fig. 16: Auxiliary Fluid Pump & Components**  
Courtesy of GENERAL MOTORS COMPANY

#### Auxiliary Fluid Pump Replacement (Hybrid)

| Callout                                                                                                                                                                                                                                                                                                             | Component Name                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b>                                                                                                                                                                                                                                                                                       |                                                                                                                                                       |
| <ol style="list-style-type: none"> <li>1. Set the park brake and chock the wheels.</li> <li>2. Remove the battery tray. Refer to <b>Battery Tray Replacement</b>.</li> <li>3. Disconnect the range selector cable from the range selector lever. Refer to <b>Range Selector Lever Cable Replacement</b>.</li> </ol> |                                                                                                                                                       |
| 1                                                                                                                                                                                                                                                                                                                   | A/Trans Auxiliary Fluid Pump Seal                                                                                                                     |
| 2                                                                                                                                                                                                                                                                                                                   | A/Trans Auxiliary Fluid Pump Gasket                                                                                                                   |
| 3                                                                                                                                                                                                                                                                                                                   | A/Trans Auxiliary Fluid Pump Assembly<br><b>Procedure</b><br>Disconnect/connect the electrical connector.                                             |
| 4                                                                                                                                                                                                                                                                                                                   | A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 2)<br><br><b>CAUTION:</b><br>Refer to <b>Fastener Caution</b> .<br><br><b>Tighten</b><br>22 (16 lb ft) |
|                                                                                                                                                                                                                                                                                                                     | A/Trans Auxiliary Fluid Pump Bolt                                                                                                                     |

|   |                                                                                                                                                                                                                                                                                         |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <b>Tighten</b><br>22 (16 lb ft)                                                                                                                                                                                                                                                         |
| 6 | Trans Auxiliary Fluid Pump Outlet Pipe Seal (Qty: 2)                                                                                                                                                                                                                                    |
| 7 | A/Trans Auxiliary Fluid Pump Outlet Pipe<br><br><b>Procedure</b><br><br><ol style="list-style-type: none"> <li>1. Fasten pipe to auxiliary pump and tighten bolt just enough to hold in place.</li> <li>2. Align pipe to case and tighten bolt just enough to hold in place.</li> </ol> |
| 8 | A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 2)<br><br><b>NOTE:</b><br><b>Check the fluid.</b><br><br><b>Tighten</b><br>22 (16 lb ft)                                                                                                                                                 |

#### AUXILIARY FLUID PUMP OUTLET PIPE REPLACEMENT (HYBRID)



**Fig. 17: Auxiliary Fluid Pump Outlet Pipe, Seals & Bolts**  
Courtesy of GENERAL MOTORS COMPANY

#### Auxiliary Fluid Pump Outlet Pipe Replacement (Hybrid)

| Callout                                                                                                    | Component Name                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b><br>Remove the battery tray. Refer to <b><u>Battery Tray Replacement</u></b> . |                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1                                                                                                          | A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 2)<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>22 (16 lb ft)                                                                                                                                                                                                                                           |
| 2                                                                                                          | Trans Auxiliary Fluid Pump Outlet Pipe Seal (Qty: 2)                                                                                                                                                                                                                                                                                                                                                   |
| 3                                                                                                          | A/Trans Auxiliary Fluid Pump Outlet Pipe<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. Fasten pipe to auxiliary pump and tighten bolt just enough to hold in place.</li> <li>2. Align pipe to case and tighten bolt just enough to hold in place.</li> <li>3. Check the transmission fluid level. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b> .</li> </ol> |

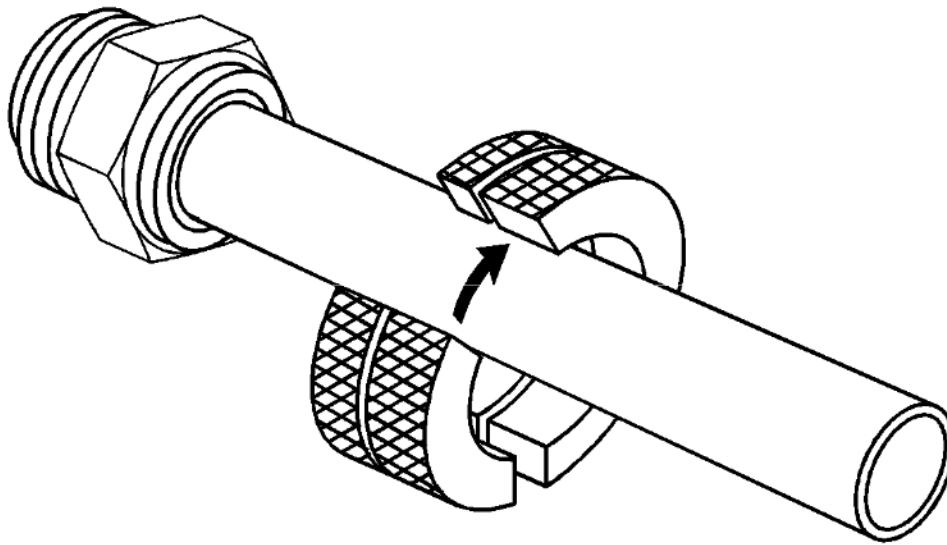
## TRANSMISSION FLUID COOLER HOSE/PIPE QUICK-CONNECT FITTING DISCONNECTION AND CONNECTION

### Special Tools

- **DT-28585** Universal Snap Ring Remover for the 5/8 inch Line
- **DT-41623-B** 3/8 inch Line Quick Release Tool

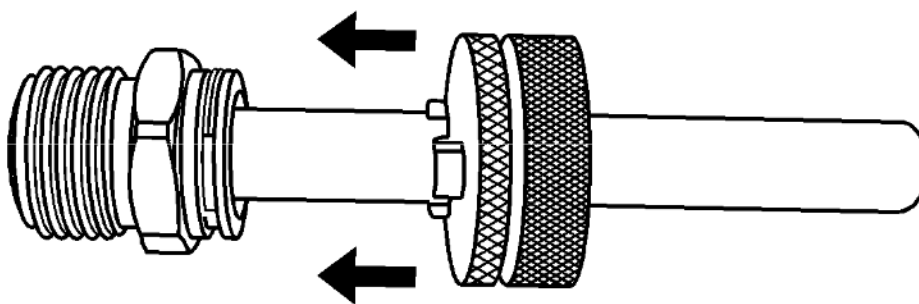
### Removal Procedure

1. Remove the plastic caps from the quick connect fittings by pulling the caps back along the pipe before installation.



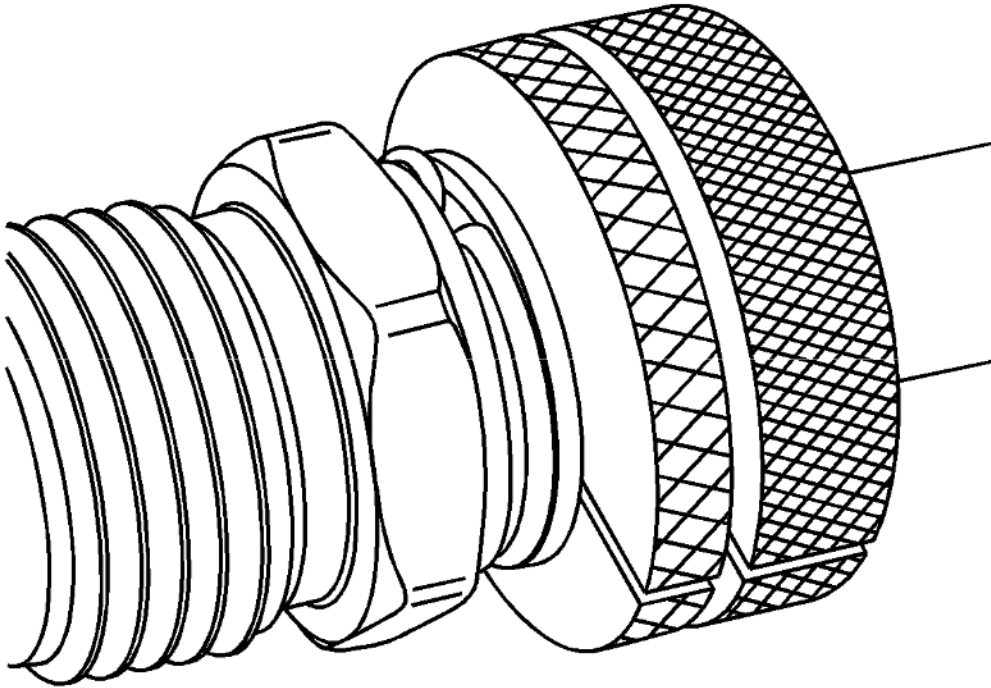
**Fig. 18: View Of J 41623-B & Generator Cooling Inlet Pipe**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the **DT-41623-B** 3/8 inch line quick release tool onto the transmission oil cooler (TOC) pipe, or use the **DT-28585** universal snap ring remover for the 5/8 inch line.



**Fig. 19: Sliding J 41623-B Toward Generator Cooling Inlet Pipe Fitting**  
Courtesy of GENERAL MOTORS COMPANY

3. Slide the **DT-41623-B** 3/8 inch line quick release tool toward the TOC pipe fitting, or use the **DT-28585** universal snap ring remover for the 5/8 inch line.



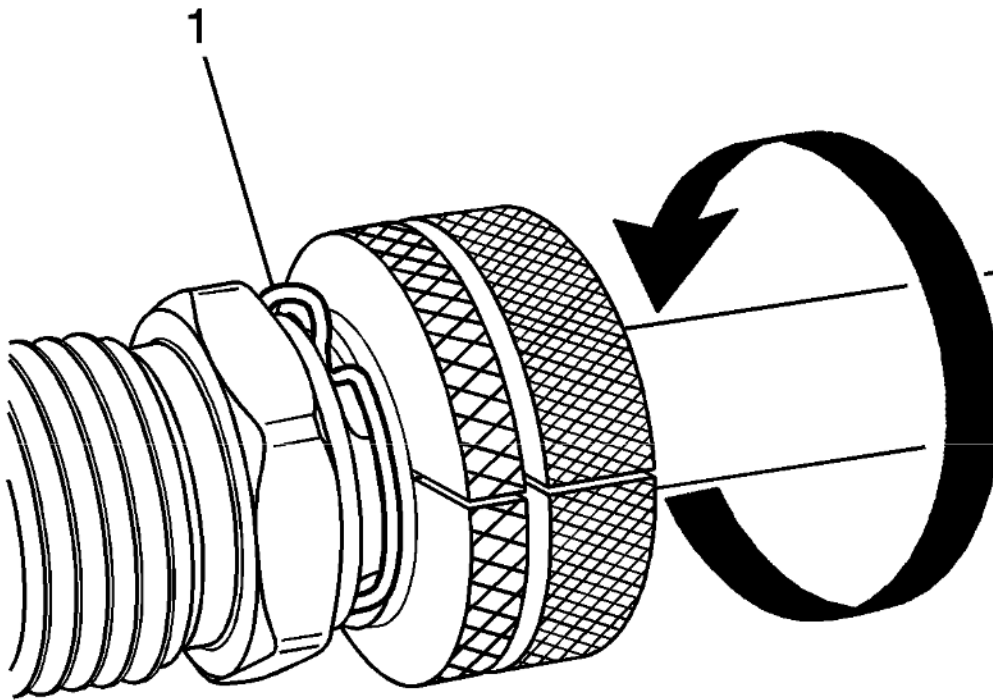
**Fig. 20: Quick-Connect On Coolant Pipe**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Rotate the DT-41623-B 3/8 inch line quick release tool to engage the TOC pipe fitting's retainer slots.

The DT-41623-B 3/8 inch line quick release tool should be nearly flush with the fitting.

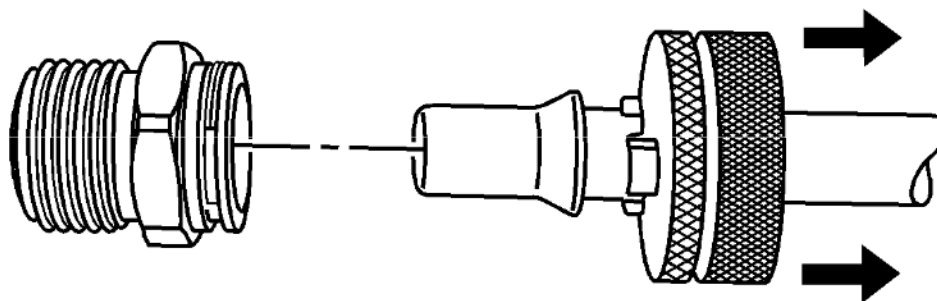
4. Connect the **DT-41623-B** 3/8 inch line quick release tool onto the TOC pipe fitting.





**Fig. 21: Quick-Connect & Retainer Clip**  
Courtesy of GENERAL MOTORS COMPANY

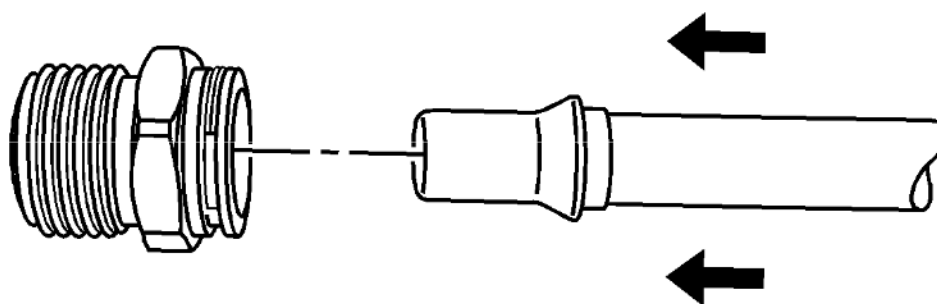
5. Rotate the **DT-41623-B** 3/8 inch line quick release tool or use the **DT-28585** universal snap ring remover for the 5/8 inch line until the retainer clip (1) rises above the fitting retainer seat.



**Fig. 22: View Of J 41623-B & Generator Cooling Inlet Pipe**  
Courtesy of GENERAL MOTORS COMPANY

6. Pull back on the TOC pipe to disengage the pipe from the TOC pipe fitting.
7. Remove the **DT-41623-B** 3/8 inch line quick release tool or the **DT-28585** universal snap ring remover for the 5/8 inch line from the TOC pipe.

#### Installation Procedure



**Fig. 23: View Of Generator Cooling Inlet Pipe & Generator Cooling Inlet Pipe Fitting**  
Courtesy of GENERAL MOTORS COMPANY

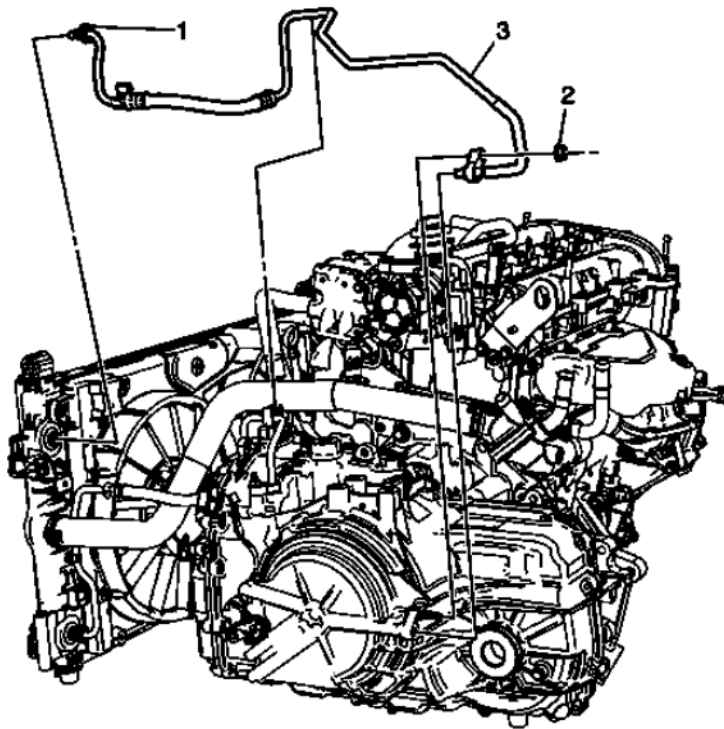
**NOTE:** Discard the TOC retaining clip and install a new retaining clip.

1. Install the TOC pipe into the TOC pipe fitting.

A distinct snap should be heard or felt when assembling the TOC pipe to the fitting.

2. To ensure the cooler line is properly installed, give the cooler pipe a gentle pull.

#### **TRANSMISSION FLUID COOLER OUTLET PIPE REPLACEMENT (LUK)**



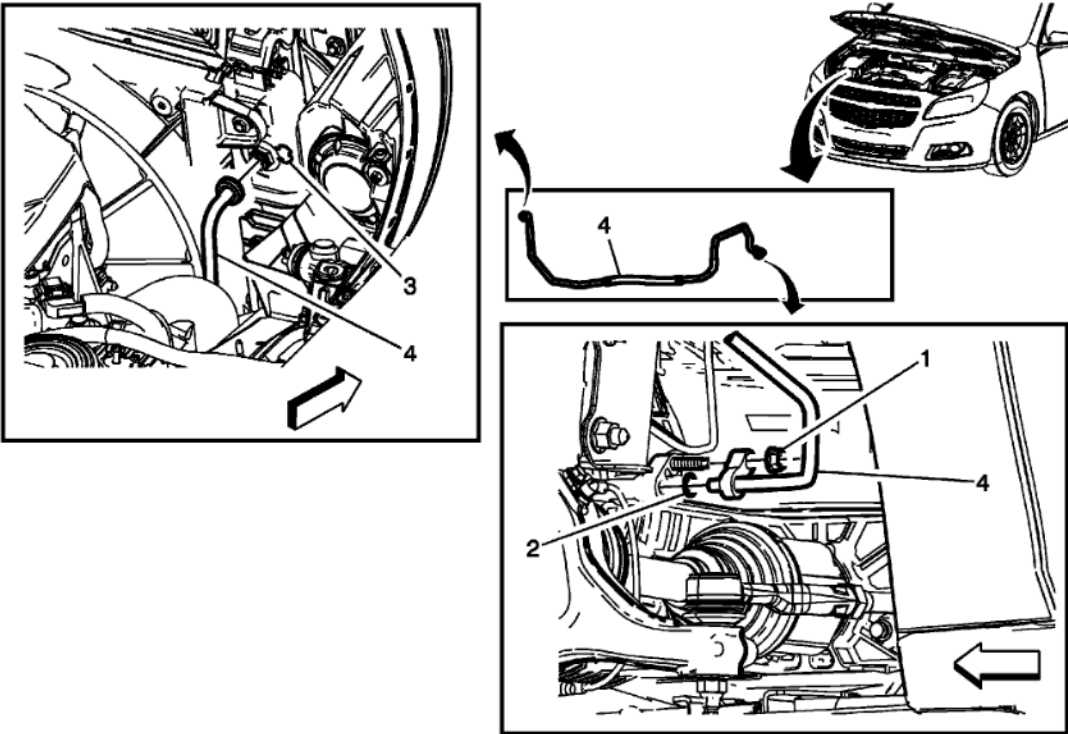
**Fig. 24: Fluid Cooler Outlet Pipe**  
 Courtesy of GENERAL MOTORS COMPANY

#### Transmission Fluid Cooler Outlet Pipe Replacement (LUK)

| Callout                                                                                                                                                                                                                                                                                                                                                                             | Component Name                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise the vehicle. Refer to <u><b>Lifting and Jacking the Vehicle</b></u> .</li> <li>2. Remove the front wheelhouse front liner - left side. Refer to <u><b>Front Wheelhouse Front Liner Replacement (Left Side)</b></u> , <u><b>Front Wheelhouse Front Liner Replacement (Right Side)</b></u> .</li> </ol> |                                                                                                                                                                                                                                       |
| 1                                                                                                                                                                                                                                                                                                                                                                                   | Transmission Fluid Cooler Outlet Hose Quick Disconnect<br><b>Procedure</b><br>Remove and discard the sealing washer.<br>Refer to <u><b>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</b></u> |
| 2                                                                                                                                                                                                                                                                                                                                                                                   | Transmission Fluid Cooler Outlet Hose Nut<br><br><b>CAUTION:</b><br>Refer to <u><b>Fastener Caution</b></u> .<br><br><b>Tighten</b><br>22 (16 lb ft)                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                     | Transmission Fluid Cooler Outlet Hose                                                                                                                                                                                                 |

|   |                                                                                                                                                                                                                                                                                                                                                                                             |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Note the routing of the transmission line to ensure proper installation.</li> <li>2. Remove the transmission line from the clips securing the line to the transmission and fan shroud.</li> <li>3. Inspect the transmission fluid level. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b> .</li> </ol> |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TRANSMISSION FLUID COOLER OUTLET PIPE REPLACEMENT (LCV)



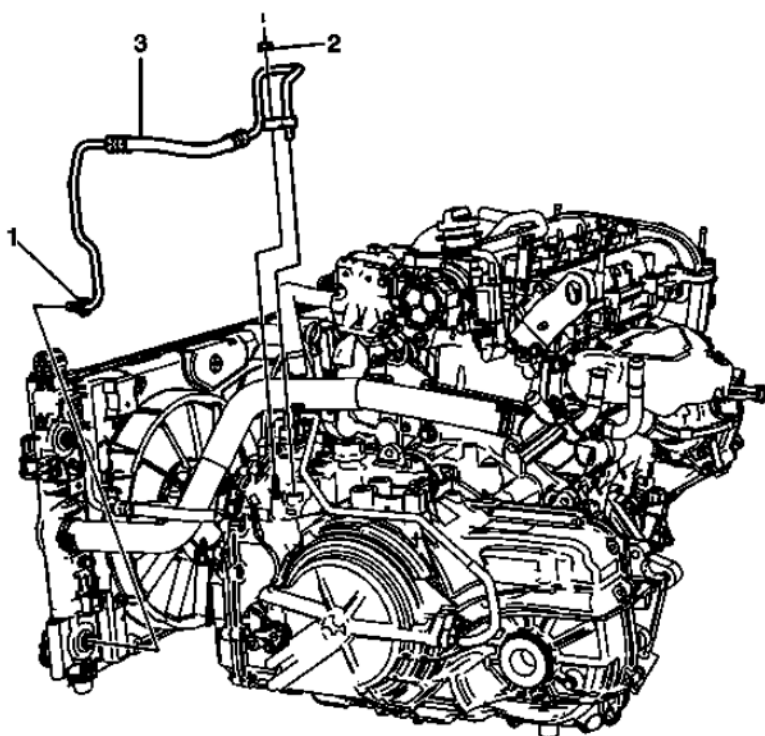
**Fig. 25: Transmission Fluid Cooler Outlet Pipe (LCV)**  
Courtesy of GENERAL MOTORS COMPANY

Transmission Fluid Cooler Outlet Pipe Replacement (LCV)

| Callout                                                                                                                                          | Component Name                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b><br>Remove the left front tire and wheel assembly. Refer to <b><u>Tire and Wheel Removal and Installation</u></b> . |                                                                                                               |
| 1                                                                                                                                                | Transmission Fluid Cooler Outlet Pipe Nut<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> . |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>Tighten</b><br>22 N.m (17 lb ft)<br><br><b>NOTE:</b><br><b>Cap the fittings and plug the holes when removing the transmission fluid cooler outlet pipe.</b>                                                                                                                                                                                                                                                              |
| 2 | Transmission Fluid Cooler Outlet Pipe Seal<br><br><b>NOTE:</b><br><b>Remove and discard the old sealing washer and replace with NEW.</b>                                                                                                                                                                                                                                                                                    |
| 3 | Transmission Fluid Cooler Outlet Pipe Quick Disconnect Retaining Clip<br><b>Procedure</b><br>Remove and discard the sealing washer and replace with a NEW sealing washer. Refer to <b><u>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</u></b> .                                                                                                                                   |
| 4 | Transmission Fluid Cooler Outlet Pipe<br><br><b>Procedures</b> <ol style="list-style-type: none"> <li>1. Note the routing of the transmission line to ensure proper installation.</li> <li>2. Remove the transmission line from the retaining clips.</li> <li>3. Adjust the transmission fluid level. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b> .</li> <li>4. Inspect for fluid leaks.</li> </ol> |

## TRANSMISSION FLUID COOLER INLET PIPE REPLACEMENT (LUK)



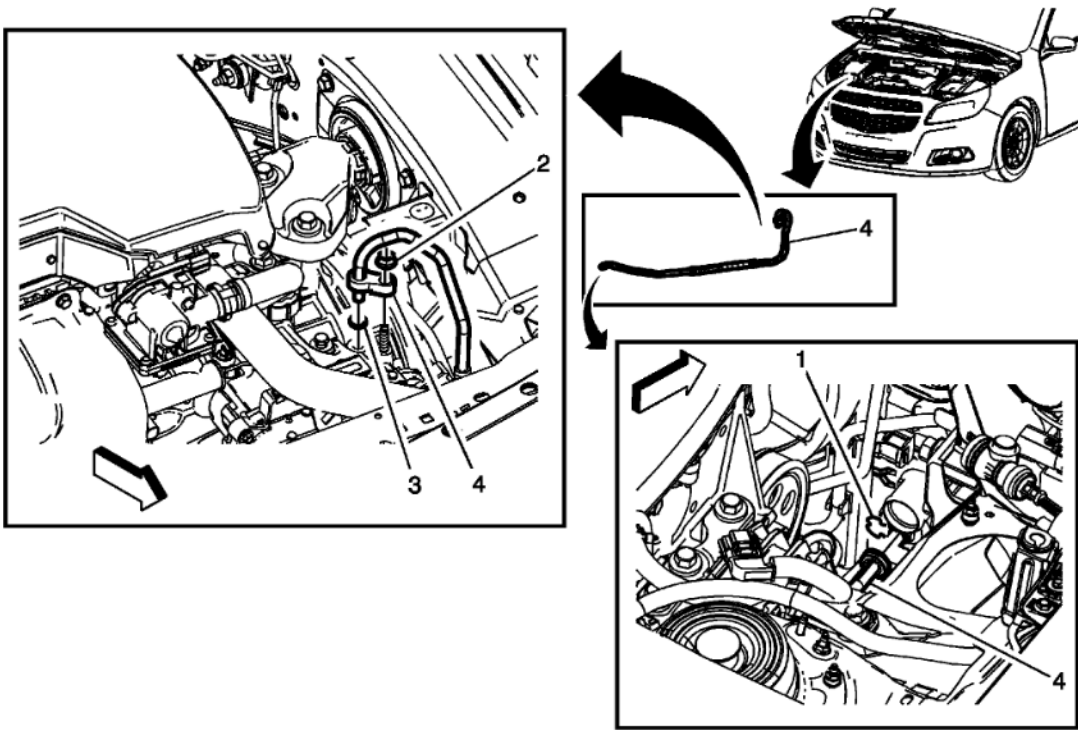
**Fig. 26: Fluid Cooler Inlet Pipe**  
 Courtesy of GENERAL MOTORS COMPANY

#### Transmission Fluid Cooler Inlet Pipe Replacement (LUK)

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Component Name                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise the vehicle. Refer to <b><u>Lifting and Jacking the Vehicle</u></b> .</li> <li>2. Reposition the engine control module and bracket without disconnecting the electrical. Refer to <b><u>Engine Control Module Replacement (LCV)</u></b> , <b><u>Engine Control Module Replacement (LTG)</u></b> , for the 2.0L and 2.5L engines or <b><u>Engine Control Module Replacement</u></b> for the 2.2L and 2.4L engines.</li> </ol> |                                                                                                                                                                                                                                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Transmission Fluid Cooler Inlet Hose Quick Disconnect<br><b>Procedure</b><br>Remove and discard the sealing washer.<br>Refer to <b><u>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</u></b> . |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Transmission Fluid Cooler Inlet Hose Nut<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>22 (16 lb ft)                                                                                    |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | <p>Transmission Fluid Cooler Inlet Hose</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Note the routing of the transmission line to ensure proper installation.</li> <li>2. Remove the transmission line from the clips securing the line to the transmission and fan shroud.</li> <li>3. Inspect the transmission fluid level. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b>.</li> </ol> |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**TRANSMISSION FLUID COOLER INLET PIPE REPLACEMENT (LCV)**



**Fig. 27: Transmission Fluid Cooler Inlet Pipe (LCV)**  
 Courtesy of GENERAL MOTORS COMPANY

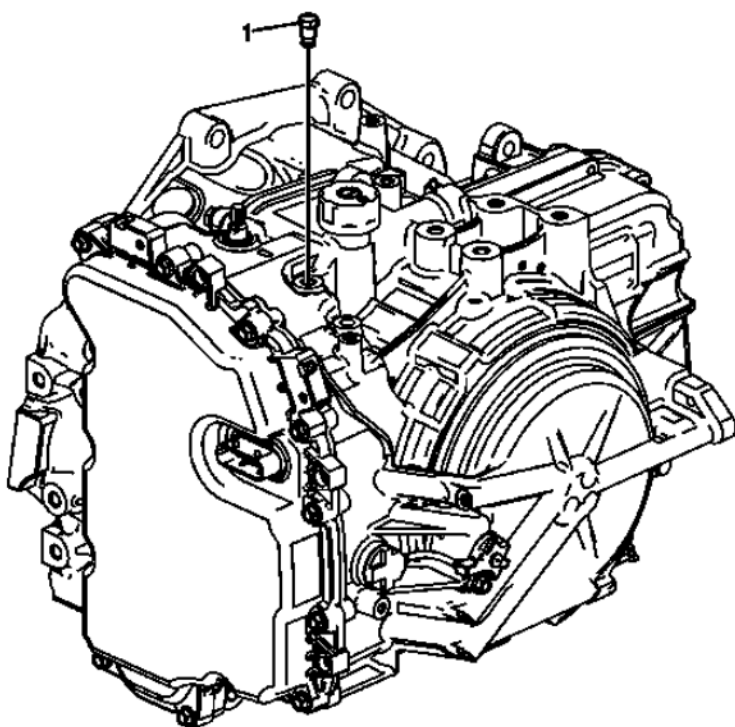
**Transmission Fluid Cooler Inlet Pipe Replacement (LCV)**

| Callout                                                                                                     | Component Name                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b><br>Remove the battery tray. Refer to <b><u>Battery Tray Replacement</u></b> . |                                                                                                                                                                                                                                                                                           |
| 1                                                                                                           | Transmission Fluid Cooler Inlet Pipe Quick Disconnect Retaining Clip<br><b>Procedure</b><br>Remove and discard the sealing washers and replace with a NEW sealing washer. Refer to <b><u>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</u></b> . |



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 | <p>Transmission Fluid Cooler Inlet Pipe Nut</p> <p><b>CAUTION:</b><br/>Refer to <b><u>Fastener Caution</u></b> .</p> <p><b>Tighten</b><br/>22 N.m (16 lb ft)</p>                                                                                                                                                                                                                                                                 |
| 3 | <p>Transmission Fluid Cooler Inlet Pipe Seal</p> <p><b>Procedure</b></p> <p><b>NOTE:</b><br/><b>Cap the fittings and plug the holes when removing the transmission fluid cooler inlet pipe.</b></p> <p>Remove and discard the sealing washers and replace with a NEW sealing washer.</p>                                                                                                                                         |
| 4 | <p>Transmission Fluid Cooler Inlet Pipe</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Note the routing of the transmission line to ensure proper installation.</li> <li>2. Remove the transmission line from the retaining clips.</li> <li>3. Adjust the transmission fluid level. Refer to <b><u>Transmission Fluid Level and Condition Check</u></b> .</li> <li>4. Inspect for fluid leaks.</li> </ol> |

## AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

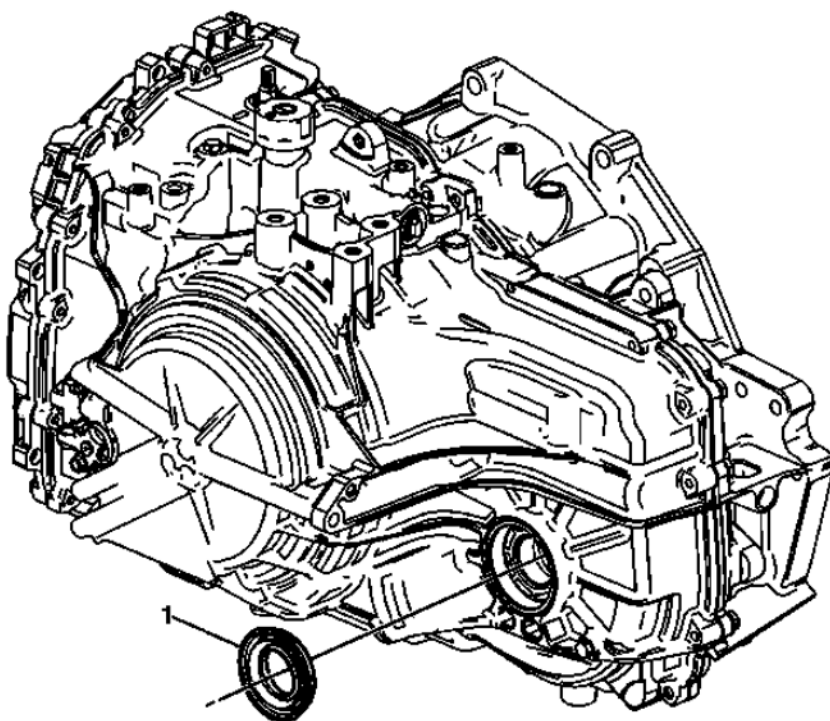


**Fig. 28: Identifying Pressure Test Plug**  
 Courtesy of GENERAL MOTORS COMPANY

#### Automatic Transmission Fluid Pressure Test Hole Plug Replacement

| Callout                                                                                                                                                                                                                                                                                                                                              | Component Name                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b><br>Reposition the engine control module without disconnecting the electrical connectors. Refer to <b><u>Engine Control Module Replacement (LCV)</u></b> , <b><u>Engine Control Module Replacement (LTG)</u></b> , for the 2.0L and 2.5L engines or <b><u>Engine Control Module Replacement</u></b> for the 2.4L engine. |                                                                                                                                      |
| 1                                                                                                                                                                                                                                                                                                                                                    | Fluid Pressure Test Plug<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>12 (106 lb in) |

#### FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE



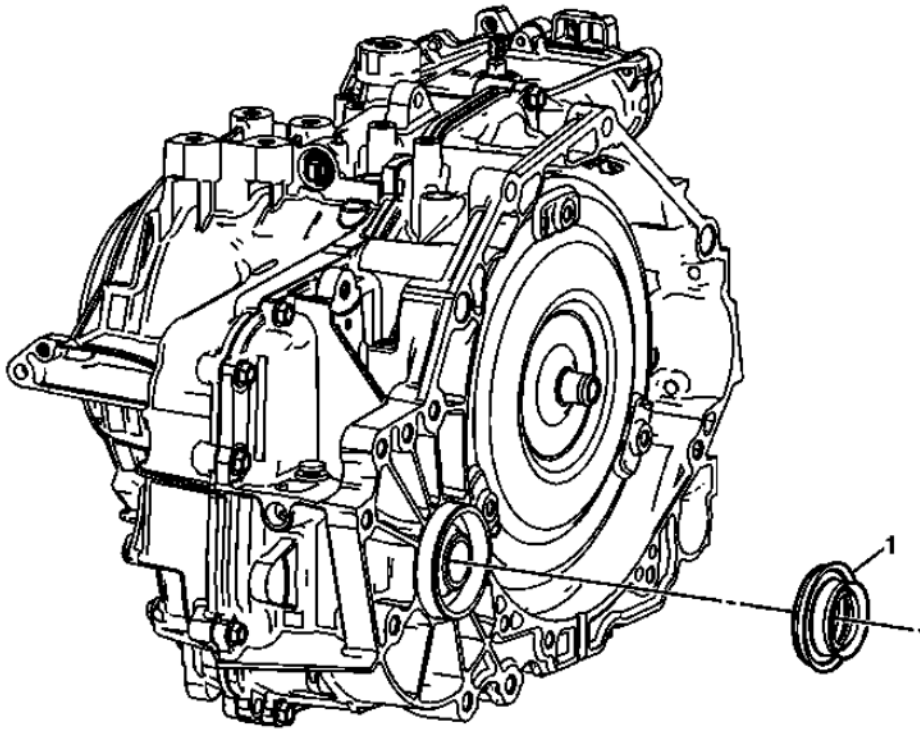
**Fig. 29: Identifying Left Front Wheel Drive Shaft Seal**  
 Courtesy of GENERAL MOTORS COMPANY

#### Front Wheel Drive Shaft Seal Replacement - Left Side

| Callout                                                                                                                                                                            | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b>                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .<br>2. Remove the left wheel drive shaft. Refer to <u>Front Wheel Drive Shaft Replacement - Left Side</u> . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1                                                                                                                                                                                  | Left Front Wheel Drive Shaft Oil Seal<br><br><b>NOTE:</b> <ul style="list-style-type: none"> <li>• For seal removal use GE-6125-B hammer with DT-23129 remover.</li> <li>• For seal installation use GE-8092 handle with DT-47790 installer.</li> </ul><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• DT-47790 Seal Installer</li> <li>• GE-6125-B Slide Hammer</li> <li>• GE-8092 Driver Handle</li> </ul> |

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

## FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE



**Fig. 30: Identifying Right Front Wheel Drive Shaft Seal**  
Courtesy of GENERAL MOTORS COMPANY

### Front Wheel Drive Shaft Seal Replacement - Right Side

| Callout                                                                                                                                                                                                                                    | Component Name                                                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b>                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                          |
| <ol style="list-style-type: none"><li>1. Raise the vehicle. Refer to <b>Lifting and Jacking the Vehicle</b> .</li><li>2. Remove the intermediate drive shaft. Refer to <b>Front Wheel Drive Intermediate Shaft Replacement</b> .</li></ol> |                                                                                                                                                                                                                                                                                          |
| 1                                                                                                                                                                                                                                          | <p>Right Front Wheel Drive Shaft Oil Seal</p> <p><b>NOTE:</b></p> <ul style="list-style-type: none"><li>• For seal removal use GE-6125-B hammer with DT-23129 remover.</li><li>• For seal installation use GE-8092 handle with DT-47790 installer.</li></ul> <p><b>Special Tools</b></p> |

- **DT-23129** Universal Seal Remover
- **DT-47790** Seal Installer
- **GE-6125-B** Slide Hammer
- **GE-8092** Driver Handle

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

## MANUAL SHIFT SHAFT AND SEAL REPLACEMENT

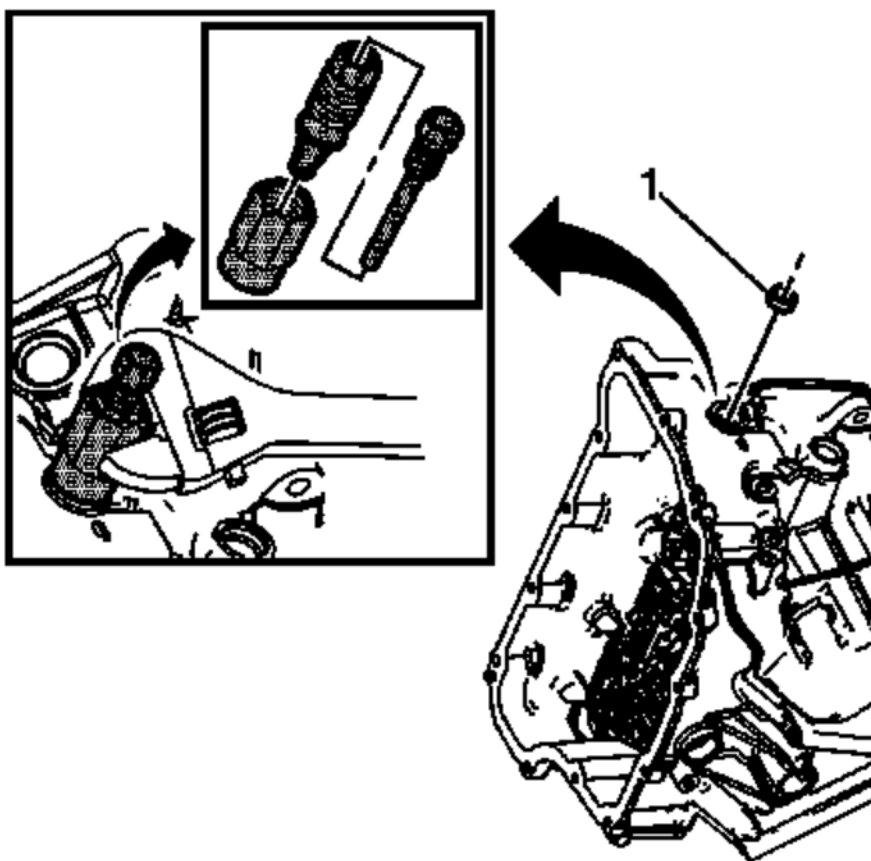
### Special Tools

- **DT-45201** Cooler Line Seal Remover
- **DT-46626** Seal Installer

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

### Removal Procedure

1. Remove the manual shaft and position switch assembly. Refer to **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**.

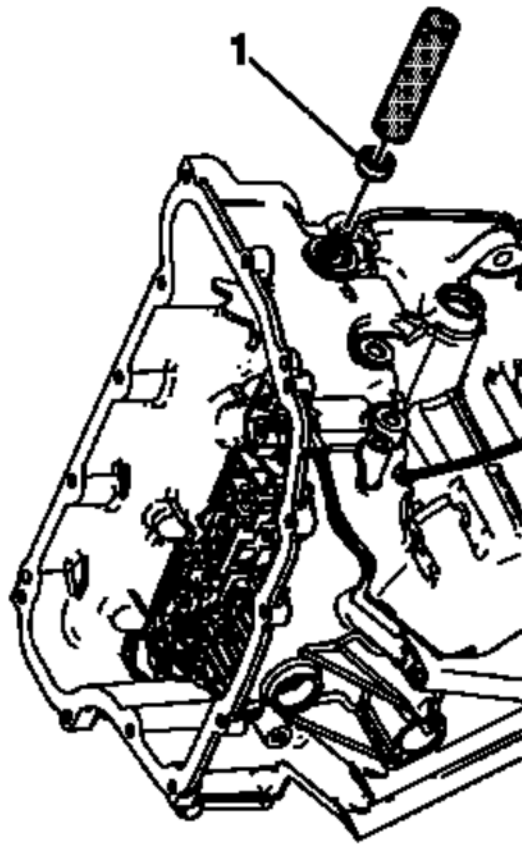


**Fig. 31: Identifying Seal Removal Tool J 45201**  
Courtesy of GENERAL MOTORS COMPANY

2. Remove the manual shaft seal (1) using **DT-45201** remover.

#### **Installation Procedure**

1. Install the manual shaft and position switch assembly. Refer to **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**.



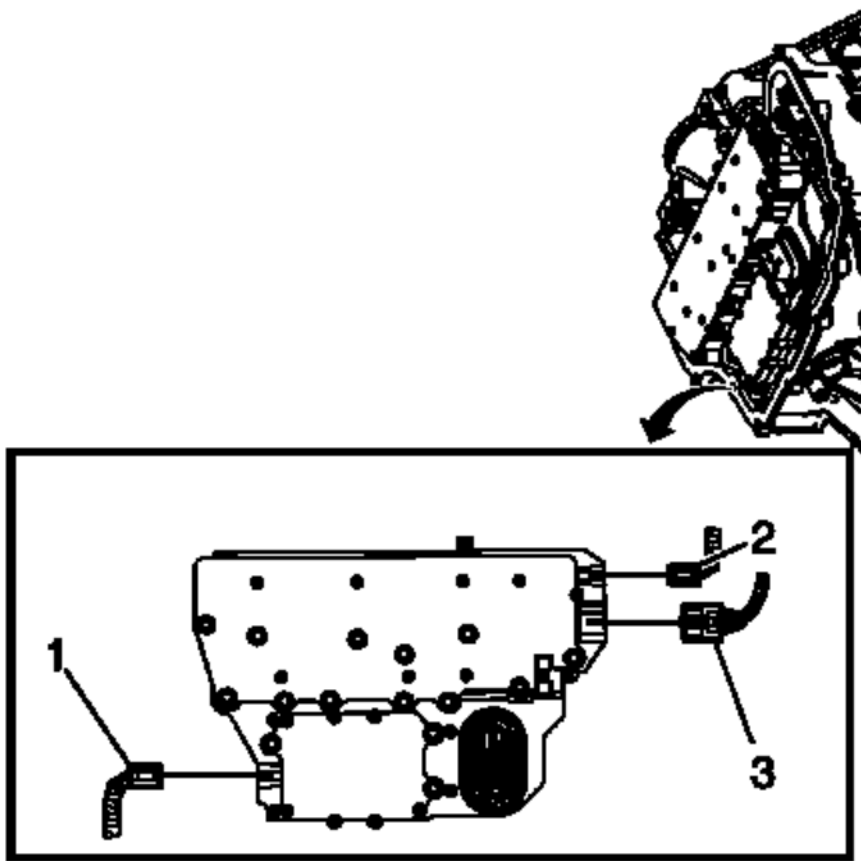
**Fig. 32: Identifying Seal Installation Tool J-46626**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the manual shaft seal (1) using **DT-46626** installer.

## **CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY REPLACEMENT**

### **Removal Procedure**

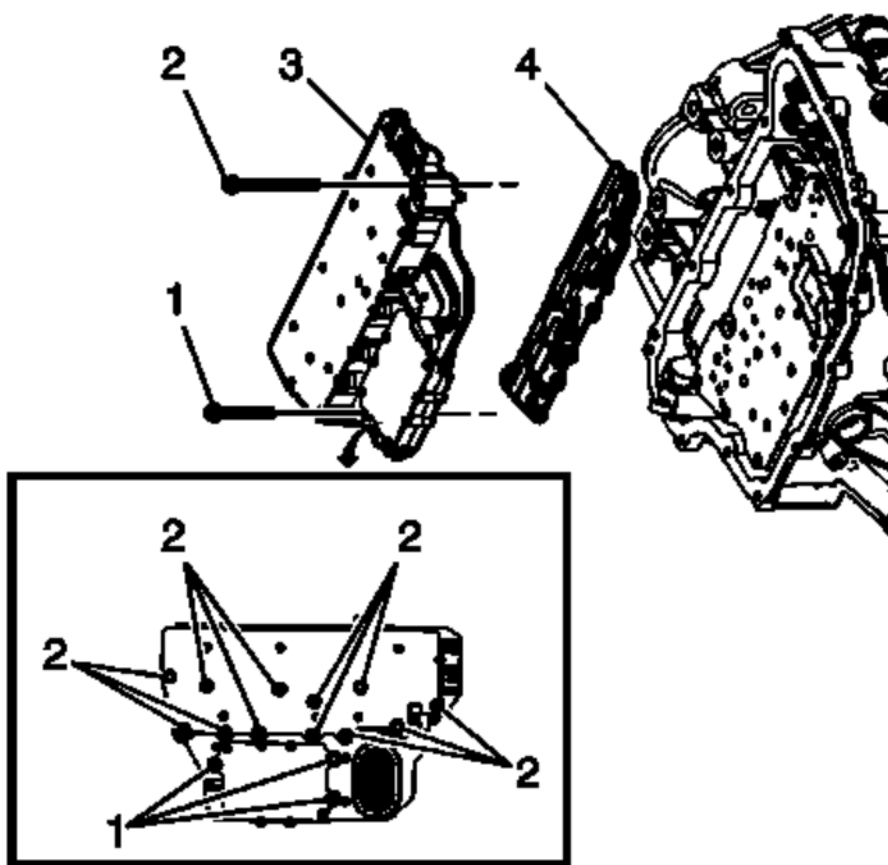
1. Remove the transmission control valve body cover. Refer to **Control Valve Body Cover Replacement**.



**Fig. 33: Identifying Input Speed Sensor Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the input speed sensor electrical connector (1).
3. Disconnect the output speed sensor electrical connector (2).
4. Disconnect the shift position switch electrical connector (3).





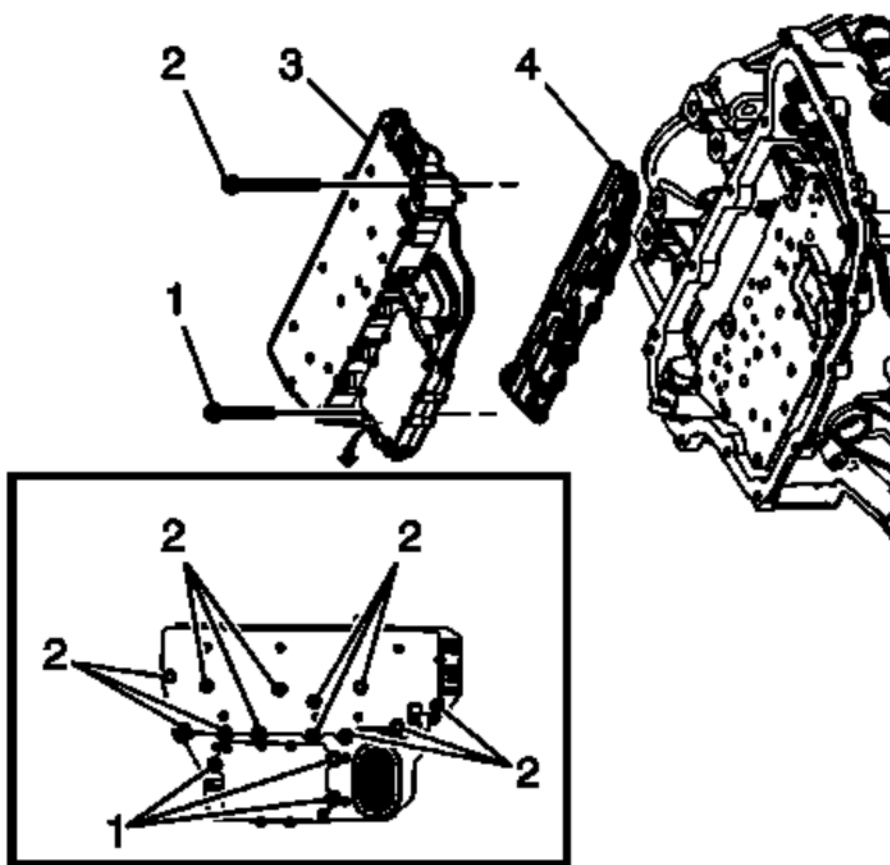
**Fig. 34: Identifying Control Valve Body & Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

5. Remove the 3 control valve body bolts (1) M5 x 40.5.
6. Remove the 12 control valve body bolts (2) M6 x 97.
7. Remove the control solenoid valve assembly (3) with transmission control module.

**CAUTION:** Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.

8. Remove the control solenoid valve assembly filter plate (4). Discard the filter plate. It is not reusable.
9. Inspect the pressure switch seals for damage or contamination. Replace the control solenoid valve assembly as necessary.
10. Inspect the channel plate bolt pass through holes for damage or burnelling. Any damage could cause leaking. Replace as necessary.

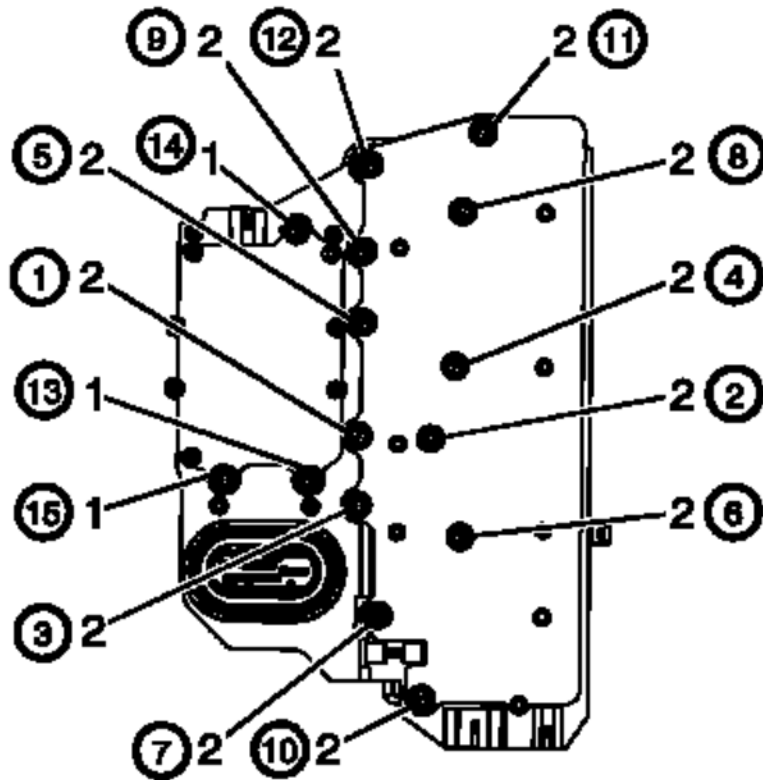
#### Installation Procedure



**Fig. 35: Identifying Control Valve Body & Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.

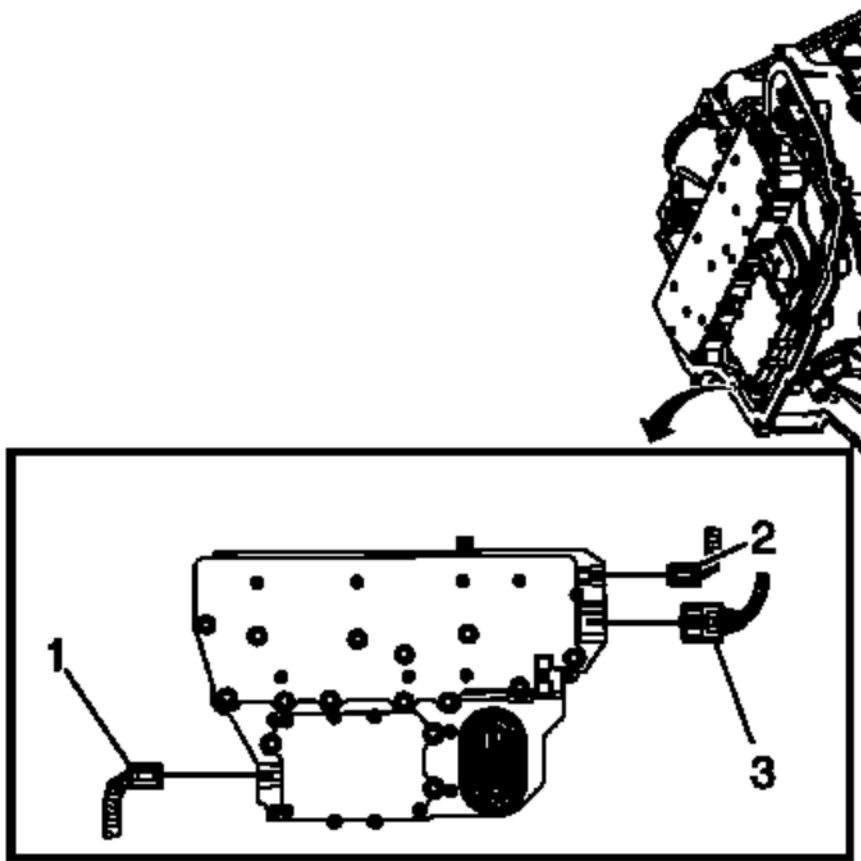
1. Install a NEW control solenoid valve assembly filter plate (4) to prevent fluid leaks past the fluid seals.
2. Install the control solenoid valve assembly (3) with transmission control module.
3. Hand start the control valve body bolts (1, 2).



**Fig. 36: Identifying Control Valve Body Bolt Tightening Sequence**  
 Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

4. Secure the 12 control valve body bolts (2) M6 x 97 and tighten in sequence to 10 N.m (89 lb in).
5. Secure the 3 control valve body bolts (1) M5 x 40.5 and tighten in sequence to 8 N.m (71 lb in).



**Fig. 37: Identifying Input Speed Sensor Electrical Connector**  
 Courtesy of GENERAL MOTORS COMPANY

6. Connect the input speed sensor electrical connector (1).
7. Connect the output speed sensor electrical connector (2).
8. Connect the shift position switch electrical connector (3).
9. Install the transmission control valve body cover. Refer to **Control Valve Body Cover Replacement**.
10. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to **Service Programming System (SPS)**.

**NOTE:** The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update

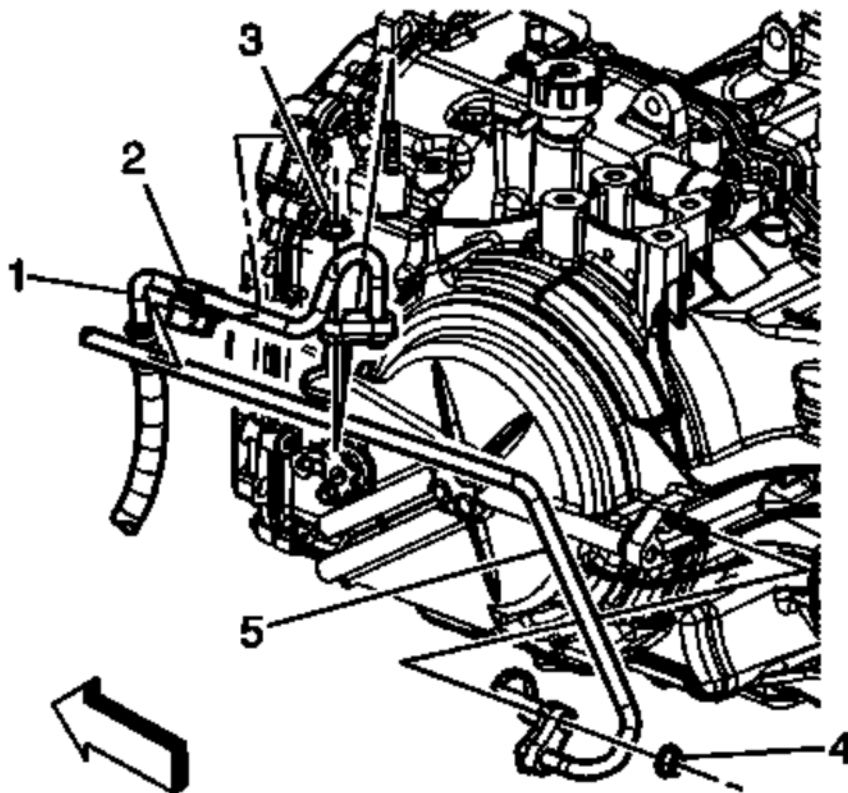
- Any service in response to a shift quality concern

11. Perform the Transmission Adaptive Values Learn procedure. Refer to Transmission Adaptive Values Learn.

## CONTROL VALVE BODY COVER REPLACEMENT

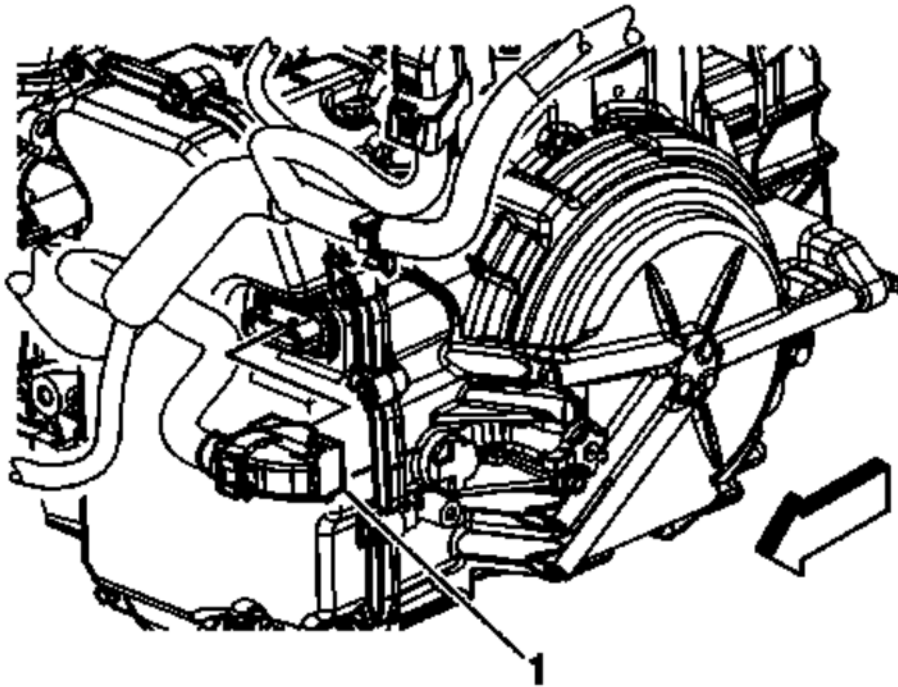
### Removal Procedure

1. Remove the battery tray. Refer to Battery Tray Replacement.



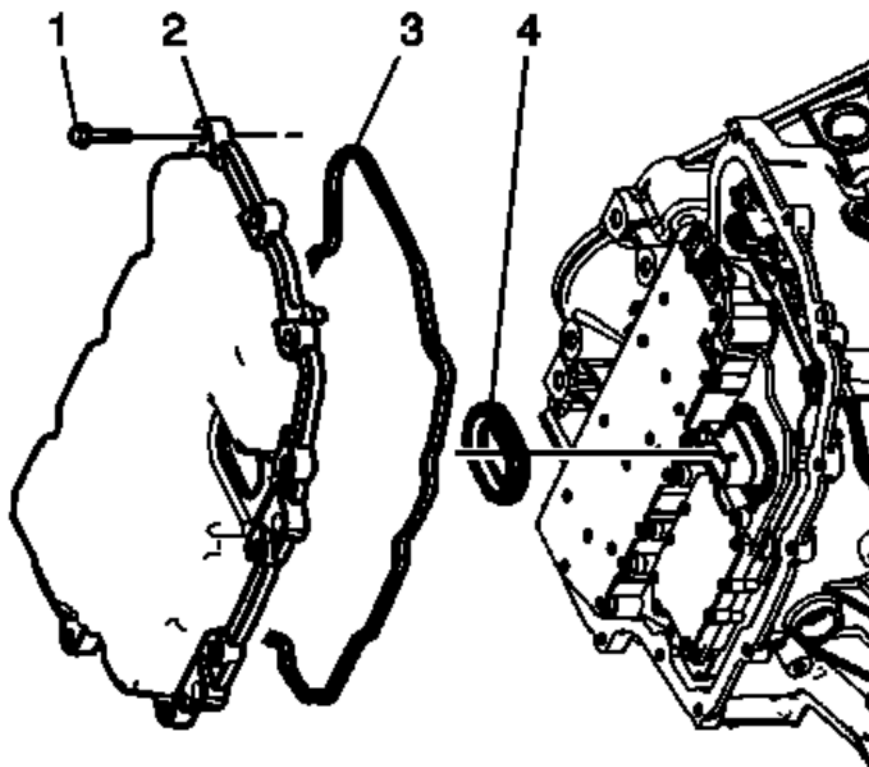
**Fig. 38: Identifying Cooler Inlet & Outlet Hoses**  
Courtesy of GENERAL MOTORS COMPANY

2. Remove the oil cooler inlet (1) and outlet (2) hoses from the retainer (2) on the control valve body cover.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle.
4. Remove the front transmission mount. Refer to Transmission Front Mount Replacement.
5. Drain the transmission. Refer to Transmission Fluid Drain and Fill.



**Fig. 39: Identifying Control Valve Body Transmission Control Module (TCM) Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the control valve body transmission control module (TCM) electrical connector (1), then the wiring harness from the cover.



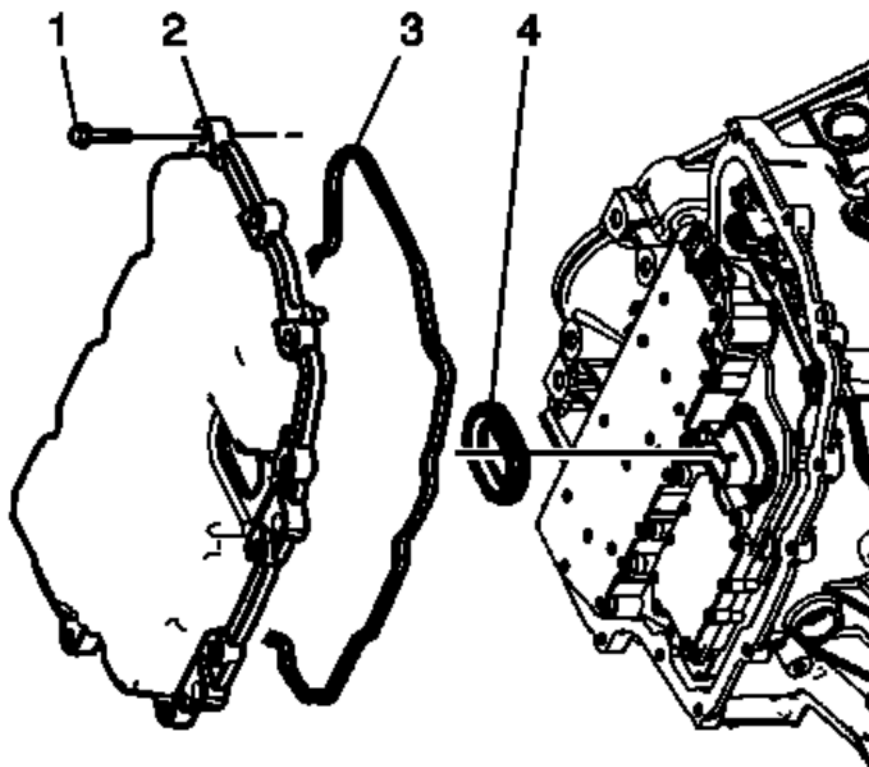
**Fig. 40: View Of Control Valve Body**  
 Courtesy of GENERAL MOTORS COMPANY

7. Remove the control valve body cover bolts (1).
8. Support the transmission with a transmission jack.
9. Using the transmission jack raise the transmission to gain clearance for removal of the control valve body cover.
10. Remove the control valve body cover.
11. Remove the control valve body cover gasket.

**CAUTION:** Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections.

12. Remove the control valve body cover wiring connector hole seal.
13. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

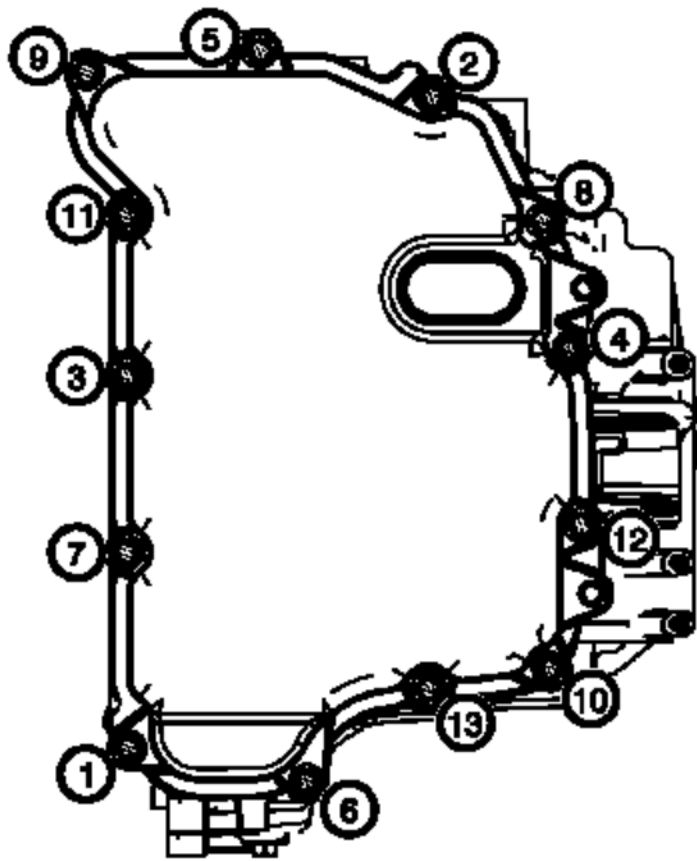
#### Installation Procedure



**Fig. 41: View Of Control Valve Body**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the control valve body cover wiring connector hole seal (4).
2. Install the control valve body cover gasket (3) to the control valve body cover.
3. Install the control valve body cover (2).
4. Lower the transmission and remove the transmission jack.
5. Hand start the control valve body cover bolts (1).



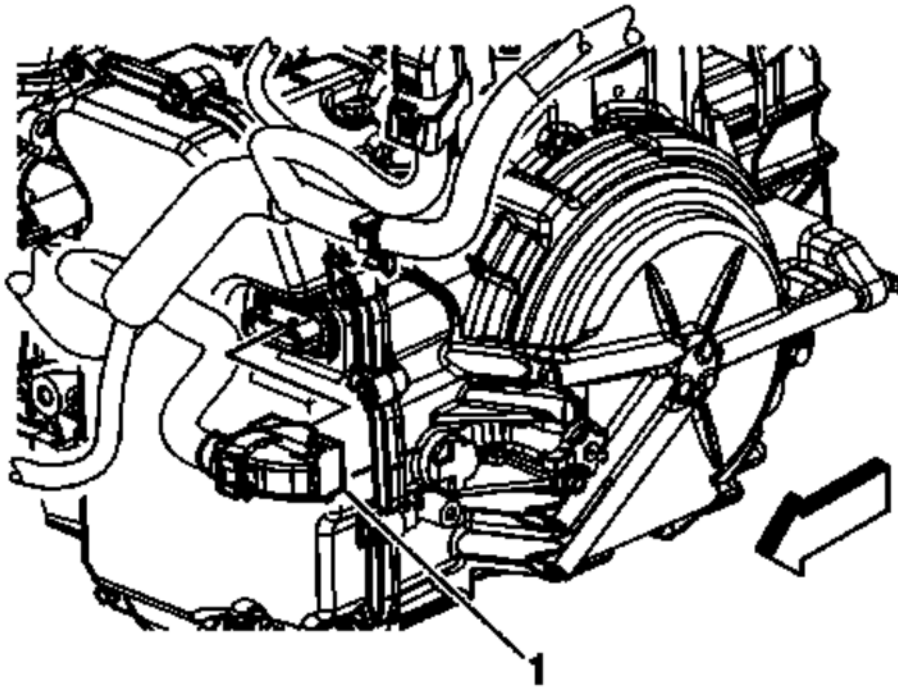


**Fig. 42: Identifying Valve Body Cover Bolt Tightening Sequence**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

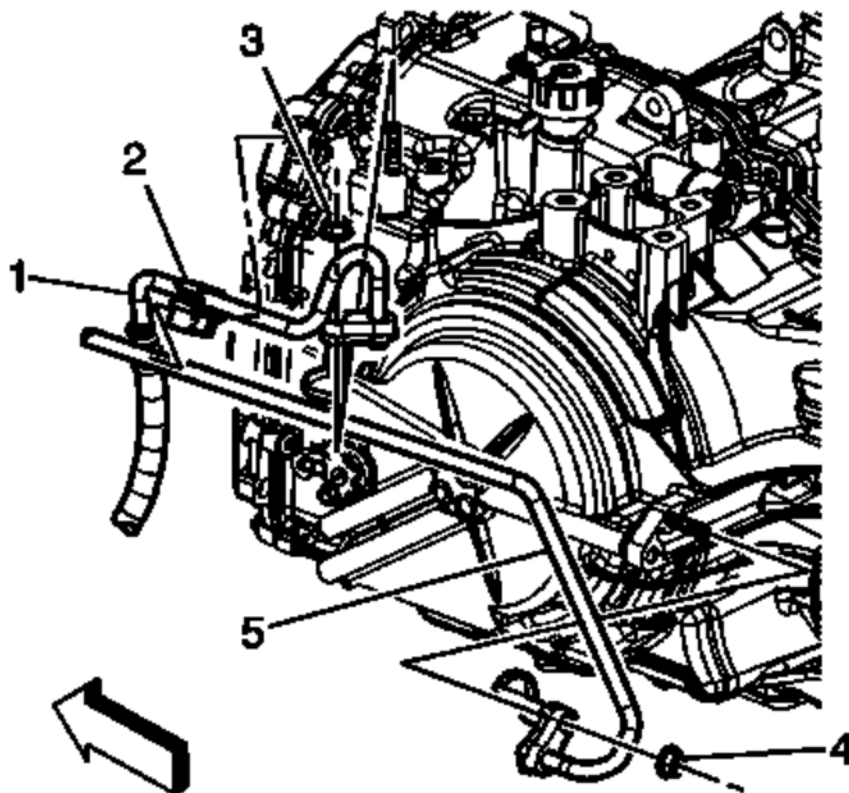
**NOTE:** Install all control valve body cover bolts and studs by hand then torque all bolts and studs in sequence.

6. Install the control valve body cover bolts. Tighten the bolts in sequence to 12 N.m (106 lb in).



**Fig. 43: Identifying Control Valve Body Transmission Control Module (TCM) Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

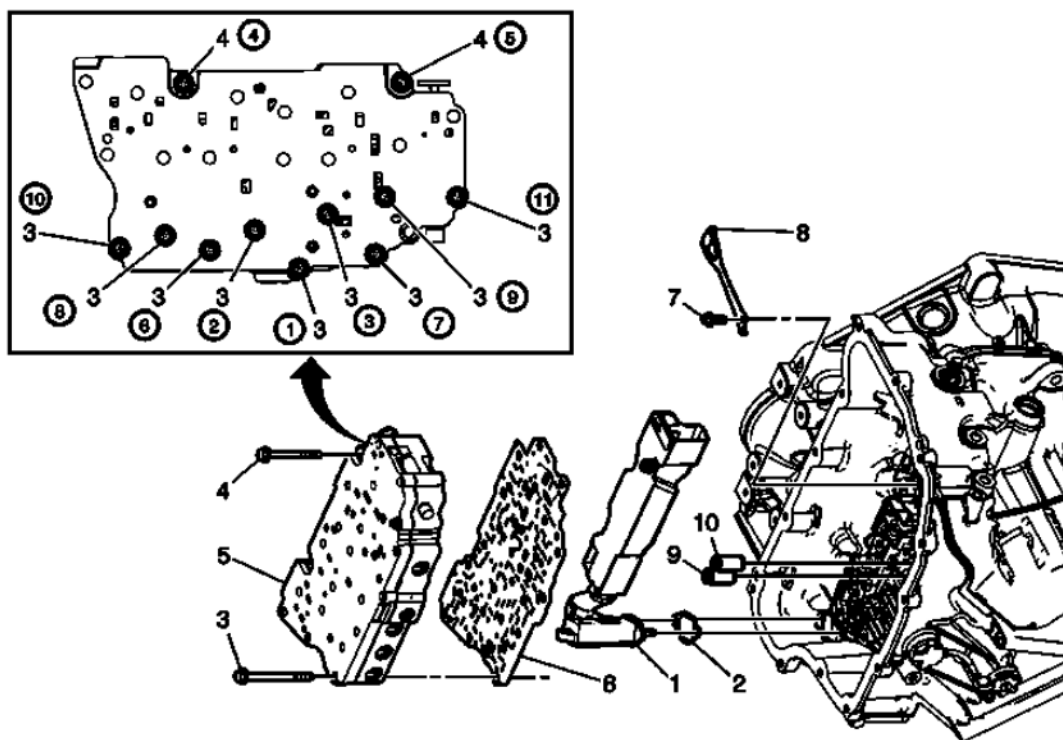
7. Connect the control valve body TCM electrical connector (1), then clip the wiring harness to the cover.
8. Install the front transmission mount. Refer to **Transmission Front Mount Replacement**.
9. Lower the vehicle.



**Fig. 44: Identifying Cooler Inlet & Outlet Hoses**  
Courtesy of GENERAL MOTORS COMPANY

10. Install the oil cooler inlet (1) and outlet (5) hoses to the retainer (2) on the control valve body cover.
11. Fill the transmission. Refer to **Transmission Fluid Drain and Fill**.
12. Install the battery tray. Refer to **Battery Tray Replacement**.
13. Check for leaks.

## CONTROL VALVE BODY REPLACEMENT



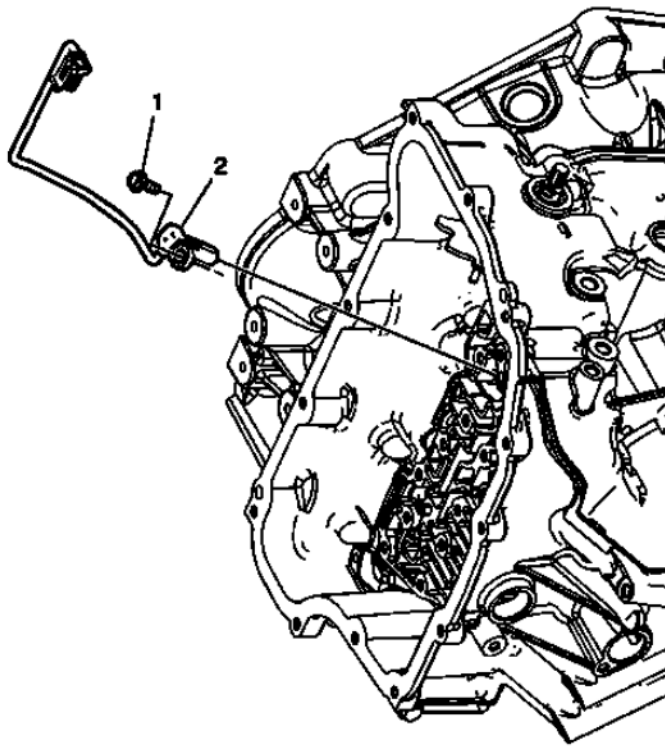
**Fig. 45: View Of Control Valve Body**  
 Courtesy of GENERAL MOTORS COMPANY

### Control Valve Body Replacement

| Callout                                                                                                                                                                                                          | Component Name                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b><br>Remove the control solenoid valve and transmission control module assembly. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Replacement</u></b> . |                                                                                                                                                                                                                |
| 1                                                                                                                                                                                                                | Fluid Level Control Valve                                                                                                                                                                                      |
| 2                                                                                                                                                                                                                | Fluid Level Control Valve Gasket                                                                                                                                                                               |
| 3                                                                                                                                                                                                                | Control Valve Body Bolt M6 x 60 (Qty: 9)<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>NOTE:</b><br>Tighten in specified sequence.<br><br><b>Tighten</b><br>12 N.m (106 lb in) |
|                                                                                                                                                                                                                  | Control Valve Body Bolt M6 x 53 (Qty: 2)<br><br><b>NOTE:</b>                                                                                                                                                   |

|    |                                                                                                                                                  |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 4  | <b>Tighten in specified sequence.</b><br><br><b>Tighten</b><br>12 N.m (106 lb in)                                                                |
| 5  | Control Valve Body Assembly                                                                                                                      |
| 6  | Control Valve Body Spacer Plate Assembly                                                                                                         |
| 7  | Manual Shaft Detent Spring Bolt M6 x 16<br><br><b>NOTE:</b><br><b>Tighten in specified sequence.</b><br><br><b>Tighten</b><br>12 N.m (106 lb in) |
| 8  | Manual Shaft Detent Lever Spring Assembly                                                                                                        |
| 9  | 1-2-3-4 Clutch Fluid Passage Seal<br><br><b>NOTE:</b><br><b>Discard the seal. It is not reusable.</b>                                            |
| 10 | Low/Reverse Clutch Fluid Passage Seal<br><br><b>NOTE:</b><br><b>Discard the seal. It is not reusable.</b>                                        |

## OUTPUT SPEED SENSOR REPLACEMENT



**Fig. 46: Identifying Output Speed Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

### Output Speed Sensor Replacement

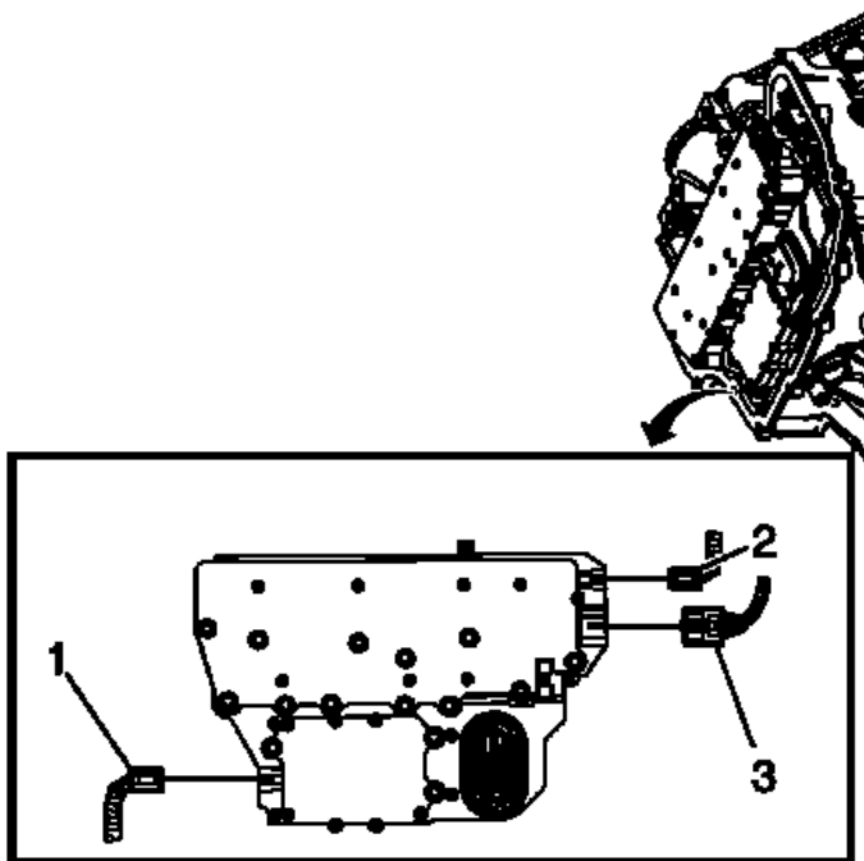
| Callout                                                                                                                                                                                                                                                                                                                       | Component Name                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedure</b> <ol style="list-style-type: none"> <li>1. Remove the control solenoid valve and transmission control module assembly. Refer to <b><u>Control Solenoid Valve and Transmission Control Module Assembly Replacement</u></b>.</li> <li>2. Perform the service fast learn adapt procedure.</li> </ol> |                                                                                                                                                  |
| 1                                                                                                                                                                                                                                                                                                                             | Output Speed Sensor Bolt M6 x 18<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>12 N.m (106 lb in) |
| 2                                                                                                                                                                                                                                                                                                                             | Output Speed Sensor                                                                                                                              |

### INPUT SPEED SENSOR REPLACEMENT

#### Removal Procedure

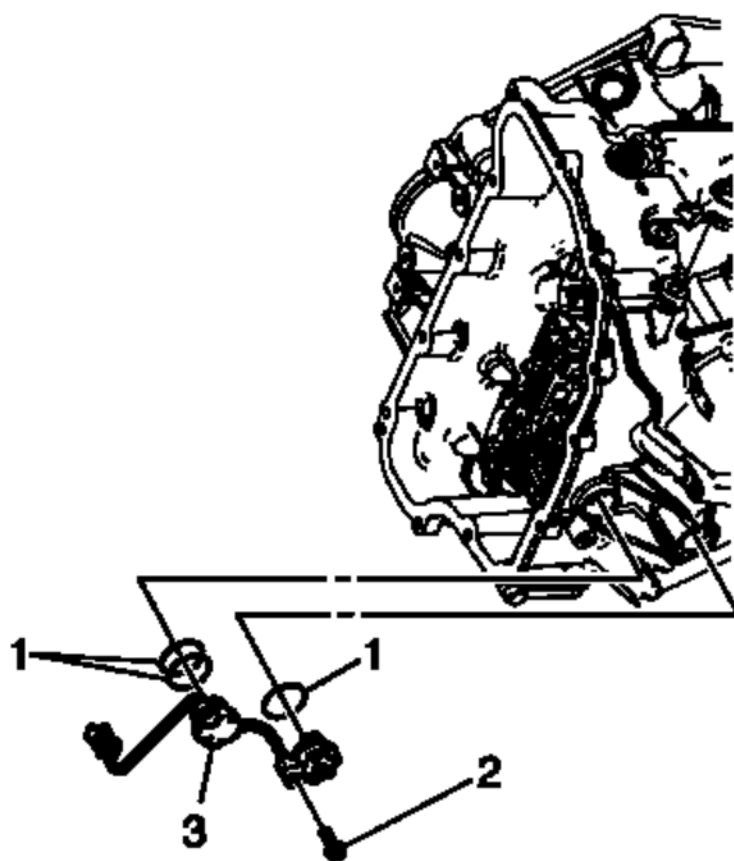
1. Remove the control solenoid valve and transmission control module assembly. Refer to **Control Solenoid**

## Valve and Transmission Control Module Assembly Replacement.



**Fig. 47: Identifying Input Speed Sensor Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the input speed sensor electrical connector (1).

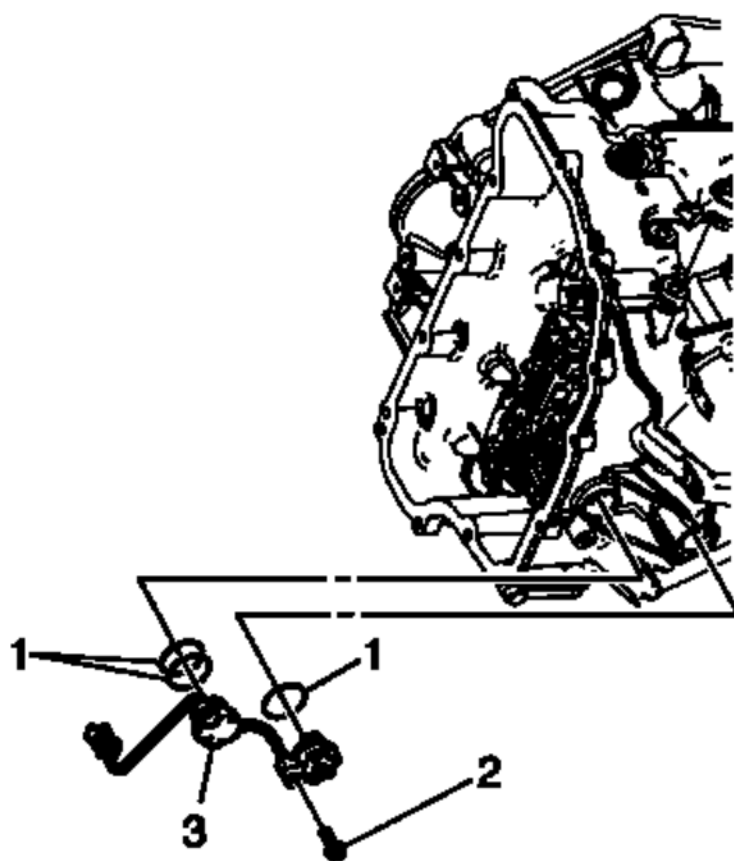


**Fig. 48: Identifying Input Speed Sensor Mounting Bolt**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove the input speed sensor bolt (2) M6 x 23.
4. Remove the input speed sensor (3).
5. Remove the 3 input speed sensor seals (1).

#### **Installation Procedure**



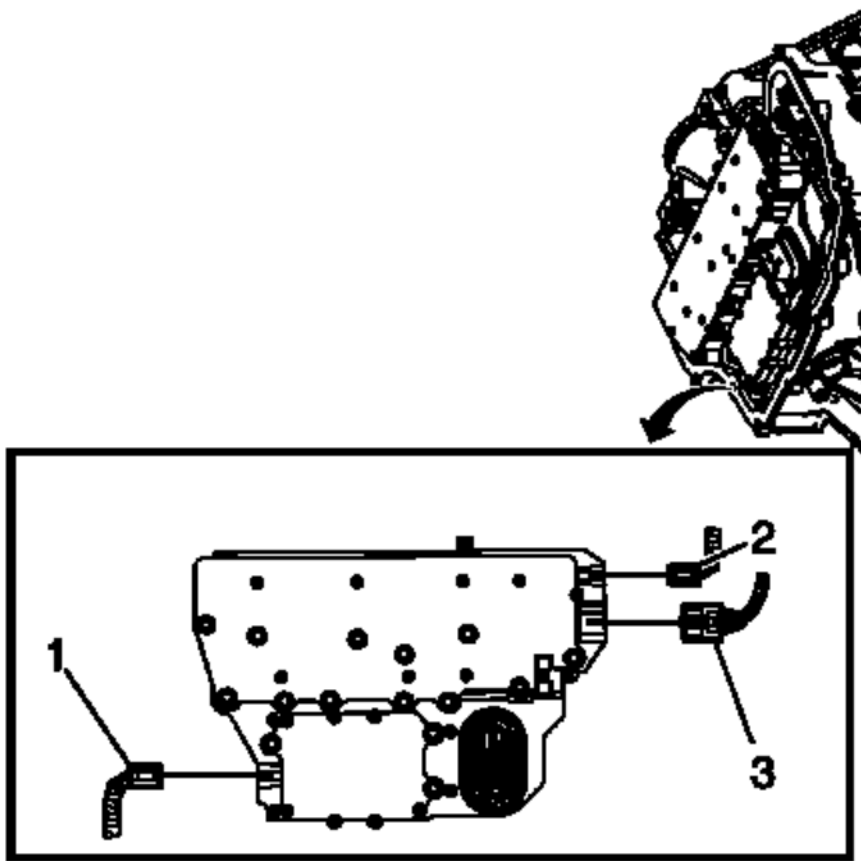


**Fig. 49: Identifying Input Speed Sensor Mounting Bolt**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the 3 input speed sensor seals (1).
2. Install the input speed sensor (3).

**CAUTION: Refer to Fastener Caution .**

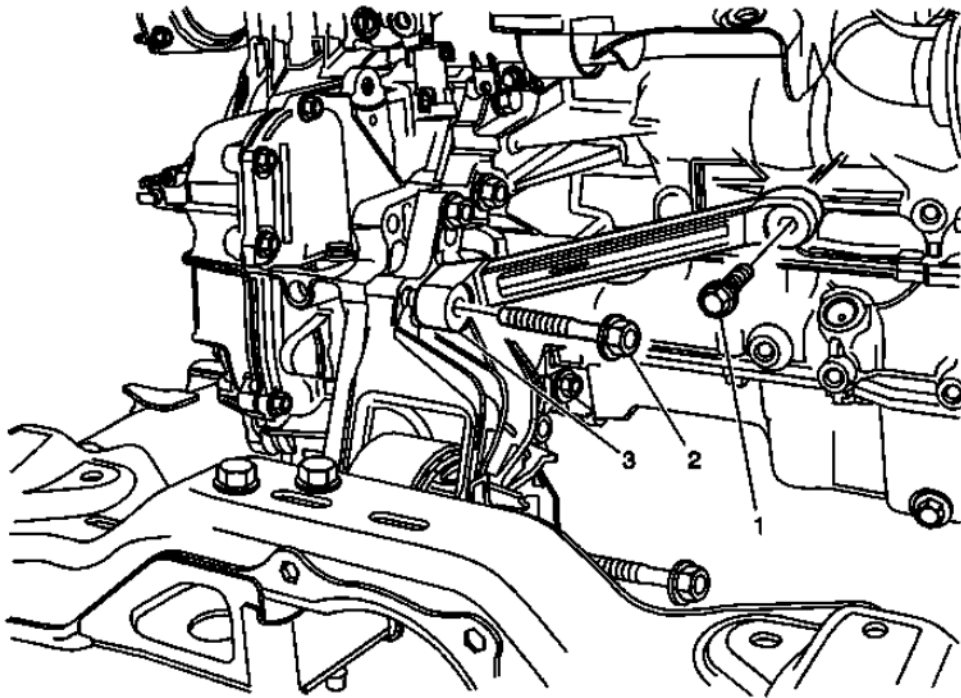
3. Install the input speed sensor bolt (2) M6 x 23 and tighten to 12 (106 lb in).



**Fig. 50: Identifying Input Speed Sensor Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

4. Connect the input speed sensor electrical connector (1).
5. Install the control solenoid valve and transmission control module assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement**.
6. Perform the service fast learn adapt procedure.

## TRANSMISSION BRACE REPLACEMENT



**Fig. 51: Transmission Brace & Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

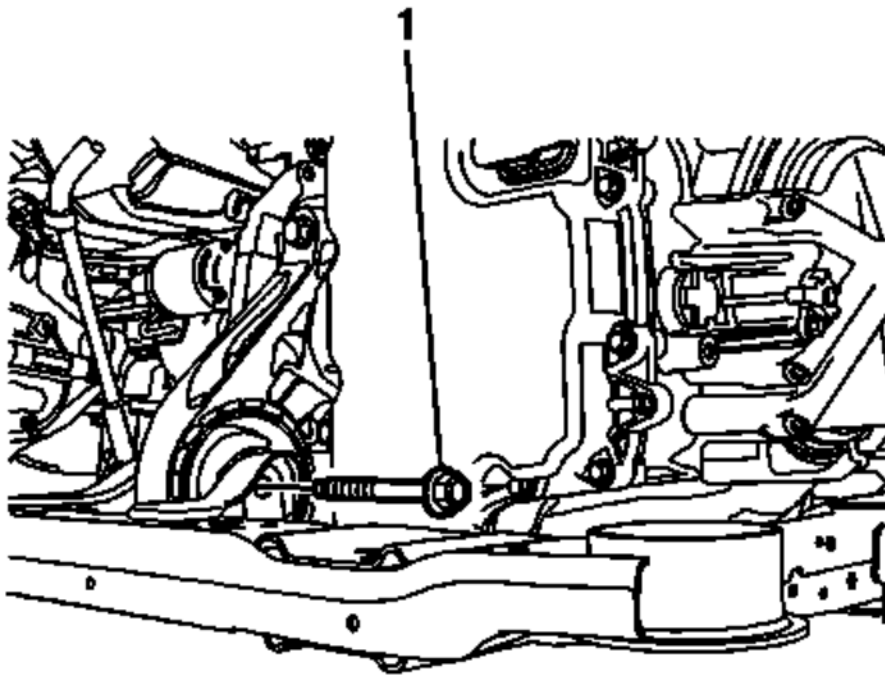
#### Transmission Brace Replacement

| Callout                                                                                                                                                                                                                                                                                                                                                               | Component Name                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .</li> <li>2. Remove the catalytic converter. Refer to <u>Catalytic Converter Replacement (LUK)</u> , <u>Catalytic Converter Replacement (LCV)</u> , <u>Catalytic Converter Replacement (LTG)</u> .</li> </ol> |                                                                                                                               |
| 1                                                                                                                                                                                                                                                                                                                                                                     | Rear Transaxle Brace Bolt<br><br><b>CAUTION:</b><br>Refer to <u>Fastener Caution</u> .<br><br><b>Tighten</b><br>50 (37 lb ft) |
| 2                                                                                                                                                                                                                                                                                                                                                                     | Rear Transaxle Brace Bolt<br><b>Tighten</b><br>100 (74 lb ft)                                                                 |
| 3                                                                                                                                                                                                                                                                                                                                                                     | Rear Transaxle Brace                                                                                                          |

#### TRANSMISSION MOUNT REPLACEMENT - LEFT SIDE

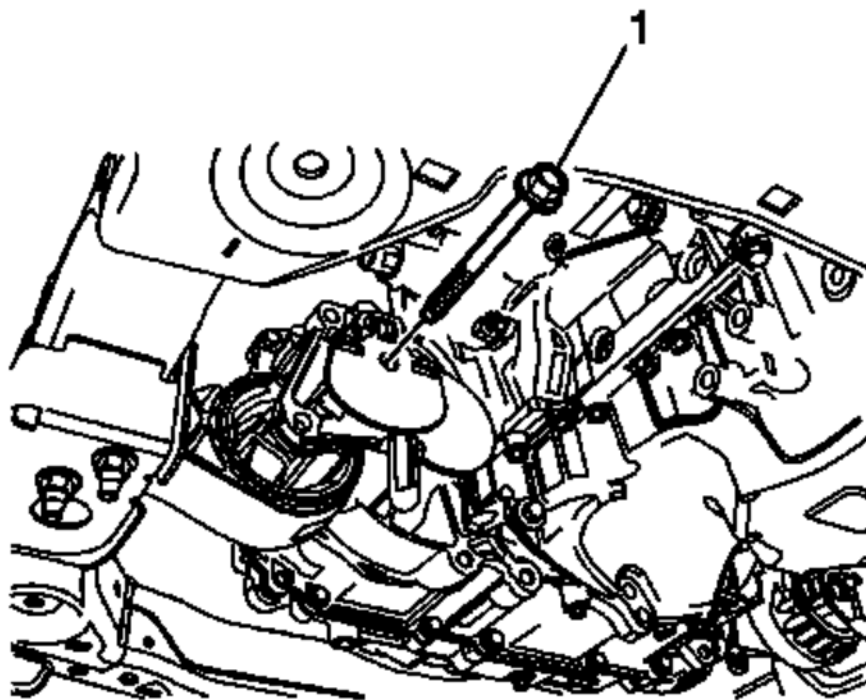
## Removal Procedure

1. Remove the battery box. Refer to **Battery Tray Replacement** .
2. Prior to removing the mount, mark mount to transmission, mount to body interfaces and fasteners to mount interfaces using spray paint or a marker for correct positioning during installation.
3. Install the engine support fixture. Refer to **Engine Support Fixture** .
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .



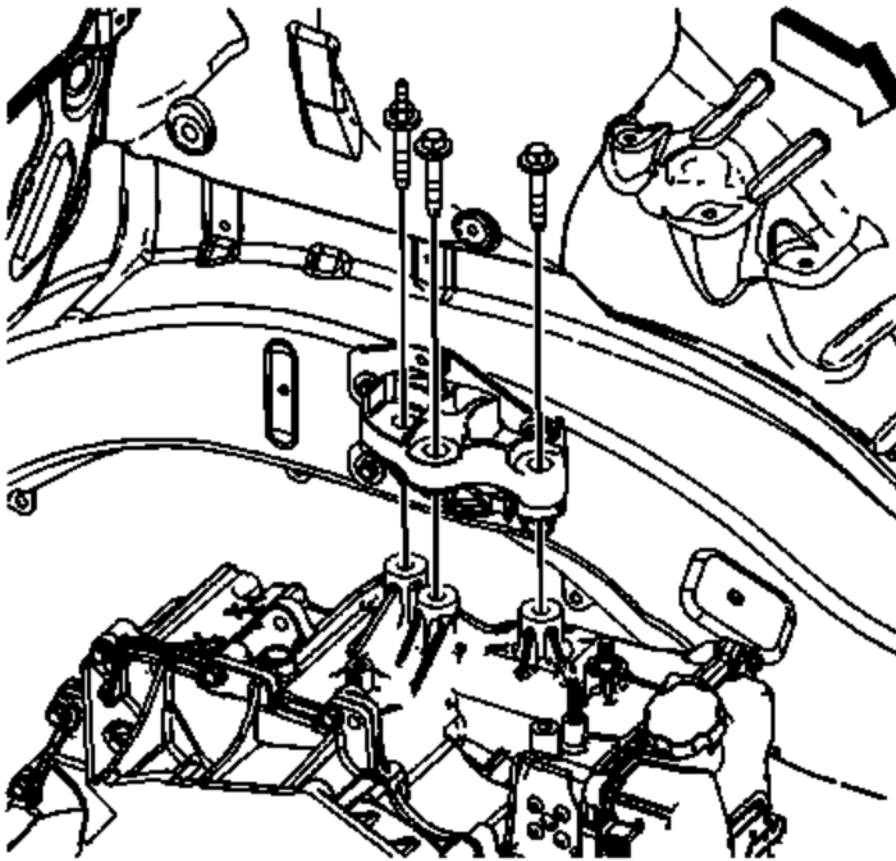
**Fig. 52: Identifying Front Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

5. Remove the front transmission mount through bolt (1).



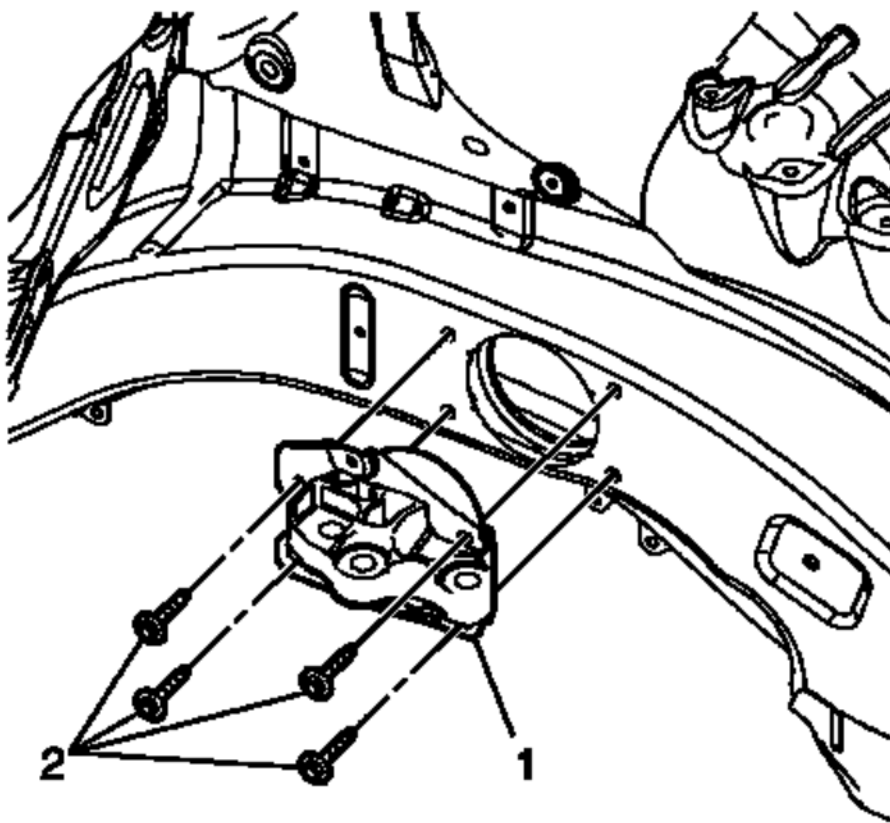
**Fig. 53: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

6. Remove the rear transmission mount through bolt (1).
7. Lower the vehicle.



**Fig. 54: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

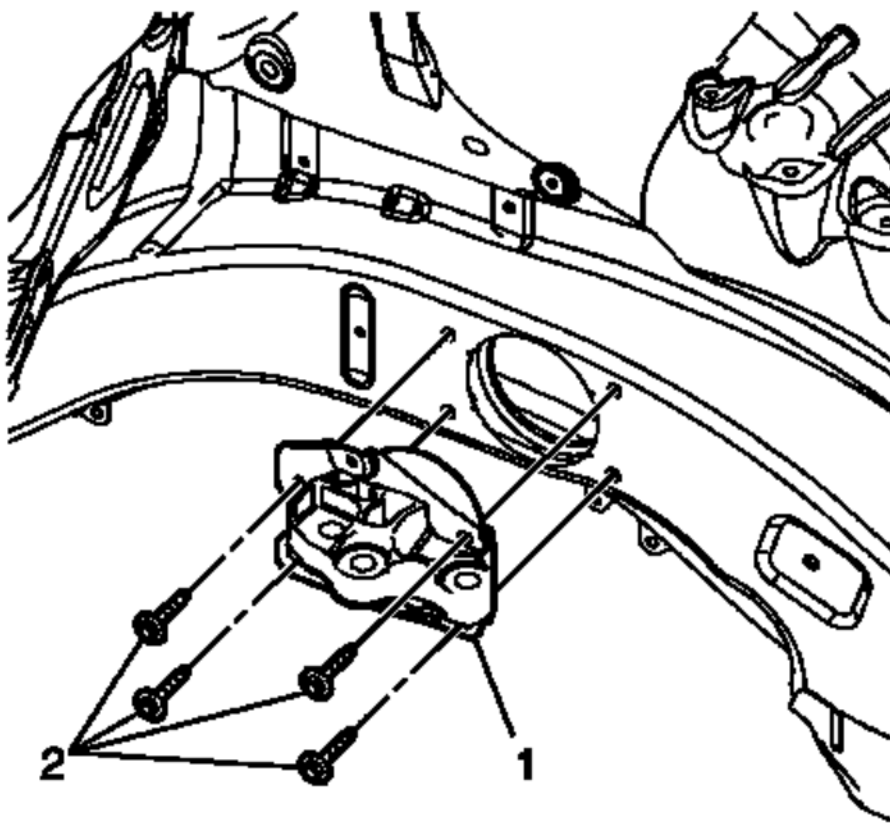
8. Remove the transmission mount to transmission bolts.



**Fig. 55: Transmission Mount To Frame Rail Bolts**  
Courtesy of GENERAL MOTORS COMPANY

9. Using the engine support, lower the transmission enough to provide clearance for the left transmission mount.
10. Remove the transmission mount to frame rail bolts (2).
11. Remove the left transmission mount (1).

#### **Installation Procedure**



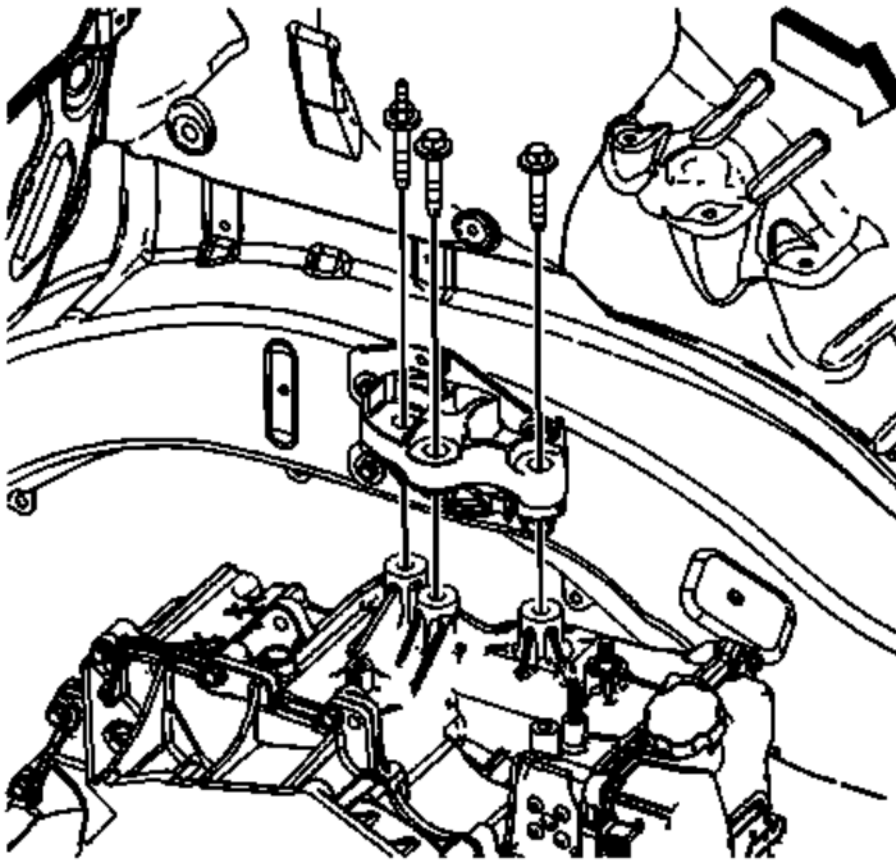
**Fig. 56: Transmission Mount To Frame Rail Bolts**  
Courtesy of GENERAL MOTORS COMPANY

1. Using the outline made by the spray paint or marker, install the left transmission mount (1).

**CAUTION: Refer to Fastener Caution .**

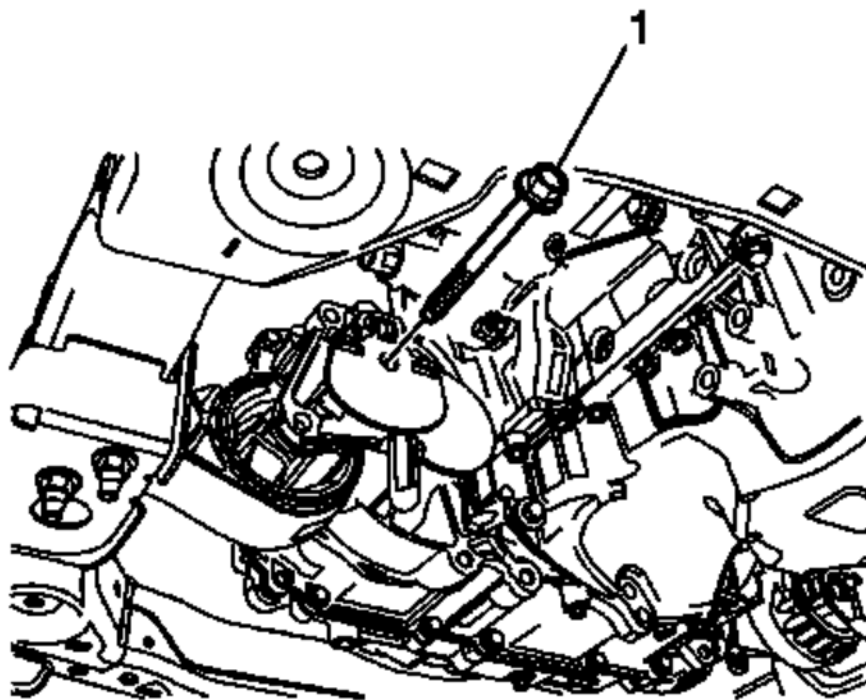
2. Install the transmission mount to frame rail bolts (2) and tighten to 22 N.m (16 lb ft).
3. Using the engine support, raise the transmission until the transmission contacts the left transmission mount.





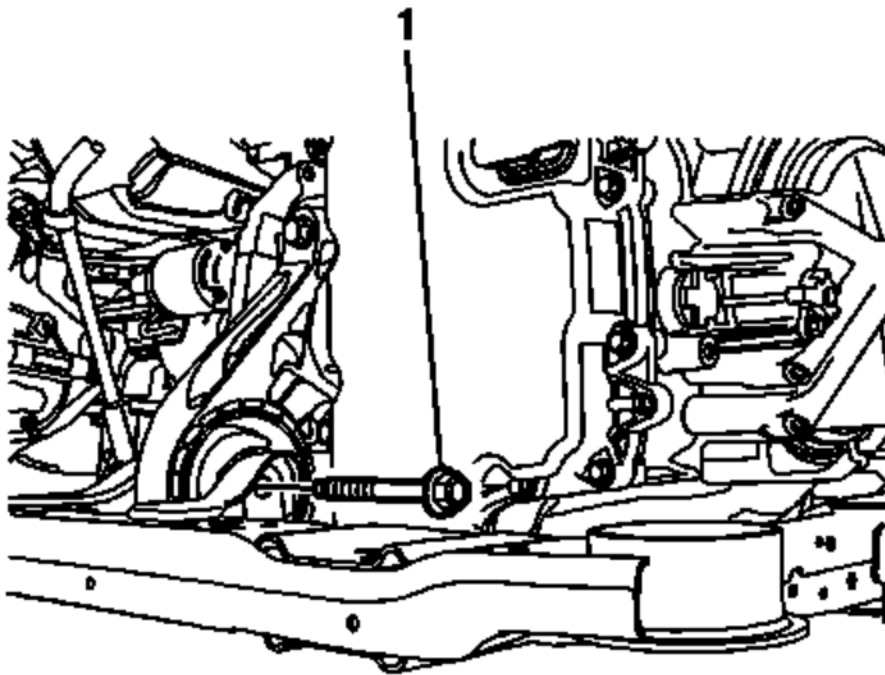
**Fig. 57: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

4. Install the transmission mount to transmission bolts and tighten to 50 N.m (37 lb ft) plus 90-105 degrees.
5. Install the wheel and tire assembly. Refer to **Tire and Wheel Removal and Installation** .
6. Raise the vehicle.



**Fig. 58: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

7. Install the rear transmission mount through bolt (1) and tighten to 105 N.m (77 lb ft).



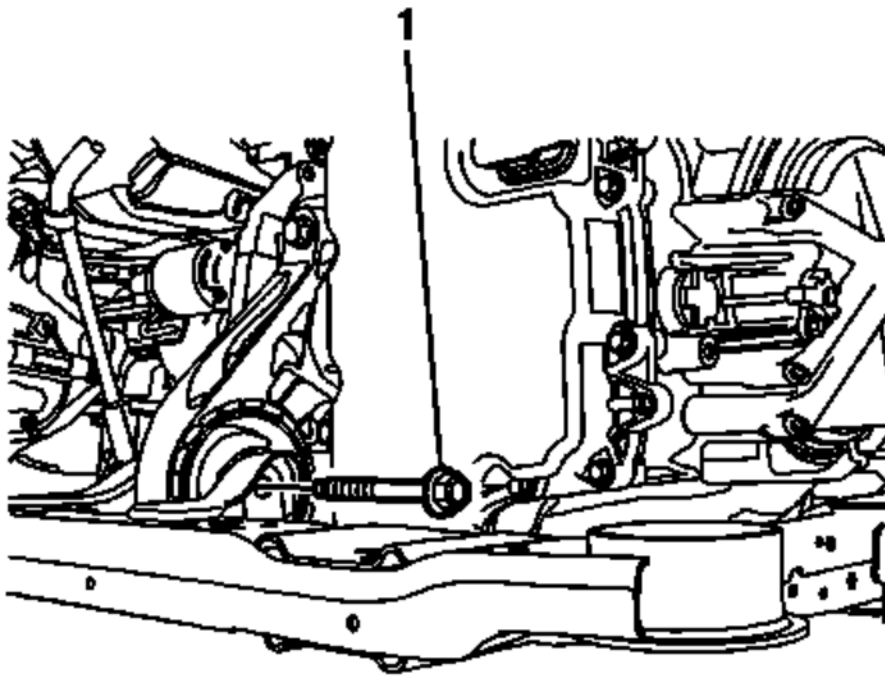
**Fig. 59: Identifying Front Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

8. Install the front transmission mount through bolt (1) and tighten to 100 N.m (74 lb ft).
9. Perform the Powertrain Mount Balancing - Lower. Refer to the appropriate engine section.
10. Lower the vehicle.
11. Remove the engine support fixture.
12. Install the battery box. Refer to **Battery Tray Replacement** .

## **TRANSMISSION FRONT MOUNT REPLACEMENT**

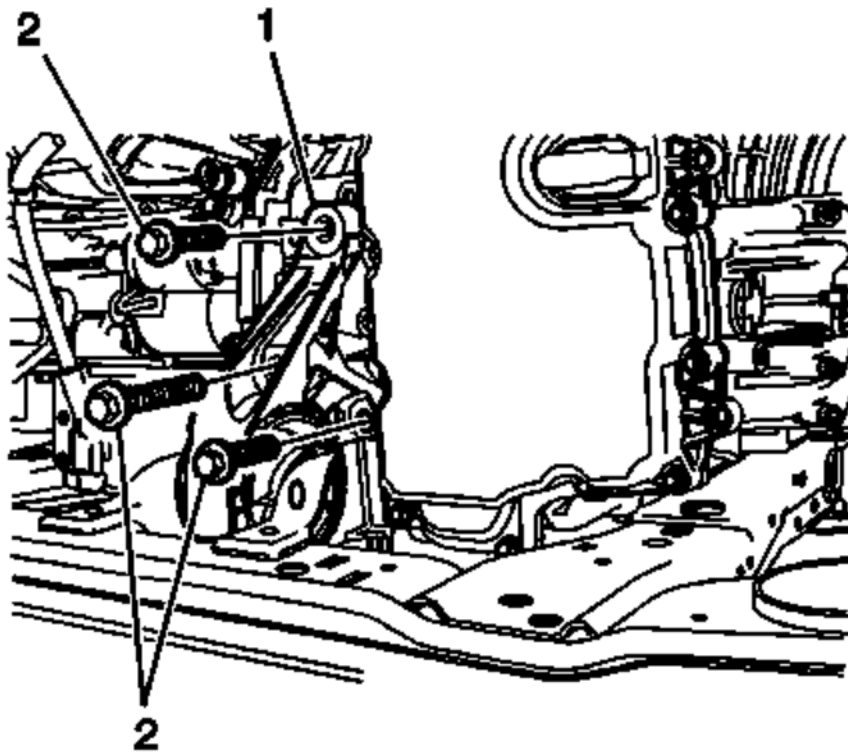
### **Removal Procedure**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the generator control module pump bracket bolt and reposition the pump without disconnecting the hoses. Refer to **Generator Control Module Coolant Pump Replacement** .



**Fig. 60: Identifying Front Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

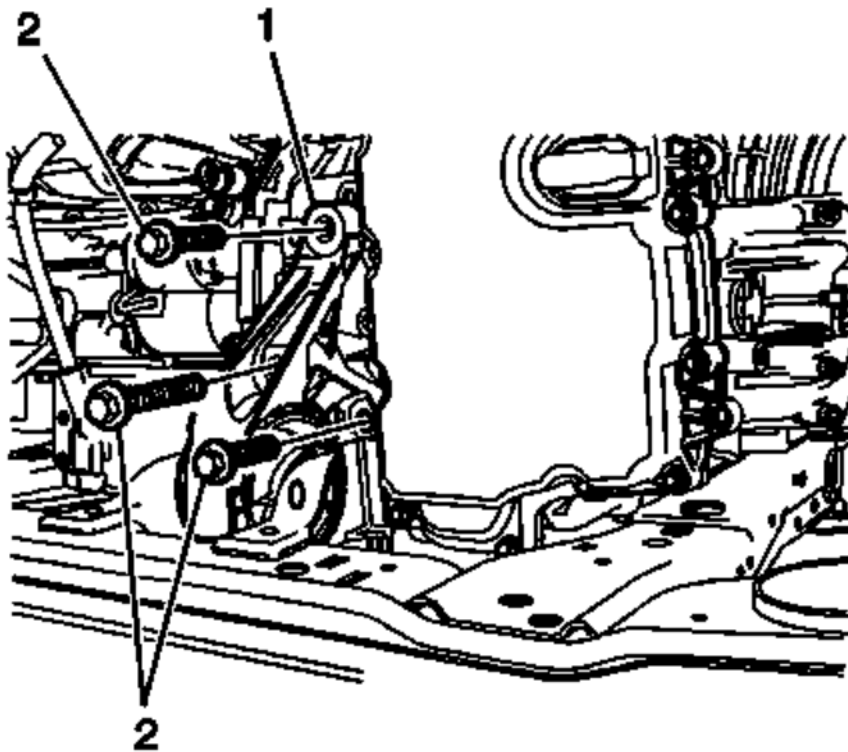
3. Remove the front transaxle mount through bolt (1).



**Fig. 61: Transaxle Mount & Attachment Bolts**  
Courtesy of GENERAL MOTORS COMPANY

4. Remove the three transaxle mount-to-transaxle attachment bolts (2).
5. Remove the transaxle mount (1) from the vehicle.

#### **Installation Procedure**

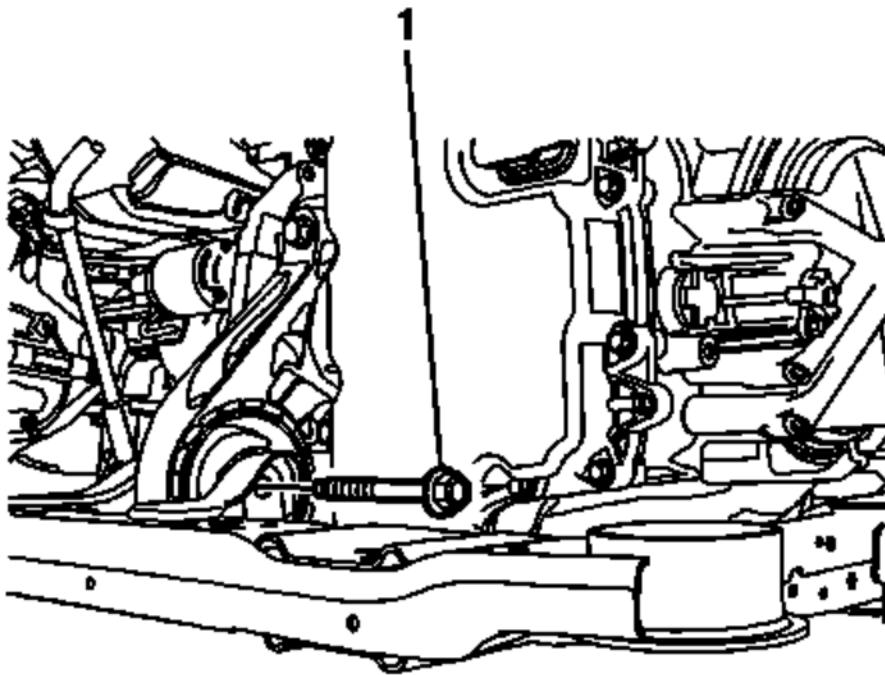


**Fig. 62: Transaxle Mount & Attachment Bolts**  
Courtesy of GENERAL MOTORS COMPANY

1. Install the transaxle mount (1).

**CAUTION:** Refer to Fastener Caution .

2. Install the transaxle mount bolts (2) and tighten to 62 (46 lb ft).



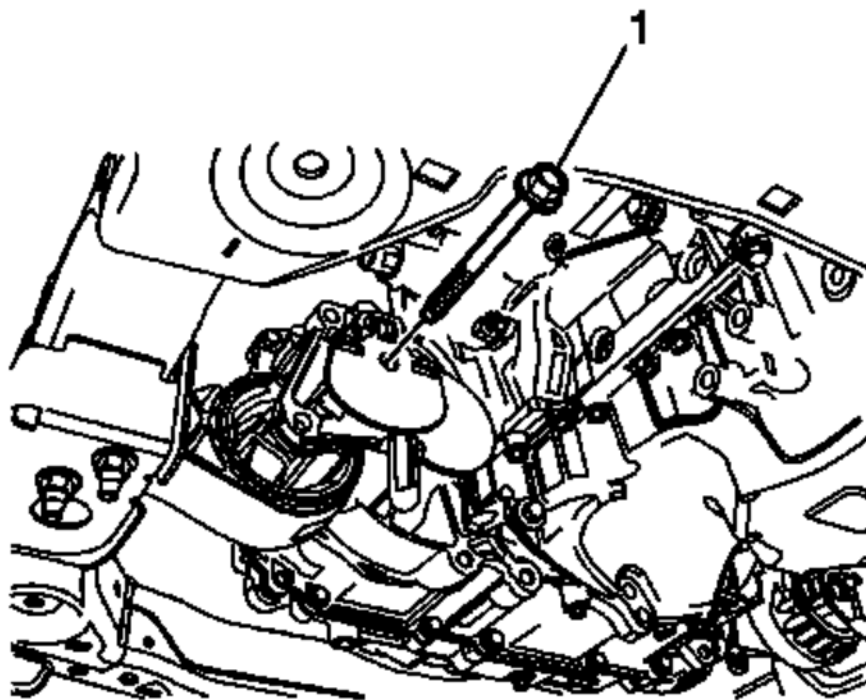
**Fig. 63: Identifying Front Transmission Mount Through Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

3. Install the transaxle mount through bolt (1) and tighten to 100 (74 lb ft).
4. Install the generator control module pump. Refer to **Generator Control Module Coolant Pump Replacement** .
5. Perform the Powertrain Mount Balancing - Lower procedure. Refer to the appropriate engine section.
6. Lower the vehicle.

## **TRANSMISSION REAR MOUNT BRACKET REPLACEMENT**

### **Removal Procedure**

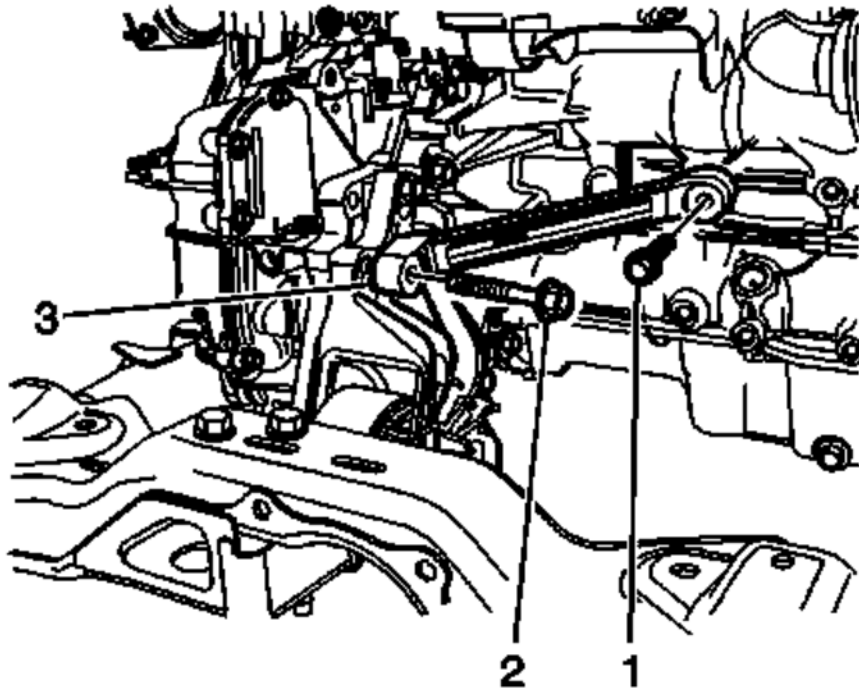
1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the left tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (LUK)** , **Catalytic Converter Replacement (LCV)** , **Catalytic Converter Replacement (LTG)** .
4. Using a suitable jack stand, support the rear of the powertrain.



**Fig. 64: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission mount to bracket through bolt (1).

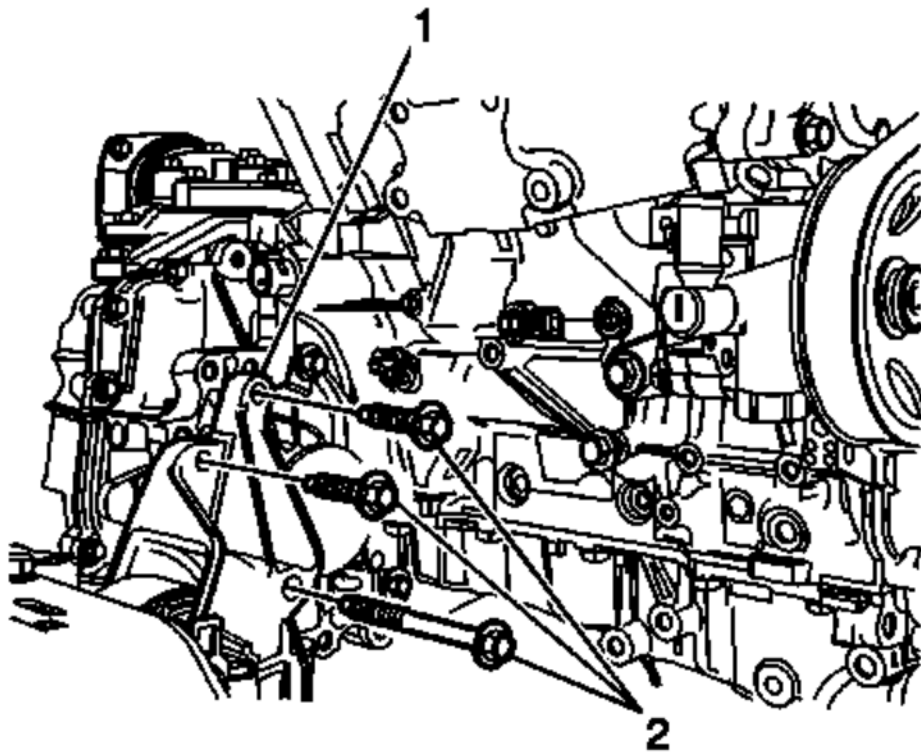




**Fig. 65: Transaxle Brace & Bolt**

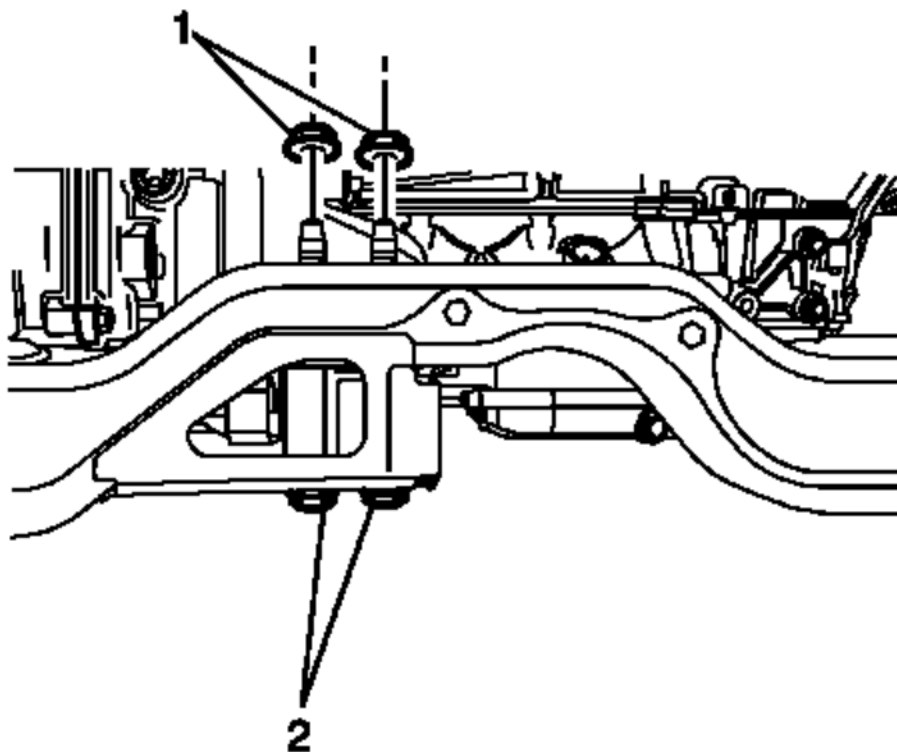
Courtesy of GENERAL MOTORS COMPANY

6. Remove the transaxle brace bolt (1), then loosen bolt (2) until it no longer engages the transaxle.
7. Remove the transaxle brace (3) with bolt (2) still retained in the brace.



**Fig. 66: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

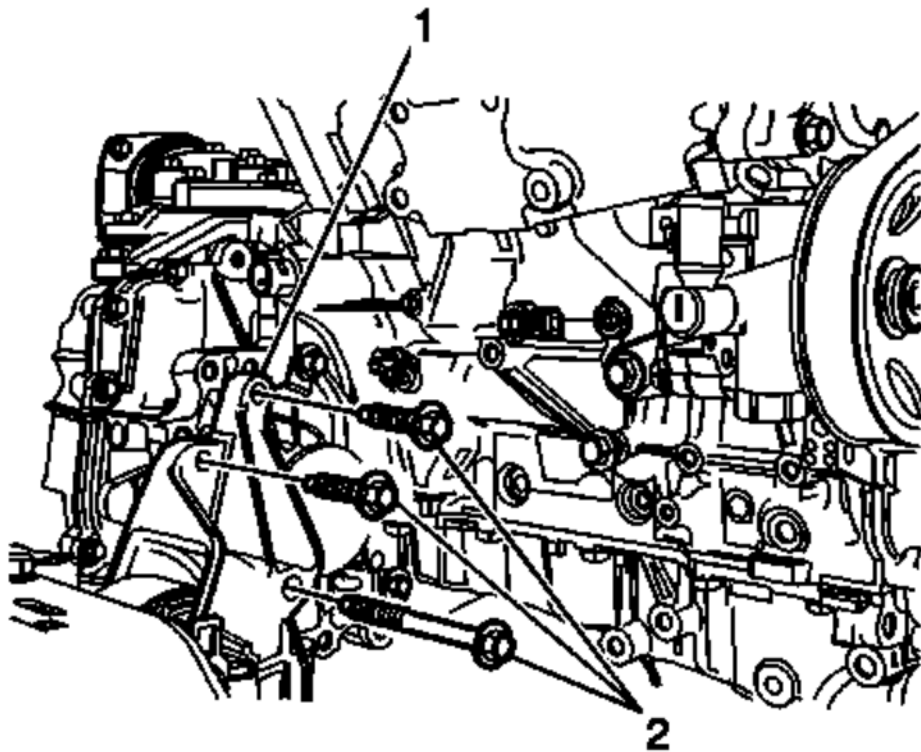
8. Remove the three transmission mount to transmission bolts (2).



**Fig. 67: Rear Mount To Frame Fasteners**  
Courtesy of GENERAL MOTORS COMPANY

9. Remove the rear mount to frame fasteners (1, 2), then remove the mount and bracket from the vehicle.

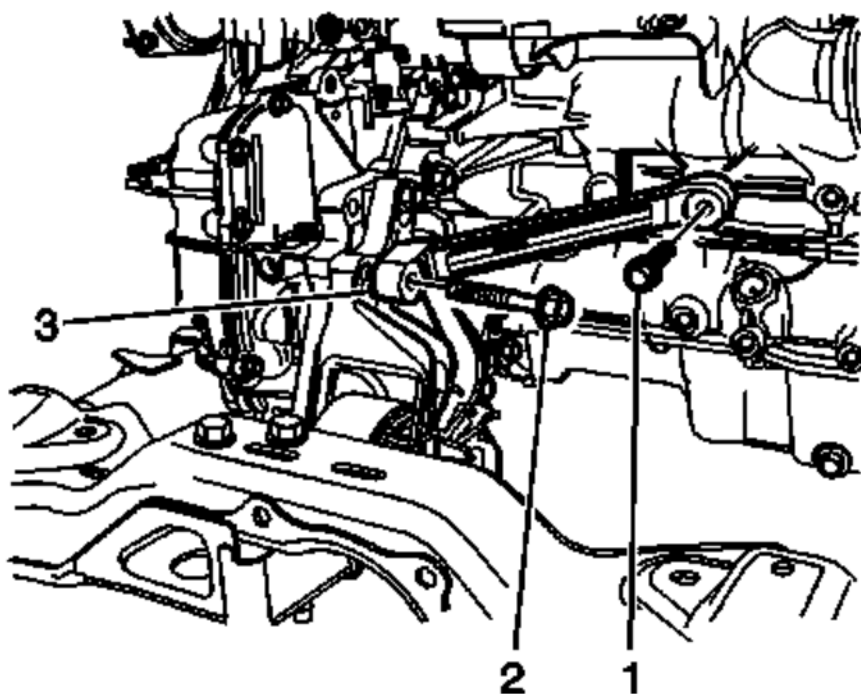
#### Installation Procedure



**Fig. 68: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

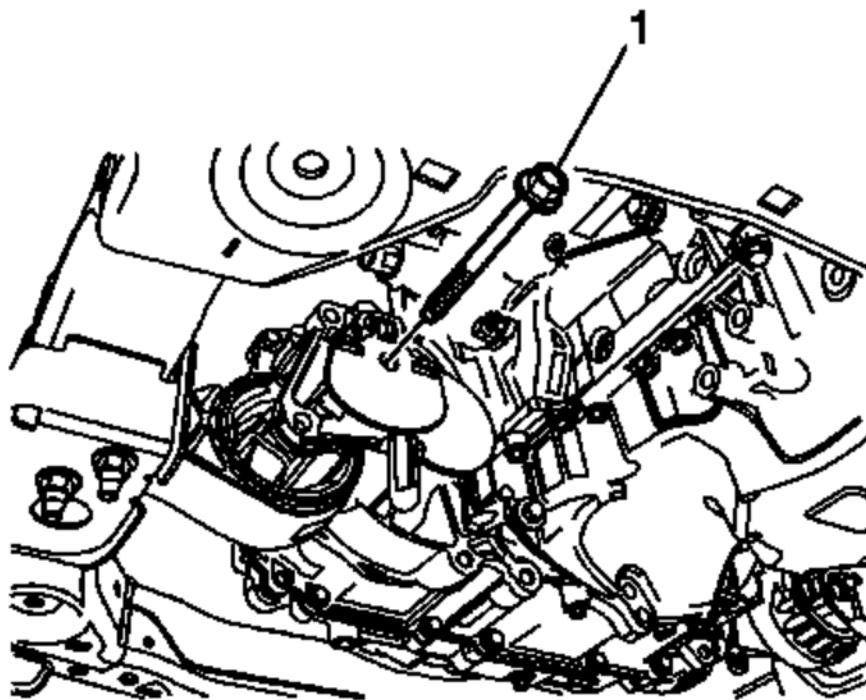
1. Install the three transmission mount bracket to transmission bolts (2) and tighten to 100 (74 lb ft).



**Fig. 69: Transaxle Brace & Bolt**

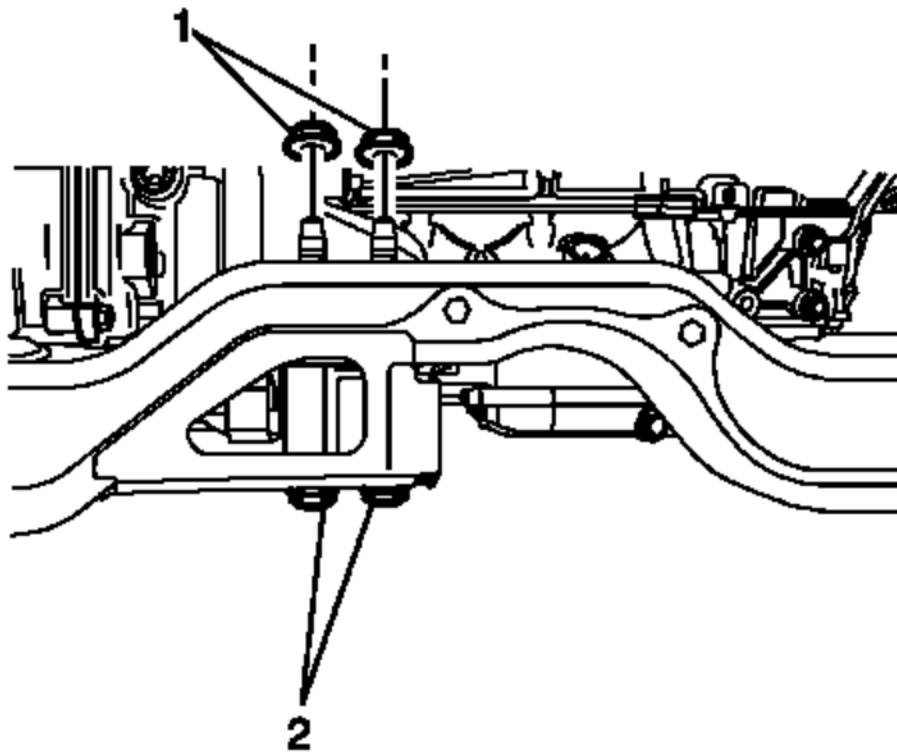
Courtesy of GENERAL MOTORS COMPANY

2. Install the transaxle brace (3) with bolt (2) seated in the brace.
3. Install the transaxle brace bolt (1) and tighten to 50 (37 lb ft).
4. Tighten brace bolt (2) to 100 (74 lb ft).



**Fig. 70: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

5. Install the transmission mount to bracket through bolt (1) and tighten to 105 (77 lb ft).



**Fig. 71: Rear Mount To Frame Fasteners**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Use NEW bolts only.

6. Install the rear mount to frame fasteners (1, 2) and tighten to 100 (74 lb ft) plus 120-130 degrees.
7. Remove the jack stand.
8. Install the left tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
9. Install the catalytic converter. Refer to **Catalytic Converter Replacement (LUK)** , **Catalytic Converter Replacement (LCV)** , **Catalytic Converter Replacement (LTG)** .
10. Lower the vehicle.

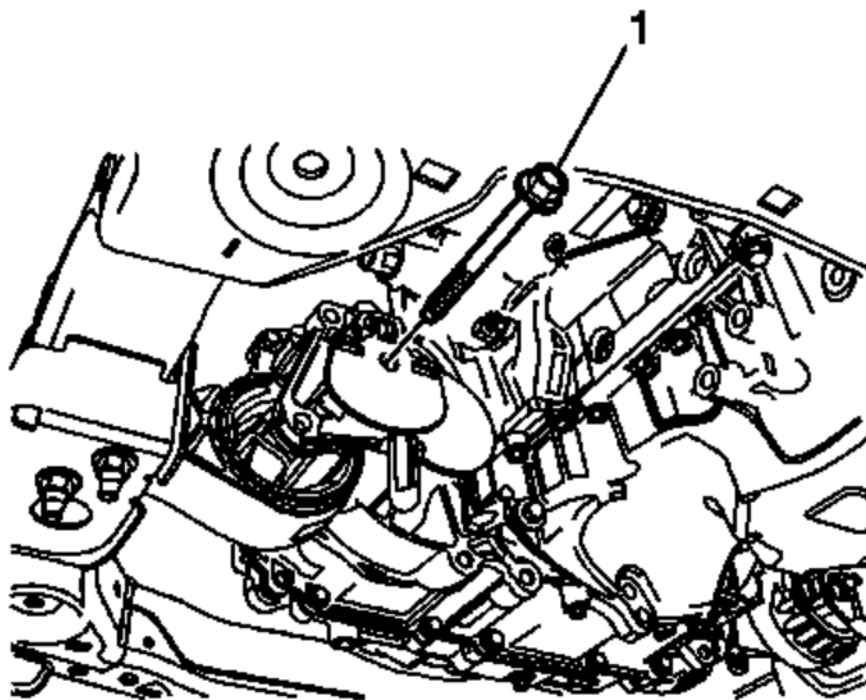
## TRANSMISSION REAR MOUNT REPLACEMENT

### Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Prior to removing the mount, mark the mount fasteners to mount and mount to sub frame interfaces using spray paint or a marker for correct positioning during installation.
3. Remove the catalytic converter. Refer to **Catalytic Converter Replacement (LUK)** , **Catalytic**

**Converter Replacement (LCV) , Catalytic Converter Replacement (LTG) .**

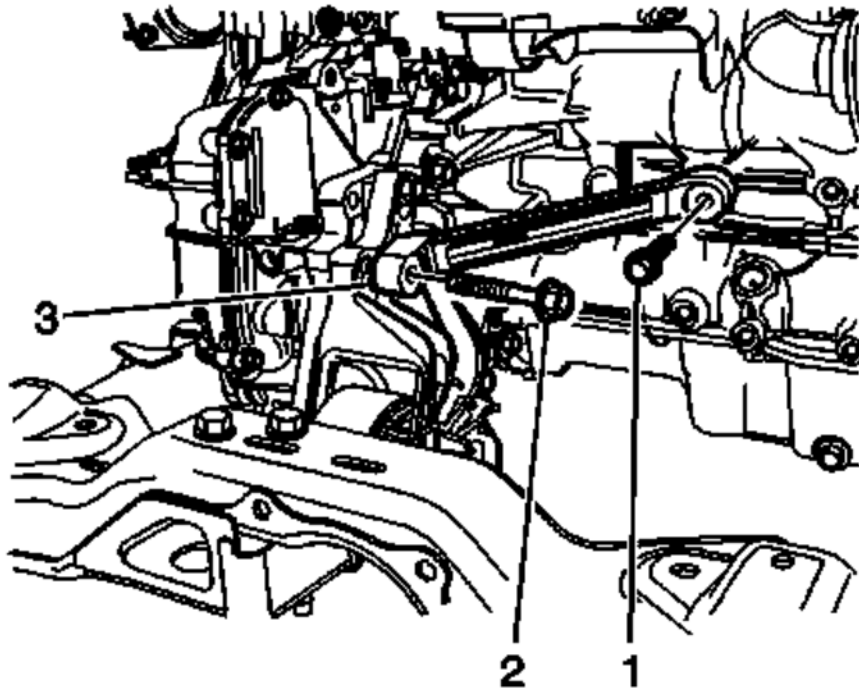
4. Using a suitable jack stand, support the rear of the powertrain.



**Fig. 72: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission mount to bracket through bolt (1).

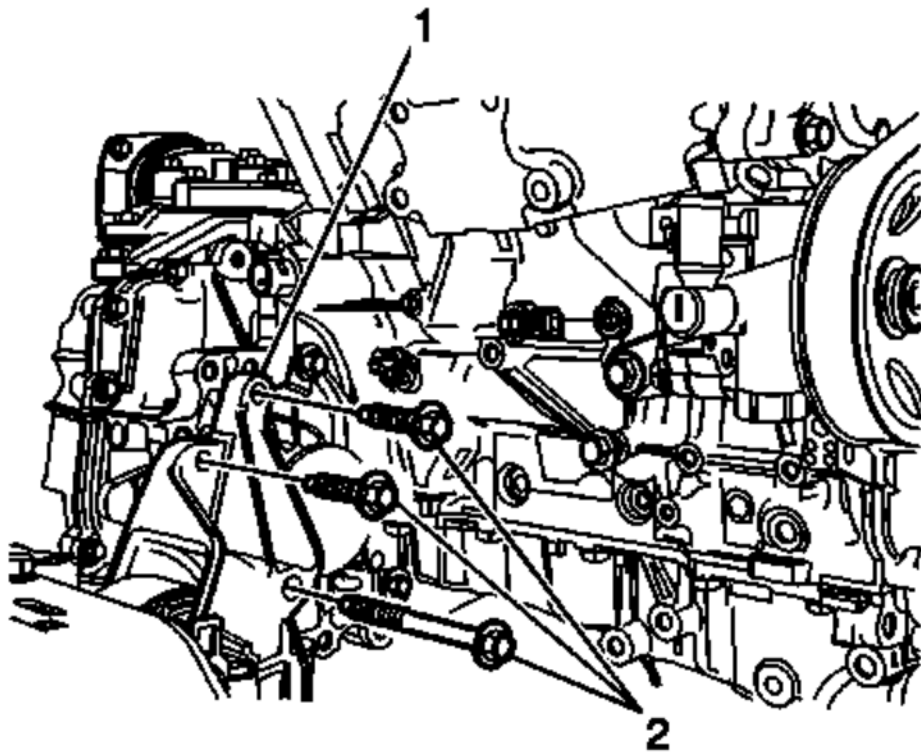




**Fig. 73: Transaxle Brace & Bolt**

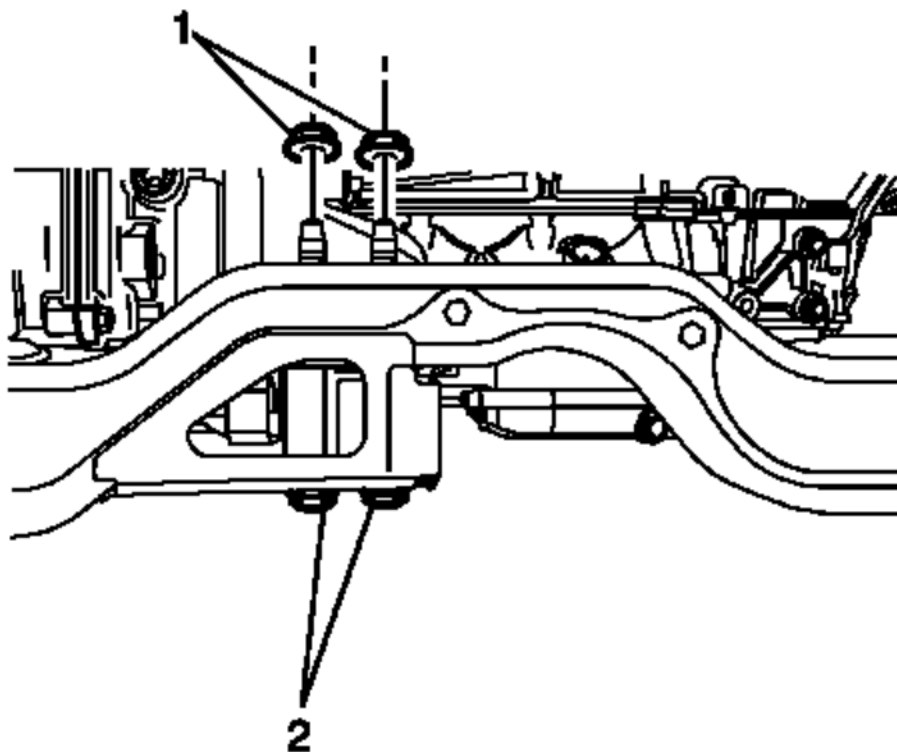
Courtesy of GENERAL MOTORS COMPANY

6. Remove the transaxle brace bolt (1), then loosen bolt (2) until it no longer engages the transaxle.
7. Remove the transaxle brace (3) with bolt (2) still retained in the brace.



**Fig. 74: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

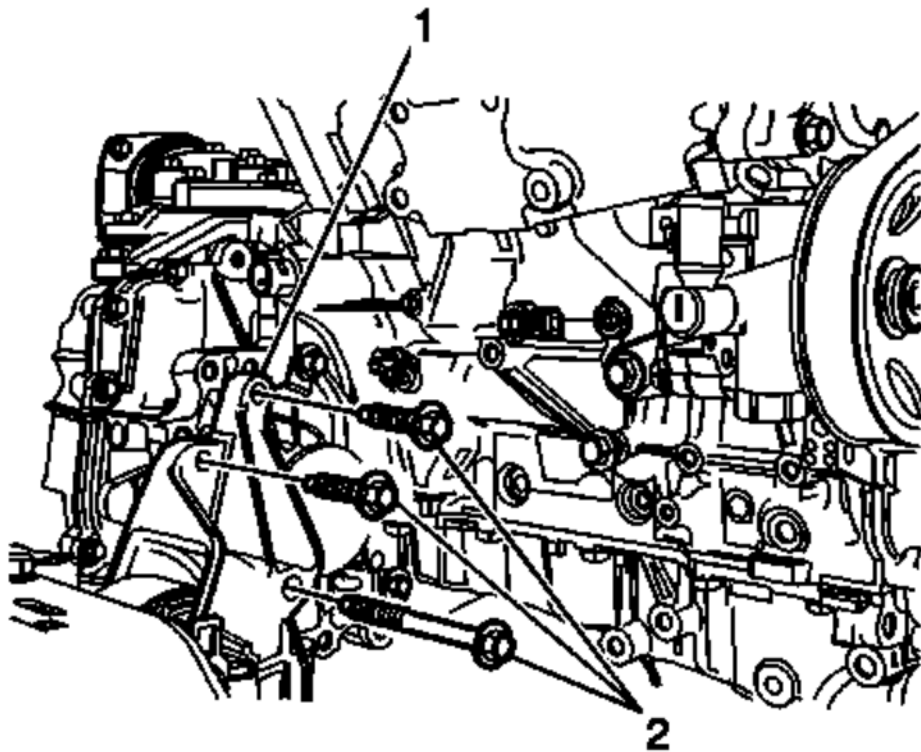
8. Remove the transmission mount to transmission bolts (2).



**Fig. 75: Rear Mount To Frame Fasteners**  
Courtesy of GENERAL MOTORS COMPANY

9. Remove the rear mount to frame fasteners (1, 2), then remove the mount from the vehicle.

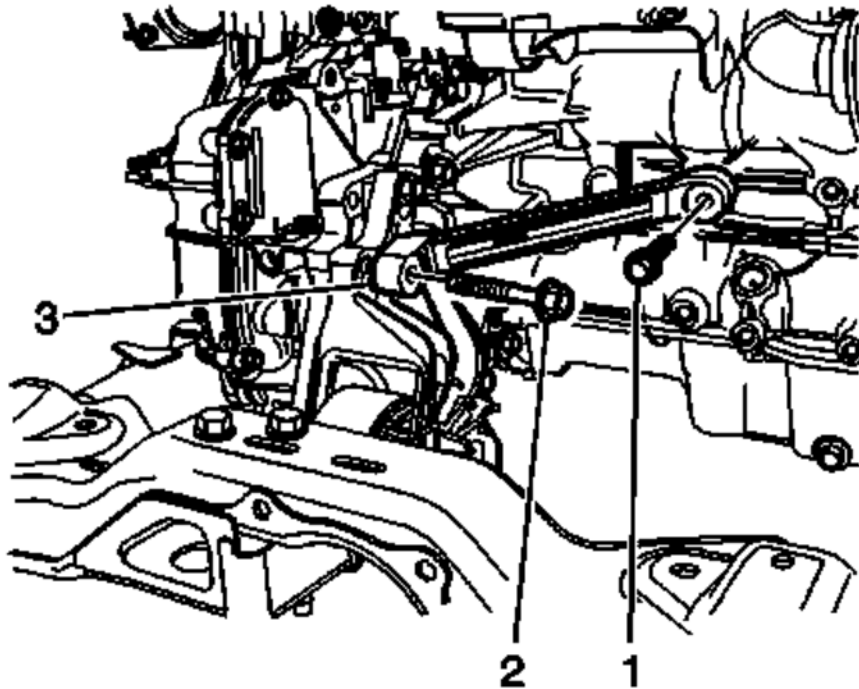
#### Installation Procedure



**Fig. 76: Transmission Mount To Transmission Bolts**  
Courtesy of GENERAL MOTORS COMPANY

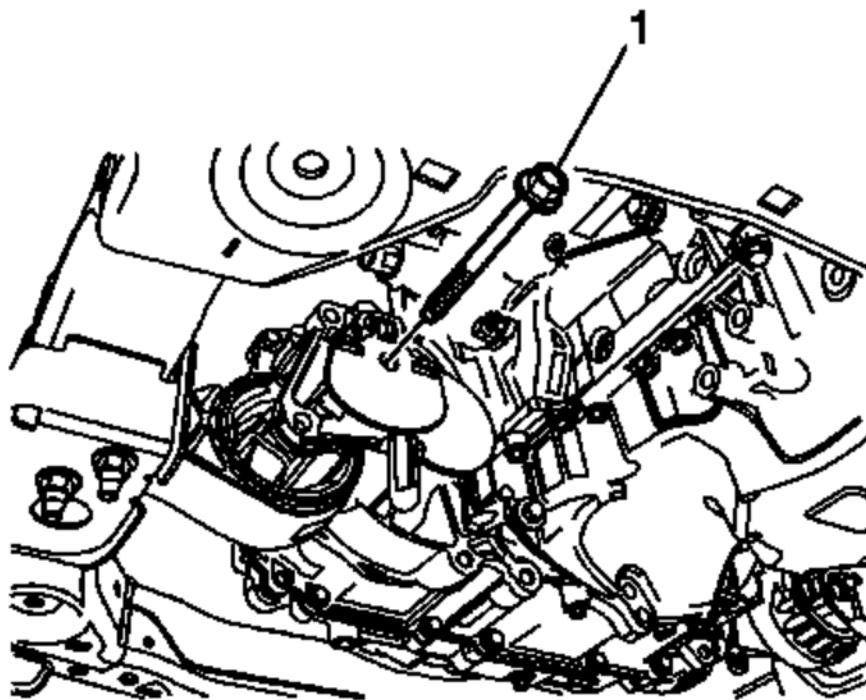
**CAUTION:** Refer to Fastener Caution .

1. Using the outline made by the spray paint or marker, install the transmission mount to transmission bolts (2) and tighten to 100 (74 lb ft).



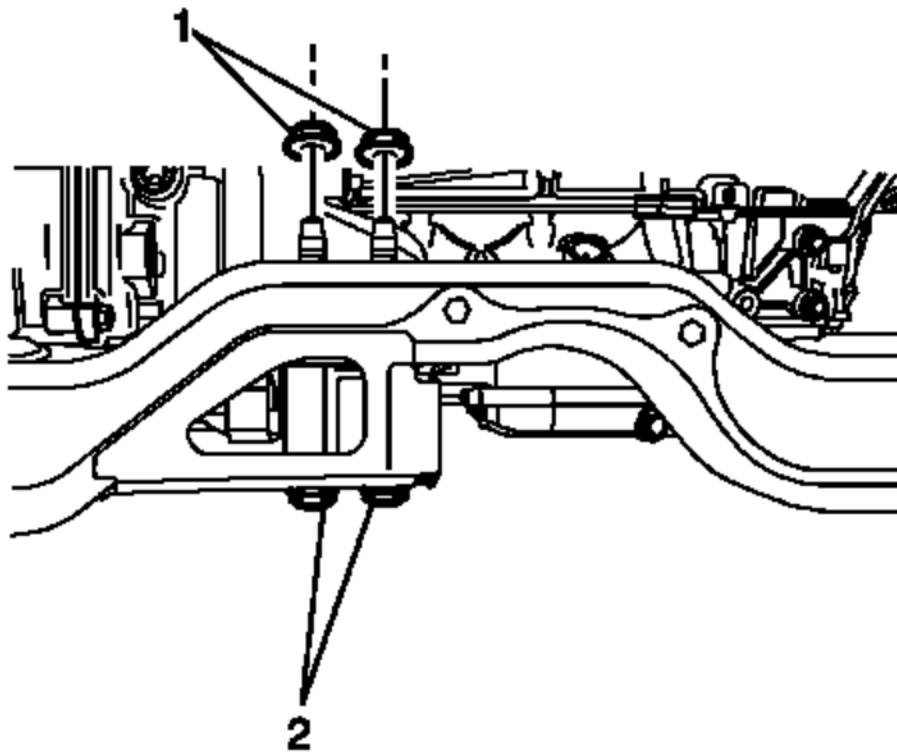
**Fig. 77: Transaxle Brace & Bolt**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the transaxle brace (3) with bolt (2) seated in the brace.
3. Install the transaxle brace bolt (1) and tighten to 50 (37 lb ft).
4. Tighten the brace bolt (2) to 100 (74 lb ft).



**Fig. 78: Rear Transmission Mount Through Bolt**  
Courtesy of GENERAL MOTORS COMPANY

5. Install the transmission mount to bracket through bolt (1) and tighten to 100 (74 lb ft).



**Fig. 79: Rear Mount To Frame Fasteners**  
 Courtesy of GENERAL MOTORS COMPANY

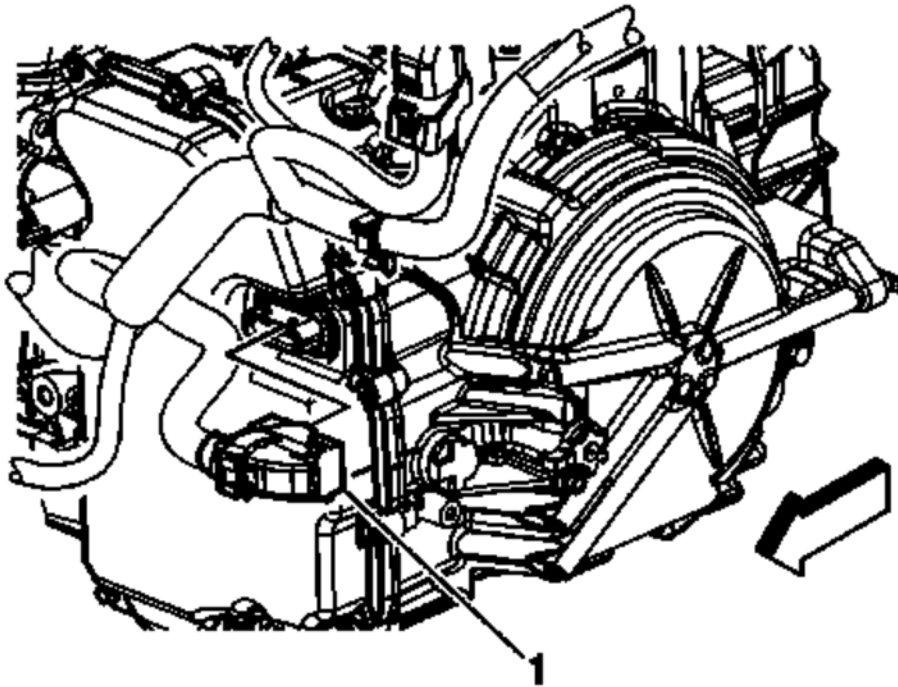
**NOTE:** Use NEW bolts only.

6. Install the rear mount to frame fasteners (1, 2) and tighten to 100 (74 lb ft) plus 120-130 degrees.
7. Install the catalytic converter. Refer to **Catalytic Converter Replacement (LUK)** , **Catalytic Converter Replacement (LCV)** , **Catalytic Converter Replacement (LTG)** .
8. Perform the Powertrain Mount Balancing - Lower procedure. Refer to the appropriate engine section.
9. Remove the jack stand.
10. Lower the vehicle.

## TRANSMISSION REPLACEMENT

### Removal Procedure

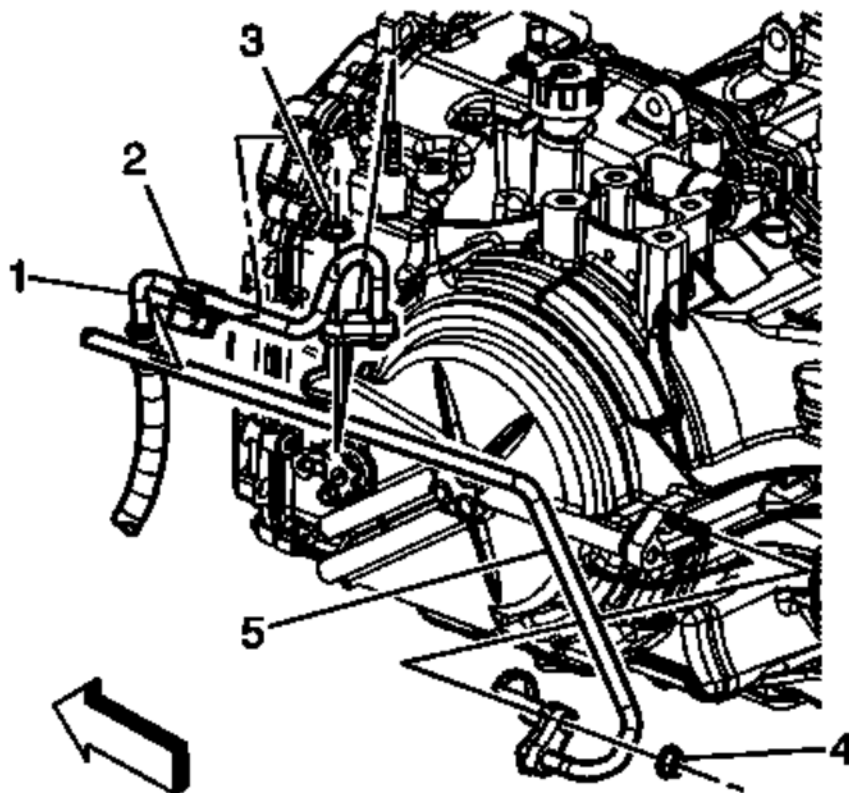
1. Remove the battery tray. Refer to **Battery Tray Replacement** .
2. Remove the transmission range select lever cable and bracket from the transmission.
3. Drain the transmission fluid. Refer to **Transmission Fluid Drain and Fill** .



**Fig. 80: Identifying Control Valve Body Transmission Control Module (TCM) Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

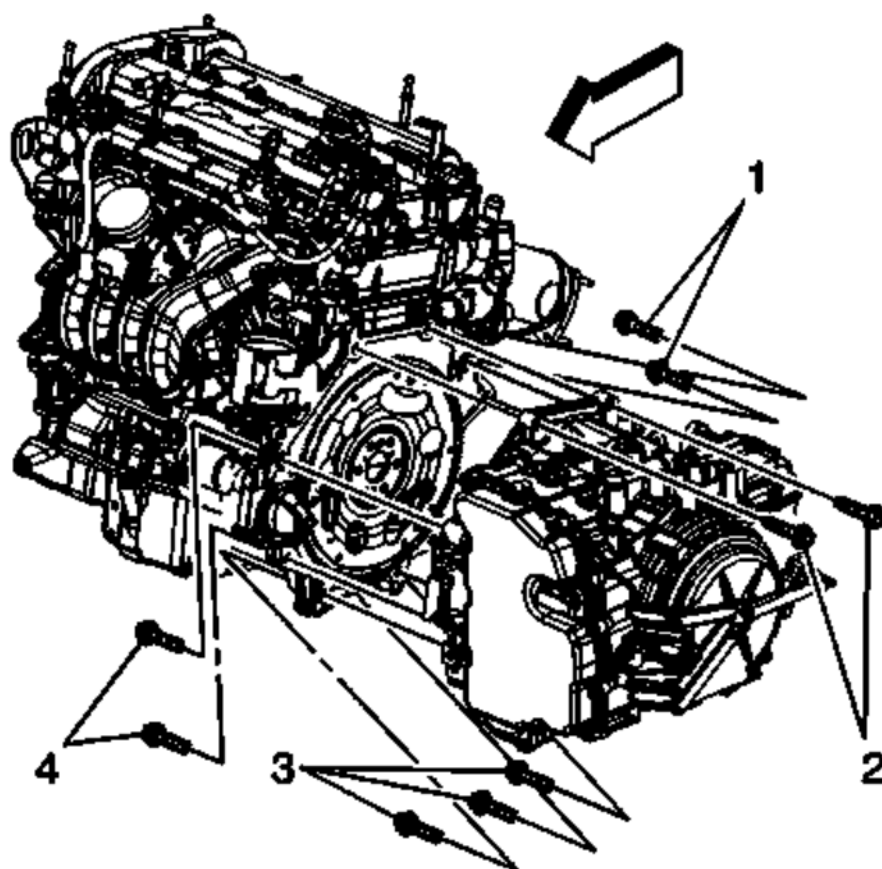
4. Disconnect the control valve body transmission control module (TCM) electrical connector (1) then unclip the connector from the transmission.





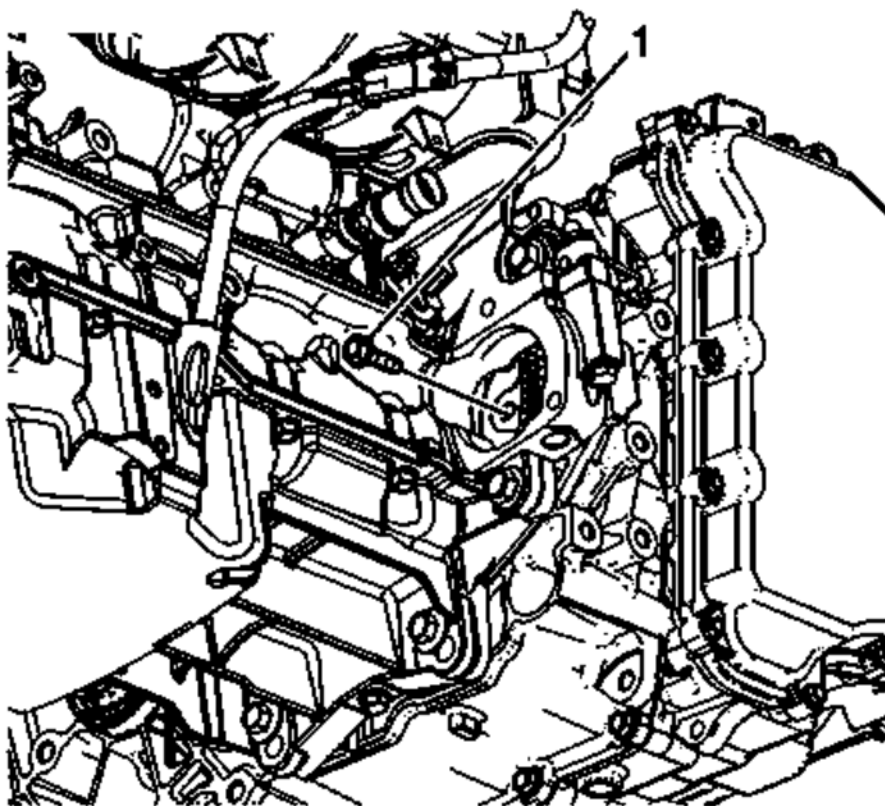
**Fig. 81: Identifying Cooler Inlet & Outlet Hoses**  
Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission fluid cooler inlet (1) and outlet (5) hoses from the retainer (2) on the control valve body cover.
6. Remove the transmission fluid cooler inlet hose nut (3) from the transmission.
7. Remove the transmission fluid cooler inlet hose (1) from the transmission.
8. Remove the transmission fluid cooler outlet hose nut (4) from the transmission.
9. Remove the transmission fluid cooler outlet hose (5) from the transmission.
10. Plug and/or cap the hose and transmission to prevent contamination.



**Fig. 82: Identifying Transmission-To-Engine Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

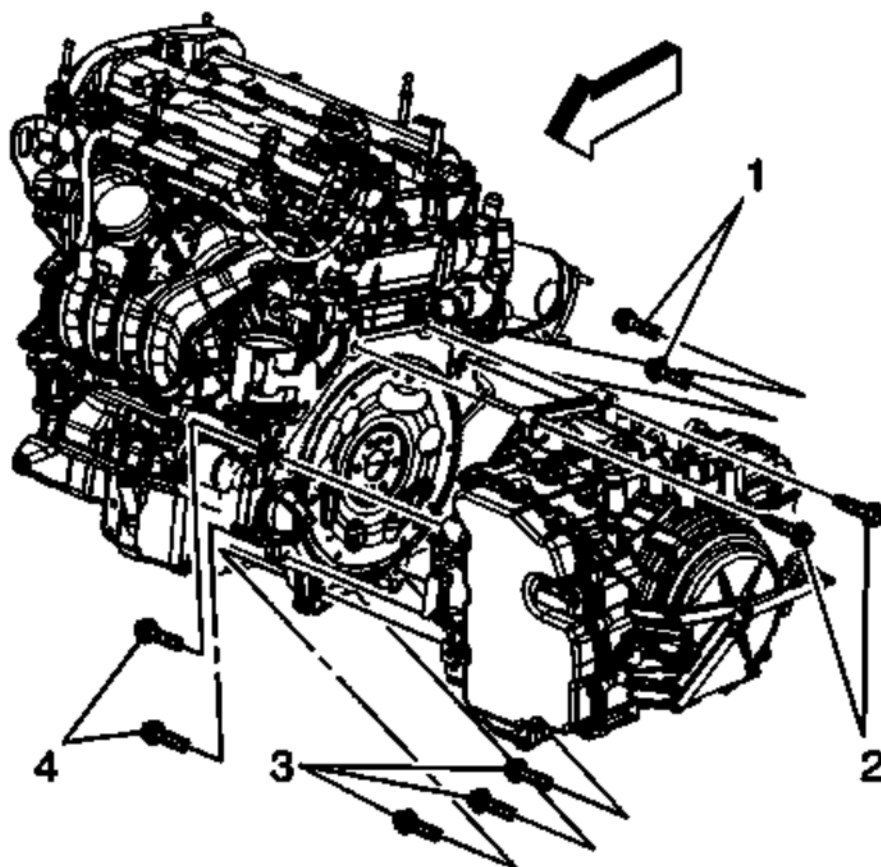
11. Remove the upper transmission to engine bolts (2).
12. Remove the frame. Refer to **Drivetrain and Front Suspension Frame Replacement** .
13. Disconnect the wheel drive shafts from the transmission. Refer to **Front Wheel Drive Shaft Replacement - Left Side** , and **Front Wheel Drive Shaft Replacement - Right Side** .
14. Remove the intermediate drive shaft. Refer to **Front Wheel Drive Intermediate Shaft Replacement** .
15. Remove the rear transmission mount from the transmission. Refer to **Transmission Rear Mount Replacement**.
16. Remove the front transmission mount from the transmission. Refer to **Transmission Front Mount Replacement**.



**Fig. 83: Identifying Starter Bolts**

Courtesy of GENERAL MOTORS COMPANY

17. Remove the starter. Refer to **Starter Replacement (LUK)** , **Starter Replacement (LCV, LTG)** .
18. Mark the relationship of the flywheel to the torque converter for reassembly.
19. Remove the torque converter to flywheel bolts (1).
20. Lower the vehicle.
21. Remove the three left transmission mount bolts from the transmission. Refer to **Transmission Mount Replacement - Left Side**.
22. Lower the transmission side with the support fixture to allow clearance for removal.
23. Unclip the engine wiring harness from the transmission.
24. Raise the vehicle.
25. Use a transmission jack in order to support the transmission.



**Fig. 84: Identifying Transmission-To-Engine Bolts**  
Courtesy of GENERAL MOTORS COMPANY

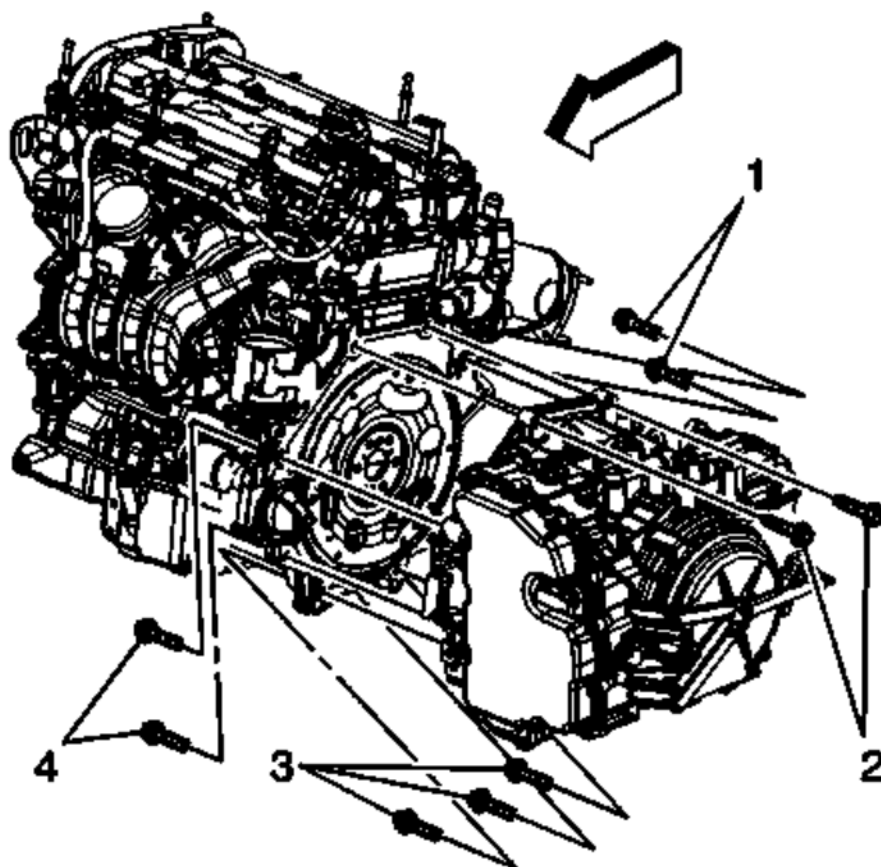
26. Remove the remaining transmission fasteners (1, 3, 4).

**NOTE:** Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

27. Separate the transmission from the engine.  
28. Lower the transmission with the transmission jack far enough to remove the transmission.  
29. Flush and flow test the transmission oil cooler and lines. Refer to **Transmission Fluid Cooler Flushing and Flow Test**.

#### Installation Procedure

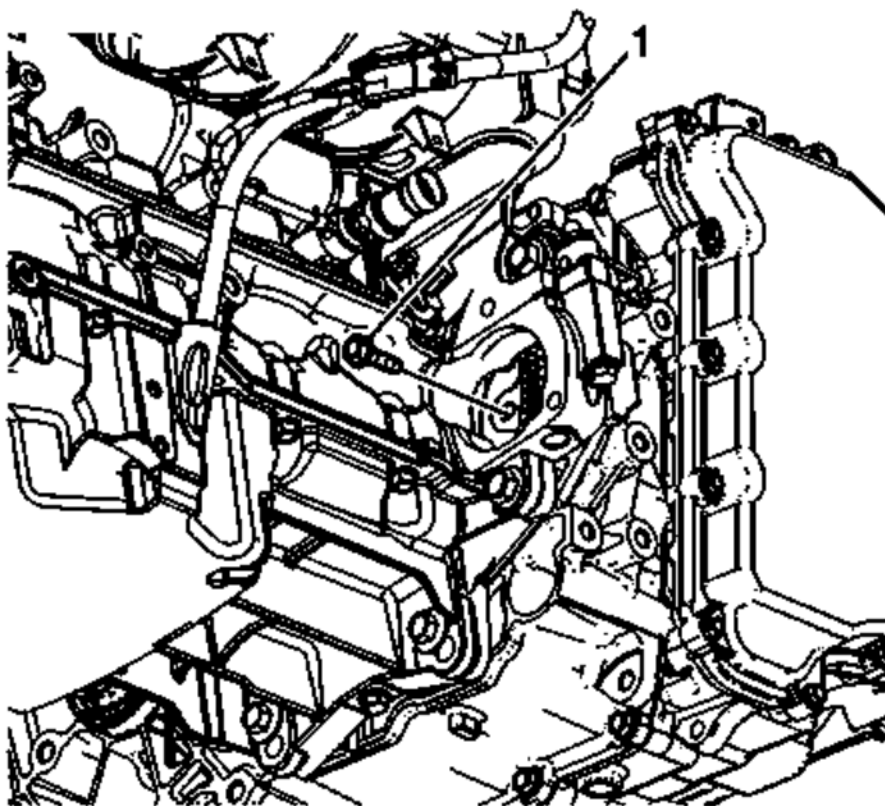
1. Raise the transmission with the transmission jack and position the transmission to the engine.



**Fig. 85: Identifying Transmission-To-Engine Bolts**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

2. Install the transmission bolts (1, 3, 4) and tighten to 58 (43 lb ft).
3. Remove the transmission jack.

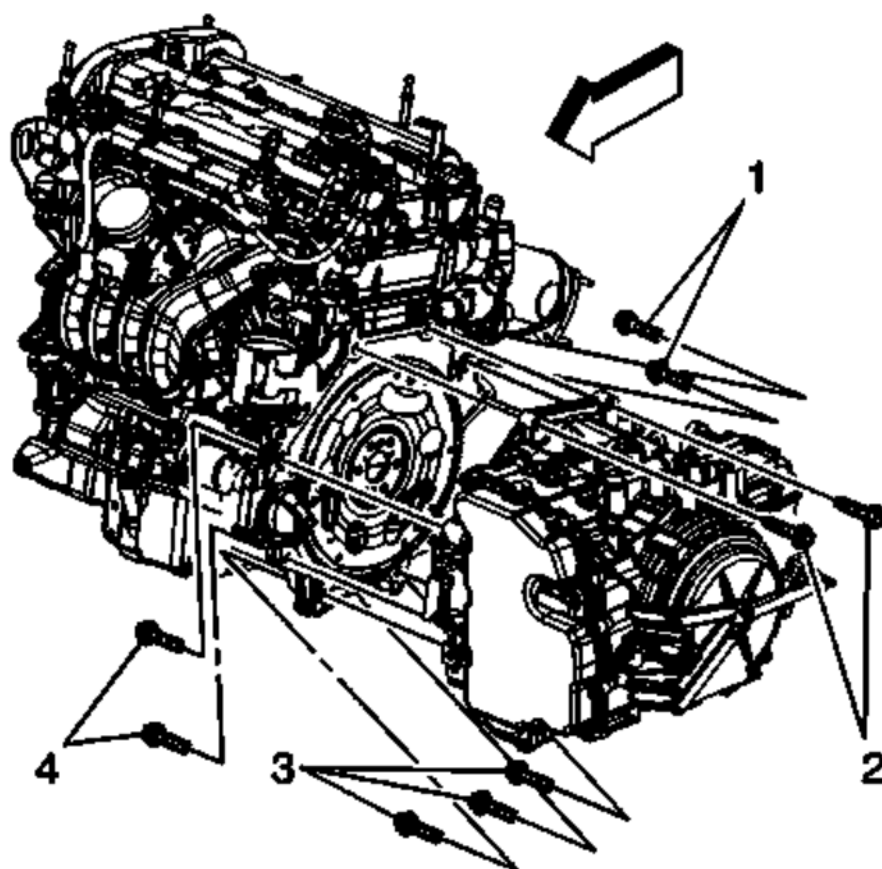


**Fig. 86: Identifying Starter Bolts**

Courtesy of GENERAL MOTORS COMPANY

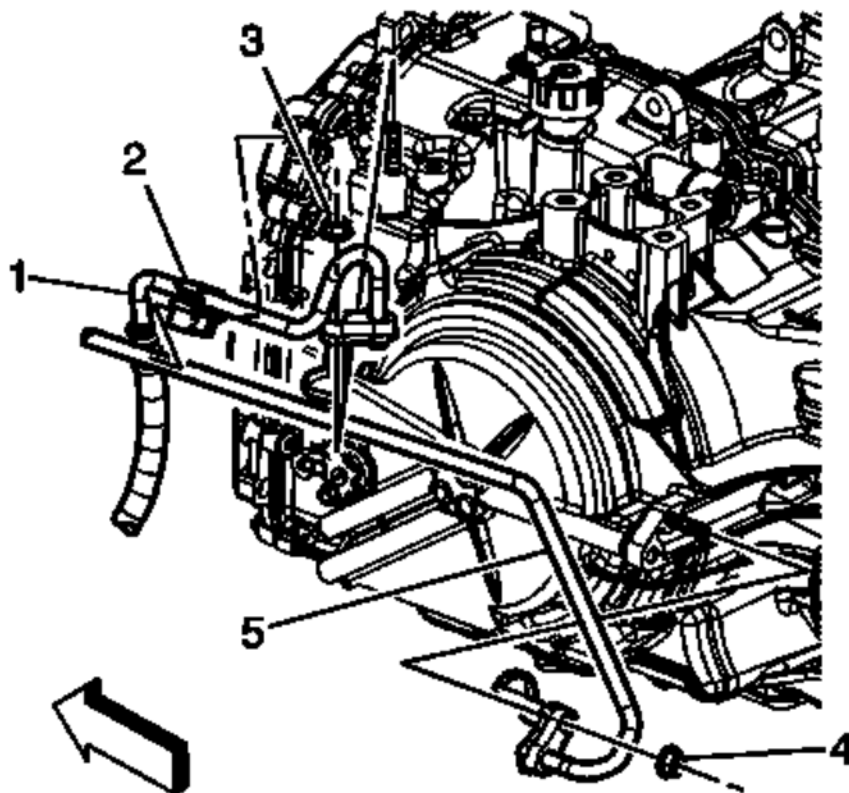
**NOTE:** If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation. Refer to Adhesives, Fluids, Lubricants, and Sealers for the recommended threadlock material.

4. Install the torque converter to flywheel bolts (1) and tighten to 62 (46 lb ft).
5. Install the starter. Refer to Starter Replacement (LUK) , Starter Replacement (LCV, LTG) .
6. Install the front transmission mount to the transmission. Refer to Transmission Front Mount Replacement.
7. Install the rear transmission mount to the transmission. Refer to Transmission Rear Mount Replacement.
8. Install the left transmission mount to the transmission. Refer to Transmission Mount Replacement - Left Side.
9. Install the intermediate drive shaft. Refer to Front Wheel Drive Intermediate Shaft Replacement .
10. Install the wheel drive shafts to the transmission. Refer to Front Wheel Drive Shaft Replacement - Left Side , and Front Wheel Drive Shaft Replacement - Right Side .
11. Install the frame. Refer to Drivetrain and Front Suspension Frame Replacement .



**Fig. 87: Identifying Transmission-To-Engine Bolts**  
Courtesy of GENERAL MOTORS COMPANY

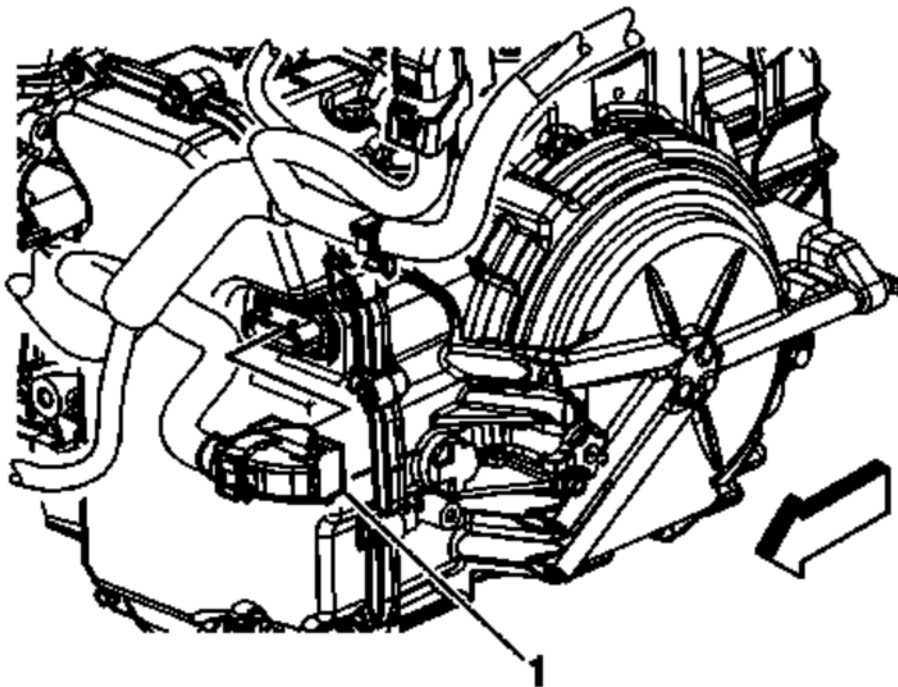
12. Install the upper transmission to engine bolt (2) and tighten to 58 (43 lb ft).
13. Remove the engine support fixture.



**Fig. 88: Identifying Cooler Inlet & Outlet Hoses**  
Courtesy of GENERAL MOTORS COMPANY

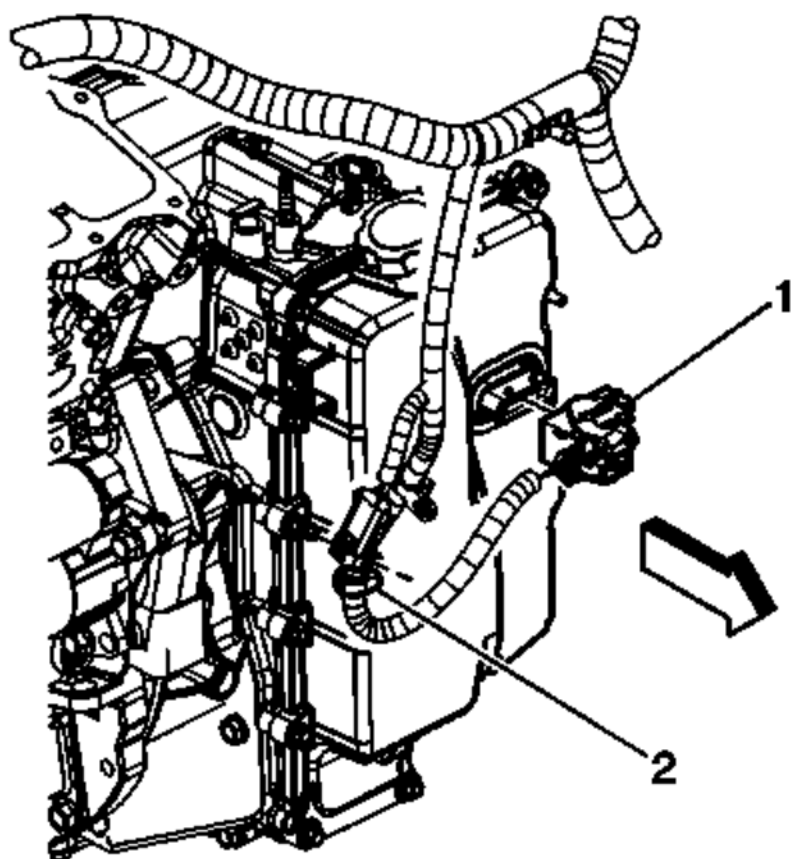
14. Install the transmission fluid cooler outlet hose (5) to the transmission.
15. Install the transmission fluid cooler pipe retainer nut (4) and tighten to 22 (16 lb ft).
16. Install the transmission fluid cooler inlet hose (1) to the transmission.
17. Install the transmission fluid cooler pipe retainer nut (3) and tighten to 22 (16 lb ft).





**Fig. 89: Identifying Control Valve Body Transmission Control Module (TCM) Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

18. Connect the control valve body TCM electrical connector (1).



**Fig. 90: Identifying Wire Harness Retainer & TCM Electrical Connector**  
 Courtesy of GENERAL MOTORS COMPANY

19. Connect the control valve body TCM electrical connector (1).
20. Install the transmission range select lever cable and bracket on the transmission.
21. Install the battery tray. Refer to **Battery Tray Replacement**.
22. Adjust the automatic transmission range selector lever cable. Refer to **Range Selector Lever Cable Adjustment**.
23. Fill the transmission with fluid. Refer to **Transmission Fluid Drain and Fill**.
24. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to **Service Programming System (SPS)**.

**NOTE:** The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement

- TCM software/calibration update
- Any service in response to a shift quality concern

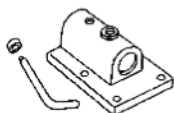
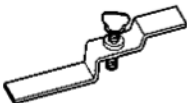
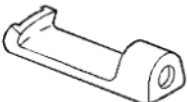
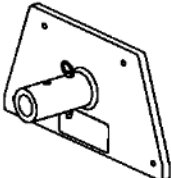
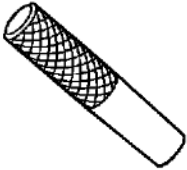
25. Perform the Transmission Adaptive Values Learn procedure. Refer to **Transmission Adaptive Values Learn** .
26. Road test the vehicle.

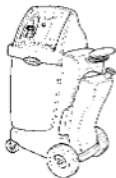
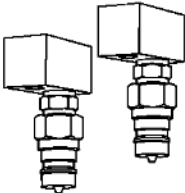
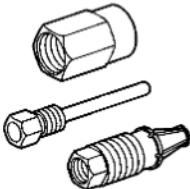
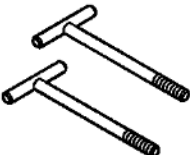
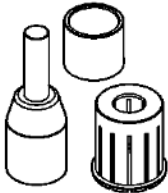
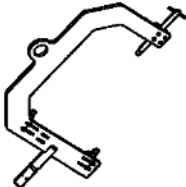
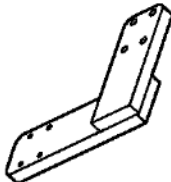
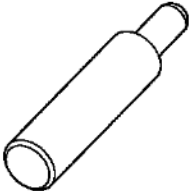
## 2013 TRANSMISSION

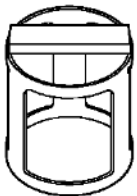
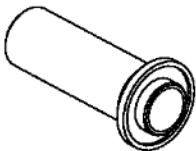
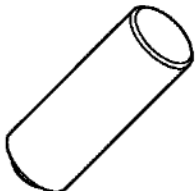
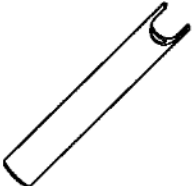
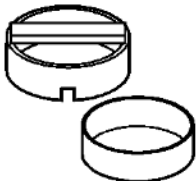
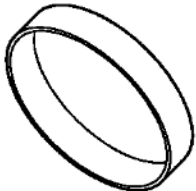
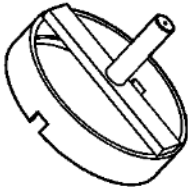
Automatic Transmission - 6T40 (MH8, MHH) - Special Tools and Equipment - Special Tools - Malibu

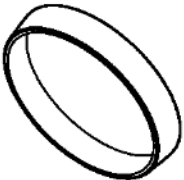
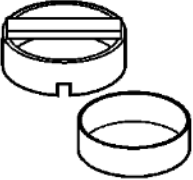
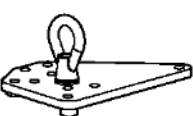
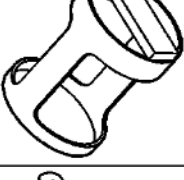
### SPECIAL TOOLS AND EQUIPMENT

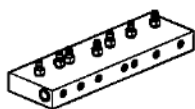
#### SPECIAL TOOLS

| Illustration                                                                        | Tool Number/Description                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------|
|    | DT-3289-20<br>J-3289-20<br>KM-113-2-A<br>Holding Fixture    |
|    | DT-21366<br>J-21366<br>Converter Holding Strap              |
|  | DT-23129<br>J-23129<br>KM-586<br>Universal Seal Remover     |
|  | DT-28585<br>J-28585<br>KM-J-28585<br>Snap Ring Remover      |
|  | DT-39890<br>J-39890<br>Transmission Holding Fixture Adapter |
|  | DT-41229<br>J-41229<br>Manual Shaft Pin Installer           |
|                                                                                     |                                                             |

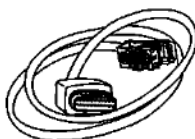
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|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|    | <p>DT-45096<br/>J-45096<br/>Transmission Oil Cooling System Flush and Flow Test Tool</p> |
|    | <p>DT-45096-50<br/>J-45096-50<br/>Transmission Cooling Flush Adapter</p>                 |
|    | <p>DT-45201<br/>DT-48203<br/>J-45201<br/>Cooler Line Seal Remover</p>                    |
|   | <p>DT-46409<br/>J-46409<br/>KM-922<br/>Torque Converter Lifting Handles</p>              |
|  | <p>DT-46620<br/>J-46620<br/>Seal Installer</p>                                           |
|  | <p>DT-46625<br/>J-46625<br/>Holding Fixture</p>                                          |
|  | <p>DT-46625-10<br/>J-46625-10<br/>Holding Fixture Adapter</p>                            |
|  | <p>DT-46626<br/>J-46626<br/>Seal Installer</p>                                           |
|                                                                                     |                                                                                          |

|                                                                                     |                                        |
|-------------------------------------------------------------------------------------|----------------------------------------|
|    | DT-47694<br>Spring Compressor          |
|    | DT-47790<br>Seal Installer             |
|    | DT-47791-B<br>Seal Installer           |
|   | DT-47792<br>Seal Installer             |
|  | DT-47793<br>Differential Rotating Tool |
|  | DT-47794<br>Spring Compressor          |
|  | DT-47796<br>Seal Protector             |
|  | DT-47797<br>Spring Installer           |
|                                                                                     |                                        |

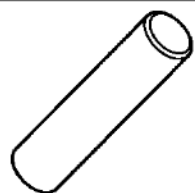
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|    | <p>DT-47798<br/>Seal Protector</p>                  |
|    | <p>DT-47799<br/>Clutch Piston Spring Compressor</p> |
|    | <p>DT-47805<br/>Seal Protector</p>                  |
|   | <p>DT-47807<br/>Clutch Piston Seal Installer</p>    |
|  | <p>DT-47811-A<br/>Lift Plate</p>                    |
|  | <p>DT-47951-1<br/>Seal Protector</p>                |
|  | <p>DT-47951-2<br/>Spring Compressor</p>             |
|  | <p>DT-48056<br/>Spring Compressor Bridge</p>        |



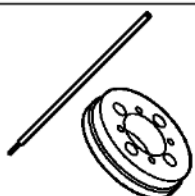
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Control Solenoid Test Plate



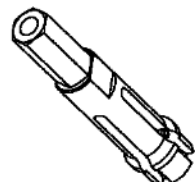
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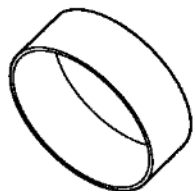
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Seal Installer



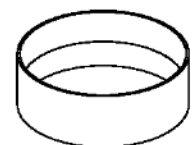
DT-49131  
Seal Staking Tool



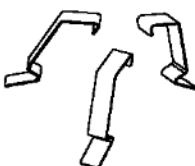
DT-49938  
Differential Rotating Tool



DT-50117  
Seal Installer

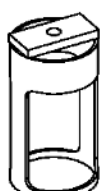
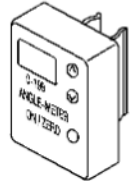
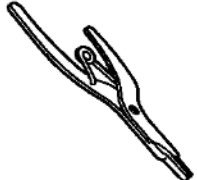
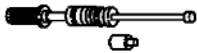


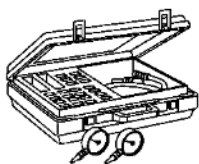
DT-50117-1  
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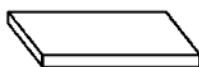
DT-50117-2  
Seal Protector Retaining Clips



|                                                                                     |                                                              |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------|
|    | DT-50573<br>Retaining Ring Installer                         |
|    | EL-35616<br>J-35616<br>GM-Approved Terminal Test Kit         |
|    | EL-38522<br>J-38522<br>Variable Signal Generator             |
|   | EN-45059<br>J-45059<br>KM-470-B<br>Angle Meter               |
|  | GE-5586-A<br>J-5586-A<br>Snap Ring Pliers                    |
|  | GE-6125-1B<br>J-6125-1B<br>KM-J-7004<br>Slide Hammer         |
|  | GE-8059<br>J-8059<br>KM-396<br>Snap Ring Pliers-Parallel Jaw |
|  | GE-8092<br>J-8092<br>KM-J-8092<br>Driver Handle              |



GE-21867-A  
J-21867-A  
Oil Pressure Gauge Kit



GE-34673  
J-34673  
Flat Gauge Bar

## 2013 TRANSMISSION

### Automatic Transmission - 6T40 (MH8, MHH) - Specifications - Malibu

## SPECIFICATIONS

### FASTENER TIGHTENING SPECIFICATIONS (OFF VEHICLE)

#### Fastener Tightening Specifications (Off Vehicle)

| Application                                                       | Ref No.* | Quantity                  | Size         | Specification |              |
|-------------------------------------------------------------------|----------|---------------------------|--------------|---------------|--------------|
|                                                                   |          |                           |              | Metric        | English      |
| A/Trans Auxiliary Fluid Pump Outlet Bolt (Hybrid Models)          | 350      | 4                         | -            | 22 N.m        | 16 lb ft     |
| A/Trans Auxiliary Fluid Pump Bolt (Hybrid Models)                 | 355      | 1                         | -            | 22 N.m        | 16 lb ft     |
| A/Trans Auxiliary Fluid Pump (Pump to Motor) Bolt (Hybrid Models) | 370      | 4                         | -            | 10-12 N.m     | 89-106 lb in |
| A/Trans Fluid Pump Bolt to Converter Housing                      |          |                           |              |               |              |
| • First Pass                                                      | 200      | 7 - 6T30, 8 - 6T40/45/50  | M8x33        | 10 N.m        | 89 lb in     |
| • Final Pass                                                      | 200      |                           | M8x33        | 45°           |              |
| A/Trans Fluid Pump Cover Bolt                                     | 302      | 3 - 6T30, 23 - 6T40/45/50 | M6x25        | 12 N.m        | 106 lb in    |
| A/Trans Fluid Pump Cover Bolt                                     | 320      | 20 - 6T30,                | M6x21.5      | 12 N.m        | 106 lb in    |
| Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt     | 4        | 12                        | M6x97        | 10 N.m        | 89 lb in     |
| Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt     | 6        | 3                         | M5x40.5      | 7 N.m         | 62 lb in     |
| Control Valve Body Assembly (Complete) Bolt                       | 400      | 1                         | M5x40.5      | 7 N.m         | 62 lb in     |
| Control Valve Body to Case Bolt                                   | 9        | 2                         | M6x53        | 11 N.m        | 97 lb in     |
| Control Valve Body to Case Bolt                                   | 10       | 9                         | M6x60        | 11 N.m        | 97 lb in     |
| Control Valve Body Cover Bolt                                     | 1        | 13                        | M6x30        | 12 N.m        | 106 lb in    |
| Drain Plug                                                        | 64       | 1                         | 1/8"-27 NPTF | 12 N.m        | 106 lb in    |
| Fluid Level Hole Plug                                             | 63       | 1                         | 1/8"-27 NPTF | 12 N.m        | 106 lb in    |

|                                                                                |     |                            |                                       |        |           |
|--------------------------------------------------------------------------------|-----|----------------------------|---------------------------------------|--------|-----------|
| Fluid Pressure Test Hole Plug                                                  | 51  | 1                          | 1/8"-27 NPTF                          | 12 N.m | 106 lb in |
| Front Differential Carrier Baffle Bolt - Converter Housing                     | 204 | 2                          | M6x25                                 | 12 N.m | 106 lb in |
| Front Differential Carrier Baffle Bolt - Case                                  | 61  | 2                          | M6x18.5 - 6T30,<br>M6x16 - 6T40/45/50 | 12 N.m | 106 lb in |
| Input Shaft Support Bolt                                                       | 57  | 3                          | M6x50                                 | 12 N.m | 106 lb in |
| Input Speed Sensor Bolt                                                        | 21  | 1                          | M6x23                                 | 9 N.m  | 80 lb in  |
| Manual Shift Detent Spring                                                     | 17  | 1                          | M6x16                                 | 12 N.m | 106 lb in |
| Output Speed Sensor Bolt                                                       | 15  | 1                          | M6x18                                 | 9 N.m  | 80 lb in  |
| Torque Converter and Differential Housing Bolt                                 |     |                            |                                       |        |           |
| • First Pass                                                                   | 27  | 14 - 6T30, 15 - 6T40/45/50 | M8x30                                 | 10 N.m | 89 lb in  |
| • Final Pass                                                                   | 27  |                            | M8x30                                 | 50°    |           |
| *Reference number refers to the component callout number in Disassembled Views |     |                            |                                       |        |           |

## FASTENER TIGHTENING SPECIFICATIONS (ON VEHICLE)

### Fastener Tightening Specifications (On Vehicle)

| Application                                         | Specification |                   |
|-----------------------------------------------------|---------------|-------------------|
|                                                     | Metric        | English           |
| A/Trans Control Bolt                                | 9             | 80 lb in          |
| A/Trans Flex Plate Bolt                             | 60            | 45 lb ft          |
| Rear Trans Brace Bolt - Inboard                     | 50            | 37 lb ft          |
| Rear Trans Brace Bolt - Outboard                    | 100           | 74 lb ft          |
| Torque Converter to Flywheel Bolt                   | 60            | 45 lb ft          |
| Transmission Bolt (1, 2, 3) - 6T40                  | 75            | 55 lb ft          |
| Transmission Bolt (4, 5) - 6T40                     | 50            | 37 lb ft          |
| Transmission Bolt (1, 2, 3, 4) - 6T45               | 75            | 55 lb ft          |
| Transmission Bolt (5) - 6T45                        | 50            | 37 lb ft          |
| Transmission Fluid Cooler Outlet Pipe Nut           | 22            | 17 lb ft          |
| Transmission Fluid Cooler Pipe Inlet Nut            | 22            | 17 lb ft          |
| Transmission Front Mount Through Bolt               | 100           | 74 lb ft          |
| Transmission Front Mount to Transmission Bolts      | 62            | 46 lb ft          |
| Transmission Mount Bolt - Left Side to Frame Rail   | 22            | 16 lb ft          |
| Transmission Mount Bolt - Left Side to Transmission | 50 + 60-75°   | 37 lb ft + 60-75° |
| Transmission Mount Nut - Left Side to Body          | 22            | 16 lb ft          |
| Transmission Rear Mount Through Bolt                | 105           | 747 lb ft         |

|                                                |                |                     |
|------------------------------------------------|----------------|---------------------|
| Transmission Rear Mount to Cradle              | 100 + 120-130° | 74 lb ft + 120-130° |
| Transmission Rear Mount to Transmission        | 100            | 74 lb ft            |
| Transmission Range Selector Cable Bracket Bolt | 18             | 14 lb ft            |
| Transmission Range Selector Lever Nut          | 20             | 15 lb ft            |

## TRANSMISSION GENERAL SPECIFICATIONS (6T40/6T45/6T50)

### Transmission General Specifications (6T40/6T45/6T50)

| Name                                                        | 6T40/6T45/6T50                                                                            |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| RPO Codes                                                   | MH8, MH7, MHK, MHH, MHC, MHJ, MNH, MHB                                                    |
| Production Location                                         | Korea/China/Mexico/Toledo                                                                 |
| Transmission Drive                                          | Front Wheel Drive                                                                         |
| Reverse Gear Ratio                                          | 2.94                                                                                      |
| 1st Gear Ratio                                              | 4.584                                                                                     |
| 2nd Gear Ratio                                              | 2.964                                                                                     |
| 3rd Gear Ratio                                              | 1.912                                                                                     |
| 4th Gear Ratio                                              | 1.446                                                                                     |
| 5th Gear Ratio                                              | 1.000                                                                                     |
| 6th Gear Ratio                                              | 0.746                                                                                     |
| Effective Final Drive Gear Ratio                            | 2.64/2.89/3.23/3.53/3.87                                                                  |
| Torque Converter Size- Diameter of Torque Converter Turbine | 236 mm                                                                                    |
| Pressure Taps Line                                          | Pressure                                                                                  |
| Transmission Fluid Type                                     | DEXRON VI®                                                                                |
| Transmission Fluid Capacity                                 | 8.0 L/8.5 Quarts                                                                          |
| Transmission Type: 6                                        | Six Forward Gears                                                                         |
| Transmission Type: T                                        | Transverse Mount                                                                          |
| Transmission Type: 40/45/50                                 | Product Series                                                                            |
| Position Quadrant                                           | P, R, N, D, * *(Refer to the applicable owner's manual)                                   |
| Case Material                                               | Die Cast Aluminum                                                                         |
| Transmission Net Weight                                     | 81/86 kg (178/190 lbs)                                                                    |
| Maximum Trailer Towing Capacity                             | N/A                                                                                       |
| Maximum Gross Vehicle Weight (GVW)                          | 6T40 - 2000 kg (4, 409 lbs)<br>6T45 - 2200 kg (4, 850 lbs)<br>6T50 - 2500 kg (5, 511 lbs) |

## ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

### Adhesives, Fluids, Lubricants, and Sealers

| Application                  | Type of Material | GM Part Number |          |
|------------------------------|------------------|----------------|----------|
|                              |                  | United States  | Canada   |
| Automatic Transmission Fluid | DEXRON®VI        | 88861037       | 19264717 |

|                        |            |          |          |
|------------------------|------------|----------|----------|
| Torque Converter Bolts | Threadlock | 12345382 | 10953489 |
|------------------------|------------|----------|----------|

## FLUID CAPACITY SPECIFICATIONS (6T40/45/50)

### Fluid Capacity Specifications (6T40/45/50)

| Application                                      | Specification  |                 |
|--------------------------------------------------|----------------|-----------------|
|                                                  | Metric         | English         |
| Valve Body Cover Removal - Approximate Capacity  | 5.0-7.0 liters | 5.3-7.4 quarts  |
| Fluid Change - Drain Plug - Approximate Capacity | 4.0-6.0 liters | 4.2- 6.3 quarts |
| Overhaul - Approximate Capacity                  | 8.0-8.5 liters | 8.5-9.0 quarts  |

## FLUID PUMP SELECTIVE SPECIFICATIONS

### Fluid Pump Selective Specifications

| Fluid Pump Body Pocket Depth |                  | Fluid Pump Gear Thickness |                  |
|------------------------------|------------------|---------------------------|------------------|
| Metric                       | English          | Metric                    | English          |
| 12.617-12.625 mm             | 0.4967-0.4970 in | 12.580-12.588 mm          | 0.4952-0.4955 in |
| 12.626-12.636 mm             | 0.4970-0.4974 in | 12.589-12.599 mm          | 0.4956-0.4960 in |
| 12.637-12.645 mm             | 0.4975-0.4978 in | 12.600-12.608 mm          | 0.4960-0.4963 in |

## CLUTCH & BAND APPLICATION

### Range Reference

| Range                     | Park     | Reverse | Neutral  | Drive       |         |         |         |         |         |         |
|---------------------------|----------|---------|----------|-------------|---------|---------|---------|---------|---------|---------|
|                           |          |         |          | 1st Braking | 1st     | 2nd     | 3rd     | 4th     | 5th     | 6th     |
| 1-2-3-4 Clutch            | -        | -       | -        | Applied     | Applied | Applied | Applied | Applied | -       | -       |
| 3-5 Reverse Clutch        | -        | Applied | -        | -           | -       | -       | Applied | -       | Applied | -       |
| 4-5-6 Clutch              | -        | -       | -        | -           | -       | -       | -       | Applied | Applied | Applied |
| 2-6 Clutch                | -        | -       | -        | -           | -       | Applied | -       | -       | -       | Applied |
| Low and Reverse Clutch    | Applied* | Applied | Applied* | Applied     | -       | -       | -       | -       | -       | -       |
| Low Clutch Assembly (OWL) | -        | -       | -        | Holding     | Holding | -       | -       | -       | -       | -       |

\* = Applied with NO load

## SHIFT SOLENOID VALVE STATE AND GEAR RATIO

### Shift Solenoid Valve State and Gear Ratio

| <b>Gear</b> | <b>Shift SOL 1</b> | <b>1-2-3-4 CL PC SOL 5 N.L.</b> | <b>2-6 CL PC SOL 4 N.L.</b> | <b>3-5 REV CL PC SOL 2 N.H.</b> | <b>LOW REV 4-5-6 CL PC SOL 3 N.H.</b> | <b>Gear Ratio 6T30</b> | <b>Gear Ratio 6T40/45/50</b> |
|-------------|--------------------|---------------------------------|-----------------------------|---------------------------------|---------------------------------------|------------------------|------------------------------|
| Park        | ON                 | OFF                             | OFF                         | OFF                             | ON                                    | -                      | -                            |
| Reverse     | ON                 | OFF                             | OFF                         | ON                              | ON                                    | 2.87                   | 2.940                        |
| Neutral     | ON                 | OFF                             | OFF                         | OFF                             | ON                                    | -                      | -                            |
| 1st Braking | ON                 | ON                              | OFF                         | OFF                             | ON                                    | 4.449                  | 4.584                        |
| 1st         | OFF                | ON                              | OFF                         | OFF                             | OFF                                   | 4.449                  | 4.584                        |
| 2nd         | OFF                | ON                              | ON                          | OFF                             | OFF                                   | 2.908                  | 2.964                        |
| 3rd         | OFF                | ON                              | OFF                         | ON                              | OFF                                   | 1.893                  | 1.912                        |
| 4th         | OFF                | ON                              | OFF                         | OFF                             | ON                                    | 1.446                  | 1.446                        |
| 5th         | OFF                | OFF                             | OFF                         | ON                              | ON                                    | 1.000                  | 1.000                        |
| 6th         | OFF                | OFF                             | ON                          | OFF                             | ON                                    | 0.742                  | 0.746                        |

For shift solenoid 1, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure).

For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure

## TRANSMISSION FLUID PRESSURE SWITCH LOGIC

### Transmission Fluid Pressure Switch Logic

| <b>Gear</b>                | <b>Transmission Fluid Pressure Switch States</b> |                  |                 |                 |
|----------------------------|--------------------------------------------------|------------------|-----------------|-----------------|
|                            | <b>Switch 1</b>                                  | <b>*Switch 3</b> | <b>Switch 4</b> | <b>Switch 5</b> |
| Park                       | Low                                              | Low              | Low             | Low             |
| Reverse                    | Low                                              | Low              | Low             | Low             |
| Neutral                    | Low                                              | Low              | Low             | Low             |
| Drive 1st - Engine Braking | Low                                              | High             | Low             | Low             |
| Drive 1st                  | High                                             | High             | Low             | High            |
| Drive 2nd                  | High                                             | Low              | Low             | High            |
| Drive 3rd                  | Low                                              | High             | Low             | High            |
| Drive 4th                  | High                                             | High             | Low             | Low             |
| Drive 5th                  | Low                                              | High             | High            | Low             |
| Drive 6th                  | High                                             | Low              | High            | Low             |

High = 12V (Switch Open or Pressurized)

Low = 0V (Switch Closed or No Pressure)

Note: All transmission fluid pressure switches are normally closed (NC)

\*Transmission fluid pressure switch 2 does not exist

## TRANSMISSION INTERNAL MODE SWITCH LOGIC

### Transmission Internal Mode Switch Logic

| <b>Gear Selector Position</b> | <b>Signal A</b> | <b>Signal B</b> | <b>Signal C</b> | <b>Signal P</b> |
|-------------------------------|-----------------|-----------------|-----------------|-----------------|
|                               |                 |                 |                 |                 |

|                 |     |     |     |     |
|-----------------|-----|-----|-----|-----|
| Park            | LOW | HI  | HI  | LOW |
| Park/Reverse    | LOW | LOW | HI  | LOW |
| Reverse         | LOW | LOW | HI  | HI  |
| Reverse/Neutral | HI  | LOW | HI  | HI  |
| Neutral         | HI  | LOW | HI  | LOW |
| Neutral/Drive 6 | HI  | LOW | LOW | LOW |
| Drive 6         | HI  | LOW | LOW | HI  |
| Drive 6/Drive 4 | LOW | LOW | LOW | HI  |
| Drive 4         | LOW | LOW | LOW | LOW |
| Drive 4/Drive 3 | LOW | HI  | LOW | LOW |
| Drive 3         | LOW | HI  | LOW | HI  |
| Drive 3/Drive 2 | HI  | HI  | LOW | HI  |
| Drive 2         | HI  | HI  | LOW | LOW |
| Open            | HI  | HI  | HI  | HI  |
| Invalid         | HI  | HI  | HI  | LOW |
| Invalid         | LOW | HI  | HI  | HI  |

HI = Ignition voltage  
LOW = 0 volts

## SOLENOID VALVE PRESSURE (GEN 1)

### Line PC Solenoid Valve Pressure

| Requested Pressure (kPa) | Actual Pressure |             |
|--------------------------|-----------------|-------------|
|                          | Metric          | English     |
| None                     | 345-550 kPa     | 50-80 psi   |
| 200                      | 690-900 kPa     | 100-130 psi |
| 400                      | 1100-1310 kPa   | 160-190 psi |
| 600                      | 1520-1725 kPa   | 220-250 psi |
| 800                      | 1860-2275 kPa   | 270-330 psi |
| 1000                     | 1860-2275 kPa   | 270-330 psi |
| 1200                     | 1860-2275 kPa   | 270-330 psi |
| 1400                     | 1860-2275 kPa   | 270-330 psi |
| 1600                     | 1860-2275 kPa   | 270-330 psi |
| 1800                     | 1860-2275 kPa   | 270-330 psi |
| 2000                     | 1860-2275 kPa   | 270-330 psi |

## SOLENOID VALVE PRESSURE (GEN 2)

### Line PC Solenoid Valve Pressure

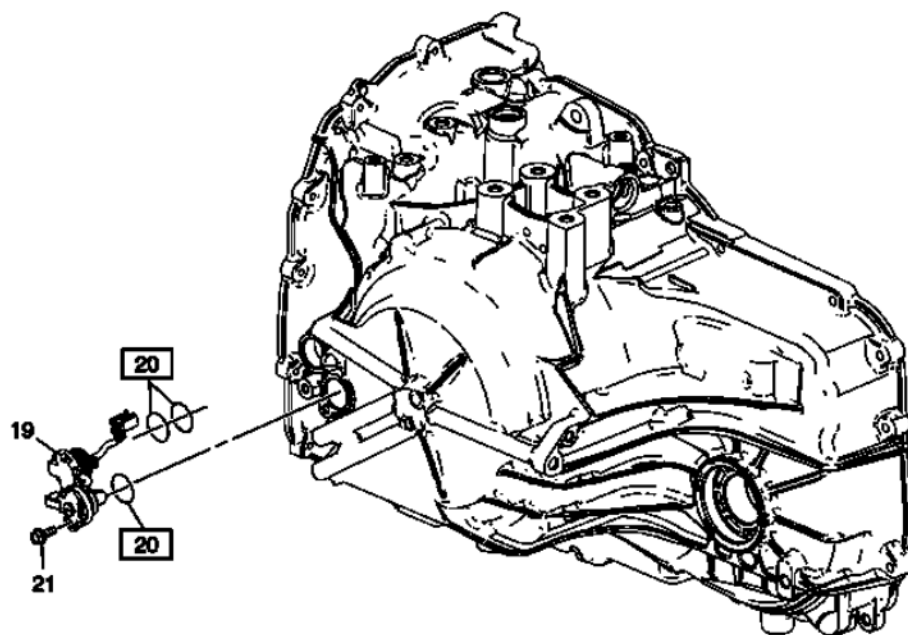
| Requested Pressure (kPa) | Actual Pressure |           |
|--------------------------|-----------------|-----------|
|                          | Metric          | English   |
| None                     | 172-379 kPa     | 25-55 psi |



|      |               |             |
|------|---------------|-------------|
| 200  | 662-869 kPa   | 96-126 psi  |
| 400  | 1145-1351 kPa | 166-196 psi |
| 600  | 1634-1841 kPa | 237-267 psi |
| 800  | 2117-2324 kPa | 307-337 psi |
| 1000 | 2117-2324 kPa | 307-337 psi |
| 1200 | 2117-2324 kPa | 307-337 psi |
| 1400 | 2117-2324 kPa | 307-337 psi |
| 1600 | 2117-2324 kPa | 307-337 psi |
| 1800 | 2117-2324 kPa | 307-337 psi |

## TRANSMISSION PARTS KIT SPECIFICATIONS

A/Trans Seal Kit (Gen 1& 2) 24251028



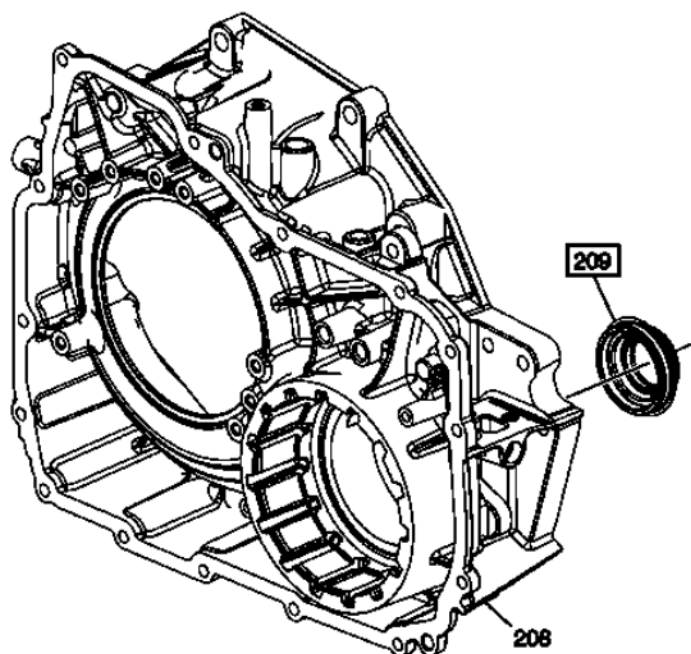
**Fig. 1: Automatic Trans Seal Kit (Gen 1 And 2) 24251028**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
 Callouts without boxes are shown for relationship purposes only.

A/Trans Seal Kit (Gen 1& 2) 24251028

| Callout | Quantity | Component Name                                  |
|---------|----------|-------------------------------------------------|
| 20      | 3        | A/Trans Input Speed Sensor Assembly O-Ring Seal |

## Front Wheel Seal Kit (Gen 1& 2) 19258415



**Fig. 2: Front Wheel Seal Kit (Gen 1 And 2) 19258415**

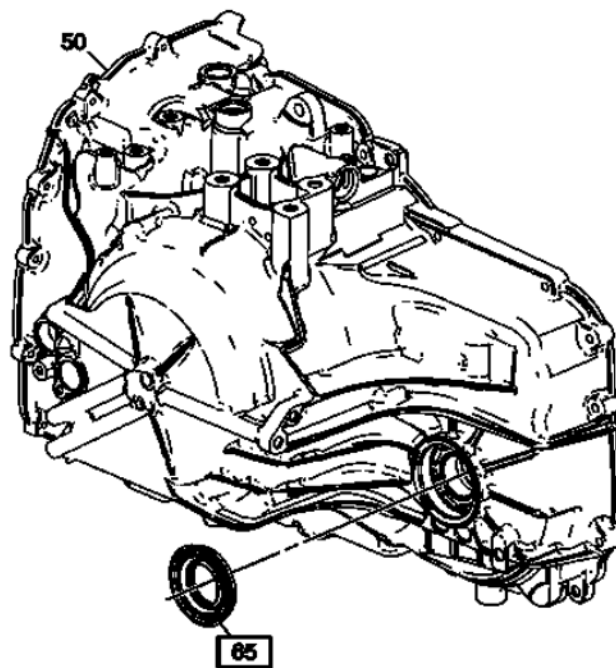
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
Callouts without boxes are shown for relationship purposes only.

### Front Wheel Seal Kit (Gen 1& 2) 19258415

| Callout | Quantity | Component Name                            |
|---------|----------|-------------------------------------------|
| 209     | 1        | Front Wheel Drive Shaft Oil Seal Assembly |

### Front Wheel Seal Kit (Gen 1& 2) 19258416



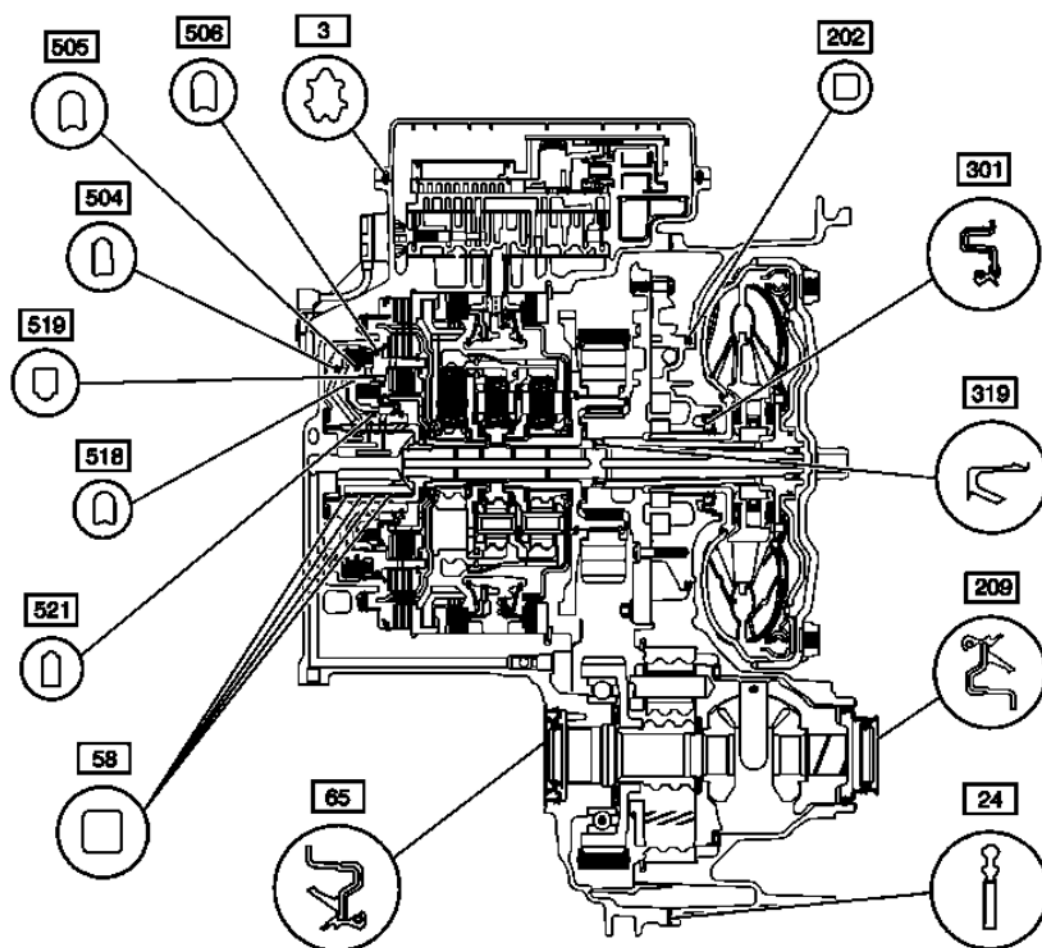
**Fig. 3: Front Wheel Seal Kit (Gen 1 And 2) 19258416**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
 Callouts without boxes are shown for relationship purposes only.

**Front Wheel Seal Kit (Gen 1& 2) 19258416**

| Callout | Quantity | Component Name                |
|---------|----------|-------------------------------|
| 65      | 1        | Drive Shaft Oil Seal Assembly |

**A/Trans Seal Kit (Gen 1) 24251353 (1 of 2)**



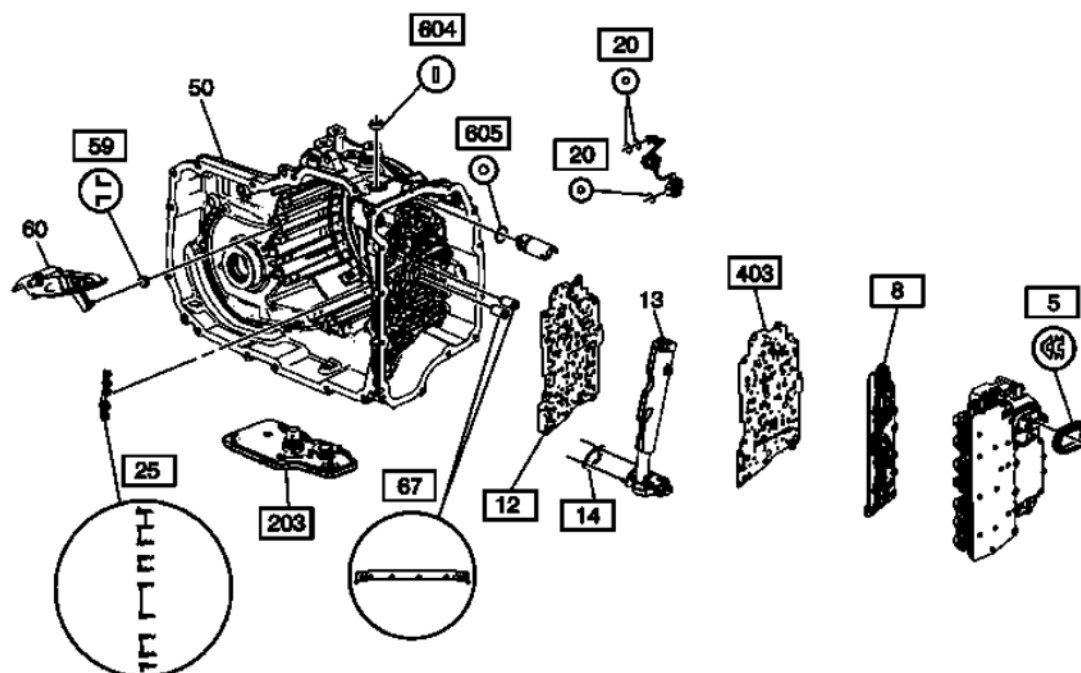
**Fig. 4: Automatic Trans Seal Kit (Gen 1) 24251353 (1 Of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

**A/Trans Seal Kit (Gen 1) 24251353 (1 of 2)**

| Callout | Quantity | Component Name                                 |
|---------|----------|------------------------------------------------|
| 3       | 1        | Control Valve Body Cover Gasket                |
| 24      | 1        | Torque Converter Housing Gasket                |
| 58      | 4        | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring   |
| 65      | 1        | Drive Shaft Oil Seal Assembly                  |
| 202     | 1        | Torque Converter and Differential Housing Seal |
| 209     | 1        | Front Wheel Drive Shaft Oil Seal Assembly      |
| 301     | 1        | Torque Converter Fluid Seal Assembly           |
| 319     | 1        | Torque Converter Fluid Seal Assembly           |
| 504     | 1        | 3-5-Reverse Clutch Piston Inner Seal           |
| 505     | 1        | 3-5-Reverse Clutch Piston Inner Seal           |
| 506     | 1        | 3-5-Reverse Clutch Piston Dam Seal             |
| 518     | 1        | 4-5-6 Clutch Piston Outer Seal                 |

|     |   |                                |
|-----|---|--------------------------------|
| 519 | 1 | 4-5-6 Clutch Piston Outer Seal |
| 521 | 1 | 4-5-6 Clutch Piston Inner Seal |

# A/Trans Seal Kit (Gen 1) 24251353 (2 of 2)



**Fig. 5: Automatic Trans Seal Kit (Gen 1) 24251353 (2 Of 2)**

Courtesy of GENERAL MOTORS COMPANY

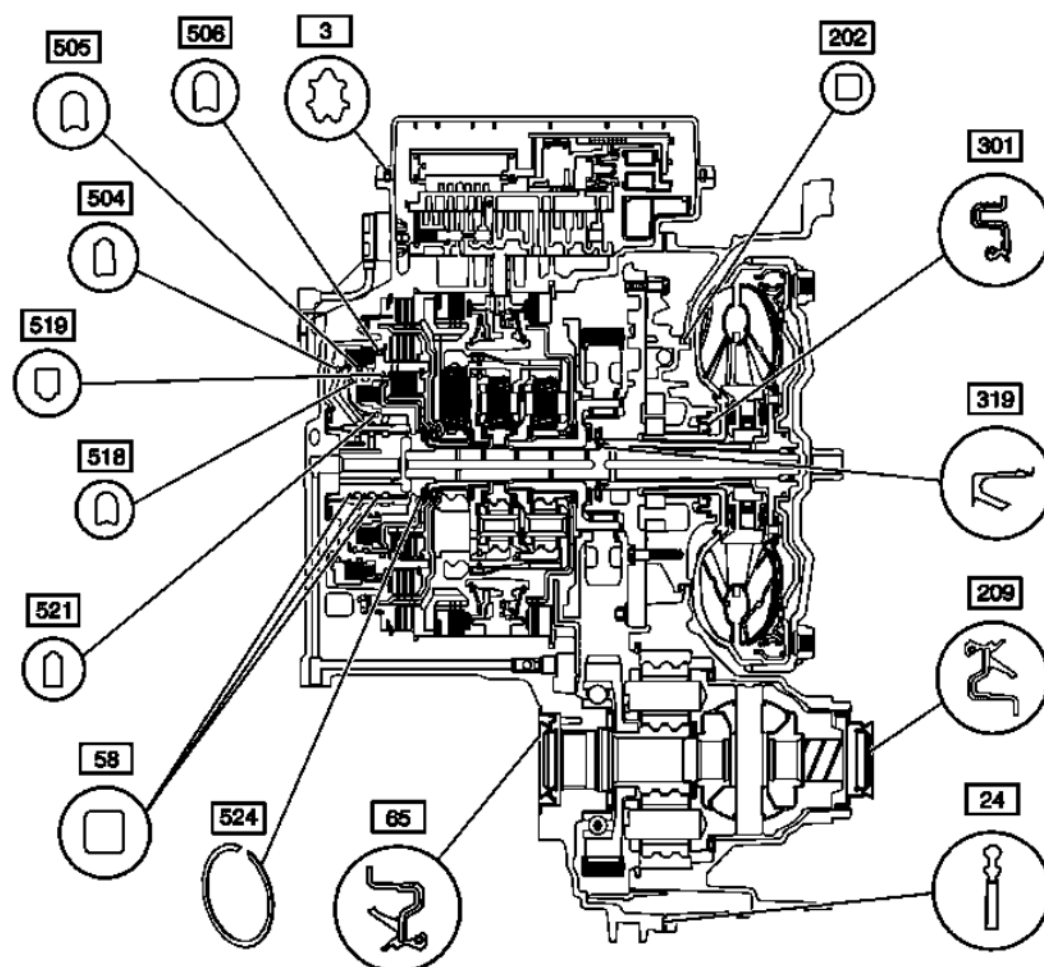
**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

# A/Trans Seal Kit (Gen 1) 24251353 (2 of 2)

| Callout | Quantity | Component Name                                    |
|---------|----------|---------------------------------------------------|
| 5       | 1        | Control Valve Body Cover Hole Seal                |
| 8       | 1        | Control Valve Body Filter Plate Assembly          |
| 12      | 1        | Control Valve Body Spacer Plate Assembly          |
| 14      | 1        | A/Trans Fluid Level Control Valve Gasket          |
| 20      | 3        | A/Trans Input Speed Sensor Assembly O-Ring Seal   |
| 25      | 1        | A/Trans Fluid Pump Seal Assembly                  |
| 59      | 1        | Drive Link Lube Fluid Seal                        |
| 67      | 1        | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 203     | 1        | A/Trans Fluid Filter Assembly                     |

|     |   |                                                   |
|-----|---|---------------------------------------------------|
| 403 | 1 | Channel Plate to Valve Body Spacer Plate Assembly |
| 604 | 1 | Manual Shift Shaft Seal                           |
| 605 | 1 | Park Pawl Actuator Guide Seal                     |

#### A/Trans Seal Kit (Gen 2) 24260603 (1 of 2)



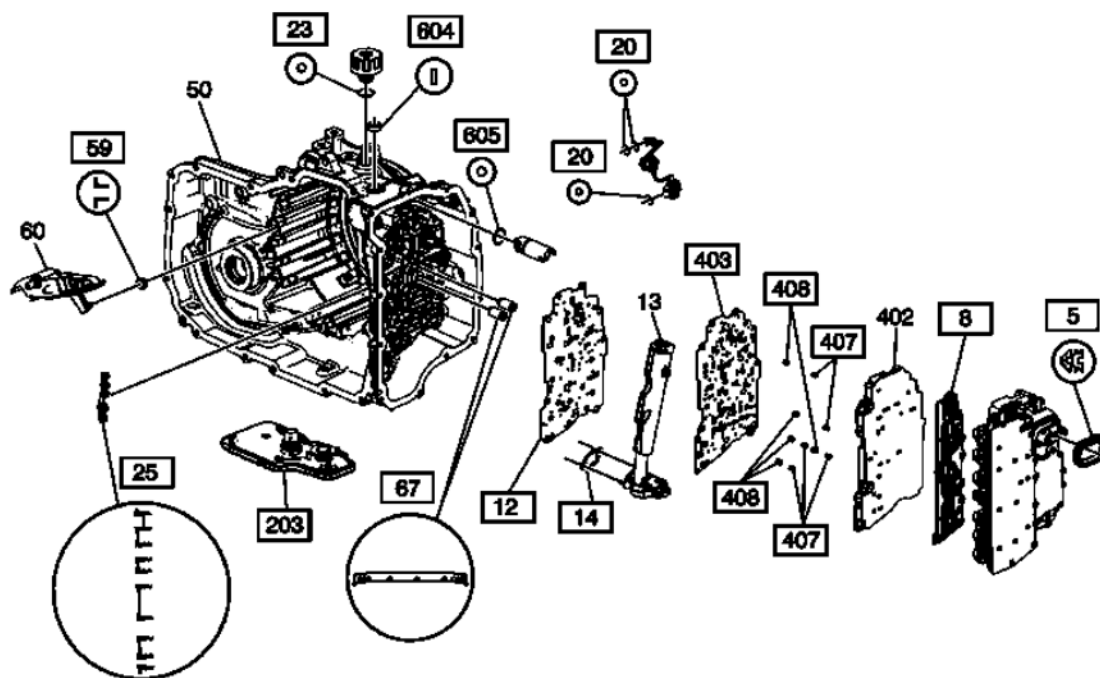
**Fig. 6: Automatic Trans Seal Kit (Gen 2) 24260603 (1 Of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

#### A/Trans Seal Kit (Gen 2) 24260603 (1 of 2)

| Callout | Quantity | Component Name                                 |
|---------|----------|------------------------------------------------|
| 3       | 1        | Control Valve Body Cover Gasket                |
| 24      | 1        | Torque Converter Housing Gasket                |
| 58      | 3        | 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring   |
| 65      | 1        | Drive Shaft Oil Seal Assembly                  |
| 202     | 1        | Torque Converter and Differential Housing Seal |
| 209     | 1        | Front Wheel Drive Shaft Oil Seal Assembly      |

|     |   |                                             |
|-----|---|---------------------------------------------|
| 301 | 1 | Torque Converter Fluid Seal Assembly        |
| 319 | 1 | Torque Converter Fluid Seal Assembly        |
| 504 | 1 | 3-5-Reverse Clutch Piston Inner Seal        |
| 505 | 1 | 3-5-Reverse Clutch Piston Inner Seal        |
| 506 | 1 | 3-5-Reverse Clutch Piston Dam Seal          |
| 518 | 1 | 4-5-6 Clutch Piston Outer Seal              |
| 519 | 1 | 4-5-6 Clutch Piston Outer Seal              |
| 521 | 1 | 4-5-6 Clutch Piston Inner Seal              |
| 524 | 1 | 4-5-6 Clutch Piston Fluid Dam Retainer Ring |

#### A/Trans Seal Kit (Gen 2) 24260603 (2 of 2)



**Fig. 7: Automatic Trans Seal Kit (Gen 2) 24260603 (2 Of 2)**

Courtesy of GENERAL MOTORS COMPANY

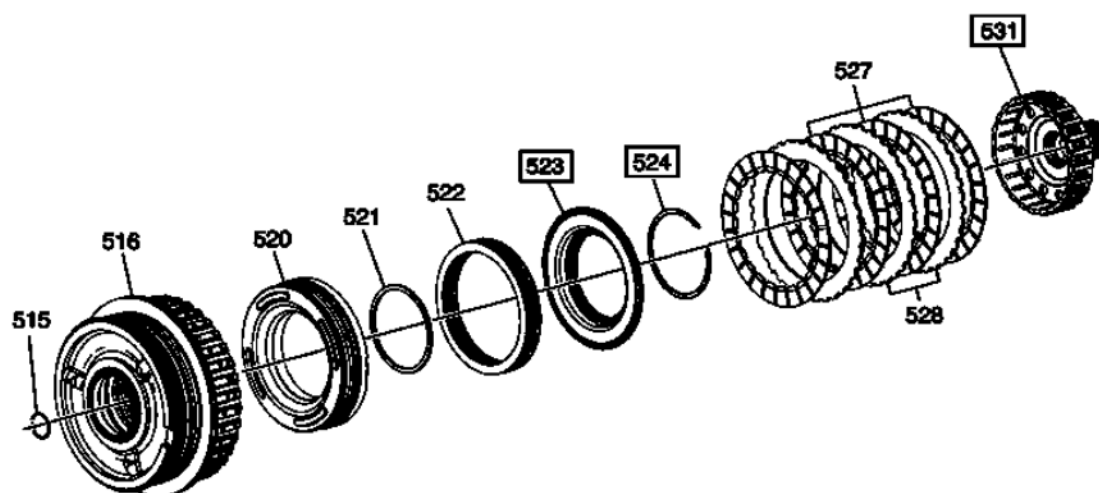
**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

#### A/Trans Seal Kit (Gen 2) 24260603 (2 of 2)

| Callout | Quantity | Component Name                           |
|---------|----------|------------------------------------------|
| 5       | 1        | Control Valve Body Cover Hole Seal       |
| 8       | 1        | Control Valve Body Filter Plate Assembly |
| 12      | 1        | Control Valve Body Spacer Plate Assembly |
| 14      | 1        | A/Trans Fluid Level Control Valve Gasket |

|     |   |                                                   |
|-----|---|---------------------------------------------------|
| 20  | 3 | A/Trans Input Speed Sensor Assembly O-Ring Seal   |
| 23  | 1 | Fill Cap Seal                                     |
| 25  | 1 | A/Trans Fluid Pump Seal Assembly                  |
| 59  | 1 | Drive Link Lube Fluid Seal                        |
| 67  | 1 | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 203 | 1 | A/Trans Fluid Filter Assembly                     |
| 403 | 1 | Channel Plate to Valve Body Spacer Plate Assembly |
| 407 | 5 | Actuator Feed Accumulator Spring                  |
| 408 | 5 | Actuator Feed Accumulator Piston                  |
| 604 | 1 | Manual Shift Shaft Seal                           |
| 605 | 1 | Park Pawl Actuator Guide Seal                     |

#### Transmission Kit (Gen 1) 24260701



**Fig. 8: Transmission Kit (Gen 1) 24260701**  
Courtesy of GENERAL MOTORS COMPANY

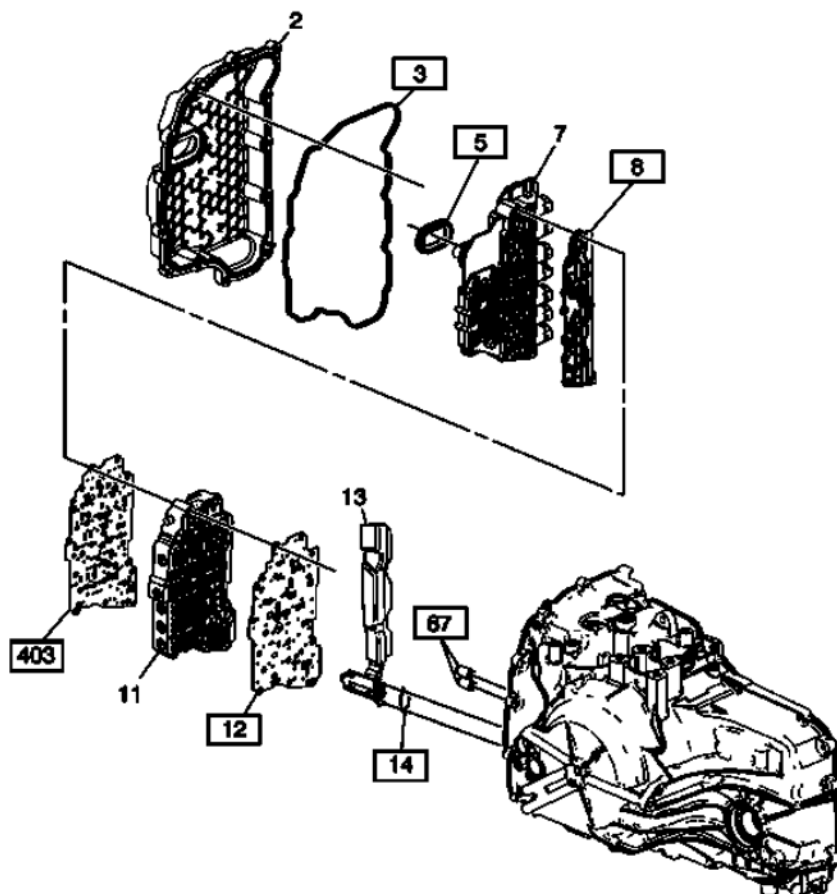
**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
Callouts without boxes are shown for relationship purposes only.

#### Transmission Kit (Gen 1) 24260701



| Callout | Quantity | Component Name                              |
|---------|----------|---------------------------------------------|
| 523     | 1        | 4-5-6 Clutch Piston Fluid Dam Assembly      |
| 524     | 1        | 4-5-6 Clutch Piston Fluid Dam Retainer Ring |
| 531     | 1        | Reaction Carrier Hub Assembly               |

#### Control Valve Body Kit (Gen 1) 24248473



**Fig. 9: Control Valve Body Kit (Gen 1) 24248473**

Courtesy of GENERAL MOTORS COMPANY

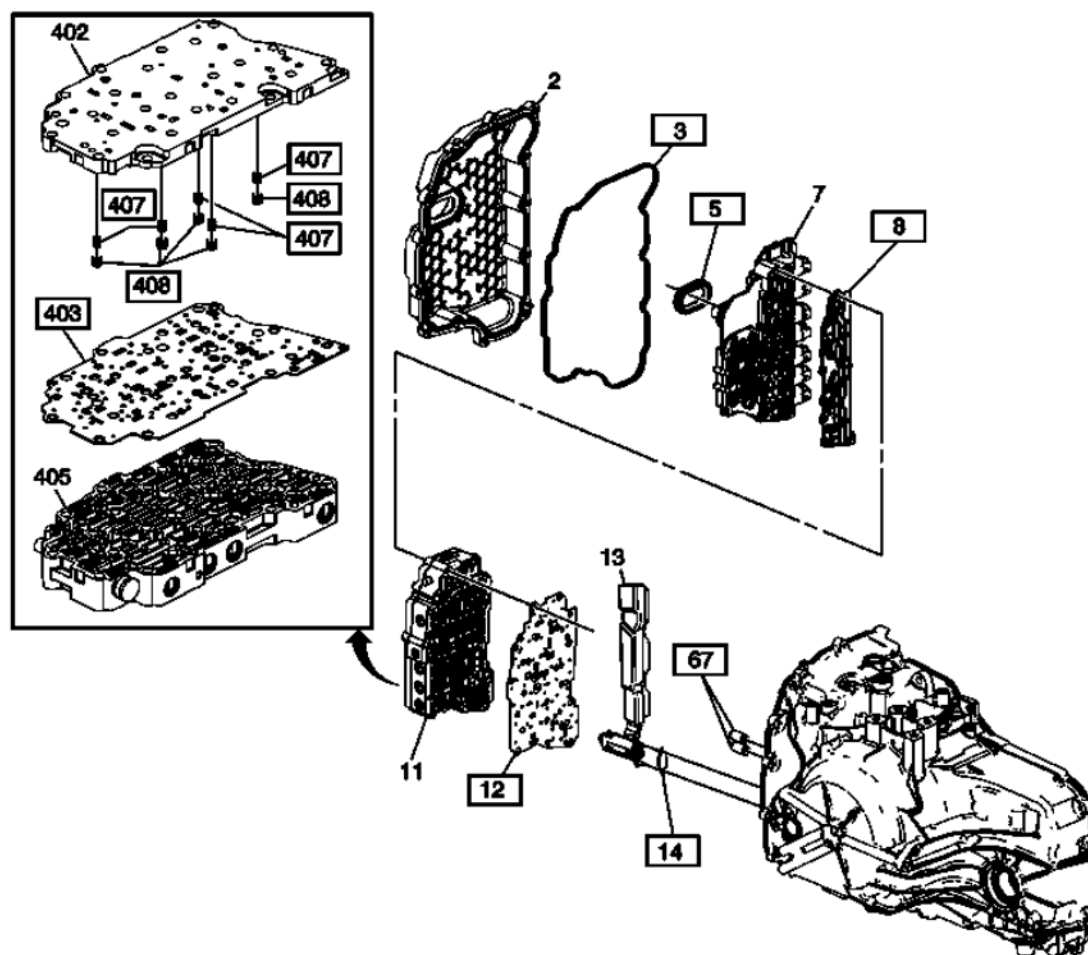
**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

#### Control Valve Body Kit (Gen 1) 24248473

| Callout | Quantity | Component Name                           |
|---------|----------|------------------------------------------|
| 3       | 1        | Control Valve Body Cover Gasket          |
| 5       | 1        | Control Valve Body Cover Hole Seal       |
| 8       | 1        | Control Valve Body Filter Plate Assembly |

|     |   |                                                   |
|-----|---|---------------------------------------------------|
| 12  | 1 | Control Valve Body Spacer Plate Assembly          |
| 14  | 1 | A/Trans Fluid Level Control Valve Gasket          |
| 67  | 2 | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 403 | 1 | Channel Plate to Valve Body Spacer Plate Assembly |

#### Control Valve Body Kit (Gen 2) 24260702



**Fig. 10: Control Valve Body Kit (Gen 2) 24260702**

Courtesy of GENERAL MOTORS COMPANY

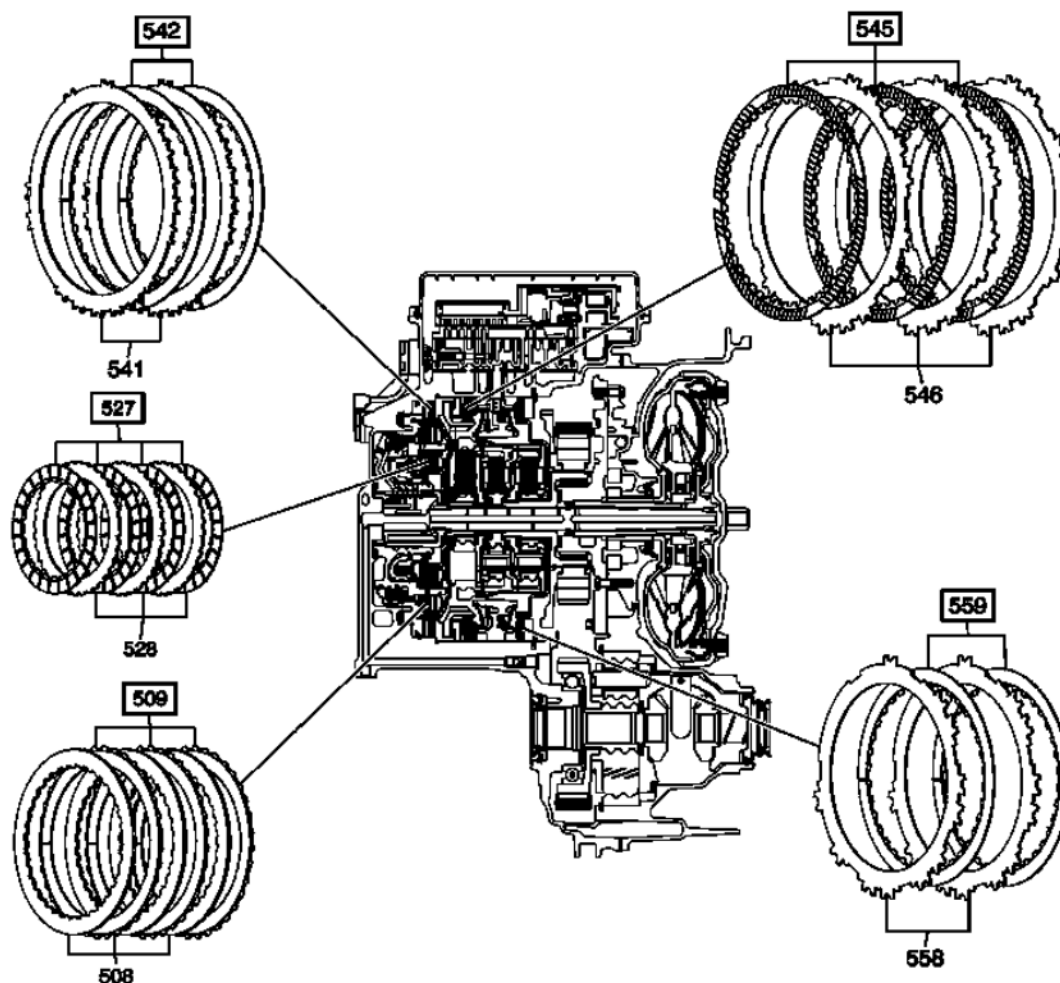
**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

#### Control Valve Body Kit (Gen 2) 24260702

| Callout | Quantity | Component Name                  |
|---------|----------|---------------------------------|
| 3       | 1        | Control Valve Body Cover Gasket |

|     |   |                                                   |
|-----|---|---------------------------------------------------|
| 5   | 1 | Control Valve Body Cover Hole Seal                |
| 8   | 1 | Control Valve Body Filter Plate Assembly          |
| 12  | 1 | Control Valve Body Spacer Plate Assembly          |
| 14  | 1 | A/Trans Fluid Level Control Valve Gasket          |
| 67  | 2 | 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal |
| 403 | 1 | Channel Plate to Valve Body Spacer Plate Assembly |
| 407 | 5 | Actuator Feed Accumulator Spring                  |
| 408 | 5 | Actuator Feed Accumulator Piston                  |

#### Clutch Plate Package (Gen 1) 24249460



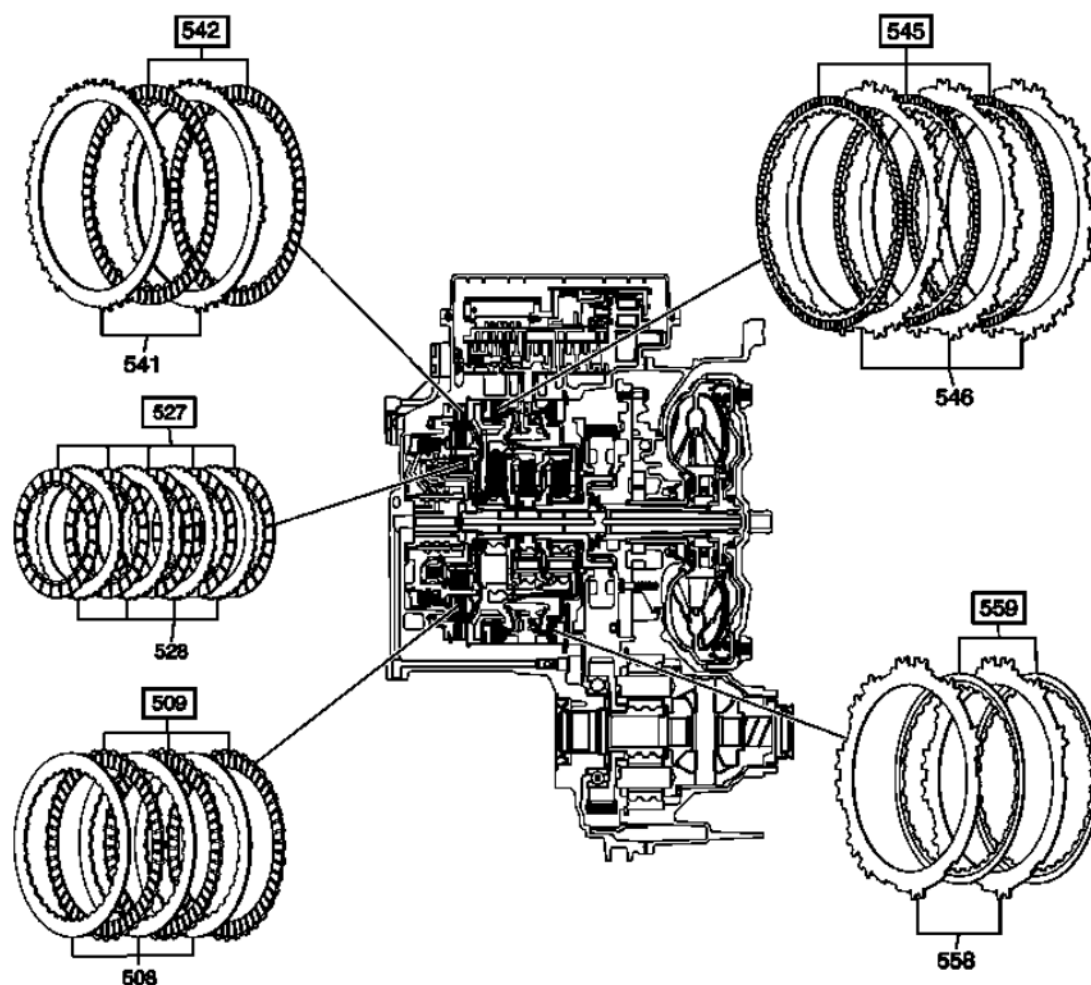
**Fig. 11: Clutch Plate Package (Gen 1) 24249460**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
 Callouts without boxes are shown for relationship purposes only.

### Clutch Plate Package (Gen 1) 24249460

| Callout | Quantity | Component Name                                              |
|---------|----------|-------------------------------------------------------------|
| 509     | 3        | 3-5 Reverse Clutch (w/Friction Material) Plate Assembly     |
| 527     | 4        | 4-5-6 Clutch (w/Friction Material) Plate Assembly           |
| 542     | 2        | 2-6 Clutch (w/Friction Material) Plate Assembly             |
| 545     | 3        | Low and Reverse Clutch (w/Friction Material) Plate Assembly |
| 559     | 2        | 1-2-3-4 Clutch (w/Friction Material) Plate Assembly         |

### Clutch Plate Package (Gen 2) 24260695



**Fig. 12: Clutch Plate Package (Gen 2) 24260695**

Courtesy of GENERAL MOTORS COMPANY

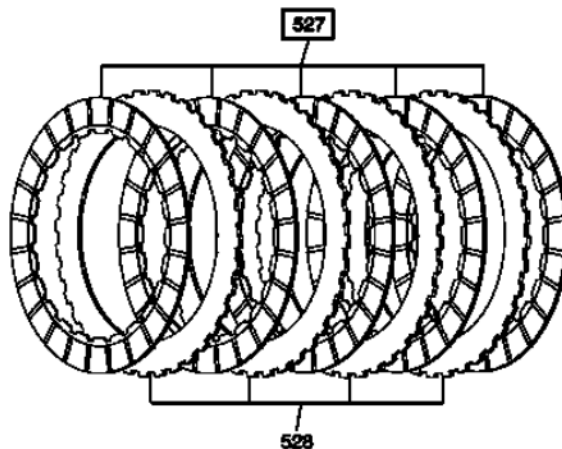
**NOTE:** Callouts with boxes around them indicate part is included in the service kit.

Callouts without boxes are shown for relationship purposes only.

#### Clutch Plate Package (Gen 2) 24260695

| Callout | Quantity | Component Name                                              |
|---------|----------|-------------------------------------------------------------|
| 509     | 3        | 3-5 Reverse Clutch (w/Friction Material) Plate Assembly     |
| 527     | 5        | 4-5-6 Clutch (w/Friction Material) Plate Assembly           |
| 542     | 2        | 2-6 Clutch (w/Friction Material) Plate Assembly             |
| 545     | 3        | Low and Reverse Clutch (w/Friction Material) Plate Assembly |
| 559     | 2        | 1-2-3-4 Clutch (w/Friction Material) Plate Assembly         |

#### 4-5-6 Plate Assembly (Gen 2) 24260700



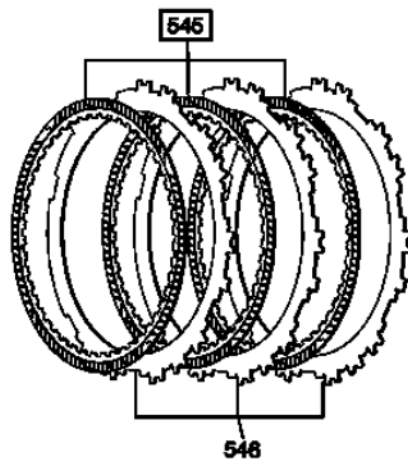
**Fig. 13: 4-5-6 Plate Assembly (Gen 2) 24260700**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
Callouts without boxes are shown for relationship purposes only.

#### 4-5-6 Plate Assembly (Gen 2) 24260700

| Callout | Quantity | Component Name                                    |
|---------|----------|---------------------------------------------------|
| 527     | 5        | 4-5-6 Clutch (w/Friction Material) Plate Assembly |

#### Low and Reverse Plate Assembly (Gen 2) 24260696



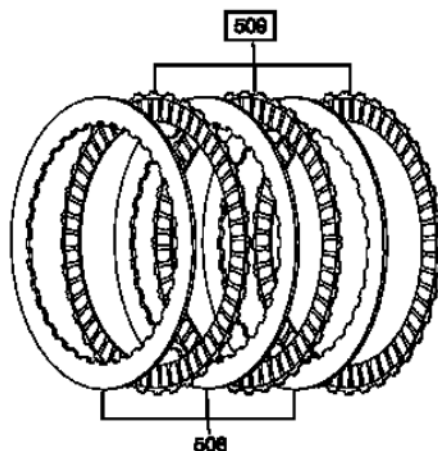
**Fig. 14: Low And Reverse Plate Assembly (Gen 2) 24260696**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

**Low and Reverse Plate Assembly (Gen 2) 24260696**

| Callout | Quantity | Component Name                                              |
|---------|----------|-------------------------------------------------------------|
| 545     | 3        | Low and Reverse Clutch (w/Friction Material) Plate Assembly |

**3-5 Reverse Plate Assembly (Gen 2) 24260697**



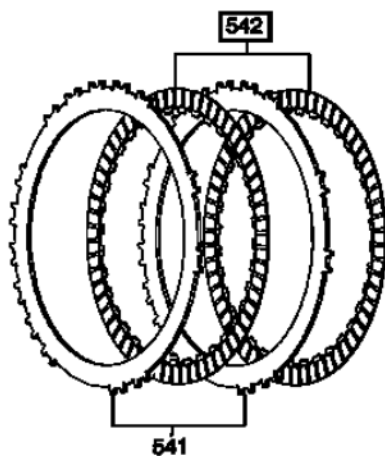
**Fig. 15: 3-5 Reverse Plate Assembly (Gen 2) 24260697**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

### 3-5 Reverse Plate Assembly (Gen 2) 24260697

| Callout | Quantity | Component Name                                          |
|---------|----------|---------------------------------------------------------|
| 509     | 3        | 3-5 Reverse Clutch (w/Friction Material) Plate Assembly |

### 2-6 Plate Assembly (Gen 2) 24260698



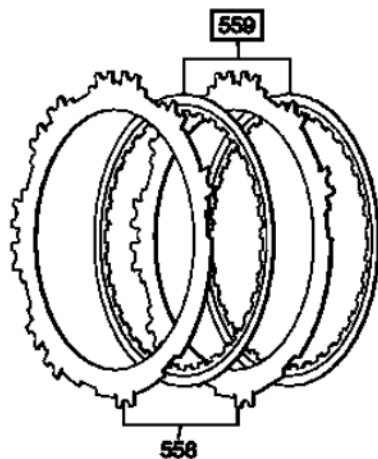
**Fig. 16: 2-6 Plate Assembly (Gen 2) 24260698**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

### 2-6 Plate Assembly (Gen 2) 24260698

| Callout | Quantity | Component Name                                  |
|---------|----------|-------------------------------------------------|
| 542     | 2        | 2-6 Clutch (w/Friction Material) Plate Assembly |

### 1-2-3-4 Plate Assembly (Gen 2) 24260699



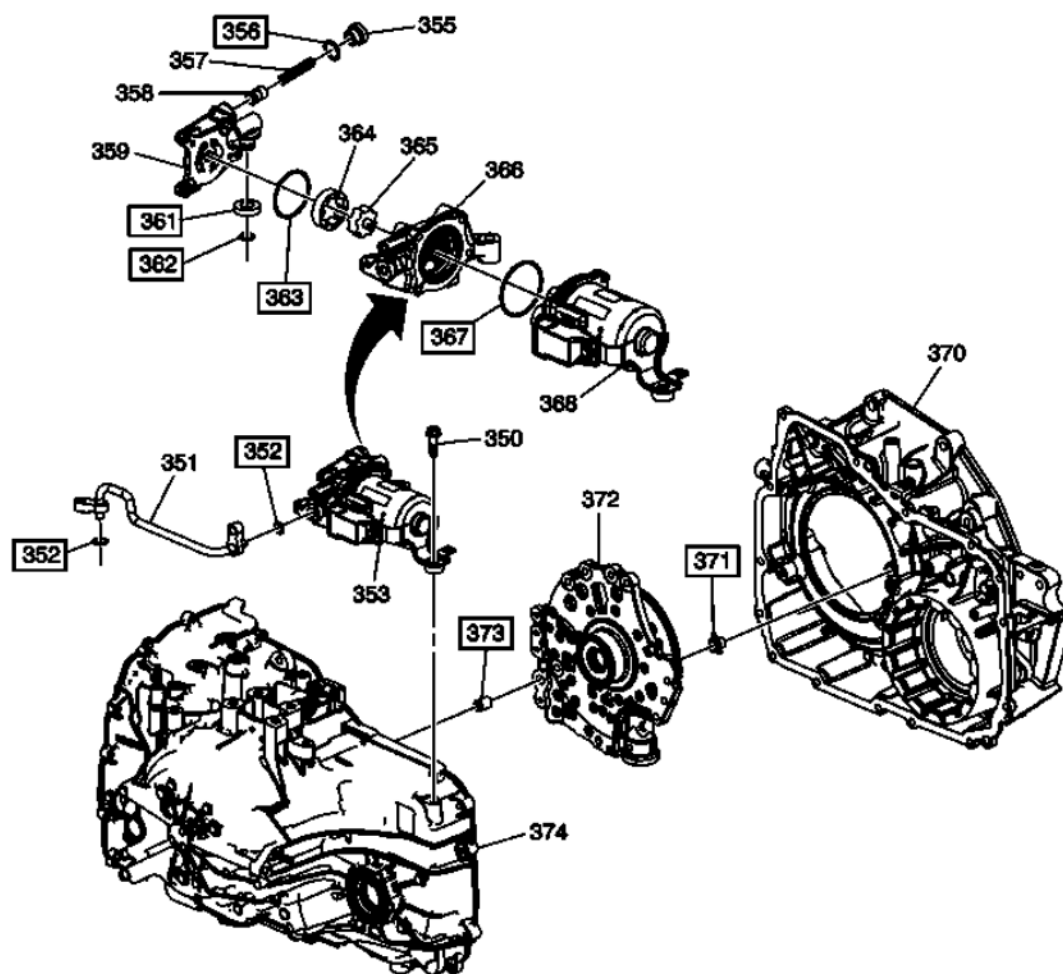
**Fig. 17: 1-2-3-4 Plate Assembly (Gen 2) 24260699**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
 Callouts without boxes are shown for relationship purposes only.

**1-2-3-4 Plate Assembly (Gen 2) 24260699**

| Callout | Quantity | Component Name                                      |
|---------|----------|-----------------------------------------------------|
| 559     | 2        | 1-2-3-4 Clutch (w/Friction Material) Plate Assembly |

**A/Trans Seal Kit (Gen 2) 24260704**



**Fig. 18: Automatic Trans Seal Kit (Gen 2) 24260704**  
 Courtesy of GENERAL MOTORS COMPANY

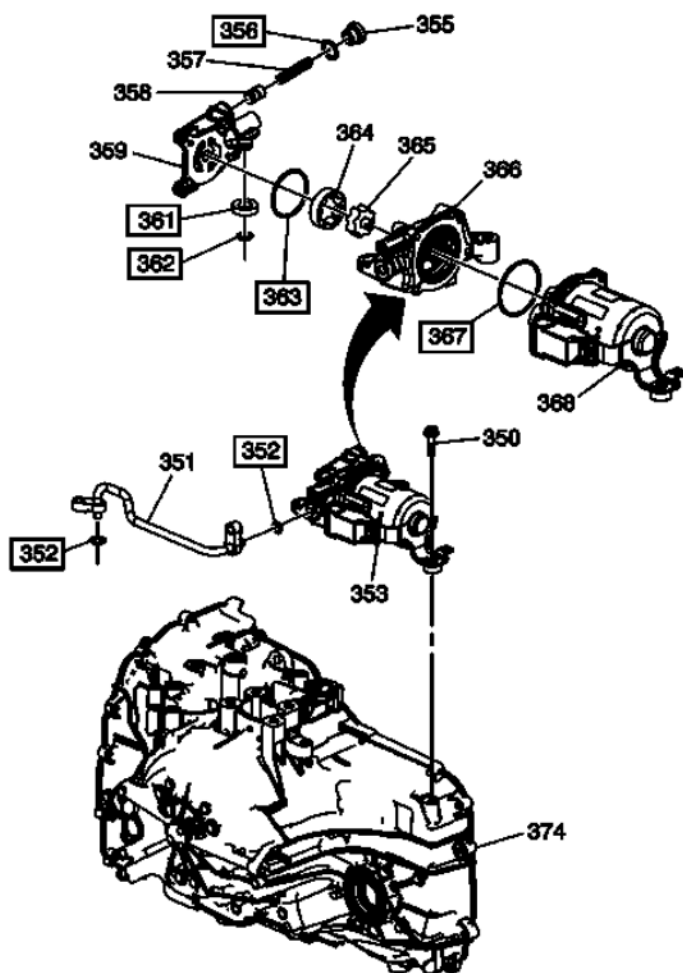
**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
 Callouts without boxes are shown for relationship purposes only.



### A/Trans Seal Kit (Gen 2) 24260704

| Callout | Quantity | Component Name                                         |
|---------|----------|--------------------------------------------------------|
| 352     | 2        | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly |
| 356     | 1        | Pressure Regulator Valve Spring Spacer                 |
| 361     | 1        | A/Trans Auxiliary Fluid Pump Gasket                    |
| 362     | 1        | A/Trans Auxiliary Fluid Pump Seal                      |
| 363     | 1        | A/Trans Auxiliary Fluid Pump Cover Seal                |
| 367     | 1        | A/Trans Auxiliary Fluid Pump Motor Cover Seal- O-Ring  |
| 371     | 1        | A/Trans Auxiliary Fluid Inlet Pump Seal                |
| 373     | 1        | A/Trans Fluid Trough Check Ball                        |

### A/Trans Auxiliary Seal Kit (Gen 2) 24260705



**Fig. 19: Automatic Trans Auxiliary Seal Kit (Gen 2) 24260705**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** Callouts with boxes around them indicate part is included in the service kit.  
Callouts without boxes are shown for relationship purposes only.

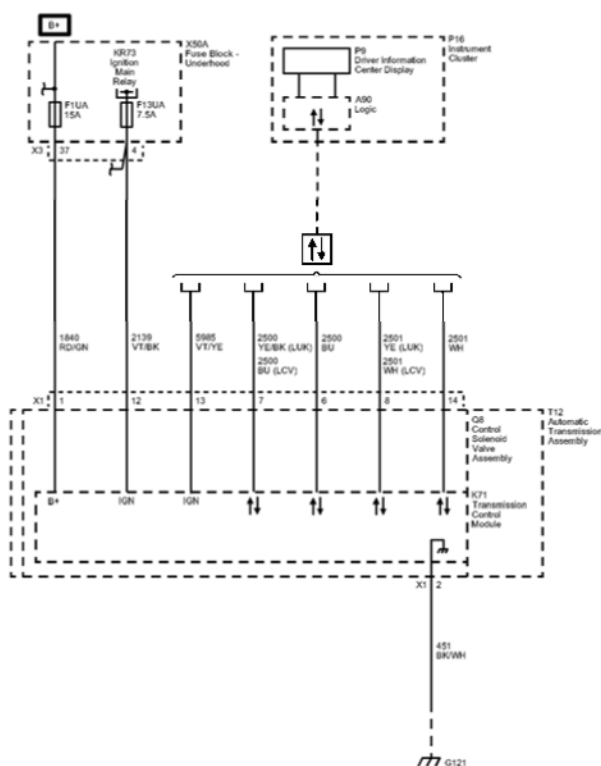
**A/Trans Auxiliary Seal Kit (Gen 2) 24260705**

| Callout | Quantity | Component Name                                         |
|---------|----------|--------------------------------------------------------|
| 352     | 2        | A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly |
| 356     | 1        | Pressure Regulator Valve Spring Spacer                 |
| 361     | 1        | A/Trans Auxiliary Fluid Pump Gasket                    |
| 362     | 1        | A/Trans Auxiliary Fluid Pump Seal                      |
| 363     | 1        | A/Trans Auxiliary Fluid Pump Cover Seal                |
| 367     | 1        | A/Trans Auxiliary Fluid Pump Motor Cover Seal- O-Ring  |

## Automatic Transmission - 6T40 (MH8, MHH) - Schematic and Routing Diagrams - Automatic Transmission Controls Schematics - Malibu

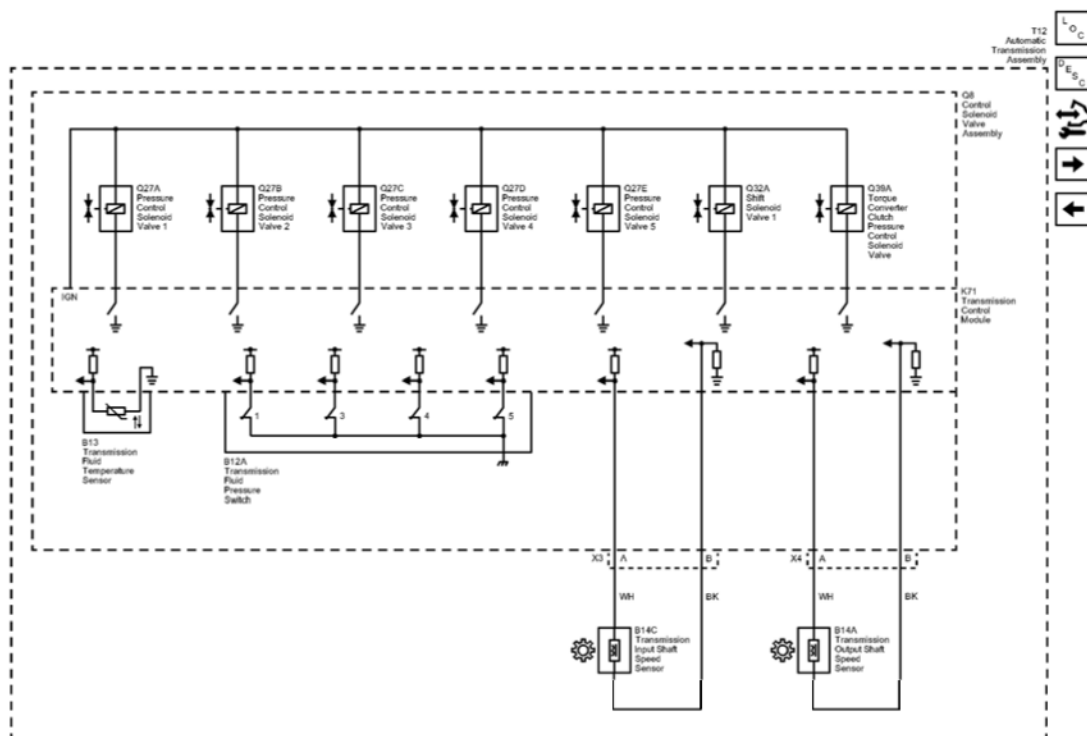
## AUTOMATIC TRANSMISSION CONTROLS WIRING SCHEMATICS

## Module Power, Ground, Serial Data, and MIL Wiring Schematics



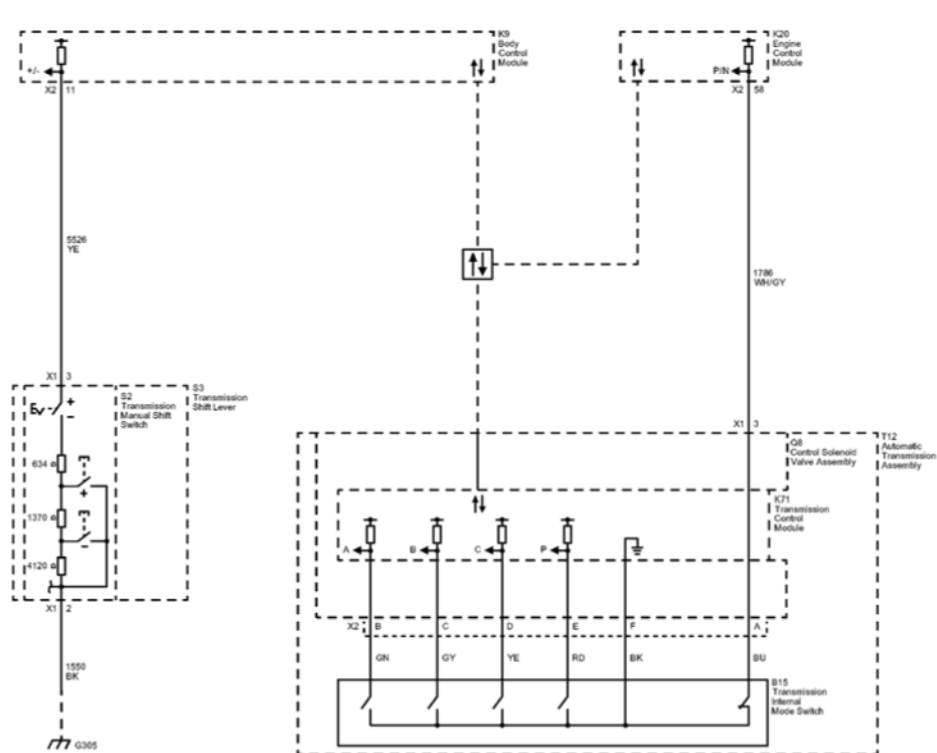
**Fig. 1: Module Power, Ground, Serial Data, and MIL Wiring Schematics**  
**Courtesy of GENERAL MOTORS COMPANY**

## Speed and Temperature Sensors, Valve Position, Pressure and Shift Controls Wiring Schematics



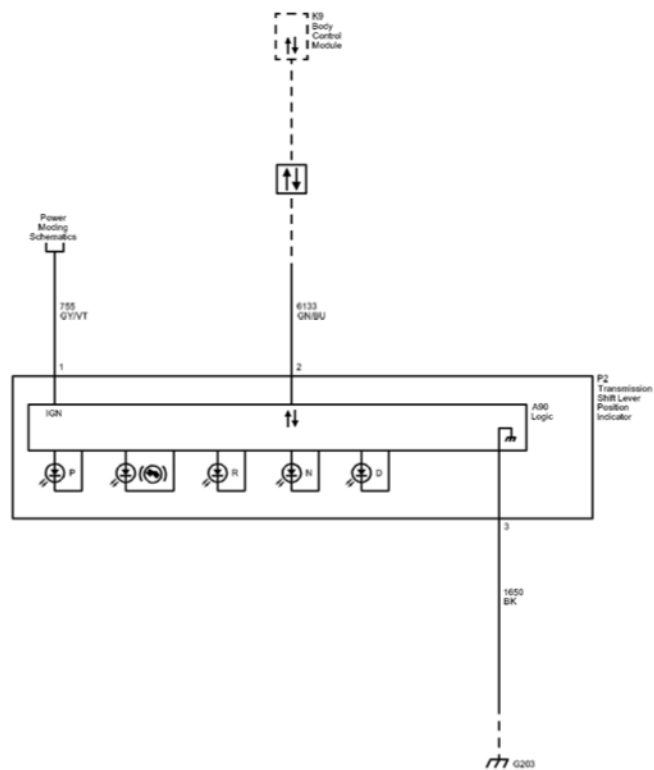
**Fig. 2: Speed and Temperature Sensors, Valve Position, Pressure and Shift Controls Wiring Schematics**  
 Courtesy of GENERAL MOTORS COMPANY

#### Internal Mode Switch and Manual Shift Switch Wiring Schematics



**Fig. 3: Internal Mode Switch and Manual Shift Switch Wiring Schematics**  
 Courtesy of GENERAL MOTORS COMPANY

### Shift Lever Position Indicator Wiring Schematics



**Fig. 4: Shift Lever Position Indicator Wiring Schematics**  
 Courtesy of GENERAL MOTORS COMPANY

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