

Venice Service Manual

Transmission



14. Transmission

14.1. Automatic Transmission

14.1.1. Transmission General Specifications (6T40)

Name	6T40
RPO Code	MH8
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	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 Gross Vehicle Weight (GVW)	6T40 – 2000 kg (4,409 lbs)

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14.1.1.1.

Approximate Fluid Capacities

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

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14.1.1.2. Transmission Internal Mode Switch Logic

Transmission Internal Mode Switch Logic

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
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/M	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				

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14.1.1.3. Transmission Parts Kit Specifications

Table 1: A/Trans Seal Kit

Table 2: Front Wheel Drive Shaft Seal Kit (Right Hand Side)

Table 3: Front Wheel Drive Shaft Seal Kit (Left Hand Side)

Table 4: A/Trans Seal Kit (1 of 2)

Table 5: A/Trans Seal Kit (2 of 2)

Table 6: Control Valve Body Kit

Table 7: Clutch Plate Package

Table 8: 4-5-6 Plate Assembly

Table 9: Low and Reverse Plate Assembly

Table 10: 3-5 Reverse Plate Assembly

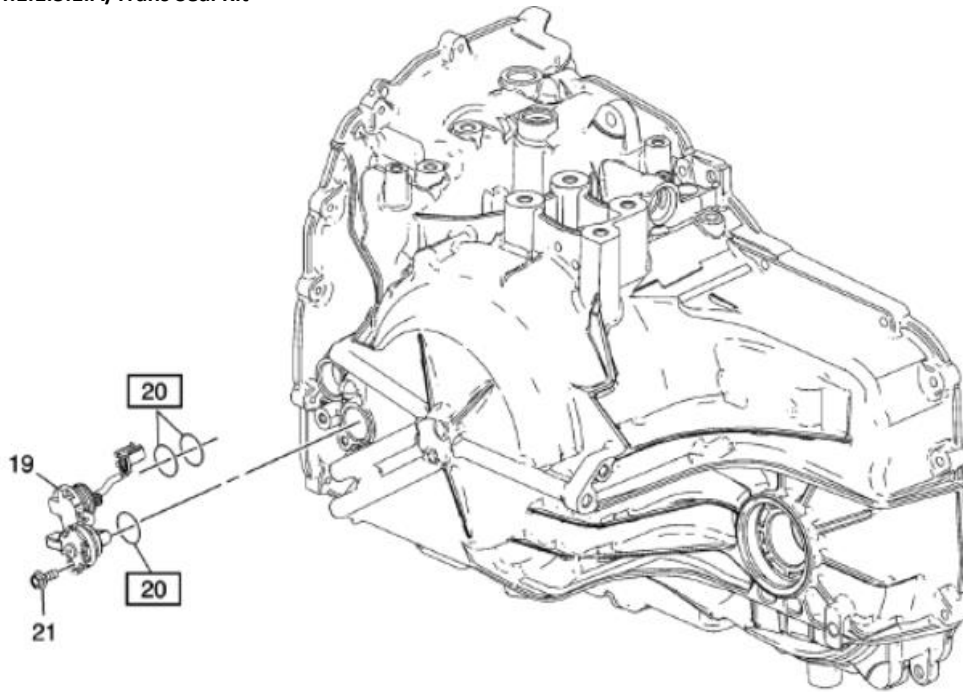
Table 11: 2-6 Plate Assembly

Table 12: 1-2-3-4 Plate Assembly

Table 13: A/Trans Seal Kit

Table 14: A/Trans Auxiliary Seal Kit

14.1.1.3.1.A/Trans Seal Kit

**Note:**

Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

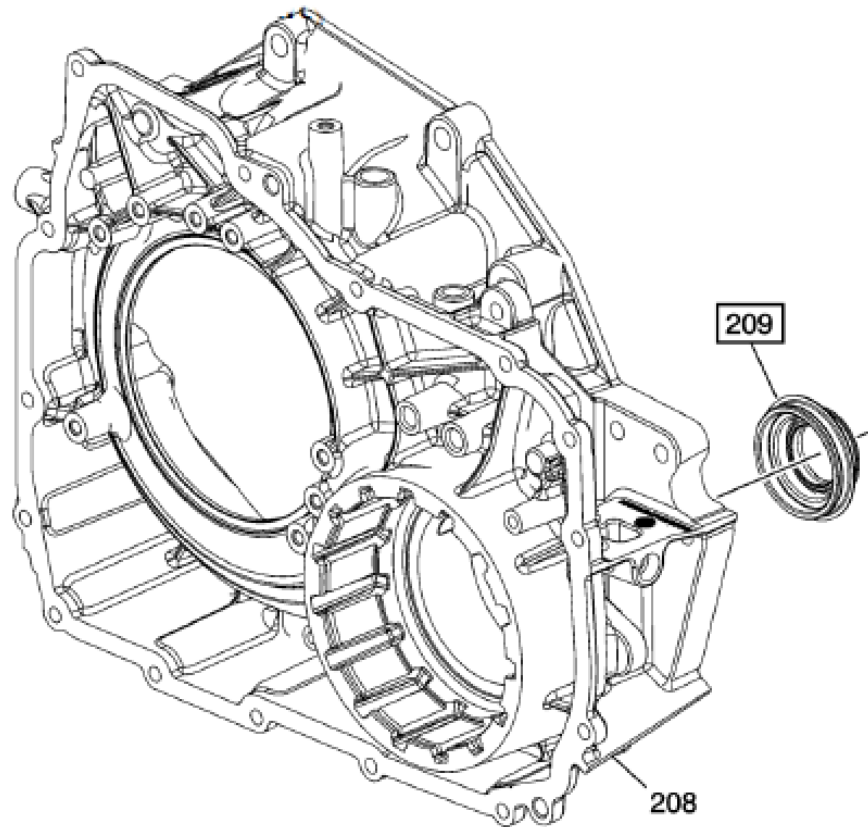
A/Trans Seal Kit

Callout	Quantity	Component Name
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal

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14.1.1.3.2.Front Wheel Drive Shaft Seal Kit (Right Hand Side)



Note:

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Front Wheel Drive Shaft Seal Kit (Right Hand Side)

Callout	Quantity	Component Name
209	1	Front Wheel Drive Shaft Oil Seal Assembly

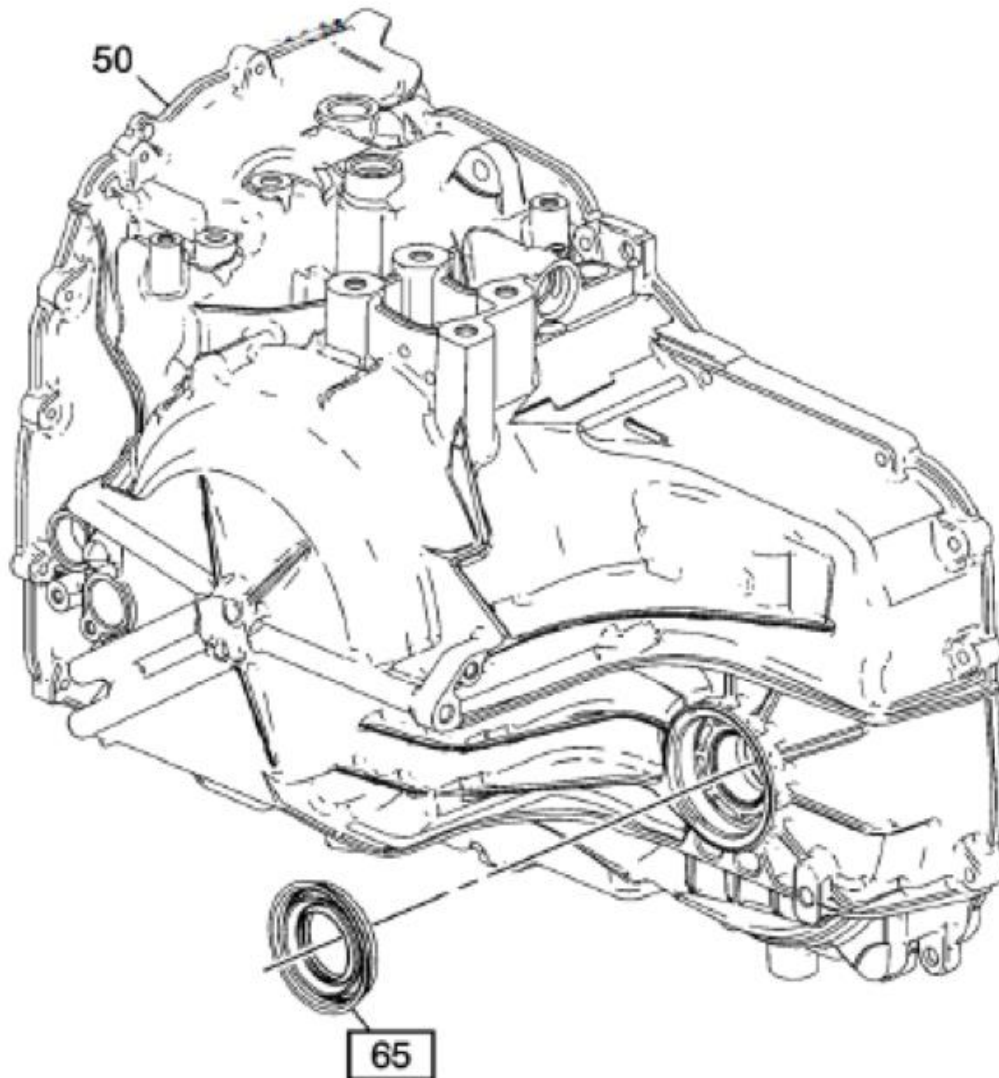
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14.1.1.3.3.Front Wheel Drive Shaft Seal Kit (Left Hand Side)



Note:

Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

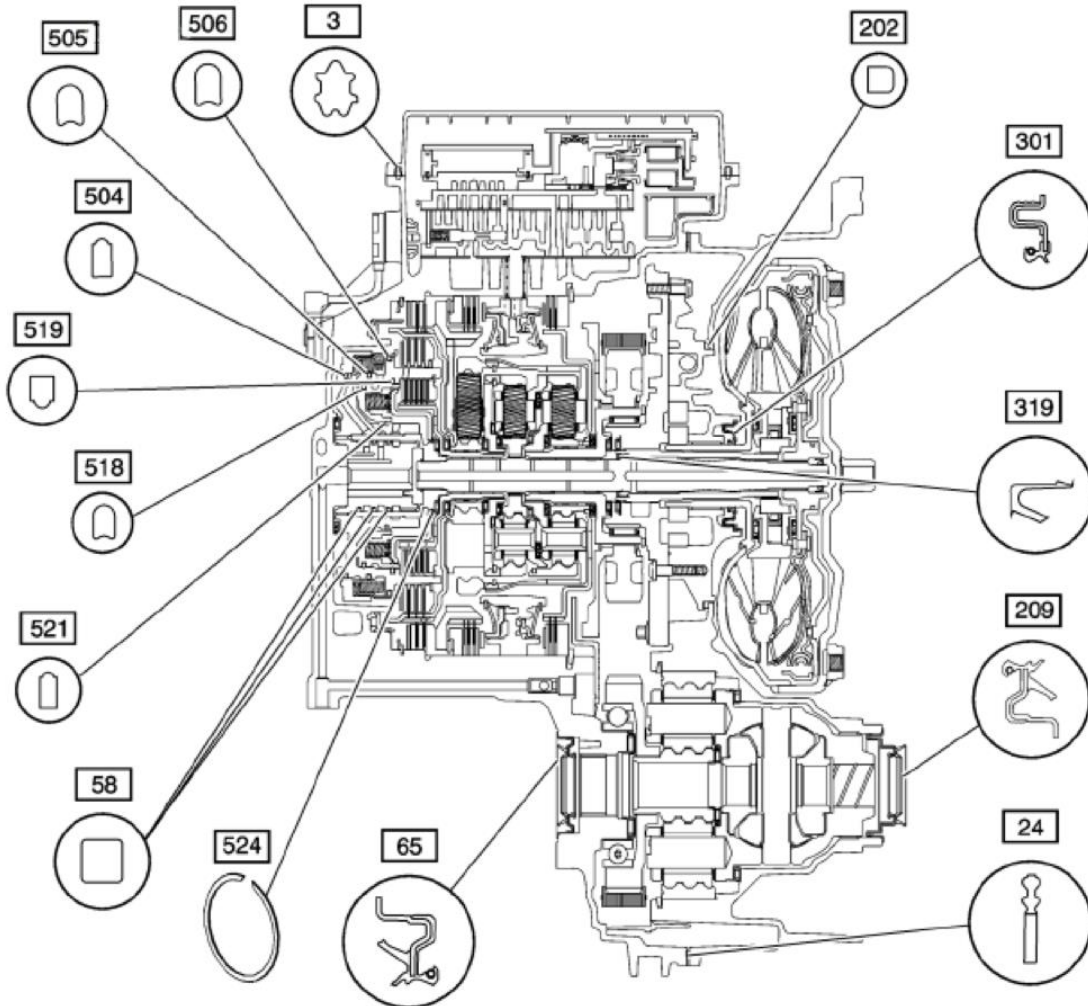
Front Wheel Drive Shaft Seal Kit (Right Hand Side)

Callout	Quantity	Component Name
65	1	Front Wheel Drive Shaft Oil Seal Assembly

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14.1.1.3.4.A/Trans Seal Kit (1 of 2)



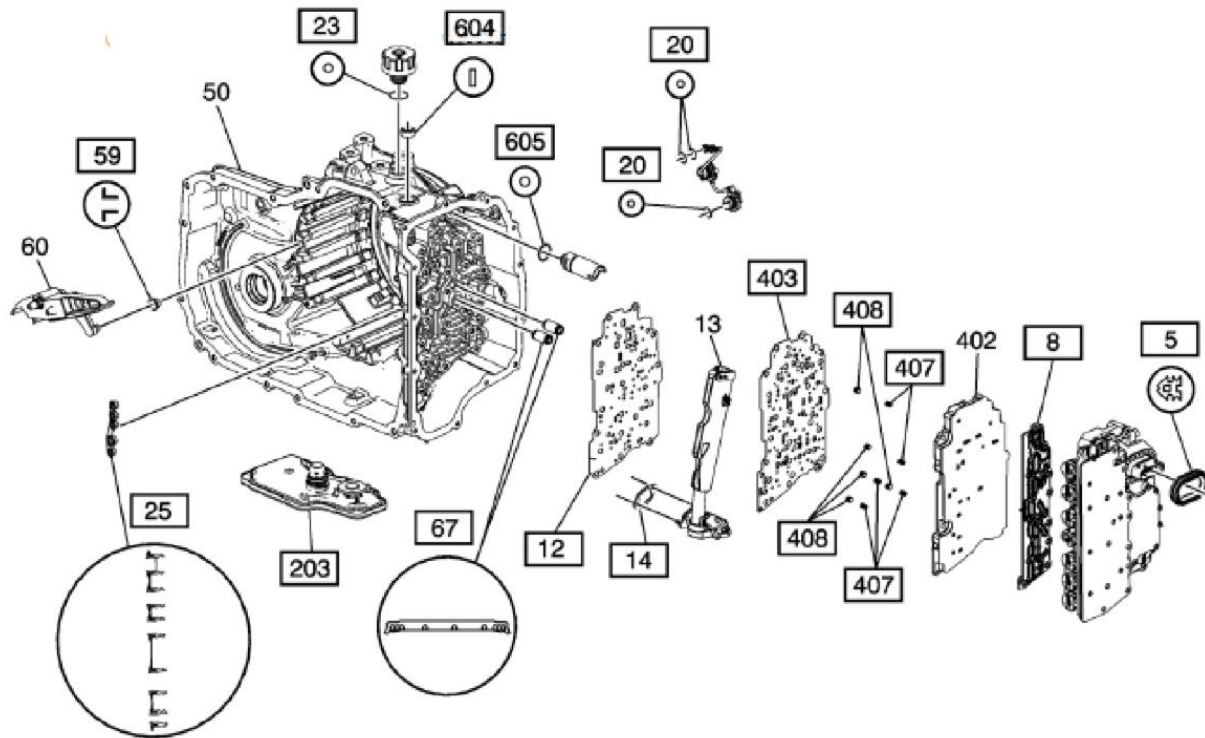
Front Wheel Drive Shaft Seal Kit (Right Hand Side)

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

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14.1.1.3.5.A/Trans Seal Kit (2 of 2)



Note:

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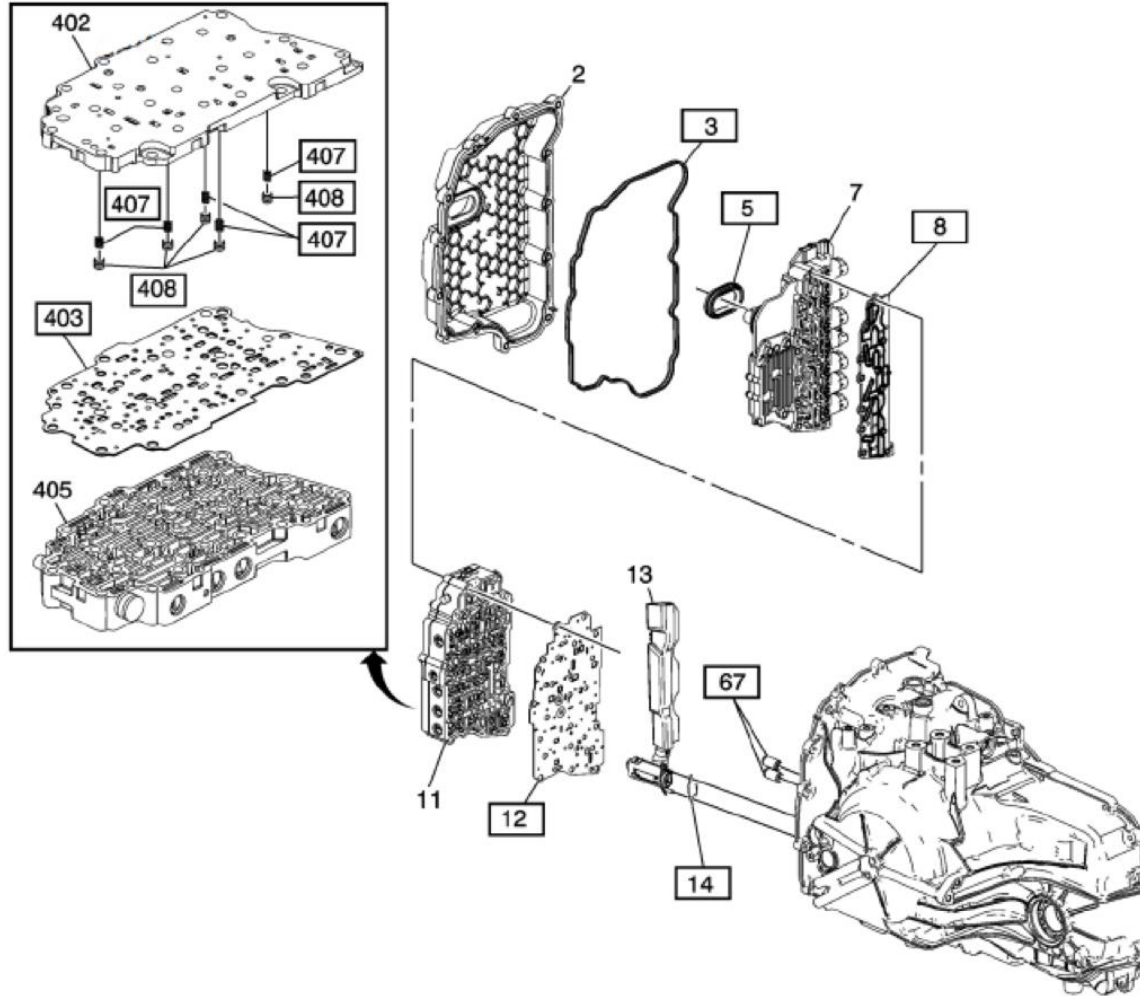
A/Trans Seal Kit (2 of 2)

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

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14.1.1.3.6.Control Valve Body Kit



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

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

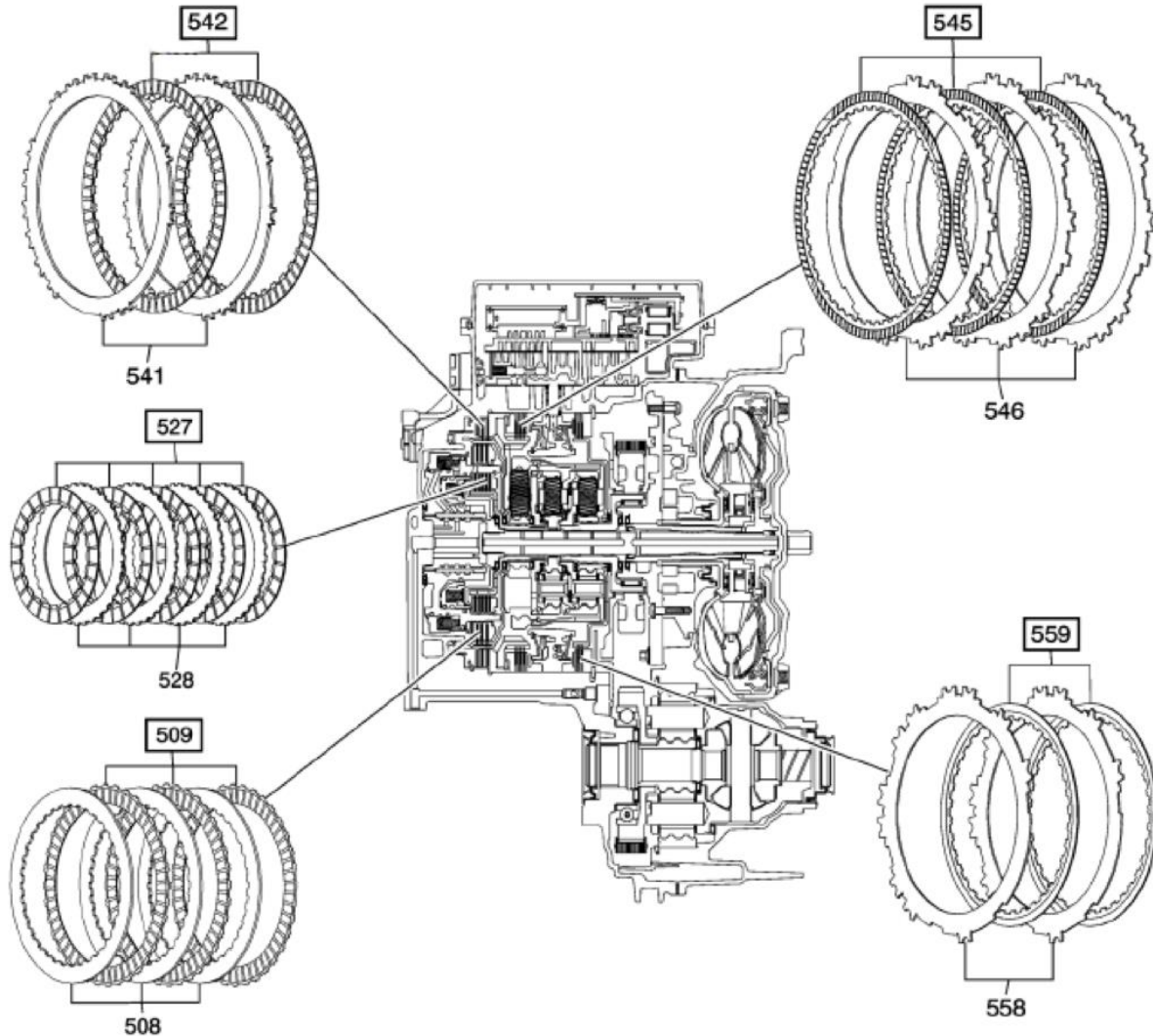
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14.1.1.3.7.Clutch Plate Package



Note:

Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

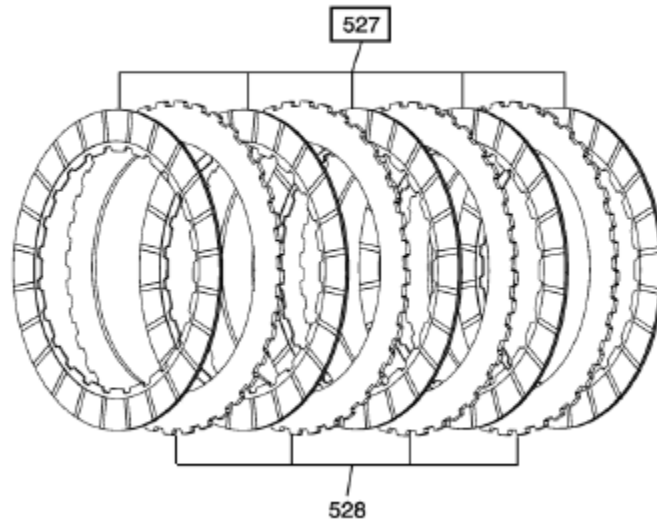
Clutch Plate Package

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

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14.1.1.3.8.4-5-6 Plate Assembly

**Note:**

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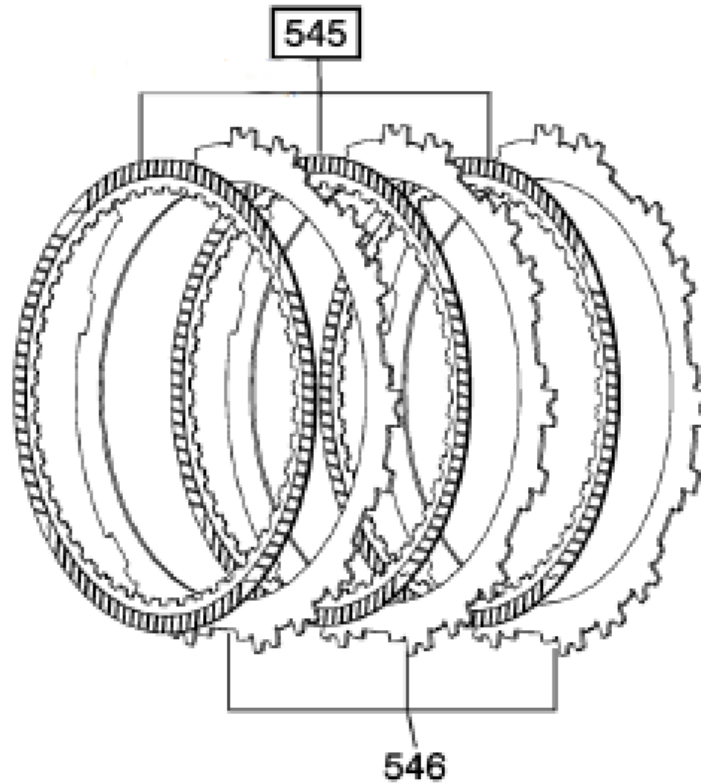
Plate Assembly

Callout	Quantity	Component Name
527	5	4-5-6 Clutch (w/Friction Material) Plate Assembly

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14.1.1.3.9.Low and Reverse Plate Assembly



Note:	
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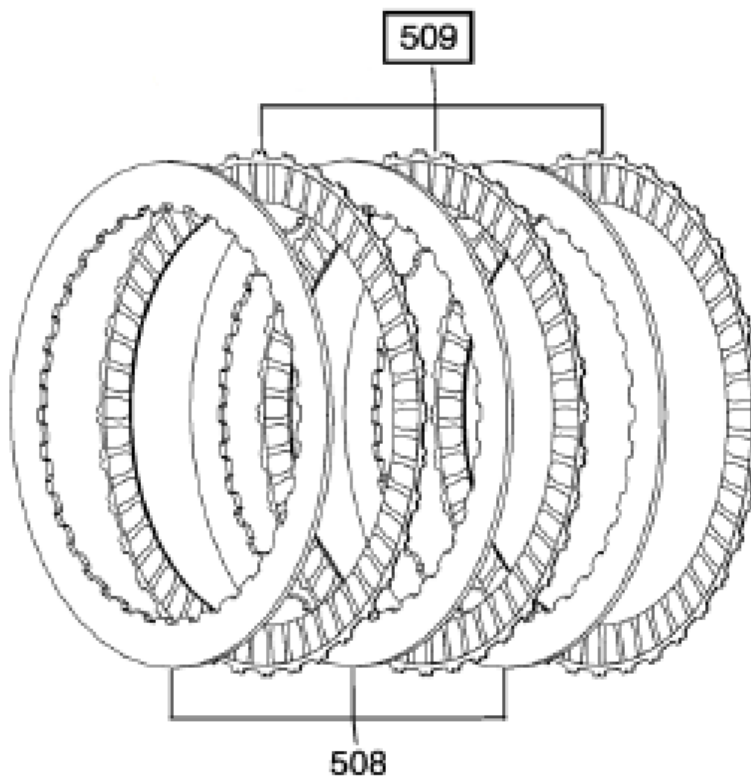
Low and Reverse Plate Assembly

Callout	Quantity	Component Name
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly

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14.1.1.3.10. 3-5 Reverse Plate Assembly



Note:

Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

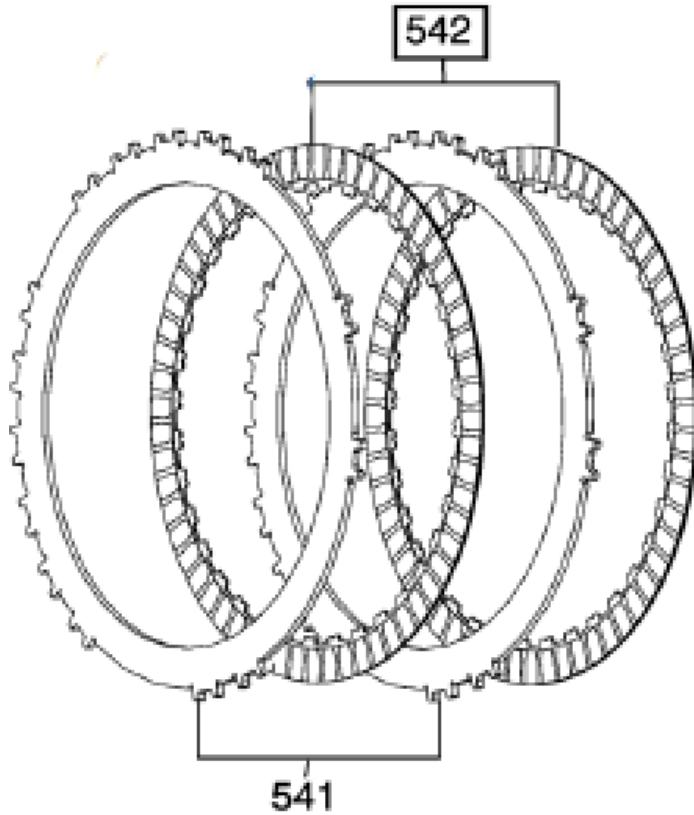
3-5 Reverse Plate Assembly

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly

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14.1.1.3.11. 2-6 Plate Assembly



Note:

Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

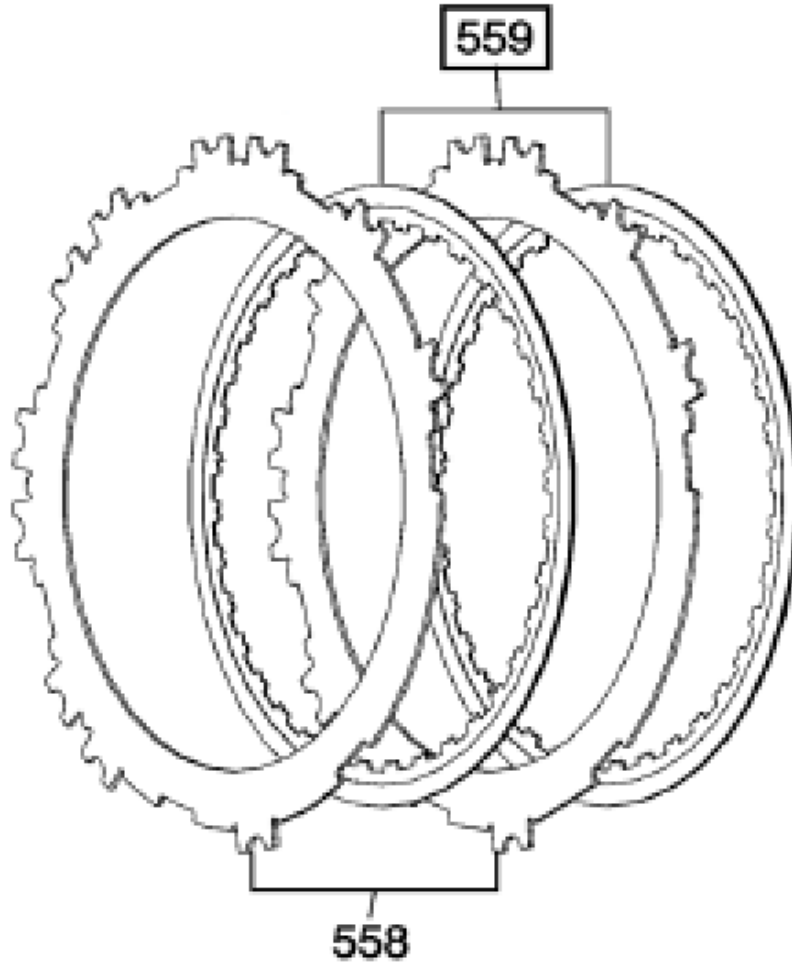
2-6 Plate Assembly

Callout	Quantity	Component Name
542	2	2-6 Clutch (w/Friction Material) Plate Assembly

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14.1.1.3.12. 1-2-3-4 Plate Assembly

**Note:**

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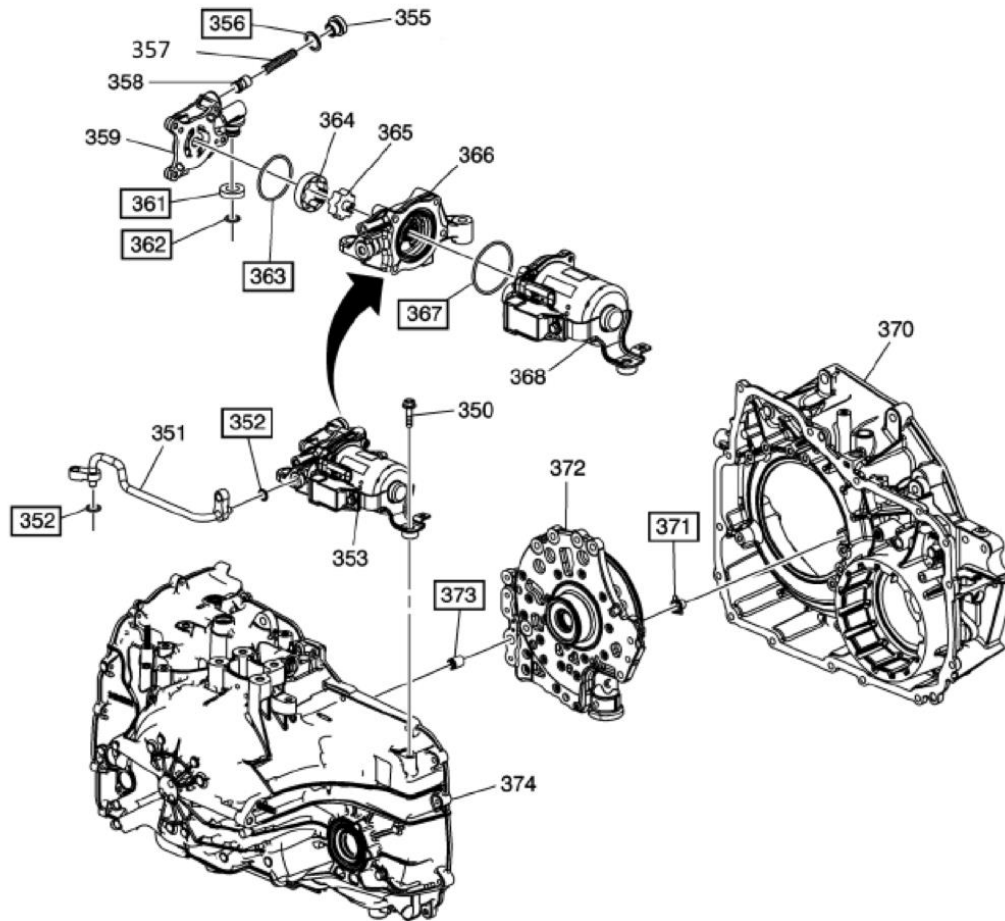
1-2-3-4 Plate Assembly

Callout	Quantity	Component Name
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

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14.1.1.3.13. A/Trans Seal Kit



Note:
Callouts with boxes around them indicate part is included in the service kit. **Callouts** without boxes are shown for relationship purposes only.

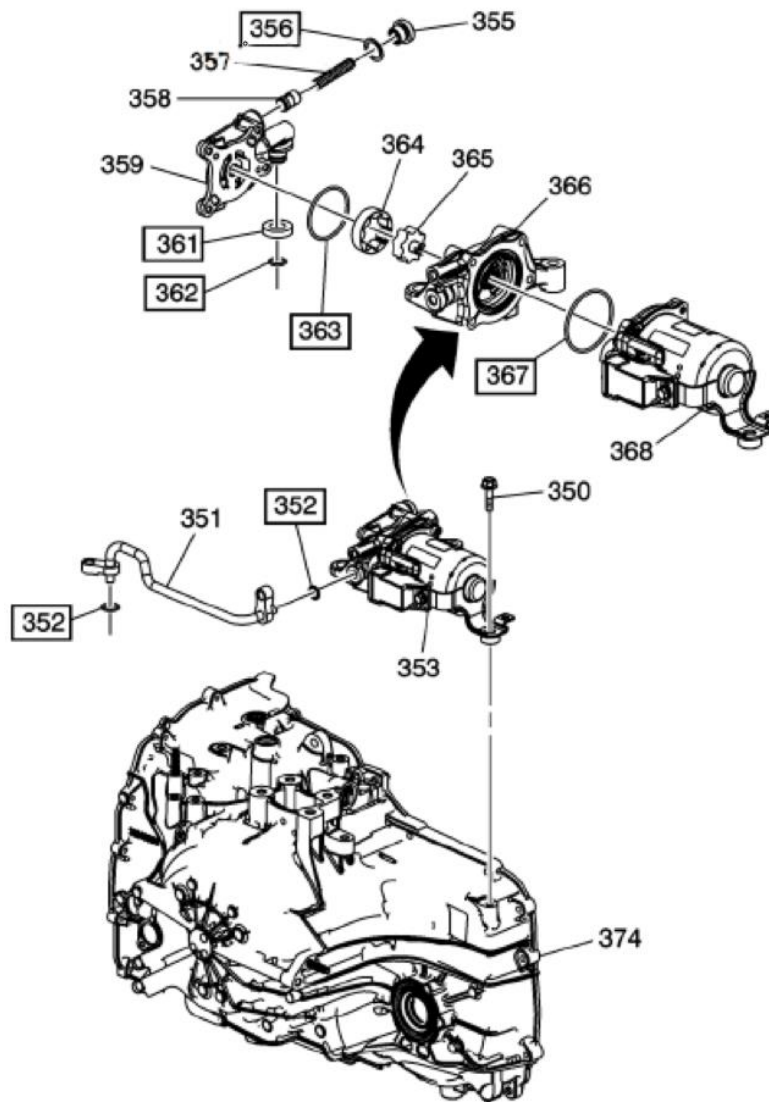
A/Trans Seal Kit

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

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14.1.1.3.14. A/Trans Auxiliary Seal Kit



Note:
Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

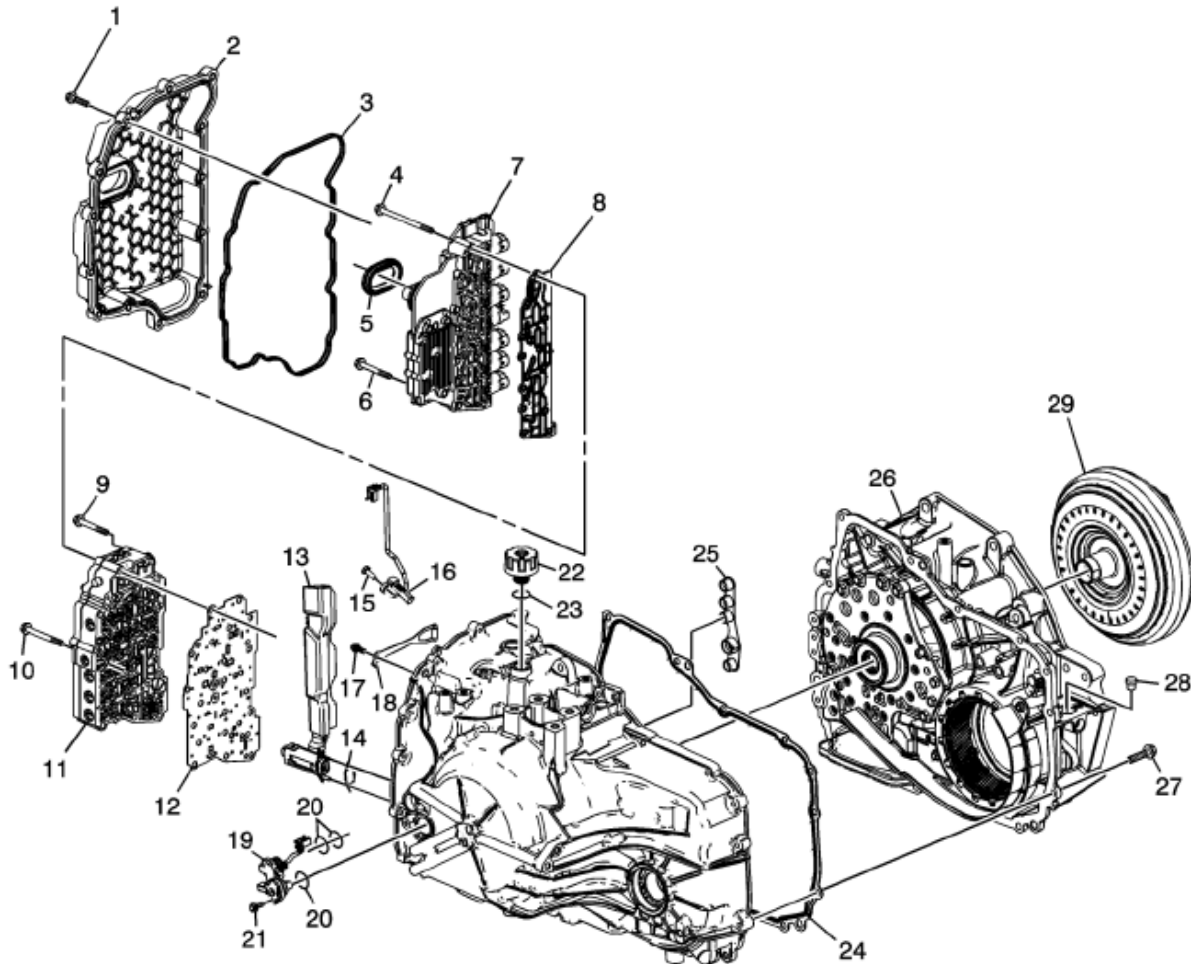
A/Trans Auxiliary Seal Kit

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

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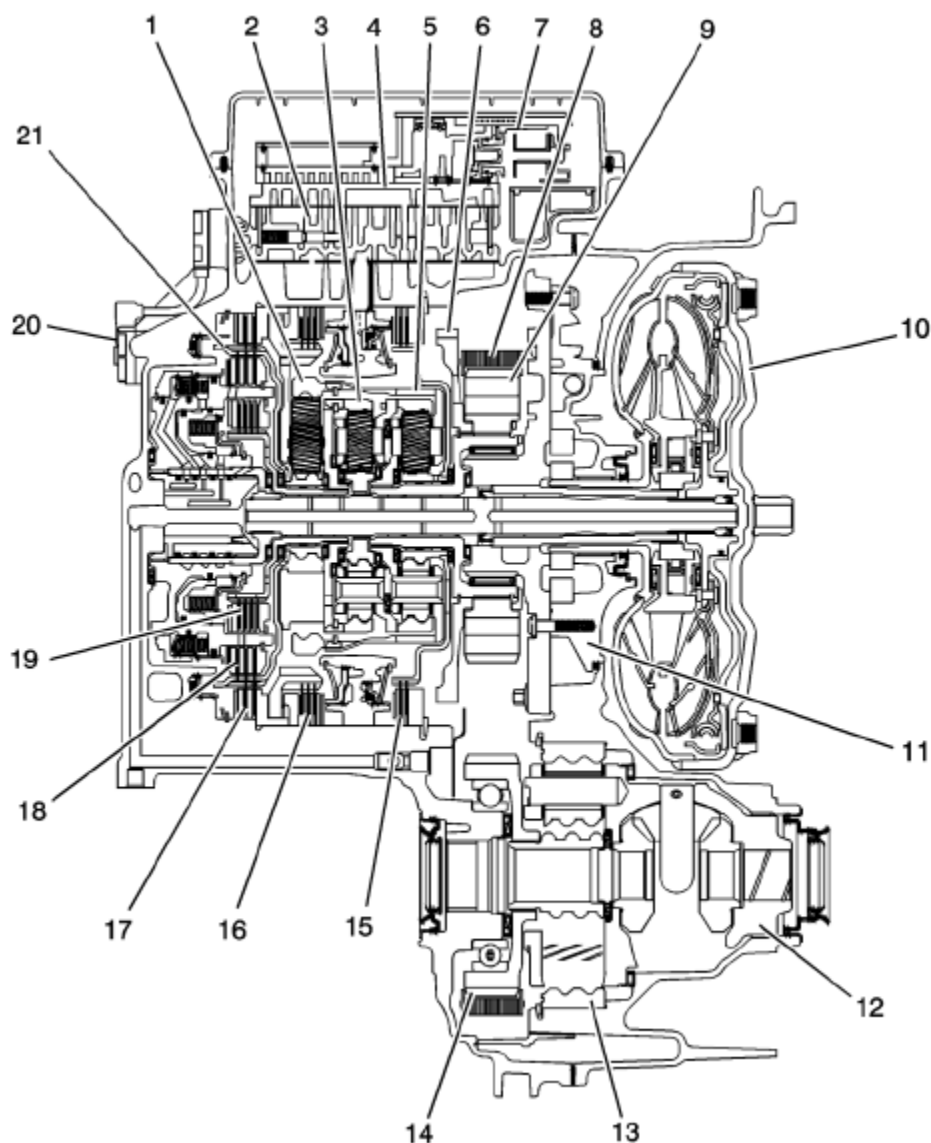
14.1.2. Component Location



- | | |
|---|---|
| 1. Control Valve Body Cover Bolt | 16. A/Trans Output Speed Sensor Assembly |
| 2. Control Valve Body Cover Assembly | 17. Manual Shaft Detent Spring Bolt |
| 3. Control Valve Body Cover Gasket | 18. Manual Shaft Detent Lever Spring Assembly |
| 4. Control Valve Body Bolt | 19. A/Trans Input Speed Sensor Assembly |
| 5. Control Valve Body Cover Hole Seal | 20. A/Trans Input Speed Sensor Assembly ORing Seal |
| 6. Control Solenoid Valve Heat Sink Bolt | 21. A/Trans Input Speed Sensor Bolt |
| 7. Control Solenoid (w/Body and TCM) Valve Assembly | 22. Fill Cap |
| 8. Control Valve Body Filter Plate Assembly | 23. Fill Cap Seal |
| 9. Control Valve Body Bolt | 24. Torque Converter Housing Gasket |
| 10. Control Valve Body Bolt | 25. A/Trans Fluid Pump Seal Assembly |
| 11. Control Valve Body Assembly | 26. Torque Converter with Fluid Pump Housing Assembly |
| 12. Control Valve Body Spacer Plate Assembly | 27. Torque Converter and Differential Housing Bolt |
| 13. A/Trans Fluid Level Control Valve | 28. A/Trans Fluid Fill Tube Plug Assembly Torque Converter Assembly |
| 14. A/Trans Fluid Level Control Valve Gasket | |
| 15. A/Trans Output Speed Sensor Bolt | |

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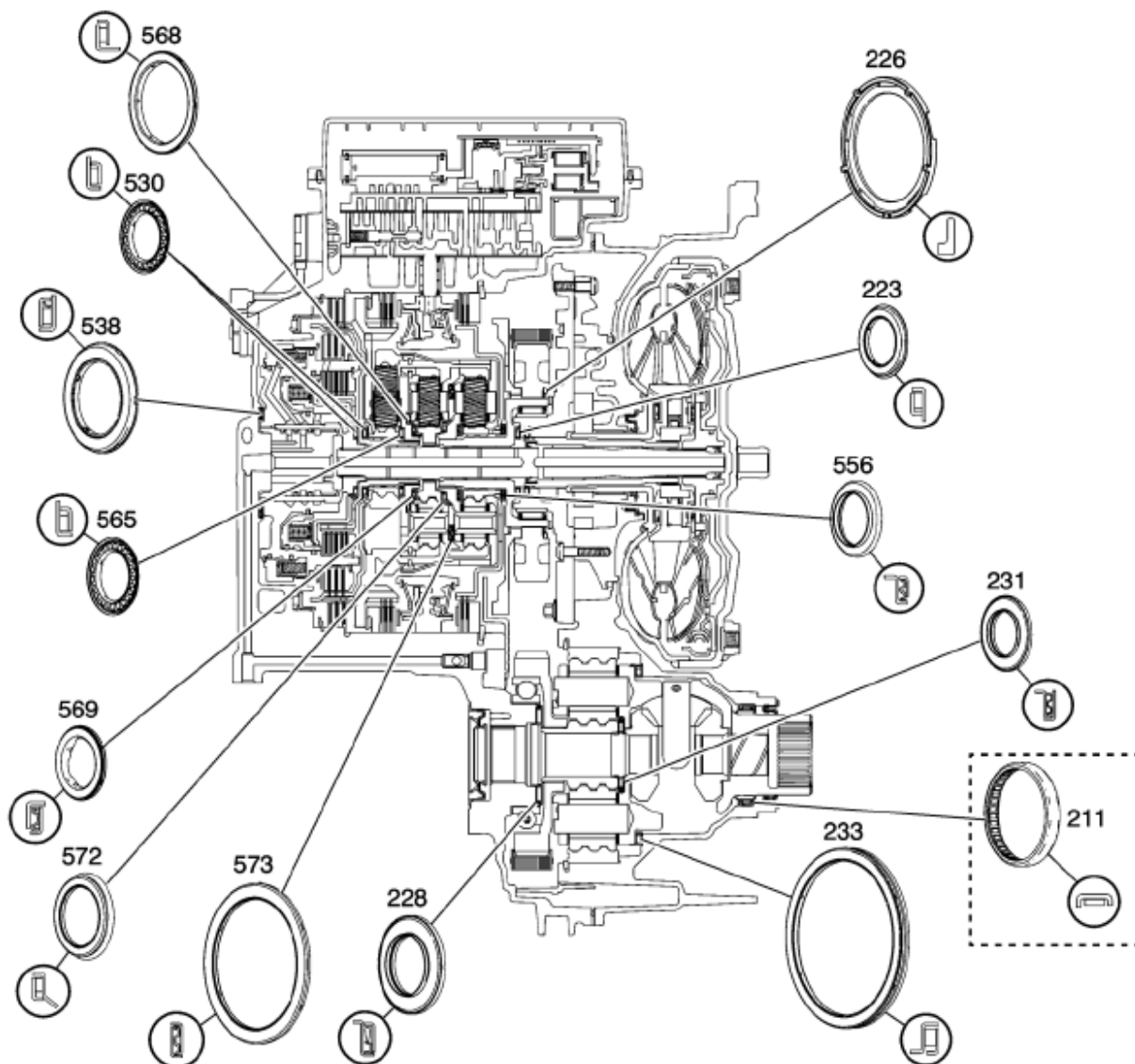


- | | |
|---|---|
| 1. Reaction Carrier Assembly | 12. Differential Carrier Assembly |
| 2. Control Valve Body Assembly | 13. Front Differential Ring Gear |
| 3. Input Carrier Assembly | 14. Driven Sprocket |
| 4. Valve Channel Plate | 15. 1-2-3-4 Clutch Assembly |
| 5. Output Carrier Assembly | 16.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

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14.1.2.1. Bushing, Bearing, and Washer Locations



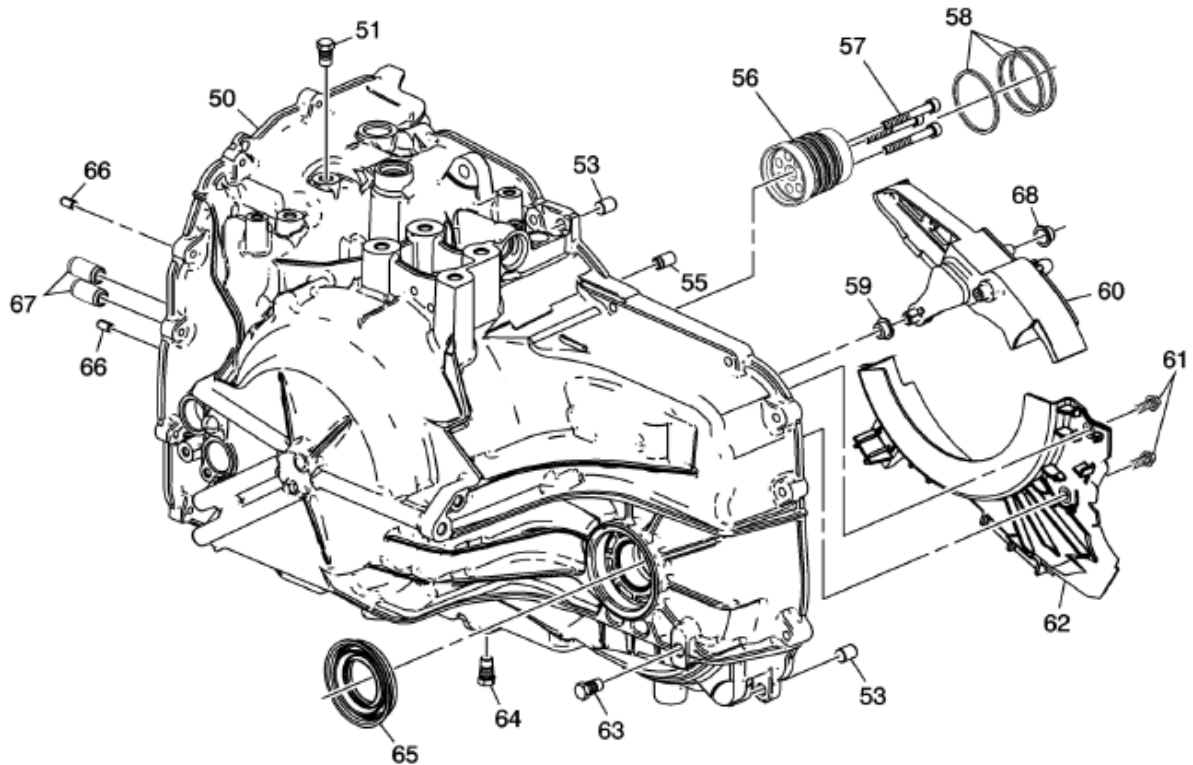
211 - Front Differential Carrier Bearing Assembly
 223 - Drive Sprocket Bearing Assembly
 226 - Drive Sprocket Thrust Washer
 228 - Drive Sprocket Bearing Assembly
 231 - Differential Sun Gear to Differential Housing Bearing Assembly
 233 - Front Differential Carrier Bearing Assembly
 530 - Reaction 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
 573 - Output Carrier Thrust Bearing Assembly

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14.1.2.2. Transmission Case Assembly

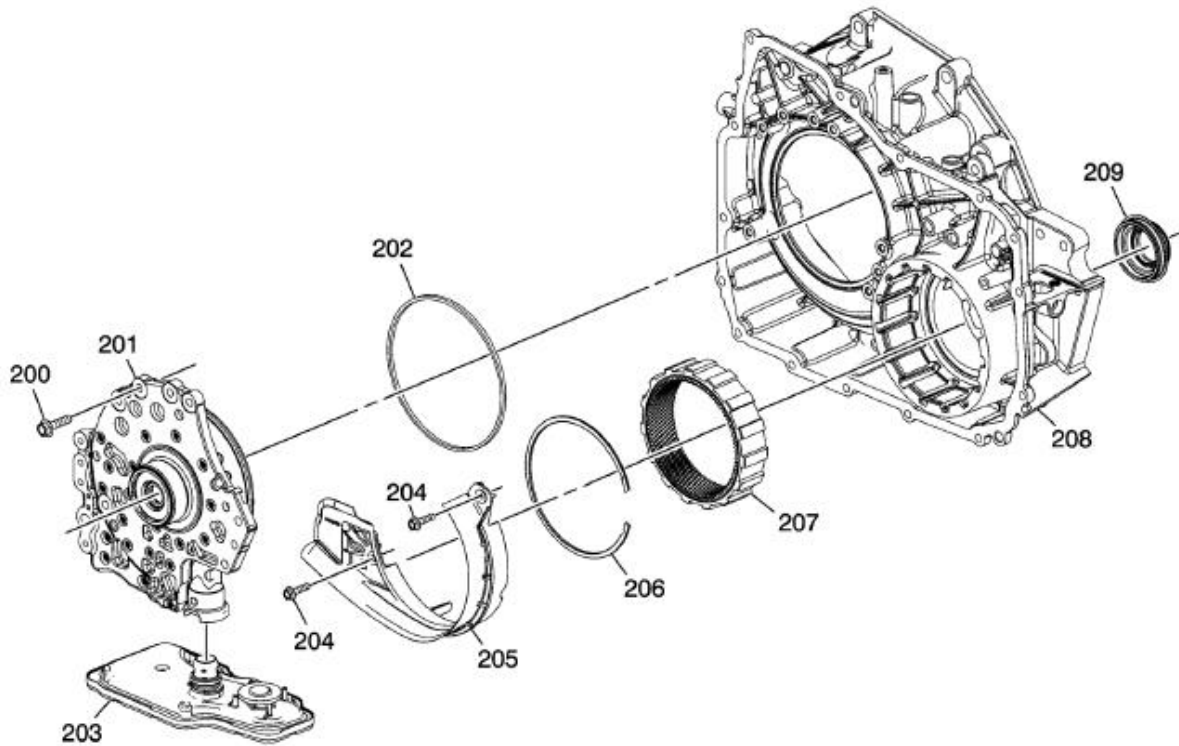


22. A/Trans Case Assembly	31. Front Differential Carrier Baffle Bolt
23. A/Trans Fluid Pressure Test Hole Plug	32. Front Differential Carrier Baffle
24. Transmission Case Cover Locator Pin	33. Oil Level Plug
25. A/Trans Fluid Check Ball	34. Drain Plug
26. Input Shaft Support	35. Drive Shaft Oil Seal Assembly
27. Input Shaft Support Bolt	36. Control Valve Body Locator Pin
28. 3-5Reverse and 4-5-6 Clutch Fluid Seal Ring (Qty: 3)	37. 1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
29. Drive Link Lube Fluid Seal	Drive Link Lube Fluid Seal
30. Drive Link Lube Scoop	

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14.1.2.3. Torque Converter and Fluid Pump Housing Assembly



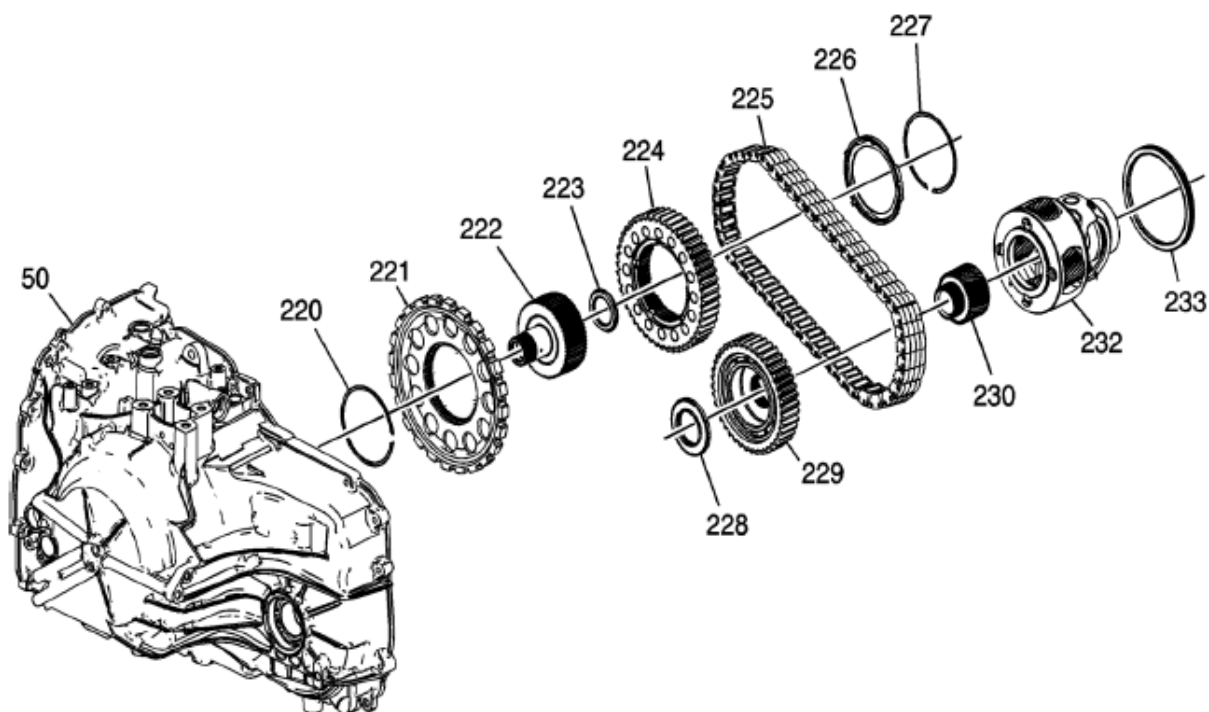
200. A/Trans Fluid Pump Bolt
201. A/Trans Fluid Pump Assembly
202. Torque Converter and Differential Housing Seal
203. A/Trans Fluid Filter Assembly
204. Front Differential Carrier Baffle Bolt

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

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14.1.2.4. Drive Link Assembly



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

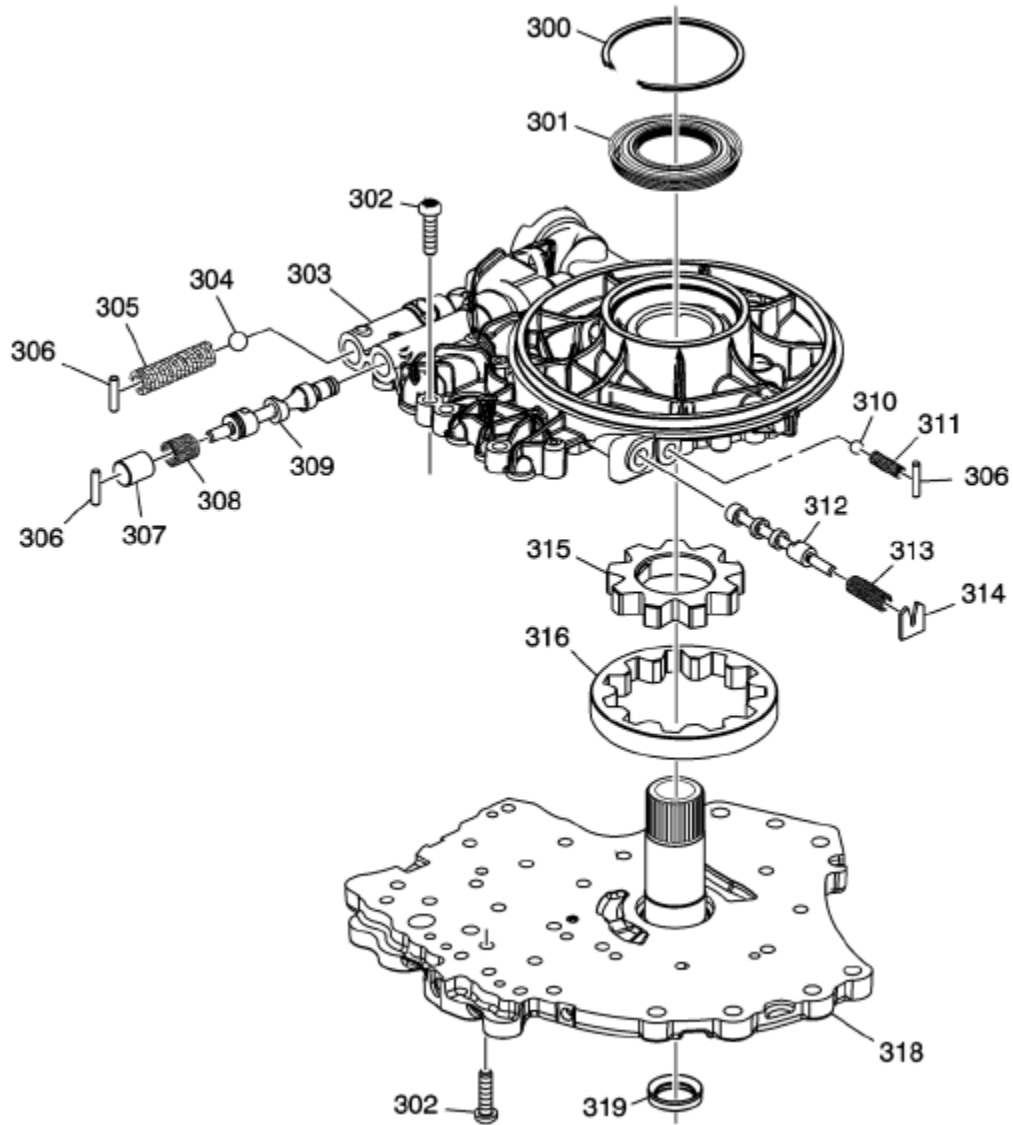
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14.1.2.5. Oil Pump Assembly



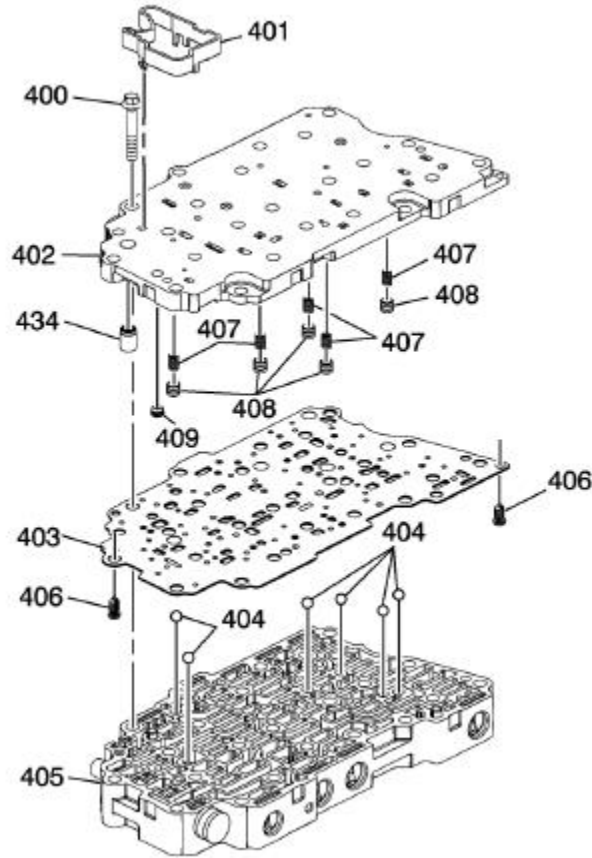
300. Torque Converter Fluid Seal Retainer
 301. Torque Converter Fluid Seal Assembly
 302. A/Trans Fluid Pump Cover Bolt
 303. A/Trans Fluid Pump Body
 304. Pump Blowoff Ball Valve
 305. Pump Blowoff Valve Spring
 306. Pressure Regulator Valve Bore Plug Retainer
 307. Pressure Regulator Valve Bore Plug
 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

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14.1.2.6. Control Valve Body Assembly (1 of 2)



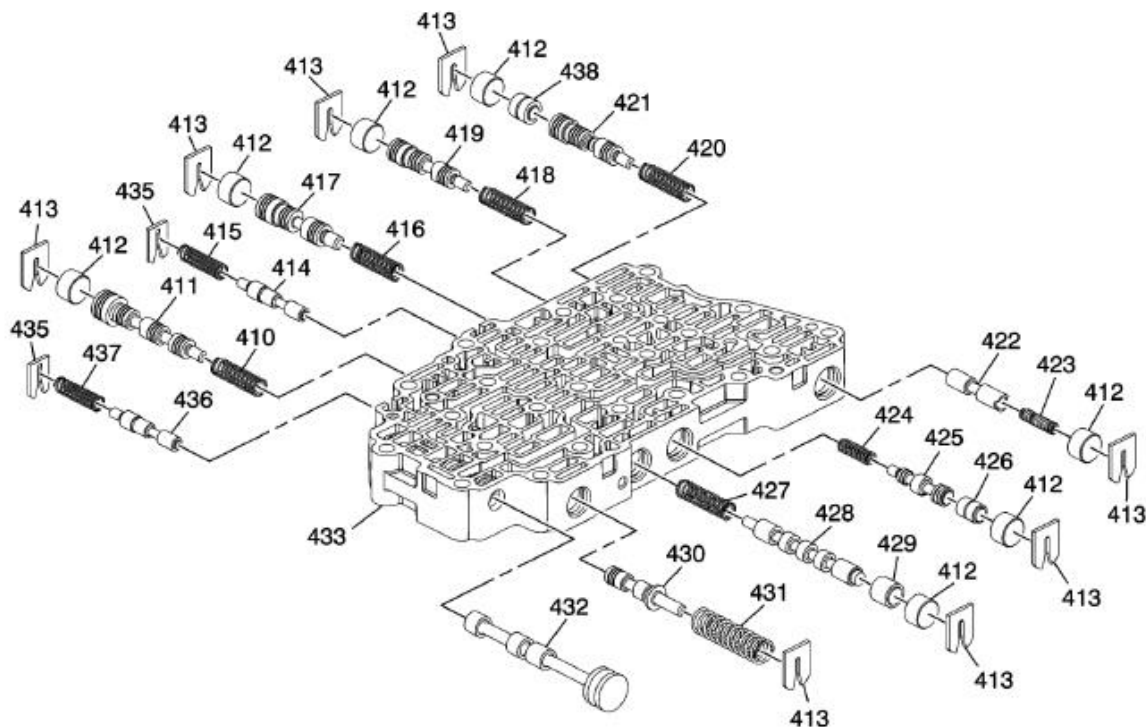
400. Control Valve Body Bolt
 401. Control Solenoid Valve Support
 402. Valve Channel Plate
 403. Channel Plate to Valve Body Spacer Plate Assembly
 404. Control Valve Body Ball Check Valve (Qty:6)
 405. Control Valve Body Assembly

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

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14.1.2.7. Control Valve Body Assembly (2 of 2)



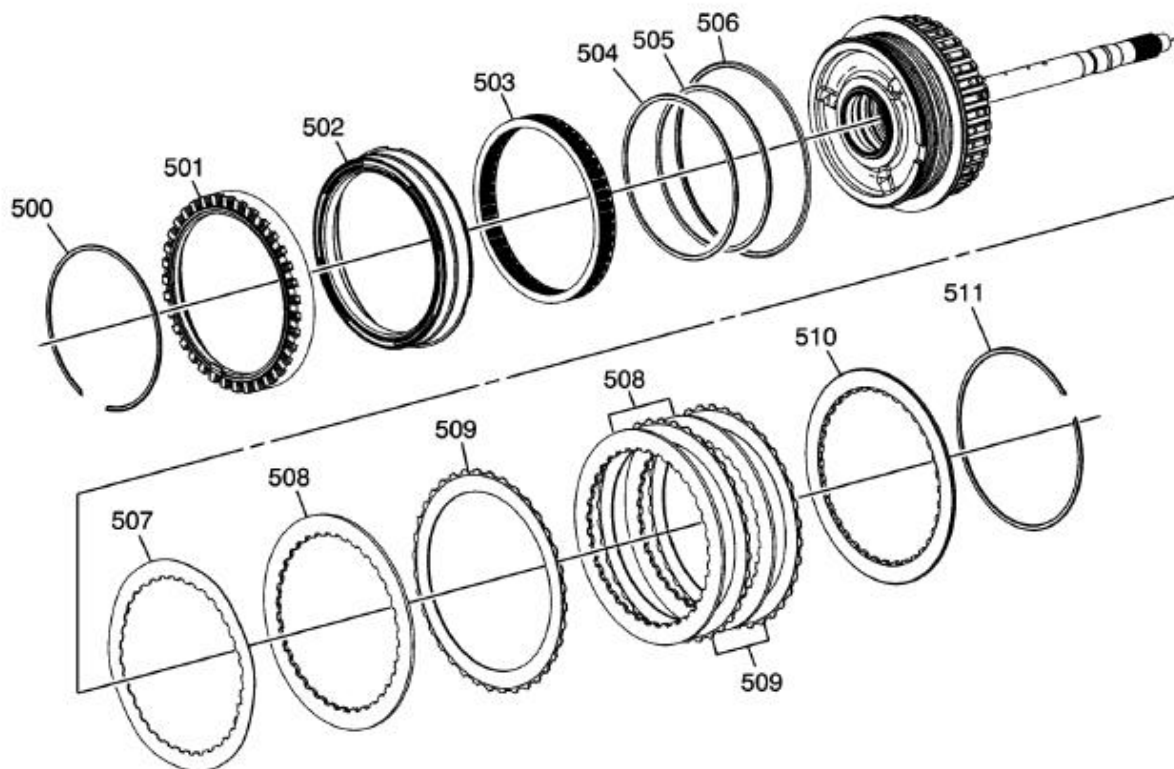
410. Low Reverse and 4-5-6 Clutch Regulator Valve Spring
 411. Low Reverse and 4-5-6 Clutch Regulator Valve
 412. Clutch Valve Bore Plug
 413. Valve Spring Retainer
 414. 1-2-3-4 Clutch Boost Valve

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

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14.1.2.8. 3-5 Reverse Clutch Assembly

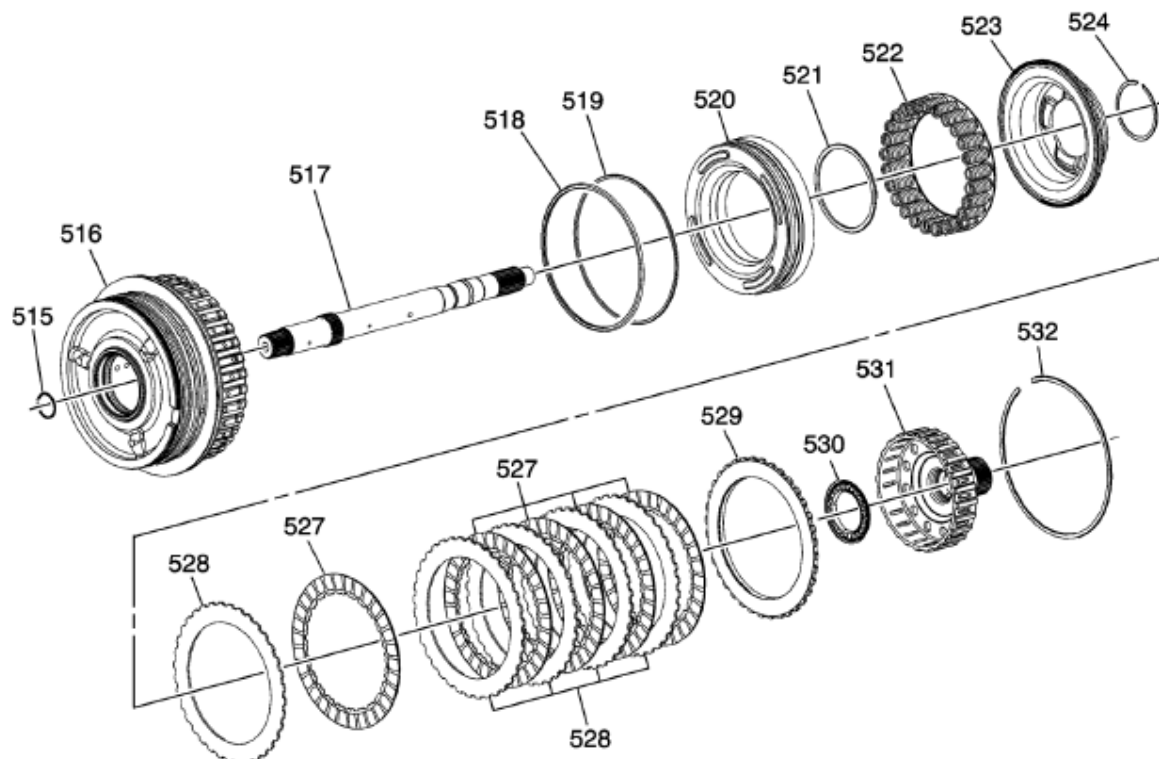


500. A/Trans Input Shaft Speed Sensor Reluctor Wheel Retainer Ring	506. 3-5Reverse Clutch Piston Dam Seal
501. A/Trans Input Shaft Speed Sensor Reluctor Wheel	507. 3-5Reverse Clutch Apply Plate
502. 3-5Reverse Clutch Piston	508. 3-5Reverse Clutch Plate
503. 3-5Reverse Clutch Piston Return Spring Assembly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

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14.1.2.9. 4-5-6 Clutch Assembly



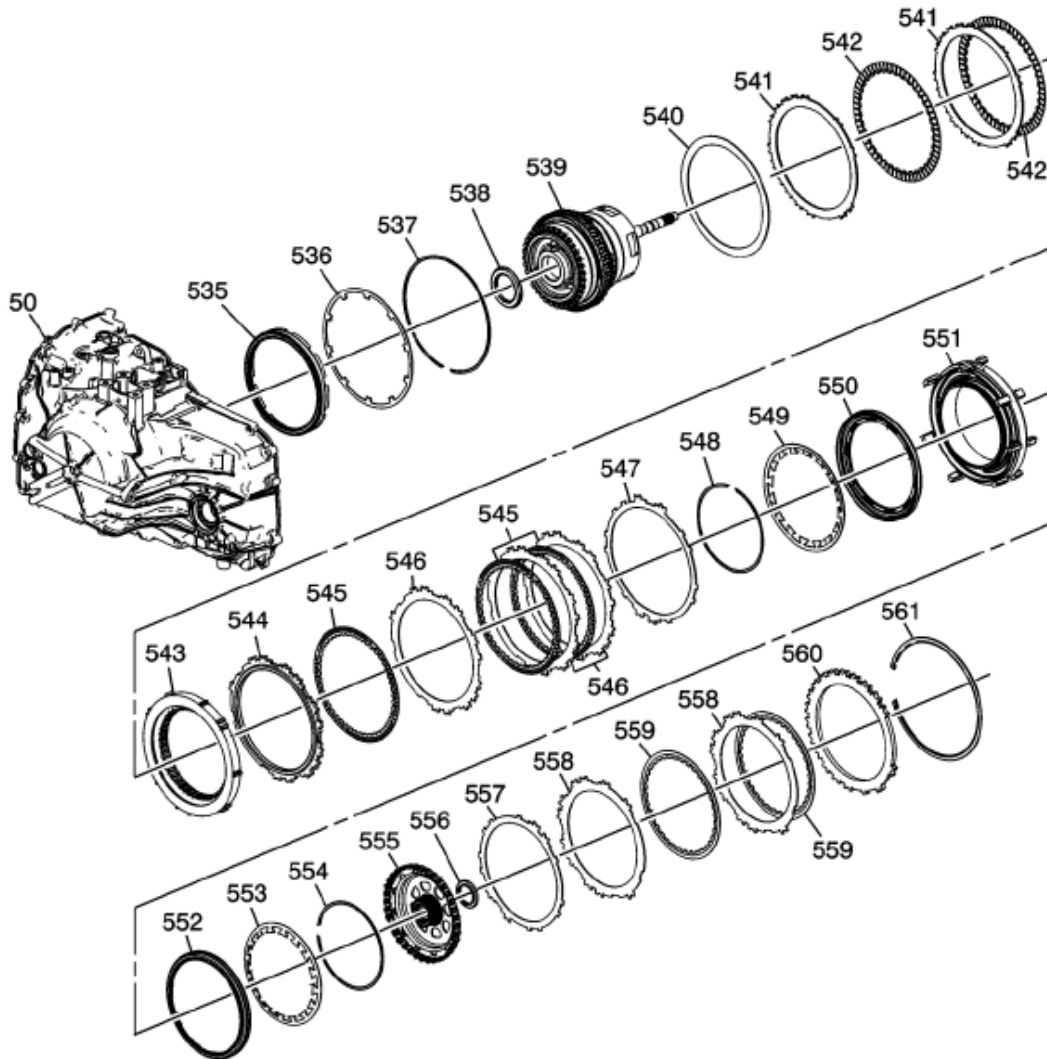
515. Turbine Shaft Retainer Ring
 516. 3-5Reverse and 456 Clutch Housing Assembly
 517. Turbine Shaft
 518. 4-5-6 Clutch Piston Outer Seal
 519. 4-5-6 Clutch Piston Outer Seal
 520. 4-5-6 Clutch Piston

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)

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14.1.2.10. 2-6, Low and Reverse and 1-2-3-4 Clutch Plate Assemblies



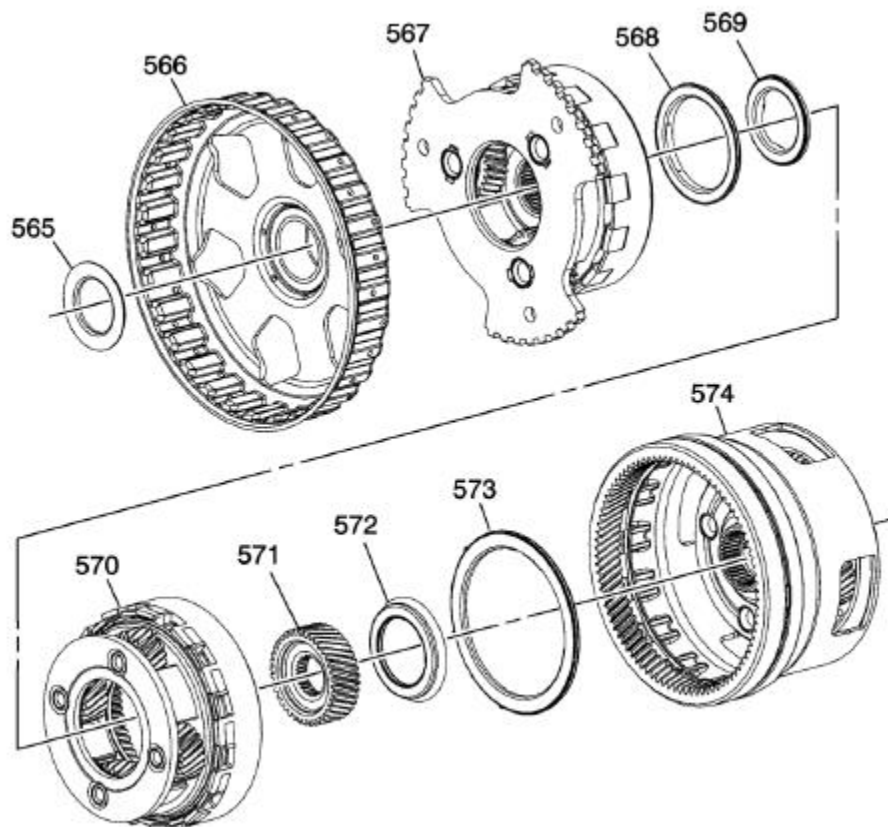
50. A/Trans Case
 535. 2-6 Clutch Piston Assembly
 536. 2-6 Clutch Spring
 537. 2-6 Clutch Spring Retainer Ring
 538. 3-5Reverse and 4-5-6 Clutch Housing Thrust Bearing
 539. 3-5Reverse and 4-5-6 Clutch Housing Assembly
 540. 2-6 Clutch Apply (Waved) Plate
 541. 2-6 Clutch Plate (Qty: 2)
 542. 2-6 Clutch (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: 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

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14.1.2.11. Input, Output and Reaction Gearsets



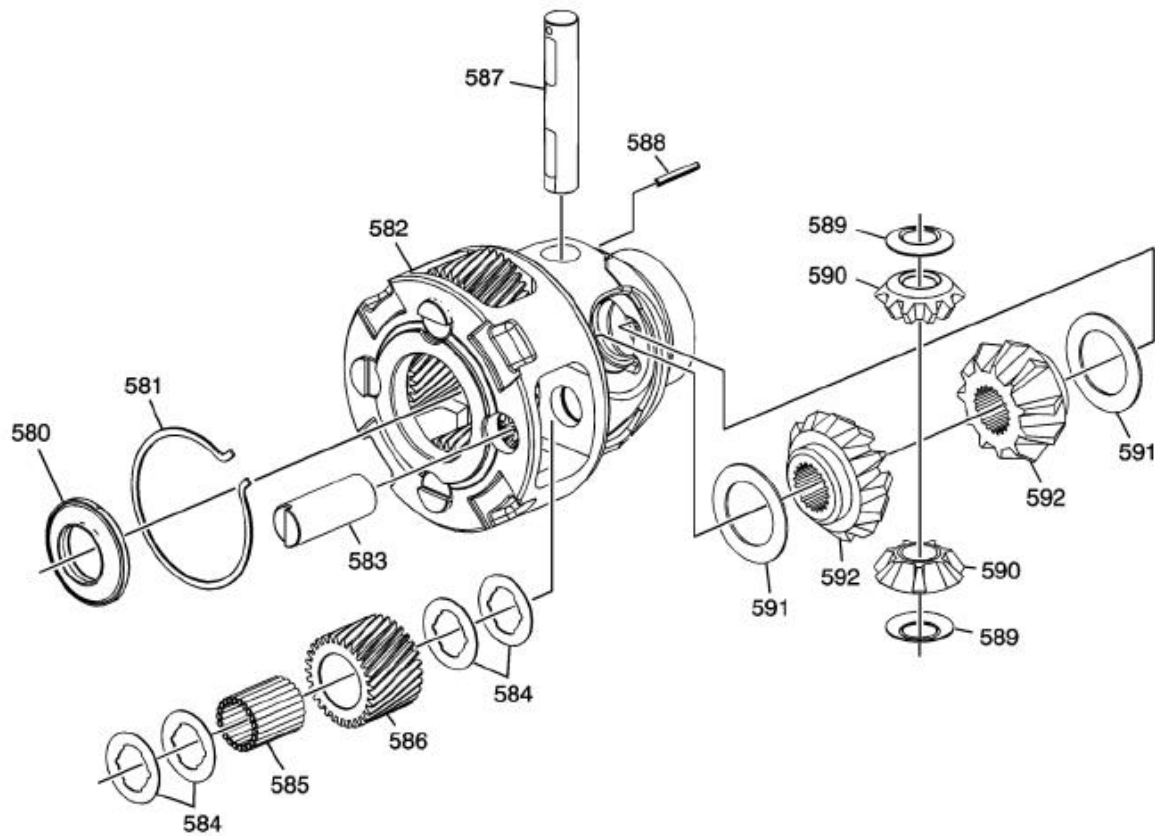
565. Reaction Sun Gear Thrust Bearing Assembly
566. Reaction Sun Gear Assembly
567. Reaction Carrier Assembly
568. Input Carrier Thrust Bearing Assembly
569. Input Sun Gear Thrust Bearing Assembly

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

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Transmission

14.1.2.12. Front Differential Carrier Assembly (2 Pinion)



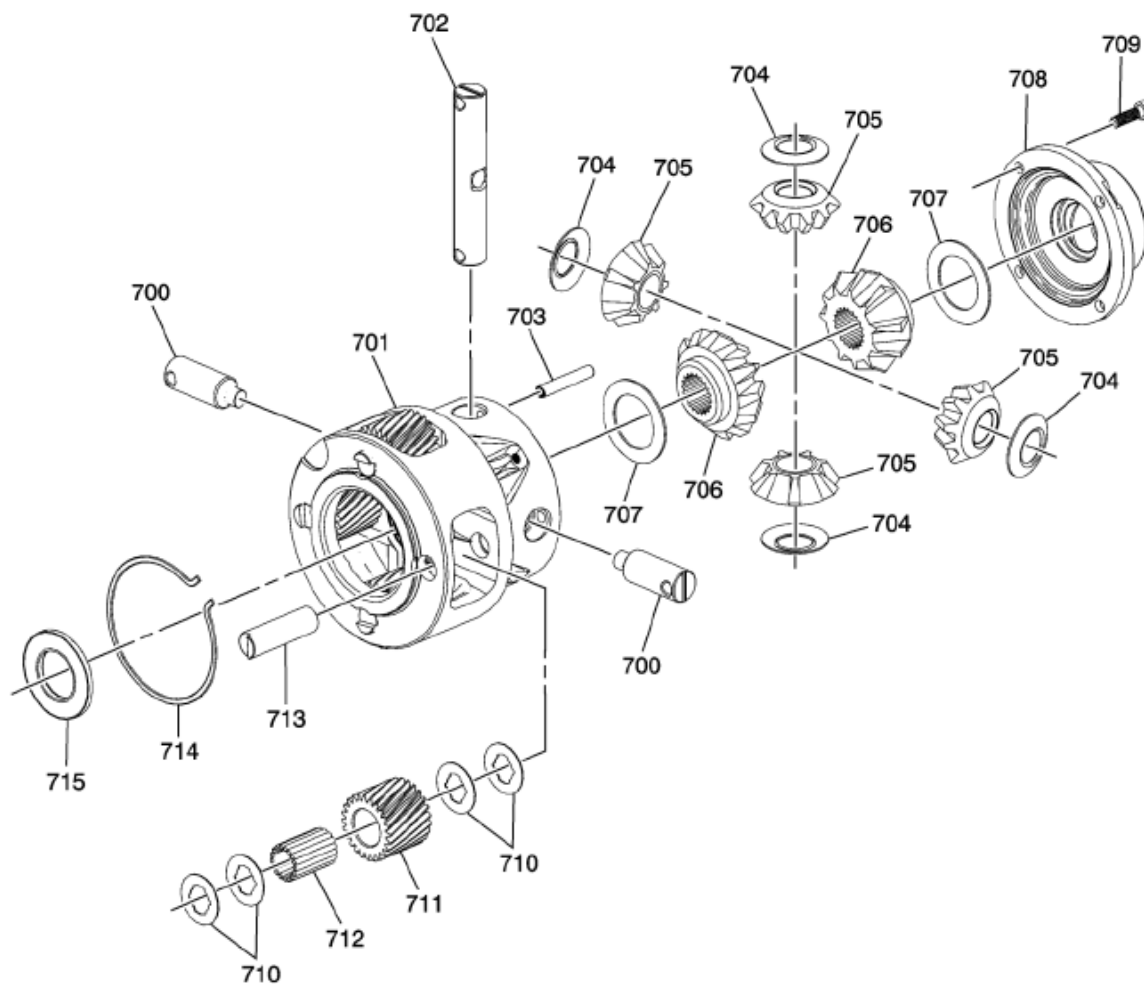
580. Differential Sun Gear to Differential Housing Bearing Assembly
 581. Final Drive Retainer
 582. Differential Carrier Assembly
 583. Final Drive Pinion Pin
 584. Final Drive Inner and Outer Washer
 585. Final Drive Roller

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

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14.1.2.13. Front Differential Carrier Assembly (4 Pinion)



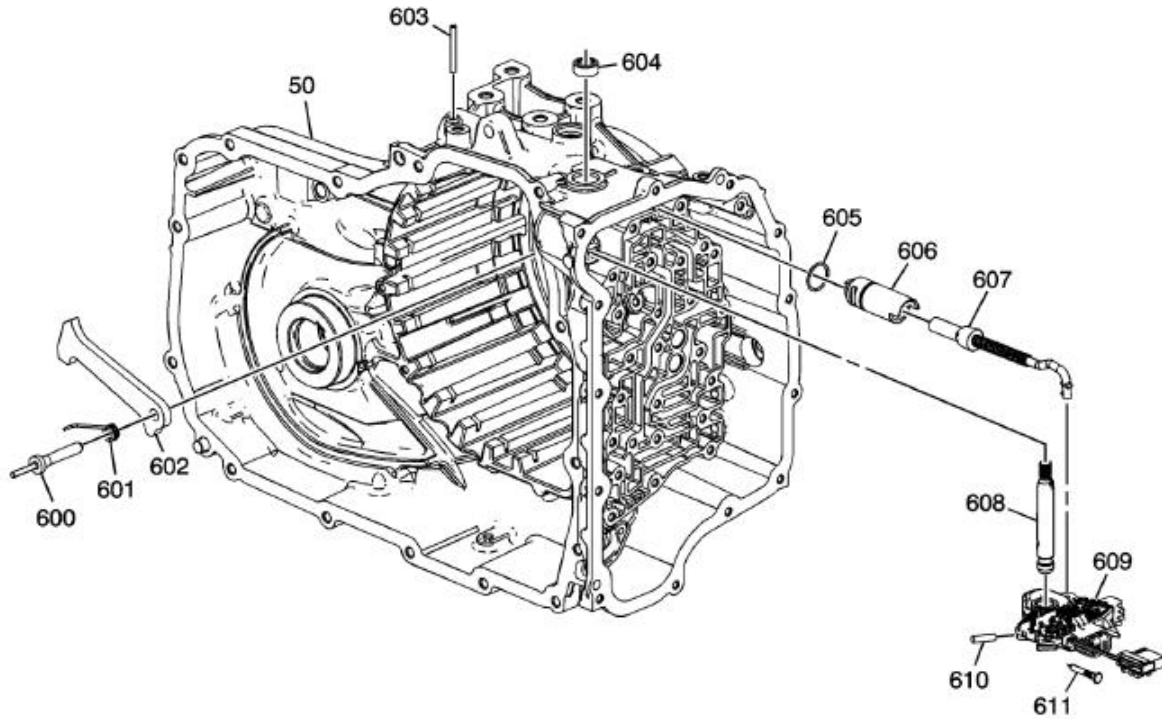
700. Front Differential Pinion Gear Shaft
 701. Differential Carrier Assembly
 702. Front Differential Pinion Gear Shaft
 703. Front Differential Pinion Gear Shaft
 704. Front Differential Pinion Thrust Washer
 705. Front Differential Pinion Gear
 706. Front Differential Side Gear
 707. Front Differential 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

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Transmission

14.1.2.14. Park System Components

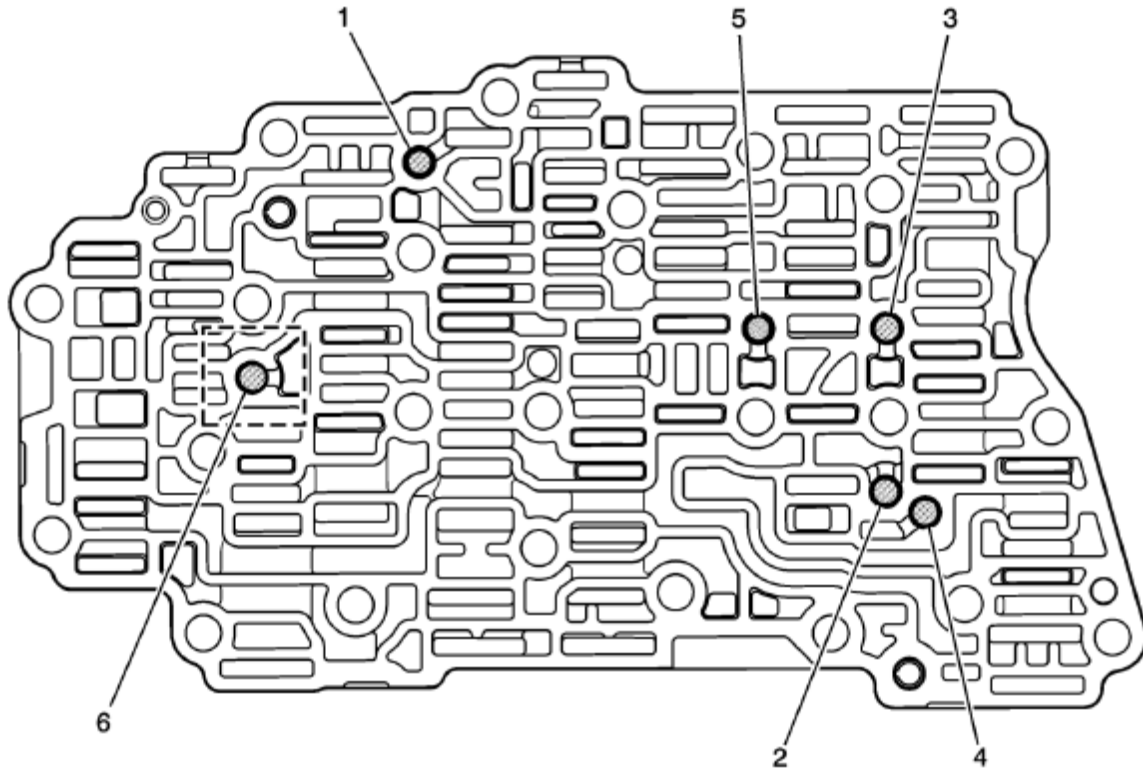


50. A/Trans Case	606. Park Pawl Actuator Guide
600. Park Pawl Shaft	607. Park Pawl Actuator Assembly
601. Park Pawl Spring	608. Manual Shift Detent Lever Shaft
602. Park Pawl	609. Manual Shift Detent (w/Shaft Position Switch) Lever Assembly
603. Park Pawl Actuator Guide Pin	610. Manual Shift Detent Lever Pin
604. Manual Shift Shaft Seal	611. Manual Shift Shaft Pin
605. Park Pawl Actuator Guide Seal	

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14.1.2.14.1. Ball Check Valve Locations



I.D.	Input Oil	Input Oil	Output Oil
1	Latch	456 CL	Latch
2	35 Rev CL FD	Drive 16	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

Note:

- Ball check valve #6 is only required for start/stop transmissions equipped with an auxiliary pump.
- Ball check valve #6 is optional in non-start/ stop transmissions.
- Ball check valve #6 should NOT be used in start/stop transmissions equipped with an auxiliary accumulator.

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14.1.3. Diagnostic Information and Procedures

14.1.3.1. DTC P0601, P0603, P0604, or P062F

14.1.3.1.1. 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.

14.1.3.1.2. 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

14.1.3.1.3. Circuit/System Description

This is an internal fault detection of the transmission control module (TCM), which is part of the control solenoid valve assembly. This fault is handled inside the TCM and no external circuits are involved.

14.1.3.1.4. 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

14.1.3.1.5. Conditions for Setting the DTC

P0601

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

P0603

TCM has detected a nonvolatile memory checksum error at TCM power-up.

P0604

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

P062F

TCM has detected a nonvolatile memory error during power-down.

14.1.3.1.6. 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.

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14.1.3.1.7. Conditions for Clearing the DTC

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

14.1.3.1.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXXX](#)

Connector End View Reference

Component Connector End Views [Section XXXXXXXX](#)

Inline Harness Connector End Views [Section XXXXXXXX](#)

Description and Operation

Electronic Component Description [Section XXXXXXXX](#)

Transmission Component and System Description [Section XXXXXXXX](#)

Transmission General Description [Section XXXXXXXX](#)

Electrical Information Reference

Circuit Testing [Section XXXXXXXX](#)

Connector Repairs [Section XXXXXXXX](#)

Testing for Intermittent Conditions and Poor Connections [Section XXXXXXXX](#)

Wiring Repairs [Section XXXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXXX](#)

Scan Tool Reference

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

14.1.3.1.9. 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 min 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.

14.1.3.1.10. Repair Instructions

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

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

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14.1.3.2. DTC P0634

14.1.3.2.1. 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.

14.1.3.2.2. DTC Descriptors

DTC P0634

Control Module Over-temperature

14.1.3.2.3. 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.

14.1.3.2.4. 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.

14.1.3.2.5. 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.

14.1.3.2.6. 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.

14.1.3.2.7. Conditions for Clearing the DTC

P0634 is a Type A DTC.

14.1.3.2.8. Diagnostic Aids

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

14.1.3.2.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXX](#)

Connector End View Reference

Component Connector End Views [Section XXXXX](#)

Inline Harness Connector End Views [Section XXXXX](#)

Description and Operation

Electronic Component Description [Section XXXXX](#)

Transmission Component and System Description [Section XXXXX](#)

Transmission General Description [Section XXXXX](#)

Electrical Information Reference

Circuit Testing [Section XXXXX](#)

Connector Repairs [Section XXXXX](#)

Testing for Intermittent Conditions and Poor Connections [Section XXXXX](#)

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Wiring Repairs [Section XXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXX](#)

Scan Tool Reference

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

14.1.3.2.10. 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 scan tool TCM Temperature parameter is less than 146°C (295°F).

⇒ If 146°C (295°F) or greater

Replace the Q8 Control Solenoid Valve assembly.

↓ If less than 146°C (295°F)

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. Clear the TCM DTCs with a scan tool.

6. Operate the vehicle until normal engine temperature is reached.

7. Verify the scan tool Transmission Fluid Temperature parameter is less than 140°C (284°F).

⇒ If 140°C (284°F) or greater

a. Ignition OFF.

b. 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)

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.

⇒ If the DTC sets

Replace the Q8 Control Solenoid Valve Assembly.

↓ If the DTC does not set

10. All OK.

14.1.3.2.11. Repair Instructions

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

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

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14.1.3.3. DTC P0658 or P0659

14.1.3.3.1. 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.

14.1.3.3.2. DTC Descriptors

DTC P0658

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

14.1.3.3.3. 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 pressure control solenoid valves and shift solenoid valves.

14.1.3.3.4. 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.

14.1.3.3.5. 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.

14.1.3.3.6. 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.

14.1.3.3.7. Conditions for Clearing the DTC

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

14.1.3.3.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics **Section XXXXXXX**

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Connector End View Reference

Component Connector End Views [Section XXXXXXXX](#)

Inline Harness Connector End Views [Section XXXXXXXX](#)

Description and Operation

Electronic Component Description [Section XXXXXXXX](#)

Transmission Component and System Description [Section XXXXXXXX](#)

Transmission General Description [Section XXXXXXXX](#)

Electrical Information Reference

Circuit Testing [Section XXXXXXXX](#)

Connector Repairs [Section XXXXXXXX](#)

Testing for Intermittent Conditions and Poor Connections [Section XXXXXXXX](#)

Wiring Repairs [Section XXXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXXX](#)

Scan Tool Reference

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

14.1.3.3.9.Circuit/System Verification

1. Engine Running and the gear selector lever in the Park position.
2. Verify the scan tool High Side Driver 1 parameter displays On.

⇒ If On is not displayed

Refer to Circuit/System Testing.

⇓ If On is displayed

3. 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.

⇓ 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.

⇓ If the DTC does not set

6. All OK.

14.1.3.3.10. 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.

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⇒ 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 DT4861610 adapter harness between the vehicle harness connector, and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Command the High Side Driver 1 ON with a scan tool.
7. Verify the scan tool High Side Driver 1 parameter displays On.

⇒ If On is not displayed
Replace the Q8 Control Solenoid Valve Assembly.

⇓ If On is displayed

8. 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

9. All OK.

14.1.3.3.11. 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

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14.1.3.4. DTC P0667, P0668, or P0669

14.1.3.4.1. 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.

14.1.3.4.2. 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

14.1.3.4.3. 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.

14.1.3.4.4. 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.

14.1.3.4.5. 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.

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14.1.3.4.6. 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.

14.1.3.4.7. Conditions for Clearing the DTC

P0667, P0668, and P0669 are Type B DTCs.

14.1.3.4.8. 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.

14.1.3.4.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXX](#)

Connector End View Reference

Component Connector End Views [Section XXXXXXX](#)

Inline Harness Connector End Views [Section XXXXXXX](#)

Description and Operation

Electronic Component Description [Section XXXXXXX](#)

Transmission Component and System Description [Section XXXXXXX](#)

Transmission General Description [Section XXXXXXX](#)

Electrical Information Reference

Circuit Testing [Section XXXXXXX](#)

Connector Repairs [Section XXXXXXX](#)

Testing for Intermittent Conditions and Poor Connections [Section XXXXXXX](#)

Wiring Repairs [Section XXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXX](#)

Scan Tool Reference

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

14.1.3.4.10. Circuit/System Verification

1. Ignition ON.
2. 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)

3. 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)

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.

14.1.3.4.11. Repair Instructions

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

- Perform the [Transmission Adaptive Values](#) Learn following all transmission repairs

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VANDERHALL

- **Control Module References** for Control Solenoid Valve Assembly replacement, programming and setup

14.1.3.5. DTC P06AC, P06AD, or P06AE

14.1.3.5.1. 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.

14.1.3.5.2. 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

14.1.3.5.3. 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.

14.1.3.5.4. 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.

14.1.3.5.5. 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.

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14.1.3.5.6.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.

14.1.3.5.7.Conditions for Clearing the DTC

P06AC, P06AD, and P06AE are Type B DTCs.

14.1.3.5.8.Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXX](#)

Connector End View Reference

Component Connector End Views [Section XXXXXXX](#)

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Wiring Repairs [Section XXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXX](#)

Scan Tool Reference

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

14.1.3.5.9.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.

14.1.3.5.10. 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

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14.1.3.6. DTC P0711 - P0713

14.1.3.6.1. 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.

14.1.3.6.2. 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

14.1.3.6.3. 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.

14.1.3.6.4. 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.

14.1.3.6.5. 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.

14.1.3.6.6. Action Taken When the DTC Sets

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

14.1.3.6.7. Conditions for Clearing the DTC

P0711, P0712, and P0713 are Type B DTCs.

14.1.3.6.8. Reference Information

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Automatic Transmission Controls Schematics [Section XXXXXXXX](#)

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Testing for Intermittent Conditions and Poor Connections [Section XXXXXXXX](#)

Wiring Repairs [Section XXXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXXX](#)

Scan Tool Reference

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

14.1.3.6.9. Circuit/System Verification

1. Engine idling at the normal operating temperature.
2. 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)

3. 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)

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.

14.1.3.6.10. 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

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14.1.3.7. DTC P0716, P0717, P07BF, or P07C0

14.1.3.7.1. 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.

14.1.3.7.2. 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

14.1.3.7.3. Circuit/System Description

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

14.1.3.7.4. Typical Scan Tool Data

Transmission ISS

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, normal operating temperature, transmission in PARK Parameter Normal Range: 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
Operating Conditions: Key ON, Engine OFF or Engine running, normal operating temperature Parameter Normal Range: OK			
12 V	OK	OK	OK
Signal	Out Of Range	OK	OK

14.1.3.7.5. Conditions for Running the DTC

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 2wire 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.

14.1.3.7.6. 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.

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- 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 Nm (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.

14.1.3.7.7. 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.

14.1.3.7.8. 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.

14.1.3.7.9. Conditions for Clearing the DTC

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

14.1.3.7.10. 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.

14.1.3.7.11. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXX](#)

Connector End View Reference

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Wiring Repairs [Section XXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXX](#)

Scan Tool Reference

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

Special Tools

DT48616-10 Adapter Harness

14.1.3.7.12. 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.

⇓ 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.

⇓ 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.

⇓ If the DTC does not set

7. All OK.

14.1.3.7.13. 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 DT4861610 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

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Replace the Q8 Control Solenoid Valve Assembly.

↓ If between 495–505 RPM

6. 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.

14.1.3.7.14. 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

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14.1.3.8. DTC P0722, P0723, P077C, or P077D

14.1.3.8.1. 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.

14.1.3.8.2. 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

14.1.3.8.3. Diagnostic Fault Information

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

14.1.3.8.4. Typical Scan Tool Data

Transmission ISS

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Drive vehicle, normal operating temperature Voltage Parameter Normal Range: 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
Operating Conditions: Key ON, Engine OFF or Engine running, normal operating temperature Parameter Normal Range: OK			
12 V	OK	OK	OK
Signal	Out Of Range	OK	Out Of Range

14.1.3.8.5. 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 2wire 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.

14.1.3.8.6. 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.

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- Transmission input speed is between 1,000–8,191 RPM.
- Calculated throttle position is 8% or greater.
- Engine torque is 30 Nm (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.

14.1.3.8.7. 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.

14.1.3.8.8. 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.

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Transmission



- 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.

14.1.3.8.9. Conditions for Clearing the DTC

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

14.1.3.8.10. 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.

14.1.3.8.11. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXX](#)

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXX](#)

Scan Tool Reference

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

Special Tools

DT48616-10 Adapter Harness

14.1.3.8.12. 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.

↓ 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.

↓ 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

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Refer to Circuit/System Testing.

↓ If the DTC does not set

6. All OK.

14.1.3.8.13. 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 DT48616-10 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.

14.1.3.8.14. 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

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14.1.3.9. DTC P0741 or P0742

14.1.3.9.1. 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.

14.1.3.9.2. 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

14.1.3.9.3. Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The TCC pressure control solenoid valve is normally low and 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 valve 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 to the TCC pressure control solenoid valves, which decreases the apply pressure and allows 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 sensor and engine RPM provided by the engine control module (ECM).

14.1.3.9.4. 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 Nm (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%.

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- Engine torque signal is valid.
- Throttle position signal is valid.
- Engine torque is 60 Nm (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.

14.1.3.9.5. 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.

14.1.3.9.6. 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.

14.1.3.9.7. Conditions for Clearing the DTC

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

14.1.3.9.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics [Section XXXXXXX](#)

Connector End View Reference

Component Connector End Views [Section XXXXXXX](#)

Inline Harness Connector End Views [Section XXXXXXX](#)

Description and Operation

Electronic Component Description [Section XXXXXXX](#)

Transmission Component and System Description [Section XXXXXXX](#)

Transmission General Description [Section XXXXXXX](#)

Electrical Information Reference

Circuit Testing [Section XXXXXXX](#)

Connector Repairs [Section XXXXXXX](#)

Testing for Intermittent Conditions and Poor Connections [Section XXXXXXX](#)

Wiring Repairs [Section XXXXXXX](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions [Section XXXXXXX](#)

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Scan Tool Reference

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

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness

14.1.3.9.9.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

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 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.

↓ 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.

14.1.3.9.10. 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.

⇒ 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.

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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.

14.1.3.9.11. 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.

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14.1.3.10. DTC P0751 or P0752

14.1.3.10.1. 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.

14.1.3.10.2. 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

14.1.3.10.3. 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.

14.1.3.10.4. Conditions for Running the DTC

- 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 400–7,500 RPM for 5 s.
- Output shaft speed is 100 RPM or greater or the throttle 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.

14.1.3.10.5. 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.

14.1.3.10.6. Action Taken When the DTC Sets

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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 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 1,350 RPM, or neutral if the output speed is 1,350 RPM or greater.

14.1.3.10.7. Conditions for Clearing the DTC

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

14.1.3.10.8. Diagnostic Aids

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

14.1.3.10.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Inline Harness Connector End Views

Description and Operation

Drive Range, First Gear Engine Braking

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

14.1.3.10.10. 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.

⇒ If another DTC is set

Refer to Diagnostic Trouble Code (DTC) List Vehicle.

↓ 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.

⇒ 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. From a stop, accelerate to 72 km/h (45 mph) with the throttle position greater than 15%. Perform this test 8 times.

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7. Verify DTC P0751 or P0752 did not set.
⇒ If DTC P0751 or P0752 sets
Refer to Circuit/System Testing.
↓ 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.
⇒ If the DTC sets
Refer to Circuit/System Testing.
↓ If the DTC does not set
10. All OK.

14.1.3.10.11. Circuit/System Testing

Note:
You must perform the Circuit/System Verification first.

7. Engine idling at the normal operating temperature.
8. Verify the transmission line pressures are within the specified range. Refer to **Line Pressure Check** and **Solenoid Valve Pressure**.
⇒ If the pressures are not within range
Refer to Fluid Pressure High or Low.
↓ If the pressures are within range
9. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
10. 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
11. 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.

P0752 Output Carrier Assembly

Output carrier pinion pins too high or too low.

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.

14.1.3.10.12. 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

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14.1.3.11. DTC P0776 or P0777

14.1.3.11.1. 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.

14.1.3.11.2. 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

14.1.3.11.3. 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 sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

14.1.3.11.4. 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 Nm (33 lb ft) or greater.
- DTC runs continuously during shift when the 3-5-R clutch is commanded OFF, until commanded range is attained.

14.1.3.11.5. 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.

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- 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.

14.1.3.11.6. 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.

14.1.3.11.7. Conditions for Clearing the DTC

P0776 and P0777 are Type A DTCs.

14.1.3.11.8. 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.

14.1.3.11.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Inline Harness Connector End Views

Description and Operation

- Drive Range, Third Gear
- Drive Range Fourth Gear
- Drive Range, Fifth Gear
- Electronic Component Description
- Transmission Component and System Description
- Transmission General Description

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

14.1.3.11.10. Circuit/System Verification

14.1.3.11.11. Warning:
14.1.3.11.12. Refer to Parking Brake and Drive Wheels Warning.

Note:
If other DTCs are set, diagnose those DTCs first.

7. Ignition ON.

8. 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

9. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.

10. 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

11. Ignition ON, clear the TCM DTCs with a scan tool.

12. 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.

↓ If DTC P0776 or P0777 does not set

13. 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.

14. Verify the DTC does not set.

⇒ If the DTC sets

Refer to Circuit/System Testing.

↓ If the DTC does not set

15. All OK.

14.1.3.11.13. 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**.

⇒ 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.

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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.

14.1.3.11.14. 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

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14.1.3.12. DTC P0796 or P0797

14.1.3.12.1. 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.

14.1.3.12.2. 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

14.1.3.12.3. Circuit/System Description

Pressure control solenoid valve 3 is part of the control solenoid valve assembly, which has no serviceable components. Pressure control solenoid valve 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 sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

14.1.3.12.4. 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 Nm (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.

14.1.3.12.5. 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.

14.1.3.12.6. Action Taken When the DTC Sets

- P0796 and P0797 are Type A DTCs.

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- 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.

14.1.3.12.7. Conditions for Clearing the DTC

P0796 and P0797 are Type A DTCs.

14.1.3.12.8. 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.

14.1.3.12.9. Reference Information

Schematic Reference

- Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Drive Range Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- 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

14.1.3.12.10. Circuit/System Verification

14.1.3.12.11. Warning:
14.1.3.12.12. 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.

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⇒ 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.

↓ 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.

↓ If the DTC does not set

9. All OK.

14.1.3.12.13. 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.

⇒ 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

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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.

14.1.3.12.14. 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

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Transmission



14.1.3.13. DTC P0815, P0816, or P0826

14.1.3.13.1. 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.

14.1.3.13.2. DTC Descriptors

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

14.1.3.13.3. Typical Scan Tool Data

Driver Shift Request

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Tap Up/Tap Down Switch Signal Circuit	Invalid	None	Invalid/None

14.1.3.13.4. Circuit/System Description

When the shift lever is placed in manual mode (M), the driver shift request (DSR), also known as the tap shift function is activated. The DSR 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 to perform the upshift or downshift.

14.1.3.13.5. Conditions for Running the DTC

P0815 or P0816

- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 V or greater.
- DTC P0815, P0816, P0826, P1761, P182E, P1876, P1877, or P1915 is not set.
- Time since the last gear range change is greater than 1 second.

P0826

- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 V or greater.
- DTC P0826 or P1761 is not set.

14.1.3.13.6. Conditions for Setting the DTC

P0815 – Condition 1

Transmission control module (TCM) detects an upshift request for 1 second with the shift lever in PARK, or NEUTRAL.

P0815 – Condition 2

TCM detects an upshift request for 10 minutes with the shift lever in a forward range.

P0816 – Condition 1

TCM detects a downshift request for 1 second with the shift lever in PARK, or NEUTRAL.

P0816 – Condition 2

TCM detects a downshift request for 10 minutes with the shift lever in a forward range.

P0826

TCM detects an invalid voltage on the TAP up/down signal circuit for 1 minute.

14.1.3.13.7. Action Taken When the DTC Sets

- DTCs P0815, P0816, and P0826 are Type C DTCs.
- TCM disables TAP shift operation.

14.1.3.13.8. Conditions for Clearing the DTC

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Transmission



DTCs P0815, P0816, and P0826 are Type C DTCs.

14.1.3.13.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

- Transmission General 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

14.1.3.13.10. Circuit/System Verification

14.1.3.13.11. Warning:
14.1.3.13.12. Refer to Parking Brake and Drive Wheels Warning.

1. Ignition ON.
2. Verify with a scan tool there were no internal mode switch (IMS) DTCs set.

⇒ If IMS DTCs were set

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

↓ If IMS DTCs were not set

3. 3. Shift lever in the M position, 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.

⇒ If the parameter does not display the correct values

Refer to Circuit/System Testing below.

↓ If the parameter displays the correct value

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to **Testing for Intermittent Conditions and Poor Connections**.

14.1.3.13.13. Circuit/System Testing

1. Ignition OFF, disconnect the harness connector from the S3 transmission shift lever.
2. Test for less than 10 Ω between the S3 transmission shift lever harness connector terminal 2 and ground.

⇒ If 10 Ω or greater

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

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.

↓ If less than 10 Ω

3. Ignition ON.
4. Test for 11 V or greater at the S3 transmission shift lever harness connector between signal circuit terminal 3 and ground.

⇒ If less than 11 V

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4.1. Ignition OFF, remove the connector at the K9 body control module.
4.2. Test for infinite resistance between the S3 transmission shift lever harness connector signal circuit terminal 3 and ground.
⇒ If less than infinite resistance, repair the short to ground in the circuit.

↓ If infinite resistance.

4.3. Test for less than 2 Ω in the signal circuit end to end.
⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
⇒ If less than 2 Ω , replace the K9 body control module.

↓ If 11 V or greater

5. Ignition OFF.

6. Test for 5.8–6.4 k Ω between the S3 transmission shift lever connector terminal 3 and terminal 2.

⇒ If not between 5.8–6.4 k Ω

Replace the S3 transmission shift lever.

↓ If between 5.8–6.4 k Ω

7. Test for 1.8–2.2 k Ω between the S3 shift lever connector terminal 3 and terminal 2 with the tap down button depressed.

⇒ If not between 1.8–2.2 k Ω

Replace the S3 transmission shift lever.

14.1.3.13.14. ↓ If between 1.8–2.2 k Ω

8. Test for 580–680 Ω between the S3 shift lever connector terminal 3 and terminal 2 with the tap up button depressed.

⇒ If not between 580–680 Ω

Replace the S3 transmission shift lever.

↓ If between 580–680 Ω

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

⇒ If 2 Ω or greater

Repair the open/high resistance in the circuit.

↓ If less than 2 Ω

10. Replace the K9 body control module.

14.1.3.13.15. Repair Instructions

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

- Refer to **Control Module References** for BCM replacement, programming and setup.
- Refer to **Transmission Control Replacement** for AT TAP shift switch replacement.

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14.1.3.14. DTC P0850 - P0852

14.1.3.14.1. 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.

14.1.3.14.2. 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

14.1.3.14.3. Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0850, P0851	P0850, P0852	P0850, P0852	-

14.1.3.14.4. Typical Scan Tool Data

Park/Neutral Position Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, transmission in park at normal operating temperature Parameter Normal Range: Park/Neutral			
Signal	Park/Neutral	In Gear	In Gear

14.1.3.14.5. Circuit/System Description

The transmission manual shift shaft switch assembly, also known as the transmission internal mode switch is a sliding contact switch attached to the manual shift shaft inside the transmission case. The park/neutral position switch is integrated into the transmission internal mode switch 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 park/neutral position 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.

14.1.3.14.6. Conditions for Running the DTC

- Ignition voltage is between 8–18 V.
- Engine speed is 1000 RPM or greater.
- Runs continuously when above conditions are met.

14.1.3.14.7. Conditions for Setting the DTC

P0850 and P0851

- ECM detects the Park/Neutral switch signal equals 0 V (Park/Neutral) when the transmission internal mode switch reports a Drive range.
- Throttle position is 10 % or greater.
- Engine torque is 75 Nm (55 lb ft) or greater.
- Vehicle speed is 10 km/h (6 mph) or greater.
- Above conditions must be met for 0.2 s.

P0852

- ECM detects the Park/Neutral switch signal equals 12 V (In Gear) when the IMS reports a Park/Neutral range for 0.2 s.

14.1.3.14.8. Action Taken When the DTC Sets

- DTCs P0850, P0851, and P0852 are Type C DTCs.
- ECM uses the transmission internal mode switch position, which is determined by the transmission control module and broadcast over GMLAN, for engine startup.

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14.1.3.14.9. Conditions for Clearing the DTC

DTCs P0850, P0851, and P0852 are Type C DTCs.

14.1.3.14.10. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

DT48616-10 Adapter Harness

14.1.3.14.11. 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. Verify the scan tool TCM 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

5. Verify the scan tool 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.

↓ If Park/Neutral and In Gear is displayed

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

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Refer to Circuit/System Testing.

↓ If the DTC does not set

8. All OK.

14.1.3.14.12. 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 DT48616-10 adapter harness to the vehicle harness connector.

Note:
All testing in steps 3 through 5 will be performed at the DT48616-10 adapter harness connector.

3. Test for less than 5 Ω between the ground circuit terminal 2 and ground.

⇒ If 5 Ω or greater

3.1. Disconnect the ground circuit at the ground connection.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.

↓ If less than 5 Ω

4. Ignition ON.

5. Test for 11–13 V between signal circuit terminal 3 and ground.

⇒ If not between 11–13 V

5.1. Ignition OFF, remove the harness connector at the K20 Engine Control Module.

5.2. 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.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K20 Engine Control Module.

↓ If between 11–13 V

6. Ignition OFF, disconnect the DT48616-10 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 X2 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

11.1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.

11.2. Install the DT48616-10 adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.

11.3. Test for infinite resistance between the DT48616-10 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 X2 connector signal circuit terminal A and ground. Ignition ON.

13. Verify the scan tool ECM Park/Neutral Position Switch parameter displays Park/Neutral.

⇒ If Park/Neutral is not displayed

13.1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.

13.2. Install the DT48616-10 adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.

13.3. Test for less than 2 Ω between adapter harness connector terminal 3 and the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A.

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⇒ If 2 Ω or greater, replace the Q8 Control Solenoid Valve Assembly.

⇒ If less than 2 Ω , replace the K20 Engine Control Module.

⇓ If Park/Neutral is displayed

14. Replace the B15 Transmission Internal Mode Switch.

14.1.3.14.13. 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 control module replacement, programming and setup

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14.1.3.15. DTC P0961 - P0963

14.1.3.15.1. 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.

14.1.3.15.2. 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

14.1.3.15.3. Circuit/System Description

The line pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The normally high line pressure control solenoid valve regulates and directs oil pressure to the pressure regulator valve. Increasing line pressure control solenoid valve pressure increases transmission line pressure. The transmission control module (TCM) varies the current to the line pressure control solenoid valve 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.

14.1.3.15.4. 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.

14.1.3.15.5. Conditions for Setting the DTC

P0961

TCM detects an internal electrical malfunction of the line pressure control solenoid valve circuit where the measured line pressure control solenoid valve current does not equal the commanded line pressure control solenoid valve current for 5 s.

P0962

TCM detects a short to ground on the line pressure control solenoid valve control circuit for 2 s.

P0963

TCM detects an open circuit or short to voltage on the line pressure control solenoid valve control circuit for 5 s.

14.1.3.15.6. 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.

14.1.3.15.7. Conditions for Clearing the DTC

- P0961 and P0963 are Type B DTCs.
- P0962 is a Type A DTC.

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14.1.3.15.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

DT48616-10 Adapter Harness

14.1.3.15.9. Circuit/System Verification

14.1.3.15.10. Warning:
14.1.3.15.11. 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.

⇓ 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.

⇓ If the DTC does not set

5. All OK.

14.1.3.15.12. 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.

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⇒ If contaminated

Repair as necessary.

↓ If not contaminated

3. Verify the resistance is within the specified range for each solenoid valve 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.

Note:
If the Line Pressure Control Solenoid Valve is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Line Pressure Control Solenoid Valve through all of the pressure commands:
 - 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.

14.1.3.15.13. 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 module replacement, programming and setup

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Transmission



14.1.3.16. DTC P0965 - P0967

14.1.3.16.1. 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.

14.1.3.16.2. 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

14.1.3.16.3. Circuit/System Description

Pressure control solenoid valve 2 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid valve 2 regulates and directs fluid pressure to the 3–5 reverse clutch regulator valve. Increasing pressure control solenoid valve 2 pressure increases pressure to the 3–5 reverse clutch. The transmission control module (TCM) varies the current to the pressure control solenoid valve 2 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to the pressure control solenoid valve 2 increases pressure control solenoid valve 2 fluid pressure by closing OFF the solenoid valve exhaust port. Decreasing the current to the pressure control solenoid valve 2 decreases clutch pressure control solenoid valve 2 fluid pressure by opening the solenoid valve exhaust port. Power to pressure control solenoid valve 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.

14.1.3.16.4. 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.

14.1.3.16.5. Conditions for Setting the DTC

P0965

TCM detects an internal electrical performance malfunction of the pressure control solenoid valve 2 control circuit where the measured pressure control solenoid valve 2 current does not equal the commanded pressure control solenoid valve 2 current for 5 s.

P0966

TCM detects a short to ground on the pressure control solenoid valve 2 control circuit for 1 s.

P0967

TCM detects an open or short to voltage on the pressure control solenoid valve 2 control circuit for 1 s.

14.1.3.16.6. 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.

14.1.3.16.7. Conditions for Clearing the DTC

- P0965 is a Type C DTC.
- P0966 and P0967 are Type A DTCs.

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14.1.3.16.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

14.1.3.16.9. 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.

↓ 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.

↓ If the DTC does not set

6. All OK.

14.1.3.16.10. 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.

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Transmission



↓ If not contaminated

3. Verify the resistance is within the specified range for each solenoid valve 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.

Note:
If the Pressure Control Solenoid Valve 2 is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 2 On and Off:
 - 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.

14.1.3.16.11. 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

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Transmission



14.1.3.17. DTC P0969 - P0971

14.1.3.17.1. 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.

14.1.3.17.2. 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

14.1.3.17.3. Circuit/System Description

Pressure control solenoid valve 3 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid valve 3 regulates and directs fluid pressure to the R1/4-5-6 regulator valve. Increasing pressure control solenoid valve 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 valve 3 by controlling the time the low side driver is ON and OFF. Decreasing the current to pressure control solenoid valve 3 increases fluid pressure by closing off the solenoid valve exhaust port. Increasing the current to the pressure control solenoid valve 3 decreases fluid pressure by opening the exhaust port. Power is supplied to the pressure control solenoid valve 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.

14.1.3.17.4. 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.

14.1.3.17.5. Conditions for Setting the DTC

P0969

TCM detects an internal electrical performance malfunction of the pressure control solenoid valve 3 control circuit where the measured pressure control solenoid valve 3 currents does not equal the commanded clutch pressure control solenoid valve 3 current for 5 s.

P0970

TCM detects a short to ground on the pressure control solenoid valve 3 control circuit for 1 s.

P0971

TCM detects an open or short to voltage on the pressure control solenoid valve 3 control circuit for 1 s.

14.1.3.17.6. 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.

14.1.3.17.7. Conditions for Clearing the DTC

- P0969 is a Type C DTC.
- P0970 and P0971 are Type A DTCs.

14.1.3.17.8. Reference Information

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- Inline Harness Connector End Views

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- 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

14.1.3.17.9. 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.

↓ 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.

↓ If the DTC does not set

6. All OK.

14.1.3.17.10. 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

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3. Verify the resistance is within the specified range for each solenoid valve 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.

Note:
If the Pressure Control Solenoid Valve 3 is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 3 On and Off:
 - 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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ If Malfunction is not displayed

7. All OK.

14.1.3.17.11. 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 module replacement, programming and setup

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Transmission



14.1.3.18. DTC P0973 or P0974

14.1.3.18.1. 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.

14.1.3.18.2. DTC Descriptors

DTC P0973

Shift Solenoid Valve 1 Control Circuit Low Voltage

DTC P0974

Shift Solenoid Valve 1 Control Circuit High Voltage

14.1.3.18.3. 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 valve 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.

14.1.3.18.4. Conditions for Running the DTC

- Engine speed is 400–7500 RPM for 5 s.
- Ignition voltage is 9–32 V.

14.1.3.18.5. 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.

14.1.3.18.6. 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.

14.1.3.18.7. Conditions for Clearing the DTC

- DTC P0973 is a Type A DTC.
- DTC P0974 is a Type B DTC.

14.1.3.18.8. Reference Information

Schematic Reference

- Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Electronic Component Description
- Transmission Component and System Description

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Transmission



- 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

14.1.3.18.9. 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 s 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.

⇓ 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.

⇓ If the DTC does not set

6. All OK.

14.1.3.18.10. 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 valve listed in the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.

⇒ If the resistance is not within range

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Transmission



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.

Note:
If Shift Solenoid Valve 1 is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. 6. Verify the scan tool parameters listed below do not display Malfunction when commanding Shift Solenoid Valve 1 On and Off:
 - 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.

14.1.3.18.11. 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 module replacement, programming and setup

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Transmission



14.1.3.19. DTC P1761

14.1.3.19.1. 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.

14.1.3.19.2. DTC Descriptors

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

14.1.3.19.3. 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. 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.

14.1.3.19.4. Conditions for Running the DTC

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

14.1.3.19.5. 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.

14.1.3.19.6. 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

14.1.3.19.7. Conditions for Clearing the DTC

P1761 is a Type C DTC.

14.1.3.19.8. Reference Information

Schematic Reference

- Automatic Transmission Controls Schematics
- Body Control System Schematics
- Data Communication Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References for scan tool information

14.1.3.19.9. Circuit/System Verification

Note:
• DTC P1761 is an informational DTC. • Diagnose all other K9 Body Control Module DTCs prior to DTC P1761

1. Verify there are no other K9 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.

14.1.3.19.10. 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

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14.1.3.20. DTC P182E or P1915

14.1.3.20.1. 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.

14.1.3.20.2. DTC Descriptors

DTC P182E

Internal Mode Switch Indicates Invalid Range

DTC P1915

Internal Mode Switch Does Not Indicate Park/Neutral During Start

14.1.3.20.3. 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
Low Reference	-	P182E	P182E	P182E, P1915

14.1.3.20.4. Typical Scan Tool Data

Internal Mode Switch A/B/C/P

Circuit	Short to Ground	Open	Short to Voltage
Signal A	Low	High	High
Signal B	Low	High	High
Signal C	Low	High	High
Signal P	Low	High	High
High = 12 volts Low = 0 volts			

14.1.3.20.5. 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 the position 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 TCM Internal Mode Switch A/B/C/P parameter. The Internal Mode Switch A/B/C/P parameter represents 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.

14.1.3.20.6. 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, P0722, or P0723 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.

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- Ignition voltage is 6–32 V.
- DTC runs when conditions above are met during engine start sequence.

14.1.3.20.7. 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.

14.1.3.20.8. 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 4th gear.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits manual shifting of forward gears.
- TCM turns the high side driver OFF.
- TCM enables torque management.

14.1.3.20.9. Conditions for Clearing the DTC

P182E and P1915 are Type A DTCs.

14.1.3.20.10. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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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

14.1.3.20.11. Circuit/System Verification

1. Verify the range selector lever cable is adjusted properly. Refer to [Range Selector Lever Cable Adjustment](#).

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⇒ 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.

↓ 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.

↓ 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.

↓ If the DTC does not set

7. All OK.

14.1.3.20.12. Circuit/System Testing

Note:
You must perform the 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

- 5.1. Ignition OFF, disconnect the vehicle harness X1 connector at the Q8 Control Solenoid Valve Assembly.
- 5.2. Install the DT-48616-10 adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.
- 5.3. 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.

5.4. Disconnect the harness connector at the K20 Engine Control Module.

5.5. 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.

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↓ 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 parameter 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 3amp fused jumper wire between terminal A and terminal F.
10. Verify the ECM Park/Neutral Position Switch parameter displays Park/Neutral.

⇒ If Park/Neutral is not displayed

- 10.1. Ignition OFF, remove the jumper wire and disconnect the X1 connector at the Q8 Control Solenoid Valve Assembly.
- 10.2. Install the DT-48616-10 adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.
- 10.3. Test for less than 2 Ω between the adapter harness terminal 2 and the X2 connector terminal F at the Q8 Control Solenoid Valve Assembly.

⇒ If greater than 2 Ω , replace the Q8 Control Solenoid Valve Assembly.

↓ If less than 2 Ω .

- 10.4. Disconnect the connector at the K20 Engine Control Module.
- 10.5. Test for less than 2 Ω in the vehicle harness park/neutral signal circuit, end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , replace the K20 Engine Control Module.

↓ If Park/Neutral is displayed

11. Replace the B15 Transmission Internal Mode Switch.

14.1.3.20.13. Repair Instructions

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

- Perform the **Transmission Adaptive Values Learn** following all transmission repairs.
- Control Valve Body Cover Replacement
- Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement
- Range Selector Lever Cable Adjustment
- **Control Module References** - for control module replacement, programming and setup

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14.1.3.21. DTC P1876

14.1.3.21.1. 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.

14.1.3.21.2. DTC Descriptors

DTC P1876

Up and Down Shift Enable Switch Circuit Low Voltage

14.1.3.21.3. Circuit/System Description

When the shift lever is placed in the M position, the transmission will enter manual mode, also known as tap shift. The manual mode allows the vehicle operator to select an upshift by pressing the plus (+) button or downshift 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) for an upshift or downshift.

14.1.3.21.4. 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.

14.1.3.21.5. Conditions for Setting the DTC

TCM detects a shift request for 3 s when the shift lever is in Park, Reverse, or Neutral, a total of 5 times.

14.1.3.21.6. 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.

14.1.3.21.7. Conditions for Clearing the DTC

P1876 is a Type C DTC.

14.1.3.21.8. Reference Information

Schematic Reference

- Automatic Transmission Controls Schematics
- Body Control System Schematics
- Data Communication Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

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Scan Tool Reference

Control Module References for scan tool information

14.1.3.21.9. 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.

⇒ If DTC P182E or P1915 was set

Refer to DTC P182E or P1915.

⇓ If DTC P182E or P1915 was not set

2. Ignition ON.
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.

⇒ If the specified values are not correct

Refer to Range Selector Lever Cable Adjustment.

⇓ If the specified values are correct

4. Shift lever in the M position.
5. Verify the scan tool Driver Shift Request parameter changes from Inactive to Upshift when the plus button is pressed, and from Inactive to Downshift when the minus button is pressed.

⇒ If Inactive, Upshift, and Downshift are not displayed

Refer to Circuit/System Testing.

⇓ If Inactive, Upshift, and Downshift are displayed

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.

⇓ If the DTC does not set

8. All OK.

14.1.3.21.10. 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 S3 Transmission Shift Lever. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the vehicle harness connector ground circuit terminal 2 and ground.

⇒ If 10 Ω or greater

2.1. Disconnect the vehicle harness at the ground connection.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit

⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.

⇓ If less than 10 Ω

3. Ignition ON.
4. Test for 11–13 V at the vehicle harness connector between signal circuit terminal 3 and ground.

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⇒ If not between 11–13 V

4.1. Ignition OFF, remove the connector at the K9 Body Control Module.

4.2. 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.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the signal circuit wire.

↓ If less than 2 Ω .

4.4. Replace the K9 Body Control Module.

↓ 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

14.1.3.21.11. 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

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14.1.3.22. DTC P2714 or P2715

14.1.3.22.1. 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.

14.1.3.22.2. 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

14.1.3.22.3. Circuit/System Description

Pressure control solenoid valve 4 is part of the control solenoid valve assembly which has no serviceable components. Pressure control solenoid valve 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 sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

14.1.3.22.4. 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 Nm (33 lb ft) or greater.
- The attained range is not 1st gear.
- High side driver is enabled.
- Runs continuously when above conditions are met.

14.1.3.22.5. Conditions for Setting the DTC

P2714

TCM detects an incorrect on-coming clutch gear ratio, or shift flare. This condition must occur 3 times.

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P2715

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up. This condition must occur 3 times.

14.1.3.22.6. 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.

14.1.3.22.7. Conditions for Clearing the DTC

P2714 and P2715 are Type A DTCs.

14.1.3.22.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Drive Range, Second Gear
- Drive Range, Sixth Gear
- 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

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14.1.3.22.9. 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.

⇓ 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.

⇓ If the DTC does not set

9. All OK.

14.1.3.22.10. 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.

⇒ 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 solenoid valves when performing the solenoid valve 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.

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↓ 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.

14.1.3.22.11. 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

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14.1.3.23. DTC P2719 - P2721

14.1.3.23.1. 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.

14.1.3.23.2. 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

14.1.3.23.3. Circuit/System Description

Pressure control solenoid valve 4 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid valve 4 regulates and directs oil pressure to the 2-6 clutch regulator valve. Increasing pressure control solenoid valve 4 pressure increases pressure to the 2-6 clutch. The transmission control module (TCM) varies current to the pressure control solenoid valve 4 by controlling the amount of time the low side driver is ON and OFF. Increasing the ON time increases current to the pressure control solenoid valve 4. Increasing current to pressure control solenoid valve 4 increases oil pressure by closing off the solenoid valve exhaust port. Decreasing the current to the pressure control solenoid valve 4 decreases oil pressure by opening the exhaust port. Pressure control solenoid valve 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.

14.1.3.23.4. 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.

14.1.3.23.5. Conditions for Setting the DTC

P2719

TCM detects an internal electrical performance malfunction on the clutch pressure solenoid valve 4 control circuit where the measured clutch pressure control solenoid valve 4 current does not equal the commanded clutch pressure control solenoid valve 4 current for 5s.

P2720

TCM detects a short to ground on the clutch pressure control solenoid valve 4 control circuit for 1 s.

P2721

TCM detects an open or short to voltage on the clutch pressure control solenoid valve 4 control circuit for 1 s.

14.1.3.23.6. 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.

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Transmission



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.

14.1.3.23.7. Conditions for Clearing the DTC

- P2719 is a Type C DTC.
- P2720 and P2721 are Type A DTCs.

14.1.3.23.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

14.1.3.23.9. 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.

⇓ 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.

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6. Verify the DTC does not set.

⇒ If the DTC sets

Refer to Circuit/System Testing.

⇓ If the DTC does not set

7. All OK.

14.1.3.23.10. Circuit/System Testing

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 valve 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.

Note:

If the Pressure Control Solenoid Valve 4 is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 4 On and Off:

- 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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ If Malfunction is not displayed

7. All OK.

14.1.3.23.11. 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 module replacement, programming and setup

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14.1.3.24. DTC P2723 or P2724

14.1.3.24.1. 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.

14.1.3.24.2. 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

14.1.3.24.3. Circuit/System Description

Pressure control solenoid valve 5 is part of the control solenoid valve assembly, which has no serviceable components. The pressure control solenoid valve 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 sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

14.1.3.24.4. 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.

14.1.3.24.5. Conditions for Setting the DTC

P2723

TCM detects an incorrect oncoming 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.

14.1.3.24.6. 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.

14.1.3.24.7. Conditions for Clearing the DTC

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P2723 and P2724 are Type A DTCs.

14.1.3.24.8. 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.

14.1.3.24.9. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range Fourth
- Gear
- 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

14.1.3.24.10. Circuit/System Verification

Note:
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.

⇒ If DTC P2723 or P2724 sets
Refer to Circuit/System Testing.

⇓ If DTC P2723 or P2724 does not set

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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.

⇓ If the DTC does not set

7. All OK.

14.1.3.24.11. 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](#).

⇒ 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 solenoid valves when performing the solenoid valve 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.

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

- Q27E Pressure Control Solenoid Valve 5 Stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damage gasket seal.

14.1.3.24.12. Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs

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- **Control Module References-** for Control Solenoid Valve Assembly replacement, programming and setup

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DTC P2728 - P2730

14.1.3.24.13. 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.

14.1.3.24.14. 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

14.1.3.24.15. Circuit/System Description

Pressure control solenoid valve 5 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid valve 5 regulates and directs oil pressure to the 1-2-3-4 clutch regulator valve. Increasing pressure control solenoid valve 5 pressure increases pressure to the 1-2-3-4 clutch. The transmission control module (TCM) varies the current to the pressure control solenoid valve 5 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to pressure control solenoid valve 5 decreases pressure control solenoid valve 5 oil pressure by opening the solenoid valve exhaust port. Decreasing the current to pressure control solenoid valve 5 increases pressure control solenoid valve 5 oil pressure by closing OFF the solenoid valve exhaust port. Pressure control solenoid valve 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.

14.1.3.24.16. 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.

14.1.3.24.17. Conditions for Setting the DTC

P2728

TCM detects an internal electrical performance malfunction of the pressure control solenoid valve 5 control circuit where the measured clutch pressure control solenoid valve 5 current does not equal the commanded clutch pressure control solenoid valve 5 current for 5 s.

P2729

TCM detects a short to ground on the clutch pressure control solenoid valve 5 control circuit for 1 s.

P2730

TCM detects an open or short to voltage on the clutch pressure control solenoid valve 5 control circuit for 1 s.

14.1.3.24.18. 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.

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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.

14.1.3.24.19. Conditions for Clearing the DTC

- P2728 is a Type C DTC.
- P2729 and P2730 are Type A DTCs.

14.1.3.24.20. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

14.1.3.24.21. 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.

⇓ 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

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Refer to Circuit/System Testing.

↓ If the DTC does not set

6. All OK.

14.1.3.24.22. 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 valve 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.

Note:
If the Pressure Control Solenoid Valve 5 is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 5 On and Off:
 - 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.

14.1.3.24.23. 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 module replacement, programming and setup

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14.1.3.25. DTC P2762, P2763, or P2764

14.1.3.25.1. 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.

14.1.3.25.2. 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

14.1.3.25.3. Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The normally low TCC pressure control solenoid valve regulates oil pressure to the TCC regulator valve and TCC control valve. Increasing TCC pressure control solenoid valve 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 valve by controlling the amount of time the low side driver is ON and OFF. Increasing current to the TCC pressure control solenoid valve increases oil pressure by closing OFF the solenoid valve exhaust port. Decreasing current to the TCC pressure control solenoid valve decreases oil pressure by opening up the solenoid valve exhaust port. TCC pressure control solenoid valve 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.

14.1.3.25.4. 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.

14.1.3.25.5. Conditions for Setting the DTC

P2762

TCM detects an internal electrical performance malfunction on the TCC pressure control solenoid valve control circuit where the measured TCC pressure control solenoid valve current does not equal the commanded TCC pressure control solenoid valve current for 5 s.

P2763

TCM detects an open/high resistance or short to voltage on the TCC pressure control solenoid valve control circuit for 5 s.

P2764

TCM detects a short to ground on the TCC pressure control solenoid valve control circuit for 5 s.

14.1.3.25.6. Action Taken When the DTC Sets

P2762

P2762 is a Type C DTC.

P2763

- P2763 is a Type B DTC.
- TCM inhibits 6th gear.

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- 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.

14.1.3.25.7. Conditions for Clearing the DTC

- P2762 is a Type C DTC.
- P2763 is a Type B DTC.
- P2764 is a Type A DTC.

14.1.3.25.8. Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

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

14.1.3.25.9. 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

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⇒ If Malfunction is displayed
Refer to Circuit/System Testing.

↓ 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.

↓ If the DTC does not set

6. All OK.

14.1.3.25.10. 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 valve 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.

Note:
If the TCC Pressure Control Solenoid Valve is not commanded from the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the TCC Pressure Control Solenoid Valve On and Off:
 - 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.

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14.1.3.25.11. 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 module replacement, programming and setup

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DTC B270A

14.1.3.25.12. 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.

14.1.3.25.13. DTC Descriptors

DTC B270A 01

Park Lock Solenoid Control Circuit Short to Battery

DTC B270A 02

Park Lock Solenoid Control Circuit Short to Ground

14.1.3.25.14. Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuse B+	B270A 02, 1	1	-	-
Control	B270A 02, 1	1	B270A 01, 2	-
Ground	-	1	-	-

1. Transmission shift control lever will not move from PARK with the brake pedal applied.
2. Transmission shift control lever will move from PARK without the brake pedal applied.

14.1.3.25.15. Circuit/System Description

The body control module controls the transmission shift lock control solenoid actuator by providing a battery positive voltage to the solenoid when the brake pedal is applied. The body control module monitors the voltage and current flow of the control circuit.

14.1.3.25.16. Conditions for Running the DTC

- Ignition ON / Vehicle in Service Mode.
- Brake pedal is applied.
- Transmission is in the PARK position.
- DTC runs continuously once the above conditions are met.

14.1.3.25.17. Conditions for Setting the DTC

B270A 01

The body control module detects a short to voltage in the transmission shift lock control solenoid actuator control circuit for 1 s.

B270A 02

The body control module detects a short to ground in the transmission shift lock control solenoid actuator control circuit for 1 s.

14.1.3.25.18. Action Taken When the DTC Sets

The body control module will not attempt to enable the voltage supply circuit of the transmission shift lock control solenoid actuator until the next key cycle.

14.1.3.25.19. Conditions for Clearing the DTC

- A current DTC B270A will clear when the malfunction is no longer present and the ignition switch is cycled.
- A history DTC will clear after 100 ignition cycles with no current DTC active during the 100 ignition cycles.

14.1.3.25.20. Reference Information

Schematic Reference

- Body Control System Schematics
- Shift Lock Control Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

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Automatic Transmission Shift Lock Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

14.1.3.25.21. Circuit/System Verification

1. Ignition ON / Vehicle in Service Mode.
2. Verify the scan tool Brake Transmission Shift Interlock Solenoid Actuator Command parameter changes from Inactive to Active when the brake pedal is applied.

⇒ If the Brake Transmission Shift Interlock Solenoid Actuator Command does not change

Refer to Stop Lamps Malfunction

↓ If the Brake Transmission Shift Interlock Solenoid Actuator Command changes

3. Verify the S3 Transmission Shift Lever moves out of the PARK position when the brake pedal is applied.

⇒ If the S3 Transmission Shift Lever does not move out of the PARK position

Refer to Circuit/System Testing.

↓ If the S3 Transmission Shift Lever does move out of the PARK position

4. All OK.

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14.1.3.25.22. Circuit/System Testing

1. Ignition OFF, scan tool disconnected, all doors closed, all accessories OFF, open and close driver's door, 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 Ω between the ground circuit terminal 2 and ground.

⇒ If 10 Ω or greater

- 2.1. Ignition OFF.
- 2.2. Test for less than 2 Ω in the ground circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.

↓ If less than 10 Ω

3. Ignition ON / Vehicle in Service Mode, connect a test lamp between the control circuit terminal 4 and the ground circuit terminal 2.
4. Verify the test lamp turns ON and OFF when commanding the Brake Transmission Shift Interlock Solenoid Actuator ON and OFF with a scan tool.

⇒ If the test lamp is always OFF

- 4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
- 4.2. Test for infinite resistance between the control circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

↓ If infinite resistance

- 4.3. Test for less than 2 Ω in the control circuit end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.

↓ If less than 2 Ω

- 4.4. Ignition ON / Vehicle in Service Mode.

- 4.5. Verify a test lamp illuminates between each B+ and ignition circuit terminal at the control module harness connector.

⇒ If the test lamp does not illuminate, repair the circuit or fuse as necessary.

⇒ If the test lamp illuminates at each B+ and ignition circuit, replace the K9 Body Control Module.

⇒ If the test lamp is always ON

- 4.1. Ignition OFF, disconnect the harness connector at the K9 body control module, ignition ON / Vehicle in Service Mode.
- 4.2. Test for less than 1 V between the control circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K9 Body Control Module.

↓ If the test lamp turns ON and OFF

5. Test or replace the S3 Transmission Shift Lever.

14.1.3.25.23. Component Testing

1. Ignition OFF, disconnect the harness connector at the S3 Transmission Shift Lever.
2. Install a 3 A fused jumper wire between the control terminal 4 and 12 V. Momentarily install a jumper wire between the ground terminal 2 and ground.
3. Verify the solenoid turns on and off/clicks, etc.
⇒ If the solenoid does not turn on and off/clicks, etc.
Replace the S3 Transmission Shift Lever.
↓ If the solenoid does turn on and off/clicks, etc.
4. All OK

14.1.3.25.24. Repair Instructions

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

- Transmission Control Replacement
- **Control Module References** for control module replacement, programming, and setup.

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14.1.3.26. Symptoms

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
- Noise and Vibration Diagnosis
 - Whine/Growl Noise
 - Noise and Vibration Analysis
 - Torque Converter Diagnosis
- 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
 - Harsh Downshift
- 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

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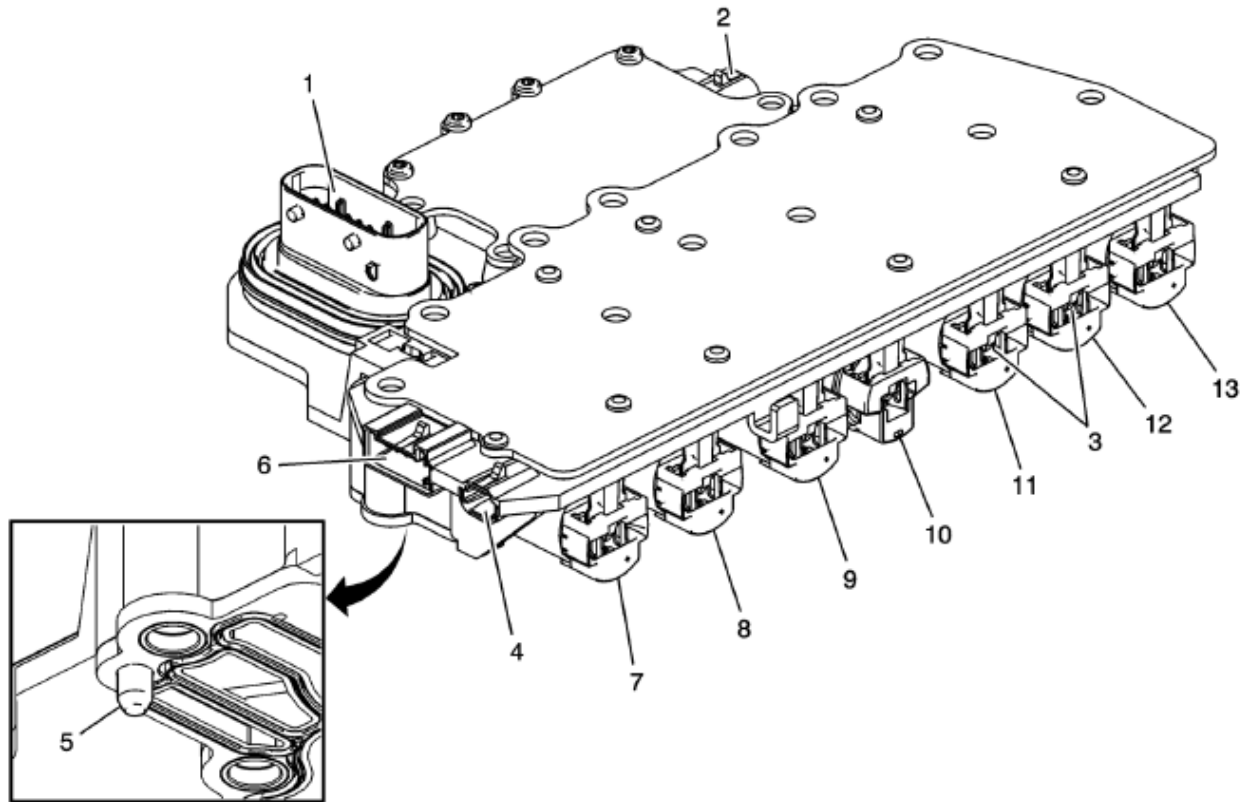


- Symptom Not Found or No Symptom Detected
 - – Transmission Fluid Level and Condition Check
 - – Road Test
 - – Line Pressure Check

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14.1.3.27. Control Solenoid Valve and Transmission Control Module Assembly Inspection



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 valve is within the range in the table below, with the solenoid valves at room temperature. If the resistance of any solenoid valve 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 valve 2 (11) and pressure control solenoid valve 4 (12).	

Solenoid Resistance

Solenoid Name	Illustration Number	Expected Resistance Ω
Pressure Control Solenoid Valve 3	7	4.55–5.75

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Pressure Control Solenoid Valve 5	8	4.55–5.75
TCC Pressure Control Solenoid Valve	9	3.42–4.18 Clear/transparent Connector 4.55–5.75 Yellow Connector
Shift Solenoid Valve 1	10	16.2–19.8
Pressure Control Solenoid Valve 2	11	4.55–5.75
Pressure Control Solenoid Valve 4	12	4.55–5.75
Line Pressure Control Solenoid Valve	13	4.55–5.75

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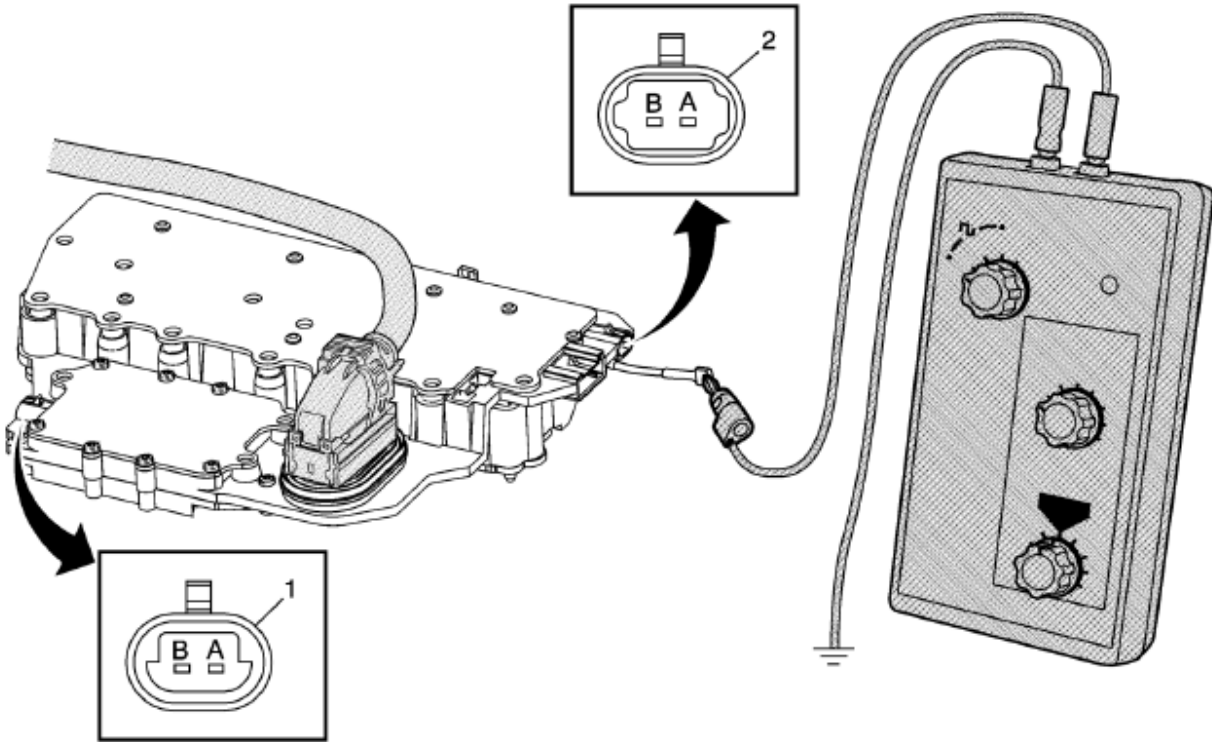
Transmission

14.1.3.28. 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



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](#).

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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**.

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14.1.3.29. 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 – Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches. – 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 2015–MY 2017 Gen 2 64–76°C (147–169 °F) ▪ MY 2015–MY 2017 Gen 3 86–106°C (187–223°F) – Transmission Adaptive Values Learn will abort if the transmission fluid temperature increases to the values listed below: ▪ MY 2015–MY 2017 Gen 2 86°C (187°F) ▪ MY 2015–MY 2017 Gen 3 126°C (259°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 retry procedure. If the procedure repeatedly fails, a limit that engineering set is being exceeded and there is possibly a transmission hardware issue. Starting the procedure at the minimum temperature will help prevent the procedure from aborting due to an over temperature condition.

1. Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:
 - 1.1. Module Diagnostics
 - 1.2. Transmission Control Module
 - 1.3. Configurations/Reset Functions
 - 1.4. 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.

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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:
Gen 1 and Gen 2 may have the same RPO code. 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, Gen 2, or Gen 3.
- 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

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14.1.3.30. 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.

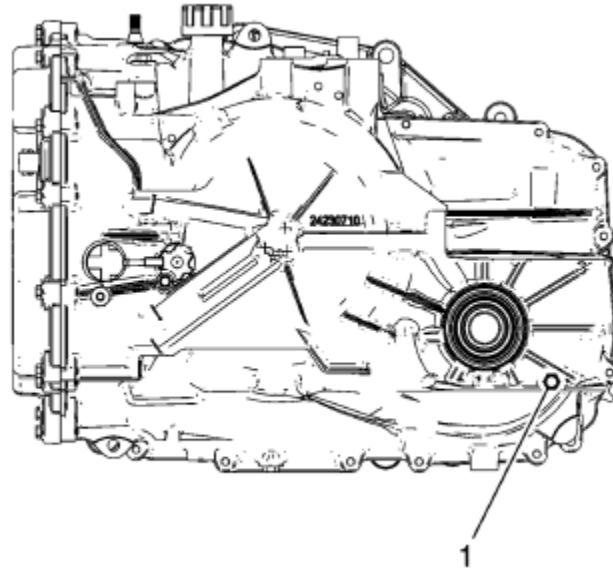
4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

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 overfilled transmission. TFT 95°C underfilled, TFT 85°C overfilled. An underfilled transmission will cause premature component wear or damage. An overfilled 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.

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6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.
 - 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**.
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 overfilled transmission. TFT 95°C underfilled, TFT 85°C overfilled. An underfilled transmission will cause premature component wear or damage. An overfilled 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

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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 .

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

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- 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**.

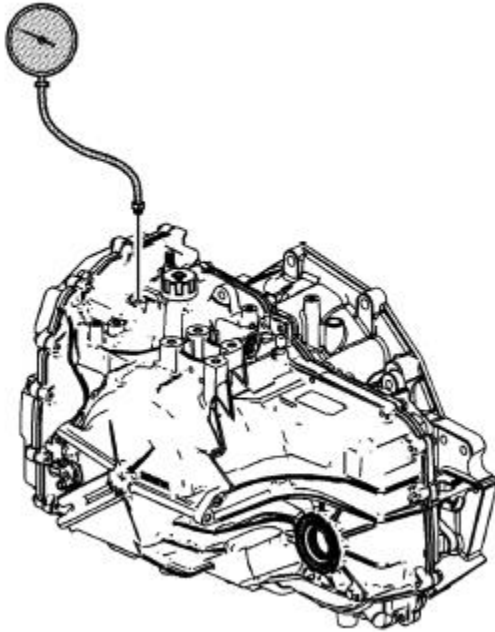
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14.1.3.31. Line Pressure Check

Special Tools

GE-21867-A Oil Pressure Gauge Kit



Warnings:
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**.
14. If the pressure readings vary greatly, refer to **Fluid Pressure High or Low**.
15. Turn the engine OFF.

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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 Nm (106 lb in).

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14.1.3.32. 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 Stepln
- 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.

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

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- 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.
- 5.1. Apply the brake pedal and ensure the parking brake is set.
- 5.2. Move the gear selector through the following ranges:
- 5.2.1. PARK to REVERSE
 - 5.2.2. REVERSE to NEUTRAL
 - 5.2.3. NEUTRAL to DRIVE
 - 5.2.4. DRIVE to REVERSE
 - 5.2.5. REVERSE to DRIVE
- 5.3. Pause 2 to 3 seconds in each gear position.
- 5.4. 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.

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6. Monitor transmission range on the scan tool, transmission data list.
 - 6.1. Apply the brake pedal and ensure the parking brake is set.
 - 6.2. Move the gear selector through all ranges.
 - 6.3. Pause 2 to 3 seconds in each range.
 - 6.4. Return gear selector to PARK.
 - 6.5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
 - 7.1. Apply the brake pedal and ensure the parking brake is set.
 - 7.2. Ensure the gear selector is in PARK.
 - 7.3. 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 off-going 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,

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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.

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14.1.3.33. 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.

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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.

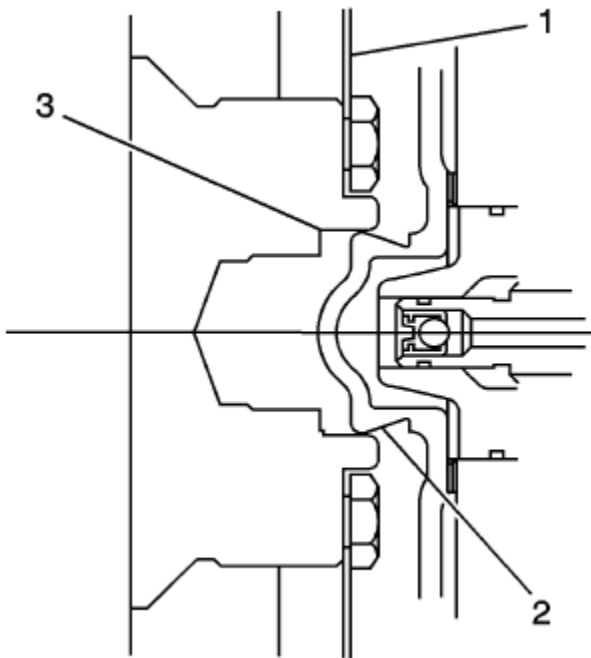
Refer to **Symptoms Engine Controls** in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

Torque Converter Vibration Test

Note:

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.

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.

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Caution:
Refer to Fastener Caution.

- 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**.
- Lower the vehicle.
- 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.
- Install the torque converter access cover and bolts (if equipped) and tighten according to **Fastener Tightening Specifications**.

Torque Converter Replacement Guide

Condition	Action
- Transmission Fluid Oxidized/Discolored - Clutch Fiber Material	Do not replace the torque converter. Refer to Transmission Fluid Level and Condition Check.
Transmission Fluid Contaminated with Metal Particles	Note: 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 Symptoms - Automatic Transmission.
Noise—Whine	- Refer to Symptoms - Automatic Transmission. - Do not replace the torque converter if noise is present in Neutral/Park. Refer to Symptoms Engine Mechanical
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 Symptoms Engine Controls
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 Symptoms Engine Controls
DTC P0741—TCC Stuck OFF/High Slip—Intermittent Only	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
DTC P0741—TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
DTC P0742—TCC Stuck ON	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
Transmission Fluid Contaminated with Sludge/Metal Particles as a result of: - Engine Coolant/Oil - Pump damage - Drive sprocket support damage - Turbine/stator shaft damage - Internal converter damage with no damage found in the transmission	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. - Refer to Torque Converter Stator in this procedure. - Refer to Symptoms - Engine Controls
Poor Launch – Good Acceleration above 48 km/h (30 mph)	Do not replace the torque converter until completing all engine and transmission diagnostics.

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	Refer to Torque Converter Stator in this procedure. Refer to Symptoms - Engine Controls
Stripped Converter Bolt Holes	Replace the torque converter. Inspect flexplate and refer to Lower Engine Noise, Regardless of Engine Speed
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.

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14.1.3.34. 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.

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14.1.3.35. 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.

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14.1.3.36. Fluid Leak Diagnosis

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. 3. Operate the vehicle for 15–20 minutes under city driving conditions until normal operating temperatures are reached.
4. 4. Shut OFF the engine.
5. 5. Inspect the suspected leak area.
6. 6. Trace the leak path through the powder in order to find the source of the leak.
7. 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. 3. Detect the leak with the black light.
4. 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

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- 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

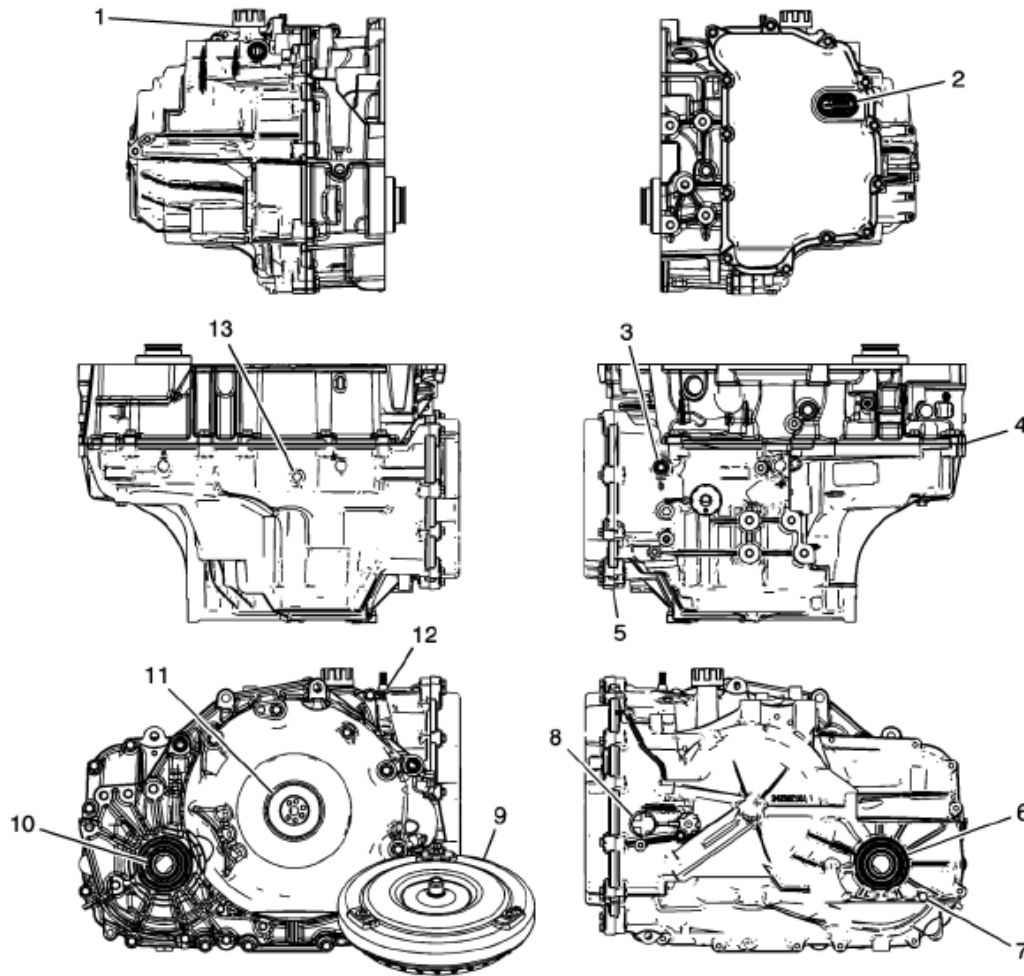
Leak at the Vent

- 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

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(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
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14.1.3.37. 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.

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14.1.3.38. 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

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14.1.3.39. 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](#).

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14.1.3.40. Whine/Growl Noise

Checks	Causes
Differential Assembly (232)	- Inspect for worn wheel bearings or axles. - Inspect for worn or damaged Side Gear Thrust Washer) or Pinion Gear Thrust Washer - Inspect for loose or worn Side Gear Axle Splines - Inspect for damaged or worn Side Gear - Inspect for worn or damaged Final Drive Inner and Outer Washers (584) - Inspect for loose, damaged or worn Front Differential Carrier Thrust Bearings, (228, 231, 233) - Inspect for broken, worn or disengaged Final Drive Pinion Pin Retainer (581) - Inspect for damaged or worn Pinion Gears
Drive Link Assembly (225)	- Inspect for worn, loose or damaged links - Inspect for broken, worn or loose Drive Link Lube Scoop (60)
Drive Sprocket Assembly (224)	- Inspect for improper Drive Sprocket (224) tooth surface finish - Inspect for broken or damaged Drive Sprocket (224) teeth - Inspect for worn or damaged Drive Sprocket Thrust Bearings (223, 556) - Inspect for worn or damaged Output Carrier Transfer Drive Gear Hub Assembly splines (222) - Inspect for loose, worn or damaged Output Carrier Transfer Drive Gear Hub Assembly bushing
Driven Sprocket Assembly (229)	- Inspect for worn, binding or damaged Driven Sprocket Bearing Assembly (228) - Inspect for worn or damaged Driven Sprocket Ball Bearing Assembly - Inspect for improper Driven Sprocket (229) tooth surface finish - Inspect for broken or damaged Driven Sprocket (229) teeth
Input Carrier Assembly (570)	- Inspect for pitted/spalled Pinion Gear teeth - Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings - Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings - Inspect for loose or broken Hub and Ring Gear - Inspect for loose or broken Output Internal Gear Retainer - Inspect for loose or worn Sun Gear Thrust Bearings (569, 572)
Output Carrier Assembly (574)	- Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings - Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings - Inspect for loose Hub and Ring Gear
Output Sun Gear Assembly (555)	- Inspect for worn or damaged Output Sun Gear Thrust Bearing (556) - Inspect for loose, worn or damaged Output Sun Gear bushing - Inspect for worn or damaged Output Sun Gear teeth

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Reaction Carrier Assembly (567)	- Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings - Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings - Inspect for loose hub and Ring Gear - Inspect for worn or damaged Reaction Carrier Thrust Bearings (565)
Reaction Sun Gear Assembly (566)	Inspect for loose, worn or damaged Reaction Sun Gear Assembly bushing
Fluid Pump Assembly (201)	- Inspect for proper fluid level - Inspect for leaking Pump Fluid Outlet Seal Assembly (24) or Filter Seal
3–5–Reverse Clutch Assembly	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (508–510) - Inspect for loose or worn Backing Plate Retainer (511) - Inspect for loose Speed Sensor Reluctor Wheel (501) or Retainer (500)
4–5–6 Clutch Assembly	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (425–428) - Inspect for loose or worn Clutch Dam Retainer (524) - Inspect for loose or worn 3–5–Reverse/4–5–6 Clutch Housing Bushing
1–2–3–4 Clutch Assembly	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (557–559) - Inspect for loose or worn Clutch Spring Retainer (561)
Low and Reverse Clutch Assembly (OWC) (543)	- Inspect for stripped or sheared Low and Reverse Clutch Assembly (543) splines - Inspect for nonrotating - Low and Reverse Clutch Assembly (543)
Low and Reverse Clutch	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (545–547) - Inspect for loose or worn Clutch Spring Retainer (548)
2–6 Clutch Assembly	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (540–542) - Inspect for loose or worn Clutch Spring Retainer (537)
Case Assembly (50)	- Inspect for loose or broken Transmission Mount Bolts - Inspect for loose Torque Converter and Differential Housing Bolts (26) - Inspect for loose, worn or damaged differential bushing - Inspect for loose or broken Input Shaft Support Bolts (57) - Inspect for loose or broken Front Differential Carrier Baffle Bolts (61) - Inspect for stripped or sheared splines

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	• Inspect for loose, worn or damaged bushing
Torque Converter Housing Assembly (208)	• Inspect for loose or broken Front Differential Ring Gear Retainer (206) • Inspect for loose, worn or damaged differential bushing • Inspect for loose or broken Pinion Gear Shaft Retainer Pin • Inspect for loose or broken Front Differential Carrier Baffle Bolts (204) • Inspect for loose or broken Fluid Pump Bolts (200) • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for loose, worn or damaged bushing
Control Valve Body Cover Assembly (2)	• Inspect for loose, missing or broken Valve Body Cover Bolts (1)
Torque Converter (28)	• Inspect for improper alignment of Torque Converter to the Crankshaft • Inspect for ballooning of the Torque Converter
Differential Carrier Assembly (232)	• Inspect for worn or damaged Differential Carrier (582) • Inspect for worn or damaged Pinion Pins (583) • Inspect for broken, worn or damaged Differential Sun Gear Bearing (231) or Driven Sprocket Bearing (228) • Inspect for worn or damaged Differential Side Gear teeth, Final Drive Pinion Gear (586) teeth or Final Drive Sun Gear (230) teeth • Inspect for worn or damaged Differential Side Gear Thrust Washers or Final • Drive Inner and Outer Washers (584) • Inspect for worn or damaged Final Drive Rollers (585) • Inspect for broken or damaged Differential Pinion Gear Shaft Retainer

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14.1.3.41. Automatic Transmission Fluid Leaks

Automatic Transmission Fluid Leaks

Checks	Causes
Torque Converter (28)	Inspect for damage
Case Assembly (50)	• Inspect for cracked or broken Case (50) • Inspect for porosity or damage on the sealing surfaces • Inspect for loose Oil Cooler Line Bolts or damaged Oil Cooler Line Seals • Inspect for damaged Manual Shift Shaft Seal (604) • Inspect for damaged or worn Axle Seal (65) or Axle Seal Slinger on the axle shafts • Inspect for plugged Vent Cap (52) • Inspect for loose Pressure Test Plug (51), Drain Plug (64) and Fluid Level Plug (63) • Inspect for damaged Park Pawl Actuator Guide Seal (605) • Inspect for damaged or worn Input Speed Sensor Seals (19)
Torque Converter Housing Assembly (208)	• Inspect for damaged Torque Converter Housing Assembly (208) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Seal (23) • Inspect for damaged or worn Torque Converter Fluid Seal (301) • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for damaged or worn Axle Seal (209) or Axle Seal Slings on the axle shafts • Inspect for loose, missing or damaged Fluid Fill Tube Plug Assembly (27) • Inspect for damaged Torque Converter and Differential Housing Seal (202)
Valve Body Cover Assembly (2)	• Inspect for damaged or warped Valve Body Cover Assembly (2) • Inspect for damaged or improperly installed Valve Body Cover Gasket (3) • Inspect for loose Valve Body Cover Bolts (1) • Inspect for damaged or improperly installed Wire Connector Hole Seal (5)

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14.1.3.42. Shift Indicator Indicates Wrong Gear Selection

Shift Indicator Indicates Wrong Gear Selection

Checks	Causes
Shift Cable	• Inspect for damage. • Verify proper attachment to shifter. • Verify cable is locked into shifter bracket. • Verify cable is properly attached to the transmission. • Verify that the cable is locked into the transmission bracket. • Verify proper cable adjustment. Refer to Range Selector Lever Cable Adjustment.
Manual Shaft	• Verify shift lever is properly attached to the manual shaft. • Verify manual shaft is not twisted or damaged.
Manual Shift Detent Lever with Shaft Position Switch Assembly, IMS	Verify proper operation. Refer to Transmission Internal Mode Switch Logic.

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14.1.3.43. No Park

Checks	Causes
Differential Carrier Assembly (232)	- Inspect for damaged or broken Front Differential Assembly (232). - Inspect for damaged or broken Front Differential Side Gear or Pinion Gear. - Inspect for damaged or broken Front Differential Pinion Gear Shaft. - Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin. - Inspect for worn, stripped or sheared Front Differential Side Gear splines. - Inspect for damaged or broken Final Drive Sun, Pinion or Ring Gear. - Inspect for worn, stripped or sheared Final Drive Sun Gear splines.
Output Carrier Transfer Drive Gear Hub Assembly (222)	- Inspect for broken Drive Gear Hub (222). - Inspect for worn, stripped or sheared Drive Gear hub (222) splines. - Inspect for disengaged or broken Park Gear Retainer Ring (220). - Inspect for damaged or broken park Gear (221). - Inspect for disengaged or broken Drive Sprocket Retainer Ring (227).
Drive Link Assembly (225)	- Inspect for broken, worn or damaged Drive Link Assembly (225). - Inspect for broken, worn or damaged Drive Sprocket (224). - Inspect for broken, worn or damaged Driven Sprocket Assembly (229). - Inspect for worn, stripped or sheared Driven Sprocket splines. - Inspect for broken Drive Gear Hub (222).
Case Assembly (50)	- Inspect for broken or damaged Case. - Inspect for broken or bent Park Pawl Shaft (600). - Inspect for broken or missing Park Pawl Actuator Guide Pin (603) or Manual Shaft Pin (611). - Inspect for broken or missing Manual Shaft Detent Lever Pin (610). - Inspect for broken or missing Manual Shift Shaft Pin (611). - Inspect for damaged or broken Manual Shift Detent Lever Shaft (608). - Inspect for loose, damaged or broken Detent Lever Spring Assembly (17). - Inspect for broken, lose or misaligned Park Pawl Actuator Guide (606). - Inspect for binding, bent or broken Park Pawl (602) or Actuator Assembly (607).

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14.1.3.44. No Drive in All Ranges

No Drive in All Ranges

Checks	Causes
Case Assembly (50)	• Inspect for cracked or broken Case (50). • Inspect for stripped or sheared splines. • Inspect for binding Manual Shift Detent Lever Assembly (609). • Inspect for missing Manual Shift Shaft Pin (611). • Inspect for missing Manual Shaft Lever Pin (610). • Inspect for interference or binding Park Pawl Actuator Assembly (607). • Inspect for broken or disengaged 1–2–3–4 Clutch Backing Plate Retainer Ring (561). • Inspect for loose or damaged case bushing. • Inspect A/Trans Fluid Pump Seal Assembly (25) for damage.
Torque Converter (28)	• Inspect for stripped or sheared splines on Turbine Shaft. • Inspect for missing Torque Converter to Flywheel bolts. • Inspect for damaged or disengaged Torque Converter Hub to Oil Pump Drive Gear.
Torque Converter Housing (208)	• Inspect for stripped or sheared Differential Ring Gear splines. • Inspect for broken or disengaged Differential Ring Gear Retainer (206). • Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (26). • Inspect for loose, missing or broken Fluid Pump bolts (200).
35R/456 Housing Assembly (516)	• Inspect for damaged or broken Input Shaft Thrust Bearing Assembly (538). • Inspect for stripped or sheared splines on the Input Shaft to the 3–5 • Reverse/4–5–6 Clutch Housing (516).
Oil Pump Assembly (201)	• Inspect for fluid leaks / improper fluid level. • Inspect for leaking Fluid Outlet Seal Assembly (24). • Inspect for loose or missing Oil Pump Bolts (200). • Inspect for damaged, restricted or improperly installed Oil Filter Assembly (203). • Inspect for damaged or leaking Oil Filter Neck Seal. • Inspect for broken or seized Fluid Pump Drive Gear (315) and Fluid Pump Driven Gear (316).
Low & Reverse Clutch Assembly (543)	• Inspect for stripped or sheared splines to the Reaction Carrier (567).
Input Carrier Assembly (570)	• Inspect for stripped or sheared castle splines to ring gear. • Inspect for improperly installed carrier pinion gear pins. • Inspect for damaged or broken Pinion Gears. • Inspect for stripped or sheared splines on the Input Sun Gear (571). • Inspect for damaged or broken Output Internal Gear. • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing Assembly (568) and Output Carrier Thrust Bearing Assembly (573).

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	Inspect for damaged or broken Input Carrier Thrust Bearings (569, 572).
Reaction Carrier Assembly (567)	- Inspect for stripped or sheared Reaction Carrier Assembly (567) splines. - Inspect for damaged or broken Input Carrier Thrust Bearings (568). - Inspect for damaged or broken Pinion Gear teeth. - Inspect for damaged or broken Reaction Internal Gear teeth. - Inspect for disengaged or broken Reaction Internal Gear retainer ring.
Reaction Sun Gear Assembly (566)	- Inspect for damaged or broken weld at Sun Gear. - Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Output Carrier Assembly (574)	- Inspect for stripped or sheared splines to reaction internal ring gear. - Inspect for damaged or broken Input Sun Gear Thrust Bearings (572). - Inspect for damaged or broken Pinion Gear teeth. - Inspect for damaged or broken Input Carrier Thrust Bearings (573). - Inspect for broken or damaged Output Internal Gear.
Output Sun Gear Assembly (555)	- Inspect for stripped or sheared Output Sun Gear Assembly (555) splines. - Inspect for broken Output Sun Gear Assembly (555) hub or weld.
LowReverse 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)	- Inspect for broken, worn or damaged Drive Link Assembly (225). - Inspect for broken, worn or damaged Drive Sprocket (224). - Inspect for broken, worn or damaged Driven Sprocket Assembly (229). - Inspect for broken Drive Gear Hub (222).
Differential Carrier Assembly (232)	- Inspect for stripped or sheared splines on Differential Side Gear. - Inspect for stripped or sheared splines Final Drive Sun Gear (230). - Inspect for stripped or sheared splines Differential Carrier to PTU (AWD only). - Inspect for stripped broken or disengaged Final Drive Retainer (581). - Inspect for damaged or broken Pinion Gear teeth. - Inspect for damaged or broken Final Drive Rollers (585). - Inspect for broken, worn or damaged Final Drive Inner and Outer Thrust Washers (584).
Control Solenoid (w/Body and TCM) Valve Assembly	- Check that the Manual Valve (432) is engaged with Manual Shift Detent Lever - Assembly (609). - Inspect the Control Solenoid (w/Body and TCM) Valve Assembly (7) and verify - that it is functioning properly.

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14.1.3.45. No First and Reverse Gears

No First and Reverse Gears

Checks	Causes
Low and Reverse Clutch Assembly (543)	• Inspect for stripped or sheared internal or external splines on Low and Reverse Clutch Assembly (543) • Inspect for broken or disengaged retainer ring
Low and Reverse Clutch	• Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545–547) • Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545–547) • Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544) • Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550) • Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)
Low-Reverse and 1–2–3–4 Clutch Housing (551)	• Inspect for disengaged or broken Low and Reverse Clutch Piston Spring Retainer (548) • Inspect for broken or deformed Low and Reverse Clutch Piston (550) • Inspect for damaged or improper surface finish in the piston bore

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14.1.3.46. 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 Control Solenoid Valve and • Transmission Control Module Assembly Solenoid Performance Test.
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 stickiness.
1234 Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 1-2-3-4 Clutch Plates (557–559), Backing Plate (560). • Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and Piston Seals damaged, worn or delaminating. • Inspect for broken or fatigued 1-2-3-4 Clutch Piston Return Spring (553). • Inspect for broken or disengaged 1-2-3-4 Clutch Piston Return Spring Retainer (554). • Inspect for broken or fatigued 1-2-3-4 Clutch Waved Plate (557). • Inspect for disengaged or broken 1-2-3-4 Clutch Backing Plate Retainer (561). • Inspect for broken, porous or improper surface finish or plugged oil passages of the Low-Reverse/ 1-2-3-4 Clutch Housing (551). • Inspect for worn or damaged Low-Reverse/ 1-2-3-4 Clutch Housing (551) splines.
Output Sun Gear Assembly (555)	Inspect for stripped or sheared splines on the Output Sun Gear shell.
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared splines on the Input Ring Gear • Inspect for disengaged or broken Input Ring Gear Retainer.
Output Carrier Assembly (574)	• Low/Reverse Clutch Assembly (OWC) (543) splines stripped or sheared. • Inspect for disengaged or broken Reaction Ring Gear Retainer.
Case Assembly (50)	1. Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67). 2. Inspect for worn or damaged case splines or retainer ring grooves.
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.

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14.1.3.47. No Second and Sixth Gear

No Second and Sixth Gear

Checks	Causes
2-6 Clutch Assembly	- Inspect for damaged or worn 2-6 Clutch Plates (540-542). - Inspect for damaged, worn, broken, improper surface finish or sheared splines on the Low-Reverse Clutch Assembly (543). - Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating. - Inspect for broken or binding 2-6 clutch Piston Return Spring (536).
Reaction Carrier Assembly (567)	- Inspect for stripped or sheared splines on the Input Ring Gear. - Inspect for disengaged or broken Input Ring Gear Retainer.
Reaction Sun Gear Assembly (566)	- Inspect for damaged or broken Reaction Sun Gear Assembly hub. - Inspect for damaged or broken sun gear weld. - Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Case Assembly (50)	- Inspect for stripped or sheared splines. - Inspect for broken or disengaged 2-6 Clutch Piston Return Spring Retainer (537). - Inspect for damaged, worn, or improper surface finish in the piston bore.
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 Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.

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14.1.3.48. No Third, Fifth, and Reverse Gear

No Third, Fifth, and Reverse Gear

Checks	Causes
3–5 Reverse Clutch Assembly	- Inspect for damaged, stripped or sheared splines on 3–5 Reverse Clutch Plates (507–509), Backing Plate (510) - Inspect for sheared or stripped splines on 3–5 Rev/4–5–6 Housing (516) to Turbine Shaft (517) - Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3–5 Rev/4–5–6 Housing (516) - 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 (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 worn, broken or damaged Speed Sensor Reluctor Wheel (501)
Reaction Sun Gear Assembly (566)	Inspect for stripped or sheared splines
Reaction Carrier (567)	- Inspect for broken or disengaged Input Internal Gear Retainer - Inspect for stripped or sheared splines on the Input Internal Gear
Output Carrier (574)	Inspect for stripped or sheared splines for the Reaction Internal Ring Gear
4–5–6 Clutch Assembly	- Inspect for plugged or missing 4–5–6 Piston Dam Oil Feed hole - Inspect for leaking 4–5–6 Piston Dam

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14.1.3.49. No Fourth, Fifth, and Sixth Gear

No Fourth, Fifth, and Sixth Gear

Checks	Causes
4-5-6 Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 4-5-6 Clutch Plates (526-528), Backing Plate (529) • Inspect for broken or fatigued 4-5-6 Clutch Waved Plate (525) • Inspect for damaged or broken 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521) • Inspect for broken or fatigued 4-5-6 Piston Return Spring (522) • Inspect for broken or disengaged 4-5-6 Backing Plate Retainer (532) • Inspect for damaged or broken 4-5-6 Clutch Dam Piston (523) and piston seals damaged, worn or delaminating • Inspect for broken or disengaged 4-5-6 Clutch Dam Retainer (524) • Inspect for stripped or sheared splines on the Reaction Carrier Hub (531) • Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516) • Inspect for loose, worn or damaged 3-5 Rev/4-5-6 Housing Bushing • Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516)
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 stickyness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check the pressure control solenoid 3 (R1/456) for proper operation. Refer to Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.

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14.1.3.50. 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)	- Inspect for damaged or fatigued 1–2–3–4 Clutch Wave Plate (557) and Low and Reverse Clutch Wave Plate (547). Refer to Clutch Plate Diagnosis. - Inspect for stripped or sheared splines on 1–2–3–4 Clutch Plate (546). Refer to Clutch Plate Diagnosis. - Inspect for improperly positioned or plugged Low Reverse Piston (550) air bleed. - Inspect for correct fluid level.
Low and Reverse Clutch Assembly (OWC) (543)	Inspect for stripped or sheared internal and external splines on Low and Reverse Clutch Assembly (543).

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14.1.3.51. 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	• Inspect for improper surface finish on Low and Reverse Clutch Plates (545– 547) • Inspect for broken or fatigued Low and Reverse Clutch Apply Plate (547) • Inspect for damaged or broken Low and Reverse Clutch Piston (550) and piston seals damaged, worn or leaking • Inspect for fatigued or binding Low and Reverse Clutch Piston Return Spring (549)

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14.1.3.52. 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)	• Inspect for damaged or broken 1–2–3–4 Clutch Piston (552) and piston seals damaged, worn or leaking. • Inspect for fatigued or binding 1–2–3–4 Clutch Piston Return Spring (553). • Inspect for improper surface finish on 1–2–3–4 Clutch Plates (557–559). Refer to Clutch Plate Diagnosis. • Inspect for broken or fatigued 1–2–3–4 Clutch Waved Plate (557). • Inspect for plugged or restricted Low-Reverse and 1–2–3–4 Clutch Piston Housing (551) air bleed.
Case Assembly (50)	• Inspect for leaking or loose fitting Fluid Check Valve (55). • Inspect for leaking or damaged 1–2–3–4 and Low-Reverse Clutch Fluid Passage Seals (67).

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14.1.3.53. Harsh or Late Second and Sixth Shift

Harsh or Late Second and Sixth Shift

Checks	Causes
2-6 Clutch Assembly	• Inspect for worn or improper surface finish on the 2-6 Clutch Plates (540- 542) • Inspect for fatigued 2-6 Clutch Piston Apply Plate (540) • Inspect for plugged, restricted or incorrect orientation of the 2-6 Clutch Piston (535) air bleed
Case Assembly (50)	• Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating • Inspect for fatigued 2-6 Clutch Piston Return Spring (536)

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14.1.3.54. Harsh or Late Third, Fifth, and Reverse Shift

Harsh or Late Third, Fifth, and Reverse Shift

Checks	Causes
3-5 Reverse Clutch Assembly	• Inspect for damaged splines or improper surface finish on 3-5 Reverse Clutch Plates (507-509), Backing Plate (510) • Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504- 506) • Inspect for warped 3-5 Rev/4-5-6 Clutch Housing (516) • Inspect for broken or fatigued 3-5 Reverse Clutch Waved Plate (507)

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14.1.3.55. Harsh Fourth, Fifth, and Sixth Shift

Harsh Fourth, Fifth, and Sixth Shift

Checks	Causes
4-5-6 Clutch Assembly	• Inspect for leaking or damaged 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521) • Inspect for plugged or restricted 4-5-6 Piston Dam air bleed • Inspect for leaking or damaged 4-5-6 Clutch Dam (523) • Inspect for plugged or restricted Dam oil feed hole in the 4-5-6 Piston (520) • Inspect for fatigued 4-5-6 Clutch Piston Spring (522) • Inspect for leaking 4-5-6 Clutch Dam Seals (523) • Inspect for improper surface finish on 4-5-6 Clutch Plates (525-528) • Inspect for fatigued 4-5-6 Clutch Waved Plate (525) • 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)

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14.1.3.56. Harsh Downshift

Harsh Downshift

Checks	Causes
Control Valve Body Assembly	• Check the engine for diagnostic codes. If the engine controller signals the transmission that engine torque is inaccurate, the transmission will command high time pressure. • Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308) Gen 1 / Gen 2 or pressure regulator valve (310) or spring (309) Gen 3. • Inspect for stuck actuator feed limit valve (430) or spring (431). • Inspect for stuck clutch select valve (428) or spring (427). • Inspect for stuck 1-2-3-4 clutch regulator valve (417) or spring (416). • Inspect for stuck 1-2-3-4 clutch boost valve (414) or spring (415). • Inspect for stuck 2-6 clutch regulator valve (419) or spring (418). • Inspect for stuck 3-5 reverse clutch regulator valve (421) or spring (420). • Inspect for stuck low reverse and 4-5-6 clutch regulator valve (411) or spring (410). • Inspect for stuck low reverse and 4-5-6 clutch boost valve (436) and spring (437) Gen 2 / Gen 3 only.

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14.1.3.57. Harsh Torque Converter Clutch Apply, or Inoperative or No Electronically Controlled Capacity Clutch Control

Harsh Torque Converter Clutch Apply, or Inoperative or No Electronically Controlled Capacity Clutch Control

Checks	Causes
Torque Converter Assembly (28)	• Inspect for leaking or damaged Torque Converter Clutch Hub Seal. • Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

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14.1.3.58. 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 Torque Converter Diagnosis .
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

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14.1.3.59. Harsh Torque Converter Clutch Apply, or Inoperative or No Electronically Controlled Capacity Clutch Control

Harsh Torque Converter Clutch Apply, or Inoperative or No Electronically Controlled Capacity Clutch Control

Checks	Causes
Torque Converter Assembly (28)	• Inspect for leaking or damaged Torque Converter Clutch Hub Seal. • Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

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14.1.3.60. 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 Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.
Control Valve Body Assembly	- Inspect the 3-5-Reverse Clutch Regulator Valve (421) and Control Valve Body Ball Check Valve (404) for debris and stickyness. - Inspect the Clutch Select Valve (428) and the Actuator Feed Limit Valve (430) for debris and stickyness.
Low and Reverse Clutch	- Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545–547) - Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545–547) - Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544) - Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550) - Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)
Transmission Case Assembly	Inspect the Input Shaft Support (56) for missing or damaged Fluid Seal Rings (58).

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14.1.3.61. Fluid Pressure High or Low

Fluid Pressure High or Low

Checks	Causes
Fluid Pump Assembly (201)	- Inspect for loose fluid pump bolts (204). - Inspect for leaking or damaged fluid pump outlet seals (24) and oil filter seal. - Inspect for improperly installed, restricted or damaged oil filter (203). - Inspect for sticking line pressure blow off valve (304). - Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308). - Inspect for damaged or restricted oil ports in the oil pump body (303).
Torque Converter Housing (208)	- Inspect for missing or restricted differential lube oil circuit orifice. - Inspect for missing front differential carrier baffle (205).
Control Solenoid Valve Assembly (w/Body and TCM) (7)	- Inspect for leaking or damaged filter plate assembly seals (8). - Verify VBS operation is not stuck high or low.
Case Assembly (50)	- Inspect for proper fluid level. - Inspect for missing lube oil circuit orifice or front differential carrier baffle (62). - Inspect for leaking or damaged valve body spacer plate assembly (12). - Inspect for damaged or leaking fluid check valve (55). - Inspect for leaking, damaged or broken fluid level control valve (13).
Torque Converter Assembly (28)	- Inspect for damaged torque converter clutch seal (inside converter assembly). - Inspect for damaged or disengaged torque converter hub to oil pump drive gear.

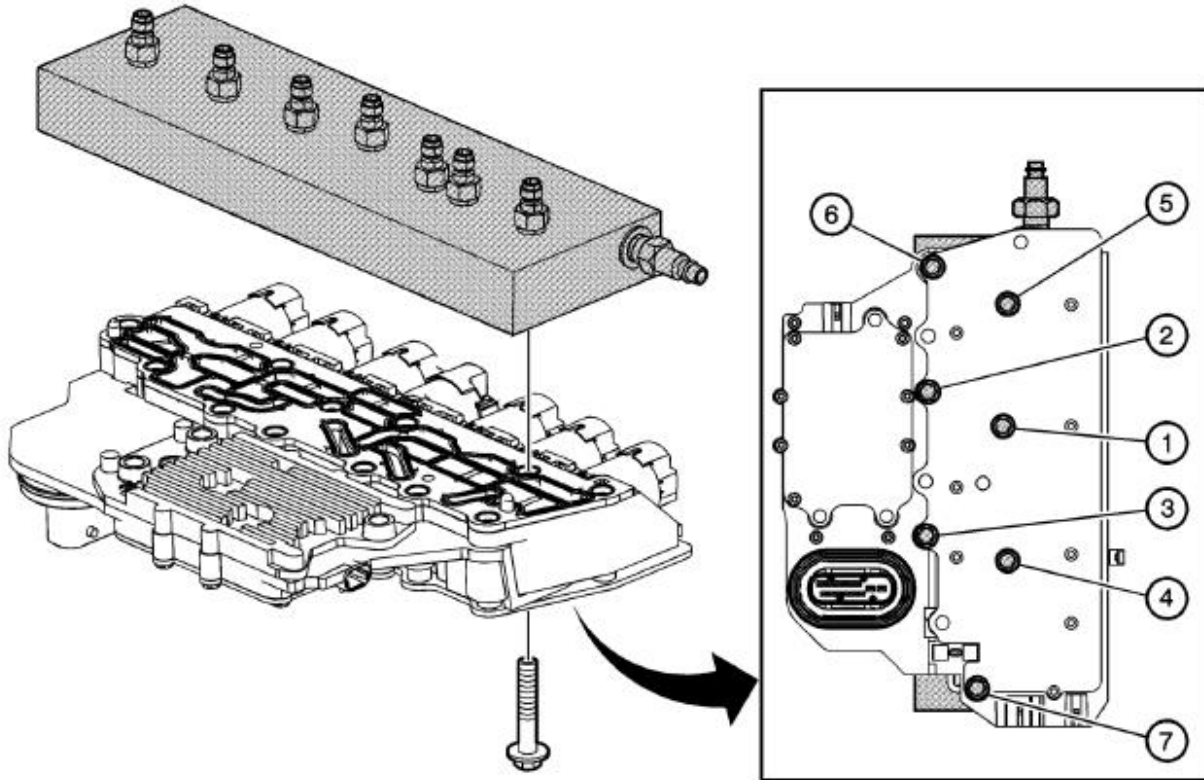
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14.1.3.62. Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness



Note:

Air inlet may be installed at either end of the DT-486161 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. The DT-48616-1 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 or a blank screen.
⇒ If scan tool does not show Invalid or a blank form
 - 2.1. Do not attempt to complete the performance test as it will not work on a Gen 1 Q8 Control Solenoid Valve Assembly.
 - 2.2. Verify the vehicle model year, engine, and options to make certain the correct diagnostic is selected.
- ↓ If scan tool shows Invalid or a blank form

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3. Remove the Q8 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 Q8 Control Solenoid Valve Assembly. Use the bolts and washers supplied with the tool to attach the test block. **Tighten** the bolts to 5 Nm (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 Q8 Control Solenoid Valve Assembly.

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 min. The ignition must remain ON during the 5 min 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.

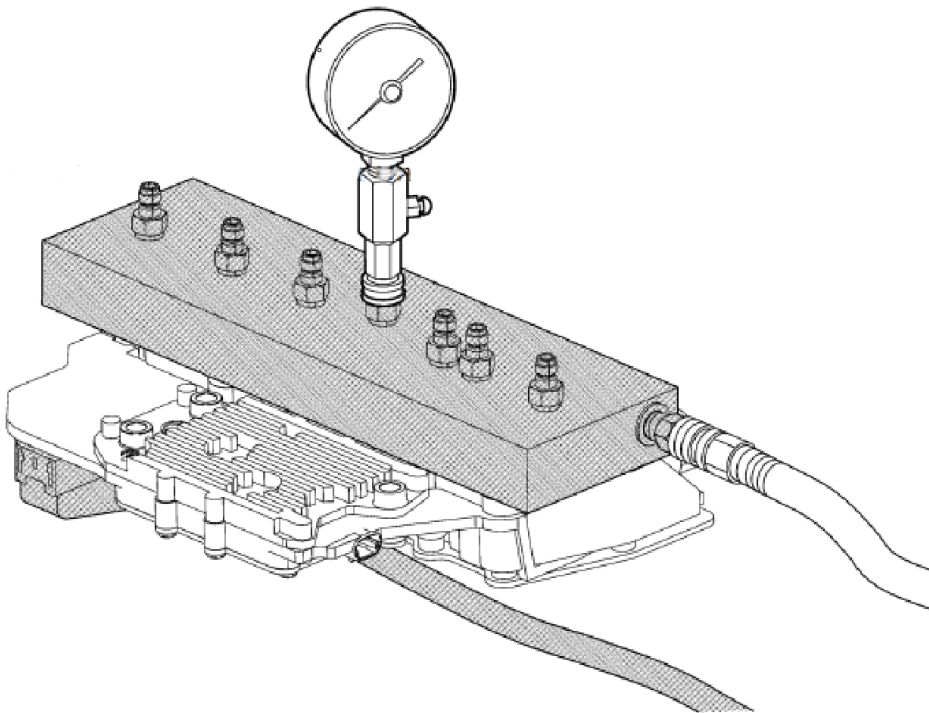
⇒ If the pressure gauge does not change
Replace the Q8 Control Solenoid Valve Assembly.

⇓ If the pressure gauge changes

10. Solenoids are not grossly stuck. Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification

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		Commanded State	
Component	Port On Test Plate	On	Off
Pressure Control Solenoid Valve 2, 35R	GEN 2 C	Full pressure to gauge	No pressure to gauge
Pressure Control Solenoid Valve 4, 26	B	Full pressure to gauge	No pressure to gauge
Pressure Control Solenoid Valve 5, 1234	GEN 2-F	Full pressure to gauge	No pressure to gauge
Shift Solenoid Valve	D	Full pressure to gauge	Below full pressure to gauge
Line Pressure Control Solenoid Valve	A	Command to highest setting, full pressure to gauge	Command to lowest setting, below full pressure to gauge
TCC Pressure Control Solenoid Valve	E	Full pressure to gauge	No pressure to gauge

Note:

With the key on engine off, 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.

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14.1.3.63. Symptoms Automatic Transmission Shift Lock Control

Note:
The following steps must be completed before using the symptom tables.

1. Perform the **Diagnostic System Check Vehicle** before using the Symptom Tables in order to verify that all of the following are true:

- There are no DTCs set.
- The control modules can communicate via the serial data link.

2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Automatic Transmission Shift Lock Control Description and Operation**.

14.1.3.63.1. Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the automatic transmission shift lock control. Refer to
- Checking Aftermarket Accessories.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

14.1.3.63.2. Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections**

14.1.3.63.3. Symptom List

Refer to a symptom diagnostic procedure in order to diagnose the symptom:

Transmission Control Lever Malfunction

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14.1.3.64. Transmission Control Lever Malfunction

14.1.3.64.1. 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.

14.1.3.64.2. Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Fuse B+	B270A 02, 1	1	-	-
Control	B270A 02, 1	1	B270A 01, 2	-
Ground	-	1	-	-
1. Transmission shift control lever will not move from PARK with the brake pedal applied. 2. Transmission shift control lever will move from PARK without the brake pedal applied.				

14.1.3.64.3. Circuit/System Description

The body control module (BCM) controls the transmission shift lock control solenoid actuator by providing a battery positive voltage to the solenoid when the brake pedal is applied. The BCM monitors the voltage and current flow of the control circuit.

14.1.3.64.4. Reference Information

Schematic Reference

- Body Control System Schematics
- Shift Lock Control Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Automatic Transmission Shift Lock Control Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

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14.1.3.64.5. Circuit/System Verification

1. Ignition ON / Vehicle in Service Mode.
2. Verify the scan tool Brake Transmission Shift Interlock Solenoid Actuator Command parameter changes from Inactive to Active when the brake pedal is applied.
⇒ If the Brake Transmission Shift Interlock Solenoid Actuator Command does not change
Refer to Stop Lamps Malfunction.
↓ If the Brake Transmission Shift Interlock Solenoid Actuator Command changes
3. Verify the S3 Transmission Shift Lever moves out of the PARK position when the brake pedal is applied.
⇒ If the S3 Transmission Shift Lever does not move out of the PARK position
Refer to Circuit/System Testing.
↓ If the S3 Transmission Shift Lever does move out of the PARK position
All OK.

14.1.3.64.6. 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 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
⇒ If 10 Ω or greater
 - 2.1. Ignition OFF.
 - 2.2. Test for less than 2 Ω in the ground circuit end to end.
⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
⇒ If less than 2 Ω , repair the open/high resistance in the ground connection.
↓ If less than 10 Ω
3. Ignition ON / Vehicle in Service Mode, connect a test lamp between the control circuit terminal 4 and the ground circuit terminal 2.
4. Verify the test lamp turns ON and OFF when commanding the Brake Transmission Shift Interlock Solenoid Actuator ON and OFF with a scan tool.
⇒ If the test lamp is always OFF
 - 4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 4.2. Test for infinite resistance between the control circuit and ground.
⇒ If less than infinite resistance, repair the short to ground on the circuit.
↓ If infinite resistance
 - 4.3. Test for less than 2 Ω in the control circuit end to end.
⇒ If 2 Ω or greater, repair the open/high resistance in the circuit.
↓ If less than 2 Ω
 - 4.4. Ignition ON / Vehicle in Service Mode.
 - 4.5. Verify a test lamp illuminates between each B+ and ignition circuit terminal at the control module harness connector.
⇒ If the test lamp does not illuminate, repair the circuit or fuse as necessary.
⇒ If the test lamp illuminates at each B+ and ignition circuit, replace the K9 Body Control Module.
⇒ If the test lamp is always ON
 - 4.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON / Vehicle in Service Mode.
 - 4.2. Test for less than 1 V between the control circuit and ground.
⇒ If 1 V or greater, repair the short to voltage on the circuit.
⇒ If less than 1 V, replace the K9 Body Control Module.
↓ If the test lamp turns ON and OFF
5. Test or replace the S3 Transmission Shift Lever.

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14.1.3.64.7. Component Testing

1. Install a 10 A fused jumper wire between the control terminal 4 and 12 V. Momentarily install a jumper wire between the ground terminal 2 and ground.
2. Verify the solenoid turns on and off/clicks, etc.
⇒ If the solenoid does not turn on and off/clicks, etc.
Replace the S3 Transmission Shift Lever.
↓ If the solenoid does turn on and off/clicks, etc.
3. All OK.

14.1.3.64.8. Repair Instructions

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

- Transmission Control Replacement
- **Control Module References** for control module replacement, programming, and setup

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14.1.4. Specifications

14.1.4.1. Fastener Specifications (On Vehicle)

Table 1: Single Use Threaded Fastener/Component Tightening Specifications

Table 2: Reusable Threaded Fastener Tightening Specifications

Single Use Threaded Fastener/Component Tightening Specifications

Application	Specification
	Metric (English)
A/Trans Fluid Pump Bolt to Converter Housing	
• First Pass:	10 Nm (89 lb in)
• Final Pass:	45 Degrees
Torque Converter and Differential Housing Bolt	
• First Pass:	10 Nm (89 lb in)
• Final Pass:	50 Degrees
Transmission Mount Bolt – Left Side to Transmission	
• First Pass:	58 Nm (43 lb ft)
• Final Pass:	60- 75 Degrees
Transmission Mount Bracket to Transmission Bolt – Rear	
• First Pass:	100 Nm (74 lb ft)
• Final Pass:	30-45 Degrees

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Reusable Threaded Fastener Tightening Specifications

Application	Specification
	Metric (English)
A/Trans Fluid Pump Cover Bolt	12 Nm (106 lb in)
A/Trans Fluid Pump Cover Bolt	12 Nm (106 lb in)
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	12 Nm (106 lb in)
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	7 Nm (62 lb in)
Control Valve Body Assembly (Complete) Bolt	7 Nm (62 lb in)
Control Valve Body to Case Bolt	12 Nm (106 lb in)
Control Valve Body to Case Bolt	11 Nm (97 lb in)
Control Valve Body Cover Bolt	12 Nm (106 lb in)
Drain Plug	12 Nm (106 lb in)
Fluid Level Hole Plug	12 Nm (106 lb in)
Fluid Pressure Test Hole Plug	12 Nm (106 lb in)
Front Differential Carrier Baffle Bolt – Converter Housing	12 Nm (106 lb in)
Front Differential Carrier Baffle Bolt – Case	12 Nm (106 lb in)
Grommet Fasteners	9 Nm (80 lb in)
Input Shaft Support Bolt	12 Nm (106 lb in)
Input Speed Sensor Bolt	9 Nm (80 lb in)
Manual Shift Detent Spring	12 Nm (106 lb in)
Oil Cooler Fitting	20 Nm (15 lb ft)
Oil Cooler Fitting to Radiator	20 Nm (15 lb ft)
Output Speed Sensor Bolt	9 Nm (80 lb in)
Torque Converter to Flywheel Bolt	60 Nm (44 lb ft)
Transmission Bolt (1, 2, 4) – 6T30 (1.4L LDD, L2N, L2I)	60 Nm (44 lb ft)
Transmission Control Fasteners	9 Nm (80 lb in)
Transmission Fluid Cooler Outlet Pipe Nut	22 Nm (17 lb ft)
Transmission Fluid Cooler Pipe Inlet Nut	22 Nm (17 lb ft)
Transmission Mount to Frame Bolt	100 Nm (74 lb ft)
Transmission Mount Nut – Left Side to Body	58 Nm (43 lb ft)
Transmission Nut (1) and Bolt (3) – 6T30 (1.4L LDD, L2N, L2I)	40 Nm (30 lb ft)
Transmission Range Selector Cable Bracket Bolt	22 Nm (17 lb ft)
Transmission Range Selector Lever Nut	30 Nm (22 lb ft)

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Application	Ref No*	Quantity	Size	Specification	
				Metric	English
A/Trans Fluid Pump Bolt to Converter Housing					
• First Pass:	200	8	M8x33	10 Nm	89 lb in
• Final Pass:	200		M8x33	45°	
A/Trans Fluid Pump Cover Bolt	302	23	M6x25	12 Nm	106 lb in
A/Trans Fluid Pump Cover Bolt	320	20	M6x21.5	12 Nm	106 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	4	12	M6x97	10 Nm	89 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	6	3	M5x40.5	7 Nm	62 lb in
Control Valve Body Assembly (Complete) Bolt	400	1	M5x40.5	7 Nm	62 lb in
Control Valve Body to Case Bolt	9	2	M6x53	11 Nm	97 lb in
Control Valve Body to Case Bolt	10	9	M6x60	11 Nm	97 lb in
Control Valve Body Cover Bolt	1	13	M6x30	12 Nm	106 lb in
Drain Plug	64	1	1/8"–27 NPTF	12 Nm	106 lb in
Fluid Level Hole Plug	63	1	1/8"–27 NPTF	12 Nm	106 lb in
Fluid Pressure Test Hole Plug	51	1	1/8"–27 NPTF	12 Nm	106 lb in
Front Differential Carrier Baffle Bolt – Converter Housing	204	2	M6x25	12 Nm	106 lb in
Front Differential Carrier Baffle Bolt – Case	61	2	M6x16	12 Nm	106 lb in
Input Shaft Support Bolt	57	3	M6x50	12 Nm	106 lb in
Input Speed Sensor Bolt	21	1	M6x23	9 Nm	80 lb in
Manual Shift Detent Spring	17	1	M6x16	12 Nm	106 lb in
Output Speed Sensor Bolt	15	1	M6x18	9 Nm	80 lb in
Torque Converter and Differential Housing Bolt					
• First Pass:	27	15	M8x30	10 Nm	89 lb in
• Final Pass:	27	15	M8x30	50°	

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14.1.5. Repair Instructions – On Vehicle

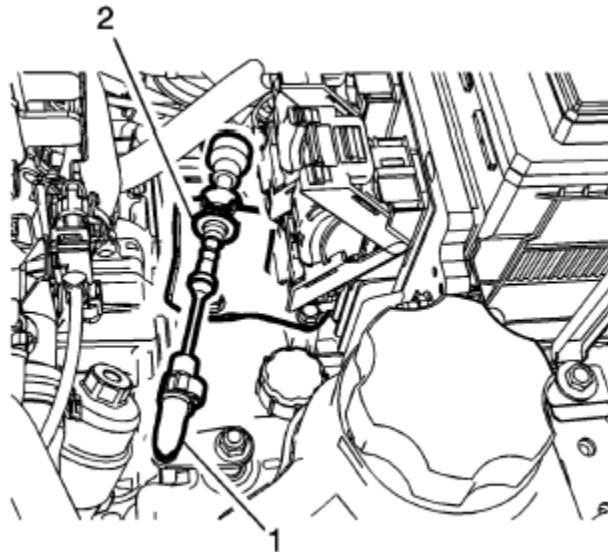
14.1.5.1. Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement

14.1.5.1.1. Special Tools

DT-41229 Manual Shaft Pin Installer

DT-48550 Detent Lever Pin Remover

14.1.5.1.2. Removal Procedure



1. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.
2. Remove the control valve body cover. Refer to [Control Valve Body Cover Replacement](#).
3. Remove the control valve body. Refer to [Control Valve Body Replacement](#).
4. Remove the manual shaft detent lever hub pin (1) using DT-48550 remover.
5. Remove the manual shift shaft pin (5) using diagonal pliers or equivalent tool. Discard the pin.
6. Remove the manual shaft (2).

Note:

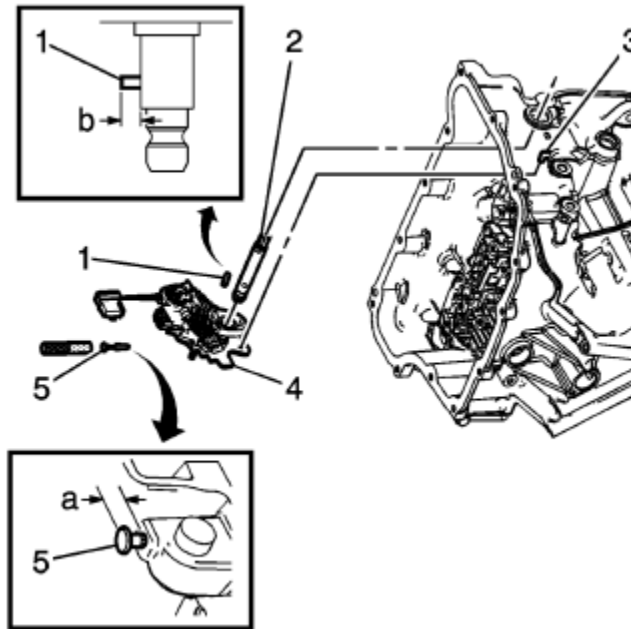
- Disconnect the actuator rod (3) from the detent lever assembly. Do not remove the actuator rod from the transmission case.
- Do not pull the park actuator rod end out beyond the machined oil passage surface in the case. A no park condition will exist if the park pawl actuator assembly is pulled out 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.

7. Remove the manual shaft detent (w/shift position switch) lever assembly (4).

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14.1.5.1.3. Installation Procedure



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 DT41229 Installer.

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.

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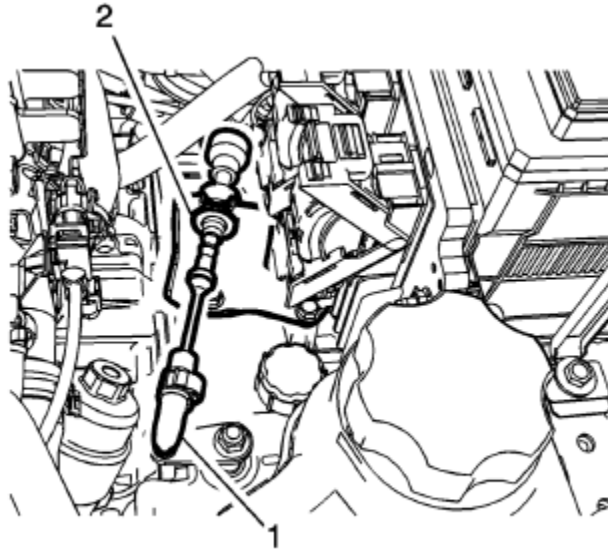
Transmission

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. Connect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.

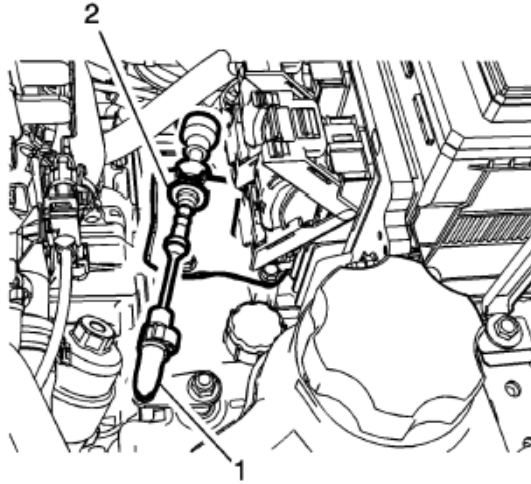
Venice Service Manual

Transmission

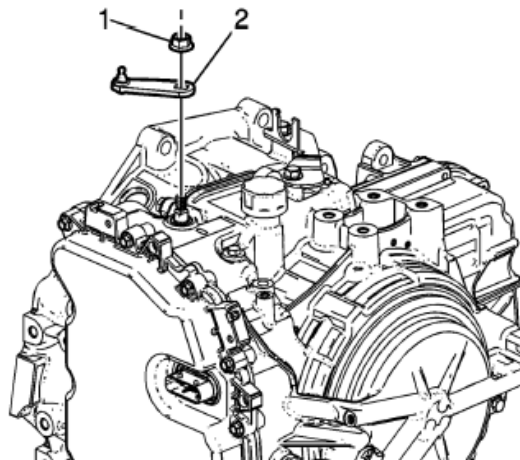
14.1.5.2. Automatic Transmission Range Selector Lever Replacement

14.1.5.2.1. Removal Procedure

1. Set the park brake and chock the wheels.



2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.
3. Press the locking tabs inward in order to release the transmission range selector lever cable (2) from the cable bracket.



Warning:

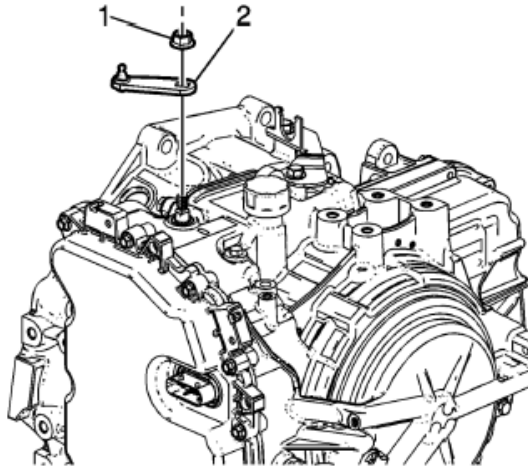
Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

4. Remove the transmission range selector lever nut (1).
5. Remove the transmission range selector lever (2).

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Transmission

14.1.5.2.2. Installation Procedure

**Warning:**

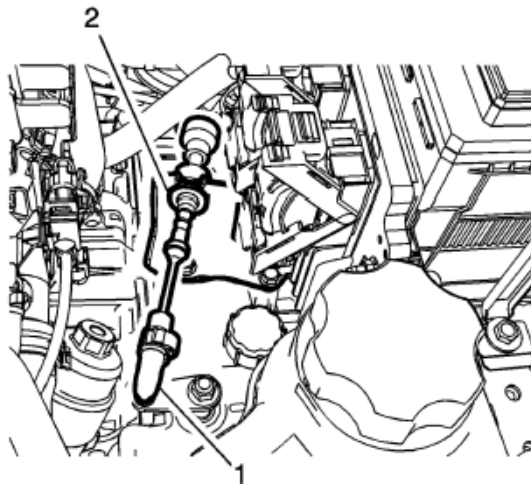
Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

1. Install the transmission range selector lever (2).

Caution:

Refer to Fastener Caution.

2. Install the transmission range selector lever nut (1) and tighten to 30 Nm (22 lb ft).



3. Install the transmission range selector lever cable (2) to the cable bracket.

Warning:

After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to shift into PARK causing potential vehicle damage and bodily injury.

4. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin.
5. Check the range selector cable adjustment. Refer to Range Selector Lever Cable Adjustment.

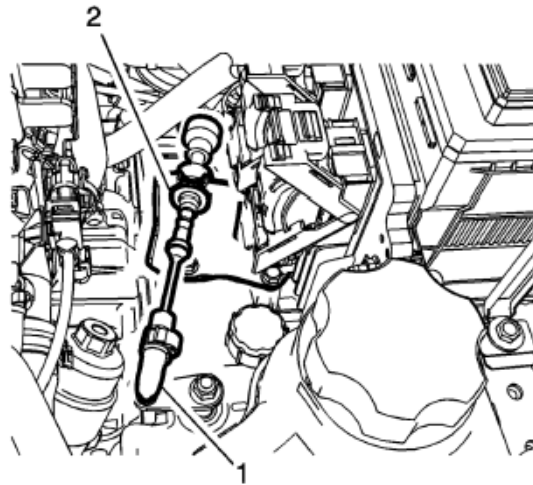
Venice Service Manual

Transmission

14.1.5.3. Range Selector Lever Cable Replacement

14.1.5.3.1. Removal Procedure

1. Set the park brake and chock the wheels.



2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.
3. Press the locking tabs inward in order to release the transmission range selector lever cable (2) from the cable bracket.
4. Remove the Center Console.
5. Disconnect the transmission range selector lever cable terminal from the shift lever pin.
6. Release the transmission range selector lever cable retainer (1) and remove the transmission range selector cable from the transmission control lever base.
7. Move the floor carpet in order to gain access to the gear shift cable grommet (2).
8. Remove the grommet fasteners (1) and the transmission range selector lever cable grommet from the cowl panel.
9. Remove the transmission range selector lever cable from the vehicle.

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Transmission

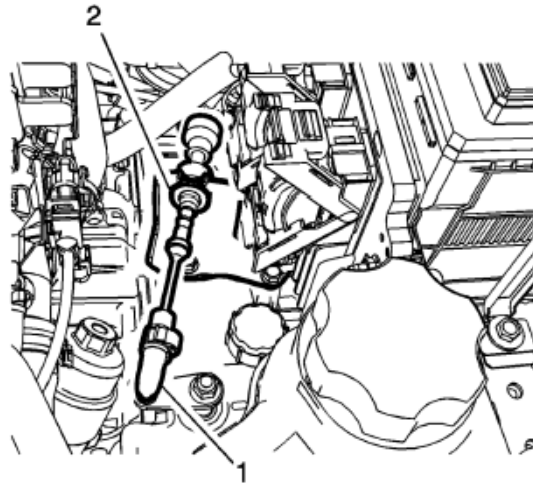
14.1.5.3.2. Installation Procedure

1. Install the transmission range selector lever cable to the vehicle.
2. Install the transmission range selector lever cable grommet to the cowl panel.

Caution:

Refer to Fastener Caution.

3. Install the grommet fasteners (1) and tighten to 9 Nm (80 lb in).
4. Install the transmission range selector lever cable to the transmission control lever base. Insure the cable retainer is fully secured to the transmission control lever base.
5. Connect the transmission range selector lever cable terminal to the shift lever pin.
6. Install the **Center Console**.



7. Install the transmission range selector lever cable (2) to the cable bracket.

Warning:

After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to shift into PARK causing potential vehicle damage and bodily injury.

8. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin.
9. Adjust the automatic transmission range selector lever cable. Refer to **Range Selector Lever Cable Adjustment**.

Venice Service Manual

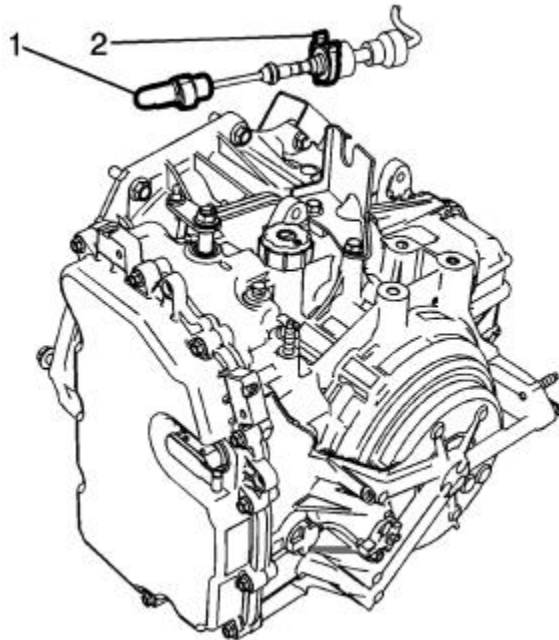
Transmission

14.1.5.4. Range Selector Lever Cable Adjustment

Note:

Adjust the automatic transmission range selector cable while the transmission and the gear selector are in the Park position only. Failure to do so may cause mis-adjustment.

1. Set the park brake and chock the wheels.
2. Verify the transmission range select lever is in the park position.
3. Verify the transmission manual shift lever is in the park position.



4. Disconnect the range selector cable (2) from the range selector cable bracket.

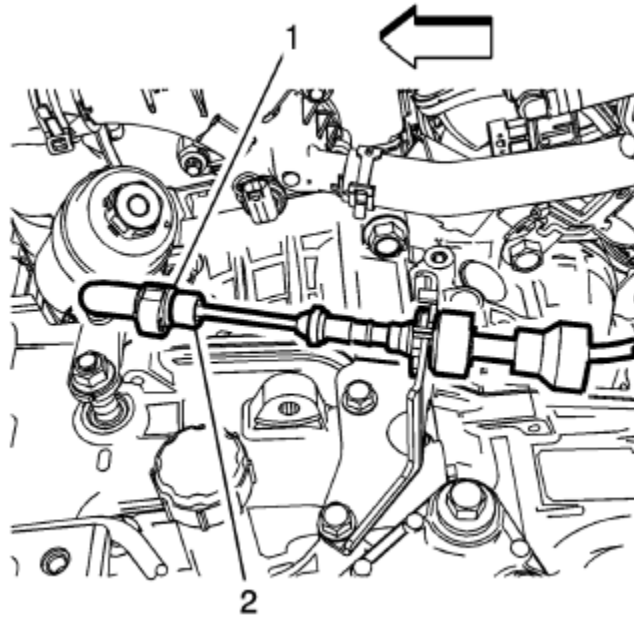
Warning:

After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to shift into PARK causing potential vehicle damage and bodily injury.

5. Disconnect the range selector cable end (1) from the range selector lever.
6. Release the range select cable adjuster clip from the cable end (1).
7. Connect the range selector cable (2) to the range selector cable bracket.
8. Connect the range selector cable end (1) to the range selector lever.

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9. Depress the adjuster clip (1) locking the adjuster clip completely.
10. Ensure the cable tube (2) is secure.
11. Check the transmission range select lever in all gear selections for proper operation.

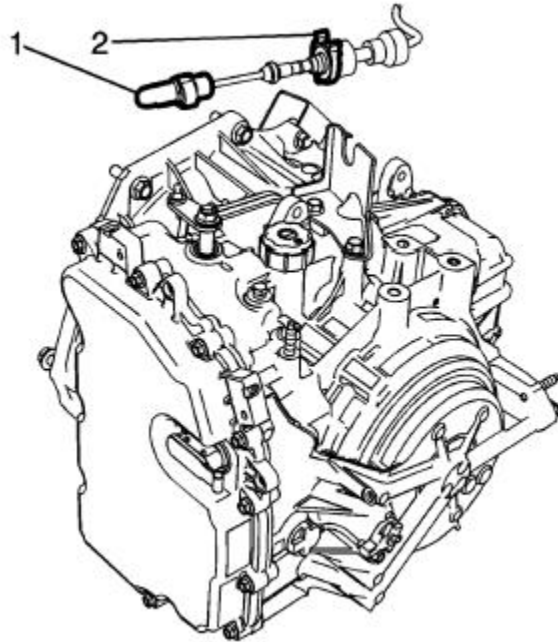
Venice Service Manual

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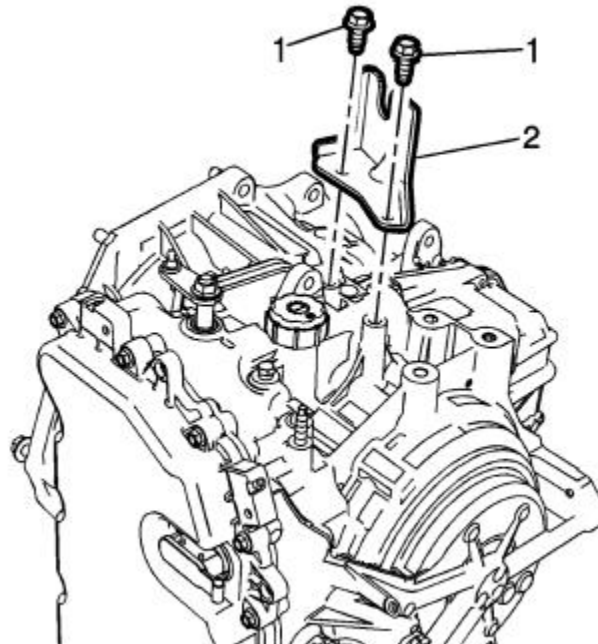
14.1.5.5. Range Selector Lever Cable Bracket Replacement

14.1.5.5.1. Removal Procedure

1. Set the park brake and chock the wheels.



2. Disconnect the range selector cable end (1) from the range selector lever.
3. Disconnect the range selector cable (2) from the range selector cable bracket.

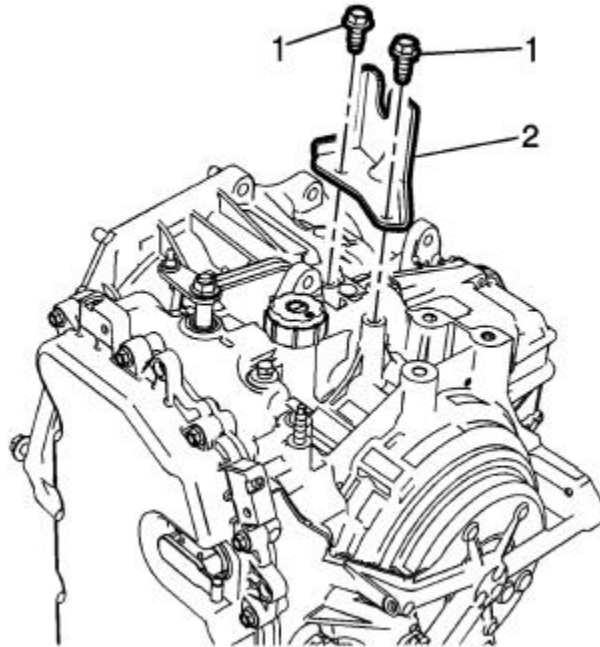


4. Remove the transmission range selector cable bracket bolts (1).
5. Remove the transmission range selector cable bracket (2).

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14.1.5.5.2. Installation Procedure

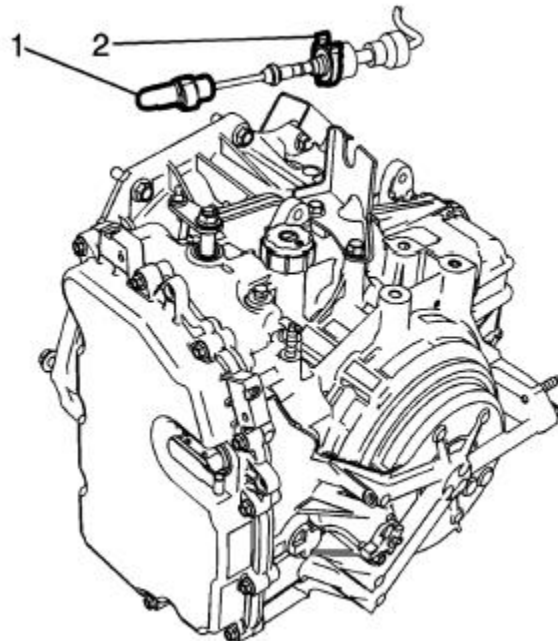


1. Install the transmission range selector cable bracket (2).

Caution:

Refer to Fastener Caution.

2. Install the transmission range selector cable bracket bolts (1) and tighten to 22 Nm (16 lb ft).



3. Connect the range selector cable (2) to the range selector cable bracket.
4. Connect the range selector cable end (1) to the range selector lever.
6. Check the range selector cable adjustment. Refer to **Range Selector Lever Cable Adjustment**.

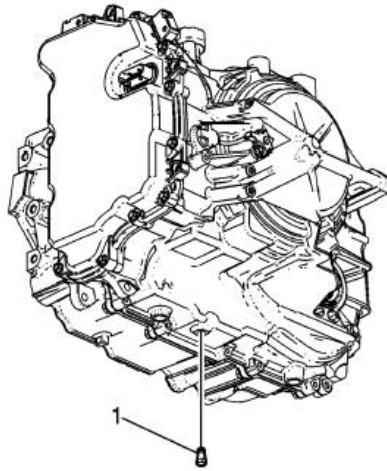
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14.1.5.6. Transmission Fluid Drain and Fill

14.1.5.6.1. Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



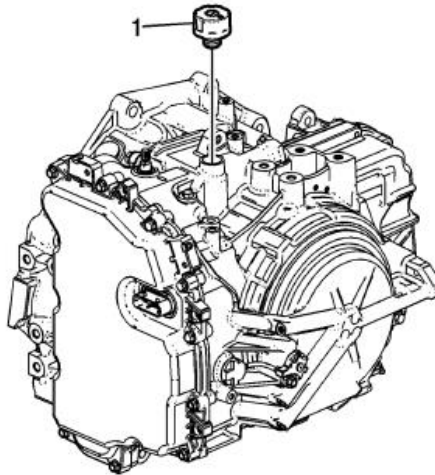
2. Remove the fluid drain plug (1).
3. Drain transmission fluid into a suitable container.

Caution:

Refer to Component Fastener Tightening Caution.
--

4. Install the fluid drain plug (1) and tighten to 12 Nm (106 lb in).

14.1.5.6.2. Installation Procedure



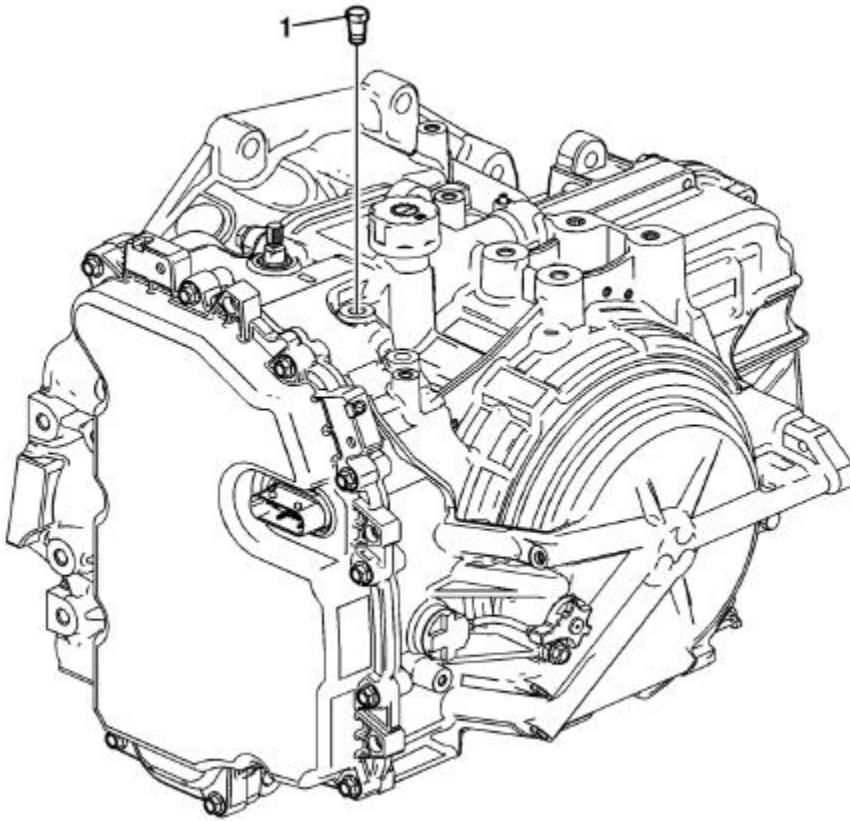
1. Lower the vehicle.
2. Remove ECU
3. Remove Intake hose from Throttle Body
4. Remove Horn
5. Remove the fluid fill cap (1).
6. Fill the transmission to the proper level with the correct fluid. Refer to Transmission Fluid Level and Condition Check and Approximate Fluid Capacities.
7. Install the fluid fill cap (1).

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14.1.5.7. Automatic Transmission Fluid Pressure Test Hole Plug Replacement

Automatic Transmission Fluid Pressure Test Hole Plug Replacement

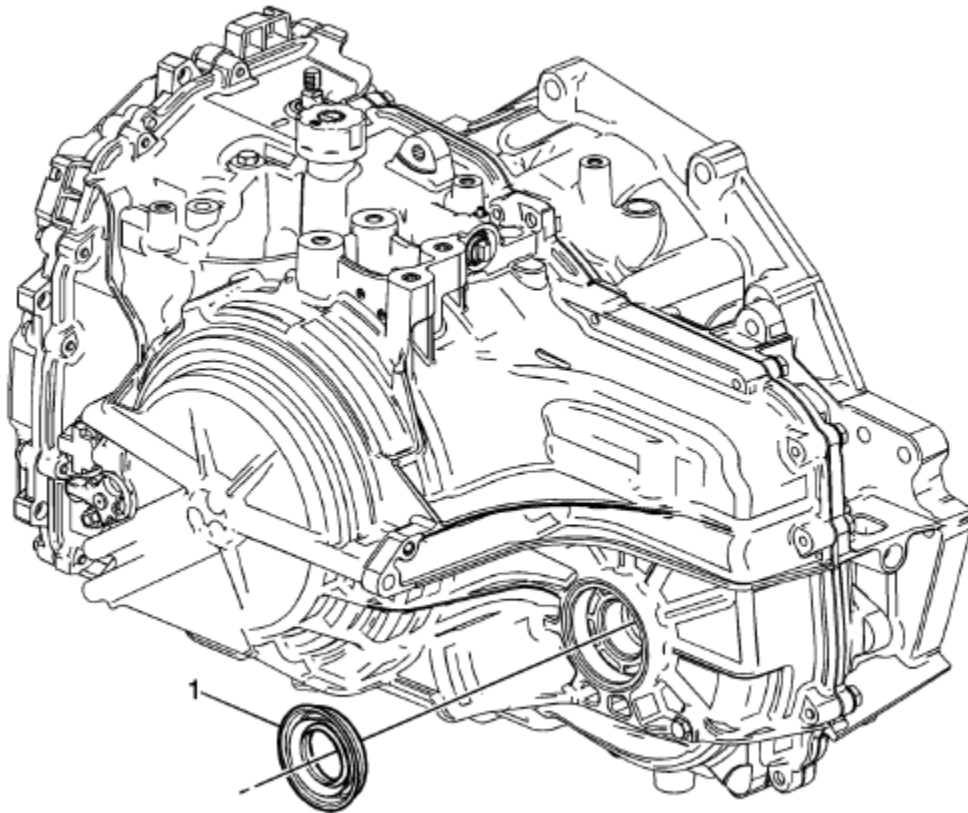


Callout	Component Name
1	Fluid Pressure Test Plug Caution: Refer to Component Fastener Tightening Caution. Tighten 12 Nm (106 lb in)

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14.1.5.8. Front Wheel Drive Shaft Seal Replacement Left Side



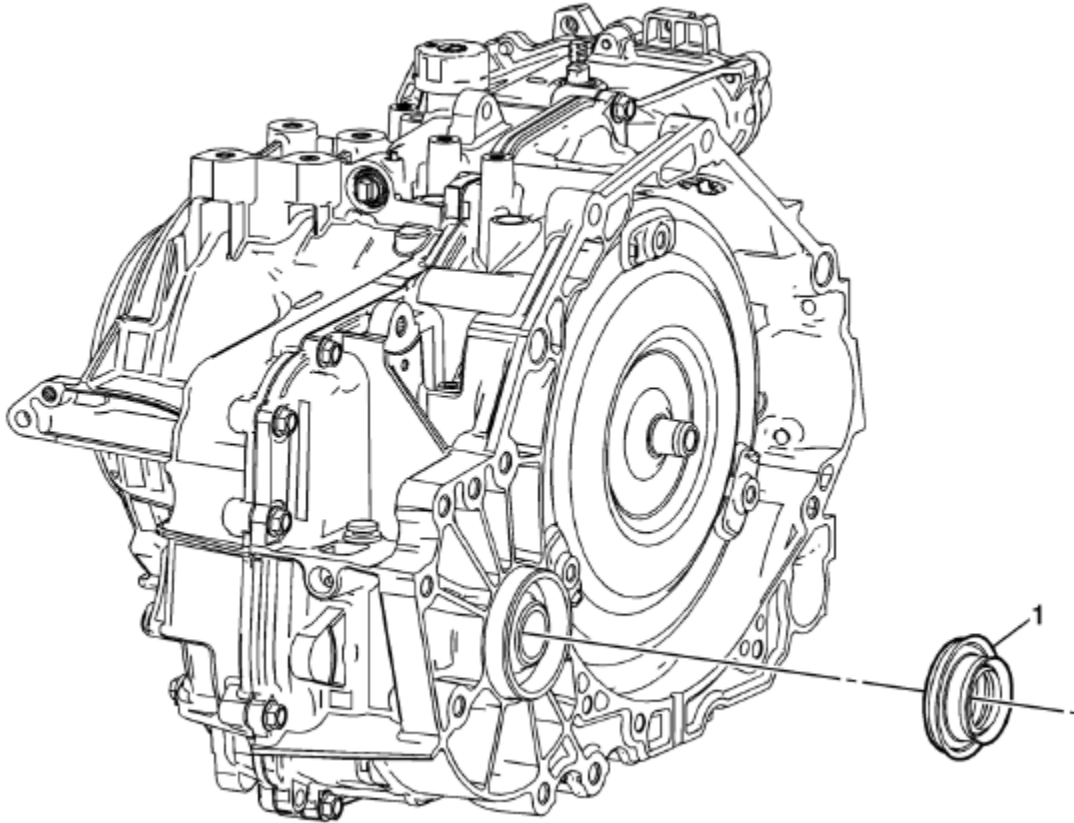
Front Wheel Drive Shaft Seal Replacement Left Side

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
2. Remove the left wheel drive shaft. Refer to Front Wheel Drive Shaft Replacement .	

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14.1.5.9. Front Wheel Drive Shaft Seal Replacement Right Side



Front Wheel Drive Shaft Seal Replacement Right Side

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .	
2. Remove the left wheel drive shaft. Refer to Front Wheel Drive Shaft Replacement .	

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14.1.5.10. Manual Shift Shaft and Seal Replacement

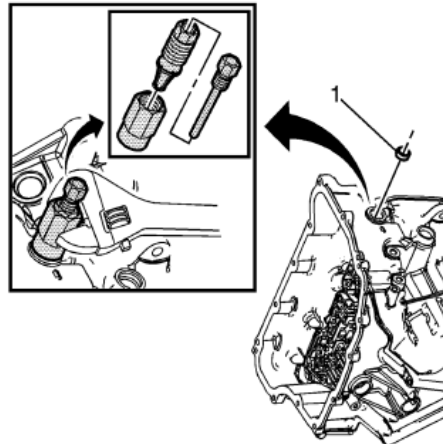
14.1.5.10.1. Special Tools

DT-45201 Cooler Line Seal Remover

DT- 49101 Seal Installer

14.1.5.10.2. Removal Procedure

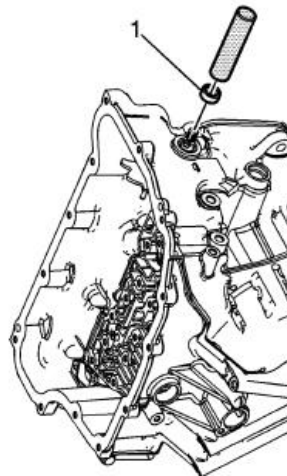
1. Remove ECU
2. Remove the Cooling system Overflow tank
Push to side it is not necessary to disconnect the hoses or drain
3. Disconnect the air intake hose from the throttle body
4. Remove the manual shaft and position switch assembly. Refer to Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement.



5. Remove the manual shaft seal (1) using DT-45201 remover .

14.1.5.10.3. Installation Procedure

1. Install the manual shaft and position switch assembly. Refer to Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement.



2. Install the manual shaft seal (1) using DT-49101 seal installer
3. Connect the Air intake hose to the throttle body
4. Install Cooling system **Overflow tank**
5. Install **ECU**

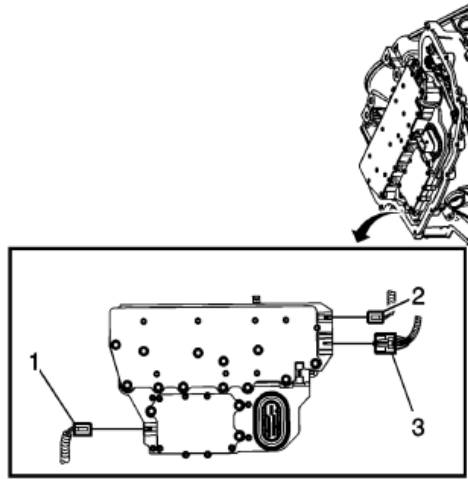
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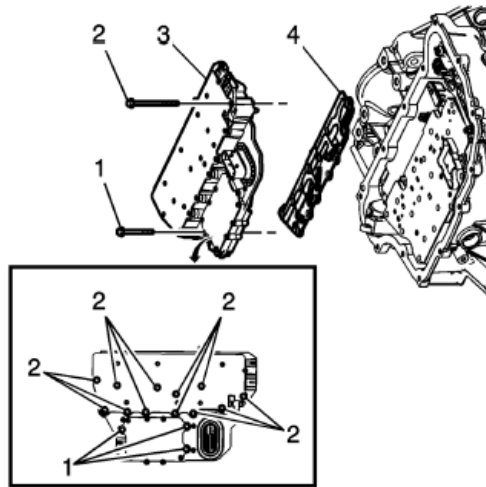
14.1.5.11. Control Solenoid Valve and Transmission Control Module Assembly Replacement

14.1.5.11.1. Removal Procedure

1. Remove the transmission control valve body cover. Refer to [Control Valve Body Cover Replacement](#).



2. Disconnect the output speed sensor electrical connector (2).
3. Disconnect the shift position switch electrical connector (3).
4. Disconnect the input speed sensor electrical connector (1).



5. Remove the 3 control solenoid valve assembly bolts (1) M5 x 40.5.
6. Remove the 12 control solenoid valve assembly bolts (2) M6 x 97.
7. Remove the control solenoid valve assembly with transmission control module (3).

Caution:

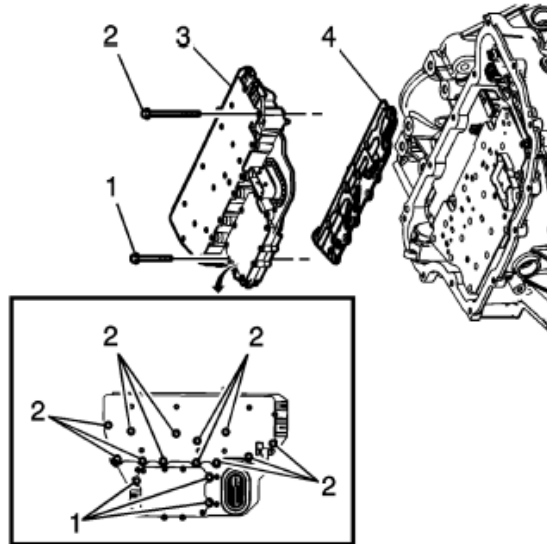
Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.

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.

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14.1.5.11.2. Installation Procedure



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 with transmission control module (3).
3. Hand start the control valve body bolts (1, 2).

Caution:

Refer to Fastener Caution.

4. Secure the 12 control solenoid valve assembly bolts (2) M6 x 97 and tighten in sequence to 12 Y (106 lb in).
5. Secure the 3 control valve body bolts (1) M5 x 40.5 and tighten in sequence to 7 Y (62 lb in).
6. Connect the input speed sensor electrical connector (1).
7. Connect the output speed sensor electrical connector (2).
8. Install the transmission control valve body cover. Refer to [Control Valve Body Cover Replacement](#).
9. After repairs, refer to [Control Module References](#) for programming and set up procedures.
10. Perform the transmission adaptive values learn. Refer to [Transmission Adaptive Values Learn](#).

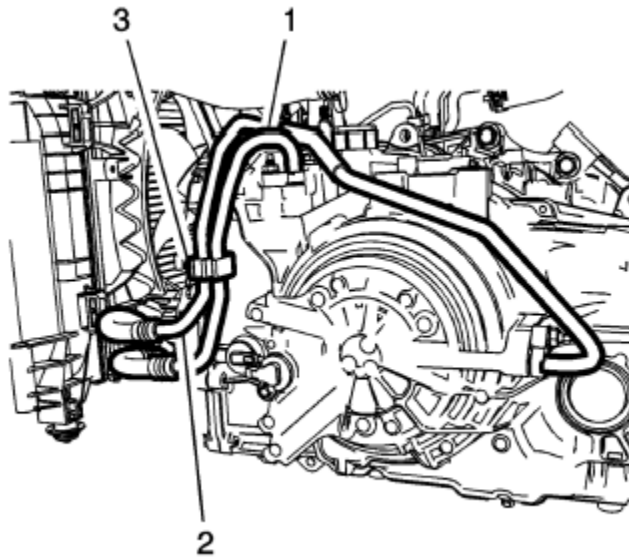
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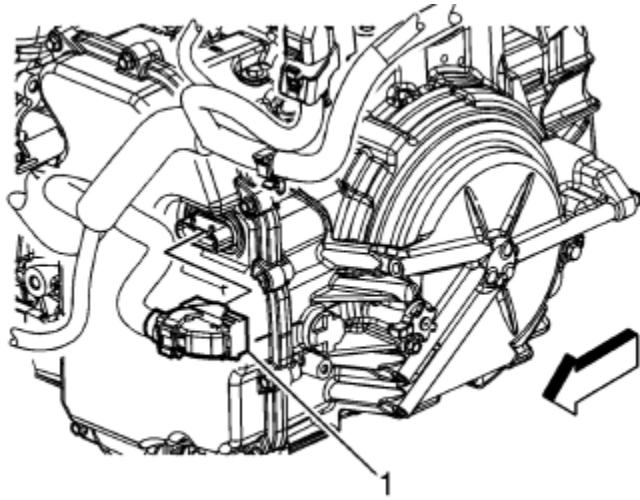
14.1.5.12. Control Valve Body Cover Replacement

14.1.5.12.1. Removal Procedure

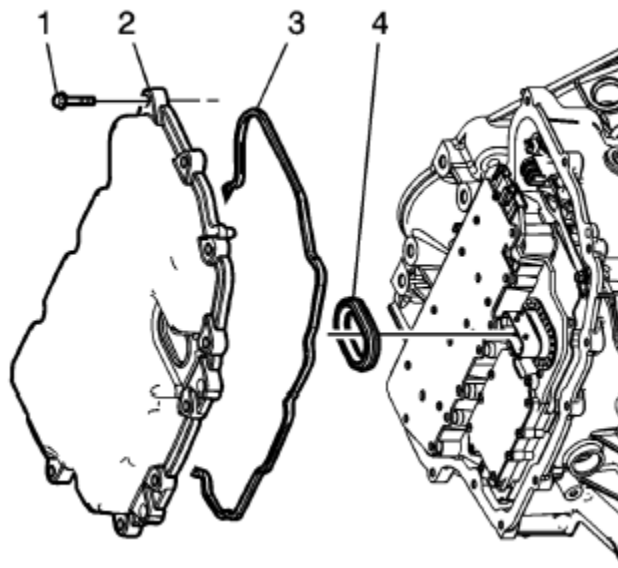
1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the Sway bar
4. Remove the Hood, Refer to [Hood in Body Repair](#)
5. Remove Radiator Overflow Tank
6. Remove the Radiator Fan Relay
7. Remove Front Valiance
8. Disconnect Electrical Connectors from Headlight and Turn signal
9. Disconnect Air Charge Cooler
10. Disconnect grounds along Radiator support
11. Drain Cooling system
12. Disconnect Lines to Transmission cooler
13. Disconnect Radiator cooling hoses
14. Remove Radiator support
15. Drain the transmission fluid.



16. Remove oil cooler inlet (1) and outlet (2) hoses from the retainer (3) on the control valve body cover.



17. Disconnect the control valve body transmission control module electrical connector (1), then unclip the wiring harness from the cover.



18. Remove the control valve body cover bolts (1).
19. Remove the control valve body cover (2).
20. Remove the control valve body cover gasket (3).

Caution:

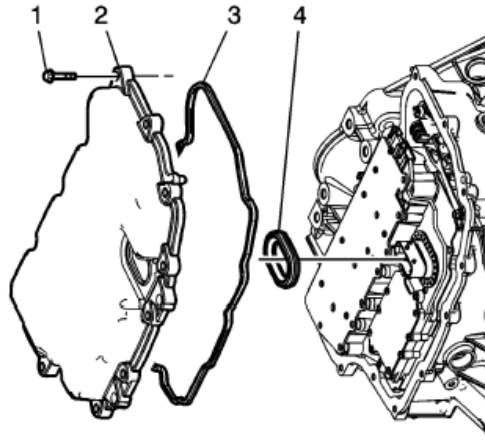
Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections.

21. Remove the control valve body cover wiring connector hole seal (4).
22. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

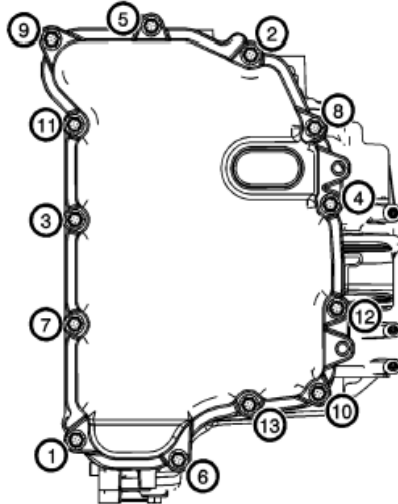
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14.1.5.12.2. Installation Procedure



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. Hand start the control valve body cover bolts (1).



Caution:

Refer to Component Fastener Tightening Caution.
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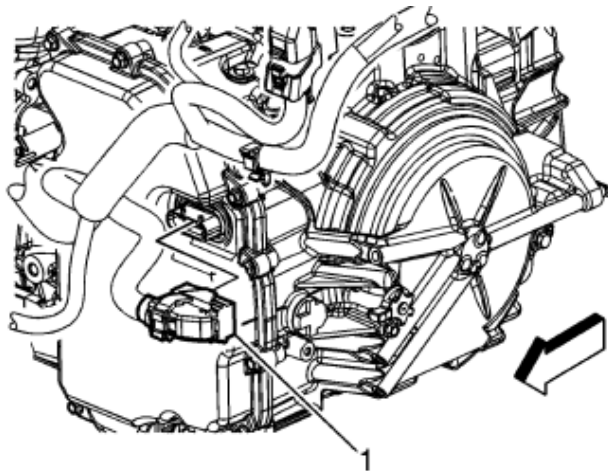
Note:

Install all control valve body cover bolts and studs by hand then torque all bolts and studs in sequence.

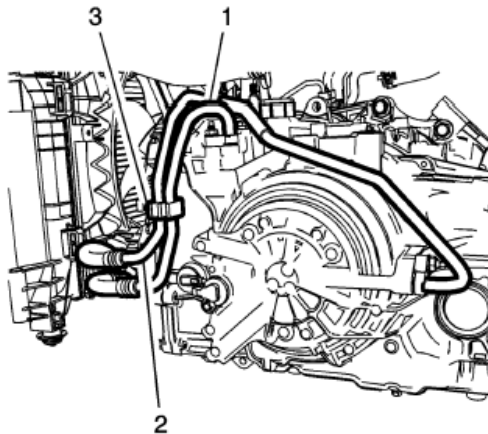
5. Install the control valve body cover bolts. **Tighten** the bolts in sequence to 12 Nm (106 lb in).

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6. Connect the control valve body transmission control module electrical connector (1), then clip the wiring harness to the cover.
7. Raise the vehicle.

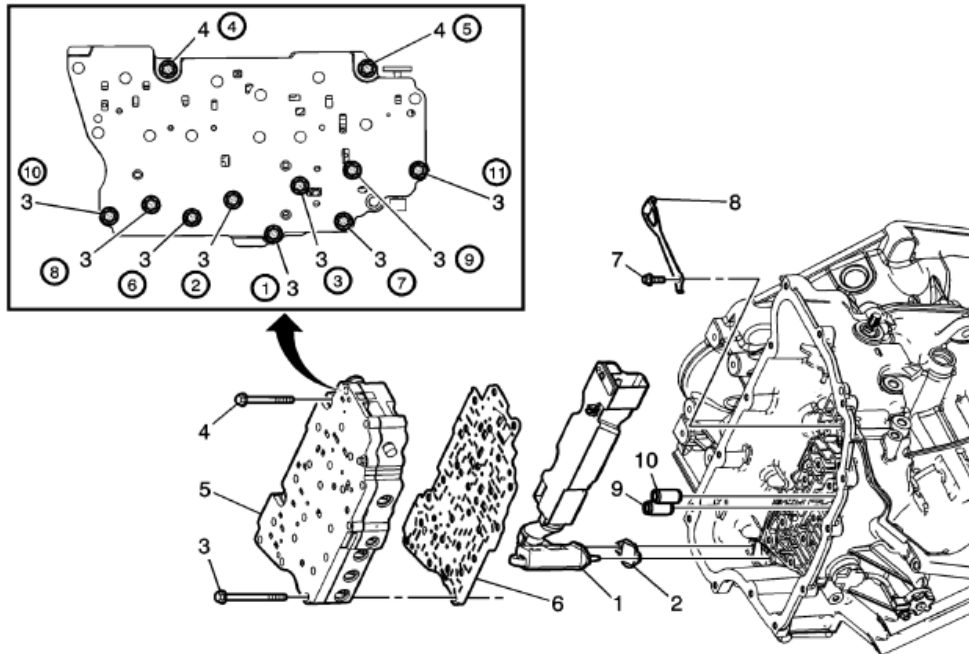


8. Install the oil cooler inlet (1) and outlet (2) hoses to the retainer (3) on the control valve body cover.
9. Install Radiator support
10. Connect Radiator cooling hoses
11. Connect Lines to Transmission cooler
12. Re-fill Cooling system
13. Connect grounds along Radiator support
14. Connect Electrical Connectors from Headlight and Turn signal
15. Connect Air Charge Cooler
16. Install Front Valiance
17. Install the Radiator Fan Relay
18. Install Radiator Overflow Tank
19. Install the Sway bar
20. Fill the transmission with correct fluid.
21. Check transmission fluid level. Refer to Transmission Fluid Level and Condition Check.
22. Lower the vehicle.
23. Connect the battery negative cable. Refer to Battery Negative Cable Disconnection and Connection.
24. Check for leaks.

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14.1.5.13. Control Valve Body Replacement



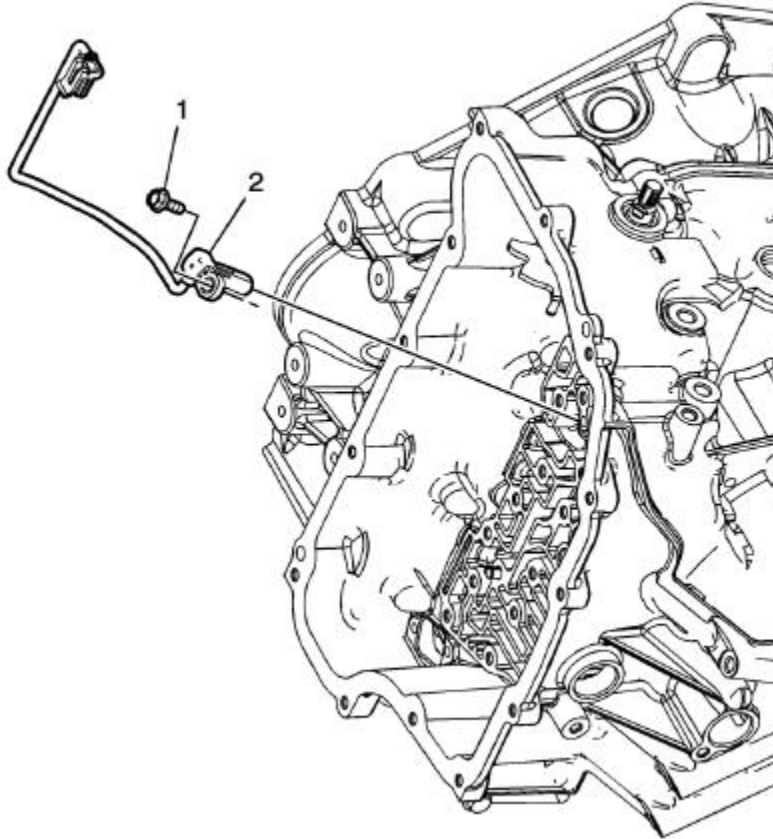
Control Valve Body Replacement

Callout	Component Name
Preliminary Procedure	
Remove the control solenoid valve and transmission control module assembly. Refer to Control Solenoid Valve and Transmission Control Module Assembly Replacement .	
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket Procedure DISCARD the Gasket. Use a NEW gasket ONLY.
3	Control Valve Body Bolt M6 x 60 (Qty: 9) Caution: Refer to Fastener Caution . Tip: Tighten in specified sequence. Tighten 11 Nm (97 lb in)
4	Control Valve Body Bolt M6 x 53 (Qty: 2) Tip: Tighten in specified sequence. Tighten 11 Nm (97 lb in)
5	Control Valve Body Assembly Procedure 1. After repairs, refer to Control Module References for programming and set up procedures. 2. Perform the transmission adaptive values learn. Refer to Transmission Adaptive Values Learn.
6	Control Valve Body Spacer Plate Assembly
7	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) Tighten 12 Nm (106 lb in)
8	Manual Shaft Detent Lever Spring Assembly
9	1-2-3-4 Clutch Fluid Passage Seal Tip: Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal Tip: Discard the seal. It is not reusable.

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14.1.5.14. Output Speed Sensor Replacement



Callout	Component Name
Preliminary Procedure Remove the control valve body. Refer to Control Valve Body Replacement .	
1	Output Speed Sensor Bolt M6 x 18 Tighten 9 Nm (80 lb in) Caution: Refer to Fastener Caution .
2	Output Speed Sensor Procedure Perform the transmission adaptive values learn procedure. Refer to Transmission Adaptive Values Learn .

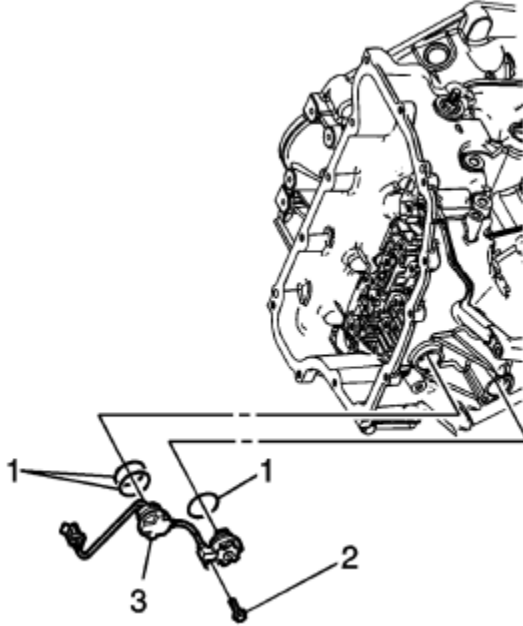
Venice Service Manual

Transmission

14.1.5.15. Input Speed Sensor Replacement

14.1.5.15.1. Removal Procedure

1. Remove the control solenoid valve and transmission control module assembly. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).

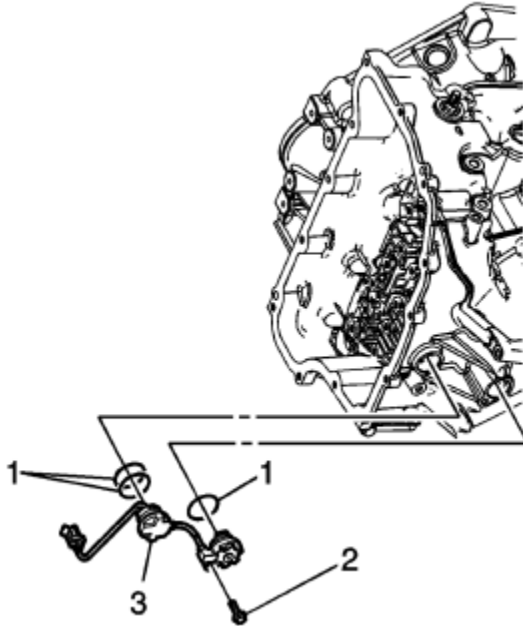


2. Remove the input speed sensor bolt (2) M6 x 23.
3. Unlock the 2 retaining tabs inside the transmission housing.
4. Remove the input speed sensor (3).
5. Remove the 3 input speed sensor seals (1).

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14.1.5.15.2. Installation Procedure



1. Install the 3 input speed sensor seals (1).
2. Install the input speed sensor (3).
3. Verify that the retaining tabs are locked completely.

Caution:
Refer to Fastener Caution.

4. Install the input speed sensor bolt (2) M6 x 23 and tighten to 9 Nm (80 lb in).
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 transmission adaptive values learn procedure. Refer to [Transmission Adaptive Values Learn](#).

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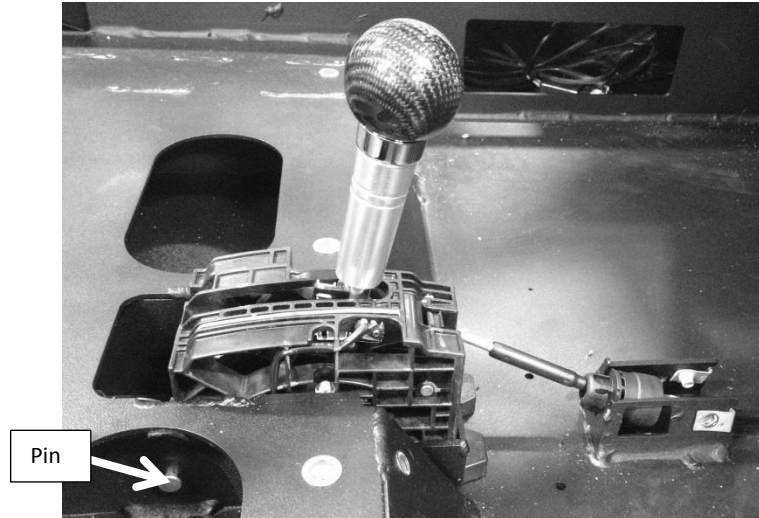
Transmission

14.1.5.16. Transmission Control Replacement

14.1.5.16.1. Tools

- Hammer
- 3/16 inch Punch

14.1.5.16.2. Removal



1. Remove both Left and Right Seats, [Refer to Seats in Interior Trim](#)
2. Remove the Shift boot surround, [Refer to Shift boot surround in Interior Trim](#)
3. Disconnect the range selector lever cable. Refer to [Range Selector Lever Cable Replacement](#).
4. Disconnect the transmission control electrical connectors.
5. Using the Hammer and Punch drive the Transmission Control Pin out of the chassis
6. Remove the Transmission Control Lever

14.1.5.16.3. Installation

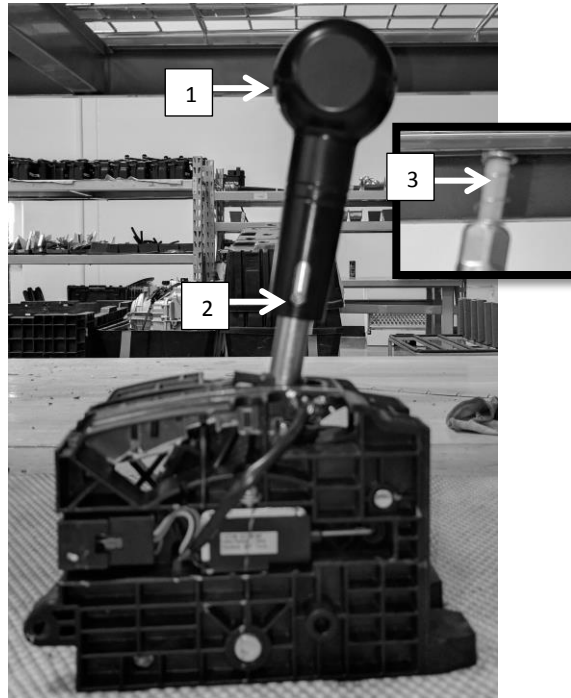
Warning
After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to shift into PARK causing potential vehicle damage and bodily injury.

1. Insert the Transmission control lever in to the chassis
 - 1.1. Align the hole in chassis to the hole in the Transmission Control Lever
2. Insert the Transmission Control Pin through the chassis and the Control Lever
3. Connect the electrical connections to the Transmission Control Lever
4. Connect the Range Selector Cable Refer to [Range Selector Lever Cable Replacement](#).
5. Install the Shift boot surround, [Refer to Shift boot surround in Interior Trim](#)
6. Install both Right and Left Seats, [Refer to Seats in Interior Trim](#)

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14.1.5.17. Transmission Control Handle Replacement



Callout	Component Name
1	Transmission Control Handle Procedure Press Shift Boot Down to access Set Screws Remove Transmission Control Handle set screw
2	Transmission Control Handle set screw
3	Shift Handle Spring

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Transmission

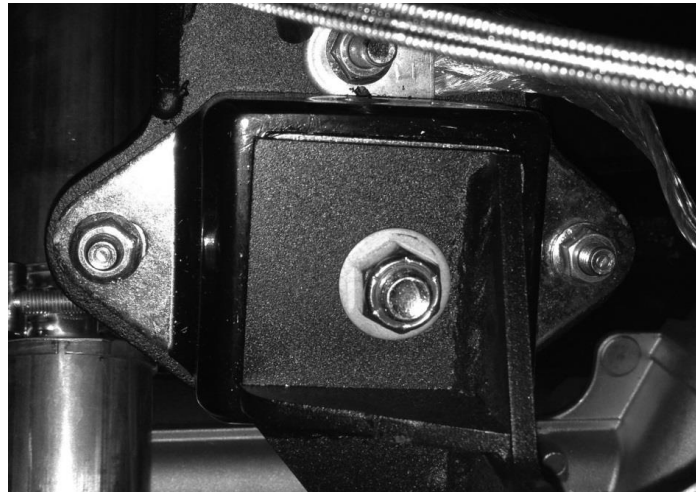
14.1.5.18. Transmission Mount Bracket Replacement – Rear

14.1.5.18.1. Tools

- 16mm socket

14.1.5.18.2. Removal

1. Lift and support the vehicle
2. Remove the Hood, [Refer to Hood in Body Repair](#)



3. Using a suitable jack stand, support the rear of the transmission.
4. Remove the single nut on the upper side Transmission Mount Bracket
5. Remove and DISCARD the 3 rear transmission mount bracket to transmission bolts
6. Remove the rear transmission mount bracket

14.1.5.18.3. Installation

1. Install the rear transmission mount bracket
2. Install the 3 NEW rear transmission mount bracket to transmission bolts and tighten to 100 Nm (74 lb ft) plus 30–45 degrees.
3. Remove the jack stand.;
4. Install a NEW nut on the upper side of the Transmission Mount Bracket and tighten to 54 Nm (40 lb ft)
5. Lower the vehicle.
7. Install the Hood, [Refer to Hood in Body Repair](#)

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Transmission

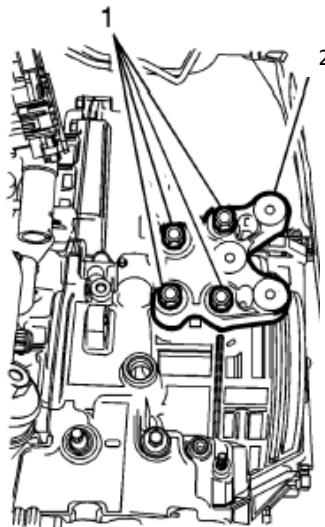
14.1.5.19. Transmission Mount Replacement Left Side

14.1.5.19.1. Tools

- 16mm Socket

14.1.5.19.2. Removal

1. Lift and support the vehicle
2. Support the transmission, with a floor jack
3. Remove Junction Box, Refer to [Junction Box Replacement](#)
4. Remove ECU, Refer to [ECU Replacement](#)
5. Remove Horn, Refer to [Horn Replacement](#)
6. Remove ECU Fuse Bracket
7. Remove the Left Transmission Bracket
8. Remove Intake Throttle Body Hose
9. Using a suitable jack stand, support the left side of the transmission.
10. Remove the single bolt on the left side of the Transmission mount
11. Remove the 3 nut on the right side of the
12. Remove the left side mount bracket

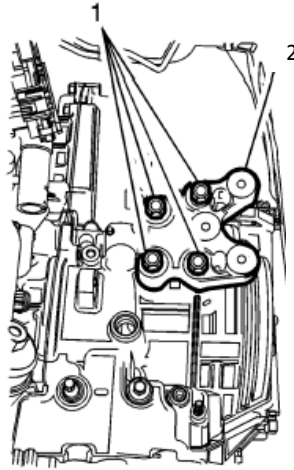


13. Remove the 4 left transmission mount bracket to transmission bolts (1)
14. Remove the left transmission mount bracket (2) from the transmission.

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14.1.5.19.3. Installation

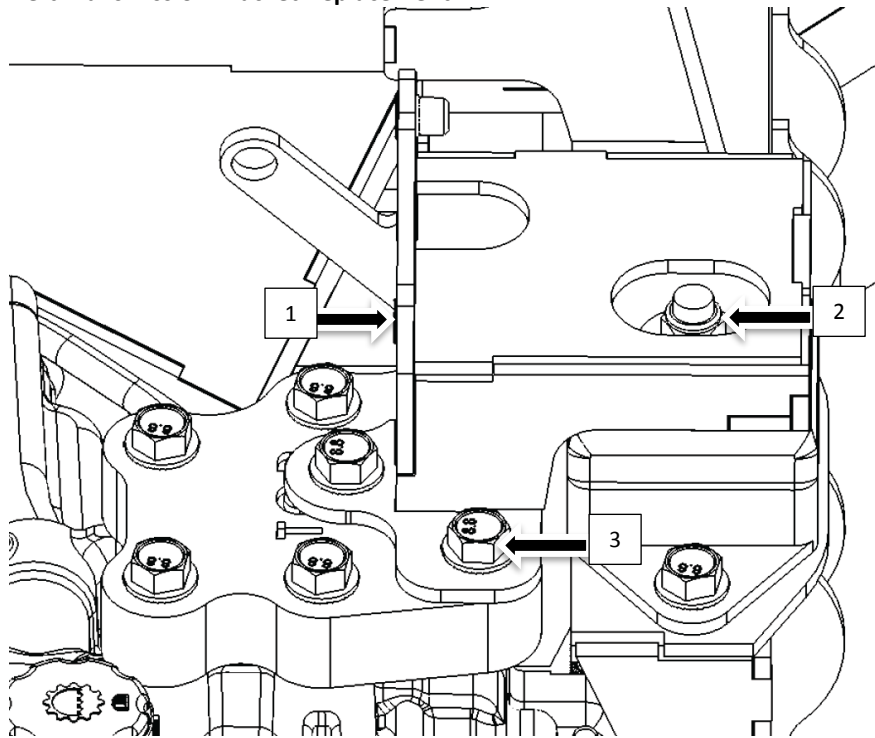


1. Install the left transmission mount bracket (2) to the transmission.
2. Install the left transmission mount bracket to transmission bolts (1) and tighten to 62 Nm (46 lb ft).
3. Install the left Transmission bracket, Refer to Left Transmission Bracket Replacement
4. Remove the Jack supporting the Transmission
5. Install the Intake Throttle Body Hose
6. Install the Left Transmission Bracket
7. Install the ECU Fuse Bracket
8. Install the Horn
9. Install the ECU
10. Install the Engine Bay Fuse Box
11. Lower the Vehicle

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14.1.5.20. Left Transmission Bracket Replacement



Left Transmission Bracket Replacement

Callout	Component Name
Preliminary Procedure 1. Disconnect the Negative Battery Cable 2. Using a suitable jack stand, support the rear of the transmission. 1. Remove the ECU, Refer to ECU Replacement 2. Remove the Junction Block, Refer to Junction Block Replacement 3. Remove the Junction Bock/ ECU Bracket, Refer to Junction Bock/ ECU Bracket Replacement	
1	Left Transmission Bracket
2	Transmission Mount Bushing Nut Tighten 54 Nm (40 lb ft)
3	Left Side Transmission Mount Bolts (Qty:3) Tighten 62 Nm (46 lb ft).

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14.1.5.21. Transmission Replacement

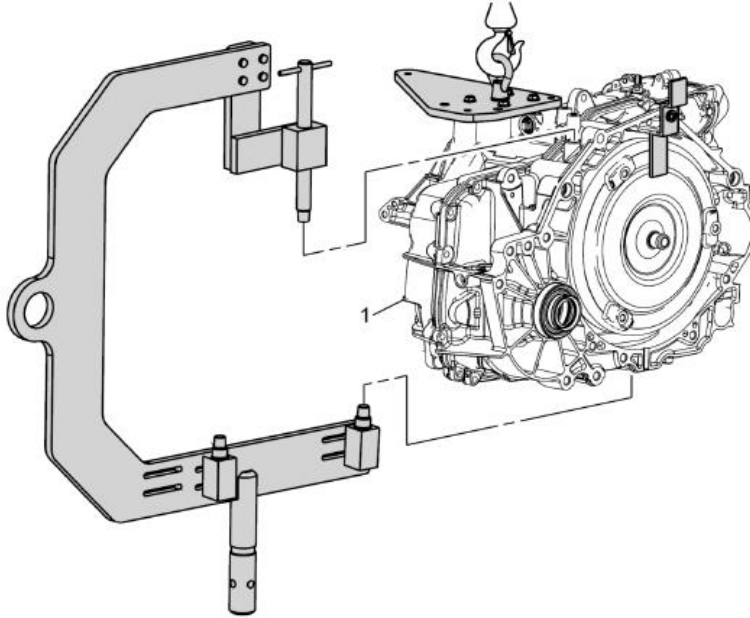
Transmission Removal and installation is only possible as a complete Power Train (Engine and Transmission)
See Powertrain Removal

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Transmission

14.1.6. Repair Instructions – Off Vehicle

14.1.6.1. Lift Plate and Holding Fixture Installation



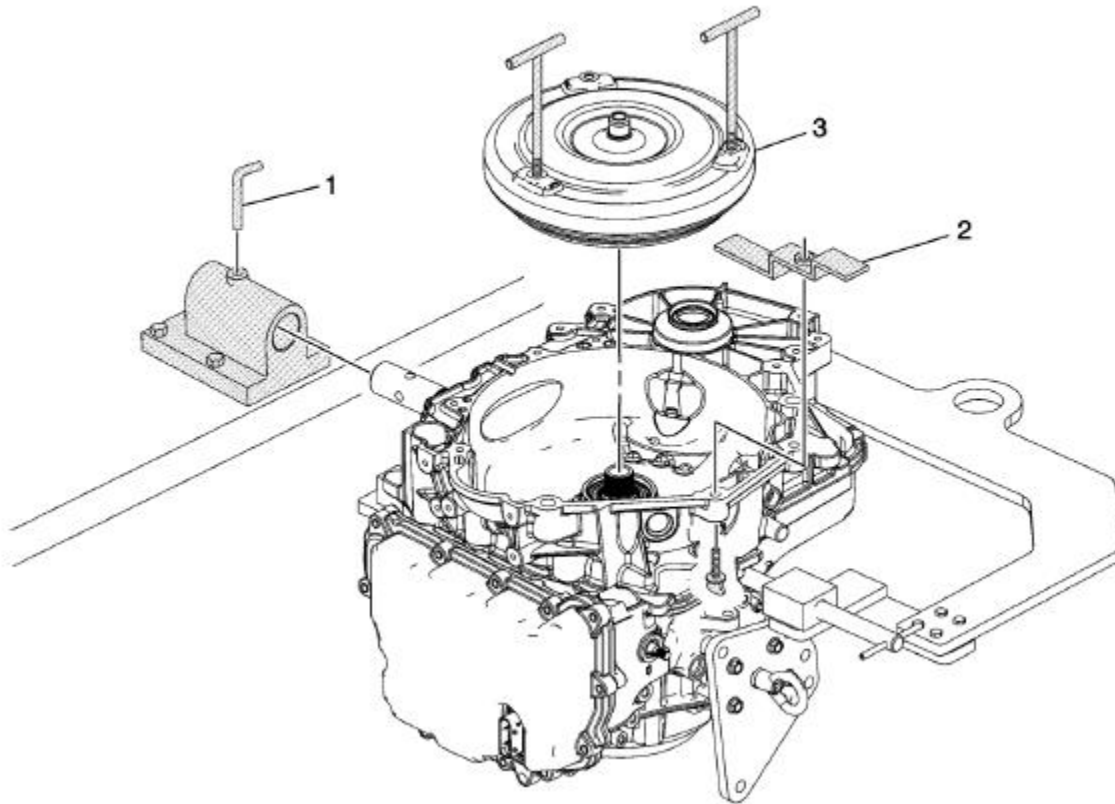
Lift Plate and Holding Fixture Installation

Callout	Component Name
1	Transmission Case Assembly Warning: Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly. Warning: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury. Caution: Refer to Fastener Caution. Procedure Note: Only 2 bolt holes on the lift plate will align with the bosses on the transmission case. This is sufficient for lifting the transmission to install the holding fixture. 1. Install DT-47811-A Transmission Lift Plate 2. Tighten bolts and nut to 12 Nm (106 lb in). 3. Raise the transmission with an overhead hoist. 4. Install DT-46625 Transmission Holding Fixture. 5. Adjust mounting block on fixture to match bosses on case, then tighten bolts to 13 Nm (10 lb ft). 6. Ensure the DT-46625 Transmission Holding Fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. 7. Install lock pin for DT- 3289-20 Holding Fixture. Special Tools • DT-3289-20 Holding Fixture • DT-46625 Transmission Holding Fixture • DT-46625-10 Transmission Holding Fixture Adapter • DT-47811-A Transmission Lift Plate

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Transmission

14.1.6.2. Torque Converter Removal



Callout	Component Name
1	Lock Pin Warning: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury. Note: Ensure the DT 328920 holding fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. DT39890 holding fixture adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. Special Tools DT 3289-20 Holding Fixture DT-39890 Transmission Holding Fixture Adapter
2	DT 21366 Torque Converter Holding Strap
3	Torque Converter Assembly Caution: 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. Note: Failure to raise the torque converter straight up could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tool DT 46409 Torque Converter Lifting Handles

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Transmission

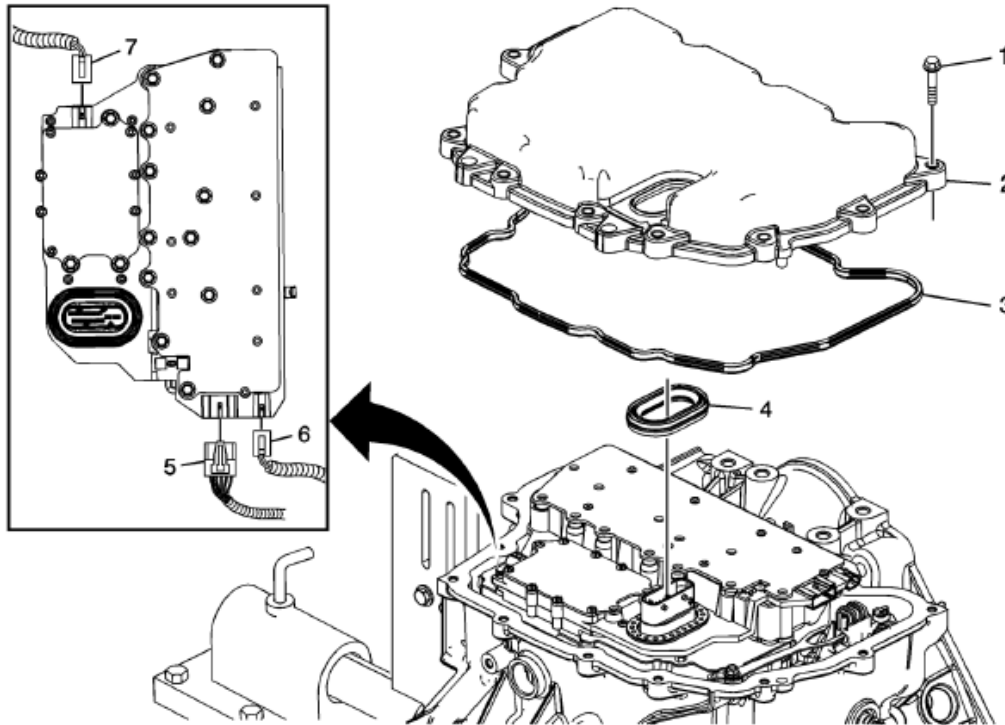
14.1.6.3. Control Valve Body Assembly Removal

Table 1: Control Valve Body Cover Removal

Table 2: Control Solenoid (With Body and TCM) Valve Assembly Removal

Table 3: Control Valve Body Assembly Removal

14.1.6.3.1. Control Valve Body Cover Removal



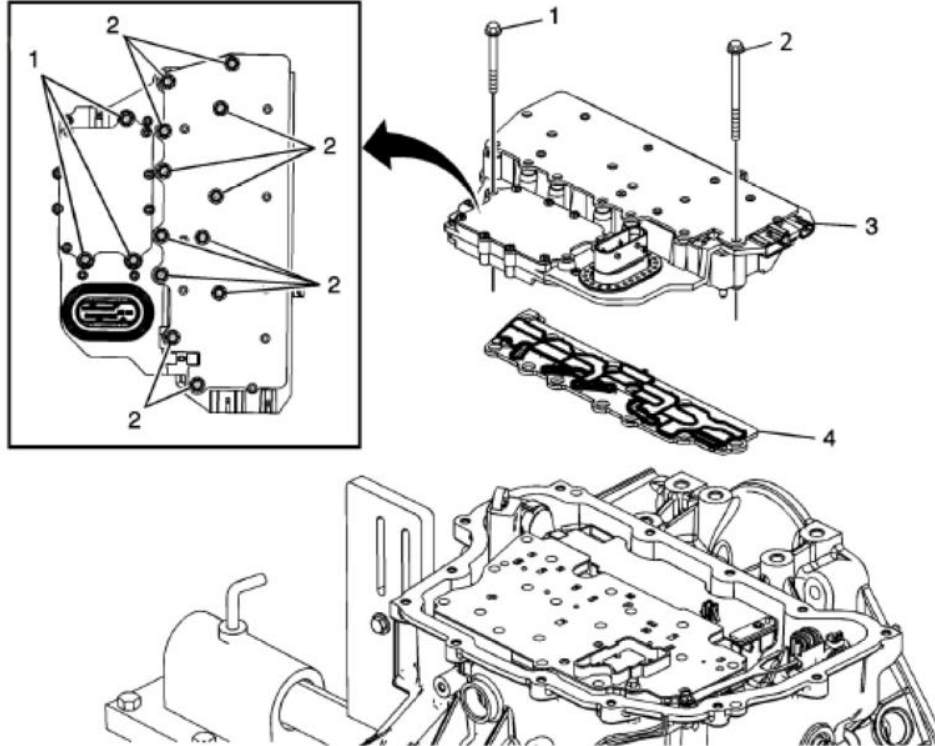
Control Valve Body Cover Removal

Callout	Component Name
1	Control Valve Body Cover Bolts M6 x 30 (Qty: 13)
2	Control Valve Body Cover
3	Control Valve Body Gasket Note: Discard the seal. It is not reusable.
4	Control Valve Body Cover Wiring Connector Hole Seal Caution: Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections. Note: Discard the seal. It is not reusable.
5	Shift Position Switch Connector
6	Output Speed Sensor Connector
7	Input Speed Sensor Connector

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Transmission

14.1.6.3.2. Control Solenoid (With Body and TCM) Valve Assembly Removal



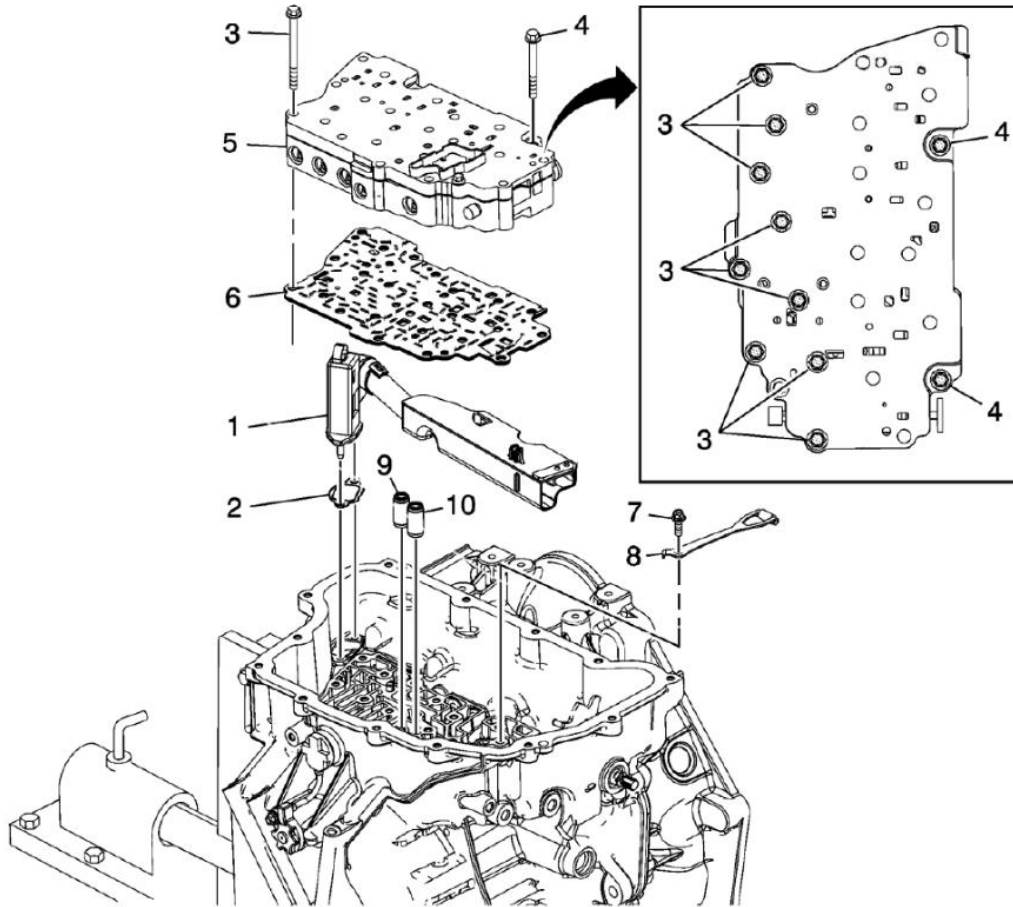
Control Solenoid (With Body and TCM) Valve Assembly Removal

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
	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. Note: Discard the filter plate. It is not reusable.

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Transmission

14.1.6.3.3. Control Valve Body Assembly Removal



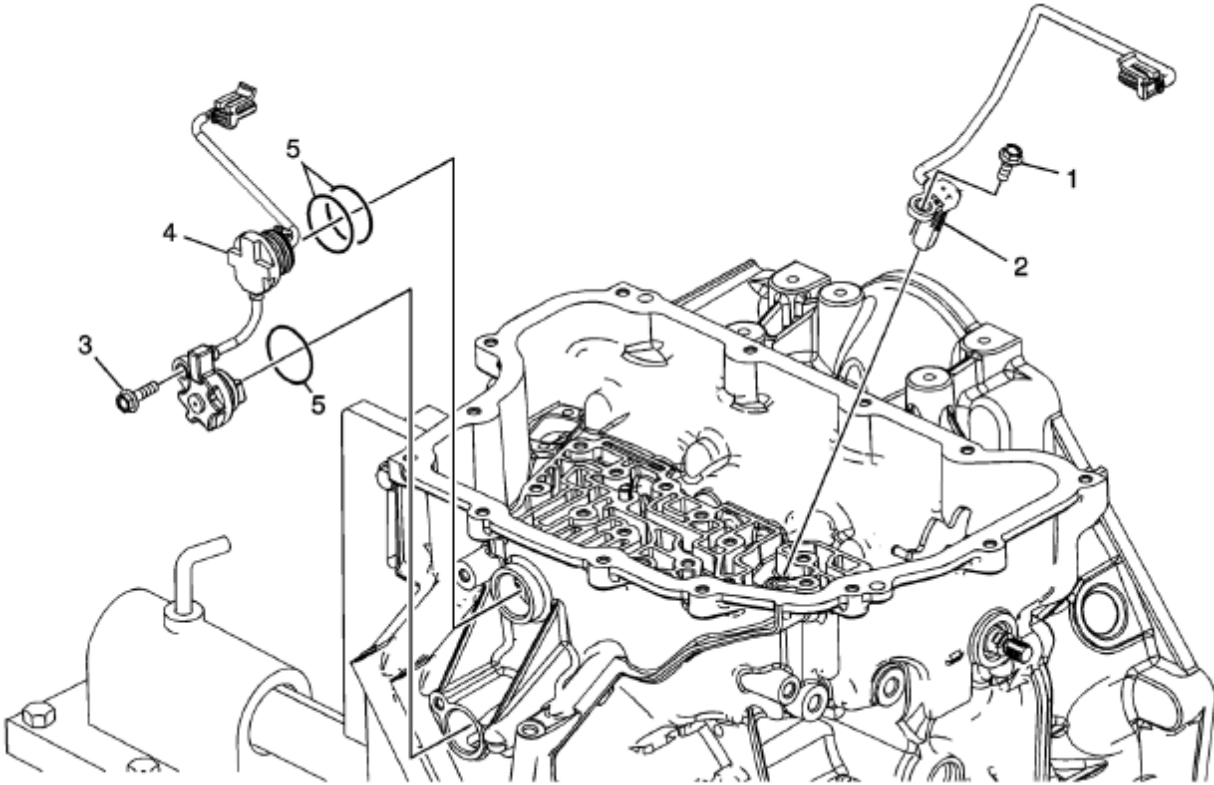
Control Valve Body Assembly Removal

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 Note: Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal Note: Discard the seal. It is not reusable.

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14.1.6.4. Input and Output Speed Sensor Removal



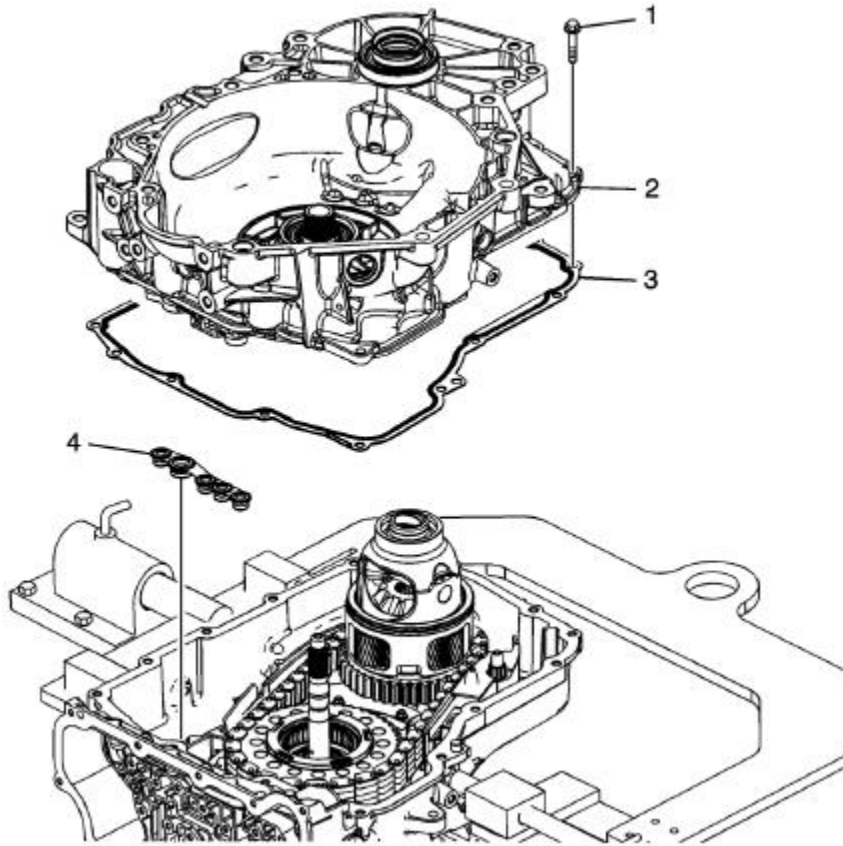
Input and Output Speed Sensor Removal

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 Note: 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) Note: Discard the seals. They are not reusable.

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Transmission

14.1.6.5. Torque Converter Housing with Fluid Pump Assembly Removal



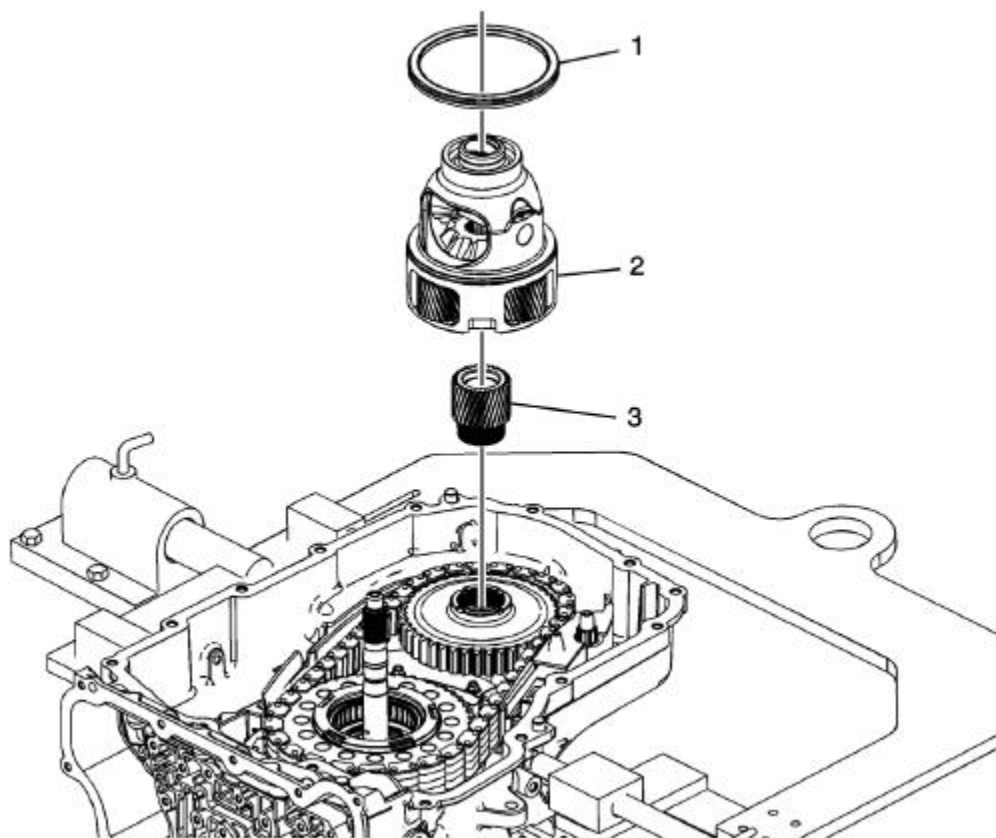
Torque Converter Housing with Fluid Pump Assembly Removal

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 Note: Discard the seal. It is not reusable.
4	Fluid Pump Seal Assembly Note: Discard the seal. It is not reusable.

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Transmission

14.1.6.6. Differential Carrier Removal



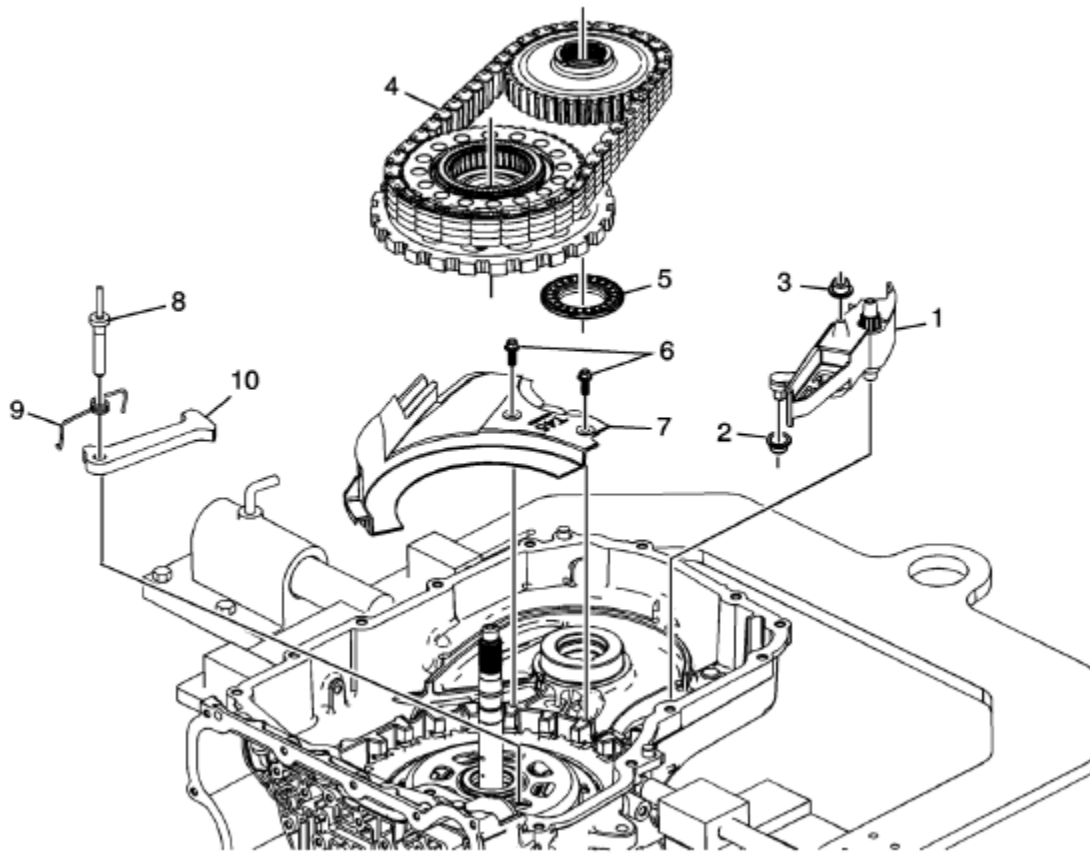
Differential Carrier Removal

Callout	Component Name
1	Front Differential Carrier Bearing Assembly
2	Differential Carrier Assembly
3	Final Drive Sun Gear

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14.1.6.7. Drive and Driven Sprocket, Drive Link, and Park Pawl Removal



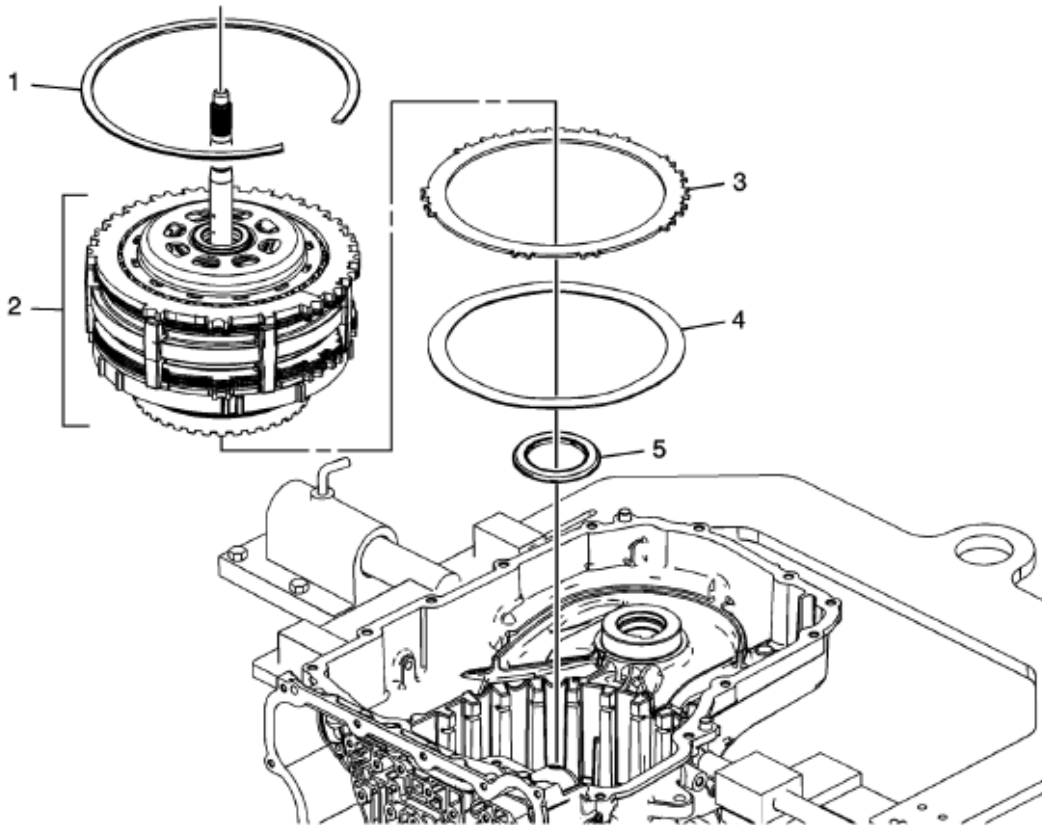
Drive and Driven Sprocket, Drive Link, and Park Pawl Removal

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 Procedure 1. The drive link, drive and driven sprocket assemblies must be removed at the same time. 2. The driven sprocket ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.
5	Driven Sprocket Bearing Assembly Note: The driven sprocket bearing may be stuck to the driven sprocket.
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

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Transmission

14.1.6.8. Internal Components Removal



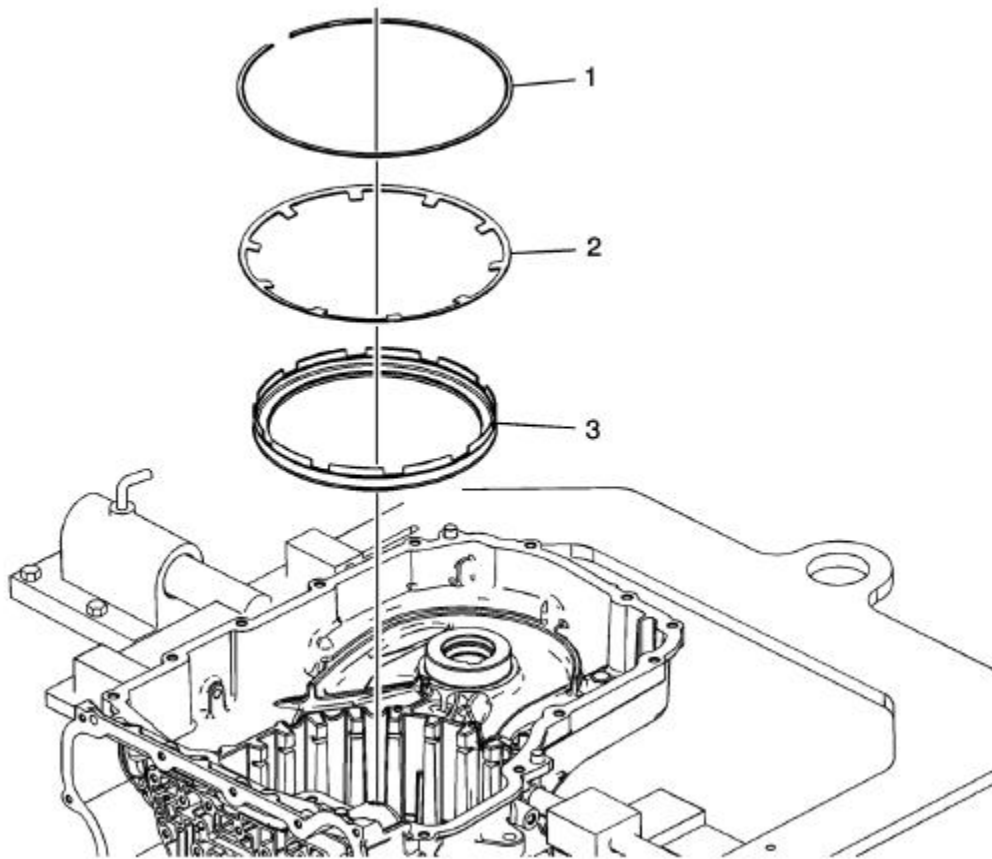
Internal Components Removal

Callout	Component Name
1	1–2–3–4 Clutch Backing Plate Retainer Ring Warning: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result. Caution: 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. Note: Remove one end of the retainer using DT-28585 snap ring remover or equivalent and work the retainer out of the case groove. Special Tool DT-28585 Snap Ring Remover or equivalent
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 Note: This unit is heavy – weighs 40 lbs. (18 Kg).
3	2–6 Clutch Plate (Qty: 1)
4	2–6 Clutch Apply Plate (Waved)
5	35R and 456 Clutch Housing Thrust Bearing Assembly

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14.1.6.9. 2-6 Clutch Piston Removal



2-6 Clutch Piston Removal

Callout	Component Name
1	2-6 Clutch Spring Retainer Special Tool DT-28585 Snap Ring Remover or equivalent
2	2-6 Clutch Spring
3	2-6 Clutch Piston Assembly

Note:

- Use pliers to remove the piston.
- Inspect the piston seals for damage and/or wear. The piston is reusable.

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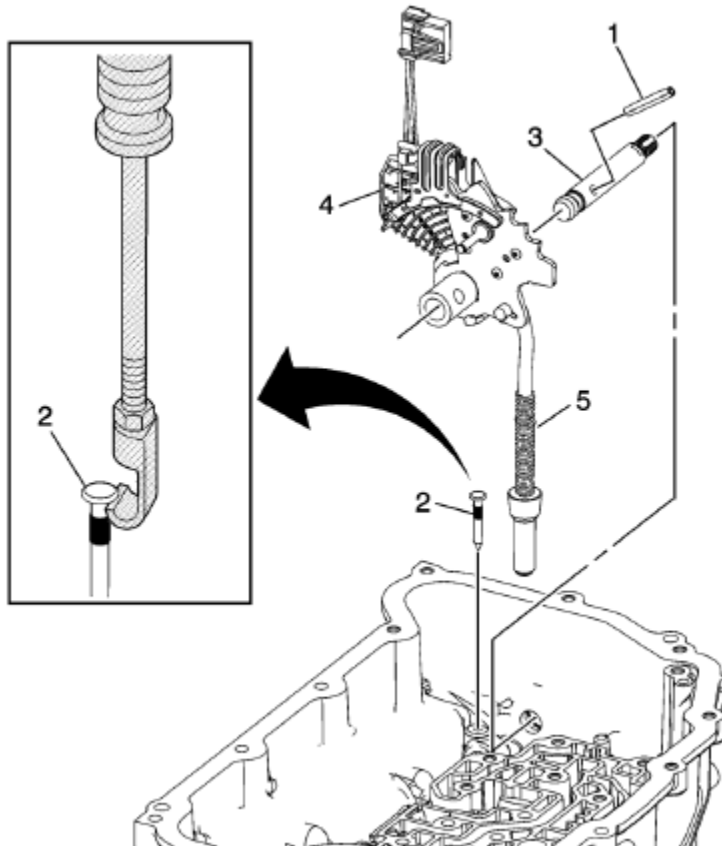
Transmission

14.1.6.10. Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal

Table 1: Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal

Table 2: Park Pawl Actuator Guide Removal Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal

14.1.6.10.1. Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal



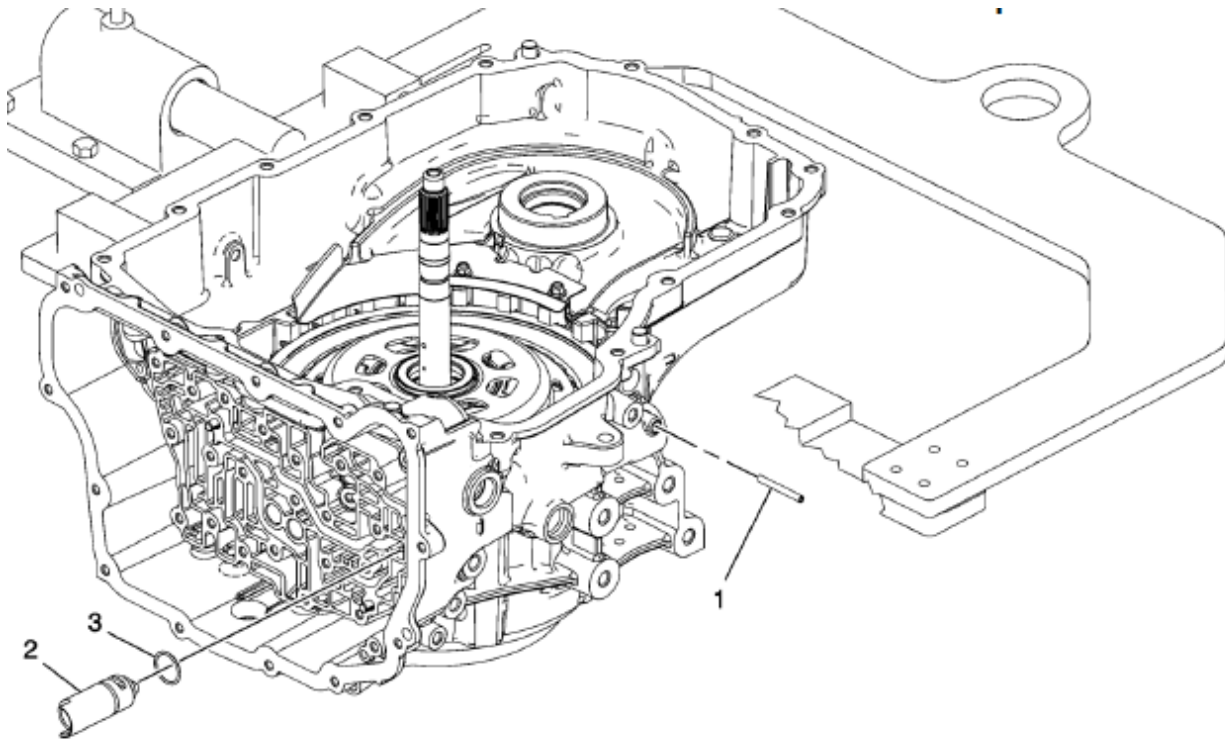
Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin Note: Use side cutter to remove the pin (1) and discard.
2	Manual Shift Shaft Pin Note: Discard the pin. It is not reusable.
	Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer
3	• Manual Shaft
4	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly
5	Park Pawl Actuator Assembly

14.1.6.10.2. Park Pawl Actuator Guide Removal

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Transmission



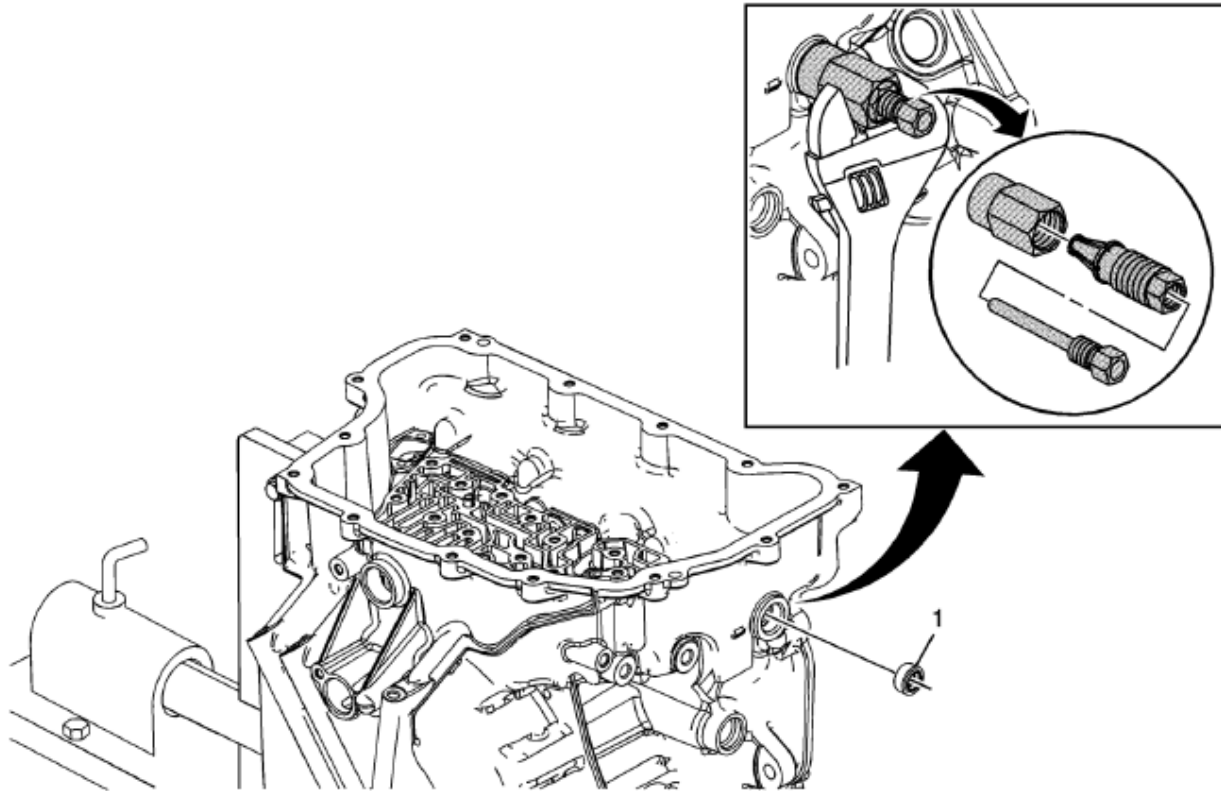
Park Pawl Actuator Guide Removal

Callout	Component Name
1	Park Pawl Actuator Guide Pin Note: Use side cutter to remove the pin (1) and discard.
2	Park Pawl Actuator Guide Assembly
3	Park Pawl Actuator Guide Assembly Seal Note: Discard the seal. It is not reusable.

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14.1.6.11. Manual Shift Shaft Seal Removal



Manual Shift Shaft Seal Removal

Callout	Component Name
1	Manual Shift Shaft Seal Note: Use the DT-45201 seal remover to remove the seal to prevent damage to the case surface. Special Tools DT-45201 Seal Remover

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Transmission

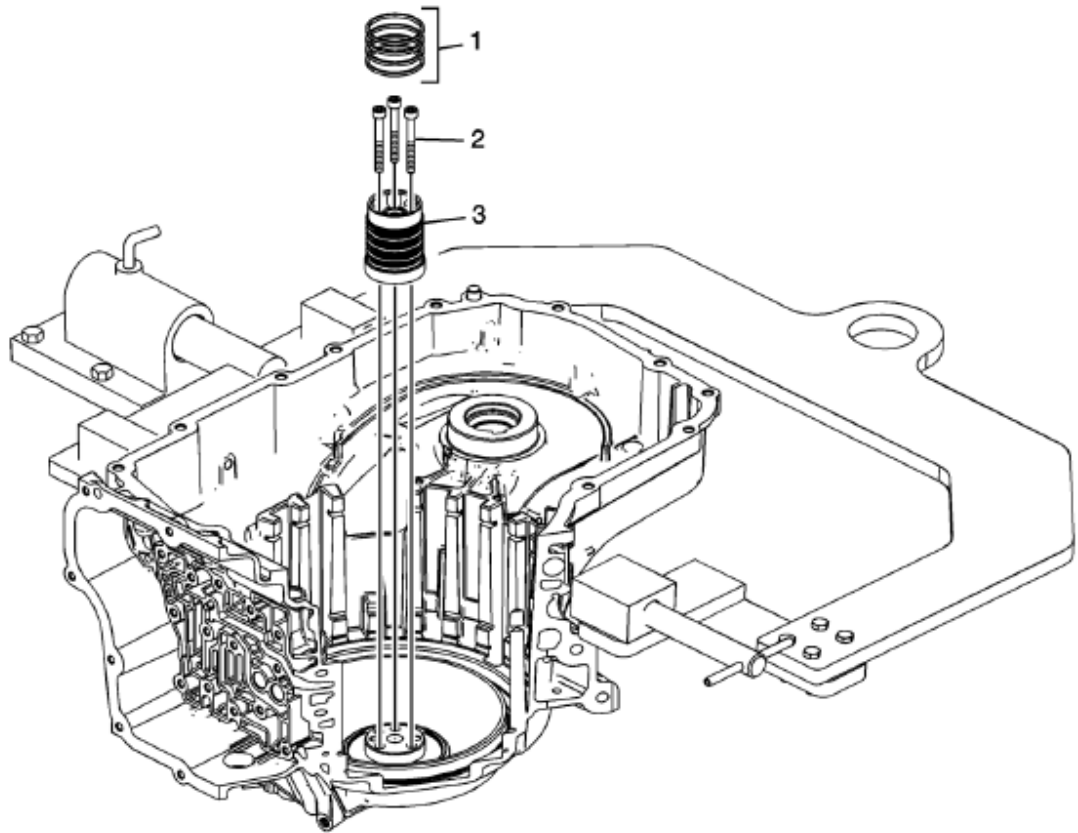
14.1.6.12.

Input

Shaft

Support

Replacement



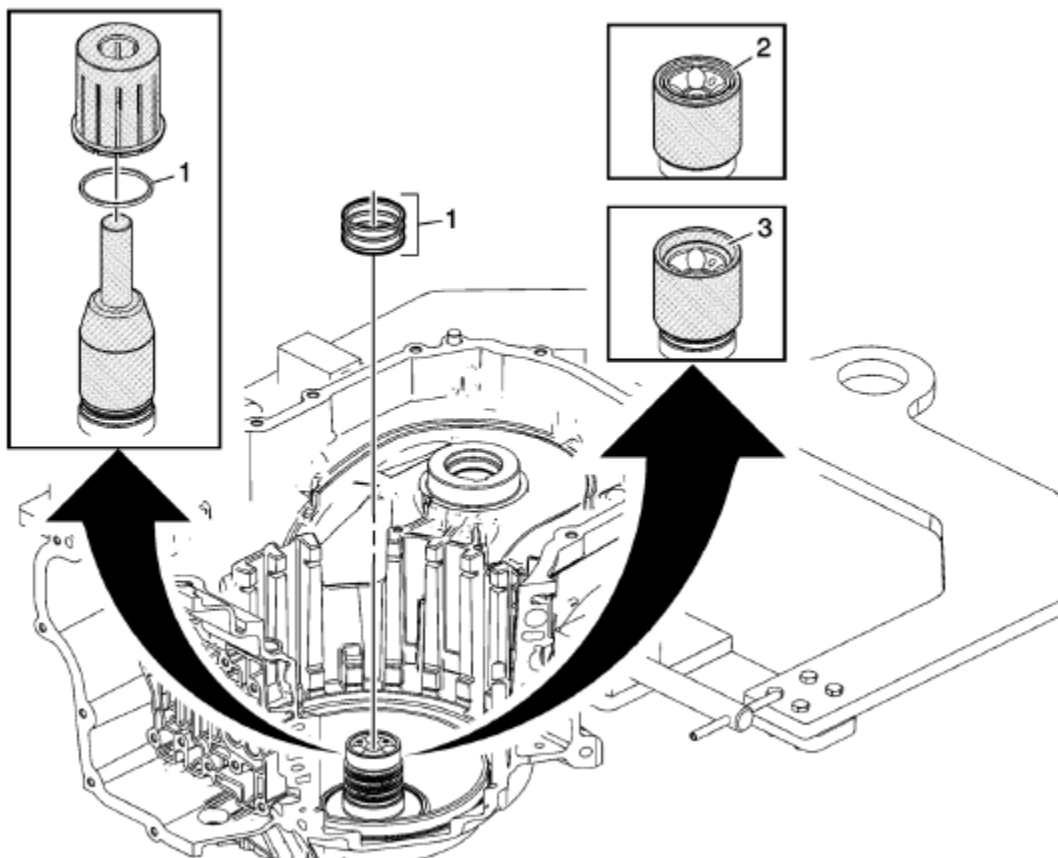
Input Shaft Support Replacement

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3) Note: • Discard the fluid seals. They are not reusable. • Refer to 3-5Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement.

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14.1.6.13. 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement



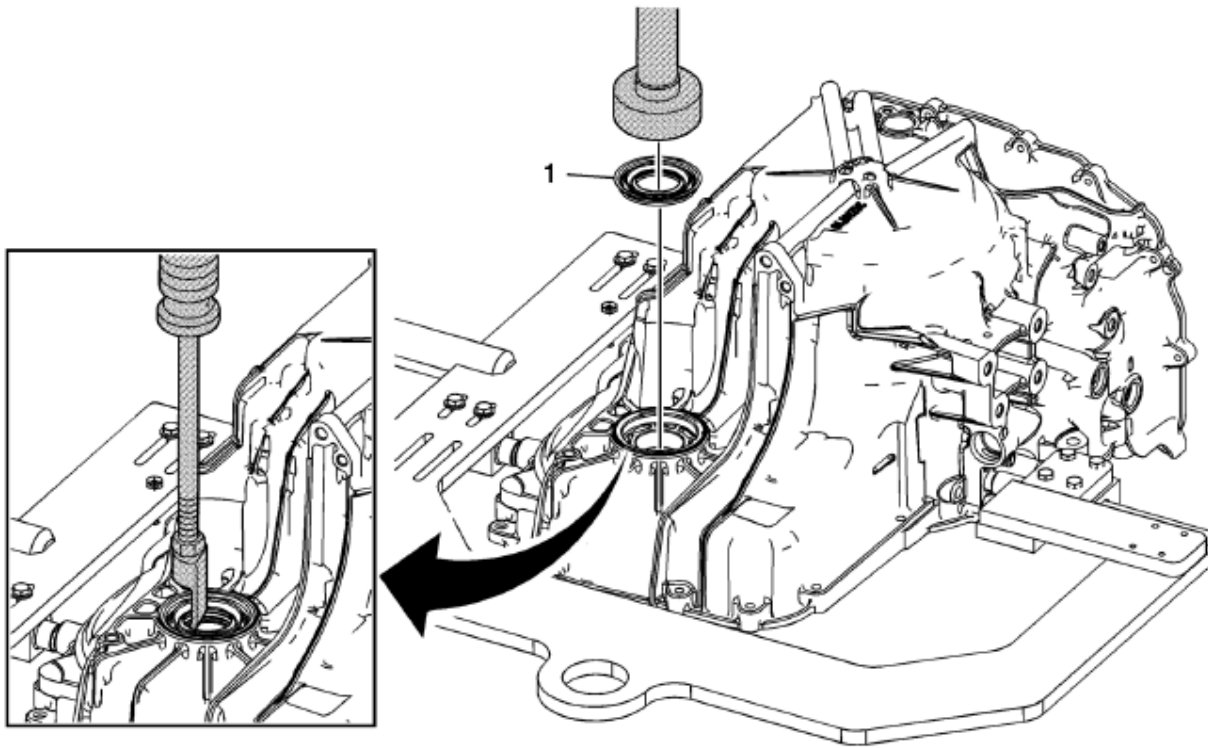
3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement

Callout	Component Name
Special Tools	
DT-46620 Seal Installer	

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14.1.6.14. Front Wheel Drive Shaft Seal Replacement - Case Side



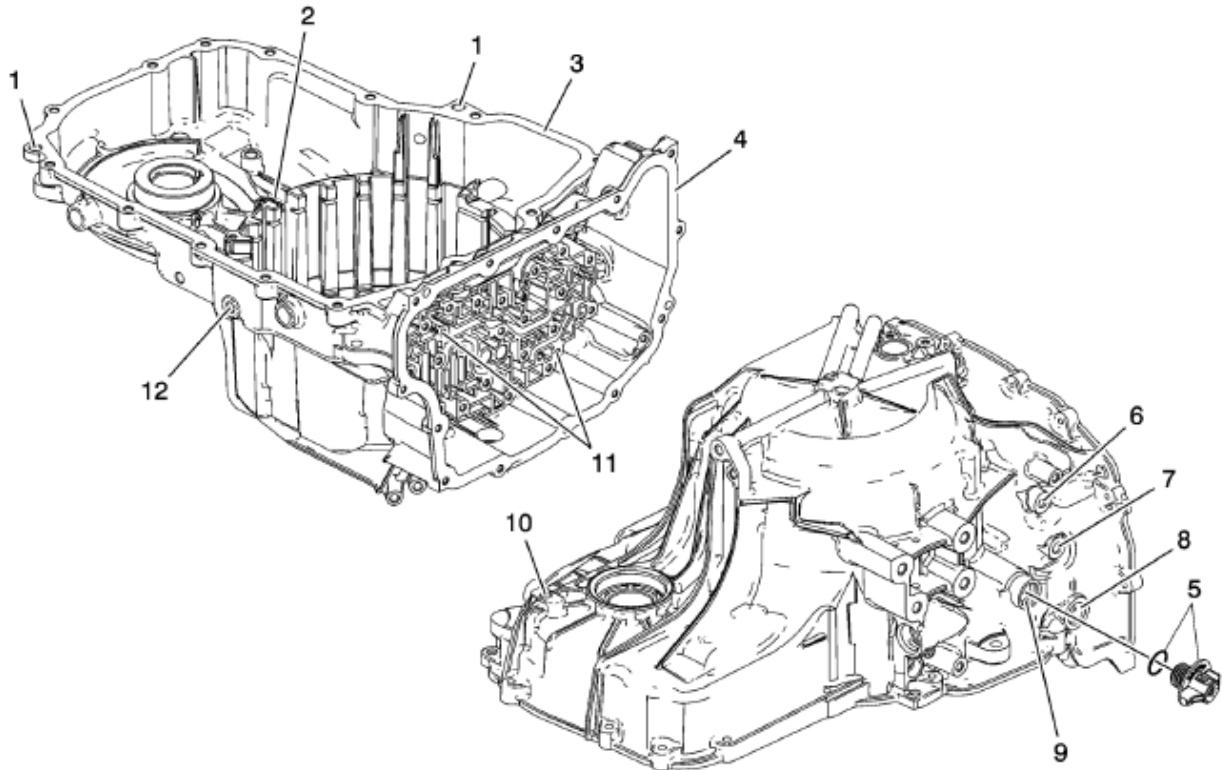
Front Wheel Drive Shaft Seal Replacement - Case Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal
	Special Tools • DT-23129 Universal Seal Remover • DT- 47790 Seal Installer • GE-6125-1B Slide Hammer • GE8092 Driver Handle

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14.1.6.15. Transmission Case Cleaning and Inspection



Transmission Case Cleaning and Inspection

Callout	Component Name
Caution: 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. Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels 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. Preliminary Procedures - Thoroughly clean the transmission case assembly, including case threads, with clean solvent. - Clean gasket sealing surfaces. Remove all residual gasket material. 3. Inspect all threaded holes. If necessary, repair any thread damage.	
1	Torque Converter Housing Locating Pin Procedure Inspect the torque converter housing locating pins. Specification The locating pins installed height is 7.4 mm (0.29 in).
2	Fluid Trough Check Ball Specification The check ball installed depth is 11 mm (0.43 in).
3	Converter Housing Sealing Surface
4	Control Valve Body Cover Sealing Surface
5	Fill Cap Seal
6	Transmission Fluid Cooler Pipe Sealing Surface
7	Fluid Pressure Test Plug
Caution: Refer to Fastener Caution .	

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	Tighten 12 Nm (106 lb in)
8	Manual Shift Shaft Seal Surface
9	Fluid Fill Cap Sealing Surface
10	Fluid Level Plug Tighten 12 Nm (106 lb in)
11	Valve Body Locating Pin Procedure Inspect the valve body locating pins. Specification The locating pins installed height is 5.8 mm (0.22 in).
12	Drain Plug Tighten 12 Nm (106 lb in)

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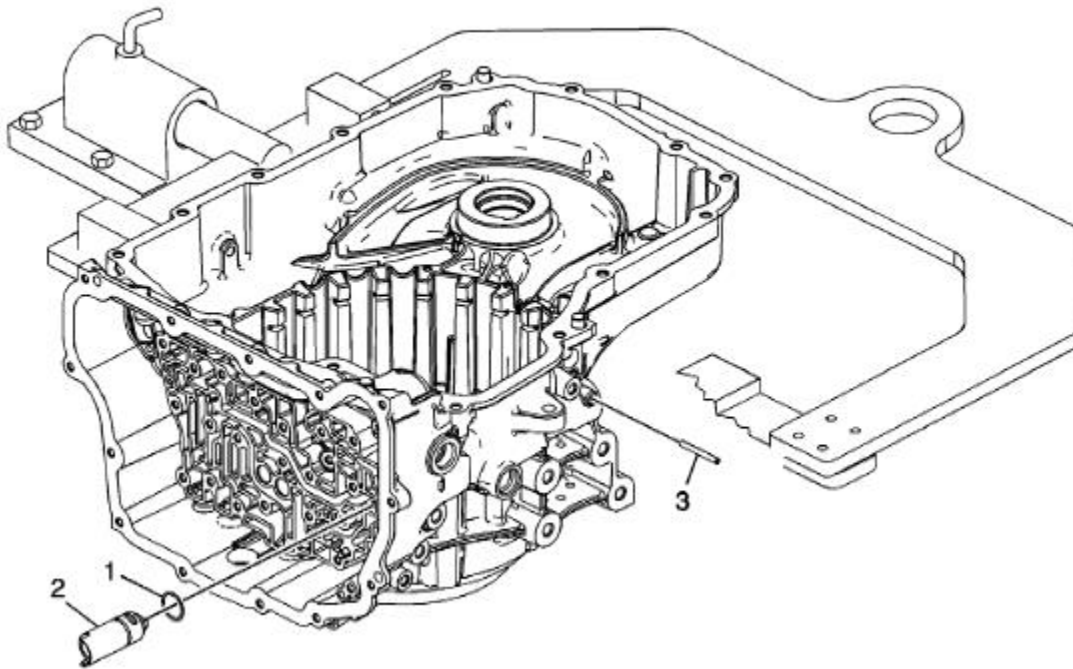
Transmission

14.1.6.16. Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Installation

Table 1: Park Pawl Actuator Guide Installation

Table 2: Park Pawl Actuator Installation

14.1.6.16.1. Park Pawl Actuator Guide Installation



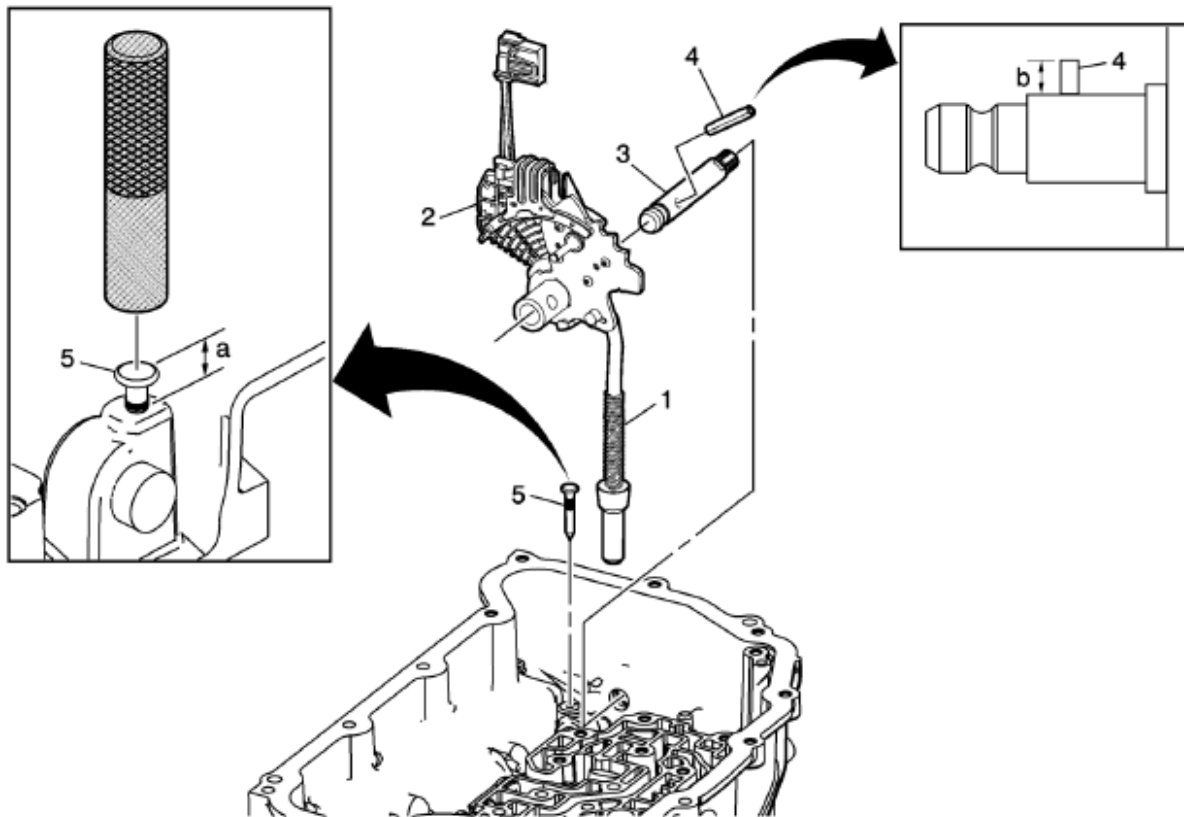
Park Pawl Actuator Installation

Callout	Component Name
1	Park Pawl Actuator Guide Assembly Seal
2	Park Pawl Actuator Guide Assembly
3	Park Pawl Actuator Guide Pin
Caution: Refer to Fastener Caution. Procedure Install the park pawl actuator guide pin to correct height. Tighten 7.2 mm (0.28 in)	

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14.1.6.16.2. Park Pawl Actuator Installation



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
	Note: Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
4	Manual Shaft Detent Lever Hub Pin
	Caution: Refer to Fastener Caution.
	Procedure Install the manual shaft detent lever hub pin to correct height.
	Note: Use a NEW pin to ensure proper engagement with the shaft.
	Specification 7.9 mm (0.38 in) (b)
	Special Tools DT-48550 Detent Lever Pin Remover

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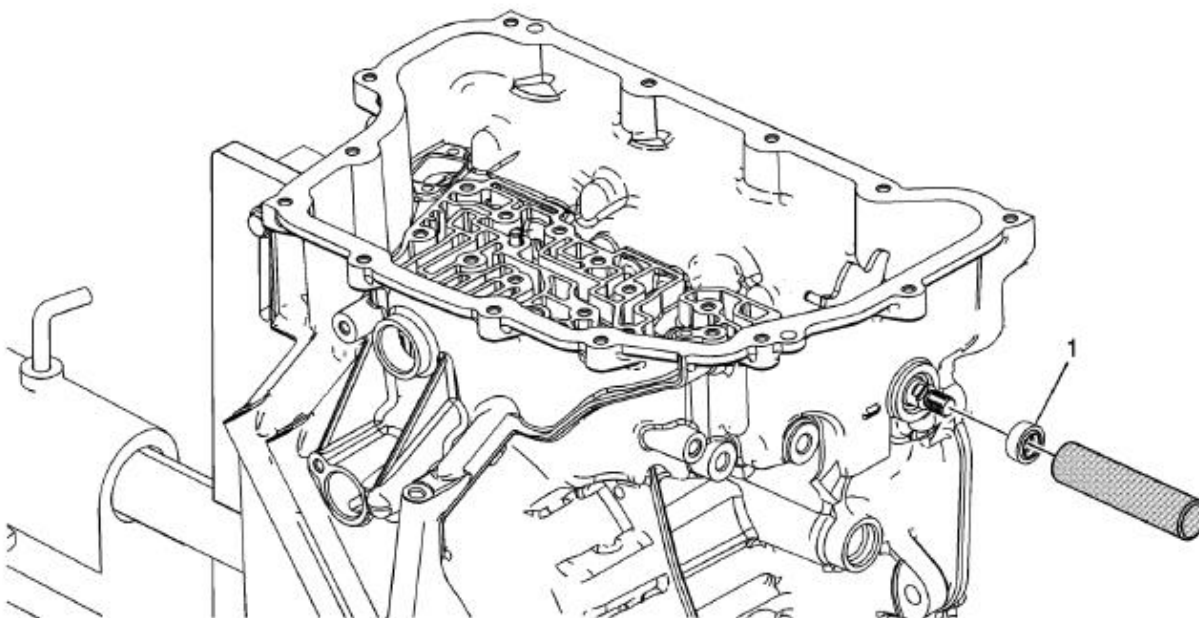


5	Manual Shift Shaft Pin Caution: Use the manual shaft pin installer to install the pin at the correct height to properly secure the manual shaft. If you install the pin too deep, the case bore may crack. Procedure Inspect pin installed height is within specifications. Note: Use a NEW pin to ensure proper engagement with the case. Specification 7.2–8.2 mm (0.28–0.32 in) (a) Special Tools DT-41229 Manual Shaft Pin Installer
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14.1.6.17. Manual Shift Shaft Seal Installation



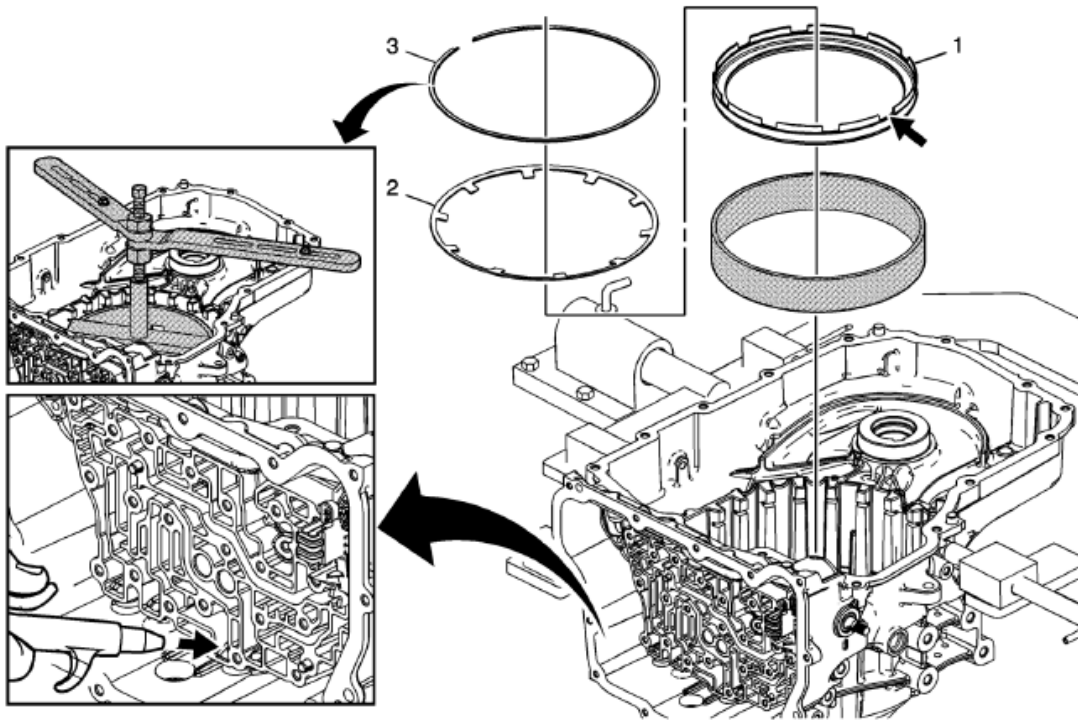
Manual Shift Shaft Seal Installation

Callout	Component Name
1	Manual Shift Shaft Seal Special Tool DT-49101 Seal Installer

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14.1.6.18. 2-6 Clutch Piston Installation



2-6 Clutch Piston Installation

Callout	Component Name
1	2-6 Clutch Piston Assembly Note: - Position the 2-6 piston air bleed and large slot toward the top of the case. - 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. Special Tool DT-47796 Seal Protector
2	2-6 Clutch Spring
3	2-6 Clutch Spring Retainer Caution: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. 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

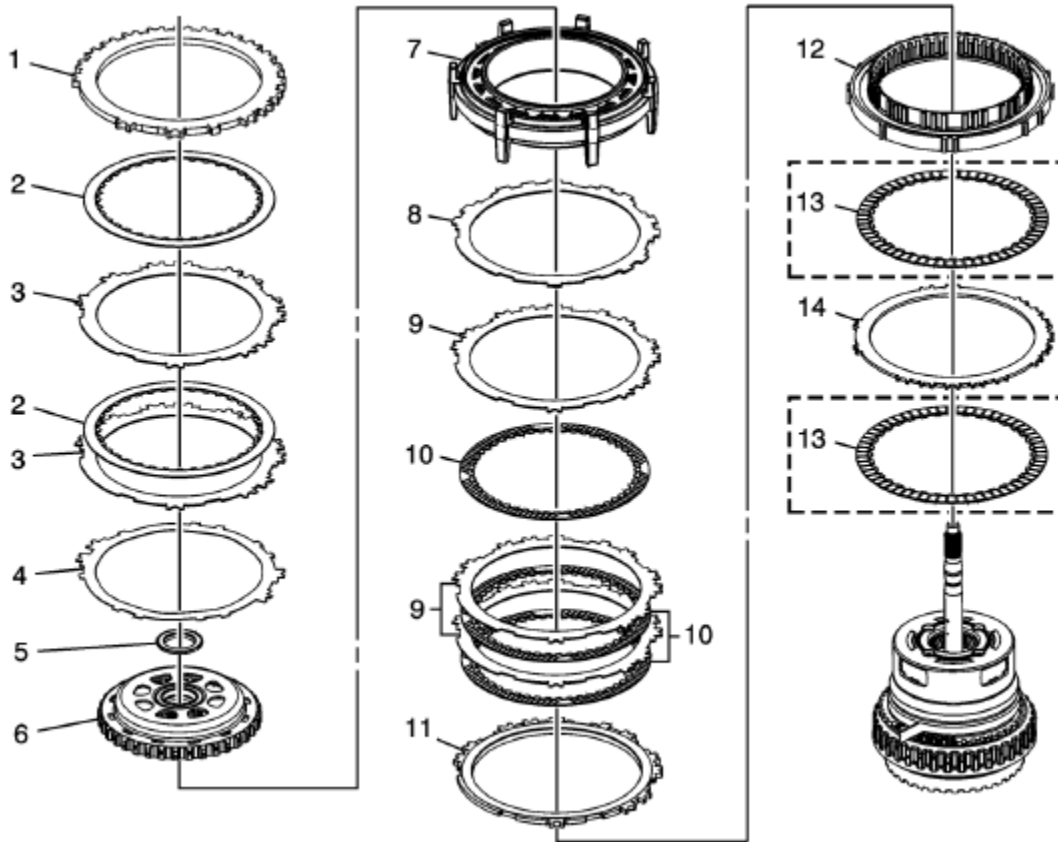
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14.1.6.19. Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble



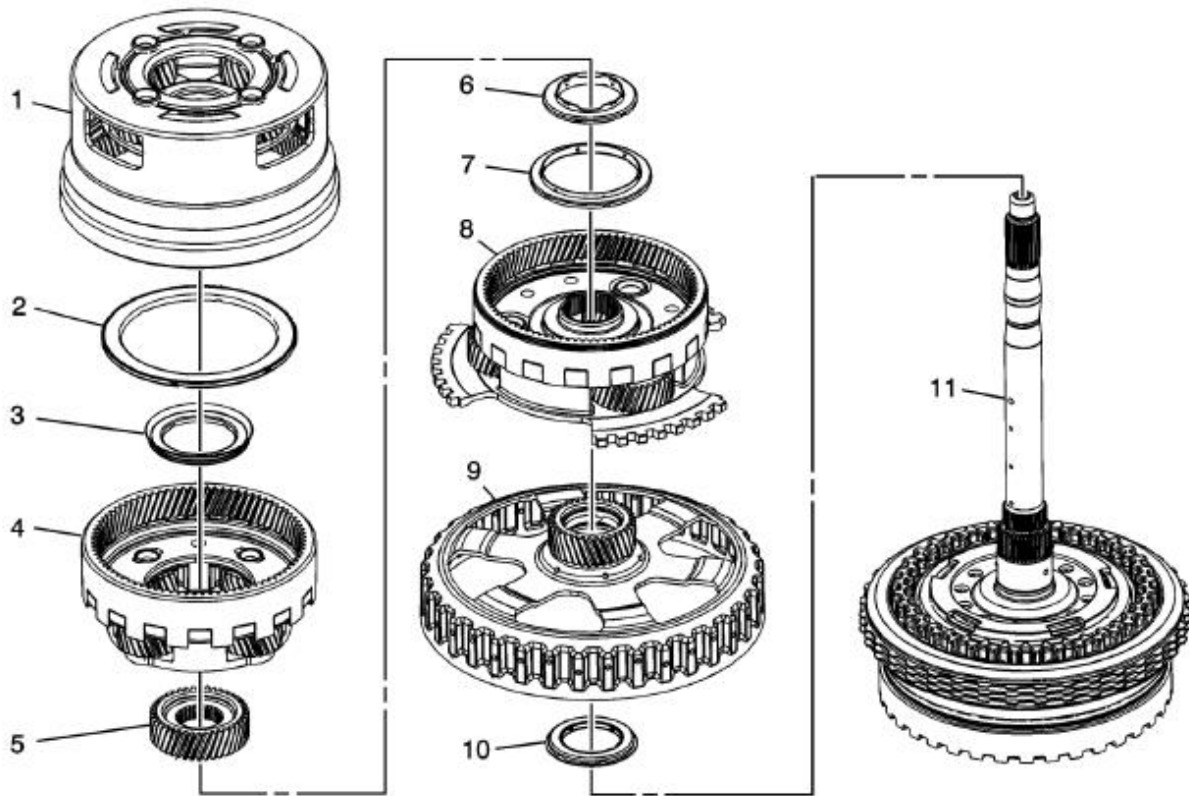
Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble

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 Note: The sun gear thrust bearing may be stuck to the driven sprocket hub.
6	Output Sun Gear Assembly
7	LowReverse 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 Note: The number of grooves in the clutch plate friction material varies depending on model.
14	2-6 Clutch Plate (Qty: 1)

14.1.6.20. Input, Reaction, and Output Carrier Disassemble

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Input, Reaction, and Output Carrier Disassemble

Callout	
1	Output Carrier Assembly Note: The 6T40 has 4 pinions.
2	Output Carrier Thrust Bearing Assembly
3	Input Sun Gear Thrust Bearing Assembly
4	Input Carrier Assembly Note: The 6T40 has 4 pinions.
5	Input Sun Gear
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Thrust Bearing Assembly
8	Reaction Carrier Assembly
9	Reaction Carrier Sun Gear Assembly
10	Reaction Carrier Sun Gear Thrust Bearing Note: The sun gear thrust bearing may be stuck to the sun gear.
11	3-5 Reverse and 4-5-6 Clutch Housing Assembly

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14.1.6.21. 3-5 Reverse and 4-5-6 Clutch Housing Disassemble

Table 1: Turbine Shaft, Reluctor Wheel and Piston Removal

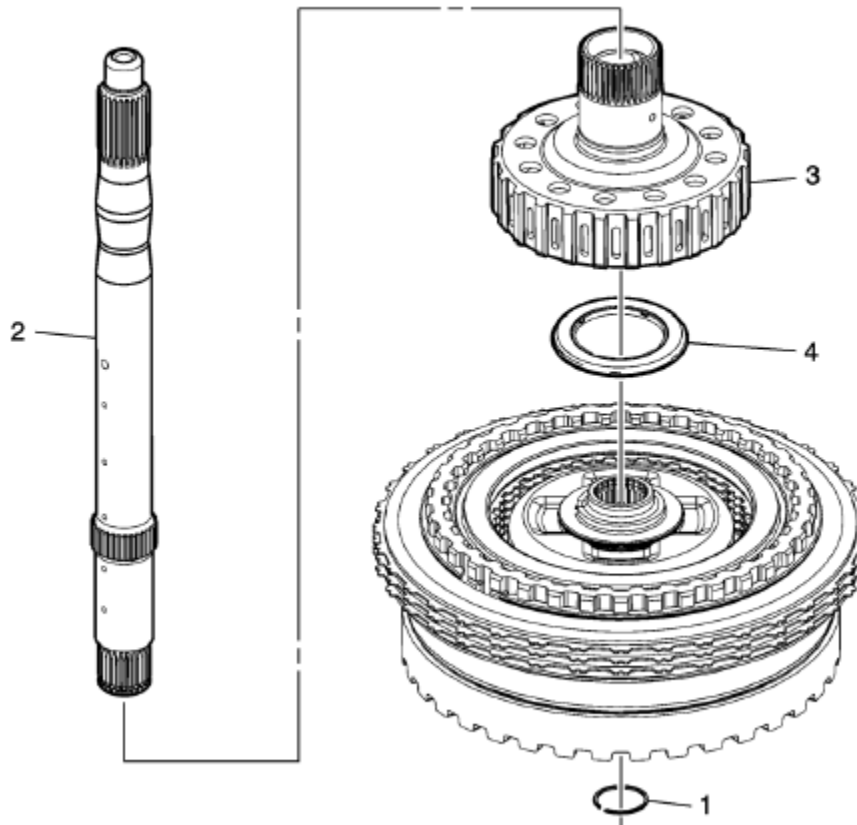
Table 2: 4-5-6 Clutch Plate Removal

Table 3: 4-5-6 Clutch Piston Removal

Table 4: Reluctor Wheel and Piston Removal

Table 5: 3-5 Reverse Clutch Plate Removal

14.1.6.21.1. Turbine Shaft, Reluctor Wheel and Piston Removal



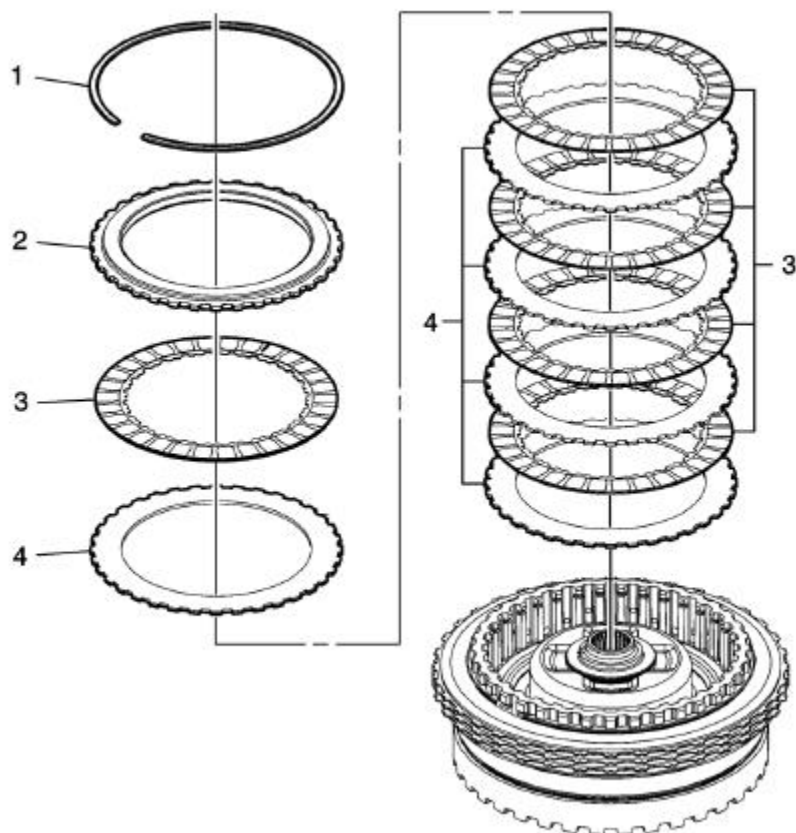
Turbine Shaft, Reluctor Wheel and Piston Removal

Callout	Component Name
1	Turbine Shaft Retainer Ring Note: Discard the retainer ring. It is not reusable. Special Tools GE 5586-A Snap Ring Pliers or equivalent
2	Turbine Shaft
3	Reaction Carrier Hub Assembly
4	Reaction Carrier Hub Thrust Bearing Assembly

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14.1.6.21.2. 4-5-6 Clutch Plate Removal



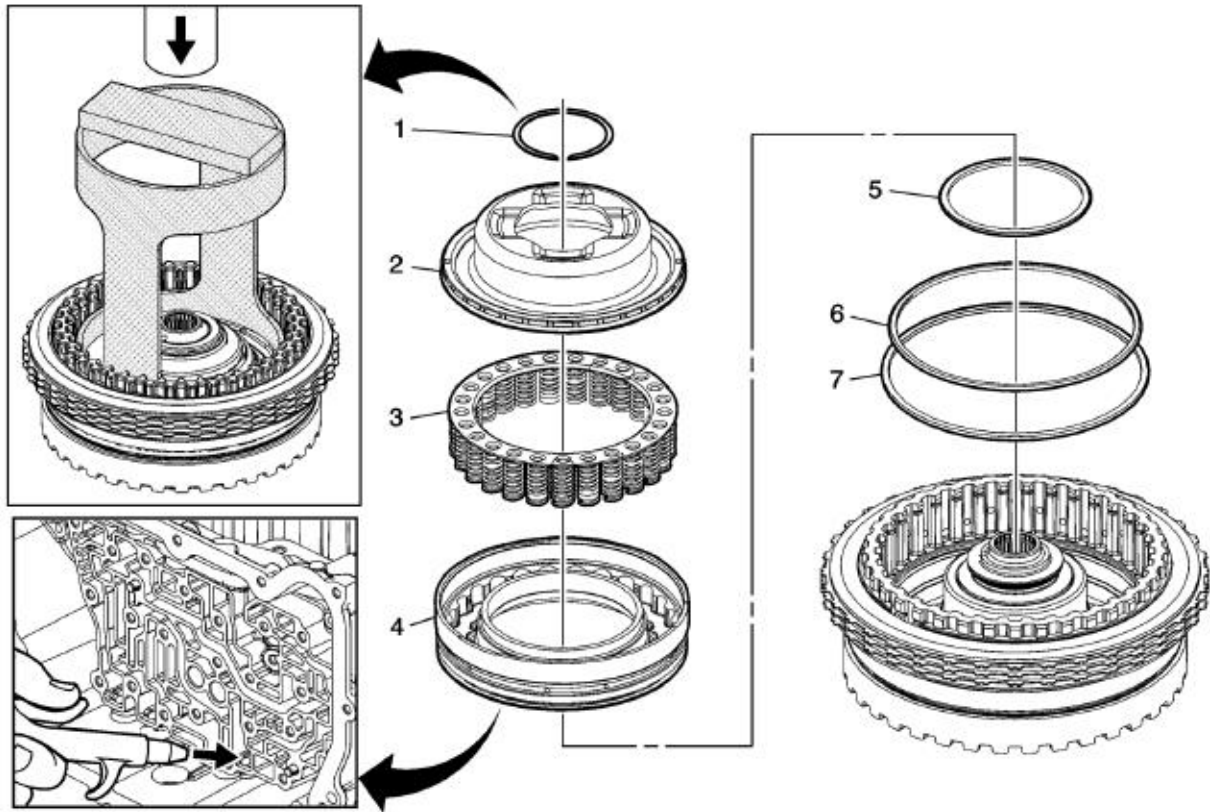
4-5-6 Clutch Plate Removal

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)

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14.1.6.21.3. 4-5-6 Clutch Piston Removal



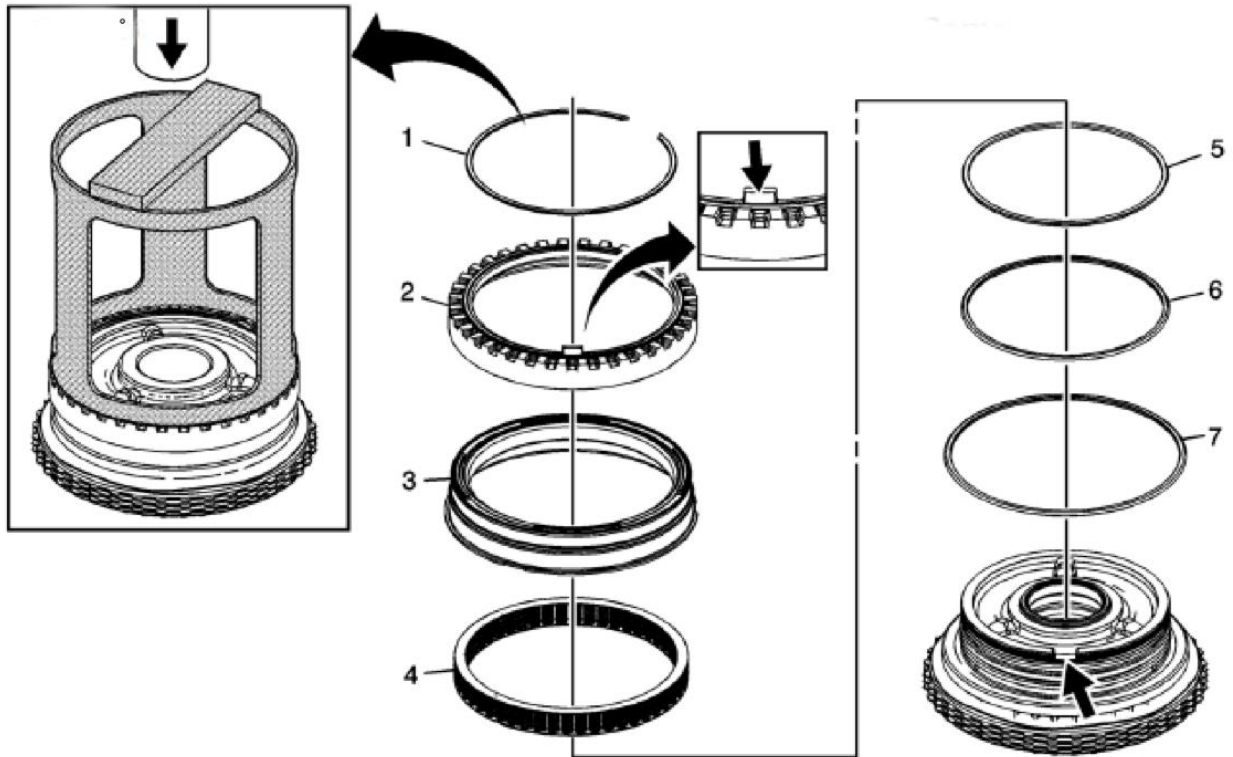
4-5-6 Clutch Piston Removal

Callout	Component Name
1	4-5-6 Clutch Dam Retaining Ring Note: The 4-5-6 clutch dam retaining ring is not reusable. Special Tools • DT-47951-2 Spring Compressor • GE 5586-A Snap Ring Pliers or equivalent
2	4-5-6 Clutch Piston Fluid Dam Assembly Procedure 1. Place the 3-5 reverse and 4-5-6 clutch housing onto the support hub in the case. 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 from the clutch housing.
3	4-5-6 Clutch Piston Return Spring Assembly
4	4-5-6 Clutch Piston Note: 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)

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14.1.6.21.4. Reluctor Wheel and Piston Removal



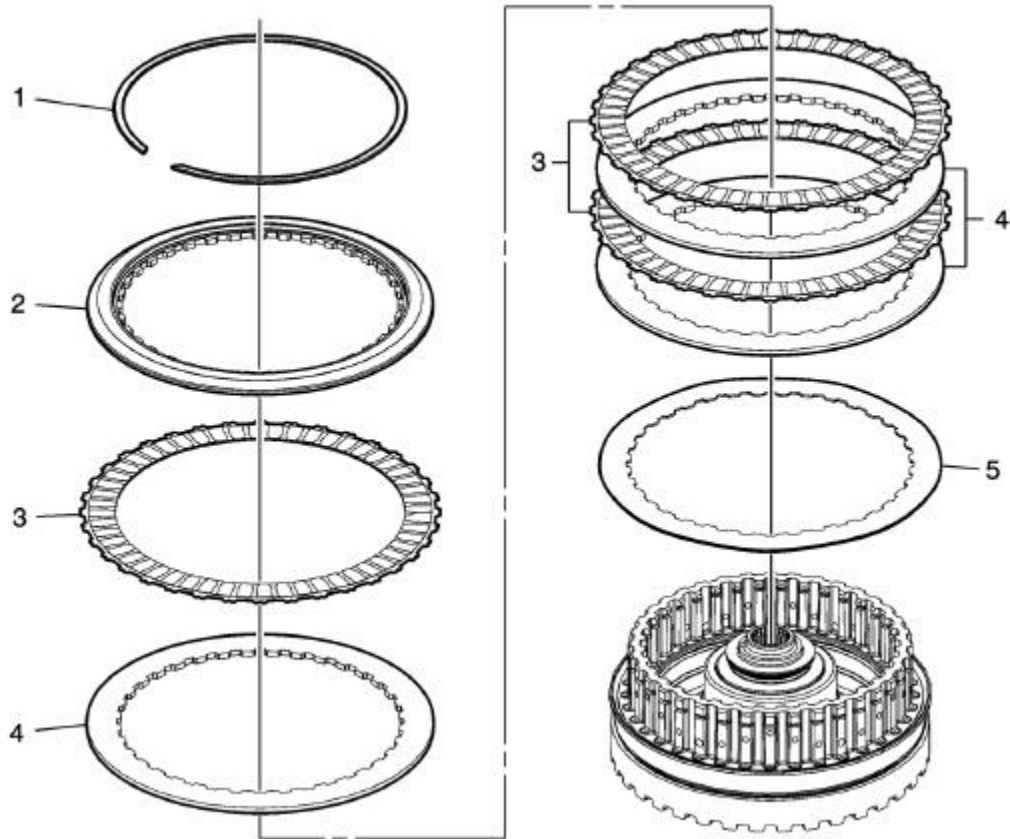
Reluctor Wheel and Piston Removal

Callout	Component Name
1	Input Shaft Speed Sensor Reluctor Ring Retainer Ring Caution: Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. Special Tool DT-47694 Piston Spring Compressor
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)

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14.1.6.21.5. 3-5 Reverse Clutch Plate Removal



3-5 Reverse Clutch Plate Removal

Callout	Component Name
1	3-5 Reverse Clutch Backing Plate Ring Retainer Ring Note: Gently push down on the backing plate to get enough clearance between the backing plate and retainer.
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)

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14.1.6.22. 3-5 Reverse and 4-5-6 Clutch Housing Assemble

Table 1: 4-5-6 Clutch Piston Installation

Table 2: 4-5-6 Clutch Fluid Dam Installation

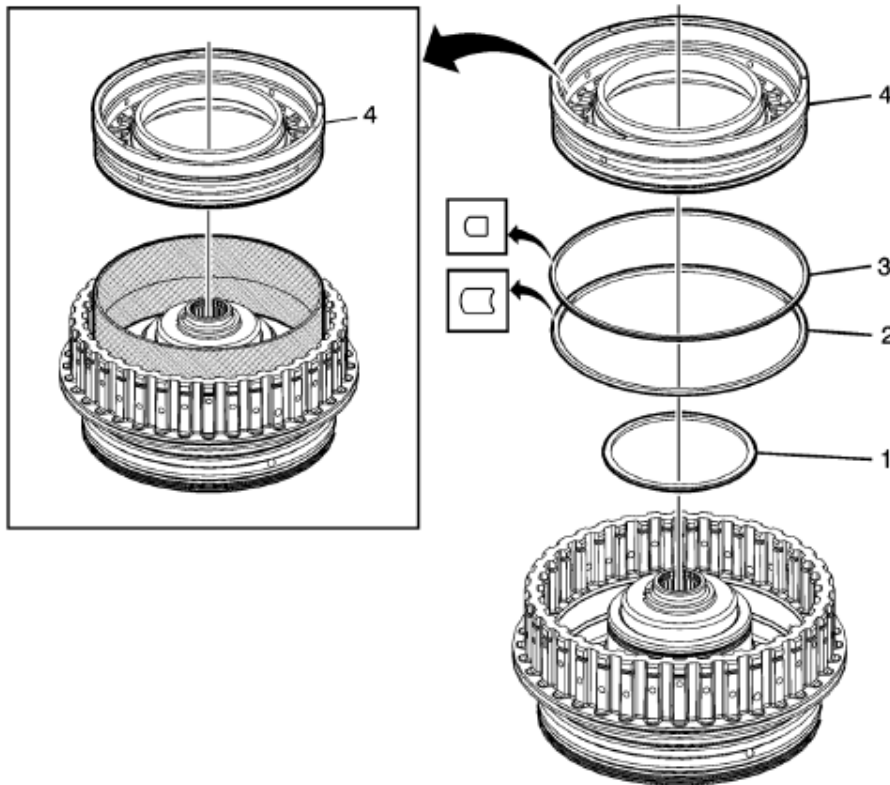
Table 3: 3-5 Reverse Clutch Plates Installation

Table 4: Reluctor Wheel and Piston Installation

Table 5: 4-5-6 Clutch Plates Installation

Table 6: Turbine Shaft Installation

14.1.6.22.1. 4-5-6 Clutch Piston Installation



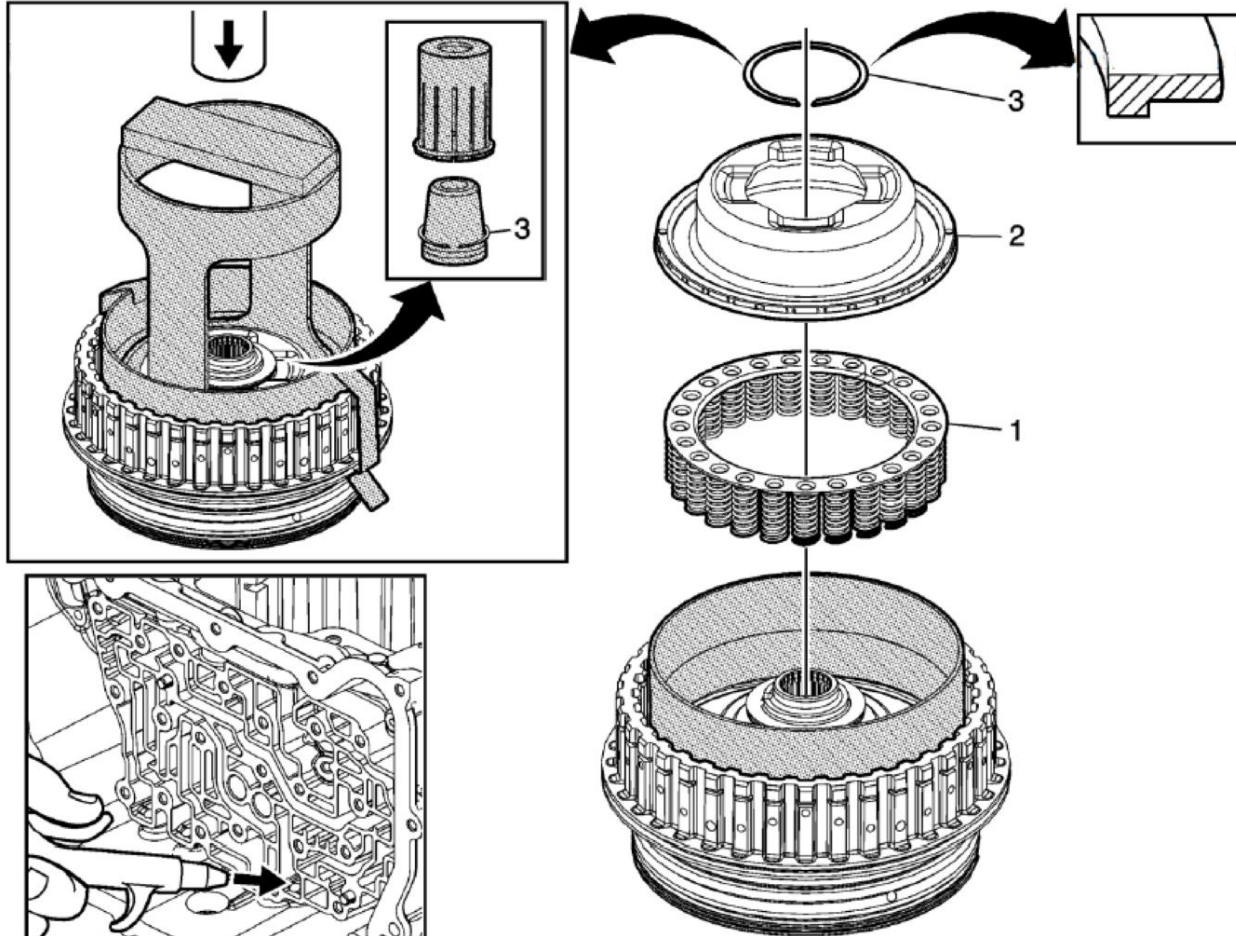
4-5-6 Clutch Piston Installation

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	4-5-6 Clutch Piston Note: - DT-47805 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT47805 seal protector to ease the installation of the piston. - DT479512 spring compressor can be used as a pusher if necessary. Special Tools - DT-47805 Seal Protector - DT-479512 Spring Compressor

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14.1.6.22.2. 4-5-6 Clutch Fluid Dam Installation



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 Note: 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. Special Tools DT-47951-1 Seal Protector for 6T40
3	4-5-6 Clutch Dam Retaining Ring Caution: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure 1. Leave the seal protector on the clutch housing while installing the retaining ring. Install the dam retainer clips DT-50117-1 seal protector to hold the seal protector in place. 2. Use DT-466202 retaining clips and DT 50573 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.

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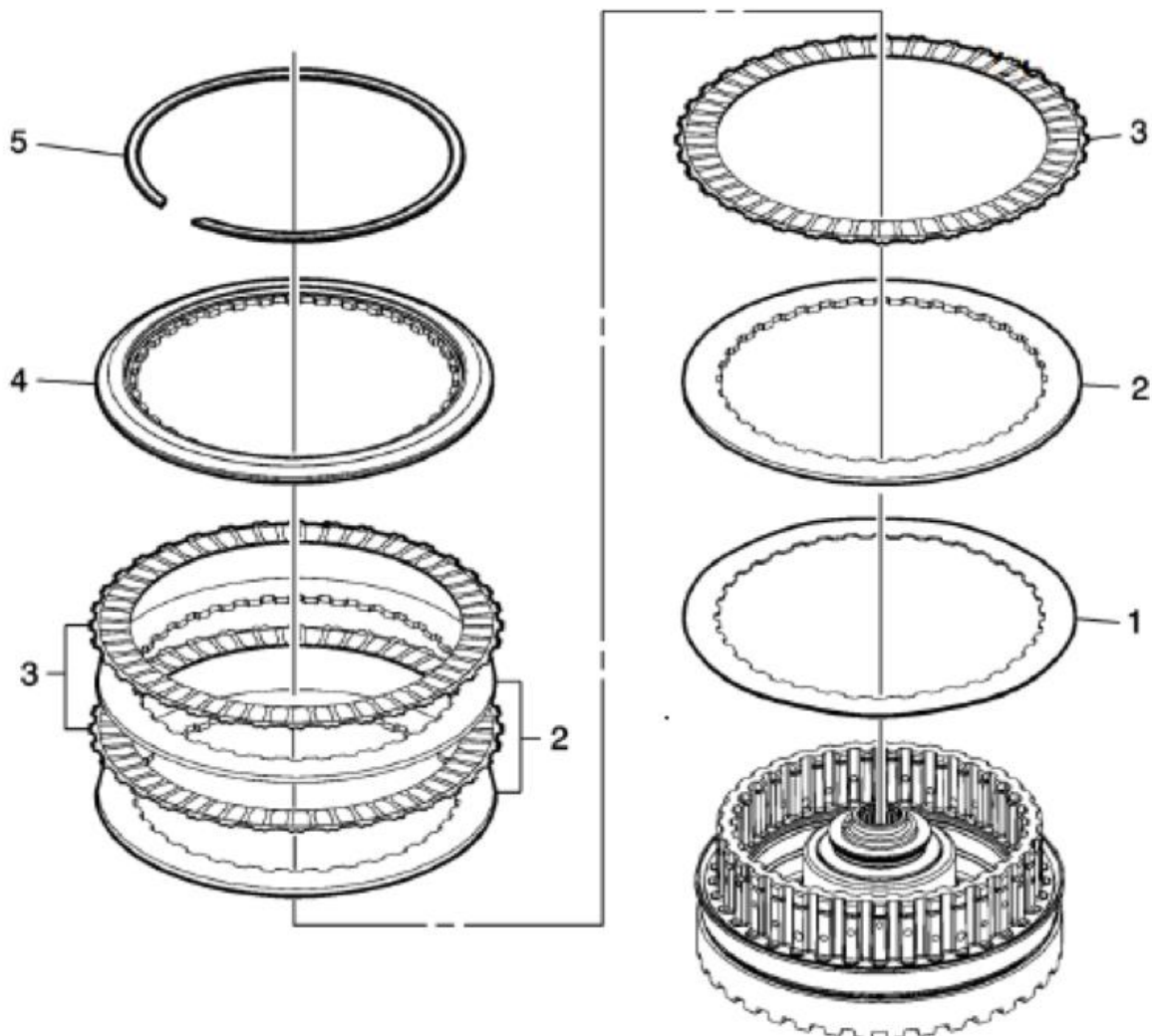
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	3. Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. Special Tools • DT-47951-2 Spring Compressor • DT 46620 Seal Installer • DT 501171 Seal Protector • DT 501172 Seal Protector Retaining Clips • DT 50573 Retaining Ring Installer
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14.1.6.22.3. 3-5 Reverse Clutch Plates Installation



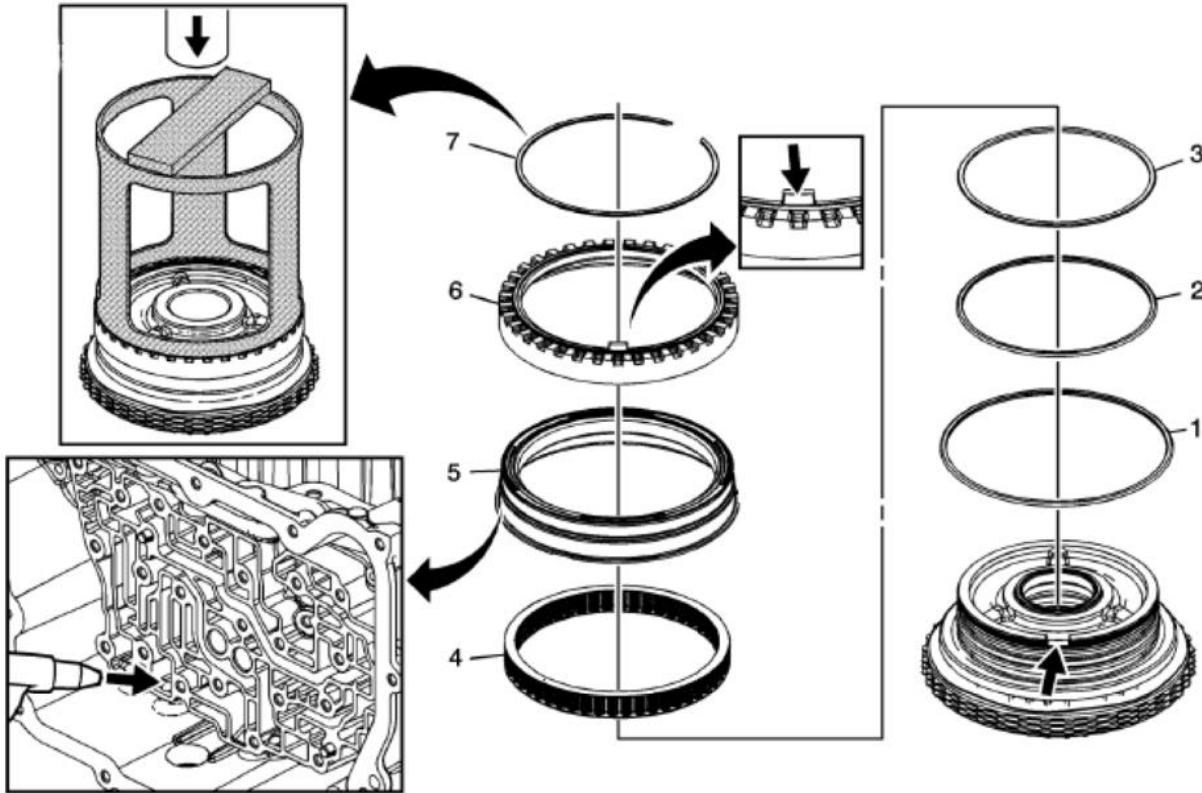
3-5 Reverse Clutch Plates Installation

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

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14.1.6.22.4. Reluctor Wheel and Piston Installation



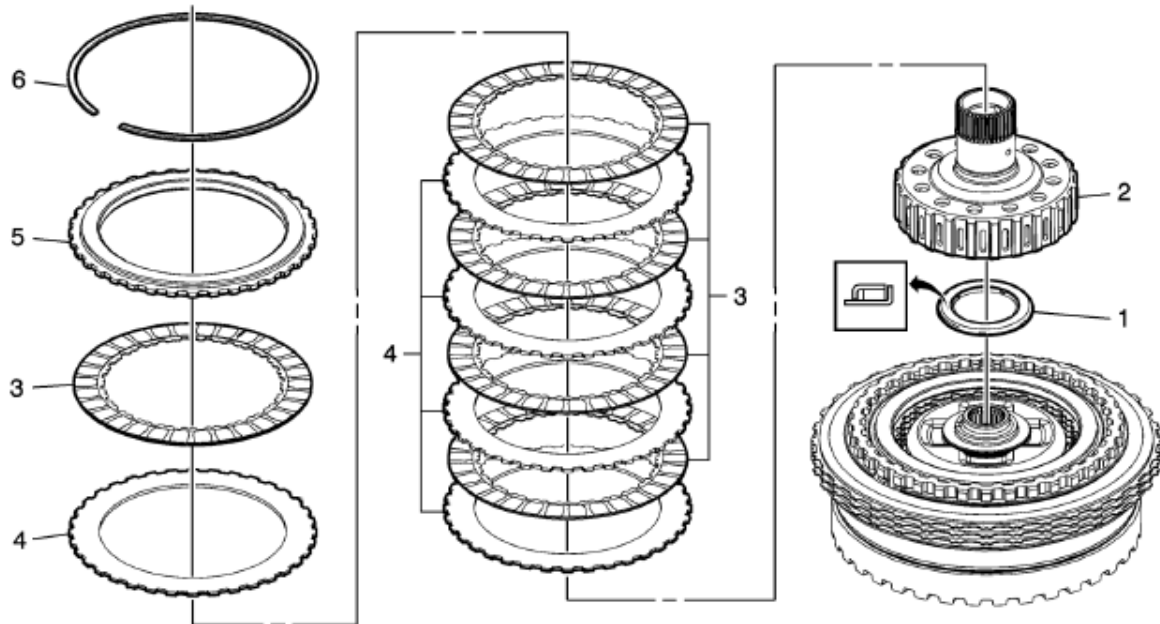
Reluctor Wheel and Piston Installation

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	Input Shaft Speed Sensor Reluctor Ring Retainer Ring
Caution: Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. Caution: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure 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	

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14.1.6.22.5. 4-5-6 Clutch Plates Installation



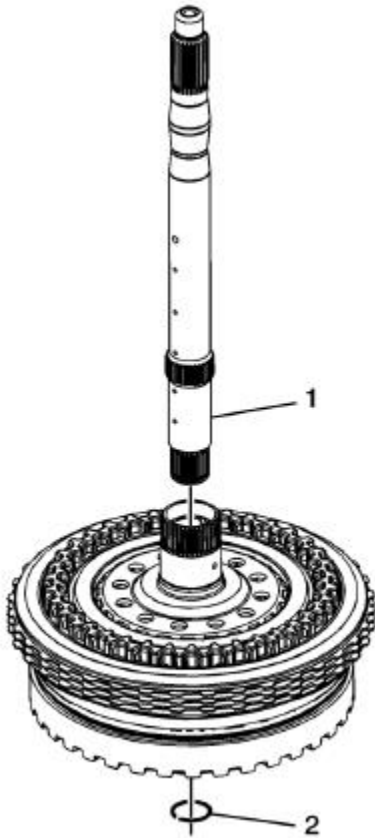
4-5-6 Clutch Plates Installation

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

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14.1.6.22.6. Turbine Shaft Installation



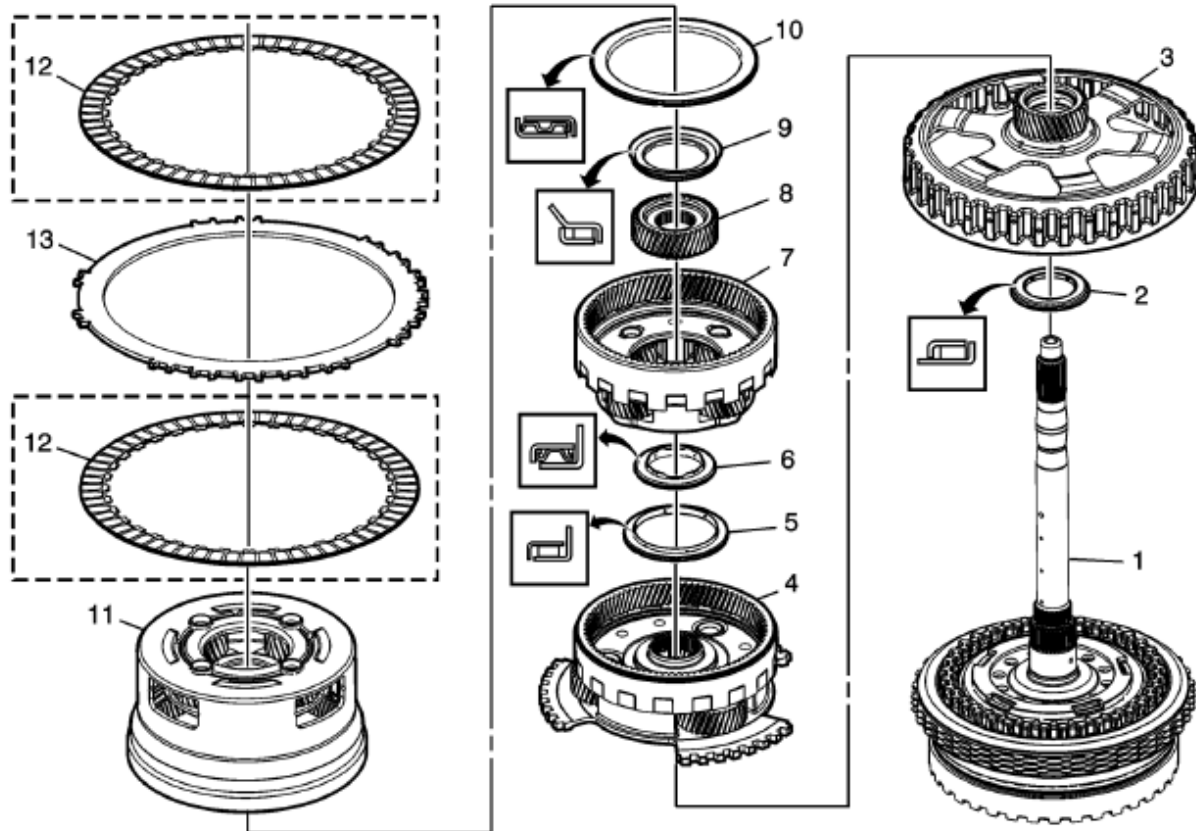
Turbine Shaft Installation

Callout	Component Name
1	Turbine Shaft
2	Turbine Shaft Retainer Ring
Note: Do not reuse the turbine shaft retainer ring.	
Special Tools GE 5586-A Snap Ring Pliers or equivalent	

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14.1.6.23. Input, Reaction, and Output Carrier Assemble



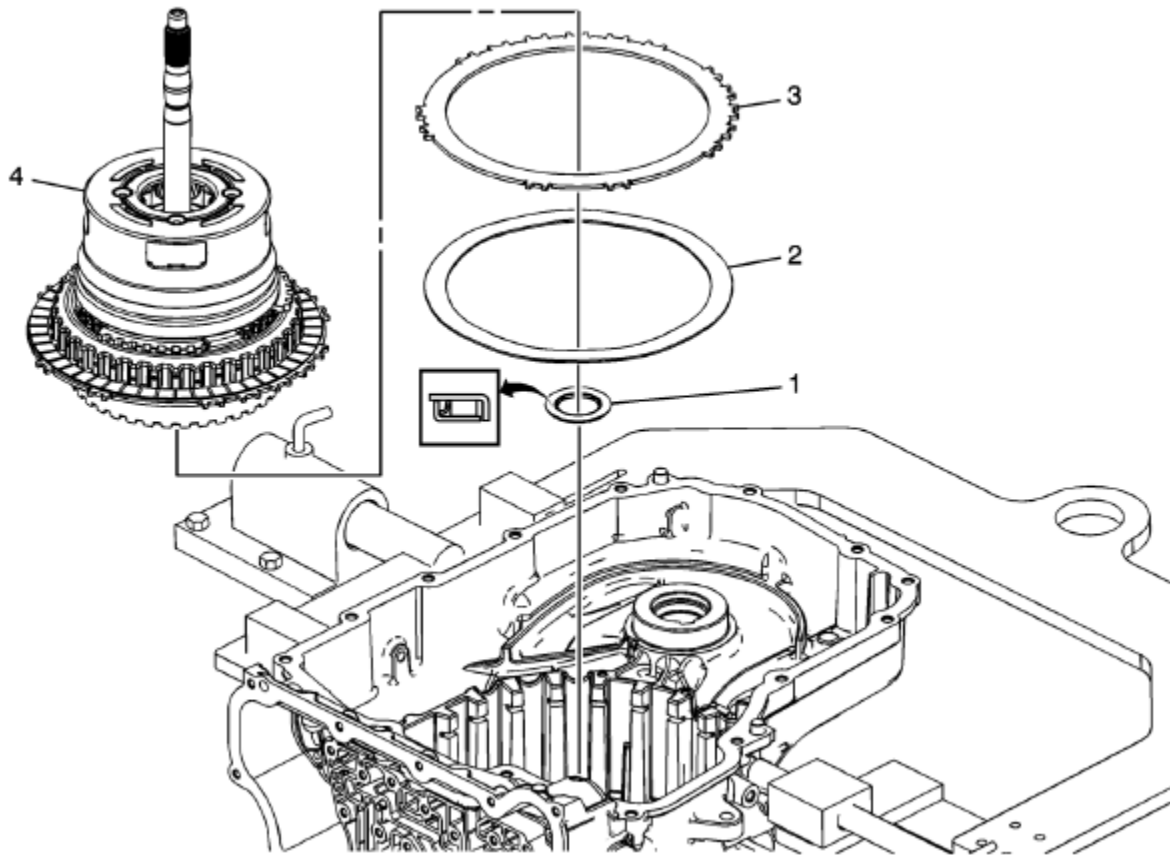
Input, Reaction, and Output Carrier Assemble

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
5	Input Carrier Thrust Bearing Assembly
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Assembly
8	Input Sun Gear
9	Input Sun Gear Thrust Bearing Assembly
10	Output Carrier Thrust Bearing Assembly
11	Output Carrier Assembly
12	2-6 Clutch Plate Assembly (Qty: 2)
	Note: • Begin with the clutch plate assembly and alternate with the clutch plate. • The number of grooves in the clutch plate friction material varies depending on model.
13	2-6 Clutch Plate (Qty: 1) Note: Only install one 2-6 Clutch Plate at this time. The remaining clutch plate is installed into the case.

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14.1.6.24. 3-5Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation



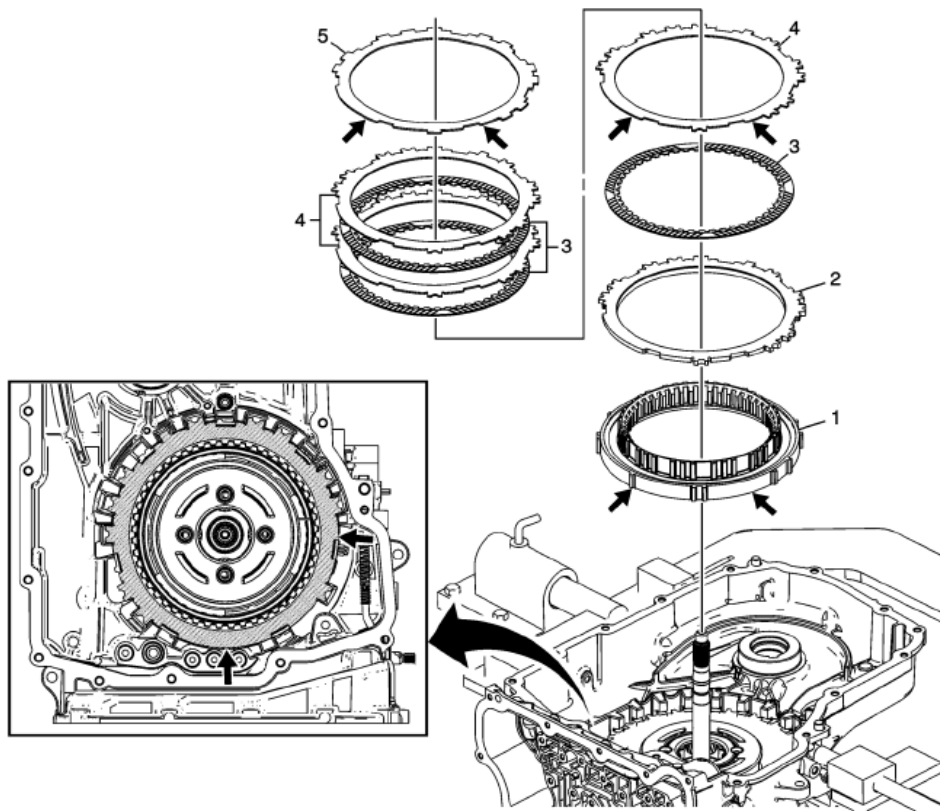
3-5Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation

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) Note: - Only install one 2-6 Clutch Plate. The remaining clutch plate is installed with the gear-set assembly. - 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.
4	3-5 Reverse and 4-5-6 Clutch Housing Assembly and Gear-set Note: 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.

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14.1.6.25. Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation



Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation

Callout	Component Name
1	Low and Reverse Clutch Assembly (OWC) Note: - The low and reverse clutch assembly should rotate freely in one direction and lock in the opposite direction. Rotate the clutch assembly and listen/feel for the ratchet of the clutch in it's designed rotational direction. - With the valve body face at the 6 o'clock position, align the large flat areas of the low and reverse clutch assembly between the 2 o'clock and 5 o'clock position
2	Low and Reverse Clutch Backing Plate
3	Low and Reverse Clutch Plate (Qty: 3)
4	Low and Reverse Clutch Plate (Qty: 3) Note: With the valve body face at the 6 o'clock position, align the large flat areas of the low and reverse clutch plate between the 2 o'clock and 5 o'clock position.
5	Low and Reverse Clutch Apply (Waved) Plate Note: - With the valve body face at the 6 o'clock position, align the large flat areas of the low and reverse clutch apply plate between the 2 o'clock and 5 o'clock position. - 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.

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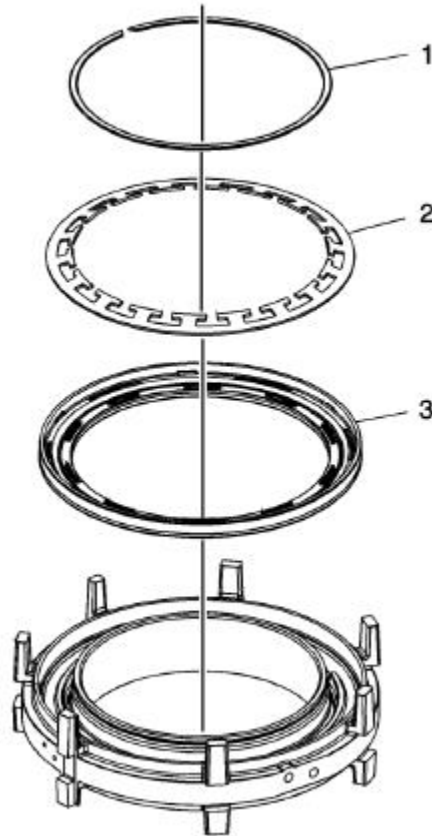
Transmission

Low and Reverse and 1-2-3-4 Clutch Housing Disassemble

Table 1: Low and Reverse Clutch Piston Removal

Table 2: 1-2-3-4 Clutch Piston Removal

14.1.6.25.1. Low and Reverse Clutch Piston Removal



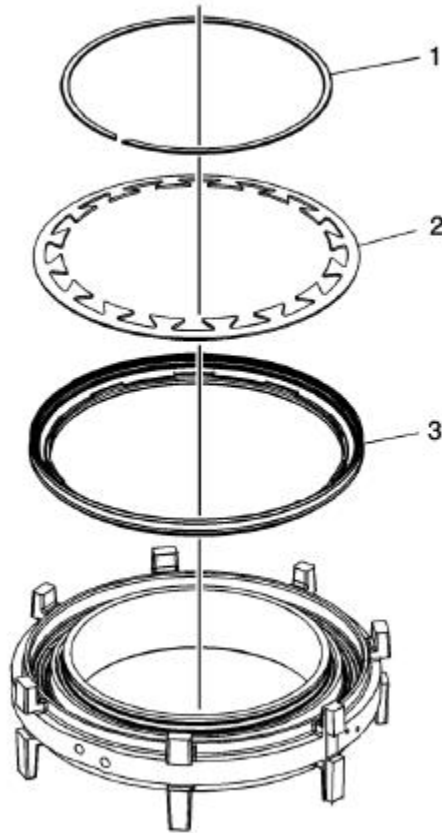
Low and Reverse Clutch Piston Removal

Callout	Component Name
1	Low and Reverse Clutch Spring Retainer Special Tool GE-8059 Snap Ring Pliers – Parallel Jaw
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Piston

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14.1.6.25.2. 1-2-3-4 Clutch Piston Removal



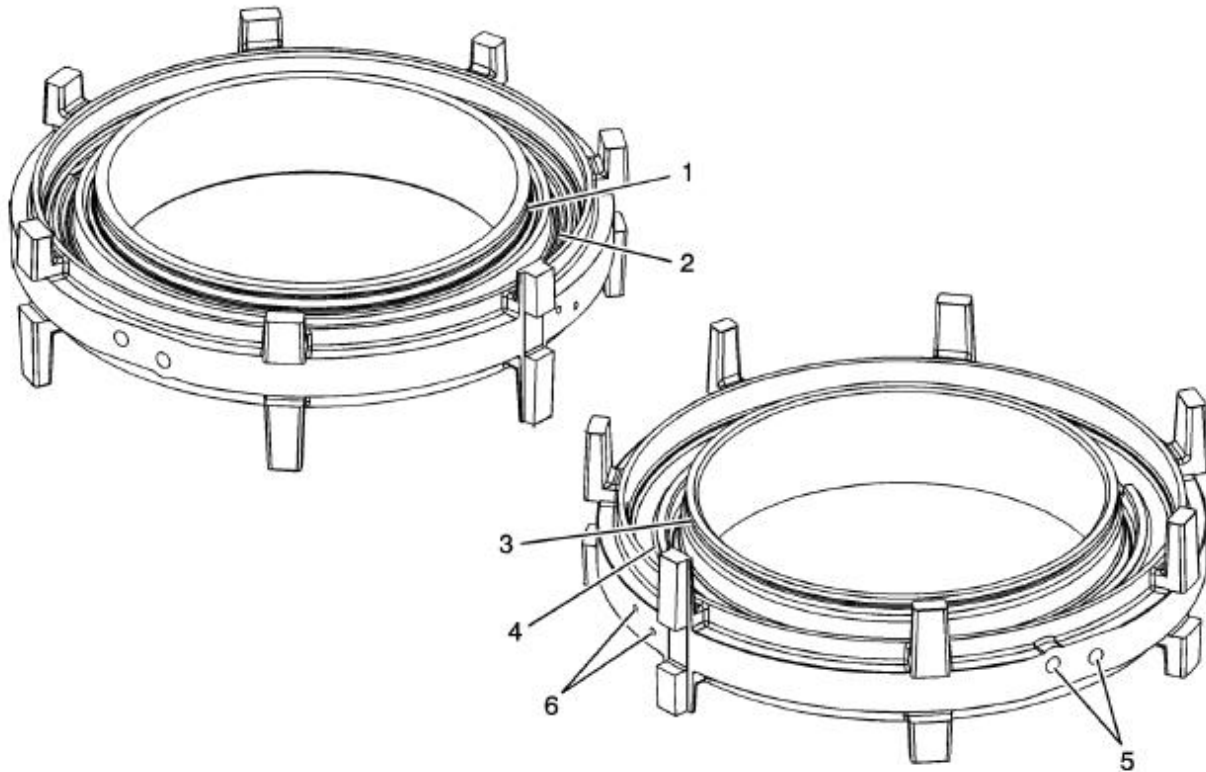
1-2-3-4 Clutch Piston Removal

Callout	Component Name
1	1-2-3-4 Clutch Spring Retainer Special Tool GE-8059 Snap Ring Pliers – Parallel Jaw
2	1-2-3-4 Clutch Spring
3	1-2-3-4 Clutch Piston

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14.1.6.26. Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection



Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection

Callout	Component Name
Caution: 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.	
Preliminary Procedures	
1. Thoroughly clean the housing with clean solvent.	
2. Inspect the piston bores and retainer ring grooves for wear, damage or porosity.	
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

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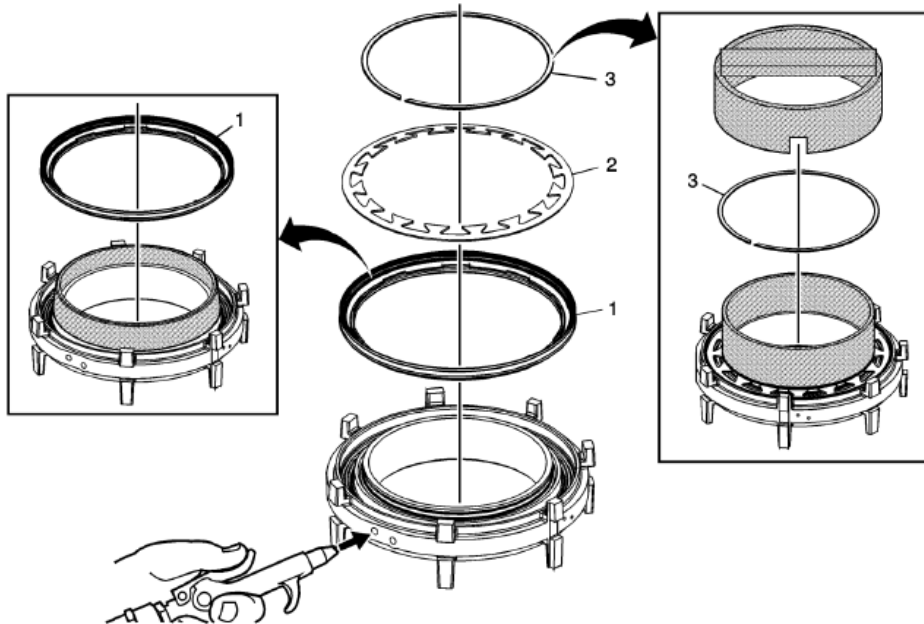
Transmission

14.1.6.27. Low and Reverse and 1-2-3-4 Clutch Housing Assemble

Table 1: 1-2-3-4 Clutch Piston Installation

Table 2: Low and Reverse Clutch Piston Installation

14.1.6.27.1. 1-2-3-4 Clutch Piston Installation



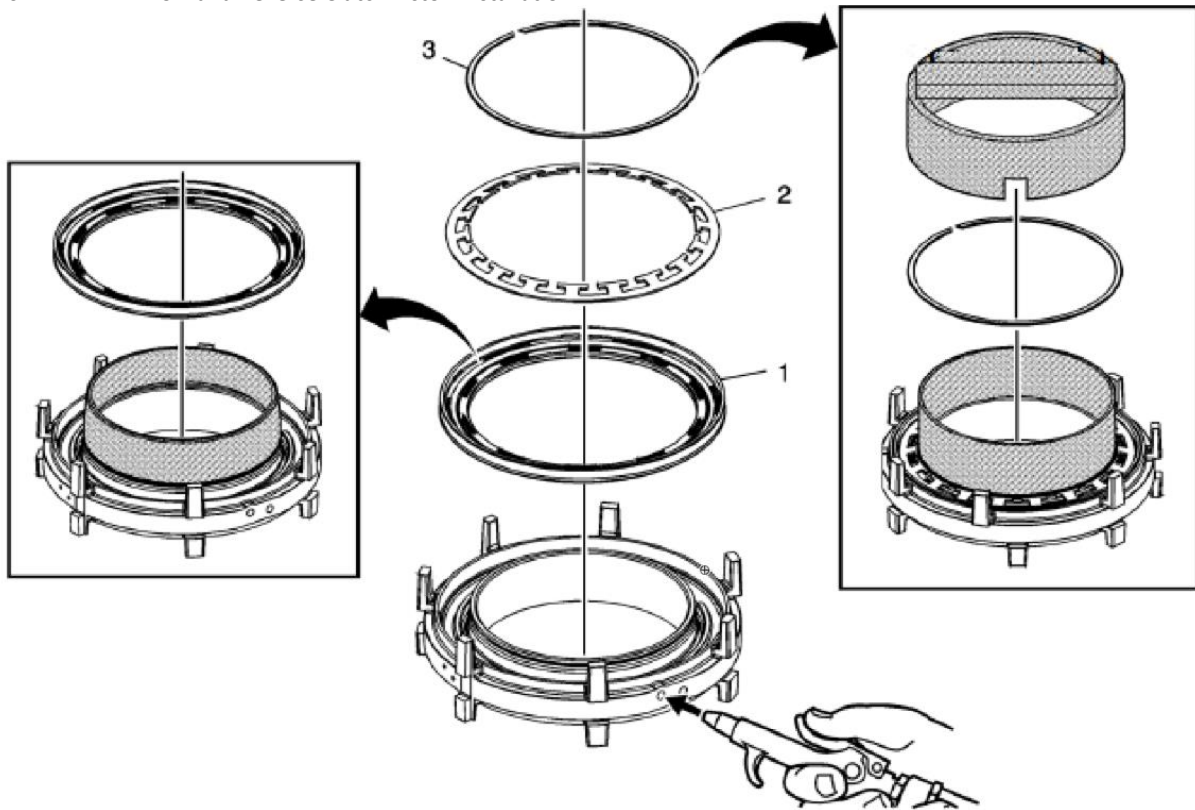
1-2-3-4 Clutch Piston Installation

Callout	Component Name
1	1-2-3-4 Clutch Piston Note: DT-47798 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT-47798 seal protector to ease the installation of the piston. Special Tool DT-47798 Seal Protector
2	1-2-3-4 Clutch Spring
3	1-2-3-4 Clutch Spring Retainer Caution: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Note: - Place the retainer onto DT-47799-1 which is part of DT-47799 spring compressor. Compressing the spring using DT-47799-2 which is part of DT-47799 spring compressor, will install the retainer into the retainer groove. - Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. Special Tool DT-47799- Clutch Piston Spring Compressor

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14.1.6.27.2. Low and Reverse Clutch Piston Installation



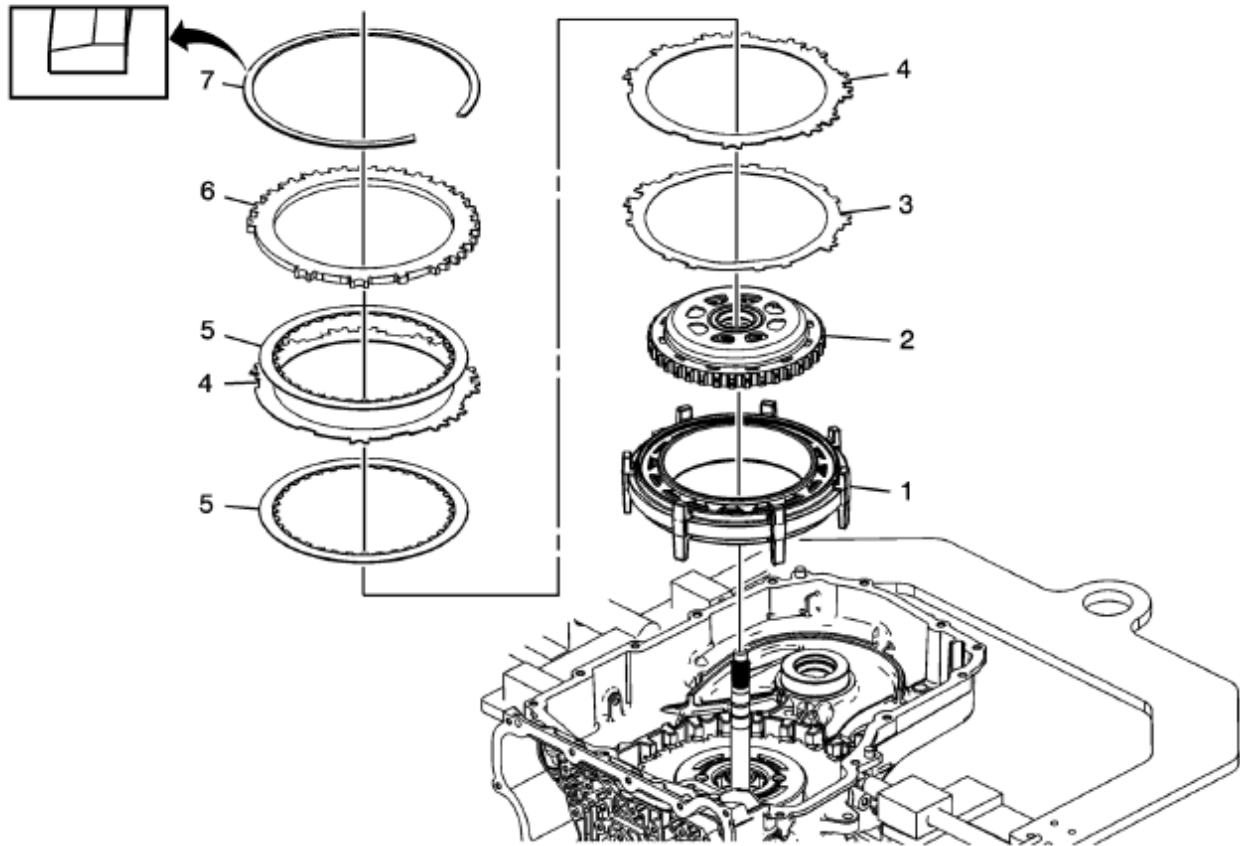
Low and Reverse Clutch Piston Installation

Callout	Component Name
1	Low and Reverse Clutch Piston Note: DT-47807 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT47807 seal protector to ease the installation of the piston. Special Tool DT-47807 Clutch Piston Seal Protector
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Spring Retainer Caution: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Note: - Place the retainer onto DT-477941 which is part of DT-47794 spring compressor. Compressing the spring using DT477942 which is part of DT47794 spring compressor, will install the retainer into the retainer groove. - Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. Special Tool DT47794 Spring Compressor

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14.1.6.28. Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation



Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation

Callout	Component Name
1	Low and Reverse and 1-2-3-4 Clutch Housing Note: 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 Note: - Align the single pair of tabs with the bottom valve body end of the case. - 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
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 Note: 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 Warning: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result. Caution: 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. Note:

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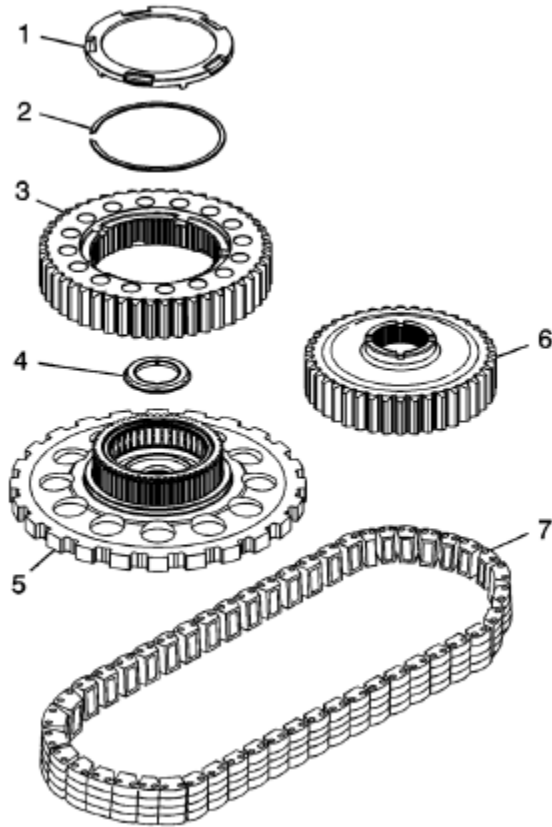


	Install the retainer with the taper facing away from the backing plate. Align the retainer opening with the largest gap in the case splines toward the bottom of the case. Install one end of the retainer into the retainer ring groove. Use DT-28585 snap ring remover and work the retainer into the case 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
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14.1.6.29. Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection



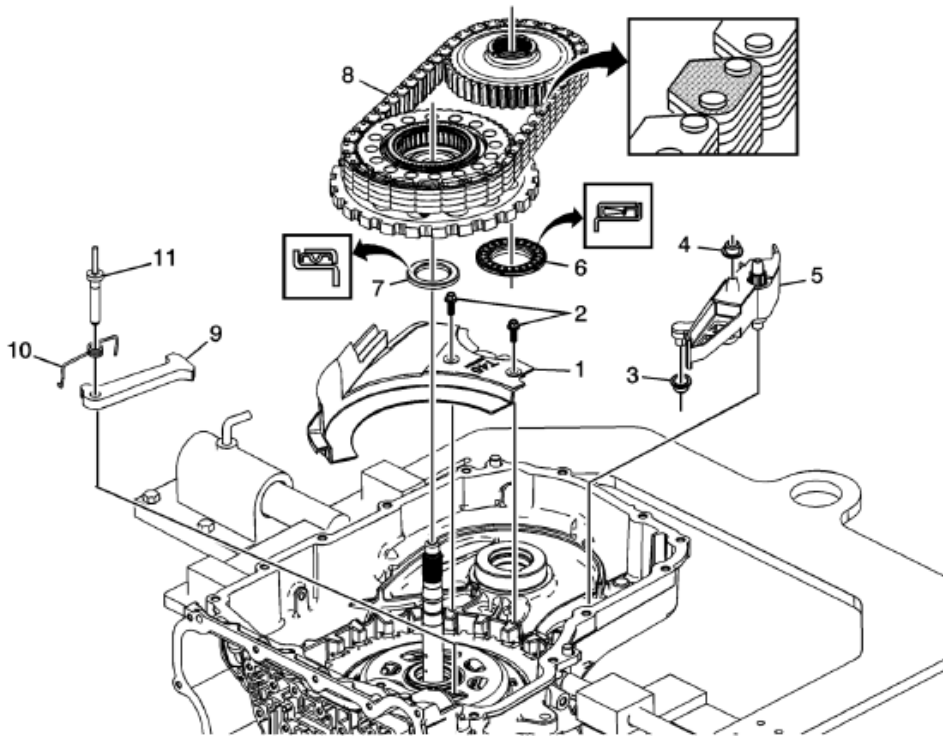
Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection

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

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14.1.6.30. Drive and Driven Sprocket, Drive Link, and Park Pawl Installation



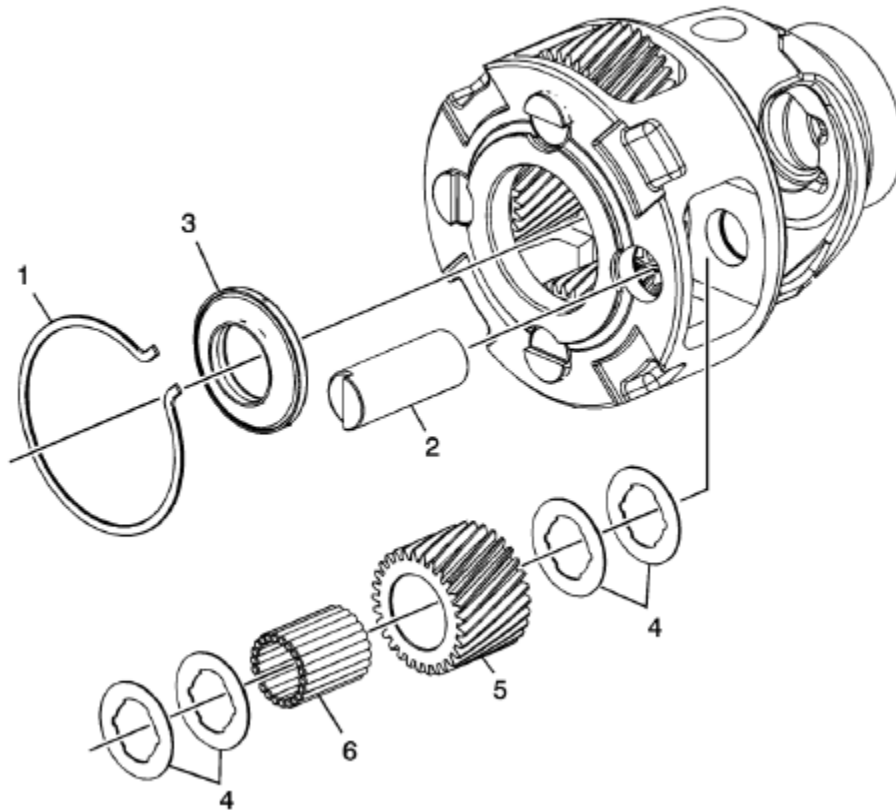
Drive and Driven Sprocket, Drive Link, and Park Pawl Installation

Callout	Component Name
1	Front Differential Carrier Baffle
2	Front Differential Carrier Baffle Bolt M6 x 16 (Qty: 2)
	Caution: Refer to Fastener Caution.
	Tighten 12 Nm (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
8	Driven Sprocket Assembly, Drive Sprocket Assembly and Drive Link
	Note:
	• Install the drive link with the colored links and/or part number facing up. • The drive link, drive, and driven sprocket assemblies must be installed at the same time. • The ball bearing should spin freely and smoothly. • 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.
9	Park Pawl
10	Park Pawl Spring
11	Park Pawl Shaft
	Note: Check to ensure that the park pawl operates freely and is not binding.

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14.1.6.31. Front Differential Carrier Cleaning and Inspection



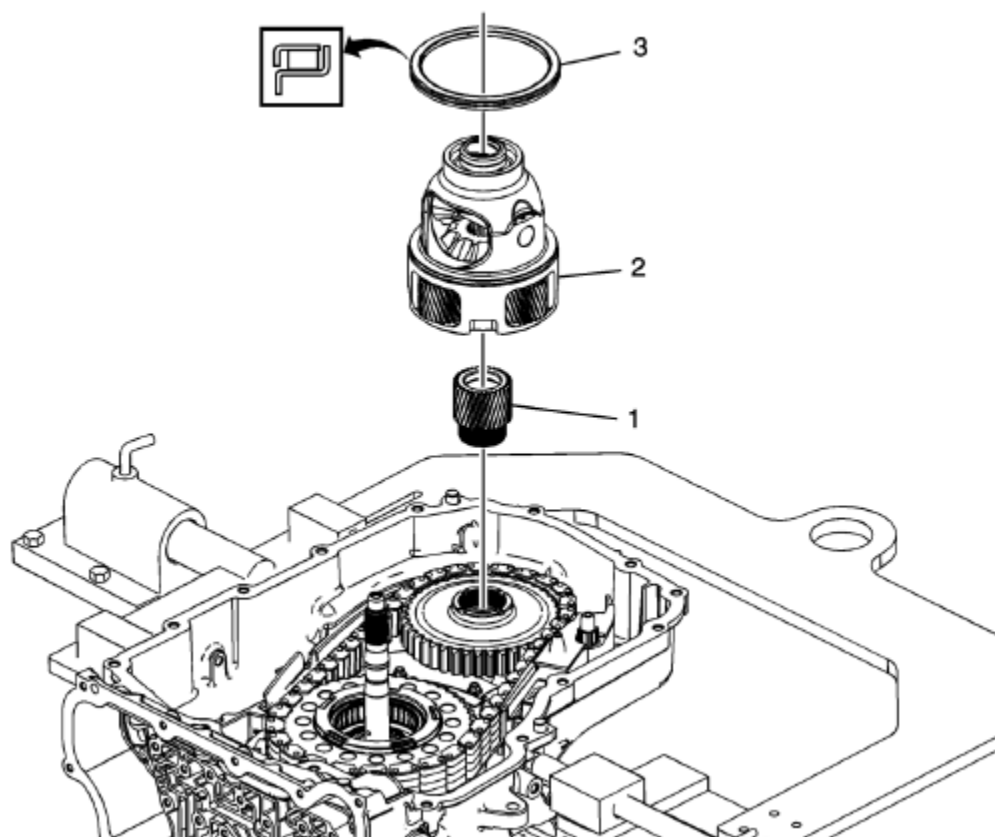
Front Differential Carrier Cleaning and Inspection

Callout	Component Name
Caution: 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. Note: 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

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14.1.6.32. Front Differential Carrier Installation



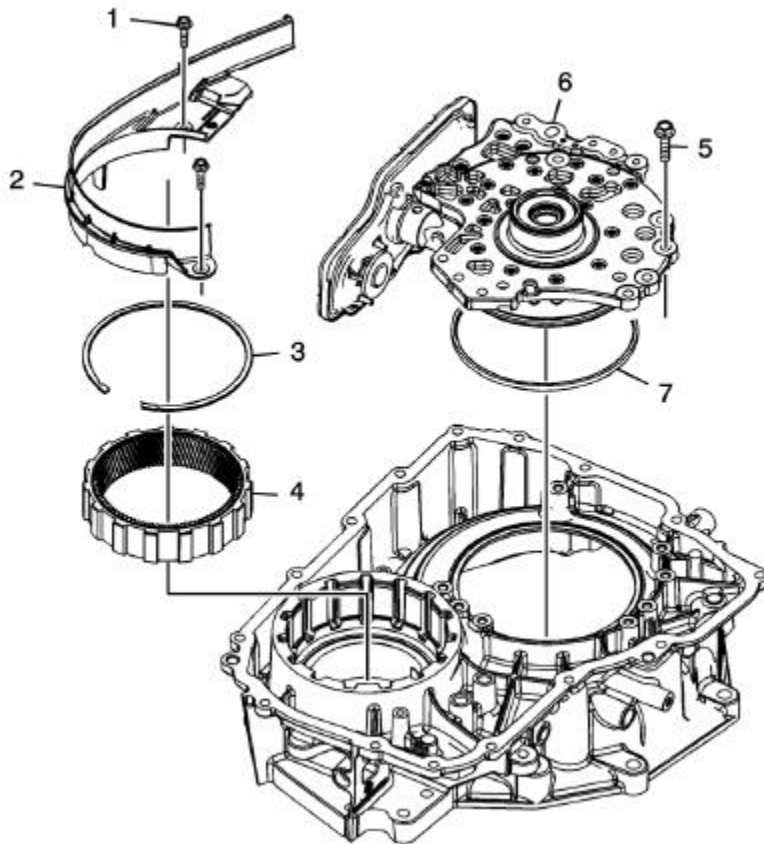
Front Differential Carrier Installation

Callout	Component Name
1	Final Drive Sun Gear
2	Differential Carrier Assembly
3	Front Differential Carrier Bearing Assembly

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14.1.6.33. Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal



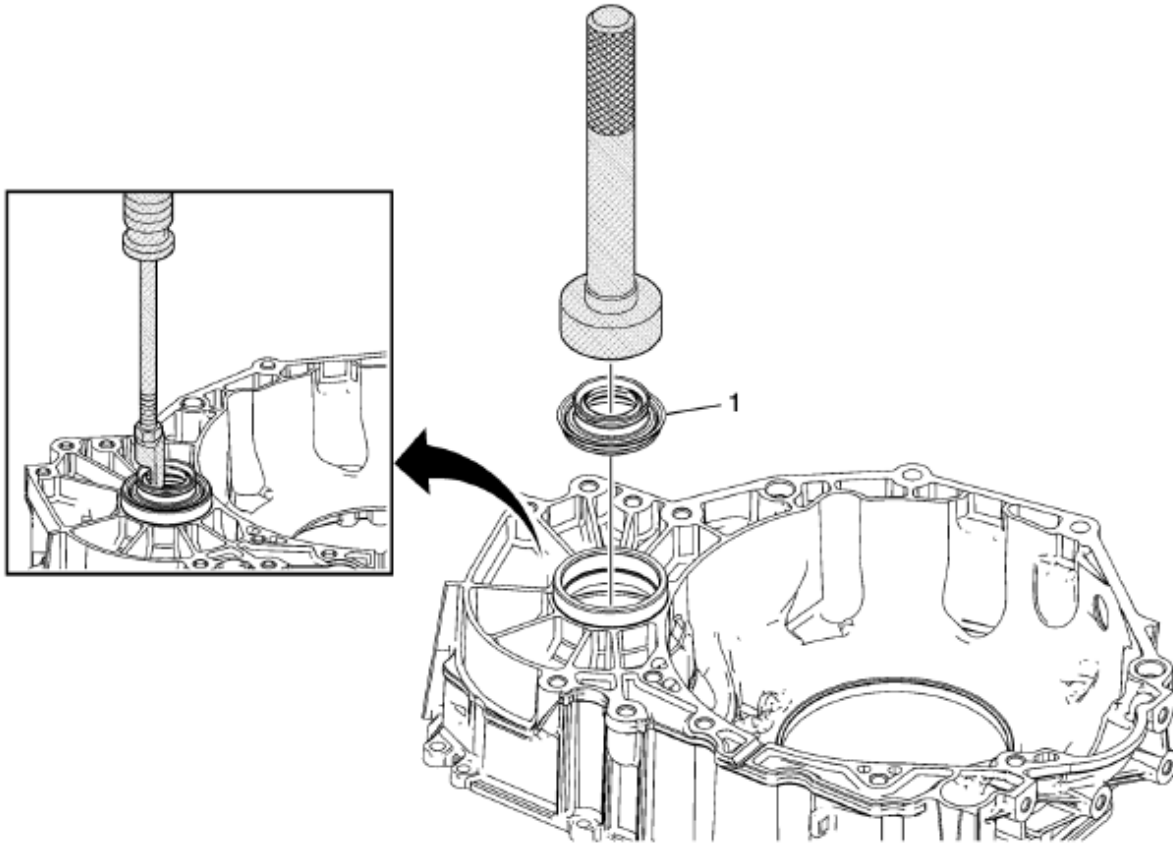
Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal

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
	Note: Note the direction of the taper to ensure proper installation.
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

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14.1.6.34. Front Wheel Drive Shaft Seal Replacement Torque Converter Housing Side



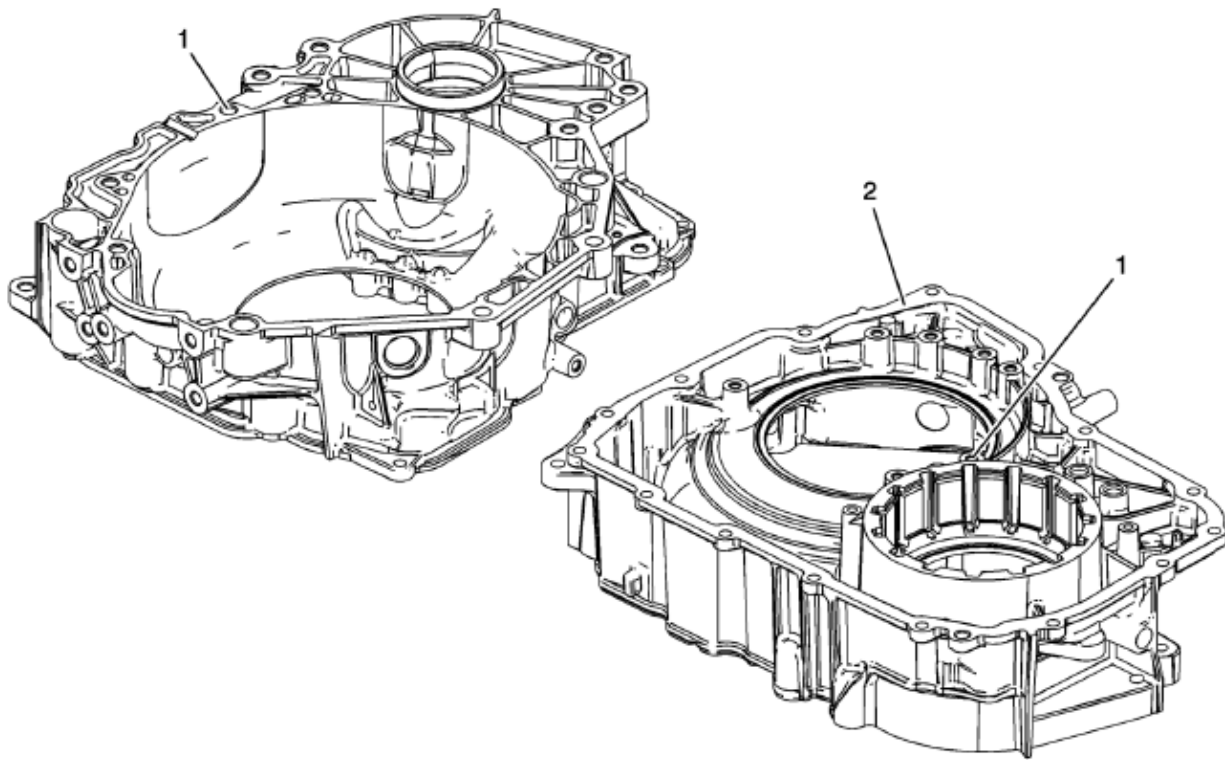
Front Wheel Drive Shaft Seal Replacement Torque Converter Housing Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly
	Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-1B Slide Hammer • GE-8092 Driver Handle

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14.1.6.35. Torque Converter Housing Cleaning and Inspection



Callout	Component Name
Caution: 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: 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.	
Preliminary Procedure Thoroughly clean the torque converter housing, including case threads with clean solvent.	
1	Threaded Hole
2	Gasket Sealing Surface

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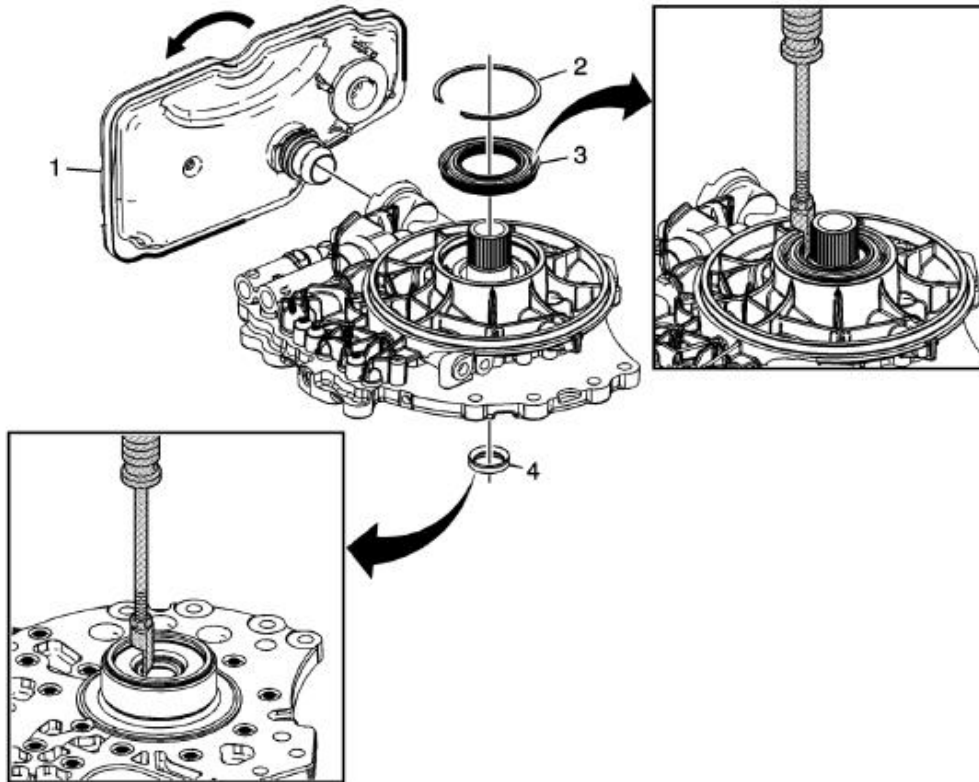
Transmission

14.1.6.36. Transmission Fluid Pump Disassemble

Table 1: Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Table 2: Fluid Pump Disassemble

14.1.6.36.1. Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble



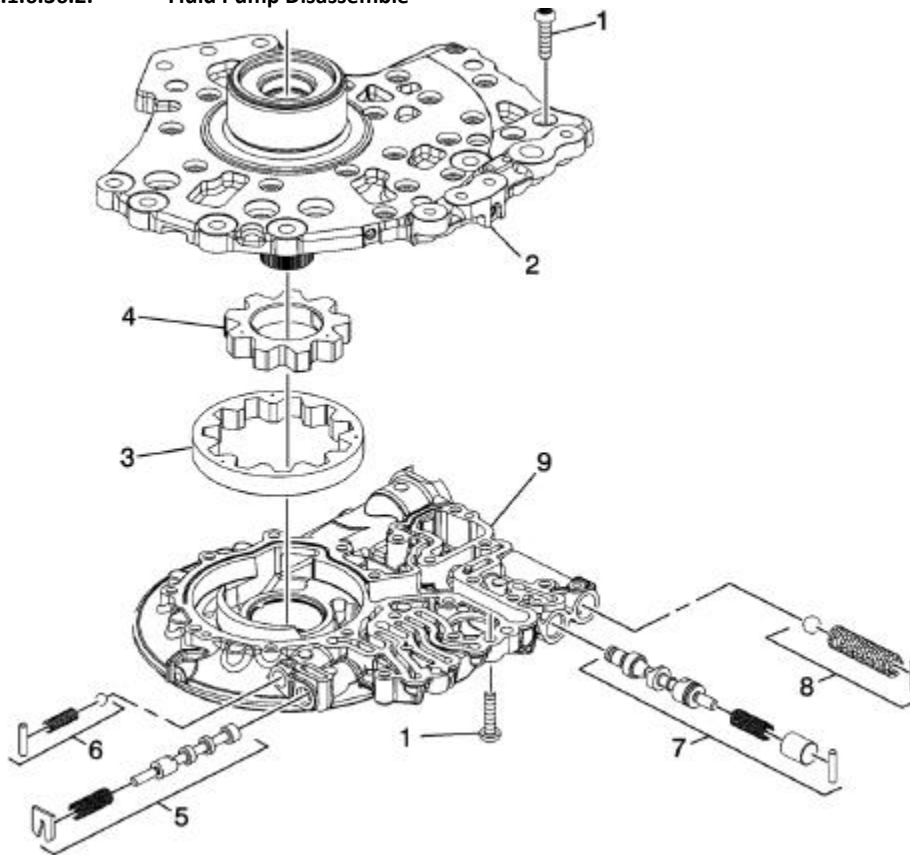
Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Callout	Component Name
1	Fluid Filter Assembly Note: - DISCARD the fluid filter assembly. It is not reusable. - Rotate filter 90 degrees to disengage locking tangs.
2	Torque Converter Fluid Seal Retainer
3	Torque Converter Fluid Seal Special Tools - DT-23129 Universal Seal Remover - GE-6125-1B Slide Hammer
4	Torque Converter Fluid Seal Assembly Special Tools - DT-23129 Universal Seal Remover - GE-6125-1B Slide Hammer

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14.1.6.36.2. Fluid Pump Disassemble

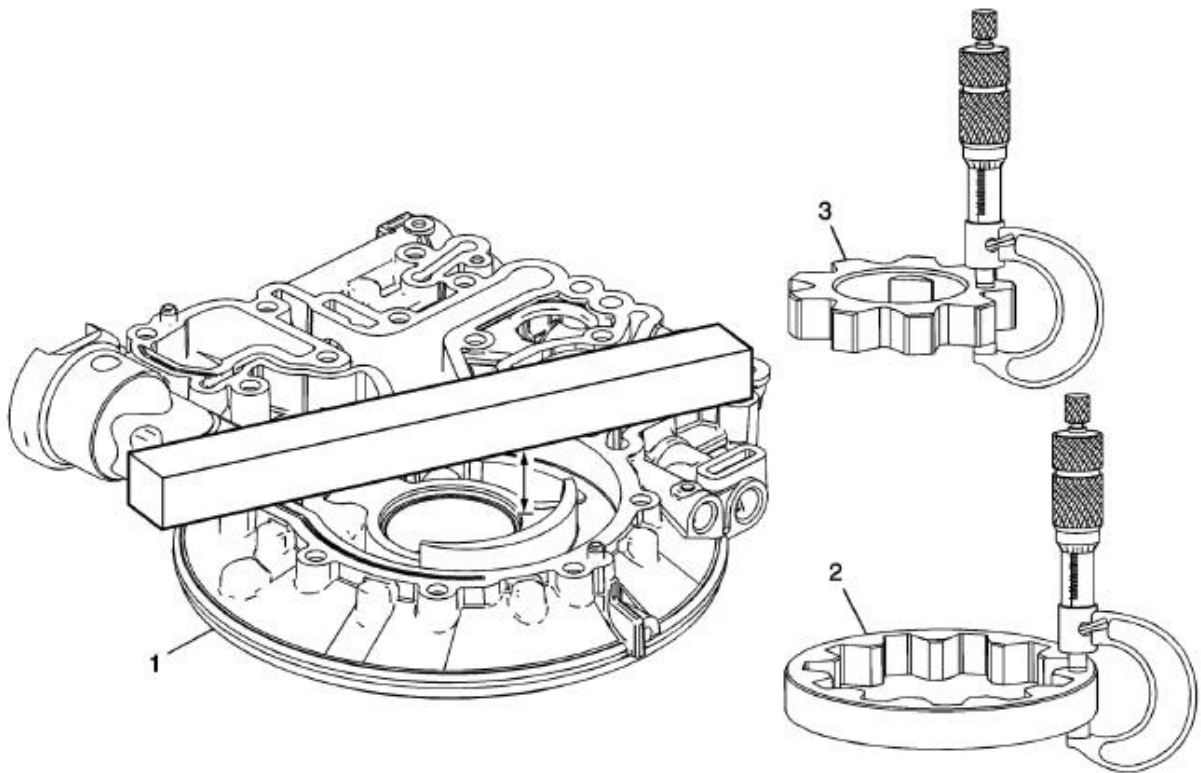


Callout	Component Name
Warning: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result. Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. Caution: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components and the pump body for wear and/or damage.	
1	Fluid Pump Cover Bolts M6 x 25 (Qty: 23) Note: 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

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14.1.6.37. Fluid Pump Selective Measurement



Callout	Component Name
1	A/Trans Fluid Pump Body Note: Measure the distance from the bottom of a gauge bar to the bottom of the pump rotor cavity. Refer to Fluid Pump Selective Specifications. Special Tools GE 34673 Flat Gauge Bar or equivalent
2	A/Trans Fluid Pump Driven Gear Note: Refer to Fluid Pump Selective Specifications to select the correct gear.
3	A/Trans Fluid Pump Drive Gear Note: Refer to Fluid Pump Selective Specifications to select the correct gear.

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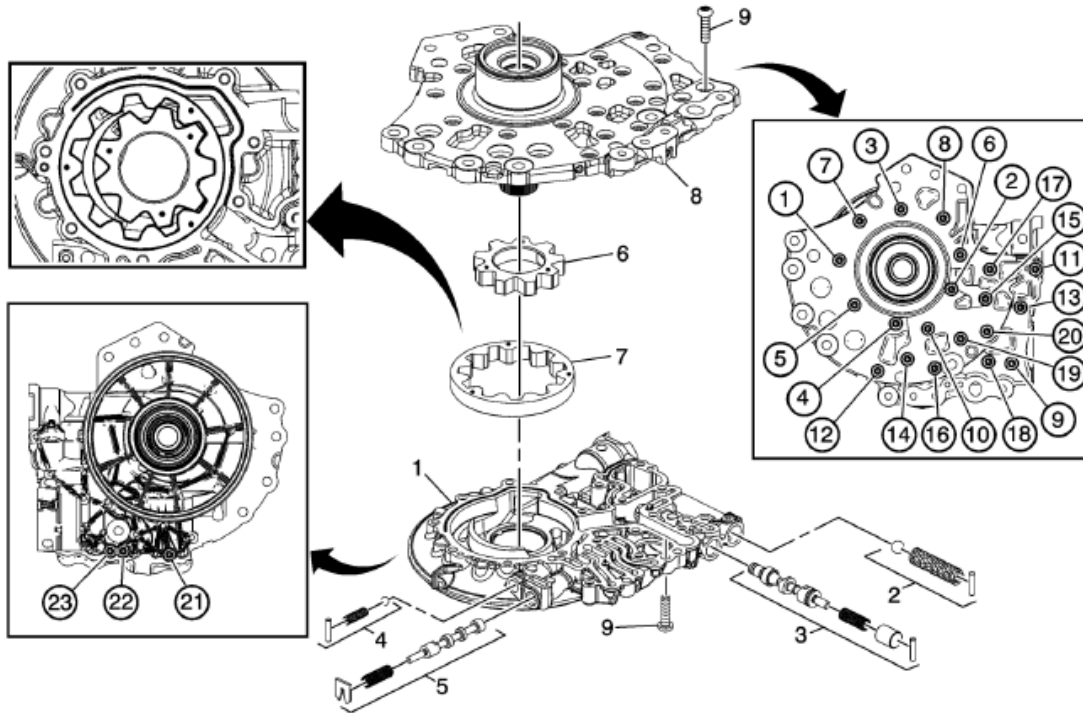
Transmission

14.1.6.38. Transmission Fluid Pump Assemble

Table 1: Fluid Pump w/Valve Trains Assemble

Table 2: Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

14.1.6.38.1. Fluid Pump w/Valve Trains Assemble



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 Note: - Align ID feature dots with the driven gear as shown above. - The chamfer on the drive gear teeth faces the pump body.
7	Fluid Pump Driven Gear Note: - Align ID feature dots with the drive gear as shown above, some models. - The chamfer on the driven gear O.D. faces the pump body.
8	Fluid Pump Cover
9	Fluid Pump Cover Bolts M6 x 25 (Qty: 23) Caution: Refer to Fastener Caution. Tighten 12 Nm (106 lb in)

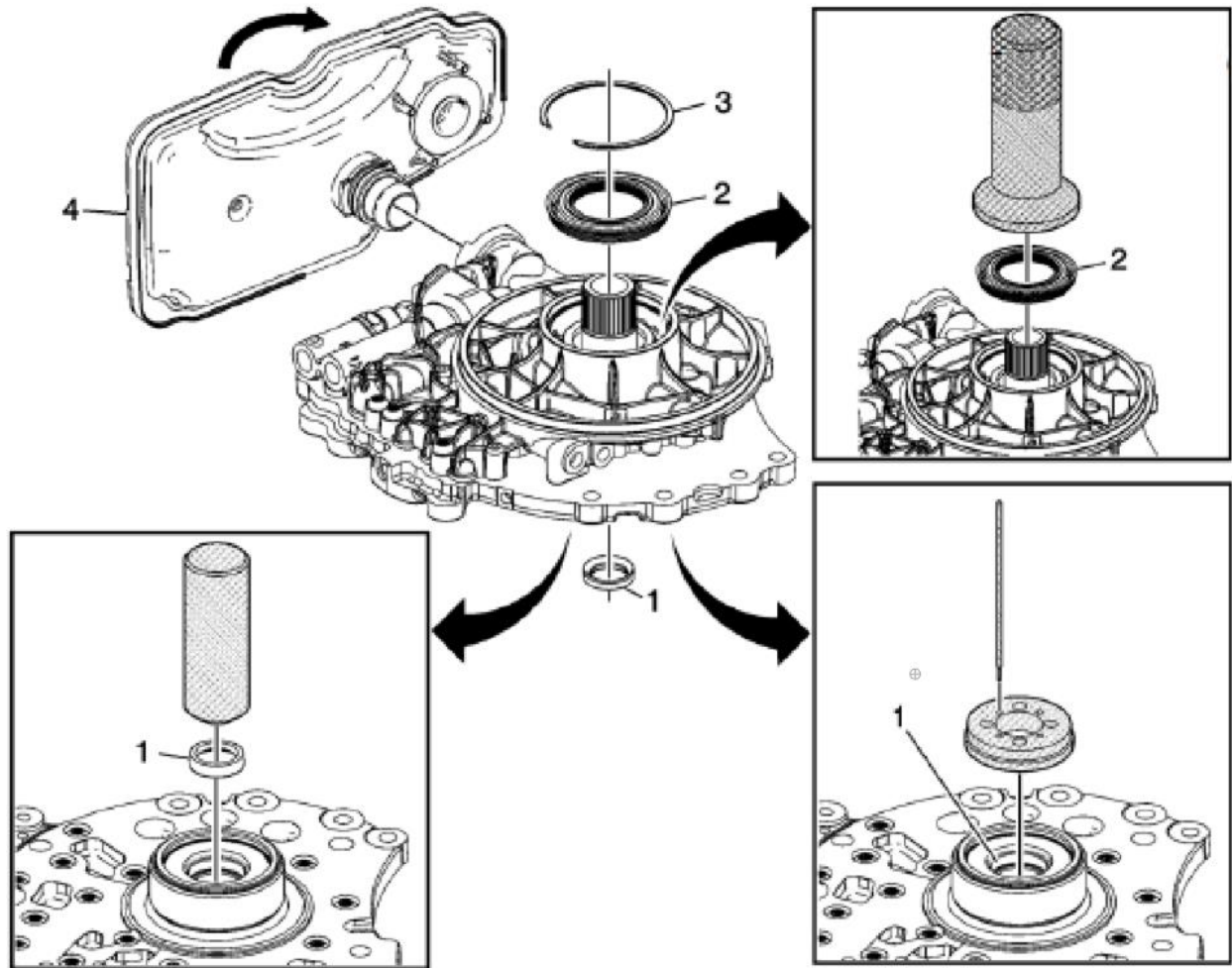
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14.1.6.38.2. Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

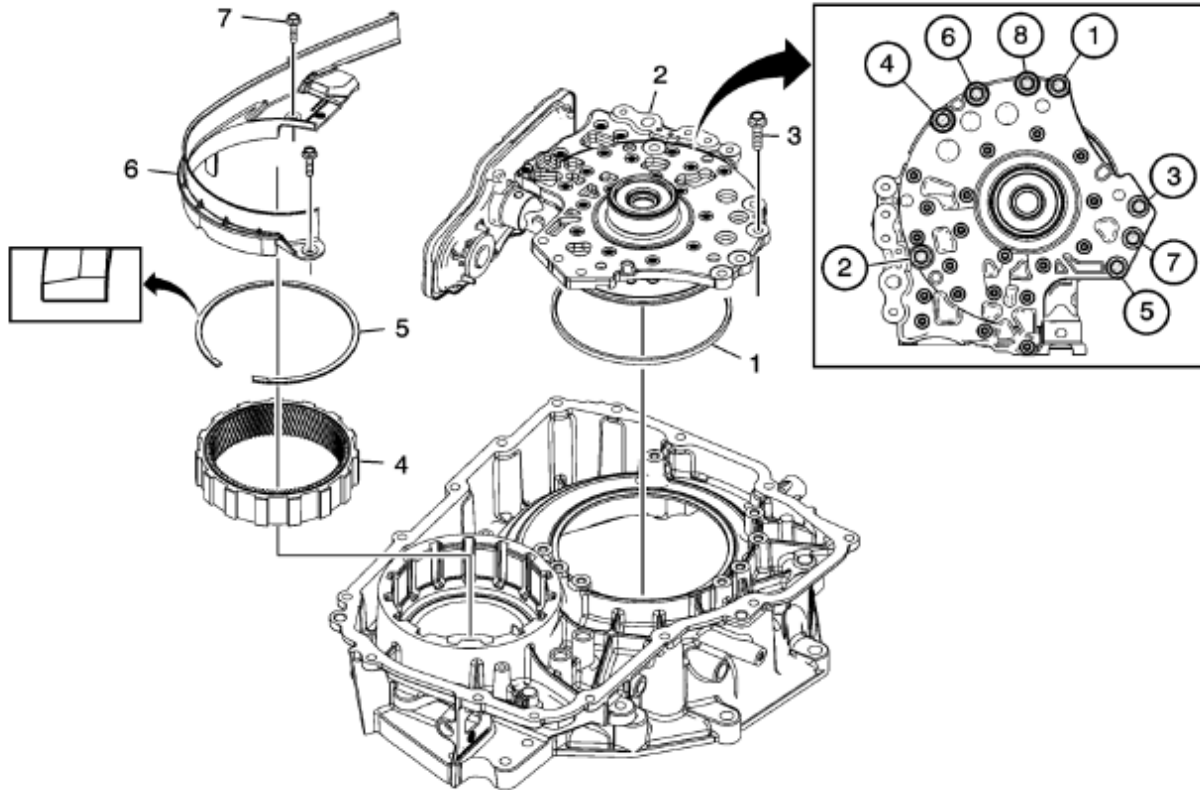


Callout	Component Name
1	Torque Converter Fluid Seal Assembly Note: The fluid seal assembly must be staked in place using DT-49131 seal staking tool to ensure proper seal retention. Special Tool - DT-47792 Seal Installer - DT-49131 Seal Staking Tool
2	Torque Converter Fluid Seal Special Tool DT47791A Seal Installer
3	Torque Converter Fluid Seal Retainer
4	Fluid Filter Assembly Note: - Install a NEW fluid filter assembly. It is not reusable. - Rotate filter 90 degrees to engage locking tangs.

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14.1.6.39. Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation



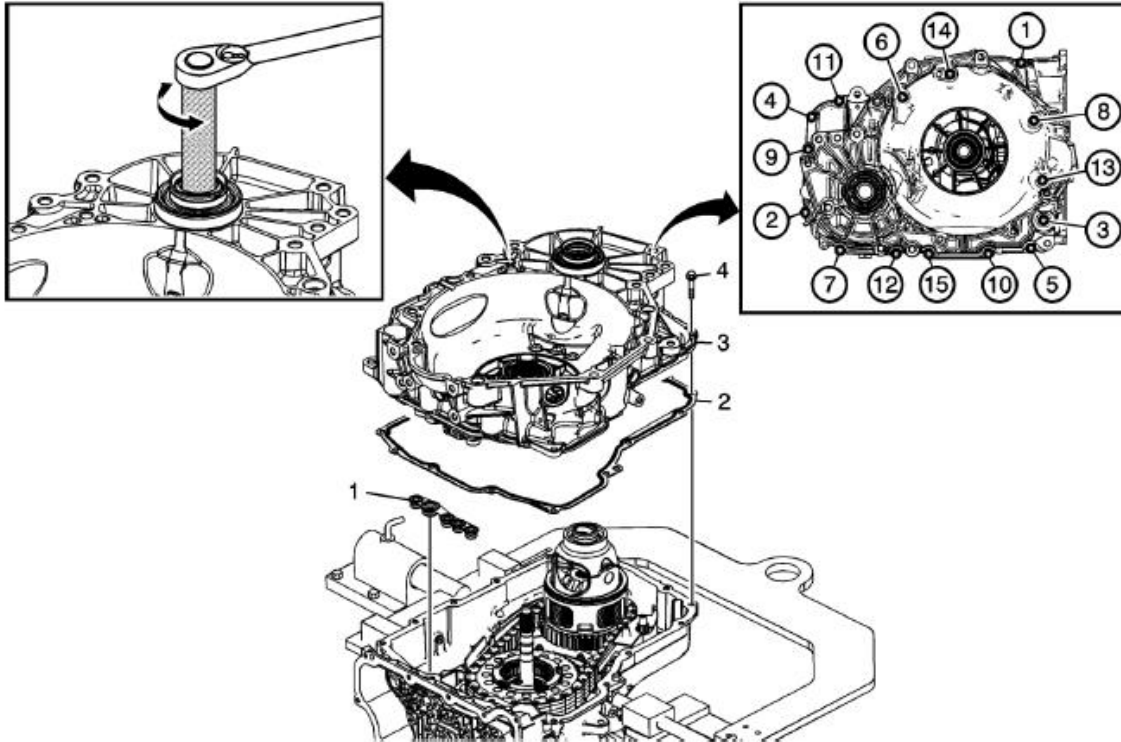
Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation

Callout	Component Name
1	Torque Converter and Differential Housing Seal
2	Fluid Pump Assembly
3	Fluid Pump Bolts M8 x 33 (Qty: 8)
	Caution: Refer to Fastener Caution.
	Tighten 10 Nm (89 lb in) then rotate the bolt an additional 45 degrees
	Special Tool EN-45059 Angle Meter or equivalent
4	Front Differential Ring Gear
5	Front Differential Ring Gear Retainer Note: Install the retainer with the taper facing away from the ring gear.
6	Front Differential Carrier Baffle
7	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)
	Tighten 12 Nm (106.21 lb in)

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14.1.6.40. Torque Converter Housing with Fluid Pump Assembly Installation



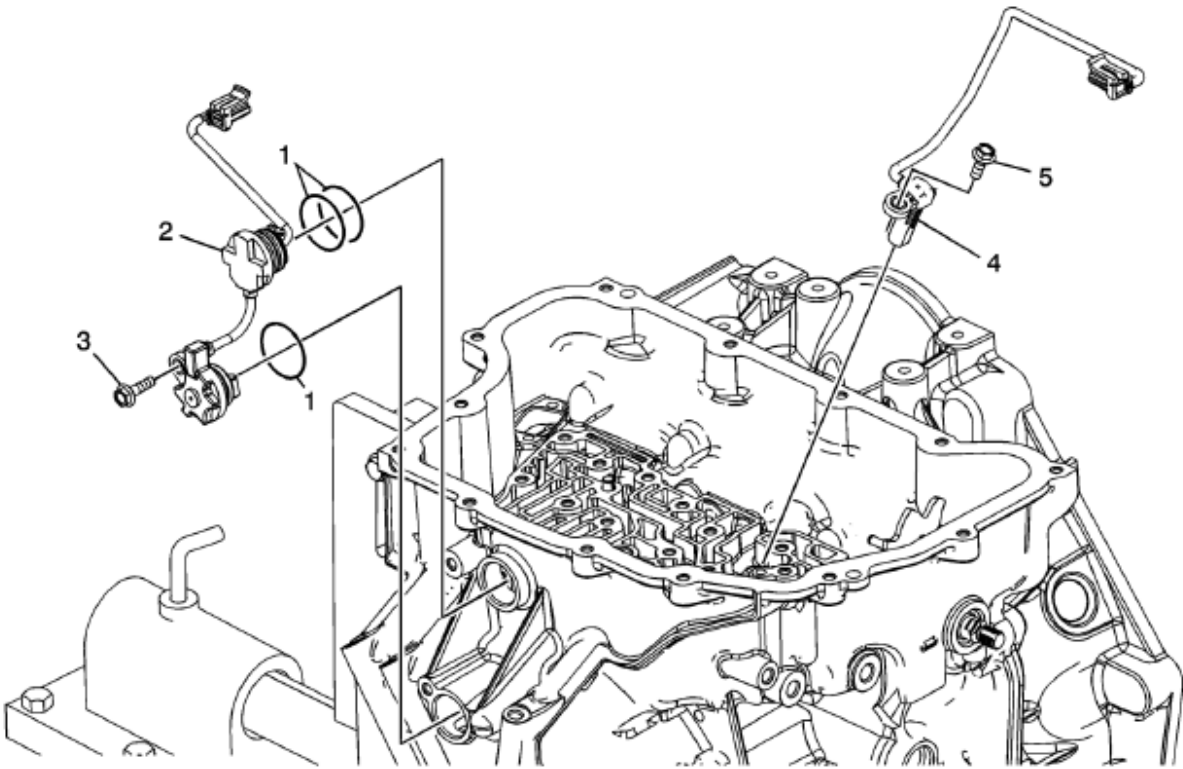
Torque Converter Housing with Fluid Pump Assembly Installation

Callout	Component Name
1	Fluid Pump Seal Assembly
2	Torque Converter Housing Gasket
3	Torque Converter (w/Fluid Pump) Housing Assembly Note: 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. - DT47793 Differential Rotating Tool for 6T40/45 applications - DT49938 Differential Rotating Tool for 6T50 applications Special Tools - DT-47793 Differential Rotating Tool - DT-49938 Differential Rotating Tool
4	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15) Caution: Refer to Fastener Caution. Procedure Tighten the bolts in sequence shown. Tighten 10 Nm (89 lb in) then rotate the bolt an additional 50 degrees Special Tool EN45059 Angle Meter or equivalent

14.1.6.41. Input and Output Speed Sensor Installation

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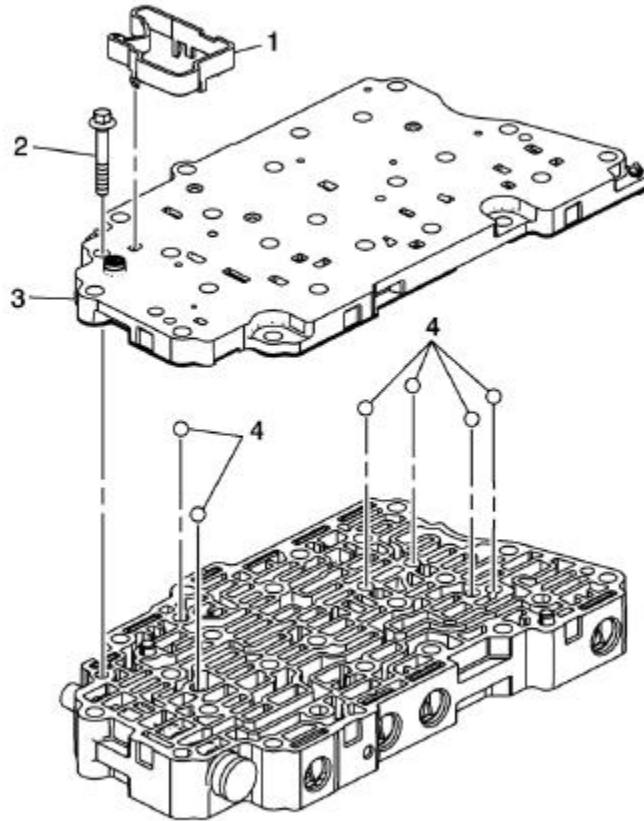
Input and Output Speed Sensor Installation

Callout	Component Name
1	Input Speed Sensor Assembly Seals
2	Input Speed Sensor Assembly
3	Input Speed Sensor Bolt M6 x 23 (Qty: 1)
	Caution: Refer to Fastener Caution.
	Tighten 9 Nm (80 lb in)
4	A/Trans Output Speed Sensor Assembly
5	A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1)
	Tighten 9 Nm (80 lb in)

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14.1.6.42. Control Valve Body Assembly Disassemble

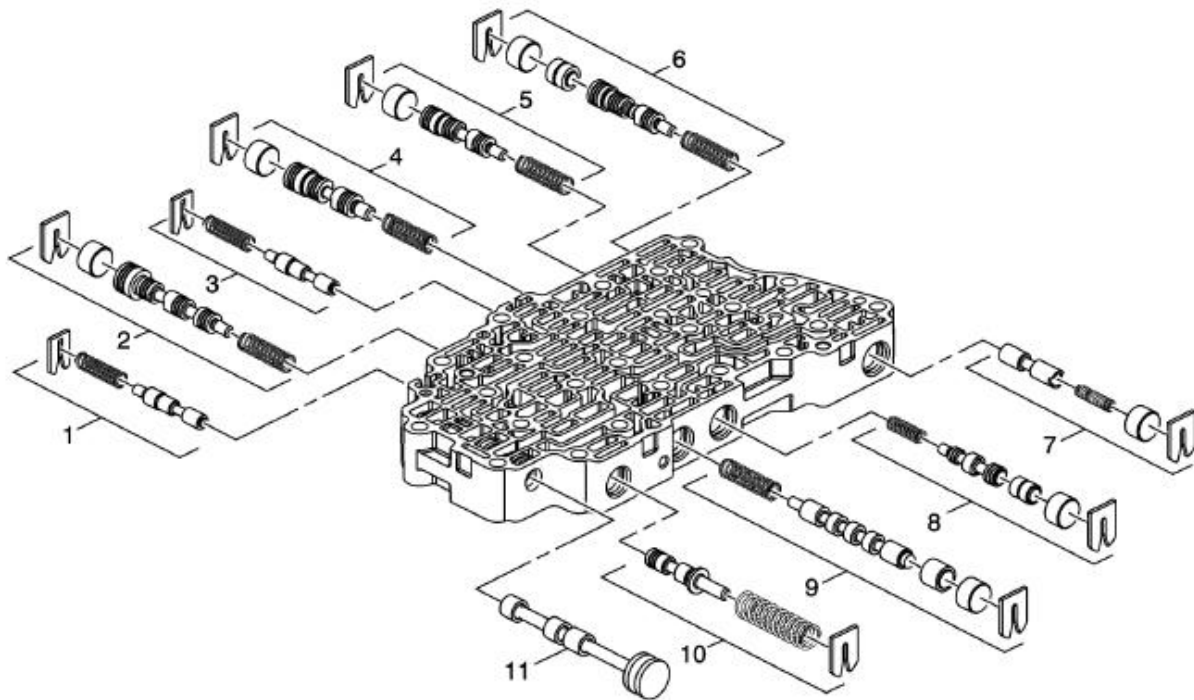


Callout	Component Name
1	Control Solenoid Valve Support
2	Control Valve Body Bolt M5 x 40.5 (Qty: 1)
3	Valve Channel Plate Note: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
4	Valve Body Ball Check Valves (Qty: 6)

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14.1.6.43. Control Valve Body Cleaning and Inspection



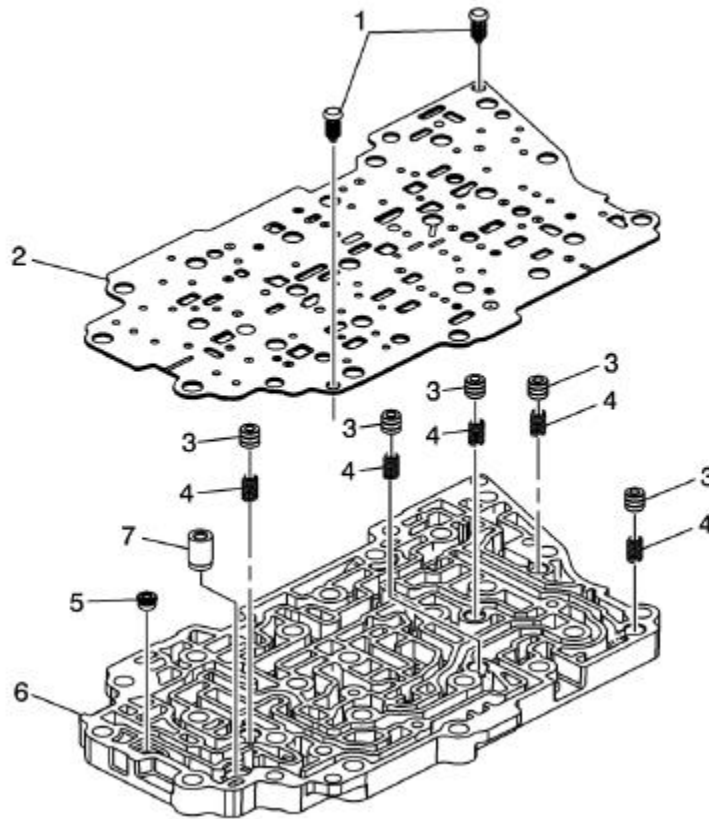
Control Valve Body Cleaning and Inspection

Callout	Component Name
Warning: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
Caution: 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.	
Preliminary Procedure 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

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14.1.6.44. Control Valve Channel Plate Cleaning and Inspection



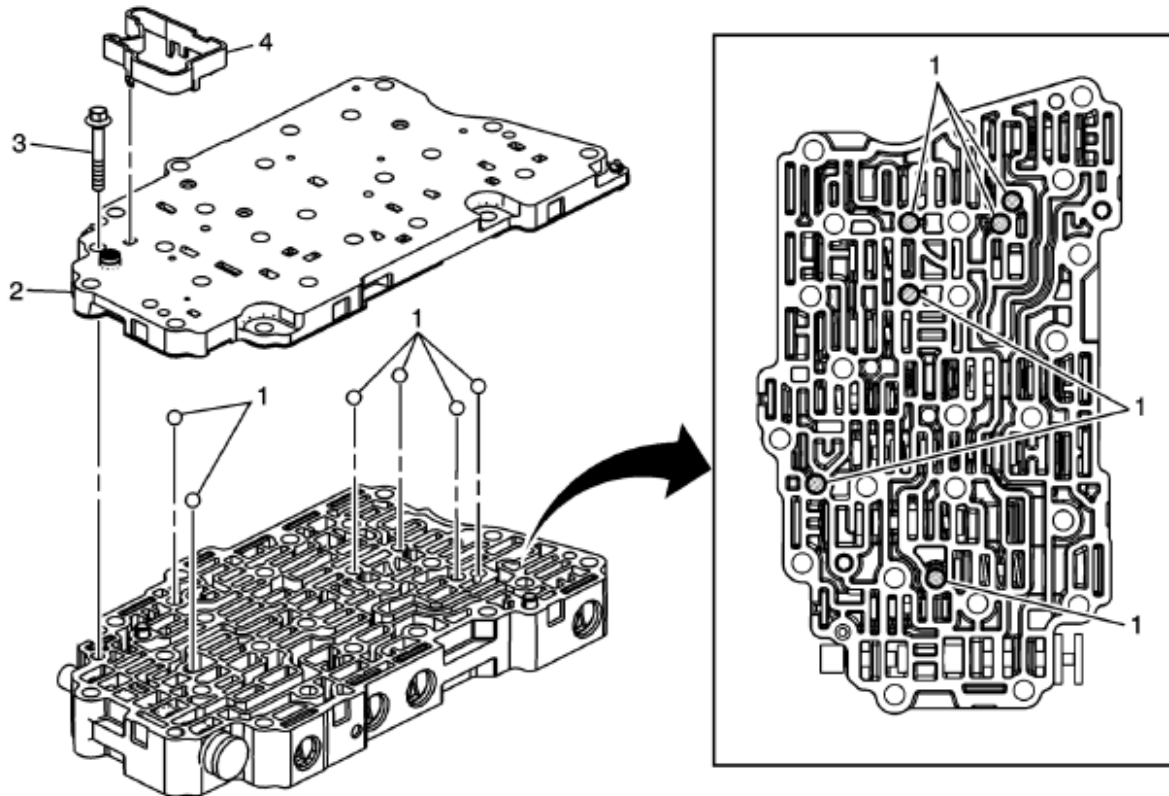
Control Valve Channel Plate Cleaning and Inspection

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 Note: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
7	Control Valve Channel Plate Ball Spring Assembly

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14.1.6.45. Control Valve Body Assembly Assemble



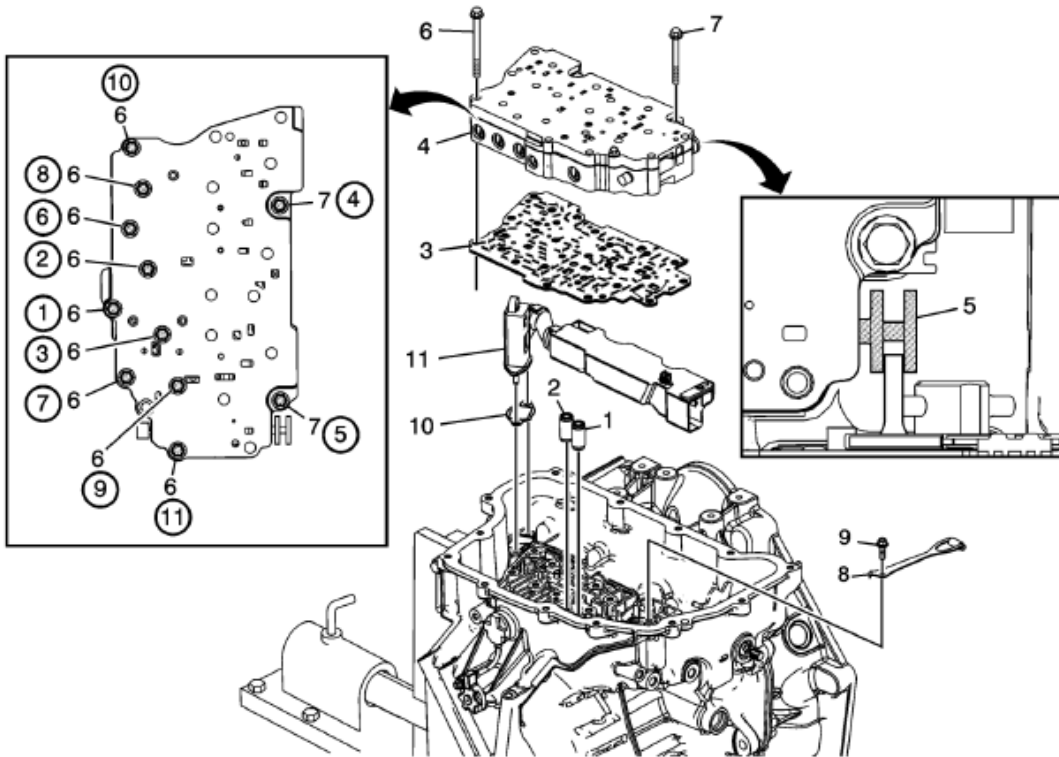
Control Valve Body Assembly Assemble

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)
	Caution: Refer to Fastener Caution.
	Tighten 7 Nm (62 lb in)
4	Control Solenoid Valve Support

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14.1.6.46. Control Valve Body Assembly Installation



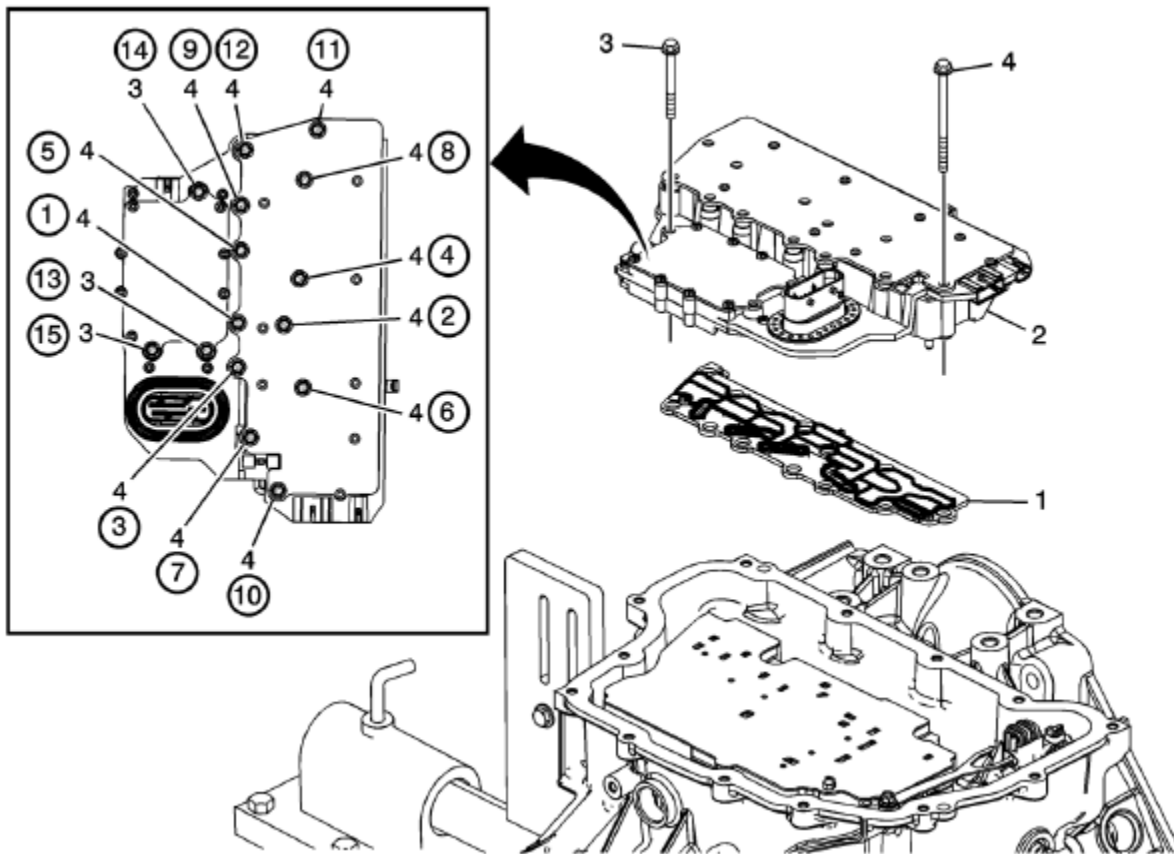
Control Valve Body Assembly Installation

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
5	Manual Valve Note: Align the manual valve to the rod on the manual shift detent lever.
6	Control Valve Body Bolt M6 x 60 (Qty: 9) Caution: Refer to Fastener Caution. Tighten 11 Nm (97 lb in)
7	Control Valve Body Bolt M6 x 53 (Qty: 2) Tighten 11 Nm (97 lb in)
8	Manual Shaft Detent Lever Spring Assembly
9	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) Tighten 12 Nm (106 lb in)
10	Fluid Level Control Valve Gasket
11	Fluid Level Control Valve

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14.1.6.47. Control Solenoid Valve and Transmission Control Module Assembly Installation



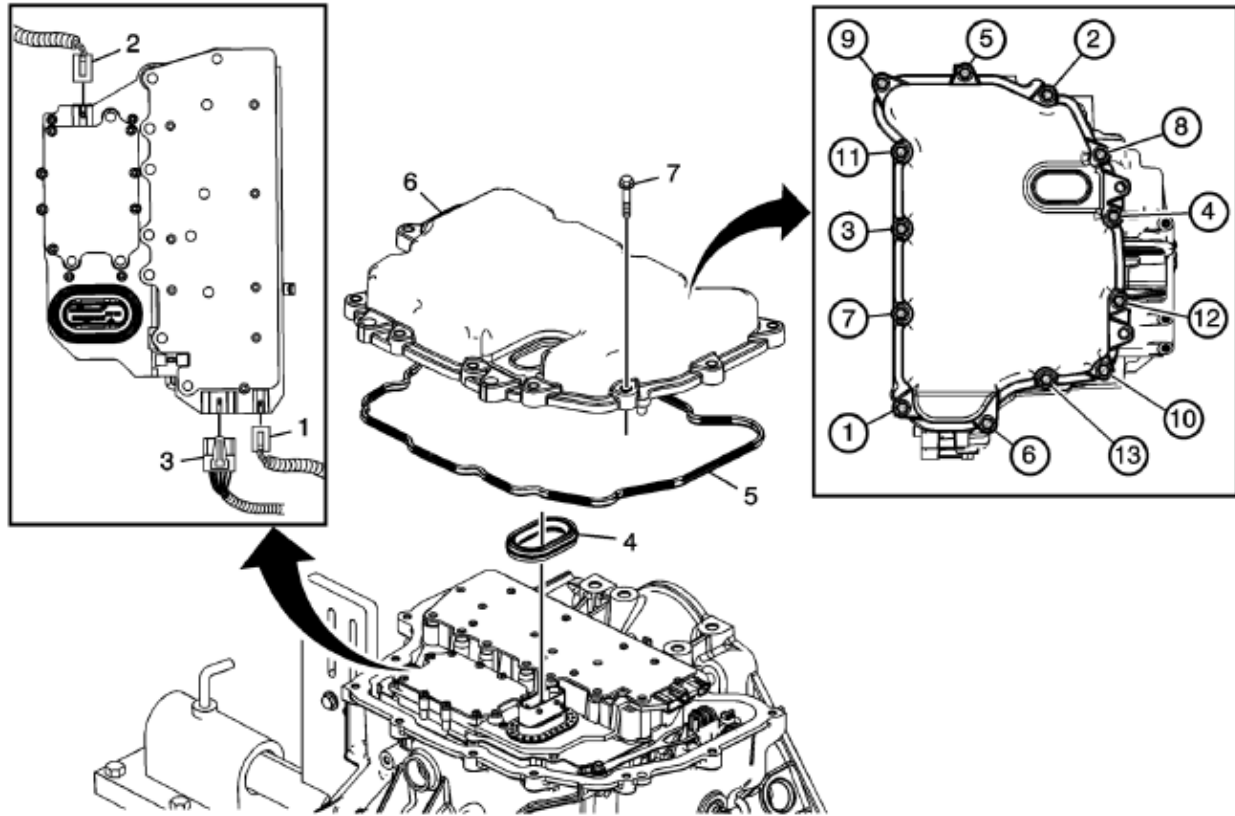
Control Solenoid Valve and Transmission Control Module Assembly Installation

Callout	Component Name
1	Control Solenoid Valve Assembly Filter Plate 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. Note: Install a NEW filter plate to prevent fluid leaks past the fluid seals.
2	Control Solenoid (w/Body and TCM) Valve Assembly
3	Control Valve Body Bolt M5 x 40.5 (Qty: 3) Caution: Refer to Fastener Caution. Tighten 7 Nm (62 lb in)
4	Control Valve Body Bolt M6 x 97 (Qty: 12) Tighten 10 Nm (89 lb in)

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14.1.6.48. Control Valve Body Cover Installation



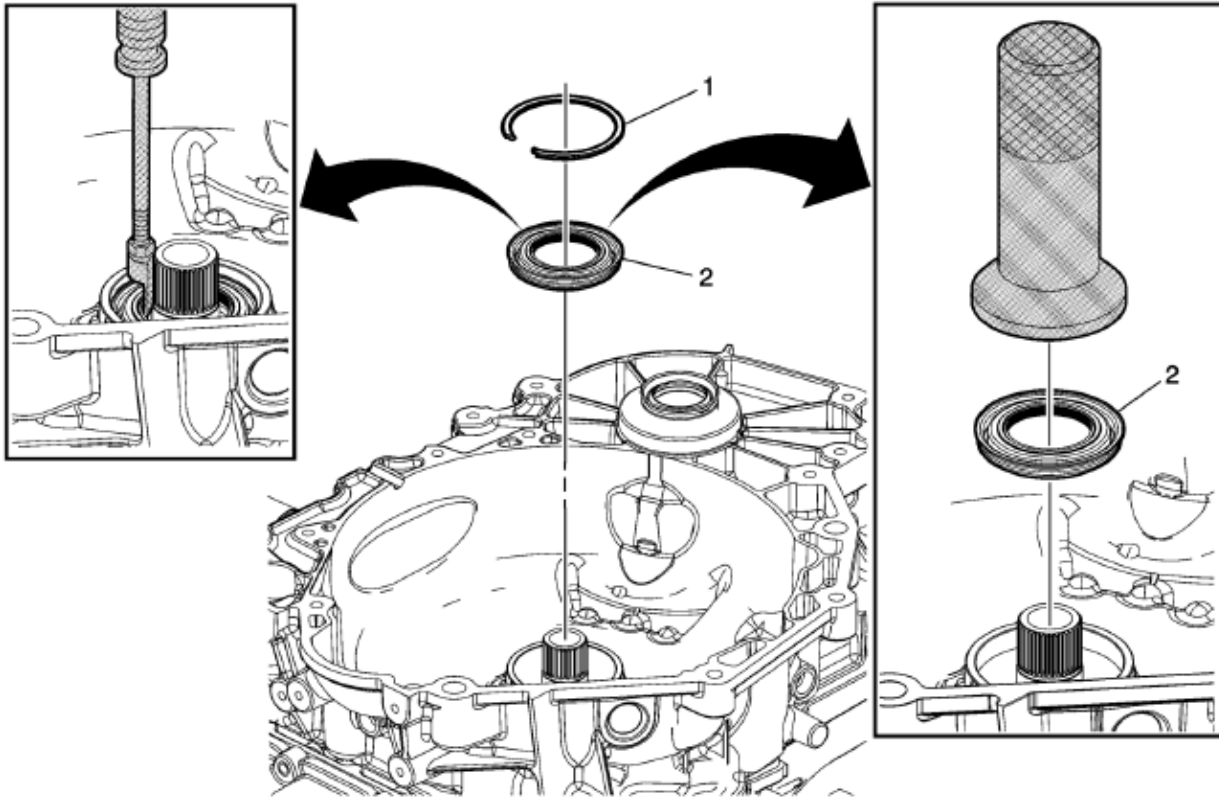
Control Valve Body Cover Installation

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
	Note: Do not reuse the valve body cover wiring connector hole seal.
	Control Valve Body Cover Gasket
	Note: Do not reuse the valve body cover gasket.
	Control Valve Body Cover
	Control Valve Body Cover Bolts M6 x 30 (Qty: 13)
	Caution: Refer to Fastener Caution.
	Tighten 12 Nm (106 lb in)

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14.1.6.49. Torque Converter Fluid Seal Replacement



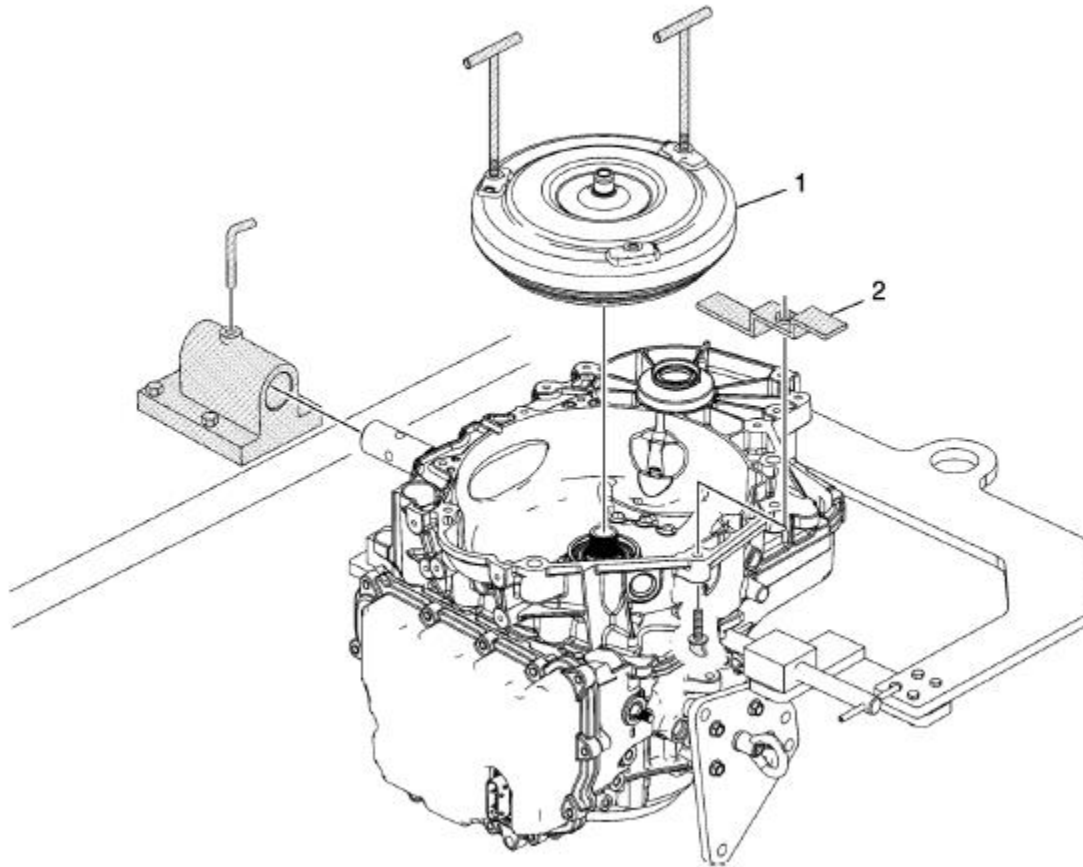
Torque Converter Fluid Seal Replacement

Callout	Component Name
1	Torque Converter Fluid Seal Retainer
2	Torque Converter Fluid Seal
Special Tools DT-47791-A Seal Installer DT-6125-B Slide Hammer EN-23129 Universal Seal Remover	

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14.1.6.50. Torque Converter Installation



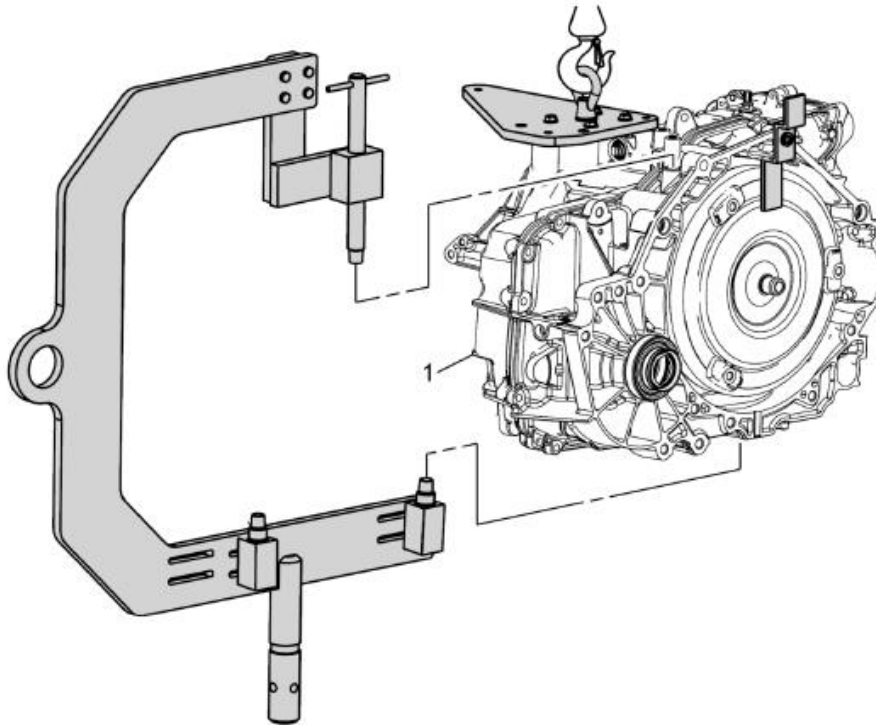
Torque Converter Installation

Callout	Component Name
1	Torque Converter Assembly Note: Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tool DT-46409 Torque Converter Lifting Handles
2	DT-21366 Converter Holding Strap Warning: 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.

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14.1.6.51. Lift Plate and Holding Fixture Removal



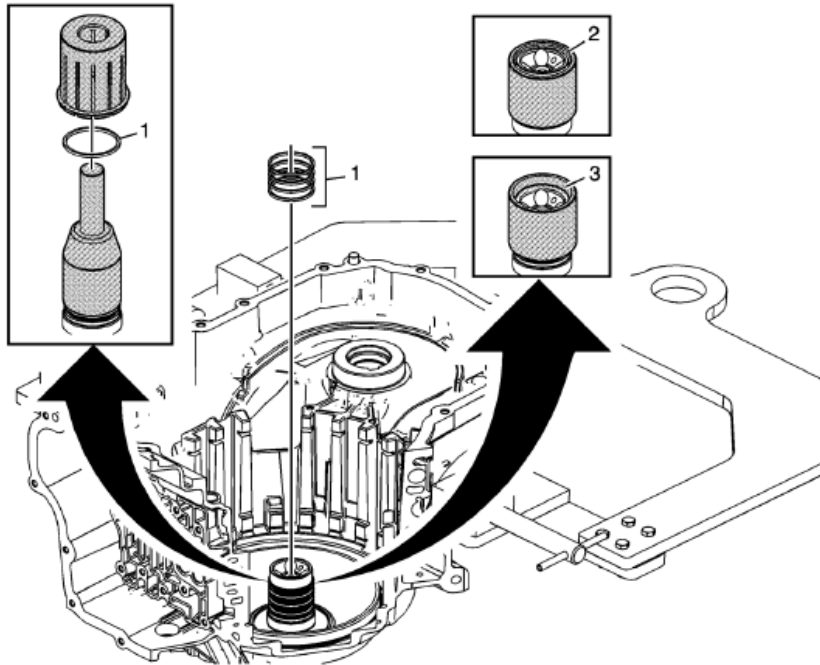
Lift Plate and Holding Fixture Removal

Callout	Component Name
1	Transmission Case Assembly Warning: Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly. Caution: Refer to Fastener Caution. Procedure Note: Only 2 bolt holes on the lift plate will align with the bosses on the transmission case. This is sufficient for lifting the transmission to remove the holding fixture. 1. Install DT-47811-A Transmission Lift Plate. 2. Tighten bolts and nut to 12 Nm (106 lb in). 3. Remove lock pin from DT46625 Transmission Holding Fixture. 4. Raise the transmission with an overhead hoist in order to remove the DT-46625 Transmission Holding Fixture. 5. Lower the transmission assembly onto the transmission jack in order to remove the DT-47811-A Transmission Lift Plate. Special Tools • DT-328920 Holding Fixture • DT-46625 Transmission Holding Fixture • DT-46625-10 Transmission Holding Fixture Adapter • DT-47811A Transmission Lift Plate

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14.1.6.52. 3-5 Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement



3-5Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement

Callout	Component Name
Special Tools DT46620 Seal Installer	
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 4) Procedure 1. Place DT-46620-3 which is part of DT-46620 seal installer over the case hub and adjust it so that only the bottom seal ring is exposed. 2. Place a NEW fluid seal ring onto DT-46620-3 which is part of DT-46620 seal installer . 3. Use DT-46620-2 which is part of DT-46620 seal installer to push the fluid seal ring down over DT-46620-3 which is part of DT-46620 seal installer into the hub ring groove. 4. Repeat the above steps to install
2	Small Chamfer Up Caution: 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. Procedure Install DT-46620-1 which is part of DT-46620 seal installer with the large chamfer end down over the fluid seal rings and leave DT-46620-1 which is part of DT-46620 seal installer on the seals for at least 60 seconds.
3	Large Chamfer Up Procedure 1. Install DT-46620-1 which is part of DT-46620 seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. 2. Leaving DT-46620-1 which is part of DT-46620 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.

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14.1.7. Transmission Cooling

14.1.8. Diagnostic Information and Procedures

14.1.8.1. Fastener Specifications

Fastener Specifications

Application	Specification	
	Metric	English
Oil Cooler Fitting Cooler Fitting	20 Nm	15 lb ft
Transmission Fluid Cooler Nut	22 Nm	16 lb ft

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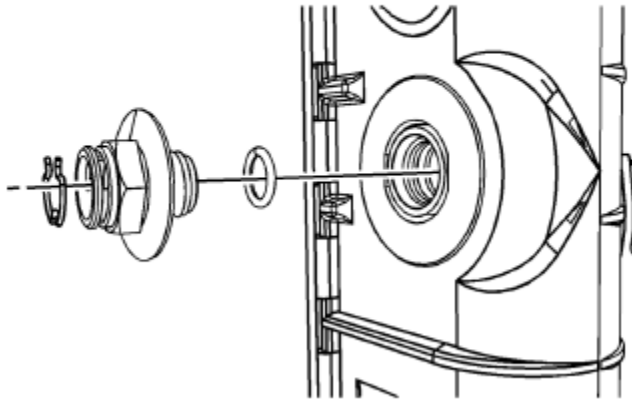
Transmission

14.1.9. Repair instructions

14.1.9.1. Transmission Fluid Cooler Pipe Connector Replacement Radiator

14.1.9.1.1. Removal Procedure

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Transmission Fluid Cooler Pipe » Remove — Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.



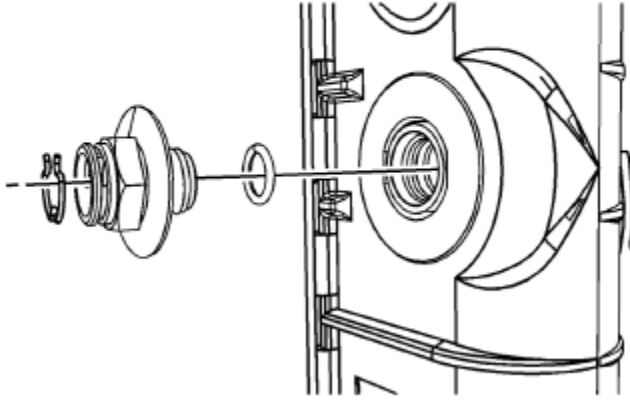
Note:
Do not remove the upper and lower transaxle oil cooler fittings from the radiator at the same time otherwise the transaxle oil cooler will fall inside the radiator end tank.

3. Transmission Fluid Cooler Pipe Connector » Remove
4. Remove and DISCARD the O-ring seal.

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14.1.9.1.2. Installation Procedure



1. Install a NEW O-ring seal.

Caution:

Refer to Fastener Caution.

Note:

The correct thread engagement is critical. Cross-threaded fittings can achieve proper tightness and still leak.

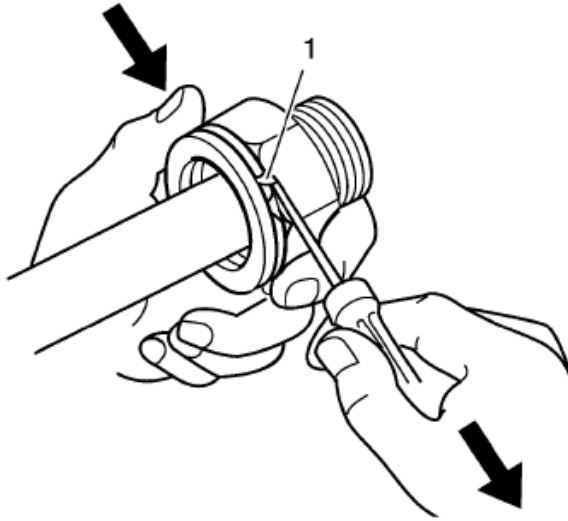
2. Transmission Fluid Cooler Pipe Connector » Install and tighten 20 Nm (15 lb ft).
3. Transmission Fluid Cooler Pipe » Install — Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection
4. Fill the cooling system. [Refer to Cooling System Draining and Filling.](#)
5. Check the transmission fluid level. [Refer to Transmission Fluid Level and Condition Check](#)

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14.1.9.2. Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection

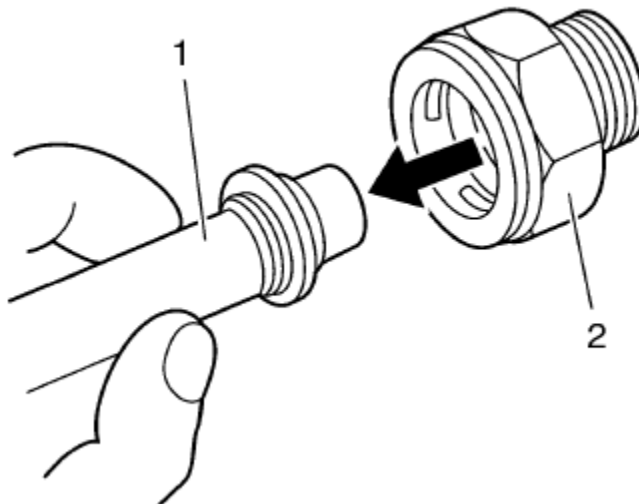
14.1.9.2.1. Removal Procedure



Note

Perform the following procedure when removing the retaining rings and cooler lines from the quick connect fittings located on the radiator and/or the transmission.

1. Pull the plastic cap back from the quick connect fitting and down along the cooler line about 5 cm (2 in).
2. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring (1) in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed.
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.



5. Pull the cooler line (1) straight out from the quick connect fitting (2).

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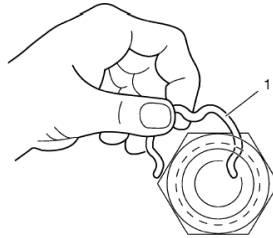
Transmission

14.1.9.2.2. Installation Procedure

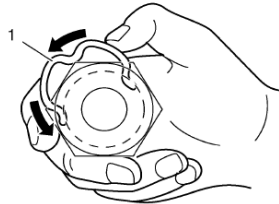
Note

- Do not reuse any of the existing oil lines or oil line fittings if there is excessive corrosion.
- Do not reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.
- Ensure the following procedures are performed when installing the new retaining rings onto the fittings.

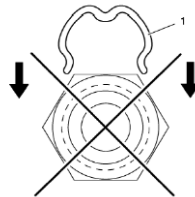
1. Install a new retaining ring into the quick connect fitting using the following procedure:



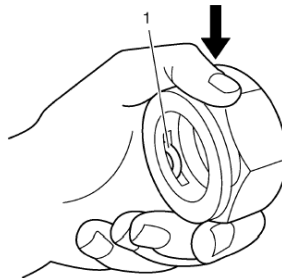
- 1.1. Hook one of the open ends of the retaining ring (1) in one of the slots in the quick connect fitting.



- 1.2. Rotate the retaining ring (1) around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting.



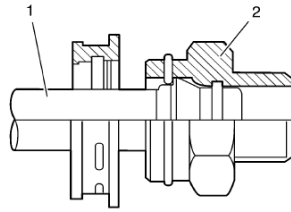
- 1.3. Do not install the new retaining ring (1) onto the fitting by pushing the retaining ring.



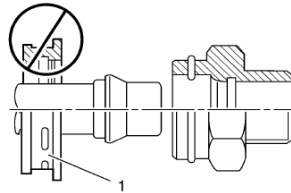
- 1.4. Ensure that the three retaining ring ears are seen from inside the fitting (1) and that the retaining ring moves freely in the fitting slots.

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2. Install the cooler line (1) into the quick connect fitting (2).
3. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.

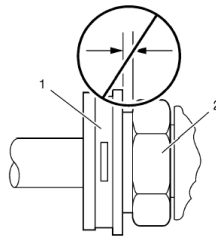


4. Do not use the plastic cap (1) on the cooler line to install the cooler line into the fitting.
5. Pull back sharply on the cooler line to ensure that the cooler line is fastened into the quick connect fitting.

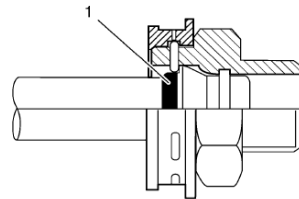
Note:

Do not manually depress the retaining clip when installing the plastic cap.

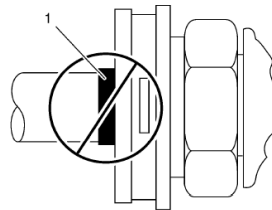
6. Position (snap) the plastic cap (1) onto the fitting. Do not manually depress the retaining ring when installing the plastic cap onto the quick connect fitting.
7. Ensure that the plastic cap is fully seated against the fitting.



8. Ensure that no gap is present between the plastic cap (1) and the fitting (2).



9. Ensure that the yellow identification band (1) on the tube is hidden within the quick connect fitting.



10. A hidden yellow identification band (1) indicates proper joint seating.
11. Fill the transmission to the proper level.

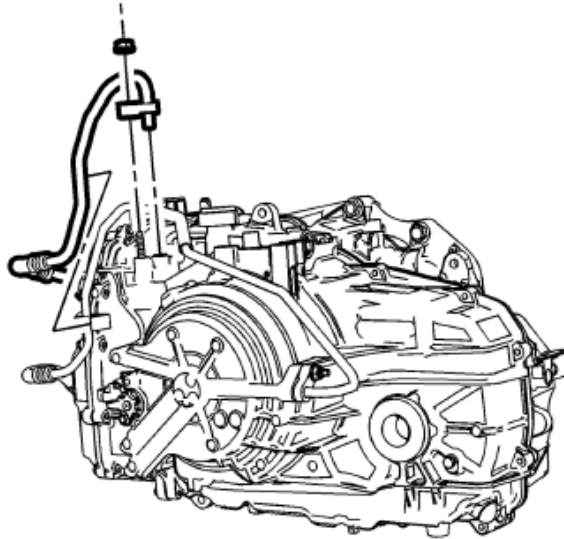
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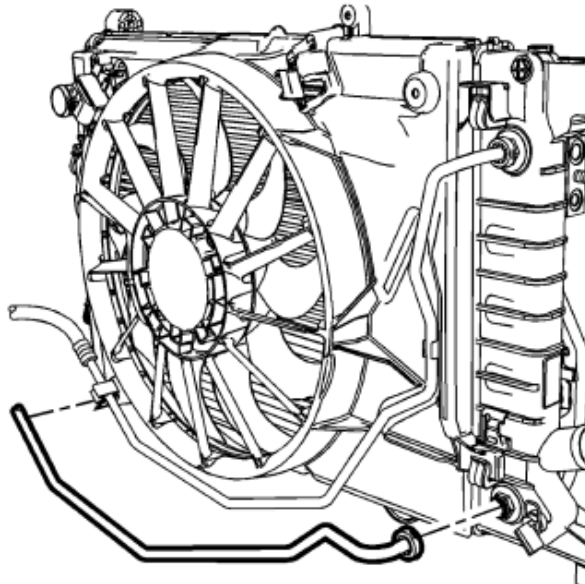
14.1.9.3. Fluid Cooler Inlet Hose Replacement

14.1.9.3.1. Removal Procedure

1. Remove the Hood, **Refer to Hood in Body Repair**
2. Remove Right Front Valance, **Refer to Front Valance in Body Repair**
3. Remove Cooling System Overflow tank
4. Remove Throttle Body Intake Hose



5. Remove the trans fluid cooler nut.
6. Remove and unclip the trans fluid cooler hose from the transmission.



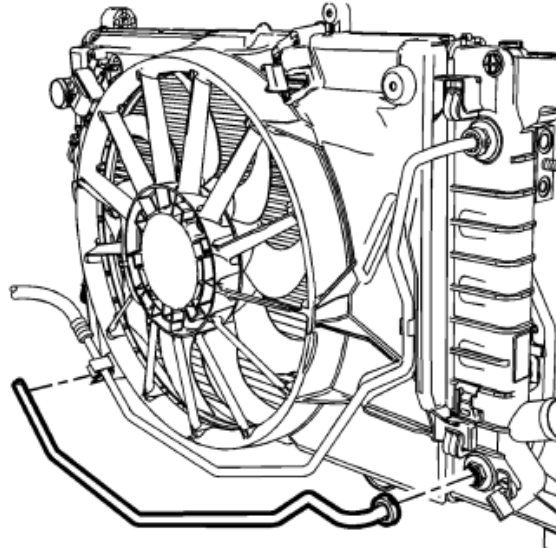
7. Remove the transmission fluid cooler hose from the radiator. Refer to Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.
8. Unclip the transmission fluid cooler hose from fan shroud and remove from vehicle.

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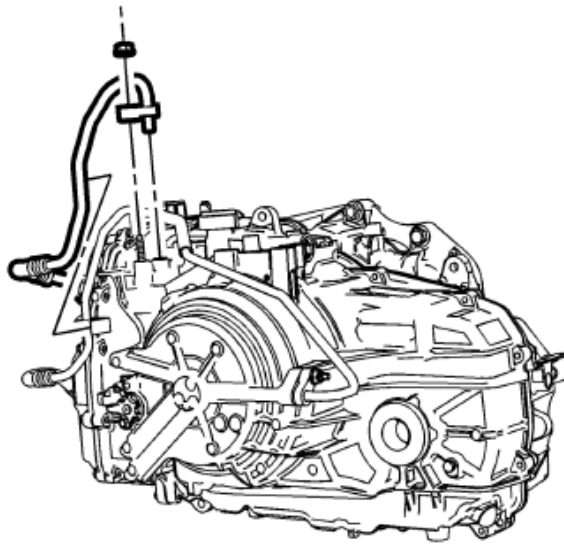
Transmission

14.1.9.3.2. Installation Procedure

1. Inspect the seals for cracks, cuts or damage. Replace if necessary.



2. Install the transmission fluid cooler hose to the radiator. Refer to Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.
3. Clip the transmission fluid cooler hose to the fan shroud.



Caution:

Refer to Fastener Caution.

4. Install and clip the trans fluid cooler hose to the transmission.
5. Install the trans fluid cooler nut and tighten to 22 Nm (16 lb ft).
6. Install Throttle Body Intake Hose
7. Install Cooling System Overflow Tank
8. Adjust the transmission fluid level.
9. Inspect for fluid leaks.
10. Install Right Front Valance, **Refer to Valance in Body Repair**
11. Install Hood, Refer to Hood in Body Repair

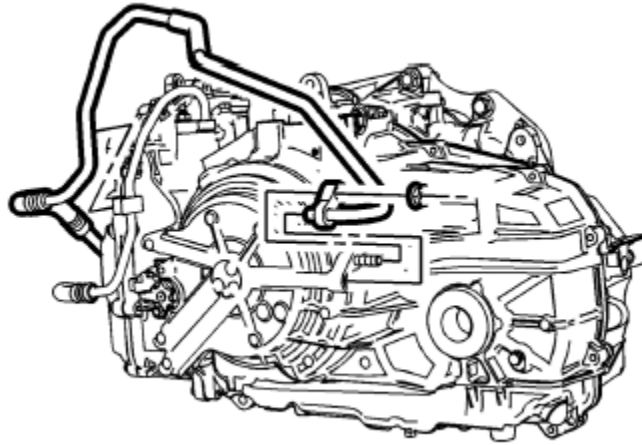
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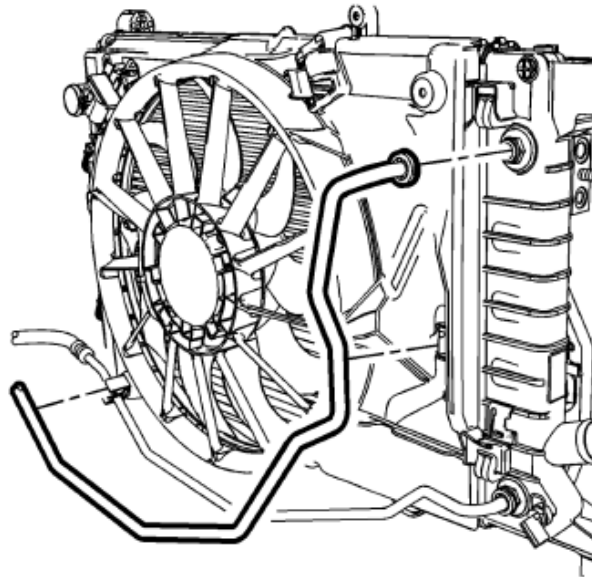
14.1.9.4. Fluid Cooler Outlet Hose Replacement

14.1.9.4.1. Removal Procedure

1. Remove Hood, [Refer to Hood in Body Repair](#)
2. Remove Front Valance, [Refer to Valance in Body Repair](#)
3. Remove Cooling system Overflow tank
4. Remove Throttle Body Intake Hose



5. Remove the trans fluid cooler nut.
6. Remove and unclip the trans fluid cooler hose from the transmission.



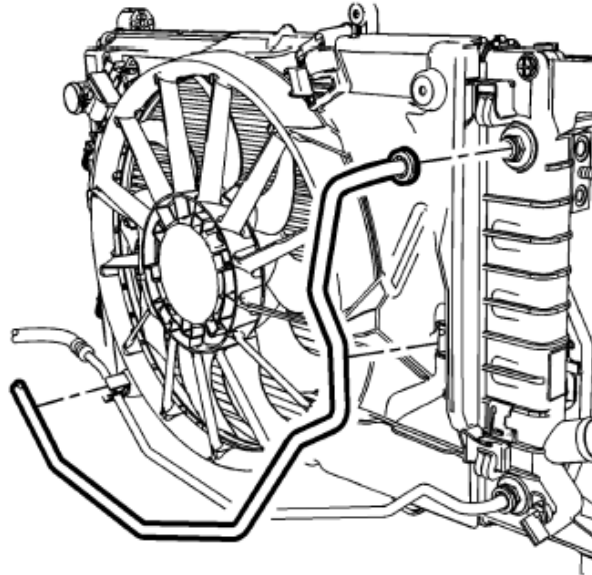
7. Remove the transmission fluid cooler hose from the radiator. Refer to Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.
8. Unclip the transmission fluid cooler hose from fan shroud and remove from vehicle.

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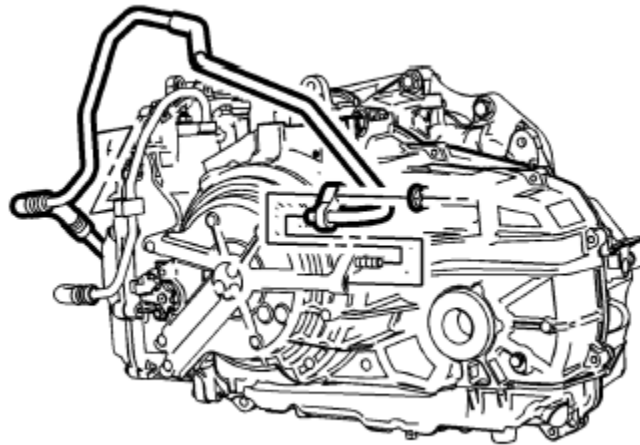
Transmission

14.1.9.4.2. Installation Procedure

1. Inspect the seals for cracks, cuts or damage. Replace if necessary.



2. Install the transmission fluid cooler hose to the radiator. Refer to Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection.
3. Clip the transmission fluid cooler hose to the fan shroud.



Caution:

Refer to Fastener Caution.

4. Install and clip the trans fluid cooler hose to the transmission.
5. Install the trans fluid cooler nut and tighten to 22 Nm (16 lb ft).
6. Install Throttle Body Intake Hose
7. Install Cooling System Overflow Tank
8. Inspect for fluid leaks.
9. Install Right Front Valance, **Refer to Valance in Body Repair**
10. Install Hood, Refer to Hood in Body Repair