

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Component Locator - Equinox & Terrain

COMPONENT LOCATOR

DISASSEMBLED VIEWS

Case and Associated Parts

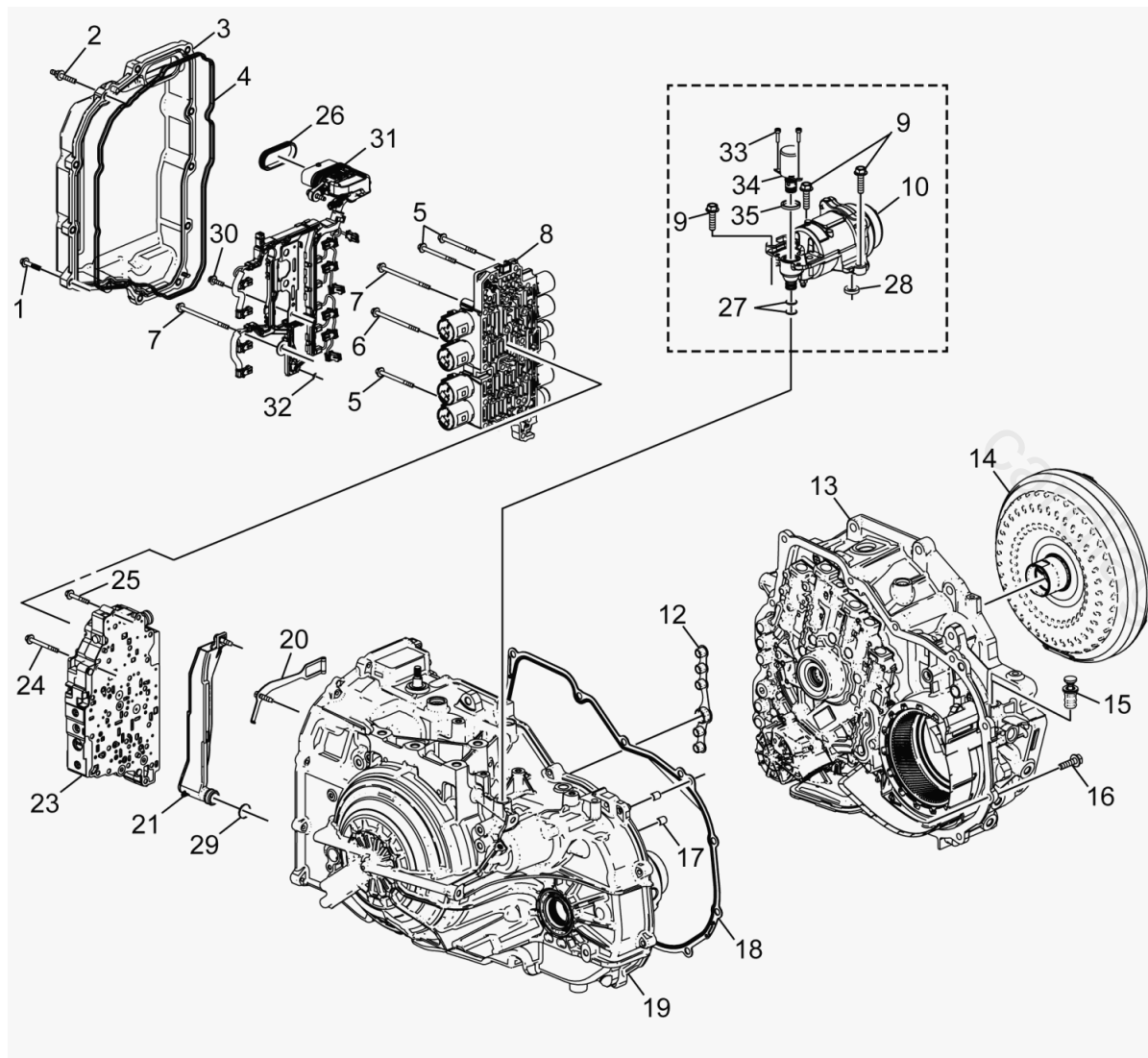


Fig. 1: Case And Associated Parts Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Valve Body Cover Bolt
2	Control Valve Body Cover Stud
3	Control Valve Body Cover
4	Control Valve Body Cover Gasket
5	Control Valve Body Bolt
6	Control Valve Body Bolt
7	Control Valve Body Bolt
8	Control Valve Solenoid Body - Model Dependent
9	Automatic Transmission Auxiliary Fluid Accumulator Bolt - Model Dependent

Callout	Component Name
10	Automatic Transmission Auxiliary Fluid Accumulator - Model Dependent
12	Automatic Transmission Fluid Pump Seal
13	Torque Converter and Differential Housing
14	Torque Converter
15	Transmission Fluid Filler Tube Plug
16	Torque Converter and Differential Housing Bolt
17	Transmission Case Locating Pin
18	Torque Converter Housing Gasket
19	Automatic Transmission Case
20	Manual Shift Detent Lever Spring - Model Dependent
21	Fluid Transfer Pipe
23	Control Valve Body - Model Dependent
24	Control Valve Body Bolt
25	Control Valve Body Bolt
26	Body Side Wiring Harness Opening Seal
27	Automatic Transmission Case Seal - Model Dependent
28	Accumulator Bypass Valve Seal - Model Dependent
29	Fluid Transfer Pipe Seal
30	Control Valve Solenoid Body Bolt
31	Automatic Transmission Wiring Harness - Model Dependent
32	Automatic Transmission Fluid Temperature Sensor Seal
33	Accumulator Valve Body Bolt - Model Dependent
34	Shift On/Off Solenoid Valve - Model Dependent
35	Accumulator Bypass Valve Seal - Model Dependent

Transmission Case Assembly

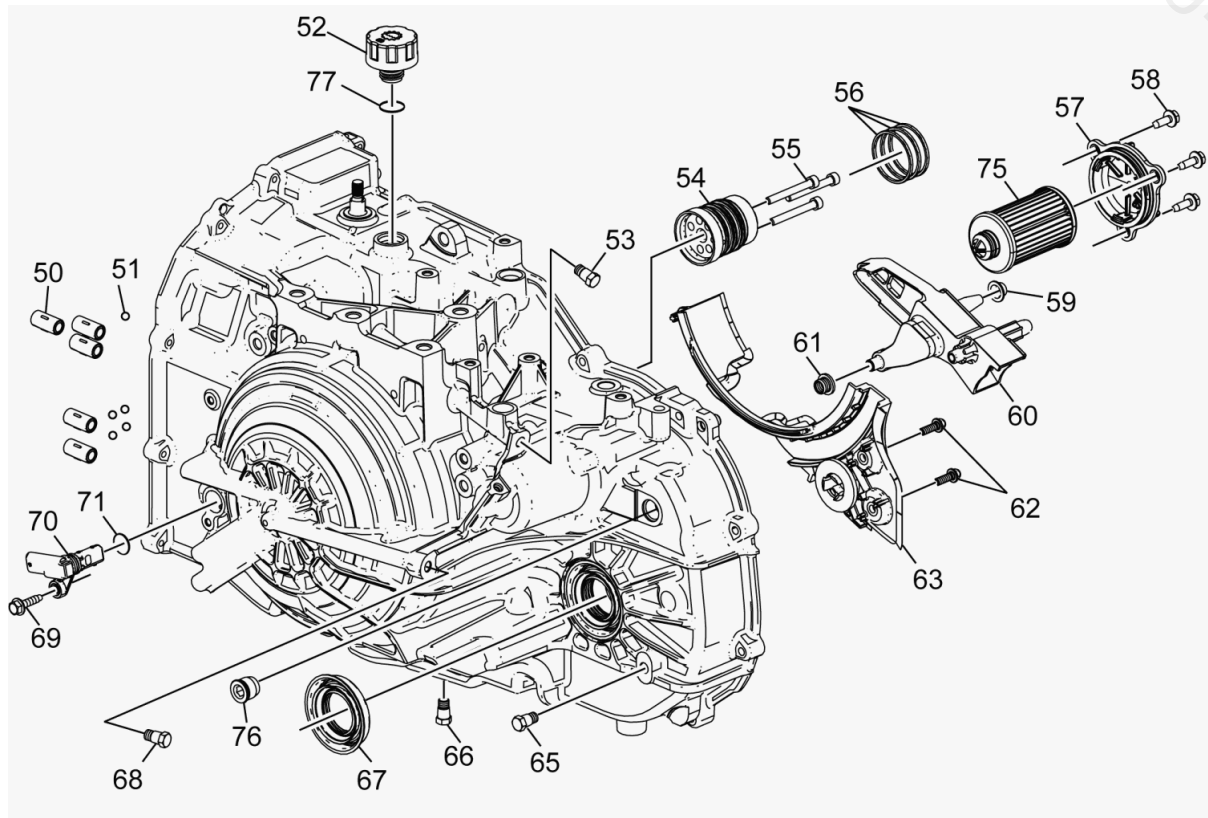


Fig. 2: Transmission Case Assembly Components
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
50	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
51	Control Valve Body Ball Check Valve

Callout	Component Name
52	Transmission Fluid Filler Cap
53	Automatic Transmission Fluid Pressure Test Hole Plug
54	Input Shaft Support
55	Input Shaft Support Bolt
56	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
57	Automatic Transmission Fluid Filter Cover
58	Automatic Transmission Fluid Filter Cover Bolt
59	Drive Link Lubricant Fluid Seal
60	Drive Link Lubricant Scoop
61	Drive Link Lubricant Fluid Seal
62	Front Differential Carrier Baffle Bolt
63	Front Differential Carrier Baffle
65	Automatic Transmission Fluid Level Hole Plug
66	Automatic Transmission Fluid Pan Drain Plug
67	Front Wheel Drive Shaft Oil Seal
68	Automatic Transmission Case Hole Plug
69	Automatic Transmission Input Speed Sensor Bolt
70	Automatic Transmission Input Speed Sensor
71	Automatic Transmission Input Speed Sensor Seal - O-Ring
75	Automatic Transmission Fluid Filter
76	Automatic Transmission Case Hole Plug
77	Automatic Transmission Fluid Filter Cap Seal

Torque Converter and Differential Housing Assembly

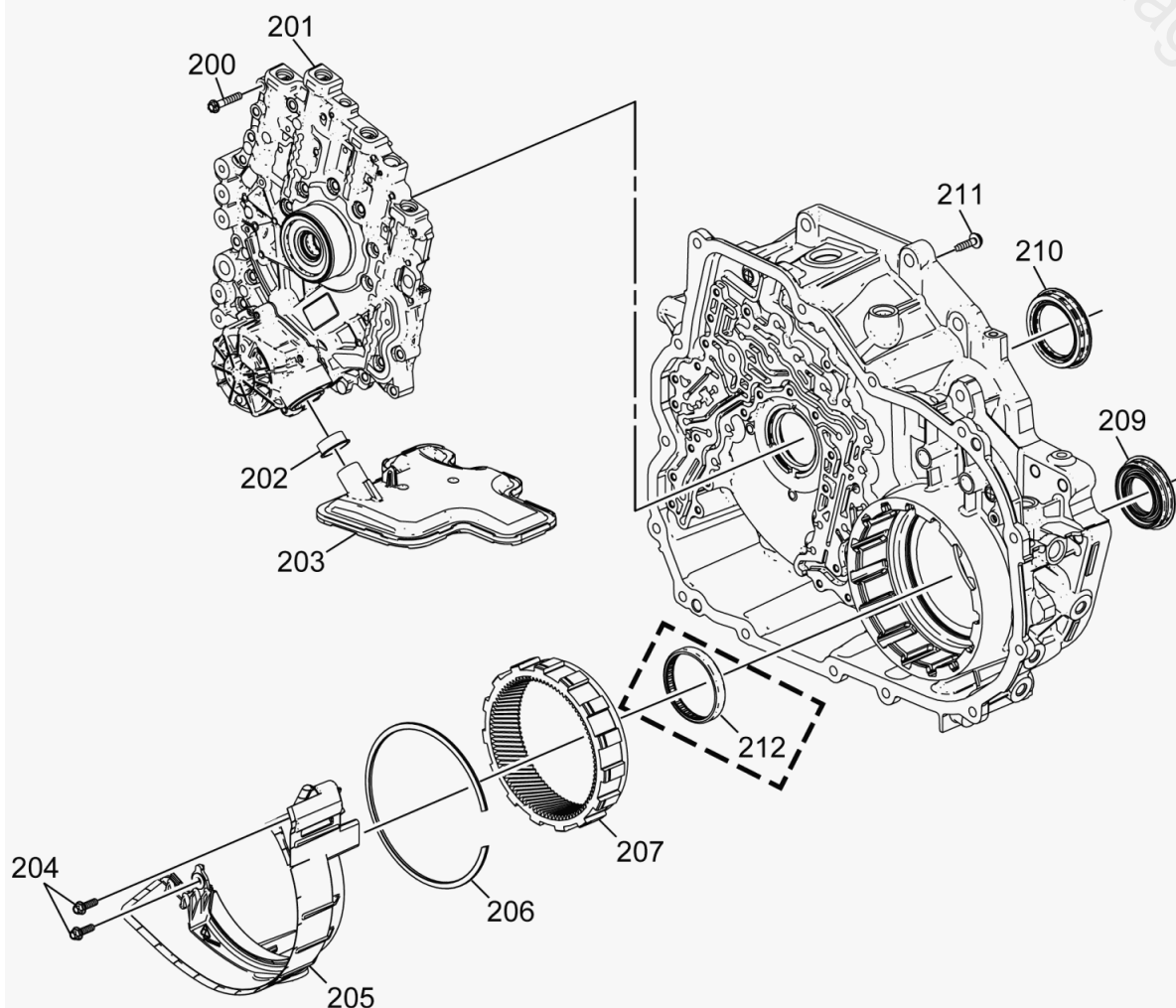


Fig. 3: Torque Converter and Differential Housing Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
200	Automatic Transmission Fluid Pump Cover Bolt
201	Automatic Transmission Fluid Pump Assembly
202	Automatic Transmission Fluid Filter Seal
203	Automatic Transmission Fluid Filter
204	Front Differential Carrier Baffle Bolt
205	Front Differential Carrier Baffle
206	Front Differential Rear Gear Retainer
207	Front Differential Ring Gear
209	Front Wheel Drive Shaft Oil Seal
210	Torque Converter Fluid Seal
211	Automatic Transmission Fluid Pump Cover Bolt
212	Front Differential Carrier Bearing - Model Dependent

Drive Link Assembly

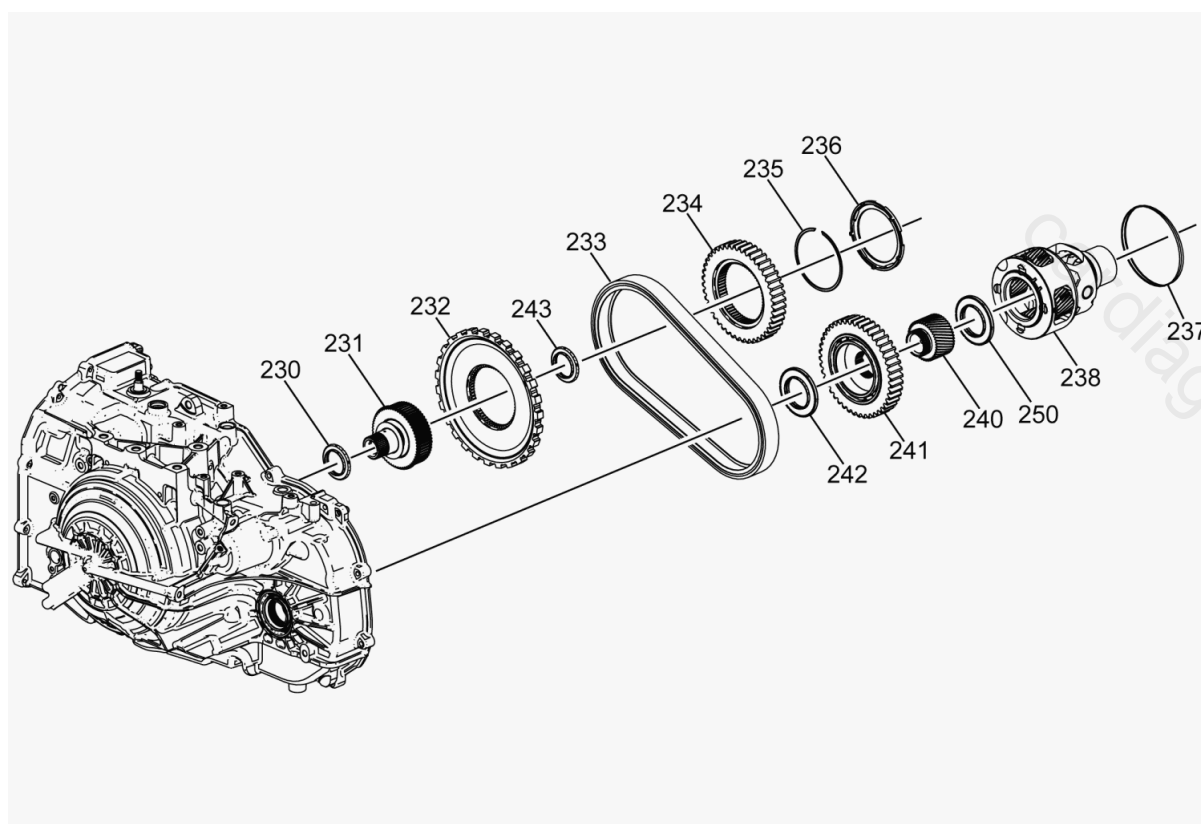


Fig. 4: Drive Link Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
230	Output Sun Gear Thrust Bearing
231	Output Carrier Transfer Drive Gear Hub Assembly
232	Park Gear
233	Drive Link
234	Drive Sprocket
235	Drive Sprocket Retaining Ring
236	Drive Sprocket Thrust Washer
237	Front Differential Carrier Bearing
238	Front Differential Carrier
239	Differential Carrier Sun Gear Thrust Bearing
240	Front Differential Carrier Sun Gear

Callout	Component Name
241	Driven Sprocket
242	Driven Sprocket Bearing
243	Reaction Carrier Sun Gear Thrust Bearing

Front Differential Carrier Assembly

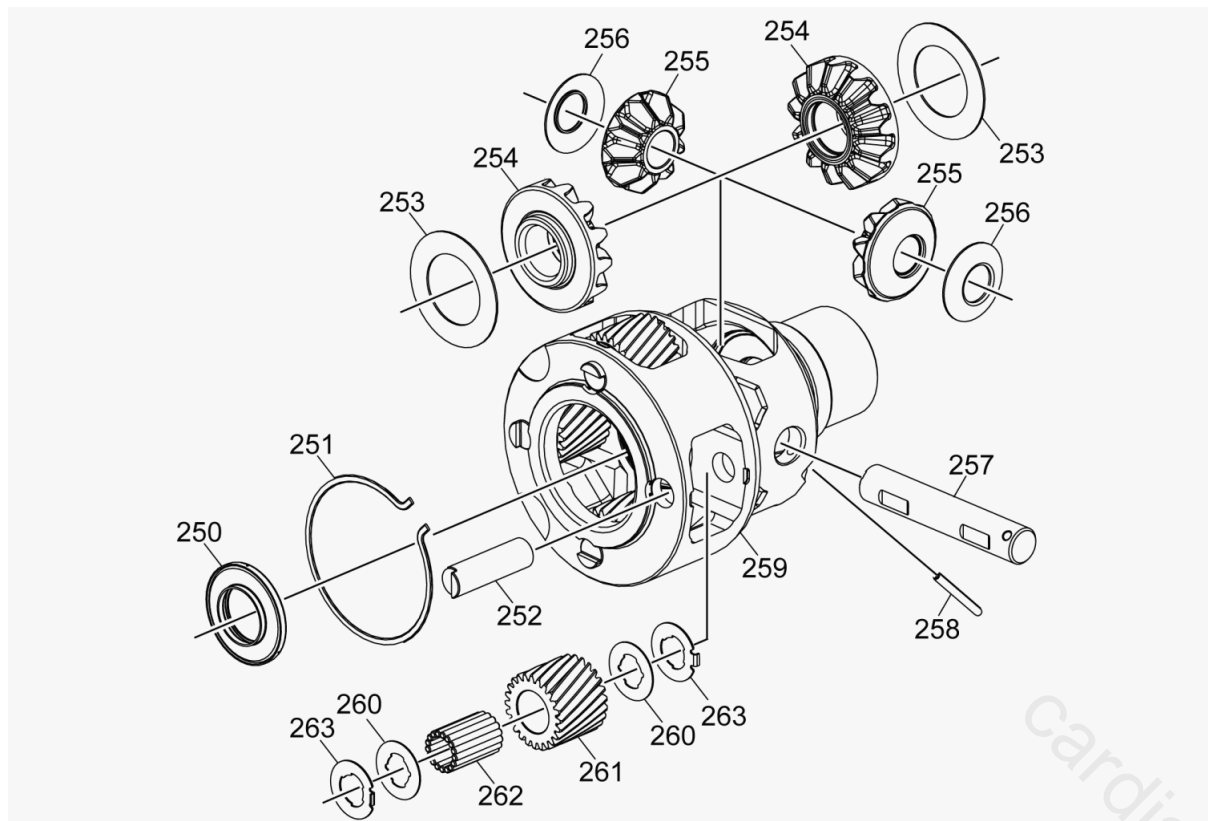


Fig. 5: Front Differential Carrier Assembly Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
250	Differential Sun Gear to Differential Housing Bearing Assembly
251	Final Drive Retainer
252	Final Drive Pinion Pin
253	Front Differential Side Gear Thrust Washer
254	Front Differential Side Gear
255	Front Differential Pinion Gear Thrust Washer
256	Front Differential Pinion Gear
257	Front Differential Pinion Gear Shaft
258	Front Differential Pinion Gear Shaft Pin
259	Differential Carrier
260	Final Drive Inner and Outer Washer
261	Pinion Final Drive Gear
262	Final Drive Roller

Oil Pump Assembly

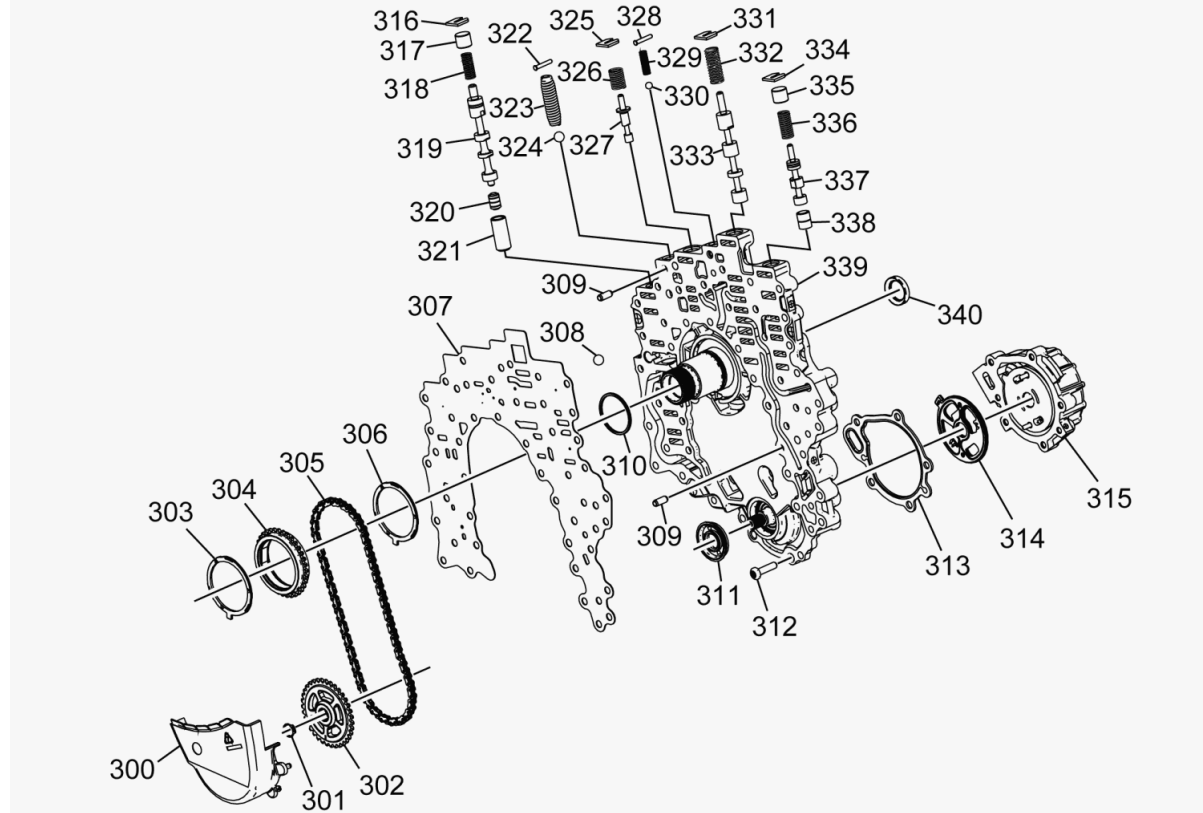


Fig. 6: Oil Pump Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
300	Automatic Transmission Fluid Baffle
301	Drive Sprocket Retaining Ring
302	Driven Sprocket
303	Driven Sprocket Thrust Washer
304	Drive Sprocket
305	Drive Link
306	Driven Sprocket Thrust Washer
307	Auxiliary Control Valve Body Spacer Plate
308	Automatic Transmission Fluid Pump Ball Check Valve
309	Automatic Transmission Fluid Pump Locating Pin
310	Torque Converter Fluid Seal Ring
311	Automatic Transmission Fluid Pump Shaft Seal
312	Automatic Transmission Fluid Pump Cover Bolt
313	Automatic Transmission Fluid Pump Gasket
314	Automatic Transmission Fluid Pump Pressure Plate Seal
315	Automatic Transmission Fluid Pump
316	Pressure Regulator Valve Spring Retainer
317	Pressure Regulator Valve Plug
318	Pressure Regulator Valve Spring
319	Pressure Regulator Valve
320	Pressure Regulator Shuttle Valve
321	Pressure Regulator Valve Bore Bushing
322	Line Blowoff Ball Valve Spring Retainer
323	Automatic Transmission Fluid Pump Blowoff Ball Valve Spring
324	Automatic Transmission Fluid Pump Blowoff Ball Valve
325	Lube Regulator Valve Bore Plug Retainer
326	Lube Boost Valve Spring
327	Lube Regulator Valve
328	Torque Converter Clutch Blowoff Ball Valve Retainer

Callout	Component Name
329	Torque Converter Clutch Blowoff Ball Valve Spring
330	Torque Converter Clutch Blowoff Ball Valve
331	Torque Converter Clutch Control Valve Retainer
332	Torque Converter Clutch Control Valve Spring
333	Torque Converter Clutch Control Valve
334	Torque Converter Clutch Regulator Application Valve Bore Plug Retainer
335	Torque Converter Clutch Regulator Application Valve Bore Plug
336	Torque Converter Clutch Regulator Apply Valve Spring
337	Torque Converter Clutch Regulator Apply Valve
338	Torque Converter Clutch Regulator Application Shuttle Valve
339	Drive Sprocket Support
340	Stator Shaft Seal

Control Valve Solenoid Body Assembly (with ETRS)

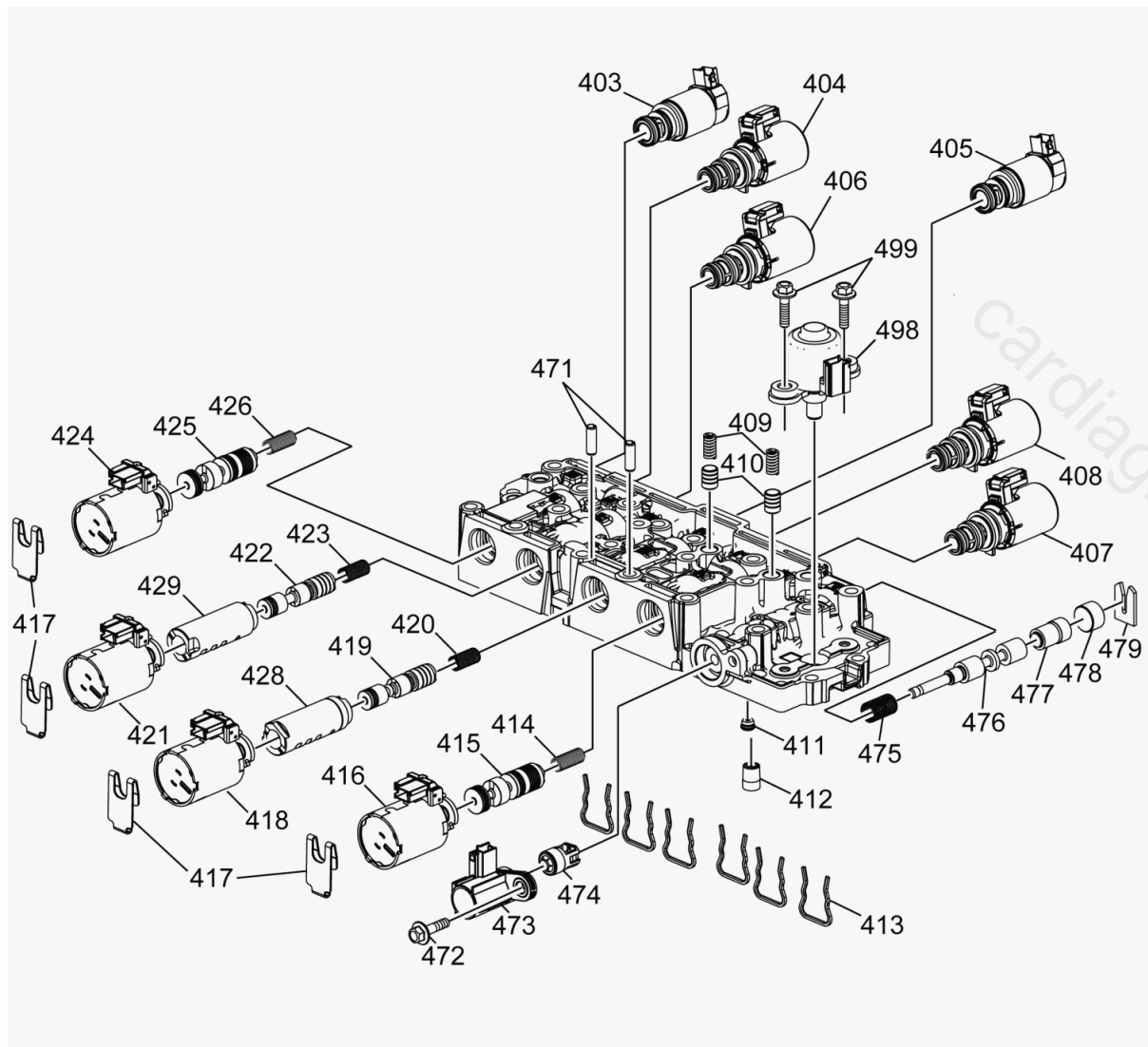


Fig. 7: Control Valve Solenoid Body Assembly Components (With ETRS).
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
403	Shift Solenoid Valve
404	Shift Solenoid Valve
405	Shift Solenoid Valve
406	Shift Solenoid Valve
407	Shift Solenoid Valve
408	Shift Solenoid Valve
409	Variable Feed Solenoid Clutch Accumulator Piston Spring

Callout	Component Name
410	Variable Feed Solenoid Clutch Accumulator Piston
411	Variable High and 2-3-4 Clutch Housing Valve
412	Automatic Transmission Fluid Trough Check Ball
413	Control Valve Solenoid Retainer
414	2-9 Clutch Regulator Valve Spring
415	2-9 Clutch Regulator Valve
416	Shift Solenoid Valve
417	Control Valve Solenoid Retainer
418	Shift Solenoid Valve
419	1-2-3-4-5-6 Clutch Regulator Valve
420	1-2-3-4-5-6 Clutch Regulator Spring
421	Shift Solenoid Valve
422	1-Reverse and 6-7-8-9 Clutch Regulator Valve
423	1-Reverse and 6-7-8-9 Clutch Regulator Valve Spring
424	Shift Solenoid Valve
425	5-7-Reverse Clutch Regulator Valve
426	5-7-Reverse Clutch Regulator Valve Spring
427	Control Valve Solenoid Body Bolt (Qty: 4)
428	1-2-3-4-5-6 Clutch Regulator Valve Sleeve
429	1-Reverse and 6-7-8-9 Clutch Regulator Valve Sleeve
471	Clutch Regulator Valve Sleeve Pin
472	Control Valve Solenoid Body Bolt
473	Mode Valve Position Switch
474	Mode Valve Position Switch Magnet
475	Mode 1 Valve Spring
476	Mode 1 Electronic Transmission Range Selector Valve
477	Mode 1 Valve
478	Mode 1 Valve Bore Plug
479	Mode 1 Valve Bore Plug Retainer
498	Park Inhibitor Solenoid
499	Control Valve Solenoid Body Bolt

Control Valve Solenoid Body Assembly (without ETRS)

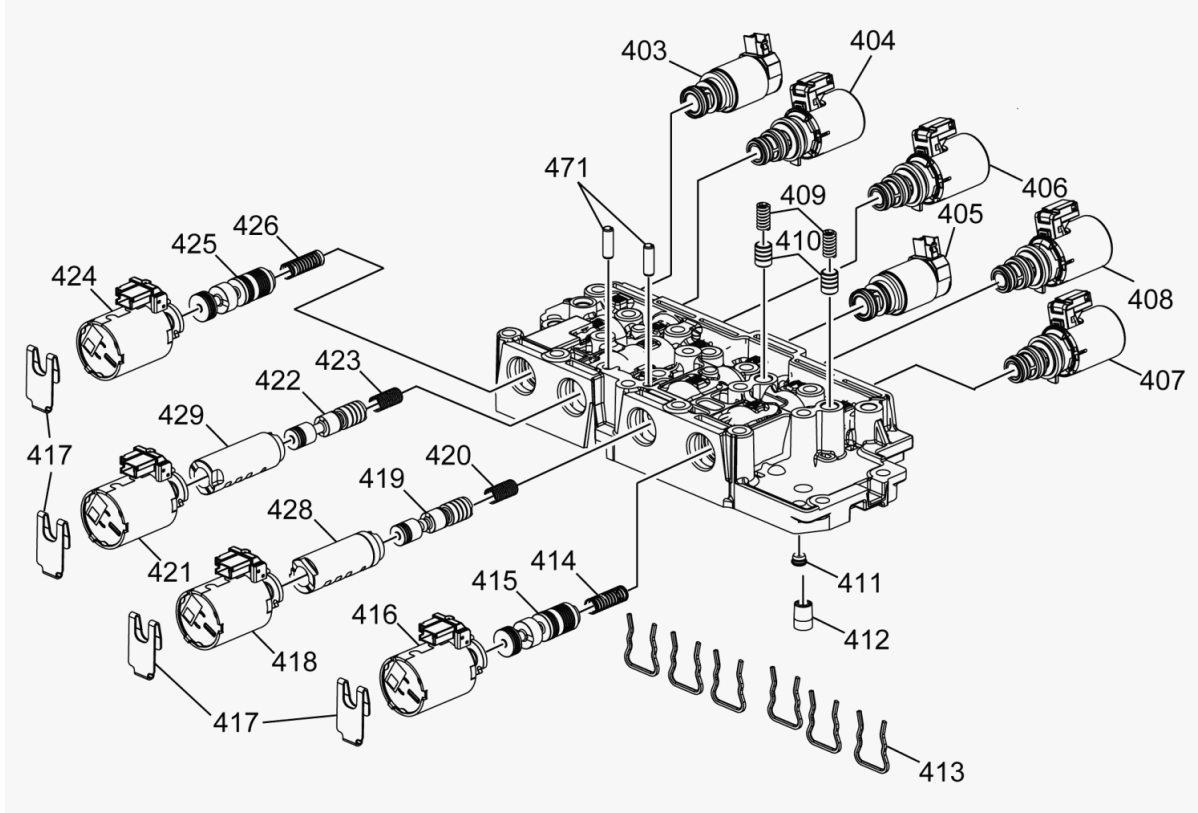


Fig. 8: Control Valve Solenoid Body Assembly Components (Without ETRS)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
403	Shift Solenoid Valve
404	Shift Solenoid Valve
405	Shift Solenoid Valve
406	Shift Solenoid Valve
407	Shift Solenoid Valve
408	Shift Solenoid Valve
409	Variable Feed Solenoid Clutch Accumulator Piston Spring
410	Variable Feed Solenoid Clutch Accumulator Piston
411	Variable High and 2-3-4 Clutch Housing Valve
412	Automatic Transmission Fluid Trough Check Ball
413	Control Valve Solenoid Retainer
414	2-9 Clutch Regulator Valve Spring
415	2-9 Clutch Regulator Valve
416	Shift Solenoid Valve
417	Control Valve Solenoid Retainer
418	Shift Solenoid Valve
419	1-2-3-4-5-6 Clutch Regulator Valve
420	1-2-3-4-5-6 Clutch Regulator Spring
421	Shift Solenoid Valve
422	1-Reverse and 6-7-8-9 Clutch Regulator Valve
423	1-Reverse and 6-7-8-9 Clutch Regulator Valve Spring
424	Shift Solenoid Valve
425	5-7-Reverse Clutch Regulator Valve
426	5-7-Reverse Clutch Regulator Valve Spring
427	Control Valve Solenoid Body Bolt (Qty: 4)
428	1-2-3-4-5-6 Clutch Regulator Valve Sleeve
429	1-Reverse and 6-7-8-9 Clutch Regulator Valve Sleeve
471	Clutch Regulator Valve Sleeve Pin

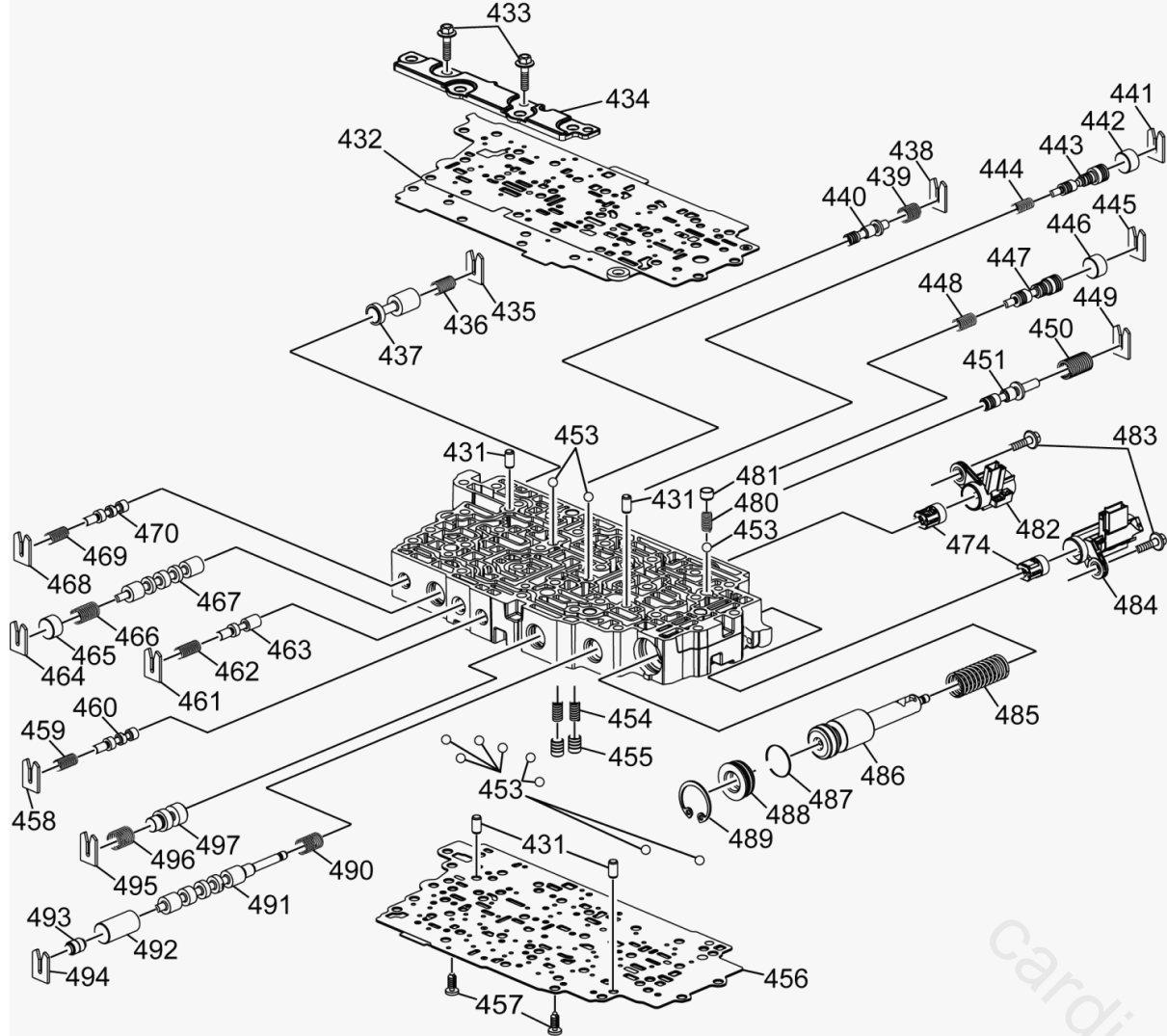


Fig. 9: Control Valve Body Assembly Components (With ETRS)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
431	Control Valve Body Locating Pin
432	Control Valve Body Spacer Plate
433	Control Valve Solenoid Body Bolt
434	Oil Transfer Plate
435	Oil Level Control Valve Spring Retainer
436	Automatic Transmission Fluid Level Control Valve Spring
437	Automatic Transmission Fluid Level Control Valve
438	Feed Limit Valve Spring Retainer
439	Feed Limit Valve Spring
440	Feed Limit Valve
441	4th Clutch Regulator Valve Bore Plug Retainer
442	4th Clutch Regulator Valve Bore Plug
443	4th Clutch Regulator Valve
444	3-8 Clutch Regulator Valve Spring
445	3-8 Clutch Regulator Valve Bore Plug Retainer
446	3-8 Clutch Regulator Valve Bore Plug
447	3-8 Clutch Regulator Valve
448	3-8 Clutch Regulator Valve Spring
449	Actuator Feed Limit Valve Spring Retainer
450	Actuator Feed Limit Valve Spring
451	Actuator Feed Limit Valve
452	Manual Valve
453	Control Valve Body Ball Check Valve

Callout	Component Name
454	Variable Feed Solenoid Clutch Accumulator Piston Spring
455	Variable Feed Solenoid Clutch Accumulator Piston
456	Control Valve Body Spacer Plate
457	Control Valve Body Spacer Plate Retainer
458	5-7-Reverse Clutch Boost Valve Spring Retainer
459	1-2-3-4-5-6 Clutch Boost Valve Spring
460	1-2-3-4-5-6 Clutch Boost Valve
461	Latch Valve Spring Retainer
462	Latch Valve Spring
463	Latch Valve
464	Clutch Selector Valve Bore Plug Retainer
465	Clutch Selector Valve Bore Plug
466	Clutch Selector Valve Spring
467	Clutch Selector Valve
468	1-2-3-4-5-6 Clutch Boost Valve Spring Retainer
469	5-7-Reverse Clutch Boost Valve Spring
470	5-7-Reverse Clutch Boost Valve
474	Mode Valve Position Switch Magnet
480	Park Selector Valve Spring
481	Park Selector Valve Bore Plug
482	Mode Valve Position Switch
483	Control Valve Solenoid Body Bolt
484	Parking Servo Piston Switch
485	Park Release Servo Piston Spring
486	Park Release Servo Piston
487	Park Release Servo Piston Seal
488	Park Release Servo Valve Bore Plug
489	Park Release Servo Valve Bore Plug Retainer
490	Mode 2 Valve Spring
491	Mode 2 Electronic Transmission Range Selector Valve
492	Modulator Valve Bushing
493	Mode 2 Valve
494	Electronic Transmission Range Selector Mode Enable Valve Spring Retainer
495	Mode 2 Valve Bore Plug Retainer
496	Electronic Transmission Range Selector Mode Enable Valve Spring
497	Electronic Transmission Range Selector Mode Enable Valve

Control Valve Body Assembly (without ETRS)

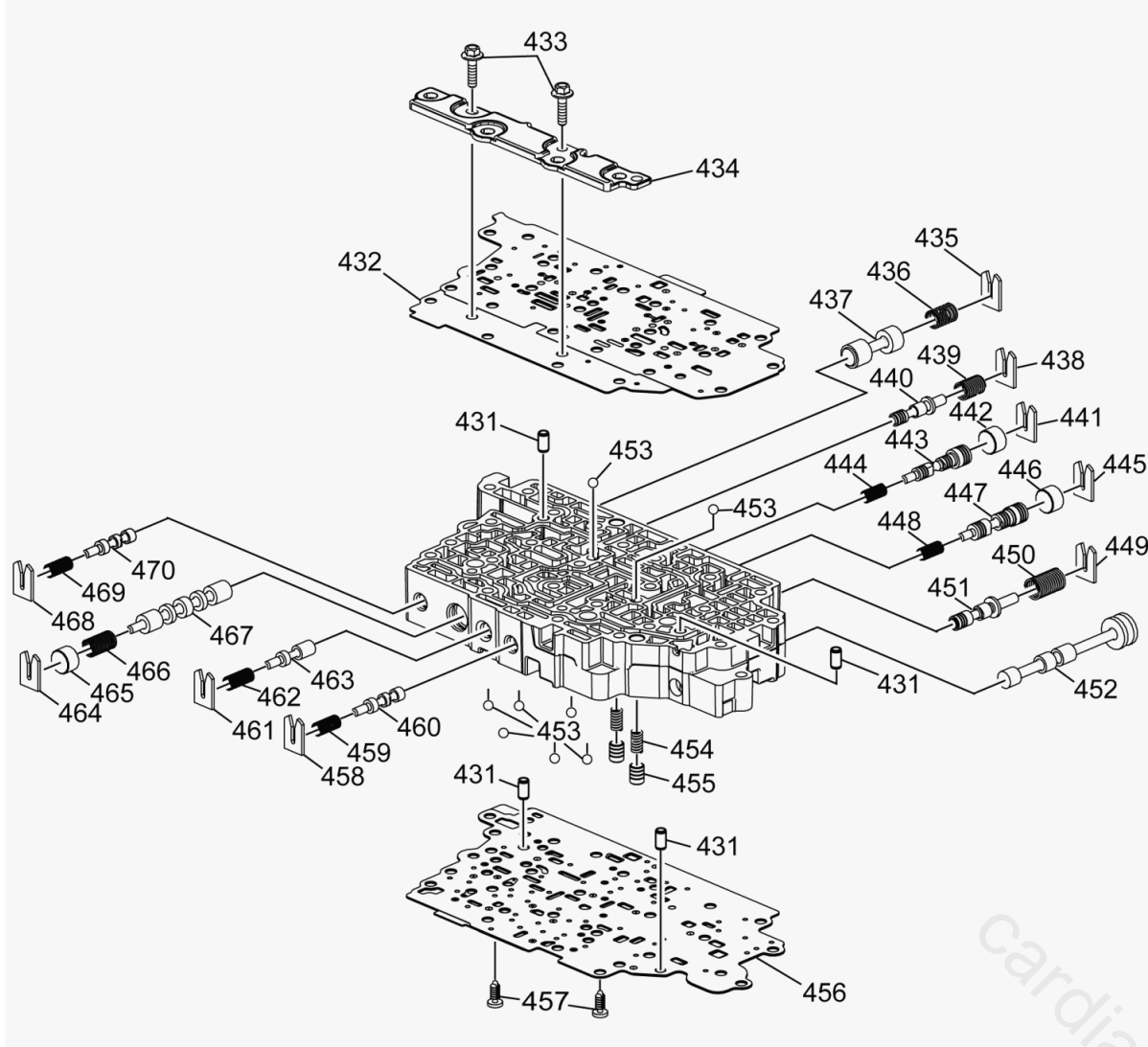


Fig. 10: Control Valve Body Assembly Components (Without ETRS)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
431	Control Valve Body Locating Pin
432	Control Valve Body Spacer Plate
433	Control Valve Solenoid Body Bolt
434	Oil Transfer Plate
435	Oil Level Control Valve Spring Retainer
436	Automatic Transmission Fluid Level Control Valve Spring
437	Automatic Transmission Fluid Level Control Valve
438	Feed Limit Valve Spring Retainer
439	Feed Limit Valve Spring
440	Feed Limit Valve
441	4th Clutch Regulator Valve Bore Plug Retainer
442	4th Clutch Regulator Valve Bore Plug
443	4th Clutch Regulator Valve
444	4th Clutch Regulator Valve Spring
445	3-8 Clutch Regulator Valve Bore Plug Retainer
446	3-8 Clutch Regulator Valve Bore Plug
447	3-8 Clutch Regulator Valve
448	3-8 Clutch Regulator Valve Spring
449	Actuator Feed Limit Valve Spring Retainer
450	Actuator Feed Limit Valve Spring
451	Actuator Feed Limit Valve
452	Manual Valve

Callout	Component Name
453	Control Valve Body Ball Check Valve
454	Variable Feed Solenoid Clutch Accumulator Piston Spring
455	Variable Feed Solenoid Clutch Accumulator Piston
456	Control Valve Body Spacer Plate
457	Control Valve Body Spacer Plate Retainer
458	1-2-3-4-5-6 Clutch Boost Valve Spring Retainer
459	1-2-3-4-5-6 Clutch Boost Valve Spring
460	1-2-3-4-5-6 Clutch Boost Valve
461	Latch Valve Spring Retainer
462	Latch Valve Spring
463	Latch Valve
464	Clutch Selector Valve Bore Plug Retainer
465	Clutch Selector Valve Bore Plug
466	Clutch Selector Valve Spring
467	Clutch Selector Valve
468	5-7-Reverse Clutch Boost Valve Spring Retainer
469	5-7-Reverse Clutch Boost Valve Spring
470	5-7-Reverse Clutch Boost Valve

Output Carrier Transfer Drive Gear Hub Assembly

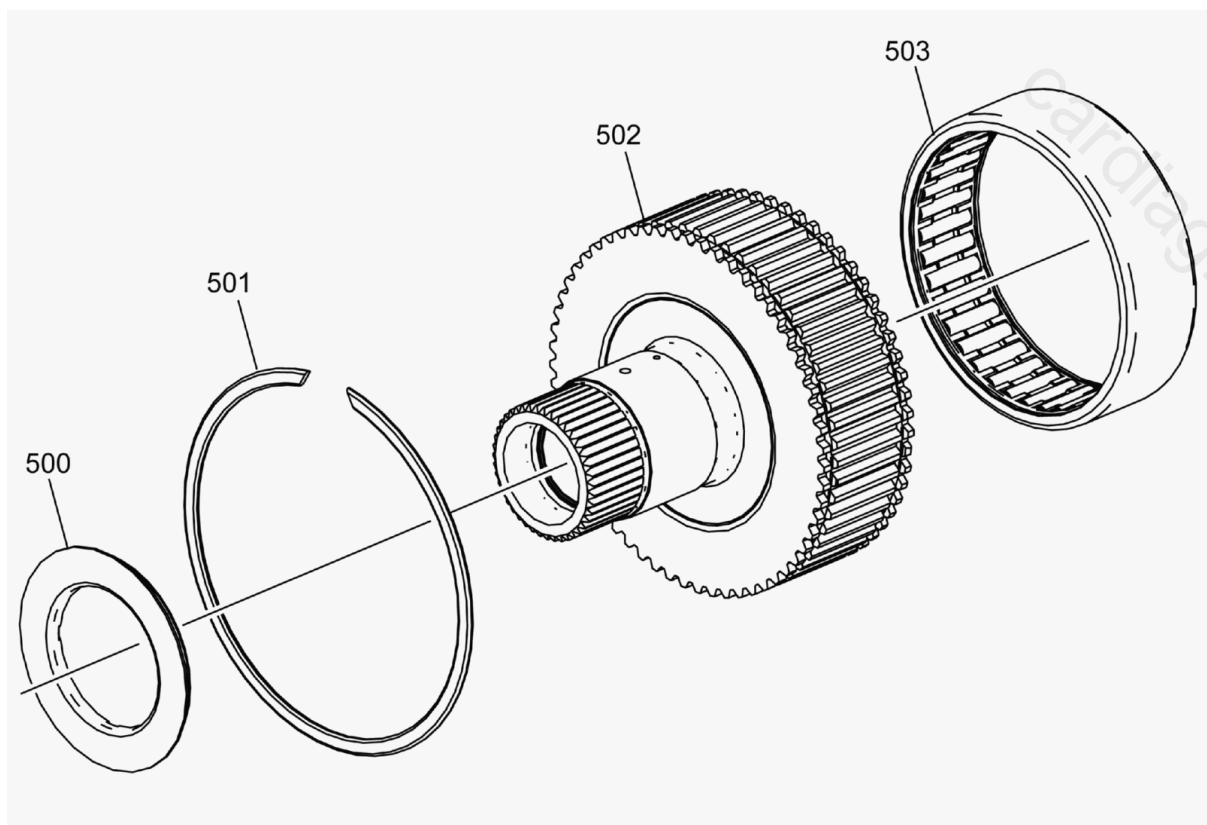


Fig. 11: Output Carrier Transfer Drive Gear Hub Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
500	Reaction Sun Gear Thrust Bearing
501	Drive Sprocket Retaining Ring
502	Output Carrier Transfer Drive Gear Hub
503	Output Carrier Hub Bearing

2-9 and 3-8 Clutch Plate Assemblies

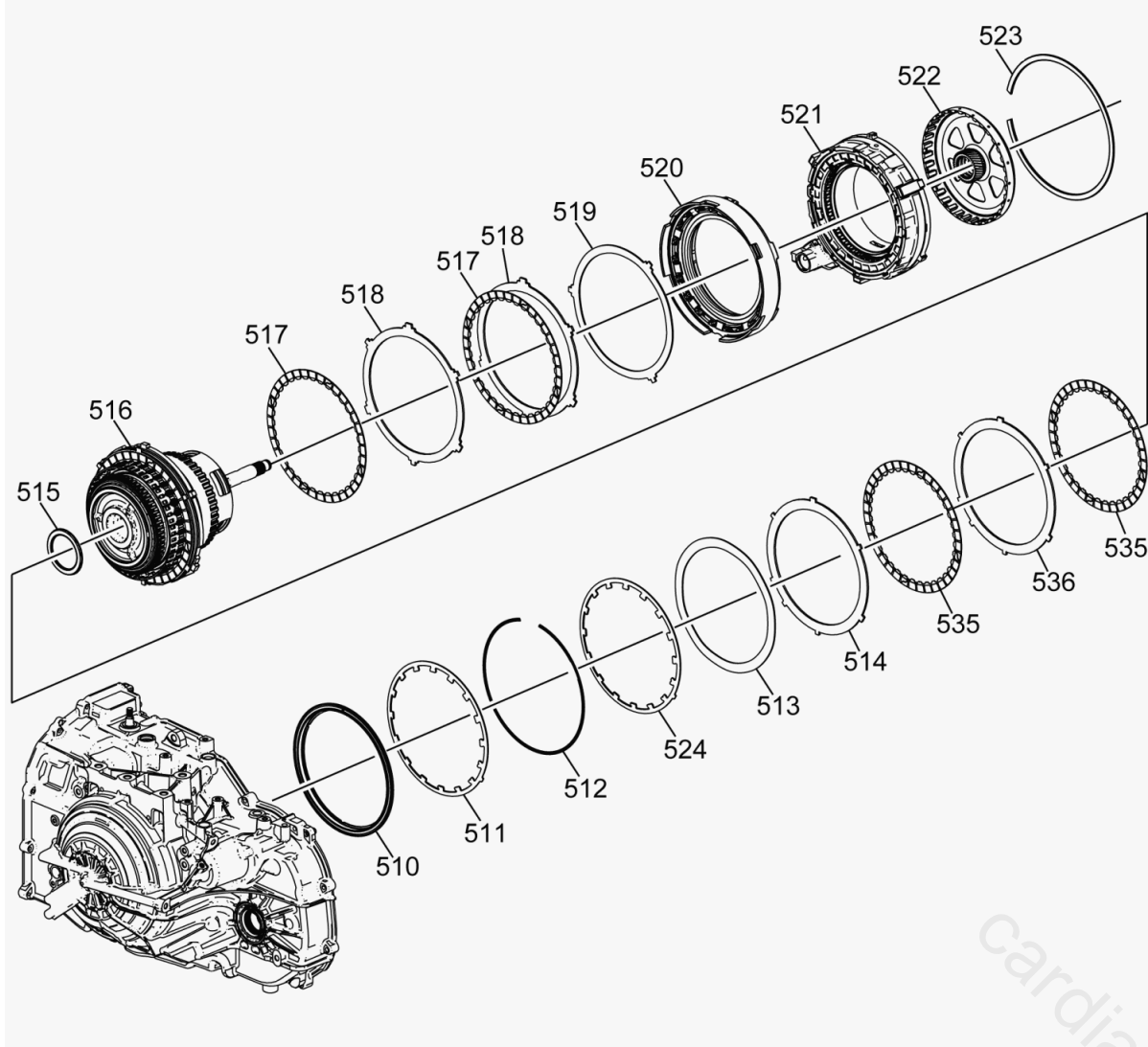


Fig. 12: 2-9 and 3-8 Clutch Plate Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
510	3-8 Clutch Piston
511	3-8 Clutch Spring
512	3-8 Clutch Spring Retaining Ring
513	3-8 Clutch Plate - Wave
514	3-8 Clutch Plate
535	3-8 Clutch Plate - Friction
536	3-8 Clutch Plate
515	6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing
516	5-7-Reverse and 6-7-8-9 Clutch Housing
517	2-9 Clutch Plate - Friction
518	2-9 Clutch Plate
519	2-9 Clutch Waved Plate
520	2-9 and 4 Clutch Piston Housing Assembly
521	1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Assembly
522	Output Sun Gear
523	1-2-3-4-5-6 Clutch Piston Housing Return Ring
524	3-8 Clutch Apply Ring

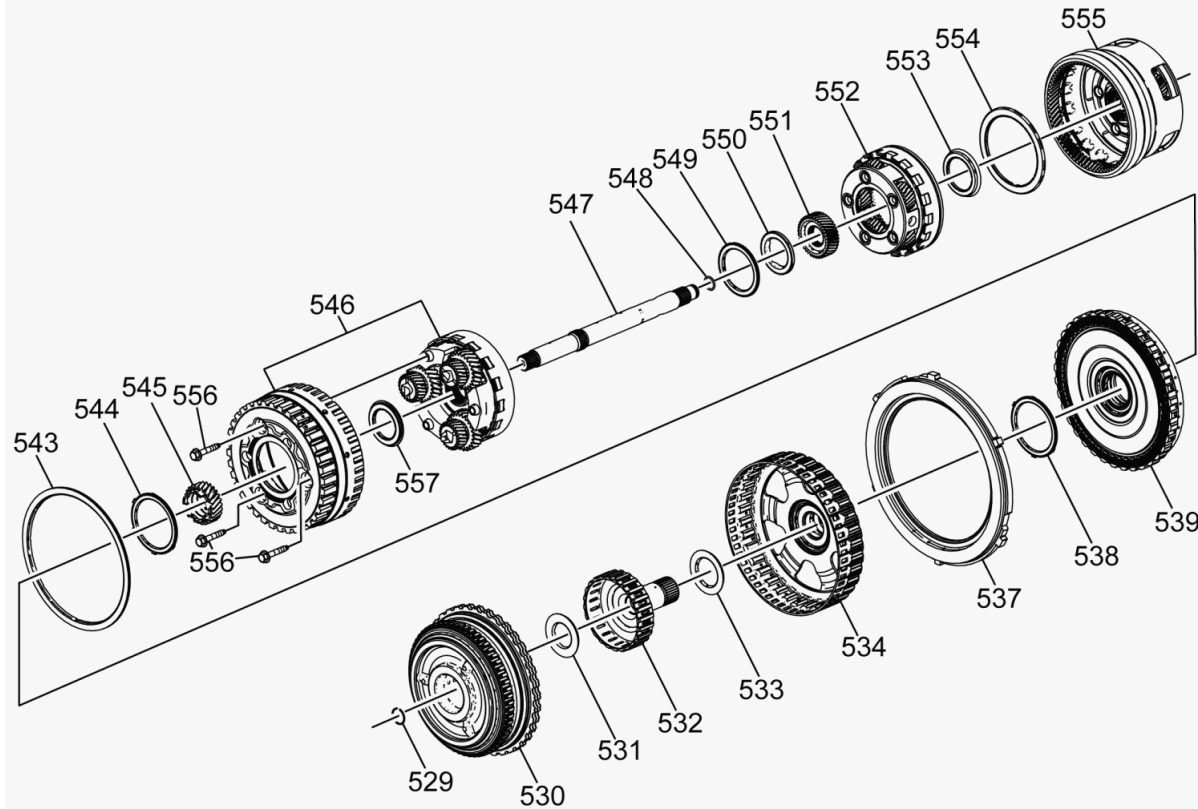


Fig. 13: 5-7-Rev and 6-7-8-9 Clutch Housing Assembly Components (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
529	Turbine Shaft Retainer Ring
530	5-7-Reverse and 6-7-8-9 Clutch Housing Assembly
531	Reaction Carrier Hub Bearing
532	Reaction Carrier Hub
533	Reaction Carrier Sun Gear Thrust Bearing
534	3-8 and 5-7-Reverse Clutch Hub
537	2-9 Clutch Backing Plate
538	Overdrive Sun Gear Thrust Bearing
539	2-9 and 4 Clutch Hub Assembly
543	4th Clutch Thrust Bearing
544	Overdrive Sun Gear Thrust Bearing
545	Reaction Sun Gear
546	Overdrive Carrier
547	Turbine Shaft
548	Turbine Shaft Seal
549	Input Carrier Thrust Bearing
550	Input Sun Gear Thrust Bearing
551	Input Sun Gear
552	Input Carrier
553	Input Sun Gear Thrust Bearing
554	Output Carrier Thrust Bearing
555	Output Carrier
556	Overdrive and Reaction Carrier Bolt (Qty: 3)
557	Reaction Sun Gear Thrust Bearing

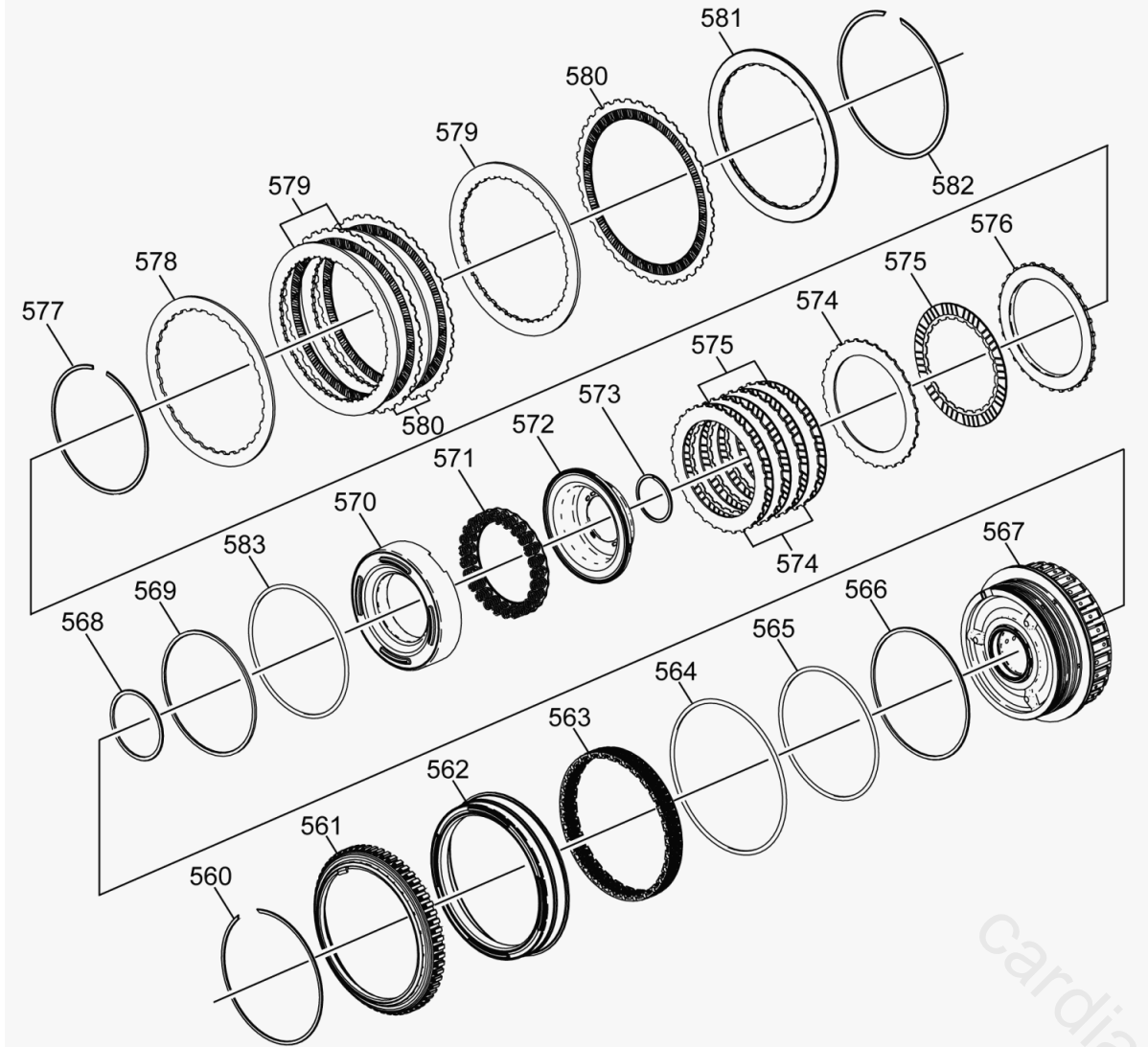


Fig. 14: 5-7-Rev and 6-7-8-9 Clutch Housing Assembly Components (2 Of 2)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
560	Automatic Transmission Input Shaft Speed Sensor Reluctor Ring Retaining Ring
561	Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel
562	3-5-Reverse Clutch Piston
563	5-7-Reverse Piston Retainer Spring
564	3-5-Reverse Clutch Piston Dam Seal
565	3-5-Reverse Clutch Piston Inner Seal
566	3-5-Reverse Clutch Piston Inner Seal
567	5-7-Reverse and 6-7-8-9 Clutch Housing
568	4-5-6 Clutch Piston Inner Seal
569	4-5-6 Clutch Piston Dam Seal
570	6-7-8-9 Clutch Piston
571	6-7-8-9 Clutch Piston Retainer Spring
572	6-7-8-9 Clutch Piston Dam
573	4-5-6 Clutch Dam Retaining Ring
574	6-7-8-9 Clutch Plate
575	6-7-8-9 Clutch Plate - Friction
576	6-7-8-9 Clutch Backing Plate
577	6-7-8-9 Clutch Backing Plate Retaining Ring
578	5-7-Reverse Clutch Apply Plate
579	5-7-Reverse Clutch Plate
580	5-7-Reverse Clutch Plate - Friction
581	5-7-Reverse Clutch Backing Plate

Callout	Component Name
582	5-7-Reverse Clutch Backing Plate Retaining Ring
583	4-5-6 Clutch Piston Outer Seal

1-Rev and 1-2-3-4-5-6 Clutch Piston Housing Assembly

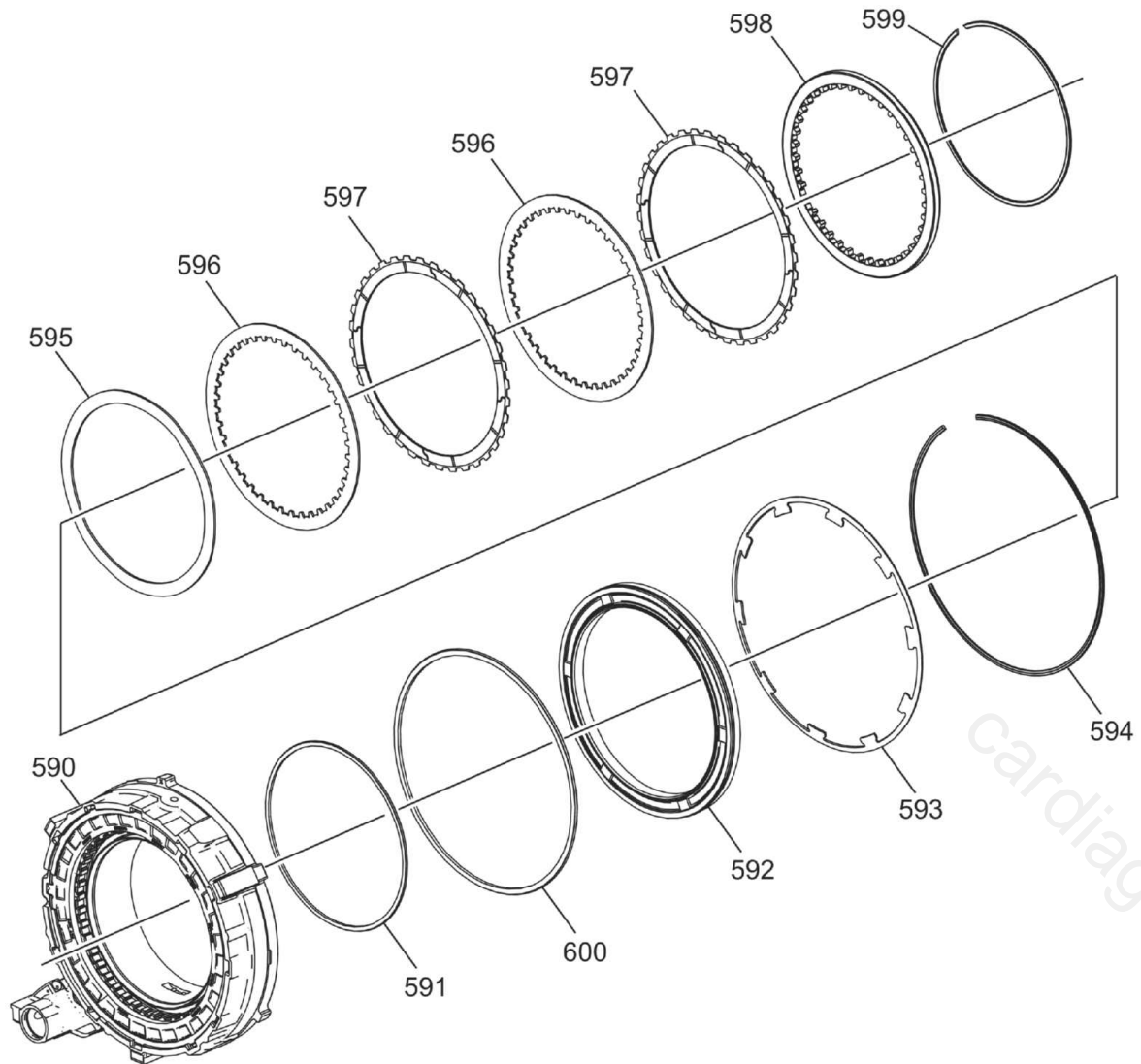


Fig. 15: 1-Rev and 1-2-3-4-5-6 Clutch Piston Housing Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
590	1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing
591	1-2-3-4-5-6 Clutch Piston Inner Seal
592	1-2-3-4-5-6 Clutch Piston
593	1-2-3-4-5-6 Clutch Piston Return Spring
594	1-2-3-4-5-6 Clutch Spring Retaining Ring
595	1-2-3-4-5-6 Clutch Plate - Wave
596	1-2-3-4-5-6 Clutch Plate
597	1-2-3-4-5-6 Clutch Plate - Friction
598	1-2-3-4-5-6 Clutch Backing Plate
599	1-2-3-4-5-6 Clutch Backing Plate Retaining Ring
600	1-2-3-4-5-6 Clutch Piston Seal

2-9 and 4 Clutch Piston Housing Assembly

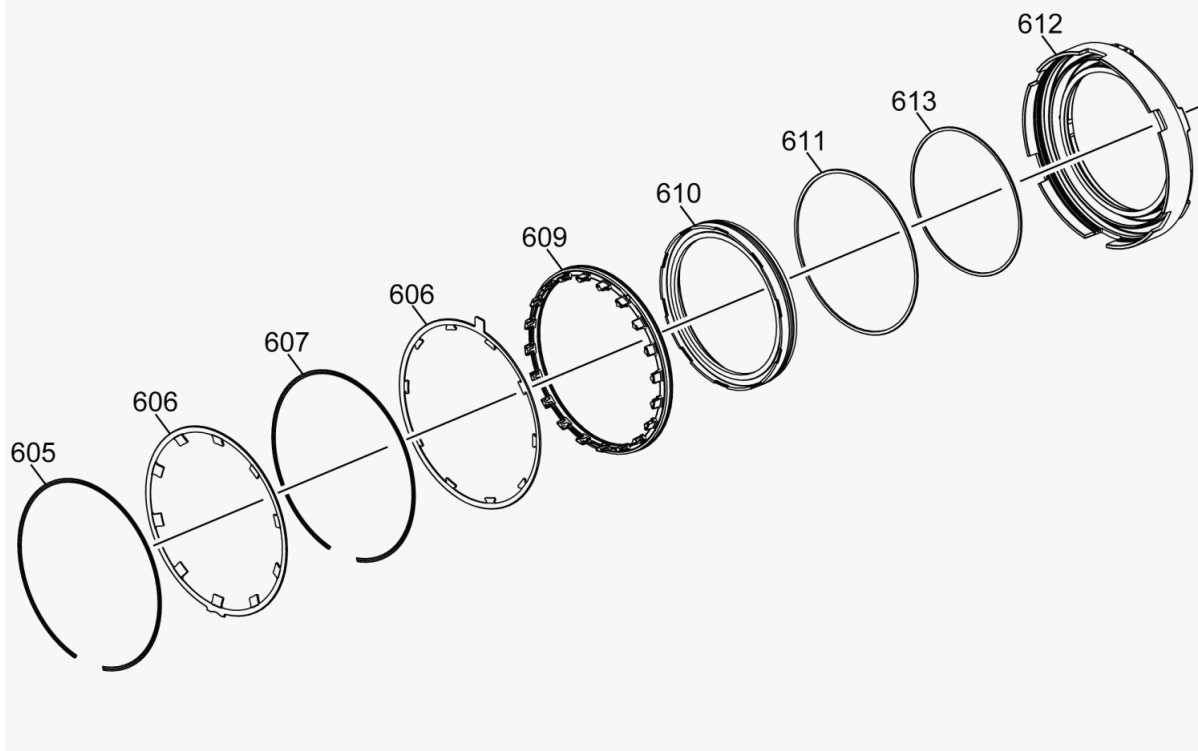


Fig. 16: 2-9 and 4 Clutch Piston Housing Assembly Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
605	3-8 Clutch Spring Retaining Ring
606	4th Clutch Piston Return Spring
607	4th Clutch Piston Retaining Ring
609	2-9 Clutch Piston
610	4th Clutch Piston
611	4th Clutch Piston Outer Seal
612	2-9 and 4 Clutch Piston Housing
613	4th Clutch Piston Inner Seal

2-9 and 4 Clutch Hub Assembly

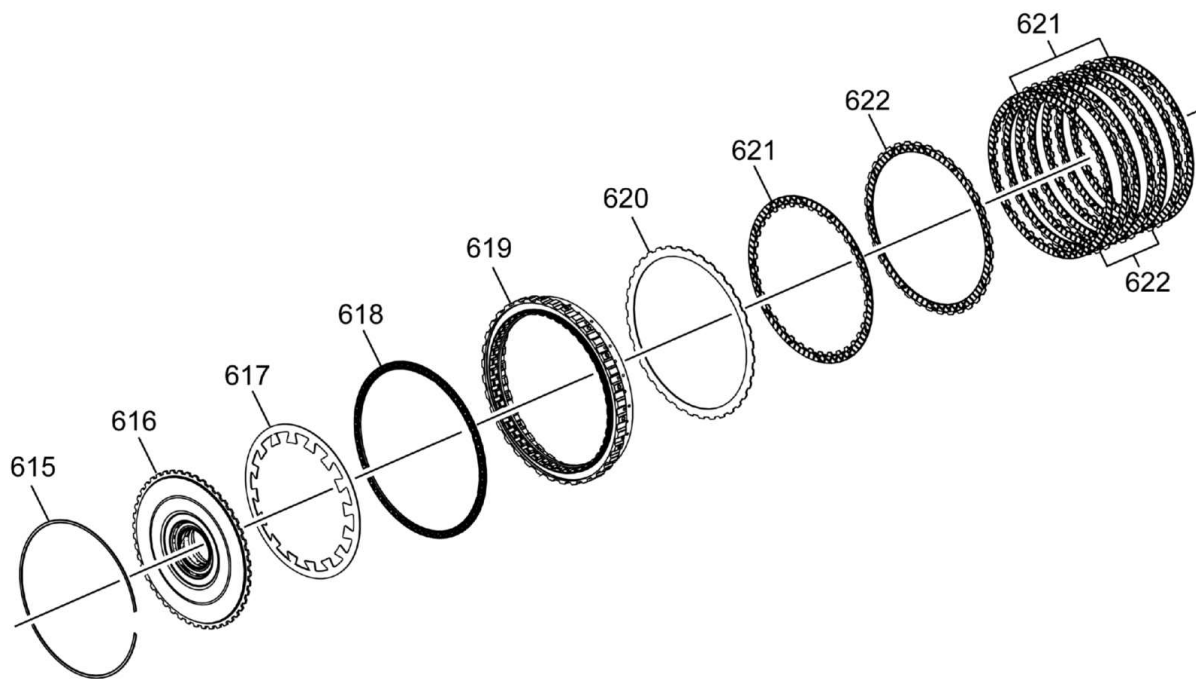


Fig. 17: 2-9 and 4 Clutch Hub Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
615	2-9 and 4 Clutch Hub Ring
616	Overdrive Sun Hub
617	2-9 and 4 Clutch Hub Spring
618	4th Gear Bearing
619	2-9 and 4 Clutch Hub
620	4th Clutch Plate - Apply
621	4th Clutch Plate - Friction
622	4th Clutch Plate

Park System Components (with ETRS)

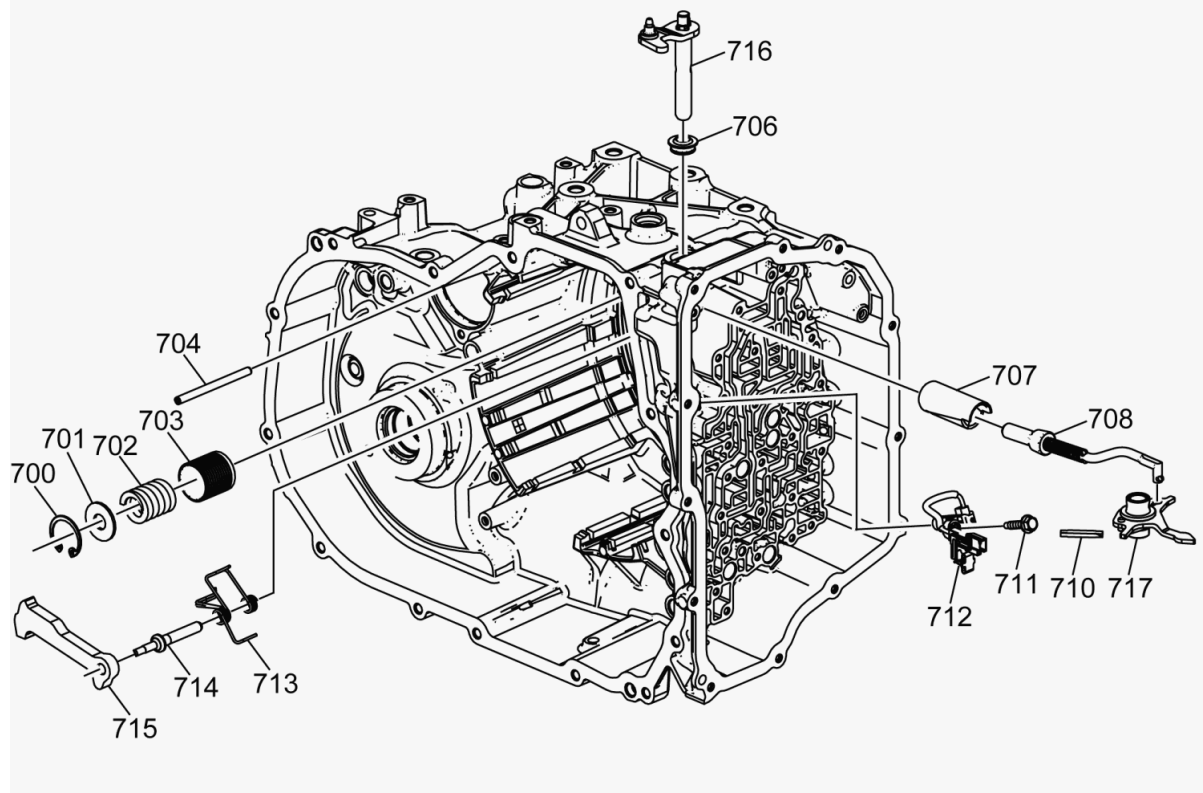


Fig. 18: Park System Components (With ETRS)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
700	4th Clutch Accumulator Piston Retaining Ring
701	4th Clutch Accumulator Piston Spring Washer
702	4th Clutch Accumulator Piston Spring
703	4th Clutch Accumulator Piston
704	Park Pawl Actuator Guide Pin
705	Manual Shift Detent Lever Shaft
707	Park Pawl Actuator Guide
708	Park Pawl Actuator
710	Manual Shift Detent Lever Pin
711	Automatic Transmission Output Speed Sensor Bolt
712	Automatic Transmission Output Speed Sensor
713	Park Pawl Spring
714	Park Pawl Shaft
715	Park Pawl
716	Manual Shift Shaft
717	Park Release Lever

Park System Components (without ETRS)

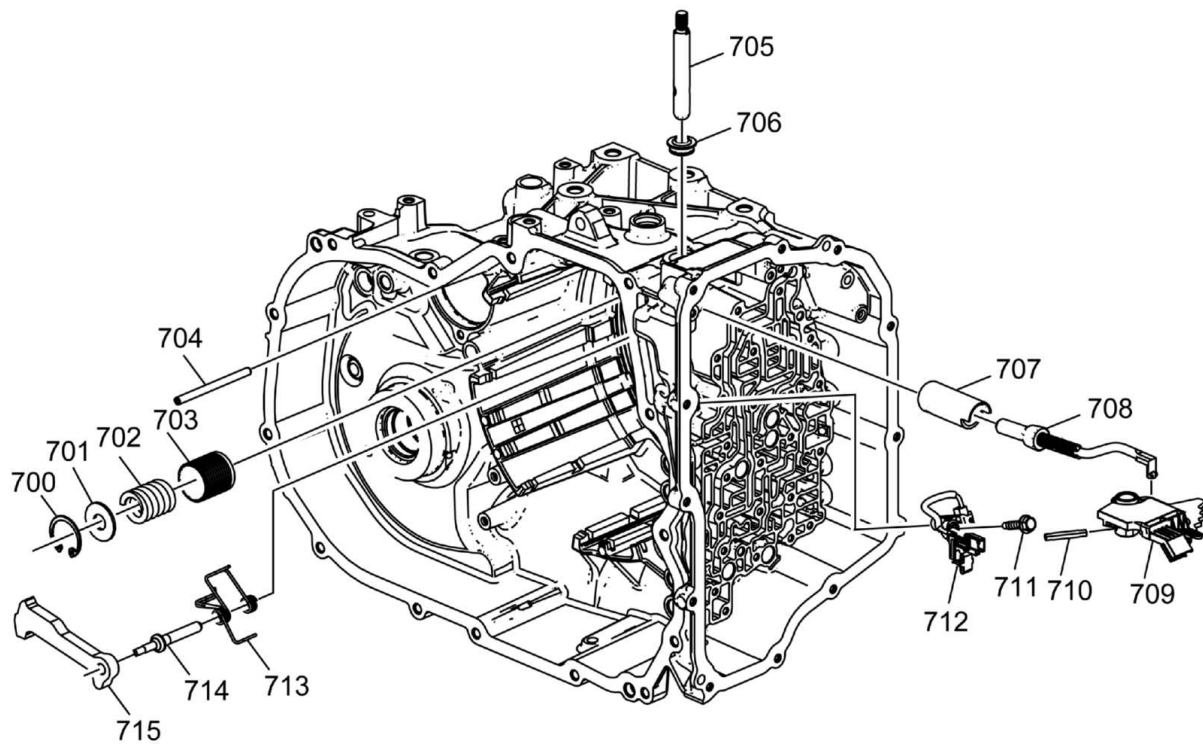


Fig. 19: Park System Components (Without ETRS)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
700	4th Clutch Accumulator Piston Retaining Ring
701	4th Clutch Accumulator Piston Spring Washer
702	4th Clutch Accumulator Piston Spring
703	4th Clutch Accumulator Piston
704	Park Pawl Actuator Guide Pin
705	Manual Shift Detent Lever Shaft
706	Manual Shift Shaft Seal
707	Park Pawl Actuator Guide
708	Park Pawl Actuator
709	Manual Shift Detent Lever
710	Manual Shift Detent Lever Pin
711	Automatic Transmission Output Speed Sensor Bolt
712	Automatic Transmission Output Speed Sensor
713	Park Pawl Spring
714	Park Pawl Shaft
715	Park Pawl

COMPONENT LOCATION

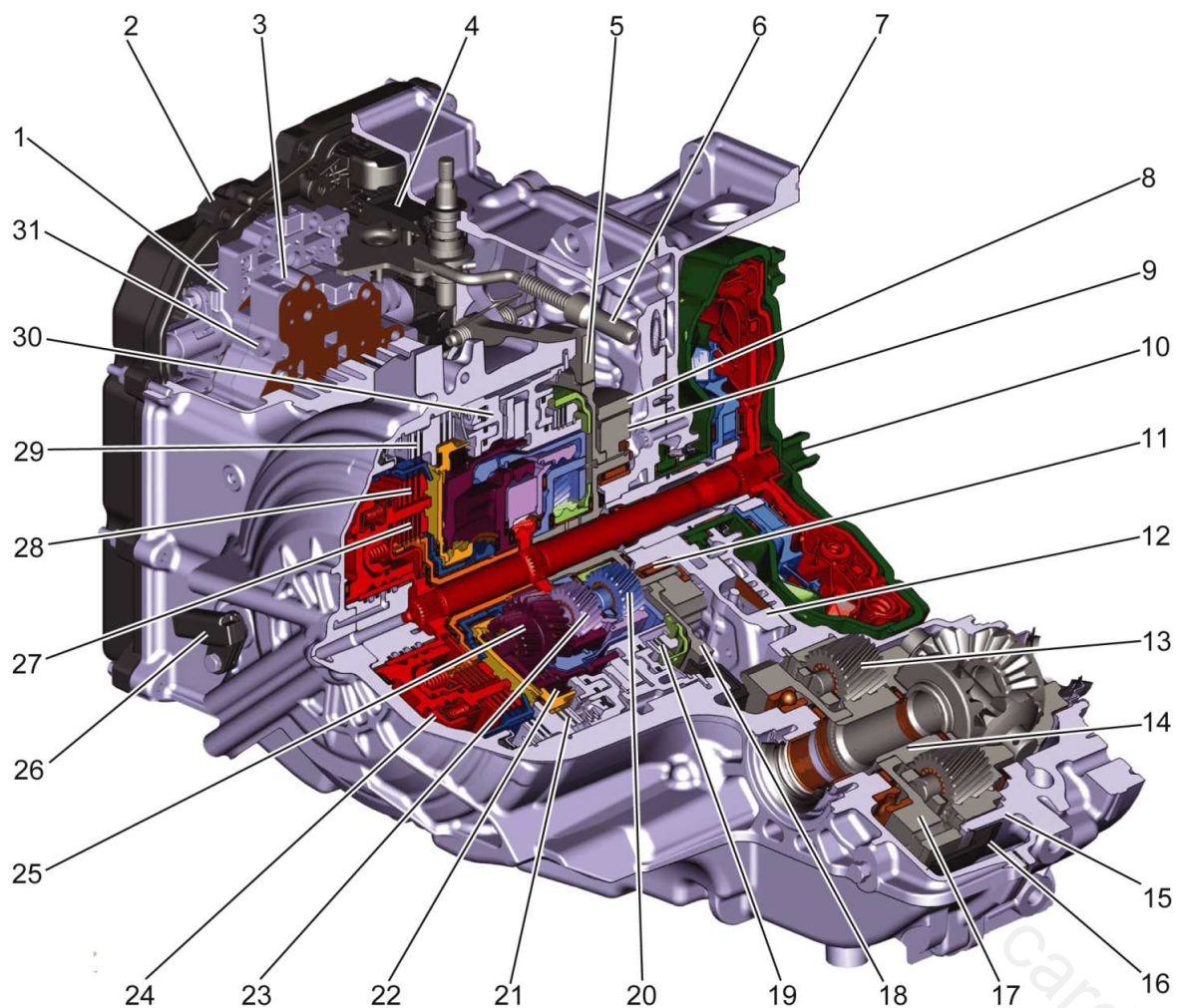


Fig. 20: A/T Component Locations

Courtesy of GENERAL MOTORS COMPANY

1. Control Valve Solenoid Body Assembly
2. Control Valve Body Cover
3. Control Valve Body Assembly
4. Manual Shift Detent Lever
5. Park Pawl
6. Park Pawl Actuator
7. Torque Converter Housing
8. Drive Link
9. Drive Sprocket
10. Torque Converter
11. Output Carrier Transfer Drive Gear Hub Assembly
12. Automatic Transmission Fluid Pump
13. Front Differential Carrier
14. Front Differential Carrier Sun Gear
15. Front Differential Ring Gear
16. Front Differential Carrier Baffle
17. Driven Sprocket
18. Park Gear
19. 1-2-3-4-5-6 Clutch
20. Output Carrier Assembly
21. 2-9 Clutch
22. 4th Clutch

23. Input Carrier Assembly
24. Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel
25. Overdrive and Reaction with Input Internal Gear Carrier
26. Automatic Transmission Input Speed Sensor
27. 6-7-8-9 Clutch
28. 5-7-Reverse Clutch
29. 3-8 Clutch
30. 1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing
31. Manual Valve

BUSHING, BEARING, AND WASHER LOCATIONS

Bushing, Bearing, And Washer Locations

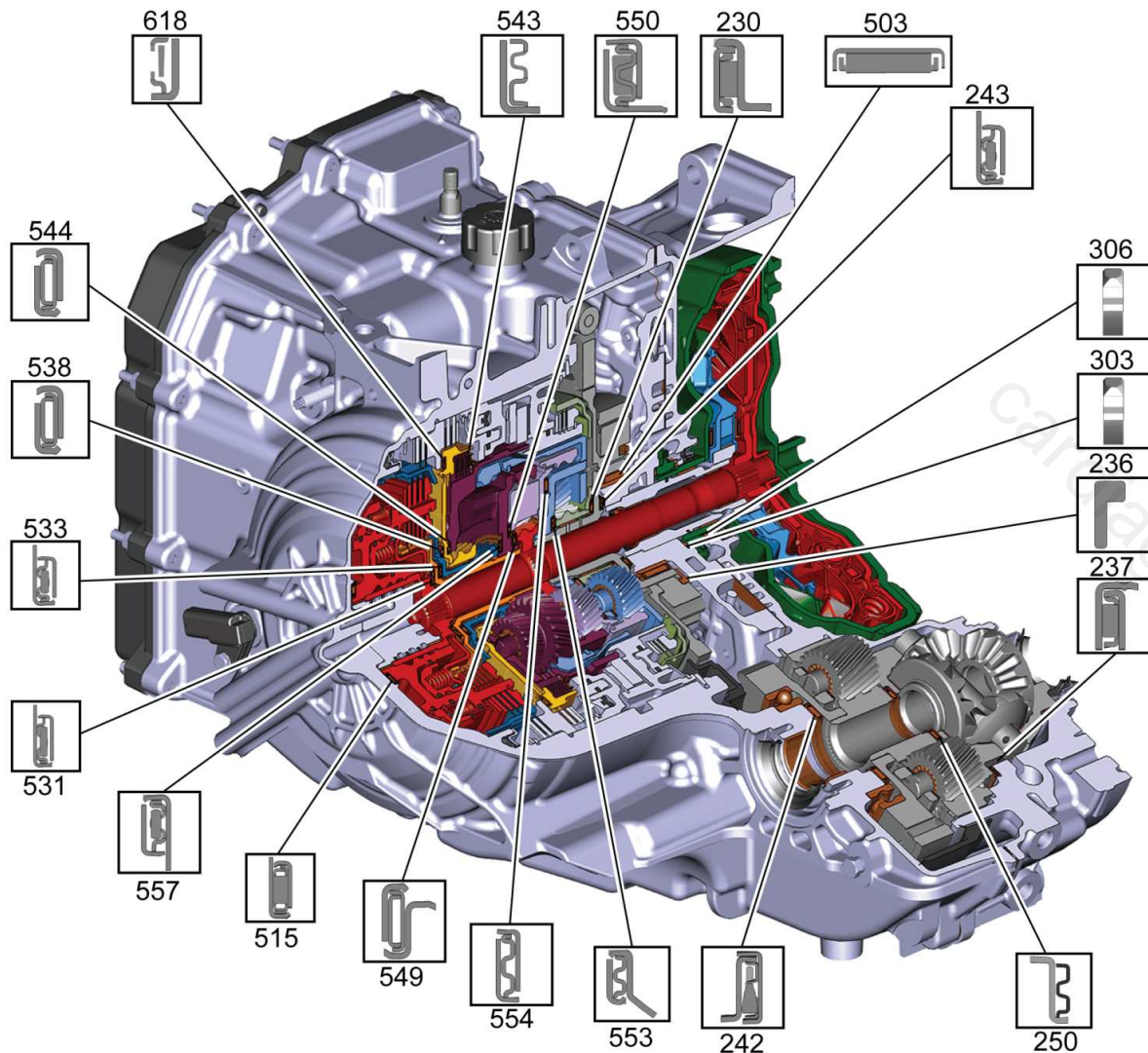


Fig. 21: Bushing, Bearing and Washer Locations
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
230	Output Sun Gear Thrust Bearing
236	Drive Sprocket Thrust Washer
237	Front Differential Carrier Bearing
239	Differential Carrier Sun Gear Thrust Bearing
242	Driven Sprocket Bearing
303	Driven Sprocket Thrust Washer
306	Driven Sprocket Thrust Washer
500	Reaction Sun Gear Thrust Bearing
503	Output Carrier Hub Bearing

Callout	Component Name
515	6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing
531	Reaction Carrier Hub Bearing
533	Reaction Carrier Sun Gear Thrust Bearing
538	Overdrive Sun Gear Thrust Bearing
543	4th Clutch Thrust Bearing
544	Overdrive Sun Gear Thrust Bearing
549	Input Carrier Thrust Bearing
550	Input Sun Gear Thrust Bearing
553	Input Sun Gear Thrust Bearing
554	Output Carrier Thrust Bearing
618	4th Gear Bearing

SEAL LOCATIONS

Seal Locations (1 of 2)

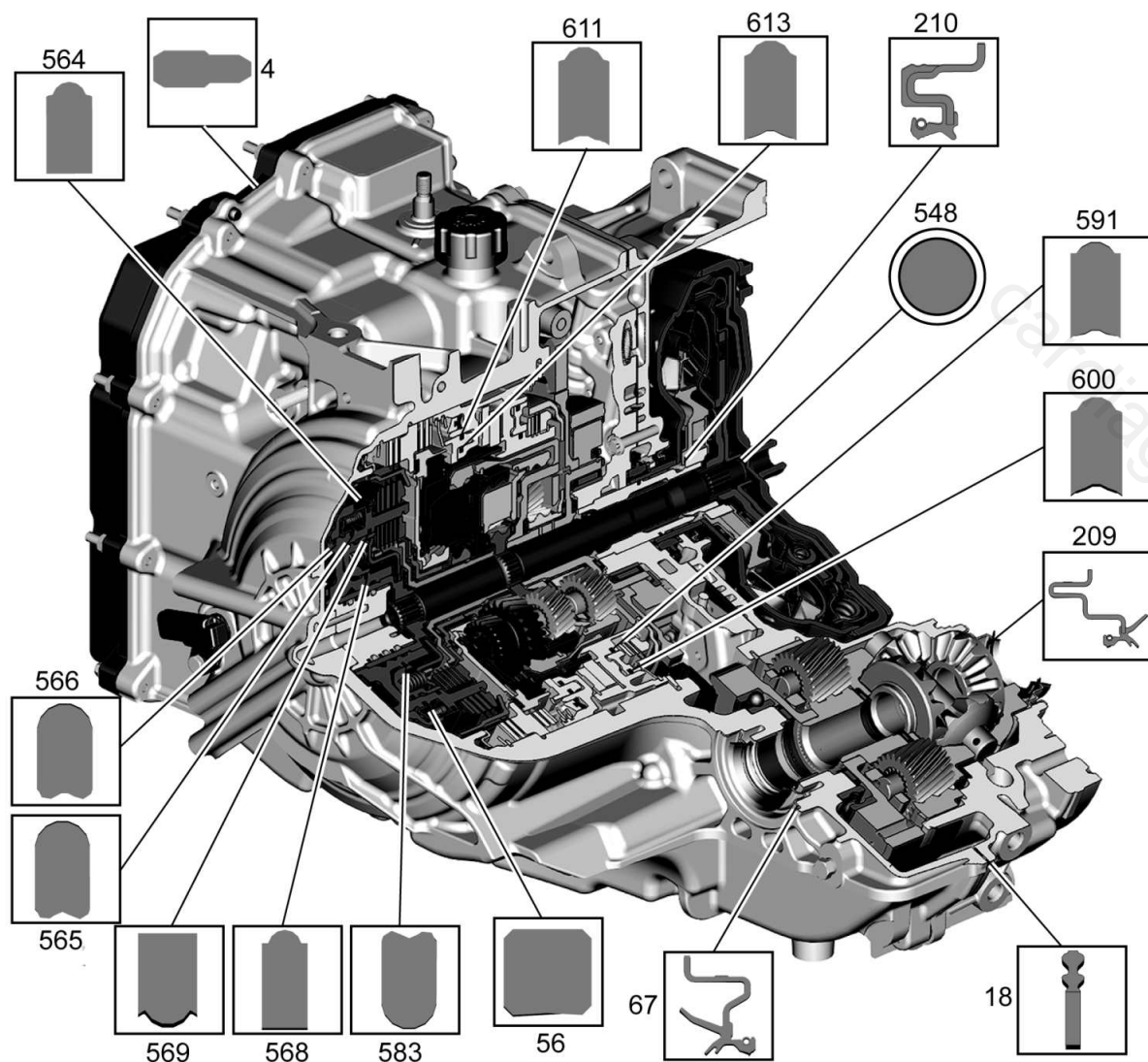


Fig. 22: Seal Locations (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
4	Control Valve Body Cover Gasket
18	Torque Converter Housing Gasket
56	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
67	Front Wheel Drive Shaft Oil Seal
209	Front Wheel Drive Shaft Oil Seal
210	Torque Converter Fluid Seal
548	Turbine Shaft Seal

Callout	Component Name
564	3-5-Reverse Clutch Piston Dam Seal
565	3-5-Reverse Clutch Piston Inner Seal
566	3-5-Reverse Clutch Piston Inner Seal
568	4-5-6 Clutch Piston Inner Seal
569	4-5-6 Clutch Piston Dam Seal
583	4-5-6 Clutch Piston Outer Seal
591	1-2-3-4-5-6 Clutch Piston Inner Seal
600	1-2-3-4-5-6 Clutch Piston Seal
611	4th Clutch Piston Outer Seal
613	4th Clutch Piston Inner Seal

Seal Locations (2 of 2)

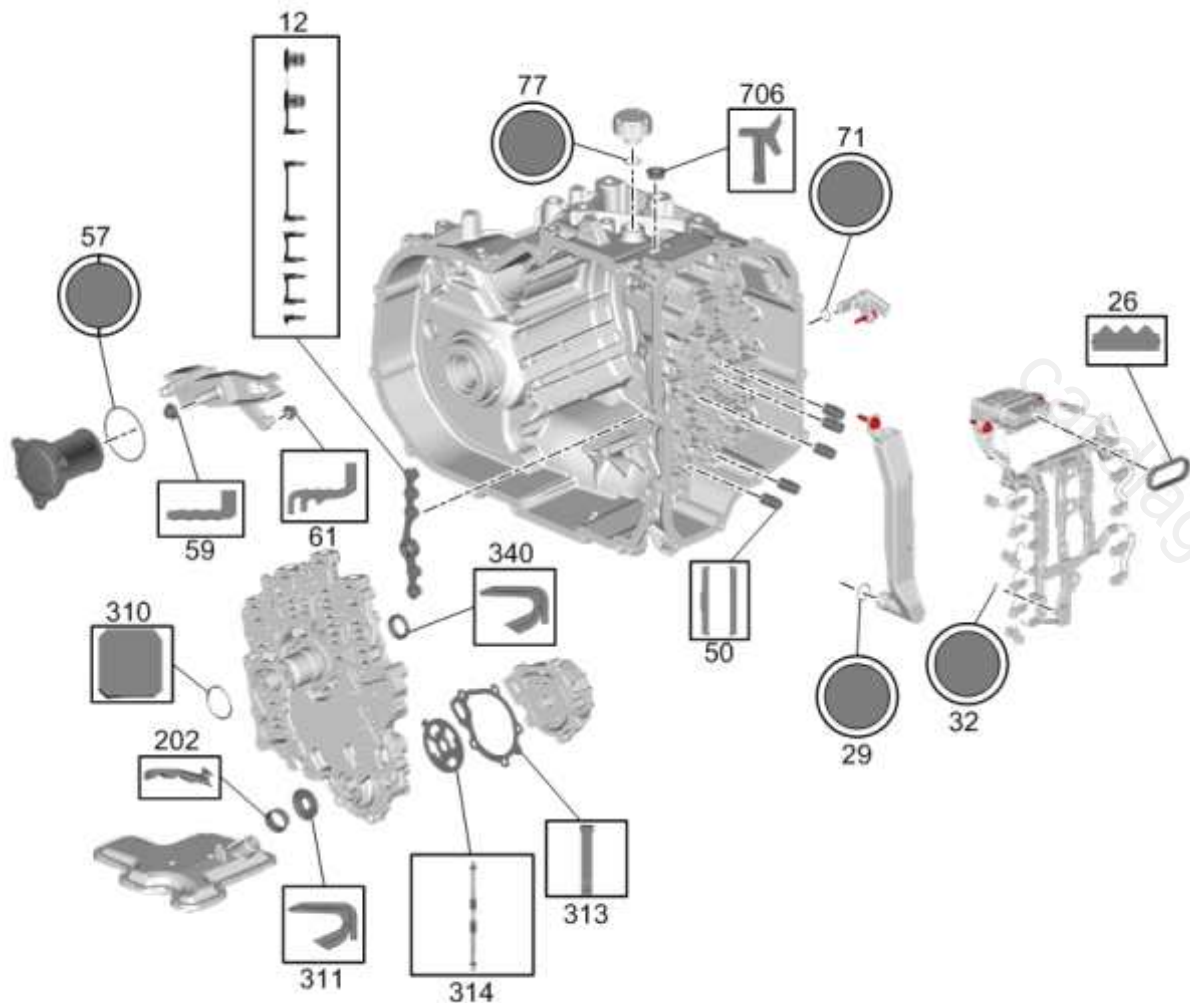


Fig. 23: Seal Locations (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
12	Automatic Transmission Fluid Pump Seal
26	Body Side Wiring Harness Opening Seal
29	Fluid Transfer Pipe Seal
32	Automatic Transmission Wiring Harness Seal
50	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
57	Automatic Transmission Fluid Filter Cover - Seal
59	Drive Link Lubricant Fluid Seal
61	Drive Link Lubricant Fluid Seal
71	Automatic Transmission Input Speed Sensor - Seal

Callout	Component Name
77	Transmission Fluid Filler Cap - Seal
202	Automatic Transmission Fluid Filter Seal
310	Torque Converter Fluid Seal Ring
311	Automatic Transmission Fluid Pump Shaft Seal
313	Automatic Transmission Fluid Pump Gasket
314	Automatic Transmission Fluid Pump Seal
340	Stator Shaft Seal
706	Manual Shift Shaft Seal

Seal Location (Accumulator)

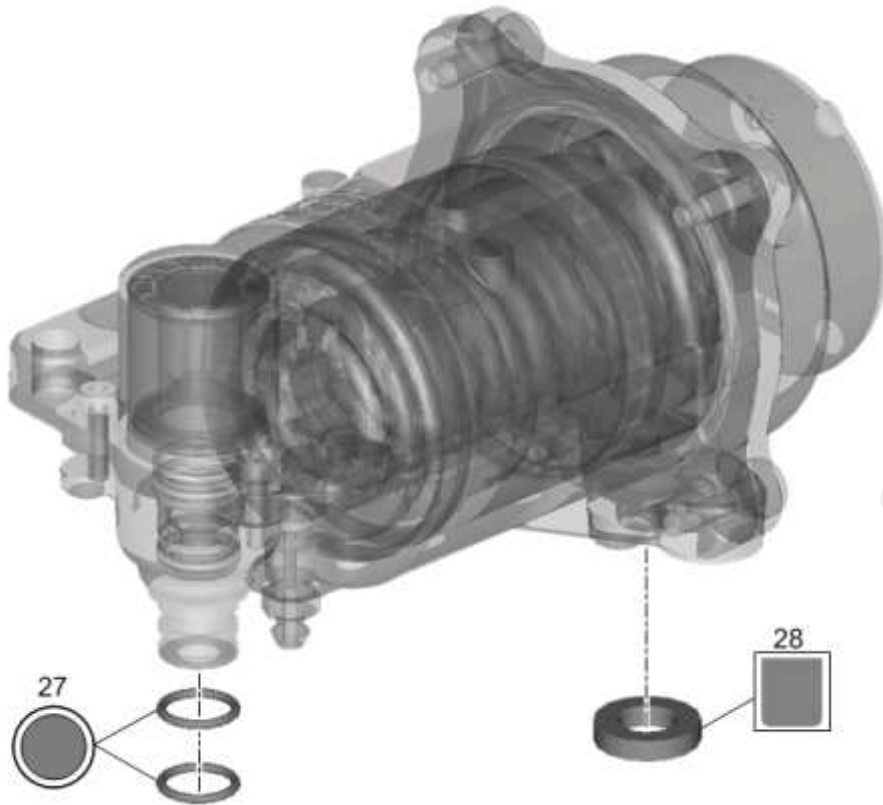


Fig. 24: Seal Location (Accumulator)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
27	Automatic Transmission Case Seal
28	Accumulator Bypass Valve Seal

BALL CHECK VALVE LOCATIONS (WITHOUT ETRS)

Control Valve Body - Case Side

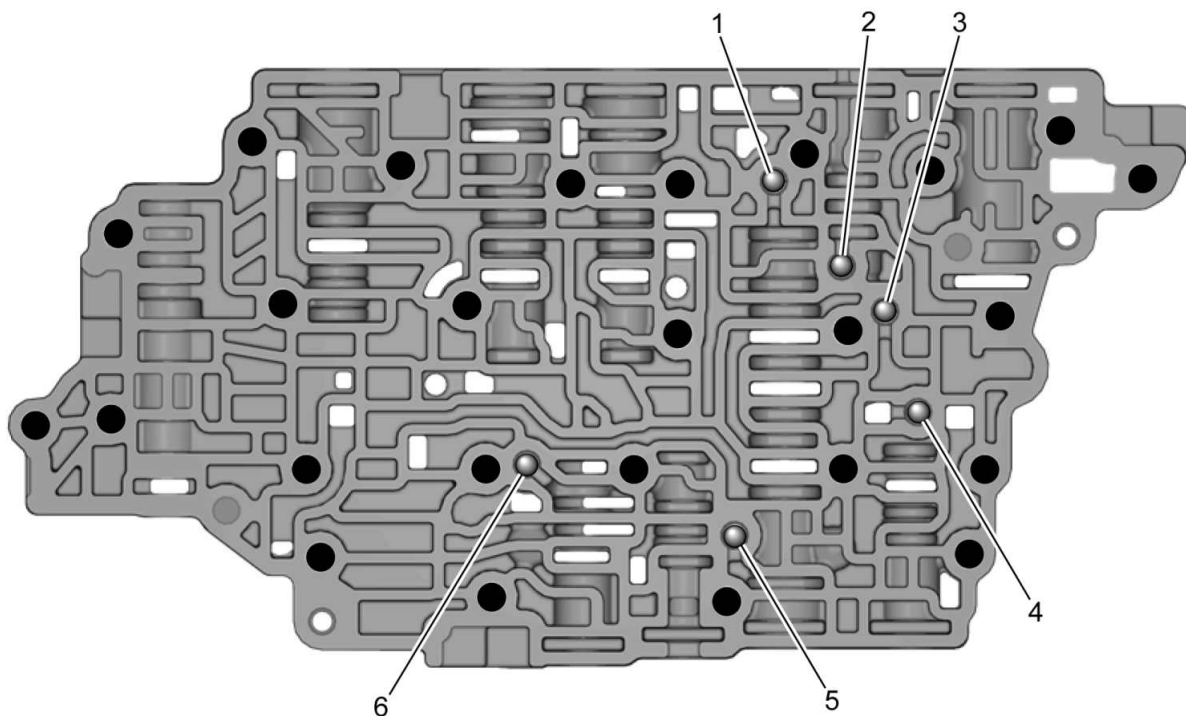


Fig. 25: Control Valve Body Ball Check Valve Locations - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body - Case Side

I.D.	Input Oil	Input Oil	Output Oil
1	Clutch Select Solenoid	1 Reverse Apply	Clutch Select Valve Signal
2	1 Reverse Limit	-	1 Reverse Release
3	Drive 2	Reverse/57R Feed	57 Reverse Clutch Feed
4	57 Reverse Clutch Feed	-	57 Reverse Clutch Feed
5	6789 Clutch	1 Reverse/6789 Latch	Latch
6	Drive	-	Drive

Control Valve Body - Control Valve Solenoid Side

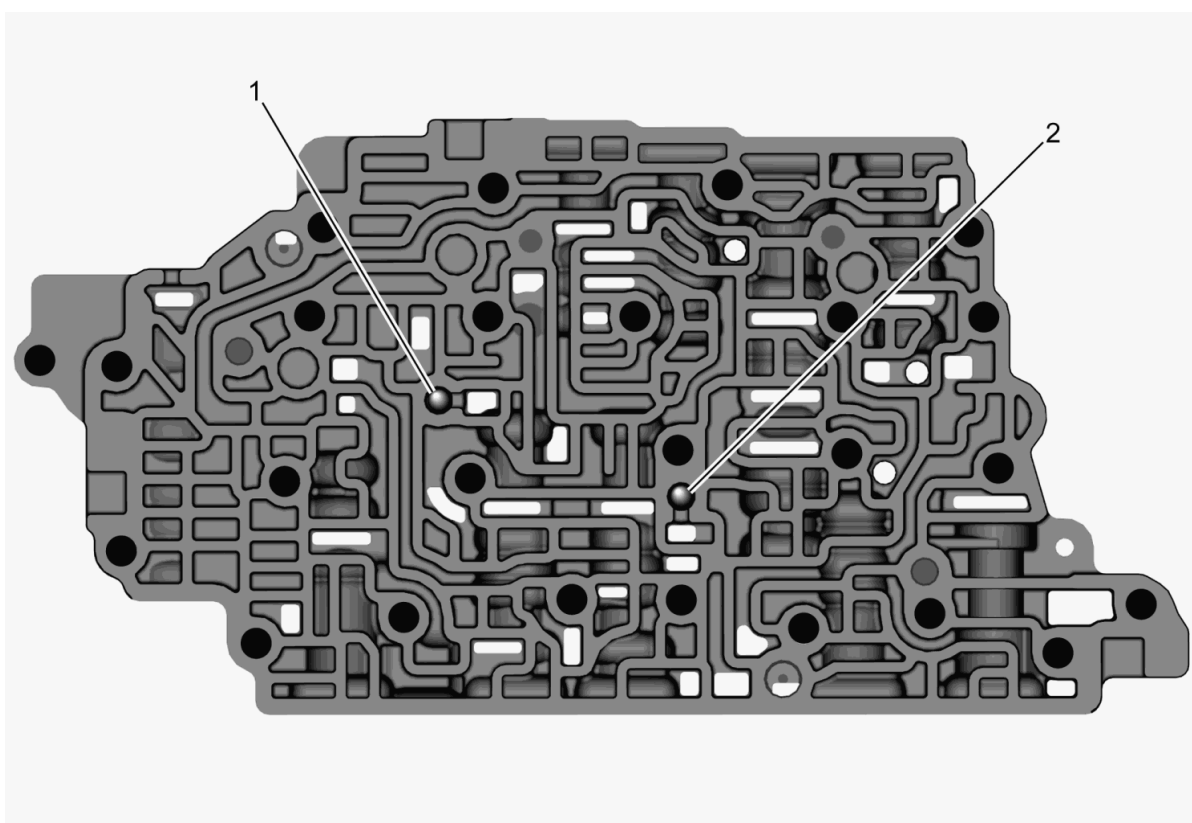


Fig. 26: Control Valve Body Ball Check Valve Locations - Control Valve Solenoid Side
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body - Control Valve Solenoid Side

I.D.	Input Oil	Input Oil	Output Oil
1	123456CL	-	123456CL
2	29 CL	-	29 CL

Automatic Transmission Case

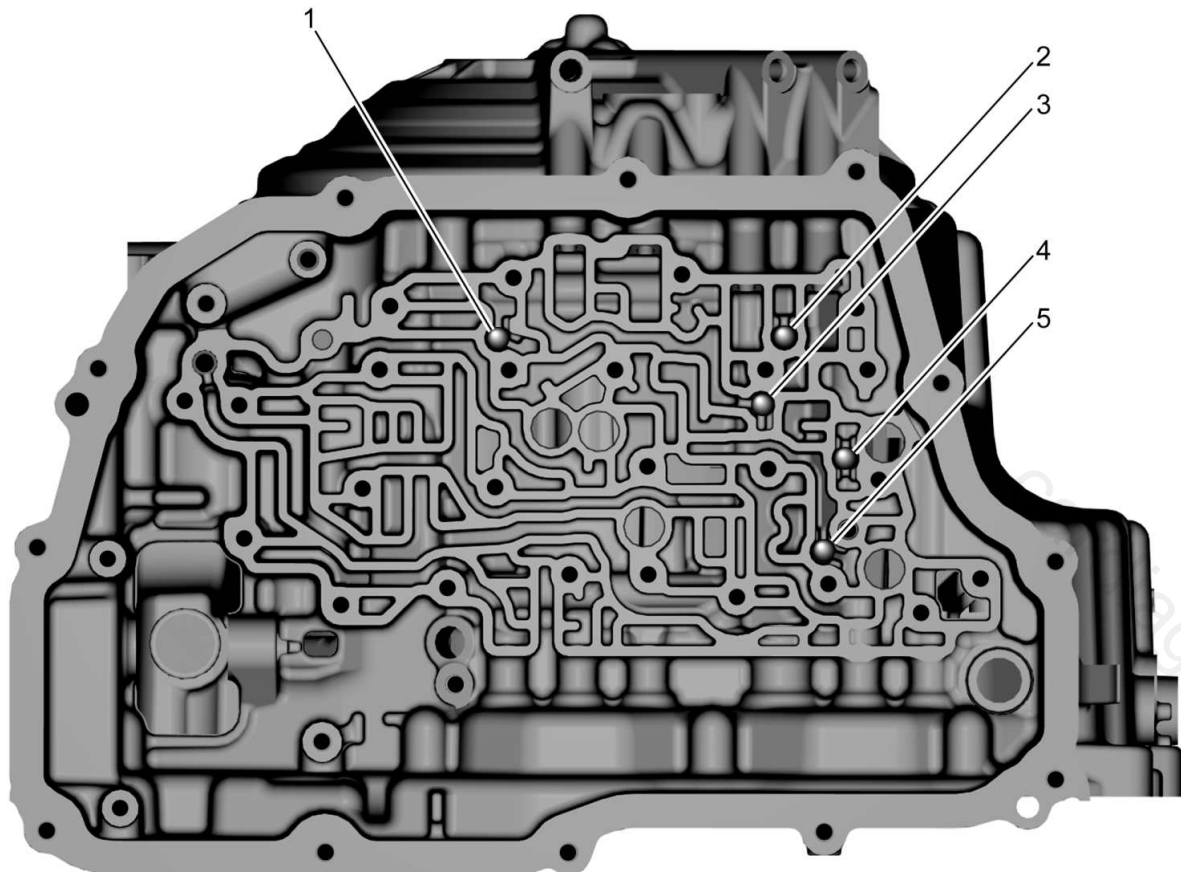


Fig. 27: Automatic Transmission Case Ball Check Valve Locations

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Case

I.D.	Input Oil	Input Oil	Output Oil
1	38 CL	-	38 CL
2	57 Rev CL	-	57 Rev CL
3	6789 CL	-	6789 CL
4	1 Rev Limit	-	1 Rev Release
5	1 Rev Feed	-	1 Rev Apply

BALL CHECK VALVE LOCATIONS (WITH ETRS)

Control Valve Body - Control Valve Solenoid Side

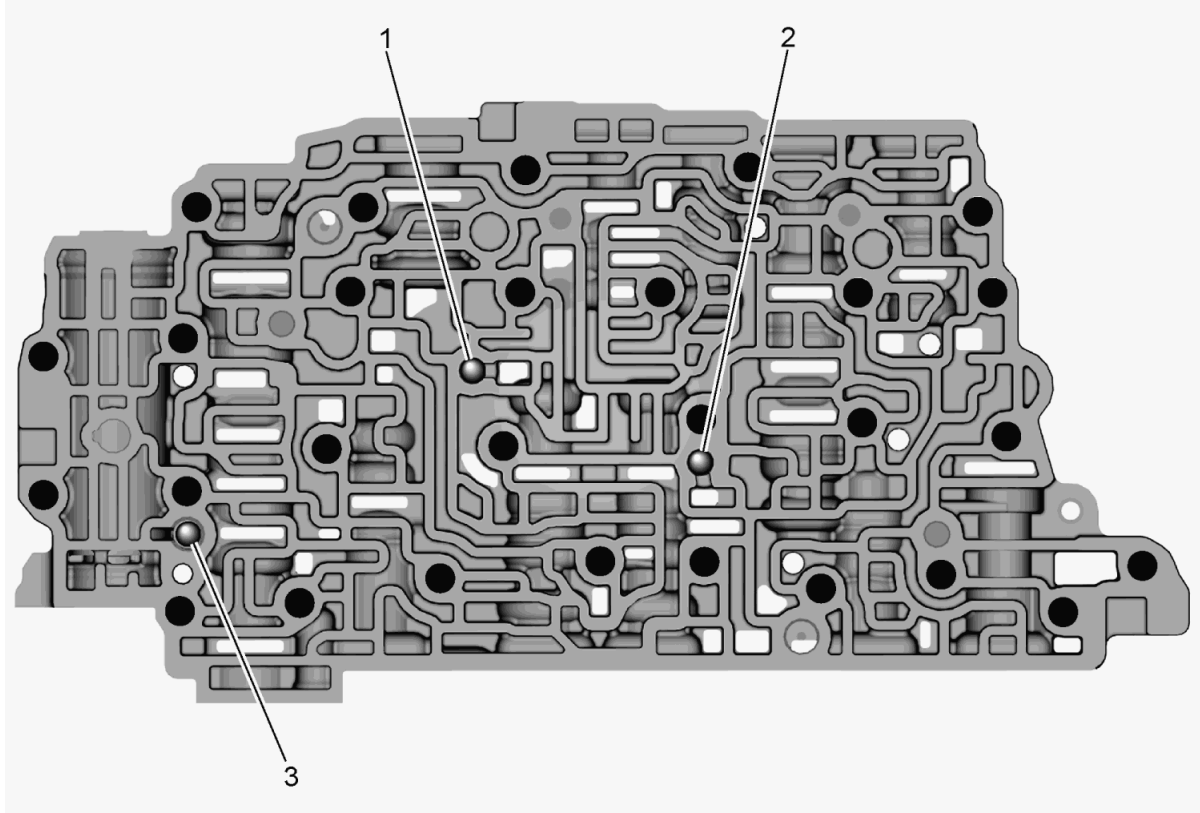


Fig. 28: Control Valve Body Ball Check Valve Locations - Control Valve Solenoid Side
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body - Control Valve Solenoid Side

I.D.	Input Oil	Input Oil	Output Oil
1	29 CL	-	29 CL
2	123456 CL	-	123456 CL
3	Park On	-	Park On

Control Valve Body - Case Side

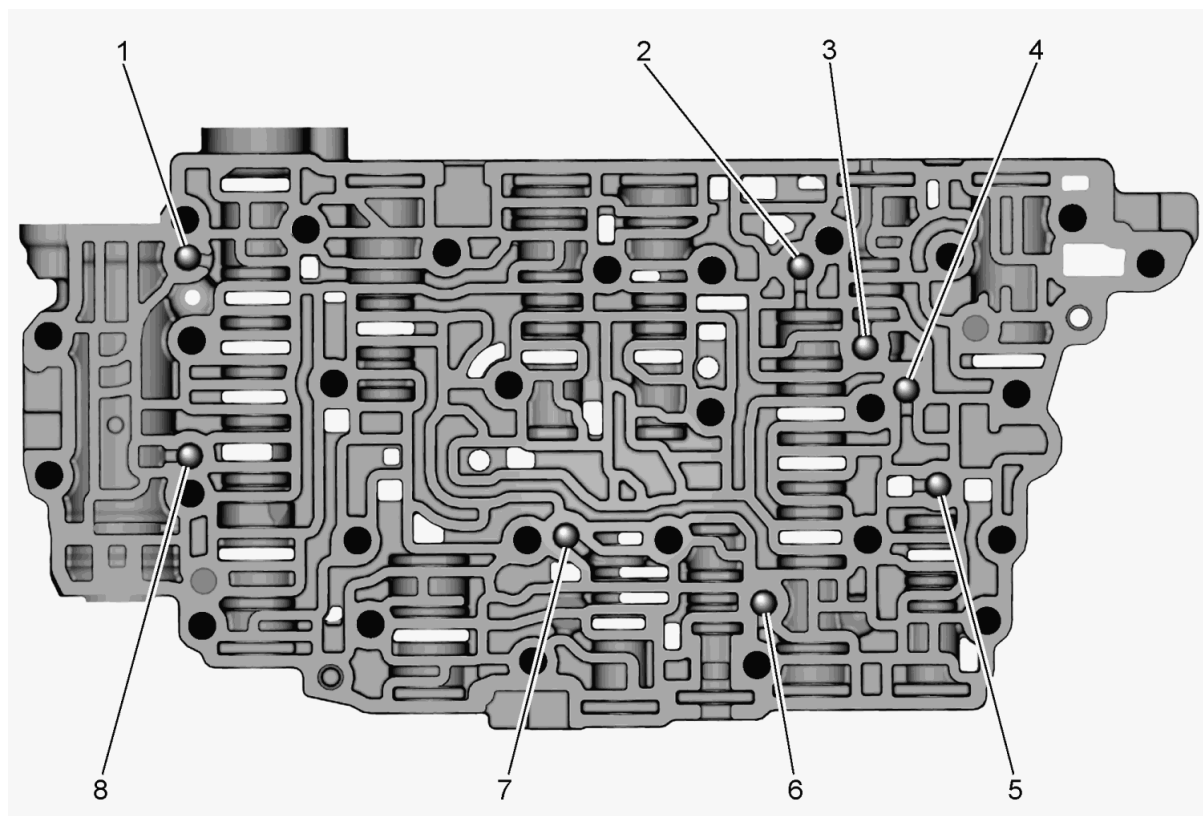
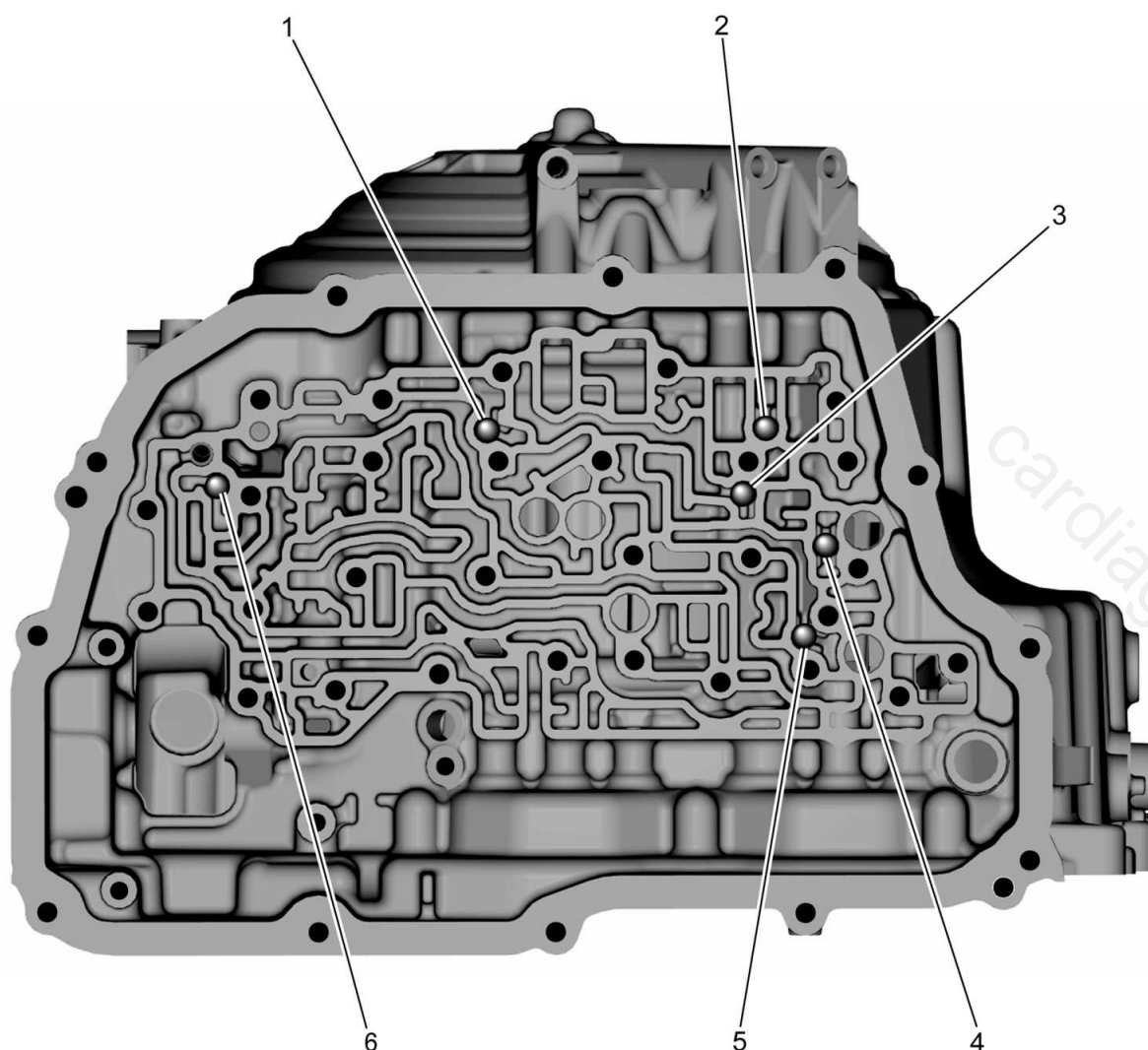


Fig. 29: Control Valve Body Ball Check Valve Locations - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body - Case Side

I.D.	Input Oil	Input Oil	Output Oil
1	Park On	-	Park On
2	Clutch Select Solenoid	1 Reverse Apply	Clutch Select Valve Signal
3	1 Reverse Limit	-	1 Reverse Release
4	Drive 2	Reverse/57R Feed	57R Clutch Feed
5	57R Clutch Feed	-	57R Clutch Feed
6	6789 Clutch	1 Rev/6789 Latch	Latch
7	Drive	-	Drive
8	Feed 1	-	Feed 1

Automatic Transmission Case**Fig. 30: Automatic Transmission Case Ball Check Valve Locations**

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Case

I.D.	Input Oil	Input Oil	Output Oil
1	38 CL	-	38 CL
2	57 Rev CL	-	57 Rev CL
3	6789 CL	-	6789 CL
4	1 Rev Limit	-	1 Rev Release
5	1 Rev Feed	-	1 Rev Apply
6	Park Off	-	Park Off

TRANSMISSION SOLENOID INFORMATION**Transmission Control Solenoids**

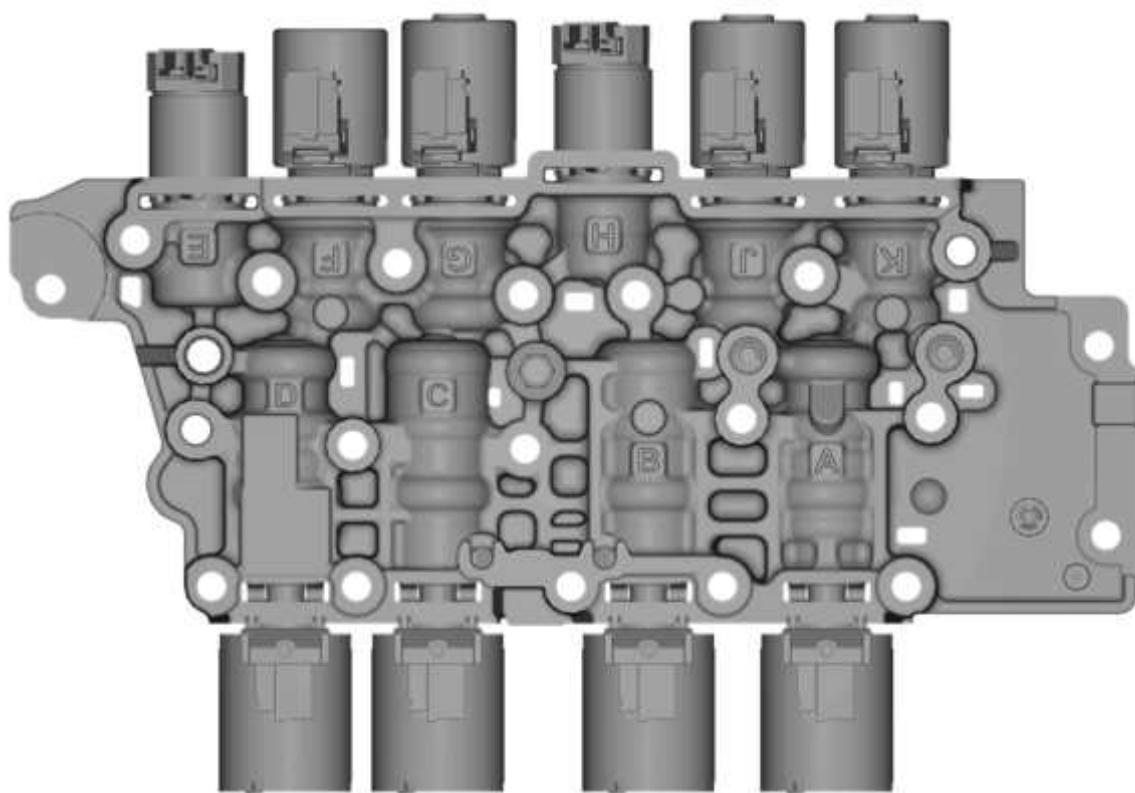


Fig. 31: Transmission Control Solenoids
Courtesy of GENERAL MOTORS COMPANY

Transmission Control Solenoids

Valve Body Bore Location	Solenoid Name	Solenoid Type	Controlled Element	Resistance Value at 20°C (68°F)	High Side Driver
A	Q77B Transmission Control Solenoid Valve 2	Normally Low, Linear Force, Pintle Type	2-9 Clutch	5.0 - 5.4 Ω	2
B	Q77A Transmission Control Solenoid Valve 1	Normally High, Linear Force, Pintle Type	1-2-3-4-5-6 Clutch	5.0 - 5.4 Ω	2
C	Q77F Transmission Control Solenoid Valve 6	Normally High, Linear Force, Pintle Type	5-7-8-9 Clutch and Selectable One Way Clutch	5.0 - 5.4 Ω	1
D	Q77E Transmission Control Solenoid Valve 5	Normally Low, Linear Force, Pintle Type	5-7-R Clutch	5.0 - 5.4 Ω	1
E	Q77K Transmission Control Solenoid Valve 10	Normally Closed, ON - OFF	Accumulator Pressure Release	19.0 - 19.6 Ω	1
F	Q77G Transmission Control Solenoid Valve 7	Variable Force, Normally High	Line Pressure	5.0 - 5.4 Ω	2
G	Q77H Transmission Control Solenoid Valve 8	Variable Force, Normally Low	Torque Converter Clutch (TCC)	5.0 - 5.4 Ω	2

Valve Body Bore Location	Solenoid Name	Solenoid Type	Controlled Element	Resistance Value at 20°C (68°F)	High Side Driver
H	Q77J Transmission Control Solenoid Valve 9	Normally Closed, ON - OFF	Clutch Select Valve	19.0 - 19.6 Ω	1
J	Q77D Transmission Control Solenoid Valve 4	Variable Force, Normally Low	4th Clutch	5.0 - 5.4 Ω	2
K	Q77C Transmission Control Solenoid Valve 3	Variable Force, Normally Low	3 - 8 Clutch	5.0 - 5.4 Ω	2

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Description And Operation - Equinox & Terrain

DESCRIPTION AND OPERATION

DEFINITIONS AND ABBREVIATIONS

Throttle Positions

Engine Braking

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

Full Throttle Downshift

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

Heavy Throttle

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

Light Throttle

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

Medium Throttle

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

Minimum Throttle

The least amount of throttle opening required for an upshift.

Wide Open Throttle (WOT)

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

Zero Throttle Coastdown

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

Shift Condition Definitions

Bump

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

Chuggle

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

Delayed

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

Double Bump - Double Feel

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

Early

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

End Bump

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

Firm

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

Flare

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

Harsh - Rough

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

Hunting

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

Initial Feel

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

Late

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

Shudder

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

Slipping

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

Soft

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

Surge

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

Tie-Up

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

Noise Conditions

Drive Link Noise

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

Final Drive Noise

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

Planetary Gear Noise

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

Pump Noise

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

Torque Converter Noise

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

Driver Shift Control

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

Transmission Abbreviations

A/C

Air Conditioning

AC

Alternating Current

AT

Automatic Transmission

CC

Climate Control

DC

Direct Current

DIC

Driver Information Center

DLC

Data Link Connector

DMM

Digital Multimeter

DSC

Driver Shift Control

DTC

Diagnostic Trouble Code

EBTCM

Electronic Brake/Traction Control Module

ECCC

Electronically-Controlled Capacity Clutch

ECT

Engine Coolant Temperature

EMI

Electromagnetic Interference

IAT

Intake Air Temperature

IGN

Ignition

IMS

Internal Mode Switch

ISS

Input Speed Sensor

MAP

Manifold Absolute Pressure

MIL

Malfunction Indicator Lamp

NC

Normally Closed

NO

Normally Open

OBD

On Board Diagnostic

OSS

Output Speed Sensor

PC

Pressure Control

PCM

Powertrain Control Module

PCS

Pressure Control Solenoid

PS

Pressure Switch

PWM

Pulse Width Modulation

RPM

Revolutions Per Minute

SS

Shift Solenoid

STL

Service Transmission Lamp

TAP

Transmission Adaptive Pressure

TCC

Torque Converter Clutch

TFP

Transmission Fluid Pressure

TFT

Transmission Fluid Temperature

TP

Throttle Position

VSS

Vehicle Speed Sensor

WOT

Wide Open Throttle

TRANSMISSION IDENTIFICATION INFORMATION

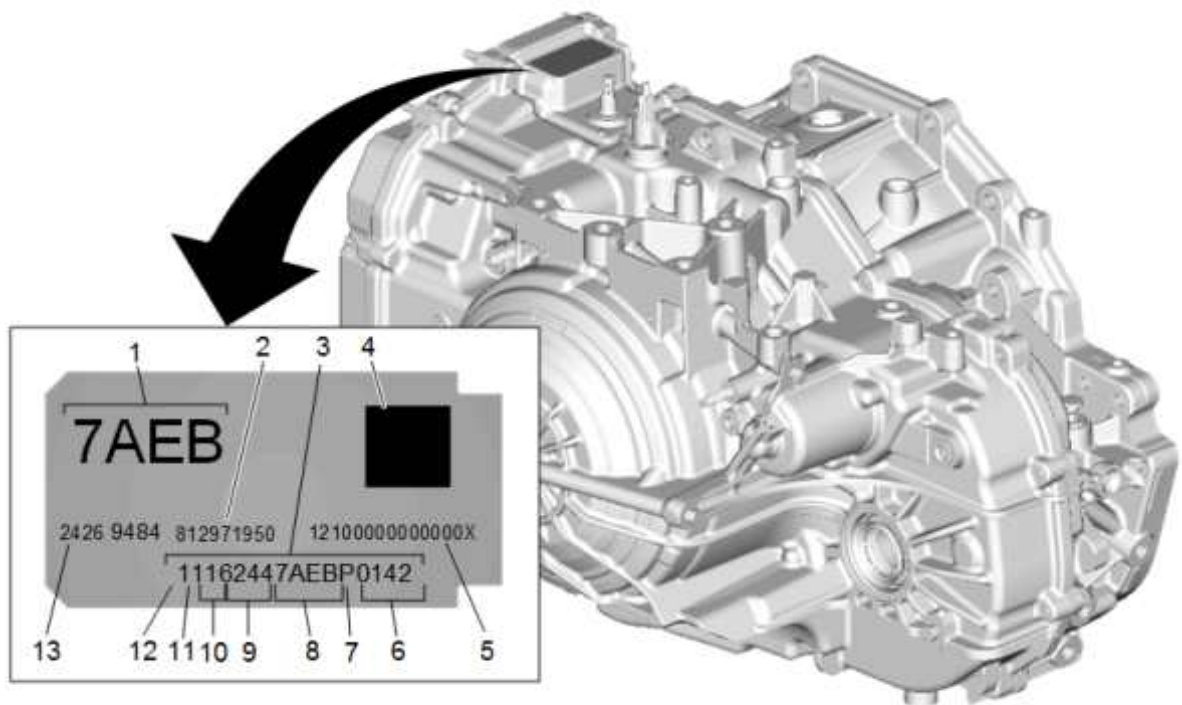


Fig. 1: Identifying Transmission Identification Label

Courtesy of GENERAL MOTORS COMPANY

1. Broadcast Code
2. Source DUNS Number
3. Transmission Unique Number (TUN)
4. 2D Machine Readable Matrix
5. VPPS Code
6. Part Sequence Number
7. Site ID
8. Broadcast Code
9. Julian Date
10. Year of Build
11. Shift ID
12. Line Plant ID
13. GM Part Number

CONTROL VALVE SOLENOID BODY IDENTIFICATION INFORMATION

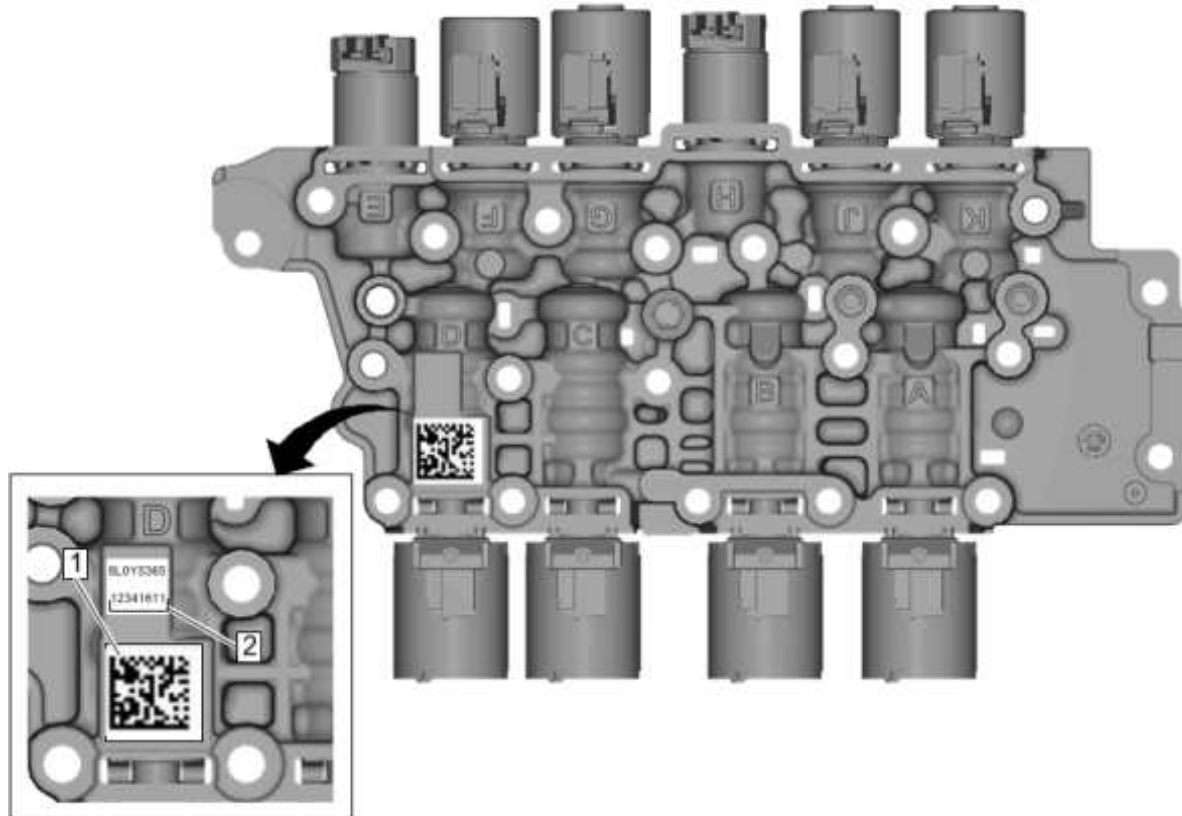


Fig. 2: Identifying Control Valve Solenoid Body Identification Label
Courtesy of GENERAL MOTORS COMPANY

1. Data Matrix
2. Part Unique Number (PUN)

TRANSMISSION GENERAL DESCRIPTION

The Hydra-matic 9T50 is a fully automatic, 9-speed, transverse mounted, electronic-controlled transmission. It consists primarily of a 4-element torque converter, a compound planetary gear set, friction and mechanical clutch assemblies, and a hydraulic pressurization and control system.

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

The planetary gear sets provide the 9 forward gear ratios and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a transmission control module (TCM). The TCM receives and monitors various electronic sensor inputs and uses this information to shift the transmission at the optimum time.

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

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

The friction components used in this transmission consist of 7 multiple disc clutches. The multiple disc clutches combine with one away clutch to deliver 10 different gear ratios, 9 forward and one reverse, through the gear sets. The gear sets then transfer torque through the transfer drive gear, transfer driven gear and differential assembly.

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

PARK (P)

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

REVERSE (R)

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

NEUTRAL (N)

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

DRIVE (D)

Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the 9 forward gear ratios. Downshifts to a lower gear, or higher gear ratio, are available for safe passing by depressing the accelerator or by manually selecting a lower gear in the manual mode range.

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

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

TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION

The mechanical components of the 9T50 are as follows:

- Torque Converter Assembly
- Automatic Transmission Fluid Pump
- 1-2-3-4-5-6 Clutch
- 2-9 Clutch
- 3-8 Clutch
- 4th Clutch
- 5-7-Reverse Clutch
- 6-7-8-9 Clutch
- Control Valve Solenoid Body Assembly
- Control Valve Body Assembly
- Drive Sprocket, Driven Sprocket And Link Assembly
- Front Differential Carrier
- Overdrive and Reaction with Input Internal Gear Carrier
- Reaction Sun Gear Assembly
- Output Carrier Assembly

The electrical components of the 9T50 are as follows:

- Automatic Transmission Output Speed Sensor
- Automatic Transmission Input Speed Sensor
- Manual Shift Detent Lever with Shaft Position Switch
- Control Valve Solenoid Body Assembly
 - 2 pressure control (PC) solenoids

- 4 linear force (LF) solenoids
- 4 variable force (VF) solenoids

For more information refer to: [Electronic Component Description](#).

MANUAL MODE DESCRIPTION AND OPERATION

Manual Mode Shifting Operation

Electronic Range Select (ERS) Mode

ERS or manual mode allows you to choose the top-gear limit of the transmission and the vehicle's speed while driving downhill or towing a trailer. The vehicle has an electronic shift position indicator within the instrument cluster. When using the ERS mode a number will display next to the L, indicating the current gear that has been selected.

To use this feature:

1. Transmission Range - L.
2. Press the Plus (+) or Minus (-) to increase or decrease the gear range available.

When you shift from Drive (D) to Low (L), the transmission will shift to a pre-determined lower gear range. The highest gear range available for this pre-determined range is displayed next to L in Driver Information Center (DIC). The number displayed in the DIC is the highest gear that the transmission will be allowed to operate in. This means that all gears below that number are available. For example when fourth (4) is shown next to the L, first (1) through 4 gears are automatically shifted by the vehicle. The transmission will not shift into fifth (5) until the plus (+) is used or you shift back into Drive (D).

While in Low (L), the transmission will prevent shifting to a lower gear range if the engine speed is too high. You have a brief period of time to slow the vehicle. If vehicle speed is not reduced within the time allowed, the lower gear range shift will not be completed. You must further slow the vehicle, then press the minus (-) button to the desired lower gear range.

In manual mode, the K71 Transmission Control Module will always have final authority of when to allow an upshift or downshift. The upshift or downshift into the appropriate gear is based on engine RPM, vehicle speed and other control parameters. The transmission will not automatically downshift to the next lower gear if it would cause an engine over speed condition or upshift to a higher if it would result in too low of engine RPM.

TRANSMISSION ADAPTIVE FUNCTIONS

The 9 Speed FWD transmission utilizes a line pressure control system during upshifts to compensate for new transmission build variation and the normal wear of transmission components. New transmission to transmission variation and normal wear of the apply components within the transmission over time can cause shift time (the time required to apply a clutch) to be longer or shorter than desired. In order to compensate for these changes, the transmission control module (TCM) adjusts the pressure commands to the various pressure control (PC) solenoids, to maintain the originally calibrated shift timing. The automatic adjusting process is referred to as "adaptive learning" and it is used to ensure consistent shift feel plus increase transmission durability. The TCM monitors the input speed sensor (ISS), intermediate speed sensor and the output speed sensor (OSS) during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the corresponding PC solenoid signal to maintain the set shift feel.

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

TRANSMISSION INDICATORS AND MESSAGES

The following transmission related indicators and messages may be displayed on the Instrument Panel Cluster (IPC).

SERVICE TRANSMISSION

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

SHIFT DENIED

This message displays when attempting to use the automatic transmission manual mode to shift to too low or too high of a gear.

SHIFT TO PARK

This message displays when the transmission needs to be shifted to P (Park). This may appear when turning the ignition off or removing the key from the vehicle if the vehicle is not in P (Park).

TRANSMISSION HOT - IDLE ENGINE

This message displays and a chime sounds if the transmission fluid in the vehicle gets hot. Driving with the transmission fluid temperature high can cause damage to the vehicle. Stop the vehicle and let it idle to allow the transmission to cool. This message clears when the fluid temperature reaches a safe level.

ELECTRONIC COMPONENT DESCRIPTION

Common Electronic Component Description

Transmission Control Module

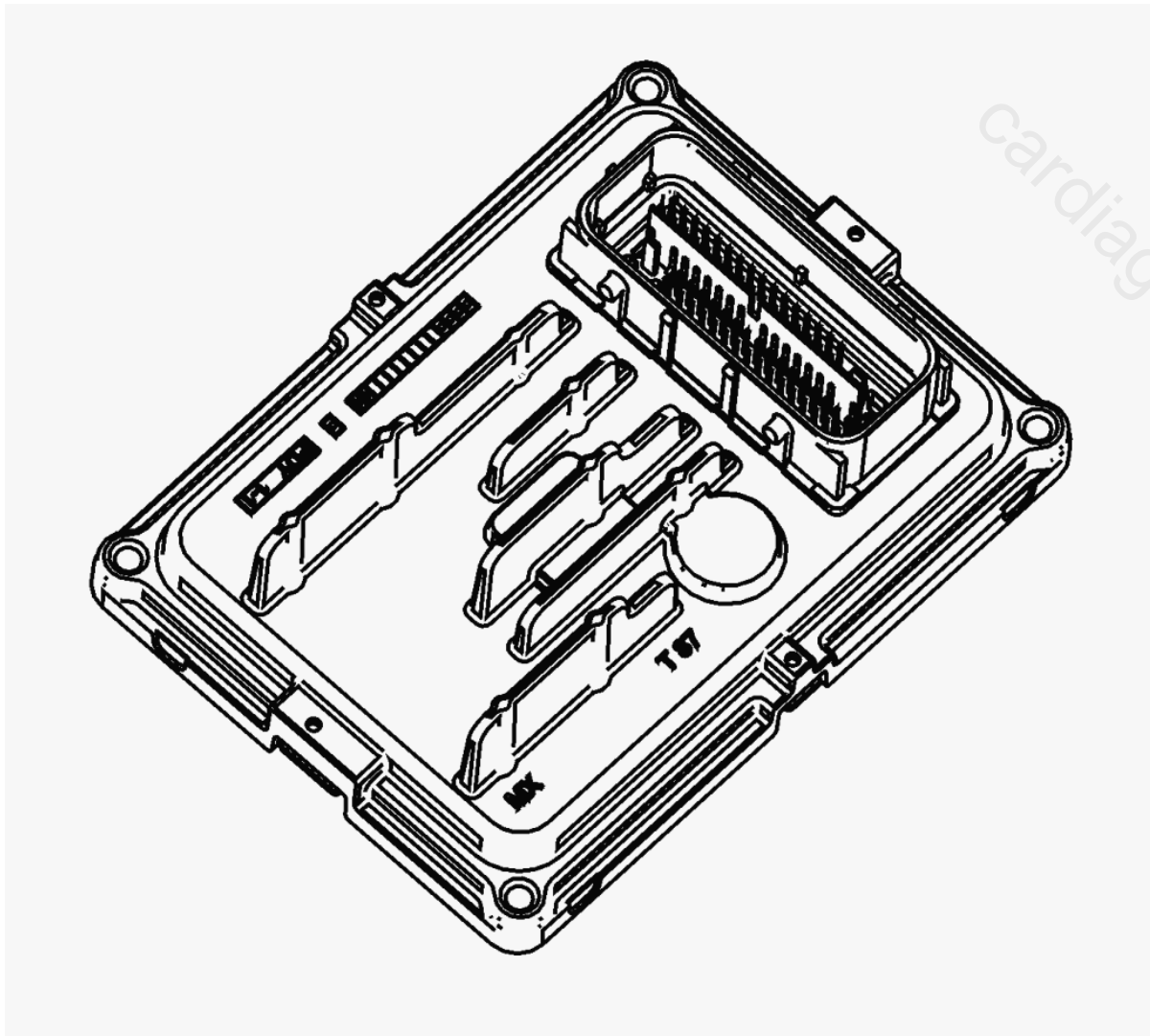


Fig. 3: Transmission Control Module

Courtesy of GENERAL MOTORS COMPANY

The Transmission Control Module (TCM) for this transmission is a stand alone controller mounted in a bracket to the side cover of the transmission assembly. The TCM has one 66 way connector to interface with vehicle electrical system, transmission assembly and other vehicle control modules. The TCM receives and sends various input and output signals from a number of switches and sensors within the

transmission and throughout the vehicle. In addition, the TCM is part of a network of other control modules on the vehicle. This network of control modules will share information with each other, over a common serial data communications line. Based upon the TCM software/calibrations and input information the TCM receives, it will always have final authority of when to allow an upshift or downshift whether in manual mode operation or in drive position for automatic shifting. The TCM will command a 2-3 shift when the accelerator pedal position is below a certain calibrated value. When the pedal position is above this calibrated value, the TCM will command 2-4 shift.

Transmission Control Solenoid Valves

The 9 speed transmission could contain a maximum of twelve individual solenoids - RPO dependent - installed in various bore locations on the lower control valve body assembly and transmission case. Eight of the twelve solenoid valves are used to control pressure regulation and direction of transmission fluid. The four ON/OFF solenoid valves are only used to direct transmission fluid.

The normal operating current range for these solenoid valves is between 0 - 1.2 amps. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM will turn OFF the high side driver to that solenoid and set a DTC. The high side driver will reset when the circuit fault is corrected and the ignition switch is cycled.

There are three slightly different designed variations of the pressure regulating solenoid valves used on this transmission. They are; linear variable force solenoid, normally low variable force solenoid and normally high variable force solenoid.



Fig. 4: Normally Low - Linear Solenoid
Courtesy of GENERAL MOTORS COMPANY

Normally Low - Linear Solenoids

- A normally low linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanic pushing or pulling force or motion.
- When energized, the solenoid armature applies force to the face of a pressure regulating spool valve.
- The solenoid actuator applies minimum force with minimum current applied to the solenoid coil.
- The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.
- Transmission control solenoid valves 2 and 5 are normally low.



Fig. 5: Normally Low - Linear Solenoid
Courtesy of GENERAL MOTORS COMPANY

Normally High - Linear Solenoids

- A normally high linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanic pushing or pulling force or motion.
- When energized, the solenoid armature applies force to the face of a pressure regulating spool valve.
- The solenoid actuator applies maximum force with minimum current applied to the solenoid coil.
- The solenoid actuator applies minimum force with maximum current applied to the solenoid coil.
- Transmission control solenoid valves 1 and 6 are normally high.

Normally Low - Variable Force Solenoid

A normally low variable force solenoid is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid coil.

- The solenoid valve varies the control pressure depending on the current applied to the solenoid coil.
- The solenoid valve control pressure is low with no or minimum current applied to the solenoid coil.
- The solenoid valve control pressure increases with increasing current applied to the solenoid coil.
- Transmission control solenoid valves 3, 4, and 8 are of the normally low design.



Fig. 6: Normally High - Variable Force Solenoid
Courtesy of GENERAL MOTORS COMPANY

Normally High - Variable Force Solenoid

- A normally high variable force solenoid is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid coil.
- The solenoid valve varies the control pressure depending on the current applied to the solenoid coil.
- The solenoid valve control pressure is high with no or minimum current applied to the solenoid coil.
- The solenoid valve control pressure decreases with increasing current applied to solenoid coil.
- Transmission control solenoid valve 7 is a normally high solenoid.



Fig. 7: ON/OFF Solenoid
Courtesy of GENERAL MOTORS COMPANY

ON/OFF Solenoids

- The ON/OFF solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid coil.

- This solenoid is normally closed solenoid that is controlled ON (fully open) or OFF (fully closed).
- Transmission control solenoid valves 9, 10, 11 & 12 are ON/OFF solenoids.

Solenoid Characterization

Transmission control solenoid valves 1-8 are pressure regulating valves. Each solenoid valve is tested after assembly to determine the output fluid pressure at certain electrical values, applied to the coil winding. This information is referred to as solenoid current/pressure data points. The solenoid valves are tested two ways, with an increasing and then a decreasing electrical current applied to the coil winding. The resultant current versus pressure data points are saved and assigned a file number. This file number is marked on the solenoid valve housing end or on the valve body itself. The solenoid performance data file is stored on the TIS web site. This data file is programmed and stored in the vehicle's TCM. Replacing any of the following components will require the TCM to be programmed with either the new or existing solenoid valve performance data, depending on what component is replaced.

- Transmission assembly - program the TCM with the new data file stored on the TIS web site for all pressure regulating solenoid valves.
- Lower control valve body assembly with solenoid valves - program the TCM with the new data file stored on the TIS web site for all pressure regulating solenoid valves.
- Transmission Control Module - program the TCM with the existing data file stored on the TIS web site for all pressure regulating solenoid valves.
- One or more solenoids - program the TCM with the new data file stored on the TIS web site for all pressure regulating solenoid valves that were replaced.



Fig. 8: Transmission Fluid Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

Transmission Fluid Temperature Sensor

The transmission fluid temperature sensor is a 2 wire negative temperature coefficient thermistor. The TCM supplies a 5 V signal circuit and a low reference circuit to the transmission fluid temperature sensor. The transmission fluid temperature sensor measures the temperature of the fluid in the transmission fluid pan. As the temperature of the fluid increase, the resistance of the sensor decreases, varying the voltage on the signal circuit. The transmission fluid sensor is part of the transmission internal wire harness assembly and has no serviceable parts. If the transmission fluid temperature sensor is faulty, then replace the internal transmission wire harness that has the sensor attached to it.



Fig. 9: Transmission Input and Intermediate Speed Sensors
 Courtesy of GENERAL MOTORS COMPANY

Transmission Input and Intermediate Speed Sensors

The input and intermediate speed sensors are housed together in one component assembly. The sensor is mounted on the exterior of the transmission case. Each sensor is triggered by a separate reluctor ring inside the transmission case. The input and intermediate speed sensors are both hall-effect type sensors. The TCM supplies a single 9 V reference circuit to power up both sensors. Each sensor has an independent signal circuit that returns to the TCM. The TCM uses the signals to determine the rotational speed of the input shaft and the reaction gear set. As the rotational speed of the reluctor wheel increases, the frequency of the speed signal increases. The transmission control module uses this information along with the output speed sensor signal to determine transmission line pressure, shift patterns, correct gear ratio and torque converter clutch slip speed.

- The input reluctor ring is part of the 5-7-R and 6-7-9 clutch subassembly.
- The intermediate reluctor ring is part of the 3-8 and 5-7-R clutch hub assembly.



Fig. 10: Automatic Transmission Output Speed Sensor
 Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Output Speed Sensor

The output speed sensor assembly is a two wire hall-effect type sensor. The sensor is mounted on the interior of the transmission case. The TCM supplies a 9 V reference circuit and signal circuit to the output speed sensor. As the rotational speed of the output carrier assembly increases, the frequency of the output speed sensor signal increases. The reluctor ring is part of the Park gear assembly, which is splined to the transmission output shaft. The TCM used the output speed sensor signal along with the input and intermediate speed sensor signals to determine transmission line pressure, shift patterns, correct gear ratio and the torque converter clutch slip speed.



Fig. 11: Automatic Transmission Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Wiring Harness

The transmission internal wire harness is serviced by replacement only. No repairs to the internal wire harness should be attempted.



Fig. 12: Automatic Transmission Auxiliary Fluid Accumulator
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Auxiliary Fluid Accumulator - If Equipped

The Transmission Fluid Pressure Accumulator Solenoid Valve is part of the Stop/Start system on the vehicle. The automatic transmission auxiliary fluid accumulator is used to supply transmission fluid line pressure to the appropriate clutches for an auto start event. Attached to the accumulator is a normally closed ON/OFF solenoid. When the ignition is ON, the engine control ignition relay supplies 12 V to the accumulator solenoid. To complete the circuit, the transmission control module (TCM) supplies a control circuit to the accumulator solenoid. When the engine control module (ECM) requests an auto start event, a serial data message is sent to the TCM, to command the solenoid ON. This allows captured pressurized fluid to exit the accumulator to apply the clutches for a 1st gear start.

Non-ETRS Electronic Component Description

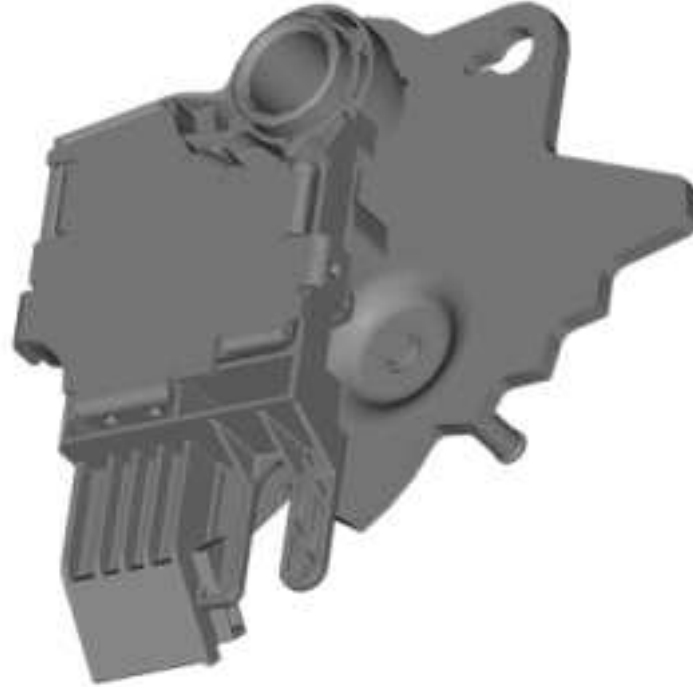


Fig. 13: Transmission Range Sensor
Courtesy of GENERAL MOTORS COMPANY

Transmission Range Sensor

The transmission range sensor is a hall-effect that has two PWM output signal circuits. The engine control module (ECM) supplies a 5 V reference circuit and a low reference circuit to the transmission range sensor. Sensor 1 signal circuit is an input to the TCM. Sensor 2 signal circuit is an input to the ECM. Each transmission gear range position has different duty cycle values of the PWM signal. The TCM uses the information from sensor 1 signal to determine what transmission gear range the vehicle operator has selected and apply the clutches for that gear. The ECM uses the information from sensor 2 signal to determine if the transmission is in park or neutral to enable the starter motor for engine cranking.

ETRS Equipped Electronic Component Description

Transmission Range Control Valve Switch

The transmission range control valve switch is a linear hall effect sensor that changes current flow based on magnetic field position relative to the sensor. The transmission control module (TCM) supplies a 9 V reference circuit to the transmission range control valve switch. Sensor signal circuit is an input to the TCM. The sensor signal circuit toggles between 0.8V and 2V based on valve position.

Park Inhibit Solenoid Actuator

The park inhibit solenoid actuator (PISA) is an actuator that when energized, will lock the park servo in the applied position, holding the parking pawl out of the park position.

Transmission Park Valve Switch

The transmission park valve switch is a linear hall effect sensor that changes current flow based on magnetic field position relative to the sensor. The transmission control module (TCM) supplies a 9 V

reference circuit to the transmission park valve switch. Sensor 1 signal circuit and sensor 2 signal circuits both toggle between 0.8V and 2V based on valve position. There are two sensors within the component to serve as a redundancy for safety.

ETRS Component Name Correlation Chart

Component Code	Function	Scan Tool Parameter - in TCM unless specified	Units
B13 Transmission Fluid Temperature Sensor	Oil Temperature	Transmission Fluid Temperature	Degrees
B14A Transmission Output Shaft Speed Sensor	Output Shaft Speed - Park Gear	Transmission OSS	RPM
"B14E Transmission Input/Intermediate Shaft Speed Sensor - Includes B14C Input Shaft Speed Sensor and B14D Intermediate Shaft Speed Sensor"	Input Shaft Speed -	Transmission ISS	RPM
	Intermediate Shaft Speed	Transmission Intermediate Speed Sensor	RPM
B280 Automatic Transmission Accumulator Solenoid Valve	Accumulator - Autostop	Transmission Accumulator Solenoid Valve Command - ECM	On/Off
B315A Transmission Range Control Valve 1 Position Switch	Mode Valve 1/A Position Sensor	Transmission Range Sensor 1	Volts
B315B Transmission Range Control Valve 2 Position Switch	Mode Valve 2/B Position Sensor	Transmission Range Sensor 2	Volts
B316 Transmission Park Valve Position Switch	Park Valve Position Sensor 1	Transmission Park Valve Position Sensor 1	Volts
	Park Valve Position Sensor 2	Transmission Park Valve Position Sensor 2	Volts
Q77A Transmission Control Solenoid Valve 1	CB123456 - LFS	Transmission Control Solenoid Valve 1	Pressure
Q77B Transmission Control Solenoid Valve 2	CB29 - LFS	Transmission Control Solenoid Valve 2	Pressure
Q77C Transmission Control Solenoid Valve 3	CB38 - VFS	Transmission Control Solenoid Valve 3	Pressure
Q77D Transmission Control Solenoid Valve 4	C4 - VFS	Transmission Control Solenoid Valve 4	Pressure
Q77E Transmission Control Solenoid Valve 5	C57R - LFS	Transmission Control Solenoid Valve 5	Pressure
Q77F Transmission Control Solenoid Valve 6	SOWC - C5789 - LFS	Transmission Control Solenoid Valve 6	Pressure
Q77G Transmission Control Solenoid Valve 7	Line - VFS	Transmission Control Solenoid Valve 7	Pressure
Q77H Transmission Control Solenoid Valve 8	TCC - VFS	Transmission Control Solenoid Valve 8	Pressure
Q77J Transmission Control Solenoid Valve 9	Clutch Select	Transmission Control Solenoid Valve 9	On/Off
Q77K Transmission Control Solenoid Valve 10	Accumulator Pressure Release	Transmission Control Solenoid Valve 10	On/Off
M123 Transmission Park Valve Lock Solenoid Actuator	Park Inhibit Solenoid Actuator	Transmission Control Solenoid Valve 11	On/Off
LFS - Linear Force Solenoid VFS - Variable Force Solenoid			

ETRS System Operation

Park:

Solenoids F and G are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. Line pressure is directed by the transmission range control valves to the park on hydraulic circuit, which is used to assist the park servo return spring in overcoming the park servo apply fluid. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.

Reverse:

- Solenoids D, E, G, and PISA are on. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves.
- Solenoid D shuttles the transmission range control valve 2, allowing line pressure to enter the reverse hydraulic circuit feeding the clutch selector valve. The clutch selector valve directs the reverse fluid to the SOWC Servo which holds the SOWC during reverse. Solenoid E directs line pressure to the 57R Clutch.

Neutral (commanded with speed below a certain threshold):

- Solenoids F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. If shifting from Park to Neutral, solenoids C and D are on for 350 ms or less which shuttles the transmission range control valves, applying the park servo which disengages the parking pawl.
- If shifting to neutral from reverse or drive, the PISA is held on and the mode valves are returned to their default positions. Hydraulically, the system is in a Park state at this time. However, because the PISA was held on during the shift from R/D to Neutral, the parking pawl remains disengaged.

Neutral Shift (for unique conditions):

- Solenoids C, D, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C shuttles the transmission range control valve 1 to allow line pressure to enter the Feed 1 hydraulic circuit which applies the park servo, disengaging the parking pawl. Solenoid D shuttles the transmission range control valve 2, preventing Feed 1 fluid from entering the drive hydraulic circuit.

Neutral High (commanded with speed above a certain threshold):

- Solenoids D, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid D shuttles transmission range control valve 1 which allows Feed 0 fluid to enter the Reverse hydraulic circuit which applies the park servo, disengaging the parking pawl. The clutch selector valve is shuttled to prevent reverse fluid from applying any clutches.

Drive - 1st Gear - Lock - Engine Braking:

- Solenoids C, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.

Drive - 1st Gear - Freewheel:

- Solenoids C, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional

parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F allows line pressure to enter the 1 Rev/6789C hydraulic circuit.

- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.

Drive - 2nd Gear:

- Solenoids B, C, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.
- Solenoid B allows Drive fluid to enter the 29C hydraulic circuit, applying the 29C Clutch assembly.

Drive - 3rd Gear:

- Solenoids C, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C is PWM in order to create a pressure high enough to shuttle the transmission range control valve 1 and the 38C regulator valve. This allows Drive fluid to enter the clutch selector valve, which directs Drive fluid into the Drive 2 hydraulic circuit. The 38C Regulator valve directs Drive 2 fluid into the 38C hydraulic circuit applying the 38C Clutch assembly.
- The transmission control valve 1 allows line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.

Drive - 4th Gear:

- Solenoids C, D, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.
- Solenoid D is PWM in order to create a pressure high enough to shuttle the transmission range control valve 1 and 4th Clutch regulator valve. This allows Drive fluid to enter the clutch selector valve, which directs Drive fluid into the Drive 2 hydraulic circuit. The 4th Clutch Regulator valve directs Drive 2 fluid into the 4th Clutch hydraulic circuit applying the 4C Clutch assembly.

Drive - 5th Gear:

- Solenoids C, E, F, G, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost. Solenoid F prevents line pressure from entering the 1 Rev/6789C hydraulic circuit.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.

- Drive 2 fluid enters the 57R Clutch Feed hydraulic circuit. Solenoid E allows 57R Clutch Feed to apply the 57RC Clutch Assembly.

Drive - 6th Gear:

- Solenoids C, G, H, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost.
- Line pressure is now able to flow through Solenoid F into the 1 Rev/6789C Clutch Feed hydraulic circuit. 1 Rev/6789C Clutch Feed fluid is directed into 6789C Clutch hydraulic circuit by the Clutch Selector Valve, which applies the 6789C Clutch Assembly.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. The Drive fluid passes through Solenoid A and into the 123456C Clutch assembly.
- Solenoid H allows line pressure to enter the TCC VFS Hydraulic circuit, shuttling TCC Control Valve and TCC Reg Apply Valve.

Drive - 7th Gear:

- Solenoids A, C, E, G, H, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost.
- Line pressure is now able to flow through Solenoid F into the 1 Rev/6789C Clutch Feed hydraulic circuit. 1 Rev/6789C Clutch Feed fluid is directed into 6789C Clutch hydraulic circuit by the Clutch Selector Valve, which applies the 6789C Clutch Assembly.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. Solenoid A does not allow Drive fluid to enter the 123456C Feed hydraulic circuit.
- Solenoid H allows line pressure to enter the TCC VFS Hydraulic circuit, shuttling TCC Control Valve and TCC Reg Apply Valve.
- Drive 2 fluid enters the 57R Clutch Feed hydraulic circuit. Solenoid E allows 57R Clutch Feed to apply the 57RC Clutch Assembly.

Drive - 8th Gear:

- Solenoids A, C, G, H, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost.
- Solenoid C is PWM in order to create a pressure high enough to shuttle the transmission range control valve 1 and the 38C regulator valve. This allows Drive fluid to enter the clutch selector valve, which directs Drive fluid into the Drive 2 hydraulic circuit. The 38C Regulator valve directs Drive 2 fluid into the 38C hydraulic circuit applying the 38C Clutch assembly. Solenoid A does not allow Drive fluid to enter the 123456C Feed hydraulic circuit.
- Solenoid H allows line pressure to enter the TCC VFS Hydraulic circuit, shuttling TCC Control Valve and TCC Reg Apply Valve.
- Line pressure is now able to flow through Solenoid F into the 1 Rev/6789C Clutch Feed hydraulic circuit. 1 Rev/6789C Clutch Feed fluid is directed into 6789C Clutch hydraulic circuit by the Clutch Selector Valve, which applies the 6789C Clutch Assembly.

Drive - 9th gear:

- Solenoids A, B, C, G, H, and PISA are on. Solenoid G shuttles the mode enable valve to provide line pressure to transmission range control valves. The PISA is held on to prevent an unintentional parking pawl engagement if hydraulic pressure at the park servo is lost.
- Solenoid C shuttles the transmission control valve 1 allowing line pressure to enter Feed 1 hydraulic circuit, which directs fluid to the transmission control valve 2. The transmission control valve 2 directs Feed 1 fluid to the Drive hydraulic circuit. Solenoid A does not allow Drive fluid to enter the 123456C Feed hydraulic circuit.

- Solenoid H allows line pressure to enter the TCC VFS Hydraulic circuit, shutting TCC Control Valve and TCC Reg Apply Valve.
- Solenoid B allows Drive fluid to enter the 29C hydraulic circuit, applying the 29C Clutch assembly.

9TXX ETRS Component Application Chart

Solenoid Application Chart

Range	Gear	Solenoids								
		A	B	C	D	E	F	G	H	PISA
Park	Park	Off	Off	Off	Off	Off	On	On	Off	Off
Reverse	Reverse	Off	Off	Off	On	On	Off	On	Off	On
Neutral	Neutral	Off	Off	Off*	Off*	Off	On	On	Off	On
	Neutral Shift	Off	Off	On	On	Off	On	On	Off	On
	Neutral High	Off	Off	Off	On	Off	On	On	Off	On
Drive	1 - Lock - Engine Braking	Off	Off	On	Off	Off	On	On	Off	On
	1 - Freewheel	Off	Off	On	Off	Off	Off	On	Off	On
	2	Off	On	On	Off	Off	On	On	Off	On
	3	Off	Off	On	Off	Off	On	On	Off	On
	4	Off	Off	On	On	Off	On	On	Off	On
	5	Off	Off	On	Off	On	On	On	Off	On
	6	Off	Off	On	Off	Off	Off	On	On	On
	7	On	Off	On	Off	On	Off	On	On	On
	8	On	Off	On	Off	Off	Off	On	On	On
	9	On	On	On	Off	Off	Off	On	On	On

* On/Stroked for ≤ 350 ms in order to apply park servo, releasing the parking pawl when shifting from PARK to Neutral

Electronically Controlled Valve Application Chart

Range	Gear	Mode Valves		
		Mode Enable Valve	Transmission Range Mode Valve 1	Transmission Range Mode Valve 2
Park	Park	On	Default	Default
Reverse	Reverse	On	Default	Stroked
Neutral	Neutral	On	Default*	Default*
	Neutral Shift	On	Stroked	Stroked
	Neutral High	On	Default	Stroked
Drive	1	On	Stroked	Default
	2	On	Stroked	Default
	3	On	Stroked	Default
	4	On	Stroked	Default
	5	On	Stroked	Default
	6	On	Stroked	Default
	7	On	Stroked	Default
	8	On	Stroked	Default
	9	On	Stroked	Default

* On/Stroked for ≤ 350 ms in order to apply park servo, releasing the parking pawl when shifting from PARK to Neutral

Hydraulic Component Application Chart

Range	Gear	Clutch/Servo							
		Park Servo	Selective One-way Clutch Servo	123456C	29C	38C	4C	57RC	6789C

Range	Gear	Clutch/Servo							
		Park Servo	Selective One-way Clutch Servo	123456C	29C	38C	4C	57RC	6789C
Park	Park	Released	Released	Released	Released	Released	Released	Released	Released
Reverse	Reverse	Applied	Applied	Released	Released	Released	Released	Applied	Released
Neutral	Neutral	Released	Released	Released	Released	Released	Released	Released	Released
	Neutral Shift	Applied	Applied	Released	Released	Released	Released	Released	Released
	Neutral High	Applied	Applied	Released	Released	Released	Released	Released	Released
Drive	1 - Lock (Engine Braking)	Applied	Applied	Applied	Released	Released	Released	Released	Released
	1 - Freewheel	Applied	Released	Applied	Released	Released	Released	Released	Released
	2	Applied	Released	Applied	Applied	Released	Released	Released	Released
	3	Applied	Released	Applied	Released	Applied	Released	Released	Released
	4	Applied	Released	Applied	Released	Released	Applied	Released	Released
	5	Applied	Released	Applied	Released	Released	Released	Applied	Released
	6	Applied	Released	Applied	Released	Released	Released	Released	Applied
	7	Applied	Released	Released	Released	Released	Released	Applied	Applied
	8	Applied	Released	Released	Released	Applied	Released	Released	Applied
	9	Applied	Released	Released	Applied	Released	Released	Released	Applied
Applied/Released = Hydraulic pressure applied/released on the component									

MECHANICAL POWERFLOW FROM THE TORQUE CONVERTER TO THE TURBINE SHAFT - ENGINE RUNNING

The mechanical power flow in the Hydra-matic 9T45/50/60/65 transmission begins at the point of connection between the torque converter and the engine flywheel. When the engine is running, the torque converter cover (pump) is forced to rotate at engine speed. As the torque converter rotates it multiplies engine torque and transmits it to the turbine shaft (547). The turbine shaft provides the primary link to the mechanical operation of the transmission.

The Hydra-matic 9T45/50/60/65 automatic transmission requires a constant supply of pressurized fluid to cool and lubricate all of the components throughout the unit. It also requires a holding force to be applied to the clutches during the various gear range operations. The automatic transmission fluid pump assembly (315), and the control valve solenoid body assembly (8) provide for the pressurization and distribution of fluid throughout the transmission.

1. Power from the Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Power to Drive the Fluid Pump

The drive sprocket (304) is splined (keyed) to the torque converter hub. The drive link (305) is driven by the drive sprocket (304) and in turn drives the driven sprocket (302). The fluid pump drive shaft is splined to the driven sprocket, therefore when the engine is running, the transmission fluid pump is operating.

3. Fluid Coupling Drives the Turbine

Transmission fluid inside the torque converter assembly (14) creates a fluid coupling which in turn drives the torque converter turbine.

4. Turbine Shaft Driven

As the torque converter turbine rotates, the turbine shaft (547), which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

Mechanical Powerflow from The Torque Converter To The Turbine Shaft - Engine Running

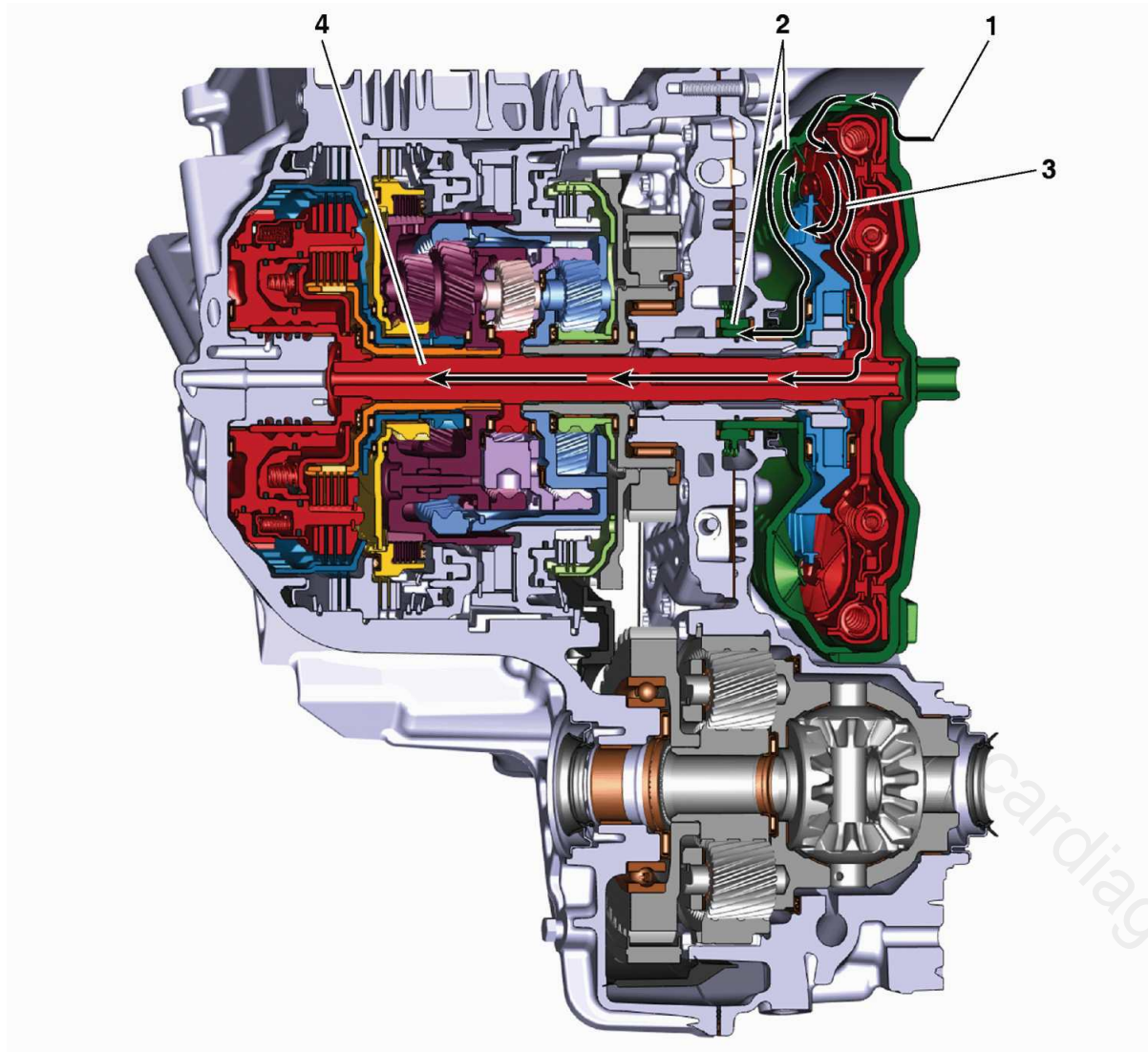


Fig. 14: Mechanical Powerflow From Torque Converter To Turbine Shaft - Engine Running Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

PARK - ENGINE RUNNING (HYDRAULIC CIRCUITS WITHOUT ETRS)

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

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

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

1 Reverse & 6789 Regulator Valve

The 1 Reverse & 6-7-8-9 solenoid is energized which applies pressure against the 1 Reverse & 6-7-8-9 Regulator Valve spring force. This allows line fluid to be blocked from entering the 1 REV/6789 FEED fluid circuit.

Park - Engine Running



Courtesy of GENERAL MOTORS COMPANY

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

VFS Line Solenoid

ETRS Mode Enable Valve

LINE VFS fluid is routed to the ETRS mode enable valve applying pressure against ETRS mode enable valve spring force. This allows LINE fluid to be directed into the RANGE FEED fluid circuit. RANGE FEED fluid is then directed to the mode 1 ETRS valve.

Mode 1 ETRS Valve

RANGE FEED fluid is routed to the mode 1 ETRS valve and into the FEED 0 fluid circuit.

Mode 2 ETRS Valve

FEED 0 fluid is routed to the mode 2 ETRS valve and into the PARK ON fluid circuit. PARK ON fluid is directed to the ball check valve #14 and #15.

Ball Check Valve #14

PARK ON fluid is routed to the ball check valve #14. The ball check valve is seated by PARK ON fluid pressure.

Ball Check Valve #15

PARK ON fluid is routed to the ball check valve #15 applying pressure against the ball check valve spring force.

Park Release Servo Piston

PARK ON fluid is directed past ball check valve #15 and into the park release servo piston assisting with park release servo piston spring force to keep park engaged.

1 Reverse & 6789 Regulator Valve

The 1 Reverse and 6-7-8-9 solenoid is energized which applies pressure against the 1 Reverse and 6-7-8-9 Regulator Valve spring force. This allows LINE fluid to be blocked from entering the 1 REV/6789 FEED fluid circuit.

Park - Engine Running

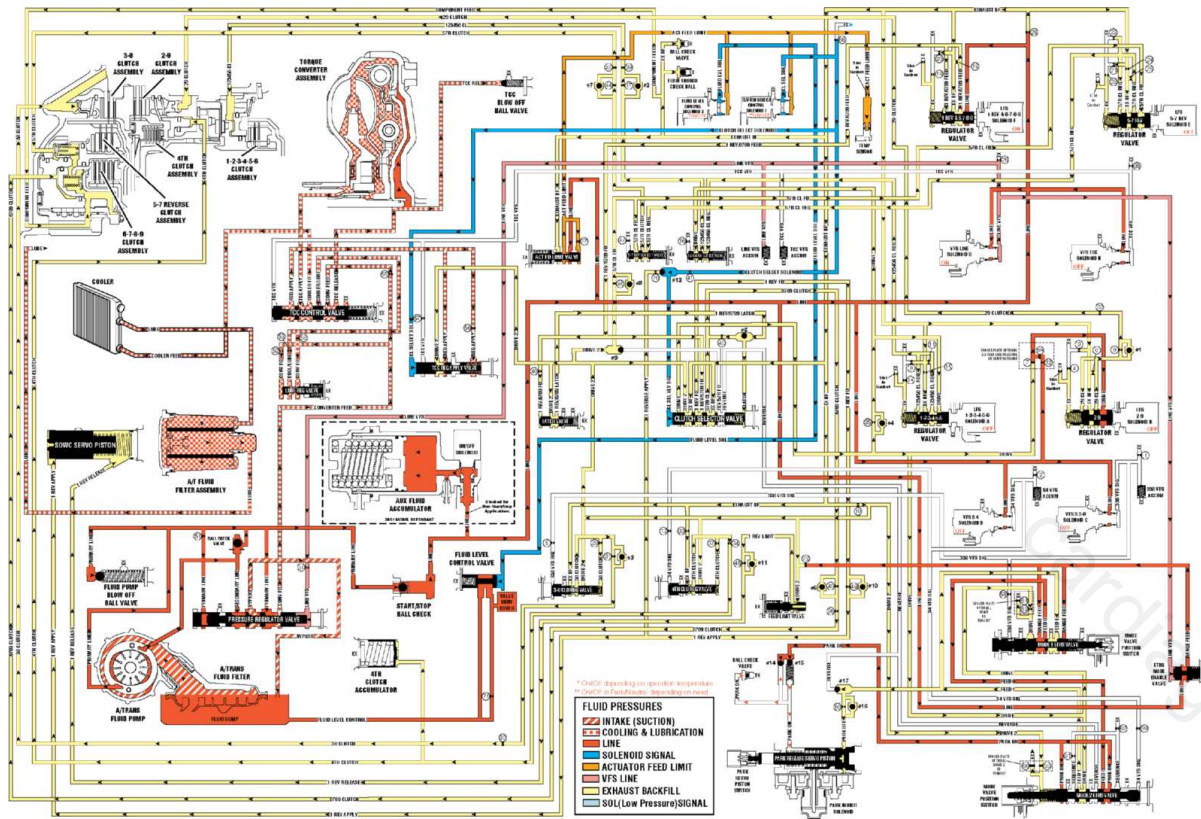


Fig. 16: Park - Engine Running Hydraulic Diagram (With ETRS)
Courtesy of GENERAL MOTORS COMPANY

PARK - ENGINE RUNNING (MECHANICAL POWERFLOW)

In Park range, there are three levels of power flow coexisting. The graphics will follow each flow separately by numerical designation, in relation to the following text.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly drives the output carrier assembly (555) pinions.

5. Output Carrier Assembly Held

The output carrier assembly (555) is splined to, and held by, the output carrier transfer drive gear hub (502). The output internal gear (input carrier assembly) (552) drives the output carrier assembly (555) pinions, which then drives the output sun gear (522).

6. Power Flow Terminated At The Output Sun Gear

Without the 1-2-3-4-5-6 clutch applied, torque cannot be transferred from the output sun gear (522), thus power flow is terminated.

7. Torque from Wheels to Front Differential Carrier Pinions

Torque from the vehicle travels through the wheels to the front differential carrier (238), and is transferred to the front differential carrier sun gear (240), which is splined to driven sprocket (241).

8. Park Gear Held/Power Flow Terminated at Front Differential Drive Pinion Gear Assembly

The park lock gear is held by the park pawl (715). The park lock gear is splined to the output carrier transfer drive gear hub (502). Therefore power flow is terminated at the output carrier transfer drive gear hub (502).

9. Drive Sprocket Held

The drive sprocket (234) is in mesh with the drive link (233), which is in mesh with and held by the driven sprocket (241).

Park - Engine Running

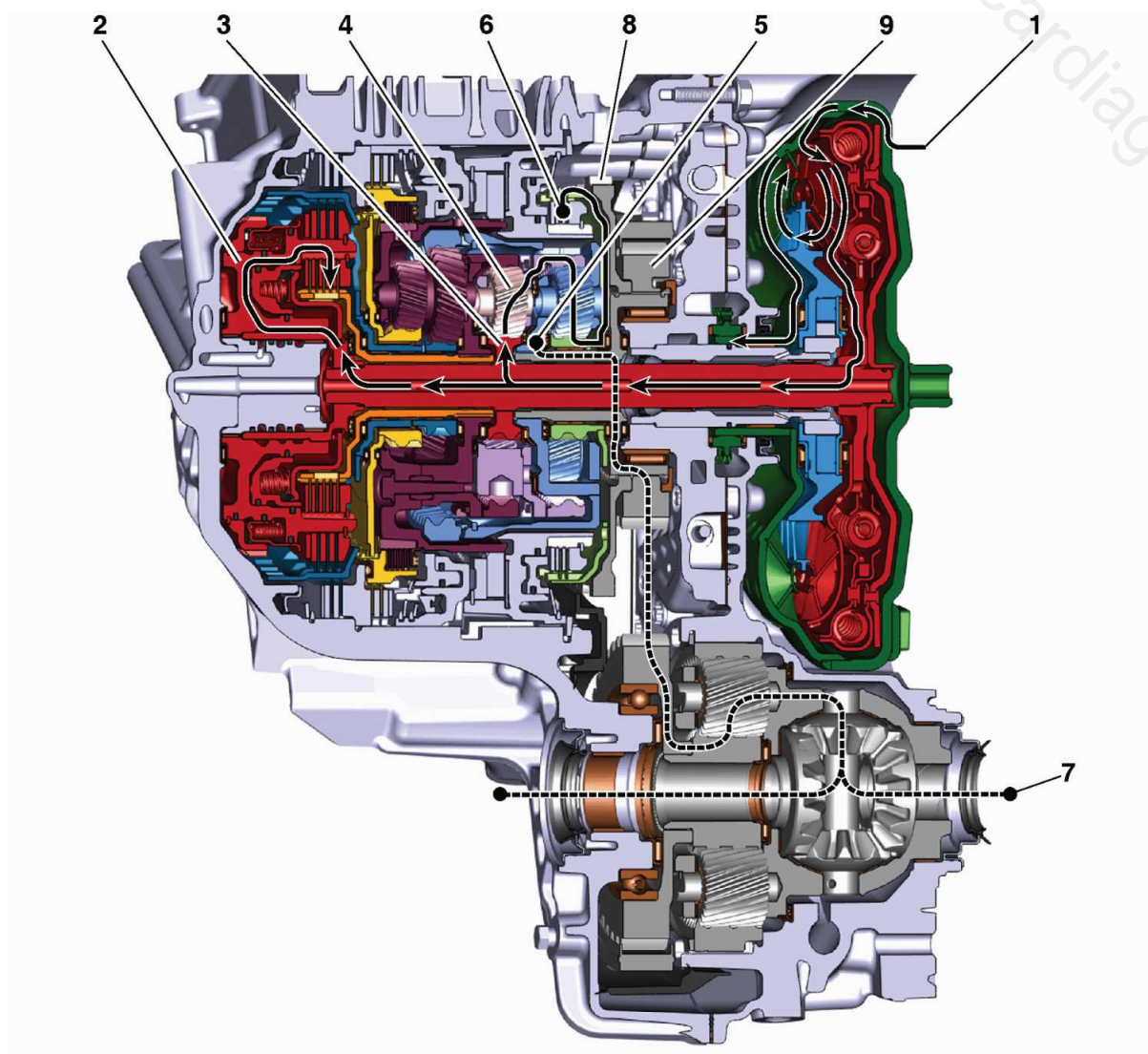


Fig. 17: Park - Engine Running Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

REVERSE (HYDRAULIC CIRCUITS WITHOUT ETRS)

When the gear selector is moved to the Reverse (R) position (from the Park position) the 5-7 reverse solenoid and clutch select control solenoid is commanded ON and the 1 reverse & 6-7-8-9 solenoid is commanded OFF and the following changes occur in the transmission's hydraulic and electrical systems:

Fluid Pressure Directed In Preparation For a Shift

Manual Valve

With the manual valve in the reverse position, line pressure is directed into the reverse fluid circuit to the clutch select valve.

Clutch Select Control Solenoid

The clutch select control solenoid energizes allowing ACTUATOR FEED LIMIT fluid to enter the CLUTCH SELECT SOLENOID fluid circuit. CLUTCH SELECT SOLENOID fluid is routed to the TCC regulator apply valve and the clutch select valve.

#12 Ball Check Valve and Clutch Select Valve

CLUTCH SELECT SOLENOID fluid is routed thru orifice #41 and seating the #12 ball check valve against the 1 REVERSE APPLY fluid passage allowing fluid to be directed into the CLUTCH SELECT VALVE SIGNAL fluid circuit to the clutch select valve applying pressure against clutch select valve spring force. REVERSE fluid from the manual valve is routed to the clutch select valve which is directed into the REV/57R FEED fluid circuit. REV/57R FEED fluid is directed to the #9 ball check valve.

#9 Ball Check Valve

REV/57R FEED fluid seats the #9 ball check valve against the DRIVE 2 fluid circuit allowing REV/57R FEED to enter the 57R CLUTCH FEED fluid circuit. The 57R CLUTCH FEED fluid is routed thru orifice #46 and to the #8 ball check valve.

#8 Ball Check Valve

The 57R CLUTCH FEED fluid seats the #8 ball check valve and is forced thru orifice #46. 57R CLUTCH FEED fluid is routed to the 5-7 reverse clutch boost valve and to the 5-7 reverse regulator valve.

5-7 Reverse Clutch Boost Valve

The 57R CLUTCH FEED fluid seats the #8 ball check valve and is forced thru orifice #46. 57R CLUTCH FEED fluid is routed to the 5-7 reverse clutch boost valve awaiting valve shift.

5-7 Reverse Regulator Valve

The 57R CLUTCH FEED fluid is routed to the 5-7 reverse regulator valve awaiting valve shift.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and #45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

The VFS S4 solenoid is energized at low pressure allowing LINE fluid to enter the S4 VFS SIGNAL fluid circuit. S4 VFS SIGNAL fluid is directed to the mode 2 ETRS valve and 4th clutch regulator

valve.

Mode 2 ETRS Valve

S4 VFS SIGNAL fluid is routed to the mode 2 ETRS valve applying pressure against mode 2 ETRS valve spring force. This allows FEED 0 fluid to be directed into the REVERSE fluid circuit. REVERSE fluid is then directed to the #17 ball check valve and the clutch selector valve.

4th Clutch Regulator Valve

S4 VFS SIGNAL fluid is routed to the 4th clutch regulator valve applying pressure against 4th clutch regulator valve spring force. Pressure on the 4th clutch regulator valve is low enough to not apply the 4th clutch.

#17 Ball Check Valve

REVERSE fluid seats the #17 ball check valve against the FEED 1 fluid circuit. The REVERSE fluid seats the #16 ball check valve and is routed thru orifice #80 into the PARK OFF fluid circuit. PARK OFF fluid is directed to the park release servo piston.

Park Release Servo Piston

PARK OFF fluid is directed to the park release servo piston applying pressure against park release servo piston spring force. The park inhibit solenoid is then energized on.

Clutch Select Control Solenoid

The clutch select control solenoid energizes allowing ACTUATOR FEED LIMIT fluid to enter the CLUTCH SELECT SOLENOID fluid circuit. CLUTCH SELECT SOLENOID fluid is routed to the TCC regulator apply valve and the clutch selector valve.

Clutch Selector Valve and #12 Ball Check Valve

CLUTCH SELECT SOLENOID fluid is routed thru orifice #41 and seats the #12 ball check valve against the 1 REVERSE APPLY fluid circuit which allows CLUTCH SELECT SOLENOID fluid to enter the CLUTCH SELECT VALVE SIGNAL fluid circuit. CLUTCH SELECT VALVE SIGNAL fluid circuit is directed to the clutch selector valve applying pressure against clutch selector valve spring force. REVERSE fluid from the mode 2 ETRS valve is routed to the clutch selector valve which is directed into the REV/57R FEED fluid circuit. REV/57R FEED fluid is directed to the #9 ball check valve.

#9 Ball Check Valve

REV/57R FEED fluid seats the #9 ball check valve against the DRIVE 2 fluid circuit allowing REV/57R FEED to enter the 57R CLUTCH FEED fluid circuit. The 57R CLUTCH FEED fluid is routed thru orifice #46 and to the #8 ball check valve.

#8 Ball Check Valve

The 57R CLUTCH FEED fluid seats the #8 ball check valve and is forced thru orifice #46. 57R CLUTCH FEED fluid is routed to the 5-7 reverse clutch boost valve and to the 5-7 reverse regulator valve.

5-7 Reverse Clutch Boost Valve

The 57R CLUTCH FEED fluid seats the #8 ball check valve and is forced thru orifice #46. 57R CLUTCH FEED fluid is routed to the 5-7 reverse clutch boost valve awaiting valve shift.

5-7 Reverse Regulator Valve

The 57R CLUTCH FEED fluid is routed to the 5-7 reverse regulator valve awaiting valve shift.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and #45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

57R CLUTCH fluid is directed into the 5-7 rev clutch piston spring force which applies holding force to the 5-7 rev clutch plates.

SOWC Servo Piston Applies

Reverse & 6-7-8-9 Solenoid

The 1 reverse & 6-7-8-9 solenoid de-energizes releasing pressure against the 1 reverse & 6-7-8-9 regulator valve spring force. This allows LINE fluid to enter the 1 REV/6789 FEED fluid circuit. 1 REV/6789 FEED fluid is routed thru orifice #40 to the latch valve and to the clutch select valve.

Clutch Selector Valve

1 REV/6789 FEED fluid is routed thru the clutch select valve into the 1 REVERSE FEED fluid circuit. 1 REVERSE FEED fluid seats ball check valve #10 and is forced thru orifice #49 into the 1 REVERSE APPLY fluid circuit. 1 REVERSE APPLY fluid is directed to the SOWC servo piston.

SOWC Servo Piston

1 REVERSE APPLY fluid is directed into the SOWC servo piston applying pressure against piston spring force.

Reverse

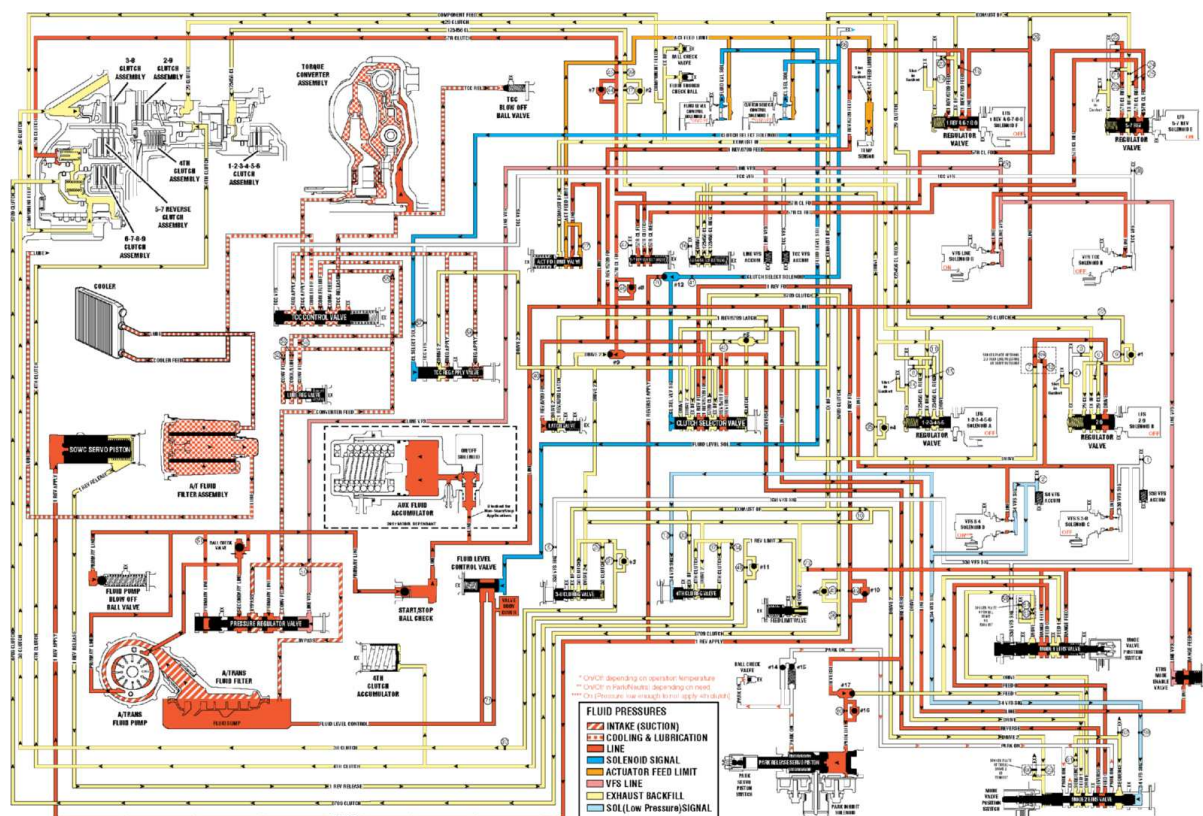


Fig. 19: Reverse Hydraulic Diagram (With ETRS).

Courtesy of GENERAL MOTORS COMPANY

REVERSE (MECHANICAL POWERFLOW)

In Reverse (R), torque from the engine is multiplied through the torque converter assembly (14), the transmission gear sets, and the front differential carrier assembly (238), thereby sending power to the vehicle's drive axles. The planetary gear sets operate in reduction and also reverse the direction of input torque. The gear ratio for Reverse gear range is 2.960:1. When the gear selector lever is moved into the Reverse (R) gear range, the parking pawl (715) disengages from the parking gear (232) allowing the drive sprocket (234) and connected components to rotate. The manual shift detent lever (709) and manual valve (452) are also moved into the Reverse gear position in order to channel the transmission fluid.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly drives the output carrier assembly (555) pinions.

5. 5-7-Reverse Clutch Applied

The 5-7-reverse clutch plates (578-582) are applied and connect the 3-5-reverse and 6-7-8-9 clutch housing (530) to the 3-8 and 5-7-reverse clutch hub (534).

6. 1- Reverse and 1-2-3-4-5-6 Clutch Piston Applied

The 1- reverse and 1-2-3-4-5-6 clutch piston is applied and holds the overdrive carrier (546)

7. Overdrive Carrier Held

The overdrive carrier (546) is held by the 1- Reverse and 1-2-3-4-5-6 Clutch Piston housing (590).

8. 3-8 and 5-7-Reverse Clutch Hub Driving

With the overdrive carrier (546) held by the 1- Reverse and 1-2-3-4-5-6 Clutch Piston housing (590), the 3-8 and 5-7-reverse clutch hub (534) drives the overdrive carrier assembly pinion gears.

9. Output Carrier Assembly Drive

The overdrive carrier (546) pinion gears are in mesh with, and drive, the internal gear (output carrier assembly) (555) in the direction opposite of torque converter rotation to achieve reversal of direction.

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Reverse

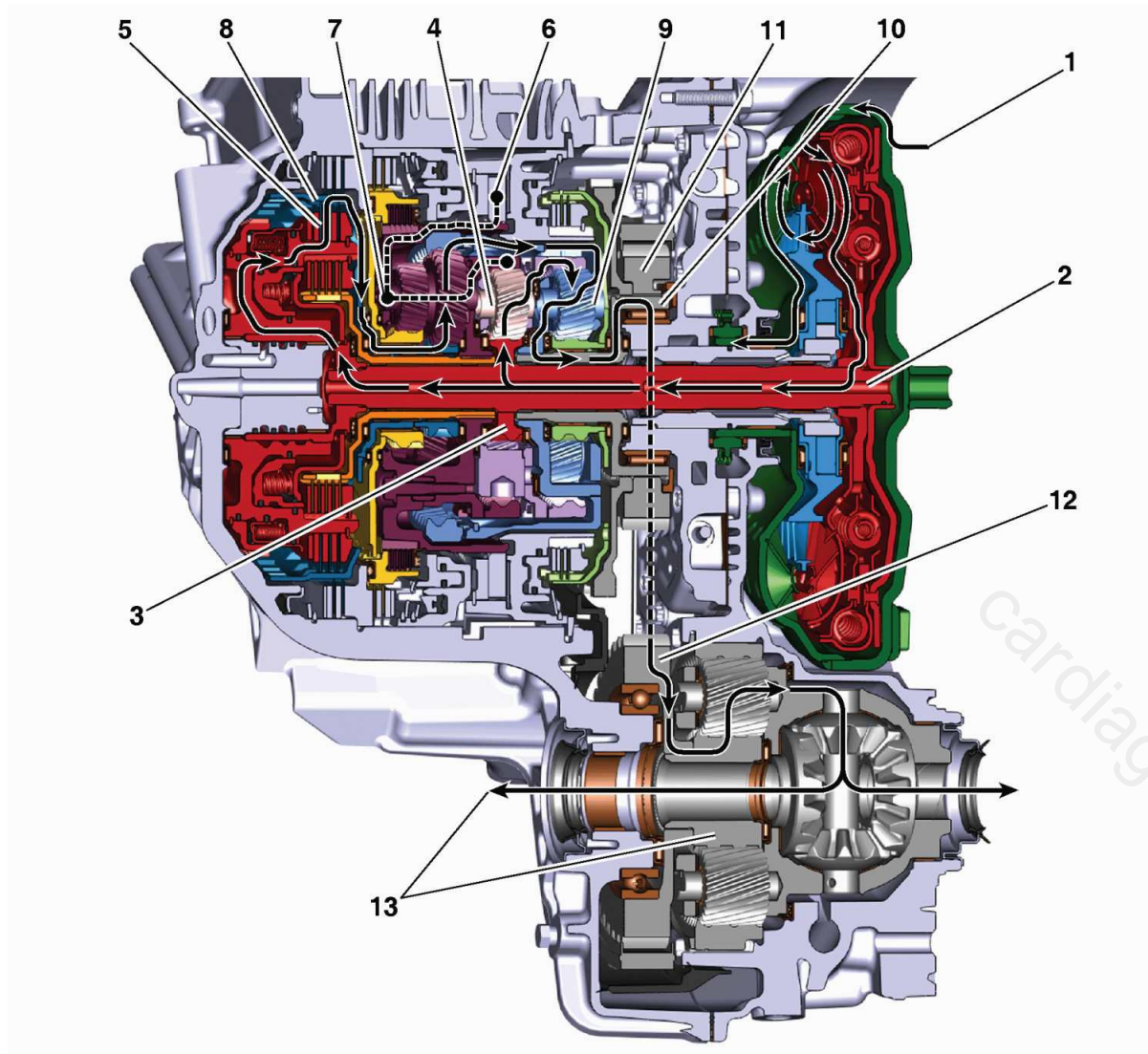


Fig. 20: Reverse Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

NEUTRAL - ENGINE RUNNING (HYDRAULIC CIRCUITS WITHOUT ETRS)

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the 5-7 reverse solenoid and clutch select control solenoid is commanded OFF and the 1 reverse & 6-7-8-9 solenoid is commanded ON and the following changes would occur in the hydraulic system.

5-7 Reverse Clutch Releases

Manual Valve

The manual valve is moved to the Neutral position and blocks line pressure from entering the reverse and drive fluid circuits. The reverse fluid from the clutch select valve is opened to an exhaust passage at the manual valve.

Clutch Select Control Solenoid

The clutch select control solenoid is signaled off allowing CLUTCH SELECT SOLENOID fluid to exhaust from the TCC regulator apply valve and the clutch select valve.

Clutch Select Valve

The clutch selector valve spring pressure shifts the valve to allow CLUTCH SELECT VALVE SIGNAL fluid to seat the #12 ball check valve allowing CLUTCH SELECT VALVE SIGNAL fluid to be exhausted thru orifice #41 into the CLUTCH SELECT SOLENOID fluid circuit which is routed thru orifice #68 and exhausted thru the EXHAUST fluid circuit.

TCC Regulator Apply Valve

The TCC regulator apply valve spring pressure shifts the valve to allow CLUTCH SELECT SOLENOID fluid to be exhausted thru orifice #68 and exhausted thru the EXHAUST fluid circuit.

#9 Ball Check Valve

REV/57R FEED fluid releases and unseats the #9 ball check valve against the DRIVE 2 fluid circuit allowing REV/57R FEED to exhaust into the EX BACKFILL fluid circuit.

5-7 Reverse Solenoid

The 5-7 reverse solenoid de-energizes releasing pressure against the 5-7 reverse regulator valve spring force. This blocks 57R CLUTCH FEED fluid from entering the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is exhausted thru orifice #25 and #24 into the EX BACKFILL fluid circuit and thru orifice #21 into the EXHAUST fluid circuit.

5-7 Reverse Clutch Assembly

The 5-7 reverse clutch is released allowing 57R CLUTCH fluid to exhaust thru orifice #45 and #44 to the 5-7 clutch boost valve into the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid continues thru orifice #22 into the EXHAUST fluid circuit.

SOWC Servo Piston Releases

1 Reverse & 6-7-8-9 Solenoid

The 1 reverse & 6-7-8-9 solenoid energizes applying pressure against the 1 reverse & 6-7-8-9 regulator valve spring force. This blocks LINE fluid from entering the 1 REV/6789 FEED fluid circuit. 1 REV/6789 FEED fluid is routed to the EXHAUST BACKFILL fluid circuit and thru orifice #20 into the EXHAUST fluid circuit.

SOWC Servo Piston

The SOWC servo piston is released. 1 REVERSE APPLY fluid is exhausted thru orifice #49 into the 1 REVERSE FD fluid circuit and directed thru the clutch select valve into the EXHAUST BACKFILL fluid circuit.

Neutral - Engine Running

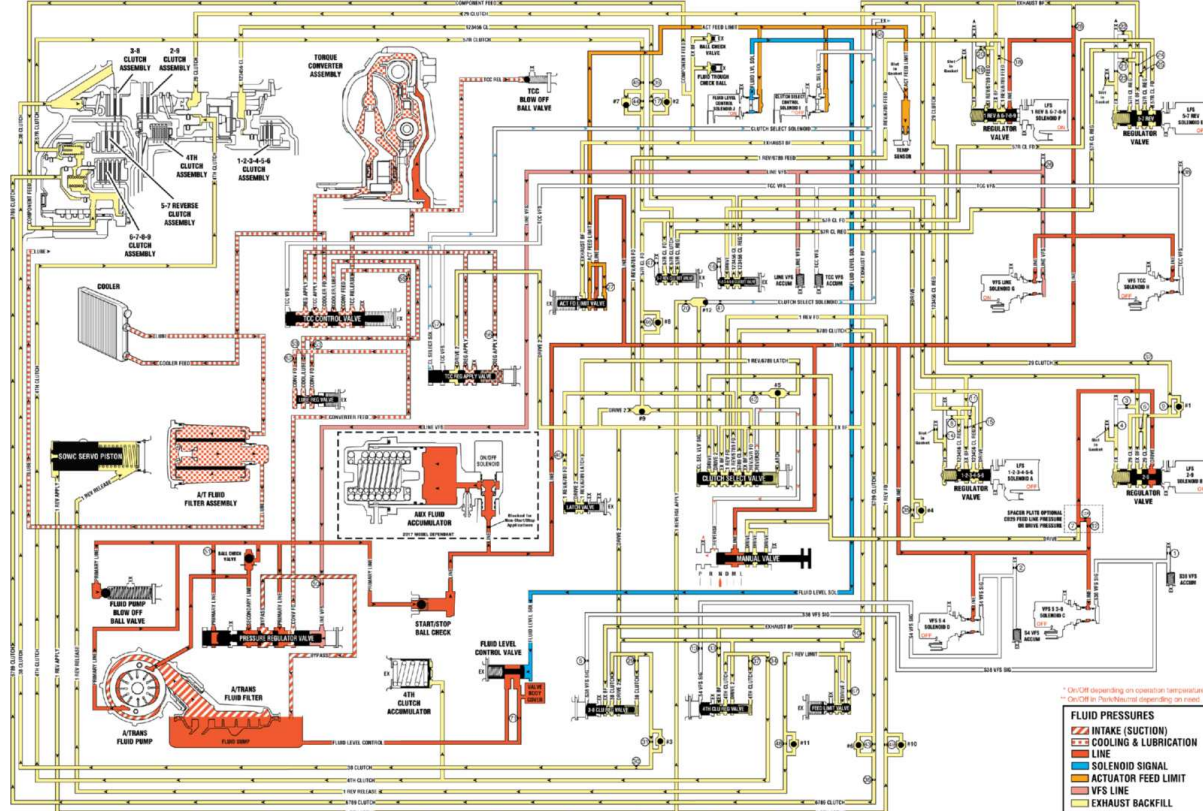


Fig. 21: Neutral - Engine Running Hydraulic Diagram (Without ETRS)

Courtesy of GENERAL MOTORS COMPANY

NEUTRAL - ENGINE RUNNING (HYDRAULIC CIRCUITS WITH ETRS)

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the 5-7 reverse solenoid and clutch select control solenoid is commanded OFF and the 1 reverse & 6-7-8-9 solenoid and VFS-S3 - 8 solenoid is commanded ON and the following changes would occur in the hydraulic system.

5-7 Reverse Clutch Releases

VFS S3-8 Solenoid

The VFS S3-8 solenoid is energized at low pressure allowing LINE fluid to enter the S38 VFS SIGNAL fluid circuit. S38 VFS SIGNAL fluid is directed to the mode 1 ETRS valve and 3-8 clutch regulator valve.

Mode 1 ETRS Valve

S38 VFS SIGNAL fluid is routed to the mode 1 ETRS valve applying pressure against mode 1 ETRS valve spring force. This allows RANGE FEED fluid to be directed into the FEED 1 fluid circuit. FEED 1 fluid is then directed to the #17 ball check valve and the mode 2 ETRS valve.

#17 Ball Check Valve

FEED 1 fluid seats the #17 ball check valve against the REVERSE fluid circuit. The FEED 1 fluid seats the #16 ball check valve and is routed thru orifice #80 into the PARK OFF fluid circuit. PARK OFF fluid is directed to the park release servo piston.

Park Release Servo Piston

PARK OFF fluid is directed to the park release servo piston applying pressure against park release servo piston spring force. The park inhibit solenoid is then energized on.

3-8 Clutch Regulator Valve

S38 VFS SIGNAL fluid is routed to the 3-8 clutch regulator valve applying pressure against 3-8 clutch regulator valve spring force. Pressure on the 3-8 clutch regulator valve is low enough to not apply the 3-

8 clutch.

Clutch Select Control Solenoid

The clutch select control solenoid is signaled off allowing CLUTCH SELECT SOLENOID fluid to exhaust from the TCC regulator apply valve and the clutch select valve.

Clutch Selector Valve

The clutch selector valve spring pressure shifts the valve to allow CLUTCH SELECT VALVE SIGNAL fluid to seat the #12 ball check valve allowing CLUTCH SELECT VALVE SIGNAL fluid to be exhausted thru orifice #41 into the CLUTCH SELECT SOLENOID fluid circuit which is routed thru orifice #68 and exhausted thru the EXHAUST fluid circuit.

TCC Regulator Apply Valve

The TCC regulator apply valve spring pressure shifts the valve to allow CLUTCH SELECT SOLENOID fluid to be exhausted thru orifice #68 and exhausted thru the EXHAUST fluid circuit

5-7 Reverse Solenoid

The 5-7 reverse solenoid de-energizes releasing pressure against the 5-7 reverse regulator valve spring force. This blocks 57R CLUTCH FEED fluid from entering the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is exhausted thru orifice #25 and #24 into the EX BACKFILL fluid circuit and thru orifice #21 into the EXHAUST fluid circuit.

5-7 Reverse Clutch Assembly

The 5-7 reverse clutch is released allowing 57R CLUTCH fluid to exhaust thru orifice #45 and #44 to the 5-7 clutch boost valve into the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid continues thru orifice #22 into the EXHAUST fluid circuit.

SOWC Servo Piston Releases

1 Reverse & 6-7-8-9 Solenoid

The 1 reverse & 6-7-8-9 solenoid energizes applying pressure against the 1 reverse & 6-7-8-9 regulator valve spring force. This blocks LINE fluid from entering the 1 REV/6789 FEED fluid circuit. 1 REV/6789 FEED fluid is routed to the EXHAUST BACKFILL fluid circuit and thru orifice #20 into the EXHAUST fluid circuit.

SOWC Servo Piston

The SOWC servo piston is released. 1 REVERSE APPLY fluid is exhausted thru orifice #49 into the 1 REVERSE FD fluid circuit and directed thru the clutch select valve into the EXHAUST BACKFILL fluid circuit.

Neutral - Engine Running

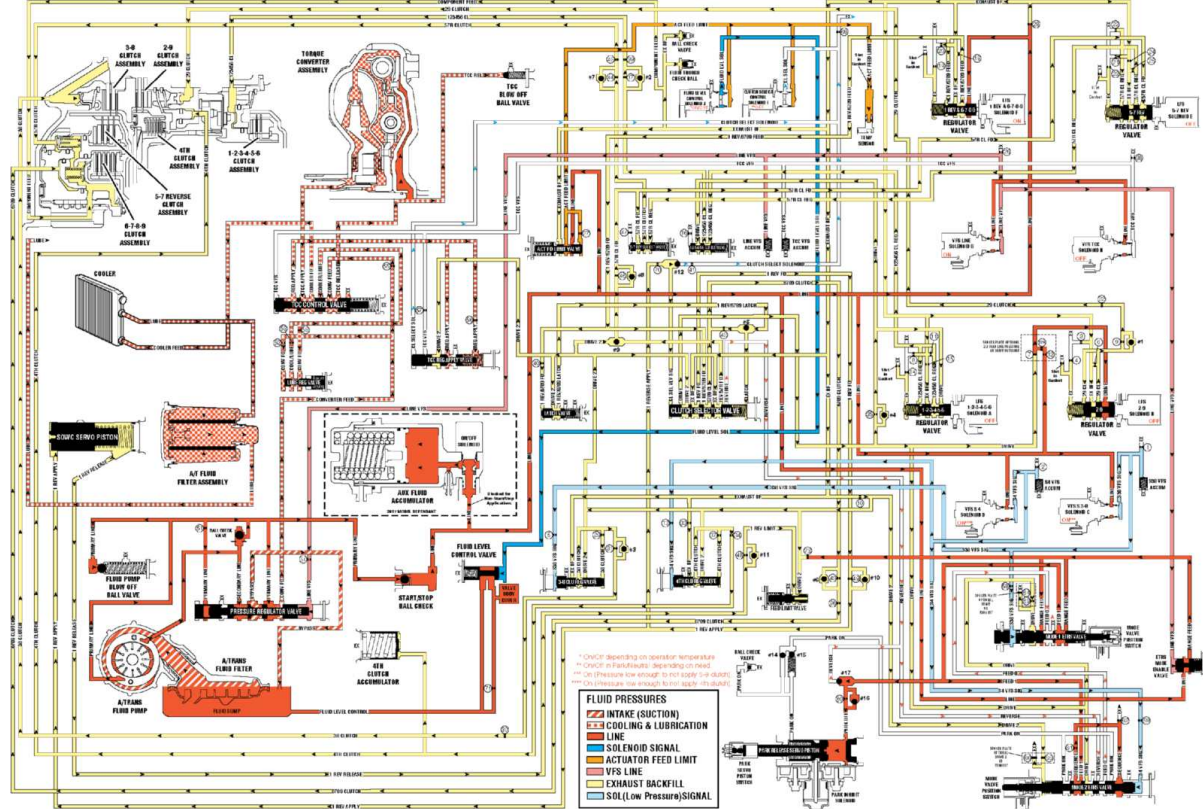


Fig. 22: Neutral - Engine Running Hydraulic Diagram (With ETRS)
 Courtesy of GENERAL MOTORS COMPANY

NEUTRAL - ENGINE RUNNING (MECHANICAL POWERFLOW)

When the gear selector lever is placed in the Neutral (N) position, the mechanical power flow through the transmission is similar to Park gear range. The primary difference is that the park pawl (715) is not engaged with the park gear (232), which allows the drive sprocket (234) to rotate freely in either direction. Assuming that the vehicle is on level ground, the weight of the vehicle (transferred through the drive axles) holds the front differential carrier (238), thus power flow does not travel to the drive sprocket (234). Under these conditions, power flow through the transmission is the same as in Park. The manual shift detent lever (709) and manual valve (452) are moved into the Neutral (N) range position.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driven

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly drives the output carrier assembly (555) pinions.

5. Output Carrier Assembly Held

The output carrier assembly (555) is splined to, and held by, the output carrier transfer drive gear hub (502). The output internal gear (input carrier assembly) (552) drives the output carrier assembly (555) pinions, which then drives the output sun gear (522).

6. Power Flow Terminated At The Output Sun Gear

Without the 1-2-3-4-5-6 clutch applied, torque cannot be transferred from the output sun gear (522), thus power flow is terminated.

7. 1- Reverse and 1-2-3-4-5-6 Clutch Piston Applied

The 1- reverse and 1-2-3-4-5-6 clutch piston is applied but not carrying a load.

8. Torque from Wheels to Front Differential Carrier Assembly Pinions

Torque from the vehicle travels through the wheels to the front differential carrier assembly (238), and is transferred to the driven sprocket (241) and connected components.

9. Power Flow Terminated at the drive sprocket

The front differential carrier (238) transfers torque to the drive sprocket (234), which is now free to rotate in either direction, and power flow is terminated. With the shift select lever in neutral, the vehicle is capable of forward or reverse motion, due to an incline or direct force (pushing).

Neutral - Engine Running

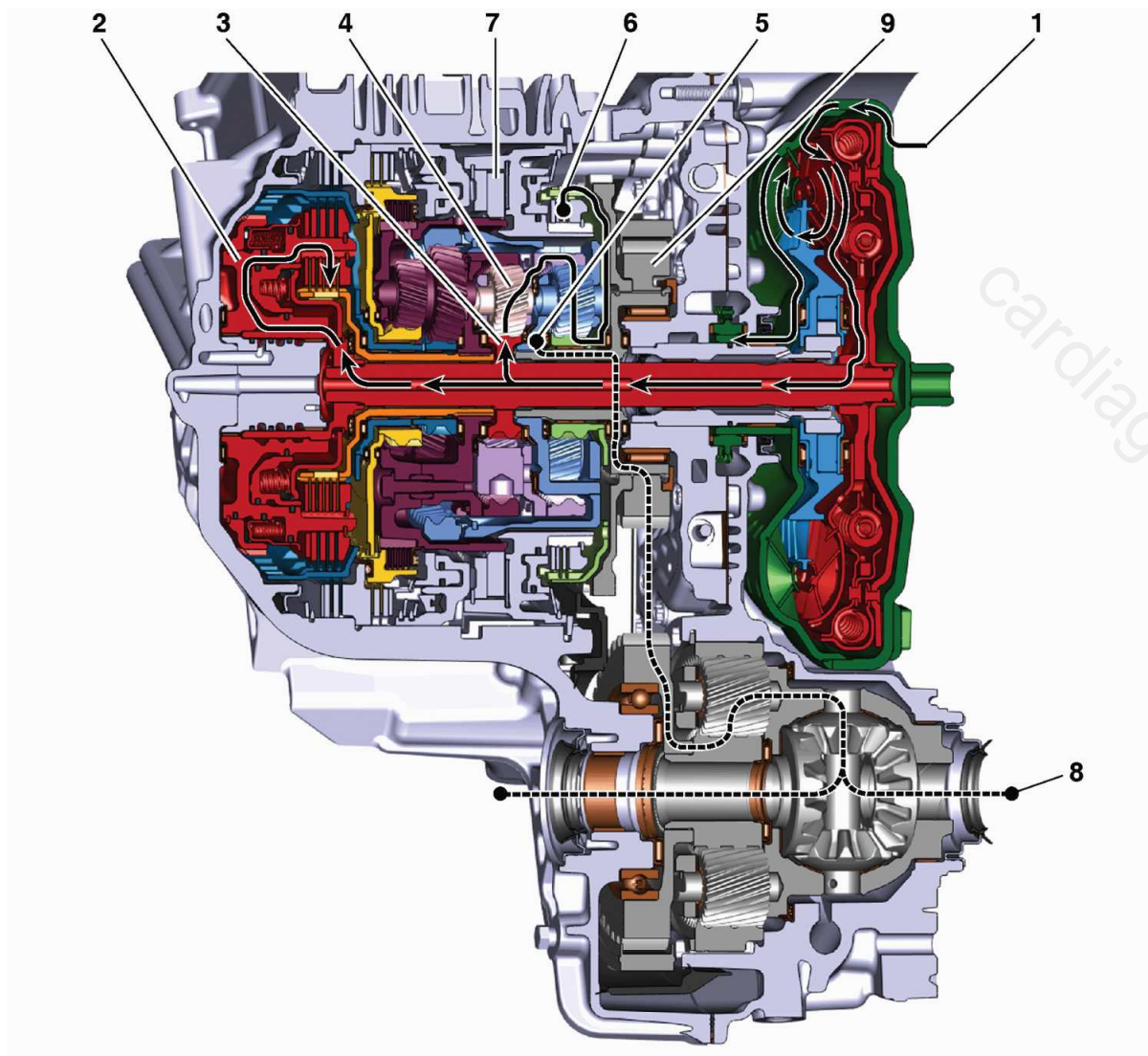


Fig. 23: Neutral - Engine Running Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, throttle position sensor and other vehicle sensors to determine the precise moment to de-energize or "turn off" 1-2-3-4-5-6 solenoid.

Fluid Pressure Is Directed To The 1-2-3-4-5-6 Clutch Assembly

Manual Valve

The manual valve is moved to the drive position and allows line fluid pressure to enter the drive fluid circuit. Drive fluid is then routed to the clutch select valve, 2-9 regulator valve, 1-2-3-4-5-6 regulator valve and 1-2-3-4-5-6 clutch boost valve.

Clutch Select Valve

DRIVE fluid is directed thru the clutch select valve and into the DRIVE 2 fluid circuit which is directed to the 3-8 clutch regulator valve, 4th clutch regulator valve, feed limit valve, TCC regulator apply valve and latch valve.

Latch Valve

DRIVE 2 fluid is directed thru the latch valve and into the 1 REV/6789 LATCH fluid circuit which is directed to the #5 ball check valve.

#5 Ball Check Valve

1 REV/6789 LATCH fluid seats the #5 ball check valve against the 6789 CLUTCH fluid circuit allowing 1 REV/6789 LATCH fluid to enter the LATCH fluid circuit. LATCH fluid is directed to the clutch select valve applying pressure with the clutch select valve spring force.

1-2-3-4-5-6 Clutch Applies

1-2-3-4-5-6 Solenoid

The 1-2-3-4-5-6 solenoid is de-energized allowing drive fluid to enter the 1-2-3-4-5-6 regulator valve and enter the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid is directed to the 1-2-3-4-5-6 clutch boost valve.

1-2-3-4-5-6 Clutch Boost Valve

123456 CLUTCH REGULATOR fluid is directed thru the 1-2-3-4-5-6 clutch boost valve and into the 123456 CLUTCH fluid circuit. 123456 CLUTCH fluid seats the ball check valve #2 and is forced thru orifice #17, #39. 123456 CLUTCH fluid is then directed to the 1-2-3-4-5-6 clutch assembly.

1-2-3-4-5-6 Clutch Assembly

123456 CLU fluid is directed to the 1-2-3-4-5-6 clutch assembly housing. 123456 CLU fluid moves the piston against spring force to apply holding of the 1-2-3-4-5-6 clutch plates.

Drive Range, First Gear

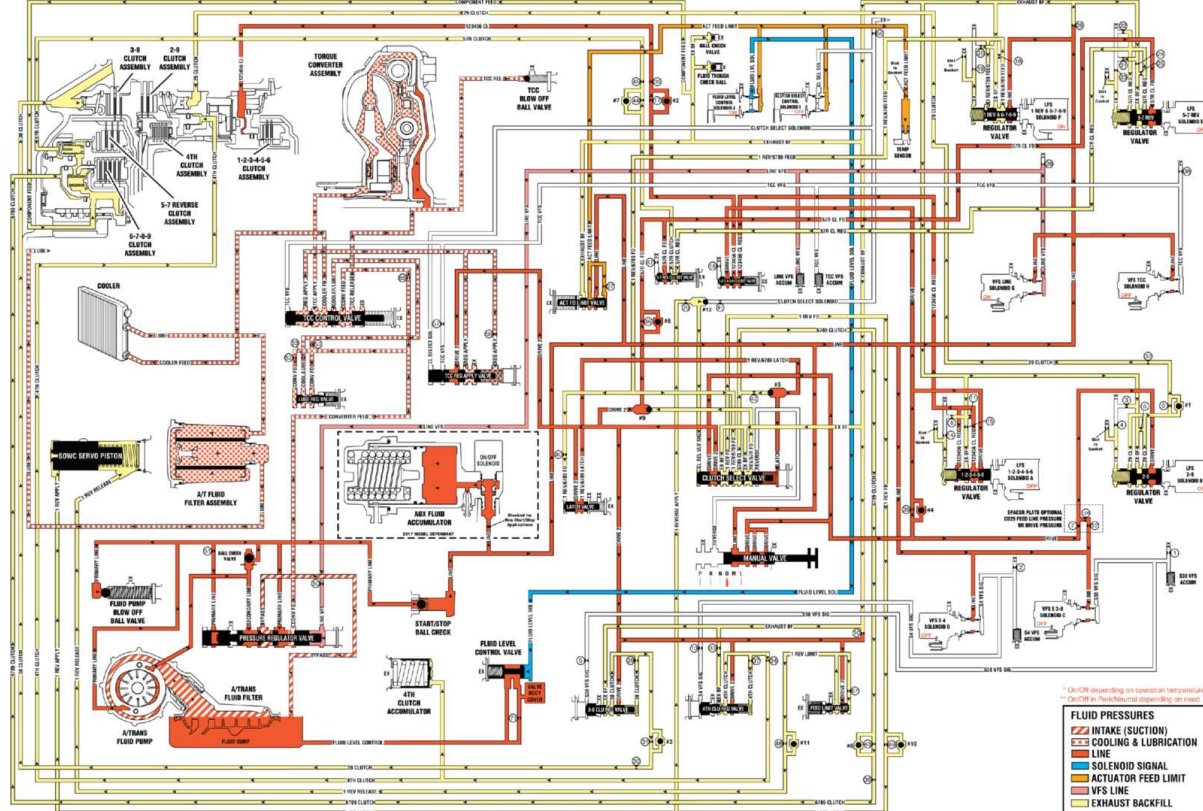


Fig. 24: Drive Range, First Gear Hydraulic Diagram (Without ETRS)
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, throttle position sensor and other vehicle sensors to determine the precise moment to de-energize or "turn off" 1-2-3-4-5-6 solenoid and the VFS S4 solenoid.

Fluid Pressure Is Directed To The 1-2-3-4-5-6 Clutch Assembly

VFS S4 Solenoid

The VFS S4 solenoid is energized off. Spring pressure shifts the 4th clutch regulator valve and the mode 2 ETRS valve to allow S4 VFS SIG fluid to exhaust thru orifice #2.

Clutch Selector Valve

DRIVE fluid is directed thru the clutch selector valve and into the DRIVE 2 fluid circuit which is directed to the 3-8 clutch regulator valve, 4th clutch regulator valve, feed limit valve, TCC regulator apply valve, latch valve, #9 ball check valve and mode 2 ETRS valve.

Latch Valve

DRIVE 2 fluid is directed thru the latch valve and into the 1 REV/6789 LATCH fluid circuit which is directed to the #5 ball check valve.

#5 Ball Check Valve

1 REV/6789 LATCH fluid seats the #5 ball check valve against the 6789 CLUTCH fluid circuit allowing 1 REV/6789 LATCH fluid to enter the LATCH fluid circuit. LATCH fluid is directed to the clutch select valve applying pressure with the clutch select valve spring force.

Mode 2 ETRS Valve

DRIVE 2 fluid is directed thru orifice #65 and into the mode 2 ETRS valve applying pressure with the mode 2 ETRS valve spring force.

1-2-3-4-5-6 Clutch Applies

1-2-3-4-5-6 Solenoid

The 1-2-3-4-5-6 solenoid is de-energized allowing drive fluid to enter the 1-2-3-4-5-6 regulator valve and enter the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid is directed to the 1-2-3-4-5-6 clutch boost valve.

1-2-3-4-5-6 Clutch Boost Valve

123456 CLUTCH REGULATOR fluid is directed thru the 1-2-3-4-5-6 clutch boost valve and into the 123456 CLUTCH fluid circuit. 123456 CLUTCH fluid seats the ball check valve #2 and is forced thru orifice #17, #39. 123456 CLUTCH fluid is then directed to the 1-2-3-4-5-6 clutch assembly.

1-2-3-4-5-6 Clutch Assembly

123456 CLU fluid is directed to the 1-2-3-4-5-6 clutch assembly housing. 123456 CLU fluid moves the piston against spring force to apply holding of the 1-2-3-4-5-6 clutch plates.

Drive Range, First Gear

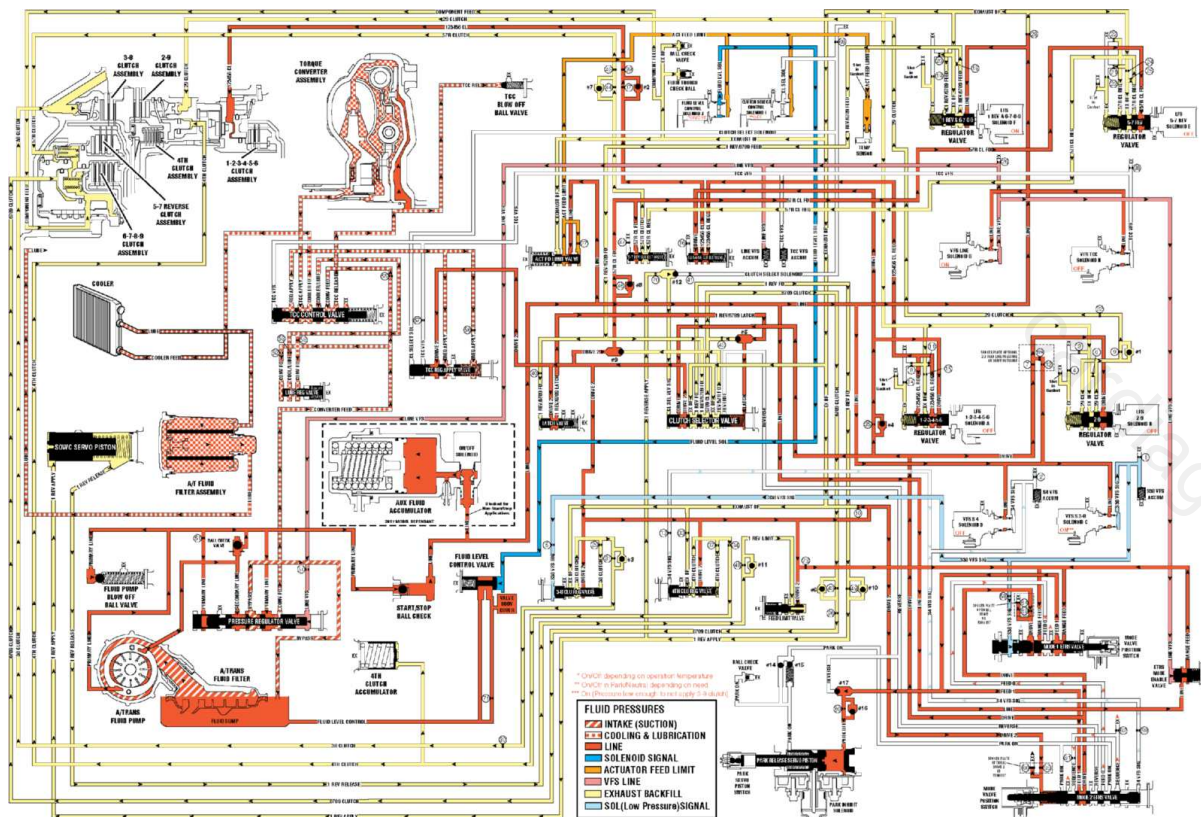


Fig. 25: Drive Range, First Gear Hydraulic Diagram (With ETRS).
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR (MECHANICAL POWERFLOW)

In Drive Range (D) - First Gear, torque from the engine is multiplied through the torque converter and transmission gear sets to the vehicle's drive axles. The planetary gear sets operate in reduction to achieve a First gear starting ratio of 4.689:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

6. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

7. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

8. 1-reverse and 1-2-3-4-5-6 clutch piston Holding

The input carrier assembly (552) pinion gears attempt to drive the overdrive carrier (546) in the direction opposite of engine rotation, but the carrier is held stationary by the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590). When the throttle is released, however, the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590) will overrun, allowing the vehicle to coast, at least briefly, until the TCM determines that engine braking is required. At that time, the 1-reverse and 1-2-3-4-5-6 clutch piston will apply and hold the 1-reverse and 1-2-3-4-5-6 clutch piston housing inner race.

9. Overdrive Carrier Held

The overdrive carrier (546) is held by the 1- Reverse and 1-2-3-4-5-6 Clutch Piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, First Gear

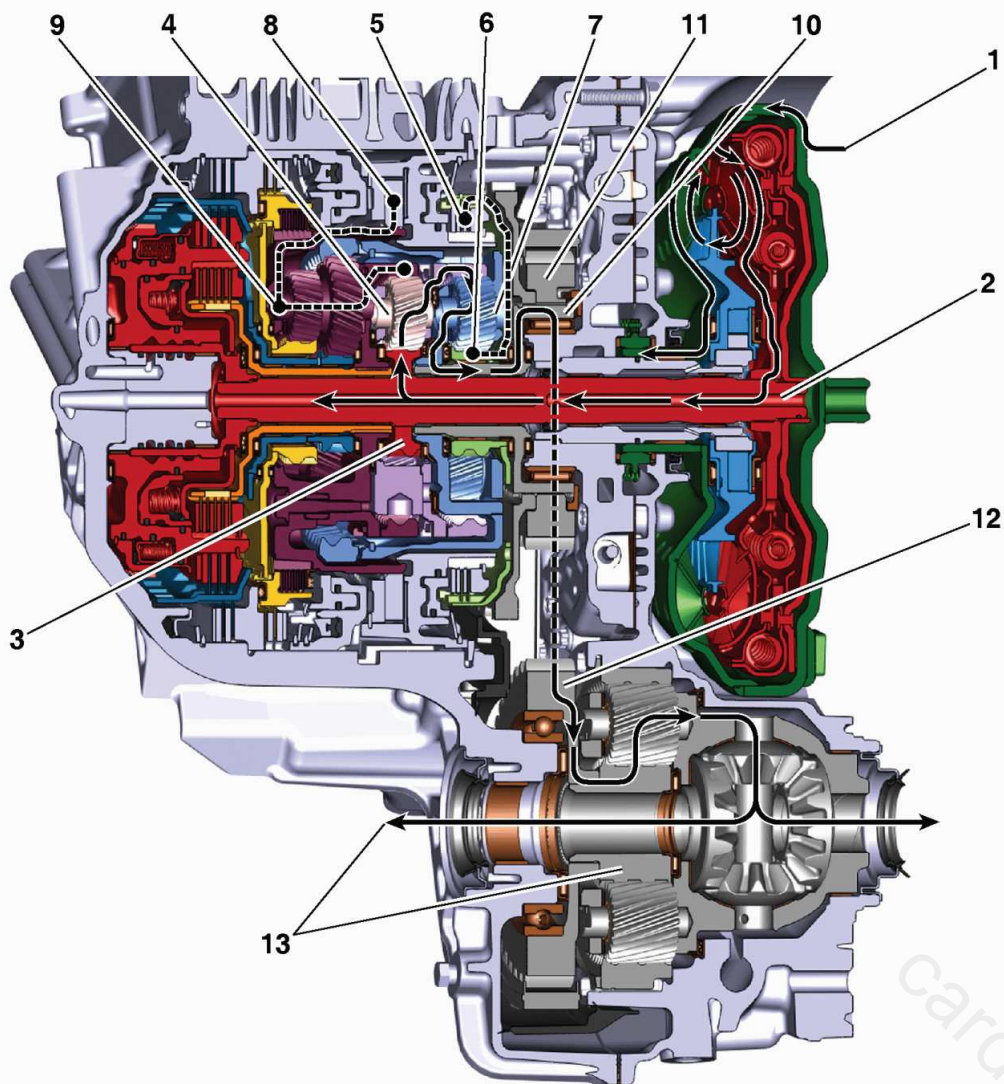


Fig. 26: Drive Range, First Gear Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SECOND GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 2-9 solenoid.

2-9 Clutch Applies

2-9 Solenoid

The 2-9 solenoid energizes allowing drive fluid to enter the 2-9 regulator valve and enter the 2-9 CLUTCH fluid circuit. 2-9 CLUTCH fluid seats ball check valve #1 then is forced thru orifice #9 and #32 to the 2-9 clutch assembly.

2-9 Clutch Assembly

29 CLUTCH fluid is directed to the 2-9 clutch assembly housing. 29 CLUTCH fluid moves the piston against spring force to apply holding of the 2-9 clutch plates.

Drive Range, Second Gear

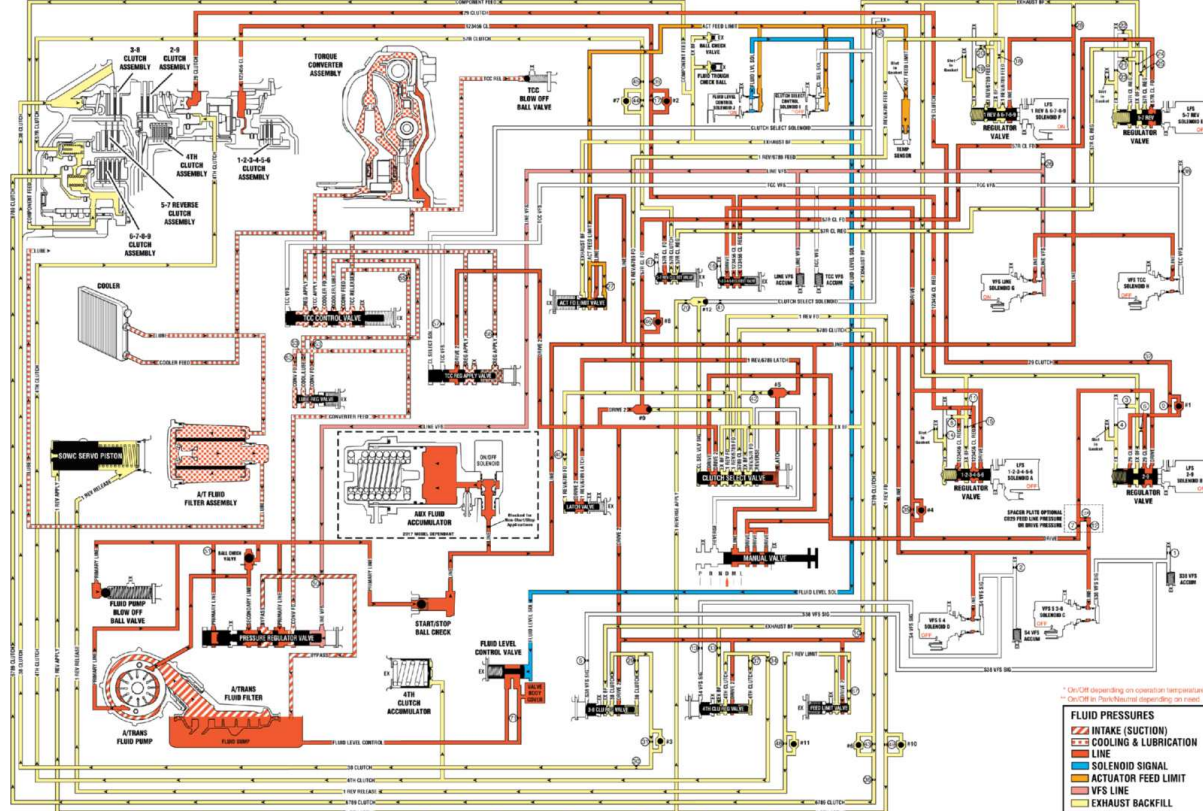


Fig. 27: Drive Range, Second Gear Hydraulic Diagram (Without ETRS)
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SECOND GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 2-9 solenoid.

2-9 Clutch Applies

2-9 Solenoid

The 2-9 solenoid energizes allowing drive fluid to enter the 2-9 regulator valve and enter the 2-9 CLUTCH fluid circuit. 2-9 CLUTCH fluid seats ball check valve #1 then is forced thru orifice #9 and #32 to the 2-9 clutch assembly.

2-9 Clutch Assembly

29 CLUTCH fluid is directed to the 2-9 clutch assembly housing. 29 CLUTCH fluid moves the piston against spring force to apply holding of the 2-9 clutch plates.

Drive Range, Second Gear

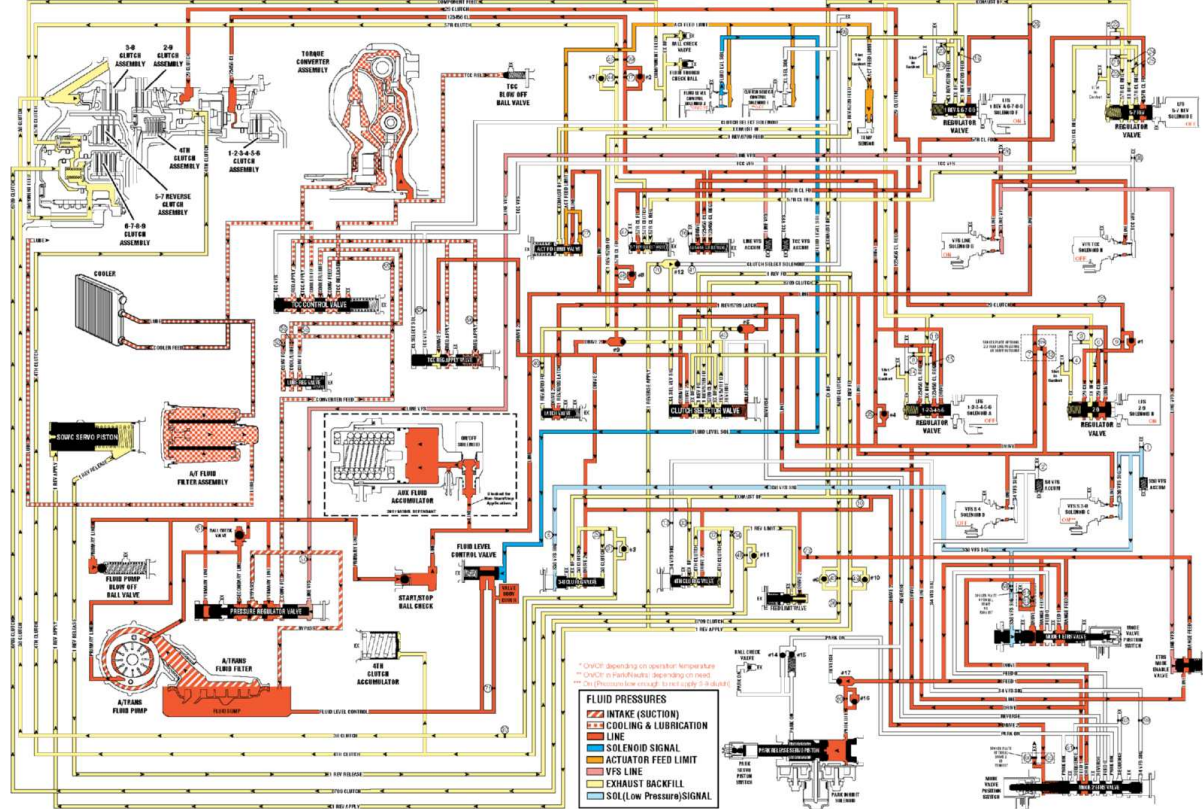


Fig. 28: Drive Range, Second Gear Hydraulic Diagram (With ETRS)
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SECOND GEAR (MECHANICAL POWERFLOW)

As vehicle speed increases, input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors are sent to the transmission control module (TCM). The TCM processes this information to determine the precise moment to shift the transmission into Second gear. In Second gear, the planetary gear sets continue to operate in reduction at a gear ratio of 3.306:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

6. 2-9 Clutch Assembly Applied

The 2-9 clutch plates (517-519), splined to the 2-9 and 4th clutch hub (619) and the 2-9 and 4th clutch piston housing (520), are applied and hold the 2-9 and 4th clutch hub (619) stationary.

7. Overdrive Carrier Driven

The overdrive internal gear (output carrier assembly) (555), drives the overdrive carrier (546) large pinion gears. The overdrive carrier (546) small pinion is also driven around the 2-9 and 4th clutch hub (539) by the input carrier assembly (552) pinion gears in mesh with the input internal gear, to provide reduction through the gearsets.

8. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

9. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Second Gear

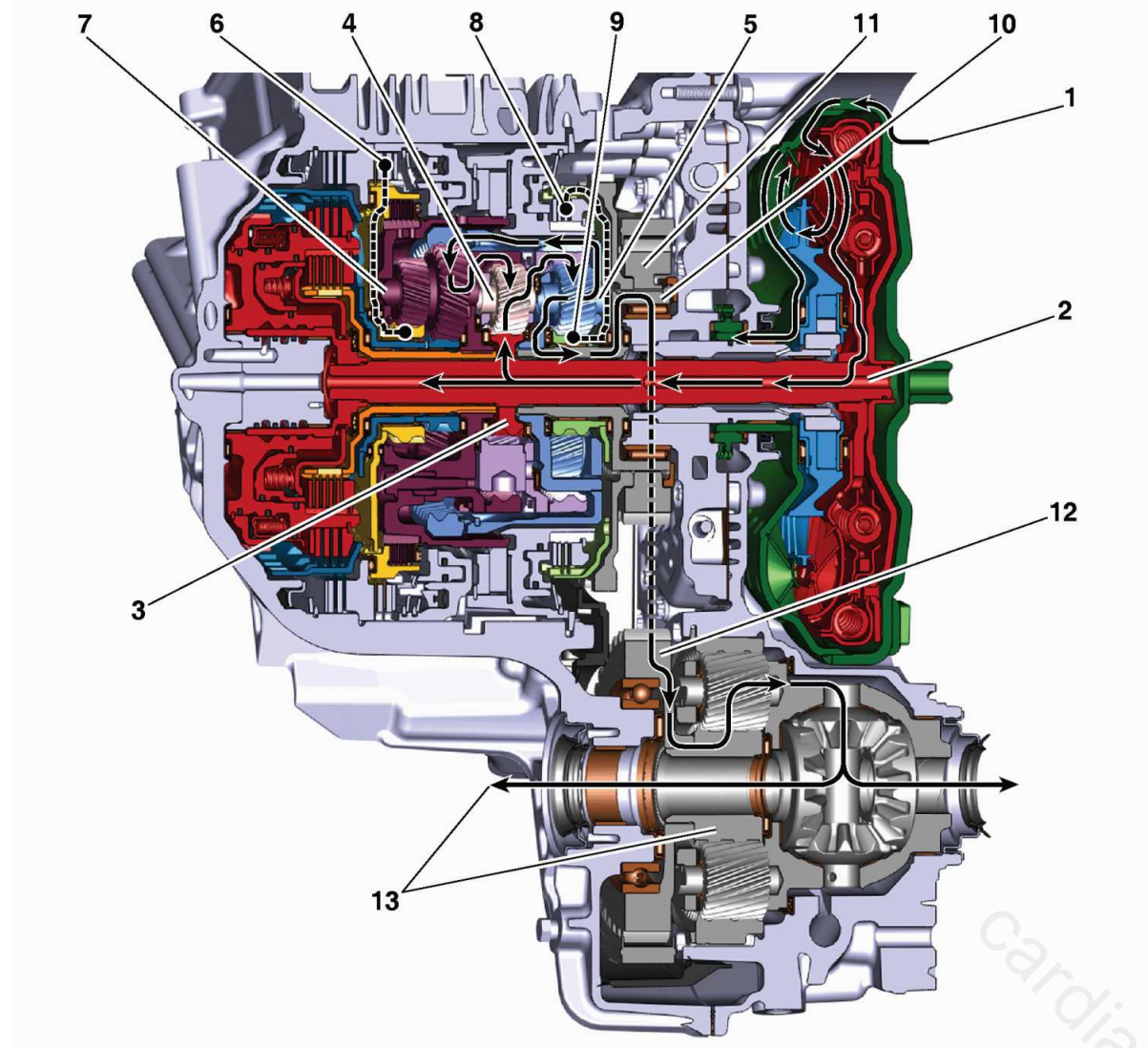


Fig. 29: Drive Range, Second Gear Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, THIRD GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the 2-9 solenoid. At the same time the S3-8 solenoid is also commanded ON to regulate 3-8 clutch apply.

3-8 Clutch Applies

S3-8 Solenoid

The S3-8 solenoid is energized allowing line fluid to enter the S38 VFS SIG fluid circuit. S38 VFS SIG fluid is directed to the 3-8 clutch regulator valve.

3-8 Clutch Regulator Valve

S38 VFS SIG fluid is directed thru orifice #5 and into the 3-8 clutch regulator valve where it applies pressure against the 3-8 clutch regulator valve spring force. This allows DRIVE 2 fluid to enter the 38 CLUTCH fluid circuit. 38 CLUTCH fluid seats ball check valve #3 then is forced thru orifice #31 and #30 to the 3-8 clutch assembly.

3-8 Clutch Assembly

38 CLUTCH fluid is directed to the 3-8 clutch assembly. 3-8 CLUTCH fluid moves the piston against spring force to apply holding of the 3-8 clutch plates.

2-9 Clutch Releases

2-9 Solenoid

2-9 Solenoid

The 2-9 solenoid is energized off allowing 29 CLUTCH fluid to exhaust. Spring pressure shifts the valve to allow 29 CLUTCH fluid to exhaust into EX BACKFILL from the 2-9 clutch assembly.

2-9 Clutch Assembly

The 2-9 clutch is released allowing 29 CLUTCH fluid to exhaust thru the 2-9 solenoid.

Drive Range, Third Gear

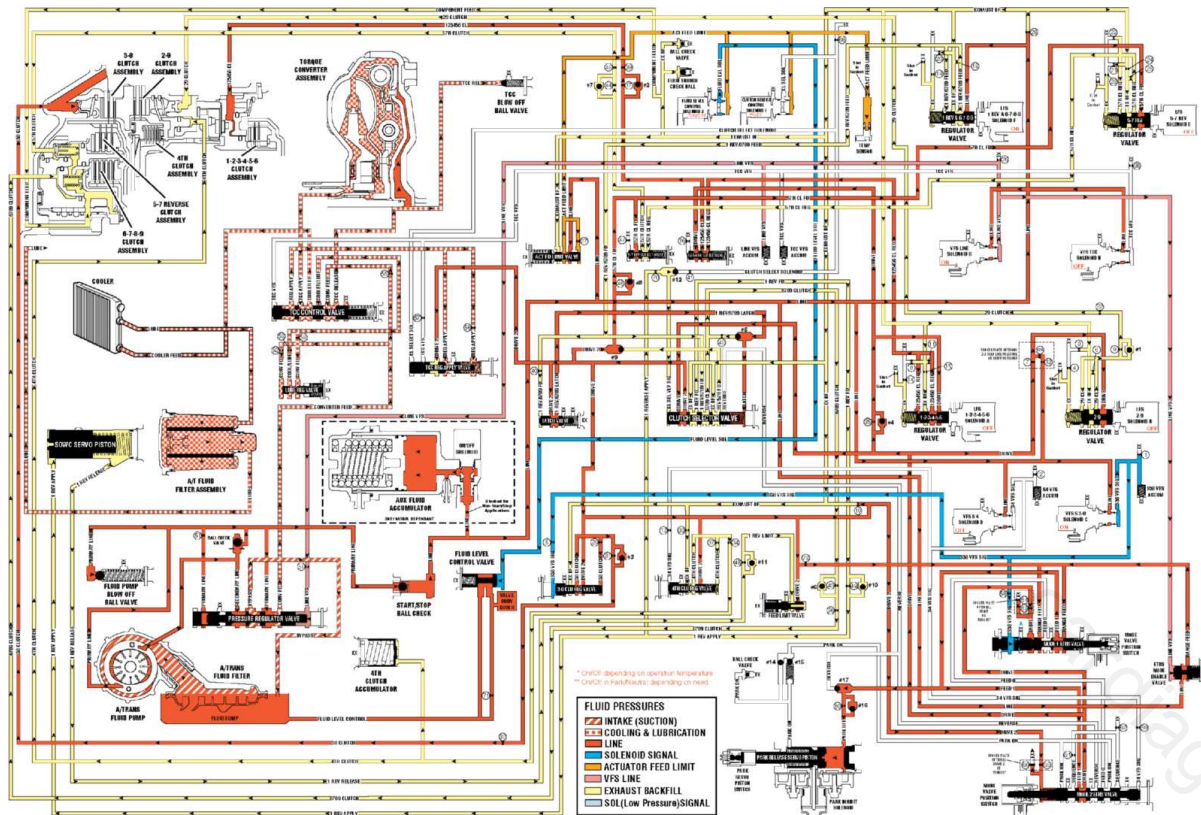


Fig. 31: Drive Range, Third Gear Hydraulic Diagram (With ETRS).
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, THIRD GEAR (MECHANICAL POWERFLOW)

As vehicle speed increases, input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors are sent to the transmission control module (TCM). The TCM processes this information to determine the precise moment to shift the transmission into Third gear. In Third gear, the planetary gear sets continue to operate in reduction at a gear ratio of 3.012:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

6. 3-8 Clutch Assembly Applied

The 3-8 clutch plates (510-514, 535, 536), splined to the 3-8 and 5-7-reverse clutch hub (534) and the transmission case (19), are applied and hold the 3-8 and 5-7-reverse clutch hub (534) stationary.

7. Overdrive Carrier Driven

The overdrive internal gear (output carrier assembly) (555), drives the overdrive carrier (546) large pinion gears. The overdrive carrier (546) large pinion is also driven around the 3-8 and 5-7-reverse clutch hub (534) by the input carrier assembly (552) pinion gears in mesh with the input internal gear, to provide reduction through the gearsets.

8. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

9. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Third Gear

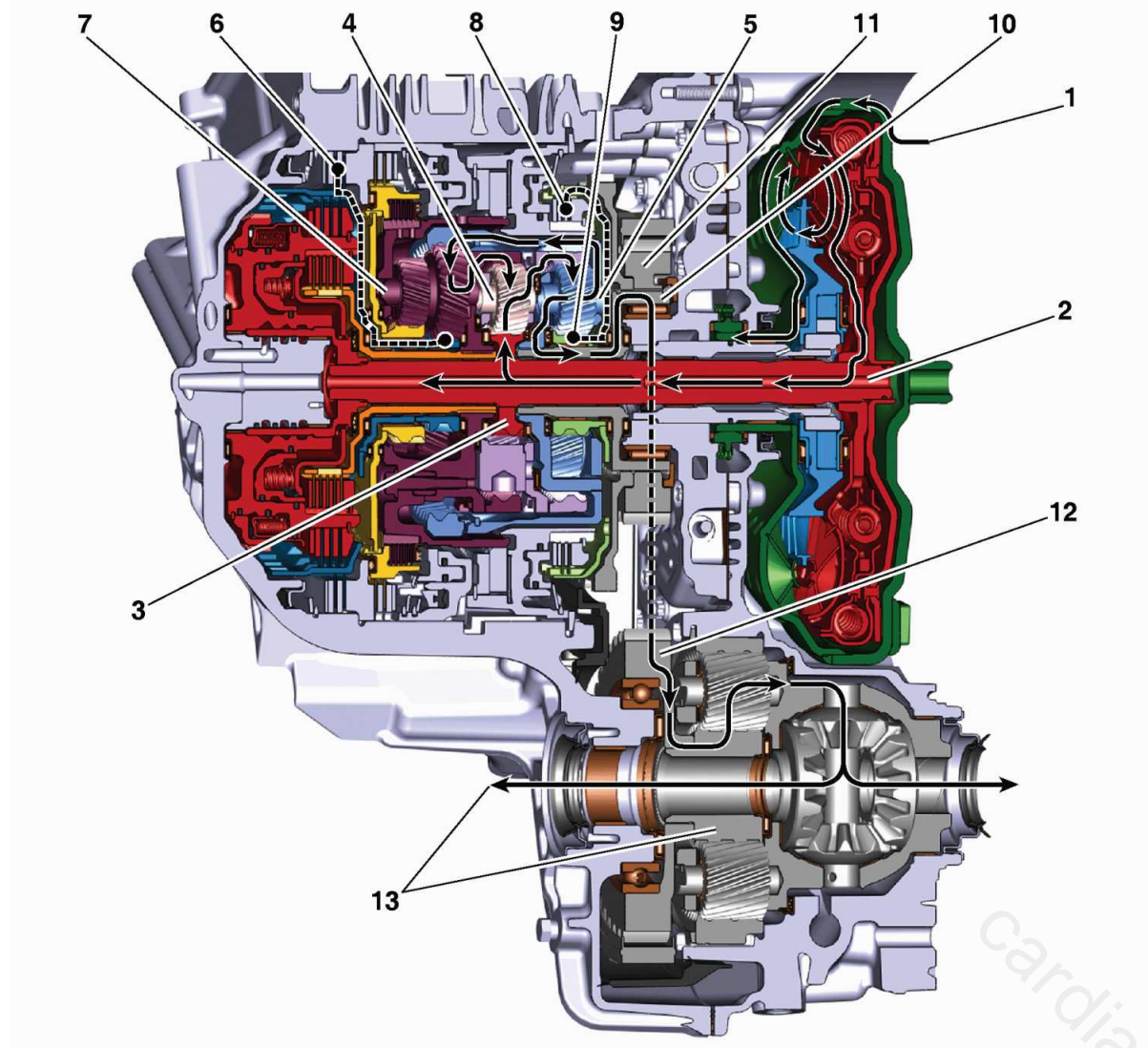


Fig. 32: Drive Range, Third Gear Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the S38 solenoid. At the same time the S4 solenoid is commanded ON to regulate 4th clutch apply.

4th Clutch Applies

S4 Solenoid

The S4 solenoid is energized allowing line fluid to enter the S4 VFS SIG fluid circuit. S4 VFS SIG fluid is directed to the 4th clutch regulator valve.

4th Clutch Regulator Valve

S4 VFS SIG fluid is directed thru orifice #13 and into the 4th clutch regulator valve where it applies pressure against the 4th clutch regulator valve spring force. This allows DRIVE 2 fluid to enter the 4TH CLUTCH fluid circuit. 4TH CLUTCH fluid is directed thru orifice #34 and to the 4th clutch accumulator and 4th clutch assembly.

4th Clutch Accumulator

4TH CLUTCH fluid is directed thru orifice #34 and into the 4th clutch accumulator where it applies pressure against the 4th clutch accumulator spring force.

4th Clutch Assembly

4TH CLUTCH fluid is directed to the 4th clutch assembly. 4TH CLUTCH fluid moves the piston against spring force to apply holding of the 4th clutch plates.

3-8 Clutch Releases

S3-8 Solenoid

The S3-8 solenoid is energized off allowing S38 VFS SIG fluid to exhaust thru orifice #1. Spring pressure shifts the 3-8 clutch regulator valve to allow 38 CLUTCH fluid to exhaust into EX BACKFILL from the 3-8 clutch assembly.

3-8 Clutch Assembly

The 3-8 clutch is released allowing 38 CLUTCH fluid to exhaust thru the 3-8 clutch regulator valve.

Drive Range, Fourth Gear

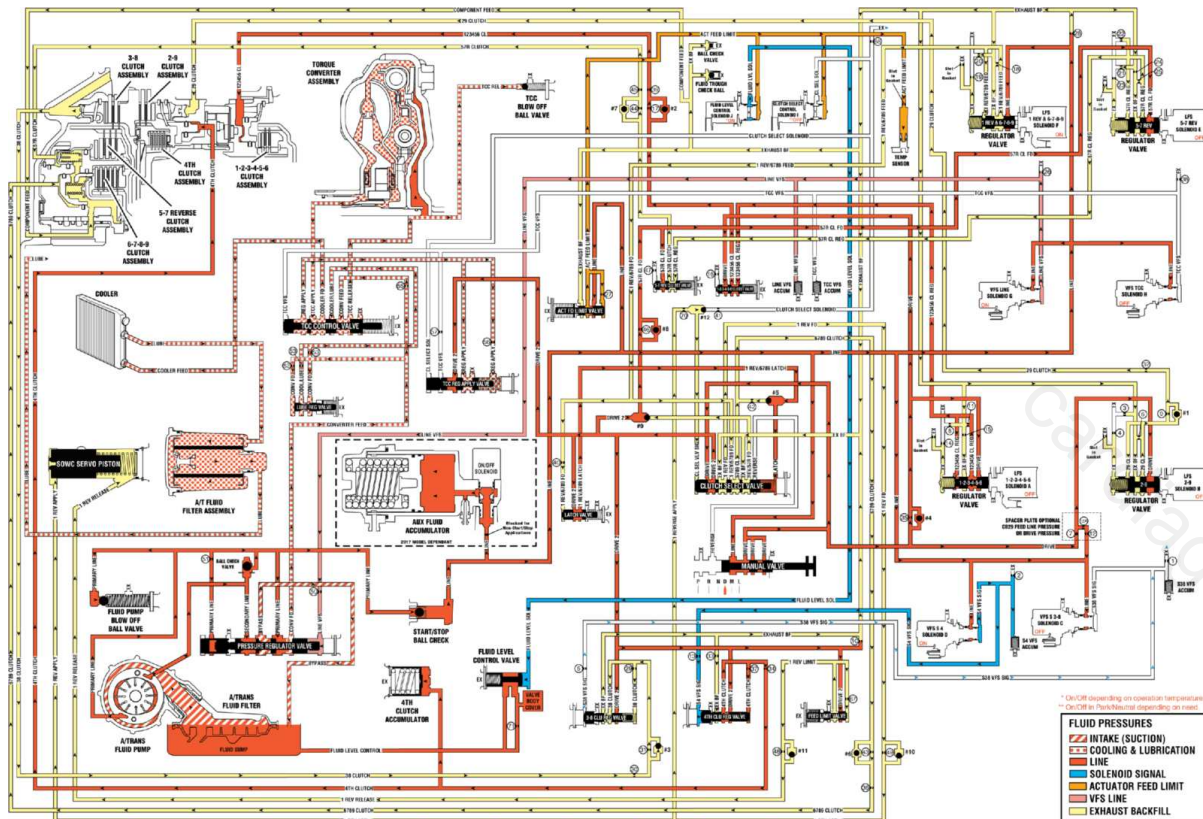


Fig. 33: Drive Range, Fourth Gear Hydraulic Diagram (Without ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command the S38 solenoid to low pressure. At the same time the S4 solenoid is commanded ON to regulate 4th clutch apply.

4th Clutch Applies

VFS S4 Solenoid

The VFS S4 solenoid is energized allowing line fluid to enter the S4 VFS SIG fluid circuit. S4 VFS SIG fluid is directed to the 4th clutch regulator valve.

4th Clutch Regulator Valve

S4 VFS SIG fluid is directed thru orifice #13 and into the 4th clutch regulator valve where it applies pressure against the 4th clutch regulator valve spring force. This allows DRIVE 2 fluid to enter the 4TH CLUTCH fluid circuit. 4TH CLUTCH fluid is directed thru orifice #34 and to the 4th clutch accumulator and 4th clutch assembly.

4th Clutch Accumulator

4TH CLUTCH fluid is directed thru orifice #34 and into the 4th clutch accumulator where it applies pressure against the 4th clutch accumulator spring force.

4th Clutch Assembly

4TH CLUTCH fluid is directed to the 4th clutch assembly. 4TH CLUTCH fluid moves the piston against spring force to apply holding of the 4th clutch plates.

3-8 Clutch Releases

VFS S3-8 Solenoid

The S3-8 solenoid is commanded to low pressure allowing the 3-8 clutch regulator valve to shift enough to prevent pressurized DRIVE 2 fluid from entering the 38 CLUTCH fluid passage and engaging the 3-8 clutch.

3-8 Clutch Assembly

The 3-8 clutch is released allowing 38 CLUTCH fluid to exhaust thru the 3-8 clutch regulator valve.

Drive Range, Fourth Gear

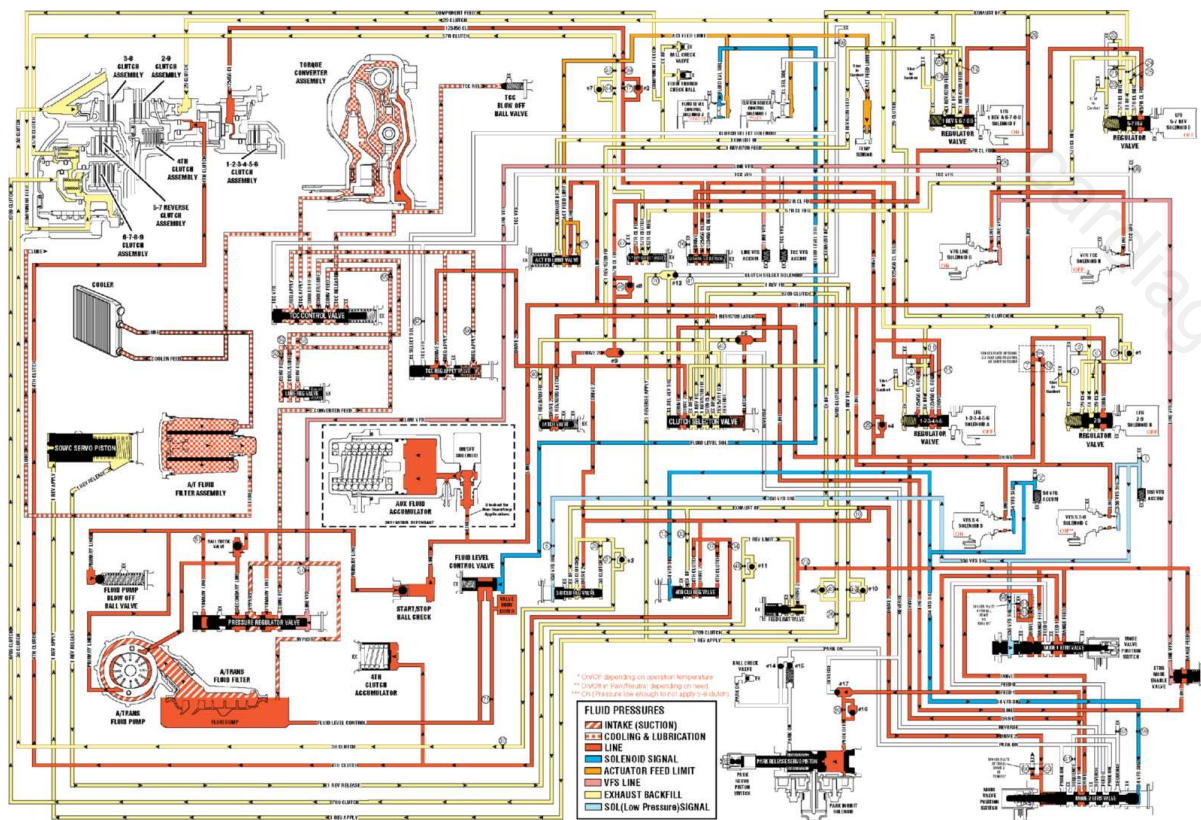


Fig. 34: Drive Range, Fourth Gear Hydraulic Diagram (With ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR (MECHANICAL POWERFLOW)

As vehicle speed increases, input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors are sent to the transmission control module (TCM). The TCM processes this information to determine the precise moment to shift the transmission into Fourth gear. In Fourth gear, the planetary gear sets continue to operate in reduction at a gear ratio of 2.446:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

6. 4th Clutch Assembly Applied

The 4th clutch plates (620-622), splined to the overdrive carrier (546) and the 2-9 and 4th clutch hub (619), are applied and hold the overdrive carrier (546) which rotate at the same speed and direction.

7. Overdrive Carrier Driven

The overdrive internal gear (output carrier assembly) (555), drives the overdrive carrier (546) large pinion gears. The overdrive carrier (546) with the 2-9 and 4th clutch hub (539) is also driven by the input carrier assembly (552) pinion gears in mesh with the input internal gear, to provide reduction through the gearsets.

8. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

9. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Fourth Gear

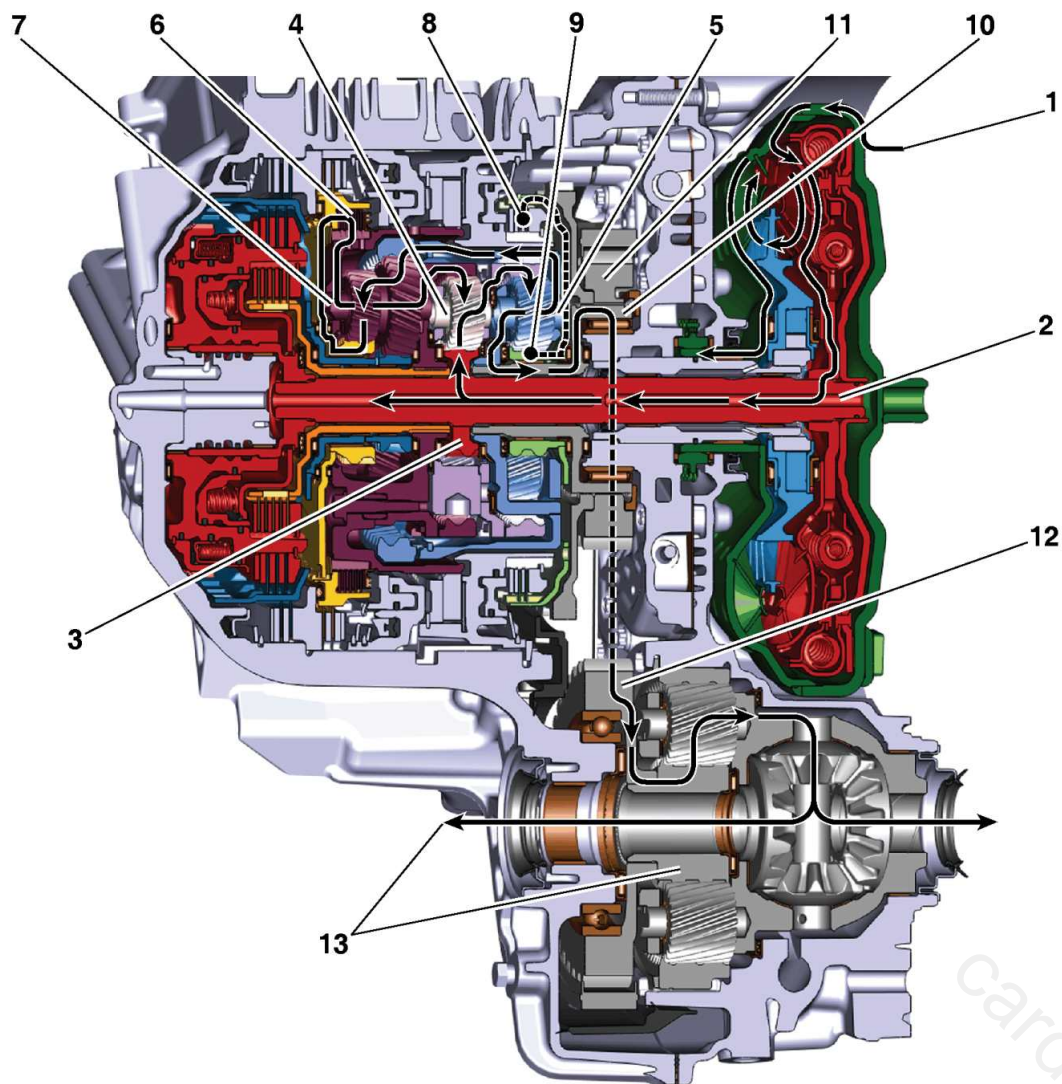


Fig. 35: Drive Range, Fourth Gear Mechanical Powerflow Diagram
 Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 5-7 reverse solenoid. At the same time the S4 solenoid is commanded OFF.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and #45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

57R CLUTCH fluid is directed into the 5-7 rev clutch piston spring force which applies holding force to the 5-7 rev clutch plates.

4th Clutch Releases

S4 Solenoid

The S4 solenoid is energized off allowing S4 VFS SIG fluid to exhaust thru orifice #2. Spring pressure shifts the 4th clutch regulator valve to allow 4TH CLUTCH fluid to exhaust into EX BACKFILL from the 4th clutch assembly.

4th Clutch Assembly

The 4th clutch is released allowing 4TH CLUTCH fluid to exhaust thru the 4th clutch regulator valve.

Drive Range, Fifth Gear

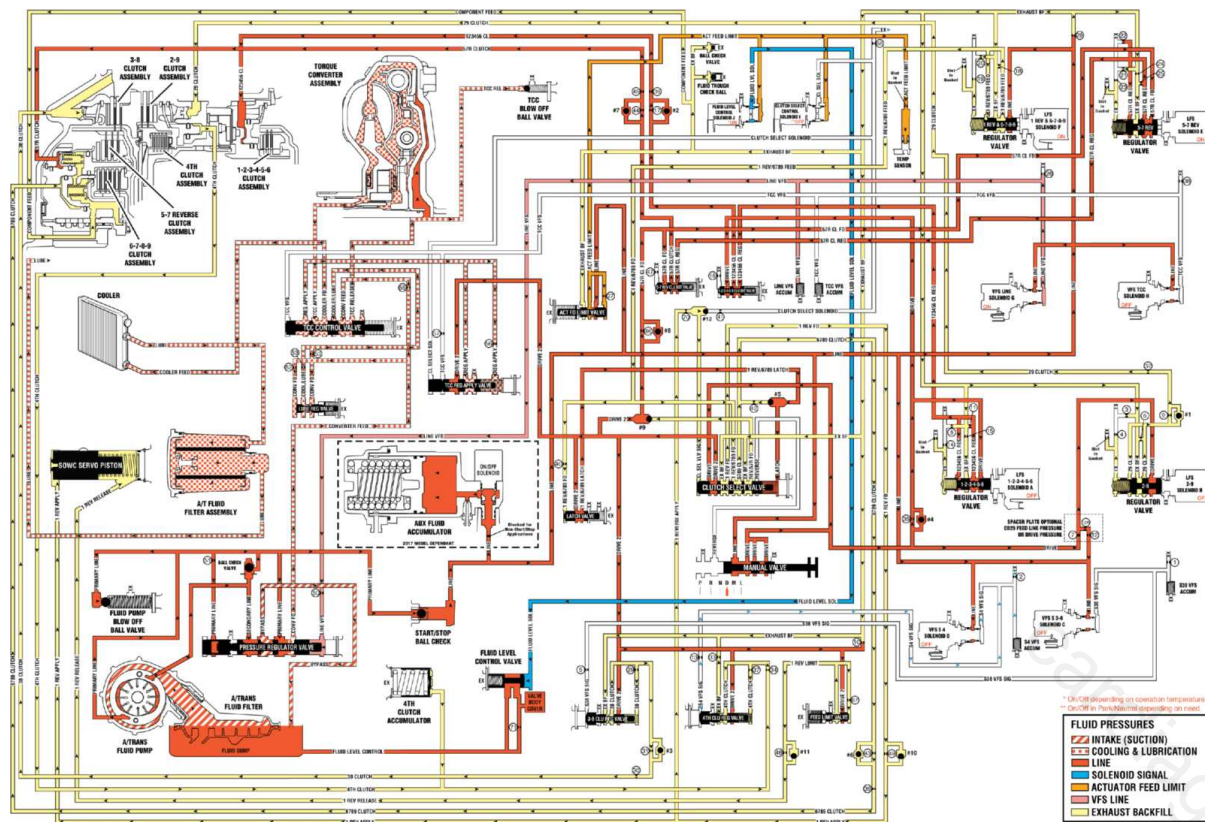


Fig. 36: Drive Range, Fifth Gear Hydraulic Diagram (Without ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 5-7 reverse solenoid. At the same time the S4 solenoid is commanded OFF.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and #45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

57R CLUTCH fluid is directed into the 5-7 rev clutch piston spring force which applies holding force to the 5-7 rev clutch plates.

4th Clutch Releases

S4 Solenoid

The S4 solenoid is energized off allowing S4 VFS SIG fluid to exhaust thru orifice #2. Spring pressure shifts the 4th clutch regulator valve to allow 4TH CLUTCH fluid to exhaust into EX BACKFILL from the 4th clutch assembly.

4th Clutch Assembly

The 4th clutch is released allowing 4TH CLUTCH fluid to exhaust thru the 4th clutch regulator valve.

Drive Range, Fifth Gear

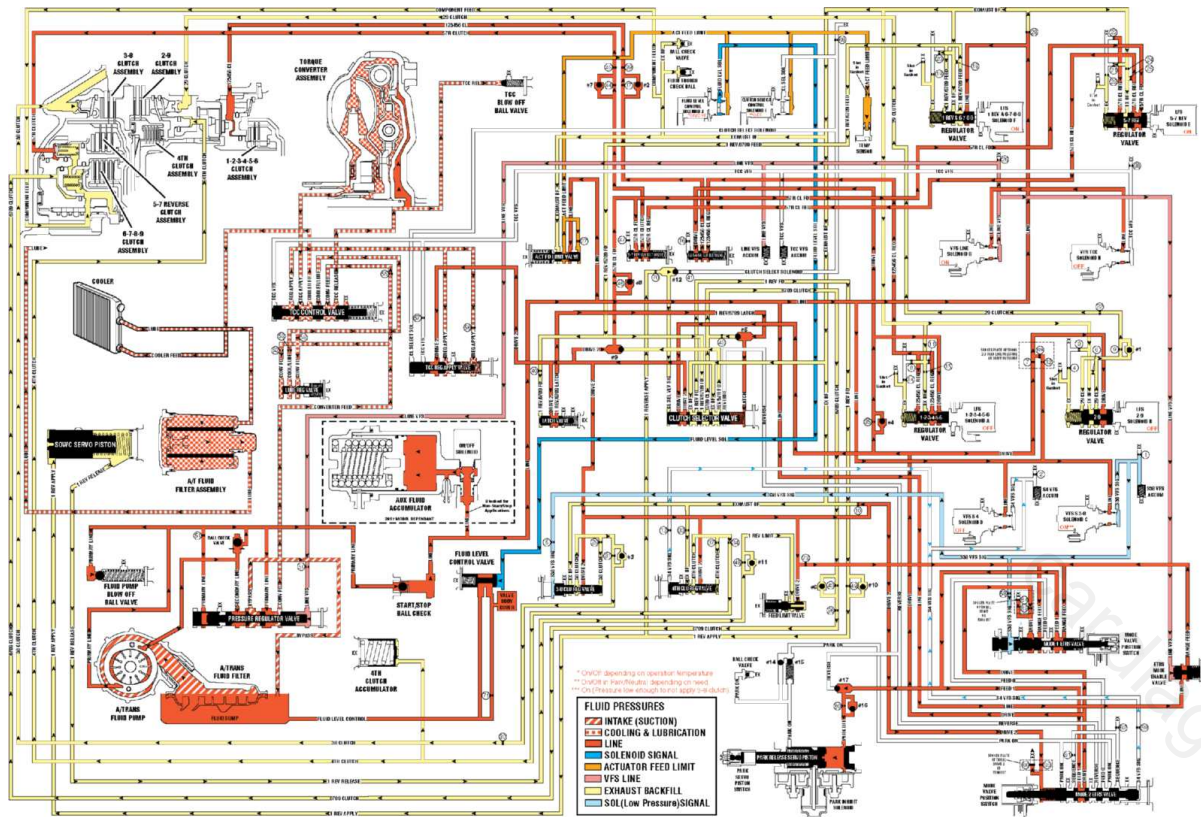


Fig. 37: Drive Range, Fifth Gear Hydraulic Diagram (With ETRS).

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR (MECHANICAL POWERFLOW)

As vehicle speed increases, input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors are sent to the transmission control module (TCM). The TCM processes this information to determine the precise moment to shift the transmission into Fifth gear. In Fifth gear, the planetary gear sets continue to operate in reduction at a gear ratio of 1.923:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly (552) pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

6. 5-7-Reverse Clutch Assembly Applied

The 5-7-reverse clutch plates (578-582), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the 3-8 and 5-7-reverse clutch hub (534), are applied and drive the 3-8 and 5-7-reverse clutch hub (534).

7. Overdrive Carrier Driving

The 3-8 and 5-7-reverse clutch hub (534) is meshed with and drives the overdrive carrier (546). The overdrive carrier (546) large pinion gears are driven around the overdrive internal gear (output carrier assembly) (555), to provide reduction through the gearsets.

8. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

9. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Fifth Gear

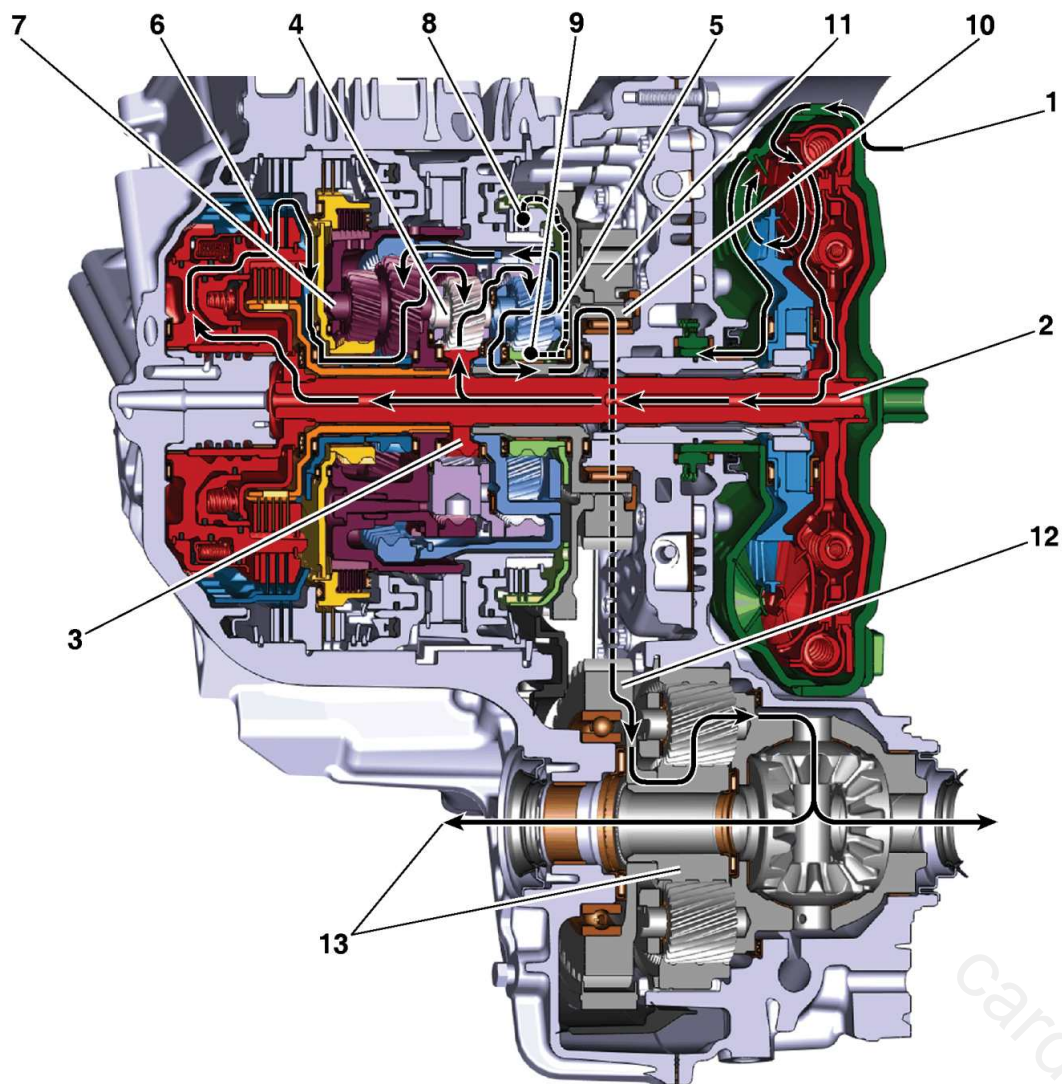


Fig. 38: Drive Range, Fifth Gear Mechanical Powerflow Diagram
 Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SIXTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the 1 rev & 6789 solenoid. At the same time the 5-7 reverse solenoid is commanded OFF.

1 Reverse & 6-7-8-9 Clutch Applies

1 Reverse & 6-7-8-9 Solenoid

The 1 reverse & 6-7-8-9 solenoid de-energizes releasing pressure against the 1 reverse & 6-7-8-9 regulator valve spring force. This allows LINE fluid to enter the 1 REV/6789 FEED fluid circuit. 1 REV/6789 FEED fluid is routed thru orifice #40 to the latch valve and to the clutch select valve.

Latch Valve

1 REV/6789 FEED fluid is directed into the latch valve applying pressure against the latch valve spring force. This blocks DRIVE 2 fluid from entering 1 REV/6789 LATCH fluid circuit.

Clutch Select Valve

1 REV/6789 FEED fluid is routed thru the clutch select valve into the 6789 CLUTCH fluid circuit. 6789 CLUTCH fluid is directed thru orifice #42 and to ball check valve #5 and the 6789 clutch assembly.

#5 Ball Check Valve

6789 clutch fluid seats the #5 ball check valve against the 1 REV/6789 LATCH fluid circuit allowing 1 REV/6789 FD fluid to enter the LATCH fluid circuit. LATCH fluid is directed to the clutch select valve

applying pressure with the clutch select valve spring force.

6-7-8-9 Clutch Assembly

6789 CLUTCH fluid seats ball check valve #6 then forced thru orifice #43 and #36 to the 6-7-8-9 clutch assembly. 6789 CLUTCH fluid is directed into the 6-7-8-9 clutch piston spring force which applies holding force to the 6-7-8-9 clutch plates.

5-7 Reverse Clutch Releases

5-7 Reverse Solenoid

The 5-7 reverse solenoid de-energizes releasing pressure against the 5-7 reverse regulator valve spring force. This blocks 57R CLUTCH FEED fluid from entering the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is exhausted thru orifice #25 and #24 into the EX BACKFILL fluid circuit and thru orifice #21 into the EXHAUST fluid circuit.

5-7 Reverse Clutch Assembly

The 5-7 reverse clutch is released allowing 57R CLUTCH fluid to exhaust thru orifice #45 and #44 to the 5-7 clutch boost valve into the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid continues thru orifice #22 into the EXHAUST fluid circuit.

Torque Converter Clutch (TCC) Applies

Torque Converter Clutch (TCC) Solenoid

The TCC solenoid is commanded ON, allowing LINE fluid to enter the TCC VFS fluid circuit. TCC VFS fluid is directed to the TCC VFS accumulator and thru orifice #57 to the TCC regulator apply valve and to the TCC control valve.

TCC Regulator Apply Valve

TCC VFS fluid, at the TCC regulator apply valve, opposes TCC regulator apply valve spring force and orificed regulated apply fluid pressure to regulate DRIVE 2 fluid into the REGULATED APPLY fluid circuit. REGULATED APPLY fluid is routed to the TCC control valve and through orifice #56 to the spring end of the TCC regulator apply valve.

TCC Control Valve

TCC VFS fluid moves the TCC control valve against TCC control valve spring force, allowing REGULATED APPLY fluid to pass through the valve into the TCC APPLY fluid circuit and apply the torque converter clutch. TCC release fluid passes through the TCC control valve and is exhausted.

Drive Range, Sixth Gear

5-7 Reverse Solenoid

The 5-7 reverse solenoid de-energizes releasing pressure against the 5-7 reverse regulator valve spring force. This blocks 57R CLUTCH FEED fluid from entering the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is exhausted thru orifice #25 and #24 into the EX BACKFILL fluid circuit and thru orifice #21 into the EXHAUST fluid circuit.

5-7 Reverse Clutch Assembly

The 5-7 reverse clutch is released allowing 57R CLUTCH fluid to exhaust thru orifice #45 and #44 to the 5-7 clutch boost valve into the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid continues thru orifice #22 into the EXHAUST fluid circuit.

Torque Converter Clutch (TCC) Applies

Torque Converter Clutch (TCC) Solenoid

The TCC solenoid is commanded ON, allowing LINE fluid to enter the TCC VFS fluid circuit. TCC VFS fluid is directed to the TCC VFS accumulator and thru orifice #57 to the TCC regulator apply valve and to the TCC control valve.

TCC Regulator Apply Valve

TCC VFS fluid, at the TCC regulator apply valve, opposes TCC regulator apply valve spring force and orificed regulated apply fluid pressure to regulate DRIVE 2 fluid into the REGULATED APPLY fluid circuit. REGULATED APPLY fluid is routed to the TCC control valve and through orifice #56 to the spring end of the TCC regulator apply valve.

TCC Control Valve

TCC VFS fluid moves the TCC control valve against TCC control valve spring force, allowing REGULATED APPLY fluid to pass through the valve into the TCC APPLY fluid circuit and apply the torque converter clutch. TCC release fluid passes through the TCC control valve and is exhausted.

Drive Range, Sixth Gear

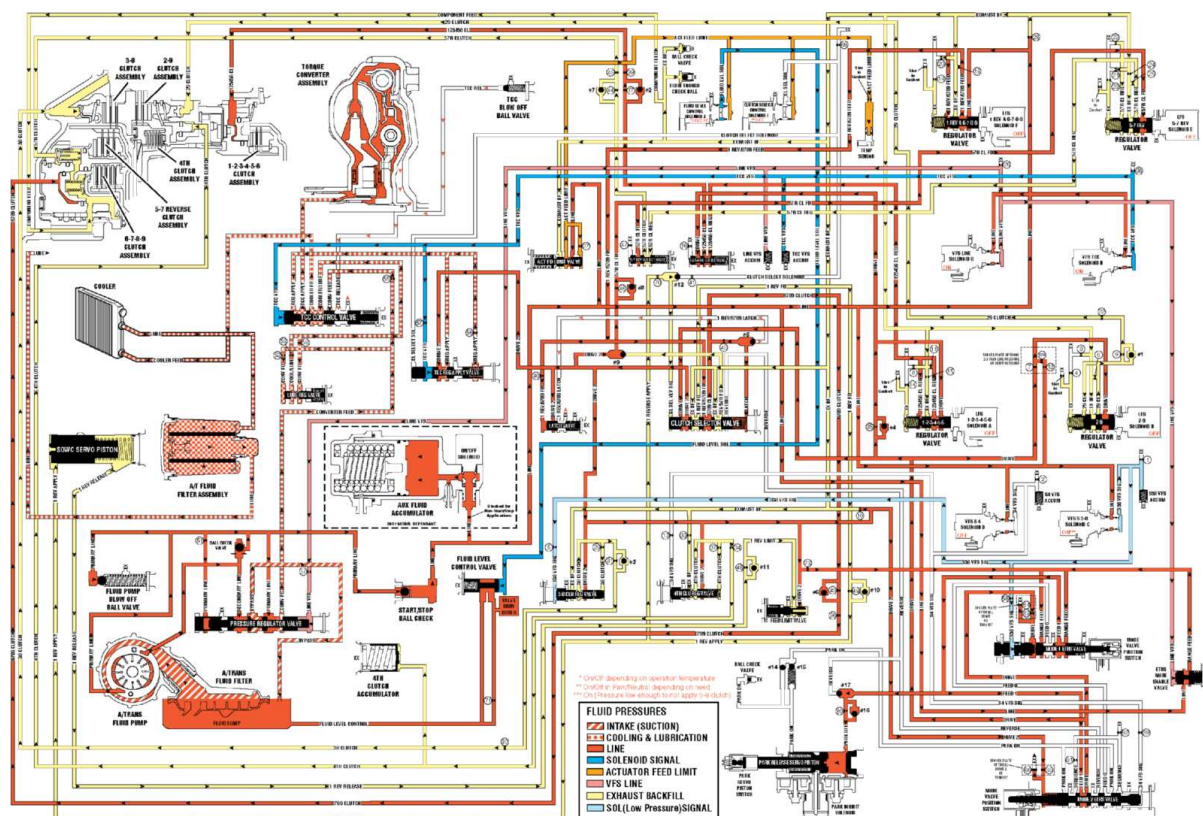


Fig. 40: Drive Range, Sixth Gear Hydraulic Diagram (With ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SIXTH GEAR (MECHANICAL POWERFLOW)

As vehicle speed increases, input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors are sent to the transmission control module (TCM). The TCM processes this information to determine the precise moment to shift the transmission into Sixth gear. In Sixth gear, the planetary gear sets continue to operate in reduction at a gear ratio of 1.446:1.

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. Input Carrier Assembly Driven

The input carrier assembly (552) pinions walk around the input internal gear (overdrive carrier) (546) and drive the input carrier assembly (552).

5. Output Carrier Assembly Driven

The output internal gear (input carrier assembly) (552) drives the output carrier assembly pinions, which then drive the output carrier assembly (555) around the stationary output sun gear (522).

6. 6-7-8-9 Clutch Assembly Applied

The 6-7-8-9 clutch plates (570-577), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the reaction carrier hub (532), are applied and drive the reaction carrier hub (532).

7. Overdrive Carrier Driving

The 3-8 and 5-7-reverse clutch hub (534) is splined to and drives the overdrive carrier (546). The overdrive carrier (546) large pinion gears are driven around the overdrive internal gear (output carrier assembly) (555), to provide reduction through the gearsets.

8. 1-2-3-4-5-6 Clutch Assembly Applied

The 1-2-3-4-5-6 clutch plates (591-600), splined to the output sun gear (522) and the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590), are applied and hold the output sun gear (522) stationary.

9. Output Sun Gear Held

With the 1-2-3-4-5-6 clutch applied, the output sun gear (522) is held stationary to the 1-reverse and 1-2-3-4-5-6 clutch piston housing (590).

10. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

11. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

12. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

13. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Sixth Gear

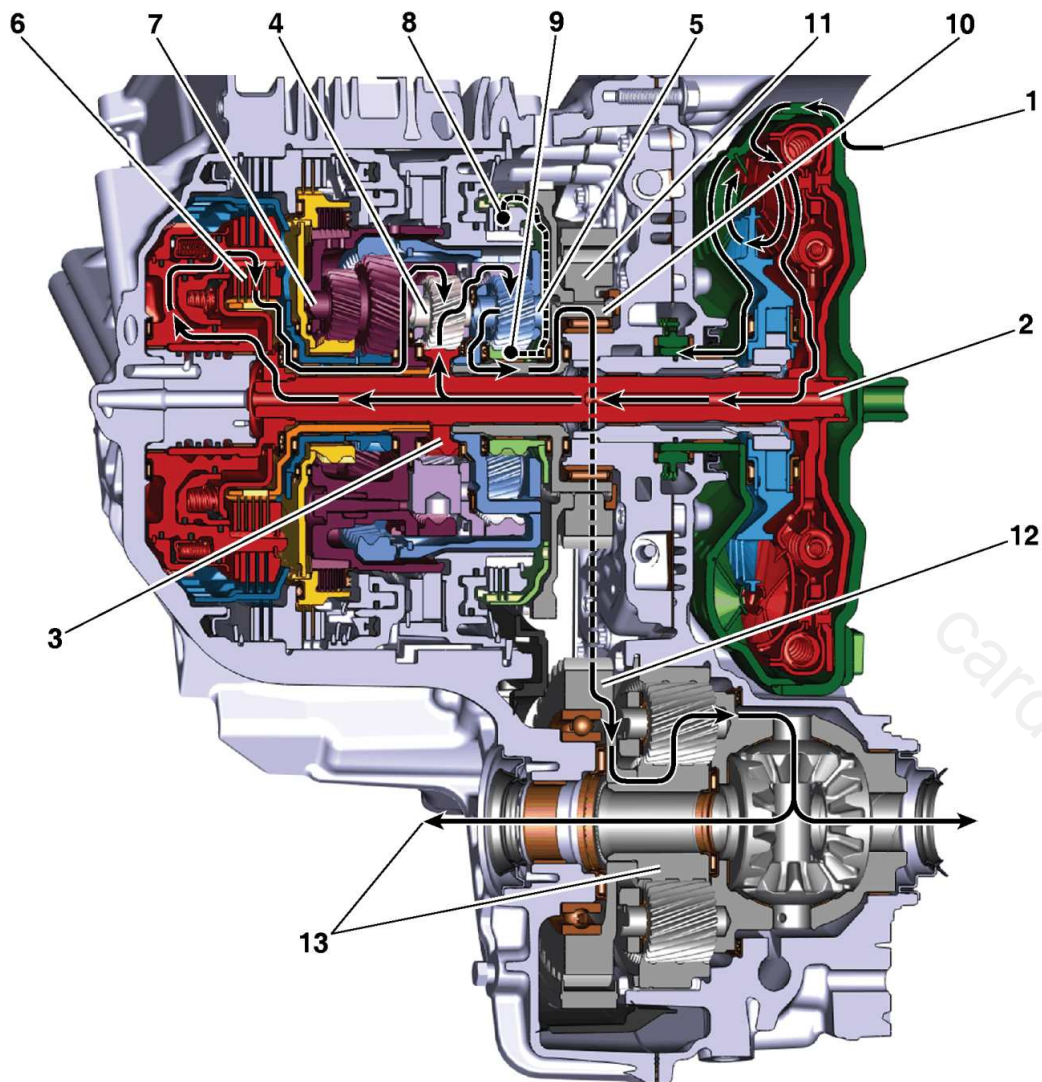


Fig. 41: Drive Range, Sixth Gear Mechanical Powerflow Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SEVENTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 5-7 reverse solenoid. At the same time the 1-2-3-4-5-6 solenoid is commanded ON.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and

#45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

57R CLUTCH fluid is directed into the 5-7 rev clutch piston spring force which applies holding force to the 5-7 rev clutch plates.

1-2-3-4-5-6 Clutch Releases

1-2-3-4-5-6 Solenoid

The 1-2-3-4-5-6 solenoid energizes applying pressure against the 1-2-3-4-5-6 regulator valve spring force. This blocks DRIVE fluid from entering the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid is exhausted thru orifice #15 and #11 into the EX BACKFILL fluid circuit and thru orifice #8 into the EXHAUST fluid circuit.

1-2-3-4-5-6 Clutch Assembly

The 1-2-3-4-5-6 clutch is released allowing 123456 CLUTCH fluid to exhaust thru orifice #39 and #17 to the 1-2-3-4-5-6 clutch boost valve into the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid continues thru orifice #11 into the EXHAUST fluid circuit.

Drive Range, Seventh Gear

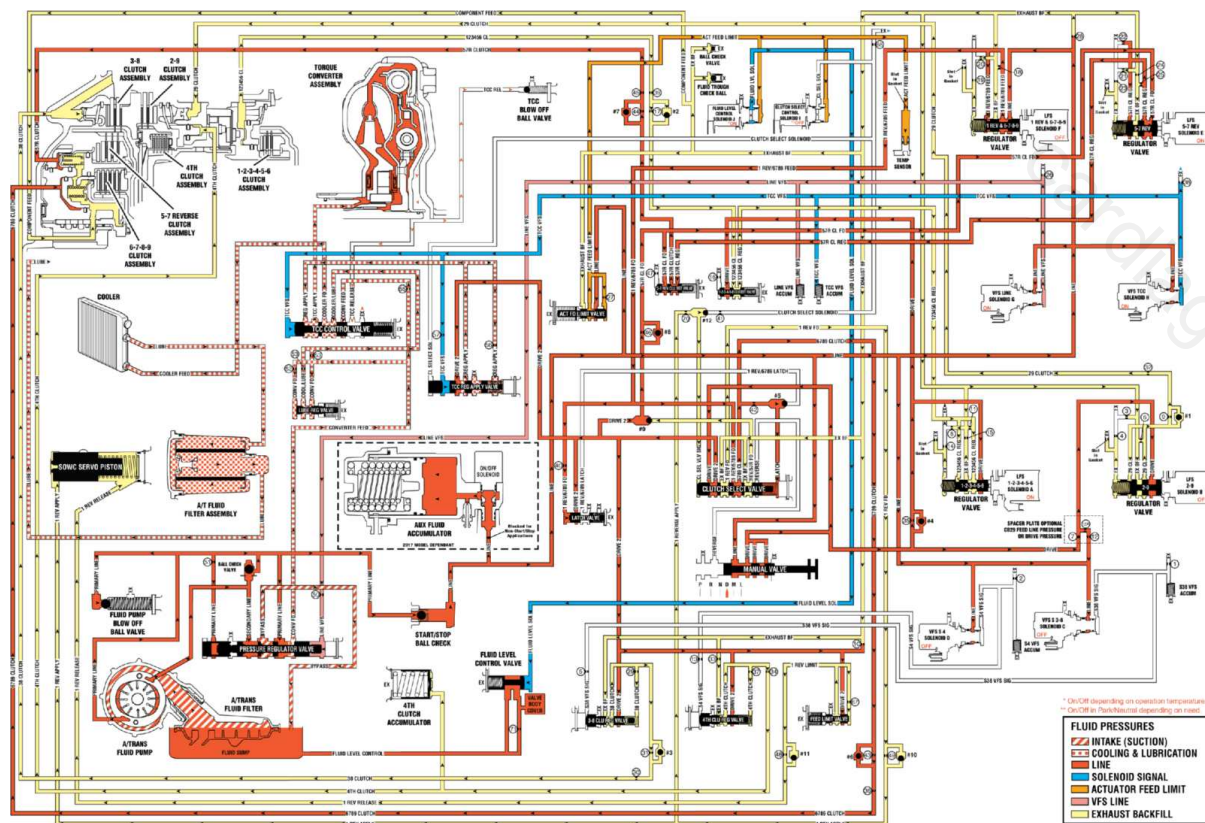


Fig. 42: Drive Range, Seventh Gear Hydraulic Diagram (Without ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SEVENTH GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 5-7 reverse solenoid. At the same time the 1-2-3-4-5-6 solenoid is commanded ON.

5-7 Reverse Clutch Applies

5-7 Reverse Solenoid

The 5-7 reverse solenoid energizes applying pressure against the 5-7 reverse regulator valve spring force. This allows 57R CLUTCH FEED fluid to enter the 57R CLUTCH REGULATOR fluid circuit.

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve.

5-7 Reverse Clutch Boost Valve

57R CLUTCH REGULATOR fluid is routed to the 5-7 reverse clutch boost valve and into the 57R CLUTCH fluid circuit. 57R CLUTCH fluid seats ball check valve #7 and is forced thru orifice #44 and #45 to the 5-7 reverse clutch assembly.

5-7 Reverse Clutch Assembly

57R CLUTCH fluid is directed into the 5-7 rev clutch piston spring force which applies holding force to the 5-7 rev clutch plates.

1-2-3-4-5-6 Clutch Releases

1-2-3-4-5-6 Solenoid

The 1-2-3-4-5-6 solenoid energizes applying pressure against the 1-2-3-4-5-6 regulator valve spring force. This blocks DRIVE fluid from entering the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid is exhausted thru orifice #15 and #11 into the EX BACKFILL fluid circuit and thru orifice #8 into the EXHAUST fluid circuit.

1-2-3-4-5-6 Clutch Assembly

The 1-2-3-4-5-6 clutch is released allowing 123456 CLUTCH fluid to exhaust thru orifice #39 and #17 to the 1-2-3-4-5-6 clutch boost valve into the 123456 CLUTCH REGULATOR fluid circuit. 123456 CLUTCH REGULATOR fluid continues thru orifice #11 into the EXHAUST fluid circuit.

Drive Range, Seventh Gear

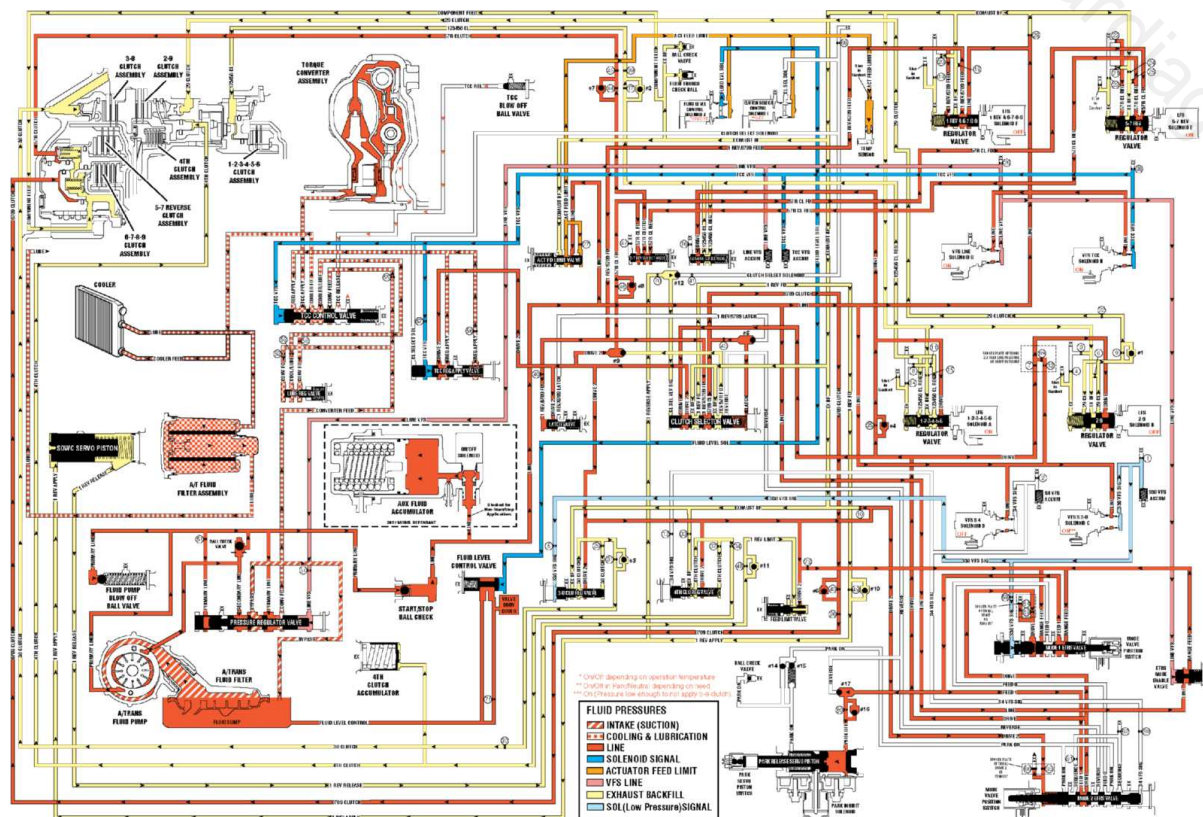


Fig. 43: Drive Range, Seventh Gear Hydraulic Diagram (With ETRS)

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SEVENTH GEAR (MECHANICAL POWERFLOW)

Drive Range - Seventh Gear is used to maximize engine efficiency and fuel economy under most driving conditions. Input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors, are used by the TCM to determine the precise moment to shift the transmission into Seventh gear. In Seventh gear, the planetary gear sets rotate as a unit (direct drive), allowing the transfer gears to provide a 1.000:1 gear ratio to the front differential carrier (238).

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. 5-7-Reverse Clutch Assembly Applied

The 5-7-reverse clutch plates (578-582), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the 3-8 and 5-7-reverse clutch hub (534), are applied and drive the 3-8 and 5-7-reverse clutch hub (534).

5. 6-7-8-9 Clutch Assembly Applied

The 6-7-8-9 clutch plates (570-577), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the reaction carrier hub (532), are applied and drive the reaction carrier hub (532).

6. Overdrive Carrier Driving

With both the 3-8 and 5-7-reverse clutch hub (534) and the reaction carrier hub (532) driving at converter turbine speed, the overdrive carrier pinions act as wedges and provide direct drive to the overdrive internal gear (output carrier assembly) (555).

7. Input Carrier Assembly Driven

With both the input internal gear (overdrive carrier assembly) (546) and the input sun gear (551) driving at converter turbine speed, the input carrier pinions act as wedges to obtain direct drive through the input carrier assembly (552).

8. Output Carrier Assembly Driving

With both the overdrive carrier (546) and the input carrier assembly (552) driving at converter turbine speed, the output carrier assembly (555) rotates as a unit, providing direct drive to the output carrier transfer drive gear hub (502).

9. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

10. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

11. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

12. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Seventh Gear

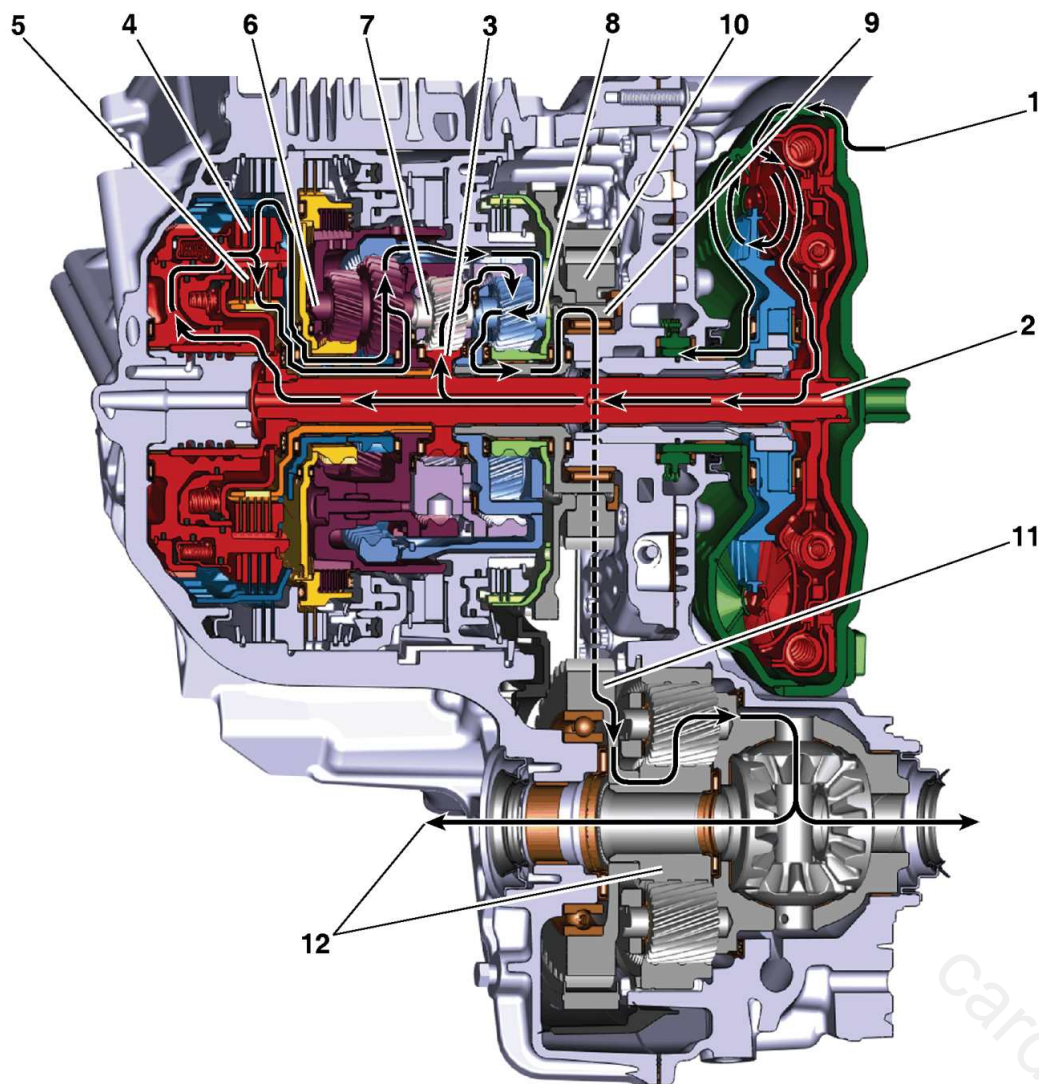


Fig. 44: Drive Range, Seventh Gear Mechanical Powerflow Diagram
 Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, EIGHTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the S3-8 solenoid. At the same time the 5-7 reverse solenoid is commanded OFF.

3-8 Clutch Applies

S3-8 Solenoid

The S3-8 solenoid is energized allowing line fluid to enter the S38 VFS SIG fluid circuit. S38 VFS SIG fluid is directed to the 3-8 clutch regulator valve.

3-8 Clutch Regulator Valve

S38 VFS SIG fluid is directed thru orifice #5 and into the 3-8 clutch regulator valve where it applies pressure against the 3-8 clutch regulator valve spring force. This allows DRIVE 2 fluid to enter the 38 CLUTCH fluid circuit. 38 CLUTCH fluid seats ball check valve #3 then is forced thru orifice #31 and #30 to the 3-8 clutch assembly.

3-8 Clutch Assembly

38 CLUTCH fluid is directed to the 3-8 clutch assembly. 3-8 CLUTCH fluid moves the piston against spring force to apply holding of the 3-8 clutch plates.

5-7 Reverse Clutch Releases

5-7 Reverse Solenoid

3-8 CLUTCH fluid is directed to the 3-8 clutch assembly. 3-8 CLUTCH fluid moves the piston against spring force to apply holding of the 3-8 clutch plates.

5-7 Reverse Clutch Releases

5-7 Reverse Solenoid

The 5-7 reverse solenoid de-energizes releasing pressure against the 5-7 reverse regulator valve spring force. This blocks 57R CLUTCH FEED fluid from entering the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid is exhausted thru orifice #25 and #24 into the EX BACKFILL fluid circuit and thru orifice #21 into the EXHAUST fluid circuit.

5-7 Reverse Clutch Assembly

The 5-7 reverse clutch is released allowing 57R CLUTCH fluid to exhaust thru orifice #45 and #44 to the 5-7 clutch boost valve into the 57R CLUTCH REGULATOR fluid circuit. 57R CLUTCH REGULATOR fluid continues thru orifice #22 into the EXHAUST fluid circuit.

Drive Range, Eighth Gear

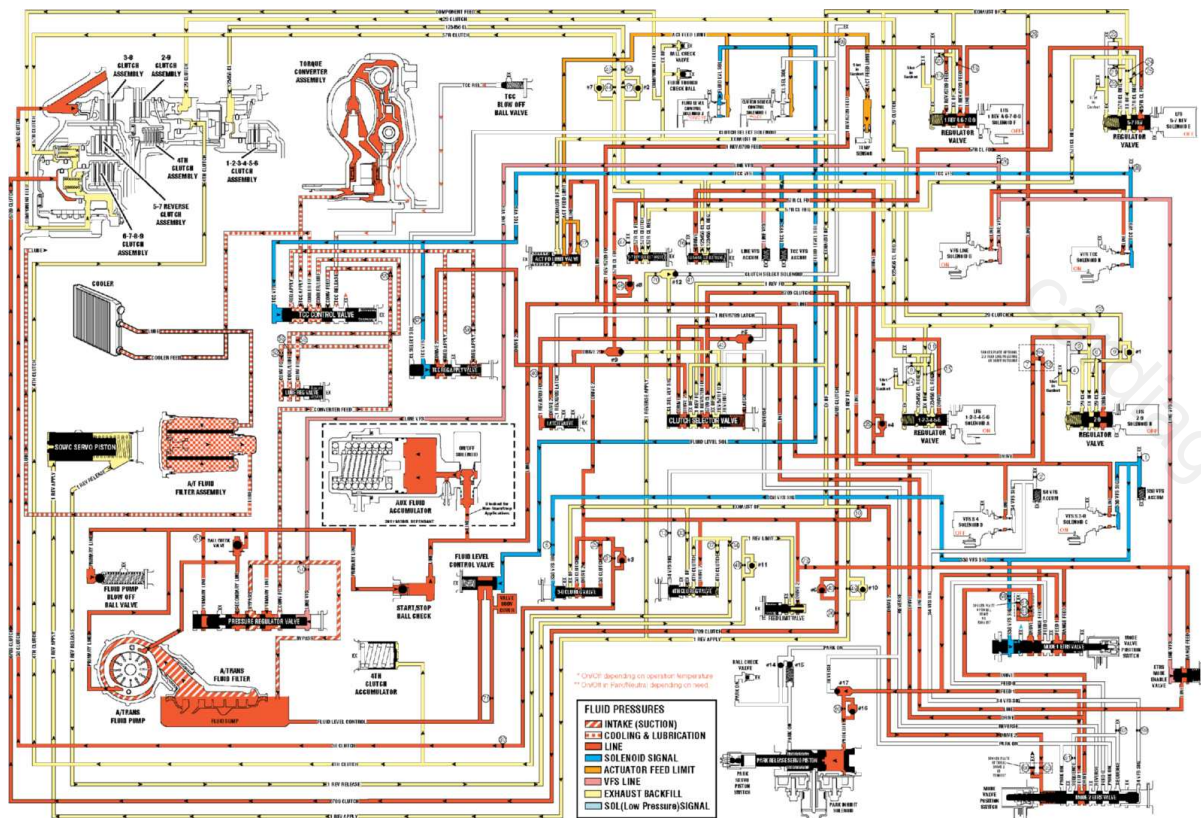


Fig. 46: Drive Range, Eighth Gear Hydraulic Diagram (With ETRS).

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, EIGHTH GEAR (MECHANICAL POWERFLOW)

Drive Range - Eighth Gear is used to maximize engine efficiency and fuel economy beyond Seventh gear calibrations. Input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors, are used by the TCM to determine the precise moment to shift the transmission into Eighth gear. In Eighth gear, the planetary gear sets rotate in overdrive, providing a 0.747:1 gear ratio between the torque converter turbine and the front differential carrier assembly (238).

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. 6-7-8-9 Clutch Assembly Applied

The 6-7-8-9 clutch plates (570-577), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the reaction carrier hub (532), are applied and drive the reaction carrier hub (532).

5. 3-8 Clutch Assembly Applied

The 3-8 clutch plates (510-514, 535, 536), splined to the 3-8 and 5-7-reverse clutch hub (534) and the transmission case (19), are applied and hold the 3-8 and 5-7-reverse clutch hub (534) stationary.

6. Overdrive Carrier Driving

The overdrive carrier (546) large pinion gears are driven around the stationary 3-8 and 5-7-reverse clutch hub (534), and over drive the overdrive internal gear (output carrier assembly) (555).

7. Input Carrier Assembly Driven

With both the input internal gear (overdrive carrier assembly) (546) and the input sun gear (551) driving at converter turbine speed, the input carrier pinions act as wedges to obtain direct drive to obtain direct drive to the output internal gear, which drives the output carrier assembly (555) pinions.

8. Output Carrier Assembly Driving

The output carrier assembly (555) is splined to, and drives the output carrier transfer drive gear hub (502).

9. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

10. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

11. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

12. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Eighth Gear

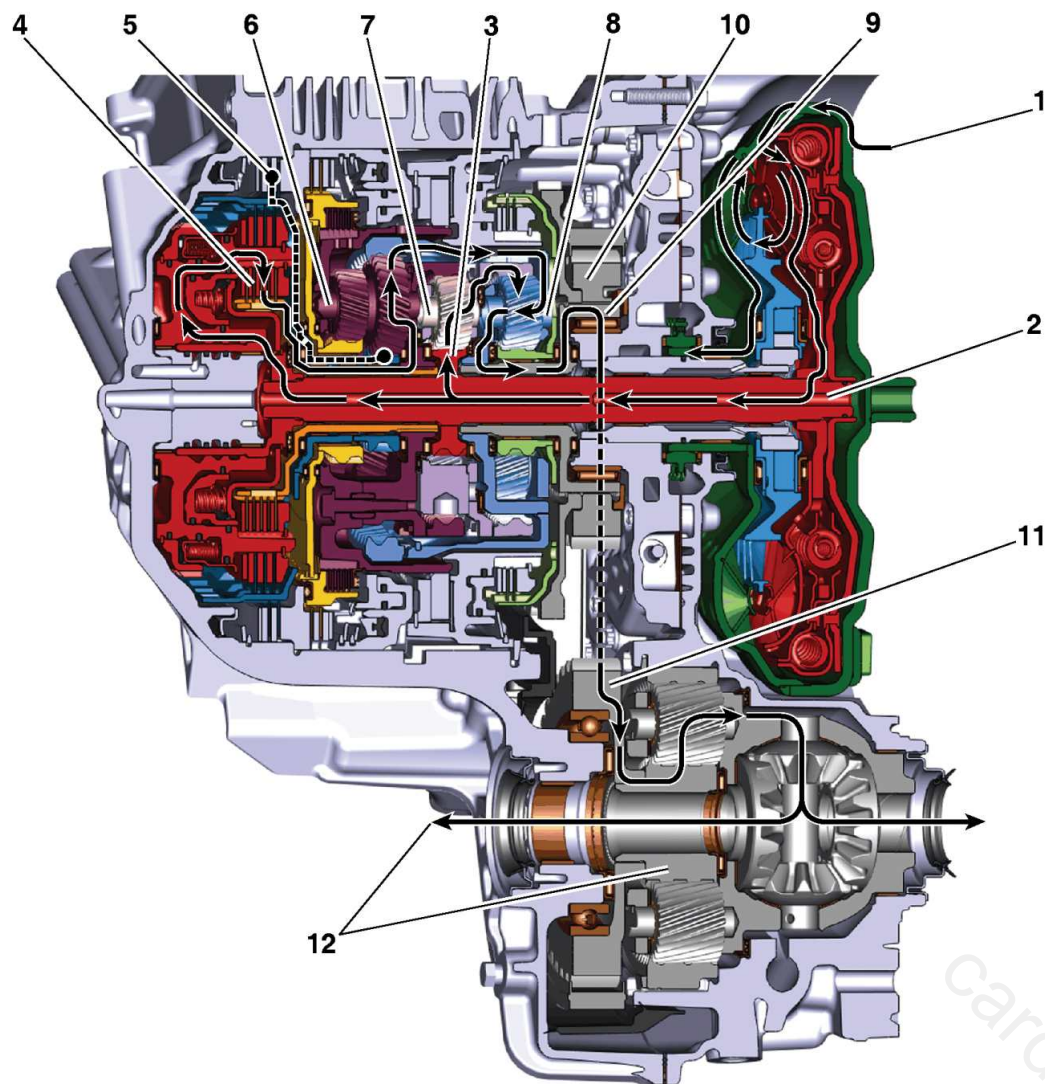


Fig. 47: Drive Range, Eighth Gear Mechanical Powerflow Diagram
 Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, NINTH GEAR (HYDRAULIC CIRCUITS WITHOUT ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 2-9 solenoid. At the same time the S3-8 solenoid is commanded OFF.

2-9 Clutch Applies

2-9 Solenoid

The 2-9 solenoid energizes allowing drive fluid to enter the 2-9 regulator valve and enter the 2-9 CLUTCH fluid circuit. 2-9 CLUTCH fluid seats ball check valve #1 then is forced thru orifice #9 and #32 to the 2-9 clutch assembly.

2-9 Clutch Assembly

29 CLUTCH fluid is directed to the 2-9 clutch assembly housing. 29 CLUTCH fluid moves the piston against spring force to apply holding of the 2-9 clutch plates.

3-8 Clutch Releases

S3-8 Solenoid

The S3-8 solenoid is energized off allowing S38 VFS SIG fluid to exhaust thru orifice #1. Spring pressure shifts the 3-8 clutch regulator valve to allow 38 CLUTCH fluid to exhaust into EX BACKFILL from the 3-8 clutch assembly.

3-8 Clutch Assembly

The 3-8 clutch is released allowing 38 CLUTCH fluid to exhaust thru the 3-8 clutch regulator valve.

Drive Range, Ninth Gear

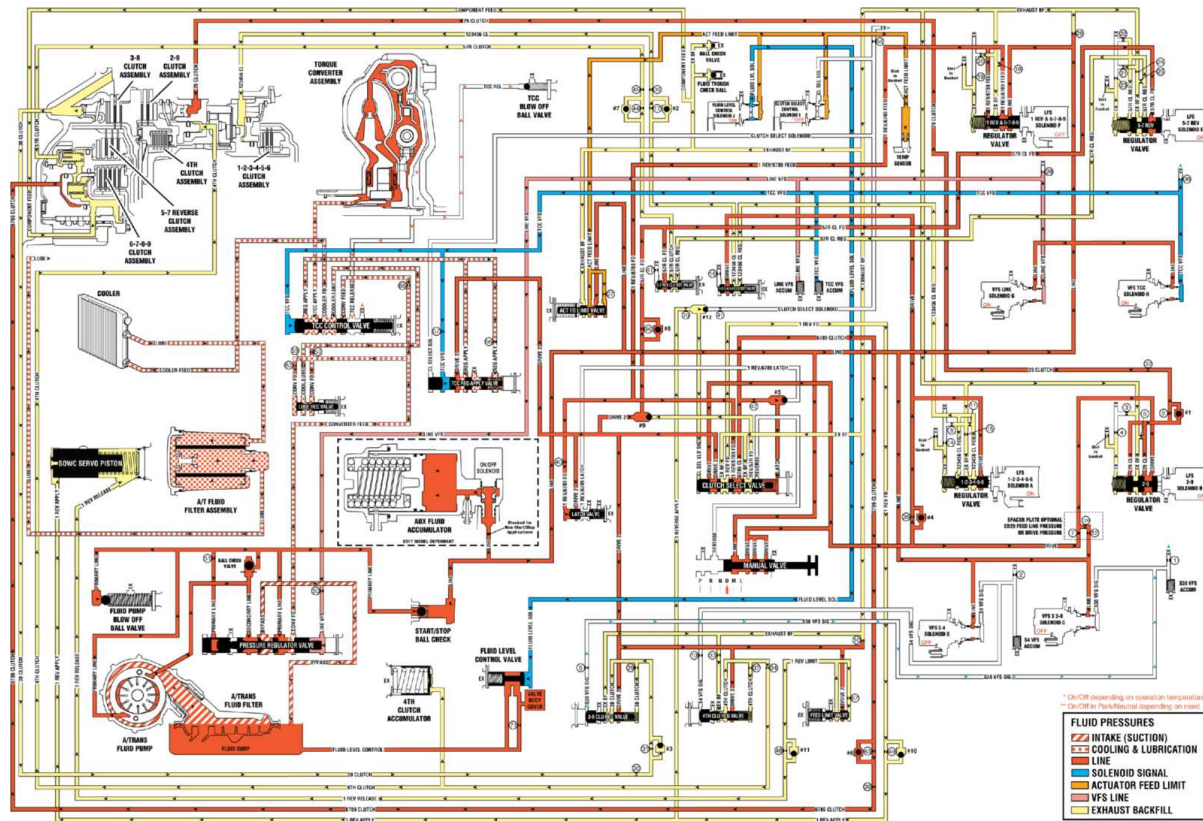


Fig. 48: Drive Range, Ninth Gear Hydraulic Diagram (Without ETRS)
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, NINTH GEAR (HYDRAULIC CIRCUITS WITH ETRS)

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the 2-9 solenoid. At the same time the S3-8 solenoid is commanded to low pressure.

2-9 Clutch Applies

2-9 Solenoid

The 2-9 solenoid energizes allowing drive fluid to enter the 2-9 regulator valve and enter the 2-9 CLUTCH fluid circuit. 2-9 CLUTCH fluid seats ball check valve #1 then is forced thru orifice #9 and #32 to the 2-9 clutch assembly.

2-9 Clutch Assembly

29 CLUTCH fluid is directed to the 2-9 clutch assembly housing. 29 CLUTCH fluid moves the piston against spring force to apply holding of the 2-9 clutch plates.

3-8 Clutch Releases

VFS S3-8 Solenoid

The S3-8 solenoid is commanded to low pressure allowing the 3-8 clutch regulator valve to shift enough to prevent pressurized DRIVE 2 fluid from entering the 38 CLUTCH fluid passage and engaging the 3-8 clutch.

3-8 Clutch Assembly

The 3-8 clutch is released allowing 38 CLUTCH fluid to exhaust thru the 3-8 clutch regulator valve.

Drive Range, Ninth Gear

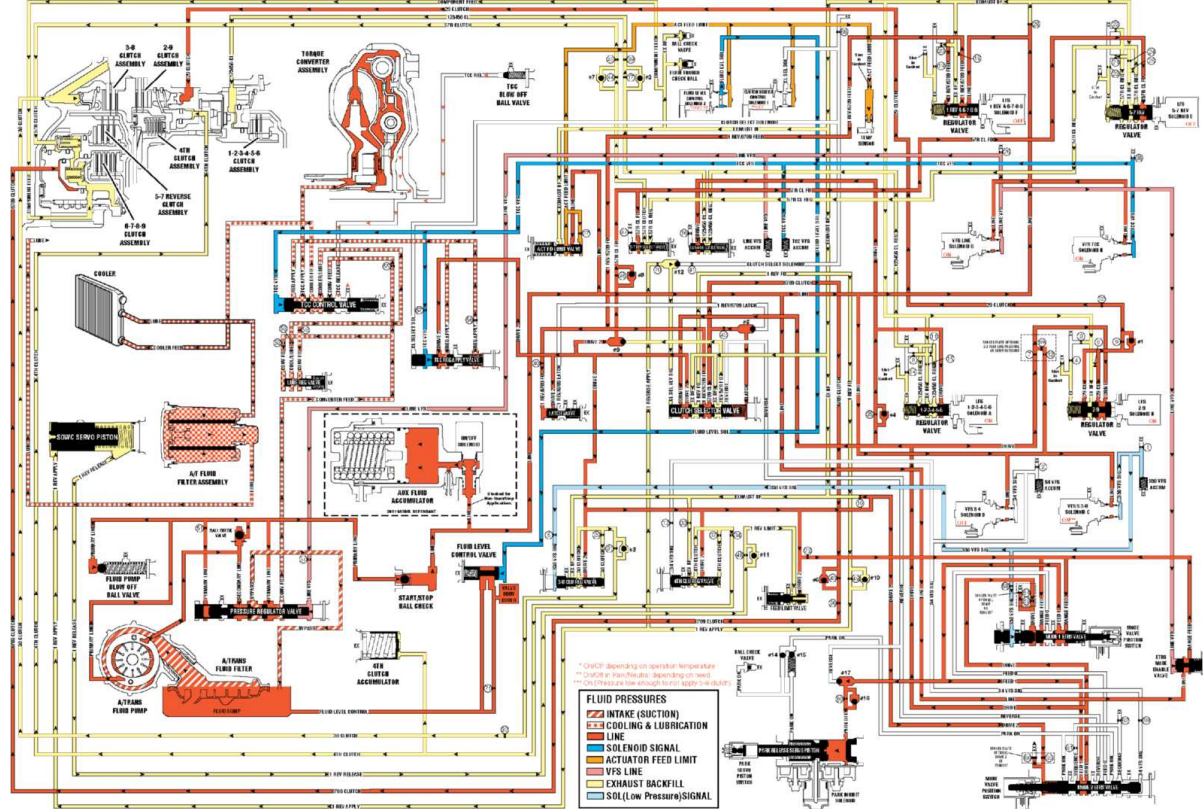


Fig. 49: Drive Range, Ninth Gear Hydraulic Diagram (With ETRS)
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, NINTH GEAR (MECHANICAL POWERFLOW)

Drive Range - Ninth Gear is used to maximize engine efficiency and fuel economy beyond Eighth gear calibrations. Input signals from the transmission speed sensors (input and output), throttle position (TP) sensor, and other vehicle sensors, are used by the TCM to determine the precise moment to shift the transmission into Ninth gear. In Ninth gear, the planetary gear sets rotate in overdrive, providing a 0.617:1 gear ratio between the torque converter turbine and the front differential carrier assembly (238).

1. Power From The Engine

Torque from the engine is transferred to the transmission through the engine flywheel which is bolted to the torque converter assembly (14).

2. Turbine Shaft Driven

As the torque converter turbine rotates, the 5-7-reverse and 6-7-8-9 clutch housing (530) and the turbine shaft (547) which is splined to the torque converter turbine, is also forced to rotate at turbine speed.

3. Input Sun Gear Driving

The input sun gear (551), which is splined to the turbine shaft (547), drives the input carrier assembly (552) pinion gears.

4. 6-7-8-9 Clutch Assembly Applied

The 6-7-8-9 clutch plates (570-577), splined to the 5-7-reverse and 6-7-8-9 clutch housing (530) and the reaction carrier hub (532), are applied and drive the reaction carrier hub (532).

5. 2-9 Clutch Assembly Applied

The 2-9 clutch plates (517-519), splined to the 2-9 and 4th clutch hub (619) and the 2-9 and 4th clutch piston housing (520), are applied and hold the 2-9 and 4th clutch hub (619) stationary.

6. Overdrive Carrier Driving

The overdrive carrier (546) small pinion gears are driven around the stationary 2-9 and 4th clutch hub (539), and over drive the overdrive internal gear (output carrier assembly) (555).

7. Input Carrier Assembly Driven

With both the input internal gear (overdrive carrier assembly) (546) and the input sun gear (551) driving at converter turbine speed, the input carrier pinions act as wedges to obtain direct drive to obtain direct drive to the output internal gear, which drives the output carrier assembly (555) pinions.

8. Output Carrier Assembly Driving

The output carrier assembly (555) is splined to, and drives the output carrier transfer drive gear hub (502).

9. Output Carrier Transfer Drive Gear Hub Driven

The output carrier transfer drive gear hub (502) is splined to, and driven by, the output carrier assembly (555).

10. Drive Sprocket Driving

The drive sprocket (234), splined to and driven by the output carrier transfer drive gear hub (502), drives the drive link (233) which drives the driven sprocket (241).

11. Driven Sprocket Driven

The driven sprocket (241), driven by the drive link (233), is splined to the front differential carrier sun gear (240).

12. Front Differential Carrier Sun Gear Driving

The front differential carrier sun gear (240), is in mesh with, and drives, the front differential carrier (238), thus transferring power to the front differential carrier and to the drive axles.

Drive Range, Ninth Gear

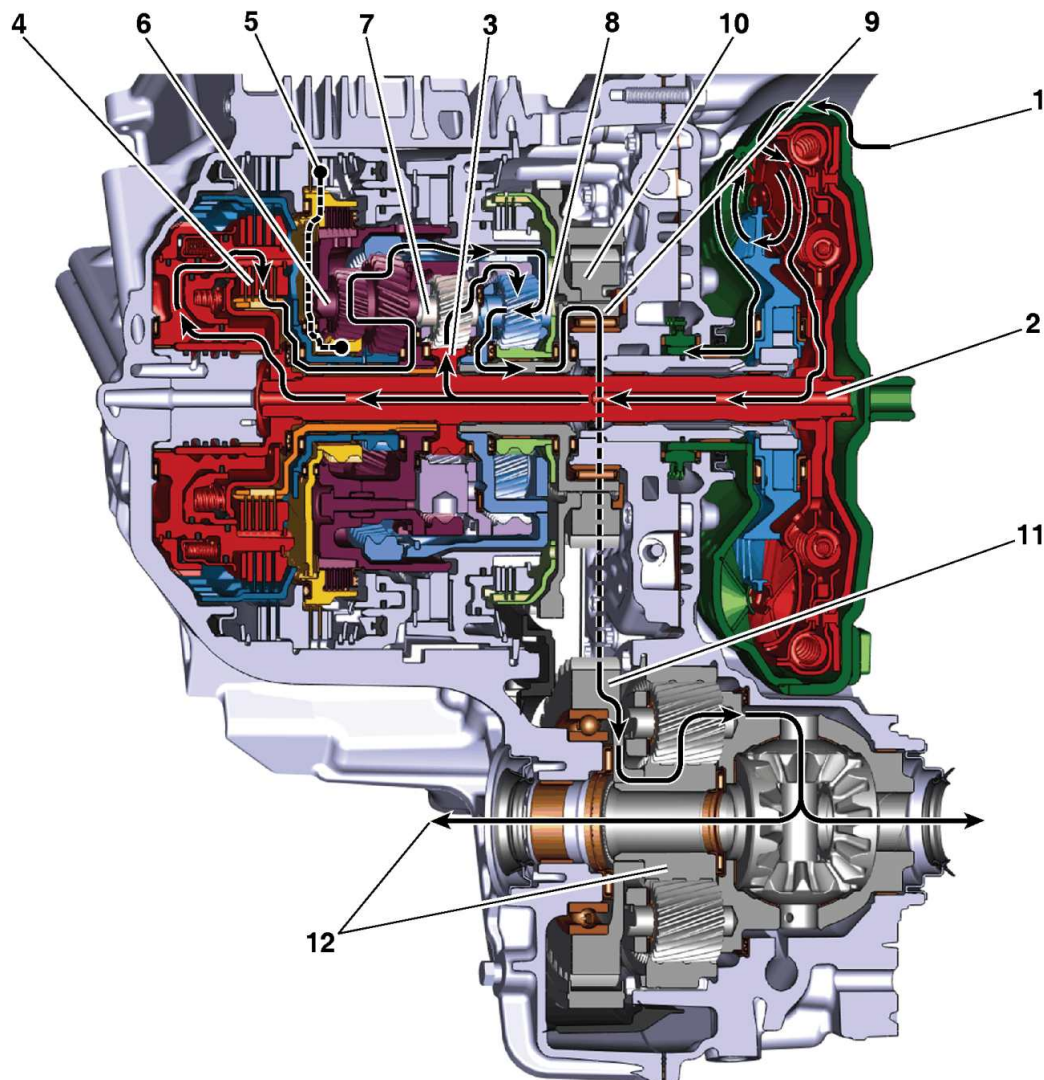


Fig. 50: Drive Range, Ninth Gear Mechanical Powerflow Diagram
 Courtesy of GENERAL MOTORS COMPANY

FLUID PASSAGES (HYDRAULIC CIRCUITS WITHOUT ETRS)

Control Valve Solenoid Body - Fluid Pan Side

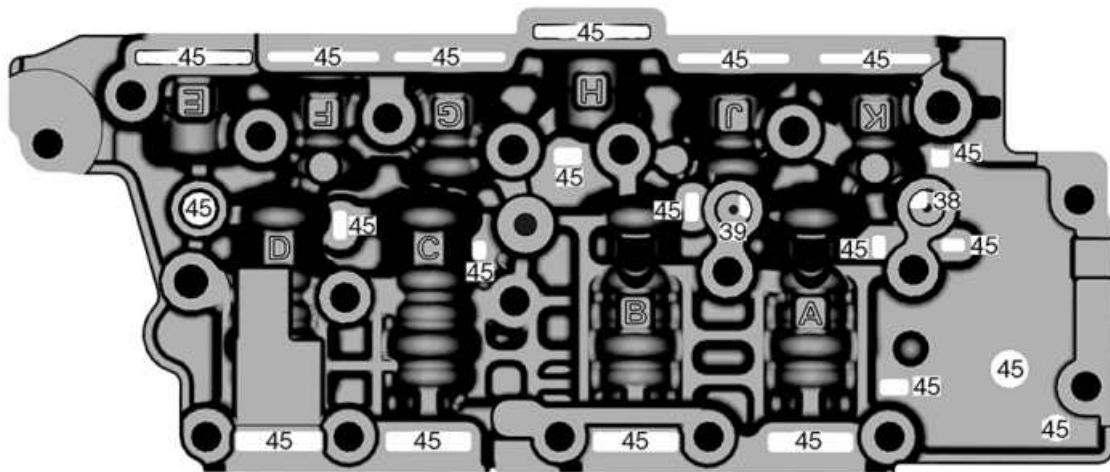


Fig. 51: Control Valve Solenoid Body Fluid Passages - Fluid Pan Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
45	Exhaust

Control Valve Solenoid Body - Control Valve Body Side

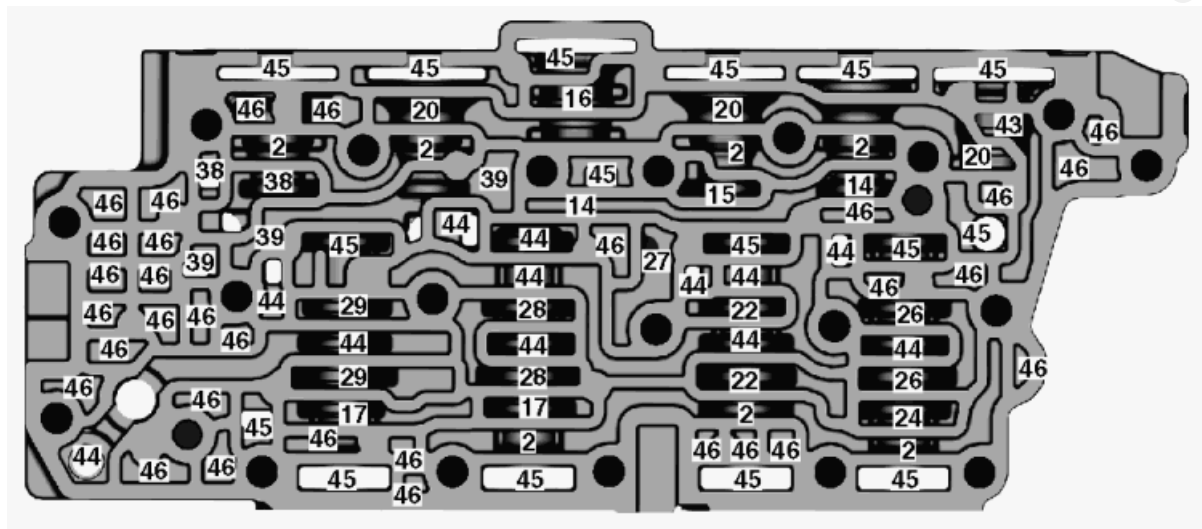


Fig. 52: Control Valve Solenoid Body Fluid Passages - Control Valve Body Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
20	Actuator Feed Limit
22	1-Reverse/6-7-8-9 Feed

Callout	Component Name
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
44	Exhaust Backfill
45	Exhaust
46	Void

Control Valve Body Spacer Plate - Control Valve Solenoid Side

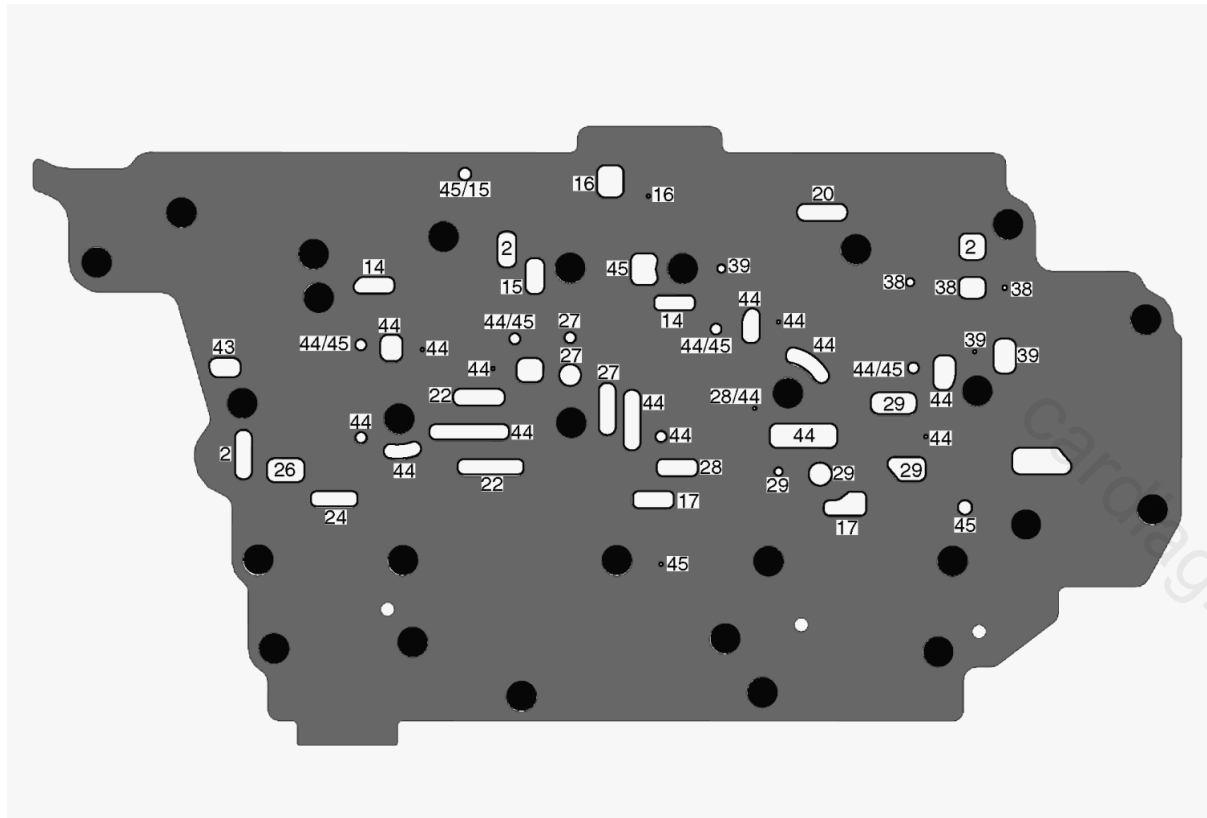


Fig. 53: Control Valve Solenoid Body Spacer Plate Fluid Passages - Control Valve Solenoid Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
20	Actuator Feed Limit
22	1-Reverse/6-7-8-9 Feed
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
43	Fluid Level Solenoid
44	Exhaust Backfill

Callout	Component Name
45	Exhaust

Control Valve Body - Control Valve Solenoid Body Side

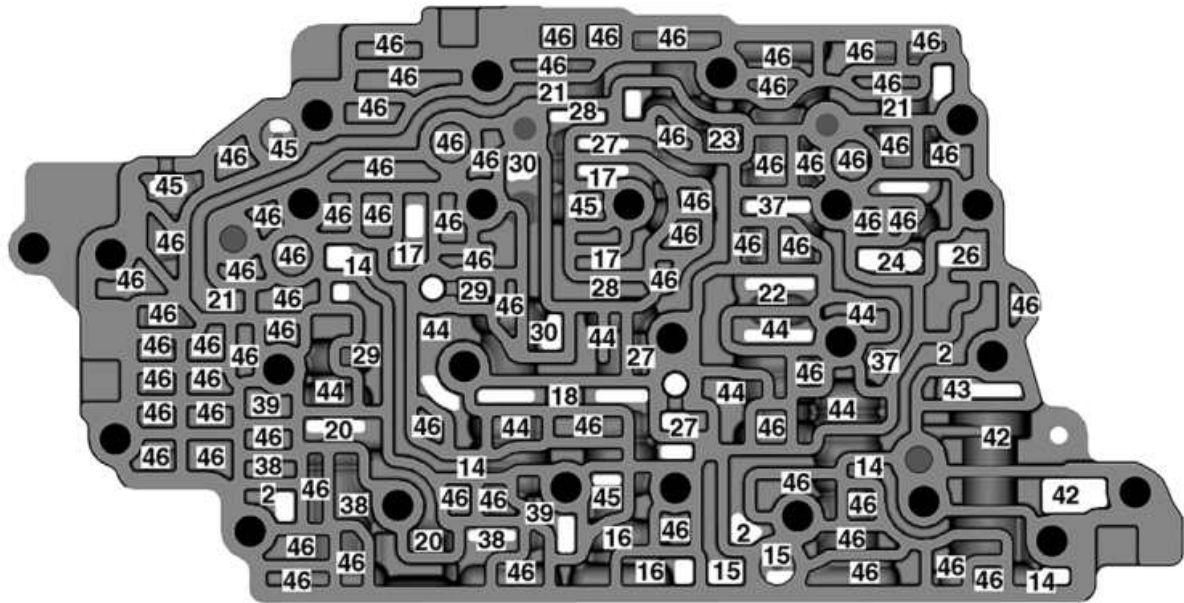


Fig. 54: Control Valve Body Fluid Passages - Control Valve Solenoid Body Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
30	3-8 Clutch
37	Reverse/5-7-Reverse Feed
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
43	Fluid Level Solenoid
44	Exhaust Backfill
45	Exhaust
46	Void

Control Valve Body - Case Side

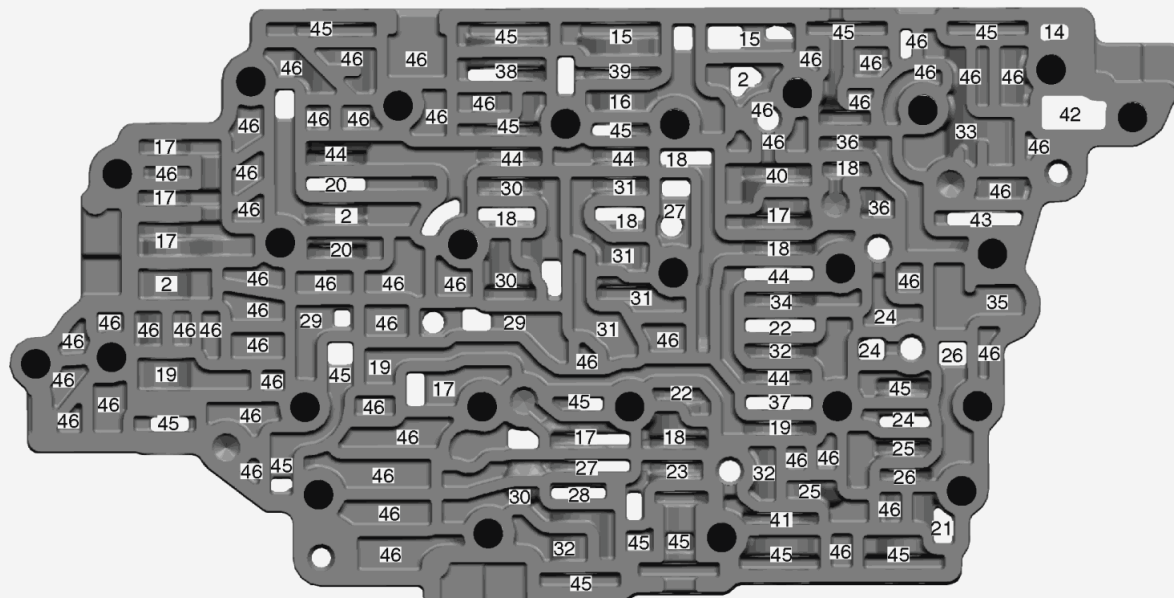


Fig. 55: Control Valve Body Fluid Passages - Case Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release
36	1-Reverse Limit
37	Reverse/5-7-Reverse Feed
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
40	Clutch Select Valve Signal
41	Latch

Callout	Component Name
42	Fluid Level Control
43	Fluid Level Solenoid
44	Exhaust Backfill
45	Exhaust
46	Void

Control Valve Body Spacer Plate - Case Side

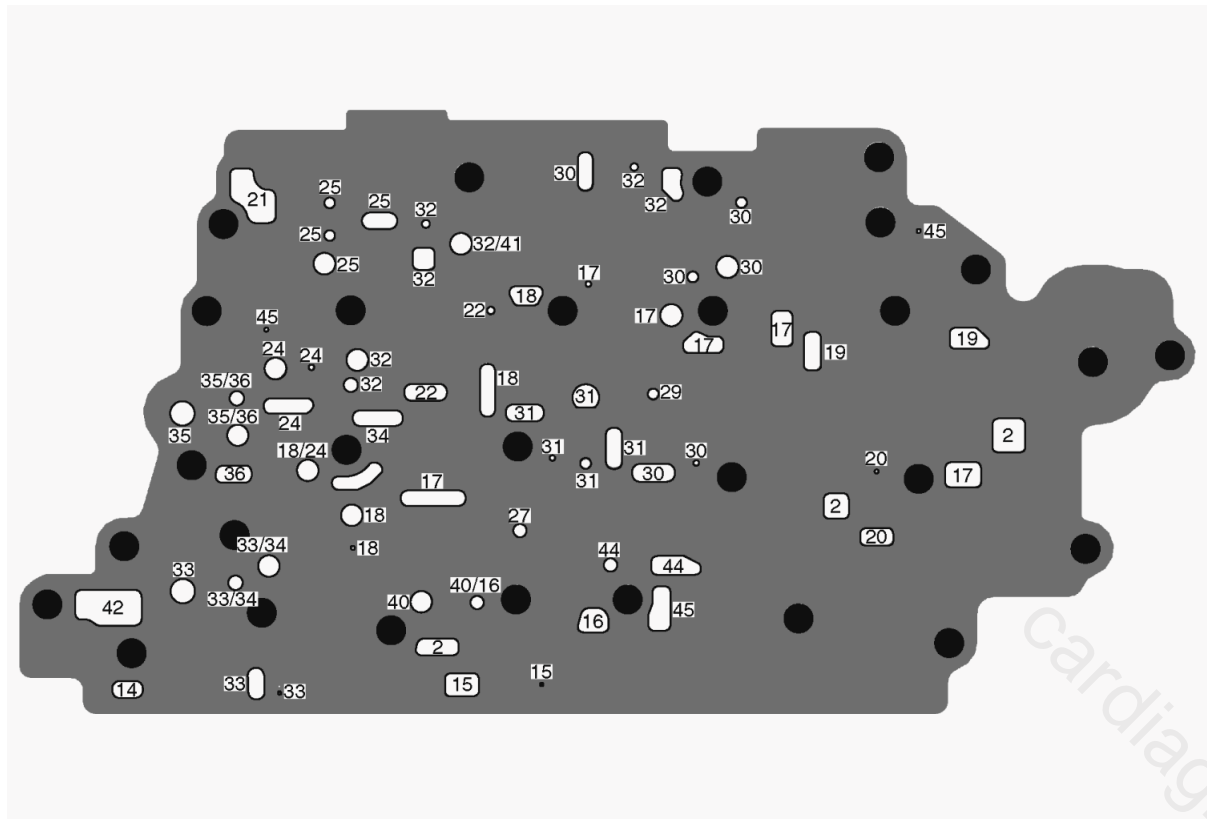


Fig. 56: Control Valve Solenoid Body Spacer Plate Fluid Passages - Case Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release

Callout	Component Name
36	1-Reverse Limit
40	Clutch Select Valve Signal
41	Latch
42	Fluid Level Control
44	Exhaust Backfill
45	Exhaust

Automatic Transmission Case - Control Valve Body Side

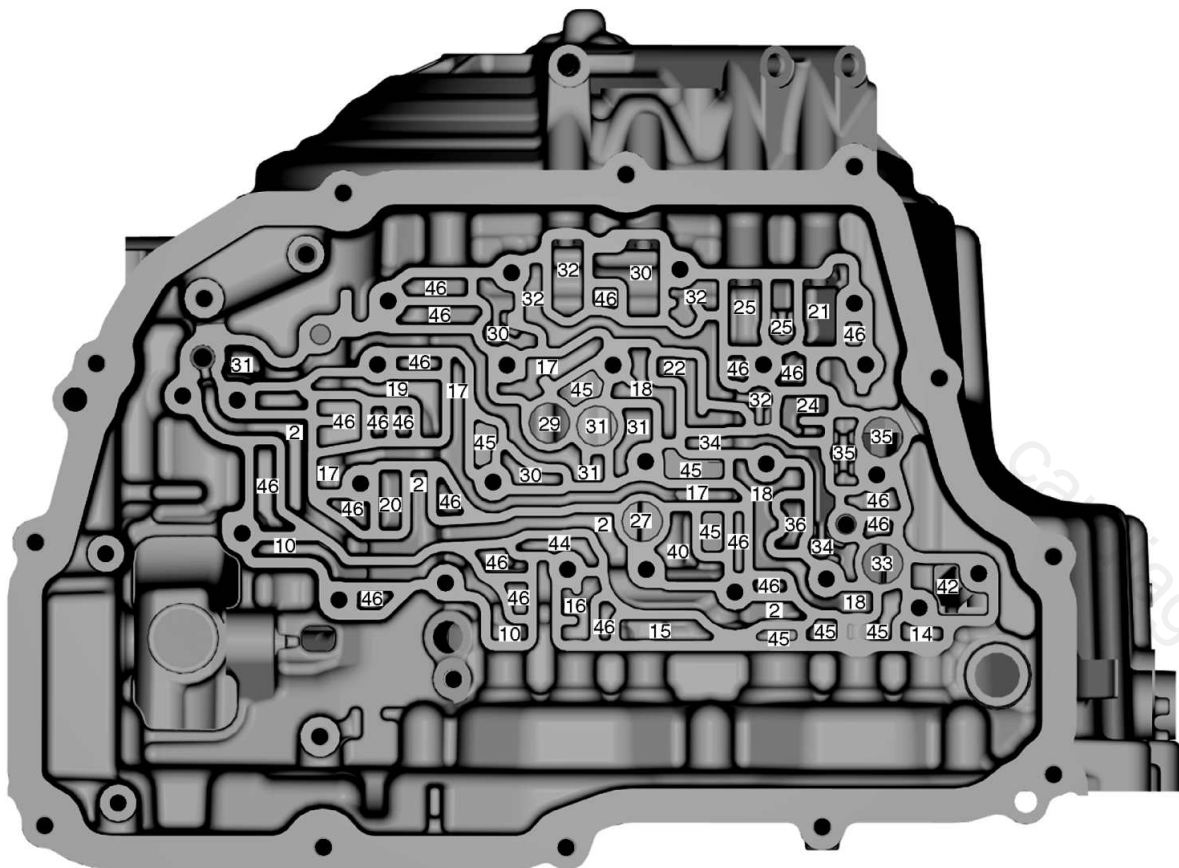


Fig. 57: Automatic Transmission Case Fluid Passages - Control Valve Body Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
10	Cooler Feed
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch

Callout	Component Name
27	1-2-3-4-5-6 Clutch
29	2-9 Clutch
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release
36	1-Reverse Limit
40	Clutch Select Valve Signal
42	Fluid Level Control
44	Exhaust Backfill
45	Exhaust
46	Void

Automatic Transmission Case - Torque Converter Housing Side

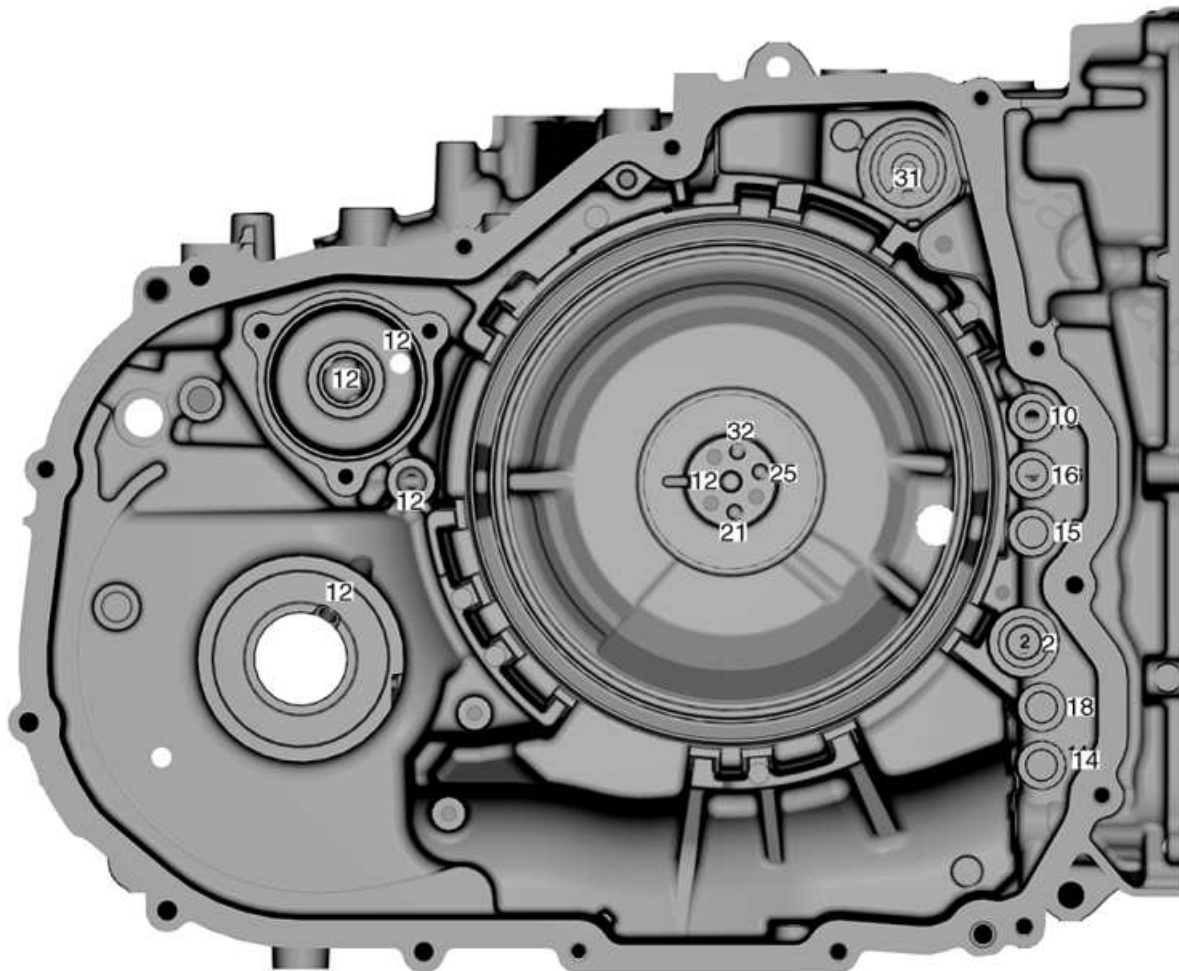


Fig. 58: Automatic Transmission Case Fluid Passages - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
10	Cooler Feed
12	Lube
14	Line VFS
15	TCC VFS

Callout	Component Name
16	Clutch Select Solenoid
18	Drive 2
21	Component Feed
25	5-7-Reverse Clutch
31	4th Clutch
32	6-7-8-9 Clutch

Torque Converter Housing - Automatic Transmission Case Side

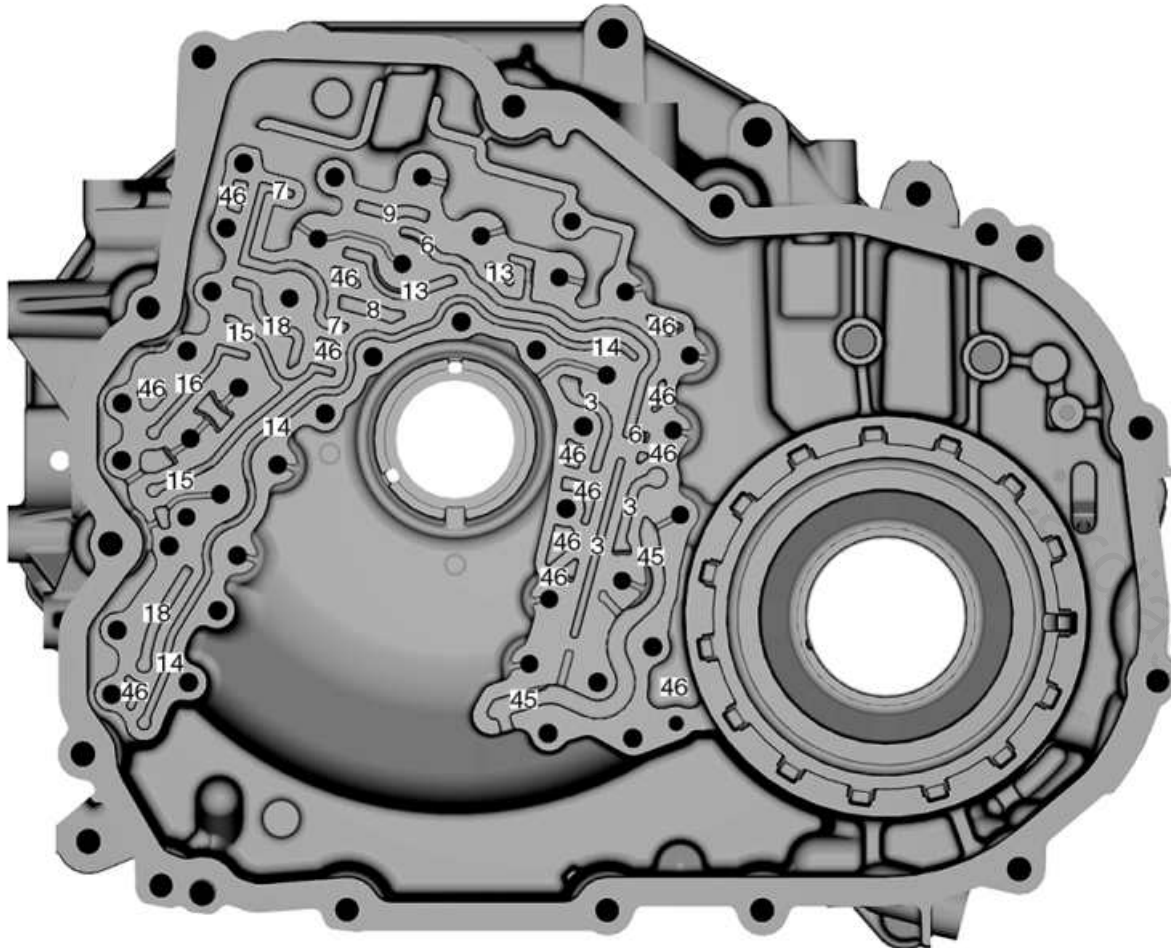


Fig. 59: Torque Converter Housing Fluid Passages - Automatic Transmission Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
46	Void

Auxiliary Control Valve Body Spacer Plate - Drive Sprocket Support Side

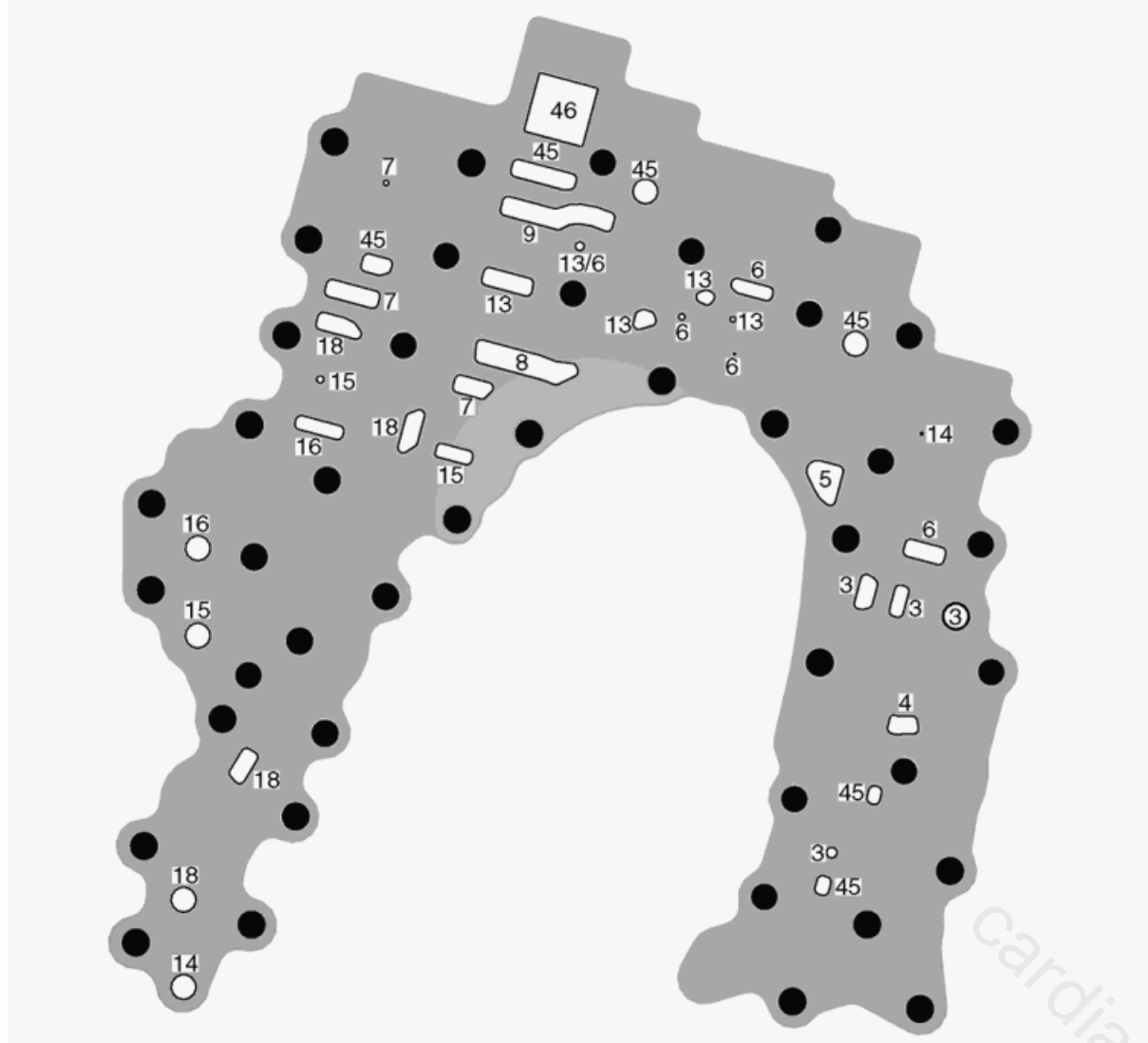


Fig. 60: Auxiliary Control Valve Body Spacer Plate Fluid Passages - Drive Sprocket Support Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
4	Secondary Line
5	Bypass
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
45	Exhaust
46	Void

Drive Sprocket Support - Torque Converter Housing Side

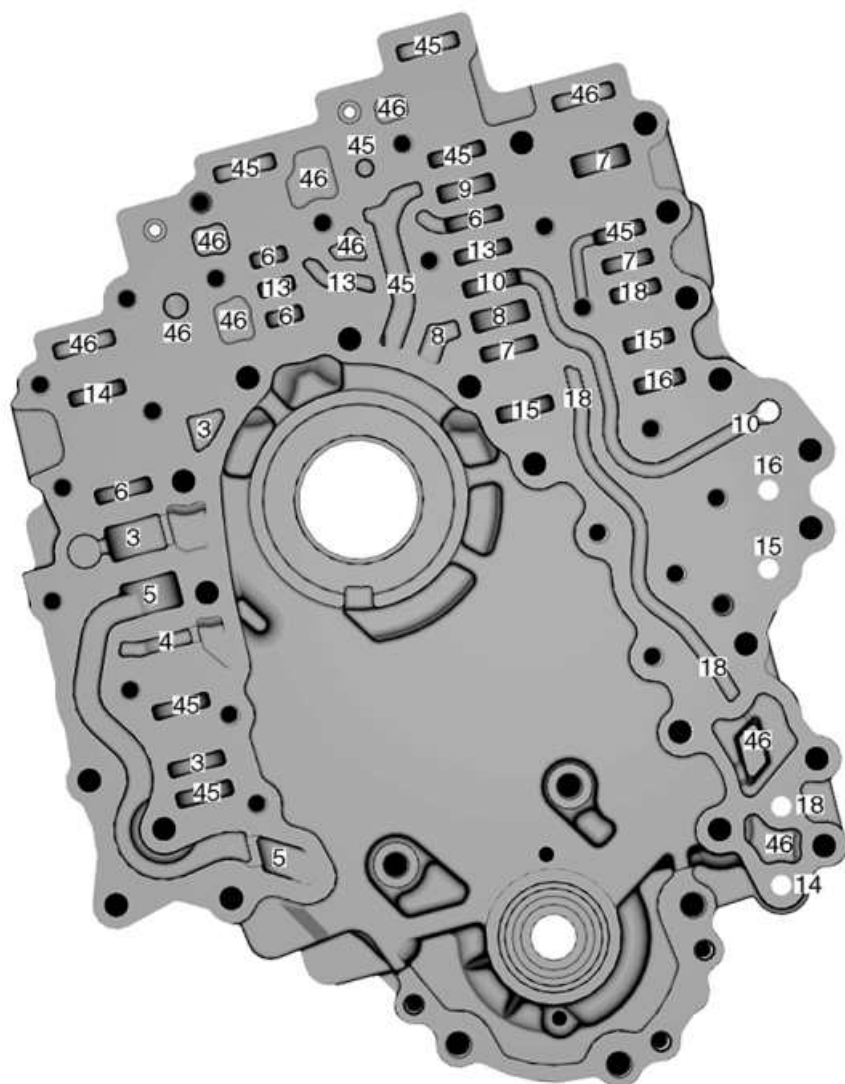


Fig. 61: Drive Sprocket Support Fluid Passages - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
4	Secondary Line
5	Bypass
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
10	Cooler Feed
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
45	Exhaust
46	Void

Drive Sprocket Support - Automatic Transmission Fluid Pump Side

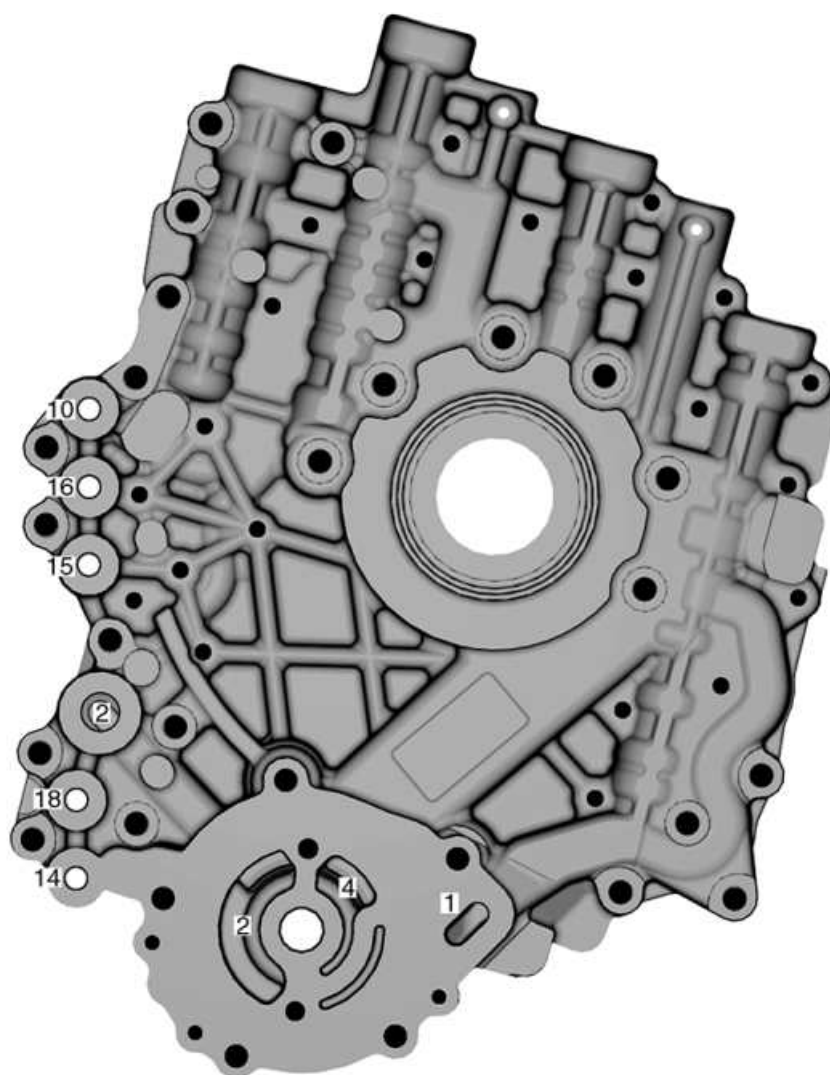


Fig. 62: Drive Sprocket Support Fluid Passages - Automatic Transmission Fluid Pump Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
4	Secondary Line
10	Cooler Feed
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2

Automatic Transmission Fluid Pump Gasket - Drive Sprocket Support Side

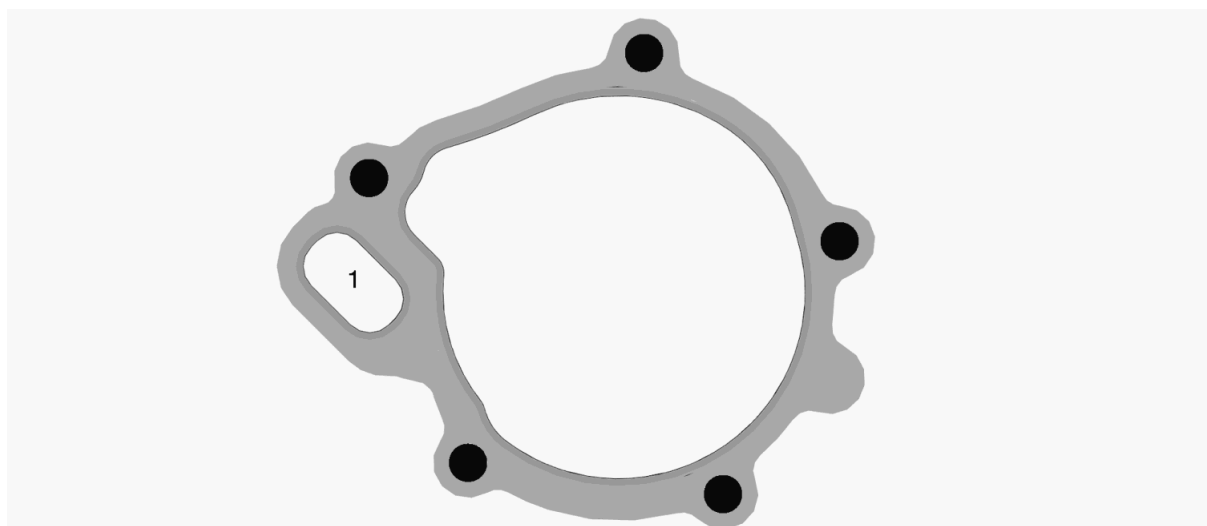


Fig. 63: Automatic Transmission Fluid Pump Gasket Fluid Passages - Drive Sprocket Support Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction

Automatic Transmission Fluid Pump - Drive Sprocket Support Side

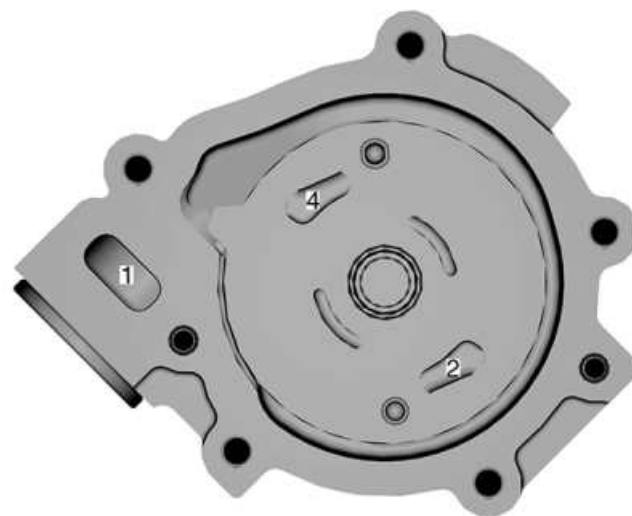


Fig. 64: Automatic Transmission Fluid Pump Fluid Passages - Drive Sprocket Support Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
4	Secondary Line

FLUID PASSAGES (HYDRAULIC CIRCUITS WITH ETRS)

Control Valve Solenoid Body - Fluid Pan Side

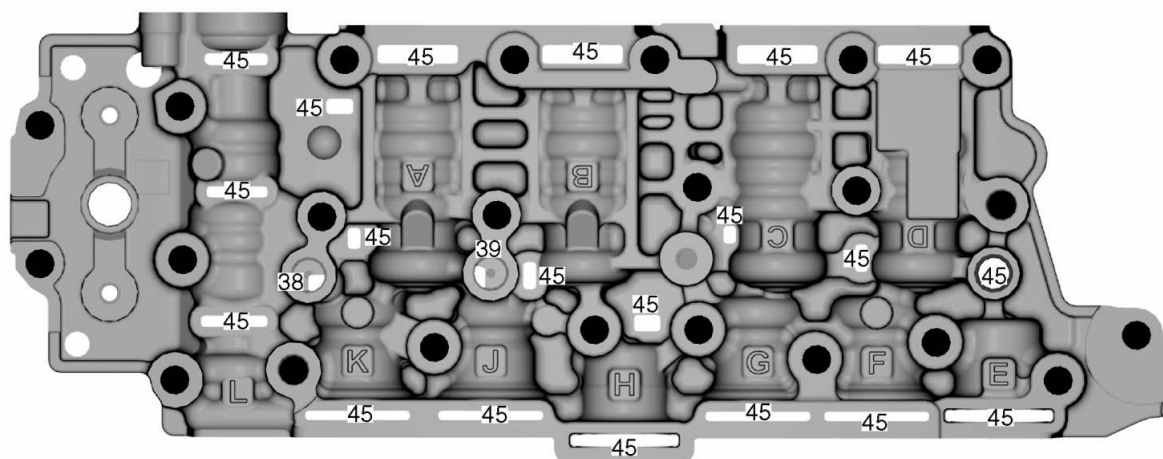


Fig. 65: Control Valve Solenoid Body Fluid Passages - Fluid Pan Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
45	Exhaust

Control Valve Solenoid Body - Control Valve Body Side

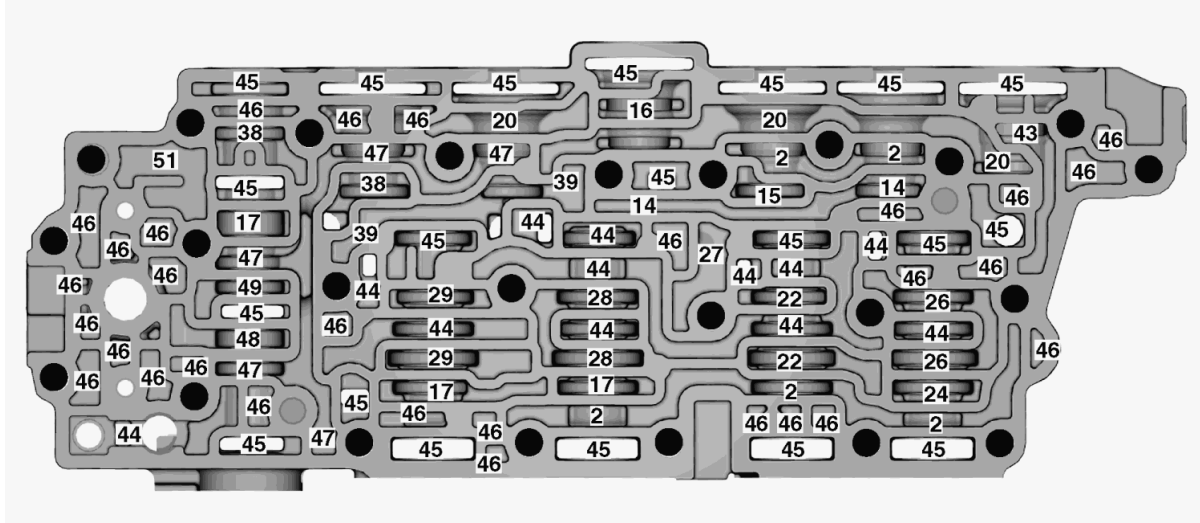


Fig. 66: Control Valve Solenoid Body Fluid Passages - Control Valve Body Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
20	Actuator Feed Limit
22	1-Reverse/6-7-8-9 Feed
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
44	Exhaust Backfill
45	Exhaust
46	Void

Control Valve Body Spacer Plate - Control Valve Solenoid Side

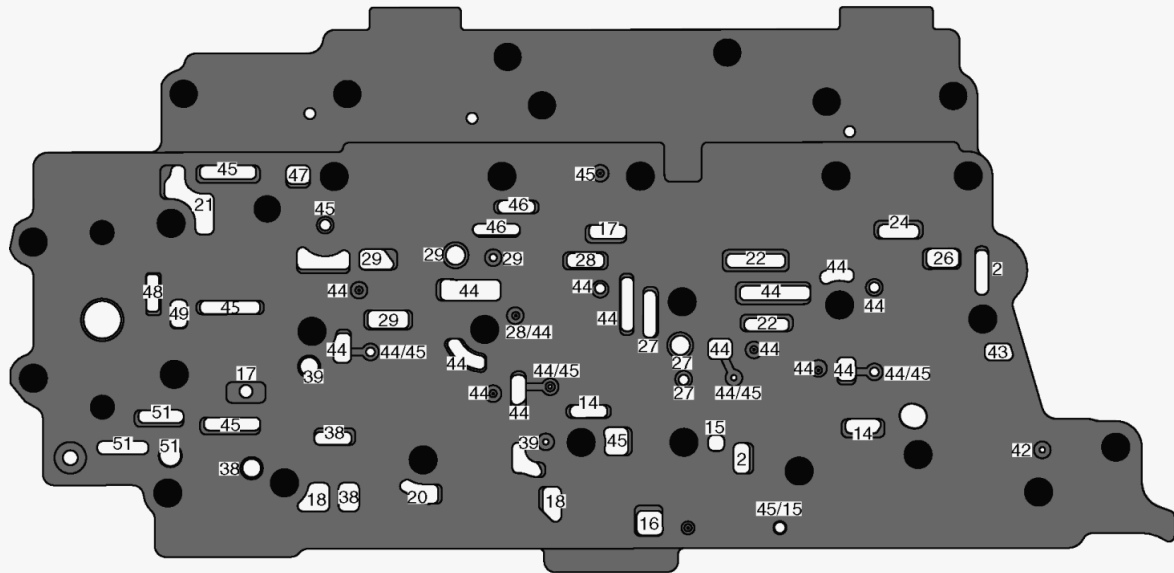


Fig. 67: Control Valve Body Spacer Plate Fluid Passages - Control Valve Solenoid Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
20	Actuator Feed Limit
22	1-Reverse/6-7-8-9 Feed
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
43	Fluid Level Solenoid
44	Exhaust Backfill
45	Exhaust
46	Void
47	Range Feed
48	Feed 1
49	Feed 0
51	Park On

Control Valve Body - Control Valve Solenoid Body Side

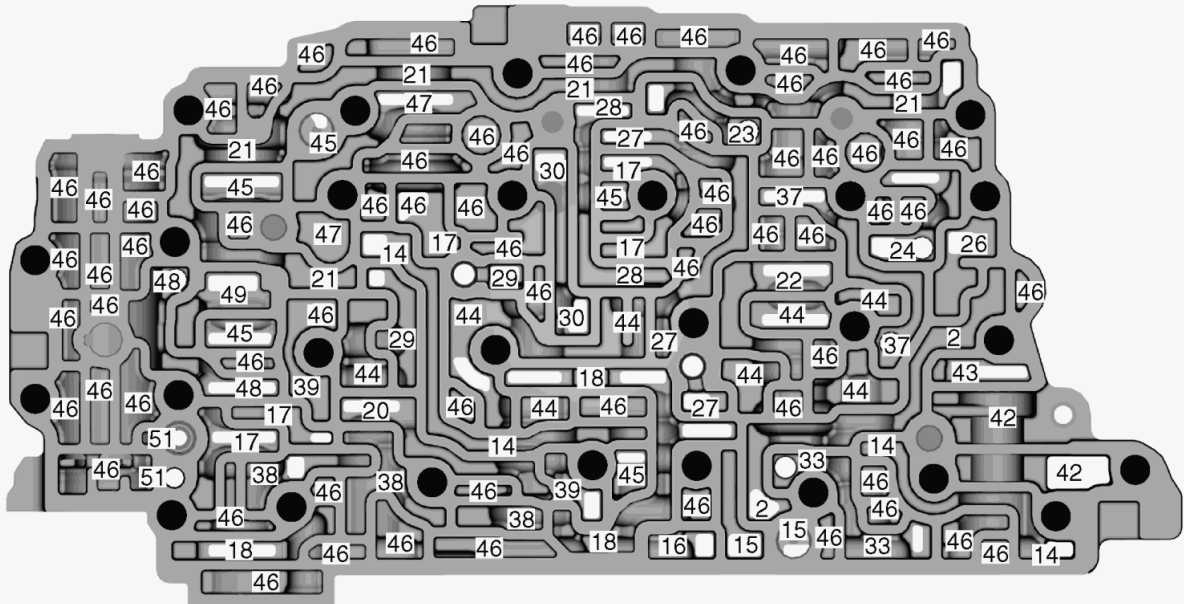


Fig. 68: Control Valve Body Fluid Passages - Control Valve Solenoid Body Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
30	3-8 Clutch
37	Reverse/5-7-Reverse Feed
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
43	Fluid Level Solenoid
44	Exhaust Backfill
45	Exhaust
46	Void
47	Range Feed
48	Feed 1
49	Feed 0
51	Park On

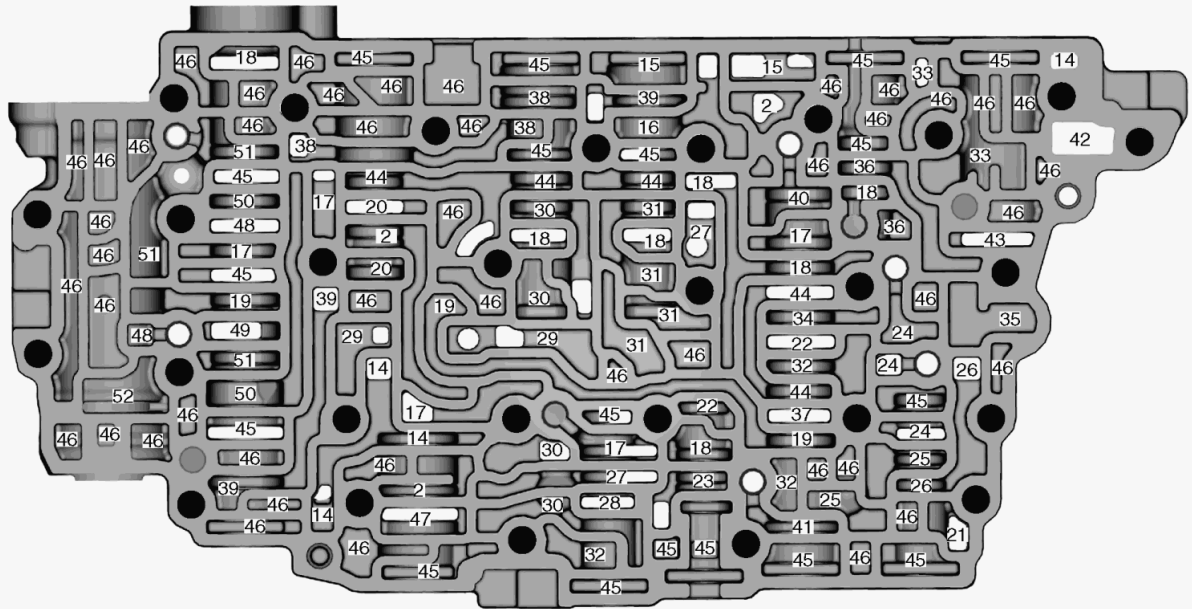


Fig. 69: Control Valve Body Fluid Passages - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch
28	1-2-3-4-5-6 Clutch Regulator
29	2-9 Clutch
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release
36	1-Reverse Limit
37	Reverse/5-7-Reverse Feed
38	S38 Variable Force Solenoid Valve Signal
39	S4 Variable Force Solenoid Valve Signal
40	Clutch Select Valve Signal
41	Latch

Callout	Component Name
42	Fluid Level Control
43	Fluid Level Solenoid
44	Exhaust Backfill
45	Exhaust
46	Void
47	Range Feed
48	Feed 1
49	Feed 0
50	Sequence
51	Park On
52	Park Off

Control Valve Body Spacer Plate - Case Side

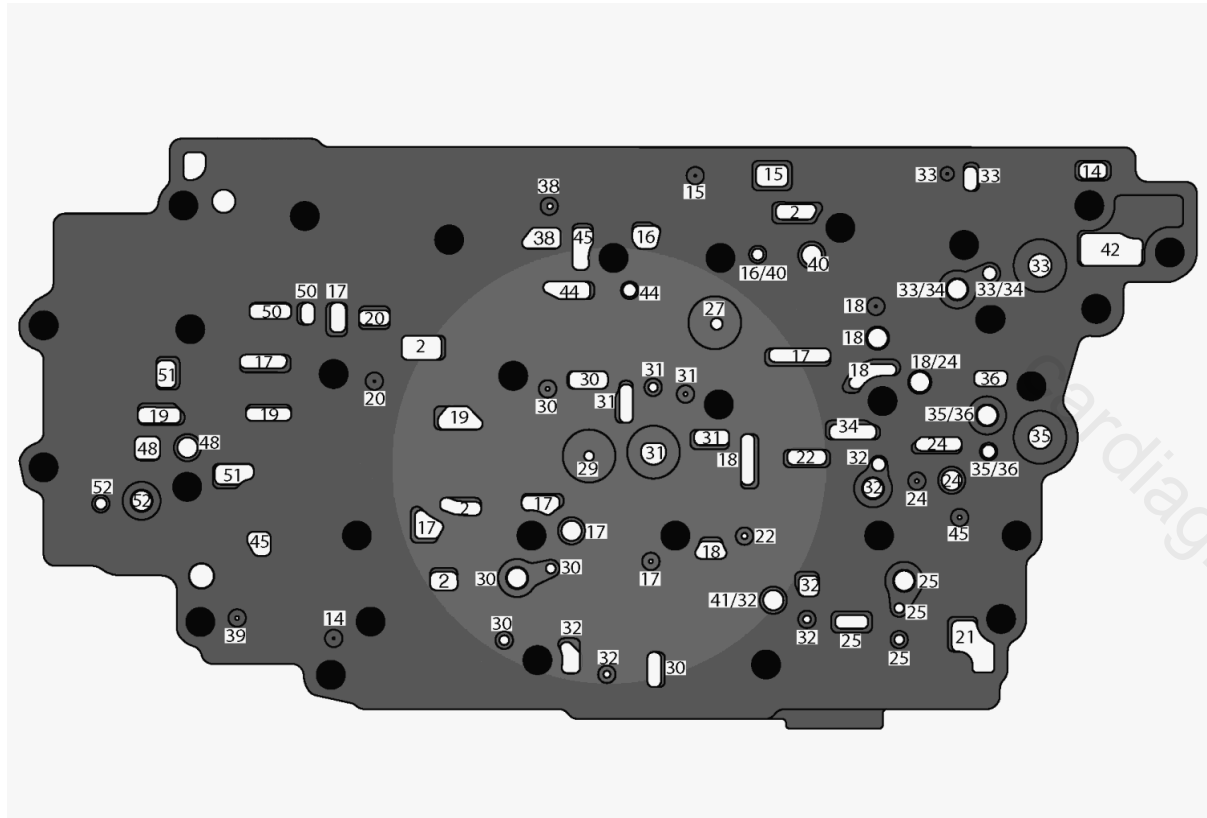


Fig. 70: Control Valve Body Spacer Plate Fluid Passages - Case Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
23	1-Reverse/6-7-8-9 Latch
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch
26	5-7-Reverse Clutch Regulator
27	1-2-3-4-5-6 Clutch

Callout	Component Name
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release
36	1-Reverse Limit
40	Clutch Select Valve Signal
41	Latch
42	Fluid Level Control
44	Exhaust Backfill
45	Exhaust
48	Feed 1
50	Sequence
51	Park On
52	Park Off

Automatic Transmission Case - Control Valve Body Side

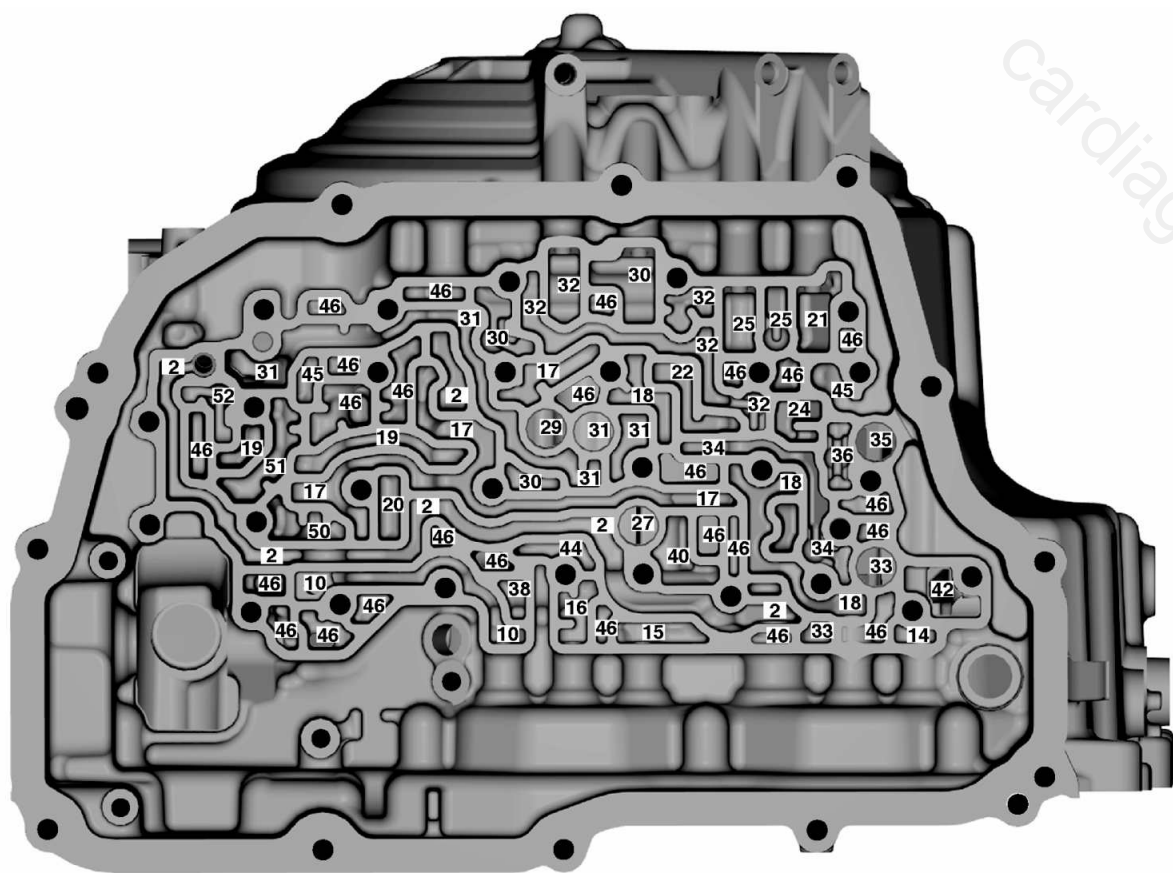


Fig. 71: Automatic Transmission Case Fluid Passages - Control Valve Body Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
10	Cooler Feed
14	Line VFS

Callout	Component Name
15	TCC VFS
16	Clutch Select Solenoid
17	Drive
18	Drive 2
19	Reverse
20	Actuator Feed Limit
21	Component Feed
22	1-Reverse/6-7-8-9 Feed
24	5-7-Reverse Clutch Feed
25	5-7-Reverse Clutch
27	1-2-3-4-5-6 Clutch
29	2-9 Clutch
30	3-8 Clutch
31	4th Clutch
32	6-7-8-9 Clutch
33	1-Reverse Apply
34	1-Reverse Feed
35	1-Reverse Release
36	1-Reverse Limit
40	Clutch Select Valve Signal
42	Fluid Level Control
44	Exhaust Backfill
45	Exhaust
46	Void
50	Sequence
51	Park On
52	Park Off

Automatic Transmission Case - Torque Converter Housing Side

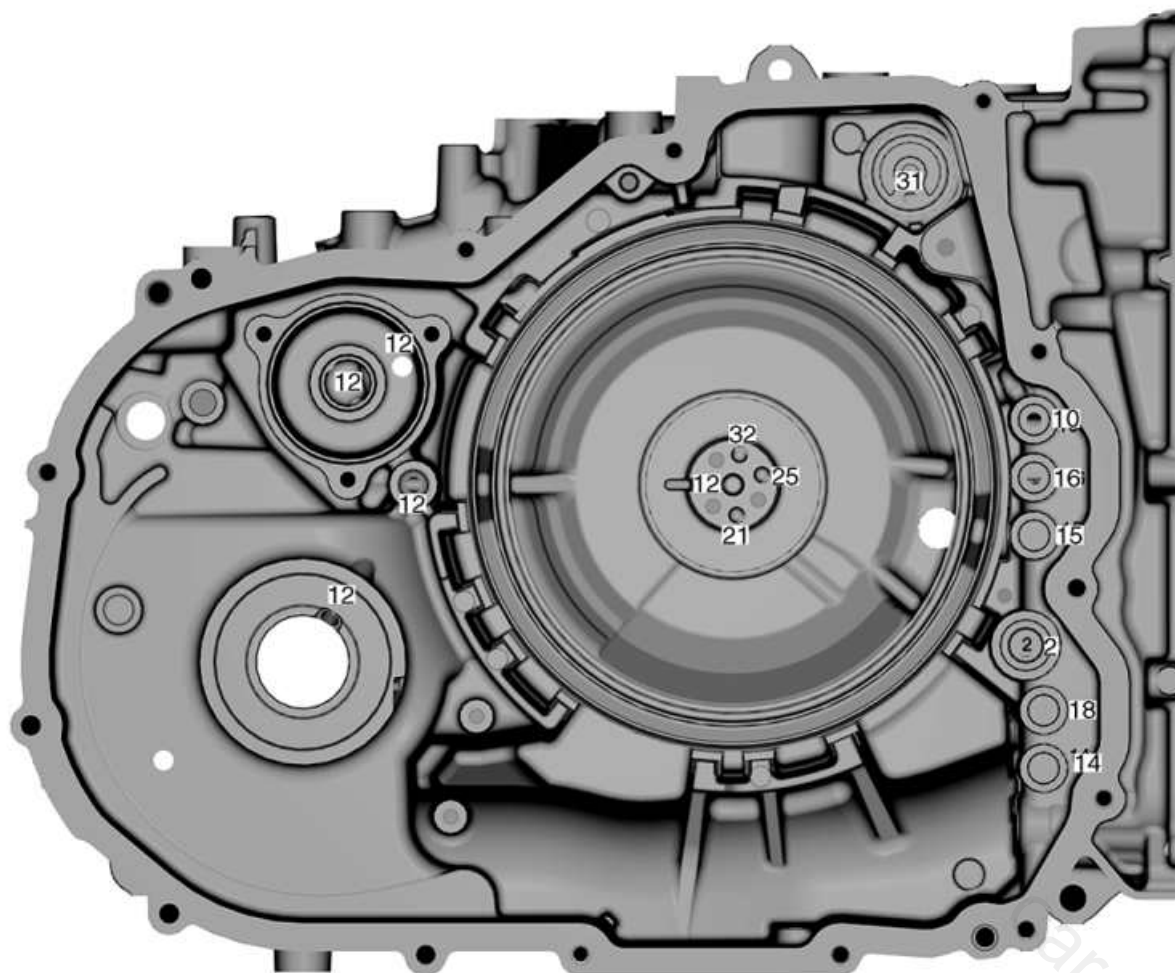


Fig. 72: Automatic Transmission Case Fluid Passages - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
10	Cooler Feed
12	Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
21	Component Feed
25	5-7-Reverse Clutch
31	4th Clutch
32	6-7-8-9 Clutch

Torque Converter Housing - Automatic Transmission Case Side

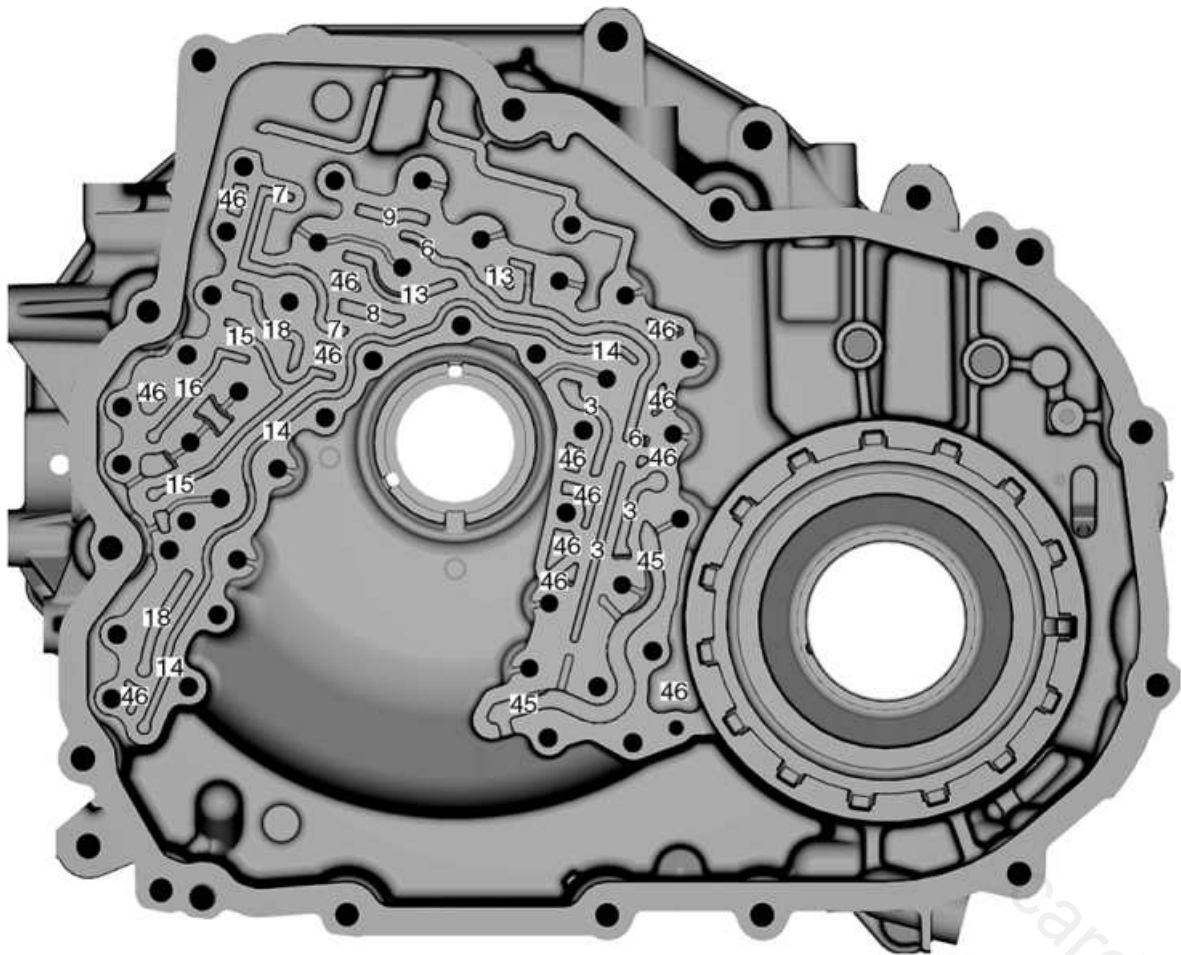


Fig. 73: Torque Converter Housing Fluid Passages - Automatic Transmission Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
46	Void

Auxiliary Control Valve Body Spacer Plate - Drive Sprocket Support Side

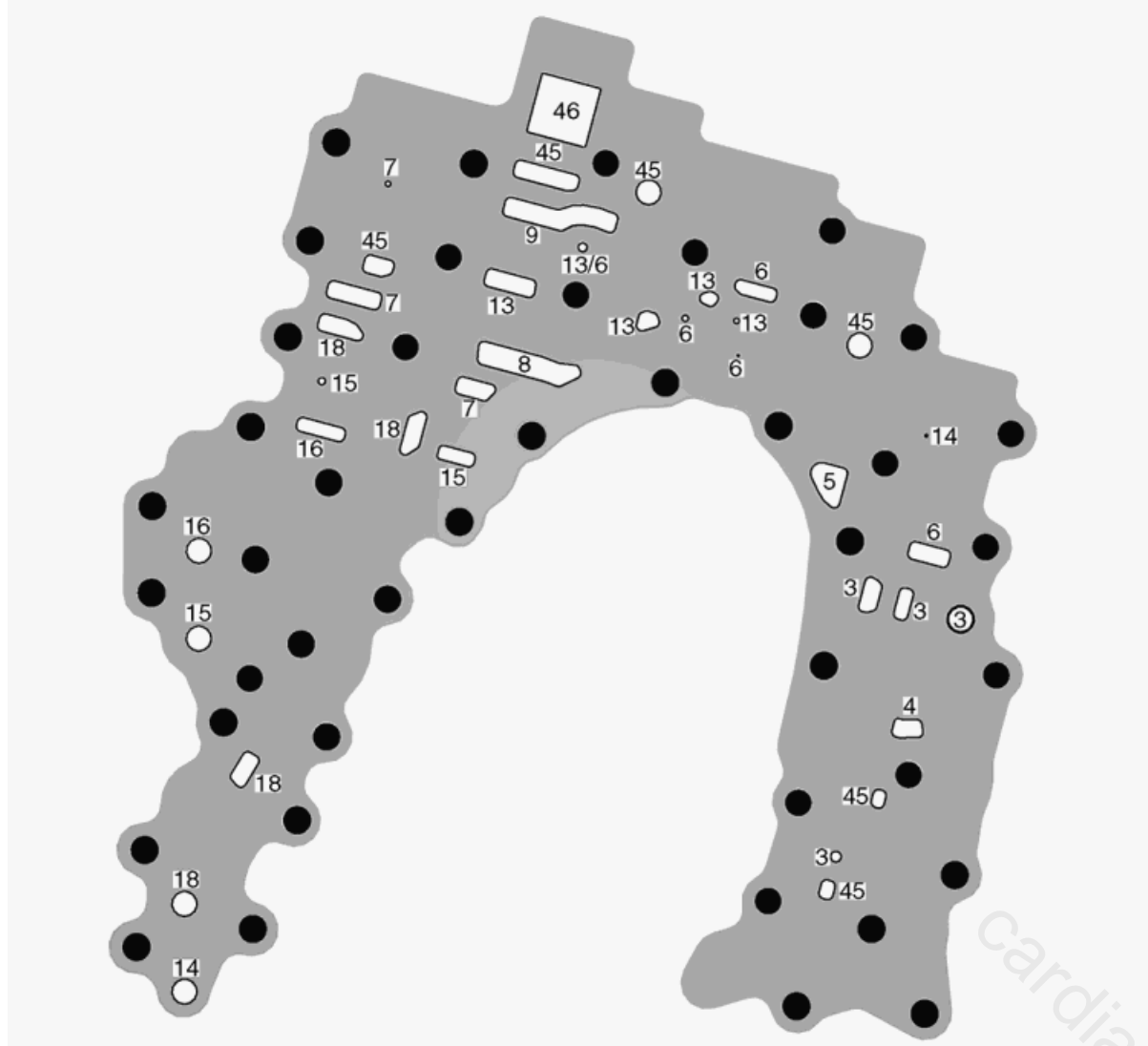


Fig. 74: Auxiliary Control Valve Body Spacer Plate Fluid Passages - Drive Sprocket Support Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
4	Secondary Line
5	Bypass
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
45	Exhaust
46	Void

Drive Sprocket Support - Torque Converter Housing Side

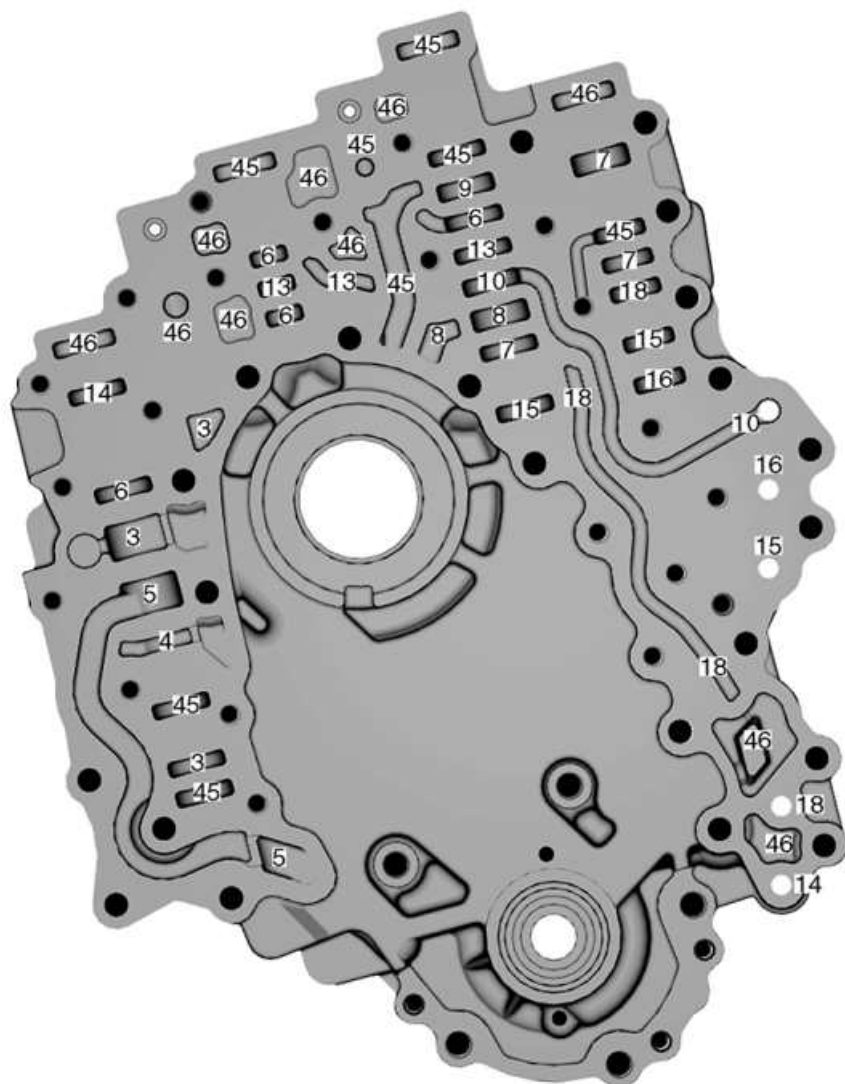


Fig. 75: Drive Sprocket Support Fluid Passages - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Primary Line
4	Secondary Line
5	Bypass
6	Converter Feed
7	Regulator Apply
8	TCC Apply
9	TCC Release
10	Cooler Feed
13	Cooler/Lube
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2
45	Exhaust
46	Void

Drive Sprocket Support - Automatic Transmission Fluid Pump Side

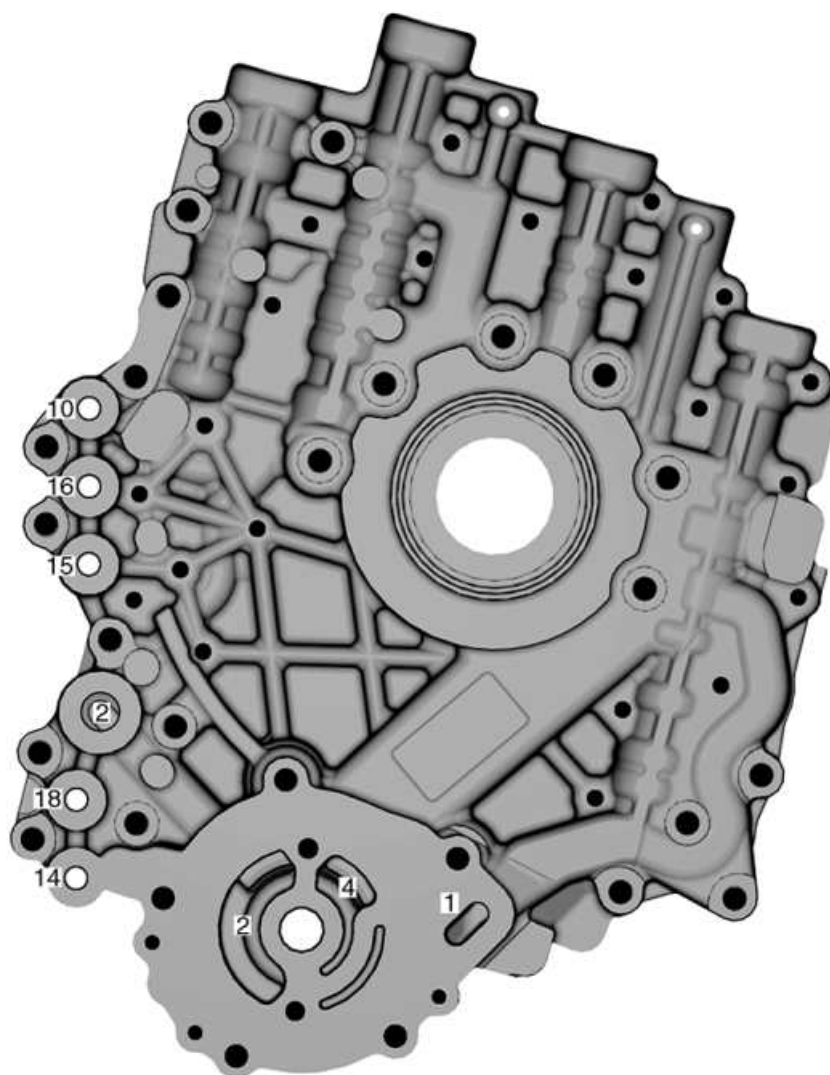


Fig. 76: Drive Sprocket Support Fluid Passages - Automatic Transmission Fluid Pump Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
4	Secondary Line
10	Cooler Feed
14	Line VFS
15	TCC VFS
16	Clutch Select Solenoid
18	Drive 2

Automatic Transmission Fluid Pump Gasket - Drive Sprocket Support Side

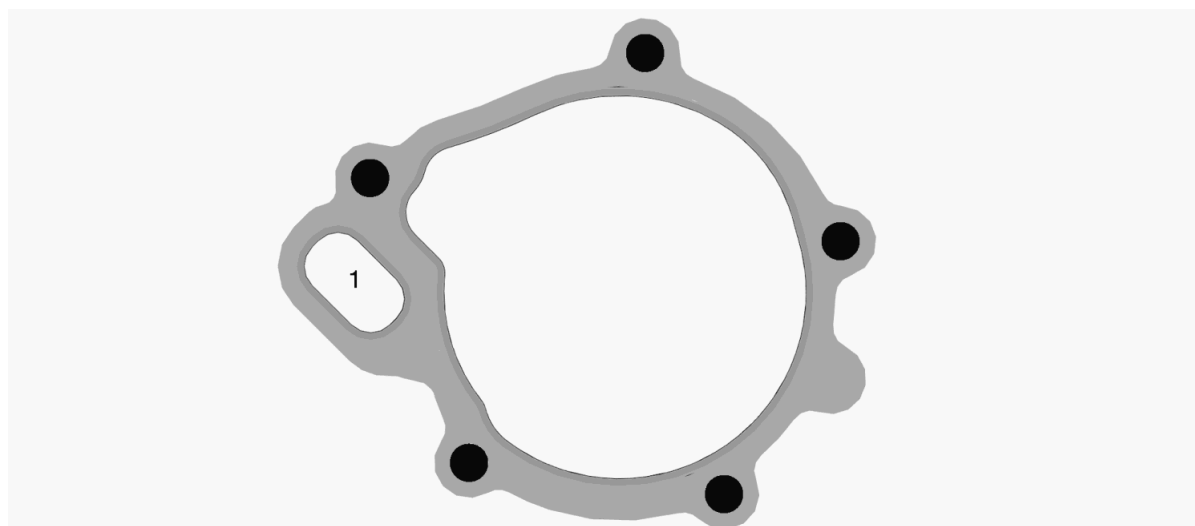


Fig. 77: Automatic Transmission Fluid Pump Gasket Fluid Passages - Drive Sprocket Support Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction

Automatic Transmission Fluid Pump - Drive Sprocket Support Side

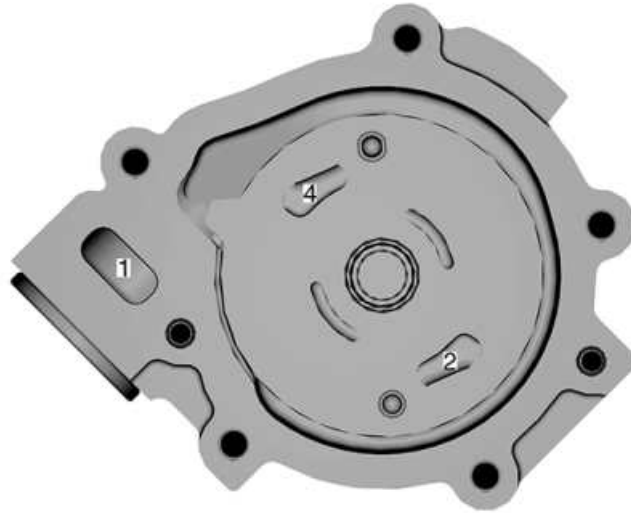


Fig. 78: Automatic Transmission Fluid Pump Fluid Passages - Drive Sprocket Support Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
4	Secondary Line

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Diagnostic Information And Procedures - Equinox & Terrain

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0601, P0602, P0603, P0604, P0606, P062F, P16F3 OR P16FB: CONTROL MODULE

Diagnostic Instructions

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

DTC Descriptor

DTC P0601

Control Module Read Only Memory Performance

DTC P0602

Control Module Not Programmed

DTC P0603

Control Module Long Term Memory Reset

DTC P0604

Control Module Random Access Memory Performance

DTC P0606

Control Module Processor Performance

DTC P062F

Control Module Long Term Memory Performance

DTC P16F3

Control Module Redundant Memory Performance

DTC P16FB

Control Module Vehicle Speed System Circuitry Performance

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Conditions for Running the DTC

- Ignition Voltage = Greater than 11 V
- {P16FB} Transmission Output Speed = Greater than a predefined threshold

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Control Module = Internal Malfunction/Not Programmed - For greater than 10 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- High Side Driver 1, 2 = Off
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Torque Reduction = Enabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P16FB} Transmission gear allowed = Reverse or Gear 5
- {RPO (EPH)} Engine Speed = Idle

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P0602 is not set.
 - **If the DTC is set**
 1. Perform all necessary programming and setup procedures for the control module: K71 Transmission Control Module

2. Verify the DTC does not set.

- If the DTC sets - Replace the component: K71 Transmission Control Module
- If the DTC does not set

3. All OK.

- **Go to next step: If the DTC is not set**

3. Ignition/Vehicle & All vehicle systems - Off

4. Disconnect the electrical connector: K71 Transmission Control Module

5. Verify a condition does not exist with the component: K71 Transmission Control Module @ Wiring Harness Connector - Defective/Loose/Poor Connection/Visible Damage

- **If a condition exists**

Repair or replace as necessary.

- **Go to next step: If no condition exists**

6. Connect the electrical connector: K71 Transmission Control Module

7. Ignition - On/Vehicle - In Service Mode

8. Clear the DTCs.

9. Ignition/Vehicle & All vehicle systems - Off

10. Ignition - On/Vehicle - In Service Mode

11. Verify DTC P0601, P0603, P0604, P0606, P062F, P16F3, P16FB is not set.

- **If the DTC is set**

Replace the component: K71 Transmission Control Module

- **Go to next step: If the DTC is not set**

12. All OK.

Repair Instructions

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

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

DTC P0658, P0659, P2727, P2729, P2730, P2736, P2738, P2739, P2826, P2827, P282F OR P2830: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE/TRANSMISSION CONTROL SOLENOID VALVE 5, 6, 9, 10 CONTROL CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P0658

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

DTC P2727

Transmission Control Solenoid Valve 5 Control Circuit Open

DTC P2729

Transmission Control Solenoid Valve 5 Control Circuit Low Voltage

DTC P2730

Transmission Control Solenoid Valve 5 Control Circuit High Voltage

DTC P2736

Transmission Control Solenoid Valve 6 Control Circuit Open

DTC P2738

Transmission Control Solenoid Valve 6 Control Circuit Low Voltage

DTC P2739

Transmission Control Solenoid Valve 6 Control Circuit High Voltage

DTC P2826

Transmission Control Solenoid Valve 9 Control Circuit Low Voltage

DTC P2827

Transmission Control Solenoid Valve 9 Control Circuit High Voltage

DTC P282F

Transmission Control Solenoid Valve 10 Control Circuit Low Voltage - If equipped

DTC P2830

Transmission Control Solenoid Valve 10 Control Circuit High Voltage - If equipped

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1	P2738	P2736	P2739	-
Control - Terminal 17	P2729	P2727	P2730	-
Control - Terminal 21	P2826	P2826	P2827	-
Control - Terminal 23	P282F	P282F	P2830	-
Control - Terminal 33	1	P0658	P0659	-
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data

High Side Driver 1 Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running			
Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Not Run or OK	Not Run or OK	Malfunction

High Side Driver 1 Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running			
Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Malfunction	Malfunction	Not Run or OK

High Side Driver 1 Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Not Run or OK	Not Run or OK	Malfunction

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Malfunction	Malfunction	Not Run or OK

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 1, 17, 21, 23	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Control - Terminal 33	The output circuit is switched to 12 V to activate the component.

Component	Description
Q77 Transmission Control Solenoid Valve	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion. • The solenoid actuator varies the force depending on the current applied to the solenoid coil. • The solenoid actuator applies minimum force with minimum current applied to the solenoid coil. • The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

Control Circuit = Commanded state does not match the actual state - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Additional actions taken:

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Disabled
- {P2727, P2730} Transmission gear allowed = Reverse or Gear 1-4, 6, 8, 9
- {P2729} Transmission gear allowed = Reverse or Gear 5, 7
- {P2736, P2739} Transmission gear allowed = Reverse or Gear 6-9
- {P2738} Transmission gear allowed = Gear 1-5
- {P2826} Transmission gear allowed = Gear 1-9
- {P2827} Transmission gear allowed = Park or Reverse

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\).](#)

Connector End View Reference

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

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition/Vehicle - On
2. Engine - Running
3. Verify the scan tool parameter:
 - High Side Driver 1 Circuit Open Test Status = Not Run or OK
 - High Side Driver 1 Circuit Low Voltage Test Status = Not Run or OK
 - High Side Driver 1 Circuit High Voltage Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Open Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Low Voltage Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit High Voltage Test Status = Not Run or OK
 - **If not the specified state**

Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing
- **Go to next step: If the DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 15 & Ground
4. Ignition - On/Vehicle - In Service Mode
5. Perform the scan tool control function: High Side Driver 1 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Connect the electrical connector: T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off

3. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

4. Test for infinite resistance between the test points: Control circuit terminal 15 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

5. Test for less than 2 Ω between the test points: Control circuit terminal 15 @ Component harness & The other end of the circuit @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

• **If the test lamp is always On**

1. Connect the electrical connector: T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off

3. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

4. Ignition - On/Vehicle - In Service Mode

5. Test for less than 1 V between the test points: Control circuit terminal 15 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

• **Go to next step: If the test lamp turns On and Off**

6. Connect the electrical connector: T12 Automatic Transmission Assembly

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

9. Test for less than 2 Ω between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & The other end of the circuit @ Control module harness
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & The other end of the circuit @ Control module harness
- {P2826, P2827} Control circuit terminal 3 @ Component harness & The other end of the circuit @ Control module harness
- {P282F, P2830} Control circuit terminal 2 @ Component harness & The other end of the circuit @ Control module harness
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

• **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & Ground
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
- {P2826, P2827} Control circuit terminal 3 @ Component harness & Ground
- {P282F, P2830} Control circuit terminal 2 @ Component harness & Ground
- **If less than infinite resistance**

Repair the short to ground on the circuit.

- **Go to next step: If infinite resistance**

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & Ground
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
- {P2826, P2827} Control circuit terminal 3 @ Component harness & Ground
- {P282F, P2830} Control circuit terminal 2 @ Component harness & Ground
- **If 1 V or greater**

Repair the short to voltage on the circuit.

- **Go to next step: If less than 1 V**

13. Connect the electrical connector: T12 Automatic Transmission Assembly

14. Ignition/Vehicle - Off

15. Remove the component: Transmission Cover

16. Connect the electrical connector: T12 Automatic Transmission Assembly

17. Disconnect the electrical connector: Q77 Transmission Control Solenoid Valve

18. Test for less than 2 Ω between the test points: Control circuit terminal 33 &

- {P2727, P2729, P2730} Terminal 1 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness
- {P2736, P2738, P2739} Terminal 1 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness
- {P2826, P2827} Terminal 1 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness
- {P282F, P2830} Terminal 1 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

19. Test for infinite resistance between the test points: Control circuit terminal 33 @ Control module harness & Ground

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

20. Test for less than 2 Ω between the test points:

- {P2727, P2729, P2730} Terminal 2 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness & The other end of the circuit @ Control module harness
- {P2736, P2738, P2739} Terminal 2 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness & The other end of the circuit @ Control module harness
- {P2826, P2827} Terminal 2 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness & The other end of the circuit @ Control module harness
- {P282F, P2830} Terminal 2 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness & The other end of the circuit @ Control module harness
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

21. Test for infinite resistance between the test points: Ground &

- {P2727, P2729, P2730} Terminal 2 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness

- {P2736, P2738, P2739} Terminal 2 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness
- {P2826, P2827} Terminal 2 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness
- {P282F, P2830} Terminal 2 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

22. Test for infinite resistance between the test points: Control circuit terminal 33 @ Control module harness &

- {P2727, P2729, P2730} Control circuit terminal 17 @ Component harness
- {P2736, P2738, P2739} Control circuit terminal 1 @ Component harness
- {P2826, P2827} Control circuit terminal 21 @ Component harness
- {P282F, P2830} Control circuit terminal 23 @ Component harness
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

23. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Test the resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve

Verify the value is within the range listed in the table: [Transmission Solenoid Information](#)

- **If not in the specified range**

Replace the component: Q77 Transmission Control Solenoid Valve

- **Go to next step: If in the specified range**

2. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Ground

- **If less than infinite resistance**

Replace the component: Q77 Transmission Control Solenoid Valve

- **Go to next step: If infinite resistance**

3. All OK.

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Removal](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0707, P0708, P2802, P2803 OR P2805: TRANSMISSION RANGE SENSOR 1-2 CIRCUIT VOLTAGE/TRANSMISSION RANGE SENSORS 1-2 NOT PLAUSIBLE

Diagnostic Instructions

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

DTC Descriptor

DTC P0707

Transmission Range Sensor 1 Circuit Low Voltage

DTC P0708

Transmission Range Sensor 1 Circuit High Voltage

DTC P2802

Transmission Range Sensor 2 Circuit Low Voltage

DTC P2803

Transmission Range Sensor 2 Circuit High Voltage

DTC P2805

Transmission Range Sensors 1-2 Not Plausible

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0708, P2803*	P0708, P2803*	P0708, P2803**	-
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	P0707*	P0708*	P0708**	P2805*
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	P2802	P2803	P2803**	P2805*
Low Reference	-	P0708, P2803*	P0708, P2803**	-
* Additional DTCs may set. ** Additional DTCs may set. & Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

Transmission Range Sensor 1, 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 6 to 92%			
5 V Reference	100%	100%	100%
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	0%	100%	100%
Signal 2 - Terminal 2 @ B15 Transmission Internal Mode Switch	0%	100%	100%
Low Reference	-	100%	100%

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
5 V Reference	Regulated voltage supplied by the control module.
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	The control module input circuit has an internal resistance connected to 5 V.
Signal 2 - Terminal 2 @ B15 Transmission Internal Mode Switch	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B15 Transmission Internal Mode Switch	The hall-effect sensor has 2 separate PWM signal circuits. The transmission gear selected determines the duty cycle of the PWM signal.
K20 Engine Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module controls a series of actuators to ensure optimal engine performance. The control module does this by reading values from a variety of sensors, interprets the data and adjusts the engine actuators accordingly.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

The control module K71 uses the information from the sensor signal 1 to determine what transmission gear range the vehicle operator selected.

The control module K20 uses the information from the sensor signal 2 to determine if the transmission is in neutral or park to enable the starter.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0707, P2802

Signal circuit = Short to Ground - For greater than 1 s

P0708, P2803

Signal circuit = Short to Voltage/Open/High Resistance - For greater than 1 s

P2805

Transmission Range Sensor 1, 2 = Not Plausible

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- {P2802, P2803, P2805} M64 Starter Motor = Disabled
- Autostart/Autostop = Disabled

- Default shift pattern = Enabled
- Grade braking = Disabled
- High Side Driver 1 = Off
- {P0707, P0708} High Side Driver 2 = Off
- Line Pressure Command = Maximum
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- High Side Driver 1, 2 = Off

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P0641, P0651, P0697, P06A3, P2805 is not set.
 - **If DTC P0641, P0651, P0697, P06A3, P06D2 is set**

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

- **If DTC P2805 is set**

Replace the component: B303 Transmission Range Sensor

- **Go to next step: If DTC P0641, P0651, P0697, P06A3, P2805 is not set**

3. Verify the condition does not exist: Incorrect adjustment - Refer to [Range Selector Lever Cable Adjustment](#)
- **If a condition exists**
- Repair or replace as necessary.
- **Go to next step: If no condition exists**
4. Operate the component: S3 Transmission Shift Lever - Select each position

Verify the scan tool parameter: Transmission Range Sensor 1, 2 = The value should be within the range listed in the table: [Transmission Range Sensor Duty Cycles](#)

- **If not in the specified range**
- Refer to Circuit/System Testing
- **Go to next step: If in the specified range**
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.

Verify the DTC does not set.

- **If the DTC sets**
- Refer to Circuit/System Testing
- **Go to next step: If the DTC is not set**
6. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Test for less than 10 Ω between the test points: Low Reference circuit terminal 10 & Ground
 - **If 10 Ω or greater**
 1. Disconnect the electrical connector: K20 Engine Control Module
 2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 10 @ Component harness & Terminal 23 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K20 Engine Control Module
 - **Go to next step: If less than 10 Ω**
4. Ignition - On/Vehicle - In Service Mode
5. Test for 4.8 to 5.2 V between the test points: 5 V Reference circuit terminal 11 & Low Reference circuit terminal 10
 - **If less than 4.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the appropriate electrical connector: K20 Engine Control Module
 5. Test for infinite resistance between the test points: 5 V Reference circuit terminal 11 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance

6. Test for less than 2 Ω between the test points: 5 V Reference circuit terminal 11 @ Component harness & Terminal 39 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K20 Engine Control Module
- **If greater than 5.2 V**
 1. Disconnect the appropriate electrical connector: K20 Engine Control Module
 2. Ignition - On/Vehicle - In Service Mode
 3. Test for less than 1 V between the test points: 5 V Reference circuit terminal 11 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K20 Engine Control Module
- **Go to next step: If between 4.8 and 5.2 V**
6. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
7. Ignition/Vehicle - Off
8. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
9. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Red lead @
 - {P0707, P0708} Signal circuit terminal 9
 - {P2802, P2803} Signal circuit terminal 8
 - Black lead @ Ground
10. Ignition - On/Vehicle - In Service Mode
11. Verify the scan tool parameter:

Transmission Range Sensor 1, 2 = 48 to 52%

- **If not between 48 and 52%**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the appropriate electrical connector:
 - {P0707, P0708} K71 Transmission Control Module
 - {P2802, P2803} K20 Engine Control Module
 5. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 6. Ignition - On/Vehicle - In Service Mode
 7. Test for less than 1 V between the test points:
 - {P0707, P0708} Signal circuit terminal 9 @ Component harness & Ground
 - {P2802, P2803} Signal circuit terminal 8 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
 8. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 9. Ignition/Vehicle - Off
 10. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 11. Test for infinite resistance between the test points:
 - {P0707, P0708} Signal circuit terminal 9 @ Component harness & Ground
 - {P2802, P2803} Signal circuit terminal 8 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance

12. Test for less than 2 Ω between the test points:

- {P0707, P0708} Signal circuit terminal 9 @ Component harness & The other end of the circuit
- {P2802, P2803} Signal circuit terminal 8 @ Component harness & The other end of the circuit
- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component:
- {P0707, P0708} K71 Transmission Control Module
- {P2802, P2803} K20 Engine Control Module

• **Go to next step: If between 48 and 52%**

12. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

13. Ignition/Vehicle - Off

14. Remove the component: Control Valve Body Cover

15. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

16. Disconnect the electrical connector: B15 Transmission Internal Mode Switch

17. Install the special tool: **EL-38522** Variable Signal Generator

- Set the voltage to 5 V
- Set the frequency to 300 Hz
- Set the duty cycle to 50%
- Black lead @ Ground
- Red lead @
 - {P0707, P0708} Signal circuit terminal 2
 - {P2802, P2803} Signal circuit terminal 4

18. Ignition - On/Vehicle - In Service Mode

19. Verify the scan tool parameter: Transmission Range Sensor 1 & Transmission Range Sensor 2 = 48 to 52%

• **If not between 48 and 52%**

Replace the component: Automatic Transmission Wiring Harness

• **Go to next step: If between 48 and 52%**

20. Test or replace the component: B15 Transmission Internal Mode Switch

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Replacement](#)
- Refer to [Manual Shift Detent Lever Shaft Replacement](#) - B15 Transmission Internal Mode Switch
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P0711, P0712, P0713: TRANSMISSION FLUID TEMPERATURE SENSOR

Diagnostic Instructions

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

DTC Descriptor

DTC P0711

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0712	P0713	P0713	P0711
Low Reference	-	P0713	*	P0711
* Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data**Transmission Fluid Temperature**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On			
Parameter Normal Range: 35 to 100Å,Å°C (95 to 112Å,Å°F)			
Signal	170Å,Å°C (338Å,Å°F)	-40Å,Å°C (-40Å,Å°F)	-40Å,Å°C (-40Å,Å°F)
Low Reference	-	-40Å,Å°C (-40Å,Å°F)	-40Å,Å°C (-40Å,Å°F)

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B13 Transmission Fluid Temperature Sensor	The component B13 is part of the wiring harness: Automatic Transmission Wiring Harness The temperature sensor is a negative temperature coefficient thermistor, a resistor which changes based on temperature. - Low temperature produces a high resistance: 46 kΩ @ -40Å,Å°C (-40Å,Å°F) - High temperature produces a low resistance: 70 Ω @ 140Å,Å°C (284Å,Å°F)
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

The sensor is an input to the control module K71. The input signal is used to determine the temperature of the fluid: Transmission

Conditions for Running the DTC

P0711

- DTC P0300-P0304, P0712, P0713, P16F3, P2818 = Not set
- DTCs related to the following system/component = Not Set
 - B14A Transmission Output Shaft Speed Sensor
 - B34 Engine Coolant Temperature Sensor
 - B75 Mass Air Flow Sensor
 - B107 Accelerator Pedal Position Sensor
 - B115 Vehicle Speed Sensor
 - Q17 Fuel Injector
- Accelerator Pedal = Greater than 5%
- Engine Coolant Temperature = -40 to 150°C (-40 to 302°F)
- Engine Speed = Greater than 500 RPM
- Engine Torque = Greater than 50 N.m (36 lb ft)
- Ignition Voltage = Greater than 9 V
- Transmission Fluid Temperature = -40 to 150°C (-40 to 302°F)
- Vehicle Speed = Greater than 10 km/h (6 MPH)

Frequency the DTC runs = Continuously - After the running conditions are met

P0712, P0713

- Battery Voltage = Greater than 9 V
- Run/Crank Ignition 1 Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0711

Transmission Fluid Temperature = The temperature does not change within a predetermined time.

P0712

Transmission Fluid Temperature = Warmer than 150°C (302°F)

P0713

Transmission Fluid Temperature = Colder than -40°C (-40°F)

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Transmission Hot Mode = Enabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Verify the correct fluid level and condition: [Transmission Fluid Level and Condition Check](#)

- **If a condition exists**

Repair or replace as necessary.

- **Go to next step: If no condition exists**

2. Verify the scan tool parameter: Transmission Fluid Temperature = -39 to 169 Å, Å°C (-38 to 336 Å, Å°F)

- **If not between -39 and 169 Å, Å°C (-38 and 336 Å, Å°F)**

Refer to Circuit/System Testing

- **Go to next step: If between -39 and 169 Å, Å°C (-38 and 336 Å, Å°F)**

3. Operate the cold vehicle above 64 km/h (40 MPH) for 10 min.

Verify the scan tool parameter: Transmission Fluid Temperature = Temperature increases greater than 2 Å, Å°C (4 Å, Å°F)

- **If the temperature does not increase 2 Å, Å°C (4 Å, Å°F) or greater**

Refer to Circuit/System Testing

- **Go to next step: If the temperature increases greater than 2 Å, Å°C (4 Å, Å°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. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

5. All OK.

[Circuit/System Testing](#)

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly

3. Test for less than 10 Ω between the test points: Low Reference circuit terminal 22 & Ground

- **If 10 Ω or greater**

1. Disconnect the electrical connector: K71 Transmission Control Module
2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 22 @ Component harness & Terminal 28 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **Go to next step: If less than 10 Ω**

4. Ignition - On/Vehicle - In Service Mode

5. Verify the scan tool parameter: Transmission Fluid Temperature = Less than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)

- **Warmer than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: Signal circuit terminal 23 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance - Replace the component: K71 Transmission Control Module

- **Go to next step: Colder than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 23 & Low Reference circuit terminal 22

7. Verify the scan tool parameter: Transmission Fluid Temperature = Greater than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)

- **Colder than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Signal circuit terminal 23 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
5. Ignition/Vehicle - Off
6. Test for less than 2 Ω between the test points: Signal circuit terminal 23 @ Component harness & Terminal 63 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **Go to next step: Warmer than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

8. Test or replace the component: B13 Transmission Fluid Temperature Sensor

Component Testing

1. Ignition/Vehicle - Off
2. Remove the component: Transmission Cover
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Test for 45 to 44000 Ω between the test points: Signal terminal 23 & Low Reference terminal 22

- **If not between 40 and 45000 Ω**

Replace the component: B13 Transmission Fluid Temperature Sensor

- **Go to next step: If between 40 and 45000 Ω**

5. Verify the value is within the range listed in the table: Refer to [Temperature Versus Resistance \(B13 Transmission Fluid Temperature Sensor\)](#)

- If not in the specified range

Replace the component: B13 Transmission Fluid Temperature Sensor

- Go to next step: If in the specified range

6. All OK.

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#) - B13 Transmission Fluid Temperature Sensor
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0716, P0717, P07BF OR P07C0: INPUT SPEED SENSOR

Diagnostic Instructions

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

DTC Descriptor

DTC P0716

Input Speed Sensor Performance

DTC P0717

Input Speed Sensor Circuit No Signal

DTC P07BF

Input Speed Sensor Circuit Low Voltage

DTC P07C0

Input Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P07BF, P17F6, P17FB, P176C, P187E	P07BF, P17F6, P17FB, P176C, P187E	P07C0	P0716, P0717
Signal	P07BF	P07BF	P07C0*	P0716, P0717
* Internal control module damage may occur if the circuit is shorted to B+.				

Typical Scan Tool Data

Transmission Input Speed

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Signal circuit = 0 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
9 V Reference	The control module input circuit has an internal resistance connected to 9 V.
Signal	Grounded through the control module.

Component	Description
B14C Transmission Input Shaft Speed Sensor	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	- The reluctor ring has 60 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: 5-7-R and 6-7-8-9 clutch sub assembly. The clutch sub assembly is splined to the input shaft.

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Input Shaft

Conditions for Running the DTC

P0716

- Accelerator Pedal Position = Greater than 5%
- Engine Torque = 30 to 8, 191 N.m (22 to 6, 041 lb ft)
- Power Mode Status = Run
- Transmission Input Speed = 160 to 254 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

P0717

- Accelerator Pedal Position = Greater than 5%
- Brake Pedal Position Less than 70%
- Engine Torque 30 to 8, 191 N.m (22 to 6, 041 lb ft)
- Power Mode Status = Run
- Transmission Input Speed = Greater than 320 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

P07BF, P07C0

- Battery Voltage = Greater than 10 V
- Power Mode Status = Run
- Run/Crank Voltage = Greater than 10 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0716

Input Speed Sensor = Greater than 850 RPM For greater than 1.5 s

P0717

Input Speed Sensor = Less than 100 RPM For greater than 4 s

P07BF

Input Speed Sensor = Less than 0.25 V - Signal circuit For greater than 1 s

P07C0

Input Speed Sensor = Greater than 4.75 V - Signal circuit For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category P0716, P0717, P07BF, P07C0 = Type A

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up or Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission gear allowed = 5th Gear & Reverse

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

The following components are combined into one housing:

- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor

Each sensor is triggered by a separate reluctor ring inside the transmission.

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

- [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](#)

Special Tools

EL-38522 Variable Signal Generator

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: 9 V Reference 1 Circuit Status = OK
 - **If not the specified state**

Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
3. Engine - Running
4. Transmission - Park
5. Verify the scan tool parameter: Transmission ISS & Engine Speed. - The difference between the following parameters is less than 50 RPM:
 - **If not the specified state**

Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
6. Transmission - Reverse
7. Verify the scan tool parameter: Transmission ISS 0 RPM
 - **If not the specified state**

Refer to: Circuit/System Testing
 - **Go to next step: If the specified state**
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. Verify the DTC does not set.
 - **If the DTC sets**

Refer to: Circuit/System Testing
 - **Go to next step: If the DTC is not set**
9. All OK.

[Circuit/System Testing](#)

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: B14C Transmission Input Shaft Speed Sensor
3. Ignition - On/Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points 9 V Reference circuit terminal 12
 - **If less than 8.3 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: K71 Transmission Control Module
 3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
 - **If greater than 9.6 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: K71 Transmission Control Module
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 3
7. Ignition - On/Vehicle - In Service Mode
8. Verify the scan tool parameter: Transmission Input Speed 291 to 311 RPM
 - **If not between 291 and 311 RPM**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: K71 Transmission Control Module
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: Signal circuit terminal 3 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
 5. Ignition/Vehicle - Off
 6. Test for infinite resistance between the test points: Signal circuit terminal 3 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 3 @ Component harness & Terminal 15 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

- Go to next step: If between 291 and 311 RPM

9. Test or replace the component: B14E Transmission Input/Intermediate Shaft Speed Sensor

Repair Instructions

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

- Refer to [Automatic Transmission Input Speed Sensor Replacement](#) - B14E Transmission Input/Intermediate Shaft Speed Sensor
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P0721, P0722, P0723, P077C OR P077D: OUTPUT SPEED SENSOR

Diagnostic Instructions

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

DTC Descriptor

DTC P0721

Output Speed Sensor Performance

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P0723

Output Speed Sensor Circuit Intermittent

DTC P077C

Output Speed Sensor Circuit Low Voltage

DTC P077D

Output Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C	P077C	P077D	P0721, P0722, P0723
Signal	P077C	P077C	P077D*	P0721, P0722, P0723
* Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

Transmission Output Speed

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed = Greater than 2 km/h (1.2 MPH) Parameter Normal Range: 0 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14A Transmission Output Shaft Speed Sensor	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	- The reluctor ring has 27 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: Park Gear

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Output Shaft

Conditions for Running the DTC

P0721

- Battery Voltage = Greater than 9 V
- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

P0722, P0723

- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V
- {P0722} Transmission Fluid Temperature = Greater than -40°C (-40°F)

Frequency the DTC runs = Continuously - After the running conditions are met

P077C, P077D

- Battery Voltage = Greater than 10 V
- Power Mode Status = Run
- Run/Crank Voltage = Greater than 10 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0721

Output Speed Sensor = Less than 25 RPM Increase Forward & Reverse Gear

P0722

Output Speed Sensor = Greater than 30 RPM

P0723

Output Speed Sensor = Greater than 500 RPM Decrease - For 1.5 s

P077C

Output Speed Sensor = Less than 0.25 V - Signal circuit For greater than 1 s

P077D

Output Speed Sensor = Greater than 4.75 V - Signal circuit For greater than 1 s

Actions Taken When the DTC Sets

DTC P0721, P0722, P0723, P077C, P077D = Type A

- Autostart/Autostop = Disabled
- Default shift pattern = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = 1st Gear Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- Transmission gear allowed = Reverse & Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: 9 V Reference 2 Circuit Status = OK

- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

CAUTION: Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.

3. Raise and support the vehicle.
4. Start and idle the engine.
5. Transmission in Drive
6. Verify the scan tool parameter: Transmission OSS = The value should change smoothly and gradually as the vehicle speed is increased and decreased.

- **If the value does not change smoothly and gradually**

Refer to Circuit/System Testing

- **Go to next step: If the value changes smoothly and gradually**

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. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

8. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Ignition - On/Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 7 & Ground

- **If less than 8.3 V**

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: X1 @ K71 Transmission Control Module
5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.

- If infinite resistance
- 6. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 7 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **If greater than 9.6 V**
- 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
- 2. Clear DTCs
- 3. Ignition/Vehicle - Off
- 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
- 5. Disconnect the electrical connector: K71 Transmission Control Module
- 6. Ignition - On/Vehicle - In Service Mode
- 7. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 8.3 and 9.6 V**
- 5. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
- 6. Ignition/Vehicle - Off
- 7. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
- 8. Install the special tool: - **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 6
- 9. Ignition - On/Vehicle - In Service Mode
- 10. Verify the scan tool parameter: Transmission OSS = 640 to 700 RPM
 - **If not between 640 and 700 RPM**
 - 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 - 2. Ignition/Vehicle - Off
 - 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 - 4. Disconnect the electrical connector: K71 Transmission Control Module
 - 5. Ignition - On/Vehicle - In Service Mode
 - 6. Test for less than 1 V between the test points: Signal circuit terminal 6 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
 - 7. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 - 8. Ignition/Vehicle - Off
 - 9. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 - 10. Test for infinite resistance between the test points: Signal circuit terminal 6 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 - 11. Test for less than 2 Ω between the test points: Signal circuit terminal 6 @ Component harness & Terminal 14 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 640 and 700 RPM**

11. Remove the component: Transmission Cover
12. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
13. Ignition/Vehicle - Off
14. Disconnect the electrical connector: B14A Transmission Output Shaft Speed Sensor
15. Ignition - On/Vehicle - In Service Mode
16. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 1 & Ground
 - **If not between 8.3 and 9.6 V**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 8.3 and 9.6 V**

17. Ignition Off
18. Install the special tool: - **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 2
19. Ignition - On/Vehicle - In Service Mode
20. Verify the scan tool parameter: Transmission OSS = 640 to 700 RPM
 - **If not between 640 and 700 RPM**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 640 and 700 RPM**

21. Replace the component: B14A Transmission Output Shaft Speed Sensor

Repair Instructions

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

- Refer to [Automatic Transmission Output Speed Sensor Replacement](#)
- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0741, P2817 OR P2818: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK OFF/TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK

Diagnostic Instructions

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

DTC Descriptor

DTC P0741

Torque Converter Clutch (TCC) System Stuck Off

DTC P2817

Transmission Control Solenoid Valve 8 Stuck Off

DTC P2818

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77H Transmission Control Solenoid Valve 8	P0741, P2817, P2818	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
Torque Converter Clutch Control Valve	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Torque Converter Clutch Regulator Apply Valve • Valve Spring • Valve Body Bore	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Torque Converter Clutch Blowoff Ball Valve • Torque Converter Clutch Blowoff Ball Valve Spring • Torque Converter Clutch Blowoff Ball Valve Retainer	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Torque Converter Assembly - Torque Converter Clutch	P0741, P2817, P2818	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Damaged or worn component: • Torque converter clutch friction lining worn. • Clutch Piston • Clutch Housing

The solenoid valve is used to regulate fluid pressure to other transmission control valves for torque converter clutch operation. DTC P0741, P2817, P2818 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

Description and Operation

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- DTC P281B, P281D, P281E = Not set
- Accelerator Pedal Position = 0 to 1%
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 400 RPM
- Engine Torque = 55 to 800 N.m (40 to 590 lb ft)
- High Side Driver 2 = On
- Ignition = On
- Power Mode Status = Accessory or Ignition
- Transmission Fluid Temperature = 7 to 130 °C (20 to 266 °F)
- Transmission Range = P, R, N
- Vehicle Speed = 3 to 9 km/h (2 to 6 MPH)

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P0741

Torque Converter Clutch Control Valve = Stuck Off

P2817

Torque Converter Clutch = Not applied

P2818

Torque Converter Clutch = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Exceptions listed below

- Autostart/Autostop = Disabled
- Neutral Idle Mode = Disabled
- Torque Converter Clutch = On
- Transmission Adaptive Pressure Control = Freeze current adapt values

DTC P2817 = Type B DTC

- Torque Converter Clutch = Off
- Transmission Adaptive Pressure Control = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC - Exceptions listed below

DTC P2817 = Type B DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
 - **If a condition exists**

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. - Refer to **Road Test**
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0741, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2817, P2818 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077D, P07C0, P176B, P176C, P176C, P176D, P17D3 is set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0741, P2817, P2818 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P0741, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2817, P2818 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077D, P07C0, P176B, P176C, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0741, P2817, P2818 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

7. All OK.

Repair Instructions

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

- Refer to [Torque Converter Replacement](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P0746

Transmission Control Solenoid Valve 1 Stuck Off

DTC P0747

Transmission Control Solenoid Valve 1 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition

Component	DTC	Condition
Q77A Transmission Control Solenoid Valve 1	P0746, P0747	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 1-2-3-4-5-6 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0746, P0747	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• 1-2-3-4-5-6 Clutch Boost Valve • Valve Spring • Valve Spring	P0746, P0747	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
1-2-3-4-5-6 Clutch Assembly - Oil Feed Circuit	P0746, P0747	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
1-2-3-4-5-6 Clutch Assembly	P0746, P0747	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Binding, sticking or stuck component: Clutch Plates • Damaged or worn component: • Clutch Plates • Clutch Piston • Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 1-2-3-4-5-6 regulator valve that controls the fluid pressure to the 1-2-3-4-5-6 clutch.

DTC P0746, P0747 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Engine Speed = 400 RPM
- High Side Driver 1, 2 = On
- Ignition/Vehicle = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P0746

Clutch 1-2-3-4-5-6 = Not applied

P0747

Clutch 1-2-3-4-5-6 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values

- {P0746} Transmission gear allowed = Reverse or Gear 7
- {P0747} Engine Torque = Less than a predefined threshold
- {P0747} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. - Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0746, P0747, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P0746, P0747 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P0746, P0747, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0746, P0747 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

7. All OK.

Repair Instructions

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

- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Disassemble](#) - 1-2-3-4-5-6 Clutch Assembly
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P0776

Transmission Control Solenoid Valve 2 Stuck Off

DTC P0777

Transmission Control Solenoid Valve 2 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77B Transmission Control Solenoid Valve 2	P0776, P0777	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 2-9 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0776, P0777	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
2-9 Clutch Assembly - Oil Feed Circuit	P0776, P0777	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Gasket - O-Ring - Seal
2-9 Clutch Assembly	P0776, P0777	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 2-9 regulator valve that controls the fluid pressure to the 2-9 clutch.

DTC P0776, P0777 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)

- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\). Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\). Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\). Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\). Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- High Side Driver 2 = On
- Ignition = On
- Power Mode Status = Accessory or Ignition

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P0776

Clutch 2-9 = Not applied

P0777

Clutch 2-9 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P0776} Transmission gear allowed = Reverse or Gear 5
- {P0777} Transmission gear allowed = Gear 2 or Gear 9

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

[Transmission Solenoid Information](#)

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)

- **If a condition exists**

Repair or replace as necessary.

- **Go to next step: If no condition exists**

2. Ignition - On/Vehicle - In Service Mode

3. Clear DTCs

4. Road test the vehicle. Refer to: [Road Test](#)

5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0776, P0777, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P0776 or P0777 is set**

Refer to Diagnostic Fault Information

- **Go to next step: If none of the DTCs are set**

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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P0776, P0777, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P0776 or P0777 is set**

Refer to Diagnostic Fault Information

- **Go to next step: If none of the DTCs are set**

7. All OK.

Repair Instructions

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

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#) - 2-9 Clutch Assembly
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK OFF/ON

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)

- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)
- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC P0796

Transmission Control Solenoid Valve 3 Stuck Off

DTC P0797

Transmission Control Solenoid Valve 3 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77C Transmission Control Solenoid Valve 3	P0796, P0797	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 3-8 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0796, P0797	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
3-8 Clutch Assembly - Oil Feed Circuit	P0796, P0797	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal

Component	DTC	Condition
3-8 Clutch Assembly	P0796, P0797	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 3-8 regulator valve that controls the fluid pressure to the 3-8 clutch.

DTC P0796, P0797 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- High Side Driver 2 = On

- Ignition = On
- Power Mode Status = Accessory or Ignition

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P0796

Clutch 3-8 = Not applied

P0797

Clutch 3-8 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P0796} Transmission gear allowed = Reverse or Gear 5
- {P0797} Transmission gear allowed = Reverse or Gear 3 or Gear 8

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)

- **If a condition exists**

Repair or replace as necessary.

- **Go to next step: If no condition exists**

2. Ignition - On/Vehicle - In Service Mode

3. Clear DTCs

4. Road test the vehicle. Refer to: [Road Test](#)

5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0796, P0797, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0796 or P0797 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P0796, P0797, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0796 or P0797 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

7. All OK.

Repair Instructions

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

- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0815, P0816 OR P0826: UP AND DOWN SHIFT SWITCH CIRCUITS

Diagnostic Instructions

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

DTC Descriptor

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0815, P0816, P0826	-	-	-
Ground	-	-	-	-

Typical Scan Tool Data**K9 Body Control Module Up and Down Shift Switch**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition - On/Vehicle - In Service Mode Parameter Normal Range: ON			
Signal	ON	OFF	ON
Ground	-	-	-

Typical Scan Tool Data**K71 Transmission Control Module Up and Down Shift Switch**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition - On/Vehicle - In Service Mode Parameter Normal Range: • Inactive • In Transition • Upshift • Downshift			
Signal	Invalid	None	None
Ground	-	None	-

Circuit/System Description

For an overview of the component/system, refer to [Manual Mode Description and Operation](#)

Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 12 V.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
S2 Transmission Manual Shift Switch	The switch S2 has an internal resistor ladder network. A specific resistance is generated dependent on the position of the switch. S2 is part of the component: Transmission Control Lever Knob

The switches are connected in series between the ground and the signal circuit and are inputs to the control module K9. When a switch is pressed, the voltage drop across the switch changes. The driver shift request is sent over serial data to the control module K71. The control module K71 ignores a shift request if the transmission shift lever is not in the manual mode position, or the operating conditions are out of range.

Conditions for Running the DTC

P0815, P0816

- DTC P0815, P0816, P0826, P1761 = Not set
- Engine Speed = 400 to 7, 500 RPM
- Greater than 1 s since last transmission shift operation.
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 5 s

P0826

- DTC P1761 = Not set
- Engine Speed = 400 to 7, 500 RPM
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 5 s

Conditions for Setting the DTC

P0815

Condition 1

- Up and Down Shift Switch = Upshift
- Transmission Range = Park or Neutral or Reverse

The above conditions must occur for greater than 1 s.

Condition 2

- Up and Down Shift Switch = Upshift
- Transmission Range = Forward Gear

The above condition(s) must occur for greater than 2 min.

P0816

Condition 1

- Up and Down Shift Switch = Downshift
- Transmission Range = Park or Neutral or Reverse

The above conditions must occur for greater than 1 s.

Condition 2

- Up and Down Shift Switch = Downshift
- Transmission Range = Forward Gear

The above condition(s) must occur for greater than 2 min.

P0826

Up and Down Shift Switch = Invalid

The above condition(s) must occur for greater than 1 min.

Actions Taken When the DTC Sets

DTC P0815, P0816, P0826 = Type C

Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTC P0815, P0816, P0826 = Type C

Diagnostic Aids

A high resistance or short to voltage in the signal circuit will not set a DTC.

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

1. Ignition - On/Vehicle - In Service Mode

2. Operate the component: S3 Transmission Shift Lever - L

Verify the scan tool parameter: Driver Shift Control Mode Switch @ Body Control Module = Active or On

- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

3. Press and hold the switch: S2 Transmission Manual Shift Switch - Upshift

Verify the scan tool parameter: Driver Shift Control Mode Switch = Up or Upshift

- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

4. Press and hold the switch: S2 Transmission Manual Shift Switch - Downshift

Verify the scan tool parameter: Driver Shift Control Mode Switch = Down or Downshift

- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

6. All OK.

Circuit/System Testing

NOTE: Circuit/System Verification must be performed before proceeding with Circuit/System Testing.

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off

2. Remove the component: Transmission Control Lever Knob

3. Disconnect the electrical connector: S2 Transmission Manual Shift Switch

4. Test for less than 10 Ω between the test points: Low Reference circuit terminal 12 @ Component harness & Ground

- **If 10 Ω or greater**

1. Disconnect the appropriate ground connection:

2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 12 @ Component harness & The other end of the circuit

- 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.

- **Go to next step: If less than 10 Ω**

5. Ignition - On/Vehicle - In Service Mode

6. Verify the scan tool parameter: Driver Shift Control Mode Switch @ K9 Body Control Module = Inactive

or Off

- **If not the specified state**

1. Ignition/Vehicle - Off

2. Disconnect the appropriate electrical connector: @ K9 Body Control Module

3. Test for infinite resistance between the test points: Signal circuit terminal 11 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance - Replace the component: K9 Body Control Module

- **Go to next step: If the specified state**

7. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 11 @ Component harness & Ground circuit terminal 12

8. Verify the scan tool parameter: Driver Shift Control Mode Switch = Error or Invalid

- **If not the specified state**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)

2. Disconnect the appropriate electrical connector: K9 Body Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 1 V between the test points: Signal circuit terminal 11 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V

5. Ignition/Vehicle - Off

6. Test for less than 2 Ω between the test points: Signal circuit terminal 11 @ Component harness & The other end of the circuit

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K9 Body Control Module

- **Go to next step: If the specified state**

9. Test or replace the component: Transmission Control Lever Knob

Component Testing

1. Ignition/Vehicle - Off

2. Remove the component: Transmission Control Lever Knob

3. Disconnect the electrical connector: S2 Transmission Manual Shift Switch

4. Test for 5, 900 to 6, 400 Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 5, 900 and 6, 400 Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If between 5, 900 and 6, 400 Ω**

5. Press and hold the switch: S2 Transmission Manual Shift Switch - Downshift

6. Test for 1, 900 to 2, 100 k Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 1, 900 to 2, 100 k Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If between 1, 900 to 2, 100 k Ω**

7. Press and hold the switch: S2 Transmission Manual Shift Switch - Upshift

8. Test for 600 to 660 Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 600 and 660 Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If not between 600 and 660 Ω**

9. Test for infinite resistance between the test points: Each terminal of the component & The component's housing

- **If less than infinite resistance**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If infinite resistance**

10. All OK.

Repair Instructions

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

- Refer to [Transmission Control Lever Knob Replacement](#)
- For the system learn/reset procedure, refer to [Transmission Service Fast Learn Procedure](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P08CA OR P08CB: TRANSMISSION CONTROL SOLENOID VALVE 11 CONTROL CIRCUIT LOW/HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P08CA

Transmission Control Solenoid Valve 11 Control Circuit Low Voltage

DTC P08CB

Transmission Control Solenoid Valve 11 Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 28	P2670	P2670	P2671	-
Control - Terminal 10	P282F	P282F	P08CB	-

Typical Scan Tool Data

Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine idling. Parameter Normal Range: OK or Not Run			
Control - Terminal 28	Malfunction	Malfunction	-
Control - Terminal 10	Malfunction	Malfunction	-

Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine idling. Parameter Normal Range: OK or Not Run			
Control - Terminal 28	-	-	Malfunction
Control - Terminal 10	-	-	Malfunction

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 28	Supplied by a control module.
Control - Terminal 10	The output circuit is switched to ground to activate the component.

Component	Description
Q77L Transmission Control Solenoid Valve 11	A solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid. This is a normally closed valve that is controlled on/off.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

Conditions for Running the DTC

- Battery Voltage = 8 to 32 V
- Power Mode Status = Accessory or Run/Crank
- Run/Crank Voltage = Greater than 5 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P08CA

Control circuit = Short to Ground - For less than 1 s

P08CB

Control circuit = Short to Voltage - For less than 1 s

Actions Taken When the DTC Sets

DTC P08CA, P08CB = Type C

Actions Taken When the DTC Sets = None

Conditions for Clearing the DTC

DTC P08CA, P08CB = Type C

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

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

[Transmission Solenoid Information](#)

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

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

[Control Module References](#)

[Circuit/System Verification](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P2670, P2671 is not set.
 - **If any of the DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **Go to next step: If none of the DTCs are set**
3. Engine Running
4. Verify the scan tool parameter:
 - Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status = OK or Not Run
 - Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status = OK or Not Run
 - **If not the specified state**

Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
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. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing
 - **Go to next step: If the DTC is not set**
6. All OK.

[Circuit/System Testing](#)

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground

4. Ignition - On/Vehicle - In Service Mode

5. Perform the scan tool control function: High Side Driver 2 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Ignition/Vehicle - Off & Remove - Test lamp

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points: Control circuit terminal 28 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Ignition/Vehicle - Off & Remove - Test lamp

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 1 V between the test points: Control circuit terminal 28 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and Off**

6. Remove - Test Lamp

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector: @ K71 Transmission Control Module

9. Test for less than 2 Ω between the test points: Control circuit terminal 10 @ Component harness & Terminal 22 @ Control module harness

- **If 2 Ω or greater - Repair the open/high resistance in the circuit.**
- **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points: Control circuit terminal 10 & Ground

- **If less than infinite resistance - Repair the short to ground on the circuit.**
- **Go to next step: If infinite resistance**

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points: Control circuit terminal 10 & Ground

- **If 1 V or greater - Repair the short to voltage on the circuit.**
- **Go to next step: If less than 1 V**

13. Ignition/Vehicle - Off

14. Remove the component: Transmission Cover

15. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly

16. Disconnect the electrical connector: Q77L Transmission Control Solenoid Valve 11

17. Ignition - On/Vehicle - In Service Mode

18. Test for less than 1 V between the test points:

- Control circuit terminal 49 & Ground
- Control circuit terminal 22 & Ground
- **If 1 V or greater Replace the component: Automatic Transmission Wiring Harness**
- **Go to next step: If less than 1 V** If less than 1 V

19. Ignition/Vehicle - Off

20. Test for infinite resistance between the test points:

- Control circuit terminal 49 & Ground
- Control circuit terminal 22 & Ground
- **If less than infinite resistance - Replace the component:** Automatic Transmission Wiring Harness
- **Go to next step: If infinite resistance**

21. Connect a jumper wire between the test points: Control circuit terminal 1 & Control circuit terminal 2

22. Test for less than 4 Ω between the test points: Control circuit terminal 49 & Control circuit terminal 33

- **If 4 Ω or greater - Replace the component:** Automatic Transmission Wiring Harness
- **Go to next step: If less than 4 Ω**

NOTE: The component's temperature should be 19 to 21 Å , $\text{Å}^{\circ}\text{C}$ (66 to 70 Å , $\text{Å}^{\circ}\text{F}$) while testing.

23. Test for 19.0 to 19.9 Ω between the test points: Control terminal 1 & Control terminal 2

- **If not between 19.0 and 19.9 Ω**

Replace the component: Q77L Transmission Control Solenoid Valve 11

- **Go to next step: If between 19.0 and 19.9 Ω**

24. Test for infinite resistance between the test points: Each terminal of the component & The component's housing

- **If less than infinite resistance**

Replace the component: Q77L Transmission Control Solenoid Valve 11

- **Go to next step: If infinite resistance**

25. Replace the component: K71 Transmission Control Module

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- Perform the scan tool learn/reset function: [Transmission Service Fast Learn Procedure](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0960, P0962, P0963, P0964, P0966, P0967, P0968, P0970, P0971, P2670, P2671, P2718, P2720, P2721, P2812, P2814, P2815, P281B, P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 1, 2, 3, 4, 7, 8 CONTROL CIRCUIT/ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P0960

Transmission Control Solenoid Valve 1 Control Circuit Open

DTC P0962

Transmission Control Solenoid Valve 1 Control Circuit Low Voltage

DTC P0963

Transmission Control Solenoid Valve 1 Control Circuit High Voltage

DTC P0964

Transmission Control Solenoid Valve 2 Control Circuit Open

DTC P0966

Transmission Control Solenoid Valve 2 Control Circuit Low Voltage

DTC P0967

Transmission Control Solenoid Valve 2 Control Circuit High Voltage

DTC P0968

Transmission Control Solenoid Valve 3 Control Circuit Open

DTC P0970

Transmission Control Solenoid Valve 3 Control Circuit Low Voltage

DTC P0971

Transmission Control Solenoid Valve 3 Control Circuit High Voltage

DTC P2670

Actuator High Control Circuit Group 2 Low Voltage

DTC P2671

Actuator High Control Circuit Group 2 High Voltage

DTC P2718

Transmission Control Solenoid Valve 4 Control Circuit Open

DTC P2720

Transmission Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Transmission Control Solenoid Valve 4 Control Circuit High Voltage

DTC P2812

Transmission Control Solenoid Valve 7 Control Circuit Open

DTC P2814

Transmission Control Solenoid Valve 7 Control Circuit Low Voltage

DTC P2815

Transmission Control Solenoid Valve 7 Control Circuit High Voltage

DTC P281B

DTC P281D

Transmission Control Solenoid Valve 8 Control Circuit Low Voltage

DTC P281E

Transmission Control Solenoid Valve 8 Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 2	P281D	P281B	P281E	-
Control - Terminal 3	P0966	P0964	P0967	-
Control - Terminal 4	P2720	P2718	P2721	-
Control - Terminal 18	P2814	P2812	P2815	-
Control - Terminal 19	P0962	P0960	P0963	-
Control - Terminal 20	P0970	P0968	P0971	-
Control - Terminal 49	1	P2670	P2671	-
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data**High Side Driver 2 Circuit High Voltage Test Status**

Circuit	Short to Ground	Open	Short to Voltage
Operation Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 49	Not Run or OK	Not Run or OK	Malfunction

High Side Driver 2 Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 49	Malfunction	Malfunction	Not Run or OK

High Side Driver 2 Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 49	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 2-4, 18-20	Not Run or OK	Not Run or OK	Malfunction

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 2-4, 18-20	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 2-4, 18-20	Malfunction	Malfunction	Not Run or OK

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 2-4, 18-20	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Control - Terminal 49	The output circuit is switched to 12 V to activate the component.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Q77 Transmission Control Solenoid Valve	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion. • The solenoid actuator varies the force depending on the current applied to the solenoid coil. • The solenoid actuator applies minimum force with minimum current applied to the solenoid coil. • The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

Control Circuit = Commanded state does not match the actual state - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Additional actions taken:

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled

- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Disabled
- {P0960, P0963} Transmission gear allowed = Reverse or Gear 1-6
- {P0962} Transmission gear allowed = Reverse or Gear 7, 8, 9
- {P0964, P0967} Transmission gear allowed = Reverse or Gear 1, 3-8
- {P0966} Transmission gear allowed = Gear 2, 9
- {P0968, P0971} Transmission gear allowed = Reverse
- {P0970} Transmission gear allowed = Gear 1-9
- {P2670} Transmission gear allowed = Park
- {P2718, P2721} Transmission gear allowed = Gear 1-3, 5-9
- {P2720} Transmission gear allowed = Park
- {P2812, P2815} Transmission gear allowed =
 - Park - If less than 5 km/h (3 MPH)
 - Neutral - If greater than 5 km/h (3 MPH)
- {P2814} Transmission gear allowed = Park

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H))

Connector End View Reference

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

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition On - Engine Running
2. Verify the scan tool parameter:
 - High Side Driver 2 Circuit Open Test Status = Not Run or OK
 - High Side Driver 2 Circuit Low Voltage Test Status = Not Run or OK

- High Side Driver 2 Circuit High Voltage Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Open Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Low Voltage Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status = Not Run or OK
- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

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 data.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

4. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground
4. Ignition - On/Vehicle - In Service Mode
5. Perform the scan tool control function: High Side Driver 2 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Connect the electrical connector: T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector:
 - K71 Transmission Control Module
 - T12 Automatic Transmission Assembly
4. Test for infinite resistance between the test points: Control circuit terminal 28 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
5. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector:
 - K71 Transmission Control Module
 - T12 Automatic Transmission Assembly
4. Ignition - On/Vehicle - In Service Mode

5. Test for less than 1 V between the test points: Control circuit terminal 28 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

• **Go to next step: If the test lamp turns On and Off**

6. Connect the electrical connector: T12 Automatic Transmission Assembly

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

9. Test for less than 2 Ω between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Terminal 19 @ Control module harness
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Terminal 3 @ Control module harness
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Terminal 20 @ Control module harness
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Terminal 4 @ Control module harness
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Terminal 18 @ Control module harness
- {P281B, P281D, P281E} Control circuit terminal 14 @ Component harness & Terminal 2 @ Control module harness
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

• **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Ground
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Ground
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Ground
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Ground
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
- {P281B, P281D, P281E} Control circuit terminal 14 @ Component harness & Ground
- **If less than infinite resistance**

Repair the short to ground on the circuit.

• **Go to next step: If infinite resistance**

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Ground
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Ground
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Ground
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Ground
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
- {P281B, P281D, P281E} Control circuit terminal 14 @ Component harness & Ground
- **If 1 V or greater**

Repair the short to voltage on the circuit.

• **Go to next step: If less than 1 V**

13. Connect the electrical connector: T12 Automatic Transmission Assembly

14. Ignition/Vehicle - Off

15. Disconnect the electrical connector: T12 Automatic Transmission Assembly

16. Remove the component: Transmission Cover

17. Connect the electrical connector: T12 Automatic Transmission Assembly

18. Disconnect the electrical connector: Q77 Transmission Control Solenoid Valve

19. Test for less than 2 Ω between the test points: Control circuit terminal 49 &

- {P0960, P0962, P0963} Terminal 1 @ Q77A Transmission Control Solenoid Valve 1
- {P0964, P0966, P0967} Terminal 1 @ Q77B Transmission Control Solenoid Valve 2
- {P0968, P0970, P0971} Terminal 1 @ Q77C Transmission Control Solenoid Valve 3
- {P2718, P2720, P2721} Terminal 1 @ Q77D Transmission Control Solenoid Valve 4
- {P2812, P2814, P2815} Terminal 1 @ Q77G Transmission Control Solenoid Valve 7
- {P281B, P281D, P281E} Terminal 1 @ Q77H Transmission Control Solenoid Valve 8
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

20. Test for infinite resistance between the test points: Control circuit terminal 49 & Ground

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

21. Test for less than 2 Ω between the test points:

- {P0960, P0962, P0963} Terminal 2 @ Q77A Transmission Control Solenoid Valve 1 - Electrical Connector & Control circuit terminal 19
- {P0964, P0966, P0967} Terminal 2 @ Q77B Transmission Control Solenoid Valve 2 - Electrical Connector & Control circuit terminal 3
- {P0968, P0970, P0971} Terminal 2 @ Q77C Transmission Control Solenoid Valve 3 - Electrical Connector & Control circuit terminal 20
- {P2718, P2720, P2721} Terminal 2 @ Q77D Transmission Control Solenoid Valve 4 - Electrical Connector & Control circuit terminal 4
- {P2812, P2814, P2815} Terminal 2 @ Q77G Transmission Control Solenoid Valve 7 - Electrical Connector & Control circuit terminal 18
- {P281B, P281D, P281E} Terminal 2 @ Q77H Transmission Control Solenoid Valve 8 - Electrical Connector & Control circuit terminal 2
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

22. Test for infinite resistance between the test points: Ground &

- {P0960, P0962, P0963} Terminal 2 @ Q77A Transmission Control Solenoid Valve 1 - Electrical Connector
- {P0964, P0966, P0967} Terminal 2 @ Q77B Transmission Control Solenoid Valve 2 - Electrical Connector
- {P0968, P0970, P0971} Terminal 2 @ Q77C Transmission Control Solenoid Valve 3 - Electrical Connector
- {P2718, P2720, P2721} Terminal 2 @ Q77D Transmission Control Solenoid Valve 4 - Electrical Connector
- {P2812, P2814, P2815} Terminal 2 @ Q77G Transmission Control Solenoid Valve 7 - Electrical Connector

- {P281B, P281D, P281E} Terminal 2 @ Q77H Transmission Control Solenoid Valve 8 - Electrical Connector

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

23. Test for infinite resistance between the test points: Control circuit terminal 49 &

- {P0960, P0962, P0963} Control circuit terminal 19
- {P0964, P0966, P0967} Control circuit terminal 3
- {P0968, P0970, P0971} Control circuit terminal 20
- {P2718, P2720, P2721} Control circuit terminal 4
- {P2812, P2814, P2815} Control circuit terminal 18
- {P281B, P281D, P281E} Control circuit terminal 2
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If infinite resistance**

24. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Test the resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve

Verify the value is within the range listed in the table: [Transmission Solenoid Information](#)

- **If not in the specified range**

Replace the component: Q77 Transmission Control Solenoid Valve

- **Go to next step: If in the specified range**

2. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Ground

- **If less than infinite resistance**

Replace the component: Q77 Transmission Control Solenoid Valve

- **Go to next step: If infinite resistance**

3. All OK.

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Removal](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P171A, P171B, P171C: TRANSMISSION ACCUMULATOR SOLENOID VALVE CONTROL CIRCUIT

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)

- An overview of each diagnostic category can be found here: [Diagnostic Procedure Instructions](#)

DTC Descriptor

DTC P171A

Transmission Accumulator Solenoid Valve Control Circuit

DTC P171B

Transmission Accumulator Solenoid Valve Control Circuit Low Voltage

DTC P171C

Transmission Accumulator Solenoid Valve Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	P171B	P171B, P171C	P171C	P171A
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	P171B	P171B	P171C	P171A

Typical Scan Tool Data

Transmission Accumulator Solenoid Valve Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Malfunction	Not Run or OK	Not Run or OK
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Malfunction	Not Run or OK	Not Run or OK

Transmission Accumulator Solenoid Valve Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Malfunction	Not Run or OK
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Malfunction	Not Run or OK

Transmission Accumulator Solenoid Valve Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			

Circuit	Short to Ground	Open	Short to Voltage
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Not Run or OK	Malfunction
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Not Run or OK	Malfunction

Circuit/System Description

For an overview of the component/system, refer to: [Electronic Component Description](#)

Circuit	Description
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	The output circuit is switched to 12 V to activate the component.
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	The output circuit is switched to ground to activate the component.

Component	Description
B280 Automatic Transmission Accumulator Solenoid Valve	A solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid. This is a normally closed valve that is controlled on/off.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

The solenoid valve directs pressurized fluid to exit the accumulator to apply the clutches for a 1st gear start, during an Auto Start event.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P171A

Control circuit = Open/High Resistance - For greater than 1 s

P171B

Control circuit = Short to Ground - For greater than 1 s

P171C

Control circuit = Short to Voltage - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

- Autostart/Autostop = Disabled
- {P171B} Transmission Adaptive Values Learn = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H))

Connector End View Reference

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

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P0658, P0659 is not set.

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

Refer to [DTC P0658, P0659, P2727, P2729, P2730, P2736, P2738, P2739, P2826, P2827, P282F or P2830](#)

- **Go to next step: If none of the DTCs are set**

3. Clear DTCs
4. Perform the scan tool control function: Transmission Accumulator Solenoid Valve - On and Off

Verify the scan tool parameter:

- Transmission Accumulator Solenoid Valve Control Circuit Open Test Status = Not Run or OK
- Transmission Accumulator Solenoid Valve Control Circuit Low Voltage Test Status = Not Run or OK
- Transmission Accumulator Solenoid Valve Control Circuit High Voltage Test Status = Not Run or OK
- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

5. Perform the scan tool control function: Transmission Accumulator Solenoid Valve - On and Off

Verify a click can be heard or felt at the component when it is turned On and Off:

- **If a click cannot be heard or felt**

Refer to Circuit/System Testing

- **Go to next step: If a click can be heard or felt**

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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

7. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: B280 Automatic Transmission Accumulator Solenoid Valve

3. Connect a test lamp between the test points: Control circuit terminal 1 & Ground

4. Ignition - On/Vehicle - In Service Mode

5. Perform the scan tool control function: High Side Driver 1 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Ignition/Vehicle - Off & Remove - Test lamp

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points: Control circuit terminal 1 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points: Control circuit terminal 1 @ Component harness & Terminal 33 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Ignition/Vehicle - Off & Remove - Test lamp

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 1 V between the test points: Control circuit terminal 1 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and Off**

6. Remove - Test Lamp

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector: K71 Transmission Control Module
9. Test for less than 2 Ω between the test points: Control circuit terminal 2 @ Component harness & Terminal 24 @ Control module harness
- **If 2 Ω or greater**
- Repair the open/high resistance in the circuit.
- **Go to next step: If less than 2 Ω**
10. Test for infinite resistance between the test points: Control circuit terminal 2 & Ground
- **If less than infinite resistance**
- Repair the short to ground on the circuit.
- **Go to next step: If infinite resistance**
11. Ignition - On/Vehicle - In Service Mode
12. Test for less than 1 V between the test points: Control circuit terminal 2 & Ground
- **If 1 V or greater**
- Repair the short to voltage on the circuit.
- **Go to next step: If less than 1 V**
13. Ignition/Vehicle - Off

NOTE: The component's temperature should be 19 to 21 $\text{ }^{\circ}\text{C}$ (66 to 70 $\text{ }^{\circ}\text{F}$) while testing.

14. Test for 17 to 19 Ω between the test points: Control terminal 1 & Control terminal 2
- **If not between 17 and 19 Ω**
- Replace the component: B280 Automatic Transmission Accumulator Solenoid Valve
- **Go to next step: If between 17 and 19 Ω**
15. Test for infinite resistance between the test points: Each terminal of the component & The component's housing
- **If less than infinite resistance**
- Replace the component: B280 Automatic Transmission Accumulator Solenoid Valve
- **Go to next step: If infinite resistance**
16. Replace the component: K71 Transmission Control Module

Repair Instructions

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

- Refer to [Auxiliary Fluid Accumulator Removal](#)
- Refer to [Auxiliary Fluid Accumulator Installation](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P171D: TRANSMISSION ACCUMULATOR SYSTEM PERFORMANCE

Diagnostic Instructions

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

DTC Descriptor

DTC P171D

Transmission Accumulator System Performance

Diagnostic Fault Information

Component	DTC	Condition
B280 Automatic Transmission Accumulator Solenoid Valve	P171D	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Accumulator Valve Body Bolt • Solenoid Valve
Transmission Accumulator	P171D	• Blocked or restricted component: Fluid/oil passage • Leaking component: Transmission Accumulator

Circuit/System Description

The solenoid valve directs pressurized fluid to exit the accumulator to apply the clutches for a 1st gear start, during an Auto Start event.

For an overview of the component/system, refer to [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Ignition = On
- Ignition Voltage = Greater than 9 V
- Transmission Fluid Temperature = 0 to 110 Å, Å°C (32 to 230 Å, Å°F)
- Engine Off Time = Greater than 1.2 s
- Engine Speed = Less than 5 RPM - During an autostart or autostop event

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Turbine Speed = Greater than a predefined threshold

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC - Additional actions taken:

- Autostart/Autostop = Disable
- Line Pressure Command = Maximum
- Transmission Adaptive Pressure Control = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Transmission - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to: [Road Test](#)
5. Verify DTC P171D is not set.
 - **If DTC P171D is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If no DTC is set**
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.

Verify DTC P171D is not set.
 - **If DTC P171D is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If no DTC is set**
7. All OK.

Repair Instructions

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

- Refer to [Auxiliary Fluid Accumulator Installation](#)
- Refer to [Auxiliary Fluid Accumulator Removal](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P175E: TRANSMISSION CONTROL SYSTEM - SHIFT LIMITING ACTIVE

Diagnostic Instructions

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

DTC Descriptor

DTC P175E

Transmission Control System - Shift Limiting Active

Circuit/System Description

DTC P175E is an informational DTC.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 2 min

Conditions for Setting the DTC

DTCs related to the following system/component = Set - 100 Ignition cycles

- B107 Accelerator Pedal Position Sensor
- B14A Transmission Output Shaft Speed Sensor
- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor
- B26 Crankshaft Position Sensor
- B303 Transmission Range Sensor
- B74 Manifold Absolute Pressure Sensor
- B75 Mass Air Flow Sensor
- Q14 Exhaust Gas Recirculation Valve
- Q17 Fuel Injector
- Q77 Transmission Control Solenoid Valve
- Engine Misfire
- Fuel Trim

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify there are no DTCs set related to the following system/component:

- B107 Accelerator Pedal Position Sensor
- B14A Transmission Output Shaft Speed Sensor
- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor
- B26 Crankshaft Position Sensor
- B303 Transmission Range Sensor
- B74 Manifold Absolute Pressure Sensor
- B75 Mass Air Flow Sensor
- Q14 Exhaust Gas Recirculation Valve
- Q17 Fuel Injector
- Q77 Transmission Control Solenoid Valve
- Engine Misfire

- Fuel Trim
- **If a related DTC is set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **Go to next step: If a related DTC is not set**
2. 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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to step 1

- **Go to next step: If the DTC is not set**

3. All OK.

Repair Instructions

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

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

DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P175F

Acceleration Sensor Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- DTC U0121 = Not set
- Ignition = On
- Serial Data = Enabled

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 3 s

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K17 Electronic Brake Control Module
- K71 Transmission Control Module

The above condition(s) must occur 5 times.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following system/component: Serial Data

- **If other DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If no other DTCs are set**

1. Ignition/Vehicle - Off
2. Replace the component: K17 Electronic Brake Control Module
3. Operate the vehicle within the Conditions for Running the DTC.

Verify the DTC does not set.

- If the DTC sets - Replace the component: K71 Transmission Control Module
- If the DTC is not set

4. All OK.

- **Go to next step: If no DTC is set**

3. All OK.

Repair Instructions

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

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

DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- DTC U0073 = Not set
- Battery Voltage = Greater than 11 V
- Ignition = On
- Ignition Voltage = Greater than 11 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K9 Body Control Module
- K71 Transmission Control Module

The above condition(s) must occur for greater than 10 s.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following system/component: Serial Data
 - **If a related DTC is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **Go to next step: If a related DTC is not set**
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC.

Verify the DTC does not set.

- **If the DTC sets**
 1. Ignition/Vehicle - Off
 2. Replace the component: K9 Body Control Module
 3. Operate the vehicle within the Conditions for Running the DTC.
 4. Verify the DTC does not set.

- If the DTC sets - Replace the component: K71 Transmission Control Module
- If the DTC is not set

5. All OK.

- **Go to next step: If the DTC is not set**

5. All OK.

Repair Instructions

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

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

DTC P176B, P176C, P176D, P178F, P17C4 OR P17D3: INTERMEDIATE SPEED SENSOR CIRCUIT/INTERMEDIATE SPEED SENSOR DIRECTION

Diagnostic Instructions

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

DTC Descriptor

DTC P176B

Intermediate Speed Sensor Circuit Performance

DTC P176C

Intermediate Speed Sensor Circuit Low Voltage

DTC P176D

Intermediate Speed Sensor Circuit High Voltage

DTC P17D3

Intermediate Speed Sensor 1 Direction Signal Invalid

DTC P178F

Intermediate Speed Sensor Direction Not Plausible - Forward

DTC P17C4

Intermediate Speed Sensor Direction Not Plausible - Reverse

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P07BF, P17FB, P17F6, P176C, P187E	P07BF, P17FB, P17F6, P176C, P187E	-	P176B, P176C, P176D, P178F, P17C4
Signal	P176C	P176C	P176D*	P176B, P176C, P176D, P178F, P17C4

* Internal control module damage may occur if the circuit is shorted to B+.

Typical Scan Tool Data

Transmission Intermediate Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed = Greater than 2 km/h (1.2 MPH) Parameter Normal Range: 0 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
5 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14C Transmission Input Shaft Speed Sensor	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	- The reluctor ring has 56 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: 3-8 and 5-7-R clutch hub assembly

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: 3-8 and 5-7-R clutch hub assembly

Conditions for Running the DTC

P176B

- Battery Voltage = Greater than 9 V
- Engine = Running
- Run/Crank Ignition 1 Voltage = Greater than 9 V
- Transmission Input Speed = Greater than 172 RPM
- Transmission Output Speed = Greater than 89 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

P176C, P176D, P17D3

- Battery Voltage = Greater than 9 V
- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

P178F, P17C4

- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 500 RPM
- Run/Crank Ignition 1 Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P176B

Transmission Intermediate Speed Sensor & Output Speed Sensor = Greater than 20 RPM - For greater than 1 s

P176C

Transmission Intermediate Speed Sensor = Less than 0.25 V - For 1 s

P176D

Transmission Intermediate Speed Sensor = Greater than 4.75 V - For 1 s

P17D3

Shifting from Gear 1 & Reverse Gear = Greater than 25 RPM - For 3.5 s

P178F

Transmission Intermediate Speed Sensor = Forward Gear / & / Gear Status = Reverse Gear - For 2.5 s

P17C4

Transmission Intermediate Speed Sensor = Reverse Gear / & / Gear Status = Forward Gear - For 2.5 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- Transmission gear allowed = Reverse & Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

The following components are combined into one housing:

- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor

Each sensor is triggered by a separate reluctor ring inside the transmission.

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

Special Tools

EL-38522 Variable Signal Generator Equivalent regional tools:

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: 9 V Reference 1 Circuit Status = OK
 - **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**

CAUTION: Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.

3. Raise and support the vehicle.
4. Engine - Idling
5. Transmission in Drive
6. Verify the scan tool parameter: Transmission Intermediate Speed Sensor = The value should change smoothly and gradually as the vehicle speed is increased and decreased.
 - **If the value does not change smoothly and gradually**

Refer to Circuit/System Testing

- **Go to next step: If the value changes smoothly and gradually**

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. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

8. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector: @ B14D Transmission Intermediate Shaft Speed Sensor
3. Ignition - On/Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Ground

- **If less than 8.3 V**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 8 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If greater than 9.6 V**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If between 8.3 and 9.6 V**

5. Ignition/Vehicle - Off
6. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 1
7. Ignition - On/Vehicle - In Service Mode
8. Verify the scan tool parameter: Transmission Input Speed 313 to 323 RPM

- **If not between 313 and 323 RPM**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On/Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V

5. Ignition/Vehicle - Off

6. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
7. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 13 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 313 and 323 RPM**
9. Test or replace the component: B14C Transmission Input Shaft Speed Sensor & B14D Transmission Intermediate Shaft Speed Sensor

Repair Instructions

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

- Refer to [Automatic Transmission Input Speed Sensor Replacement](#) - B14E Transmission Input/Intermediate Shaft Speed Sensor
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P17F5-P17F7, P17FA-P17FC OR P17FF: TRANSMISSION PARK VALVE POSITION SWITCH/SENSOR 1-2 CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P17F5

Transmission Park Valve Position Switch 1 Circuit

DTC P17F6

Transmission Park Valve Position Sensor 1 Circuit Low Voltage

DTC P17F7

Transmission Park Valve Position Sensor 1 Circuit High Voltage

DTC P17FA

Transmission Park Valve Position Switch 2 Circuit

DTC P17FB

Transmission Park Valve Position Sensor 2 Circuit Low Voltage

DTC P17FC

Transmission Park Valve Position Sensor 2 Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P17F6, P17FB	P17F6, P17FB	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal - Sensor 1	P17F6	P17F6	P17F7	-
Signal - Sensor 2	P17FB	P17FB	P17FC	-

Typical Scan Tool Data

Transmission Park Valve Position Sensor 1/Transmission Park Valve Position Sensor 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: 0.7 to 2.2 V			
9 V Reference	0 V	0 V	-
Signal	0 V	0 V	4.8 to 5.0 V

Circuit/System Description

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The control module input circuit has an internal resistance connected to ground.

Component	Description
B316 Transmission Park Valve Position Switch	The switch contains 2 hall-effect sensors and additional electronics. It detects the strength of the magnetic field caused by a magnet that is mounted to the park release lever. When the strength changes, the sensors change the amount of current they consume.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.

Conditions for Running the DTC

Ignition Voltage = 9 to 32 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P17F5

Transmission Park Valve Position Sensor 1 = 1.3 to 1.5 V - For greater than 1 s

P17F6

Transmission Park Valve Position Sensor 1 = Less than 0.4 V - For greater than 1 s

P17F7

Transmission Park Valve Position Sensor 1 = Greater than 2.5 V - For greater than 1 s

P17FA

Transmission Park Valve Position Sensor 2 = 1.3 to 1.5 V - For greater than 1 s

P17FB

Transmission Park Valve Position Sensor 2 = Less than 0.4 V - For greater than 1 s

P17FC

Transmission Park Valve Position Sensor 2 = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Autostart/Autostop = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H))

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Engine - Running
2. Transmission Range - Park

Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = 0.6 to 1.0 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 0.6 to 1.0 V
- **If not between 0.6 and 1.0 V**

Refer to Circuit/System Testing

- **Go to next step: If between 0.6 and 1.0 V**

3. Transmission Range - Reverse Gear

Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = 1.7 to 2.1 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 1.7 to 2.1 V
- **If not between 1.7 and 2.1 V**

Refer to Circuit/System Testing

- **Go to next step: If between 1.7 and 2.1 V**

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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector:

- B14E Transmission Input/Intermediate Shaft Speed Sensor
- X1 @ T12 Automatic Transmission Assembly

3. Ignition - On/Vehicle - In Service Mode

4. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- **If less than 8.6 V**

1. Disconnect the electrical connector: K71 Transmission Control Module

2. Test for infinite resistance between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Terminal 7 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If greater than 9.2 V**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If between 8.6 and 9.2 V**

5. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Less than 0.4 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V

- **If 0.4 V or greater**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 0.4 V between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 @ T12 Automatic Transmission Assembly (harness side) & Ground
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 @ T12 Automatic Transmission Assembly (harness side) & Ground
- If 0.4 V or greater - Repair the short to voltage on the circuit.
- If less than 0.4 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If less than 0.4 V**

6. Connect a 3 A fused jumper wire between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 & 9 V Reference circuit terminal 1 X1
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 & 9 V Reference circuit terminal 1 X1

7. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Greater than 4.8 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
- **If less than 4.8 V**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 @ Component harness & Ground
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 @ Component harness & Ground
- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 @ Component harness & Terminal 59 @ Control module harness
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 @ Component harness & Terminal 61 @ Control module harness
- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **Go to next step: If greater than 4.8 V**

8. Ignition/Vehicle - Off & Remove - Jumper wire(s)

9. Remove the component: Control Valve Body Cover

10. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

11. Disconnect the electrical connector: B316 Transmission Park Valve Position Switch

12. Ignition - On/Vehicle - In Service Mode

13. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Less than 0.4 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V
- **If 0.4 V or greater**

Replace the component: Automatic Transmission Wiring Harness

14. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 1 & Ground

- **If not between 8.6 and 9.2 V**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 8.6 and 9.2 V**

15. Connect a 3 A fused jumper wire between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 2 @ B316 Transmission Park Valve Position Switch (harness side) & Terminal 1
- {P17FA, P17FB, P17FC} Signal circuit terminal 3 @ Component harness & Terminal 1

16. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Greater than 4.8 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
- **If less than 4.8 V**

Replace the component: Automatic Transmission Wiring Harness

- Go to next step: If 4.8 V or greater

17. Test or replace the component: B316 Transmission Park Valve Position Switch

Repair Instructions

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

- Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#), [Control Valve Body Assembly Installation \(with ETRS\)](#), / [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#) - B316 Transmission Park Valve Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P187D, P18E7 OR P18E8: TRANSMISSION PARK VALVE STUCK ON/TRANSMISSION PARK VALVE POSITION SENSOR 1-2 PERFORMANCE

Diagnostic Instructions

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

DTC Descriptor

DTC P187D

Transmission Park Valve Stuck On

DTC P18E7

Transmission Park Valve Position Sensor 1 Performance

DTC P18E8

Transmission Park Valve Position Sensor 2 Performance

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Control Valve Body • Mode 2 Electronic Transmission Range Selector Valve • Electronic Transmission Range Selector Mode Enable Valve/Spring	P187D, P18E7, P18E8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Control Solenoid Valve Body • Mode 1 Electronic Transmission Range Selector Valve	P187D, P18E7, P18E8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Circuit/System Description

DTC P187D, P18E7, P18E8 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)
- Fluid Passages (Hydraulic Circuits Without ETRS) Fluid Passages (Hydraulic Circuits With ETRS)

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Transmission Range Command = Park & Transmission Range Control Valve 1 Position
Switch/Transmission Range Control Valve 2 Position Switch = Low - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Diagnostic Aids

Wiring harness routing is critical. - Starter Ground Cable/Starter Positive Cable - Electromagnetic Interference

Reference Information

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
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.

Verify DTC P187D, P18E7, P18E8, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.

- **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P187D, P18E7, P18E8 is set**

Refer to Diagnostic Fault Information

- **Go to next step: If none of the DTCs are set**

5. All OK.

[Repair Instructions](#)

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

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC OR P27F0: TRANSMISSION PARK VALVE STUCK OFF/TRANSMISSION RANGE CONTROL VALVE 1-2 POSITION SWITCH/TRANSMISSION RANGE CONTROL ENABLE VALVE STUCK OFF

[Diagnostic Instructions](#)

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

DTC P187E

Transmission Park Valve Stuck Off

DTC P18AA

Transmission Range Control Valve 1 Position Switch Circuit Stuck On

DTC P18AB

Transmission Range Control Valve 1 Position Switch Circuit Stuck Off

DTC P18AC

Transmission Range Control Valve 2 Position Switch Circuit Stuck On

DTC P18AD

Transmission Range Control Valve 2 Position Switch Circuit Stuck Off

DTC P18AE

Transmission Range Control Enable Valve Stuck Off

DTC P27EC

Transmission Range Control Valve 1 Position Switch Performance

DTC P27F0

Transmission Range Control Valve 2 Position Switch Performance

Diagnostic Fault Information**NOTE:** The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
B280 Automatic Transmission Accumulator Solenoid Valve	P18AA - During an autostop event	Leaking
Q77D Transmission Control Solenoid Valve 4	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve

Component	DTC	Condition
Control Valve Body - Mode 1 Electronic Transmission Range Selector Valve - Electronic Transmission Range Selector Mode Enable Valve/Spring - Control Valve Body Spacer Plate - Feed Limit Valve/Spring - Clutch Selector Valve/Spring	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	- Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring
Control Solenoid Valve Body Mode 2 Electronic Transmission Range Selector Valve	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	- Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring
Automatic Transmission Fluid Pump Body - Automatic Transmission Fluid Pump - Pressure Regulator Valve	P18AB & P18AD	- Damaged component: Automatic Transmission Fluid Pump - Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring

Circuit/System Description

DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [**Park - Engine Running \(Hydraulic Circuits Without ETRS\) Park - Engine Running \(Hydraulic Circuits With ETRS\) Park - Engine Running \(Mechanical Powerflow\)**](#)
- [**Reverse \(Hydraulic Circuits Without ETRS\) Reverse \(Hydraulic Circuits With ETRS\) Reverse \(Mechanical Powerflow\)**](#)
- [**Neutral - Engine Running \(Hydraulic Circuits Without ETRS\) Neutral - Engine Running \(Hydraulic Circuits With ETRS\) Neutral - Engine Running \(Mechanical Powerflow\)**](#)
- [**Drive Range, First Gear \(Hydraulic Circuits Without ETRS\) Drive Range, First Gear \(Hydraulic Circuits With ETRS\) Drive Range, First Gear \(Mechanical Powerflow\)**](#)
- [**Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Second Gear \(Hydraulic Circuits With ETRS\) Drive Range, Second Gear \(Mechanical Powerflow\)**](#)
- [**Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Third Gear \(Hydraulic Circuits With ETRS\) Drive Range, Third Gear \(Mechanical Powerflow\)**](#)
- [**Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\) Drive Range, Fourth Gear \(Mechanical Powerflow\)**](#)
- [**Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\) Drive Range, Fifth Gear \(Mechanical Powerflow\)**](#)

- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\) Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\) Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\) Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\) Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\) Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)
- [Fluid Passages \(Hydraulic Circuits Without ETRS\) Fluid Passages \(Hydraulic Circuits With ETRS\)](#)

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Transmission Range Command = Park & Transmission Range Control Valve 1 Position

Switch/Transmission Range Control Valve 2 Position Switch = Low - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Diagnostic Aids

If fluid pressure is less than 345 kPa (50 PSI), DTC P18AB & P18AD may set.

Reference Information

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Transmission - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. DTCs related to the following system/component = Not Set
 - B315A Transmission Range Control Valve 1 Position Switch

- B315B Transmission Range Control Valve 2 Position Switch
- B316 Transmission Park Valve Position Switch
- **If a related DTC is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **Go to next step: If a related DTC is not set**

3. Ignition - On/Vehicle - In Service Mode

4. Clear DTCs

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.

Verify DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.

- **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0 is set**

Refer to Diagnostic Fault Information

- **Go to next step: If none of the DTCs are set**

6. All OK.

Repair Instructions

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

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P18A2 OR P18A4: TRANSMISSION PARK INHIBIT ACTUATOR CONTROL CIRCUIT LOW/HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P18A2

Transmission Park Inhibit Actuator Control Circuit Low Voltage

DTC P18A4

Transmission Park Inhibit Actuator Control Circuit High Voltage

Diagnostic Fault Information

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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 22	P18A2	P18A2	P18A4	-
Control - Terminal 49	P2670	P2671	P2671	-

Typical Scan Tool Data

Transmission Park Valve Lock Solenoid Actuator Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	-	-	Malfunction
Control - Terminal 49	-	-	-

Transmission Park Valve Lock Solenoid Actuator Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	Malfunction	Malfunction	-
Control - Terminal 49	Malfunction	Malfunction	-

Transmission Park Valve Lock Solenoid Actuator Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	Malfunction	Malfunction	-
Control - Terminal 49	-	Malfunction	-

Circuit/System Description

Circuit	Description
Control - Terminal 28	The output circuit is switched to 12 V to activate the component.
Control - Terminal 10	The output circuit is switched to ground to activate the component.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.
M123 Transmission Park Valve Lock Solenoid Actuator	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion.

When the M123 Transmission Park Valve Lock Solenoid Actuator/Transmission Control Solenoid Valve 11 is energized, it prevent the transmission from going into park, by holding the Park Release Servo Piston in the extended position.

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P18A2

The control module detects a short to ground or The control module detects an open circuit. - For greater than 1 s

P18A4

The control module detects a short to voltage. - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P2670, P2671 is not set.
 - If the DTC is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

3. Perform the scan tool control function: Transmission Control Solenoid Valve 11 - On and Off

Verify the scan tool parameter:

- Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status = OK or Not Run
- Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status = OK or Not Run
- Transmission Control Solenoid Valve 11 Control Circuit Open Test Status = OK or Not Run
- **If not the specified state**

Refer to Circuit/System Testing

- **Go to next step: If the specified state**
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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground
4. Ignition - On/Vehicle - In Service Mode
5. Perform the scan tool control function: High Side Driver 2 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off & Remove - Test lamp
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: K71 Transmission Control Module
5. Test for infinite resistance between the test points: Control circuit terminal 28 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

6. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Remove - Test Lamp
2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Ignition/Vehicle - Off
4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
5. Disconnect the electrical connector: K71 Transmission Control Module
6. Ignition - On/Vehicle - In Service Mode
7. Test for less than 1 V between the test points: Control circuit terminal 28 @ Component harness & Ground

- If 1 V or greater - Repair the short to ground on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and Off**

6. Remove - Test Lamp
7. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
8. Ignition/Vehicle - Off
9. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
10. Disconnect the electrical connector: K71 Transmission Control Module

11. Test for less than 2 Ω between the test points: Control circuit terminal 10 @ Component harness & Control circuit terminal 22 @ Control module harness

- If 2 Ω or greater

Repair the open/high resistance in the circuit.

- If less than 2 Ω

12. Test for infinite resistance between the test points: Control circuit terminal 10 @ Component harness & Ground

- **If less than infinite resistance**

Repair short to ground on the circuit.

- **Go to next step: If infinite resistance**

13. Ignition - On/Vehicle - In Service Mode

14. Test for less than 1 V between the test points: Control circuit terminal 10 & Ground

- **If 1 V or greater**

Repair the short to voltage on the circuit.

- If less than 1 V

15. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

16. Ignition/Vehicle - Off

17. Connect the electrical connector: K71 Transmission Control Module

18. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly

19. Remove the component: Control Valve Body Cover

20. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

21. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator

22. Connect a test lamp between the test points: Control circuit terminal 1 @ Component harness & Ground

23. Ignition - On/Vehicle - In Service Mode

24. Perform the scan tool control function: High Side Driver 2 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp does not turn On and Off**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If the test lamp turns On and Off**

25. Connect a test lamp between the test points: Control circuit terminal 1 @ Component harness & Control circuit terminal 2 @ Component harness

26. Perform the scan tool control function: Transmission Control Solenoid Valve 11 - On and Off

Verify the test lamp turns On and Off.

- **If the test lamp does not turn On and Off**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If the test lamp turns On and Off**

27. Test or replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

Component Testing

Static Test

1. Ignition/Vehicle - Off

2. Remove the component: Control Valve Body Cover

3. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator

4. Test for 15 to 25 Ω between the test points: Control terminal 1 & Control terminal 2

- **If not between 15 to 25 Ω**

Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

- **Go to next step: If between 15 to 25 Ω**

5. Test for infinite resistance between the test points: Each terminal of the component & The component's housing

- **If less than infinite resistance**

Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

- **Go to next step: If infinite resistance**

6. All OK.

Repair Instructions

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

- Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#) - M123 Transmission Park Valve Lock Solenoid Actuator
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P18A8: TRANSMISSION PARK CONTROL SOLENOID ACTUATOR STUCK OFF

Diagnostic Instructions

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

DTC Descriptor

DTC P18A8

Transmission Park Control Solenoid Actuator Stuck Off

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77D Transmission Control Solenoid Valve 4	P18A8	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
M123 Transmission Park Valve Lock Solenoid Actuator	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
Control Valve Body • Mode 2 Electronic Transmission Range Selector Valve • Electronic Transmission Range Selector Mode Enable Valve/Spring • Control Valve Body Spacer Plate • Feed Limit Valve/Spring • Clutch Selector Valve/Spring	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Control Solenoid Valve Body • Mode 1 Electronic Transmission Range Selector Valve	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Circuit/System Description

DTC P18A8 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)
- [Fluid Passages \(Hydraulic Circuits Without ETRS\)](#) [Fluid Passages \(Hydraulic Circuits With ETRS\)](#)

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Transmission Range Command Actual - Transmission Range Control Valve 1 Position Switch/Transmission Range Control Valve 2 Position Switch = Low

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
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 DTC P18A8, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.
 - **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P18A8 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
6. All OK.

Repair Instructions

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

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P188B: TRANSMISSION RANGE SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P188B

Transmission Range Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- DTC U0121 = Not set
- Ignition = On
- Serial Data = Enabled

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 3 s

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K20 Engine Control Module
- K71 Transmission Control Module

The above condition(s) must occur 5 times.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following system/component: Serial Data

- **If other DTCs are set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If no other DTCs are set**

1. Ignition/Vehicle - Off
2. Replace the component: K71 Transmission Control Module
3. Operate the vehicle within the Conditions for Running the DTC.

Verify the DTC does not set.

- If the DTC sets - Replace the component: K20 Engine Control Module
- If the DTC is not set

4. All OK.

- **Go to next step: If no DTC is set**

3. All OK.

Repair Instructions

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

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

DTC P189C: TRANSMISSION RANGE COMMAND MESSAGE PERFORMANCE

Diagnostic Instructions

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

DTC Descriptor

DTC P189C

Transmission Range Command Message Performance

Circuit/System Description

Circuit	Description
Serial Data	Digitally encoded information for communication between devices.

Component	Description
K20 Engine Control Module	The control module controls a series of actuators to ensure optimal engine performance. The control module does this by reading values from a variety of sensors, interprets the data and adjusts the engine actuators accordingly.
K71 Transmission Control Module	The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

Conditions for Running the DTC

Ignition = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Commanded state does not match the actual state

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following system/component: LIN Bus
 - **If a related DTC is set**

Refer to **[Diagnostic Trouble Code \(DTC\) List - Vehicle](#)**
 - **Go to next step: If a related DTC is not set**
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 data.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **Go to next step: If the DTC does not set**

4. All OK.

Circuit/System Testing

NOTE: It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector.
 - K20 Engine Control Module
 - K71 Transmission Control Module
3. Test for less than 1 V between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
 - **If greater than 1 V**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
4. Test for infinite resistance between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & Ground
 - **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **Go to next step: If infinite resistance**
5. Test for less than 10 Ω between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
 - **If greater than 10 Ω**
Repair the open/high resistance in the circuit.
 - **Go to next step: If less than 10 Ω**
6. Replace the component: K71 Transmission Control Module
7. Verify DTC P189C is not set.
 - **If the DTC sets**
Replace the component: K20 Engine Control Module
 - **Go to next step: If the DTC does not set**
8. All OK.

Repair Instructions

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

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

DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P2714

Transmission Control Solenoid Valve 4 Stuck Off

DTC P2715

Transmission Control Solenoid Valve 4 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77D Transmission Control Solenoid Valve 4	P2714, P2715	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 4th Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2714, P2715	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
4th Clutch Oil Feed Circuit	P2714, P2715	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
4th Clutch Assembly	P2714, P2715	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Binding, sticking or stuck component: Clutch Plates • Damaged or worn component: • Clutch Plates • Clutch Piston • Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 4th regulator valve that controls the fluid pressure to the 4th clutch. DTC P2714, P2715 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P2714

Clutch 4 = Not applied

P2715

Clutch 4 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled

- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2714} Transmission gear allowed = Reverse or Gear 7
- {P2715} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2714, P2715 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2714, P2715 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2714, P2715 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P2714, P2715 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

7. All OK.

Repair Instructions

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

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P2723

Transmission Control Solenoid Valve 5 Stuck Off

DTC P2724

Transmission Control Solenoid Valve 5 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77E Transmission Control Solenoid Valve 5	P2723, P2724	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 5-7-Reverse Clutch Boost Valve • Valve Spring • Valve Body Bore	P2723, P2724	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
• 5-7-R Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2723, P2724	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
5-7-R Clutch Assembly Oil Feed Circuit	P2723, P2724	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
5-7-R Clutch Assembly	P2723, P2724	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Binding, sticking or stuck component: Clutch Plates • Damaged or worn component: • Clutch Plates • Clutch Piston • Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 5-7-R regulator valve that controls the fluid pressure to the 5-7-R clutch.

DTC P2723, P2724 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)

- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine = Running
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On
- Ignition = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P2723

Clutch 5-7-R = Not applied

P2724

Clutch 5-7-R = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {with EPH} Transmission gear allowed = Reverse or Gear 3, 8
- {without EPH} Transmission gear allowed = Reverse or Gear 4

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2723, P2724 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2723, P2724 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2723, P2724 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2723, P2724 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
7. All OK.

Repair Instructions

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

- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\) Control Valve Body Cleaning and Inspection \(with ETRS\)](#)

- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2731, P2732, P2733: TRANSMISSION CONTROL SOLENOID VALVE 6 PERFORMANCE/STUCK

Diagnostic Instructions

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

DTC Descriptor

DTC P2731

Transmission Control Solenoid Valve 6 Performance

DTC P2732

Transmission Control Solenoid Valve 6 Stuck Off

DTC P2733

Transmission Control Solenoid Valve 6 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77F Transmission Control Solenoid Valve 6	P2731, P2732, P2733	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• Clutch Select Valve • Valve Spring • Valve Body Bore	P2731, P2732, P2733	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2731, P2732, P2733	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve - Oil Feed Circuit	P2731, P2732, P2733	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Gasket - O-Ring - Seal
2-9 Clutch Assembly	P2731	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing	P2731	Stuck
6-7-8-9 Clutch Assembly	P2731, P2732, P2733	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the regulator valve that controls fluid pressure to the following components:

- Clutch Selector Valve
- Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve
- 6-7-8-9 Clutch Assembly

DTC P2731, P2732, P2733 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine = Running
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On
- Ignition = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P2731

Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve = Not released

P2732

Clutch 6-7-8-9 = Not applied

P2733

Clutch 6-7-8-9 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- Manual Shift Control = Disabled

- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2731} Transmission gear allowed = Reverse or Gear 1
- {P2732} Transmission gear allowed = Reverse or Gear 5
- {P2733} Transmission gear allowed = Reverse or Gear 7

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2732, P2733 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2731, P2732, P2733 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2732, P2733 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P2731, P2732, P2733 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are set

7. All OK.

Repair Instructions

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

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#)
- Refer to [2-9 and 4 Clutch Piston Housing Assemble](#)
- Refer to [2-9 and 4 Clutch Piston Housing Installation](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Disassemble](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Assemble](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Installation](#)
- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- For control module replacement, programming and setup, refer to: [Control Module References](#)

DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE: TRANSMISSION CONTROL SOLENOID VALVE 1-8 CALIBRATION INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P27A7

Transmission Control Solenoid Valve 1 Calibration Incorrect

DTC P27A8

Transmission Control Solenoid Valve 2 Calibration Incorrect

DTC P27A9

Transmission Control Solenoid Valve 3 Calibration Incorrect

DTC P27AA

Transmission Control Solenoid Valve 4 Calibration Incorrect

DTC P27AB

Transmission Control Solenoid Valve 5 Calibration Incorrect

DTC P27AC

Transmission Control Solenoid Valve 6 Calibration Incorrect

DTC P27AD

Transmission Control Solenoid Valve 7 Calibration Incorrect

DTC P27AE

Transmission Control Solenoid Valve 8 Calibration Incorrect

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Conditions for Running the DTC

Ignition/Vehicle = On

Conditions for Setting the DTC

Transmission Control Solenoid Valve 1-8 Calibration Data = Not Programmed

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- The control module uses default replacement values.

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

- DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE is an informational DTC.
- This procedure is required when the following component has been repaired, replaced, removed, or serviced:
 - T12 Automatic Transmission Assembly
 - K71 Transmission Control Module
 - Control Valve Body Assembly
 - Transmission Control Solenoid Valve 1-8

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE is not set.
 - **If any of the DTCs are set**

Refer to [Solenoid Valve Characterization Reprogramming](#)
 - **Go to next step: If no DTC is set**
3. All OK.

Repair Instructions

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

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

DTC P27EB, P27ED OR P27EE: TRANSMISSION RANGE CONTROL VALVE 1 POSITION SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P27EB

Transmission Range Control Valve 1 Position Switch Circuit

DTC P27ED

Transmission Range Control Valve 1 Position Switch Circuit Low Voltage

DTC P27EE

Transmission Range Control Valve 1 Position Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C, P27ED, P27F1	P077C, P27ED, P27F1	-	-
Signal	P27ED	P27ED	P27EE	-

Typical Scan Tool Data

Transmission Range Control Valve 1 Position Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 0.6 to 1.0 V - Default 1.7 to 2.2 V - Active			
9 V Reference	0 V	0 V	0.6 to 1.0 V
Signal	0 V	0 V	4.9 to 5.0 V

Circuit/System Description

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The control module input circuit has an internal resistance connected to ground.

Component	Description
B315A Transmission Range Control Valve 1 Position Switch	A linear hall effect sensor that changes current flow based on the magnetic field's position relative to the sensor.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.

The B315A Transmission Range Control Valve 1 Position Switch monitors the position of the Mode 1 Electronic Transmission Range Selector Valve

- Default = Low Voltage
- Active = High Voltage

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Ignition/Vehicle = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P27EB

Transmission Range Control Valve 1 Position Switch = 1.3 to 1.5 V - For greater than 1 s

P27ED

Transmission Range Control Valve 1 Position Switch = Less than 0.4 V - For greater than 1 s

P27EE

Transmission Range Control Valve 1 Position Switch = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

P27EB

Autostart/Autostop = Disabled

P27ED, P27EE

- Autostart/Autostop = Disabled
- Line Pressure Command = Low

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

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

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)

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

DTC Type Reference

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

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

[Parking Brake and Drive Wheels Warning](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 0.6 to 1.0 V

- **If not between 0.6 and 1.0 V**

Refer to Circuit/System Testing

- **Go to next step: If between 0.6 and 1.0 V**

3. Engine - Running
4. Transmission Range - D
5. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 1.7 to 2.1 V

- **If not between 1.7 and 2.1 V**

Refer to Circuit/System Testing

- **Go to next step: If between 1.7 and 2.1 V**

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.

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

- **Go to next step: If the DTC is not set**

7. All OK.

[Circuit/System Testing](#)

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Ignition - On/Vehicle - In Service Mode
4. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 7 & Ground
 - **If less than 8.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.

- If infinite resistance
- 6. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **If greater than 9.2 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 8.8 and 9.2 V**
- 5. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 21 X1 @ T12 Automatic Transmission Assembly
 - Black lead @ Ground
- 6. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 2.0 to 3.7 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 62 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 21 X1 @ Component harness & Terminal 62 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
 - **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 21 X1 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 2.0 and 2.3 V**
- 7. Remove the transmission cover.

8. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
9. Disconnect the component: B315A Transmission Range Control Valve 1 Position Switch
10. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 2 & Ground
 - **If less than 8.8 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 1 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
 - **If greater than 9.2 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
11. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 1 @ Component harness
 - Black lead @ Ground
12. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 8 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
 - **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: K71 Transmission Control Module
5. Ignition - On/Vehicle - In Service Mode
6. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
- **Go to next step: If between 2.0 and 2.3 V**
13. Test or replace the component: B315A Transmission Range Control Valve 1 Position Switch

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Solenoid Body Replacement](#) - B315A Transmission Range Control Valve 1 Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P27EF, P27F1 OR P27F2: TRANSMISSION RANGE CONTROL VALVE 2 POSITION SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P27EF

Transmission Range Control Valve 2 Position Switch Circuit

DTC P27F1

Transmission Range Control Valve 2 Position Switch Circuit Low Voltage

DTC P27F2

Transmission Range Control Valve 2 Position Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C, P27ED, P27F1	P077C, P27ED, P27F1	-	-
Signal	P27F1	P27F1	P27F2	-

Typical Scan Tool Data

Transmission Range Control Valve 2 Position Switch

Circuit	Short to Ground	Open	Short to Voltage

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 0.6 to 1.0 V - Default 1.7 to 2.2 V - Active			
9 V Reference	0 V	0 V	0.6 to 1.0 V
Signal	0 V	0 V	4.9 to 5.0 V

Circuit/System Description

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The control module input circuit has an internal resistance connected to ground.

Component	Description
Transmission Range Control Valve 2 Position Switch	A linear hall effect sensor that changes current flow based on the magnetic field's position relative to the sensor.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.

The B315B Transmission Range Control Valve 2 Position Switch monitors the position of the Mode 1 Electronic Transmission Range Selector Valve

- Default = Low Voltage
- Active = High Voltage

Conditions for Running the DTC

Battery Voltage = Greater than 9 V

Ignition/Vehicle = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P27EF

Transmission Range Control Valve 2 Position Switch = 1.3 to 1.5 V - For greater than 1 s

P27F1

Transmission Range Control Valve 2 Position Switch = Less than 0.4 V - For greater than 1 s

P27F2

Transmission Range Control Valve 2 Position Switch = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Line Pressure Command = Low

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

Parking Brake and Drive Wheels Warning

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 0.6 to 1.0 V
 - **If not between 0.6 and 1.0 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 0.6 and 1.0 V**
3. Engine - Running
4. Transmission Range - D
5. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 1.7 to 2.1 V
 - **If not between 1.7 and 2.1 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 1.7 and 2.1 V**
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.

Verify the DTC does not set.
 - **If the DTC sets**
Refer to Circuit/System Testing
 - **Go to next step: If the DTC is not set**
7. All OK.

Circuit/System Testing

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
5. Ignition - On/Vehicle - In Service Mode
6. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 7 & Ground
 - **If less than 8.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 6. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
 - **If greater than 9.2 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
7. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 20 X1 @ T12 Automatic Transmission Assembly
 - Black lead @ Ground
8. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 60 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 20 X1 @ Component harness & Terminal 60 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 20 X1 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 2.0 and 2.3 V**
- 9. Remove the transmission cover.
- 10. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly X1
- 11. Disconnect the component: B315B Transmission Range Control Valve 2 Position Switch
- 12. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 2 & Ground
 - **If less than 8.8 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 1 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
 - **If greater than 9.2 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
- 13. Install the special tool: **EL-38522** Variable Signal Generator.
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 1 @ Component harness
 - Black lead @ Ground
- 14. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
 2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
4. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 9 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
- **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
- **Go to next step: If between 2.0 and 2.3 V**
15. Test or replace the component: B315B Transmission Range Control Valve 2 Position Switch

Repair Instructions

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

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Solenoid Body Replacement](#) - B315B Transmission Range Control Valve 2 Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2820 OR P2821: TRANSMISSION CONTROL SOLENOID VALVE 9 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P2820

Transmission Control Solenoid Valve 9 Stuck Off

DTC P2821

Transmission Control Solenoid Valve 9 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
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Component	DTC	Condition
Q77J Transmission Control Solenoid Valve 9	P2820, P2821	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• Clutch Selector Valve • Valve Spring • Valve Body Bore	P2820, P2821	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Oil Feed Circuit	P2820, P2821	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal

Circuit/System Description

The solenoid valve controls the oil flow to the appropriate component: Clutch Selector Valve

DTC P2820, P2821 sets only when there is a hydraulic/mechanical problem.

For an overview of the component/system, refer to:

- **Electronic Component Description**
- **Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)**
- **Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)**
- **Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)**
- **Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)**
- **Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)**
- **Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)**
- **Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)**
- **Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)**
- **Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)**
- **Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)**
- **Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)**

- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS). Drive Range, Ninth Gear (Hydraulic Circuits With ETRS). Drive Range, Ninth Gear (Mechanical Powerflow).

Conditions for Running the DTC

- DTCs related to the following system/component = Not Set
 - B14A Transmission Output Shaft Speed Sensor
 - B14C Transmission Input Shaft Speed Sensor
 - B14D Transmission Intermediate Shaft Speed Sensor
 - B15 Transmission Internal Mode Switch
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 400 RPM
- High Side Driver 1 = On
- High Side Driver 2 = On
- Ignition/Vehicle = On
- Transmission Fluid Temperature = -256 to 130 Å, Å°C (-430 to 266 Å, Å°F)
- Transmission OSS = Greater than 34 RPM

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P2820

Clutch Selector Valve = Not applied

P2821

Clutch Selector Valve = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2820} 1st Gear = Not Available
- {P2820} Transmission gear allowed = Reverse or Gear 2

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

Reference Information

Component View Reference

Transmission Solenoid Information

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2820, P2821 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2820 or P2821 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
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.

Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2820, P2821 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2820 or P2821 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
7. All OK.

Repair Instructions

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

- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)

SOLENOID VALVE CHARACTERIZATION REPROGRAMMING

The solenoids in this transmission require unique performance characteristic data in order to function at maximum efficiency. This data is programmed and stored in the vehicle's transmission control module (TCM). When a transmission assembly, TCM, or solenoids are replaced during service, the performance characteristic data for the solenoids must be retrieved from a web server "cloud" repository and reprogrammed into the TCM.

Reprogramming also ensures that the characteristic data relationship is properly matched between the solenoids, valve body, and transmission.

Solenoid characterization reprogramming is performed using the TIS2Web Service Programming System (SPS).

Solenoid Reprogramming Procedure

Perform solenoid characterization reprogramming after one of the following service procedures:

NOTE: Select "Replace Transmission" at the MCVM Characterization selection screen.

- Replace transmission assembly

NOTE: Select "Replace Valve Body" at the MCVM Characterization selection screen.

- Replace valve body assembly

NOTE: Select "Replace Solenoid" at the MCVM Characterization selection screen.

- Replace solenoid (currently not an available Service Procedure)

NOTE: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

- Replace TCM

NOTE: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

- Solenoid characterization may also be performed to "refresh" characterization data.

To perform solenoid characterization after a transmission component replacement:

1. Document the new Transmission Unique Number (TUN) or Part Unique Number (PUN) as required.
 - The TUN location may be found here: [Transmission Identification Information](#) . Since the TUN can be difficult to access when the transmission is installed in the vehicle, ensure you document the 16-digit TUN prior to installing the transmission in the vehicle.
 - The PUN location may be found here: [Control Valve Solenoid Body Identification Information](#) . Before installing the control valve solenoid body onto the transmission, document the 16-digit PUN. If the control valve solenoid body PUN has not been saved for reference, it may be necessary to disassemble the control valve solenoid body from the transmission to clearly read the control valve solenoid body PUN.
2. Log into TIS2Web/SPS.
3. Type the vehicle identification number (VIN).
4. Perform the SPS Transmission Control Module programming event.

- Select "Transmission Control Module - Programming" to update TCM calibrations and Solenoid Characterization data.

OR

- Select "Transmission Control Module - MCVM Operations" to update Solenoid Characterization data only.
5. From the "MCVM (Mechanical Characterization and Virtual Matching) Operation Selection" screen, select the applicable service procedure to be performed. You will be prompted to provide the necessary Transmission Unique Number (TUN) or Part Unique Number (PUN) when replacing a transmission part.

At this point, the system will read the VIN from the engine control module (ECM) using the multiple diagnostic interface (MDI) and then retrieve the applicable genealogy data tree from the cloud. This data tree accesses the original characterization data so that it may be updated with the new component information. The system acquires characterization data for the given TUN/PUN via the cloud and updates the genealogy tree. The TCM is updated with the correct solenoid characterization data, and the cloud is updated with the new genealogy relationship.

SYMPTOMS - AUTOMATIC TRANSMISSION

NOTE: Use the symptom tables only if the following conditions are met:

- Refer to: [Diagnostic Starting Point - Vehicle](#) .
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to: [Transmission General Description](#) , and [Transmission Component and System Description](#) .

Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

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

Symptom List

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

- Fluid Diagnosis
 - [Transmission Fluid Level and Condition Check](#)
 - [Automatic Transmission Fluid Leaks](#)
 - [Fluid Leak Diagnosis](#)
- Noise and Vibration Diagnosis
 - [Whine/Growl Noise](#)
 - [Noise and Vibration Analysis](#)
 - [Torque Converter Diagnosis \(LTG\)](#)[Torque Converter Diagnosis \(LYX\)](#)
- Range Performance Diagnosis
 - [No Park](#)
 - [No Drive in All Ranges](#)
 - [No Reverse Gear](#)
 - [Shift Indicator Indicates Wrong Gear Selection](#)
- Shift Quality Feel Diagnosis

- [Harsh Garage Shift](#)
- Torque Converter Diagnosis
 - [Torque Converter Diagnosis \(LTG\)](#)[Torque Converter Diagnosis \(LYX\)](#)
 - [No Torque Converter Clutch Apply](#)
 - [No Torque Converter Clutch Release](#)
- Symptom Not Found or No Symptom Detected
 - [Transmission Fluid Level and Condition Check](#)
 - [Road Test](#)

TRANSMISSION FLUID LEVEL AND CONDITION CHECK

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself.

CAUTION: Use Dexron[®] VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.

NOTE: Ensure the transmission has enough fluid in it to safely start the vehicle without damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20 - 25[°]C (68 - 77[°]F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

NOTE: If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

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

CAUTION: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95[°]C (185 - 203[°]F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95[°]C under-filled, TFT 85[°]C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.

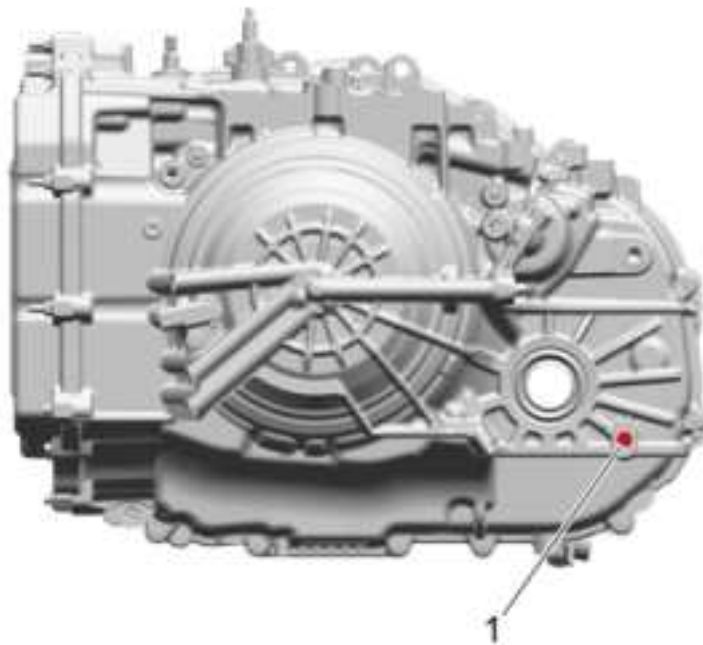


Fig. 1: Oil Level Plug

Courtesy of GENERAL MOTORS COMPANY

6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.

Oil Level Plug (1)

- If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
 - If no fluid comes out, add fluid until fluid drips out.
7. Inspect the fluid color. The fluid should be red or dark brown.
- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
 - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).
8. Inspect for external leaks. Refer to [Fluid Leak Diagnosis](#).
9. If the fluid was changed, reset the transmission oil life monitor if applicable.

Dipstick Level Checking Procedure (If equipped)

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P). Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.
4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

CAUTION:

The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95°C (185 - 203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

NOTE:

- If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
- Check the transmission fluid level when the TFT is at between 85 - 95°C (185 - 203°F). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is at the specified temperature.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

5. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. Remove the dipstick and wipe it with a clean rag or paper towel.
7. Inspect the fluid color. The fluid should be red or dark brown.
 - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
 - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).
8. Install the dipstick. Wait three seconds and then remove it again.

NOTE: Always check the fluid level at least twice. Consistent readings are important to maintaining proper fluid level. If inconsistent readings are noted, inspect the transmission vent cap to ensure it is clean and unclogged.

NOTE: It is not necessary to get the fluid level all the way up to the MAX mark. Anywhere within the crosshatch band is acceptable.

9. Check both sides of the dipstick and read the lower level.
10. Install and remove the dipstick again to verify the reading.

NOTE: Do not add more than one half pint (0.25L) at a time without rechecking the level. Once the oil is on the dipstick bullet, it will not take much more fluid to raise the fluid level into the crosshatch band. Do not overfill. Also, if the fluid level is low, inspect the transmission for leaks. Refer to [Fluid Leak Diagnosis](#).

11. If the fluid level is not within the crosshatch band, and the transmission temperature is at 90°C (194°F), add or drain fluid as necessary to bring the level into the crosshatch band. If the fluid level is low, add only enough fluid to bring the level into the crosshatch band.
12. If the fluid level is in the acceptable range, install the dipstick.
13. If the fluid was changed, reset the transmission oil life monitor if applicable.

Fluid Condition Inspection

- Inspect the fluid color. The fluid should be red in color. The fluid may also turn brown from normal use, and does not always indicate contamination.

NOTE: Fluid that is very dark or black and has a burnt odor usually indicates contamination or overheating.

- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission damage. Refer to [Road Test](#) to verify transmission operation. Change the transmission fluid if no other conditions are found.
- Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).

ROAD TEST

NOTE: The Road Test Procedure should be performed only as part of the Symptom Diagnosis.

Perform the road test in conjunction with the symptom diagnosis. Refer to [Symptoms - Automatic Transmission](#).

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Step-In Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
 - REVERSE
 - Driver Shift Control

NOTE: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to [Transmission Fluid Level and Condition Check](#).
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.
- Ensure the transmission fluid temperature is at least 90°C (194°F).

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#).
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to [Fluid Leak Diagnosis](#).

Electrical Function Check

Perform this procedure in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.

Refer to [Control Module References](#) for typical data values. Data that is questionable may indicate a concern.

- Engine Speed
- Transmission ISS
- Transmission OSS
- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Line PC Sol. Pressure Cmd.
- Brake Switch
- ECT, Engine Data List
- Trans. Fluid Temp.
- TCM Temperature
- Calc. Throttle Position
- Ignition Voltage
- TFP Switch 1
- TFP Switch 3
- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1
- Shift Solenoid 2
- TCC PC Sol. Duty Cycle
- TCC Slip Speed

5. Check the garage shifts.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through the following ranges:
 1. PARK to REVERSE
 2. REVERSE to NEUTRAL
 3. NEUTRAL to DRIVE
 4. DRIVE to REVERSE
 5. REVERSE to DRIVE
3. Pause 2 to 3 seconds in each gear position.
4. Verify the gear engagements are immediate (less than 2 seconds to complete if transmission fluid temperature is above 20°C (68°F) 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.
- **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**
- **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 Garage Shift](#).

6. Monitor transmission range on the scan tool, transmission data list.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through all ranges.
3. Pause 2 to 3 seconds in each range.
4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.

7. Check throttle position input.

1. Apply the brake pedal and ensure the parking brake is set.
2. Ensure the gear selector is in PARK.
3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

Upshift Control and Torque Converter Clutch (TCC) Apply

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:

- Calc. Throttle Position
- Vehicle Speed
- Engine Speed
- Transmission ISS
- Transmission OSS
- Commanded Gear
- TCC PC Sol. Pressure Cmd.
- TCC Slip Speed

- TFP Switch 1
 - TFP Switch 3
 - TFP Switch 4
 - TFP Switch 5
 - PC Sol. 2 Pressure Cmd.
 - PC Sol. 3 Pressure Cmd.
 - PC Sol. 4 Pressure Cmd.
 - PC Sol. 5 Pressure Cmd.
 - Shift Solenoid 1 and 2
2. Place the gear selector in the DRIVE position.
 3. Accelerate the vehicle using a steady throttle position between 15 and 20 percent. Hold the throttle steady.
 4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.
 5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.
 6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

NOTE: This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Full lockup is available at highway speeds on some applications.

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

- Check for DTCs.
- Refer to [Torque Converter Diagnosis \(LTG\)](#)[Torque Converter Diagnosis \(LYX\)](#).

Part Throttle Step-In Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle at light throttle (5 - 15 percent) until 3rd gear is just achieved.
3. Quickly increase throttle angle until commanded gear indicates that a downshift to 2nd gear is commanded.
4. Verify that the transmission downshifts within 2 seconds of the throttle movement.
5. Repeat steps 2 to 4 at higher speed to achieve 4th gear and then step in to command a 4th gear to 3rd gear downshift.
6. Repeat steps 2 to 4 at higher speed to achieve 5th gear and then step in to command a 5th to 4th gear downshift.
7. Repeat steps 2 to 4 at higher speed to achieve 6th gear and then step in to command a 6th gear to 5th gear downshift.
8. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

Manual Downshifts

Manual downshift testing is not required since all vehicles equipped are also equipped with some form of Driver Shift Control (DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

Coasting Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 6th gear with the TCC applied.
3. Release the throttle and apply the brakes
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

Manual Gear Range Selection

This application does not utilize manual forward gear ranges.

Reverse

Perform the following test using a 10 - 15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will upshift automatically when maximum engine speed is achieved and will protect from any downshift which may cause excessive engine RPMs.

TORQUE CONVERTER DIAGNOSIS (LTG)

Torque Converter Stator

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

Poor Acceleration at Low Speed - Stator Roller Clutch Freewheels at All Times

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48 - 55 km/h (30 - 34 mph). At speeds above 48 - 55 km/h (30 - 34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

Poor Acceleration at High Speed - Stator Roller Clutch is Locked Up at All Times

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48 - 55 km/h (30 - 34 mph). Visual examination of the converter may reveal a blue color from overheating.

Torque Converter Bearing Noise

NOTE: Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.

CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.

3. Depress the accelerator to approximately 1, 200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

Torque Converter Clutch

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

Torque Converter Clutch Shudder

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release, or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

If Shudder Occurs During TCC Apply, Release and ECCC

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

If Shudder Occurs After TCC has Locked

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

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

Torque Converter Vibration Test

The **Noise and Vibration Analysis** procedure should be performed prior to performing this test.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.

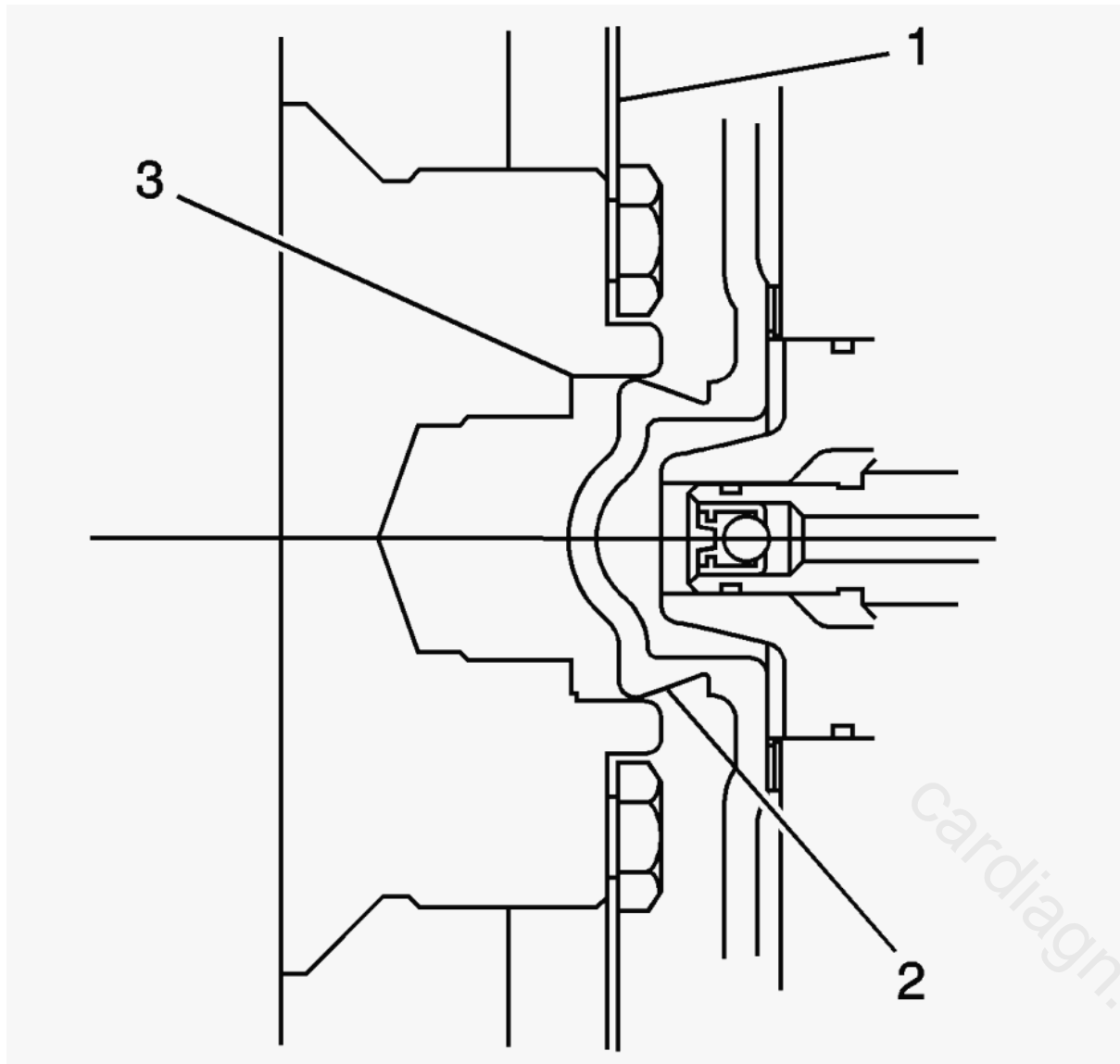


Fig. 2: Aligning Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS COMPANY

CAUTION: When installing the torque converter to the flexplate, make sure to use specified bolts. DO NOT use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.

CAUTION: Refer to [Fastener Caution](#) .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .

Torque Converter Replacement Guide

Condition	Action

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	Do not replace the torque converter for clutch system or gasket 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, P2817, or P2818 diagnostic table.
DTC P0741 - TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
DTC P0742 - TCC Stuck ON	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 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.

Condition	Action
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. • 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.

TORQUE CONVERTER DIAGNOSIS (LYX)

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.

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2. Put the gear selector in DRIVE.

CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.

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A torque converter noise will increase under this load.

Torque Converter Clutch

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- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

If Shudder Occurs After TCC has Locked

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

Refer to [Symptoms - Engine Controls](#) in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

Torque Converter Vibration Test

The [Noise and Vibration Analysis](#) procedure should be performed prior to performing this test.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.

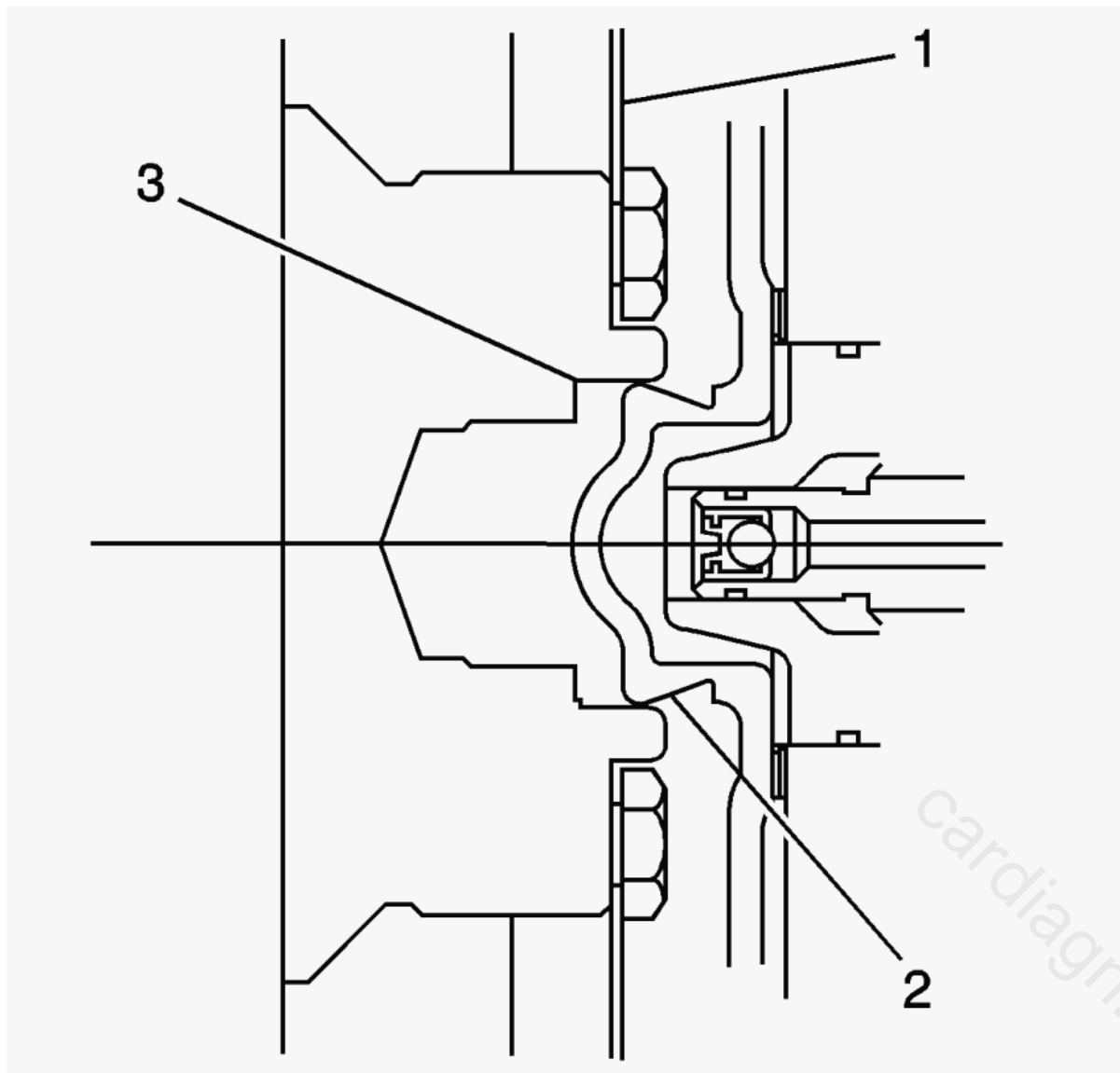


Fig. 3: Aligning Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS COMPANY

CAUTION: When installing the torque converter to the flexplate, make sure to use specified bolts. **DO NOT** use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.

CAUTION: Refer to [Fastener Caution](#) .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .

Torque Converter Replacement Guide

Condition	Action

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to Transmission Fluid Level and Condition Check .
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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.
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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.

Condition	Action
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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.

CLUTCH PLATE DIAGNOSIS

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Delamination - splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates

- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
 - The valve body face is not flat.
 - Porosity in between channels.
 - The valve train retainers are improperly installed.
 - The checkballs are misplaced.
 - Malfunctioning valves.
- The Teflon[®] seal rings are worn or damaged.

ENGINE COOLANT/WATER IN TRANSMISSION

CAUTION: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts - washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to [Transmission Fluid Cooler Flow Test and Flushing](#).

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. Operate the vehicle for 15 - 20 minutes under city driving conditions until normal operating temperatures are reached.
4. Shut OFF the engine.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Valve Body Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

Case Leak

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

Leak at the Torque Converter End

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

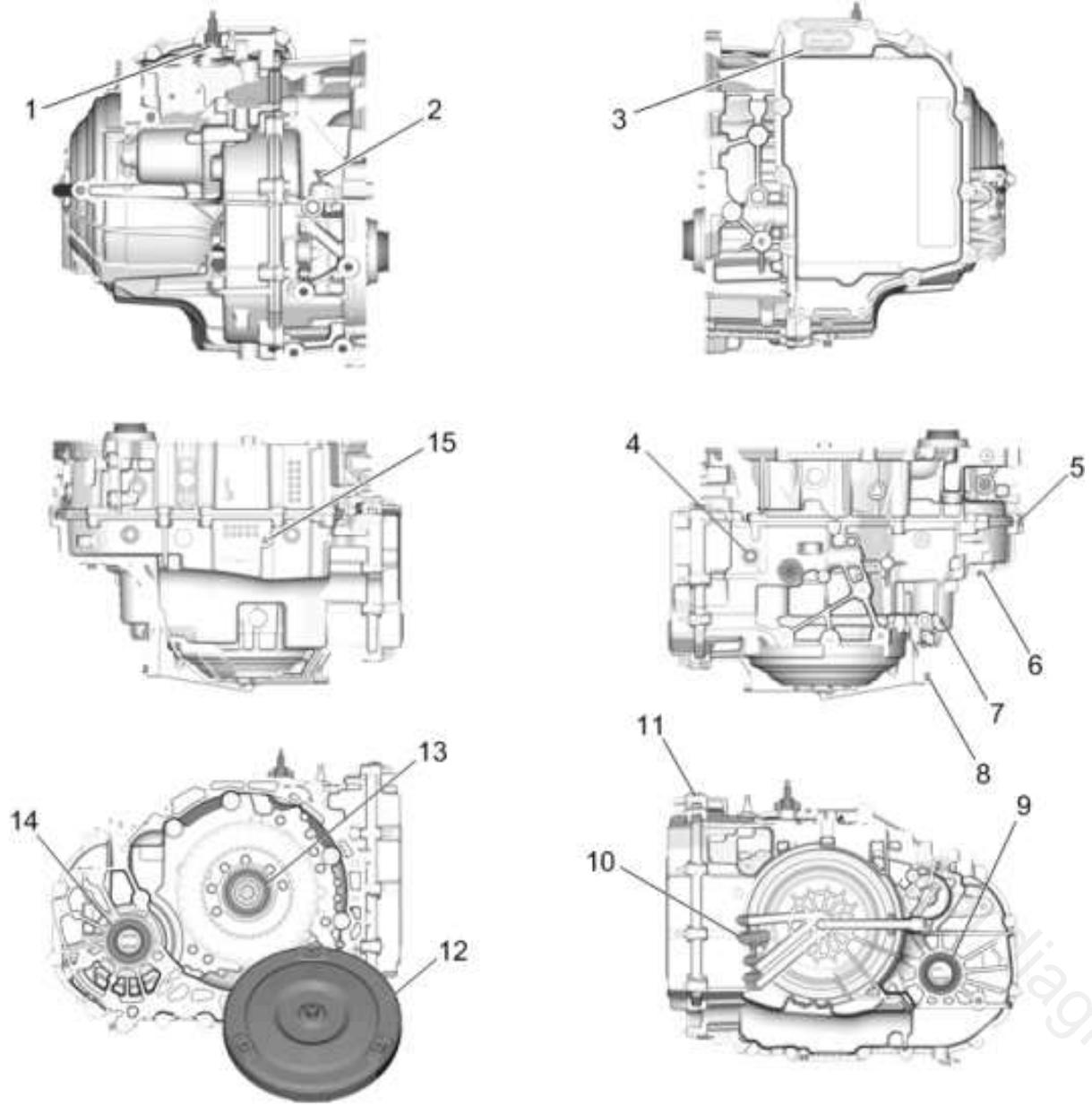


Fig. 4: Fluid Leak Inspection Points
Courtesy of GENERAL MOTORS COMPANY

Leak Inspection Points

1. Transmission Fluid Filler Cap
2. Transmission Fluid Filler Tube Plug
3. Body Side Wiring Harness Opening Seal
4. Manual Shift Shaft Seal
5. Torque Converter Housing Gasket
6. Automatic Transmission Fluid Level Hole Plug
7. Automatic Transmission Fluid Pressure Test Hole Plug
8. Automatic Transmission Case Hole Plug
9. Front Wheel Drive Shaft Oil Seal
10. Automatic Transmission Input Speed Sensor
11. Control Valve Body Gasket
12. Torque Converter Assembly
13. Torque Converter Fluid Seal
14. Front Wheel Drive Shaft Oil Seal
15. Automatic Transmission Fluid Pan Drain Plug

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

WARNING: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. Apply the epoxy. A clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before assembling the components.
5. Repeat the fluid leak diagnosis procedures.

BUSHING AND MATING SHAFT INSPECTION

NOTE: Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the vibration may be a result of poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
 - Missing bolts, nuts, and studs
 - Stripped threads
 - Cracks
- Inspect the flywheel for the following conditions:
 - Missing or loose bolts
 - Cracks
 - Imbalance

- Inspect the torque converter for the following conditions:
 - Missing or loose bolts or lugs
 - Missing or loose balance weights
 - Imbalance caused by heat distortion or fluid contamination
- If the noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is more noticeable as RPM increases, the vibration may be an engine imbalance or a transmission imbalance. Refer to [Torque Converter Diagnosis \(LTG\)](#)/[Torque Converter Diagnosis \(LYX\)](#).

WHINE/GROWL NOISE

Checks	Causes
Front Differential Carrier (238)	• 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 • Inspect for loose, damaged or worn Front Differential Carrier Thrust Bearings • Inspect for broken, worn or disengaged Final Drive Pinion Pin Retainer • Inspect for damaged or worn Pinion Gears
Drive Link (233)	• Inspect for worn, loose or damaged links • Inspect for broken, worn or loose Drive Link Lubricant Scoop (60)
Drive Sprocket (234)	• Inspect for improper Drive Sprocket (234) tooth surface finish • Inspect for broken or damaged Drive Sprocket (234) teeth • Inspect for worn or damaged Output Sun Gear Thrust Bearings (230) • Inspect for worn or damaged Output Carrier Transfer Drive Gear Hub Assembly splines (231) • Inspect for loose, worn or damaged Output Carrier Transfer Drive Gear Hub Assembly bushing
Driven Sprocket (241)	• Inspect for worn, binding or damaged Driven Sprocket Bearing Assembly (242) • Inspect for worn or damaged Driven Sprocket Ball Bearing Assembly • Inspect for improper Driven Sprocket (241) tooth surface finish • Inspect for broken or damaged Driven Sprocket (241) teeth

Checks	Causes
Input Carrier Assembly (552)	• 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 (550, 553)
Output Carrier Transfer Drive Gear Hub Assembly (231)	• 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
Overdrive and Reaction with Input Internal Gear Carrier	• 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 Overdrive Sun Gear Thrust Bearing (544)
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for proper fluid level • Inspect for leaking Automatic Transmission Fluid Filter Seal (202)
1-2-3-4-5-6 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (595 - 599) • Inspect for loose or worn 1-2-3-4-5-6 Clutch Backing Plate Retaining Ring (599)
2-9 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (517 - 519) • Inspect for loose or worn 1-2-3-4-5-6 Clutch Piston Housing Return Ring (523)
3-8 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (513 - 514) • Inspect for loose or worn 3-8 Clutch Spring Retaining Ring (511) • Inspect for loose Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel (561) or Retainer (560)

Checks	Causes
4th Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (540 - 542)
5-7-Reverse Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (578 - 581) • Inspect for loose or worn 5-7-Reverse Clutch Backing Plate Retaining Ring (582)
6-7-8-9 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (574 - 576) • Inspect for loose or worn 6-7-8-9 Clutch Backing Plate Retaining Ring (577)
Automatic Transmission Case (19)	• Inspect for loose or broken Transmission Mount Bolts • Inspect for loose Torque Converter and Differential Housing Bolts (16) • Inspect for loose, worn or damaged differential bushing • Inspect for loose or broken Input Shaft Support Bolts (55) • Inspect for loose or broken Front Differential Carrier Baffle Bolts (62) • Inspect for stripped or sheared splines • Inspect for loose, worn or damaged bushing
Torque Converter Housing (13)	• 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 Automatic Transmission Fluid Pump Cover Bolt (200) • Inspect for loose Torque Converter and Differential Housing Bolts (16) • Inspect for loose, worn or damaged bushing
Control Valve Body Cover (3)	Inspect for loose, missing or broken Valve Body Cover Bolts (1)
Torque Converter (14)	• Inspect for improper alignment of Torque Converter to the Crankshaft • Inspect for ballooning of the Torque Converter

Checks	Causes
Front Differential Carrier (238)	• Inspect for worn or damaged Front Differential Carrier (238) • Inspect for worn or damaged Pinion Pins • Inspect for broken, worn or damaged Differential Sun Gear Bearing or Driven Sprocket Bearing • Inspect for worn or damaged Differential Side Gear teeth, Final Drive Pinion Gear teeth or Final Drive Sun Gear teeth • Inspect for worn or damaged Differential Side Gear Thrust Washers or Final Drive Inner and Outer Washers • Inspect for worn or damaged Final Drive Rollers • Inspect for broken or damaged Differential Pinion Gear Shaft Retainer

AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (14)	Inspect for damage
Automatic Transmission Case (19)	• Inspect for cracked or broken Case (19) • 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 (706) • Inspect for damaged or worn Front Wheel Drive Shaft Oil Seal (67) • Inspect for plugged Transmission Fluid Filler Cap (52) • Inspect for loose Automatic Transmission Fluid Pan Drain Plug (66) and Automatic Transmission Fluid Level Plug (65)
Torque Converter and Differential Housing (13)	• Inspect for damaged Torque Converter Housing Assembly (13) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Gasket (18) • Inspect for damaged or worn Torque Converter Fluid Seal (210) • Inspect for loose Torque Converter and Differential Housing Bolts (16) • Inspect for loose, missing or damaged Transmission Fluid Filler Tube Plug (15)
Control Valve Body Cover (3)	• Inspect for damaged or warped Valve Body Cover Assembly (3) • Inspect for damaged or improperly installed Valve Body Cover Gasket • Inspect for loose Valve Body Cover Bolts (1, 2) • Inspect for damaged or improperly installed Body Side Wiring Harness Opening Seal (26)

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 Shift Detent Lever Shaft (705)	• Verify shift lever is properly attached to the manual shaft. • Verify manual shaft is not twisted or damaged.
Manual Shift Detent Lever (709)	Verify proper operation. Refer to Transmission Range Sensor Duty Cycles

NO PARK

Checks	Causes
Front Differential Carrier (238)	• Inspect for damaged or broken Front Differential Assembly (238). • 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 Assembly (555)	• Inspect for broken Output Carrier Transfer Drive Gear Hub (231). • Inspect for worn, stripped or sheared Output Carrier Transfer Drive Gear Hub (231) splines. • Inspect for damaged or broken park Gear (232). • Inspect for disengaged or broken Drive Sprocket Retainer Ring (235).

Checks	Causes
Drive Link (233)	- Inspect for broken, worn or damaged Drive Link Assembly (233). - Inspect for broken, worn or damaged Drive Sprocket (234). - Inspect for broken, worn or damaged Driven Sprocket Assembly (241). - Inspect for worn, stripped or sheared Driven Sprocket splines. - Inspect for broken Output Carrier Transfer Drive Gear Hub Assembly (231).
Automatic Transmission Case (19)	- Inspect for broken or damaged Case. - Inspect for broken or bent Park Pawl Shaft (714). - Inspect for broken or missing Park Pawl Actuator Guide Pin (704). - Inspect for broken or missing Manual Shift Detent Lever Pin (710). - Inspect for damaged or broken Manual Shift Detent Lever Shaft (705). - Inspect for loose, damaged or broken Manual Shift Detent Lever Spring (20). - Inspect for broken, loose or misaligned Park Pawl Actuator Guide (707). - Inspect for binding, bent or broken Park Pawl (715).

HARSH GARAGE SHIFT

Checks	Causes
Input Carrier Assembly (552)	Inspect for worn or stripped Output Internal Gear Splines.
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (590)	- Inspect for damaged or fatigued 1-2-3-4-5-6 Clutch Wave Plate (595). Refer to Clutch Plate Diagnosis. - Inspect for stripped or sheared splines on 1-2-3-4-5-6 Clutch Plate (596). Refer to Clutch Plate Diagnosis. - Inspect for correct fluid level.

NO DRIVE IN ALL RANGES

Checks	Causes

Checks	Causes
Automatic Transmission Case (19)	• Inspect for cracked or broken Case (19). • Inspect for stripped or sheared splines. • Inspect for binding Manual Shift Detent Lever Assembly (709). • Inspect for missing Manual Shift Detent Lever Pin (710). • Inspect for interference or binding Park Pawl Actuator Assembly (708). • Inspect for broken or disengaged 1-2-3-4-5-6 Clutch Piston Housing Return Ring (523). • Inspect for loose or damaged case bushing. • Inspect Automatic Transmission Fluid Pump Shaft Seal (311) for damage.
Torque Converter (14)	• Inspect for stripped or sheared splines on Turbine Shaft. • Inspect for missing Torque Converter to Flywheel bolts.
Torque Converter and Differential Housing (13)	• Inspect for stripped or sheared Front Differential Ring Gear (207) Splines. • Inspect for broken or disengaged Front Differential Rear Gear Retainer (206). • Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (16). • Inspect for loose, missing or broken Automatic Transmission Fluid Pump Cover Bolts (200, 211).
5-7-Reverse and 6-7-8-9 Clutch Housing (530)	• Inspect for damaged or broken Input Sun Gear Thrust Bearing (550, 553). • Inspect for stripped or sheared splines on the Turbine Shaft to the 5-7-Reverse and 6-7-8-9 Clutch Housing (547).
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for fluid leaks/improper fluid level. • Inspect for leaking Fluid Outlet Seal Assembly (24). • Inspect for loose or missing Automatic Transmission Fluid Pump Cover Bolt (312). • Inspect for damaged, restricted or improperly installed Automatic Transmission Fluid Filter (203). • Inspect for damaged or leaking Automatic Transmission Fluid Filter Seal (202). • Inspect for broken or seized Automatic Transmission Fluid Pump (315).

Checks	Causes
Input Carrier Assembly (552)	• 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 (551). • Inspect for damaged or broken Output Carrier (555). • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing (549) and Output Carrier Thrust Bearing (554). • Inspect for damaged or broken Input Sun Gear Thrust Bearing (550, 553).
Overdrive Carrier (546)	• Inspect for stripped or sheared splines.
Output Carrier Assembly (555)	• Inspect for damaged or broken Input Sun Gear Thrust Bearings (550, 553). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Input Carrier Thrust Bearings (549). • Inspect for broken or damaged Output Internal Gear.
Output Sun Gear Assembly (555)	• Inspect for broken Output Sun Gear Assembly (555) hub or weld.
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing	Inspect for disengaged or broken 1-2-3-4-5-6 Clutch Backing Plate Retaining Ring (599).
Drive Link (233)	• Inspect for broken, worn or damaged Drive Link Assembly (233). • Inspect for broken, worn or damaged Drive Sprocket (234). • Inspect for broken, worn or damaged Driven Sprocket Assembly (241). • Inspect for broken Drive Gear Hub (231).
Front Differential Carrier (238)	• 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).

Checks	Causes
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.

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter (14)	• Inspect for damaged Torque Converter Clutch Seal (inside converter assembly). • Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis (LTG) Torque Converter Diagnosis (LYX).
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for worn or damaged Torque Converter Fluid Seal Assembly (301). • Inspect for worn, damaged or sticking Torque Converter Clutch Control Valve (333) or Torque Converter Clutch Regulator Apply Valve (337). Refer to: Transmission Fluid Pump Disassemble , and Transmission Fluid Pump Assemble
Torque Converter and Differential Housing (13)	Inspect for leaking or damaged Torque Converter Fluid Seal (210), and Automatic Transmission Fluid Pump Assembly (201).

NO TORQUE CONVERTER CLUTCH RELEASE

Checks	Causes
Torque Converter (14)	Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis (LTG) Torque Converter Diagnosis (LYX) .
Automatic Transmission Fluid Pump Assembly (201)	Inspect for worn, damaged or sticking Torque Converter Clutch Control Valve (333) or Torque Converter Clutch Regulator Apply Valve (337). Refer to: Transmission Fluid Pump Disassemble , and Transmission Fluid Pump Assemble

NO REVERSE GEAR

Checks	Causes
Control Valve Body (23)	• Inspect the 3-8 Clutch Regulator Valve (487) and Control Valve Body Ball Check Valve (453) for debris and stickiness. • Inspect the Clutch Selector Valve (467) and the Actuator Feed Limit Valve (451) for debris and stickiness.
Automatic Transmission Case (19)	• Inspect the Input Shaft Support (54) for missing or damaged Fluid Seal Rings (56).

Checks	Causes
5-7-Reverse and 6-7-8-9 Clutch Housing (516)	• Inspect for damaged, stripped or sheared splines on 5-7-Reverse Clutch Plate (579-580), 5-7-Reverse Clutch Backing Plate (581). • Inspect for stripped or sheared splines on 5-7-Reverse and 6-7-8-9 Clutch Housing (567) to Turbine Shaft (547). • 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 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for broken, porous or improper surface finish or plugged oil passages of the 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for failure of the 6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing (515). • Inspect for disengaged or broken 5-7-Reverse Clutch Backing Plate Retaining Ring (582). • Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (564 - 566). • Inspect for damaged or broken 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (562). • Inspect for broken or fatigued 3-5-Reverse Clutch Piston Retainer Spring (563). • Inspect for disengaged or broken Automatic Transmission Input Shaft Speed Sensor Reluctor Ring Retaining Ring (560). • Inspect for broken Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel (561).

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Repair Instructions - Off Vehicle - Equinox & Terrain

REPAIR INSTRUCTIONS - OFF VEHICLE

LIFT PLATE AND HOLDING FIXTURE INSTALLATION

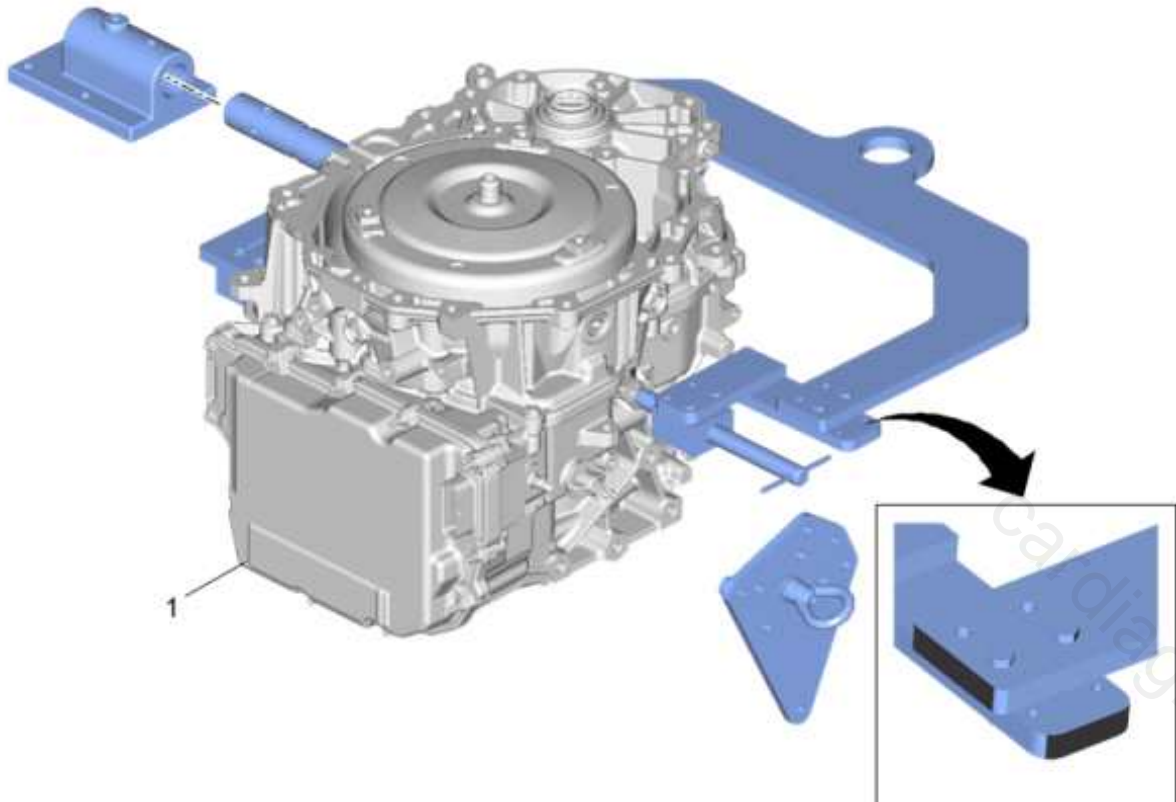


Fig. 1: Lift Plate And Holding Fixture

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1	Transmission Case WARNING: Handle with care, the transmission assembly weighs over 90.7 kg (200 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 1. Install DT-47811-A Lift Plate. 2. Tighten bolts and nut to 12 N.m (106 lb in). 3. Raise the transmission with an overhead hoist in order to install the holding fixture. 4. Adjust mounting block on DT-46625 Transmission Holding Fixture to match bosses on case, then tighten bolts to 13 N.m (10 lb ft). 5. Ensure the DT-3289-20 Holding Fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. DT-39890 Transmission Holding Fixture Adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. 6. Install lock pin for DT-3289-20 Holding Fixture. 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. Special Tools • DT-3289-20 Holding Fixture • DT-46625 Transmission Holding Fixture • DT-46625-10 Transmission Holding Fixture Adapter • DT-47811-A Lift Plate Equivalent regional tools: Special Tools .

TORQUE CONVERTER REMOVAL

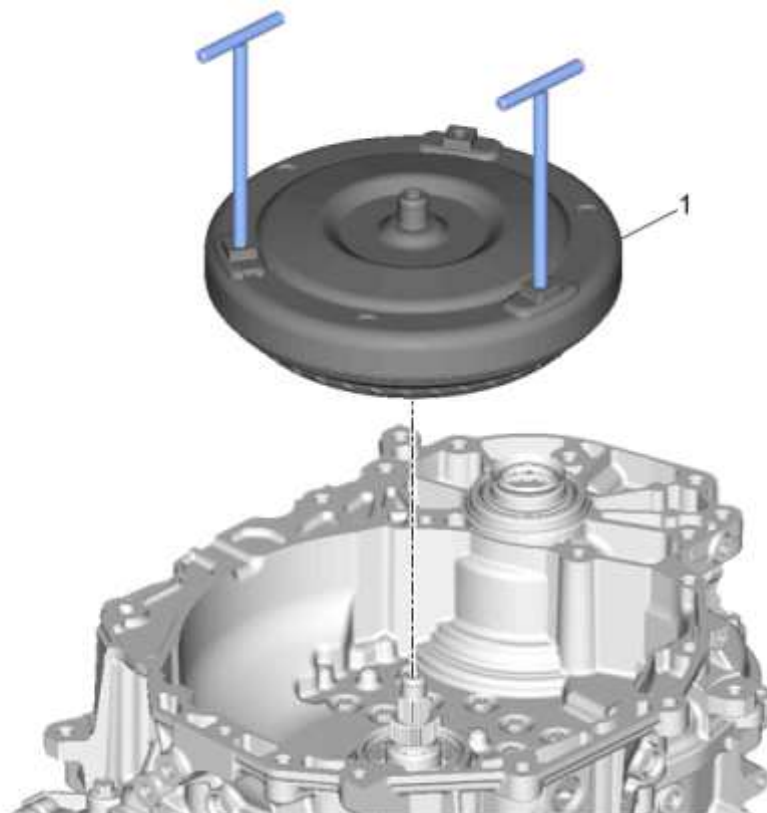


Fig. 2: Torque Converter

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter 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. Special Tools DT-46409 Torque Converter Lifting Handles Equivalent regional tools: Special Tools.

AUXILIARY FLUID ACCUMULATOR REMOVAL

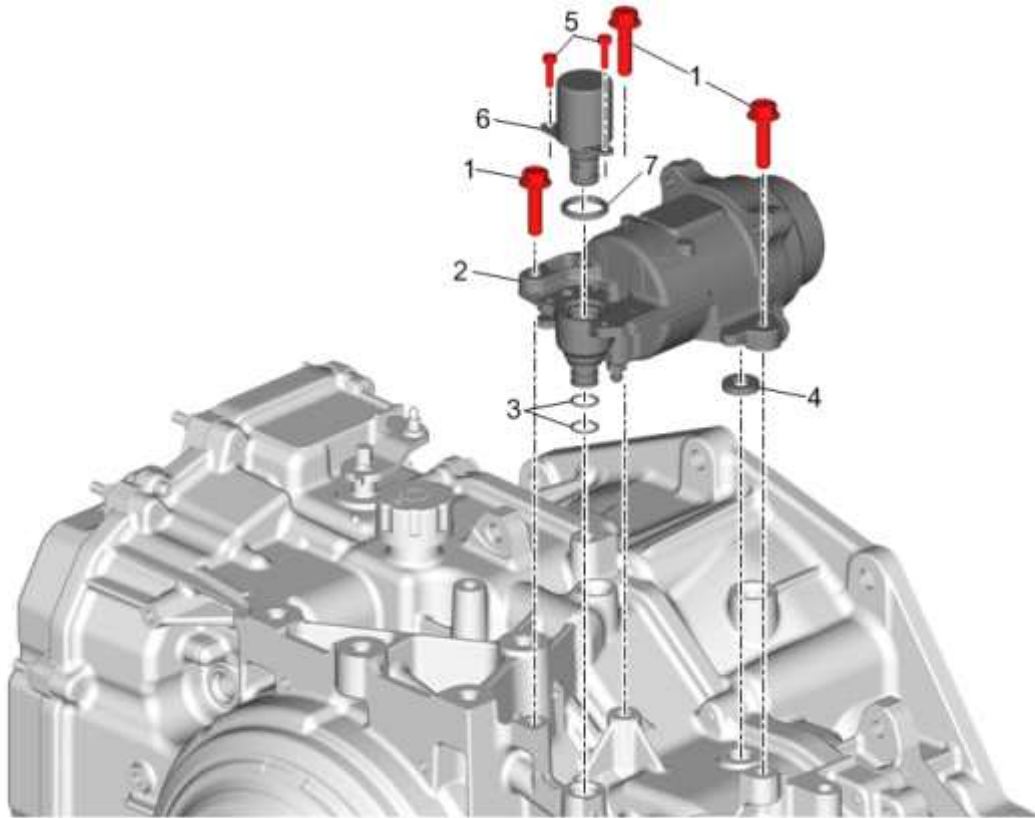


Fig. 3: Auxiliary Fluid Accumulator
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Auxiliary Fluid Accumulator Bolt (Qty: 3)
2	Automatic Transmission Auxiliary Fluid Accumulator
3	Automatic Transmission Case Seal (Qty: 2) NOTE: Remove and DISCARD the O-ring seal.
4	Accumulator Bypass Valve Seal NOTE: Remove and DISCARD the seal.
5	Shift On/Off Solenoid Valve NOTE: Repair or replace as necessary.
6	Accumulator Valve Body Bolt (Qty: 2)
7	Accumulator Bypass Valve Seal NOTE: Remove and DISCARD the seal.

CONTROL VALVE BODY COVER REMOVAL

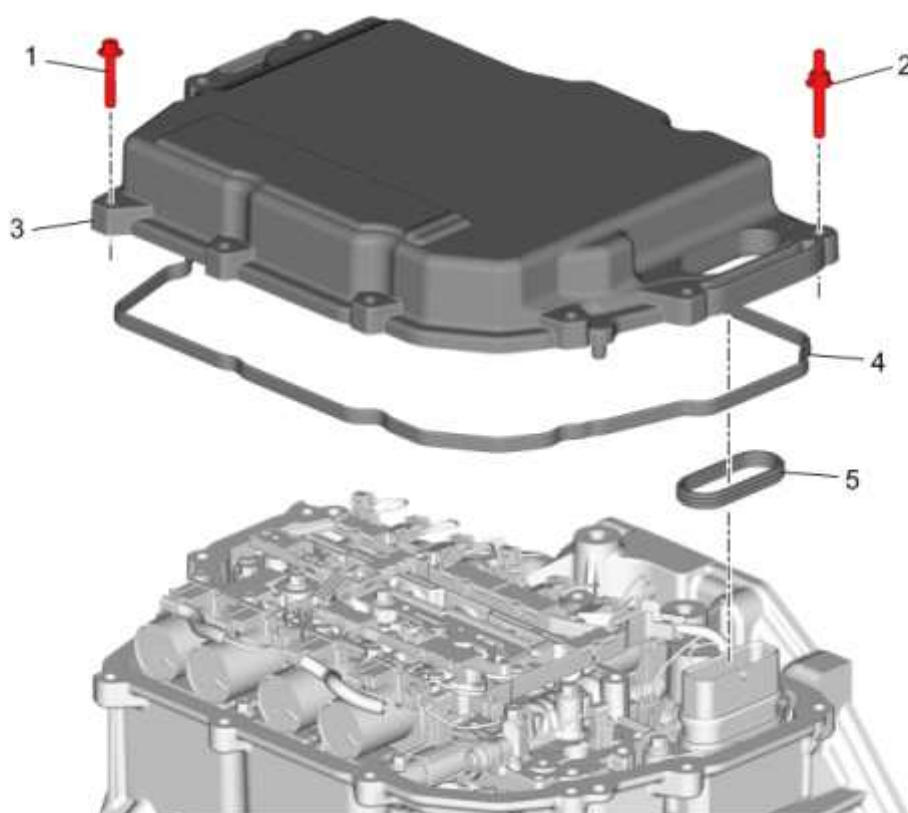


Fig. 4: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Control Valve Body Cover Bolt (Qty: 6)
2	Control Valve Body Cover Stud (Qty: 6)
3	Control Valve Body Cover
4	Control Valve Body Cover Gasket
5	Body Side Wiring Harness Opening Seal NOTE: DISCARD the seal.

CONTROL VALVE BODY ASSEMBLY REMOVAL (WITHOUT ETRS)

Control Valve Solenoid Body Wiring Harness Removal

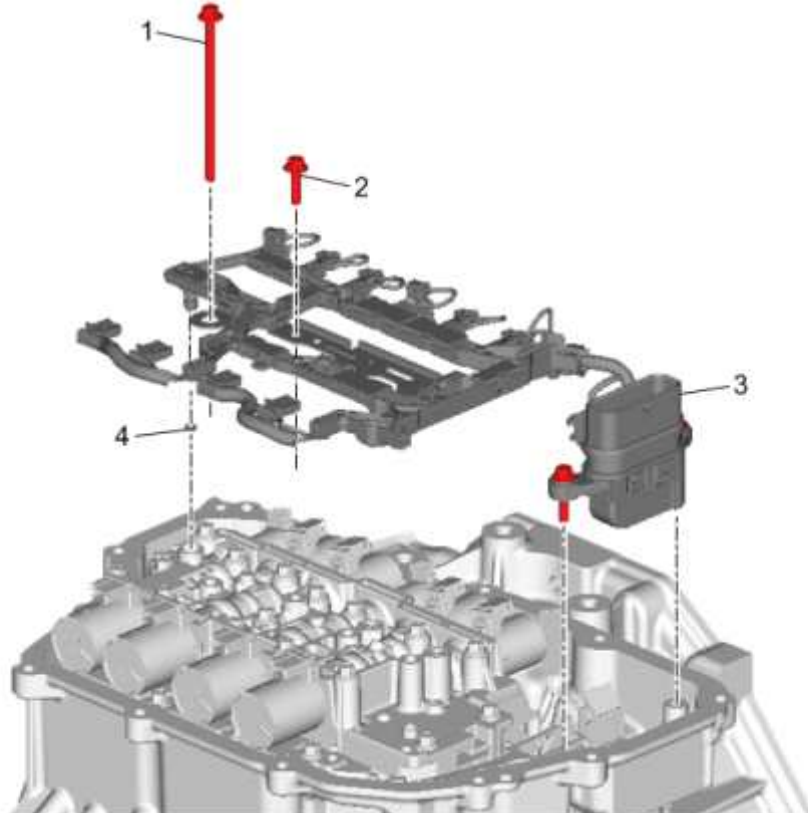


Fig. 5: Control Valve Solenoid Body Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Wiring Harness Removal

Callout	Component Name
1	Control Valve Body Bolt (Qty: 3)
2	Control Valve Solenoid Body Bolt
3	Automatic Transmission Wiring Harness Procedure 1. Ensure you disconnect all the connectors from the valve body. 2. On-Vehicle the Variable Feed Solenoid Clutch Accumulator Piston and Spring may fall out. Refer to Control Valve Body Assembly Disassemble (without ETRS). NOTE: The bolts are captured with harness.
4	Automatic Transmission Wiring Harness Seal NOTE: Remove and DISCARD the seal.

Control Valve Solenoid Body Removal

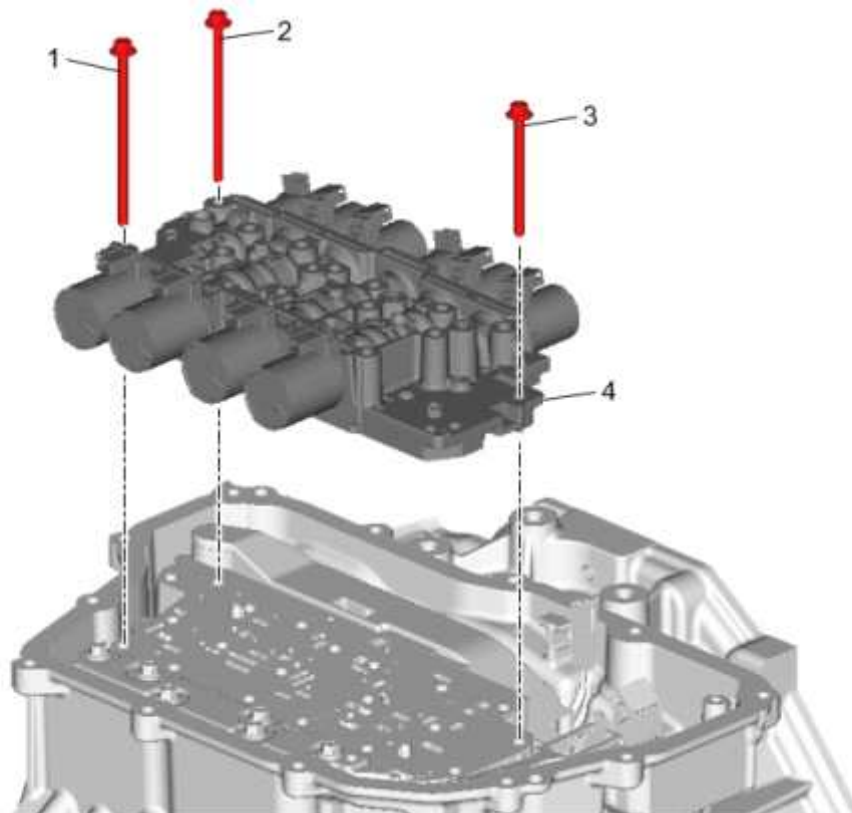


Fig. 6: Control Valve Solenoid Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Removal

Callout	Component Name
1	Control Valve Body Bolt (Qty: 5)
2	Control Valve Body Bolt (Qty: 9)
3	Control Valve Body Bolt (Qty: 3)
4	Control Valve Solenoid Body

Control Valve Body Removal

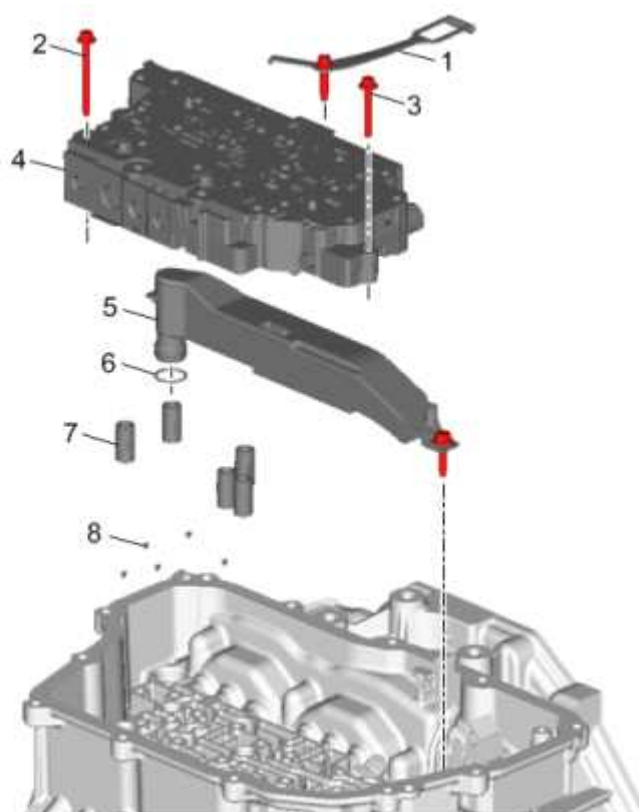


Fig. 7: Control Valve Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Removal

Callout	Component Name
1	Manual Shift Detent Lever Spring NOTE: The bolt is captured with spring.
2	Control Valve Body Bolt (Qty: 4)
3	Control Valve Body Bolt
4	Control Valve Body
5	Fluid Transfer Pipe NOTE: The bolt is captured with pipe.
6	Fluid Transfer Pipe Seal NOTE: Remove and DISCARD the seal.
7	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal (Qty: 5) NOTE: Remove and DISCARD the seal.
8	Control Valve Body Ball Check Valve (Qty: 5) NOTE: On-Vehicle these may fall out.

CONTROL VALVE BODY ASSEMBLY REMOVAL (WITH ETRS)

Control Valve Solenoid Body Wiring Harness Removal

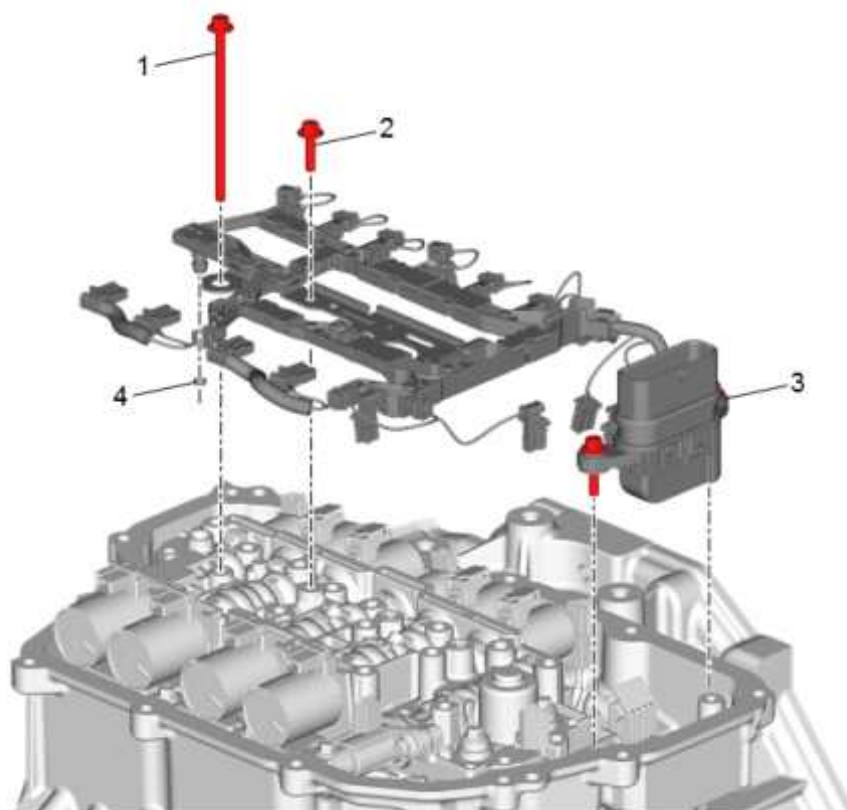


Fig. 8: Control Valve Solenoid Body Wiring Harness
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Wiring Harness Removal

Callout	Component Name
1	Control Valve Body Bolt (Qty: 3)
2	Control Valve Solenoid Body Bolt
3	Automatic Transmission Wiring Harness Procedure 1. Ensure you disconnect all the connectors from the valve body. 2. On-Vehicle the Variable Feed Solenoid Clutch Accumulator Piston and Spring may fall out. Refer to Control Valve Body Assembly Disassemble (with ETRS) . NOTE: The bolts are captured with harness.
4	Automatic Transmission Wiring Harness Seal Procedure Remove and DISCARD the seal.

Park Inhibitor Solenoid Removal

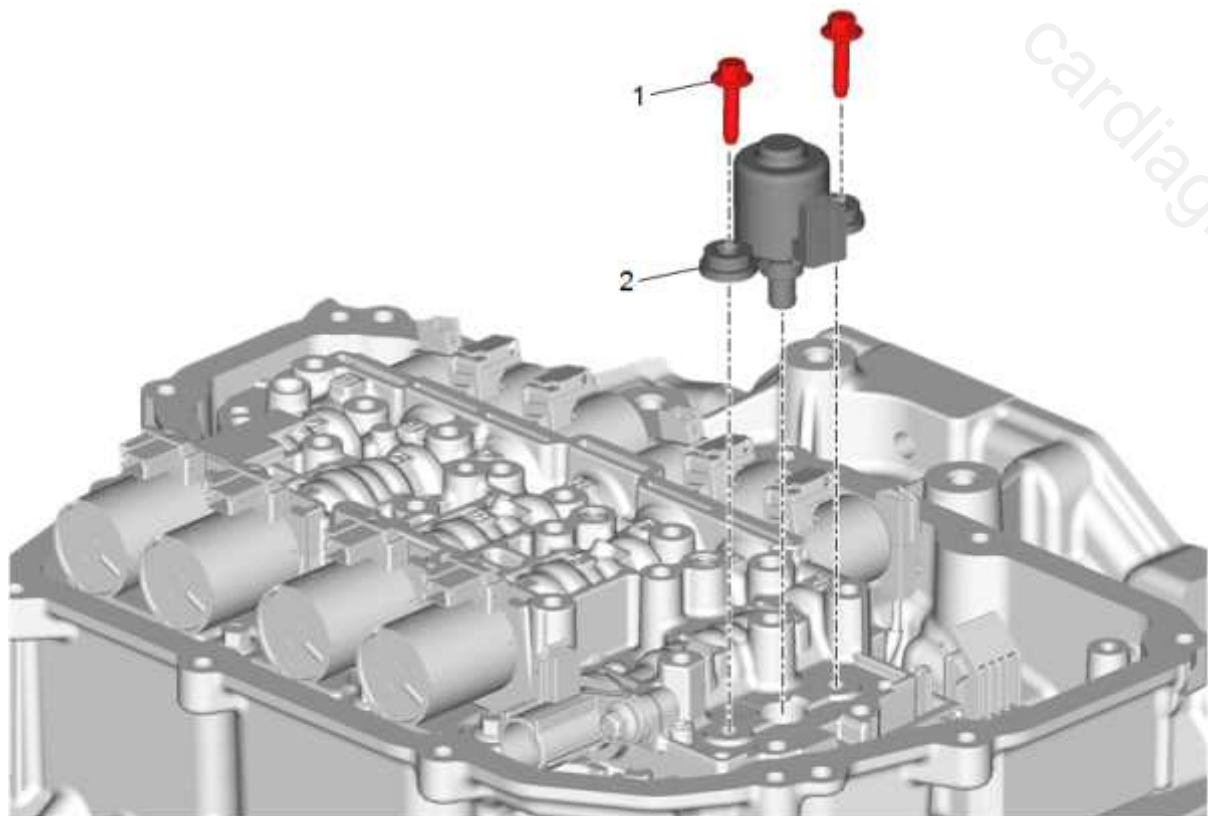


Fig. 9: Park Inhibitor Solenoid
 Courtesy of GENERAL MOTORS COMPANY

Park Inhibitor Solenoid Removal

Callout	Component Name
1	Control Valve Solenoid Body Bolt (Qty: 2)
2	Park Inhibitor Solenoid

Control Valve Solenoid Body Removal

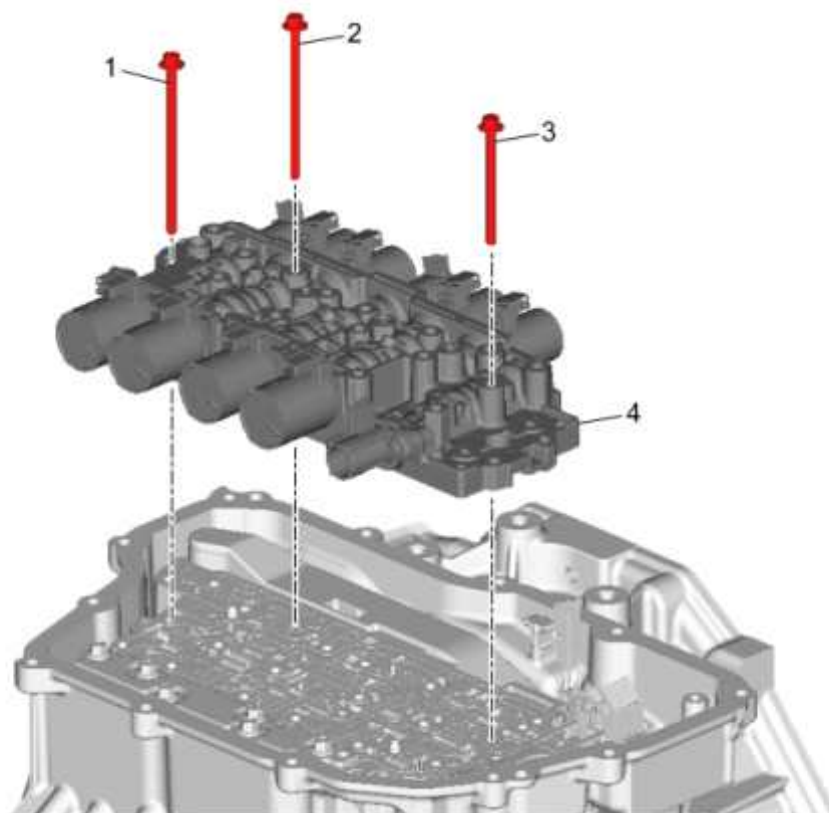


Fig. 10: Control Valve Solenoid Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Removal

Callout	Component Name
1	Control Valve Body Bolt (Qty: 5)
2	Control Valve Body Bolt (Qty: 12)
3	Control Valve Body Bolt (Qty: 3)
4	Control Valve Solenoid Body

Fluid Transfer Pipe Removal

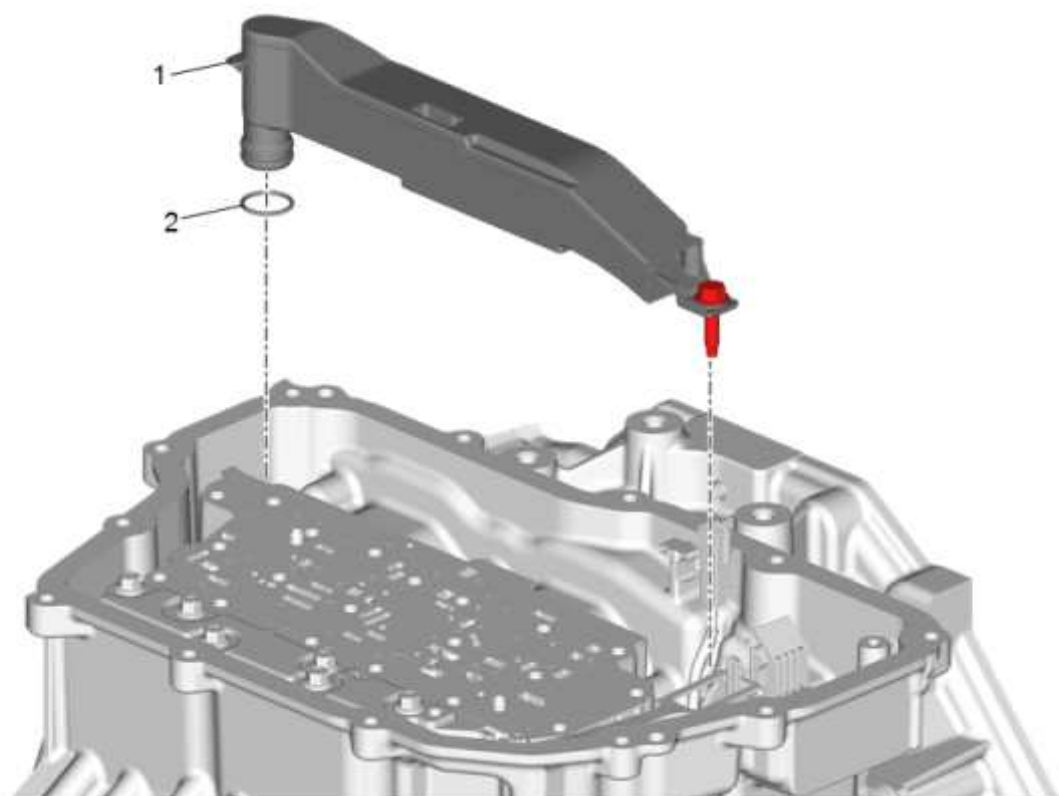


Fig. 11: Fluid Transfer Pipe
 Courtesy of GENERAL MOTORS COMPANY

Fluid Transfer Pipe Removal

Callout	Component Name
1	Fluid Transfer Pipe
2	Fluid Transfer Pipe Seal Procedure Remove and DISCARD the seal.

Control Valve Body Removal

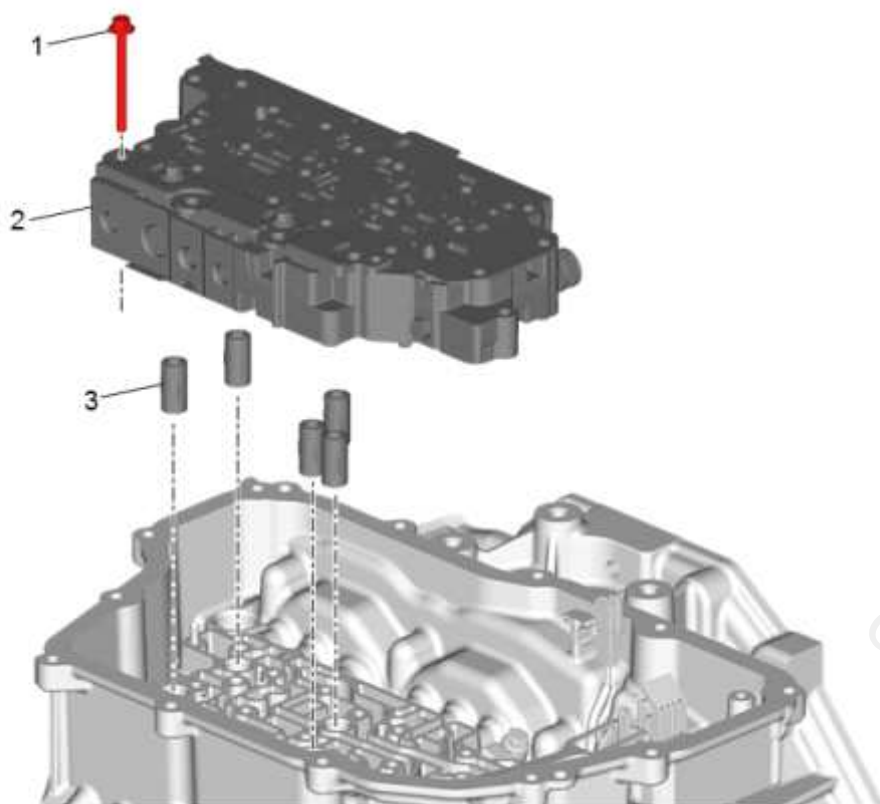


Fig. 12: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Removal

Callout	Component Name
1	Control Valve Body Bolt (Qty: 5)
2	Control Valve Body
3	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal (Qty: 5) Procedure Remove and DISCARD the seal.
4	Control Valve Body Ball Check Valve (Qty: 6) NOTE: On-Vehicle these may fall out.

Control Valve Body Ball Check Valve Removal

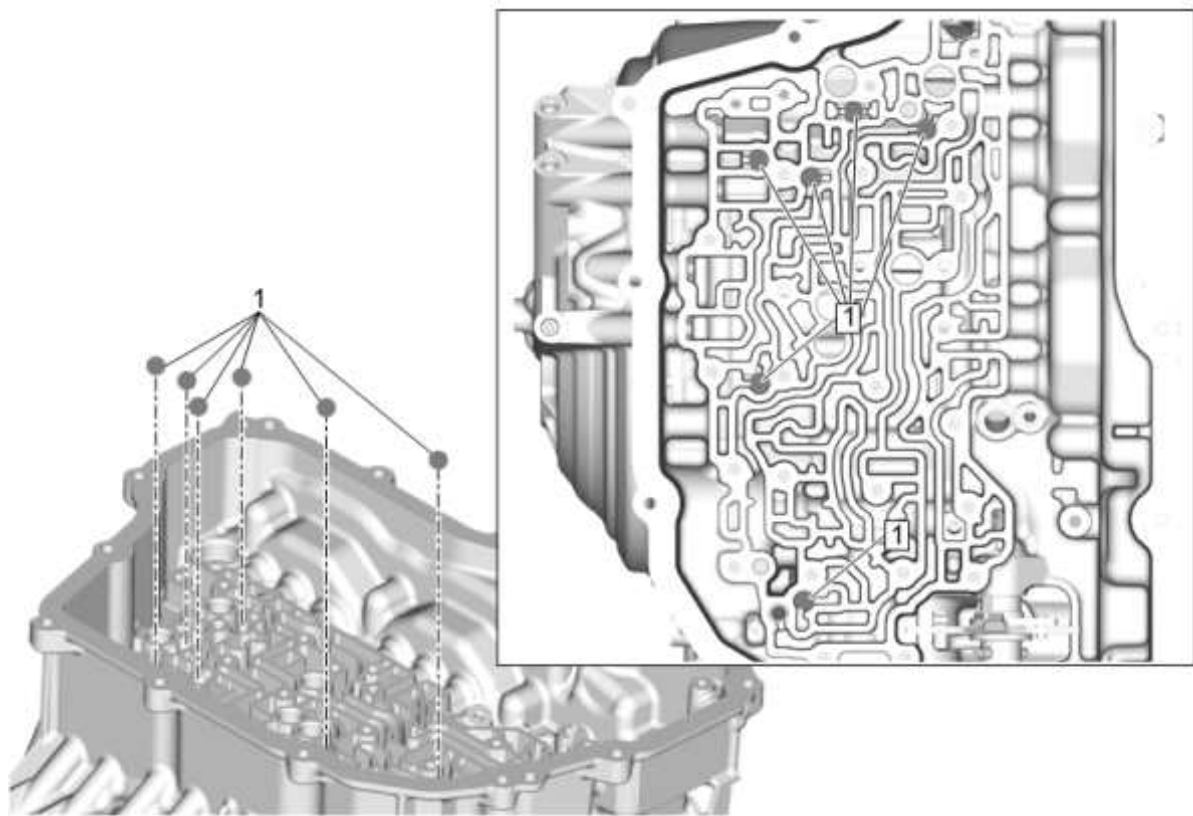


Fig. 13: Control Valve Body Ball Check Valve
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Ball Check Valve Removal

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 6)

INPUT AND OUTPUT SPEED SENSOR REMOVAL

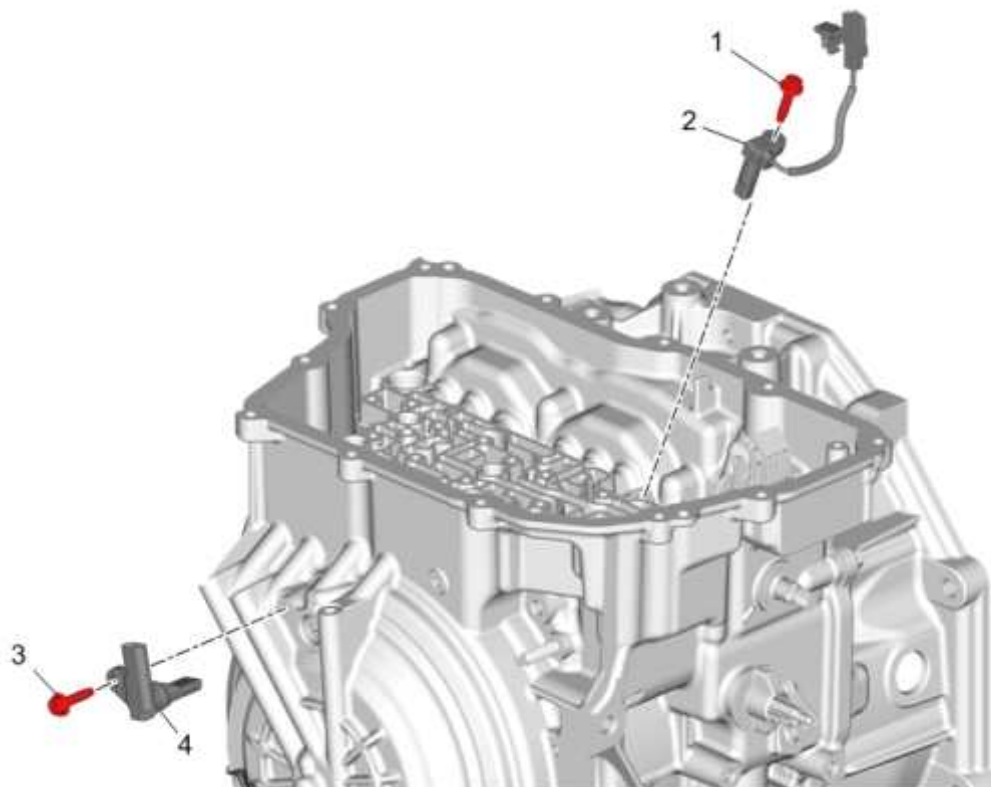


Fig. 14: Input And Output Speed Sensor
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Output Speed Sensor Bolt

Callout	Component Name
2	Automatic Transmission Output Speed Sensor
3	Automatic Transmission Input Speed Sensor Bolt
4	Automatic Transmission Input Speed Sensor

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY REMOVAL

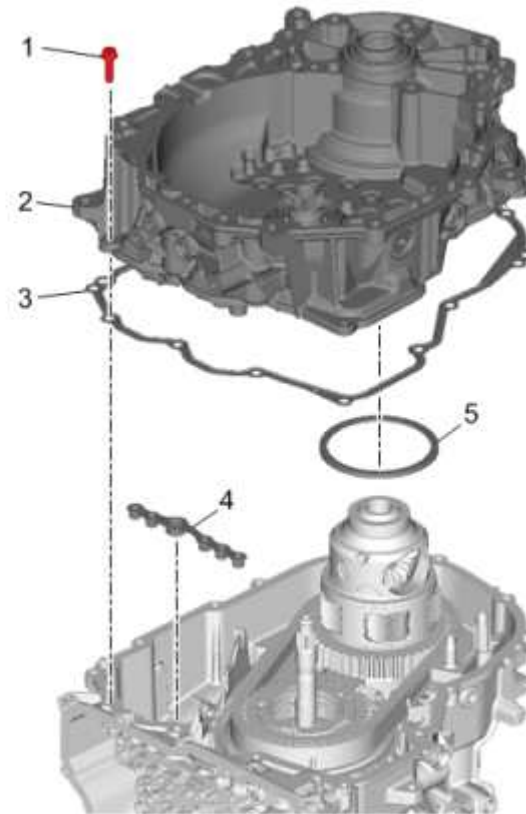


Fig. 15: Torque Converter Housing With Fluid Pump Assembly.
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter and Differential Housing Bolt (Qty: 14)
2	Torque Converter Housing
3	Torque Converter Housing Gasket NOTE: DISCARD the gasket.
4	Automatic Transmission Fluid Pump Seal NOTE: DISCARD the seal.
5	Front Differential Carrier Bearing

FRONT DIFFERENTIAL CARRIER REMOVAL

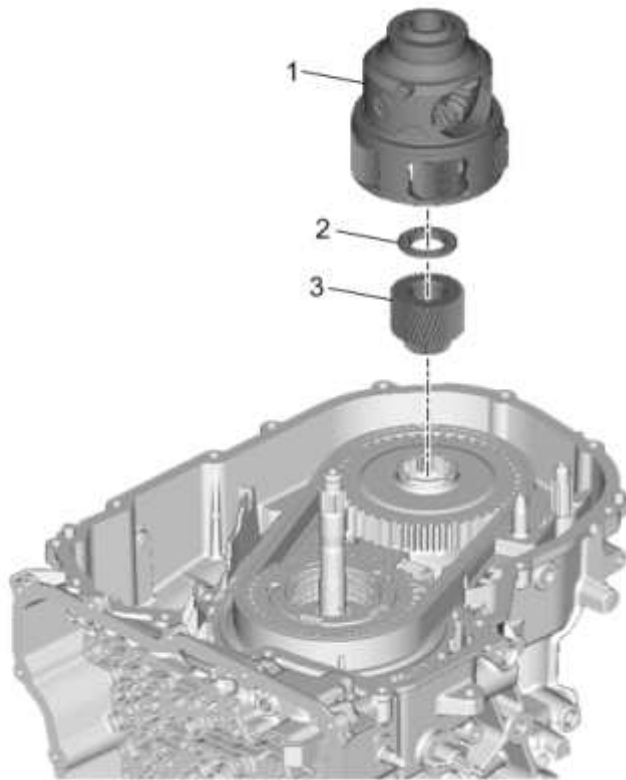


Fig. 16: Front Differential Carrier

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier
2	Differential Carrier Sun Gear Thrust Bearing
3	Front Differential Carrier Sun Gear

DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL REMOVAL

Drive Sprocket, Driven Sprocket, and Drive Link Removal

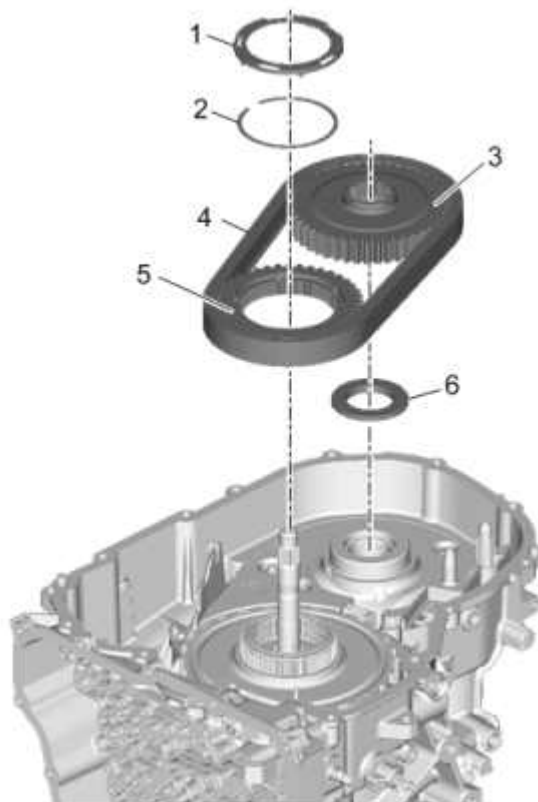


Fig. 17: Drive Sprocket, Driven Sprocket And Drive Link

Courtesy of GENERAL MOTORS COMPANY

Drive Sprocket, Driven Sprocket, and Drive Link Removal

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Drive Sprocket Retaining Ring
3	Driven Sprocket Procedure 1. The driven sprocket (3), drive sprocket (5), and drive link (4) must be removed at the same time. 2. The driven sprocket (3) ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.
4	Drive Link
5	Drive Sprocket
6	Driven Sprocket Bearing NOTE: The driven sprocket (3) bearing may be stuck to the driven sprocket.

Park Gear and Output Carrier Hub Removal

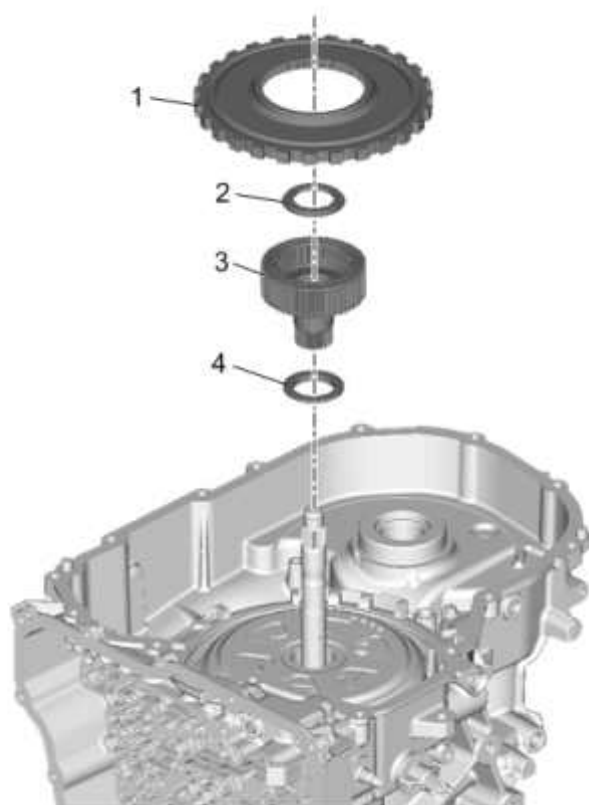


Fig. 18: Park Gear And Output Carrier Hub

Courtesy of GENERAL MOTORS COMPANY

Park Gear and Output Carrier Hub Removal

Callout	Component Name
1	Park Gear
2	Output Sun Gear Thrust Bearing
3	Output Carrier Transfer Drive Gear Hub
4	Output Sun Gear Thrust Bearing

Park Pawl and Front Differential Carrier Baffle Removal

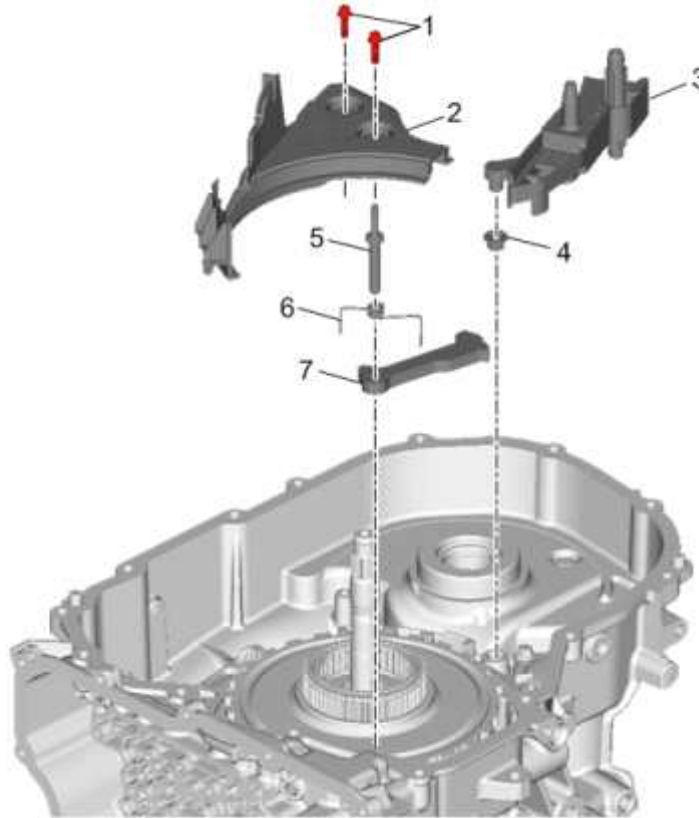


Fig. 19: Park Pawl And Front Differential Carrier Baffle

Courtesy of GENERAL MOTORS COMPANY

Park Pawl and Front Differential Carrier Baffle Removal

Callout	Component Name
1	Front Differential Carrier Baffle Bolt (Qty: 2)
2	Front Differential Carrier Baffle
3	Drive Link Lubricant Scoop
4	Drive Link Lubricant Fluid Seal
5	Park Pawl Shaft
6	Park Pawl
7	Park Pawl Spring

INTERNAL COMPONENTS REMOVAL

1-2-3-4-5-6 Clutch Piston Housing Retaining Ring, Output Sun Gear and 1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Removal

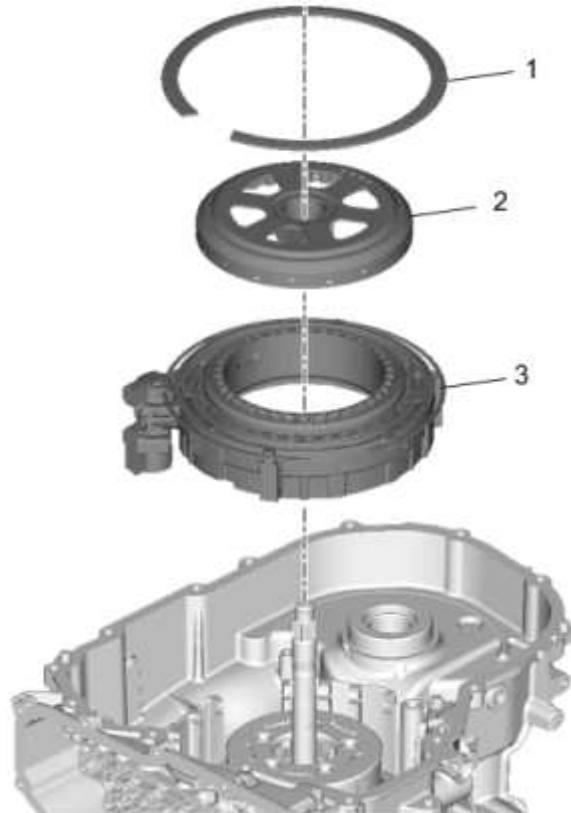


Fig. 20: 1-2-3-4-5-6 Clutch Piston Housing Retaining Ring, Output Sun Gear And 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing

Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-6 Clutch Piston Housing Return Ring, Output Sun Gear and 1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Removal

Callout	Component Name
1	1-2-3-4-5-6 Clutch Piston Housing Return 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 Equivalent regional tools: Special Tools
2	Output Sun Gear
3	1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing

2-9 and 4 Clutch Piston Housing and 2-9 Clutch Plates Removal

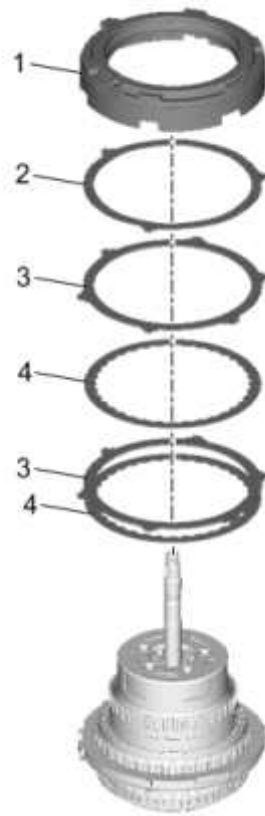


Fig. 21: 2 - 9 And 4 Clutch Piston Housing And 2-9 Clutch Plates
 Courtesy of GENERAL MOTORS COMPANY

2-9 and 4 Clutch Piston Housing and 2-9 Clutch Plates Removal

Callout	Component Name
1	2-9 and 4 Clutch Piston Housing
2	2-9 Clutch Plate - Wave
3	2-9 Clutch Plate (Qty: 2)
4	2-9 Clutch Plate - Friction (Qty: 2)

5-7-Reverse and 6-7-8-9 Clutch Housing Removal

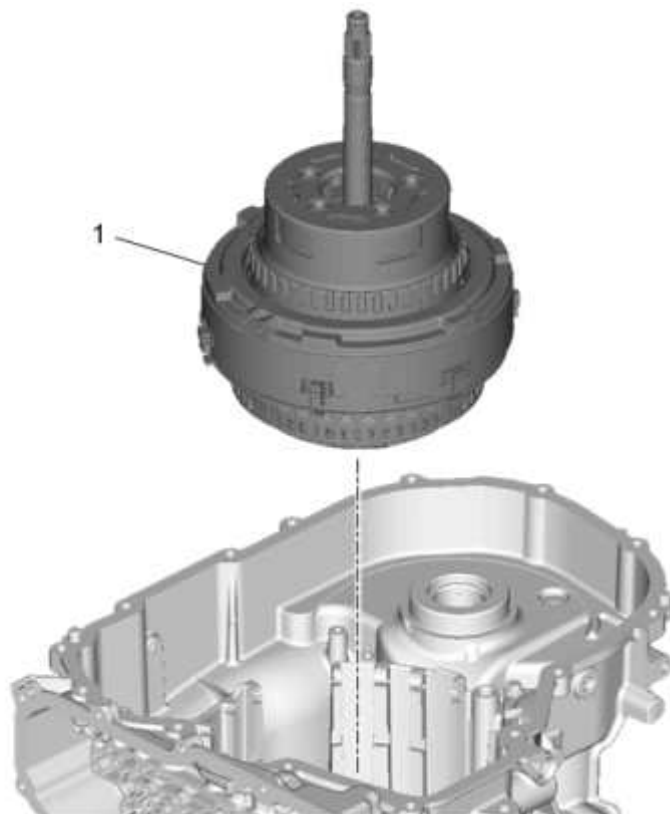


Fig. 22: 5-7-Reverse And 6-7-8-9 Clutch Housing
 Courtesy of GENERAL MOTORS COMPANY

5-7-Reverse and 6-7-8-9 Clutch Housing Removal

Callout	Component Name
1	5-7-Reverse and 6-7-8-9 Clutch Housing

3-8 CLUTCH PLATE REMOVAL

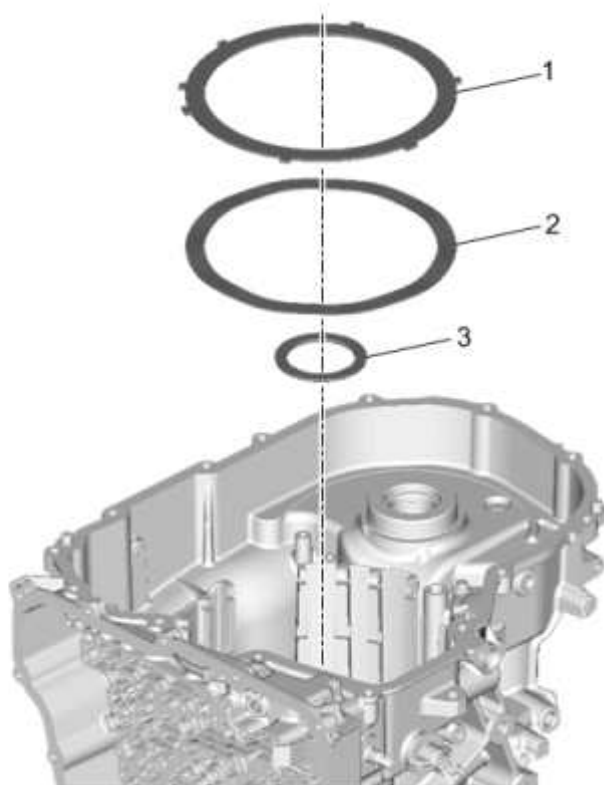


Fig. 23: 3-8 Clutch Plate

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3-8 Clutch Plate
2	3-8 Clutch Plate - Wave
3	6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing

3-8 CLUTCH PISTON REMOVAL

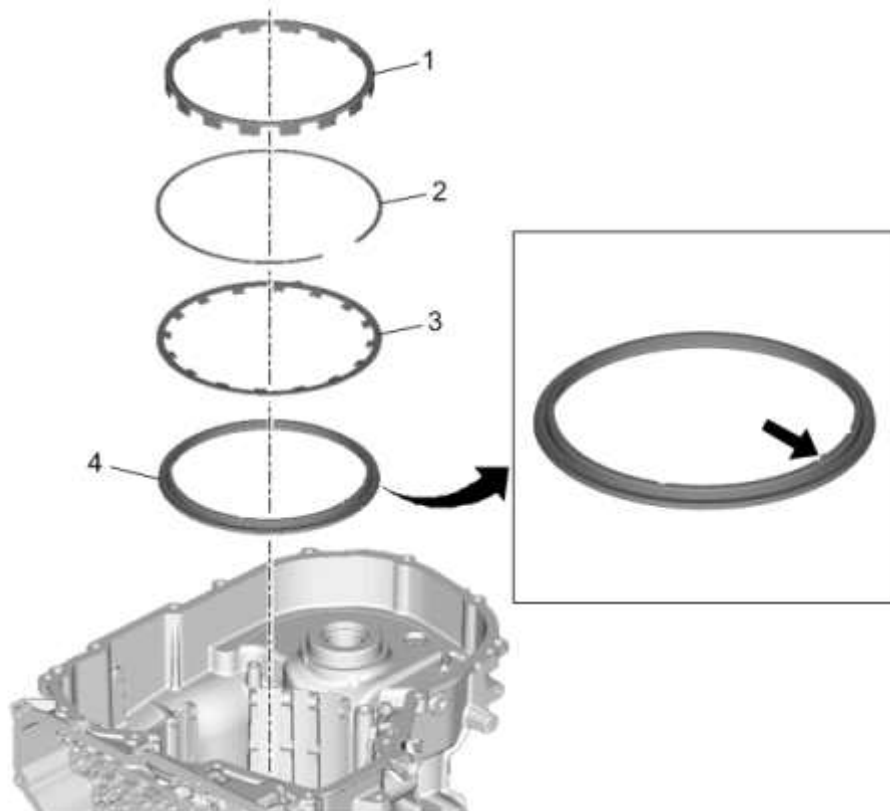


Fig. 24: 3-8 Clutch Piston

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3-8 Clutch Apply Ring
2	3-8 Clutch Spring Retaining Ring
3	3-8 Clutch Spring
4	3-8 Clutch Piston
	NOTE: Use thin tip screwdriver at the tab of the piston to remove.

TRANSMISSION FLUID FILTER ASSEMBLY REMOVAL

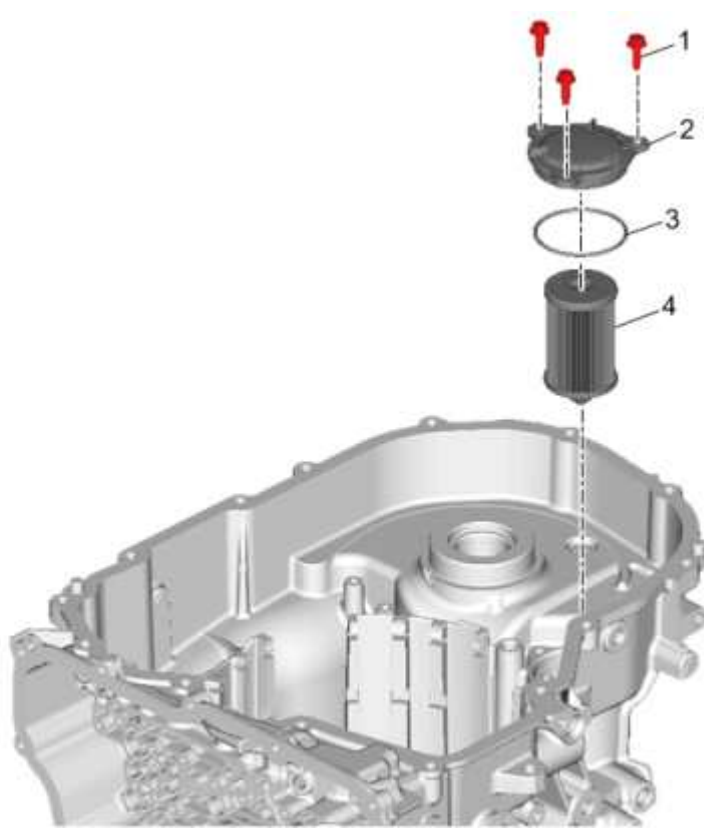


Fig. 25: Transmission Fluid Filter Assembly
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Fluid Filter Cover Bolt
2	Automatic Transmission Fluid Filter Cover
3	Automatic Transmission Fluid Filter Seal NOTE: Remove and DISCARD the seal.
4	Automatic Transmission Fluid Filter NOTE: Remove and DISCARD the filter.

PARK RELEASE LEVER AND PARK PAWL ACTUATOR REMOVAL

Manual Shift Shaft and Park Release Lever Removal

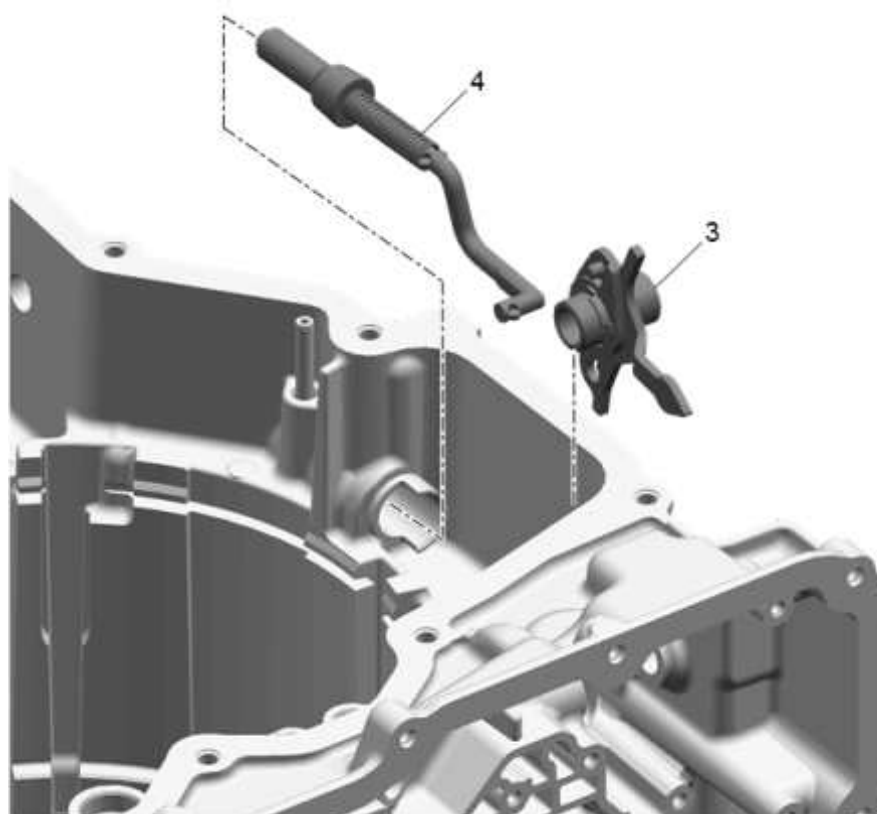


Fig. 26: Manual Shift Shaft And Park Release Lever
 Courtesy of GENERAL MOTORS COMPANY

Manual Shift Shaft and Park Release Lever Removal

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin NOTE: Use a punch from the top to remove the pin (1) and discard.
2	Manual Shift Shaft
3	Park Release Lever
4	Park Pawl Actuator

Park Pawl Actuator Guide Removal

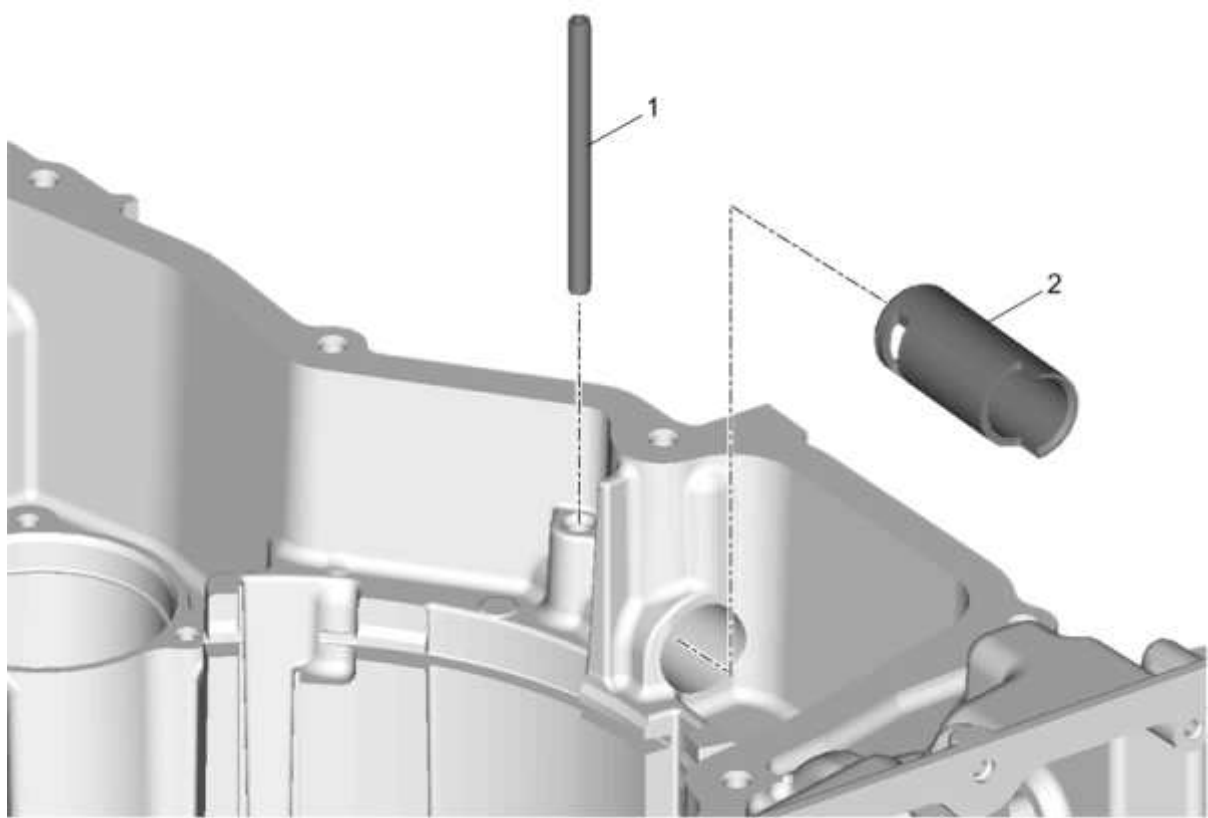


Fig. 27: Park Pawl Actuator Guide

Courtesy of GENERAL MOTORS COMPANY

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

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR REMOVAL

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

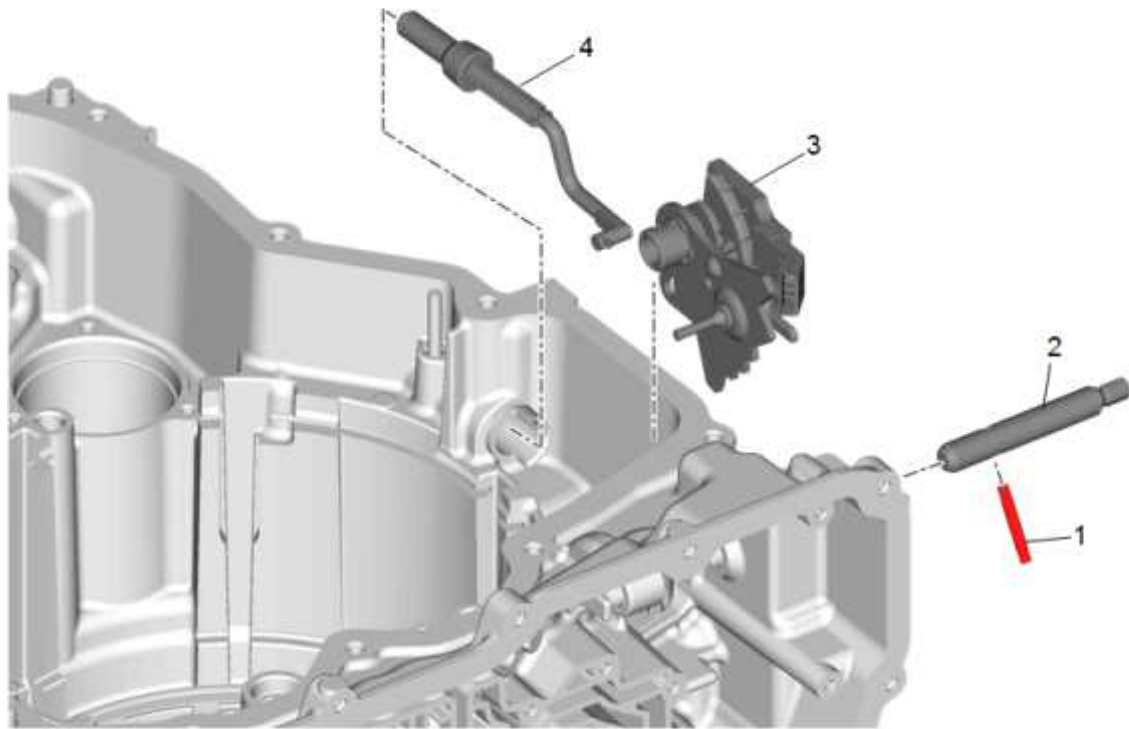


Fig. 28: Manual Shaft Detent (W/Shift Position Switch) Lever Assembly

Courtesy of GENERAL MOTORS COMPANY

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

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin NOTE: Use a punch from the top to remove the pin (1) and discard.
2	Manual Shaft
3	Manual Shaft Detent Lever Assembly
4	Park Pawl Actuator

Park Pawl Actuator Guide Removal

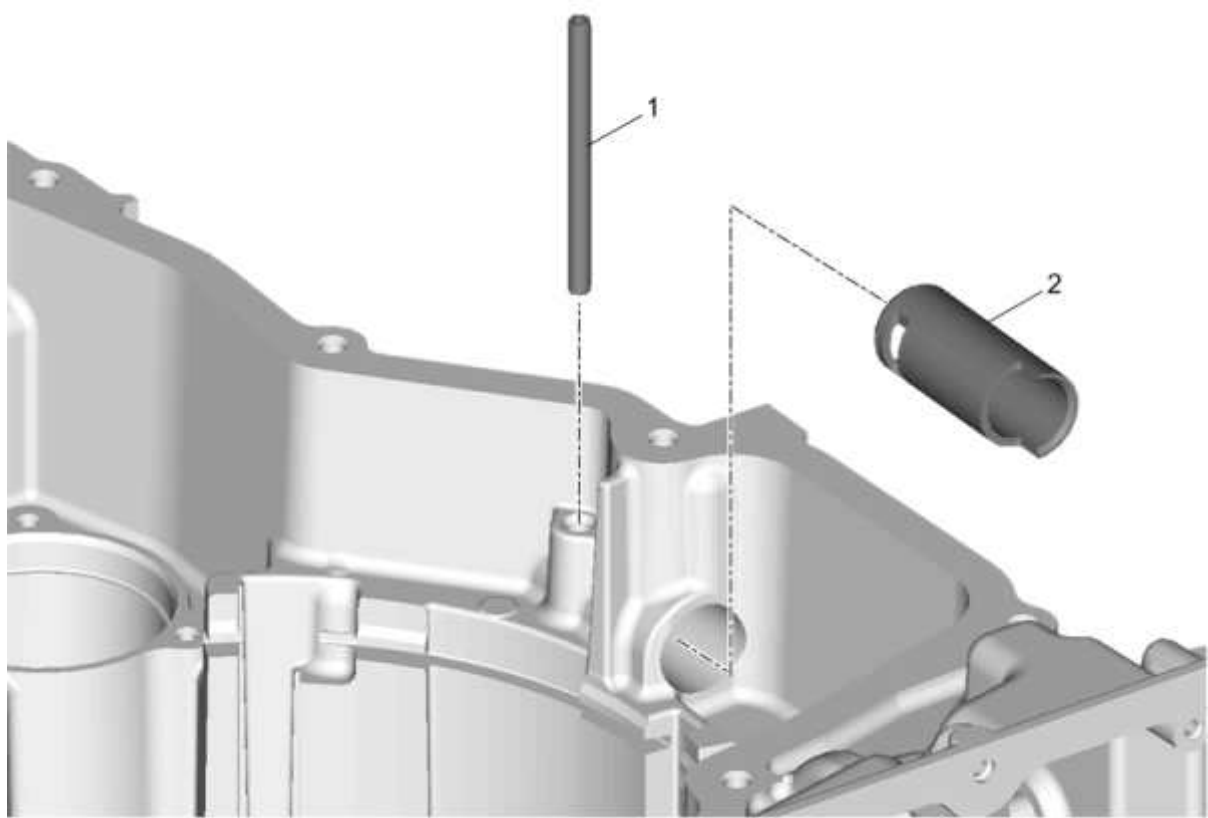


Fig. 29: Park Pawl Actuator Guide

Courtesy of GENERAL MOTORS COMPANY

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

MANUAL SHIFT SHAFT SEAL REMOVAL

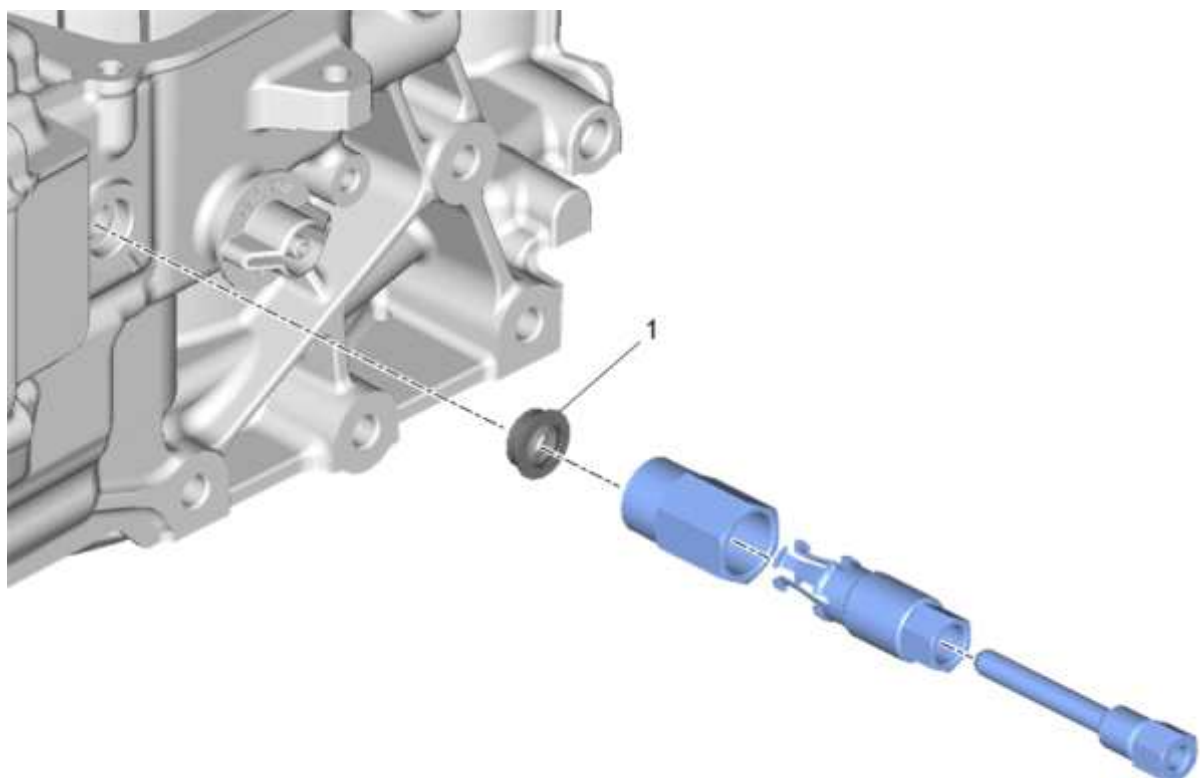


Fig. 30: Manual Shift Shaft Seal
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Shift Shaft Seal CAUTION: Do not damage the case bore during removal of the manual shift shaft seal. CAUTION: Refer to Seal Reuse Caution . NOTE: • Use the DT-45201 seal remover to remove the seal to prevent damage to the case surface. • Remove and DISCARD the seal. Special Tools DT-45201 Seal Remover Equivalent regional tools: Special Tools .

INPUT SHAFT SUPPORT OVERHAUL

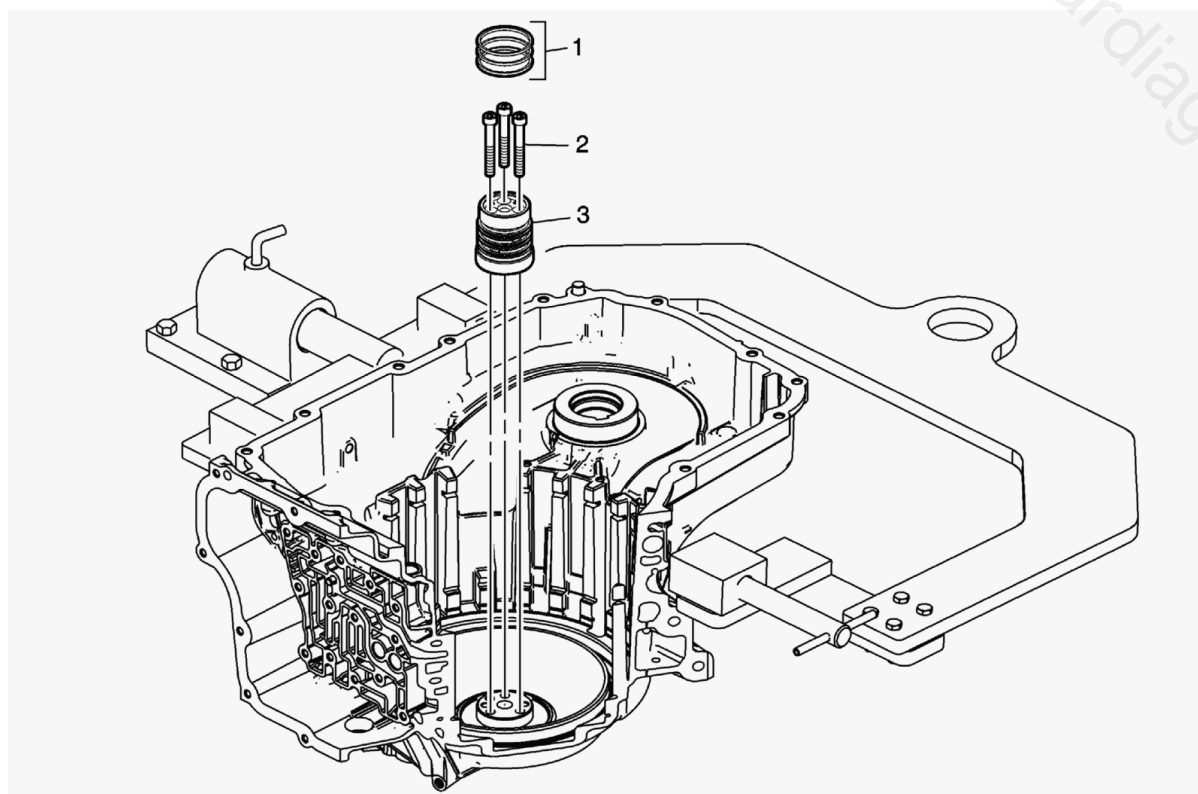


Fig. 31: Input Shaft Support
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Overhaul.
2	Input Shaft Support Bolts M6 x 50 (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
3	Input Shaft Support NOTE: Inspect the support for wear, damage or porosity.

3-5-REVERSE AND 4-5-6 CLUTCH FLUID SEAL RING OVERHAUL

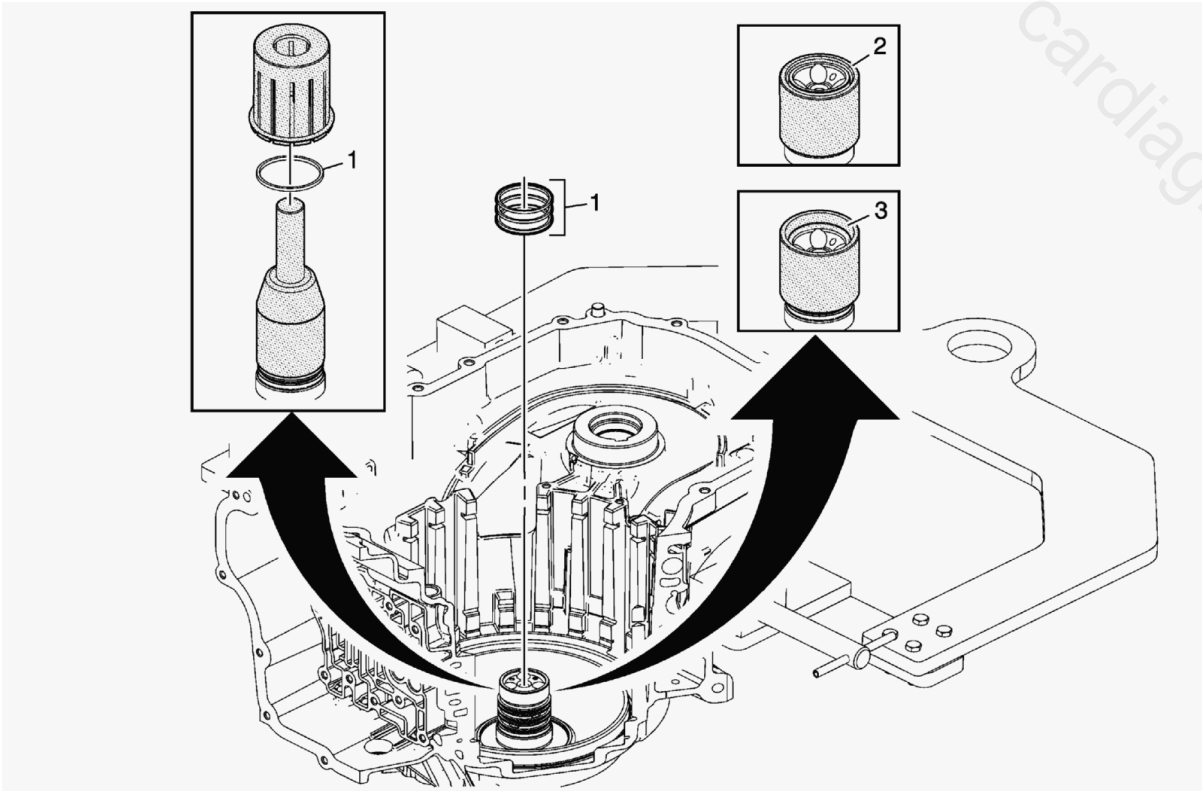


Fig. 32: 3-5-Reverse And 4-5-6 Clutch Fluid Seal Ring
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Special Tools DT-46620 Seal Installer For equivalent regional tools, refer to Special Tools .	
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Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3) 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 all 3 seal rings, adjusting DT-46620-3 which is part of DT-46620 seal installer to the appropriate ring groove.
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.

FRONT WHEEL DRIVE SHAFT SEAL REMOVAL - CASE SIDE

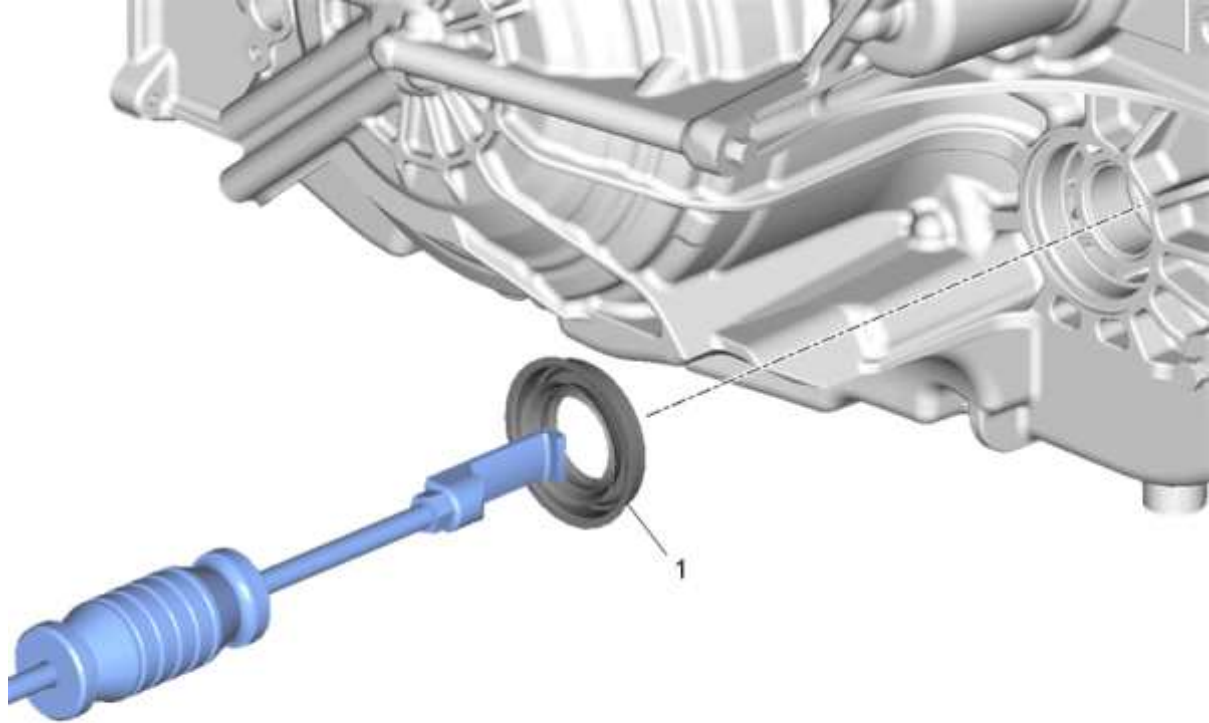


Fig. 33: Front Wheel Drive Shaft Seal - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal NOTE: Remove and DISCARD the seal. Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer Equivalent regional tools: <u>Special Tools</u>

4TH CLUTCH ACCUMULATOR PISTON REMOVAL

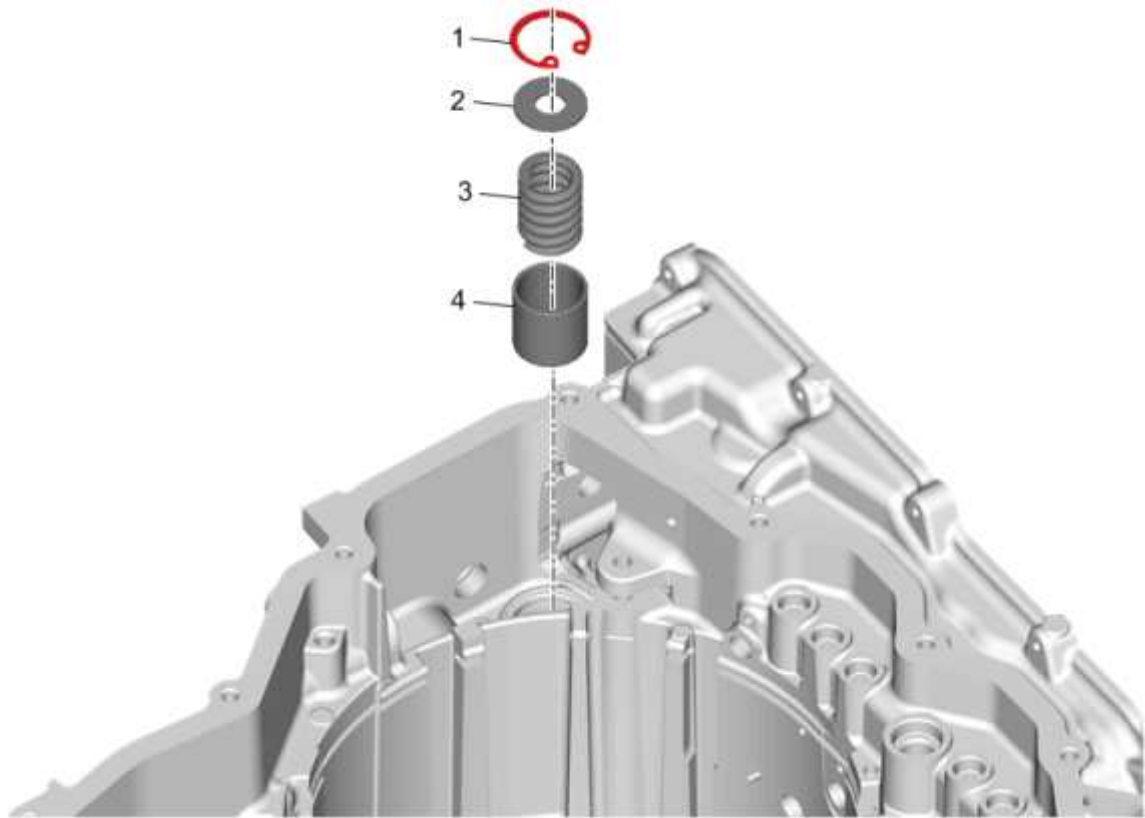


Fig. 34: 4th Clutch Accumulator Piston
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	4th Clutch Accumulator Piston Retaining Ring
2	4th Clutch Accumulator Piston Spring Washer
3	4th Clutch Accumulator Piston Spring
4	4th Clutch Accumulator Piston

TRANSMISSION CASE CLEANING AND INSPECTION

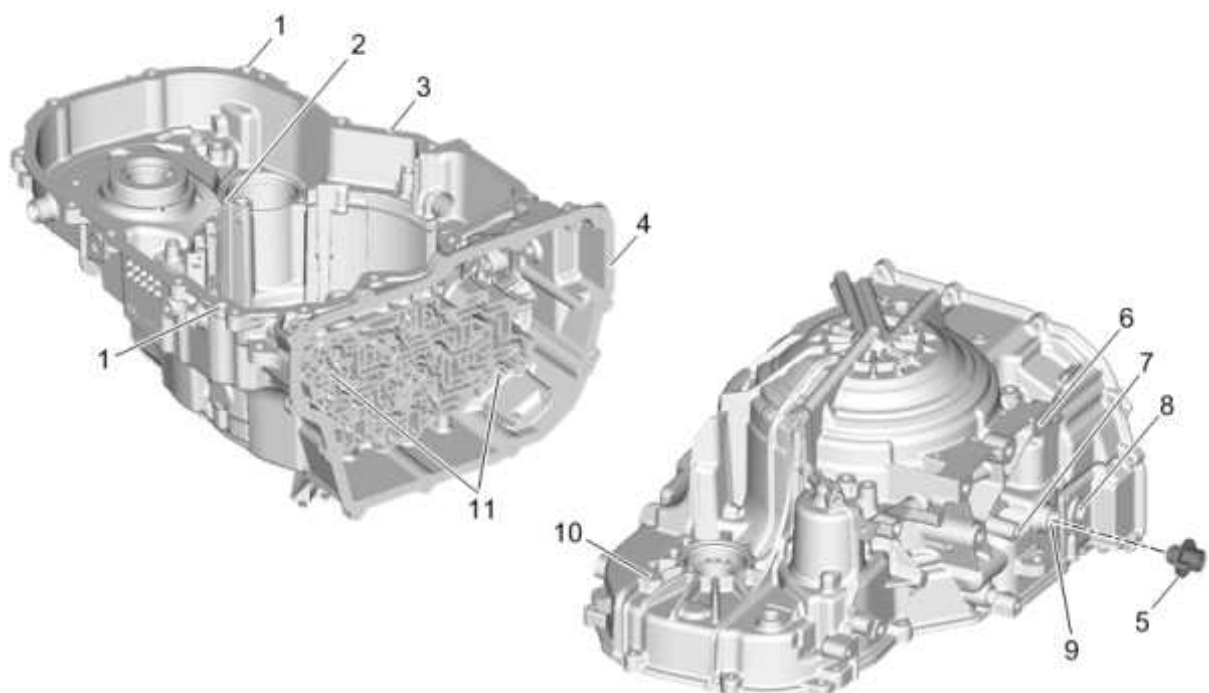


Fig. 35: Transmission Case Cleaning And Inspection Points
 Courtesy of GENERAL MOTORS COMPANY

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 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 transmission case assembly, including case threads, with clean solvent. 2. 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. NOTE: The locating pins installed height is 7.4 mm (0.29 in).
2	Fluid Trough Check Ball NOTE: 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 Hole Plug CAUTION: Refer to <u>Fastener Caution</u> . Tighten 12 N.m (106 lb in)
8	Manual Shift Shaft Seal Surface
9	Fluid Fill Cap Sealing Surface
10	Fluid Level Hole Plug Tighten 12 N.m (106 lb in)

Callout	Component Name
11	Valve Body Locating Pin Procedure Inspect the valve body locating pins. NOTE: The locating pins installed height is 5.8 mm (0.22 in).

4TH CLUTCH ACCUMULATOR PISTON INSTALLATION

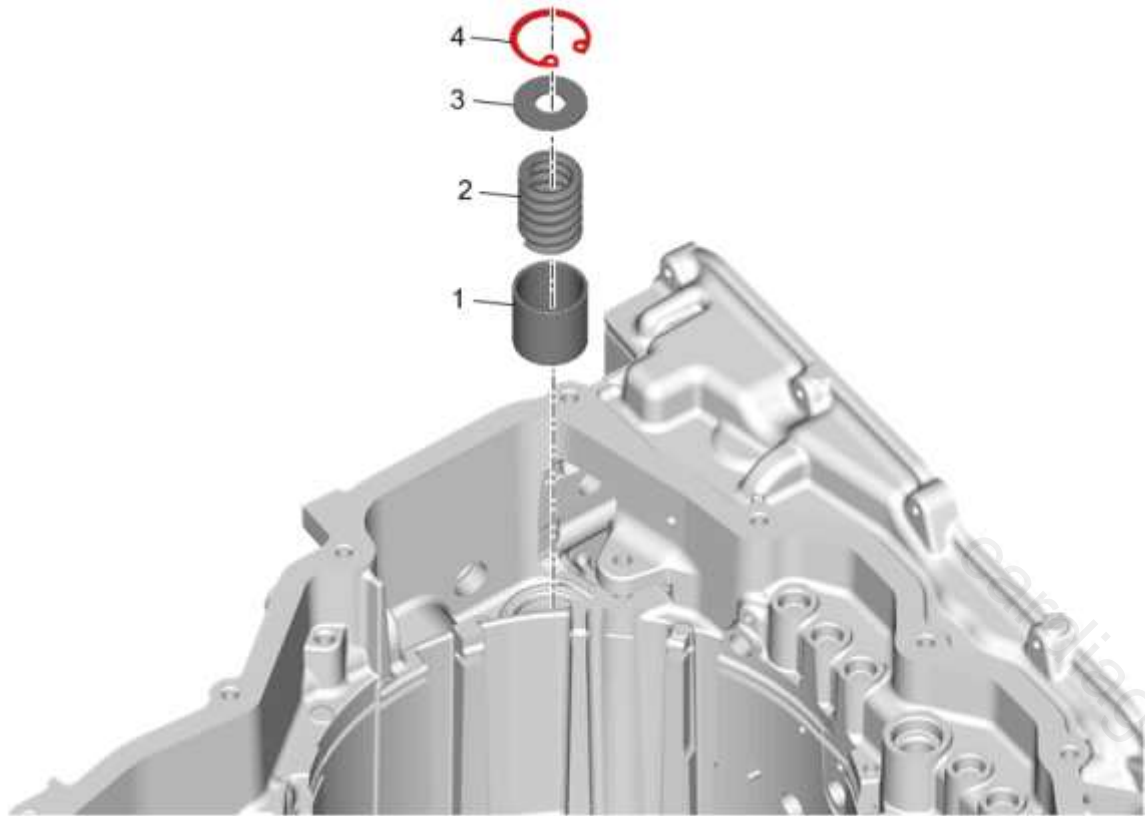


Fig. 36: 4th Clutch Accumulator Piston

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	4th Clutch Accumulator Piston
2	4th Clutch Accumulator Piston Spring
3	4th Clutch Accumulator Piston Spring Washer
4	4th Clutch Accumulator Piston Retaining Ring

FRONT WHEEL DRIVE SHAFT SEAL INSTALLATION - CASE SIDE

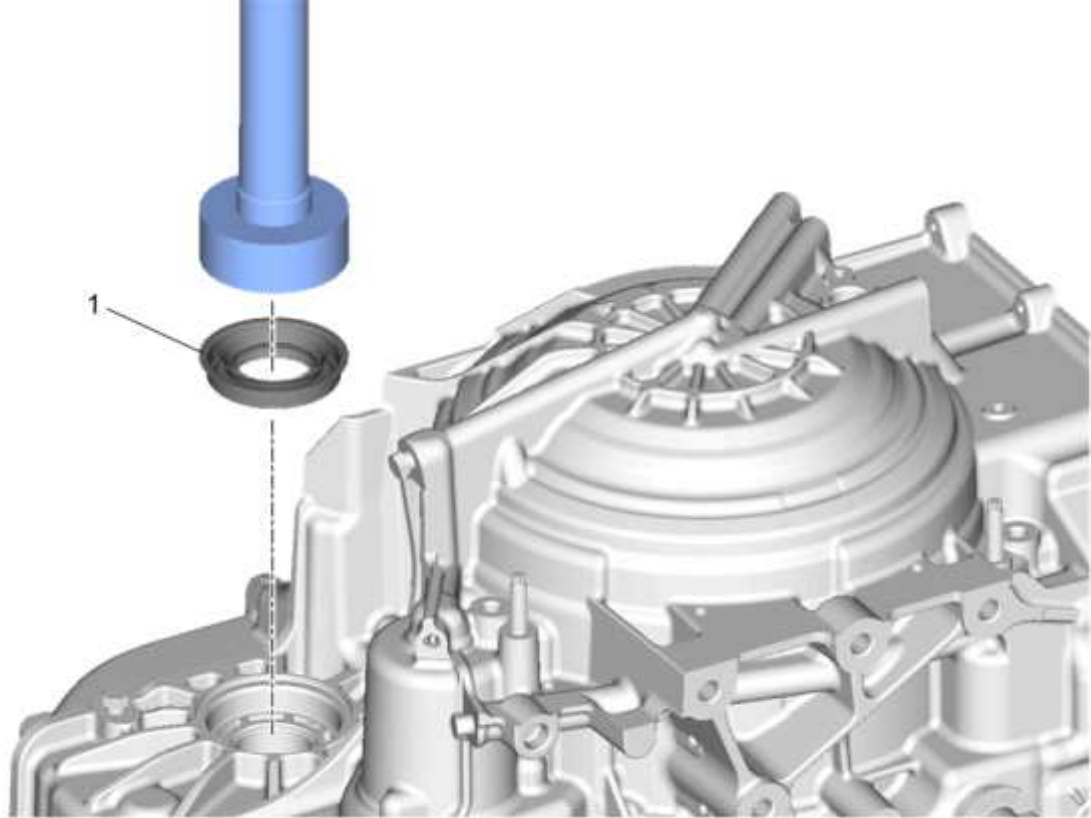


Fig. 37: Front Wheel Drive Shaft Seal - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal NOTE: Install a NEW seal. Do NOT reuse the old seal. Special Tools • DT-47790 Seal Installer • GE-8092 Driver Handle Equivalent regional tools: <u>Special Tools</u>

PARK RELEASE LEVER AND PARK PAWL ACTUATOR INSTALLATION

Park Pawl Actuator Guide Installation

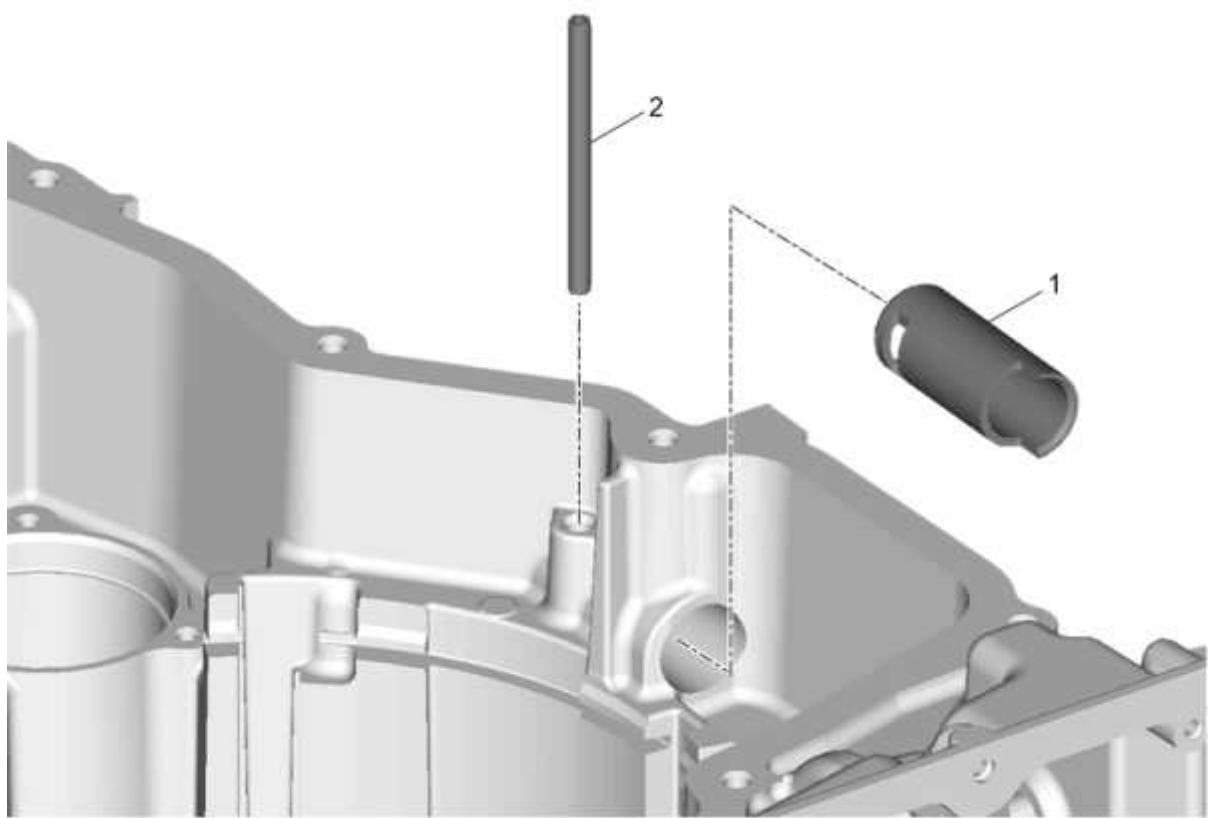


Fig. 38: Park Pawl Actuator Guide

Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Guide Installation

Callout	Component Name
1	Park Pawl Actuator Guide NOTE: Install park pawl actuator guide in proper orientation to allow pin to be fully installed. Failure to install properly can cause damage to guide or allow vehicle to not fully engage in park.
2	Park Pawl Actuator Guide Pin Procedure 1. Install a NEW park pawl actuator guide pin. 2. Install the park pawl actuator guide pin till bottoms out.

Manual Shift Shaft and Park Release Lever Installation

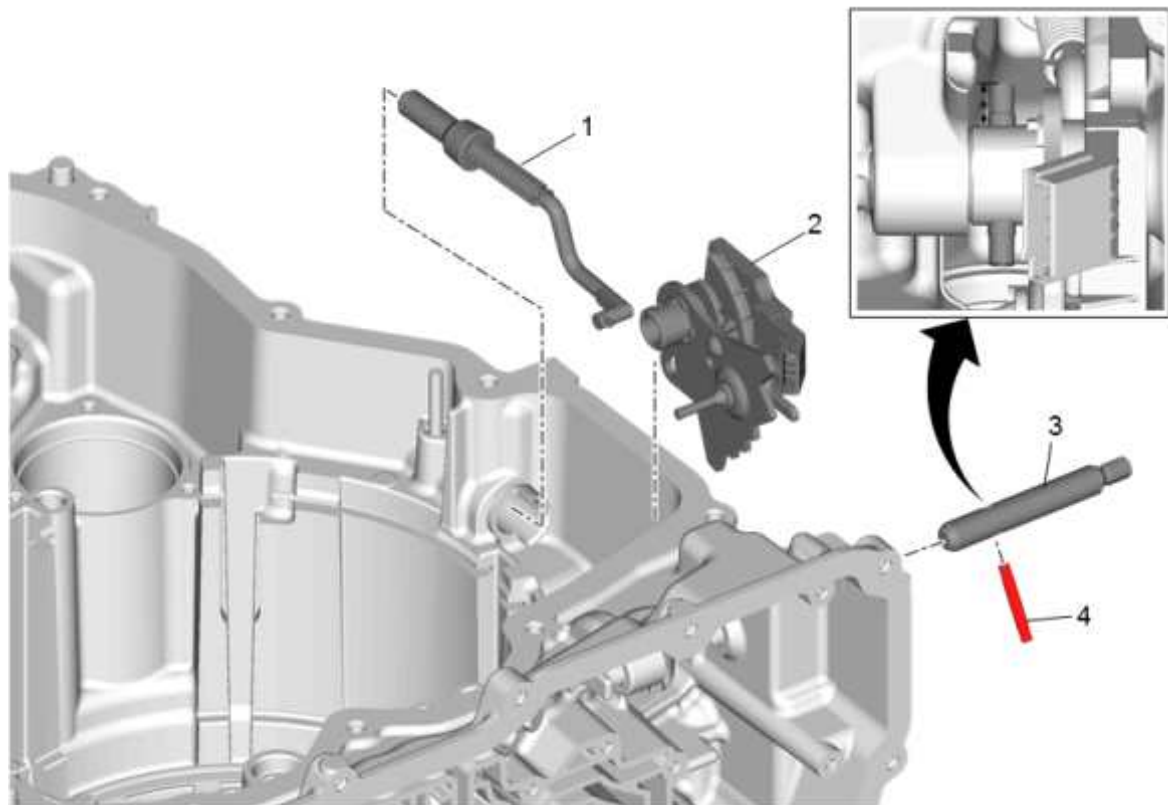


Fig. 39: Manual Shift Shaft And Park Release Lever

Courtesy of GENERAL MOTORS COMPANY

Manual Shift Shaft and Park Release Lever Installation

Callout	Component Name
1	Park Pawl Actuator
2	Park Release Lever
3	Manual Shift 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 1. Install a NEW manual shaft detent lever hub pin. 2. Install the manual shaft detent lever hub pin to correct height. Specification 7.9 mm (0.38 in) (a)

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

Park Pawl Actuator Guide Installation

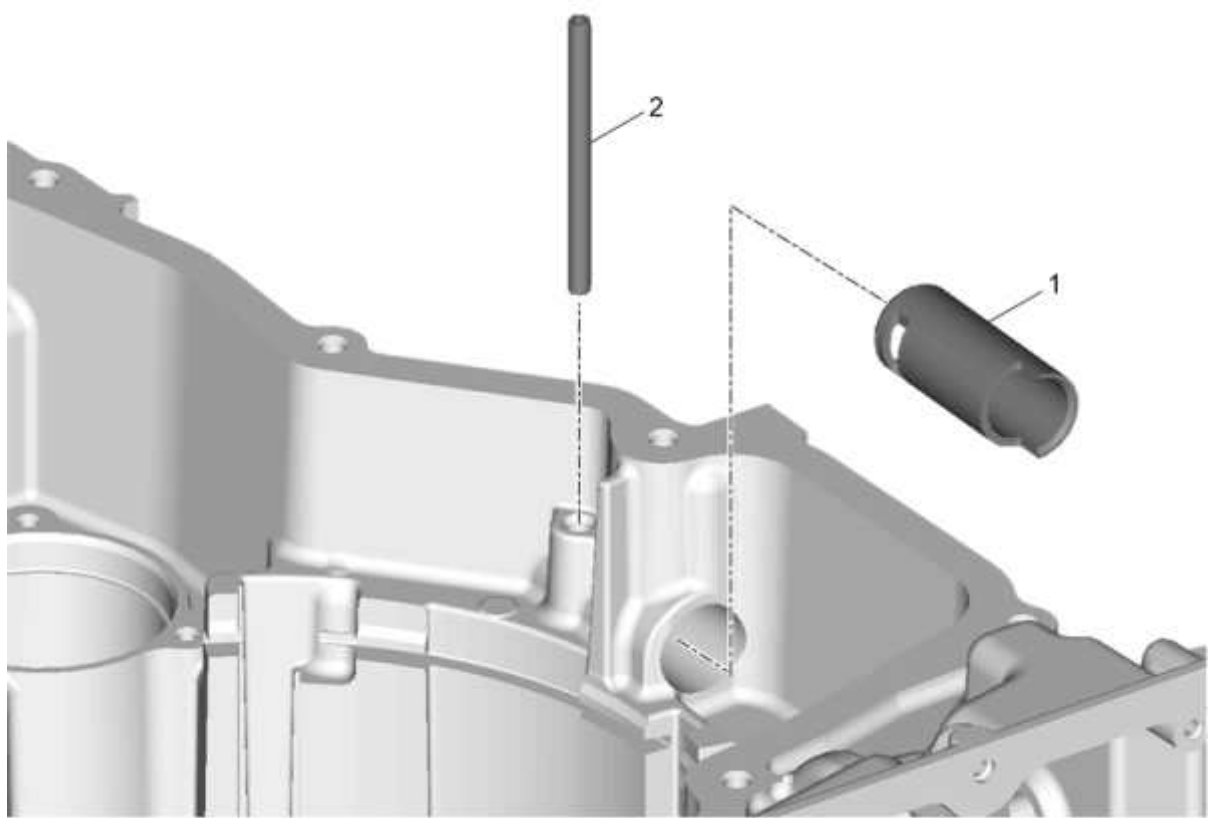


Fig. 40: Park Pawl Actuator Guide

Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Guide Installation

Callout	Component Name
1	Park Pawl Actuator Guide NOTE: Install park pawl actuator guide in proper orientation to allow pin to be fully installed. Failure to install properly can cause damage to guide or allow vehicle to not fully engage in park.
2	Park Pawl Actuator Guide Pin Procedure 1. Install a NEW park pawl actuator guide pin. 2. Install the park pawl actuator guide pin till bottoms out.

Park Pawl Actuator Installation

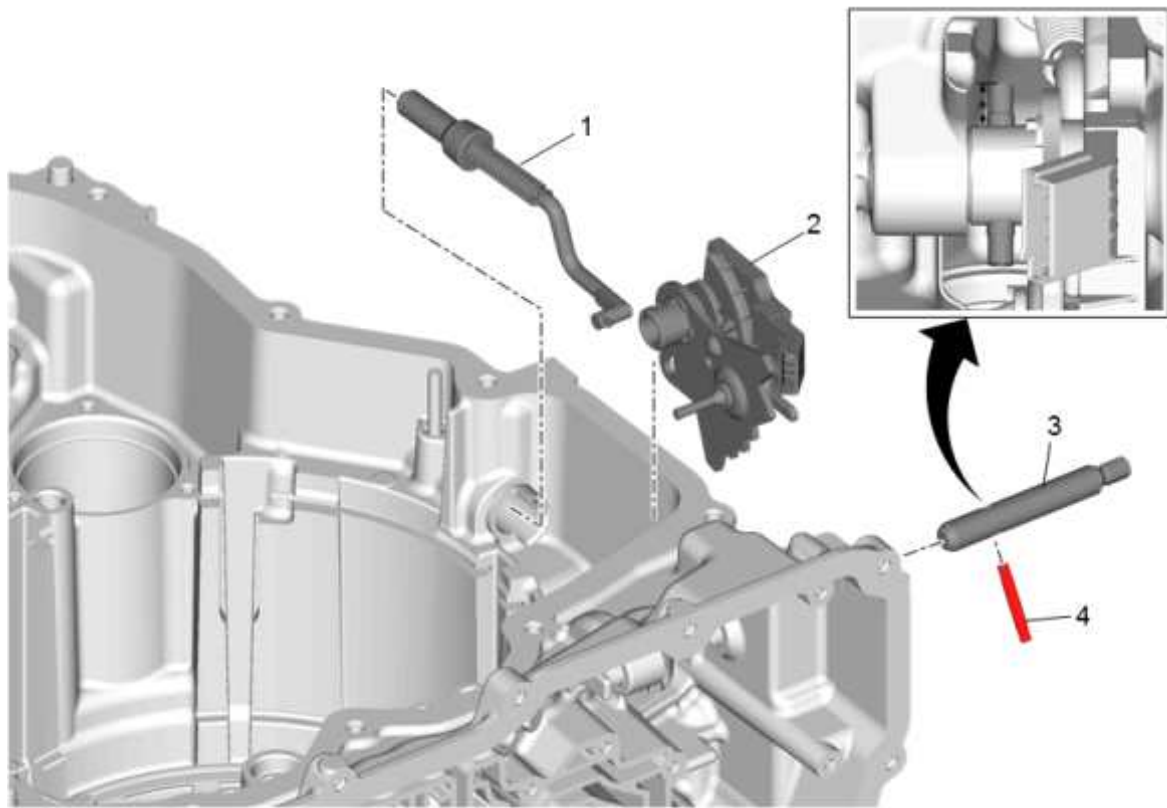


Fig. 41: Park Pawl Actuator

Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Installation

Callout	Component Name
1	Park Pawl Actuator
2	Manual Shaft Detent 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 1. Install a NEW manual shaft detent lever hub pin. 2. Install the manual shaft detent lever hub pin to correct height. Specification 7.9 mm (0.38 in) (a)

MANUAL SHIFT SHAFT SEAL INSTALLATION

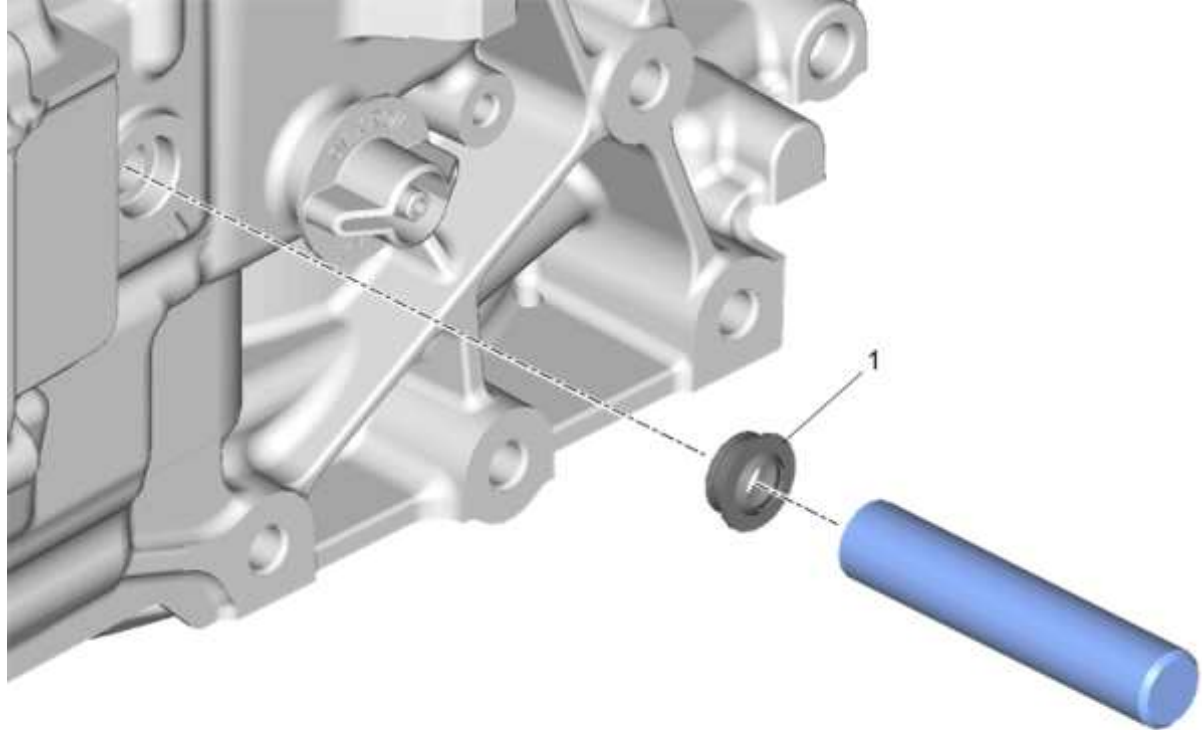


Fig. 42: Manual Shift Shaft Seal

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Shift Shaft Seal CAUTION: When installing the seal, ensure the seal lip is firmly seated against the case bore surface. Do not allow the seal lip to be crushed, or a leak may result. NOTE: Install a NEW seal. Do NOT reuse the old seal. Special Tool DT-49101 Seal Installer Equivalent regional tools: Special Tools .

TRANSMISSION FLUID FILTER ASSEMBLY INSTALLATION

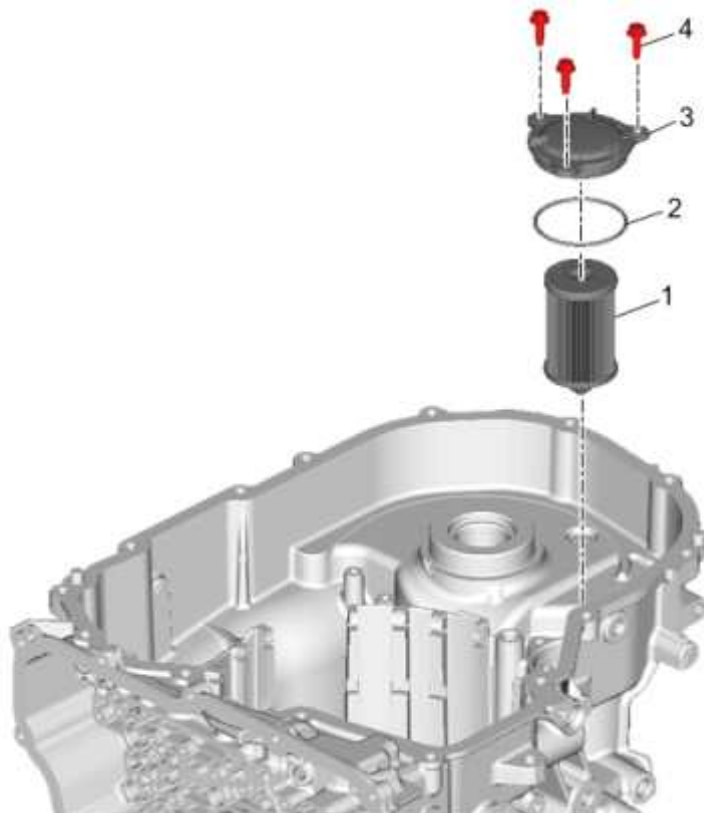


Fig. 43: Transmission Fluid Filter Assembly
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Fluid Filter NOTE: Install a NEW filter. DO NOT reuse old filter.
2	Automatic Transmission Fluid Filter Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	Automatic Transmission Fluid Filter Cover
4	Automatic Transmission Fluid Filter Cover Bolt CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)

3-8 CLUTCH PISTON INSTALLATION

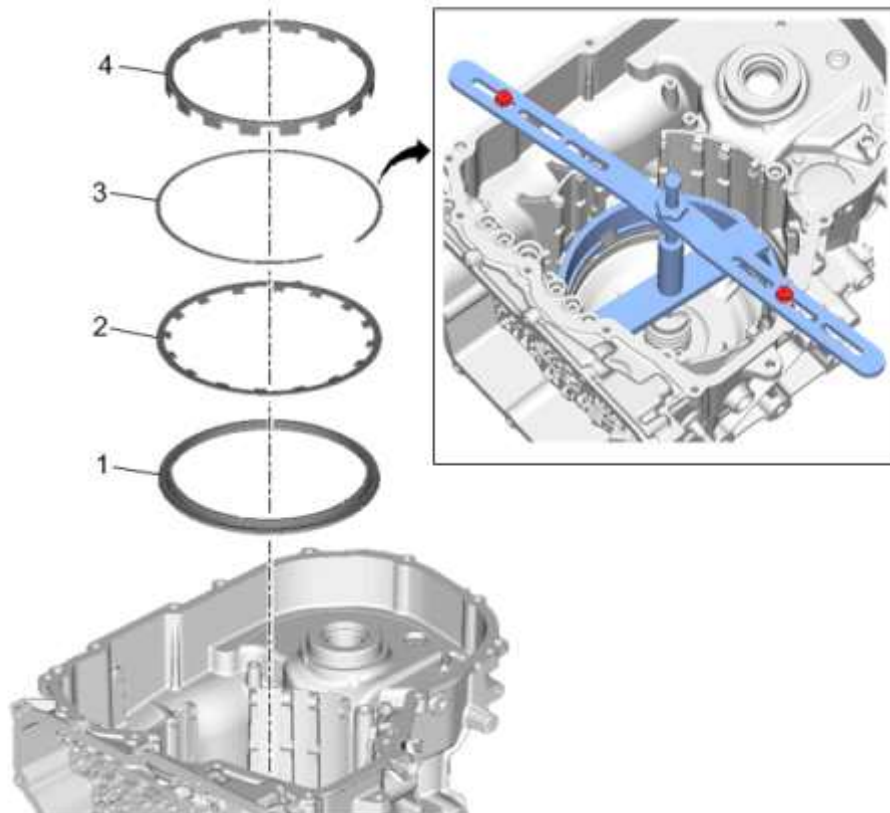


Fig. 44: 3-8 Clutch Piston

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3-8 Clutch Piston
2	3-8 Clutch Spring NOTE: Ensure spring is centered in housing.
3	3-8 Clutch Spring Retaining Ring NOTE: Ensure the retaining ring is engaged fully. Special Tools • DT-47797 Spring Installer • DT-48056 Spring Compressor Bridge Equivalent regional tools: Special Tools
4	3-8 Clutch Apply Ring

3-8 CLUTCH PLATE INSTALLATION

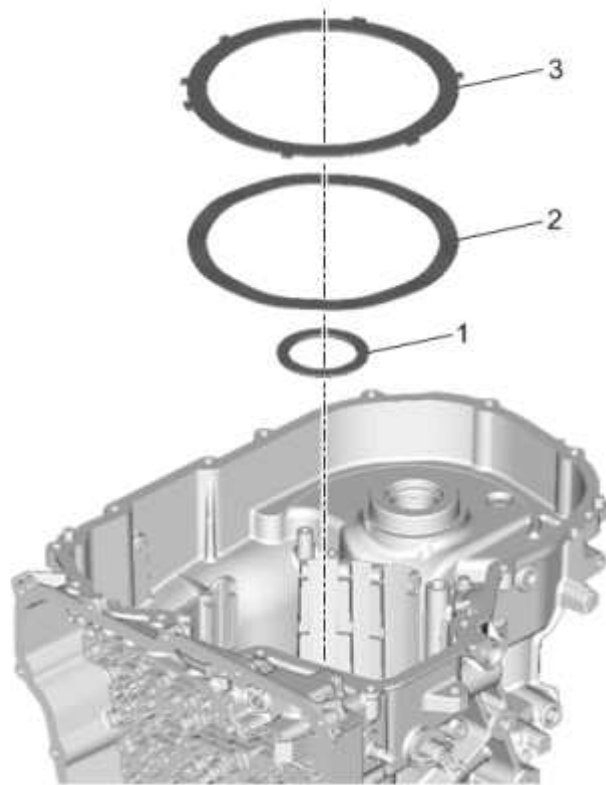


Fig. 45: 3-8 Clutch Plate

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing
2	3-8 Clutch Plate - Wave
3	3-8 Clutch Plate

INPUT, REACTION, AND OUTPUT CARRIER DISASSEMBLE

Input, Reaction, and Output Carrier Disassemble



Fig. 46: Input, Reaction And Output Carrier

Courtesy of GENERAL MOTORS COMPANY

Input, Reaction, and Output Carrier Disassemble

Callout	Component Name
1	Output Carrier
2	Output Carrier Thrust Bearing
3	Input Sun Gear Thrust Bearing
4	Input Carrier

O/D and Reaction Carrier Disassemble



Fig. 47: O/D And Reaction Carrier

Courtesy of GENERAL MOTORS COMPANY

O/D and Reaction Carrier Disassemble

Callout	Component Name
1	Input Sun Gear
2	Input Sun Gear Thrust Bearing
3	Input Carrier Thrust Bearing
4	Overdrive Carrier
5	Reaction Sun Gear
6	Overdrive Sun Gear Thrust Bearing

2-9 AND 4 CLUTCH HUB DISASSEMBLE

2-9 and 4 Clutch Hub Removal

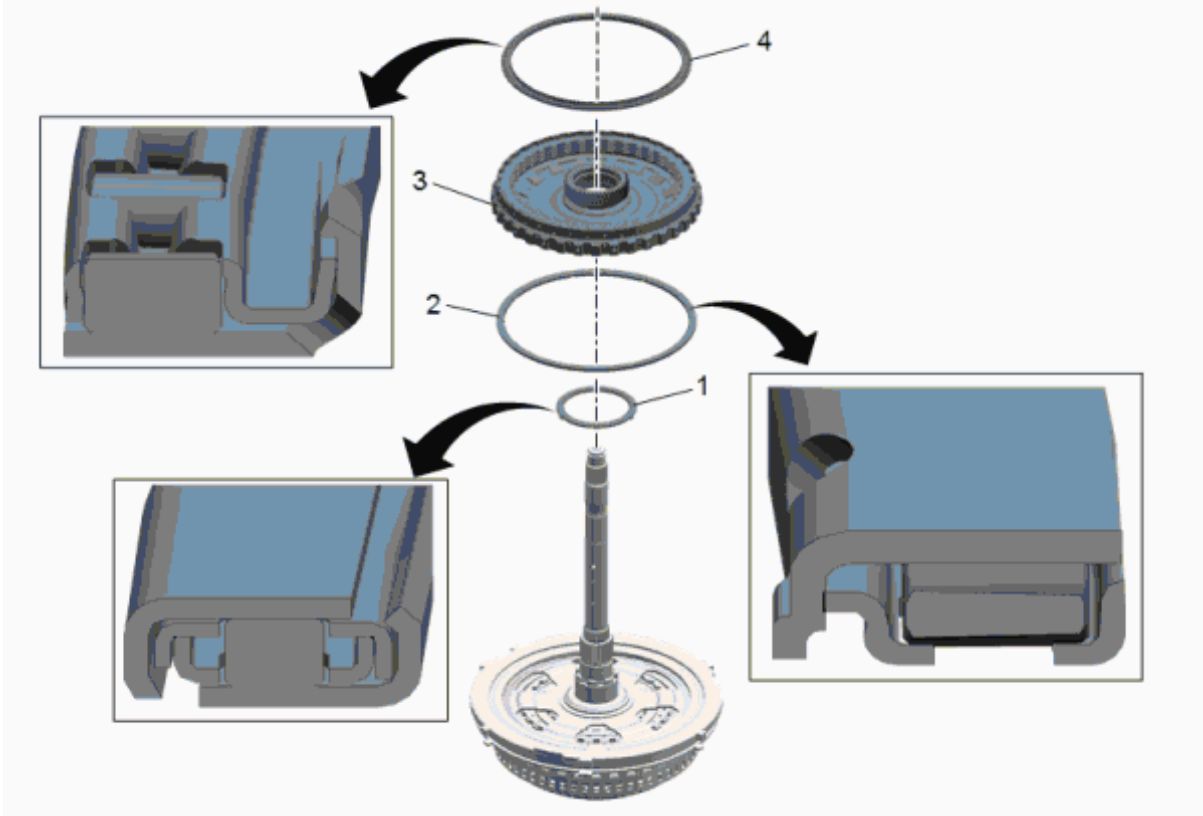


Fig. 48: 2-9 And 4 Clutch Hub
 Courtesy of GENERAL MOTORS COMPANY

2-9 and 4 Clutch Hub Removal

Callout	Component Name
1	2-9 and 4 Clutch Hub Assembly

2-9 and 4 Clutch Hub Disassemble

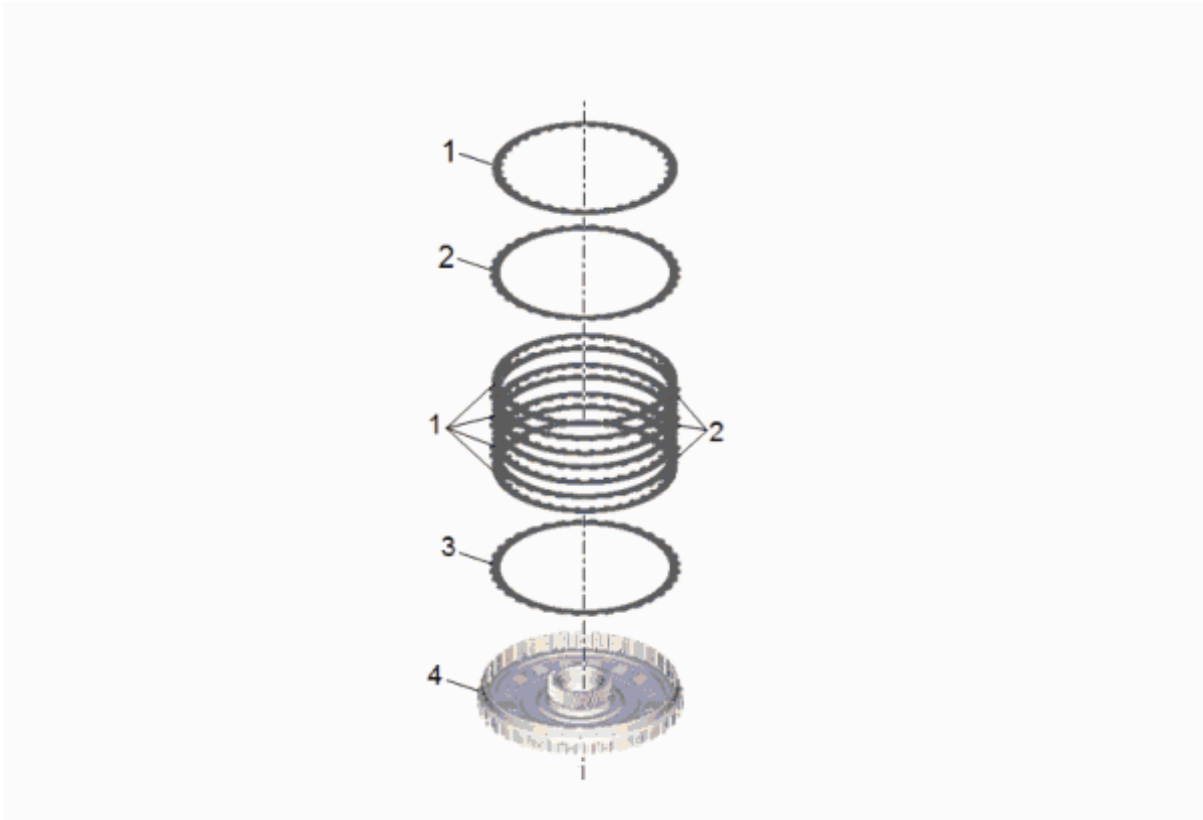


Fig. 49: 2-9 And 4 Clutch Hub
 Courtesy of GENERAL MOTORS COMPANY

2-9 and 4 Clutch Hub Disassemble

Callout	Component Name

Callout	Component Name
1	4th Clutch Thrust Bearing
2	4th Clutch Plate - Friction (Qty: 4) (Internal Spline)
3	4th Clutch Plate - Friction (Qty: 5) (External Spline)
4	4th Clutch Plate
5	2-9 and 4 Clutch Hub
6	Reaction Sun Gear Thrust Bearing

5-7-REVERSE AND 6-7-8-9 CLUTCH HOUSING DISASSEMBLE

Turbine Shaft, 3-8 and 5-7 Reverse Clutch Hub, Reaction Carrier Hub and Plates Disassemble

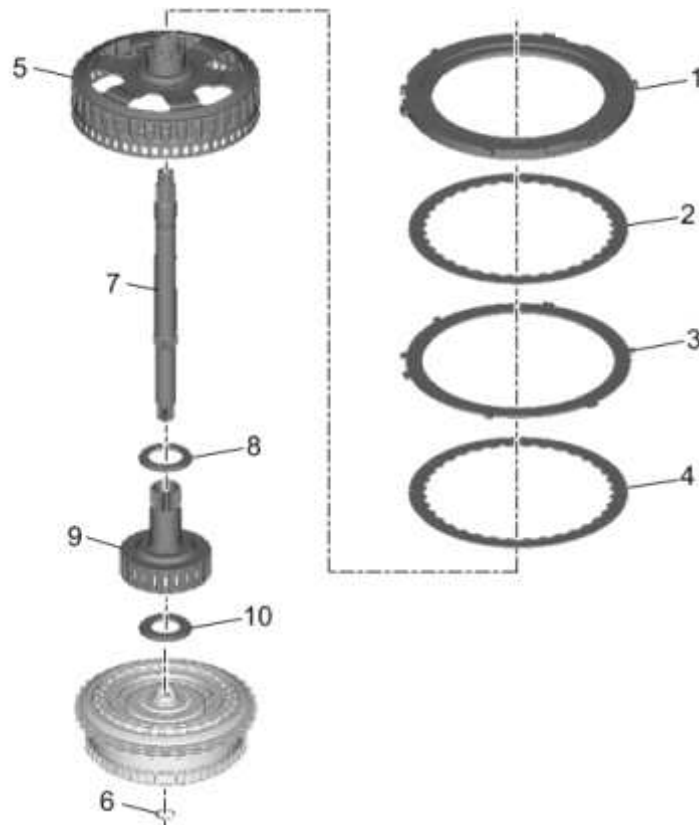


Fig. 50: Turbine Shaft, 3-8 And 5-7 Reverse Clutch Hub, Reaction Carrier Hub And Plates
Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft, 3-8 and 5-7 Reverse Clutch Hub, Relation Carrier Hub and Plates Disassemble

Callout	Component Name
1	2-9 Clutch Backing Plate
2	3-8 Clutch Plate - Friction
3	3-8 Clutch Plate
4	3-8 Clutch Plate - Friction
5	3-8 and 5-7-Reverse Clutch Hub
6	Turbine Shaft Retainer Ring NOTE: Remove and DISCARD the retainer.
7	Turbine Shaft
8	Reaction Carrier Sun Gear Thrust Bearing
9	Reaction Carrier Hub
10	Reaction Carrier Hub Bearing

Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston and Spring, and Seals Disassemble

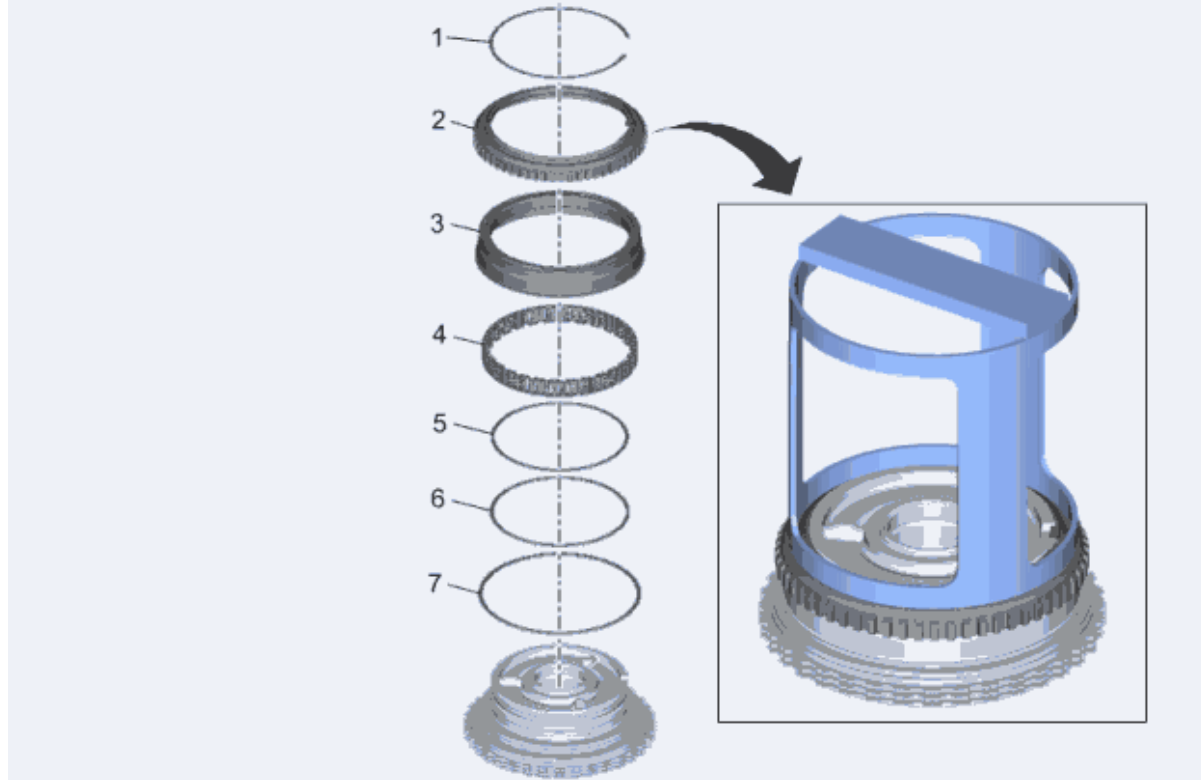


Fig. 51: Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston And Spring And Seals

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston and Spring, and Seals Disassemble

Callout	Component Name
1	Automatic Transmission Input Shaft Speed Sensor Reluctor Ring Retaining Ring
2	Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel Special Tools DT-47694 Piston Spring Compressor Equivalent regional tools: Special Tools
3	3-5-Reverse Clutch Piston
4	5-7-Reverse Piston Retainer Spring
5	3-5-Reverse Clutch Piston Dam Seal NOTE: Remove and DISCARD the seal.
6	3-5-Reverse Clutch Piston Inner Seal NOTE: Remove and DISCARD the seal.
7	3-5-Reverse Clutch Piston Inner Seal NOTE: Remove and DISCARD the seal.

6-7-8-9 Plate Assembly Disassemble

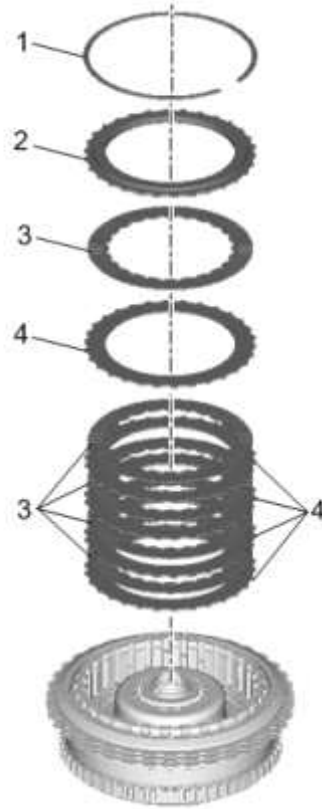


Fig. 52: 6-7-8-9 Plate Assembly

Courtesy of GENERAL MOTORS COMPANY

6-7-8-9 Plate Assembly Disassemble

Callout	Component Name
1	6-7-8-9 Clutch Backing Plate Retaining Ring
2	6-7-8-9 Clutch Backing Plate
3	6-7-8-9 Clutch Plate - Friction
4	6-7-8-9 Clutch Plate

6-7-8-9 Clutch Plates, Dam, and Piston Disassemble

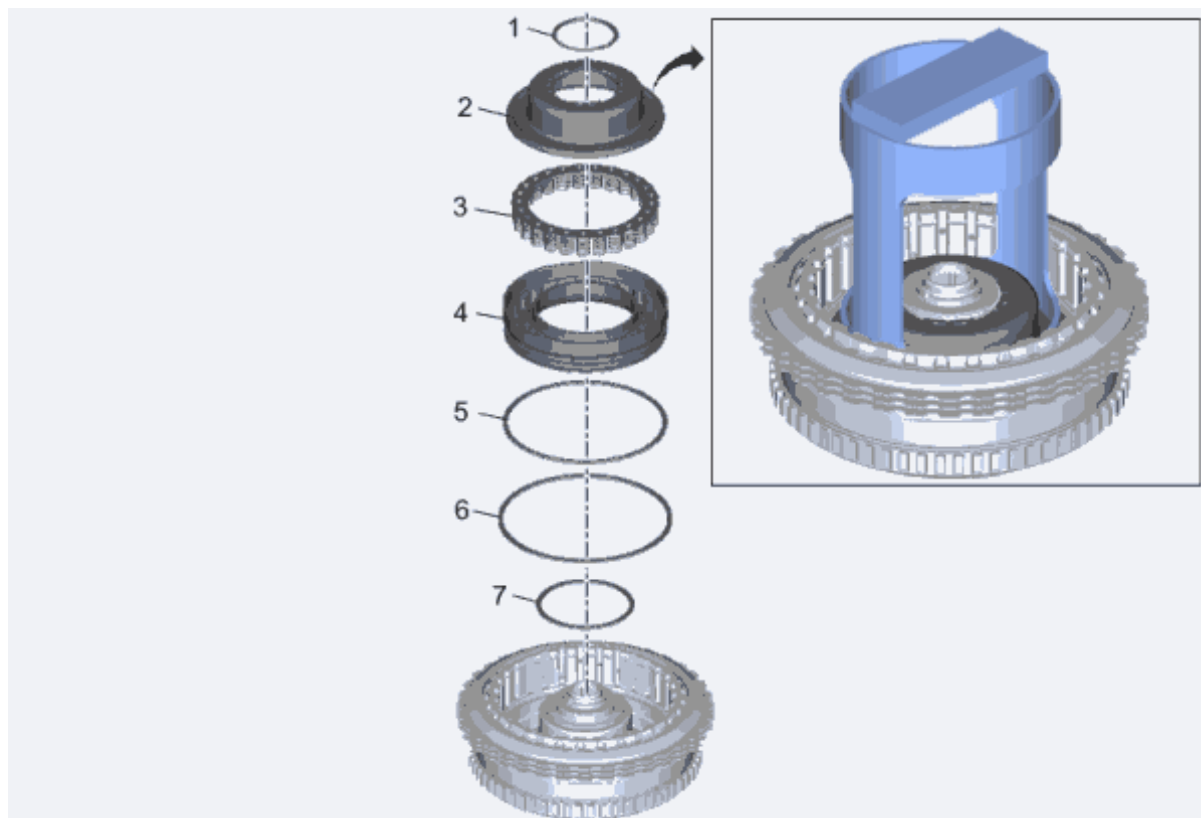


Fig. 53: 6-7-8-9 Clutch Plates, Dam And Piston

Courtesy of GENERAL MOTORS COMPANY

6-7-8-9 Clutch Plates, Dam, and Piston Disassemble

Callout	Component Name
1	4-5-6 Clutch Dam Retaining Ring NOTE: Remove and DISCARD the retainer.
2	6-7-8-9 Clutch Piston Dam Special Tools DT-47951-2 Spring Compressor Equivalent regional tools: Special Tools
3	6-7-8-9 Clutch Piston Retainer Spring
4	6-7-8-9 Clutch Piston
5	4-5-6 Clutch Piston Outer Seal NOTE: Remove and DISCARD the seal.
6	4-5-6 Clutch Piston Dam Seal NOTE: Remove and DISCARD the seal.
7	4-5-6 Clutch Piston Inner Seal NOTE: Remove and DISCARD the seal.

5-7-Reverse Clutch Plates Disassemble

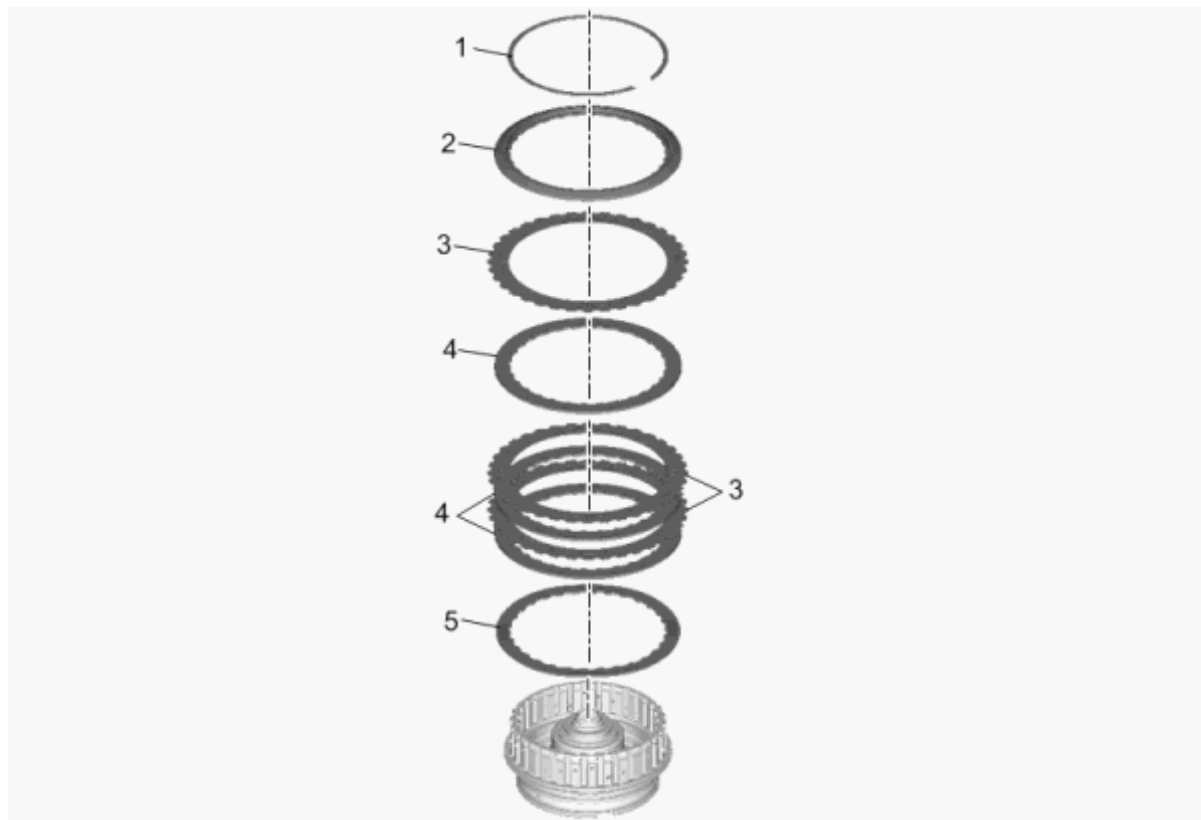


Fig. 54: 5-7-Reverse Clutch Plates

Courtesy of GENERAL MOTORS COMPANY

5-7-Reverse Clutch Plates Disassemble

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

Callout	Component Name
1	5-7-Reverse Clutch Backing Plate Retaining Ring
2	5-7-Reverse Clutch Backing Plate
3	5-7-Reverse Clutch Plate - Friction
4	5-7-Reverse Clutch Plate
5	5-7-Reverse Clutch Apply Plate

5-7-REVERSE AND 6-7-8-9 CLUTCH HOUSING ASSEMBLE

5-7-Reverse Clutch Plates Assemble

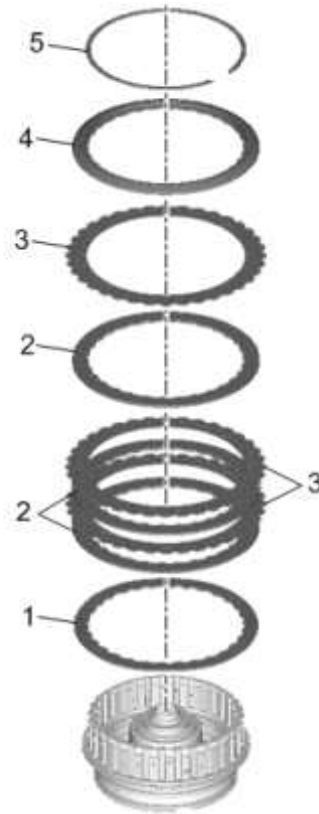


Fig. 55: 5-7-Reverse Clutch Plates

Courtesy of GENERAL MOTORS COMPANY

5-7-Reverse Clutch Plates Assemble

Callout	Component Name
1	5-7-Reverse Clutch Apply Plate
2	5-7-Reverse Clutch Plate
3	5-7-Reverse Clutch Plate - Friction
4	5-7-Reverse Clutch Backing Plate
5	5-7-Reverse Clutch Backing Plate Retaining Ring

6-7-8-9 Clutch Plates, Dam, and Piston Assemble

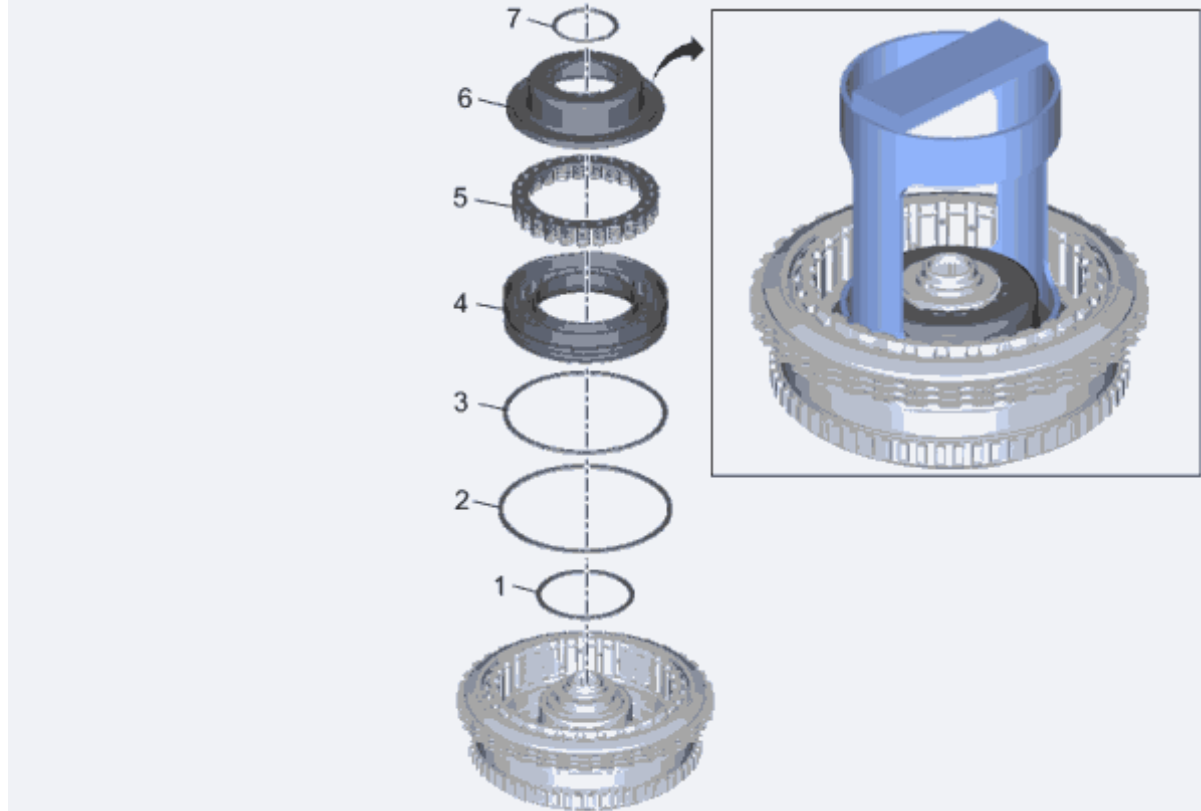


Fig. 56: 6-7-8-9 Clutch Plates, Dam And Piston
 Courtesy of GENERAL MOTORS COMPANY

6-7-8-9 Clutch Plates, Dam, and Piston Assemble

Callout	Component Name
1	4-5-6 Clutch Piston Inner Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
2	4-5-6 Clutch Piston Dam Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	4-5-6 Clutch Piston Outer Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
4	6-7-8-9 Clutch Piston
5	6-7-8-9 Clutch Piston Retainer Spring
6	6-7-8-9 Clutch Piston Dam Special Tools DT-47951-2 Spring Compressor Equivalent regional tools: Special Tools
7	4-5-6 Clutch Dam Retaining Ring NOTE: Install a NEW retainer. Do NOT reuse the old retainer.

6-7-8-9 Plate Assembly Assemble

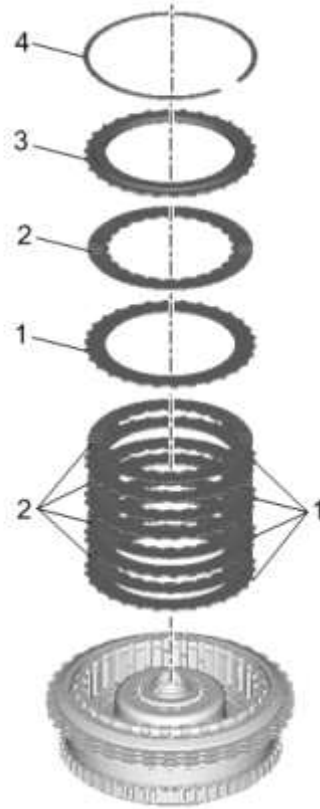


Fig. 57: 6-7-8-9 Plate Assembly

Courtesy of GENERAL MOTORS COMPANY

6-7-8-9 Plate Assembly Assemble

Callout	Component Name
1	6-7-8-9 Clutch Plate
2	6-7-8-9 Clutch Plate - Friction
3	6-7-8-9 Clutch Backing Plate
4	6-7-8-9 Clutch Backing Plate Retaining Ring

Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston and Spring, and Seals Assemble

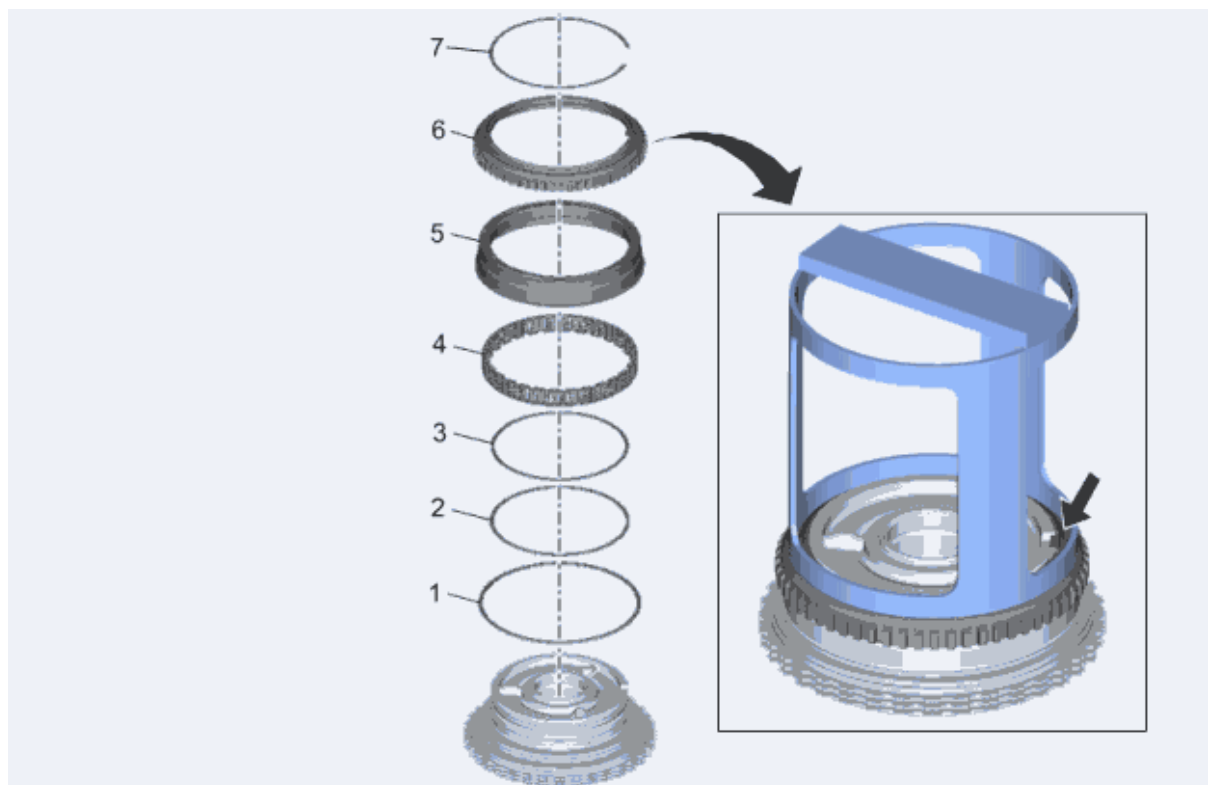


Fig. 58: Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston And Spring And Seals

Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel, 3-5-Reverse Clutch Piston and Spring, and Seals Assemble

Callout	Component Name
1	3-5-Reverse Clutch Piston Inner Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
2	3-5-Reverse Clutch Piston Inner Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	3-5-Reverse Clutch Piston Dam Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
4	5-7-Reverse Piston Retainer Spring
5	3-5-Reverse Clutch Piston
6	Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel
7	Automatic Transmission Input Shaft Speed Sensor Reluctor Ring Retaining Ring Special Tools DT-47694 Piston Spring Compressor Equivalent regional tools: Special Tools

Turbine Shaft, 3-8 and 5-7 Reverse Clutch Hub, Reaction Carrier Hub and Plates Assemble

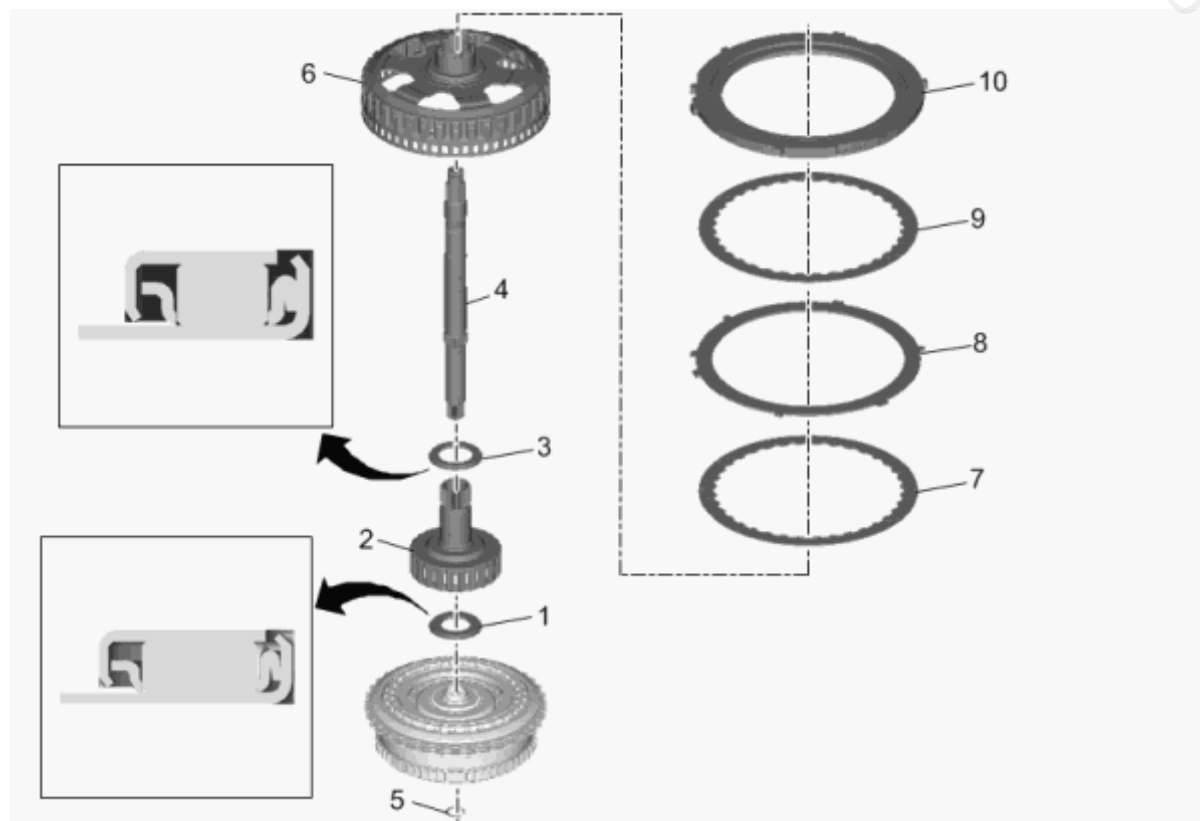


Fig. 59: Turbine Shaft, 3-8 And 5-7 Reverse Clutch Hub, Reaction Carrier Hub And Plates
Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft, 3-8 and 5-7 Reverse Clutch Hub, Reaction Carrier Hub and Plates Assemble

Callout	Component Name
1	Reaction Carrier Hub Bearing

Callout	Component Name
2	Reaction Carrier Hub
3	Reaction Carrier Sun Gear Thrust Bearing
4	Turbine Shaft
5	Turbine Shaft Retainer Ring NOTE: Install a NEW retainer. Do NOT reuse the old retainer.
6	3-8 and 5-7-Reverse Clutch Hub
7	3-8 Clutch Plate - Friction
8	3-8 Clutch Plate
9	3-8 Clutch Plate - Friction
10	2-9 Clutch Backing Plate

2-9 AND 4 CLUTCH HUB ASSEMBLE

2-9 and 4 Clutch Hub Assemble

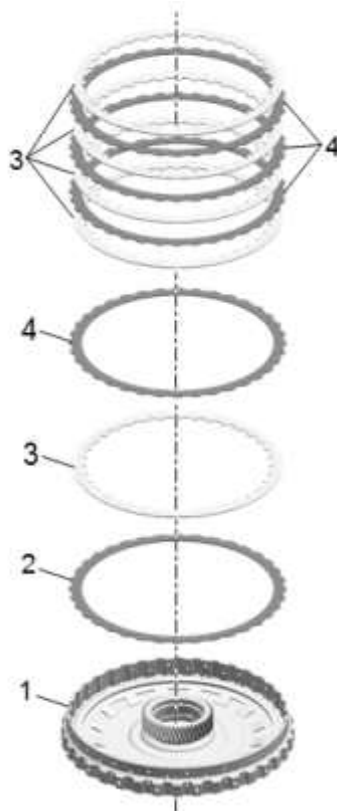


Fig. 60: 2-9 And 4 Clutch Hub

Courtesy of GENERAL MOTORS COMPANY

2-9 and 4 Clutch Hub Assemble

Callout	Component Name
1	2-9 and 4 Clutch Hub
2	4th Clutch Plate
3	4th Clutch Plate - Friction (Qty: 5) (External Spline)
4	4th Clutch Plate - Friction (Qty: 4) (Internal Spline)
5	4th Clutch Thrust Bearing
6	Reaction Sun Gear Thrust Bearing

2-9 and 4 Clutch Hub Installation

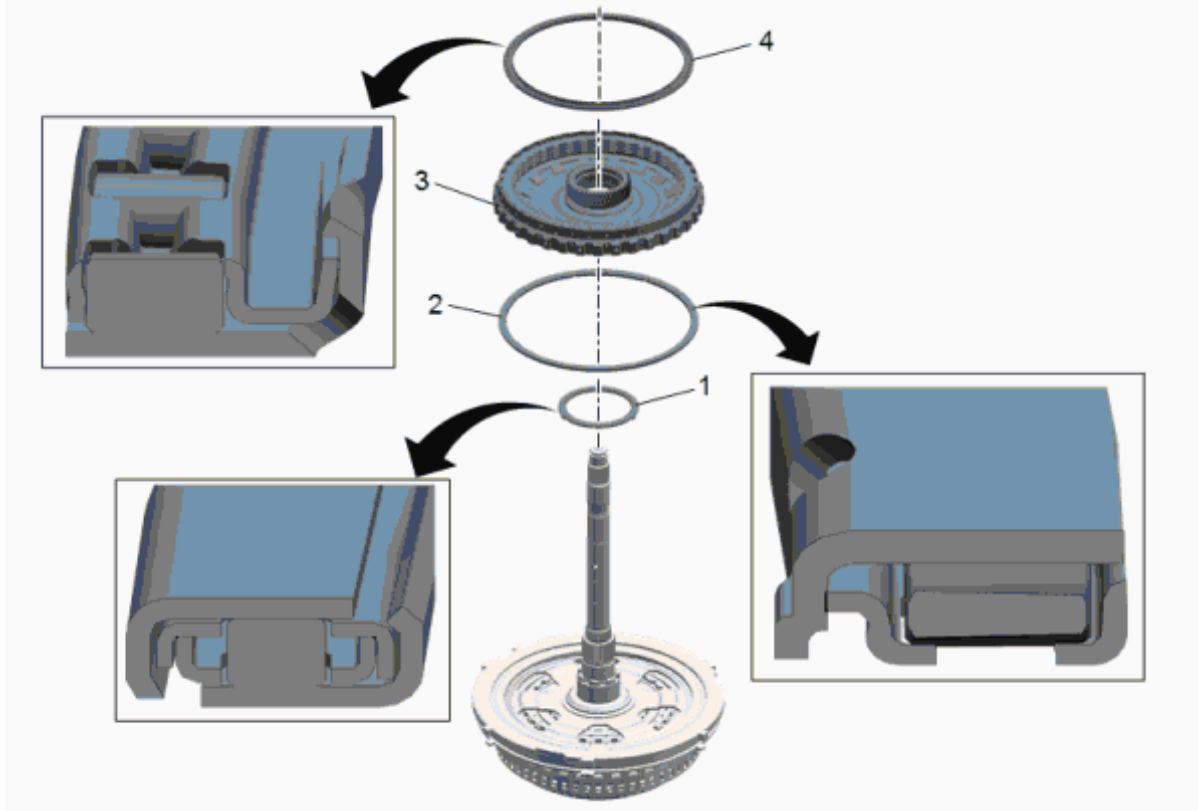


Fig. 61: 2-9 And 4 Clutch Hub

Courtesy of GENERAL MOTORS COMPANY

2-9 and 4 Clutch Hub Installation

Callout	Component Name
1	2-9 and 4 Clutch Hub Assembly

OVERDRIVE AND REACTION WITH INPUT INTERNAL GEAR CARRIER OVERHAUL

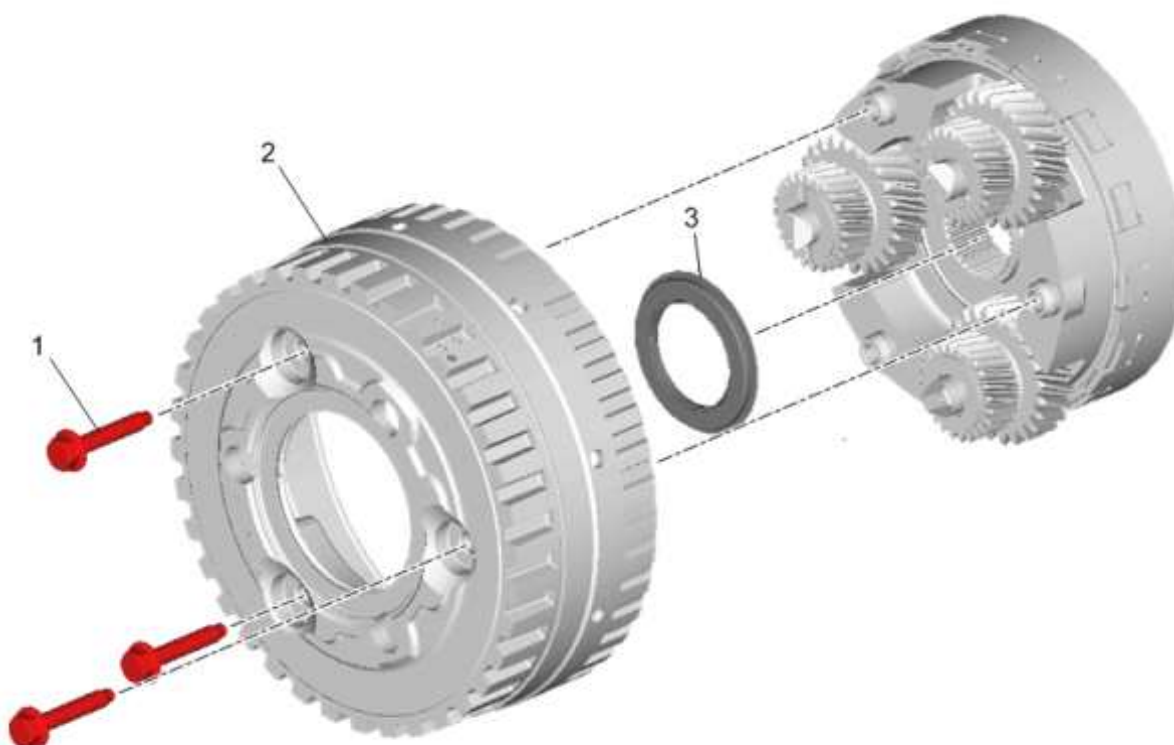


Fig. 62: Overdrive And Reaction With Input Internal Gear Carrier

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1	Overdrive and Reaction Carrier Bolt (Qty: 3) Tighten 9 N.m (80 lb in)
2	Overdrive Carrier
3	Reaction Sun Gear Thrust Bearing NOTE: Bearing is only serviceable part.

INPUT, REACTION, AND OUTPUT CARRIER ASSEMBLE

O/D and Reaction Carrier Assemble

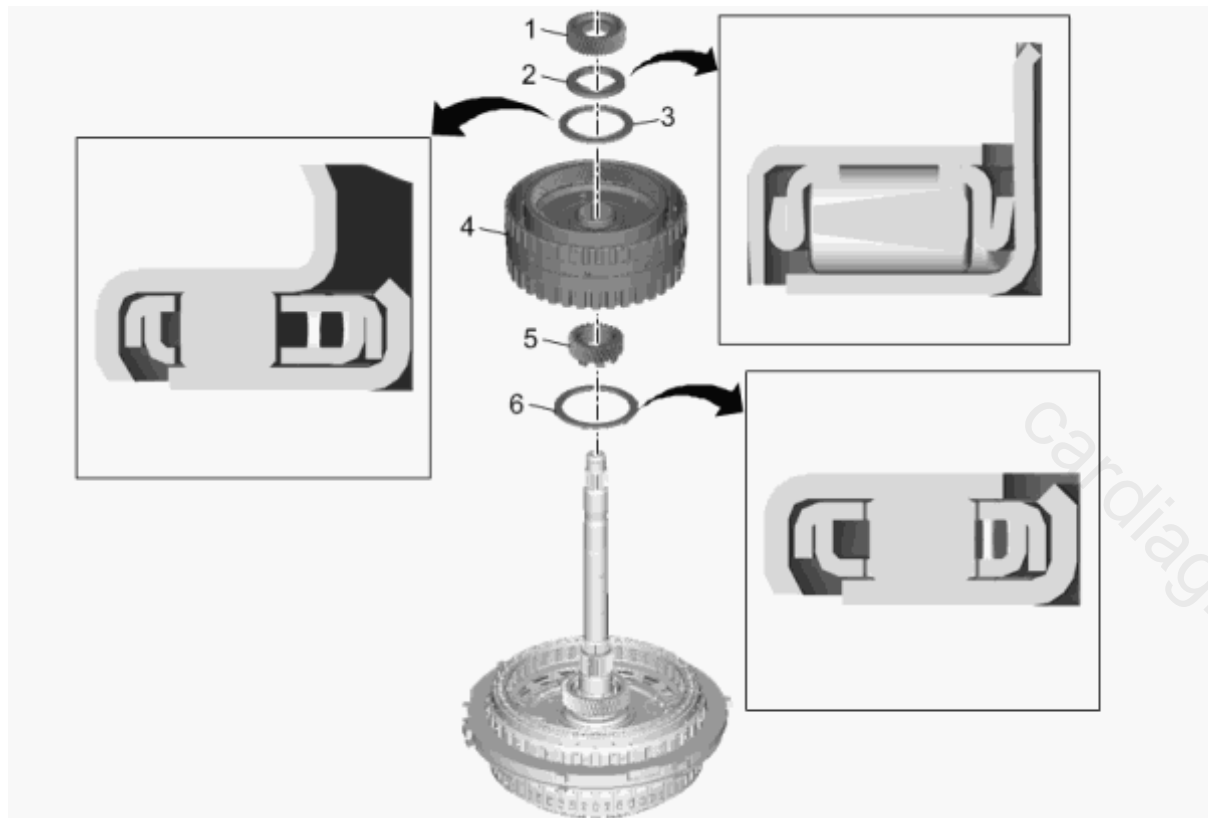


Fig. 63: O/D And Reaction Carrier

Courtesy of GENERAL MOTORS COMPANY

O/D and Reaction Carrier Assemble

Callout	Component Name
1	Input Sun Gear
2	Input Sun Gear Thrust Bearing
3	Input Carrier Thrust Bearing NOTE: Ensure the carrier is seated properly.
4	Overdrive Carrier
5	Reaction Sun Gear
6	Overdrive Sun Gear Thrust Bearing

Input, Reaction, and Output Carrier Assemble

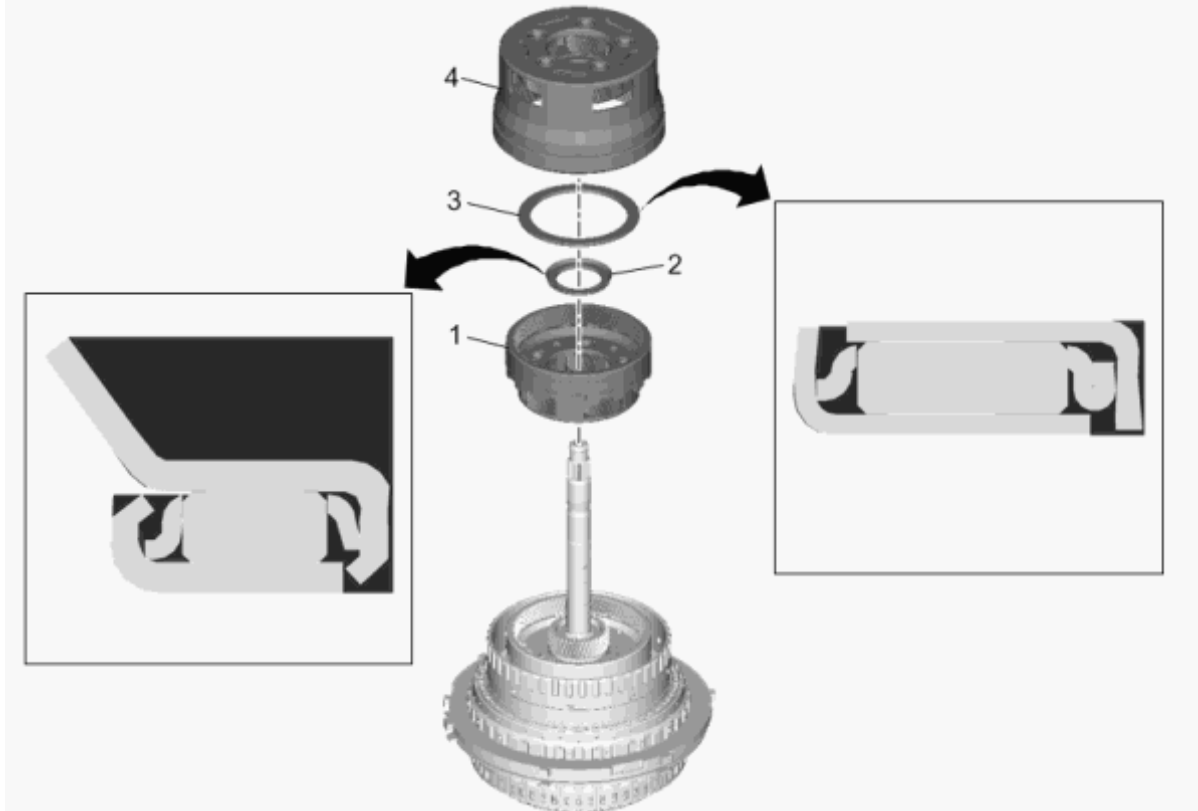


Fig. 64: Input, Reaction And Output Carrier
Courtesy of GENERAL MOTORS COMPANY

Input, Reaction, and Output Carrier Assemble

Callout	Component Name
1	Input Carrier NOTE: Ensure the carrier is seated properly.
2	Input Sun Gear Thrust Bearing
3	Output Carrier Thrust Bearing
4	Output Carrier NOTE: Ensure the carrier is seated properly.

5-7-REVERSE AND 6-7-8-9 CLUTCH HOUSING INSTALLATION

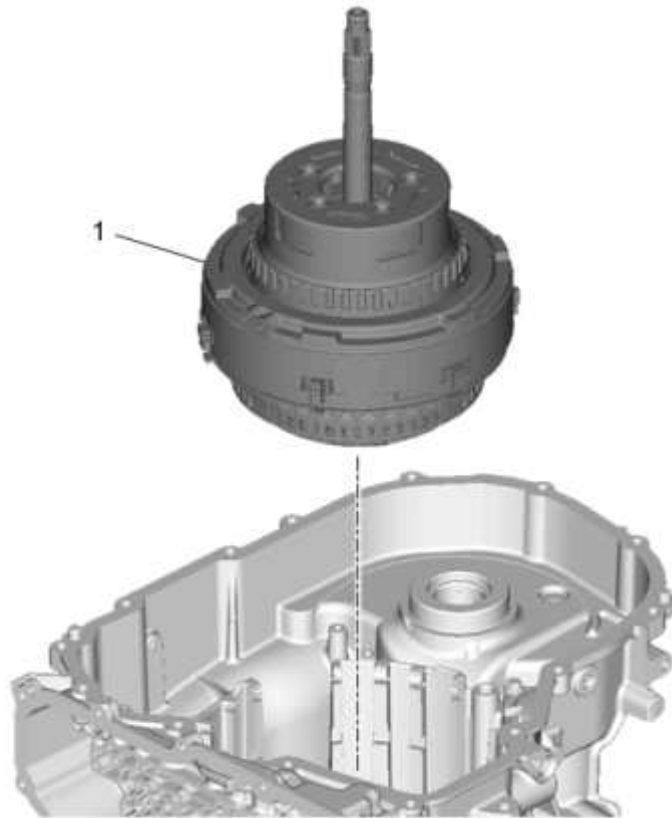


Fig. 65: 5-7-Reverse And 6-7-8-9 Clutch Housing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	5-7-Reverse and 6-7-8-9 Clutch Housing NOTE: Line up all the smaller tabs on the plates.

2-9 CLUTCH PLATE INSTALLATION

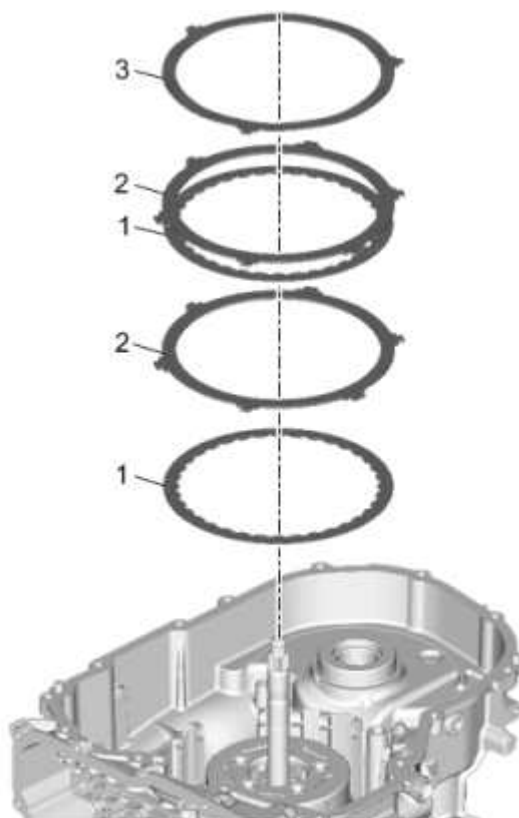


Fig. 66: 2-9 Clutch Plate
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-9 Clutch Plate - Friction
2	2-9 Clutch Plate
3	2-9 Clutch Plate - Wave

2-9 AND 4 CLUTCH PISTON HOUSING DISASSEMBLE

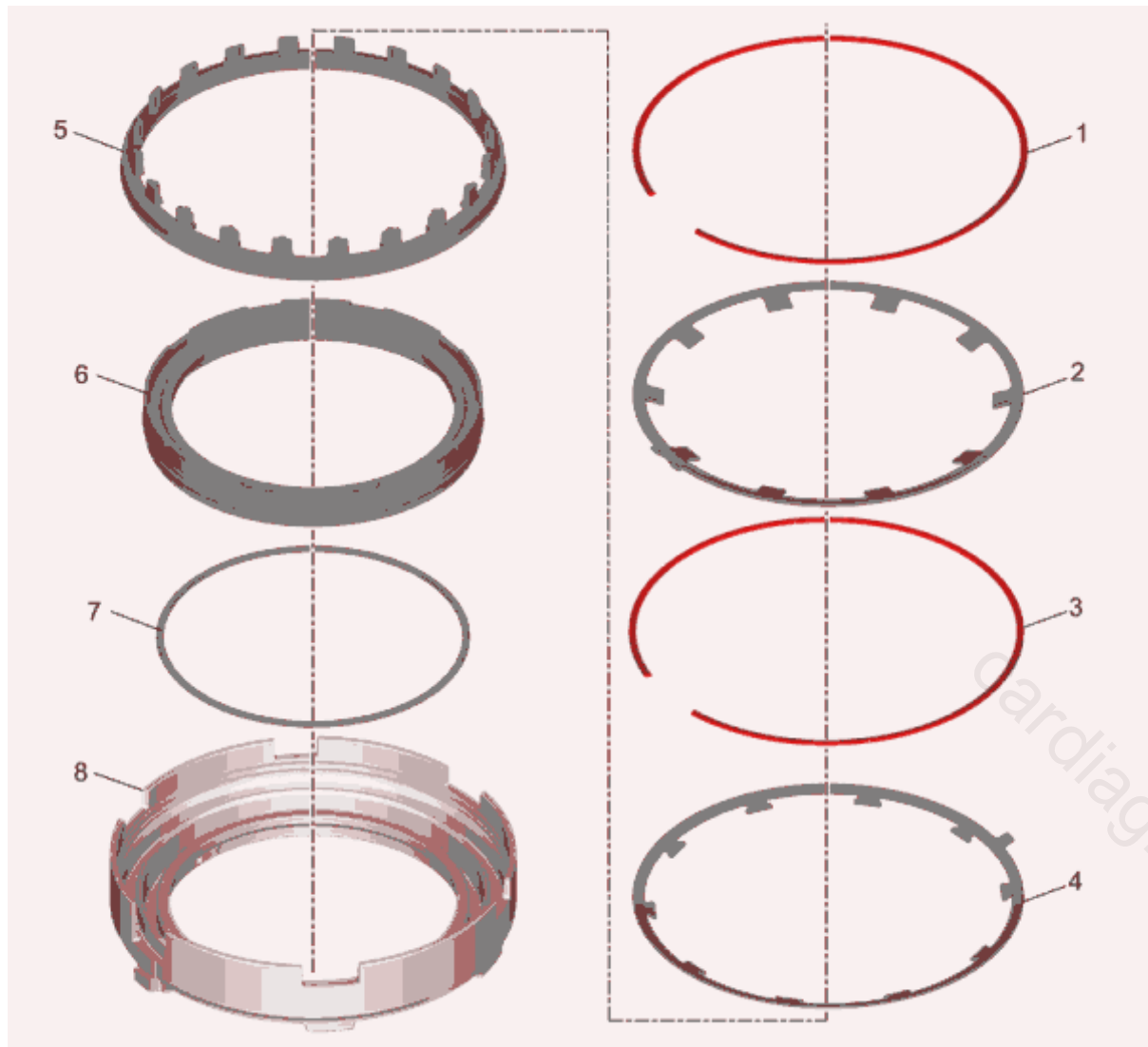


Fig. 67: 2-9 And 4 Clutch Piston Housing

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	4th Clutch Piston Retaining Ring
2	4th Clutch Piston Return Spring
3	2 - 9 Clutch Piston Retaining Ring
4	2-9 Clutch Piston Return Spring
5	2-9 Clutch Piston
6	4th Clutch Piston
7	4th Clutch Piston Inner Seal NOTE: Remove and DISCARD the seal.
8	2-9 and 4 Clutch Piston Housing

2-9 AND 4 CLUTCH PISTON HOUSING ASSEMBLE

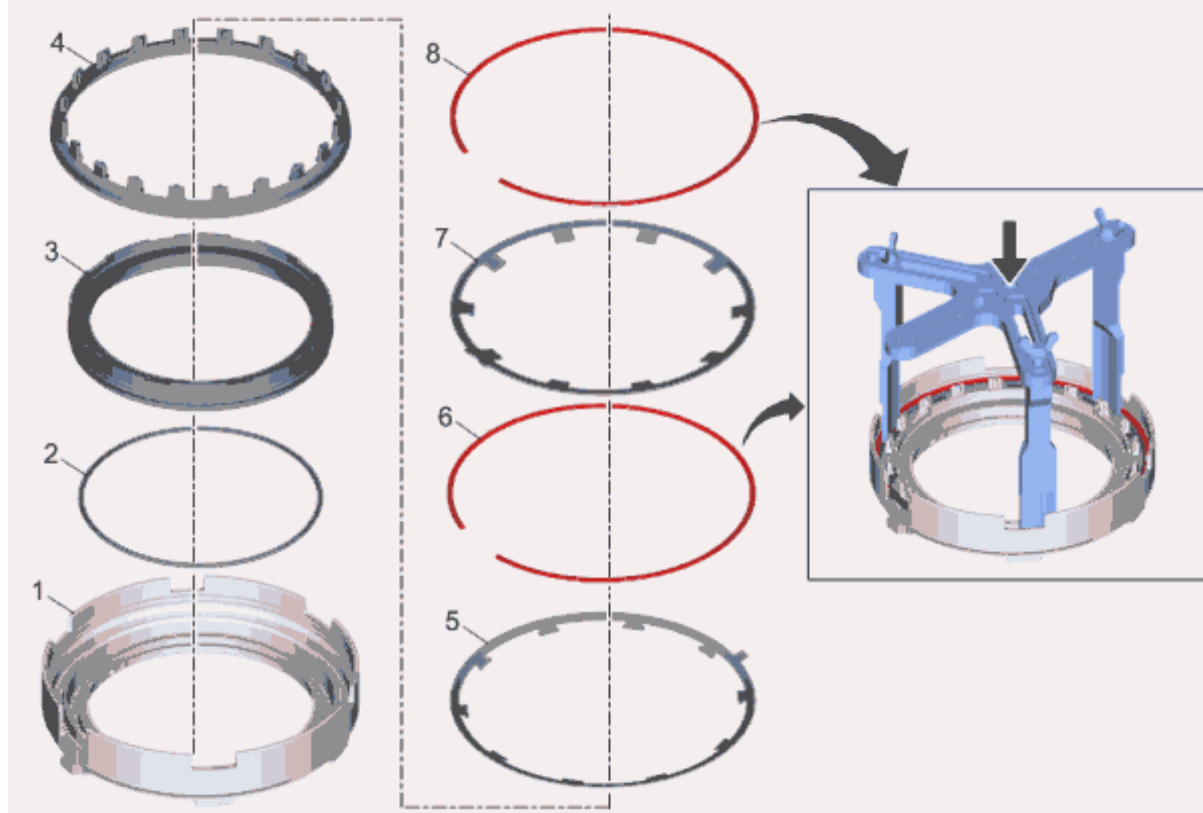


Fig. 68: 2-9 And 4 Clutch Piston Housing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-9 and 4 Clutch Piston Housing
2	4th Clutch Piston Inner Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	4th Clutch Piston
4	2-9 Clutch Piston
5	2-9 Clutch Piston Return Spring
6	2-9 Clutch Piston Retaining Ring Procedure 1. Install - DT-51892 Bridge Kit 2. Use a press to push down to install retaining ring. 3. Remove - DT-51892 Bridge Kit Special Tool DT-51892 Bridge Kit Equivalent regional tools: Special Tools
7	4th Clutch Piston Return Spring

Callout	Component Name
8	4th Clutch Piston Retaining Ring Procedure 1. Install - DT-51892 Bridge Kit 2. Use a press to push down to install retaining ring. 3. Remove - DT-51892 Bridge Kit Special Tool DT-51892 Bridge Kit Equivalent regional tools: Special Tools

2-9 AND 4 CLUTCH PISTON HOUSING INSTALLATION

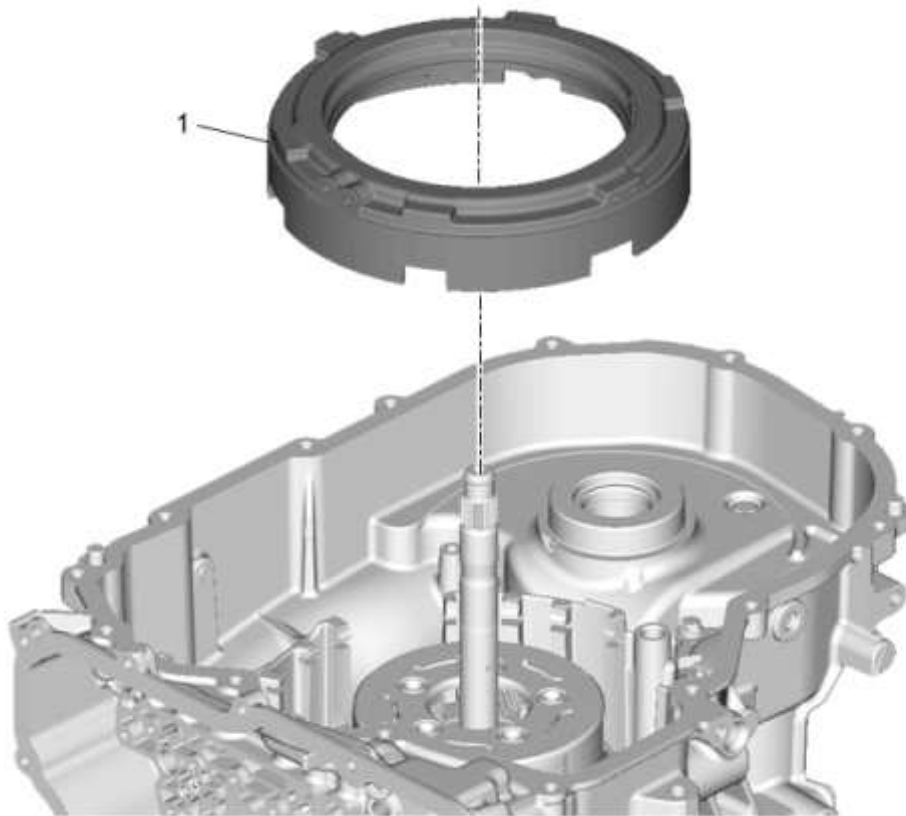


Fig. 69: 2-9 And 4 Clutch Piston Housing
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-9 and 4 Clutch Piston Housing NOTE: Ensure the lube holes line up properly.

1-REVERSE AND 1-2-3-4-5-6 CLUTCH PISTON HOUSING DISASSEMBLE

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (1 of 2) Disassemble

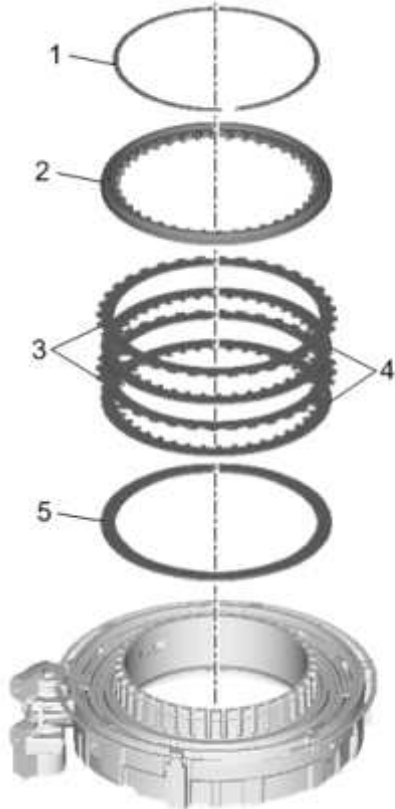


Fig. 70: 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing (1 of 2)
 Courtesy of GENERAL MOTORS COMPANY

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (1 of 2) Disassemble

Callout	Component Name
1	1-2-3-4-5-6 Clutch Backing Plate Retaining Ring
2	1-2-3-4-5-6 Clutch Backing Plate
3	1-2-3-4-5-6 Clutch Plate - Friction (Qty: 2)
4	1-2-3-4-5-6 Clutch Plate (Qty: 2)
5	1-2-3-4-5-6 Clutch Plate - Wave

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (2 of 2) Disassemble

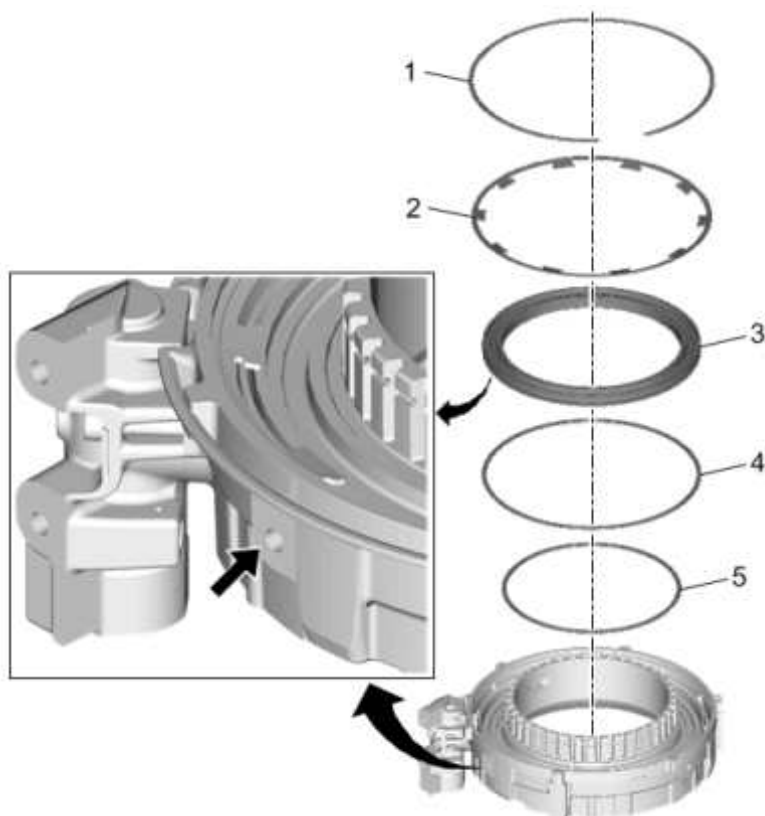


Fig. 71: 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing (2 of 2).
 Courtesy of GENERAL MOTORS COMPANY

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (2 of 2) Disassemble

Callout	Component Name
1	1-2-3-4-5-6 Clutch Spring Retaining Ring
2	1-2-3-4-5-6 Clutch Piston Return Spring
3	1-2-3-4-5-6 Clutch Piston NOTE: Blow air in port to help release the piston from the housing.
4	1-2-3-4-5-6 Clutch Piston Inner Seal NOTE: Remove and DISCARD the seal.
5	1-2-3-4-5-6 Clutch Piston Seal NOTE: Remove and DISCARD the seal.

1-REVERSE AND 1-2-3-4-5-6 CLUTCH PISTON HOUSING ASSEMBLE

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (1 of 2) Assemble

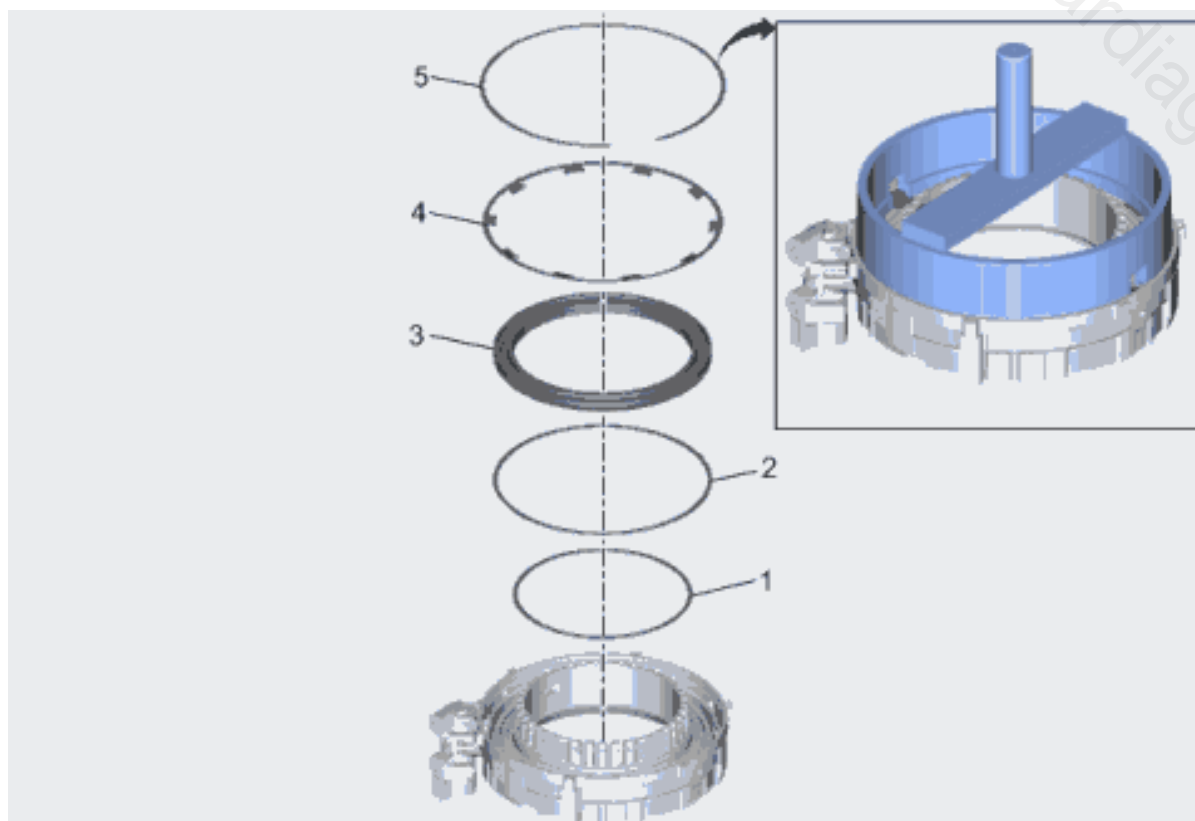


Fig. 72: 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing (1 of 2).
 Courtesy of GENERAL MOTORS COMPANY

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (1 of 2) Assemble

Callout	Component Name

Callout	Component Name
1	1-2-3-4-5-6 Clutch Piston Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
2	1-2-3-4-5-6 Clutch Piston Inner Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	1-2-3-4-5-6 Clutch Piston
4	1-2-3-4-5-6 Clutch Piston Return Spring NOTE: Ensure spring is centered.
5	1-2-3-4-5-6 Clutch Spring Retaining Ring Procedure Press on the DT-47797 Spring Installer until you hear the retaining ring snap into the groove. Special Tools DT-47797 Spring Installer Equivalent regional tools: Special Tools

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (2 of 2) Assemble

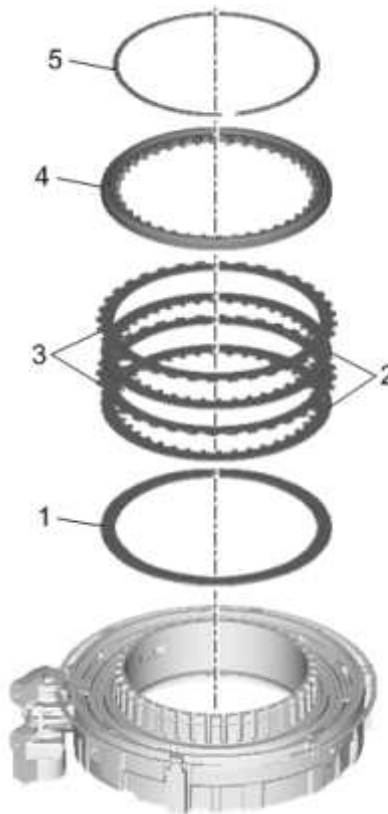


Fig. 73: 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing (2 of 2)

Courtesy of GENERAL MOTORS COMPANY

1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (2 of 2) Assemble

Callout	Component Name
1	1-2-3-4-5-6 Clutch Plate - Wave
2	1-2-3-4-5-6 Clutch Plate (Qty: 2)
3	1-2-3-4-5-6 Clutch Plate - Friction (Qty: 2)
4	1-2-3-4-5-6 Clutch Backing Plate

Callout	Component Name
5	1-2-3-4-5-6 Clutch Backing Plate Retaining Ring

1-REVERSE AND 1-2-3-4-5-6 CLUTCH PISTON HOUSING INSTALLATION

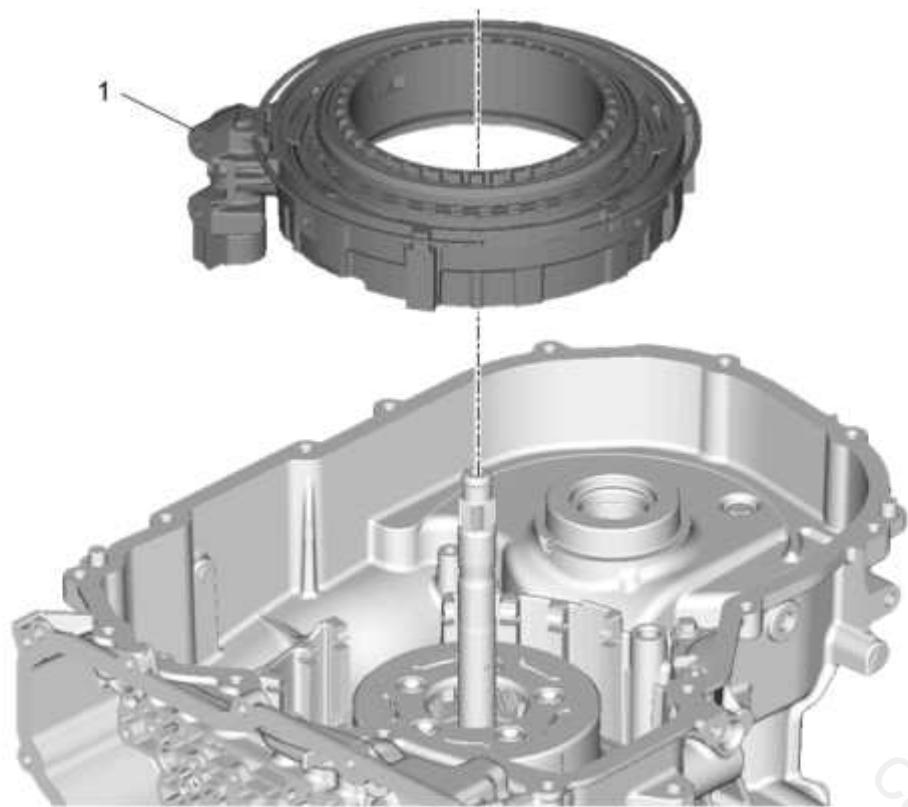


Fig. 74: 1-Reverse And 1-2-3-4-5-6 Clutch Piston Housing
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing NOTE: Make sure lube holes line up properly.

OUTPUT SUN GEAR INSTALLATION

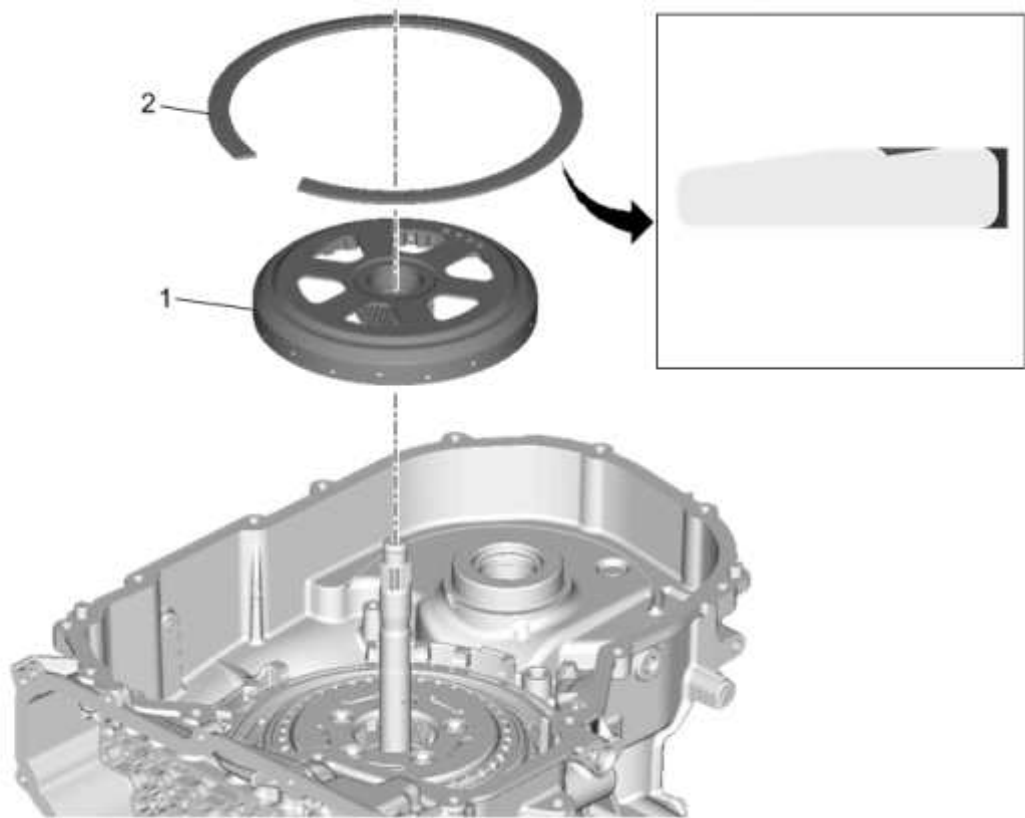


Fig. 75: Output Sun Gear
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Output Sun Gear
2	1-2-3-4-5-6 Clutch Piston Housing Return 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.

DRIVE SPROCKET, DRIVEN SPROCKET, AND DRIVE LINK CLEANING AND INSPECTION

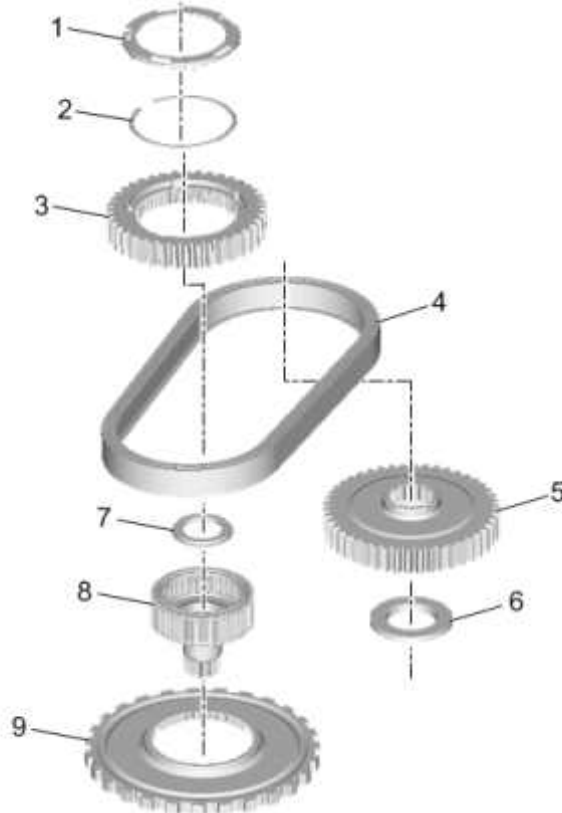


Fig. 76: Drive Sprocket, Driven Sprocket And Drive Link
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Output Sun Gear Thrust Bearing
3	Drive Sprocket
4	Drive Link
5	Driven Sprocket
6	Driven Sprocket Bearing
7	Output Sun Gear Thrust Bearing
8	Output Carrier Transfer Drive Gear Hub Assembly
9	Park Gear

DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL INSTALLATION

Park Pawl and Front Differential Carrier Baffle Installation

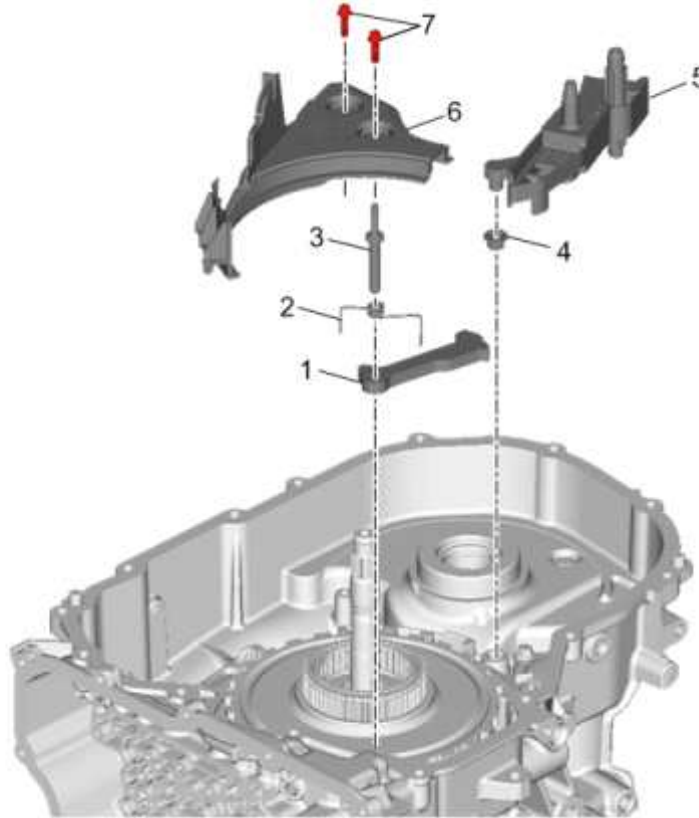


Fig. 77: Park Pawl And Front Differential Carrier Baffle

Courtesy of GENERAL MOTORS COMPANY

Park Pawl and Front Differential Carrier Baffle Installation

Callout	Component Name
1	Park Pawl
2	Park Pawl Spring
3	Park Pawl Shaft NOTE: Check to ensure that the park pawl operates freely and is not binding.
4	Drive Link Lubricant Fluid Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
5	Drive Link Lubricant Scoop
6	Front Differential Carrier Baffle
7	Front Differential Carrier Baffle Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)

Park Gear and Output Carrier Hub Installation

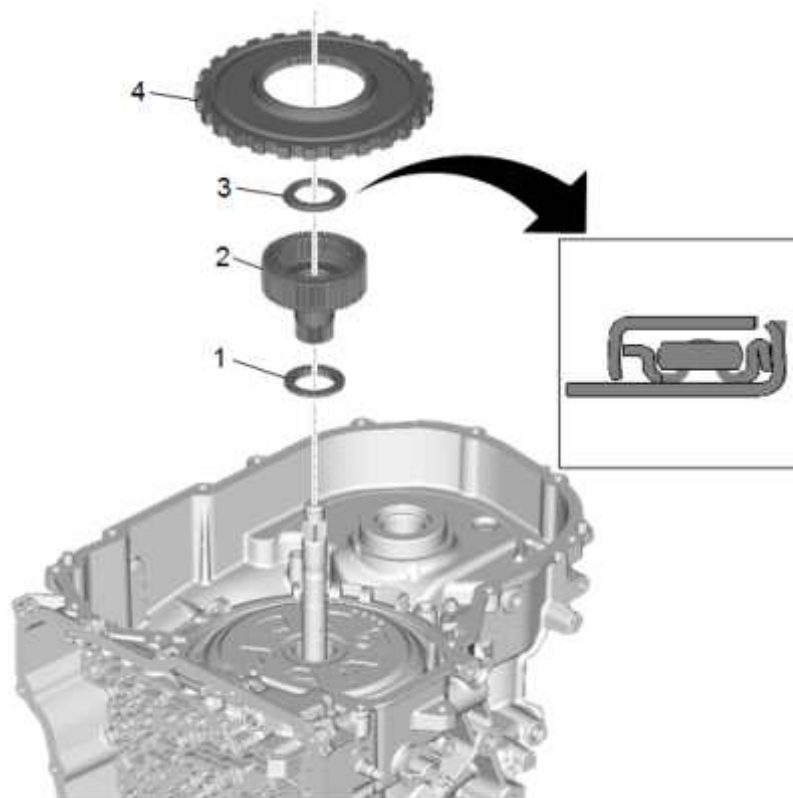


Fig. 78: Park Gear And Output Carrier Hub
 Courtesy of GENERAL MOTORS COMPANY

Park Gear and Output Carrier Hub Installation

Callout	Component Name
1	Output Sun Gear Thrust Bearing
2	Output Carrier Transfer Drive Gear Hub
3	Output Sun Gear Thrust Bearing
4	Park Gear

Drive Sprocket, Driven Sprocket, and Drive Link Installation

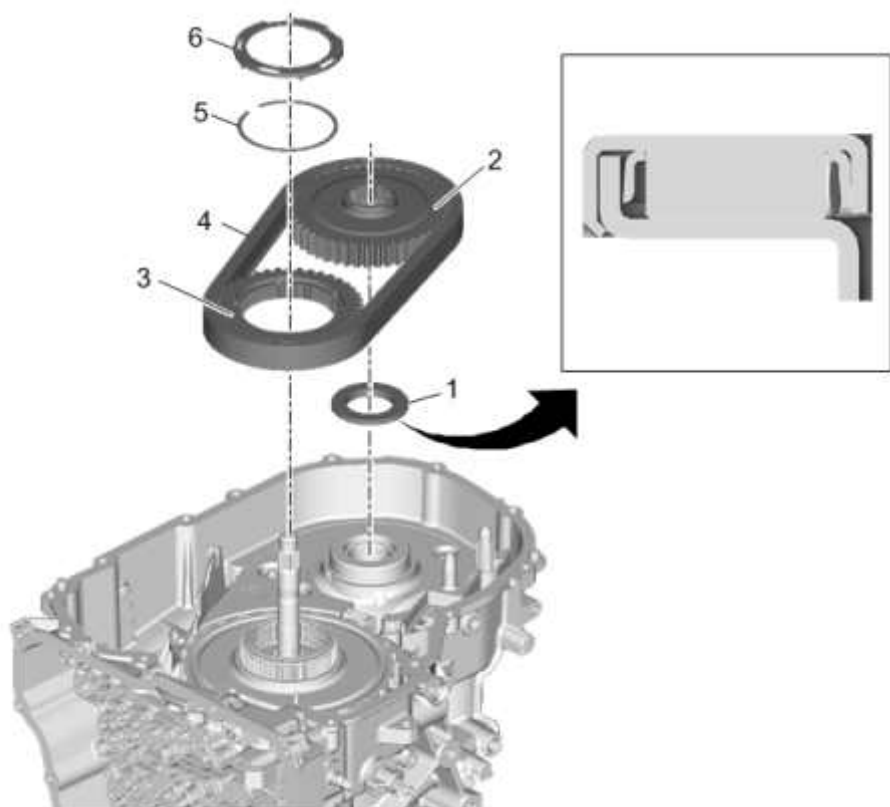


Fig. 79: Drive Sprocket, Driven Sprocket And Drive Link
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Driven Sprocket Bearing
2	Driven Sprocket 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 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. • The ball bearing should spin freely and smoothly.
3	Drive Link
4	Drive Sprocket
5	Drive Sprocket Retaining Ring
6	Drive Sprocket Thrust Washer

This diagram shows an exploded view of a mechanical assembly. The components are numbered as follows:

- 1:** A large, curved, C-shaped component, likely a bracket or housing part.
- 2:** A small, cylindrical component, possibly a pin or a small shaft.
- 3:** A ring-like component with a central hole, likely a flange or a bearing.
- 4:** Two small, circular components, possibly washers or spacers.
- 5:** A large, cylindrical component with external teeth, likely a gear or a pulley.
- 6:** A smaller cylindrical component with external teeth, likely a pinion or a small gear.

The diagram illustrates the assembly sequence, showing how these components fit together. A large, complex component is shown in the background, which appears to be the main housing or frame of the assembly. The exploded view shows the components being assembled onto this main structure.

Callout	Component Name

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

FRONT DIFFERENTIAL CARRIER INSTALLATION

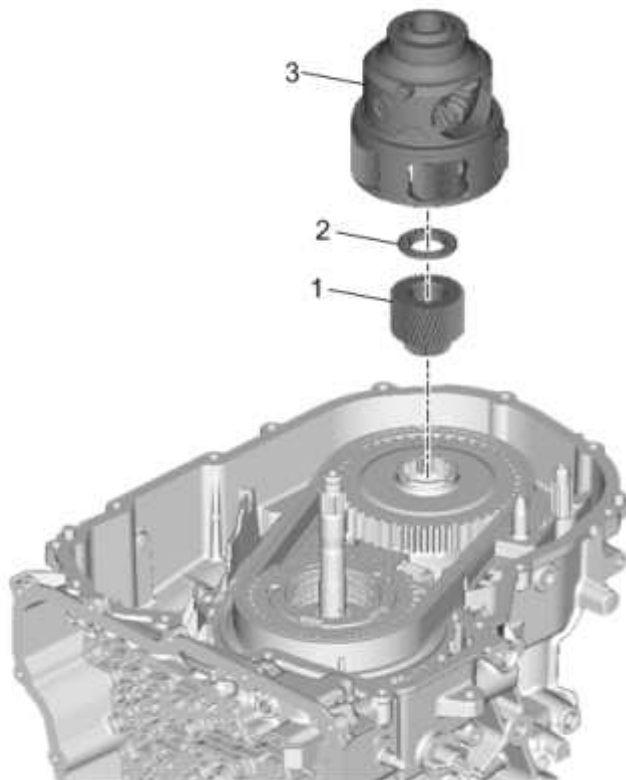


Fig. 81: Front Differential Carrier

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier Sun Gear

Callout	Component Name
2	Differential Carrier Sun Gear Thrust Bearing
3	Front Differential Carrier

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR REMOVAL

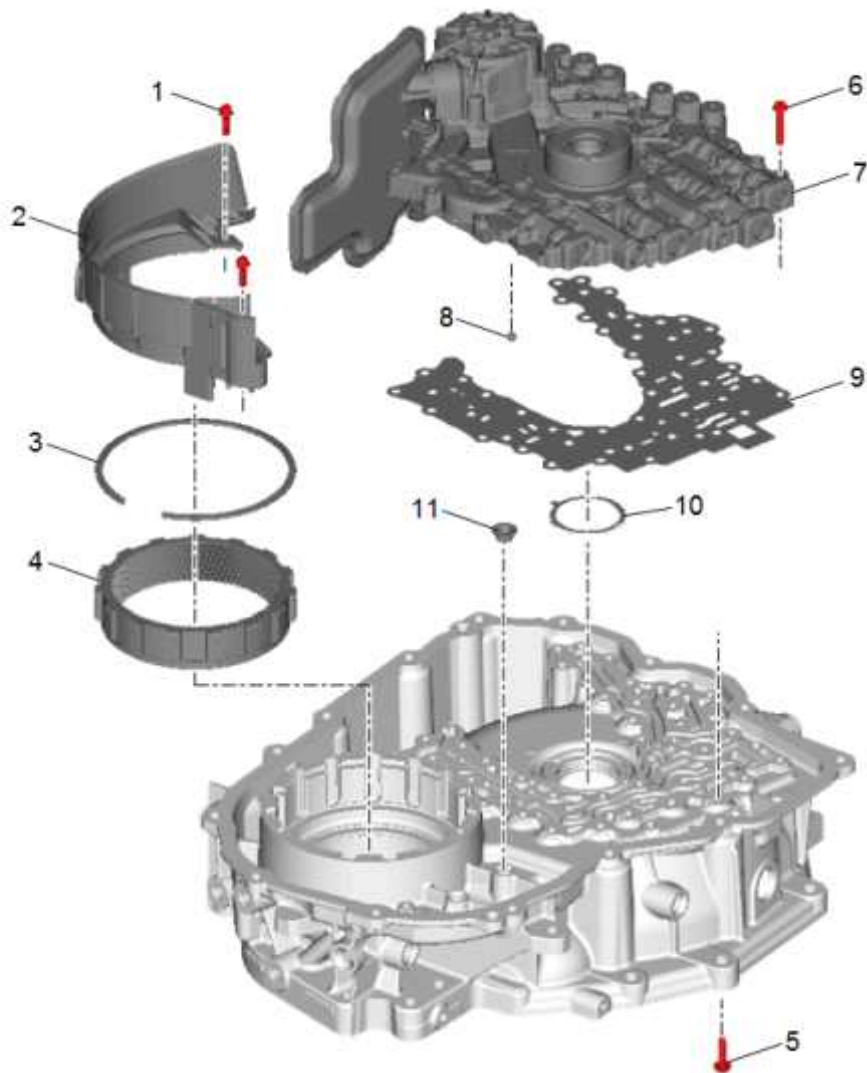


Fig. 82: Transmission Fluid Pump, Front Differential Carrier Baffle And Front Differential Ring Gear

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier Baffle Bolt (Qty: 2)
2	Front Differential Carrier Baffle
3	Front Differential Rear Gear Retainer NOTE: Note the direction of the taper to ensure proper installation.
4	Front Differential Ring Gear
5	Automatic Transmission Fluid Pump Cover Bolt (Qty: 19) NOTE: Remove and DISCARD the bolts.
6	Automatic Transmission Fluid Pump Cover Bolt (Qty: 22)
7	Automatic Transmission Fluid Pump
8	Automatic Transmission Fluid Pump Ball Check Valve

Callout	Component Name
9	Auxiliary Control Valve Body Spacer Plate NOTE: Remove and DISCARD the plate.
10	Driven Sprocket Thrust Washer
11	Drive Link Lubricant Fluid Seal NOTE: Remove and DISCARD the seal.

FRONT WHEEL DRIVE SHAFT SEAL REMOVAL - TORQUE CONVERTER HOUSING SIDE

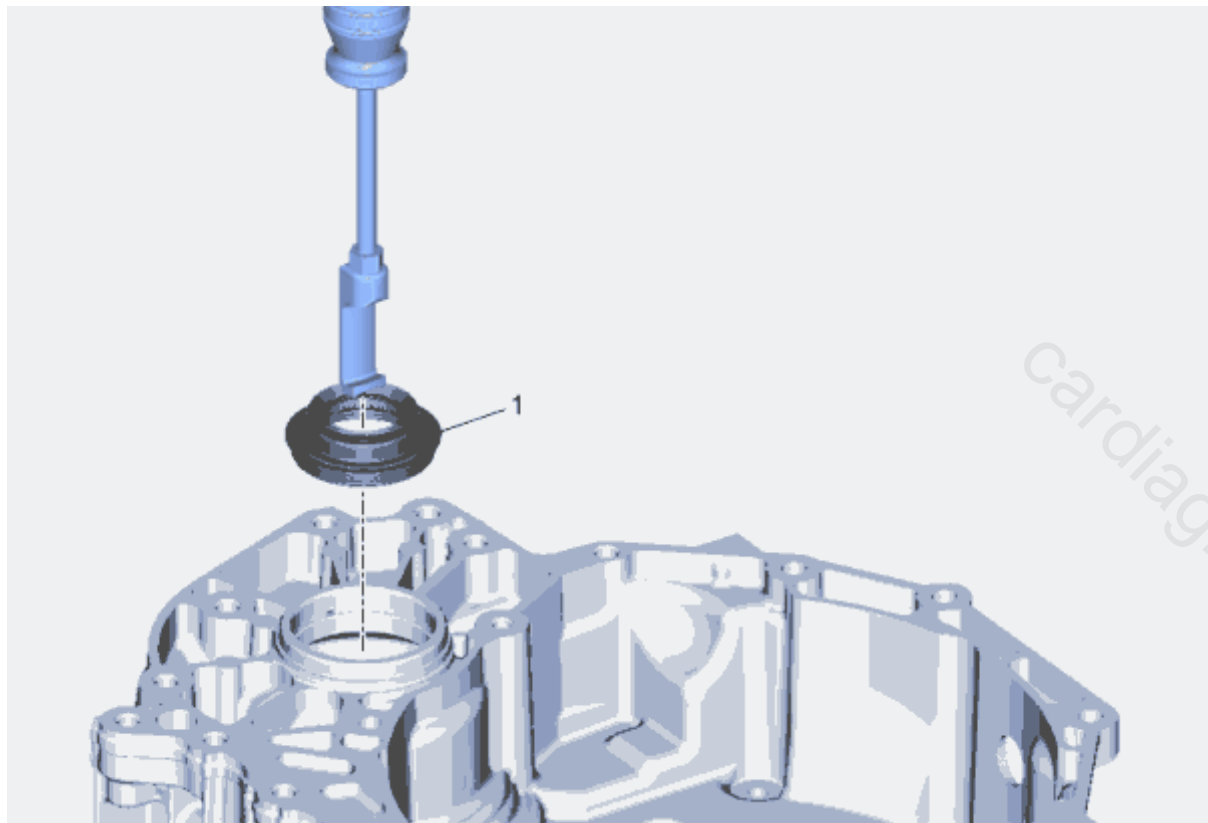


Fig. 83: Front Wheel Drive Shaft Seal - Torque Converter Housing Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal NOTE: Remove and DISCARD the seal. Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer Equivalent regional tools: Special Tools .

TORQUE CONVERTER AND DIFFERENTIAL HOUSING CLEANING AND INSPECTION

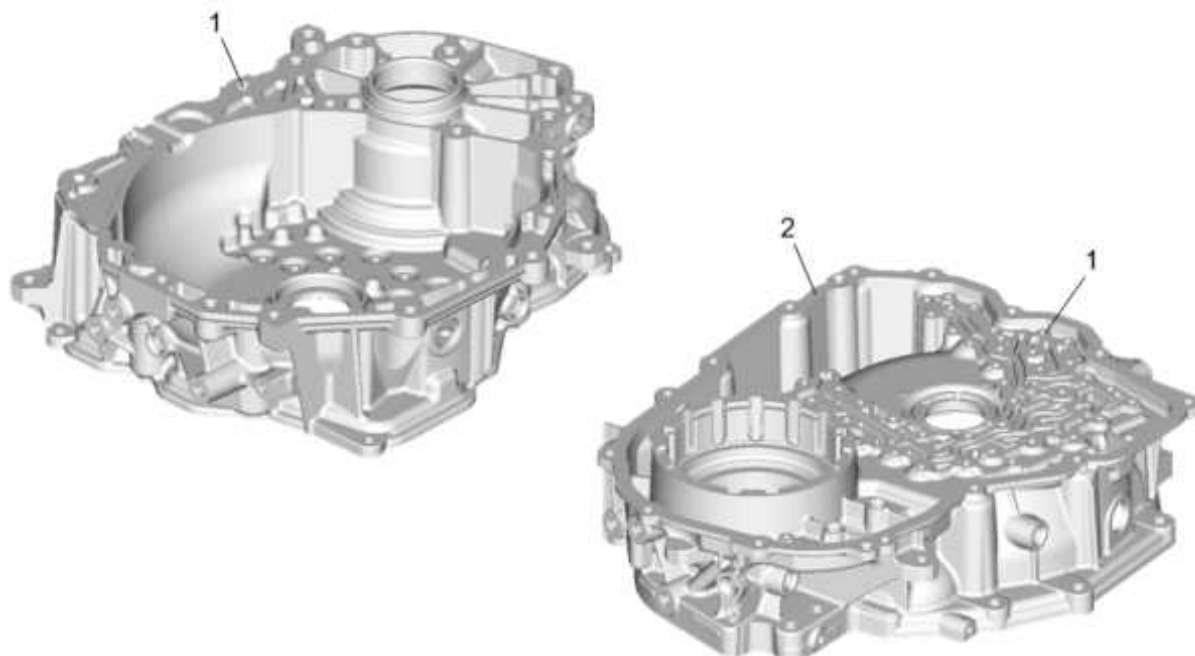


Fig. 84: Torque Converter And Differential Housing

Courtesy of GENERAL MOTORS COMPANY

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

FRONT WHEEL DRIVE SHAFT SEAL INSTALLATION - TORQUE CONVERTER HOUSING SIDE

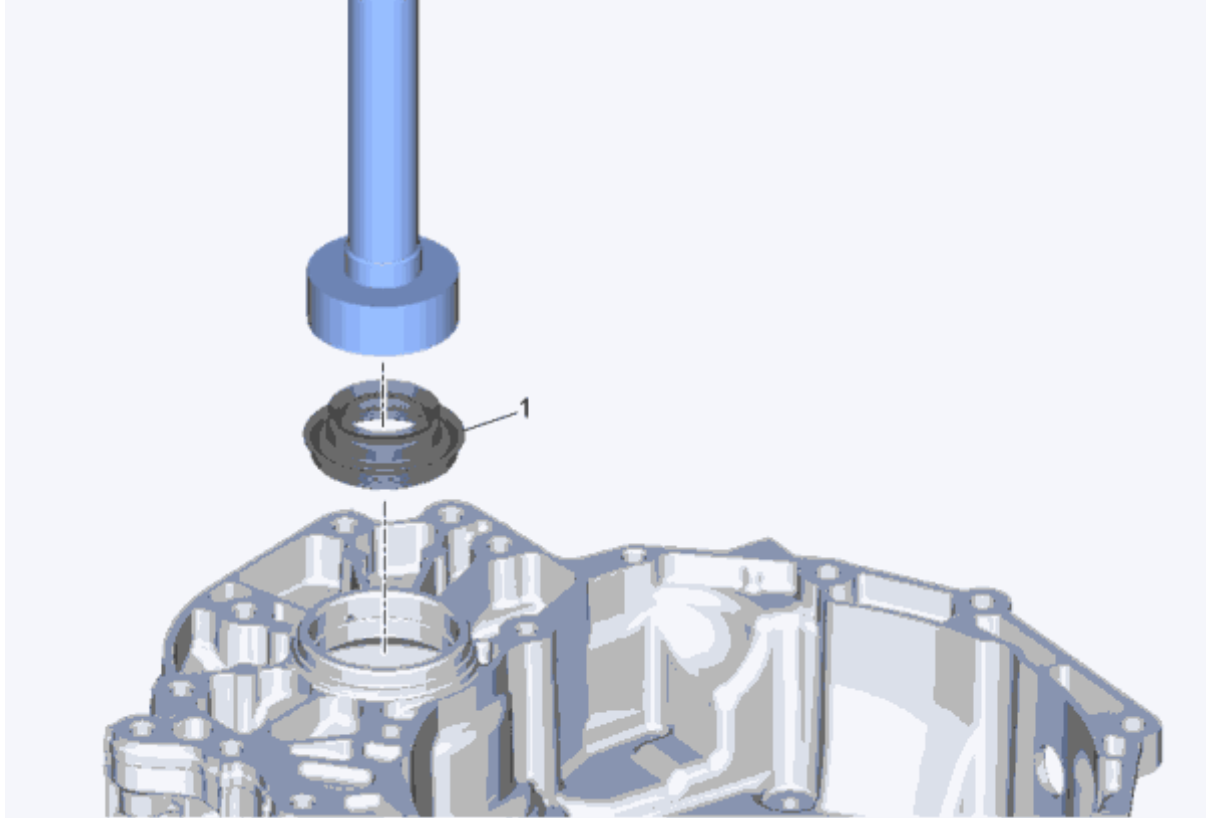


Fig. 85: Front Wheel Drive Shaft Seal - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal NOTE: Install a NEW seal. Do NOT reuse the old seal. Special Tools • DT-47790 Seal Installer • GE-8092 Driver Handle Equivalent regional tools: Special Tools .

TRANSMISSION FLUID PUMP DISASSEMBLE

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

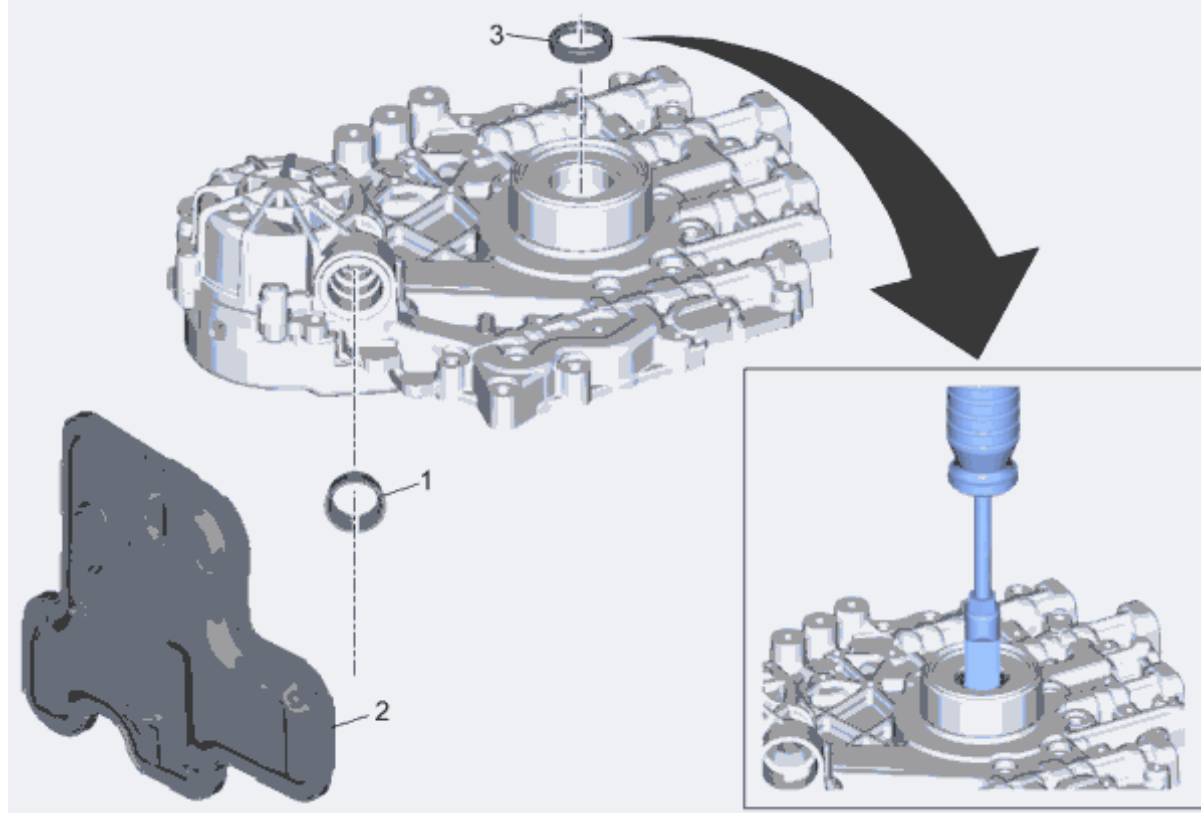


Fig. 86: Fluid Filter Assembly And Torque Converter Fluid Seal

Courtesy of GENERAL MOTORS COMPANY

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Callout	Component Name
1	Automatic Transmission Fluid Filter Seal NOTE: Remove and DISCARD the seal.
2	Automatic Transmission Fluid Filter NOTE: Remove and DISCARD the filter.
3	Torque Converter Fluid Seal NOTE: Remove and DISCARD the seal. Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer Equivalent regional tools: Special Tools

Drive Chain, Drive Sprocket, and Driven Sprocket Disassemble

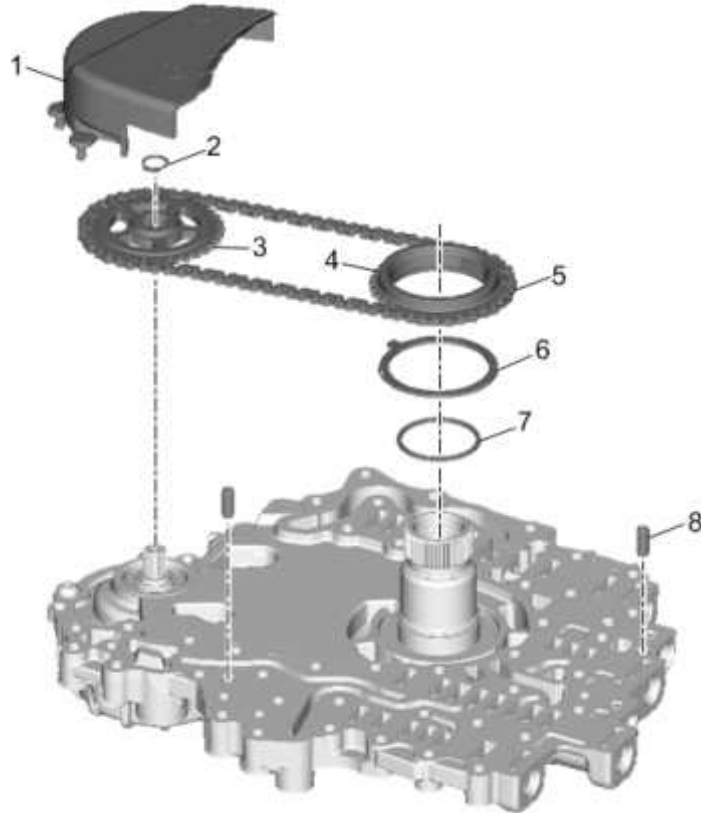


Fig. 87: Drive Chain, Drive Sprocket And Driven Sprocket

Courtesy of GENERAL MOTORS COMPANY

Drive Chain, Drive Sprocket, and Driven Sprocket Disassemble

Callout	Component Name
1	Automatic Transmission Fluid Baffle
2	Drive Sprocket Retaining Ring
3	Driven Sprocket NOTE: Remove the sprockets and chain at the same time.
4	Drive Sprocket
5	Drive Link
6	Driven Sprocket Thrust Washer
7	Torque Converter Fluid Seal Ring
8	Automatic Transmission Fluid Pump Locating Pin (Qty: 2)

Automatic Transmission Fluid Pump Disassemble

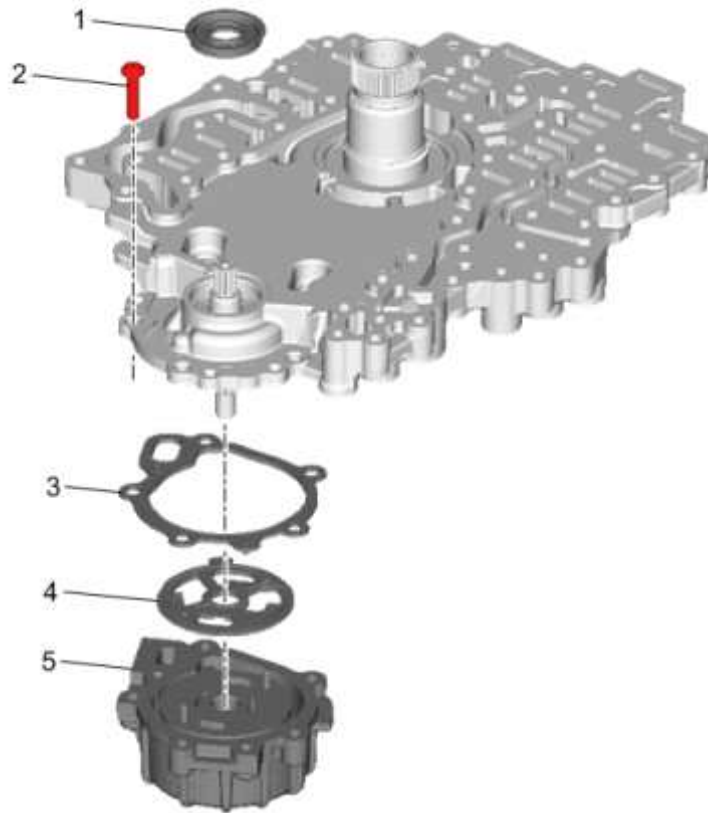


Fig. 88: Automatic Transmission Fluid Pump
 Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Disassemble

Callout	Component Name
1	Automatic Transmission Fluid Pump Shaft Seal NOTE: Remove and DISCARD the seal.
2	Automatic Transmission Fluid Pump Cover Bolt (Qty: 5)
3	Automatic Transmission Fluid Pump Gasket NOTE: Remove and DISCARD the gasket.
4	Automatic Transmission Fluid Pump Seal NOTE: Remove and DISCARD the seal.
5	Automatic Transmission Fluid Pump

Automatic Transmission Fluid Pump Body Disassemble (1 of 2)

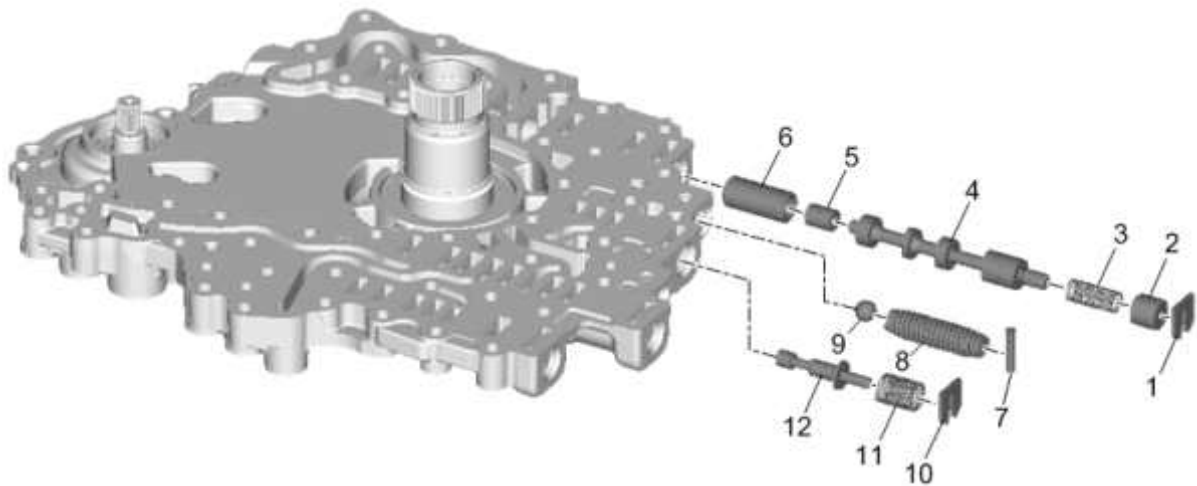


Fig. 89: Automatic Transmission Fluid Pump Body (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Disassemble (1 of 2)

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 for wear and/or damage.	
1	Pressure Regulator Valve Bore Plug Retainer
2	Pressure Regulator Valve Plug
3	Pressure Regulator Valve Spring
4	Pressure Regulator Valve
5	Pressure Regulator Shuttle Valve
6	Pressure Regulator Valve Bore Bushing
7	Line Blowoff Ball Valve Spring Retainer
8	Automatic Transmission Fluid Pump Blowoff Ball Valve Spring
9	Automatic Transmission Fluid Pump Blowoff Ball Valve
10	Lube Regulator Valve Bore Plug Retainer
11	Lube Boost Valve Spring
12	Lube Regulator Valve

Automatic Transmission Fluid Pump Body Disassemble (2 of 2)

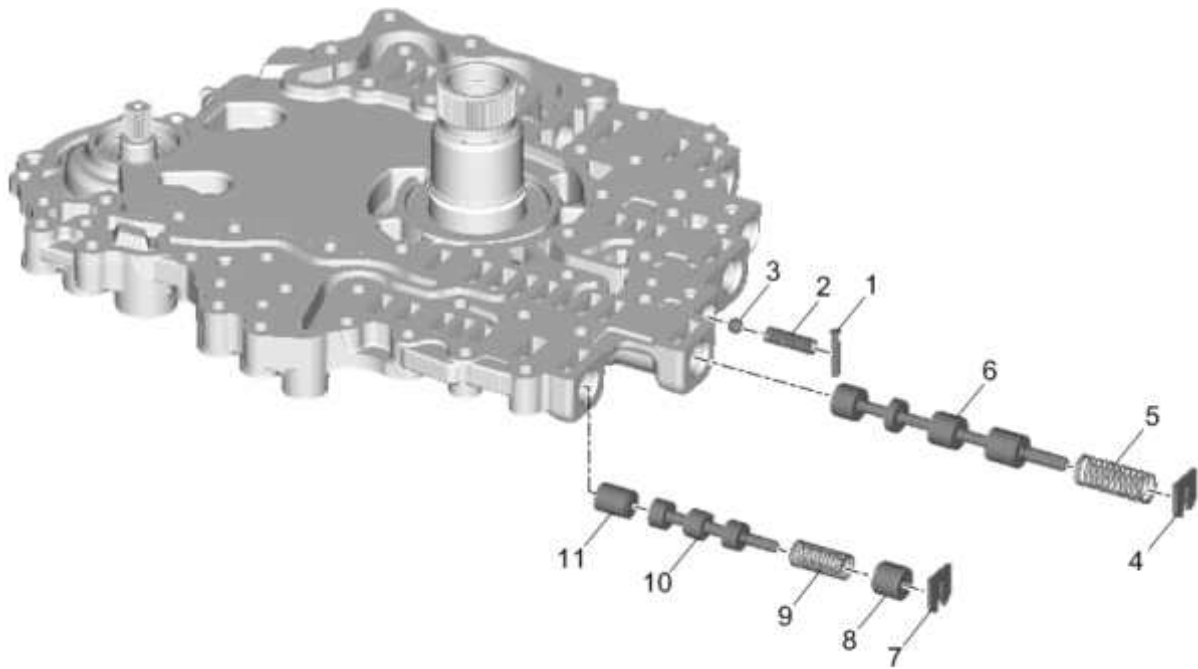


Fig. 90: Automatic Transmission Fluid Pump Body (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Disassemble (2 of 2)

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 for wear and/or damage.	
1	Torque Converter Clutch Blowoff Ball Valve Retainer
2	Torque Converter Clutch Blowoff Ball Valve Spring
3	Torque Converter Clutch Blowoff Ball Valve
4	Torque Converter Clutch Control Valve Retainer
5	Torque Converter Clutch Control Valve Spring
6	Torque Converter Clutch Control Valve
7	Torque Converter Clutch Regulator Application Valve Bore Plug Retainer
8	Torque Converter Clutch Regulator Application Valve Bore Plug
9	Torque Converter Clutch Regulator Apply Valve Spring
10	Torque Converter Clutch Regulator Apply Valve
11	Torque Converter Clutch Regulator Application Shuttle Valve

TRANSMISSION FLUID PUMP ASSEMBLE

Automatic Transmission Fluid Pump Body Assemble (1 of 2)

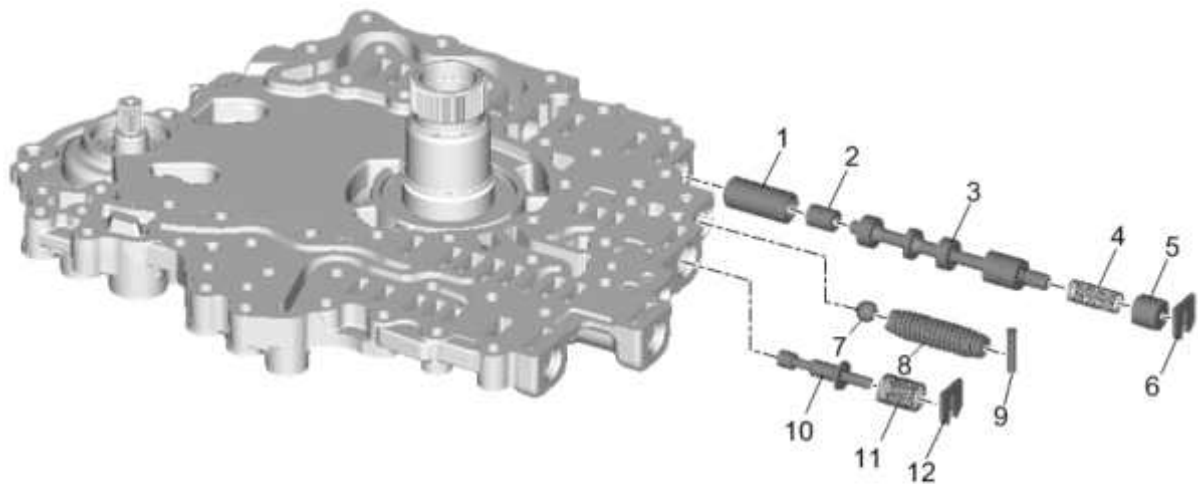


Fig. 91: Automatic Transmission Fluid Pump Body (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Assemble (1 of 2)

Callout	Component Name
1	Pressure Regulator Valve Bore Bushing
2	Pressure Regulator Shuttle Valve
3	Pressure Regulator Valve
4	Pressure Regulator Valve Spring
5	Pressure Regulator Valve Plug
6	Pressure Regulator Valve Bore Plug Retainer
7	Automatic Transmission Fluid Pump Blowoff Ball Valve
8	Automatic Transmission Fluid Pump Blowoff Ball Valve Spring
9	Line Blowoff Ball Valve Spring Retainer
10	Lube Regulator Valve
11	Lube Boost Valve Spring
12	Lube Regulator Valve Bore Plug Retainer

Automatic Transmission Fluid Pump Body Assemble (2 of 2)

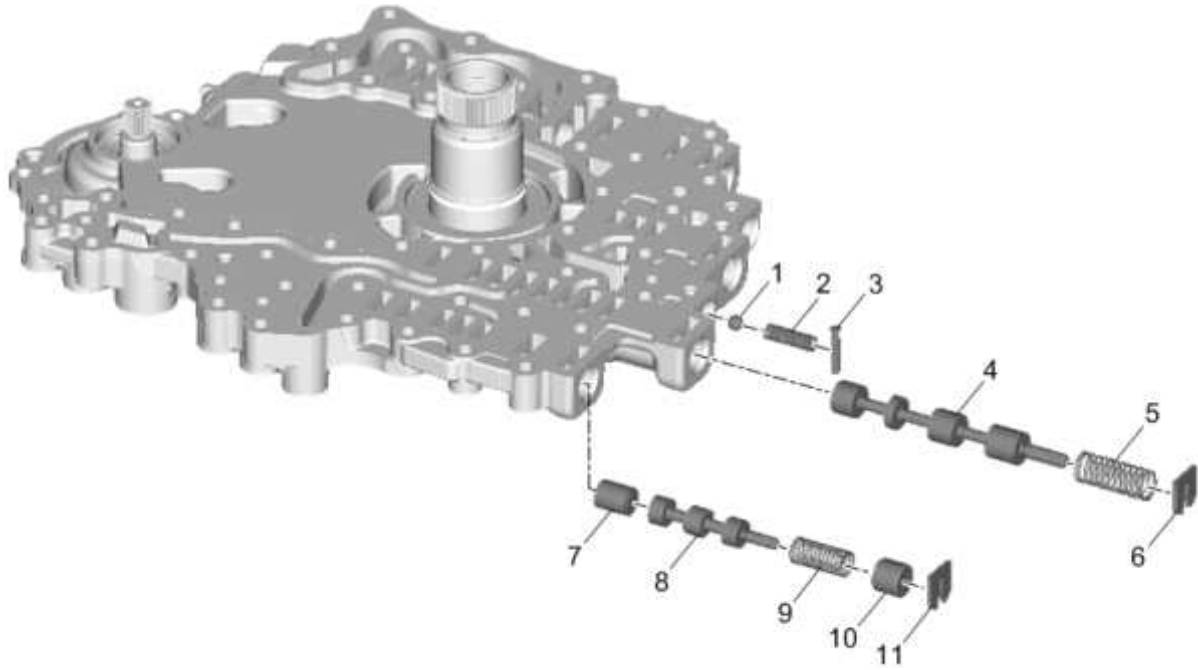


Fig. 92: Automatic Transmission Fluid Pump Body (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Assemble (2 of 2)

Callout	Component Name
1	Torque Converter Clutch Blowoff Ball Valve
2	Torque Converter Clutch Blowoff Ball Valve Spring
3	Torque Converter Clutch Blowoff Ball Valve Retainer
4	Torque Converter Clutch Control Valve
5	Torque Converter Clutch Control Valve Spring
6	Torque Converter Clutch Control Valve Retainer
7	Torque Converter Clutch Regulator Application Shuttle Valve
8	Torque Converter Clutch Regulator Apply Valve
9	Torque Converter Clutch Regulator Apply Valve Spring
10	Torque Converter Clutch Regulator Application Valve Bore Plug
11	Torque Converter Clutch Regulator Application Valve Bore Plug Retainer

Automatic Transmission Fluid Pump Assemble

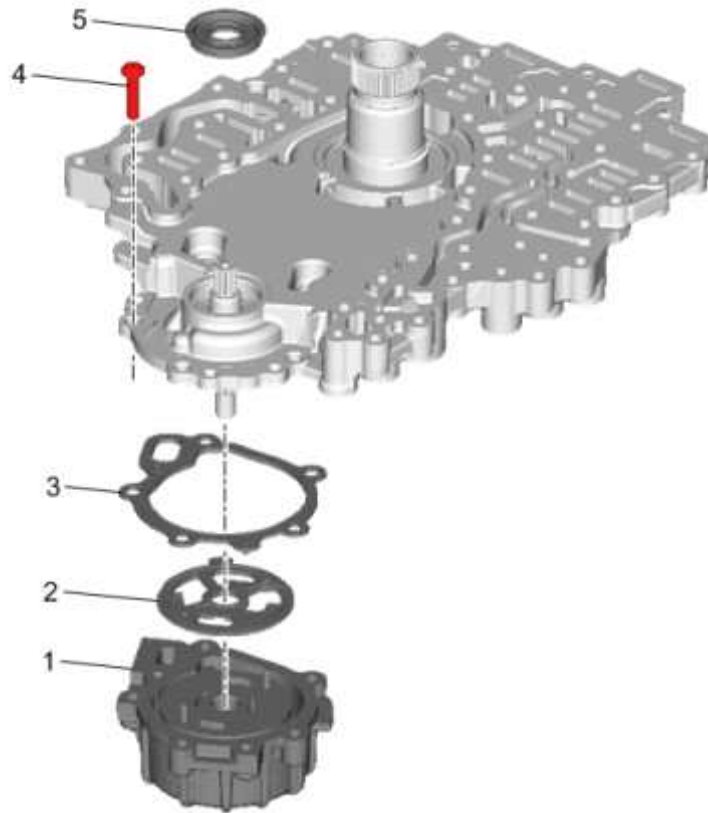


Fig. 93: Automatic Transmission Fluid Pump
 Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Assemble

Callout	Component Name
1	Automatic Transmission Fluid Pump
2	Automatic Transmission Fluid Pump Seal Procedure Install a NEW seal. Do NOT reuse the old seal.
3	Automatic Transmission Fluid Pump Gasket Procedure Install NEW gaskets. Do NOT reuse old gaskets.
4	Automatic Transmission Fluid Pump Cover Bolt (Qty: 5) CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
5	Automatic Transmission Fluid Pump Shaft Seal Procedure Install a NEW seal. Do NOT reuse the old seal.

Drive Chain, Drive Sprocket, and Driven Sprocket Assemble

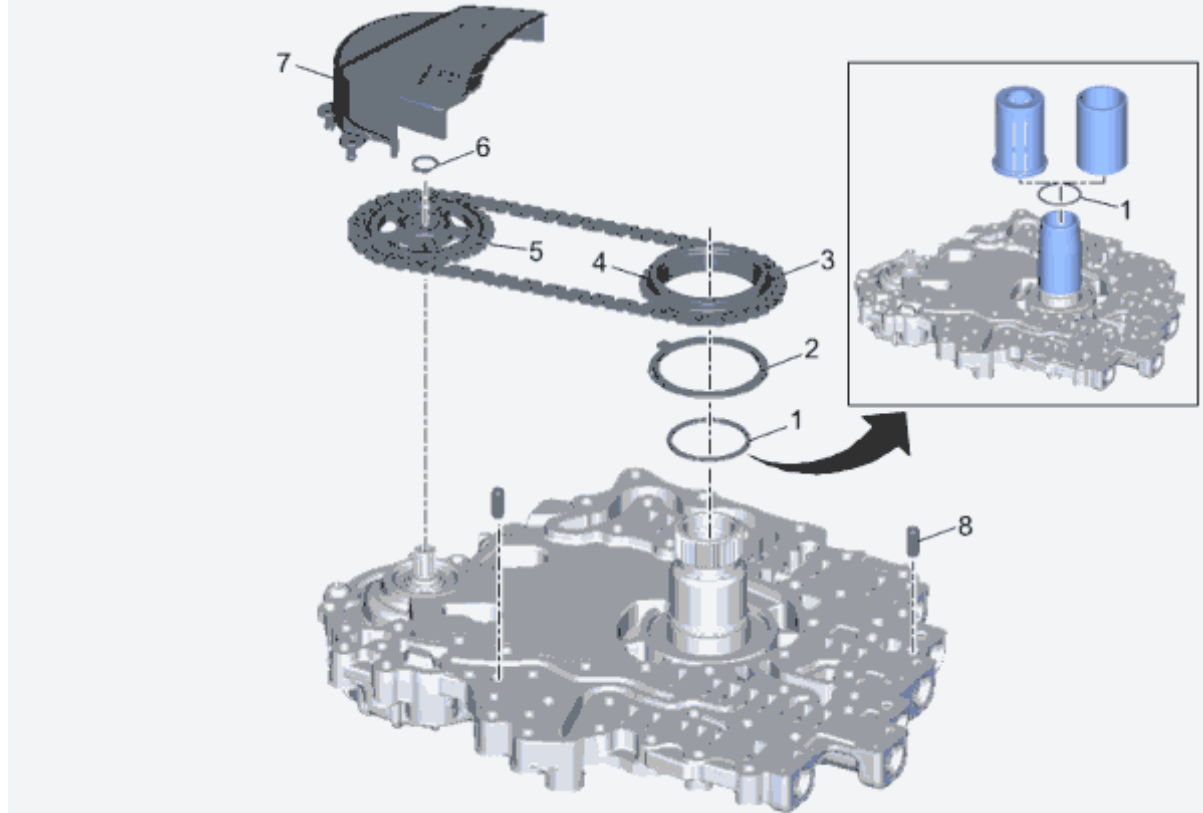


Fig. 94: Drive Chain, Drive Sprocket And Driven Sprocket
Courtesy of GENERAL MOTORS COMPANY

Drive Chain, Drive Sprocket, and Driven Sprocket Assemble

Callout	Component Name
1	Torque Converter Fluid Seal Ring Procedure 1. Place DT-51191-4 which is part of DT-51191 Pump Seal Installer Set over the Stator Support. 2. Place a NEW Torque Converter Fluid Seal Ring onto DT-51191-4. 3. Use DT-51191-2 to push the Torque Converter Fluid Seal Ring down over DT-51191-4 into the Seal groove. 4. Remove DT-51191-4 5. Install DT-51191-1 with the chamfer end down over the Torque Converter Fluid Seal Ring and leave on the Seal Ring for at least 60 seconds. Special Tools DT-51191 Pump Seal Installer Set Equivalent regional tools: Special Tools
2	Driven Sprocket Thrust Washer
3	Drive Link Procedure Install the sprockets and chain together as an assembly.
4	Drive Sprocket
5	Driven Sprocket
6	Drive Sprocket Retaining Ring
7	Automatic Transmission Fluid Baffle
8	Automatic Transmission Fluid Pump Locating Pin (Qty: 2)

Fluid Filter Assembly and Torque Converter Fluid Seal Assemble

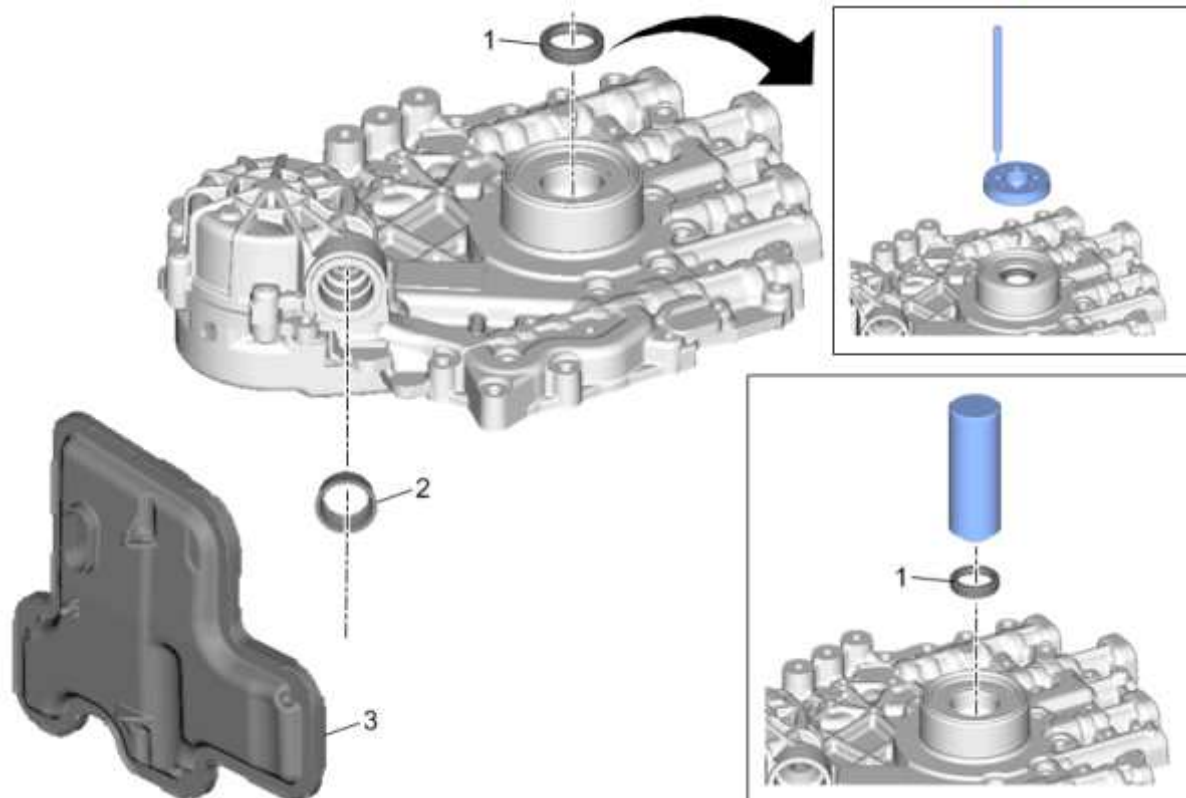


Fig. 95: Fluid Filter Assembly And Torque Converter Fluid Seal

Courtesy of GENERAL MOTORS COMPANY

Fluid Filter Assembly and Torque Converter Fluid Seal Assemble

Callout	Component Name
1	Torque Converter Fluid Seal Procedure 1. Install a NEW seal. Do NOT reuse the old seal. 2. The fluid seal assembly must be staked in place using DT-49131 seal staking tool or suitable center punch to ensure proper seal retention. Special Tools • DT-47792 Seal Installer • DT-49131 Seal Staking Tool Equivalent regional tools: Special Tools
2	Automatic Transmission Fluid Filter Seal Procedure Install a NEW seal. Do NOT reuse the old seal.
3	Automatic Transmission Fluid Filter Procedure Install a NEW filter. DO NOT reuse old filter.

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR INSTALLATION

Callout	Component Name
1	Drive Link Lubricant Fluid Seal NOTE: • Install a NEW seal. Do NOT reuse the old seal. • Ensure seal is installed with the correct orientation.
2	Automatic Transmission Fluid Pump Ball Check Valve
3	Auxiliary Control Valve Body Spacer Plate NOTE: Install a NEW plate. DO NOT reuse the old plate.
4	Driven Sprocket Thrust Washer
5	Automatic Transmission Fluid Pump

Callout	Component Name
6	Automatic Transmission Fluid Pump Cover Bolt (Qty: 19) CAUTION: Refer to Fastener Caution . CAUTION: Refer to Torque-to-Yield Fastener Caution . NOTE: Install NEW bolts. Do NOT reuse old bolts. Tighten in sequence 1. First Pass: 6 N.m (53 lb in) 2. Final Pass: 20 degrees
7	Automatic Transmission Fluid Pump Cover Bolt (Qty: 22) Tighten in sequence 1. First Pass: 6 N.m (53 lb in) 2. Final Pass: 20 degrees Special Tool EN-45059 Angle Meter or equivalent Equivalent regional tools: Special Tools
8	Front Differential Ring Gear
9	Front Differential Rear Gear Retainer NOTE: Install the retainer with the taper facing away from the ring gear.
10	Front Differential Carrier Baffle
11	Front Differential Carrier Baffle Bolt (Qty: 2) Tighten 9 N.m (80 lb in)

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY INSTALLATION

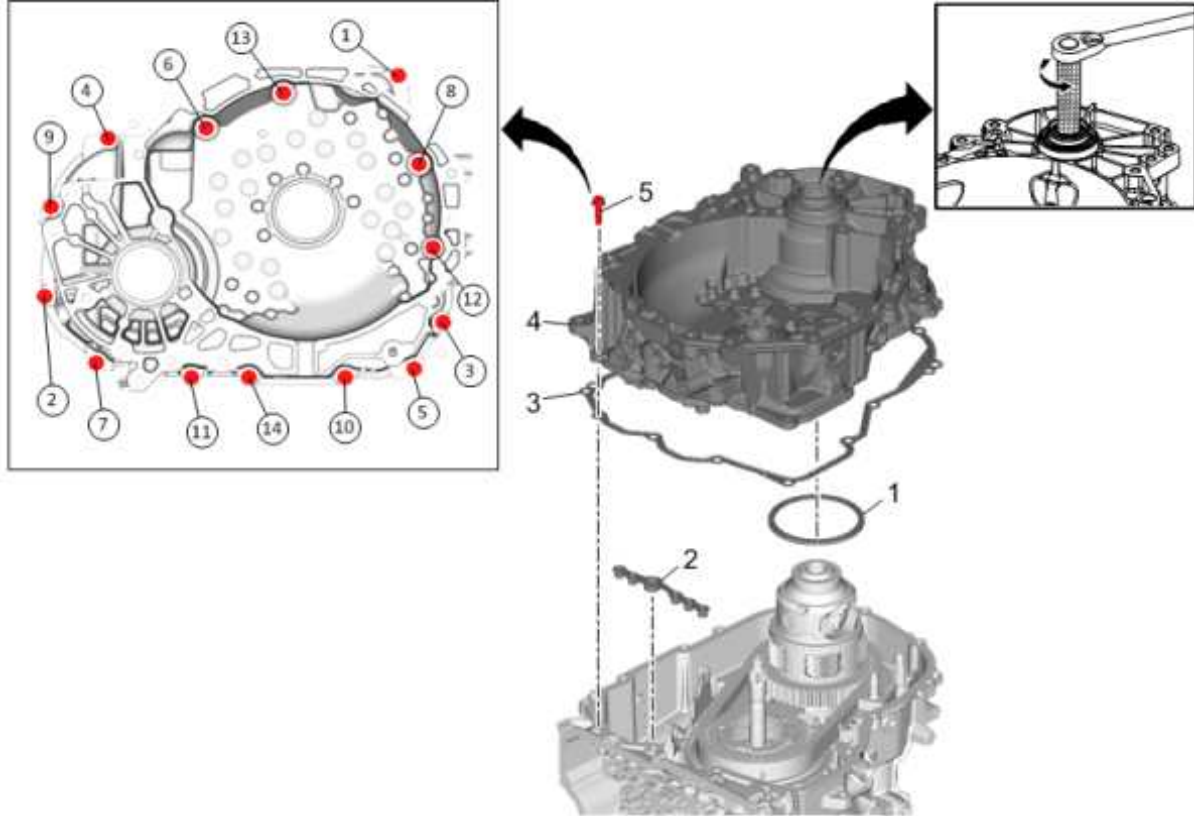


Fig. 97: Torque Converter Housing With Fluid Pump Assembly (With Tightening Sequence)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier Bearing
2	Automatic Transmission Fluid Pump Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	Torque Converter Housing Gasket NOTE: Install a NEW gasket. Do NOT reuse the old gasket.
4	Torque Converter Housing 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. DT-47793 Differential Rotating Tool Special Tools DT-47793 Differential Rotating Tool Equivalent regional tools: Special Tools
5	Torque Converter and Differential Housing Bolt (Qty: 14) CAUTION: Refer to Fastener Caution . Tighten in sequence 38 N.m (28 lb ft)

INPUT AND OUTPUT SPEED SENSOR INSTALLATION

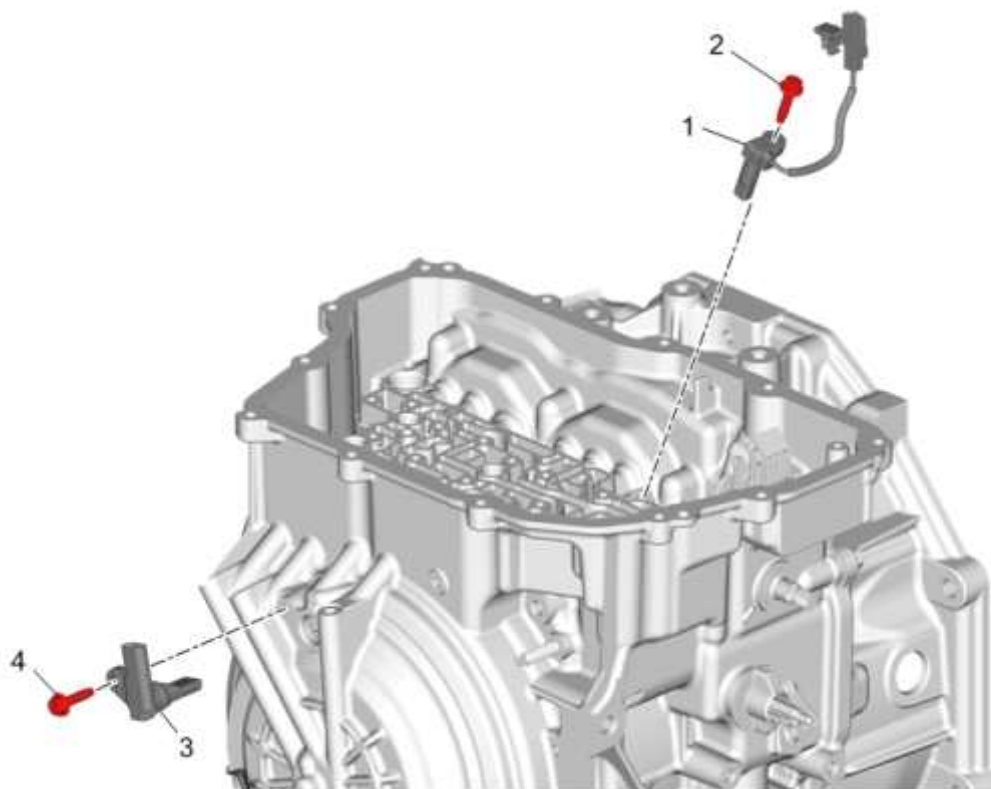


Fig. 98: Input And Output Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Output Speed Sensor
2	Automatic Transmission Output Speed Sensor Bolt CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
3	Automatic Transmission Input Speed Sensor
4	Automatic Transmission Input Speed Sensor Bolt Tighten 9 N.m (80 lb in)

CONTROL VALVE BODY ASSEMBLY DISASSEMBLE (WITHOUT ETRS)

Control Valve Solenoid Body Disassemble

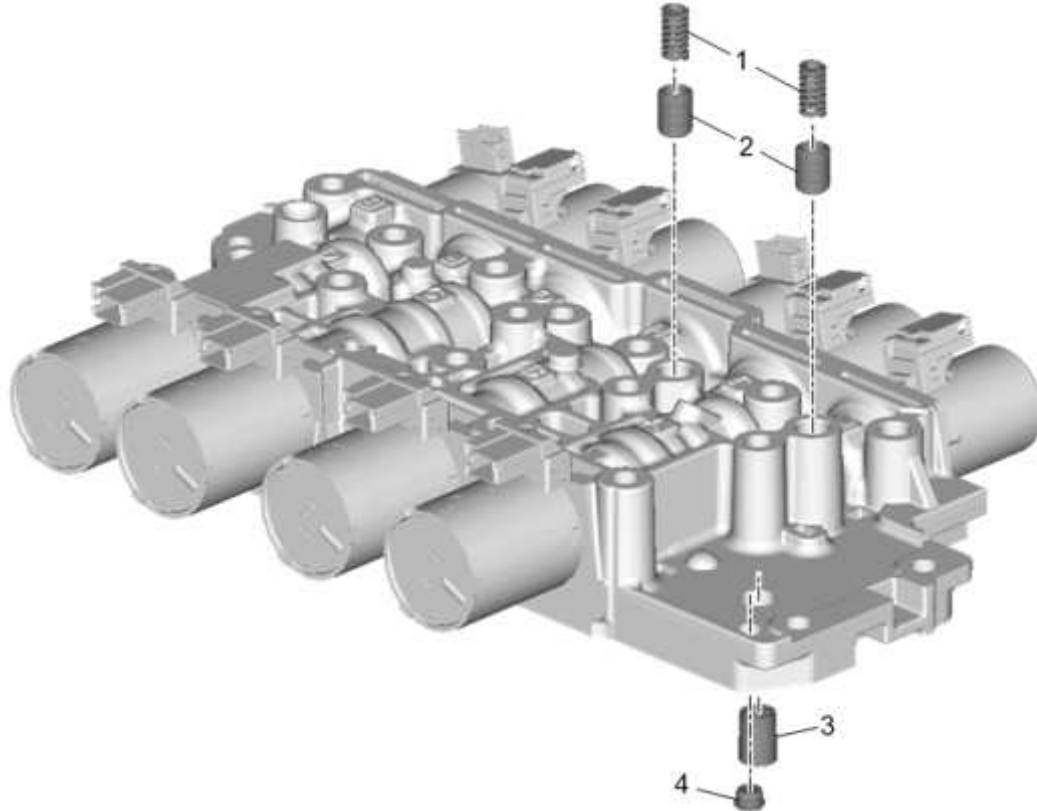
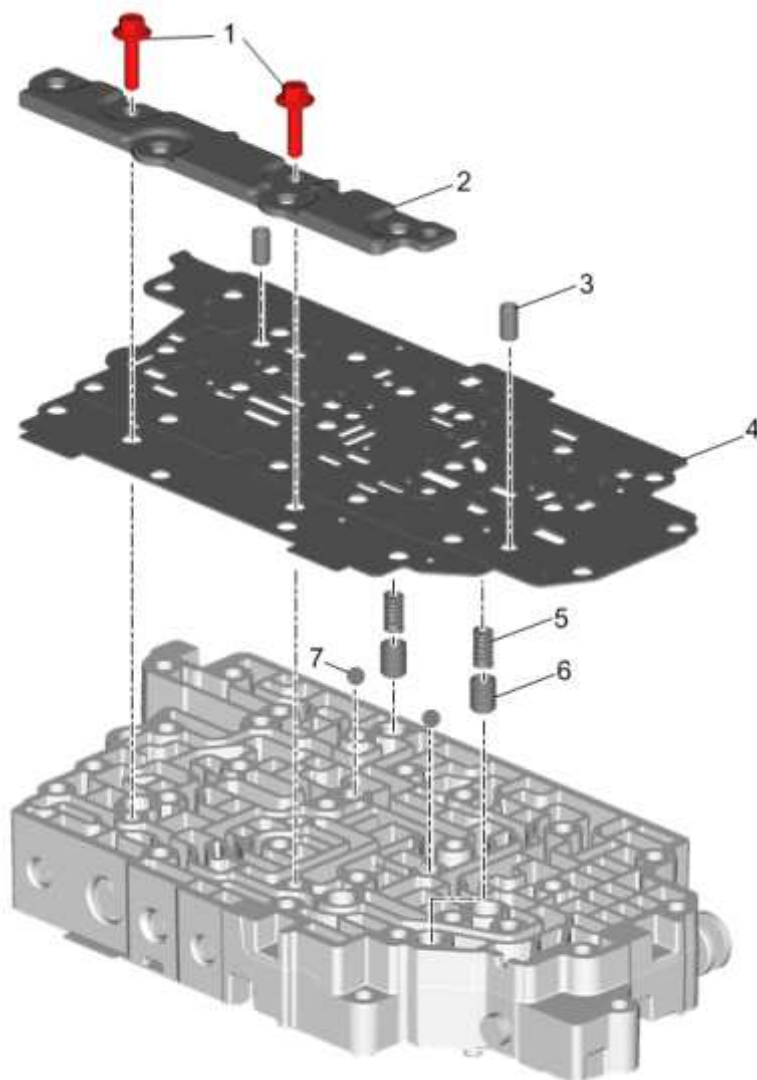


Fig. 99: Control Valve Solenoid Body
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Disassemble

Callout	Component Name
1	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
2	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
3	Control Valve Channel Plate Ball Check Valve Spring
4	Variable High and 2-3-4 Clutch Housing Valve

Control Valve Body Plate Disassemble



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Fig. 100: Control Valve Body Plate

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Plate Disassemble

Callout	Component Name
1	Control Valve Solenoid Body Bolt (Qty: 2)
2	Oil Transfer Plate
3	Control Valve Body Locating Pin (Qty: 2)
4	Control Valve Body Spacer 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.
5	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
6	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
7	Control Valve Body Ball Check Valve (Qty: 2)

Control Valve Body Disassemble

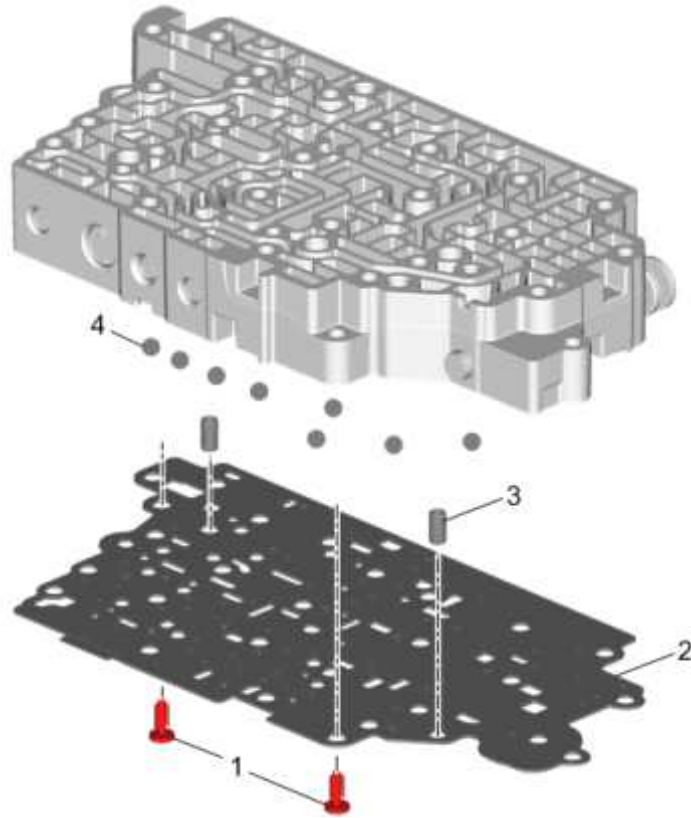


Fig. 101: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Disassemble

Callout	Component Name
1	Control Valve Body Spacer Plate Retainer (Qty: 2)
2	Control Valve Body Spacer 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.
3	Control Valve Body Locating Pin (Qty: 2)
4	Control Valve Body Ball Check Valve (Qty: 6)

CONTROL VALVE BODY ASSEMBLY DISASSEMBLE (WITH ETRS)

Control Valve Solenoid Body Disassemble

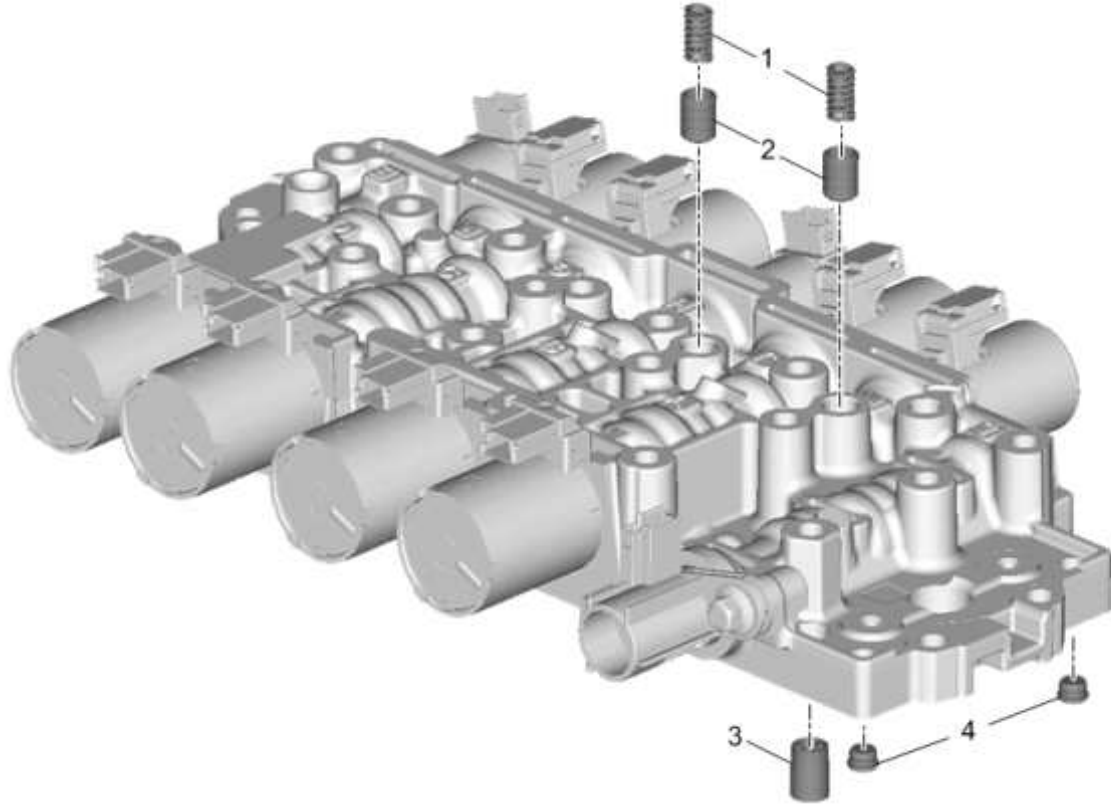


Fig. 102: Control Valve Solenoid Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Disassemble

Callout	Component Name
1	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
2	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
3	Control Valve Channel Plate Ball Check Valve Spring
4	Variable High and 2-3-4 Clutch Housing Valve (Qty: 2)

Control Valve Body Disassemble

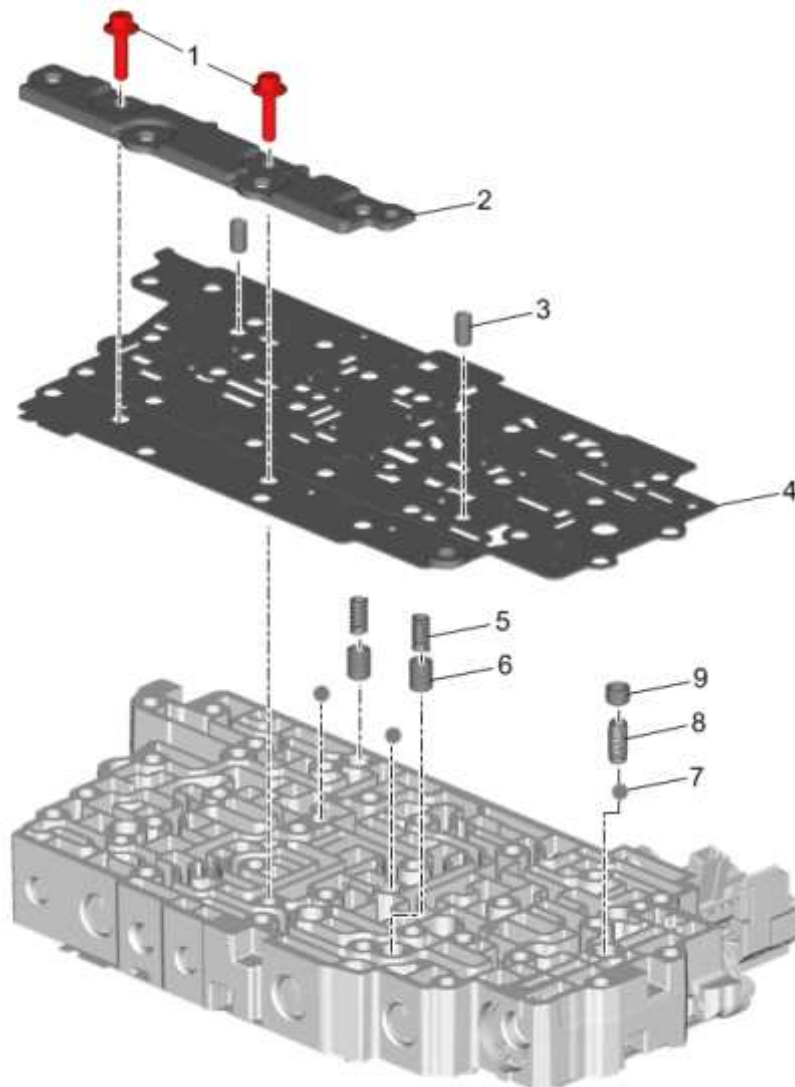


Fig. 103: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Disassemble

Callout	Component Name
1	Control Valve Solenoid Body Bolt (Qty: 2)
2	Oil Transfer Plate
3	Control Valve Body Locating Pin (Qty: 2)
4	Control Valve Body Spacer 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.
5	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
6	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
7	Control Valve Body Ball Check Valve (Qty: 3)
8	Park Selector Valve Spring
9	Park Selector Valve Bore Plug

Control Valve Body Plate Disassemble

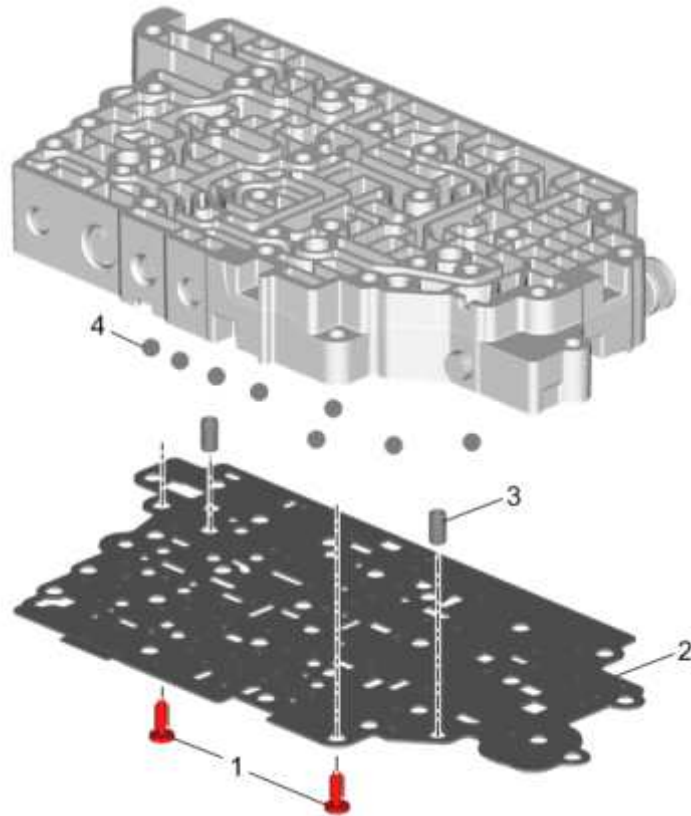


Fig. 104: Control Valve Body Plate

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Plate Disassemble

Callout	Component Name
1	Control Valve Body Spacer Plate Retainer (Qty: 2)
2	Control Valve Body Spacer 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.
3	Control Valve Body Locating Pin (Qty: 2)
4	Control Valve Body Ball Check Valve (Qty: 8)

CONTROL VALVE SOLENOID BODY CLEANING AND INSPECTION (WITHOUT ETRS)

Control Valve Solenoid Body (1 of 2)

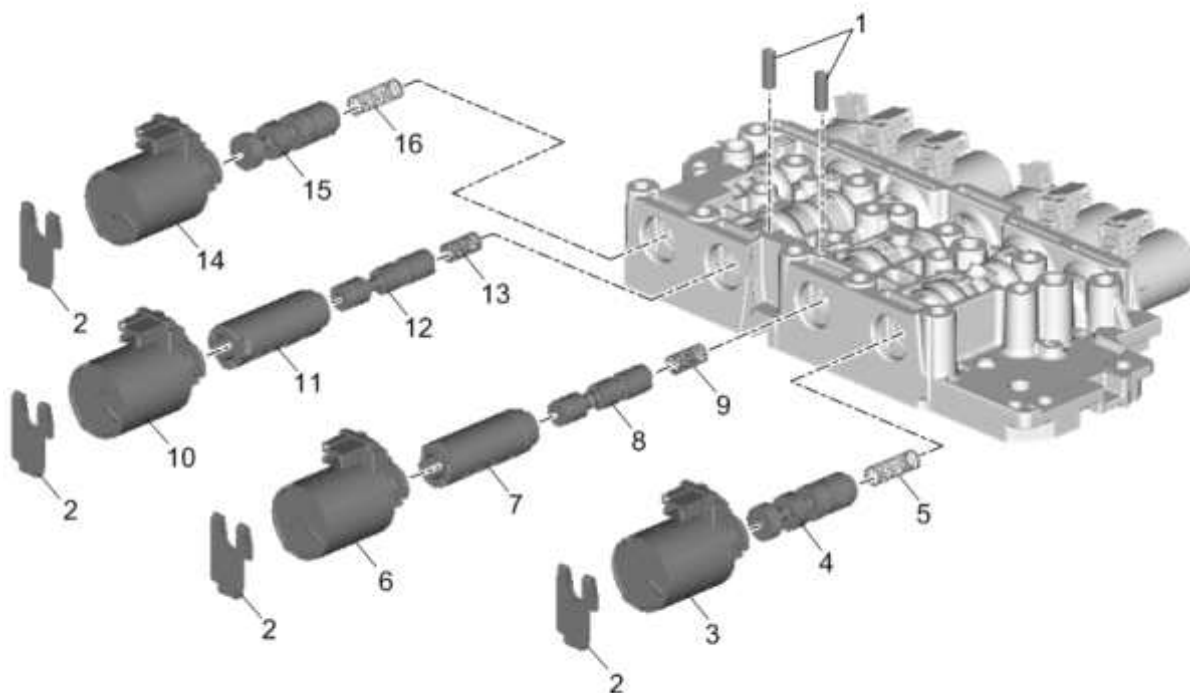


Fig. 105: Control Valve Solenoid Body (1 Of 2)
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body (1 of 2)

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 solenoid body. The control valve solenoid body assembly is only replaceable as an assembly.	
1	Clutch Regulator Valve Sleeve Pin
2	Control Valve Solenoid Retainer
3	Shift Solenoid Valve
4	2-9 Clutch Regulator Valve
5	5-7-Reverse Clutch Regulator Valve Spring
6	Shift Solenoid Valve
7	1-Reverse and 6-7-8-9 Clutch Regulator Valve Sleeve
8	1-2-3-4-5-6 Clutch Regulator Valve
9	1-2-3-4-5-6 Clutch Regulator Spring
10	Shift Solenoid Valve
11	1-2-3-4-5-6 Clutch Regulator Valve Sleeve
12	1-Reverse and 6-7-8-9 Clutch Regulator Valve
13	1-2-3-4-5-6 Clutch Regulator Spring
14	Shift Solenoid Valve

Callout	Component Name
15	5-7-Reverse Clutch Regulator Valve
16	5-7-Reverse Clutch Regulator Valve Spring

Control Valve Solenoid Body (2 of 2)

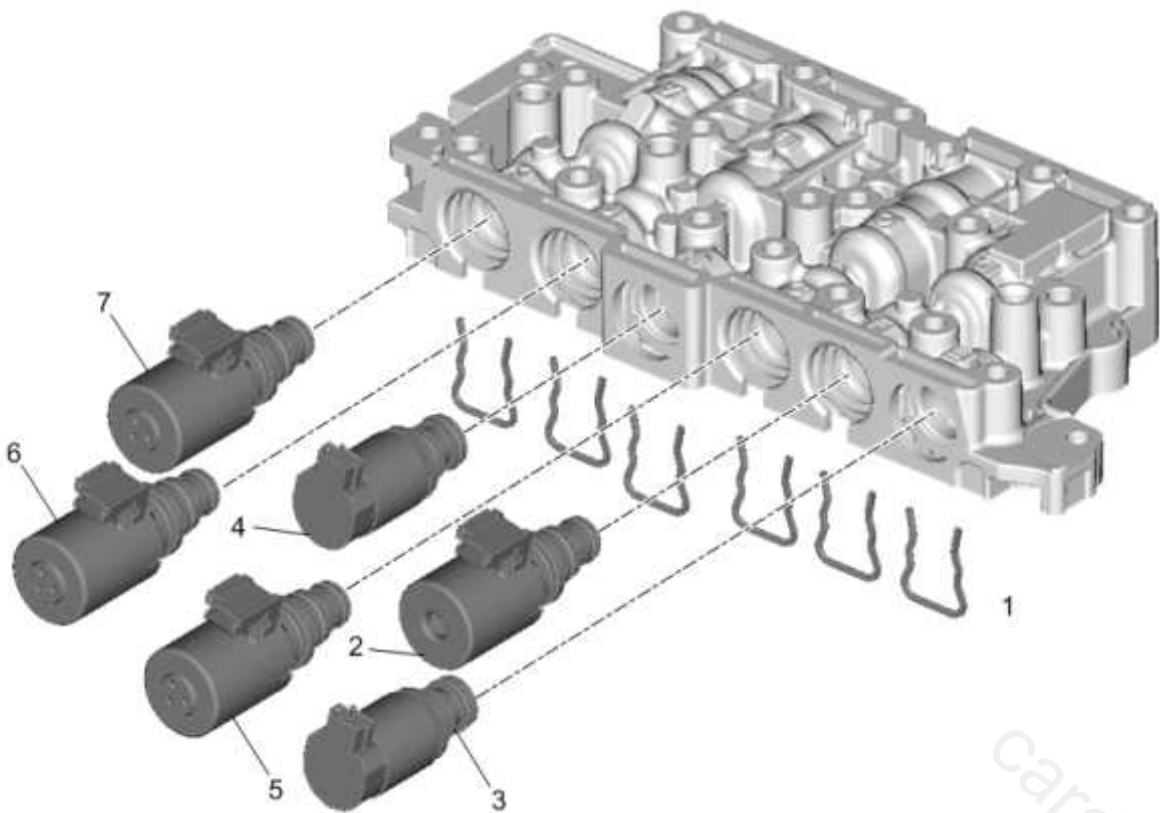


Fig. 106: Control Valve Solenoid Body (2 Of 2)
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body (2 of 2)

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 solenoid body. The control valve solenoid body assembly is only replaceable as an assembly.	
1	Control Valve Solenoid Retainer (Qty: 6)
2	Shift Solenoid Valve
3	Shift Solenoid Valve
4	Shift Solenoid Valve
5	Shift Solenoid Valve
6	Shift Solenoid Valve
7	Shift Solenoid Valve

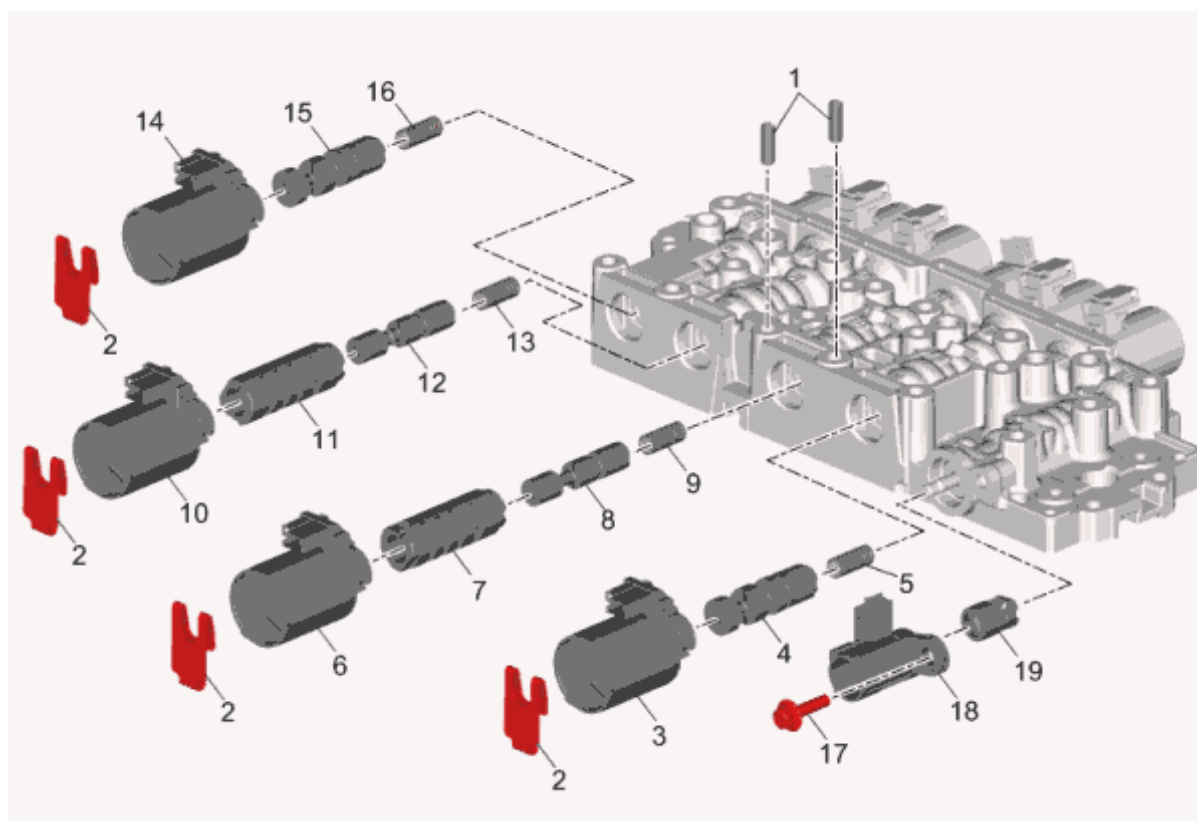


Fig. 107: Control Valve Solenoid Body (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body (1 of 2)

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 solenoid body. The control valve solenoid body assembly is only replaceable as an assembly.	
1	Clutch Regulator Valve Sleeve Pin (Qty: 2)
2	Control Valve Solenoid Retainer
3	Shift Solenoid Valve
4	2-9 Clutch Regulator Valve
5	2-9 Clutch Regulator Valve Spring
6	Shift Solenoid Valve
7	1-2-3-4-5-6 Clutch Regulator Valve Sleeve
8	1-2-3-4-5-6 Clutch Regulator Valve
9	1-2-3-4-5-6 Clutch Regulator Spring
10	Shift Solenoid Valve
11	1-Reverse and 6-7-8-9 Clutch Regulator Valve Sleeve
12	1-Reverse and 6-7-8-9 Clutch Regulator Valve
13	1-Reverse and 6-7-8-9 Clutch Regulator Valve Spring

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 solenoid body. The control valve solenoid body assembly is only replaceable as an assembly.	
1	Control Valve Solenoid Retainer (Qty: 6)
2	Shift Solenoid Valve
3	Shift Solenoid Valve
4	Shift Solenoid Valve
5	Shift Solenoid Valve
6	Shift Solenoid Valve
7	Shift Solenoid Valve
8	Mode 1 Valve Bore Plug Retainer
9	Mode 1 Valve Bore Plug
10	Mode 1 Valve
11	Mode 1 Electronic Transmission Range Selector Valve
12	Mode 1 Valve Spring

CONTROL VALVE BODY CLEANING AND INSPECTION (WITHOUT ETRS)

Control Valve Body (1 of 2)

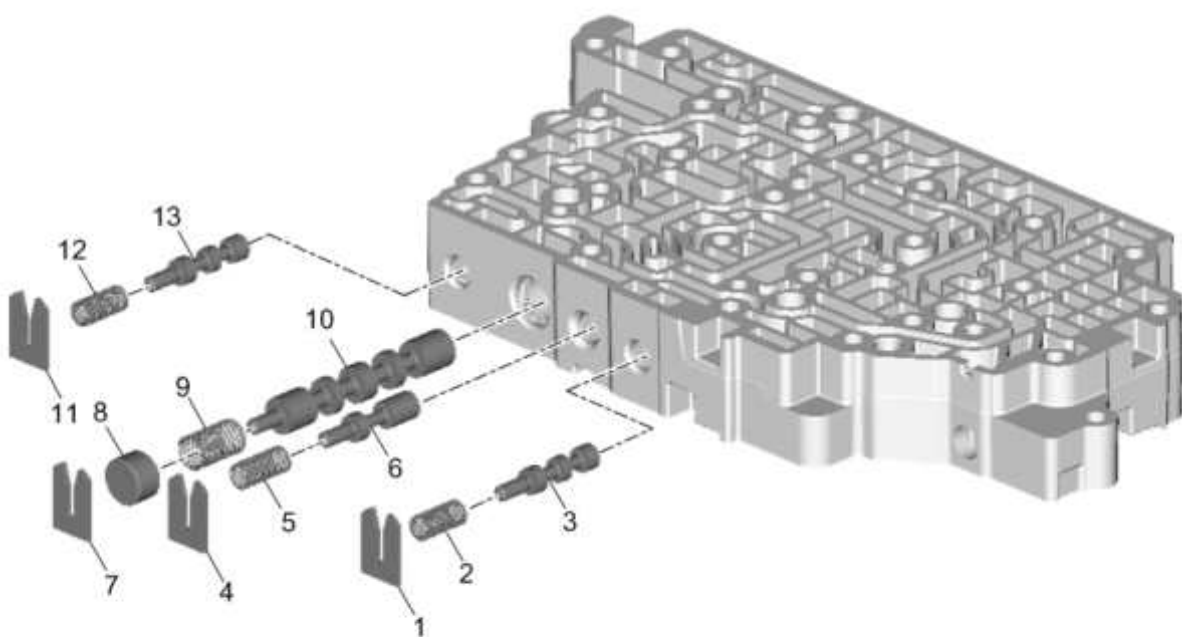


Fig. 109: Control Valve Body (1 Of 2)
Courtesy of GENERAL MOTORS COMPANY

Control Valve Body (1 of 2)

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	1-2-3-4-5-6 Clutch Boost Valve Spring Retainer
2	1-2-3-4-5-6 Clutch Boost Valve Spring
3	1-2-3-4-5-6 Clutch Boost Valve
4	Latch Valve Spring Retainer
5	Latch Valve Spring
6	Latch Valve
7	Clutch Selector Valve Bore Plug Retainer
8	Clutch Selector Valve Bore Plug
9	Clutch Selector Valve Spring
10	Clutch Selector Valve
11	5-7-Reverse Clutch Boost Valve Spring Retainer
12	5-7-Reverse Clutch Boost Valve Spring
13	5-7-Reverse Clutch Boost Valve

Control Valve Body (2 of 2)

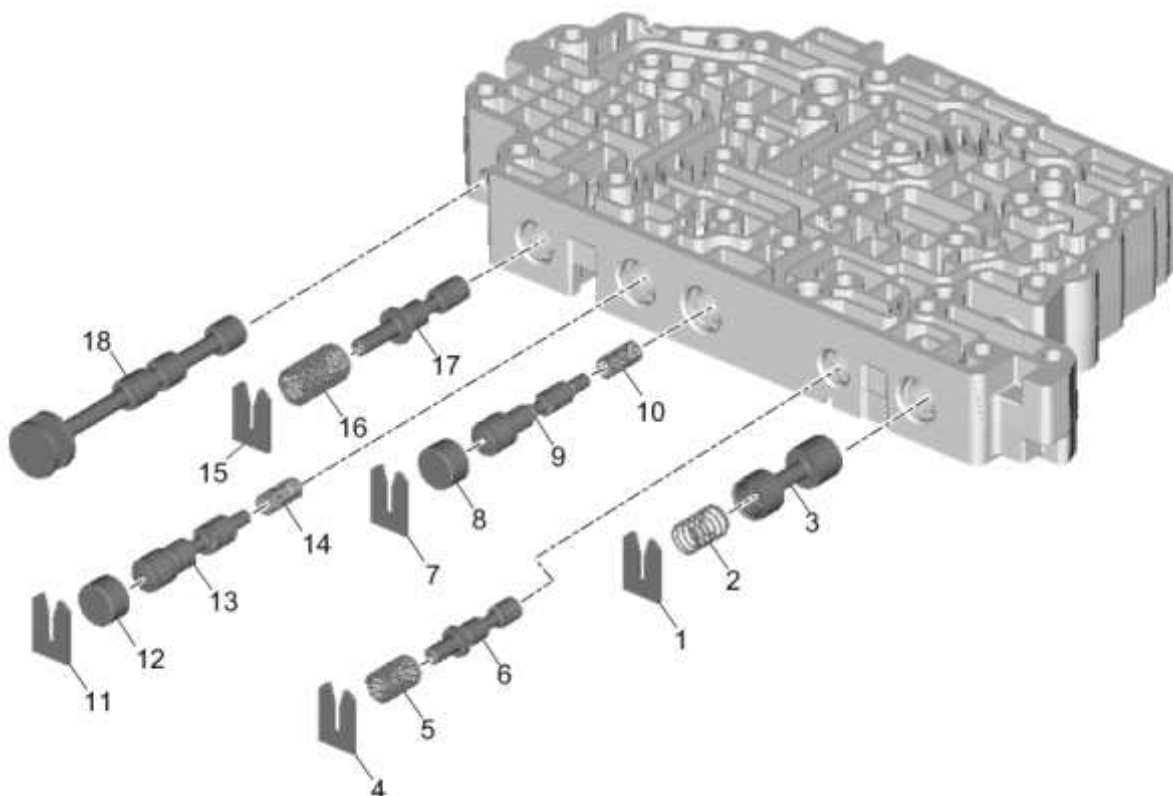


Fig. 110: Control Valve Body (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

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	Oil Level Control Valve Spring Retainer
2	Automatic Transmission Fluid Level Control Valve Spring
3	Automatic Transmission Fluid Level Control Valve
4	Feed Limit Valve Spring Retainer
5	Feed Limit Valve Spring
6	Feed Limit Valve
7	4th Clutch Regulator Valve Bore Plug Retainer
8	4th Clutch Regulator Valve Bore Plug
9	4th Clutch Regulator Valve
10	Ã,Â
11	3-8 Clutch Regulator Valve Bore Plug Retainer
12	3-8 Clutch Regulator Valve Bore Plug
13	3-8 Clutch Regulator Valve
14	3-8 Clutch Regulator Valve Spring
15	Actuator Feed Limit Valve Spring Retainer
16	Actuator Feed Limit Valve Spring
17	Actuator Feed Limit Valve
18	Manual Valve

CONTROL VALVE BODY CLEANING AND INSPECTION (WITH ETRS)

Control Valve Body (1 of 2)

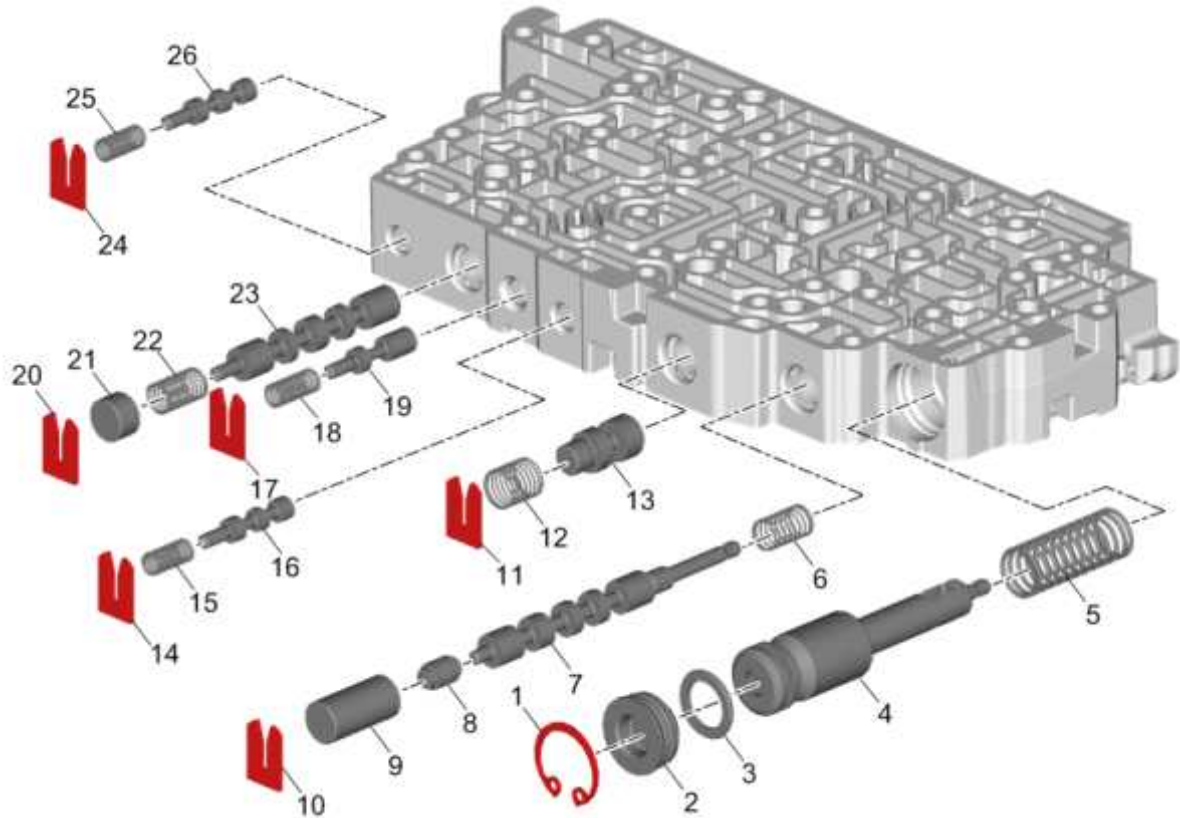


Fig. 111: Control Valve Body (1 Of 2)
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body (1 of 2)

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	Park Release Servo Valve Bore Plug Retainer
2	Park Release Servo Valve Bore Plug
3	Park Release Servo Piston
4	Park Release Servo Piston Seal
5	Park Release Servo Piston Spring
6	Mode 2 Valve Spring
7	Mode 2 Electronic Transmission Range Selector Valve
8	Mode 2 Valve
9	Modulator Valve Bushing
10	Mode 2 Valve Bore Plug Retainer
11	Electronic Transmission Range Selector Mode Enable Valve Spring Retainer
12	Electronic Transmission Range Selector Mode Enable Valve Spring
13	Electronic Transmission Range Selector Mode Enable Valve
14	Mode 2 Valve Bore Plug Retainer

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	Automatic Transmission Fluid Level Control Valve
2	Automatic Transmission Fluid Level Control Valve Spring
3	Oil Level Control Valve Spring Retainer
4	Feed Limit Valve
5	Feed Limit Valve Spring
6	Feed Limit Valve Spring Retainer
7	4th Clutch Regulator Valve Bore Plug Retainer
8	4th Clutch Regulator Valve Bore Plug
9	4th Clutch Regulator Valve
10	3-8 Clutch Regulator Valve Spring
11	3-8 Clutch Regulator Valve Spring
12	3-8 Clutch Regulator Valve
13	3-8 Clutch Regulator Valve Bore Plug
14	3-8 Clutch Regulator Valve Bore Plug Retainer
15	Actuator Feed Limit Valve Spring Retainer
16	Actuator Feed Limit Valve
17	Actuator Feed Limit Valve Spring
18	Control Valve Solenoid Body Bolt CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
19	Mode Valve Position Switch
20	Mode Valve Position Switch Magnet
21	Control Valve Solenoid Body Bolt Tighten 9 N.m (80 lb in)
22	Parking Servo Piston Switch
23	Mode Valve Position Switch Magnet

CONTROL VALVE BODY ASSEMBLY ASSEMBLE (WITHOUT ETRS)

Control Valve Body Assemble

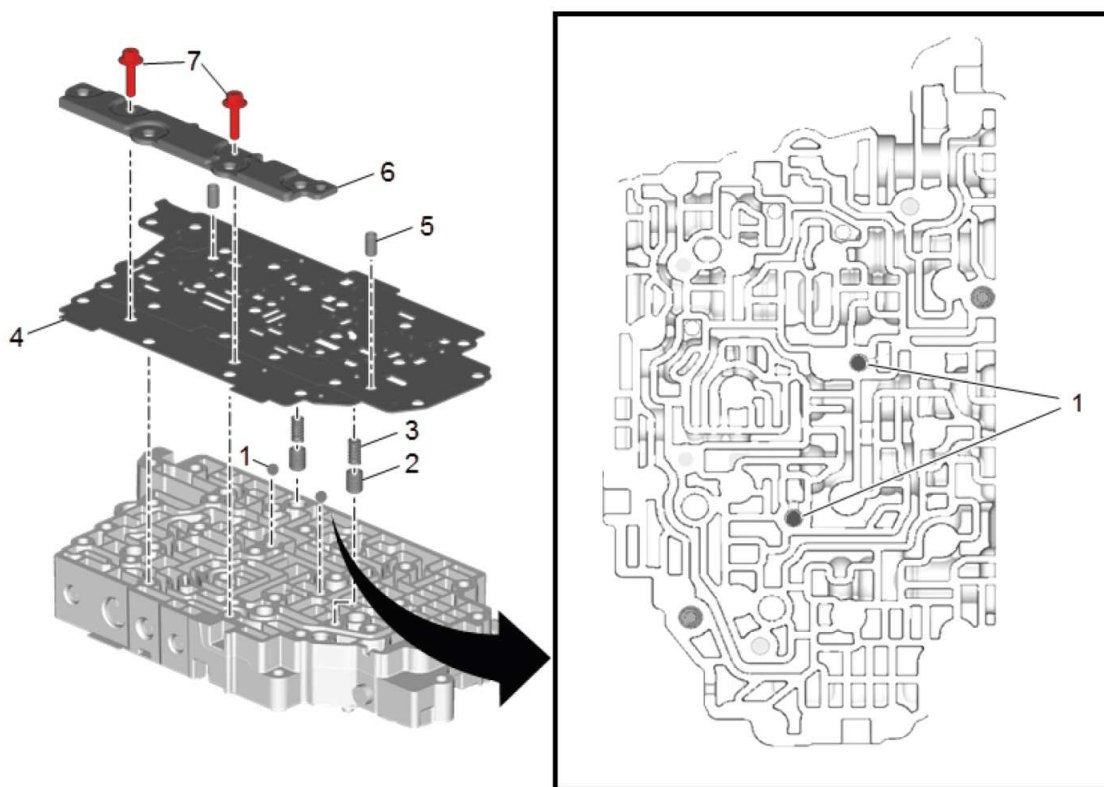


Fig. 113: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Assemble

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 2)
2	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
3	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
4	Control Valve Body Spacer 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.
5	Control Valve Body Locating Pin (Qty: 2)
6	Oil Transfer Plate
7	Control Valve Solenoid Body Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)

Control Valve Body Plate Assemble

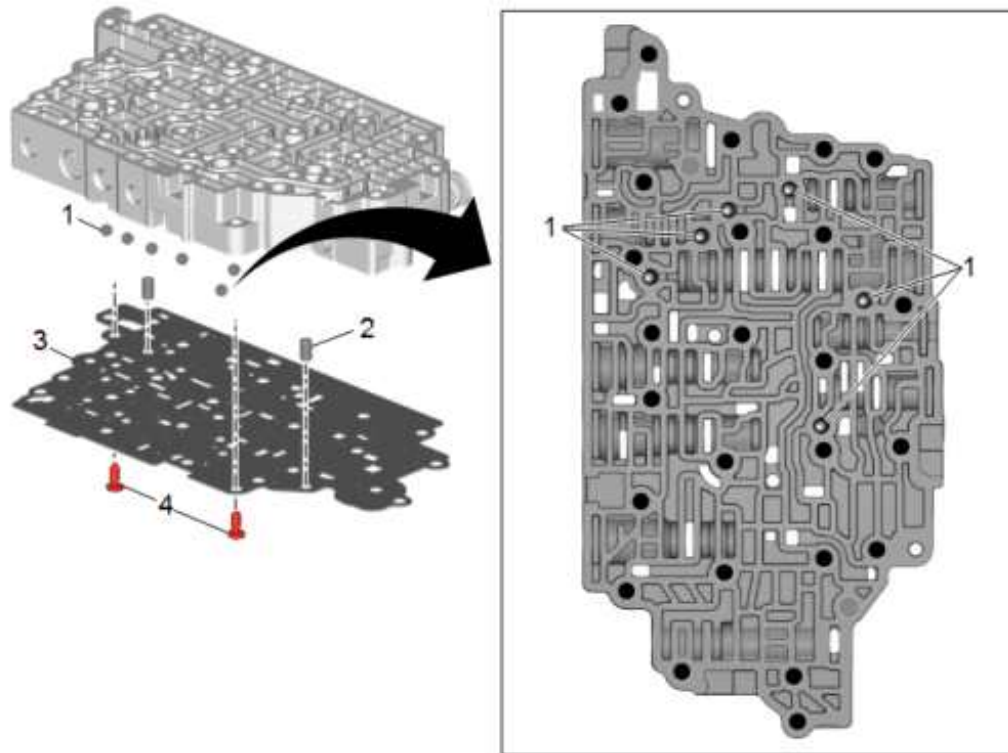


Fig. 114: Control Valve Body Plate
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Plate Assemble

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 6)
2	Control Valve Body Locating Pin (Qty: 2)
3	Control Valve Body Spacer 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	Control Valve Body Spacer Plate Retainer (Qty: 2)

Control Valve Solenoid Body Assemble

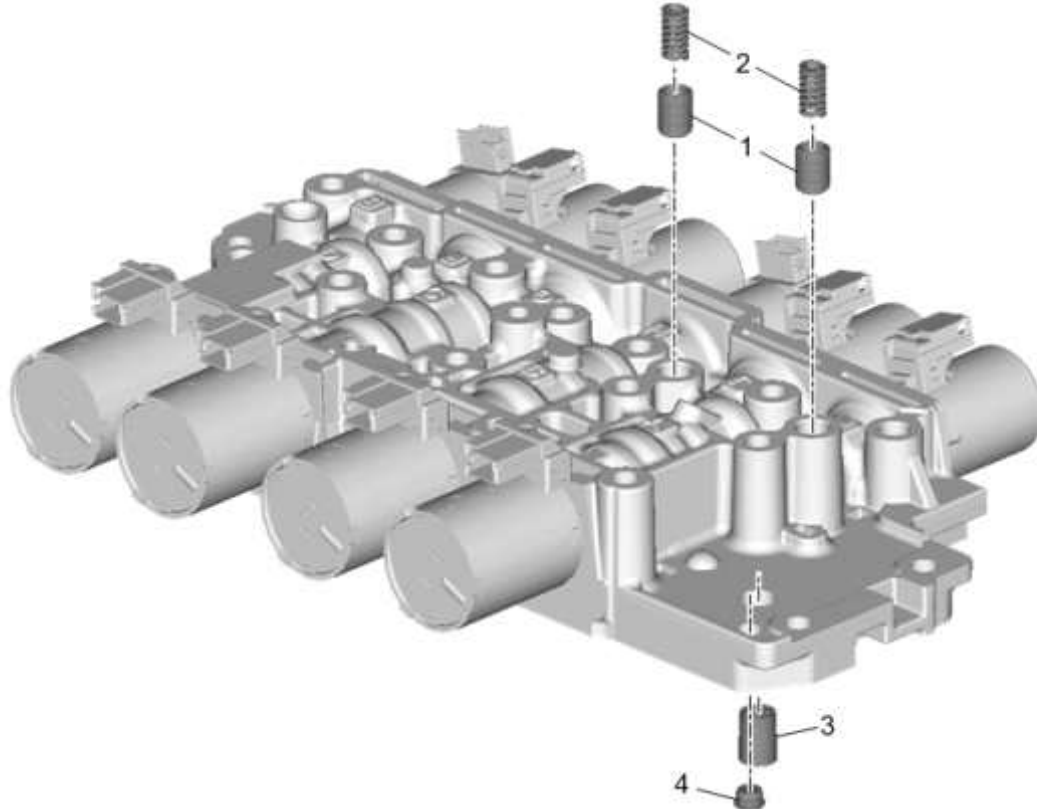


Fig. 115: Control Valve Solenoid Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Assemble

Callout	Component Name
1	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
2	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
3	Control Valve Channel Plate Ball Check Valve Spring
4	Variable High and 2-3-4 Clutch Housing Valve

CONTROL VALVE BODY ASSEMBLY ASSEMBLE (WITH ETRS)

Control Valve Body Assemble

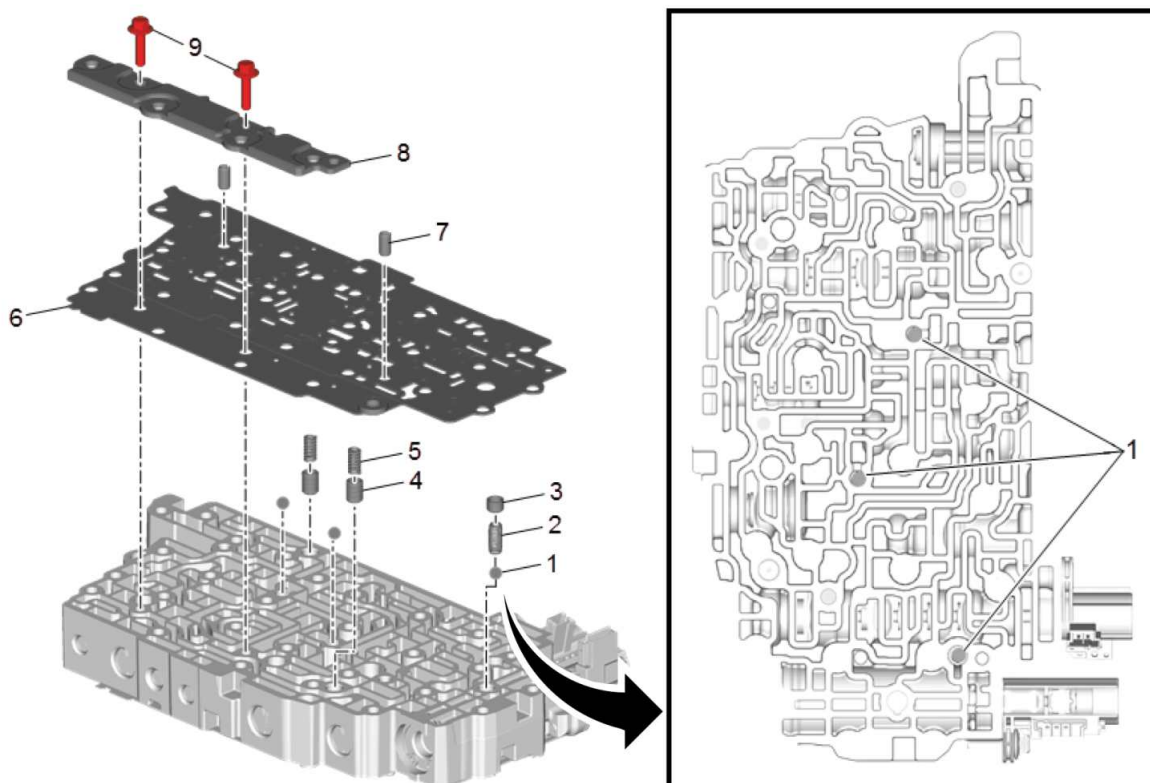


Fig. 116: Control Valve Body
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Assemble

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 3)
2	Park Selector Valve Spring
3	Park Selector Valve Bore Plug
4	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
5	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
6	Control Valve Body Spacer 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 Body Locating Pin (Qty: 2)
8	Oil Transfer Plate
9	Control Valve Solenoid Body Bolt (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)

Control Valve Body Plate Assemble

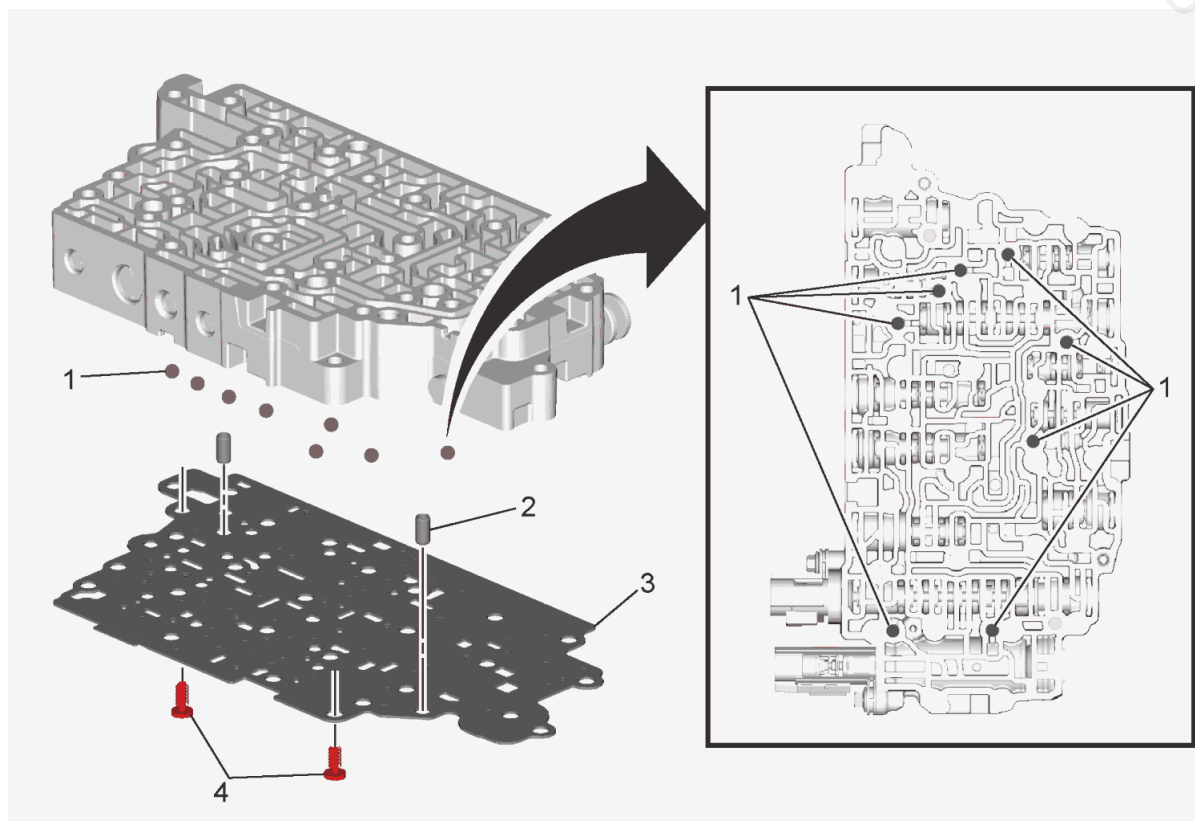


Fig. 117: Control Valve Body Plate
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Plate Assemble

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 8)

Callout	Component Name
2	Control Valve Body Locating Pin (Qty: 2)
3	Control Valve Body Spacer 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	Control Valve Body Spacer Plate Retainer (Qty: 2)

Control Valve Solenoid Body Assemble

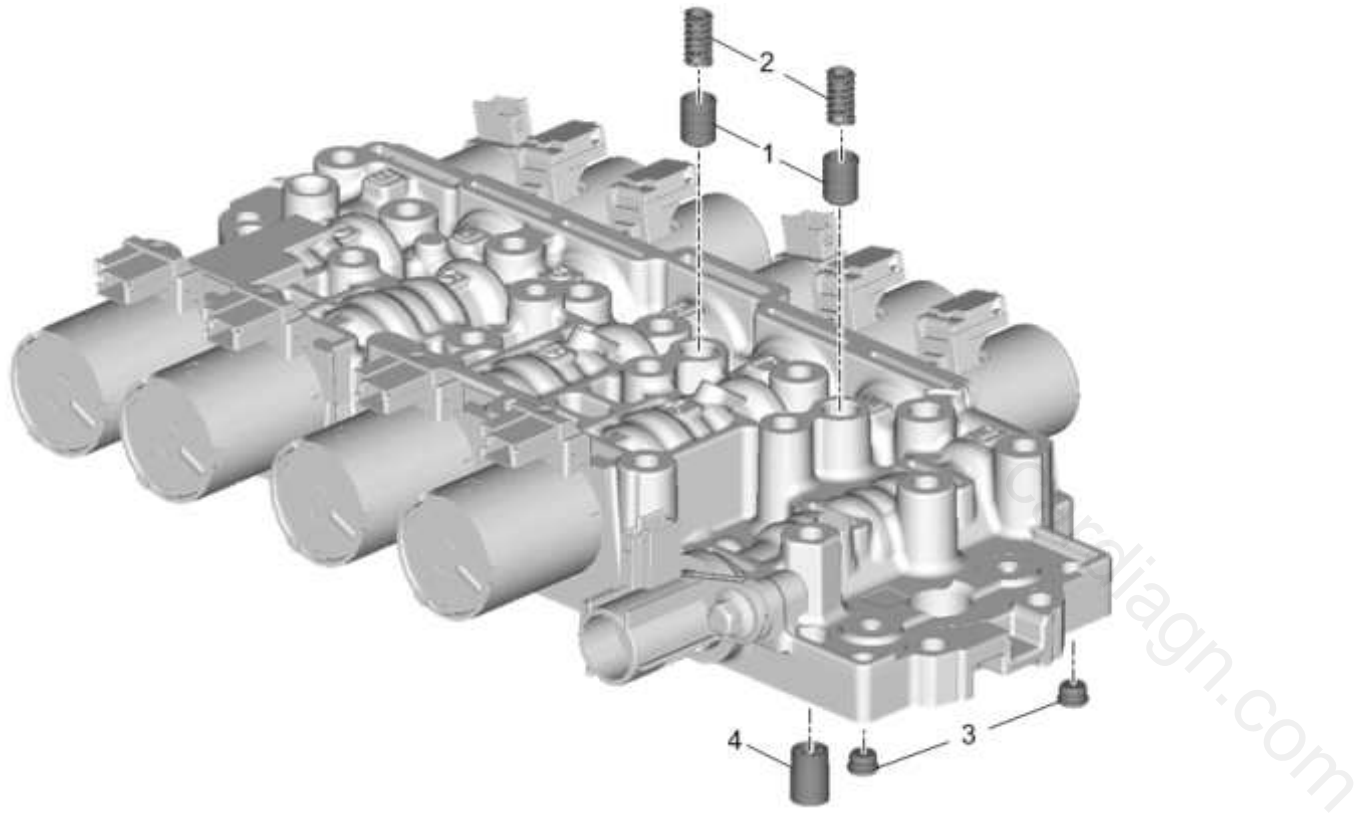


Fig. 118: Control Valve Solenoid Body
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Assemble

Callout	Component Name
1	Variable Feed Solenoid Clutch Accumulator Piston (Qty: 2)
2	Variable Feed Solenoid Clutch Accumulator Piston Spring (Qty: 2)
3	Variable High and 2-3-4 Clutch Housing Valve (Qty: 2)
4	Control Valve Channel Plate Ball Check Valve Spring

CONTROL VALVE BODY ASSEMBLY INSTALLATION (WITHOUT ETRS)

Control Valve Body Ball Check Valve Installation

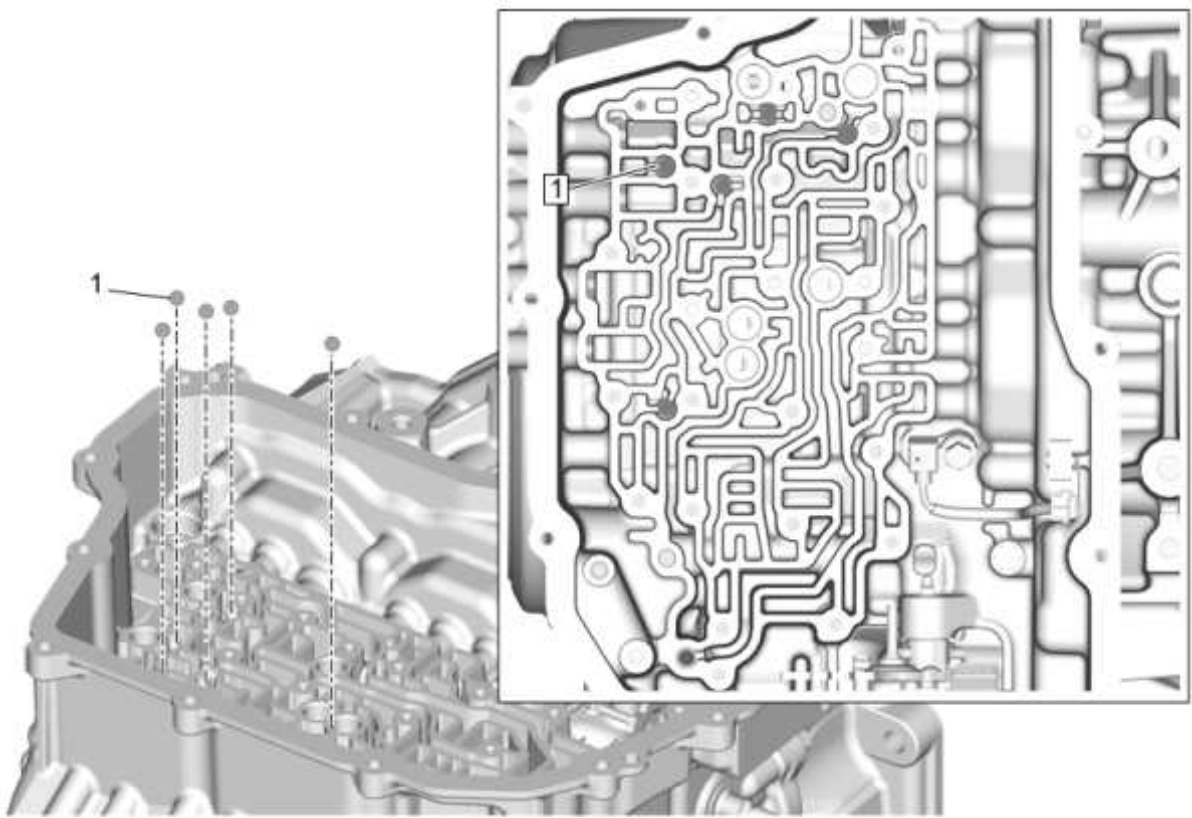
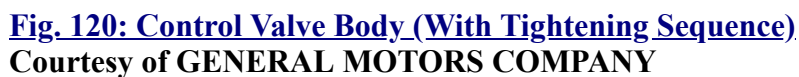


Fig. 119: Control Valve Body Ball Check Valve
Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Ball Check Valve Installation

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 5)

Control Valve Body Installation



Callout	Component Name
1	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal (Qty: 5) NOTE: Install NEW seals. Do NOT reuse old seals.
2	Fluid Transfer Pipe Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	Fluid Transfer Pipe CAUTION: Refer to <u>Fastener Caution</u> . NOTE: The bolt is captured with pipe. Tighten 9 N.m (80 lb in)
4	Control Valve Body

Callout	Component Name
1	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal (Qty: 5) NOTE: Install NEW seals. Do NOT reuse old seals.
2	Fluid Transfer Pipe Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
3	Fluid Transfer Pipe CAUTION: Refer to <u>Fastener Caution</u> . NOTE: The bolt is captured with pipe. Tighten 9 N.m (80 lb in)
4	Control Valve Body

Callout	Component Name
5	Manual Valve NOTE: Align the manual valve to the rod on the manual shift detent lever.
6	Control Valve Body Bolt Tighten in sequence 9 N.m (80 lb in)
7	Control Valve Body Bolt (Qty: 4) Tighten in sequence 8 N.m (71 lb in)
8	Manual Shift Detent Lever Spring NOTE: The bolt is captured with spring. Tighten 9 N.m (80 lb in)

Control Valve Solenoid Body Installation

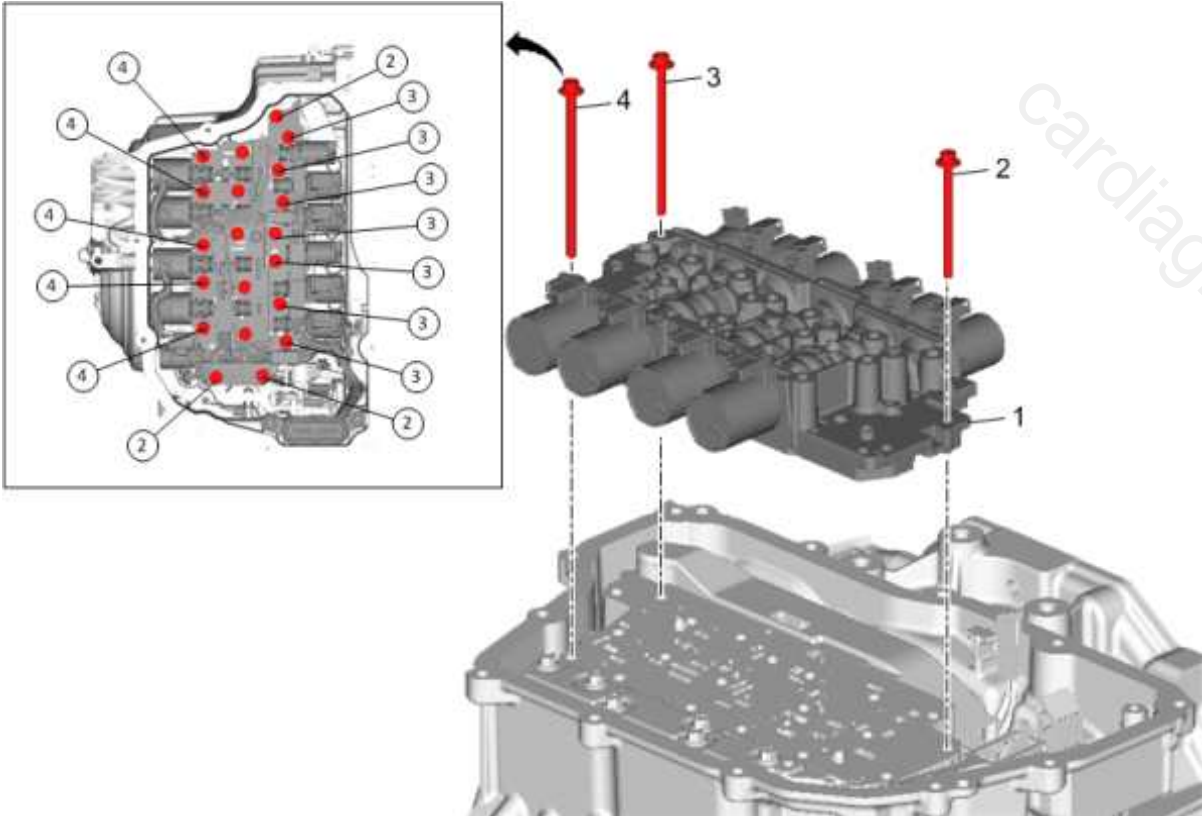


Fig. 121: Control Valve Solenoid Body (With Tightening Sequence).
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Installation

Callout	Component Name
1	Control Valve Solenoid Body
2	Control Valve Body Bolt (Qty: 3) NOTE: Hand tighten and follow torque sequence below.

Callout	Component Name
3	Control Valve Body Bolt (Qty: 6) NOTE: Hand tighten and follow torque sequence below.
4	Control Valve Body Bolt (Qty: 5) NOTE: Hand tighten and follow torque sequence below.

Control Valve Solenoid Body Wiring Harness Installation

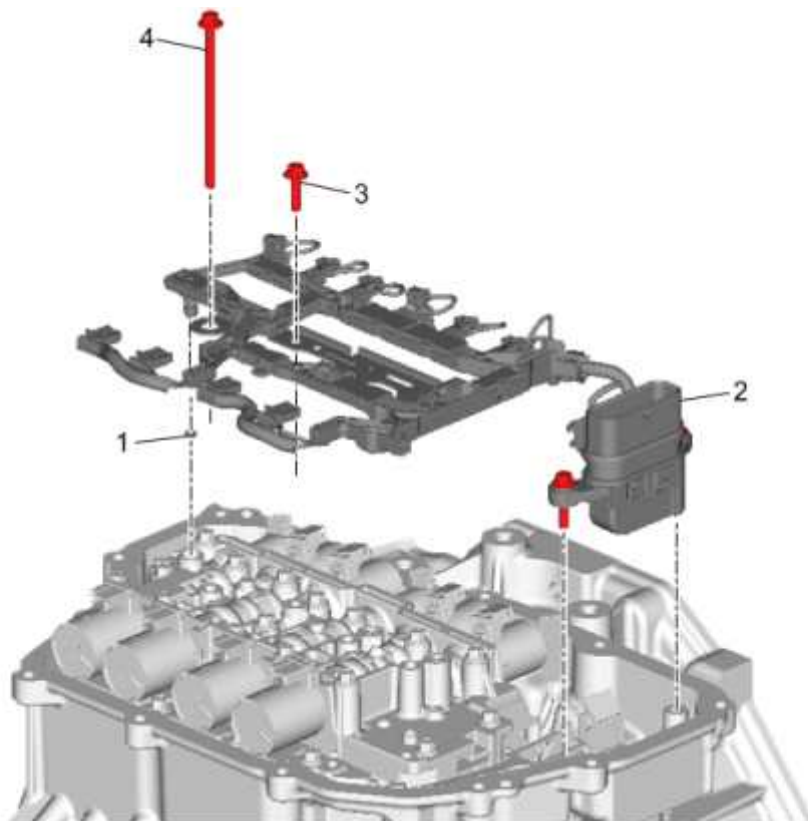


Fig. 122: Control Valve Solenoid Body Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Wiring Harness Installation

Callout	Component Name
1	Automatic Transmission Fluid Temperature Sensor Seal NOTE: Install a NEW seal. Do NOT reuse the old seal.
2	Automatic Transmission Wiring Harness Procedure Ensure you connect all the connectors to the valve body. Tighten 8 N.m (71 lb in) NOTE: The bolts are captured with harness.
3	Control Valve Solenoid Body Bolt Tighten 9 N.m (80 lb in)

Callout	Component Name
4	Control Valve Body Bolt (Qty: 3) NOTE: Hand tighten and follow torque sequence below.

Control Valve Solenoid Body Torque Sequence

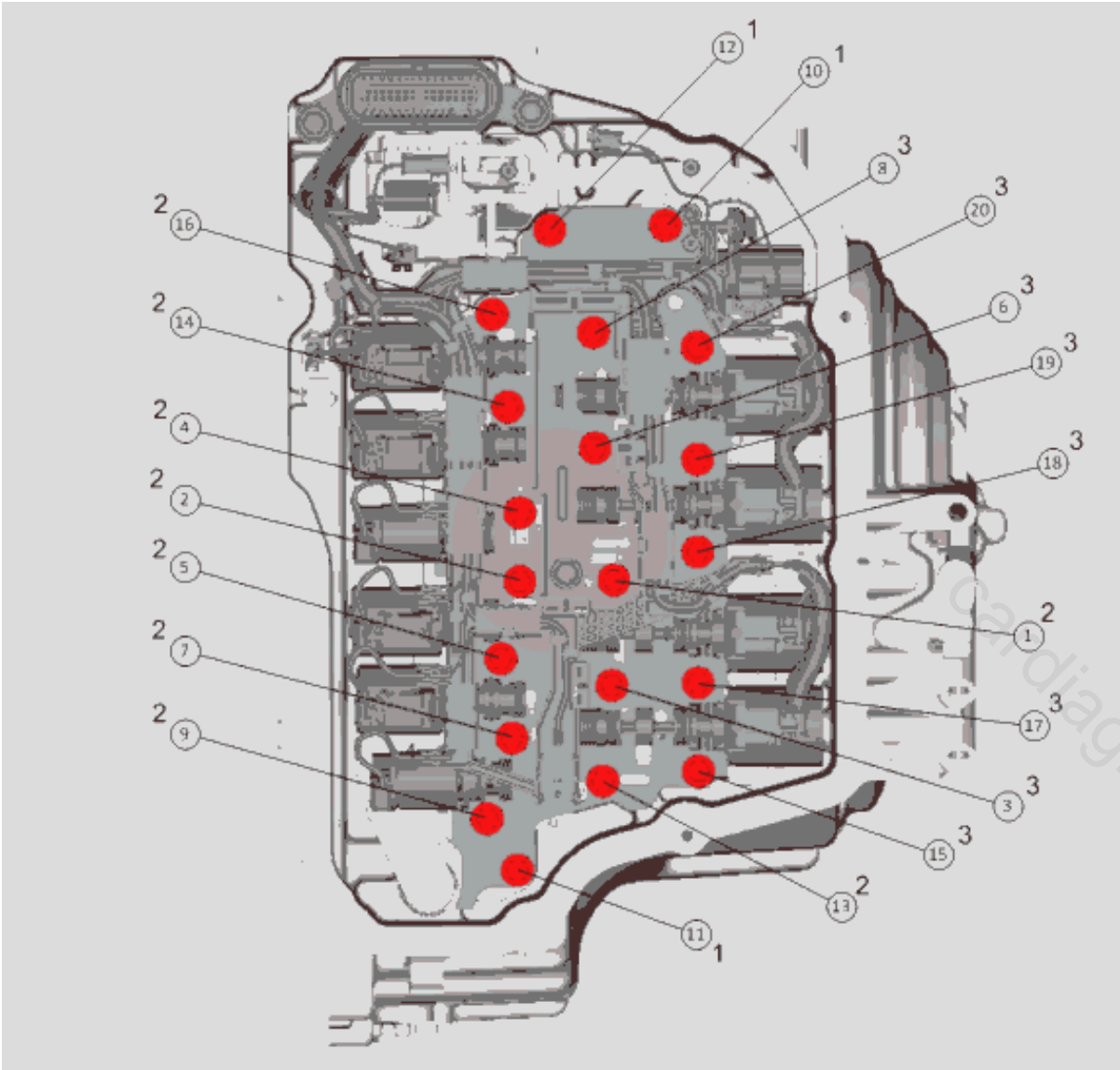


Fig. 123: Control Valve Solenoid Body Torque Sequence
Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Torque Sequence

Callout	Component Name
1	Control Valve Body Bolt (Qty: 3) Tighten in sequence 8 N.m (71 lb in)
2	Control Valve Body Bolt (Qty: 9) Tighten in sequence 8 N.m (71 lb in)
3	Control Valve Body Bolt (Qty: 8) Tighten in sequence 8 N.m (71 lb in)

CONTROL VALVE BODY ASSEMBLY INSTALLATION (WITH ETRS)

Control Valve Body Ball Check Valve Installation

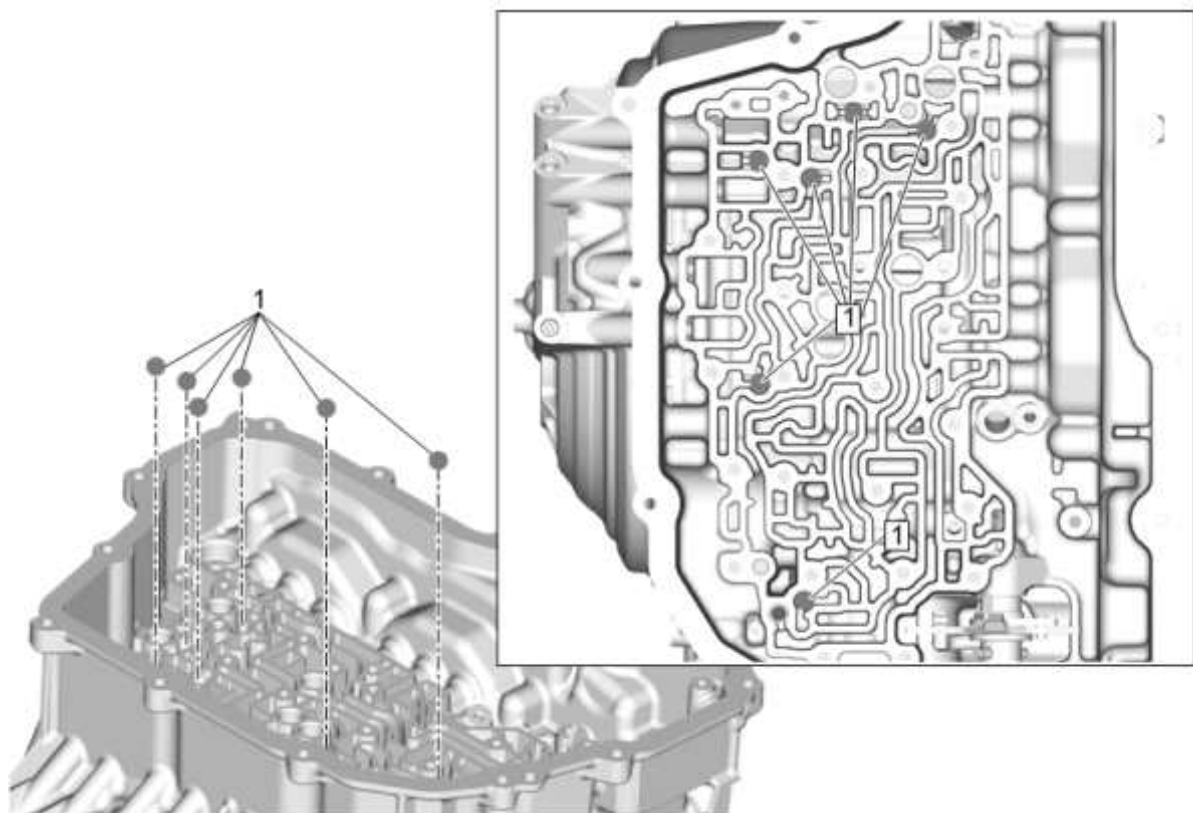


Fig. 124: Control Valve Body Ball Check Valve
Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Ball Check Valve Installation

Callout	Component Name
1	Control Valve Body Ball Check Valve (Qty: 6)

Fluid Transfer Pipe Installation

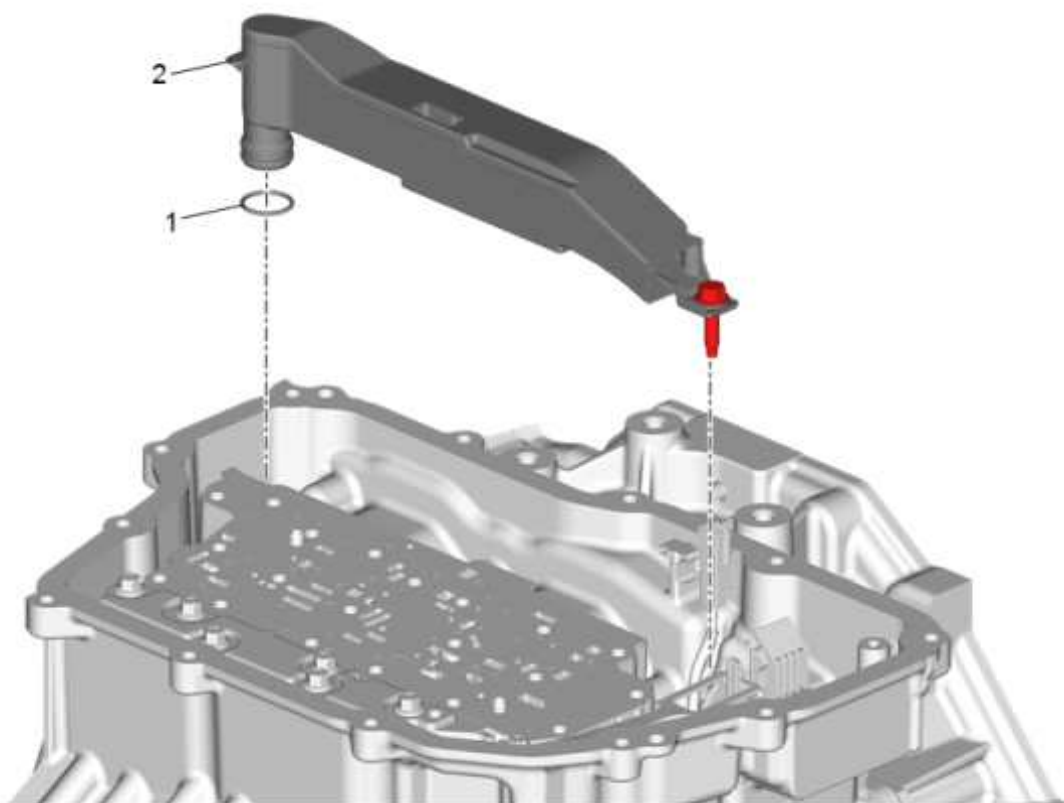


Fig. 125: Fluid Transfer Pipe
Courtesy of GENERAL MOTORS COMPANY

Fluid Transfer Pipe Installation

Callout	Component Name

Callout	Component Name
1	Fluid Transfer Pipe Seal Procedure Install NEW seals. Do NOT reuse old seals.
2	Fluid Transfer Pipe CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)

Control Valve Body Installation

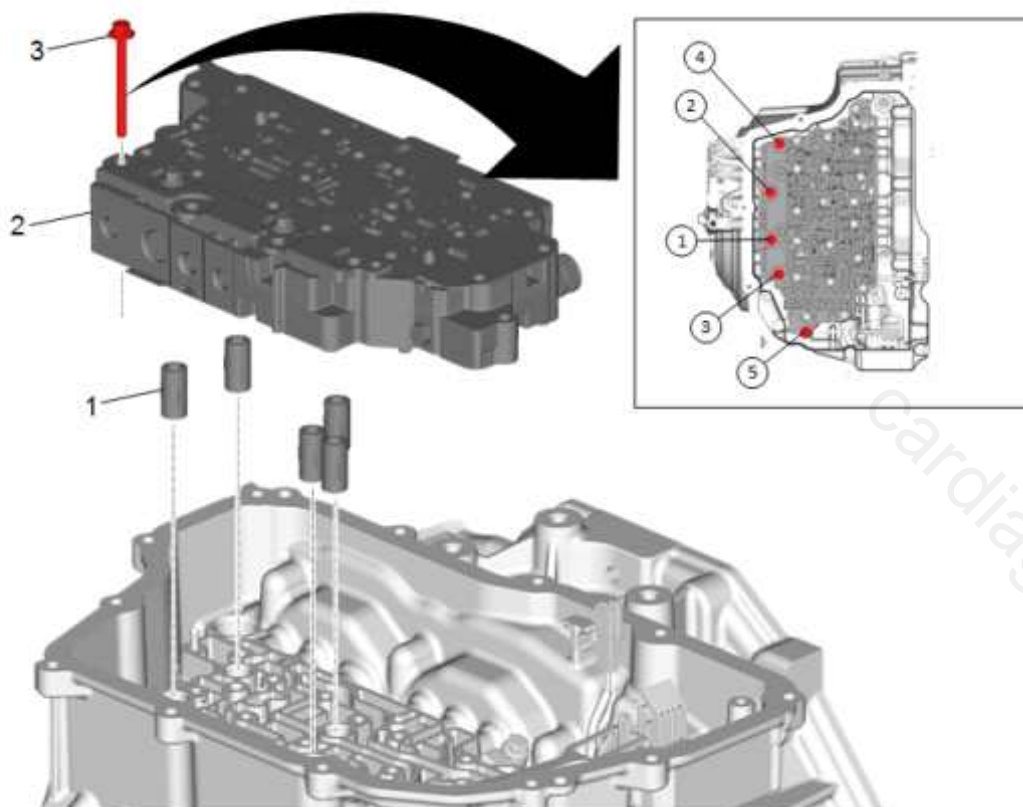


Fig. 126: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Installation

Callout	Component Name
1	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal (Qty: 5) Procedure Install NEW seals. Do NOT reuse old seals.
2	Control Valve Body
3	Control Valve Body Bolt (Qty: 5) Tighten in sequence 8 N.m (71 lb in)

Control Valve Solenoid Body Installation

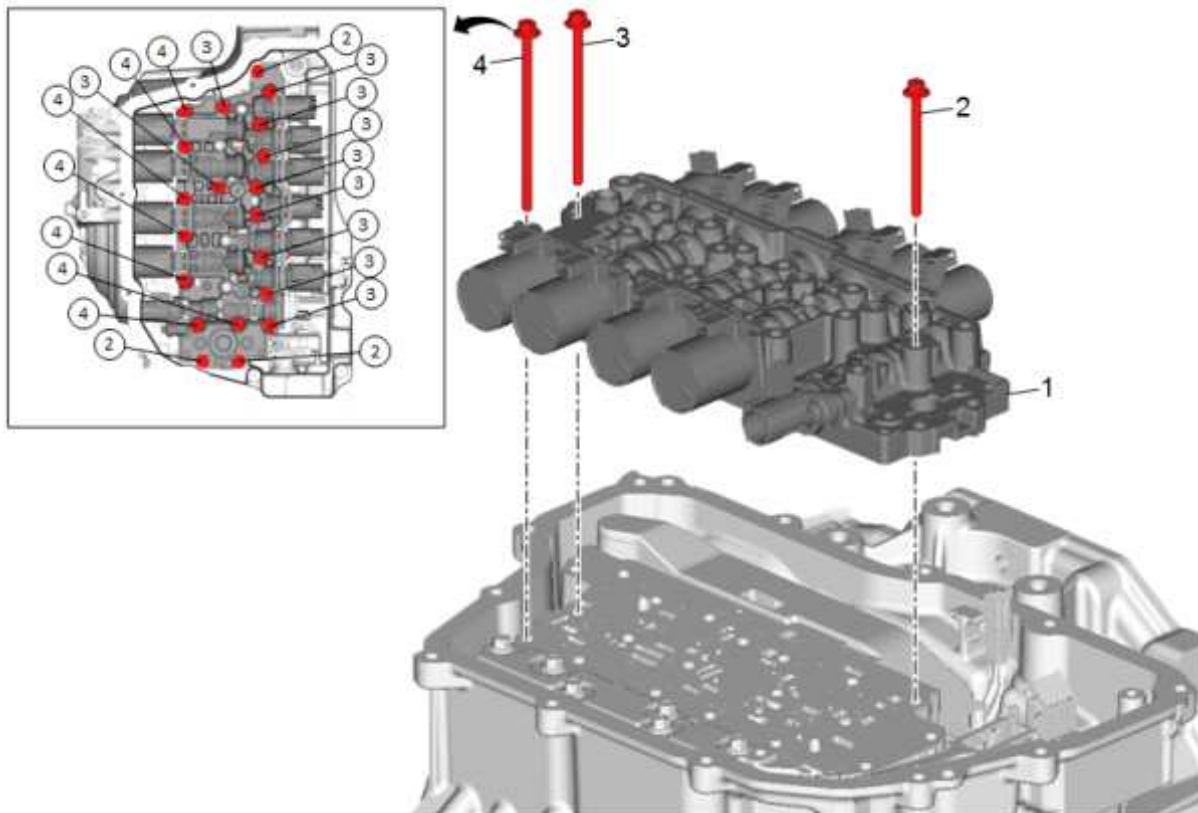


Fig. 127: Control Valve Solenoid Body (With Tightening Sequence).

Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Installation

Callout	Component Name
1	Control Valve Solenoid Body
2	Control Valve Body Bolt (Qty: 3) Procedure Hand tighten and follow torque sequence below.
3	Control Valve Body Bolt (Qty: 12) Procedure Hand tighten and follow torque sequence below.
4	Control Valve Body Bolt (Qty: 5) Procedure Hand tighten and follow torque sequence below.

Park Inhibitor Solenoid Installation

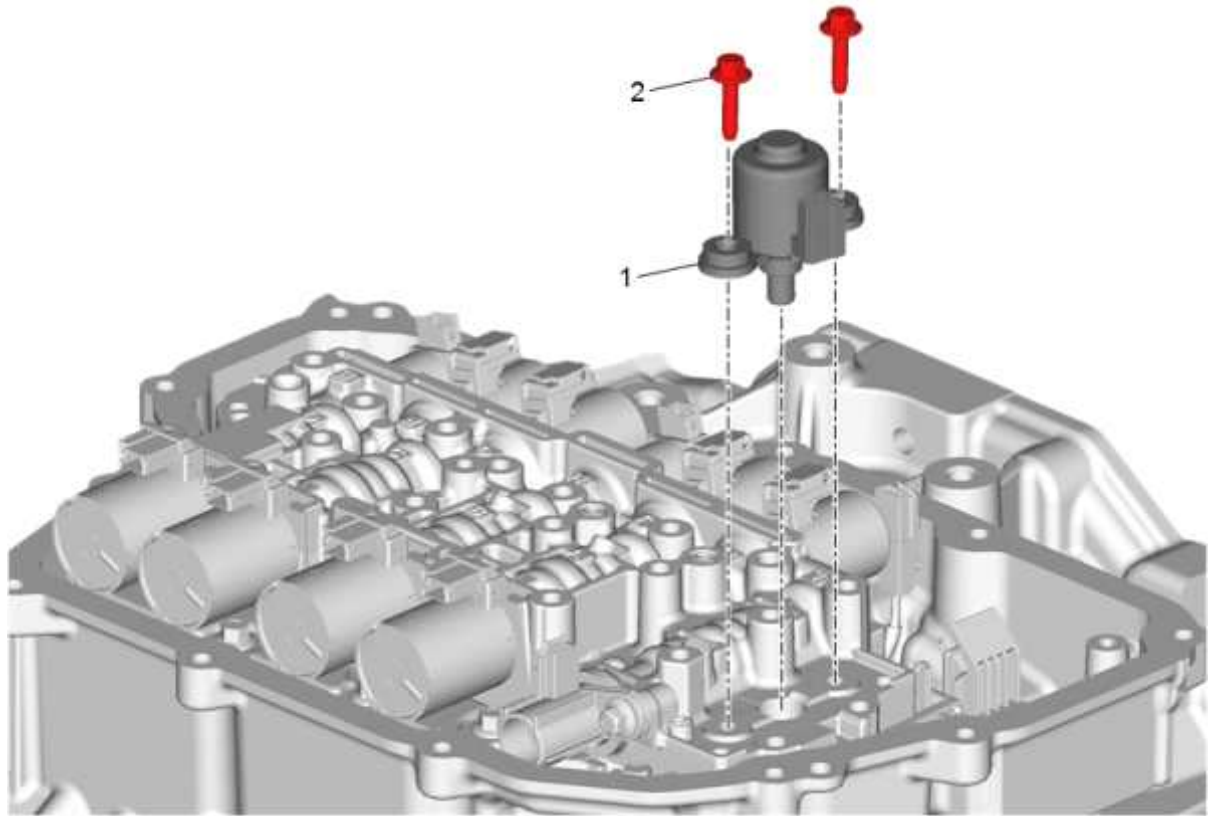


Fig. 128: Park Inhibitor Solenoid

Courtesy of GENERAL MOTORS COMPANY

Park Inhibitor Solenoid Installation

Callout	Component Name
1	Park Inhibitor Solenoid
2	Control Valve Solenoid Body Bolt (Qty: 2) Tighten 8 N.m (71 lb in)

Control Valve Solenoid Body Wiring Harness Installation

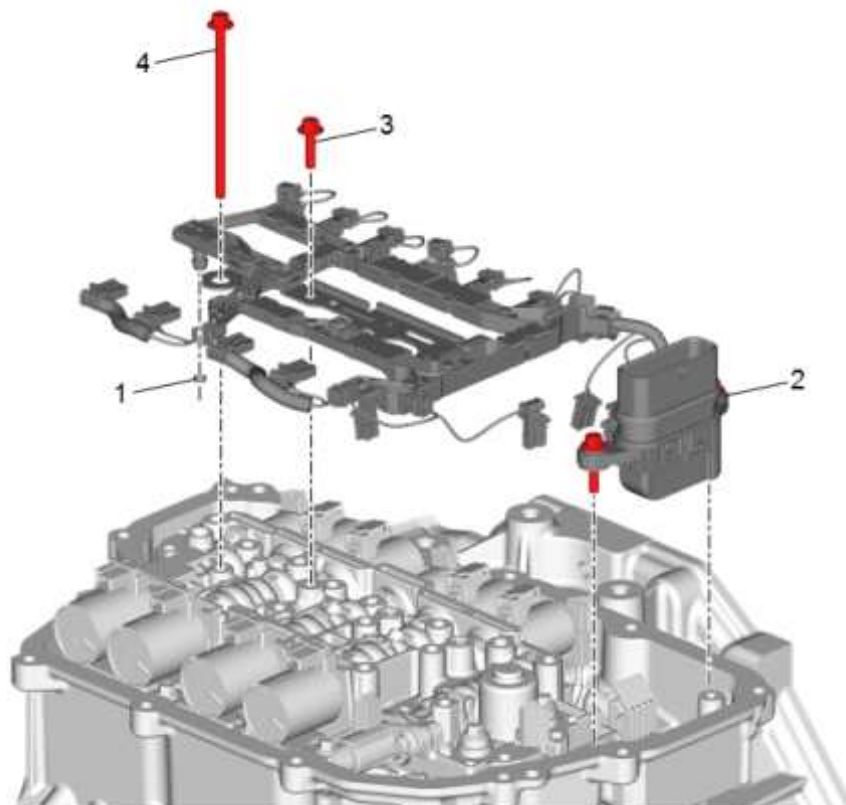


Fig. 129: Control Valve Solenoid Body Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Wiring Harness Installation

Callout	Component Name
1	Automatic Transmission Fluid Temperature Sensor Seal Procedure Install NEW seals. Do NOT reuse old seals.
2	Automatic Transmission Wiring Harness Procedure Ensure you connect all the connectors to the valve body. Tighten 8 N.m (71 lb in) NOTE: The bolts are captured with harness.
3	Control Valve Solenoid Body Bolt Tighten in sequence 9 N.m (80 lb in) Procedure Hand tighten and follow torque sequence below.
4	Control Valve Body Bolt (Qty: 3) Procedure Hand tighten and follow torque sequence below.

Control Valve Solenoid Body Torque Sequence

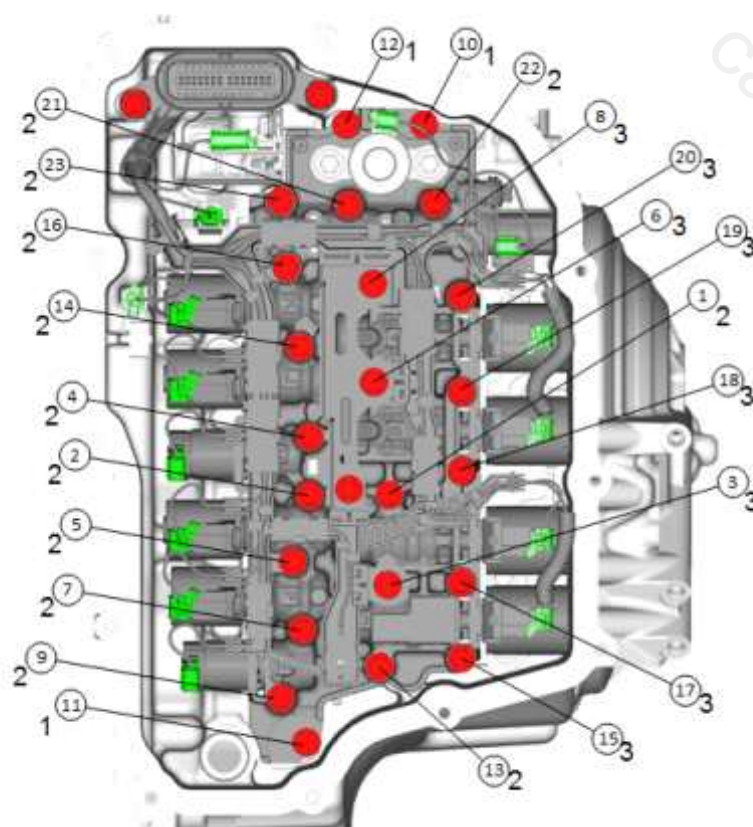


Fig. 130: Control Valve Solenoid Body Torque Sequence

Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Torque Sequence

Callout	Component Name
1	Control Valve Body Bolt (Qty: 3) Tighten in sequence 8 N.m (71 lb in)
2	Control Valve Body Bolt (Qty: 12) Tighten in sequence 8 N.m (71 lb in)

Callout	Component Name
3	Control Valve Body Bolt (Qty: 8) Tighten in sequence 8 N.m (71 lb in)

CONTROL VALVE BODY COVER INSTALLATION

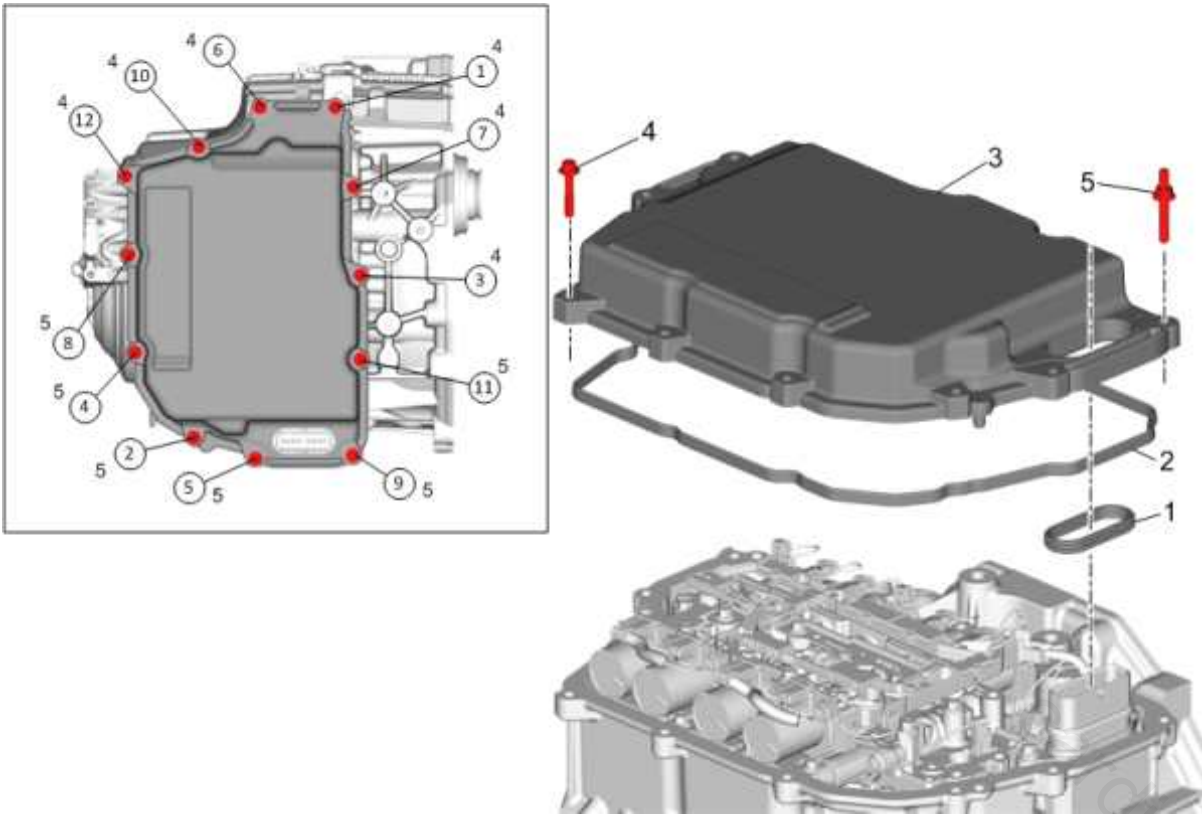


Fig. 131: Control Valve Body Cover (With Tightening Sequence)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Body Side Wiring Harness Opening Seal NOTE: Install a NEW seal.
2	Control Valve Body Cover Gasket
3	Control Valve Body Cover
4	Control Valve Body Cover Bolt (Qty: 6) CAUTION: Refer to <u>Fastener Caution</u> . Tighten in sequence 9 N.m (80 lb in)
5	Control Valve Body Cover Stud (Qty: 6) Tighten in sequence 9 N.m (80 lb in)

AUXILIARY FLUID ACCUMULATOR INSTALLATION

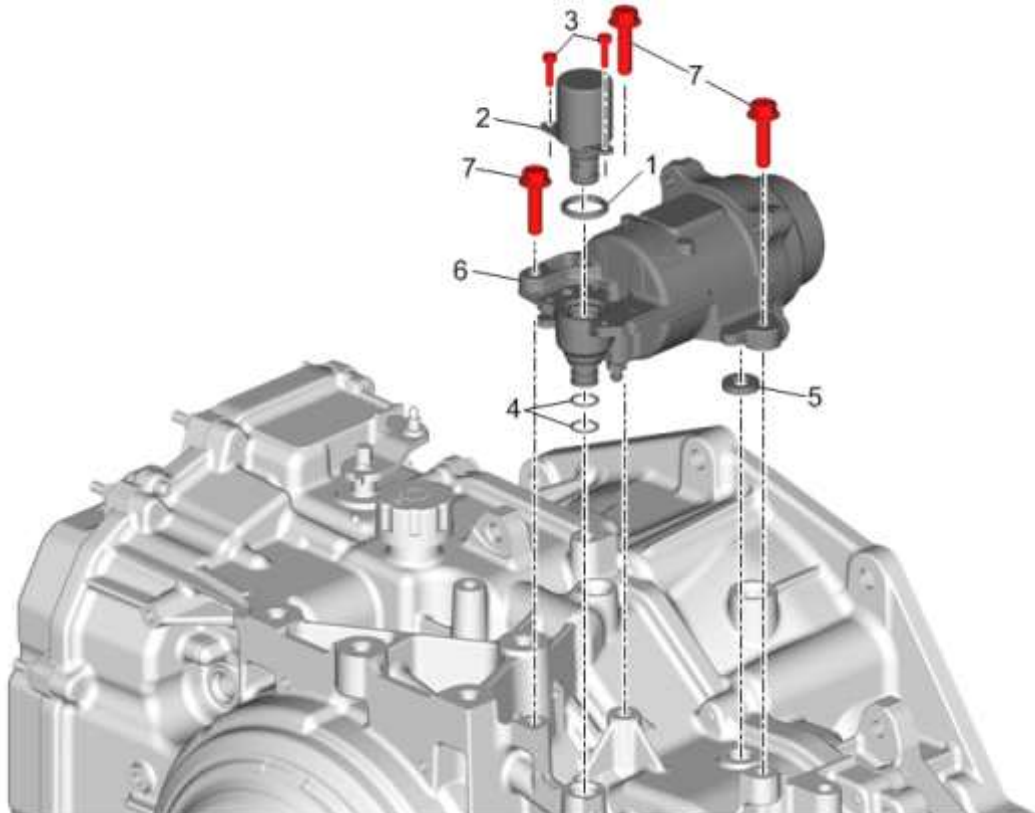


Fig. 132: Auxiliary Fluid Accumulator
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Accumulator Bypass Valve Seal NOTE: Install a NEW seal.
2	Shift On/Off Solenoid Valve NOTE: Repair or replace as necessary.
3	Accumulator Valve Body Bolt (Qty: 2) CAUTION: Refer to Fastener Caution . Tighten 2.7 N.m (24 lb in)
4	Automatic Transmission Case Seal (Qty: 2) NOTE: Install a NEW seal.
5	Accumulator Bypass Valve Seal NOTE: Install a NEW seal.
6	Automatic Transmission Auxiliary Fluid Accumulator

Callout	Component Name
7	Automatic Transmission Auxiliary Fluid Accumulator Bolt (Qty: 3) Tighten 8 N.m (71 lb in)

TORQUE CONVERTER FLUID SEAL REMOVAL

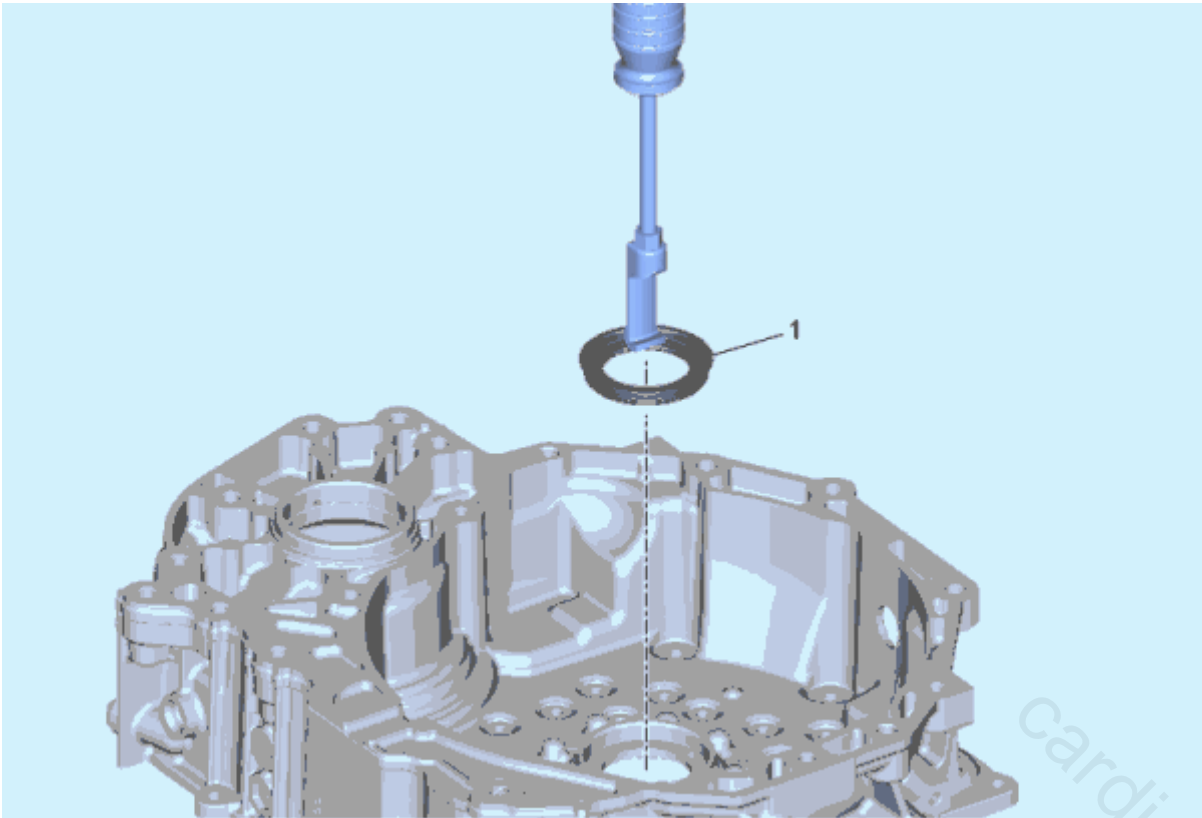


Fig. 133: Torque Converter Fluid Seal
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter Fluid Seal NOTE: Remove and DISCARD the seal. Special Tools • DT-6125-B Slide Hammer • EN-23129 Universal Seal Remover Equivalent regional tools: Special Tools .

TORQUE CONVERTER FLUID SEAL INSTALLATION

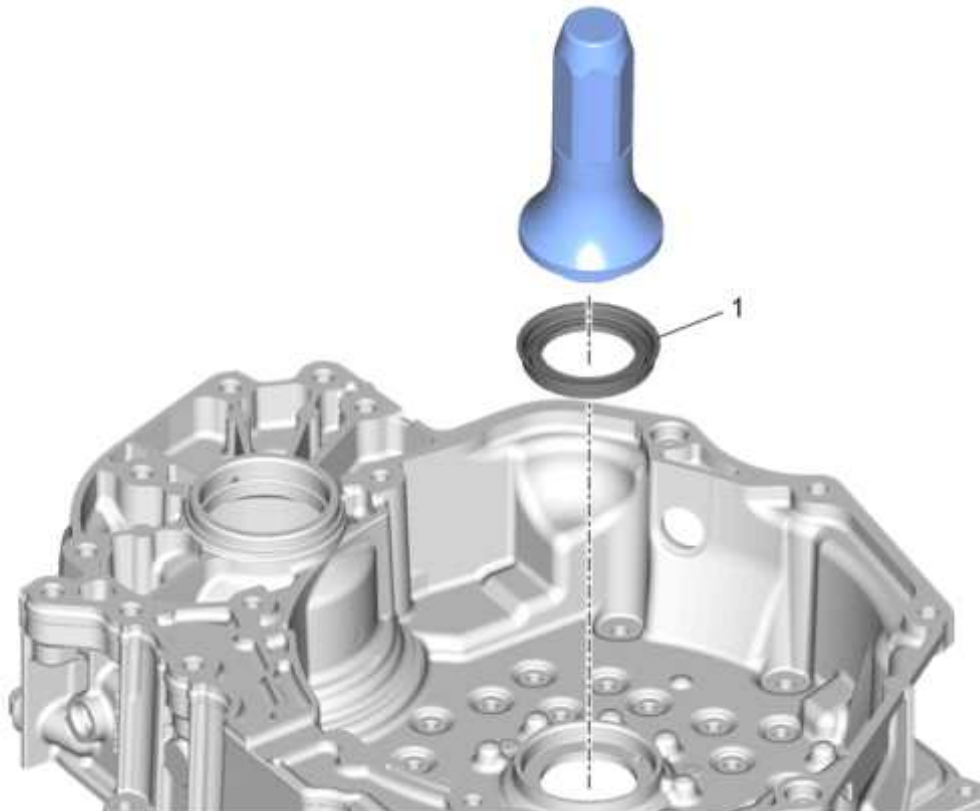


Fig. 134: Torque Converter Fluid Seal
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter Fluid Seal NOTE: Install a NEW seal. Do NOT reuse the old seal. Special Tools J-29162 Seal Installer Equivalent regional tools: Special Tools .

TORQUE CONVERTER INSTALLATION

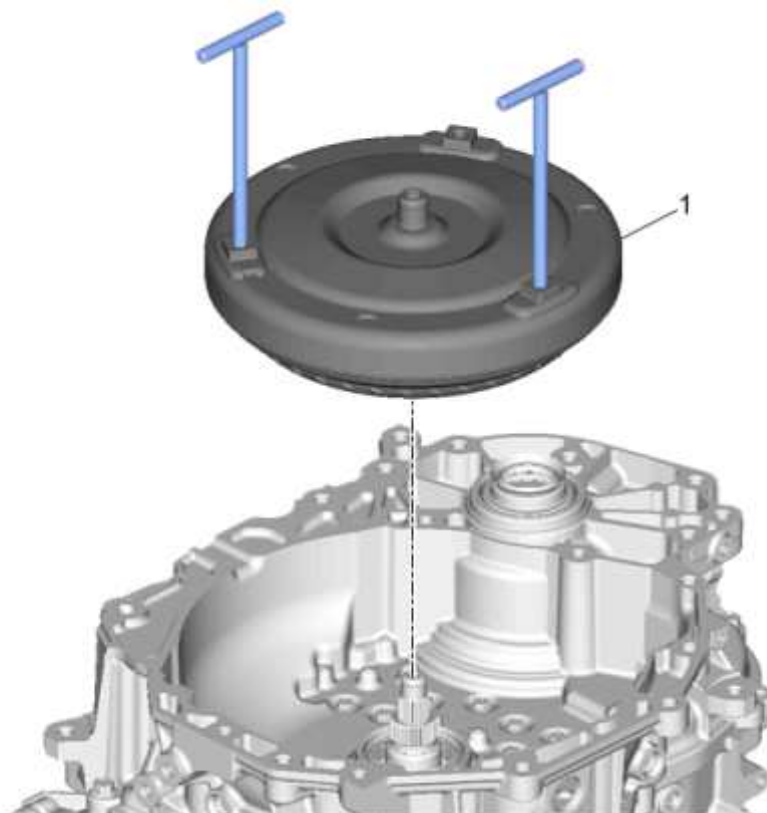


Fig. 135: Torque Converter

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter CAUTION: Lower the torque converter straight down. Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tools DT-46409 Torque Converter Lifting Handles Equivalent regional tools: Special Tools.

LIFT PLATE AND HOLDING FIXTURE REMOVAL

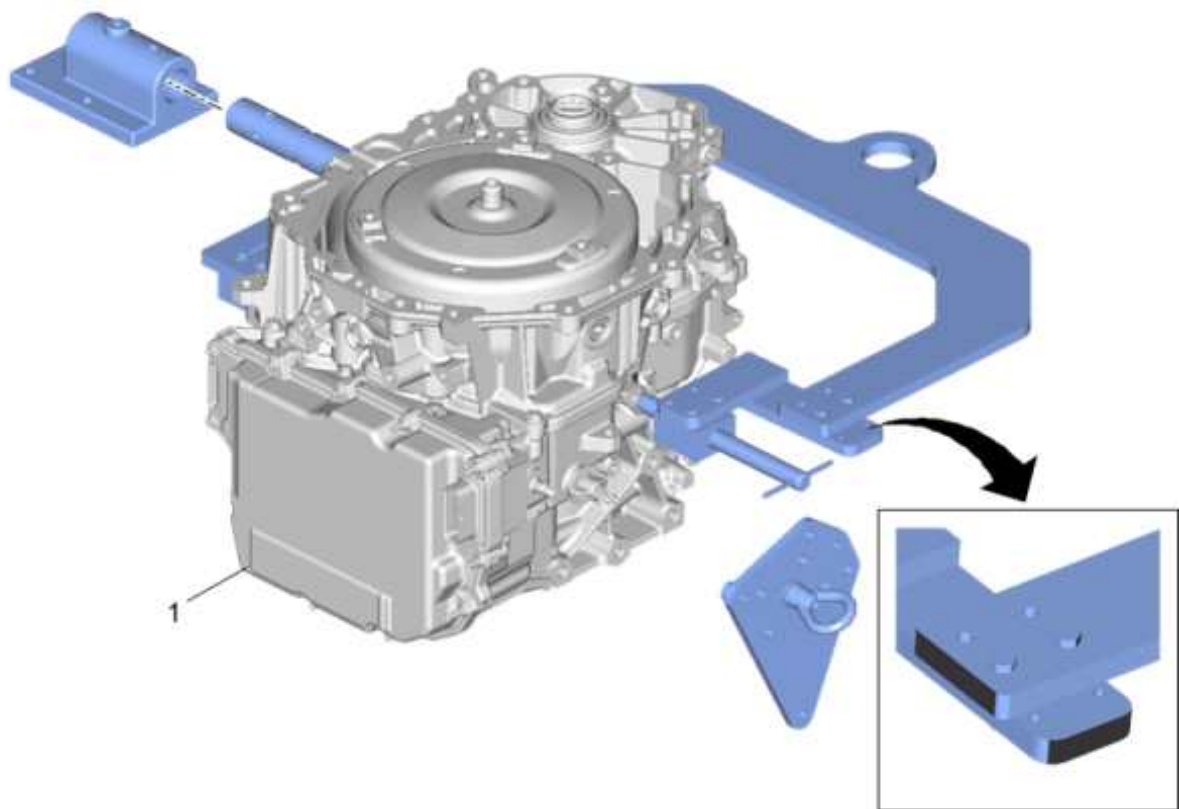


Fig. 136: Lift Plate And Holding Fixture
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1	Transmission Case WARNING: Handle with care, the transmission assembly weighs over 90.7 kg (200 lbs). Bodily injury could occur if not handled properly. 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. CAUTION: Refer to Fastener Caution . Procedure 1. Install DT-47811-A Lift Plate. 2. Tighten bolts and nut to 12 N.m (106 lb in). 3. Install DT-3289-20 Holding Fixture 4. Remove lock pin from DT-3289-20 Holding Fixture. 5. Raise the transmission with an overhead hoist in order to remove the holding DT-46625 Transmission Holding Fixture. 6. Lower the transmission assembly onto the transmission jack in order to remove the DT-47811-A Lift Plate. 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. Special Tools • DT-3289-20 Holding Fixture • DT-46625 Transmission Holding Fixture • DT-46625-10 Transmission Holding Fixture Adapter • DT-47811-A Lift Plate Equivalent regional tools: Special Tools .

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Repair Instructions - On Vehicle - Equinox & Terrain

REPAIR INSTRUCTIONS - ON VEHICLE

TRANSMISSION SERVICE FAST LEARN PROCEDURE

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: [Diagnostic System Check - Vehicle](#)
- Review the description of Strategy Based Diagnosis: [Strategy Based Diagnosis](#)

Description

The learn procedure performs a series of individual clutch applications which allows the control module K71 to learn initial clutch apply pressures. The control module uses the learn values for clutch control and timing of shifts.

When to Perform the Procedure

NOTE: Failure to perform this procedure may result in poor system performance, DTCs being set, or customer dissatisfaction.

This procedure is required when the following component has been repaired, replaced, removed, or serviced:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly
- Any condition/repair related to the following: Shift Quality
- Calibration Update or Software Update
- Torque Converter Assembly
- Transmission - External/Internal Components

Conditions for Running the Procedure

Transmission Fluid Temperature = 75 to 85Â°C (167 to 185Â°F)

Reference Information

Scan Tool Reference

[Control Module References](#)

With Scan Tool

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#)

1. Engine running.
2. Select: Module Diagnostics
3. Select: Transmission
4. Select: Configuration/Reset Functions
5. Select: Learn Functions
6. Select: Transmission Service Fast Learn
7. Follow the instructions on the scan tool.

Verify the scan tool procedure was successful.

- If the procedure was not successful

Refer to: Step 1

- Go to next step: If the procedure was successful

8. All OK.

Repair Instructions

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

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

Removal Procedure

1. Set the parking brake.
2. Shift the transmission control into Reverse position.

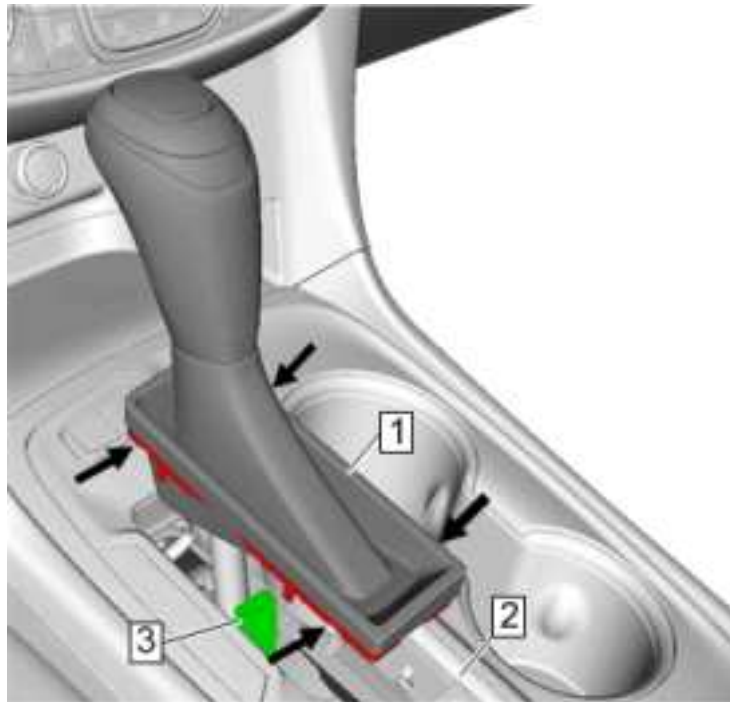


Fig. 1: Transmission Control Lever Boot, Lever Boot Bezel And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

NOTE: The transmission control lever boot snaps to the lever boot bezel in four locations (arrows): two on the passenger side, one on the driver side, and one on the front side.

3. Unclip the transmission control lever boot (1) from the lever boot bezel (2), using a flat bladed tool.
4. Pull the lever boot up to gain access to the electrical connector (3).

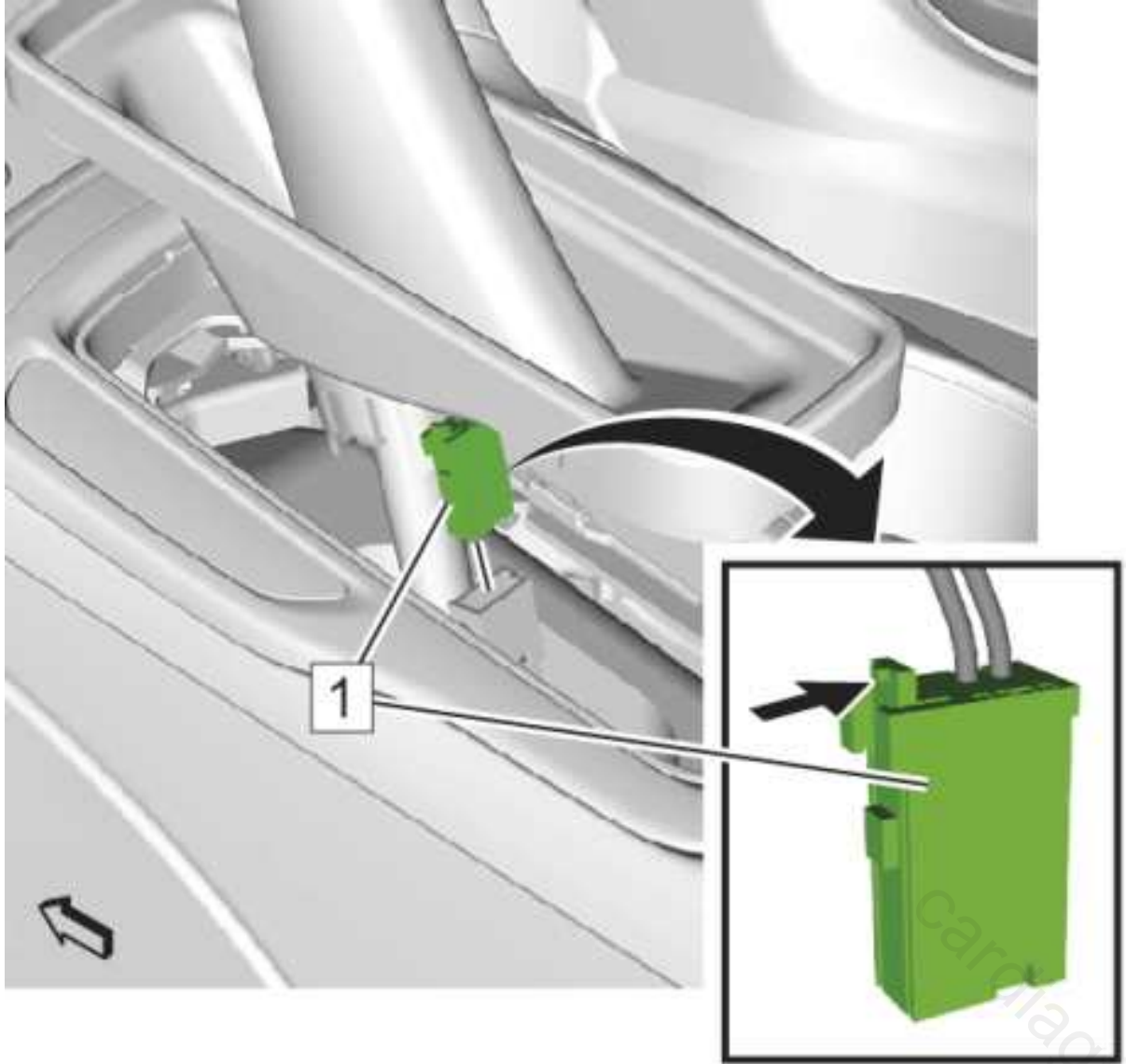


Fig. 2: Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

5. Disconnect Electrical Connector (1)

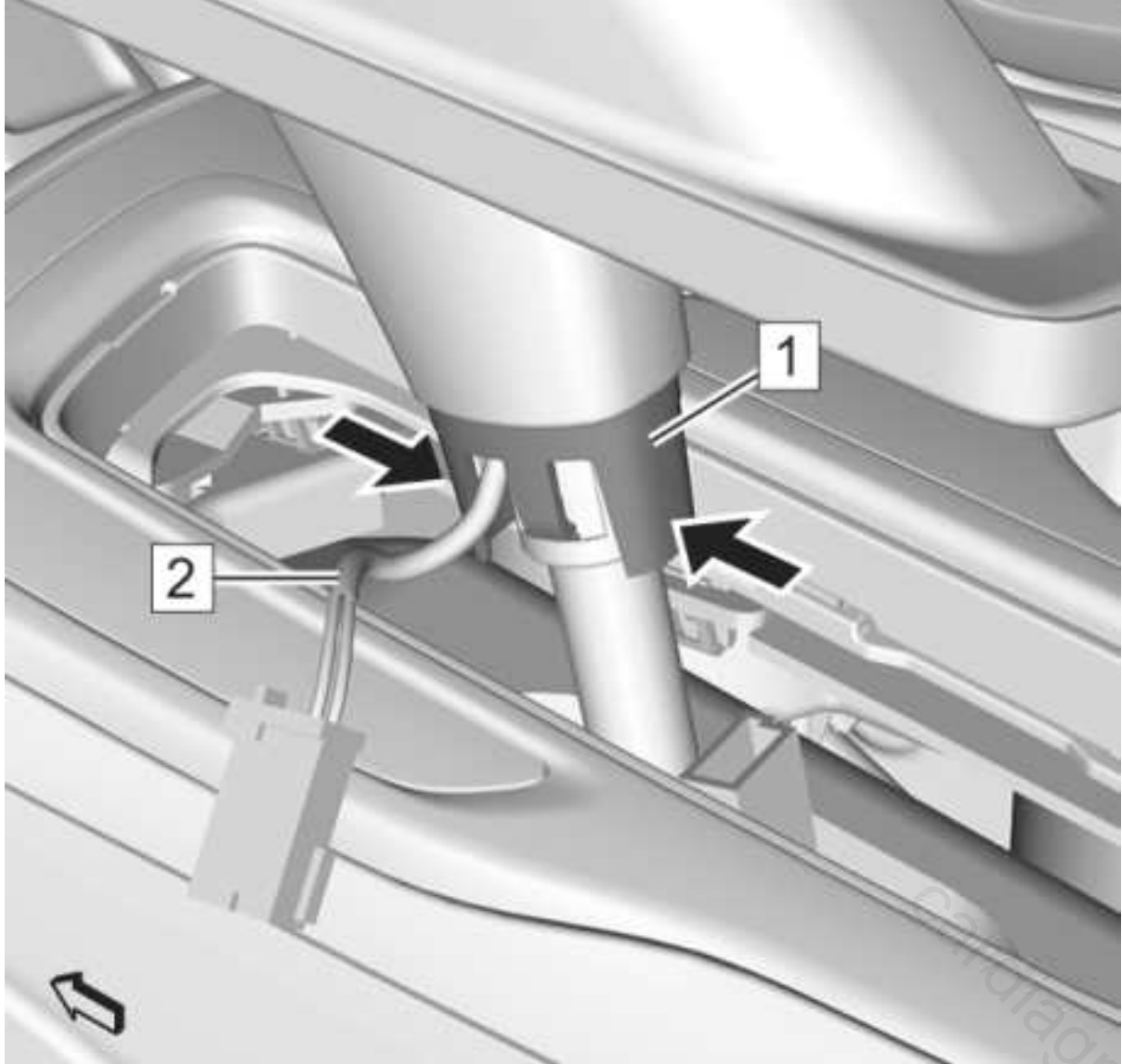


Fig.3: Upper Boot Ring And Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

6. Detach the transmission control lever boot from the transmission control lever knob.
 1. Pull the transmission control lever boot over the transmission control lever knob to gain access to the upper boot ring (1).
 2. Press the upper boot ring (arrows) to disengage the snaps.
 3. Push the upper boot ring along with the lever boot down.
 4. Guide the wiring harness (2) upwards out of the upper boot ring.

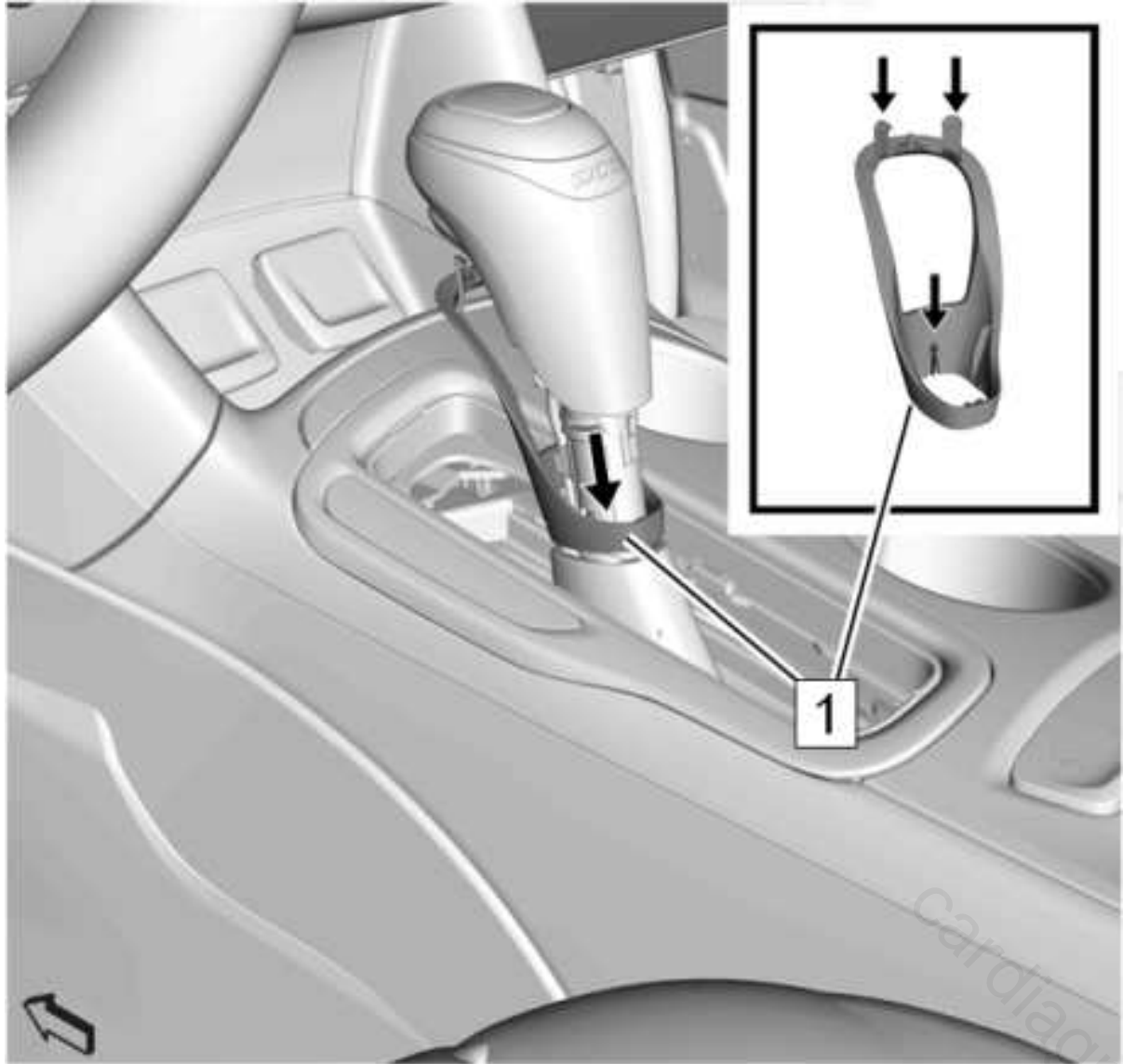


Fig. 4: Transmission Control Lever Knob Extension

Courtesy of GENERAL MOTORS COMPANY

NOTE: Press the button while sliding the lever knob extension downwards.

7. Detach the transmission control lever knob extension (1) from the lever knob with a flat bladed tool, then slide the lever knob extension downwards.

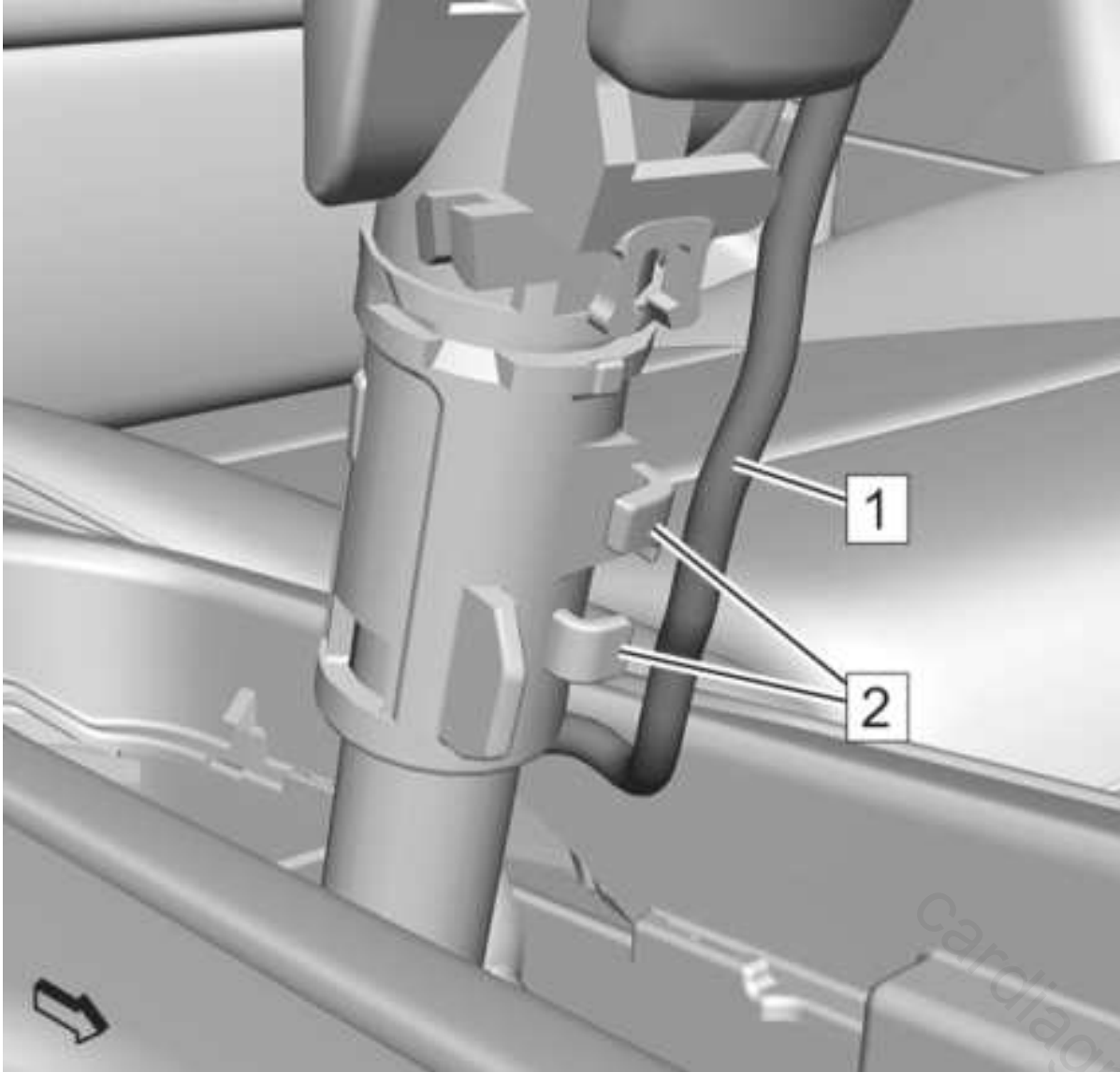


Fig.5: Wiring Harness And Holders

Courtesy of GENERAL MOTORS COMPANY

NOTE: The graphic is shown without the transmission control lever knob extension for clarity.

8. Position aside Wiring Harness (1)

1. Detach the wiring harness from the 2 holders (2).
2. Guide the wiring harness upwards out the bottom hole of the transmission control lever knob extension.

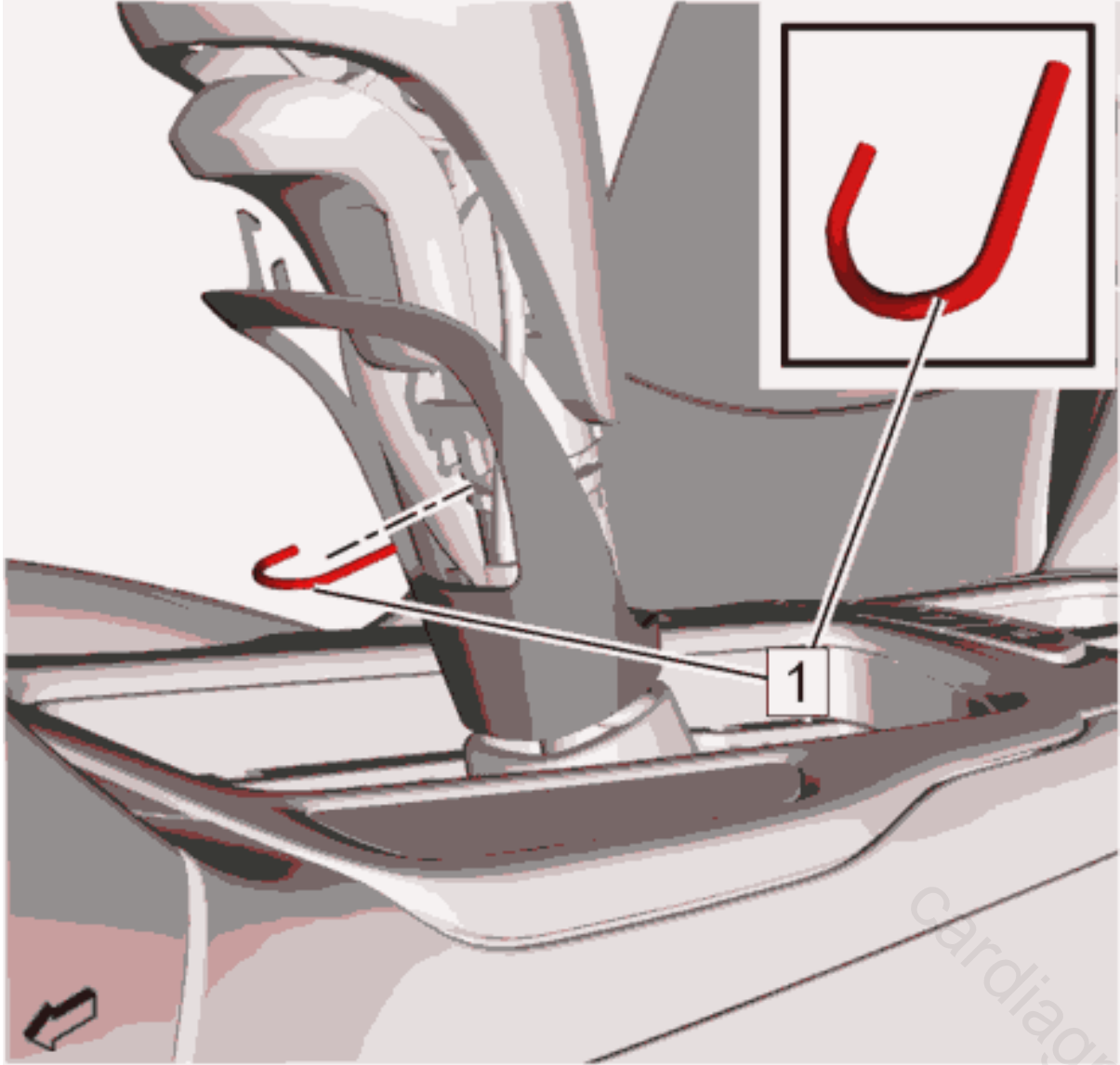


Fig. 6: Transmission Control Lever Knob Retainer
Courtesy of GENERAL MOTORS COMPANY

9. Remove the transmission control lever knob retainer (1).

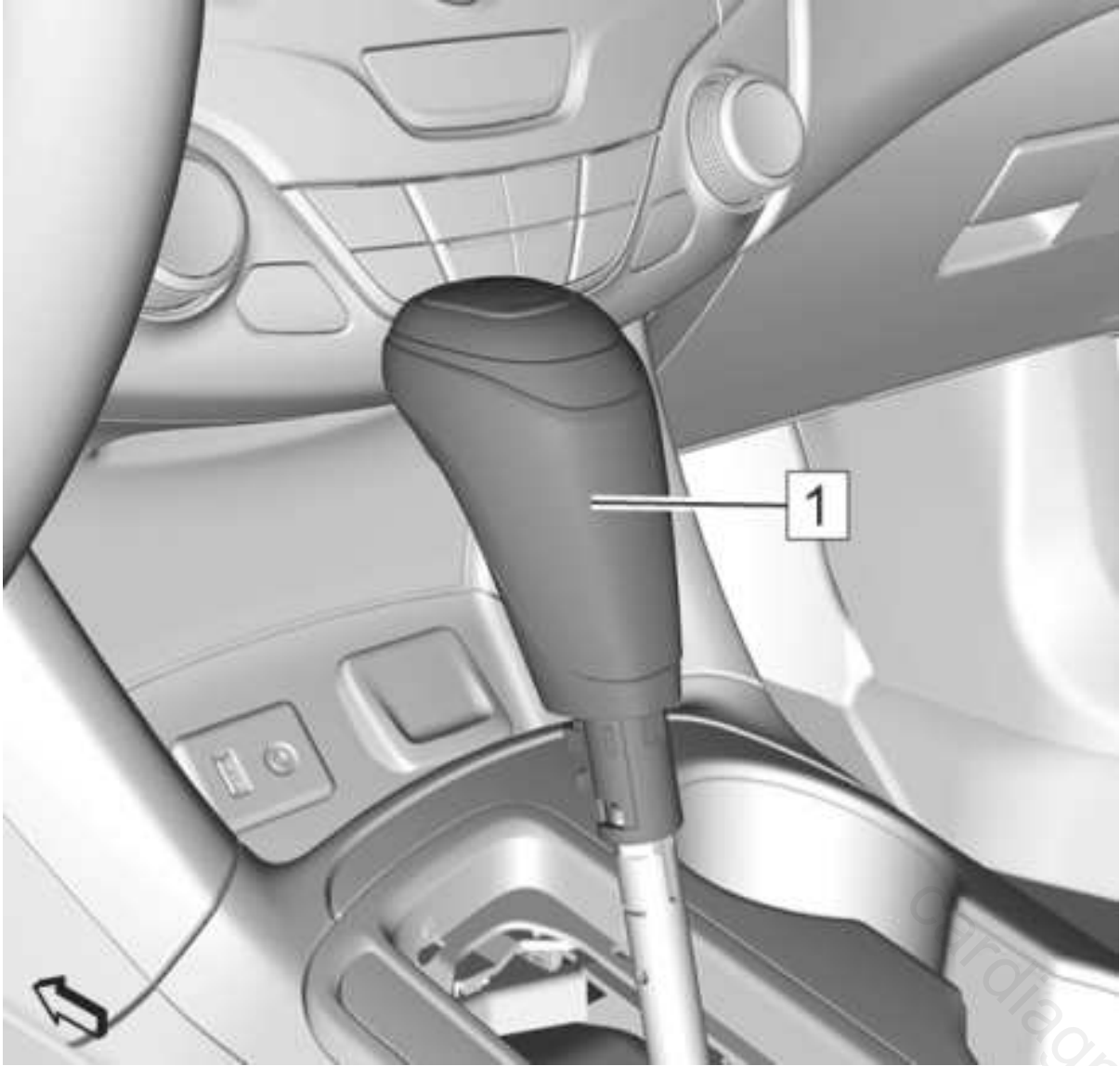


Fig. 7: Transmission Control Lever Knob

Courtesy of GENERAL MOTORS COMPANY

NOTE: This is a press fit and will require some force to pull the transmission control lever knob off. Before applying an upward force, ensure the wiring harness is free.

10. Remove Transmission Control Lever Knob (1) @ Transmission Control Lever

Installation Procedure

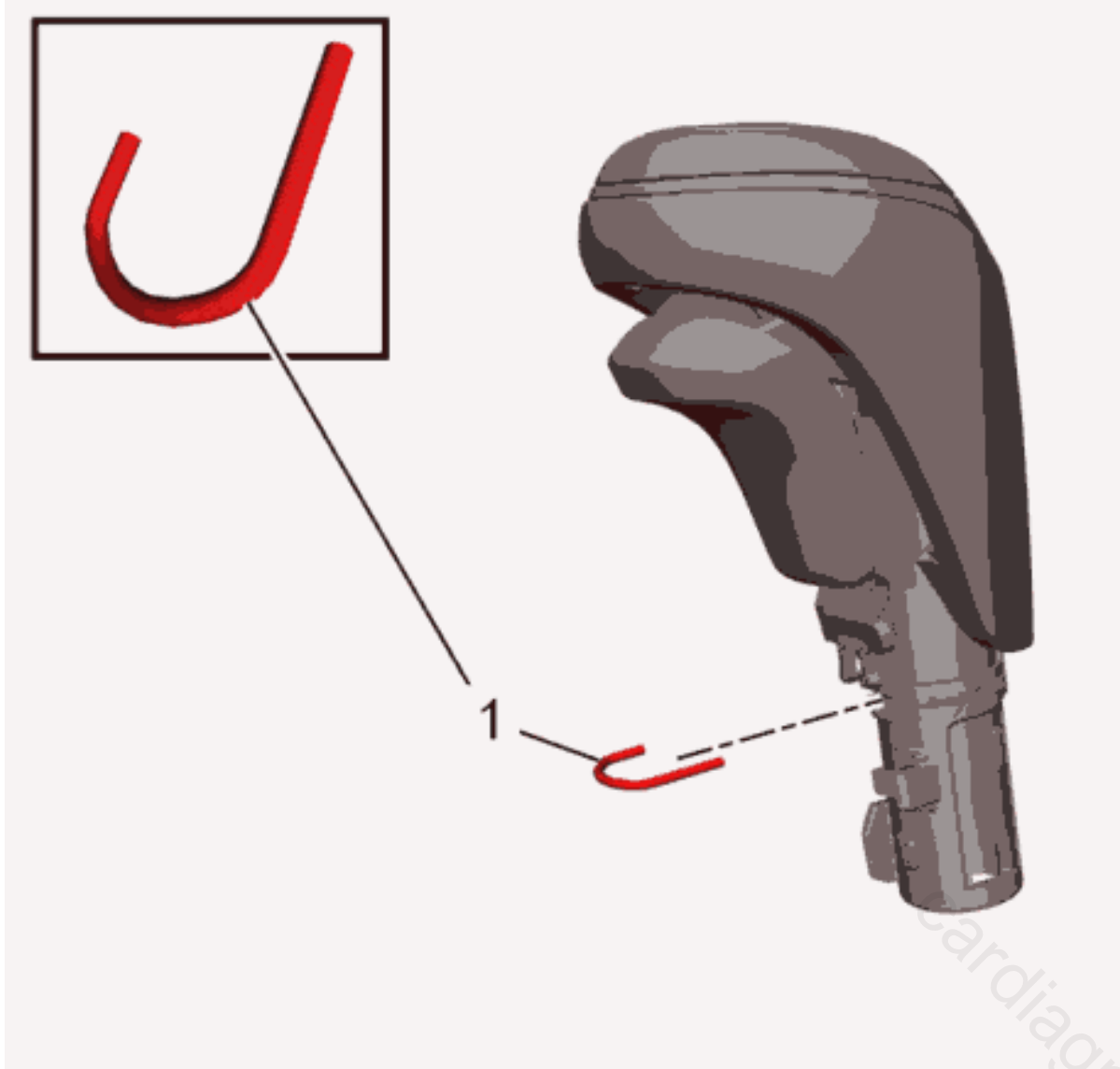


Fig. 8: Transmission Control Lever Knob Retainer
Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission control lever knob retainer (1).

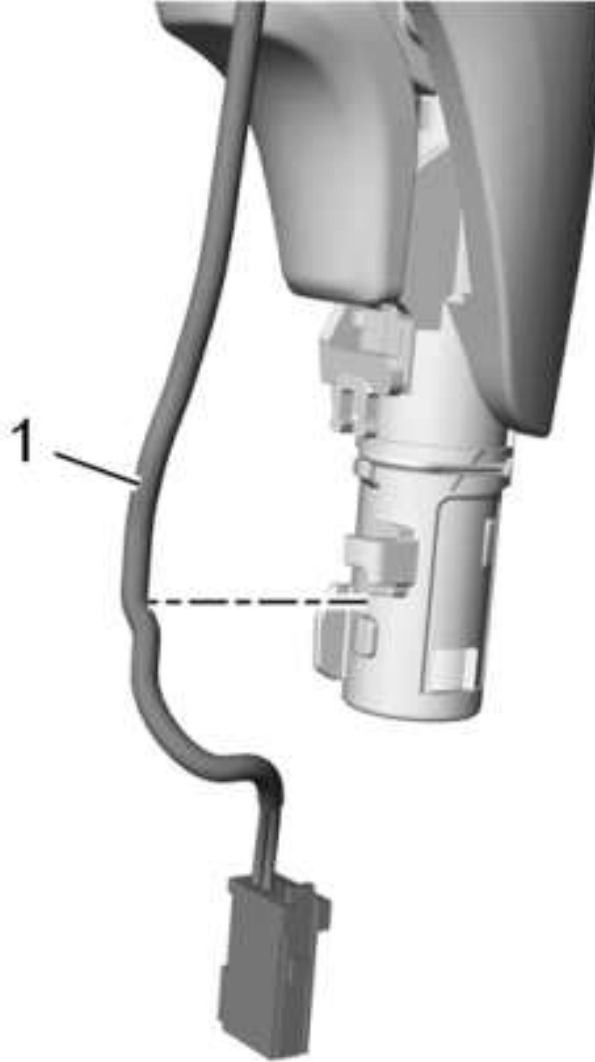


Fig.9: Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

2. Reposition Wiring Harness (1)

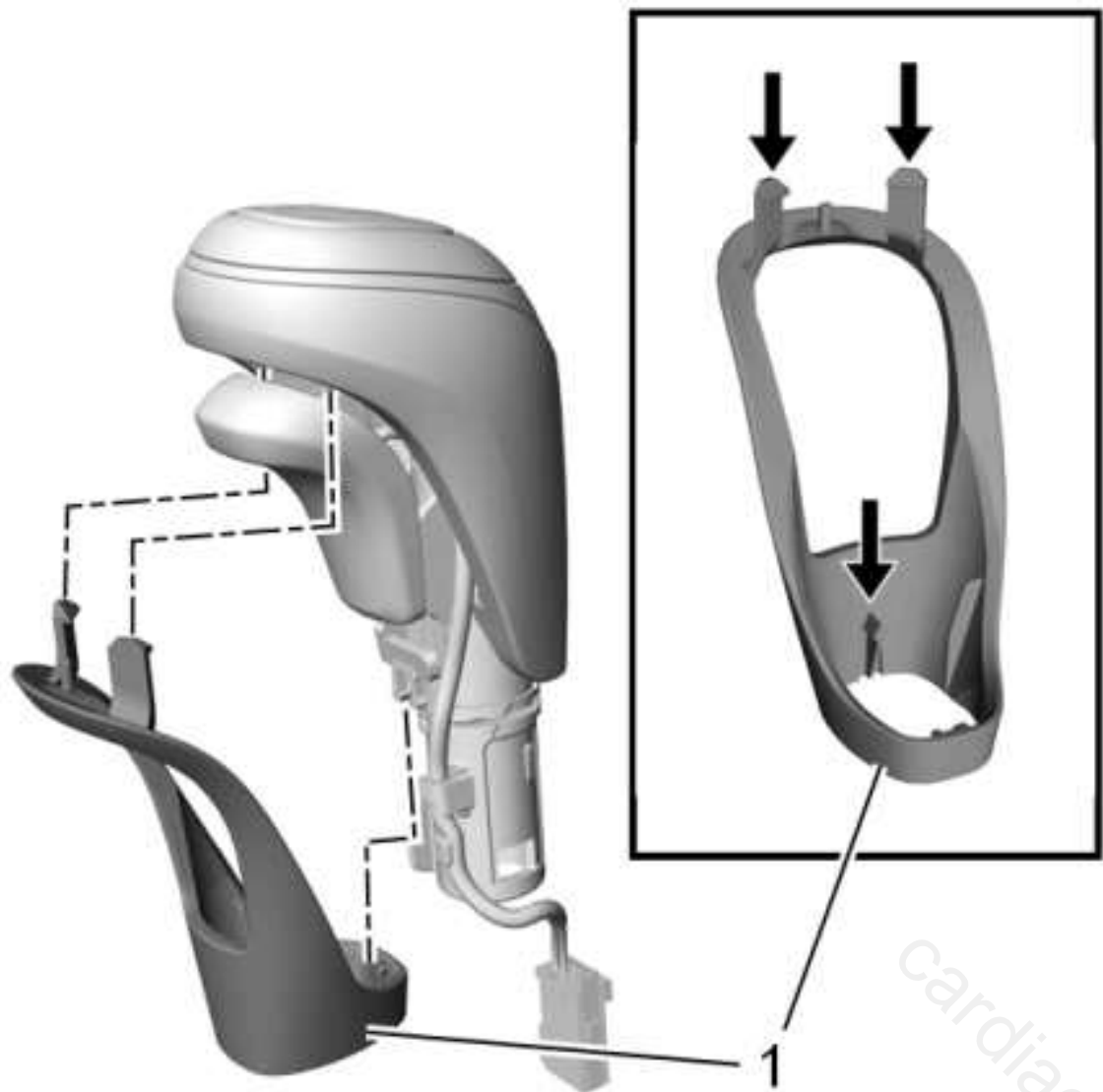


Fig. 10: Transmission Control Lever Knob Retainer
Courtesy of GENERAL MOTORS COMPANY

3. Guide the wiring harness through the transmission control lever knob retainer (1).
4. Attach the transmission control lever knob extension (1) to the lever knob.

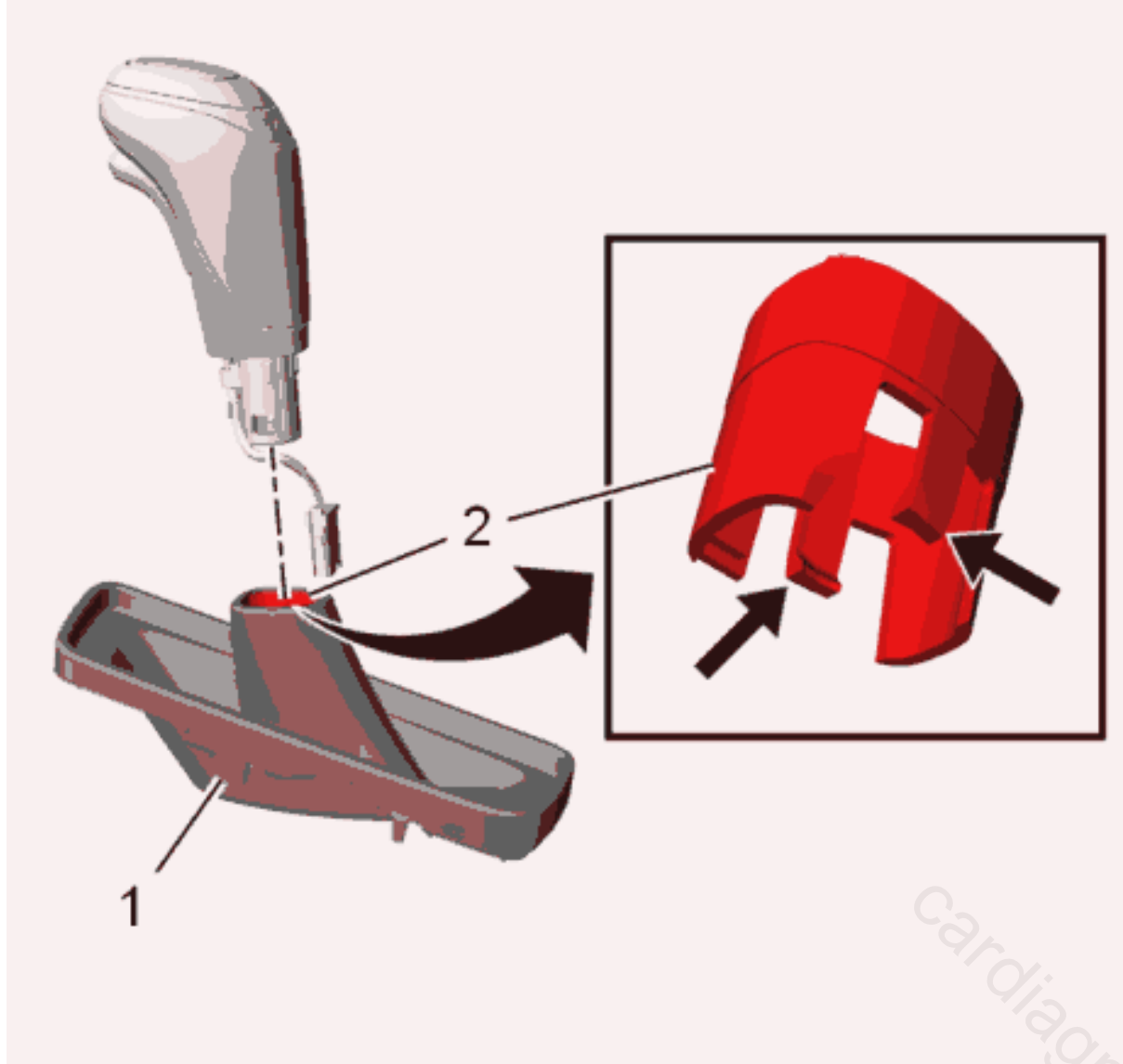


Fig. 11: Transmission Control Lever Boot And Upper Boot Ring
Courtesy of GENERAL MOTORS COMPANY

5. Attach the transmission control lever boot (1) to the transmission control lever knob.
 1. Guide the wiring harness through the transmission control lever boot (1).
 2. Clip the upper boot ring (2) into the bottom of the transmission control lever knob.



NOTE: When installing the transmission control lever knob, a defined snap noise should be audible and a snap effect should be felt. After installation, check the retention of the transmission control lever knob by pulling it upwards with two hands and significant force in an attempt to remove it.

6. Install Transmission Control Lever Knob (1) @ Transmission Control Lever
7. Shift the transmission control lever into "P" position

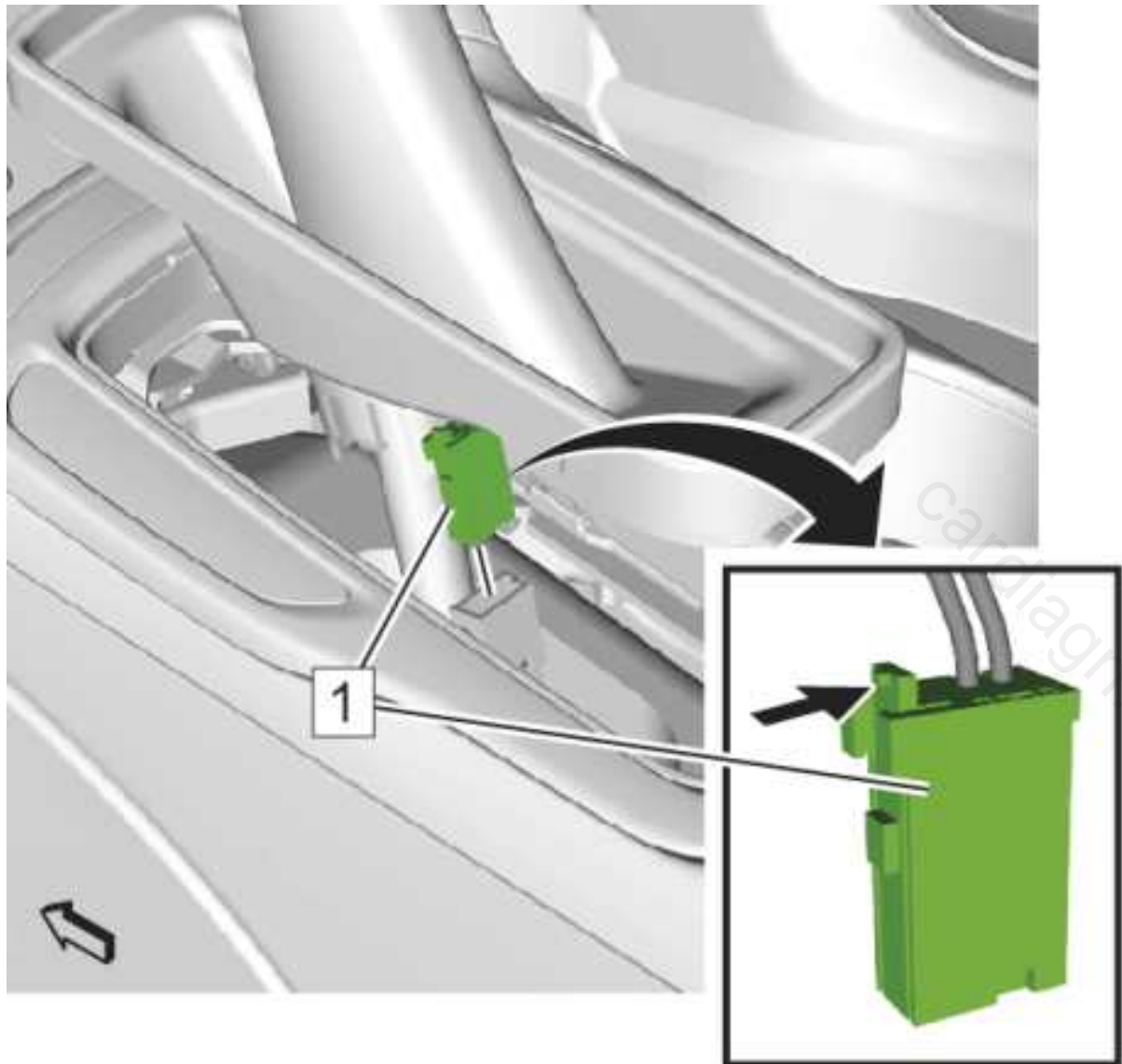


Fig. 13: Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

8. Connect Electrical Connector (1)

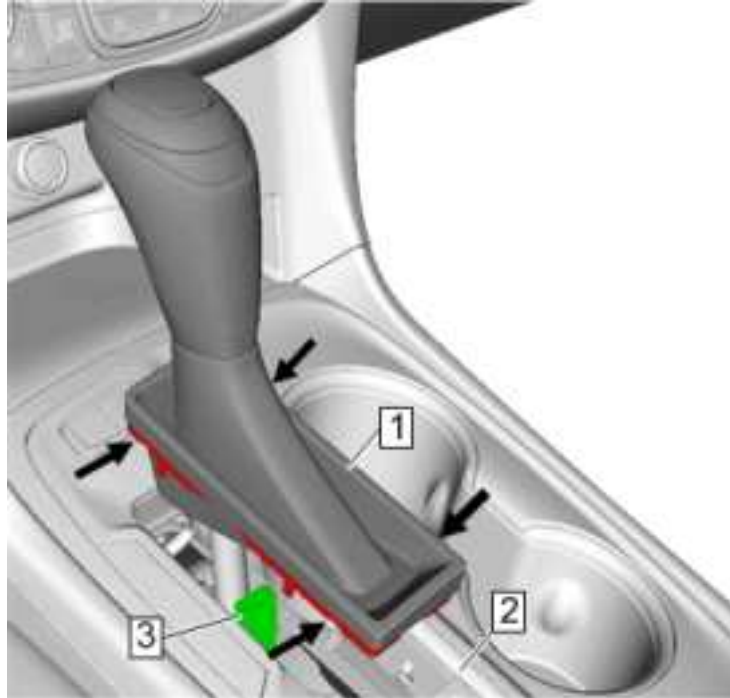


Fig. 14: Transmission Control Lever Boot, Lever Boot Bezel And Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

NOTE: The transmission control lever boot snaps to the lever boot bezel in four locations (arrows): two on the passenger side, one on the driver side, and one on the front side. Before pushing the transmission control lever boot into the lever boot bezel, ensure proper alignment along the edges to avoid visible gaps.

9. Clip the transmission control lever boot (1) into the lever boot bezel (2).
10. Release the parking brake.

ELECTRONIC TRANSMISSION SHIFT CONTROL PUSHBUTTON REPLACEMENT

Removal Procedure

1. Remove the front floor console transmission shift opening bezel. Refer to [Front Floor Console Transmission Shift Opening Bezel Replacement \(Terrain\)](#).

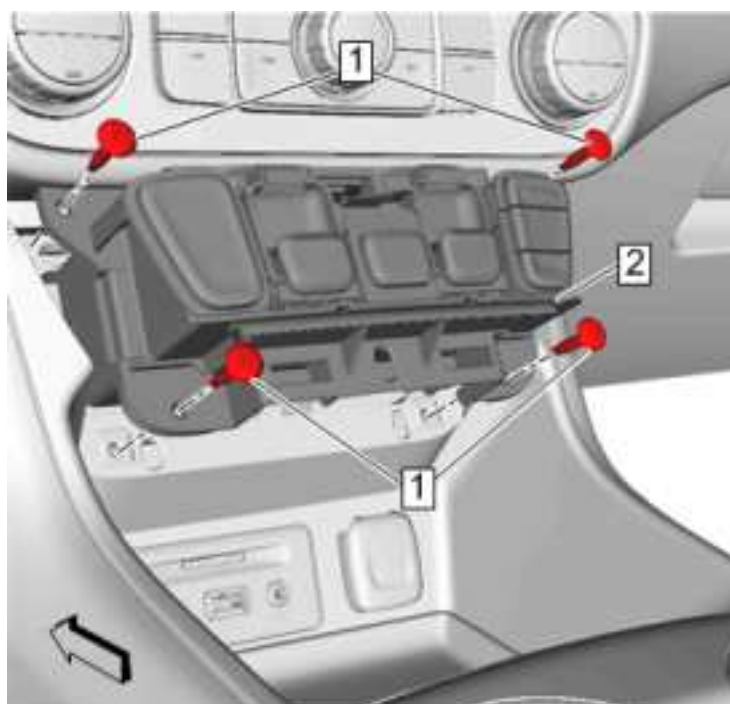


Fig. 15: Electronic Transmission Shift Control Pushbutton
Courtesy of GENERAL MOTORS COMPANY

2. Remove the screws (1)
3. Remove the electronic transmission shift control pushbutton assembly (2)
4. Disconnect the electrical connector.

Installation Procedure

1. Connect the electrical connector.

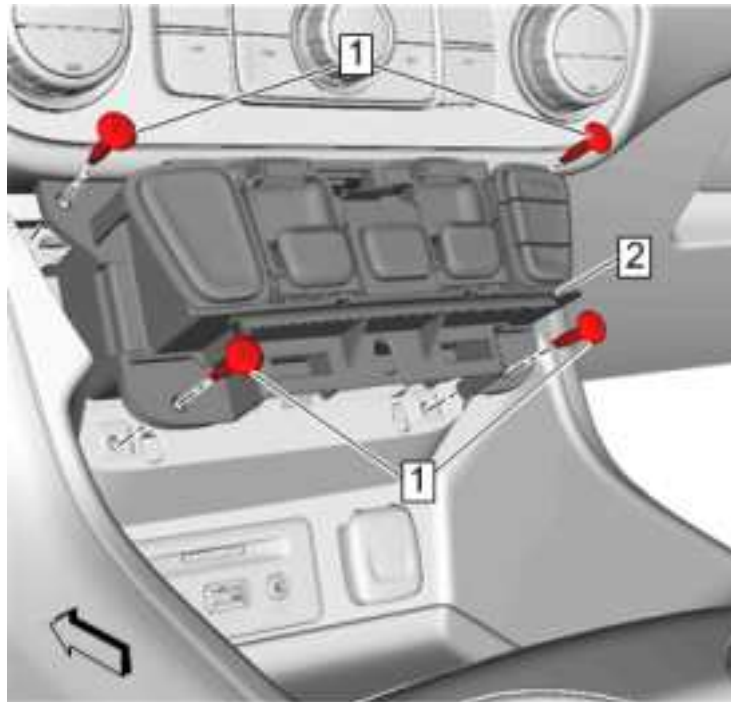


Fig. 16: Electronic Transmission Shift Control Pushbutton

Courtesy of GENERAL MOTORS COMPANY

2. Install the electronic transmission shift control pushbutton assembly (2)

CAUTION: Refer to Fastener Caution .

3. Install the screws.
4. Install the front floor console transmission shift opening bezel. Refer to Front Floor Console Transmission Shift Opening Bezel Replacement (Terrain).

TRANSMISSION CONTROL MODULE REPLACEMENT

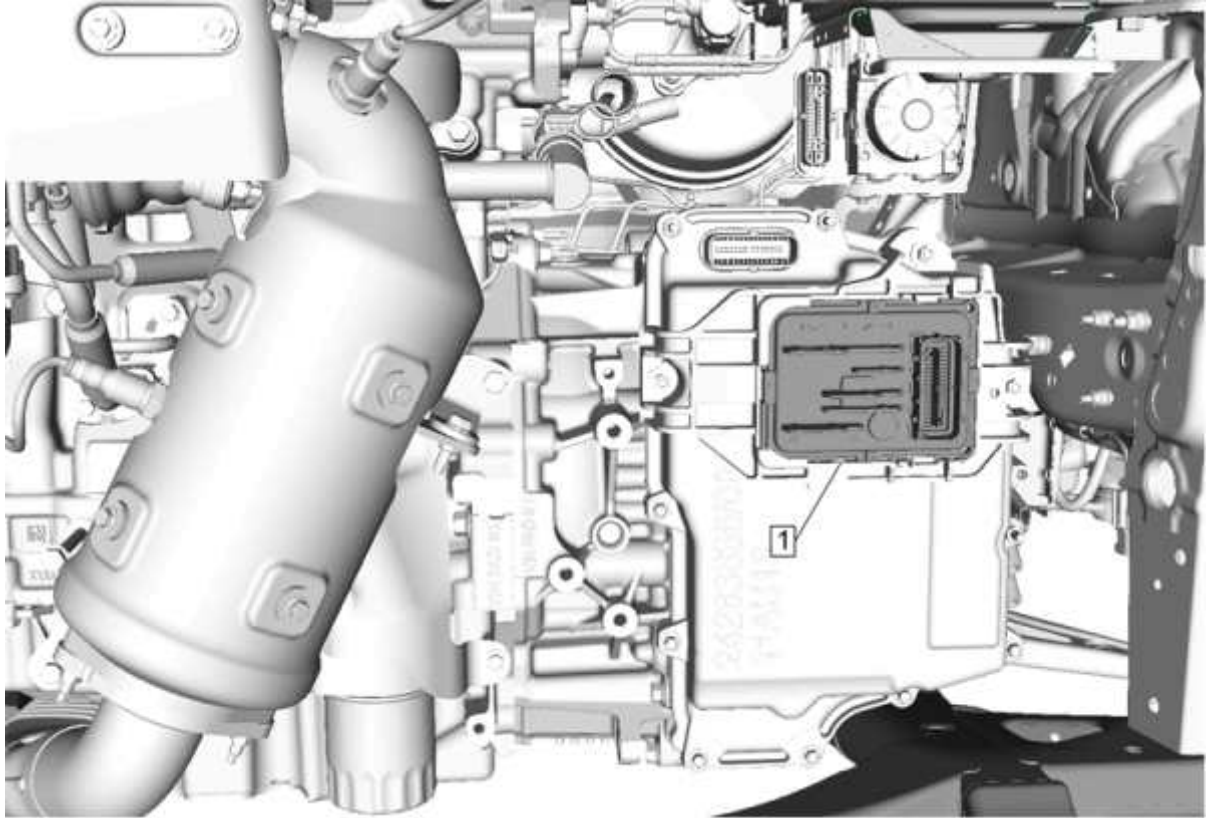


Fig. 17: Transmission Control Module
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transmission Control Module Procedure 1. Disconnect the electrical connector. 2. Remove the module from the module bracket by releasing the retaining tabs. 3. Program the transmission control module, if replaced. Refer to Solenoid Valve Characterization Reprogramming NOTE: Radiator assembly removed for clarity.

TRANSMISSION CONTROL MODULE BRACKET REPLACEMENT

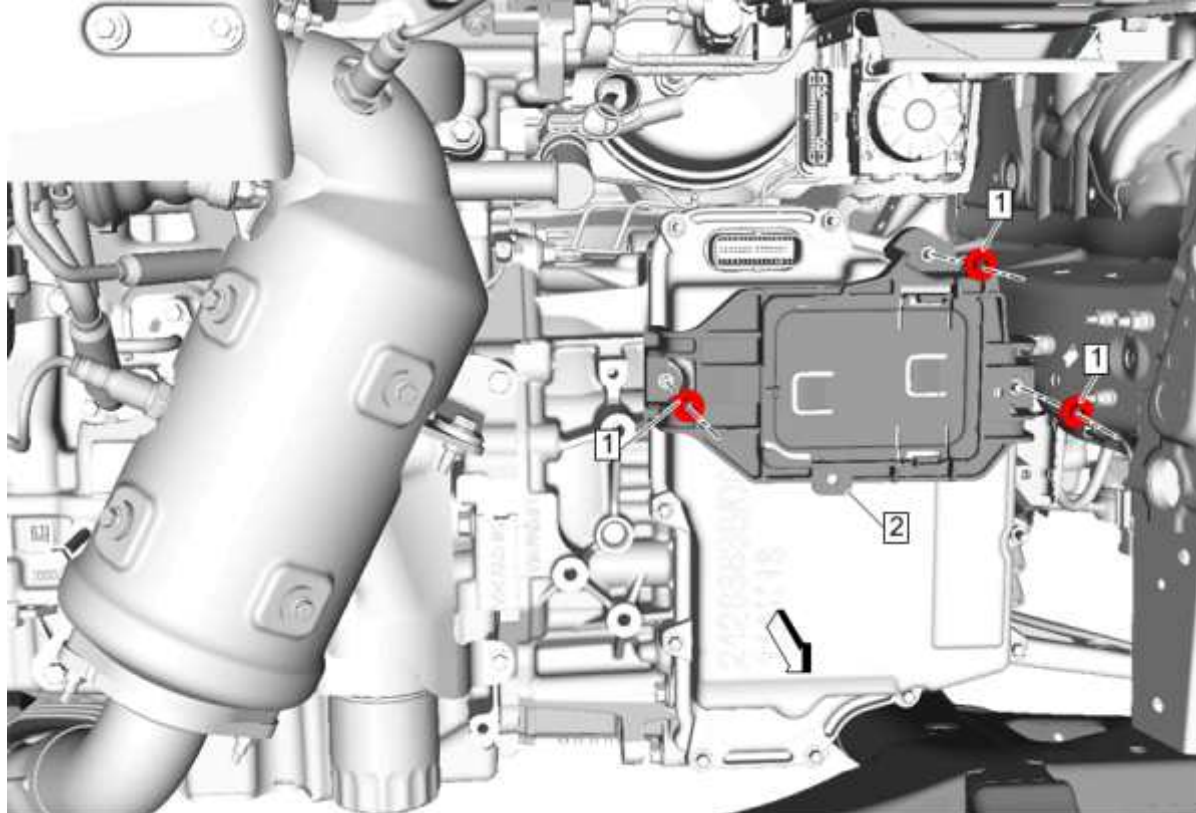


Fig. 18: Transmission Control Module Bracket
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Transmission Control Module. Refer to Transmission Control Module Replacement	
1	Transmission Control Module Bracket Nut (Qty: 3) NOTE: Radiator assembly removed for clarity. CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Transmission Control Module Bracket

TRANSMISSION CONTROL REPLACEMENT

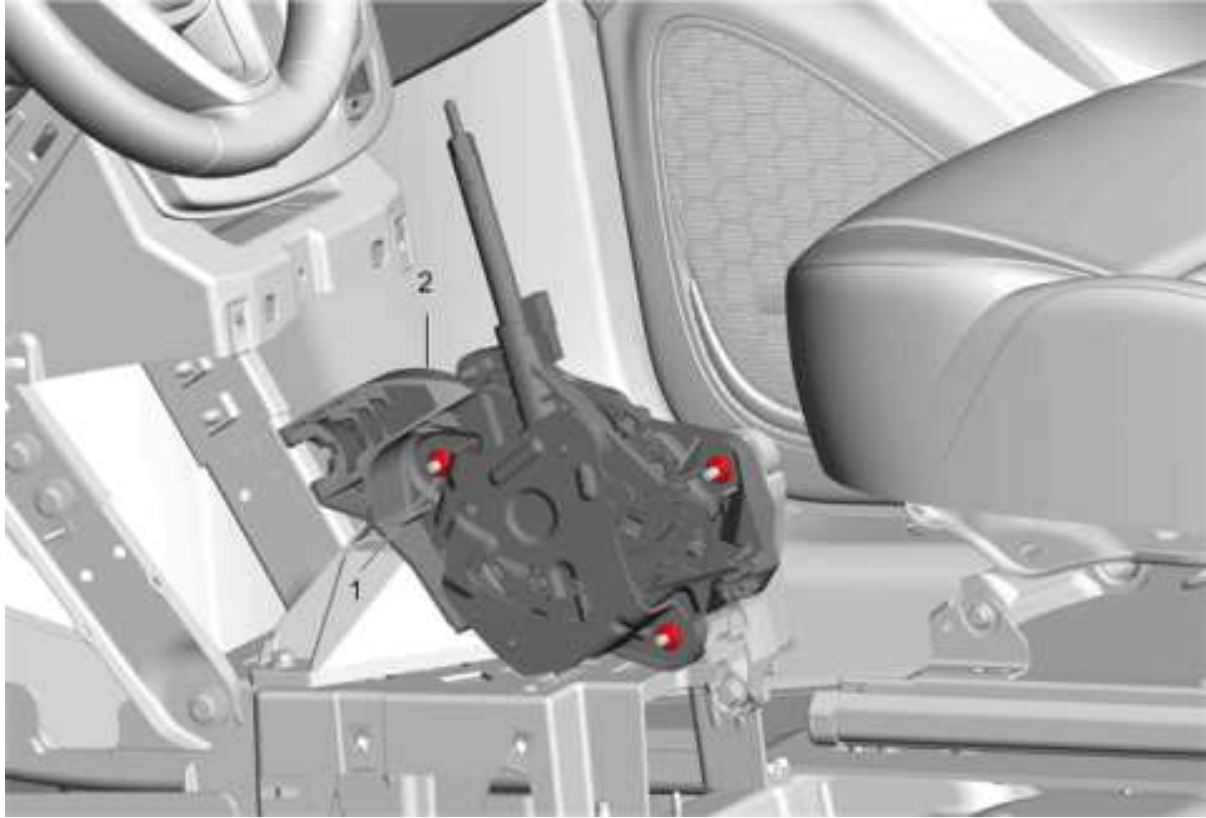


Fig. 19: Transmission Control

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove the front floor console. Refer to Front Floor Lower Console Replacement (Equinox). 2. Disconnect the shift control cable from the transmission control. Refer to Range Selector Lever Cable Replacement 3. Disconnect the electrical connector.	
1	Transmission Control Fastener (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Transmission Control

TRANSMISSION CONTROL BRACKET REPLACEMENT

Removal Procedure

1. Remove Transmission control. Refer to [Transmission Control Replacement](#)



Fig. 20: Left I/P Center Support Bracket Bolt, Automatic Transmission Control Bracket And Nuts

Courtesy of GENERAL MOTORS COMPANY

2. Remove the left instrument panel center support bracket bolt (1).
3. Remove the automatic transmission control bracket nuts (2) from the automatic transmission control bracket (3).

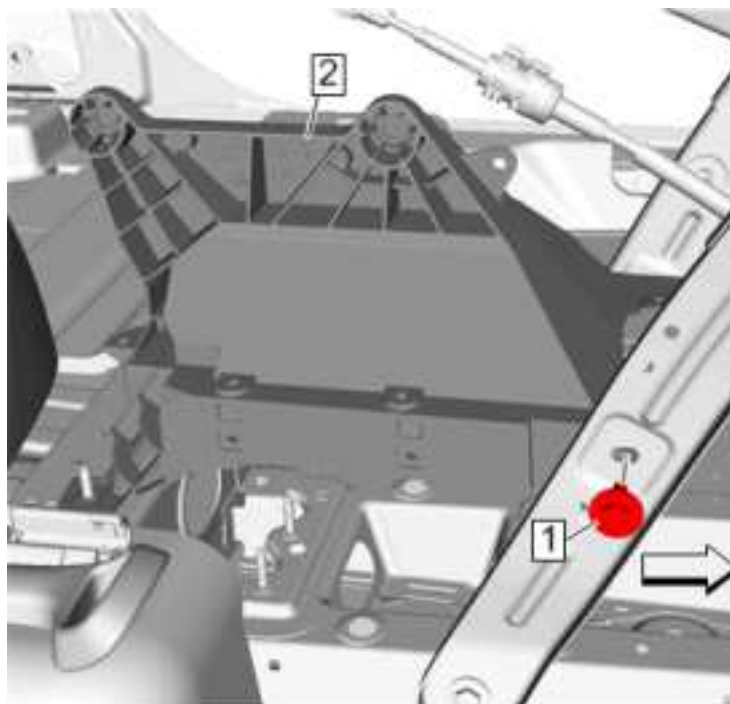


Fig. 21: Right I/P Center Support Bracket Bolt And Automatic Transmission Control Bracket

Courtesy of GENERAL MOTORS COMPANY

4. Remove the right instrument panel center support bracket bolt (1).
5. Remove the automatic transmission control bracket (2).

Installation Procedure

1. Position the transmission control bracket in the vehicle.



Fig. 22: Left I/P Center Support Bracket Bolt, Automatic Transmission Control Bracket And Nuts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install the automatic transmission control nuts (2) to the automatic transmission control bracket (3) and tighten to 9 N.m (80 lb in).
3. Install the left instrument panel center support bracket bolt (1) and tighten to 22 N.m (16 lb ft).

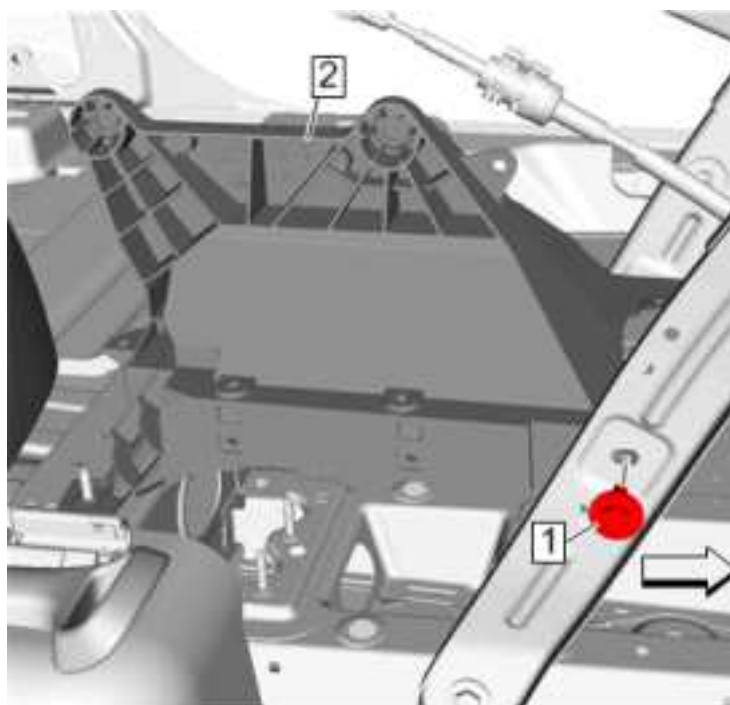


Fig. 23: Right I/P Center Support Bracket Bolt And Automatic Transmission Control Bracket

Courtesy of GENERAL MOTORS COMPANY

4. Install the right instrument panel center support bracket bolt (1) and tighten to 22 N.m (16 lb ft).
5. Install Transmission control. Refer to [Transmission Control Replacement](#)

ELECTRONIC TRANSMISSION RANGE SELECTOR MANUAL PARK RELEASE CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

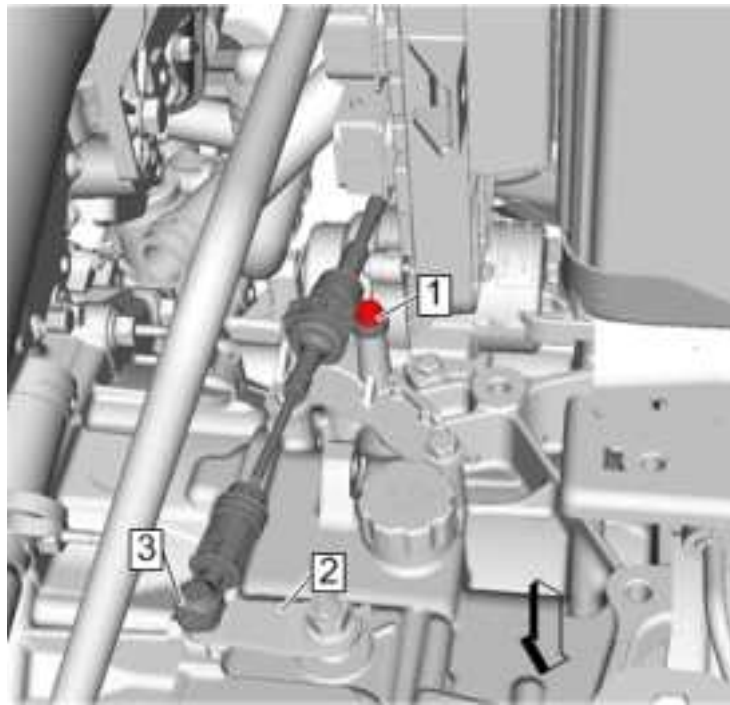


Fig. 24: Automatic Transmission Range Selector Lever Cable Terminal, Shift Lever And Clamp Bolt

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the electronic transmission range selector manual park release cable terminal (3) from the transmission manual shift lever (2).
3. Remove the bolt (1) retaining the electronic transmission range selector manual park release cable to the cable bracket.
4. Remove the electronic transmission range selector manual park release cable from the transmission.
5. Remove the front floor lower console. Refer to [**Front Floor Lower Console Replacement \(Equinox\)**](#)

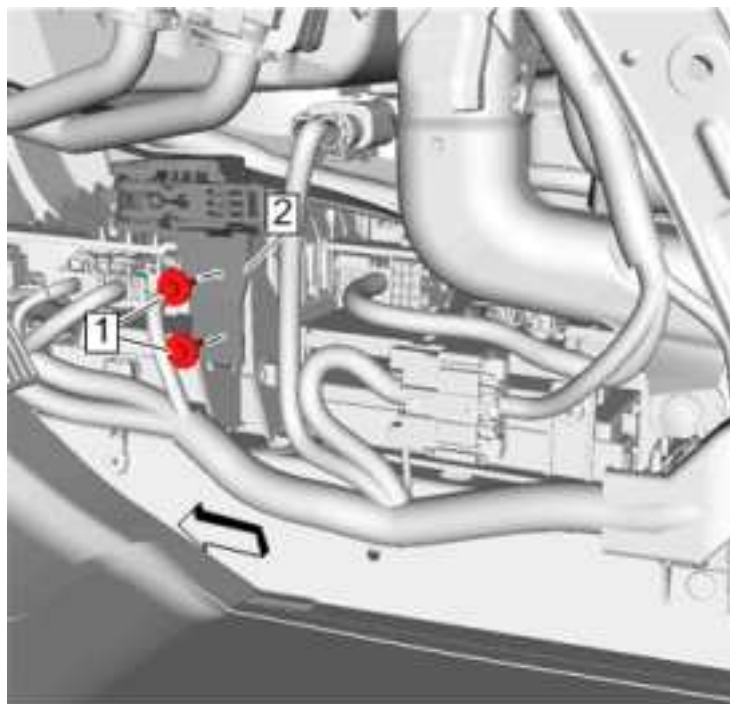


Fig. 25: Range Selector Manual Park Release Cable Handle And Retaining Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove the electronic transmission range selector manual park release cable retaining bolts (1).
7. Reposition the front left carpet to access the shift cable grommet, if necessary.

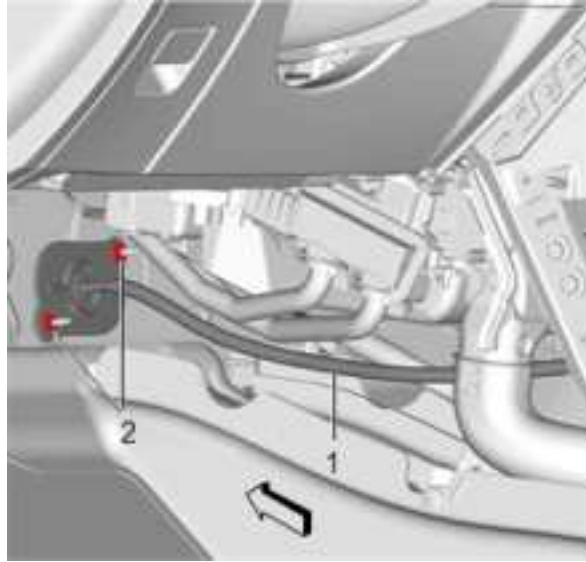


Fig. 26: Range Selector Manual Park Release Cable And Cable Grommet Fasteners
Courtesy of GENERAL MOTORS COMPANY

8. Remove the electronic transmission range selector manual park release cable grommet fasteners (2).
9. Remove the electronic transmission range selector manual park release cable (1) from the vehicle.

Installation Procedure

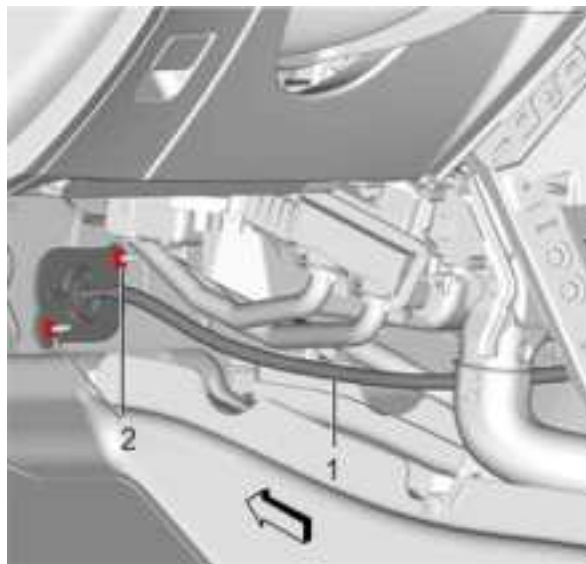


Fig. 27: Range Selector Manual Park Release Cable And Cable Grommet Fasteners
Courtesy of GENERAL MOTORS COMPANY

1. Install the electronic transmission range selector manual park release cable (1) through the cowl panel.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the electronic transmission range selector manual park release cable grommet fasteners (2) and tighten to 6 N.m (53 lb in).

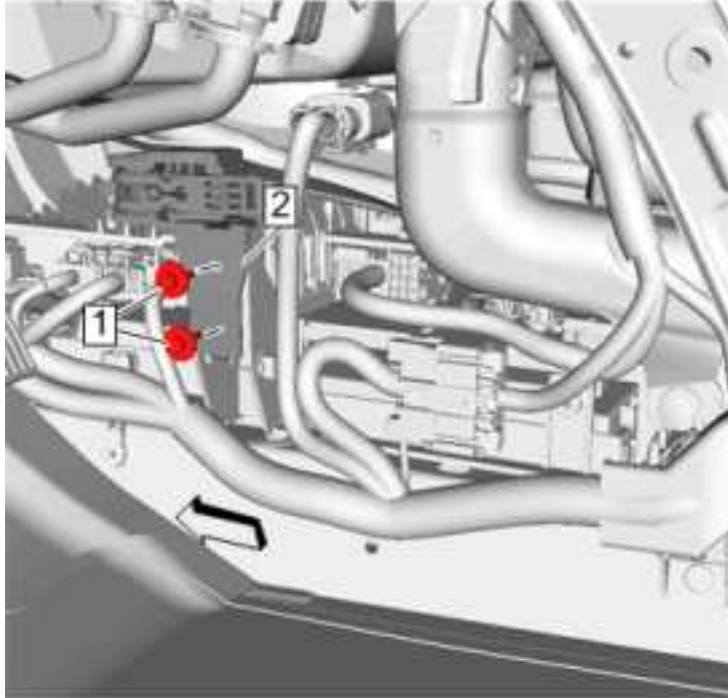


Fig. 28: Range Selector Manual Park Release Cable Handle And Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Position the electronic transmission range selector manual park release cable handle (2) to the bracket.
4. Install the electronic transmission range selector manual park release cable handle fasteners (1) and tighten to 2.5 N.m (22 lb in).
5. Install the front floor lower console. Refer to [Front Floor Lower Console Replacement \(Equinox\)](#)
6. Position the front left carpet, if necessary.
7. Install the electronic transmission range selector manual park release cable to the cable bracket on the transmission.

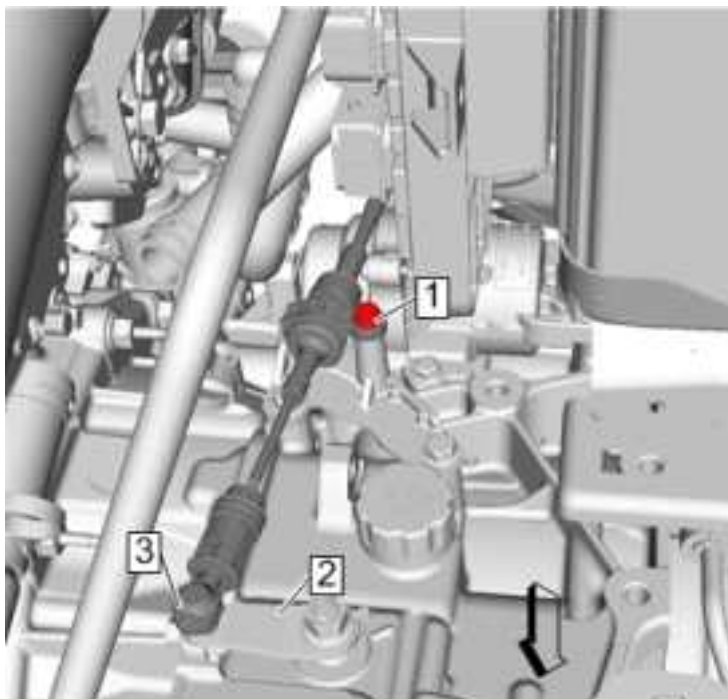


Fig. 29: Automatic Transmission Range Selector Lever Cable Terminal, Shift Lever And Clamp Bolt
Courtesy of GENERAL MOTORS COMPANY

8.

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.

9. Connect the electronic transmission range selector manual park release cable terminal (3) to the transmission manual shift lever (2).
10. Install the electronic transmission range selector manual park release cable bolt (1) and tighten to 9 N.m (80 lb in).

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER CABLE BRACKET REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Disconnect the range selector lever cable from the range selector lever cable bracket. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#)

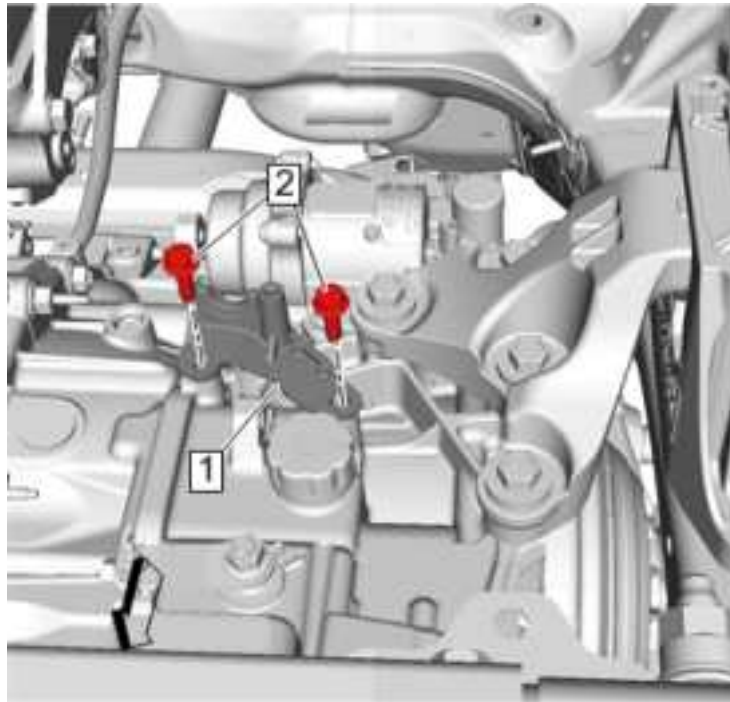


Fig. 30: Transmission Range Selector Cable Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

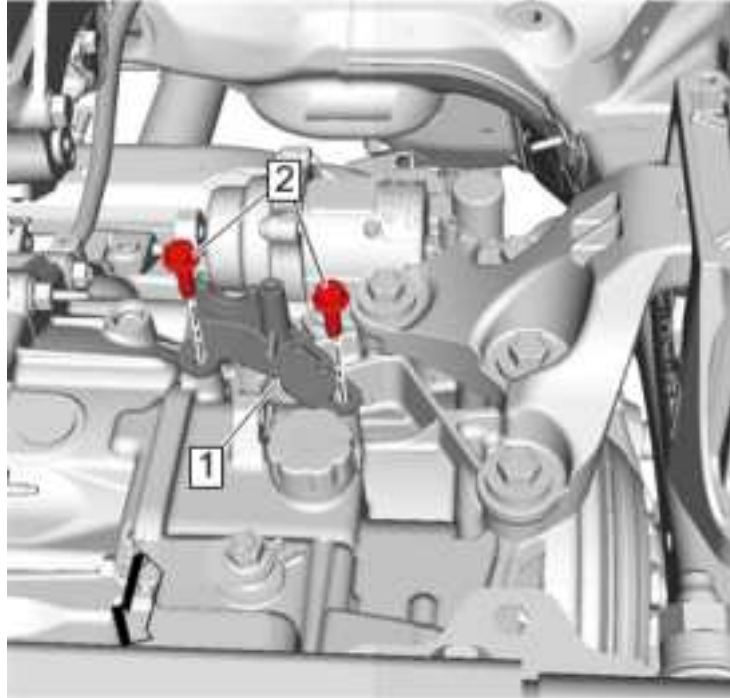


Fig. 31: Transmission Range Selector Cable Bracket And Bolts
 Courtesy of GENERAL MOTORS COMPANY

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

CAUTION: Refer to [Fastener Caution](#) .

2. Install the transmission range selector lever cable bracket bolts (2) and tighten to 22 N.m (16 lb ft).
3. Connect the range selector lever cable to the range selector lever cable bracket. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#)
4. Check the range selector cable adjustment. Refer to [Range Selector Lever Cable Adjustment](#)

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

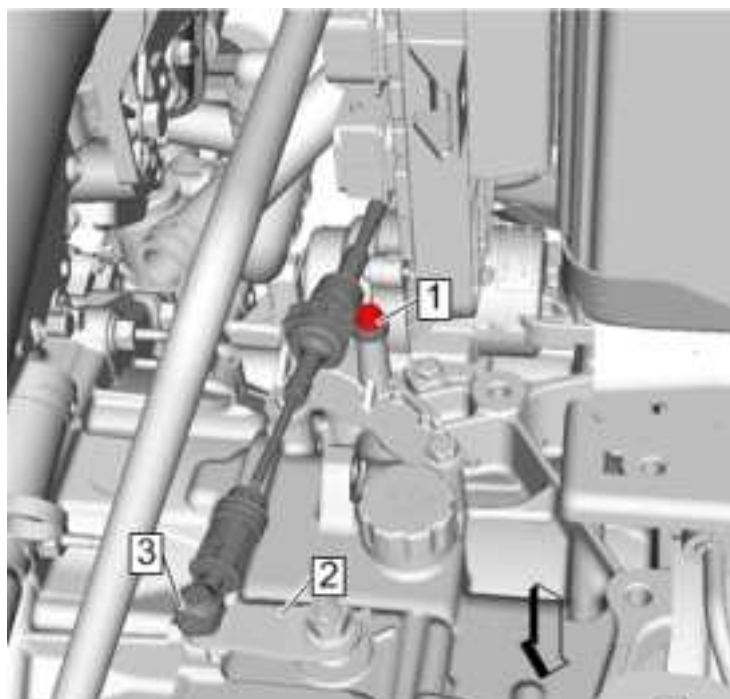


Fig. 32: Automatic Transmission Range Selector Lever Cable Terminal, Shift Lever And Clamp Bolt

2. Disconnect the range selector lever cable terminal (3) from the transmission manual shift lever (2).
3. Remove the bolt (1) retaining the automatic transmission range selector lever cable to the cable bracket.
4. Remove the range selector lever cable from the transmission.
5. Remove the front floor lower console. Refer to [Front Floor Lower Console Replacement \(Equinox\)](#).

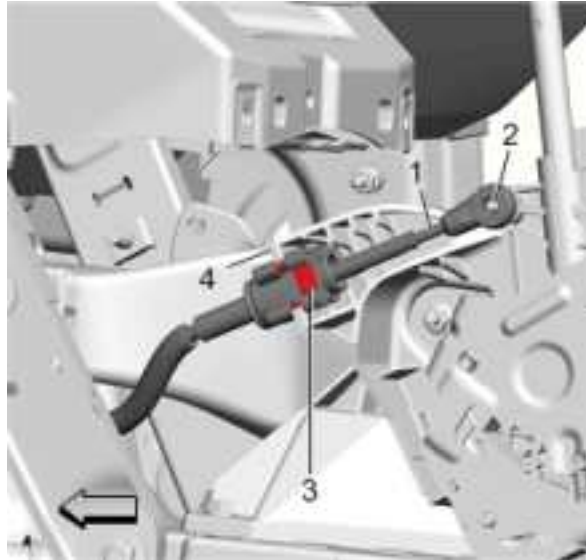


Fig. 33: Range Selector Lever Cable Components

Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the range selector lever cable terminal (1) from the transmission control shift lever pin (2).
7. Push the locking tab (3) rearward in order to release the range selector lever cable (1) from the transmission control assembly (4).
8. Reposition the front left carpet to access the shift cable grommet, if necessary.

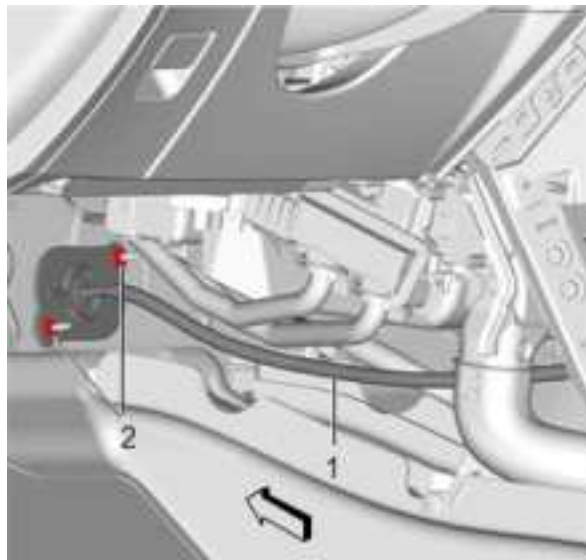


Fig. 34: Range Selector Manual Park Release Cable And Cable Grommet Fasteners

Courtesy of GENERAL MOTORS COMPANY

9. Remove the range selector lever cable grommet fasteners (2).
10. Remove the range selector lever cable (1) from the vehicle.

Installation Procedure

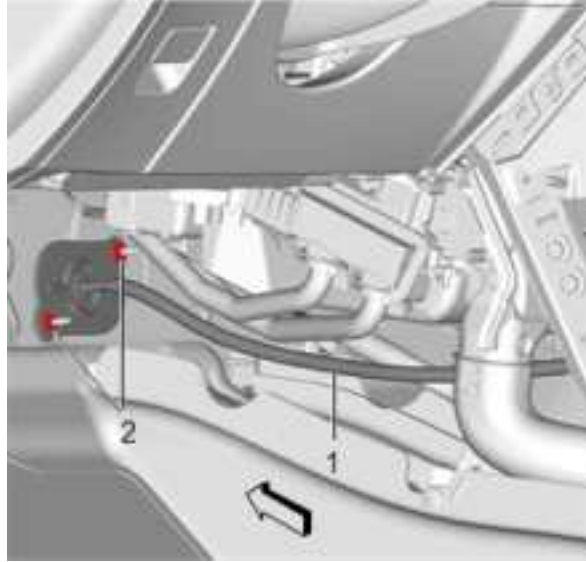


Fig. 35: Range Selector Manual Park Release Cable And Cable Grommet Fasteners
 Courtesy of GENERAL MOTORS COMPANY

1. Install the range selector lever cable (1) through the cowl panel.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the range selector lever cable grommet fasteners (2) and tighten to 6 N.m (53 lb in).

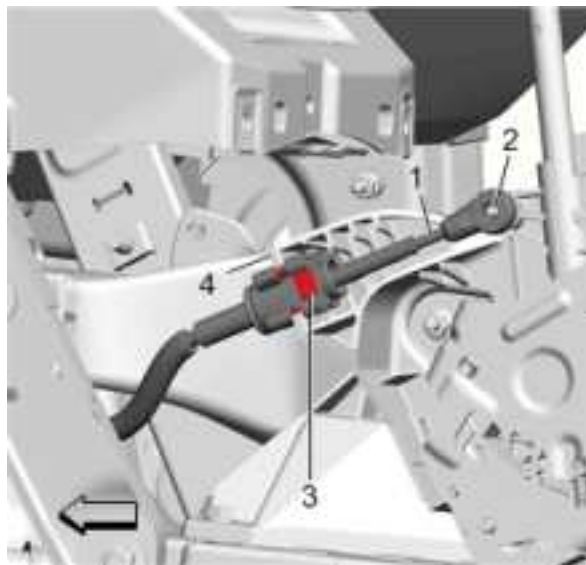


Fig. 36: Range Selector Lever Cable Components
 Courtesy of GENERAL MOTORS COMPANY

3. Install the cable (1) to transmission control assembly (4).
4. Push the locking tab (3) forward in order to lock the range selector lever cable (1) to the transmission control assembly (4).

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. Connect the transmission range selector lever cable terminal to the transmission control shift lever pin (2).
6. Install the front floor lower console. Refer to [Front Floor Lower Console Replacement \(Equinox\)](#).
7. Position the front left carpet, if necessary.
8. Install the transmission range selector lever cable to the cable bracket on the transmission.

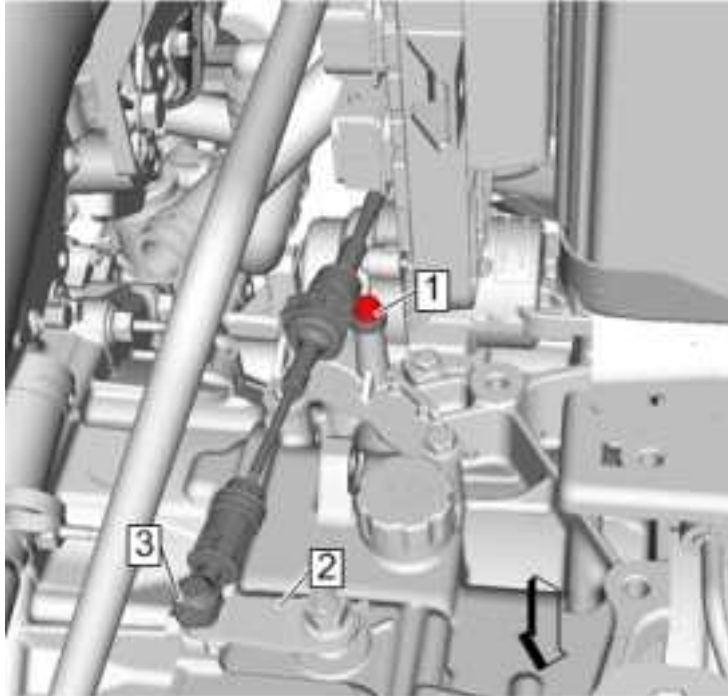


Fig. 37: Automatic Transmission Range Selector Lever Cable Terminal, Shift Lever And Clamp Bolt

Courtesy of GENERAL MOTORS COMPANY

- 9.
10. Connect the transmission range selector lever cable terminal (3) to the transmission manual shift lever (2).
11. Install the automatic transmission range selector lever bolt (1) and tighten to 9 N.m (80 lb in).
12. Adjust the range selector lever cable. Refer to [Range Selector Lever Cable Adjustment](#)

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER CABLE LEVER REPLACEMENT

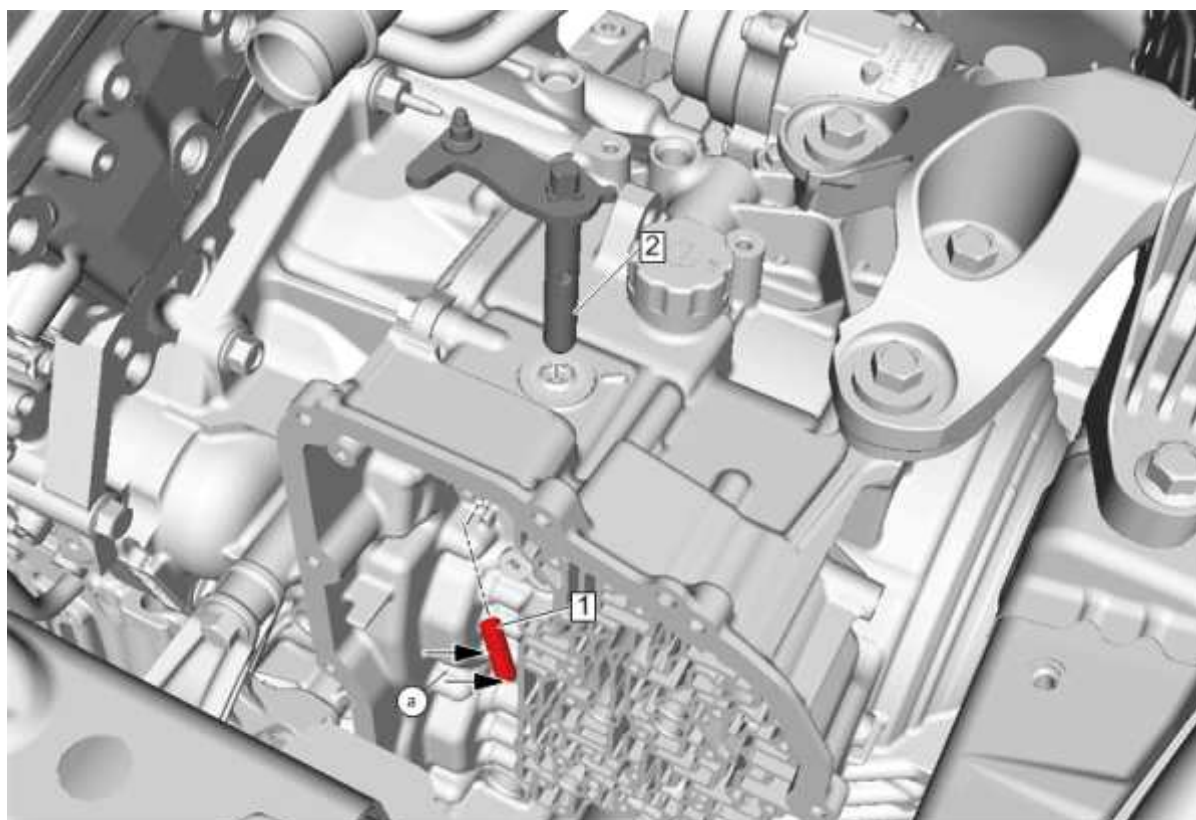


Fig. 38: Automatic Transmission Range Selector Lever Cable Lever

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. Disconnect the electronic transmission range selector manual park release cable from the automatic transmission range selector lever cable lever, then position out of the way. <u>Electronic Transmission Range Selector Manual Park Release Cable Replacement</u> 2. Remove Control Valve Body. Refer to <u>Control Valve Body Replacement</u>	
	Manual Shaft Detent Lever Hub Pin CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1 Install the manual shaft detent lever hub pin to correct height. NOTE: Install a NEW manual shaft detent lever hub pin. Specification 7.9 mm (0.38 in) (a)
2	Manual Shaft NOTE: Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
3	Manual Shaft Detent Lever Assembly
4	Park Pawl Actuator

RANGE SELECTOR LEVER CABLE ADJUSTMENT

1. Remove the engine control module bracket. Refer to [Engine Control Module Bracket Replacement](#)

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.

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

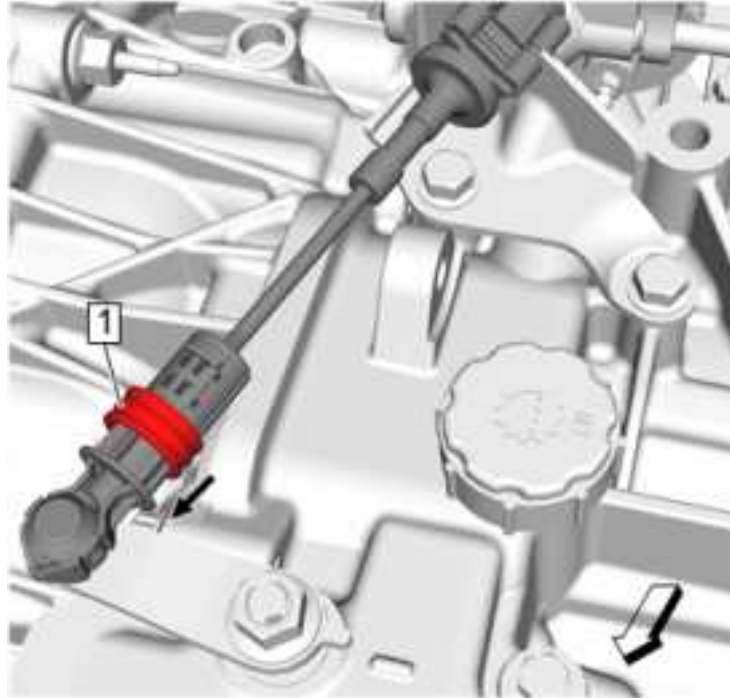


Fig. 39: Retaining Collar

Courtesy of GENERAL MOTORS COMPANY

5. Pull the retaining collar (1) forward.

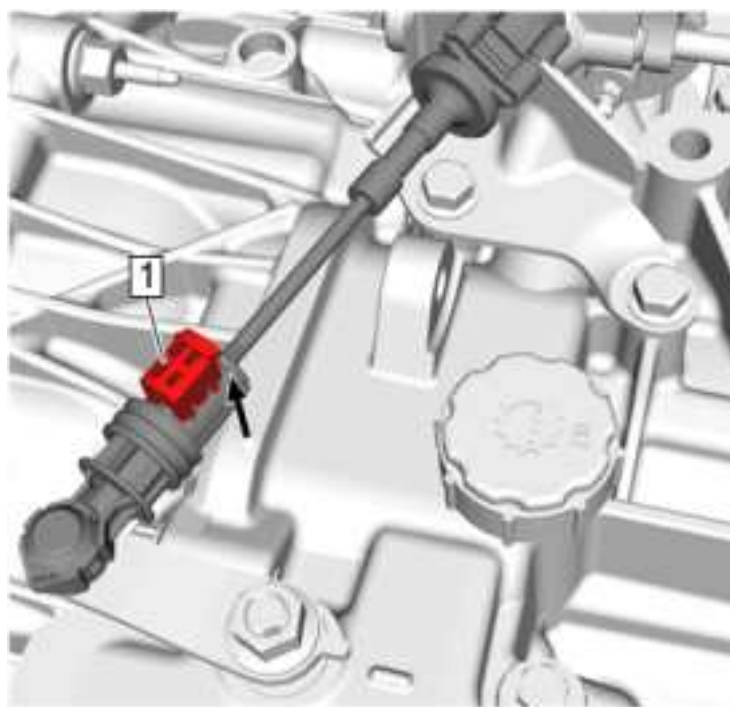


Fig. 40: Range Select Cable Adjusting Retainer

Courtesy of GENERAL MOTORS COMPANY

6. Release the range select cable adjusting retainer by pushing it upward (1).

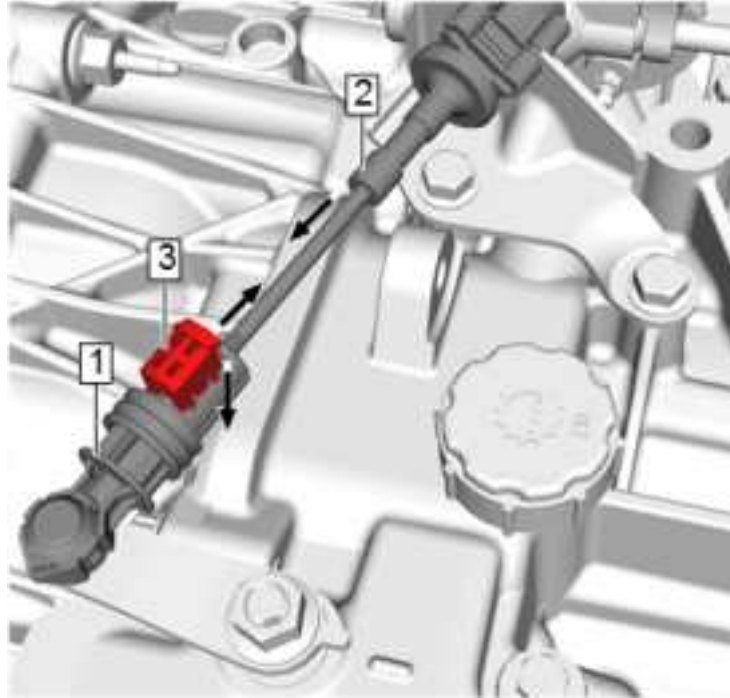


Fig. 41: Range Select Cable Halves And Adjuster Retainer
 Courtesy of GENERAL MOTORS COMPANY

7. Slide the two halves (1, 2) of the range select cable together until all free play is removed.
8. Depress the adjuster retainer (3) locking the adjuster retainer completely.

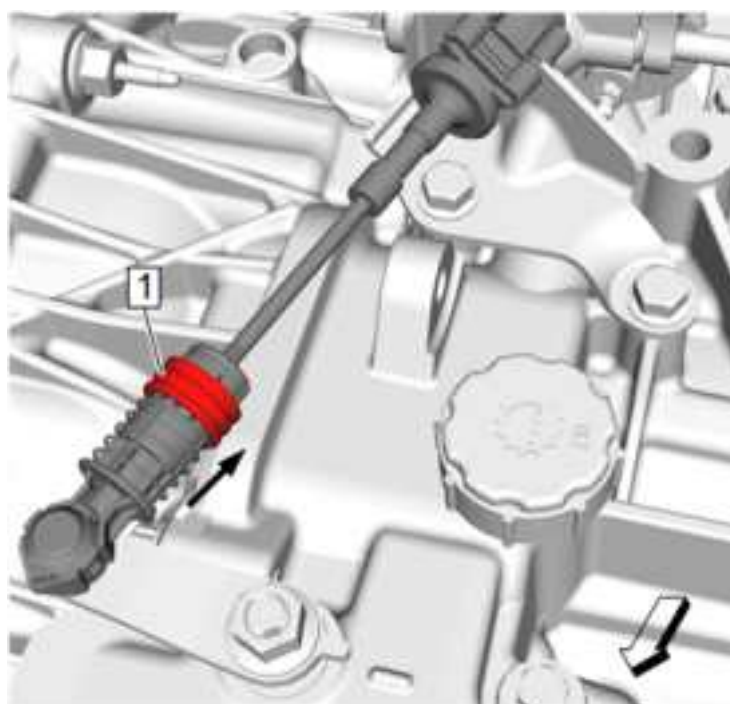


Fig. 42: Retaining Collar
 Courtesy of GENERAL MOTORS COMPANY

9. Release the retaining collar (1).

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.

10. Pull both halves of the range select cable in opposite directions to verify the cable adjuster is secured.
11. Check the transmission range select lever in all gear selections for proper operation.

12. Install the engine control module bracket. Refer to [Engine Control Module Bracket Replacement](#)

AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

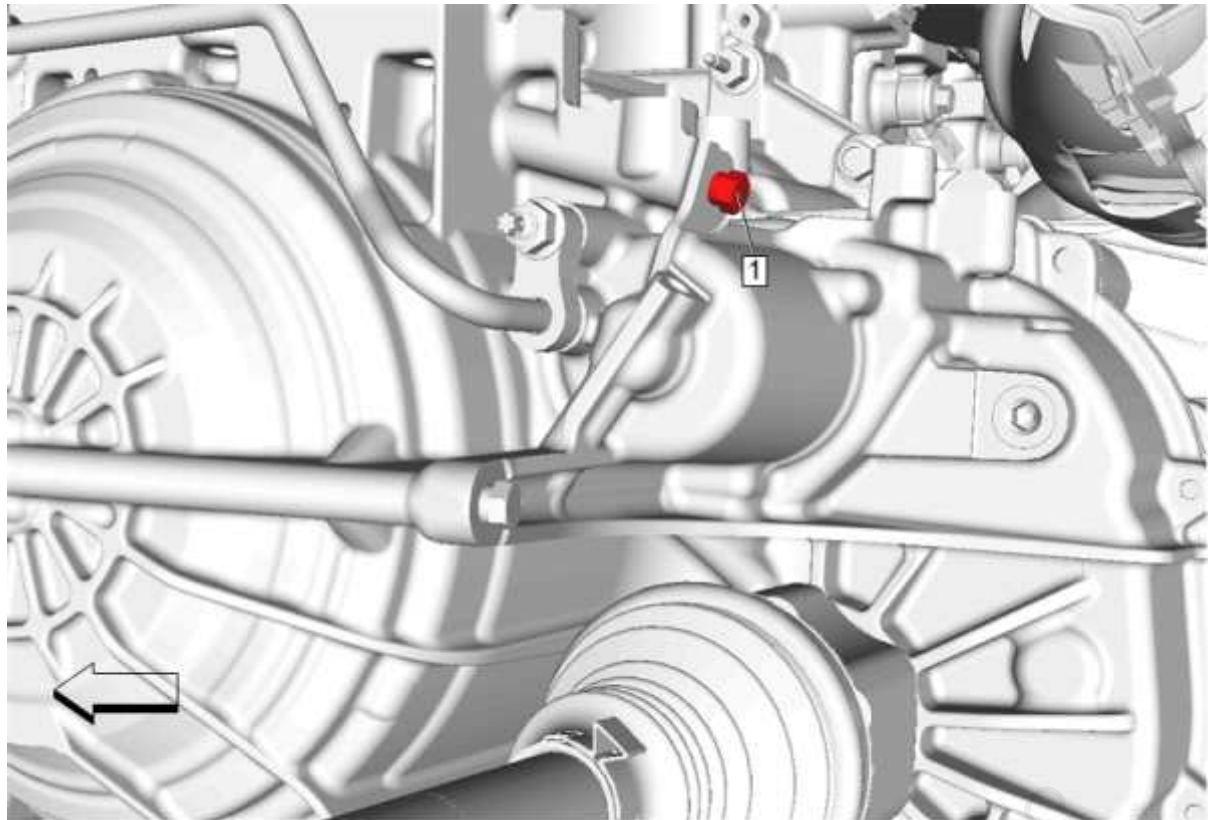


Fig. 43: Automatic Transmission Fluid Pressure Test Hole Plug

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation	
1	Automatic Transmission Fluid Pressure Test Hole Plug CAUTION: Refer to Component Fastener Tightening Caution . Tighten 12 N.m (106 lb in)

TRANSMISSION FLUID FILLER CAP REPLACEMENT

Removal Procedure

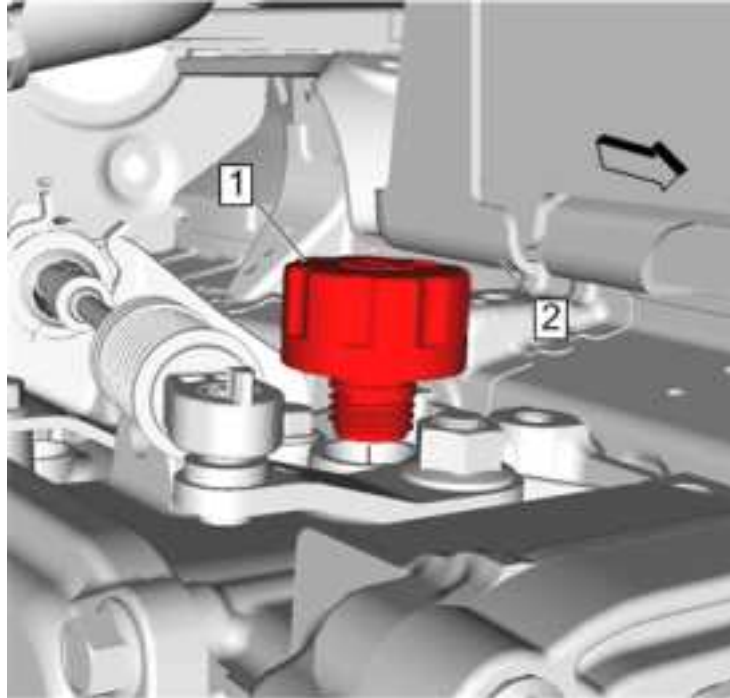


Fig. 44: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

1. Remove the transmission fluid filler cap (1).

Installation Procedure

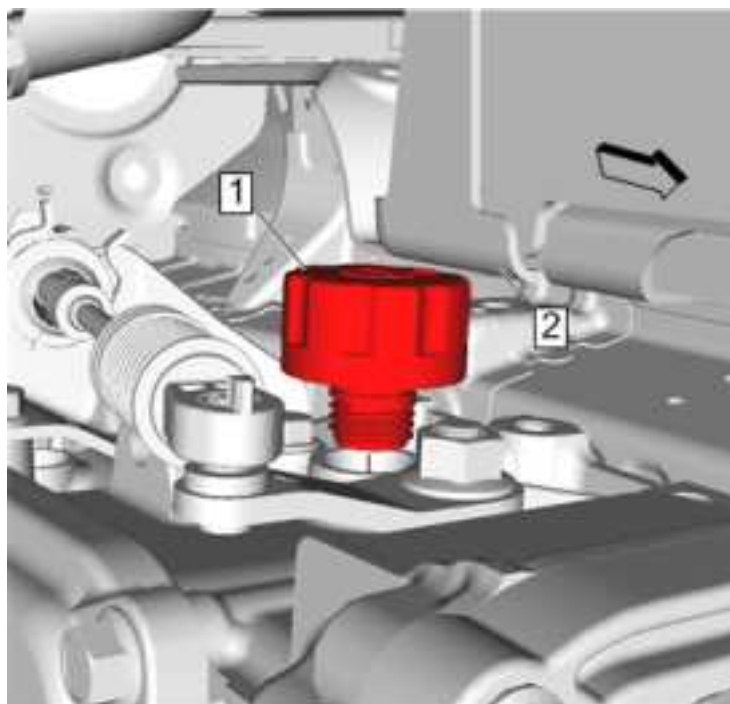


Fig. 45: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission fluid filler cap (1).

TRANSMISSION FLUID FILLER TUBE PLUG REPLACEMENT

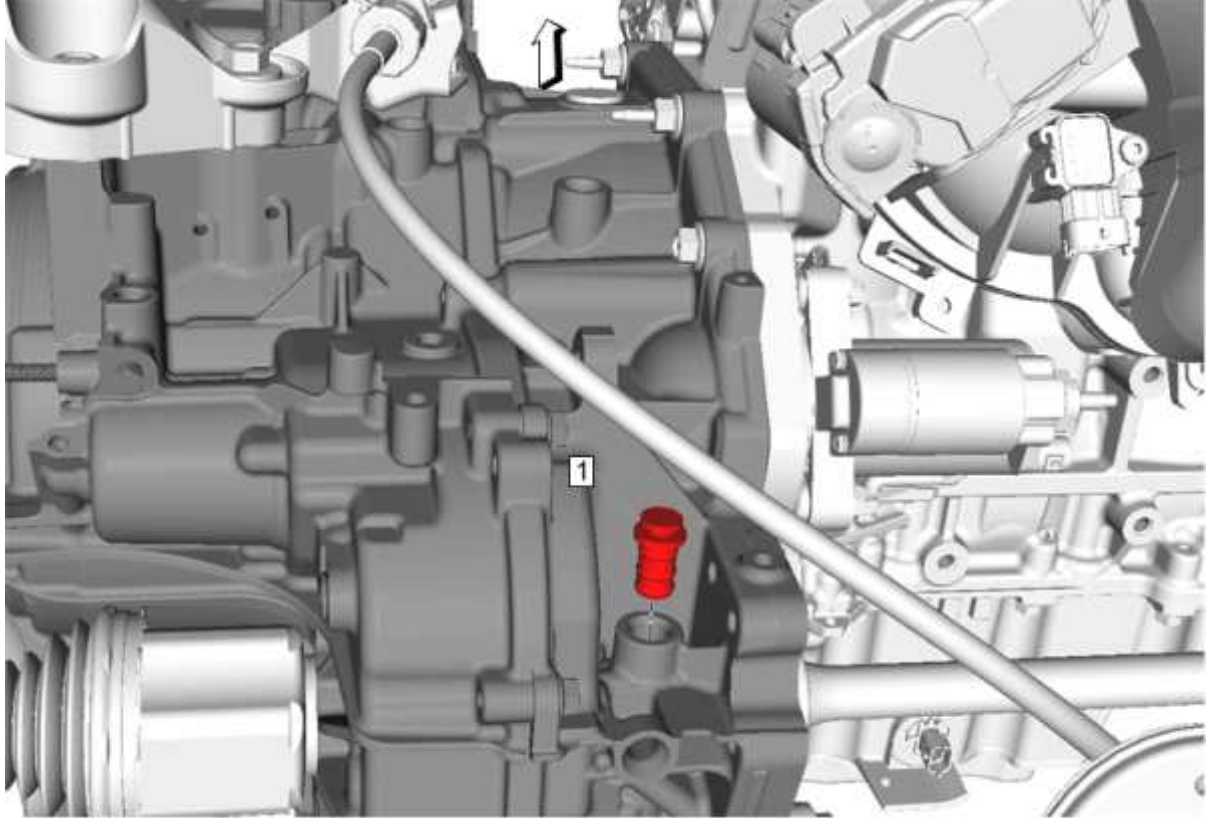


Fig. 46: Transmission Fluid Filler Tube Plug
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Fluid Pressure Test Plug

AUTOMATIC TRANSMISSION FLUID PAN DRAIN PLUG REPLACEMENT

Removal Procedure

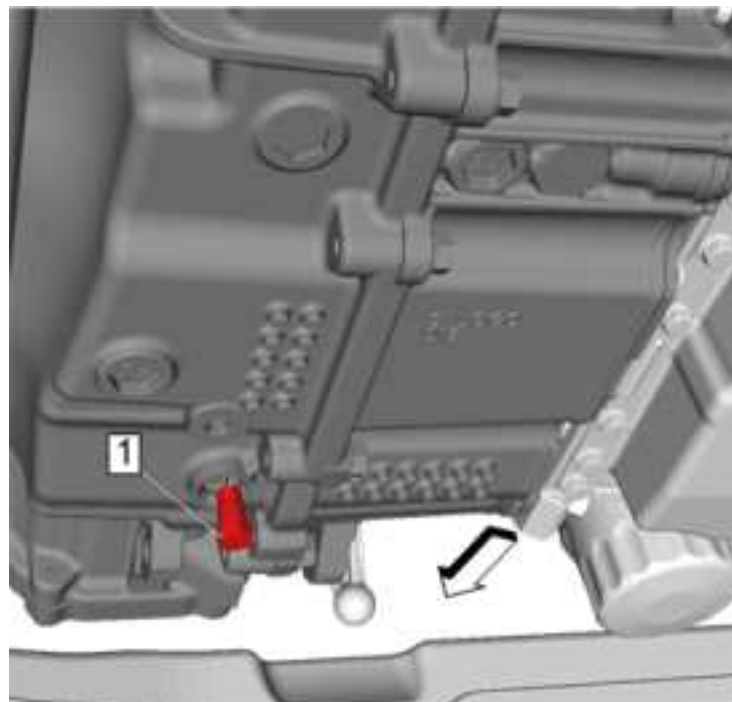


Fig. 47: Fluid Drain Plug
 Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the fluid pan drain plug (1).
3. Drain transmission fluid into a suitable container.

CAUTION: Refer to [Component Fastener Tightening Caution](#) .

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

Installation Procedure

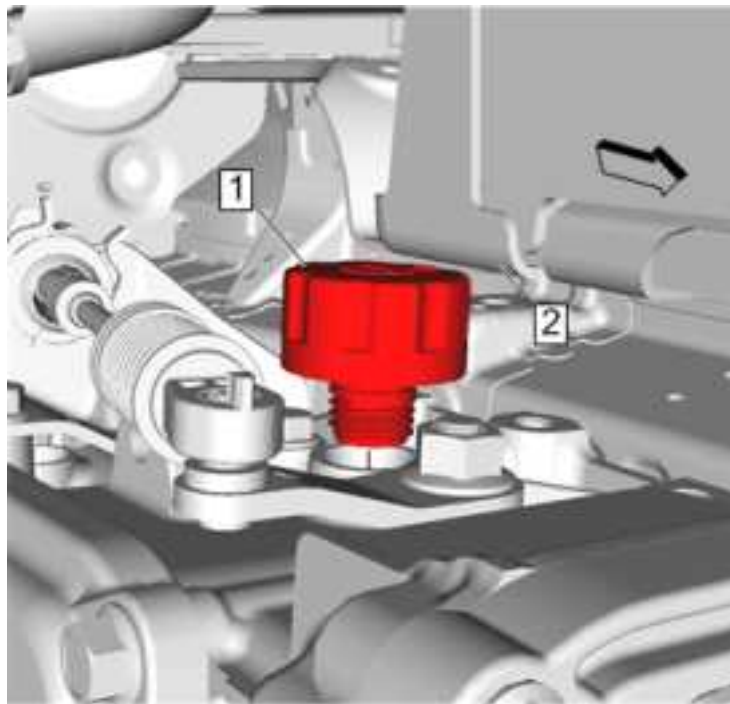


Fig. 48: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

1. Lower the vehicle.

NOTE: If the transmission fluid filler cap cannot be accessed, proceed to the next step in this procedure.

2. Remove the fluid fill cap (1), if accessible.
3. Remove the left front wheel and tire assembly. Refer to [Tire and Wheel Removal and Installation](#)

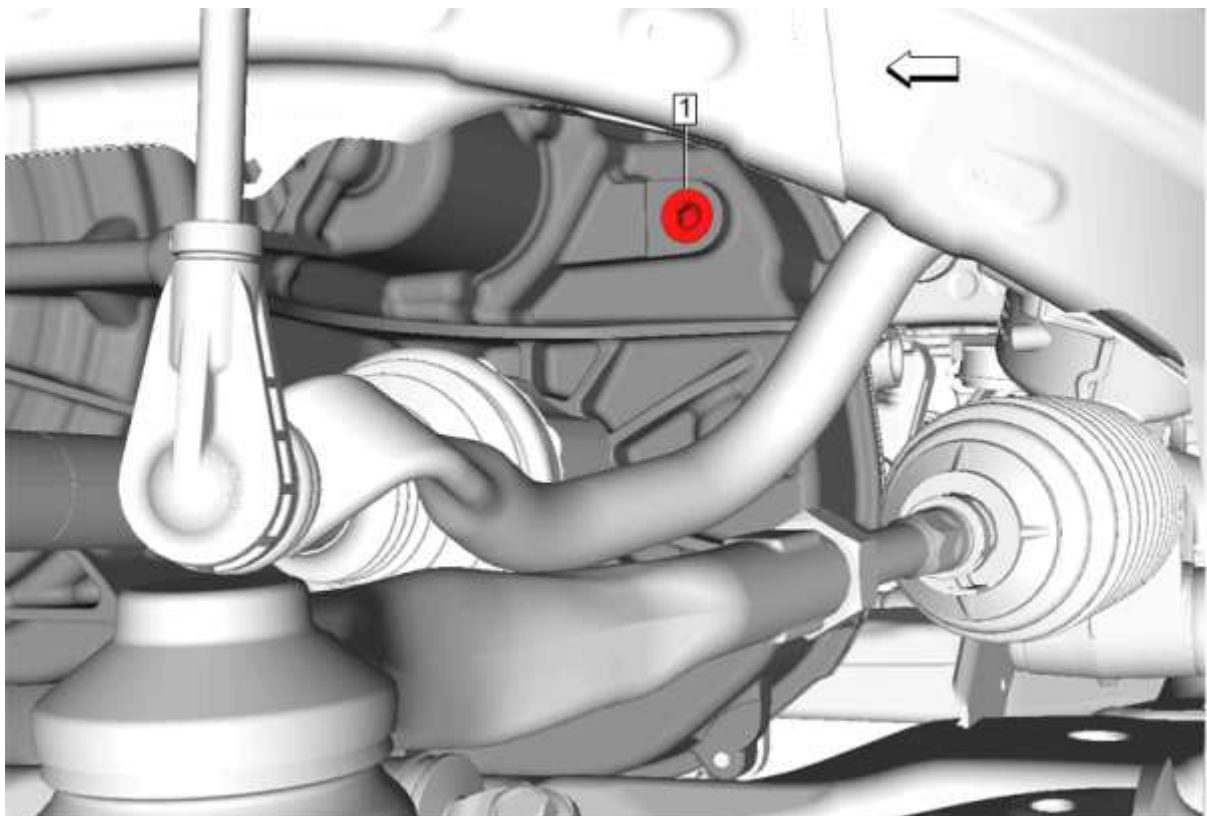


Fig. 49: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

4. Remove the fluid filler plug (1) from the transmission.
5. Fill the transmission to the proper level with the correct fluid. Refer to [Transmission Fluid Level and Condition Check](#) , and [Adhesives, Fluids, Lubricants, and Sealers](#) .
6. Install the fluid fill cap (1), if accessible.

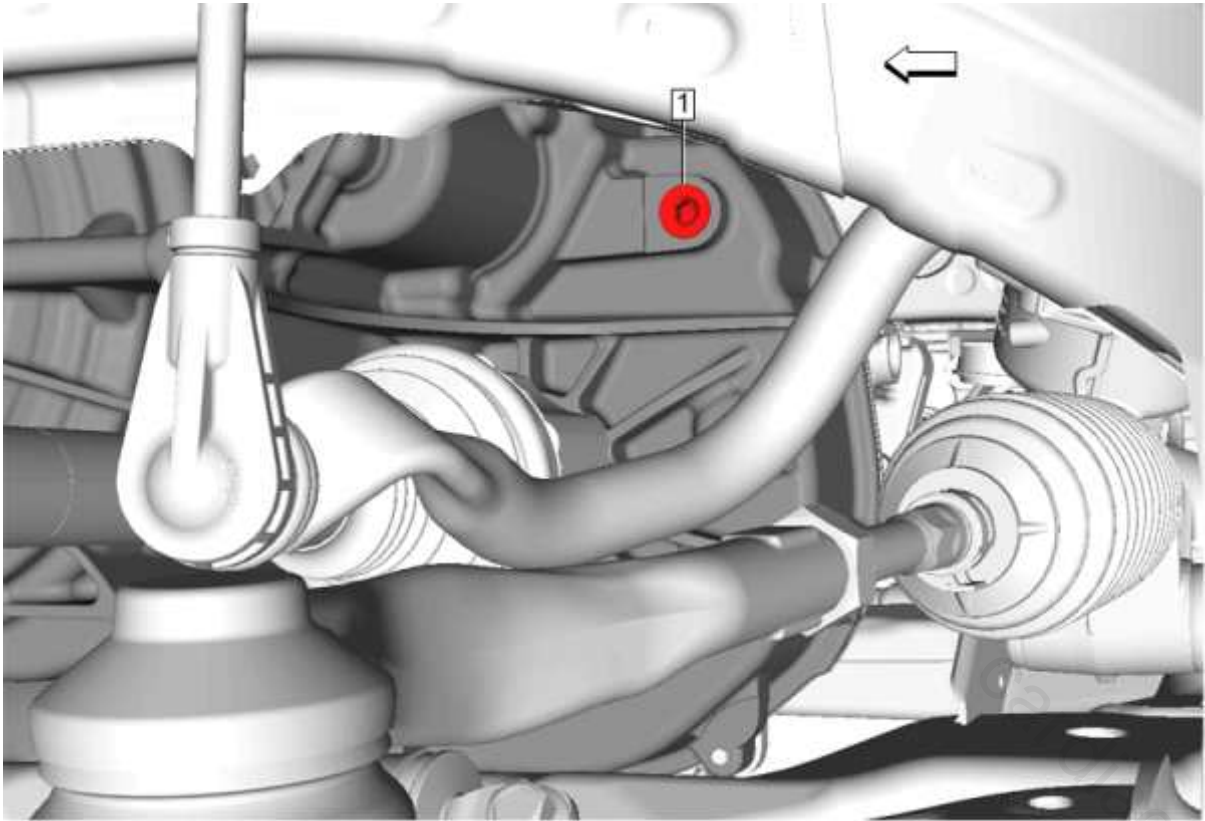


Fig. 50: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Component Fastener Tightening Caution](#) .

7. Install the fluid filler plug (1) to the transmission and tighten to 40 N.m (30 lb ft).
8. Install the left front wheel and tire assembly. Refer to [Tire and Wheel Removal and Installation](#)

AUTOMATIC TRANSMISSION FLUID LEVEL HOLE PLUG REPLACEMENT

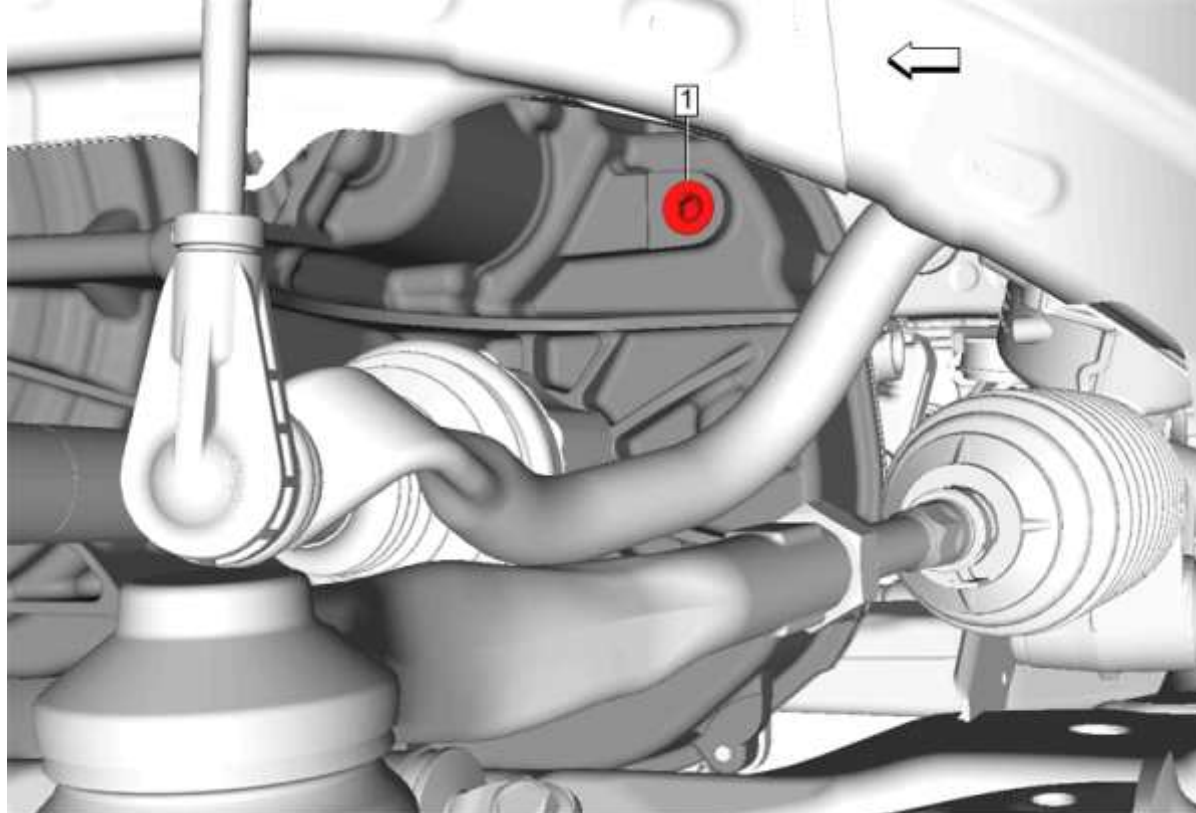


Fig. 51: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation	
1	Fluid Filler Plug CAUTION: Refer to Component Fastener Tightening Caution . Tighten 40 N.m (30 lb ft)

AUTOMATIC TRANSMISSION CASE HOLE PLUG REPLACEMENT (CASE HOLE PLUG)

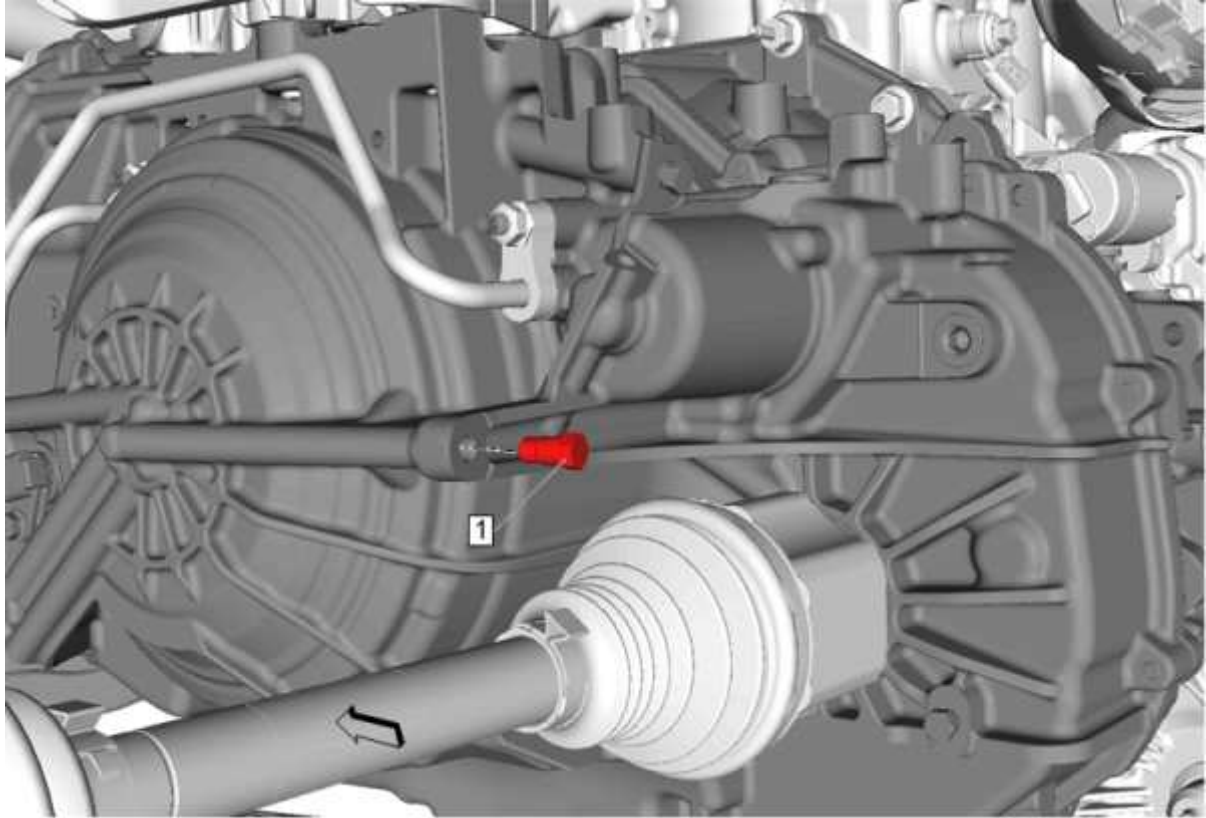


Fig. 52: Automatic Transmission Case Hole Plug (Case Hole Plug).

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation	
1	Automatic Transmission Case Hole Plug CAUTION: Refer to Component Fastener Tightening Caution . Tighten 12 N.m (106 lb in)

AUTOMATIC TRANSMISSION CASE HOLE PLUG REPLACEMENT (AUXILIARY FLUID FILL PLUG)

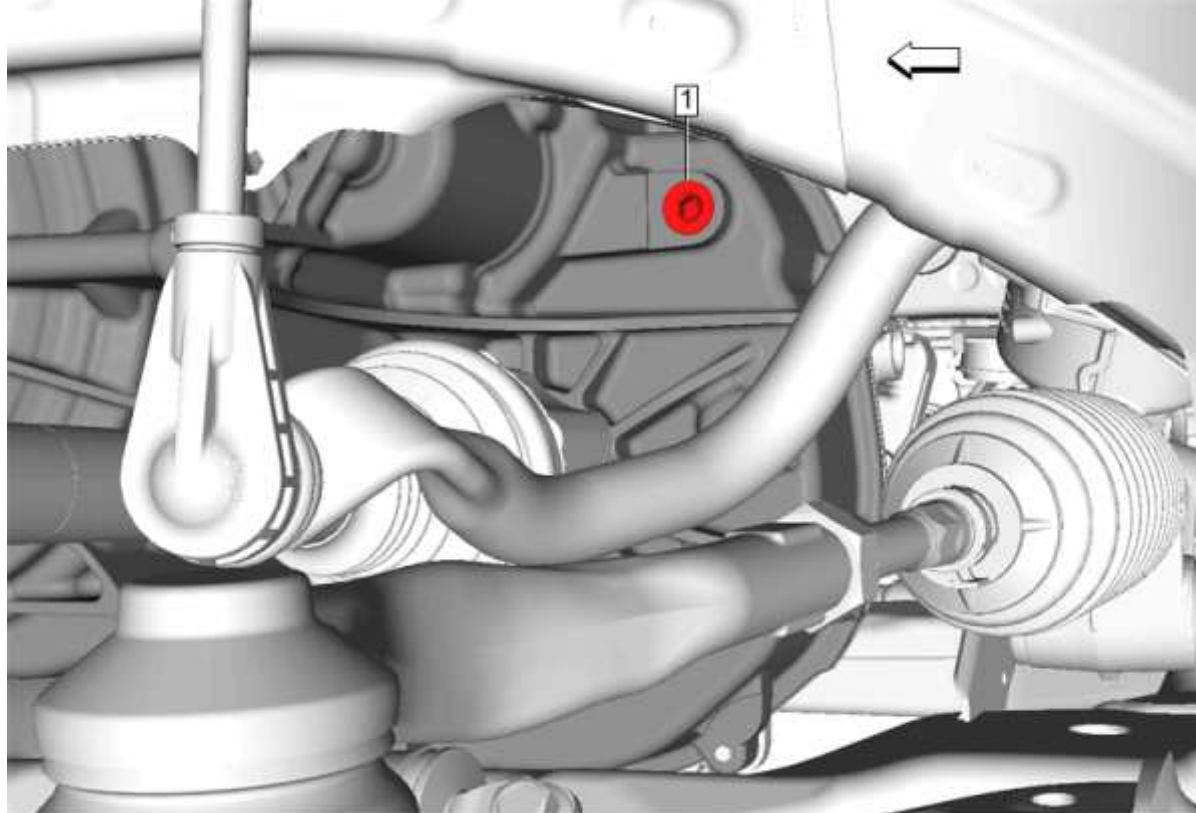


Fig. 53: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove tire and wheel assembly. Refer to Tire and Wheel Removal and Installation	
1	Fluid Filler Plug CAUTION: Refer to Component Fastener Tightening Caution . Tighten 40 N.m (30 lb ft)

MANUAL SHIFT DETENT LEVER SHAFT REPLACEMENT

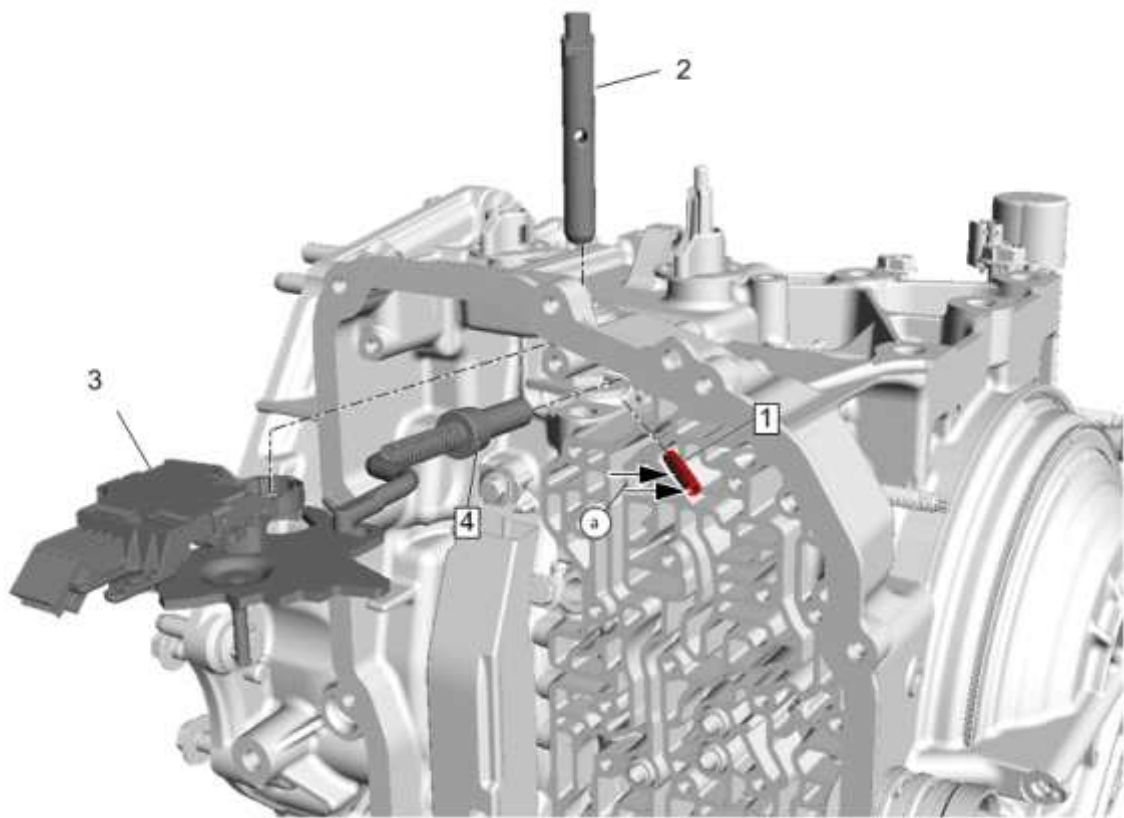


Fig. 54: Manual Shift Detent Lever Shaft
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Automatic Transmission Range Selector Lever Cable. Refer to Automatic Transmission Range Selector Lever Cable Replacement 2. Remove Control Valve Body. Refer to Control Valve Body Replacement	
1	Manual Shaft Detent Lever Hub Pin CAUTION: Refer to Fastener Caution . Procedure Install the manual shaft detent lever hub pin to correct height. NOTE: Install a NEW manual shaft detent lever hub pin. Specification 7.9 mm (0.38 in) (a)
2	Manual Shaft NOTE: Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
3	Manual Shaft Detent Lever Assembly
4	Park Pawl Actuator

MANUAL SHIFT SHAFT SEAL REPLACEMENT

Special Tools

- **DT-45201** Cooler Line Seal Remover
- **DT-49101** Seal Installer

For equivalent regional tools, [Special Tools](#)

Removal Procedure

1. Remove the manual shift detent lever shaft assembly. Refer to [Manual Shift Detent Lever Shaft Replacement](#)

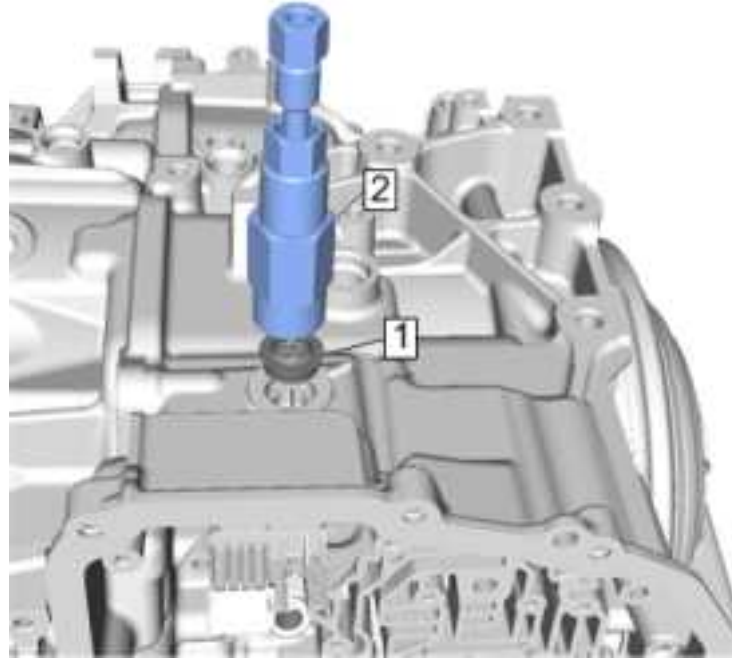


Fig. 55: Manual Shaft Seal And Special Tool
 Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

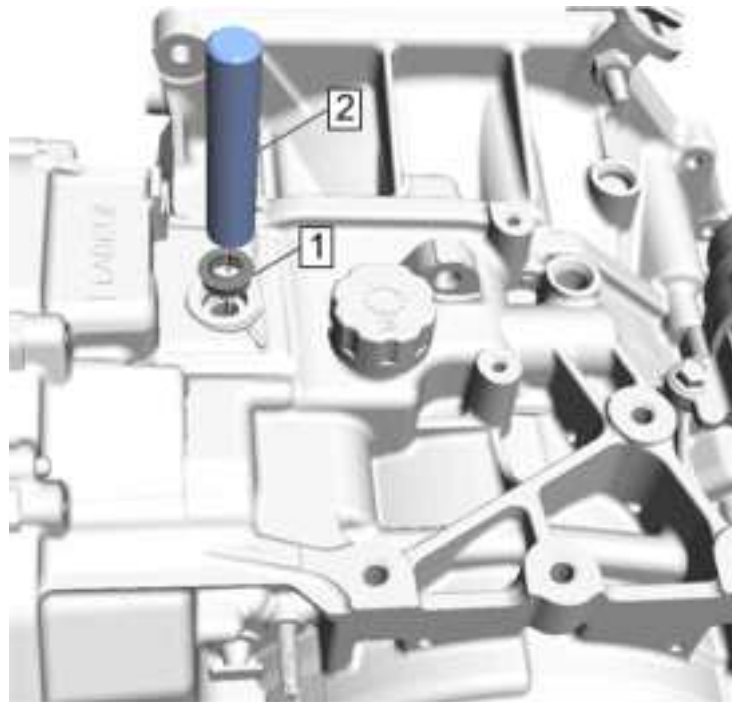


Fig. 56: Manual Shaft Seal And Special Tool
 Courtesy of GENERAL MOTORS COMPANY

1. Install the manual shaft seal (1) using **DT-49101** seal installer.

2. Install the manual shift detent lever shaft assembly. Refer to [Manual Shift Detent Lever Shaft Replacement](#)

FRONT WHEEL DRIVE SHAFT OIL SEAL REPLACEMENT (LEFT SIDE)

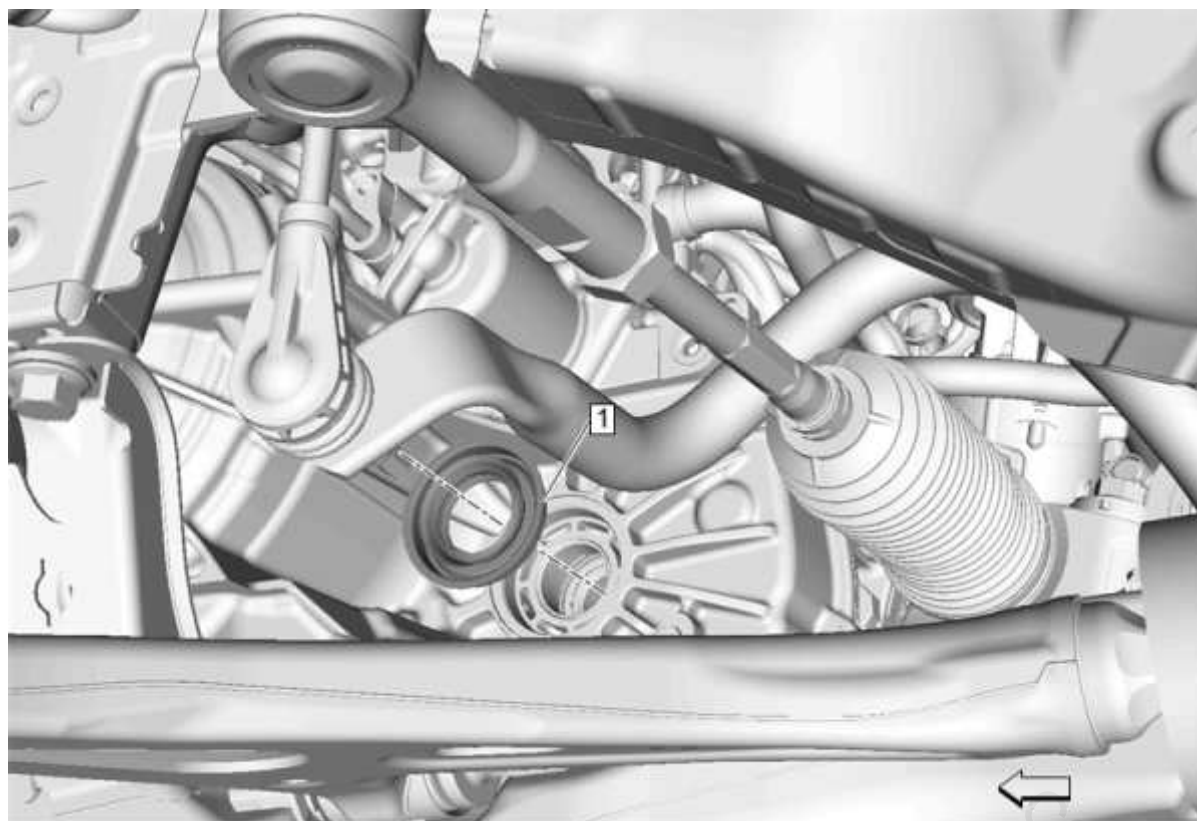


Fig. 57: Front Wheel Drive Shaft Oil Seal (Left Side)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Wheel Drive Half Shaft - Left Side. Refer to Front Wheel Drive Half Shaft Replacement - Left Side	
1	Left Front Wheel Drive Shaft Oil Seal Procedure 1. For seal removal use GE-6125-1B slide hammer with DT-23129 universal seal remover. 2. For seal installation use GE-8092 driver handle with DT-47790 seal installer. Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-1B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, Special Tools

FRONT WHEEL DRIVE SHAFT OIL SEAL REPLACEMENT (RIGHT SIDE)

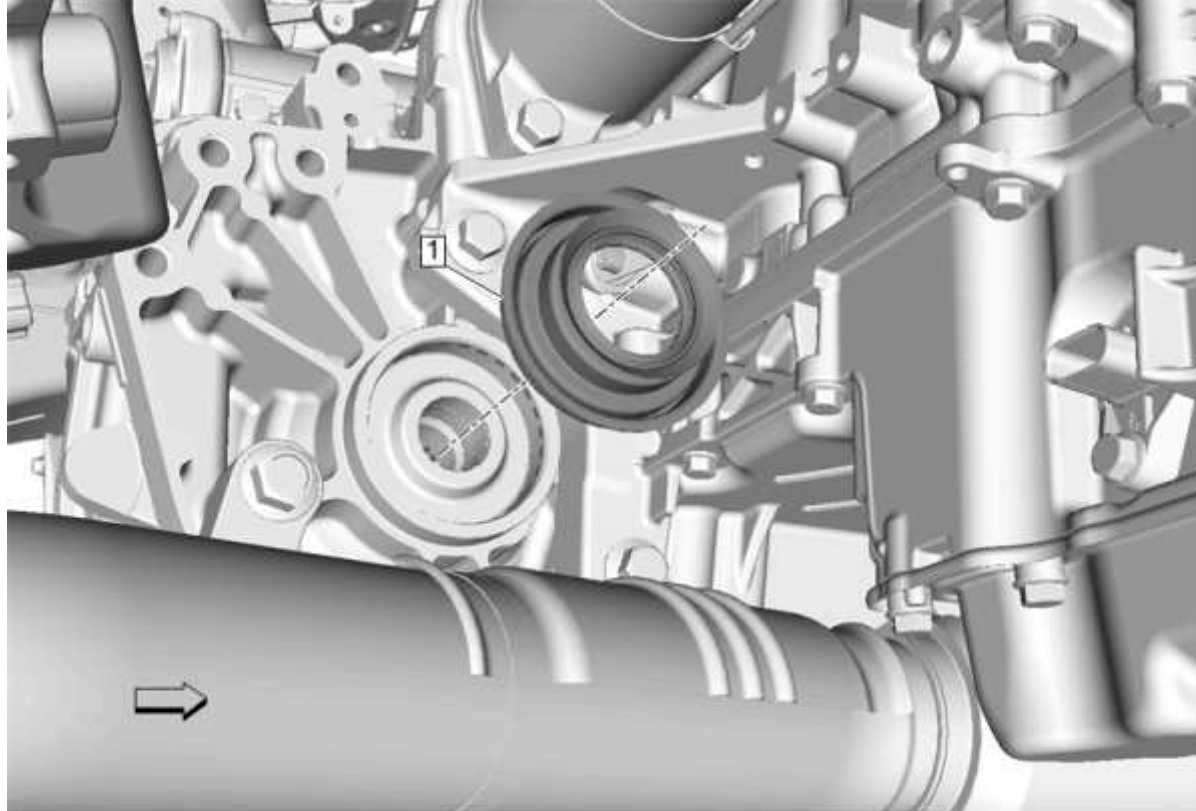


Fig. 58: Front Wheel Drive Shaft Oil Seal (Right Side)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Front Wheel Drive Half Shaft - Right Side. Refer to Front Wheel Drive Half Shaft Replacement - Right Side (AWD) , Front Wheel Drive Half Shaft Replacement - Right Side (M3U, MHG, MNH, MNK with FWD) , Front Wheel Drive Half Shaft Replacement - Right Side (M3D, M3H with FWD) .	
1	Right Front Wheel Drive Shaft Oil Seal Procedure 1. For seal removal use GE-6125-1B slide hammer with DT-23129 universal seal remover. 2. For seal installation use GE-8092 driver handle with DT-47790 seal installer. Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-1B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, Special Tools .

CONTROL VALVE BODY COVER REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection \(KL9\)](#) .
2. Remove the charge air cooler outlet air tube. Refer to [Charge Air Cooler Outlet Air Tube Replacement](#) .
3. Remove the transmission control module bracket. Refer to [Transmission Control Module Bracket Replacement](#)

4. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#)

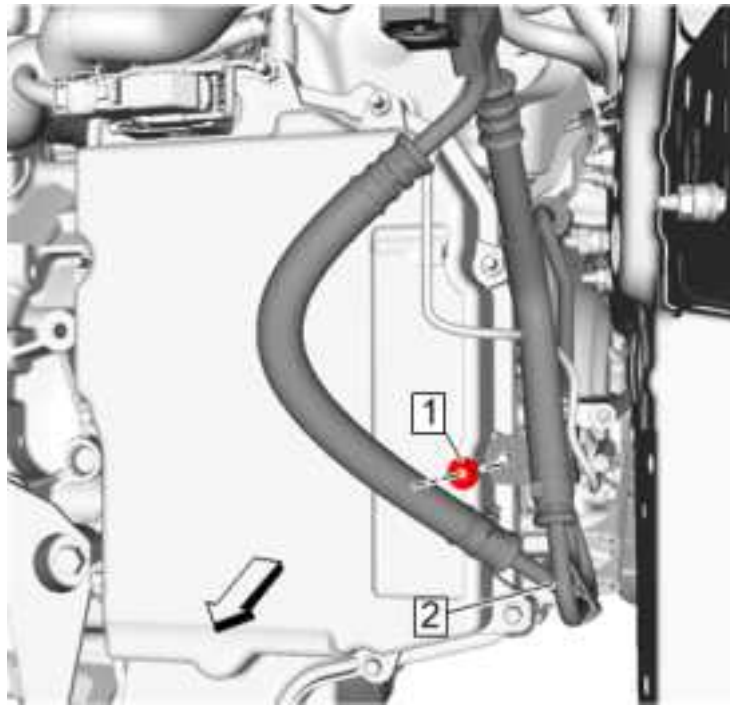


Fig. 59: Transmission Fluid Cooler Pipes And Nut

Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission fluid cooler pipe nut (1) from the transmission.
6. Reposition the transmission fluid cooler pipes (2) out of the way.

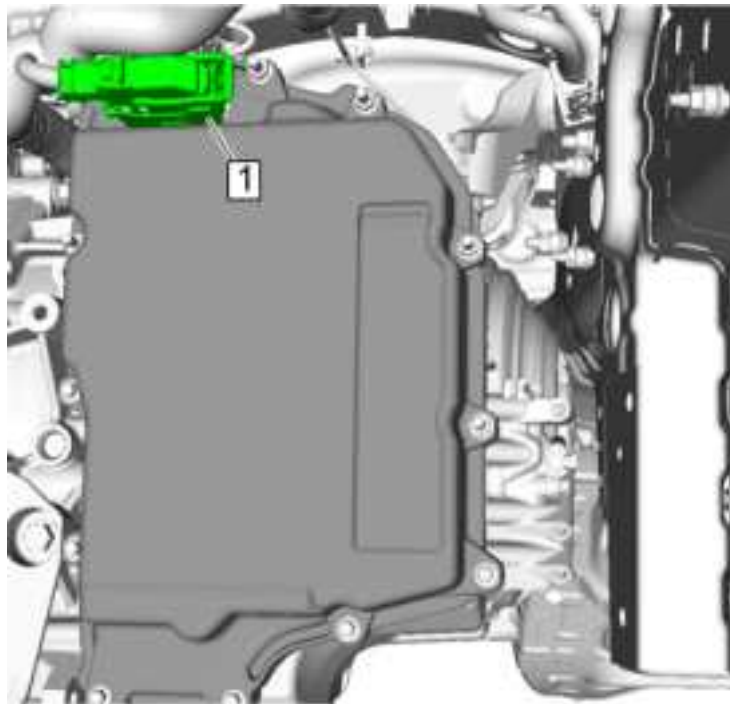


Fig. 60: Control Valve Body Transmission Control Module Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the control valve body transmission control module electrical connector (1), then unclip the wiring harness from the cover.
8. Remove the body ground cable and wiring harness assembly mounting bolt at front of transmission and position ground cable and harness out of the way.

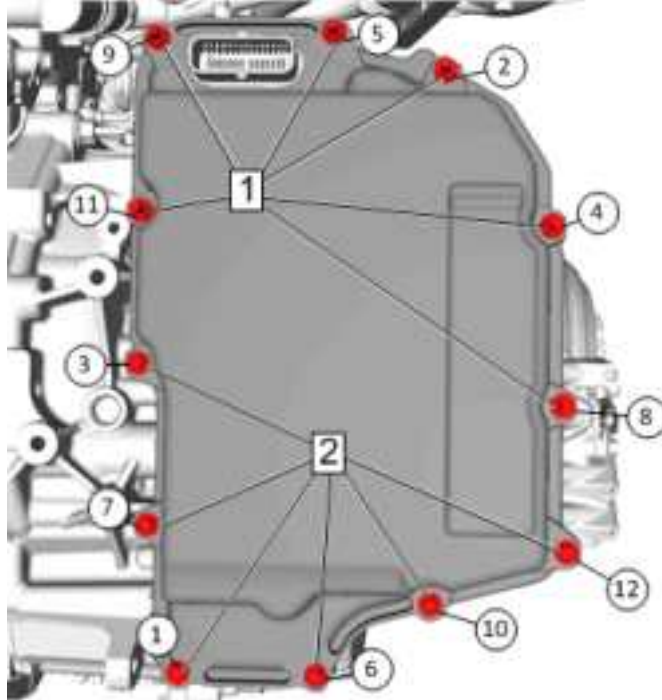


Fig. 61: Control Valve Body Cover Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS COMPANY

9. Remove the control valve body cover bolts (1, 2).

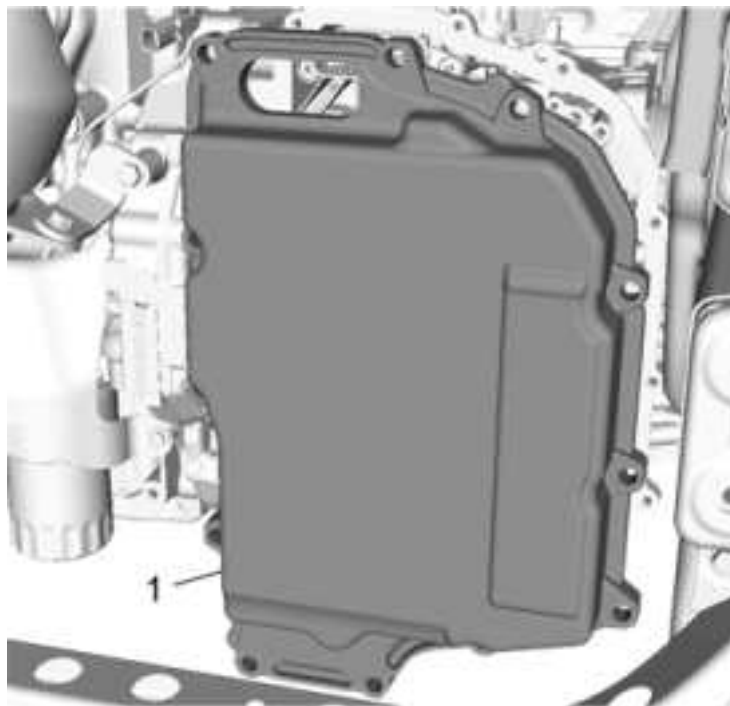


Fig. 62: Control Valve Body Cover
 Courtesy of GENERAL MOTORS COMPANY

10. Remove the control valve body cover (1).
11. Clean the transmission case and control valve body cover gasket surfaces. Inspect and replace the gasket as necessary.

Installation Procedure

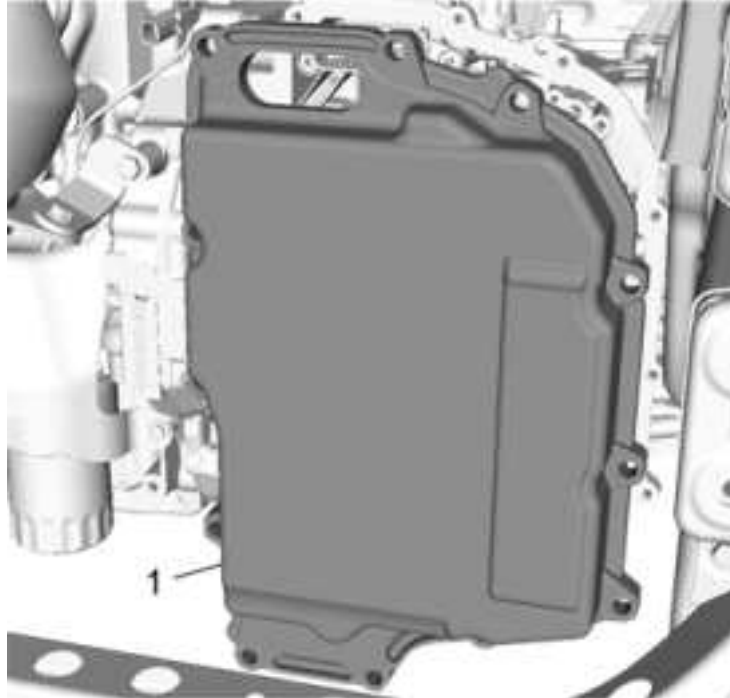


Fig. 63: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

1. Install the control valve body cover (1).

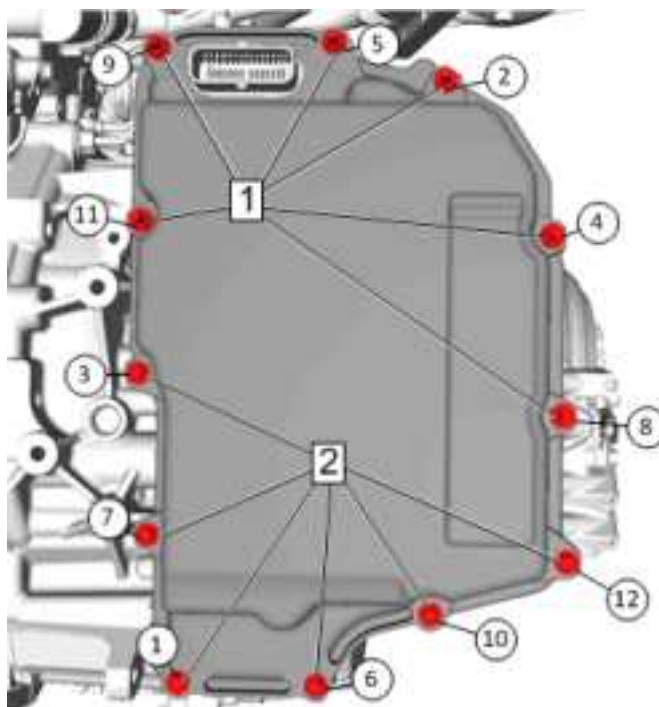


Fig. 64: Control Valve Body Cover Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

NOTE: The number (1) bolts are stud bolts.

2. Hand start the control valve body cover bolts (1, 2).

CAUTION: Refer to [Fastener Caution](#) .

NOTE: Install all control valve body cover bolts and stud bolts by hand then torque all bolts in sequence.

3. Install the control valve body cover bolts. Tighten the bolts in sequence to 9 N.m (80 lb in).
4. Install the body ground cable and wiring harness assembly to the front of transmission.

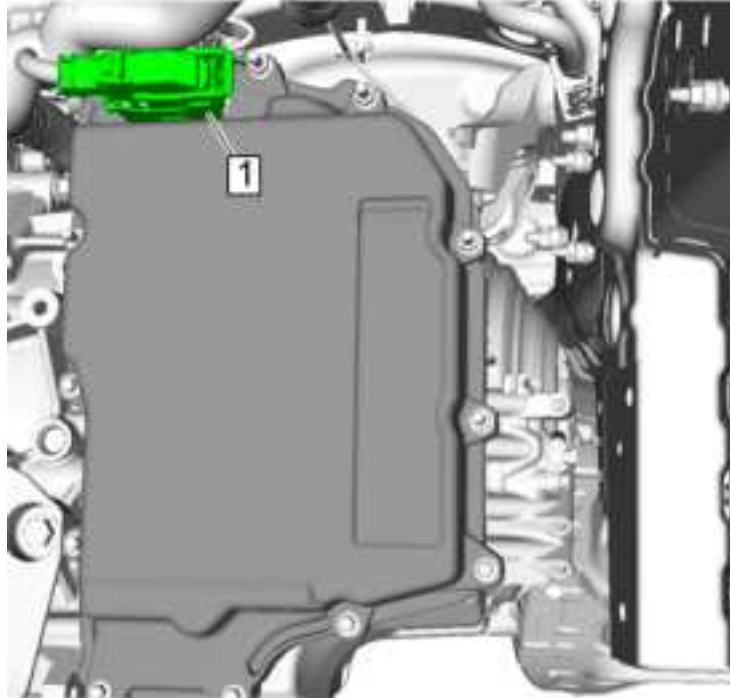


Fig. 65: Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

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

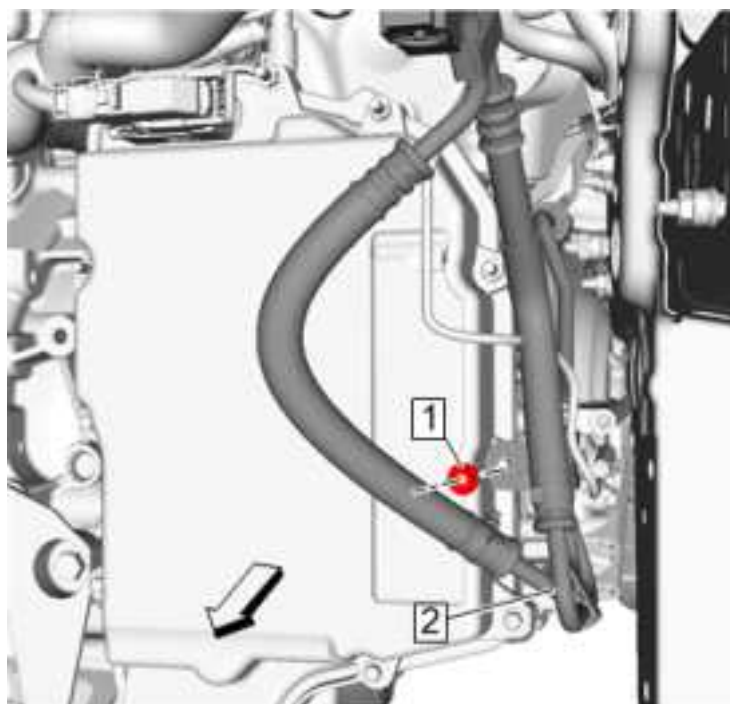


Fig. 66: Transmission Fluid Cooler Pipes And Nut
Courtesy of GENERAL MOTORS COMPANY

6. Reposition the transmission fluid cooler outlet pipes (2) to the transmission
7. Install the transmission fluid cooler inlet pipe nut (1) to the transmission and tighten to 9 N.m (80 lb in).
8. Fill the transmission with correct fluid. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#)
9. Check transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#) .
10. Install the transmission control module bracket. Refer to [Transmission Control Module Bracket Replacement](#)
11. Install the charge air cooler outlet air tube. Refer to [Charge Air Cooler Outlet Air Tube Replacement](#) .
12. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection \(KL9\)](#) .

13. Check for leaks.

CONTROL VALVE BODY REPLACEMENT

Removal Procedure

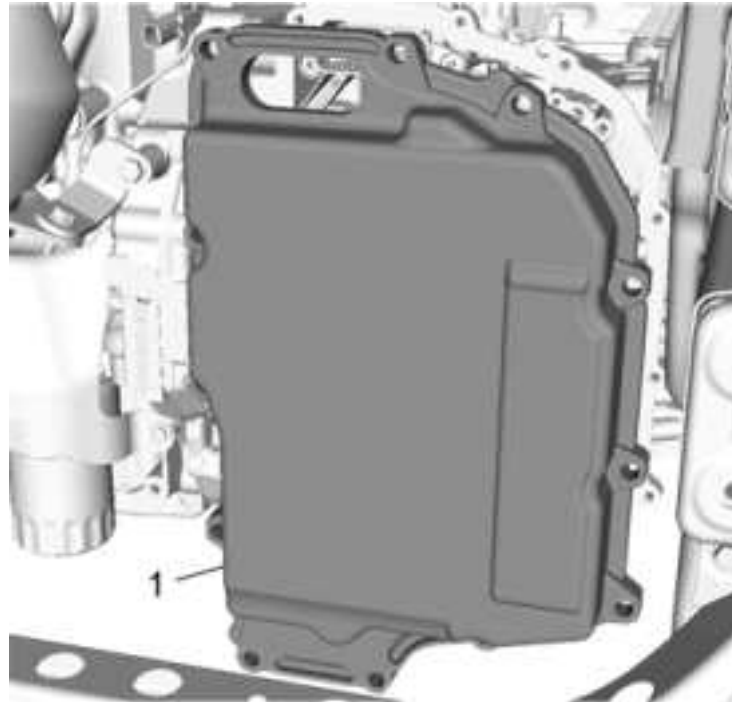


Fig. 67: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

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

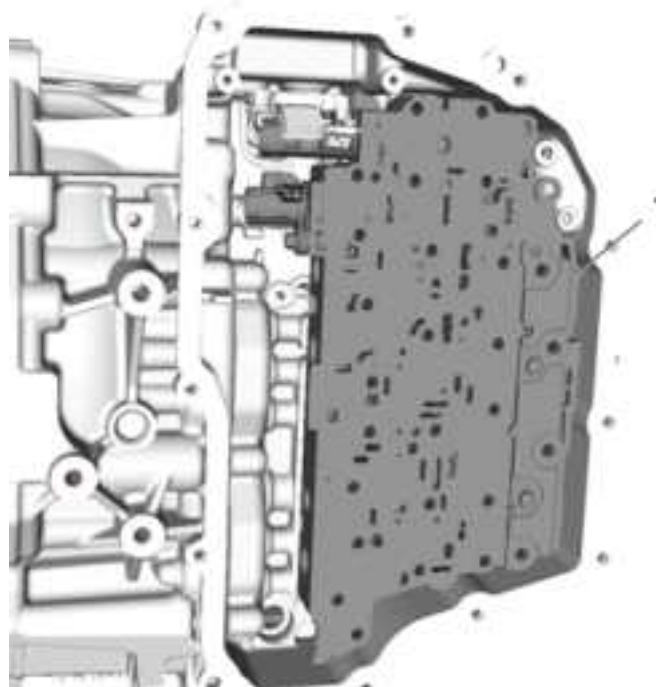


Fig. 68: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

2. Remove the control valve body (1) from the transmission. Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#) [Control Valve Body Assembly Removal \(with ETRS\)](#)

Installation Procedure

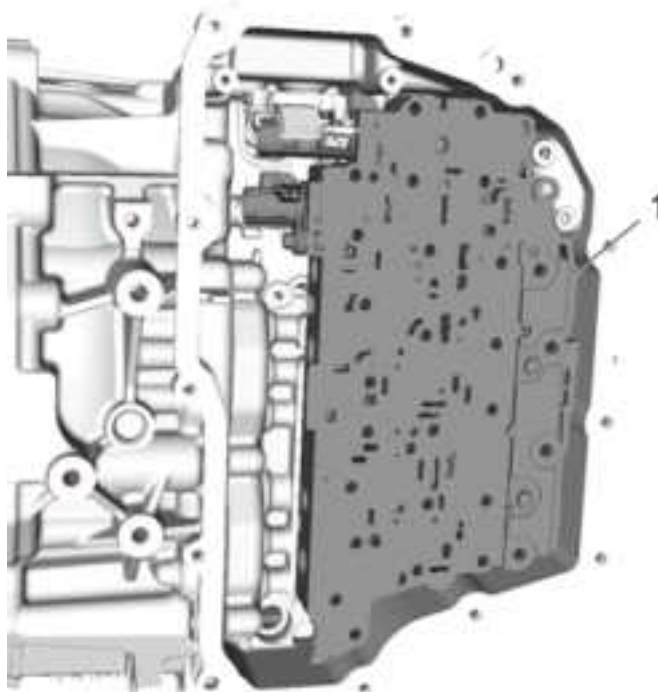


Fig. 69: Control Valve Body

Courtesy of GENERAL MOTORS COMPANY

1. Install the control valve body (1) to the transmission. Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#), [Control Valve Body Assembly Installation \(with ETRS\)](#).

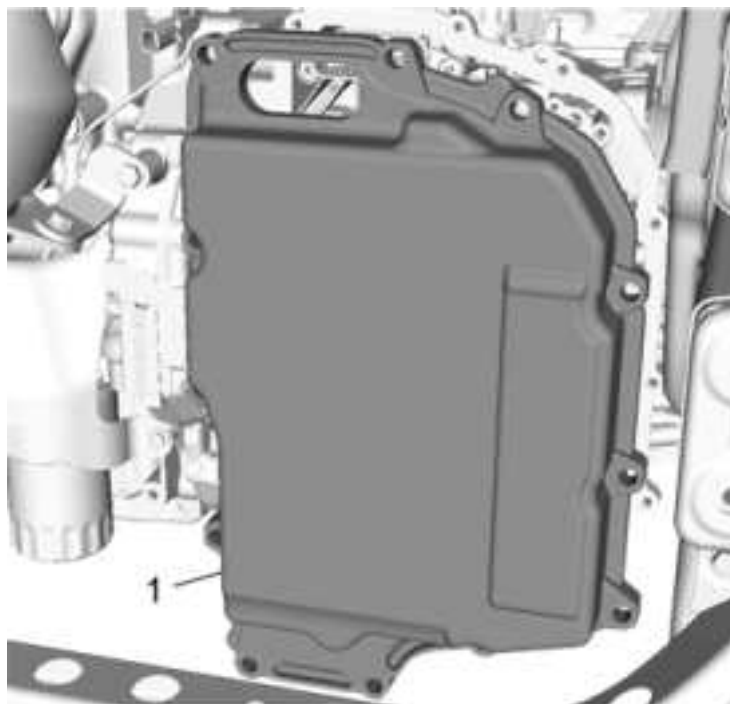


Fig. 70: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

2. Install the control valve body cover (1) to the transmission. Refer to [Control Valve Body Cover Replacement](#).
3. Reprogram the transmission. Refer to [Solenoid Valve Characterization Reprogramming](#).

CONTROL VALVE SOLENOID BODY REPLACEMENT

Removal Procedure

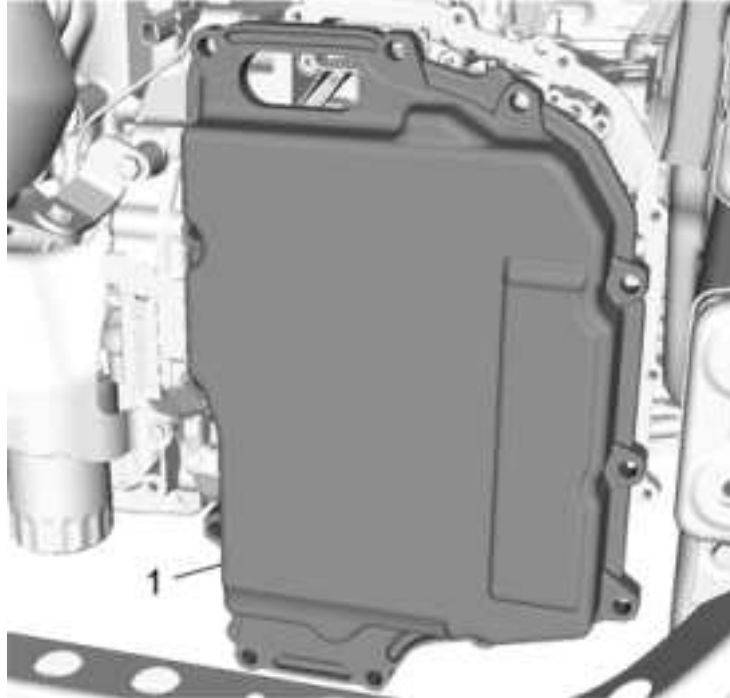


Fig. 71: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

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

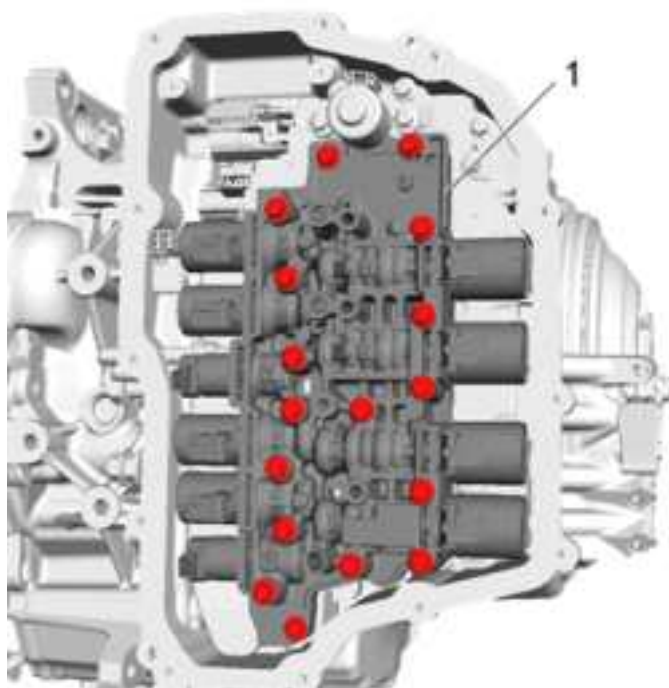


Fig. 72: Control Valve Solenoid Body

Courtesy of GENERAL MOTORS COMPANY

2. Remove the control valve solenoid body (1) from the transmission. Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#)

Installation Procedure

1. Document the new Transmission Unique Number (TUN) or Part Unique Number (PUN) as required.

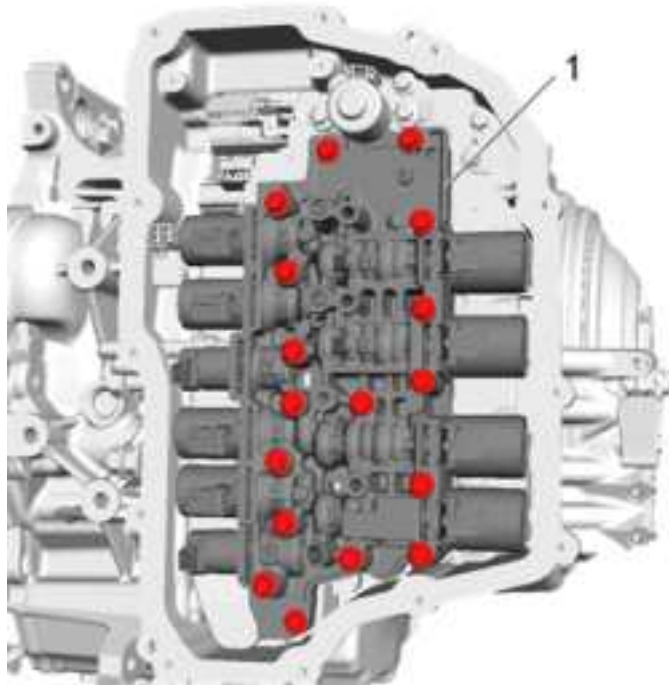


Fig. 73: Control Valve Solenoid Body

Courtesy of GENERAL MOTORS COMPANY

2. Install the control valve solenoid body (1) to the transmission. Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#), [Control Valve Body Assembly Installation \(with ETRS\)](#).

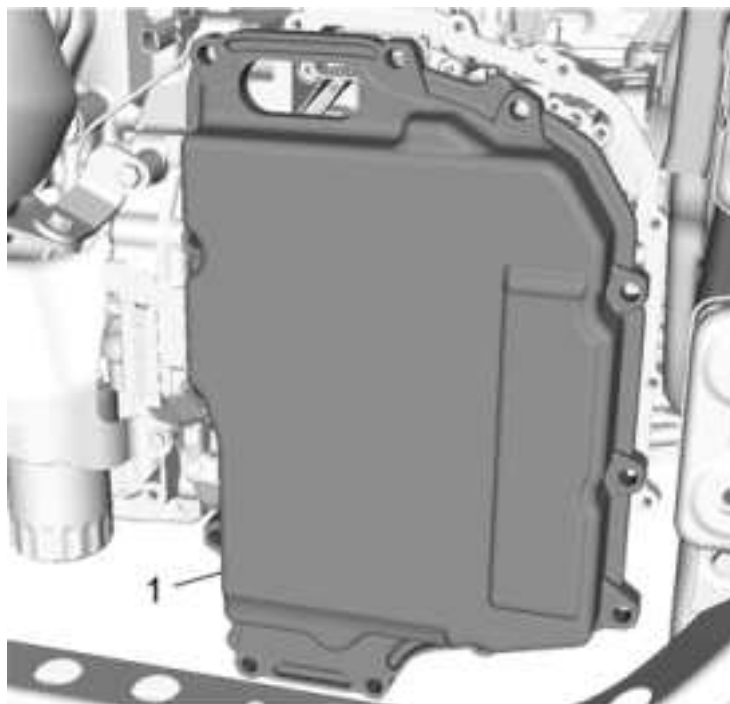


Fig. 74: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

3. Install the control valve body cover (1) to the transmission. Refer to [Control Valve Body Cover Replacement](#)
4. Reprogram the transmission. Refer to [Solenoid Valve Characterization Reprogramming](#)

AUTOMATIC TRANSMISSION INPUT SPEED SENSOR REPLACEMENT

Removal Procedure

1. Remove the left front wheel house liner. Refer to [Front Wheelhouse Liner Replacement - Left Side \(Equinox\)](#), [Front Wheelhouse Liner Replacement - Left Side \(Terrain\)](#).

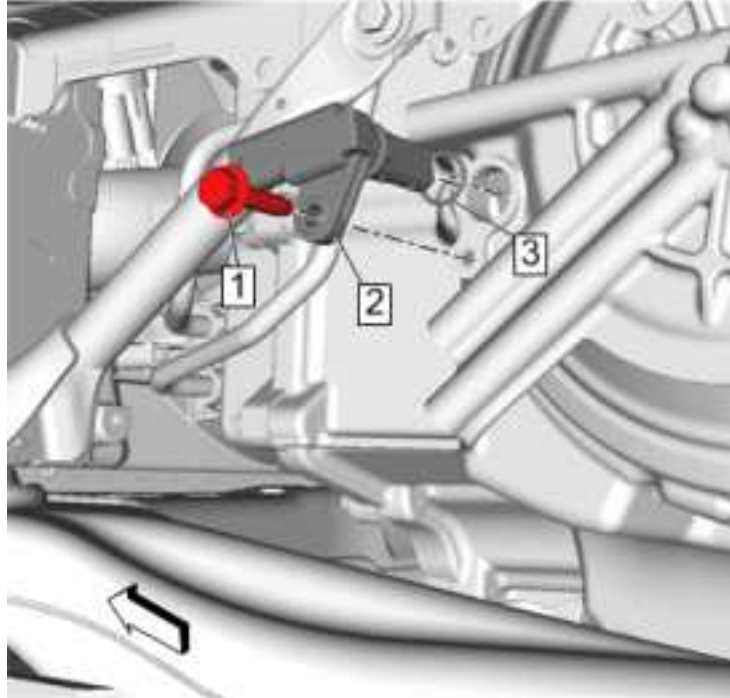


Fig. 75: Input Speed Sensor, Bolt And Seal
 Courtesy of GENERAL MOTORS COMPANY

2. Remove the input speed sensor bolt (1).
3. Remove the input speed sensor (2).
4. Remove the input speed sensor seal (3).

Installation Procedure

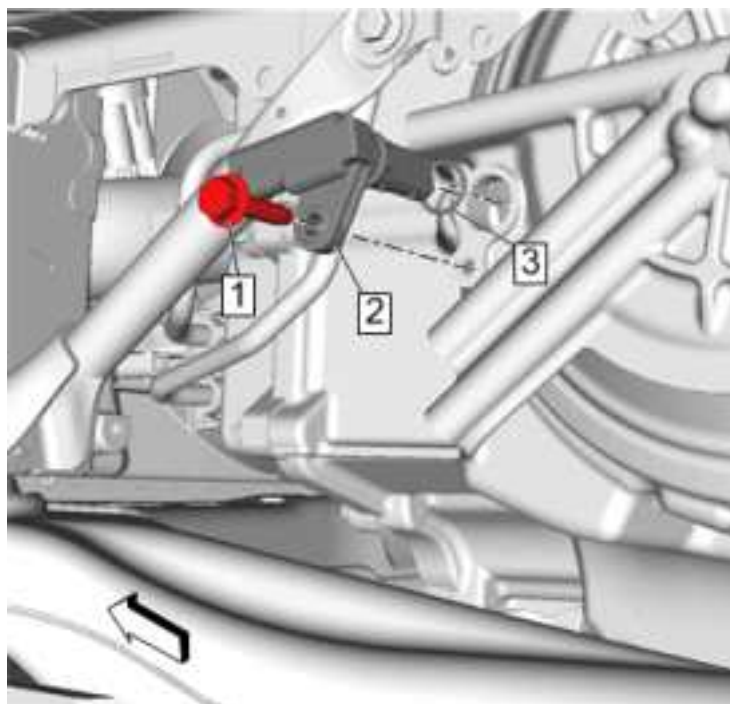


Fig. 76: Input Speed Sensor, Bolt And Seal
 Courtesy of GENERAL MOTORS COMPANY

1. Install the input speed sensor seal (3).
2. Install the input speed sensor (2).

CAUTION: Refer to [Fastener Caution](#) .

3. Install the input speed sensor bolt (1) and tighten to 9 N.m (80 lb in).
4. Install the left front wheel house liner. Refer to [Front Wheelhouse Liner Replacement - Left Side \(Equinox\)](#) [Front Wheelhouse Liner Replacement - Left Side \(Terrain\)](#) .

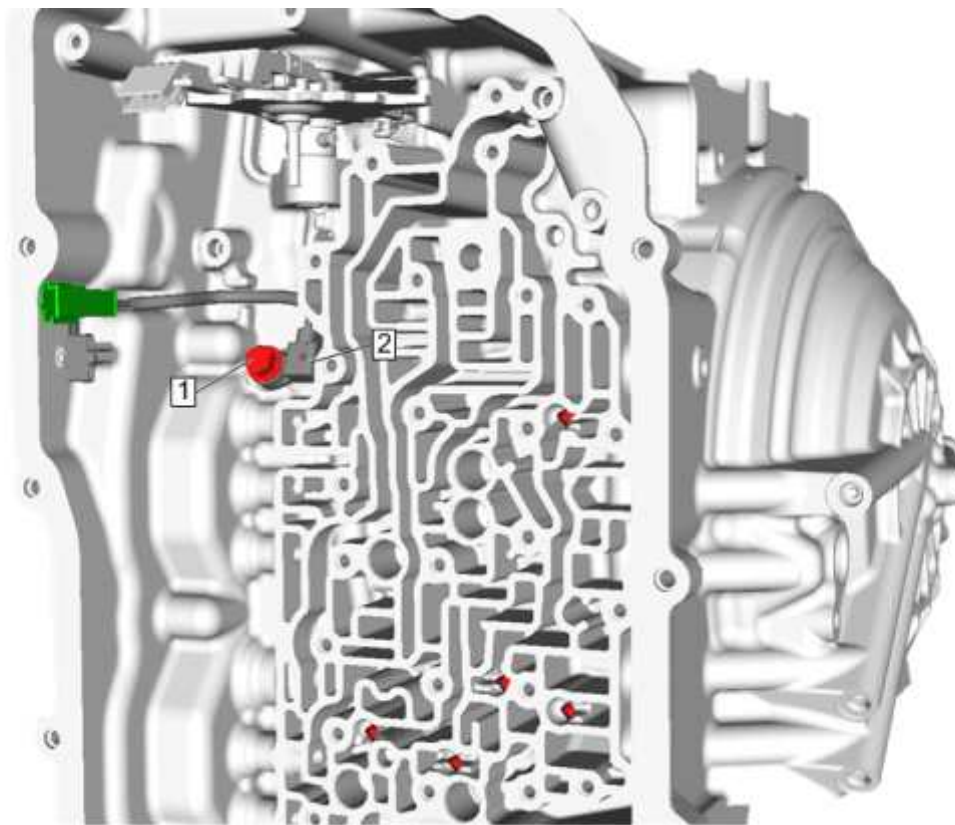


Fig. 77: Automatic Transmission Output Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the control valve body. Refer to Control Valve Body Replacement	
1	Output Speed Sensor Bolt CAUTION: Refer to Fastener Caution . Tighten 9 N.m (80 lb in)
2	Output Speed Sensor Procedure Perform the transmission service fast learn procedure. Refer to Transmission Service Fast Learn Procedure .

TRANSMISSION MOUNT REPLACEMENT (LEFT SIDE M3U)

Special Tools

EN-45059 Angle Meter

Equivalent regional tools: [Special Tools](#)

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#)
2. Support the transmission using a suitable jack.



Fig. 78: Left Transmission Mount And Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Remove the left transmission mount to body bolts (5).
4. Remove and DISCARD the left transmission mount to transmission bolts (1, 2, 3).
5. Remove the transmission mount (4) from the vehicle.

Installation Procedure



Fig. 79: Left Transmission Mount And Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the left transmission mount (4) to the vehicle.

CAUTION: Refer to **Fastener Caution** .

2. Install the transmission mount to body bolts (5) and tighten to 100 N.m (74 lb ft).

CAUTION: Refer to **Torque-to-Yield Fastener Warning** .

3. Install the NEW left transmission mount to transmission bolt (1) and initially tighten to 35 N.m (26 lb ft).
4. Install the NEW left transmission mount to transmission bolt (2) and initially tighten to 35 N.m (26 lb ft).
5. Install the NEW left transmission mount to transmission bolt (3) and initially tighten to 35 N.m (26 lb ft).
6. Tighten left transmission mount to transmission bolts (1-3) to 100 N.m (74 lb ft) plus 60 - 75 degrees, using the **EN-45059** meter.
7. Remove the transmission jack.
8. Install the battery tray. Refer to [Battery Tray Replacement](#) .

TRANSMISSION MOUNT REPLACEMENT (LEFT SIDE M3D/M3H)

Special Tools

EN-45059 Angle Meter

Equivalent regional tools: [Special Tools](#)

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#)
2. Support the transmission using a suitable jack.



Fig. 80: Left Transmission Mount And Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Remove and DISCARD the left transmission mount to transmission bolts (2).
4. Remove the left transmission mount to body bolts (1).
5. Remove the transmission mount (3) from the vehicle.

Installation Procedure



Fig. 81: Left Transmission Mount And Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Install the left transmission mount (3) to the vehicle.

CAUTION: Refer to [Fastener Caution](#) .

2. Install the transmission mount to body bolts (1) and tighten to 100 N.m (74 lb ft).

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

3. Install the NEW left transmission mount to transmission bolts (2) and tighten to 100 N.m (74 lb ft) plus 60 - 75 degrees, using the EN-45059 meter.
4. Remove the transmission jack.
5. Install the battery tray. Refer to [Battery Tray Replacement](#) .

TRANSMISSION MOUNT STRUT REPLACEMENT (ALL WHEEL DRIVE)

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#)
2. Prior to removing the transmission rear strut, mark the transmission rear strut fasteners to transmission rear strut to sub frame interfaces using spray paint or a marker for correct positioning during installation.
3. Remove the two piece propeller shaft. Refer to [Two-Piece Propeller Shaft Replacement](#)
4. Using a suitable jack stand, support the rear of the powertrain.

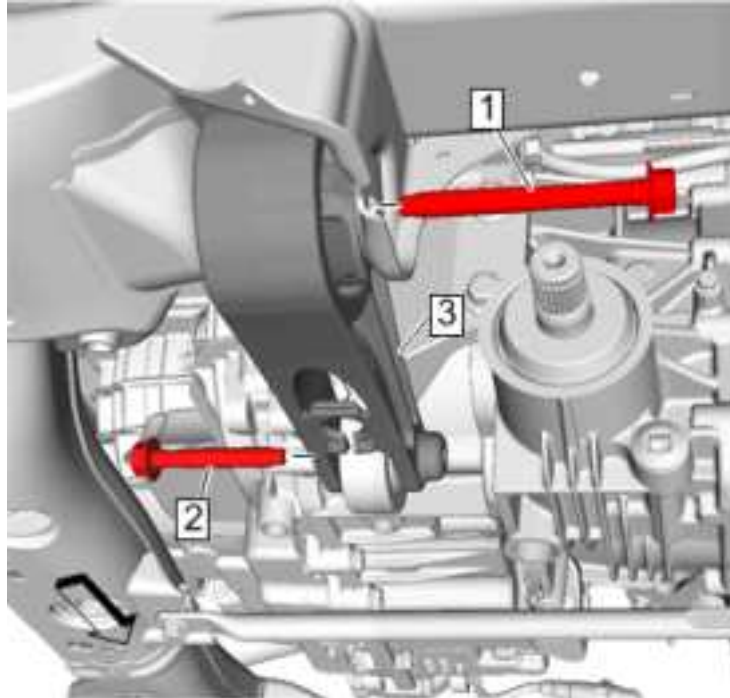


Fig. 82: Transmission Rear Strut And Bolts

Courtesy of GENERAL MOTORS COMPANY

5. Remove and DISCARD the transmission rear strut through bolt (2).
6. Remove and DISCARD the transmission rear strut to drivetrain and front suspension cradle bolt (1).
7. Remove the transmission rear strut (3).

Installation Procedure

1. Using the outline made by the spray paint or marker, position the transmission rear strut to the drivetrain and front suspension cradle.

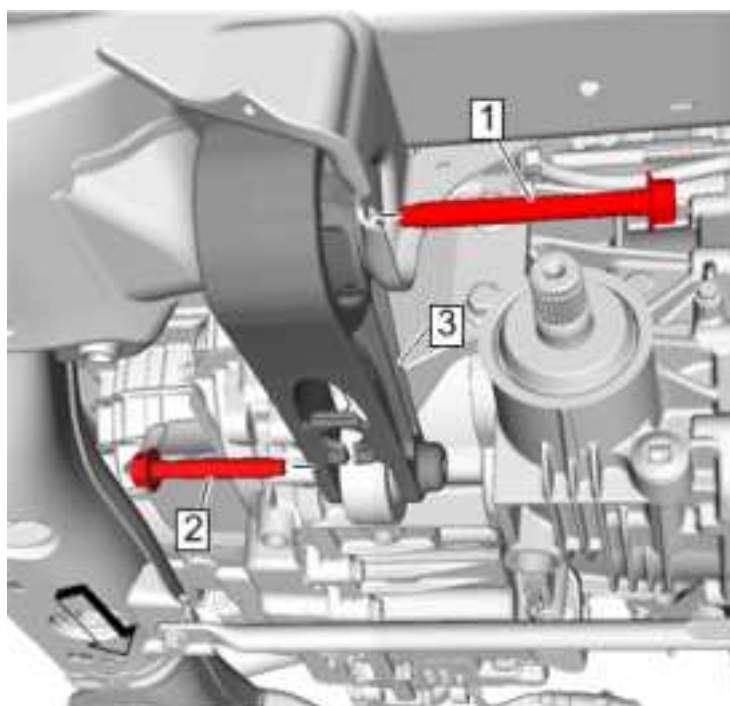


Fig. 83: Transmission Rear Strut And Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

2. Install the NEW transmission rear strut bolt (2) and tighten the bolt to 80 N.m (59 lb ft) plus 45 to 60 degrees.

3. Install the NEW transmission rear strut to bracket through bolt (1) and tighten to 100 N.m (74 lb ft) plus 120 to 135 degrees.
4. Install the two piece propeller shaft. Refer to [Two-Piece Propeller Shaft Replacement](#)
5. Remove the jack stand.
6. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#)

TRANSMISSION MOUNT STRUT REPLACEMENT (FRONT WHEEL DRIVE)

Removal Procedure

1. Remove the transmission mount strut bracket. Refer to [Transmission Mount Strut Bracket Replacement \(Front Wheel Drive\)](#)
2. Prior to removing the transmission strut, mark the transmission strut fasteners to transmission strut to sub frame interfaces using spray paint or a marker for correct positioning during installation.
3. Using a suitable jack stand, support the rear of the powertrain.

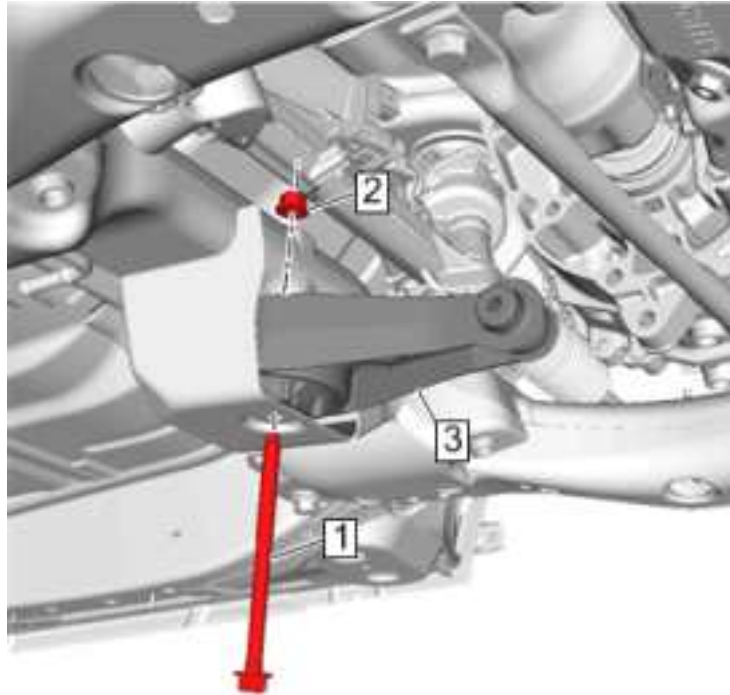


Fig. 84: Transmission Strut, Nut And Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove the strut through bolt retaining nut (2).
5. Remove and DISCARD the transmission strut through bolt (1).
6. Remove the transmission strut (3).

Installation Procedure

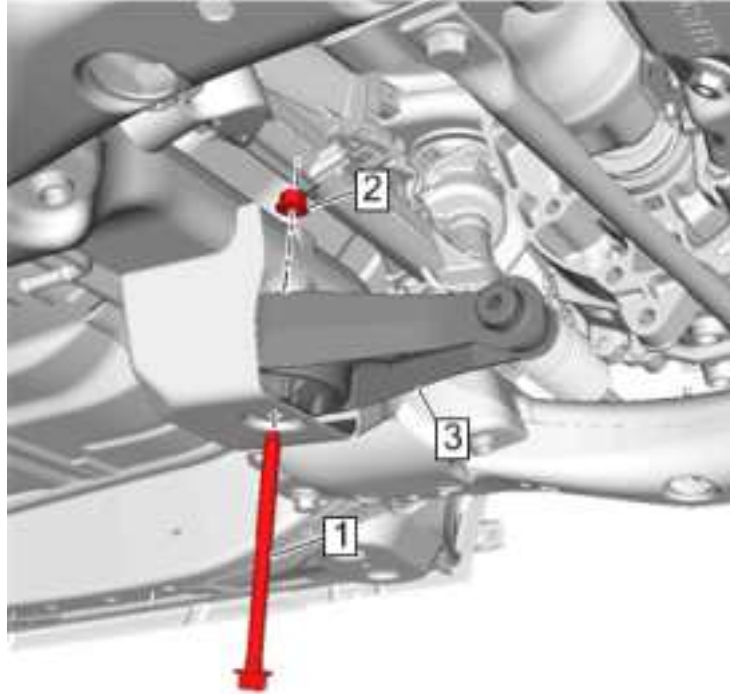


Fig. 85: Transmission Strut, Nut And Bolt

Courtesy of GENERAL MOTORS COMPANY

1. Using the outline made by the spray paint or marker, position the transmission strut (3) to the drivetrain and front suspension cradle.

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

2. Install the NEW transmission strut to bracket through bolt (1) and nut (2) then tighten to 100 N.m (74 lb ft) plus 120 to 135 degrees.
3. Perform the Powertrain Mount Balancing - Lower procedure. Refer to the appropriate engine section.
4. Remove the jack stand.
5. Install the transmission mount strut bracket. Refer to [Transmission Mount Strut Bracket Replacement \(Front Wheel Drive\)](#)

TRANSMISSION MOUNT STRUT BRACKET REPLACEMENT (ALL WHEEL DRIVE)

Removal Procedure

1. Remove the transmission mount strut. Refer to [Transmission Mount Strut Replacement \(All Wheel Drive\)](#).

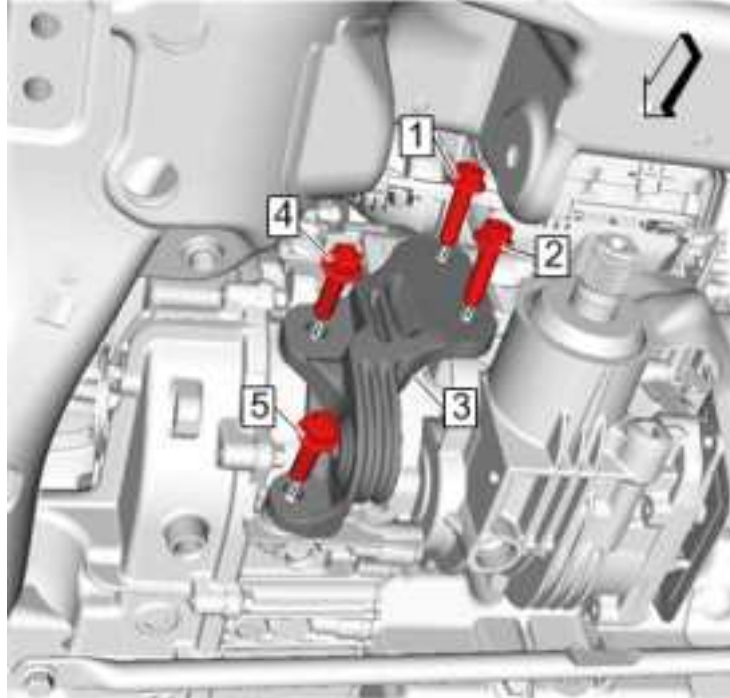


Fig. 86: Transmission Rear Mount Strut Bracket And Bolts
 Courtesy of GENERAL MOTORS COMPANY

2. Remove and DISCARD the 2 transmission rear mount strut bracket to power transfer unit bolts (1, 2).
3. Remove and DISCARD the 2 transmission rear mount strut bracket to transmission bolts (4, 5).
4. Remove the transmission rear mount strut bracket (3) from the transmission.

Installation Procedure

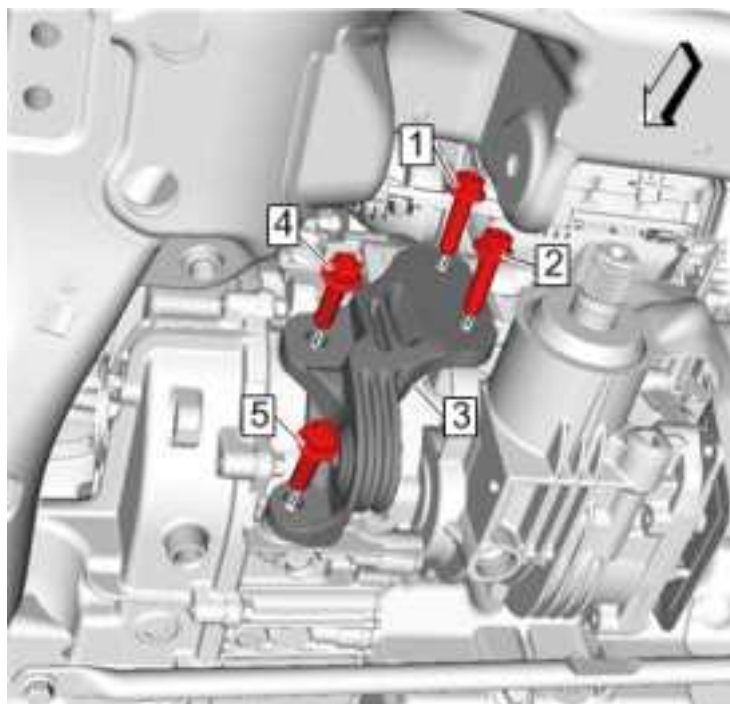


Fig. 87: Transmission Rear Mount Strut Bracket And Bolts
 Courtesy of GENERAL MOTORS COMPANY

1. Position the transmission rear mount strut bracket (3) to the transmission.

CAUTION: Refer to [Fastener Caution](#) .

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

2. Install the 2 NEW transmission rear mount strut bracket to power transfer unit bolts (1, 2) first and tighten to 100 N.m (74 lb ft) plus 60 - 75 degrees.

3. Install the 2 NEW transmission rear mount strut bracket to transmission bolts (4, 5) and tighten to 100 N.m (74 lb ft) plus 60 - 75 degrees.
4. Install the transmission mount strut. Refer to [Transmission Mount Strut Replacement \(All Wheel Drive\)](#).

TRANSMISSION MOUNT STRUT BRACKET REPLACEMENT (FRONT WHEEL DRIVE)

Removal Procedure

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

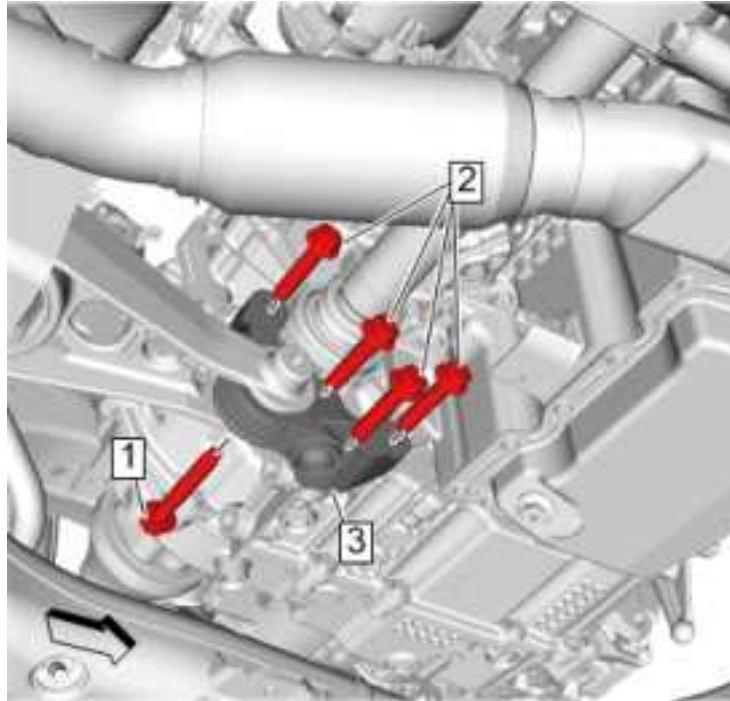


Fig. 88: Transmission Mount Strut Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

2. Remove the transmission mount strut bracket to transmission mount strut bolt (1).
3. Remove and DISCARD the transmission mount strut bracket bolt (2).
4. Remove the transmission mount strut bracket (3) from the transmission.

Installation Procedure

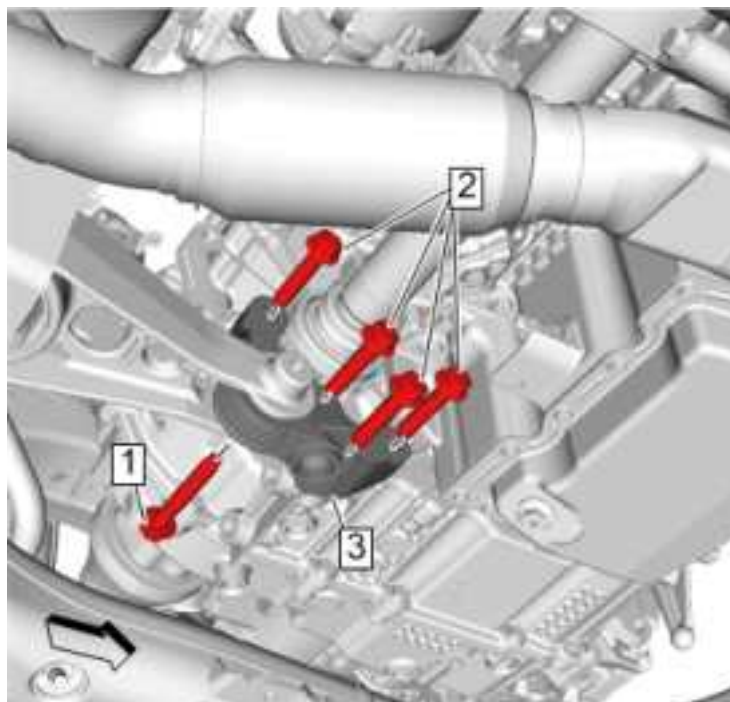


Fig. 89: Transmission Mount Strut Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Position the transmission mount strut bracket (3) to the transmission.

CAUTION: Refer to [Torque-to-Yield Fastener Caution](#) .

2. Install the four NEW transmission mount strut bracket to transmission bolts (2) and tighten to 100 N.m (74 lb ft) plus 60 to 75 degrees.
3. Install the transmission mount strut bracket to transmission mount strut bolt (1) and tighten to 80 N.m (59 lb ft) plus 45 to 60 degrees.
4. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#)

FLUID TRANSFER PIPE REPLACEMENT

Removal Procedure

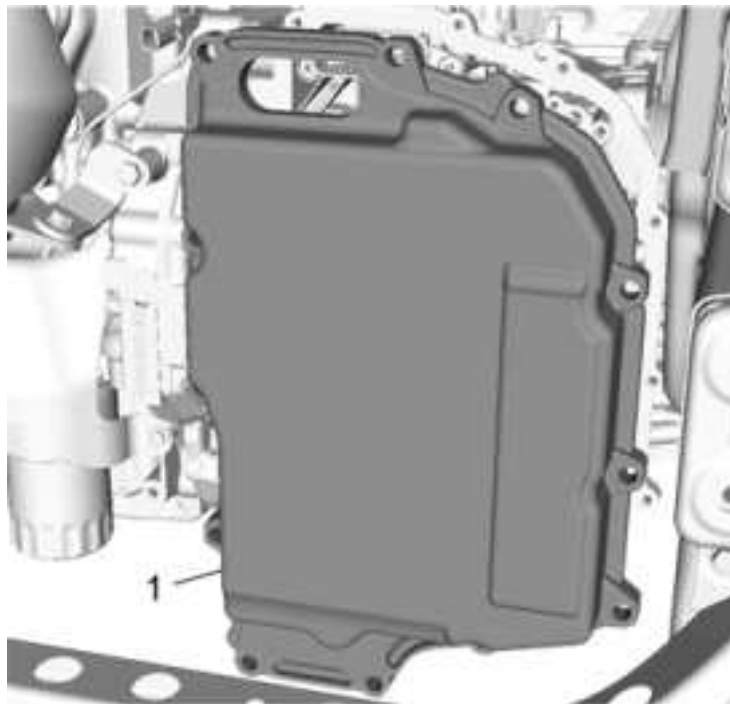


Fig. 90: Control Valve Body Cover
Courtesy of GENERAL MOTORS COMPANY

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

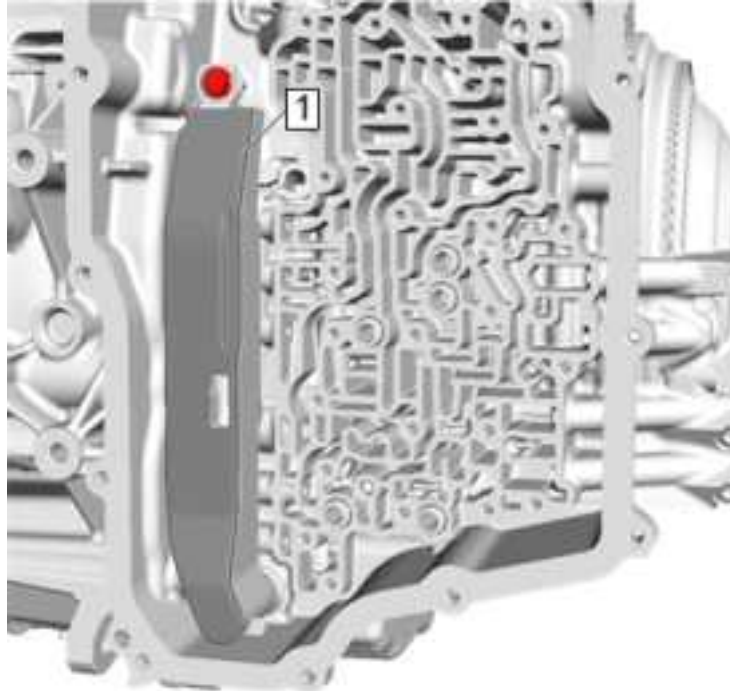


Fig. 91: Fluid Transfer Pipe

Courtesy of GENERAL MOTORS COMPANY

2. Remove the fluid transfer pipe (1) from the transmission. Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#) [Control Valve Body Assembly Removal \(with ETRS\)](#)

Installation Procedure

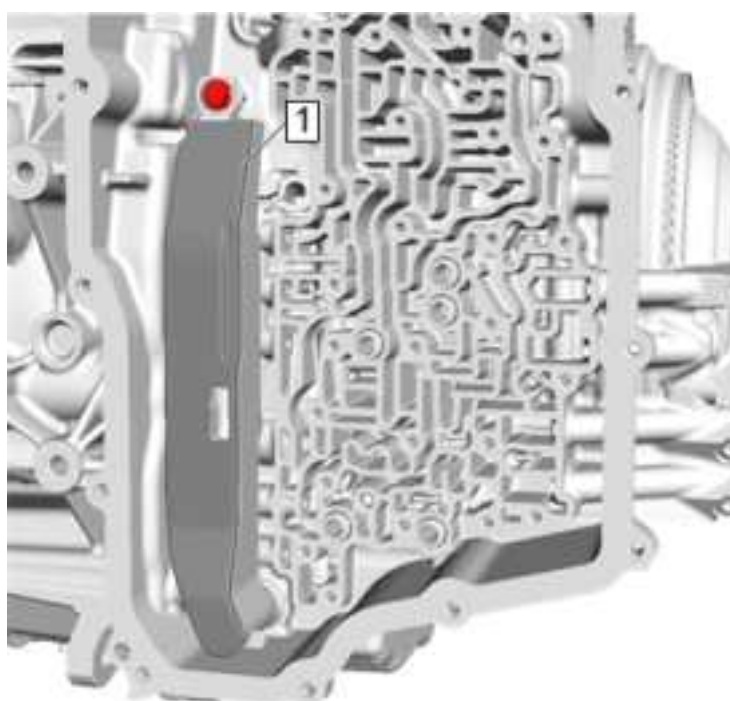


Fig. 92: Fluid Transfer Pipe

Courtesy of GENERAL MOTORS COMPANY

1. Install the fluid transfer pipe (1) to the transmission. Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#) [Control Valve Body Assembly Installation \(with ETRS\)](#)

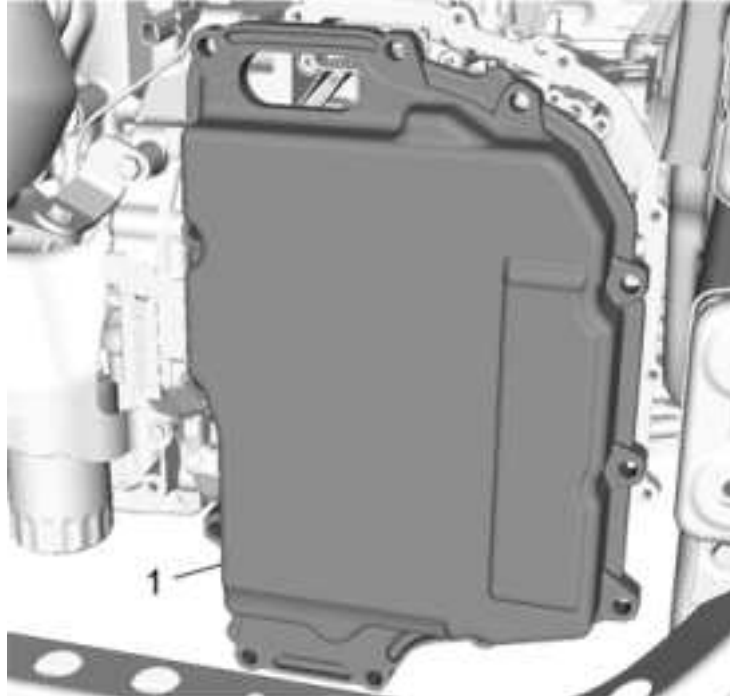


Fig. 93: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

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

TORQUE CONVERTER REPLACEMENT

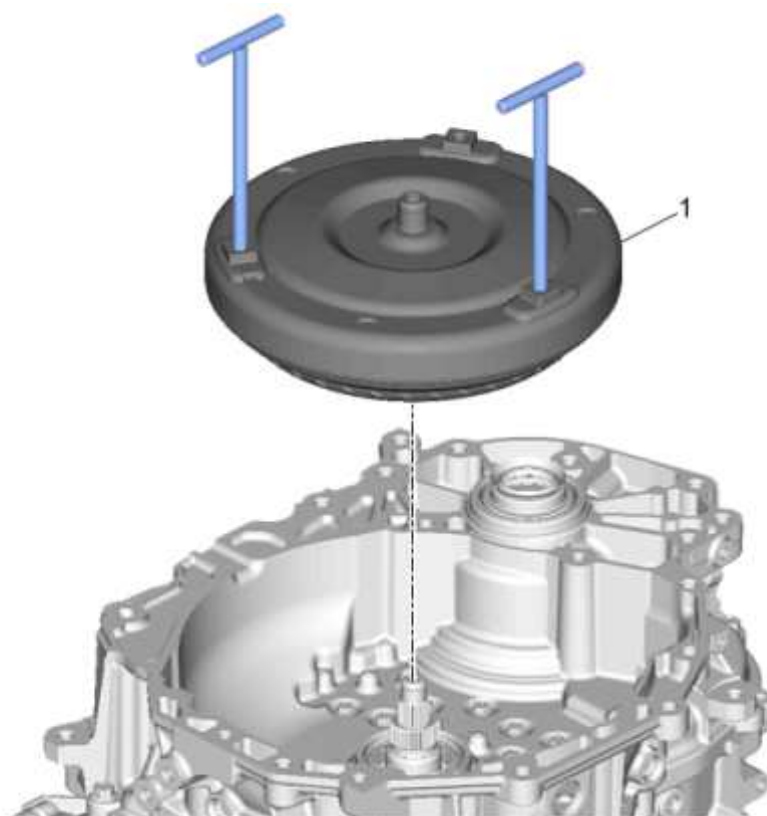


Fig. 94: Torque Converter

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures	
1. Remove Transmission. Refer to Transmission Replacement (Front Wheel Drive)Transmission Replacement (All Wheel Drive). 2. Position the transmission assembly so the torque converter is facing up.	

Callout	Component Name
1	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. CAUTION: Lower the torque converter straight down. Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. CAUTION: Failure to raise the torque dampener assembly straight up could damage the torque dampener clutch lip seal inside the torque dampener clutch assembly. Special Tools DT-46409 Torque Converter Lifting Handles For equivalent regional tools, refer to Special Tools.

TORQUE CONVERTER FLUID SEAL REPLACEMENT

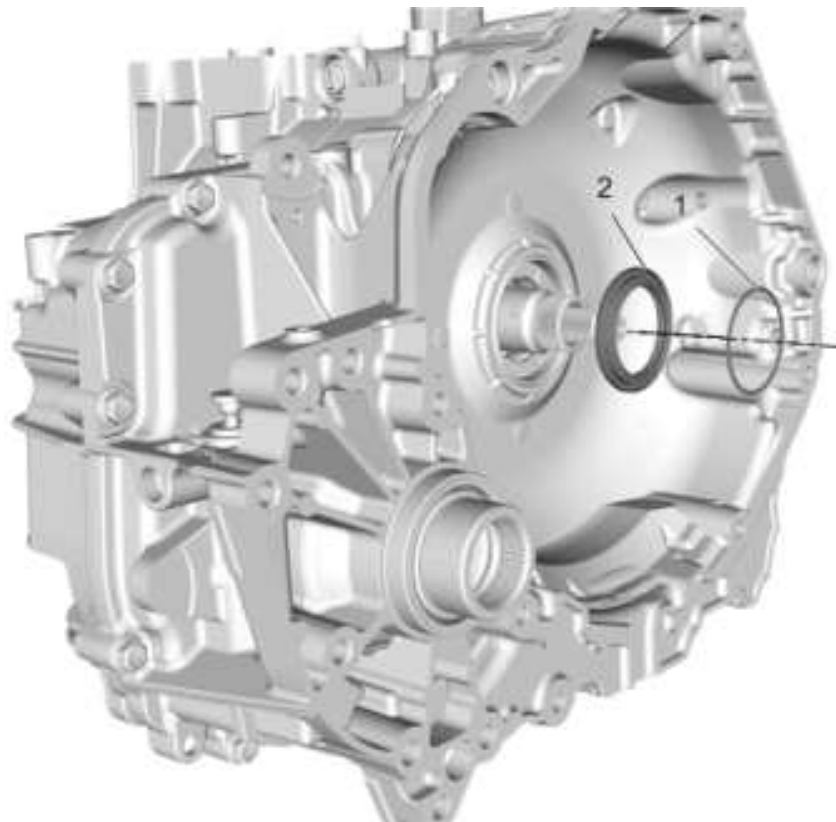


Fig. 95: Torque Converter Fluid Seal

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove Torque Converter. Refer to Torque Converter Replacement .	
1	Torque Converter Fluid Seal Retainer

Callout	Component Name
2	Torque Converter Fluid Seal Special Tools • DT-6125-1B Slide Hammer • J-29162 Seal Installer • EN-23129 Universal Seal Remover For equivalent regional tools, refer to Special Tools .

AUTOMATIC TRANSMISSION WIRING HARNESS REPLACEMENT

Removal Procedure

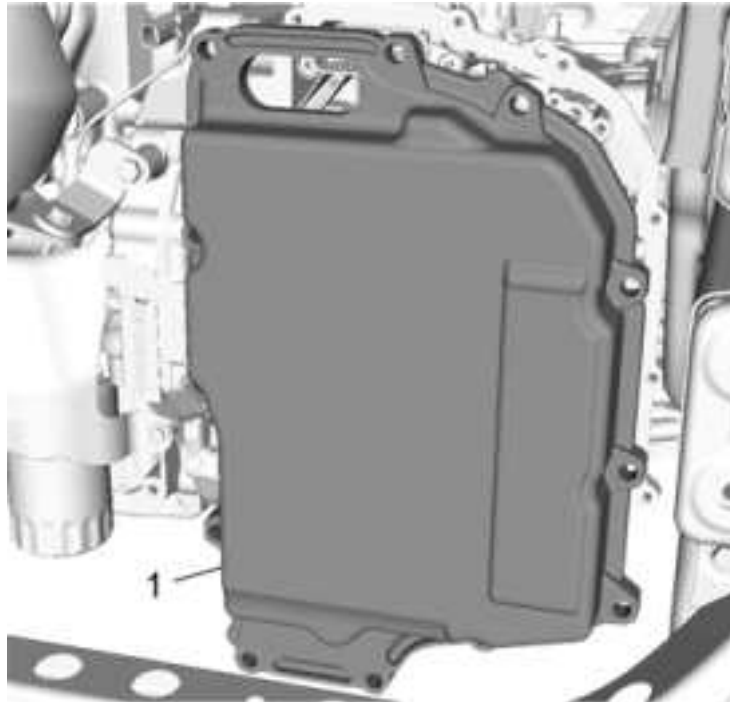


Fig. 96: Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

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

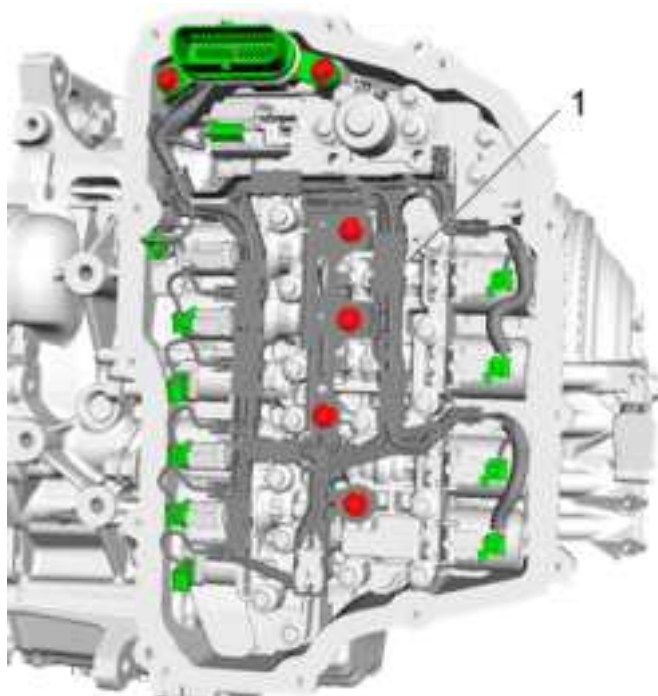


Fig. 97: Automatic Transmission Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

2. Remove the automatic transmission wiring harness (1) from the transmission. Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#)

Installation Procedure

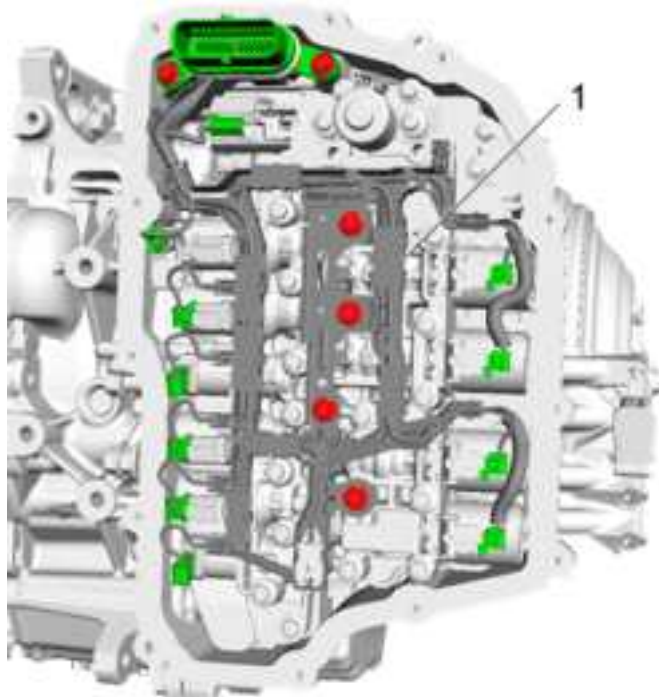


Fig. 98: Automatic Transmission Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

1. Install the automatic transmission wiring harness (1) to the transmission. Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#), [Control Valve Body Assembly Installation \(with ETRS\)](#)

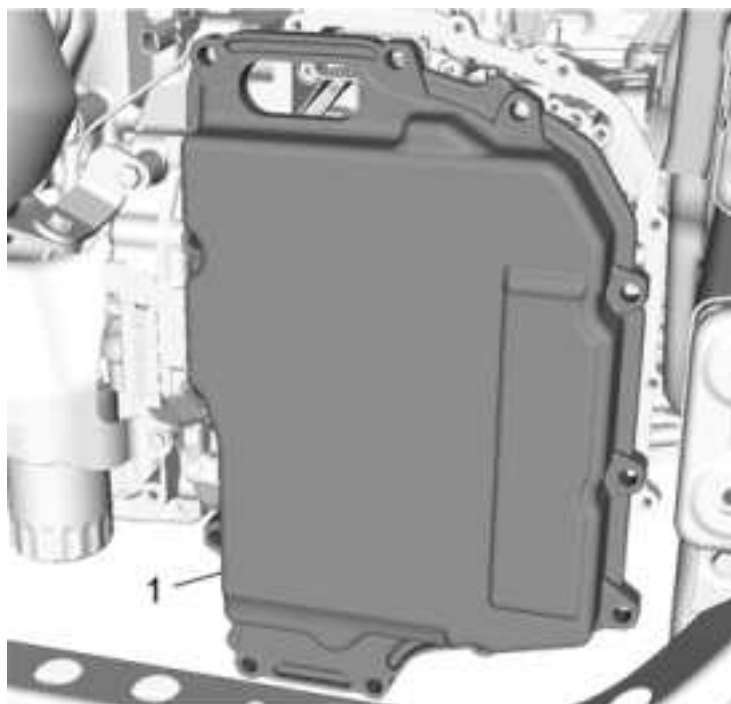


Fig. 99: Control Valve Body Cover
Courtesy of GENERAL MOTORS COMPANY

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

Removal Procedure

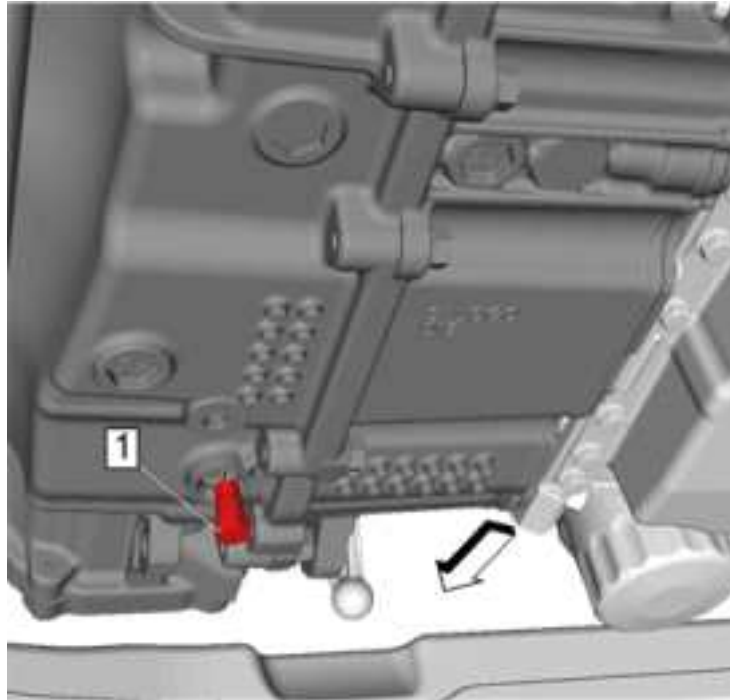


Fig. 100: Fluid Drain Plug

Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the fluid drain plug (1).
3. Drain transmission fluid into a suitable container.

CAUTION: Refer to [Component Fastener Tightening Caution](#) .

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

Installation Procedure

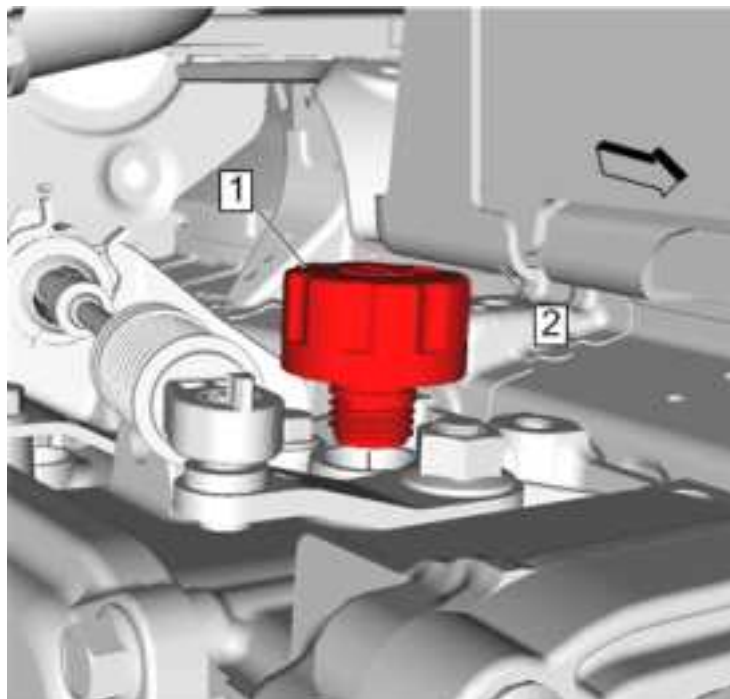


Fig. 101: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

1. Lower the vehicle.

NOTE:

If the transmission fluid filler cap cannot be accessed, proceed to the next step in this procedure.

2. Remove the fluid fill cap (1), if accessible.
3. Remove the left front wheel and tire assembly. Refer to [Tire and Wheel Removal and Installation](#)

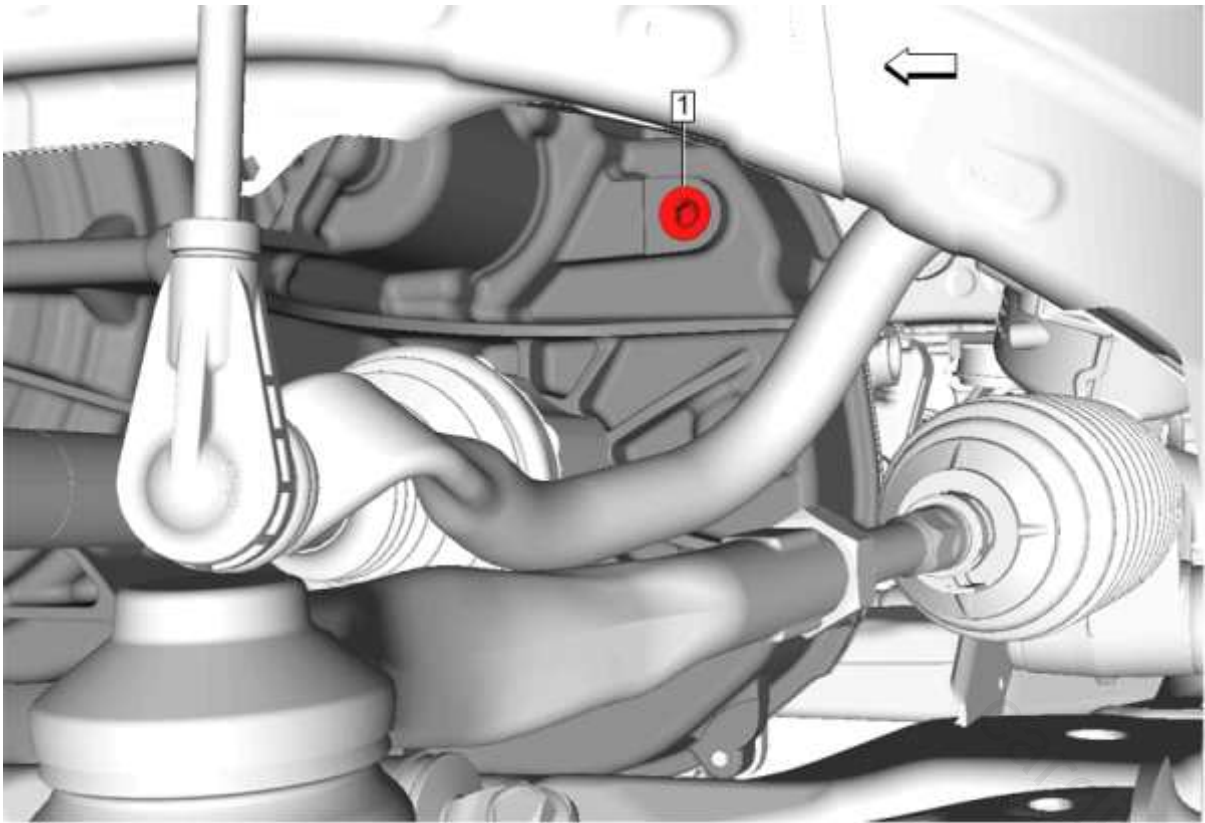


Fig. 102: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

4. Remove the fluid filler plug (1) from the transmission.
5. Fill the transmission to the proper level with the correct fluid. Refer to [Transmission Fluid Level and Condition Check](#) , and [Adhesives, Fluids, Lubricants, and Sealers](#) .

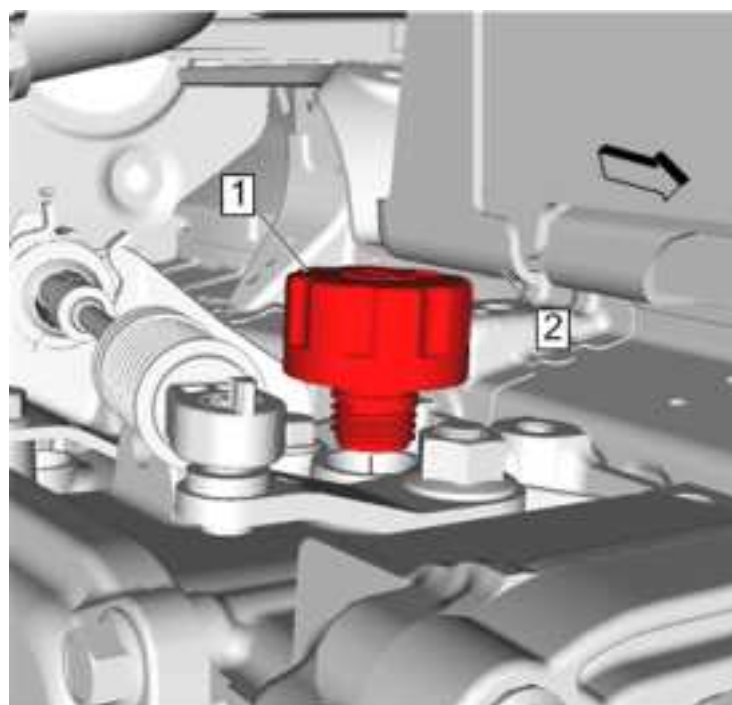


Fig. 103: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

6. Install the fluid fill cap (1), if accessible.

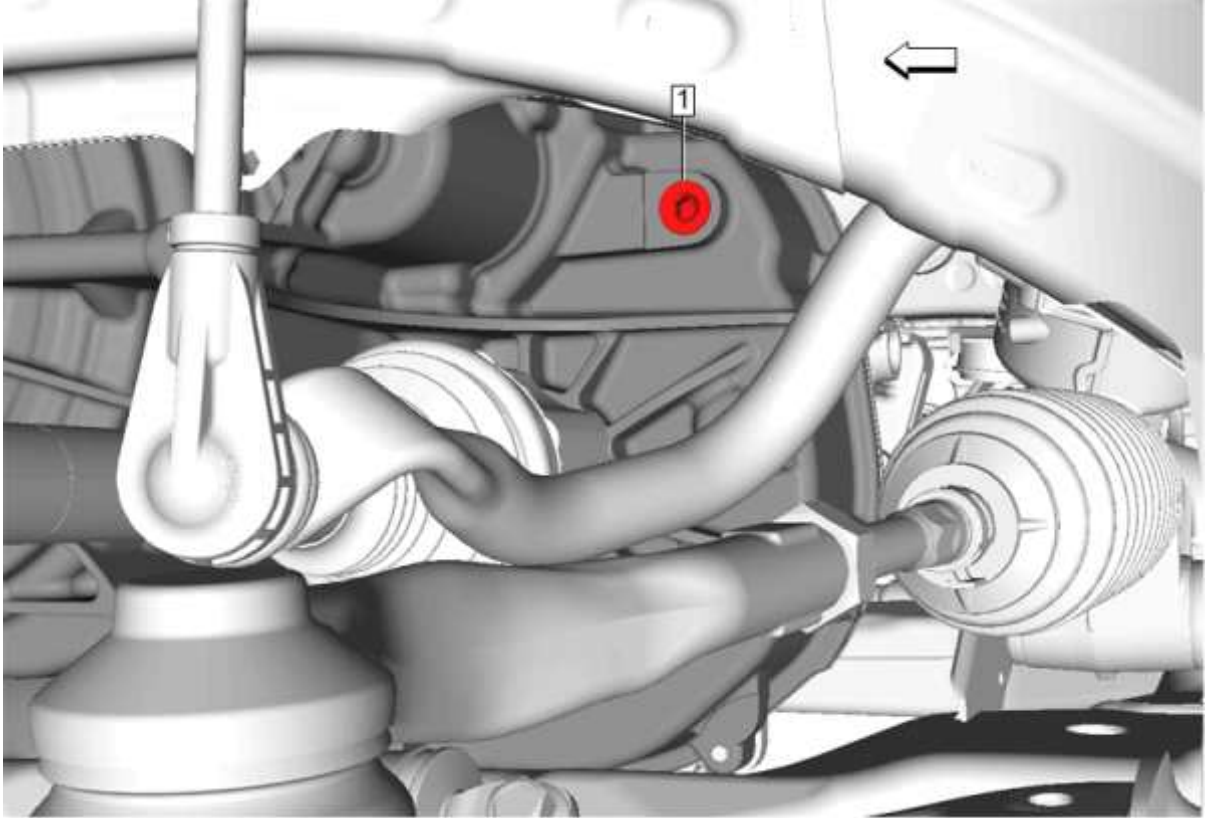


Fig. 104: Fluid Filler Plug

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Component Fastener Tightening Caution](#) .

7. Install the fluid filler plug (1) to the transmission and tighten to 40 N.m (30 lb ft).
8. Install the left front wheel and tire assembly. Refer to [Tire and Wheel Removal and Installation](#)

TRANSMISSION REPLACEMENT (FRONT WHEEL DRIVE)

Removal Procedure

1. Disconnect the transmission range select lever cable from the transmission. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#)
2. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#)

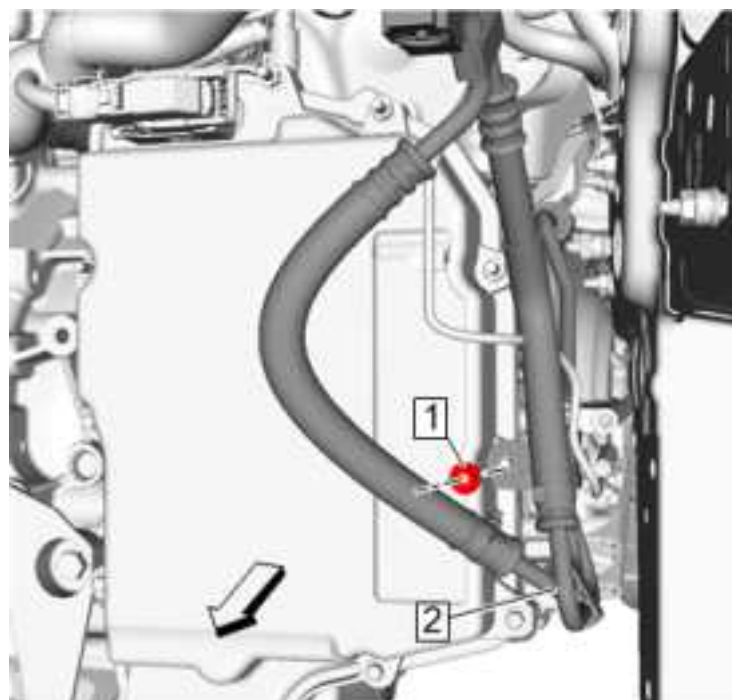


Fig. 105: Transmission Fluid Cooler Pipes And Nut

Courtesy of GENERAL MOTORS COMPANY

3. Remove the transmission fluid cooler pipe nut (1) from the transmission.
4. Remove the transmission fluid cooler pipes (2). Refer to [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(MNH, MHG\)](#) [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(M3D, M3H, M3U\)](#) .

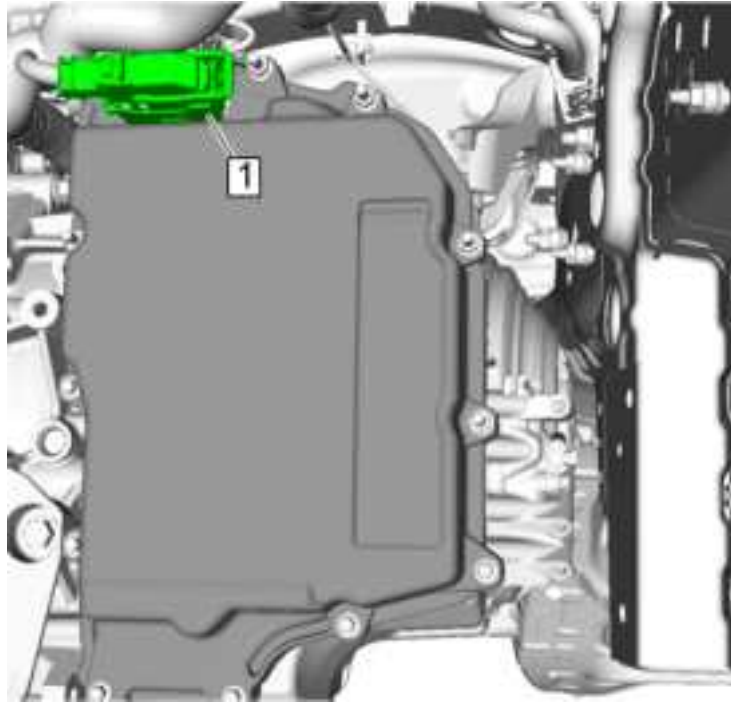


Fig. 106: Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the control valve body transmission control module electrical connector (1), then unclip the wiring harness from the cover.
6. Remove the body ground cable and wiring harness assembly mounting bolt at front of transmission and position ground cable and harness out of the way.
7. Plug and/or cap the pipes and the transmission to prevent contamination.

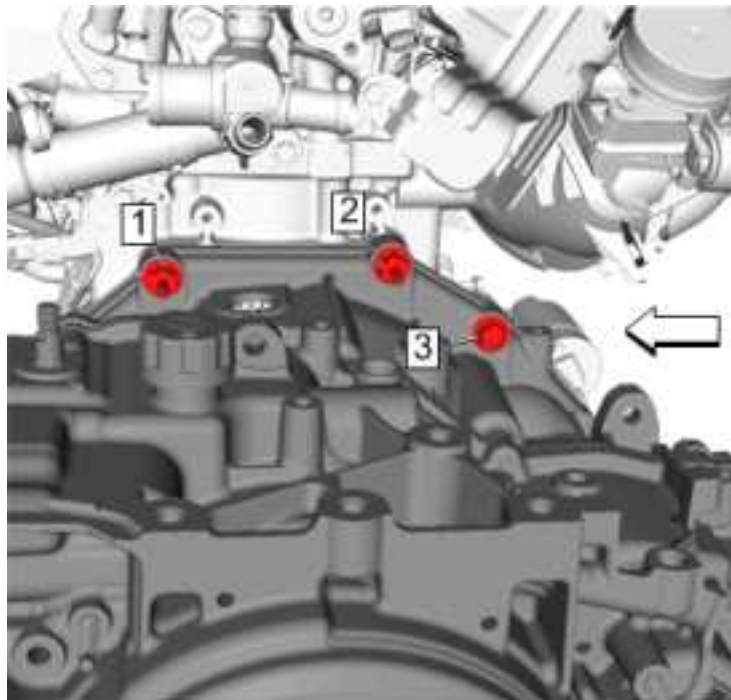


Fig. 107: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper transmission to engine bolts (1, 2, 3).
9. Remove the drivetrain and front suspension cradle. Refer to [Drivetrain and Front Suspension Cradle Replacement \(Front Wheel Drive\)](#)

10. Disconnect the wheel drive shafts from the transmission. Refer to [Front Wheel Drive Half Shaft Replacement - Left Side](#) , and [Front Wheel Drive Half Shaft Replacement - Right Side \(M3U, MHG, MNH, MNK with FWD\)](#). [Front Wheel Drive Half Shaft Replacement - Right Side \(M3D, M3H with FWD\)](#).
11. Remove the transmission mount strut and transmission mount strut bracket from the transmission. Refer to [Transmission Mount Strut Bracket Replacement \(Front Wheel Drive\)](#).
12. Remove the starter. Refer to [Starter Replacement \(LYX - Front Wheel Drive\)](#). [Starter Replacement \(LTG - Front Wheel Drive\)](#). [Starter Replacement \(LH7 - Front Wheel Drive\)](#).
13. Mark the relationship of the flywheel to the torque converter for reassembly.

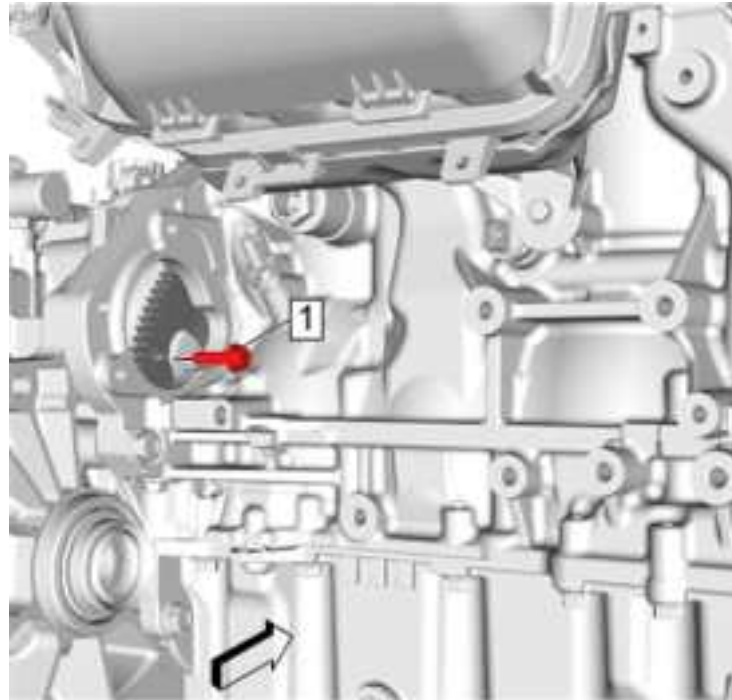


Fig. 108: Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS COMPANY

14. Remove the torque converter to flywheel bolts (1).
15. Remove the auxiliary water pump and bracket from the transmission. Refer to [Auxiliary Water Pump Replacement \(LYX with KL9\)](#). [Auxiliary Water Pump Replacement \(LH7 Equinox\)](#). [Auxiliary Water Pump Replacement \(LTG with KL9\)](#). [Auxiliary Water Pump Replacement \(LH7 Terrain\)](#).
16. Lower the vehicle.
17. Install the engine support fixture. Refer to [Engine Support Fixture](#).
18. Remove the left transmission mount to transmission bolts. Refer to [Transmission Mount Replacement \(Left Side M3U\)](#). [Transmission Mount Replacement \(Left Side M3D/M3H\)](#).
19. Lower the transmission side with the support fixture to allow clearance for removal.
20. Unclip the engine wiring harness from the transmission.
21. Raise the vehicle.
22. Use a transmission jack in order to support the transmission.
23. Remove the oil pump flow control valve heat shield, if equipped. Refer to [Oil Pump Flow Control Valve Heat Shield Replacement](#).
24. Remove the three way catalytic converter. Refer to [Warm Up Three-Way Catalytic Converter Replacement \(LYX\)](#). [Warm Up Three-Way Catalytic Converter Replacement \(LTG\)](#).

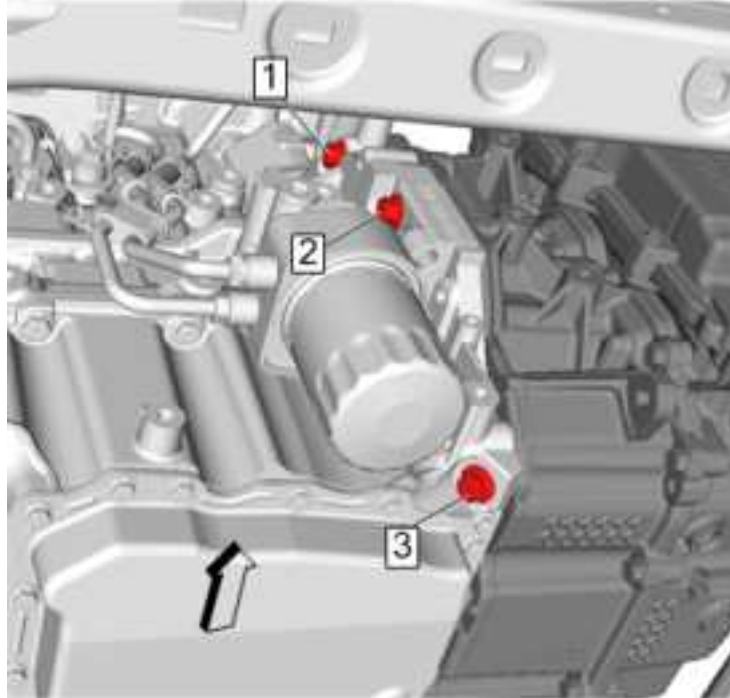


Fig. 109: Front Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

25. Remove the front transmission to engine bolts (1, 2, 3).

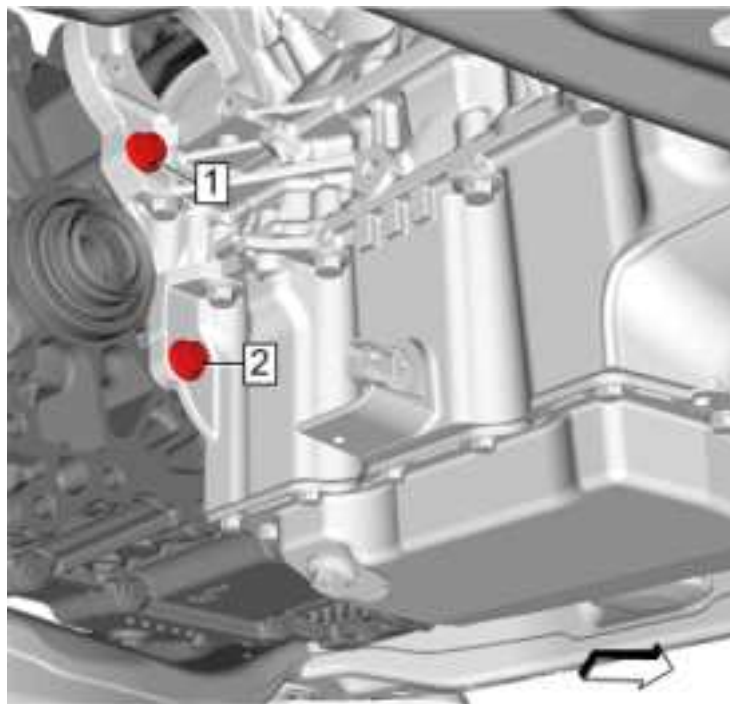


Fig. 110: Lower Transmission Fasteners
Courtesy of GENERAL MOTORS COMPANY

26. Remove the lower transmission fasteners (1, 2).

NOTE: Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

27. Separate the transmission from the engine.
28. Lower the transmission with the transmission jack far enough to remove the transmission.
29. Transfer components as necessary.
30. Flush and flow test the transmission oil cooler and lines. Refer to [Transmission Fluid Cooler Flow Test and Flushing](#)

1. Raise the transmission with the transmission jack and position the transmission to the engine.

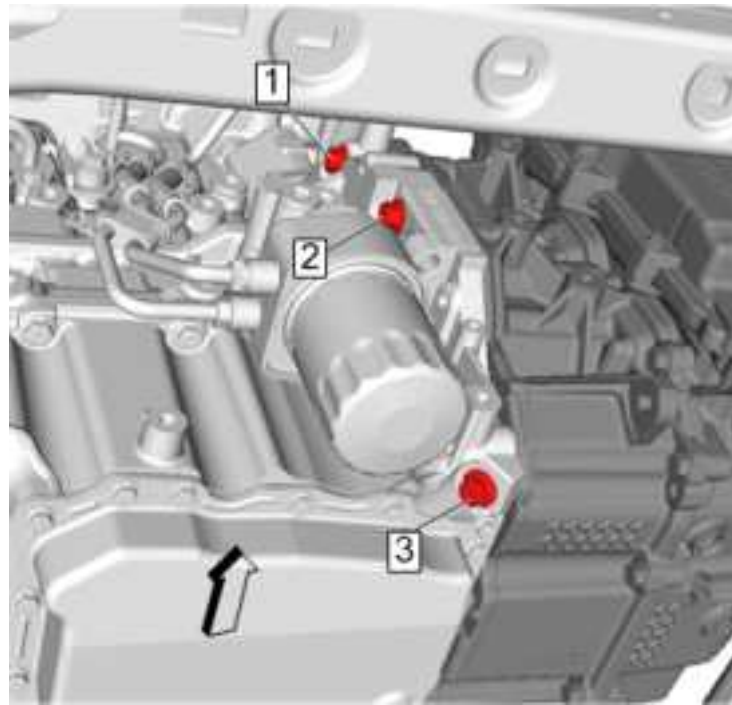


Fig. 111: Front Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install the transmission bolts (1, 2, 3) and tighten to 58 N.m (43 lb ft).

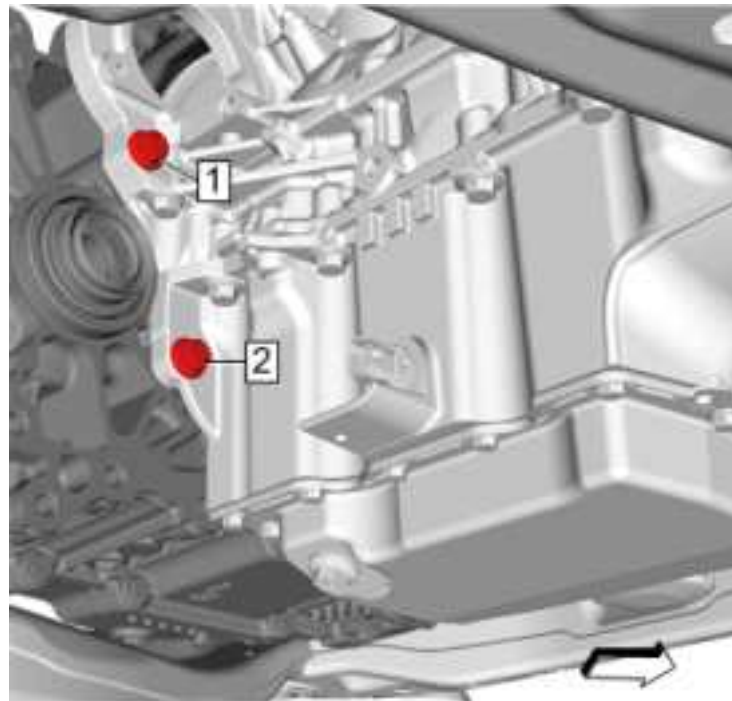


Fig. 112: Lower Transmission Fasteners
Courtesy of GENERAL MOTORS COMPANY

3. Install the front transmission to engine bolt (1, 2) and tighten to 58 N.m (43 lb ft).
4. Install the oil pump flow control valve heat shield, if equipped. Refer to [Oil Pump Flow Control Valve Heat Shield Replacement](#)
5. Remove the transmission jack.
6. Align the mark of the flywheel to the mark on the torque converter for reassembly.

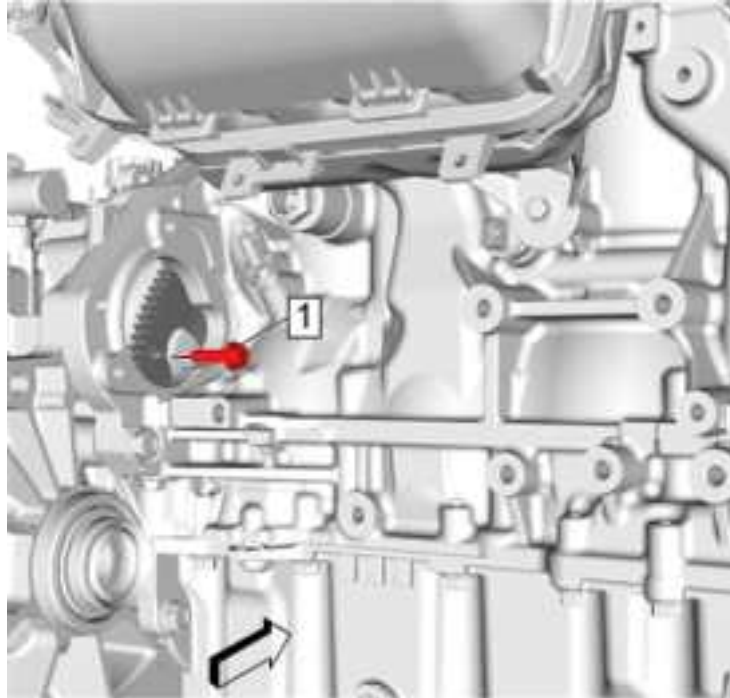


Fig. 113: Torque Converter To Flywheel Bolts
 Courtesy of GENERAL MOTORS COMPANY

NOTE: If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation. Adhesives, Fluids, Lubricants, and Sealers

7. Install the torque converter to flywheel bolts (1) and tighten to 60 N.m (44 lb ft).
8. Install the auxiliary water pump and bracket to the transmission. Refer to Auxiliary Water Pump Replacement (LYX with KL9), Auxiliary Water Pump Replacement (LH7 Equinox), Auxiliary Water Pump Replacement (LTG with KL9), Auxiliary Water Pump Replacement (LH7 Terrain).
9. Install the three way catalytic converter. Refer to Warm Up Three-Way Catalytic Converter Replacement (LYX), Warm Up Three-Way Catalytic Converter Replacement (LTG).
10. Install the starter. Refer to Starter Replacement (LYX - Front Wheel Drive), Starter Replacement (LTG - Front Wheel Drive), Starter Replacement (LH7 - Front Wheel Drive).
11. Install the left transmission mount to the transmission. Transmission Mount Replacement (Left Side M3U), Transmission Mount Replacement (Left Side M3D/M3H).
12. Install the wheel drive shafts to the transmission. Refer to Front Wheel Drive Half Shaft Replacement - Left Side, and Front Wheel Drive Half Shaft Replacement - Right Side (M3U, MHG, MNH, MNK with FWD), Front Wheel Drive Half Shaft Replacement - Right Side (M3D, M3H with FWD).
13. Install the drivetrain and front suspension cradle. Refer to Drivetrain and Front Suspension Cradle Replacement (Front Wheel Drive).
14. Install the transmission mount strut bracket to the transmission. Refer to Transmission Mount Strut Bracket Replacement (Front Wheel Drive).
15. Remove the engine support fixture. Refer to Engine Support Fixture.

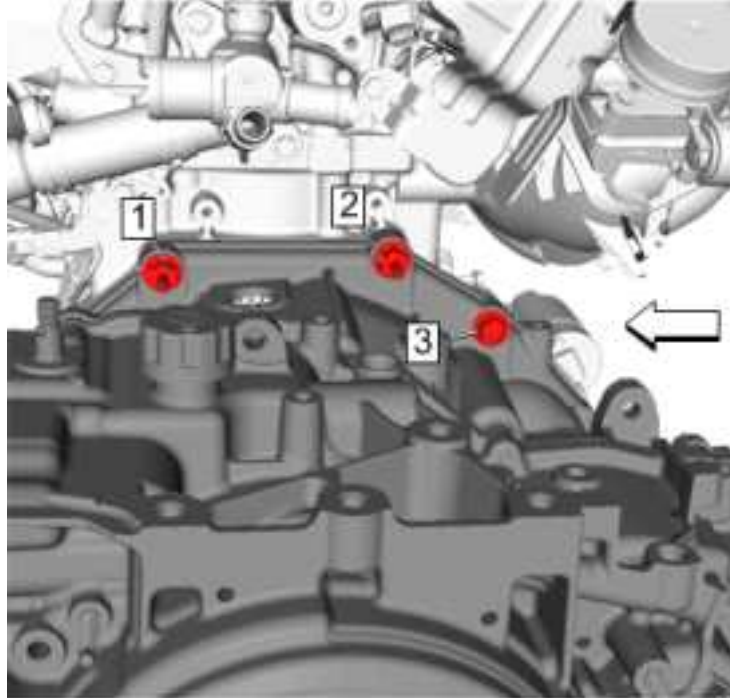


Fig. 114: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

16. Install the upper transmission to engine bolts (1, 2, 3) and tighten to 58 N.m (43 lb ft).

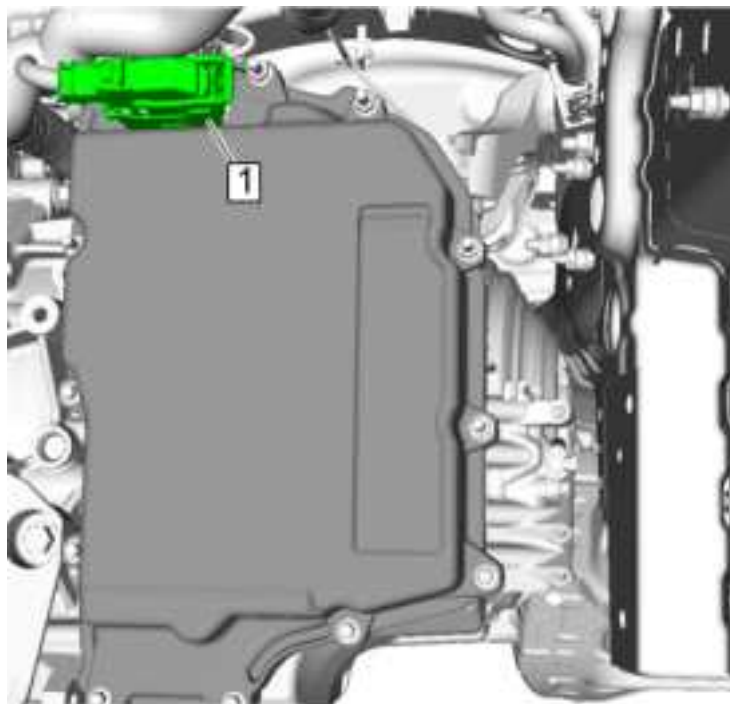


Fig. 115: Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

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

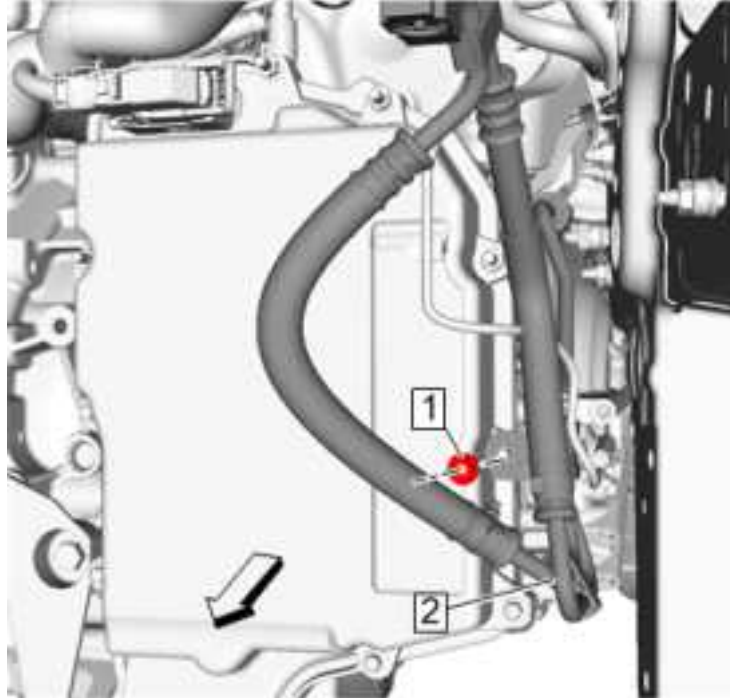


Fig. 116: Transmission Fluid Cooler Pipes And Nut
Courtesy of GENERAL MOTORS COMPANY

18. Install the transmission fluid cooler outlet pipes (2) to the transmission. Refer to [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(MNH, MHG\)](#). [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(M3D, M3H, M3U\)](#).
19. Install the transmission fluid cooler inlet pipe nut (1) to the transmission and tighten to 9 N.m (80 lb in).
20. Clip the engine wiring harness to the transmission.
21. Install the transmission range select lever cable to the transmission. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#).
22. Adjust the automatic transmission range selector lever cable. Refer to [Range Selector Lever Cable Adjustment](#).
23. Fill the transmission with fluid. Refer to [Transmission Fluid Drain and Fill](#).
24. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to [Service Programming System \(SPS\)](#).

NOTE:

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

25. Perform the Transmission Service Fast Learn procedure. Refer to [Transmission Service Fast Learn Procedure](#).
26. Reprogram the transmission. Refer to [Solenoid Valve Characterization Reprogramming](#).
27. Road test the vehicle.

TRANSMISSION REPLACEMENT (ALL WHEEL DRIVE)

Removal Procedure

1. Disconnect the transmission range select lever cable from the transmission. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#)
2. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#)

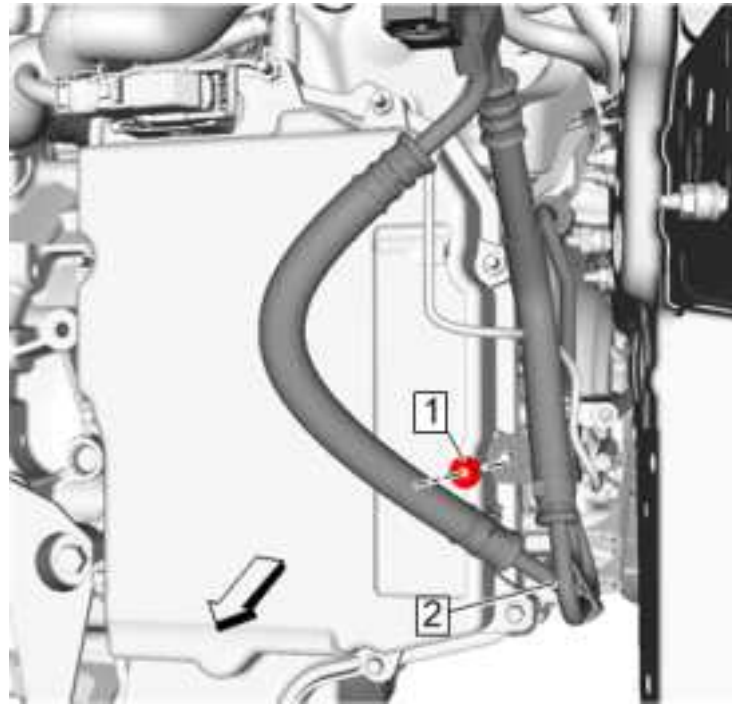


Fig. 117: Transmission Fluid Cooler Pipes And Nut
Courtesy of GENERAL MOTORS COMPANY

3. Remove the transmission fluid cooler pipe nut (1) from the transmission.
4. Remove the transmission fluid cooler pipes (2). Refer to [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(MNH, MHG\)](#) [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(M3D, M3H, M3U\)](#)

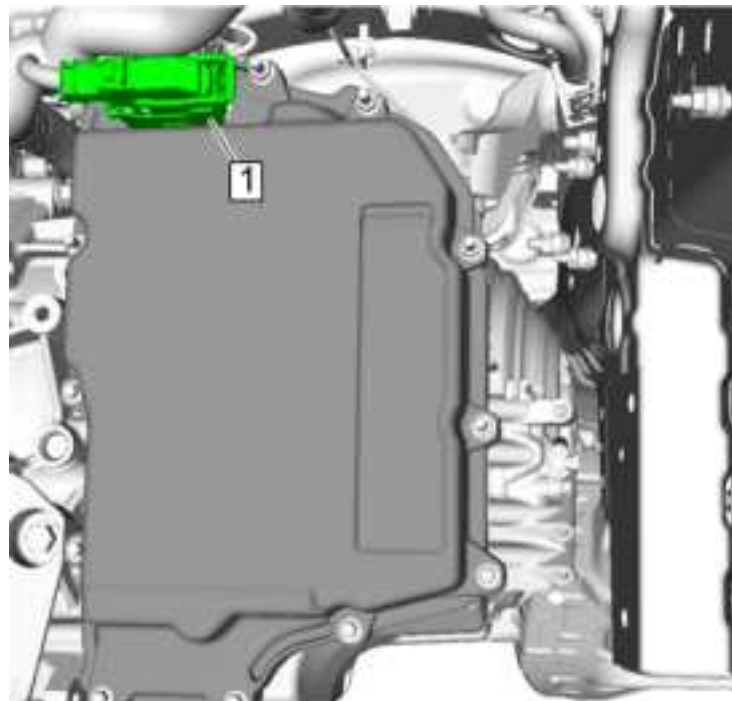


Fig. 118: Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

5. Disconnect the control valve body transmission control module electrical connector (1), then unclip the wiring harness from the cover.
6. Remove the body ground cable and wiring harness assembly mounting bolt at front of transmission and position ground cable and harness out of the way.
7. Plug and/or cap the pipes and the transmission to prevent contamination.

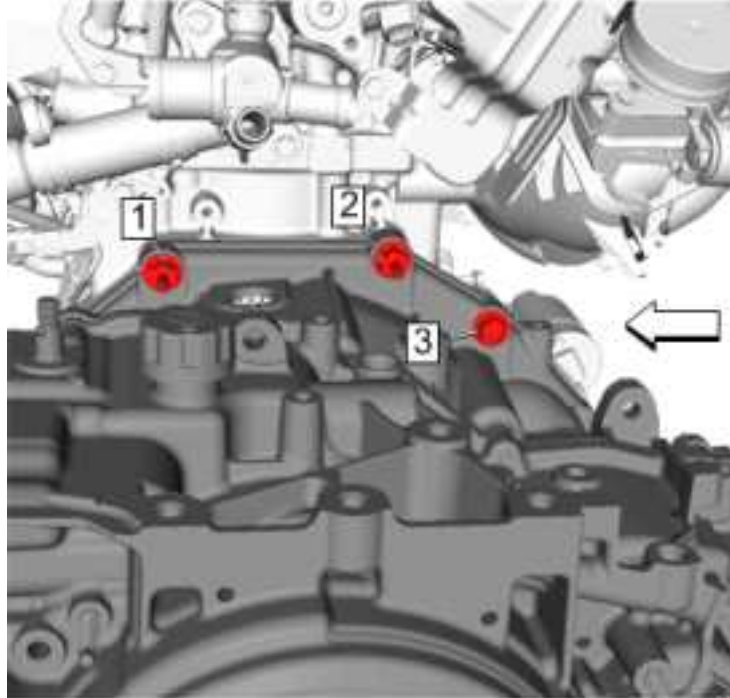


Fig. 119: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

8. Remove the upper transmission to engine bolts (1, 2, 3).
9. Remove the drivetrain and front suspension cradle. Refer to [Drivetrain and Front Suspension Cradle Replacement \(All Wheel Drive\)](#)
10. Disconnect the wheel drive shafts from the transmission. Refer to [Front Wheel Drive Half Shaft Replacement - Left Side](#) , and [Front Wheel Drive Half Shaft Replacement - Right Side \(AWD\)](#).
11. Remove the power transfer unit case. Refer to [Power Transfer Unit Case Replacement \(MNH Transmission with LYX Engine\)](#) [Power Transfer Unit Case Replacement \(M3D Transmission with LTG Engine\)](#) [Power Transfer Unit Case Replacement \(MHG Transmission with LH7 Engine\)](#).
12. Remove the transmission mount strut bracket from the transmission. Refer to [Transmission Mount Strut Bracket Replacement \(All Wheel Drive\)](#)
13. Remove the starter. Refer to [Starter Replacement \(LYX - All Wheel Drive\)](#) [Starter Replacement \(LTG - All Wheel Drive\)](#) [Starter Replacement \(LH7 - All Wheel Drive\)](#).
14. Mark the relationship of the flywheel to the torque converter for reassembly.

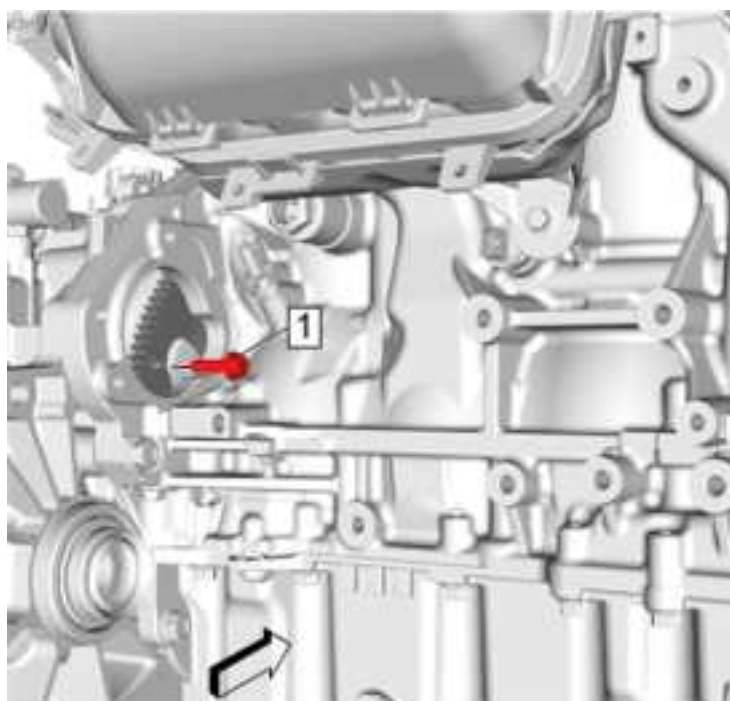


Fig. 120: Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS COMPANY

15. Remove the torque converter to flywheel bolts (1).
16. Lower the vehicle.
17. Install the engine support fixture. Refer to [Engine Support Fixture](#)
18. Remove the left transmission mount to transmission bolts. Refer to [Transmission Mount Replacement \(Left Side M3U\)](#)[Transmission Mount Replacement \(Left Side M3D/M3H\)](#)
19. Lower the transmission side with the support fixture to allow clearance for removal.
20. Unclip the engine wiring harness from the transmission.
21. Raise the vehicle.
22. Use a transmission jack in order to support the transmission.
23. Remove the oil pump flow control valve heat shield. Refer to [Oil Pump Flow Control Valve Heat Shield Replacement](#)

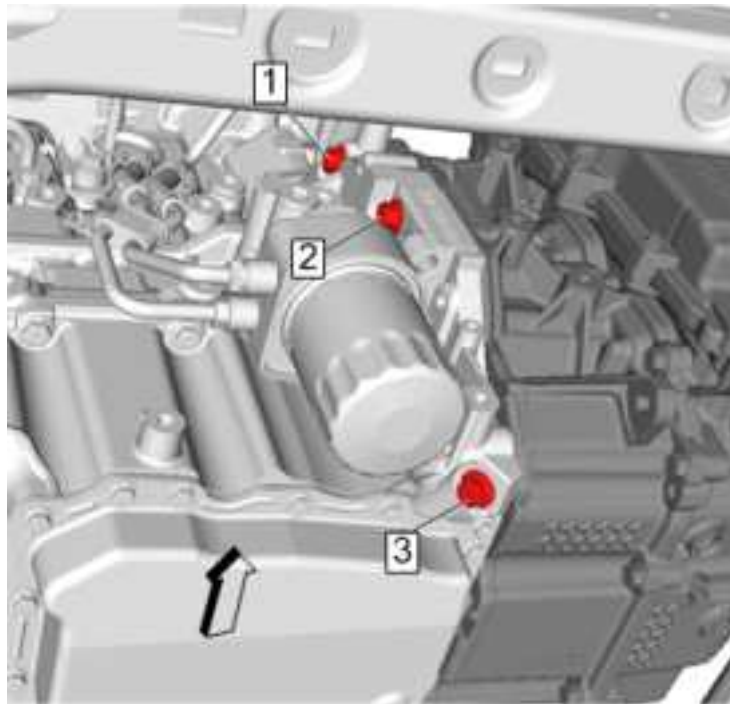
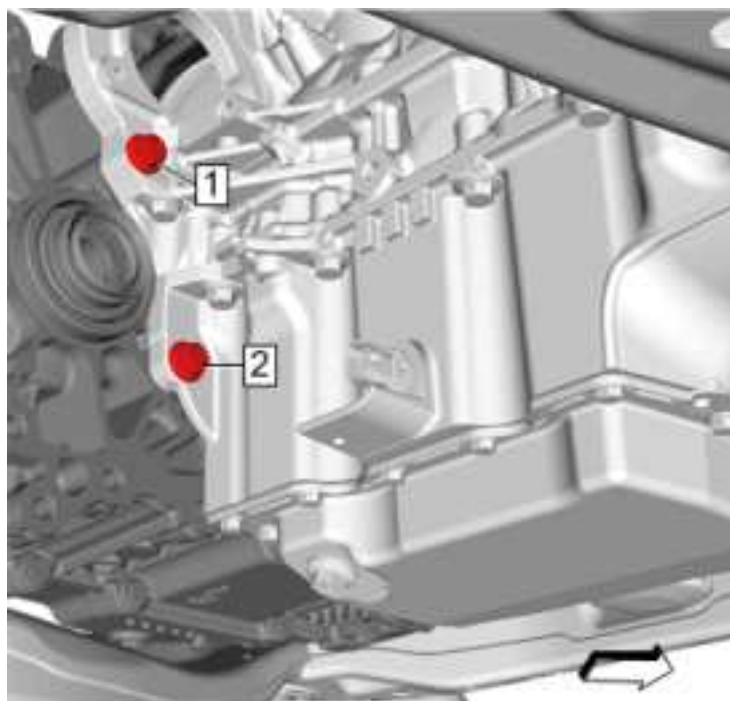


Fig. 121: Front Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

24. Remove the front transmission to engine bolts (1, 2, 3).



25. Remove the lower transmission fasteners (1, 2).

NOTE: Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

26. Separate the transmission from the engine.

27. Lower the transmission with the transmission jack far enough to remove the transmission.

28. Transfer components as necessary.

29. Flush and flow test the transmission oil cooler and lines. Refer to [Transmission Fluid Cooler Flow Test and Flushing](#)

Installation Procedure

1. Raise the transmission with the transmission jack and position the transmission to the engine.

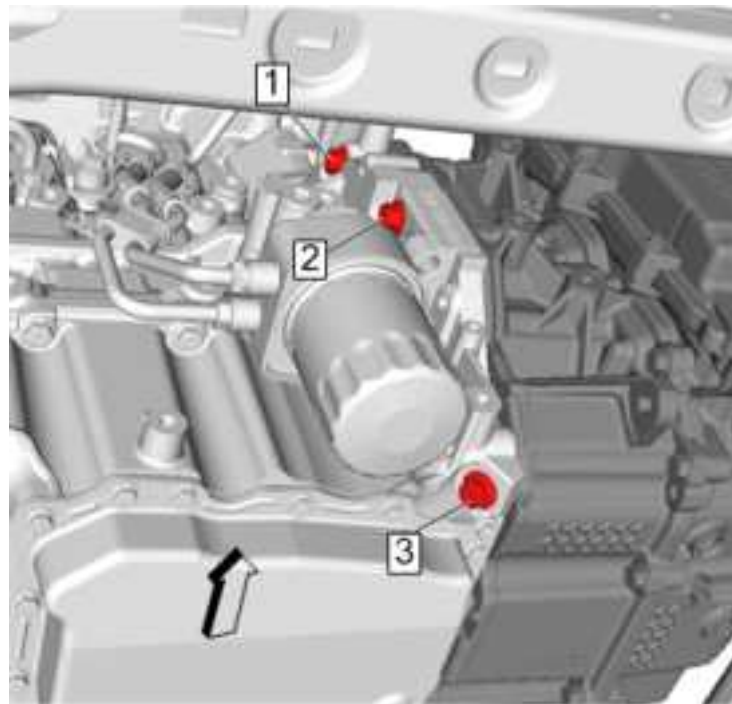


Fig. 123: Front Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

2. Install the transmission bolts (1, 2, 3) and tighten to 58 N.m (43 lb ft).

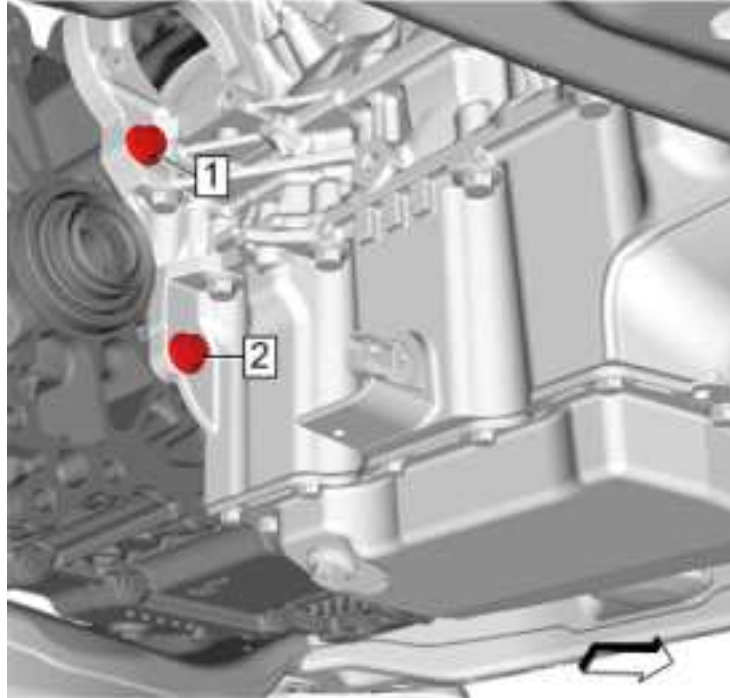


Fig. 124: Lower Transmission Fasteners

Courtesy of GENERAL MOTORS COMPANY

3. Install the front transmission to engine bolt (1, 2) and tighten to 58 N.m (43 lb ft).
4. Install the oil pump flow control valve heat shield. Refer to [Oil Pump Flow Control Valve Heat Shield Replacement](#)
5. Remove the transmission jack.
6. Align the mark of the flywheel to the mark on the torque converter for reassembly.

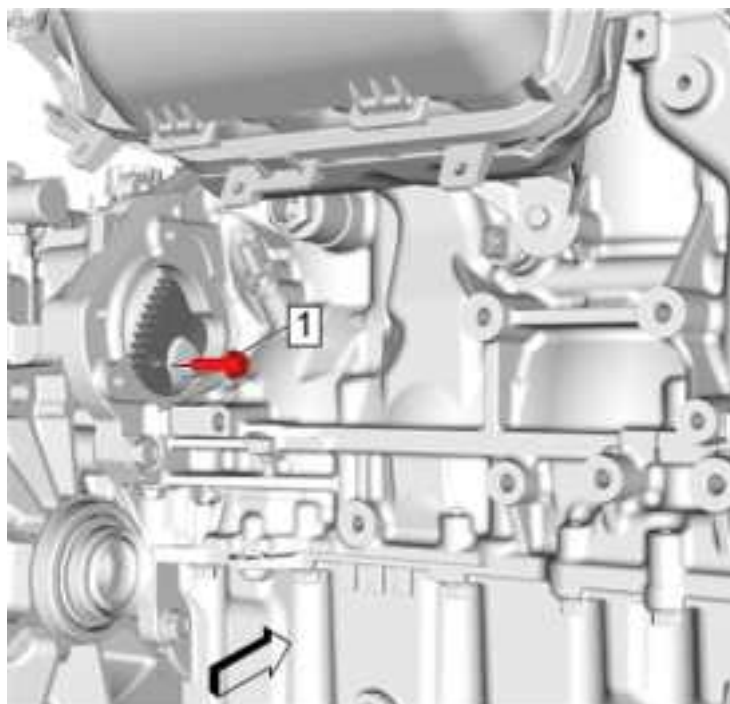


Fig. 125: Torque Converter To Flywheel Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#)

7. Install the torque converter to flywheel bolts (1) and tighten to 60 N.m (44 lb ft).
8. Install the starter. Refer to [Starter Replacement \(LYX - All Wheel Drive\)](#) [Starter Replacement \(LTG - All Wheel Drive\)](#) [Starter Replacement \(LH7 - All Wheel Drive\)](#)

9. Install the left transmission mount to the transmission. Refer to [Transmission Mount Replacement \(Left Side M3U\)](#)[Transmission Mount Replacement \(Left Side M3D/M3H\)](#).
10. Install the wheel drive shafts to the transmission. Refer to [Front Wheel Drive Half Shaft Replacement - Left Side](#) , and [Front Wheel Drive Half Shaft Replacement - Right Side \(AWD\)](#).
11. Install the power transfer unit case. Refer to [Power Transfer Unit Case Replacement \(MNH Transmission with LYX Engine\)](#) [Power Transfer Unit Case Replacement \(M3D Transmission with LTG Engine\)](#) [Power Transfer Unit Case Replacement \(MHG Transmission with LH7 Engine\)](#).
12. Install the drivetrain and front suspension cradle. Refer to [Drivetrain and Front Suspension Cradle Replacement \(All Wheel Drive\)](#).
13. Install the transmission mount strut bracket to the transmission. Refer to [Transmission Mount Strut Bracket Replacement \(All Wheel Drive\)](#).
14. Remove the engine support fixture. Refer to [Engine Support Fixture](#)

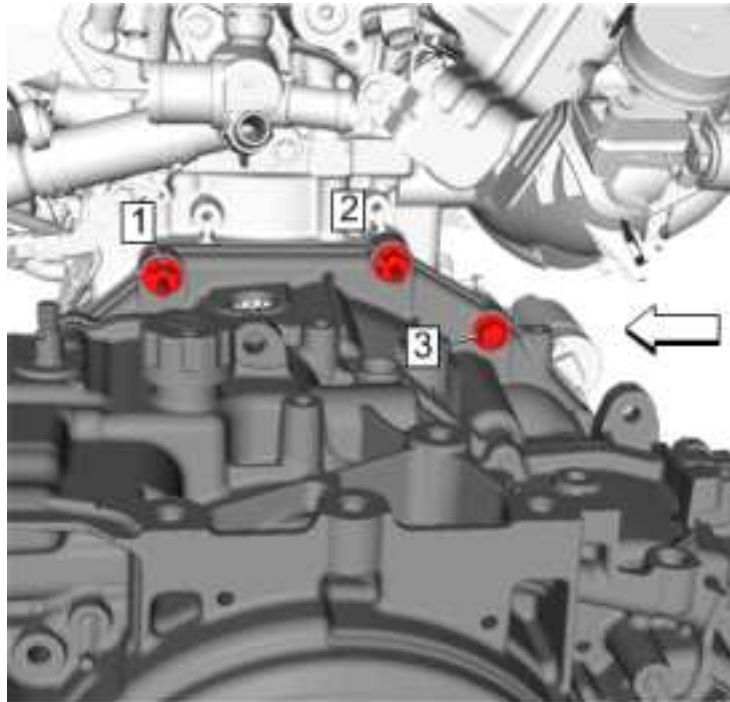
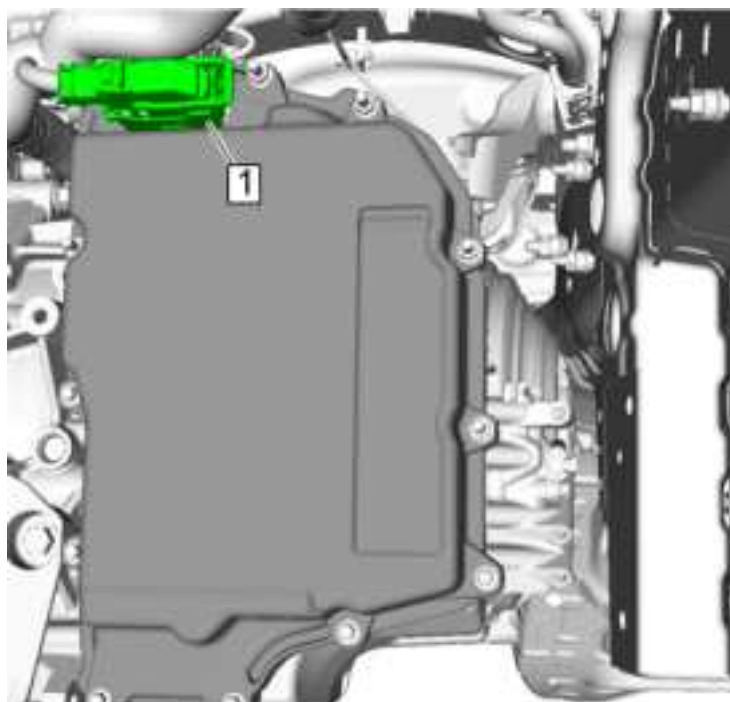


Fig. 126: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

15. Install the upper transmission to engine bolts (1, 2, 3) and tighten to 58 N.m (43 lb ft).



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

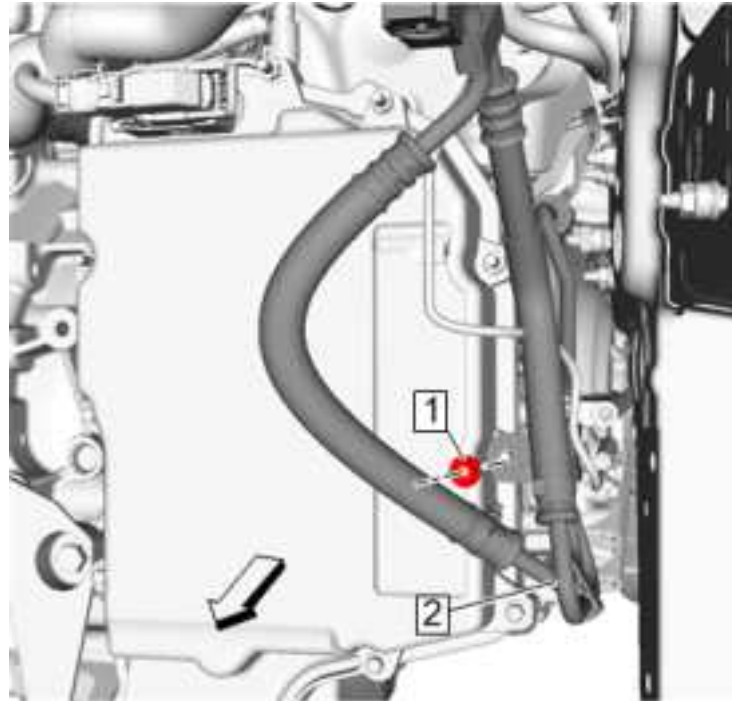


Fig. 128: Transmission Fluid Cooler Pipes And Nut
Courtesy of GENERAL MOTORS COMPANY

17. Install the transmission fluid cooler outlet pipes (2) to the transmission. Refer to [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(MNH, MHG\)](#). [Transmission Fluid Cooler Inlet and Outlet Pipe Replacement \(M3D, M3H, M3U\)](#).
18. Install the transmission fluid cooler inlet pipe nut (1) to the transmission and tighten to 9 N.m (80 lb in).
19. Clip the engine wiring harness to the transmission.
20. Install the transmission range select lever cable to the transmission. Refer to [Automatic Transmission Range Selector Lever Cable Replacement](#).
21. Adjust the automatic transmission range selector lever cable. Refer to [Transmission Fluid Drain and Fill](#).
22. Fill the transmission with fluid. Refer to [Transmission Fluid Drain and Fill](#).
23. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to [Service Programming System \(SPS\)](#).

NOTE: The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

24. Perform the Transmission Service Fast Learn procedure. Refer to [Transmission Service Fast Learn Procedure](#).
25. Reprogram the transmission. Refer to [Solenoid Valve Characterization Reprogramming](#).

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Schematic And Routing Diagrams - Automatic Transmission Controls Schematics - Equinox & Terrain

SCHEMATIC WIRING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS WIRING SCHEMATICS (9T45 (M3U) OR 9T50 (M3D M3H))

Power, Ground, Serial Data, MIL and Fluid Temperature

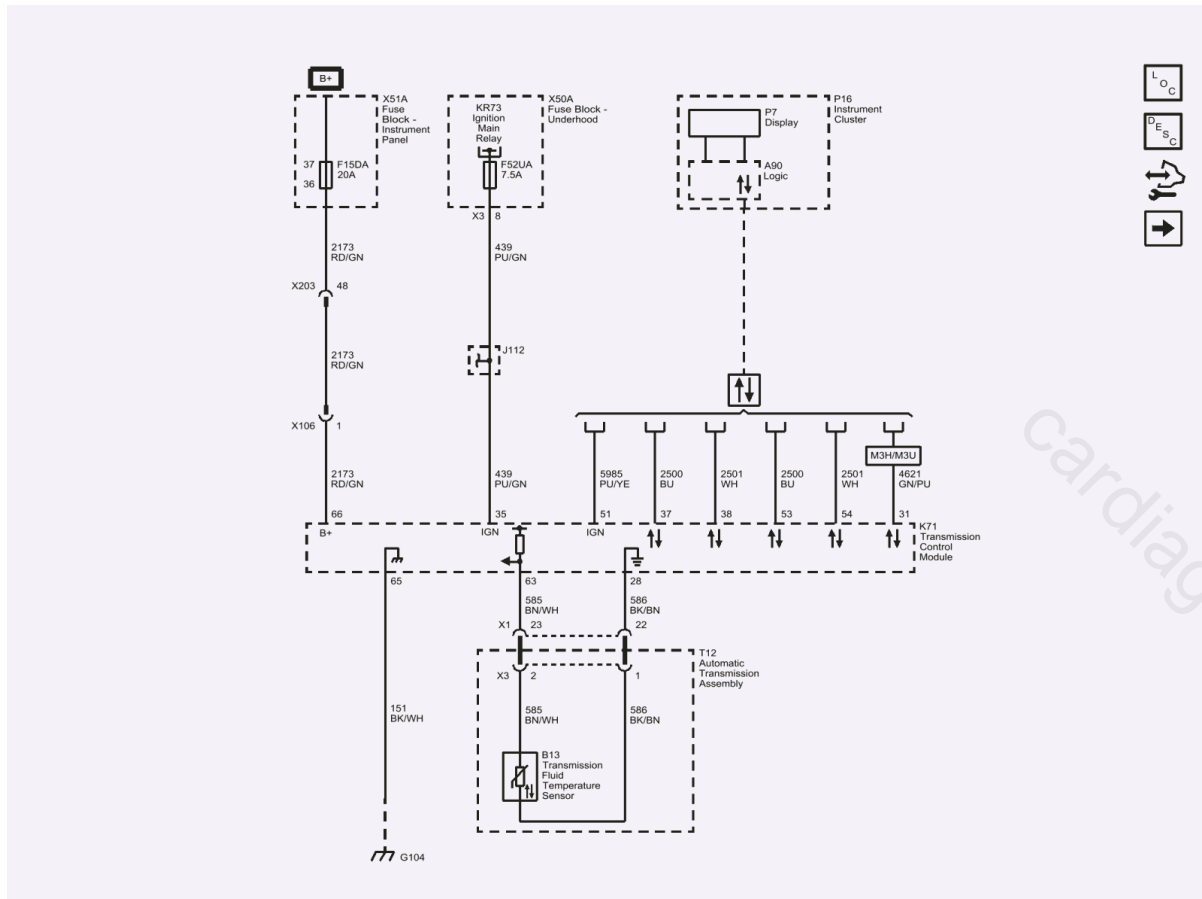


Fig. 1: Power, Ground, Serial Data, MIL and Fluid Temperature
Courtesy of GENERAL MOTORS COMPANY

Control Solenoid Vales (1 of 2)

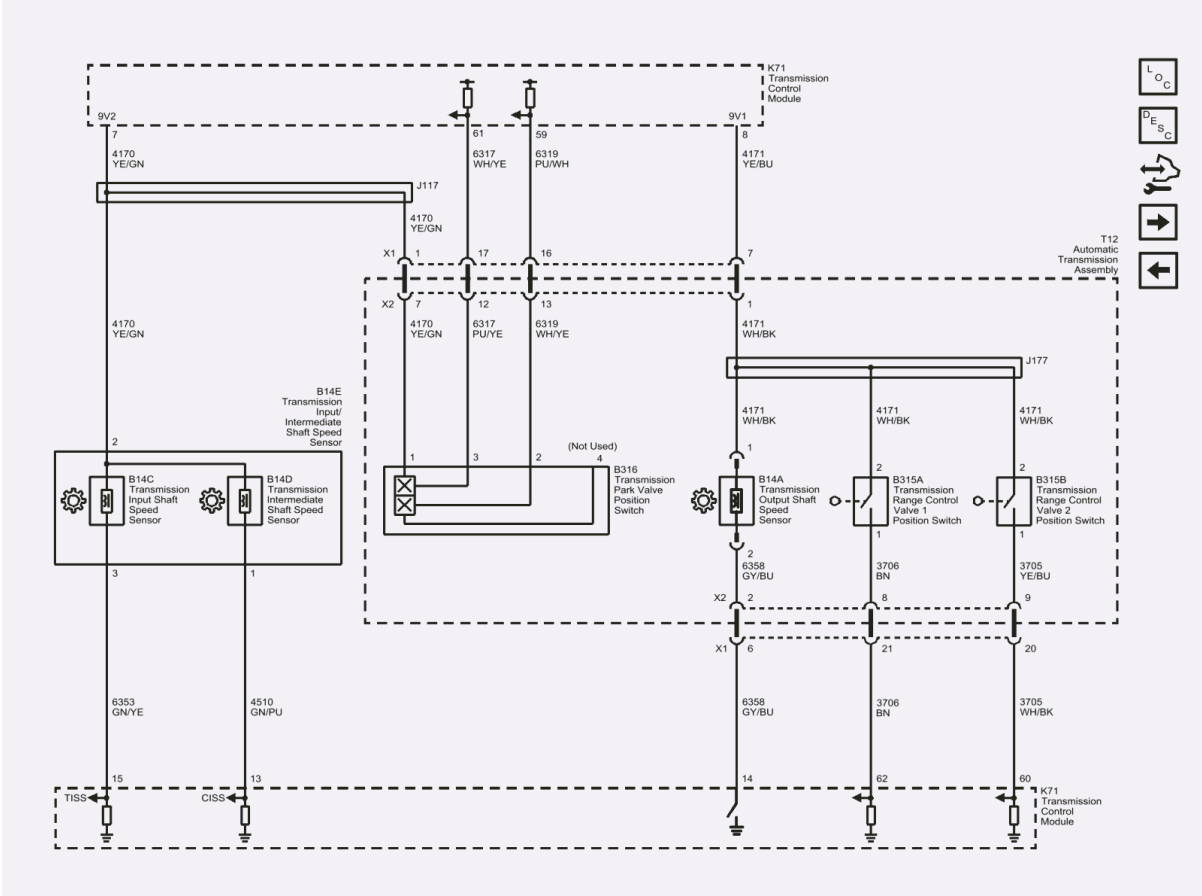


Fig. 6: Speed Sensors, Range and Park Valve Position (ETRS).
 Courtesy of GENERAL MOTORS COMPANY

Shift Controls (with EPH)

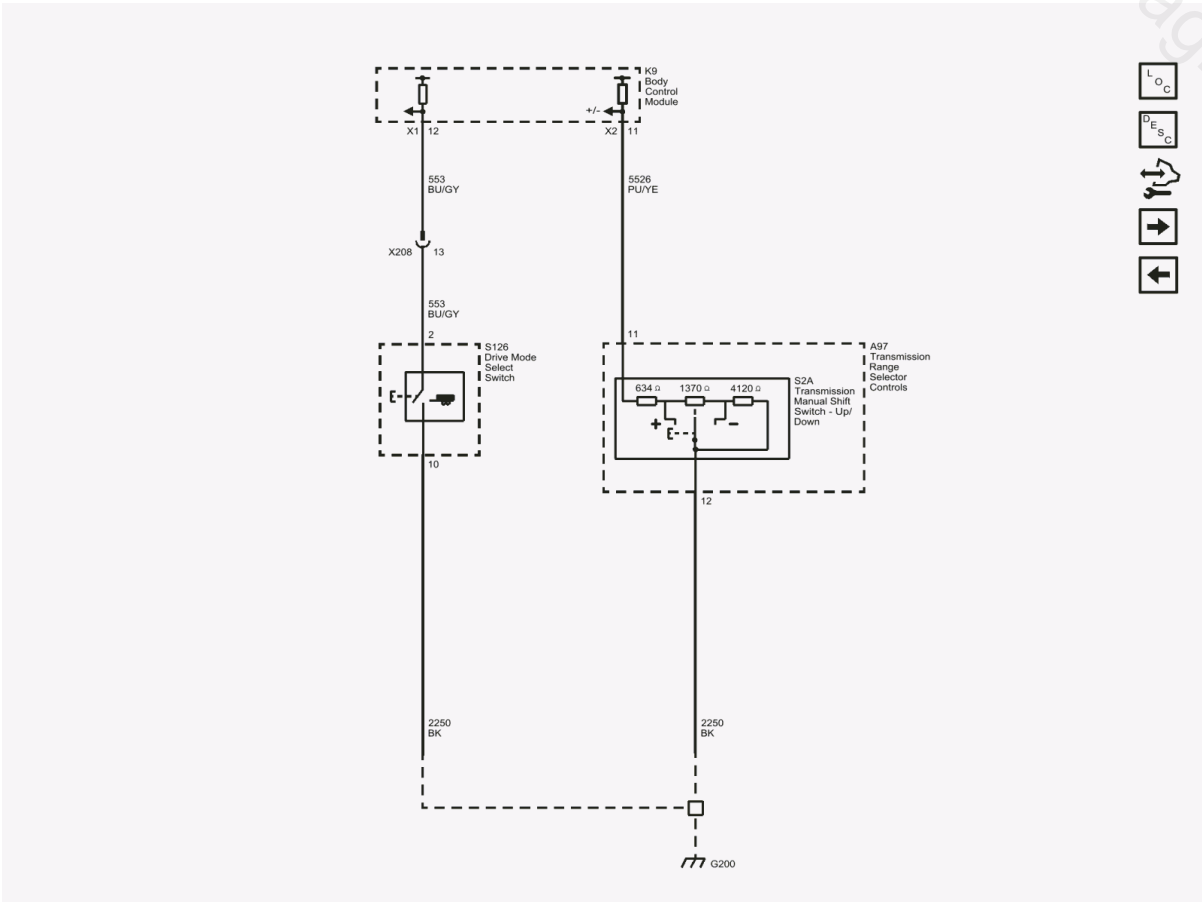


Fig. 7: Shift Controls (with EPH).
 Courtesy of GENERAL MOTORS COMPANY

Shift Controls and Indicator (without EPH)

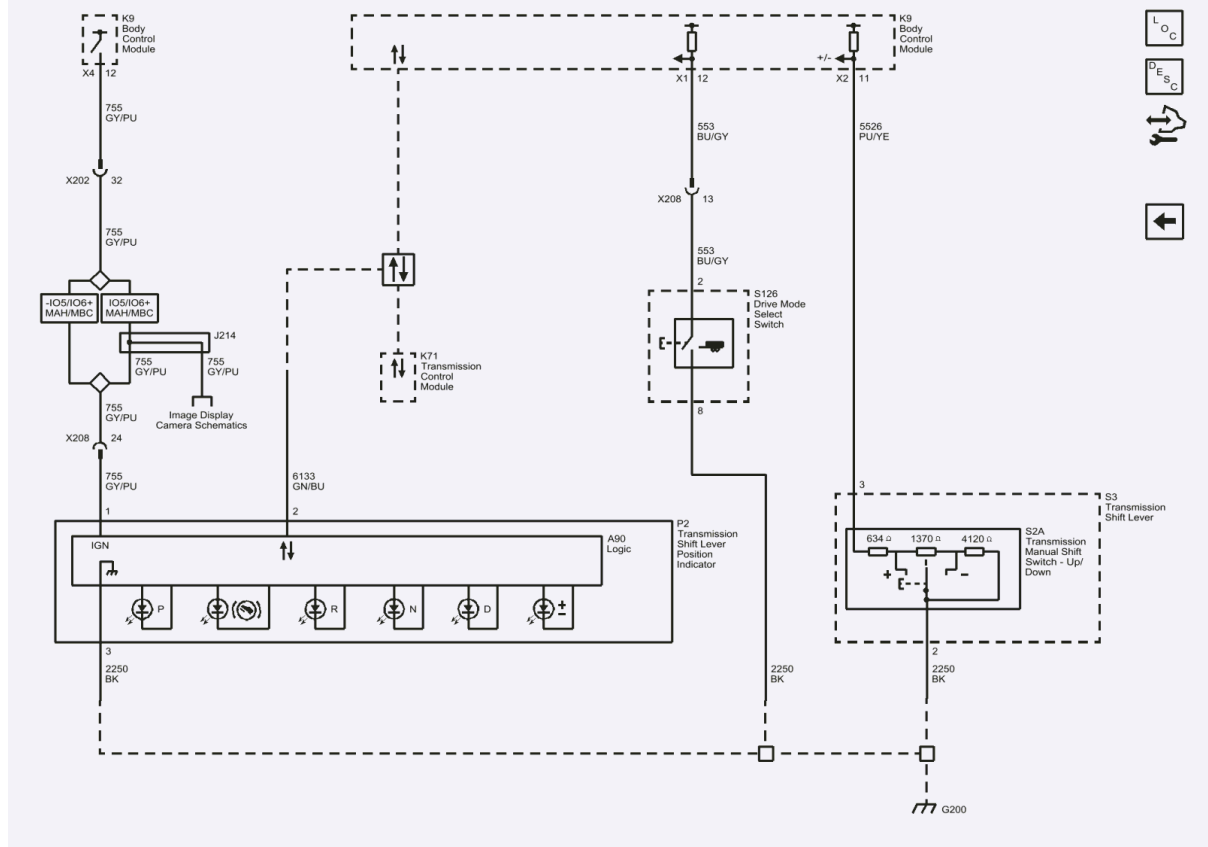


Fig. 8: Shift Controls and Indicator (without EPH).
 Courtesy of GENERAL MOTORS COMPANY

[Back To Article](#)

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Special Tools And Equipment - Special Tools - Equinox & Terrain

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

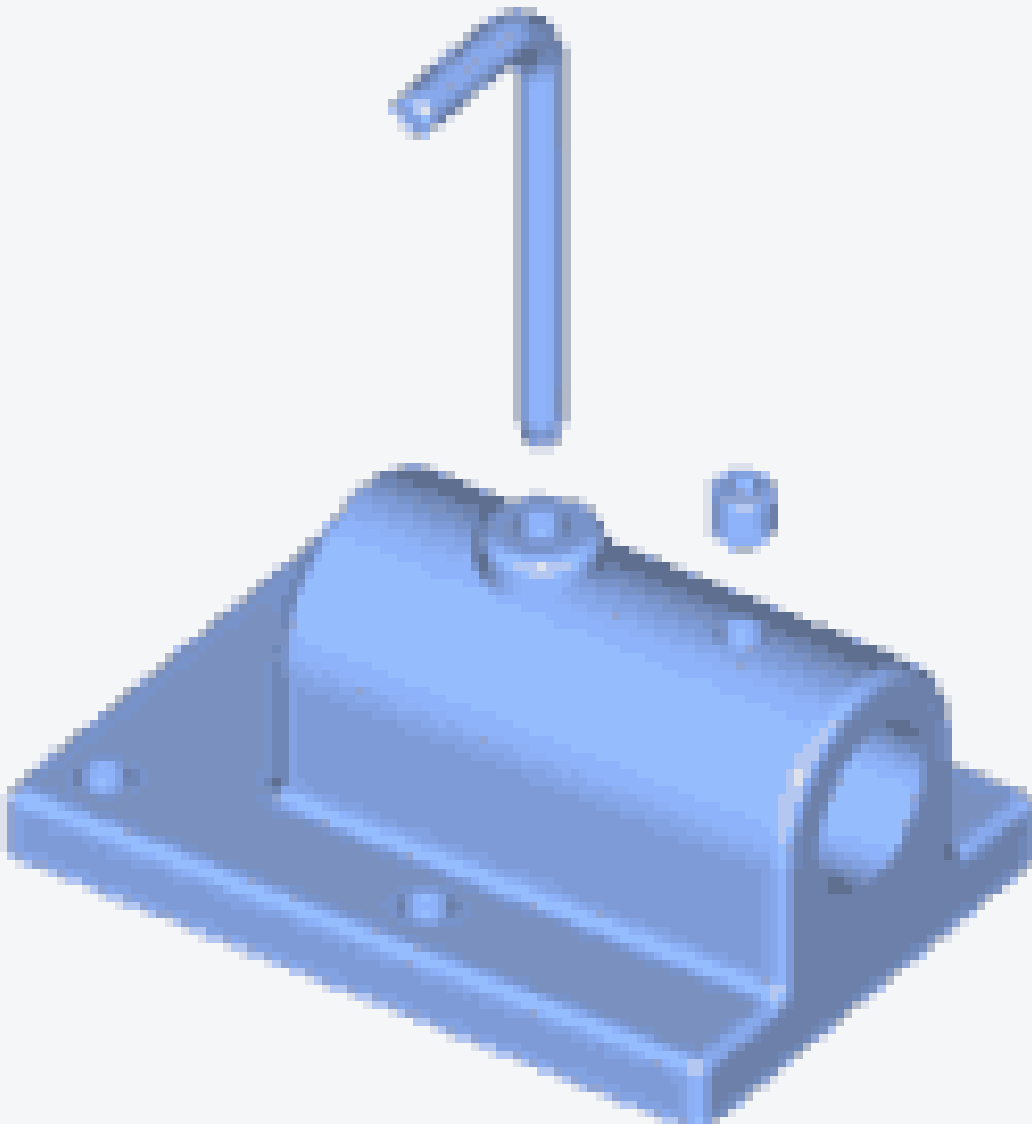
Illustration	Tool Number/Description
	DT-3289-20 J-3289-20 KM-113-2-A Holding Fixture

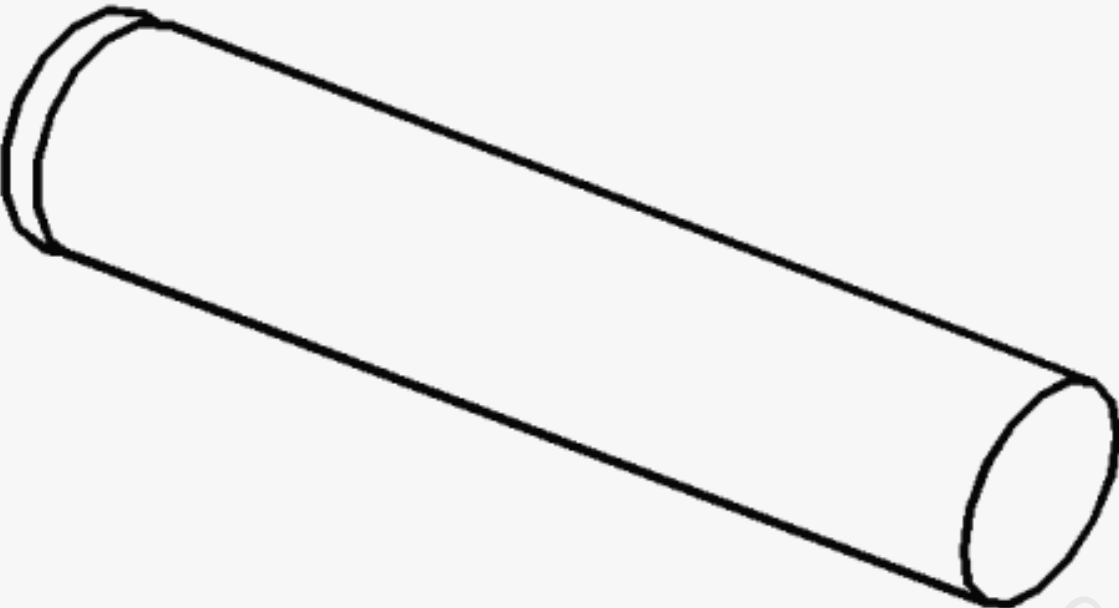
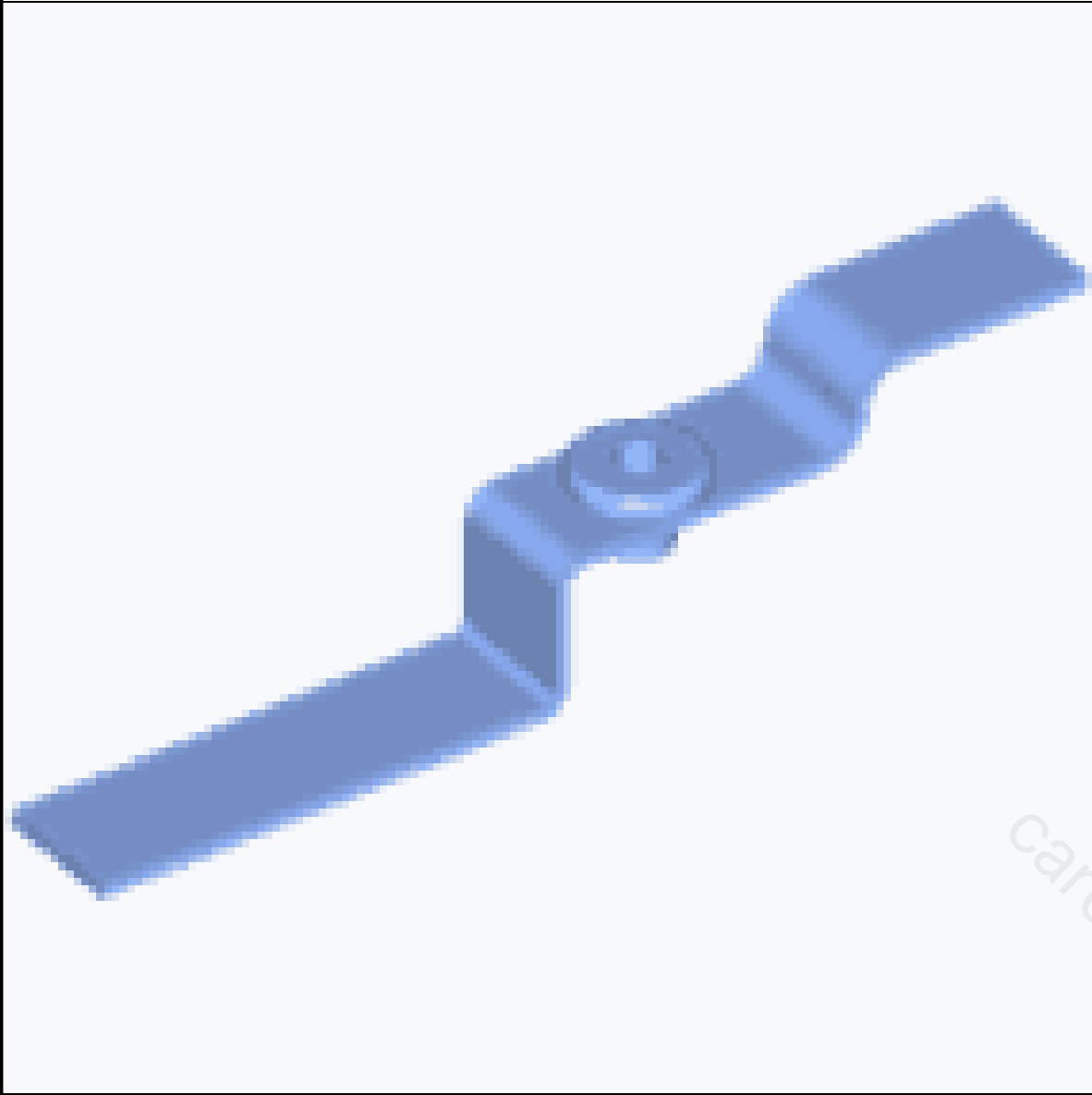
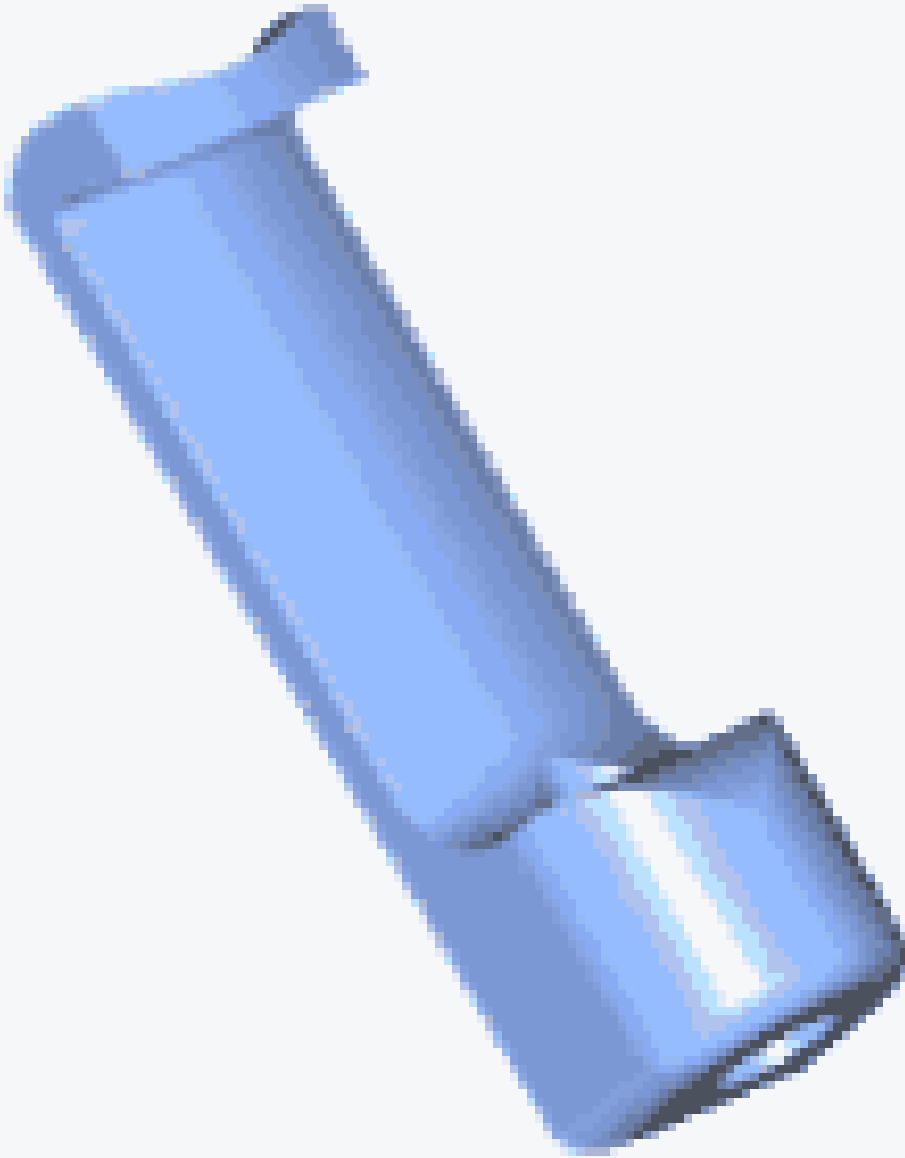
Illustration	Tool Number/Description
	DT-5590 J-5590 Bearing Installer

Illustration	Tool Number/Description
	DT-21366 J-21366 Converter Holding Strap

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Illustration	Tool Number/Description
	DT-23129 J-23129 KM-586 Universal Seal Remover

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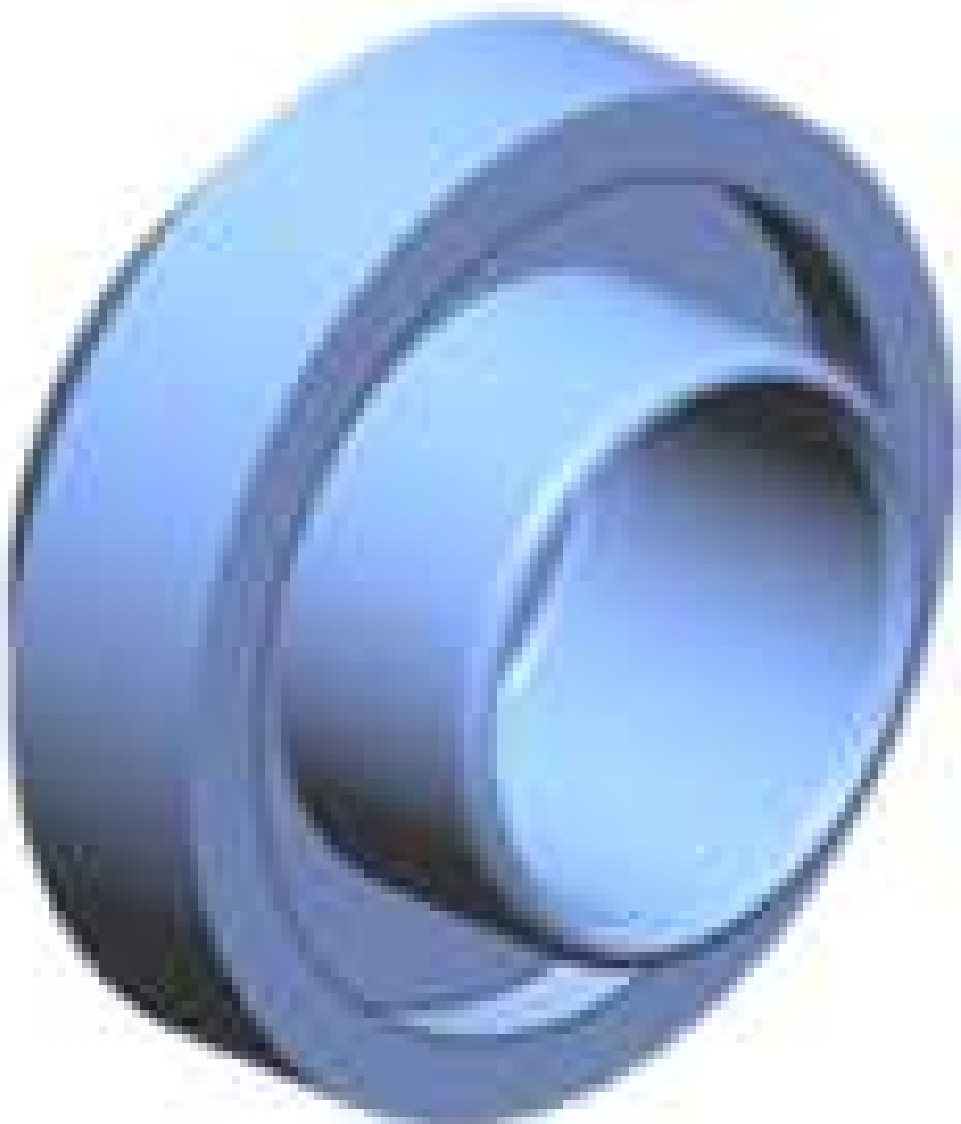
Illustration	Tool Number/Description
	DT-24384-A J-24384-A Oil Seal Installer
	DT-28585 J-28585 KM-J-28585 Snap Ring Remover

Illustration	Tool Number/Description
 A blue medical instrument, likely a suture needle, is shown diagonally. The needle has a curved tip and a handle with a small ring near the tip. The background is light blue.	

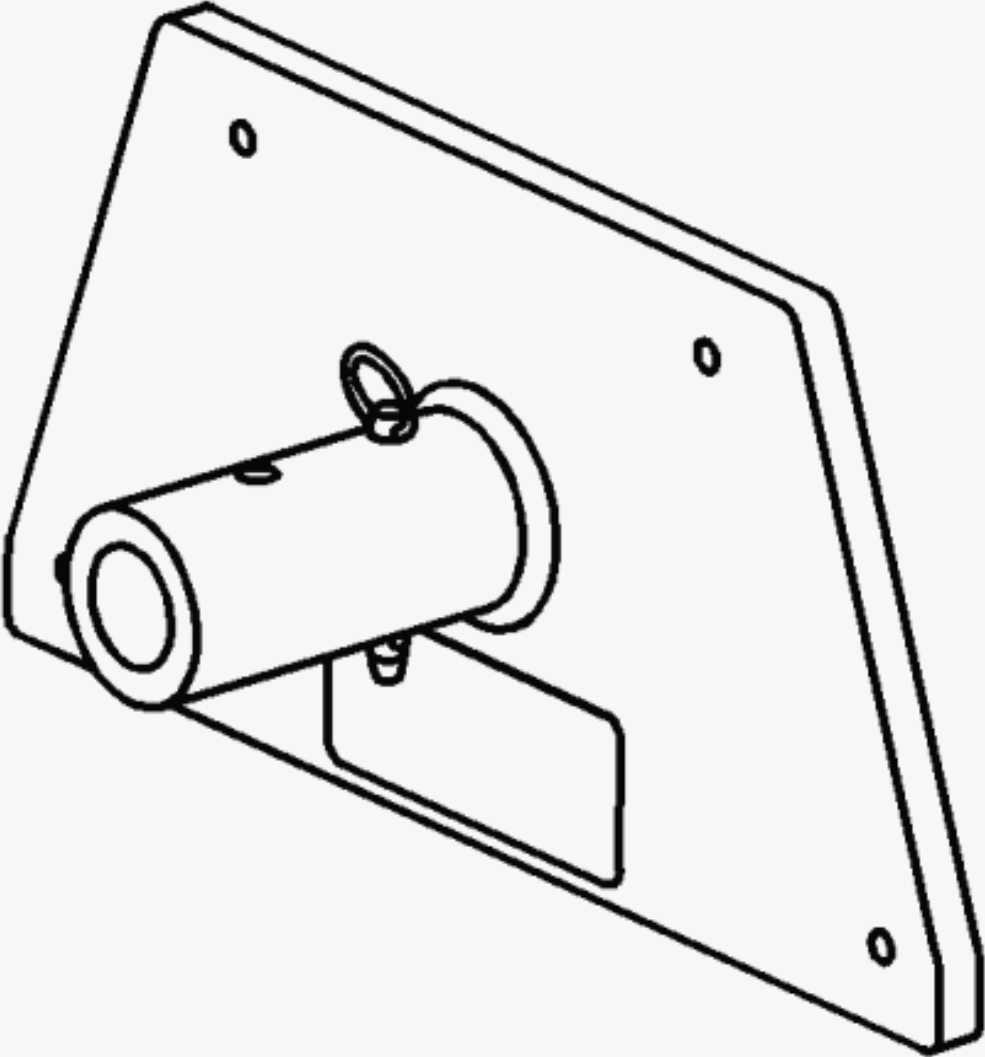
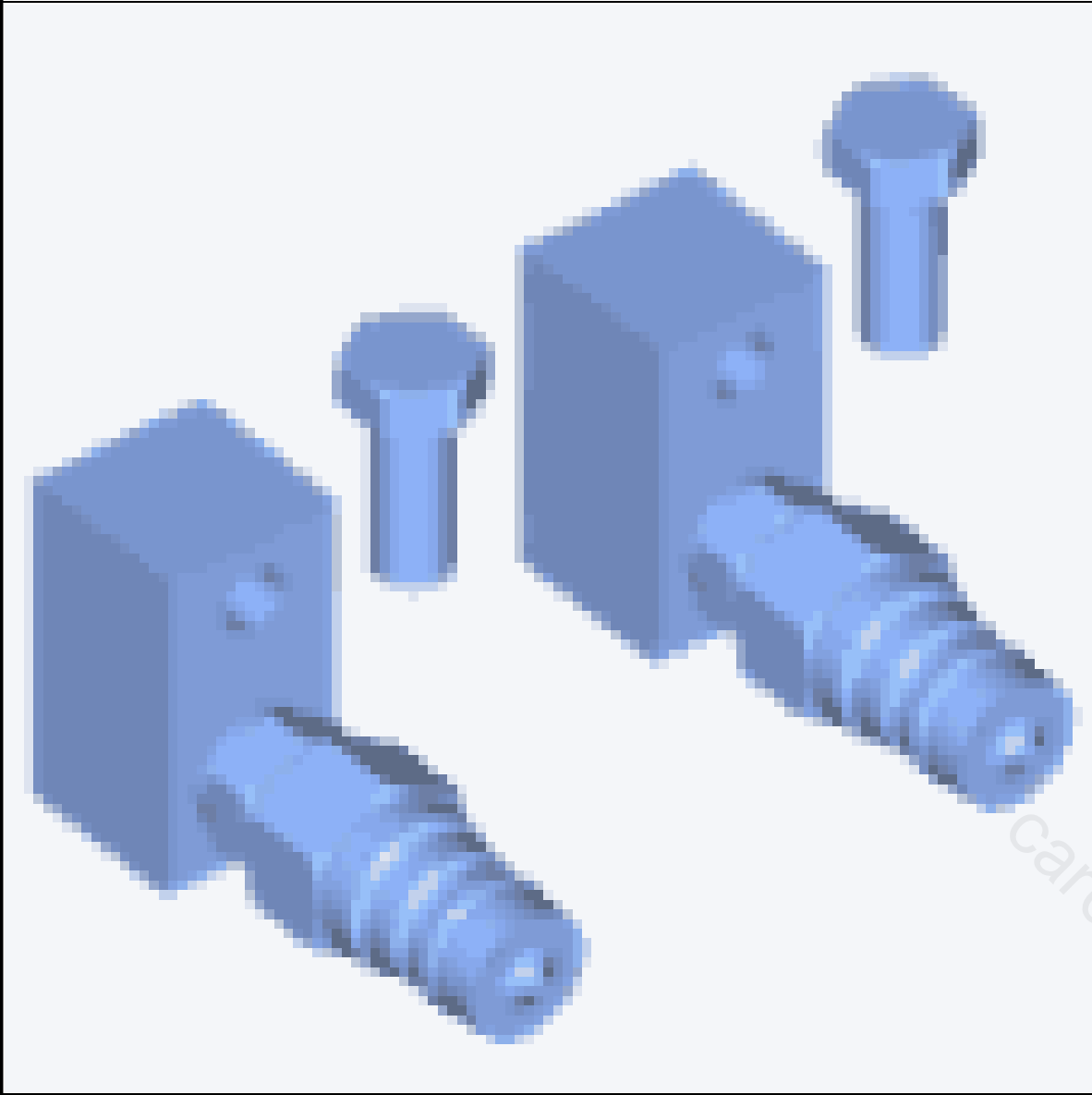
Illustration	Tool Number/Description
	DT-39890 J-39890 Transmission Holding Fixture Adapter
	DT-45096 J-45096 Transmission Oil Cooling System Flush and Flow Test Tool



Illustration	Tool Number/Description
	DT-45096-50 J-45096-50 Transmission Cooling Flush Adapter

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Illustration	Tool Number/Description
	DT-45201 DT-48203 J-45201 Cooler Line Seal Remover cardiagn.com

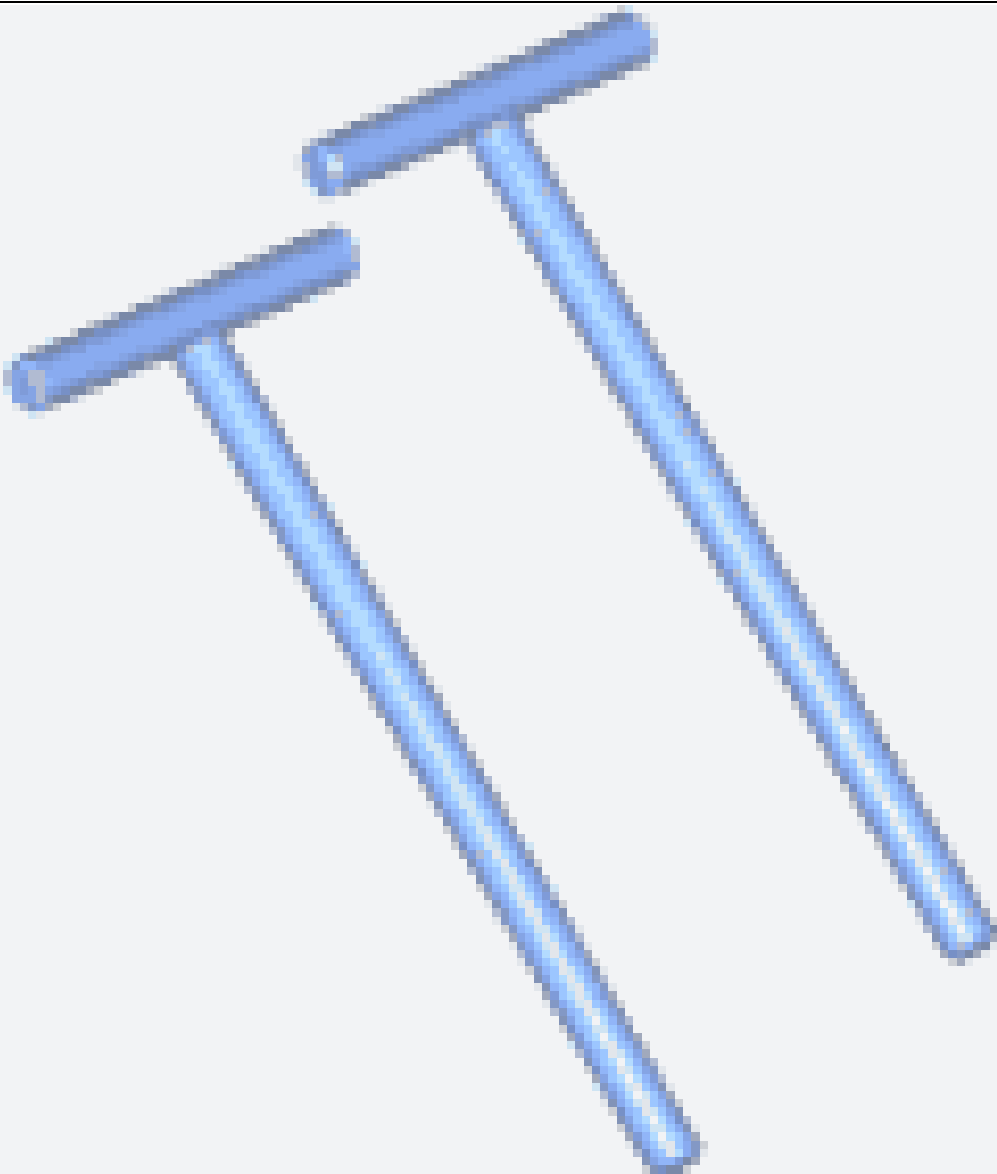
Illustration	Tool Number/Description
 The illustration shows two identical blue T-shaped lifting handles. Each handle consists of a long, cylindrical shaft and a shorter, wider T-shaped crossbar at one end. The handles are positioned diagonally, with one handle in the foreground and the other slightly behind it to the right. The background is a light gray gradient.	DT-46409 J-46409 KM-922 Torque Converter Lifting Handles



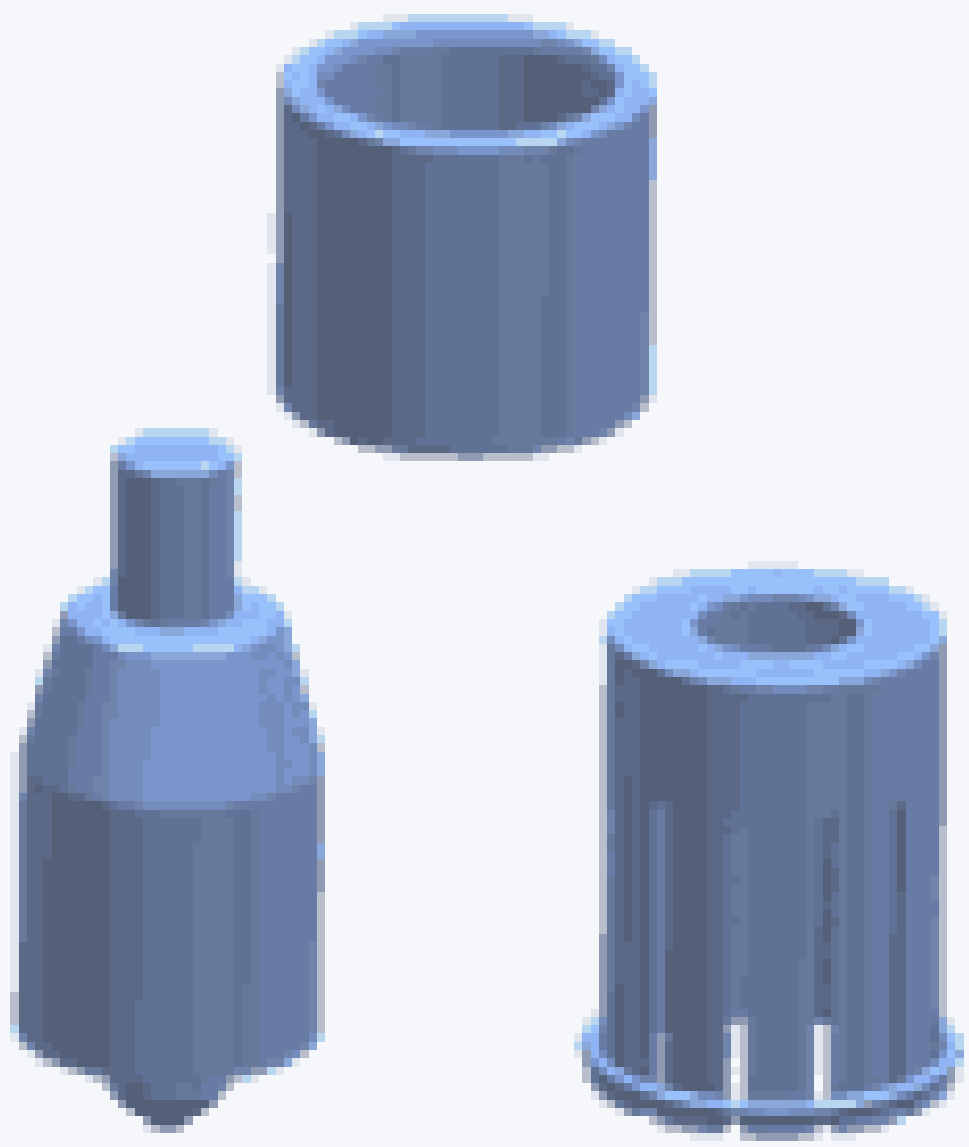
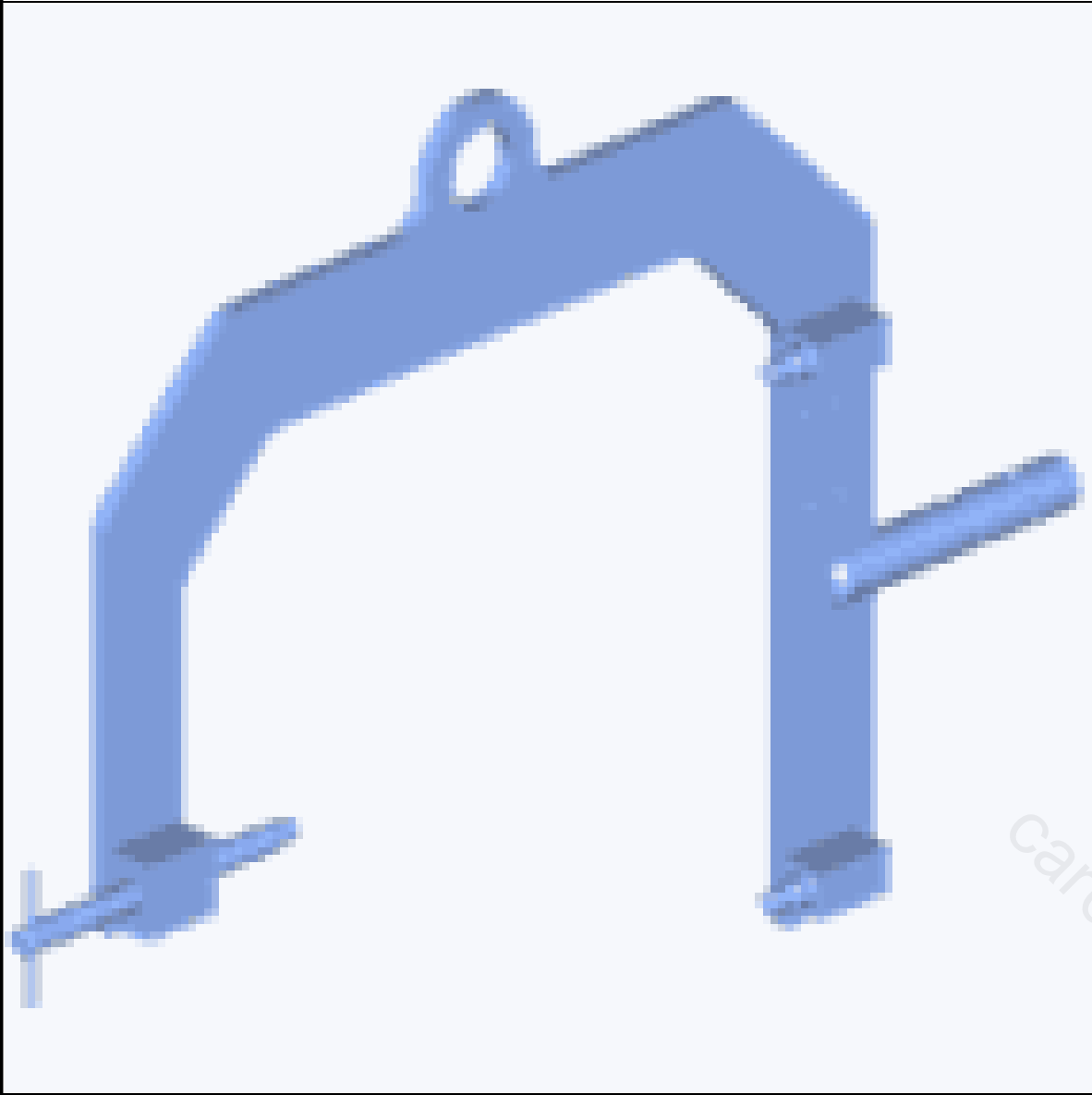
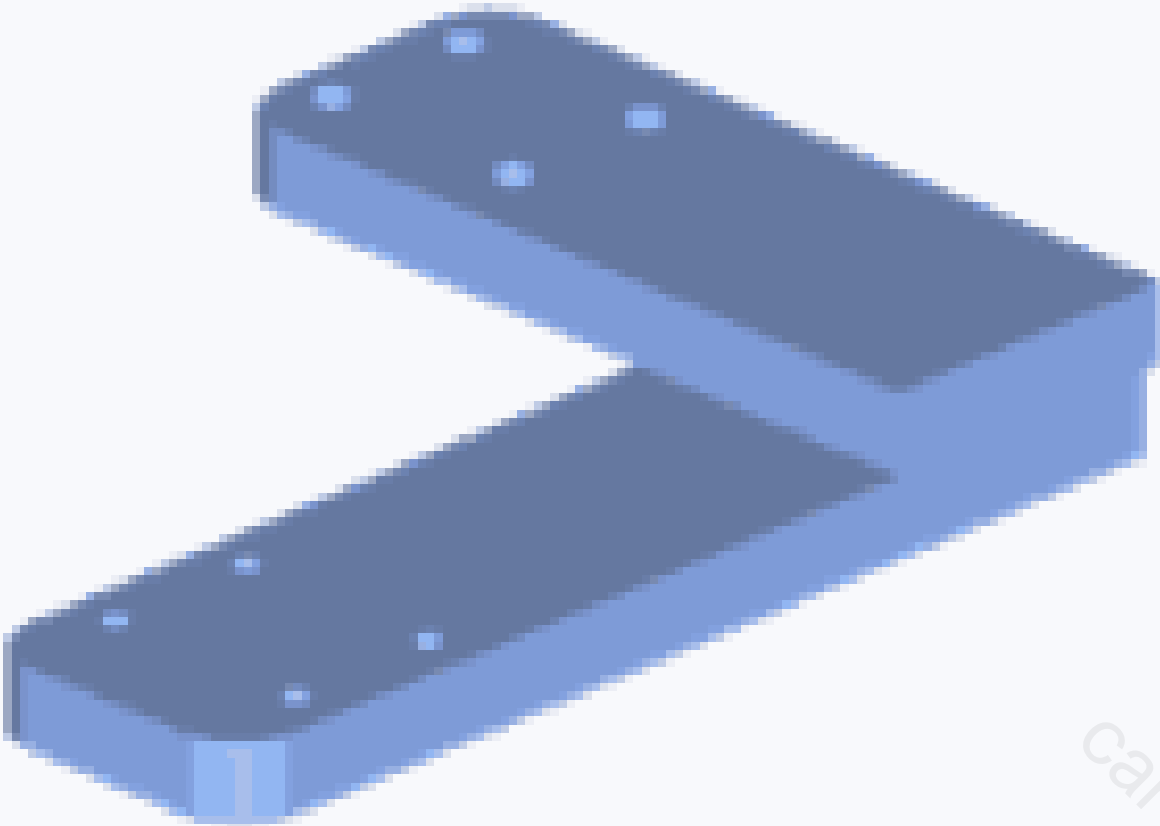
Illustration	Tool Number/Description
	DT-46620 J-46620 Seal Installer



Illustration	Tool Number/Description
	DT-46625 J-46625 Holding Fixture

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Illustration	Tool Number/Description
	DT-46625-10 J-46625-10 Holding Fixture Adapter

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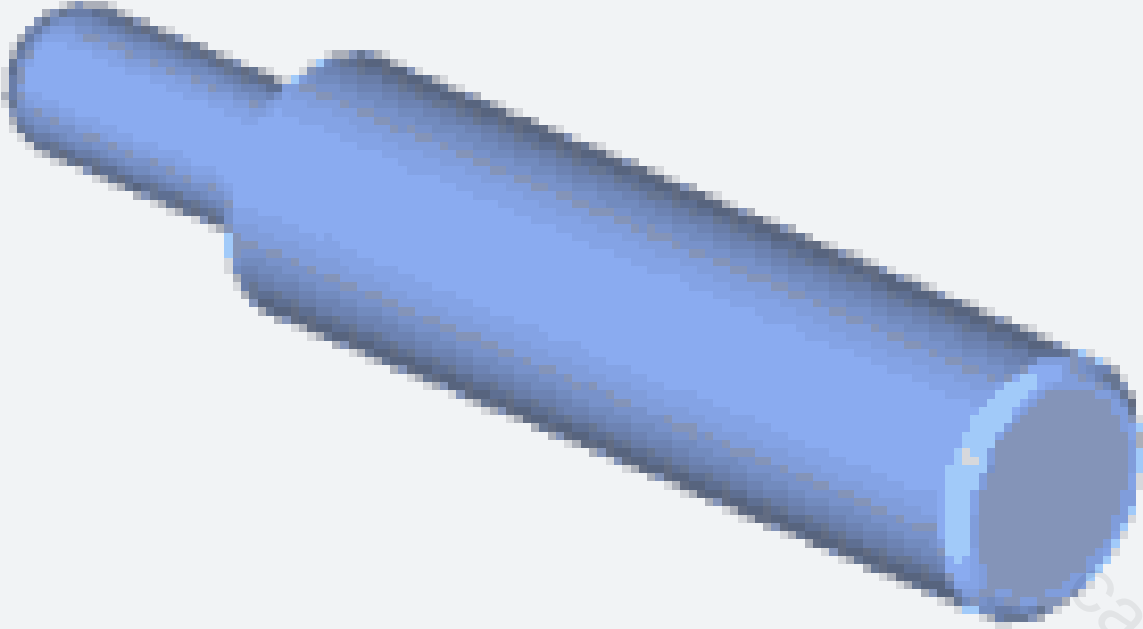
Illustration	Tool Number/Description
	DT-46626 J-46626 Seal Installer



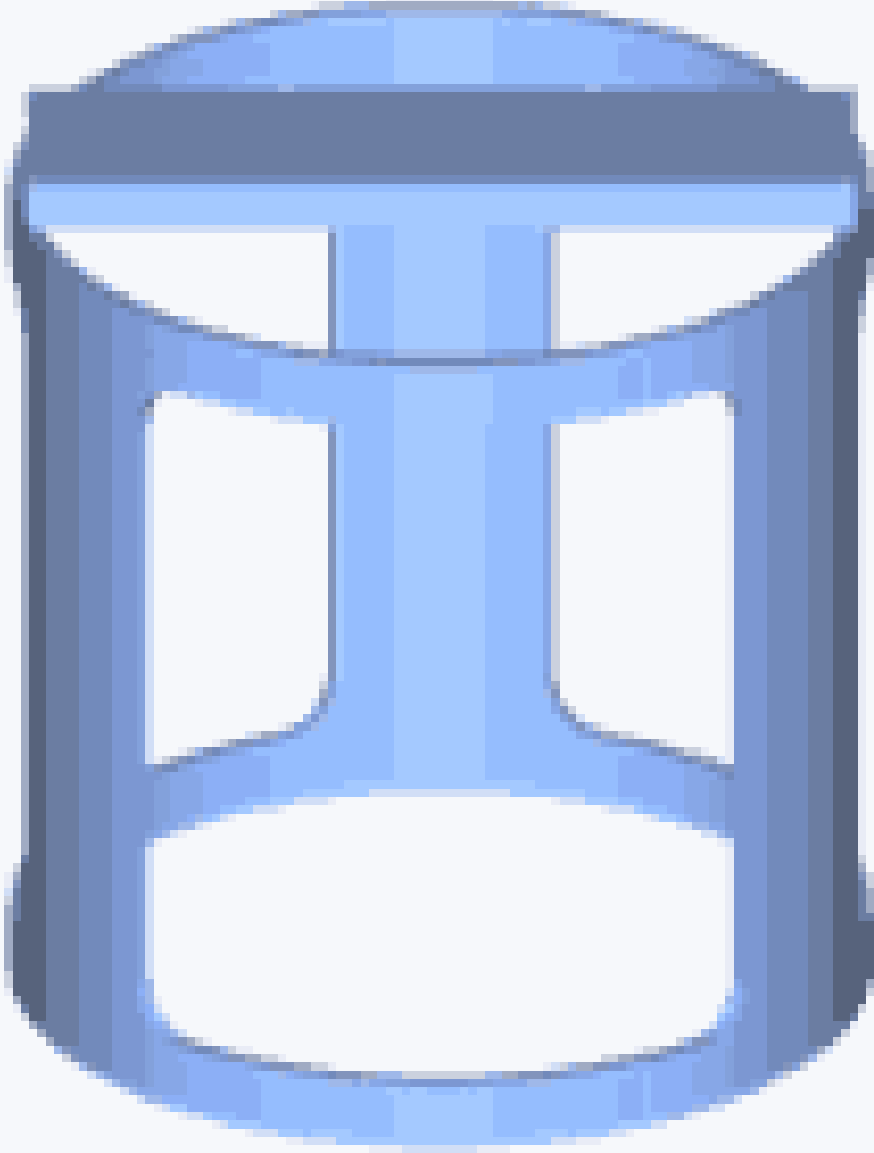
Illustration	Tool Number/Description
	DT-47694 Spring Compressor cardiagn.com

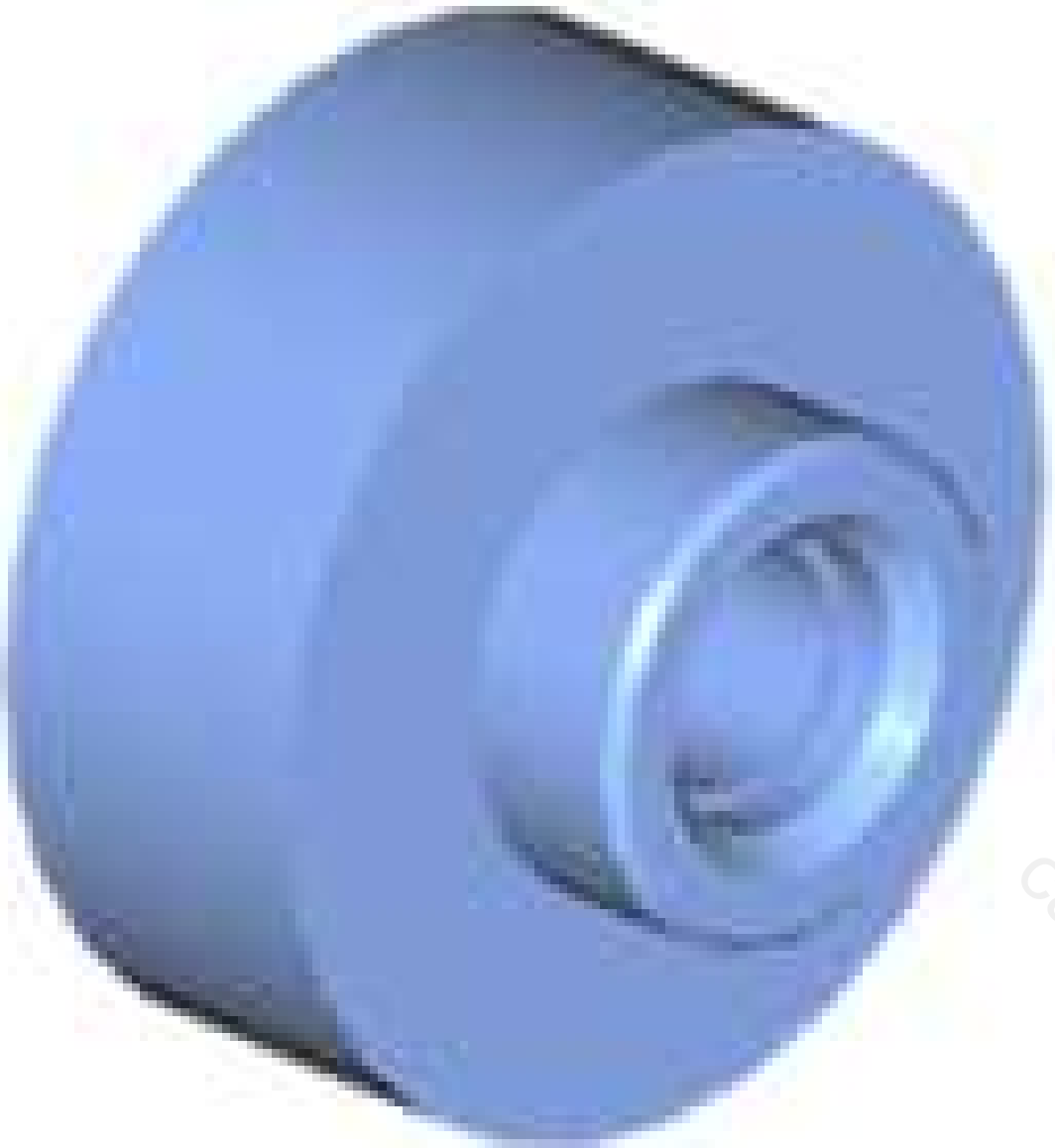
Illustration	Tool Number/Description
 A blue, cylindrical seal installer tool. It has a flared, multi-ribbed end for gripping a seal. The tool is shown from a perspective view, highlighting its rounded, bulbous shape and the concentric rings on the narrower section.	DT-47790 Seal Installer cardiagn.com

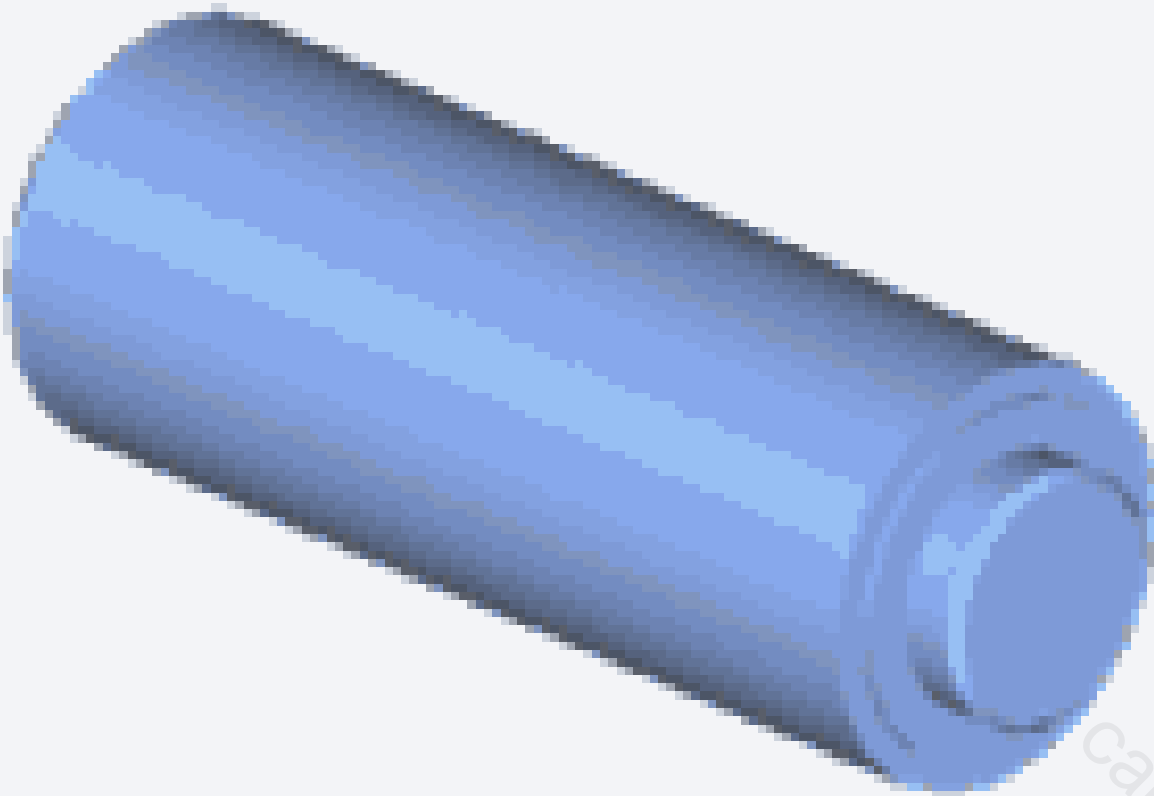
Illustration	Tool Number/Description
	DT-47792 Seal Installer



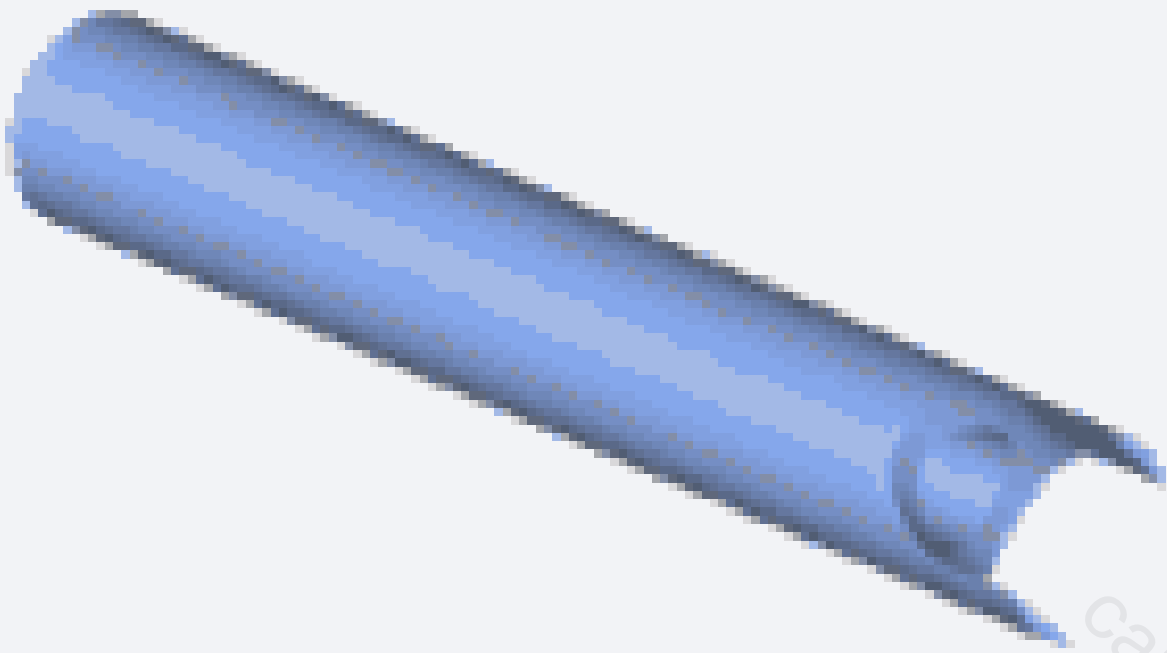
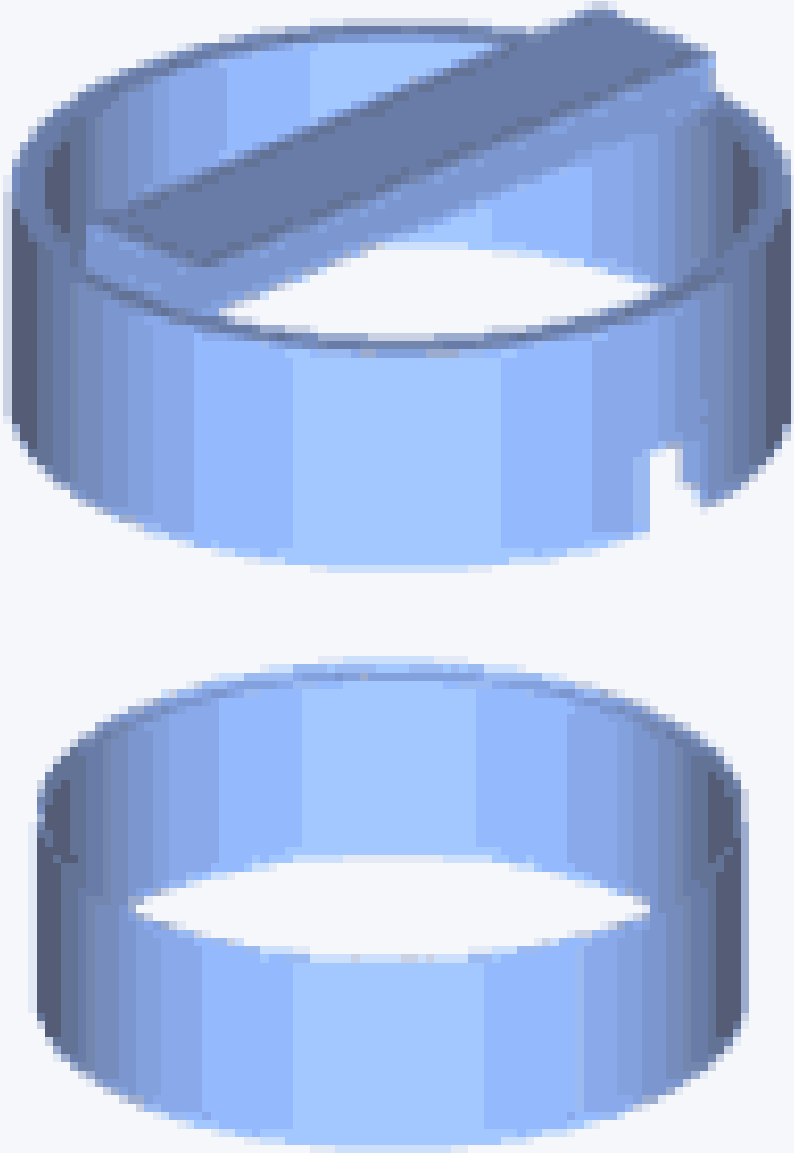
Illustration	Tool Number/Description
 A blue, cylindrical differential rotating tool, likely a catheter or probe, shown at an angle. The tool has a textured surface and a small circular feature near the tip. A watermark 'cardiagn.com' is visible diagonally across the lower right portion of the illustration.	DT-47793 Differential Rotating Tool

Illustration	Tool Number/Description
	DT-47794 Spring Compressor cardiagn.com

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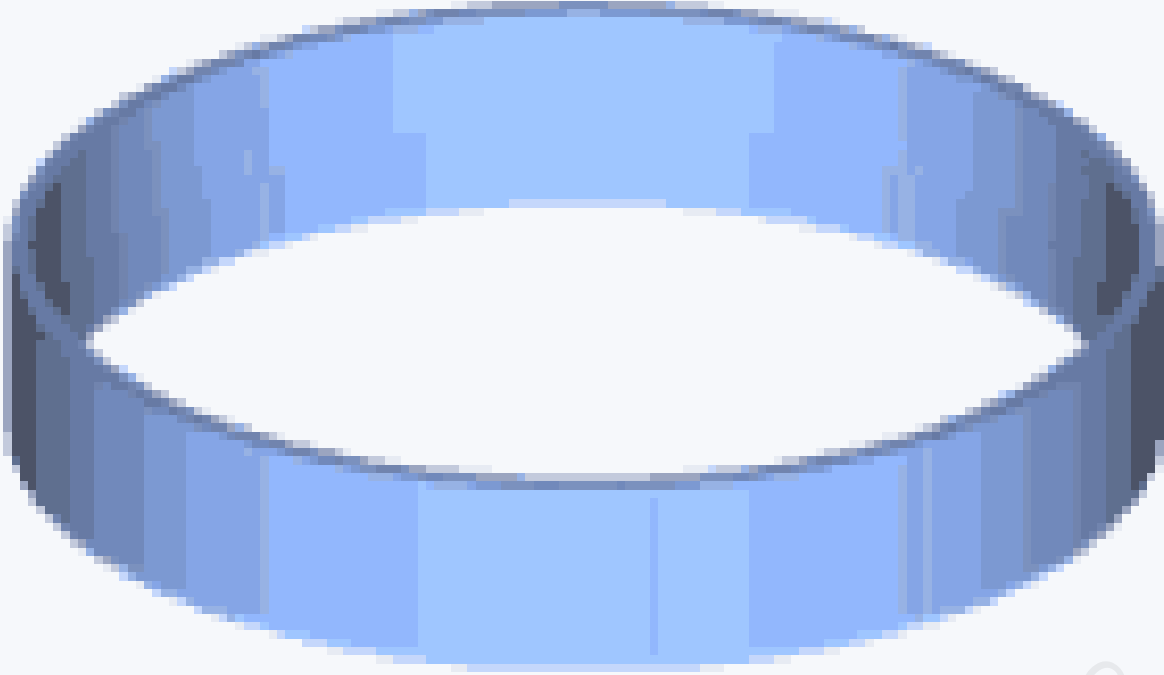
Illustration	Tool Number/Description
 A 3D perspective illustration of a blue, ring-shaped medical device. The device is a thick, circular band with a slightly flared outer edge and a recessed inner rim. It is shown against a light gray background. The device appears to be made of a flexible material, possibly rubber or plastic, and is designed to fit around a circular opening.	DT-47796 Seal Protector cardiagn.com

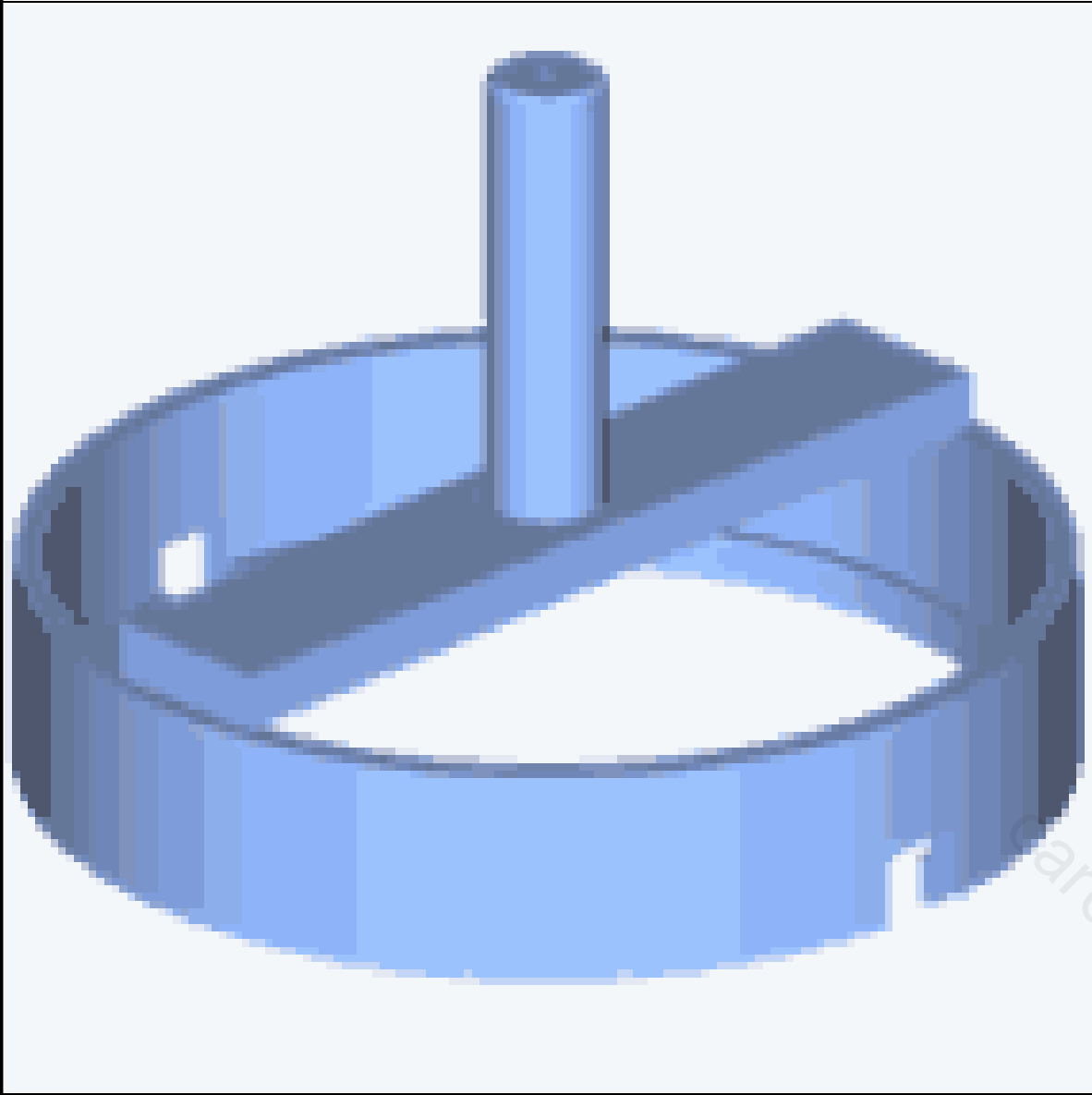
Illustration	Tool Number/Description
	DT-47797 Spring Installer



Illustration	Tool Number/Description
 A 3D perspective illustration of a blue, toroidal (donut-shaped) seal protector. The object has a thick, blue ring with a white circular center. It is shown from an isometric perspective, giving it a three-dimensional appearance. The background is a light gray gradient.	DT-47798 Seal Protector cardiagn.com

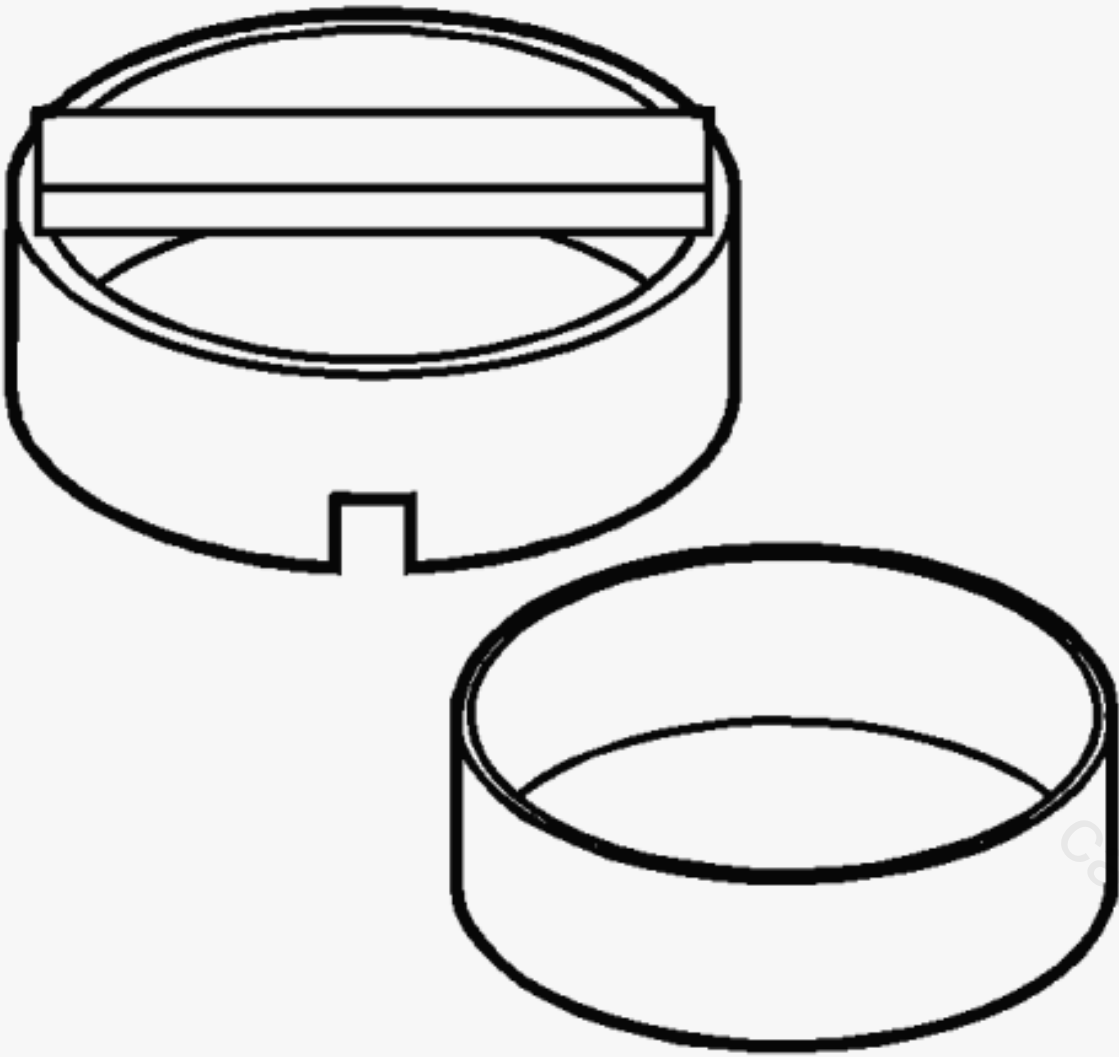
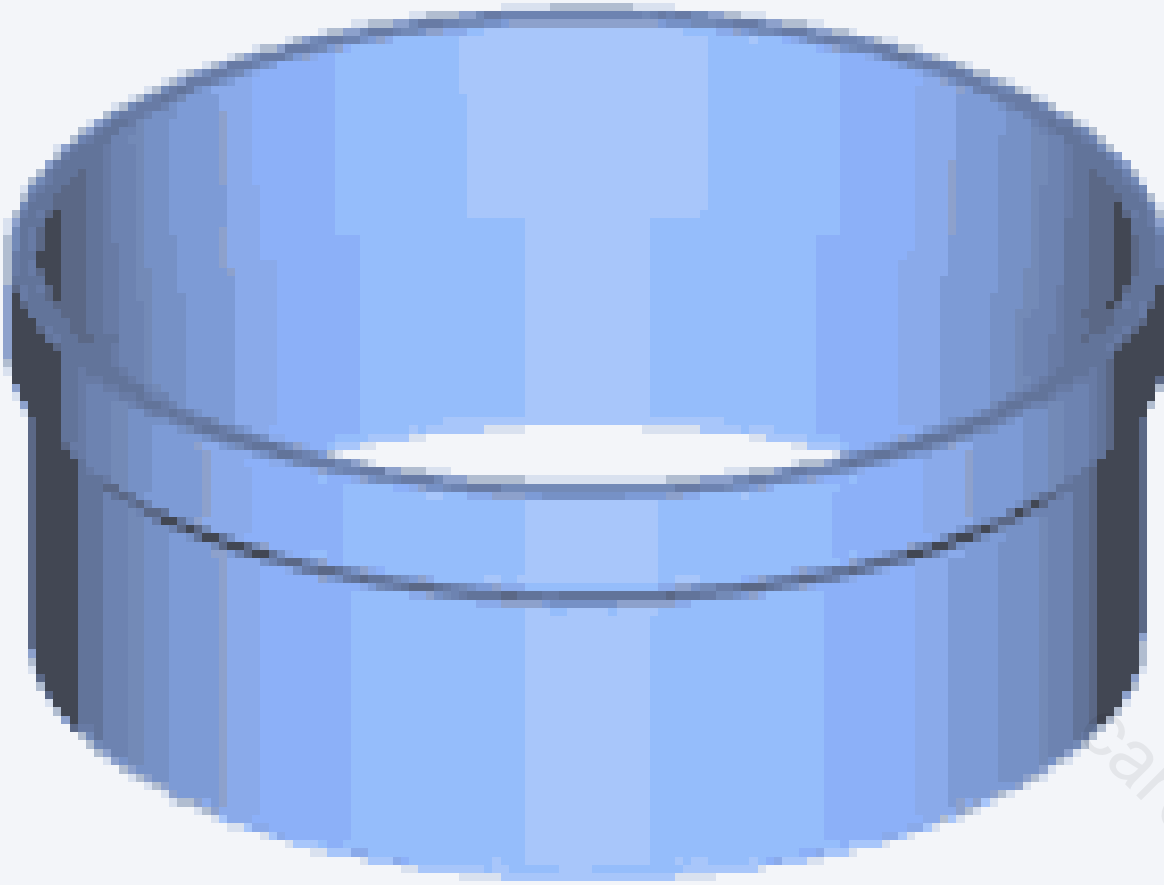
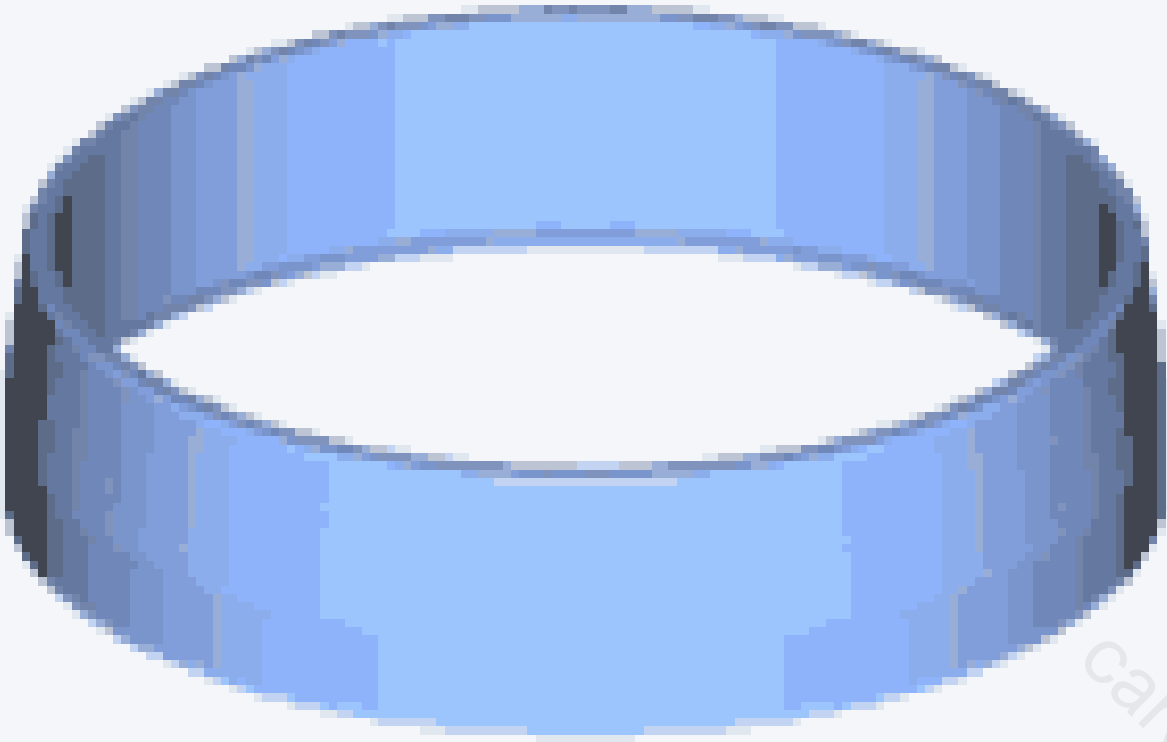
Illustration	Tool Number/Description
 The illustration shows a mechanical tool used for compressing clutch piston springs. It consists of two main parts: a larger, cylindrical body with a handle on top, and a smaller, separate ring. The handle has a rectangular grip. The larger body has a small notch at the bottom. The smaller ring is a simple cylindrical band. A faint watermark 'cardiagn.com' is visible in the background of the illustration.	DT-47799 Clutch Piston Spring Compressor

Illustration	Tool Number/Description
	DT-47805 Seal Protector

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Illustration	Tool Number/Description
	DT-47807 Clutch Piston Seal Installer cardiagn.com

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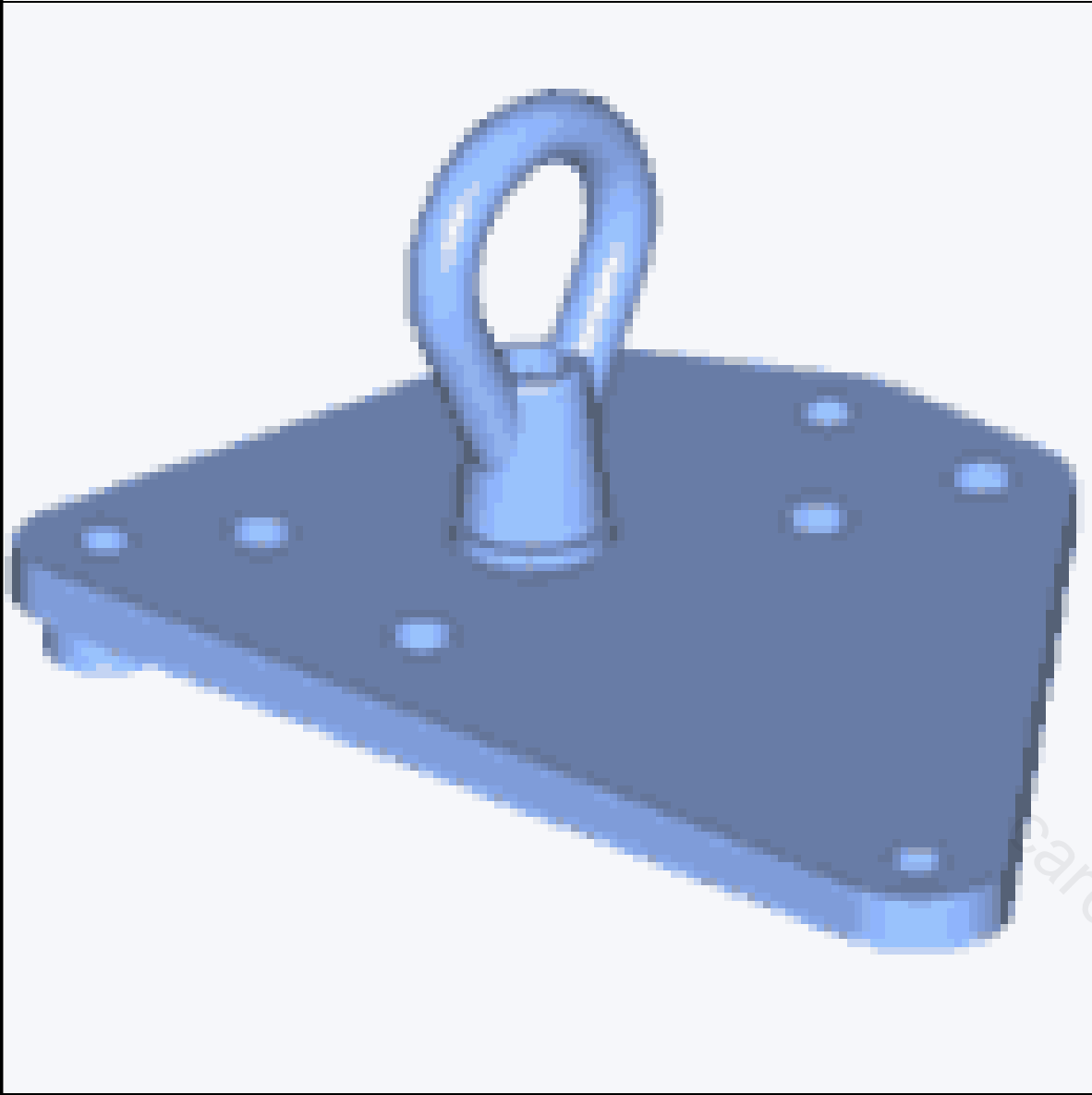
Illustration	Tool Number/Description
 A blue metal lift plate with a central ring and eight mounting holes. The plate is rectangular with rounded corners and a central ring. There are eight small circular holes arranged in two rows of four. The plate is shown from a perspective view.	DT-47811-A Lift Plate



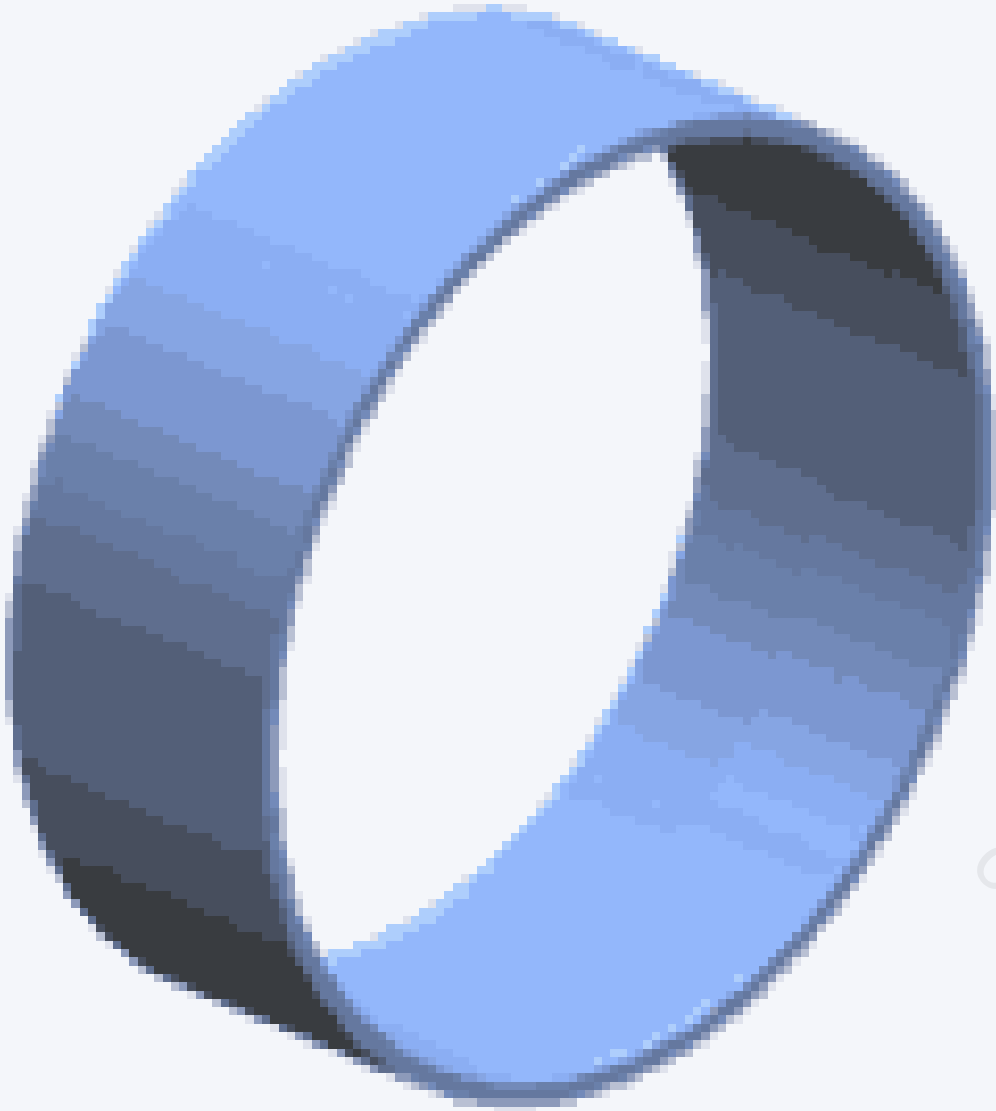
Illustration	Tool Number/Description
	DT-47951-1 Seal Protector



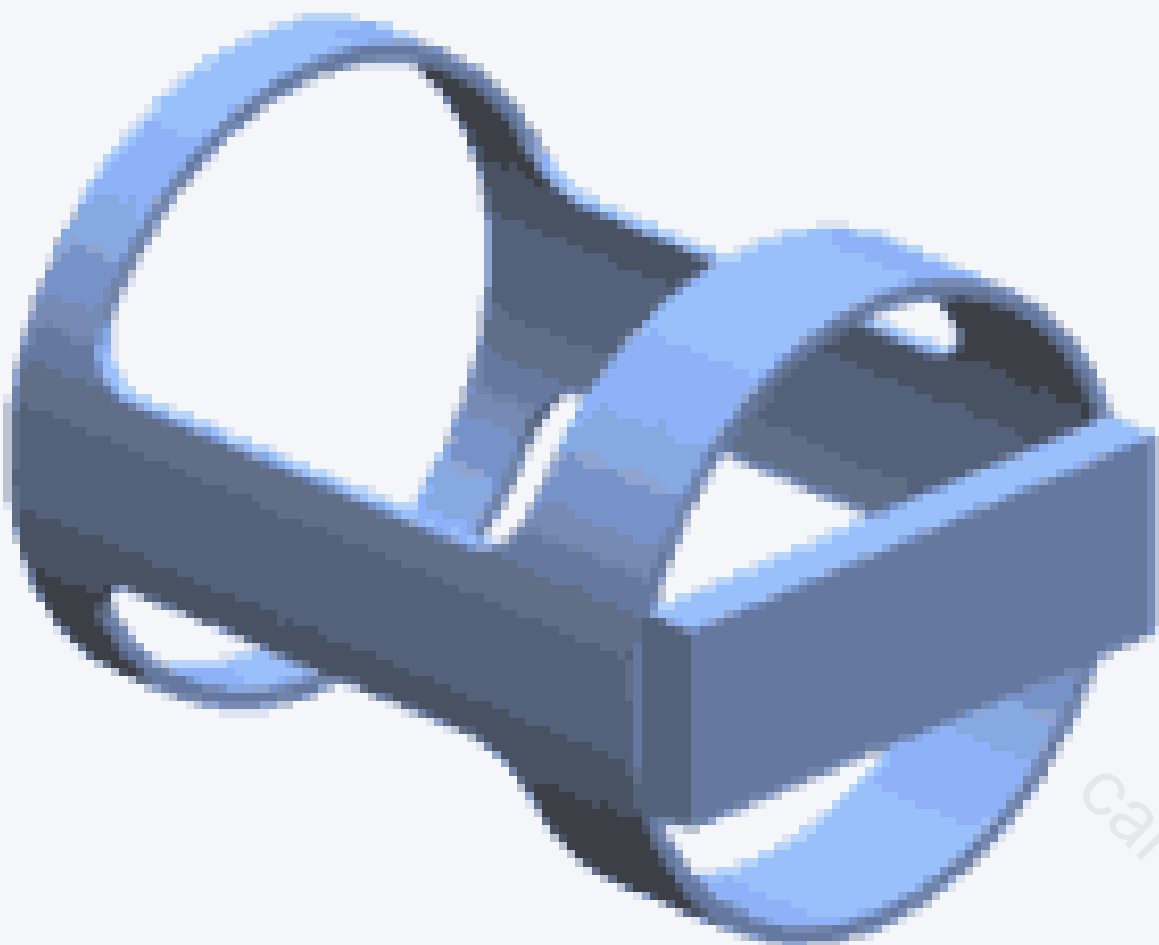
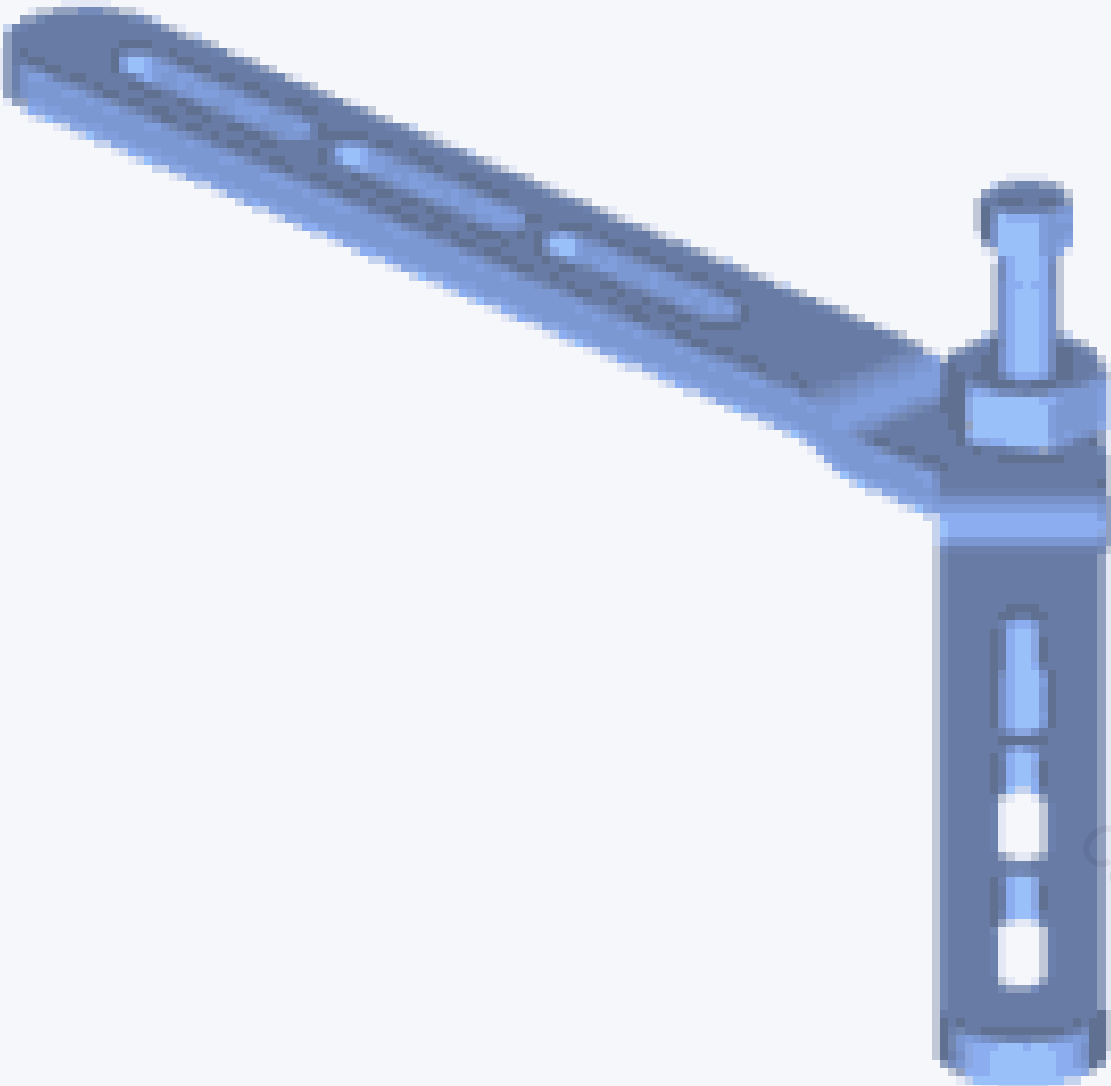
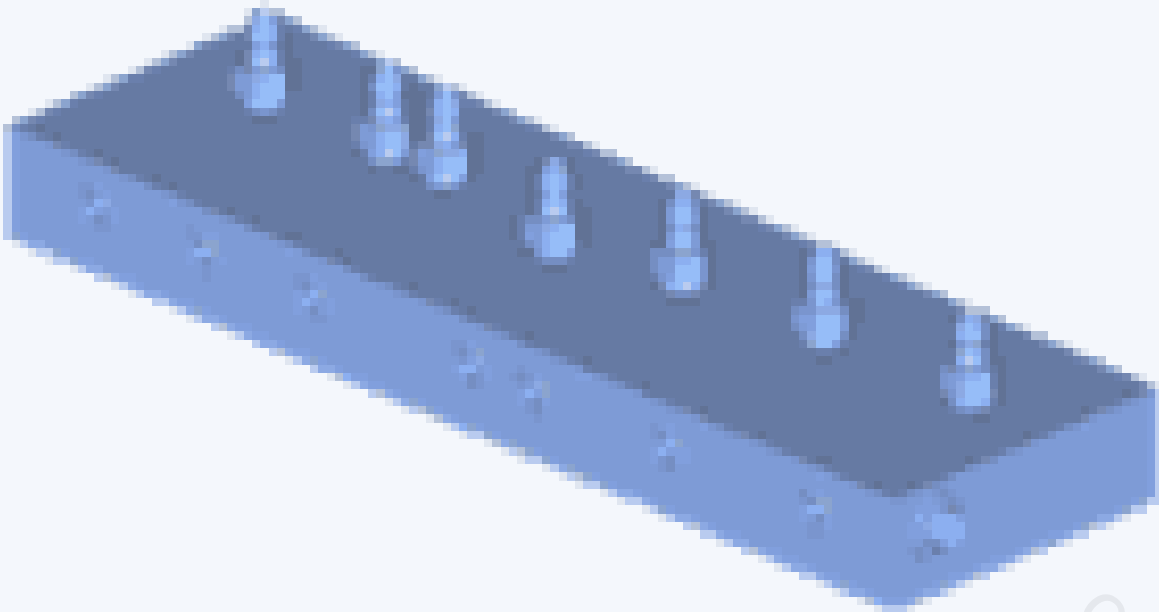
Illustration	Tool Number/Description
	DT-47951-2 Spring Compressor

Illustration	Tool Number/Description
	DT-48056 Spring Compressor Bridge

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Illustration	Tool Number/Description
	DT-48616 Control Solenoid Test Plate

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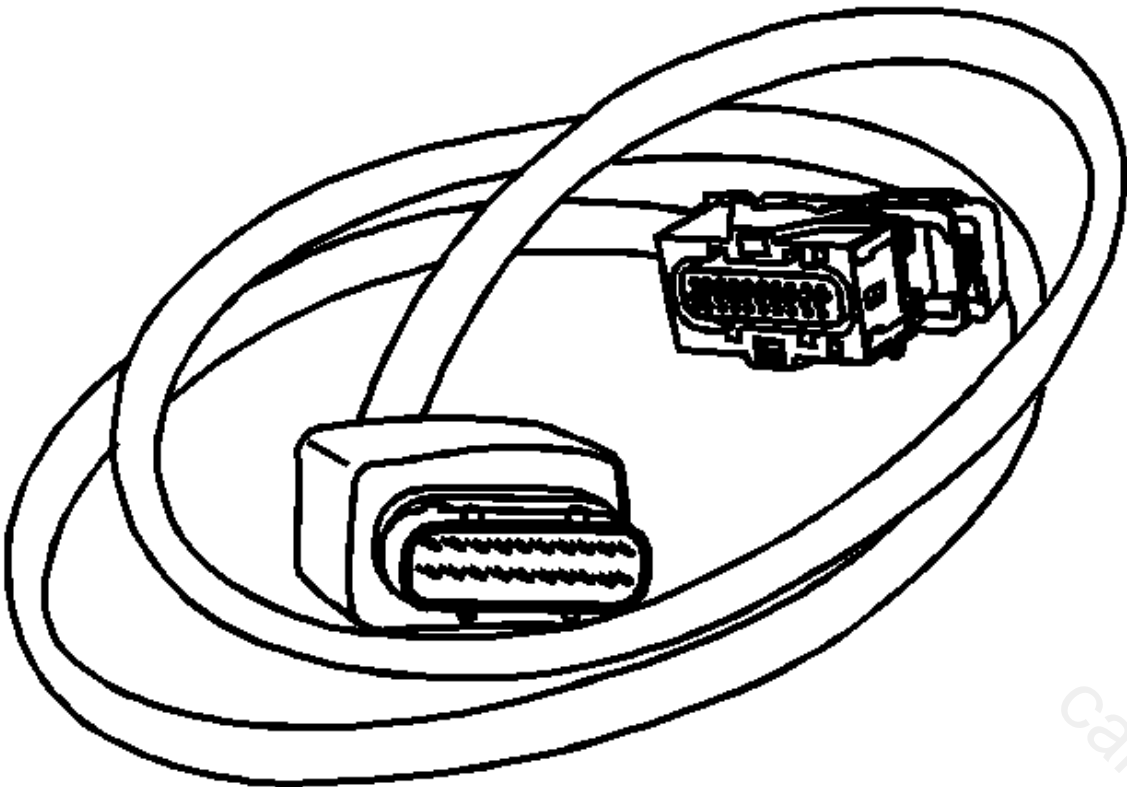
Illustration	Tool Number/Description
 cardiagn.com	DT-48616-10 Adapter Harness

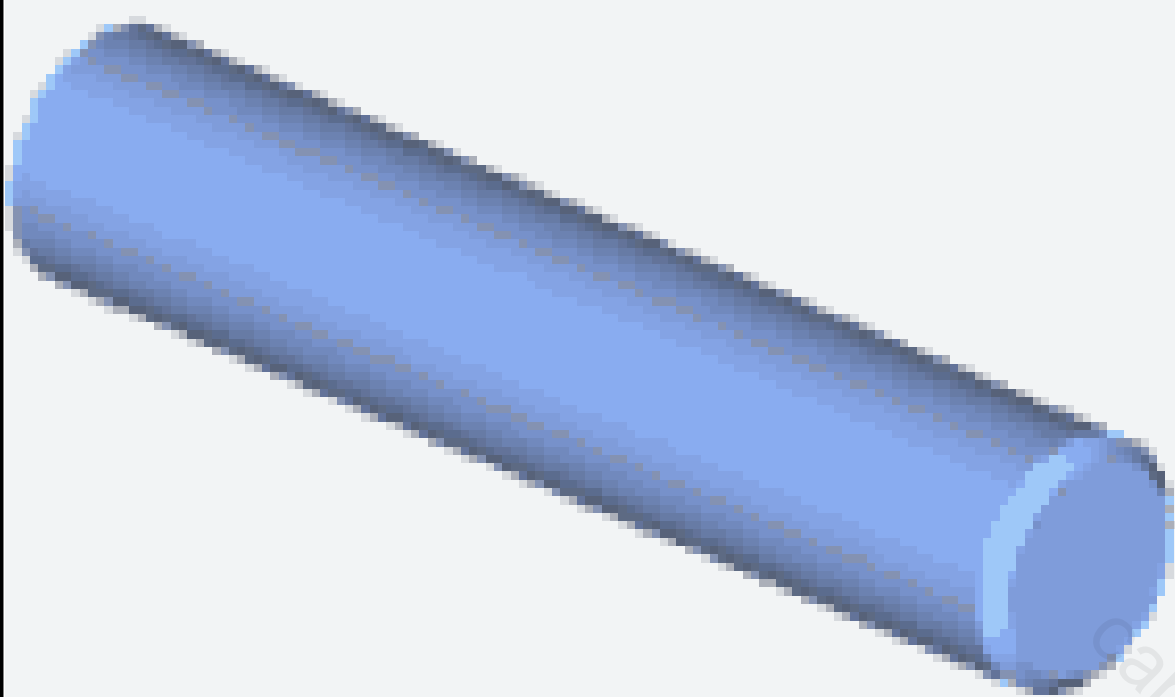
Illustration	Tool Number/Description
 A 3D rendering of a blue cylindrical tool, likely a seal installer, shown at an angle. The tool has a smooth, slightly tapered surface and a flat circular end. A faint watermark 'cardiagn.com' is visible diagonally across the lower right portion of the cylinder.	DT-49101 Seal Installer

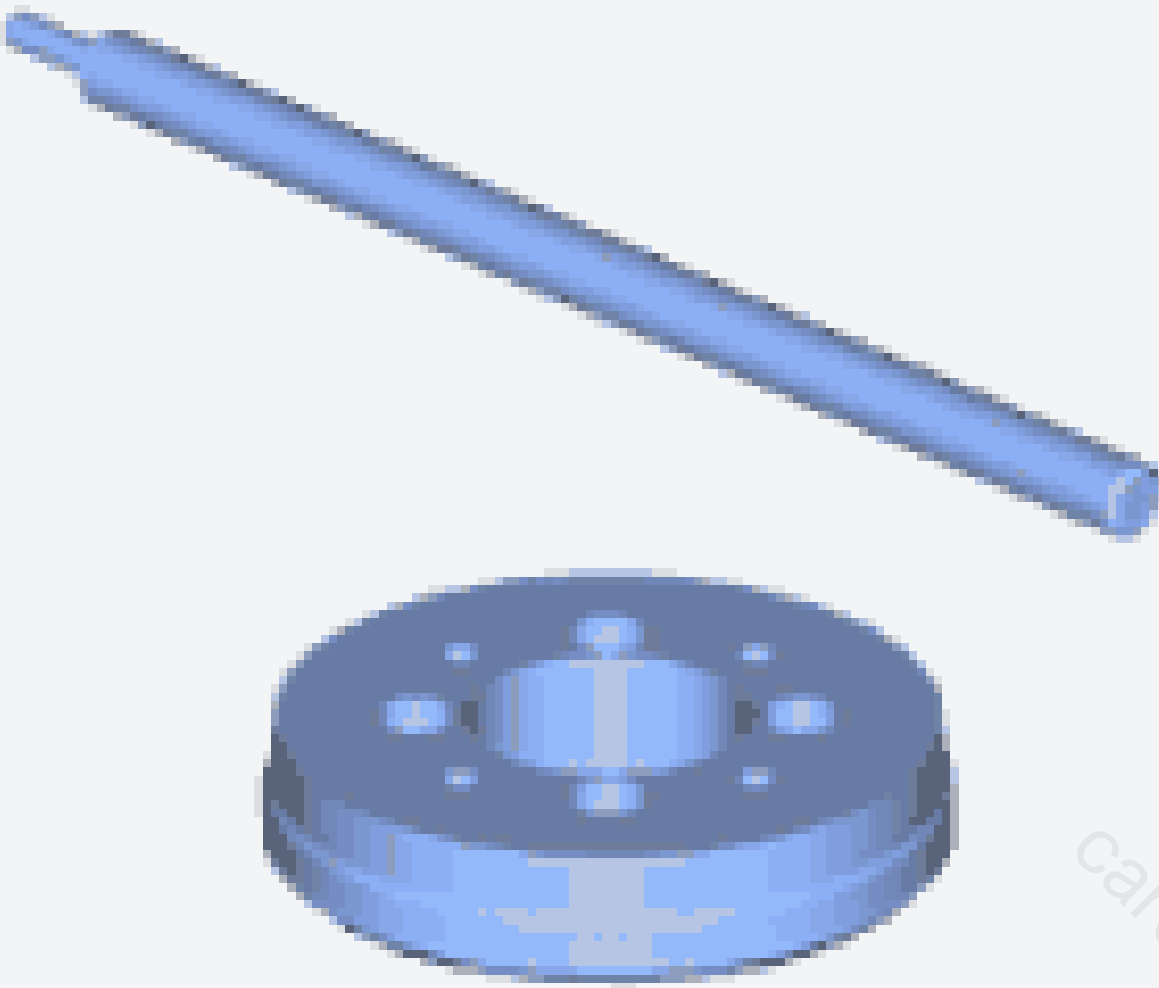
Illustration	Tool Number/Description
 The illustration shows two blue metal components. The first is a long, thin rod with a hexagonal end. The second is a circular flange with a central nut and washer. A watermark 'cardiagn.com' is visible in the bottom right corner of the illustration area.	DT-49131 Seal Staking Tool

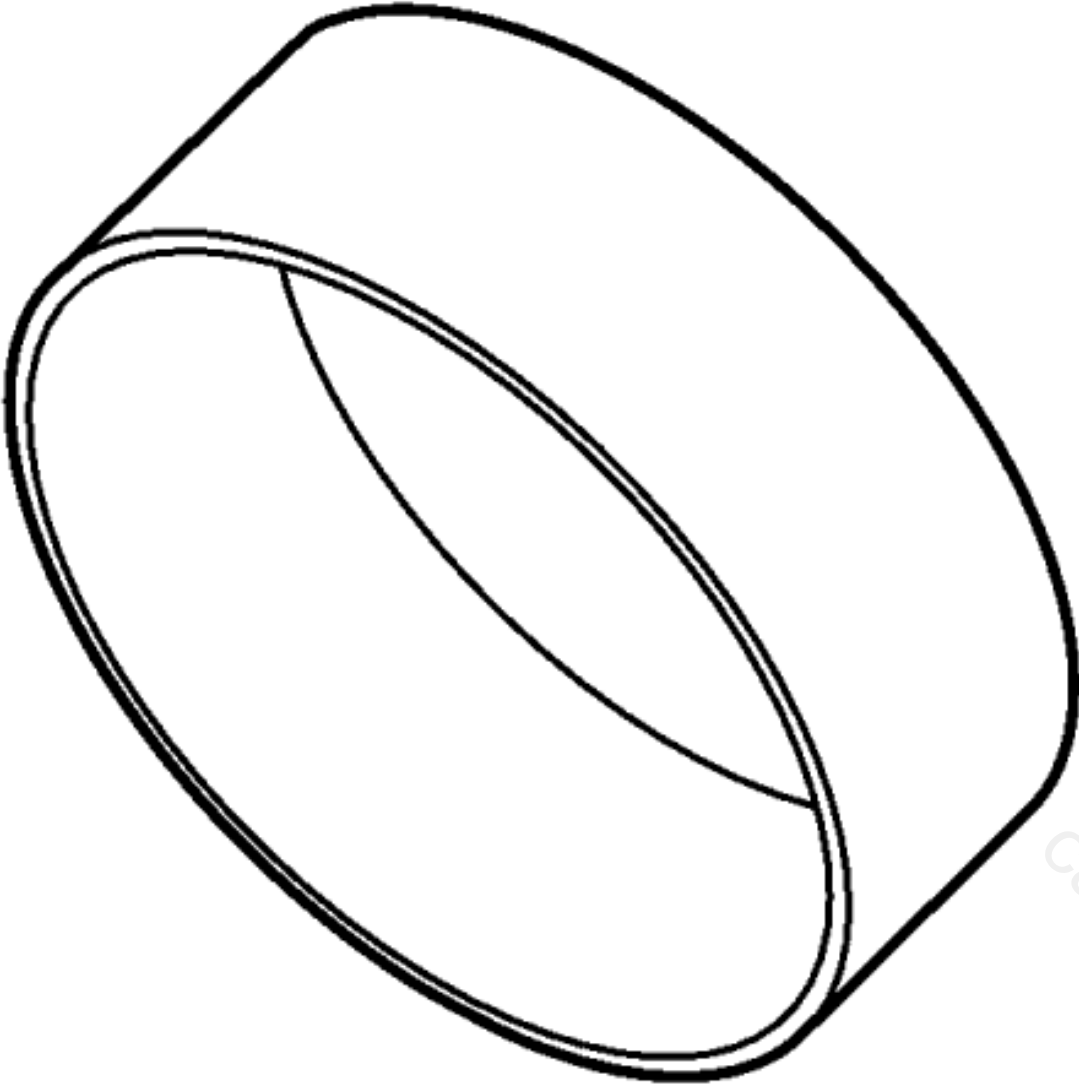
Illustration	Tool Number/Description
	DT-50117 Seal Installer

Illustration	Tool Number/Description
 The image shows three blue, cylindrical tools used for installing pump seals. They are arranged on a white background. The tool on the left is the largest, the one on the top right is medium-sized, and the one on the bottom right is the smallest. Each tool has a slightly tapered design with a wider base and a narrower top. A faint watermark 'cardiagn.com' is visible diagonally across the bottom right of the image area.	DT-51191 Pump Seal Installer Set

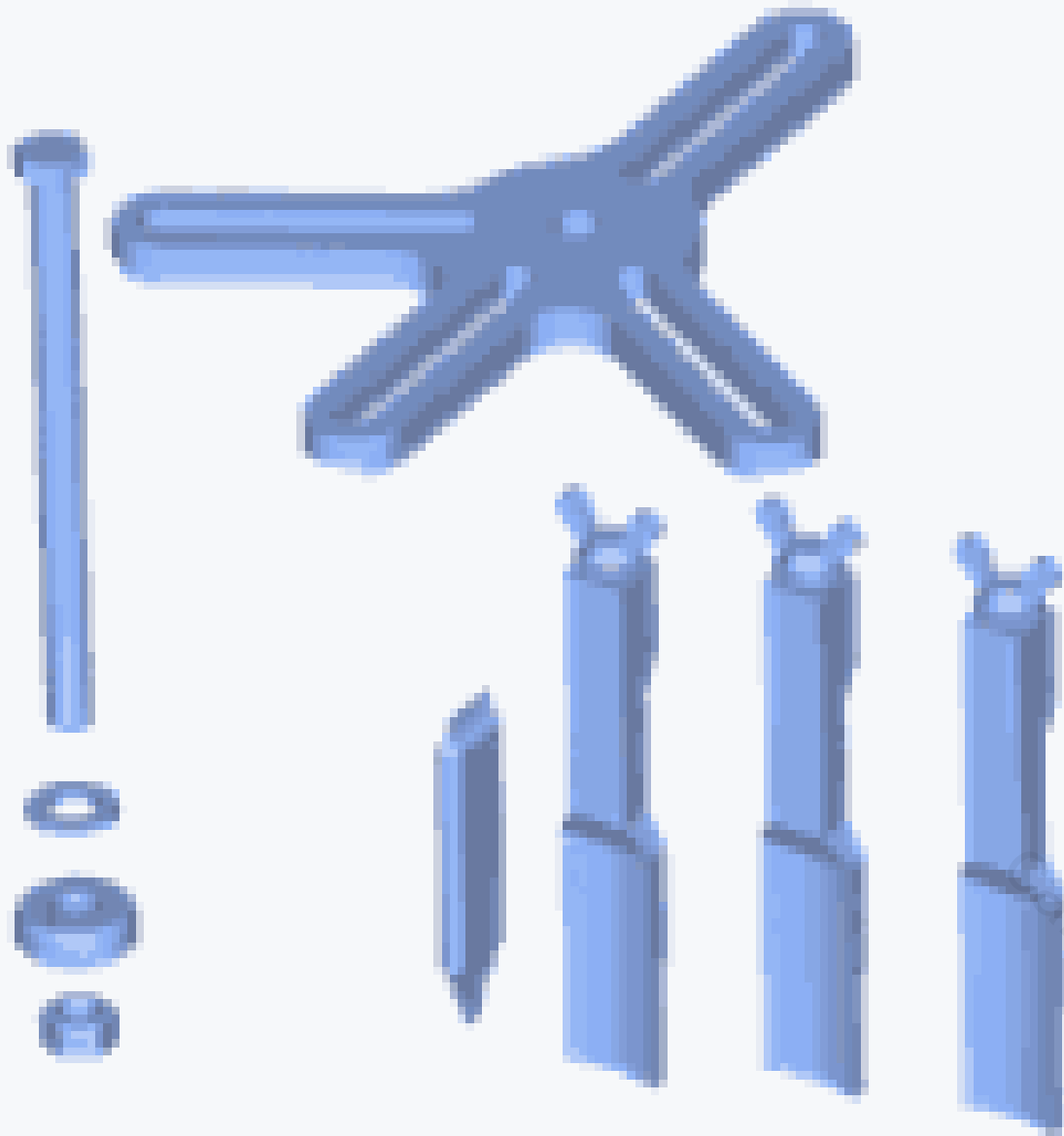
Illustration	Tool Number/Description
 The illustration shows the components of the DT-51892 Bridge Kit. At the top center is a large, blue, five-armed star-shaped connector. To its left is a long, thin blue rod. Below the rod are four small blue circular components: a washer, a large flange, and two smaller spacers. To the right of the star connector are three blue vertical bridge segments of varying heights, each with a small blue connector at the top. A diagonal watermark 'cardiagn.com' is visible across the lower right portion of the illustration.	DT-51892 Bridge Kit

Illustration	Tool Number/Description
	EL-35616 J-35616 GM-Approved Terminal Test Kit
	EL-38522 J-38522 Variable Signal Generator

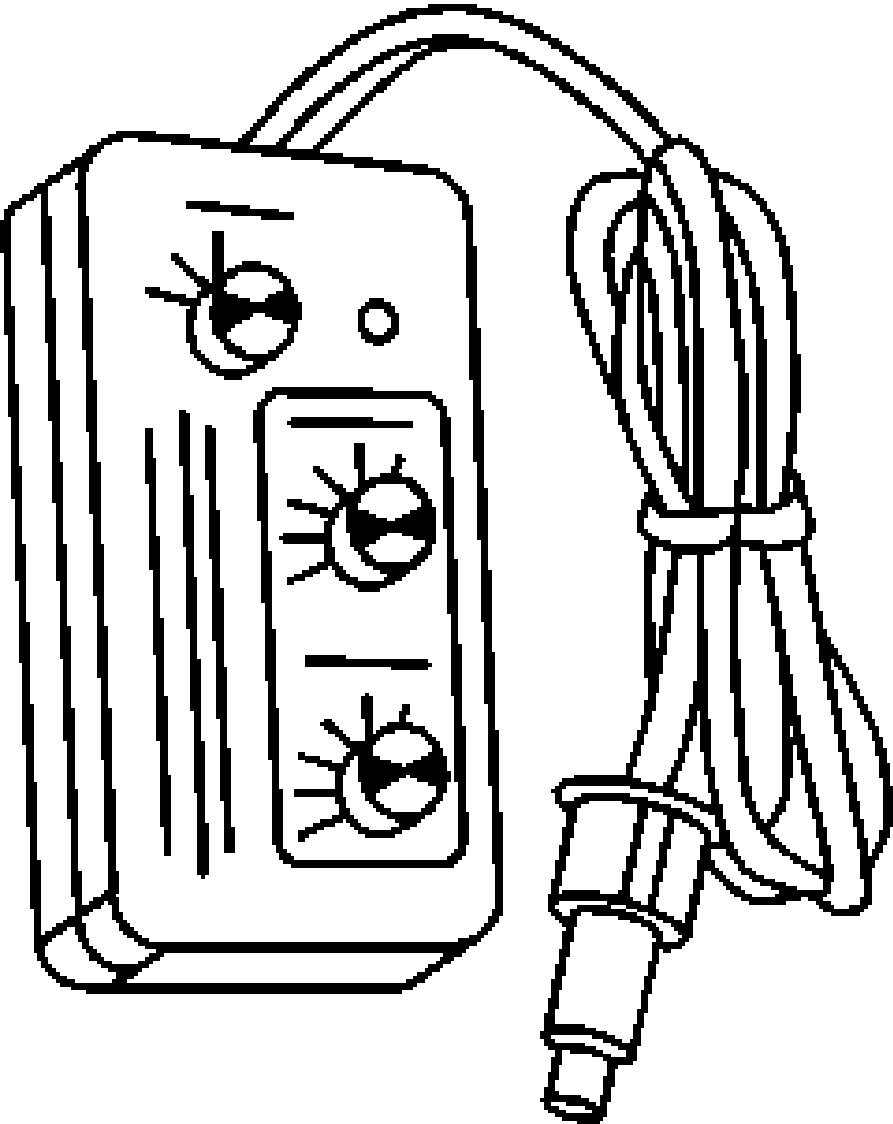
Illustration	Tool Number/Description
	

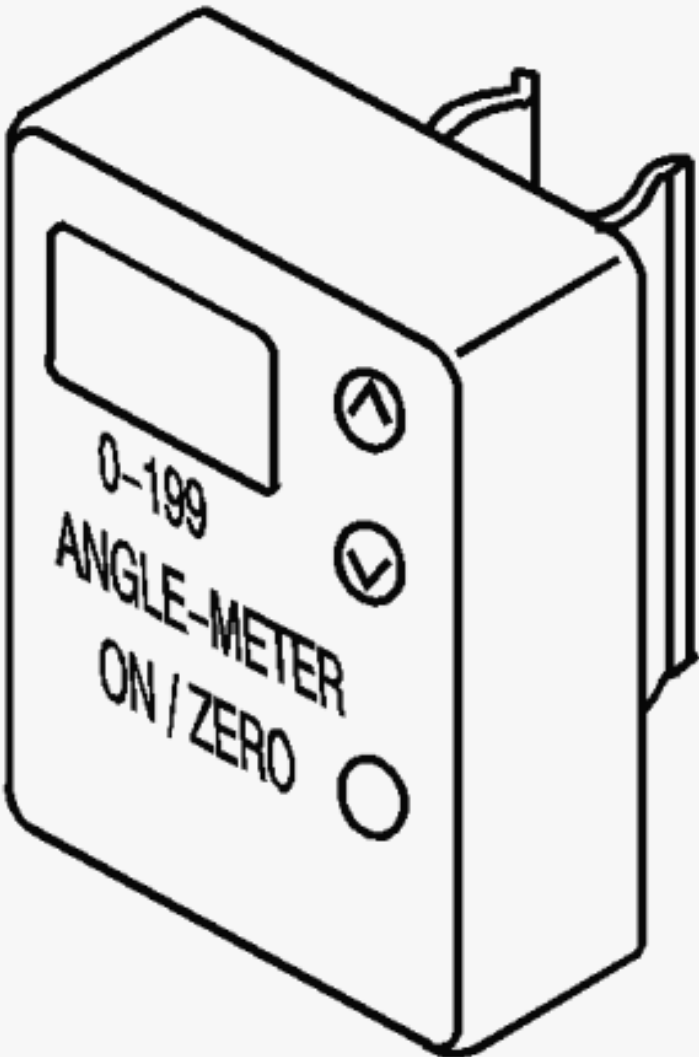
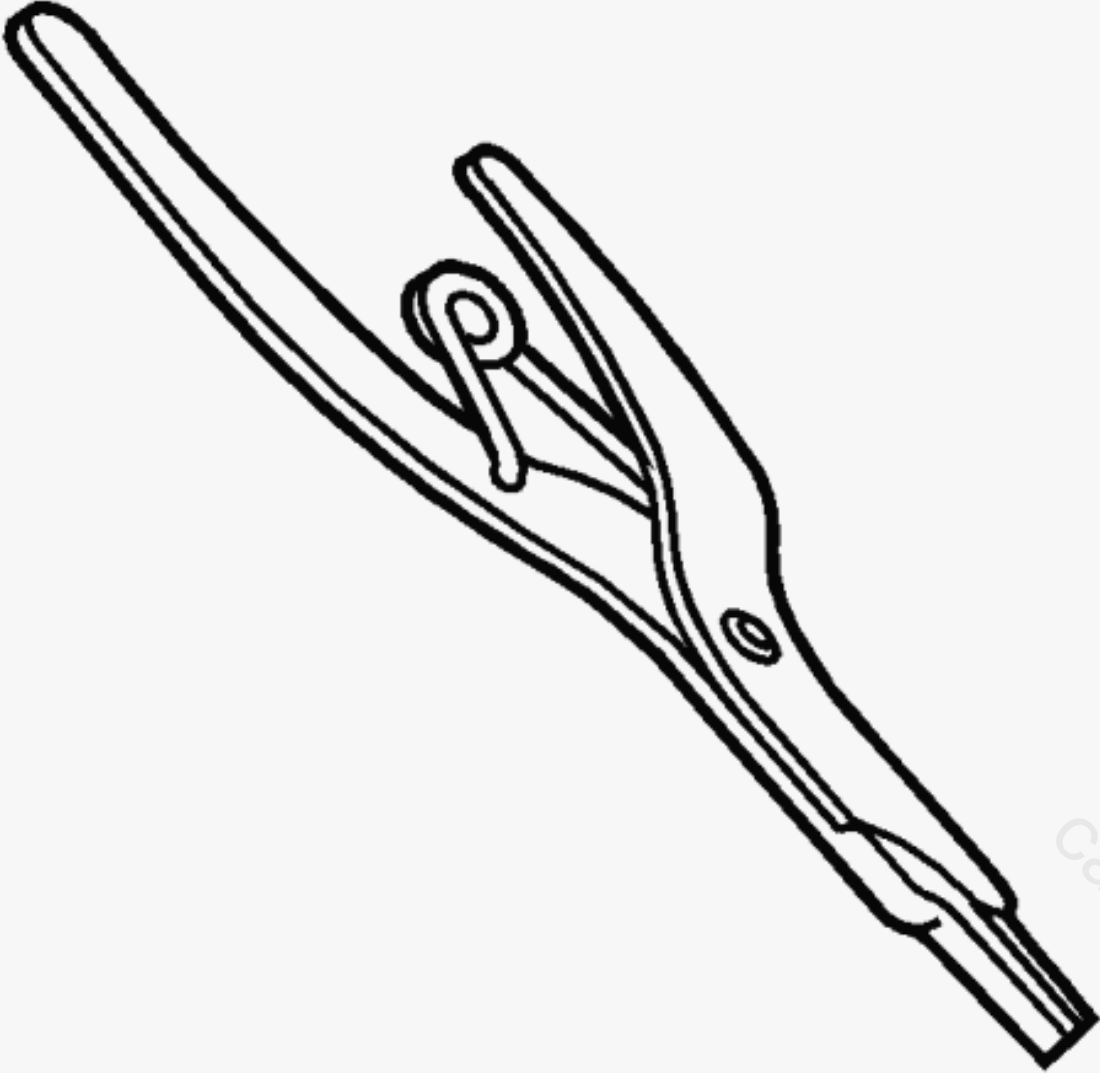
Illustration	Tool Number/Description
	EN-45059 J-45059 KM-470-B Angle Meter cardiagn.com

Illustration	Tool Number/Description
 A line drawing of a pair of snap ring pliers. The tool consists of two long, tapered handles that meet at a pivot point. One handle has a small circular hole near the pivot. The other handle has a curved, hook-like end designed to grip a snap ring. The drawing is oriented diagonally from the top-left to the bottom-right.	GE-5586-A J-5586-A Snap Ring Pliers

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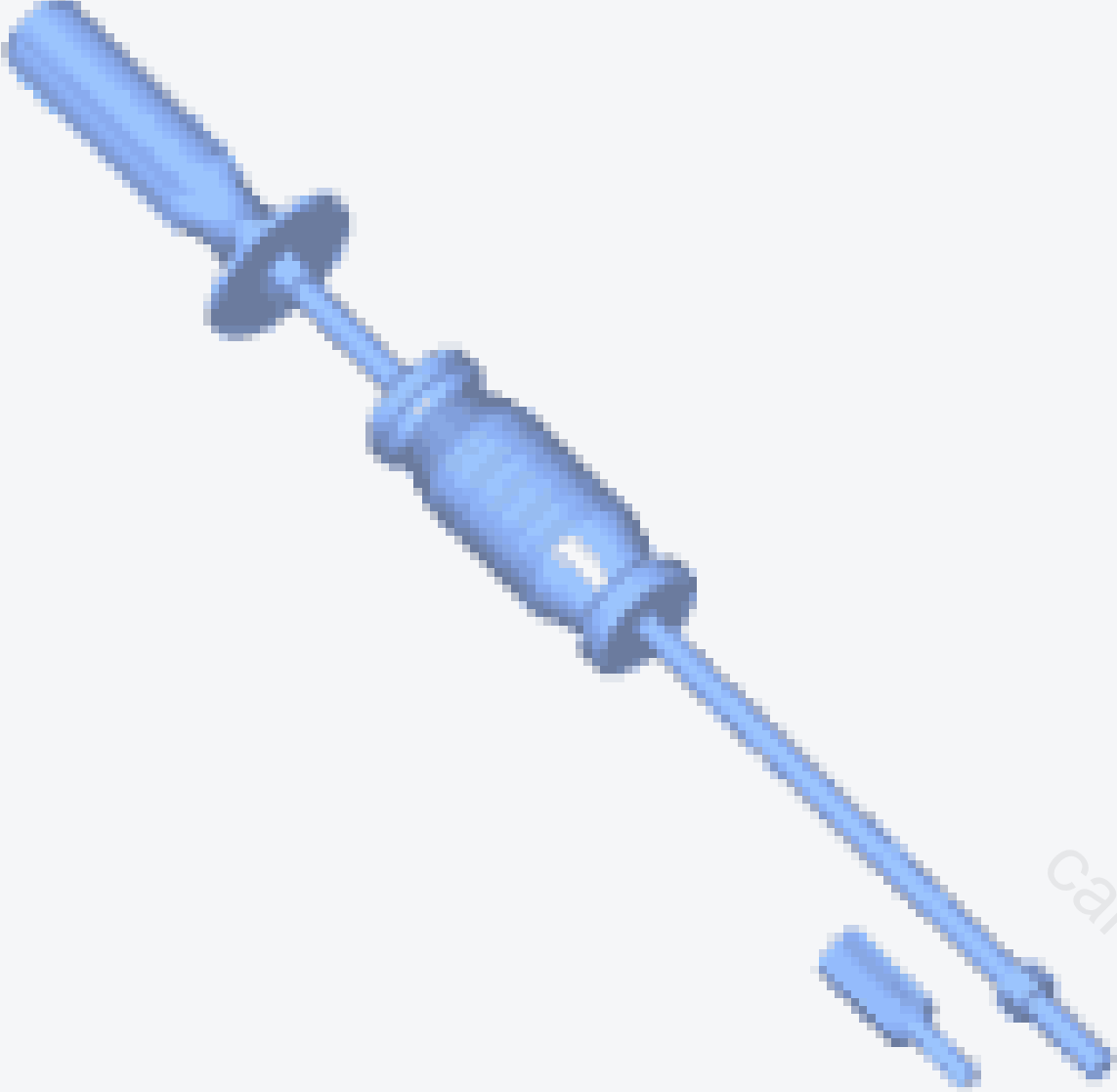
Illustration	Tool Number/Description
	GE-6125-1B J-6125-1B KM-J-7004 Slide Hammer
	GE-8059 J-8059 KM-396 Snap Ring Pliers- Parallel Jaw

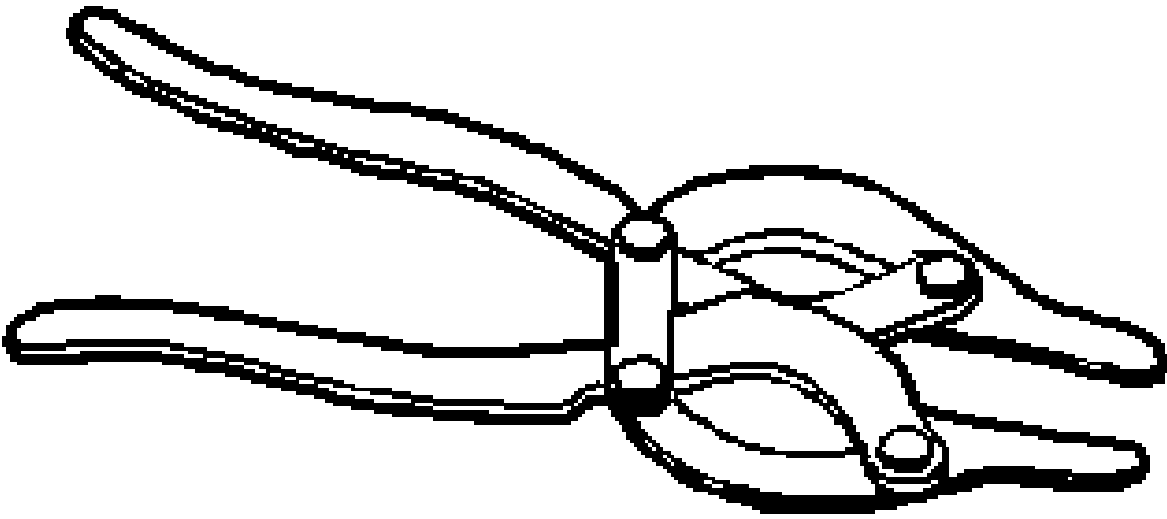
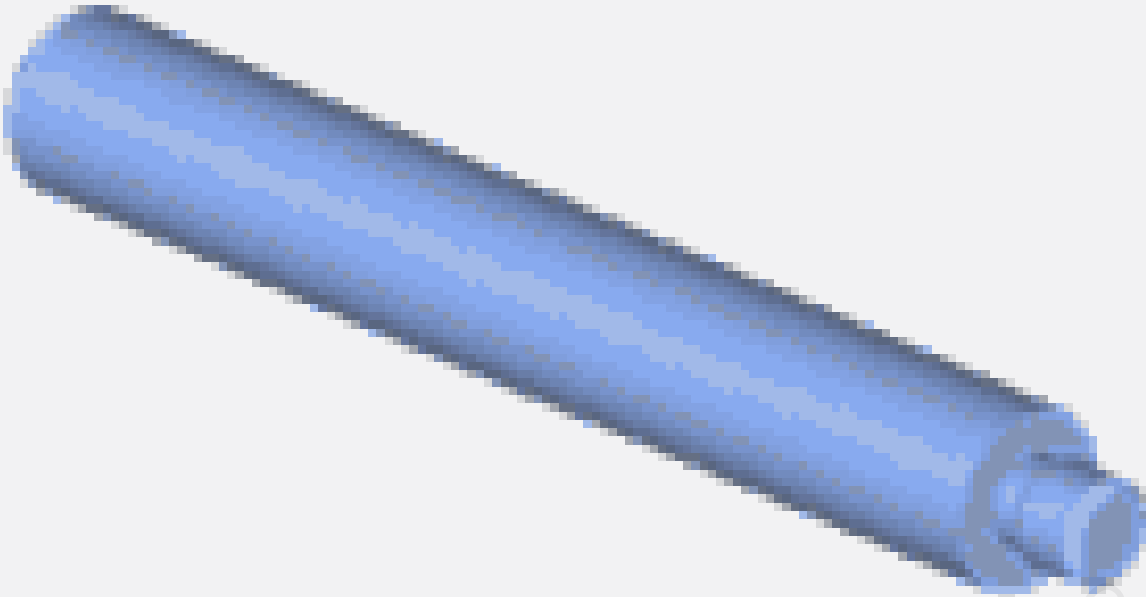
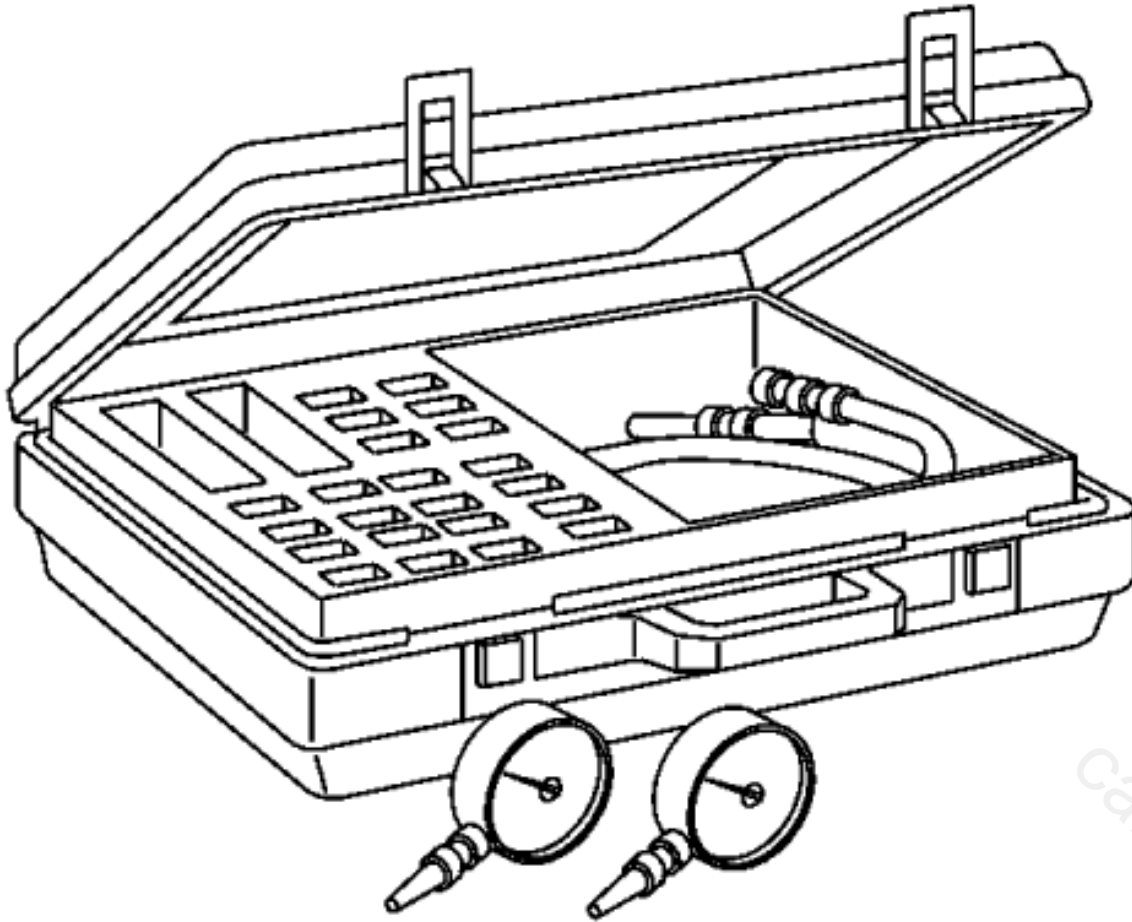
Illustration	Tool Number/Description
	

Illustration	Tool Number/Description
	GE-8092 J-8092 KM-J-8092 Driver Handle

Illustration

Tool
Number/Description



GE-21867-A
J-21867-A
Oil Pressure Gauge
Kit

cardiagn.com

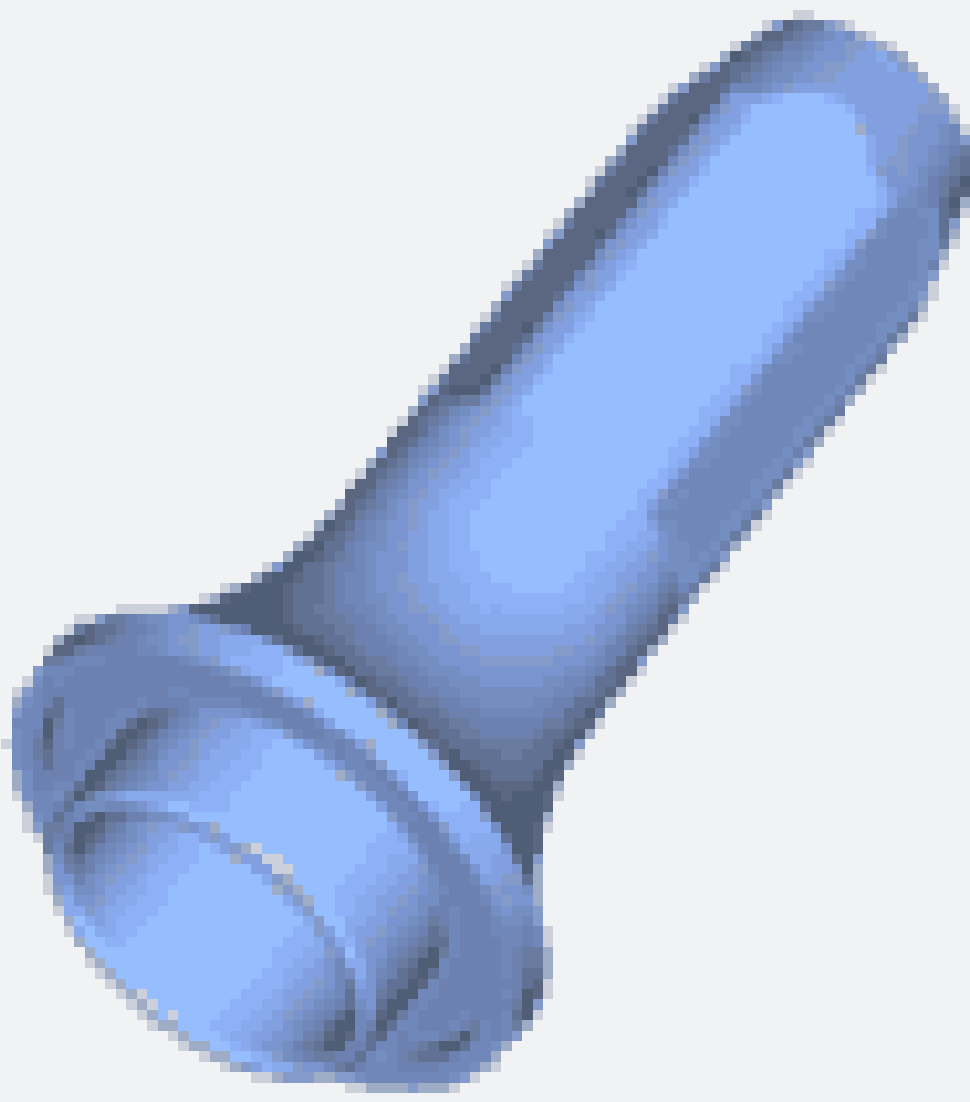
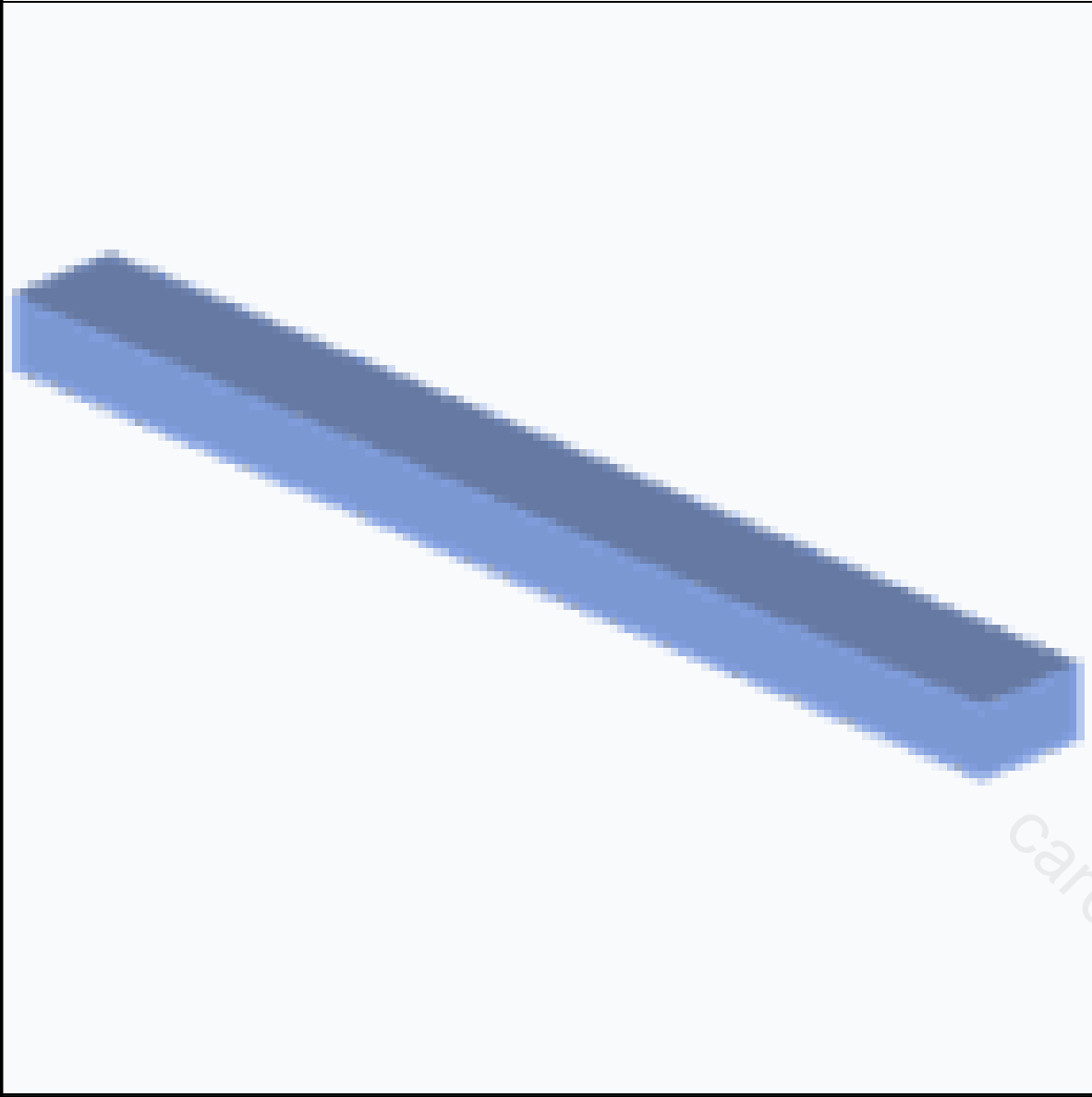
Illustration	Tool Number/Description
 A blue, cylindrical seal installer tool. It has a long, tapered body that widens into a flared, cup-like end. The tool is shown at an angle, highlighting its three-dimensional shape. The background is a light gray gradient.	J-29162 Seal Installer cardiagn.com

Illustration	Tool Number/Description
	GE-34673 J-34673 Flat Gauge Bar

2018 TRANSMISSION**Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Specifications - Equinox & Terrain****SPECIFICATIONS****TEMPERATURE VERSUS RESISTANCE (B13 TRANSMISSION FLUID TEMPERATURE SENSOR)**

Temperature	Resistance
170Â°C (338Â°F)	45.43 to 49.43 ohms
150Â°C (302Â°F)	67.68 to 71.68 ohms
140Â°C (284Â°F)	83.57 to 87.57
130Â°C (266Â°F)	104.1 to 108.1 ohms
120Â°C (248Â°F)	130.9 to 134.9 ohms
110Â°C (230Â°F)	166.3 to 170.3 ohms
100Â°C (212Â°F)	213.5 to 217.5 ohms
90Â°C (194Â°F)	277.5 to 281.5 ohms
80Â°C (176Â°F)	365.2 to 369.2 ohms
70Â°C (158Â°F)	487.3 to 491.3 ohms
60Â°C (140Â°F)	660 to 664 ohms
50Â°C (122Â°F)	908 to 912 ohms
40Â°C (104Â°F)	1.272 k to 1.276 kohms
30Â°C (86Â°F)	1.814 k to 1.818 kohms
25Â°C (77Â°F)	2.183 k to 2.187 kohms
20Â°C (68Â°F)	2.641 k to 2.645 kohms
15Â°C (59Â°F)	3.213 k to 3.217 kohms
10Â°C (50Â°F)	3.932 k to 3.936 kohms
0Â°C (32Â°F)	5.995 k to 5.999 kohms
-5Â°C (23Â°F)	7.476 k to 7.480 kohms
-10Â°C (14Â°F)	9.386 k to 9.390 kohms
-15Â°C (5Â°F)	11.869 k to 11.872 kohms
-20Â°C (-4Â°F)	15.124 k to 15.128 kohms
-25Â°C (-13Â°F)	19.473 k to 19.477 kohms
-30Â°C (-22Â°F)	25.153 k to 25.157 kohms
-35Â°C (-31Â°F)	32.858 k to 32.862 kohms
-40Â°C (-40Â°F)	43.319 k to 43.322 kohms

FASTENER SPECIFICATIONS (ON-VEHICLE)**Single Use Non-Threaded Fasteners/Components****NOTE:**

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
Automatic Transmission Fluid Filter Seal
Front Wheel Drive Shaft Oil Seal
Input Shaft Speed Sensor Seal
Manual Shaft Detent Lever Hub Pin
Manual Shift Shaft Seal

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
Park Pawl Actuator Guide Pin
Torque Converter Fluid Seal

Single Use Threaded Fastener/Component Tightening Specifications

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application	Specification
	Metric (English)
Transmission Rear Strut Bolt to Strut Bracket	
• First Pass:	70 N.m (52 lb ft)
• Final Pass:	90-105 Degrees
Transmission Rear Strut Bolt to Cradle Through Bolt	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	120-135 Degrees
Transmission Rear Mount Bracket to Transmission Bolt	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	60-75 Degrees
Transmission Mount to Body Bolt - Left Mount	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	60 - 75 Degrees

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Automatic Transmission Case Hole Plug - Auxiliary Fluid Fill Plug	40 N.m (30 lb ft)
Automatic Transmission Case Hole Plug	12 N.m (106 lb in)
Automatic Transmission Control Nut	9 N.m (80 lb in)
Automatic Transmission Fluid Level Hole Plug	40 N.m (30 lb ft)
Automatic Transmission Fluid Pressure Test Hole Plug	12 N.m (106 lb in)
Automatic Transmission Fluid Pan Drain Plug	12 N.m (106 lb in)

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Automatic Transmission Input Speed Sensor Bolt	9 N.m (80 lb in)
Automatic Transmission Output Speed Sensor Bolt	9 N.m (80 lb in)
Automatic Transmission Range Selector Lever Cable Bracket Bolt	22 N.m (16 lb ft)
Automatic Transmission Range Selector Lever Cable Bolt	9 N.m (80 lb in)
Automatic Transmission Range Selector Lever Cable Grommet Retainer Nut	6.5 N.m (58 lb in)
Automatic Transmission Range Selector Lever Nut	30 N.m (22 lb ft)
Control Valve Body Cover Bolt	9 N.m (80 lb in)
Front Ground Cable Bolt	22 N.m (16 lb ft)
Left Instrument Panel Center Support Bracket Bolt	22 N.m (16 lb ft)
Left Transmission Mount to Transmission Bolts	100 N.m (74 lb ft) plus 60 - 75 degrees
Manual Shift Detent Lever Spring Bolt	9 N.m (80 lb in)
Rear Ground Cable Bolt	45 N.m (33 lb ft)
Right Instrument Panel Center Support Bracket Bolt	22 N.m (16 lb ft)
Torque Converter Bolt @ Flywheel	60 N.m (44 lb ft)
Transmission Bolt @ Engine	58 N.m (43 lb ft)
Transmission Control Module Bracket Nut	9 N.m (80 lb in)
Transmission Fluid Cooler inlet Pipe Nut	9 N.m (80 lb in)
Transmission Rear Mount Strut Bracket @ Transmission (AWD)	100 N.m (74 lb ft) plus 60 - 75 degrees

FASTENER SPECIFICATIONS (OFF-VEHICLE)

Single Use Non-Threaded Fasteners/Components

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
1-2-3-4-5-6 Clutch Piston Seal
1-2-3-4-5-6 Clutch Piston Inner Seal
3-5-Reverse Clutch Piston Dam Seal
3-5-Reverse Clutch Piston Inner Seal
3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
4-5-6 Clutch Piston Dam Seal
4-5-6 Clutch Piston Inner Seal
4th Clutch Piston Inner Seal
4th Clutch Piston Outer Seal
Accumulator Bypass Valve Seal
Automatic Transmission Case Seal
Automatic Transmission Fluid Filter
Automatic Transmission Fluid Filter Seal
Automatic Transmission Fluid Pump Gasket
Automatic Transmission Fluid Pump Seal
Automatic Transmission Fluid Pump Shaft Seal
Body Side Wiring Harness Opening Seal

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
Control Valve Body Gasket
Control Valve Body Spacer Plate Retainer
Drive Link Lubricant Fluid Seal
Fluid Transfer Pipe Seal
Front Wheel Drive Shaft Oil Seal
Manual Shaft Detent Lever Hub Pin
Manual Shift Shaft Seal
Park Pawl Actuator Guide Pin
Torque Converter Fluid Seal
Torque Converter Housing Gasket
Turbine Shaft Seal

Single Use Threaded Fastener/Component Tightening Specifications

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Automatic Transmission Fluid Pump Cover Bolt Refer to procedure for tightening sequence and torque values.	211	19	M6 x 25	Refer to Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation

* Reference number refers to the component callout number in Disassembled Views

Reusable Threaded Fastener Tightening Specifications

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Accumulator Valve Body Bolt	33	2	M4 x.7	2.75 N.m (24 lb in)
Automatic Transmission Auxiliary Fluid Accumulator Bolt	9	3	M8 x 30	8 N.m (71 lb in)
Automatic Transmission Case Hole Plug	68	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Automatic Transmission Fluid Level Hole Plug	65	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Automatic Transmission Fluid Pan Drain Plug	66	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Automatic Transmission Fluid Filter Cover Bolt	58	3	M6 x 20	9 N.m (80 lb in)

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Automatic Transmission Fluid Pump Cover Bolt Refer to procedure for tightening sequence and torque values.	200	22	M6 x 30	Refer to Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation
Automatic Transmission Fluid Pump Cover Bolt	312	5	M6 x 25	9 N.m (80 lb in)
Automatic Transmission Input Speed Sensor Bolt	69	1	M6 x 25	9 N.m (80 lb in)
Automatic Transmission Output Speed Sensor Bolt	711	1	M6 x 25	9 N.m (80 lb in)
Control Valve Body Bolt Refer to procedure for tightening sequence and torque values.	24	4	M5 x 55	Refer to Control Valve Body Assembly Installation (without ETRS) Control Valve Body Assembly Installation (with ETRS)
Control Valve Body Bolt Refer to procedure for tightening sequence and torque values.	25	1	M5 x 37	Refer to Control Valve Body Assembly Installation (without ETRS) Control Valve Body Assembly Installation (with ETRS)
Control Valve Body Bolt Refer to procedure for tightening sequence and torque values.	5	3	M5 x 65	Refer to Control Valve Body Assembly Installation (without ETRS) Control Valve Body Assembly Installation (with ETRS)
Control Valve Body Bolt Refer to procedure for tightening sequence and torque values.	6	9	M5 x 85	Refer to Control Valve Body Assembly Installation (without ETRS) Control Valve Body Assembly Installation (with ETRS)

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Control Valve Body Bolt Refer to procedure for tightening sequence and torque values.	7	8	M5 x 94	Refer to Control Valve Body Assembly Installation (without ETRS) . Control Valve Body Assembly Installation (with ETRS) .
Control Valve Body Cover Bolt Refer to procedure for tightening sequence and torque values.	1	6	M6 x 30	Refer to Control Valve Body Cover Installation .
Control Valve Body Cover Stud Refer to procedure for tightening sequence and torque values.	2	6	M6 x 30	Refer to Control Valve Body Cover Installation .
Control Valve Solenoid Body Bolt	30	1	-	9 N.m (80 lb in)
Control Valve Solenoid Body Bolt	433	4	M5 x 55	8 N.m (71 lb in)
Control Valve Solenoid Body Bolt	472	1	M5 x 20	8 N.m (71 lb in)
Control Valve Solenoid Body Bolt	483	1	M5 x 20	8 N.m (71 lb in)
Control Valve Solenoid Body Bolt	499	2	M5 x 21	8 N.m (71 lb in)
Fluid Transfer Pipe Bolt	21	1	M6 x 25	8 N.m (71 lb in)
Front Differential Carrier Baffle Bolt	204	2	M6 x 18.5	9 N.m (80 lb in)
Front Differential Carrier Baffle Bolt - Case	62	2	M6 x 18.5	9 N.m (80 lb in)
Input Shaft Support Bolt	55	3	M6 x 50	12 N.m (106 lb in)
Manual Shift Detent Lever Spring Bolt	20	1	M6 x 25	9 N.m (80 lb in)
Overdrive and Reaction Carrier Bolt	535	3	M6 x 35	9 N.m (80 lb in)
Automatic Transmission Case Hole Plug	76	1	M8 x 16.25	40 N.m (30 lb ft)
Automatic Transmission Fluid Pressure Test Hole Plug	53	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Torque Converter and Differential Housing Bolt Refer to procedure for tightening sequence and torque values.	16	14	M8 x 30	Refer to Torque Converter Housing with Fluid Pump Assembly Installation .

* Reference number refers to the component callout number in Disassembled Views

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
9T45/50/60/65		
Valve Body Cover Removal - Approximate Capacity	2.0 - 3.0 liters	2.1 - 3.2 quarts
Fluid Change - Drain Plug - Approximate Capacity	5.0 - 6.0 liters	5.3 - 6.3 quarts
Overhaul - Approximate Capacity	8.5 - 9.5 liters	9.0 - 10 quarts

TRANSMISSION GENERAL SPECIFICATIONS

Name	9T45/9T50/9T60/9T65
RPO Codes	M3D, M3E, M3F, M3G, M3H, M3T, M3V, M3U, M3W
Production Location	Mexico
Transmission Drive	Front Wheel Drive
Reverse Gear Ratio	2.96
1st Gear Ratio	4.689
2nd Gear Ratio	3.306
3rd Gear Ratio	3.012
4th Gear Ratio	2.446
5th Gear Ratio	1.923
6th Gear Ratio	1.446
7th Gear Ratio	1.000
8th Gear Ratio	0.747
9th Gear Ratio	0.617
Effective Final Drive Gear Ratio	2.89/3.17/3.32/3.47/3.63/3.80
Torque Converter Size - Diameter of Torque Converter Turbine	228 mm
Pressure Taps Line	Pressure
Transmission Fluid Type	DEXRON VIA®
Transmission Fluid Capacity	8.82 L (9 qt)
Transmission Type: 9	9-speed FWD Transaxle
Transmission Type: T	Transverse Mount
Transmission Type: 45/50/60/65	Product Series
Position Quadrant	P, R, N, D, * * (Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transmission Net Weight	95.9 kg (211 lbs)
Maximum Trailer Towing Capacity	9T45 - 1743 kg (3842 lbs) 9T50 - 2598 kg (5727 lbs) 9T60 - 3080 kg (6790 lbs) 9T65 - 2473 kg (5452 lbs)
Maximum Gross Vehicle Weight (GVW)	9T45 - 2400 kg (5291 lbs) 9T50 - 2730 kg (6019 lbs) 9T60 - 2730 kg (6019 lbs) 9T65 - 2930 kg (6460 lbs)

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number

Application	Type of Material	United States	Canada
		United States	Canada
Automatic Transmission Fluid	DEXRON®VI	88865601	19367328
Torque Converter Bolt	Threadlocker	19333511	10953489

RANGE REFERENCE

Range	Gear	1-2-3-4-5-6 Clutch	2-9 Clutch	3-8 Clutch	4th Clutch	5-7-Reverse Clutch	6-7-8-9 Clutch	Single One Way Clutch (SOWC)
Park	P	-	-	-	-	-	-	-
Reverse	R	-	-	-	-	G	-	Holding
Neutral	N	-	-	-	-	-	-	O
Drive	1st	G	-	-	-	-	-	-
	2nd	Applied	Applied	-	-	-	-	-
	3rd	Applied	-	Applied	-	-	-	-
	4th	Applied	-	-	Applied	-	-	-
	5th	Applied	-	-	-	Applied	-	-
	6th	Applied	-	-	-	-	Applied	-
	7th	-	-	-	-	Applied	Applied	-
	8th	-	-	Applied	-	-	Applied	-
	9th	-	Applied	-	-	-	Applied	-
O = On but not carrying a load G = Garage-shift element, on and carrying load								

TRANSMISSION RANGE SENSOR DUTY CYCLES

Transmission Range Sensor Duty Cycle

NOTE: Verify the values with a scan tool.

Transmission Range	Transmission Range Sensor 1	Transmission Range Sensor 2
Park	12 to 18%	82 to 88%
Reverse	41 to 47%	53 to 59%
Neutral	55 to 61%	39 to 45%
Drive	69 to 75%	24 to 30%
Manual / Low	82 to 88%	12 to 18%

SHIFT SOLENOID VALVE STATE AND GEAR RATIO

Range	Park	Reverse	Neutral	Drive								
				1st	2nd	3rd	4th	5th	6th	7th	8th	9th
1-2-3-4-5-6 Shift Solenoid Valve A Command	On	On	On	Off	Off	Off	Off	Off	Off	On	On	On
2-9 Shift Solenoid Valve B Command	Off	Off	Off	Off	On	Off	Off	Off	Off	Off	Off	On
3-8 Shift Solenoid Valve C Command	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	On	Off

Range	Park	Reverse	Neutral	Drive								
				1st	2nd	3rd	4th	5th	6th	7th	8th	9th
4TH Shift Solenoid Valve D Command	Off	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	Off
5-7 Rev Shift Solenoid Valve E Command	Off	On	Off	Off	Off	Off	Off	On	Off	On	Off	Off
1-Reverse and 6-7-8-9 Shift Solenoid Valve F Command	Off	Off	Off	Off	On	On	On	On	Off	Off	Off	Off
Clutch Select Solenoid	On/Off	On	On/Off	Off	Off	Off	Off	Off	Off	Off	Off	Off
Gear Ratio 9T50	Â	2.96	Â	4.689	3.306	3.012	2.446	1.923	1.446	1.000	0.747	0.617
For shift solenoids, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure).												

TRANSMISSION PARTS KIT SPECIFICATIONS

1-2-3-4-5-6 Clutch Plate Assembly

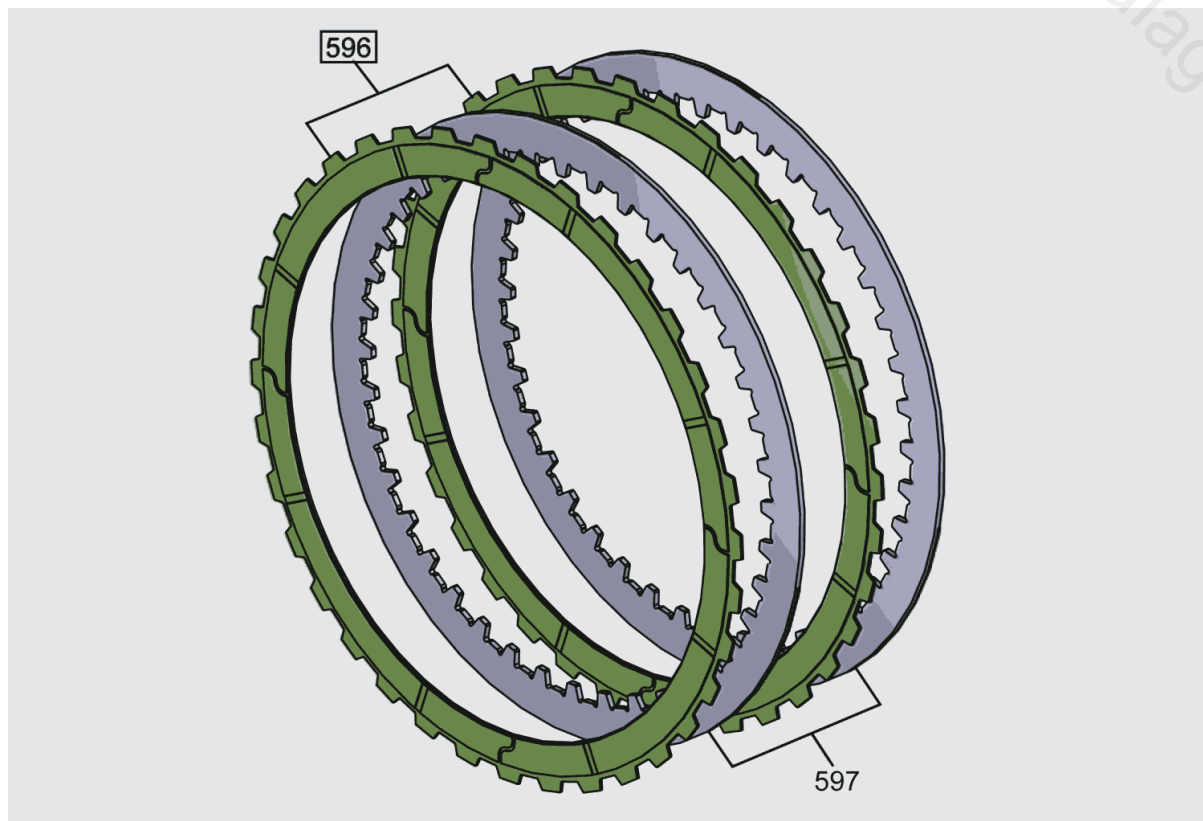


Fig. 1: 1-2-3-4-5-6 Clutch Plate Assembly Components

Courtesy of GENERAL MOTORS COMPANY

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

1-2-3-4-5-6 Clutch Plate Assembly

Callout	Quantity	Component Name

Callout	Quantity	Component Name
596	2	1-2-3-4-5-6 Clutch Plate - Friction Plate

2-9 Clutch Plate Assembly

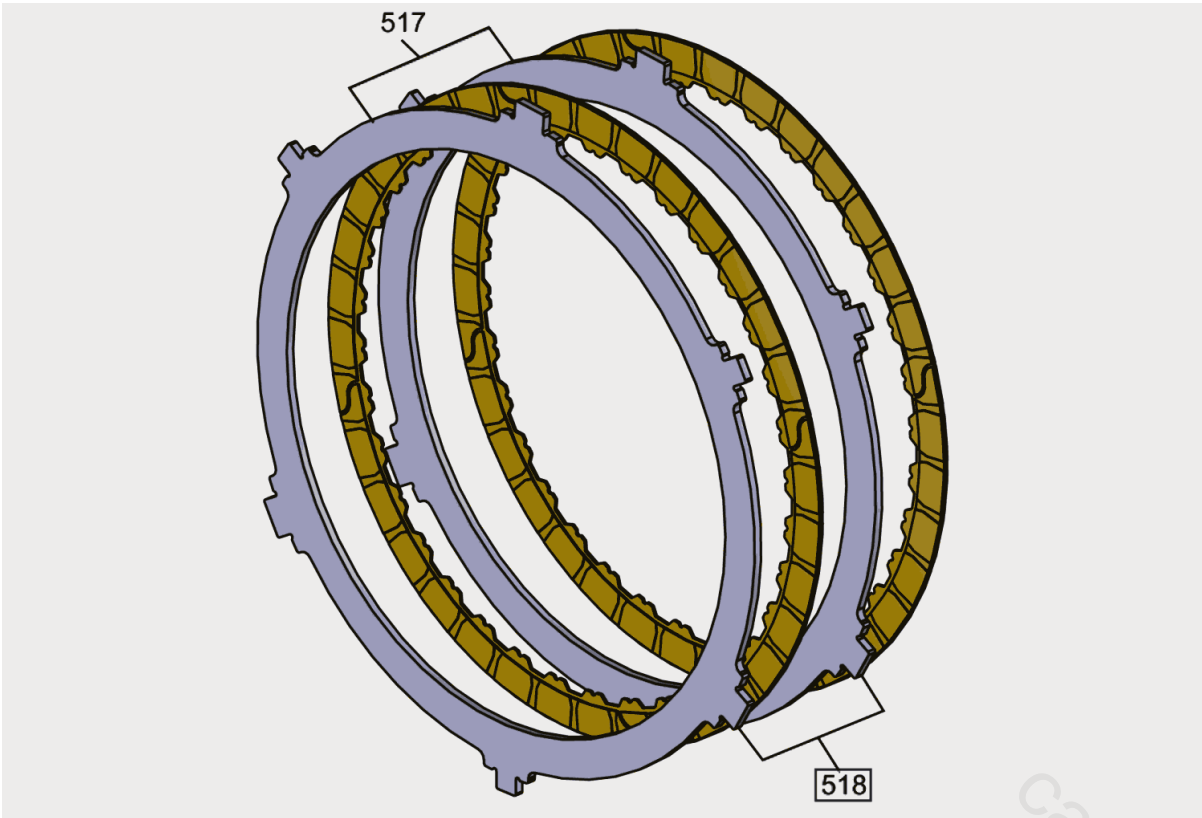


Fig. 2: 2-9 Clutch Plate Assembly Components
Courtesy of GENERAL MOTORS COMPANY

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

2-9 Clutch Plate Assembly

Callout	Quantity	Component Name
518	2	2-9 Clutch Plate - Friction Plate

3-8 Clutch Plate Assembly

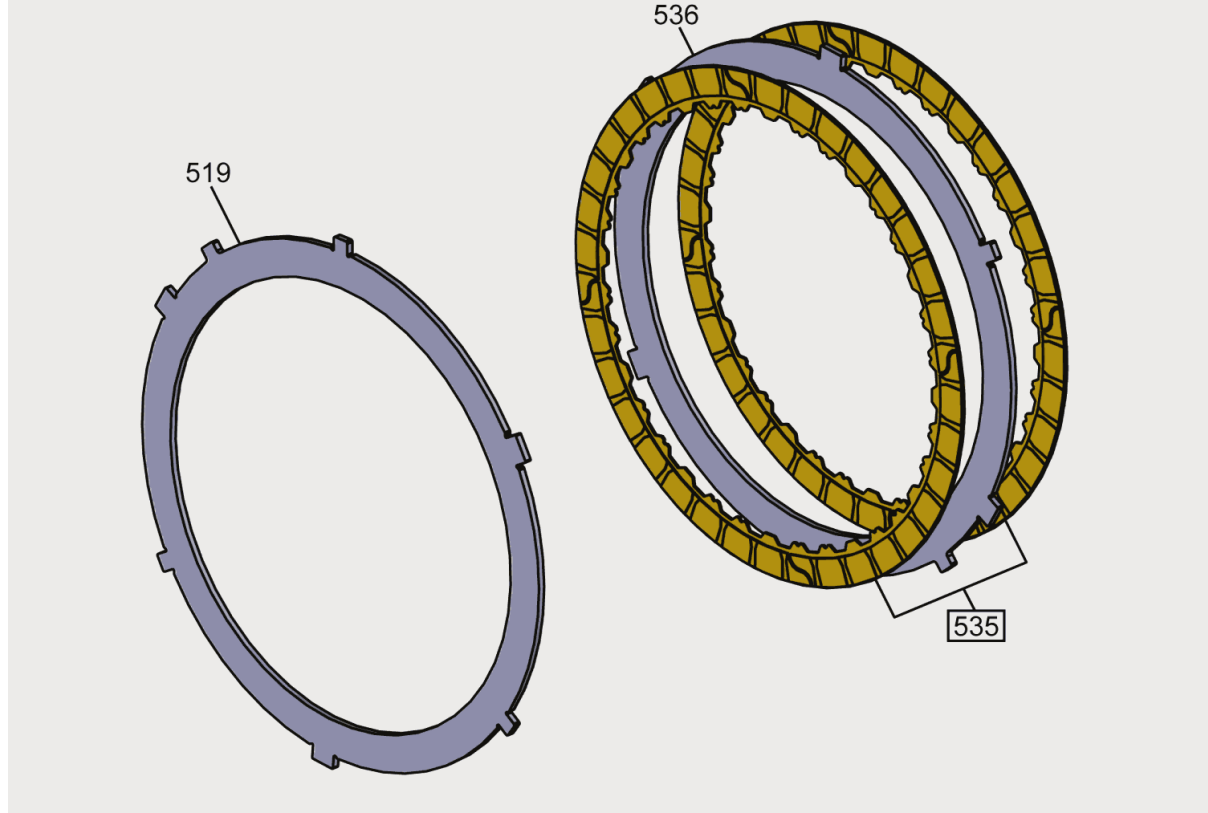


Fig. 3: 3-8 Clutch Plate Assembly Components
 Courtesy of GENERAL MOTORS COMPANY

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

3-8 Clutch Plate Assembly

Callout	Quantity	Component Name
535	2	3-8 Clutch Plate - Friction Plate

4th Clutch Plate Assembly

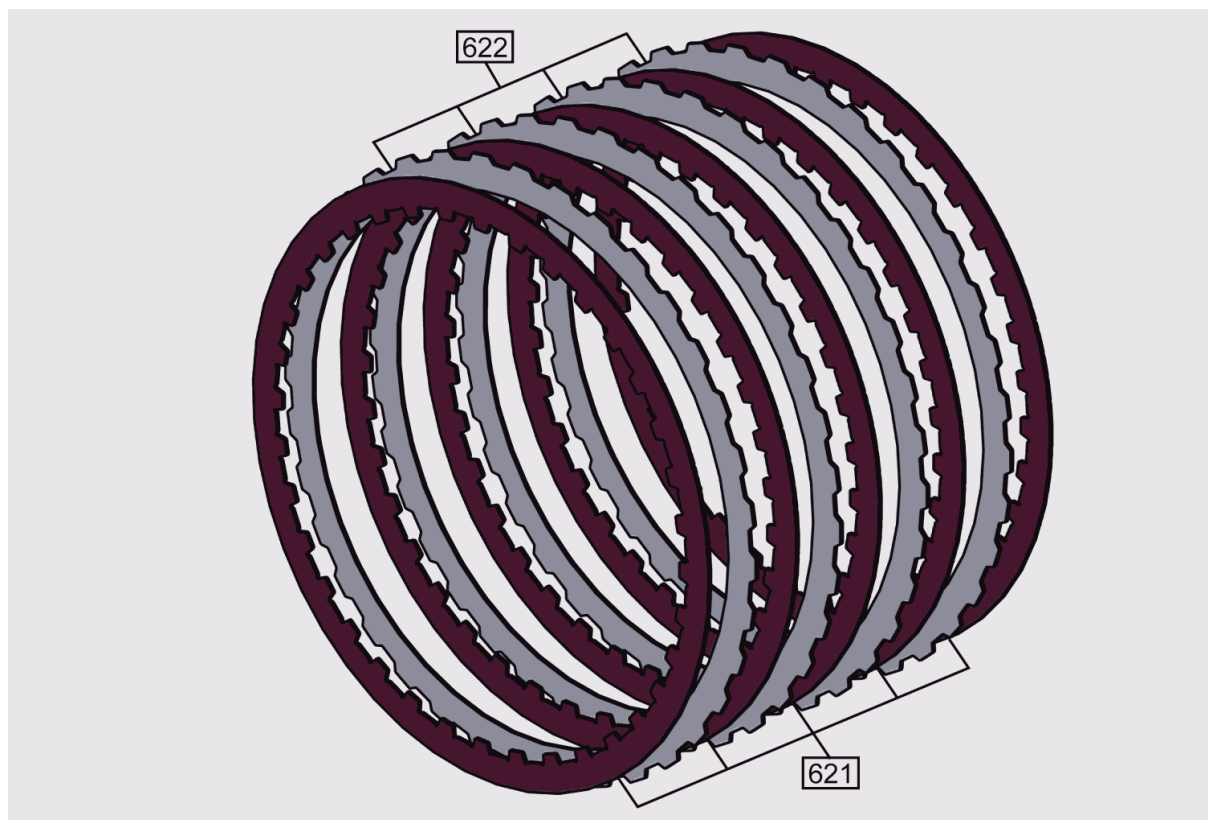


Fig. 4: 4th Clutch Plate Assembly Components
 Courtesy of GENERAL MOTORS COMPANY

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

4th Clutch Plate Assembly

Callout	Quantity	Component Name
621	5	4th Clutch Plate - Internal Spline
622	4	4th Clutch Plate - External Spline

5-7-Reverse Clutch Plate Assembly

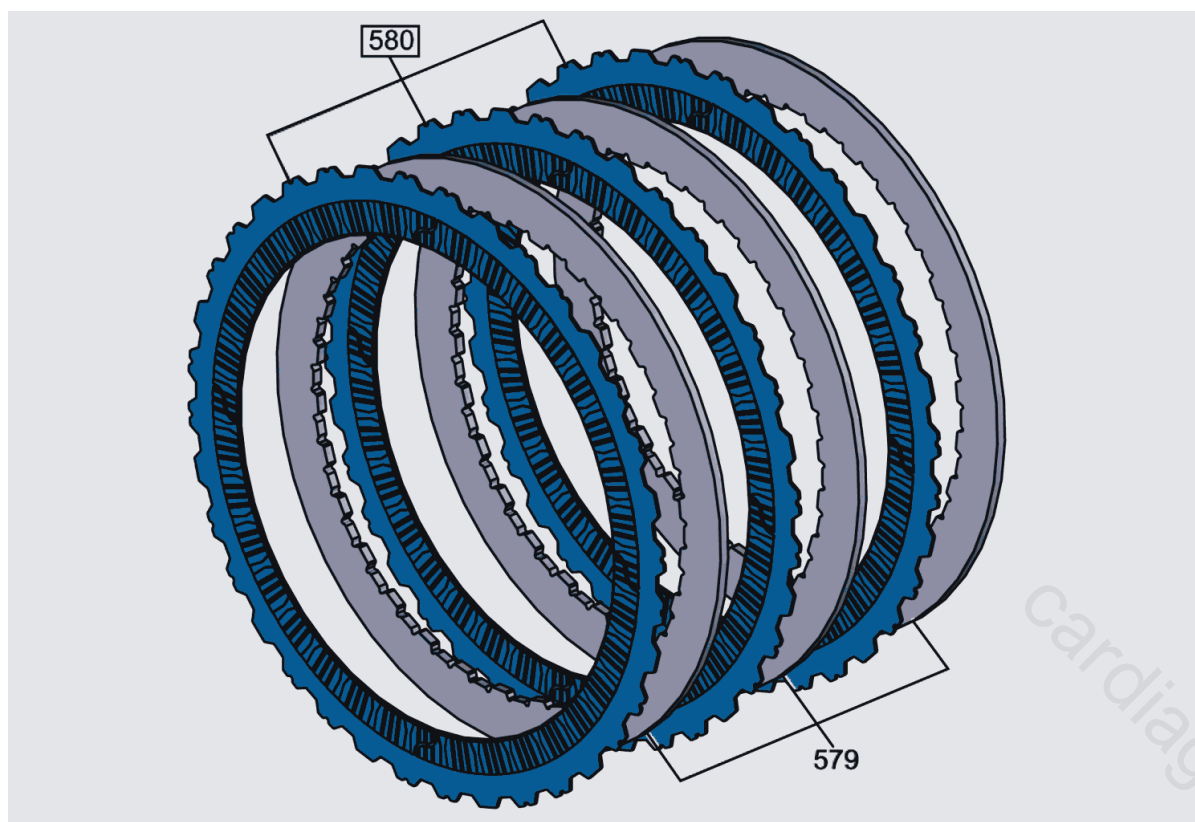


Fig. 5: 5-7-Reverse Clutch Plate Assembly Components

Courtesy of GENERAL MOTORS COMPANY

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

5-7-Reverse Clutch Plate Assembly

Callout	Quantity	Component Name
580	3	5-7-Reverse Clutch Plate - Friction Plate

6-7-8-9 Clutch Plate Assembly

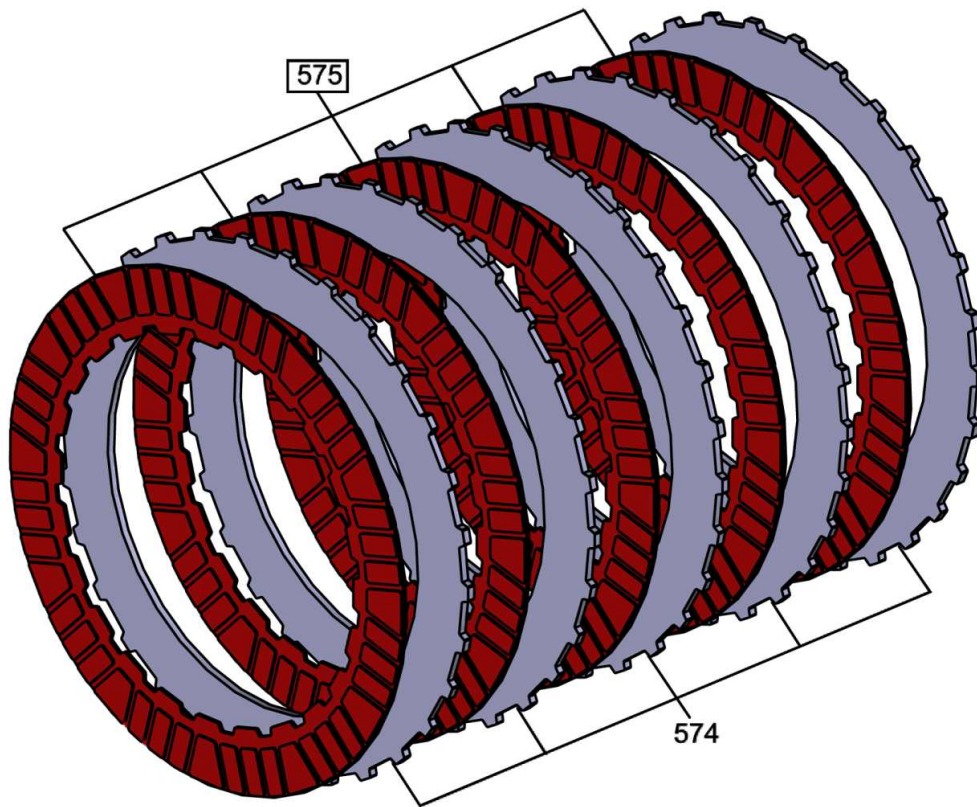


Fig. 6: 6-7-8-9 Clutch Plate Assembly Components

Courtesy of GENERAL MOTORS COMPANY

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

6-7-8-9 Clutch Plate Assembly

Callout	Quantity	Component Name
575	5	6-7-8-9 Clutch Plate - Friction Plate

Clutch Plate Package

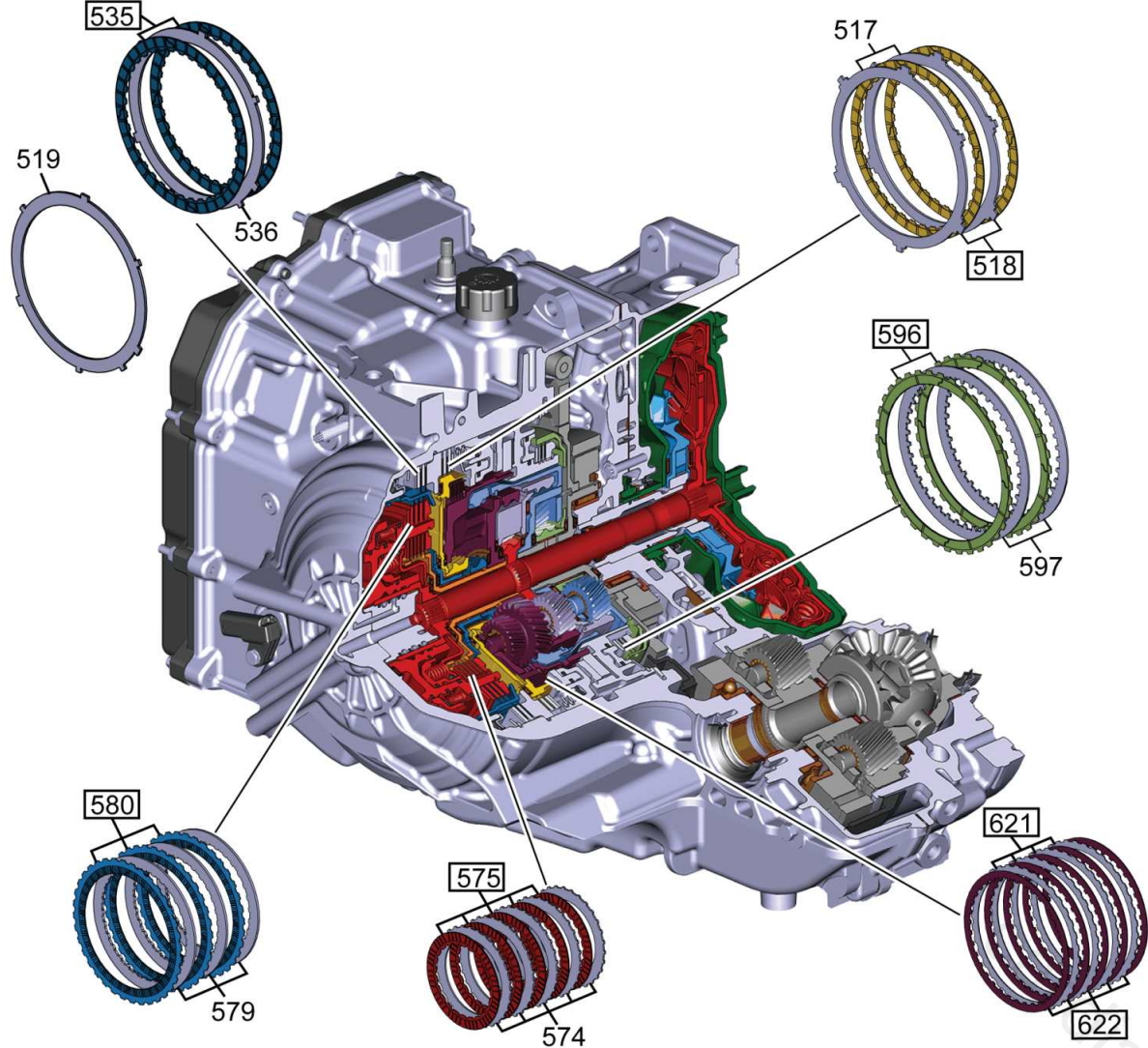


Fig. 7: Clutch Plate Package Components

Courtesy of GENERAL MOTORS COMPANY

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

Clutch Plate Package

Callout	Quantity	Component Name
518	2	2-9 Clutch Plate - Friction Plate
535	2	3-8 Clutch Plate - Friction Plate
575	5	6-7-8-9 Clutch Plate - Friction Plate
580	3	5-7-Reverse Clutch Plate - Friction Plate
596	2	1-2-3-4-5-6 Clutch Plate - Friction Plate
621	5	4th Clutch Plate - Internal Spline
622	4	4th Clutch Plate - External Spline

Automatic Transmission Seal Kit

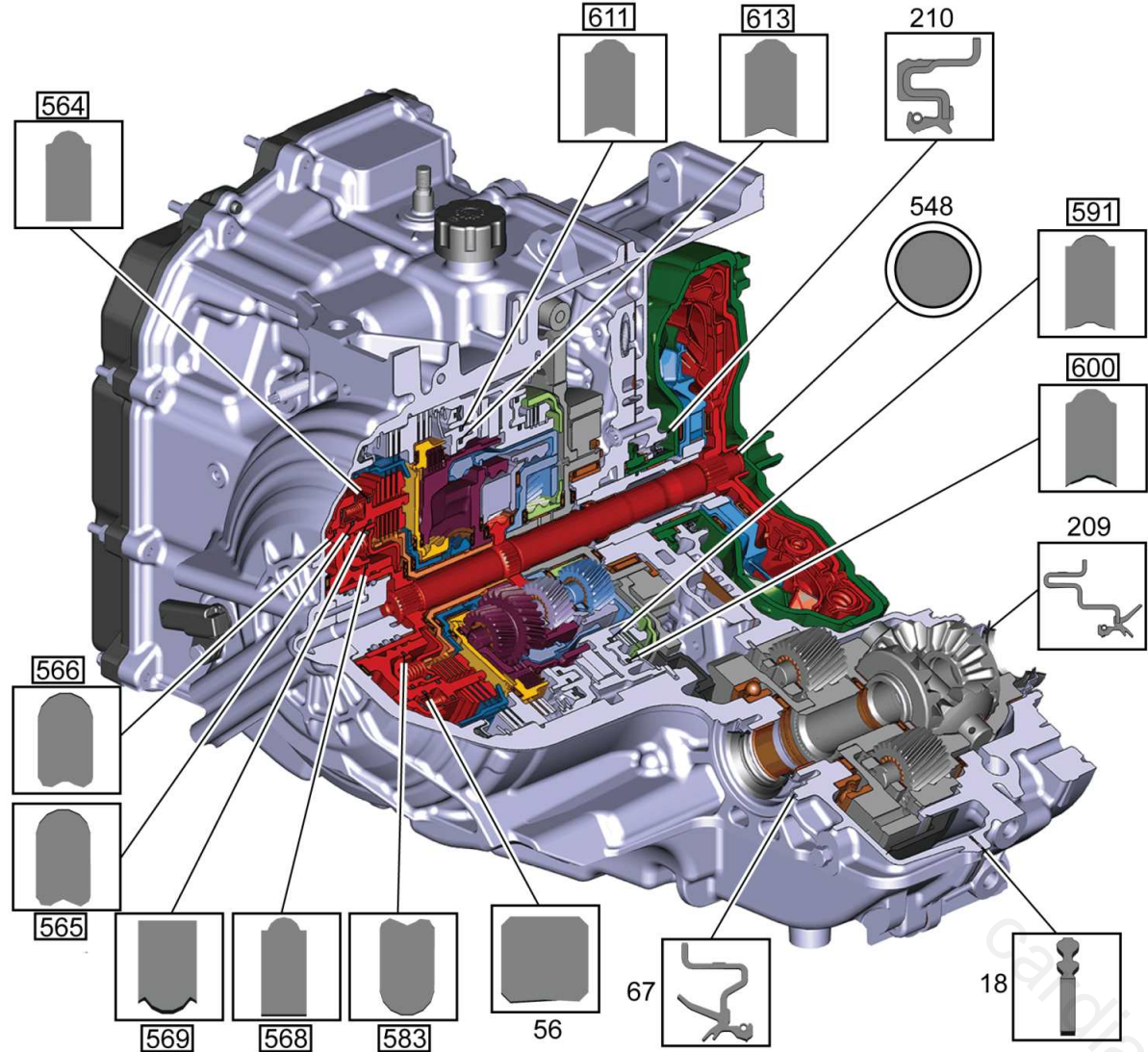


Fig. 8: Automatic Transmission Seal Kit Components
 Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit

Callout	Quantity	Component Name
564	1	3-5-Reverse Clutch Piston Dam Seal
565	1	3-5-Reverse Clutch Piston Inner Seal
566	1	3-5-Reverse Clutch Piston Inner Seal
568	1	4-5-6 Clutch Piston Inner Seal
569	1	4-5-6 Clutch Piston Dam Seal
583	1	4-5-6 Clutch Piston Outer Seal
591	1	1-2-3-4-5-6 Clutch Piston Inner Seal
600	1	1-2-3-4-5-6 Clutch Piston Seal
611	1	4th Clutch Piston Outer Seal
613	1	4th Clutch Piston Inner Seal

Automatic Transmission Retaining Ring Package

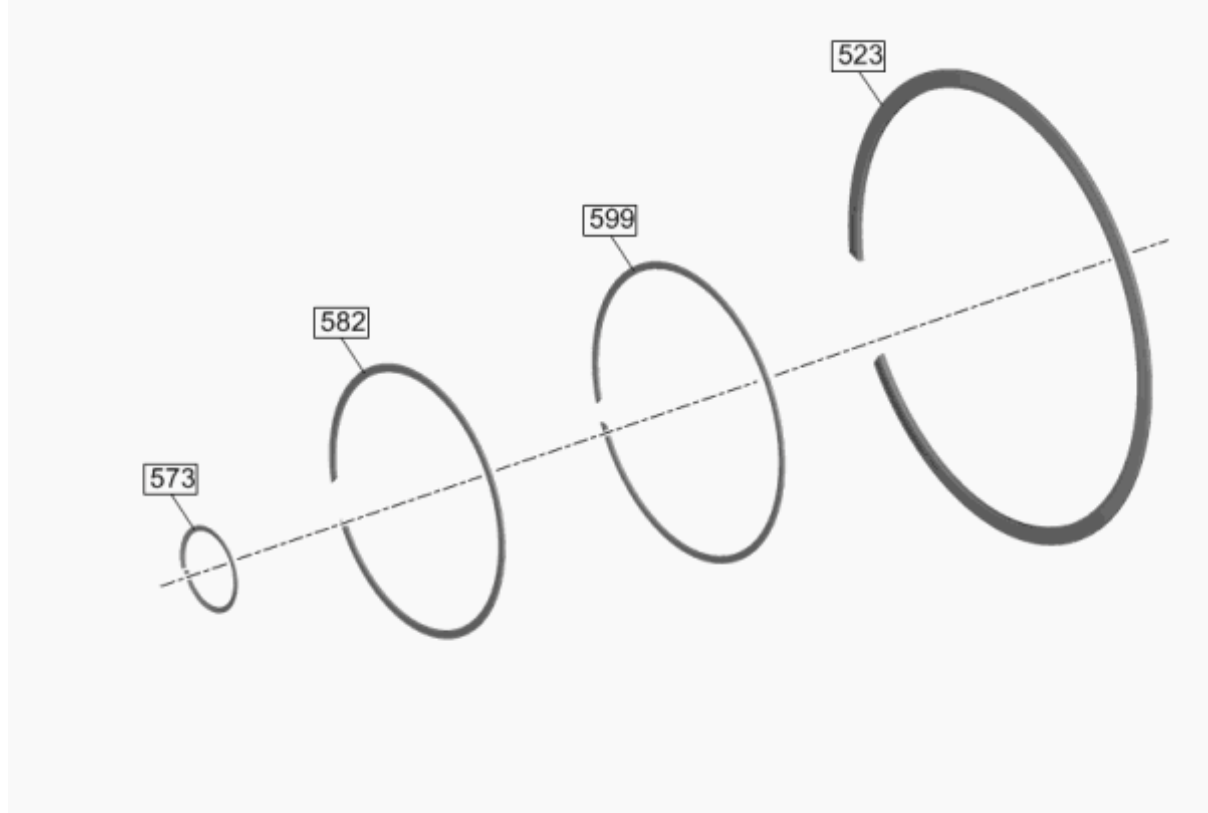


Fig. 9: Automatic Transmission Retaining Ring Package Components

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Retaining Ring Package

Callout	Quantity	Component Name
523	1	1-2-3-4-5-6 Clutch Piston Housing Return Ring
573	1	4-5-6 Clutch Dam Retaining Ring
582	1	5-7-Reverse Clutch Backing Plate Retaining Ring
599	1	1-2-3-4-5-6 Clutch Backing Plate Retaining Ring

Control Valve Body Solenoid Kit

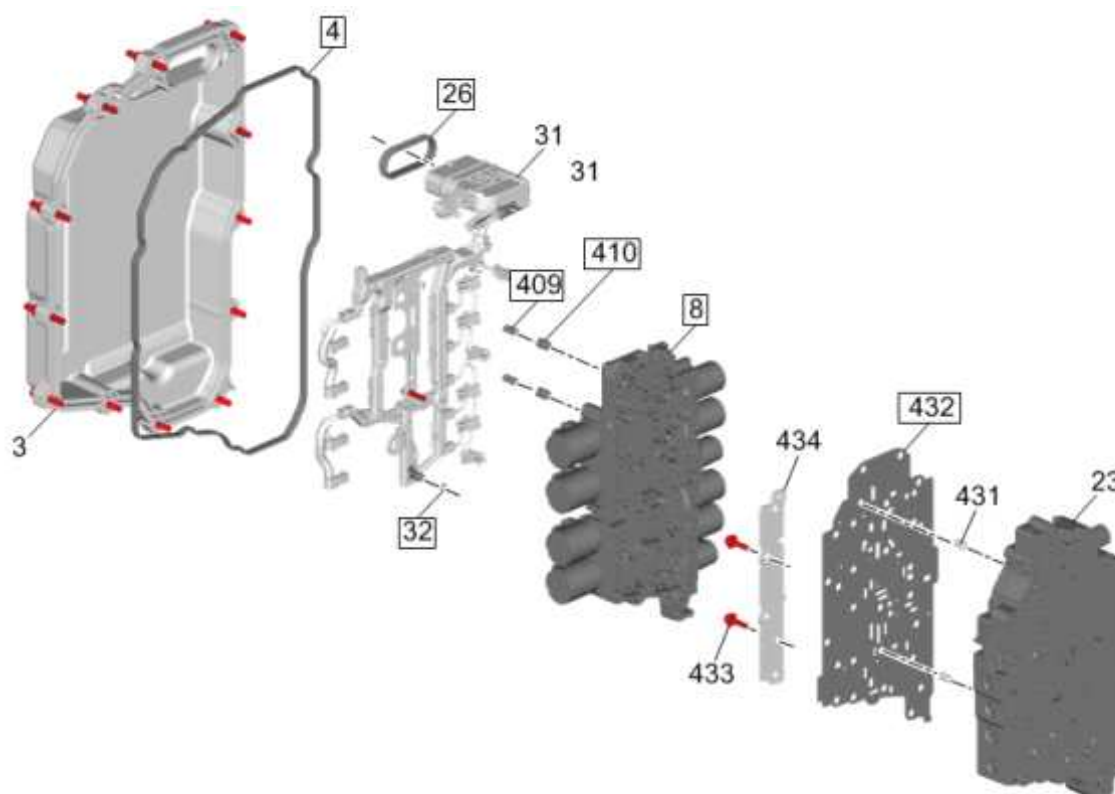


Fig. 10: Control Valve Body Solenoid Kit Components
 Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Solenoid Kit

Callout	Quantity	Component Name
4	1	Control Valve Body Cover Gasket
8	1	Control Valve Solenoid Body
26	1	Body Side Wiring Harness Opening Seal
32	1	Automatic Transmission Fluid Temperature Sensor Seal
409	2	Variable Feed Solenoid Clutch Accumulator Piston Spring
410	2	Variable Feed Solenoid Clutch Accumulator Piston
432	1	Control Valve Body Spacer Plate

Control Valve Body Kit

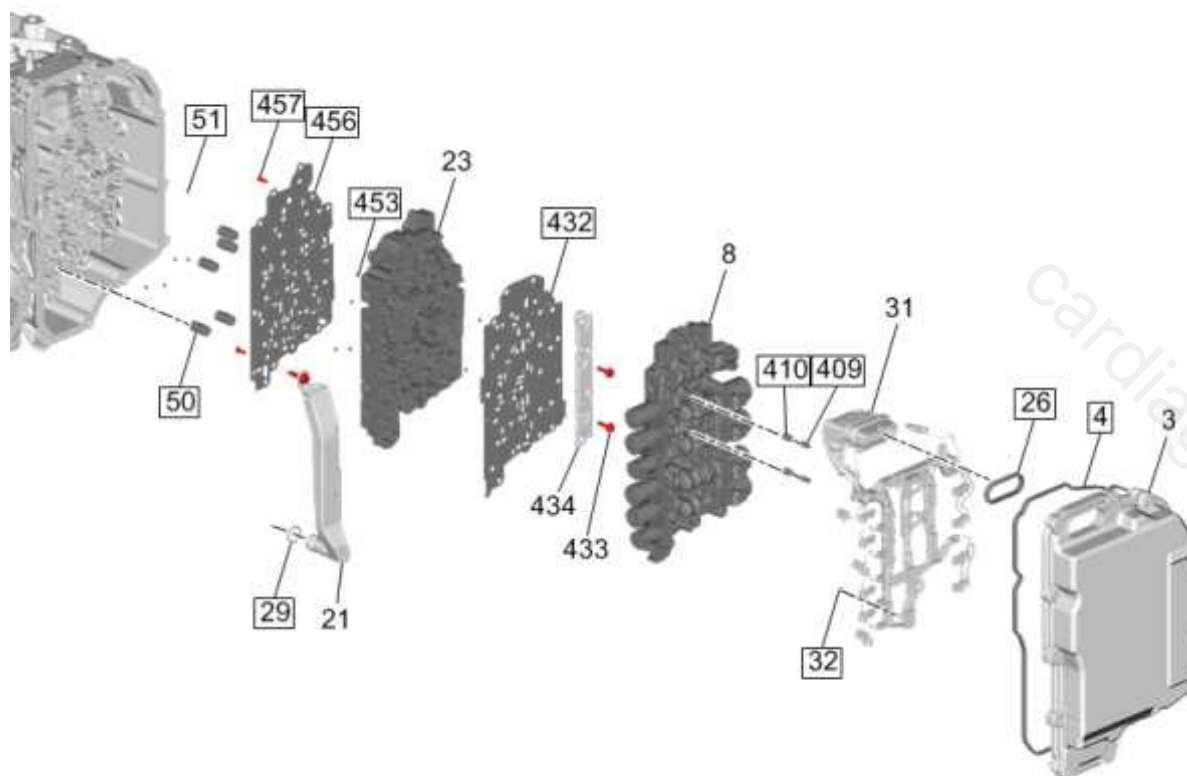


Fig. 11: Control Valve Body Kit Components
 Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Kit

Callout	Quantity	Component Name
4	1	Control Valve Body Cover Gasket
26	1	Body Side Wiring Harness Opening Seal
29	1	Fluid Transfer Pipe Seal
32	1	Automatic Transmission Fluid Temperature Sensor Seal
50	5	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
51	QTY	Control Valve Body Ball Check Valve - Model Dependent
409	2	Variable Feed Solenoid Clutch Accumulator Piston Spring
410	2	Variable Feed Solenoid Clutch Accumulator Piston
432	1	Control Valve Body Spacer Plate

Callout	Quantity	Component Name
453	QTY	Control Valve Body Ball Check Valve - Model Dependent
456	1	Control Valve Body Spacer Plate
457	2	Control Valve Body Spacer Plate Retainer

Automatic Transmission Seal Kit

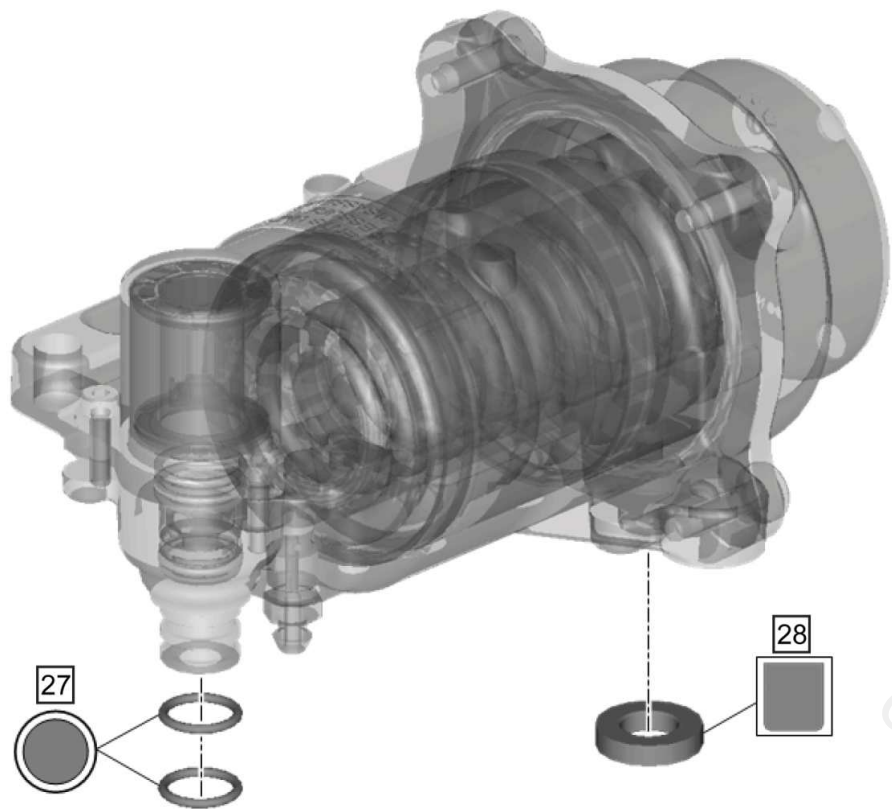


Fig. 12: Automatic Transmission Seal Kit Components
 Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit

Callout	Quantity	Component Name
27	2	Automatic Transmission Case Seal
28	1	Accumulator Bypass Valve Seal

Drive & Driven Sprocket (W/LINK) Package

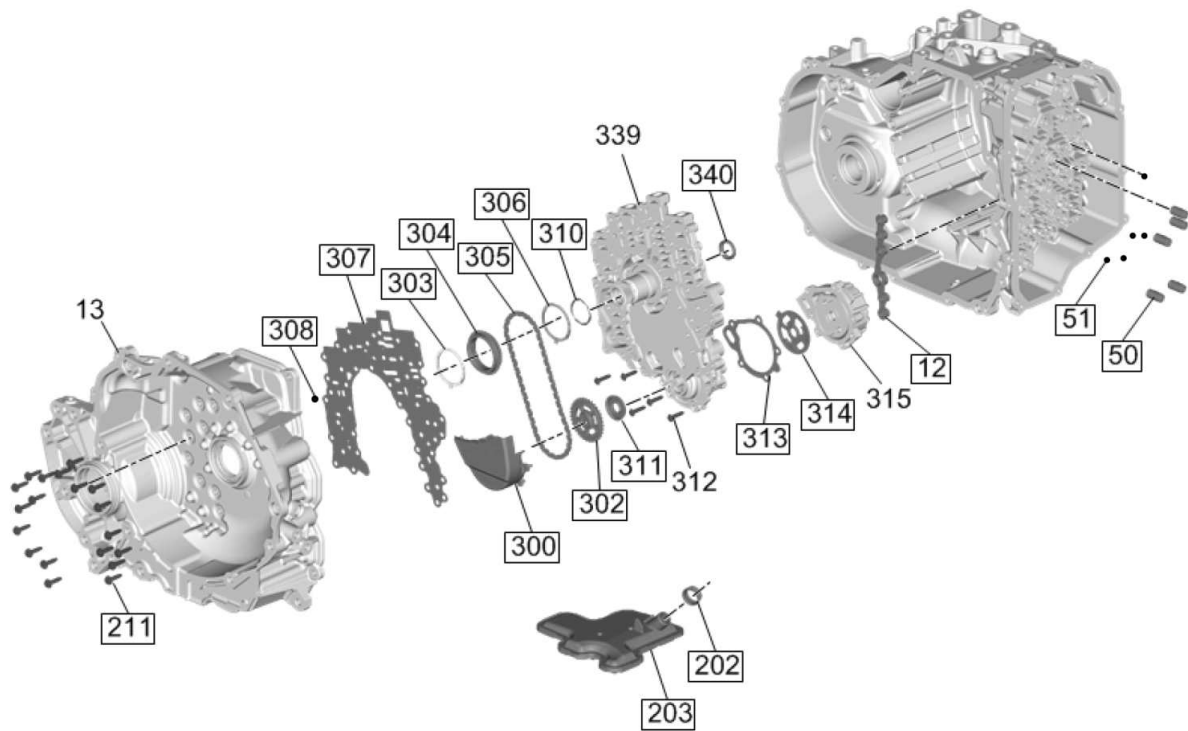


Fig. 13: Drive & Driven Sprocket (W/LINK) Package Components

Courtesy of GENERAL MOTORS COMPANY

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

Drive & Driven Sprocket (W/LINK) Package

Callout	Quantity	Component Name
12	1	Automatic Transmission Fluid Pump Seal
50	5	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
51	QTY	Control Valve Body Ball Check Valve - Model Dependent
202	1	Automatic Transmission Fluid Filter Seal
203	1	Automatic Transmission Fluid Filter
211	19	Automatic Transmission Fluid Pump Cover Bolt
300	2	Automatic Transmission Fluid Baffle Bolt
302	1	Driven Sprocket
303	1	Drive Sprocket Thrust Washer - Rear
304	1	Drive Sprocket
305	1	Drive Link
306	1	Drive Sprocket Thrust Washer - Front
307	1	Auxiliary Control Valve Body Spacer Plate
308	1	Automatic Transmission Fluid Pump Ball Check Valve
310	1	Torque Converter Fluid Seal Ring
311	1	Automatic Transmission Fluid Pump Shaft Seal
313	1	Automatic Transmission Fluid Pump Gasket
314	1	Automatic Transmission Fluid Pump Pressure Plate Seal
340	1	Stator Shaft Seal

Automatic Transmission Fluid Pump Seal Kit

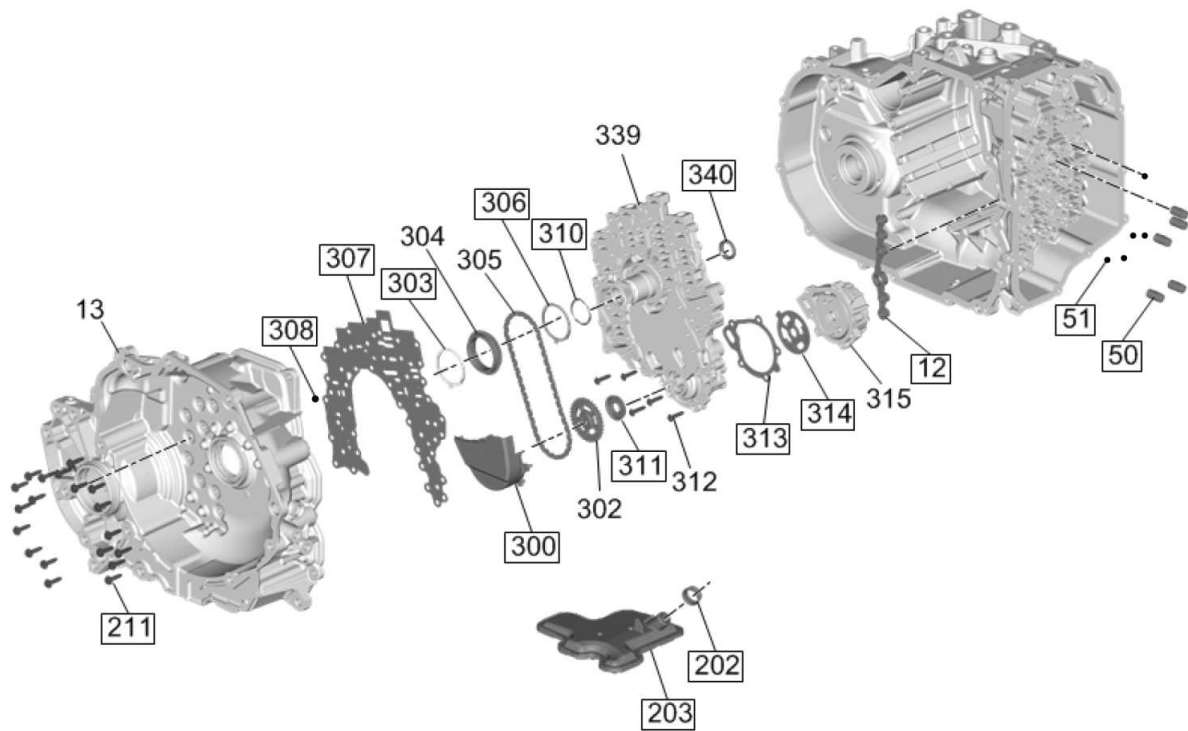


Fig. 14: Automatic Transmission Fluid Pump Seal Kit Components

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Fluid Pump Seal Kit

Callout	Quantity	Component Name
12	1	Automatic Transmission Fluid Pump Seal
50	5	1-2-3-4 Low and Reverse Clutch Fluid Passage Seal
51	QTY	Control Valve Body Ball Check Valve - Model Dependent
202	1	Automatic Transmission Fluid Filter Seal
203	1	Automatic Transmission Fluid Filter
211	19	Automatic Transmission Fluid Pump Cover Bolt
300	2	Automatic Transmission Fluid Baffle Bolt
303	1	Drive Sprocket Thrust Washer - Rear
306	1	Drive Sprocket Thrust Washer - Front
307	1	Auxiliary Control Valve Body Spacer Plate
308	1	Automatic Transmission Fluid Pump Ball Check Valve
310	1	Torque Converter Fluid Seal Ring
311	1	Automatic Transmission Fluid Pump Shaft Seal
313	1	Automatic Transmission Fluid Pump Gasket
314	1	Automatic Transmission Fluid Pump Pressure Plate Seal
340	1	Stator Shaft Seal

Automatic Transmission Seal Kit (1 of 6)

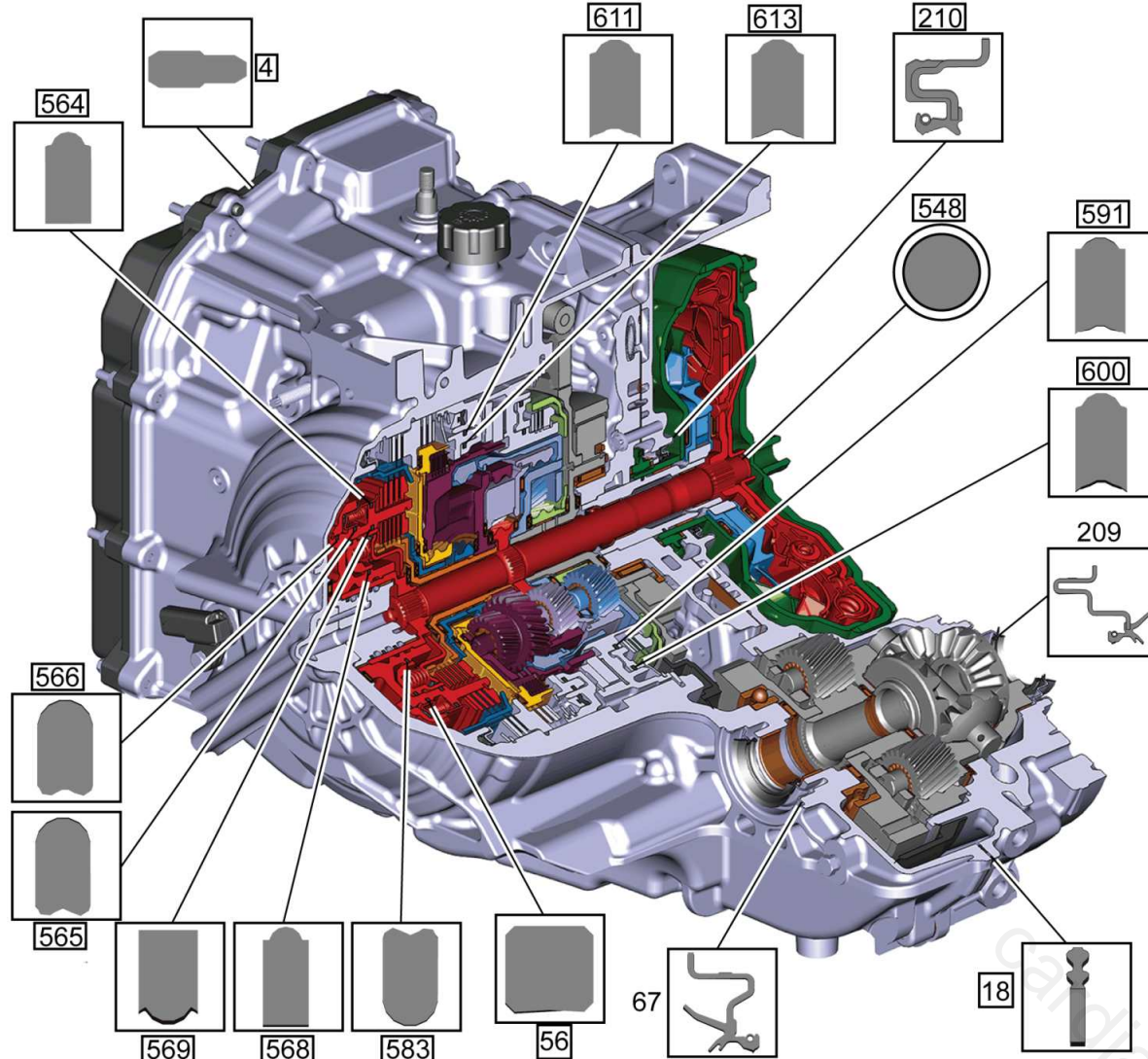


Fig. 15: Automatic Transmission Seal Kit Components (1 of 6)

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit (1 of 6)

Callout	Quantity	Component Name
4	1	Control Valve Body Cover Gasket
18	1	Torque Converter Housing Gasket
56	1	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
210	1	Torque Converter Fluid Seal
548	1	Turbine Shaft Seal
564	1	3-5-Reverse Clutch Piston Dam Seal
565	1	3-5-Reverse Clutch Piston Inner Seal
566	1	3-5-Reverse Clutch Piston Inner Seal
568	1	4-5-6 Clutch Piston Inner Seal
569	1	4-5-6 Clutch Piston Dam Seal
583	1	4-5-6 Clutch Piston Outer Seal
591	1	1-2-3-4-5-6 Clutch Piston Inner Seal
600	1	1-2-3-4-5-6 Clutch Piston Seal
611	1	4th Clutch Piston Outer Seal
613	1	4th Clutch Piston Inner Seal

Automatic Transmission Seal Kit (2 of 6)

Callout	Quantity	Component Name
706	1	Manual Shift Shaft Seal
710	1	Manual Shift Detent Lever Pin

Automatic Transmission Seal Kit (3 of 6)

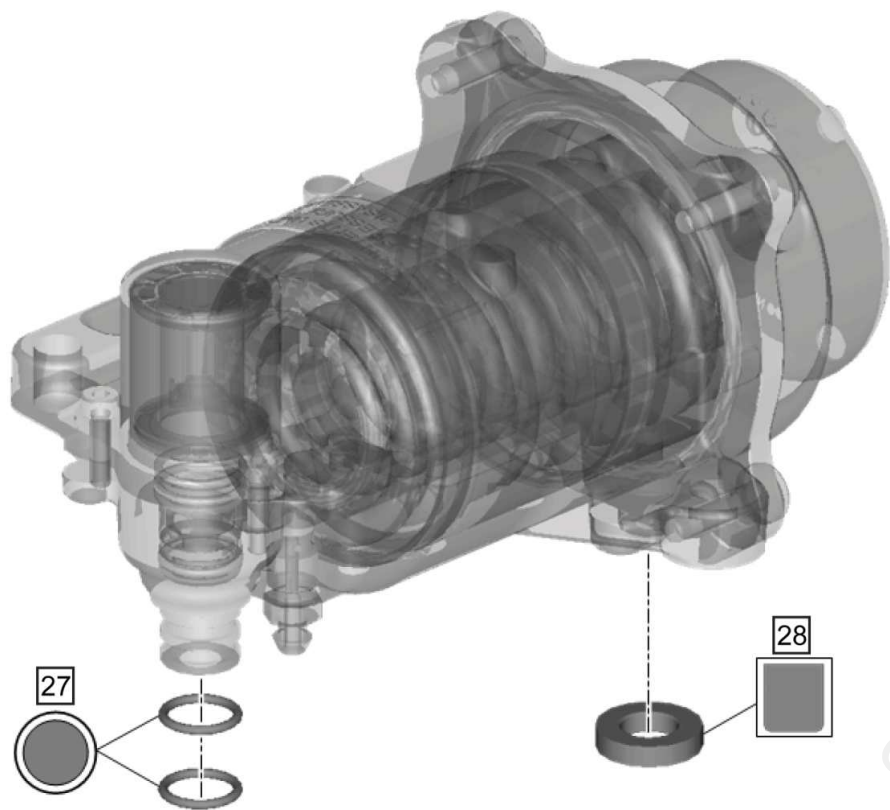


Fig. 17: Automatic Transmission Seal Kit Components (3 Of 6)
 Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit (3 of 6)

Callout	Quantity	Component Name
27	2	Automatic Transmission Case Seal
28	1	Accumulator Bypass Valve Seal

Automatic Transmission Seal Kit (4 of 6)

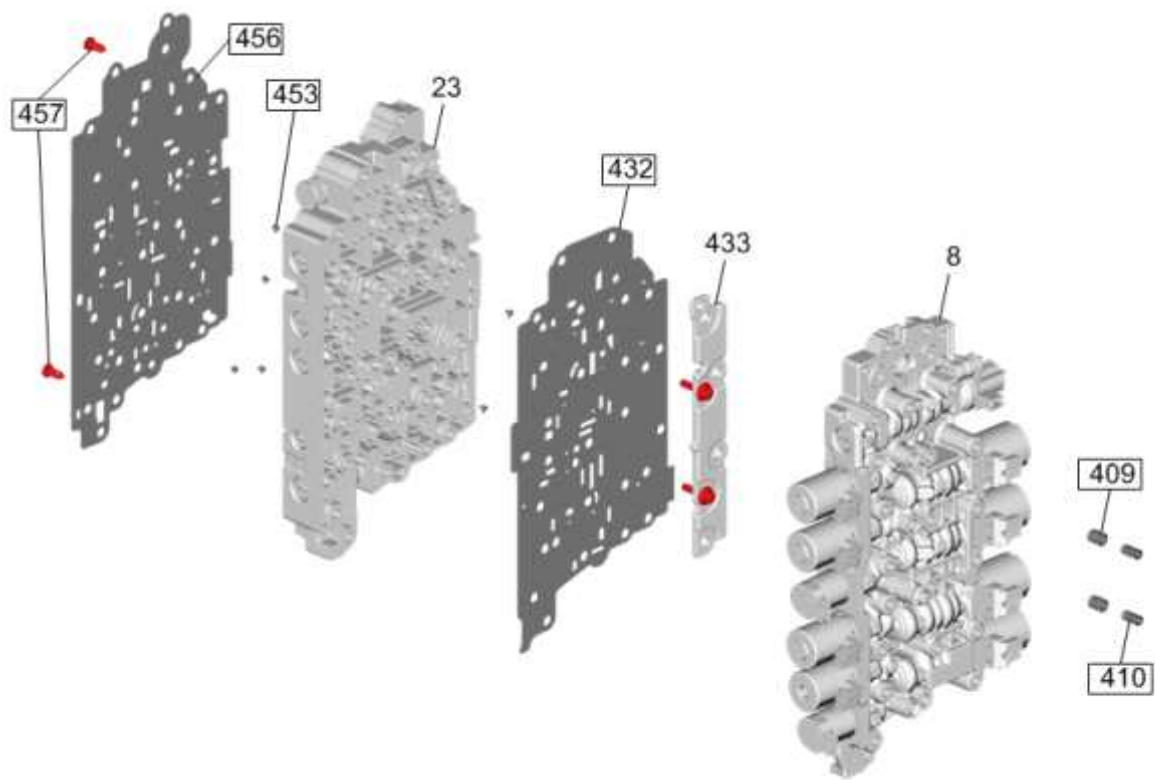


Fig. 18: Automatic Transmission Seal Kit Components (4 Of 6)

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit (4 of 6)

Callout	Quantity	Component Name
409	2	Variable Feed Solenoid Clutch Accumulator Piston Spring
410	2	Variable Feed Solenoid Clutch Accumulator Piston
432	1	Control Valve Body Spacer Plate
453	QTY	Control Valve Body Ball Check Valve - Model Dependent
456	1	Control Valve Body Spacer Plate
457	2	Control Valve Body Spacer Plate Retainer

Automatic Transmission Seal Kit (5 of 6)

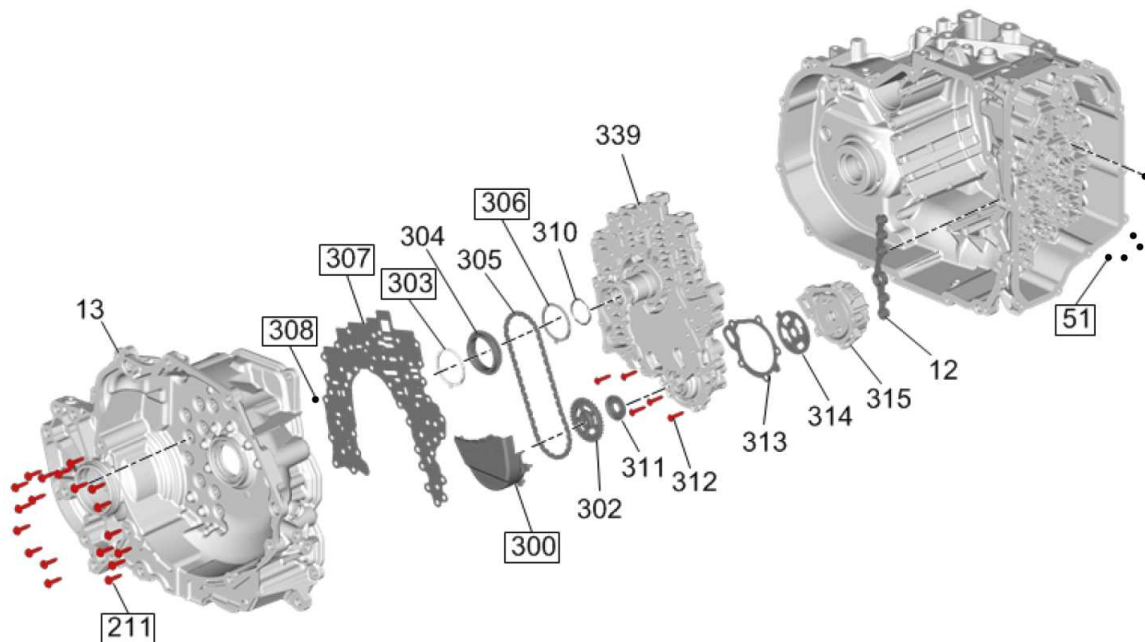


Fig. 19: Automatic Transmission Seal Kit Components (5 Of 6)

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit (5 of 6)

Callout	Quantity	Component Name
51	QTY	Control Valve Body Ball Check Valve - Model Dependent
211	19	Automatic Transmission Fluid Pump Cover Bolt
300	1	Automatic Transmission Fluid Baffle
303	1	Driven Sprocket Thrust Washer
306	1	Driven Sprocket Thrust Washer
307	1	Auxiliary Control Valve Body Spacer Plate
308	1	Automatic Transmission Fluid Pump Ball Check Valve

Automatic Transmission Seal Kit (6 of 6)

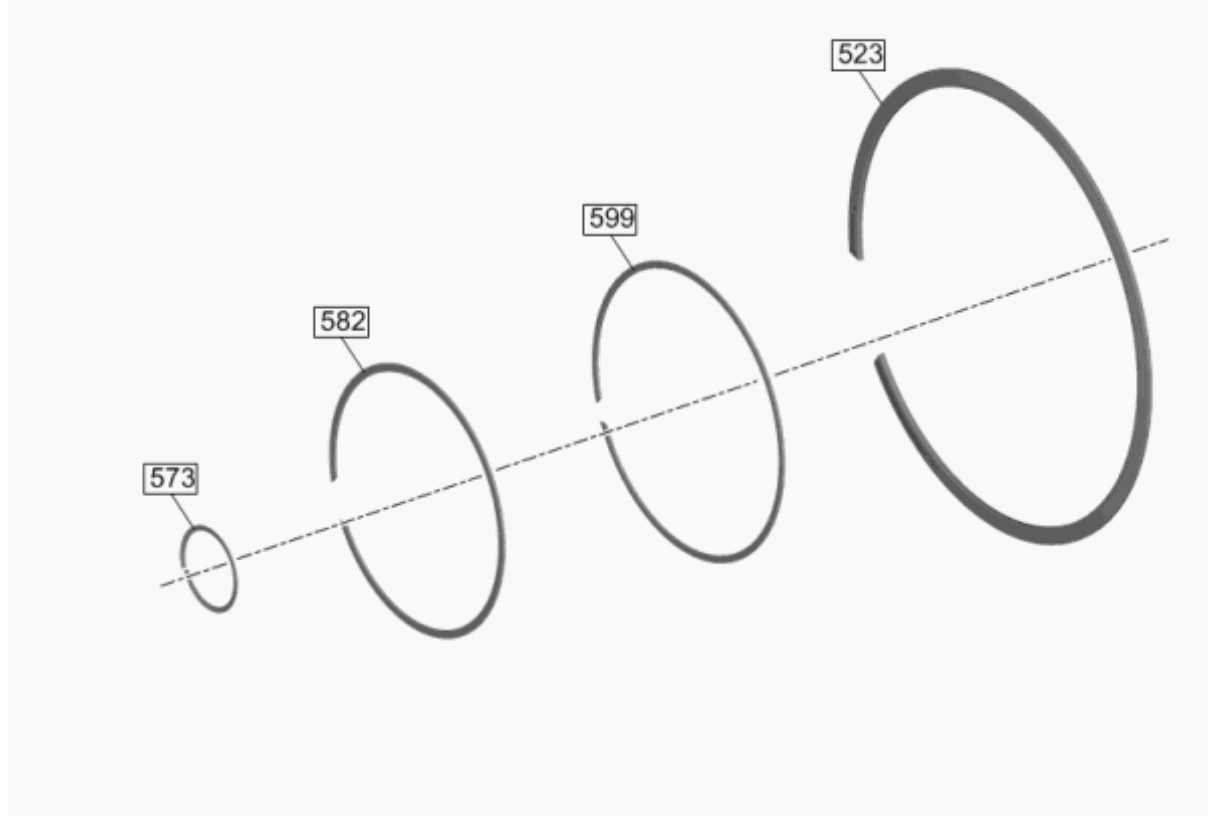


Fig. 20: Automatic Transmission Seal Kit Components (6 Of 6)

Courtesy of GENERAL MOTORS COMPANY

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

Automatic Transmission Seal Kit (6 of 6)

Callout	Quantity	Component Name
523	1	1-2-3-4-5-6 Clutch Piston Housing Return Ring
573	1	4-5-6 Clutch Dam Retaining Ring
582	1	5-7-Reverse Clutch Backing Plate Retaining Ring
599	1	1-2-3-4-5-6 Clutch Backing Plate Retaining Ring