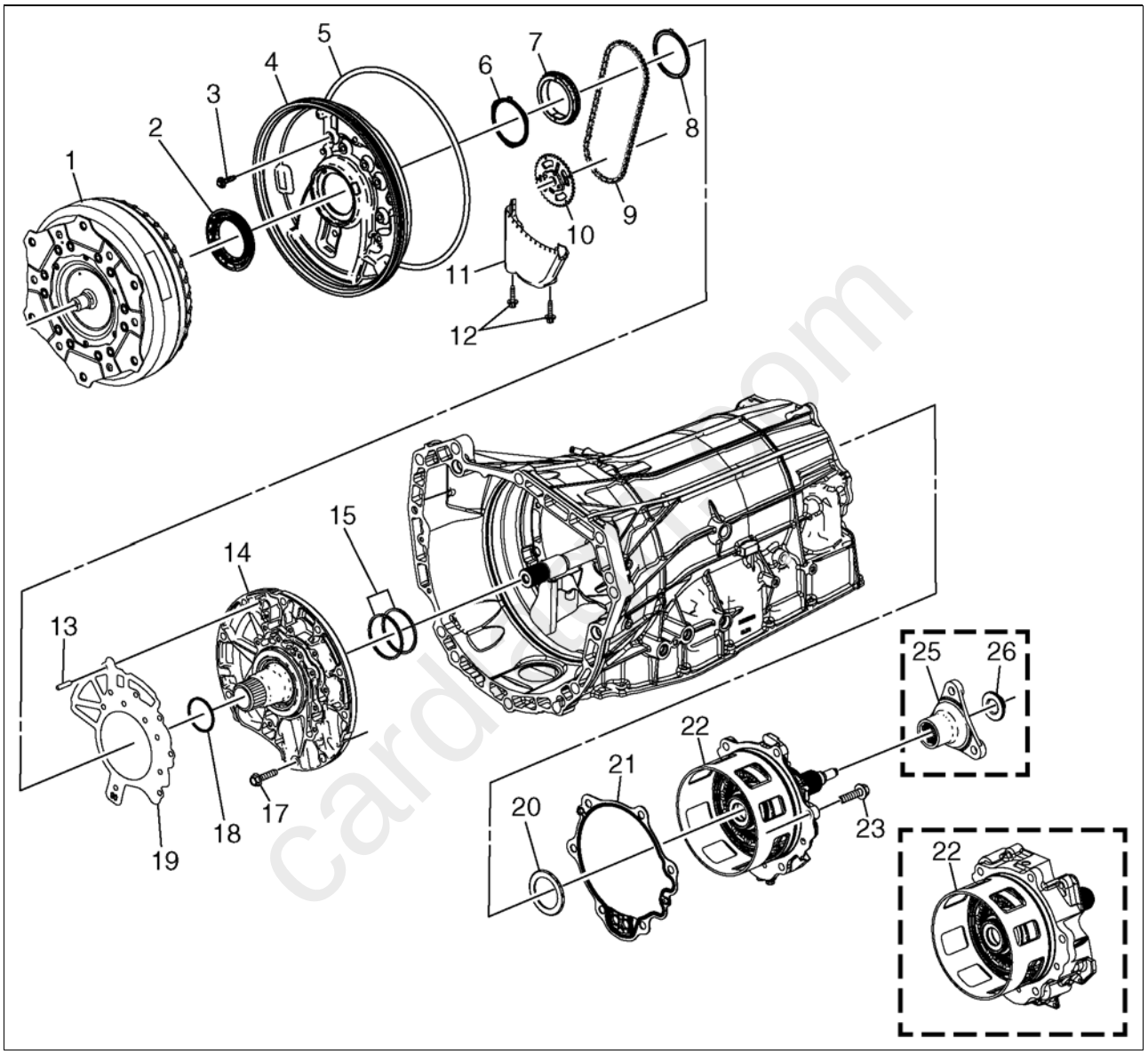
Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - COMPONENT LOCATOR

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CASE AND ASSOCIATED PARTS (1 OF 2)

Fig 1: Case and Associated Parts (1 of 2)



Courtesy of GENERAL MOTORS COMPANY

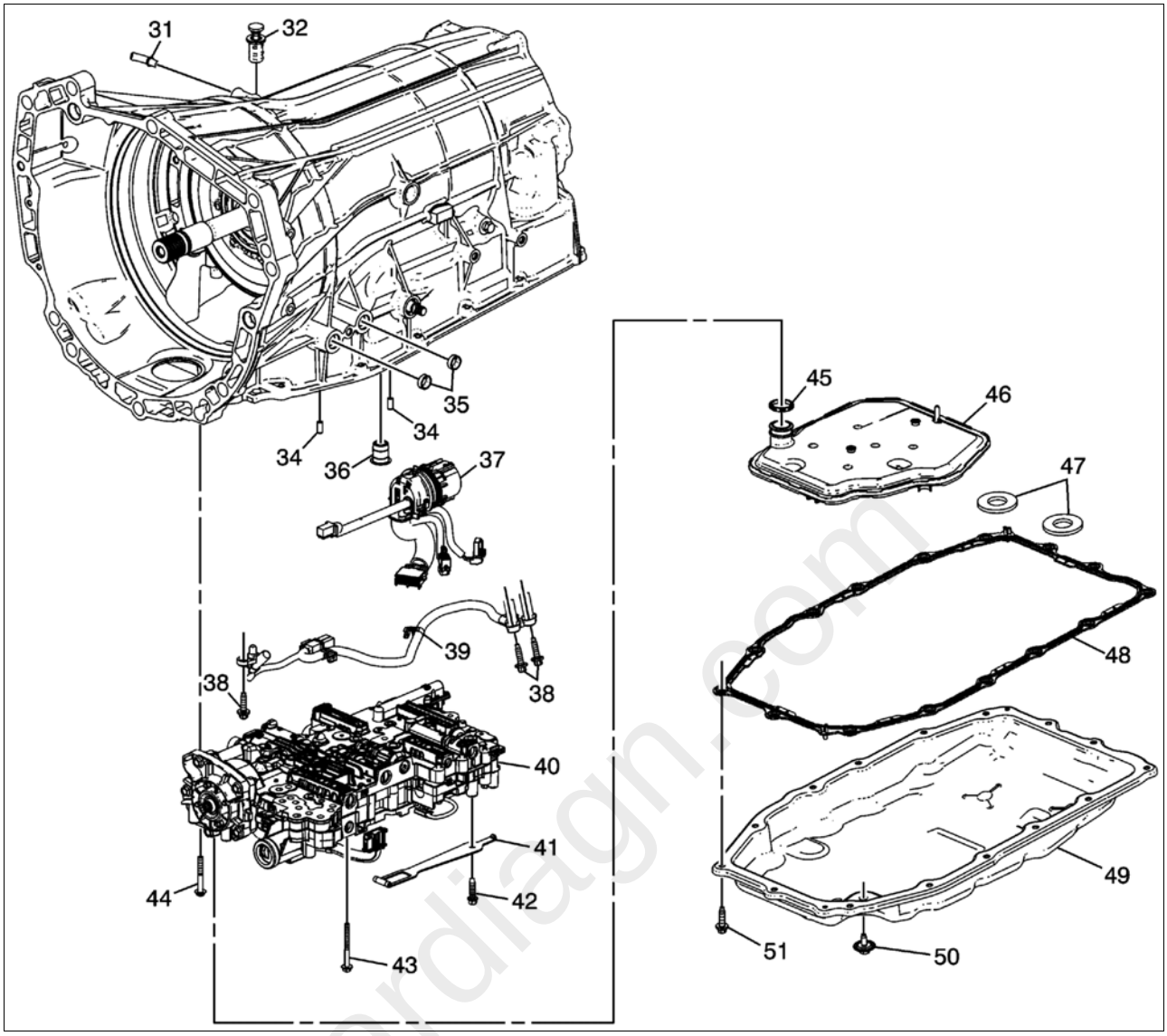
Callout	Component Name
1	Torque Converter
2	Torque Converter Fluid Seal
3	A/Trans Case Front Cover Bolt
4	A/Trans Case Front Cover

5	A/Trans Case Front Cover Seal
6	Drive Sprocket Thrust Washer - Front
7	Drive Sprocket
8	Drive Sprocket Thrust Washer - Rear
9	Drive Link Assembly
10	Driven Sprocket
11	A/Trans Fluid Baffle
12	A/Trans Fluid Baffle Bolt
13	A/Trans Case Front Cover Locating Pin
14	Stator Shaft Support
15	1-3-5-6-7 Clutch Fluid Seal Ring
17	Stator Shaft Support Bolt
18	Torque Converter Fluid Seal
19	A/Trans Front Support Cover Gasket
20	Output Carrier Thrust Bearing
21	A/Trans Case Extension Seal
22	A/Trans Case Extension Assembly
23	A/Trans Case Extension Bolt
25	Propeller Shaft Transmission Flange
26	Front Propeller Shaft Flange Nut

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CASE AND ASSOCIATED PARTS (2 OF 2)

Fig 1: Case and Associated Parts (2 of 2)



Courtesy of GENERAL MOTORS COMPANY

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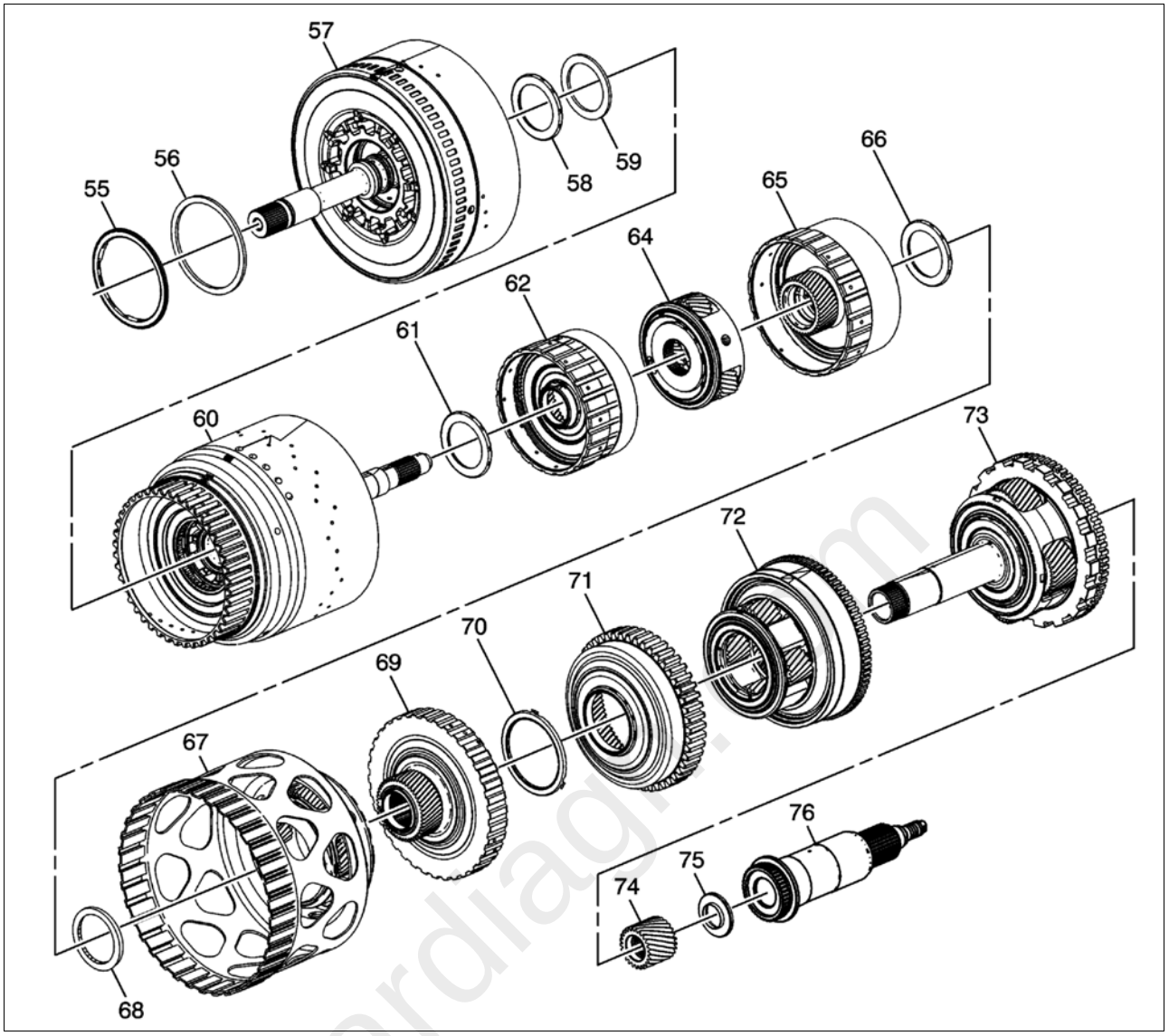
Callout	Component Name
31	A/Trans Vent
32	Transmission Fluid Fill Tube Plug
34	Control Valve Body Locating Pin
35	Transmission Cooler Pipe Fitting Seal
36	Clutch Housing Fluid Passage Seal
37	A/Trans Wiring Harness
38	Output Speed Sensor Wiring Harness Bolt
39	Output Speed Sensor Wiring Harness
40	Control (with Body and Valve) Valve Assembly

41	Manual Shaft Detent Lever Spring
42	Manual Shaft Detent Lever Spring Bolt
43	Control Valve Solenoid Body Bolt
44	Control Valve Solenoid Body Bolt
45	A/Trans Fluid Filter Seal
46	A/Trans Fluid Filter
47	A/Trans Fluid Pan Magnet
48	A/Trans Fluid Pan Gasket
49	A/Trans Fluid Pan
50	A/Trans Fluid Pan Drain Plug
51	A/Trans Fluid Pan Bolt

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CLUTCH ASSEMBLIES AND ASSOCIATED PARTS

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Fig 1: Clutch Assemblies and Associated Parts



Courtesy of GENERAL MOTORS COMPANY

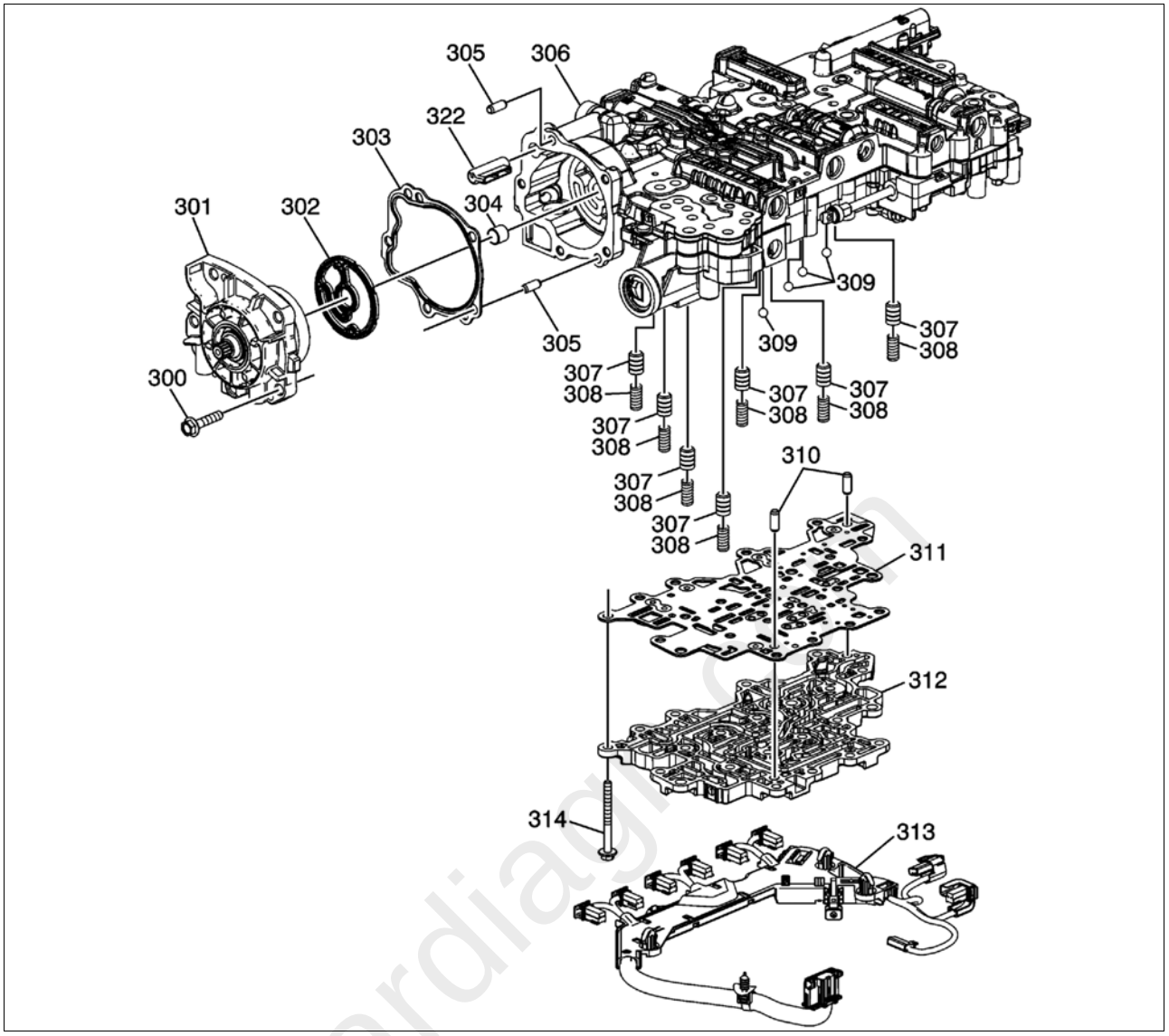
Callout	Component Name
55	1-3-5-6-7 Clutch Thrust Bearing
56	1-3-5-6-7 Clutch Thrust Bearing Washer
57	1-3-5-6-7 Clutch Assembly
58	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing
59	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing Washer
60	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly
61	4-5-6-7-8 Reverse Clutch and Direct Overdrive Internal Gear Hub Thrust Bearing
62	Direct/Overdrive Internal Gear Assembly
64	Direct/Overdrive Carrier Assembly

65	Input Internal Gear Assembly
66	Input Sun Gear Thrust Bearing
67	Input Carrier Assembly
68	Input Sun Gear Spacer
69	Input Sun Gear Assembly
70	1-2-3-4-5 Reverse Clutch Hub Thrust Bearing
71	Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
72	Reaction Carrier Assembly with Output Internal Gear Assembly
73	Output Carrier Assembly
74	Output Sun Gear
75	Output Sun Gear Thrust Bearing
76	Output Shaft

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CONTROL (WITH BODY AND VALVE) VALVE ASSEMBLY (1 OF 2)

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Fig 1: Control (with Body and Valve) Valve Assembly (1 of 2)



Courtesy of GENERAL MOTORS COMPANY

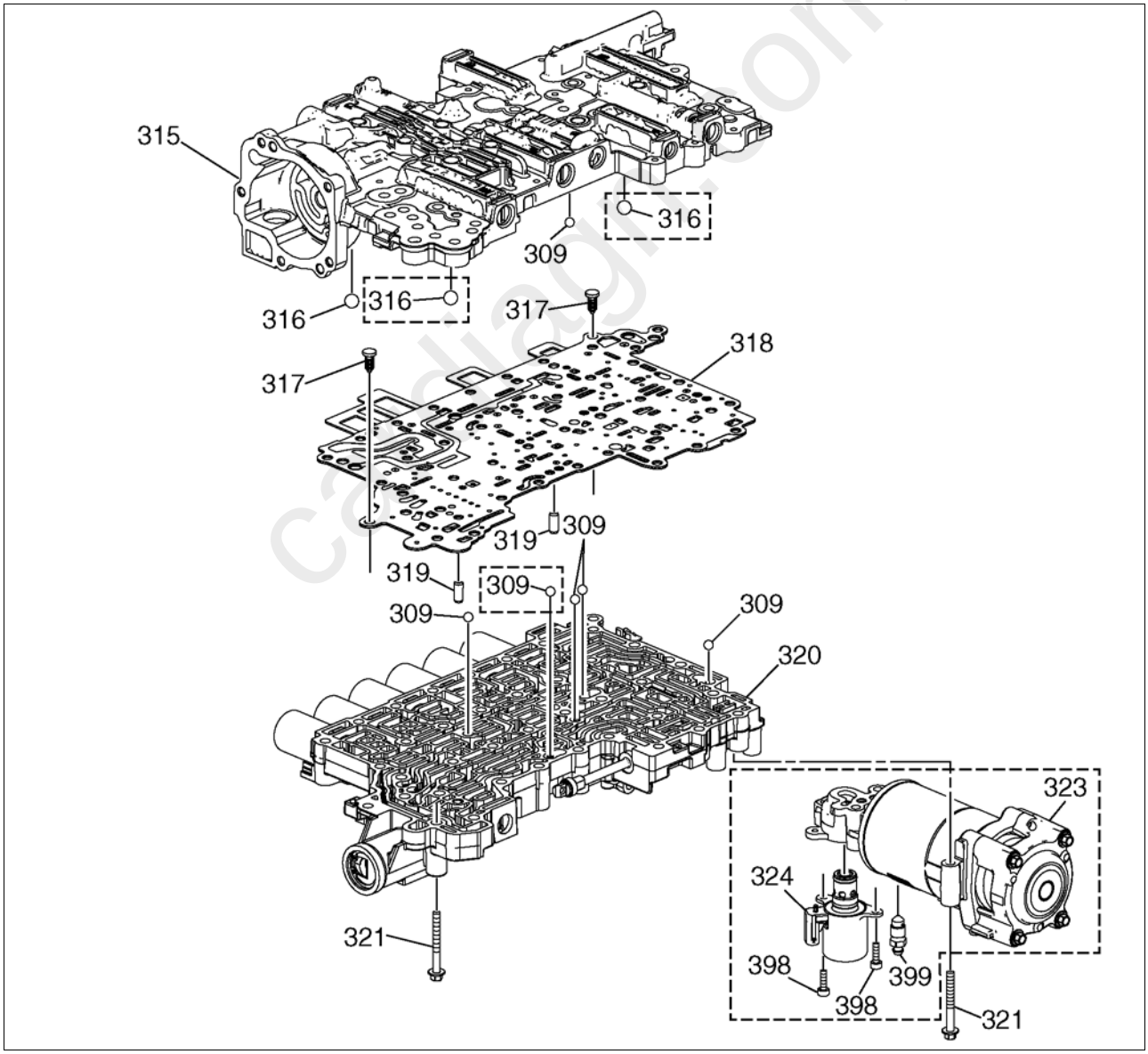
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Callout	Component Name
300	A/Trans Fluid Pump Bolt
301	A/Trans Fluid Pump Assembly
302	A/Trans Fluid Pump Seal
303	A/Trans Fluid Pump Gasket
304	A/Trans Fluid Pump Drive Shaft Bushing
305	A/Trans Fluid Pump Locator Pin
306	Control Valve Upper Body Assembly
307	Signal Accumulator Piston
308	Signal Accumulator Piston Spring

309	Cooler Flow Blowoff Ball Valve
310	Control Valve Body Locator Pin
311	Control Valve Channel Plate Spacer Plate Assembly
312	Control Valve Channel Plate
313	A/Trans Control Wiring Harness Assembly
314	Control Valve Channel Plate Bolt
322	A/Trans Fluid Passage Sleeve

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CONTROL (WITH BODY AND VALVE) VALVE ASSEMBLY (2 OF 2)

Fig 1: Control (With Body and Valve) Valve Assembly (2 Of 2)



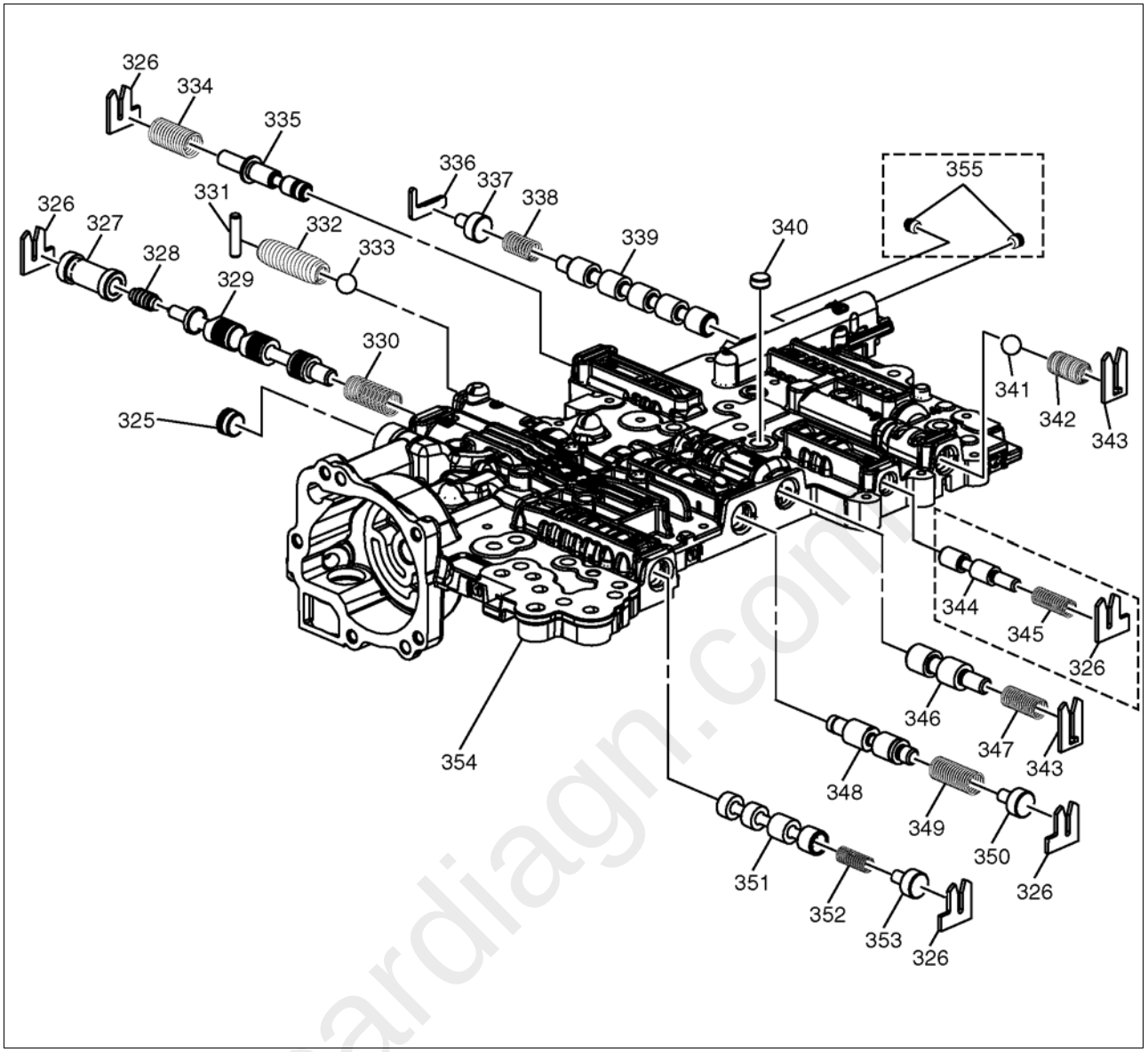
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
309	Cooler Flow Blowoff Ball Valve
315	Control Valve Upper Body
316	Control Valve Body Ball Check Valve
317	Control Valve Body Spacer Plate Retainer
318	Control Valve Body Spacer Plate (with Gasket)
319	Control Valve Body Locator Pin
320	Control Valve Solenoid Body Assembly
321	Control Valve Lower Body Bolt
323	A/Trans Auxiliary Fluid Accumulator - Model Dependent
324	A/Trans Auxiliary Fluid Accumulator Solenoid - Model Dependent
398	A/Trans Auxiliary Fluid Accumulator Bolt - Model Dependent
399	A/Trans Auxiliary Fluid Accumulator Bleeder Valve - Model Dependent

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CONTROL VALVE UPPER BODY ASSEMBLY

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Fig 1: Control Valve Upper Body Assembly



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Courtesy of GENERAL MOTORS COMPANY

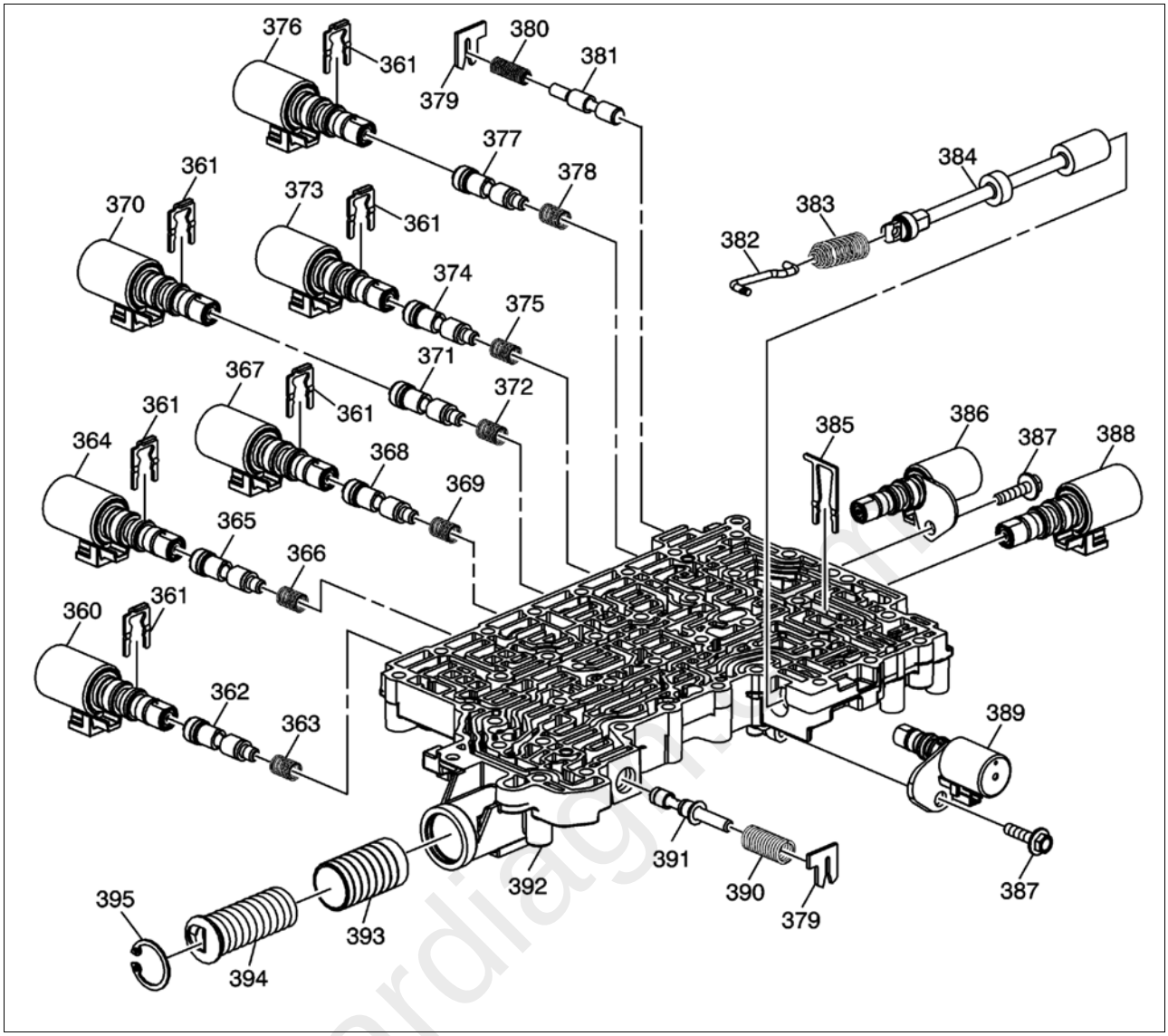
Callout	Component Name
325	Transmission Fluid Passage Plug
326	Valve Spring Retainer
327	Pressure Regulator Valve Bore Bushing
328	Pressure Regulator Shuttle Valve
329	Pressure Regulator Valve
330	Pressure Regulator Valve Spring
331	Pressure Relief Ball Valve Spring Retainer
332	Pressure Relief Ball Valve Spring

333	Pressure Relief Ball Valve
334	Feed Limit Valve Spring
335	Actuator Feed Limit Valve
336	Default Override Valve Bore Plug Retainer
337	Default Override Valve Bore Plug
338	Default Override Valve Spring
339	Default Override Valve
340	Control Valve Center Body Hole Plug
341	Clutch Piston Exhaust Blowoff Ball Valve
342	Clutch Piston Exhaust Blowoff Ball Valve Spring
343	Valve Spring Retainer
344	1-2-3-4-5 Reverse Clutch Boost Valve - Model Dependent
345	1-2-3-4-5 Reverse Clutch Boost Valve Spring - Model Dependent
346	TCC Valve
347	TCC Valve Spring
348	Lube Regulator Valve
349	Lube Regulator Valve Spring
350	Lube Regulator Valve Bore Plug
351	TCC Control Valve
352	TCC Control Valve Spring
353	TCC Control Valve Bore Plug
354	Control Valve Upper Body
355	Line Pressure Bore Plug - Model Dependent

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > CONTROL SOLENOID VALVE BODY ASSEMBLY

Fig 1: Control Solenoid Valve Body Assembly



Courtesy of GENERAL MOTORS COMPANY

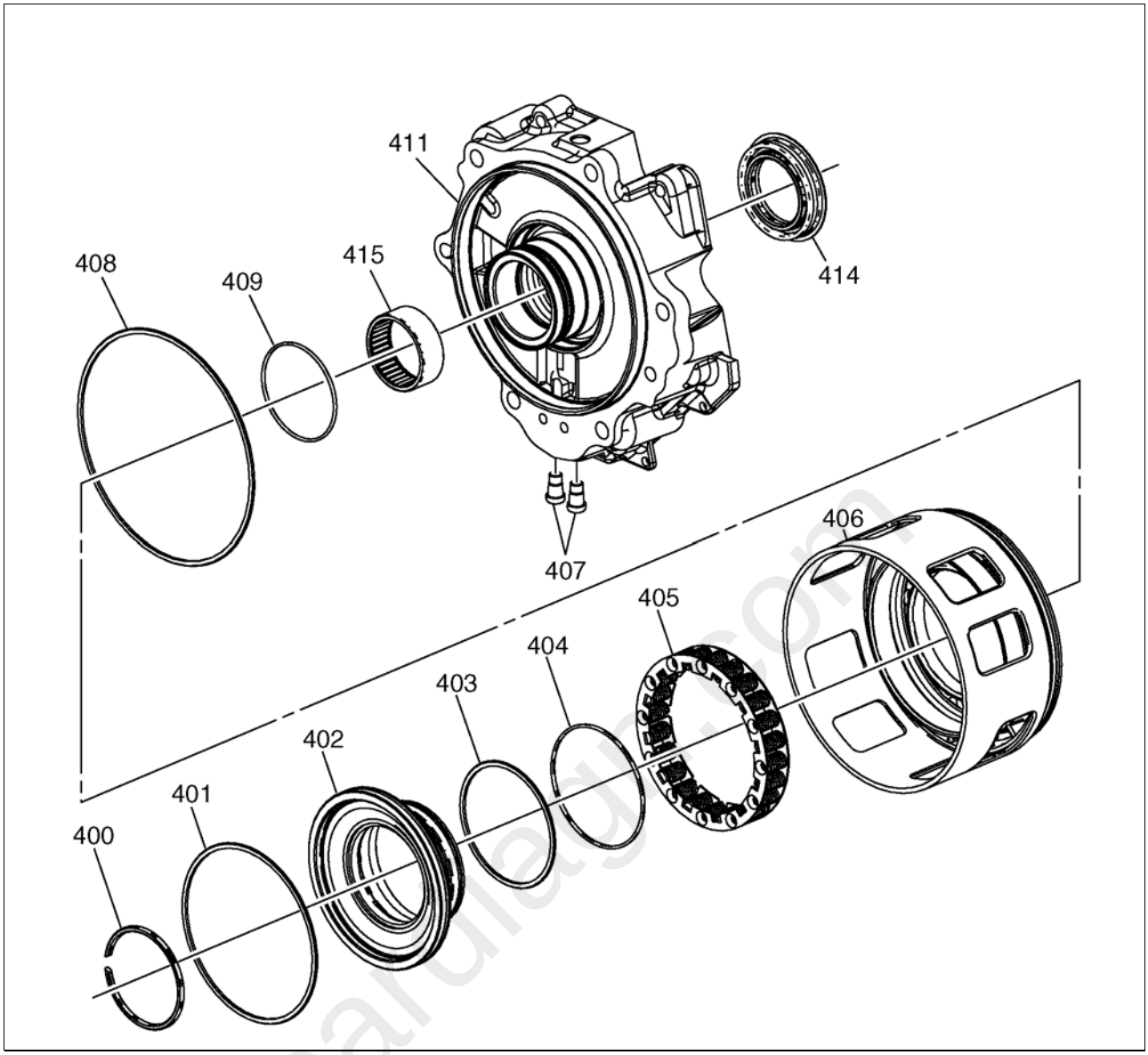
Callout	Component Name
360	TCC Control Solenoid Valve Assembly
361	Control Solenoid Valve Retainer
362	TCC Control Valve
363	TCC Control Valve Spring
364	2-3-4-6-8 Control Solenoid Valve Assembly
365	2-3-4-6-8 Control Valve
366	2-3-4-6-8 Control Valve Spring
367	1-3-5-6-7 Control Solenoid Valve Assembly
368	1-3-5-6-7 Control Valve

369	1-3-5-6-7 Control Valve Spring
370	4-5-6-7-8 Reverse Control Solenoid Valve Assembly
371	4-5-6-7-8 Reverse Control Valve
372	4-5-6-7-8 Reverse Control Valve Spring
373	1-2-7-8 Reverse Control Solenoid Valve Assembly
374	1-2-7-8 Reverse Control Valve
375	1-2-7-8 Reverse Control Valve Spring
376	1-2-3-4-5 Reverse Low Solenoid Valve Assembly
377	1-2-3-4-5 Reverse Low Solenoid Valve
378	1-2-3-4-5 Reverse Low Solenoid Valve Spring
379	Valve Spring Retainer
380	1-2-3-4-5 Reverse Clutch Boost Valve Spring
381	1-2-3-4-5 Reverse Clutch Boost Valve
382	Manual Valve Link
383	Manual Valve Spring
384	Manual Valve
385	Control Solenoid Valve Retainer
386	Default Control Solenoid Valve Assembly
387	Solenoid Valve Assembly Bolt
388	Line Pressure Control Solenoid Valve Assembly
389	1-2-3-4-5 Reverse Boost Solenoid Valve Assembly
390	Converter Feed Limit Valve Spring
391	Converter Feed Limit Valve
392	Control Valve Solenoid Body
393	1-3-5-6-7 Accumulator Piston
394	1-3-5-6-7 Accumulator Piston Spring
395	Accumulator Piston Spring Retainer

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > A/TRANS CASE EXTENSION ASSEMBLY

Fig 1: A/Trans Case Extension Assembly



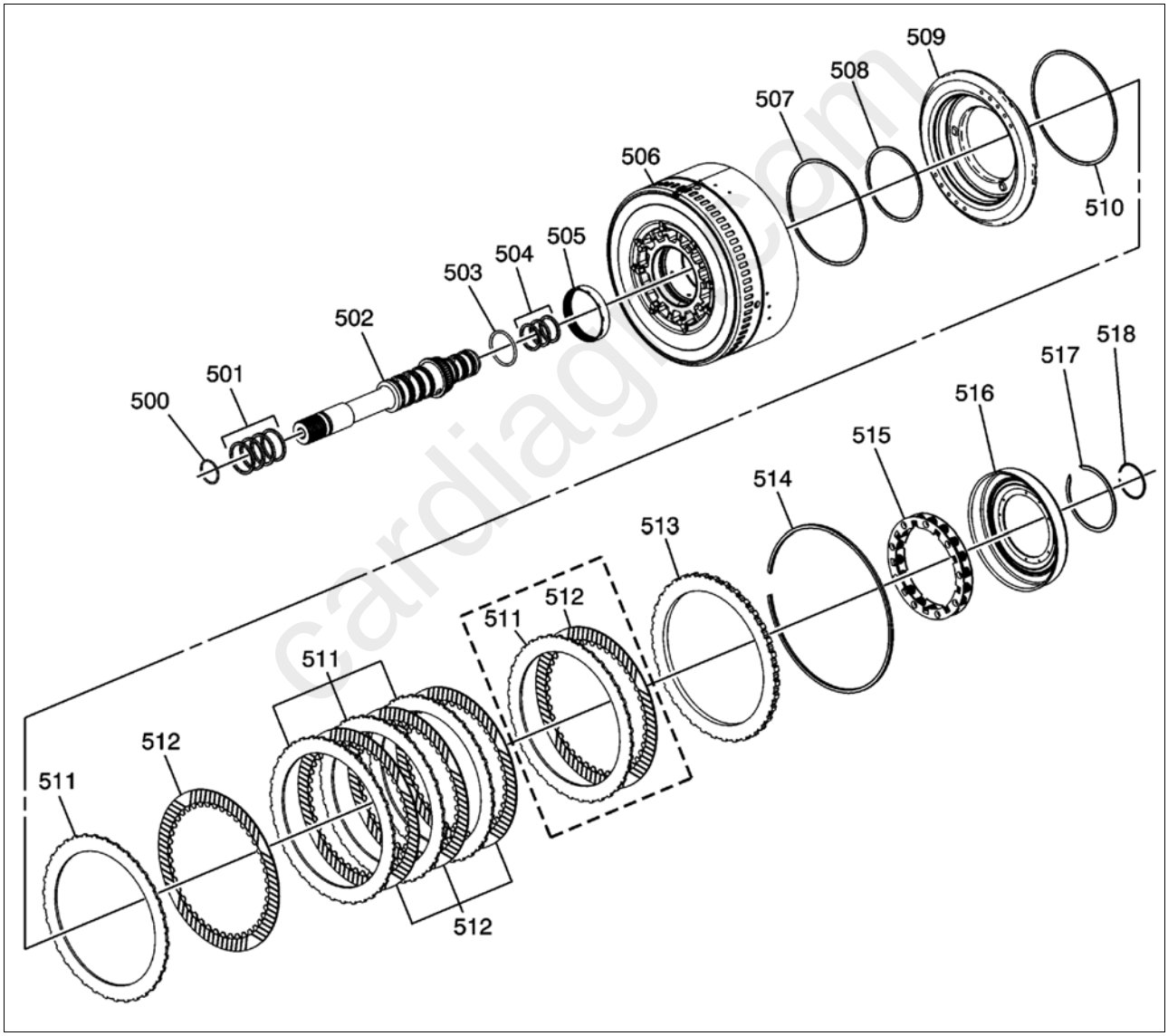
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
400	1-2-3-4-5-Reverse Clutch Piston Dam Retaining Ring
401	1-2-3-4-5-Reverse Clutch Piston Dam Seal
402	1-2-3-4-5-Reverse Clutch Piston Dam
403	1-2-3-4-5-Reverse Clutch Piston Inner Seal
404	1-2-3-4-5-Reverse Clutch Piston O-ring Seal
405	1-2-3-4-5-Reverse Clutch Piston Return Spring
406	1-2-3-4-5-Reverse Clutch Piston
407	A/Trans Case Extension Hole Plug

408	1-2-3-4-5- Reverse Clutch Piston Outer Seal
409	1-2-3-4-5-Reverse Clutch Piston Dam Inner O-ring Seal
411	A/Trans Case Extension
414	Propeller Shaft Transmission Flange Fluid Seal (Outer)
415	Output Shaft Bearing

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > 1-3-5-6-7 CLUTCH HOUSING ASSEMBLY

Fig 1: 1-3-5-6-7 Clutch Housing Assembly



Courtesy of GENERAL MOTORS COMPANY

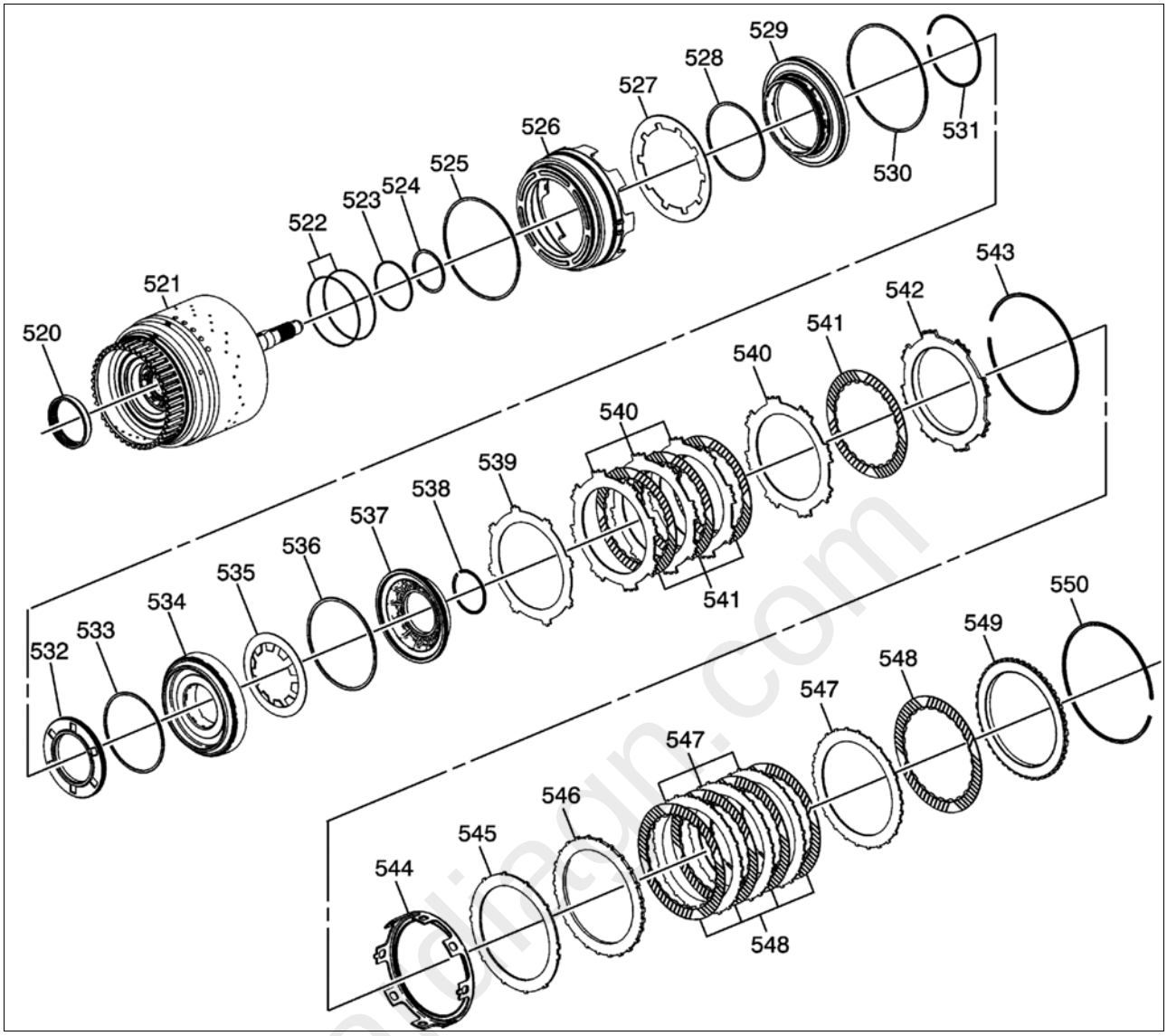
Callout	Component Name

500	Turbine Shaft O-ring Seal
501	Turbine Shaft Fluid Seal Ring
502	Turbine Shaft
503	Turbine Shaft O-ring Seal
504	Turbine Shaft Fluid Seal
505	1-3-5-6-7 Clutch Bearing
506	1-3-5-6-7 Clutch Housing
507	1-3-5-6-7 Clutch Piston Outer Seal
508	1-3-5-6-7 Clutch Piston Inner Seal
509	1-3-5-6-7 Clutch Piston
510	1-3-5-6-7 Clutch Piston Dam Seal
511	1-3-5-6-7 Clutch Plate - with LT1 (Qty: 4), with LT4 (Qty: 5)
512	1-3-5-6-7 Clutch Plate Assembly - with LT1 (Qty: 4), with LT4 (Qty: 5)
513	1-3-5-6-7 Clutch Backing Plate
514	1-3-5-6-7 Clutch Backing Plate Retaining Ring (Selective)
515	1-3-5-6-7 Clutch Piston Return Spring
516	1-3-5-6-7 Clutch Piston Dam
517	1-3-5-6-7 Clutch Piston Dam Retaining Ring
518	Turbine Shaft Retaining Ring

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING ASSEMBLY

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Assembly



Courtesy of GENERAL MOTORS COMPANY

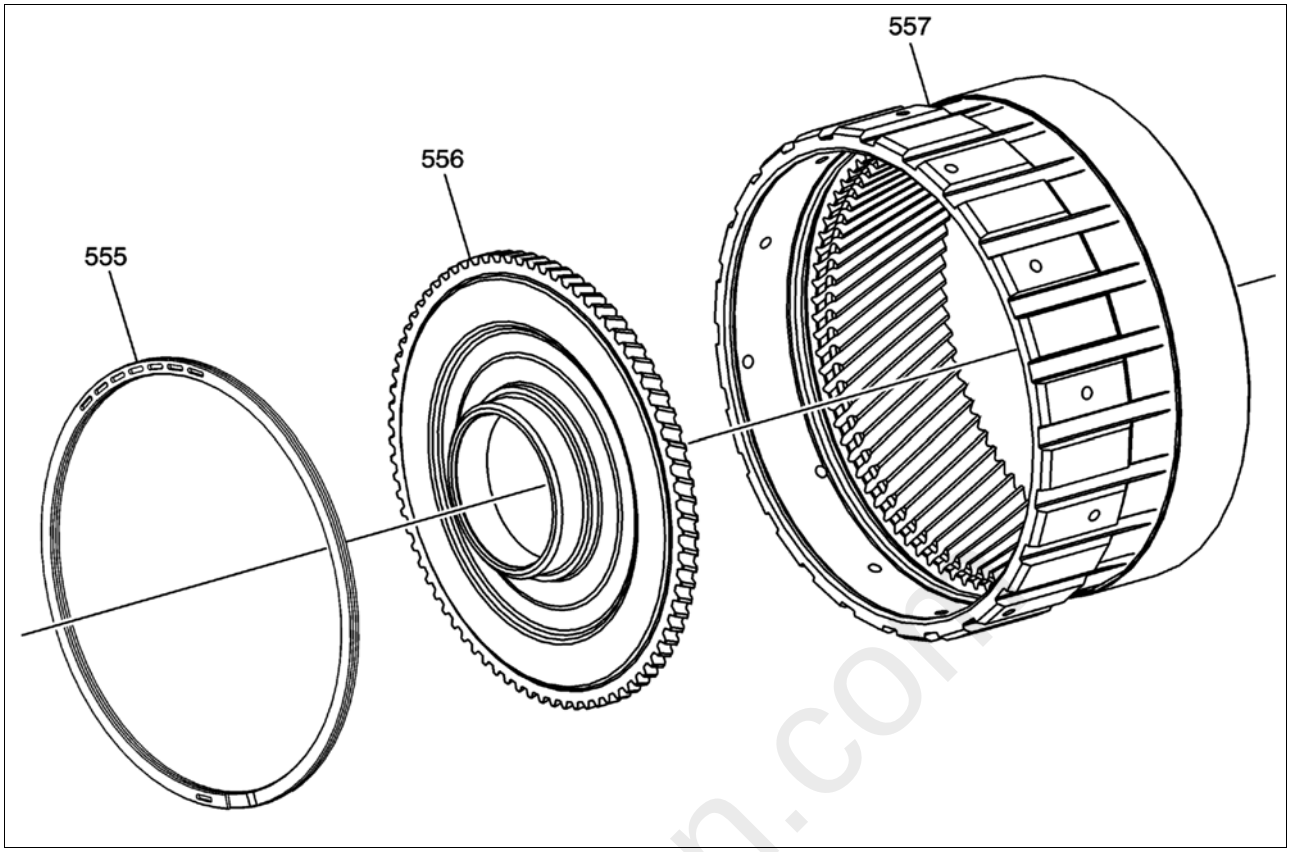
Callout	Component Name
520	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing
521	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing
522	2-3-4-6-8 Clutch Piston Dam Seal
523	4-5-6-7-8 Reverse Clutch Piston Stop O-ring Seal
524	4-5-6-7-8 Reverse Clutch Piston Seal
525	2-3-4-6-8 Clutch Piston Seal
526	2-3-4-6-8 Clutch Piston
527	2-3-4-6-8 Clutch Piston Return Spring
528	2-3-4-6-8 Clutch Piston Dam Inner Seal

529	2-3-4-6-8 Clutch Piston Dam
530	2-3-4-6-8 Clutch Piston Dam Outer Seal
531	2-3-4-6-8 Clutch Piston Dam Retaining Ring
532	4-5-6-7-8 Reverse Clutch Piston Stop
533	4-5-6-7-8 Reverse Clutch Piston Seal
534	4-5-6-7-8 Reverse Clutch Piston
535	4-5-6-7-8 Reverse Clutch Piston Return Spring
536	4-5-6-7-8 Reverse Clutch Piston Dam Seal
537	4-5-6-7-8 Reverse Clutch Piston Dam
538	4-5-6-7-8 Reverse Clutch Piston Dam Retaining Ring
539	4-5-6-7-8 Reverse Clutch (Waved) Plate
540	4-5-6-7-8 Reverse Clutch Plate
541	4-5-6-7-8 Reverse Clutch Plate Assembly
542	4-5-6-7-8 Reverse Clutch Backing Plate
543	4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring (Selective)
544	2-3-4-6-8 Clutch Apply Ring
545	2-3-4-6-8 Clutch (Waved) Plate
546	2-3-4-6-8 Clutch Apply Plate
547	2-3-4-6-8 Clutch Plate
548	2-3-4-6-8 Clutch Plate Assembly
549	2-3-4-6-8 Clutch Backing Plate
550	2-3-4-6-8 Clutch Backing Plate Retaining Ring (Selective)

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > DIRECT/OVERDRIVE INTERNAL GEAR ASSEMBLY

Fig 1: Direct/Overdrive Internal Gear Assembly



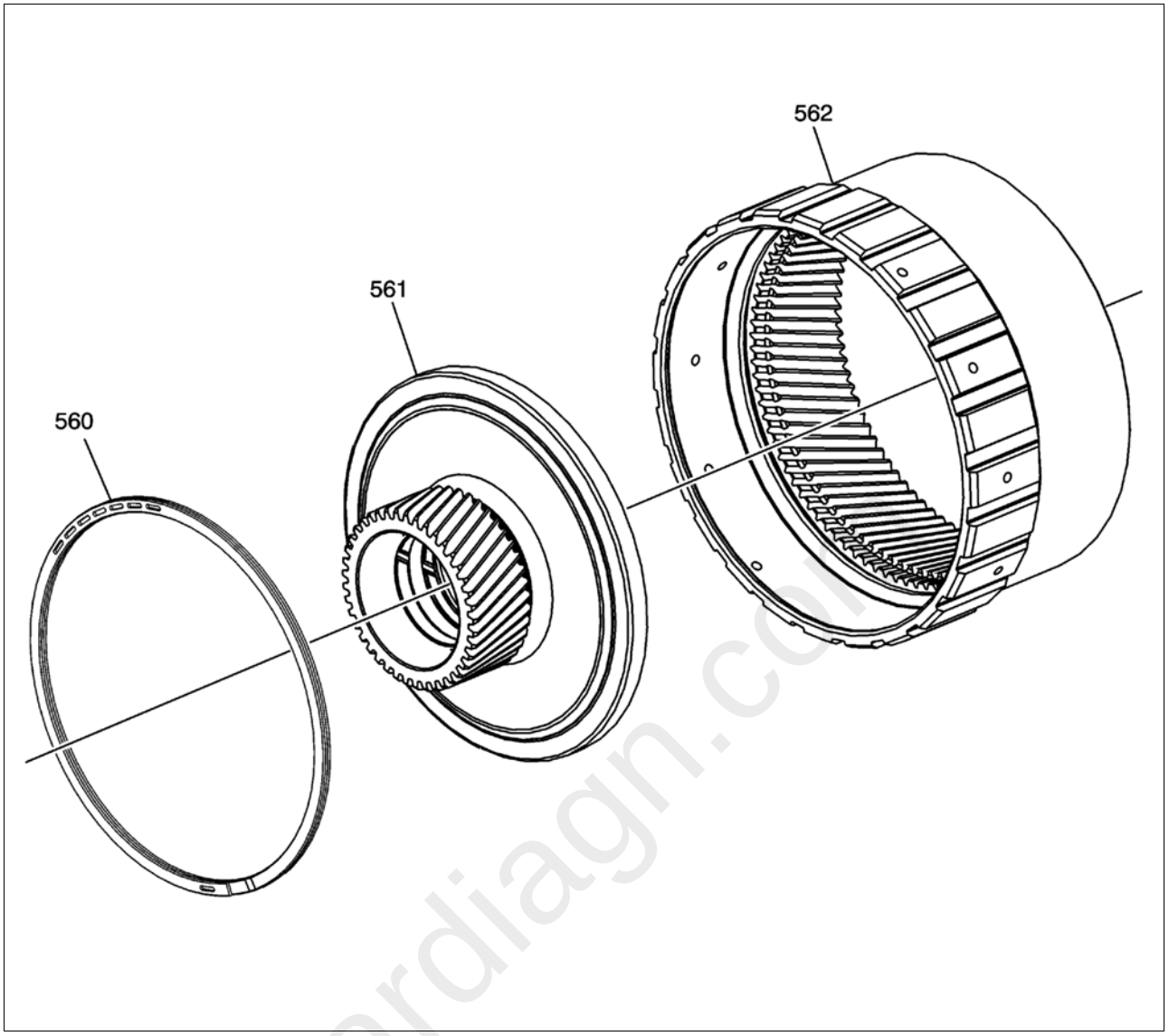
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Callout	Component Name
555	Direct/Overdrive Internal Gear Retaining Ring
556	Direct/Overdrive Internal Gear Flange
557	Direct/Overdrive Internal Gear

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > INPUT INTERNAL GEAR ASSEMBLY

Fig 1: Input Internal Gear Assembly



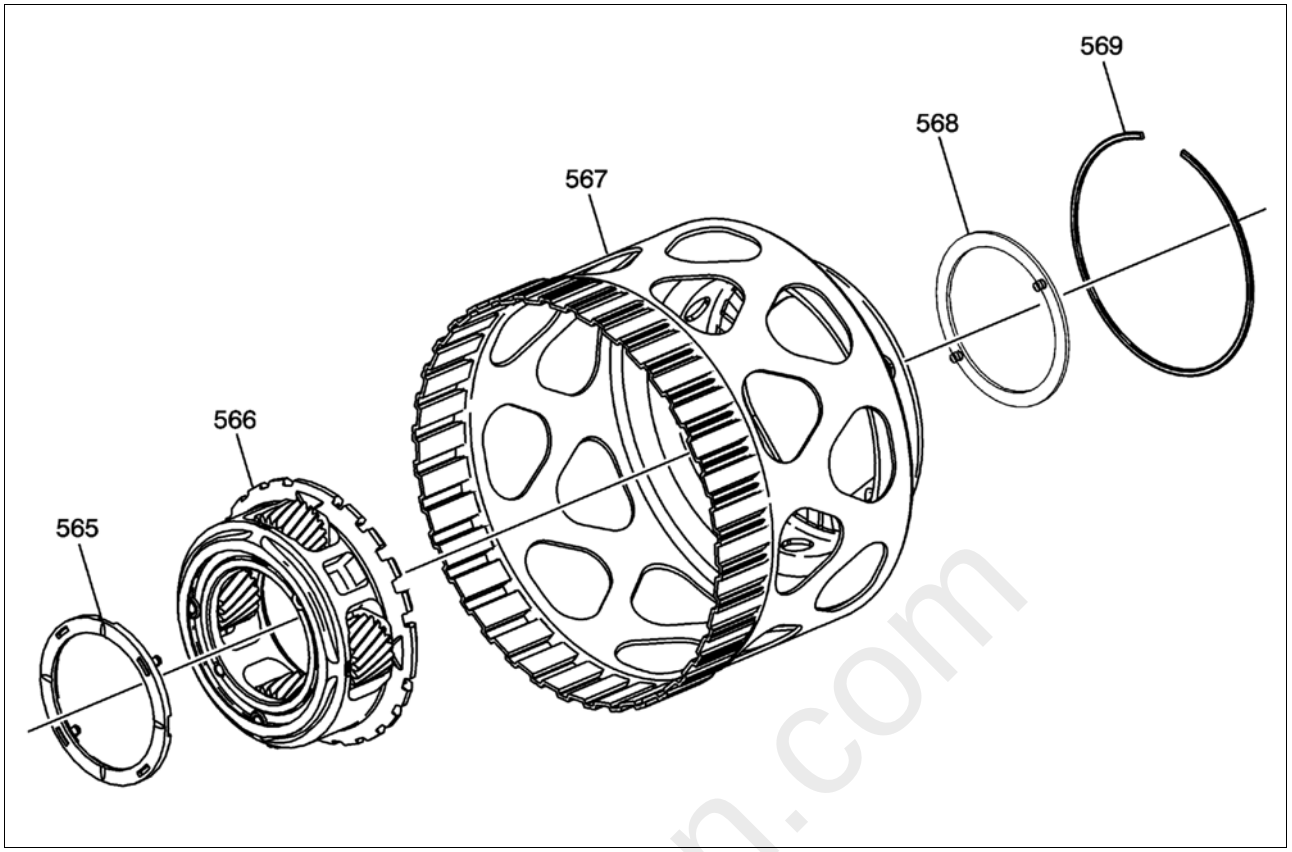
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Callout	Component Name
560	Input Internal Gear Retaining Ring
561	Direct/Overdrive Sun Gear
562	Input Internal Gear

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > INPUT CARRIER ASSEMBLY

Fig 1: Input Carrier Assembly



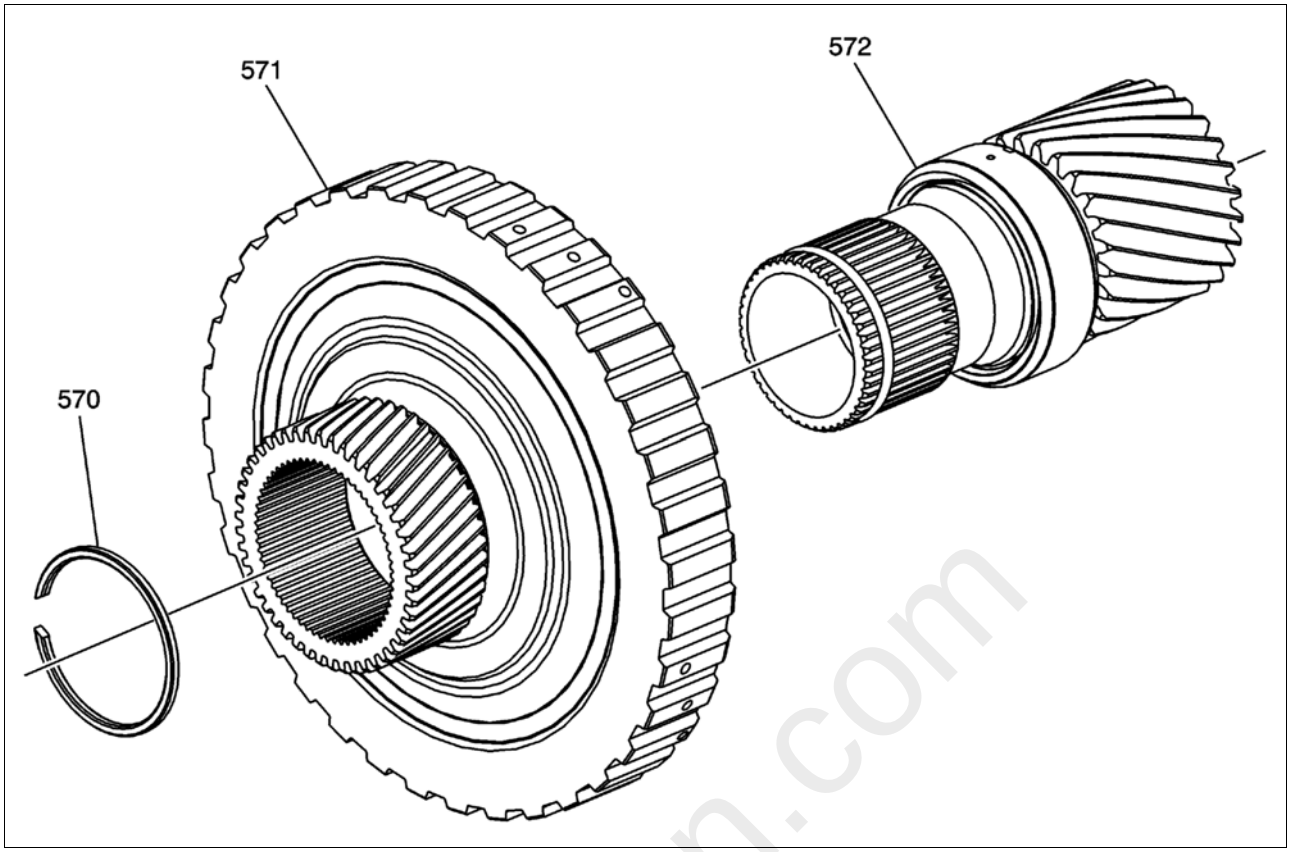
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Callout	Component Name
565	Input Carrier Thrust Washer
566	Input Carrier
567	Input Carrier Shell
568	Input Carrier Thrust Washer
569	Input Carrier Shell Retaining Ring

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > INPUT SUN GEAR ASSEMBLY

Fig 1: Input Sun Gear Assembly



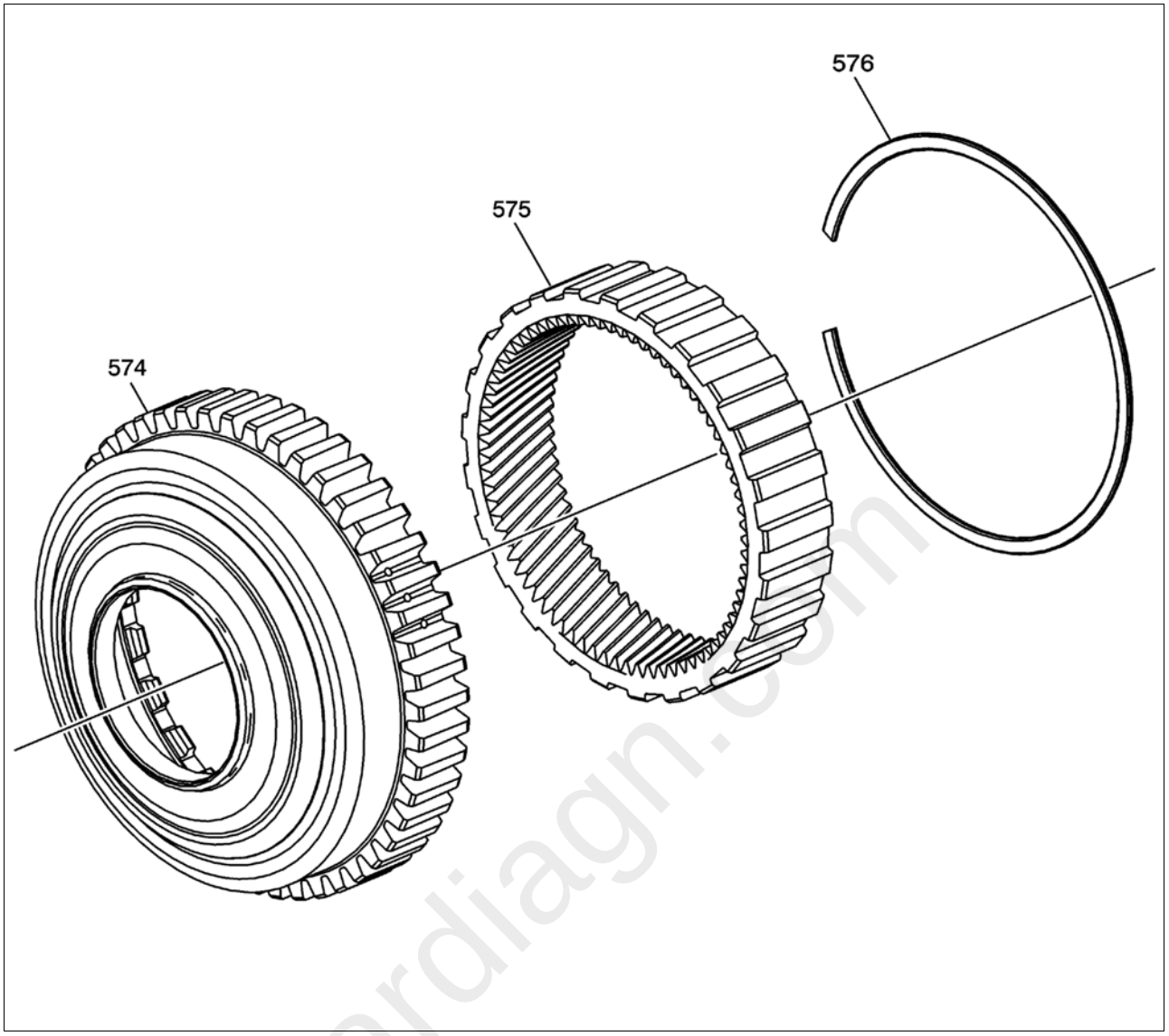
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Callout	Component Name
570	Input Sun Gear Retaining Ring
571	Input Sun Gear Assembly
572	Reaction Sun Gear Assembly

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > REACTION INTERNAL GEAR AND 1-2-3-4-5 REVERSE CLUTCH HUB ASSEMBLY

Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Clutch Hub Assembly



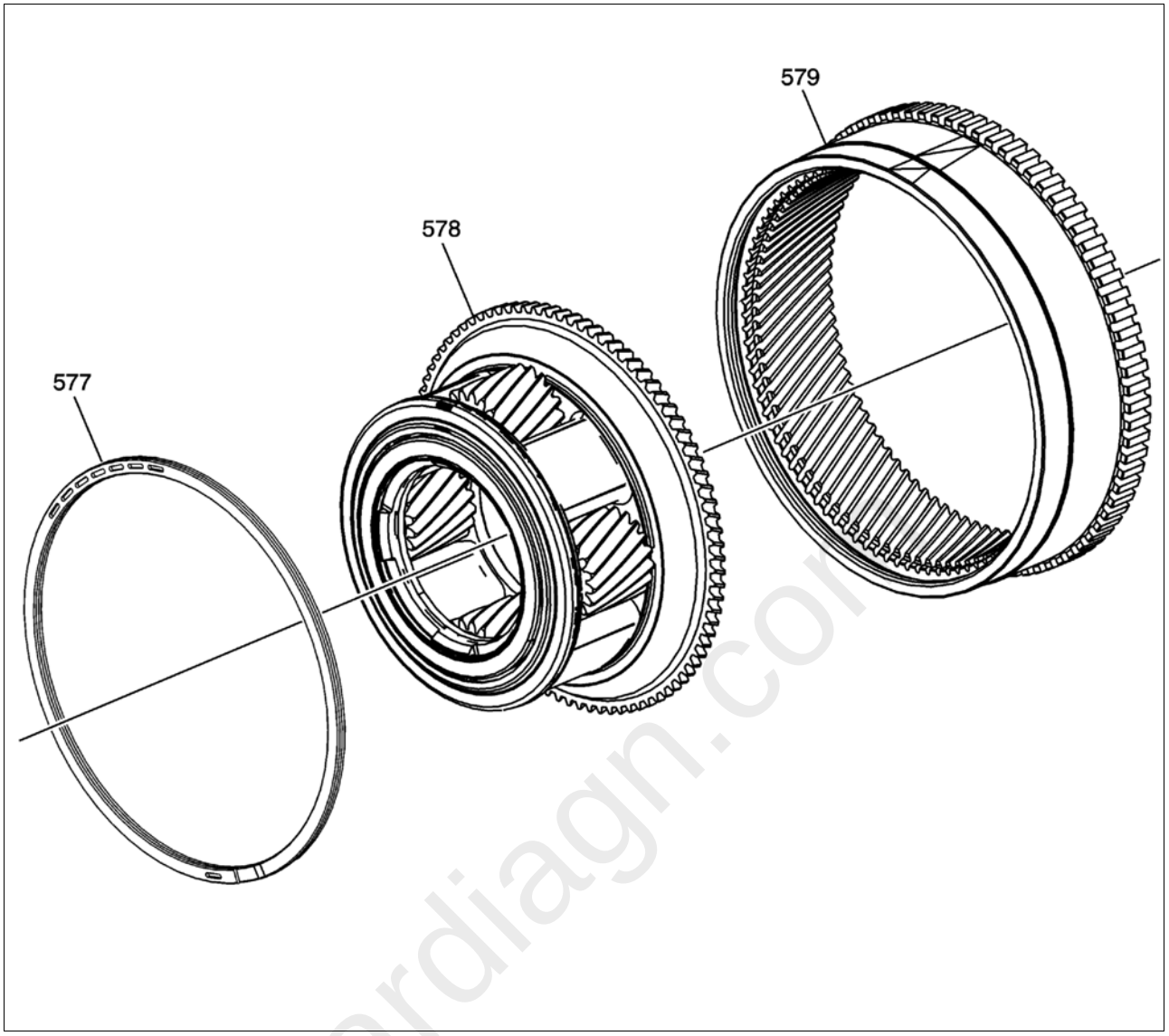
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Callout	Component Name
574	Reaction Internal Gear and 1-2-3-4-5 Reverse Clutch Hub
575	Reaction Internal Gear
576	Reaction Internal Gear Retaining Ring

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > REACTION CARRIER ASSEMBLY

Fig 1: Reaction Carrier Assembly

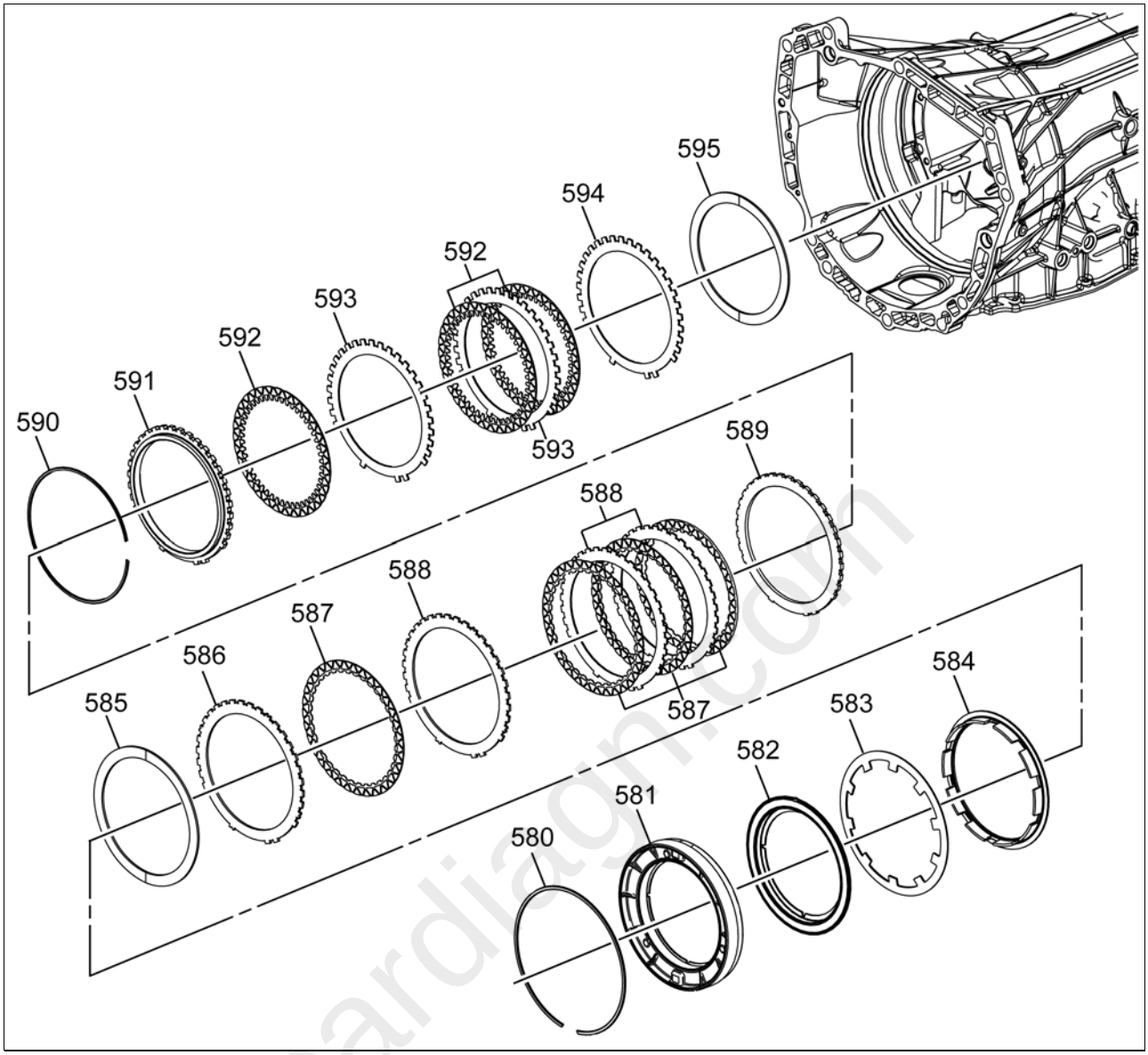


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
577	Output Internal Gear Retaining Ring
578	Reaction Carrier Assembly
579	Output Carrier Internal Gear

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > 1-2-3-4-5 REVERSE AND 1-2-7-8 REVERSE CLUTCH ASSEMBLIES

Fig 1: 1-2-3-4-5 Reverse and 1-2-7-8 Reverse Clutch Assemblies



Courtesy of GENERAL MOTORS COMPANY

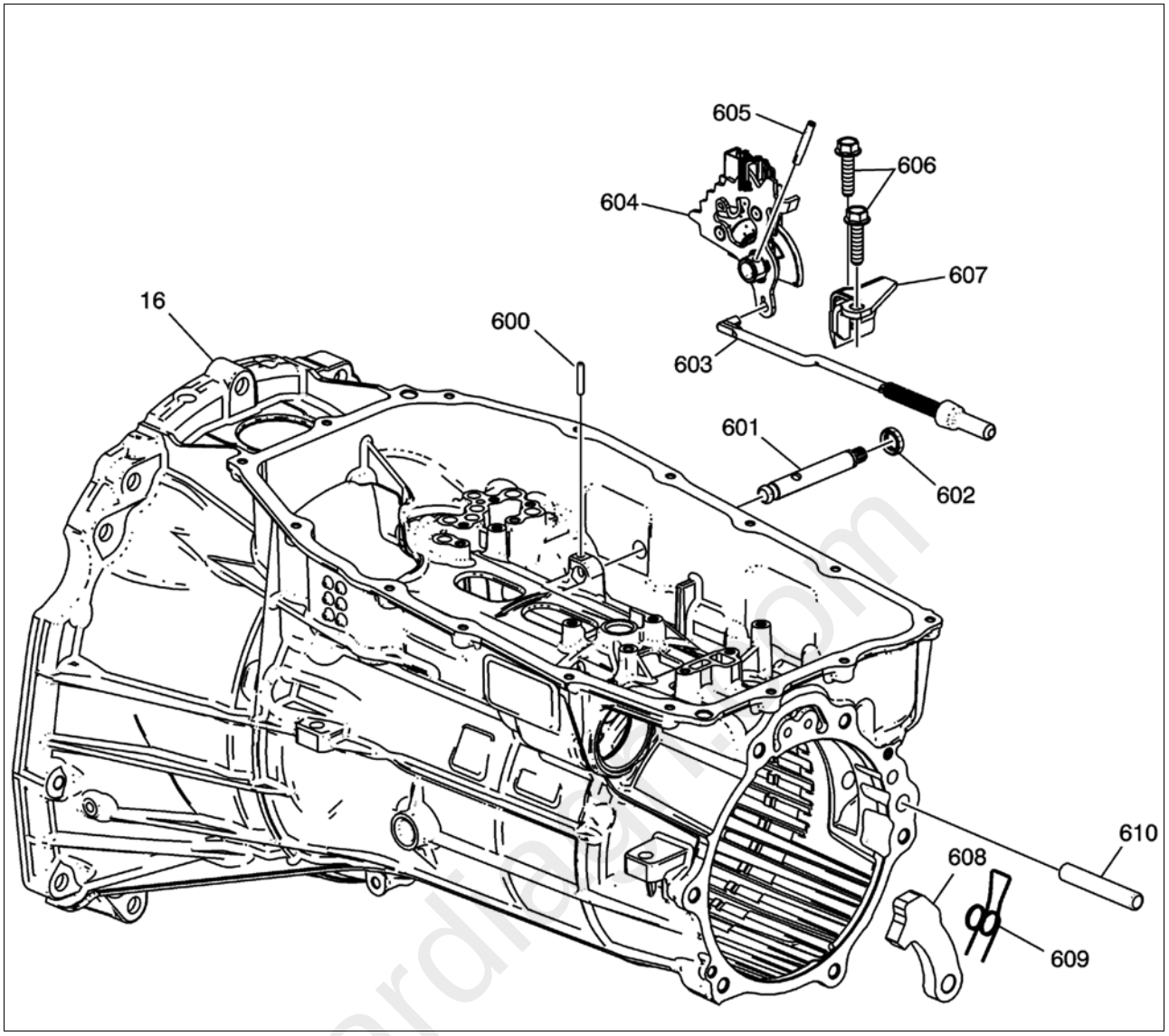
Callout	Component Name
580	1-2-7-8 Reverse Clutch Piston Housing Retaining Ring
581	1-2-7-8 Reverse Clutch Piston Housing
582	1-2-7-8 Reverse Clutch Piston
583	1-2-7-8 Reverse Clutch Return Spring
584	1-2-7-8 Reverse Clutch Apply Ring
585	1-2-7-8 Reverse Clutch (Waved) Plate
586	1-2-7-8 Reverse Clutch Apply Plate
587	1-2-7-8 Reverse Clutch Plate Assembly

588	1-2-7-8 Reverse Clutch Plate
589	1-2-7-8 Reverse Clutch Backing Plate (Selective)
590	1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring (Selective)
591	1-2-3-4-5 Reverse Clutch Backing Plate
592	1-2-3-4-5 Reverse Clutch Plate Assembly
593	1-2-3-4-5 Reverse Clutch Plate
594	1-2-3-4-5 Reverse Clutch Apply Plate
595	1-2-3-4-5 Reverse Clutch (Waved) Plate

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L90) > PARK SYSTEM COMPONENTS

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Fig 1: Park System Components



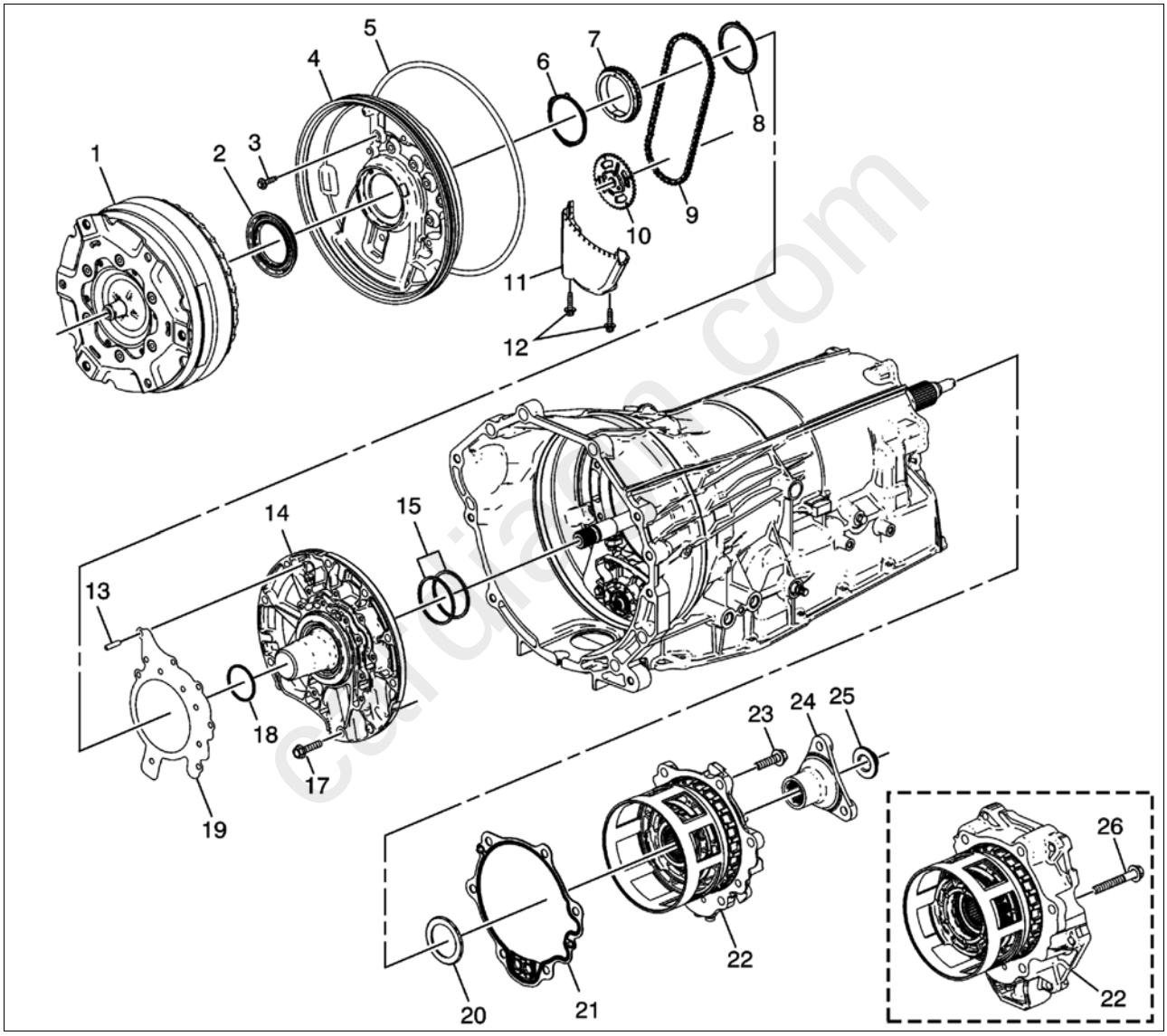
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
16	A/Trans Case Assembly
600	Manual Shift Shaft Pin
601	Manual Shift Shaft
602	Manual Shift Shaft Seal
603	Park Pawl Actuator Assembly
604	Manual Shift Shaft Position Switch Assembly
605	Manual Shift Shaft Detent Lever Hub Pin
606	Park Pawl Actuator Bracket Bolt
607	Park Pawl Actuator Bracket

608	Park Pawl
609	Park Pawl Spring
610	Park Pawl Shaft

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CASE AND ASSOCIATED PARTS (1 OF 2)

Fig 1: Case and Associated Parts (1 of 2)



Courtesy of GENERAL MOTORS COMPANY

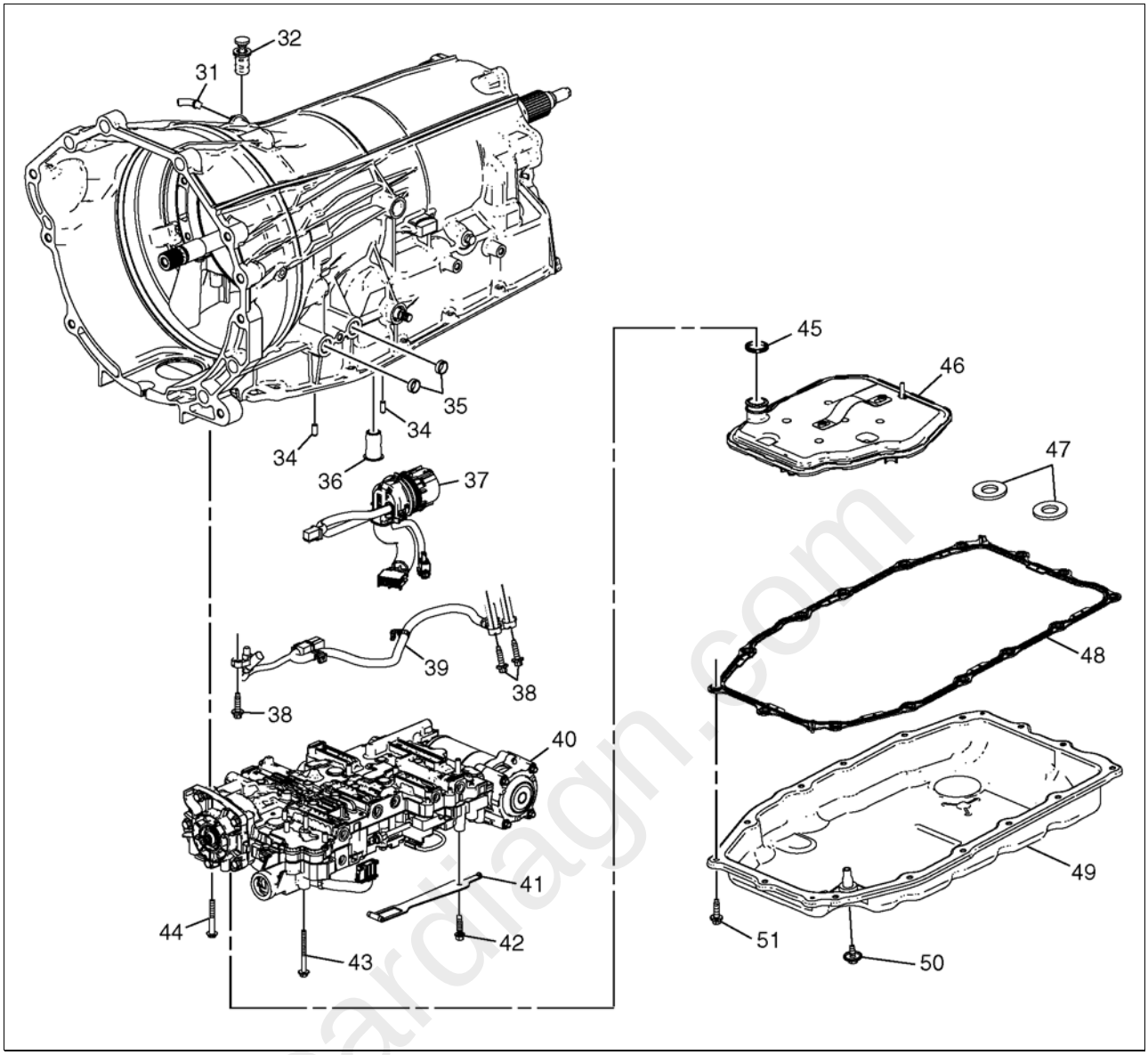
Callout	Component Name
1	Torque Converter
2	Torque Converter Fluid Seal

3	A/Trans Case Front Cover Bolt
4	A/Trans Case Front Cover
5	A/Trans Case Front Cover Seal
6	Drive Sprocket Thrust Washer - Front
7	Drive Sprocket
8	Drive Sprocket Thrust Washer - Rear
9	Drive Link Assembly
10	Driven Sprocket
11	A/Trans Fluid Baffle
12	A/Trans Fluid Baffle Bolt
13	A/Trans Case Front Cover Locating Pin
14	Stator Shaft Support
15	1-3-5-6-7 Clutch Fluid Seal Ring
17	Stator Shaft Support Bolt
18	Torque Converter Fluid Seal
19	A/Trans Front Support Cover Gasket
20	Output Carrier Thrust Bearing
21	A/Trans Case Extension Seal
22	A/Trans Case Extension Assembly
23	A/Trans Case Extension Bolt
24	Propeller Shaft Transmission Flange
25	Front Propeller Shaft Flange Nut
26	A/Trans Case Extension Bolt

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CASE AND ASSOCIATED PARTS (2 OF 2)

Fig 1: Case and Associated Parts (2 of 2)



Courtesy of GENERAL MOTORS COMPANY

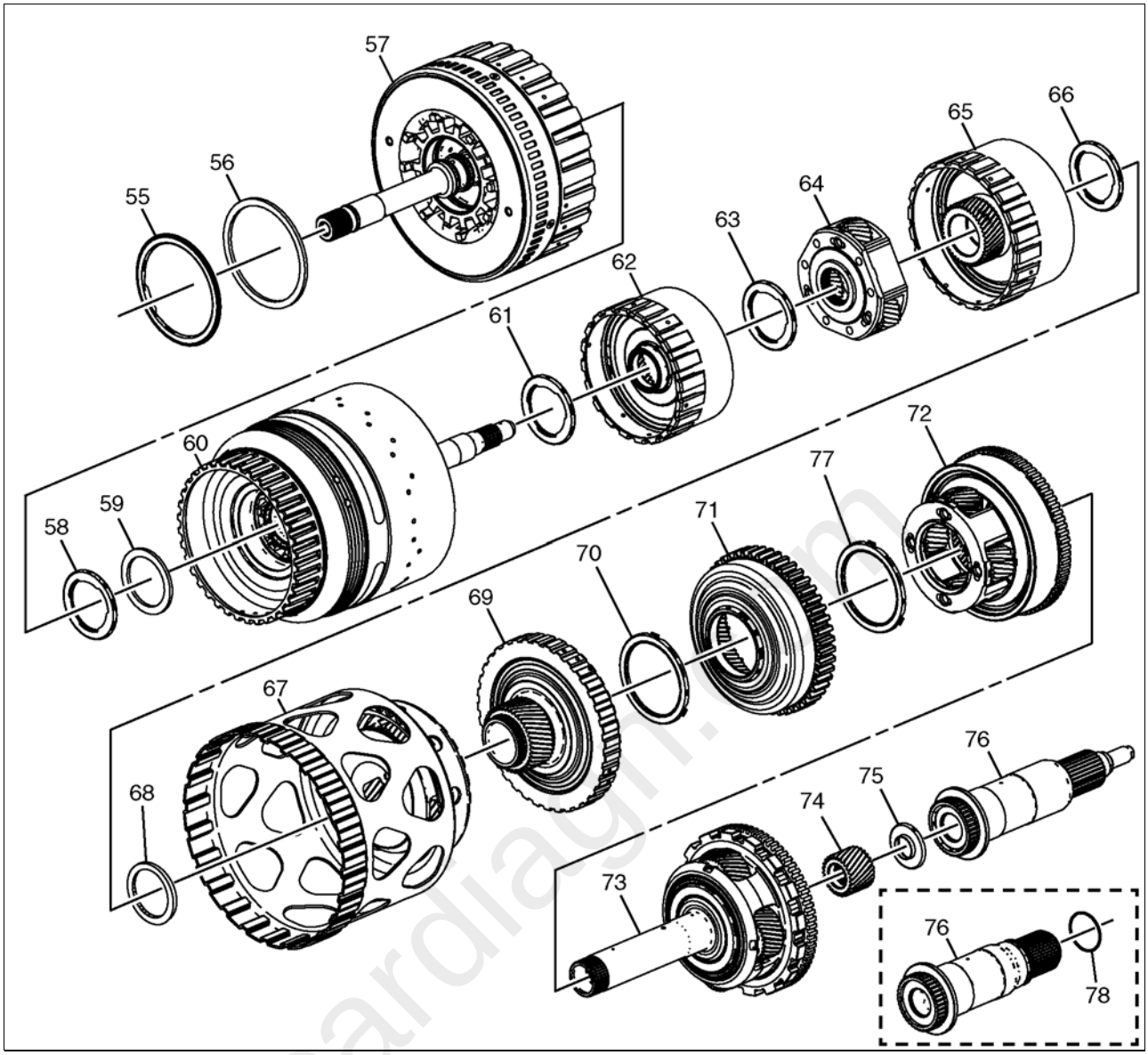
Callout	Component Name
31	A/Trans Pipe Vent
32	Transmission Fluid Fill Tube Plug
34	Control Valve Body Locating Pin
35	Transmission Fluid Cooler Pipe Fitting Seal
36	Clutch Housing Fluid Passage Seal
37	A/Trans Wiring Harness
38	Output Speed Sensor Wiring Harness Bolt
39	Output Speed Sensor Wiring Harness

40	Control (with Body and Valve) Valve Assembly
41	Manual Shaft Detent Lever Spring
42	Manual Shaft Detent Lever Spring Bolt
43	Control Valve Solenoid Body Bolt
44	Control Valve Solenoid Body Bolt
45	A/Trans Fluid Filter Seal
46	A/Trans Fluid Filter
47	A/Trans Fluid Pan Magnet
48	A/Trans Fluid Pan Gasket
49	A/Trans Fluid Pan
50	Transmission Oil Level Check Plug
51	A/Trans Fluid Pan Bolt

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CLUTCH ASSEMBLIES AND ASSOCIATED PARTS

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Fig 1: Clutch Assemblies and Associated Parts



Courtesy of GENERAL MOTORS COMPANY

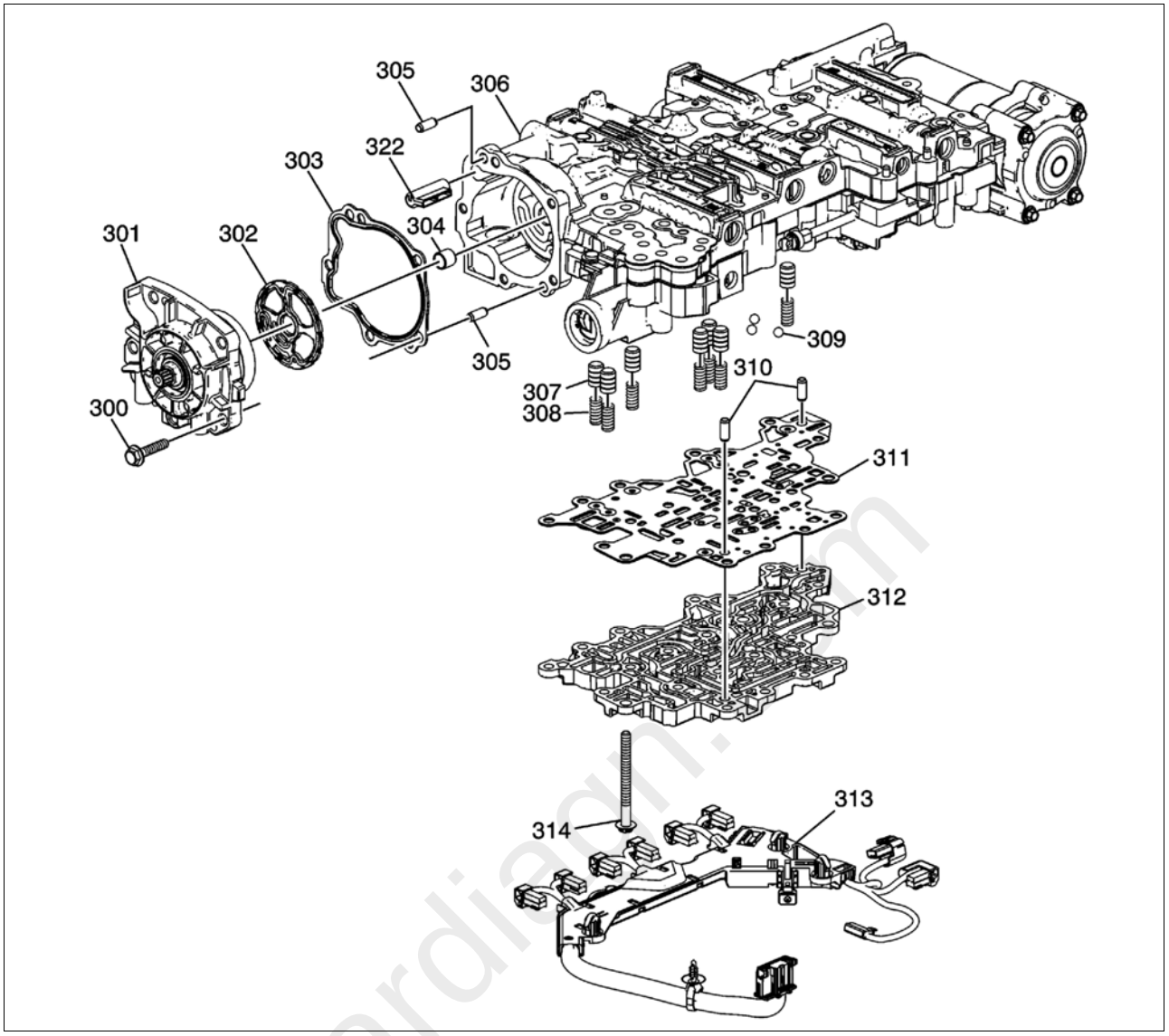
Callout	Component Name
55	1-3-5-6-7 Clutch Thrust Bearing
56	1-3-5-6-7 Clutch Thrust Bearing Washer (Selective)
57	1-3-5-6-7 Clutch Assembly
58	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing
59	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing Washer
60	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly
61	4-5-6-7-8 Reverse Clutch and Direct/Overdrive Internal Gear Hub Thrust Bearing
62	Direct/Overdrive Internal Gear Flange Assembly

63	Direct/Overdrive Carrier Thrust Bearing
64	Direct/Overdrive Carrier Assembly
65	Input Internal Gear Assembly
66	Input Sun Gear Thrust Bearing
67	Input Carrier Assembly
68	Input Sun Gear Spacer
69	Input Sun Gear Assembly
70	1-2-3-4-5 Reverse Clutch Hub Thrust Bearing
71	Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
72	Reaction Carrier Assembly
73	Output Carrier Assembly
74	Output Sun Gear
75	Output Sun Gear Thrust Bearing
76	Output Shaft
77	Reaction Carrier Thrust Bearing
78	Output Shaft Seal (O-ring)

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CONTROL (WITH BODY AND VALVE) VALVE ASSEMBLY (1 OF 2)

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Fig 1: Control (with Body and Valve) Valve Assembly (1 of 2)



Courtesy of GENERAL MOTORS COMPANY

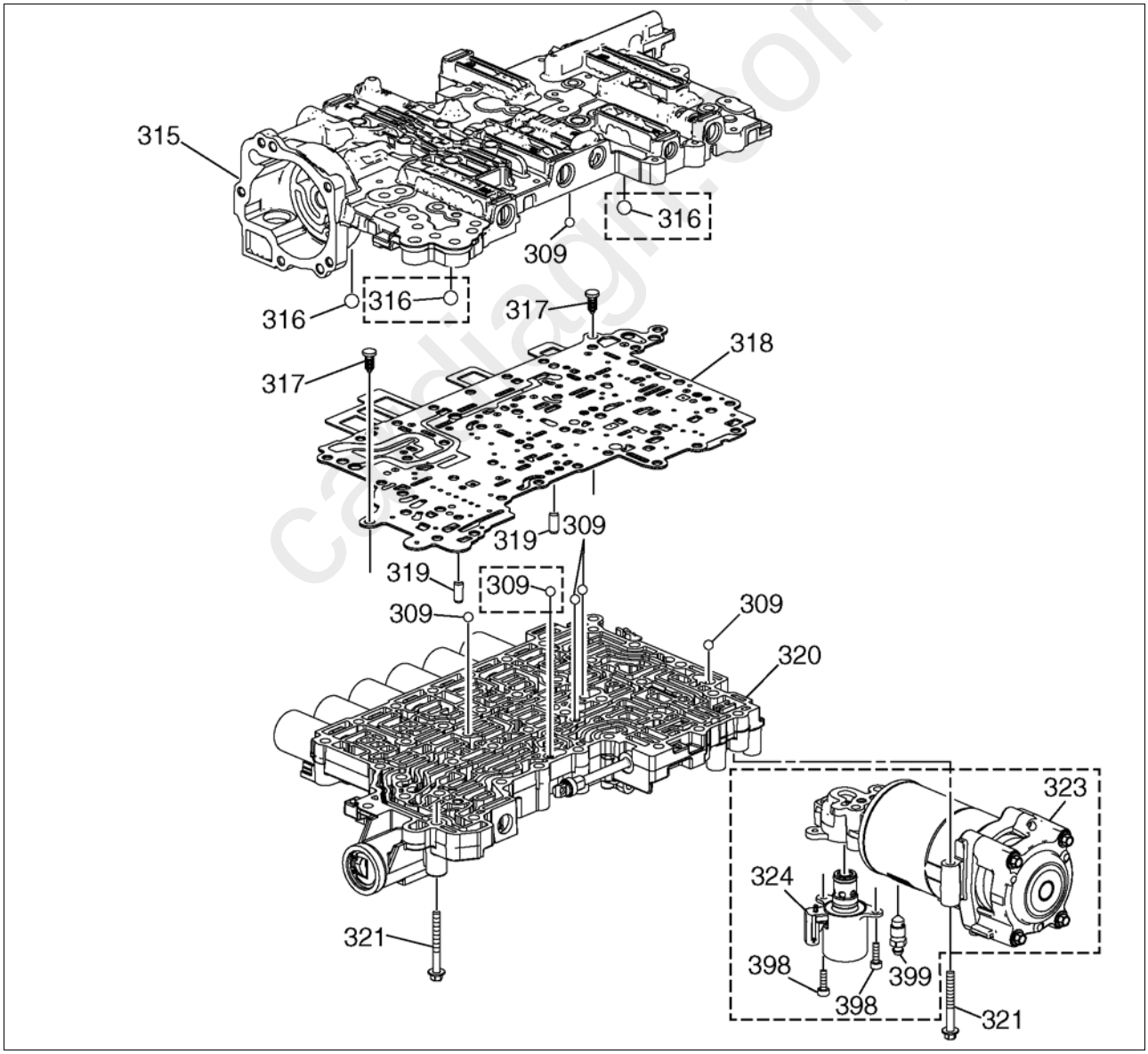
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Callout	Component Name
300	A/Trans Fluid Pump Bolt
301	A/Trans Fluid Pump Assembly
302	A/Trans Fluid Pump Seal
303	A/Trans Fluid Pump Seal
304	A/Trans Fluid Pump Drive Shaft Bushing
305	A/Trans Fluid Pump Pin
306	Control (with Body & Valve) Valve Assembly
307	Signal Accumulator Piston
308	Signal Accumulator Piston Spring

309	Cooler Flow Blowoff Ball Valve
310	Control Valve Body Locator Pin
311	Control Valve Channel Plate Spacer Plate Assembly
312	Control Valve Channel Plate
313	A/Trans Control Wiring Harness Assembly
314	Control Valve Channel Plate Bolt
322	A/Trans Fluid Passage Sleeve

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CONTROL (WITH BODY AND VALVE) VALVE ASSEMBLY (2 OF 2)

Fig 1: Control (With Body and Valve) Valve Assembly (2 Of 2)



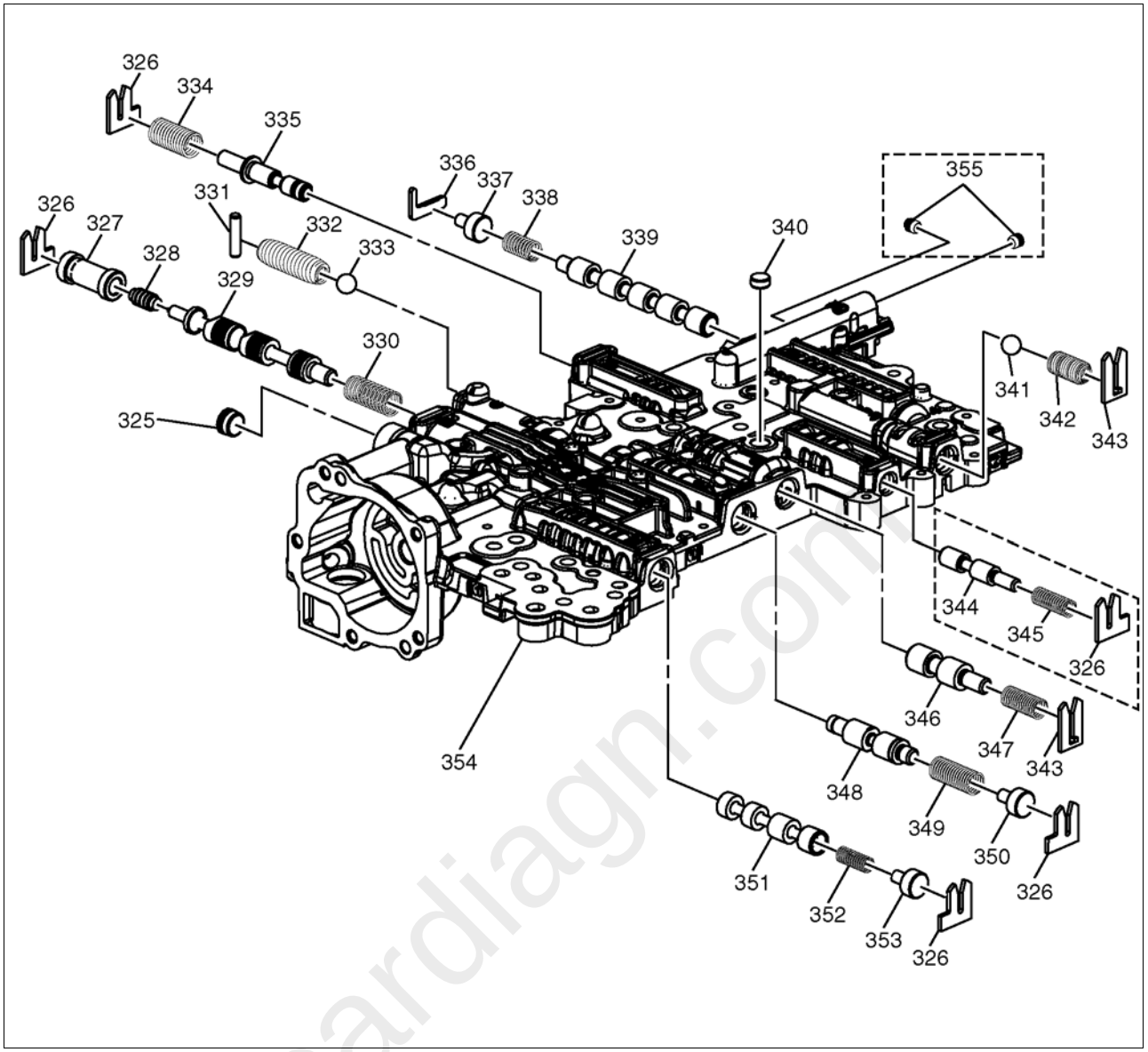
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
309	Cooler Flow Blowoff Ball Valve
315	Control Valve Upper Body
316	Control Valve Body Ball Check Valve
317	Control Valve Body Spacer Plate Retainer
318	Control Valve Body Spacer Plate (with Gasket)
319	Control Valve Body Locator Pin
320	Control Valve Solenoid Body Assembly
321	Control Valve Lower Body Bolt
323	A/Trans Auxiliary Fluid Accumulator - Model Dependent
324	A/Trans Auxiliary Fluid Accumulator Solenoid - Model Dependent
398	A/Trans Auxiliary Fluid Accumulator Bolt - Model Dependent
399	A/Trans Auxiliary Fluid Accumulator Bleeder Valve - Model Dependent

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CONTROL VALVE UPPER BODY ASSEMBLY

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Fig 1: Control Valve Upper Body Assembly



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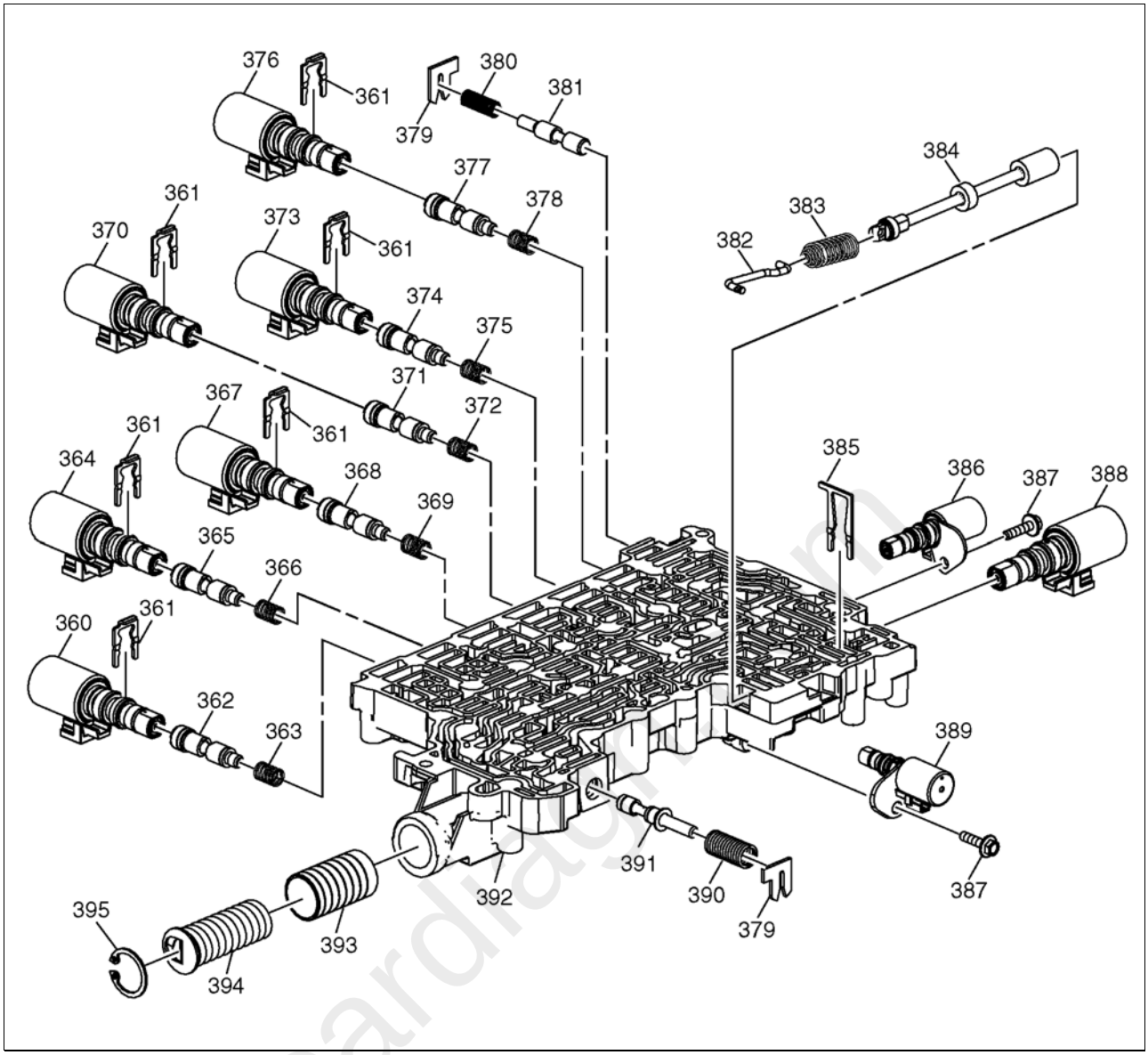
Callout	Component Name
325	Transmission Fluid Passage Plug
326	Valve Spring Retainer
327	Pressure Regulator Valve Bore Bushing
328	Pressure Regulator Shuttle Valve
329	Pressure Regulator Valve
330	Pressure Regulator Valve Spring
331	Pressure Relief Ball Valve Spring Retainer
332	Pressure Relief Ball Valve Spring

333	Pressure Relief Ball Valve
334	Feed Limit Valve Spring
335	Actuator Feed Limit Valve
336	Default Override Valve Bore Plug Retainer
337	Default Override Valve Bore Plug
338	Default Override Valve Spring
339	Default Override Valve
340	Control Valve Center Body Hole Plug
341	Clutch Piston Exhaust Blowoff Ball Valve
342	Clutch Piston Exhaust Blowoff Ball Valve Spring
343	Valve Spring Retainer
344	1-2-3-4-5 Reverse Clutch Boost Valve - Model Dependent
345	1-2-3-4-5 Reverse Clutch Boost Valve Spring - Model Dependent
346	TCC Valve
347	TCC Valve Spring
348	Lube Regulator Valve
349	Lube Regulator Valve Spring
350	Lube Regulator Valve Bore Plug
351	TCC Control Valve
352	TCC Control Valve Spring
353	TCC Control Valve Bore Plug
354	Control Valve Upper Body
355	Line Pressure Bore Plug - Model Dependent

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > CONTROL SOLENOID VALVE BODY ASSEMBLY

Fig 1: Control Solenoid Valve Body Assembly



Courtesy of GENERAL MOTORS COMPANY

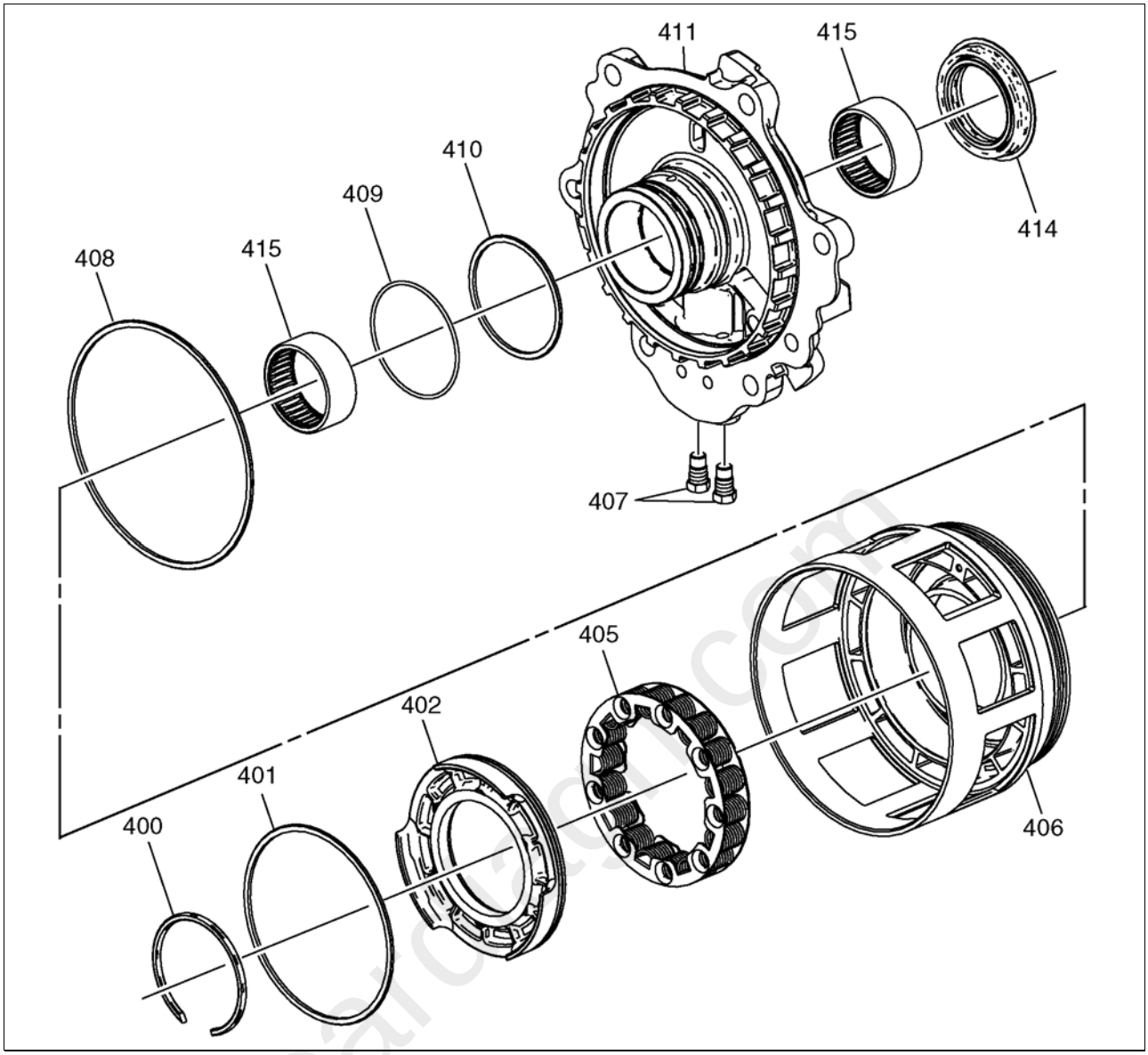
Callout	Component Name
360	TCC Control Solenoid Valve Assembly
361	Control Solenoid Valve Retainer
362	TCC Control Valve
363	TCC Control Valve Spring
364	2-3-4-6-8 Control Solenoid Valve Assembly
365	2-3-4-6-8 Control Valve
366	2-3-4-6-8 Control Valve Spring
367	1-3-5-6-7 Reverse Control Solenoid Valve Assembly

368	1-3-5-6-7 Reverse Control Solenoid Valve
369	1-3-5-6-7 Reverse Control Solenoid Valve Spring
370	4-5-6-7-8 Reverse Control Solenoid Valve Assembly
371	4-5-6-7-8 Reverse Control Valve
372	4-5-6-7-8 Reverse Control Valve Spring
373	1-2-7-8 Reverse Control Solenoid Valve Assembly
374	1-2-7-8 Reverse Control Valve
375	1-2-7-8 Reverse Control Valve Spring
376	1-2-3-4-5 Reverse Control Solenoid Valve Assembly
377	1-2-3-4-5 Reverse Control Solenoid Valve
378	1-2-3-4-5 Reverse Control Solenoid Valve Spring
379	Valve Spring Retainer
380	Lube Regulator Valve Spring
381	Lube Regulator Valve
382	Manual Valve Link
383	Manual Valve Spring
384	Manual Valve
385	Control Solenoid Valve Retainer
386	Shift Solenoid Valve Assembly
387	Control Valve Solenoid Body Bolt
388	Shift Solenoid Valve Assembly
389	Shift Solenoid Valve Assembly
390	Converter Feed Limit Valve Spring
391	Converter Feed Limit Valve
392	Control Valve Solenoid Body
393	1-3-5-6-7 Clutch Accumulator Piston
394	1-3-5-6-7 Accumulator Piston Spring
395	1-3-5-6-7 Clutch Accumulator Piston Retaining Ring

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > A/TRANS CASE EXTENSION ASSEMBLY (TWO WHEEL DRIVE)

Fig 1: A/Trans Case Extension Assembly (Two Wheel Drive)



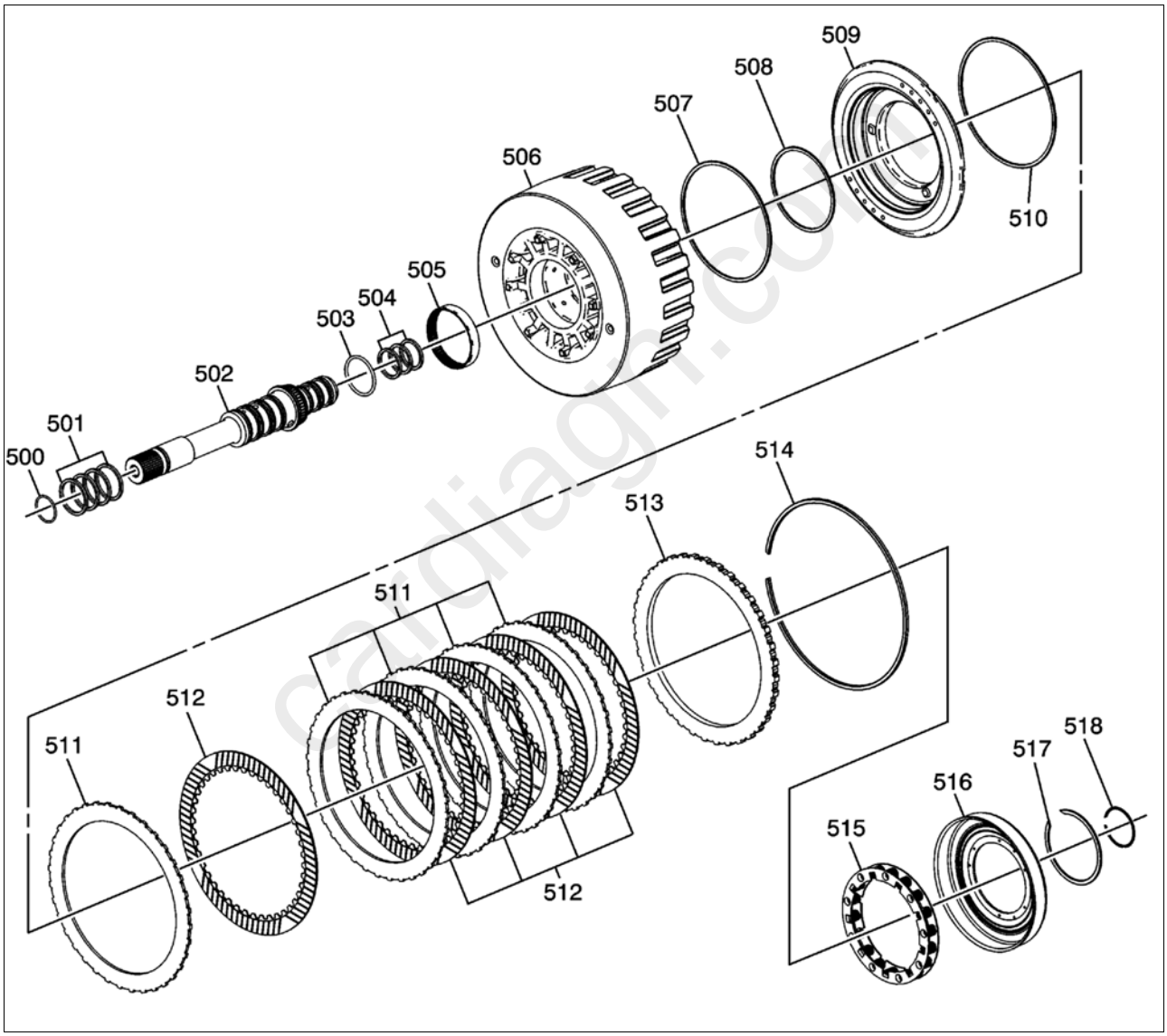
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
400	1-2-3-4-5 Reverse Clutch Piston Dam Retaining Ring
401	1-2-3-4-5 Reverse Clutch Piston Dam Seal
402	1-2-3-4-5 Reverse Clutch Piston Dam
405	1-2-3-4-5 Reverse Clutch Piston Return Spring
406	1-2-3-4-5 Reverse Clutch Piston
407	A/Trans Case Extension Hole Plug
408	1-2-3-4-5 Reverse Clutch Piston Outer Seal
409	1-2-3-4-5 Reverse Clutch Piston Dam Inner Seal (O-ring)

410	1-2-3-4-5 Reverse Clutch Piston Inner Seal
411	A/Trans Case Extension
414	Propeller Shaft Transmission Flange Fluid Seal
415	Output Shaft Bearing

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > 1-3-5-6-7 CLUTCH HOUSING ASSEMBLY

Fig 1: 1-3-5-6-7 Clutch Housing Assembly



Courtesy of GENERAL MOTORS COMPANY

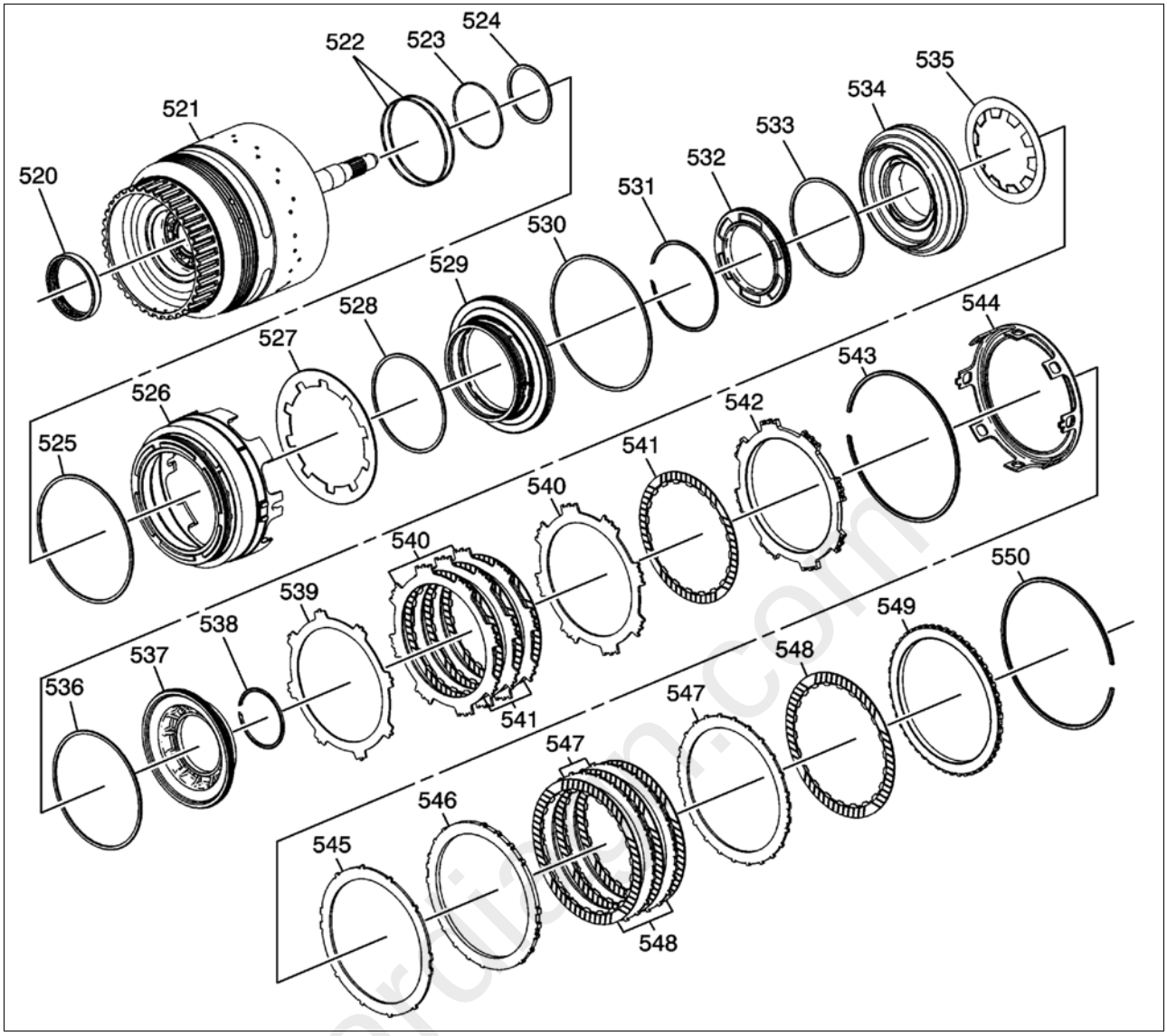
Callout	Component Name
500	Turbine Shaft O-ring Seal

501	Turbine Shaft Fluid Seal Ring
502	Turbine Shaft
503	Turbine Shaft O-ring Seal
504	Turbine Shaft Fluid Seal Ring
505	1-3-5-6-7 Clutch Bearing
506	1-3-5-6-7 Clutch Housing
507	1-3-5-6-7 Clutch Piston Seal (Outer)
508	1-3-5-6-7 Clutch Piston Seal (Inner)
509	1-3-5-6-7 Clutch Piston
510	1-3-5-6-7 Clutch Piston Dam Seal
511	1-3-5-6-7 Clutch Plate
512	1-3-5-6-7 Clutch Plate Assembly
513	1-3-5-6-7 Clutch Backing Plate
514	1-3-5-6-7 Clutch Backing Plate Retaining Ring (Selective)
515	1-3-5-6-7 Clutch Piston Return Spring
516	1-3-5-6-7 Clutch Piston Dam
517	1-3-5-6-7 Clutch Piston Dam Retaining Ring
518	Turbine Shaft Retaining Ring

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING ASSEMBLY

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Assembly



Courtesy of GENERAL MOTORS COMPANY

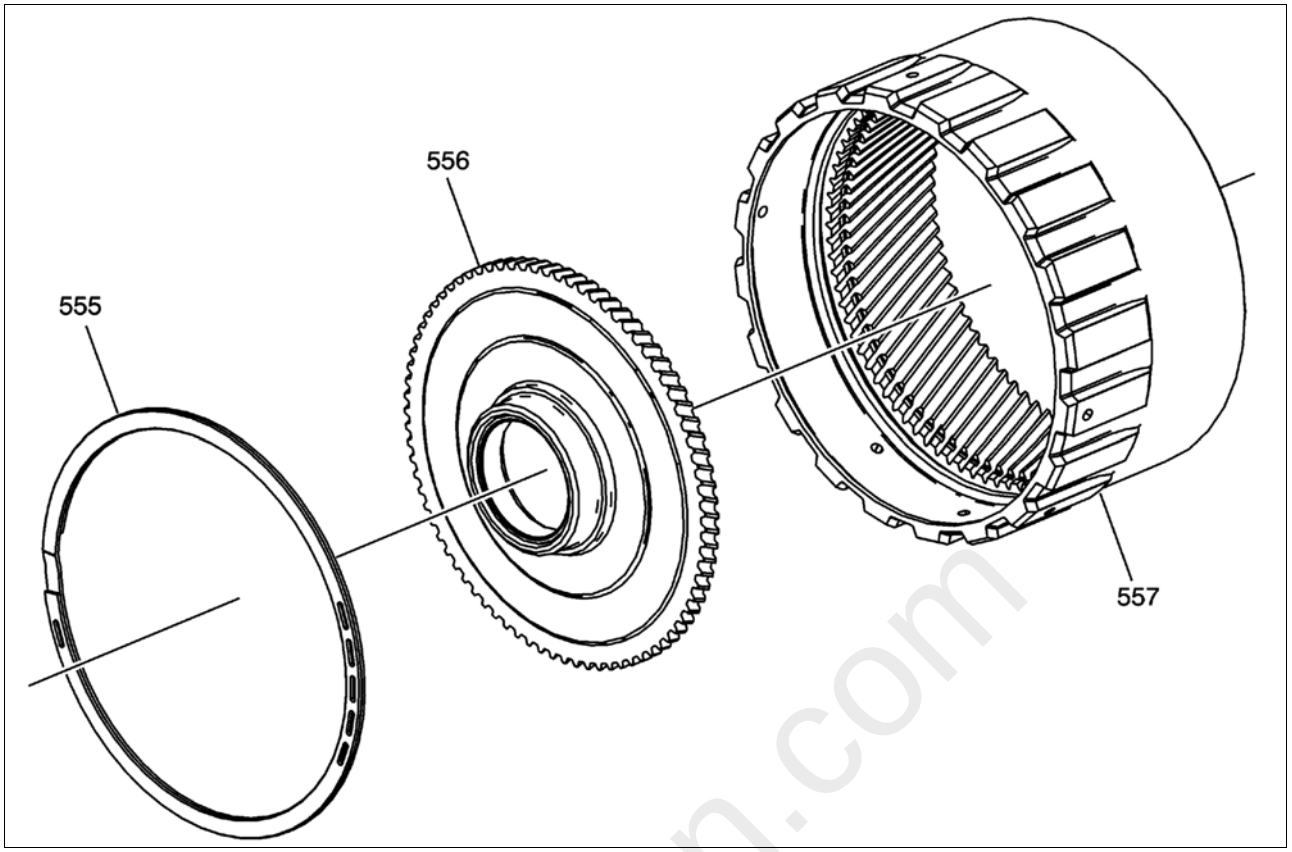
Callout	Component Name
520	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing
521	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing
522	2-3-4-6-8 Clutch Piston Dam Seal
523	4-5-6-7-8 Reverse Clutch Piston Stop Seal (O-ring)
524	4-5-6-7-8 Reverse Clutch Piston Seal
525	2-3-4-6-8 Clutch Piston Seal
526	2-3-4-6-8 Clutch Piston
527	2-3-4-6-8 Clutch Piston Return Spring
528	2-3-4-6-8 Clutch Piston Dam Seal (Inner)

529	2-3-4-6-8 Clutch Piston Dam
530	2-3-4-6-8 Clutch Piston Dam Seal (Outer)
531	2-3-4-6-8 Clutch Piston Dam Retaining Ring
532	4-5-6-7-8 Reverse Clutch Piston Stop
533	4-5-6-7-8 Reverse Clutch Piston Seal
534	4-5-6-7-8 Reverse Clutch Piston
535	4-5-6-7-8 Reverse Clutch Piston Return Spring
536	4-5-6-7-8 Reverse Clutch Piston Seal
537	4-5-6-7-8 Reverse Clutch Piston Dam
538	4-5-6-7-8 Reverse Clutch Piston Dam Retaining Ring
539	4-5-6-7-8 Reverse Clutch (Waved) Plate
540	4-5-6-7-8 Reverse Clutch Plate
541	4-5-6-7-8 Reverse Clutch Plate Assembly
542	4-5-6-7-8 Reverse Clutch Backing Plate
543	4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring (Selective)
544	2-3-4-6-8 Clutch Apply Ring
545	2-3-4-6-8 Clutch (Waved) Plate
546	2-3-4-6-8 Clutch Apply Plate
547	2-3-4-6-8 Clutch Plate
548	2-3-4-6-8 Clutch Plate Assembly
549	2-3-4-6-8 Clutch Backing Plate
550	2-3-4-6-8 Clutch Backing Plate Retaining Ring

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > DIRECT/OVERDRIVE INTERNAL GEAR ASSEMBLY

Fig 1: Direct/Overdrive Internal Gear Assembly



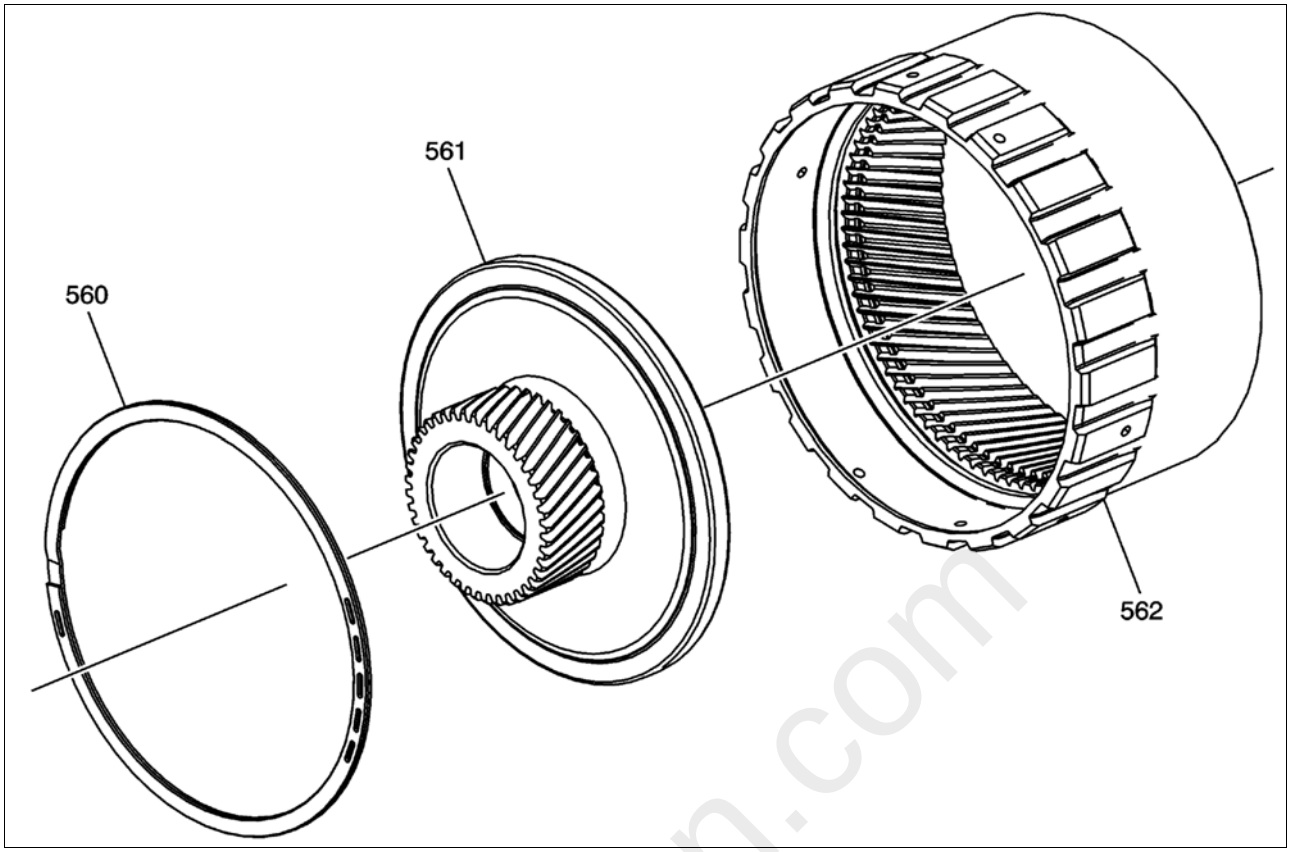
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Callout	Component Name
555	Direct/Overdrive Internal Gear Retaining Ring
556	Direct/Overdrive Internal Gear Flange
557	Direct/Overdrive Internal Gear

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > INPUT INTERNAL GEAR ASSEMBLY

Fig 1: Input Internal Gear Assembly



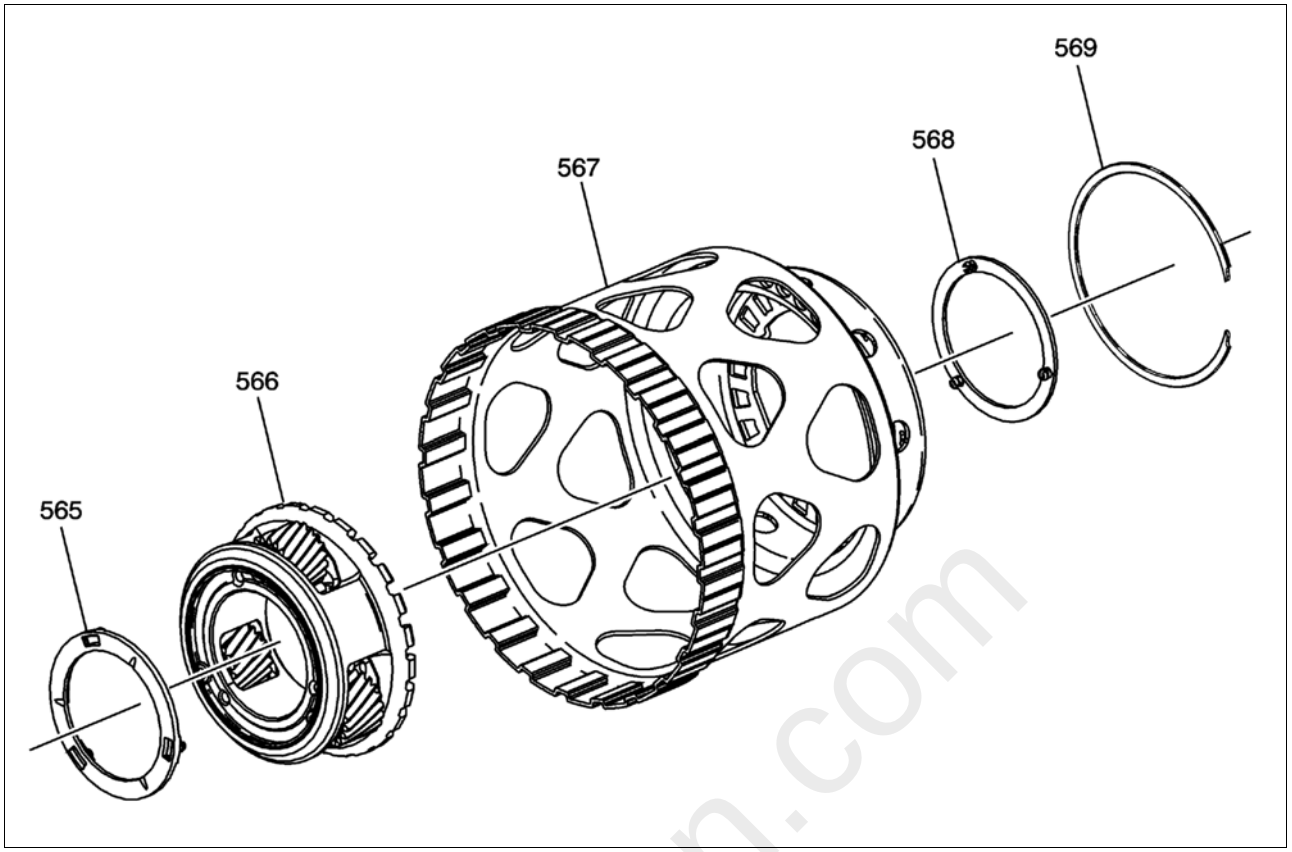
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Callout	Component Name
560	Input Internal Gear Retaining Ring
561	Direct/Overdrive Sun Gear
562	Input Internal Gear

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > INPUT CARRIER ASSEMBLY

Fig 1: Input Carrier Assembly



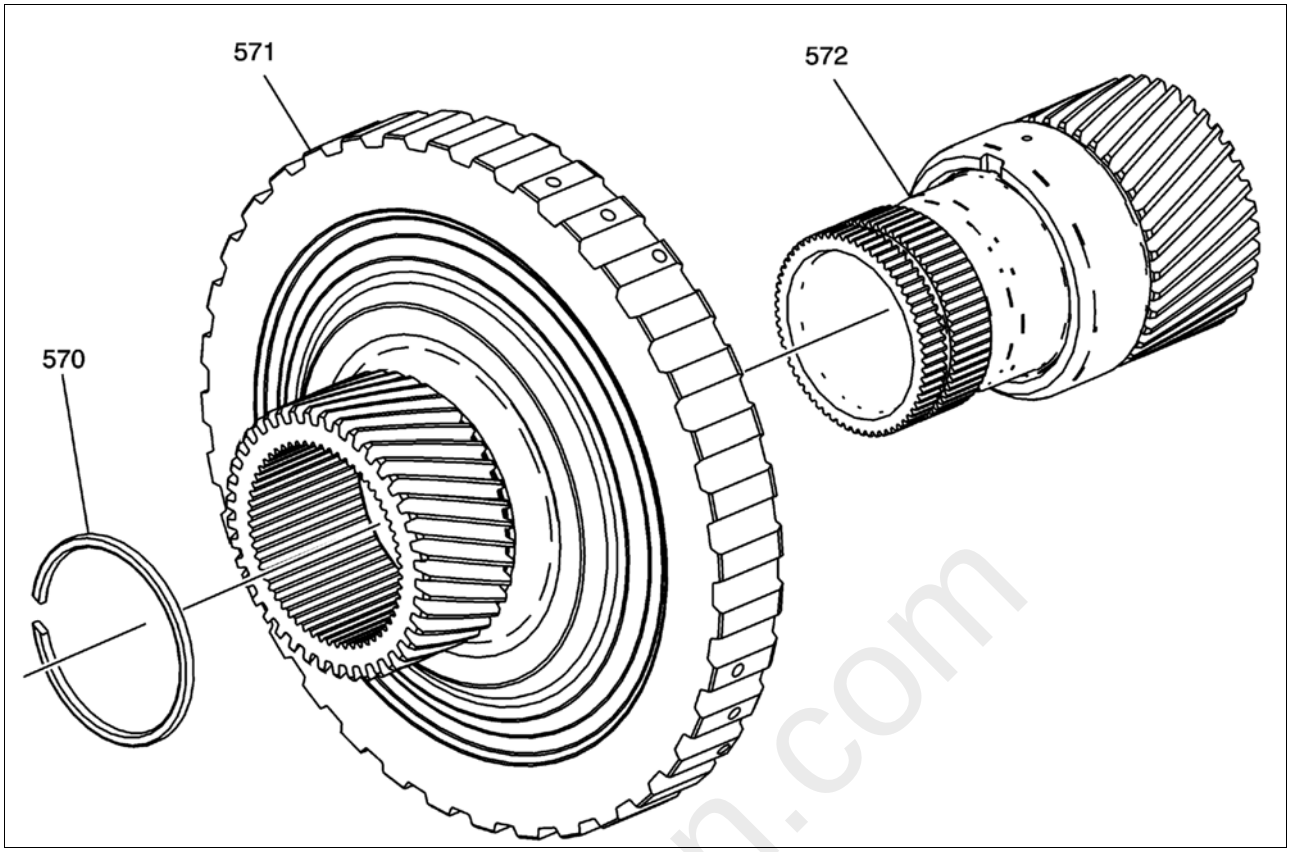
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Callout	Component Name
565	Input Carrier Thrust Washer
566	Input Carrier
567	Input Carrier Shell
568	Input Carrier Thrust Washer
569	Input Carrier Shell Retaining Ring

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > INPUT SUN GEAR ASSEMBLY

Fig 1: Input Sun Gear Assembly



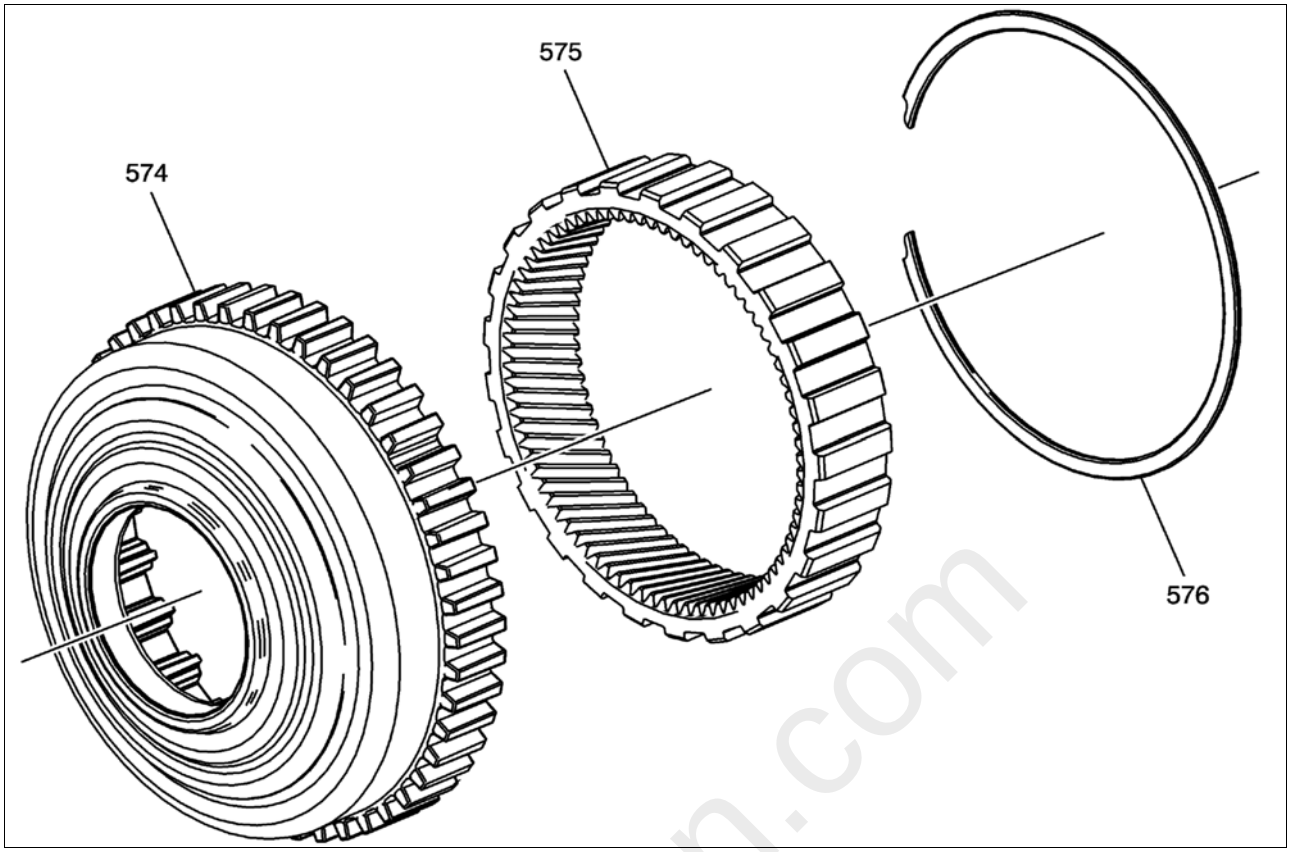
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
570	Input Sun Gear Retaining Ring
571	Input Sun Gear Assembly
572	Reaction Sun Gear Assembly

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > REACTION INTERNAL GEAR AND 1-2-3-4-5 REVERSE CLUTCH HUB ASSEMBLY

Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Clutch Hub Assembly



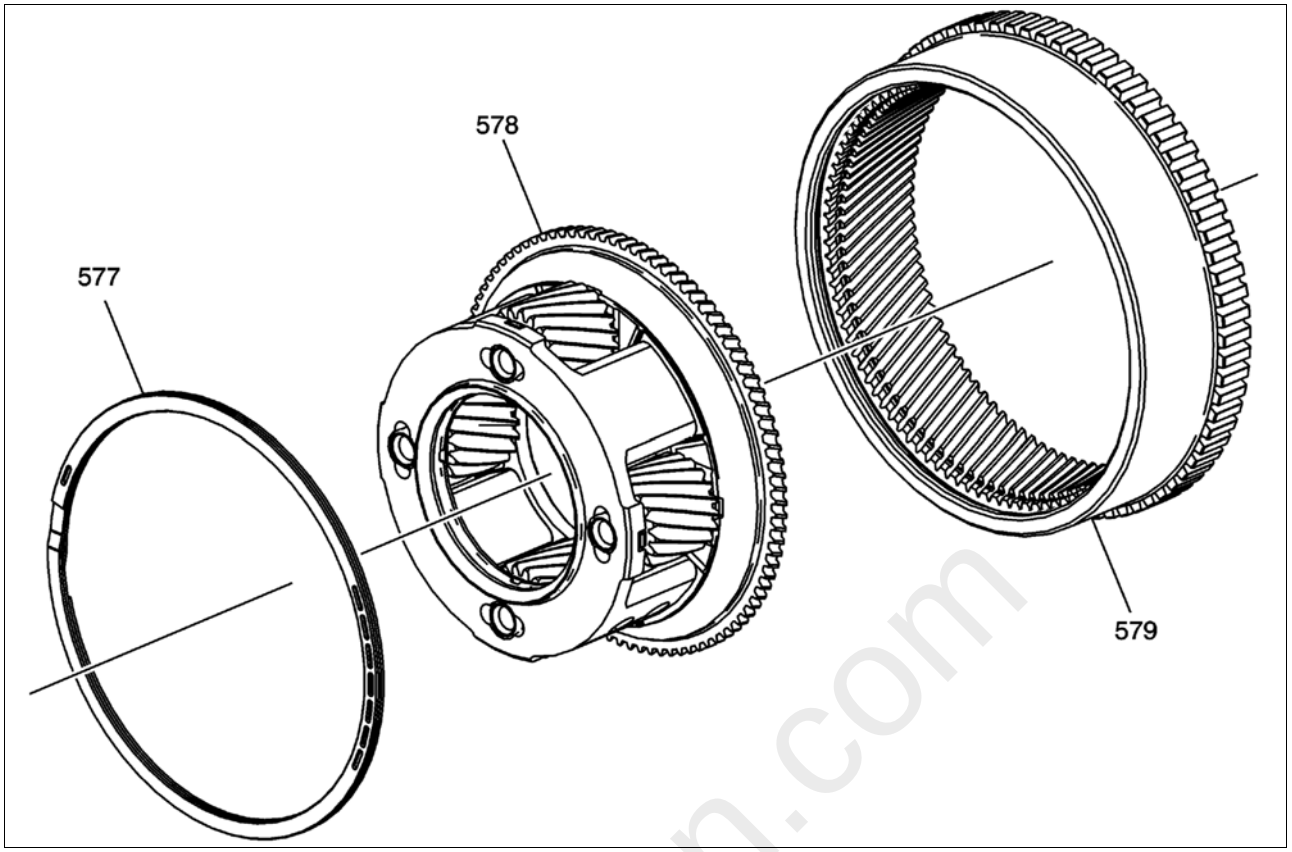
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
574	Reaction Internal Gear and 1-2-3-4-5 Reverse Clutch Hub
575	Reaction Internal Gear
576	Reaction Internal Gear Retaining Ring

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > REACTION CARRIER ASSEMBLY

Fig 1: Reaction Carrier Assembly



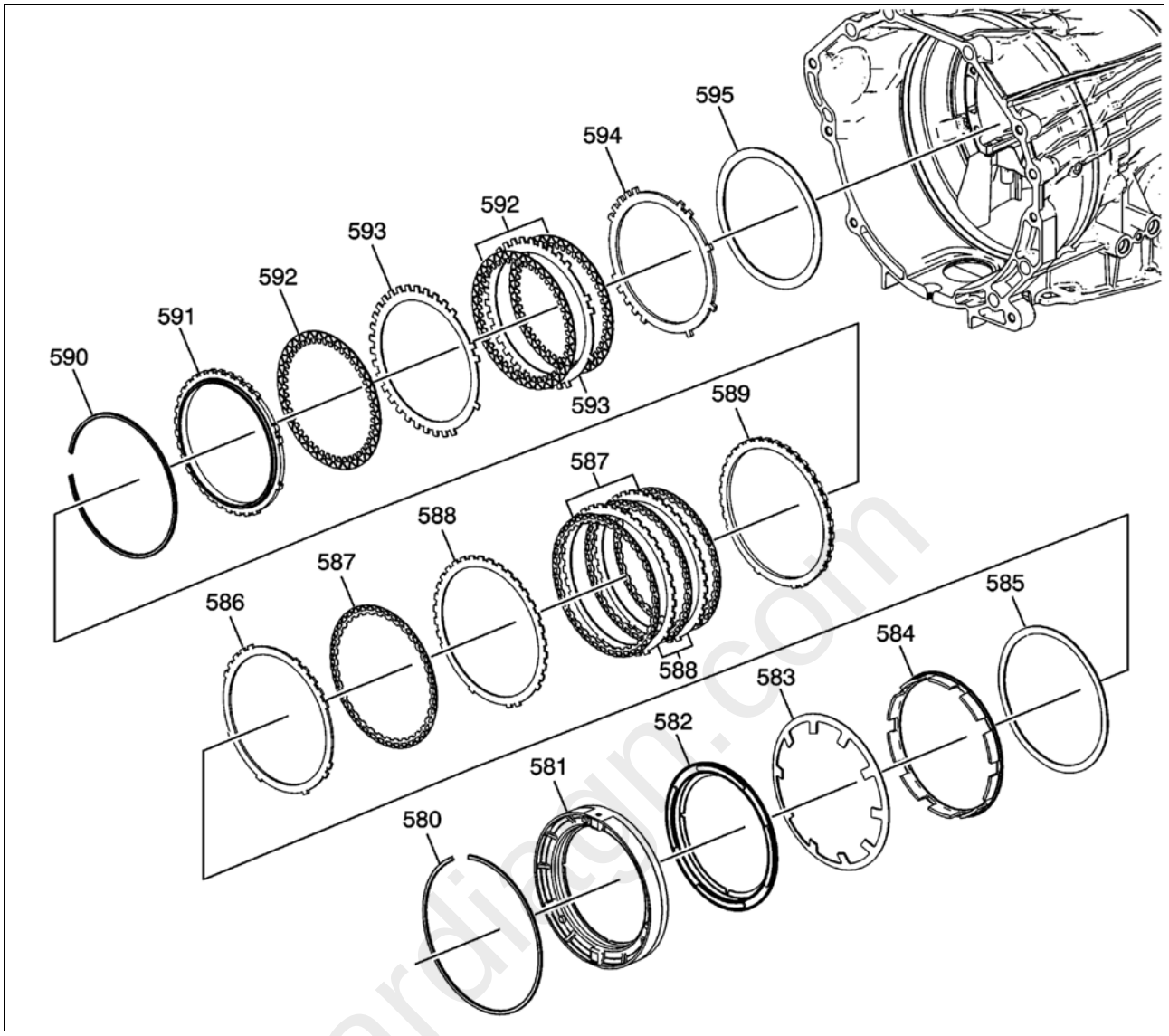
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
577	Output Internal Gear Retaining Ring
578	Reaction Carrier Assembly
579	Output Carrier Internal Gear

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COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > 1-2-3-4-5 REVERSE AND 1-2-7-8 REVERSE CLUTCH ASSEMBLIES

Fig 1: 1-2-3-4-5 Reverse and 1-2-7-8 Reverse Clutch Assemblies



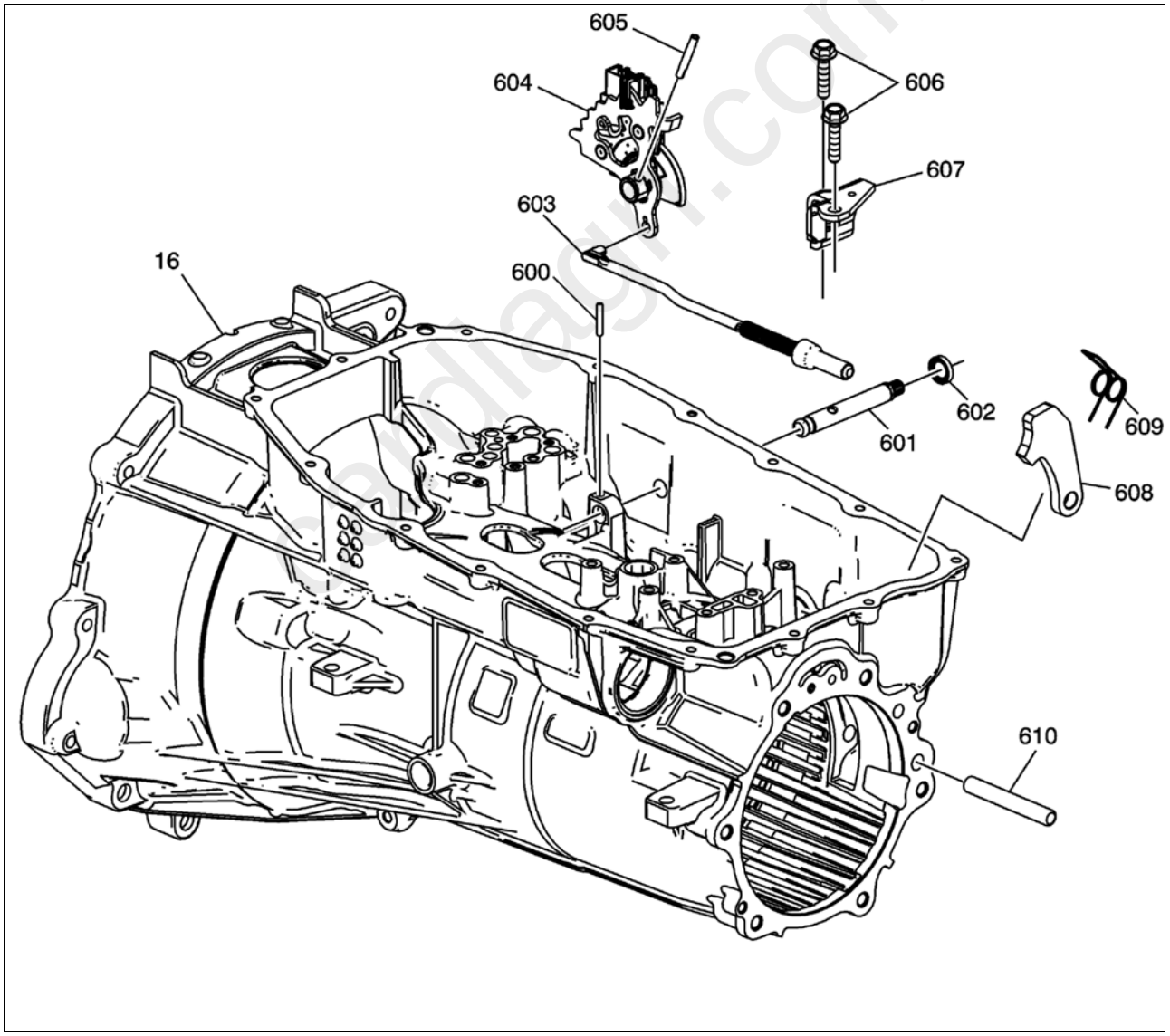
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
580	1-2-7-8 Reverse Clutch Piston Housing Retaining Ring
581	1-2-7-8 Reverse Clutch Piston Housing (with Orifice)
582	1-2-7-8 Reverse Clutch Piston (Bonded Lip)
583	1-2-7-8 Reverse Clutch Return Spring
584	1-2-7-8 Reverse Clutch Apply Ring
585	1-2-7-8 Reverse Clutch (Waved) Plate
586	1-2-7-8 Reverse Clutch Apply Plate
587	1-2-7-8 Reverse Clutch Plate Assembly
588	1-2-7-8 Reverse Clutch Plate

589	1-2-7-8 Reverse Clutch Backing Plate
590	1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring (Selective)
591	1-2-3-4-5 Reverse Clutch Backing Plate
592	1-2-3-4-5 Reverse Clutch Plate Assembly
593	1-2-3-4-5 Reverse Clutch Plate
594	1-2-3-4-5 Reverse Clutch Apply Plate
595	1-2-3-4-5 Reverse Clutch (Waved) Plate

COMPONENT LOCATOR > DISASSEMBLED VIEWS (8L45) > PARK SYSTEM COMPONENTS

Fig 1: Park System Components



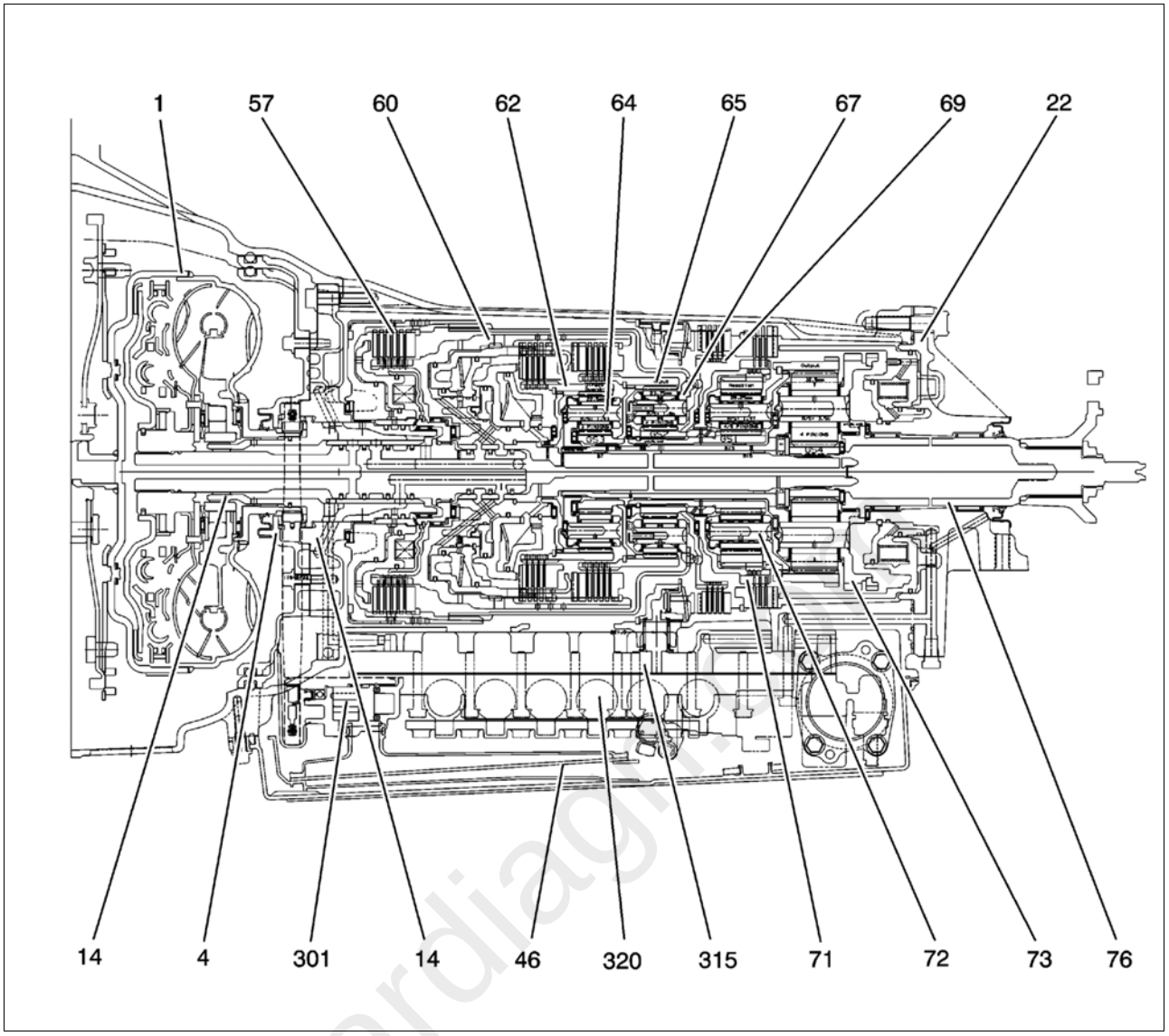
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
16	A/Trans Case Assembly
600	Manual Shift Shaft Pin
601	Manual Shift Shaft
602	Manual Shift Shaft Seal
603	Park Pawl Actuator Assembly
604	Manual Shift Shaft Position Switch Assembly
605	Manual Shaft Detent Lever Hub Pin
606	Park Pawl Actuator Bracket Bolt
607	Park Pawl Actuator Bracket
608	Park Pawl
609	Park Pawl Spring
610	Park Pawl Shaft

COMPONENT LOCATOR > COMPONENT LOCATION

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Fig 1: Automatic Trabnsmission Component Locations -- 8L90



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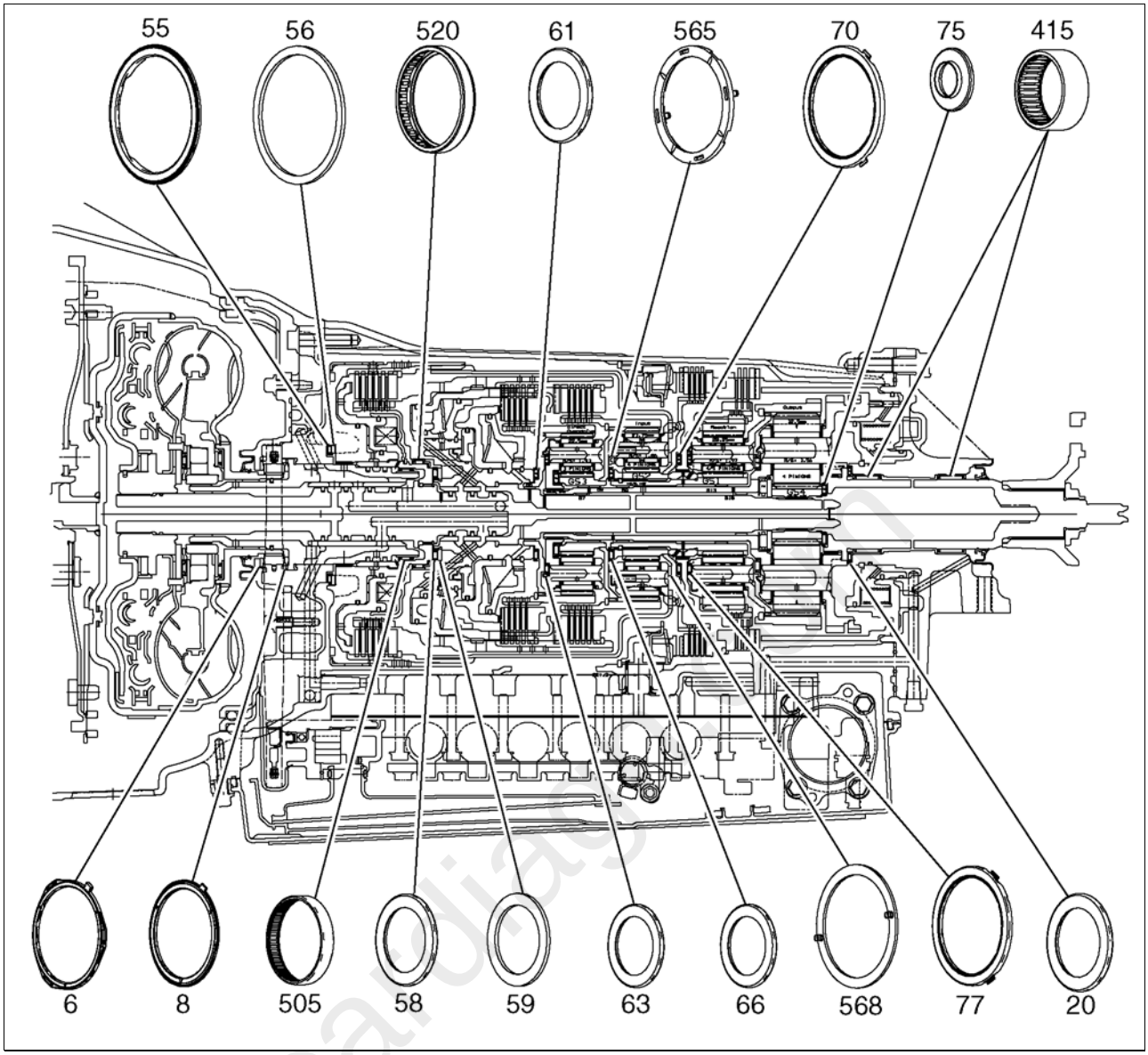
Callout	Component Name
1	Torque Converter
4	A/Trans Case Front Cover
14	Stator Shaft Support
22	A/Trans Case Extension Assembly
46	A/Trans Fluid Filter
57	1-3-5-6-7 Clutch Assembly
60	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly
62	Direct/Overdrive Internal Gear Assembly
64	Direct/Overdrive Carrier Assembly

65	Input Internal Gear Assembly
67	Input Carrier Assembly
69	Input Sun Gear Assembly
71	Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
72	Reaction Carrier Assembly with Output Internal Gear Assembly
73	Output Carrier Assembly
76	Output Shaft
301	A/Trans Fluid Pump Assembly
315	Control Valve Upper Body
320	Control Valve Solenoid Body Assembly

COMPONENT LOCATOR > BUSHING, BEARING, AND WASHER LOCATIONS

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Fig 1: Bushing, Bearing, and Washer Locations



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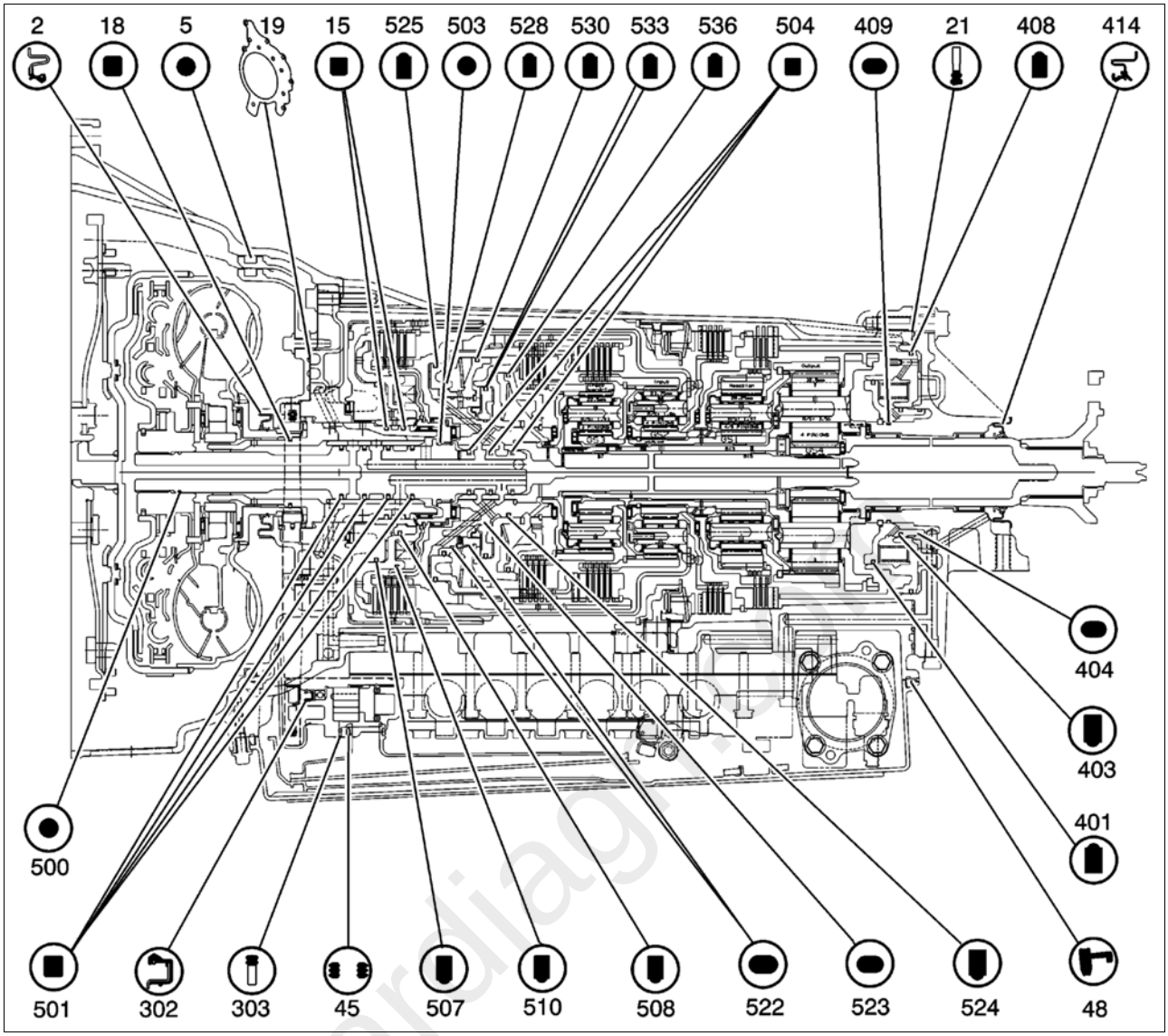
Callout	Component Name
6	Drive Sprocket Thrust Washer - Front
8	Drive Sprocket Thrust Washer - Rear
20	Output Shaft Bearing
55	1-3-5-6-7 Clutch Thrust Bearing
56	1-3-5-6-7 Clutch Thrust Bearing Washer
58	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing
59	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing Washer
61	Input Sun Gear Thrust Bearing

63	Direct/Overdrive Carrier Thrust Bearing (8L45 Only)
66	Input Sun Gear Thrust Bearing
70	1-2-3-4-5 Reverse Clutch Hub Thrust Bearing
75	Output Sun Gear Thrust Bearing
77	Reaction Carrier Thrust Bearing (8L45 Only)
415	Output Shaft Bearing (Quantity Model Dependent)
505	1-3-5-6-7 Clutch Bearing
520	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing
565	Input Carrier Thrust Washer
568	Input Carrier Thrust Washer

COMPONENT LOCATOR > SEAL LOCATIONS

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Fig 1: Seal Locations



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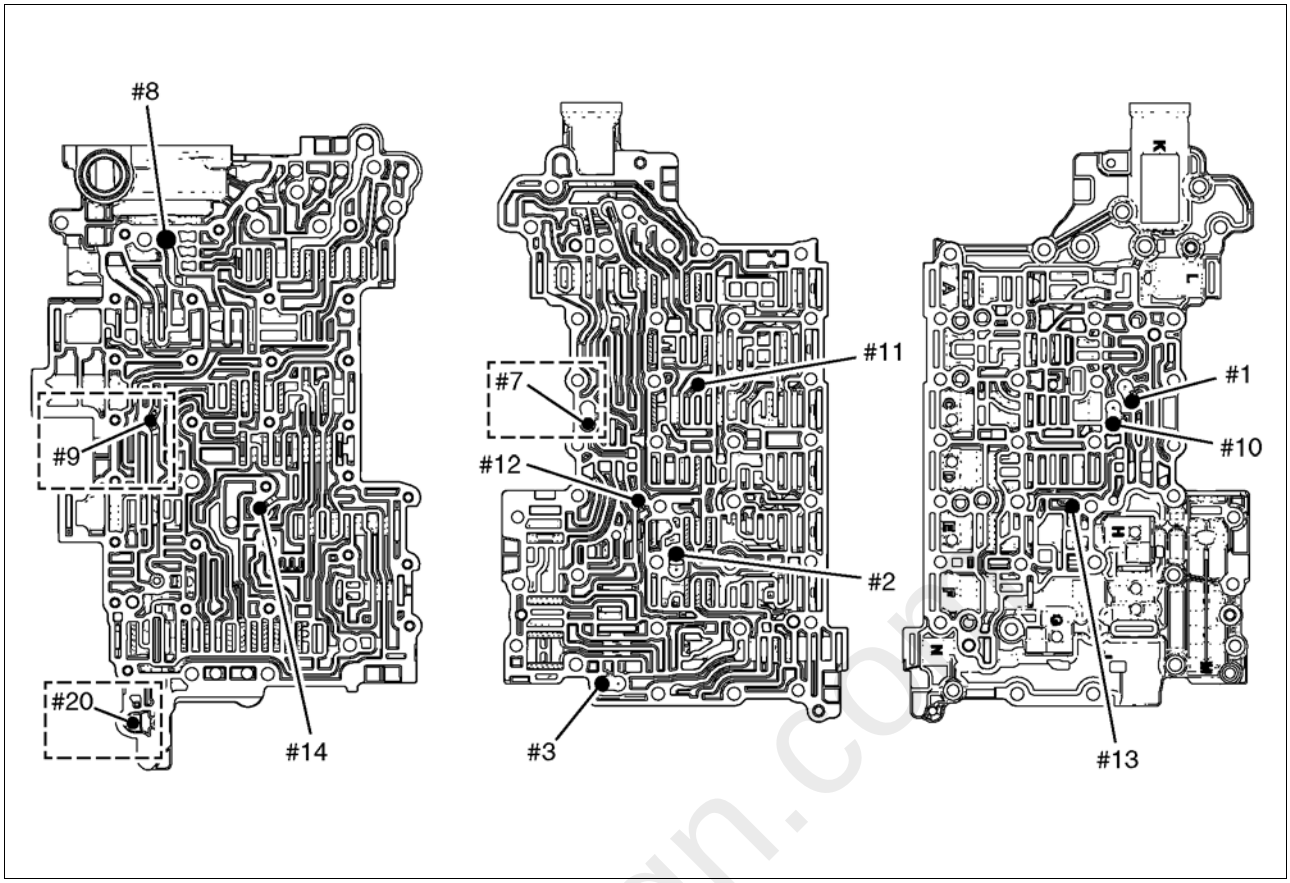
Callout	Component Name
2	Torque Converter Fluid Seal
5	A/Trans Case Front Cover Seal
15	1-3-5-6-7 Clutch Fluid Seal Ring
18	Torque Converter Fluid Seal
19	A/Trans Front Support Cover Gasket
21	A/Trans Case Extension Seal
45	A/Trans Fluid Filter Seal
48	A/Trans Fluid Pan Gasket
302	A/Trans Fluid Pump Seal

303	A/Trans Fluid Pump Gasket
401	1-2-3-4-5 Reverse Clutch Piston Dam Seal
403	1-2-3-4-5 Reverse Clutch Piston Inner Seal
404	1-2-3-4-5 Reverse Clutch Piston O-ring Seal
408	1-2-3-4-5 Reverse Clutch Piston Outer Seal
409	1-2-3-4-5 Reverse Clutch Piston Dam Inner O-ring Seal
414	Propeller Shaft Transmission Flange Fluid Seal (Outer)
500	Turbine Shaft O-ring Seal
501	Turbine Shaft Fluid Seal Ring
503	Turbine Shaft O-ring Seal
504	Turbine Shaft Fluid Seal
507	1-3-5-6-7 Clutch Piston Outer Seal
508	1-3-5-6-7 Clutch Piston Inner Seal
510	1-3-5-6-7 Clutch Piston Dam Seal
522	2-3-4-6-8 Clutch Piston Dam Seal
523	4-5-6-7-8 Reverse Clutch Piston Stop O-ring Seal
524	4-5-6-7-8 Reverse Clutch Piston Seal
525	2-3-4-6-8 Clutch Piston Seal
528	2-3-4-6-8 Clutch Piston Dam Inner Seal
530	2-3-4-6-8 Clutch Piston Dam Outer Seal
533	4-5-6-7-8 Reverse Clutch Piston Seal
536	4-5-6-7-8 Reverse Clutch Piston Dam Seal

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COMPONENT LOCATOR > BALL CHECK VALVE LOCATIONS

Fig 1: Ball Check Valve Locations



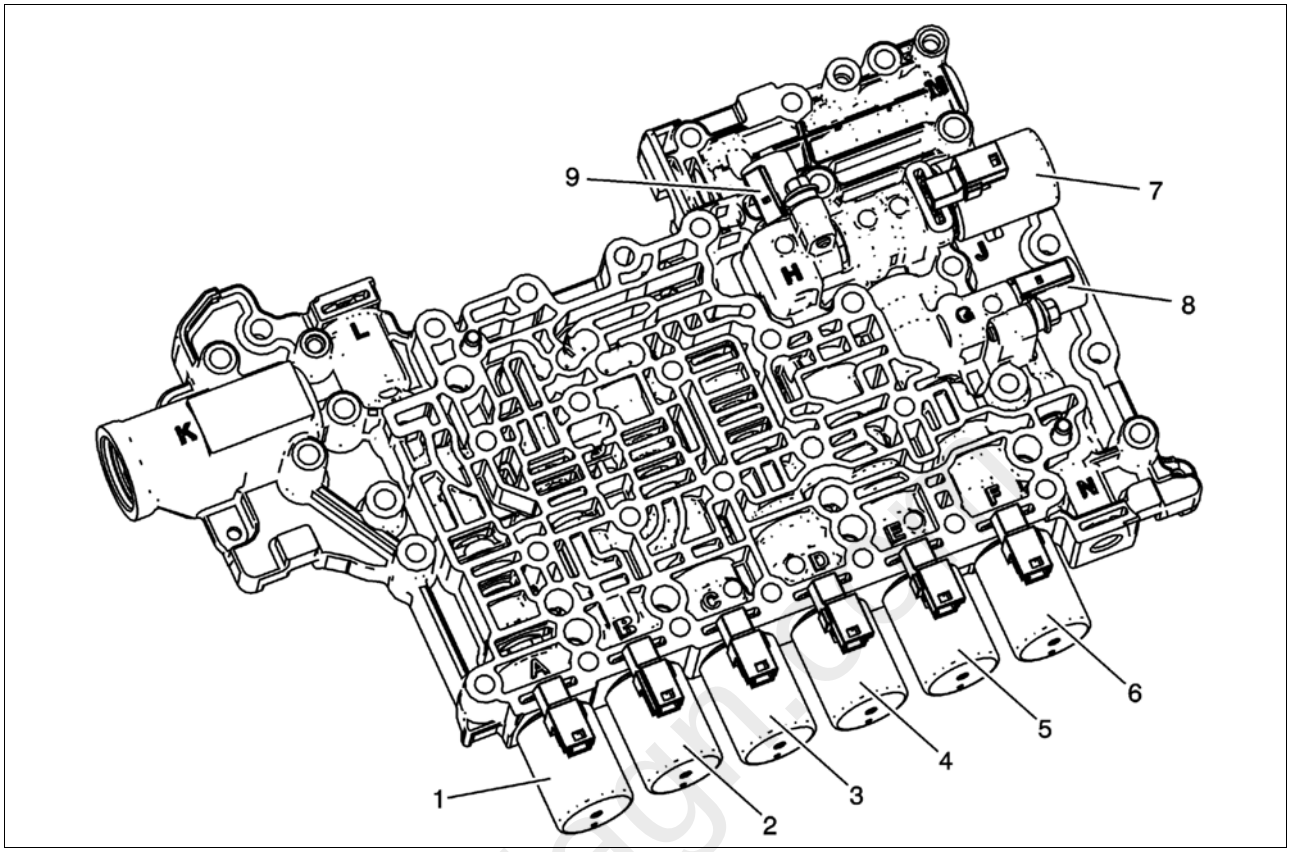
Courtesy of GENERAL MOTORS COMPANY

I.D.	Input Oil	Input Oil	Output Oil
#1	C23468	Reverse	C23468/Reverse
#2	C45678R Drive Feed	Reverse	C45678 Feed
#3	Default Latch	S9 On/Off Signal	Default Latch/S9 On/Off Signal
#7	Regulated Lube	Lube Override	Regulated Lube/Lube Override
#8	Line	-	Secondary Line
#9	Line	-	Line
#10	C23468	C45678R	C45678R/C23468
#11	C13567/C23468 Feed	-	C13567/C23468 Feed
#12	Actuator Feed	-	C45678R Feedback
#13	C45678R Feed	-	C45678R Feed
#14	C1278R Feedback	-	Actuator Feed
#20	Line	-	Line

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COMPONENT LOCATOR > TRANSMISSION SOLENOID INFORMATION > TRANSMISSION CONTROL SOLENOIDS

Fig 1: Transmission Control Solenoids



Courtesy of GENERAL MOTORS COMPANY

NOTE:

The letter B is not cast on the lower control valve solenoid body. It is shown on the above graphic for illustration only.

Transmission Control Solenoids

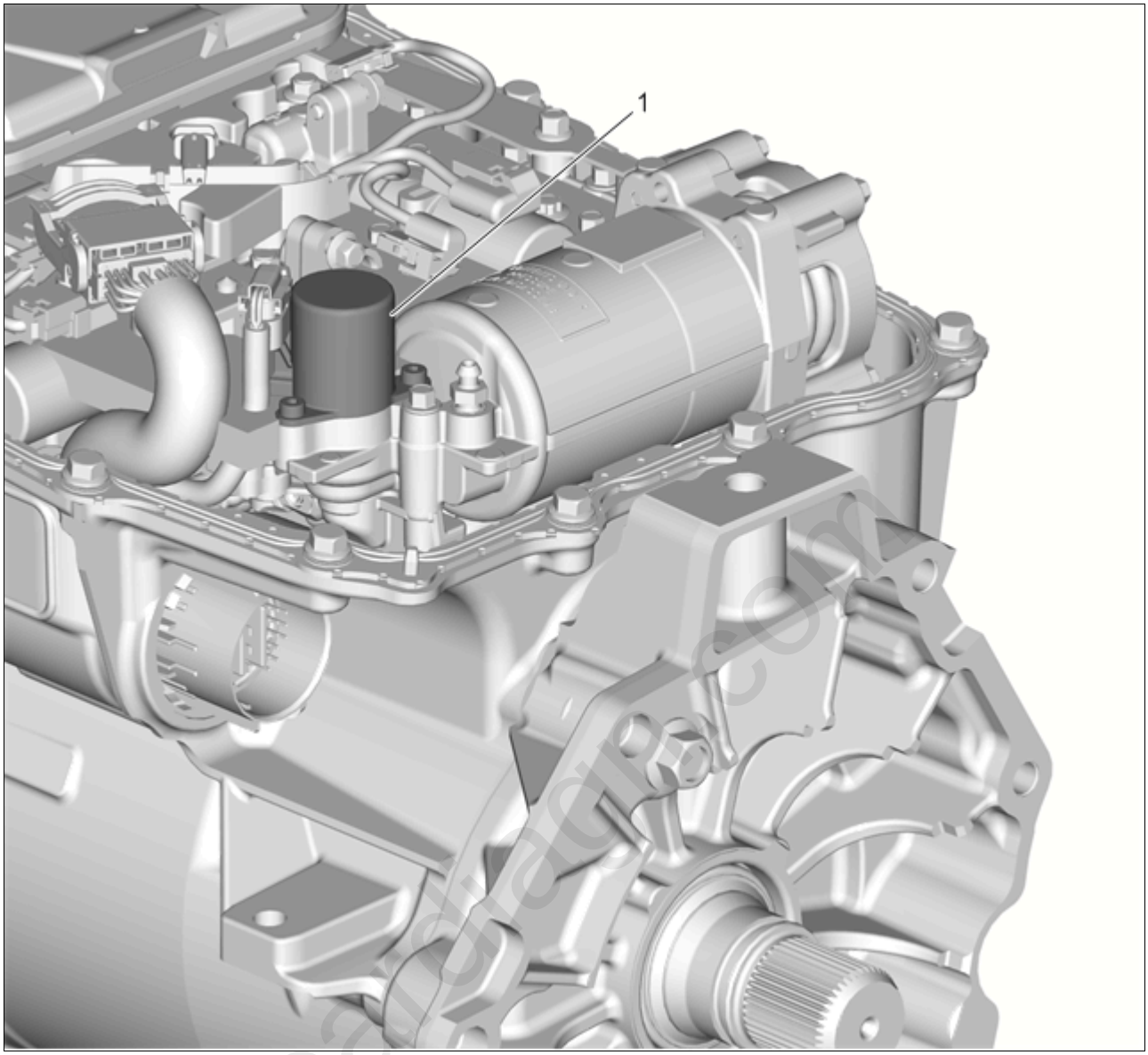
Callout Number	Solenoid Name	Solenoid Type	Controlled Element	Lower Control Valve Body Bore Location	Resistance Value at 20°C (68°F)
1	Transmission Control Solenoid Valve 7	High Pressure, Normally Low, Variable Force	Torque Converter Clutch (TCC)	A	4.5-5.5Ω
2	Transmission Control Solenoid Valve 4	High Pressure, Normally High, Variable Force	2-3-4-6-8 Clutch	B	4.5-5.5Ω

3	Transmission Control Solenoid Valve 3	High Pressure, Normally Low, Variable Force	1-3-5-6-7 Clutch	C	4.5-5.5Ω
4	Transmission Control Solenoid Valve 5	Low Pressure, Normally High, Variable Force	4-5-6-7-8-Reverse Clutch	D	4.5-5.5Ω
5	Transmission Control Solenoid Valve 1	Low Pressure, Normally High, Variable Force	1-2-7-8-Reverse Clutch	E	4.5-5.5Ω
6	Transmission Control Solenoid Valve 2	High Pressure, Normally Low, Variable Force	1-2-3-4-5-Reverse Clutch	F	4.5-5.5Ω
7	Transmission Control Solenoid Valve 6	Low Pressure, Normally High, Variable Force	Line Pressure	J	4.5-5.5Ω
8	Transmission Control Solenoid Valve 9	Normally Closed, ON - OFF	Boost Valve	G	11.0-13.0Ω
9	Transmission Control Solenoid Valve 8	Normally Closed, ON - OFF	Default Valve	H	11.0-13.0Ω

COMPONENT LOCATOR > TRANSMISSION SOLENOID INFORMATION > TRANSMISSION FLUID PRESSURE ACCUMULATOR SOLENOID VALVE - IF EQUIPPED

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Fig 1: Transmission Fluid Pressure Accumulator Solenoid Valve - If Equipped



Courtesy of GENERAL MOTORS COMPANY

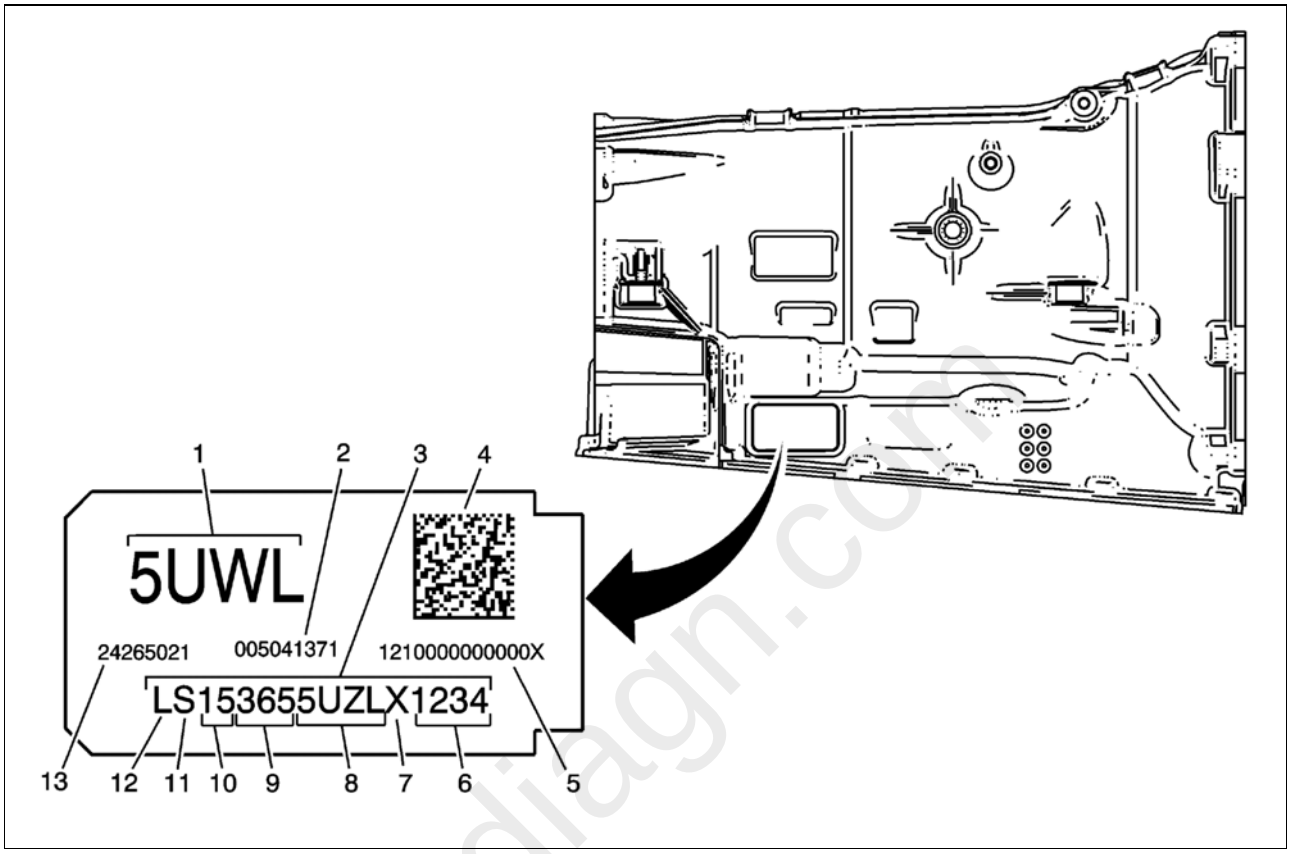
Transmission Fluid Pressure Accumulator Solenoid Valve - If Equipped

Callout Number	Solenoid Name	Solenoid Type	Controlled Elements	Location	Resistance Value @ 20°C (68°F)
1	Transmission Fluid Pressure Accumulator Solenoid Valve	Normally Closed, ON-OFF	Sends captured pressurized fluid to apply clutches for 1st gear operation	Bolted to the Transmission Fluid Pressure Accumulator Housing	17-19 Ω

Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - DESCRIPTION AND OPERATION

DESCRIPTION AND OPERATION > TRANSMISSION IDENTIFICATION INFORMATION

Fig 1: 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

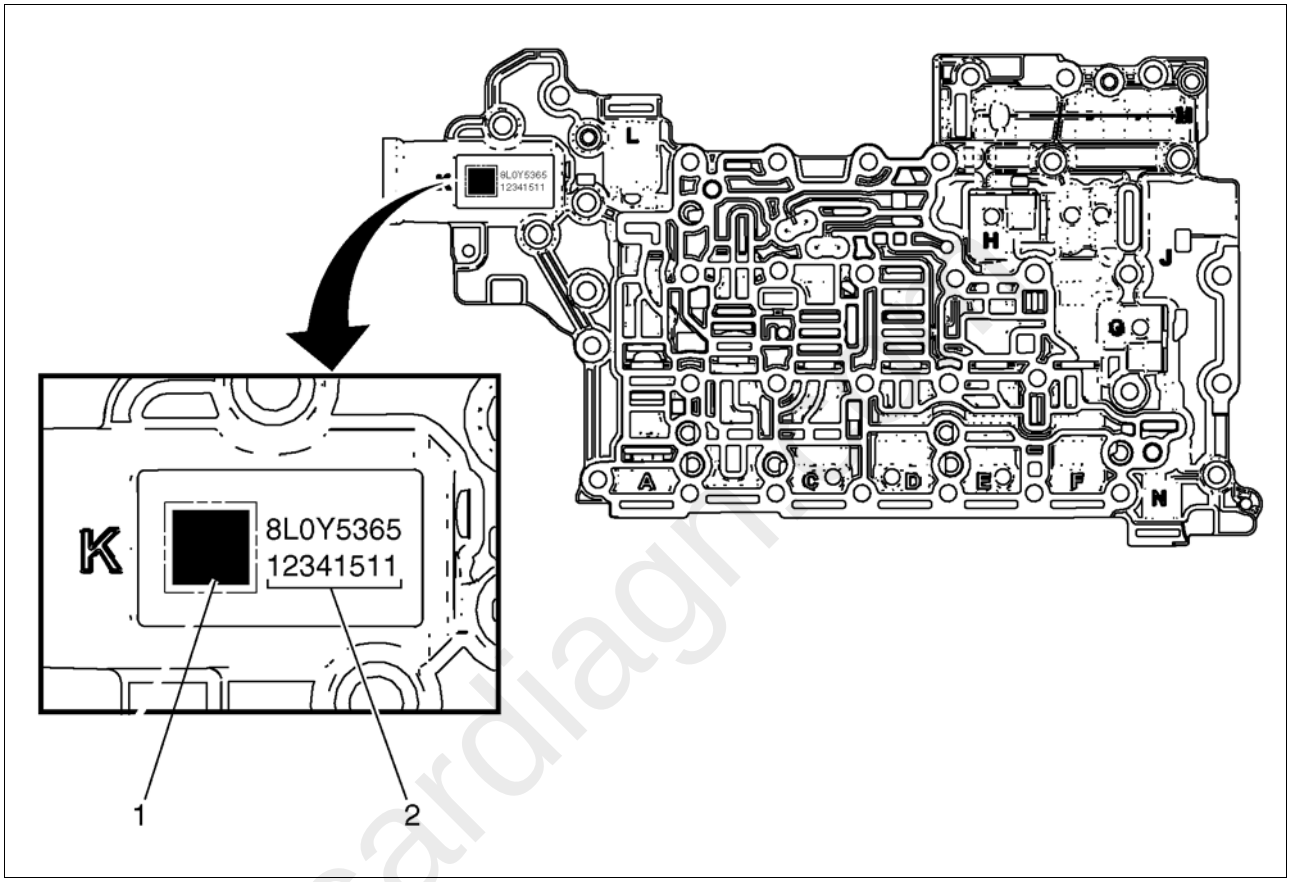
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12. Line Plant ID

13. GM Part Number

DESCRIPTION AND OPERATION > CONTROL VALVE SOLENOID BODY IDENTIFICATION INFORMATION

Fig 1: Control Valve Solenoid Body Identification Information



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Courtesy of GENERAL MOTORS COMPANY

1. Data Matrix

2. Part Unique Number (PUN)

DESCRIPTION AND OPERATION > TRANSMISSION GENERAL DESCRIPTION

The Hydra-matic 8-Speed RWD is a fully automatic, 8-speed, rear-wheel drive, electronic-controlled transmission. The eight speed ratios are generated using four simple planetary gearsets, two brake clutches, and three rotating clutches. The resultant on-axis transmission architecture utilizes a squashed torque converter, an off-axis pump and four close coupled gearsets. The three rotating clutches have been located forward of the gearsets to minimize the length of oil feeds which provides for enhanced shift response. There are different variants of the transmission, all based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

The transmission architecture features a case with integral bell housing for enhanced powertrain stiffness. A unique pump drive design allows for off-axis packaging very low in the transmission. The pump is a binary vane type which effectively allows for two pumps in the packaging size of one. This design and packaging strategy not only enables low parasitic losses and optimum priming capability but also provides for ideal oil routing to the controls system, with the pump located in the valve body itself. The transmission control module (TCM) is externally mounted, enabling packaging and powertrain integration flexibility. The controller makes use of three speed sensors which provide for enhanced shift response and accuracy.

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 8 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 hydraulic system primarily consists of an off-axis chain-driven binary vane-type pump located in the valve body, and 2 control valve body assemblies. The pump maintains the working pressures needed to stroke the clutch pistons that apply or release the friction components. These friction components, when applied or released, support the automatic shifting qualities of the transmission.

The friction components used in this transmission consist of 5 multiple disc clutches. The multiple disc clutches deliver 7 different gear ratios, 8 forward and one reverse, through the gear sets. The gear sets then transfer torque through the output shaft.

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

PARK (P)

> This position locks the rear 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 8 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.

MANUAL (M) SPORT MODE (S)

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This position allows the driver to utilize the Driver Shift Control (DSC) system, or manual mode. When the shift selector lever is moved to the M/S position, the driver may select upshifts or downshifts by using the paddle switches located on the steering wheel. An upshift is requested by pushing either + button forward. A downshift is requested by pulling either + button rearward toward the driver.
To protect the engine or transmission from damage, the TCM will only allow you to shift into a gear appropriate for engine speed and vehicle speed.

DESCRIPTION AND OPERATION > TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION

The mechanical components of the 8-Speed RWD are as follows:

- A torque converter with an electronically controlled capacity clutch (ECCC). ECCC was developed to reduce the possibility of noise, vibration, or chuggle caused by TCC apply. In a torque converter with ECCC, the pressure plate does not always fully lock to the torque converter cover. Instead, the pressure plate maintains a small amount of slippage. In RWD 8-Speed transmissions, this slippage can range from 0-50 RPM. Full lockup (0 RPM slip) is still available on some applications. TCC may apply in 1st trough 8th gear. The specific TCC apply points and the amount of clutch slippage are determined by a number of operating conditions, including throttle position, vehicle speed, gear, as well as specific vehicle application. Transmission fluid temperature will also affect TCC apply points.
- Binary Vane-Type Fluid Pump Assembly
- 1-3-5-6-7 Clutch Assembly
- 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly
- Direct/Overdrive Internal Gear Assembly
- Direct/Overdrive Carrier Assembly
- Input Internal Gear Assembly
- Input Carrier Assembly
- Input Sun Gear Assembly
- Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
- Reaction Carrier Assembly with Output Internal Gear Assembly
- Output Carrier Assembly
- Output Shaft
- Control Valve Body Assembly

The electrical components of the 8-Speed RWD are as follows:

- Input and Output Speed Sensor Assembly
- Manual Shift Shaft Position Switch

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- Control Solenoid Valve Body, which contains the following components:
    - 8 Transmission Control Solenoids
    - Torque Converter Clutch (TCC) Control Solenoid
    - Default Control Solenoid
    - 1-2-3-4-5 Reverse Boost Solenoid

DESCRIPTION AND OPERATION > MANUAL MODE DESCRIPTION AND OPERATION > TRANSMISSION GEAR SHIFT LEVER

Manual Mode operation can be entered into when the shift lever is place in Manual (M) position. When manual mode is selected, the letter M of the PRNDM display will illuminate to indicate the transmission is in manual mode.

DESCRIPTION AND OPERATION > MANUAL MODE DESCRIPTION AND OPERATION > TRANSMISSION MANUAL SHIFT SWITCH - RIGHT AND LEFT

The Transmission Manual Shift Switches consist of 2 separate switches mounted on the forward facing (back) side of the steering wheel. The upshift (+) switch is located on the right side and the downshift (-) switch is located on the left side of the steering wheel. The letter M will also change to a number (1 through 8), indicting the current gear the transmission is in or the desired gear that the operator has selected.

The Transmission Manual Shift Switch - Right and Left signals are hard wire and interface with the Body Control Module. The upshift and downshift commands are sent out on the serial data line from the Body Control Module to the Transmission Control Module and Engine Control Module.

DESCRIPTION AND OPERATION > MANUAL MODE DESCRIPTION AND OPERATION > TRANSMISSION CONTROL MODULE

In manual mode, the Transmission Control Module will always have final authority of when to allow an upshift or downshift. The Transmission Control Module only allows an upshift or downshift into the appropriate gear 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 an upshift if it would result in too low of engine RPM.

If the Transmission Control Module prevents an upshift or downshift for any reason, a SHIFT DENIED message will be displayed on the instrument cluster.

DESCRIPTION AND OPERATION > MANUAL MODE DESCRIPTION AND OPERATION > MANUAL MODE SHIFTING OPERATION

1. With the engine running, place the shift lever in Manual (M) position. The letter M of PRNDM display will initially illuminate to indicate Manual Mode, and then change to indicate the current gear.

2. Momentary pressing the Transmission Manual Shift Switch - Right will command the transmission to the next higher gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to upshift to that gear.

3. Momentary pressing the Transmission Manual Shift Switch - Left will command the transmission to the next lower gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to downshift to that gear.

4. To exit Manual Mode, place the shift lever in Drive (D) position.

DESCRIPTION AND OPERATION > TRANSMISSION ADAPTIVE FUNCTIONS

The Hydra-Matic® 8-Speed RWD 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 A/T input speed sensor (ISS) and the A/T output speed sensor (OSS) during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the corresponding 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.

DESCRIPTION AND OPERATION > TRANSMISSION INDICATORS AND MESSAGES

The following transmission related indicators and messages may be displayed on the Instrument Panel Cluster (IPC). Also, the malfunction indicator lamp (MIL) may be illuminated, indicating a powertrain DTC has set, along with an IPC message. If a DTC is set, refer to Diagnostic Trouble Code (DTC) List - Vehicle .

Service Transmission

This message displays if there is a problem with the transmission or a DTC has been set.

Shift Denied - Manual Mode

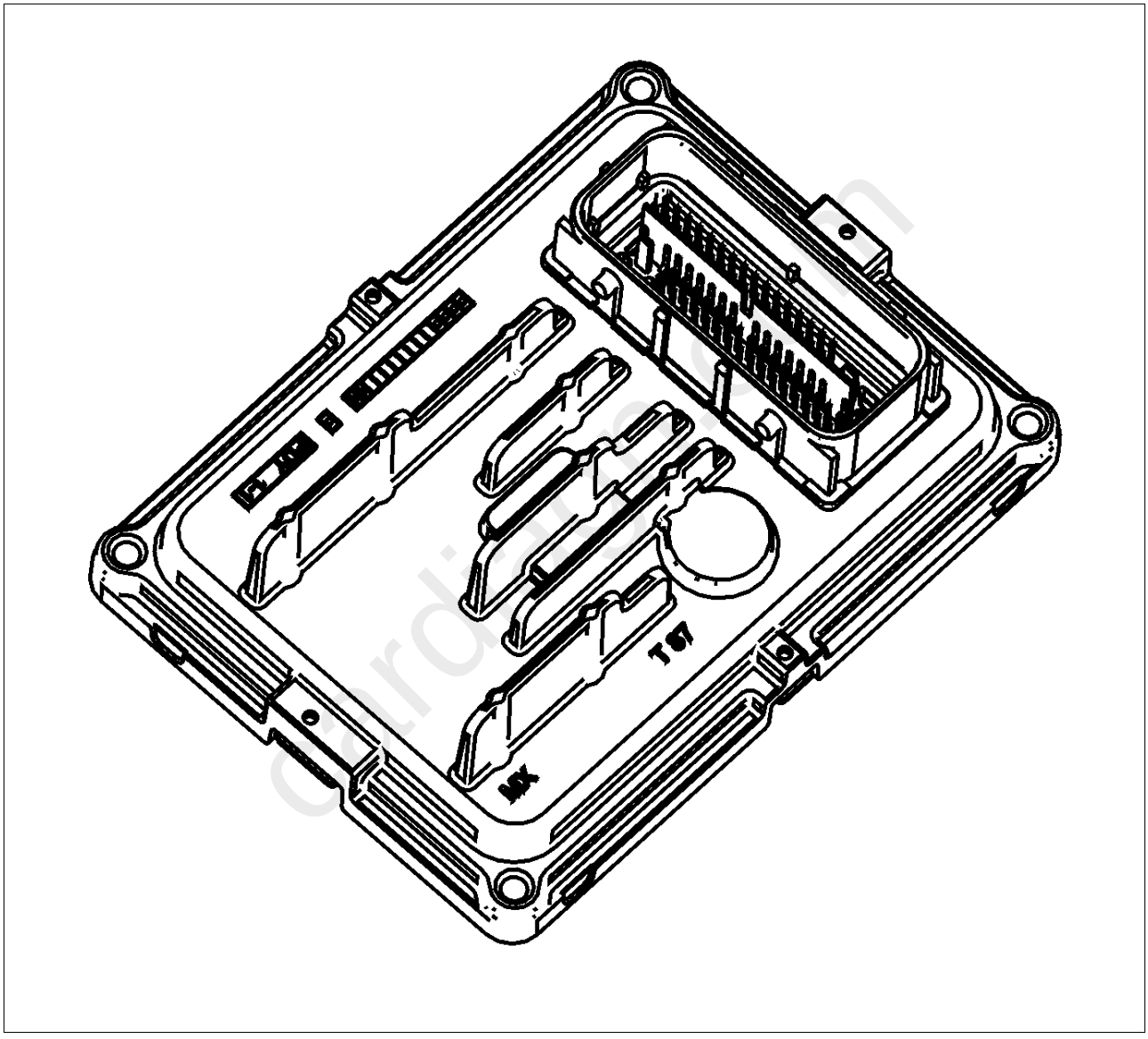
This message displays when attempting to shift to a gear not appropriate for the vehicle speed and engine RPM.

Transmission Hot

This message displays when the transmission control module (TCM) detects a transmission fluid temperature of 132°C (270°F) or greater for 5 seconds.

DESCRIPTION AND OPERATION > ELECTRONIC COMPONENT DESCRIPTION > TRANSMISSION CONTROL MODULE

Fig 1: Transmission Control Module



Courtesy of GENERAL MOTORS COMPANY

The Transmission Control Module (TCM) for this transmission is a standalone controller mounted to the vehicle. The TCM has one 66 way connector to interface with vehicle electrical system, transmission assembly and other vehicle control modules. The TCM sends and receives various input and output signals from a number of switches and sensors internal and external to the transmission. In addition, the TCM is part of a network of other control modules on the vehicle. The network of control modules will share information with each other, over a common serial data communications line. Based upon the

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.

DESCRIPTION AND OPERATION > ELECTRONIC COMPONENT DESCRIPTION > TRANSMISSION SOLENOID VALVES

The 8L45/90 transmission contains a total of nine individual solenoids installed in various bore locations on the lower control valve body assembly. Seven of the nine solenoid valves are used to control pressure regulation and direction of transmission fluid and the two ON/OFF solenoid valves are only used to direct transmission fluid.

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

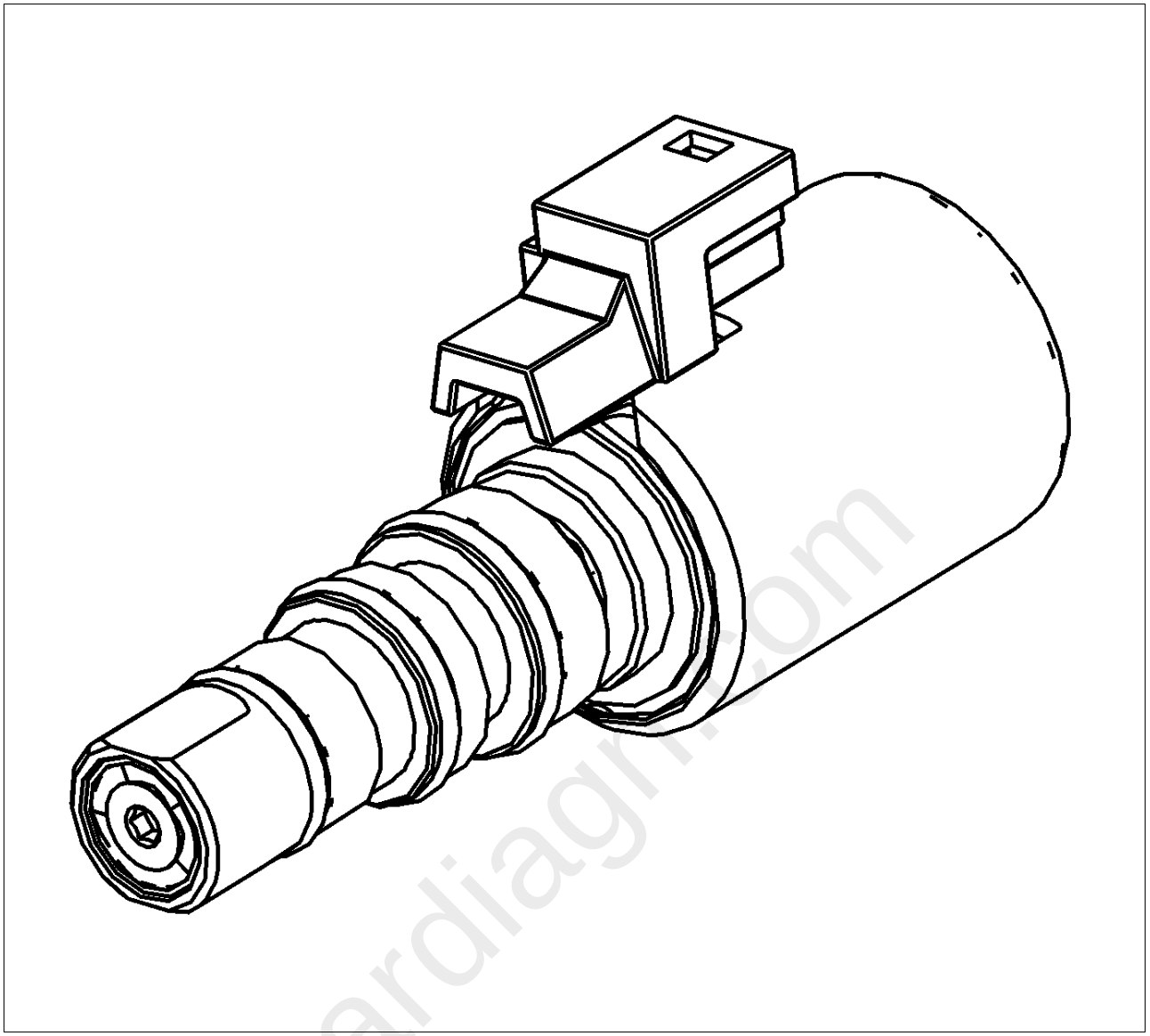
- High Pressure = Indicates the solenoid valve is controlling or directing line pressure.
- Low Pressure = Indicates the solenoid valve is directing a pressurized fluid that is less than line pressure.
- Normally Low = When no current is applied to the solenoid valve coil the variable restriction is closed, resulting in no or low pressure.
- Normally High = When no current is applied to the solenoid valve coil the variable restriction is open, resulting in maximum or high pressure.
- Variable Force Solenoid Valve = This type of solenoid can increase or decrease the amount of pressurized fluid based on the amount of current applied to solenoid valve coil.

DESCRIPTION AND OPERATION > ELECTRONIC COMPONENT DESCRIPTION > PRESSURE REGULATING SOLENOID VALVES

High Pressure, Normally Low, Variable Force Solenoid Valves

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Fig 1: Transmission Control Solenoid Valve



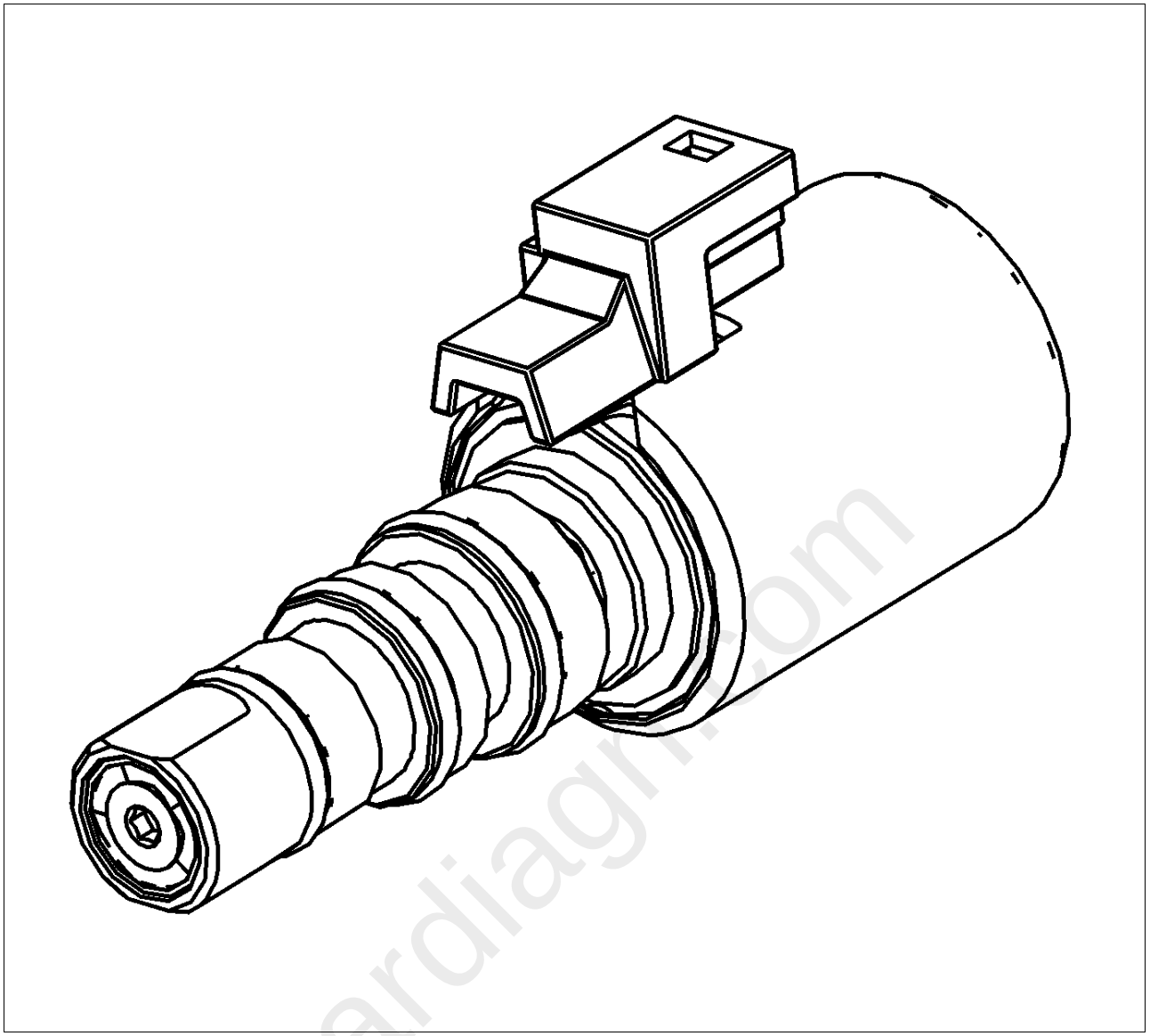
Courtesy of GENERAL MOTORS COMPANY

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Transmission Control Solenoid Valves 2, 3, and 7 are high pressure, normally low, variable force solenoid valves. This type of solenoid valve regulates hydraulic fluid pressure based on current flow through the solenoid valve coil windings. Each solenoid valve receives 12 V from a high side driver internal to the TCM. Each solenoid valve has a control circuit to an individual low side driver internal to the TCM, which turns ON and OFF to control the amount of current. As an increasing current is applied to the solenoid coil windings, the force imparted to the armature overcomes the armature spring pressure resulting in an increase in fluid pressure to the controlled element. The normal operating current range for these solenoid valves is between 0-1.2 A. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM turn off the high side driver to that solenoid and sets a DTC. The high side driver will reset when the circuit fault is corrected and the ignition switch is cycled.

Low Pressure Normally High, Variable Force Solenoid Valves

Fig 2: Transmission Control Solenoid Valve



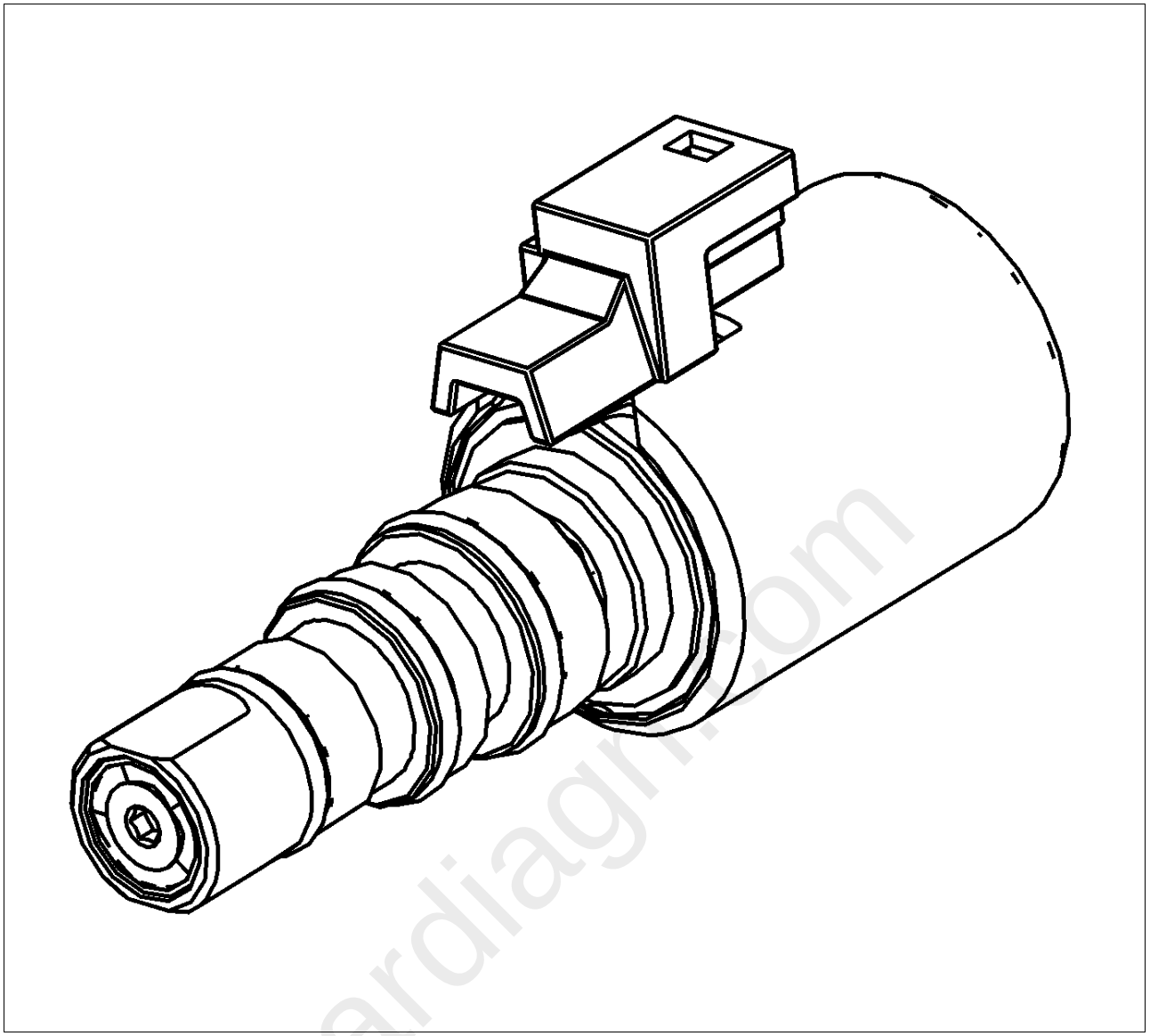
Courtesy of GENERAL MOTORS COMPANY

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Transmission Control Solenoid Valves 1, 5, and 6 are low pressure, normally high, variable force solenoid valves. This type of solenoid valve regulates hydraulic fluid pressure based on current flow through the solenoid valve coil windings. Each solenoid valve receives 12 V from a high side driver internal to the TCM. Each solenoid valve has a control circuit to an individual low side driver internal to the TCM, which turns ON and OFF to control the amount current. As an increasing current is applied to the coil windings, the force imparted to the armature overcomes the low fluid pressure acting on the armature resulting in a decrease in fluid pressure to the controlled element. The normal operating current range for these solenoids is between 0-1.2 A. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM turns off the high side driver to that solenoid valve and sets a DTC. The high side driver will reset when the circuit fault is corrected and the ignition switch is cycled.

High Pressure Normally High, Variable Force Solenoid Valve

Fig 3: Transmission Control Solenoid Valve



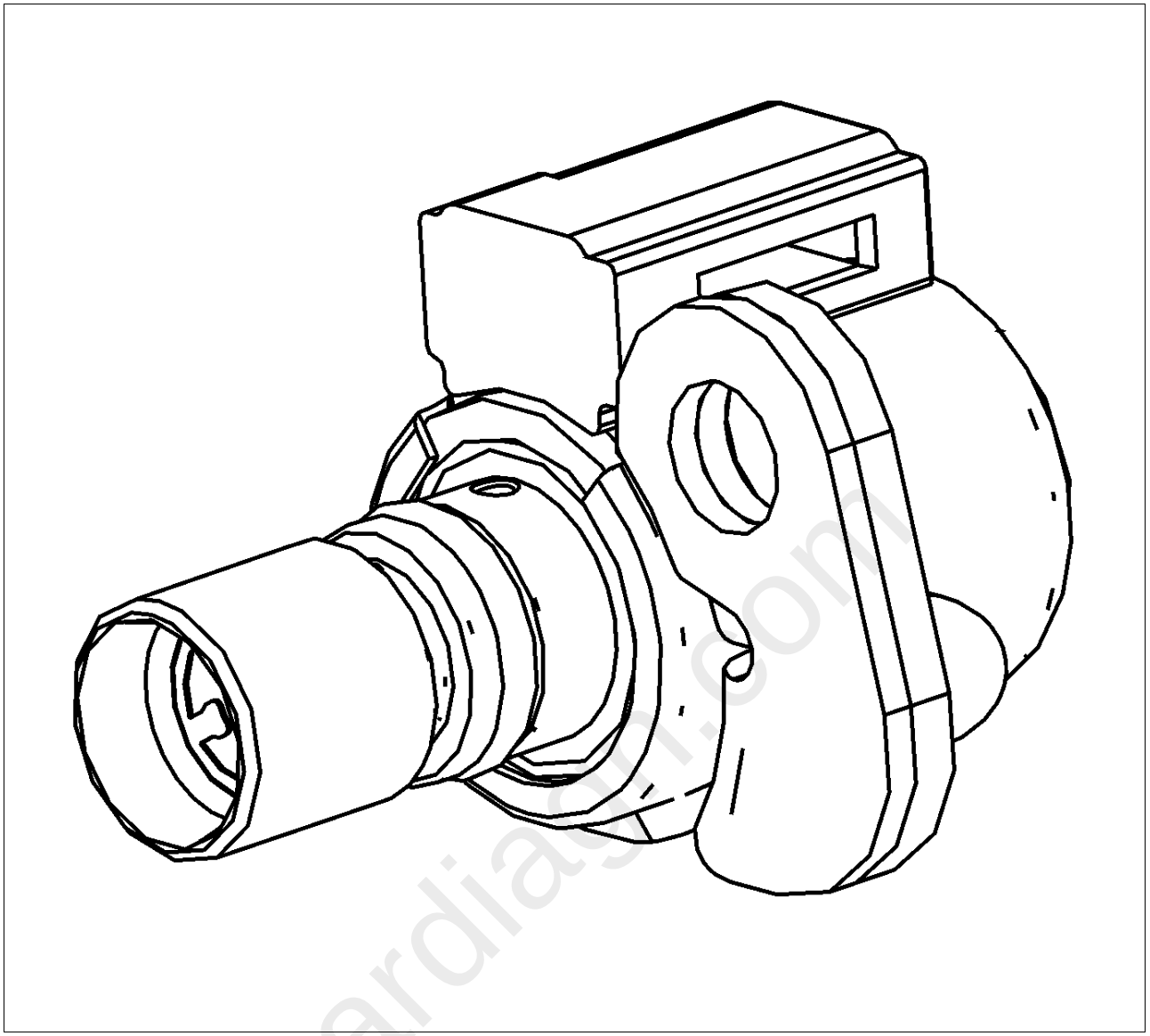
Courtesy of GENERAL MOTORS COMPANY

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Transmission Control Solenoid Valve 4 is a high pressure, normally high, variable force solenoid valve. This type of solenoid valve regulates hydraulic fluid pressure based on current flow through the solenoid valve coil windings. Each solenoid receives 12 V from a high side driver internal to the TCM. This solenoid has a control circuit to an individual low side driver internal to the TCM, which turns ON and OFF to control the amount of current. As an increasing current is applied to the coil windings, the force imparted to the armature overcomes the high fluid pressure acting on the solenoid valve armature resulting in a decrease in fluid pressure to the controlled element. The normal operating current range for this solenoid is between 0-1.2 A. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM turns off the high side driver to that solenoid and sets a DTC. The high side driver will reset when the circuit fault is corrected and the ignition switch is cycled.

ON/OFF Solenoid Valves

Fig 4: Transmission Control Solenoid Valve



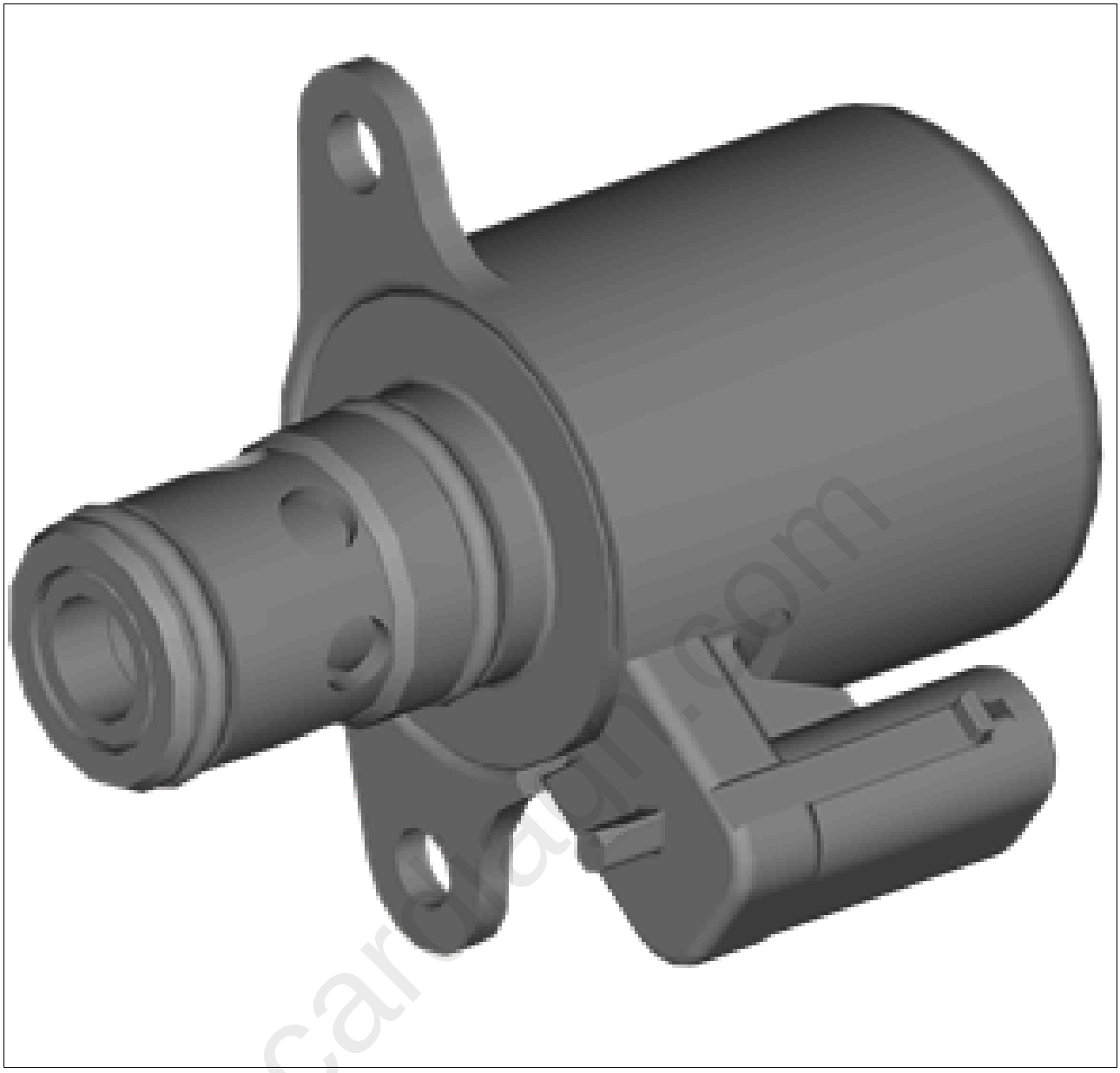
Courtesy of GENERAL MOTORS COMPANY

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Transmission Control Solenoid Valve 8 and 9 are normally low, ON/OFF solenoids. These solenoids only direct hydraulic fluid pressure when commanded ON. Each solenoid receives 12 V from a high side driver internal to the TCM. Each solenoid valve has a control circuit to an individual low side driver internal to the TCM. The normal operating current range for these solenoids is between 0-1 A. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM turns off the high side driver to that solenoid and sets a DTC. The high side driver will reset when the circuit fault is corrected and the ignition switch is cycled.

Transmission Fluid Pressure Accumulator Solenoid Valve - If Equipped

Fig 5: Transmission Fluid Pressure Accumulator Solenoid Valve



Courtesy of GENERAL MOTORS COMPANY

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 engine control module (ECM) supplies a control circuit to the accumulator solenoid. When the ECM requests an auto start event, the solenoid is commanded ON, allowing captured pressurized fluid to exit the accumulator to apply the clutches for a 1st gear start.

Solenoid Characterization

Transmission Control Solenoid Valves 1-7 are pressure regulating valves. Each solenoid valve is tested after assembly to determine the output fluid pressure at certain electrical current values, applied to coil windings. This information is refer to as solenoid current/pressure data points. The solenoid valves are tested two ways, with an increasing and decreasing electrical current applied to the coil windings. The

resultant current versus pressure data points are saved and assigned a file number. The file number is marked on the solenoid valve housing end. The 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 the new or existing solenoid valve performance data.

- TCM - program the new TCM with the existing solenoid data files stored on the TIS web site for all 7 pressure regulating solenoid valves
- One or more solenoid valves - program the TCM with the new data file for only the individual pressure regulating solenoid valves that were replaced
- Lower Control Valve Body Assembly with Solenoid Valves - program the TCM with the new data files stored on the TIS web site for all pressure regulating solenoid valves
- Transmission Assembly - program the TCM with the new data files stored on the TIS web site for all pressure regulating solenoid valves

DESCRIPTION AND OPERATION > ELECTRONIC COMPONENT DESCRIPTION > SPEED SENSORS

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Fig 1: Speed Sensors



Courtesy of GENERAL MOTORS COMPANY

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Input Speed Sensor

The input speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 9 V signal circuit and a low reference circuit to the input speed sensor. The input speed sensor produces a square wave signal by toggling the 9 V signal circuit low and high based on the leading and trailing edges on the outside diameter of the 1-3-5-6-7 clutch housing. As the rotational speed of the 1-3-5-6-7 clutch housing increases, the frequency of the input speed sensor signal increases. The TCM uses the input speed sensor signal along with the intermediate and output speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Intermediate Speed Sensor

The intermediate speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 9 V signal circuit and a low reference circuit to the intermediate speed sensor. The intermediate speed sensor produces a square wave signal by toggling the 9 V signal circuit low and high based on the leading and trailing edges on the outside diameter of the reaction carrier/output internal gear assembly.

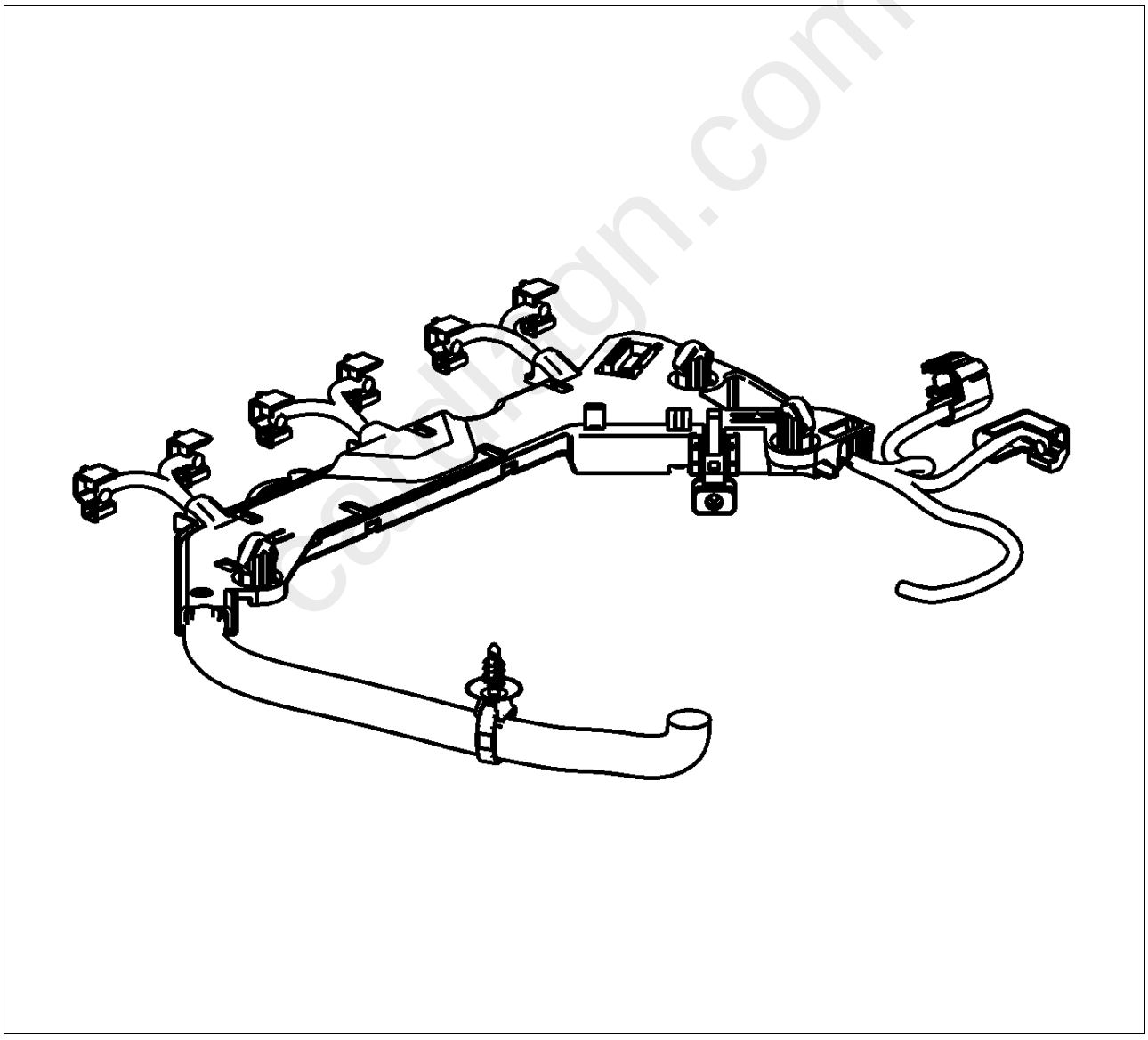
As the rotational speed of the reaction carrier/output internal gear assembly increases, the frequency of the intermediate speed sensor signal increases. The TCM uses the intermediate speed sensor signal along with the input and output speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Output Speed Sensor

The output speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 9 V signal circuit and a low reference circuit to the output speed sensor. The output speed sensor produces a square wave signal by toggling the 9 V signal circuit low and high based on the leading and trailing edges on the outside diameter of the output carrier assembly. As the rotational speed of the output carrier assembly increases, the frequency of the output speed sensor signal increases. The TCM uses the output speed sensor signal along with the input and intermediate speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Transmission Fluid Temperature Sensor

Fig 2: Transmission Fluid Temperature Sensor (Part Of Transmission Internal Wire Harness Assembly)

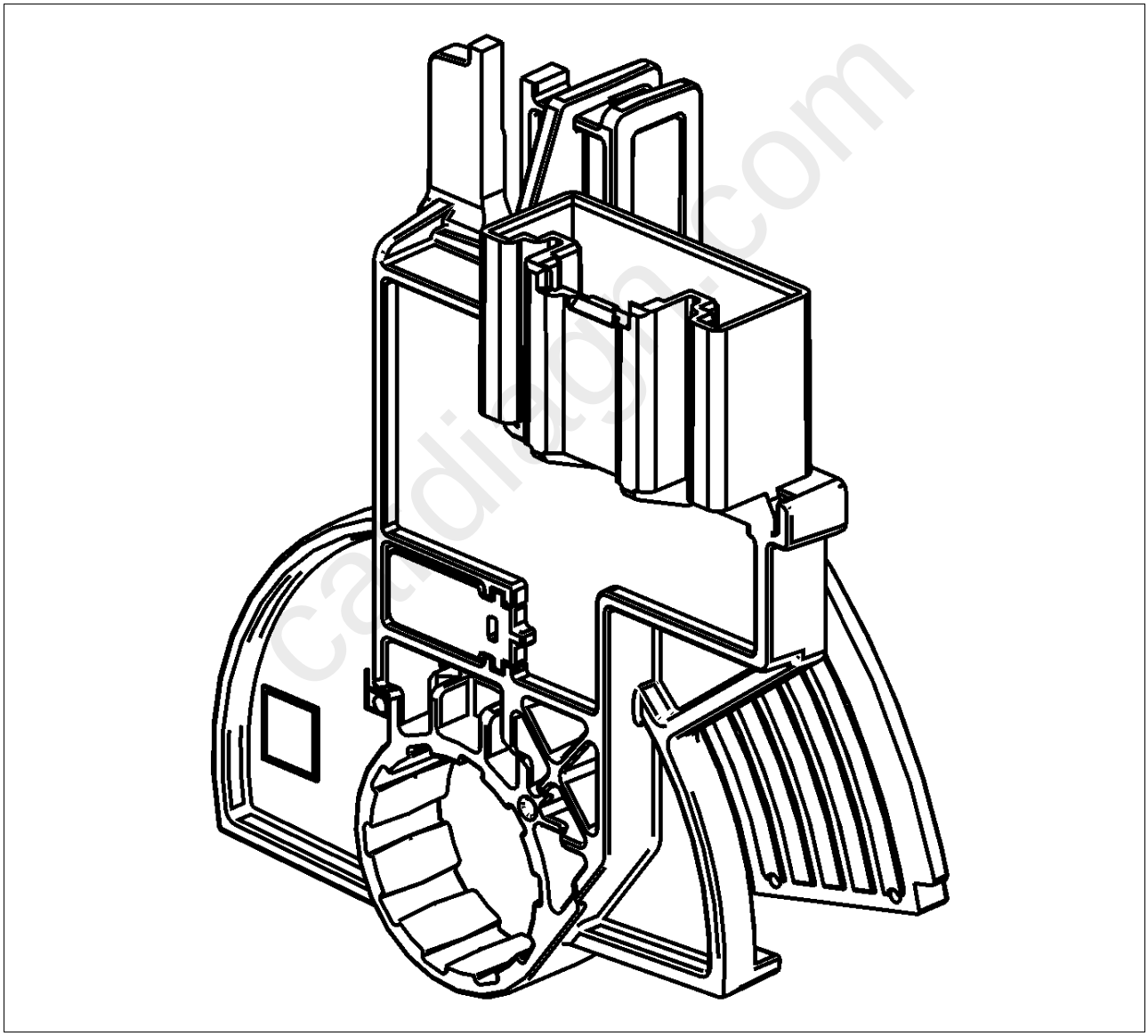


Courtesy of GENERAL MOTORS COMPANY

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 the in the transmission fluid pan. As the temperature of the fluid increases, the resistance of the sensor decreases, varying the voltage on the signal circuit. The transmission fluid temperature 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 assembly that has the temp sensor attached to it.

DESCRIPTION AND OPERATION > ELECTRONIC COMPONENT DESCRIPTION > INTERNAL MODE SWITCH (IMS)

Fig 1: Internal Mode Switch (IMS)



Courtesy of GENERAL MOTORS COMPANY

Internal Mode Switch (IMS)

The IMS contains 6 separate switches in one assembly. One mechanical switch circuit is for the park/neutral position switch which is used for engine starting. The other 5 electronic switches are called the transmission range switches and are used to indicate the gear position the vehicle operator has selected. The IMS switch assembly is mounted on the interior left side of the transmission case.

Park Neutral Position Switch of IMS

The park/neutral position switch indicates to the Engine Control Module (ECM) if the vehicle is in park/neutral or in a drive gear range. With the ignition ON, the ECM provides 12 V on the park/neutral signal circuit to the park/neutral position switch. A separate ground wire from the park/neutral position switch to chassis ground completes the circuit. When the gear shift lever in park or neutral, the switch closes and drops the voltage on the signal circuit to 0 V. In this state the engine will start and run. In reverse or drive range the park/neutral position switch opens, 12 V is then present on the signal circuit which will inhibit engine starting.

Transmission Range Switches of the IMS

The internal mode switch (IMS) indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The IMS consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit, and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting ON or 1.68-2.38 V indicating OFF. The voltage values on each IMS circuit will change and are dependent on the position of the gear selector. The state of each IMS A/B/C/P/S circuit is displayed on the scan tool.

DESCRIPTION AND OPERATION > PARK - ENGINE RUNNING

When the gear selector lever 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:

DESCRIPTION AND OPERATION > PARK - ENGINE RUNNING > 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.

1-2-7-8 Reverse Control Solenoid Valve Assembly

The 1-2-7-8 reverse control solenoid is energized (HIGH) allowing actuator feed fluid to enter the S1 VFS SIG fluid circuit which applies fluid pressure against the S1 VFS ACCUM spring force and against the 1278R control valve spring force. This allows line fluid to pass through into the 1278R CLUTCH fluid circuit.

1-2-7-8 Reverse Clutch Assembly

1278R CLU fluid is routed to the 1278 reverse clutch piston to hold the piston against spring force which holds the 1278R clutch plates.

#14 Ball Check Valve

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Line fluid travels through the 1278R control valve orifice #40 into the 1278R CLU FDBK fluid circuit and into the #14 ball check valve unseating the ball allowing fluid into the ACT FEED circuit.

1-2-3-4-5 Reverse Control Solenoid Valve Assembly

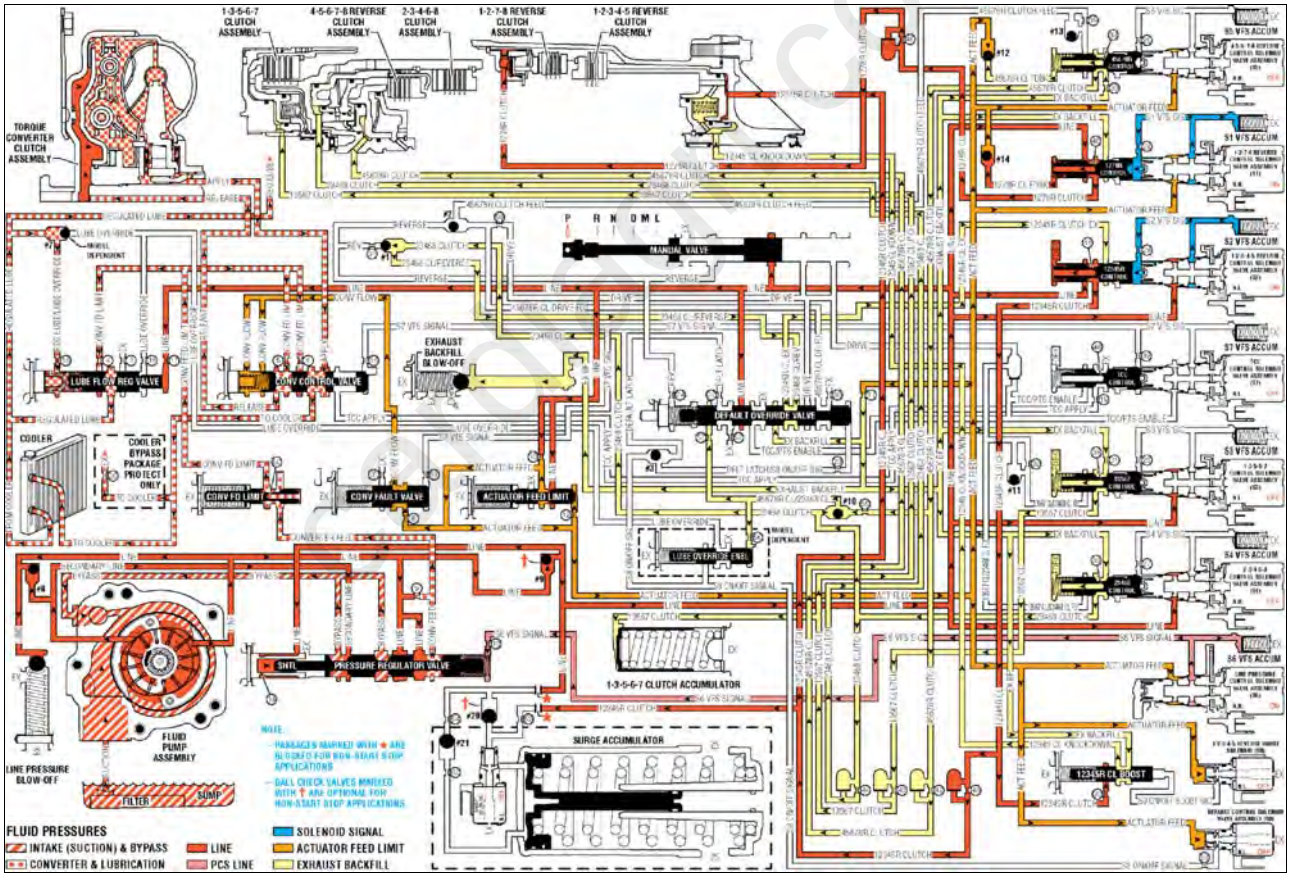
The 1-2-3-4-5 reverse control solenoid is energized (HIGH) allowing actuator feed fluid to enter the S2 VFS SIG fluid circuit which applies fluid pressure against the S2 VFS ACCUM spring force and against the 12345R control valve spring force. This allows line fluid to pass through into the 12345R CLUTCH fluid circuit.

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

12345R CLU fluid is routed to the 12345 reverse clutch piston to hold the piston against spring force which holds the 12345R clutch plates.

DESCRIPTION AND OPERATION > PARK - ENGINE RUNNING > PARK - ENGINE RUNNING

Fig 1: Park - Engine Running Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > REVERSE

When the gear selector lever is moved to the Reverse (R) position (from the Park position) the normally

high 4-5-6-7-8 reverse control solenoid valve and the 1-2-3-4-5 reverse boost solenoid is commanded ON and the following changes occur in the transmission's hydraulic and electrical systems:

DESCRIPTION AND OPERATION > REVERSE > 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 default override valve, #1 ball check valve and the #2 ball check valve.

Default Override Valve

Reverse fluid from the manual valve is routed to the default override valve to combine with the default override valve springforce to keep the valve in the off position.

#1 Ball Check Valve

Reverse fluid passes through orifice #61 to seat the #1 ball check valve against the 23468 CLU fluid circuit allowing REV fluid to enter the 23468 CL/REV fluid circuit. The 23468 CL/REV fluid is routed to the default override valve. The 23468 CL/REV fluid passes through the default override valve and into the 12345R CL EX fluid circuit. The 12345R CL EX fluid is directed to the 12345R control valve.

#2 Ball Check Valve

Reverse fluid seats the #2 ball check valve against the 45678R CL DRIVE FD fluid circuit allowing reverse fluid to be routed into the 45678 CLU FD fluid circuit. The 45678 CLU FEED fluid is directed to the #13 ball check valve and through orifice #35 to the 45678R control valve.

DESCRIPTION AND OPERATION > REVERSE > 4-5-6-7-8 REVERSE CLUTCH APPLIES

4-5-6-7-8 Reverse Control Solenoid

The 4-5-6-7-8 reverse control solenoid is energized allowing ACT FEED to enter the S5 VFS SIG fluid circuit which applies fluid pressure against the S5 VFS Accum spring force and through orifice #34 to the 45678R control valve spring force. This allows 45678R CLU FD fluid to enter the 45678R CLU fluid circuit. 45678R CL FD fluid also enters orifice #34 which is in the 45678R control valve. Fluid then enters the 45678R CL FDBK fluid circuit unseating the #12 ball check valve allowing 45678R CL FDBK fluid into the ACT FD fluid circuit.

#10 Ball Check Valve

45678R CLU fluid enters orifice #55 and unseats #10 ball check valve against the 23468 CLU fluid circuit. This allows 45678R CL fluid to enter the 45678R CL/23468 CL fluid circuit. 45678R CL/23468 CL fluid passes through orifice #56 and into the lube override enable valve. 45678R CL/23468 CL fluid applies pressure against the lube override enable valve spring force. 45678R CL/23468 CL fluid also passes through orifice #57 and into the default override valve.

4-5-6-7-8 Reverse Clutch Assembly

45678R CLU fluid is directed through orifice #42 into the 4-5-6-7-8 rev clutch piston spring force which

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applies holding force to the 4-5-6-7-8 rev clutch plates.

DESCRIPTION AND OPERATION > REVERSE > 1-2-3-4-5 REVERSE CLUTCH APPLIED

1-2-3-4-5 Reverse Boost Solenoid

The 1-2-3-4-5 reverse boost solenoid is energized allowing ACT FD fluid to enter the S8 ON/OFF BOOST SIG fluid circuit.

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

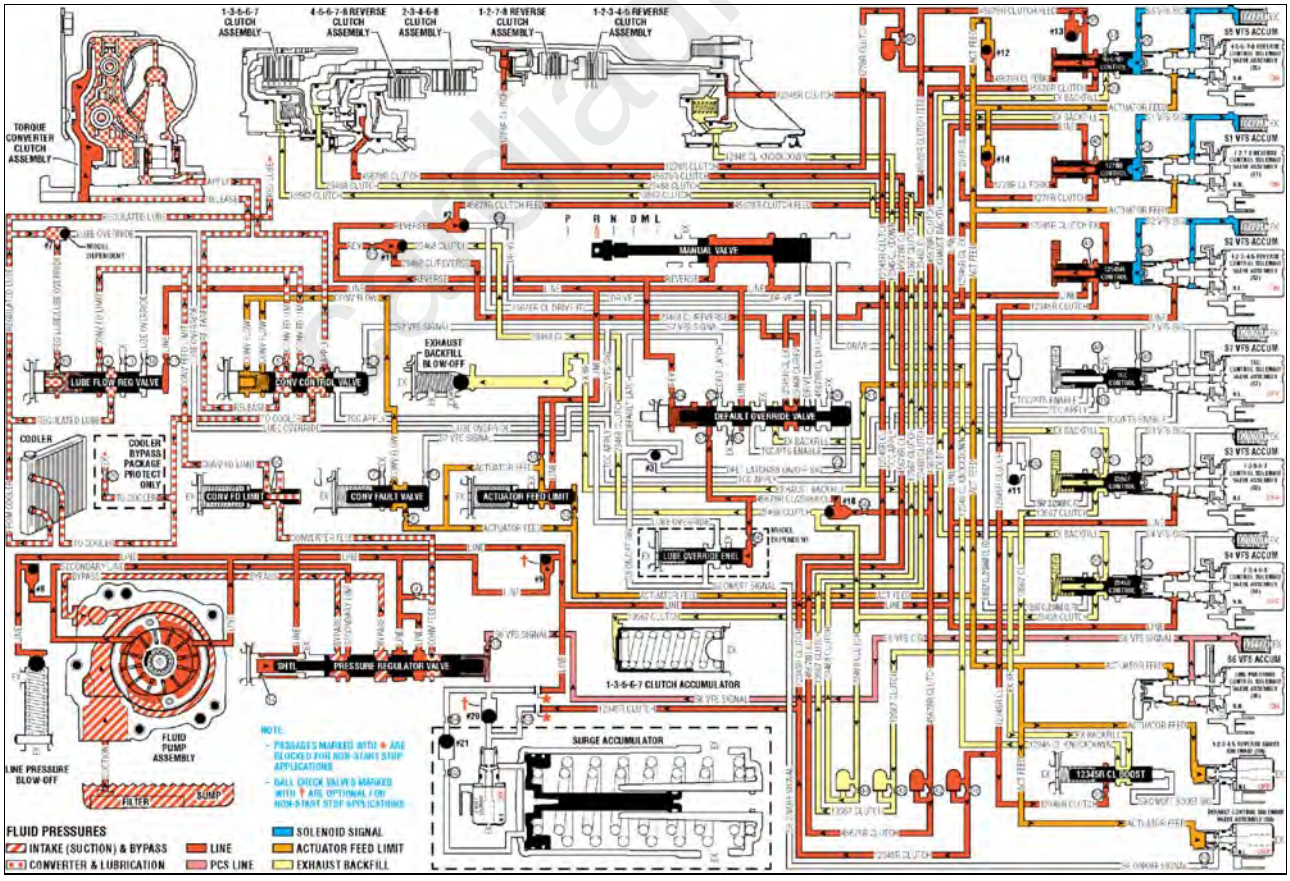
S8 ON/OFF BOOST SIG fluid enters the 12345R clu boost valve appling pressure against the 12345R clu boost valve spring force. This allows 12345R CLU fluid through orifice #33 into the 12345R clu boost valve then into the 12345 CL KNOCKDOWN fluid circuit.

1-2-3-4-5 Reverse Clutch

12345 CL KNOCKDOWN fluid enters the 1-2-3-4-5 rev clu piston appling force with the 1-2-3-4-5 rev clu piston return spring.

DESCRIPTION AND OPERATION > REVERSE > REVERSE

Fig 1: Reverse Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > NEUTRAL - ENGINE RUNNING

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 normally high 4-5-6-7-8 reverse control solenoid and normaly low 1-2-3-4-5 reverse boost solenoid is commanded OFF and the following changes would occur in the hydraulic system:

DESCRIPTION AND OPERATION > NEUTRAL - ENGINE RUNNING > 4-5-6-7-8 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 default override valve, #1 and #2 ball check valve is opened to a exhaust passage at the manual valve.

4-5-6-7-8 Reverse Control Solenoid

The 4-5-6-7-8 reverse control solenoid. is commanded off. The 45678 rev cont valve spring force moves the valve to allow S5 VFS SIG fluid to exhaust through the 45678 rev control solenoid. This also allows 45678R CL FDBK and 45678R CLUTCH fluid to exhaust into the EX BACKFILL fluid circuit.

1-2-3-4-5 Reverse Boost Solenoid

The 1-2-3-4-5 reverse boost solenoid is commanded off. This allows S8 ON/OFF BOOST SIGNAL fluid to exhaust through the 1-2-3-4-5 rev boost solenoid.

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

The 12345R clutch boost valve spring force moves the valve to allow EX BACKFILL fluid to enter 12345 CL KNOCKDOWN. When REV fluid is exhausted the #1 ball check valve seats against the REV circuit allowing 23468 CLU fluid to enter 23468 CL/REV circuit.

#10 Ball Check Valve

When 45678R CLUTCH fluid is exhausted the #10 ball check valve unseats allowing 23468 CLUTCH fluid to enter the 45678R CL/23468 CL fluid circuit which is directed through orifice #56 to the lube override enable valve and through orifice #57 to the default override valve.

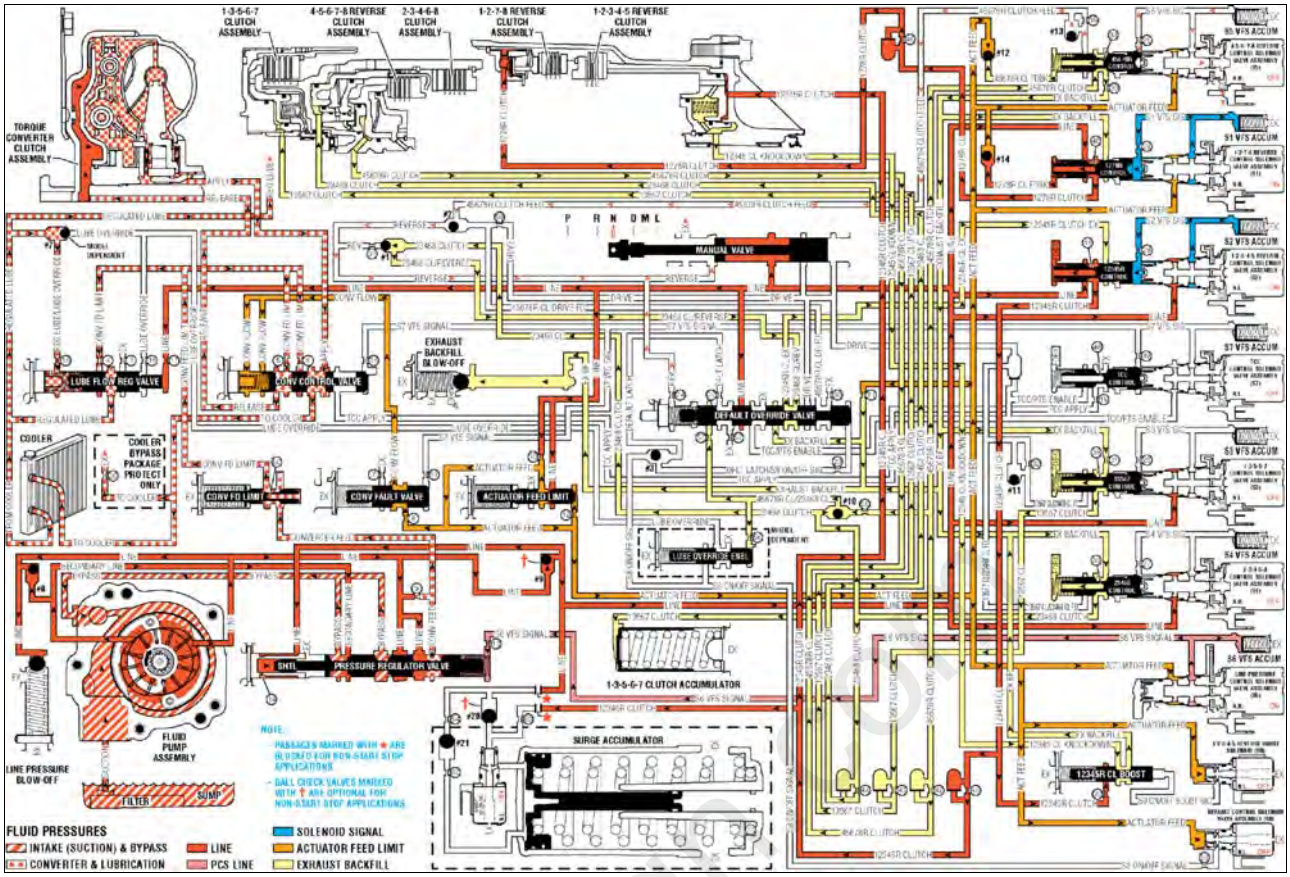
4-5-6-7-8 Reverse Clutch Assembly

45678R CLUTCH fluid is exhausted from the 4-5-6-7- 8 reverse clutch assembly through orifice #42. 45678R CLUTCH fluid continues to the 45678R control valve where it is directed thru orifice #30 into EX BACKFILL.

DESCRIPTION AND OPERATION > NEUTRAL - ENGINE RUNNING > NEUTRAL-ENGINE RUNNING

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Fig 1: Neutral - Engine Running Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, FIRST GEAR

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 energize or "turn on" 1-2-3-5-7 control solenoid and command ON the normally-low 1-2-3-4-5 reverse boost solenoid and default control solenoid.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIRST GEAR > FLUID PRESSURE IS DIRECTED TO THE 1-3-5-6-7 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 default override valve.

#2 Ball Check Valve

Drive fluid is directed thru orifice #59 into the 45678R CL DR FD fluid circuit which seats the #2 ball check valve against the reverse circuit allowing fluid to enter the 45678R CLUTCH FEED circuit. 45678R CLU FEED fluid is directed thru orifice #35 then to the 45678R control valve.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIRST GEAR > 1-3-5-6-7 CLUTCH APPLIES

1-3-5-6-7 Control Solenoid Valve Assembly

The 1-3-5-6-7 control solenoid is energized allowing line fluid to enter the S3 VFS SIG fluid circuit which applies fluid pressure against the S3 VFS SIG accumulator spring force and against the 13567 control valve spring force. This allows 13567 CL/23468 CL FD fluid to enter the 13567 clutch fluid circuit and thru the 13567 control valve orifice #38 to FDBK.

1-3-5-6-7 Clutch Accumulator

13567 CLU fluid is directed thru orifice #43 and into the 1-3- 5-6-7 clutch accumulator where it applies pressure against the 1-3-5-6-7 clutch accumulator spring force.

1-3-5-6-7 Clutch Assembly

13567 CLU fluid is also directed to the 1-3-5-6-7 clutch assembly housing. 13567 CLU fluid moves the piston against spring force to apply holding of the 1-3-5-6-7 clutch plates.

1-2-3-4-5 Reverse Boost Solenoid

The 1-2-3-4-5 rev boost solenoid is energized allowing ACT FD fluid to enter the S9 ON/OFF BOOST SIG fluid circuit.

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

S9 ON/OFF BOOST SIG fluid enters the 12345R clu boost valve appling pressure against the 12345R clu boost valve spring force. This allows 12345R CLU fluid through orifice #33 into the 12345R clu boost valve then into the 12345 CL KNOCKDOWN fluid circuit.

1-2-3-4-5 Reverse Clutch

12345 CL KNOCKDOWN fluid enters the 1-2-3-4-5 rev clu piston appling force with the 1-2-3-4-5 rev clu piston return spring.

Default Control Solenoid

The default control solenoid valve is energized allowing ACT FEED fluid to enter the S8 ON/OFF SIG fluid circuit. S8 ON/ OFF SIG fluid passes thru orifice #58 into the lube override enable valve and to the #3 ball check valve.

#3 Ball Check Valve

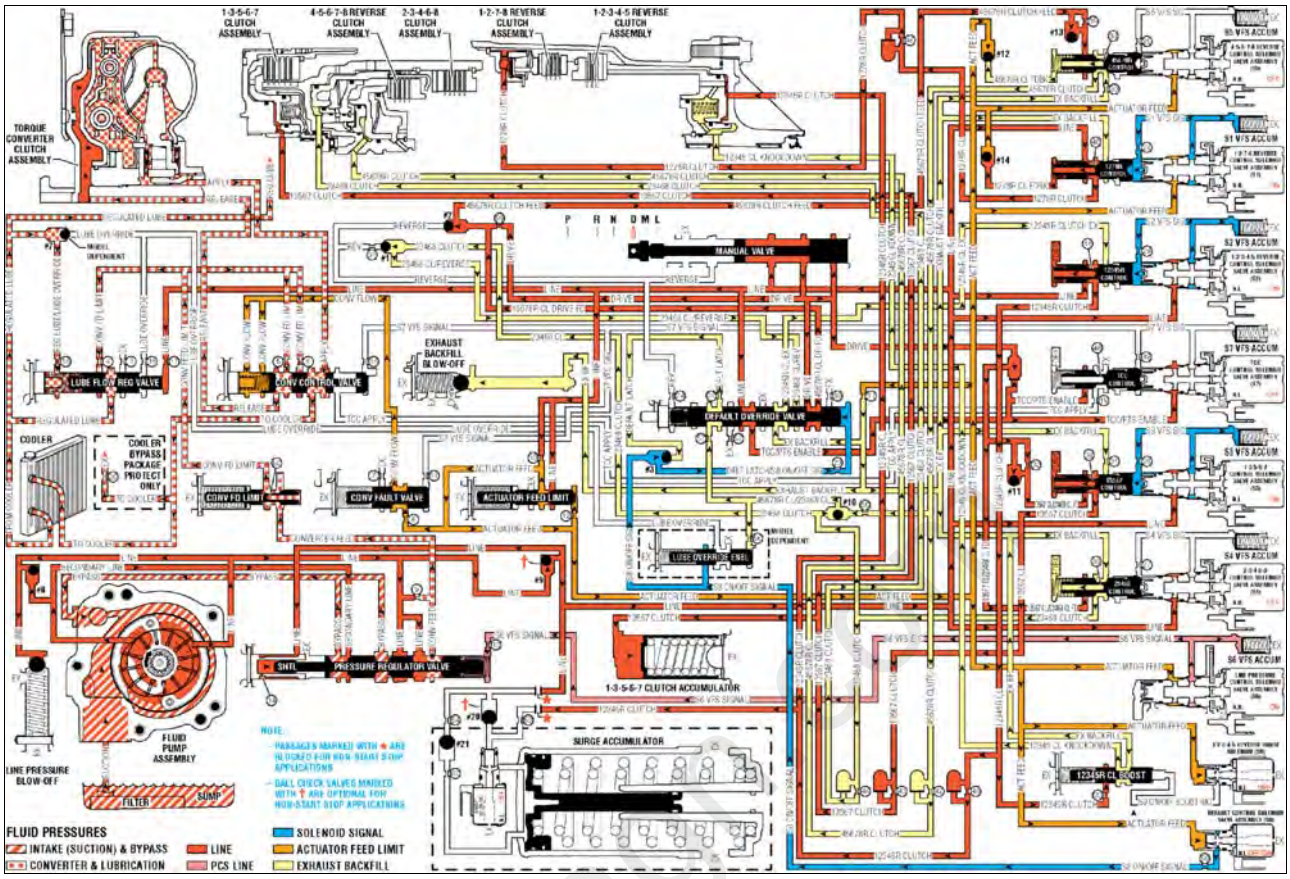
The S8 ON/OFF SIG fluid seats the #3 ball check valve against the DEFAULT LATCH circuit allowing S8 ON/OFF SIG fluid to enter the DFLT LATCH /S8 ON/OFF SIG circuit. DFLT LATCH/S8 ON/OFF SIG fluid passes thru orifice #23 to enter the default override valve applying pressure against the default override valve spring force. This allows DRIVE fluid to enter the 45678R CL DR FD circuit which seats the #2 ball check valve against the REV circuit.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIRST GEAR > DRIVE RANGE,

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FIRST GEAR

Fig 1: Drive Range, First Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, SECOND GEAR

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 normally-low pressure control solenoid 4.

DESCRIPTION AND OPERATION > DRIVE RANGE, SECOND GEAR > 2-3-4-6-8 CLUTCH APPLIES

CB26 Pressure Control Solenoid 4

The 2-3-4-6-8 control solenoid energizes allowing line fluid to enter the S4 VFS SIG fluid circuit which applies pressure against the S4 vfs accum spring force and against the 23468 control valve spring force. This allows 13567 CL/23468 CL FD fluid to enter the 23468 CLU fluid circuit. 13567 CL/23468 CL FD fluid also passes thru the 23468 control valve orifice #39 into FDBK. 23468 CLUTCH fluid is directed to the #10 ball check valve and thru orifice #44 to the 23468 clutch assembly housing.

#10 Ball Check Valve

The 23468 CLU fluid seats the #10 ball check valve against the 45678R CLU fluid circuit. 23468 CLU fluid is also directed to the #1 ball check valve.

#1 Ball Check Valve

23468 CLU fluid seats the #1 ball check valve against the REV fluid circuit. This allows 23468 CLU fluid to enter the 23468 C/REV fluid circuit which is directed to the default override valve.

Lube Override Enable Valve - Model Dependent

23468 CLU fluid enters the 45678R CL/23468 CL fluid circuit from the #10 ball check valve. 45678R CL/23468 CLU fluid passes thru orifice #56 to the lube override valve. Fluid applies pressure against the lube override enable spring force. 45678R CL/23468 CL fluid is also directed thru orifice #57 to the default override valve where it passes thru orifice #22 into DFLT LATCH fluid circuit then to the #3 ball check valve.

#3 Ball Check Valve

Default Latch fluid seats the #3 ball check valve against the S8 ON/OFF SIG fluid circuit. Allowing DEFAULT LATCH fluid to enter the DFLT LATCH/S8 ON/OFF SIG fluid circuit. DFLT LATCH/S8 ON/OFF SIG fluid passes thru orifice #23 to enter the default override valve applying pressure against the default override valve spring force. This allows DRIVE fluid to enter the 45678R CL DR FD circuit which seats the #2 ball check valve against the REV circuit.

2-3-4-6-8 Clutch Assembly

The 23468 CLU fluid passes thru orifice #44 continuing to the 2-3-4-6-8 clutch assembly housing. 23468 CLUTCH fluid applies pressure against the 23468 clutch piston which applies holding pressure to the 2-3-4-6-8 clutch plates.

DESCRIPTION AND OPERATION > DRIVE RANGE, SECOND GEAR > 1-3-5-6-7 CLUTCH RELEASES

1-3-5-6-7 Control Solenoid

The 1-3-5-6-7 control solenoid is signaled off allowing S3 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 13567 CLUTCH fluid to exhaust into EX BACKFILL from the 1-3-5-6-7 clutch accumulator and the 1-3-5-6-7 clutch assembly housing.

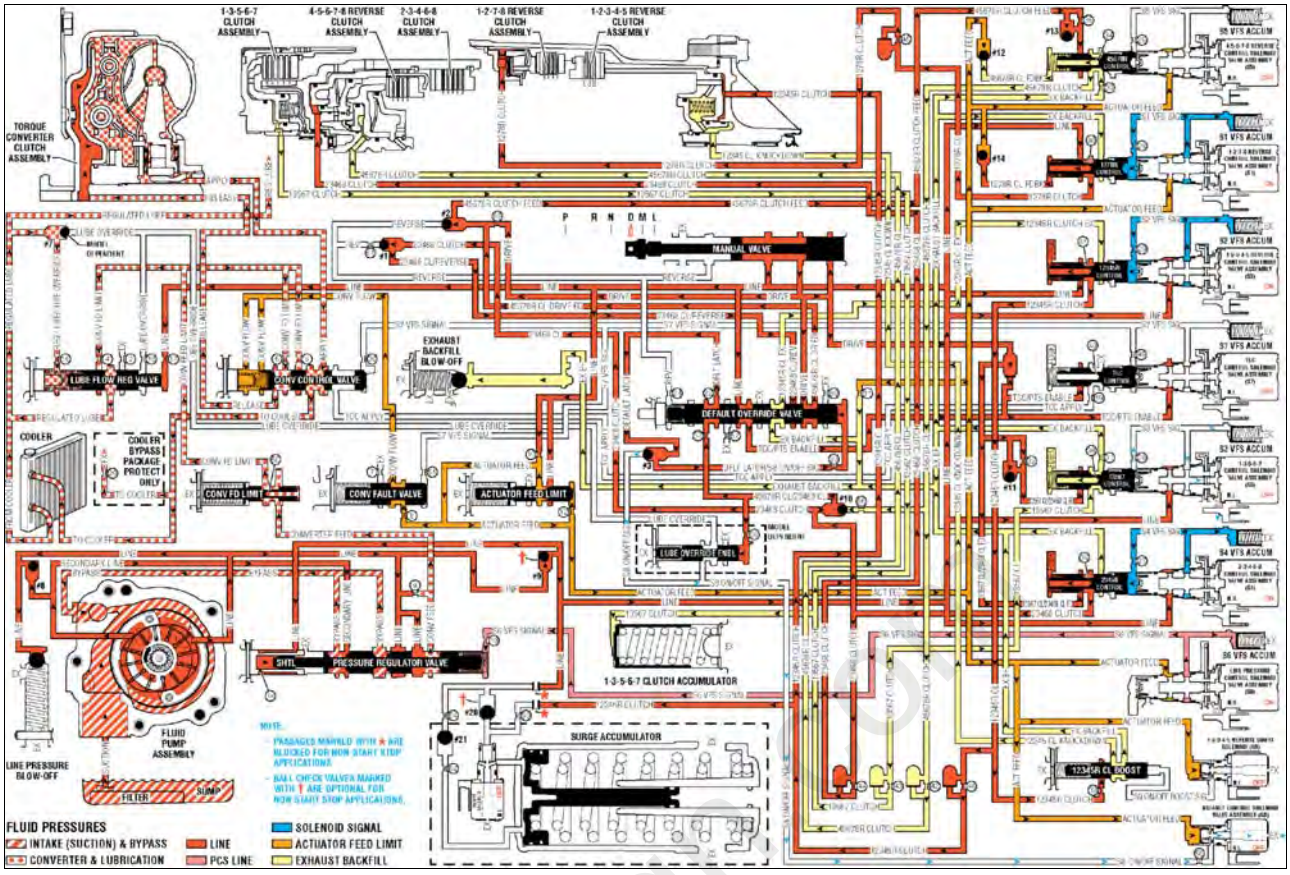
Default Control Solenoid

The default control solenoid is signaled off allowing S8 ON/ OFF SIGNAL fluid to exhaust.

DESCRIPTION AND OPERATION > DRIVE RANGE, SECOND GEAR > DRIVE RANGE, SECOND GEAR

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Fig 1: Drive Range, Second Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, THIRD GEAR

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 normally-high 1-2- 7-8 reverse control solenoid. At the same time the 1-3-5-6-7 control solenoid is also commanded ON to regulate 1-3-5-6-7 clutch apply.

DESCRIPTION AND OPERATION > DRIVE RANGE, THIRD GEAR > 1-3-5-6-7 CLUTCH APPLIES

1-3-5-6-7 Control Solenoid Valve Assembly

The 1-3-5-6-7 control solenoid is energized allowing line fluid to enter the S3 VFS SIG fluid circuit which applies fluid pressure against the S3 VFS SIG accumulator spring force and against the 13567 control valve spring force. This allows 13567 CL/23468 CL FD fluid to enter the 13567 clutch fluid circuit and thru the 13567 control valve orifice #38 to FDBK.

1-3-5-6-7 Clutch Accumulator

13567 CLU fluid is directed thru orifice #43 and into the 1-3- 5-6-7 clutch accumulator where it applies pressure against the 1-3-5-6-7 clutch accumulator spring force.

1-3-5-6-7 Clutch Assembly

13567 CLU fluid is also directed to the 1-3-5-6-7 clutch assembly housing. 13567 CLU fluid moves the piston against spring force to apply holding of the 1-3-5-6-7 clutch plates.

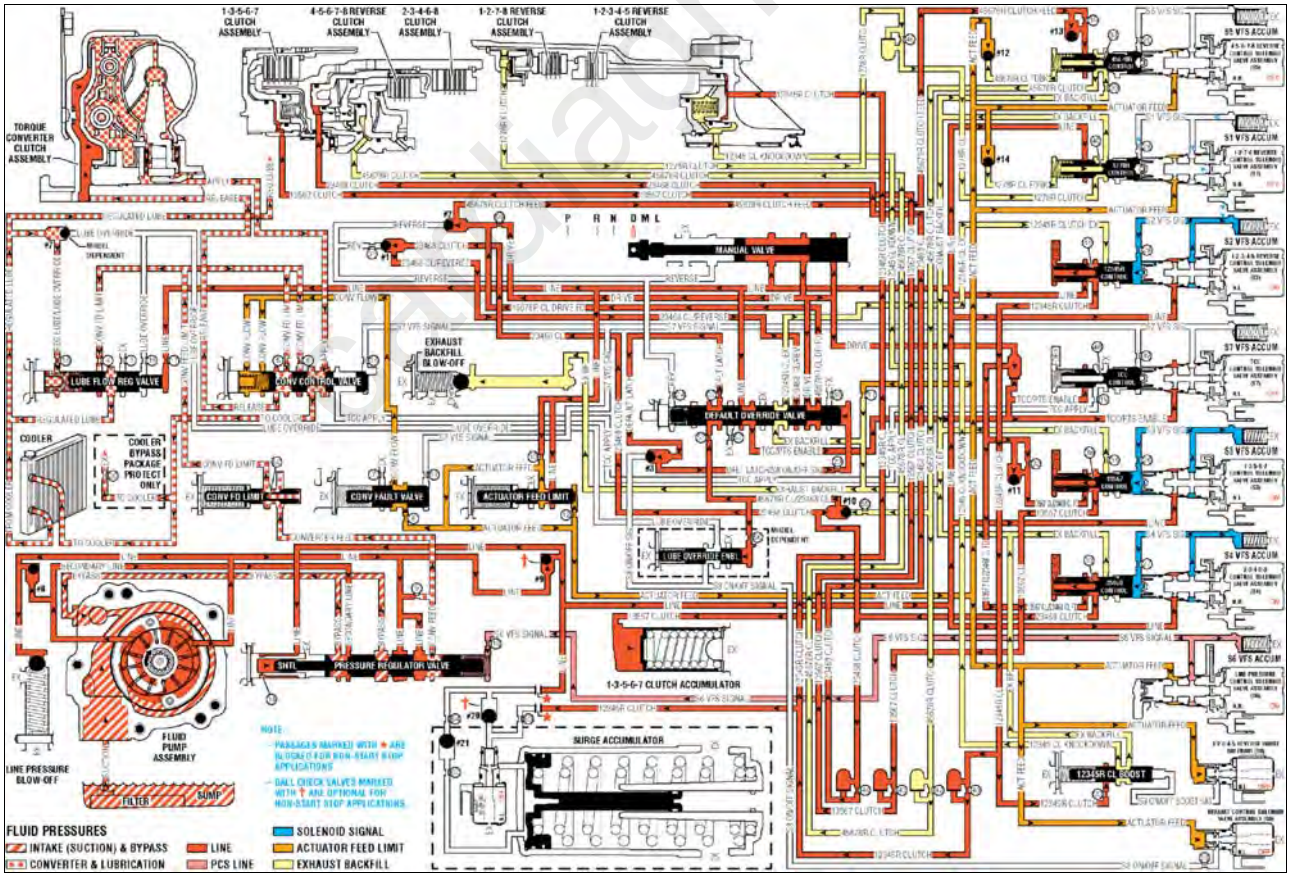
DESCRIPTION AND OPERATION > DRIVE RANGE, THIRD GEAR > 1-2-7-8 CLUTCH RELEASES

1-2-7-8 Reverse Control Solenoid

The 1-2-7-8 reverse control solenoid is signaled off allowing S1 VFS SIG fluid to exhaust and the 1278R control valve to shift do to the 1278R control valve spring force. 1278R CLU fluid exhaust into the EX BACKFILL fluid circuit from the release of the 1-2-7-8R clutch assembly plates.

DESCRIPTION AND OPERATION > DRIVE RANGE, THIRD GEAR > DRIVE RANGE, THIRD GEAR

Fig 1: Drive Range, Third Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, FOURTH GEAR

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 normally-low 1-3- 5-6-7 control solenoid. At the same time the normally-high 4-5-6-7-8 reverse control solenoid is commanded ON to regulate 4-5-6-7-8 reverse clutch apply.

DESCRIPTION AND OPERATION > DRIVE RANGE, FOURTH GEAR > 4-5-6-7-8 REVERSE CLUTCH APPLIES

4-5-6-7-8 Reverse Control Solenoid

The 4-5-6-7-8 reverse control solenoid is energized allowing ACT FEED to enter the S3 VFS SIG fluid circuit which applies fluid pressure against the S3 VFS Accum spring force and through orifice #34 to the 45678R control valve spring force. This allows 45678R CLU FD fluid to enter the 45678R CLU fluid circuit. 45678R CL FD fluid also enters orifice #34 which is in the 45678R control valve. Fluid then enters the 45678R CL FDBK fluid circuit unseating the #12 ball check valve allowing 45678R CL FDBK fluid into the ACT FD fluid circuit.

#10 Ball Check Valve

45678R CLU fluid enters orifice #55 and unseats #10 ball check valve. This allows 45678R CL fluid to enter the 45678R CL/23468 CL fluid circuit. 45678R CL/23468 CL fluid passes through orifice #56 and into the lube override enable valve. 45678R CL/23468 CL fluid applies pressure against the lube override enable valve spring force. 45678R CL/23468 CL fluid also passes through orifice #57 and into the default override valve.

4-5-6-7-8 Reverse Clutch Assembly

45678R CLU fluid is directed through orifice #42 into the 4-5-6- 7-8 rev clutch piston spring force which applies holding force to the 4-5-6-7-8 rev clutch plates.

Default Control Solenoid

The default control solenoid valve is energized allowing ACT FEED fluid to enter the S8 ON/OFF SIG fluid circuit. S8 ON/OFF SIG fluid passes thru orifice #58 thru the lube override enable valve and into the LUBE OVERRIDE fluid circuit which continues to the lube flow regulator valve. S8 ON/OFF SIG fluid is also directed to the #3 ball check valve.

DESCRIPTION AND OPERATION > DRIVE RANGE, FOURTH GEAR > 1-3-5-6-7 CLUTCH RELEASES

1-3-5-6-7 Control Solenoid

The 1-3-5-6-7 control solenoid is signaled off allowing S3 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 13567 CLUTCH fluid to exhaust into EX BACKFILL from the 1-3-5-6-7 clutch accumulator and the 1-3-5-6-7 clutch assembly housing.

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1-3-5-6-7 Clutch Assembly

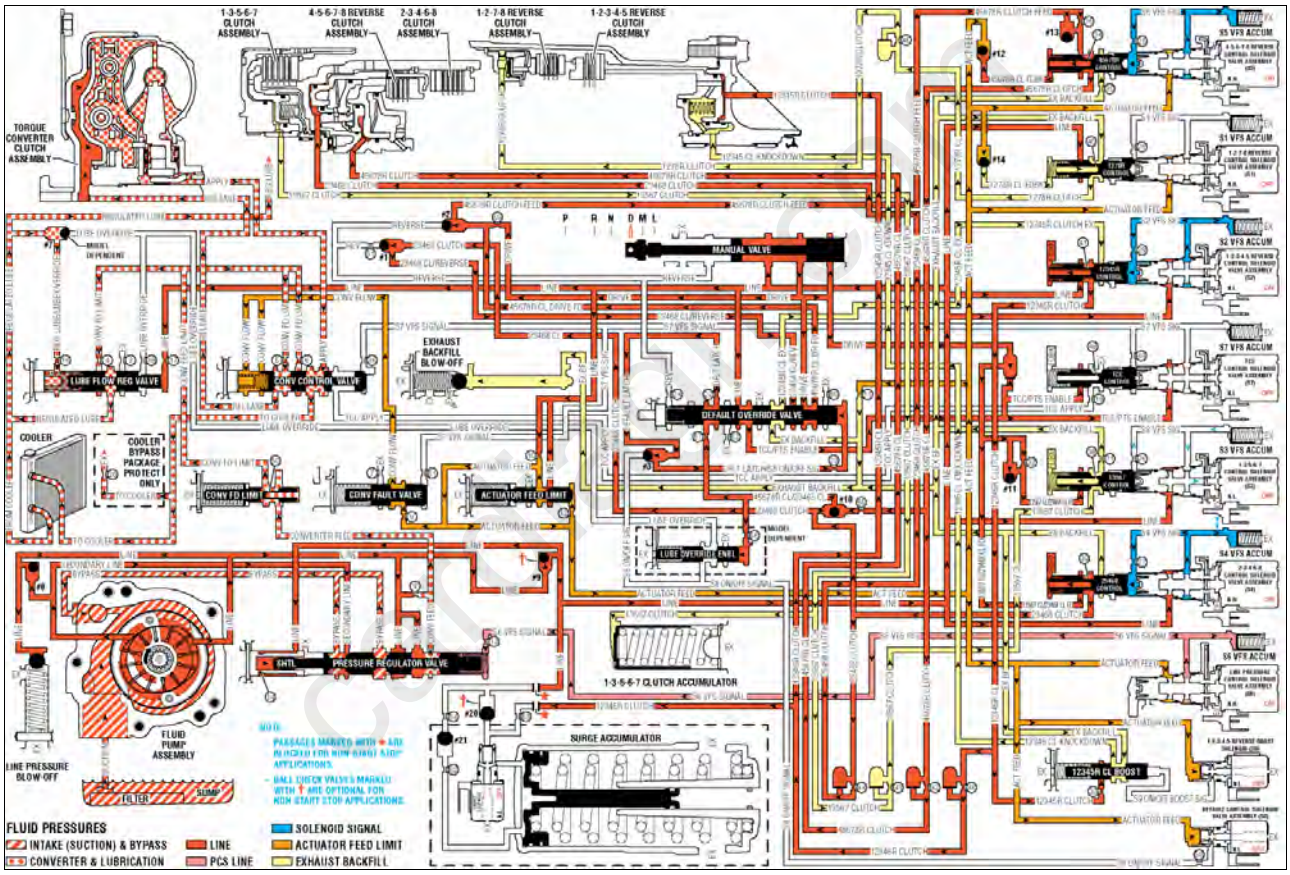
The 1-3-5-6-7 clutch is released allowing 13567 CLUTCH fluid to exhaust thru the 1-3-5-6-7 control solenoid.

1-3-5-6-7 Clutch Accumulator

The 1-3-5-6-7 clutch accumulator is released allowing 13567 CLUTCH fluid to exhaust thru the 1-3-5-6-7 control solenoid.

DESCRIPTION AND OPERATION > DRIVE RANGE, FOURTH GEAR > DRIVE RANGE, FOURTH GEAR

Fig 1: Drive Range, Fourth Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, FIFTH GEAR

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 normally-low 1-3-5-6- 7 control solenoid. At the same time the normally-high 2-3-4-6-8 control solenoid is commanded OFF.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIFTH GEAR > 1-3-5-6-7 CLUTCH APPLIES

1-3-5-6-7 Control Solenoid Valve Assembly

The 1-3-5-6-7 control solenoid is energized allowing line fluid to enter the S3 VFS SIG fluid circuit which applies fluid pressure against the S3 VFS SIG accumulator spring force and against the 13567 control valve spring force. This allows

13567 CL/23468 CL FD fluid to enter the 13567 clutch fluid circuit and thru the 13567 control valve orifice #38 to FDBK.

1-3-5-6-7 Clutch Accumulator

13567 CLU fluid is directed thru orifice #43 and into the 1-3-5-6-7 clutch accumulator where it applies pressure against the 1-3-5-6-7 clutch accumulator spring force.

1-3-5-6-7 Clutch Assembly

13567 CLU fluid is also directed to the 1-3-5-6-7 clutch assembly housing. 13567 CLU fluid moves the piston against spring force to apply holding of the 1-3-5-6-7 clutch plates.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIFTH GEAR > 2-3-4-6-8 CLUTCH RELEASES

2-3-4-6-8 Control Solenoid

The 2-3-4-6-8 control solenoid is signaled off allowing S4 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 23468 CLUTCH fluid to exhaust into EX BACKFILL from the 2-3-4-6-8 clutch assembly housing.

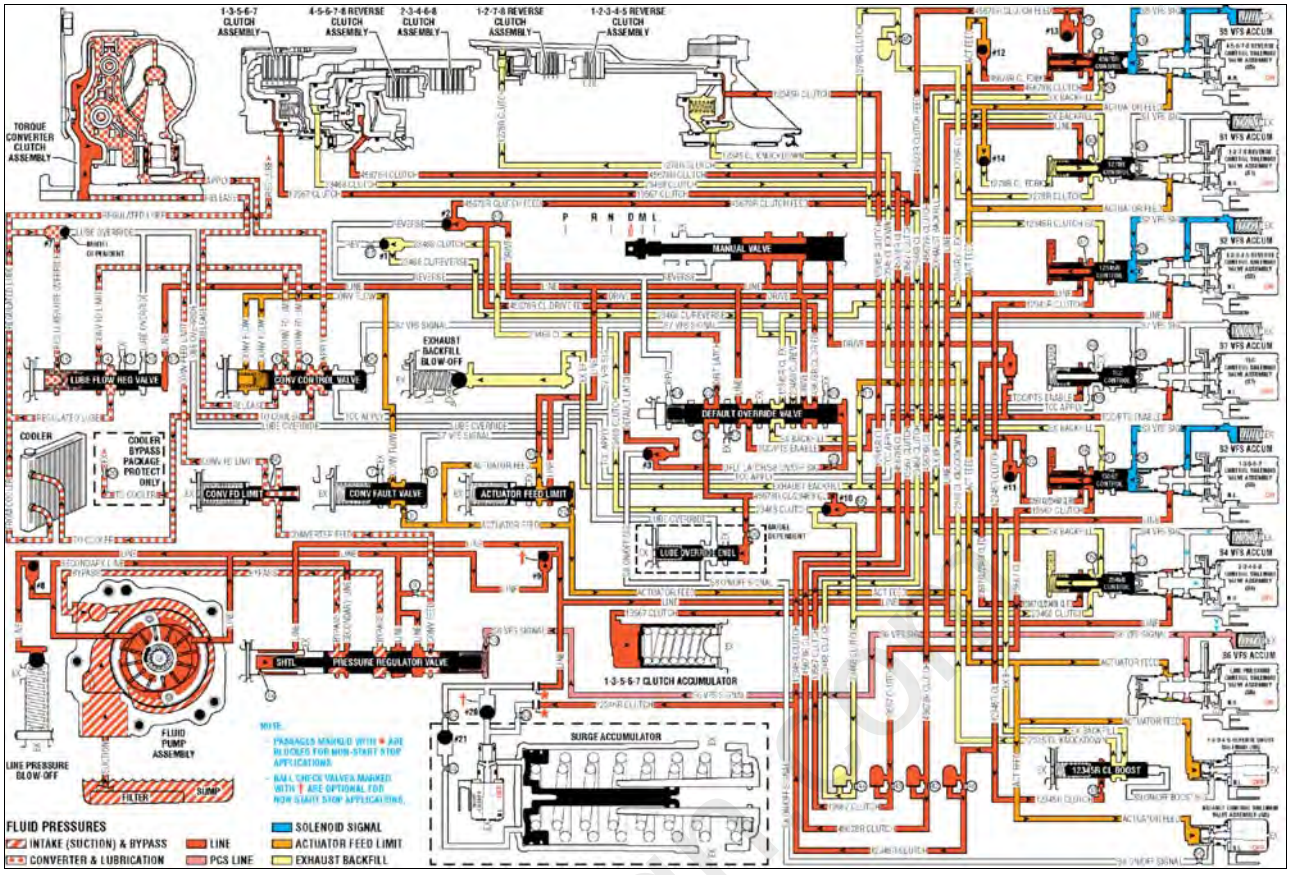
2-3-4-6-8 Clutch Assembly

The 2-3-4-6-8 clutch is released allowing 23468 CLUTCH fluid to exhaust thru the 2-3-4-6-8 control solenoid.

DESCRIPTION AND OPERATION > DRIVE RANGE, FIFTH GEAR > DRIVE RANGE, FIFTH GEAR

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Fig 1: Drive Range, Fifth Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, SIXTH GEAR

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 normally-high 2-3-4-6-8 control solenoid. At the same time the normally-low 1-2-3-4-5 reverse control solenoid and the normally-low 1-2-3-4-5 reverse boost solenoid is commanded OFF.

DESCRIPTION AND OPERATION > DRIVE RANGE, SIXTH GEAR > 2-3-4-6-8 CLUTCH APPLIES

2-3-4-6-8 Control Solenoid

The 2-3-4-6-8 control solenoid energizes allowing line fluid to enter the S4 VFS SIG fluid circuit which applies pressure against the S4 vfs accum spring force and against the 23468 control valve spring force. This allows 13567 CL/23468 CL FD fluid to enter the 23468 CLU fluid circuit. 13567 CL/23468 CL FD fluid also passes thru the 23468 control valve orifice #39 into FDBK. 23468 CLUTCH fluid is directed to the #10 ball check valve and thru orifice #44 to the 23468 clutch assembly housing.

2-3-4-6-8 Clutch Assembly

The 23468 CLU fluid passes thru orifice #44 continuing to the 2-3-4-6-8 clutch assembly housing. 23468 CLUTCH fluid applies pressure against the 23468 clutch piston which applies holding pressure to the 2-3-4-6-8 clutch plates.

DESCRIPTION AND OPERATION > DRIVE RANGE, SIXTH GEAR > 1-2-3-4-5 CLUTCH RELEASES

1-2-3-4-5 Control Solenoid

The 1-2-3-4-5 control solenoid is signaled off allowing S2 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 12345R CLUTCH fluid to exhaust into 12345R CLUTCH EX fluid circuit from the 12345R clutch boost and the 1-2-3-4-5 reverse clutch assembly housing.

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

The 1-2-3-4-5 reverse clutch is released allowing 12345R CLUTCH fluid to exhaust thru the 1-2-3-4-5 reverse control solenoid.

1-2-3-4-5 Reverse Boost Solenoid

The 1-2-3-4-5 reverse boost solenoid is commanded off. This allows S9 ON/OFF BOOST SIGNAL fluid to exhaust through the 1-2-3-4-5 rev boost solenoid.

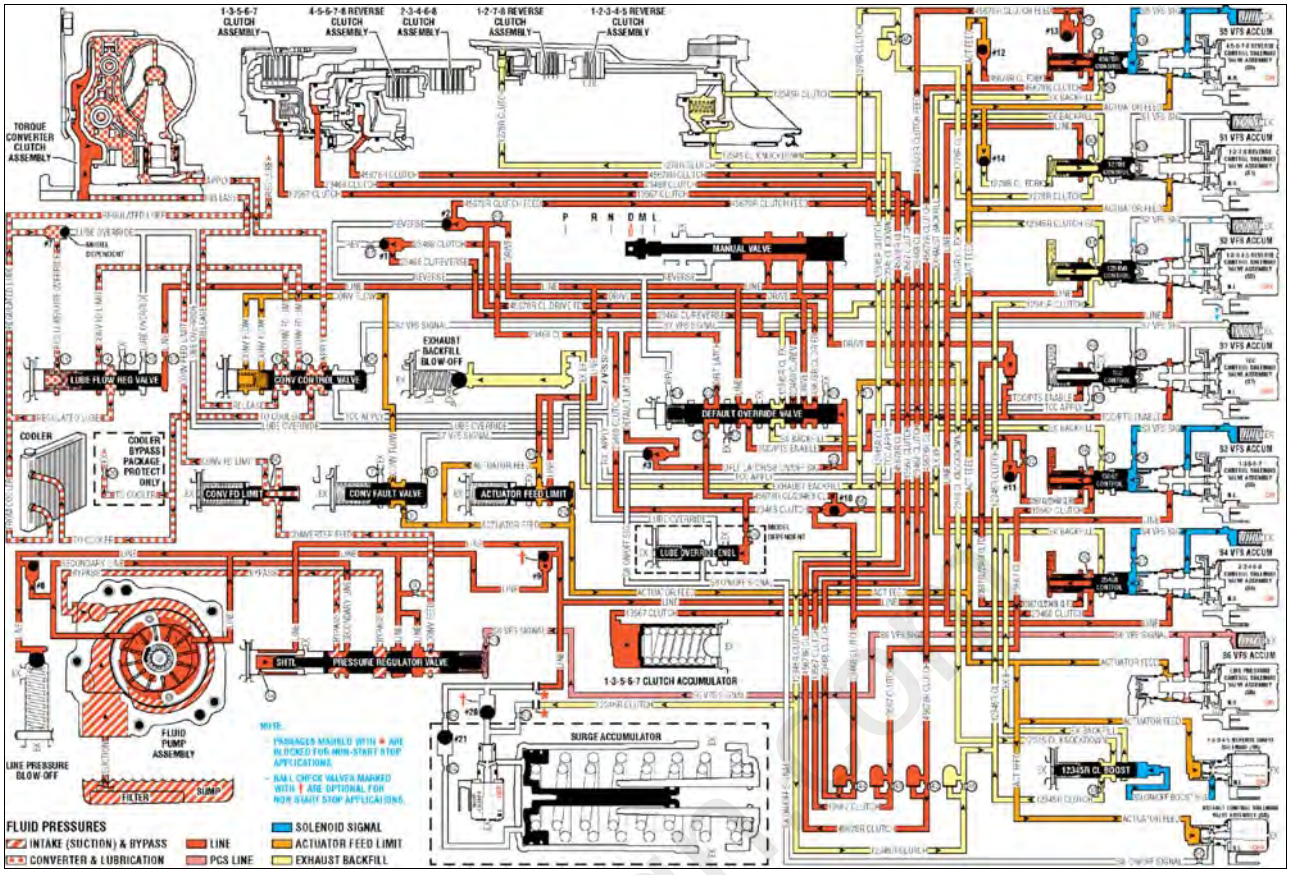
1-2-3-4-5 Reverse Clutch Boost Valve

The 12345R clutch boost valve spring force moves the valve to allow 12345 CL KNOCKDOWN fluid from the 1-2-3-4- 5 reverse clutch housing to exhaust into the 12345R clutch boost valve then into the EX BACKFILL fluid circuit.

DESCRIPTION AND OPERATION > DRIVE RANGE, SIXTH GEAR > DRIVE RANGE, SIXTH GEAR

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Fig 1: Drive Range, Sixth Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, SEVENTH GEAR

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 normally-high 1-2-7-8 reverse control solenoid. At the same time the normally-high 2-3-4-6-8 control solenoid is commanded OFF.

DESCRIPTION AND OPERATION > DRIVE RANGE, SEVENTH GEAR > 1-2-7-8 REVERSE CLUTCH APPLIES

1-2-7-8 Reverse Control Solenoid Valve Assembly

The 1-2-7-8 reverse control solenoid is energized (HIGH) allowing actuator feed fluid to enter the S1 VFS SIG fluid circuit which applies fluid pressure against the S1 VFS ACCUM spring force and against the 1278R control valve spring force. This allows line fluid to pass through into the 1278R CLUTCH fluid circuit.

1-2-7-8 Reverse Clutch Assembly

1278R CLU fluid is routed to the 1278 reverse clutch piston to hold the piston against spring force which

holds the 1278R clutch plates.

#14 Ball Check Valve

Line fluid travels through the 1278R control valve orifice #40 into the 1278R CLU FDBK fluid circuit and into the #14 ball check valve unseating the ball allowing fluid into the ACT FEED circuit.

DESCRIPTION AND OPERATION > DRIVE RANGE, SEVENTH GEAR > 2-3-4-6-8 CLUTCH RELEASES

2-3-4-6-8 Control Solenoid

The 2-3-4-6-8 control solenoid is signaled off allowing S4 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 23468 CLUTCH fluid to exhaust into EX BACKFILL from the 2-3-4-6-8 clutch assembly housing.

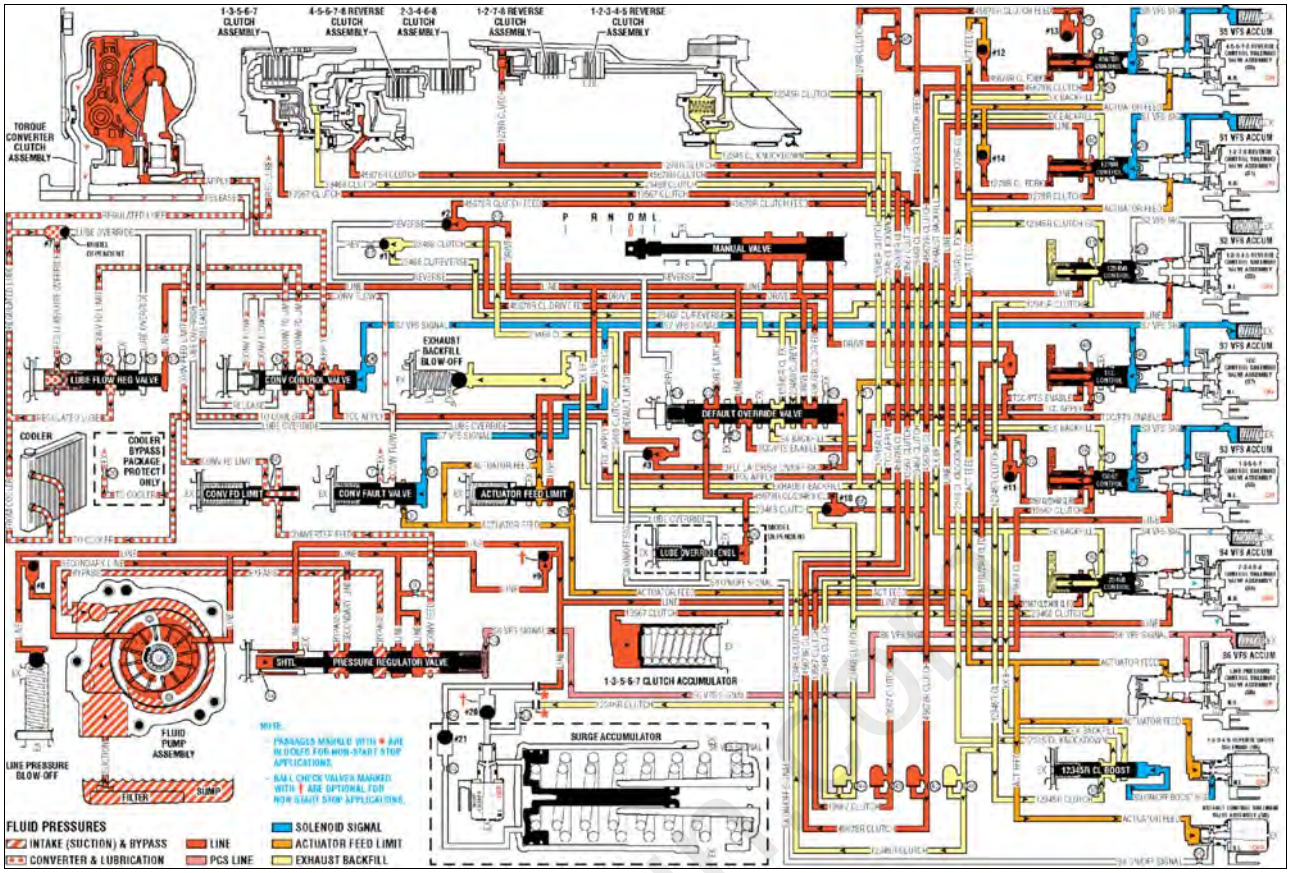
2-3-4-6-8 Clutch Assembly

The 2-3-4-6-8 clutch is released allowing 23468 CLUTCH fluid to exhaust thru the 2-3-4-6-8 control solenoid.

DESCRIPTION AND OPERATION > DRIVE RANGE, SEVENTH GEAR > DRIVE RANGE, SEVENTH GEAR

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Fig 1: Drive Range, Seventh Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > DRIVE RANGE, EIGHTH GEAR

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 normally-high 2-3-4-6-8 control solenoid. At the same time the normally-low 1-3-5-6-7 control solenoid is commanded OFF.

DESCRIPTION AND OPERATION > DRIVE RANGE, EIGHTH GEAR > 2-3-4-6-8 CLUTCH APPLIES

2-3-4-6-8 Control Solenoid

The 2-3-4-6-8 control solenoid energizes allowing line fluid to enter the S4 VFS SIG fluid circuit which applies pressure against the S4 vfs accum spring force and against the 23468 control valve spring force. This allows 13567 CL/23468 CL FD fluid to enter the 23468 CLU fluid circuit. 13567 CL/23468 CL FD fluid also passes thru the 23468 control valve orifice #39 into FDBK. 23468 CLUTCH fluid is directed to the #10 ball check valve and thru orifice #44 to the 23468 clutch assembly housing.

2-3-4-6-8 Clutch Assembly

The 23468 CLU fluid passes thru orifice #44 continuing to the 2-3-4-6-8 clutch assembly housing. 23468 CLUTCH fluid applies pressure against the 23468 clutch piston which applies holding pressure to the 2-3-4-6-8 clutch plates.

DESCRIPTION AND OPERATION > DRIVE RANGE, EIGHTH GEAR > 1-3-5-6-7 CLUTCH RELEASES

1-3-5-6-7 Control Solenoid

The 1-3-5-6-7 control solenoid is signaled off allowing S3 VFS SIG fluid to exhaust. Spring pressure shifts the valve to allow 13567 CLUTCH fluid to exhaust into EX BACKFILL from the 1-3-5-6-7 clutch accumulator and the 1-3-5-6-7 clutch assembly housing.

1-3-5-6-7 Clutch Assembly

The 1-3-5-6-7 clutch is released allowing 13567 CLUTCH fluid to exhaust thru the 1-3-5-6-7 control solenoid.

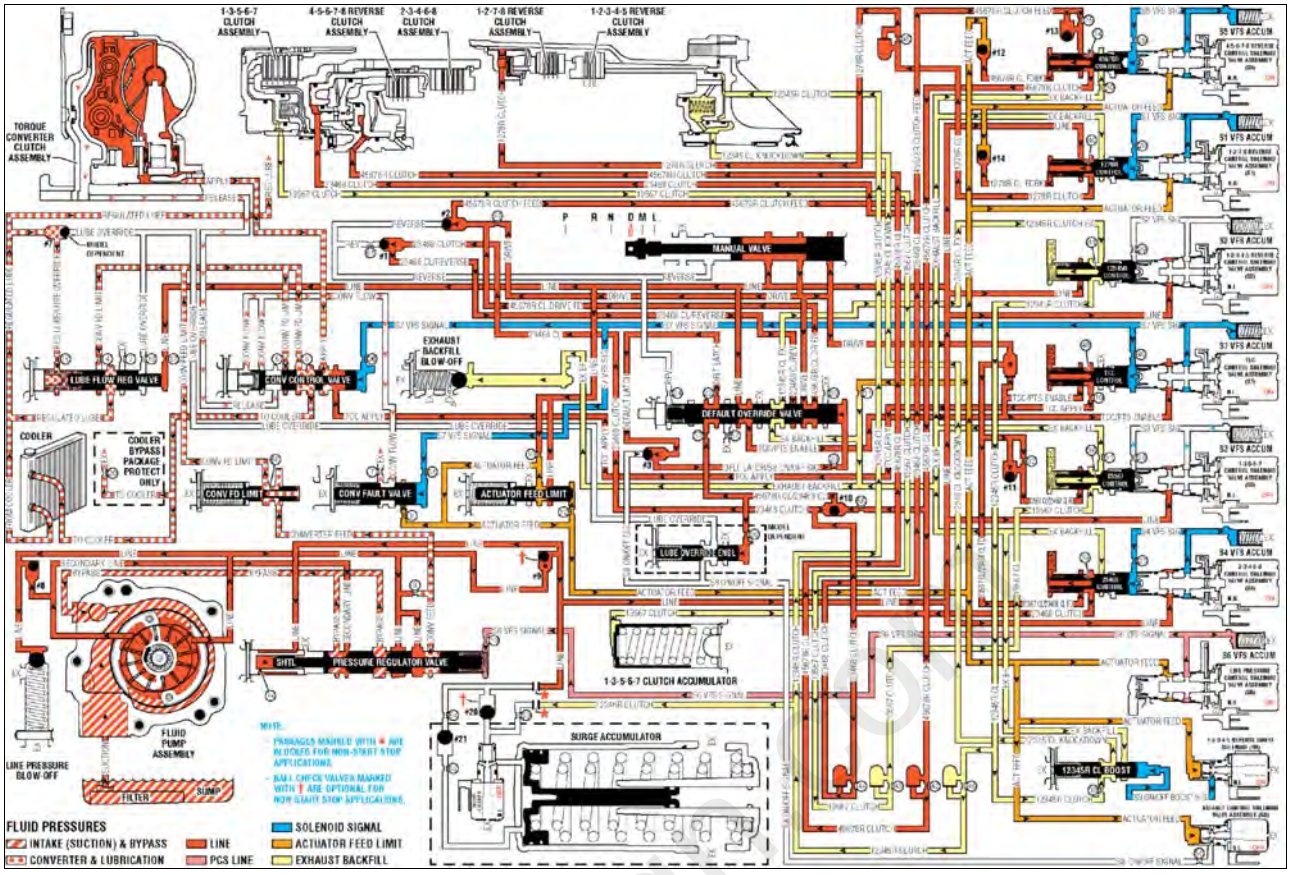
1-3-5-6-7 Clutch Accumulator

The 1-3-5-6-7 clutch accumulator is released allowing 13567 CLUTCH fluid to exhaust thru the 1-3-5-6-7 control solenoid.

DESCRIPTION AND OPERATION > DRIVE RANGE, EIGHTH GEAR > DRIVE RANGE, EIGHTH

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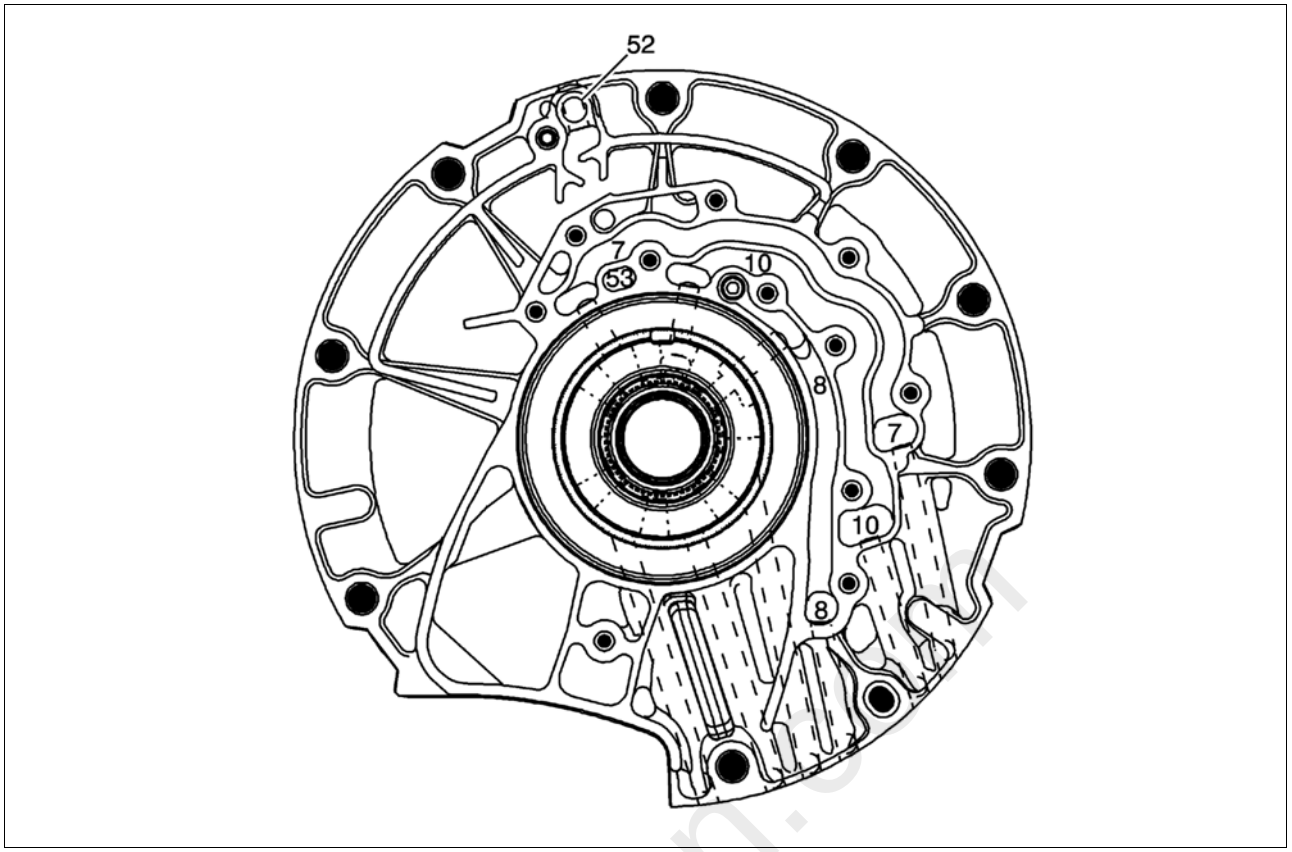
Fig 1: Drive Range, Eighth Gear Hydraulic Diagram



Courtesy of GENERAL MOTORS COMPANY

DESCRIPTION AND OPERATION > FLUID PASSAGES > STATOR SHAFT SUPPORT - FRONT COVER SIDE

Fig 1: Stator Shaft Support Fluid Passages - Front Cover Side

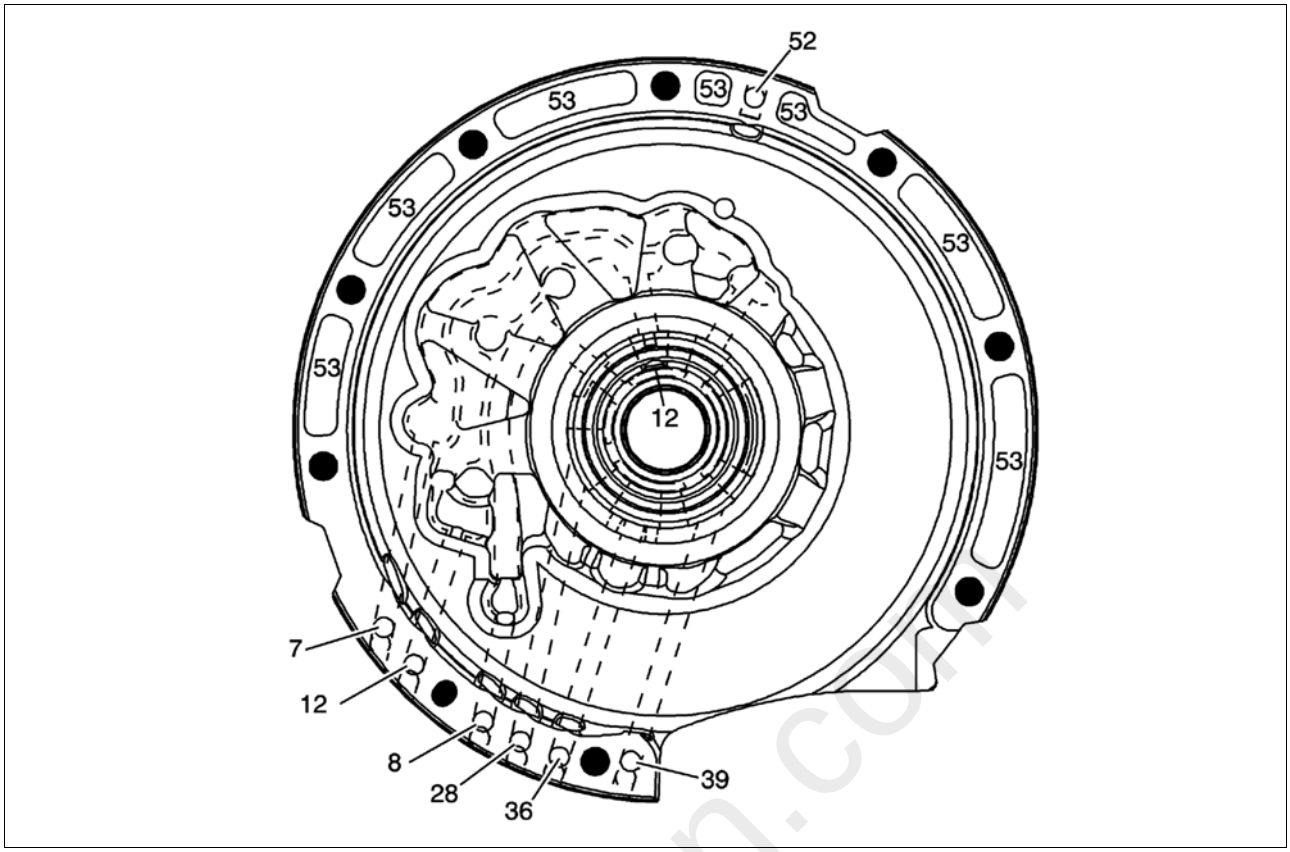


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
7	Release
8	Apply
10	From Cooler
52	Vent
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > STATOR SHAFT SUPPORT - CASE ASSEMBLY SIDE

Fig 1: Stator Shaft Support Fluid Passages - Case Assembly Side



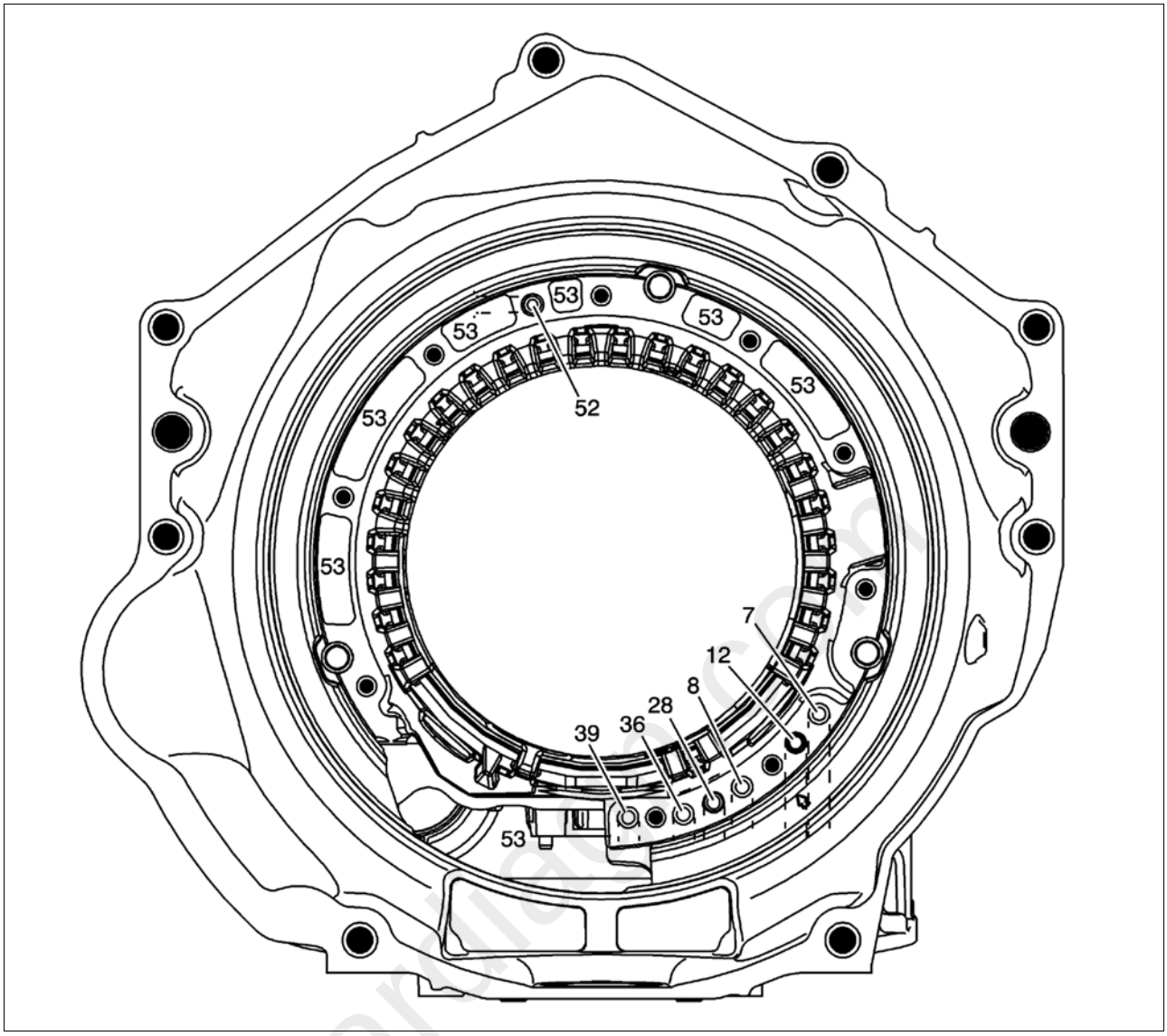
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
7	Release
8	Apply
12	Regulated Lube
28	45678R Clutch
36	13567 Clutch
39	23468 Clutch
52	Vent
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CASE ASSEMBLY - STATOR SHAFT SUPPORT SIDE

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Fig 1: Case Assembly Fluid Passages - Stator Shaft Support Side

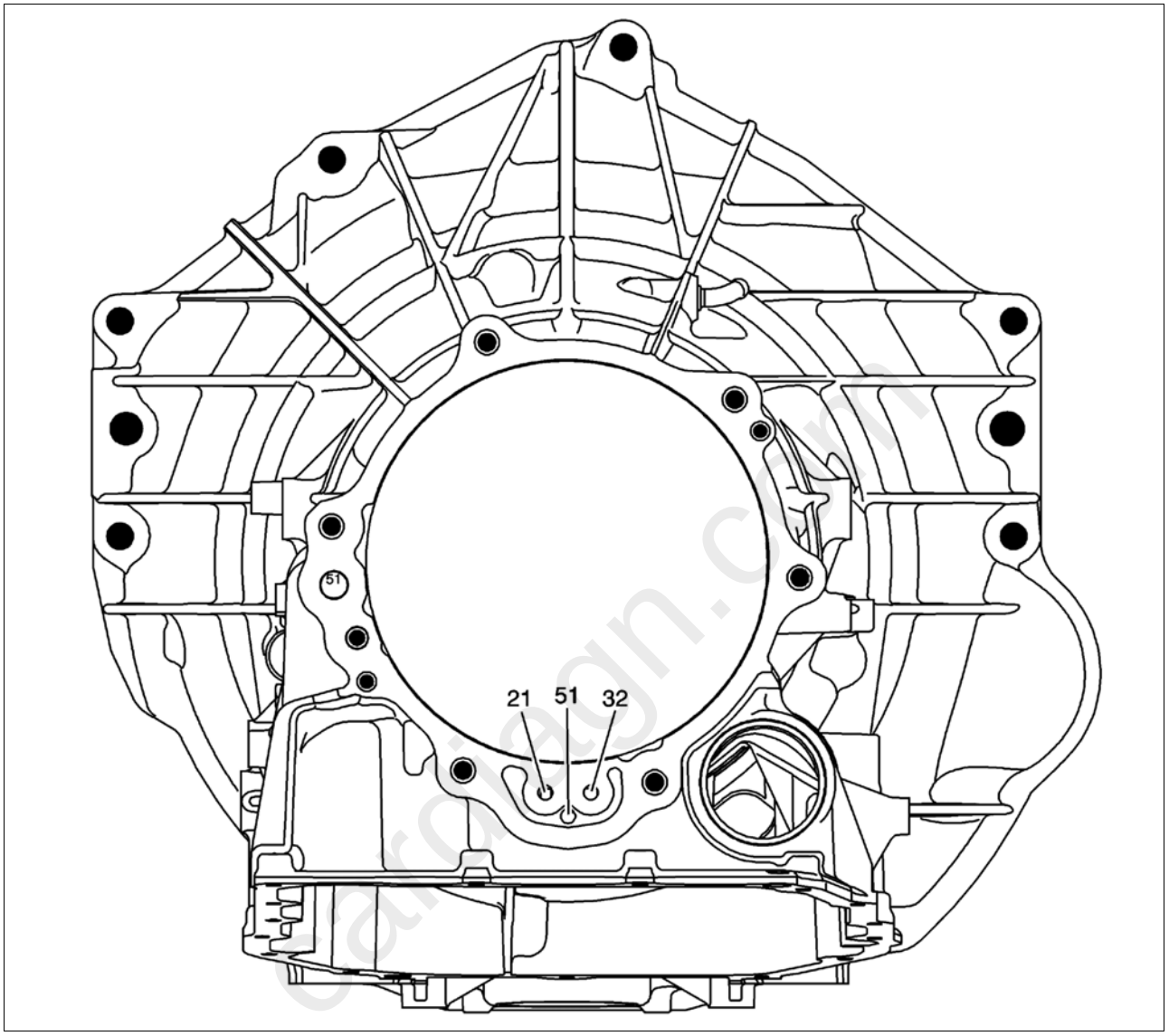


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
7	Release
8	Apply
12	Regulated Lube
28	45678R Clutch
36	13567 Clutch
39	23468 Clutch
52	Vent
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CASE ASSEMBLY - CASE EXTENSION SIDE

Fig 1: Case Assembly - Case Extension Side

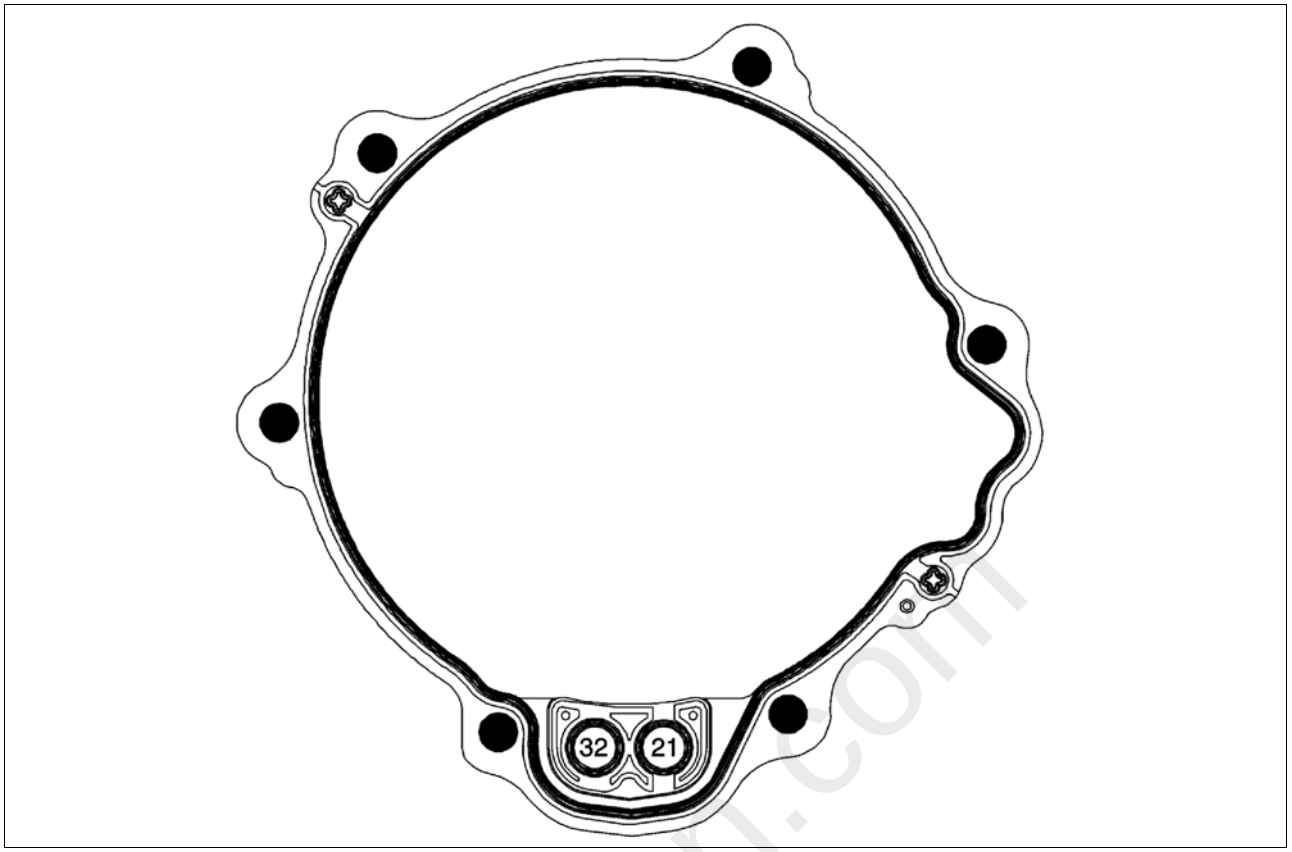


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
21	12345R Clutch
32	12345 Clutch Knockdown
51	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CASE EXTENSION SEAL - CASE ASSEMBLY SIDE

Fig 1: Case Extension Seal - Case Assembly Side



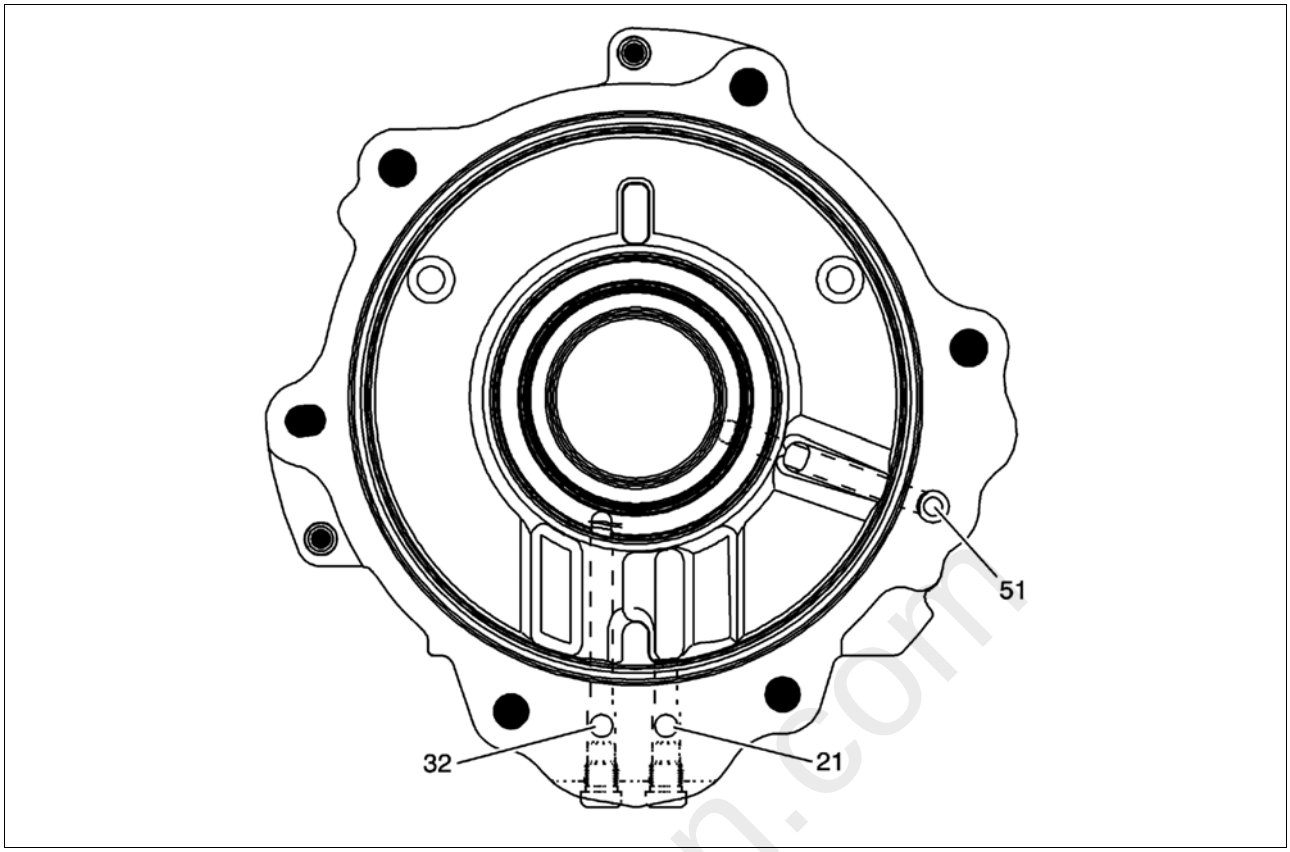
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
21	12345R Clutch
32	12345 Clutch Knockdown

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DESCRIPTION AND OPERATION > FLUID PASSAGES > CASE EXTENSION - CASE ASSEMBLY SIDE

Fig 1: Case Extension - Case Assembly Side



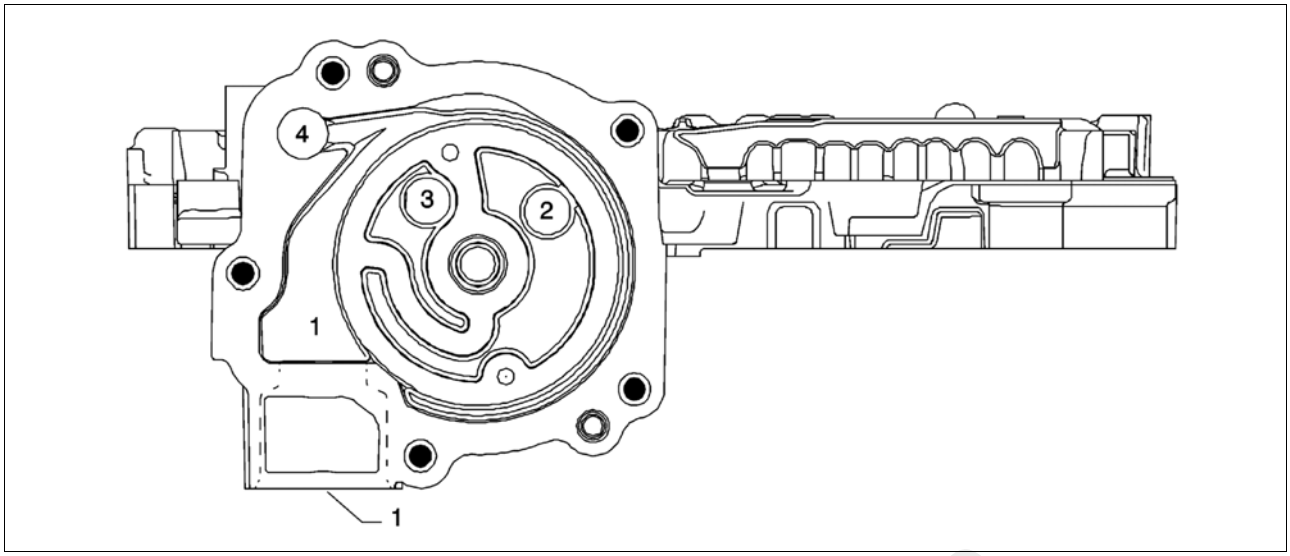
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
21	12345R Clutch
32	12345 Clutch Knockdown
51	Void

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DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE UPPER BODY ASSEMBLY - FLUID PUMP SIDE

Fig 1: Control Valve Upper Body Assembly - Fluid Pump Side



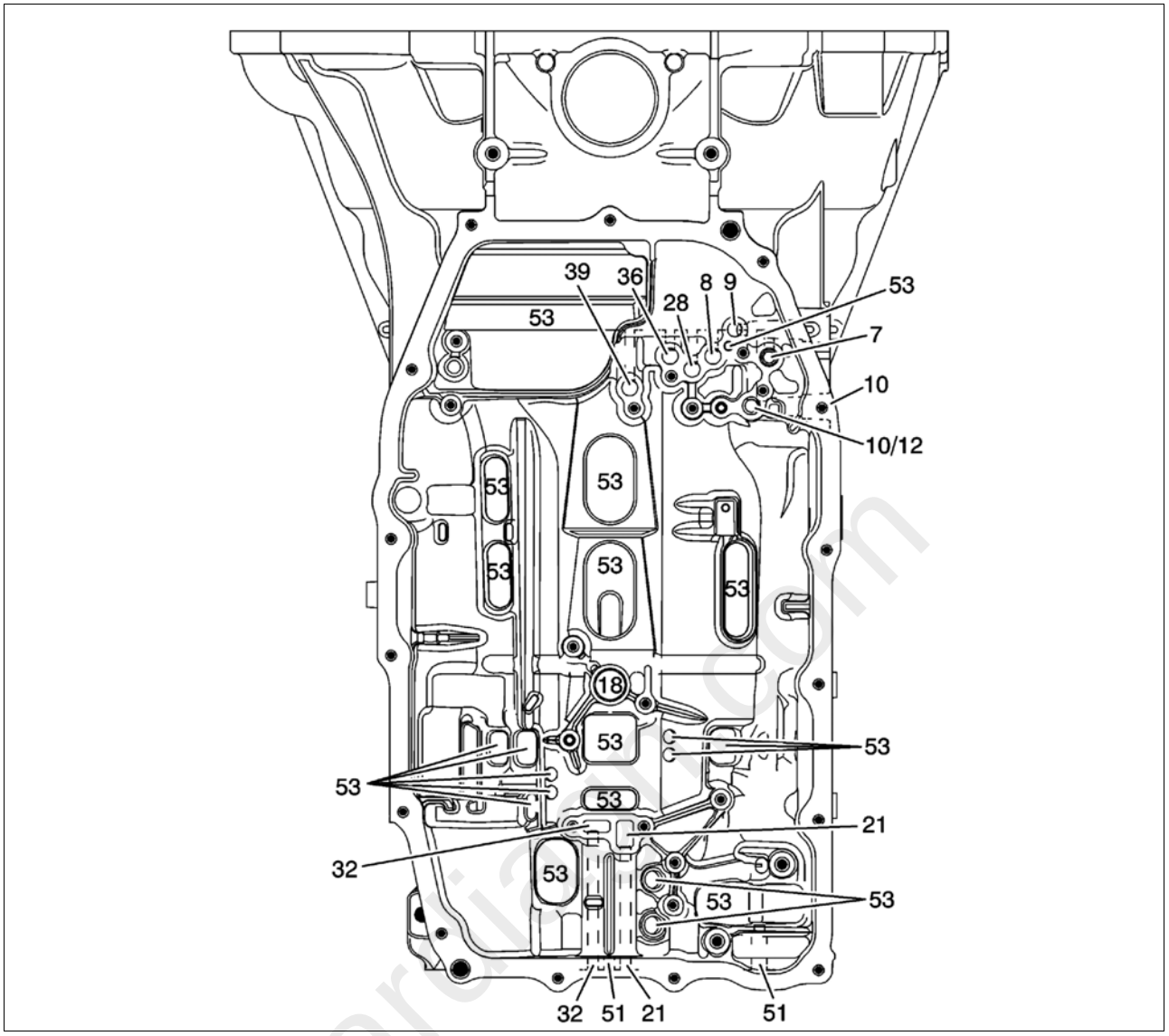
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Trans Case Locator Pin
1	Suction
2	Line
3	Secondary Line
4	Bypass

DESCRIPTION AND OPERATION > FLUID PASSAGES > CASE ASSEMBLY - CONTROL VALVE UPPER BODY ASSEMBLY SIDE

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Fig 1: Case Assembly - Control Valve Upper Body Assembly Side



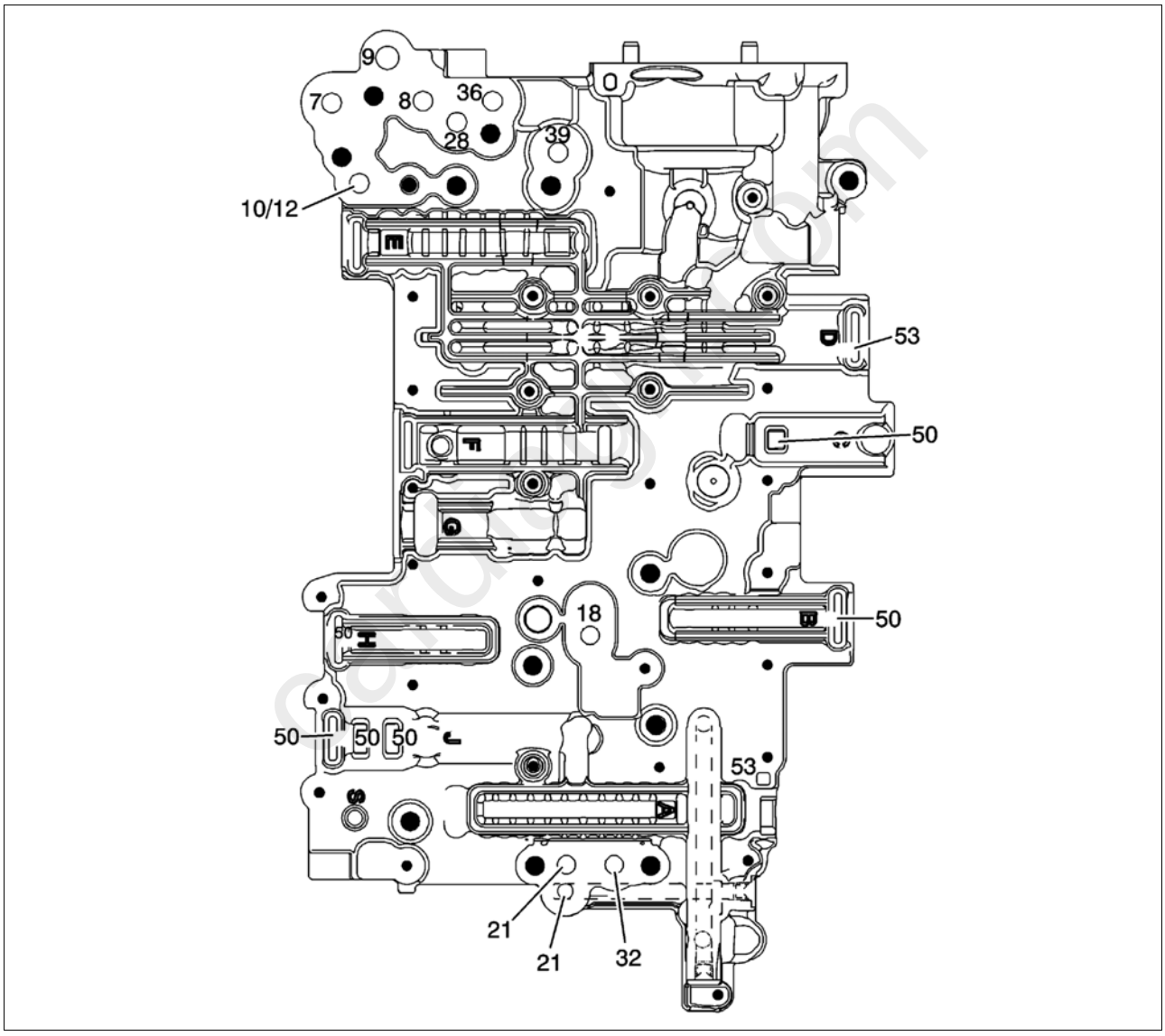
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
7	Release
8	Apply
9	To Cooler
10	From Cooler
12	Regulated Lube
18	1278R Clutch
21	12345R Clutch
28	45678R Clutch
32	12345 Clutch Knockdown

36	13567 Clutch
39	23468 Clutch
51	Void
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE UPPER BODY ASSEMBLY - CASE ASSEMBLY SIDE

Fig 1: Control Valve Upper Body Assembly - Case Assembly Side



Courtesy of GENERAL MOTORS COMPANY

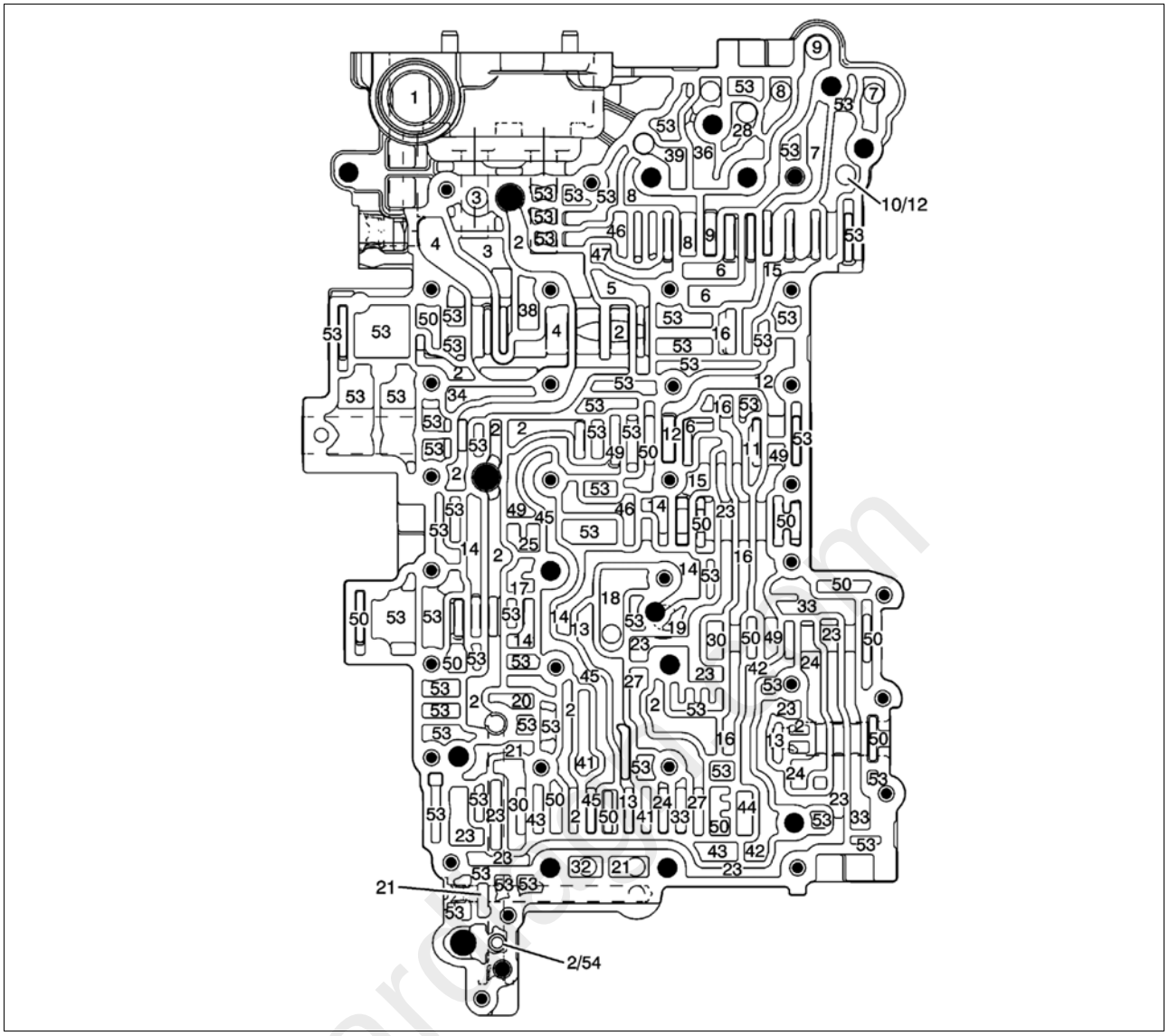
Callout	Component Name
7	Release

8	Apply
9	To Cooler
10	From Cooler
12	Regulated Lube
18	1278R Clutch
21	12345R Clutch
28	45678R Clutch
32	12345 Clutch Knockdown
36	13567 Clutch
39	23468 Clutch
50	Exhaust
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE UPPER BODY ASSEMBLY - CONTROL VALVE SOLENOID BODY SIDE

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Fig 1: Control Valve Upper Body Assembly - Control Valve Solenoid Body Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
3	Secondary Line
4	Bypass
5	Converter Feed
6	Converter Feed Limit
7	Release
8	Apply
9	To Cooler

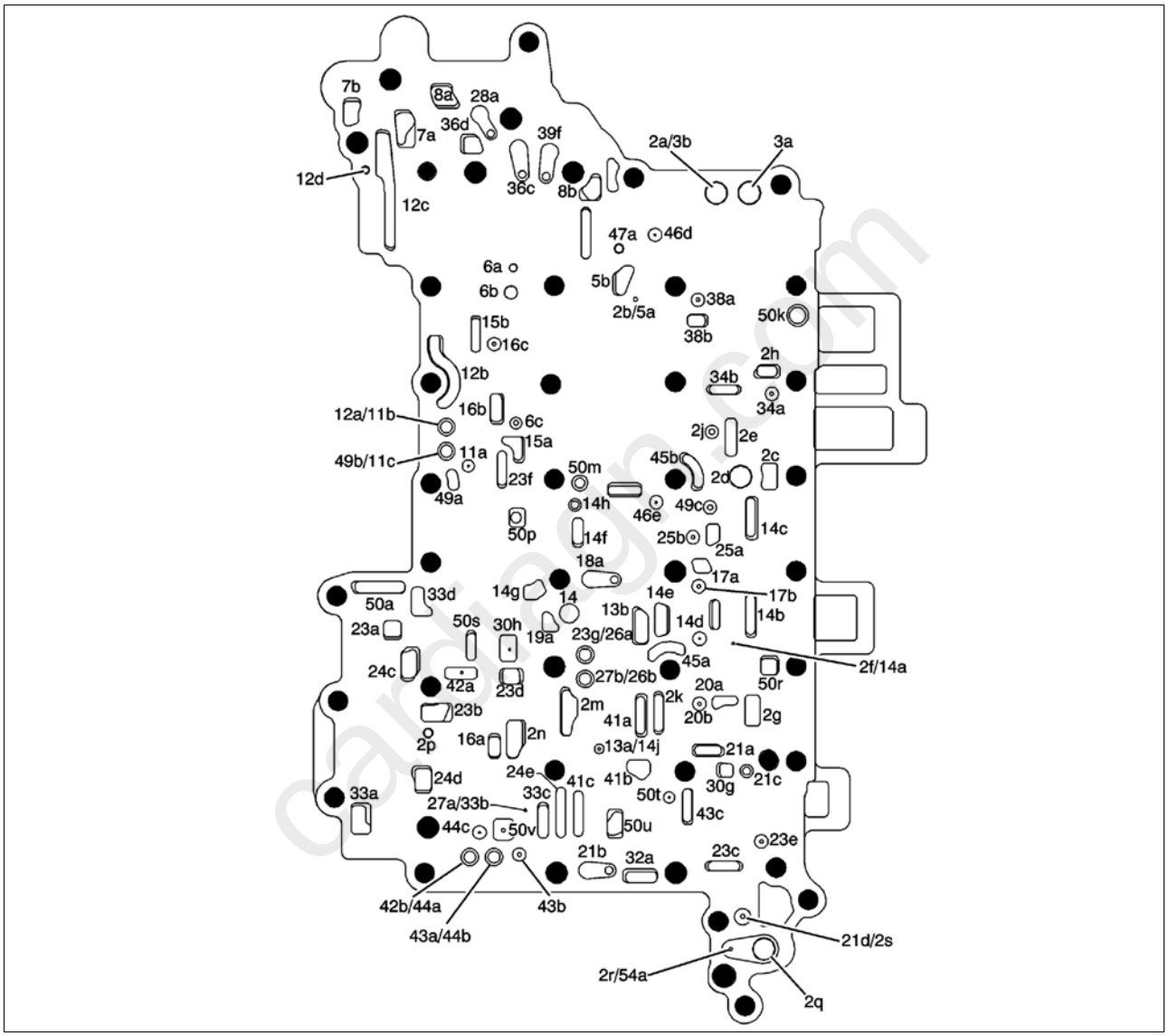
10	From Cooler
11	From Cooler/Lube Override
12	Regulated Lube
13	Exhaust Backfill
14	Actuator Feed
15	Converter Flow
16	S6 VFS Signal (PCS Line)
17	S1 VFS Signal
18	1278R Clutch
19	1278R Clutch Feedback
20	S2 VFS Signal
21	12345R Clutch
23	Reverse
24	23468 Clutch/Reverse
25	S5 VFS Signal
27	45678R Clutch Drive Feed
28	45678R Clutch
30	45678R Clutch/23468 Clutch
32	12345 Clutch Knockdown
33	Drive
34	S3 VFS Signal
36	13567 Clutch
38	S4 VFS Signal
39	23468 Clutch
41	12345R Clutch Exhaust
42	S8 ON/OFF Signal
43	Default Latch
44	Default Latch/S9 ON/OFF Signal
45	TCC PTS Enable
46	S7 VFS Signal
47	TCC Apply
49	Lube Override
50	Exhaust

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53	Void
54	Auxiliary Fluid signal

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE BODY SPACER PLATE ASSEMBLY - CONTROL VALVE UPPER BODY SIDE

Fig 1: Control Valve Body Spacer Plate Assembly - Control Valve Upper Body Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2a	Line
2b	Line
2c	Line

2d	Line
2e	Line
2f	Line
2g	Line
2h	Line
2j	Line
2k	Line
2m	Line
2n	Line
2p	Line
2q	Line
2r	Line
2s	Line
3a	Secondary Line
3b	Secondary Line
5a	Converter Feed
5b	Converter Feed
6a	Converter Feed Limit
6b	Converter Feed Limit
6c	Converter Feed Limit
7a	Release
7b	Release
8a	Apply
8b	Apply
11a	From Cooler/Lube Override
11b	From Cooler/Lube Override
11c	From Cooler/Lube Override
12a	Regulated Lube
12b	Regulated Lube
12c	Regulated Lube
12d	Regulated Lube
13a	Exhaust Backfill
13b	Exhaust Backfill

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14	Actuator Feed
14a	Actuator Feed
14b	Actuator Feed
14c	Actuator Feed
14d	Actuator Feed
14e	Actuator Feed
14f	Actuator Feed
14g	Actuator Feed
14h	Actuator Feed
14j	Actuator Feed
15a	Converter Flow
15b	Converter Flow
16a	S6 VFS Signal (PCS Line)
16b	S6 VFS Signal (PCS Line)
16c	S6 VFS Signal (PCS Line)
17a	S1 VFS Signal
17b	S1 VFS Signal
18a	1278R Clutch
19a	1278R Clutch Feedback
20a	S2 VFS Signal
20b	S2 VFS Signal
21a	12345R Clutch
21b	12345R Clutch
21c	12345R Clutch
21d	12345R Clutch
23a	Reverse
23b	Reverse
23c	Reverse
23d	Reverse
23e	Reverse
23f	Reverse
23g	Reverse
24c	23468 Clutch /Reverse

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24d	23468 Clutch /Reverse
24e	23468 Clutch /Reverse
25a	S5 VFS Signal
25b	S5 VFS Signal
26a	45678R Clutch Feed
26b	45678R Clutch Feed
27a	45678R Clutch Drive Feed
27b	45678R Clutch Drive Feed
28a	45678R Clutch
30g	45678R Clutch/23468 Clutch
30h	45678R Clutch/23468 Clutch
32a	12345 Clutch Knockdown
33a	Drive
33b	Drive
33c	Drive
33d	Drive
34a	S3 VFS Signal
34b	S3 VFS Signal
36c	13567 Clutch
36d	13567 Clutch
38a	S4 VFS Signal
38b	S4 VFS Signal
39f	23468 Clutch
41a	12345R Clutch Exhaust
41b	12345R Clutch Exhaust
41c	12345R Clutch Exhaust
42a	S8 ON/OFF Signal
42b	S8 ON/OFF Signal
43a	Default Latch
43b	Default Latch
43c	Default Latch
44a	Default Latch/S9 ON/OFF Signal
44b	Default Latch/S9 ON/OFF Signal

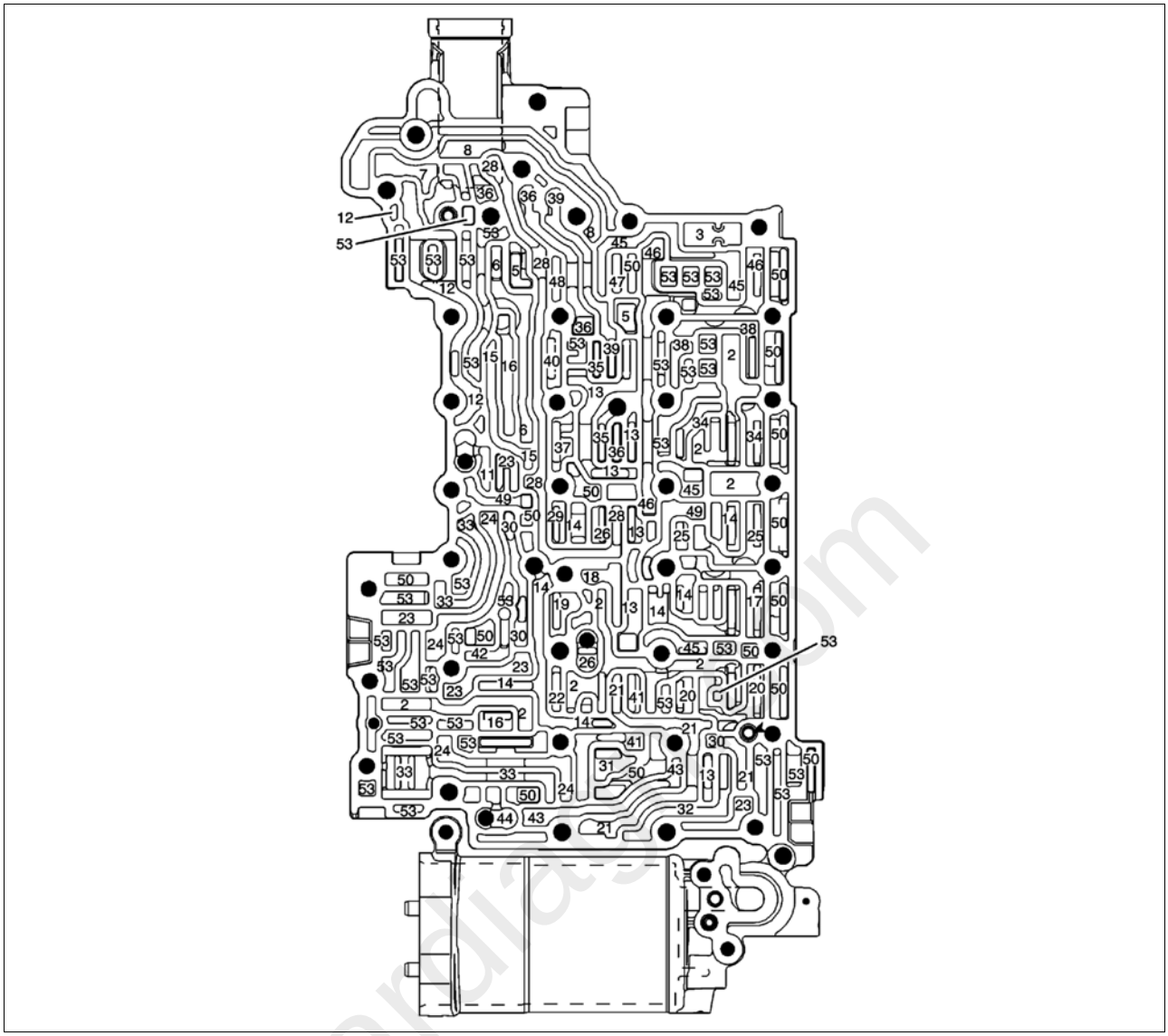
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44c	Default Latch/S9 ON/OFF Signal
45a	TCC PTS Enable
45b	TCC PTS Enable
46d	S7 VFS Signal
46e	S7 VFS Signal
47a	TCC Apply
49a	Lube Override
49b	Lube Override
49c	Lube Override
50a	Exhaust
50k	Exhaust
50m	Exhaust
50p	Exhaust
50r	Exhaust
50s	Exhaust
50t	Exhaust
50u	Exhaust
50v	Exhaust
54a	Auxiliary Fluid Signal

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DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE SOLENOID BODY - CONTROL VALVE UPPER BODY SIDE

Fig 1: Control Valve Solenoid Body - Control Valve Upper Body Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
3	Secondary Line
5	Converter Feed
6	Converter Feed Limit
7	Release
8	Apply
11	From Cooler/Lube Override
12	Regulated Lube
13	Exhaust Backfill

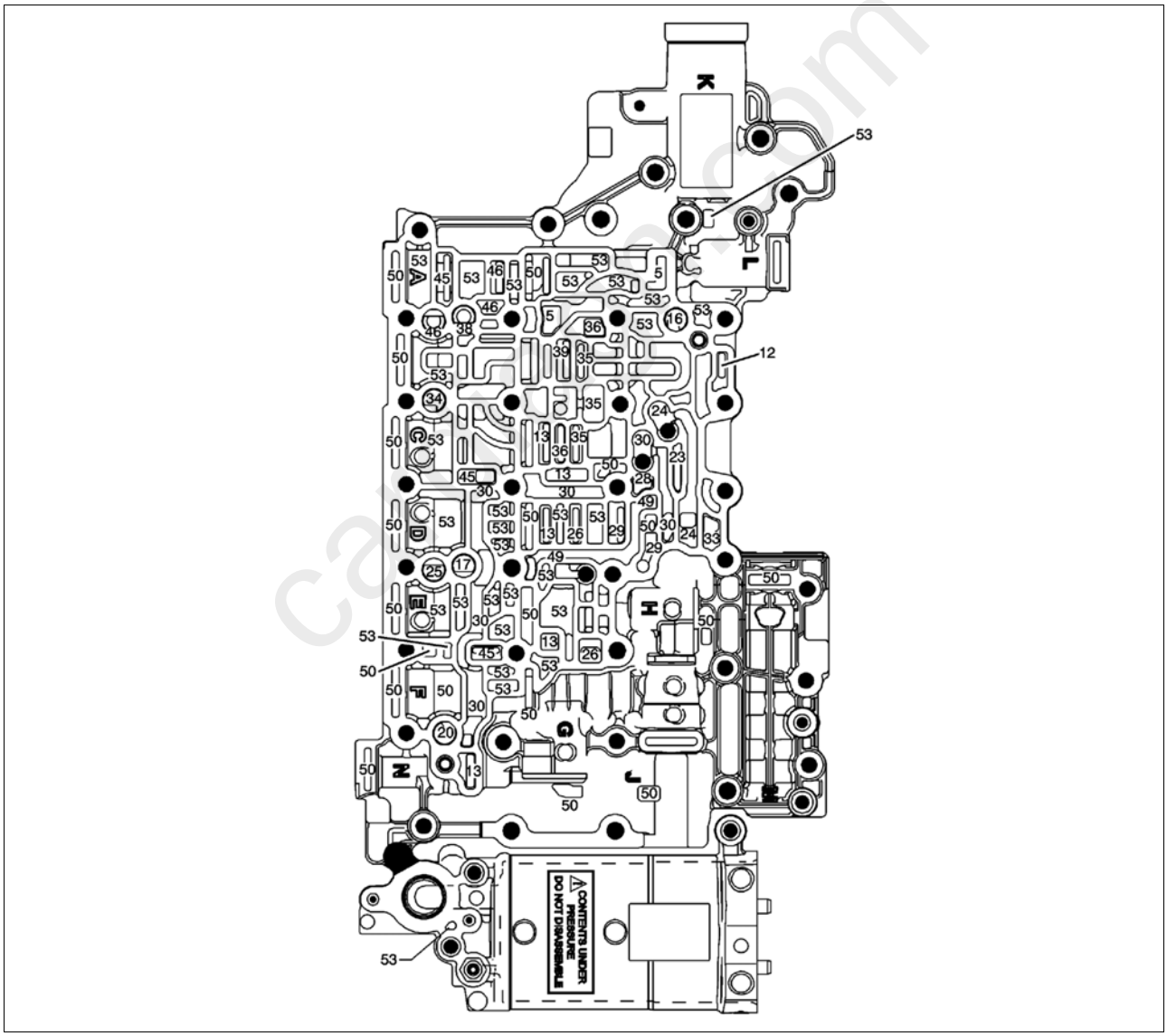
14	Actuator Feed
15	Converter Flow
16	S6 VFS Signal (PCS Line)
17	S1 VFS Signal
18	1278R Clutch
19	1278R Clutch Feedback
20	S2 VFS Signal
22	12345R Clutch Feedback
21	12345R Clutch
23	Reverse
24	23468 Clutch/Reverse
25	S5 VFS Signal
26	45678R Clutch Feed
27	45678R Clutch Drive Feed
28	45678R Clutch
29	45678R Clutch Feedback
30	45678R Clutch/23468 Clutch
31	S9 ON/OFF Boost Signal
32	12345 Clutch Knockdown
33	Drive
34	S3 VFS Signal
35	13567 Clutch Feed
36	13567 Clutch
37	13567 Clutch Feedback
38	S4 VFS Signal
39	23468 Clutch
40	23468 Clutch Feedback
41	12345R Clutch Exhaust
42	S8 ON/OFF Signal
43	Default Latch
44	Default Latch/S9 ON/OFF Signal
45	TCC PTS Enable
46	S7 VFS Signal

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47	TCC Apply
48	TCC Apply Feedback
49	Lube Override
50	Exhaust
53	Void
54	Auxiliary Fluid Signal

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE SOLENOID BODY - CONTROL VALVE CHANNEL PLATE SIDE

Fig 1: Control Valve Solenoid Body - Control Valve Channel Plate Side



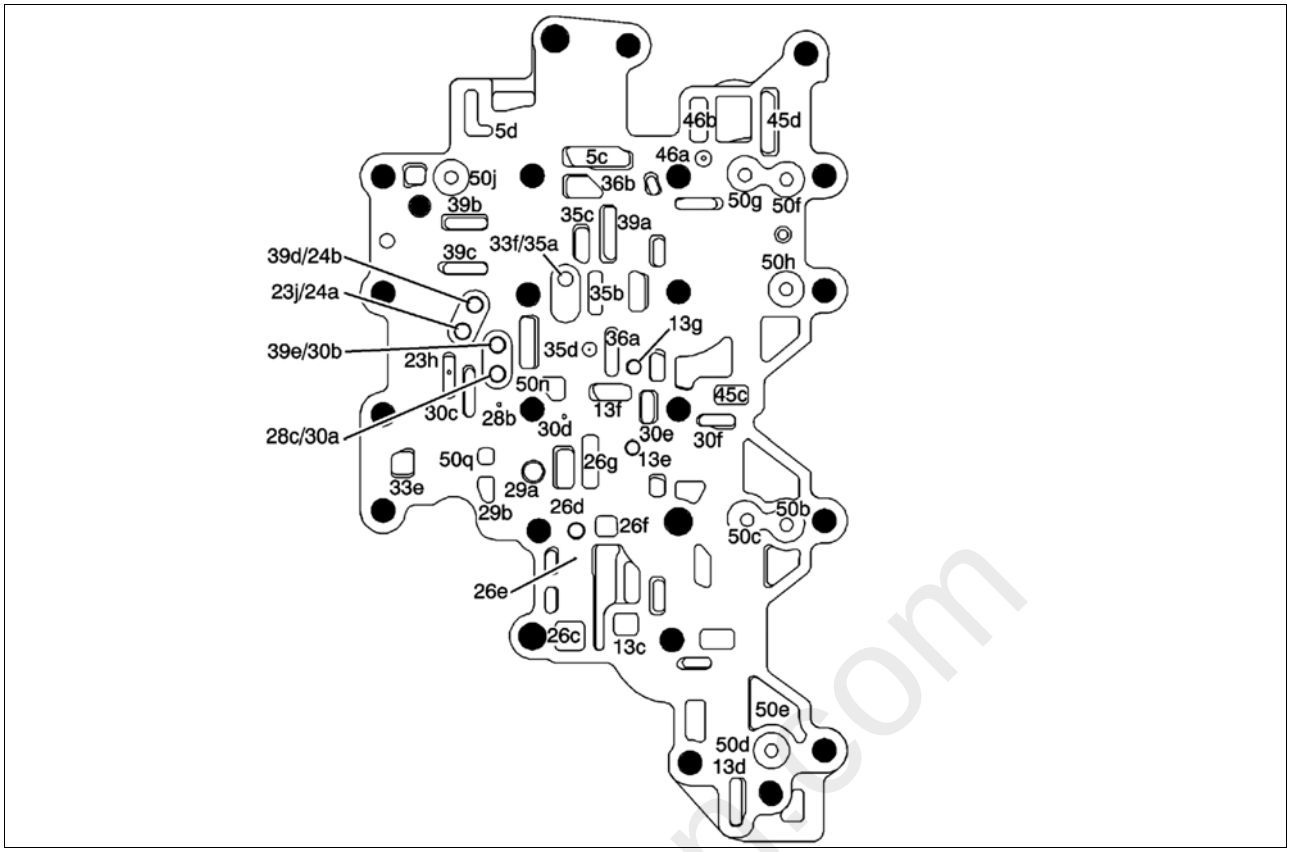
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5	Converter Feed
12	Regulated Lube
13	Exhaust Backfill
16	S6 VFS Signal (PCS Line)
17	S1 VFS Signal
20	S2 VFS Signal
23	Reverse
24	23468 Clutch/Reverse
25	S5 VFS Signal
26	45678R Clutch Feed
28	45678R Clutch
29	45678R Clutch Feedback
30	45678R Clutch/23468 Clutch
33	Drive
34	S3 VFS Signal
35	13567 Clutch Feed
36	13567 Clutch
38	S4 VFS Signal
39	23468 Clutch
45	TCC PTS Enable
46	S7 VFS Signal
49	Lube Override
50	Exhaust
53	Void
54	Auxiliary Fluid Signal

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DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE CHANNEL PLATE SPACER PLATE ASSEMBLY - CONTROL VALVE SOLENOID BODY SIDE

Fig 1: Control Valve Channel Plate Spacer Plate Assembly - Control Valve Solenoid Body Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5c	Converter Feed
5d	Converter Feed
13c	Exhaust Backfill
13d	Exhaust Backfill
13e	Exhaust Backfill
13f	Exhaust Backfill
13g	Exhaust Backfill
23h	Reverse
23j	Reverse
24a	23468 Clutch/Reverse
24b	23468 Clutch/Reverse
26c	45678R Clutch Feed
26d	45678R Clutch Feed
26e	45678R Clutch Feed

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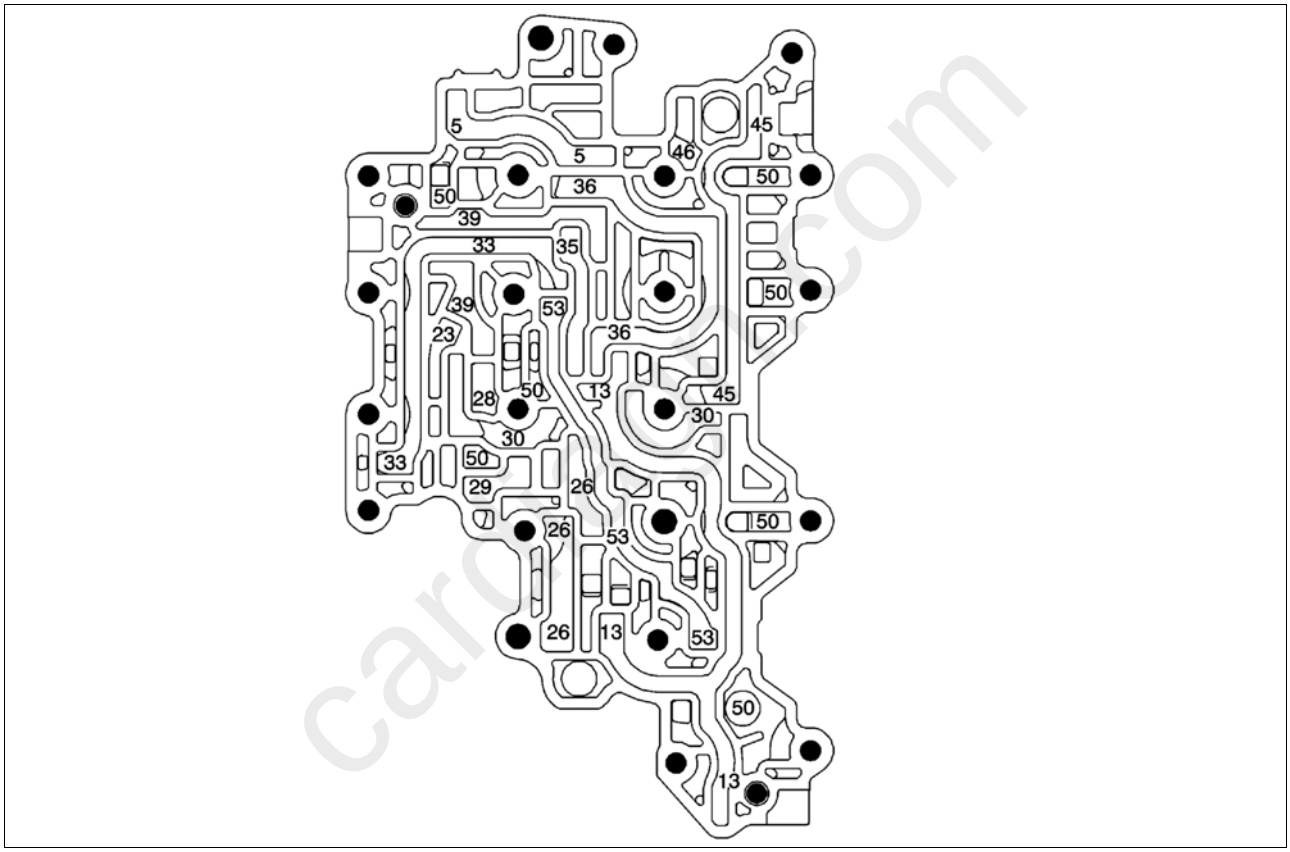
26f	45678R Clutch Feed
26g	45678R Clutch Feed
28b	45678R Clutch
28c	45678R Clutch
29a	45678R Clutch Feedback
29b	45678R Clutch Feedback
30a	45678R Clutch/23468 Clutch
30b	45678R Clutch/23468 Clutch
30c	45678R Clutch/23468 Clutch
30d	45678R Clutch/23468 Clutch
30e	45678R Clutch/23468 Clutch
30f	45678R Clutch/23468 Clutch
33e	Drive
33f	Drive
35b	13567 Clutch Feed
35c	13567 Clutch Feed
35d	13567 Clutch Feed
36a	13567 Clutch
36b	13567 Clutch
39a	23468 Clutch
39b	23468 Clutch
39c	23468 Clutch
39d	23468 Clutch
39e	23468 Clutch
45c	TCC PTS Enable
45d	TCC PTS Enable
46a	S7 VFS Signal
46b	S7 VFS Signal
50b	Exhaust
50c	Exhaust
50d	Exhaust
50e	Exhaust
50f	Exhaust

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50g	Exhaust
50h	Exhaust
50j	Exhaust
50n	Exhaust
50q	Exhaust

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE CHANNEL PLATE - CONTROL VALVE SOLENOID BODY SIDE

Fig 1: Control Valve Channel Plate - Control Valve Solenoid Body Side



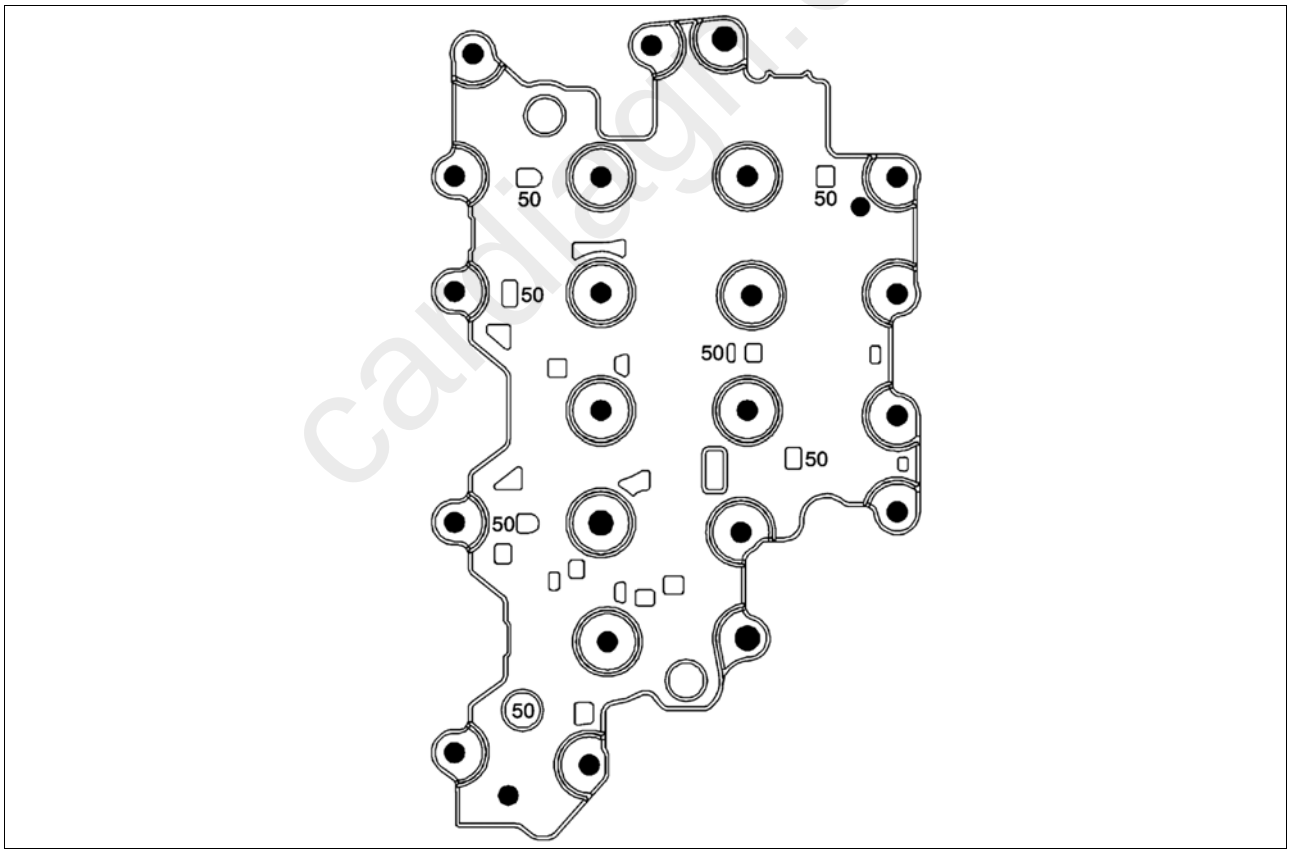
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
5	Converter Feed
13	Exhaust Backfill
23	Reverse
26	45678R Clutch Feed
28	45678R Clutch

29	45678R Clutch Feedback
30	45678R Clutch/23468 Clutch
33	Drive
35	13567 Clutch Feed
36	13567 Clutch
39	23468 Clutch
45	TCC PTS Enable
46	S7 VFS Signal
50	Exhaust
53	Void

DESCRIPTION AND OPERATION > FLUID PASSAGES > CONTROL VALVE CHANNEL PLATE - FLUID PAN SIDE

Fig 1: Control Valve Channel Plate - Fluid Pan Side



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

50	Exhaust

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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - DIAGNOSTIC INFORMATION AND
PROCEDURES

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > DTC DESCRIPTORS

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 P16F4

Control Module Transmission Range Switch Input Circuitry Performance

DTC P16FB

Control Module Speed Signal Analog to Digital Converter Performance

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > CIRCUIT/SYSTEM DESCRIPTION

This diagnostic applies to internal integrity conditions within the transmission control module (TCM). This diagnostic also addresses if the TCM is not programmed.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > CONDITIONS FOR RUNNING THE DTC

- P0601, P0602, P0603, P0604, P0606, P062F, P16F3, P16F4 or P16FB is not set.
- Ignition On.
- Battery voltage is between 9-32 V.
- Ignition voltage is 9 V or greater for 5 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > CONDITIONS FOR SETTING THE DTC

The TCM detects an internal failure or incomplete programming during TCM initialization.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > ACTION TAKEN WHEN THE DTC SETS

P0601, P0603, P0604, P0606, P062F, P16F3 or P16FB

- P0601, P0603, P0604, P0606, P062F, P16F3 and P16FB are Type A DTCs.
- TCM turns Off power to all shift and pressure control solenoids.
- TCC is disabled.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.

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- TCM commands maximum line pressure for all shifts
- TCM request the ECM to limit engine torque based on transmission input speed.
- TCM request the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.

P0602 or P16F4

- P0602 and P16F4 are Type A DTCs.
- No other default action taken.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > CONDITIONS FOR CLEARING THE DTC

P0601, P0602, P0603, P0604, P0606, P062F, P16F3, P16F4 and P16FB are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

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- INLINE HARNESS CONNECTOR END VIEWS - INDEX

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

Electrical Information Reference

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

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > CIRCUIT/SYSTEM VERIFICATION

> *NOTE:*
>
> *Replacing a K71 Transmission Control Module also requires a solenoid valve characterization reprogramming and a transmission service fast learn procedure.*

1. Ignition On.
2. Verify DTC P0602 is not set.
    1. **If the DTC is set**
        1. Program the K71 Control Module.
        2. Verify the DTC does not set.
            1. If the DTC sets, replace the K71 Transmission Control Module.
            1. If the DTC does not set
        3. All OK.
    1. **If the DTC is not set**
3. Ignition OFF and all vehicle systems OFF.
4. Disconnect the connector at the K71 Transmission Control Module.
5. Verify and inspect each connector terminal of the K71 Transmission Control Module and terminals on the wire harness connector.
    1. **If the terminals are not OK**

        Repair or replace as necessary.

    1. **If the terminals are OK**
6. Connect the connector at the K71 Transmission Control Module.
7. Ignition ON.
8. Clear DTC P0601, P0602, P0603, P0604, P0606, P062F, P16F3, P16F4 or P16FB from memory.

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9. Ignition Off and all vehicle system OFF.
10. Ignition ON.
11. 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.
12. Verify DTC P0601, P0602, P0603, P0604, P0606, P062F, P16F3 or P16F4 is not set.
    1. **If any DTC are set**

       Replace the K71 Transmission Control Module.

    1. **If none of the DTCs set**
13. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0601-P0604, P0606, P062F, P16F3, P16F4, OR P16FB: CONTROL MODULE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Solenoid Valve Characterization Reprogramming
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > DTC DESCRIPTORS

DTC P0658

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P0658	P0659	P0659	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > TYPICAL SCAN TOOL DATA

High Side Driver 1

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** On			
High Side Driver 1	Off	On	Off

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CIRCUIT/SYSTEM DESCRIPTION

The high side driver 1 is internal to the transmission control module (TCM). With the ignition On, the high side driver 1 provides 12 V to the transmission control solenoid valve 4, 5 and 8. If excessive current flow is detected in high side driver 1 circuit, the high side driver 1 will turn Off. When the circuit fault is corrected, the high side driver 1 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CONDITIONS FOR RUNNING THE DTC

P0658

- Ignition is On.
- High side driver 1 is On.
- P0658 is not pending for this ignition cycle.

P0659

- Ignition is On.
- P0659 is not pending for this ignition cycle.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CONDITIONS FOR SETTING THE DTC

P0658

TCM has detected a short to ground on the high side driver 1 circuit during TCM initialization.

P0659

TCM has detected a short to voltage on the high side driver 1 circuit during TCM initialization.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > ACTION TAKEN WHEN THE DTC SETS

P0658

- P0658 is a Type A DTC.
- TCM turns Off power to all shift and pressure control solenoids.
- TCM inhibits TCC.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM commands maximum line pressure for all shifts.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- TCM request the ECM to limit engine torque based on transmission input speed.

P0659

- P0659 is a Type C DTC.
- No default actions taken.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CONDITIONS FOR CLEARING THE DTC

DTC P0658 is a Type A DTC

DTC P0659 is a Type C DTC

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

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- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to Circuit/System Testing.
    1. **If On is displayed**
3. Verify the parameters listed below do not display Malfunction when commanding the high side driver 1, On and Off with a scan tool.
    1. High Side Driver 1 Circuit Low Voltage Test Status
    2. High Side Driver 1 Circuit Open Test Status
    3. High Side Driver 1 Circuit High Voltage Test Status
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.
    1. **If Malfunction is not displayed**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.
    1. **If the DTC does not set**
6. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down. Ignition On.
2. Command the high side driver 1 Off.
3. Connect a test lamp between the ignition circuit terminal 18 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module. Ignition

On.

3. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. **If the test lamp illuminates**

       Repair the short to voltage in the ignition circuit.

    1. **If the test lamp does not illuminate**

       Replace the K71 Transmission Control Module.

1. **If the test lamp does not illuminate**

5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 1 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.

    1. **If the test lamp turns On and Off**
7. Perform the Component Testing

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the following solenoids listed below. Refer to Transmission Solenoid Information .
    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5

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3. Q77H Transmission Control Solenoid Valve 8

5. Ignition On.
6. Command the high side driver 1 Off.
7. Connect a test lamp between terminal 2 and ground on each solenoid harness connector for the following solenoids listed below:
    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5
    3. Q77H Transmission Control Solenoid Valve 8
8. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.
        2. Verify a test lamp does not illuminate between the ignition circuit terminal 4 and ground.
            1. If the test lamp illuminates

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp does not illuminate

               Replace the transmission control wiring harness.
    1. **If the test lamp does not illuminate**
9. Connect a test lamp between terminal 2 and ground on each solenoid harness connector for the following solenoids listed below:
    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5
    3. Q77H Transmission Control Solenoid Valve 8
10. Verify the test lamp turns On and Off when commanding the high side driver 1 On and Off with a scan tool for each of the following solenoids listed below:
    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5
    3. Q77H Transmission Control Solenoid Valve 8
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Connect a test lamp between terminal 4 and ground on the automatic transmission wiring harness, electrical connector passage sleeve.

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3. Verify the test lamp turns On and Off when commanding the high side driver 1 On and Off.

    1. If the test lamp is always Off

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If the test lamp turns On and Off

       Replace the transmission control wiring harness.

1. **If the test lamp turns On and Off**

11. Disconnect the test lamp.
12. Test for 4.5-5.5 Ω between the ignition terminal 2 and the control terminal 1 on the following solenoids:

    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5

    1. **If not between 4.5-5.5 Ω**

       Replace the solenoid that is not between 4.5-5.5 Ω.

    1. **If between 4.5-5.5 Ω**

13. Test for 11.0-13.0 Ω between the ignition terminal 2 and the control terminal 1 on the Q77H Transmission Control Solenoid Valve 8.

    1. **If not between 11.0-13.0 Ω**

       Replace the Q77H Transmission Control Solenoid Valve 8.

    1. **If between 11.0-13.0 Ω**

14. Test for infinite resistance between each ignition terminal 1 and ground and then each control terminal 2 and ground on the following solenoids:

    1. Q77D Transmission Control Solenoid Valve 4
    2. Q77E Transmission Control Solenoid Valve 5
    3. Q77H Transmission Control Solenoid Valve 8

    1. **If not infinite resistance**

       Replace the solenoid that has continuity to ground.

    1. **If infinite resistance**

15. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0658 OR P0659: ACTUATOR

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HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Transmission Control Wiring Harness Replacement
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > DTC DESCRIPTORS

DTC P0711

Transmission Fluid Temperature Sensor Performance

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance

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Signal	P0712	P0713	P0713	P0711
Low Reference	P0712	P0713	P0713	P0711

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > TYPICAL SCAN TOOL DATA

Transmission Fluid Temperature Sensor

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** Transmission Fluid Temperature -40° to +130°C (-40° to +266°F)			
Signal	130°C (266°F)	-40° (-40°F)	-40° (-40°F)
Low Reference	130°C (266°F)	-40° (-40°F)	-40° (-40°F)

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid temperature sensor is a 2 wire negative temperature coefficient thermistor. The transmission control module (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 oil in the transmission fluid pan. As the temperature of the fluid increases, the resistance of the sensor decreases, varying the voltage on the signal circuit. The transmission fluid temperature sensor is part of the transmission internal wire harness assembly and has no serviceable parts.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CONDITIONS FOR RUNNING THE DTC

P0711

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0712, P0713, P0716, P0717, P0722, P0723, P077C, P0770 or P2809 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- Transmission fluid temperature is between -40°C to +130°C (-40° to +266°F).

P0712 or P0713

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- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CONDITIONS FOR SETTING THE DTC

P0711 - Condition 1

Transmission fluid temperature rate of change is 15°C (59°F) for 60 s.

P0711 - Condition 2

Transmission fluid temperature rate of change is 10°C (50°F) or greater for 8 s.

P0711 - Condition 3

Transmission fluid temperature change is 0°C (32°F) or less for 300 s.

P0712

Transmission fluid temperature sensor resistance is 47.45 Ω or less for 10 s.

P0713

Transmission fluid temperature sensor resistance is 105445 Ω or greater for 10 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > ACTION TAKEN WHEN THE DTC SETS

P0711, P0712 or P0713 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CONDITIONS FOR CLEARING THE DTC

P0711, P0712 or P0713 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > DIAGNOSTIC AIDS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > REFERENCE INFORMATION

Schematic Reference

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- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid level and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Engine idling at operating temperature.
3. Verify the scan tool Transmission Fluid Temperature parameter is between -40°C to +130°C (-40° to +266°F).
    1. **If not between -40°C to +130°C (-40° to +266°F)**

Refer to Circuit/System Testing.

1. **If between -40°C to +130°C (-40° to +266°F)**

4. Verify the Transmission Fluid Temperature parameter increases greater than 15°C (59°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.

    1. **If the temperature does not increase greater than 2°C (35°F)**

       Refer to Circuit/System Testing.

    1. **If the temperature does increase greater than 2°C (35°F)**

5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.

6. Verify the DTC does not set.

    1. **If the DTC sets**

       Refer to Circuit/System Testing.

    1. **If the DTC does not set**

7. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min. for all vehicle systems to power down.

2. Test for less than 10 Ω between the low reference circuit terminal 11 on the X175 harness connector and ground.

    1. **If 10 Ω or greater**

        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.

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

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

            2. If less than 2 Ω, replace the K71 Transmission Control Module.

    1. **If less than 10 Ω**

3. Ignition On.

4. Test for 4.8-5.2 V between the signal circuit terminal 12 and ground.

    1. **If not between 4.8-5.2 V**

        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control

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Module.

2. Test for infinite resistance between the signal circuit terminal 12 and ground.
    1. If less than infinite resistance, repair the short to ground on the circuit.
    1. If infinite resistance
3. Test for less than 1 Ω in the signal circuit end to end.
    1. If 1 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 1 Ω, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

5. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, remove the transmission fluid pan from the T12 Automatic Transmission Assembly.
3. Disconnect the vehicle harness connector at X175.
4. Remove the automatic transmission wiring harness electrical connector passage sleeve.
5. Disconnect the transmission control wiring harness.
6. Connector a jumper wire between X176 terminal 15 and terminal 16.
7. Test for infinite resistance between X175 terminal 11 and ground.
    1. **If less than infinite resistance**

       Replace the automatic transmission wire harness electrical connector passage sleeve.

    1. **If infinite resistance**
8. Test for less than 2 Ω between X175 terminal 11 and terminal 12.
    1. **If 2 Ω or greater**

       Replace the automatic transmission wire harness electrical connector passage sleeve.

    1. **If less than 2 Ω**

> *NOTE:*
>
> *The B13 Transmission Fluid Temperature Sensor is part of the transmission control wiring harness assembly.*

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9. Replace the B13 Transmission Fluid Temperature Sensor.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve) - Electrical Connector Passage Sleeve
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > DTC DESCRIPTORS

DTC P0716

Input Speed Sensor Performance

DTC P0717

Input Speed Sensor Circuit No Signal

DTC P07BF

Input Speed Sensor Circuit Low Voltage

DTC P07C0

Input Speed Sensor Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > DIAGNOSTIC FAULT INFORMATION

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Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P0717/P07BF	P07C0	P07C0	P0716
Signal	P0717/P07BF	P0717/P07BF	P07C0	P0716

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > TYPICAL SCAN TOOL DATA

Transmission Input Speed

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running **Parameter Normal Range:** 0-7500 RPM			
Transmission Input Speed	0 RPM	0 RPM	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CIRCUIT/SYSTEM DESCRIPTION

The transmission input speed sensor is a 2 wire hall effect sensor. The transmission input speed sensor signal pick up end faces the machined trigger slots on the outside diameter of the 1-3-5-6-7 clutch housing. The 9 V reference circuit is supplied by the transmission control module (TCM) to the input speed sensor. As the 1-3-5-6-7 clutch housing begins to rotate, the transmission input speed sensor produces a square wave signal. As the rotational speed of the clutch housing increases, the number or frequency of the square wave signal increases. The square wave is transmitted back to the TCM on the input speed signal circuit. The TCM uses the input speed signal to calculate transmission input shaft speed. The input, intermediate and output speed sensor signals are used to determine line pressures, shift patterns, gear ratio and torque converter clutch (TCC) apply and release.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CONDITIONS FOR RUNNING THE DTC

P0716

- P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P07BF, or P07C0 is not set.
- Transmission input speed sensor signal is 170 RPM or greater.
- Transmission output speed sensor signal is 214 RPM or greater.
- Accelerator pedal position is 5% or greater.
- Engine torque is between 30-8191 N.m (22-6041 lb ft).

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- Ignition voltage is between 9-32 V.

P0717

- P0101, P0102, P0103, P0716, P0722, P0723, P077C, P0770, P07BF or P07C0 is not set.
- Transmission output speed sensor signal is 214 RPM or greater in 6th, 7th or 8th gear.
- Transmission output speed sensor signal is 68 RPM or greater in 1st, 2nd, 3rd 4th or 5th gear.
- Accelerator pedal position is 5% or greater.
- Engine torque is between 30-8191 N.m (22-6041 lb ft).
- Ignition voltage is between 9-32 V.

P07BF

- P07C0 is not set.
- Battery voltage is between 9-32 V.

P07C0

- P07BF is not set.
- Battery voltage is between 9-32 V.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CONDITIONS FOR SETTING THE DTC

P0716

TCM has detected a 640 RPM or greater drop in the input speed sensor signal for 1.5 s.

P0717

TCM has detected a low transmission input speed sensor signal with high vehicle speed for 4 s.

P07BF

TCM has detected a low transmission input speed sensor signal voltage of 0.25 V or less for 0.05 s.

P07C0

TCM has detected a high voltage input speed sensor voltage of 4.75 V or greater for 0.05 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > ACTION TAKEN WHEN THE DTC SETS

- P0716, P0717, P07BF or P07C0 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.

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- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CONDITIONS FOR CLEARING THE DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-38522 Variable Signal Generator

For equivalent regional tools, refer to Special Tools .

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the scan tool 9V Reference 2 Circuit Status parameter does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
3. Verify the ISS/OSS supply voltage parameter does not display Out of Range.
    1. **If Out of Range is displayed**

       Refer to Circuit/System Testing.

    1. **If Out of Range is not displayed**
4. Engine idling in park position.
5. Verify the scan tool Transmission Input Speed parameter varies with engine speed and does not drop out.
    1. **If the transmission input speed does not vary with engine speed or drops out**

       Refer to Circuit/System Testing.

    1. **If the transmission input speed does vary with engine speed and does not drop out**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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1. **If the DTC does not set**

8. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.8 V between the 9 V reference 2 circuit terminal 27 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the 9 V reference 2 circuit terminal 27 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 2 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.8 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 2 circuit terminal 27 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.8 V**
3. Ignition Off.
4. Connect the red lead of the **J-38522** generator, to the signal circuit terminal 26 and connect the black lead of the **J-38522** generator to ground.
5. Set the **J-38522** generator to the specifications listed below:
    1. Signal switch to 5 V
    2. Frequency switch to 300 Hz

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3. Duty cycle switch to the 50% or the Normal position

6. Ignition On.
7. Verify the scan tool Transmission Input Speed parameter is between 250-280 RPM.
    1. **If not between 250-280 RPM**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the signal circuit terminal 24 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the signal circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If between 250-280 RPM**
8. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Remove the control valve upper body.
6. Disconnect X177 harness connector, ignition On.
7. Test for 8.3-9.8 V between the 9 V reference 2 circuit terminal 4 and ground.
    1. **If not between 8.3-9.8 V**

        Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 8.3-9.8 V**
8. Connect the red lead of the **J-38522** generator to the signal circuit terminal 5 and connect the black lead of the **J-38522** generator to ground.
9. Set the **J-38522** generator to the specifications listed below:

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1. Signal switch to 5 V
2. Frequency switch to 300 Hz
3. Duty cycle switch to the 50% or the Normal position

10. Verify the scan tool transmission input speed parameter is between 250-280 RPM.
    1. **If not between 250-280 RPM**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 250-280 RPM**
11. Remove the B14C Transmission Input Shaft Speed Sensor from the T12 Automatic Transmission Assembly.
12. Verify there is no damage or misalignment with the machine slots on the outside diameter of the 1-3-5-6-7- Clutch housing and the B14C Transmission Input Shaft Speed Sensor.
    1. **If damage or misalignment**

       Repair or replace the necessary components.

    1. **If no damage or misalignment**
13. Replace the B14C Transmission Input Shaft Speed Sensor.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0716, P0717, P07BF, OR P07C0: INPUT SPEED SENSOR > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Body Replacement
- Input and Output Speed Sensor Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > DIAGNOSTIC INSTRUCTIONS

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- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > DTC DESCRIPTORS

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P0723

Output Speed Sensor Circuit Intermittent

DTC P077C

Output Speed Sensor Circuit Low Voltage

DTC P077D

Output Speed Sensor Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P0722/P077C	P077D	P07C0	P0723
Signal	P0722/P077C	P0722/P077C	P07C0	P0723

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > TYPICAL SCAN TOOL DATA

Transmission Output Speed

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, drive range drive wheels rotating **Parameter Normal Range:** 0-7500 RPM			
Transmission Output Speed	0 RPM	0 RPM	-

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CIRCUIT/SYSTEM DESCRIPTION

The transmission output speed sensor is a 2 wire hall effect sensor. The transmission output speed sensor signal pick up end faces the machined trigger slots on the outside diameter of the output carrier assembly. A 9 V reference circuit is supplied by the transmission control module (TCM) to the output speed sensor. As the output carrier assembly begins to rotate, the transmission output speed sensor produces a square wave signal. As the rotational speed of the output carrier assembly increases, the number or frequency of the square wave signal increases. The square wave is transmitted back to the TCM on the transmission output speed sensor signal circuit. The TCM uses the transmission output speed signal to calculate transmission output shaft speed. The input, intermediate and output speed sensor signals are used to determine line pressures, shift patterns, gear ratio and torque converter clutch (TCC) apply and release.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CONDITIONS FOR RUNNING THE DTC

P0722

- P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0723, P077C or P077D is not set.
- Ignition voltage is between 9-32 V.
- Engine speed is between 3500 - 8200 RPM.
- Transmission fluid temperature is 40°C (104°F) or greater.
- Transmission input speed sensor signal is between 175 - 8200 RPM.

P0723

- P077C, P077D, P2771, P279A, P279B or P279C is not set.
- Ignition voltage is between 9-32 V.
- Engine speed is between 400-7500 RPM for 5 s.
- Transmission is in drive or reverse range.
- Transmission output speed sensor signal is 105 RPM or greater.

P077C

- P077C or P077D is not set.
- Battery voltage is between 10 - 32 V.
- Ignition voltage is 10 V or greater.

P077D

- P077C or P077D is not set.

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- Battery voltage is between 10 - 32 V.
- Ignition voltage is 10 V or greater.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CONDITIONS FOR SETTING THE DTC

P0722

TCM has detected the transmission output speed sensor signal is 30 RPM or less for 5 s.

P0723

TCM has detected the transmission output speed sensor signal has drop 1000 RPM or more instantaneously.

P077C

TCM has detected a low transmission output speed sensor signal voltage of 0.25 V for 6.25 ms.

P077D

TCM has detected a high transmission output speed sensor signal voltage of 4.75 V for 12.5 ms.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > ACTION TAKEN WHEN THE DTC SETS

- P0722, P0723, P077C or P077D are Type A DTCs.
- TCM turns Off power to all shift and pressure control solenoids.
- TCM inhibits TCC.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.
- TCM disables transmission adapts learning and freezes current adapt values
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CONDITIONS FOR CLEARING THE DTC

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-38522 Variable Signal Generator

For equivalent regional tools, refer to Special Tools .

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CIRCUIT/SYSTEM VERIFICATION

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1. Ignition On.
2. Verify the scan tool 9 V Reference 1 Circuit Status parameter does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
3. Verify the ISS/OSS supply voltage parameter does not display Out of Range.
    1. **If Out of Range is displayed**

       Refer to Circuit/System Testing.

    1. **If Out of Range is not displayed**
4. Road test the vehicle.
5. Verify the scan tool transmission output speed parameter increases with wheel speed and does not drop out.
    1. **If the transmission output speed does not increase with wheel speed or drops out**

       Refer to Circuit/System Testing.

    1. **If the transmission output speed does increase with wheel speed and does not drop out**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.8 V between the 9 V reference 1 circuit terminal 25 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control

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Module.

2. Test for infinite resistance between the 9 V reference 1 circuit terminal 25 and ground.
    1. If less than infinite resistance, repair the short to ground on the circuit.
    1. If infinite resistance
3. Test for less than 1 Ω in the 9 V reference 1 circuit end to end.
    1. If 1 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 1 Ω, replace the K71 Transmission Control Module.

1. **If greater than 9.8 V**
    1. Ignition Off.
    2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
    3. Test for less than 1 V between the 9 V reference 1 circuit terminal 25 and ground.
        1. If greater than the specified value, repair the short to voltage on the circuit.
        2. If less than the specified value, replace the K71 Transmission Control Module.

1. **If between 8.3-9.8 V**

3. Ignition Off.
4. Connect the red lead of the **J-38522** generator, to the signal circuit terminal 24 and connect the black lead of the **J-38522** generator to ground.
5. Set the **J-38522** generator to the specifications listed below:
    1. Signal switch to 5 V
    2. Frequency switch to 300 Hz
    3. Duty cycle switch to the 50% or the Normal position
6. Ignition On.
7. Verify the scan tool Transmission Output Speed parameter is between 250-280 RPM.
    1. **If not between 250-280 RPM**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the signal circuit terminal 24 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the signal circuit end to end.

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1. If 1 Ω or greater, repair the open/high resistance in the circuit.
2. If less than 1 Ω, replace the K71 Transmission Control Module.

1. **If between 250-280 RPM**

8. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Remove the control valve upper body.
6. Disconnect X177 harness connector, ignition On.
7. Test for 8.3-9.8 V between the 9 V reference 1 circuit terminal 2 and ground.
    1. **If not between 8.3-9.8 V**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 8.3-9.8 V**

8. Connect the red lead of the **J-38522** generator to the signal circuit terminal 1 and connect the black lead of the **J-38522** generator to ground.
9. Set the **J-38522** generator to the specifications listed below:
    1. Signal switch to 5 V
    2. Frequency switch to 300 Hz
    3. Duty cycle switch to the 50% or the Normal position
10. Verify the scan tool transmission input speed parameter is between 250-280 RPM.
    1. **If not between 250-280 RPM**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 250-280 RPM**

11. Remove the B14A Transmission Output Shaft Speed Sensor from the T12 Automatic Transmission Assembly.
12. Verify there is no damage or misalignment with the machine slots on the outside diameter of

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the output carrier and the B14A Transmission Output Shaft Speed Sensor.

1. **If damage or misalignment**

   Repair or replace the necessary components.

1. **If no damage or misalignment**

13. Replace the B14A Transmission Output Shaft Speed Sensor.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0722, P0723, P077C, OR P077D: OUTPUT SPEED SENSOR > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Body Replacement
- Input and Output Speed Sensor Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > DTC DESCRIPTORS

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NOTE:

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

DTC P0746

Transmission Control Solenoid Valve 1 Stuck Off - The 1-2-7-8-Reverse Clutch did not apply due to a hydraulic/mechanical condition.

DTC P0747

Transmission Control Solenoid Valve 1 Stuck On - The 1-2-7-8-Reverse Clutch did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 1 is a low pressure, normally high, variable force solenoid. The transmission control solenoid valve 1 regulates and directs pressurized oil to the 1-2-7-8-Reverse regulator valve. The 1-2-7-8-Reverse regulator valve then directs pressurized oil to the 1-2-7-8-Reverse clutch assembly to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies. The TCM compares the calculated gear ratio to the commanded gear ratio. The calculated and commanded gear ratios must match.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CONDITIONS FOR RUNNING THE DTC

P0746

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.

- Accelerator pedal position signal is 1% or greater.
- Transmission is in drive range.
- Transmission output speed is 100 RPM or greater.

P0747

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Transmission output speed is 100 RPM or greater.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CONDITIONS FOR SETTING THE DTC

P0746

TCM has detected the 1-2-7-8-Reverse Clutch did not apply, resulting in a neutral condition.

P0747

TCM has detected the 1-2-7-8-Reverse Clutch did not release, resulting in a tie-up condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > ACTION TAKEN WHEN THE DTC SETS

P0746 or P0747

- P0746 or P0747 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.

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- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 4th gear, if P0746 sets.
- Transmission shifts to 2nd gear, if P0747 sets.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CONDITIONS FOR CLEARING THE DTC

P0746 and P0747 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range, Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear

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- Electronic Component Description
- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P0746 or P0747 did not set. Refer to Road Test .
    1. **If DTC P0746 or P0747 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P0746 or P0747 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the

vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.

5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

    1. **If the DTC does not set**

6. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P0746 or P0747 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 1 stuck/sticking-debris, binding, damage valve.

P0746 or P0747 - Control Valve Solenoid Body

1-2-7-8-Reverse control valve stuck/sticking - debris, binding, damage valve, scored bore.

P0746 or P0747 - 1-2-7-8-Reverse Clutch

1-2-7-8-Reverse Clutch piston housing retaining ring not seated or clutch piston seals missing or damaged.

P0746 or P0747 - 1-2-7-8-Reverse Clutch

Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- 1-2-7-8 Reverse Clutch Piston Removal
- 1-2-7-8 Reverse Clutch Plate Assembly and Input Sun Gear Assembly Removal
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.

- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > DTC DESCRIPTORS

NOTE:

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

DTC P0776

Transmission Control Solenoid Valve 2 Stuck Off - The 1-2-3-4-5-Reverse Clutch did not apply due to a hydraulic/mechanical condition.

DTC P0777

Transmission Control Solenoid Valve 2 Stuck On - The 1-2-3-4-5-Reverse Clutch did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 2 is a high pressure, normally low, variable force solenoid. The transmission control solenoid valve 2 regulates and directs pressurized oil to the 1-2-3-4-5-Reverse regulator valve. The 1-2-3-4-5-Reverse regulator valve then directs pressurized oil to the 1-2-3-4-5-Reverse clutch assembly to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies. The TCM compares the calculated gear ratio to the commanded gear ratio. The calculated and commanded gear ratios must match.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CONDITIONS FOR RUNNING THE DTC

P0776

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Accelerator pedal position signal is 1% or greater.
- Transmission is in drive range.
- Transmission output speed is 100 RPM or greater.

P0777

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Transmission output speed is 100 RPM or greater.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CONDITIONS FOR SETTING THE DTC

P0776

TCM has detected the 1-2-3-4-5-Reverse Clutch did not apply, resulting in a neutral condition.

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P0777

TCM has detected the 1-2-3-4-5-Reverse Clutch did not release, resulting in a tie-up condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > ACTION TAKEN WHEN THE DTC SETS

P0776 or P0777

- P0776 or P0777 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 6th gear, if P0776 sets.
- Transmission shifts to 2nd gear, if P0777 sets.
- Transmission reverse gear is available.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CONDITIONS FOR CLEARING THE DTC

P0776 and P0777 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range, Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear
- Electronic Component Description
- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P0776 or P0777 did not set. Refer to Road Test .
    1. **If DTC P0776 or P0777 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P0776 or P0777 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P0776 or P0777 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 2 stuck/sticking-debris, binding, damage valve.

P0776 or P0777 - Control Valve Solenoid Body

1-2-3-4-5-Reverse control valve stuck/sticking - debris, binding, damage valve, scored bore.

P0776 or P0777 - 1-2-3-4-5-Reverse Clutch

1-2-3-4-5-Reverse Clutch piston housing retaining ring not seated or clutch piston seals missing or damaged.

P0776 or P0777 - 1-2-3-4-5-Reverse Clutch

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Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement
- Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate Assembly Removal
- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > DTC DESCRIPTORS

NOTE:

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

DTC P0796

Transmission Control Solenoid Valve 3 Stuck Off - The 1-3-5-6-7 Clutch did not apply due to a hydraulic/mechanical condition.

DTC P0797

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Transmission Control Solenoid Valve 3 Stuck On - The 1-3-5-6-7 Clutch did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 3 is a high pressure, normally low, variable force solenoid. The transmission control solenoid valve 3 regulates and directs pressurized oil to the 1-3-5-6-7 regulator valve. The 1-3-5-6-7 regulator valve then directs pressurized oil to the 1-3-5-6-7 clutch assembly to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies. The TCM compares the calculated gear ratio to the commanded gear ratio. The calculated and commanded gear ratios must match.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CONDITIONS FOR RUNNING THE DTC

P0796

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Accelerator pedal position signal is 1% or greater.
- Transmission is in drive range.
- Transmission output speed is 100 RPM or greater.

P0797

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.

- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Transmission output speed is 100 RPM or greater.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CONDITIONS FOR SETTING THE DTC

P0796

TCM has detected the 1-3-5-6-7 Clutch did not apply, resulting in a neutral condition.

P0797

TCM has detected the 1-3-5-6-7 Clutch did not release, resulting in a tie-up condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > ACTION TAKEN WHEN THE DTC SETS

P0796 or P0797

- P0796 or P0797 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 4th gear, if DTC P0796 sets.
- Transmission shifts to 3rd gear, if DTC P0797 sets.
- Transmission reverse gear is available.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CONDITIONS FOR CLEARING THE DTC

P0796 and P0797 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range, Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear
- Electronic Component Description
- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P0796 or P0797 did not set. Refer to Road Test .
    1. **If DTC P0796 or P0797 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P0796 or P0797 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P0796 or P0797 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 3 stuck/sticking-debris, binding, damage valve.

P0796 or P0797 - Control Valve Solenoid Body

1-3-5-6-7 Clutch regulator valve stuck/sticking - debris, binding, damage valve, scored bore.

P0796 or P0797 - 1-3-5-6-7 Clutch Assembly

1-3-5-6-7 Clutch piston housing retaining ring not seated or clutch piston seals missing or damaged.

P0796 or P0797 - 1-3-5-6-7 Clutch

Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- 1-3-5-6-7 Clutch Disassemble
- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > 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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > DTC DESCRIPTOR

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

DTC P1876

Up and Down Shift Enable Circuit Low Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > DIAGNOSTIC FAULT INFORMATION

Driver Shift Control Mode

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Normal Range = None				
Tap Up/Tap Down Switch Signal Circuit	0 V	0 V	5-12 V	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > TYPICAL SCAN TOOL DATA

Driver Shift Control Mode

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, In Drive Range, Manual Mode selected **Parameter Normal Range:** Active/Inactive			

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Signal	Active	Inactive	-
Ground	-	Inactive	Active

Up and Down Shift Switch

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, In Drive Range, Manual Mode selected **Parameter Normal Range:** Active/Inactive, None, Invalid			
Signal	Active	Inactive	None
Ground	Inactive	Inactive	Active

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CIRCUIT/SYSTEM DESCRIPTION

The transmission manual mode shift switches consists of 2 separate switches mounted on the forward facing side of the steering wheel. The 2 switches consist of voltage dropping resistors that are in series - parallel to each other. A 12 V signal circuit is provided by the body control module (BCM). Both the right and left switches are connected to a common chassis ground. The BCM is constantly monitoring the signal circuit for a change in voltage. When either the upshift or downshift switch is momentarily depressed, the voltage will change on the signal circuit. Depending on which switch is depressed, this will indicate either an upshift or downshift to the BCM. A signal is then sent out on the serial data line to the ECM and TCM to perform the desired upshift or downshift.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CONDITIONS FOR RUNNING THE DTC

- U0100, P0815, P0816, P0826, P1761, P182E, P1876, or P1915 is not set.
- The ignition voltage is 8.6 V or greater.
- The engine speed is 400 RPM or greater for 5 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CONDITIONS FOR SETTING THE DTC

P0815 - Condition 1

The BCM detects a stuck On Tap Up switch for 1 s in Park or Neutral.

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P0815 - Condition 2

The BCM detects a stuck On Tap Up switch for 10 min in any forward gear.

P0816 - Condition 1

The BCM detects a stuck On Tap Down switch for 1 s in Park or Neutral.

P0816 - Condition 2

The BCM detects a stuck On Tap Down switch for 10 min in any forward gear.

P0826

The BCM detects an invalid voltage on the TAP up/down signal circuit for 1 min.

P1876

The TCM detects a TAP Enable Switch requests 3 times when not in manual mode range for 2 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > ACTIONS TAKEN WHEN THE DTC SETS

- P0815, P0816, P0826, and P1876 are Type C DTCs.
- The TCM disables TAP shift operation.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CONDITIONS FOR CLEARING THE DTC

P0815, P0816, P0826, and P1876 are Type C DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > REFERENCE INFORMATION

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Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On, place the transmission shift lever into manual mode position.
2. Verify the scan tool driver shift control mode parameter displays Active.
    1. **If the parameter does not display Active**

       Refer to Circuit/System Testing.

    1. **If the parameter does display Active**
3. Verify the scan tool, Up and Down Shift Switch parameter displays Upshift, when pushing rearward on the S2R Transmission Manual Shift Switch - Right.
    1. **If the parameter does not display Upshift**

       Refer to Circuit/System Testing.

    1. **If the parameter does display Upshift**
4. Verify the scan tool, Up and Down Shift Switch parameter displays Downshift, when pushing rearward on the S2L Transmission Manual Shift Switch - Left.
    1. **If the parameter does not display Downshift**

       Refer to Circuit/System Testing.

    1. **If the parameter does display Downshift**

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5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the harness connector at the S2R Transmission Manual Shift - Right. It may take up to 2 min. for all vehicle systems to power down.
2. Test for less than 5 Ω between the ground circuit terminal 2 and ground.
    1. **If 5 Ω or greater**
        1. Ignition Off.
        2. Test for less than 2 Ω in the ground circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the wire circuit.
            2. If less than 2 Ω, repair the open/high resistance in the ground connection.
    1. **If less than 5 Ω**
3. Ignition On.
4. Test for 11.6-12.4 V between the signal circuit terminal 1 and ground.
    1. **If not between 11.6-12.4 V**
        1. Ignition Off. Disconnect the X3 connector at the K9 Body Control Module.
        2. Test for infinite resistance between the signal circuit and ground.
            1. If less than infinite resistance, repair the short to ground in the signal circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the signal circuit end to end.
            1. If greater than 2 Ω, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K9 Body Control Module.

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1. **If between 11.6-12.4 V**

5. Ignition Off.
6. Disconnect the harness connector at the S2L Transmission Manual Shift Switch - Left.
7. Test for less than 2 Ω between terminal 2 on the S2L Transmission Manual Shift Switch - Left harness connector and terminal 3 on the S2R Transmission Manual Shift Switch - Right harness connector.
    1. **If 2 Ω or greater**

        Repair the open/high resistance in the signal circuit between the S2L Transmission Manual Shift Switch - Left and the S2R Transmission Manual Shift Switch - Right.

    1. **If less than 2 Ω**
8. Test for less than 5 Ω between the ground circuit terminal 1 and ground on the S2L Transmission Manual Shift Switch - Left.
    1. **If 5 Ω or greater**
        1. Ignition Off.
        2. Test for less than 2 Ω in the ground circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the wire circuit.
            2. If less than 2 Ω, repair the open/high resistance in the ground connection.

    1. **If less than 5 Ω**
9. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Test for infinite resistance between terminal 1 and terminal 2 on S2R Transmission Manual Shift Switch - Right.
    1. **If not infinite resistance**

        Replace the S2R Transmission Manual Shift Switch - Right.

    1. **If infinite resistance**
3. Test for 600-650 Ω between terminal 1 and terminal 2 on the S2R Transmission Manual Shift Switch - Right, while depressing the switch.
    1. **If not within the specified range**

        Replace the S2R Transmission Manual Shift Switch - Right.

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1. **If within the specified range**

4. Test for 5550-5600 Ω between terminal 1 and terminal 2 on the S2L Transmission Manual Shift Switch - Left.
    1. **If not within the specified range**

       Replace the S2L Transmission Manual Shift Switch - Left.

    1. **If within the specified range**
5. Test for 1350-1400 Ω between terminal 1 and terminal 2 on the S2L Transmission Manual Switch - Left with the switch depressed.
    1. **If not within the specified range**

       Replace the S2L Transmission Manual Shift Switch - Left.

    1. **If within the specified range**
6. Replace the K9 Body Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0815, P0816, P0826, OR P1876: UPSHIFT SWITCH CIRCUIT, DOWNSHIFT SWITCH CIRCUIT, UP AND DOWN SHIFT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Manual Shift Auxiliary Position Switch Replacement - Steering Wheel (Left Side) Manual Shift Auxiliary Position Switch Replacement - Steering Wheel (Right Side)
- Refer to Control Module References for control solenoid valve assembly replacement, programming and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > DTC DESCRIPTOR

DTC P0851

Park/Neutral Position Switch Circuit Low Voltage

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0851	P0851	-	P1915
Ground	-	-	-	P1915

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > TYPICAL SCAN TOOL DATA

Park/Neutral Position Switch

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** Park/Neutral or In Gear			
Signal	Park/Neutral	In Gear	-
Ground	-	In Gear	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CIRCUIT/SYSTEM DESCRIPTION

The park/neutral position switch is internal to and part of the internal mode switch. The park/neutral switch indicates to the engine control module (ECM) if the vehicle is in park/neutral or in a drive gear range. With the ignition On, the ECM provides 12 V on the park/neutral signal to the park/neutral position switch. A separate ground wire from the park/neutral position switch to the Transmission Control Module (TCM) completes the path to ground. When the gear shift lever in park or neutral, the switch closes and drops the voltage on the signal circuit to 0 V. In this state the engine will start and run. In reverse or drive range the park/neutral switch opens, 12 V is then present on the signal circuit which will inhibit engine starting.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CONDITIONS FOR RUNNING THE DTC

- Ignition voltage is between 9-32 V.
- Vehicle speed is 10 km/h (6 mph).

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CONDITIONS FOR SETTING THE DTC

The ECM detects the Park/Neutral signal is less than 1 V, when the transmission internal mode switch reports a drive range.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > ACTION TAKEN WHEN THE DTC SETS

P0851 is Type C DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CONDITIONS FOR CLEARING THE DTC

P0851 is Type C DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > REFERENCE INFORMATION

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CIRCUIT/SYSTEM VERIFICATION

1. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

       Adjust, repair or replace as necessary.
    1. **If the range selector lever cable adjustment is OK**
2. Ignition On.
3. Verify the scan tool Engine Control Module Park/Neutral Position Switch parameter displays Park/Neutral when in Park or Neutral and In Gear when in Reverse or Drive range.
    1. **If Park/Neutral or In Gear is not displayed correctly**

       Refer to Circuit/System Testing.
    1. **If Park/Neutral or In Gear is displayed correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.
    1. **If the DTC does not set**
6. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the ground circuit terminal 30, and ground.

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1. **If 5 Ω or greater**
    1. Disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for less than 2 Ω in the ground circuit end to end.
        1. If 2 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 2 Ω, replace the K71 Transmission Control Module.
1. **If less than 5 Ω**

3. Ignition On.
4. Test for 11-13 V at the signal circuit terminal 35 and ground.
    1. **If not between 11-13 V**
        1. Ignition Off, disconnect the X1 harness connector at the K20 Engine Control Module.
        2. Test for infinite resistance between the harness connector X175, terminal 35 and ground.
            1. If less than infinite resistance, repair the short to ground in the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the signal circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K20 Engine Control Module.
    1. **If between 11-13 V**
5. Connect a 3 A fused jumper wire between signal circuit terminal 35 and the ground circuit terminal 30.
6. Verify the scan tool park/neutral position switch parameter displays Park/Neutral.
    1. **If Park/Neutral is not displayed**

        Replace the K20 Engine Control Module.
    1. **If Park/Neutral is displayed**
7. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, remove the transmission fluid pan from the T12 Automatic Transmission Assembly.
3. Disconnect the harness connector from the B15 Transmission Internal Mode Switch.

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4. Connect a jumper wire between terminal 1 and terminal 2.
5. Disconnect the X176 harness connector.
6. Test for infinite resistance between terminal 12 and ground.
    1. **If less than infinite resistance**

       Replace the transmission control wiring harness.

    1. If infinite
        1. Test for less than 2 Ω between terminal 12 and terminal 20.
        2. If 2 Ω or greater, replace the transmission control wiring harness.

    1. **If infinite resistance**
7. Disconnect the jumper wire.
8. Remove the automatic transmission wiring harness, electrical connector passage sleeve.
9. Connect a jumper wire between terminal 12 and terminal 20.
10. Test for infinite resistance between harness connector X175 terminal 30 and ground.
    1. **If less than infinite resistance**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If infinite
        1. Test for less than 2 Ω between terminal 30 and terminal 35.
        2. If 2 Ω or greater, replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If infinite resistance**
11. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve) - Electrical Connector Passage Sleeve
- Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal - for B15 Transmission Internal Mode Switch replacement.
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.

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- Transmission Control Wiring Harness Replacement
- Refer to Control Module References for control solenoid valve assembly replacement, programming and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > DTC DESCRIPTORS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P0962	P0960	P0963	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > TYPICAL

SCAN TOOL DATA

Transmission Control Solenoid Valve 1 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 1 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 1 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 1 is a low pressure, normally high, variable force solenoid valve. The transmission control module (TCM) high side driver 2, supplies 12 V to the transmission control solenoid valve 1. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P0960

TCM detects an open/high resistance in the transmission control solenoid valve 1 control circuit, for 0.3 s.

P0962

TCM detects a short to ground in the transmission control solenoid valve 1 control circuit, for 0.3 s.

P0963

TCM detects a short to power in the transmission control solenoid valve 1 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P0960 or P0963

- P0960 or P0963 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 2nd or 7th gear depending on vehicle speed.
- Transmission reverse gear is available.

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P0962

- P0962 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P0960, P0962 and P0963 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > REFERENCE INFORMATION

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 1 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 1 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 1 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 1 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963:

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TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
            1. If the test lamp illuminates, repair the short to voltage in the ignition circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
7. Remove the test lamp.
8. Test for 1.8-2.2 V between the transmission control solenoid valve 1 control circuit terminal 5 and ground.

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1. **If less than 1.8 V**
    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for infinite resistance between the control circuit and ground.
        1. If less than infinite resistance, repair the short to ground on the circuit.
        1. If infinite resistance
    3. Test for less than 2 Ω in the control circuit end to end.
        1. If 2 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 2 Ω, replace the K71 Transmission Control Module.
1. **If greater than 2.2 V**

9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77A Transmission Control Solenoid Valve 1. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.

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2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If the test lamp does not illuminate

       Replace the transmission control wiring harness.

1. **If the test lamp does not illuminate**

8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If less than 2 Ω

               Replace the transmission control wiring harness.

    1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.

10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 21 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.

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1. **If greater than 2.2 V**
    1. Ignition Off, disconnect the X176 connector, ignition On.
    2. Test for 1.8-2.2 V at the control circuit terminal 21 and ground.
        1. If greater than 2.2 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        1. If between 1.8-2.2 V

           Replace the transmission control wiring harness.
1. **If between 1.8-2.2 V**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77A Transmission Control Solenoid Valve 1.
    1. **If not between 4.5 - 5.5 Ω**

       Replace the Q77A Transmission Control Solenoid Valve 1.

    1. **If between 4.5 - 5.5 Ω**
12. Test for infinite resistance on the Q77A Transmission Control Solenoid Valve 1, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
        1. **If not infinite resistance**

           Replace the Q77A Transmission Control Solenoid Valve 1.

        1. **If infinite resistance**
13. Replace the K71 Transmission Control Module.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0960, P0962, OR P0963: TRANSMISSION CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Assembly and Transmission Wiring Harness Removal
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal

- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > DTC DESCRIPTORS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P0966	P0964	P0967	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 2 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 2 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 2 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 2 is a high pressure, normally low, variable force solenoid valve. The transmission control module (TCM) high side driver 2, supplies 12 V to the transmission control solenoid valve 2. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.

- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P0964

TCM detects an open/high resistance in the transmission control solenoid valve 2 control circuit, for 0.3 s.

P0966

TCM detects a short to ground in the transmission control solenoid valve 2 control circuit, for 0.3 s.

P0967

TCM detects a short to power in the transmission control solenoid valve 2 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P0964 or P0967

- P0964 or P0967 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

P0966

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- P0966 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 5th gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P0964, P0966 and P0967 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 2 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 2 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 2 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT >

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CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
            1. If the test lamp illuminates, repair the short to voltage in the ignition circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
7. Remove the test lamp.
8. Test for 1.8-2.2 V between the transmission control solenoid valve 2 control circuit terminal 6 and ground.

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1. **If less than 1.8 V**
    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for infinite resistance between the control circuit and ground.
        1. If less than infinite resistance, repair the short to ground on the circuit.
        1. If infinite resistance
    3. Test for less than 2 Ω in the control circuit end to end.
        1. If 2 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 2 Ω, replace the K71 Transmission Control Module.
1. **If greater than 2.2 V**

9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77B Transmission Control Solenoid Valve 2. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.

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2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If the test lamp does not illuminate

       Replace the transmission control wiring harness.

1. **If the test lamp does not illuminate**

8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If less than 2 Ω

               Replace the transmission control wiring harness.

    1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.

10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 22 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.

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1. **If greater than 2.2 V**
    1. Ignition Off, disconnect the X176 connector, ignition On.
    2. Test for 1.8-2.2 V at the control circuit terminal 22 and ground.
        1. If greater than 2.2 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        1. If between 1.8-2.2 V

           Replace the transmission control wiring harness.
1. **If between 1.8-2.2 V**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77B Transmission Control Solenoid Valve 2.
    1. **If not between 4.5-5.5 Ω**

       Replace the Q77B Transmission Control Solenoid Valve 2.

    1. **If between 4.5-5.5 Ω**
12. Test for infinite resistance on the Q77B Transmission Control Solenoid Valve 2, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
        1. **If not infinite resistance**

           Replace the Q77B Transmission Control Solenoid Valve 2.

        1. **If infinite resistance**
13. Replace the K71 Transmission Control Module.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0964, P0966, OR P0967: TRANSMISSION CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal

- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > DTC DESCRIPTORS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P0970	P0968	P0971	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 3 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 3 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 3 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 3 is a high pressure, normally low, variable force solenoid valve. The transmission control module (TCM) high side driver 2 supplies 12 V to the transmission control solenoid valve 3. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.

- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P0968

TCM detects an open/high resistance in the transmission control solenoid valve 3 control circuit, for 0.3 s.

P0970

TCM detects a short to ground in the transmission control solenoid valve 3 control circuit, for 0.3 s.

P0971

TCM detects a short to power in the transmission control solenoid valve 3 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P0968 or P0971

- P0968 or P0971 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

P0970

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- P0970 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 5th gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P0968, P0970, P0971 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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- INLINE HARNESS CONNECTOR END VIEWS - INDEX

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 3 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 3 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 3 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT >

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CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
            1. If the test lamp illuminates, repair the short to voltage on the circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
7. Remove the test lamp.
8. Test for 1.8-2.2 V between the transmission control solenoid valve 3 control circuit terminal 10 and ground.

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1. **If less than 1.8 V**
    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for infinite resistance between the control circuit and ground.
        1. If less than infinite resistance, repair the short to ground on the circuit.
        1. If infinite resistance
    3. Test for less than 2 Ω in the control circuit end to end.
        1. If 2 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 2 Ω, replace the K71 Transmission Control Module.
1. **If greater than 2.2 V**

9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77C Transmission Control Solenoid Valve 3. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.

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2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If the test lamp does not illuminate

       Replace the transmission control wiring harness.

1. **If the test lamp does not illuminate**

8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If less than 2 Ω

               Replace the transmission control wiring harness.

    1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.

10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 13 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.

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1. **If greater than 2.2 V**
    1. Ignition Off, disconnect the X176 connector, ignition On.
    2. Test for 1.8-2.2 V at the control circuit terminal 13 and ground.
        1. If greater than 2.2 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        1. If between 1.8-2.2 V

           Replace the transmission control wiring harness.
1. **If between 1.8-2.2 V**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77C Transmission Control Solenoid Valve 3.
    1. **If not between 4.5-5.5 Ω**

       Replace the Q77C Transmission Control Solenoid Valve 3.

    1. **If between 4.5-5.5 Ω**
12. Test for infinite resistance on the Q77C Transmission Control Solenoid Valve 3, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
        1. **If not infinite resistance**

           Replace the Q77C Transmission Control Solenoid Valve 3.

        1. **If infinite resistance**
13. Replace the K71 Transmission Control Module.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P0968, P0970, OR P0971: TRANSMISSION CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal

- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > DTC DESCRIPTOR

DTC P175F

Acceleration Sensor Signal Message Counter Incorrect

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > CIRCUIT/SYSTEM DESCRIPTION

The Multi-Axis Acceleration sensor sends the amount or rate of acceleration to the Electronic Brake Control Module (EBCM). To improve vehicle performance and transmission shift feel, the EBCM is constantly sending the Transmission Control Module (TCM) serial data messages with information regarding the rate of vehicle acceleration. The TCM sets this DTC when it detects a discrepancy in the structure of the message, causing the signal message integrity to be questioned.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR RUNNING THE DTC

- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- No other serial data errors are present.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR SETTING

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THE DTC

The TCM detects an error in the rolling count value that does not match with the rolling count value sent by the EBCM.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > ACTION TAKEN WHEN THE DTC SETS

- P175F is a Type C DTC.
- The TCM inhibits manual mode shift operation.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR CLEARING THE DTC

P175F is a Type C DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > REFERENCE INFORMATION

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Automatic Transmission Controls Schematics

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- Transmission General Description

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- Wiring Repairs

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > CIRCUIT/SYSTEM VERIFICATION

> *NOTE:*
>
> 1. *P175F is an informational DTC.*
> 2. *Diagnose all other K71 Transmission Control Module and K17 Electronic Brake Control Module DTCs prior to DTC P175F.*

1. Verify there are no other K71 Transmission Control Module or K17 Electronic Brake Control Module DTCs set.
    1. **If a DTC is set**

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

    1. **If a DTC is not set**
2. Complete the diagnosis by looking for a serial data fault. Refer to Scan Tool Does Not Communicate with Low Speed GMLAN Device .
    1. **If a serial data circuit fault is found**

       Repair as necessary.

    1. **If a serial data circuit fault is not found**
3. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Solenoid Valve Characterization Reprogramming
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > DTC DESCRIPTOR

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > CIRCUIT/SYSTEM DESCRIPTION

The driver shift request, also known as the manual mode shift function, allows the driver to select the desired range of gears for current driving conditions. The driver shift request shift system is activated when the gear selector is in the manual position. The driver shift request is deactivated in all other range positions. When driver shift is requested, a signal is sent to the Body Control Module (BCM) and also to the Transmission Control Module (TCM). Each time a signal is sent, an internal counter in the BCM and TCM increments. Both counters must have the same count value. This code sets when the rolling count value of the TCM does not match the same rolling count value sent from the BCM.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR SETTING THE DTC

The TCM detects an error in the rolling count value that does not match with the rolling count value sent by the BCM.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > ACTION TAKEN WHEN THE DTC SETS

- P1761 is a Type C DTC.
- The TCM inhibits manual mode shift operation.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > CONDITIONS FOR CLEARING THE DTC

P1761 is a Type C DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > REFERENCE INFORMATION

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > CIRCUIT/SYSTEM VERIFICATION

> *NOTE:*
>
> 1. *P1761 is an informational DTC.*
> 2. *Diagnose all other K71 Transmission Control Module and K9 Body Control Module DTCs prior to DTC P1761.*

1. Verify with a scan tool, there are no other K71 Transmission Control Module or K9 Body Control Module DTCs set.
    1. **If a DTC is set**

       Refer to Diagnostic Trouble Code (DTC) List - Vehicle .
    1. **If a DTC is not set**
2. Complete the diagnosis by looking for a serial data fault. Refer to Scan Tool Does Not Communicate with Low Speed GMLAN Device .
    1. **If a serial data circuit fault is found**

       Repair as necessary.
    1. **If a serial data circuit fault is not found**
3. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Solenoid Valve Characterization Reprogramming
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > DTC DESCRIPTORS

DTC P1765

Upshift Switch 2 Circuit

DTC P1766

Downshift Switch 2 Circuit

DTC P1767

Up and Down Shift Switch 2 Circuit

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Driver Shift Request

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Normal Range = None				
Tap Up/Tap Down Switch Signal 2 Circuit	0 V	0 V	5-12 V	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The drivers shift control (DSC) also known as the Tap UP/Down feature allows the driver to shift or change gears similar to a manual transmission. Activating the DSC is accomplished by placing the shift

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lever in the manual (M) mode position. To place the shift lever in M position, move the shift lever to the right from the drive (D) position gate. When the shift lever is in the M position an upshift is accomplished pushing the shift lever forward. A downshift is accomplished by pulling back or pushing rearward on the shift lever. A redundant set of Tap Up/Down switches are available on the steering wheel horizontal crossbar facing the instrument panel. The plus (+) switch is located on the right side of the steering wheel and the minus (-) switch is located on the left side of the steering wheel.

The body control module (BCM) supplies and monitors the signal circuit to the Tap Up/Down switches. When a Tap Up/Down switch is activated, the BCM recognizes the voltage change on the signal circuit. The BCM sends the requested shift command on the serial data line to the transmission control module (TCM) to perform the shift.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CONDITIONS FOR RUNNING THE DTC

P1765, P1766, or P1767

- DTCs P1761, P1765, P1766, P1767, P182E, and P1915 are not set.
- Ignition voltage is greater than 8.6 volts.
- The engine speed is greater than 500 RPM for 5 seconds.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CONDITIONS FOR SETTING THE DTC

P1765

The TCM detects a Stuck ON tap up switch for 1 second in PARK, NEUTRAL, and in manual position for 600 seconds, when the tap down switch is depressed.

P1766

The TCM detects a Stuck ON tap down switch for 1 second in PARK, NEUTRAL, and in manual position for 600 seconds when the tap up switch is depressed.

P1767

The TCM detects an invalid voltage on the TAP Up/Down Signal Circuit for 1 minute.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

- DTCs P1765, P1766, and P1767 are Type C DTCs.

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- The TCM disables TAP shift functions.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CONDITIONS FOR CLEARING THE DTC

DTCs P1765, P1766, and P1767 are Type C DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > REFERENCE INFORMATION

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, place the transmission shift lever into manual mode position.
2. Verify the scan tool Up and Down Shift Switch 2 parameter displays Upshift, when pushing rearward on the S2R Transmission Manual Shift Switch - Right.

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1. **If the parameter does not display Upshift**

   Refer to Circuit/System Testing.

1. **If the parameter does display Upshift**

3. Verify the scan tool, Up and Down Shift Switch 2 parameter displays Down Shift when pushing rearward on the S2L Transmission Manual Shift Switch - Left.

   1. **If the parameter does not display Downshift**

      Refer to Circuit/System Testing.

   1. **If the parameter does display Downshift**

4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.

5. Verify the DTC does not set.

   1. **If the DTC sets**

      Refer to Circuit/System Testing.

   1. **If the DTC does not set**

6. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition OFF, and all vehicles systems OFF. Disconnect the harness connector at the S2R Transmission Manual Shift -Right. It may take up to 2 min. for all vehicle systems to power down.

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

   1. **If 5 Ω or greater**

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

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

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

   1. **If less than 5 Ω**

4. Ignition On.

5. Test for 11.6-12.4 V between the signal circuit terminal 1 and ground.

   1. **If not between 11.6-12.4 V**

      1. Ignition OFF, disconnect the X3 connector at the K9 Body Control Module.

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2. Test for infinite resistance between the signal circuit and ground.
    1. If less than infinite resistance, repair the short to ground in the signal circuit.
    1. If infinite resistance
3. Test for less than 2 Ω in the signal circuit end to end.
    1. If greater than 2 Ω, repair the open/high resistance in the circuit.
    2. If less than 2 Ω, replace the K9 Body Control Module.

1. **If between 11.6-12.4 V**

6. Ignition OFF, disconnect the harness connector at the S2L Transmission Shift Switch - Left.
7. Test for less than 2 Ω between terminal 2 on the S2L Transmission Manual Shift Switch - Left harness connector and terminal 3 on the S2R Transmission Manual Shift Switch - Right harness connector.
    1. **If 2 Ω or greater**

       Repair the open/high resistance in the signal circuit between the S2L Transmission Manual Shift Switch - Left and the S2R Transmission Manual Shift Switch - Right.

    1. **If less than 2 Ω**
8. Test for less than 5 Ω between the ground circuit terminal 1 and ground on the S2L Transmission Manual Shift Switch - Left.
    1. **If 5 Ω or greater**
9. Test for less than 2 Ω in the ground circuit end to end.
    1. If 2 Ω or greater, repair the open/high resistance in the wire circuit.
    2. If less than 2 Ω, repair the open/high resistance in the ground connection.
    1. **If less than 5 Ω**
10. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Test for infinite resistance between terminal 1 and terminal 2 on the S2R Transmission Manual Shift Switch - Right.
    1. **If not infinite resistance**

       Replace the S2R Transmission Manual Shift Switch - Right.

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1. **If infinite resistance**

3. Test for 500-700 Ω between terminal 1 and terminal 2 on the S2R Transmission Manual Shift Switch - Right, while depressing the switch.
    1. **If not within the specified range**

       Replace the S2R Transmission Manual Shift Switch - Right.

    1. **If within the specified range**

4. Test for 500-700 Ω between terminal 1 and terminal 3 on the S2R Transmission Manual Shift Switch - Right.
    1. **If not within the specified range**

       Replace the S2R Transmission Manual Shift Switch - Right.

    1. **If within the specified range**

5. Test for 5400-5700 Ω between terminal 1 and terminal 2 on the S2L Transmission Manual Shift - Left.
    1. **If not within the specified range**

       Replace the S2L Transmission Manual Shift Switch - Left.

    1. **If within the specified range**

6. Test for 1200-1500 Ω between terminal 1 and terminal 2 on the S2L Transmission Manual Switch - Left with the switch depressed.
    1. **If not within the specified range**

       Replace the S2L Transmission Manual Shift Switch - Left.

    1. **If within the specified range**

7. Replace the K9 Body Control Module.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1765-P1767: UPSHIFT SWITCH 2 CIRCUIT, DOWNSHIFT SWITCH 2 CIRCUIT, UP AND DOWN SHIFT SWITCH 2 CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Refer to Manual Shift Auxiliary Position Switch Replacement - Steering Wheel (Left Side)Manual Shift Auxiliary Position Switch Replacement - Steering Wheel (Right Side) .
- Refer to Control Module References for body control module replacement, programming, and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > DTC DESCRIPTORS

DTC P176B

Intermediate Speed Sensor Circuit Performance

DTC P176C

Intermediate Speed Sensor Circuit Low Voltage

DTC P176D

Intermediate Speed Sensor Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P176C	P176D	P176D	P176B
Signal	P176C	P176C	P176D	P176B

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Intermediate Speed Sensor

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Drive wheel rotating **Parameter Normal Range:** 0-7500 RPM			
Transmission Intermediate Speed Sensor	0 RPM	0 RPM	-

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The intermediate speed sensor is a 2 wire hall effect sensor. The intermediate speed sensor signal pick up end faces the machined trigger slots on the outside diameter of the reaction carrier/output internal gear assembly. A 9 V reference circuit is supplied by the transmission control module (TCM) to the intermediate speed sensor. As the reaction carrier/output internal gear assembly begins to rotate, the intermediate speed sensor produces a square wave signal. As the rotational speed of the reaction carrier/output internal gear assembly increases, the number or frequency of the square wave signal increases. The square wave is transmitted back to the TCM on the signal circuit. The TCM uses the intermediate speed sensor signal to calculate transmission reaction carrier speed. The input, intermediate and output speed sensor signals are used to determine line pressures, shift patterns, gear ratio and torque converter clutch (TCC) apply and release.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CONDITIONS FOR RUNNING THE DTC

P176B

- P0716, P0717, P0722, P0723, P077C, P077D, P07BF or P07C0 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.

P176C

- P176D is not set.
- Battery voltage is between 9-32 V.

P176D

- P176C is not set.
- Battery voltage is between 9-32 V.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CONDITIONS FOR SETTING THE DTC

P176B Condition 1

TCM has detected the transmission intermediate speed sensor signal of 20 RPM or greater in 1st, 2nd or 3rd gear.

Condition 2

TCM has detected the transmission intermediate speed sensor signal gear slip of 20 RPM or greater in 3rd, 4th, 5th, 6th, 7th or 8th gear.

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P176C

TCM has detected a low transmission intermediate speed sensor signal of 0.25 V for 0.05 s.

P176D

TCM has detected a high transmission intermediate speed sensor signal voltage of 4.75 V for 0.05 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P176B, P176C and P176D are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P176B, P176C and P176D are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > REFERENCE INFORMATION

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Scan Tool Reference

Control Module References for scan tool information

Special Tools

J-38522 Variable Signal Generator

For equivalent regional tools, refer to Special Tools .

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the scan tool 9 V Reference 1 Circuit Status parameter does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
3. Verify the ISS/OSS supply voltage parameter does not display Out of Range.
    1. **If Out of Range is displayed**

       Refer to Circuit/System Testing.

    1. **If Out of Range is not displayed**
4. Road test the vehicle.
5. Verify the scan tool transmission intermediate speed sensor parameter increases with wheel speed and does not drop out.
    1. **If the transmission intermediate speed sensor parameter does not increase with wheel speed or drops out**

       Refer to Circuit/System Testing.

    1. **If the transmission intermediate speed sensor parameter does increase with wheel speed and does not drop out**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

    1. **If the DTC does not set**

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8. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.8 V between the 9 V reference 1 circuit terminal 25 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the 9 V reference 1 circuit terminal 25 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 1 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.8 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 1 circuit terminal 25 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.8 V**
3. Ignition Off.
4. Connect the red lead of the **J-38522** generator, to the signal circuit terminal 32 and connect the black lead of the **J-38522** generator to ground.
5. Set the **J-38522** generator to the specifications listed below:
    1. Signal switch to 5 V
    2. Frequency switch to 300 Hz
    3. Duty cycle switch to the 50% or the Normal position

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6. Ignition ON.
7. Verify the scan tool Intermediate Speed Sensor parameter is between 210-240 RPM.
    1. **If not between the specified range**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the signal circuit terminal 32 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the signal circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If between the specified range**
8. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Remove the control valve upper body.
6. Disconnect X177 harness connector, ignition On.
7. Test for 8.3-9.8 V between the 9 V reference 1 circuit terminal 3 and ground.
    1. **If not between 8.3-9.8 V**

        Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 8.3-9.8 V**
8. Connect the red lead of the **J-38522** generator to the signal circuit terminal 6 and connect the black lead of the **J-38522** generator to ground.
9. Set the **J-38522** generator to the specifications listed below:
    1. Signal switch to 5 V

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2. Frequency switch to 300 Hz
3. Duty cycle switch to the 50% or the Normal position

10. Verify the scan tool transmission input speed parameter is between 210-240 RPM.
    1. **If not between 210-240 RPM**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If between 210-240 RPM**

11. Remove the B14D Transmission Intermediate Shaft Speed Sensor from the T12 Automatic Transmission Assembly.
12. Verify there is no damage or misalignment with the machine slots on the outside diameter of the reaction carrier/output internal ring gear assembly and the B14D Transmission Intermediate Shaft Speed Sensor.
    1. **If damage or misalignment**

       Repair or replace the necessary components.

    1. **If no damage or misalignment**

13. Replace the B14D Transmission Intermediate Shaft Speed Sensor.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P176B-P176D: INTERMEDIATE SPEED SENSOR CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Body Replacement
- Input and Output Speed Sensor Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > DIAGNOSTIC INSTRUCTIONS

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- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > DTC DESCRIPTORS

DTC P1824

Internal Mode Switch P Circuit Low Voltage

DTC P182D

Internal Mode Switch P Circuit High Voltage

DTC P18B8

Internal Mode Switch P Circuit Shorted

DTC P18BD

Internal Mode Switch P Circuit Stuck Off - Invalid Voltage Range

DTC P18C2

Internal Mode Switch P Circuit Stuck On - Invalid Voltage Range

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P1824	P1824	-	-
Signal	P1824	P1824	P182D	P18BA/P18BF

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > TYPICAL SCAN TOOL DATA

Internal Mode Switch P

Circuits	Short to Ground	Open	Short to Voltage

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Operating Conditions: Ignition On
Parameter Normal Range: 9 V Reference Circuit = OK or Not Run. Internal Mode Switch P Signal Circuit 0.70-0.96 V or 1.68-2.38 V.

9 V Reference	Malfunction	Malfunction	Malfunction
Internal Mode Switch P	0 V	0 V	4.8-5.2 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal mode switch consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit, and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each internal mode switch circuit will change and are dependent on the position of the gear selector. The state of each internal mode switch A/B/C/P/S signal circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CONDITIONS FOR SETTING THE DTC

P1824

TCM has detected the internal mode switch P signal circuit voltage is less than 0.7 V, for 1.75 s.

P182D

TCM has detected the internal mode switch P signal circuit voltage is greater than 2.38 V, for 1.75 s.

P18B8

TCM has detected the internal mode switch P signal circuit voltage is between 0.966-1.68 V, for 1.75 s.

P18BD

TCM has detected the internal mode switch P signal circuit has an invalid voltage range of 1.68 - 2.38 V for 2.7 s.

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P18C2

TCM has detected the internal mode switch P signal circuit has an invalid voltage range of 0.70 - 0.96 V for 2.7 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

- P1824, P182D, P18B8, P18BD and P18C2 are Type B DTCs.
- TCM will substitute voltage values for the internal mode switch P signal circuit.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P1824, P182D, P18B8, P18BD and P18C2 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

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- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

       Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**
3. Verify the scan tool the 9 V Reference 1 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
4. Verify the scan tool the internal mode switch A/B/C/P/S signal circuit voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the internal mode switch voltages are not OK**

       Refer to Circuit/System Testing.

    1. **If the internal mode switch voltages are OK**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.3 V between the 9 V reference 1 circuit terminal 31 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for infinite resistance between the 9 V reference 1 circuit terminal 31 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 1 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.3 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 1 circuit terminal 31 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.3 V**
3. Ignition Off.
4. Using the **J-35616** terminal test kit, connect a 3 A fused jumper wire from the 9 V reference 1 circuit terminal 31, to the internal mode switch P signal circuit, terminal 23 at the X175 transmission connector, ignition On.
5. Verify with a scan tool the internal mode switch P signal circuit parameter displays 4.8-5.2 V.
    1. **If greater than 5.2 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.

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2. Test for less than 1 V between the internal mode switch P signal circuit, terminal 23 and ground.
    1. If greater than the specified value, repair the short to voltage on the circuit.
    2. If less than the specified value, replace the K71 Transmission Control Module.

1. **If less than 4.8 V**
    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for infinite resistance between the internal mode switch P signal circuit terminal 23 and ground.
        1. If less than infinite resistance, repair the short to ground on the circuit.
        1. If infinite resistance
    3. Test for less than 1 Ω in the internal mode switch P signal circuit end to end.
        1. If 1 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 1 Ω, replace the K71 Transmission Control Module.
    4. Test for infinite resistance between the internal mode switch P signal circuit and the internal mode switch A/B/C/S signal circuits, at the X175 harness connector.
        1. If less than infinite resistance on any circuit, repair the short between the 2 or more IMS signal circuits.
        2. If infinite resistance, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

6. Perform the Component Testing.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Disconnect the harness connector at the B15 Transmission Internal Mode Switch, ignition On.
6. Test for 8.3-9.4 V between the 9 V reference 1 circuit terminal 10 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off.

2. Disconnect the X176 connector, ignition On.
3. Test for 8.3-9.4 V between terminal 19 and ground.
    1. If less than 8.3 V

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.
    2. If between 8.3-9.4 V

       Replace the transmission control wiring harness.

1. **If greater than 9.3 V**
    1. Ignition Off.
    2. Disconnect the X176 connector, ignition On.
    3. Test for 8.3-9.4 V between terminal 19 and ground.
        1. If greater than 9.4 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.
        2. If between 8.3-9.4 V

           Replace the transmission control wiring harness.

1. **If between 8.3-9.4 V**

7. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 10 and the signal P circuit terminal 9.
8. Verify the scan tool signal P circuit parameter displays 4.8-5.2 V.
    1. **If less than 4.8 V**
        1. Ignition Off.
        2. Disconnect the X176 connector.
        3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal P circuit terminal 17, ignition On.
        4. Verify the scan tool signal P parameter displays 4.8-5.2 V.
            1. If less than 4.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            2. If between 4.8-5.2 V

               Replace the transmission control wiring harness.

    1. **If greater than 5.2 V**

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1. Ignition Off.
2. Disconnect the X176 connector.
3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal P circuit terminal 17, ignition On.
4. Verify the scan tool signal P parameter displays 4.8-5.2 V.
    1. If greater than 5.2 V

       Replace the automatic transmission wiring harness replacement, electrical connector passage sleeve.
    2. If between 4.8-5.2 V

       Replace the transmission control wiring harness.

1. **If between 4.8-5.2 V**

9. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1824, P182D, P18B8, P18BD, OR P18C2: INTERNAL MODE SWITCH P CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Shaft Position Switch Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5,

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P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > DTC DESCRIPTORS

DTC P182A

Internal Mode Switch A Circuit Low Voltage

DTC P1838

Internal Mode Switch A Circuit High Voltage

DTC P18B5

Internal Mode Switch A Circuit Shorted

DTC P18BA

Internal Mode Switch A Circuit Stuck Off - Invalid Voltage Range

DTC P18BF

Internal Mode Switch A Circuit Stuck On - Invalid Voltage Range

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P182A	P182A	-	-
Signal	P182A	P182A	P1838	P18BA/P18BF

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > TYPICAL SCAN TOOL DATA

Internal Mode Switch A

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** 9 V Reference Circuit = OK or Not Run. Internal Mode Switch A Signal Circuit 0.70-0.96 V or 1.68-2.38 V.			
9 V Reference	Malfunction	Malfunction	Malfunction
Internal Mode Switch A	0 V	0 V	4.8-5.2 V

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal mode switch consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each internal mode switch circuit will change and are dependent on the position of the gear selector. The state of each internal mode switch A/B/C/P/S signal circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CONDITIONS FOR SETTING THE DTC

P182A

TCM has detected the internal mode switch A signal circuit voltage is less than 0.7 V, for 1.75 s.

P1838

TCM has detected the internal mode switch A signal circuit voltage is greater than 2.38 V, for 1.75 s.

P18B5

TCM has detected the internal mode switch A signal circuit voltage is between 0.966-1.68 V, for 1.75 s.

P18BA

TCM has detected the internal mode switch A signal circuit has an invalid voltage range of 1.68 - 2.38 V, for 2.7 s.

P18BF

TCM has detected the internal mode switch A signal circuit has an invalid voltage range of 0.70 - 0.96 V, for 2.7 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > ACTION TAKEN WHEN

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THE DTC SETS

- P182A, P1838, P18B5, P18BA and P18BF are Type B DTCs.
- TCM will substitute voltage values for the internal mode switch A signal circuit.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P182A, P1838, P18B5, P18BA and P18BF are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

       Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**
3. Verify the scan tool the 9 V Reference 2 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
4. Verify the scan tool the internal mode switch A/B/C/P/S signal circuit voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the internal mode switch voltages are not OK**

       Refer to Circuit/System Testing.

    1. **If the internal mode switch voltages are OK**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power

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down, ignition On.

2. Test for 8.3-9.3 V between the 9 V reference 2 circuit terminal 29 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for infinite resistance between the 9 V reference 2 circuit terminal 29 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 2 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.3 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 2 circuit terminal 29 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.3 V**
3. Ignition Off.
4. Using the **J-35616** terminal test kit, connect a 3 A fused jumper wire from the 9 V reference 2 circuit terminal 29, to the internal mode switch A signal circuit, terminal 22 at the X175 transmission connector, ignition On.
5. Verify with a scan tool the internal mode switch A signal circuit parameter displays 4.8-5.2 V.
    1. **If greater than 5.2 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for less than 1 V between the internal mode switch A signal circuit, terminal 22 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If less than 4.8 V**

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1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
2. Test for infinite resistance between the internal mode switch A signal circuit terminal 22 and ground.
    1. If less than infinite resistance, repair the short to ground on the circuit.
    1. If infinite resistance
3. Test for less than 1 Ω in the internal mode switch A signal circuit end to end.
    1. If 1 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 1 Ω, replace the K71 Transmission Control Module.
4. Test for infinite resistance between the internal mode switch A signal circuit and the internal mode switch B/C/P/S signal circuits, at the X175 harness connector.
    1. If less than infinite resistance on any circuit, repair the short between the 2 or more internal mode switch signal circuits.
    2. If infinite resistance, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

6. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Disconnect the harness connector at the B15 Transmission Internal Mode Switch, ignition On.
6. Test for 8.3-9.4 V between the 9 V reference 2 circuit terminal 4 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off.
        2. Disconnect the X176 connector, ignition On.
        3. Test for 8.3-9.4 V between terminal 5 and ground.
            1. If less than 8.3 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

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2. If between 8.3-9.4 V

   Replace the transmission control wiring harness.

1. **If greater than 9.3 V**

   1. Ignition Off.
   2. Disconnect the X176 connector, ignition On.
   3. Test for 8.3-9.4 V between terminal 5 and ground.

      1. If greater than 9.4 V

         Replace the automatic transmission wiring harness, electrical connector passage sleeve.

      2. If between 8.3-9.4 V

         Replace the transmission control wiring harness.

1. **If between 8.3-9.4 V**

7. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 4 and the signal A circuit terminal 5.
8. Verify the scan tool signal A circuit parameter displays 4.8-5.2 V.

   1. **If less than 4.8 V**

      1. Ignition Off.
      2. Disconnect the X176 connector.
      3. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 5 and the signal A circuit terminal 2, ignition On.
      4. Verify the scan tool signal A parameter displays 4.8-5.2 V.

         1. If less than 4.8 V

            Replace the automatic transmission wiring harness, electrical connector passage sleeve.

         2. If between 4.8-5.2 V

            Replace the transmission control wiring harness.

   1. **If greater than 5.2 V**

      1. Ignition Off.
      2. Disconnect the X176 connector.
      3. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 5 and the signal A circuit terminal 2, ignition On.
      4. Verify the scan tool signal A parameter displays 4.8-5.2 V.

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1. If greater than 5.2 V

   Replace the automatic transmission wiring harness, electrical connector passage sleeve.

2. If between 4.8-5.2 V

   Replace the transmission control wiring harness.

1. **If between 4.8-5.2 V**

9. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182A, P1838, P18B5, P18BA, OR P18BF: INTERNAL MODE SWITCH A CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Shaft Position Switch Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > DTC DESCRIPTORS

DTC P182B

Internal Mode Switch B Circuit Low Voltage

DTC P182C

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Internal Mode Switch B Circuit High Voltage

DTC P18B6

Internal Mode Switch B Circuit Shorted

DTC P18BB

Internal Mode Switch B Circuit Stuck Off - Invalid Voltage Range

DTC P18C0

Internal Mode Switch B Circuit Stuck On - Invalid Voltage Range

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P182B	P182B	-	-
Signal	P182B	P182B	P182C	P18BB/P18C0

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > TYPICAL SCAN TOOL DATA

Internal Mode Switch B

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** 9 V Reference Circuit = OK or Not Run. Internal Mode Switch B Signal Circuit 0.70-0.96 V or 1.68-2.38 V.			
9 V Reference	Malfunction	Malfunction	Malfunction
Internal Mode Switch B	0 V	0 V	4.8-5.2 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal mode switch consists of 5 separate hall effect switches.

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Each hall effect switch is supplied a 9 V reference circuit and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each internal mode switch circuit will change and are dependent on the position of the gear selector. The state of each internal mode switch A/B/C/P/S signal circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CONDITIONS FOR SETTING THE DTC

P182B

TCM has detected the internal mode switch B signal circuit voltage is less than 0.7 V, for 1.75 s.

P182C

TCM has detected the internal mode switch B signal circuit voltage is greater than 2.38 V, for 1.75 s.

P18B6

TCM has detected the internal mode switch B signal circuit voltage is between 0.966-1.68 V, for 1.75 s.

P18BB

TCM has detected the internal mode switch B signal circuit has an invalid voltage range of 1.68 - 2.38 V for 2.7 s.

P18C0

TCM has detected the internal mode switch B signal circuit has an invalid voltage range of 0.70 - 0.96 V for 2.7 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

- P182B, P182C, P18B6, P18BB and P18C0 are Type B DTCs.
- TCM will substitute voltage values for the internal mode switch B signal circuit.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P182B, P182C, P18B6, P18BB and P18C0 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.

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2. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

       Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**
3. Verify the scan tool the 9 V Reference 1 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
4. Verify the scan tool the internal mode switch A/B/C/P/S circuit signal voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the internal mode switch voltages are not OK**

       Refer to Circuit/System Testing.

    1. **If the internal mode switch voltages are OK**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down. Ignition On.
2. Test for 8.3-9.3 V between the 9 V reference 1 circuit terminal 31 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.

2. Test for infinite resistance between the 9 V reference 1 circuit terminal 31 and ground.
    1. If less than infinite resistance, repair the short to ground on the circuit.
    1. If infinite resistance
3. Test for less than 1 Ω in the 9 V reference 1 circuit end to end.
    1. If 1 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 1 Ω, replace the K71 Transmission Control Module.

1. **If greater than 9.3 V**
    1. Ignition Off.
    2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
    3. Test for less than 1 V between the 9 V reference 1 circuit terminal 31 and ground.
        1. If greater than the specified value, repair the short to voltage on the circuit.
        2. If less than the specified value, replace the K71 Transmission Control Module.

1. **If between 8.3-9.3 V**

3. Ignition Off.
4. Using the **J-35616** terminal test kit, connect a 3 A fused jumper wire from the 9 V reference 1 circuit terminal 31, to the internal mode switch B signal circuit, terminal 28, ignition On.
5. Verify with a scan tool the internal mode switch B signal circuit parameter displays 4.8-5.2 V.

    1. **If greater than 5.2 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for less than 1 V between the internal mode switch B signal circuit, terminal 28 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.

    1. **If less than 4.8 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the internal mode switch B signal circuit terminal 28 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance

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3. Test for less than 1 Ω in the internal mode switch B signal circuit end to end.
    1. If 1 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 1 Ω, replace the K71 Transmission Control Module.
4. Test for infinite resistance between the internal mode switch B signal circuit and the internal mode switch A/C/P/S signal circuits, at the X175 harness connector.
    1. If less than infinite resistance on any circuit, repair the short between the 2 or more internal mode switch signal circuits.
    2. If infinite resistance, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

6. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Disconnect the harness connector at the B15 Transmission Internal Mode Switch, ignition On.
6. Test for 8.3-9.4 V between the 9 V reference 1 circuit terminal 10 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off.
        2. Disconnect the X176 connector, ignition On.
        3. Test for 8.3-9.4 V between terminal 19 and ground.
            1. If less than 8.3 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            2. If between 8.3-9.4 V

               Replace the transmission control wiring harness.
    1. **If greater than 9.3 V**
        1. Ignition Off.
        2. Disconnect the X176 connector, ignition On.

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3. Test for 8.3-9.4 V between terminal 19 and ground.
    1. If greater than 9.4 V

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    2. If between 8.3-9.4 V

       Replace the transmission control wiring harness.

1. **If between 8.3-9.4 V**

7. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 10 and the signal B circuit terminal 8.

8. Verify the scan tool signal B circuit parameter displays 4.8-5.2 V.

    1. **If less than 4.8 V**

        1. Ignition Off.

        2. Disconnect the X176 connector.

        3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal B circuit terminal 3, ignition On.

        4. Verify the scan tool signal B parameter displays 4.8-5.2 V.
            1. If less than 4.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            2. If between 4.8-5.2 V

               Replace the transmission control wiring harness.

    1. **If greater than 5.2 V**

        1. Ignition Off.

        2. Disconnect the X176 connector.

        3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal B circuit terminal 3, ignition On.

        4. Verify the scan tool signal B parameter displays 4.8-5.2 V.
            1. If greater than 5.2 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            2. If between 4.8-5.2 V

               Replace the transmission control wiring harness.

    1. **If between 4.8-5.2 V**

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9. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182B, P182C, P18B6, P18BB, OR P18C0: INTERNAL MODE SWITCH B CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Shaft Position Switch Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > DTC DESCRIPTORS

DTC P182E

Internal Mode Switch Indicates Invalid Range

DTC P1915

Internal Mode Switch Does Not Indicate Park/Neutral During Start

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal A	P182A	P182A	P1838	P182E

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Signal B	P182B	P182B	P182C	P182E
Signal C	P1839	P1839	P182F	P182E
Signal P	P1840	P1840	P1841	P182E
Signal S	P1824	P1824	P182D	P182E
Park/Neutral Signal	P0851	P0851	-	P1915
Park/Neutral Ground	-	-	-	P1915

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > TYPICAL SCAN TOOL DATA

Internal Mode Switch A/B/C/P/S Circuits

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** Internal Mode Switch A/B/C/PS Signal Circuits - High or Low			
Signal A	Low	Low	High
Signal B	Low	Low	High
Signal C	Low	Low	High
Signal P	Low	Low	High
Signal S	Low	Low	High

Park/Neutral Position Switch

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range;** Park/Neutral or In Gear			
Signal	Park/Neutral	In Gear	-
Ground	-	In Gear	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CIRCUIT/SYSTEM DESCRIPTION

The park/neutral position switch and the 5 Hall Effect switches are internal to and part of the internal mode switch assembly.

Park/Neutral Circuit

The park/neutral switch indicates to the engine control module (ECM) if the vehicle is in park/neutral or in

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a drive gear range. With the ignition ON, the ECM provides 12 V on the park/neutral signal to the park/neutral position switch. A separate ground wire from the park/neutral position switch to the Transmission Control Module (TCM) completes the path to ground. When the gear shift lever in park or neutral, the switch closes and drops the voltage on the signal circuit to 0 V. In this state the engine will start and run. In reverse or drive range the park/neutral switch opens, 12 V is then present on the signal circuit which will inhibit engine starting.

Hall Effect Switch Circuits

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal mode switch consists of 5 separate Hall Effect switches. Each Hall Effect switch is supplied a 9 V reference circuit and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each circuit will change and are dependent on the position of the gear selector. The state of each Hall Effect switch circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CONDITIONS FOR RUNNING THE DTC

P182E

- Ignition is On.
- Ignition voltage is between 9-32 V.

P1915

P0722 or P0723 are not set.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CONDITIONS FOR SETTING THE DTC

P182E

The internal mode switch does not indicate a valid Park, Reverse, Neutral or Drive range gear position.

P1915

The internal mode switch Park/Neutral circuit does indicate Park or Neutral during engine start.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > ACTION TAKEN WHEN THE DTC SETS

P182E or P1915

The TCM will substitute values for the Hall Effect and Park/Neutral switch circuits.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CONDITIONS FOR CLEARING THE DTC

P182E and P1915 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CIRCUIT/SYSTEM VERIFICATION

1. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

        Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**

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2. Ignition On.
3. Verify the scan tool Engine Control Module Park/Neutral Position Switch parameter displays Park/Neutral when in Park or Neutral and In Gear when in Reverse or Drive range.
    1. **If Park/Neutral or In Gear is not displayed correctly**

       Refer to Circuit/System Testing.

    1. **If Park/Neutral or In Gear is displayed correctly**
4. Verify the scan tool the 9 V Reference 1 and 9 V Reference 2 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
5. Verify the scan tool the internal mode switch A/B/C/P/S circuit voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the circuit voltages are not OK**

       Refer to Circuit/System Testing.

    1. **If the circuit voltages are OK**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly.
2. Test for less than 5 Ω between the ground circuit terminal 30 and ground.
    1. **If 5 Ω or greater**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.

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2. Test for less than 2 Ω in the ground circuit end to end.
    1. If 2 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 2 Ω, replace the K71 Transmission Control Module.

1. **If less than 5 Ω**

3. Ignition On.
4. Test for 8.3-9.3 V between the 9 V Reference 1 circuit terminal 31 and the 9 V Reference circuit 2 terminal 29 and ground.
    1. **If either circuit is greater than 9.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module. Ignition On.
        2. Test for less than 1 V between the affected 9 V Reference circuit and ground.
            1. If greater than 1 V, repair the short to voltage on the circuit.
            2. If less than 1 V, replace the K71 Transmission Control Module.

    1. **If either circuit is less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module. Ignition On.
        2. Test for infinite resistance between the affected 9 V Reference circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the affected 9 V Reference circuit end to end.
            1. If greater than 2 Ω, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.

    1. **If both circuits are between 8.3-9.3 V**

5. Verify the scan tool Internal Mode Switch A/B/C/P/S parameters display High.
    1. **If not High**
        1. Ignition Off, disconnected the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the affected signal circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            2. If infinite resistance replace the K71 Transmission Control Module.

    1. **If High**

6. Install a 3 A fused jumper wire between the affected circuit and ground.

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7. Verify the scan tool affected circuit parameter displays Low.
    1. **If not Low**
        1. Ignition Off, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for less than 1 V between the affected signal circuit and ground.
            1. If 1 V or greater, repair the short to voltage on the circuit.
            1. If less than 1 V
        3. Test for less than 2 Ω in the signal circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If Low**
8. Test for 11-13 V at the signal circuit terminal 35 and ground.
    1. **If not between 11-13 V**
        1. Ignition Off, disconnect the X1 harness connector at the K20 Engine Control Module.
        2. Test for infinite resistance between the harness connector X175 terminal 35 and ground.
            1. If less than infinite resistance, repair the short to ground in the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the signal circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K20 Engine Control Module.
    1. **If between 11-13 V**
9. Connect a 3 A fused jumper wire between the signal circuit terminal 35 and the ground circuit terminal 30.
10. Verify the scan tool Park/Neutral Position Switch parameter displays Park/Neutral.
    1. **If Park/Neutral is not displayed**

        Replace the K20 Engine Control Module.
    1. **If Park/Neutral is displayed**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL

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MODE SWITCH > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, remove the transmission fluid pan from the T12 Automatic Transmission Assembly.
3. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly.
4. Disconnect the harness connector at the B15 Transmission Internal Mode Switch.
5. Connect a jumper wire between the 9 V Reference 1 circuit terminal 10 and each signal circuit listed below one at a time:
    1. Signal B - Terminal 8
    2. Signal P - Terminal 9
    3. Signal S - Terminal 7
6. Test for infinite resistance between X175 terminal 31 and ground, for each signal circuit.
    1. **If less than infinite resistance**
        1. Remove the jumper wire.
        2. Connect a jumper wire the 9 V Reference 1 circuit terminal 19 and each signal circuit listed below one at a time:
            1. Signal B - Terminal 8
            2. Signal P - Terminal 17
            3. Signal S - Terminal 6
        3. Test for infinite resistance between X175 terminal 31 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            2. If infinite resistance

               Replace the transmission control wiring harness.
    1. **If infinite resistance**
7. Connect a jumper wire between the 9 V Reference 1 circuit terminal 10 and each signal circuit listed below one at a time:
    1. Signal B - Terminal 8
    2. Signal P - Terminal 9
    3. Signal S - Terminal 7
8. Test for less than 2 Ω between X175 and terminal 31 and each signal circuit listed below:
    1. Signal B - Terminal 28

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2. Signal P - Terminal 23
3. Signal S - Terminal 34

1. **If greater than 2 Ω**
    1. Remove the jumper wire.
    2. Connect a jumper wire between the 9 V Reference 1 circuit, X176 terminal 19 and each signal circuit listed below one at a time:
        1. Signal B - Terminal 3
        2. Signal P - Terminal 17
        3. Signal S - Terminal 6
    3. Test for less than 2 Ω between the 9 V Reference 1 circuit, X175 and each signal circuit listed below one at a time.
        1. Signal B - Terminal 28
        2. Signal P - Terminal 23
        3. Signal S - Terminal 34
            1. If greater than 2 Ω

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            2. If less than 2 Ω

               Replace the transmission control wiring harness.

1. **If less than 2 Ω**

9. Connect a jumper wire between the 9 V Reference 2 circuit terminal 4 and each signal circuit listed below one at a time:
    1. Signal A - Terminal 5
    2. Signal C - Terminal 6
10. Test for infinite resistance between X175 terminal 29 and ground, for each signal circuit.
    1. **If less than infinite resistance**
        1. Remove the jumper wire.
        2. Connect a jumper wire from the 9 V Reference 2 circuit terminal 5 and each signal circuit listed below one at a time:
            1. Signal A - Terminal 2
            2. Signal C - Terminal 11
        3. Test for infinite resistance between X175 terminal 29 and ground.

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1. If less than infinite resistance

   Replace the automatic transmission wiring harness, electrical connector passage sleeve.

2. If infinite resistance

   Replace the transmission control wiring harness.

1. **If infinite resistance**

11. Connect a jumper wire between the 9 V Reference 2 circuit, X176 terminal 5 and each signal circuit listed below one at a time:
    1. Signal A - Terminal 2
    2. Signal C - Terminal 11
12. Test for less than 2 Ω between X175 and terminal 29 and each signal circuit listed below:
    1. Signal A - Terminal 22
    2. Signal C - Terminal 21
    1. **If greater than 2 Ω**
       1. Remove the jumper wire.
       2. Connect a jumper wire between the 9 V Reference 2 circuit, X176 terminal 5 and each signal circuit listed below one at a time:
          1. Signal A - Terminal 2
          2. Signal C - Terminal 11
       3. Test for less than 2 Ω between the 9 V Reference 2 circuit, X175 terminal 29 and each signal circuit listed below one at a time:
          1. Signal A - Terminal 22
          2. Signal C - Terminal 21
          1. If greater than 2 Ω

             Replace the automatic transmission wiring harness, electrical connector passage sleeve.

          2. If less than 2 Ω

             Replace the transmission control wiring harness.

    1. **If less than 2 Ω**
13. Connect a jumper wire between terminal 1 and terminal 2.
14. Test for infinite resistance between X176 terminal 12 and ground.
    1. **If less than infinite resistance**

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Replace the transmission control wiring harness.

1. If infinite
    1. Test for less than 2 Ω between terminal 12 and terminal 20.
    2. If 2 Ω or greater, replace the transmission control wiring harness.

1. **If infinite resistance**

15. Disconnect the jumper wire.
16. Connect a jumper wire between X176 terminal 12 and terminal 20.
17. Test for infinite resistance between harness connector X175 terminal 35 and ground.
    1. **If less than infinite resistance**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If infinite
        1. Test for less than 2 Ω between terminal 30 and terminal 35.
        2. If 2 Ω or greater, replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If infinite resistance**
18. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182E OR P1915: INTERNAL MODE SWITCH > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to Control Module References for control solenoid valve assembly replacement, programming and setup.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7,

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P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > DTC DESCRIPTORS

DTC P182F

Internal Mode Switch C Circuit High Voltage

DTC P1839

Internal Mode Switch C Circuit Low Voltage

DTC P18B7

Internal Mode Switch C Circuit Shorted

DTC P18BC

Internal Mode Switch C Circuit Stuck Off - Invalid Voltage Range

DTC P18C1

Internal Mode Switch C Circuit Stuck On - Invalid Voltage Range

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P1839	P1839	-	-
Signal	P1839	P1839	P182F	P18BC/P18C1

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > TYPICAL SCAN TOOL DATA

Internal Mode Switch C

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** 9 V Reference Circuit = OK or Not Run. Internal Mode Switch C Signal Circuit 0.70-0.96 V or 1.68-2.38 V.			
9 V Reference	Malfunction	Malfunction	Malfunction
Internal Mode Switch C Signal	0 V	0 V	4.8-5.2 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each internal mode switch circuit will change and are dependent on the position of the gear selector. The state of each internal mode switch A/B/C/P/S signal circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CONDITIONS FOR SETTING THE DTC

P182F

TCM has detected the internal mode switch C signal circuit voltage is greater than 2.38 V, for 1.75 s.

P1839

TCM has detected the internal mode switch C signal circuit voltage is less than 0.7 V, for 1.75 s.

P18B7

TCM has detected the internal mode switch C signal circuit voltage is between 0.966-1.68 V, for 1.75 s.

P18BC

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TCM has detected the internal mode switch C signal circuit has an invalid voltage range of 1.68 - 2.38 V, for 2.7 s.

P18C1

TCM has detected the internal mode switch C signal circuit has an invalid voltage range of 0.70 - 0.96 V, for 2.7 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

- P182F, P1839, P18B7, P18BC and P18C1 are Type B DTCs.
- TCM will substitute voltage values for the internal mode switch C signal circuit.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P182F, P1839, P18B7, P18BC and P18C1 are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

- Circuit Testing

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

        Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**
3. Verify the scan tool the 9 V Reference 2 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

        Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
4. Verify the scan tool the internal mode switch A/B/C/P/S signal circuit voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the internal mode switch voltages are not OK**

        Refer to Circuit/System Testing.

    1. **If the internal mode switch voltages are OK**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

        Refer to Circuit/System Testing.

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1. **If the DTC does not set**

7. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.3 V between the 9 V reference 2 circuit terminal 29 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for infinite resistance between the 9 V reference 2 circuit terminal 29 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 2 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.3 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 2 circuit terminal 29 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.3 V**
3. Ignition Off.
4. Using the **J-35616** terminal test kit, connect a 3 A fused jumper wire from the 9 V reference 2 circuit terminal 29, to the internal mode switch C signal circuit, terminal 21 at the X175 transmission connector, ignition On.
5. Verify with a scan tool the internal mode switch C signal circuit parameter displays 4.8-5.2 V.

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1. **If greater than 5.2 V**

    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.

    2. Test for less than 1 V between the internal mode switch C signal circuit, terminal 21 and ground.

        1. If greater than the specified value, repair the short to voltage on the circuit.

        2. If less than the specified value, replace the K71 Transmission Control Module.

1. **If less than 4.8 V**

    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.

    2. Test for infinite resistance between the internal mode switch C signal circuit terminal 21 and ground.

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

        1. If infinite resistance

    3. Test for less than 1 Ω in the internal mode switch C signal circuit end to end.

        1. If 1 Ω or greater, repair the open/high resistance in the circuit.

        2. If less than 1 Ω, replace the K71 Transmission Control Module.

    4. Test for infinite resistance between the internal mode switch C signal circuit and the internal mode switch A/B/P/S signal circuits, at the X175 harness connector.

        1. If less than infinite resistance on any circuit, repair the short between the 2 or more internal mode switch signal circuits.

        2. If infinite resistance, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

6. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.

2. Ignition Off.

3. Connect the X175 harness connector.

4. Remove the fluid pan from the T12 Automatic Transmission Assembly.

5. Disconnect the harness connector at the B15 Transmission Internal Mode Switch, ignition On.

6. Test for 8.3-9.4 V between the 9 V reference 2 circuit terminal 4 and ground.

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1. **If less than 8.3 V**
    1. Ignition Off.
    2. Disconnect the X176 connector, ignition On.
    3. Test for 8.3-9.4 V between terminal 5 and ground.
        1. If less than 8.3 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.
        2. If between 8.3-9.4 V

           Replace the transmission control wiring harness.

1. **If greater than 9.3 V**
    1. Ignition Off.
    2. Disconnect the X176 connector, ignition On.
    3. Test for 8.3-9.4 V between terminal 5 and ground.
        1. If greater than 9.4 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.
        2. If between 8.3-9.4 V

           Replace the transmission control wiring harness.

1. **If between 8.3-9.4 V**

7. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 4 and the signal C circuit terminal 6.
8. Verify the scan tool signal C circuit parameter displays 4.8-5.2 V.
    1. **If less than 4.8 V**
        1. Ignition Off.
        2. Disconnect the X176 connector.
        3. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 5 and the signal C circuit terminal 11, ignition On.
        4. Verify the scan tool signal C parameter displays 4.8-5.2 V.
            1. If less than 4.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            2. If between 4.8-5.2 V

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Replace the transmission control wiring harness.

1. **If greater than 5.2 V**

    1. Ignition Off.
    2. Disconnect the X176 connector.
    3. Connect a 3 A fused jumper wire between the 9 V reference 2 circuit terminal 5 and the signal C circuit terminal 11, ignition On.
    4. Verify the scan tool signal C parameter displays 4.8-5.2 V.

        1. If greater than 5.2 V

            Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        2. If between 4.8-5.2 V

            Replace the transmission control wiring harness.

1. **If between 4.8-5.2 V**

9. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P182F, P1839, P18B7, P18BC, OR P18C1: INTERNAL MODE SWITCH C CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Shaft Position Switch Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > DTC DESCRIPTORS

DTC P1840

Internal Mode Switch S Circuit Low Voltage

DTC P1841

Internal Mode Switch S Circuit High Voltage

DTC P18B9

Internal Mode Switch S Circuit Shorted

DTC P18BE

Internal Mode Switch S Circuit Stuck Off - Invalid Voltage Range

DTC P18C3

Internal Mode Switch S Circuit Stuck On - Invalid Voltage Range

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P1840	P1840	-	-
Signal	P1840	P1840	P1841	P18BA/P18BF

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > TYPICAL SCAN TOOL DATA

Internal Mode Switch S

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** 9 V Reference Circuit = OK or Not Run. Internal Mode Switch S Signal Circuit = 0.70-0.96 V or 1.68-2.38 V.			
9 V Reference	Malfunction	Malfunction	Malfunction

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Internal Mode Switch S	0 V	0 V	4.8-5.2 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The internal mode switch consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit and a signal circuit from the TCM. Each signal circuit for each gear selector position will have either a voltage reading of 0.70-0.96 V indicting On or 1.68-2.38 V indicating Off. The voltage values on each internal mode switch circuit will change and are dependent on the position of the gear selector. The state of each internal mode switch A/B/C/P/S signal circuit is displayed on the scan tool.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9-32 V

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CONDITIONS FOR SETTING THE DTC

P1840

TCM has detected the internal mode switch S signal circuit voltage is less than 0.7 V, for 1.75 s.

P1841

TCM has detected the internal mode switch S signal circuit voltage is greater than 2.38 V, for 1.75 s.

P18B9

TCM has detected the internal mode switch S signal circuit voltage is between 0.966-1.68 V, for 1.75 s.

P18BE

TCM has detected the internal mode switch S signal circuit has an invalid voltage range of 1.68 - 2.38 V, for 2.7 s.

P18C3

TCM has detected has an internal mode switch S signal circuit has an invalid voltage range of 0.70 - 0.96 V, for 2.7 s.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

- P1840, P1841, P18B9, P18BE and P18BE are Type B DTCs.
- TCM will substitute voltage values for the internal mode switch S signal circuit.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P1840, P1841, P18B9, P18BE and P18BE are Type B DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the range selector lever cable adjustment is correct. Refer to Range Selector Lever Cable Adjustment .
    1. **If the range selector lever cable adjustment is not OK**

       Adjust, repair or replace as necessary.

    1. **If the range selector lever cable adjustment is OK**
3. Verify the scan tool the 9 V Reference 1 Circuit Status does not display Malfunction.
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.

    1. **If Malfunction is not displayed**
4. Verify the scan tool the internal mode switch A/B/C/P/S signal circuit voltages are correct for Park, Reverse, Neutral, Drive and Manual Mode position. Refer to Transmission Internal Mode Switch Voltage .
    1. **If the internal mode switch voltages are not OK**

       Refer to Circuit/System Testing.

    1. **If the internal mode switch voltages are OK**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > CIRCUIT/SYSTEM

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TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Test for 8.3-9.3 V between the 9 V reference 1 circuit terminal 31 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for infinite resistance between the 9 V reference 1 circuit terminal 31 and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 1 Ω in the 9 V reference 1 circuit end to end.
            1. If 1 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 1 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 9.3 V**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Test for less than 1 V between the 9 V reference 1 circuit terminal 31 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If between 8.3-9.3 V**
3. Ignition Off.
4. Using the **J-35616** terminal test kit, connect a 3 A fused jumper wire from the 9 V reference 1 circuit terminal 31, to the internal mode switch S signal circuit, terminal 34 at the X175 transmission connector, ignition On.
5. Verify with a scan tool the internal mode switch S signal circuit parameter displays 4.8-5.2 V.
    1. **If greater than 5.2 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for less than 1 V between the internal mode switch S signal circuit, terminal 34 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.

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2. If less than the specified value, replace the K71 Transmission Control Module.

1. **If less than 4.8 V**

    1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
    2. Test for infinite resistance between the internal mode switch S signal circuit terminal 34 and ground.
        1. If less than infinite resistance, repair the short to ground on the circuit.
        1. If infinite resistance
    3. Test for less than 1 Ω in the internal mode switch S signal circuit end to end.
        1. If 1 Ω or greater, repair the open/high resistance in the circuit.
        2. If less than 1 Ω, replace the K71 Transmission Control Module.
    4. Test for infinite resistance between the internal mode switch S signal circuit and the internal mode switch A/B/C/P signal circuits, at the X175 harness connector.
        1. If less than infinite resistance on any circuit, repair the short between the 2 or more internal mode switch signal circuits.
        2. If infinite resistance, replace the K71 Transmission Control Module.

1. **If between 4.8-5.2 V**

6. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off.
3. Connect the X175 harness connector.
4. Remove the fluid pan from the T12 Automatic Transmission Assembly.
5. Disconnect the harness connector at the B15 Transmission Internal Mode Switch, ignition On.
6. Test for 8.3-9.4 V between the 9 V reference 1 circuit terminal 10 and ground.
    1. **If less than 8.3 V**
        1. Ignition Off.
        2. Disconnect the X176 connector, ignition On.
        3. Test for 8.3-9.4 V between terminal 19 and ground.
            1. If less than 8.3 V

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Replace the automatic transmission wiring harness, electrical connector passage sleeve.

2. If between 8.3-9.4 V

   Replace the transmission control wiring harness.

1. **If greater than 9.3 V**

   1. Ignition Off.
   2. Disconnect the X176 connector, ignition On.
   3. Test for 8.3-9.4 V between terminal 19 and ground.

      1. If greater than 9.4 V

         Replace the automatic transmission wiring harness, electrical connector passage sleeve.

      2. If between 8.3-9.4 V

         Replace the transmission control wiring harness.

1. **If between 8.3-9.4 V**

7. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 10 and the signal S circuit terminal 7.
8. Verify the scan tool signal S circuit parameter displays 4.8-5.2 V.

   1. **If less than 4.8 V**

      1. Ignition Off.
      2. Disconnect the X176 connector.
      3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal S circuit terminal 6, ignition On.
      4. Verify the scan tool signal S parameter displays 4.8-5.2 V.

         1. If less than 4.8 V

            Replace the automatic transmission wiring harness, electrical connector passage sleeve.

         2. If between 4.8-5.2 V

            Replace the transmission control wiring harness.

   1. **If greater than 5.2 V**

      1. Ignition Off.
      2. Disconnect the X176 connector.
      3. Connect a 3 A fused jumper wire between the 9 V reference 1 circuit terminal 19 and the signal S circuit terminal 6, ignition On.

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4. Verify the scan tool signal S parameter displays 4.8-5.2 V.

    1. If greater than 5.2 V

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    2. If between 4.8-5.2 V

       Replace the transmission control wiring harness.

1. **If between 4.8-5.2 V**

9. Replace the B15 Transmission Internal Mode Switch.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P1840, P1841, P18B9, P18BE, OR P18C3: INTERNAL MODE SWITCH S CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Manual Shift Shaft Position Switch Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > DTC DESCRIPTORS

DTC P2670

Actuator High Control Circuit Group 2 Low Voltage

DTC P2671

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2670	P2671	P2670	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > TYPICAL SCAN TOOL DATA

High Side Driver 2

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** On			
High Side Driver 2	Off	On	Off

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CIRCUIT/SYSTEM DESCRIPTION

The high side driver 2 is internal to the transmission control module (TCM). With the ignition ON, the high side driver 2 provides 12 V to the transmission control solenoid valve 1, 2, 3, 6, 7 and 9. If excessive current flow is detected in the high side driver 2 circuit, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CONDITIONS FOR RUNNING THE DTC

P2670

- Ignition is On.
- High side driver 1 is On.
- P2670 is not pending for this ignition cycle.

P2671

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- Ignition is On.
- P2671 is not pending for this ignition cycle.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CONDITIONS FOR SETTING THE DTC

P2670

TCM has detected a short to ground on the high side driver 2 circuit during TCM initialization.

P2671

TCM has detected a short to voltage on the high side driver 2 circuit during TCM initialization.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > ACTION TAKEN WHEN THE DTC SETS

P2670

- P2670 is a Type A DTC.
- TCM turns Off power to all shift and pressure control solenoids.
- TCM inhibits TCC.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM commands maximum line pressure for all shifts.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- TCM request the ECM to limit engine torque based on transmission input speed.

P2671

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- P2671 is a Type C DTC.
- No default actions taken.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CONDITIONS FOR CLEARING THE DTC

P2670 is a Type A DTC

P2671 is a Type C DTC

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > REFERENCE INFORMATION

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CIRCUIT/SYSTEM VERIFICATION

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

       Refer to Circuit/System Testing.
    1. **If On is displayed**
3. Verify the parameters listed below do not display Malfunction when commanding the high side driver 2, On and Off with a scan tool.
    1. High Side Driver 2 Circuit Low Voltage Test Status
    2. High Side Driver 2 Circuit Open Test Status
    3. High Side Driver 2 Circuit High Voltage Test Status
    1. **If Malfunction is displayed**

       Refer to Circuit/System Testing.
    1. **If Malfunction is not displayed**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.
    1. **If the DTC does not set**
6. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down. Ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**

1. Ignition Off.
2. Disconnect the harness connector at the K71 Transmission Control Module. Ignition On.
3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
    1. **If the test lamp illuminates**

       Repair the short to B+ in the ignition circuit.
    1. **If the test lamp does not illuminate**

       Replace the K71 Transmission Control Module.

1. **If the test lamp does not illuminate**

5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.

    1. **If the test lamp turns On and Off**

7. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the following solenoids listed below. Refer to Transmission Solenoid Information .

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1. Q77A Transmission Control Solenoid Valve 1
2. Q77B Transmission Control Solenoid Valve 2
3. Q77C Transmission Control Solenoid Valve 3
4. Q77F Transmission Control Solenoid Valve 6
5. Q77G Transmission Control Solenoid Valve 7
6. Q77J Transmission Control Solenoid Valve 9

5. Ignition On.
6. Command the high side driver 2 Off.
7. Connect a test lamp between terminal 2 and ground on each solenoid harness connector for the following solenoids listed below:
    1. Q77A Transmission Control Solenoid Valve 1
    2. Q77B Transmission Control Solenoid Valve 2
    3. Q77C Transmission Control Solenoid Valve 3
    4. Q77F Transmission Control Solenoid Valve 6
    5. Q77G Transmission Control Solenoid Valve 7
    6. Q77J Transmission Control Solenoid Valve 9
8. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.
        2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
            1. If the test lamp illuminates

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp does not illuminate

               Replace the transmission control wiring harness.

    1. **If the test lamp does not illuminate**
9. Connect a test lamp between terminal 2 and ground on each solenoid harness connector for the following solenoids listed below:
    1. Q77A Transmission Control Solenoid Valve 1
    2. Q77B Transmission Control Solenoid Valve 2
    3. Q77C Transmission Control Solenoid Valve 3

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4. Q77F Transmission Control Solenoid Valve 6
5. Q77G Transmission Control Solenoid Valve 7
6. Q77J Transmission Control Solenoid Valve 9

10. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool for each of the following solenoids listed below:
    1. Q77A Transmission Control Solenoid Valve 1
    2. Q77B Transmission Control Solenoid Valve 2
    3. Q77C Transmission Control Solenoid Valve 3
    4. Q77F Transmission Control Solenoid Valve 6
    5. Q77G Transmission Control Solenoid Valve 7
    6. Q77J Transmission Control Solenoid Valve 9

    1. **If the test lamp is always Off**

        1. Ignition Off, disconnect the X176 harness connector.
        2. Connect a test lamp between terminal 18 and ground on the automatic transmission wiring harness, electrical connector passage sleeve.
        3. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off.

            1. If the test lamp is always Off

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp turns On and Off

               Replace the transmission control wiring harness.

    1. **If the test lamp turns On and Off**

11. Disconnect the test lamp.
12. Test for 4.5-5.5 Ω between the ignition terminal 2 and the control terminal 1 on the following solenoids:
    1. Q77A Transmission Control Solenoid Valve 1
    2. Q77B Transmission Control Solenoid Valve 2
    3. Q77C Transmission Control Solenoid Valve 3
    4. Q77F Transmission Control Solenoid Valve 6
    5. Q77G Transmission Control Solenoid Valve 7

    1. **If not between 4.5-5.5 Ω**

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Replace the solenoid that is not between 4.5-5.5 Ω.

1. **If between 4.5-5.5 Ω**

13. Test for 11.0-13.0 Ω between the ignition terminal 2 and the control terminal 1 on the Q77J Transmission Control Solenoid Valve 9.
    1. **If not between 11.0-13.0 Ω**

       Replace the Q77J Transmission Control Solenoid Valve 9.

    1. **If between 11.0-13.0 Ω**
14. Test for infinite resistance between each ignition terminal 1 and ground and then each control terminal 2 and ground on the following solenoids:
    1. Q77A Transmission Control Solenoid Valve 1
    2. Q77B Transmission Control Solenoid Valve 2
    3. Q77C Transmission Control Solenoid Valve 3
    4. Q77F Transmission Control Solenoid Valve 6
    5. Q77G Transmission Control Solenoid Valve 7
    6. Q77J Transmission Control Solenoid Valve 9

    1. **If not infinite resistance**

       Replace the solenoid that has continuity to ground.

    1. **If infinite resistance**
15. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2670 OR P2671: ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement
- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Control Valve Body Replacement
- Transmission Control Wiring Harness Replacement
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > DTC DESCRIPTORS

NOTE:

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

DTC P2714

Transmission Control Solenoid Valve 4 Stuck Off - The 2-3-4-6-8 clutch did not apply due to a hydraulic/mechanical condition.

DTC P2715

Transmission Control Solenoid Valve 4 Stuck On - The 2-3-4-6-8 clutch did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 4 is a high pressure, normally high, variable force solenoid. The transmission control solenoid valve 4 regulates and directs pressurized oil to the 2-3-4-6-8 clutch regulator valve. The 2-3-4-6-8 clutch regulator valve then directs pressurized oil to the 2-3-4-6-8 Clutch assembly to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies. The TCM compares the calculated gear ratio to the commanded gear ratio. The calculated and commanded gear ratios must match.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CONDITIONS FOR RUNNING THE DTC

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P2714

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Accelerator pedal position signal is 1% or greater.
- Transmission is in drive range.
- Transmission output speed is 100 RPM or greater.

P2715

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Transmission output speed is 100 RPM or greater.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CONDITIONS FOR SETTING THE DTC

P2714

TCM has detected the 2-3-4-6-8 Clutch did not apply, resulting in a neutral condition.

P2715

TCM has detected the 2-3-4-6-8 Clutch did not release, resulting in tie-up condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > ACTION TAKEN WHEN THE DTC SETS

P2714 or P2715

- P2714 or P2715 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 5th gear, if P2714 sets.
- Transmission shifts to 4th gear, if P2715 sets.
- Transmission reverse gear is available.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CONDITIONS FOR CLEARING THE DTC

P2714 and P2715 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > REFERENCE INFORMATION

Schematic Reference

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P2714 or P2715 did not set. Refer to Road Test .
    1. **If DTC P2714 or P2715 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P2714 or P2715 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P2714 or P2715 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 4 stuck/sticking-debris, binding, damage valve.

P2714 or P2715 - Control Valve Solenoid Body

2-3-4-6-8 Clutch regulator valve stuck/sticking - debris, binding, damage valve, scored bore.

P2714 or P2715 - 2-3-4-6-8 Clutch

2-3-4-6-8 Clutch piston housing retaining ring not seated or clutch piston seals missing or damaged.

P2714 or P2715 - 2-3-4-6-8 Clutch

Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Disassemble
- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > DTC DESCRIPTORS

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P0658	P0659	P0659	-
Control	P2720	P2718	P2721	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 4 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 4 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage

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Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 4 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			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 4 is a high pressure, normally high, variable force solenoid valve. The transmission control module (TCM) high side driver 1, supplies 12 V to the transmission control solenoid valve 4. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 1 will turn Off. When the circuit fault is corrected, the high side driver 1 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 1 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P2718

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TCM detects an open/high resistance in the transmission control solenoid valve 4 control circuit, for 0.3 s.

P2720

TCM detects a short to ground in the transmission control solenoid valve 4 control circuit, for 0.3 s.

P2721

TCM detects a short to power in the transmission control solenoid valve 4 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P2718 or P2721

- P2718 or P2721 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

P2720

- P2720 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.

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- TCM request the ECM to disable auto stop function.
- Transmission shifts to 5th gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P2718, P2720 and P2721 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > REFERENCE INFORMATION

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 4 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 4 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 4 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 1 Off.
3. Connect a test lamp between the ignition circuit terminal 18 and ground.
4. Verify the test lamp does not illuminate.
        1. **If the test lamp illuminates**
            1. Ignition Off.

2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
3. Command the high side driver 1 Off.
4. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates, repair the short to voltage in the circuit.
    2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.

1. **If the test lamp does not illuminate**

5. Verify the test lamp turns On and Off when commanding the high side driver On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
6. Disconnect the test lamp.
7. Test for less than 1 V between the control circuit terminal 13 and ground.
    1. **If 1 V or greater**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        2. Test for less than 1 V between the control circuit terminal 13 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If less than 1 V**
8. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
9. Test for less than 2 Ω in the control circuit end to end.
    1. **If 2 Ω or greater**

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Repair the open/high resistance in the circuit.

1. **If less than 2 Ω**

10. Test for infinite resistance between terminal 13 and ground.

    1. **If less than infinite resistance**

       Repair the short to ground in the circuit.

    1. **If infinite resistance**

11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, remove the fluid pan from the T12 Automatic Transmission Assembly.
3. Disconnect the harness connector at the Q77D Transmission Control Solenoid Valve 4. Refer to Transmission Solenoid Information .
4. Connect a jumper wire between terminal 1 and terminal 2 of the Q77D Transmission Control Solenoid Valve 4 harness connector.
5. Disconnect the X176 harness connector.
6. Test for less than 2 Ω on X176 connector terminal 4 and terminal 9.

    1. **If greater than 2 Ω**

       Replace the transmission control wiring harness.

    1. **If less than 2 Ω**

7. Disconnect the jumper wire.
8. Remove the automatic transmission wiring harness, electrical connector passage sleeve.
9. Connect a jumper wire between X176 harness connector terminal 4 and terminal 9.
10. Test for less than 2 Ω between X175 connector terminal 13 and terminal 18.

    1. **If greater than 2 Ω**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If less than 2 Ω**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77D Transmission Control Solenoid Valve 4.

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1. **If not between 4.5-5.5 Ω**

   Replace the Q77D Transmission Control Solenoid Valve 4.

1. **If between 4.5-5.5 Ω**

12. Test for infinite resistance on the Q77D Transmission Control Solenoid Valve 4, as listed below:

    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground

    1. **If not infinite resistance**

       Replace the Q77D Transmission Control Solenoid Valve 4.

    1. **If infinite resistance**

13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2718, P2720, OR P2721: TRANSMISSION CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > DTC DESCRIPTORS

NOTE:

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

DTC P2723

Transmission Control Solenoid Valve 5 Stuck Off - The 4-5-6-7-8-Reverse Clutch did not apply due to a hydraulic/mechanical condition.

DTC P2724

Transmission Control Solenoid Valve 5 Stuck On - The 4-5-6-7-8-Reverse Clutch did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 5 is a low pressure, normally high, variable force solenoid. The transmission control solenoid valve 5 regulates and directs pressurized oil to the 4-5-6-7-8-Reverse regulator valve. The 4-5-6-7-8-Reverse regulator valve then directs pressurized oil to the 4-5-6-7-8-Reverse clutch assembly to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies. The TCM compares the calculated gear ratio to the commanded gear ratio. The calculated and commanded gear ratios must match.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CONDITIONS FOR RUNNING THE DTC

P2723

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E, P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.

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- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Accelerator pedal position signal is 1% or greater.
- Transmission is in drive range.
- Transmission output speed is 100 RPM or greater.

P2724

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E, P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- High side driver 1 is On.
- High side driver 2 is On.
- Transmission output speed is 100 RPM or greater.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CONDITIONS FOR SETTING THE DTC

P2723

TCM has detected the 4-5-6-7-8-Reverse clutch did not apply, resulting in a neutral condition.

P2724

TCM has detected the 4-5-6-7-8-Reverse clutch did not release, resulting in a tie-up condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > ACTION TAKEN WHEN THE DTC SETS

P2723 or P2724

- P2723 or P2724 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.

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- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 3rd gear, if P2723 sets.
- Transmission shifts to 4th gear, if P2724 sets.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CONDITIONS FOR CLEARING THE DTC

P2723 and P2724 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

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- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear
- Electronic Component Description
- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P2723 or P2724 did not set. Refer to Road Test .
    1. **If DTC P2723 or P2724 did set and the transmission does not shift correctly**

Refer to Circuit/System Testing.

1. **If DTC P2723 or P2724 did not set and the transmission shifts correctly**

4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P2723 or P2724 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 5 stuck/sticking-debris, binding, damage valve.

P2723 or P2724 - Control Valve Solenoid Body

4-5-6-7-8-Reverse Clutch regulator valve stuck/sticking - debris, binding, damage valve, scored bore.

P2723 or P2724 - 4-5-6-7-8-Reverse Clutch Assembly

4-5-6-7-8-Reverse Clutch piston housing retaining ring not seated or clutch piston seals missing or damaged.

P2723 or P2724 - 4-5-6-7-8-Reverse Clutch

Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Disassemble
- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement

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- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > DTC DESCRIPTORS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P0658	P0659	P0659	-
Control	P2729	P2727	P2730	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 5 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 5 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 5 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 5 is a low pressure, normally high, variable force solenoid valve. The transmission control module (TCM) high side driver 1, supplies 12 V to the transmission control solenoid valve 5. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 1 will turn Off. When the circuit fault is corrected, the high side driver 1 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730:

TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 1 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P2727

TCM detects an open/high resistance in the transmission control solenoid valve 5 control circuit, for 0.3 s.

P2729

TCM detects a short to ground in the transmission control solenoid valve 5 control circuit, for 0.3 s.

P2730

TCM detects a short to power in the transmission control solenoid valve 5 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P2727 or P2730

- P2727 or P2730 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.

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- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

P2729

- P2729 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits manual up/manual down function.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 3rd gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P2727, P2729 and P2730 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Electronic Component Description

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- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 5 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 5 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 5 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 1 Off.
3. Connect a test lamp between the ignition circuit terminal 18 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground at the transmission case.
            1. If the test lamp illuminates, repair the short to voltage in the circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Verify the test lamp turns On and Off when commanding the high side driver On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
6. Disconnect the test lamp.

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7. Test for 1 V between the control circuit terminal 14 and ground.
    1. **If 1 V or greater**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module. Ignition On.
        2. Test for less than 1 V between the control circuit terminal 14 and ground.
            1. If greater than the specified value, repair the short to voltage on the circuit.
            2. If less than the specified value, replace the K71 Transmission Control Module.
    1. **If less than 1 V**
8. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
9. Test for less than 2 Ω in the control circuit end to end.
    1. **If 2 Ω or greater**

        Repair the open/high resistance in the circuit.
    1. **If less than 2 Ω**
10. Test for infinite resistance between terminal 14 and ground.
    1. **If less than infinite resistance**

        Repair the short to ground in the circuit.
    1. **If infinite resistance**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, remove the fluid pan from the T12 Automatic Transmission Assembly.
3. Disconnect the harness connector at the Q77E Transmission Control Solenoid Valve 5. Refer to Transmission Solenoid Information .
4. Connect a jumper wire between terminal 1 and terminal 2 of the Q77E Transmission Control Solenoid Valve 5 harness connector.
5. Disconnect the X176 harness connector.
6. Test for less than 2 Ω on X176 connector terminal 4 and terminal 7.
    1. **If greater than 2 Ω**

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Replace the transmission control wiring harness.

1. **If less than 2 Ω**

7. Disconnect the jumper wire.
8. Remove the automatic transmission wiring harness, electrical connector passage sleeve.
9. Connect a jumper wire between X176 harness connector terminal 4 and terminal 7.
10. Test for less than 2 Ω between X175 connector terminal 14 and terminal 18.
    1. **If greater than 2 Ω**

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. **If less than 2 Ω**
11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77E Transmission Control Solenoid Valve 5.
    1. **If not between 4.5-5.5 Ω**

       Replace the Q77E Transmission Control Solenoid Valve 5.

    1. **If between 4.5-5.5 Ω**
12. Test for infinite resistance on the Q77E Transmission Control Solenoid Valve 5, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
    1. **If not infinite resistance**

       Replace the Q77E Transmission Control Solenoid Valve 5.

    1. **If infinite resistance**
13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2727, P2729, OR P2730: TRANSMISSION CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement

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- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > DTC DESCRIPTORS

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

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P2738	P2736	P2739	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > TYPICAL

SCAN TOOL DATA

Transmission Control Solenoid Valve 6 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 6 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 6 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 6 is a low pressure, normally high, variable force solenoid valve. This solenoid is also referred to as, the line pressure solenoid. The transmission control module (TCM) high side driver 2, supplies 12 V to the transmission control solenoid valve 6. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CONDITIONS

FOR RUNNING THE DTC

- Ignition On.
- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P2736

TCM detects an open/high resistance in the transmission control solenoid valve 6 control circuit, for 0.3 s.

P2738

TCM detects a short to ground in the transmission control solenoid valve 6 control circuit, for 0.3 s.

P2739

TCM detects a short to power in the transmission control solenoid valve 6 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P2736

- P2736 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands maximum line pressure for all shifts.
- TCM request the ECM to disable auto stop function.

P2738

- P2738 is a Type A DTC.
- TCM turns Off power to all shift and pressure control solenoids.
- TCM inhibits TCC.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.

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- TCM commands maximum line pressure, for all shifts.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM request the ECM to disable powertrain braking.
- TCM requests the ECM to limit engine torque based on transmission input speed.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.

P2739

- P2739 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current values.
- TCM commands maximum line pressure for all shifts.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P2736, P2738 and P2739 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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- INLINE HARNESS CONNECTOR END VIEWS - INDEX

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- Electronic Component Description
- Transmission Component and System Description

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- Transmission General Description

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 6 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 6 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 6 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 6 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
            1. If the test lamp illuminates, repair the short to voltage on the circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
7. Remove the test lamp.

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8. Test for 1.8-2.2 V between the control circuit terminal 4 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the control circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the control circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 2.2 V**
9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77F Transmission Control Solenoid Valve 6. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**

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1. Disconnect the X176 harness connector.
2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If the test lamp does not illuminate

       Replace the transmission control wiring harness.

1. **If the test lamp does not illuminate**

8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If less than 2 Ω

               Replace the transmission control wiring harness.

    1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.
10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 8 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

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Replace the transmission control wiring harness.

1. **If greater than 2.2 V**
    1. Ignition Off, disconnect the X176 connector, ignition On.
    2. Test for 1.8-2.2 V at the control circuit terminal 8 and ground.
        1. If greater than 2.2 V

            Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        1. If between 1.8-2.2 V

            Replace the transmission control wiring harness.
1. **If between 1.8-2.2 V**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77F Transmission Control Solenoid Valve 6.
    1. **If not between 4.5-5.5 Ω**

        Replace the Q77F Transmission Control Solenoid Valve 6.

    1. **If between 4.5-5.5 Ω**
12. Test for infinite resistance on the Q77F Transmission Control Solenoid Valve 6, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
    1. **If not infinite resistance**

        Replace the Q77F Transmission Control Solenoid Valve 6.

    1. **If infinite resistance**
13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2736, P2738, OR P2739: TRANSMISSION CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement

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- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > DTC DESCRIPTORS

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD:

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TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoids in this transmission require unique electrical current vs. oil pressure performance matching data values in order to function at maximum performance and efficiency. This data is programmed and stored in the vehicle's transmission control module (TCM). When a transmission assembly, transmission control solenoids, or TCM is replaced, the TCM must be programmed with the new or existing solenoid performance data.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- TCM has completed initialization.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > CONDITIONS FOR SETTING THE DTC

P27A7

Transmission control solenoid valve 1 matching performance data is not programmed into the TCM.

P27A8

Transmission control solenoid valve 2 matching performance data is not programmed into the TCM.

P27A9

Transmission control solenoid valve 3 matching performance data is not programmed into the TCM.

P27AA

Transmission control solenoid valve 4 matching performance data is not programmed into the TCM.

P27AB

Transmission control solenoid valve 5 matching performance data is not programmed into the TCM.

P27AC

Transmission control solenoid valve 6 matching performance data is not programmed into the TCM.

P27AD

Transmission control solenoid valve 7 matching performance data is not programmed into the TCM.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > ACTION TAKEN WHEN THE DTC SETS

- P27A7, P27A8, P27A9, P27AA, P27AB, P27AC or P27AD are Type A DTCs.
- TCM will default to predetermined solenoid current vs. pressure values stored in memory.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > CONDITIONS FOR CLEARING THE DTC

P27A7, P27A8, P27A9, P27AA, P27AB, P27AC or P27AD are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > DIAGNOSTIC AIDS

Obtain the replacement solenoid information code for all solenoids that were replaced, from the TIS Service Information web site.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > REFERENCE INFORMATION

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Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > CIRCUIT/SYSTEM VERIFICATION

NOTE:

P27A7, P27AE, P27A9, P27AA, P27AB, P27AC and P27AD are informational DTCs.

NOTE:

Solenoid performance data is only available for the variable force solenoids, not the On/Off solenoids.

1. If the T12 Automatic Transmission Assembly was replaced.
    1. Obtain the solenoid performance data for the variable force solenoids from the TIS Service Information web site. Program the data into the existing K71 Transmission Control Module. Perform the Transmission Service Fast Learn Procedure.
    1. If the T12 Automatic Transmission was not replaced.
2. If the K71 Transmission Control Module was replaced.
    1. Obtain the existing solenoid performance data for the variable force solenoids from the TIS Service Information web site. Program the data into the new K71 Transmission Control Module. Perform the Transmission Service Fast Learn Procedure.
    1. If the K71 Transmission Control Module was not replaced.
3. If 1 or more of the variable force solenoids were replaced.
    1. Obtain the solenoid performance data form the TIS Service Information web site for the new solenoids. Program the data into the existing K71 Transmission Control Module. Perform the Transmission Service Fast Learn Procedure.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P27A7-P27AD: TRANSMISSION CONTROL SOLENOID VALVE CALIBRATION INCORRECT > REPAIR INSTRUCTIONS

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Perform the Diagnostic Repair Verification after completing the repair.

- Perform the Solenoid Valve Characterization Reprogramming .
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > DTC DESCRIPTORS

NOTE:

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

DTC P2808

Torque Converter Clutch (TCC) System Stuck Off - The TCC did not apply due to a hydraulic/mechanical condition.

DTC P2809

Torque Converter Clutch (TCC) System Stuck On - The TCC did not release due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 7 is a high pressure, normally low, variable force solenoid. This solenoid is also referred to as, the torque converter clutch (TCC) control solenoid valve assembly. The transmission control solenoid valve 7 regulates and directs pressurized oil to the TCC regulator valve, which regulates and directs pressurized oil on to the TCC control valve and finally to the torque converter to apply the clutch. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate torque converter slip speed.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CONDITIONS FOR RUNNING THE DTC

P2808

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P2808, P2812, P2814 or P2815 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- Engine torque is between 50-8191 N.m (37-6041 lb ft).
- Throttle position is between 8-100%.
- Transmission fluid temperature is 130°C (226°F) or less.
- TCC is commanded on.
- Transmission has attained 4th gear.

P2809

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P2809, P2812, P2814 or P2815 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- Engine torque is between 55-800 N.m (41-590 lb ft).
- Engine speed is 550 RPM or less.
- Throttle position is between 4% or greater.
- Vehicle speed is 45 km/h (28 mph) or less.
- Transmission fluid temperature is -6.667-130°C (20-226°F) or less.
- Transmission is in drive range.
- TCC is commanded Off.
- TCC slip speed is 300 RPM or less.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CONDITIONS FOR SETTING THE DTC

P2808

TCM has detected a high TCC slip speed with TCC commanded On.

P2809

TCM has detected a low TCC slip speed with TCC commanded Off.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > ACTION TAKEN WHEN THE DTC SETS

P2808

- P2808 is a Type B DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM inhibits TCC.
- TCM inhibits maximum gear when in hot mode.
- TCM inhibits maximum gear when not in hot mode.
- TCM commands hot mode transmission shifting pattern.

P2809

- P2809 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands TCC apply.
- TCM commands hot mode transmission shifting pattern.
- TCM limits the amount of line pressure.
- TCM requests the ECM to limit amount of torque according to each gear ratio.
- TCM requests the ECM disable neutral idle.
- TCM requests the ECM to disable auto stop function.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CONDITIONS FOR CLEARING THE DTC

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- P2808 is a Type B DTC.
- P2809 is a Type A DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range, Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear
- Electronic Component Description
- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the DTCs from the K71 Transmission Control Module with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P2808 or P2809 did not set. Refer to Road Test .
    1. **If DTC P2808 or P2809 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P2808 or P2809 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P2808 or P2809 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 7 stuck/sticking-debris, binding, damage valve.

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P2808 or P2809 - Control Valve Solenoid Body

TCC Control Valve stuck/sticking-debris, binding damage valve.

P2808 or P2809 - Control Valve Upper Body Assembly

- TCC regulator valve stuck/sticking - debris, binding, damage valve, scored bore.
- Converter control valve stuck/sticking - debris, binding, damage valve, scored bore.

P2808 or P2809 - Torque Converter Assembly

Torque Converter clutch piston seals missing or damaged.

P2808 or P2809 - Torque Converter

Fluid circuit - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2808 OR P2809: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > DTC DESCRIPTORS

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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

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P2814	P2812	P2815	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 7 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 7 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

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Transmission Control Solenoid Valve 7 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 7 is a high pressure, normally low, variable force solenoid valve. This solenoid is also referred to as, torque converter clutch (TCC) control solenoid valve assembly. The transmission control module (TCM) high side driver 2, supplies 12 V to the transmission control solenoid valve 7. A low side driver circuit in the TCM is pulsed width modulated to vary the current to the solenoid. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P2812

TCM detects an open/high resistance in the transmission control solenoid valve 7 control circuit, for 0.3 s.

P2814

TCM detects a short to ground in the transmission control solenoid valve 7 control circuit, for 0.3 s.

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P2815

TCM detects a short to power in the transmission control solenoid valve 7 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P2812 or P2815

- P2812 or P2815 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM inhibits TCC.
- TCM inhibits maximum gear when in hot mode.
- TCM inhibits maximum gear when not in hot mode.

P2814

- P2814 is a Type A DTC.
- TCM turns Off power to all shift and pressure control solenoids.
- TCM inhibits TCC.
- 2nd gear is obtained if fault was detected with the default valve in the low state.
- 8th gear is obtained if fault was detected with the default valve in the high state.
- TCM commands maximum line pressure for all shifts.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM commands hot mode transmission shifting pattern.
- TCM inhibits Tap Up/Tap Down.
- TCM request the ECM to disable powertrain braking.
- TCM requests the ECM to limit amount of torque according to each gear ratio.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM limits the amount of line pressure.
- TCM request the ECM to disable auto stop function.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P2812, P2814 and P2815 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

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Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.

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2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 7 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 7 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 7 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 7 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
        1. **If the DTC sets**

            Refer to Circuit/System Testing.

        1. **If the DTC does not set**
5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
        1. **If the test lamp illuminates**
            1. Ignition Off.
            2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
            3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
                1. If the test lamp illuminates, repair the short to voltage on the circuit.
                2. If the test lamp does not illuminate, replace the K71 Transmission Control

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Module.

1. **If the test lamp does not illuminate**

5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the high side driver 2 circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If the test lamp turns On and Off**
7. Remove the test lamp.
8. Test for 1.8-2.2 V between the control circuit terminal 3 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the control circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the control circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 2.2 V**
9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.

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1. **If between 1.8-2.2 V**

11. Perform the Component Test.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77G Transmission Control Solenoid Valve 7. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.
        2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
            1. If the test lamp illuminates

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp does not illuminate

               Replace the transmission control wiring harness.

    1. **If the test lamp does not illuminate**
8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

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3. Test for less than 2 Ω in the ignition circuit end to end.
    1. If 2 Ω or greater

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If less than 2 Ω

       Replace the transmission control wiring harness.

1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.
10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 14 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.

    1. **If greater than 2.2 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 14 and ground.
            1. If greater than 2.2 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.

    1. **If between 1.8-2.2 V**

11. Test for 4.5-5.5 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77G Transmission Control Solenoid Valve 7.
    1. **If not within the specified range**

       Replace the Q77G Transmission Control Solenoid Valve 7.

    1. **If within the specified range**

12. Test for infinite resistance on the Q77G Transmission Control Solenoid Valve 7, as listed

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below:

1. Solenoid terminal 1 and ground
2. Solenoid terminal 2 and ground
    1. **If not infinite resistance**

        Replace the Q77G Transmission Control Solenoid Valve 7.
    1. **If infinite resistance**

13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2812, P2814, OR P2815: TRANSMISSION CONTROL SOLENOID VALVE 7 CONTROL CIRCUIT > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > DTC DESCRIPTORS

NOTE:

The DTCs listed below set due to a transmission hydraulic/mechanical condition. Perform

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the Circuit/System Verification and Circuit/System Testing to identify the cause.

DTC P2817

Transmission Control Solenoid Valve 8 Stuck Off - During the 3-4 upshift the transmission did not obtain 4th gear, due to a hydraulic/mechanical condition.

DTC P2818

Transmission Control Solenoid Valve 8 Stuck On - The TCC RPM slip speed is to low when commanded on in park position due to a hydraulic/mechanical condition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 8 is a normally closed, On - Off solenoid. The transmission control solenoid valve 8 directs pressurized oil to the default valve. The transmission control module (TCM) uses information from the transmission speed sensors along with serial data information from other control modules to calculate the correct gear ratio and apply the correct clutch assemblies.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CONDITIONS FOR RUNNING THE DTC

P2817

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A, P182B, P182C, P182D, P182E, P182F, P1838, P1839, P1840, P1841, P18B5, P18B6, P18B7, P18B8, P18B9, P18BA, P18BB, P18BC, P18BD, P18BE, P18BF, P18C0, P18C1, P18C2, P18C3, P1915 or P2534 is not set.
- High side driver 1 is On.
- High side driver 2 is On.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- Accelerator pedal position is 1% or greater.
- Transmission output speed is 100 RPM or greater.
- Transmission is not in park or neutral.

P2818

- DTC P0716, P0717, P07BF, P07C0, P2812, P2814 or P2815 is not set.
- Battery voltage is between 9-32 V.
- Ignition voltage is between 9-32 V.
- Engine speed is between 400-900 RPM.
- Transmission is in park.
- Transmission temperature is between 0-40°C (32-104°F).

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CONDITIONS FOR SETTING THE DTC

P2817

During the 3-4 upshift the transmission did not obtain 4th gear, due to the transmission control solenoid valve 8, stuck in the Off position.

P2818

The torque converter clutch (TCC) slip speed obtains a low RPM value when the TCC is commanded on in park position, due to the transmission control solenoid valve 8, stuck in the On position.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > ACTION TAKEN WHEN THE DTC SETS

P2817

- P2817 is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits TCC.
- TCM requests the ECM to disable powertrain braking.
- TCM requests the ECM to disable neutral idle.
- TCM requests the ECM to disable auto grade braking.
- TCM requests the ECM to disable auto stop function.
- Transmission shifts to 3rd gear.

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- Transmission reverse gear is available.

P2818

- P2818 is a Type B DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM inhibits TCC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CONDITIONS FOR CLEARING THE DTC

- P2817 is a Type A DTC.
- P2818 is a Type B DTC.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- Drive Range, First Gear
- Drive Range, Second Gear
- Drive Range, Third Gear
- Drive Range, Fourth Gear
- Drive Range, Fifth Gear
- Drive Range, Sixth Gear
- Drive Range, Seventh Gear
- Drive Range, Eighth Gear
- Electronic Component Description

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- Neutral - Engine Running
- Park - Engine Running
- Reverse
- Transmission Component and System Description
- Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CIRCUIT/SYSTEM VERIFICATION

1. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check .
    1. **If the transmission fluid and condition is not correct**

       Repair as necessary.

    1. **If the transmission fluid level and condition is correct**
2. Ignition On, clear the TCM DTCs with a scan tool.
3. Verify the transmission operation performs as indicated in the road test instructions and DTC P2817 or P2818 did not set. Refer to Road Test .
    1. **If DTC P2817 or P2818 did set and the transmission does not shift correctly**

       Refer to Circuit/System Testing.

    1. **If DTC P2817 or P2818 did not set and the transmission shifts correctly**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.

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5. Verify the DTC does not set.
    1. **If the DTC sets**

       Refer to Circuit/System Testing.

    1. **If the DTC does not set**

6. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > CIRCUIT/SYSTEM TESTING

1. Verify the conditions listed below do not exist. Carefully inspect each component for that condition. Repair or replace as necessary.

P2817 or P2818 - Control Valve Solenoid Body

Transmission Control Solenoid Valve 8 stuck/sticking-debris, binding, damage valve.

P2817 or P2818 - Control Valve Upper Body

Default valve stuck/sticking - debris, binding, damage valve, scored bore.

P2817 or P2818 - Default Valve

Fluid circuits - plugged with debris, or leaks due to missing or damage O-rings, seals, or gaskets.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2817 OR P2818: TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Control Valve Body Assembly Disassemble
- Control Valve Body Replacement
- Solenoid Valve Characterization Reprogramming
- Transmission Solenoid Information
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > DIAGNOSTIC INSTRUCTIONS

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- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > DTC DESCRIPTORS

DTC P281D

Transmission Control Solenoid Valve 8 Control Circuit Low Voltage

DTC P281E

Transmission Control Solenoid Valve 8 Control Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P0658	P0659	P0659	-
Control	P281D	P281D	P281E	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 8 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 8 Control Circuit Low Voltage Test Status

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Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 8 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 8 is a normally closed, On/Off solenoid. This solenoid is also referred to as the default solenoid valve. The transmission control module (TCM) high side driver 1, supplies 12 V to the transmission control solenoid valve 8. A low side driver circuit in the TCM turns the solenoid On/Off. If excessive current flow is detected, the high side 1 will turn Off. When the circuit fault is corrected, the high side driver 1 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CONDITIONS FOR SETTING THE DTC

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P281D

TCM detects a short to ground in the transmission control solenoid valve 8 control circuit, for 0.3 s.

P281E

TCM detects a short to power in the transmission control solenoid valve 8 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > ACTION TAKEN WHEN THE DTC SETS

P281D

- P281D is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap up/Tap down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

P281E

- P281E is a Type A DTC.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap up/Tap down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.

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- Transmission shifts to 3rd gear.
- Transmission reverse gear is available.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CONDITIONS FOR CLEARING THE DTC

P281D and P281E are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 8 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 8 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 8 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 8 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
    1. **If the DTC sets**

        Refer to Circuit/System Testing.

    1. **If the DTC does not set**
5. All OK.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 1 Off.
3. Connect a test lamp between the ignition circuit terminal 18 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.

3. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
    1. If the test lamp illuminates, repair the short to voltage on the circuit.
    2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.

1. **If the test lamp does not illuminate**

5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 1 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
    1. **If less than 2 Ω**

       Replace the K71 Transmission Control Module.

    1. **If the test lamp turns On and Off**
7. Remove the test lamp.
8. Test for 1.4-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.4 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the control circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the control circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 2.2 V**

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9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77H Transmission Control Solenoid Valve 8. Refer to Transmission Solenoid Information . Ignition On.
5. Command the high side driver 1 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.
        2. Verify a test lamp does not illuminate between the ignition circuit terminal 4 and ground.
            1. If the test lamp illuminates

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp does not illuminate

               Replace the transmission control wiring harness.
    1. **If the test lamp does not illuminate**
8. Verify the test lamp turns On and Off when commanding the high side driver 1 On and Off with a scan tool.
    1. **If the test lamp is always Off**

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1. Ignition Off, disconnect the X176 harness connector.
2. Test for infinite resistance in the ignition circuit between terminal 4 and ground.
    1. If less than infinite resistance

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.
3. Test for less than 2 Ω in the ignition circuit end to end.
    1. If 2 Ω or greater

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.
    1. If less than 2 Ω

       Replace the transmission control wiring harness.

1. **If the test lamp turns On and Off**

9. Disconnect the test lamp.
10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 1 and ground.
            1. If less than 1.8 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.
    1. **If greater than 2.2 V**
        1. Ignition Off, disconnect the X176 connector, ignition On.
        2. Test for 1.8-2.2 V at the control circuit terminal 1 and ground.
            1. If greater than 2.2 V

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
            1. If between 1.8-2.2 V

               Replace the transmission control wiring harness.
    1. **If between 1.8-2.2 V**
11. Test for 11.0 - 13.0 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77H

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Transmission Control Solenoid Valve 8.

1. **If not between 11.0 - 13.0 Ω**

   Replace the Q77H Transmission Control Solenoid Valve 8.

1. **If between 11.0 - 13.0 Ω**

12. Test for infinite resistance on the Q77H Transmission Control Solenoid Valve 8, as listed below:

    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground

    1. **If not infinite resistance**

       Replace the Q77H Transmission Control Solenoid Valve 8.

    1. **If infinite resistance**

13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 8 CONTROL CIRCUIT VOLTAGE > REPAIR INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > DTC DESCRIPTORS

DTC P2824

Transmission Control Solenoid Valve 9 Control Circuit Open

DTC P2826

Transmission Control Solenoid Valve 9 Control Circuit Low Voltage

DTC P2827

Transmission Control Solenoid Valve 9 Control Circuit High Voltage

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > DIAGNOSTIC FAULT INFORMATION

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2760	P2761	P2761	-
Control	P2824/P2826	P2824/P2826	P2827	-

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > TYPICAL SCAN TOOL DATA

Transmission Control Solenoid Valve 9 Control Circuit Open Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	Malfunction	-

Transmission Control Solenoid Valve 9 Control Circuit Low Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage

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Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	Malfunction	-	-

Transmission Control Solenoid Valve 9 Control Circuit High Voltage Test Status

Circuits	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition On **Parameter Normal Range:** OK or Not Run			
Ignition	Malfunction	Malfunction	Malfunction
Control	-	-	Malfunction

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CIRCUIT/SYSTEM DESCRIPTION

The transmission control solenoid valve 9 is a normally closed, On/Off solenoid. This solenoid is also referred to as, the boost control solenoid valve assembly. The transmission control module (TCM) high side driver 2, supplies 12 V to the transmission control solenoid valve 9. A low side driver circuit in the TCM turns the solenoid On/Off. If excessive current flow is detected, the high side driver 2 will turn Off. When the circuit fault is corrected, the high side driver 2 will reset.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CONDITIONS FOR RUNNING THE DTC

- Ignition On.
- High side driver 2 On.
- Battery voltage is between 11-32 V for 1 s or greater.
- TCM power mode state is in accessory or ignition.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CONDITIONS FOR SETTING THE DTC

P2824

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TCM detects an open in the transmission control solenoid valve 9 control circuit, for 0.3 s.

P2826

TCM detects a short to ground in the transmission control solenoid valve 9 control circuit, for 0.3 s.

P2827

TCM detects a short to power in the transmission control solenoid valve 9 control circuit, for 0.3 s.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > ACTION TAKEN WHEN THE DTC SETS

P2824, P2826 or P2827

- P2824, P2826 and P2827 are Type A DTCs.
- TCM disables transmission adapts learning and freezes current adapt values.
- TCM commands default shift pattern and ignores all other shift requests.
- TCM inhibits Tap up/Tap down.
- TCM inhibits TCC.
- TCM request the ECM to disable powertrain braking.
- TCM request the ECM to disable neutral idle.
- TCM request the ECM to disable auto grade braking.
- TCM request the ECM to disable auto stop function.
- Transmission shifts to 4th gear.
- Transmission reverse gear is available.

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DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CONDITIONS FOR CLEARING THE DTC

P2824, P2826 and P2827 are Type A DTCs.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CIRCUIT/SYSTEM VERIFICATION

1. Ignition On.
2. Verify the parameters listed below do not display Malfunction when commanding the Transmission Control Solenoid Valve 9 On and Off with a scan tool.
    1. Transmission Control Solenoid Valve 9 Control Circuit Open Voltage Test Status
    2. Transmission Control Solenoid Valve 9 Control Circuit Low Voltage Test Status
    3. Transmission Control Solenoid Valve 9 Control Circuit High Voltage Test Status
        1. **If Malfunction is displayed**

            Refer to Circuit/System Testing.

        1. **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.

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1. **If the DTC sets**

   Refer to Circuit/System Testing.

1. **If the DTC does not set**

5. All OK.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > CIRCUIT/SYSTEM TESTING

1. Ignition Off and all vehicle systems Off. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down, ignition On.
2. Command the high side driver 2 Off.
3. Connect a test lamp between the ignition circuit terminal 19 and ground.
4. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Ignition Off.
        2. Disconnect the harness connector at the K71 Transmission Control Module, ignition On.
        3. Verify a test lamp does not illuminate between the ignition circuit terminal 19 and ground.
            1. If the test lamp illuminates, repair the short to voltage on the circuit.
            2. If the test lamp does not illuminate, replace the K71 Transmission Control Module.
    1. **If the test lamp does not illuminate**
5. Ignition On.
6. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the ignition circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance

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3. Test for less than 2 Ω in the ignition circuit end to end.
    1. If 2 Ω or greater, repair the open/high resistance in the circuit.
    2. If less than 2 Ω, replace the K71 Transmission Control Module.

1. **If the test lamp turns On and Off**

7. Remove the test lamp.
8. Test for 1.8-2.2 V between the control circuit terminal 7 and ground.
    1. **If less than 1.8 V**
        1. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module.
        2. Test for infinite resistance between the control circuit and ground.
            1. If less than infinite resistance, repair the short to ground on the circuit.
            1. If infinite resistance
        3. Test for less than 2 Ω in the control circuit end to end.
            1. If 2 Ω or greater, repair the open/high resistance in the circuit.
            2. If less than 2 Ω, replace the K71 Transmission Control Module.
    1. **If greater than 2.2 V**
9. Ignition Off, disconnect the harness connector at the K71 Transmission Control Module, ignition On.
10. Test for less than 1 V between the control circuit and ground.
    1. If 1 V or greater, repair the short to voltage on the circuit.
    2. If less than 1 V, replace the K71 Transmission Control Module.
    1. **If between 1.8-2.2 V**
11. Perform the Component Testing.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > COMPONENT TESTING

1. Perform the Circuit/System Testing first.
2. Ignition Off, connect the X175 harness connector.
3. Remove the fluid pan from the T12 Automatic Transmission.
4. Disconnect the harness connector at the Q77J Transmission Control Solenoid Valve 9. Refer

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to Transmission Solenoid Information . Ignition On.

5. Command the high side driver 2 Off.
6. Connect a test lamp between terminal 2 and ground.
7. Verify the test lamp does not illuminate.
    1. **If the test lamp illuminates**
        1. Disconnect the X176 harness connector.
        2. Verify a test lamp does not illuminate between the ignition circuit terminal 18 and ground.
            1. If the test lamp illuminates

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If the test lamp does not illuminate

               Replace the transmission control wiring harness.
    1. **If the test lamp does not illuminate**
8. Verify the test lamp turns On and Off when commanding the high side driver 2 On and Off with a scan tool.
    1. **If the test lamp is always Off**
        1. Ignition Off, disconnect the X176 harness connector.
        2. Test for infinite resistance in the ignition circuit between terminal 18 and ground.
            1. If less than infinite resistance

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.
        3. Test for less than 2 Ω in the ignition circuit end to end.
            1. If 2 Ω or greater

               Replace the automatic transmission wiring harness, electrical connector passage sleeve.

            1. If less than 2 Ω

               Replace the transmission control wiring harness.
    1. **If the test lamp turns On and Off**
9. Disconnect the test lamp.
10. Test for 1.8-2.2 V between the control circuit terminal 1 and ground.
    1. **If less than 1.8 V**

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1. Ignition Off, disconnect the X176 connector, ignition On.
2. Test for 1.8-2.2 V at the control circuit terminal 10 and ground.
    1. If less than 1.8 V

       Replace the automatic transmission wiring harness, electrical connector passage sleeve.

    1. If between 1.8-2.2 V

       Replace the transmission control wiring harness.

1. **If greater than 2.2 V**
    1. Ignition Off, disconnect the X176 connector, ignition On.
    2. Test for 1.8-2.2 V at the control circuit terminal 10 and ground.
        1. If greater than 2.2 V

           Replace the automatic transmission wiring harness, electrical connector passage sleeve.

        1. If between 1.8-2.2 V

           Replace the transmission control wiring harness.

1. **If between 1.8-2.2 V**

11. Test for 11.0 - 13.0 Ω at 20°C (68°F) between terminal 1 and terminal 2 on the Q77J Transmission Control Solenoid Valve 9.
    1. **If not between 11.0 - 13.0 Ω**

       Replace the Q77J Transmission Control Solenoid Valve 9.

    1. **If between 11.0 - 13.0 Ω**

12. Test for infinite resistance on the Q77J Transmission Control Solenoid Valve 9, as listed below:
    1. Solenoid terminal 1 and ground
    2. Solenoid terminal 2 and ground
        1. **If not infinite resistance**

           Replace the Q77J Transmission Control Solenoid Valve 9.

        1. **If infinite resistance**

13. Replace the K71 Transmission Control Module.

DIAGNOSTIC INFORMATION AND PROCEDURES > DTC P2824, P2826, OR P2827: TRANSMISSION CONTROL SOLENOID VALVE 9 CONTROL CIRCUIT > REPAIR

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INSTRUCTIONS

Perform the Diagnostic Repair Verification after completing the repair.

- Automatic Transmission Wiring Harness Replacement (Electrical Connector Passage Sleeve)
- Solenoid Valve Characterization Reprogramming
- Transmission Control Wiring Harness Replacement
- Transmission Fluid Pan and Filter Assembly Removal
- Perform the Transmission Service Fast Learn Procedure following all transmission related repairs.
- Refer to K71 Transmission Control Module: Programming and Setup

DIAGNOSTIC INFORMATION AND PROCEDURES > 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).

DIAGNOSTIC INFORMATION AND PROCEDURES > SOLENOID VALVE CHARACTERIZATION REPROGRAMMING > 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

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> *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.
    1. 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.
    2. 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.
    1. Select "Transmission Control Module - Programming" to update TCM calibrations and

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Solenoid Characterization data.

OR

2. 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - AUTOMATIC TRANSMISSION

IMPORTANT:

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 .*

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DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - AUTOMATIC TRANSMISSION > VISUAL/PHYSICAL INSPECTION

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - AUTOMATIC TRANSMISSION > INTERMITTENT

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

DIAGNOSTIC INFORMATION AND PROCEDURES > SYMPTOMS - AUTOMATIC TRANSMISSION > SYMPTOM LIST

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
    - Transmission Fluid Level and Condition Check
    - Fluid Pressure High or Low
    - Automatic Transmission Fluid Leaks
    - Fluid Leak Diagnosis
- Noise and Vibration Diagnosis
    - Whine/Growl Noise That Changes with Vehicle Speed
    - Vibration
    - Flex Plate/Torque Converter Vibration Test
    - Noise and Vibration Analysis
- Range Performance Diagnosis
    - No Park or Drive
    - No Drive in All Ranges
- Shift Quality Feel Diagnosis
    - Harsh Garage Shift
    - Harsh, Soft, Delayed or Slipping First, Third, Fifth, Sixth or Seventh Shift
    - Harsh, Soft, Delayed or Slipping Second, Third, Fourth, Sixth or Eighth Shift
    - Harsh, Soft, Delayed or Slipping Fourth, Fifth, Sixth, Seventh, Eighth or Reverse Shift
    - Harsh, Soft, Delayed or Slipping First, Second, Seventh, Eighth or Reverse Shift
    - Harsh, Soft, Delayed or Slipping First, Second, Third, Fourth, Fifth or Reverse Shift
- Shift Pattern
    - No First, Third, Fifth, Sixth or Seventh Gear
    - No Second, Third, Fourth, Sixth or Eighth Gear
    - No Fourth, Fifth, Sixth, Seventh, Eighth or Reverse Gear

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    - No First, Second, Seventh, Eighth or Reverse Gear
    - No First, Second, Third, Fourth, Fifth or Reverse Gear
- Torque Converter Diagnosis
    - Torque Converter Diagnosis
    - No Torque Converter Clutch Apply
    - No Torque Converter Clutch Release
- Symptom Not Found or No Symptom Detected
    - Transmission Fluid Level and Condition Check
    - Road Test

DIAGNOSTIC INFORMATION AND PROCEDURES > TRANSMISSION FLUID LEVEL AND CONDITION CHECK

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself. Since the transmission on this vehicle is not equipped with a fill tube and dipstick, a tube in the bottom pan is used to set the fluid level.

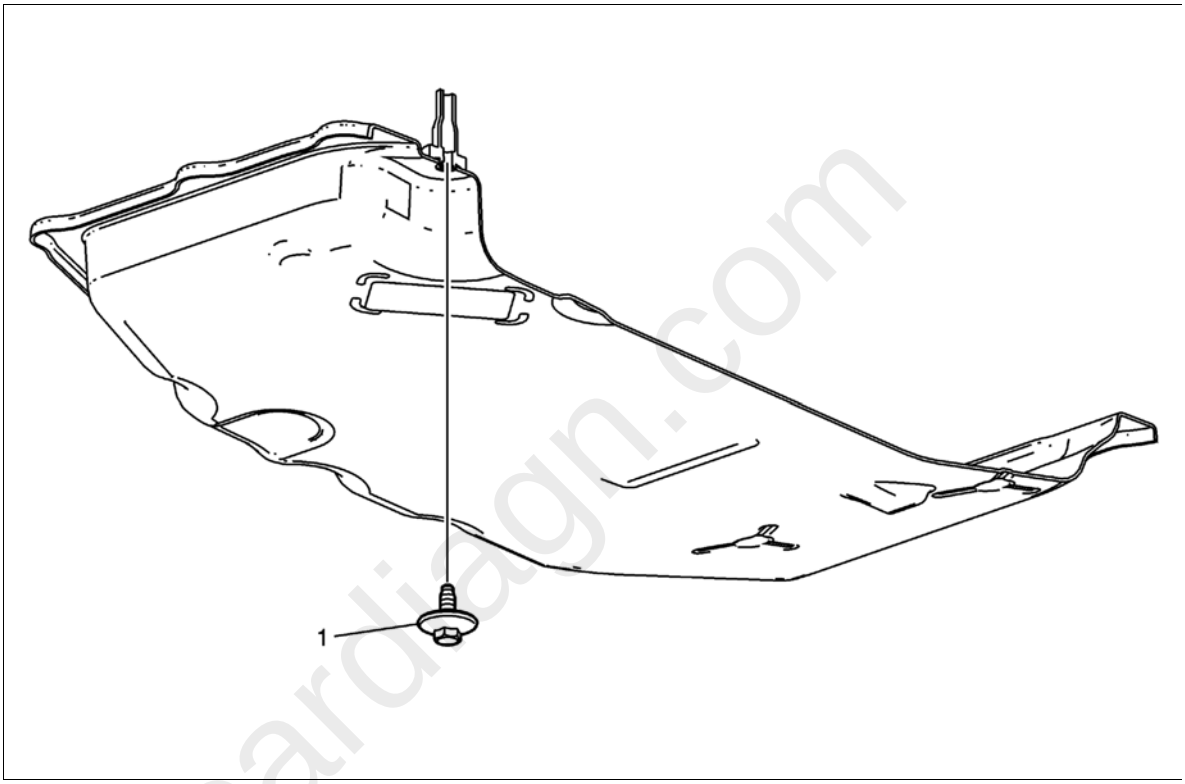
> ⚠ *CAUTION:*
>
> *The transmission fluid level must be checked when the transmission fluid temperature (TFT) is between 35-45°C (95-113°F). If the TFT is not within this range, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this range will result in either an under or over-filled transmission. TFT>45°C=under-filled, TFT<35°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:*
>
> - *CTS-V/LT1 Camaro, if running a track session, should have the transmission fluid level checked when the TFT is between 55-65°C (131-149°F).*
> - *If vehicle is equipped with a thermal bypass valve, which includes all full size and midsize trucks, the transmission fluid level should be checked only after the TFT has reached or exceeded an operating temperature of 90°C (194°F). Once the TFT has reached or exceeded 90°C (194°F), then turn OFF the vehicle and allow the TFT to cool back down to 35-45°C (95-113°F) before checking the fluid level as required. Reaching or exceeding an operating temperature of 90°C (194°F) opens the bypass valve and allows the cooler to fill up with fluid, which will result in a more accurate fluid level check.*

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1. Observe the TFT using the driver information center (DIC) or a scan tool.
2. Start and idle the engine.
3. Depress the brake pedal and move the shift lever through each gear range. Pause for at least 3 seconds in each range. Move the shift lever back to PARK. Ensure the engine RPM is low (500-800 RPM).
4. Allow the engine to idle for at least 1 minute.
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: Transmission Oil Level Check Plug



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> ⚠ *CAUTION:*
>
> *THE ENGINE MUST BE RUNNING when the trans oil level check plug is removed or excessive fluid loss will occur, resulting in an under-filled condition. An under-filled transmission will cause premature component wear or damage.*

> *NOTE:*
>
> *Continue to monitor the TFT. If the TFT is not within the specified values, reinstall the trans oil level check plug and repeat the previous steps.*

6. Remove the transmission oil level check plug (1) from the transmission fluid pan. Allow any fluid to drain.
    1. If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
    2. If no fluid comes out, add fluid until fluid drips out. Refer to Transmission Fluid Fill Procedure .
7. Inspect the fluid color. The fluid should be red or dark brown.
    1. If the fluid color is very dark or black and has a burnt odor, inspect the fluid and inside of the bottom pan for excessive metal particles or other debris. A small amount of "friction" material in the bottom pan is a "normal" condition. If large pieces and/or metal particles are noted in the fluid or bottom pan, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid filter assembly, repair the oil cooler, and flush the cooler lines.
    2. 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 .

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

8. Replace the transmission oil level check plug and tighten to 9 N.m (80 lb in).
9. Inspect for external leaks. Refer to Fluid Leak Diagnosis .

DIAGNOSTIC INFORMATION AND PROCEDURES > TRANSMISSION FLUID FILL PROCEDURE

Special Tools

- **DT-45096** Transmission Oil Cooling System Flush and Flow Test Tool
- **DT-45096-30** Transmission Cooler Flush Adapters
- **DT-45096-40** Transflow Oil Fill Adapter
- **DT-51190** Transmission Fluid Fill Adapter

For equivalent regional tools, refer to Special Tools .

> ⚠ *CAUTION:*
>
> *Use Dexron® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.*

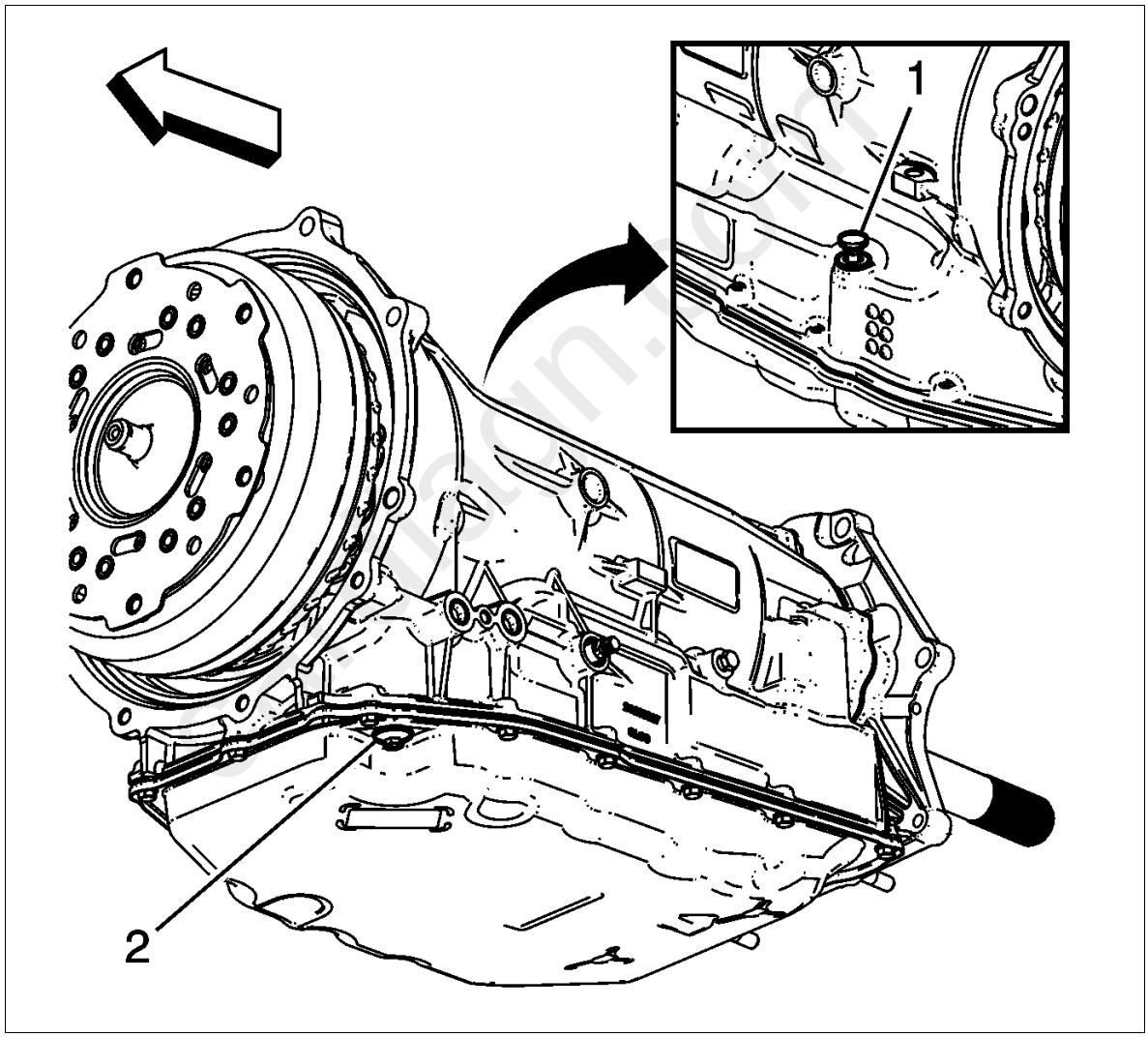
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> ⚠ *CAUTION:*
>
> *Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated. Overfilling will result in possible damage to the transmission.*

Check the transmission fluid level, refer to Transmission Fluid Level and Condition Check .

Fill Tube Plug Method

Fig 1: Fluid Fill Tube Plug And Oil Level Check Plug



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> ⚠ *CAUTION:*
>
> *Use Dexron® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.*

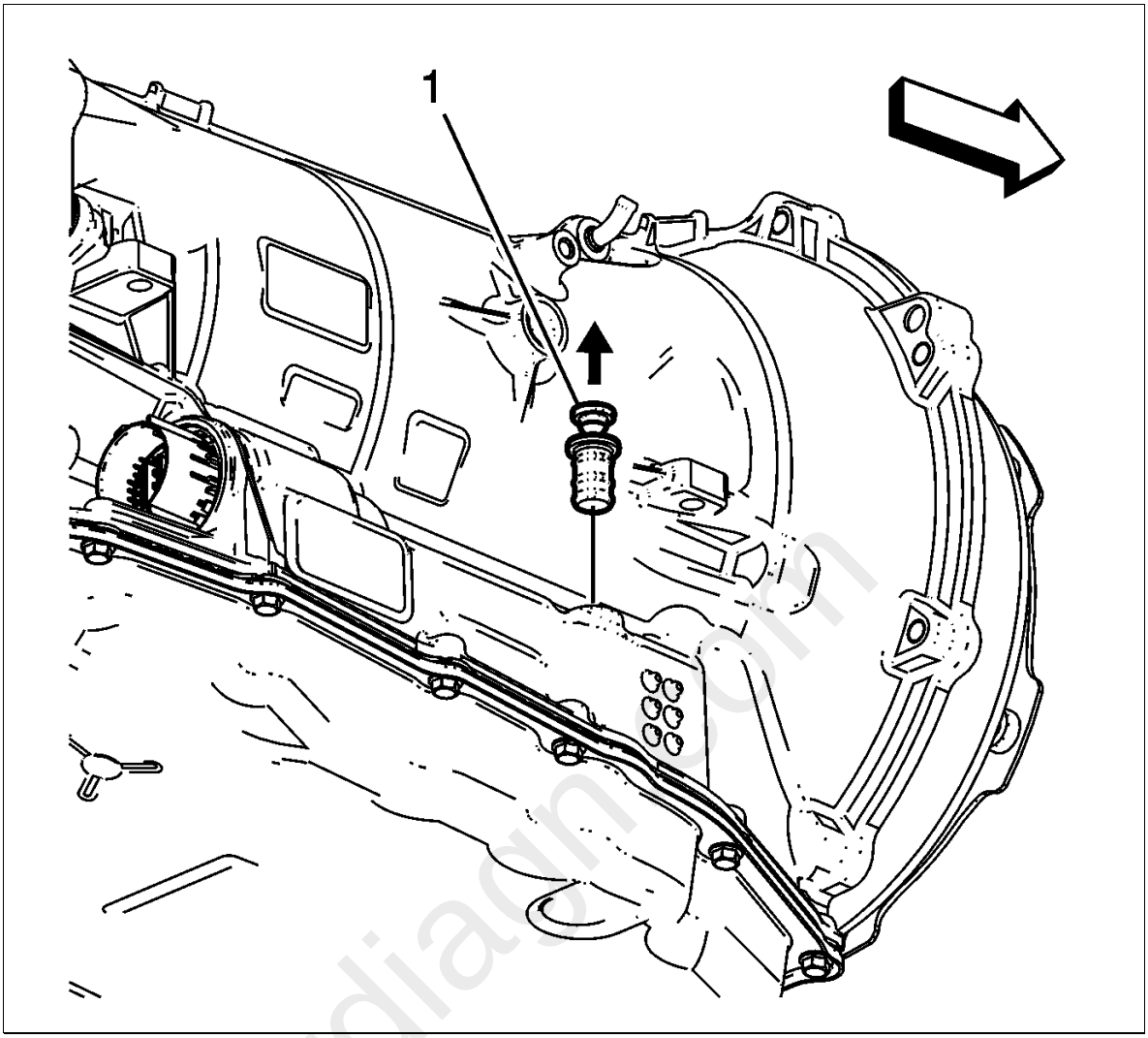
1. Based on accessibility, transmission fluid may be added through the fluid fill tube plug assembly (1) hole or through the oil level check plug (2) hole in the bottom of the transmission fluid pan.

> ⚠ *CAUTION:*
>
> *Before removing the transmission fluid fill tube plug assembly, thoroughly clean around the plug to prevent dirt or contaminants from entering the transmission during plug removal. Use compressed air to dislodge any caked dirt that may be stuck on and around the plug area. Use a mirror to confirm the area is free of dirt before removing the plug. Failure to clean around the plug may result in transmission contamination.*

2. Clean around the fluid fill tube plug (1).

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Fig 2: Plug Assembly



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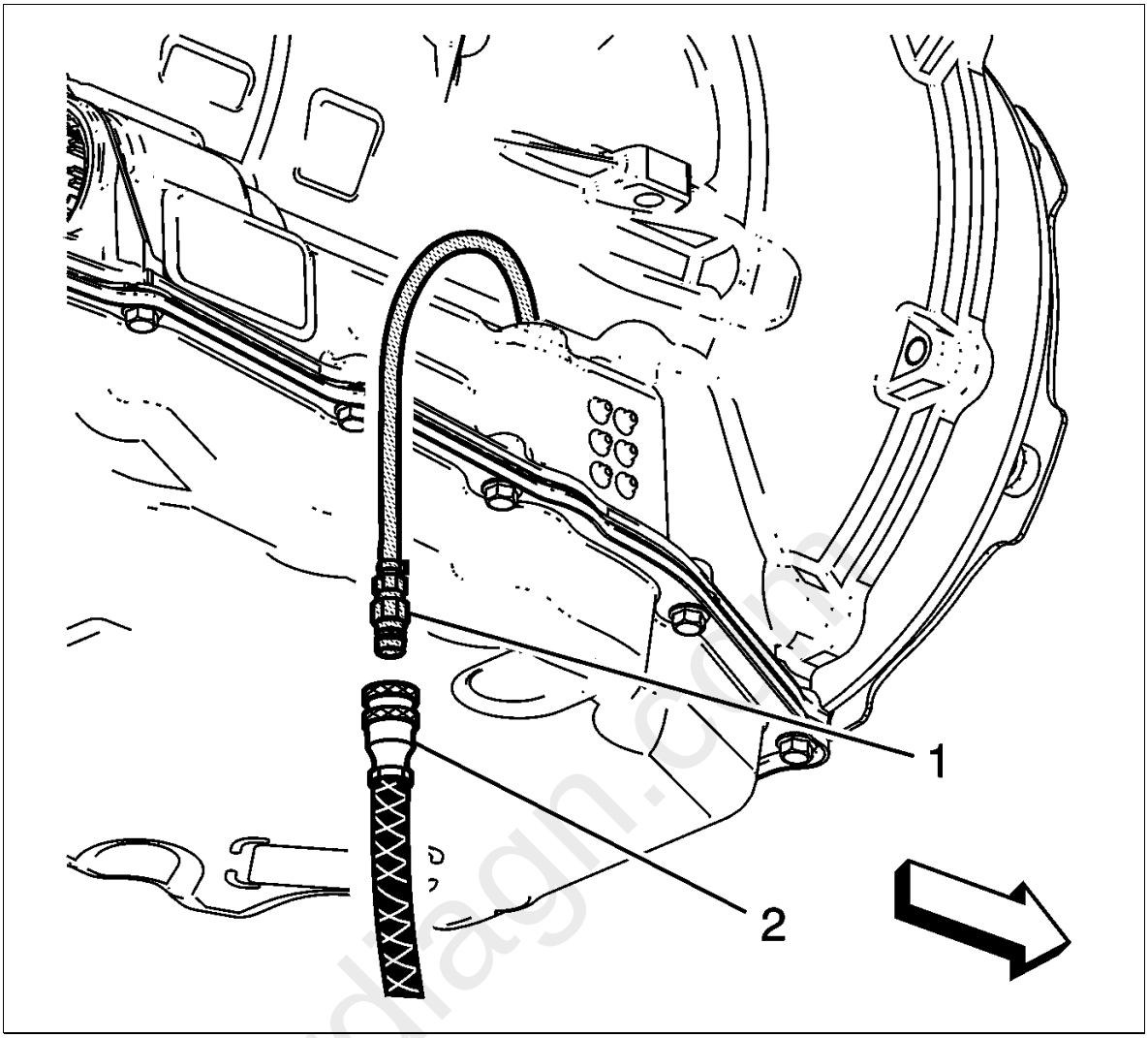
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NOTE:

It may be necessary to use a long pair of 90 degree needle nose pliers to lift the plunger and remove the plug assembly.

3. Unlock the fill tube plug by lifting the plunger. Once the plunger is lifted, remove the entire plug assembly (1).
4. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. Refer to Approximate Fluid Capacities . To avoid an under-fill condition, slightly overfill the transmission, and then allow the extra fluid to drain out through the oil level check plug during the transmission fluid level and condition check procedure.

Fig 3: Transflow Oil Fill Adapter And Test Tool



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NOTE:

*The **DT-45096** flush and flow test tool is being utilized as a convenient method to pump the fluid into the bottom pan. A suitable hand pump may also be used instead. When using the **DT-45096** flush and flow test tool, monitor the display panel to determine the amount of fluid being pumped from the tool supply tank into the transmission.*

5. Using the **DT-45096-40** transflow oil fill adapter (1) and the **DT-45096** flush and flow test tool (2), or a suitable hand pump, add transmission fluid through the fill tube plug opening. Refer to Transmission Fluid Cooler Flushing and Flow Test (Tremec 6-Speed)Transmission Fluid Cooler Flushing and Flow Test (8L90) for complete **DT-45096** flush and flow test tool operating instructions. Use the FLOW position on the main function switch to pump the fluid.

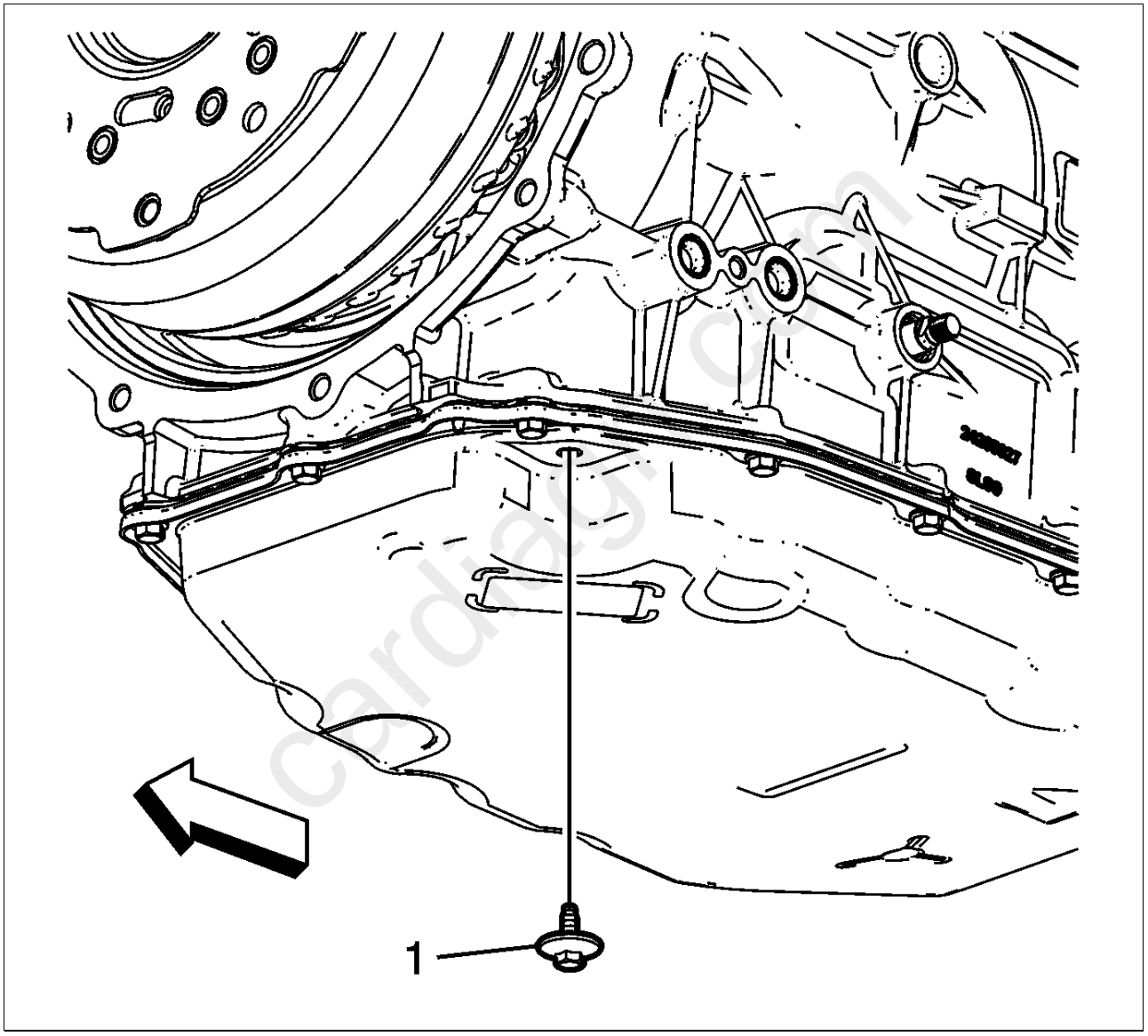
CAUTION:

Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated. Overfilling will result in possible damage to the transmission.

6. Check the fluid level. Refer to Transmission Fluid Level and Condition Check .

Check Plug Method

Fig 4: Oil Level Check Plug



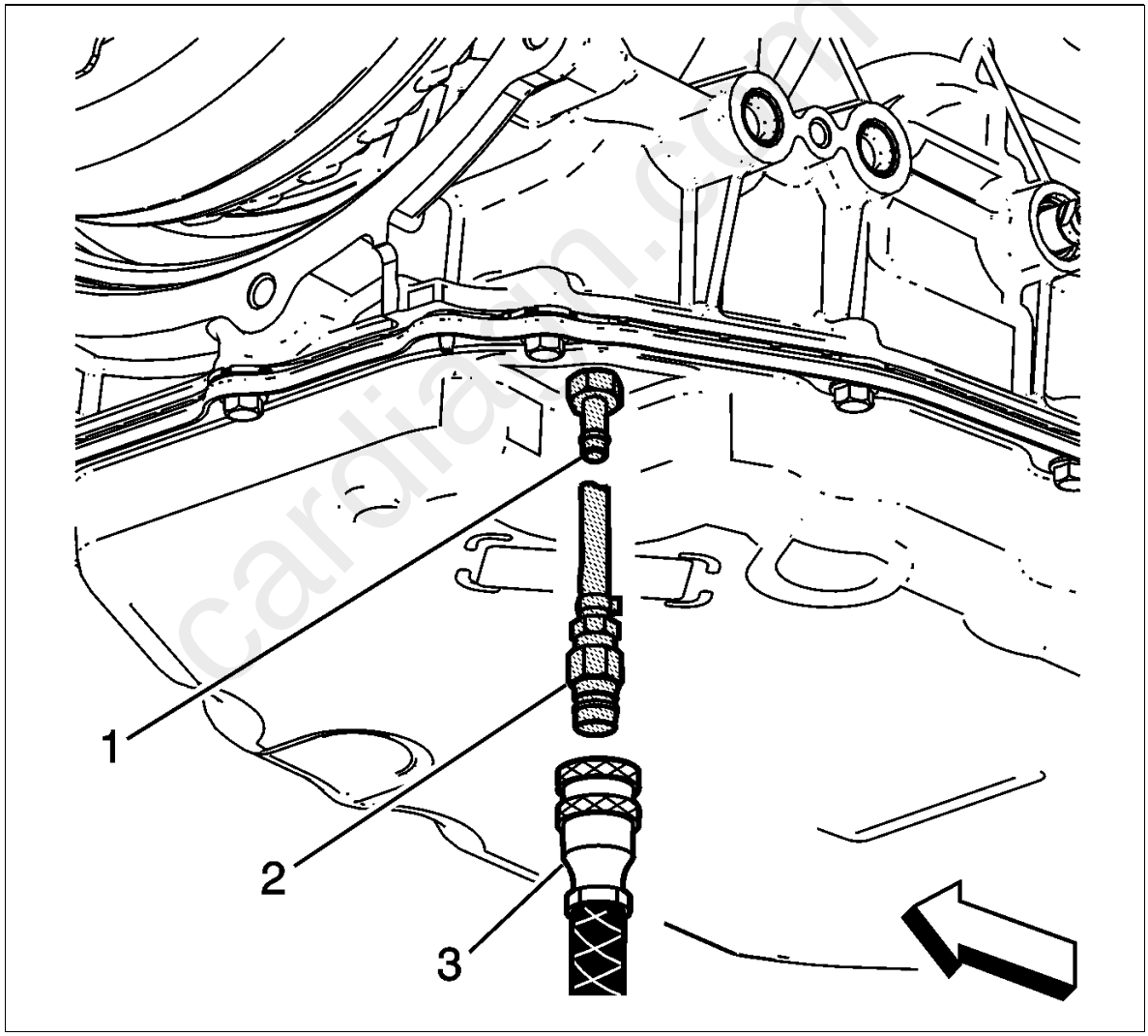
Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Use Dexron® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.*

> 📌 *NOTE:*
>
> *When the oil level check plug is removed with the engine OFF, transmission fluid may drain from the hole.*

1. Remove the oil level check plug.

Fig 5: Fluid Fill Pan Adapter



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2. Install the **DT-51190** fluid fill pan adapter (1) and, if necessary, one adapter from the **DT 45096-30** cooler flush adapters (2).

3. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. Refer to Approximate Fluid Capacities . To avoid an under-fill condition, slightly overfill the transmission, and then allow the extra fluid to drain out through the oil level check plug during the tranmission fluid level and condition check procedure.

> *NOTE:*
>
> *The **DT-45096** flush and flow test tool is being utilized as a convenient method to pump the fluid into the bottom pan. A suitable hand pump may also be used instead. When using the **DT-45096** flush and flow test tool, monitor the display panel to determine the amount of fluid being pumped from the tool supply tank into the transmission.*

4. Using the **DT-51190** fluid fill pan adapter (1), **DT-45096-30** cooler flush adapters (2), and the **DT-45096** flush and flow test tool (3), add transmission fluid through the check plug hole. Refer to Transmission Fluid Cooler Flushing and Flow Test (Tremec 6-Speed)Transmission Fluid Cooler Flushing and Flow Test (8L90) for complete DT-45096 operating instructions. Use the FLOW position on the main function switch to pump the fluid.

> *NOTE:*
>
> *Failure to start the engine and move the shift lever through the gear ranges before removing the **DT-51190** fluid fill pan adapter and **DT-45096-30** cooler flush adapters from the bottom pan will result in an excess amount of fluid draining from the check plug hole. This may lead to an under-fill condition.*

5. Start the engine and move the shift lever through each gear range. Pause for at least 3 seconds in each gear range.

> *CAUTION:*
>
> *Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated. Overfilling will result in possible damage to the transmission.*

6. With the engine still running, remove the **DT-51190** fluid fill pan adapter (1), (2), and **DT-45096** flush and flow test tool (3) and then check the fluid level. Refer to Transmission Fluid Level and Condition Check .

DIAGNOSTIC INFORMATION AND PROCEDURES > ROAD TEST

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:

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- 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.

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 .

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DIAGNOSTIC INFORMATION AND PROCEDURES > ROAD TEST > ELECTRICAL FUNCTION CHECK

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.
    1. Engine Speed
    2. Transmission ISS
    3. Transmission OSS
    4. Vehicle Speed
    5. IMS
    6. Commanded Gear
    7. Gear Ratio
    8. Line PC Sol. Pressure Cmd.
    9. Brake Switch
    10. ECT, Engine Data List
    11. Trans. Fluid Temp.
    12. TCM Temperature
    13. Calc. Throttle Position
    14. Ignition Voltage
    15. PC Sol. 2 Pressure Cmd.
    16. PC Sol. 3 Pressure Cmd.
    17. PC Sol. 4 Pressure Cmd.
    18. PC Sol. 5 Pressure Cmd.
    19. Shift Solenoid 1
    20. Shift Solenoid 2
    21. TCC PC Sol. Duty Cycle
    22. TCC Slip Speed

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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 trans fluid temperature is above 20°C) and not harsh. Note that these shifts may be almost imperceptible in some applications. Using the scan tool to monitor Transmission ISS achieving 0 rpm can be used to check delay in these cases.

> *NOTE:*
>
> *Harsh engagement may be caused by any of the following conditions:*
>
> 1. *High engine idle speed-Compare engine idle speed to desired idle speed.*
> 2. *Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.*
> 3. *A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.*
> 4. *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:*
>
> 1. *Low idle speed-Compare engine idle speed to desired idle speed.*
> 2. *Low fluid level*
> 3. *Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.*
> 4. *Cold transmission fluid temperature (TFT)-Use the scan tool to determine TFT.*
> 5. *Selector linkage-Inspect and adjust as necessary.*
> 6. *Incomplete adapting or incorrect adapting-Repeat maneuver multiple times to*

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see if delay improves. If it does not, refer to the service procedures for Harsh, Soft, Delayed or Slipping First, Second, Seventh, Eighth or Reverse Shift .

6. Monitor transmission range on the scan tool, transmission data list.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Move the gear selector through all ranges.
    3. Pause 2 to 3 seconds in each range.
    4. Return gear selector to PARK.
    5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Ensure the gear selector is in PARK.
    3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

DIAGNOSTIC INFORMATION AND PROCEDURES > 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:
    1. Calc. Throttle Position
    2. Vehicle Speed
    3. Engine Speed
    4. Transmission ISS
    5. Transmission OSS
    6. Commanded Gear
    7. TCC PC Sol. Pressure Cmd.
    8. TCC Slip Speed

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9. PC Sol. 2 Pressure Cmd.
10. PC Sol. 3 Pressure Cmd.
11. PC Sol. 4 Pressure Cmd.
12. PC Sol. 5 Pressure Cmd.
13. 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:

   1. Check for DTCs.
   2. Refer to Torque Converter Diagnosis .

DIAGNOSTIC INFORMATION AND PROCEDURES > ROAD TEST > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > ROAD TEST > MANUAL DOWNSHIFTS

Manual downshift testing is not required since all vehicles equipped with the 8L90 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.

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DIAGNOSTIC INFORMATION AND PROCEDURES > ROAD TEST > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > TORQUE CONVERTER STATOR

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > TORQUE CONVERTER BEARING NOISE

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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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > 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).

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER

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DIAGNOSIS > 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

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > TORQUE CONVERTER VIBRATION TEST

NOTE:

The Noise and Vibration Analysis procedure should be performed prior to performing this test.

DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > ISOLATING VIBRATION

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NOTE:

Some engine/transmission combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine.

To isolate and correct a flexplate or torque converter vibration:

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
4. Remove the torque converter access cover and the bolts (if equipped).
5. Mark the relationship of the torque converter to the flexplate.
6. Rotate the torque converter to inspect for defects or missing balance weights.
7. Index the converter according to "Indexing Torque Converter" procedure located within this procedure.
8. If the vibration remains, it is most likely caused by the engine.
9. Refer to "Torque Converter Replacement Guide" located within this procedure.

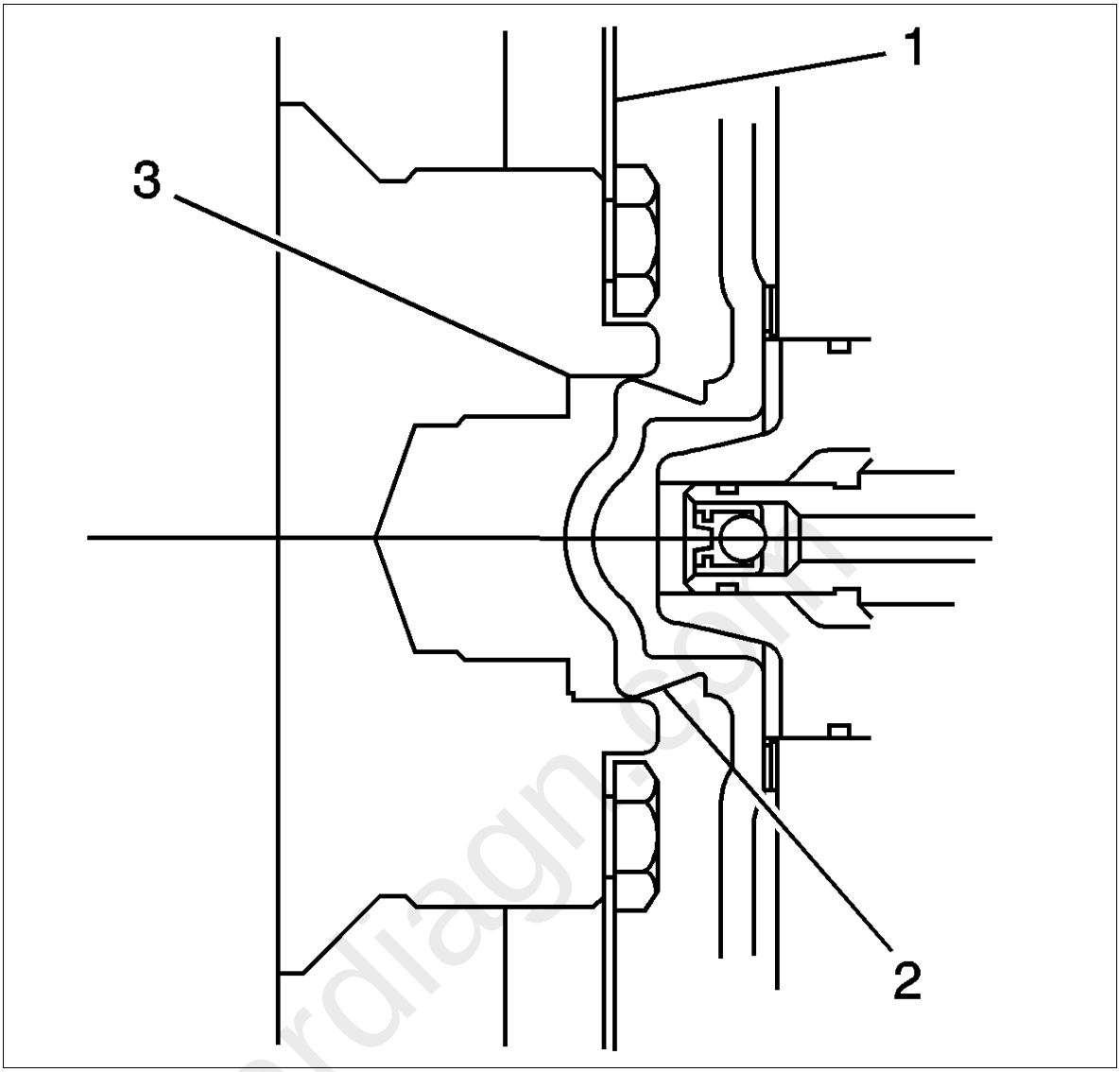
DIAGNOSTIC INFORMATION AND PROCEDURES > TORQUE CONVERTER DIAGNOSIS > INDEXING TORQUE CONVERTER

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.

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Fig 1: Torque Converter Hub In Engine Crankshaft



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⚠ *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 (Off Vehicle)Fastener

Specifications (On 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 (Off Vehicle)Fastener Specifications (On Vehicle) .

Torque Converter Replacement Guide

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to Transmission Fluid Level and Condition Check .
Transmission Fluid Contaminated with Metal Particles	Do not replace the torque converter for clutch system or gearset component damage. Fine metallic debris or clutch plate material that is suspended in the fluid will not cause damage to the internal torque converter components nor any internal transmission components.
Harsh Gear Shifts	Do not replace the torque converter. Refer to Symptoms - Automatic Transmission .
Noise-Whine	• Refer to Symptoms - Automatic Transmission . • Do not replace the torque converter if noise is present in Neutral/Park. Refer to Symptoms - Engine Mechanical.
Vibration-Out of Balance	Refer to Torque Converter Vibration Test in this procedure.
No Drive/Slips in Drive	Do not replace the torque converter until completing all engine and transmission diagnostics.
Idle Surge/Rough Idle	Do not replace the torque converter. Refer to Symptoms - Engine Controls.
TCC Apply/Release Shudder	Do not replace the torque converter. Refer to Torque Converter Clutch Shudder in this procedure.
TCC Chuggle	Do not replace the torque converter. Refer to Symptoms - Engine Controls.

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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.
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.
Torque Converter Pilot Damaged	Replace the torque converter.
Torque Converter Hub surface is damaged - scored, raised/transferred metal.	Replace the torque converter.
External Leaks in the weld areas - hub, lug or closure weld.	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

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DIAGNOSTIC INFORMATION AND PROCEDURES > FLEX PLATE/TORQUE CONVERTER VIBRATION TEST > ISOLATING VIBRATION

> ⚠ *CAUTION:*
>
> *Some engine/transaxle combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine. Ensure that the bolts do not bottom out in the lug nuts or the torque converter cover which could dent and cause internal damage.*

To isolate and correct a flywheel or torque converter vibration, separate the torque converter from the flywheel to determine if vibration is in the engine or transmission.

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
4. Remove the transmission converter cover bolts and the cover.
5. Mark the relationship of the converter to the flywheel.
6. Remove the bolts attaching the converter to the flywheel.
7. Slide the torque converter away from the flywheel.
8. Rotate the flywheel and torque converter to inspect for defects or missing balance weights.
9. Lower the vehicle.
10. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to Diagnostic System Check - Vehicle .
11. Turn the engine OFF.

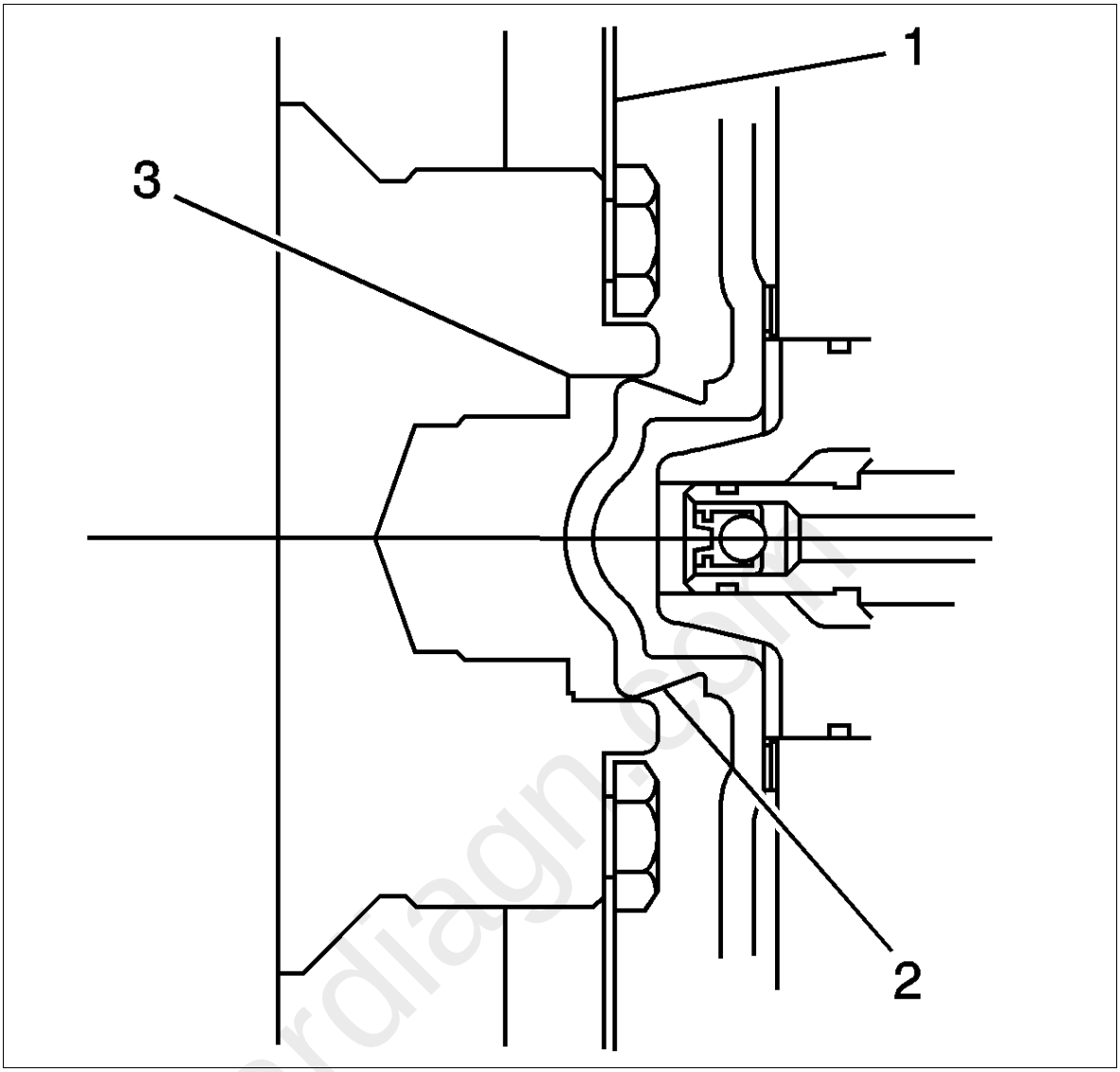
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DIAGNOSTIC INFORMATION AND PROCEDURES > FLEX PLATE/TORQUE CONVERTER VIBRATION TEST > INDEXING TORQUE CONVERTER

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 flywheel balance.

1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
2. Rotate the torque converter one bolt position.

Fig 1: Torque Converter Hub In Engine Crankshaft



Courtesy of GENERAL MOTORS COMPANY

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3. Align the torque converter hub (2) in the engine crankshaft (3) and install the torque converter to flywheel bolts.
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to Noise and Vibration Analysis .

   Repeat this procedure until you obtain the best possible balance.
6. Install the transmission converter cover bolts and the cover.

DIAGNOSTIC INFORMATION AND 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

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DIAGNOSTIC INFORMATION AND PROCEDURES > VIBRATION

Checks	Causes
Transmission Case Extension (411)	Inspect for damaged case extension.

DIAGNOSTIC INFORMATION AND PROCEDURES > 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 cause may be from poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.

- Inspect the tires for the following conditions:
    - Uneven wear
    - Imbalance
    - Mixed sizes
    - Mixed radial and bias ply
- Inspect the suspension components for the following conditions:
    - Alignment wear or damage
    - Loose fasteners
    - Driveline damage or wear
- 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

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DIAGNOSTIC INFORMATION AND PROCEDURES > WHINE/GROWL NOISE THAT CHANGES WITH VEHICLE SPEED

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing (58)	Inspect the bearing for wear or damage.
Output Carrier Assembly (73)	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers.

	• Inspect for a damaged center support roller bearing assembly. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured). • Inspect for damaged or stripped splines on the output carrier assembly.
Output Sun Gear Thrust Bearing (75)	Inspect the bearing for wear or damage.
Input Sun Gear Thrust Bearing (61)	Inspect the bearing for wear or damage.
Input Sun Gear Assembly (69)	Inspect for spline wear or damage.
1-2-3-4-5 Reverse Clutch Hub Thrust Bearing (70)	Inspect the bearing for wear or damage.
A/Trans Fluid Filter (46)	• Inspect for damaged or restricted fluid filter assembly (26) • Inspect for damaged fluid filter seal assembly (25) or improper sealing interface (leaks, fluid aeration).
A/Trans Fluid Pump Seal (302)	Inspect for worn or damaged seal.

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DIAGNOSTIC INFORMATION AND PROCEDURES > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > CLUTCH PLATE DIAGNOSIS > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > CLUTCH PLATE DIAGNOSIS > 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 is between channels.
    - The valve bushing clips are improperly installed.
    - The checkballs are misplaced.
- The Teflon® seal rings are worn or damaged.

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DIAGNOSTIC INFORMATION AND PROCEDURES > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID LEAK DIAGNOSIS > POWDER METHOD

> ⚠ *CAUTION:*
>
> *Do not clean using brake cleaner or other reactive solvents as these solvents can*

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damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type powder, such as foot 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.

DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID LEAK DIAGNOSIS > 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. Detect the leak with the black light.
3. Make the necessary repairs.

DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID LEAK DIAGNOSIS > 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

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- 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 or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

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DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID LEAK DIAGNOSIS > POSSIBLE POINTS OF FLUID LEAKS

Transmission Oil Pan

- Incorrectly tightened oil pan bolts
- Improperly installed or damaged oil pan gasket
- Damaged oil pan or mounting face
- Incorrect oil pan gasket

Case Leak

- Damaged vehicle speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler connector fittings
- Worn or damaged propeller shaft oil seal
- Loose line pressure pipe plug

- Porous casting warped torque converter housing

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 transmission case or the oil pump

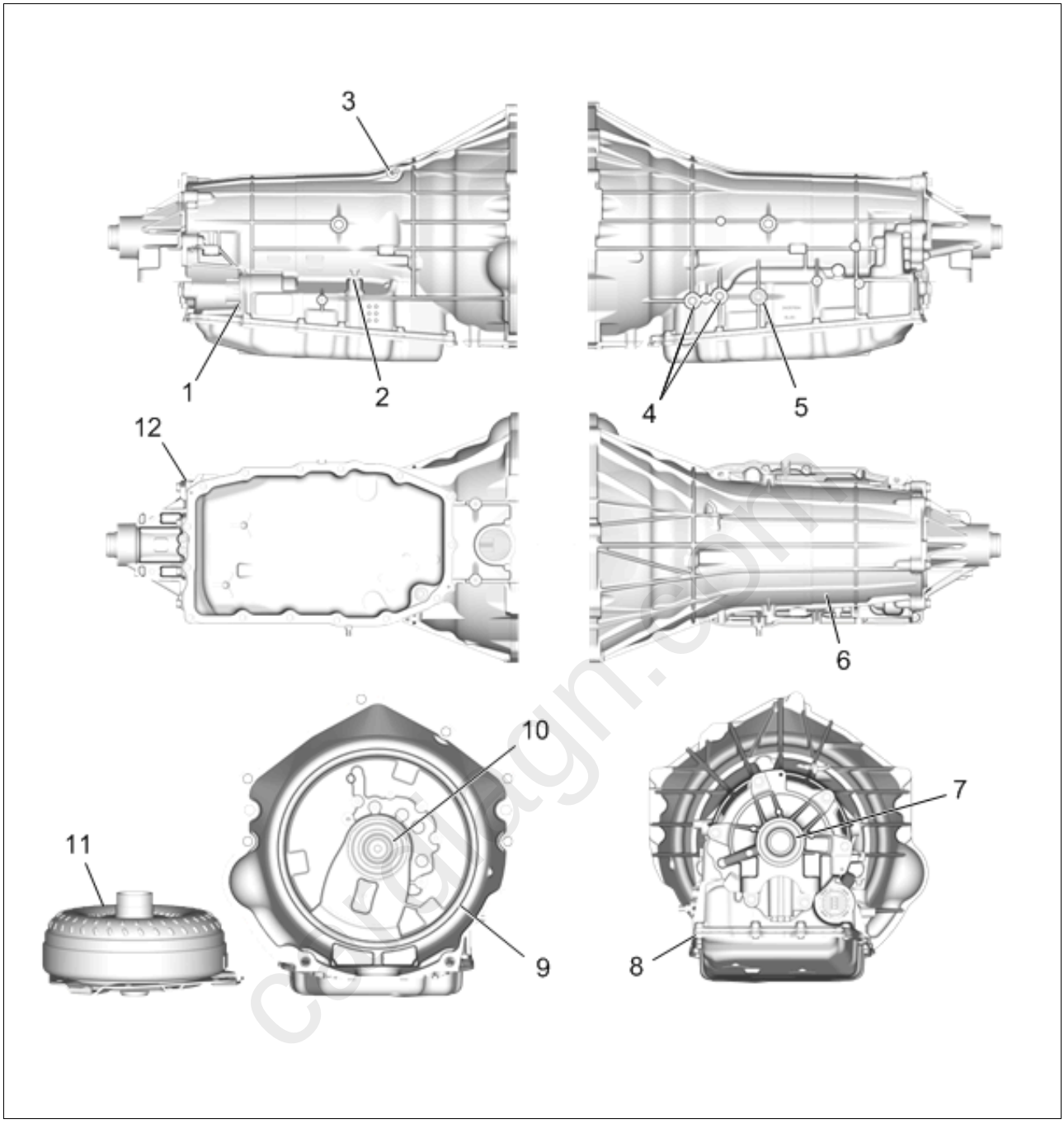
Leak at the Vent Pipe

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator
- Plugged vent
- Drain-back holes plugged
- Mispositioned oil pump to case gasket, if equipped

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DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID LEAK DIAGNOSIS > LEAK INSPECTION POINTS

Fig 1: Leak Inspection Points



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1. A/Trans Wiring Harness
2. Transmission Fluid Fill Tube Plug
3. A/Trans Vent
4. Transmission Cooler Pipe Fitting Seal
5. Manual Shift Shaft Seal
6. A/Trans Case Assembly

7. Propeller Shaft Transmission Flange Fluid Seal
8. A/Trans Fluid Pan Gasket
9. A/Trans Case Front Cover Seal
10. Torque Converter Fluid Seal
11. Torque Converter
12. A/Trans Case Extension Seal

DIAGNOSTIC INFORMATION AND PROCEDURES > CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the vehicle.

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. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush 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 starting the engine.
5. Repeat the fluid leak diagnosis procedures.

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DIAGNOSTIC INFORMATION AND PROCEDURES > AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (1)	Inspect for damage, cracks at the lug, hub and seal welds.
Automatic Transmission Fluid Pump Seal (5)	Inspect for cut, wear, or damage.
A/Trans Case Assembly (16)	• Inspect for porosity or damage. • Inspect manual shaft seal.

	• Inspect control wiring input sleeve seals.
A/Trans Case Extension Assembly (22)	• Verify oil is from transmission and not transfer case assembly (4WD/AWD). • Inspect extension seal assembly (inner seal behind boot - 2WD only). • Inspect extension to case seal (2WD only).
A/Trans Fluid Pan (49)	• Inspect the pan assembly for damage. • Inspect gasket for damage or wear. • Inspect case and pan for damage and flatness at gasket interface area.
Cooler Lines/Coolers	• Inspect and follow cooler lines to front radiator and external coolers. • Some vehicles may have rear differential external and internal coolers.

DIAGNOSTIC INFORMATION AND PROCEDURES > 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 shift cable adjustment.
Manual Shaft	• Verify shift lever is properly attached to the manual shaft. • Verify manual shaft is not twisted or damaged.

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Manual Shift Detent Lever with Shaft Position Switch Assembly, IMS	Verify proper operation.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO PARK OR DRIVE

Checks	Causes
Output Shaft Assembly (76)	Inspect for a broken or damaged output shaft. Inspect for worn splines.
A/Trans Case Assembly (16)	• Inspect for broken or damaged case. • Inspect for broken or bent park pawl actuator. • Inspect for broken or missing park pawl actuator guide pin or manual shaft pin. • Inspect for broken, loose or misaligned park pawl guide. • Inspect for binding or broken park pawl or actuator assembly.
Manual Shift Shaft Position Switch Assembly (604)	Inspect for broken or disengaged manual valve detent.

DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH GARAGE SHIFT

Checks	Causes
NOTE: *On cold days, approximately 32°F (0°C) or colder, the transmission is designed to shift differently. The transmission uses a warm-up mode shift schedule until the engine reaches normal operating temperature. While the transmission is in warm-up mode, it is normal for transmission upshifts to be delayed or held longer. This feature improves heater performance by giving quicker vehicle warm-ups.*	
Engine	Elevated engine RPM - Verify correct engine operating rpm per application.
Control Solenoid (w/Body and Valve) Valve Assembly (40)	• Incorrect or inadequate adapt activity - Perform Transmission Service Fast Learn Procedure procedure. • Incorrect TCM temperature reporting - Monitor TCM

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	temperature using Tech 2. • Line pressure control solenoid incorrect pressure.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO DRIVE IN ALL RANGES

Checks	Causes
A/Trans Fluid Pan (49)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
A/Trans Fluid Filter (46)	• Inspect for damaged or restricted fluid filter (46). • Inspect for damaged fluid filter seal (45) or improper sealing interface, leaks, and fluid aeration.
A/Trans Fluid Pump Seal (302)	Inspect for worn or damaged seal.
A/Trans Cooling/Lubrication System	Inspect transmission oil cooler (radiator) and cooler line seals for restrictions, damage, kinks, or leaks.
Torque Converter Assembly (1)	Inspect for overheating (blued), ballooning, leaks, or other damage.
Manual Valve (384)	Inspect the manual valve detent lever assembly and connection to the manual valve (384).
A/Trans Manual Shift Shaft Position Switch Assembly (308)	Inspect the switch assembly (308) and connection to the manual valve (354).
Manual Shift Shaft Position Switch Assembly (604)	Inspect PRNDL commands to and from vehicle using Tech 2.
Control Solenoid (w/Body and Valve) Valve Assembly (40)	Inspect PRNDL commands to and from vehicle using Tech 2.
Output Shaft (76)	Inspect for spline wear or damage.
Output Carrier Assembly (73)	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured).
Input Carrier Assembly (67)	Inspect carrier assembly for damaged pinion gears, thrust washers, pins, and rollers.
Input Sun Gear Assembly (69)	Inspect for spline wear or damage.

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DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH, SOFT, DELAYED OR SLIPPING FIRST, THIRD, FIFTH, SIXTH OR SEVENTH SHIFT

Checks	Causes
1-3-5-6-7 Clutch Assembly (57)	• Inspect for damaged or worn 1-3-5-6-7 clutch plates (511-512). • Inspect for damaged 1-3-5-6-7 clutch piston (509), clutch housing (506), return spring (515), and piston dam (516). • Inspect for damaged 1-3-5-6-7 clutch piston dam retaining ring (517). • Inspect for cut, worn or damaged 1-3-5-6-7 clutch piston seals (507, 508), and dam seal (510). • Inspect for improper selective 1-3-5-6-7 clutch backing plate retaining ring (514). • Inspect for damaged 1-3-5-6-7 clutch backing plate (513). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO FIRST, THIRD, FIFTH, SIXTH OR SEVENTH GEAR

Checks	Causes
1-3-5-6-7 Clutch Assembly (57)	• Inspect for damaged or worn 1-3-5-6-7 clutch plates (511-512). • Inspect for damaged 1-3-5-6-7 clutch piston (509), clutch housing (506), return spring (515), and piston dam (516). • Inspect for damaged 1-3-5-6-7 clutch piston dam retaining ring (517). • Inspect for cut, worn or damaged 1-3-5-6-7 clutch piston seals (507, 508), and dam seal (510). • Inspect for improper selective 1-3-5-6-7 clutch backing plate retaining ring (514). • Inspect for damaged 1-3-5-6-7 clutch backing plate (513). Inspect for worn splines on backing plate.

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DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH, SOFT, DELAYED OR SLIPPING SECOND, THIRD, FOURTH, SIXTH OR EIGHTH SHIFT

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 2-3-4-6-8 clutch plates (545-548). • Inspect for damaged 2-3-4-6-8 clutch piston (526), clutch housing (521), return spring (527), piston dam (529), and apply ring (544). • Inspect for damaged 2-3-4-6-8 clutch piston dam retaining ring (531). • Inspect for cut, worn or damaged 2-3-4-6-8 clutch piston seal (525), and dam seals (522, 528, 530). • Inspect for improper selective 2-3-4-6-8 clutch backing plate retaining ring (550). • Inspect for damaged 2-3-4-6-8 clutch backing plate (549). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO SECOND, THIRD, FOURTH, SIXTH OR EIGHTH GEAR

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 2-3-4-6-8 clutch plates (545-548). • Inspect for damaged 2-3-4-6-8 clutch piston (526), clutch housing (521), return spring (527), piston dam (529), and apply ring (544). • Inspect for damaged 2-3-4-6-8 clutch piston dam retaining ring (531). • Inspect for cut, worn or damaged 2-3-4-6-8 clutch piston seal (525), and dam seals (522, 528, 530). • Inspect for improper selective 2-3-4-6-8 clutch backing plate retaining ring (550). • Inspect for damaged 2-3-4-6-8 clutch backing plate (549). Inspect for worn splines on backing plate.

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DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH, SOFT, DELAYED OR SLIPPING FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH OR REVERSE SHIFT

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 4-5-6-7-8 Reverse clutch plates (539-541). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston (534), clutch housing (521), return spring (535), piston dam (537), and piston stop (532). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston dam retaining ring (538). • Inspect for cut, worn or damaged 4-5-6-7-8 Reverse clutch piston seals (524, 533), piston stop O-ring seal (523) and dam seal (536). • Inspect for improper selective 4-5-6-7-8 Reverse clutch backing plate retaining ring (543). • Inspect for damaged 4-5-6-7-8 Reverse clutch backing plate (542). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH OR REVERSE GEAR

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 4-5-6-7-8 Reverse clutch plates (539-541). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston (534), clutch housing (521), return spring (535), piston dam (537), and piston stop (532). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston dam retaining ring (538). • Inspect for cut, worn or damaged 4-5-6-7-8 Reverse clutch piston seals (524, 533), piston stop O-ring seal (523) and dam seal (536). • Inspect for improper selective 4-5-6-7-8 Reverse clutch backing plate retaining ring (543).

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	• Inspect for damaged 4-5-6-7-8 Reverse clutch backing plate (542). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, SEVENTH, EIGHTH OR REVERSE SHIFT

Checks	Causes
1-2-7-8 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-7-8 Reverse clutch plates (585-588). • Inspect for damaged 1-2-7-8 Reverse clutch piston (582), clutch piston housing (581), return spring (583), and apply ring (584). • Inspect for damaged 1-2-7-8 Reverse clutch piston housing retaining ring (580). • Inspect for damaged or improper selective 1-2-7-8 Reverse clutch backing plate (589). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO FIRST, SECOND, SEVENTH, EIGHTH OR REVERSE GEAR

Checks	Causes
1-2-7-8 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-7-8 Reverse clutch plates (585-588). • Inspect for damaged 1-2-7-8 Reverse clutch piston (582), clutch piston housing (581), return spring (583), and apply ring (584). • Inspect for damaged 1-2-7-8 Reverse clutch piston housing retaining ring (580). • Inspect for damaged or improper selective 1-2-7-8 Reverse clutch backing plate (589). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, THIRD, FOURTH, FIFTH OR REVERSE SHIFT

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Checks	Causes
1-2-3-4-5 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5 Reverse clutch plates (592-595). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston (406), clutch piston dam (402), and return spring (405). • Inspect for cut, worn or damaged 1-2-3-4-5 Reverse clutch piston seals (403, 408), piston O-ring seal (404), dam seal (401), and dam inner O-ring seal (409). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston dam retaining ring (400). • Inspect for damaged or improper selective 1-2-3-4-5 Reverse clutch backing plate retaining ring (590). • Inspect for damaged 1-2-3-4-5 Reverse clutch backing plate (591). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO FIRST, SECOND, THIRD, FOURTH, FIFTH OR REVERSE GEAR

Checks	Causes
1-2-3-4-5 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5 Reverse clutch plates (592-595). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston (406), clutch piston dam (402), and return spring (405). • Inspect for cut, worn or damaged 1-2-3-4-5 Reverse clutch piston seals (403, 408), piston O-ring seal (404), dam seal (401), and dam inner O-ring seal (409). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston dam retaining ring (400). • Inspect for damaged or improper selective 1-2-3-4-5 Reverse clutch backing plate retaining ring (590). • Inspect for damaged 1-2-3-4-5 Reverse clutch backing plate (591). Inspect for worn splines on backing plate.

DIAGNOSTIC INFORMATION AND PROCEDURES > NO TORQUE CONVERTER CLUTCH APPLY

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Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to Torque Converter Diagnosis .

DIAGNOSTIC INFORMATION AND PROCEDURES > NO TORQUE CONVERTER CLUTCH RELEASE

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to Torque Converter Diagnosis .

DIAGNOSTIC INFORMATION AND PROCEDURES > TRANSMISSION SERVICE FAST LEARN PROCEDURE

The transmission service fast learn is a procedure that is performed after any 8L45/90 transmission repair. The service fast learn procedure performs a series of tests which allow the transmission control module (TCM) to learn individual clutch apply pressures. These learn pressure values are used by the TCM for clutch control and timing of shifts. The scan tool is used to perform the transmission service fast learn procedure.

The service fast learn procedure must be performed when any of the following repairs has been made to the transmission.

- Pressure regulating solenoid replacement
- Valve body repair or replacement
- Any service/repair in response to a shift quality concern
- Any internal transmission service, repair, overhaul, or replacement
- Torque converter replacement
- TCM replacement
- Transmission assembly replacement
- Reprogramming Transmission Control Module

Failure to perform the procedure may result in poor transmission performance, DTCs being set, or customer dissatisfaction. Perform the service fast learn procedure in the exact sequence as listed below.

1. If a pressure regulating solenoid, TCM or transmission assembly was replaced, perform the Solenoid Valve Characterization Reprogramming .
2. Ignition ON, clear the DTCs with a scan tool.
3. Ignition OFF, and all vehicle systems OFF. It may take up to 2 minutes for all vehicle control

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modules to power down.

> *NOTE:*
>
> *If the transmission fluid temperature is not between 75°C (167°F) and 85°C (185°F) the scan tool will not allow you to perform the service fast learn procedure.*

4. Engine running, transmission in drive position with brake applied. Perform the service fast learn procedure with a scan tool. Follow the instructions on the scan tool.
5. Ignition OFF for 2 minutes.

DIAGNOSTIC INFORMATION AND PROCEDURES > FLUID PRESSURE HIGH OR LOW

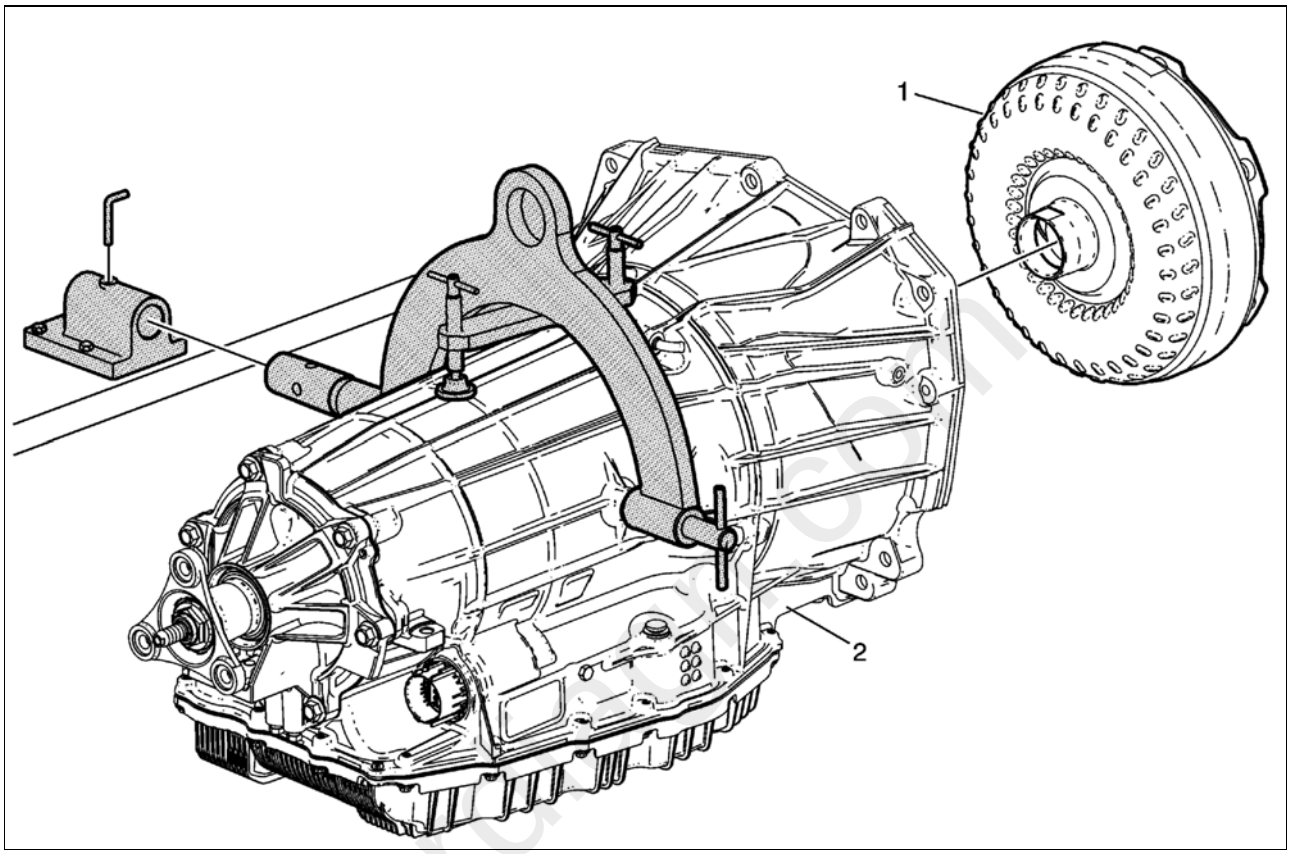
Checks	Causes
A/Trans Fluid Pump Assembly (301)	• Inspect for damaged or porous pump cover assembly. Inspect for pump surfaces not flat. • Inspect for excessive fluid pump shaft clearance or damage. • Inspect for worn or damaged fluid pump seal (302). • Inspect for worn or damaged fluid pump gasket (303).
Control Valve Upper Body Assembly (315)	• Inspect for worn, sticking, or damaged actuator feed limit valve (335) and spring (334). • Inspect for worn, sticking, or damaged 1-2-3-4-5 reverse clutch boost valve (344) and spring (345).
A/Trans Fluid Filter (46)	• Inspect for damaged or restricted fluid filter assembly (46). • Inspect for damaged fluid filter seal assembly (45).

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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - REPAIR INSTRUCTIONS - OFF VEHICLE

REPAIR INSTRUCTIONS - OFF VEHICLE > TORQUE CONVERTER REMOVAL AND HOLDING FIXTURE INSTALLATION

Fig 1: Torque Converter Removal and Holding Fixture



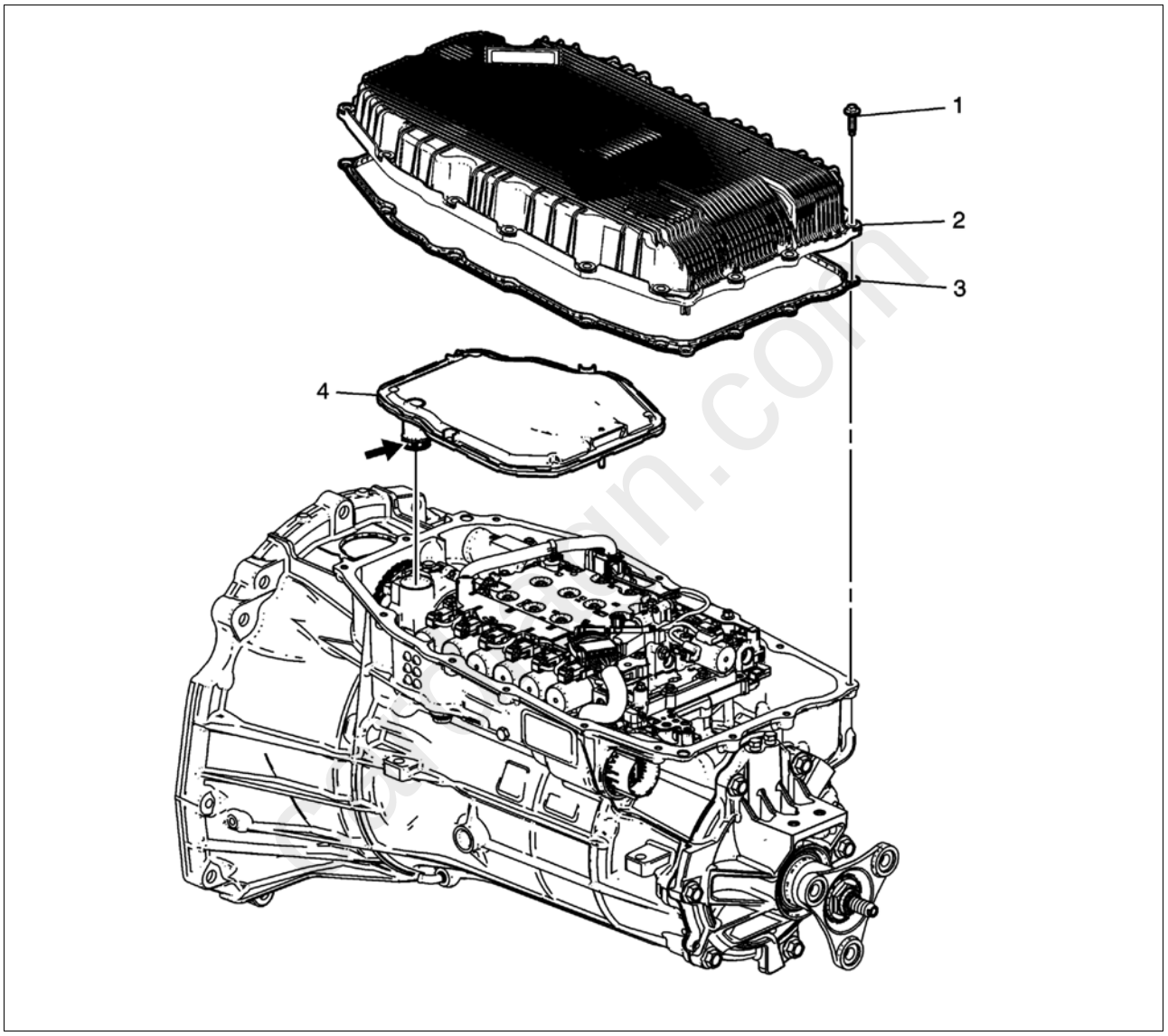
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter
2	Automatic Transmission Case Assembly Procedure 1. Rotate the transmission so that the converter housing is up and secure with locking pin. 2. Allow any remaining transmission fluid to drain from the case extension. Special Tools • **DT-03289-20** Holding Fixture Base Assembly • **DT-48989** Holding Fixture

	For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION FLUID PAN AND FILTER ASSEMBLY REMOVAL

Fig 1: Transmission Fluid Pan and Filter



Courtesy of GENERAL MOTORS COMPANY

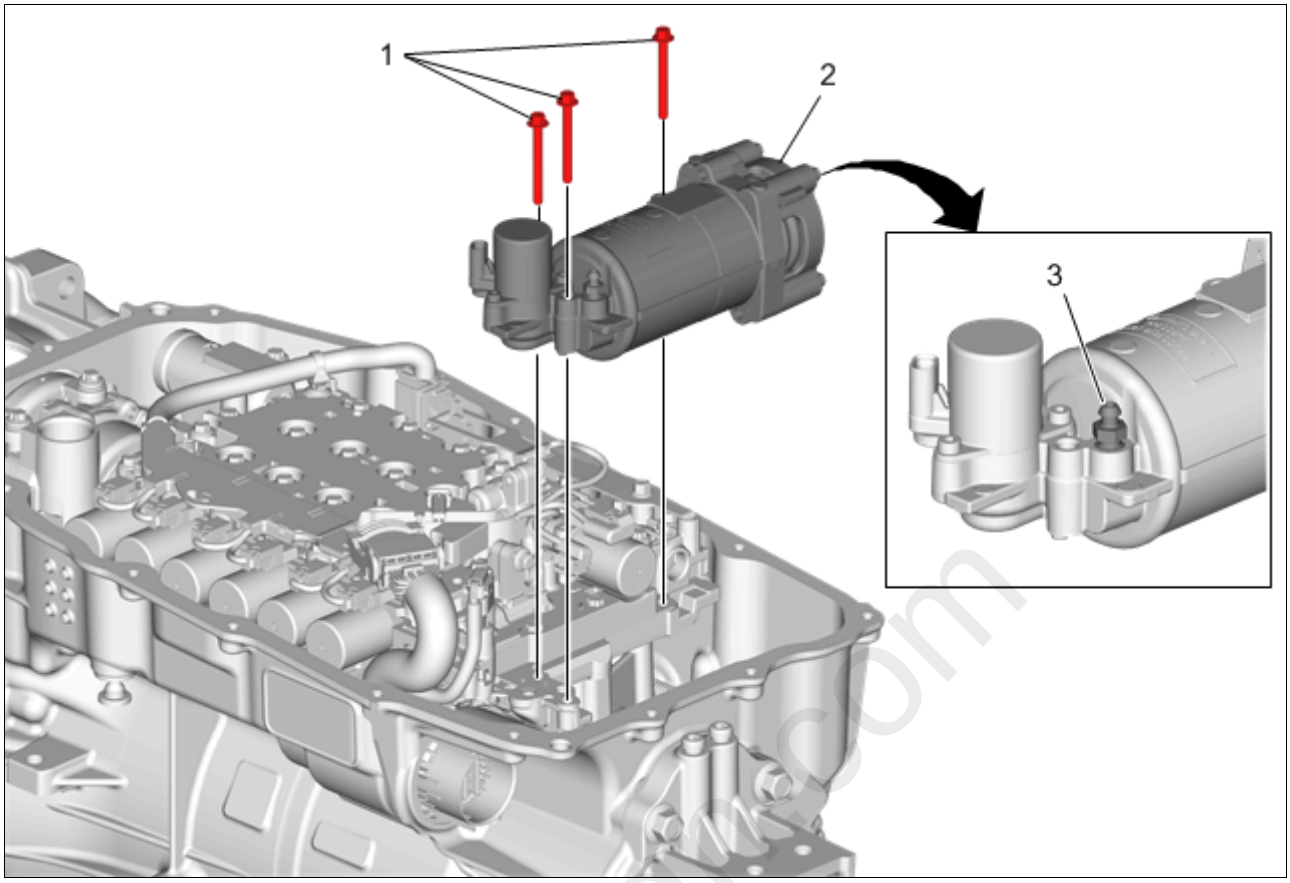
Callout	Component Name
1	A/Trans Fluid Pan Bolt M6 x 20 (Qty: 15)
2	A/Trans Fluid Pan
3	A/Trans Fluid Pan Gasket

	NOTE: *The fluid pan gasket is reusable. Inspect the gasket to determine if it may be reused. If the gasket is stuck to the case or pan, it should be replaced.*
4	A/Trans Fluid Filter *CAUTION:* *Pull the fluid filter assembly straight out to avoid damage. Do not bend or twist the filter neck.* *NOTE:* *The seal is not serviced separately. Inspect the fluid filter seal, if the seal is damaged, replace the filter.*

REPAIR INSTRUCTIONS - OFF VEHICLE > AUXILIARY FLUID ACCUMULATOR REMOVAL (WITH START/STOP)

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Fig 1: Auxiliary Fluid Accumulator (With Stop/Start)



Courtesy of GENERAL MOTORS COMPANY

Auxiliary Fluid Accumulator Removal

Callout	Component Name

WARNING:

The automatic transmission fluid accumulator may be pressurized greater than 120 psi (827 kpa) and fluid may be hot. When servicing accumulator, key must be OFF for a minimum of 10 minutes. Do not open bleeder screw until instructed to do so or personal injury may result.

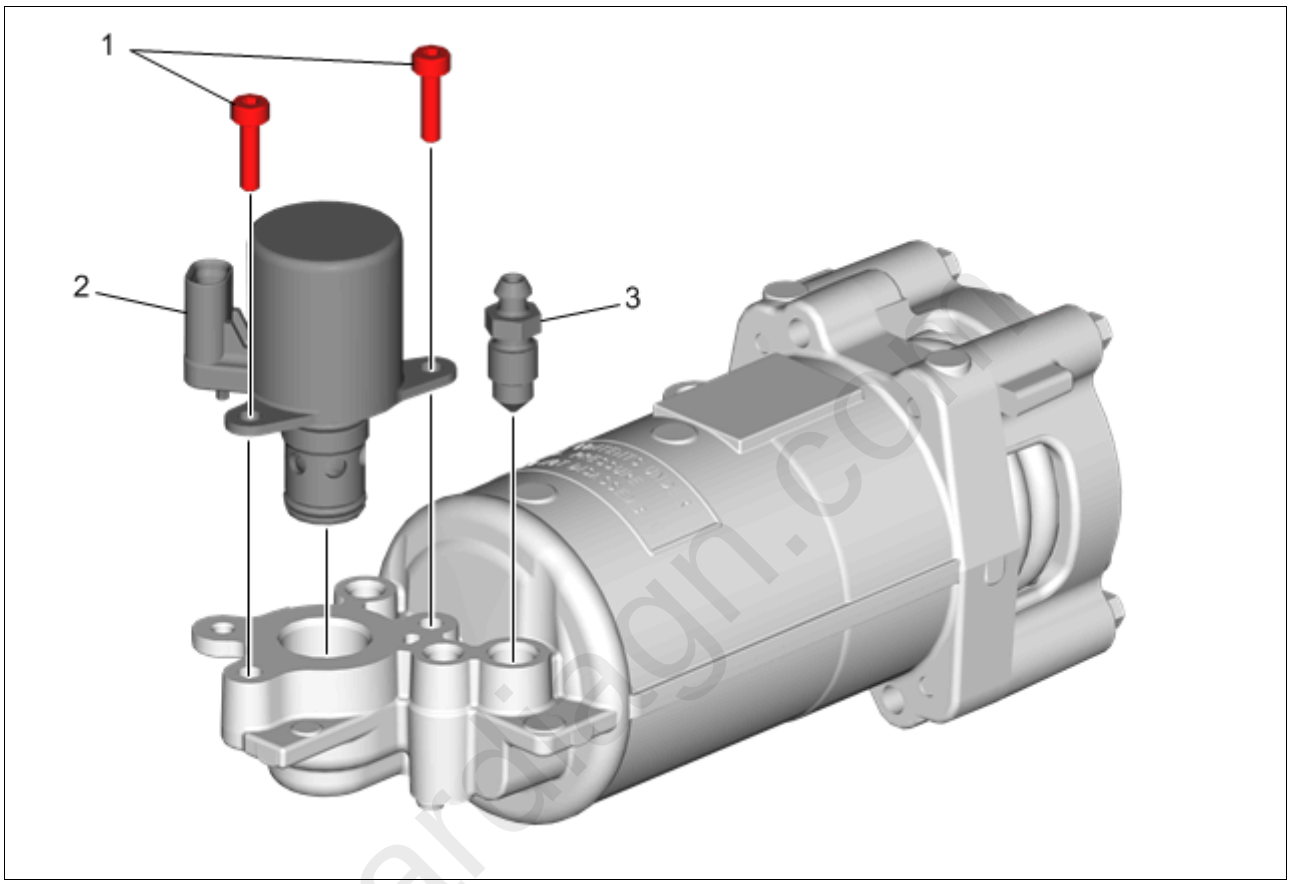
Preliminary Procedure

1. Disconnect the auxiliary fluid accumulator solenoid electrical connector.
2. Securely attach a hose from the bleeder valve into an approved container.
3. Slowly loosen bleeder valve until pressure begins to release.
4. Allow all pressure and fluid to be released from the auxiliary fluid accumulator.

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5. Remove the bleeder valve to ensure all fluid and pressure has been released.	
1	A/Trans Auxiliary Fluid Accumulator Bolt (Qty: 3)
2	A/Trans Auxiliary Fluid Accumulator
3	A/Trans Auxiliary Fluid Accumulator Bleeder Valve

Fig 2: Auxiliary Fluid Accumulator Solenoid and Bleeder Valve



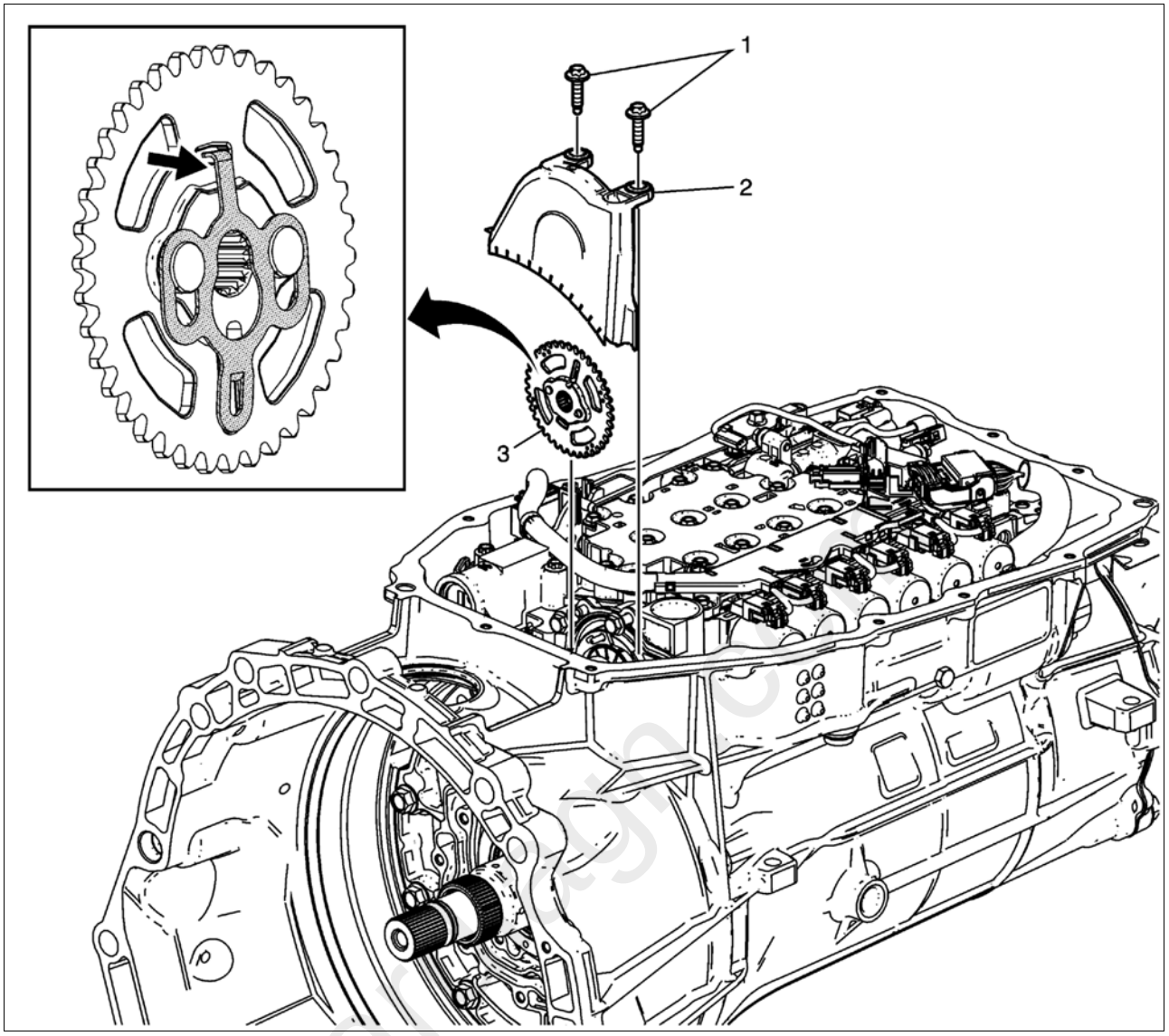
Courtesy of GENERAL MOTORS COMPANY

Auxiliary Fluid Accumulator Solenoid and Bleeder Valve Removal

Callout	Component Name
1	A/Trans Auxiliary Fluid Accumulator Solenoid Bolts (Qty: 2)
2	A/Trans Auxiliary Fluid Accumulator Solenoid
3	A/Trans Auxiliary Fluid Accumulator Bleeder Valve

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE ASSEMBLY AND TRANSMISSION WIRING HARNESS REMOVAL > A/TRANS FLUID BAFFLE AND DRIVEN SPROCKET REMOVAL

Fig 1: A/Trans Fluid Baffle and Driven Sprocket



Courtesy of GENERAL MOTORS COMPANY

A/Trans Fluid Baffle and Driven Sprocket Removal

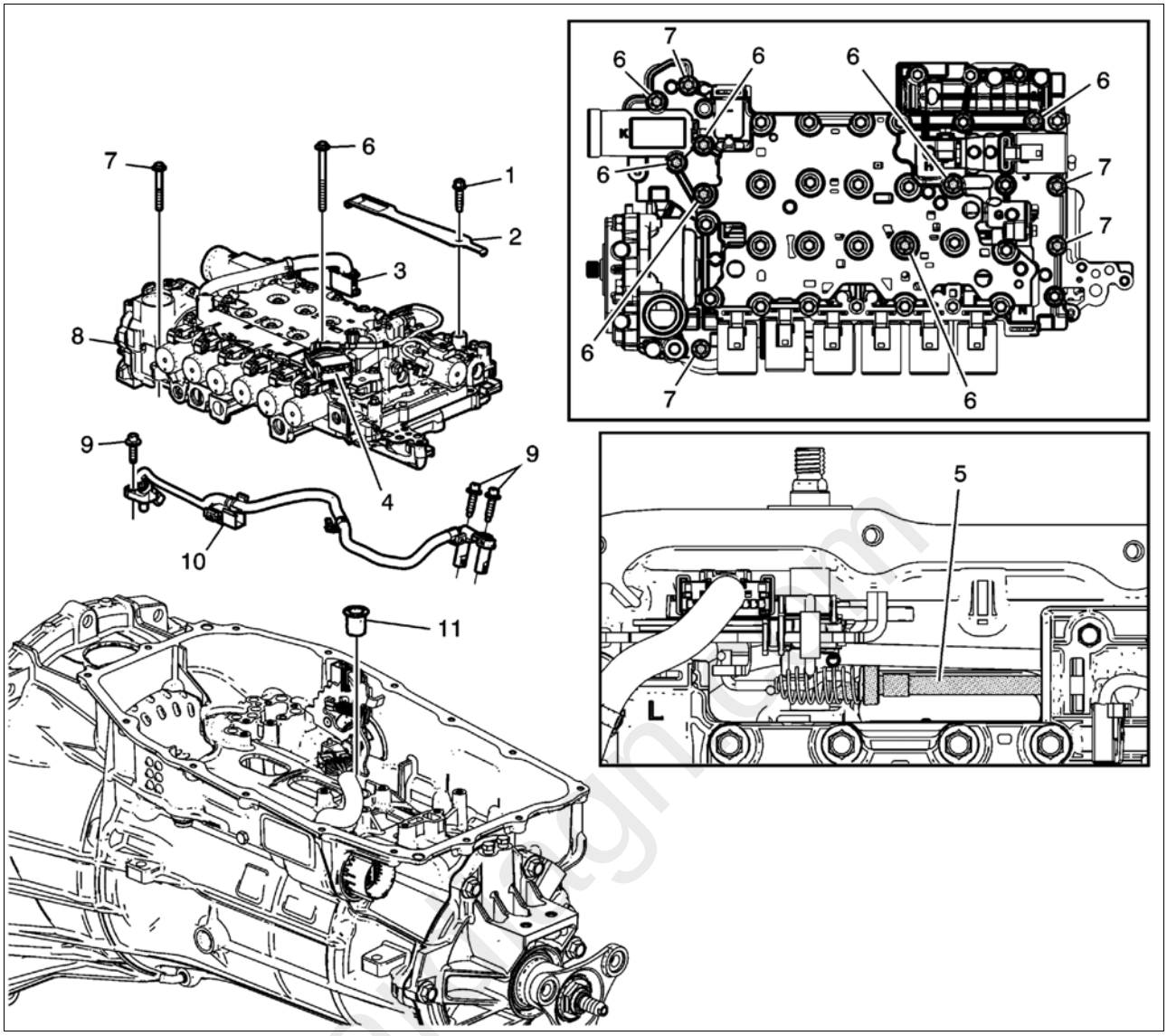
Callout	Component Name
1	A/Trans Fluid Baffle Bolt M6 x 25 (Qty: 2) *CAUTION:* *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.*

	NOTE: *Remove and DISCARD the bolts.*
2	A/Trans Fluid Baffle
3	Driven Sprocket Procedure 1. The driven sprocket locking tab is located on the back of the sprocket. 2. Rotate the sprocket as shown and simultaneously pull back and up on the tab to release the retainer. 3. Remove the driven sprocket from the oil pump shaft leaving the drive link (chain) loose in the case.

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE ASSEMBLY AND TRANSMISSION WIRING HARNESS REMOVAL > CONTROL VALVE BODY ASSEMBLY REMOVAL

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Fig 1: Control Valve Body



Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Assembly Removal

Callout	Component Name
1	Manual Shaft Detent Lever Spring Bolt M6 x 25 (Qty: 1)
2	Manual Shaft Detent Lever Spring
3	A/Trans Control Wiring Harness **Procedure** Disconnect the wiring harness connector from the manual shift shaft position switch.
4	A/Trans Wiring Harness **Procedure** Disconnect the wiring harness connector from the A/Trans control wiring harness.

5	Manual Valve **Procedure** Disconnect the manual valve from the manual valve link.
6	Control Valve Solenoid Body Bolt M6 x 68 (Qty: 7) *NOTE:* *Do not remove all the bolts in the control valve body assembly. Remove only the bolts indicated.* **Special Tools** **DT-48285** Valve Body Torx Plus Socket For equivalent regional tools, refer to Special Tools .
7	Control Valve Solenoid Body Bolt M6 x 45 (Qty: 4) *NOTE:* *Do not remove all the bolts in the control valve body assembly. Remove only the bolts indicated.* **Special Tools** **DT-48285** Valve Body Torx Plus Socket For equivalent regional tools, refer to Special Tools .
8	Control Valve Body Assembly *CAUTION:* *Use care when handling the control valve body assembly. If dropped, damage to the control solenoid valve body assembly internal components may result.*
9	Output Speed Sensor Wiring Harness Bolt M6 x 25 (Qty: 3) *CAUTION:* *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.*

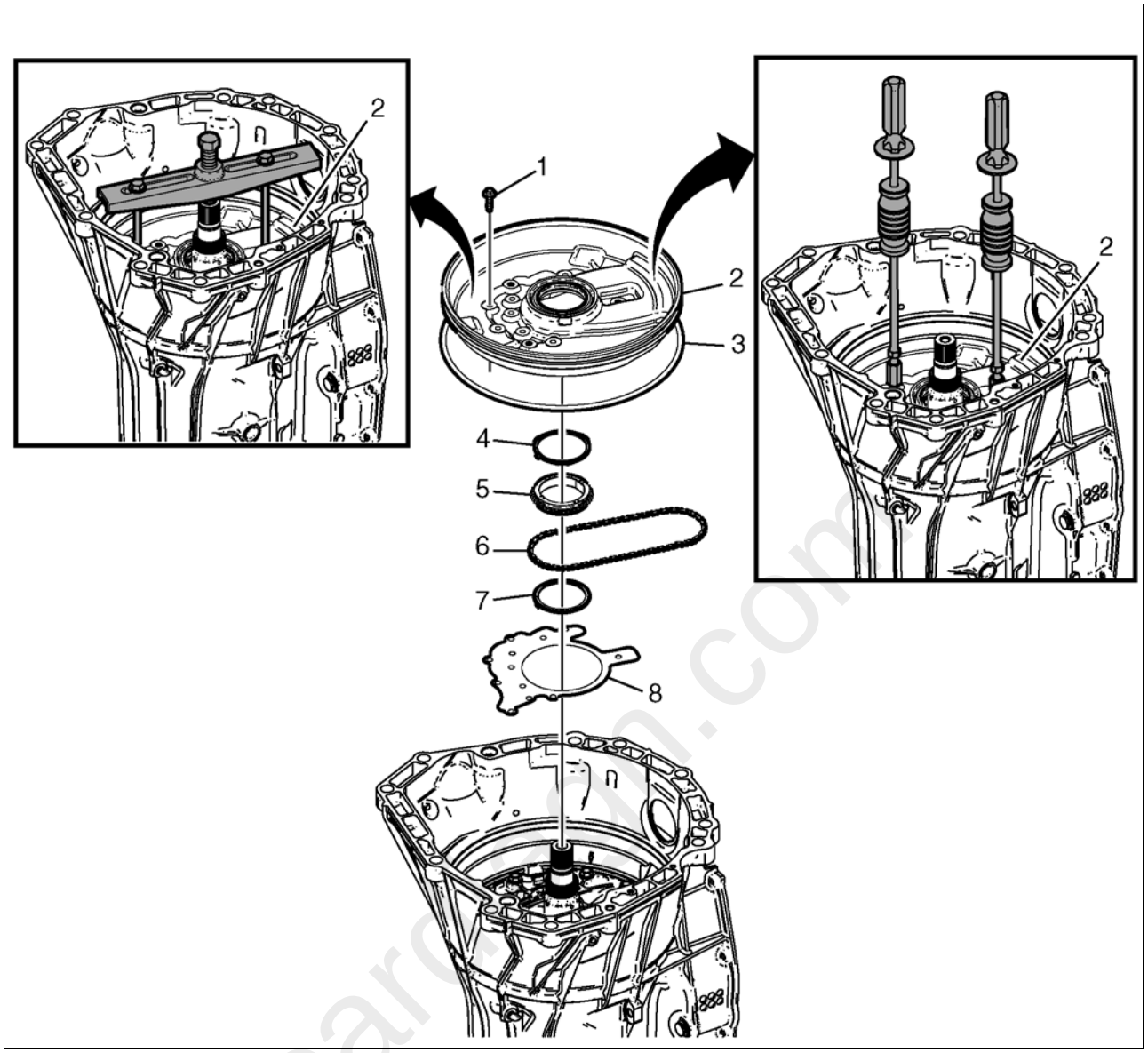
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	NOTE: *Remove and DISCARD the bolts.* **Special Tools** **DT-48285** Valve Body Torx Plus Socket For equivalent regional tools, refer to Special Tools .
10	Output Speed Sensor Wiring Harness
11	Clutch Housing Fluid Passage Seal *NOTE:* *DISCARD the seal.*

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION CASE FRONT COVER AND DRIVE LINK REMOVAL

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Fig 1: Transmission Case Front Cover and Drive Link



Courtesy of GENERAL MOTORS COMPANY

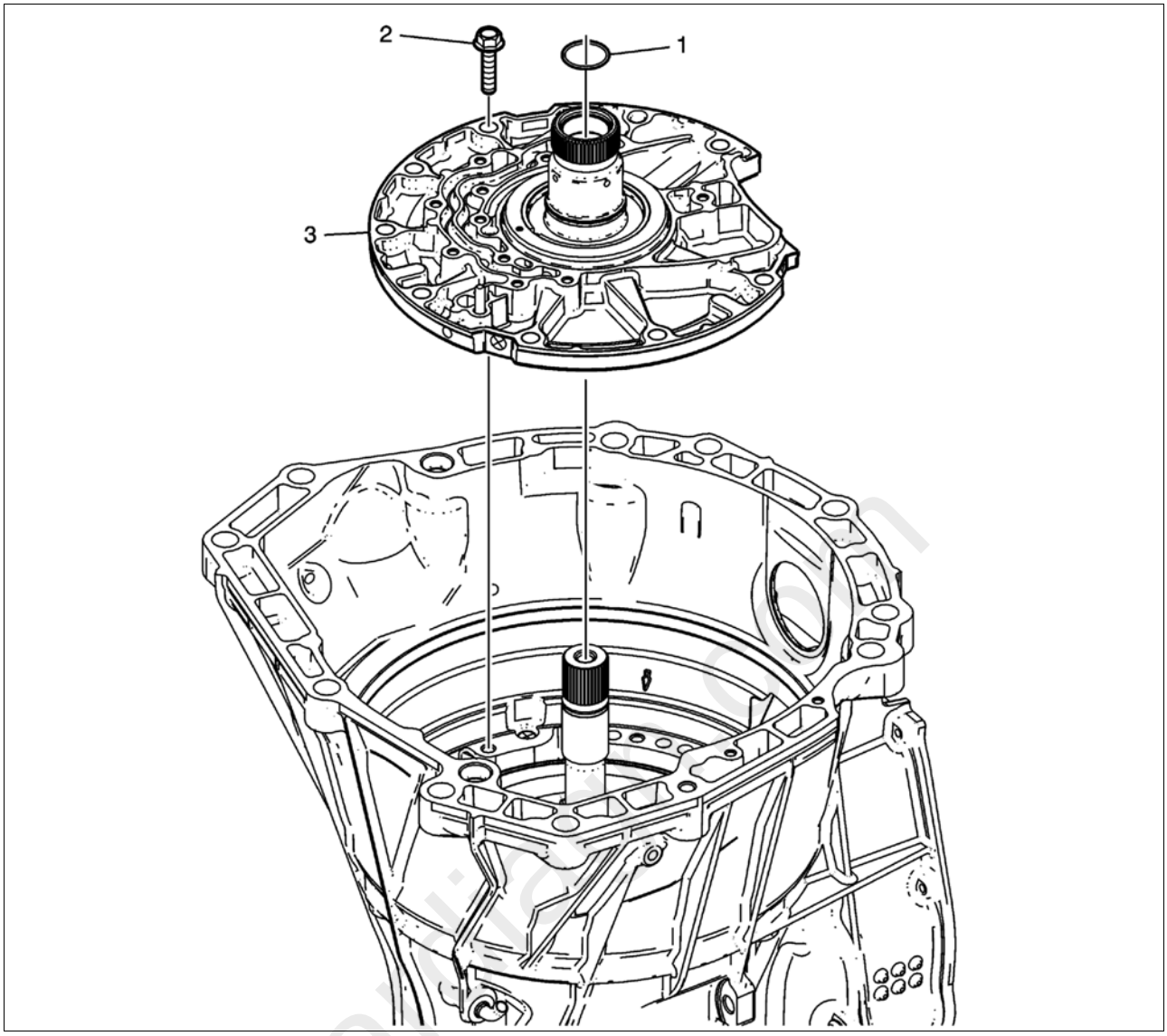
Callout	Component Name
1	A/Trans Front Cover Bolt M6 x 30 (Qty: 11) *NOTE:* *DISCARD the bolts.*
2	A/Trans Front Cover Procedure

	NOTE: *There are 2 different front cover configurations. Early design front covers have 3 threaded holes for service, late design front covers have 2 threaded holes.* 1. Use two **GE-6125-1B** slide hammers and **DT-51791** slide hammer adapters in the threaded holes of the front cover to remove it from the case for applications with 3 threaded holes. 2. Use the **GE-8433** puller bar and 2 bolts in the threaded holes of the front cover to remove it from the case for applications with 2 threaded holes. Special Tools • **DT-51791** Slide Hammer Adapters • **GE-6125-1B** Slide Hammer • **GE-8433** Puller Bar For equivalent regional tools, refer to Special Tools .
3	A/Trans Front Cover Seal *NOTE:* *DISCARD the seal.*
4	Drive Sprocket Thrust Washer (Front)
5	Drive Sprocket
6	Drive Link Assembly
7	Drive Sprocket Thrust Washer (Rear)
8	A/Trans Front Support Cover Gasket *NOTE:* *Remove and DISCARD the gasket.*

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REPAIR INSTRUCTIONS - OFF VEHICLE > STATOR SHAFT SUPPORT REMOVAL

Fig 1: Stator Shaft Support

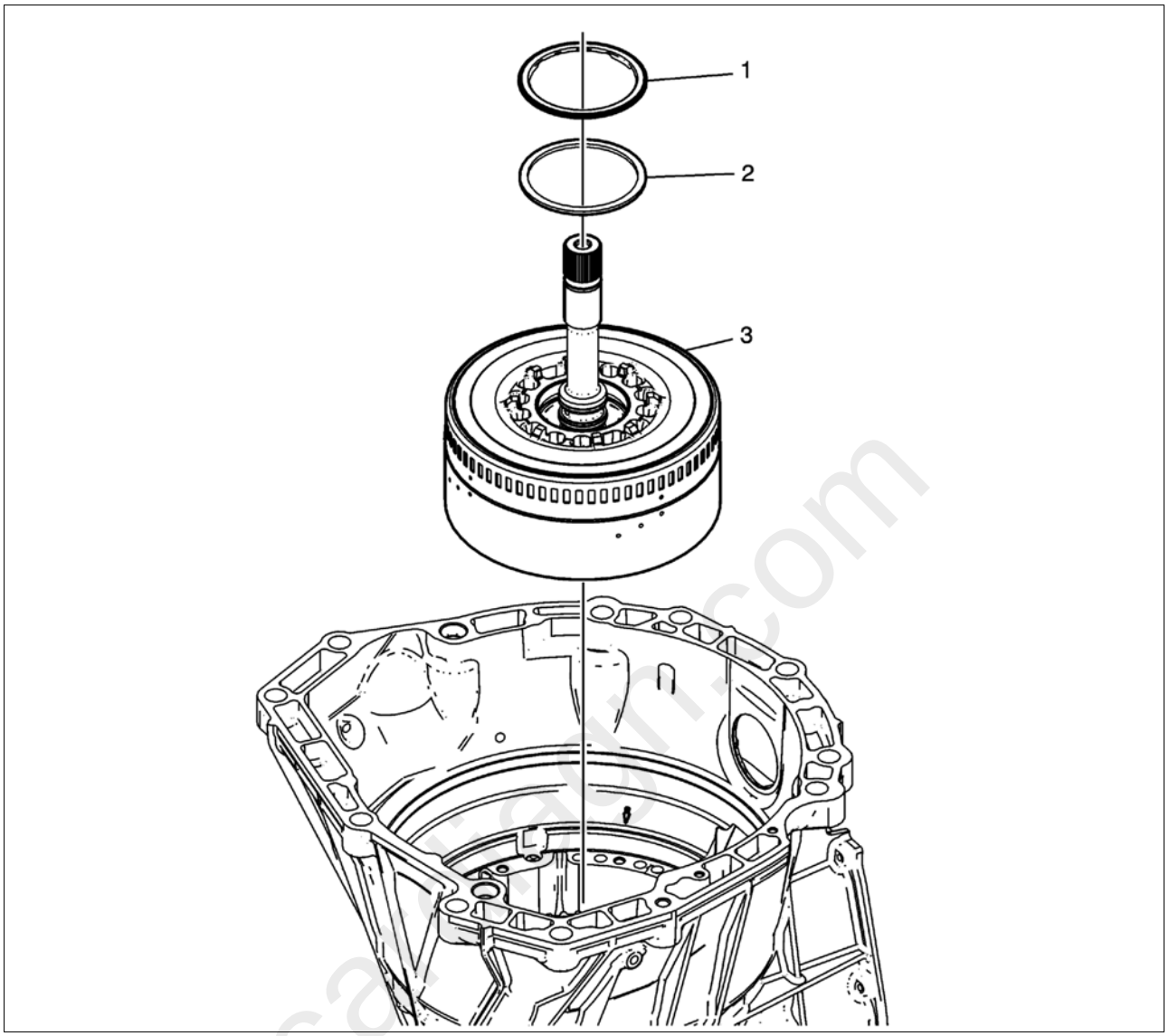


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Turbine Shaft O-ring Seal *NOTE:* *Remove and DISCARD the O-ring seal.*
2	Stator Shaft Support Bolt M8 x 35 mm (Qty: 9)
3	Stator Support Shaft Assembly

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLY REMOVAL

Fig 1: 1-3-5-6-7 Clutch

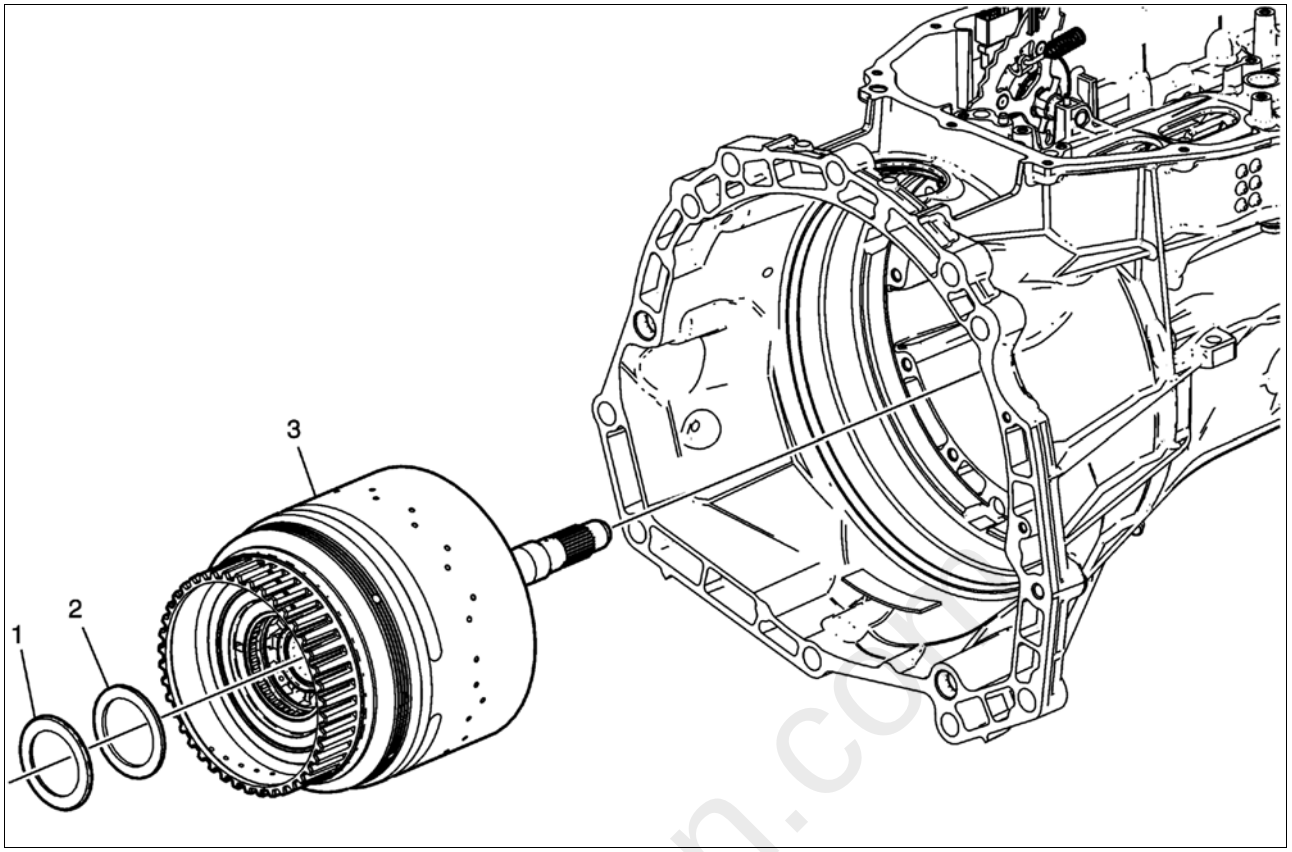


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-3-5-6-7 Clutch Thrust Bearing
2	1-3-5-6-7 Clutch Thrust Bearing Washer
3	1-3-5-6-7 Clutch Assembly

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLY REMOVAL

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch



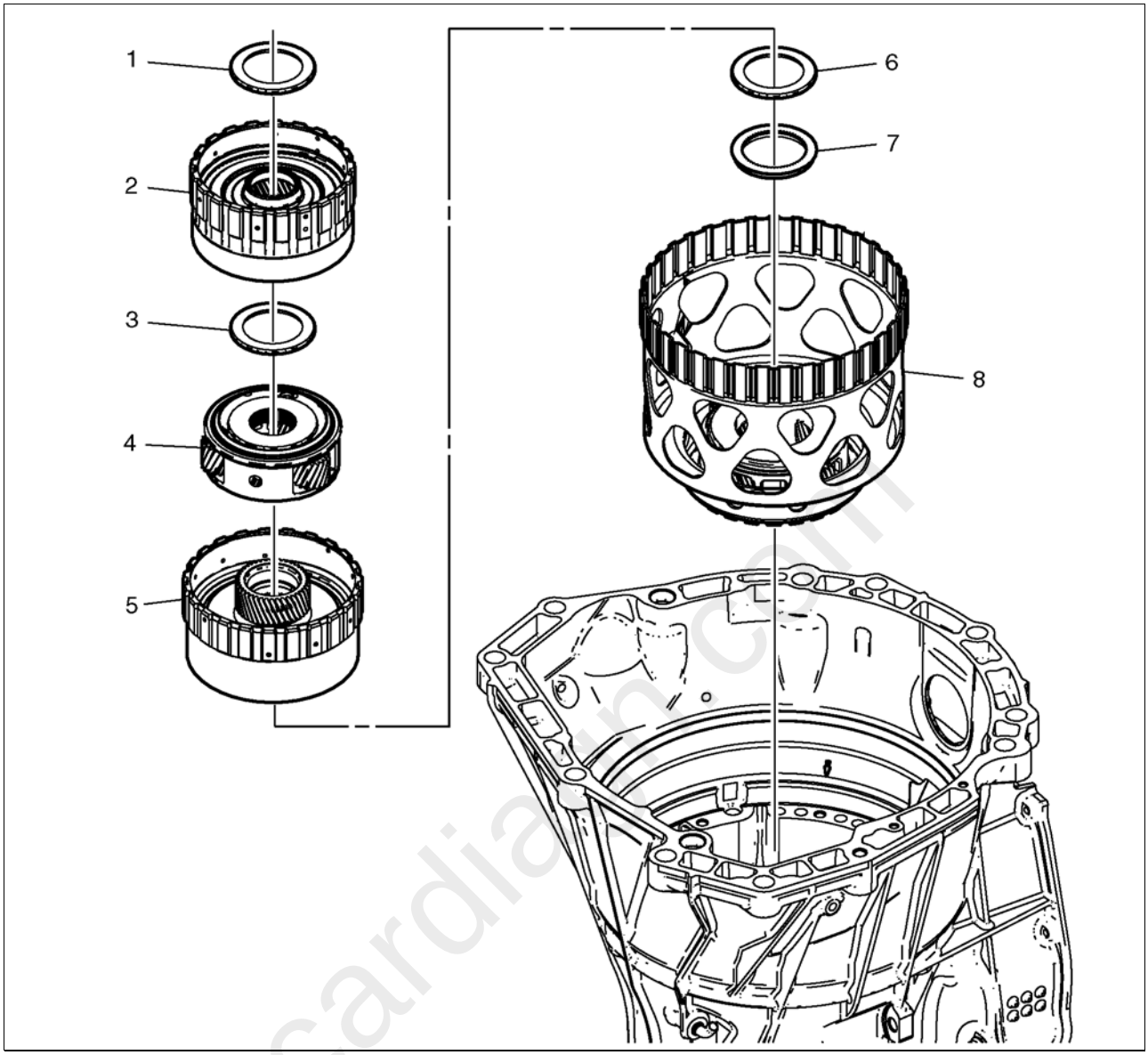
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing
2	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing Washer
3	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly *NOTE:* *Rotate the transmission horizontal to aid in removal of the 2-3-4-6-8 and 4-5-6-7-8 reverse clutch assembly.*

REPAIR INSTRUCTIONS - OFF VEHICLE > DIRECT OVERDRIVE INTERNAL GEAR, DIRECT OVERDRIVE CARRIER, INPUT INTERNAL GEAR, AND INPUT CARRIER ASSEMBLY REMOVAL

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Fig 1: Direct Overdrive Internal Gear, Direct Overdrive Carrier, Input Internal Gear, and Input Carrier Assembly



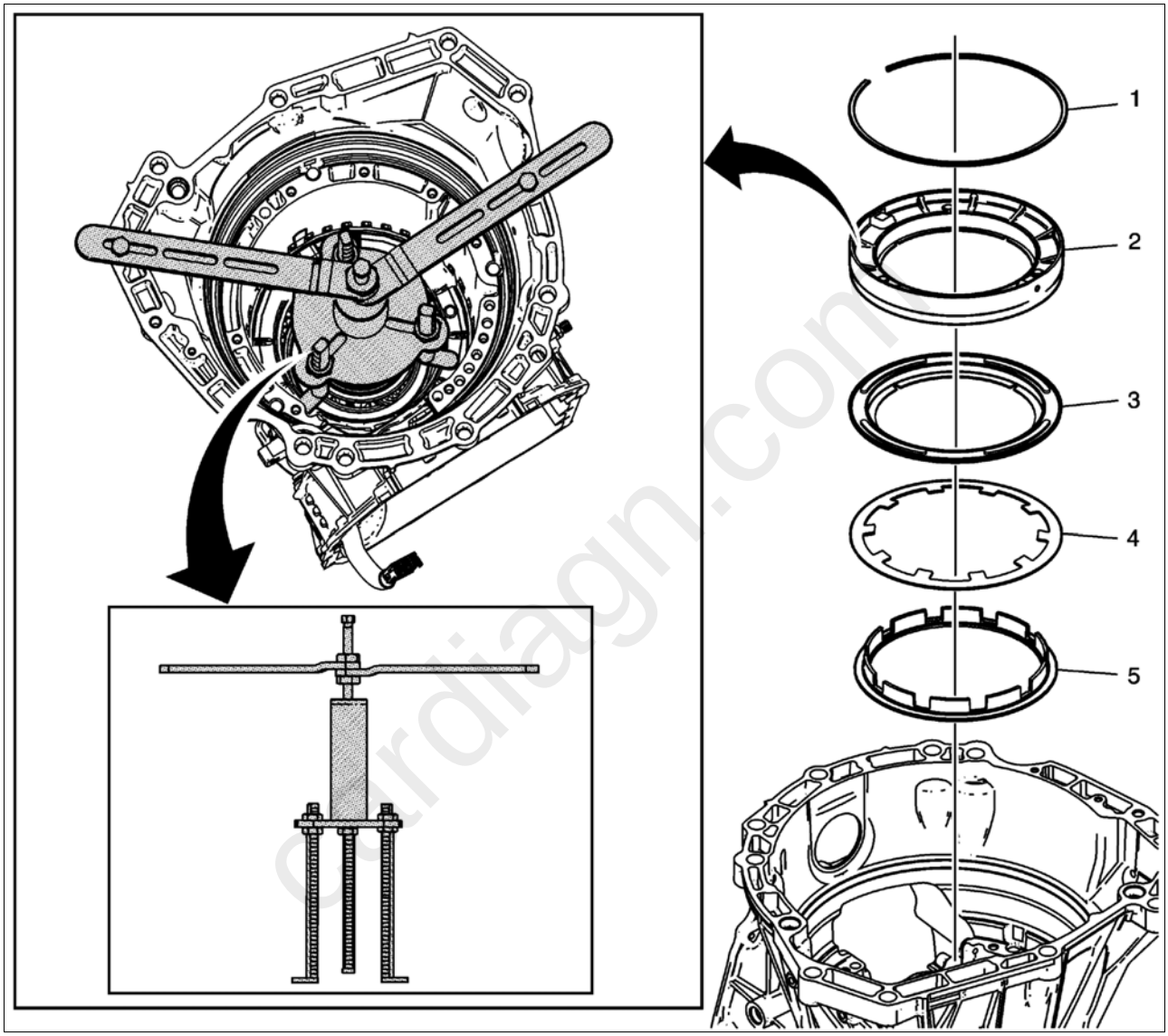
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	4-5-6-7-8 Reverse Clutch and Direct Overdrive Internal Gear Hub Thrust Bearing
2	Direct/Overdrive Internal Gear Assembly
3	Direct/Overdrive Carrier Thrust Bearing (8L45 Only)
4	Direct/Overdrive Carrier Assembly
5	Input Internal Gear Assembly
6	Input Sun Gear Thrust Bearing
7	Input Sun Gear Spacer

8	Input Carrier Assembly

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-2-7-8 REVERSE CLUTCH PISTON REMOVAL

Fig 1: 1-2-7-8 Reverse Clutch Piston



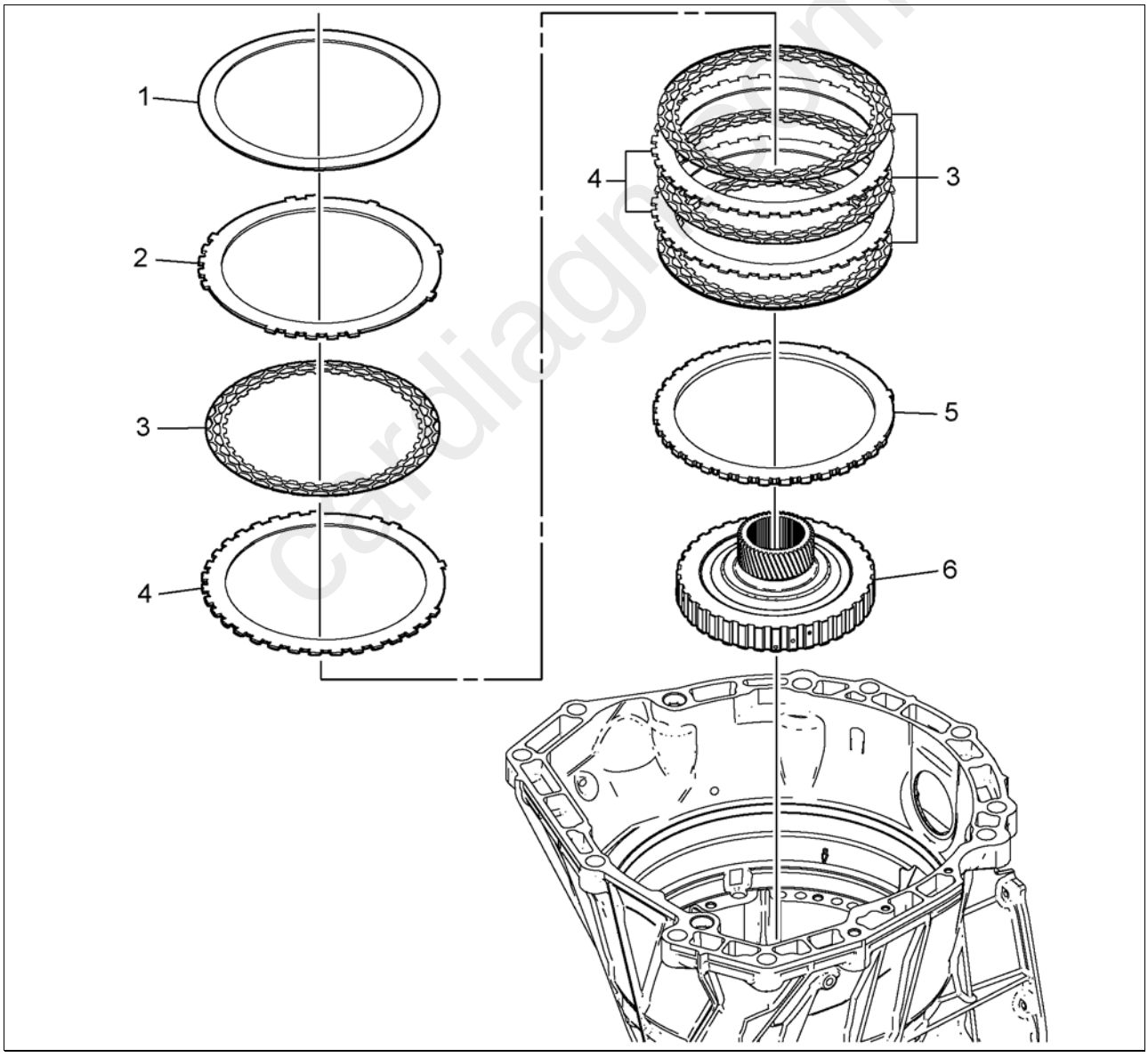
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-2-7-8 Reverse Clutch Piston Housing Retaining Ring Special Tools • **DT-35512** Bearing Installer • **DT-48056** Spring Compressor Bridge

	• **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .
2	1-2-7-8 Reverse Clutch Piston Housing
3	1-2-7-8 Reverse Clutch Piston
4	1-2-7-8 Reverse Clutch Return Spring
5	1-2-7-8 Reverse Clutch Apply Ring

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-2-7-8 REVERSE CLUTCH PLATE ASSEMBLY AND INPUT SUN GEAR ASSEMBLY REMOVAL

Fig 1: 1-2-7-8 Reverse Clutch Plate Assembly and Input Sun Gear



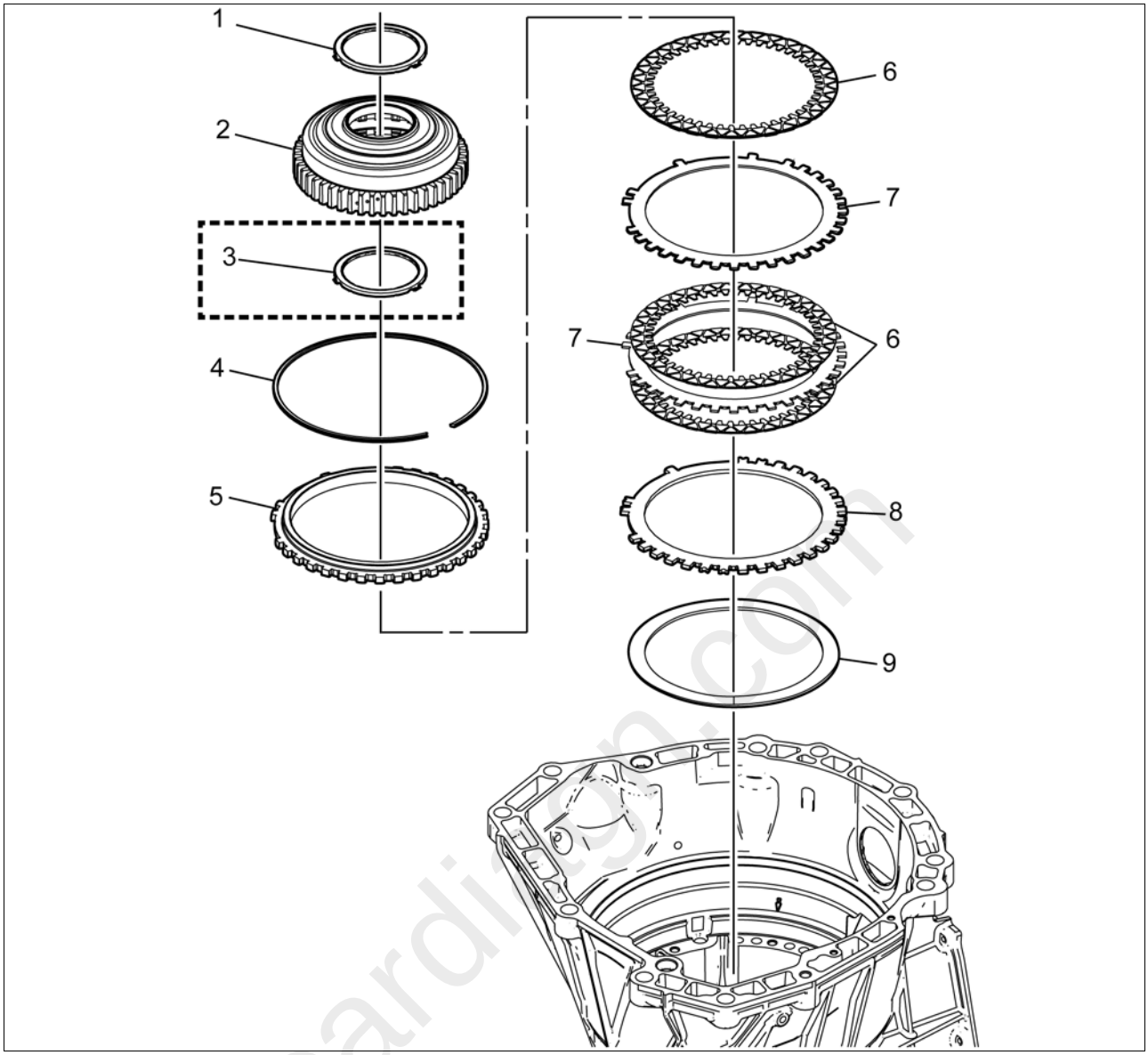
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Sun Gear Assembly
2	1-2-7-8 Reverse Clutch Backing Plate
3	1-2-7-8 Reverse Clutch Plate (Qty: 3)
4	1-2-7-8 Reverse Clutch Plate Assembly (Qty: 4)
5	1-2-7-8 Reverse Clutch Apply Plate
6	1-2-7-8 Reverse Clutch (Waved) Plate

REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION INTERNAL GEAR AND 1-2-3-4-5 REVERSE HUB AND 1-2-3-4-5 REVERSE CLUTCH PLATE ASSEMBLY REMOVAL

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Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate



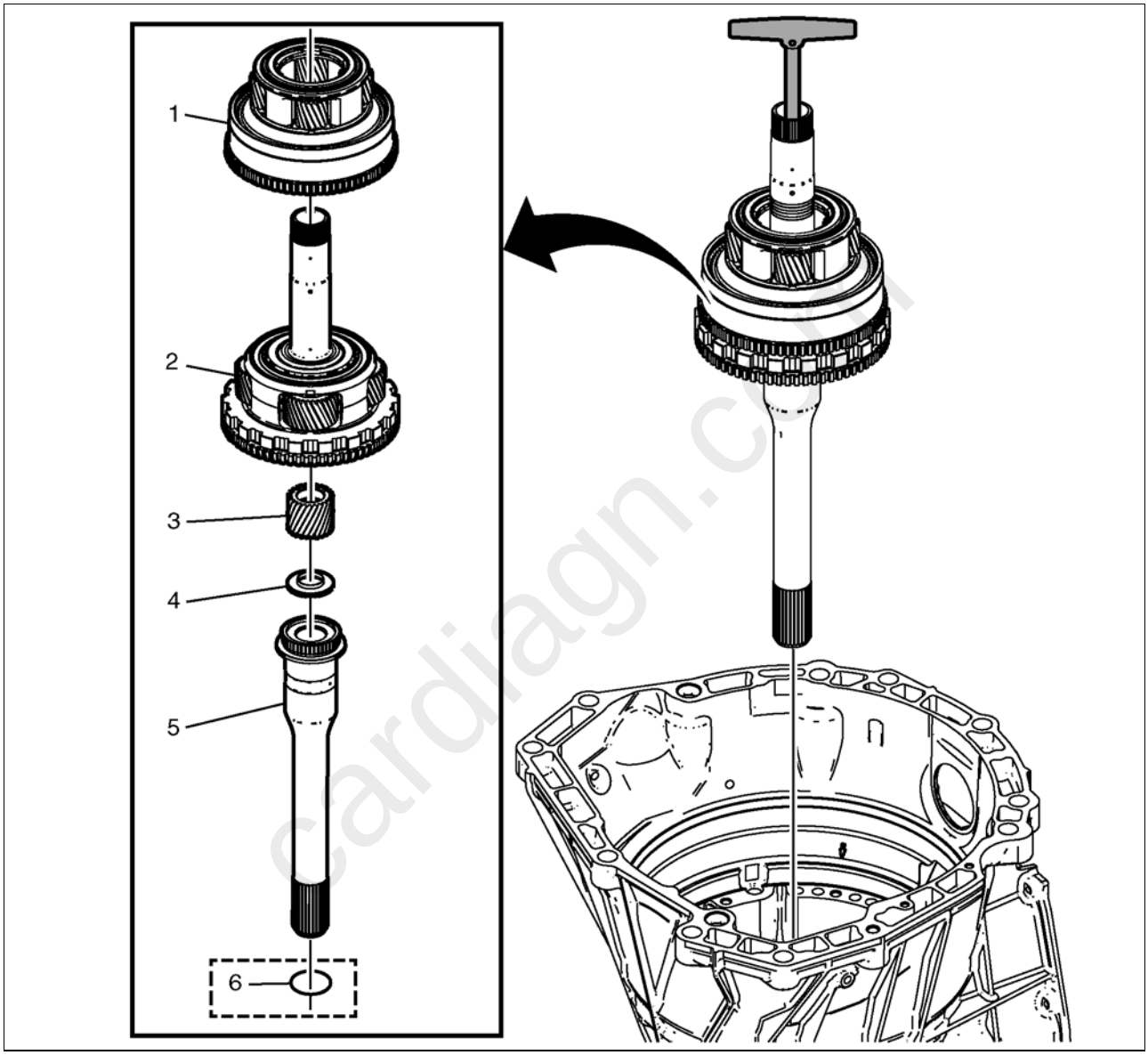
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-2-3-4-5 Reverse Clutch Hub Thrust Bearing
2	Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
3	Reaction Carrier Thrust Bearing (8L45 Only)
4	1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring
5	1-2-7-8 Reverse Clutch Backing Plate
6	1-2-3-4-5 Reverse Clutch Plate Assembly (Qty: 3)
7	1-2-3-4-5 Reverse Clutch Plate (Qty: 2)
8	1-2-3-4-5 Reverse Clutch Apply Plate

9	1-2-3-4-5 Reverse Clutch (Waved) Plate

REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION CARRIER ASSEMBLY, OUTPUT CARRIER, AND OUTPUT SHAFT REMOVAL

Fig 1: Reaction Carrier Assembly, Output Carrier, and Output Shaft



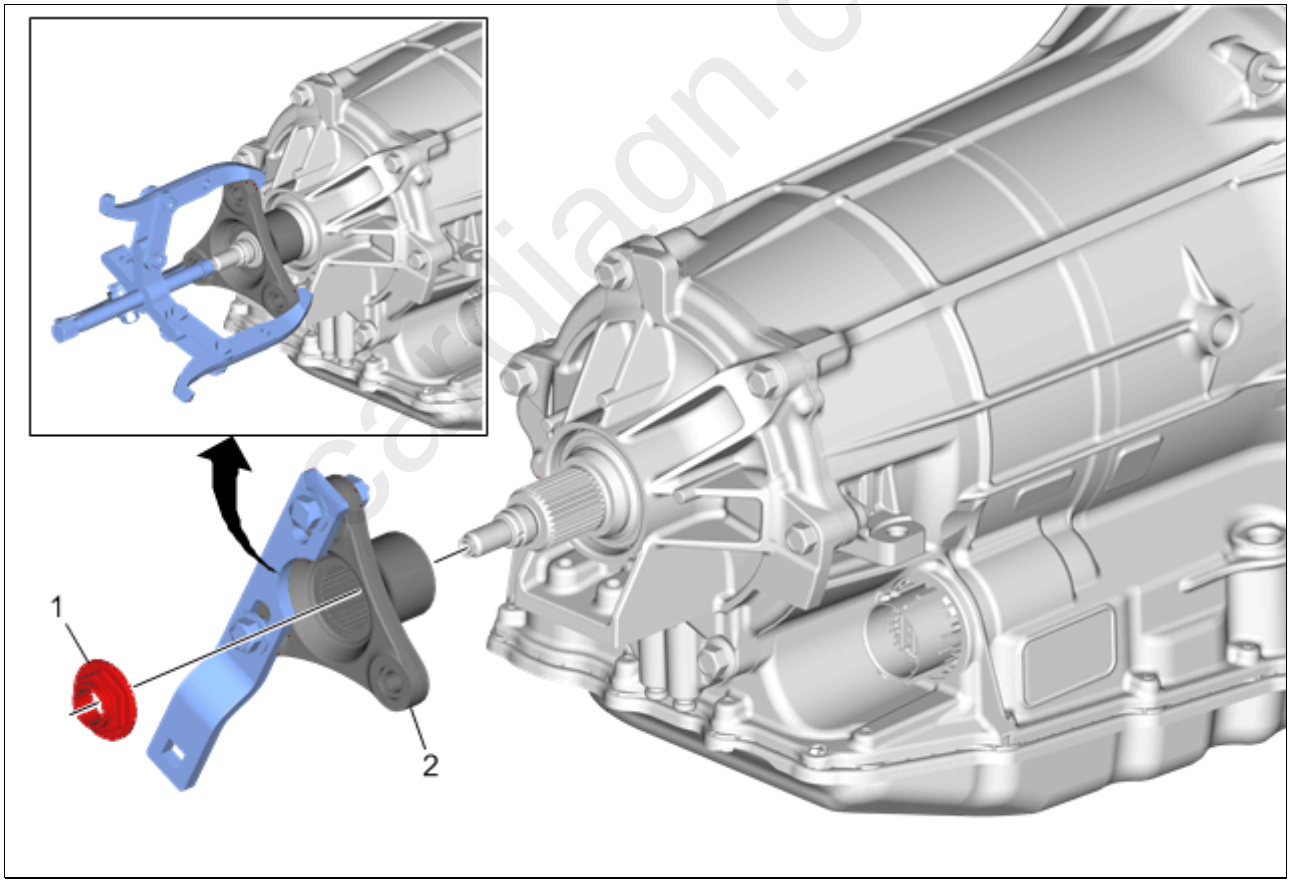
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Reaction Carrier Assembly
2	Output Carrier Assembly
3	Output Sun Gear

4	Output Sun Gear Thrust Bearing
5	Output Shaft **Special Tools** **DT-50921** Output Carrier/Shaft Lifting Tool For equivalent regional tools, refer to Special Tools .
6	Output Shaft Seal - O-Ring *NOTE:* *The output shaft seal is only present on All Wheel Drive (AWD) models.*

REPAIR INSTRUCTIONS - OFF VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE REMOVAL (REAR WHEEL DRIVE)

Fig 1: Propeller Shaft Transmission Flange (Rear Wheel Drive)



Courtesy of GENERAL MOTORS COMPANY

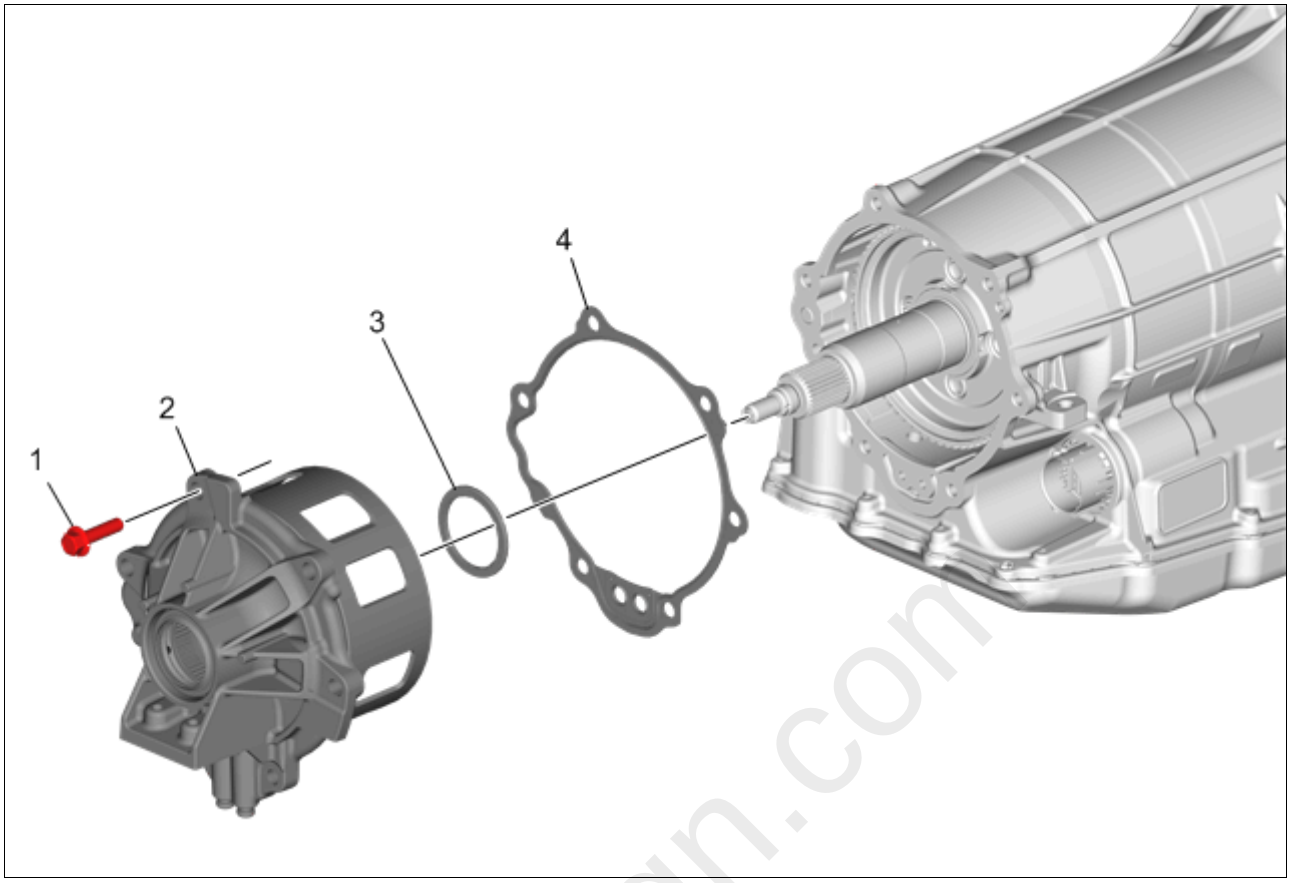
Callout	Component Name

1	Propeller Shaft Transmission Flange Nut *CAUTION:* *Do not reuse the flange nut. Reusing the flange nut may cause damage to the transmission.* **Special Tools** **DT-45012** Holding Fixture For equivalent regional tools, refer to Special Tools .
2	Propeller Shaft Transmission Flange *NOTE:* *If the propeller shaft transmission flange is not easily removed with **DT-45012** holding fixture use **DT-38416-B** harmonic balancer remover to remove the flange.* Special Tools • **DT-38416-B** Harmonic Balancer Remover • **DT-45012** Holding Fixture For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLY REMOVAL

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Fig 1: Case Extension



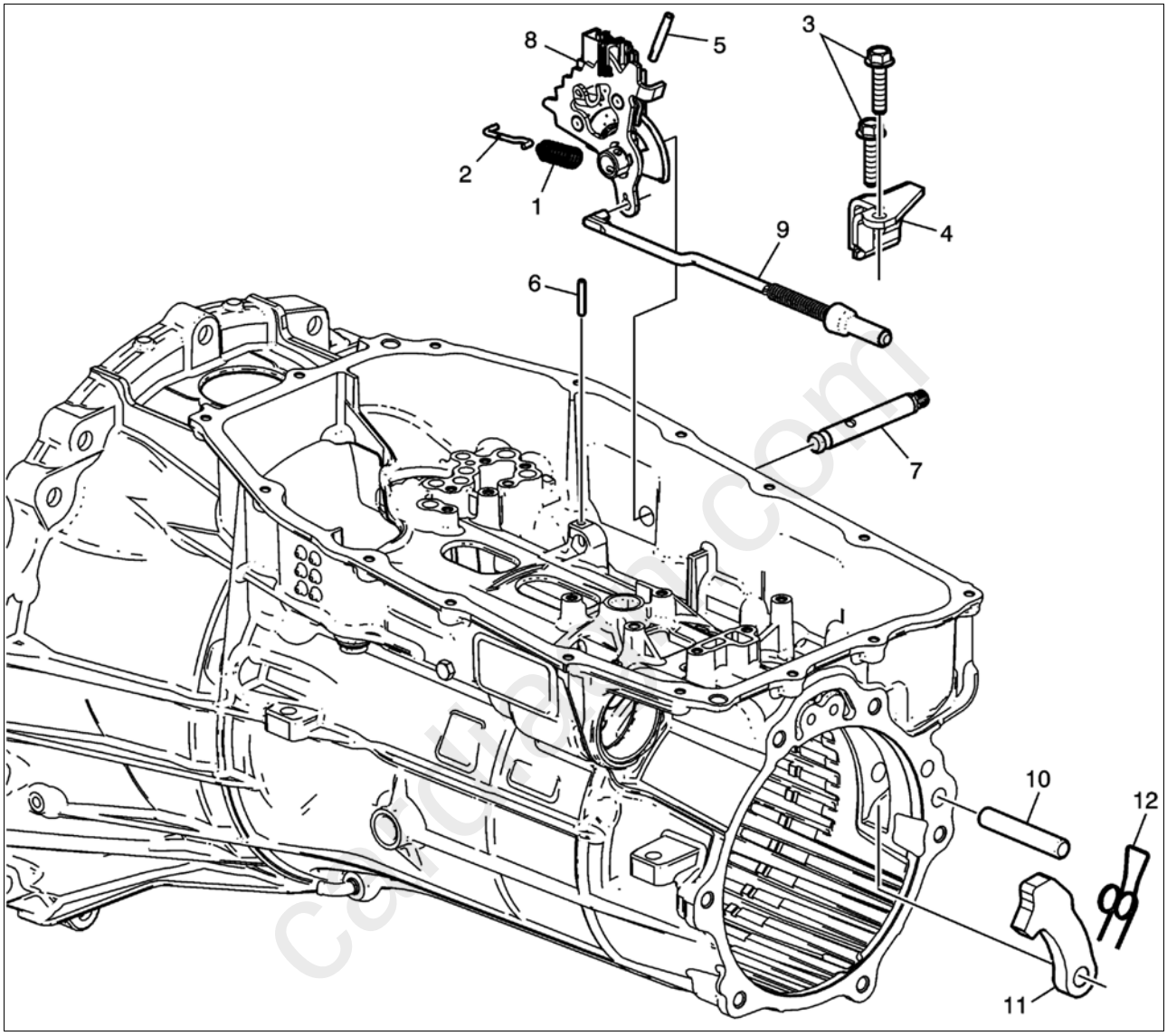
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Callout	Component Name
1	A/Trans Case Extension Bolt M10 x 40 mm (Qty: 6)
2	A/Trans Case Extension Assembly *NOTE:* *Ensure the park pawl is not engaged.*
3	Output Carrier Thrust Bearing
4	A/Trans Case Extension Seal *NOTE:* *The seal is reusable, inspect the seal and replace if damaged.*

REPAIR INSTRUCTIONS - OFF VEHICLE > MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR REMOVAL

Fig 1: Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator



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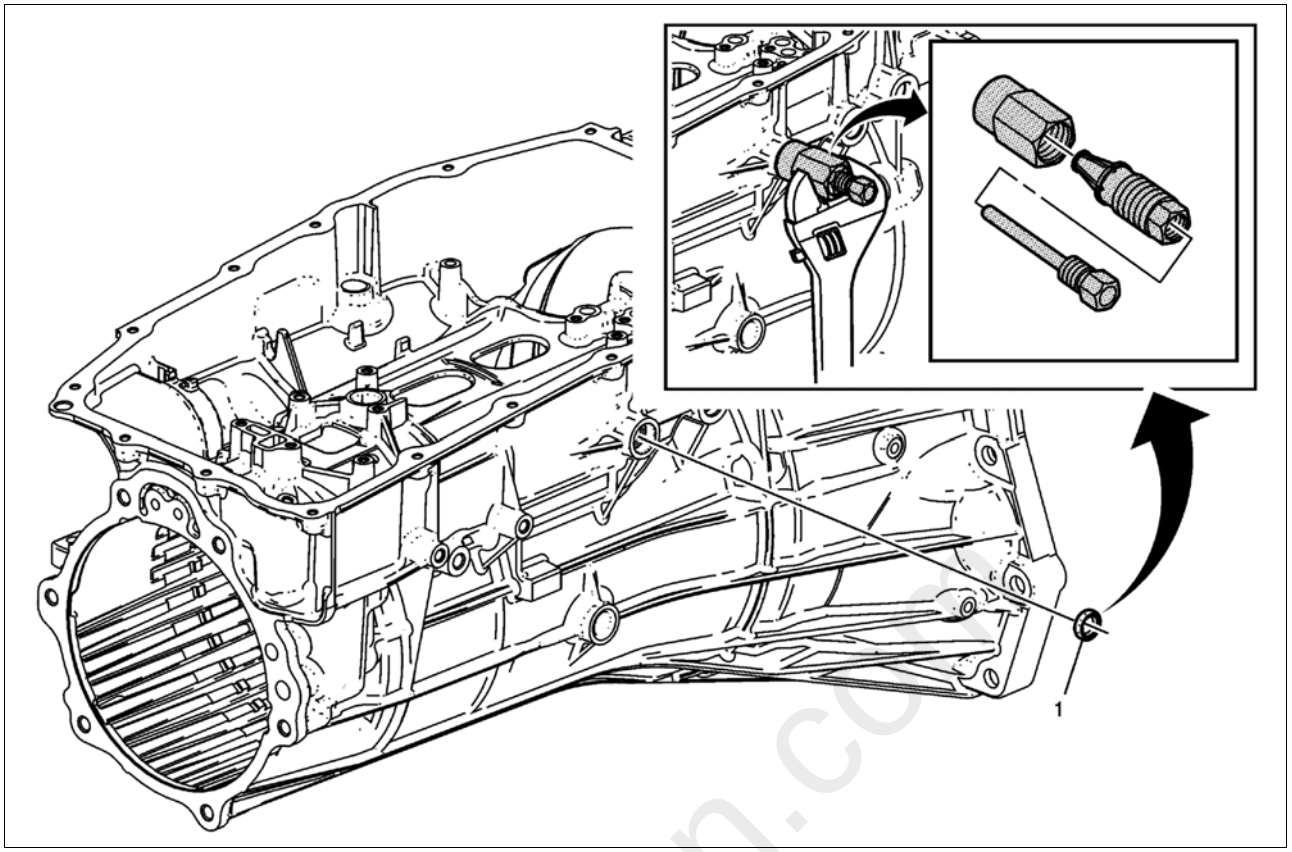
Callout	Component Name
1	Manual Valve Link Spring
2	Manual Valve Link
3	Park Pawl Actuator Bracket Bolt M8 x 35 (Qty: 2) *NOTE:*

	DISCARD the bolts.
4	Park Pawl Actuator Bracket
5	Manual Shaft Detent Lever Hub Pin *CAUTION:* *Refer to Pin Reuse Caution .*
6	Manual Shift Shaft Pin
7	Manual Shift Shaft
8	Manual Shift Shaft Position Switch Assembly
9	Park Pawl Actuator
10	Park Pawl Shaft
11	Park Pawl
12	Park Pawl Spring

REPAIR INSTRUCTIONS - OFF VEHICLE > MANUAL SHIFT SHAFT SEAL REMOVAL

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Fig 1: Manual Shift Shaft Seal



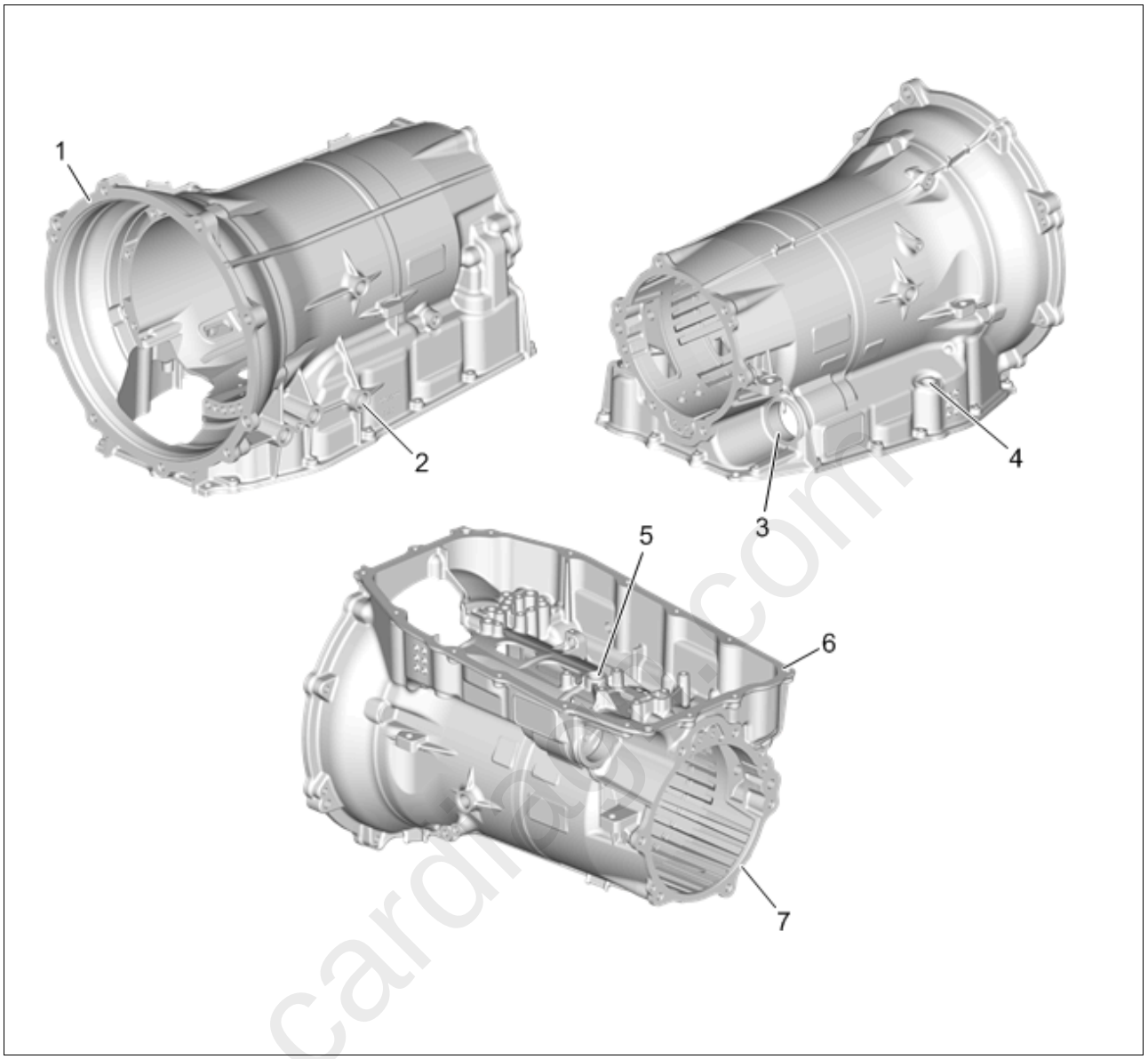
Courtesy of GENERAL MOTORS COMPANY

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 .* **Special Tools** **DT-45201** Cooler Line Seal Remover For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION CASE CLEANING AND

INSPECTION

Fig 1: Transmission Case Cleaning and Inspection Points



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.

Preliminary Procedures

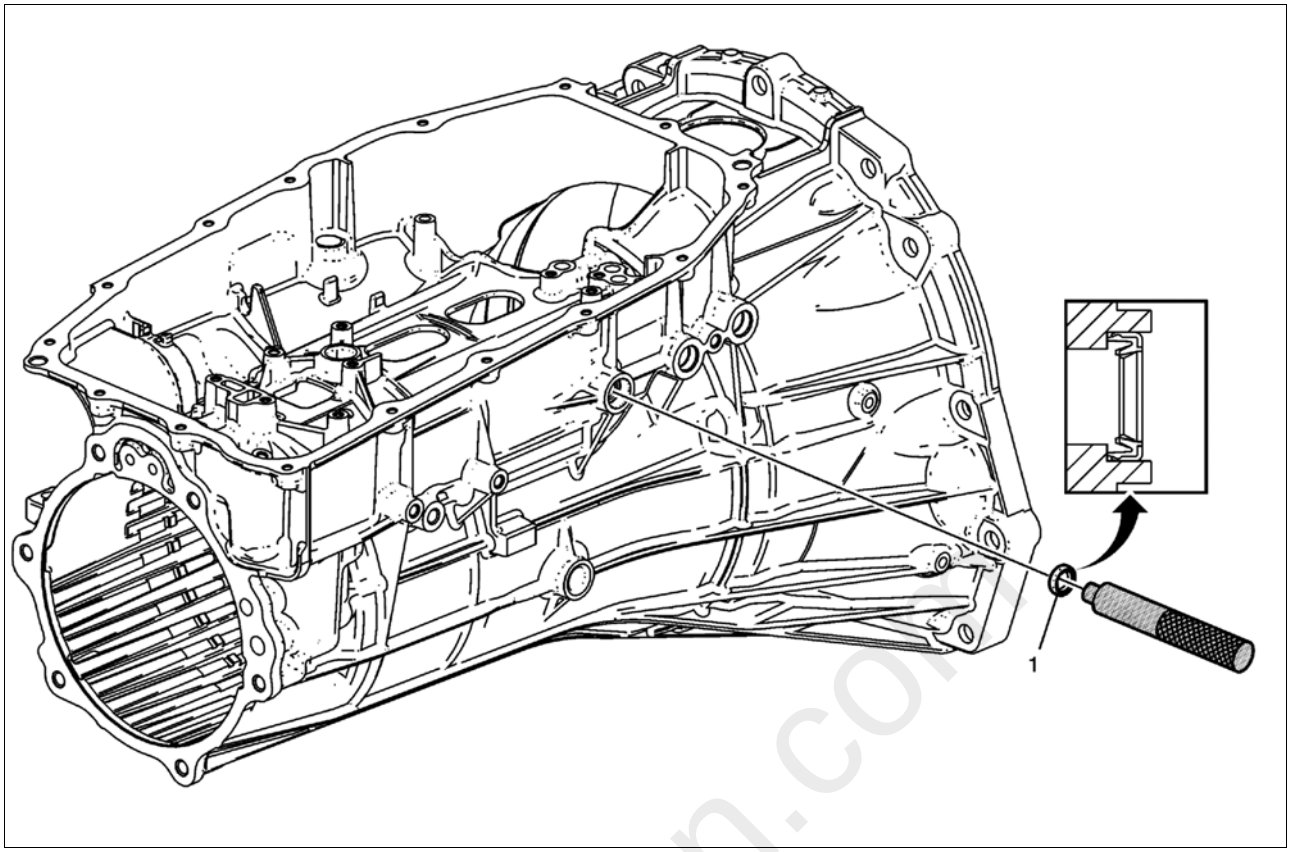
1. Thoroughly clean the transmission case assembly, including case threads, with clean solvent.
2. Clean gasket sealing surfaces. Remove all residual gasket material.
3. Inspect all threaded holes. If necessary, repair any thread damage.

1	Front Case Sealing Surface
2	Manual Shift Shaft Seal **Procedure** To service the manual shift shaft seal, refer to Manual Shift Shaft Seal Removal , or Manual Shift Shaft Seal Installation .
3	Electrical Connector Passage Sleeve Bore
4	Fill Tube Bore
5	Clutch Housing Fluid Passage Seal Surface
6	Fluid Pan Sealing Surface
7	Rear Case Sealing Surface

REPAIR INSTRUCTIONS - OFF VEHICLE > MANUAL SHIFT SHAFT SEAL INSTALLATION

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Fig 1: Manual Shift Shaft Seal



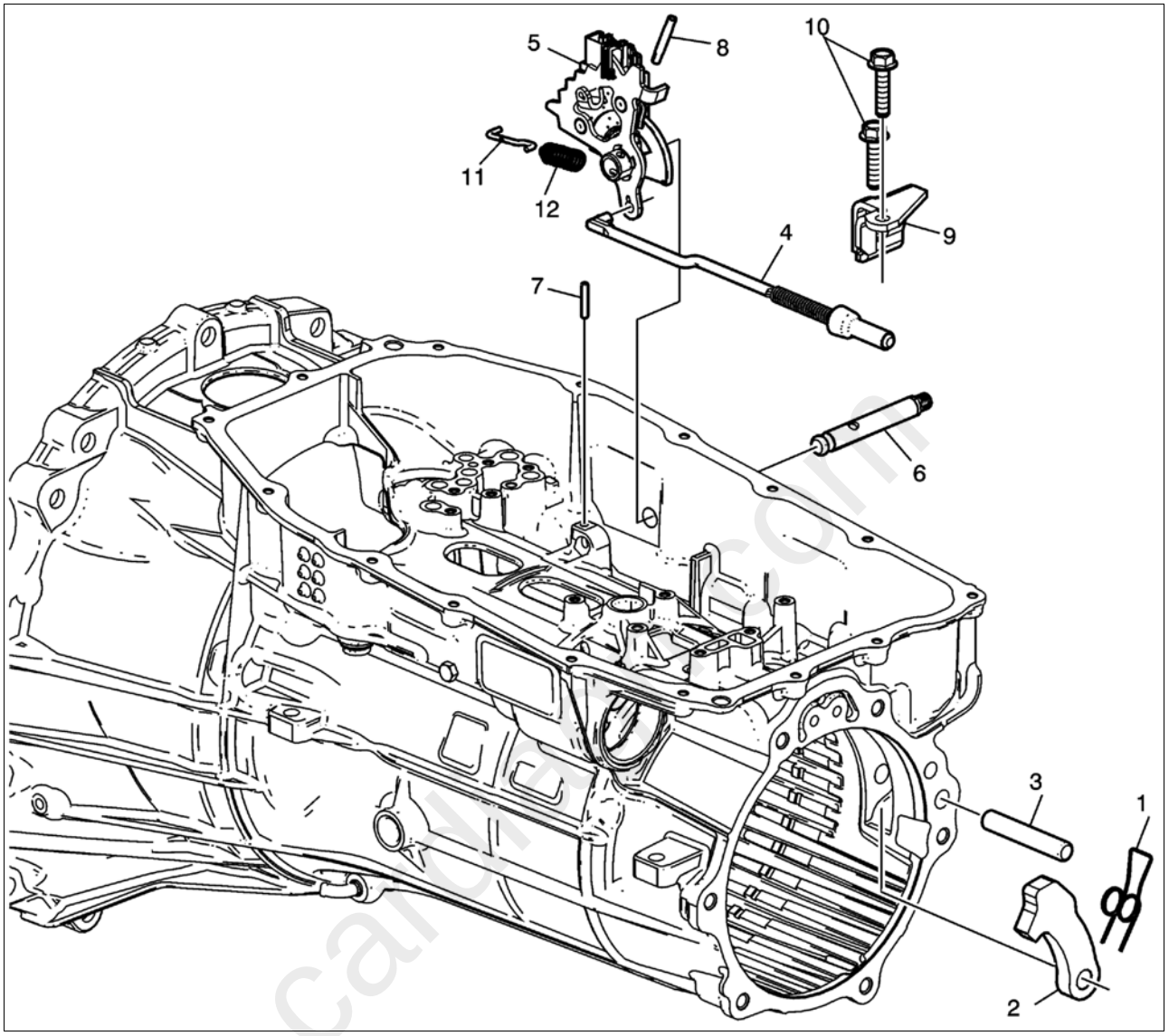
Courtesy of GENERAL MOTORS COMPANY

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.* *CAUTION:* *Refer to Seal Reuse Caution .* **Special Tools** **DT-47770** Seal Installer For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

Fig 1: Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator



Courtesy of GENERAL MOTORS COMPANY

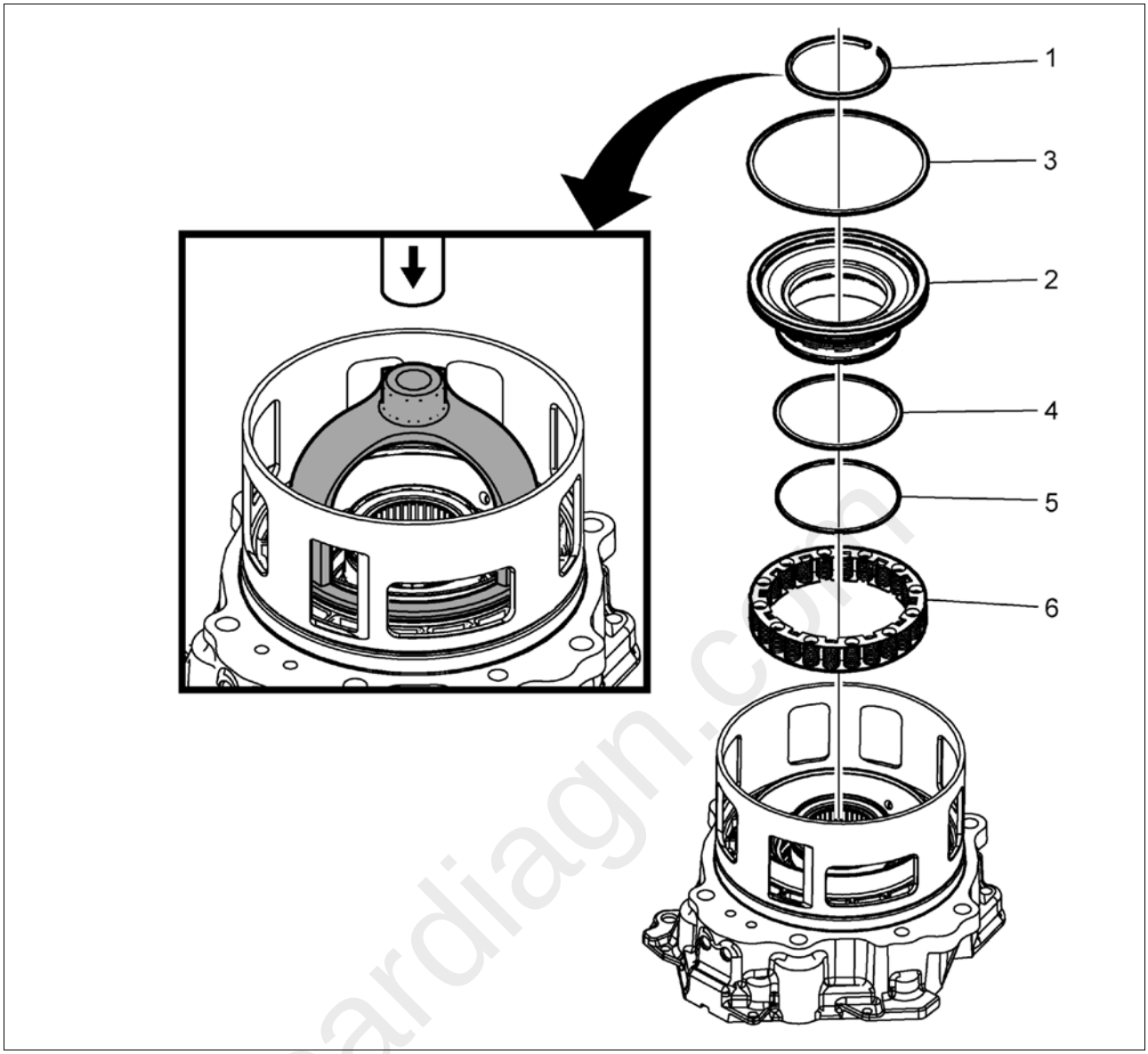
Callout	Component Name
1	Park Pawl Spring
2	Park Pawl
3	Park Pawl Shaft
4	Park Pawl Actuator
5	Manual Shift Shaft Position Switch Assembly
6	Manual Shift Shaft

7	Manual Shift Shaft Pin *CAUTION:* *Refer to Pin Reuse Caution .*
8	Manual Shaft Detent Lever Hub Pin
9	Park Pawl Actuator Bracket
10	Park Pawl Actuator Bracket Bolt M8 x 35 (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* *NOTE:* *Install NEW bolts.* **Tighten** 40 N.m (30 lb ft)
11	Manual Valve Link
12	Manual Valve Link Spring

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L90) > 1-2-3-4-5-REVERSE CLUTCH PISTON DAM REMOVAL

Fig 1: 1-2-3-4-5-Reverse Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Dam Removal

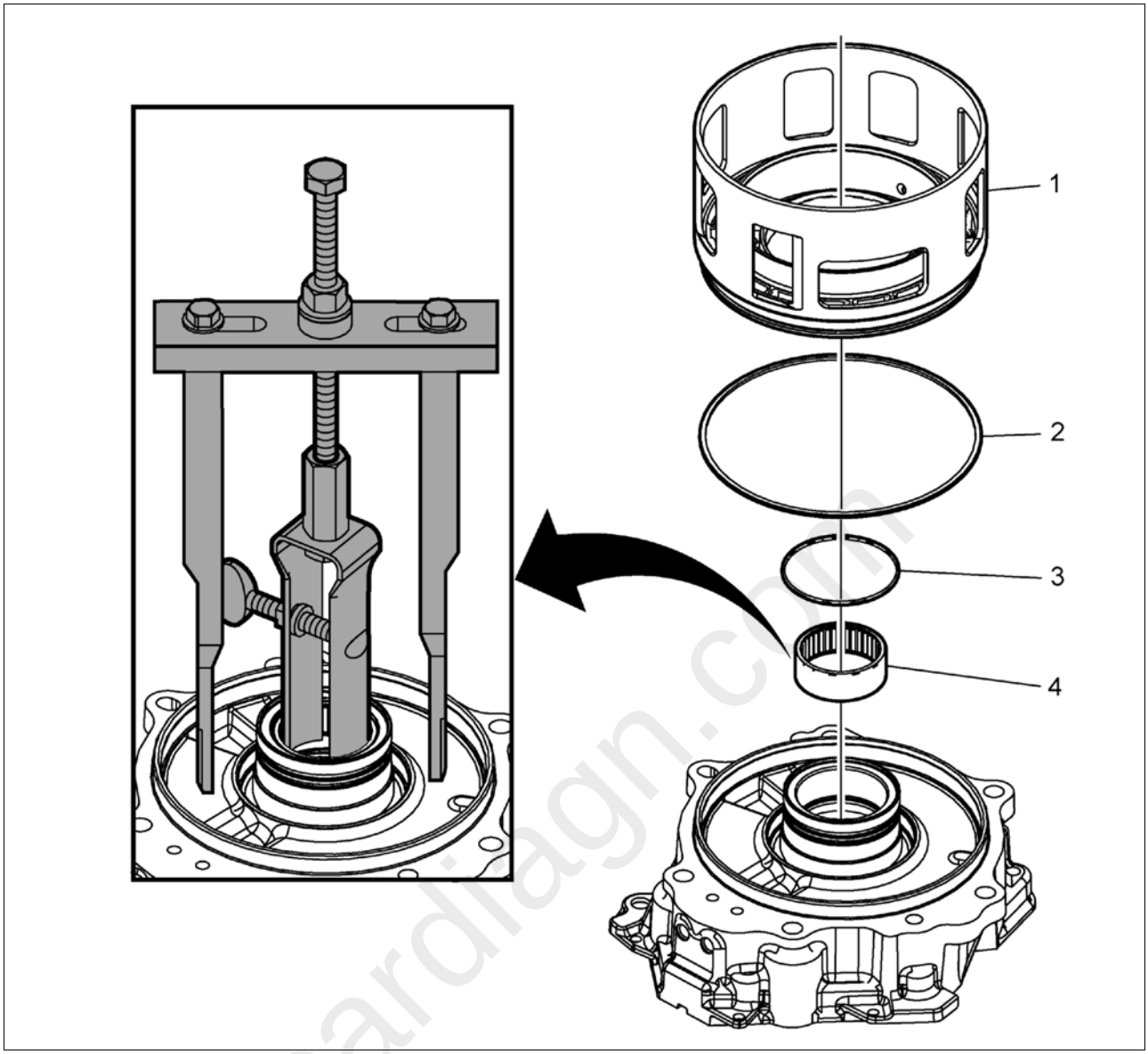
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston Dam Retaining Ring **Procedure** Use **DT-38734** adapter and an arbor press to remove the retaining ring. *NOTE:* *Discard the retaining ring, it is not reusable.*

	Special Tools **DT-38734** Intermediate Spring Compressor Adapter For equivalent regional tools, refer to Special Tools .
2	1-2-3-4-5-Reverse Clutch Piston Dam
3	1-2-3-4-5-Reverse Clutch Piston Dam Seal *CAUTION:* *Refer to Seal Reuse Caution .*
4	1-2-3-4-5-Reverse Clutch Piston Inner Seal *CAUTION:* *Refer to Seal Reuse Caution .*
5	1-2-3-4-5-Reverse Clutch Piston O-ring Seal *CAUTION:* *Refer to Seal Reuse Caution .*
6	1-2-3-4-5-Reverse Clutch Piston Return Spring

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L90) > 1-2-3-4-5-REVERSE CLUTCH PISTON REMOVAL

Fig 1: 1-2-3-4-5-Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Removal

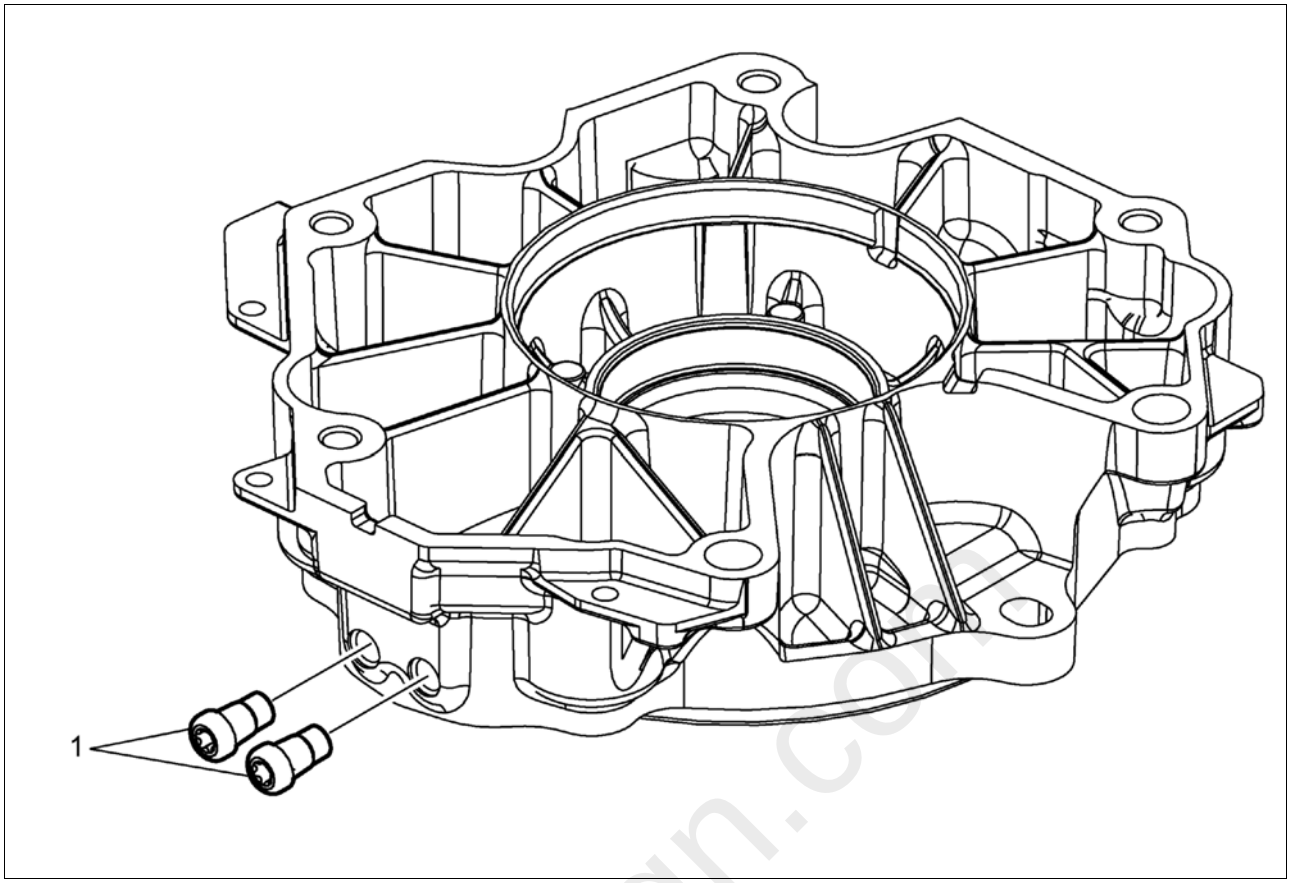
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston
2	1-2-3-4-5- Reverse Clutch Piston Outer Seal *CAUTION:* *Refer to Seal Reuse Caution .*

3	1-2-3-4-5-Reverse Clutch Piston Dam Inner O-ring Seal *CAUTION:* *Refer to Seal Reuse Caution .*
4	Output Shaft Bearing Special Tools • **DT-26941** Bushing and Bearing Remover • **DT-45124** Removal Bridge • **DT-45124-9** Puller Leg For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L90) > AUTOMATIC TRANSMISSION CASE EXTENSION HOLE PLUG REMOVAL

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Fig 1: Automatic Transmission Case Extension Hole Plug



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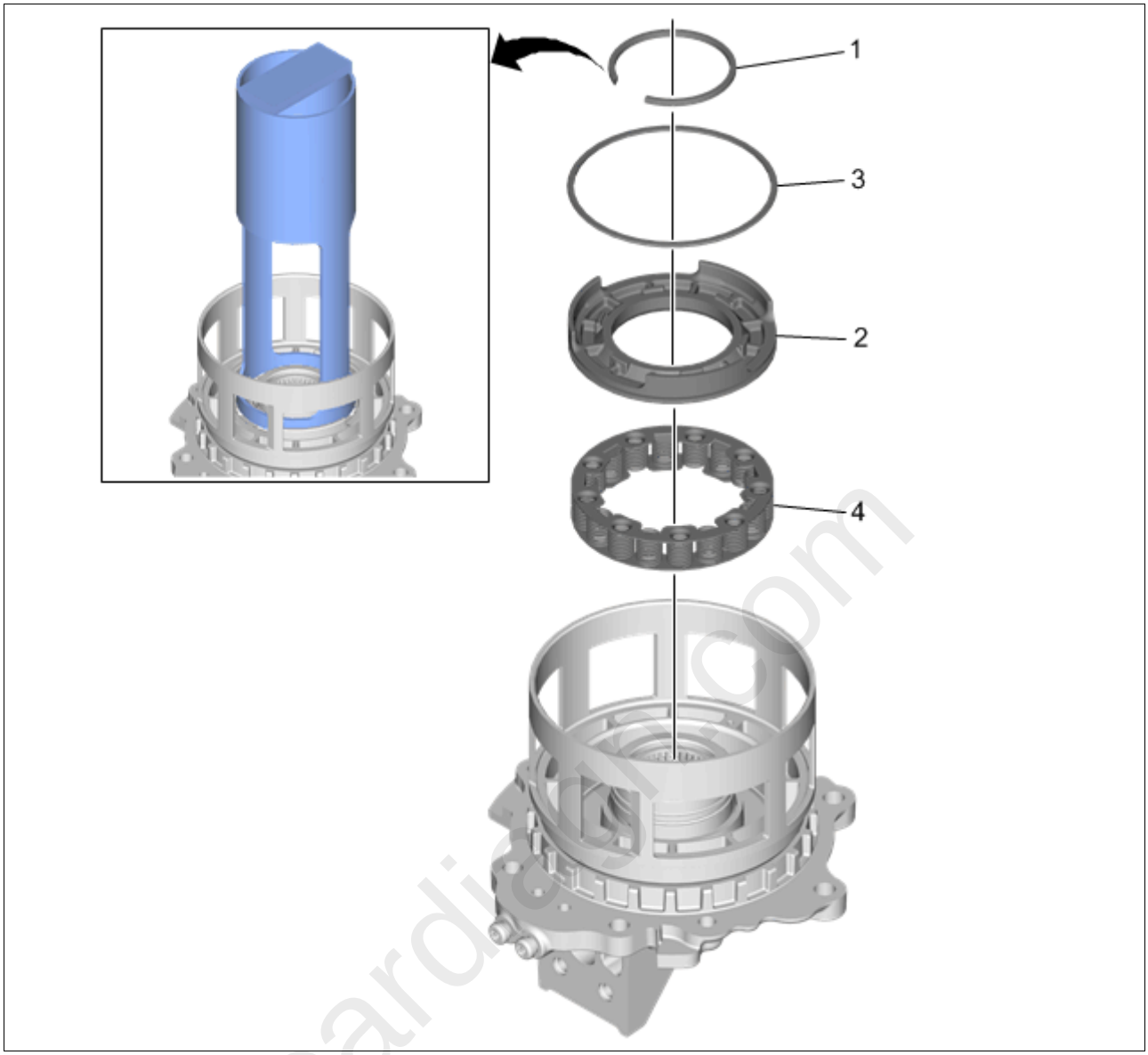
Automatic Transmission Case Extension Hole Plug Removal

Callout	Component Name
1	Automatic Transmission Case Extension Hole Plug

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L45) > 1-2-3-4-5-REVERSE CLUTCH PISTON DAM REMOVAL

Fig 1: 1-2-3-4-5-Reverse Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Dam Removal

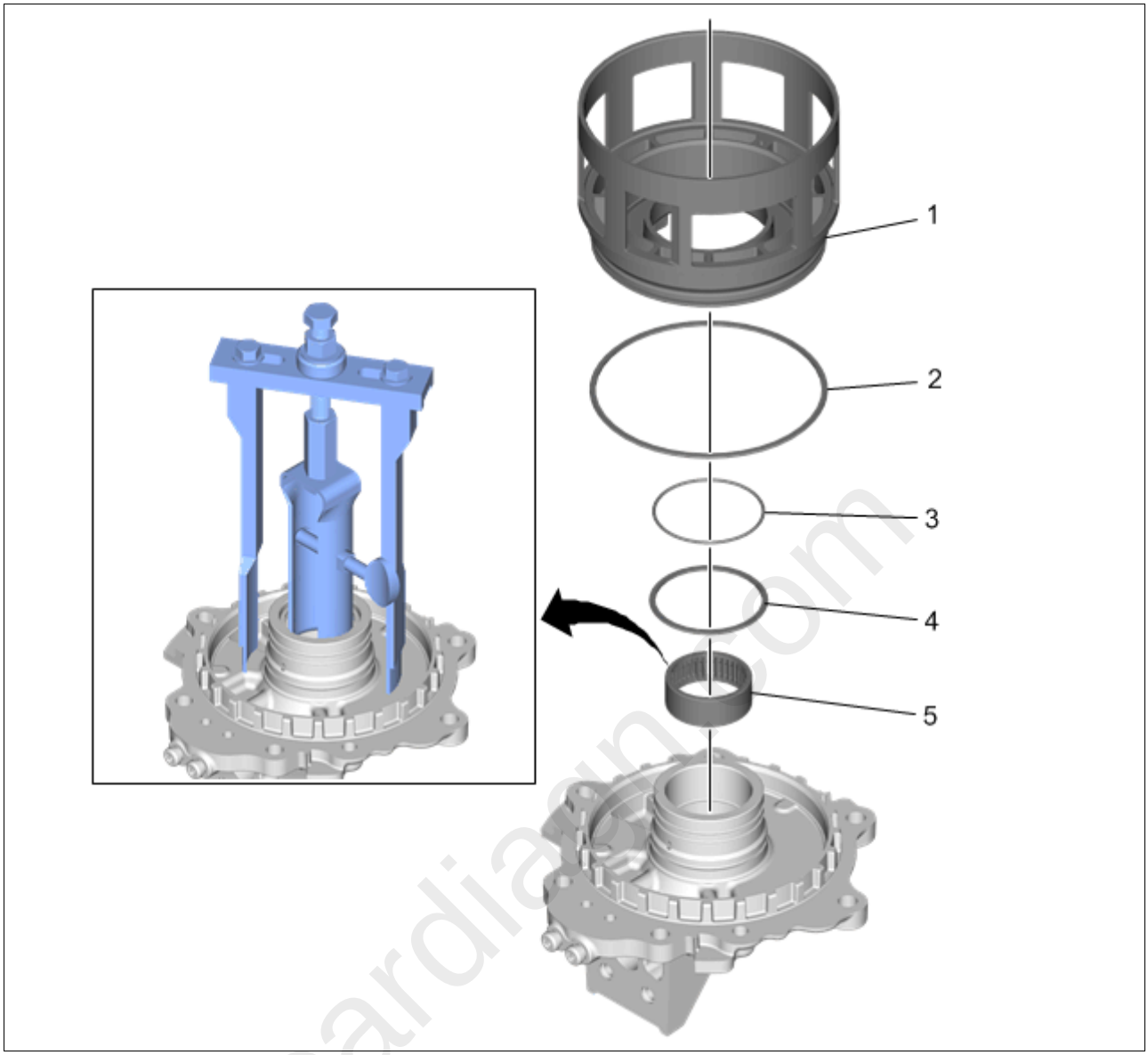
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston Dam Retaining Ring **Procedure** Use **DT-47693-2** compressor and an arbor press to remove the retaining ring. *NOTE:* *Discard the retaining ring, it is not reusable.*

	Special Tools **DT-47693-2** Compressor For equivalent regional tools, refer to Special Tools .
2	1-2-3-4-5-Reverse Clutch Piston Dam
3	1-2-3-4-5-Reverse Clutch Piston Dam Seal *CAUTION:* *Refer to Seal Reuse Caution .*
4	1-2-3-4-5-Reverse Clutch Piston Return Spring

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L45) > 1-2-3-4-5-REVERSE CLUTCH PISTON REMOVAL

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Fig 1: 1-2-3-4-5-Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Removal

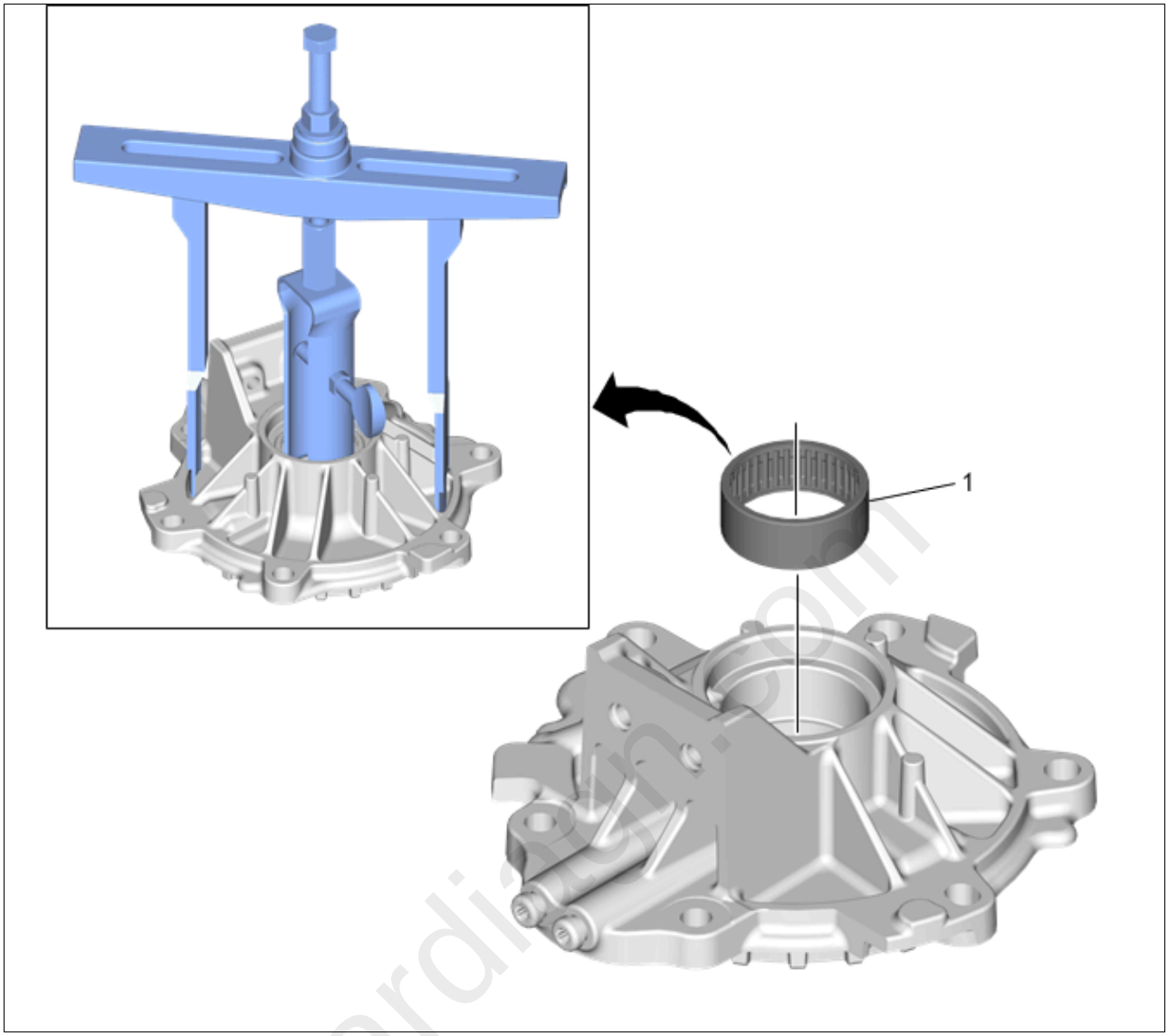
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston
2	1-2-3-4-5- Reverse Clutch Piston Outer Seal *CAUTION:* *Refer to Seal Reuse Caution .*

3	1-2-3-4-5- Reverse Clutch Piston Dam Inner Seal (O-ring) *CAUTION:* *Refer to Seal Reuse Caution .*
4	1-2-3-4-5- Reverse Clutch Piston Inner Seal *CAUTION:* *Refer to Seal Reuse Caution .*
5	Output Shaft Bearing *NOTE:* *Ensure the feet of **DT-26941** bearing remover are properly engaged with the bearing.* Special Tools • **DT-26941** Bushing and Bearing Remover • **DT-45124** Removal Bridge • **DT-45124-9** Puller Leg For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L45) > OUTPUT SHAFT BEARING REMOVAL (REAR WHEEL DRIVE MODELS ONLY)

Fig 1: Output Shaft Bearing (Rear Wheel Drive Models Only)



Courtesy of GENERAL MOTORS COMPANY

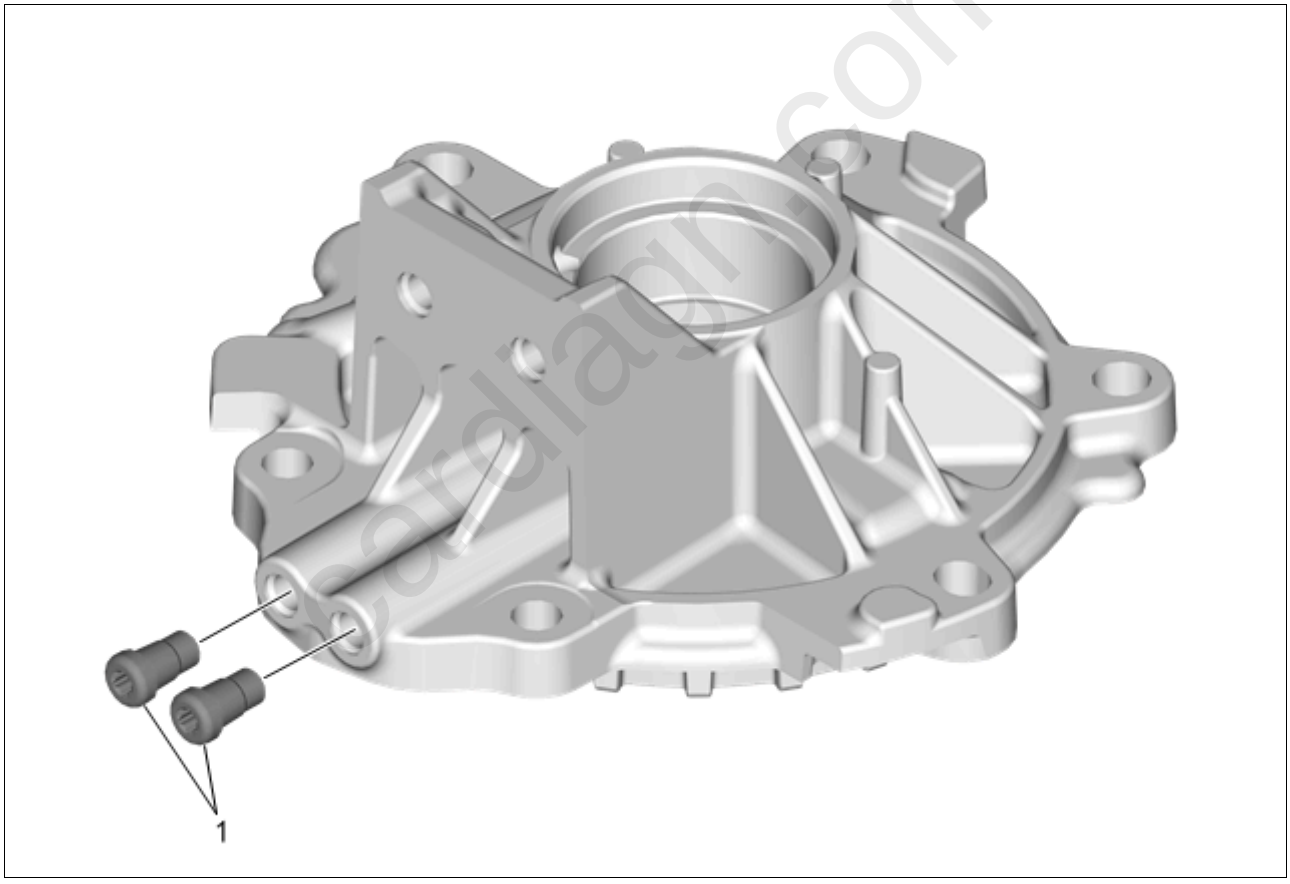
Output Shaft Bearing Removal (Rear Wheel Drive Models Only)

Callout	Component Name
1	Output Shaft Bearing **Procedure** Assemble the tools as shown. Use the **GE-8433** puller bar with threaded rod, nut, washer and bearing from **DT-45124** removal bridge. *NOTE:* *Ensure the feet of **DT-26941** bearing remover are properly engaged with the bearing.*

	Special Tools • **DT-26941** Busing and Bearing Remover • **DT-45124** Removal Bridge • **DT-45124-9** Puller Leg • **GE-8433** Puller Bar For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION DISASSEMBLE (8L45) > AUTOMATIC TRANSMISSION CASE EXTENSION HOLE PLUG REMOVAL

Fig 1: Automatic Transmission Case Extension Hole Plug



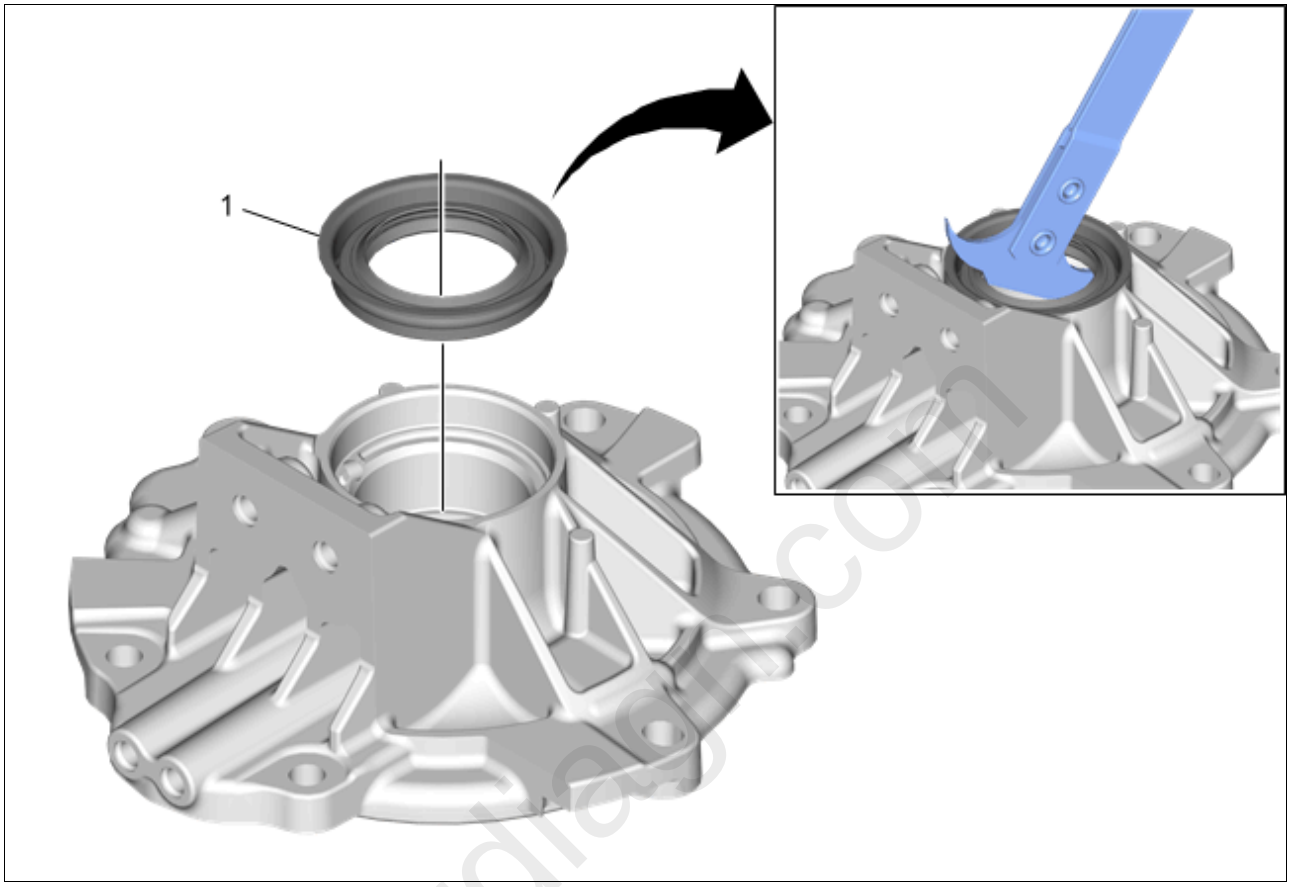
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Case Extension Hole Plug Removal

Callout	Component Name
1	Automatic Transmission Case Extension Hole Plug

REPAIR INSTRUCTIONS - OFF VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL REMOVAL (8L45 OR 8L90)

Fig 1: Propeller Shaft Transmission Flange Fluid Seal



Courtesy of GENERAL MOTORS COMPANY

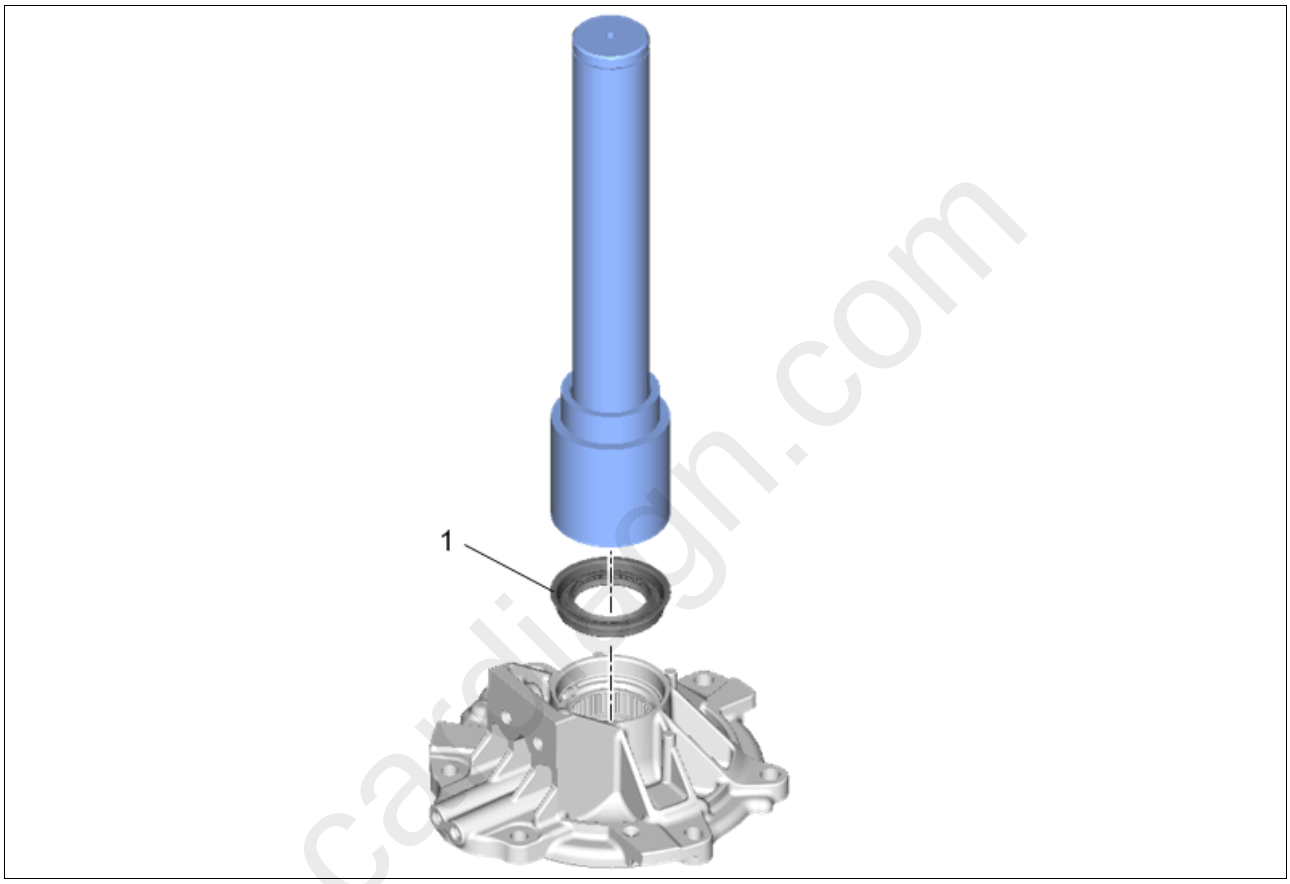
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Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	Propeller Shaft Transmission Flange Fluid Seal *NOTE:* *DISCARD the seal.*

	Special Tools **DT-45000** Seal Remover For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL INSTALLATION (8L90)

Fig 1: Propeller Shaft Transmission Flange Fluid Seal (8L90)



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Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	Propeller Shaft Transmission Flange Fluid Seal

NOTE:

Install a NEW seal.

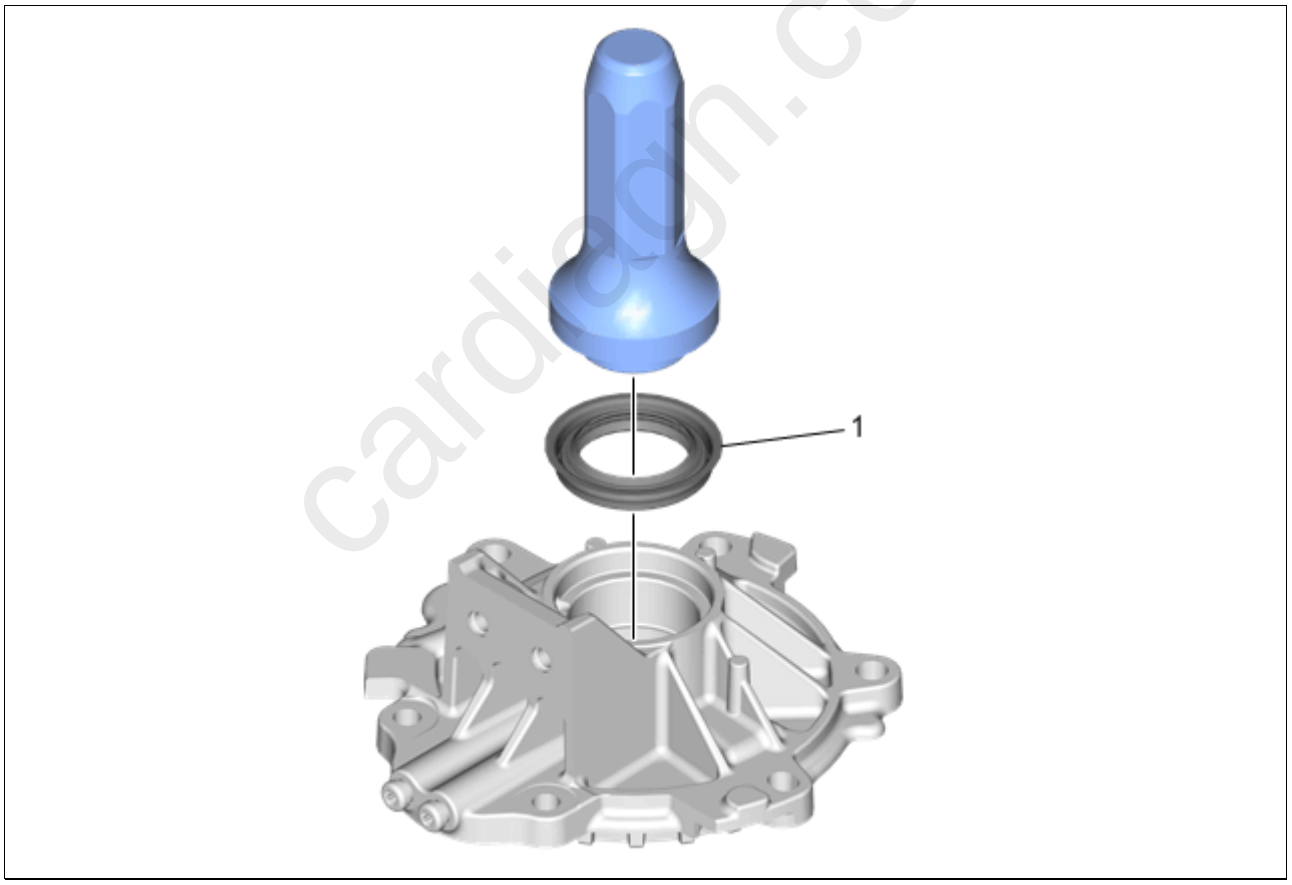
Special Tools

- **DT-22828** Input and Countershaft Race Installer
- **DT-50896** Seal Installer

Refer to:Special Tools

REPAIR INSTRUCTIONS - OFF VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL INSTALLATION (8L45)

Fig 1: Propeller Shaft Transmission Flange Fluid Seal (8L45)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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CAUTION:

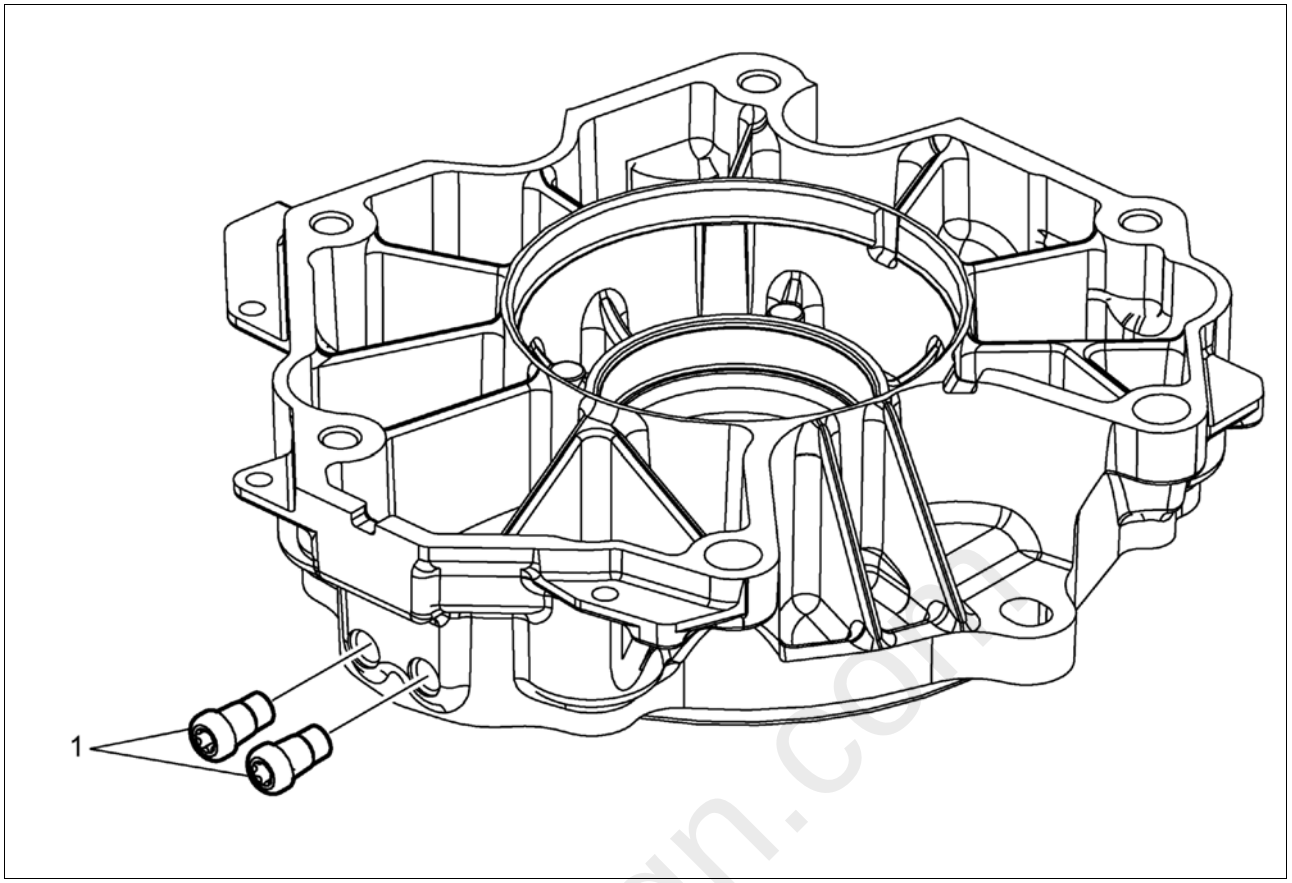
Refer to Seal Reuse Caution .

1	Propeller Shaft Transmission Flange Fluid Seal *NOTE:* *Install a NEW seal.* **Special Tools** **DT-37212** Front Output Shaft Seal Installer Refer to:Special Tools

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L90) > AUTOMATIC TRANSMISSION CASE EXTENSION HOLE PLUG INSTALLATION

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Fig 1: Automatic Transmission Case Extension Hole Plug



Courtesy of GENERAL MOTORS COMPANY

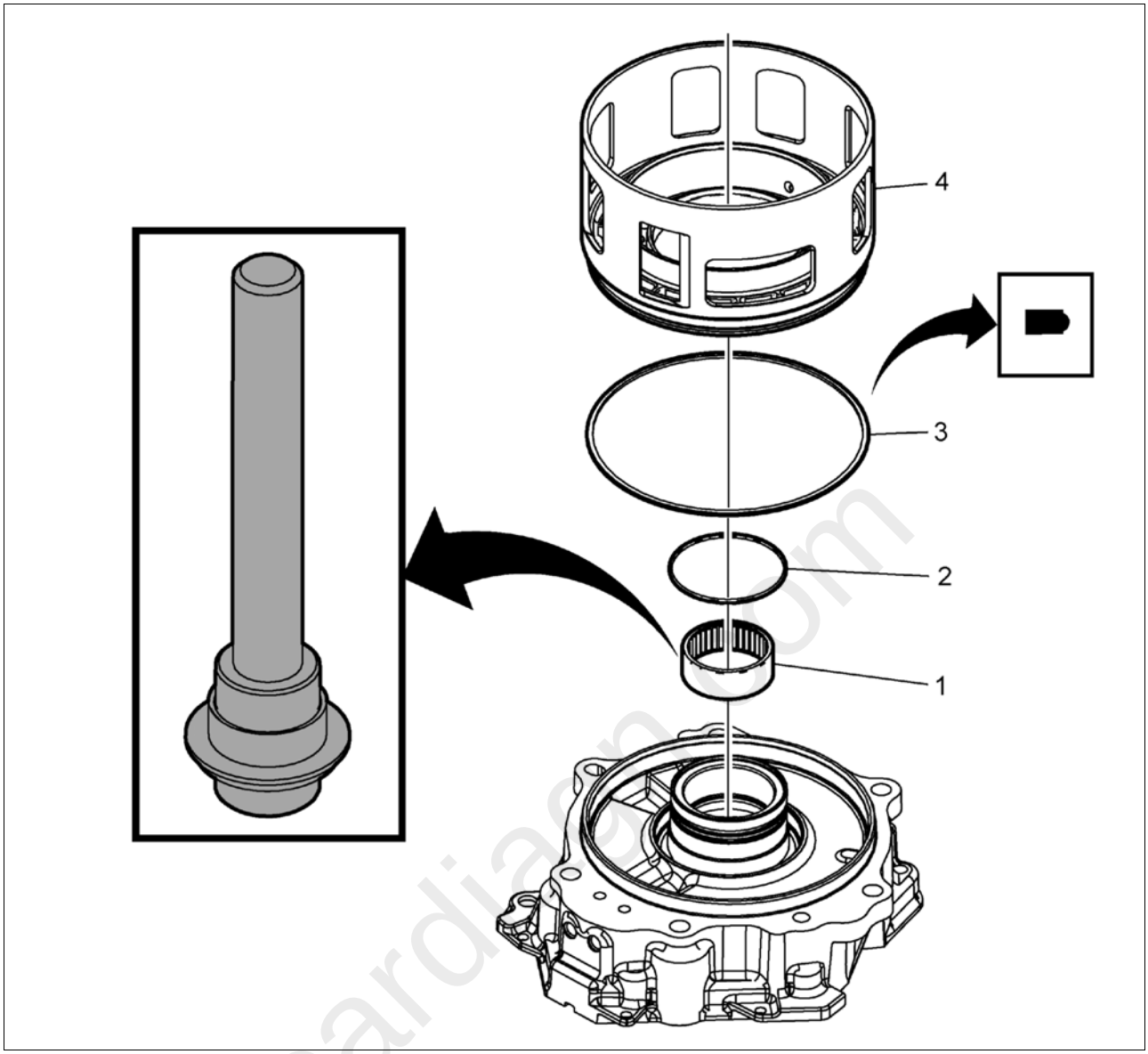
Automatic Transmission Case Extension Hole Plug Installation

Callout	Component Name
1	Automatic Transmission Case Extension Hole Plug **Tighten** 11 N.m (97 lb ft)

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L90) > 1-2-3-4-5 REVERSE CLUTCH PISTON INSTALLATION

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Fig 1: 1-2-3-4-5 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5 Reverse Clutch Piston Installation

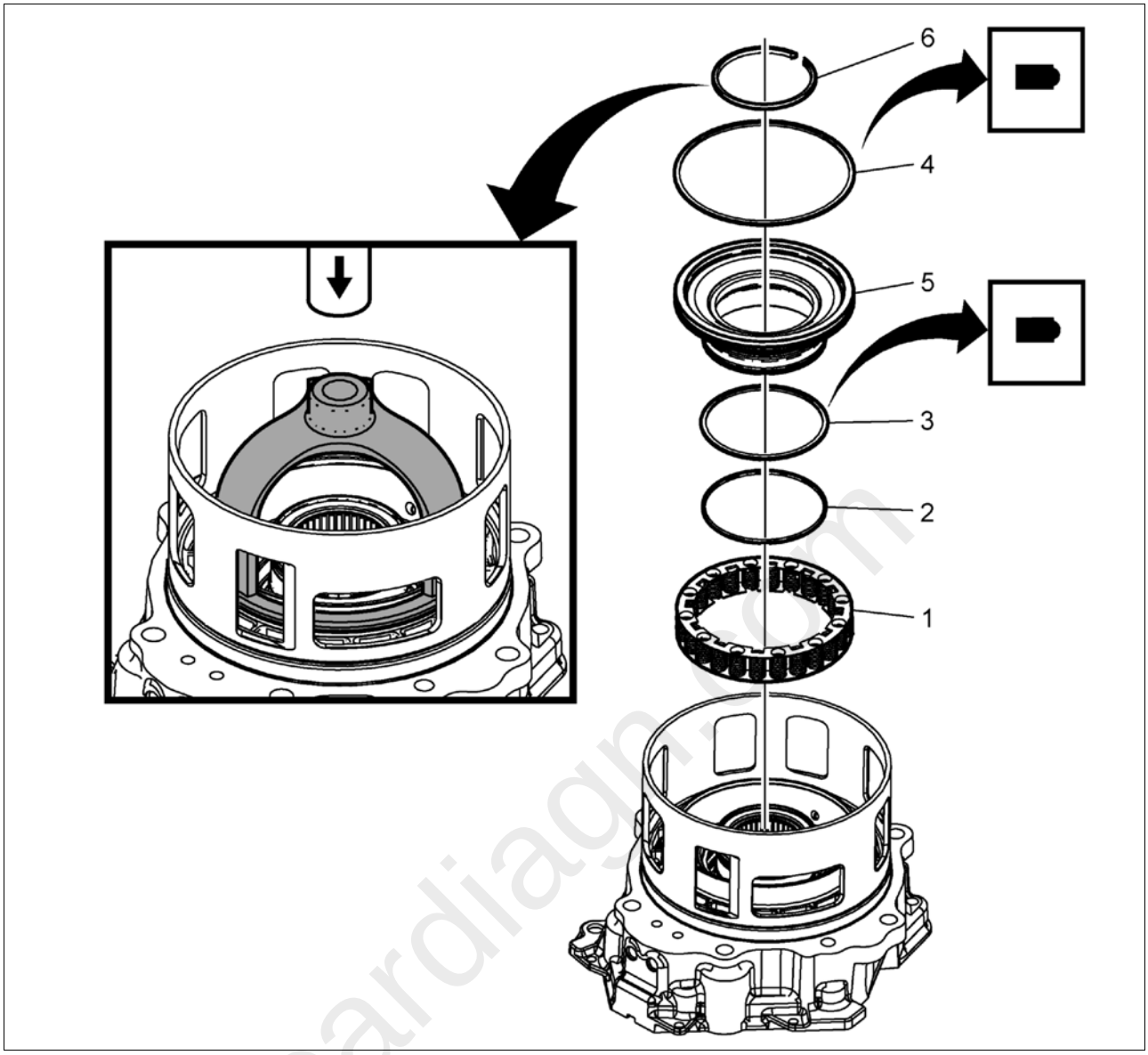
Callout	Component Name
1	Output Shaft Bearing Special Tools • **DT-50897** Bearing Installer • **GE-8092** Driver Handle For equivalent regional tools, refer to Special Tools .

2	1-2-3-4-5-Reverse Clutch Piston Dam Inner O-ring Seal *NOTE:* *Install a NEW seal, it is not reusable.*
3	1-2-3-4-5- Reverse Clutch Piston Outer Seal *NOTE:* *Install a NEW seal, it is not reusable.*
4	1-2-3-4-5-Reverse Clutch Piston

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L90) > 1-2-3-4-5-REVERSE CLUTCH PISTON DAM INSTALLATION

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Fig 1: 1-2-3-4-5-Reverse Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Dam Installation

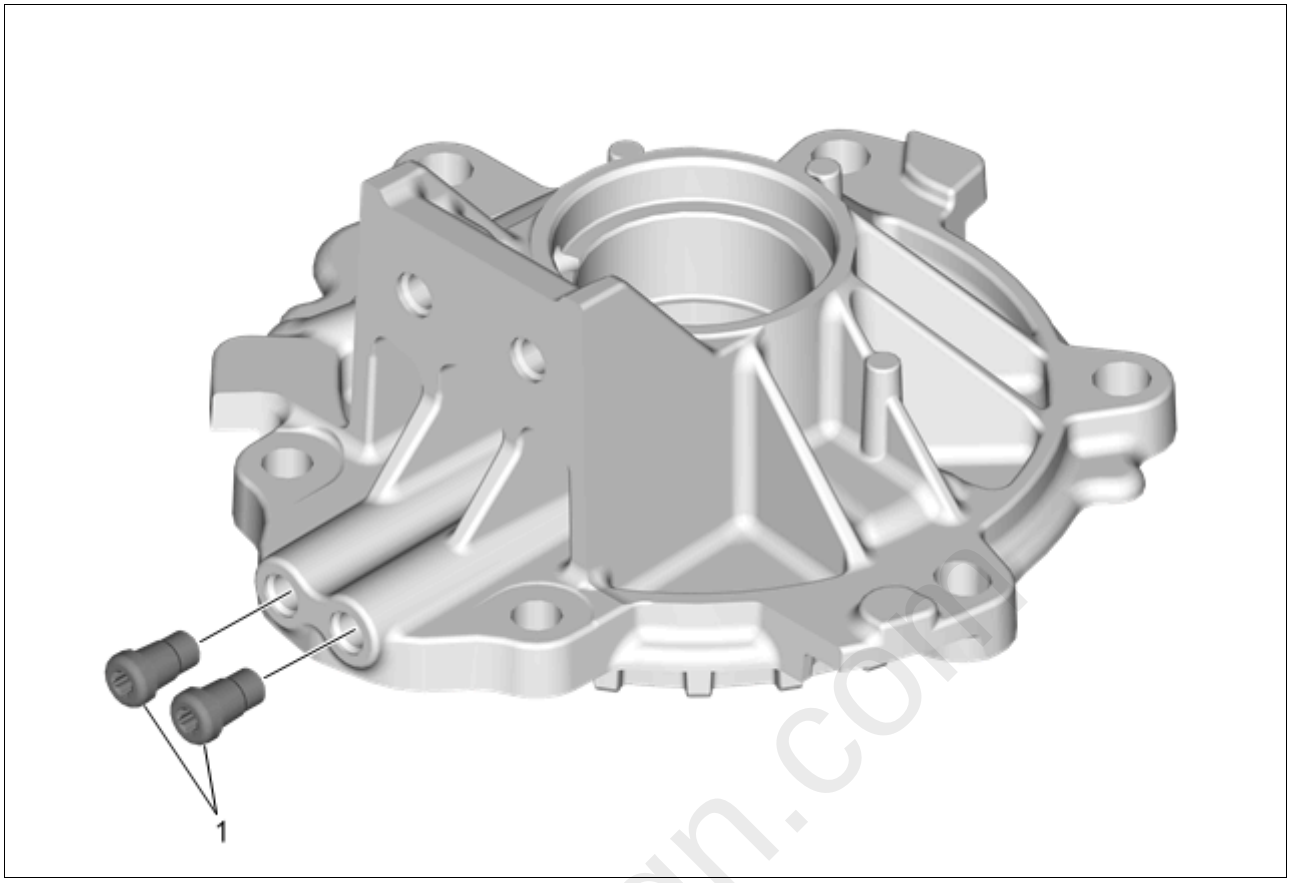
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston Return Spring
2	1-2-3-4-5-Reverse Clutch Piston O-ring Seal *NOTE:* *Install a NEW seal, it is not reusable.*

3	1-2-3-4-5-Reverse Clutch Piston Inner Seal *NOTE:* *Install a NEW seal, it is not reusable.*
4	1-2-3-4-5-Reverse Clutch Piston Dam Seal *NOTE:* *Install a NEW seal, it is not reusable.*
5	1-2-3-4-5-Reverse Clutch Piston Dam
6	1-2-3-4-5-Reverse Clutch Piston Dam Retaining Ring **Procedure** Use **DT-38734** adapter and an arbor press to install the retaining ring. *NOTE:* *Install a NEW retaining ring, it is not reusable.* **Special Tools** **DT-38734** Intermediate Spring Compressor Adapter For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L45) > AUTOMATIC TRANSMISSION CASE EXTENSION HOLE PLUG INSTALLATION

Fig 1: Automatic Transmission Case Extension Hole Plug



Courtesy of GENERAL MOTORS COMPANY

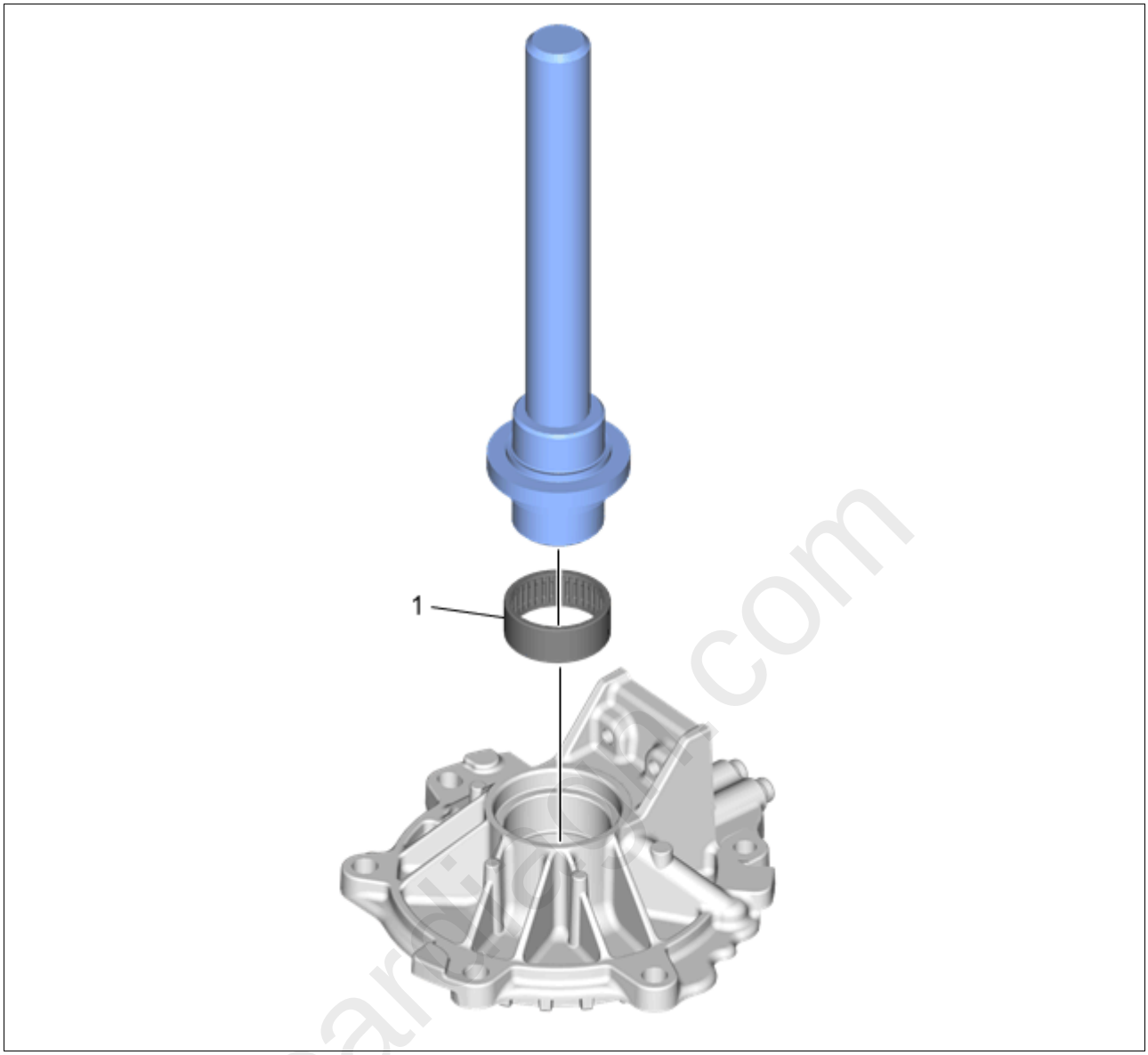
Automatic Transmission Case Extension Hole Plug Installation

Callout	Component Name
1	Automatic Transmission Case Extension Hole Plug **Tighten** 11 N.m (97 lb ft)

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L45) > OUTPUT SHAFT BEARING INSTALLATION (REAR WHEEL DRIVE MODELS ONLY)

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Fig 1: Output Shaft Bearing (Rear Wheel Drive Models)



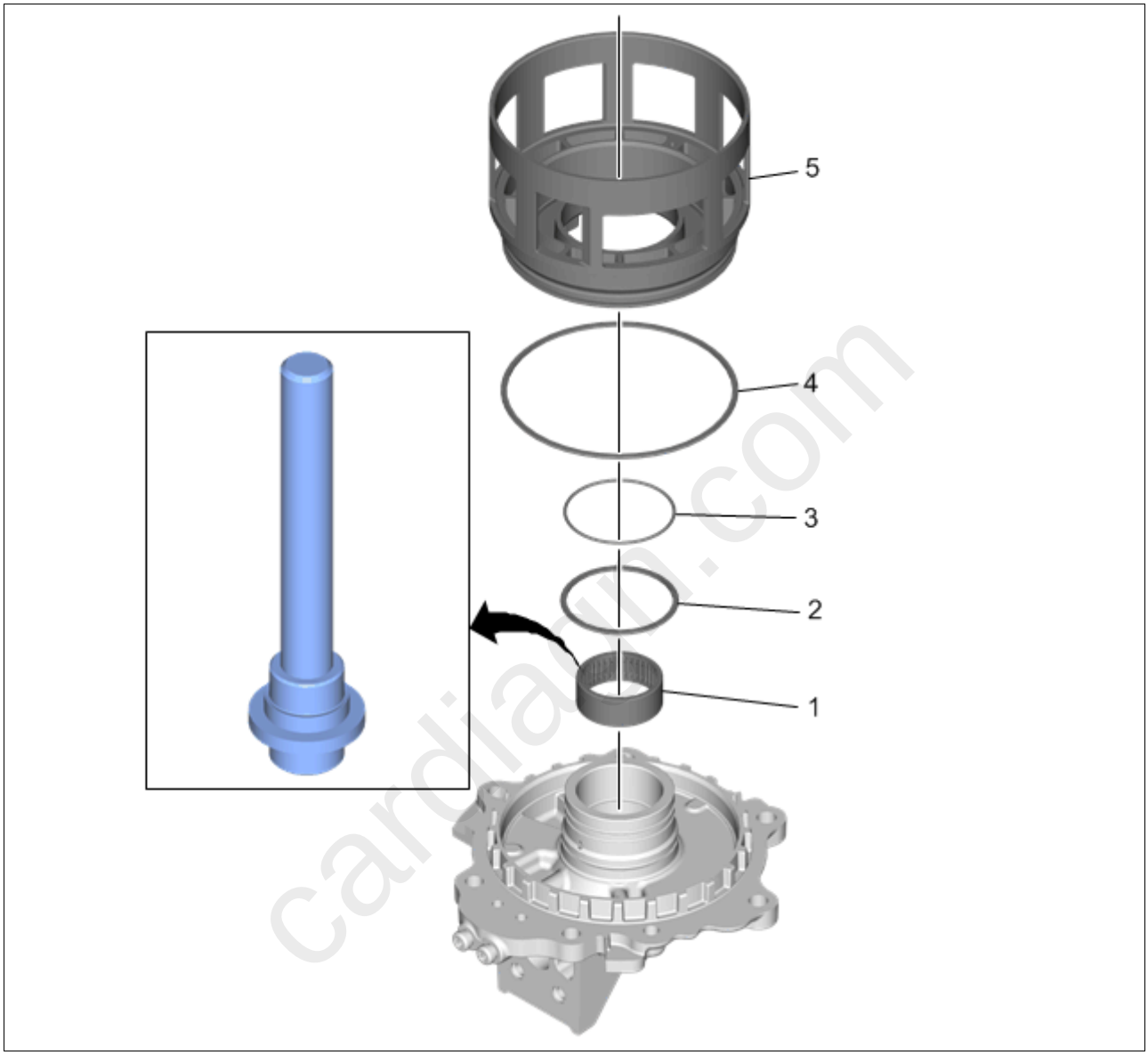
Courtesy of GENERAL MOTORS COMPANY

Output Shaft Bearing Installation (Rear Wheel Drive Models Only)

Callout	Component Name
1	Output Shaft Bearing Special Tools • **DT-51087** Bearing Installer • **GE-8092** Driver Handle For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L45) > 1-2-3-4-5 REVERSE CLUTCH PISTON INSTALLATION

Fig 1: 1-2-3-4-5 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5 Reverse Clutch Piston Installation

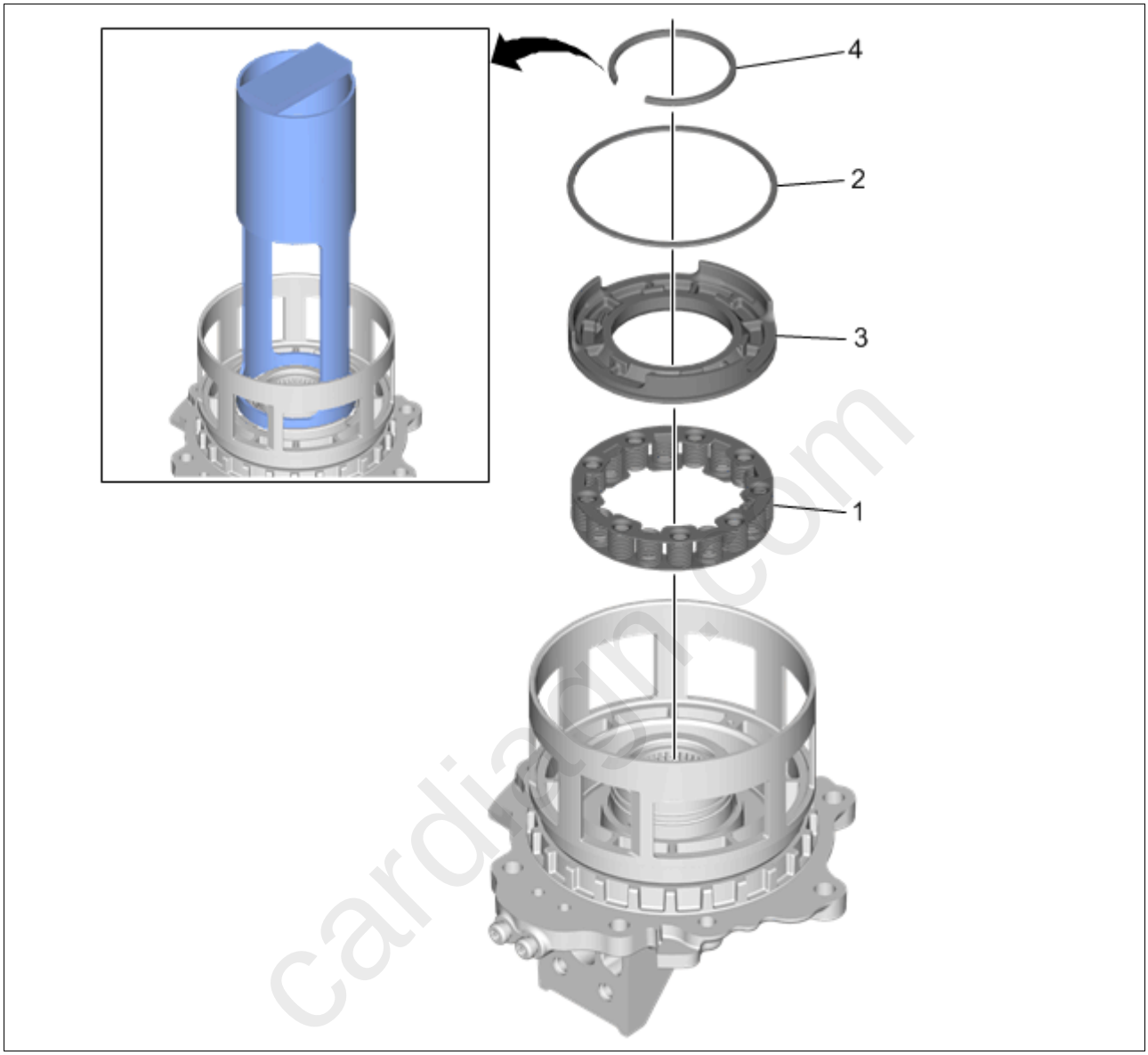
Callout	Component Name
1	Output Shaft Bearing Special Tools • **DT-51087** Bearing Installer

	• **GE-8092** Driver Handle For equivalent regional tools, refer to Special Tools .
2	1-2-3-4-5-Reverse Clutch Piston Dam Inner Seal (O-ring) *CAUTION:* *Refer to Seal Reuse Caution .* *NOTE:* *Install a NEW seal, it is not reusable.*
3	1-2-3-4-5-Reverse Clutch Piston Dam Inner Seal *CAUTION:* *Refer to Seal Reuse Caution .* *NOTE:* *Install a NEW seal, it is not reusable.*
4	1-2-3-4-5- Reverse Clutch Piston Outer Seal *CAUTION:* *Refer to Seal Reuse Caution .* *NOTE:* *Install a NEW seal, it is not reusable.*
5	1-2-3-4-5-Reverse Clutch Piston

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REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLE (8L45) > 1-2-3-4-5-REVERSE CLUTCH PISTON DAM INSTALLATION

Fig 1: 1-2-3-4-5-Reverse Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

1-2-3-4-5-Reverse Clutch Piston Dam Installation

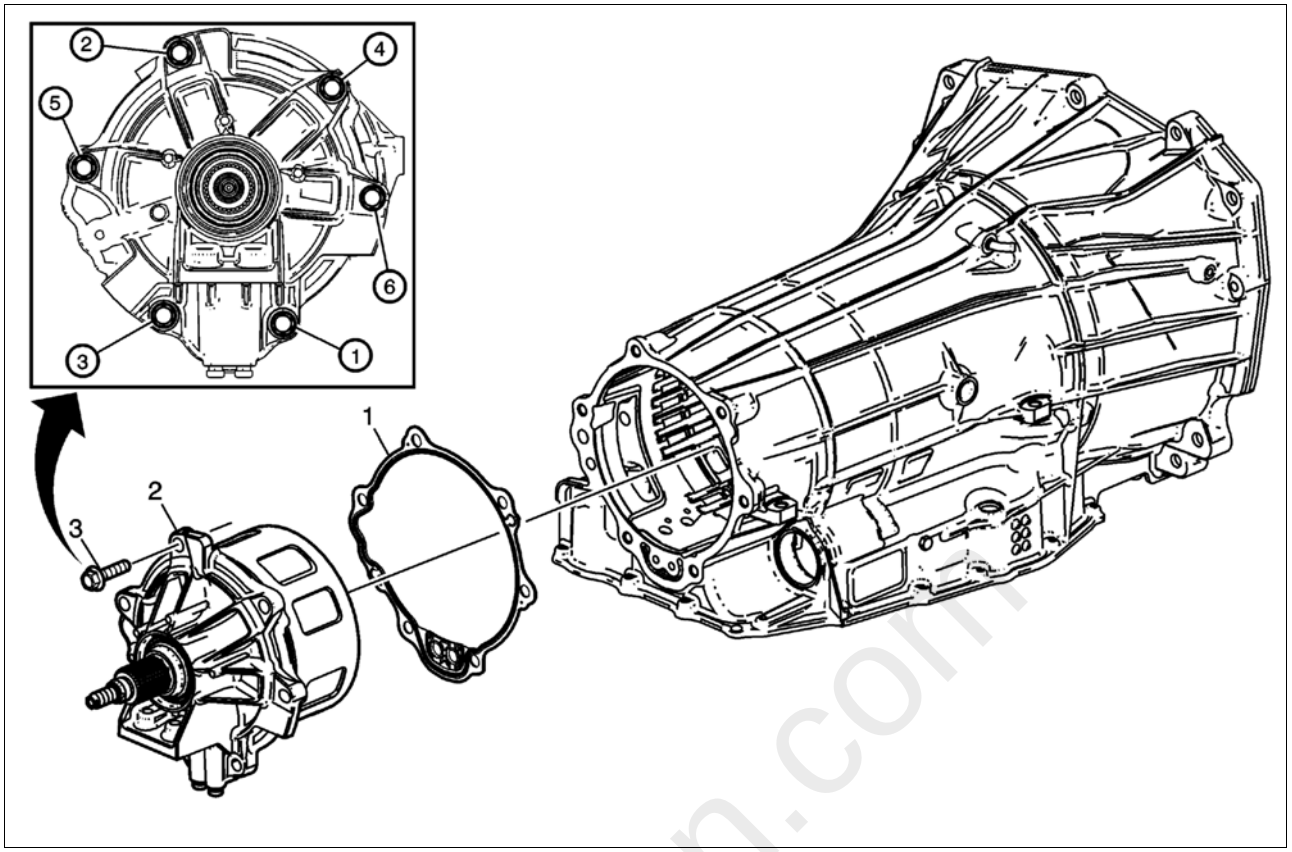
Callout	Component Name
1	1-2-3-4-5-Reverse Clutch Piston Return Spring
2	1-2-3-4-5-Reverse Clutch Piston Dam Seal

	CAUTION: *Refer to Seal Reuse Caution .* *NOTE:* *Install a NEW seal, it is not reusable.*
3	1-2-3-4-5-Reverse Clutch Piston Dam
4	1-2-3-4-5-Reverse Clutch Piston Dam Retaining Ring **Procedure** Use **DT-47693-2** compressor and an arbor press to install the retaining ring. *NOTE:* *Install a NEW retaining ring, it is not reusable.* **Special Tools** **DT-47693-2** Compressor Adapter For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > CASE EXTENSION ASSEMBLY INSTALLATION

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Fig 1: Case Extension



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Case Extension Seal *NOTE:* *The seal is reusable, inspect the seal and replace if damaged.*
2	Automatic Transmission Case Extension Assembly *NOTE:* *Ensure the park pawl is not engaged.*
3	Automatic Transmission Case Extension Bolt M10 x 40 (Qty: 6) *CAUTION:*

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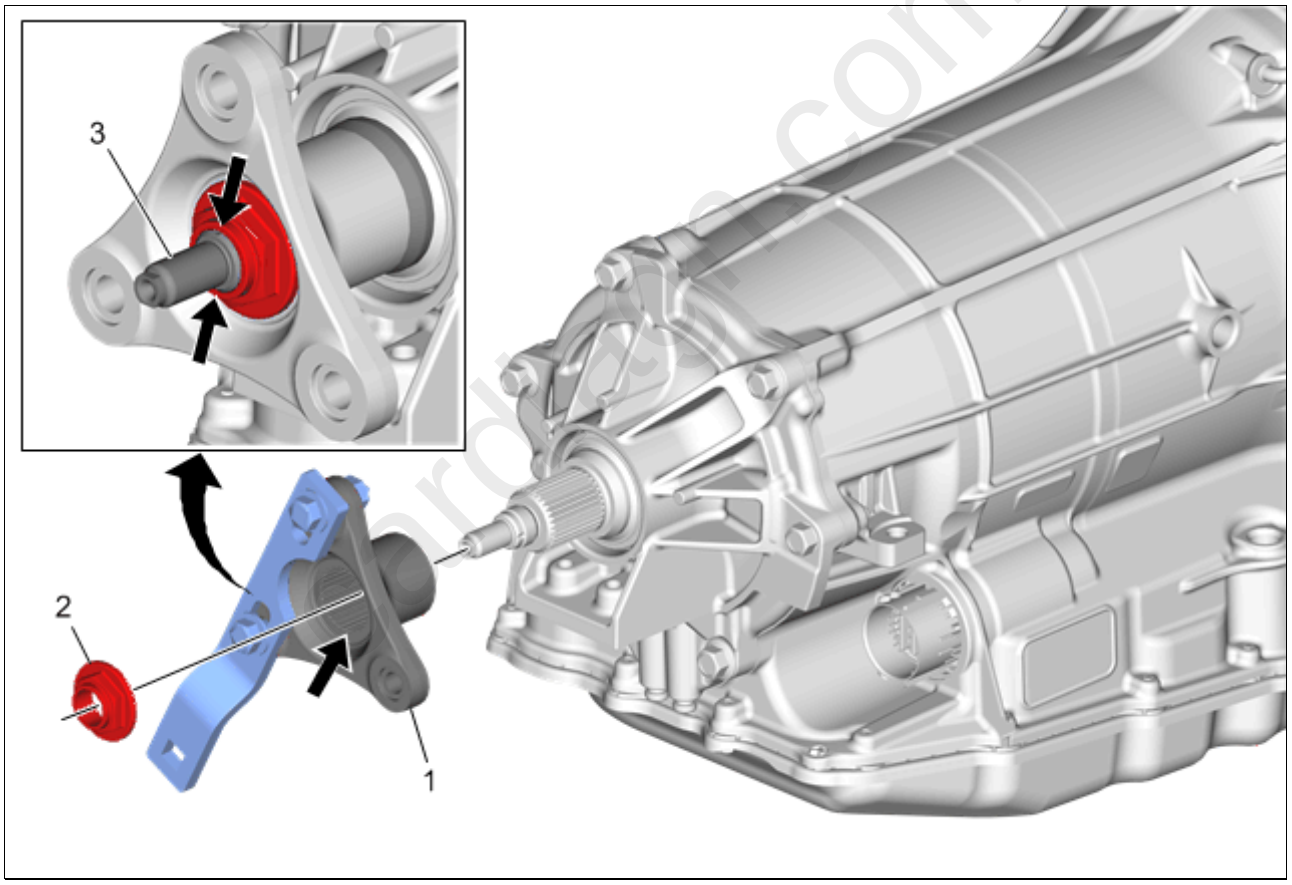
Refer to Fastener Caution .

Procedure
Tighten the bolts in the sequence shown.

1. Tighten the bolts a first pass to 20 N.m (15 lb ft)
2. Tighten the bolts a final pass to 55 Degrees

REPAIR INSTRUCTIONS - OFF VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE INSTALLATION (REAR WHEEL DRIVE)

Fig 1: Propeller Shaft Transmission Flange (Rear Wheel Drive)



Courtesy of GENERAL MOTORS COMPANY

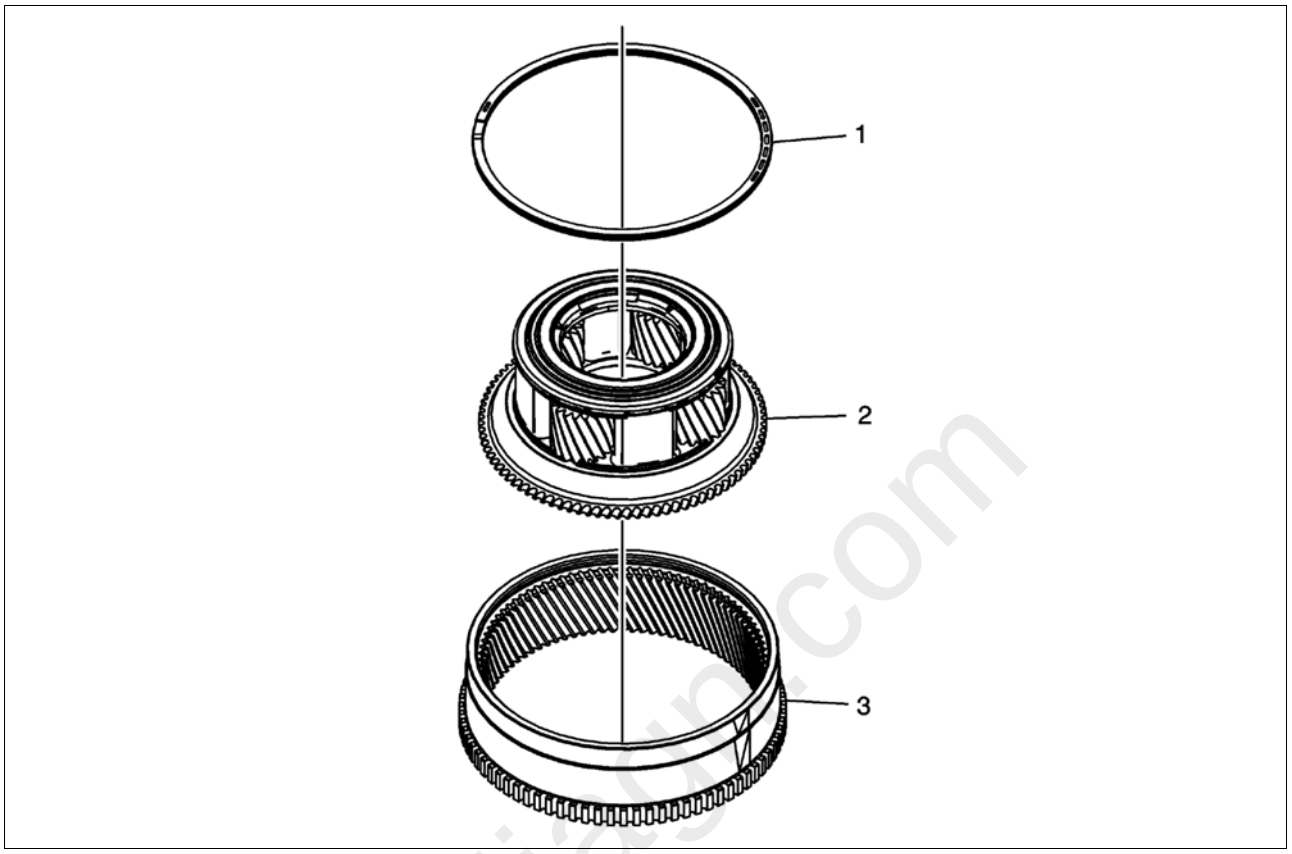
Callout	Component Name
1	Propeller Shaft Transmission Flange Procedure

	1. The output shaft splines must be thoroughly clean and dry before installing the flange. 2. Apply adhesive across the width of the flange splines and install. Refer to Adhesives, Fluids, Lubricants, and Sealers . However, if the replacement flange contains a pre-applied adhesive patch, then liquid adhesive is not required and the 24 hour cure time is not necessary. 3. Sufficient application of adhesive to every tooth on the flange will leave excess adhesive on the output shaft after installation. If no excess is observed, reapply adhesive.
2	Propeller Shaft Transmission Flange Nut *CAUTION:* *Refer to Fastener Caution .* Procedure 1. The output shaft nut threads must be thoroughly clean and dry before installing the nut. 2. Apply adhesive across the width of the nut threads prior to tightening and staking. Refer to Adhesives, Fluids, Lubricants, and Sealers . However, if the replacement nut contains a pre-applied adhesive patch, then liquid adhesive is not required. *NOTE:* *Install a NEW nut.* **Tighten** 105 N.m (77 lb ft) **Special Tools** **DT-45012** Holding Fixture For equivalent regional tools, refer to Special Tools .
3	Output Shaft *CAUTION:* *Stake the flange nut onto the output shaft. Use the two staking grooves on the shaft to locate the staking points. Failure to stake the flange nut may result in damage to the transmission.*

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REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION CARRIER OVERHAUL

Fig 1: Reaction Carrier

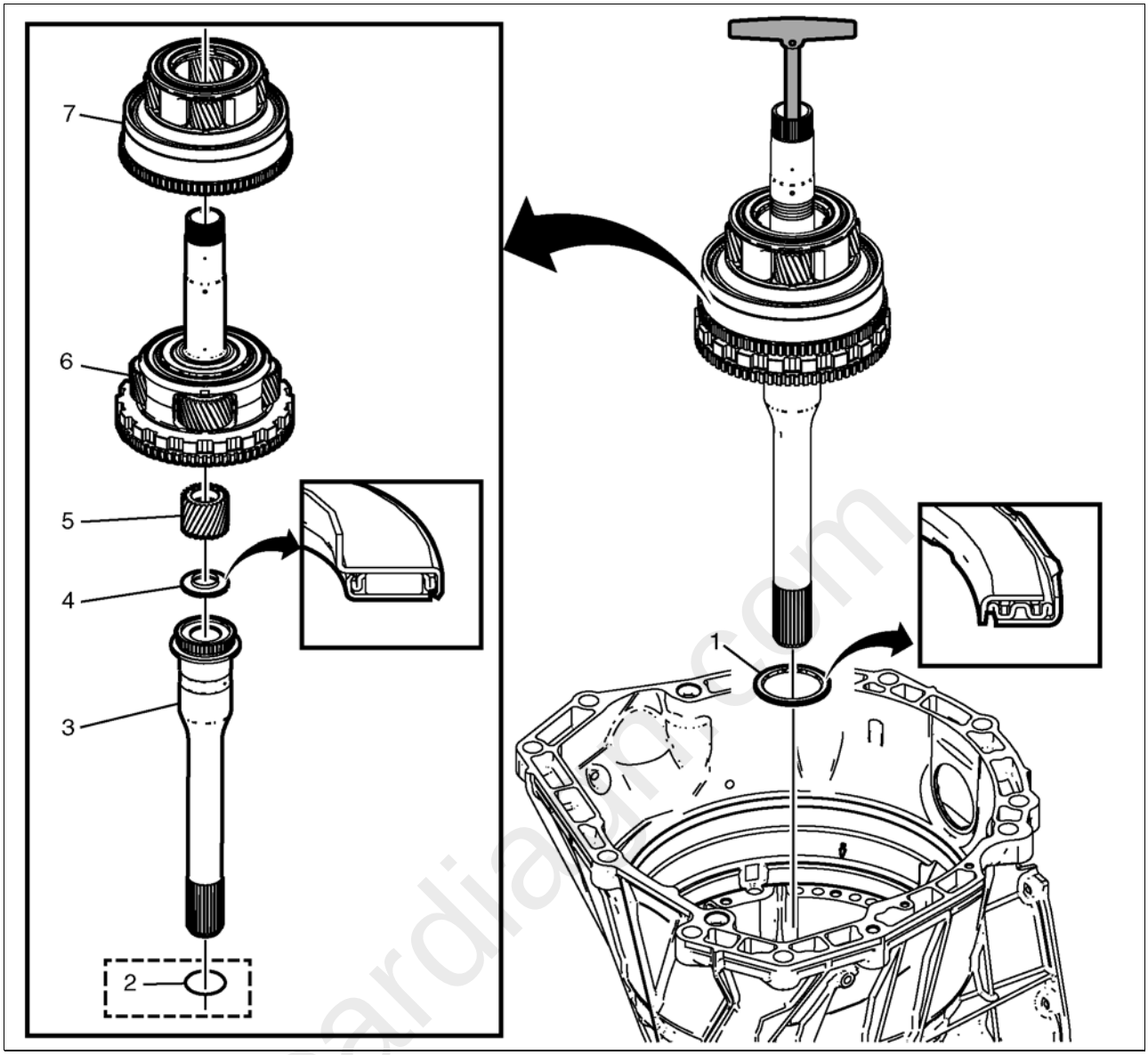


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Output Internal Gear Retaining Ring
2	Reaction Carrier
3	Output Carrier Internal Gear

REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION CARRIER ASSEMBLY, OUTPUT CARRIER, AND OUTPUT SHAFT INSTALLATION

Fig 1: Reaction Carrier Assembly, Output Carrier, and Output Shaft



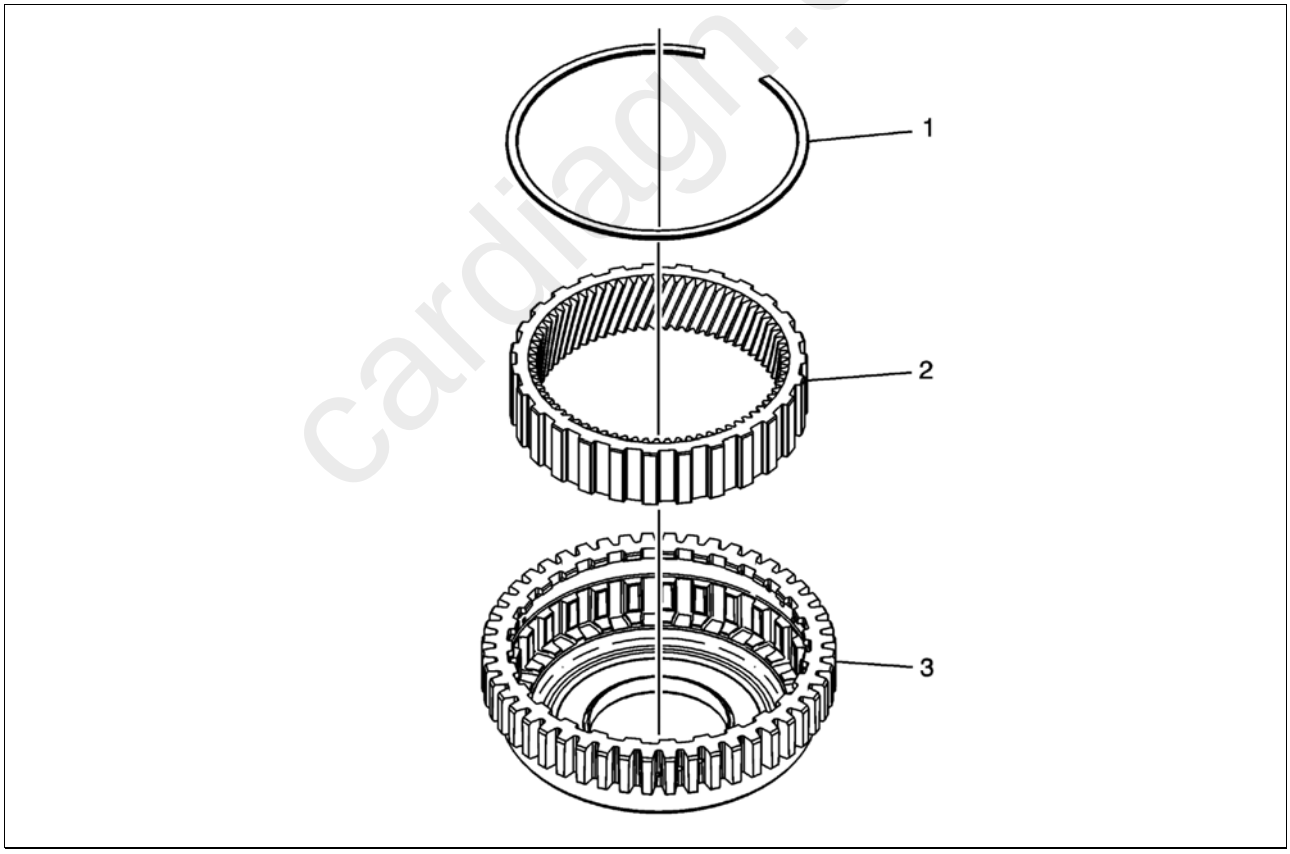
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Output Carrier Thrust Bearing
2	Output Shaft Seal—O-Ring *NOTE:* *The output shaft seal is only present on All Wheel Drive (AWD) models.*
3	Output Shaft **Special Tools**

	DT-50921 Output Carrier/Shaft Lifting Tool For equivalent regional tools, refer to Special Tools .
4	Output Sun Gear Thrust Bearing
5	Output Sun Gear
6	Output Carrier Assembly
7	Reaction Carrier Assembly *NOTE:* *Ensure the park pawl is not engaged.*

REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION INTERNAL GEAR AND 1-2-3-4-5 REVERSE HUB OVERHAUL

Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Hub



Courtesy of GENERAL MOTORS COMPANY

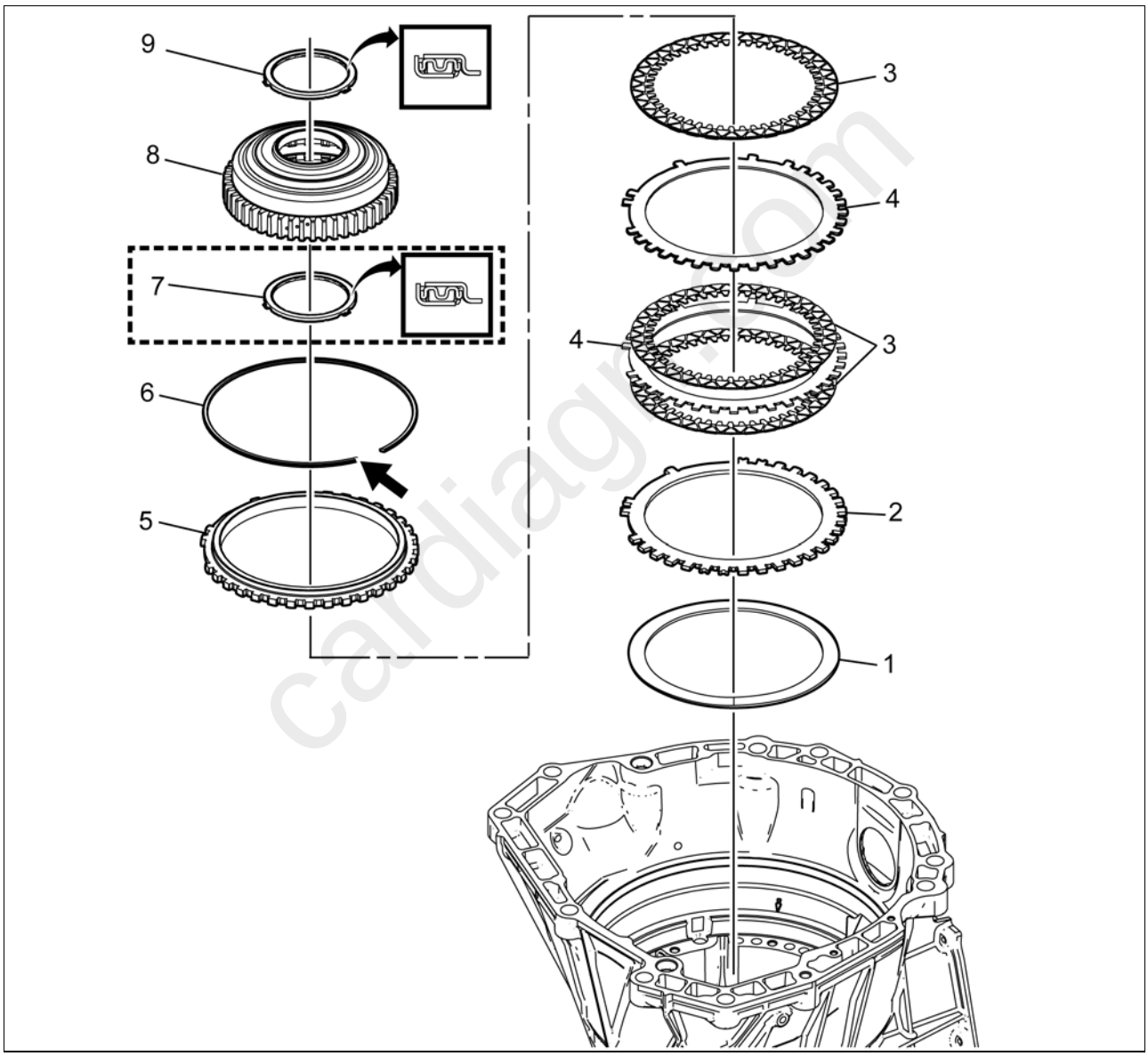
Callout	Component Name

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1	Reaction Internal Gear Retaining Ring
2	Reaction Internal Gear
3	Reaction Internal Gear and 1-2-3-4-5 Reverse Clutch Hub

REPAIR INSTRUCTIONS - OFF VEHICLE > REACTION INTERNAL GEAR AND 1-2-3-4-5 REVERSE HUB AND 1-2-3-4-5 REVERSE CLUTCH PLATE ASSEMBLY INSTALLATION

Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate



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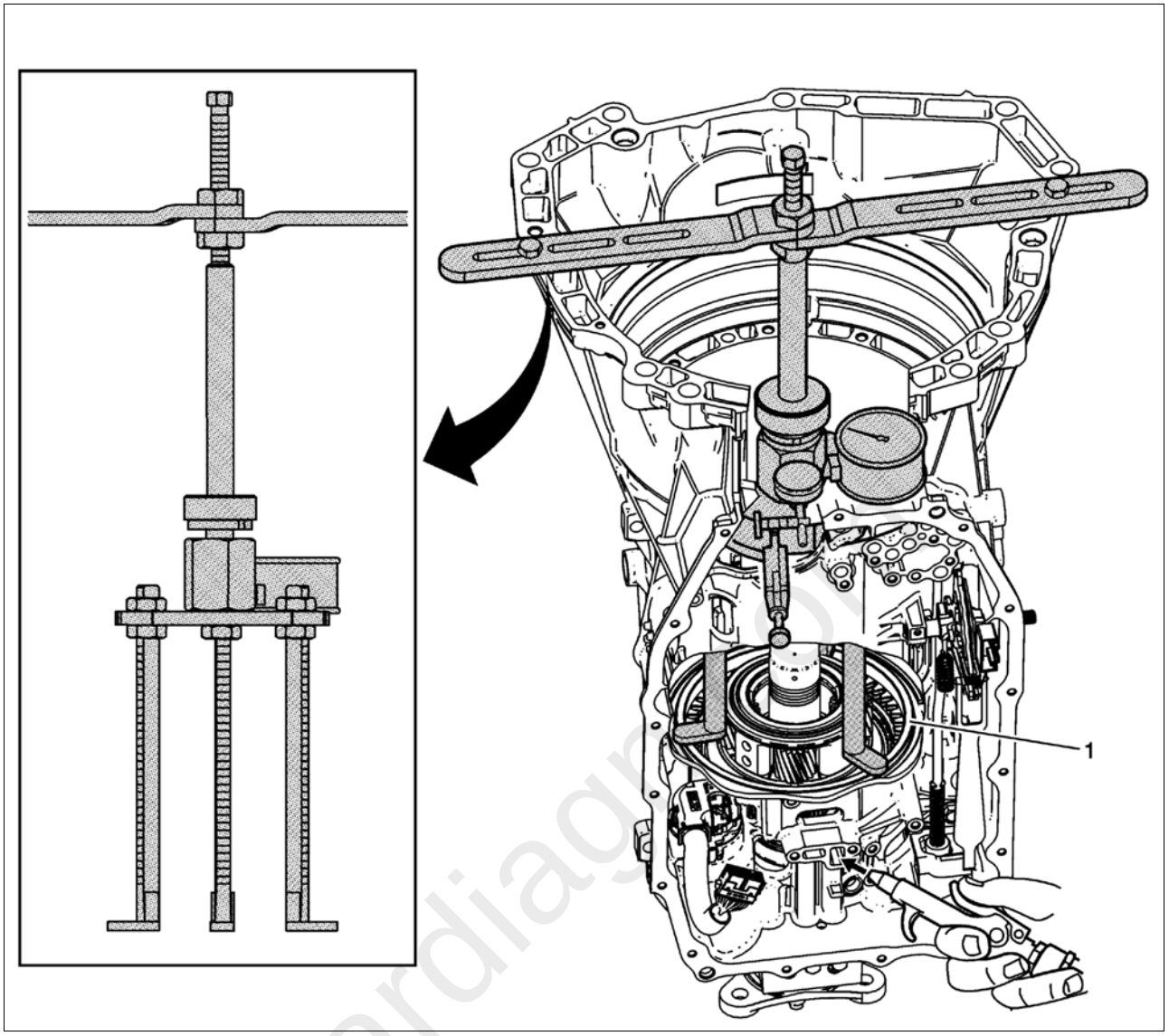
Callout	Component Name
1	1-2-3-4-5 Reverse Clutch (Waved) Plate

2	1-2-3-4-5 Reverse Clutch Apply Plate
3	1-2-3-4-5 Reverse Clutch Plate Assembly (Qty: 3)
4	1-2-3-4-5 Reverse Clutch Plate (Qty: 2)
5	1-2-7-8 Reverse Clutch Backing Plate
6	1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring Measurement . *NOTE:* *The opening of the retaining ring should be in the 9 o'clock position as indicated by the arrow.*
7	Reaction Carrier Thrust Bearing (8L45 Only)
8	Reaction Internal Gear and 1-2-3-4-5 Reverse Hub Assembly
9	1-2-3-4-5 Reverse Clutch Hub Thrust Bearing

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-2-3-4-5 REVERSE CLUTCH BACKING PLATE RETAINING RING MEASUREMENT

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Fig 1: Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate



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Callout	Component Name
Preliminary Procedure 1. Install the case extension assembly. Refer to Case Extension Assembly Installation 2. Install the 1-2-3-4-5 reverse clutch plate assembly. Refer to Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate Assembly Installation .	
1	1-2-3-4-5 Reverse Clutch Backing Plate Procedure 1. Assemble the tools as shown and apply 80 pounds of pressure to the load gauge by turning the screw on the **DT-48056** bridge clockwise.

2. Zero out the dial indicator.
3. Remove the pressure on the load gauge by turning the screw on the **DT-48056** bridge one full turn counterclockwise.
4. Apply compressed air to the indicated case passage and simultaneously adjust the screw on the **DT-48056** bridge to apply 80 pounds of pressure to the load gauge.
5. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 1-2-3-4-5 reverse clutch backing plate retaining ring.

Special Tools

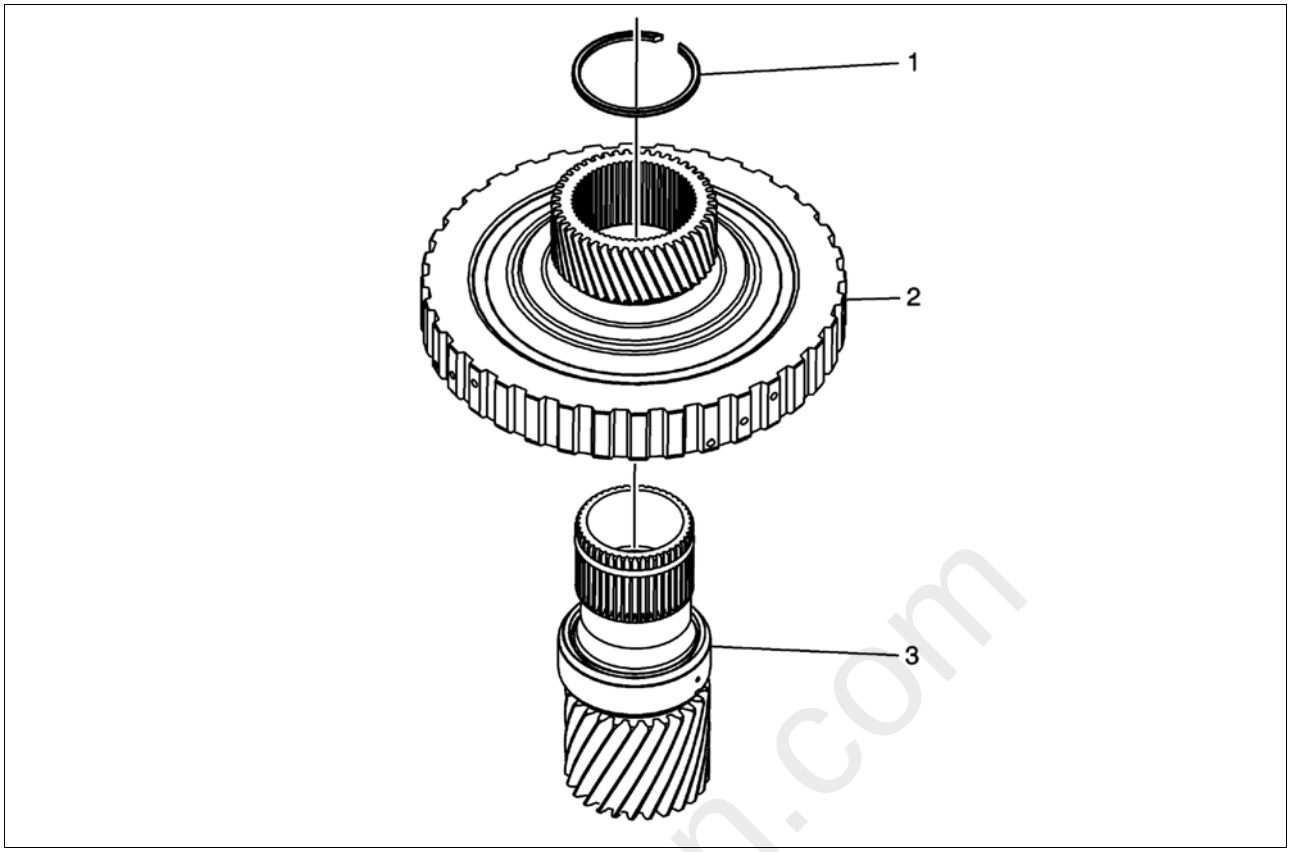
- **DT-48056** Spring Compressor Bridge
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-51328** Clutch Compressor and Air Travel Check Rod Extension
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > INPUT SUN GEAR OVERHAUL

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Fig 1: Input Sun Gear



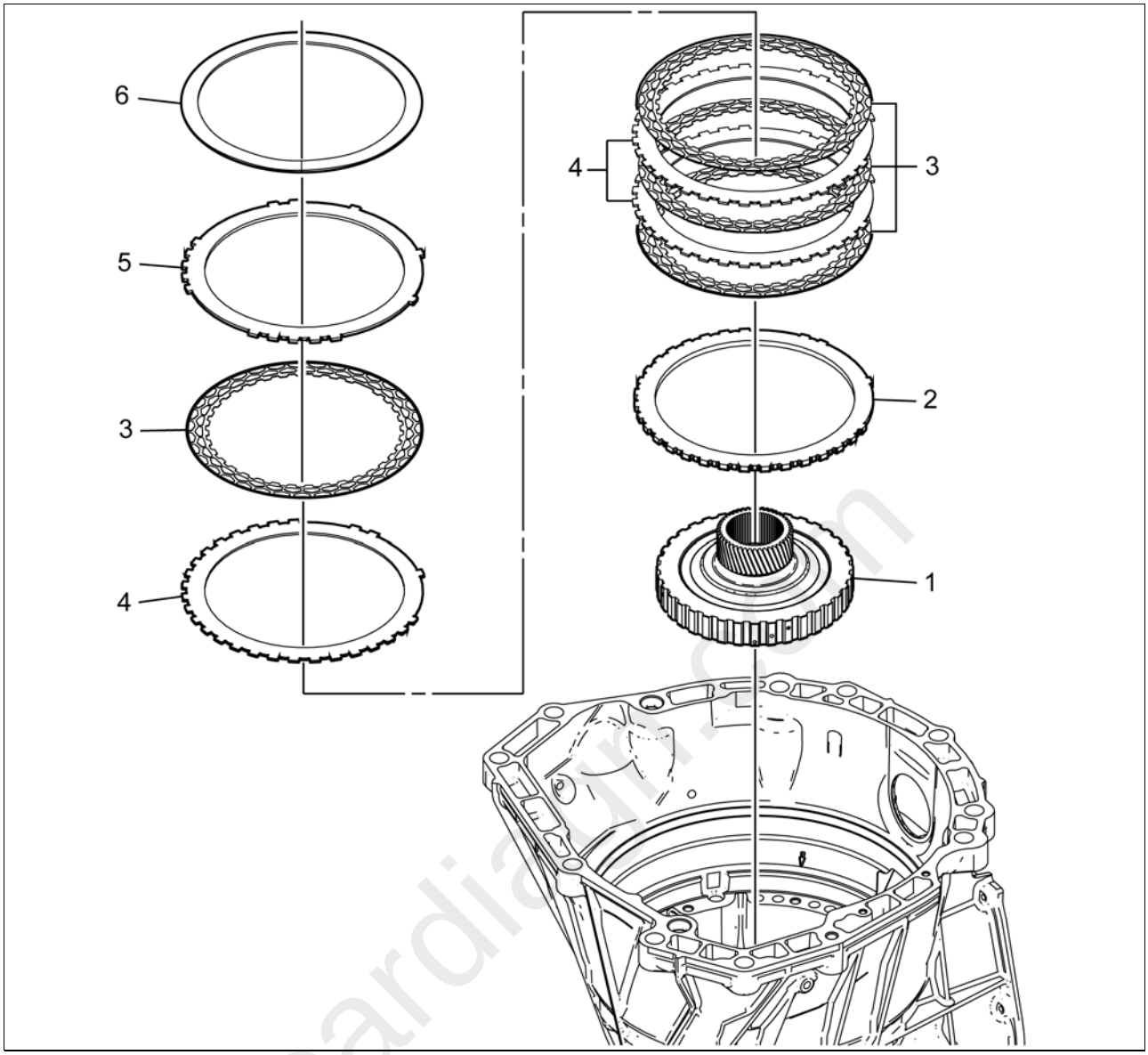
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Sun Gear Retaining Ring *NOTE:* *Discard the retaining ring, it is not reusable.*
2	Input Sun Gear Assembly
3	Reaction Sun Gear Assembly

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-2-7-8 REVERSE CLUTCH PLATE ASSEMBLY AND INPUT SUN GEAR ASSEMBLY INSTALLATION

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Fig 1: 1-2-7-8 Reverse Clutch Plate Assembly and Input Sun Gear

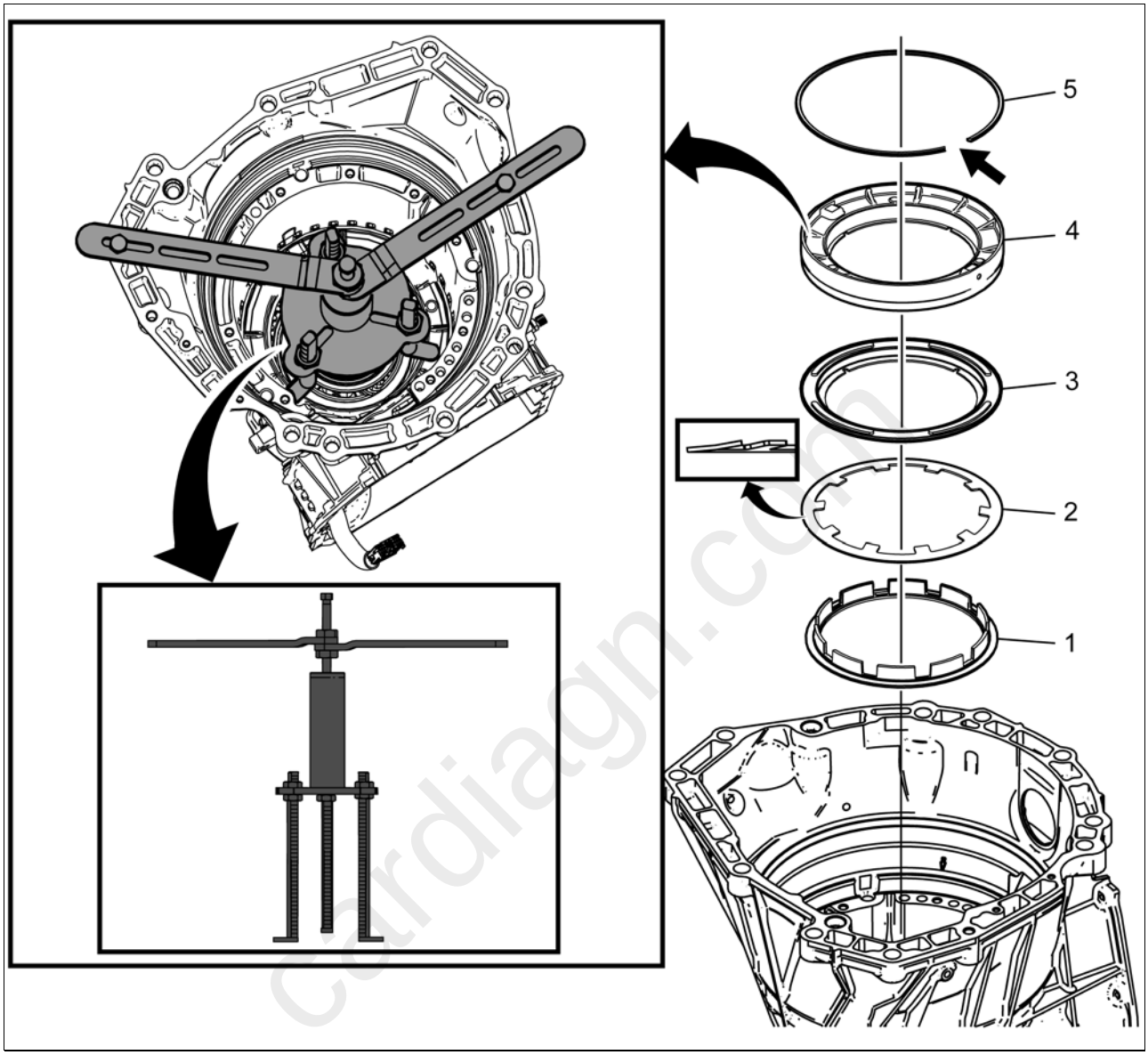


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Sun Gear Assembly
2	1-2-7-8 Reverse Clutch Backing Plate
3	1-2-7-8 Reverse Clutch Plate Assembly (Qty: 4)
4	1-2-7-8 Reverse Clutch Plate (Qty: 3)
5	1-2-7-8 Reverse Clutch Apply Plate
6	1-2-7-8 Reverse Clutch (Waved) Plate

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-2-7-8 REVERSE CLUTCH PISTON INSTALLATION

Fig 1: 1-2-7-8 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-2-7-8 Reverse Clutch Apply Ring
2	1-2-7-8 Reverse Clutch Return Spring
3	1-2-7-8 Reverse Clutch Piston
4	1-2-7-8 Reverse Clutch Piston Housing
5	1-2-7-8 Reverse Clutch Piston Housing Retaining Ring

NOTE:

The opening of the retaining ring should be in the 9 o'clock position as indicated by the arrow.

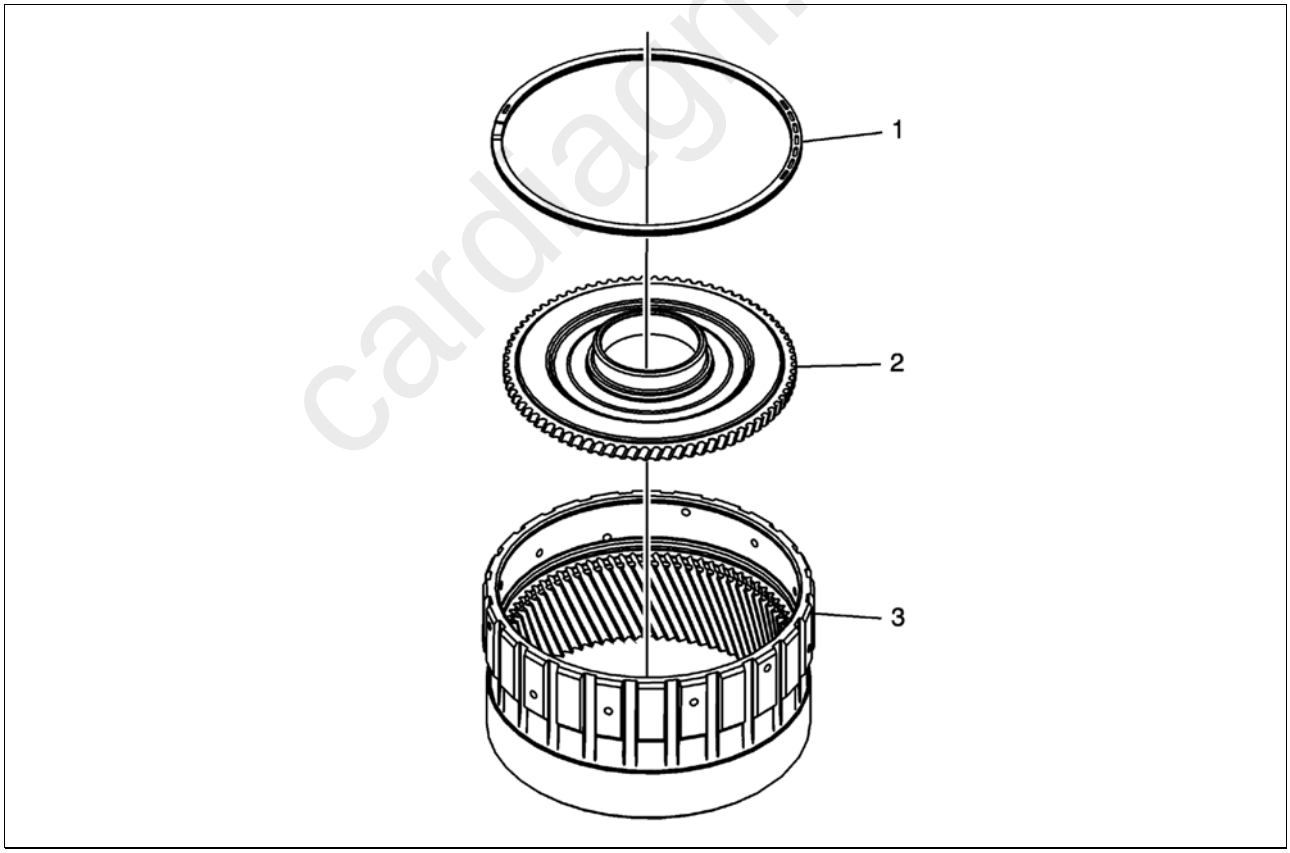
Special Tools

- **DT-35512** Bearing Installer
- **DT-48056** Spring Compressor Bridge
- **DT-50902** Adjustable Clutch Spring Compressor

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > DIRECT OVERDRIVE INTERNAL GEAR OVERHAUL

Fig 1: Direct Overdrive Internal Gear



Courtesy of GENERAL MOTORS COMPANY

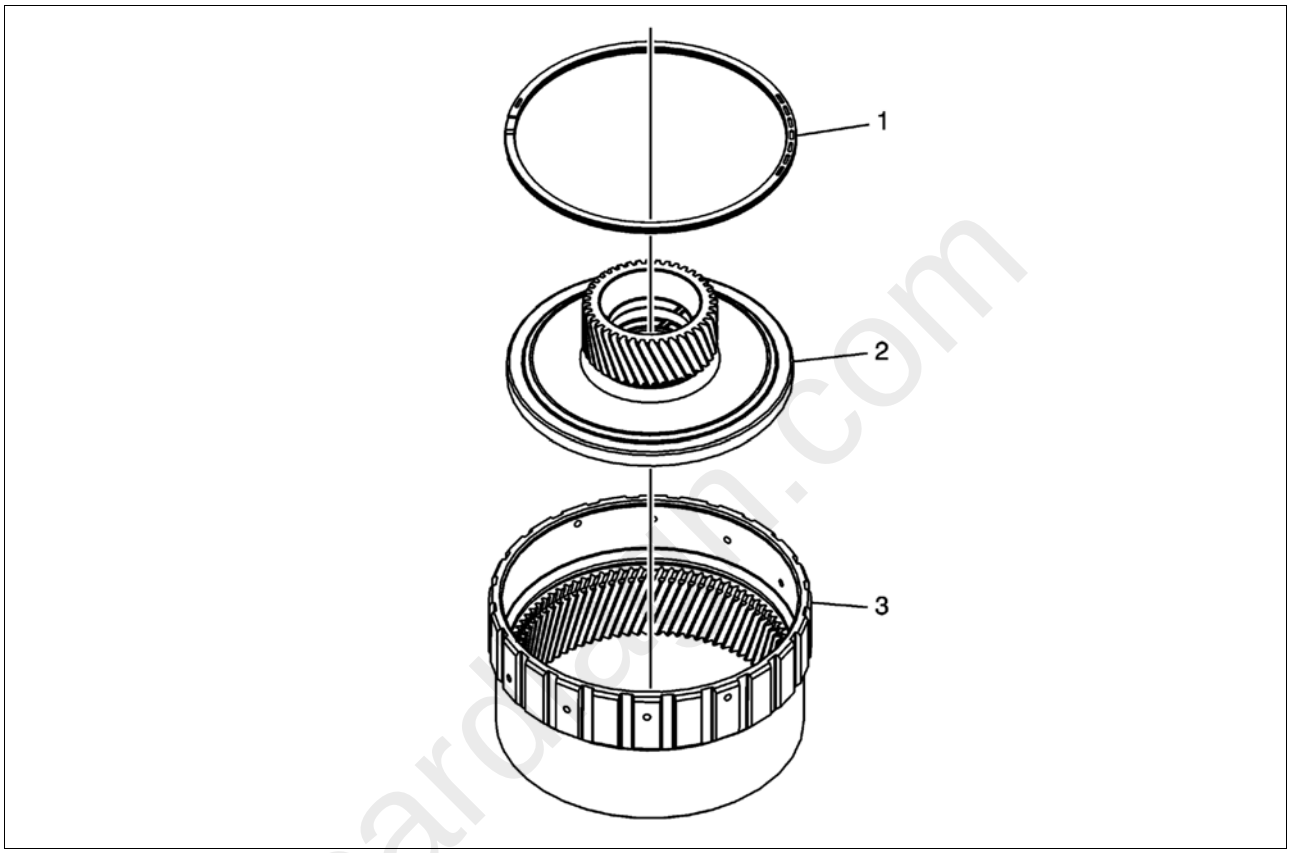
Callout	Component Name

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1	Direct Overdrive Internal Gear Retaining Ring
2	Direct Overdrive Internal Gear Flange
3	Direct Overdrive Internal Gear

REPAIR INSTRUCTIONS - OFF VEHICLE > INPUT INTERNAL GEAR OVERHAUL

Fig 1: Input Internal Gear

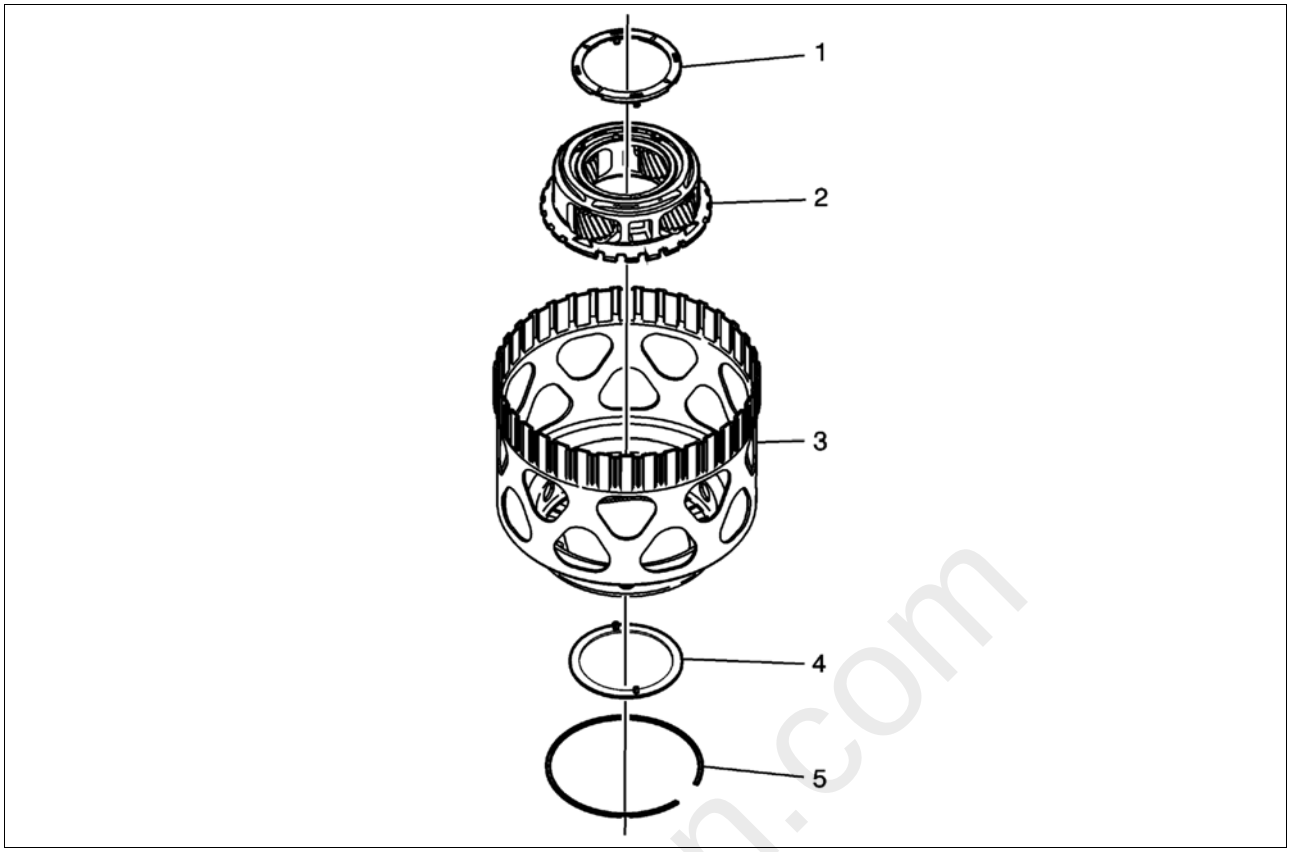


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Internal Gear Retaining Ring
2	Direct Overdrive Sun Gear
3	Input Internal Gear

REPAIR INSTRUCTIONS - OFF VEHICLE > INPUT CARRIER OVERHAUL

Fig 1: Input Carrier



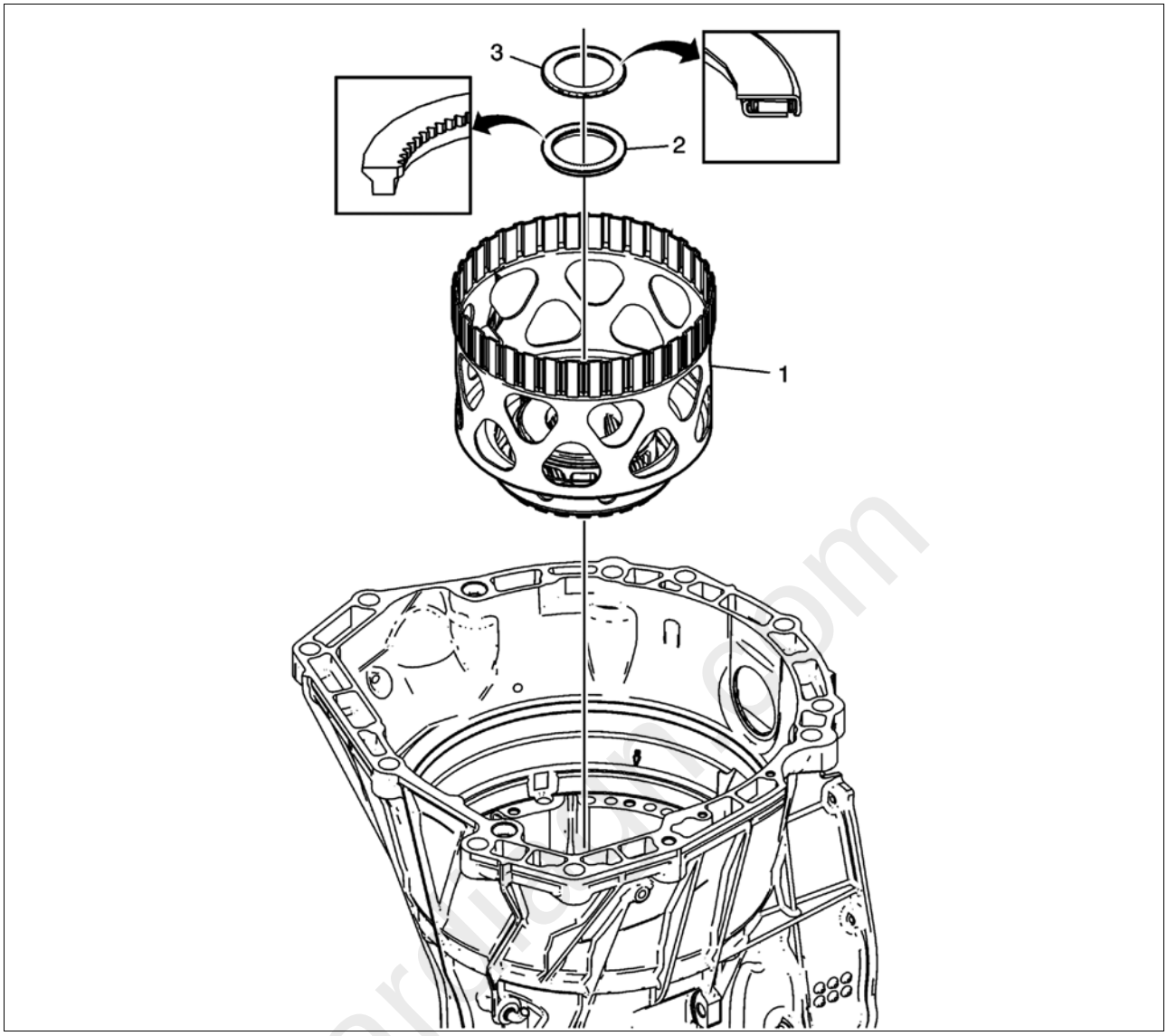
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Carrier Thrust Washer
2	Input Carrier
3	Input Carrier Shell
4	Input Carrier Thrust Washer
5	Input Carrier Shell Retaining Ring

REPAIR INSTRUCTIONS - OFF VEHICLE > INPUT CARRIER ASSEMBLY INSTALLATION

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Fig 1: Input Carrier

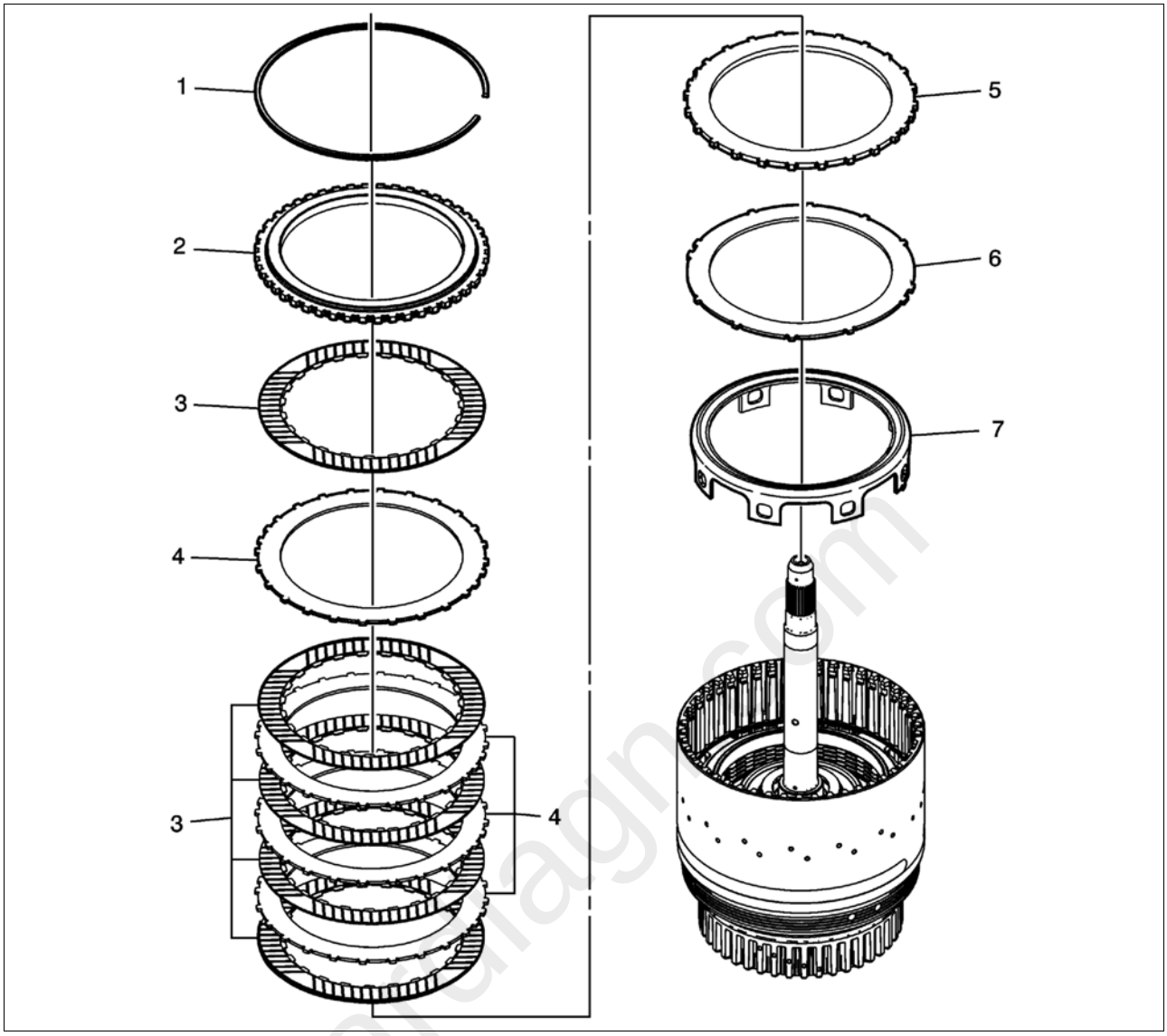


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Carrier Assembly
2	Input Sun Gear Spacer
3	Input Sun Gear Thrust Bearing

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 2-3-4-6-8 CLUTCH PLATES REMOVAL

Fig 1: 2-3-4-6-8 Clutch Plates



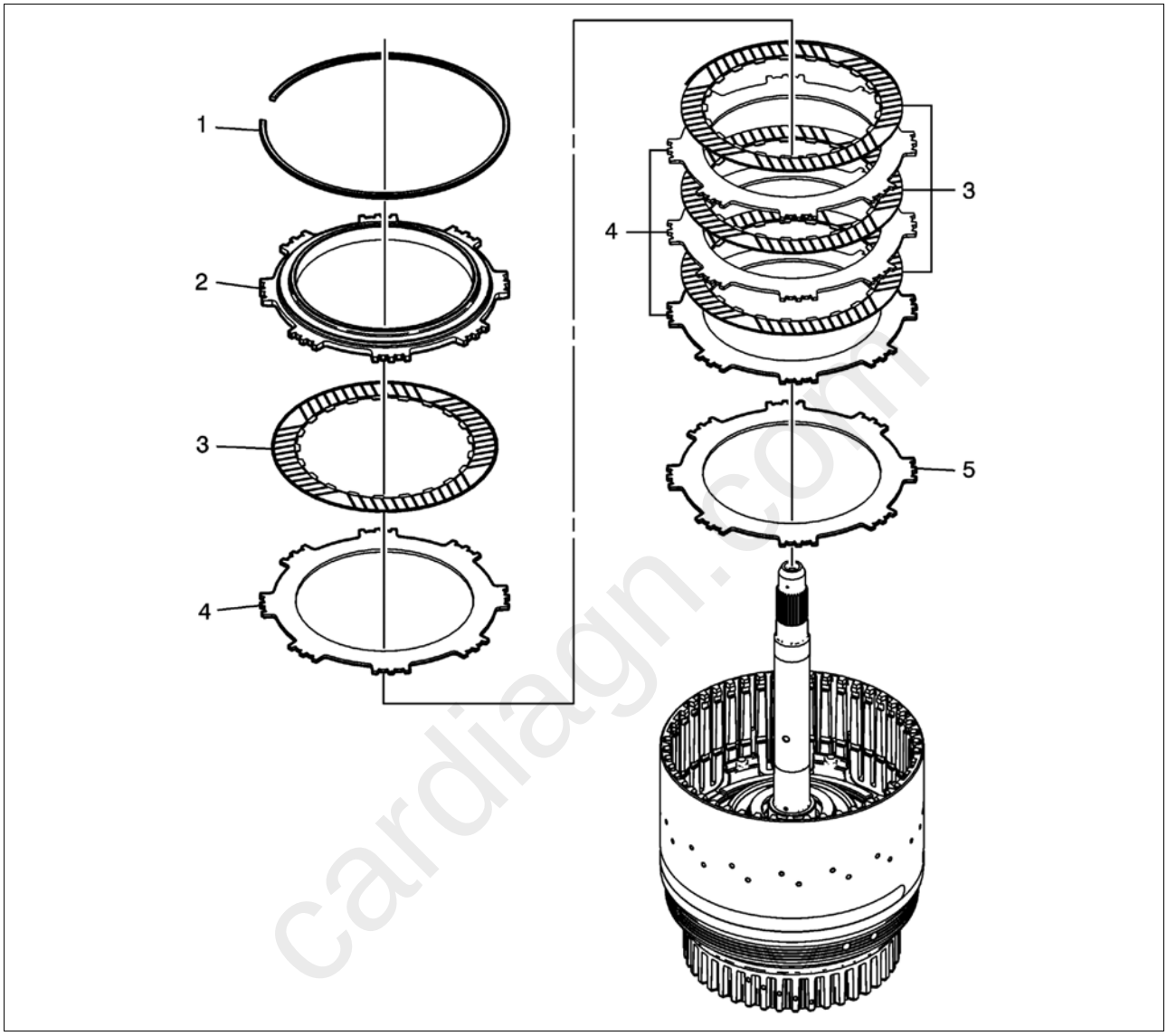
Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Plates Removal

Callout	Component Name
1	2-3-4-6-8 Clutch Backing Plate Retaining Ring (Selective)
2	2-3-4-6-8 Clutch Backing Plate
3	2-3-4-6-8 Clutch Plate Assembly (Qty:5)
4	2-3-4-6-8 Clutch Plate (Qty:4)
5	2-3-4-6-8 Clutch Apply Plate
6	2-3-4-6-8 Clutch (Waved) Plate
7	2-3-4-6-8 Clutch Apply Ring

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 4-5-6-7-8 REVERSE CLUTCH PLATES REMOVAL

Fig 1: 4-5-6-7-8 Reverse Clutch Plates



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Courtesy of GENERAL MOTORS COMPANY

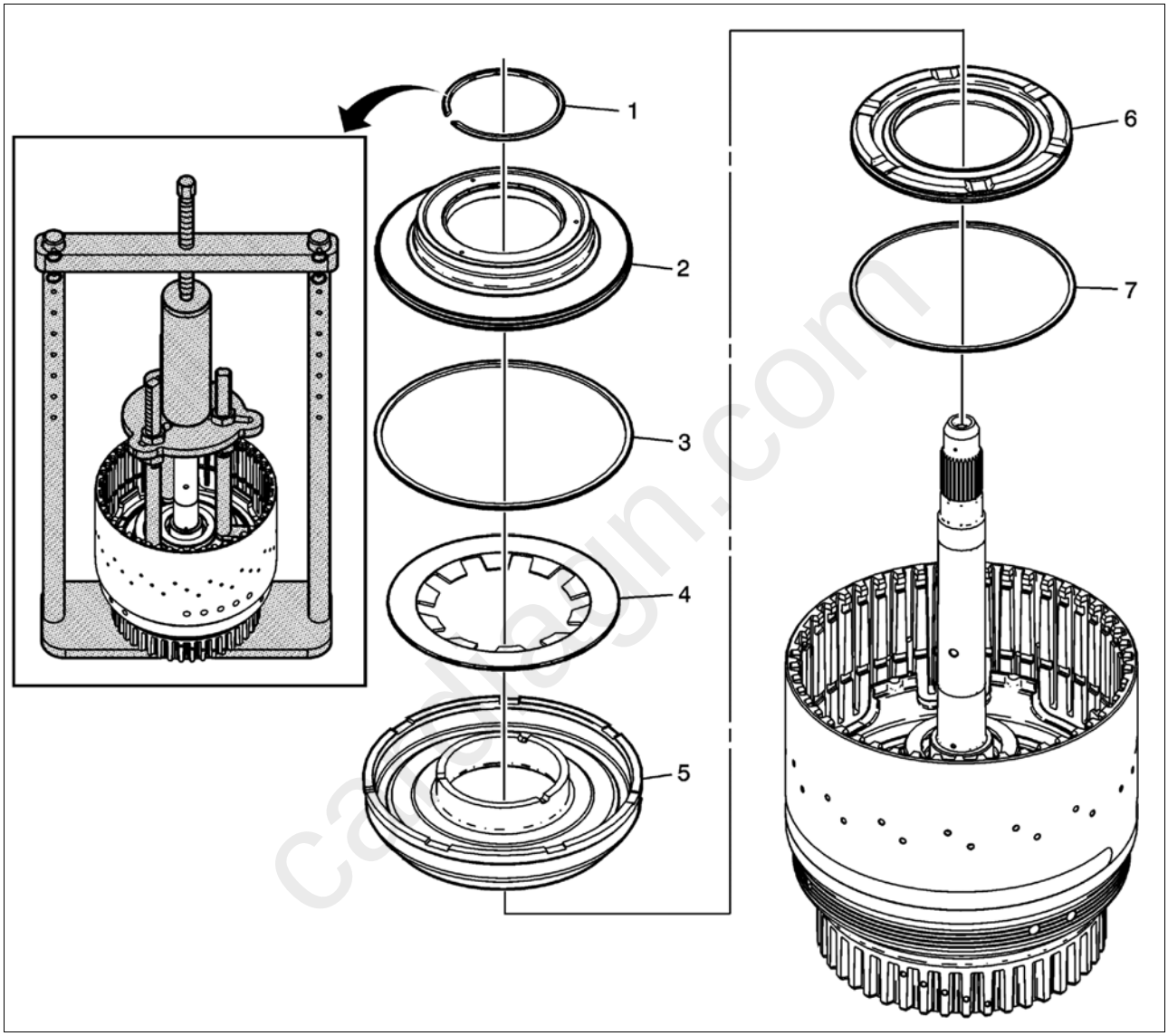
4-5-6-7-8 Reverse Clutch Plates Removal

Callout	Component Name
1	4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring (Selective)
2	4-5-6-7-8 Reverse Clutch Backing Plate
3	4-5-6-7-8 Reverse Clutch Plate Assembly (Qty:4)
4	4-5-6-7-8 Reverse Clutch Plate (Qty:4)

5	4-5-6-7-8 Reverse Clutch (Waved) Plate

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 4-5-6-7-8 REVERSE CLUTCH PISTON REMOVAL

Fig 1: 4-5-6-7-8 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

4-5-6-7-8 Reverse Clutch Piston Removal

Callout	Component Name
1	4-5-6-7-8 Reverse Clutch Piston Dam Retaining Ring *NOTE:*

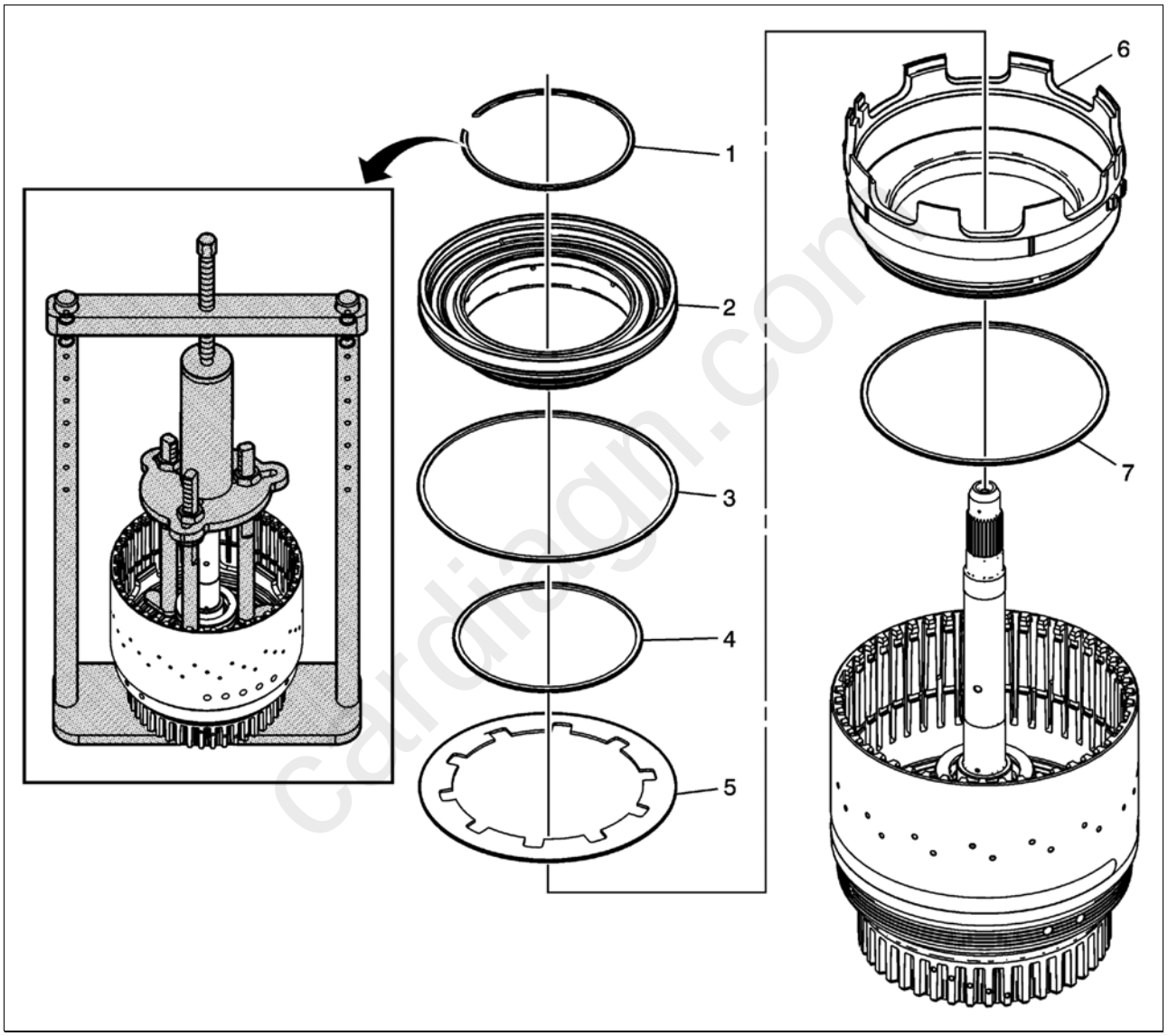
	Discard the retaining ring, it is not reusable. Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .
2	4-5-6-7-8 Reverse Clutch Piston Dam **Procedure** Use the **DT-50905** clutch air travel adapter with compressed air to remove the piston and piston dam as an assembly. **Special Tools** **DT-50905** Clutch Air Travel Adapter For equivalent regional tools, refer to Special Tools .
3	4-5-6-7-8 Reverse Clutch Piston Dam Seal *CAUTION:* *Refer to Seal Reuse Caution .*
4	4-5-6-7-8 Reverse Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring for assembly.*
5	4-5-6-7-8 Reverse Clutch Piston
6	4-5-6-7-8 Reverse Clutch Piston Stop *NOTE:* *Note the orientation of the stop for assembly*
7	4-5-6-7-8 Reverse Clutch Piston Seal *CAUTION:*

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	Refer to Seal Reuse Caution .

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 2-3-4-6-8 CLUTCH PISTON REMOVAL

Fig 1: 2-3-4-6-8 Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Piston Removal

Callout	Component Name
1	2-3-4-6-8 Clutch Piston Dam Retaining Ring

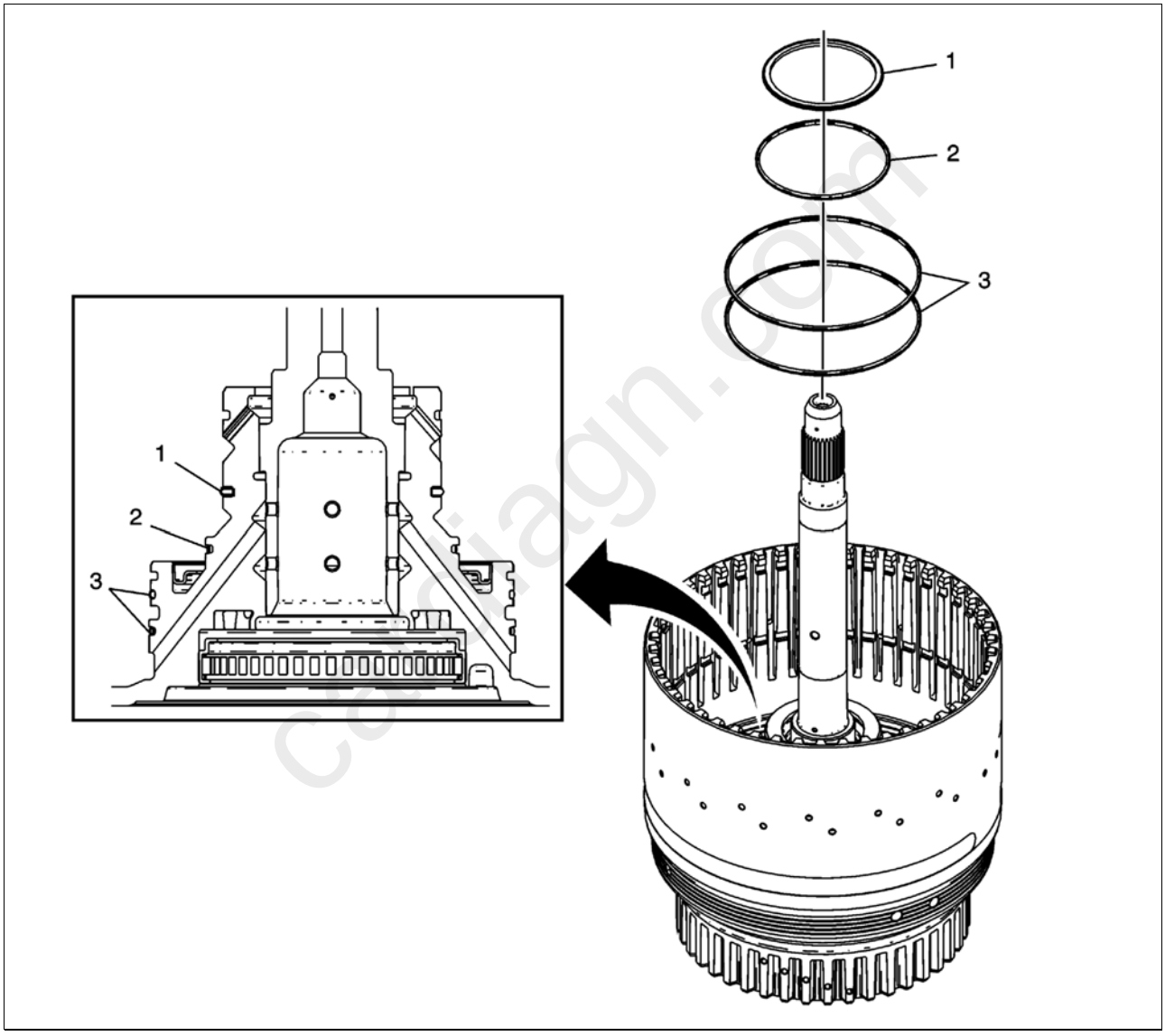
	NOTE: *Discard the retaining ring, it is not reusable.* Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .
2	2-3-4-6-8 Clutch Piston Dam **Special Tools** **DT-50905** Clutch Air Travel Adapter For equivalent regional tools, refer to Special Tools .
3	2-3-4-6-8 Clutch Piston Dam Outer Seal *CAUTION:* *Refer to Seal Reuse Caution .*
4	2-3-4-6-8 Clutch Piston Dam Inner Seal *CAUTION:* *Refer to Seal Reuse Caution .*
5	2-3-4-6-8 Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring for assembly.*
6	2-3-4-6-8 Clutch Piston
7	2-3-4-6-8 Clutch Piston Seal *CAUTION:*

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	Refer to Seal Reuse Caution .

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING SEALS REMOVAL

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals Removal

Callout	Component Name

CAUTION:

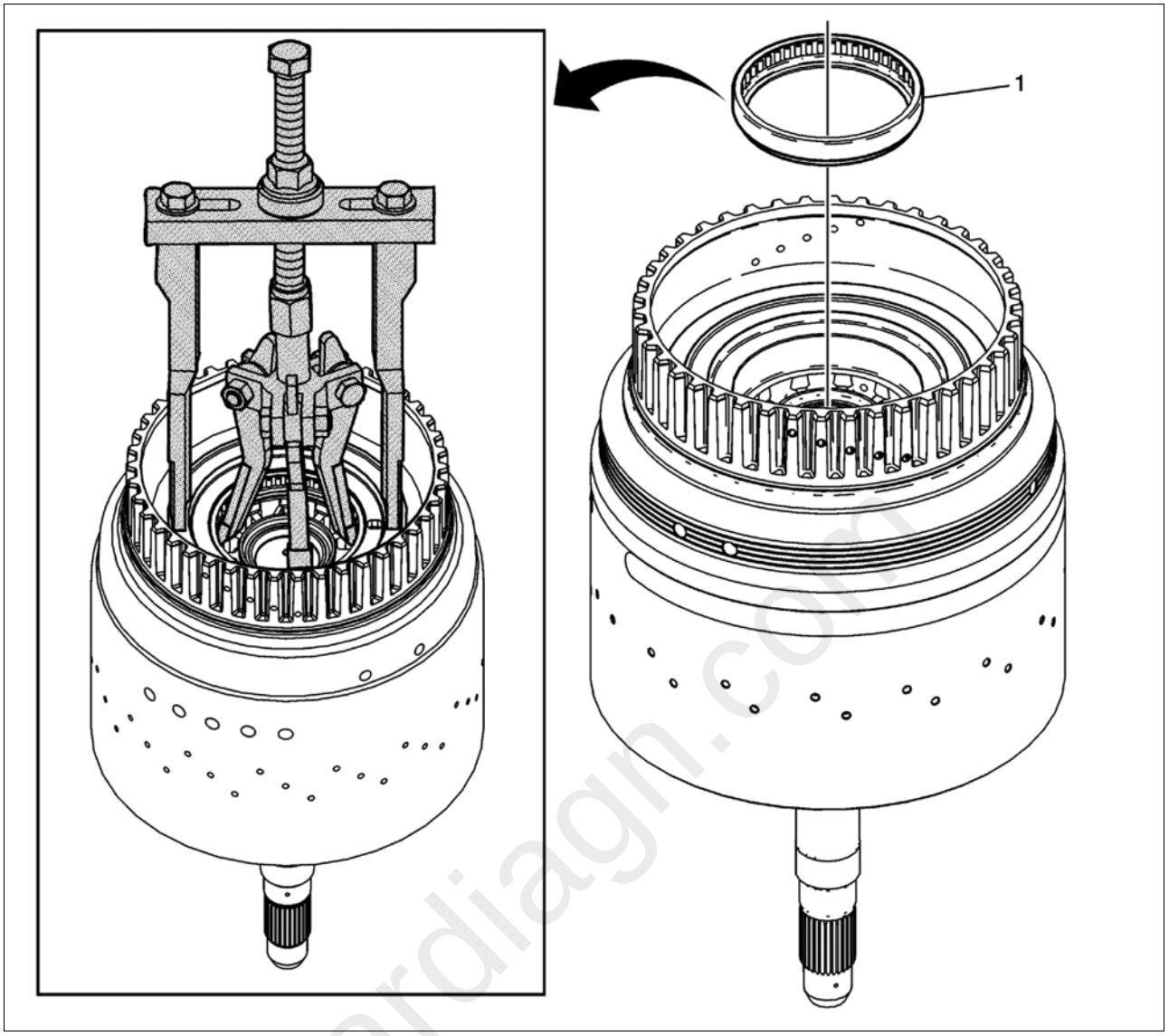
Refer to Seal Reuse Caution .

1	4-5-6-7-8 Reverse Clutch Piston Seal
2	4-5-6-7-8 Reverse Clutch Piston Stop O-ring Seal
3	2-3-4-6-8 Clutch Piston Dam Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH DISASSEMBLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING BEARING REMOVAL

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Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing



Courtesy of GENERAL MOTORS COMPANY

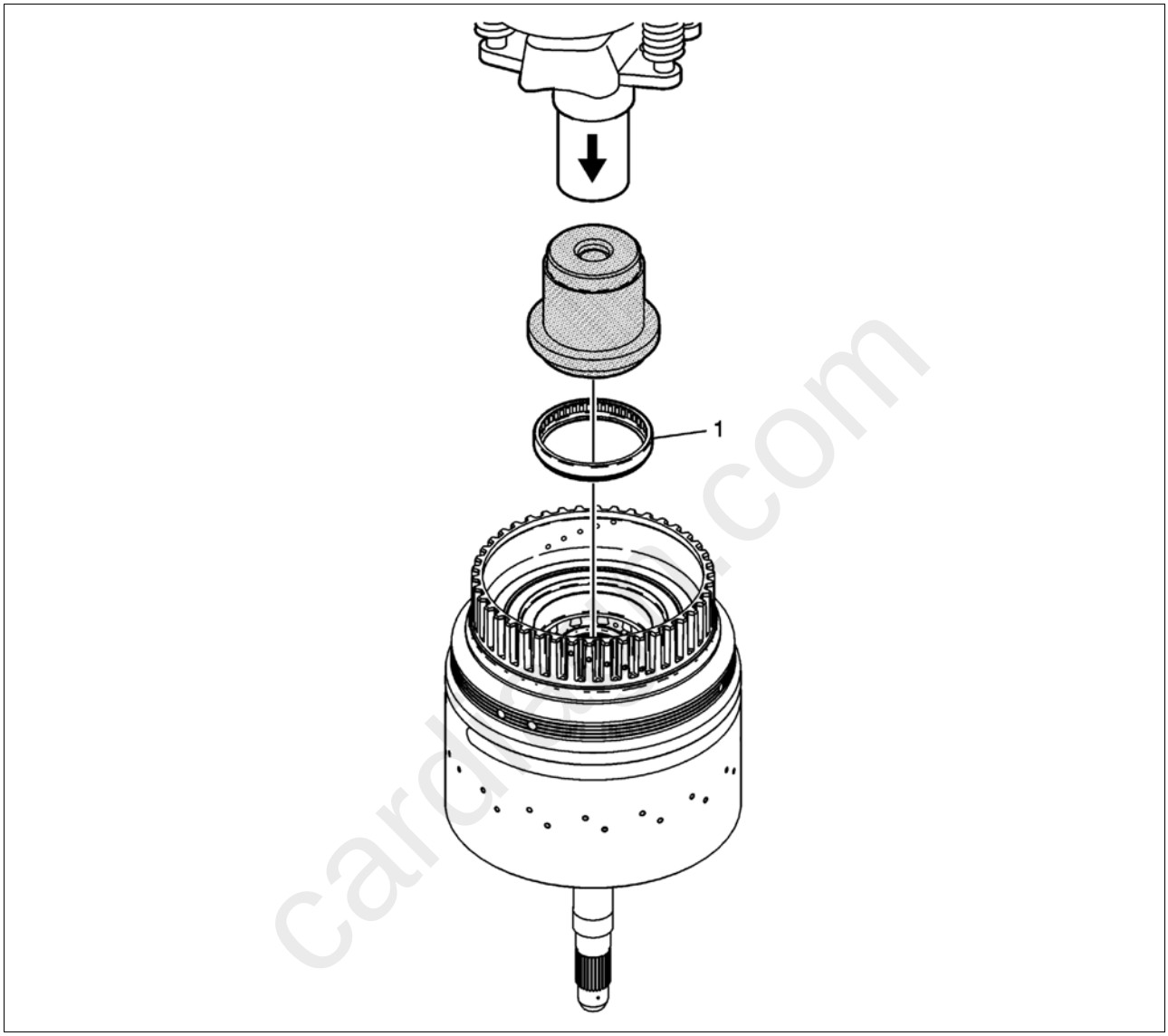
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing Removal

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing Special Tools • **DT-45124** Removal Bridge • **DT-47865** Bearing Remover For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L90) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING BEARING INSTALLATION

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing



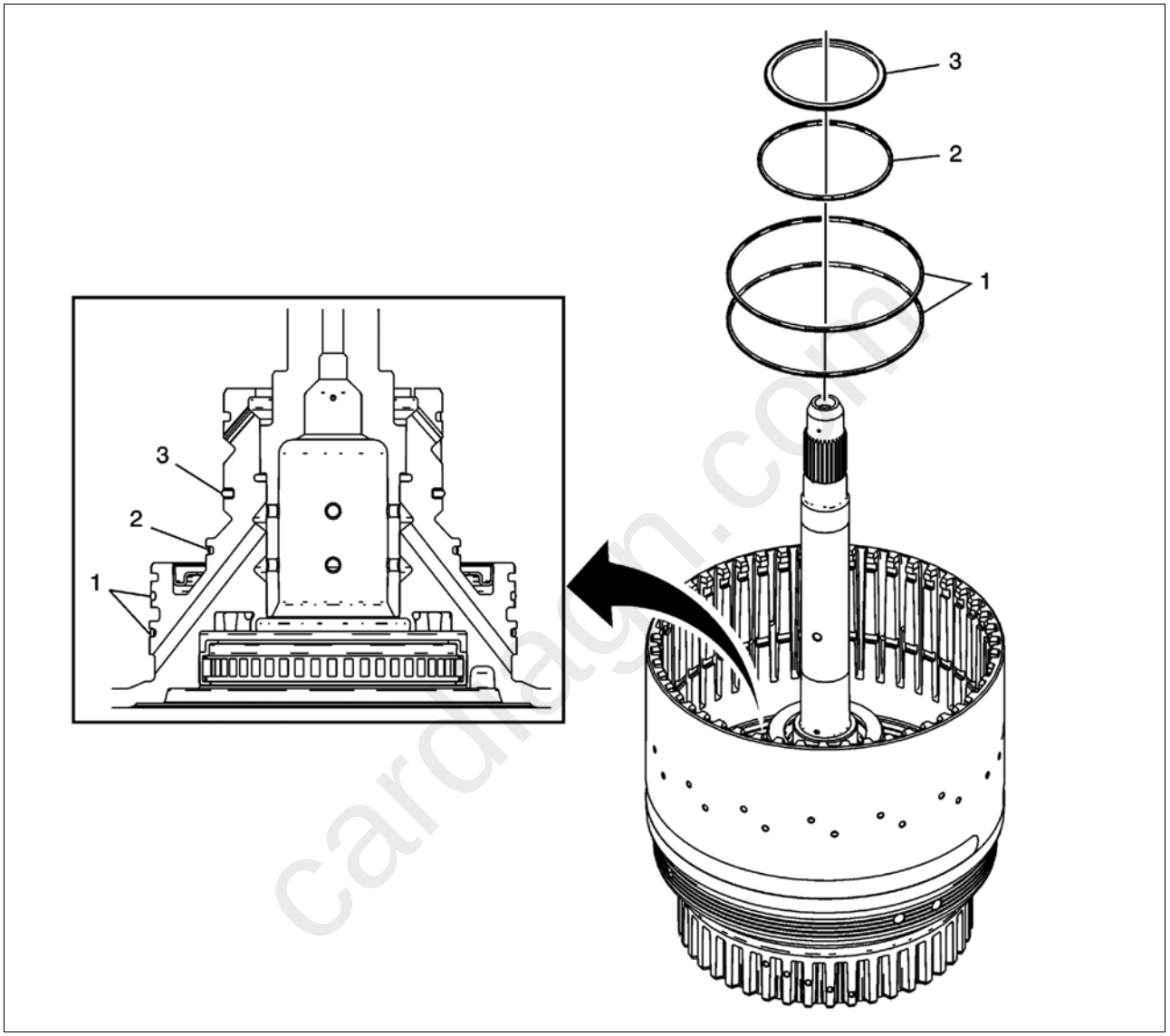
Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing Installation

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing **Procedure** Use **DT-50906** installer and a press to install the bearing. **Special Tools** **DT-50906** Bearing Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L90) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING SEALS INSTALLATION

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals



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Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals Installation

Callout	Component Name

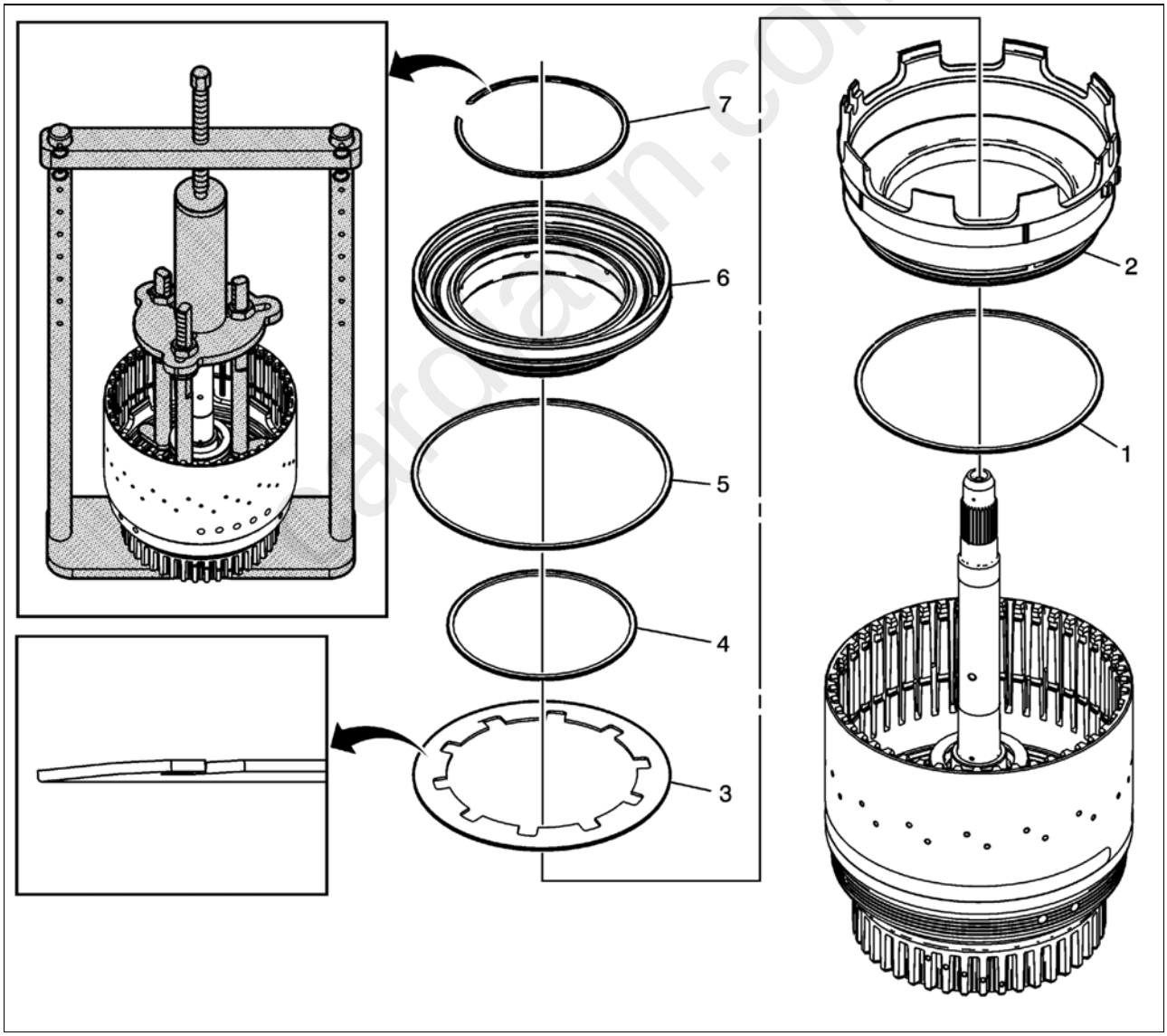
CAUTION:

Refer to Seal Reuse Caution .

1	2-3-4-6-8 Clutch Piston Dam Seal
2	4-5-6-7-8 Reverse Clutch Piston Stop O-ring Seal
3	4-5-6-7-8 Reverse Clutch Piston Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L90) > 2-3-4-6-8 CLUTCH PISTON INSTALLATION

Fig 1: 2-3-4-6-8 Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Piston Installation

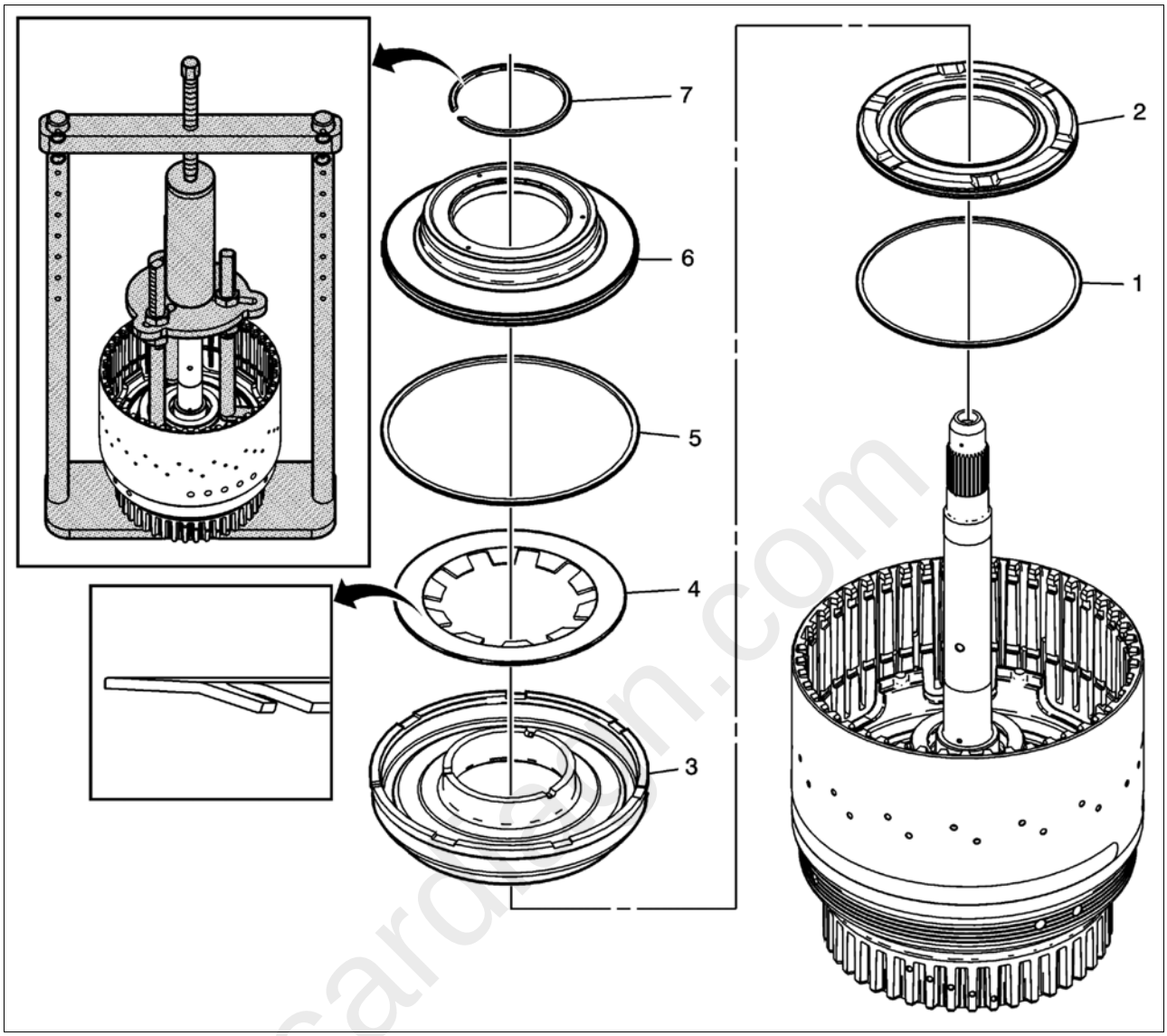
Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	2-3-4-6-8 Clutch Piston Seal
2	2-3-4-6-8 Clutch Piston
3	2-3-4-6-8 Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring for assembly.*
4	2-3-4-6-8 Clutch Piston Dam Inner Seal
5	2-3-4-6-8 Clutch Piston Dam Outer Seal
6	2-3-4-6-8 Clutch Piston Dam
7	2-3-4-6-8 Clutch Piston Dam Retaining Ring *NOTE:* • *Install a NEW retaining ring, it is not reusable.* • *It may be helpful to loosely install the retaining ring before installing the tool.* Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH

ASSEMBLE (8L90) > 4-5-6-7-8 REVERSE CLUTCH PISTON INSTALLATION

Fig 1: 4-5-6-7-8 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

4-5-6-7-8 Reverse Clutch Piston Installation

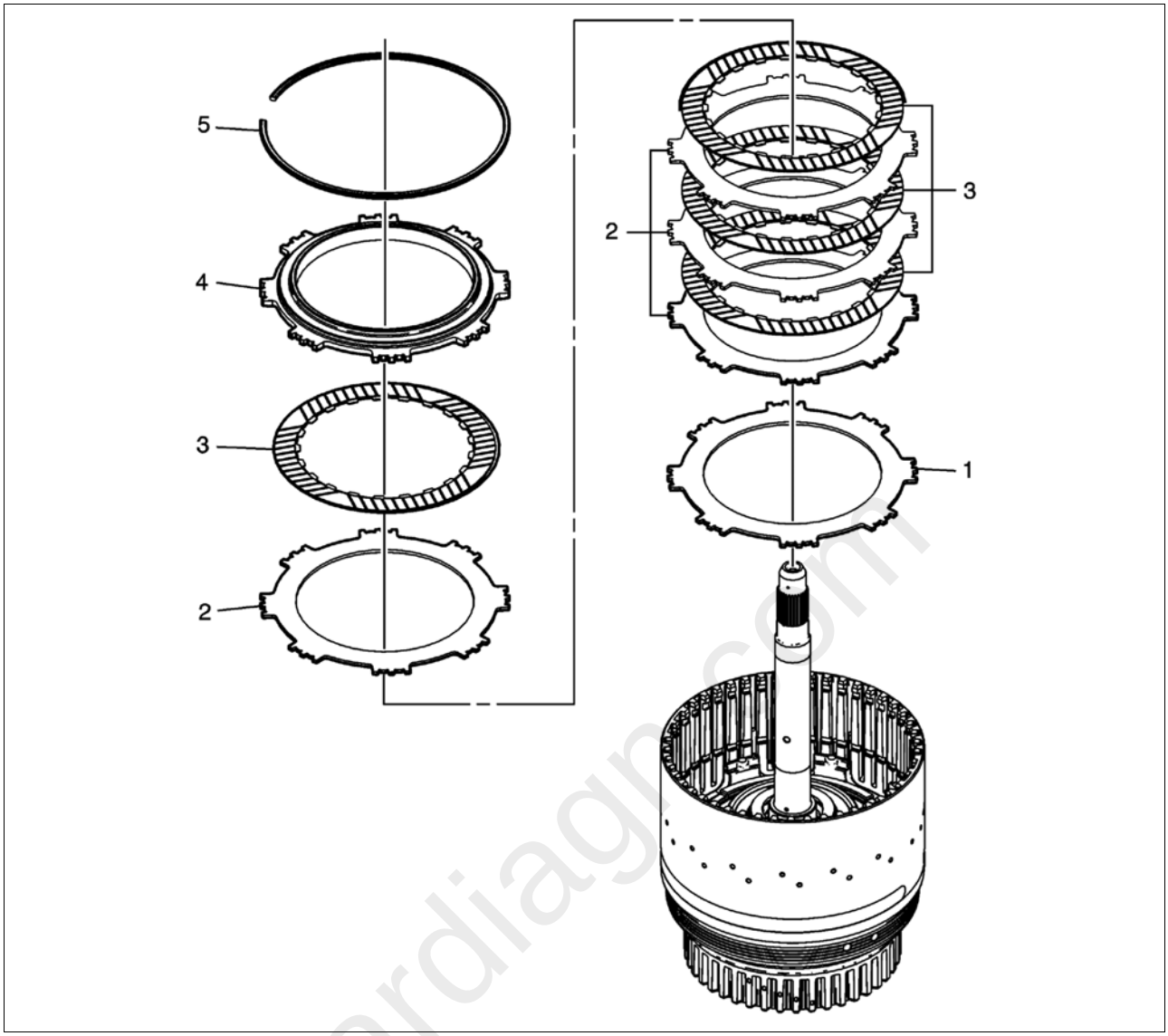
Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	4-5-6-7-8 Reverse Clutch Piston Seal

2	4-5-6-7-8 Reverse Clutch Piston Stop *NOTE:* *Note the orientation of the stop.*
3	4-5-6-7-8 Reverse Clutch Piston
4	4-5-6-7-8 Reverse Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring.*
5	4-5-6-7-8 Reverse Clutch Piston Dam Seal
6	4-5-6-7-8 Reverse Clutch Piston Dam
7	4-5-6-7-8 Reverse Clutch Piston Dam Retaining Ring *NOTE:* • *Install a NEW retaining ring, it is not reusable.* • *The points on the retaining ring should face up.* • *It may be helpful to loosely install the retaining ring before installing the tool.* Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L90) > 4-5-6-7-8 REVERSE CLUTCH PLATES INSTALLATION

Fig 1: 4-5-6-7-8 Reverse Clutch Plates



Courtesy of GENERAL MOTORS COMPANY

4-5-6-7-8 Reverse Clutch Plates Installation

Callout	Component Name
1	4-5-6-7-8 Reverse Clutch (Waved) Plate *NOTE:* • *Align center tooth with notch on piston.* • *Teeth on clutch plates go between notches on piston.*
2	4-5-6-7-8 Reverse Clutch Plate (Qty: 4)

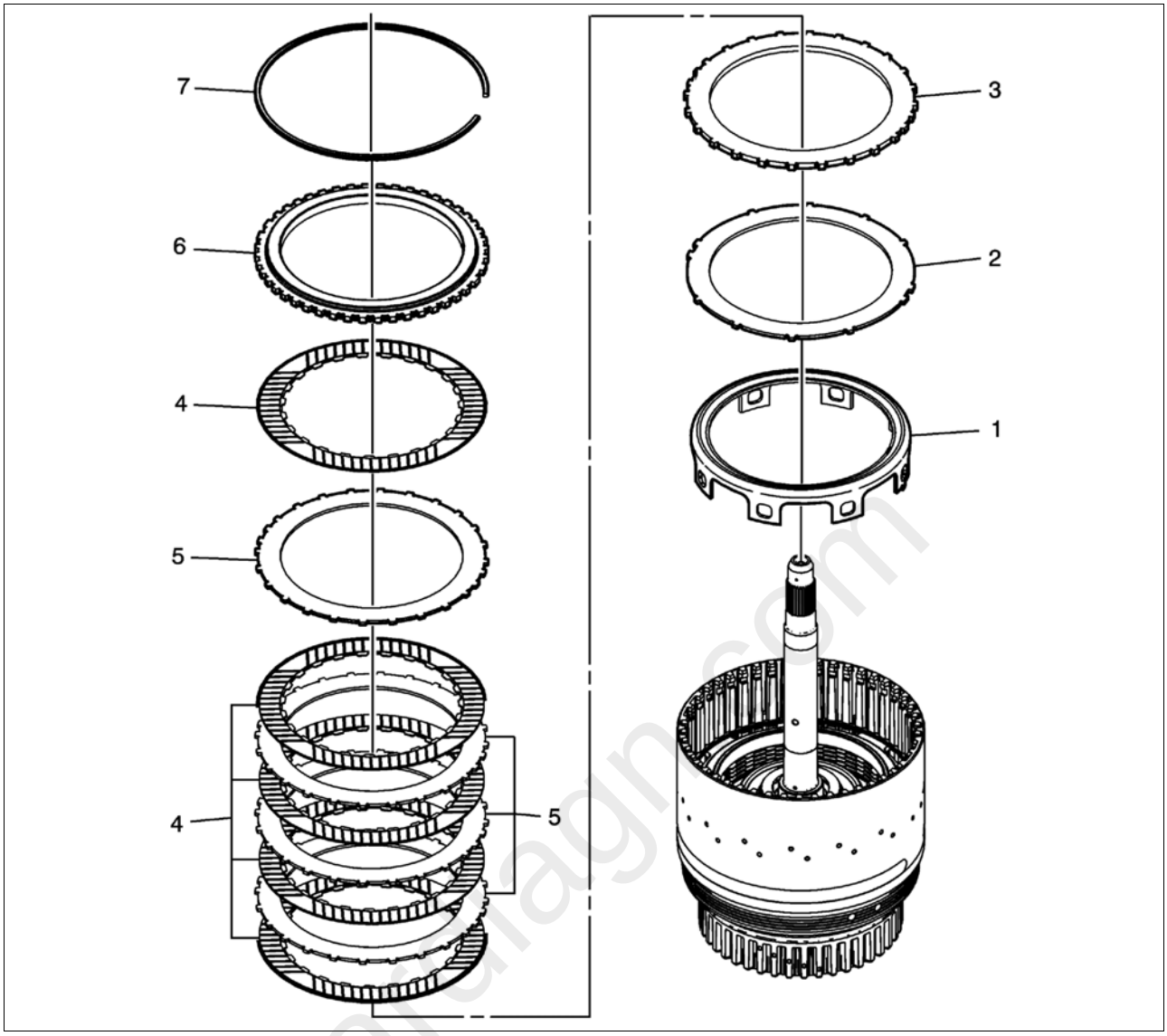
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3	4-5-6-7-8 Reverse Clutch Plate Assembly (Qty: 4)
4	4-5-6-7-8 Reverse Clutch Backing Plate
5	4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement (8L90) 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement (8L45) . *NOTE:* *The retaining ring opening should be between the teeth on the clutch plates.*

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L90) > 2-3-4-6-8 CLUTCH PLATES INSTALLATION

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Fig 1: 2-3-4-6-8 Clutch Plates



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Plates Installation

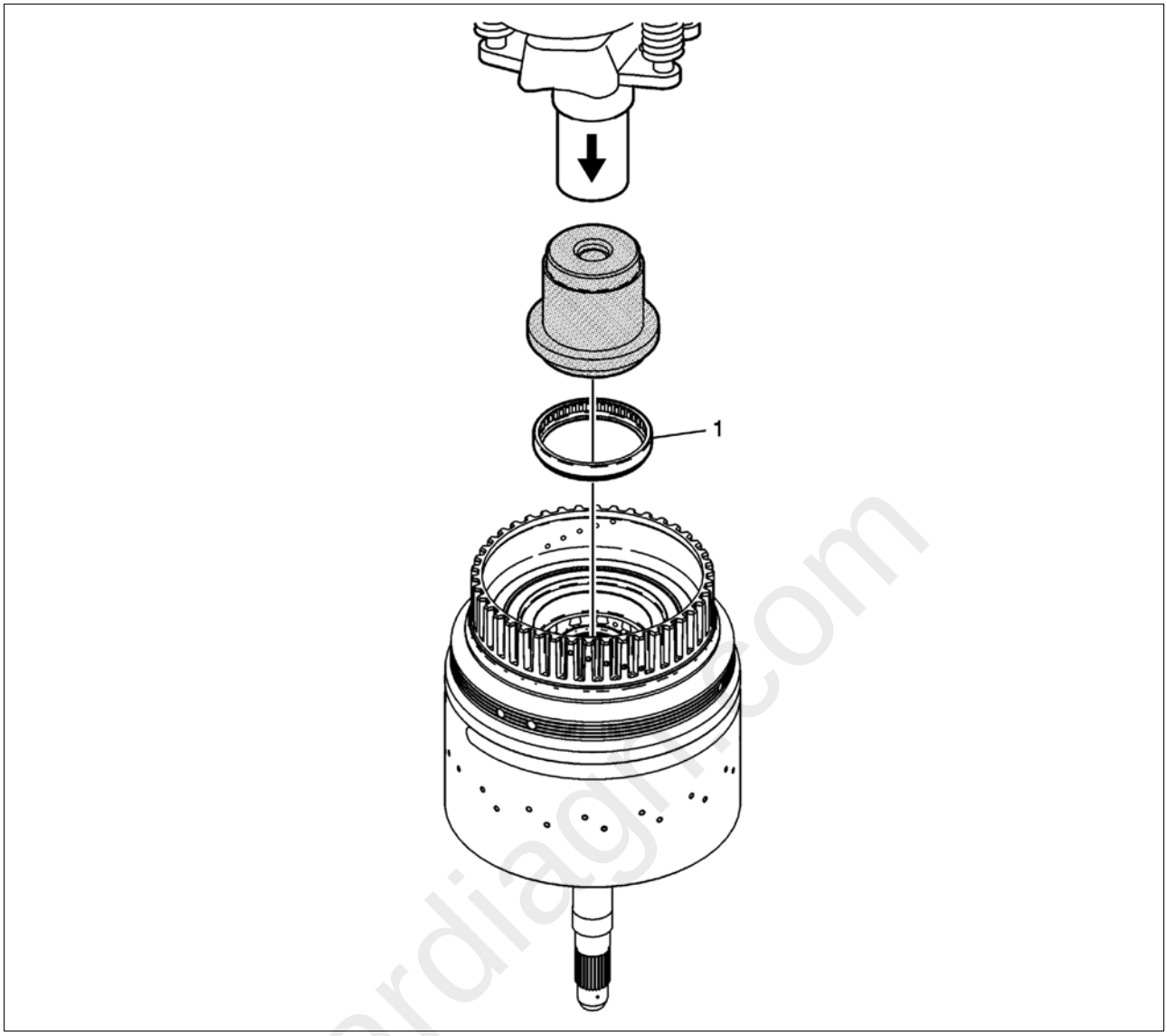
Callout	Component Name
1	2-3-4-6-8 Clutch Apply Ring *NOTE:* *Tabs align with notches in piston.*
2	2-3-4-6-8 Clutch (Waved) Plate

	NOTE: *Two tabs on clutch plate align with large notches in housing.*
3	2-3-4-6-8 Clutch Apply Plate
4	2-3-4-6-8 Clutch Plate (Qty: 4)
5	2-3-4-6-8 Clutch Plate Assembly (Qty: 5)
6	2-3-4-6-8 Clutch Backing Plate
7	2-3-4-6-8 Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement (8L90) 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement (8L45) . *NOTE:* *The retaining ring opening should align with tooth without notch.*

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING BEARING INSTALLATION

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Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing



Courtesy of GENERAL MOTORS COMPANY

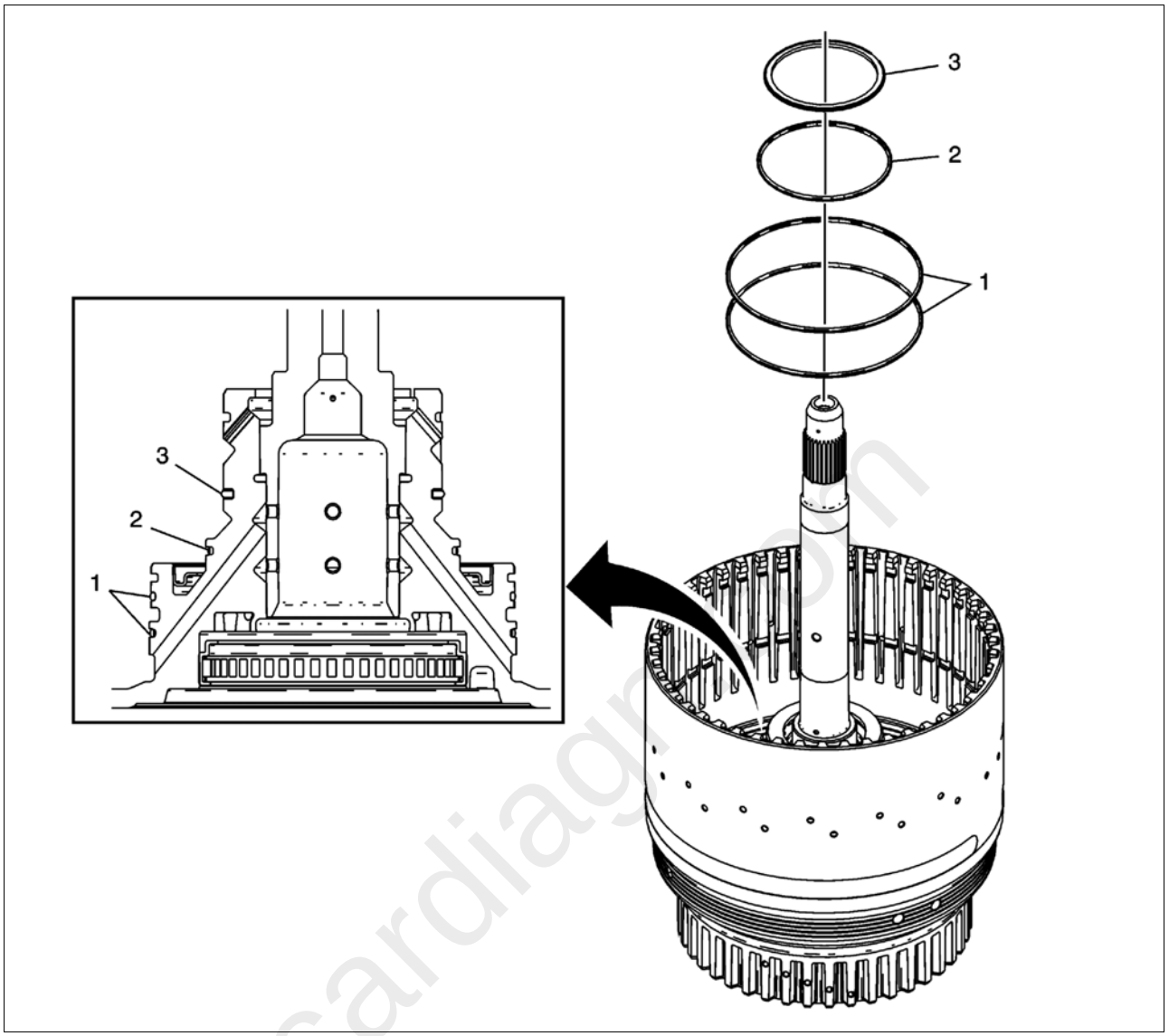
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing Installation

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Bearing **Procedure** Use **DT-51089** installer and a press to install the bearing. **Special Tools** **DT-51089** Bearing Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH HOUSING SEALS

INSTALLATION

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals



Courtesy of GENERAL MOTORS COMPANY

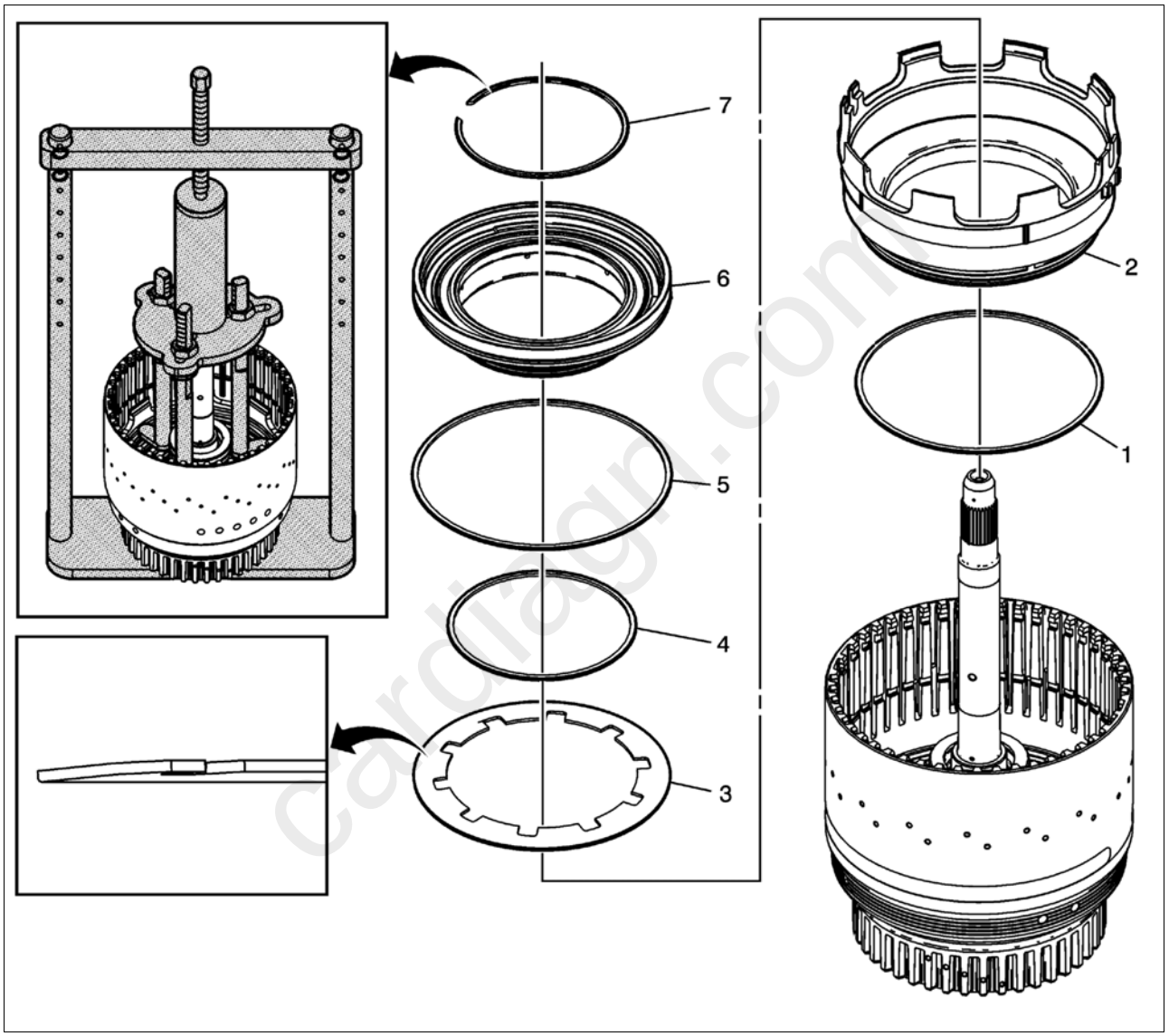
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Housing Seals Installation

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	2-3-4-6-8 Clutch Piston Dam Seal

2	4-5-6-7-8 Reverse Clutch Piston Stop O-ring Seal
3	4-5-6-7-8 Reverse Clutch Piston Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 2-3-4-6-8 CLUTCH PISTON INSTALLATION

Fig 1: 2-3-4-6-8 Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Piston Installation

Callout	Component Name
CAUTION:	

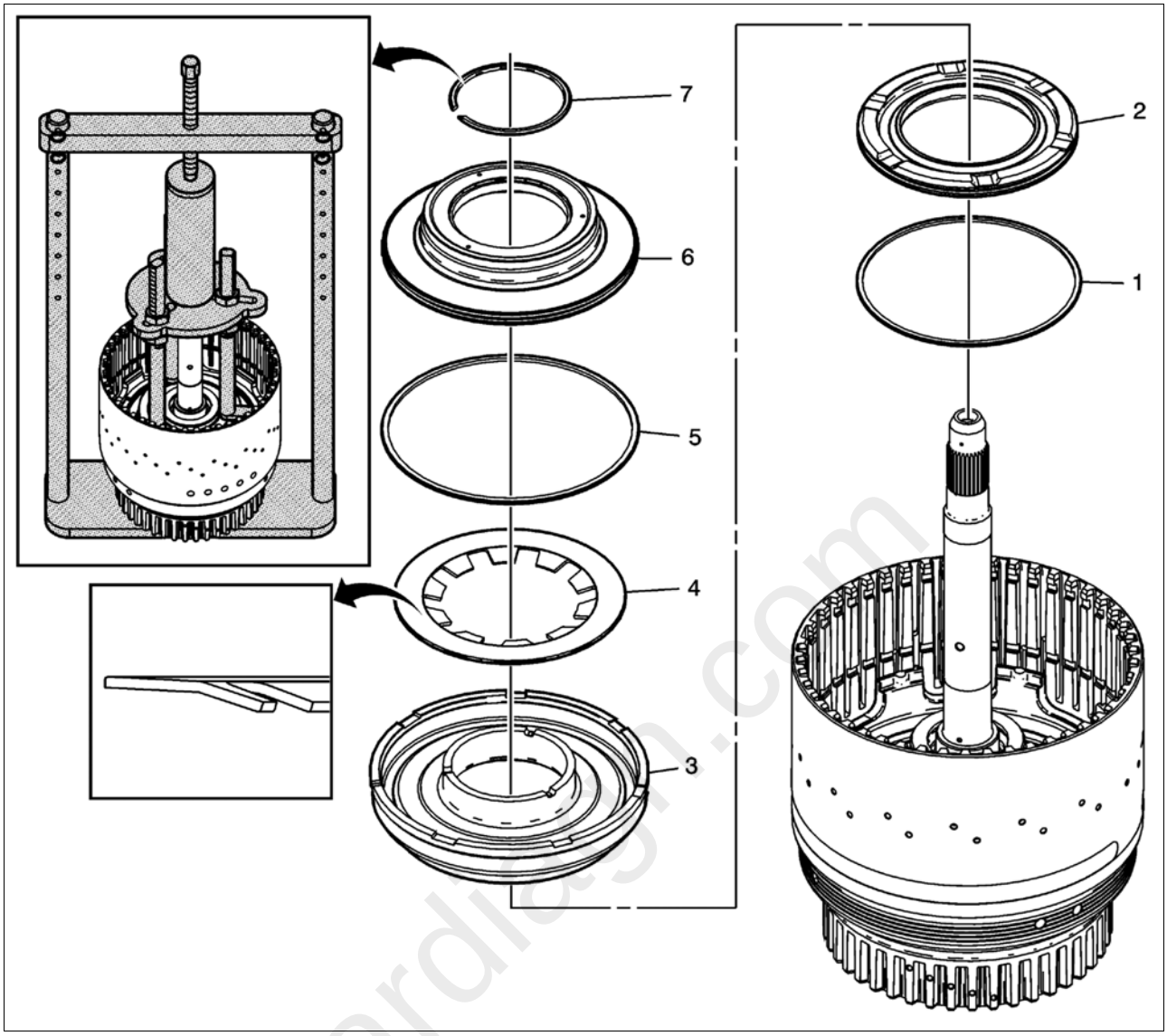
Refer to Seal Reuse Caution .

1	2-3-4-6-8 Clutch Piston Seal
2	2-3-4-6-8 Clutch Piston
3	2-3-4-6-8 Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring for assembly.*
4	2-3-4-6-8 Clutch Piston Dam Inner Seal
5	2-3-4-6-8 Clutch Piston Dam Outer Seal
6	2-3-4-6-8 Clutch Piston Dam
7	2-3-4-6-8 Clutch Piston Dam Retaining Ring *NOTE:* • *Install a NEW retaining ring, it is not reusable.* • *It may be helpful to loosely install the retaining ring before installing the tool.* Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 4-5-6-7-8 REVERSE CLUTCH PISTON INSTALLATION

Fig 1: 4-5-6-7-8 Reverse Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

4-5-6-7-8 Reverse Clutch Piston Installation

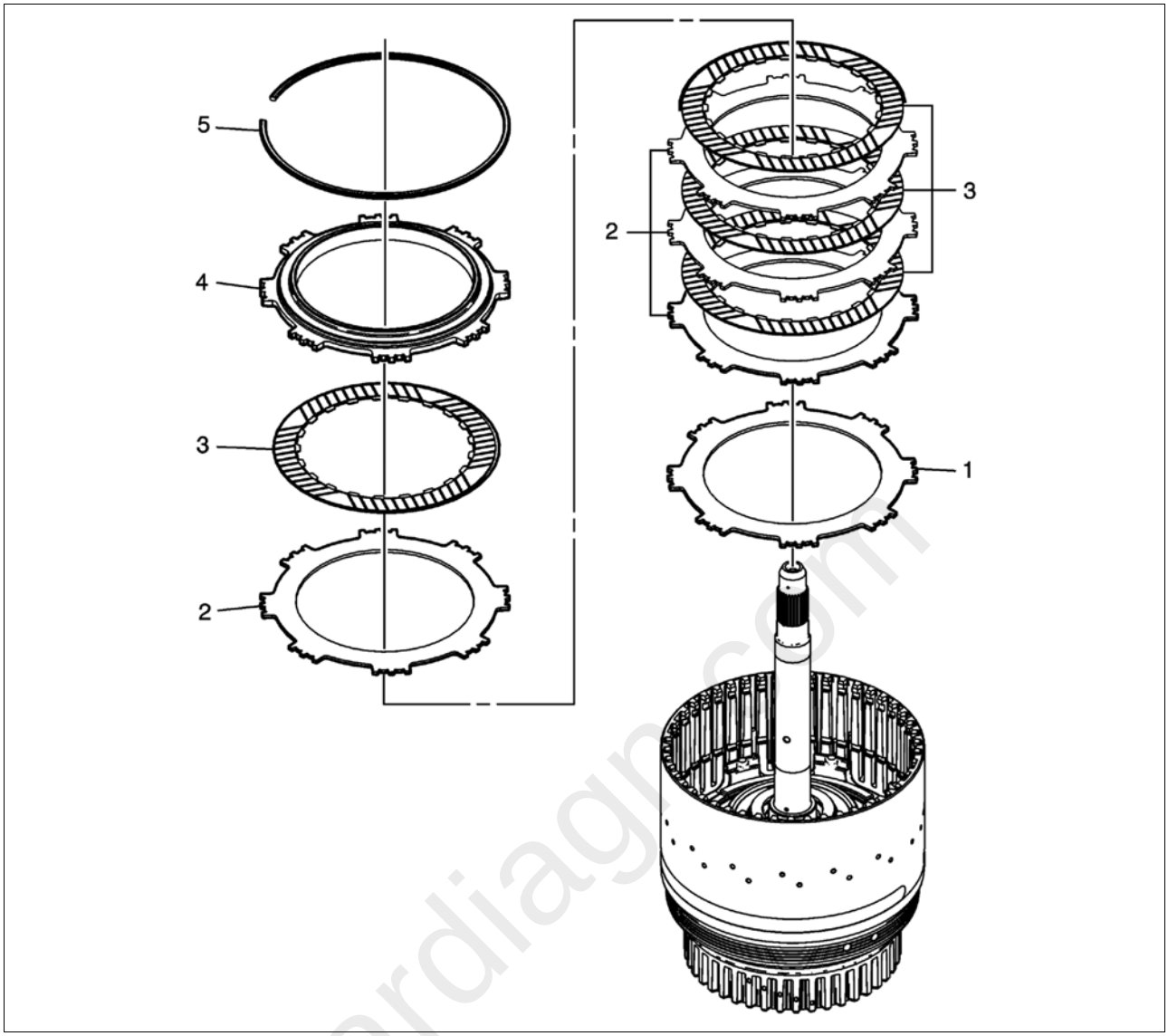
Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	4-5-6-7-8 Reverse Clutch Piston Seal
2	4-5-6-7-8 Reverse Clutch Piston Stop

	NOTE: *Note the orientation of the stop.*
3	4-5-6-7-8 Reverse Clutch Piston
4	4-5-6-7-8 Reverse Clutch Piston Return Spring *NOTE:* *Note the orientation of the spring.*
5	4-5-6-7-8 Reverse Clutch Piston Dam Seal
6	4-5-6-7-8 Reverse Clutch Piston Dam
7	4-5-6-7-8 Reverse Clutch Piston Dam Retaining Ring *NOTE:* • *Install a NEW retaining ring, it is not reusable.* • *The points on the retaining ring should face up.* • *It may be helpful to loosely install the retaining ring before installing the tool.* Special Tools • **DT-35512** Bearing Installer • **DT-50900** Clutch Travel Support Fixture • **DT-50902** Adjustable Clutch Spring Compressor For equivalent regional tools, refer to Special Tools .

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REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 4-5-6-7-8 REVERSE CLUTCH PLATES INSTALLATION

Fig 1: 4-5-6-7-8 Reverse Clutch Plates



Courtesy of GENERAL MOTORS COMPANY

4-5-6-7-8 Reverse Clutch Plates Installation

Callout	Component Name
1	4-5-6-7-8 Reverse Clutch (Waved) Plate *NOTE:* • *Align center tooth with notch on piston.* • *Teeth on clutch plates go between notches on piston.*
2	4-5-6-7-8 Reverse Clutch Plate (Qty: 4)

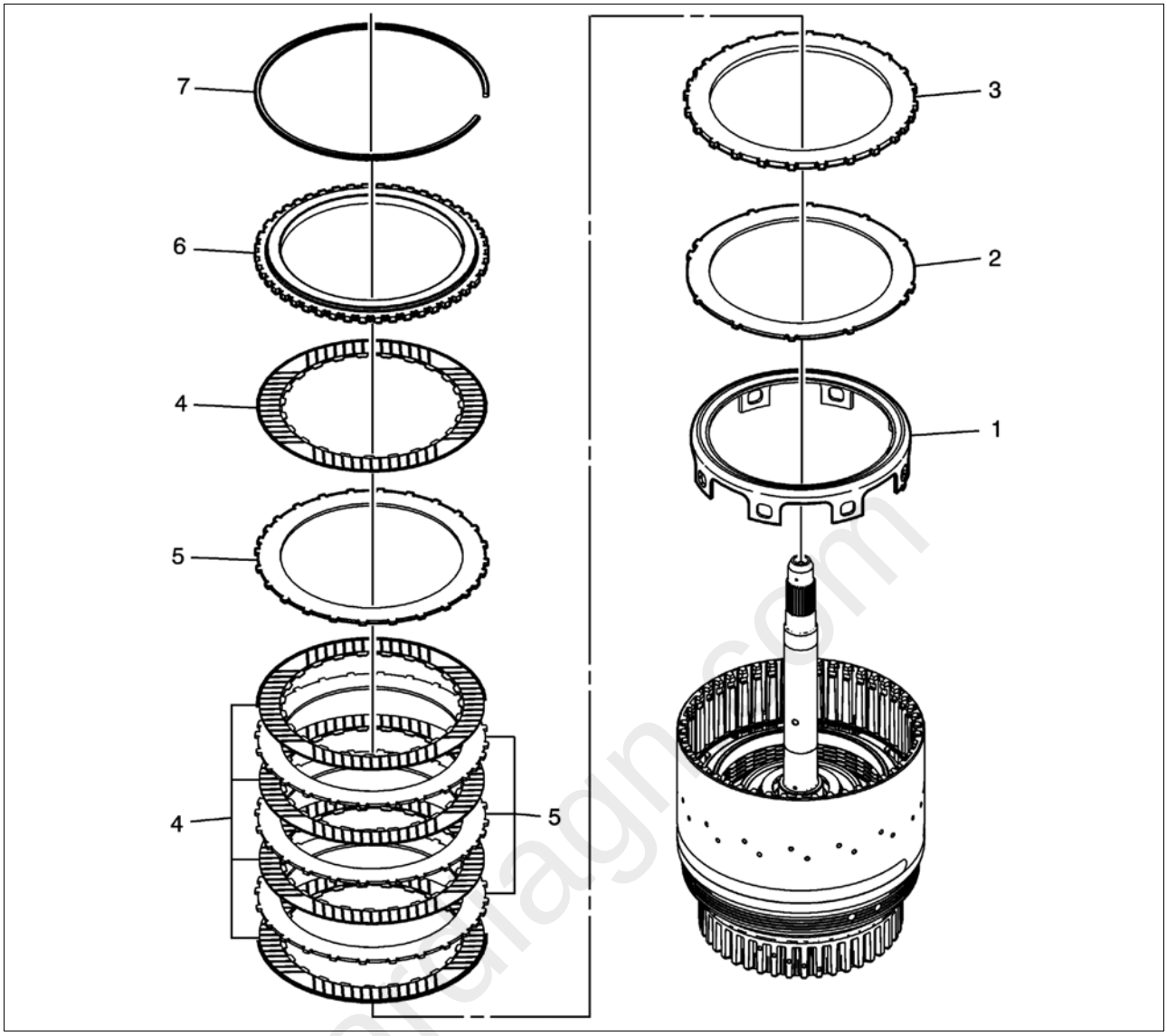
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3	4-5-6-7-8 Reverse Clutch Plate Assembly (Qty: 4)
4	4-5-6-7-8 Reverse Clutch Backing Plate
5	4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement (8L90) 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement (8L45) . *NOTE:* *The retaining ring opening should be between the teeth on the clutch plates.*

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE (8L45) > 2-3-4-6-8 CLUTCH PLATES INSTALLATION

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Fig 1: 2-3-4-6-8 Clutch Plates



Courtesy of GENERAL MOTORS COMPANY

2-3-4-6-8 Clutch Plates Installation

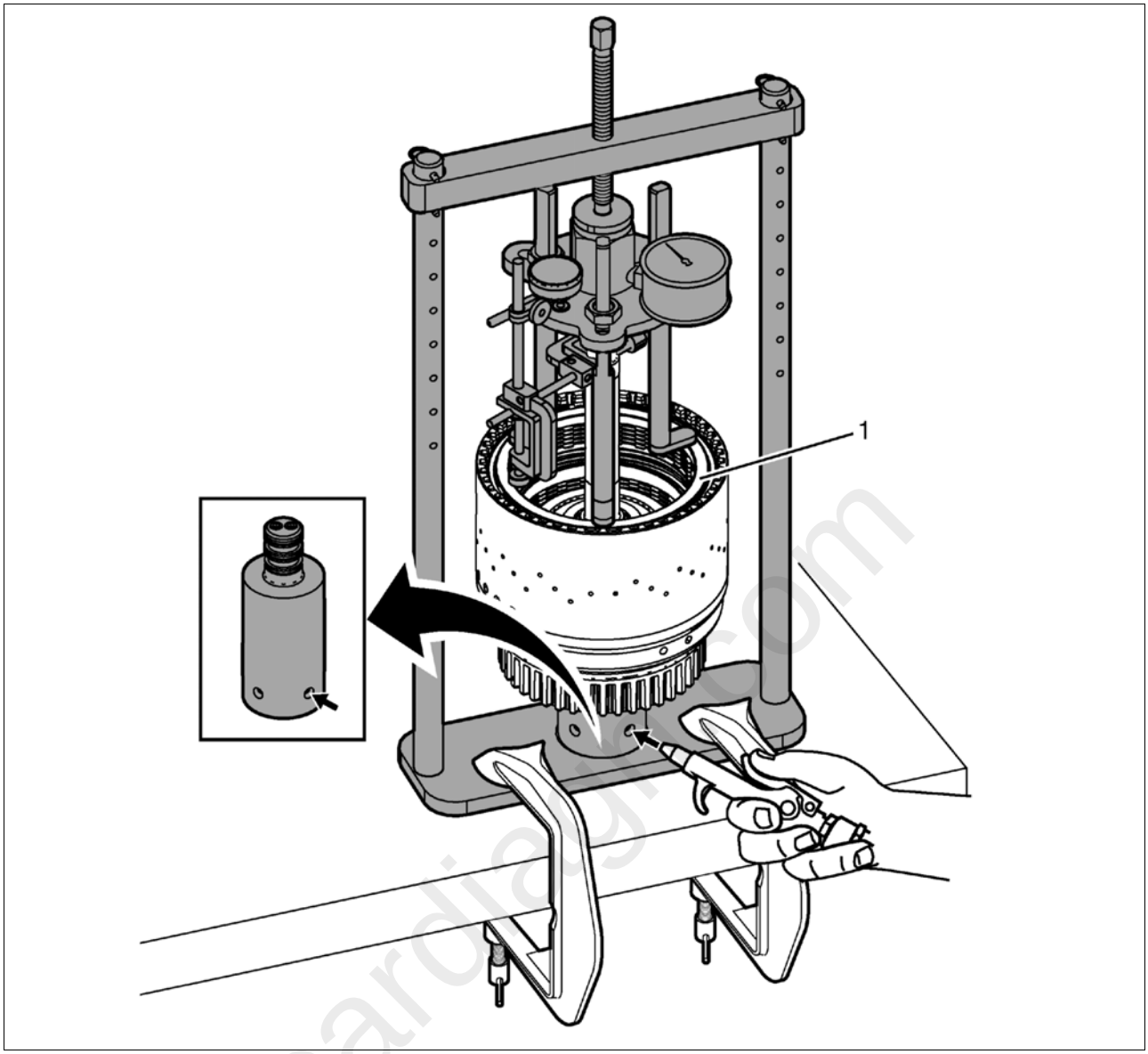
Callout	Component Name
1	2-3-4-6-8 Clutch Apply Ring *NOTE:* *Tabs align with notches in piston.*
2	2-3-4-6-8 Clutch (Waved) Plate

	NOTE: *Two tabs on clutch plate align with large notches in housing.*
3	2-3-4-6-8 Clutch Apply Plate
4	2-3-4-6-8 Clutch Plate (Qty: 4)
5	2-3-4-6-8 Clutch Plate Assembly (Qty: 5)
6	2-3-4-6-8 Clutch Backing Plate
7	2-3-4-6-8 Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement (8L90) 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement (8L45) . *NOTE:* *The retaining ring opening should align with tooth without notch.*

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 CLUTCH BACKING PLATE RETAINING RING MEASUREMENT (8L90)

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Fig 1: 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Assemble the 2-3-4-6-8 and 4-5-6-7-8 reverse clutch. Refer to 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L90) 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L45) .	
1	2-3-4-6-8 Clutch Backing Plate Procedure 1. Assemble the tools as shown and clamp the **DT-50900** fixture to the bench. 2. Apply 60 pounds of pressure to the load gauge by turning the screw on the **DT-50900** fixture clockwise. 3. Zero out the dial indicator.

4. Remove the pressure on the load gauge by turning the screw on the **DT-50900** fixture one full turn counterclockwise.
5. Apply compressed air to the indicated hole on the **DT-50905** air adapter and simultaneously adjust the screw on the **DT-50900** fixture to apply 60 pounds of pressure to the load gauge.
6. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 2-3-4-6-8 clutch backing plate retaining ring

Special Tools

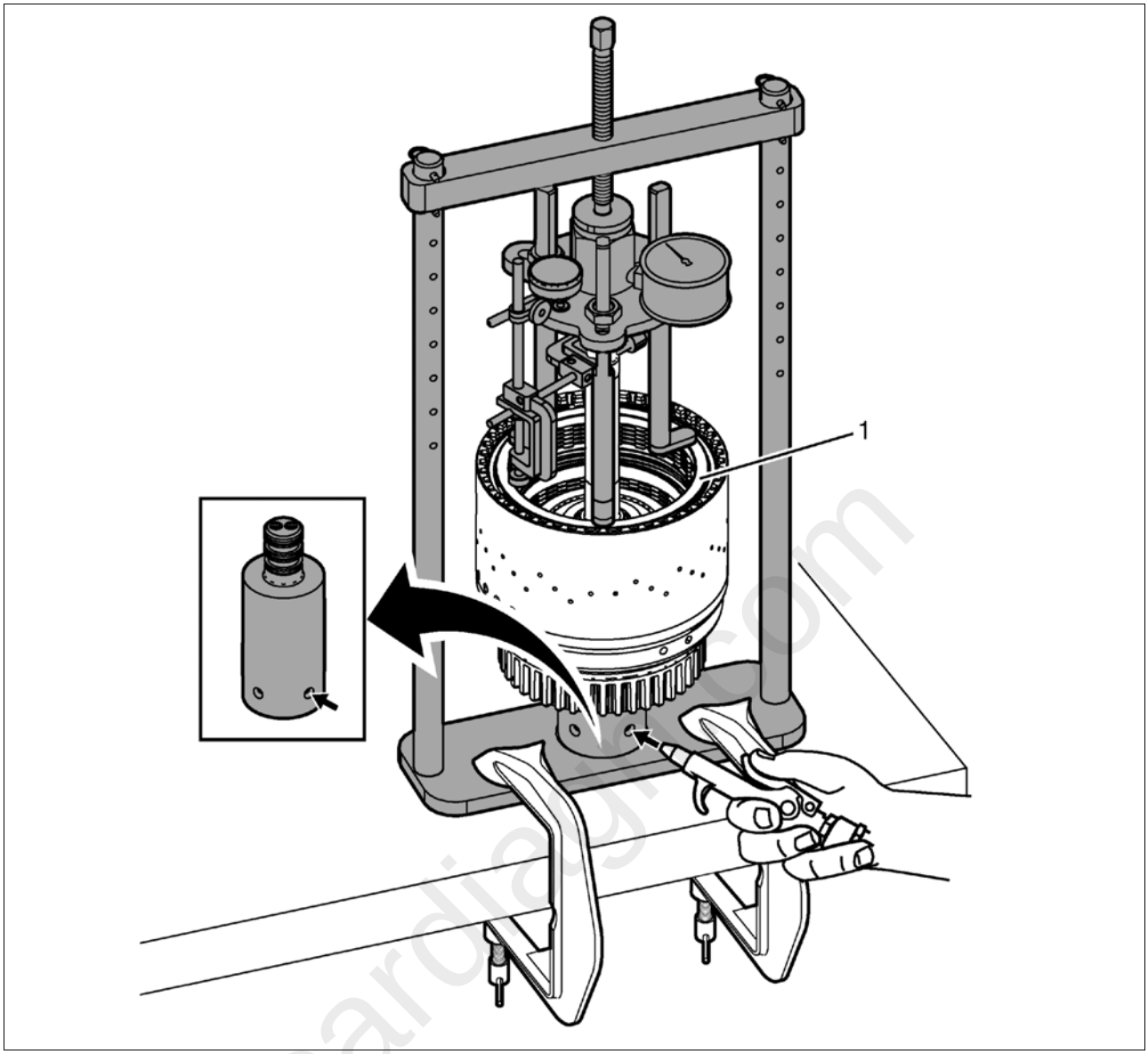
- **DT-50900** Clutch Travel Support Fixture
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-50905** Clutch Air Travel Adapter
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 CLUTCH BACKING PLATE RETAINING RING MEASUREMENT (8L45)

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Fig 1: 2-3-4-6-8 Clutch Backing Plate Retaining Ring Measurement



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Assemble the 2-3-4-6-8 and 4-5-6-7-8 reverse clutch. Refer to 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L90) 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L45) .	
1	2-3-4-6-8 Clutch Backing Plate Procedure 1. Assemble the tools as shown and clamp the **DT-50900** fixture to the bench. 2. Apply 50 pounds of pressure to the load gauge by turning the screw on the **DT-50900** fixture clockwise. 3. Zero out the dial indicator.

4. Remove the pressure on the load gauge by turning the screw on the **DT-50900** fixture one full turn counterclockwise.
5. Apply compressed air to the indicated hole on the **DT-50905** air adapter and simultaneously adjust the screw on the **DT-50900** fixture to apply 50 pounds of pressure to the load gauge.
6. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 2-3-4-6-8 clutch backing plate retaining ring

Special Tools

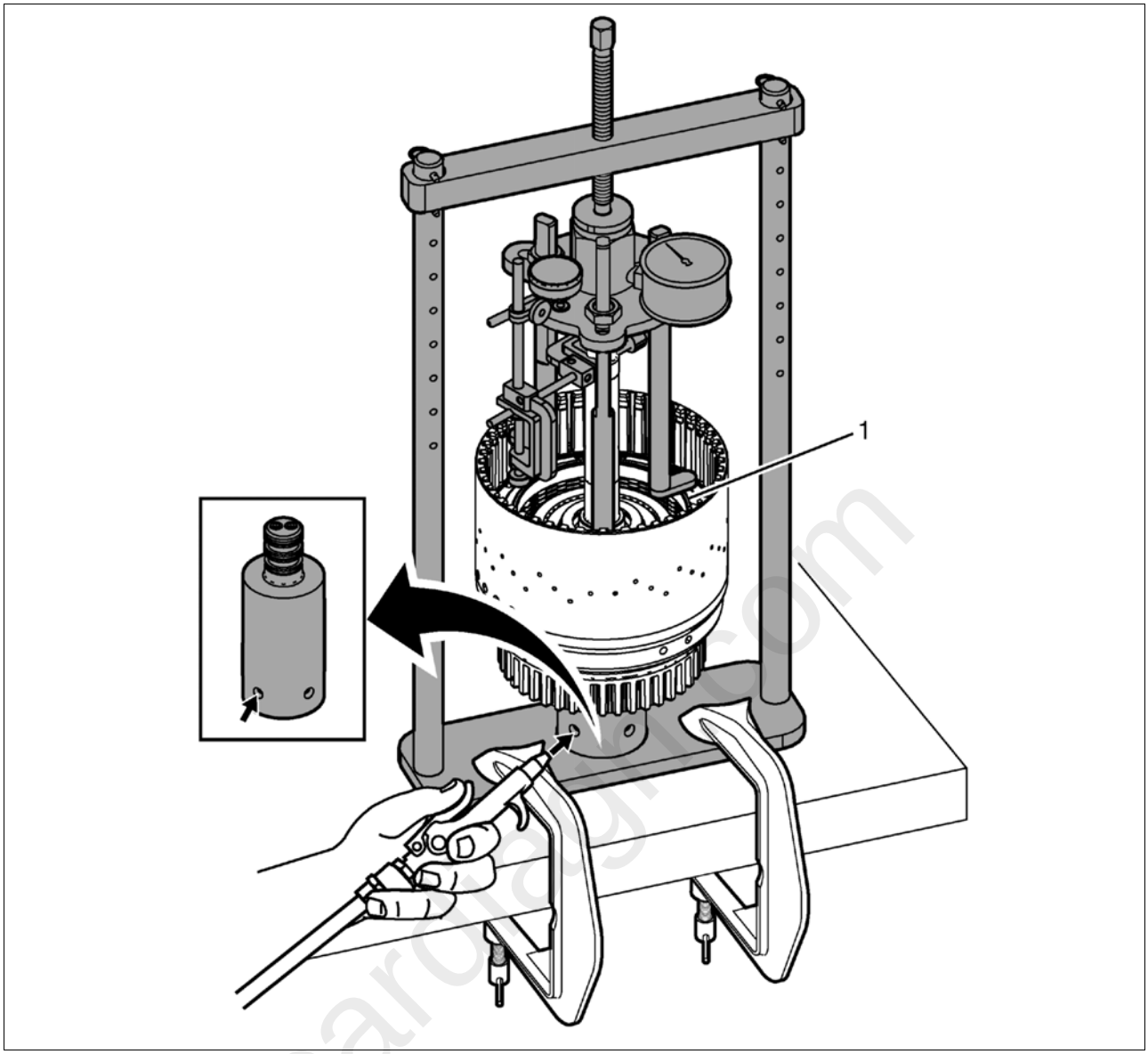
- **DT-50900** Clutch Travel Support Fixture
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-50905** Clutch Air Travel Adapter
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 4-5-6-7-8 REVERSE CLUTCH BACKING PLATE RETAINING RING MEASUREMENT (8L90)

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Fig 1: 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Assemble the 4-5-6-7-8 reverse clutch. Refer to 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L90) 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L45) .	
1	4-5-6-7-8 Reverse Clutch Backing Plate Procedure 1. Assemble the tools as shown and clamp the **DT-50900** fixture to the bench. 2. Apply 75 pounds of pressure to the load gauge by turning the screw on the **DT-50900** fixture clockwise. 3. Zero out the dial indicator.

4. Remove the pressure on the load gauge by turning the screw on the **DT-50900** fixture one full turn counterclockwise.

5. Apply compressed air to the indicated hole on the **DT-50905** air adapter and simultaneously adjust the screw on the **DT-50900** fixture to apply 75 pounds of pressure to the load gauge.

6. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 4-5-6-7-8 reverse clutch backing plate retaining ring.

Special Tools

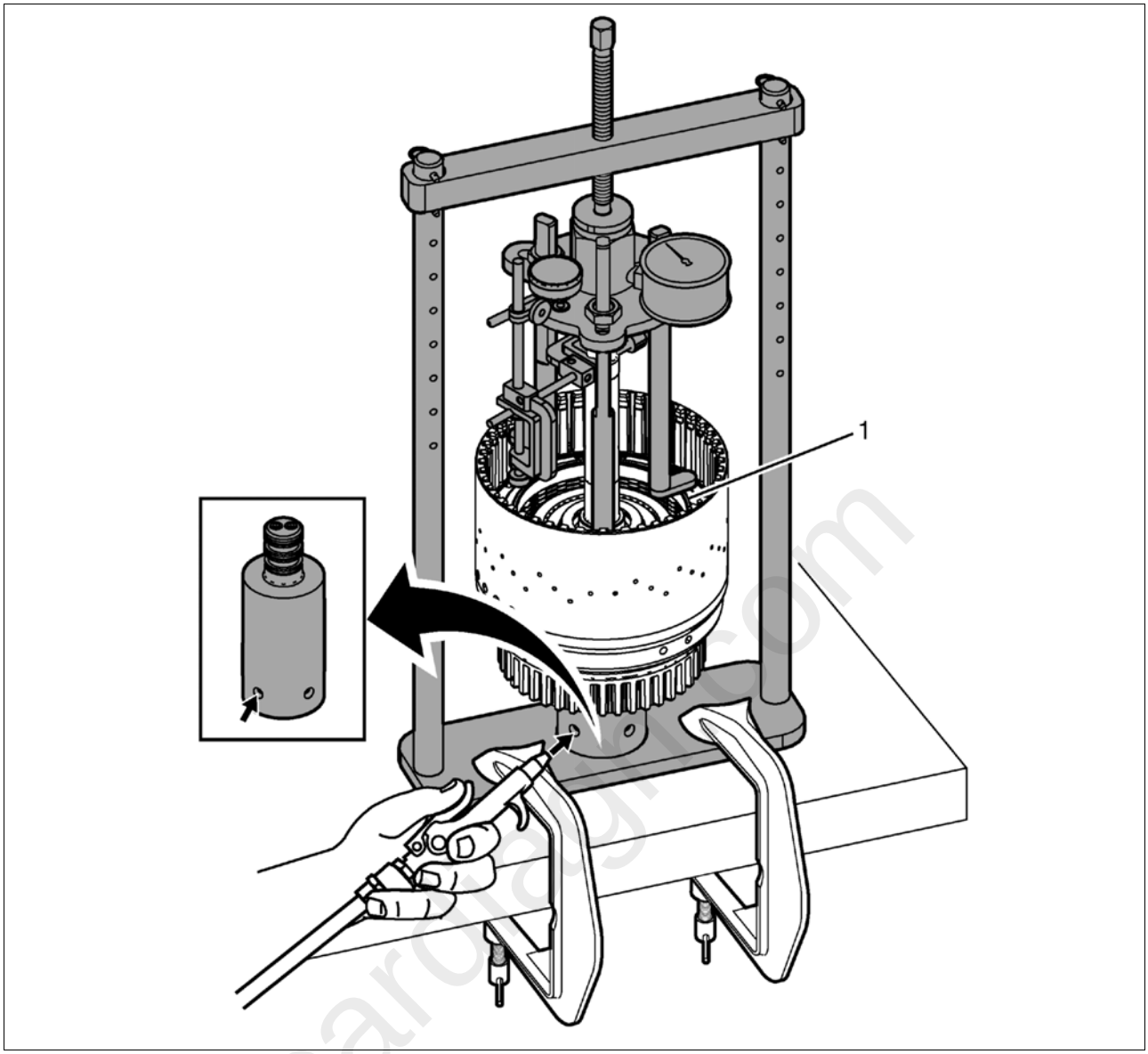
- **DT-50900** Clutch Travel Support Fixture
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-50905** Clutch Air Travel Adapter
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 4-5-6-7-8 REVERSE CLUTCH BACKING PLATE RETAINING RING MEASUREMENT (8L45)

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Fig 1: 4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring Measurement



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Assemble the 4-5-6-7-8 reverse clutch. Refer to 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L90) 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assemble (8L45) .	
1	4-5-6-7-8 Reverse Clutch Backing Plate Procedure 1. Assemble the tools as shown and clamp the **DT-50900** fixture to the bench. 2. Apply 56 pounds of pressure to the load gauge by turning the screw on the **DT-50900** fixture clockwise. 3. Zero out the dial indicator.

4. Remove the pressure on the load gauge by turning the screw on the **DT-50900** fixture one full turn counterclockwise.
5. Apply compressed air to the indicated hole on the **DT-50905** air adapter and simultaneously adjust the screw on the **DT-50900** fixture to apply 56 pounds of pressure to the load gauge.
6. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 4-5-6-7-8 reverse clutch backing plate retaining ring.

Special Tools

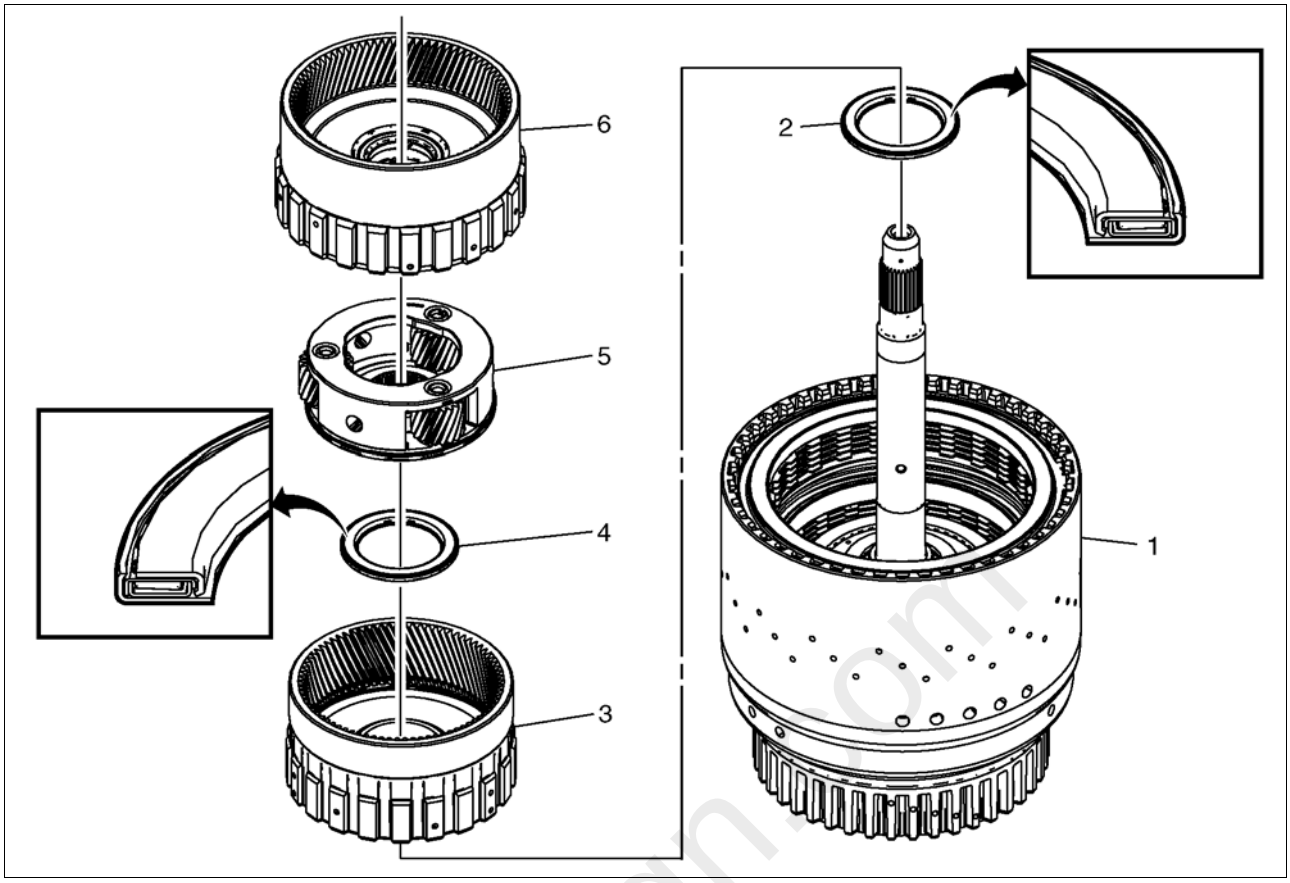
- **DT-50900** Clutch Travel Support Fixture
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-50905** Clutch Air Travel Adapter
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > DIRECT OVERDRIVE CARRIER, INPUT INTERNAL GEAR, AND 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLE

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Fig 1: Direct Overdrive Carrier, Input Internal Gear, and 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch

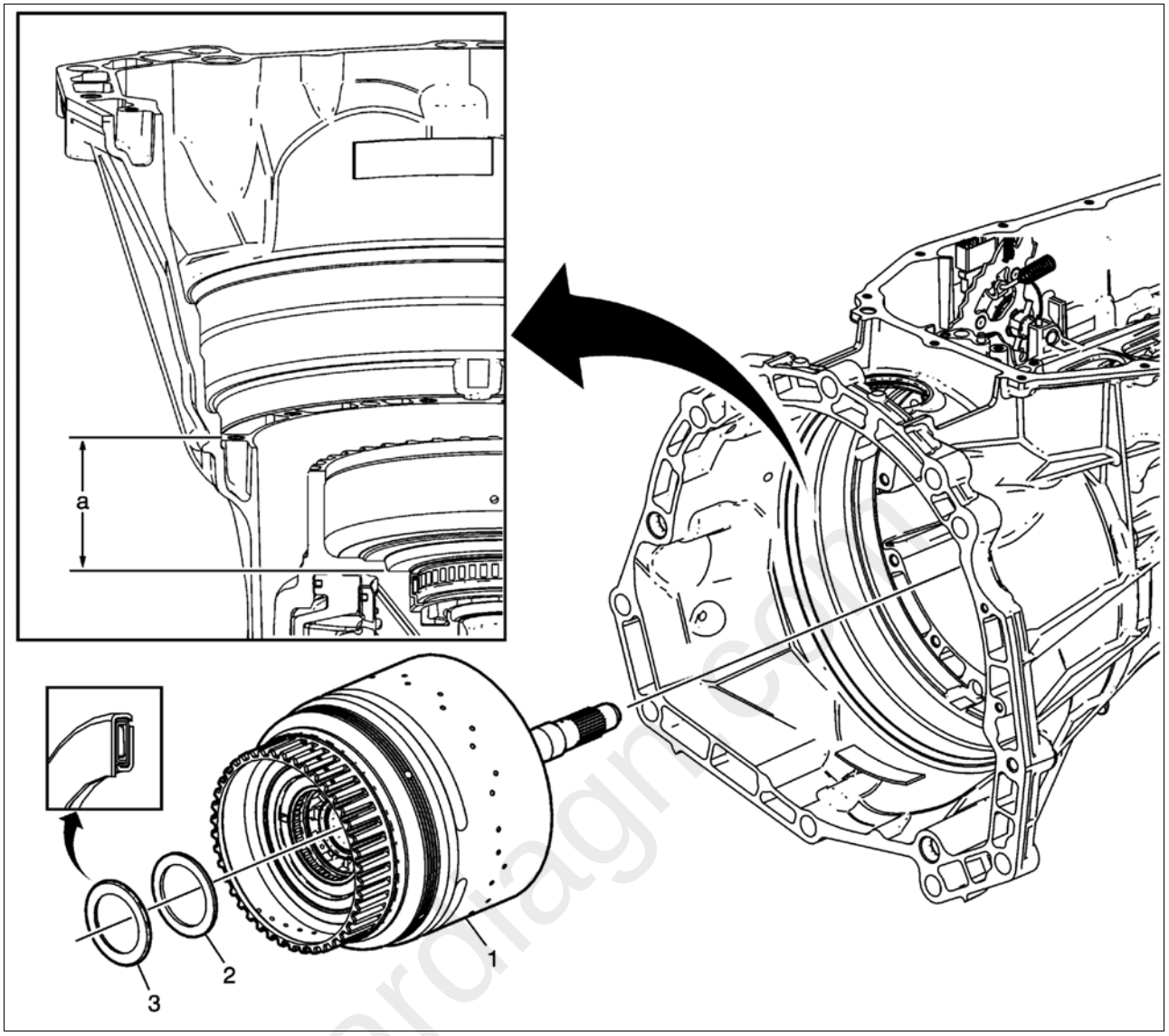


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly
2	4-5-6-7-8 Reverse Clutch and Direct Overdrive Internal Gear Hub Thrust Bearing
3	Direct/Overdrive Internal Gear Assembly
4	Direct/Overdrive Carrier Thrust Bearing (8L45 Only)
5	Direct/Overdrive Carrier Assembly
6	Input Internal Gear Assembly

REPAIR INSTRUCTIONS - OFF VEHICLE > 2-3-4-6-8 AND 4-5-6-7-8 REVERSE CLUTCH ASSEMBLY INSTALLATION

Fig 1: 2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch



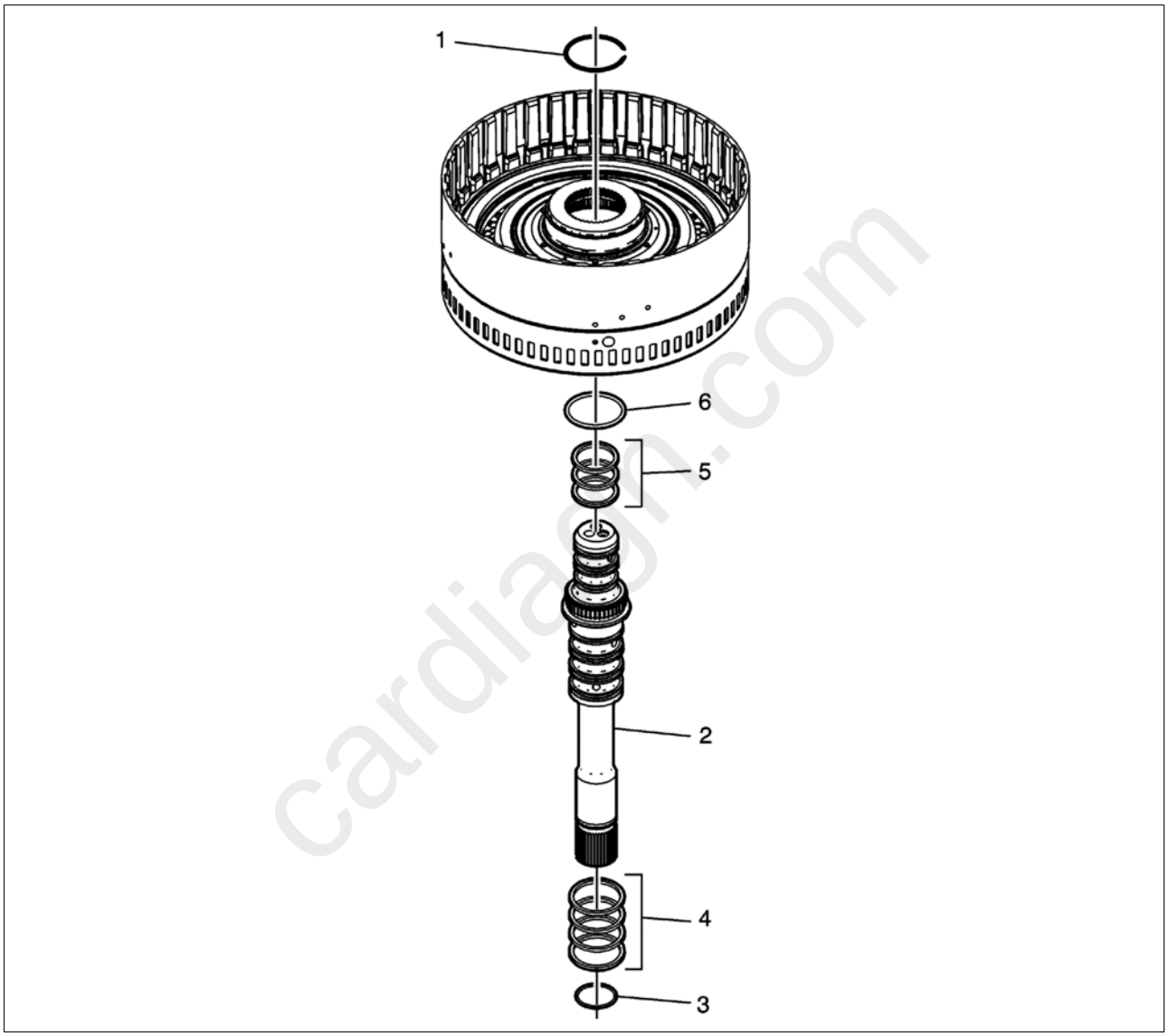
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly *NOTE:* • *Rotate the transmission horizontal to aid in installation of the 2-3-4-6-8 and 4-5-6-7-8 reverse clutch assembly.* • *Verify proper installation of the 2-3-4-6-8 and 4-5-6-7-8 reverse clutch assembly by measuring as indicated (a). An approximate measurement of 62.78 mm (2.472 in) indicates correct installation.*

2	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing Washer
3	2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Thrust Bearing

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH DISASSEMBLE > TURBINE SHAFT REMOVAL

Fig 1: Turbine Shaft



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Turbine Shaft Removal

Callout	Component Name
CAUTION:	

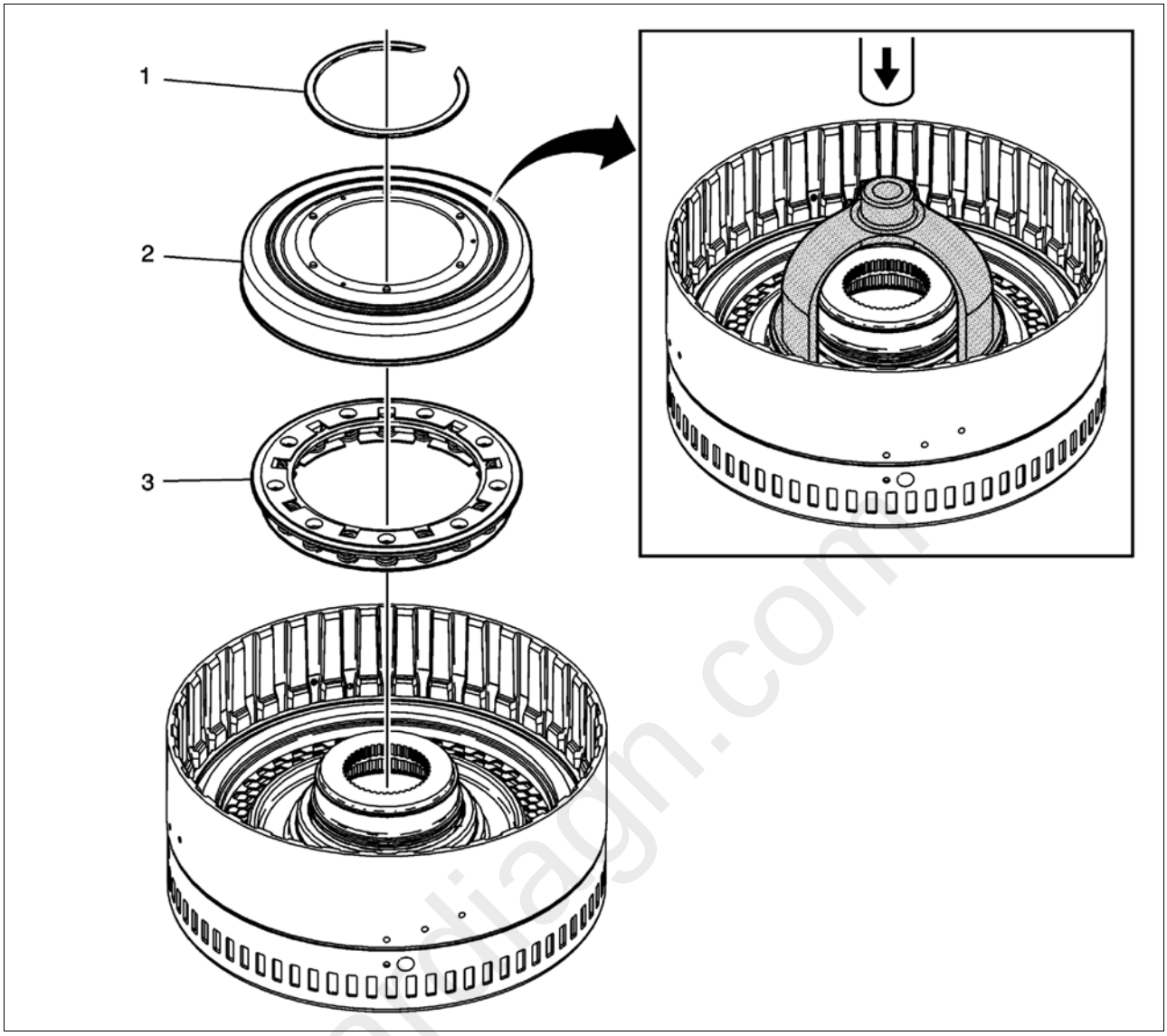
Refer to Seal Reuse Caution .

1	Turbine Shaft Retaining Ring *NOTE:* *Discard the retaining ring, it is not reusable.*
2	Turbine Shaft
3	Turbine Shaft O-ring Seal
4	Turbine Shaft Fluid Seal Ring (Qty: 4)
5	Turbine Shaft Fluid Seal Ring (Qty: 3)
6	Turbine Shaft O-ring Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH DISASSEMBLE > 1-3-5-6-7 CLUTCH PISTON DAM REMOVAL

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Fig 1: 1-3-5-6-7 Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

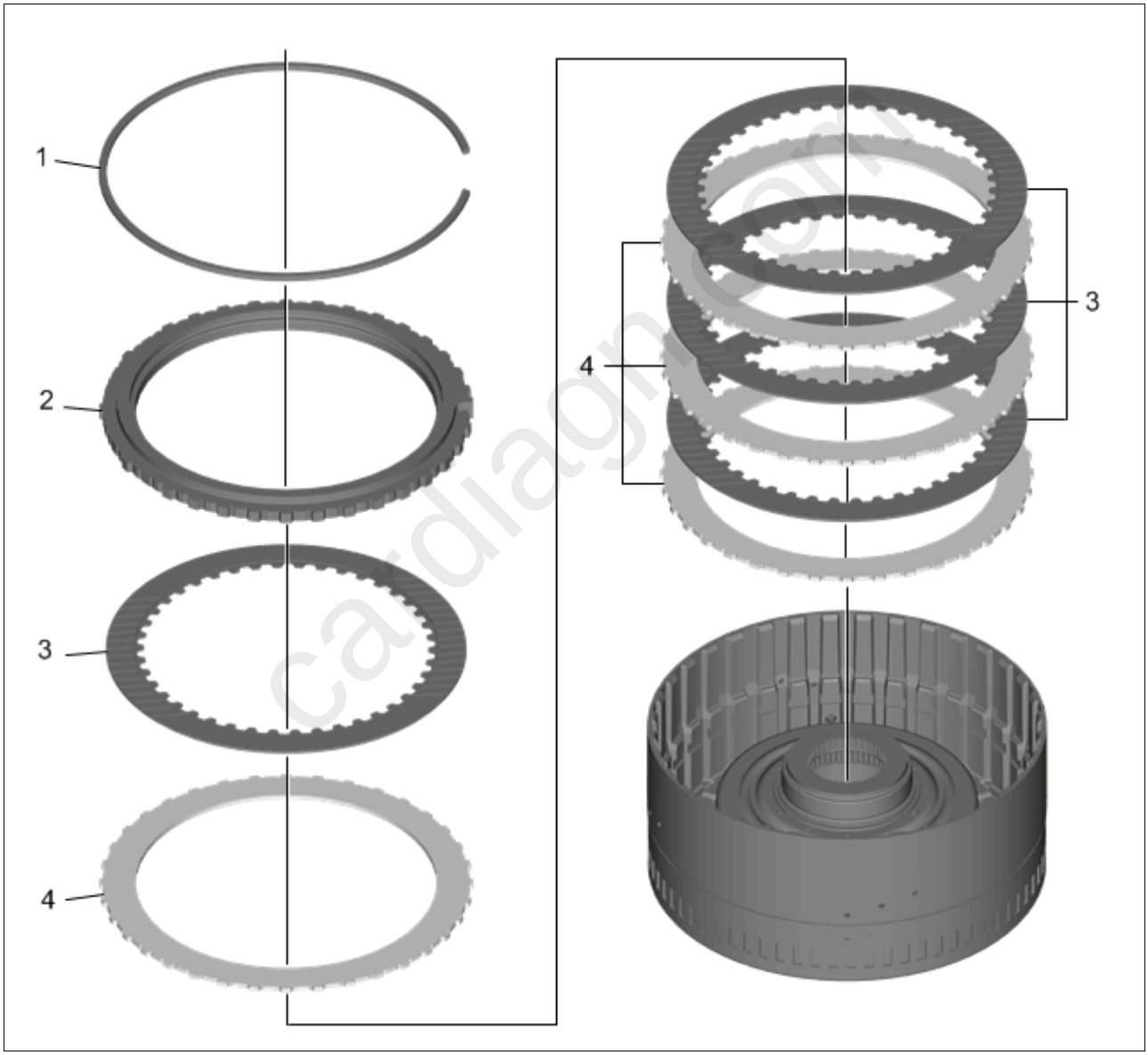
1-3-5-6-7 Clutch Piston Dam Removal

Callout	Component Name
1	1-3-5-6-7 Clutch Piston Dam Retaining Ring **Procedure** Use the **DT-38734** adapter and a press to remove the retaining ring. *NOTE:* *Discard the retaining ring, it is not reusable*

	Special Tools **DT-38734** Intermediate Spring Compressor Adapter For equivalent regional tools, refer to Special Tools .
2	1-3-5-6-7 Clutch Piston Dam
3	1-3-5-6-7 Clutch Piston Return Spring

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH DISASSEMBLE > 1-3-5-6-7 CLUTCH PLATE REMOVAL

Fig 1: 1-3-5-6-7 Clutch Plate



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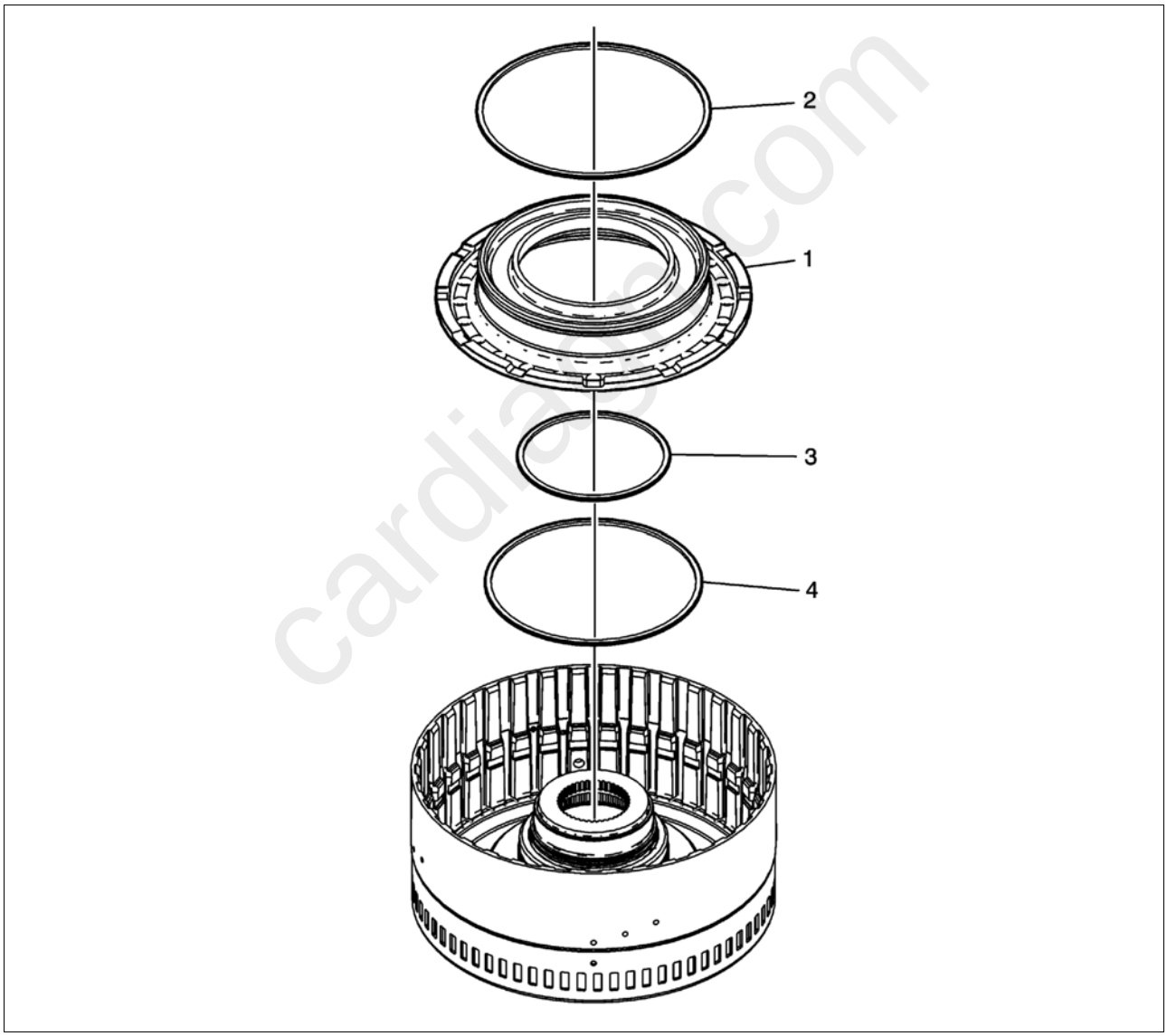
Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Plate Removal

Callout	Component Name
1	1-3-5-6-7 Clutch Backing Plate Retaining Ring (Selective)
2	1-3-5-6-7 Clutch Backing Plate
3	1-3-5-6-7 Clutch Plate Assembly - with LT1 (Qty: 4), with LT4 (Qty: 5)
4	1-3-5-6-7 Clutch Plate - with LT1 (Qty: 4), with LT4 (Qty: 5)

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH DISASSEMBLE > 1-3-5-6-7 CLUTCH PISTON REMOVAL

Fig 1: 1-3-5-6-7 Clutch Piston



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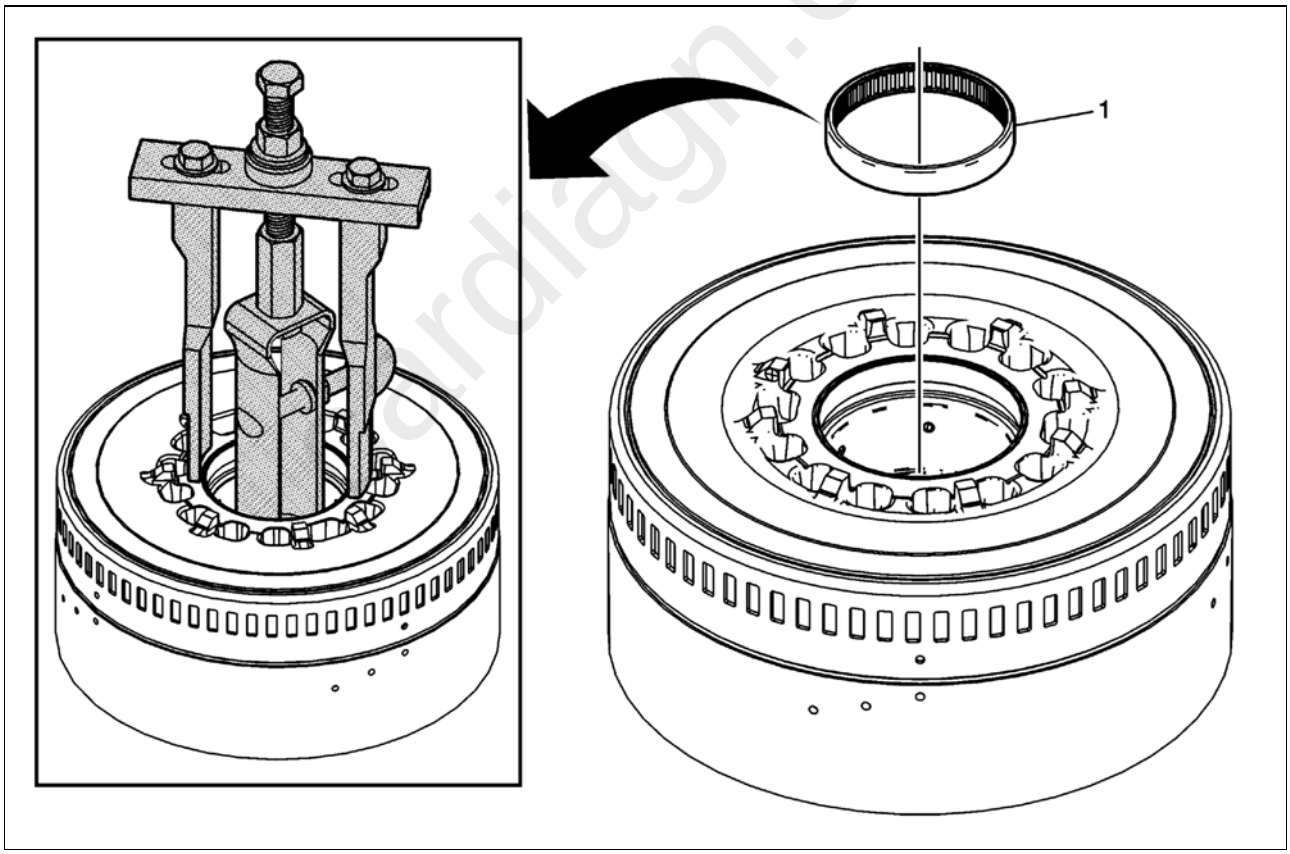
Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Piston Removal

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	1-3-5-6-7 Clutch Piston
2	1-3-5-6-7 Clutch Piston Dam Seal
3	1-3-5-6-7 Clutch Piston Inner Seal
4	1-3-5-6-7 Clutch Piston Outer Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH DISASSEMBLE > 1-3-5-6-7 CLUTCH BEARING REMOVAL

Fig 1: 1-3-5-6-7 Clutch Bearing



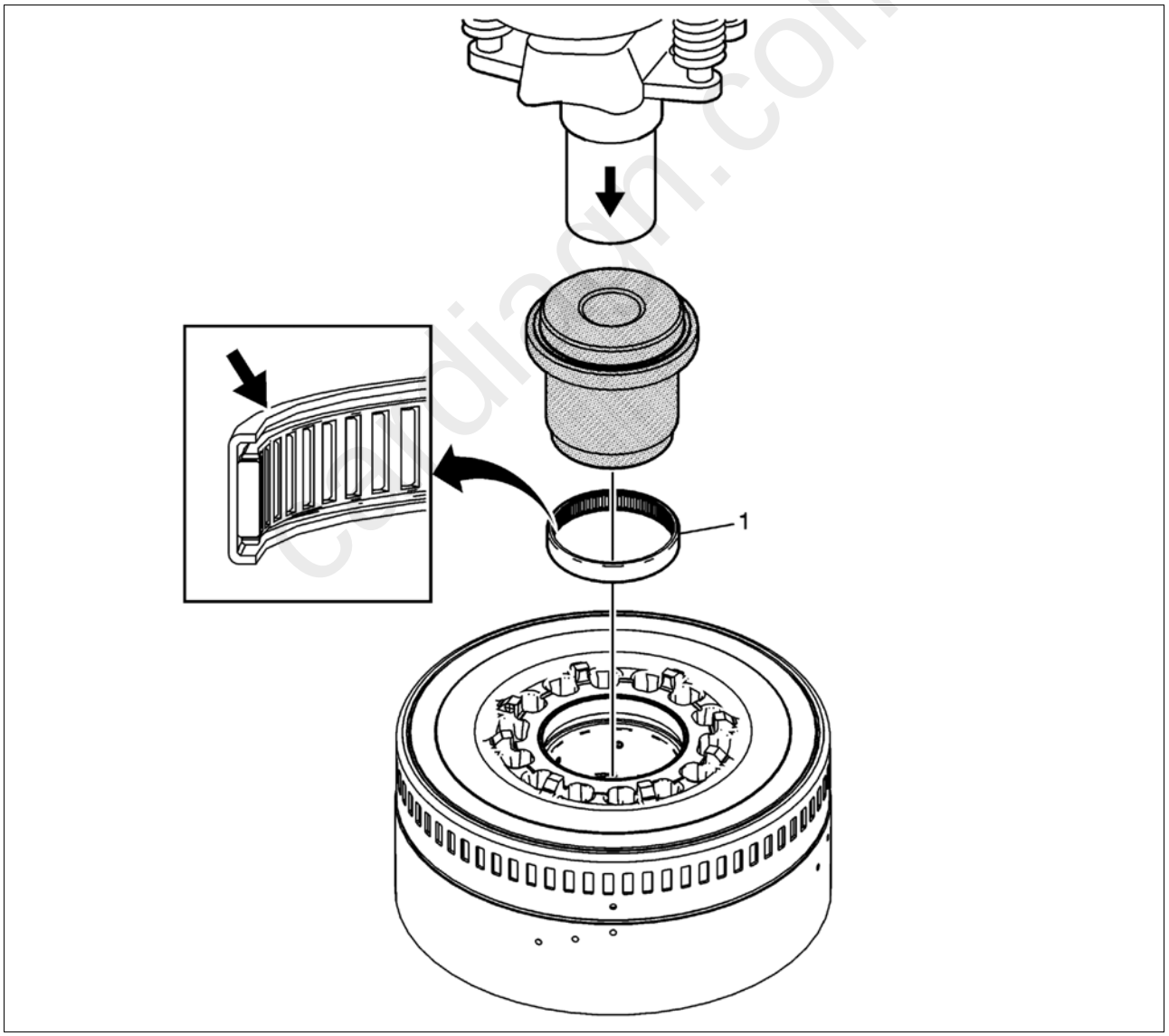
Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Bearing Removal

Callout	Component Name
1	1-3-5-6-7 Clutch Bearing Special Tools • **DT-26941** Bushing and Bearing Remover • **DT-45124** Removal Bridge For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > 1-3-5-6-7 CLUTCH BEARING INSTALLATION

Fig 1: 1-3-5-6-7 Clutch Bearing



Courtesy of GENERAL MOTORS COMPANY

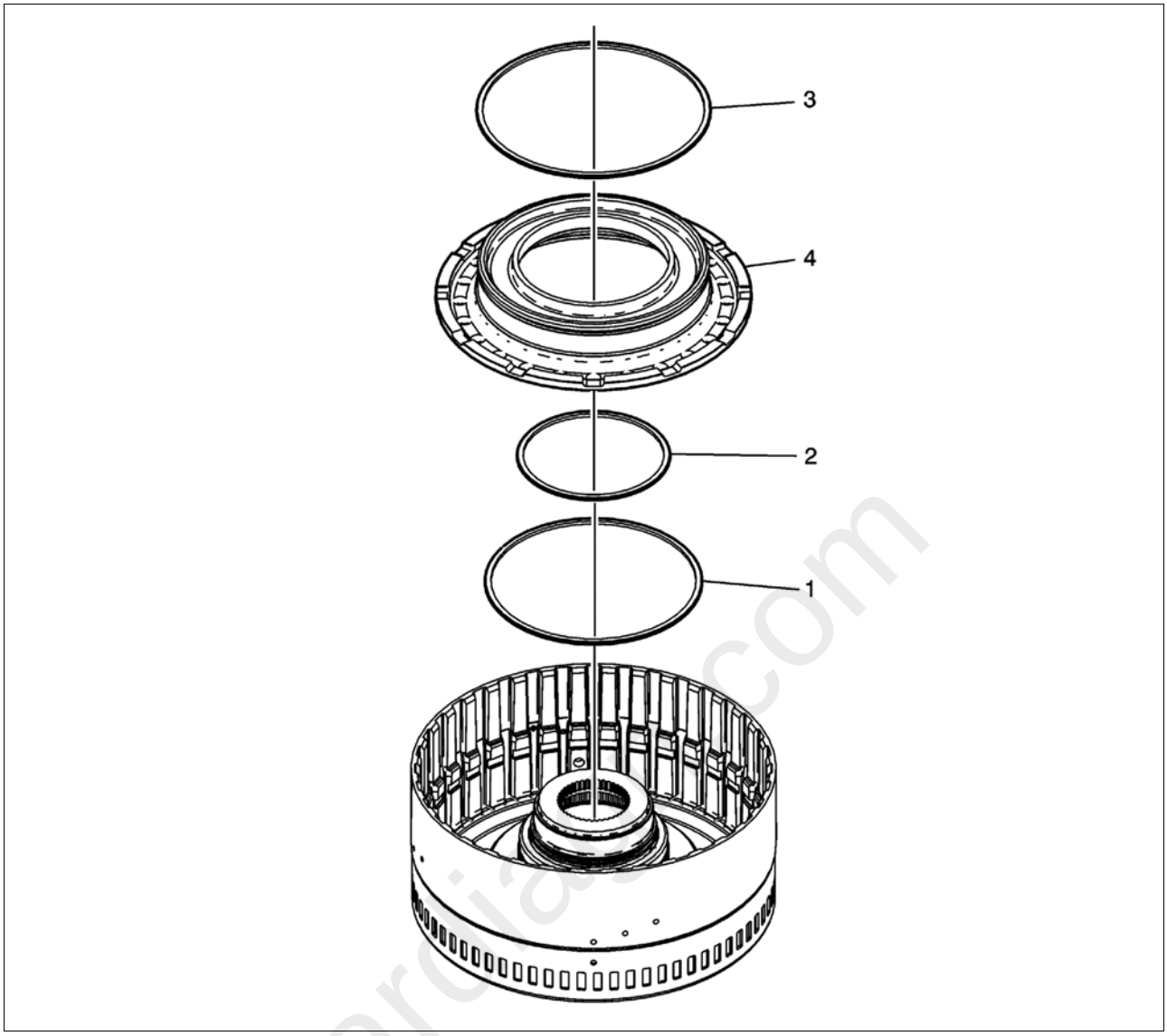
1-3-5-6-7 Clutch Bearing Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Bearing **Procedure** *NOTE:* *Press on the marked side of the bearing.* Use **DT-50906** installer and a press to install the bearing. **Special Tools** **DT-50906** Bearing Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > 1-3-5-6-7 CLUTCH PISTON INSTALLATION

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Fig 1: 1-3-5-6-7 Clutch Piston



Courtesy of GENERAL MOTORS COMPANY

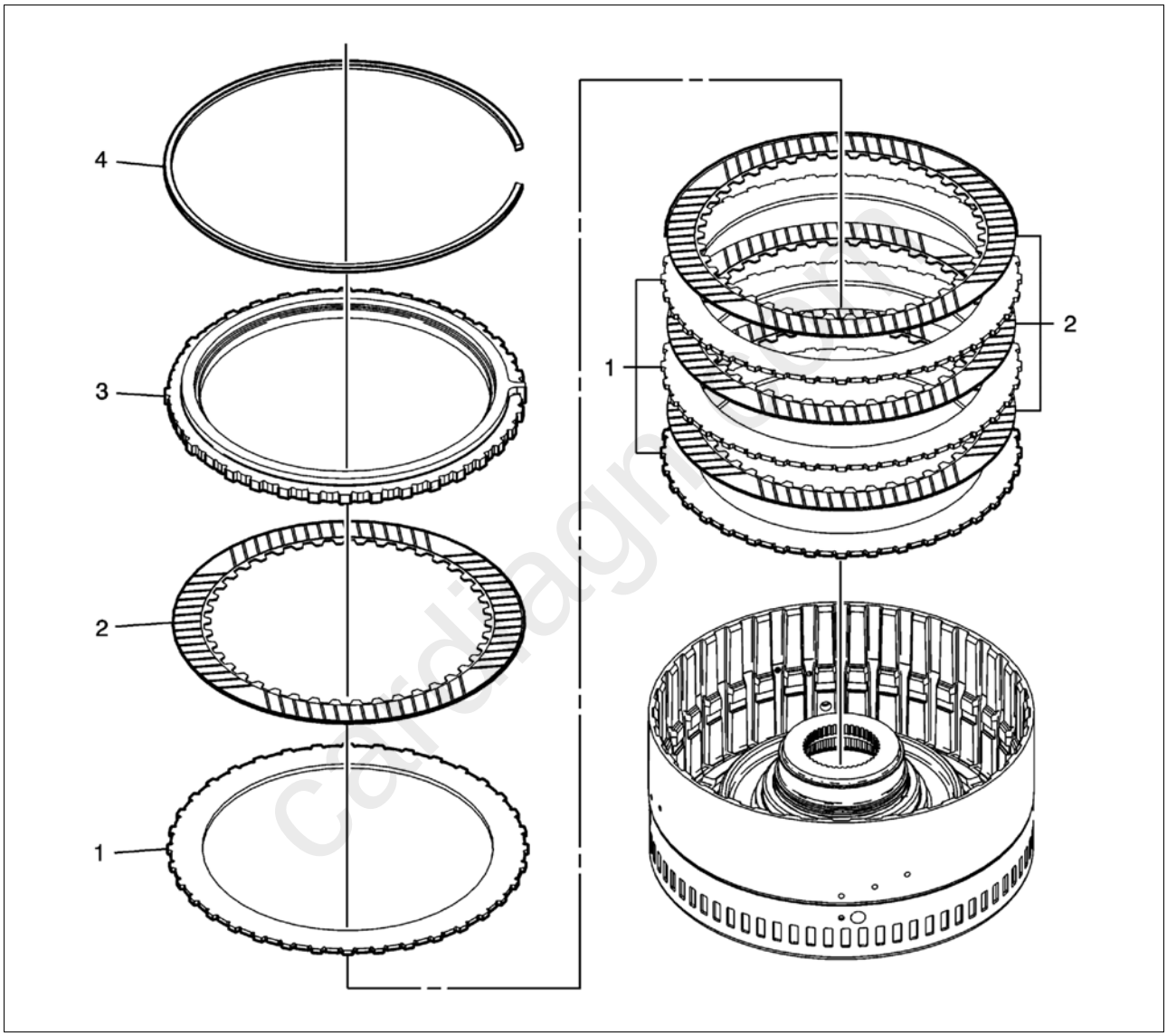
1-3-5-6-7 Clutch Piston Installation

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	1-3-5-6-7 Clutch Piston Outer Seal
2	1-3-5-6-7 Clutch Piston Inner Seal

3	1-3-5-6-7 Clutch Piston Dam Seal
4	1-3-5-6-7 Clutch Piston

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > 1-3-5-6-7 CLUTCH PLATE INSTALLATION

Fig 1: 1-3-5-6-7 Clutch Plate



Courtesy of GENERAL MOTORS COMPANY

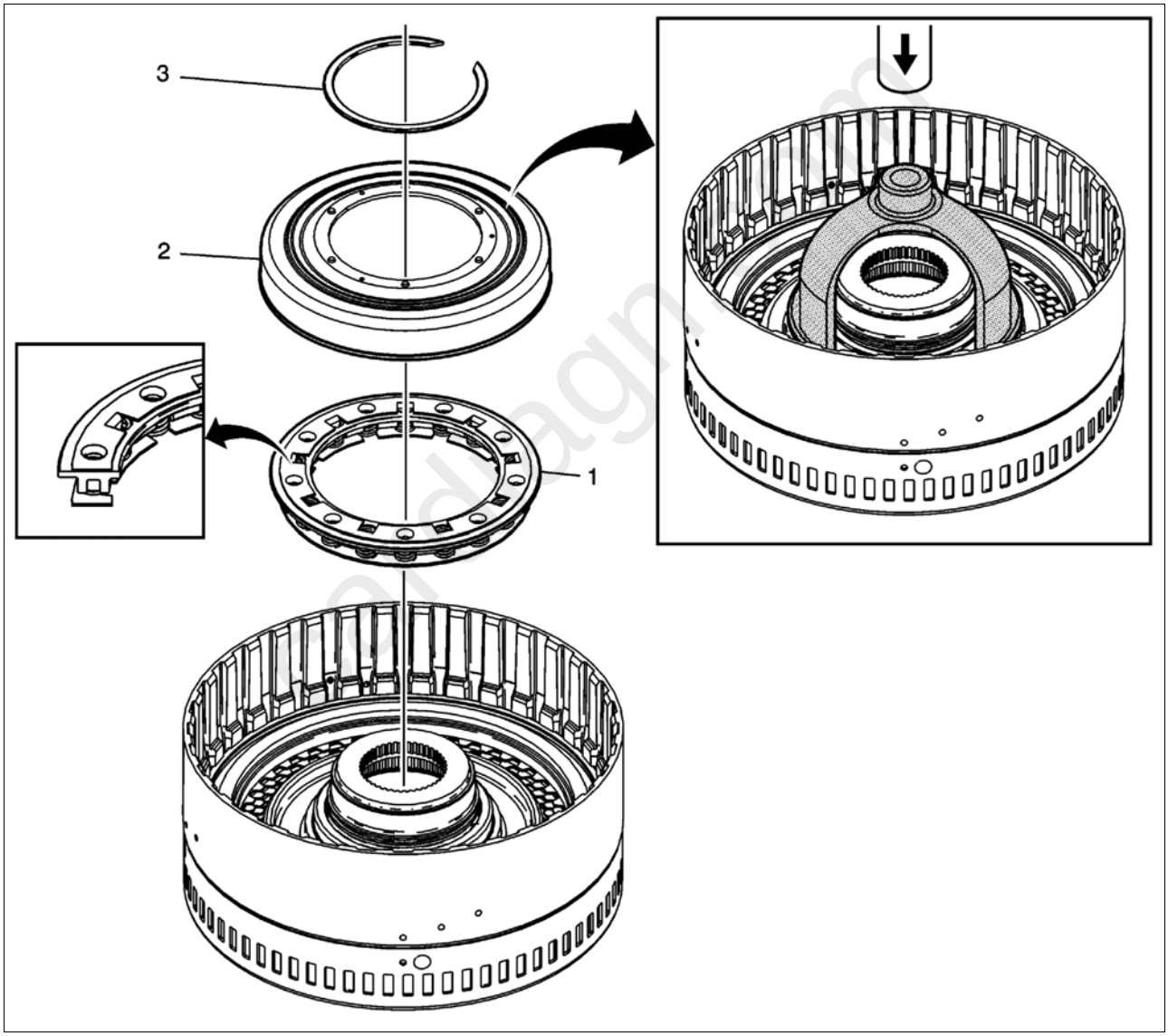
1-3-5-6-7 Clutch Plate Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Plate - with LT1 (Qty: 4), with LT4 (Qty: 5)

2	1-3-5-6-7 Clutch Plate Assembly - with LT1 (Qty: 4), with LT4 (Qty: 5)
3	1-3-5-6-7 Clutch Backing Plate
4	1-3-5-6-7 Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 1-3-5-6-7 Clutch Backing Plate Retaining Ring Measurement .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > 1-3-5-6-7 CLUTCH PISTON DAM INSTALLATION

Fig 1: 1-3-5-6-7 Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

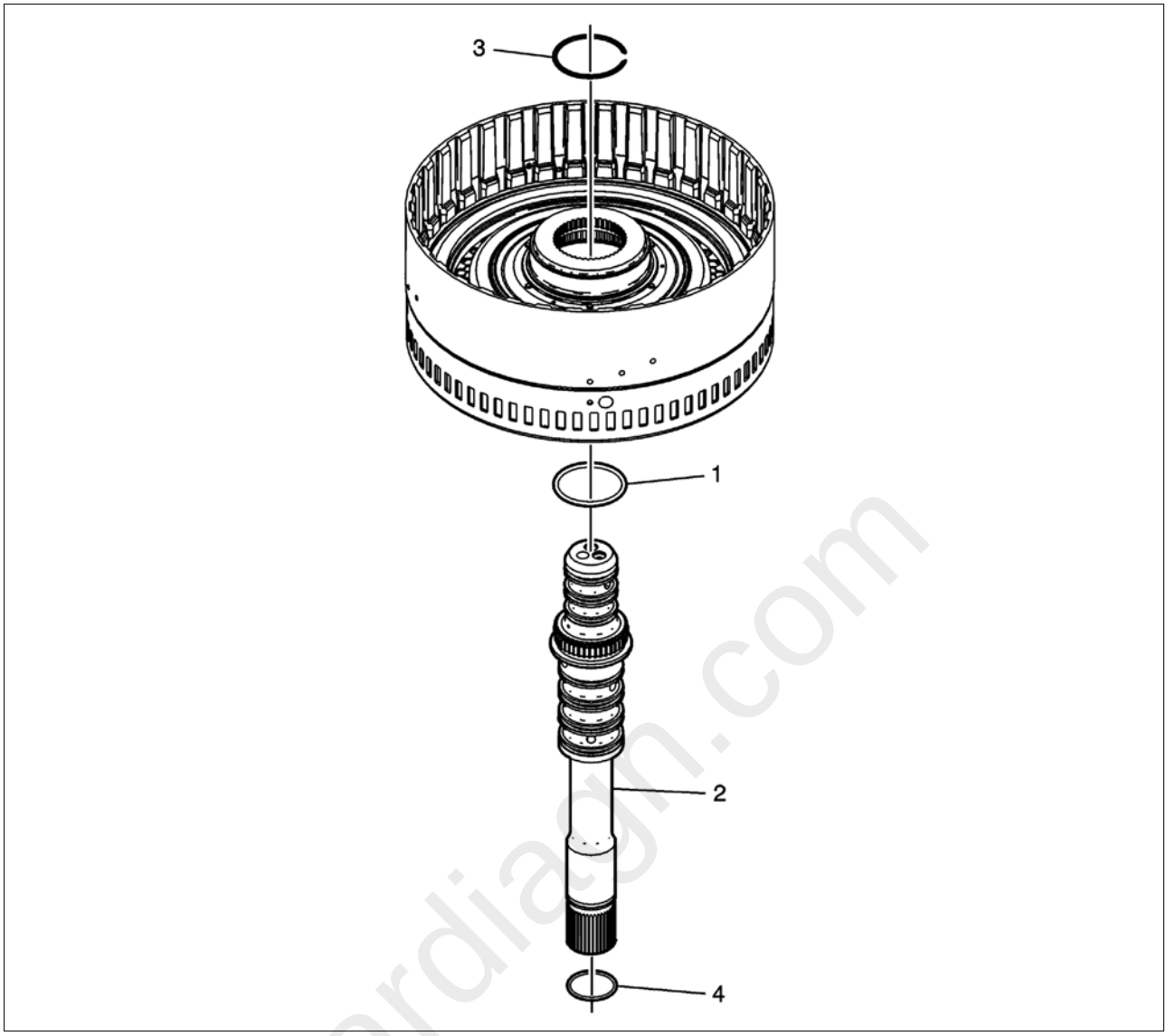
1-3-5-6-7 Clutch Piston Dam Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Piston Return Spring
2	1-3-5-6-7 Clutch Piston Dam
3	1-3-5-6-7 Clutch Piston Dam Retaining Ring **Procedure** Use the **DT-38734** adapter and a press to install the retaining ring. *NOTE:* *Install a NEW retaining ring, it is not reusable.* **Special Tools** **DT-38734** Intermediate Spring Compressor Adapter For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > TURBINE SHAFT INSTALLATION

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Fig 1: Turbine Shaft



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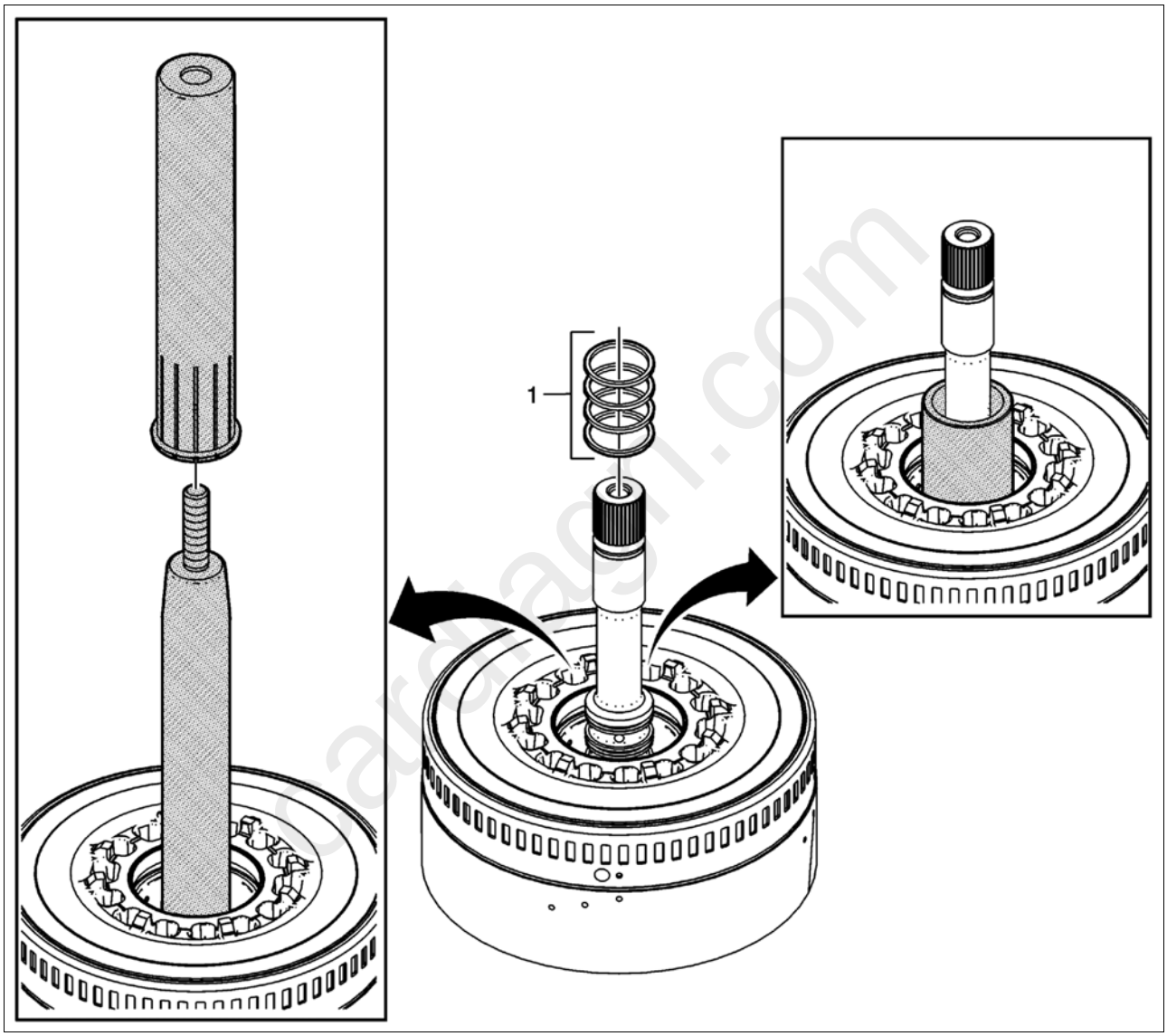
Turbine Shaft Installation

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	Turbine Shaft O-ring Seal
2	Turbine Shaft

3	Turbine Shaft Retaining Ring
4	Turbine Shaft O-ring Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > TURBINE SHAFT FLUID SEAL RING INSTALLATION

Fig 1: Turbine Shaft Fluid Seal Ring



Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft Fluid Seal Ring Installation

Callout	Component Name
1	Turbine Shaft Fluid Seal Ring (Qty: 4)

CAUTION:

Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.

CAUTION:

Size the fluid seal rings for at least 5 minutes after installation to obtain proper seal ring size. Failure to do so may cause internal transmission leaks and transmission damage.

Procedure

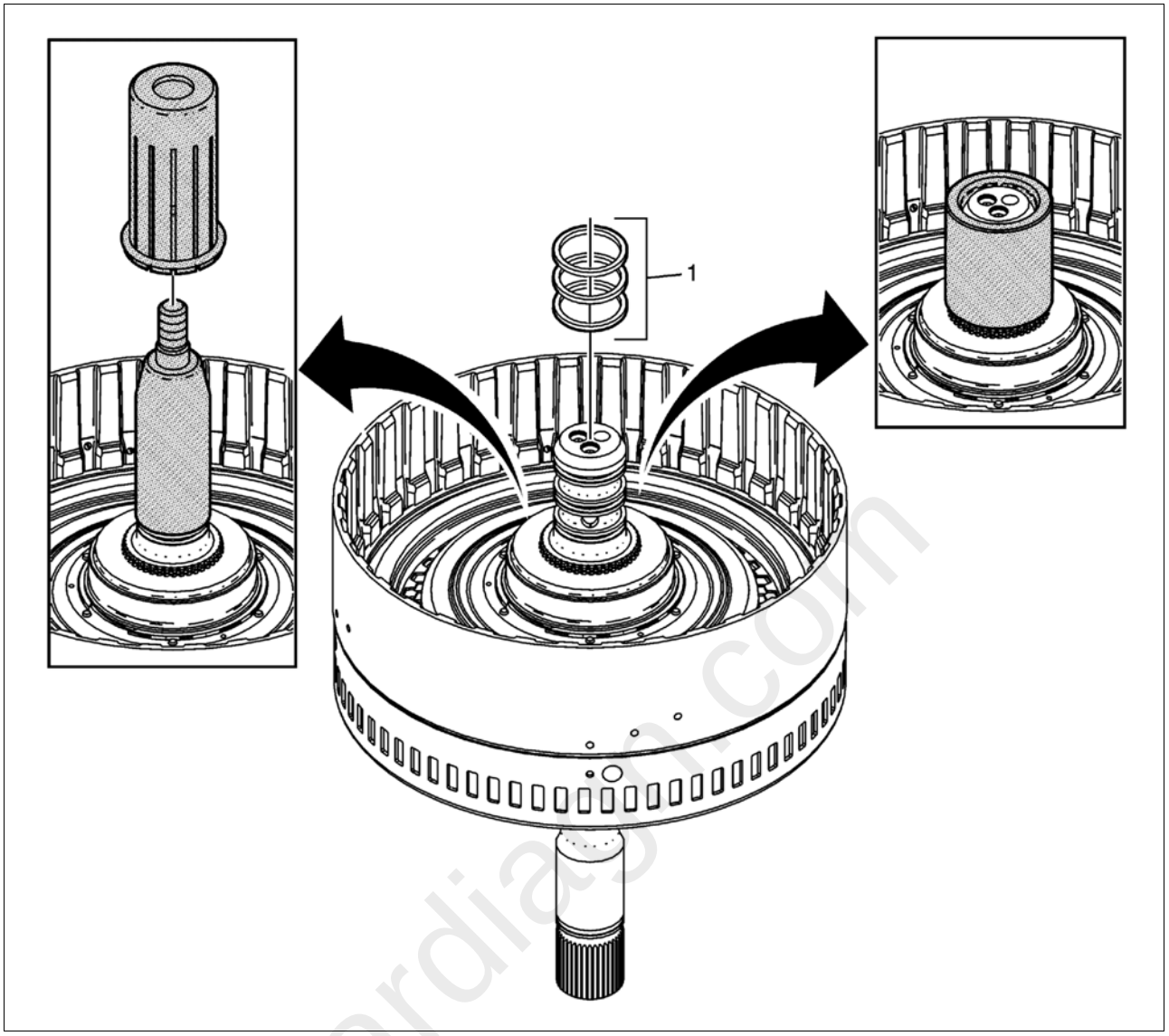
1. Adjust the turn screw on **DT-50910-3** seal protector and install the bottom seal ring first.
2. Use the large taper side of **DT-50910-1** seal sizer for initial seal sizing, then flip the tool over for final sizing.

Special Tools
DT-50910 Seal Installer
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L90) > TURBINE SHAFT FLUID SEAL RING INSTALLATION

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Fig 1: Turbine Shaft Fluid Seal Ring



Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft Fluid Seal Ring Installation

Callout	Component Name
1	Turbine Shaft Fluid Seal Ring (Qty: 3) *CAUTION:* *Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.* *CAUTION:*

Size the fluid seal rings for at least 5 minutes after installation to obtain proper seal ring size. Failure to do so may cause internal transmission leaks and transmission damage.

Procedure

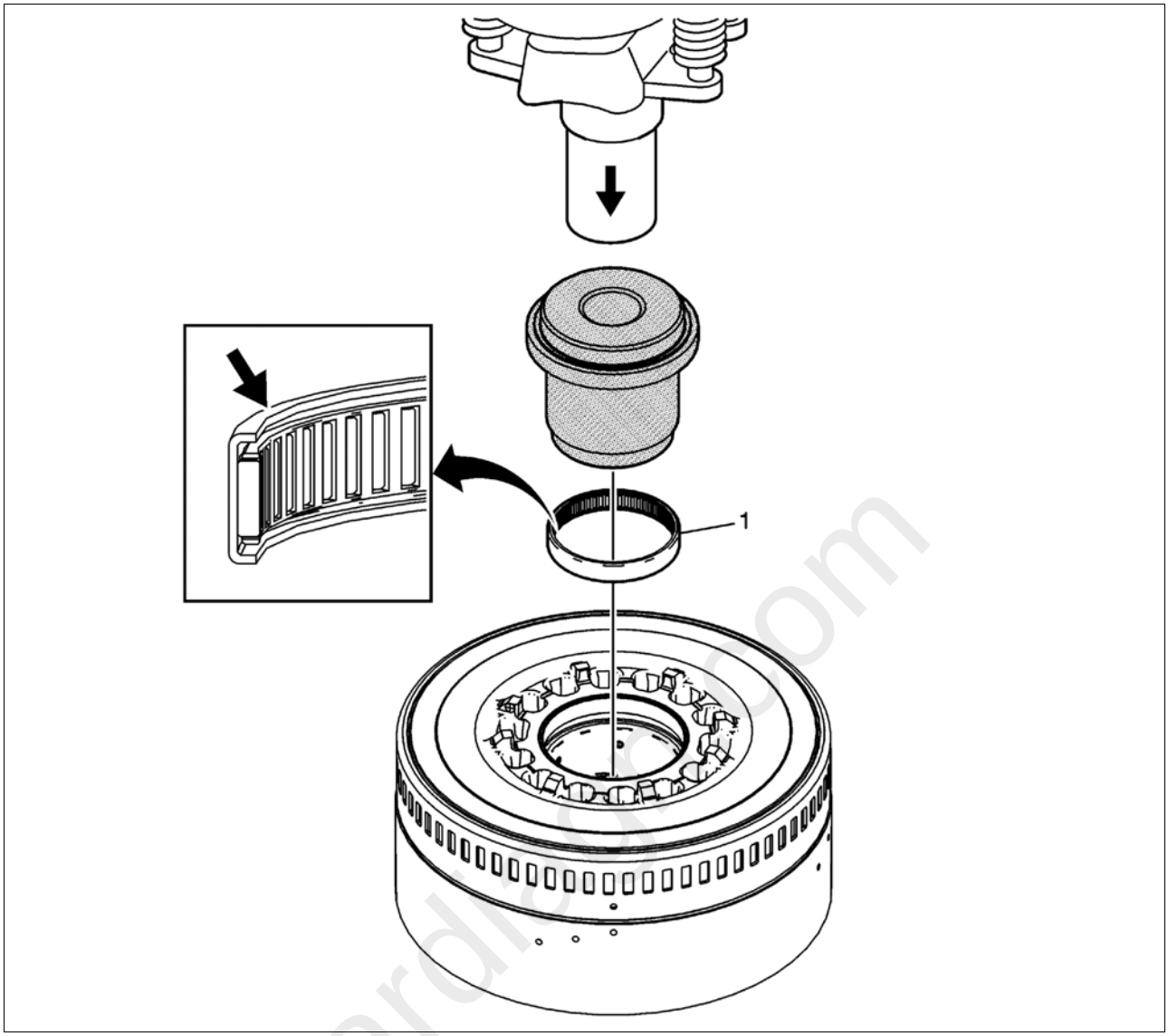
1. Adjust the turn screw on **DT-50911-3** seal protector and install the bottom seal ring first.
2. Use the large taper side of **DT-50911-1** seal sizer for initial seal sizing, then flip the tool over for final sizing.

Special Tools
DT-50911 Seal Installer
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > 1-3-5-6-7 CLUTCH BEARING INSTALLATION

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Fig 1: 1-3-5-6-7 Clutch Bearing



Courtesy of GENERAL MOTORS COMPANY

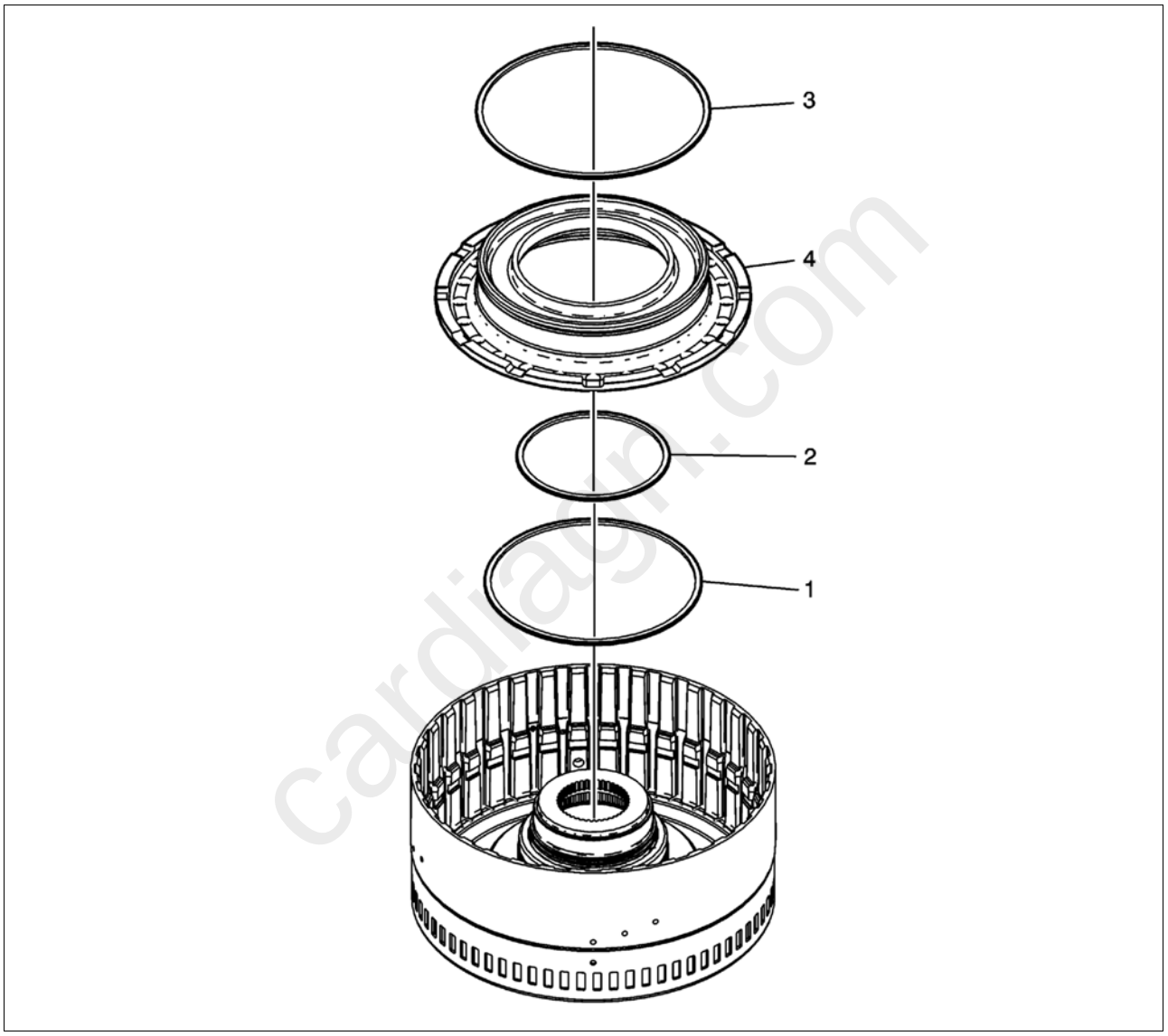
1-3-5-6-7 Clutch Bearing Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Bearing **Procedure** *NOTE:* *Press from the marked side of the bearing.* Use **DT-51089** installer and a press to install the bearing.

	Special Tools **DT-51089** Bearing Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > 1-3-5-6-7 CLUTCH PISTON INSTALLATION

Fig 1: 1-3-5-6-7 Clutch Piston



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Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Piston Installation

Callout	Component Name

CAUTION:

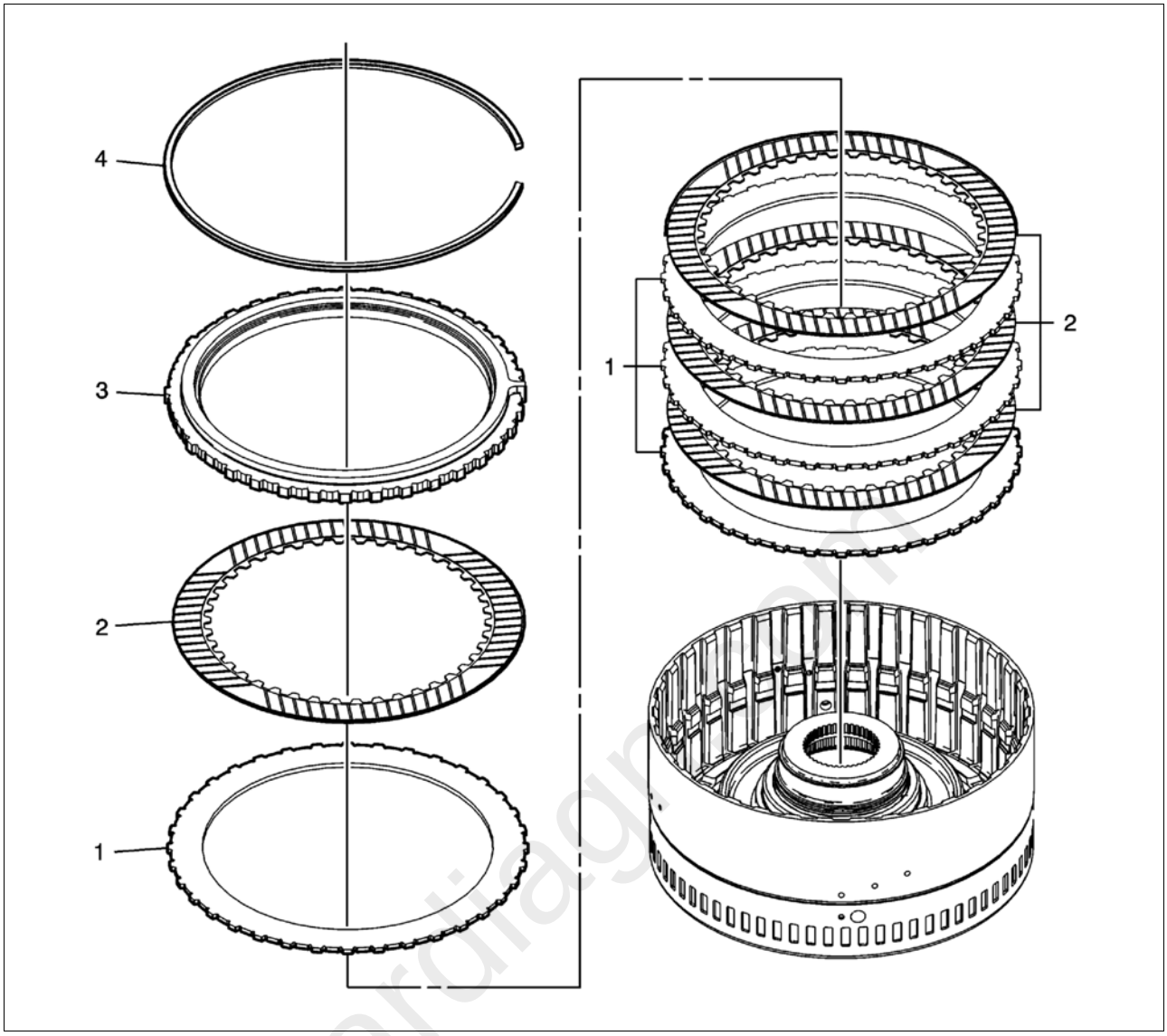
Refer to Seal Reuse Caution .

1	1-3-5-6-7 Clutch Piston Outer Seal
2	1-3-5-6-7 Clutch Piston Inner Seal
3	1-3-5-6-7 Clutch Piston Dam Seal
4	1-3-5-6-7 Clutch Piston

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > 1-3-5-6-7 CLUTCH PLATE INSTALLATION

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Fig 1: 1-3-5-6-7 Clutch Plate



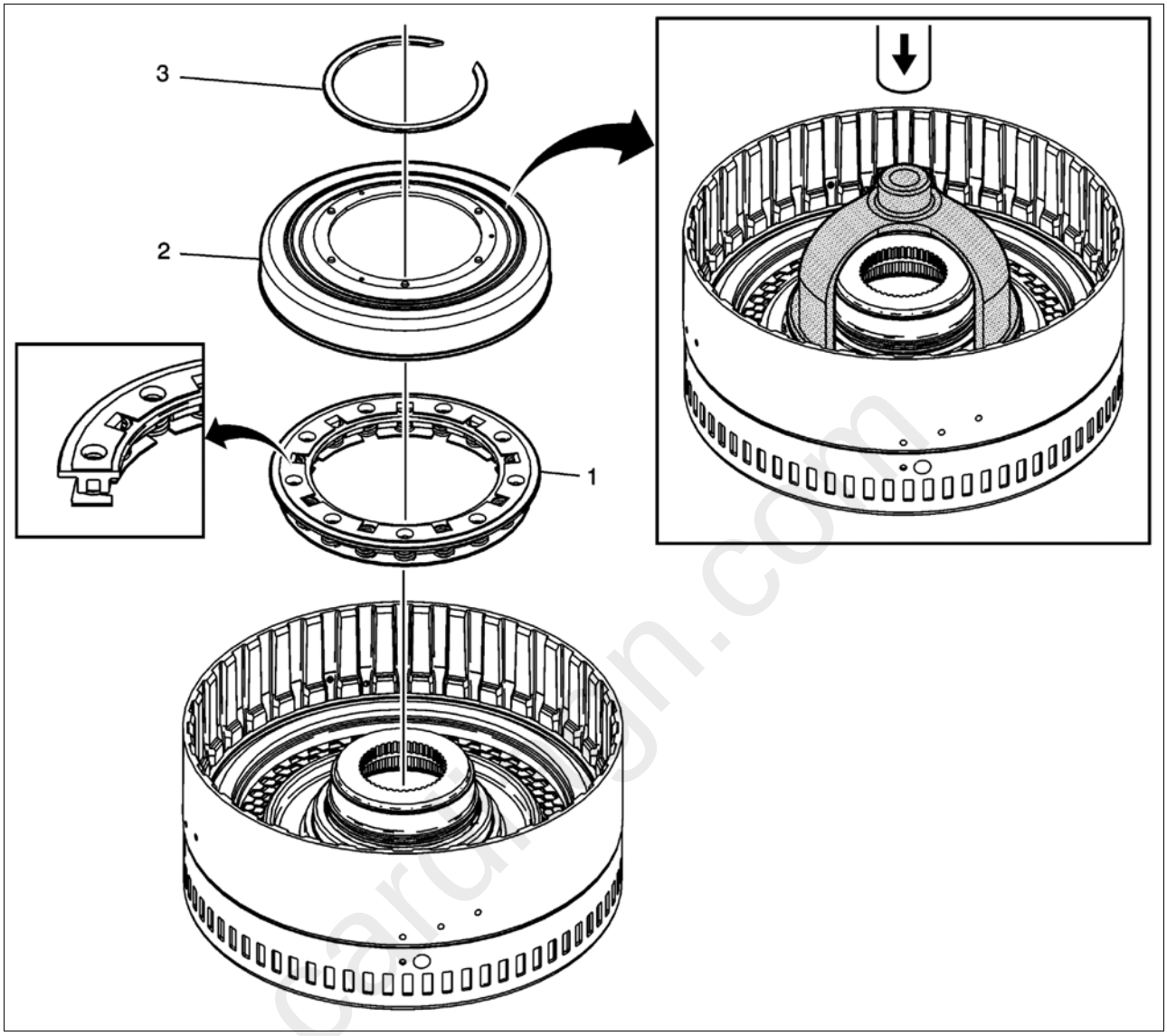
Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Plate Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Plate - with LT1 (Qty: 4), with LT4 (Qty: 5)
2	1-3-5-6-7 Clutch Plate Assembly - with LT1 (Qty: 4), with LT4 (Qty: 5)
3	1-3-5-6-7 Clutch Backing Plate
4	1-3-5-6-7 Clutch Backing Plate Retaining Ring (Selective) **Procedure** Select the correct retaining ring. Refer to 1-3-5-6-7 Clutch Backing Plate Retaining Ring Measurement .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > 1-3-5-6-7 CLUTCH PISTON DAM INSTALLATION

Fig 1: 1-3-5-6-7 Clutch Piston Dam



Courtesy of GENERAL MOTORS COMPANY

1-3-5-6-7 Clutch Piston Dam Installation

Callout	Component Name
1	1-3-5-6-7 Clutch Piston Return Spring
2	1-3-5-6-7 Clutch Piston Dam
3	1-3-5-6-7 Clutch Piston Dam Retaining Ring **Procedure** Use the **DT-38734** adapter and a press to install the retaining ring.

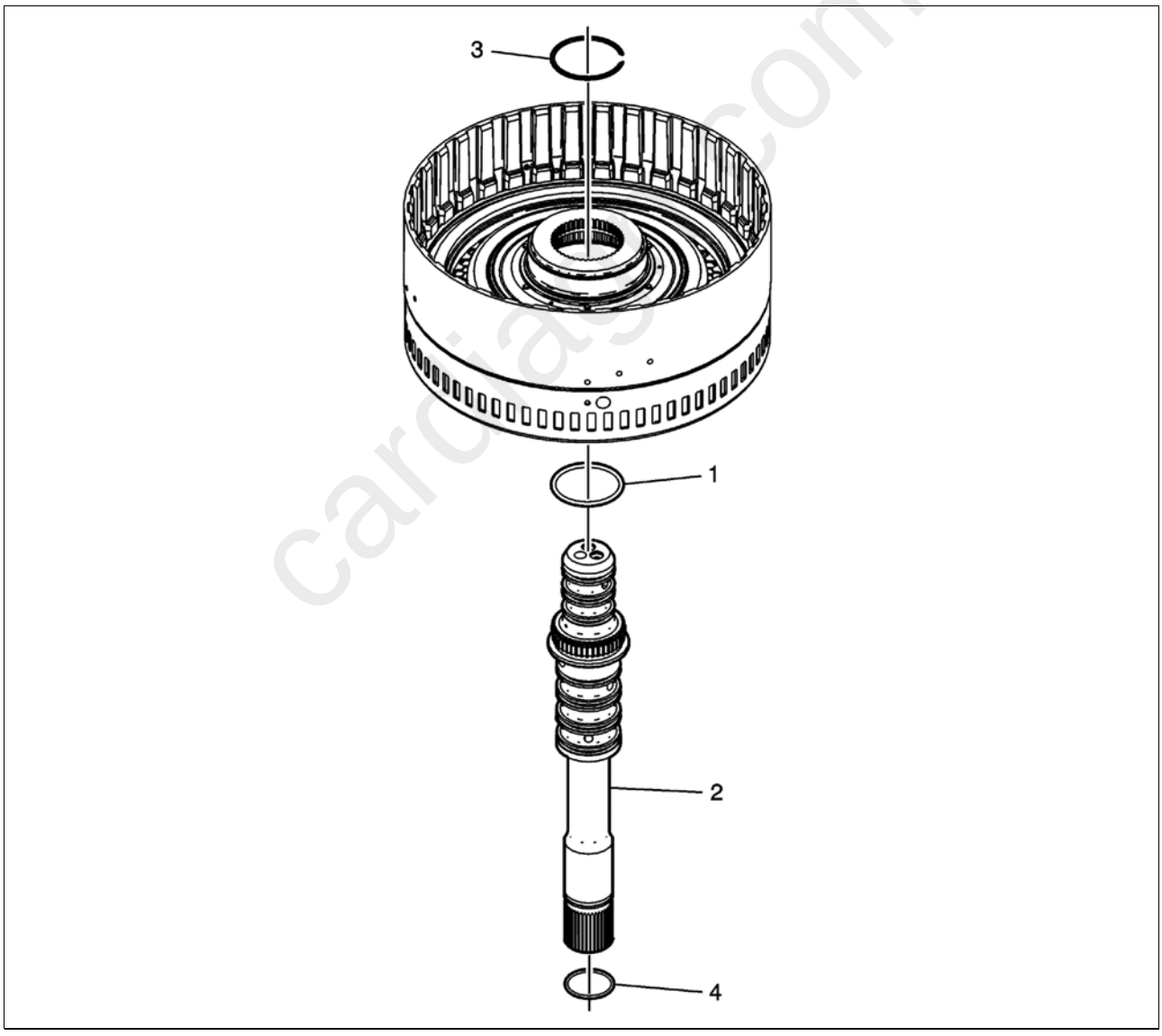
NOTE:

Install a NEW retaining ring, it is not reusable.

Special Tools
DT-38734 Intermediate Spring Compressor Adapter
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > TURBINE SHAFT INSTALLATION

Fig 1: Turbine Shaft



Courtesy of GENERAL MOTORS COMPANY

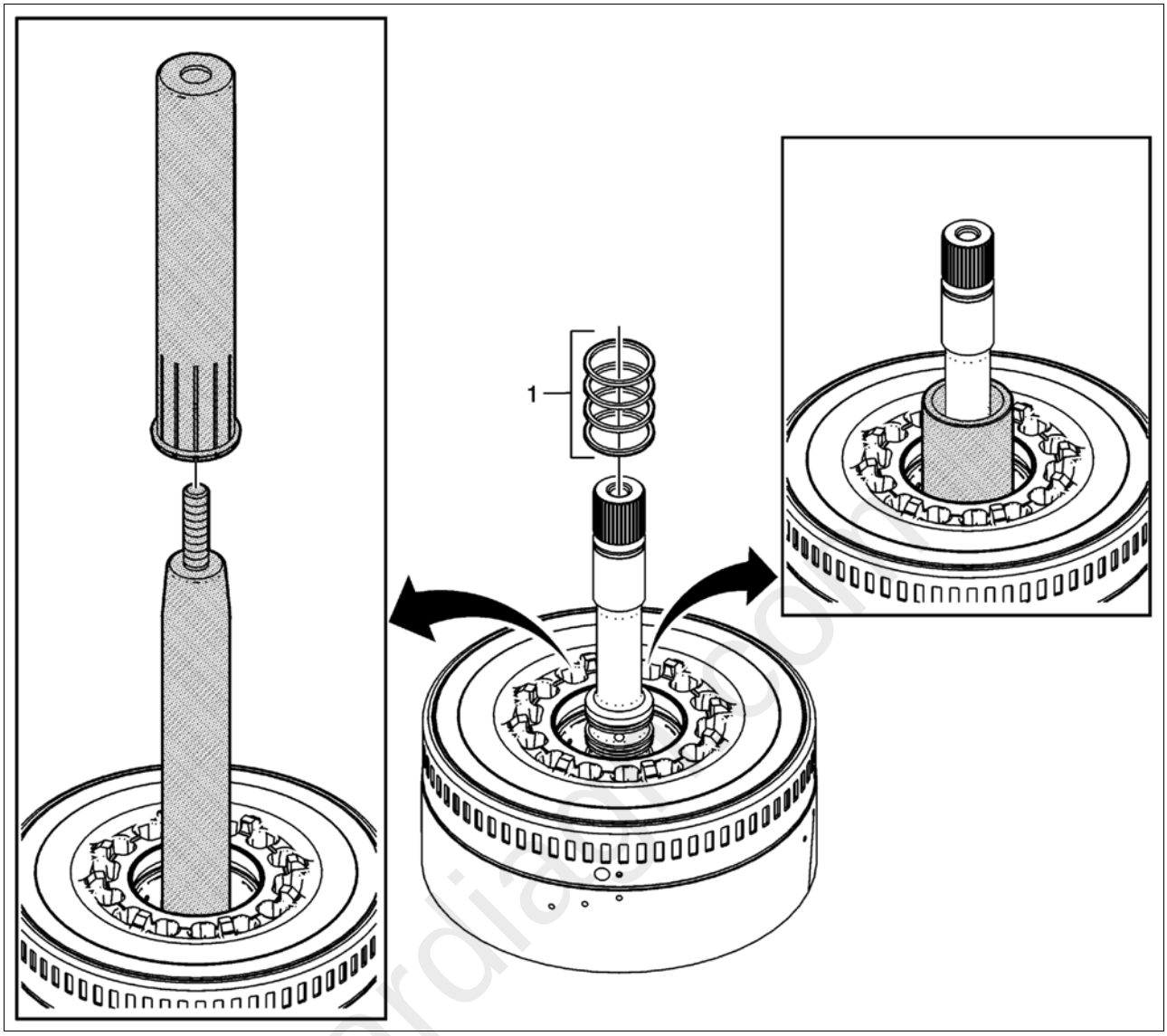
Turbine Shaft Installation

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	Turbine Shaft O-ring Seal
2	Turbine Shaft
3	Turbine Shaft Retaining Ring
4	Turbine Shaft O-ring Seal

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > TURBINE SHAFT FLUID SEAL RING INSTALLATION

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Fig 1: Turbine Shaft Fluid Seal Ring



Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft Fluid Seal Ring Installation

Callout	Component Name
1	Turbine Shaft Fluid Seal Ring (Qty: 4) *CAUTION:* *Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.* *CAUTION:*

Size the fluid seal rings for at least 5 minutes after installation to obtain proper seal ring size. Failure to do so may cause internal transmission leaks and transmission damage.

Procedure

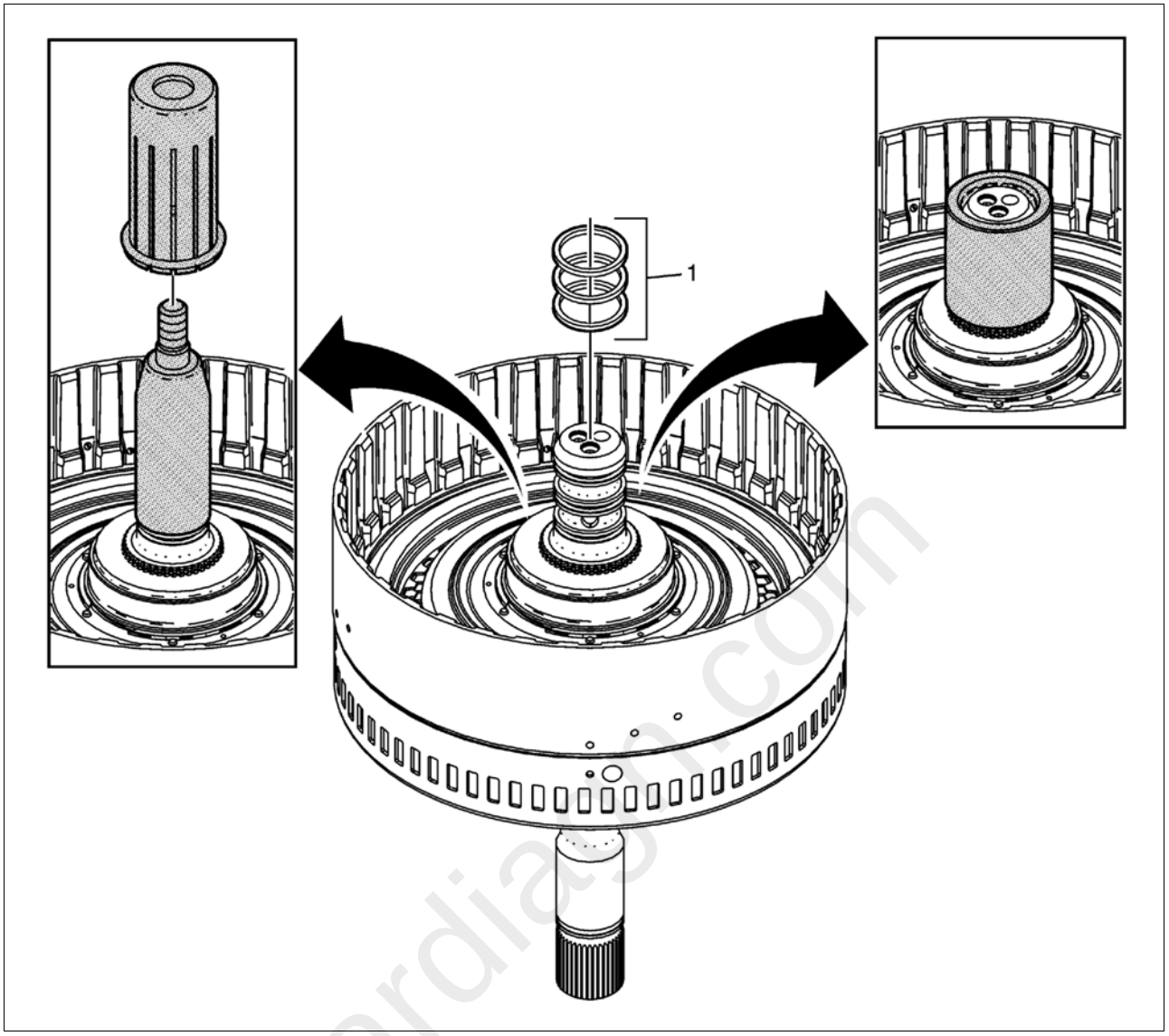
1. Adjust the turn screw on **DT-51088-3** seal protector and install the bottom seal ring first.
2. Use the large taper side of **DT-51088-1** seal sizer for initial seal sizing, then flip the tool over for final sizing.

Special Tools
DT-51088 Seal Installer
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLE (8L45) > TURBINE SHAFT FLUID SEAL RING INSTALLATION

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Fig 1: Turbine Shaft Fluid Seal Ring



Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft Fluid Seal Ring Installation

Callout	Component Name
1	Turbine Shaft Fluid Seal Ring (Qty: 3) *CAUTION:* *Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.* *CAUTION:*

Size the fluid seal rings for at least 5 minutes after installation to obtain proper seal ring size. Failure to do so may cause internal transmission leaks and transmission damage.

Procedure

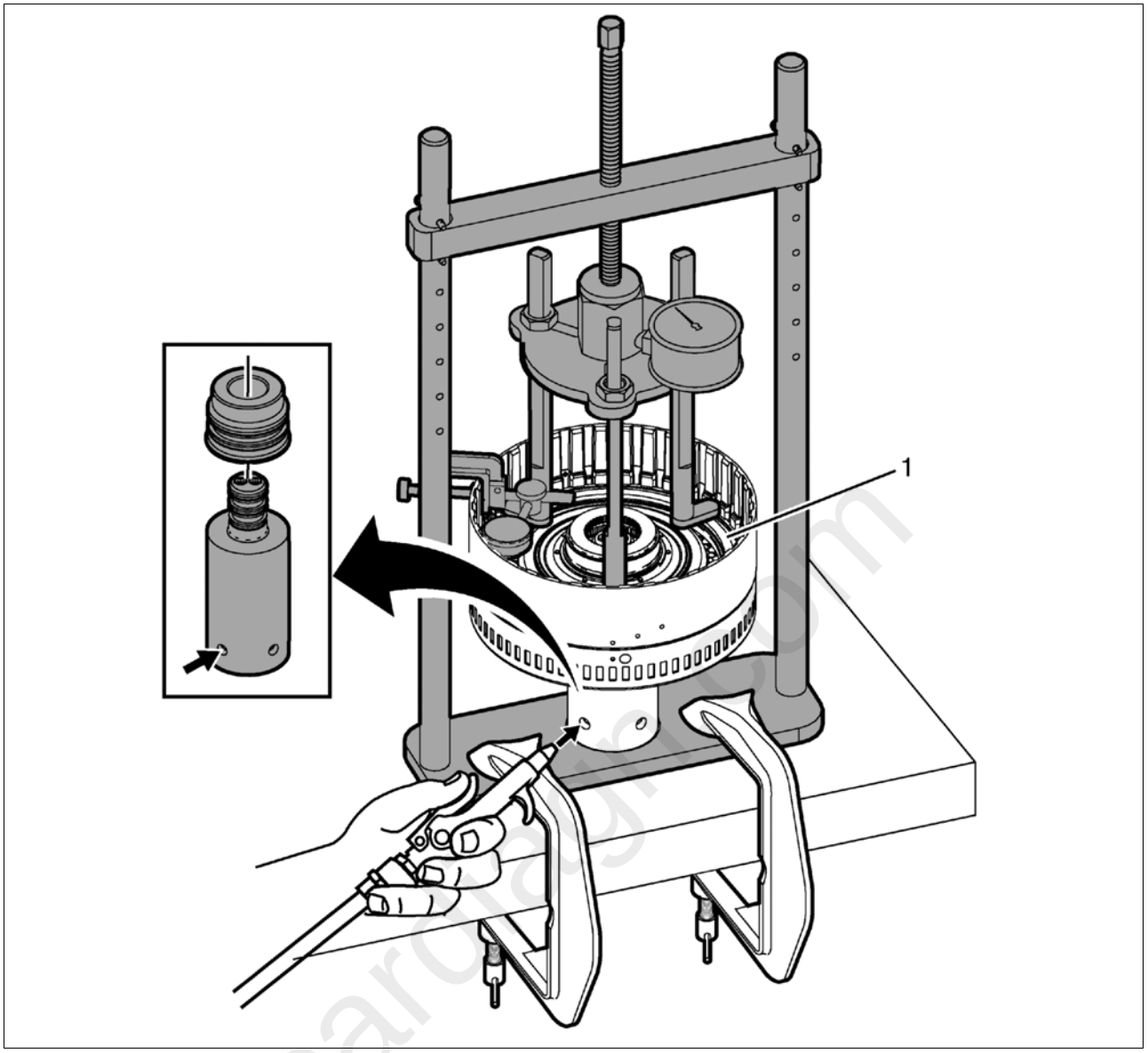
1. Adjust the turn screw on **DT-50911-3** seal protector and install the bottom seal ring first.
2. Use the large taper side of **DT-50911-1** seal sizer for initial seal sizing, then flip the tool over for final sizing.

Special Tools
DT-50911 Seal Installer
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH BACKING PLATE RETAINING RING MEASUREMENT

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Fig 1: 1-3-5-6-7 Clutch Backing Plate Retaining Ring Measurement



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Install the 1-3-5-6-7 clutch piston and 1-3-5-6-7 clutch plates. Refer to 1-3-5-6-7 Clutch Assemble (8L90) 1-3-5-6-7 Clutch Assemble (8L45) .	
1	1-3-5-6-7 Clutch Backing Plate Procedure 1. Assemble the tools as shown and clamp the **DT-50900** fixture to the bench. 2. Apply 30 pounds of pressure to the load gauge by turning the screw on the **DT-50900** fixture clockwise. 3. Ensure the plunger of the dial indicator is located on the backing plate.

4. Zero out the dial indicator.
5. Remove the pressure on the load gauge by turning the screw on the **DT-50900** fixture one full turn counterclockwise.
6. Apply compressed air to the indicated hole on the **DT-50905** air adapter and simultaneously adjust the screw on the **DT-50900** fixture to apply 30 pounds of pressure to the load gauge.
7. Observe the dial indicator measurement. Refer to Clutch Backing Plate Retaining Ring Specifications (8L90)Clutch Backing Plate Retaining Ring Specifications (8L45) to determine the correct 1-3-5-6-7 clutch backing plate retaining ring.

Special Tools

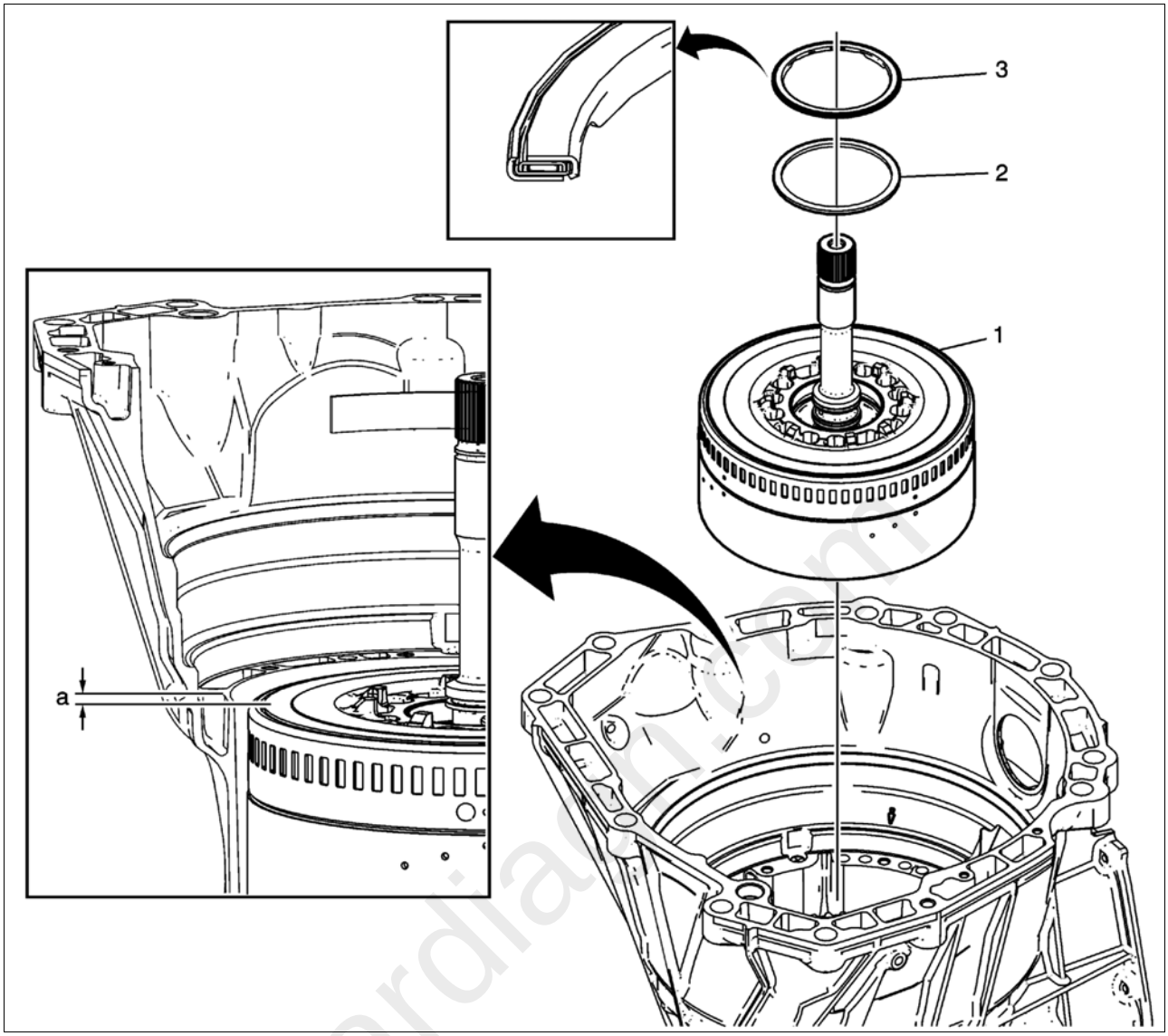
- **DT-50900** Clutch Travel Support Fixture
- **DT-50902** Adjustable Clutch Spring Compressor
- **DT-50903** Clutch Travel Load Gauge
- **DT-50905** Clutch Air Travel Adapter
- **GE-8001** Dial Indicator Set

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > 1-3-5-6-7 CLUTCH ASSEMBLY INSTALLATION

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Fig 1: 1-3-5-6-7 Clutch

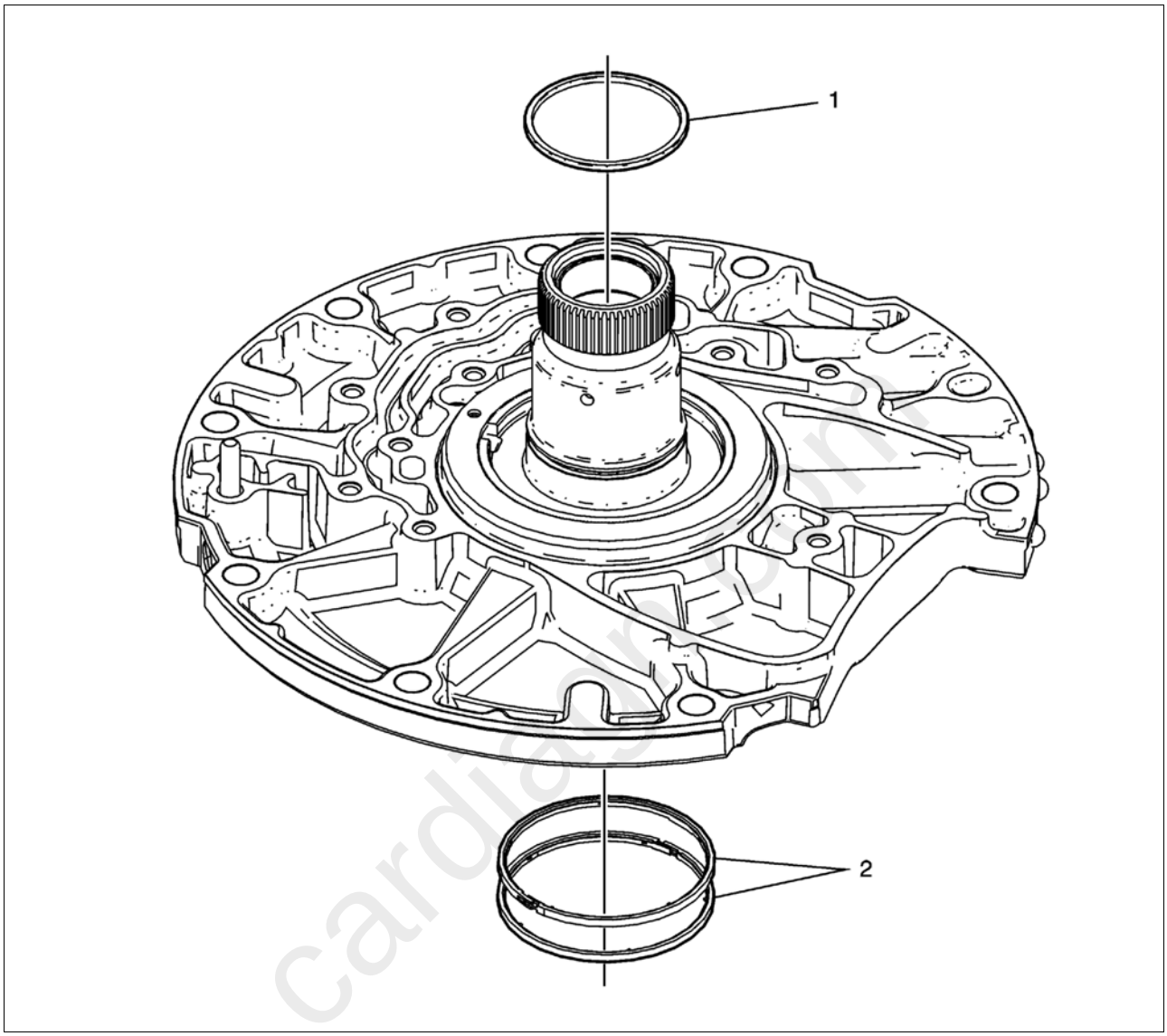


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1-3-5-6-7 Clutch Assembly *NOTE:* *Verify proper installation of the 1-3-5-6-7 clutch assembly by measuring as indicated (a). An approximate measurement of 6.49 mm (0.256 in) indicates correct installation.*
2	1-3-5-6-7 Clutch Thrust Bearing Washer
3	1-3-5-6-7 Clutch Thrust Bearing

REPAIR INSTRUCTIONS - OFF VEHICLE > STATOR SHAFT SUPPORT DISASSEMBLE

Fig 1: Stator Shaft Support

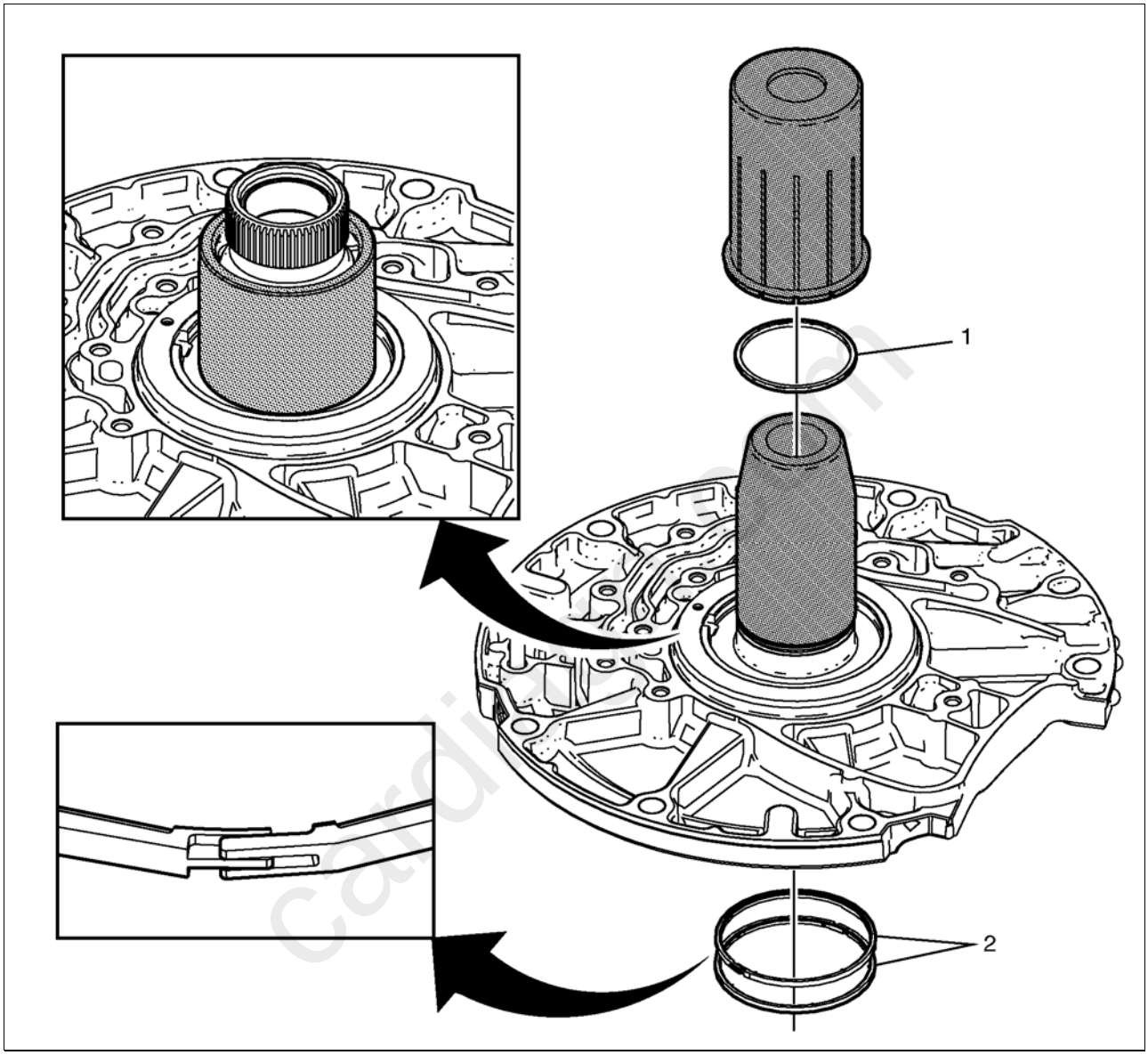


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: *Refer to Seal Reuse Caution .*	
1	Torque Converter Fluid Seal
2	1-3-5-6-7 Clutch Fluid Seal Ring (Qty: 2)

REPAIR INSTRUCTIONS - OFF VEHICLE > STATOR SHAFT SUPPORT ASSEMBLE (8L90)

Fig 1: Stator Shaft Support



Courtesy of GENERAL MOTORS COMPANY

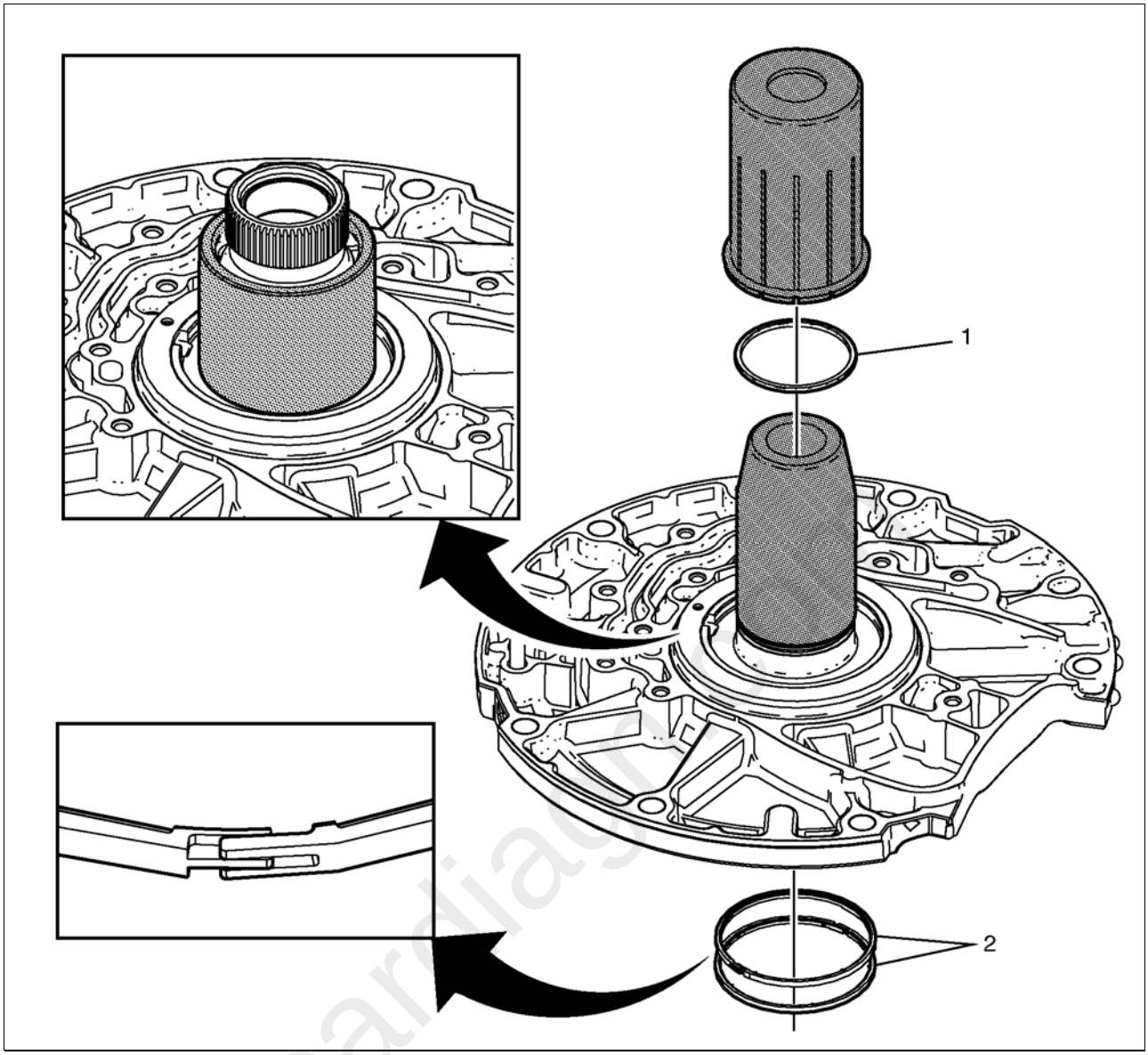
Callout	Component Name
1	Torque Converter Fluid Seal

	CAUTION: *Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.* *CAUTION:* *Size the fluid seal rings for at least 5 minutes after installation to obtain proper seal ring size. Failure to do so may cause internal transmission leaks and transmission damage.* **Procedure** Use the large taper side of **DT-50912-1** seal sizer for initial seal sizing, then flip the tool over for final sizing. **Special Tools** **DT-50912** Seal Installer For equivalent regional tools, refer to Special Tools .
2	1-3-5-6-7 Clutch Fluid Seal Ring (Qty: 2)

REPAIR INSTRUCTIONS - OFF VEHICLE > STATOR SHAFT SUPPORT ASSEMBLE (8L45)

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Fig 1: Stator Shaft Support



Courtesy of GENERAL MOTORS COMPANY

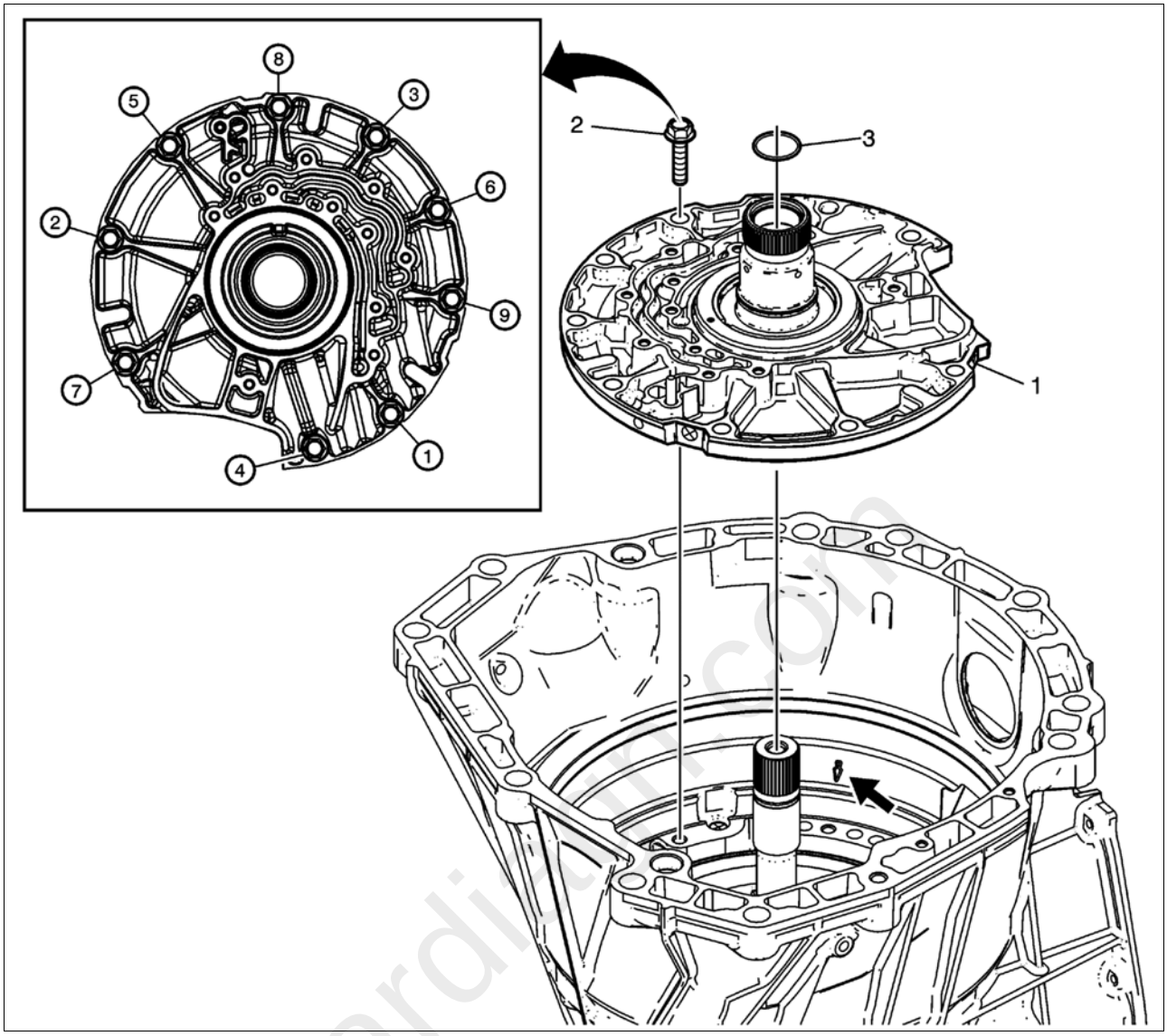
Callout	Component Name
1	Torque Converter Fluid Seal *CAUTION:* *Do not use old seal rings. Install NEW seal rings. Reusing old seal rings may cause internal transmission leaks and transmission damage.* *CAUTION:* *Size the fluid seal rings for at least 5 minutes after installation to obtain proper*

	seal ring size. Failure to do so may cause internal transmission leaks and transmission damage. Procedure 1. Use **DT-51196-1** seal protector and **DT-51196-2** seal pusher to install the seal. 2. Use the large taper side of **DT-50912-1** seal sizer for initial seal sizing, then flip the tool over for final sizing. Special Tools • **DT-50912** Seal Installer • **DT-51196** Seal Installer For equivalent regional tools, refer to Special Tools .
2	1-3-5-6-7 Clutch Fluid Seal Ring (Qty: 2)

REPAIR INSTRUCTIONS - OFF VEHICLE > STATOR SHAFT SUPPORT INSTALLATION

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Fig 1: Stator Shaft Support



Courtesy of GENERAL MOTORS COMPANY

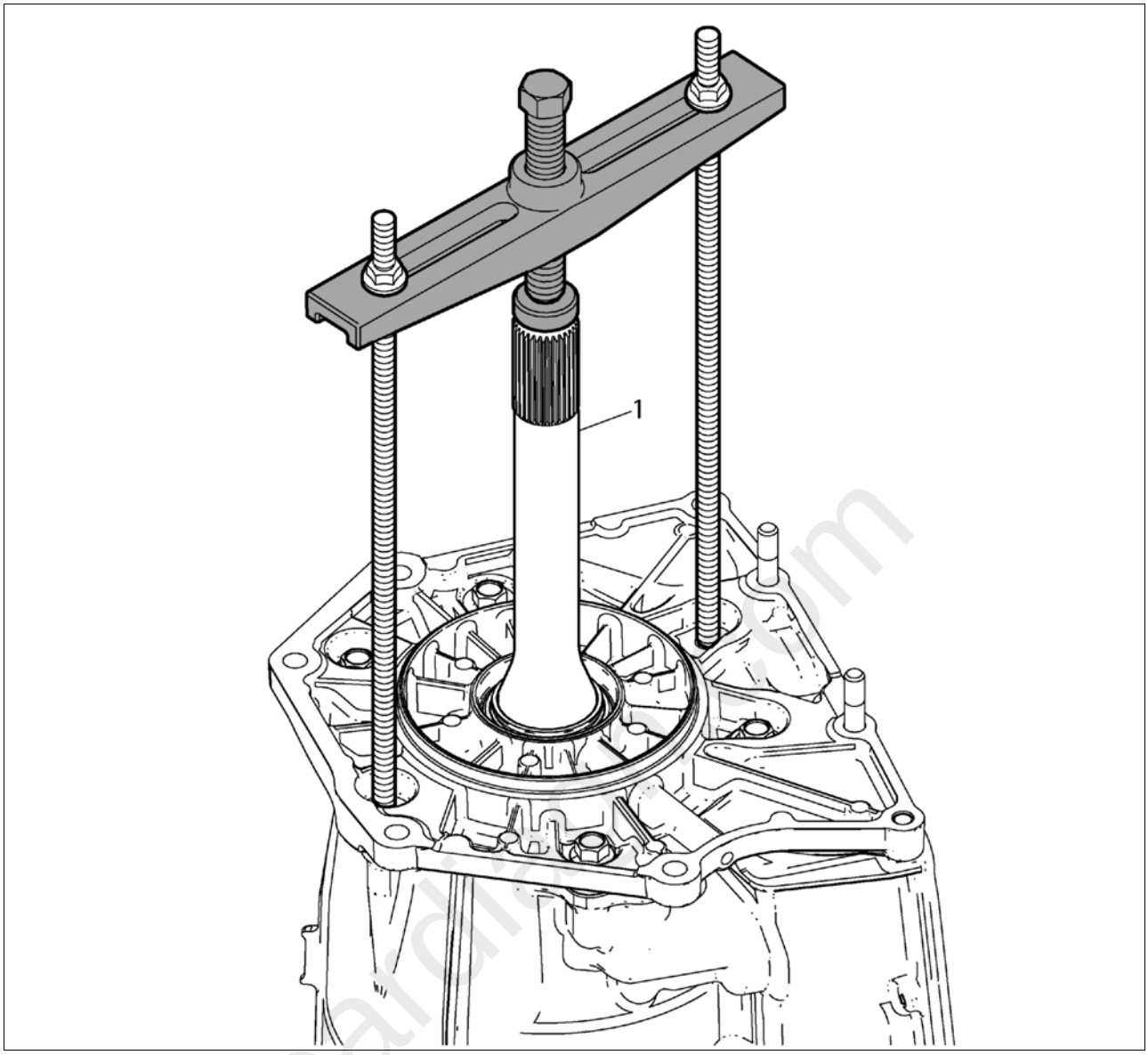
Callout	Component Name
1	Stator Support Shaft Assembly **Procedure** Align the bolt hole indicated by the arrow with the arrow that is cast into the case and push down to seat.
2	Stator Shaft Support Bolt M8 x 33 mm (Qty: 9) *CAUTION:* *Refer to Fastener Caution .*

	Procedure Tighten the bolts in the sequence shown. **Tighten** 35 N.m (26 lb ft)
3	Turbine Shaft O-ring Seal *NOTE:* *Install a NEW seal.*

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION END PLAY CHECK > TRANSMISSION END PLAY MEASUREMENT SET UP (STEP 1)

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Fig 1: Transmission End Play Measurement Set Up (Step 1)



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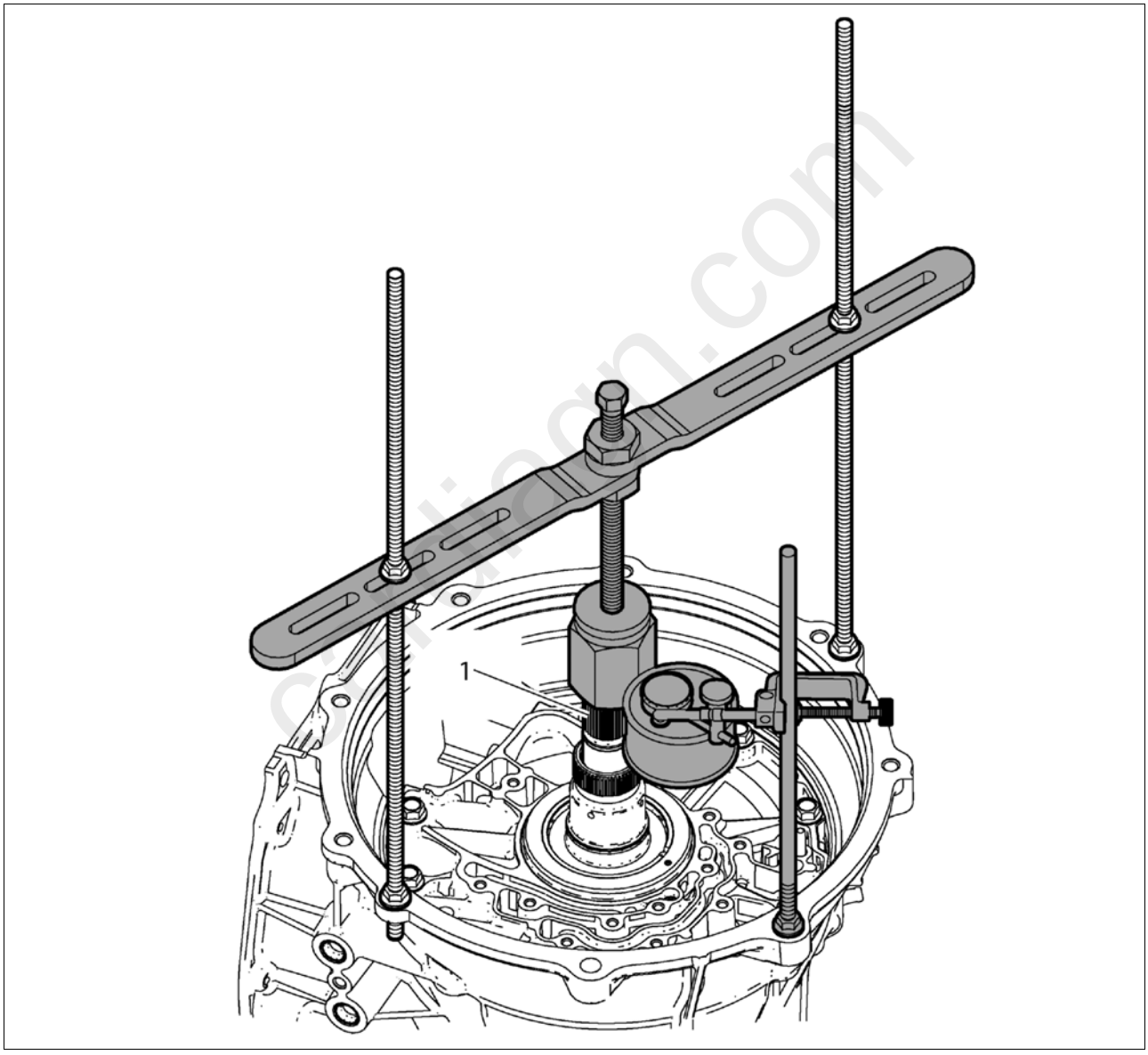
Transmission End Play Measurement Set Up (Step 1)

Callout	Component Name
1	Output Shaft Procedure 1. Install the **GE-8433-1** puller bar and thrust bearing from **DT-45124** removal bridge with two 16 in M10x1.5 threaded rods, nuts, and washers, as shown. 2. Loosely tighten the forcing screw on **GE-8433-1** puller bar. Special Tools

	• **DT-45124** Removal Bridge • **GE-8433-1** Puller Bar For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION END PLAY CHECK > TRANSMISSION END PLAY MEASUREMENT SET UP (STEP 2)

Fig 1: Transmission End Play Measurement Set Up (Step 2)



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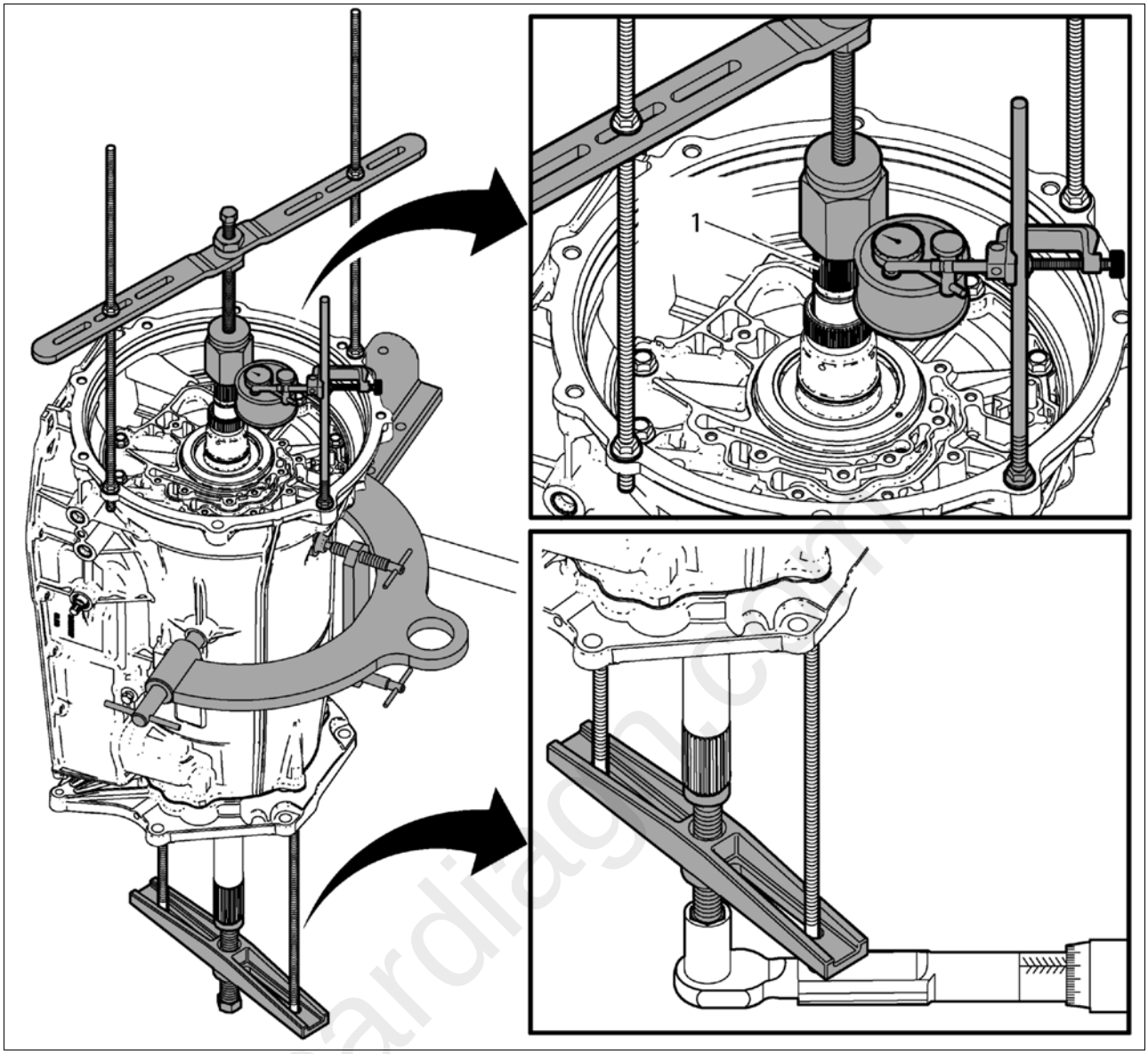
Transmission End Play Measurement Set Up (Step 2)

Callout	Component Name
1	Turbine Shaft Procedure 1. Rotate the transmission so the turbine shaft is facing up. 2. Install the **DT-48056** bridge with two 16 in 5/16-18 threaded rods, nuts and washers, as shown. 3. Install the **DT-50903** load gauge and secure with the **DT-48056** bridge forcing screw. 4. Install the **GE-8001** dial indicator in a suitable location. Special Tools • **DT-48056** Spring Compressor Bridge • **DT-50903** Clutch Travel Load Gauge • **GE-8001** Dial Indicator Set For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION END PLAY CHECK > TRANSMISSION END PLAY MEASUREMENT

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Fig 1: Transmission End Play Measurement



Courtesy of GENERAL MOTORS COMPANY

Transmission End Play Measurement

Callout	Component Name
1	Turbine Shaft Procedure 1. Ensure the foot of the dial indicator is flat with the load gauge face. 2. Apply 50 psi of pressure to **DT-50903** load gauge and zero out the dial indicator. 3. Using a torque wrench, tighten the forcing screw on **GE-8433-1** puller bar to 10 N.m (90 lb in).

4. Observe the dial indicator measurement. Refer to 1-3-5-6-7 Clutch Thrust Bearing Washer Specifications to determine the correct 1-3-5-6-7 clutch thrust bearing washer.

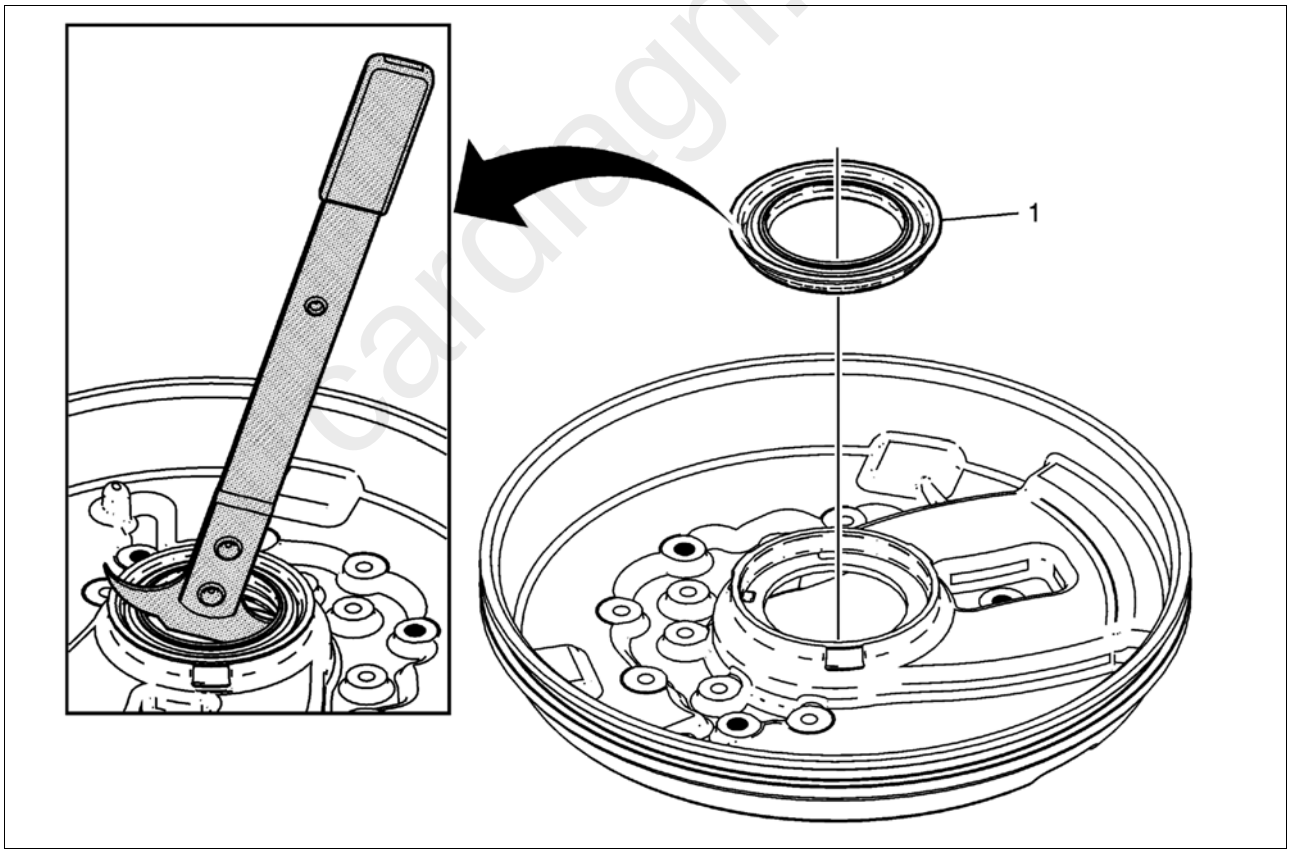
Special Tools

- **DT-45124** Removal Bridge
- **DT-48056** Spring Compressor Bridge
- **DT-50903** Clutch Travel Load Gauge
- **GE-8001** Dial Indicator Set
- **GE-8433-1** Puller Bar

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TORQUE CONVERTER FLUID SEAL REMOVAL

Fig 1: Torque Converter Fluid Seal Removal



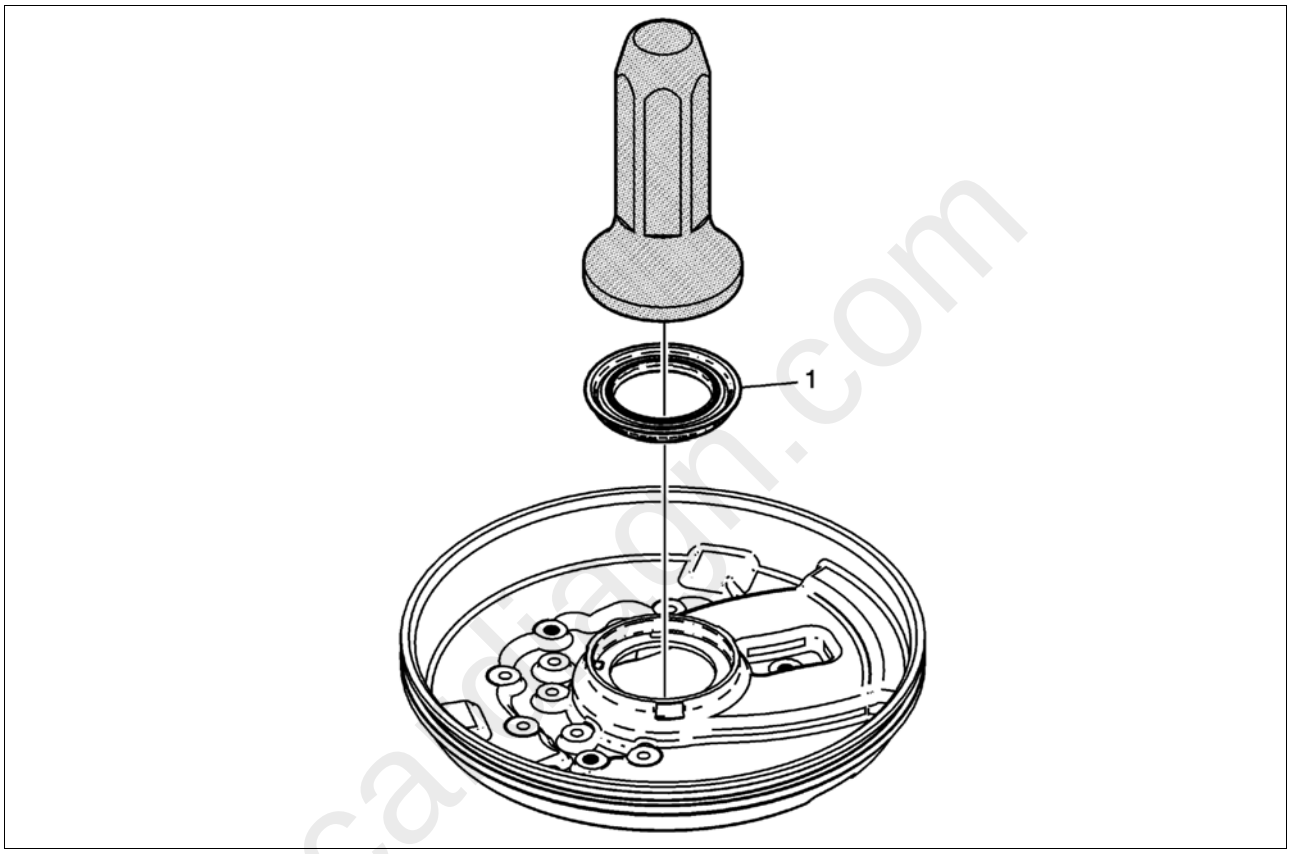
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

1	Torque Converter Fluid Seal **Special Tools** **DT-45000** Seal Remover For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TORQUE CONVERTER FLUID SEAL INSTALLATION

Fig 1: Torque Converter Fluid Seal Installation

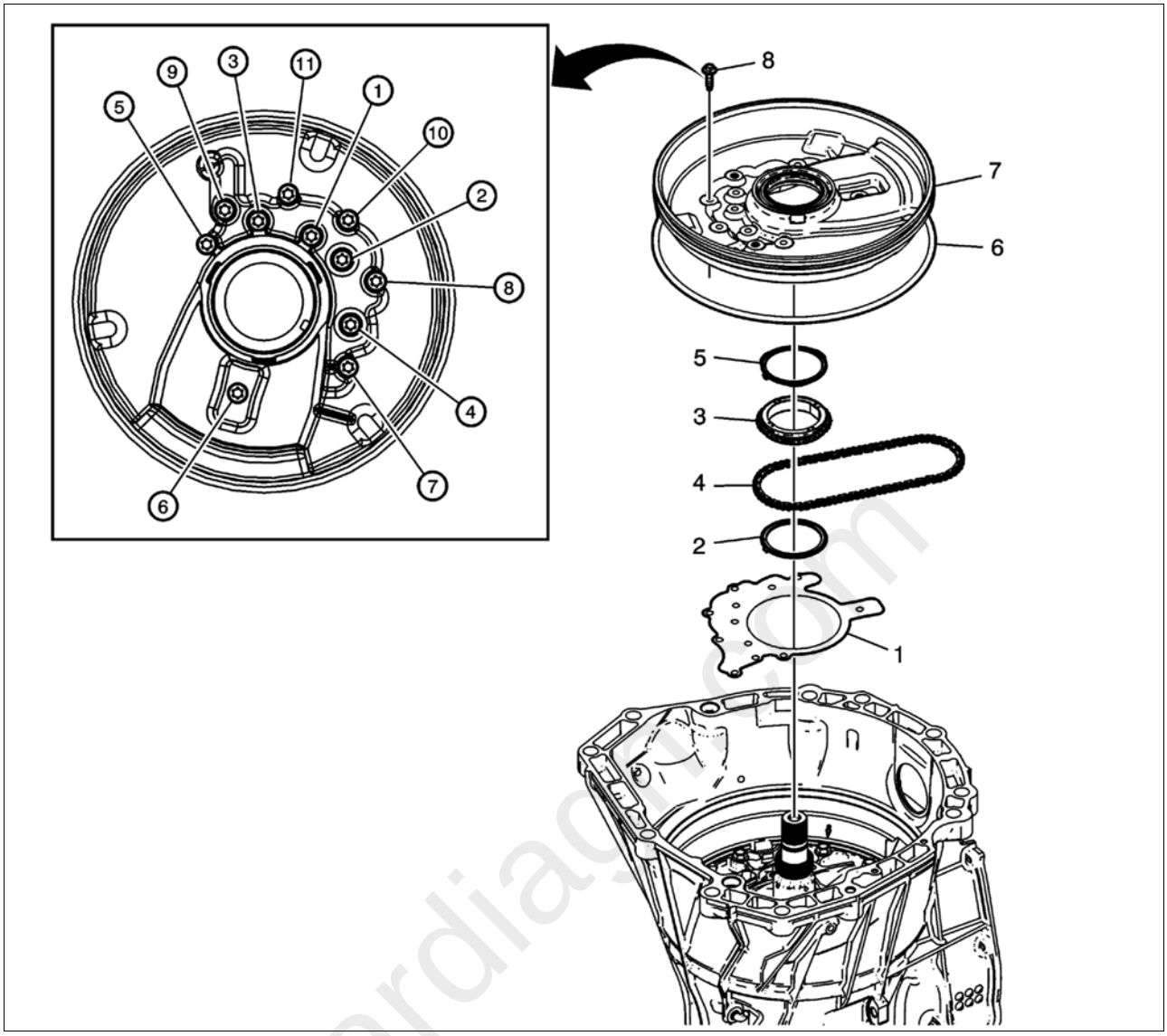


Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter Fluid Seal **Special Tools** **DT-43772** Torque Converter Seal Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION CASE FRONT COVER AND DRIVE LINK INSTALLATION

Fig 1: Transmission Case Front Cover and Drive Link



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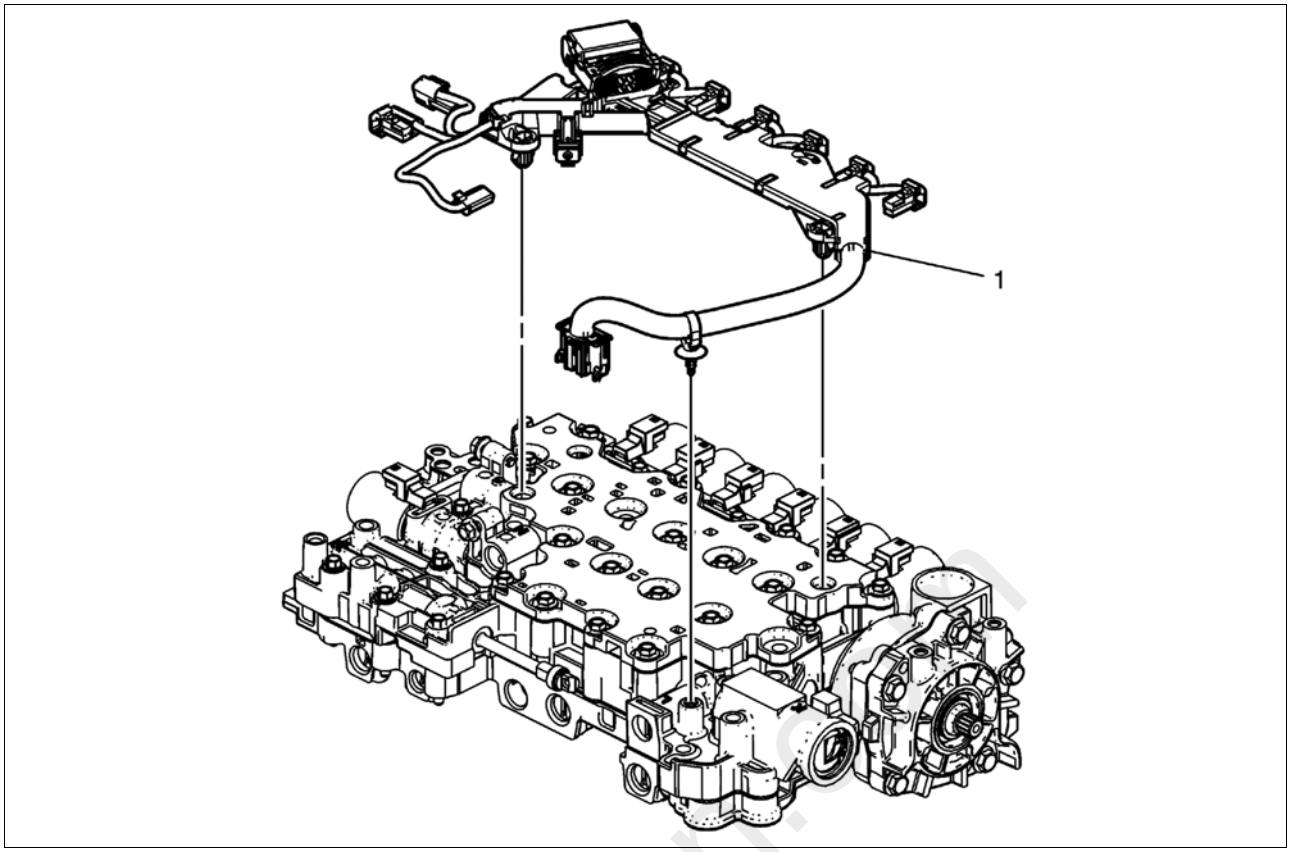
Callout	Component Name
1	Automatic Transmission Front Support Cover Gasket *NOTE:* *Install a NEW gasket.*
2	Drive Sprocket Thrust Washer (Rear)
3	Drive Sprocket
4	Drive Link Assembly

5	Drive Sprocket Thrust Washer (Front)
6	Automatic Transmission Front Cover Seal *NOTE:* *Install a NEW seal.*
7	Automatic Transmission Front Cover *NOTE:* *Ensure the drive link assembly is not pinched by the front cover and moves freely on the drive sprocket.*
8	Automatic Transmission Front Cover Bolt M6 x 30 (Qty: 11) *CAUTION:* *Refer to Fastener Caution .* **Procedure** *NOTE:* *Use NEW bolts.* Tighten the bolts in the sequence shown. 1. Tighten the bolts a first pass to 6.5 N.m (58 lb in). 2. Tighten the bolts a final pass 30 Degrees.

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY DISASSEMBLE > AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS REMOVAL

Fig 1: Automatic Transmission Control Wiring Harness



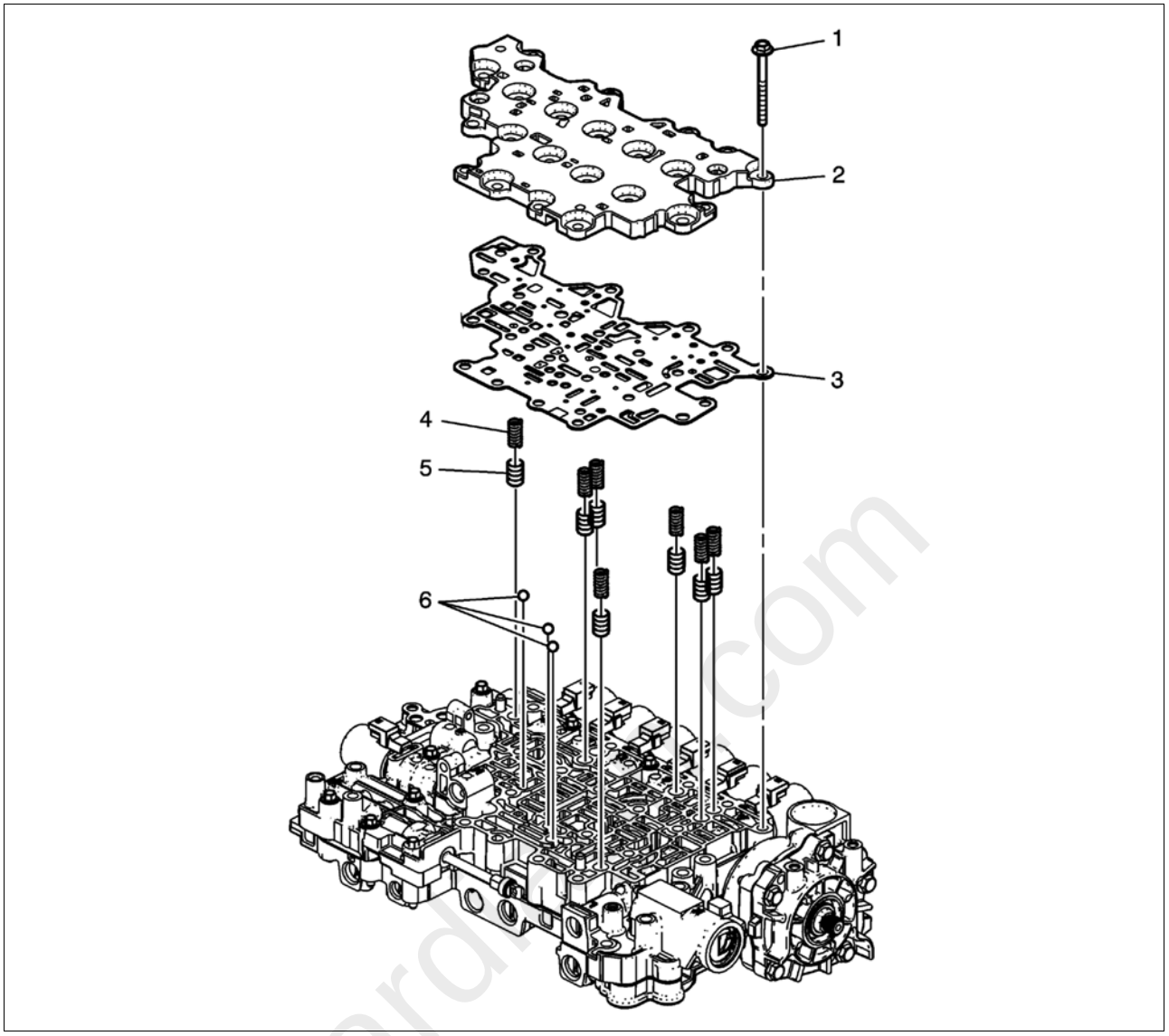
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Control Wiring Harness Removal

Callout	Component Name
1	Automatic Transmission Control Wiring Harness **Procedure** Disconnect the wiring harness connectors. *NOTE:* *Discard the wiring harness clips, they are not reusable.*

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY DISASSEMBLE > CONTROL VALVE CHANNEL PLATE REMOVAL

Fig 1: Control Valve Channel Plate



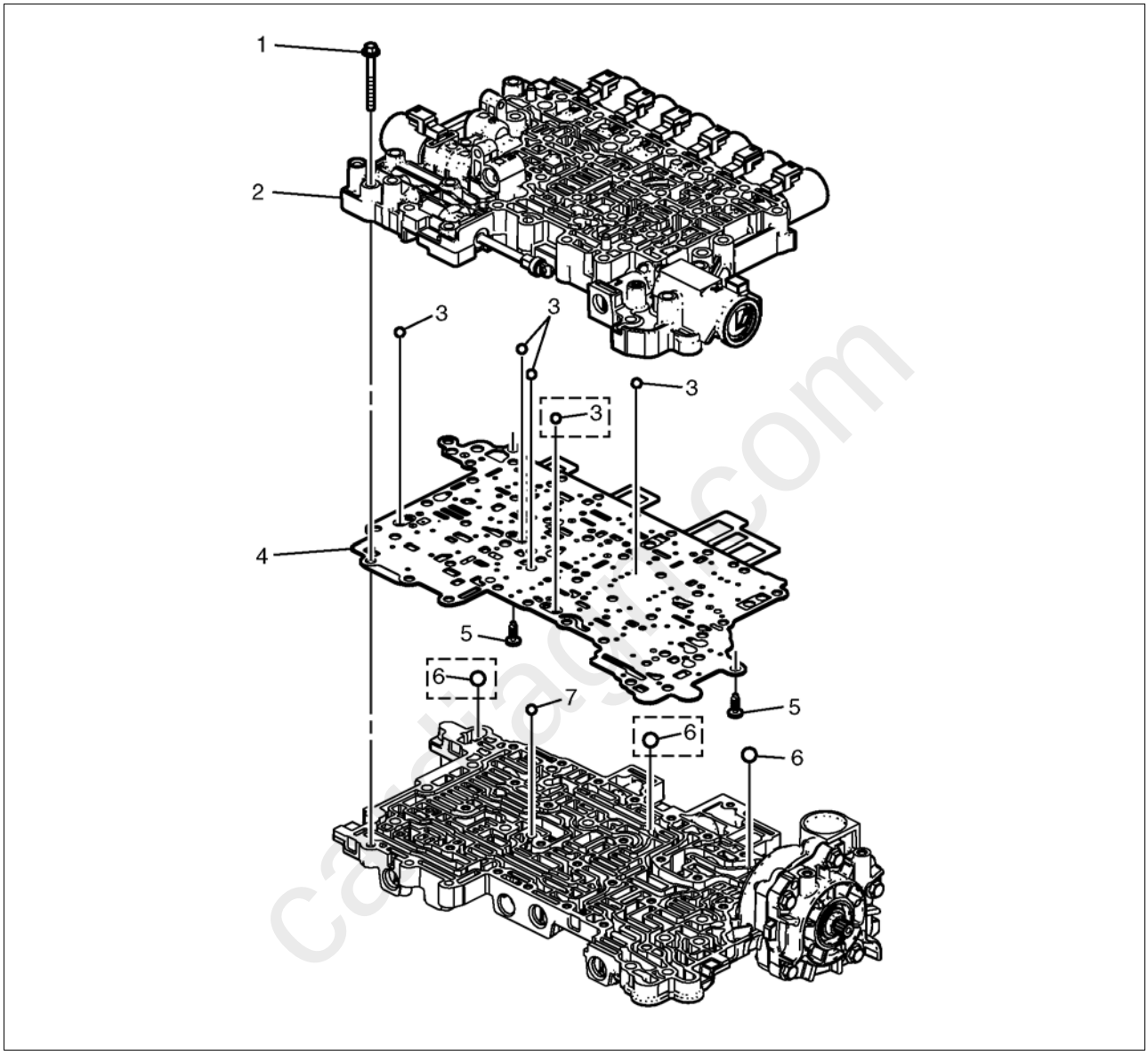
Courtesy of GENERAL MOTORS COMPANY

Control Valve Channel Plate Removal

Callout	Component Name
1	Control Valve Channel Plate Bolt M5 x 55 (Qty: 19)
2	Control Valve Channel Plate
3	Control Valve Channel Plate Spacer Plate *CAUTION:* *Do not use the old spacer plate. Install a NEW spacer plate. Reusing an old spacer plate may cause internal transmission leaks and transmission damage.*

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY DISASSEMBLE > CONTROL VALVE SOLENOID BODY ASSEMBLY REMOVAL

Fig 1: Control Valve Solenoid Body Assembly



Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Assembly Removal

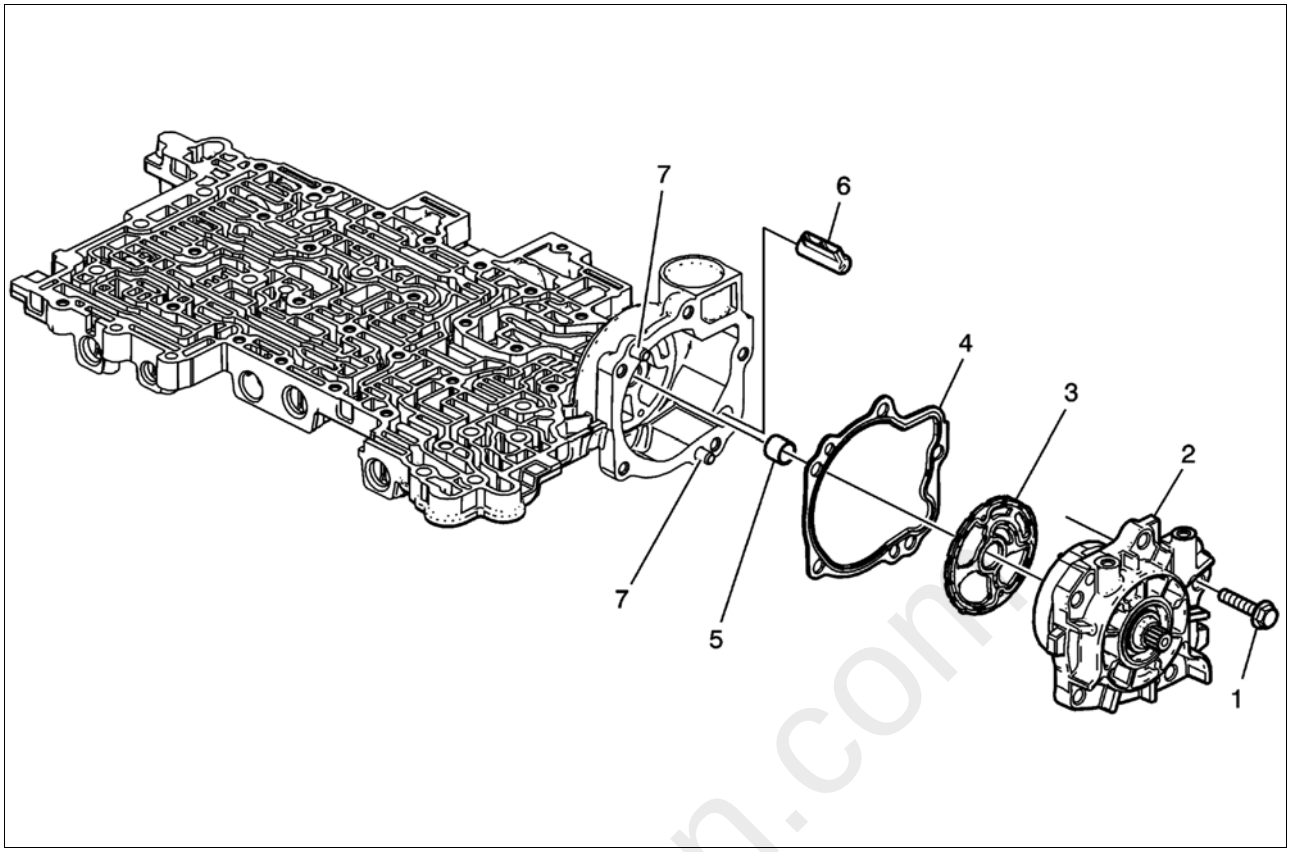
Callout	Component Name
1	Control Valve Solenoid Body Bolt M5 x 45 (Qty: 8)
2	Control Valve Solenoid Body Assembly

3	Cooler Flow Blowoff Ball Valve (Qty: 4 or 5 Model Dependent) *NOTE:* *Note the position of the ball check valves.*
4	Control Valve Body Spacer Plate Assembly *CAUTION:* *Do not use the old spacer plate. Install a NEW spacer plate. Reusing an old spacer plate may cause internal transmission leaks and transmission damage.*
5	Spacer Plate Retainer (Qty: 2) *NOTE:* *Discard the retainers, they are not reusable.*
6	Automatic Transmission Auxiliary Fluid Pump Ball Check Valve (Qty: 1 Without Surge Accumulator) (Qty: 3 With Surge Accumulator) *NOTE:* *Note the position of the ball check valve.*
7	Cooler Flow Blowoff Ball Valve (Qty: 1) *NOTE:* *Note the position of the ball check valve.*

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY DISASSEMBLE > AUTOMATIC TRANSMISSION FLUID PUMP ASSEMBLY REMOVAL

Fig 1: Automatic Transmission Fluid Pump Assembly



Courtesy of GENERAL MOTORS COMPANY

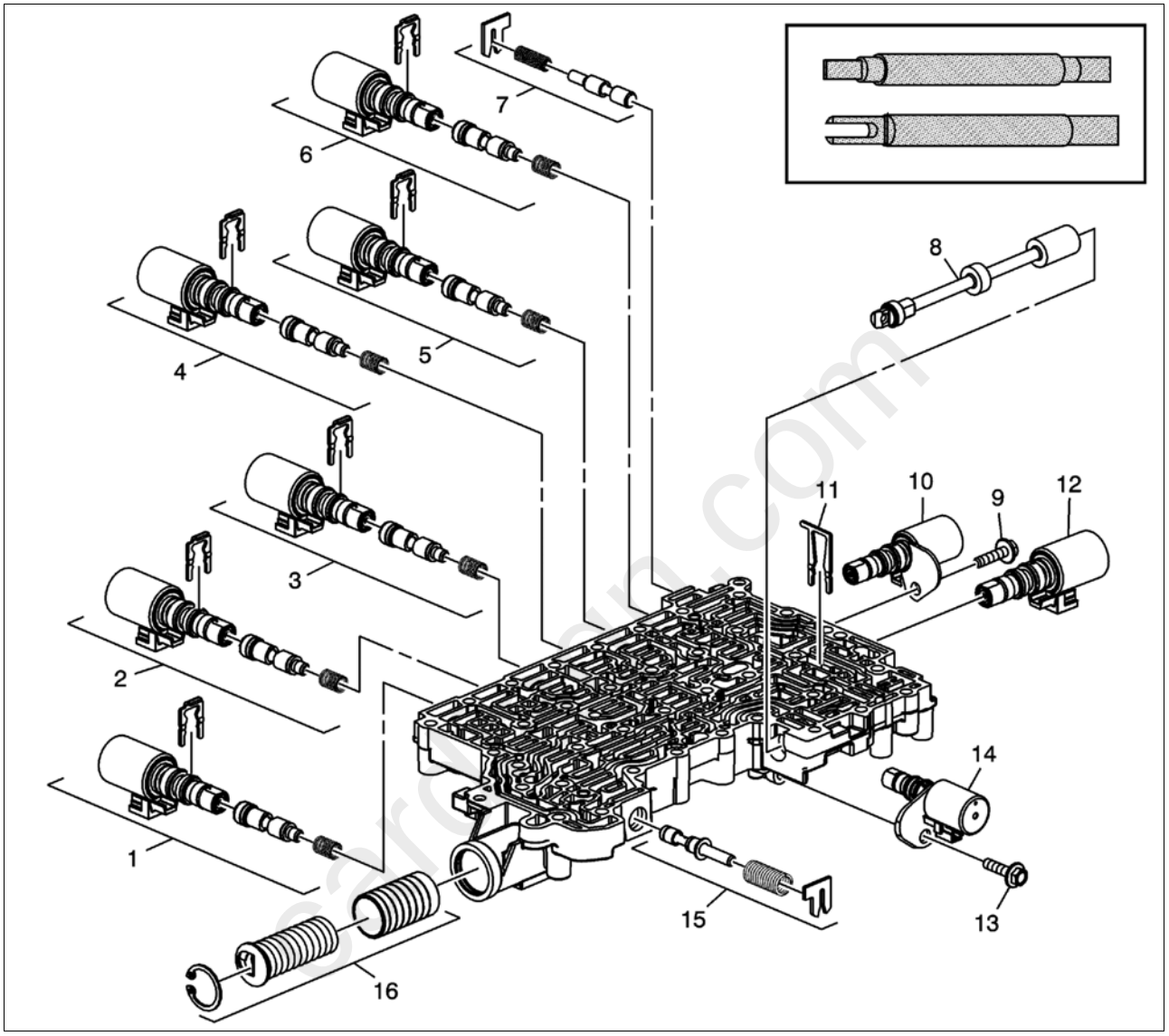
Automatic Transmission Fluid Pump Assembly Removal

Callout	Component Name
1	Automatic Transmission Fluid Pump Bolt M6 x 28 (Qty: 5)
2	Automatic Transmission Fluid Pump Assembly
3	Automatic Transmission Fluid Pump Seal *NOTE:* *Discard the seal, it is not reusable.*
4	Automatic Transmission Fluid Pump Gasket *NOTE:* *Discard the gasket, it is not reusable.*

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE SOLENOID BODY CLEANING AND INSPECTION

Fig 1: Control Valve Solenoid Body Exploded View



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.

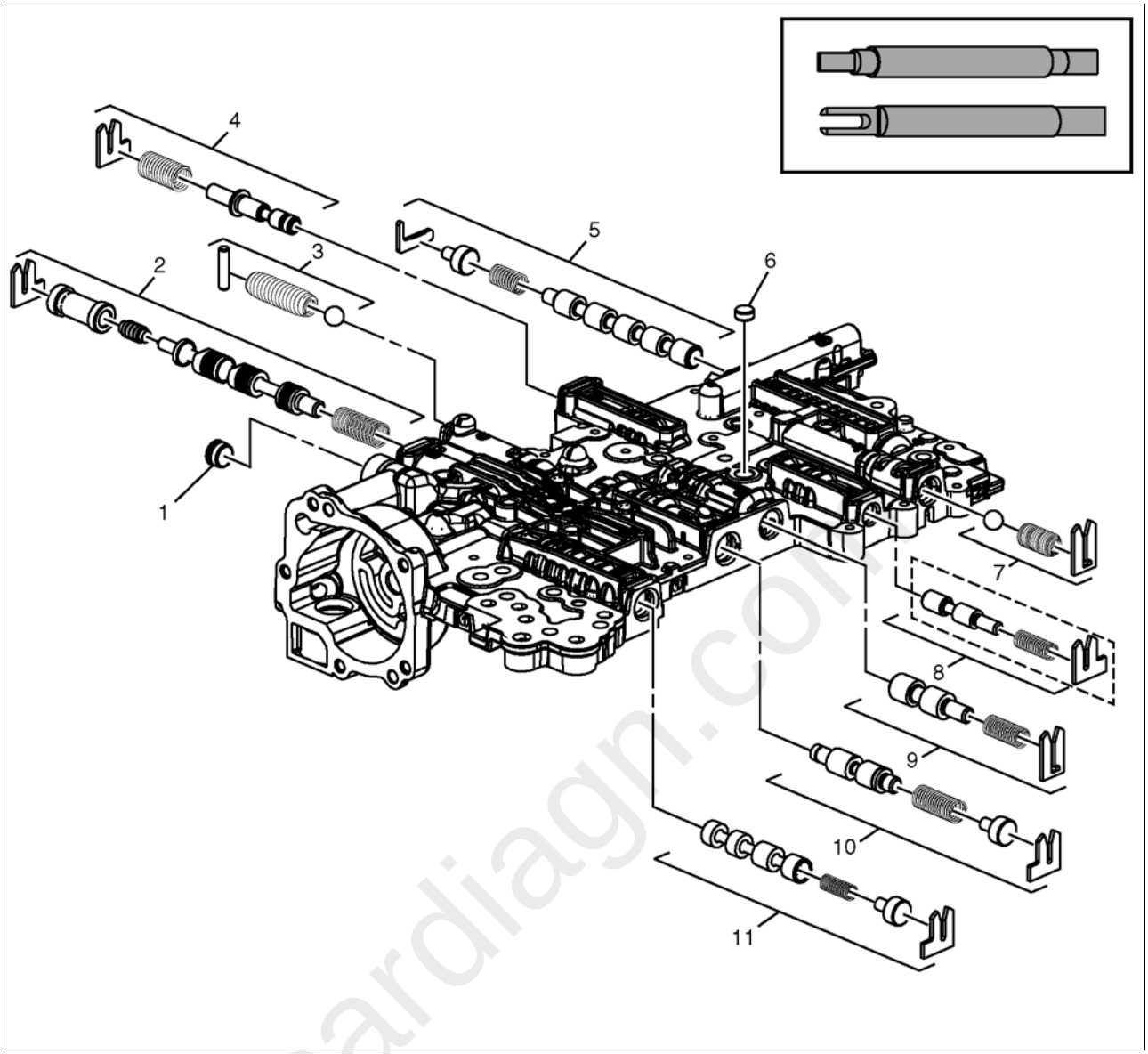
Preliminary Procedure Clean and inspect all valve components and the valve body. The control valve lower body is replaceable only as an assembly.**Special Tools DT-50914** Solenoid Valve Retainer Remover/InstallerFor equivalent regional tools, refer to Special Tools .

1	TCC Control Solenoid Valve Train
2	2-3-4-6-8 Control Solenoid Valve Train
3	1-3-5-6-7 Control Solenoid Valve Train
4	4-5-6-7-8 Reverse Control Solenoid Valve Train
5	1-2-7-8 Reverse Control Solenoid Valve Train
6	1-2-3-4-5 Reverse Low Solenoid Valve Train
7	1-2-3-4-5 Reverse Clutch Boost Valve Train
8	Manual Valve
9	Solenoid Valve Assembly Bolt
10	Default Control Solenoid Valve
11	Control Solenoid Valve Retainer
12	Line Pressure Control Solenoid Valve
13	Solenoid Valve Assembly Bolt
14	1-2-3-4-5 Reverse Boost Solenoid Valve
15	Converter Feed Limit Valve
16	1-3-5-6-7 Accumulator Piston

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE UPPER BODY ASSEMBLY CLEANING AND INSPECTION

Fig 1: Control Valve Upper Body Assembly Exploded View



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.

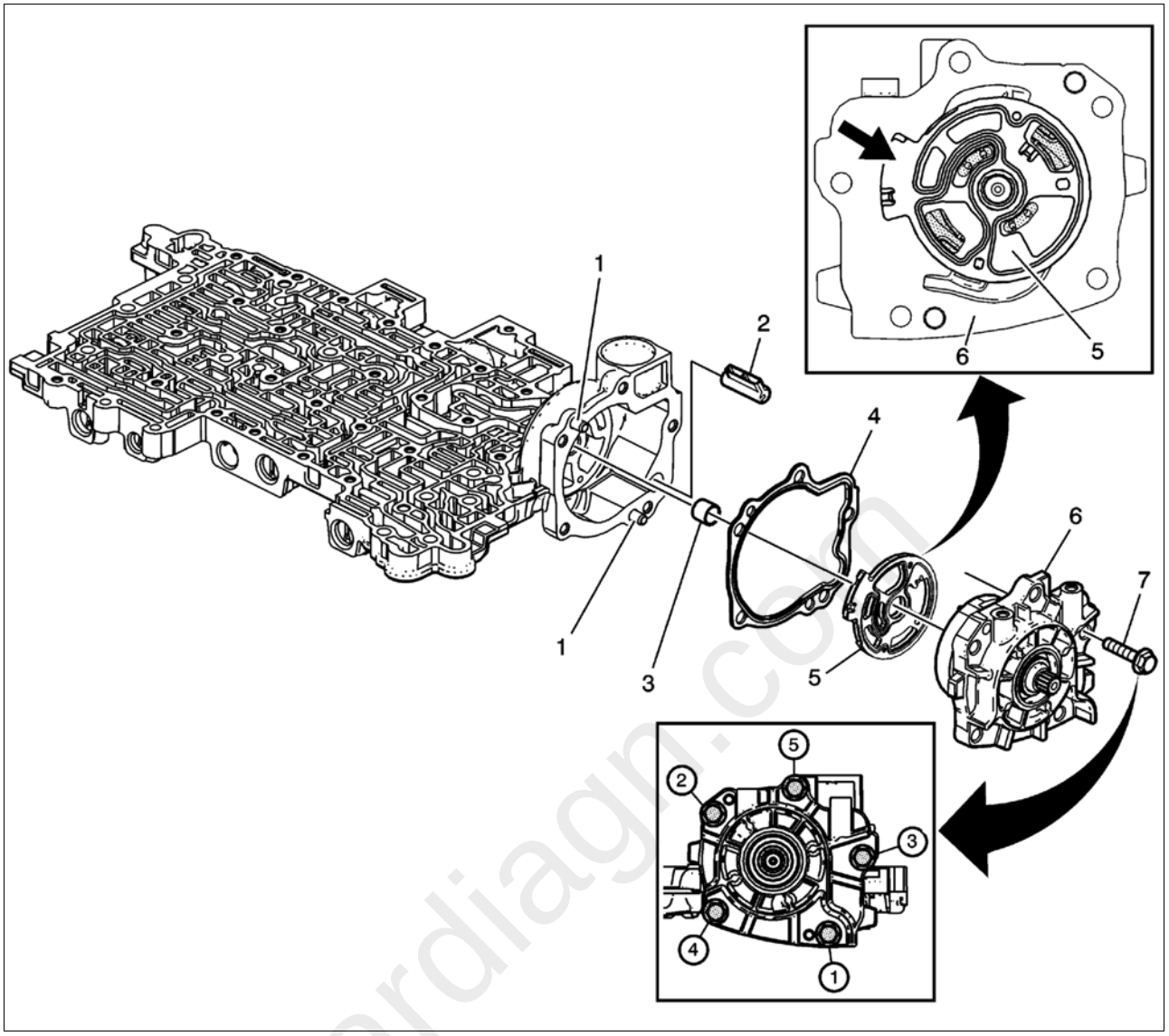
Preliminary Procedure Clean and inspect all valve components and the valve body. The control valve lower body is replaceable only as an assembly.**Special Tools DT-50914** Solenoid Valve Retainer Remover/InstallerFor equivalent regional tools, refer to Special Tools .

1	Transmission Fluid Passage Plug
2	Pressure Regulator Valve Train
3	Pressure Relief Ball Valve Train
4	Actuator Feed Limit Valve Train
5	Default Override Valve Train
6	Control Valve Center Body Hole Plug
7	Clutch Piston Exhaust Blowoff Ball Valve Train
8	Lube Override Enable Valve - Model Dependent
9	TCC Valve Train
10	Lube Regulator Valve Train
11	TCC Control Valve Train

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY ASSEMBLE > AUTOMATIC TRANSMISSION FLUID PUMP ASSEMBLY INSTALLATION

Fig 1: Automatic Transmission Fluid Pump Assembly



Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Assembly Installation

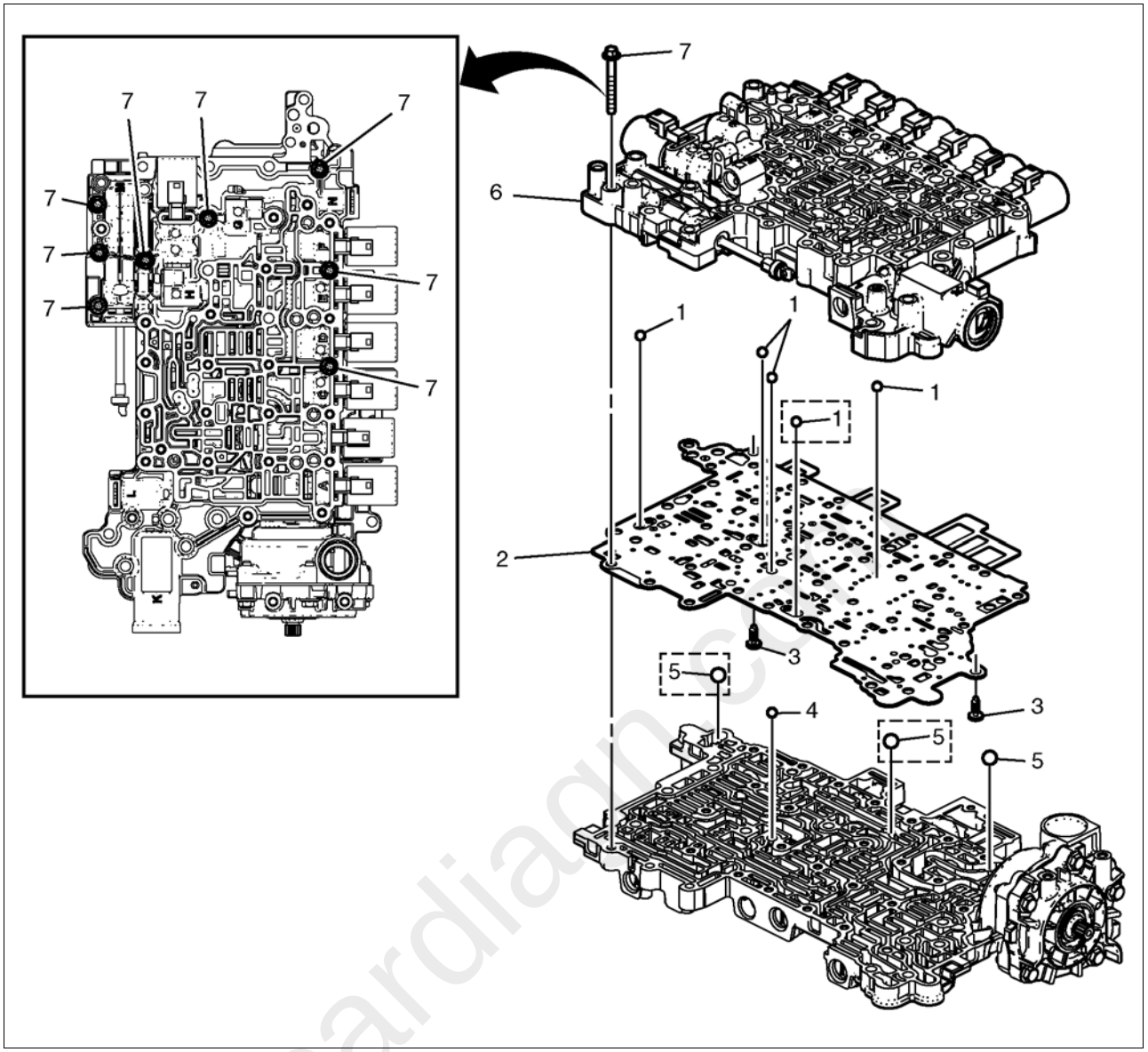
Callout	Component Name
1	Automatic Transmission Fluid Pump Locator Pin (Qty: 2)
2	Automatic Transmission Fluid Passage Sleeve
3	Automatic Transmission Fluid Pump Drive Shaft Bushing
4	Automatic Transmission Fluid Pump Gasket

	NOTE: *Install a NEW gasket, it is not reusable.*
5	Automatic Transmission Fluid Pump Seal **Procedure** Install the seal onto the pump as shown. "Side Up", indicated by the arrow, should face away from the pump assembly. *NOTE:* *Install a NEW seal, it is not reusable.*
6	Automatic Transmission Fluid Pump Assembly
7	Automatic Transmission Fluid Pump Bolt M6 x 28 (Qty: 5) *CAUTION:* *Refer to Fastener Caution .* **Procedure** Tighten the bolts in the sequence shown. **Tighten** 9 N.m (80 lb in)

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY ASSEMBLE > CONTROL VALVE SOLENOID BODY ASSEMBLY INSTALLATION

Fig 1: Control Valve Solenoid Body Assembly



Courtesy of GENERAL MOTORS COMPANY

Control Valve Solenoid Body Assembly Installation

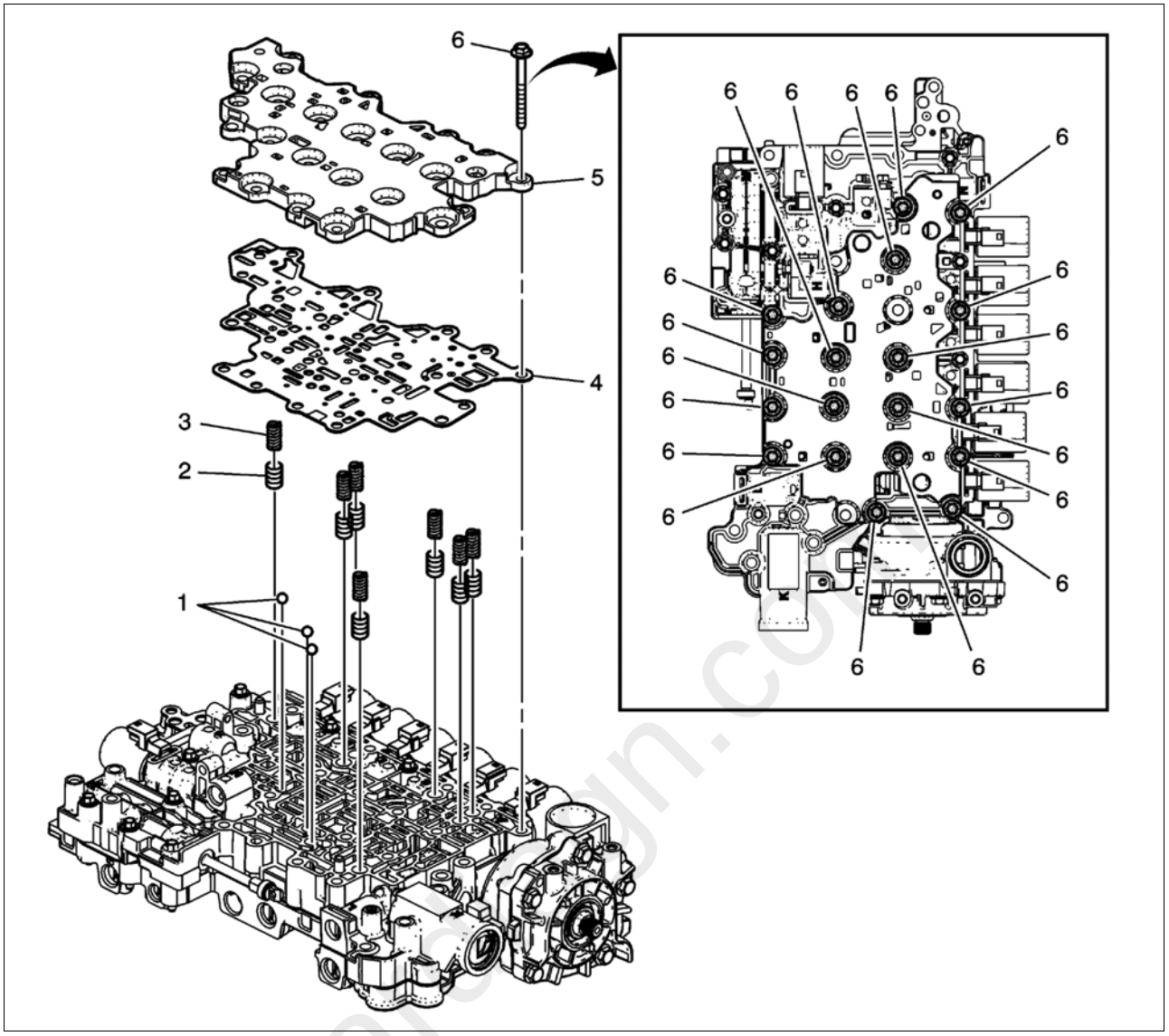
Callout	Component Name
1	Cooler Flow Blowoff Ball Valve (Qty: 4 or 5 - Model Dependent) *CAUTION:* *Refer to Ball Check Valve Grease Caution .* **Procedure**

	Install the ball check valves in the correct location in the control valve solenoid body. Refer to Ball Check Valve Locations .
2	Control Valve Body Spacer Plate Assembly *CAUTION:* *Do not use the old spacer plate. Install a NEW spacer plate. Reusing an old spacer plate may cause internal transmission leaks and transmission damage.*
3	Spacer Plate Retainer (Qty: 2)
4	Cooler Flow Blowoff Ball Valve (Qty: 1) *CAUTION:* *Refer to Ball Check Valve Grease Caution .*
5	Automatic Transmission Auxiliary Fluid Pump Ball Check Valve (Qty: 1 Without Surge Accumulator) (Qty: 3 With Surge Accumulator) *CAUTION:* *Refer to Ball Check Valve Grease Caution .*
6	Control Valve Solenoid Body Assembly
7	Control Valve Solenoid Body Bolt M5 x 45 (Qty: 8) **Procedure** Hand tighten the bolts.

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY ASSEMBLE > CONTROL VALVE CHANNEL PLATE INSTALLATION

Fig 1: Control Valve Channel Plate



Courtesy of GENERAL MOTORS COMPANY

Control Valve Channel Plate Installation

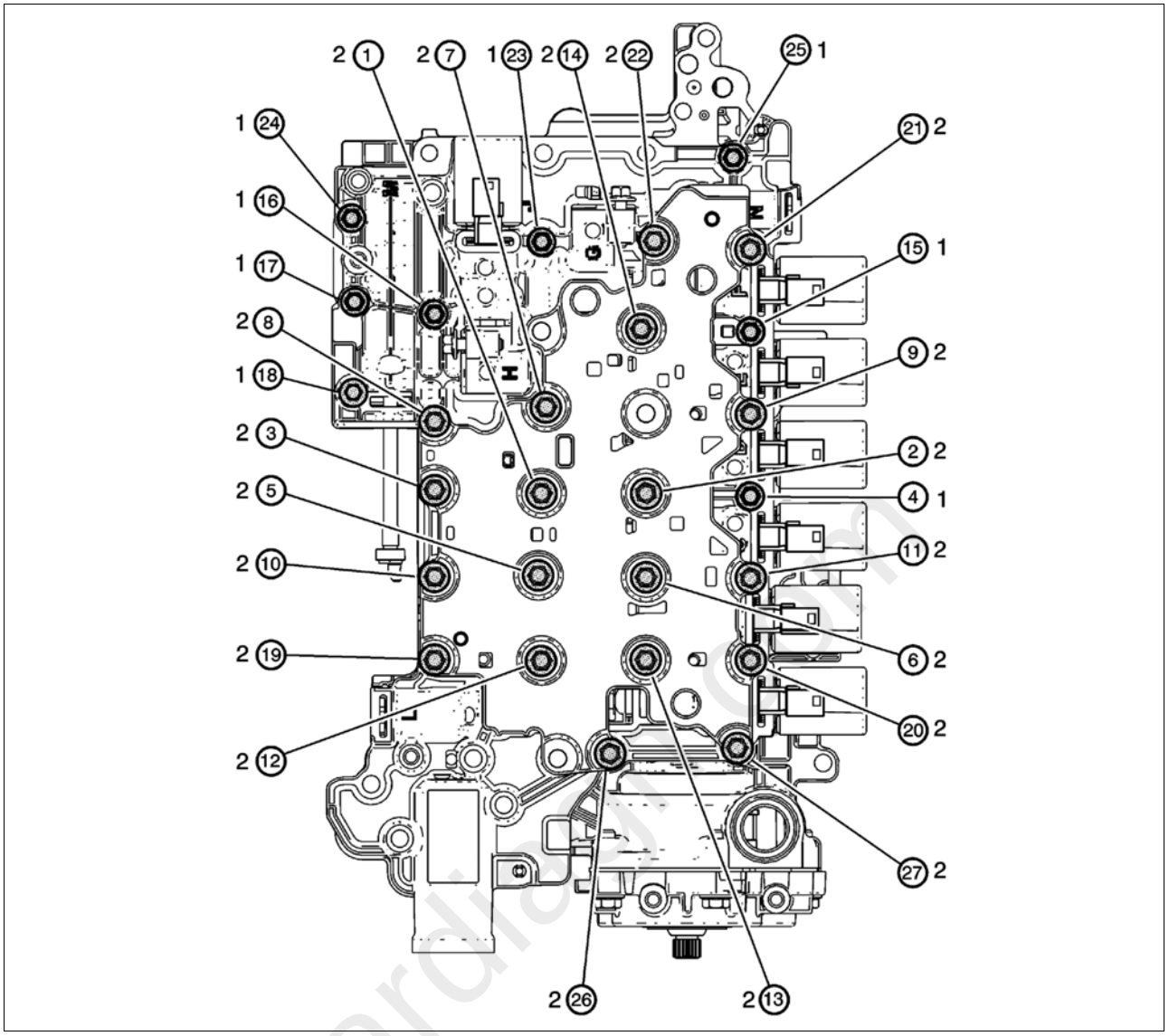
Callout	Component Name
1	Cooler Flow Blowoff Ball Valve (Qty: 3) *CAUTION:* *Refer to Ball Check Valve Grease Caution .*
2	Signal Accumulator Piston (Qty: 7)
3	Signal Accumulator Piston Spring (Qty: 7)

4	Control Valve Channel Plate Spacer Plate *CAUTION:* *Do not use the old spacer plate. Install a NEW spacer plate. Reusing an old spacer plate may cause internal transmission leaks and transmission damage.*
5	Control Valve Channel Plate
6	Control Valve Channel Plate Bolt M5 x 55 (Qty: 19) **Procedure** Hand tighten the bolts.

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY ASSEMBLE > CONTROL VALVE BODY BOLT TORQUE SEQUENCE

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Fig 1: Control Valve Body Bolt Identification And Bolt Torque Sequence



Courtesy of GENERAL MOTORS COMPANY

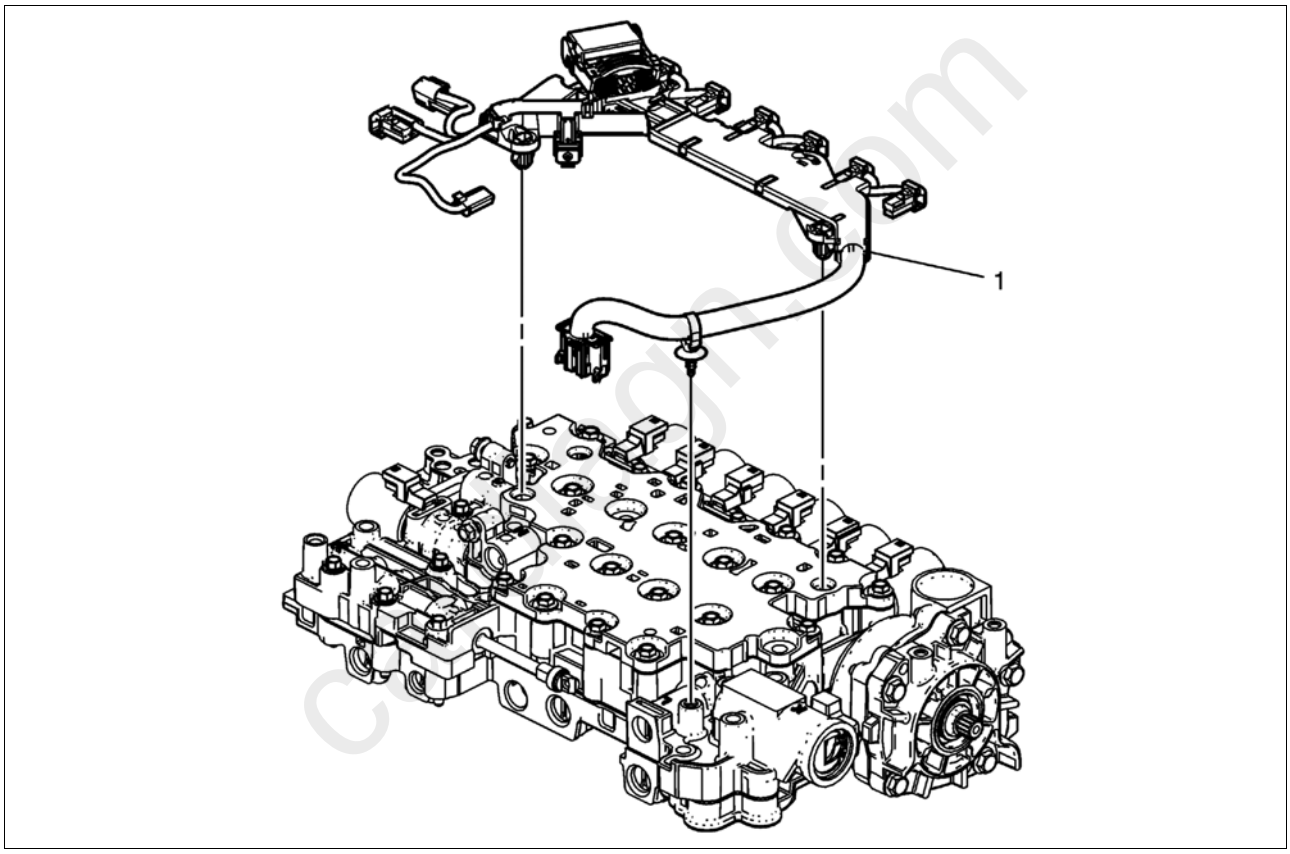
Control Valve Body Bolt Torque Sequence

Callout	Component Name
CAUTION: *Bolt torque sequencing is critical to the proper function of the control solenoid valve assembly. Failure to follow the required sequencing may result in transmission malfunction.*	
Procedure Tighten all 27 bolts in the sequence shown.	

1	Control Valve Solenoid Body Bolt M5 x 45 (Qty: 8) **Tighten** 8 N.m (71 lb in)
2	Control Valve Channel Plate Bolt M5 x 55 (Qty: 19) **Tighten** 8 N.m (71 lb in)

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE BODY ASSEMBLY ASSEMBLE > AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS INSTALLATION

Fig 1: Automatic Transmission Control Wiring Harness



Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Control Wiring Harness Installation

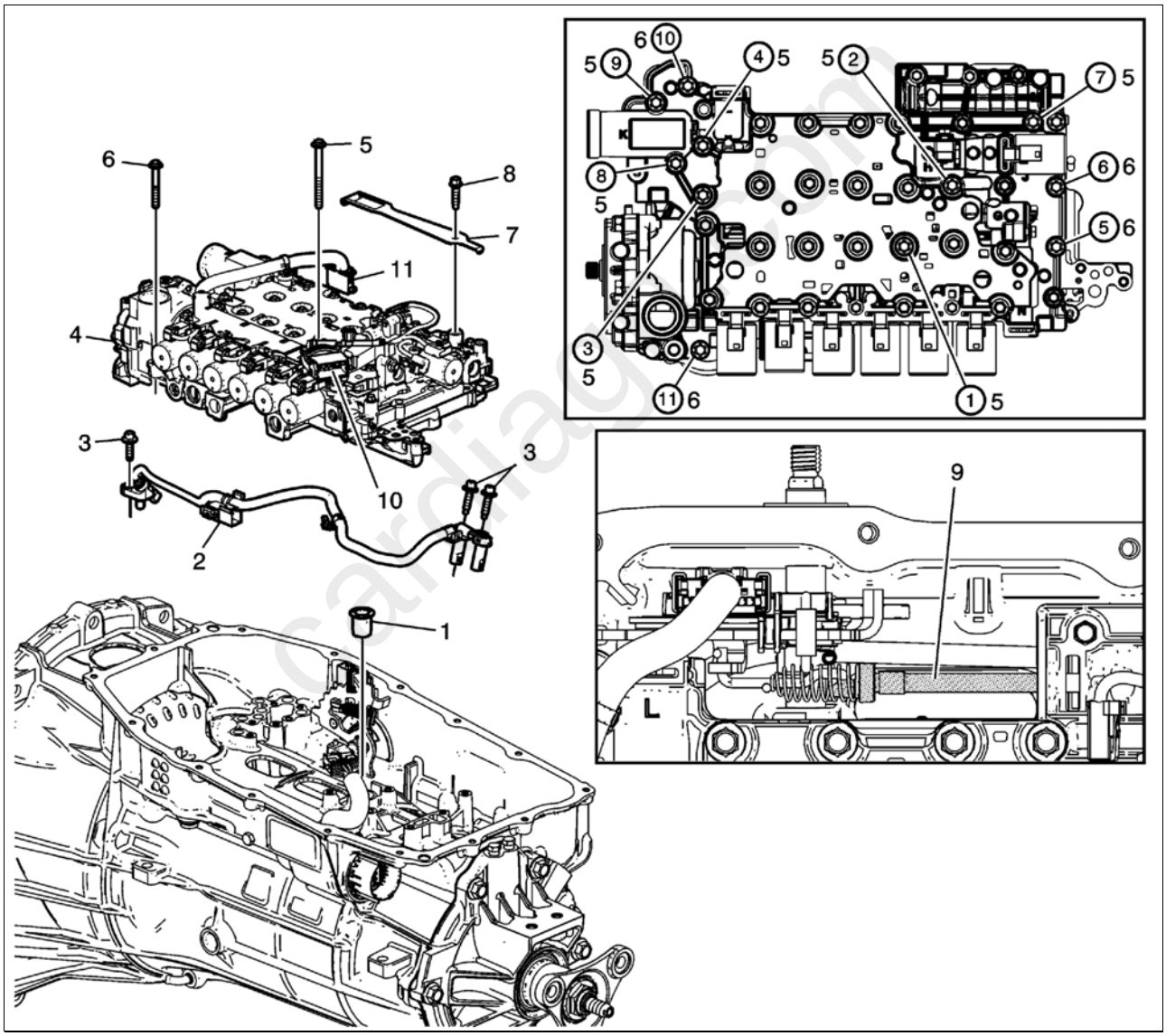
Callout	Component Name
1	Automatic Transmission Control Wiring Harness **Procedure** Connect the wiring harness connectors.

NOTE:

Install NEW wiring harness clips, they are not reusable.

REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE ASSEMBLY AND TRANSMISSION WIRING HARNESS INSTALLATION > CONTROL VALVE BODY ASSEMBLY INSTALLATION

Fig 1: Control Valve Body



Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Assembly Installation

Callout	Component Name
1	Clutch Housing Fluid Passage Seal *NOTE:* *Use a NEW seal.*
2	Output Speed Sensor Wiring Harness
3	Output Speed Sensor Wiring Harness Bolt M6 x 25 (Qty: 3) *CAUTION:* *Refer to Fastener Caution .* *CAUTION:* *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.* *NOTE:* *Install NEW bolts.* **Procedure** 1. Tighten the bolts a first pass to 4 N.m (35 lb in). 2. Tighten the bolts a final pass to 45 Degrees. **Special Tools** **DT-48285** Valve Body Torx Plus Socket For equivalent regional tools, refer to Special Tools .
4	Control Valve Body Assembly

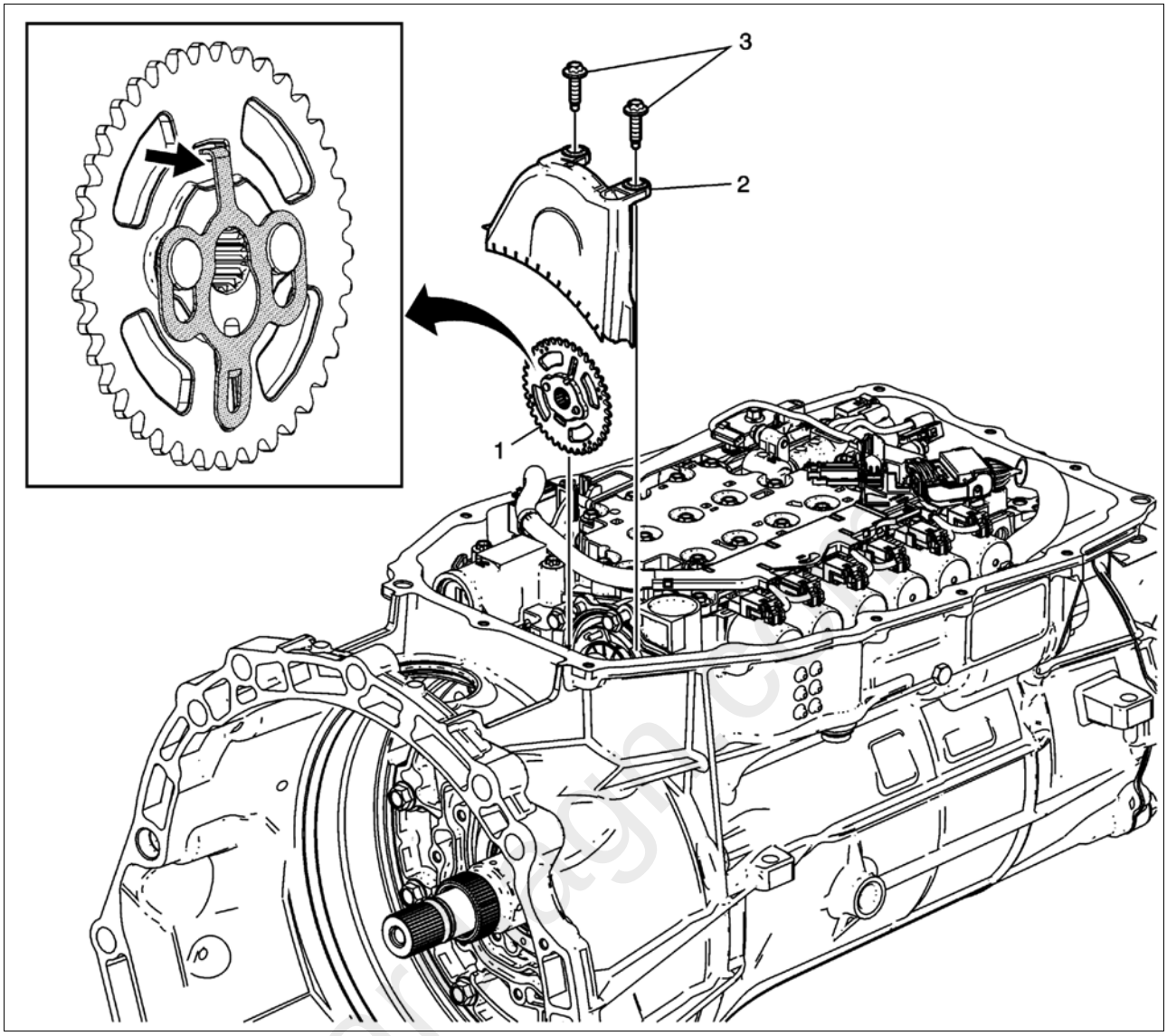
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	CAUTION: *Use care when handling the control valve body assembly. If dropped, damage to the control solenoid valve body assembly internal components may result.* Procedure 1. Connect the automatic transmission wiring harness connector to the valve body. 2. Connect the manual valve link to the manual valve.
5	Control Valve Solenoid Body Bolt M6 x 45 (Qty: 4) **Procedure** Tighten the bolts in the sequence shown. **Tighten** 9 N.m (80 lb in)
6	Control Valve Solenoid Body Bolt M6 x 68 (Qty: 7) **Procedure** Tighten the bolts in the sequence shown. **Tighten** 9 N.m (80 lb in)
7	Manual Shaft Detent Lever Spring
8	Manual Shaft Detent Lever Spring Bolt M6 x 25 (Qty: 1) **Tighten** 12 N.m (106 lb in)
9	Manual Valve **Procedure** Connect the manual valve to the manual valve link.
10	A/Trans Wiring Harness **Procedure** Connect the wiring harness connector to the A/Trans control wiring harness.
11	A/Trans Control Wiring Harness **Procedure** Connect the wiring harness connector to the manual shift shaft position switch.

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REPAIR INSTRUCTIONS - OFF VEHICLE > CONTROL VALVE ASSEMBLY AND TRANSMISSION WIRING HARNESS INSTALLATION > A/TRANS FLUID BAFFLE AND DRIVEN SPROCKET INSTALLATION

Fig 1: A/Trans Fluid Baffle and Driven Sprocket



Courtesy of GENERAL MOTORS COMPANY

A/Trans Fluid Baffle and Driven Sprocket Installation

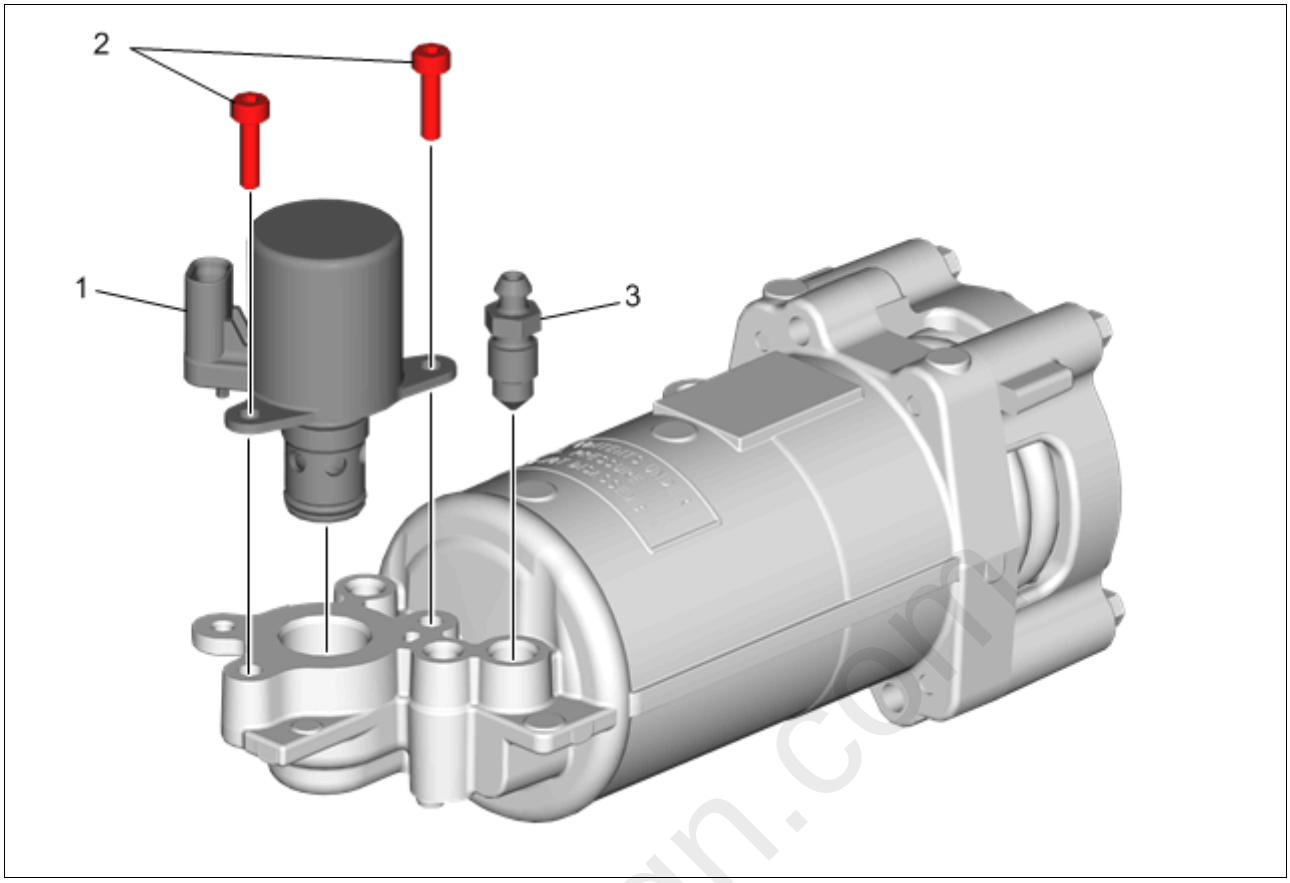
Callout	Component Name
1	Driven Sprocket Procedure *NOTE:* *Ensure the driven sprocket locking tab is in the unlocked position before installing the sprocket.*

	1. The driven sprocket locking tab is located on the back of the sprocket and faces the pump. 2. Install the drive link (chain) to the driven sprocket and then install the driven sprocket to the oil pump shaft. 3. Rotate the sprocket as shown and push down on the tab until it locks the driven sprocket in place.
2	A/Trans Fluid Baffle
3	A/Trans Fluid Baffle Bolt M6 x 25 (Qty: 2) *CAUTION:* *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.* *NOTE:* *Install NEW bolts.* **Tighten** 4 N.m (35 lb in) +45 Degrees

REPAIR INSTRUCTIONS - OFF VEHICLE > AUXILIARY FLUID ACCUMULATOR INSTALLATION (WITH START/STOP)

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Fig 1: Auxiliary Fluid Accumulator Installation (With Stop/Start)



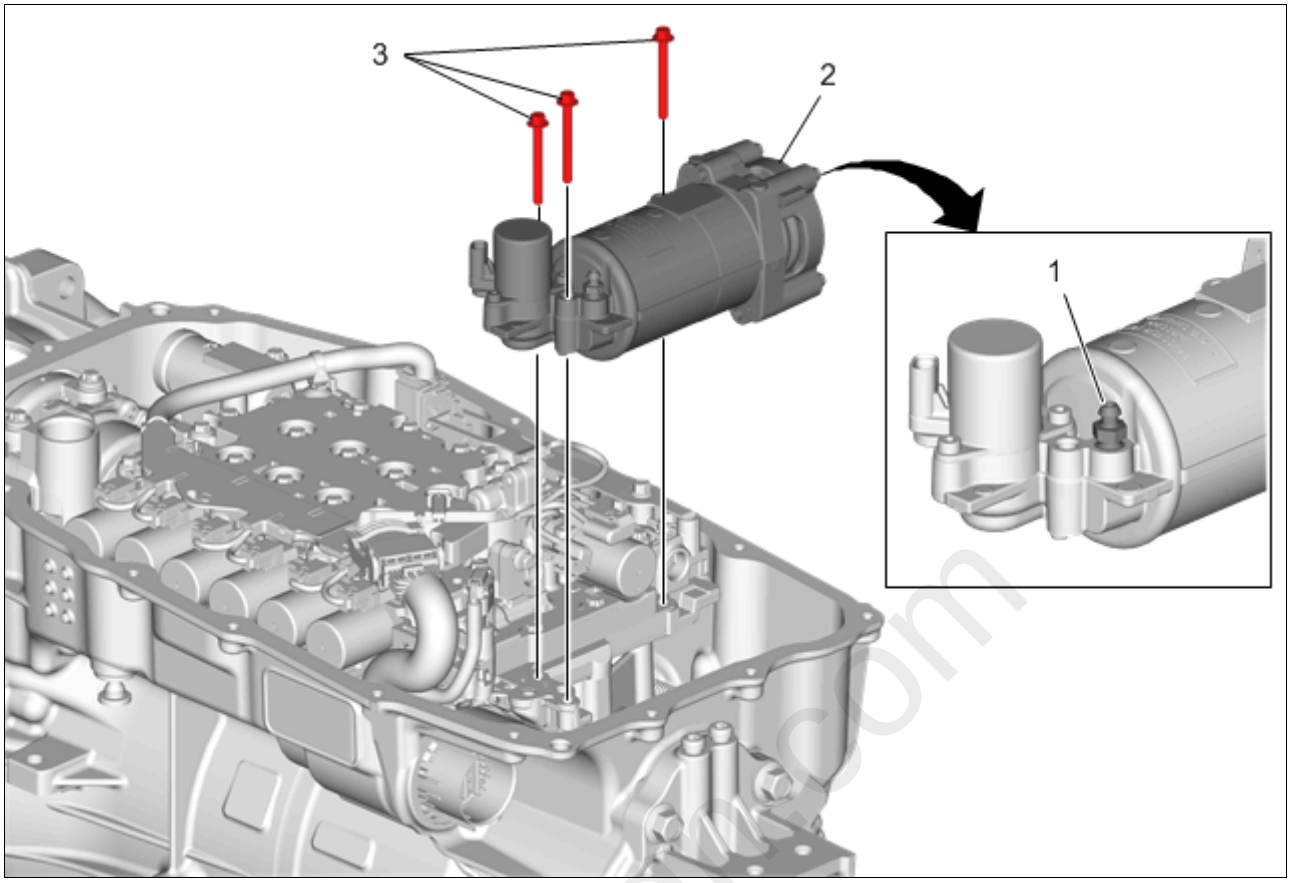
Courtesy of GENERAL MOTORS COMPANY

Auxiliary Fluid Accumulator Solenoid and Bleeder Valve Installation

Callout	Component Name
1	A/Trans Auxiliary Fluid Accumulator Solenoid
2	A/Trans Auxiliary Fluid Accumulator Solenoid Bolts (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 3 N.m (27 lb in)
3	A/Trans Auxiliary Fluid Accumulator Bleeder Valve **Tighten** 11 N.m (97 lb in)

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Fig 2: Auxiliary Fluid Accumulator



Courtesy of GENERAL MOTORS COMPANY

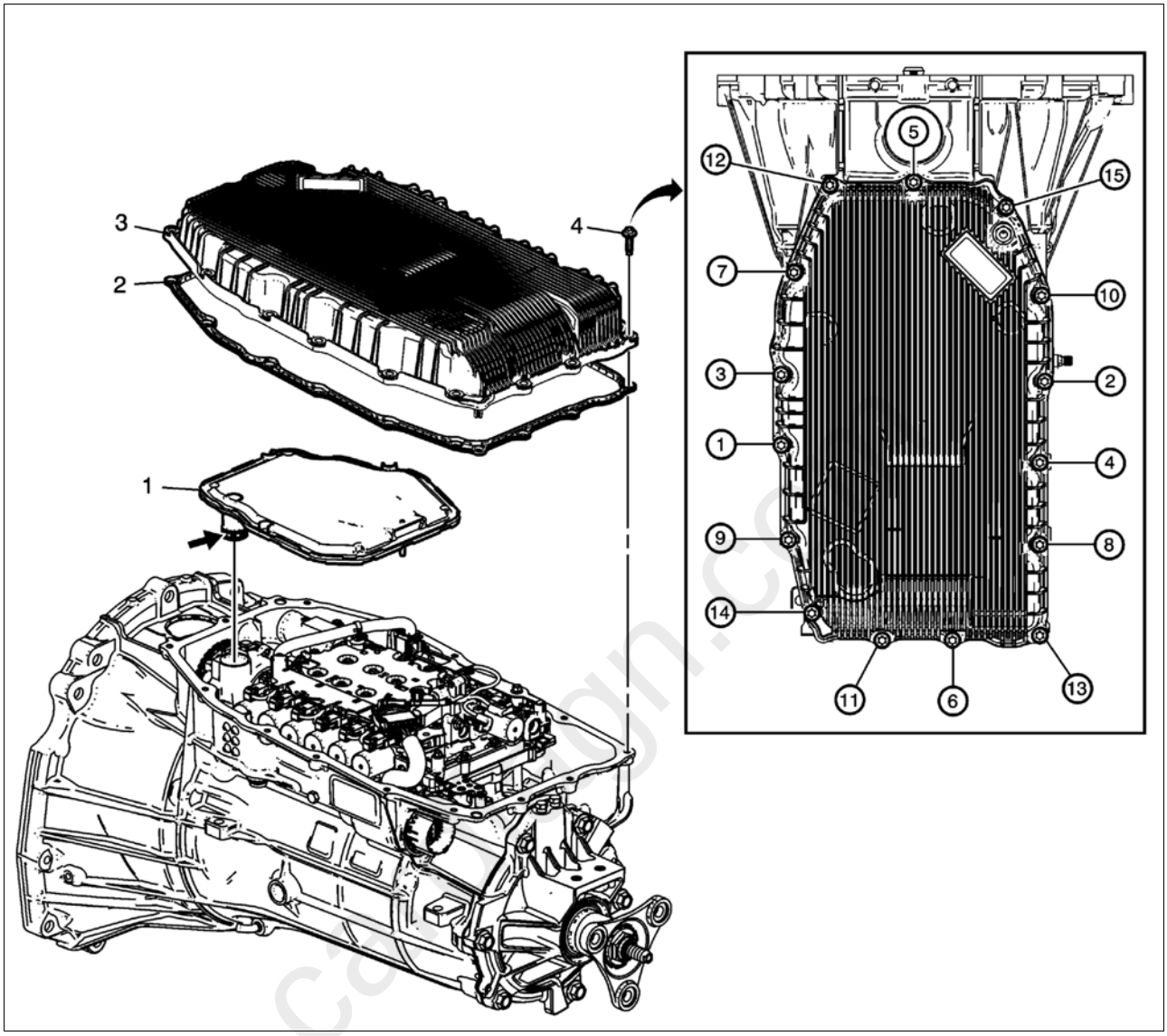
Auxiliary Fluid Accumulator Installation

Callout	Component Name
1	A/Trans Auxiliary Fluid Accumulator Bleeder Valve *NOTE:* *Ensure bleeder valve is securely tightened.*
2	A/Trans Auxiliary Fluid Accumulator
3	A/Trans Auxiliary Fluid Accumulator Bolt (Qty: 3) **Procedure** Connect the accumulator solenoid electrical connector. **Tighten** 8 N.m (71 lb in)

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REPAIR INSTRUCTIONS - OFF VEHICLE > TRANSMISSION FLUID PAN AND FILTER ASSEMBLY INSTALLATION

Fig 1: Transmission Fluid Pan and Filter Assembly



Courtesy of GENERAL MOTORS COMPANY

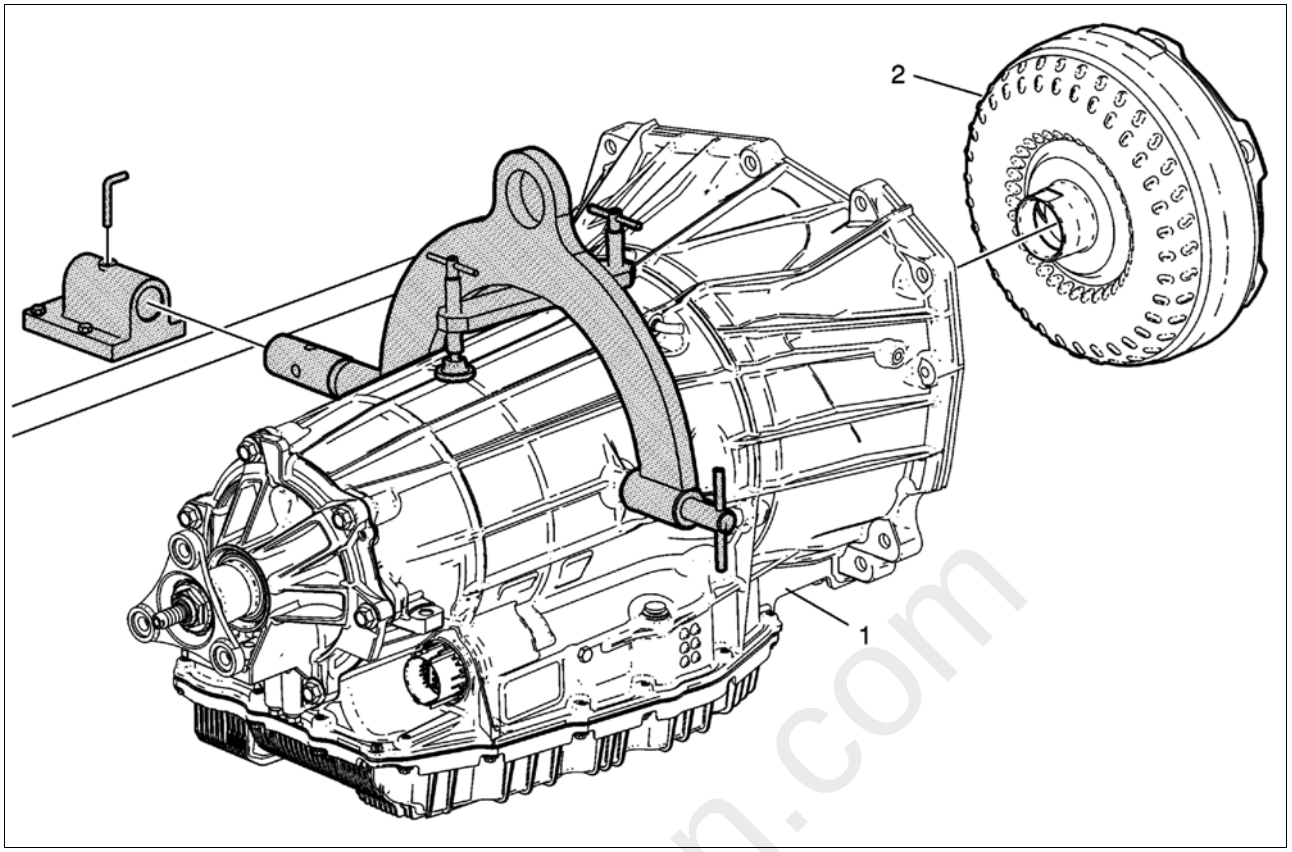
Callout	Component Name
1	Automatic Transmission Fluid Filter *NOTE:* *The seal is not serviced separately. Inspect the fluid filter seal, if the seal is damaged, replace the filter.*

2	Automatic Transmission Fluid Pan Gasket *NOTE:* *The fluid pan gasket is reusable. Inspect the gasket to determine if it may be reused. If the gasket is stuck to the case or pan, it should be replaced.*
3	Automatic Transmission Fluid Pan
4	Automatic Transmission Fluid Pan Bolt M6 x 20 (Qty: 15) *CAUTION:* *Refer to Fastener Caution .* **Procedure** Tighten the bolts in the sequence shown. **Tighten** 10 N.m (89 lb in)

REPAIR INSTRUCTIONS - OFF VEHICLE > TORQUE CONVERTER INSTALLATION AND HOLDING FIXTURE REMOVAL

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Fig 1: Torque Converter Installation and Holding Fixture



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Case Assembly **Procedure** Rotate the transmission so that the fluid pan is down. Special Tools • **DT-03289-20** Holding Fixture Base Assembly • **DT-48989** Holding Fixture For equivalent regional tools, refer to Special Tools .
2	Torque Converter

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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - REPAIR INSTRUCTIONS - ON VEHICLE

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION

Special Tools

EL-35616 Terminal Test Probe Kit

For equivalent regional tools, refer to Special Tools .

When the condition is not currently present, but is indicated in DTC history, the cause may be intermittent. An intermittent may also be the cause when there is a customer complaint, but the symptom cannot be duplicated. Refer to the Symptom Table of the system that is suspect of causing the condition before trying to locate an intermittent condition.

Most intermittent conditions are caused by faulty electrical connections or wiring. Inspect for the following items:

- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- Poor terminal to wire connection - Some conditions which fall under this description are poor crimps, poor solder joints, crimping over the wire insulation rather than the wire itself, and corrosion in the wire to terminal contact area, etc.
- Pierced or damaged insulation can allow moisture to enter the wiring causing corrosion. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits.
- Wiring which has been pinched, cut, or its insulation rubbed through may cause an intermittent open or short as the bare area touches other wiring or parts of the vehicle.
- Wiring that comes in contact with hot or exhaust components
- Refer to Inducing Intermittent Fault Conditions in order to duplicate the conditions required, in order to verify the customer concern.
- Refer to Testing for Electrical Intermittents for test procedures to detect intermittent open, high resistance, short to ground, and short to voltage conditions.
- Refer to Scan Tool Snapshot Procedure for advanced intermittent diagnosis and Vehicle Data Recorder operation.

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > TESTING FOR TERMINAL FRETTING

Some intermittent conditions can be caused by wire terminal fretting corrosion. Fretting corrosion is a build-up of insulating, oxidized wear debris that can form when there is a small motion between electrical contacts. The oxidized wear debris can pile up enough at the electrical contact spots that the electrical

resistance across the connection increases. Movement between the contacting surfaces as small as 10 to 100 microns can cause fretting. To put this in perspective, a sheet of paper is about 100 microns thick, so fretting motion is small and hard to see. Vibration and thermal expansion/contraction are the main sources that create fretting motion. Since vehicles vibrate and can experience large temperature swings, they are a good source for fretting motion. Tin, copper, nickel, and iron surfaces are all susceptible to fretting corrosion. Fretting corrosion can be difficult to see but it looks like small, dark smudges on the terminals contact surface.

To correct a fretting condition disconnect the suspect connector and add dielectric grease / lubricant (Nyogel 760G or equivalent, meeting GM specification 9986087) to both sides of the connector terminals. Then reconnect the connector and wipe away any excess lubricant. This will correct the additional terminal contact resistance due to the terminal fretting corrosion.

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > TESTING FOR PROPER TERMINAL CONTACT

It is important to test terminal contact at the component and any inline connectors before replacing a suspect component. Mating terminals must be inspected to ensure good terminal contact. A poor connection between the male and female terminal at a connector may be the result of contamination or deformation.

Contamination may be caused by the connector halves being improperly connected. A missing or damaged connector seal, damage to the connector itself, or exposing the terminals to moisture and dirt can also cause contamination. Contamination, usually in the underhood or underbody connectors, leads to terminal corrosion, causing an open circuit or intermittently open circuit.

Deformation is caused by probing the mating side of a connector terminal without the proper adapter. Always use the **EL-35616** kit when probing connectors. Other causes of terminal deformation are improperly joining the connector halves, or repeatedly separating and joining the connector halves. Deformation, usually to the female terminal contact tang, can result in poor terminal contact causing an open or intermittently open circuit.

Testing for Proper Terminal Contact in Bussed Electrical Centers

It is very important to use the correct test adapter when testing for proper terminal contact of fuses and relays in a bussed electrical center. Use the **EL-35616** kit to test for proper terminal contact. Failure to use the **EL-35616** kit can result in improper diagnosis of the bussed electrical center.

Follow the procedure below in order to test terminal contact:

1. Separate the connector halves.
2. Visually inspect the connector halves for contamination. Contamination may result in a white or green build-up within the connector body or between terminals. This causes high terminal resistance, intermittent contact, or an open circuit. An underhood or underbody connector that shows signs of contamination should be replaced in its entirety: terminals, seals, and connector body.
3. Using an equivalent male terminal/terminated lead, verify that the retention force is significantly different between a known good terminal and the suspect terminal. Replace the female terminal in question.

Flat Wire Connectors

There are no serviceable parts for flat wire connectors on the harness side or the component side.

Follow the procedure below in order to test terminal contact:

1. Remove the component in question.
2. Visually inspect each side of the connector for signs of contamination. Avoid touching either side of the connector as oil from your skin may be a source of contamination as well.
3. Visually inspect the terminal bearing surfaces of the flat wire circuits for splits, cracks, or other imperfections that could cause poor terminal contact. Visually inspect the component side connector to ensure that all of the terminals are uniform and free of damage or deformation.
4. Insert the appropriate adapter into the flat wire harness connector in order to test the circuit in question.

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > CONTROL MODULE/COMPONENT VOLTAGE AND GROUNDS

Poor voltage or ground connections can cause widely varying symptoms.

- Test all control module voltage supply circuits. Many vehicles have multiple circuits supplying voltage to a control module. Other components in the system may have separate voltage supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the voltage source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Operate the component to test the ability of the circuit to carry sufficient current. Refer to Circuit Testing , and Power Distribution Schematics .
- Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Operate the component to test the ability of the circuit to carry sufficient current. Refer to Circuit Testing , and Ground Distribution Schematics .

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > TEMPERATURE SENSITIVITY

- An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot.
- Freeze Frame, Failure Records, Snapshot, or Vehicle Data Recorder data may help with this type of intermittent condition, where applicable.
- If the intermittent is related to heat, review the data for a relationship with the following:
    - High ambient temperatures

    - Underhood/engine generated heat
    - Circuit generated heat due to a poor connection, or high electrical load
    - Higher than normal load conditions, towing, etc.
- If the intermittent is related to cold, review the data for the following:
    - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Inspect for water intrusion.
    - The condition only occurs on a cold start.
    - The condition goes away when the vehicle warms up.
- Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
- If temperature is suspected of causing an intermittent fault condition, attempt to duplicate the condition. Refer to Inducing Intermittent Fault Conditions in order to duplicate the conditions required.

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > ELECTROMAGNETIC INTERFERENCE AND ELECTRICAL NOISE

Some electrical components/circuits are sensitive to electromagnetic interference or other types of electrical noise. Inspect for the following conditions:

- A mis-routed harness that is too close to high voltage/high current devices such as secondary ignition components, motors, generator etc. - These components may induce electrical noise on a circuit that could interfere with normal circuit operation.
- Electrical system interference caused by a malfunctioning relay, or a control module driven solenoid or switch - These conditions can cause a sharp electrical surge. Normally, the condition will occur when the malfunctioning component is operating.
- Installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. - These accessories may create interference in other circuits while operating and the interference would disappear when the accessory is not operating. Refer to Checking Aftermarket Accessories .
- Test for an open diode across the A/C compressor clutch and for other open diodes. Some relays may contain a clamping diode.
- The generator may be allowing AC noise into the electrical system.

REPAIR INSTRUCTIONS - ON VEHICLE > CONNECTOR RECONNECTION - AUTOMATIC TRANSMISSION > INCORRECT CONTROL MODULE

- There are only a few situations where reprogramming a control module is appropriate:

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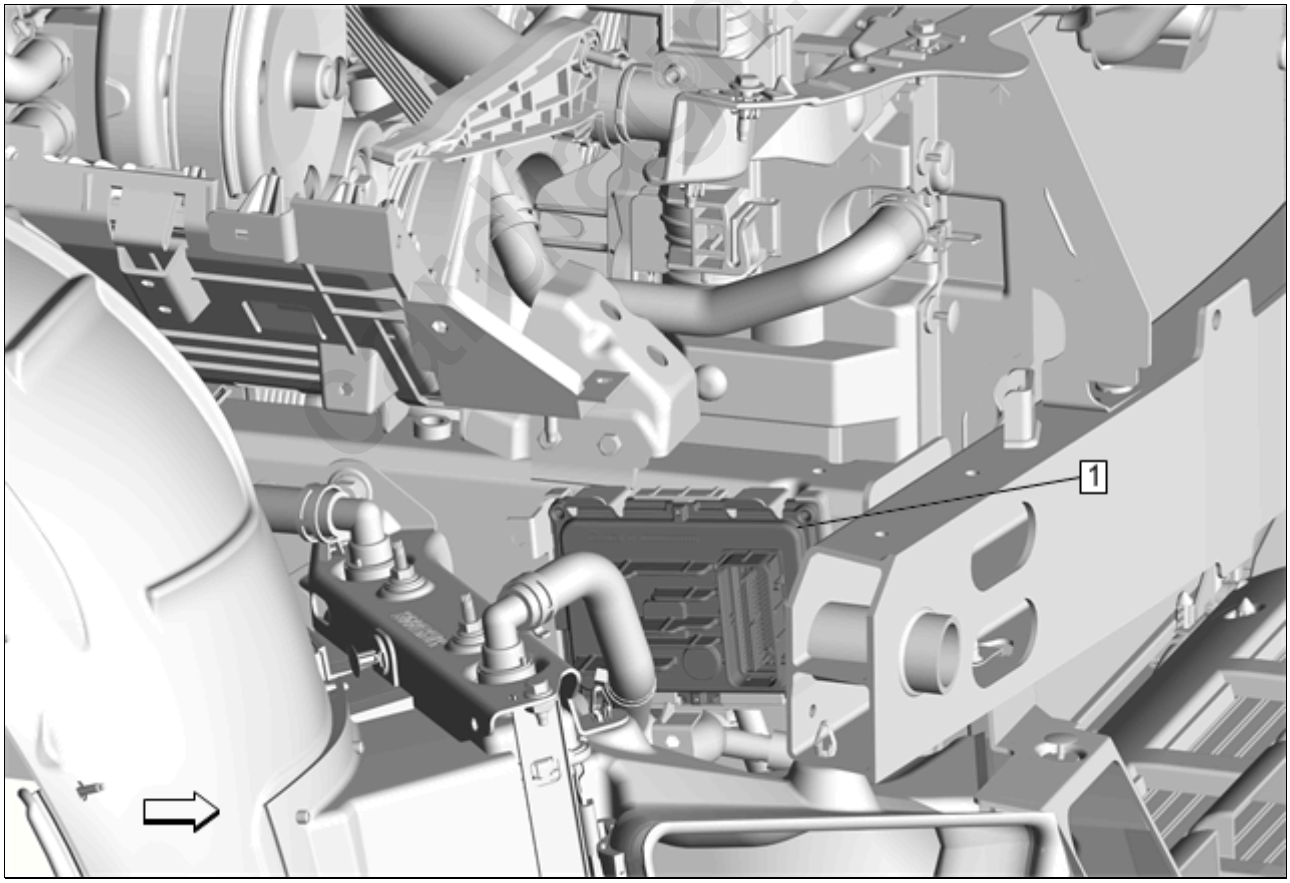
- A new service control module is installed.
- A control module from another vehicle is installed.
- Revised software/calibration files have been released for this vehicle.

> *NOTE:*
>
> *DO NOT re-program the control module with the SAME software/calibration files that are already present in the control module. This is not an effective repair for any type of concern.*

- Verify that the control module contains the correct software/calibration. If incorrect programming is found, reprogram the control module with the most current software/calibration. Refer to Control Module References for replacement, setup, and programming.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONTROL MODULE REPLACEMENT

Fig 1: Transmission Control Module



Courtesy of GENERAL MOTORS COMPANY

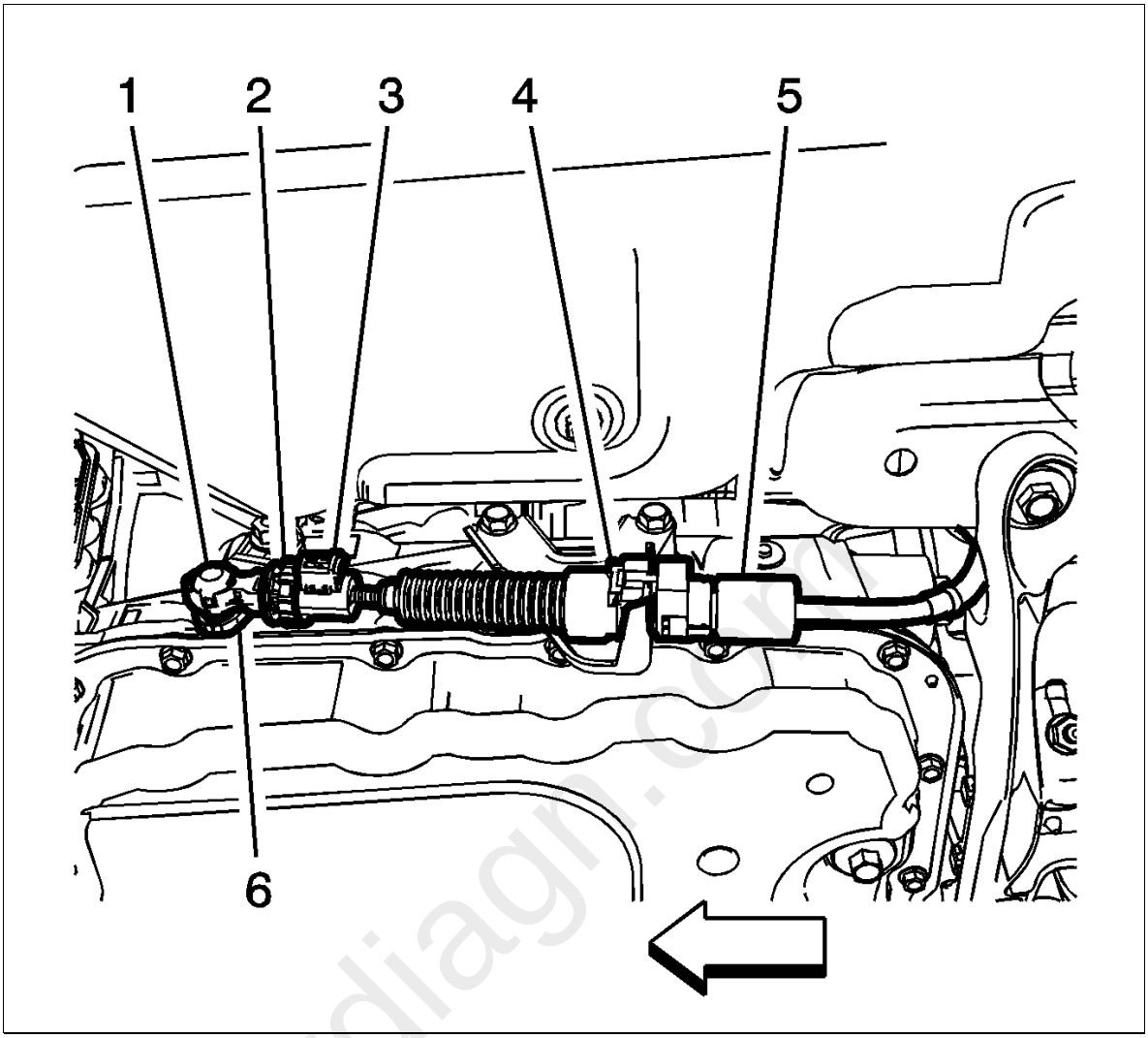
Callout	Component Name
Preliminary Procedures Front Wheelhouse Liner Replacement	
1	Transmission Control Module Procedure 1. Disconnect the electrical connector. 2. Remove the module from the module bracket by releasing the retaining tabs. 3. If installing a new module, perform the transmission control module programing and setup. Refer to K71 Transmission Control Module: Programming and Setup .

REPAIR INSTRUCTIONS - ON VEHICLE > RANGE SELECTOR LEVER CABLE REPLACEMENT > REMOVAL PROCEDURE

1. Set the park brake.
2. { If equipped }Transmission Heat Shield»Remove — Transmission Heat Shield Replacement

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Fig 1: Range Selector Lever Cable

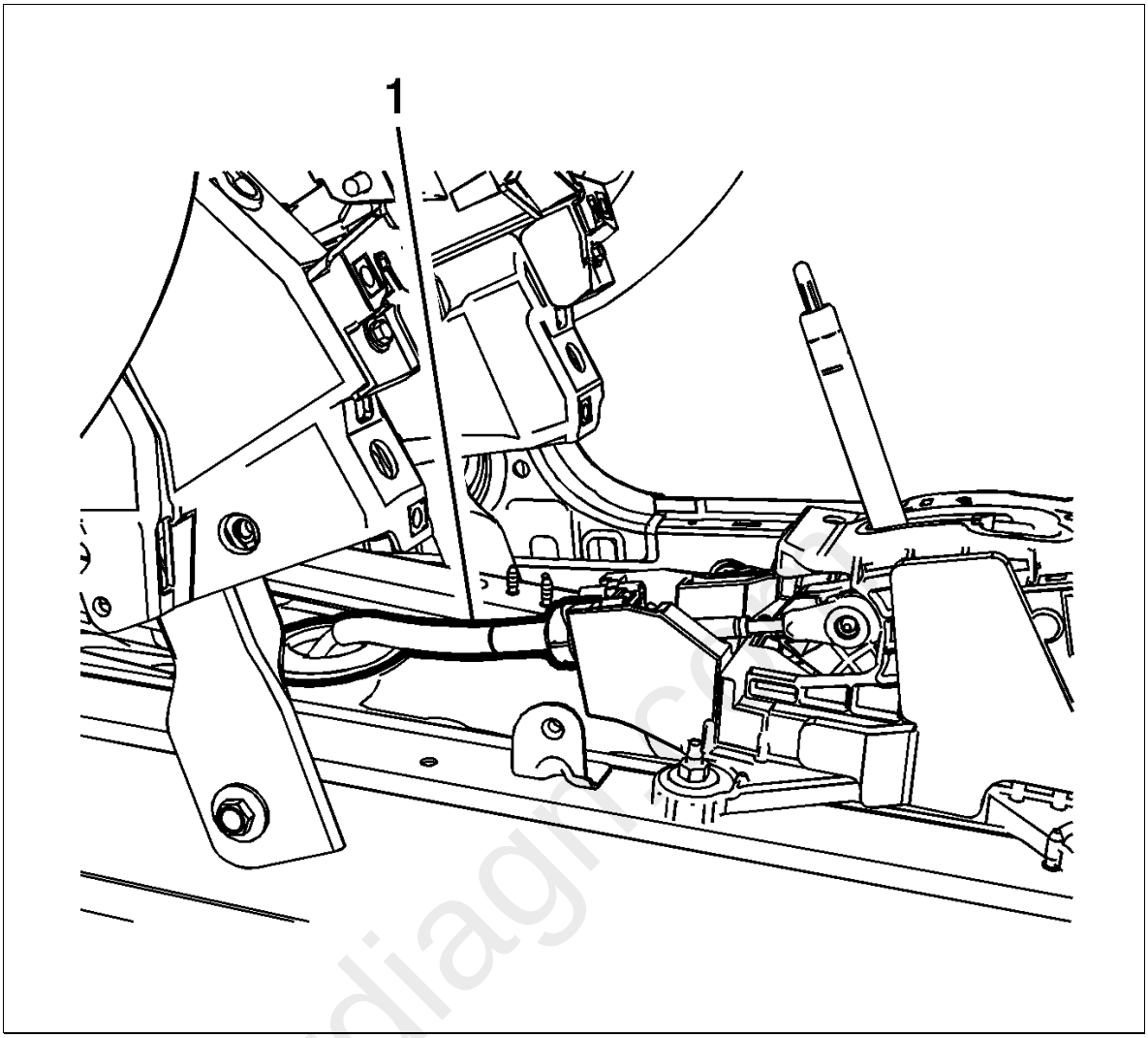


Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (6).
4. Slide the retainer (4) rearward to release the transmission range selector lever cable from the bracket.
5. Front Floor Lower Console Replacement »Remove

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Fig 2: Cable Assembly



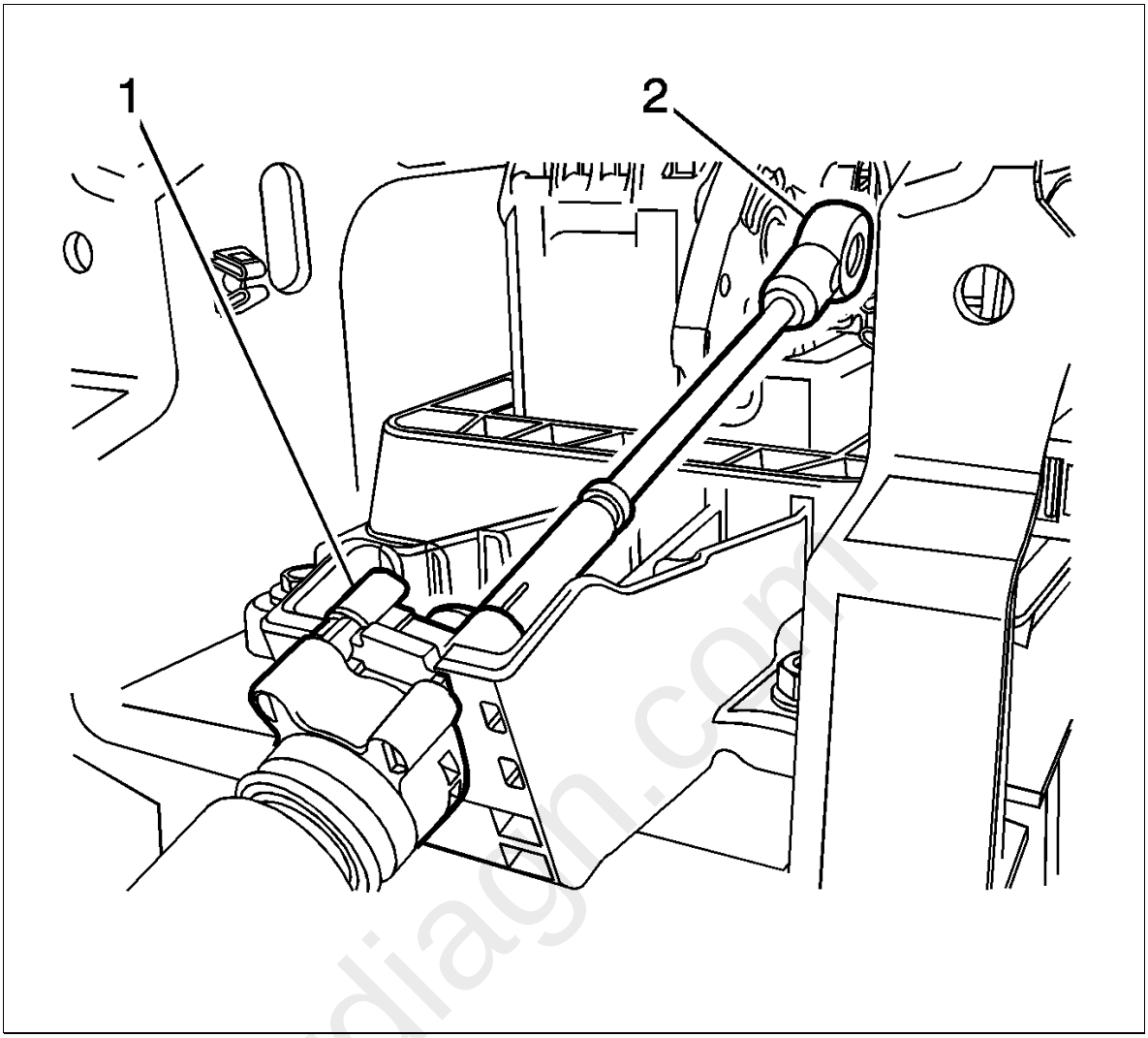
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Mark the orientation of the grommet to the floor panel for installation.

6. Remove the grommet and cable assembly (1) from the floor panel.

Fig 3: Transmission Range Selector Lever Cable Retainer & Terminal



Courtesy of GENERAL MOTORS COMPANY

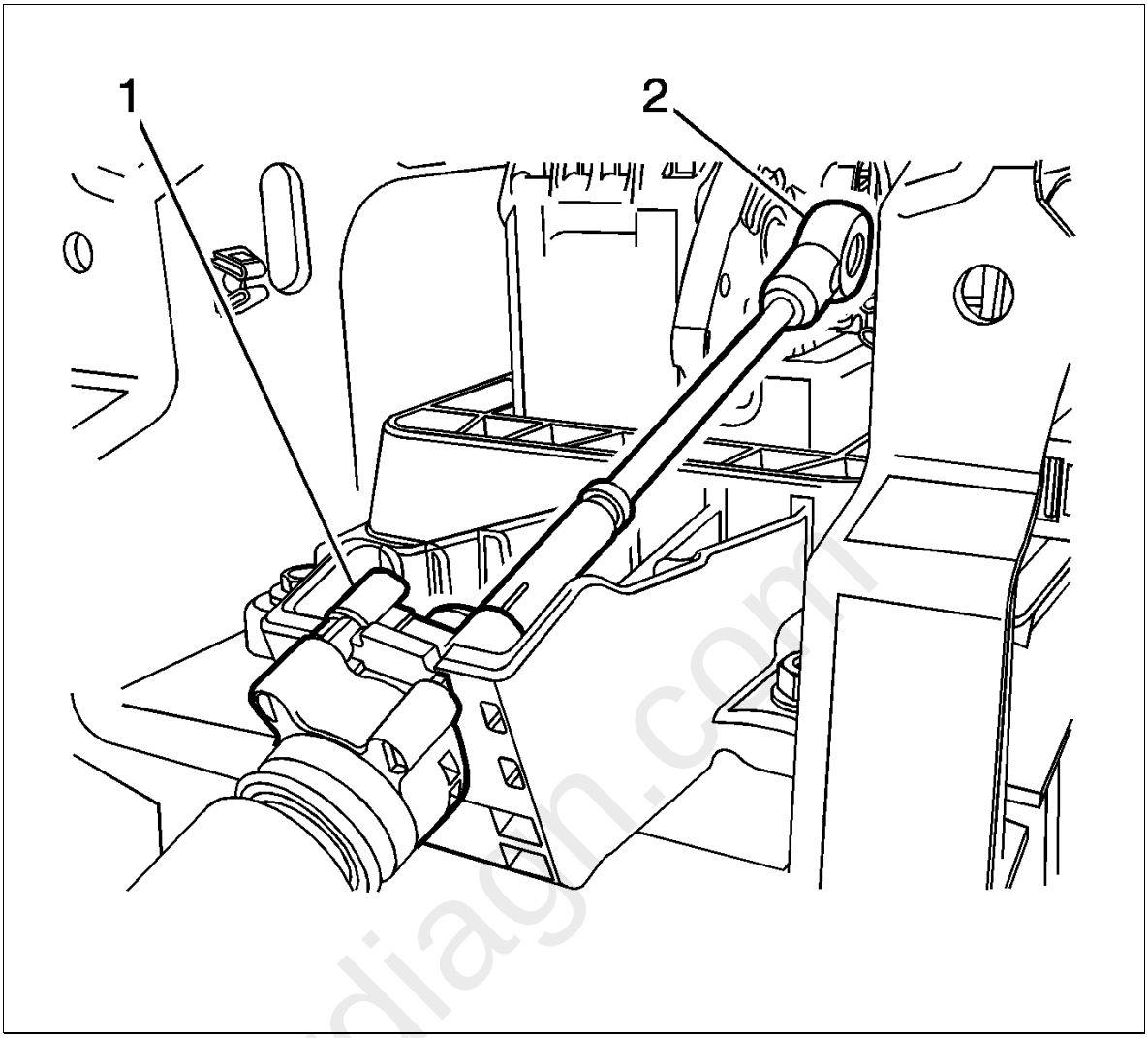
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7. Slide the transmission range selector lever cable retainer forward (1) and remove the transmission range selector cable from the transmission control base.
8. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin.
9. Remove the transmission range selector lever cable from the vehicle.

REPAIR INSTRUCTIONS - ON VEHICLE > RANGE SELECTOR LEVER CABLE REPLACEMENT > INSTALLATION PROCEDURE

1. Install the transmission range selector lever cable in the vehicle.

Fig 1: Transmission Range Selector Lever Cable Retainer & Terminal

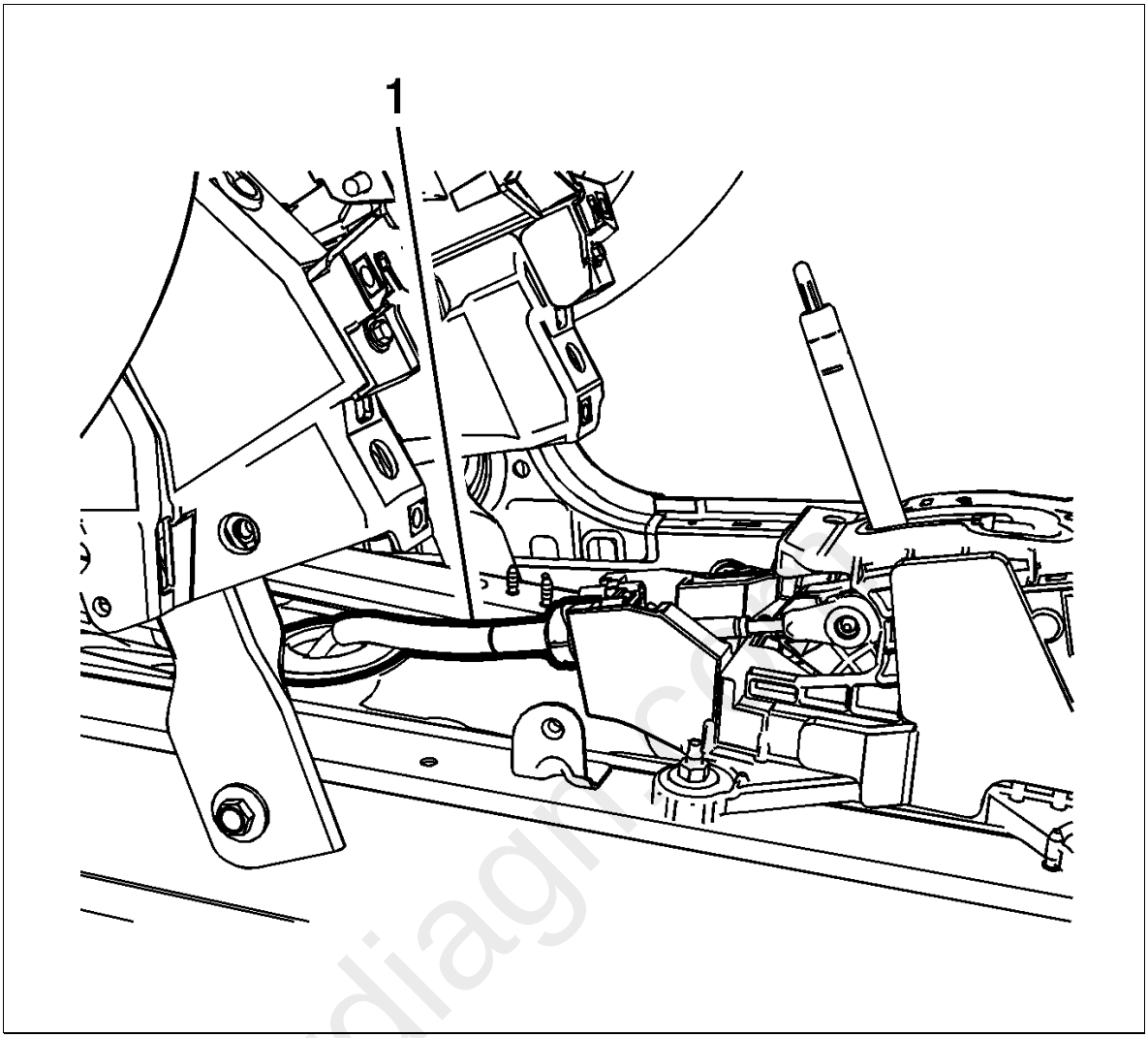


Courtesy of GENERAL MOTORS COMPANY

2. Connect the transmission range selector lever cable terminal (2) to the shift lever pin.
3. Install the transmission range selector cable to the transmission control base by pressing down until it seats into place.

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Fig 2: Cable Assembly



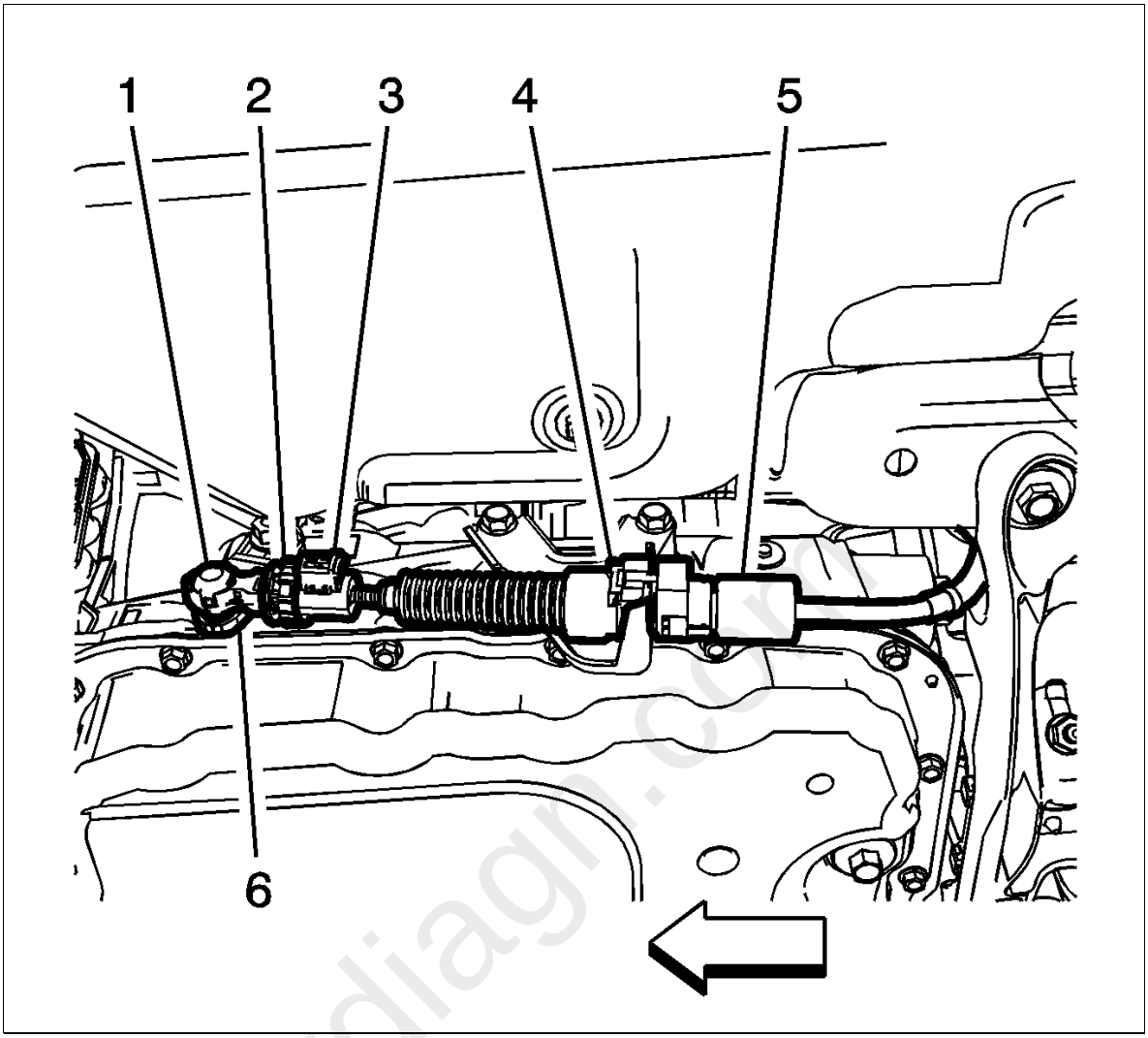
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Ensure the grommet is properly oriented.

4. Install the grommet and cable assembly (1) into the floor panel with alignment key opening.
5. Front Floor Lower Console Replacement »Install

Fig 3: Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

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.

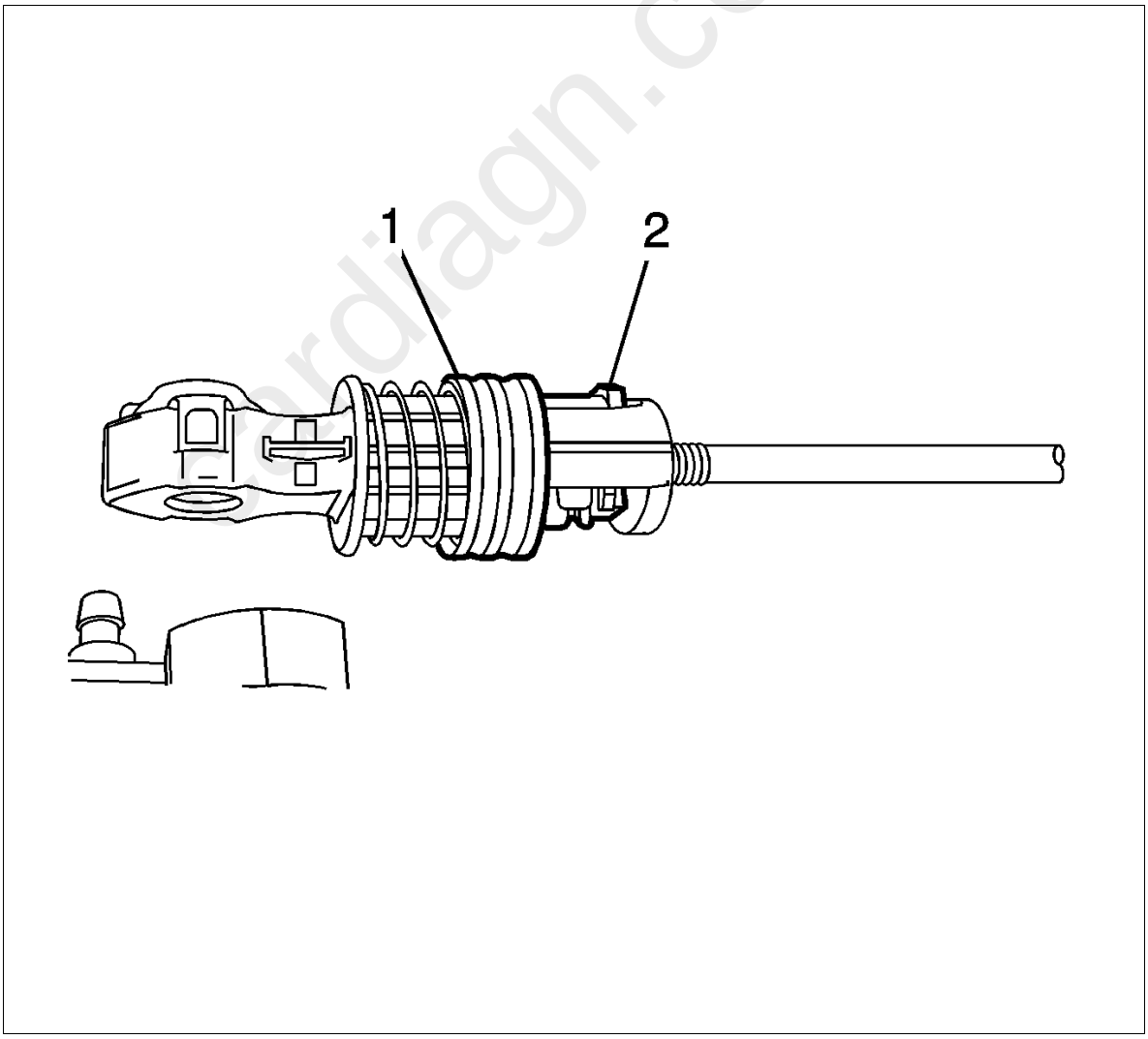
6. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (6).
7. Install the cable into the bracket and ensure cable is fully seated.
8. Adjust the cable. Range Selector Lever Cable Adjustment .
9. { If equipped }Transmission Heat Shield»Install — Transmission Heat Shield Replacement

REPAIR INSTRUCTIONS - ON VEHICLE > RANGE SELECTOR LEVER CABLE ADJUSTMENT

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

1. Set the park brake and chock the wheels.
2. Remove Transmission Heat Shield Replacement if equipped.
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 1: Retaining Collar And Adjuster Clip



Courtesy of GENERAL MOTORS COMPANY

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5. If installing a new cable, skip this step and go to the next step. Pull the retaining collar (1) forward, then release the range select cable adjuster clip (2) by pushing in on the adjuster clip from the backside.

6. Depress the adjuster clip (2) inboard, locking the adjuster clip completely.

> *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.*

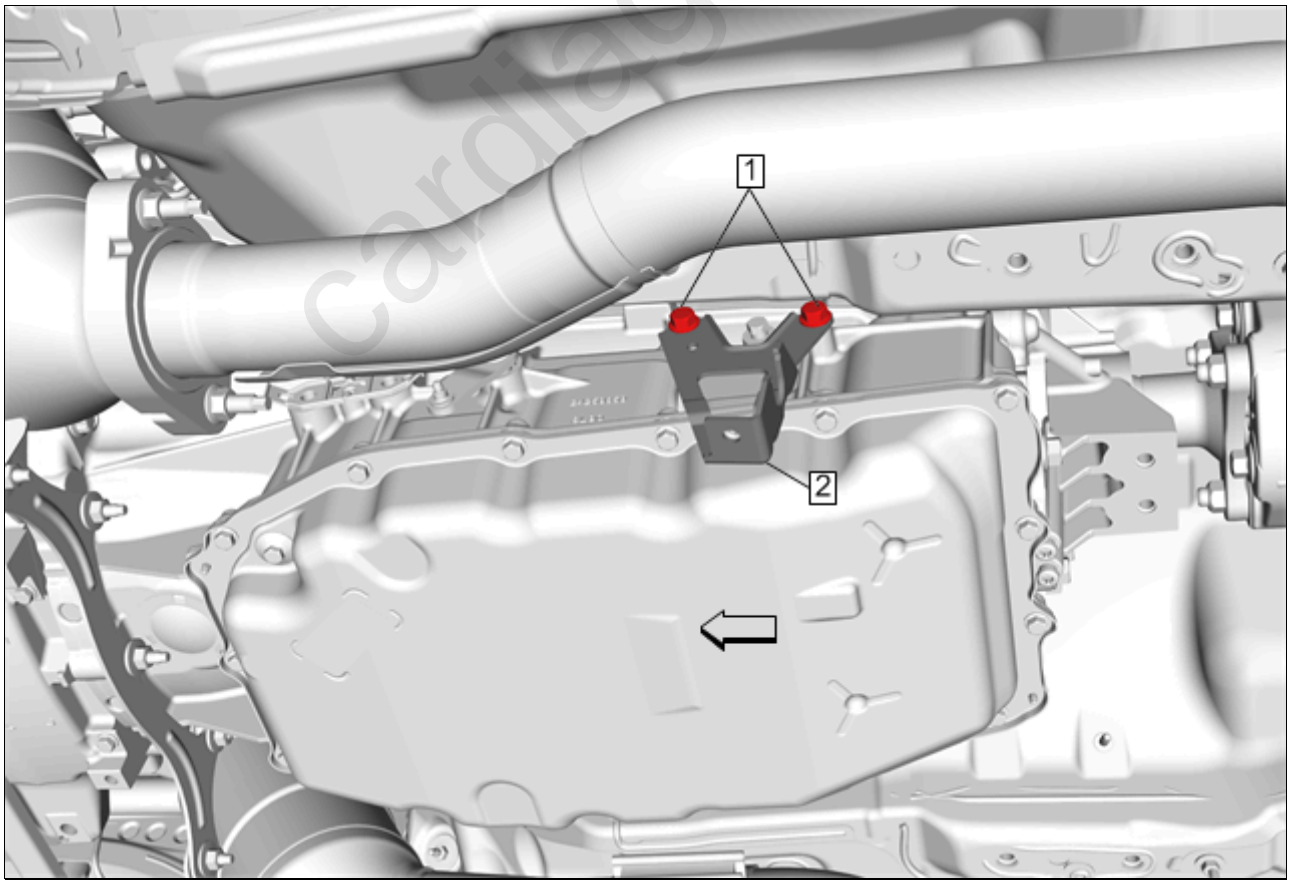
7. Ensure that the cable adjuster clip (2) is secured with retaining collar covering the adjuster clip.

8. Install Transmission Heat Shield Replacement if equipped.

9. Check the transmission range select lever in all gear selections for proper operation.

REPAIR INSTRUCTIONS - ON VEHICLE > RANGE SELECTOR LEVER CABLE BRACKET REPLACEMENT (M5T)

Fig 1: Range Selector Lever Cable Bracket (M5T)



Courtesy of GENERAL MOTORS COMPANY

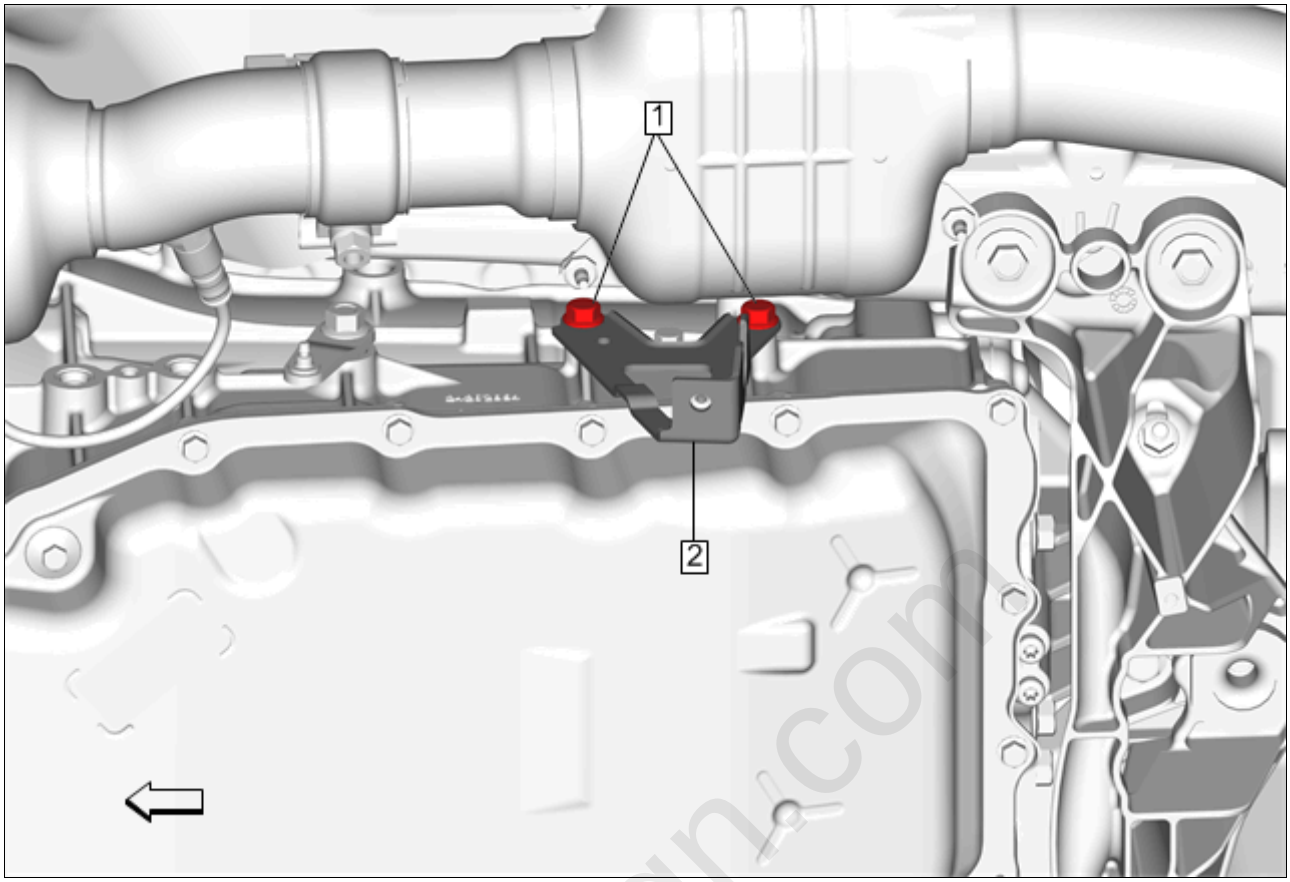
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Callout	Component Name
Preliminary Procedures 1. Apply the park brake. 2. Shift the transmission into neutral. 3. Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP) . 4. Range Selector Lever Cable Replacement .	
1	Transmission Range Selector Cable Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 22 N.m (16 lb ft)
2	Transmission Range Selector Cable Bracket

REPAIR INSTRUCTIONS - ON VEHICLE > RANGE SELECTOR LEVER CABLE BRACKET REPLACEMENT (M5U)

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Fig 1: Range Selector Lever Cable Bracket (M5U)



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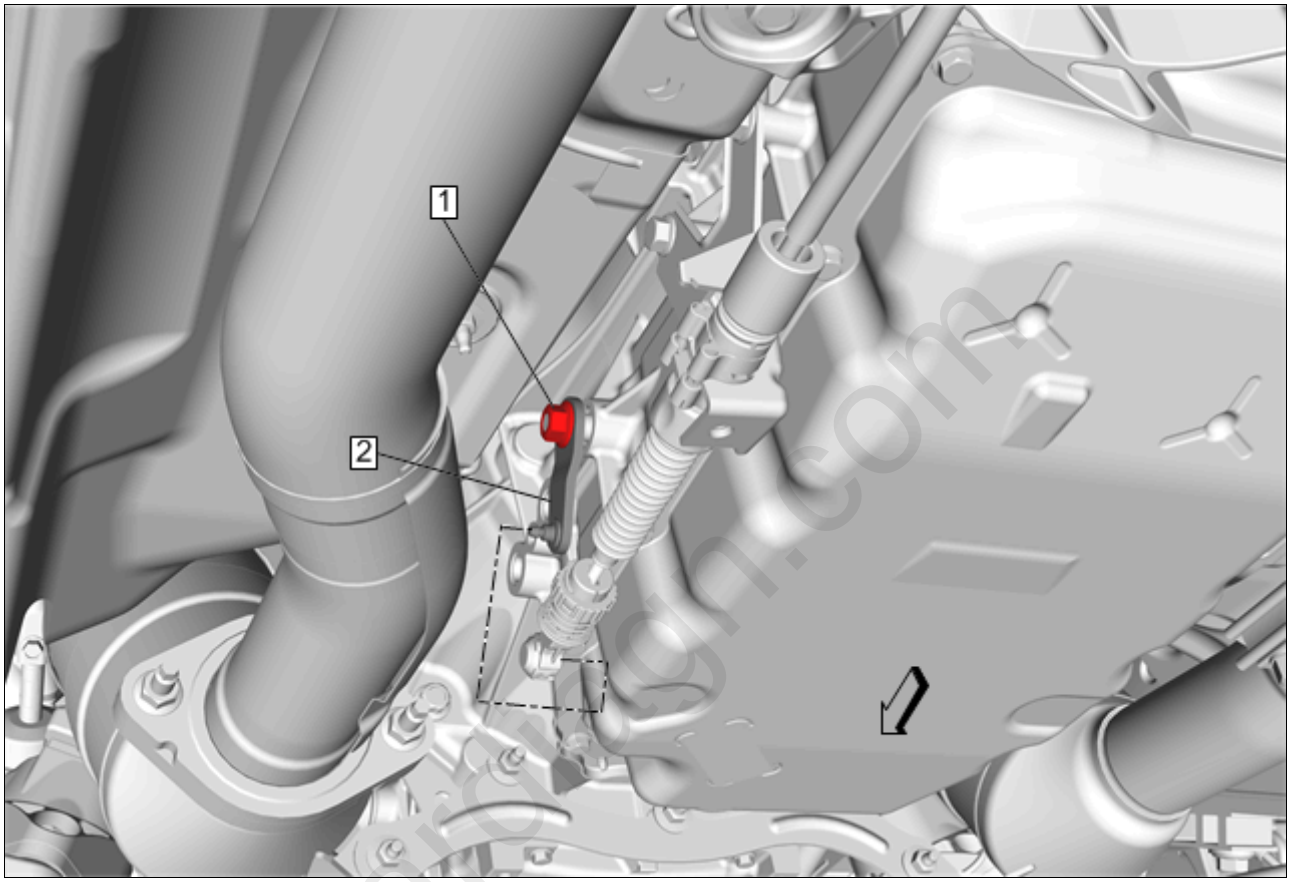
Callout	Component Name
Preliminary Procedures 1. Apply the park brake. 2. Shift the transmission into neutral. 3. Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP) . 4. Range Selector Lever Cable Replacement .	
1	Transmission Range Selector Cable Bracket Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 22 N.m (16 lb ft)

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2	Transmission Range Selector Cable Bracket

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT (M5T)

Fig 1: Automatic Transmission Range Selector Lever (M5T)



Courtesy of GENERAL MOTORS COMPANY

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Callout	Component Name

Preliminary Procedures

1. Apply the park brake.
2. Shift the transmission into neutral.
3. Remove Transmission Heat Shield Replacement if equipped.

> *WARNING:*
>
> *After installing the transmission range selector shift cable, pull up and push down on ALL connections to verify that the connections are fully seated and properly engaged. Failure to perform this task can result in the vehicle not being able to*

shift into PARK causing potential vehicle damage and bodily injury.

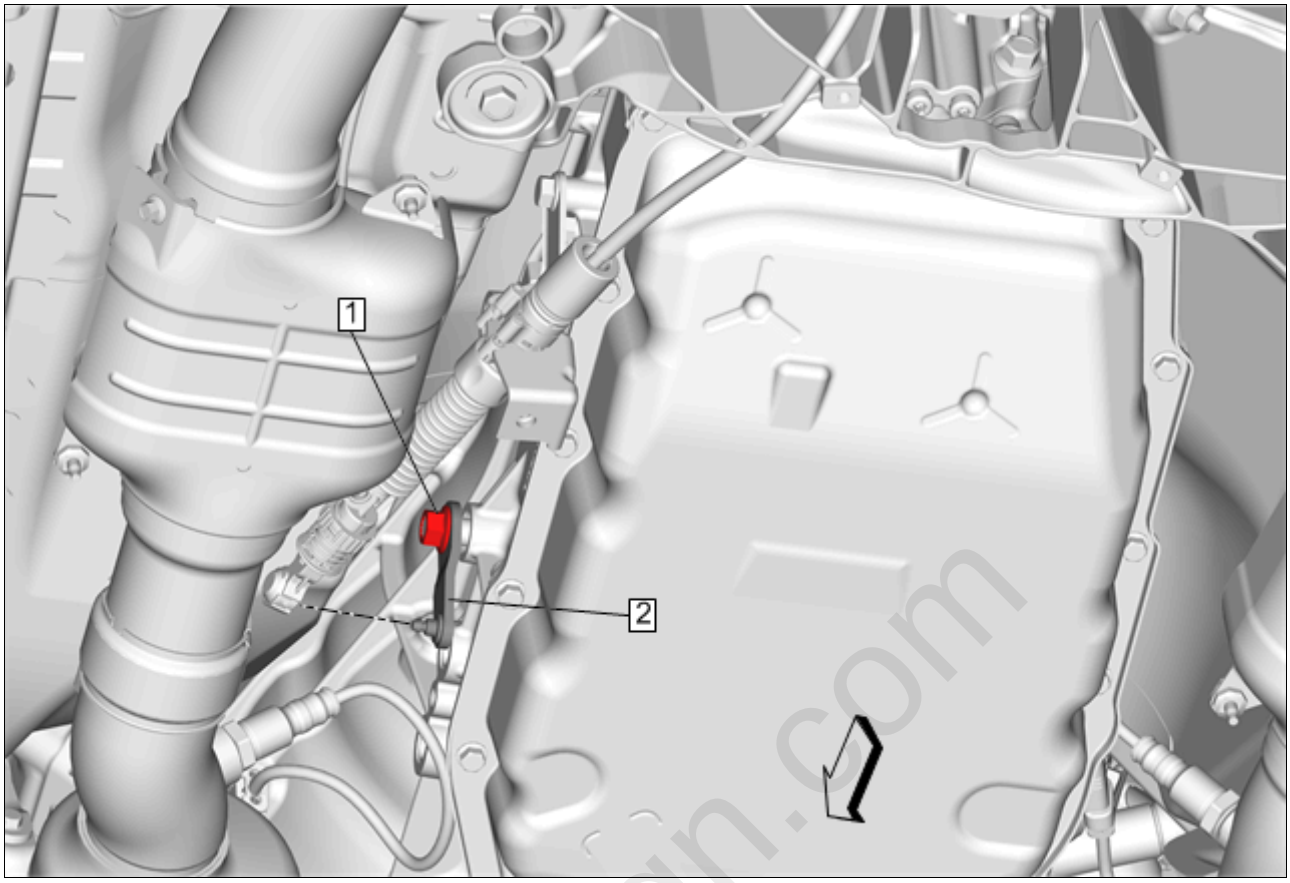
4. Disconnect the transmission range selector cable from the range selector cable lever ball stud.

1	Transmission Range Selector Cable Lever Nut *WARNING:* *Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.* *CAUTION:* *Refer to Fastener Caution .* **Tighten** 25 N.m (18 lb ft)
2	Transmission Range Selector Cable Lever

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT (M5U)

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Fig 1: Automatic Transmission Range Selector Lever (M5U)



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Preliminary Procedures

1. Apply the park brake.
2. Shift the transmission into neutral.
3. Remove Transmission Heat Shield Replacement

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

4. Disconnect the transmission range selector cable from the range selector cable lever ball stud.

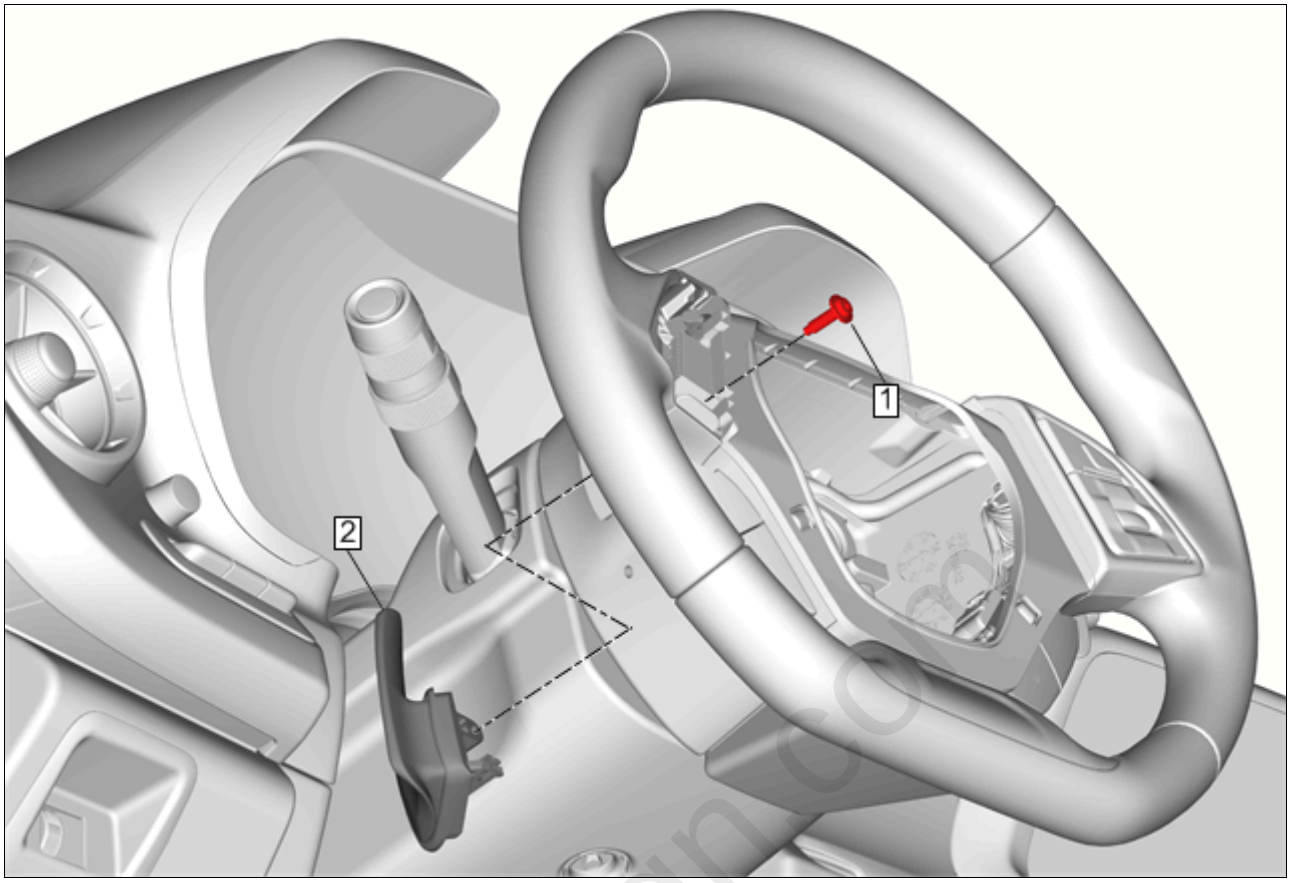
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1	Transmission Range Selector Cable Lever Nut *WARNING:* *Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.* *CAUTION:* *Refer to Fastener Caution .* **Tighten** 25 N.m (18 lb ft)
2	Transmission Range Selector Cable Lever

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT AUXILIARY POSITION SWITCH REPLACEMENT - STEERING WHEEL (LEFT SIDE)

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Fig 1: Manual Shift Auxiliary Position Switch - Steering Wheel (Left Side)



Courtesy of GENERAL MOTORS COMPANY

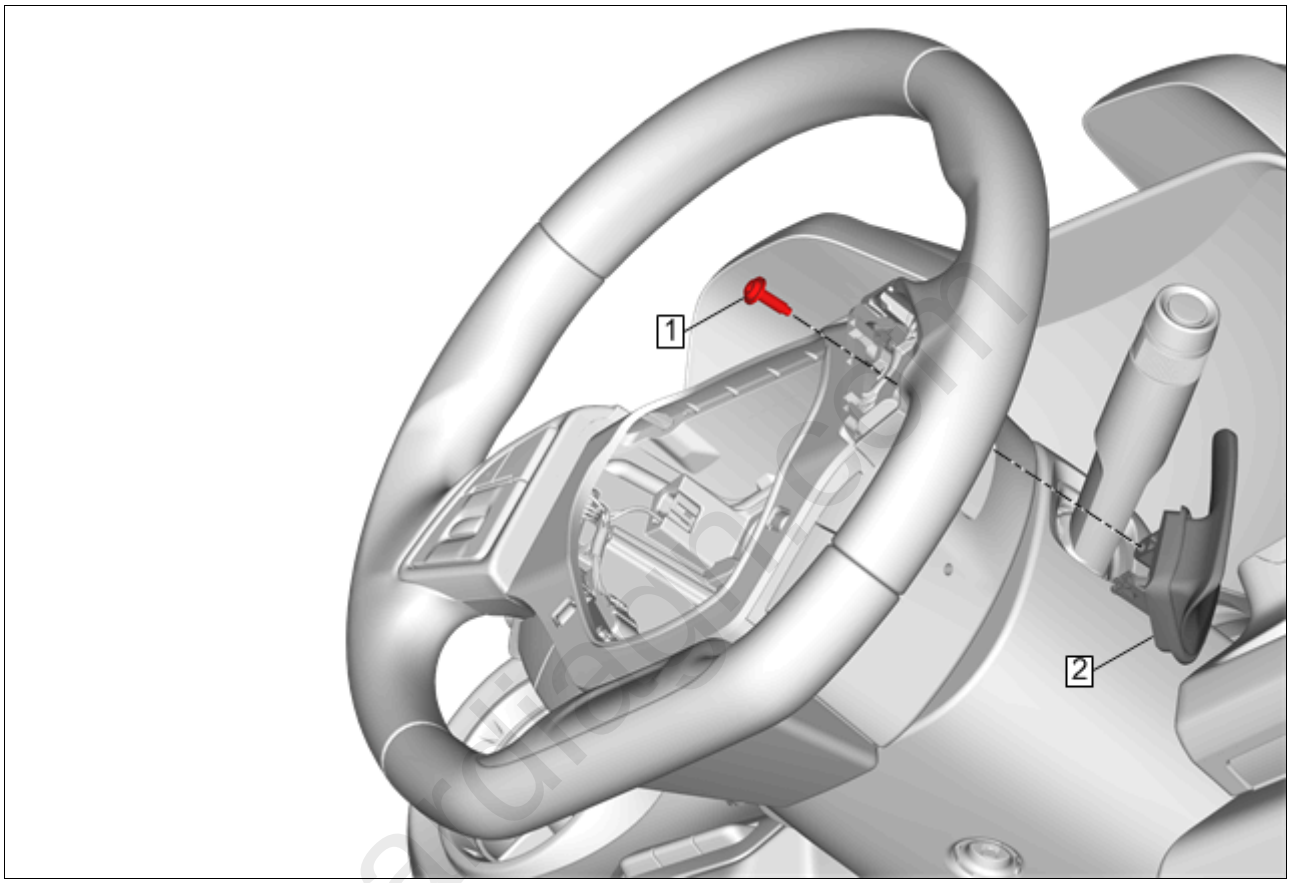
Callout	Component Name
Preliminary Procedure Remove the left side cruise control switch. Cruise Control Switch Replacement (Left Side)Cruise Control Switch Replacement (Right Side)	
1	Automatic Transmission Manual Shift Auxiliary Position Switch Bolt *CAUTION:* *Refer to Fastener Caution .* **Tighten** 2.5 N.m (22 lb in)
2	Automatic Transmission Manual Shift Auxiliary Position Switch - Left Side Procedure 1. Disconnect the electrical connector. 2. Ensure the steering wheel manual shift auxiliary position switch is properly

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	seated on the steering wheel during installation.

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT AUXILIARY POSITION SWITCH REPLACEMENT - STEERING WHEEL (RIGHT SIDE)

Fig 1: Manual Shift Auxiliary Position Switch - Steering Wheel (Right Side)



Courtesy of GENERAL MOTORS COMPANY

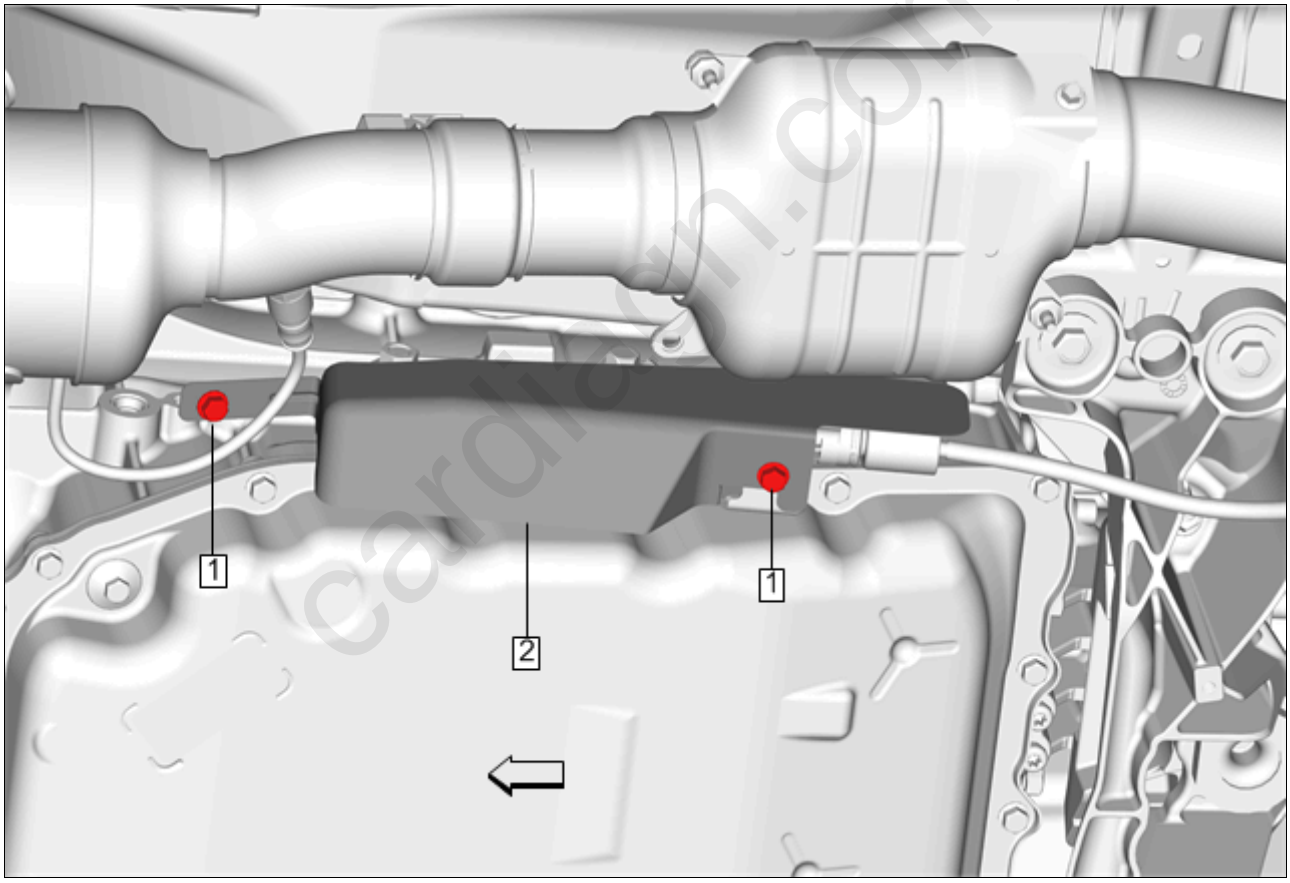
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Callout	Component Name
Preliminary Procedure Remove the right side cruise control switch. Cruise Control Switch Replacement (Left Side)Cruise Control Switch Replacement (Right Side)	
1	Automatic Transmission Manual Shift Auxiliary Position Switch Bolt *CAUTION:* *Refer to Fastener Caution .*

	Tighten 2.5 N.m (22 lb in)
2	Automatic Transmission Manual Shift Auxiliary Position Switch - Right Side Procedure 1. Disconnect the electrical connector. 2. Ensure the steering wheel manual shift auxiliary position switch is properly seated on the steering wheel during installation.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION HEAT SHIELD REPLACEMENT

Fig 1: Transmission Heat Shield



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Lifting and Jacking the Vehicle (Base) Lifting and Jacking the Vehicle (HP) .	

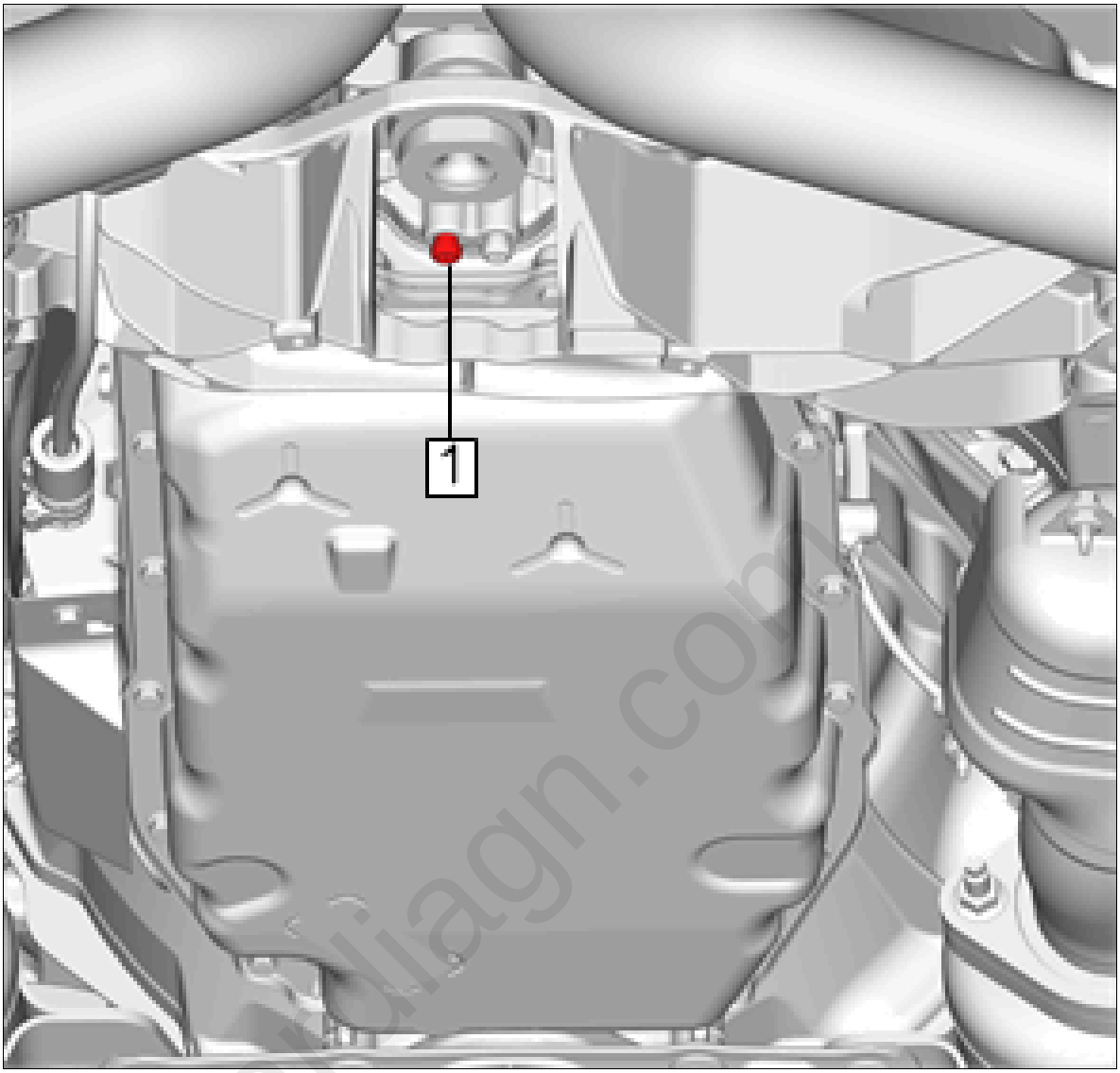
1	Transmission Heat Shield Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 9 N.m (80 lb in)
2	Transmission Heat Shield

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT > REMOVAL PROCEDURE

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .

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Fig 1: Automatic Transmission Fluid Pressure Test Hole Plug

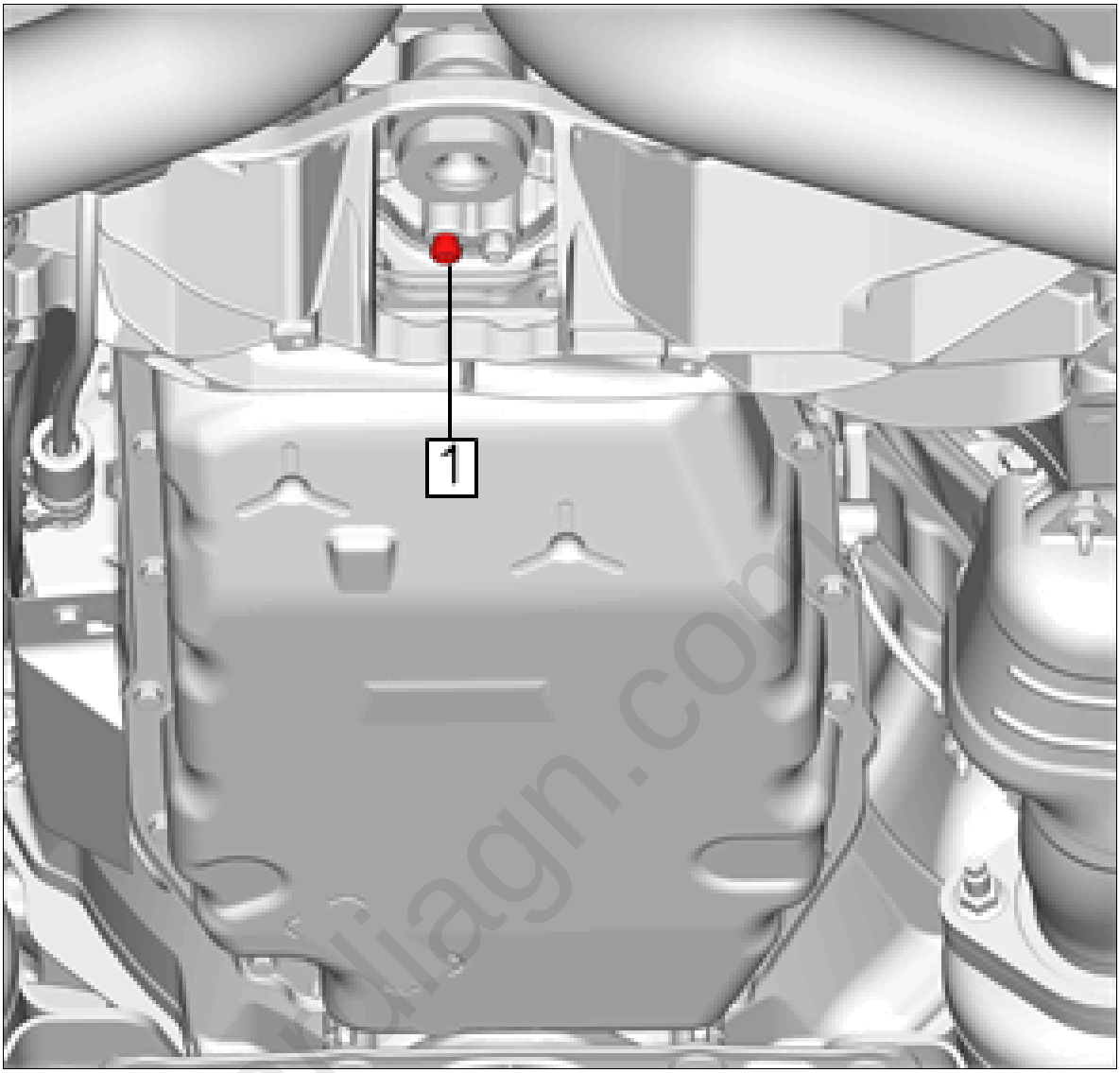


Courtesy of GENERAL MOTORS COMPANY

2. Clean the surrounding area of the automatic transmission fluid pressure test hole plug.
3. Remove the automatic transmission fluid pressure test hole plug (1).

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT > INSTALLATION PROCEDURE

Fig 1: Automatic Transmission Fluid Pressure Test Hole Plug



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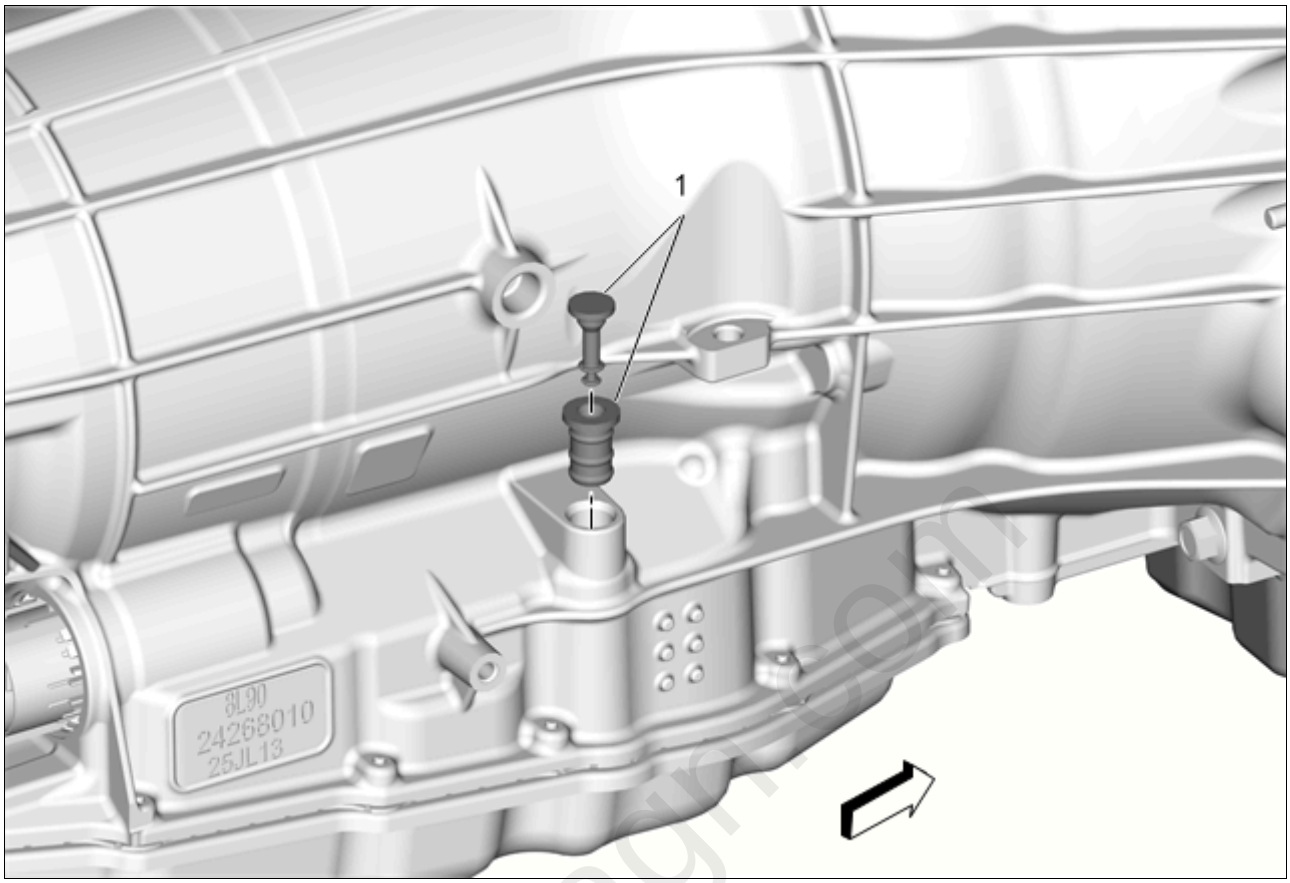
> ⚠ *CAUTION:*
>
> *Refer to Component Fastener Tightening Caution .*

1. Install the automatic transmission fluid pressure test hole plug (1) and tighten to 11 N.m (97 lb in).
2. Check the transmission fluid level (fill if necessary). Refer to Transmission Fluid Fill Procedure .
3. Lower the vehicle.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION FLUID FILLER TUBE PLUG

REPLACEMENT

Fig 1: Transmission Fluid Filler Tube Plug



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Transmission Fluid Level Tube Plug Assembly

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION MOUNT INSPECTION

⚠ *CAUTION:*

In order to avoid oil pan damage and possible engine failure, insert a block of wood that spans the width of the oil pan bottom between the oil pan and the jack support.

1. Raise the transmission/transaxle in order to remove the weight from the transmission/transaxle mount and create slight tension in the rubber.
2. Observe the transmission/transaxle mount while raising the transmission/transaxle. Replace the transmission/transaxle mount if the transmission/transaxle mount exhibits any of the following conditions:

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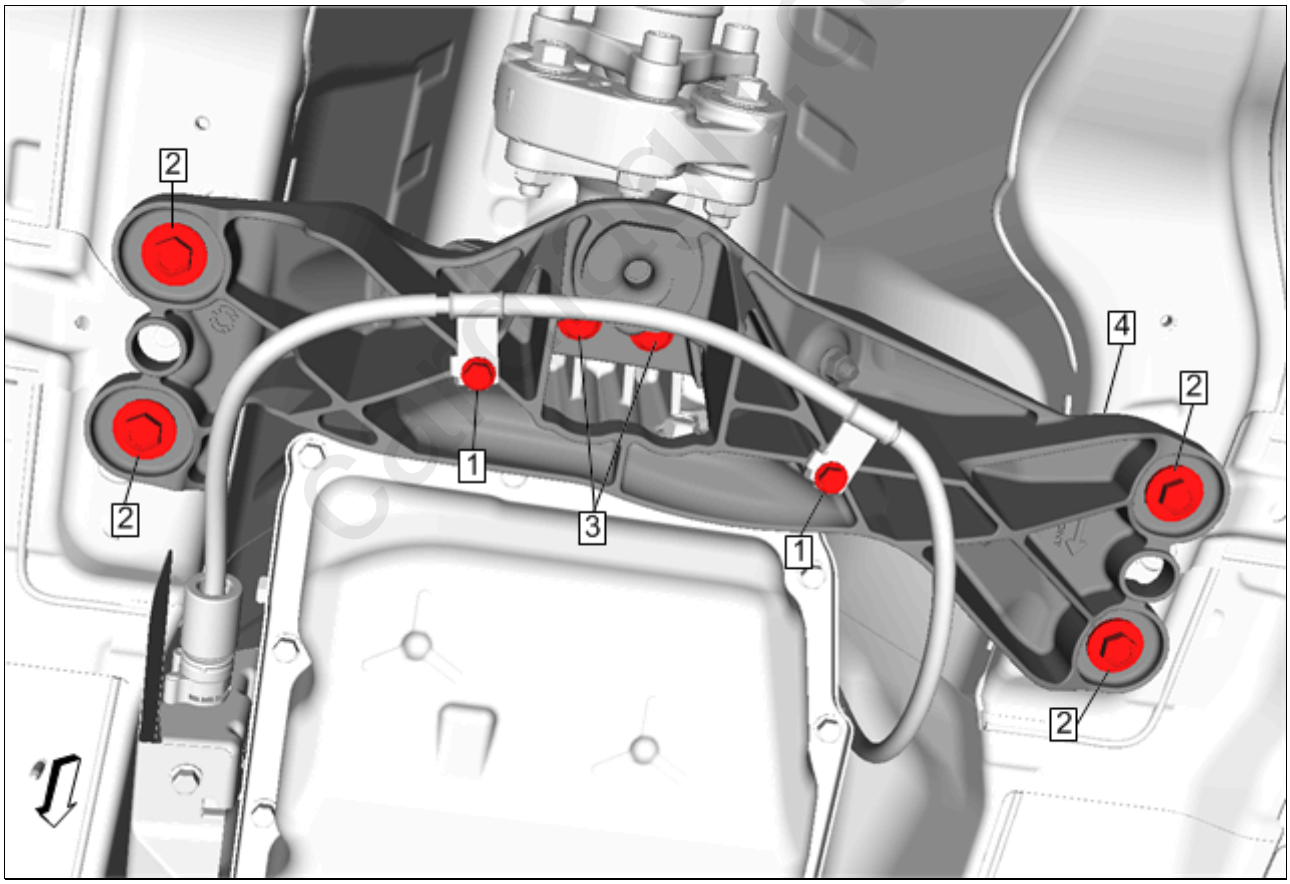
> *NOTE:*
>
> *Black paint on the rubber will crack with time, this does no constitute a failure.*

1. The hard rubber surface is covered with heat check cracks.
2. The rubber is separated from the metal plate of the transmission/transaxle mount.
3. The rubber is split through the center of the transmission/transaxle mount.

3. If there is movement between the metal plate of the transmission/transaxle mount and its attaching points, lower the transmission/transaxle on the transmission/transaxle mount. Tighten the bolts or nuts attaching the transmission/transaxle mount to the frame or transmission/transaxle mount bracket.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION MOUNT REPLACEMENT

Fig 1: Transmission Mount



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

NOTE:

The transmission support and the transmission mount are replaced as an assembly.

Preliminary Procedures

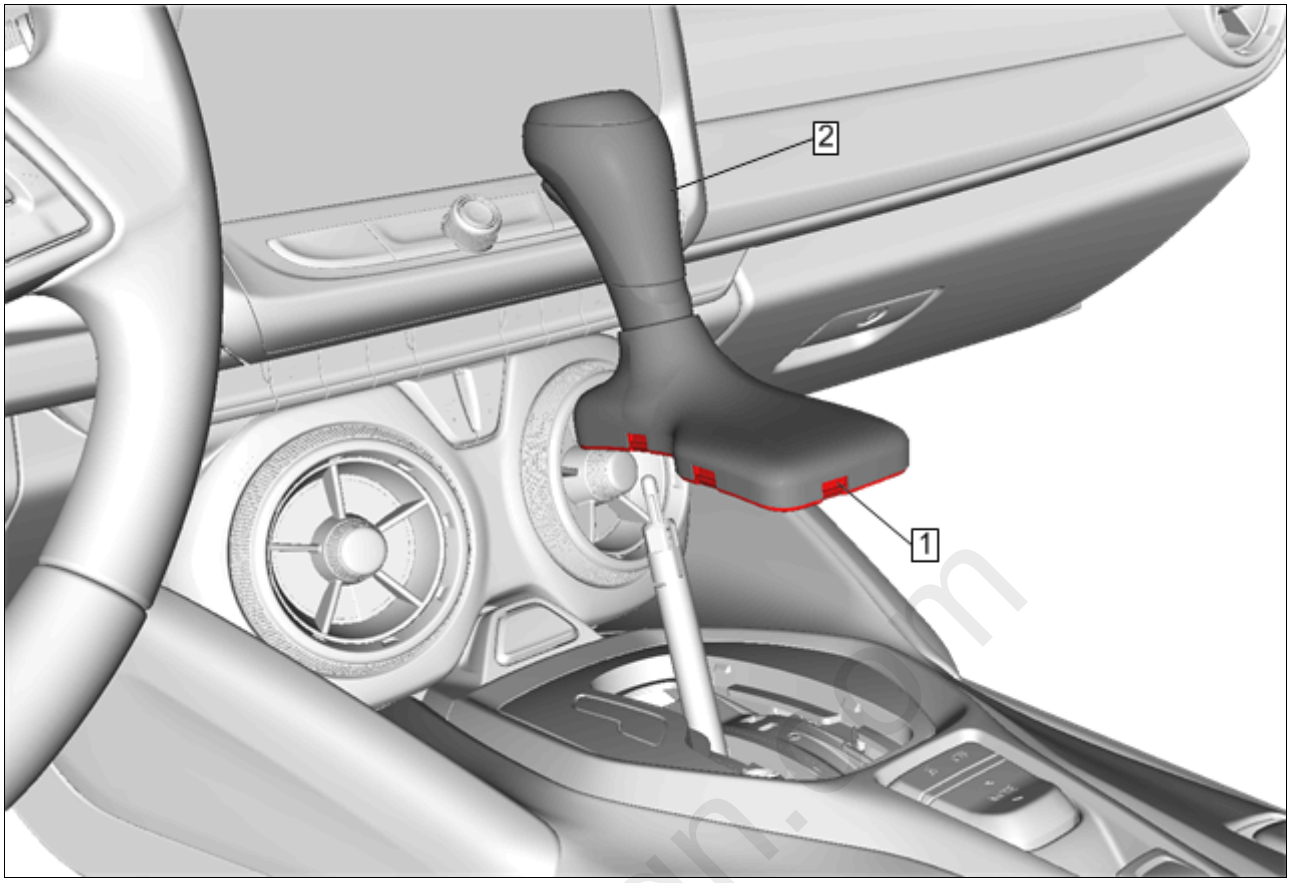
1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)
2. Support the transmission with a suitable jack.

1	Shift Control Cable Bolt (Qty: 2) *CAUTION:* *Refer to Fastener Caution* **Tighten** 9 N.m (80 lb in)
2	Transmission Support Crossmember Bolt (Qty: 4) **Tighten** 58 N.m (43 lb ft)
3	Transmission Mount Bolt (Qty: 2) **Tighten** 58 N.m (43 lb ft)
4	Transmission Support Crossmember

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REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

Fig 1: Transmission Control Lever Knob



Courtesy of GENERAL MOTORS COMPANY

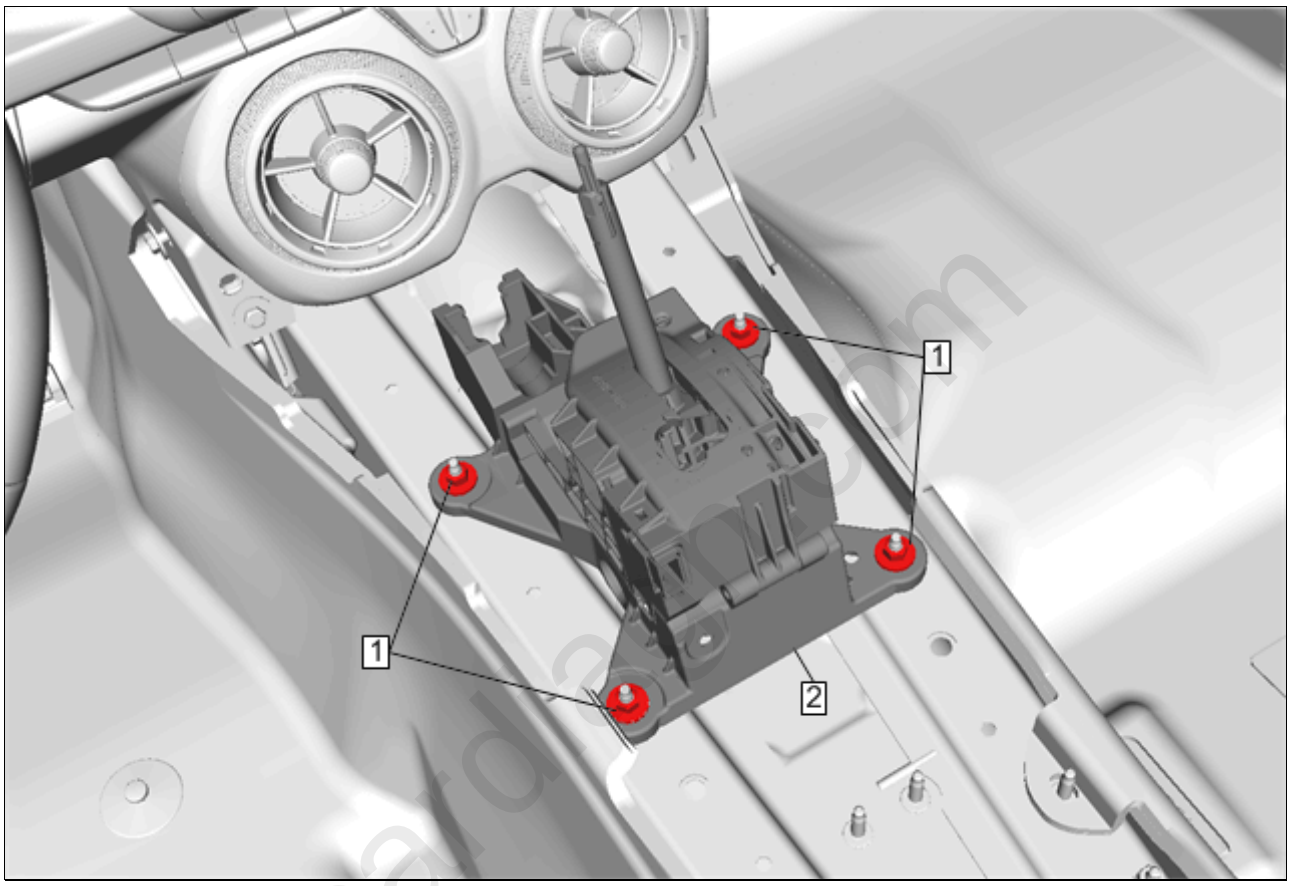
Callout	Component Name
1	Transmission Control Lever Knob Retainer (Qty: 5) **Procedure** Use a flat-bladed plastic trim tool in order to release the retainer clips securing the control lever boot. *NOTE:* *Place the transmission control in the Neutral position.*
2	Transmission Control Lever Knob *NOTE:* • *The control lever boot and knob are replaced as an assembly.* • *To remove the knob, pull upward and twist.* • *After knob installation, pull shift knob straight upward with moderate force*

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(No twisting motion) to ensure secure knob attachment to shifter rod.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONTROL REPLACEMENT

Fig 1: 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 .

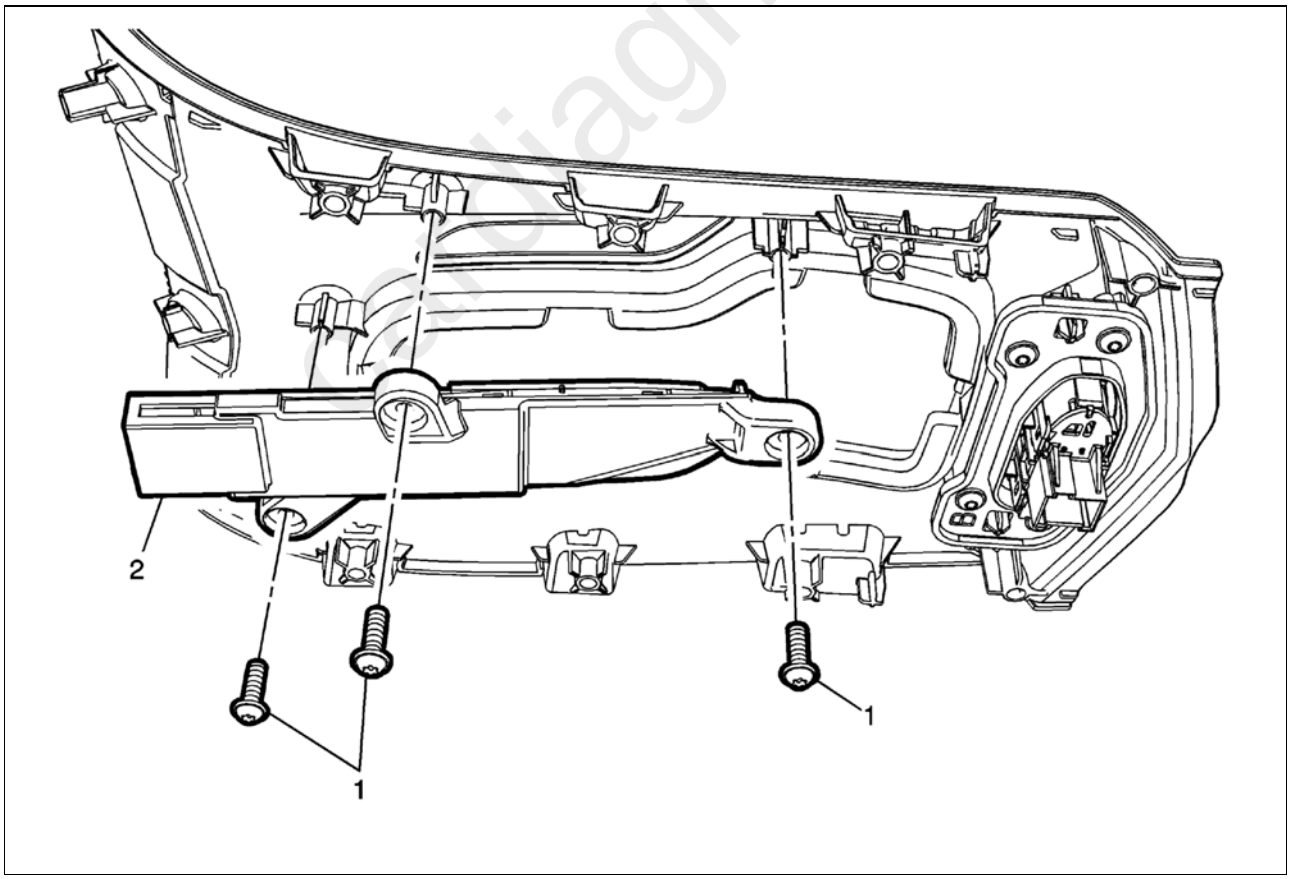
WARNING:

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.

	2. Disconnect the range selector lever cable. Refer to Range Selector Lever Cable Replacement . 3. Disconnect the transmission control electrical connector.
1	Transmission Control Fasteners (Qty: 4) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 9 N.m (80 lb in)
2	Transmission Control

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION CONTROL INDICATOR REPLACEMENT

Fig 1: Automatic Transmission Control Indicator & Screws



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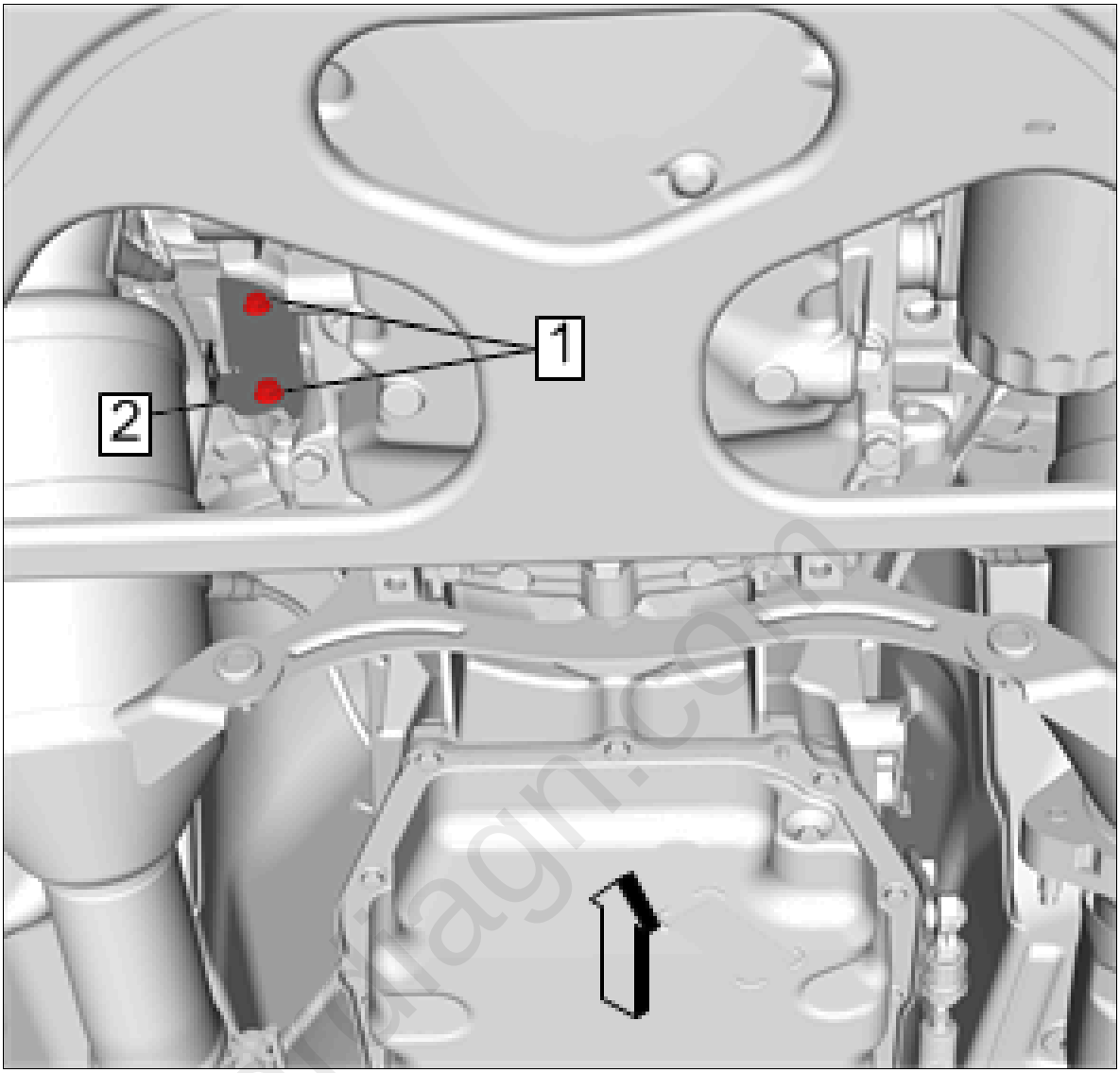
Callout	Component Name
Preliminary Procedure Remove the front floor console trim plate. Refer to Front Floor Console Trim Plate Replacement (Automatic)Front Floor Console Trim Plate Replacement (Manual) .	
1	Automatic Transmission Control Indicator Screw (Qty: 3) *CAUTION:* *Refer to Fastener Caution .* **Tighten** 2.5 N.m (22 lb in)
2	Automatic Transmission Control Indicator Assembly **Procedure** Disconnect the electrical connector.

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (M5T, LGX ENGINE) > REMOVAL PROCEDURE

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .

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Fig 1: Flywheel Inspection Cover Bolt And Cover

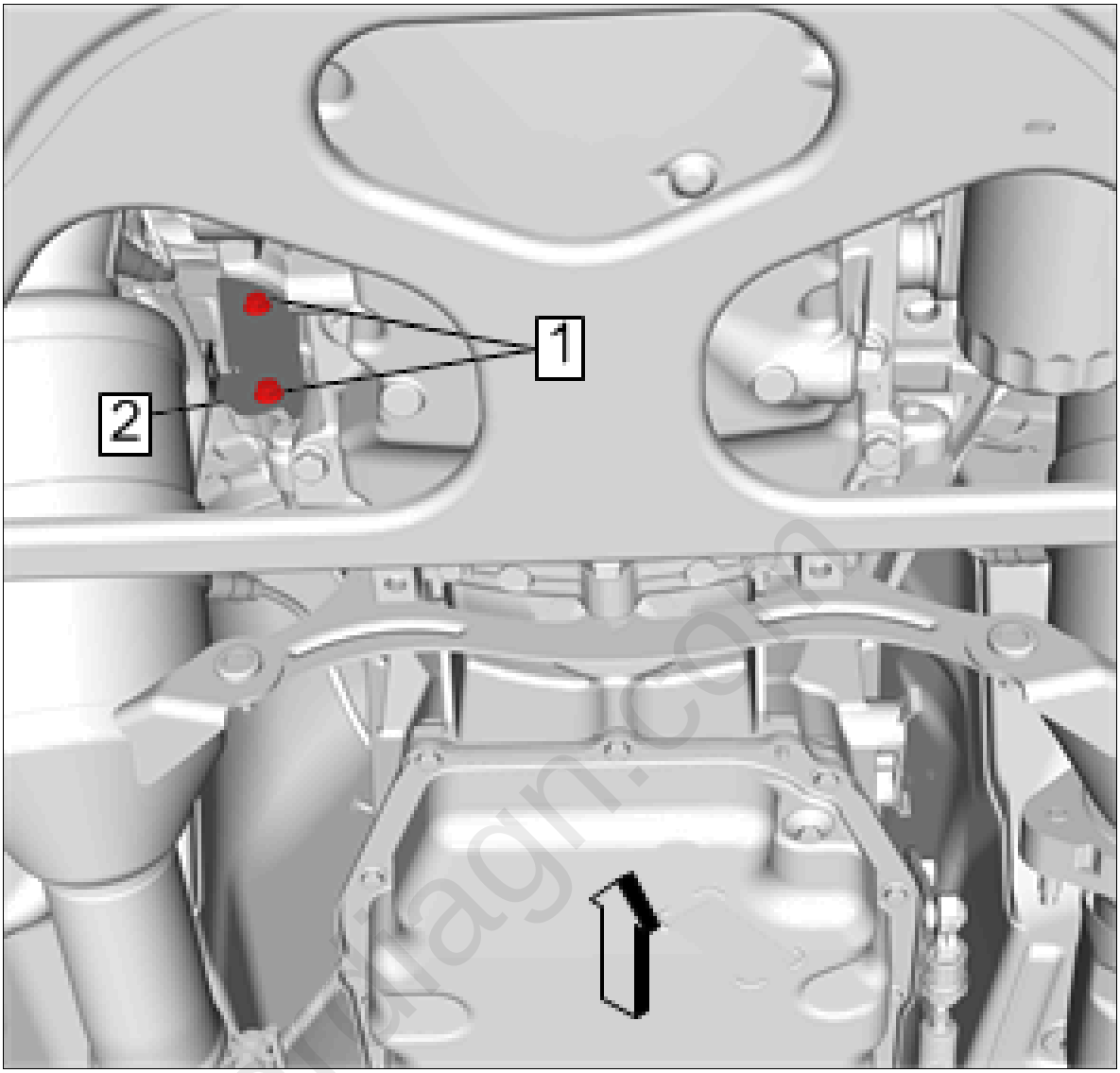


Courtesy of GENERAL MOTORS COMPANY

2. Remove the right flywheel inspection cover bolt (1) and cover (2).

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (M5T, LGX ENGINE) > INSTALLATION PROCEDURE

Fig 1: Flywheel Inspection Cover Bolt And Cover



Courtesy of GENERAL MOTORS COMPANY

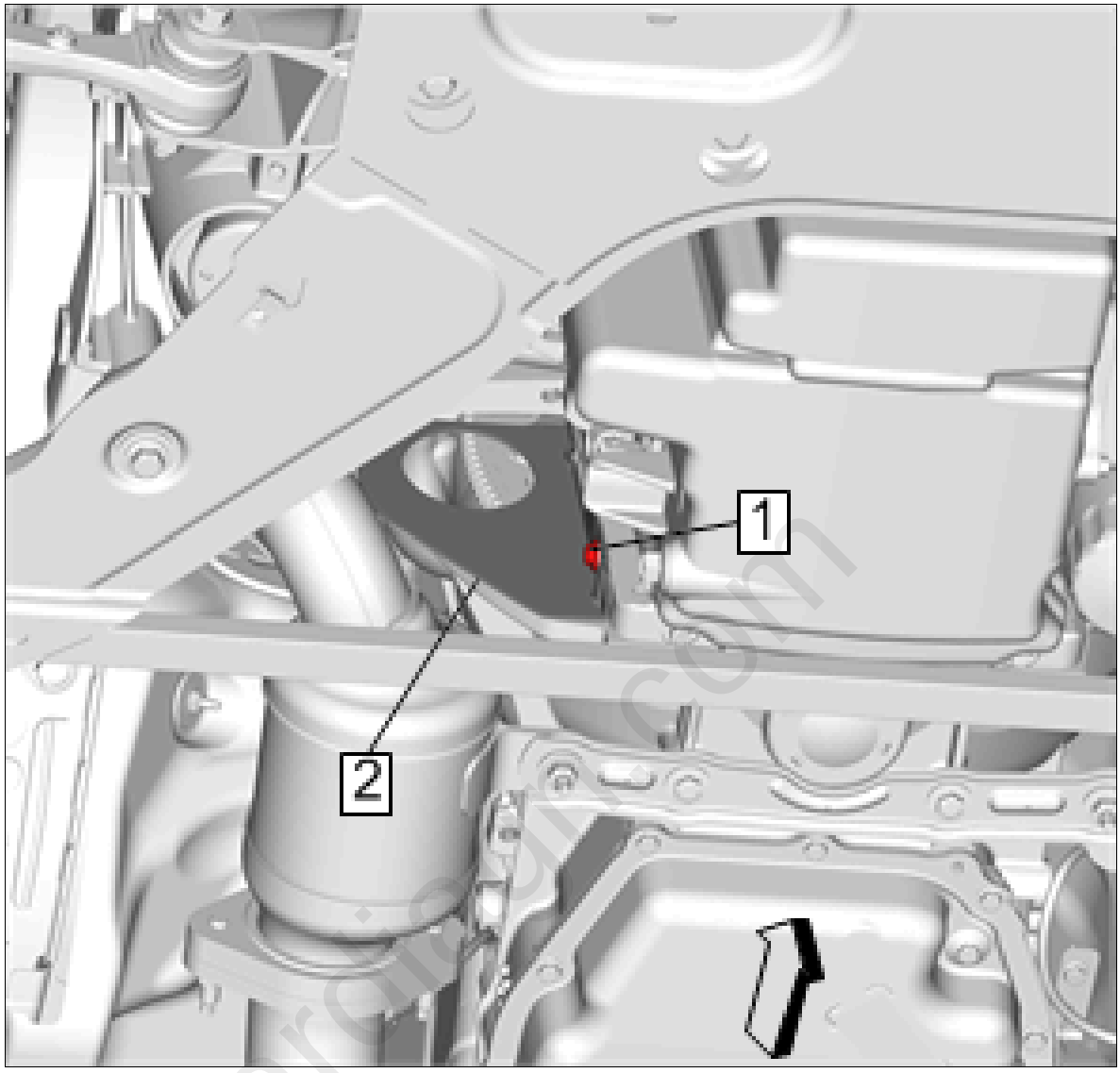
> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

1. Install the right flywheel inspection cover (2) and bolt (1). Tighten the bolt to 10 N.m (89 lb in).
2. Lower the vehicle..

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (RIGHT SIDE M5U) > REMOVAL PROCEDURE

1. Remove Starter Replacement (LT1)Starter Replacement (LGX)Starter Replacement (LTG) .

Fig 1: Right Flywheel Inspection Cover Bolt And Cover

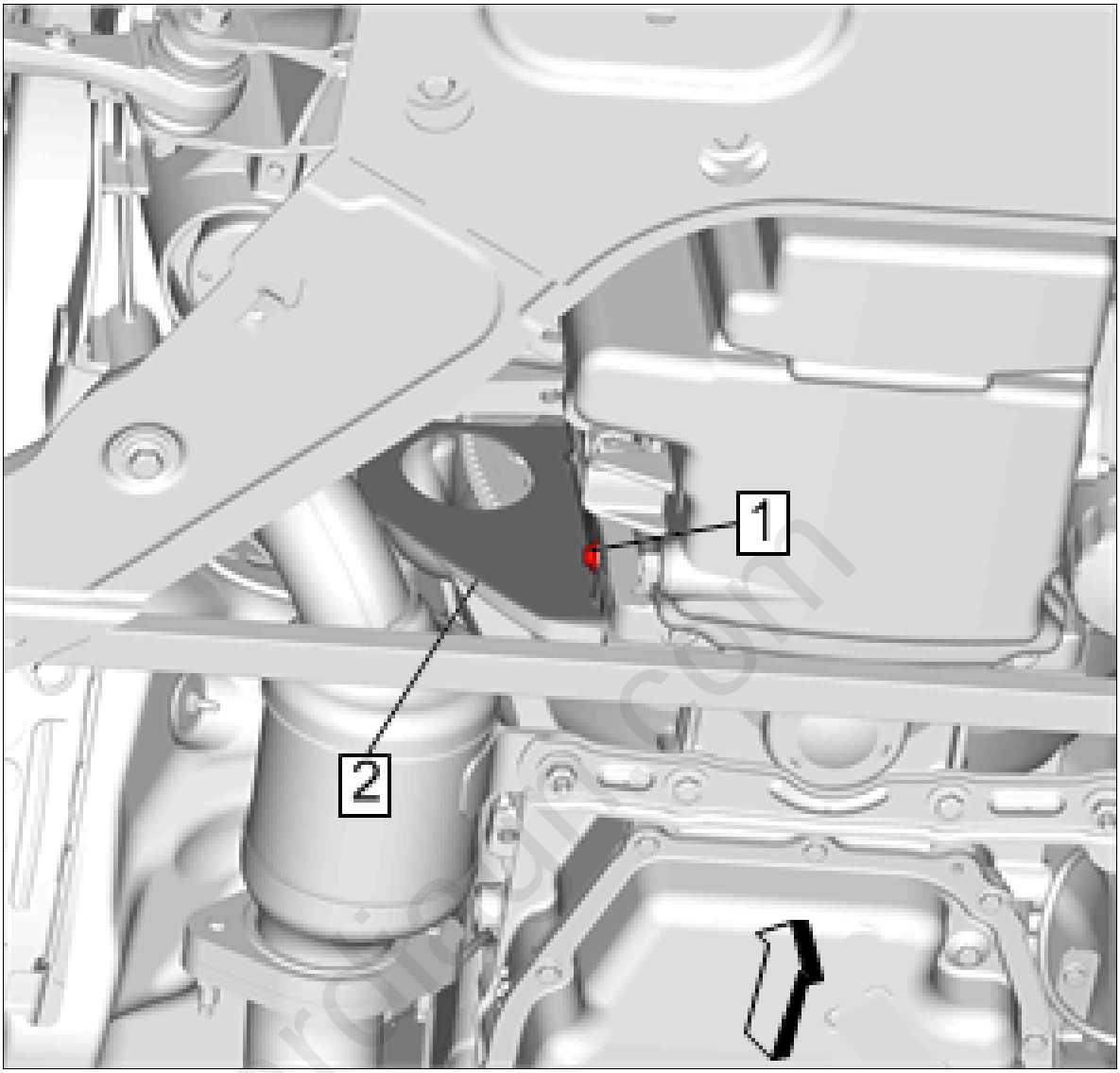


Courtesy of GENERAL MOTORS COMPANY

2. Remove the right flywheel inspection cover bolt (1) and cover (2).

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (RIGHT SIDE M5U) > INSTALLATION PROCEDURE

Fig 1: Right Flywheel Inspection Cover Bolt And Cover



Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

1. Install the right flywheel inspection cover (2) and bolt (1). Tighten the bolt to 10 N.m (89 lb in).
2. Install Starter Replacement (LT1)Starter Replacement (LGX)Starter Replacement (LTG)

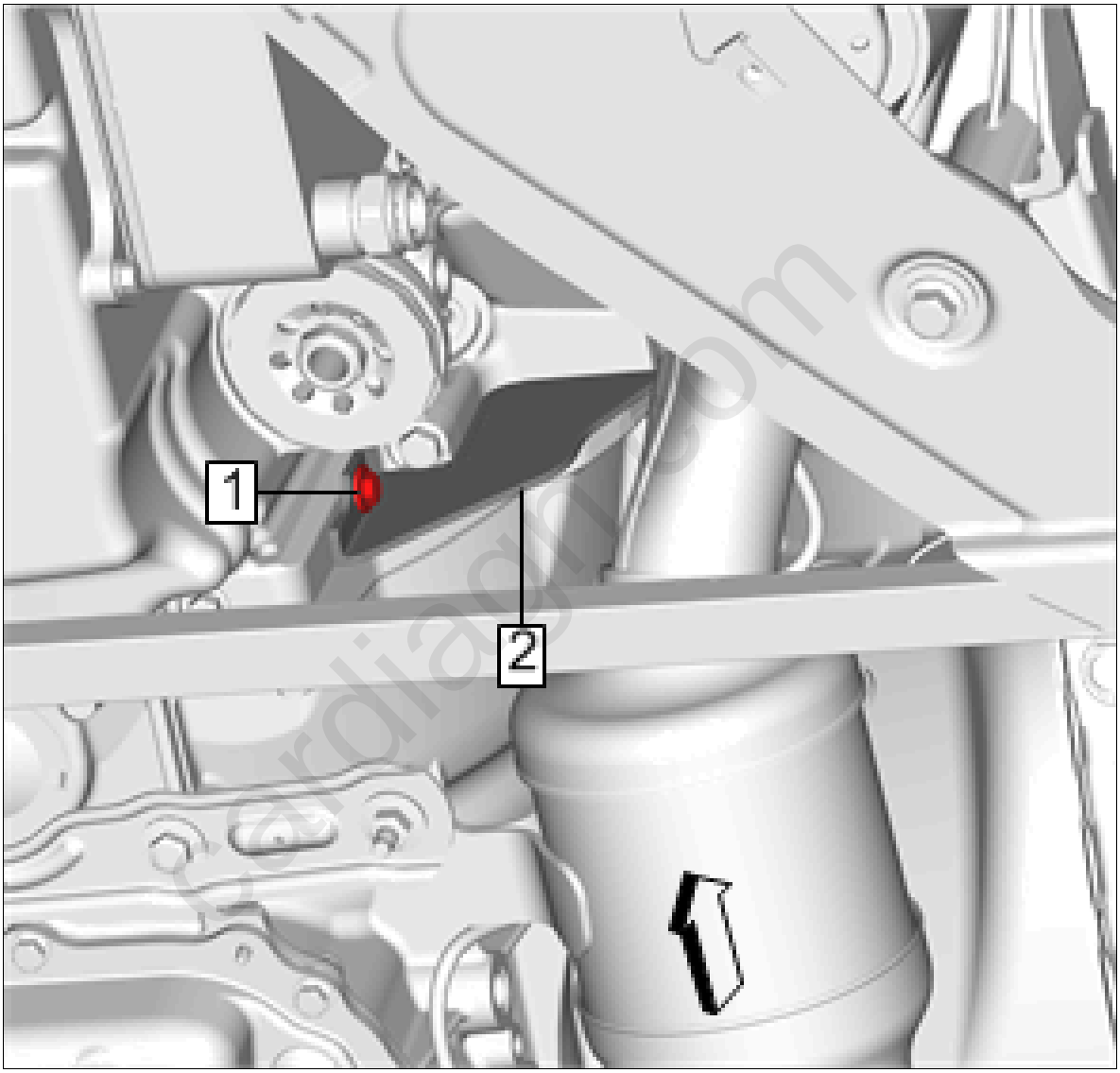
REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (LEFT SIDE M5U) > REMOVAL PROCEDURE

1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the

Vehicle (HP) .

> *NOTE:*
>
> *Oil filter not shown for clarity.*

Fig 1: Left Flywheel Inspection Cover Bolt And Cover

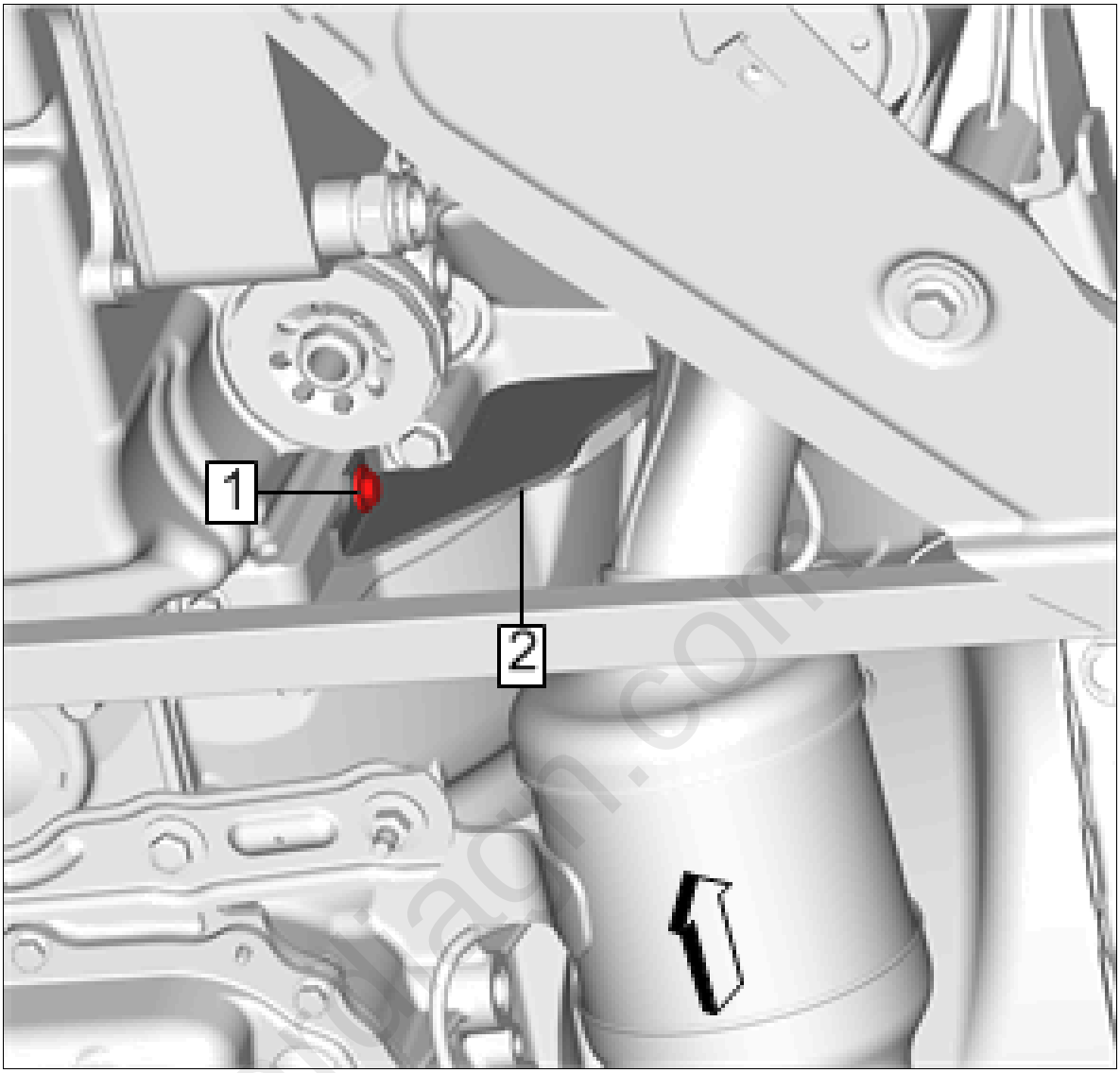


Courtesy of GENERAL MOTORS COMPANY

2. Remove the left flywheel inspection cover bolt (1) and cover (2).

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONVERTER COVER REPLACEMENT (LEFT SIDE M5U) > INSTALLATION PROCEDURE

Fig 1: Left Flywheel Inspection Cover Bolt And Cover



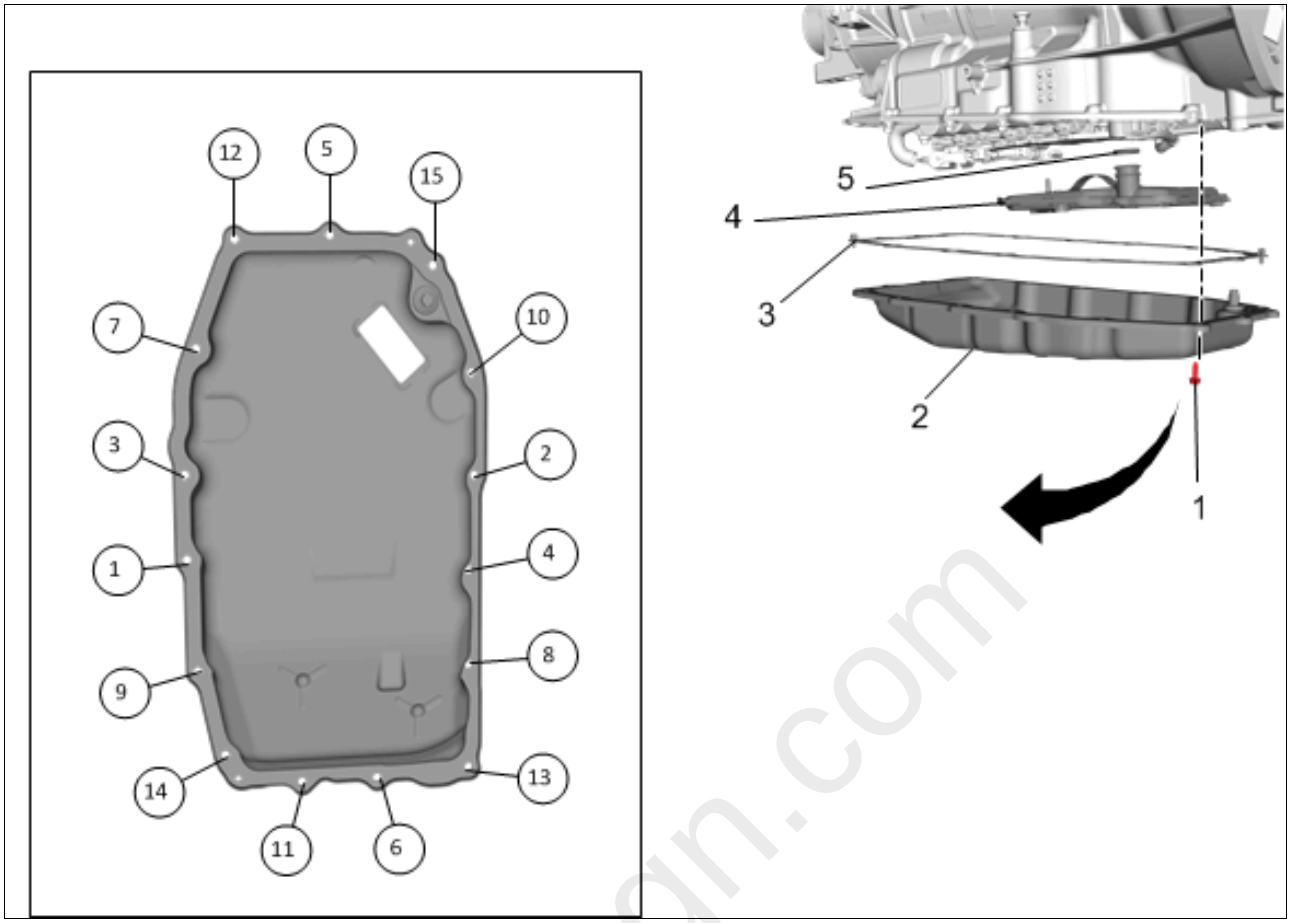
Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

1. Install the right flywheel inspection cover (2) and bolt (1). Tighten the bolt to 10 N.m (89 lb in).
2. Lower the vehicle.

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION FLUID, FLUID PAN AND/OR FILTER REPLACEMENT

Fig 1: Transmission Fluid Filter



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Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) . 2. Place a suitable drain pan under the transmission.	
1	Transmission Fluid Pan Bolt (Qty: 15) *CAUTION:* *Refer to Fastener Caution .* **Procedure** Tighten the bolts in the sequence shown. **Tighten**

	10 N.m (89 lb in)
2	Transmission Fluid Pan Assembly **Procedure** Fill the transmission with the proper amount of transmission fluid. Transmission Fluid Fill Procedure .
3	Transmission Fluid Pan Gasket **Procedure** The fluid pan gasket is reusable. Inspect the gasket to determine if it may be reused.
4	NEW Fluid Filter Assembly **Procedure** Pull the fluid filter assembly straight out. Do not bend or twist the filter neck. *NOTE:* *The seal is not serviced separately and comes with the NEW filter assembly.*
5	NEW Fluid Filter Seal Assembly *CAUTION:* *Do not damage the case sealing surface when removing the filter seal assembly.* Procedure 1. Use a flat-bladed tool to remove the filter seal and discard. 2. Lubricate the filter seal with transmission fluid before installing the filter.

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REPAIR INSTRUCTIONS - ON VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL REPLACEMENT

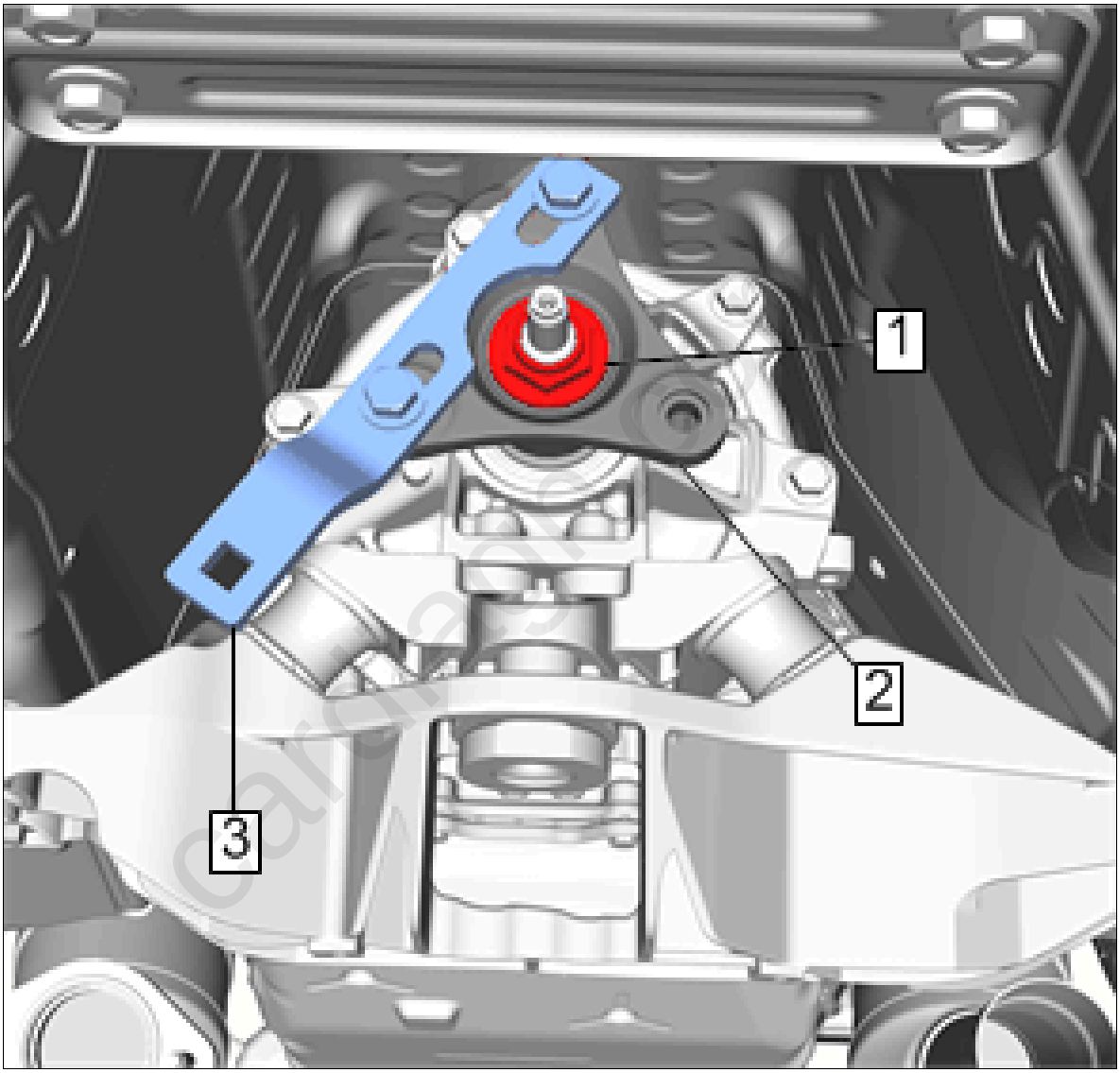
Special Tools

- **J-6125-B** Slide Hammer
- **DT-22828** Input and Countershaft Race Installer
- **DT-38416-B** Harmonic Balancer Remover
- **J-45012** Holding Fixture
- For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL REPLACEMENT > REMOVAL PROCEDURE

1. Remove the propeller shaft. Two-Piece Propeller Shaft Replacement (Coupe MM6, M13)Two-Piece Propeller Shaft Replacement (Convertible MM6, M13)Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U) .

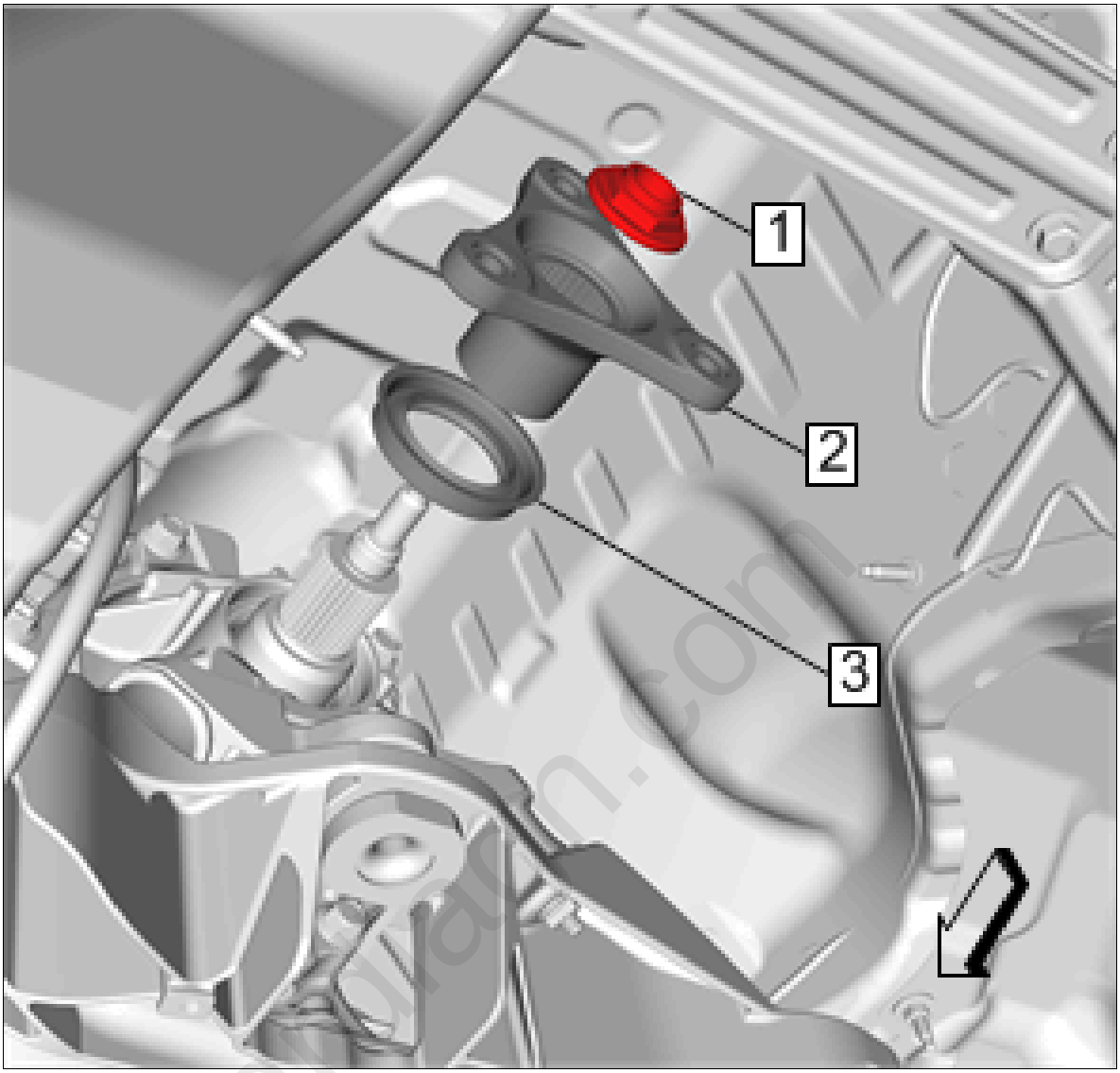
   Fig 1: Holding Fixture And Propeller Shaft Transmission Flange



Courtesy of GENERAL MOTORS COMPANY

2. Install the **J-45012** Holding Fixture (3) to the propeller shaft transmission flange (2).

Fig 2: Propeller Shaft Transmission Flange Nut



Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Do not reuse the flange nut. Reusing the flange nut may cause damage to the transmission.*

3. Remove and Discard the propeller shaft transmission flange nut (1).

> *NOTE:*
>
> *If the propeller shaft transmission flange is not easily removed with **J 45012** Holding Fixture use. **DT 38416 B** Harmonic Balancer Remover to remove the flange.*

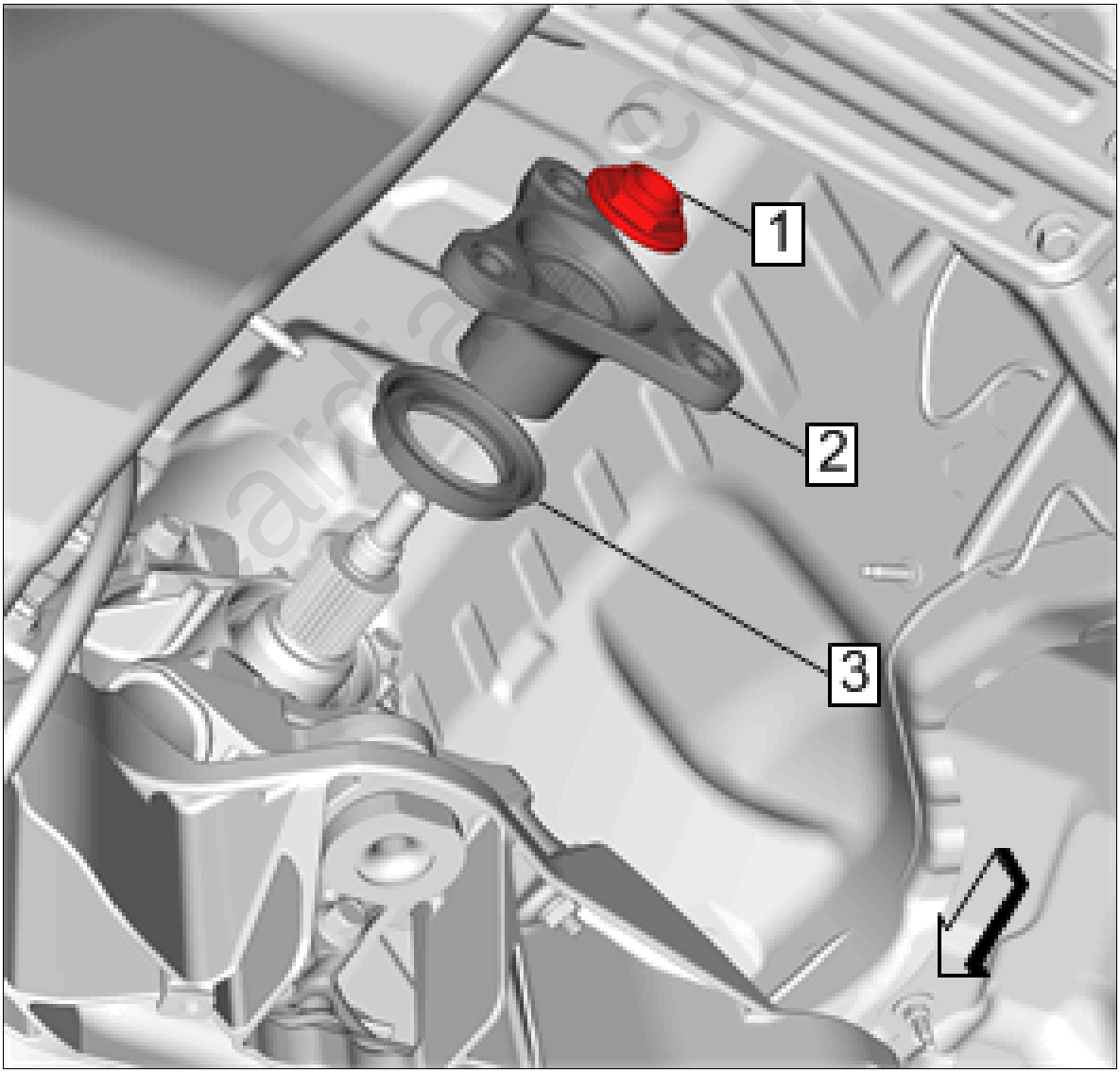
4. Remove the propeller shaft transmission flange (2) from the output shaft.

> *NOTE:*
>
> *Do not scrape or gouge the case extension housing while removing the output shaft seal.*

5. Use the **J-6125-B** Slide Hammer and **J-23129** Seal Remover to remove the propeller shaft transmission seal (3) from the case extension housing.

REPAIR INSTRUCTIONS - ON VEHICLE > PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL REPLACEMENT > INSTALLATION PROCEDURE

Fig 1: Propeller Shaft Transmission Flange Nut



Courtesy of GENERAL MOTORS COMPANY

1. Install the NEW propeller shaft transmission seal (3) using **DT-22828** Input and Countershaft Race Installer to the case extension housing.

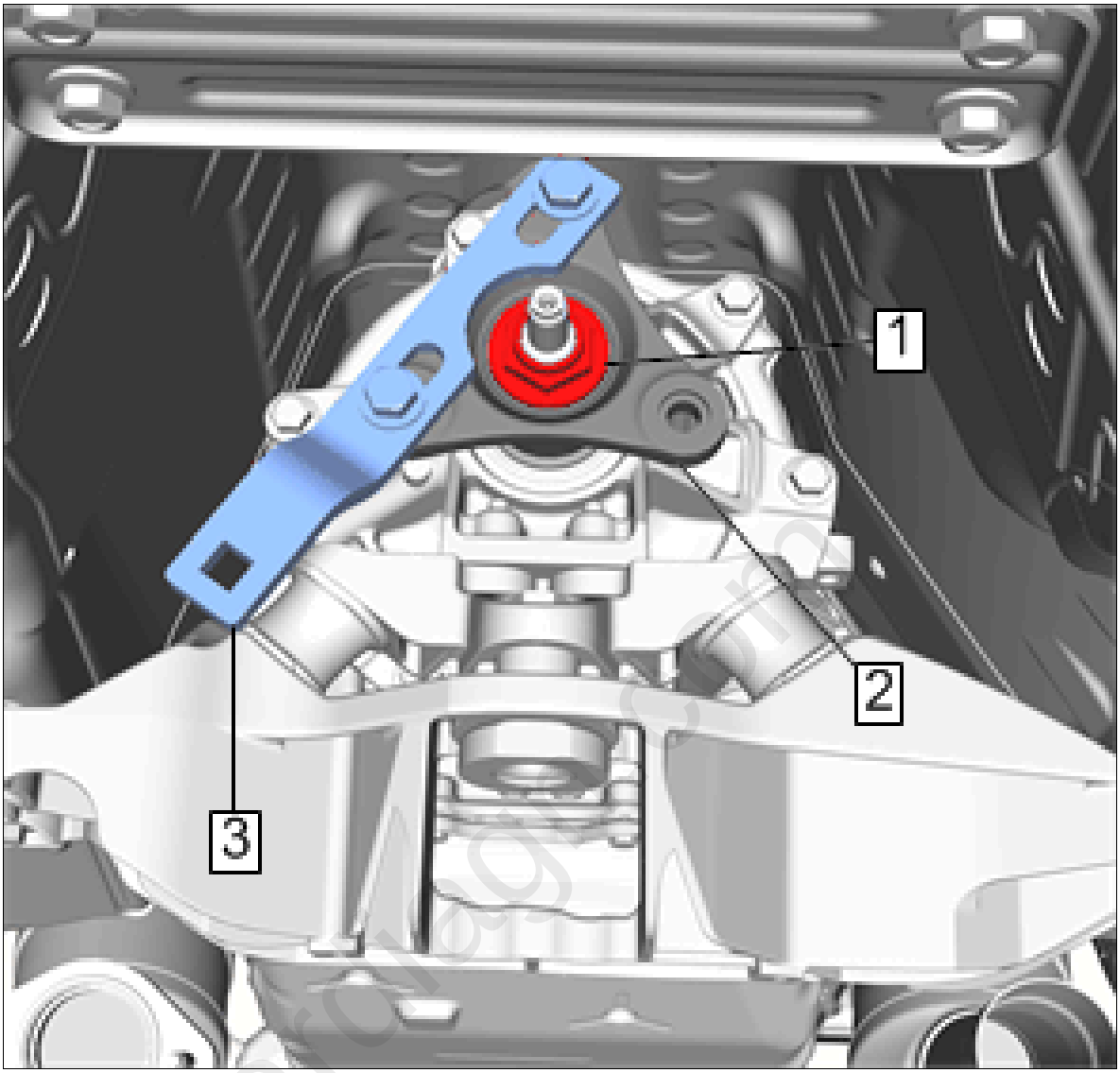
> *NOTE:*
>
> *The output shaft splines must be thoroughly clean and dry before installing the flange.*

> *NOTE:*
>
> 1. *When repairing low speed and garage shift clunk - except for moving the vehicle from the hoist, do not operate the vehicle above 5 m.p.h. at light throttle for 24 hours to allow the adhesive to cure.*
> 2. *If the replacement flange contains a pre-applied adhesive patch, then liquid adhesive is not required and the 24 hour cure time is not necessary.*

2. Apply adhesive across the width of the flange splines. Refer to Adhesives, Fluids, Lubricants, and Sealers . However, if the replacement flange contains a pre-applied adhesive patch, then liquid adhesive is not required and the 24 hour cure time is not necessary.
3. Install the propeller shaft transmission flange (2) to the output shaft.
4. Sufficient application of adhesive to every tooth on the flange will leave excess adhesive on the output shaft after installation. If no excess is observed, reapply adhesive.

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Fig 2: Holding Fixture And Propeller Shaft Transmission Flange



Courtesy of GENERAL MOTORS COMPANY

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> *NOTE:*
>
> *The output shaft nut threads must be thoroughly clean and dry before installing the flange.*

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

5. Apply adhesive across the width of the nut threads prior to tightening and staking. Refer to Adhesives, Fluids, Lubricants, and Sealers . However, if the replacement nut contains a pre-applied adhesive patch, then liquid adhesive is not required.

Install the NEW propeller shaft transmission flange nut (1) and tighten to 105 N.m (77 lb ft).

6. Remove the **J-45012** Holding Fixture (3) from the propeller shaft transmission flange (2).

> ⚠ *CAUTION:*
>
> *Stake the flange nut onto the output shaft. Use the two staking grooves on the shaft to locate the staking points. Failure to stake the flange nut may result in damage to the transmission.*

7. Stake the propeller shaft transmission flange nut (1).
8. Install the propeller shaft. Refer to Two-Piece Propeller Shaft Replacement (Coupe MM6, M13)Two-Piece Propeller Shaft Replacement (Convertible MM6, M13)Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U) .

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT SHAFT AND SEAL REPLACEMENT

Special Tools

- **DT-45201** Cooler Line Seal Remover
- **DT-47770** Seal Installer

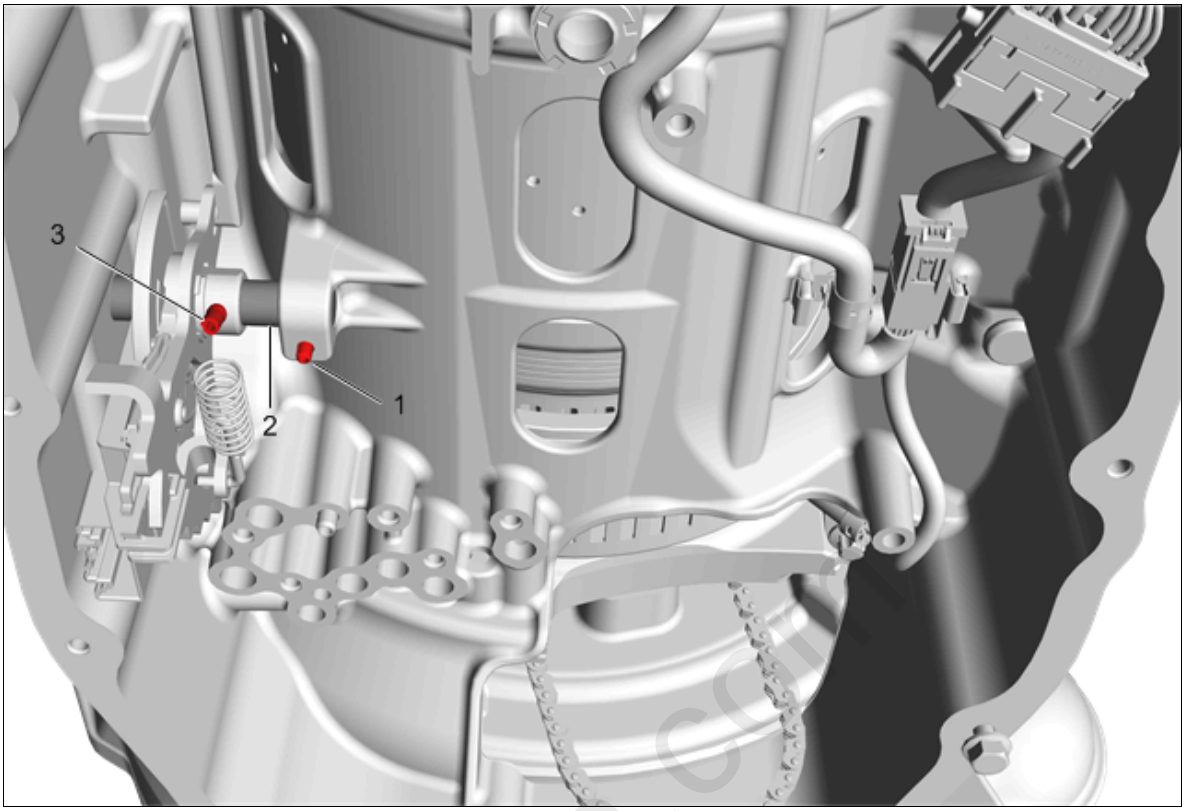
For equivalent tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT SHAFT AND SEAL REPLACEMENT > REMOVAL PROCEDURE

1. Remove the automatic transmission range selector lever. Refer to Automatic Transmission Range Selector Lever Replacement (M5T) Automatic Transmission Range Selector Lever Replacement (M5U) .
2. Remove the control valve body. Refer to Control Valve Body Replacement .

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Fig 1: Manual Shift Shaft And Pins

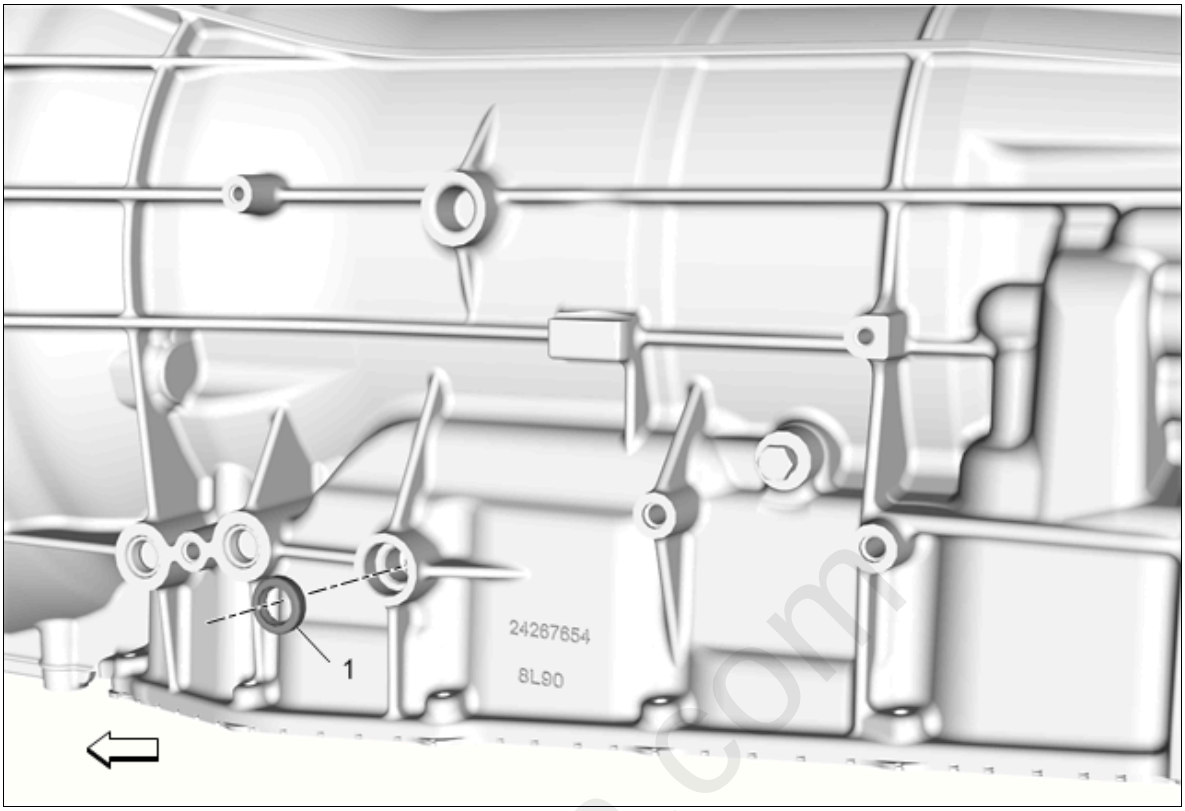


Courtesy of GENERAL MOTORS COMPANY

3. Remove and Discard the manual shift shaft detent lever hub pin (3).
4. Remove and Discard the manual shift shaft pin (1).
5. Remove the manual shift shaft (2).

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Fig 2: Manual Shift Shaft Seal



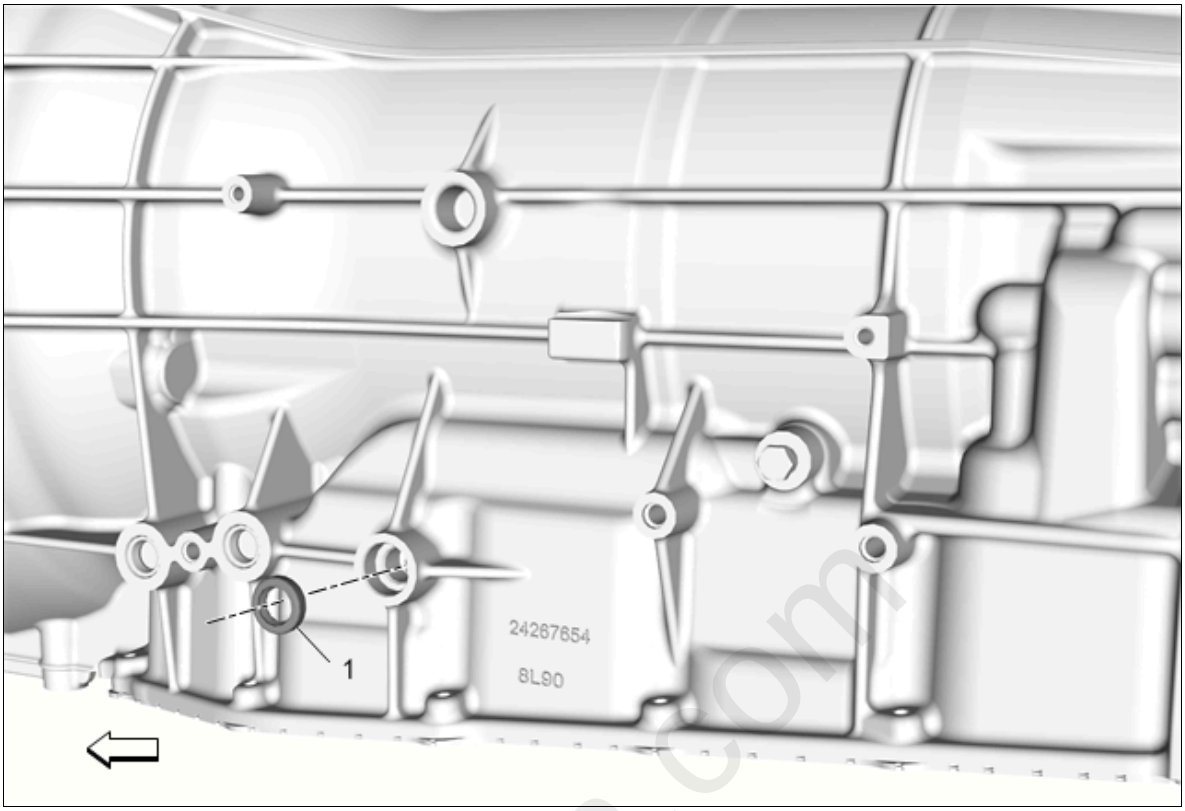
Courtesy of GENERAL MOTORS COMPANY

6. Remove and Discard the manual shift shaft seal (1) using **DT-45201** cooler line seal remover.

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT SHAFT AND SEAL REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Manual Shift Shaft Seal

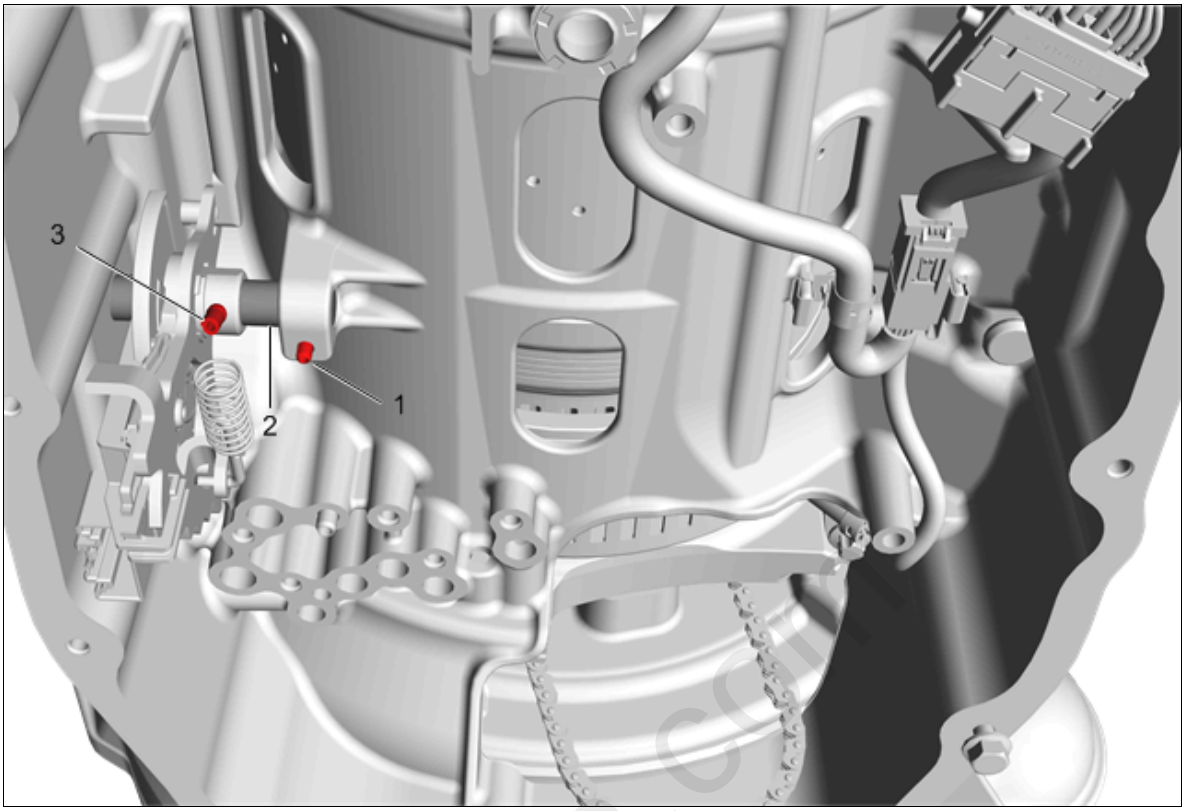


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1. Install the NEW manual shift shaft seal (1) using **DT-47770** seal installer.

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Fig 2: Manual Shift Shaft And Pins



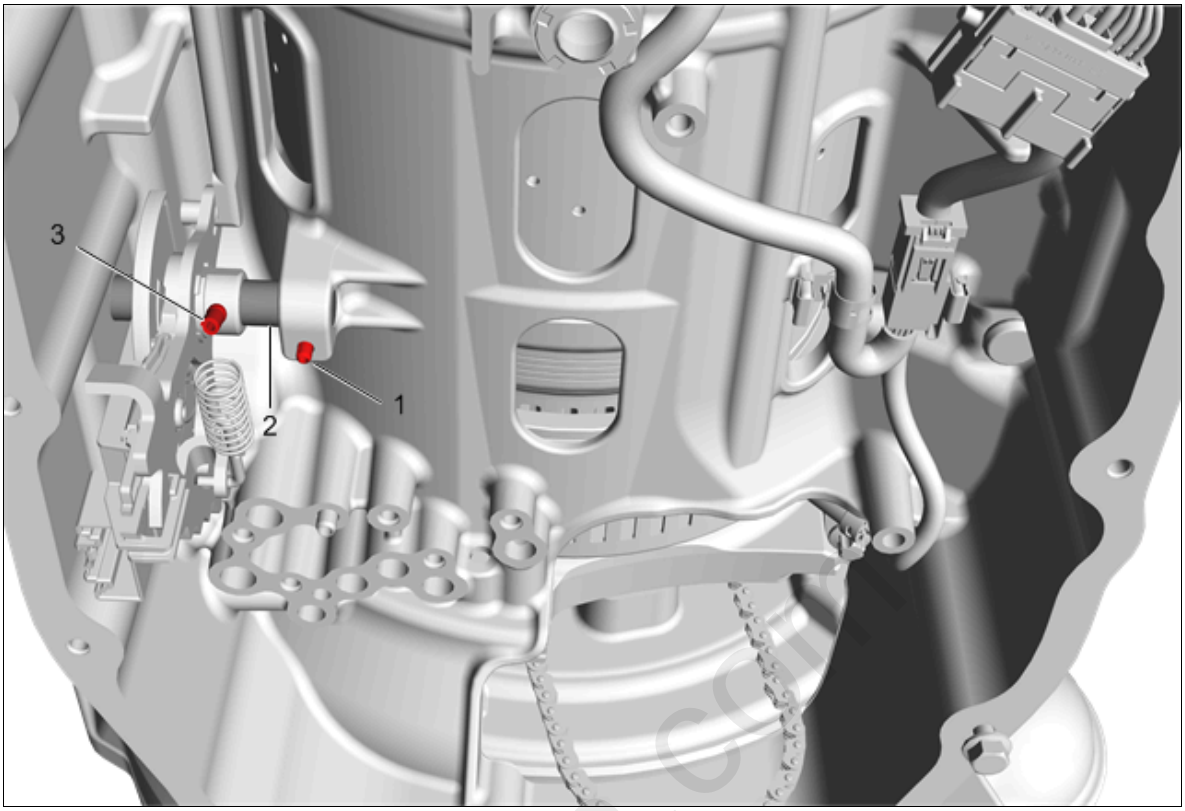
Courtesy of GENERAL MOTORS COMPANY

2. Install the manual shift shaft (2) aligning the position switch assembly onto the shaft.
3. Install the NEW manual shift shaft pin (1).
4. Install the NEW manual shift shaft detent lever hub pin (3).
5. Install the control valve body. Refer to Control Valve Body Replacement .
6. Install the automatic transmission range selector lever. Refer to Automatic Transmission Range Selector Lever Replacement (M5T) Automatic Transmission Range Selector Lever Replacement (M5U) .
7. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT SHAFT POSITION SWITCH REPLACEMENT > REMOVAL PROCEDURE

1. Remove the automatic transmission range selector lever. Refer to Automatic Transmission Range Selector Lever Replacement (M5T) Automatic Transmission Range Selector Lever Replacement (M5U) .
2. Remove the control valve body. Refer to Control Valve Body Replacement .

Fig 1: Manual Shift Shaft And Pins

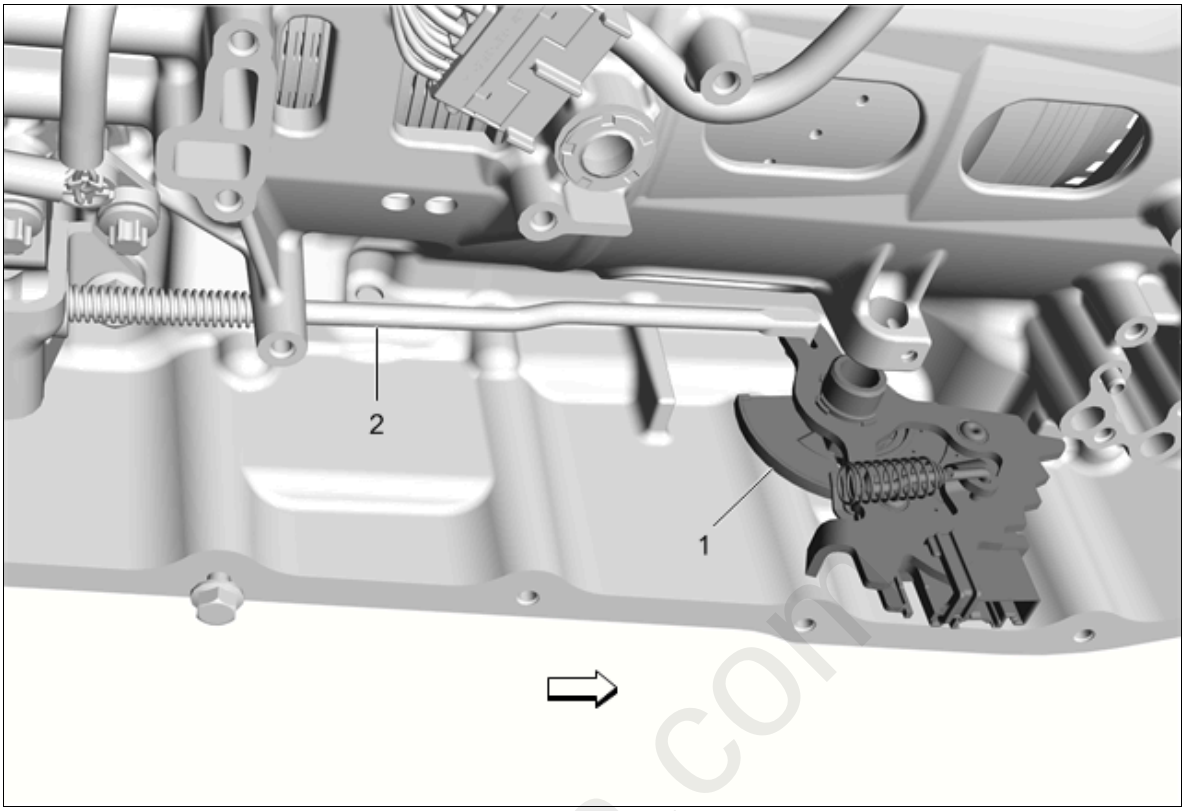


Courtesy of GENERAL MOTORS COMPANY

3. Remove and Discard the manual shift shaft detent lever hub pin (3).
4. Remove and Discard the manual shift shaft pin (1).
5. Remove the manual shift shaft (2).
6. Remove or reposition the manual shift shaft position switch assembly as necessary.

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Fig 2: Manual Shift Shaft Position Switch And Park Pawl Actuator Rod



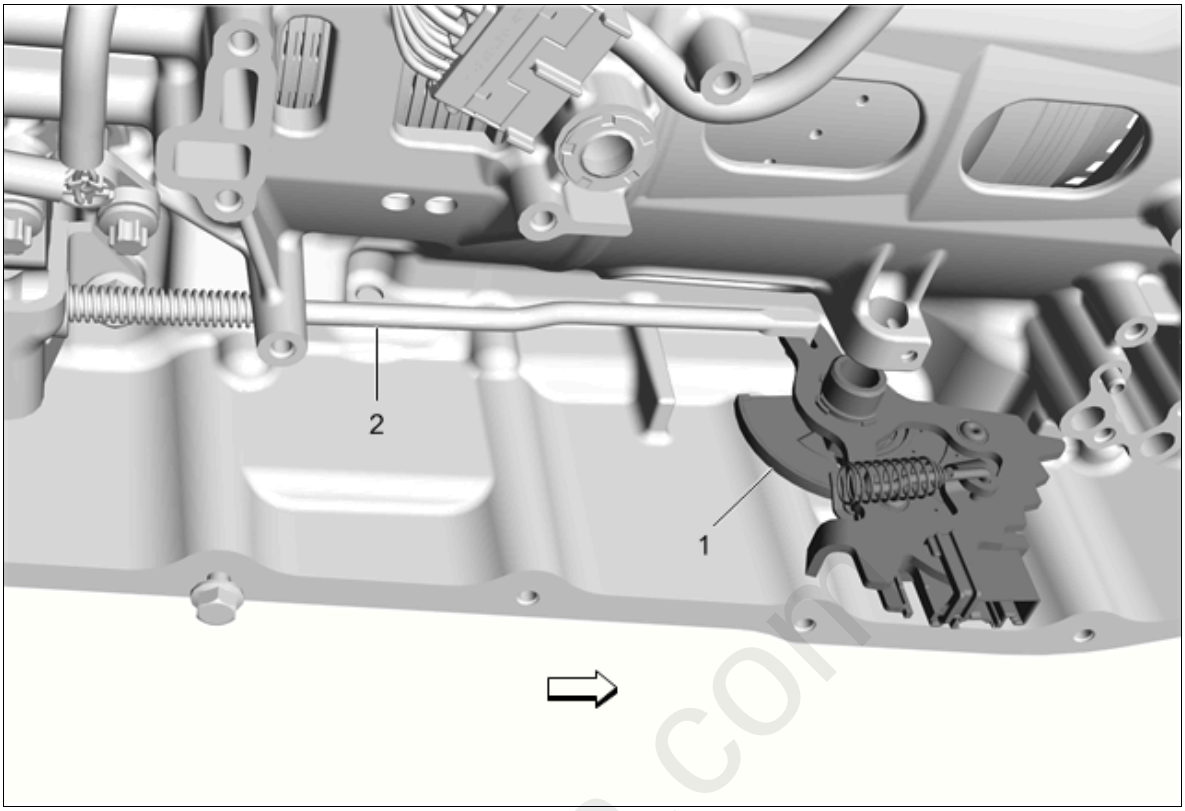
Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the park pawl actuator rod (2) from the manual shift shaft position switch (1).

REPAIR INSTRUCTIONS - ON VEHICLE > MANUAL SHIFT SHAFT POSITION SWITCH REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Manual Shift Shaft Position Switch And Park Pawl Actuator Rod

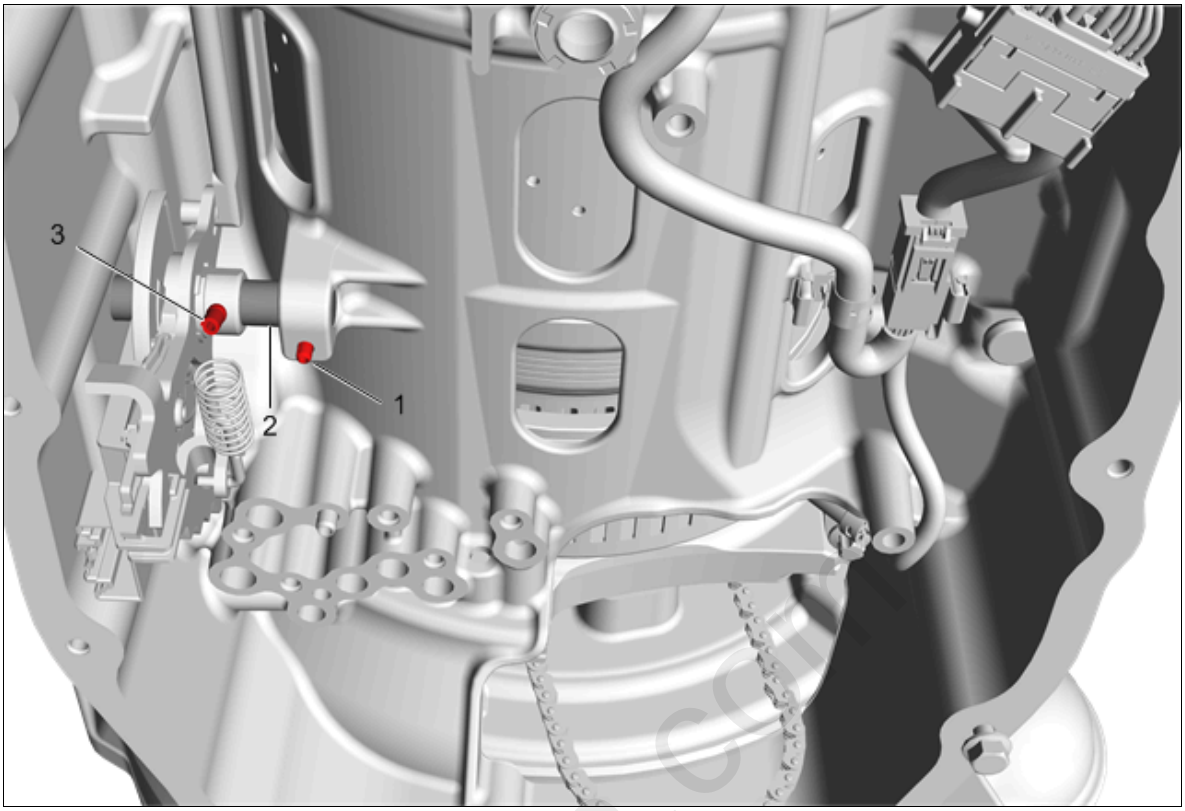


Courtesy of GENERAL MOTORS COMPANY

1. Connect the park pawl actuator rod (2) to the manual shift shaft position switch (1).
2. Install the manual shift shaft position switch assembly (1).

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Fig 2: Manual Shift Shaft And Pins



Courtesy of GENERAL MOTORS COMPANY

3. Install the manual shift shaft (2) aligning the position switch assembly onto the shaft.
4. Install the NEW manual shift shaft pin (1).
5. Install the NEW manual shift shaft detent lever hub pin (3).
6. Install the control valve body. Refer to Control Valve Body Replacement .
7. Install the automatic transmission range selector lever. Refer to Automatic Transmission Range Selector Lever Replacement (M5T) Automatic Transmission Range Selector Lever Replacement (M5U) .
8. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > INPUT AND OUTPUT SPEED SENSOR REPLACEMENT

Special Tools

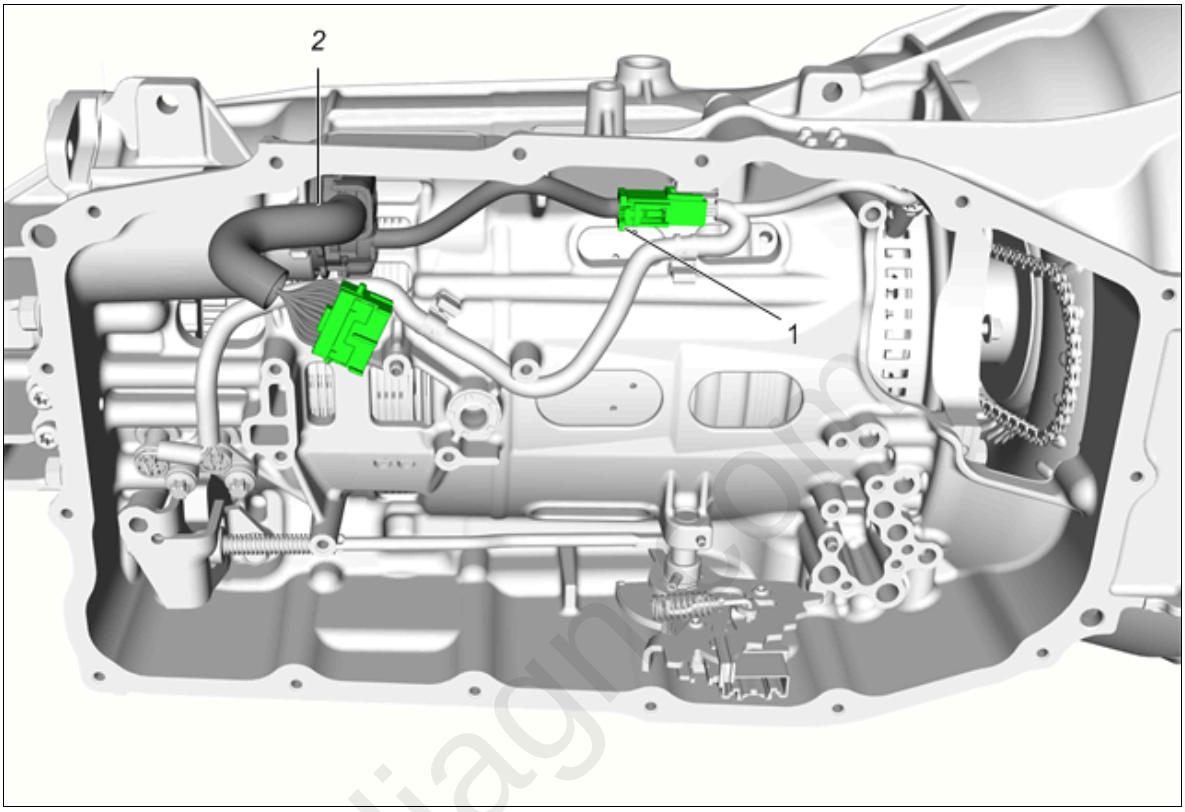
- **DT-48285** Valve Body Torx Plus Socket

For equivalent tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > INPUT AND OUTPUT SPEED SENSOR REPLACEMENT > REMOVAL PROCEDURE

1. Remove the control valve body from the transmission. Refer to Control Valve Body Replacement .

   Fig 1: Electrical Connector

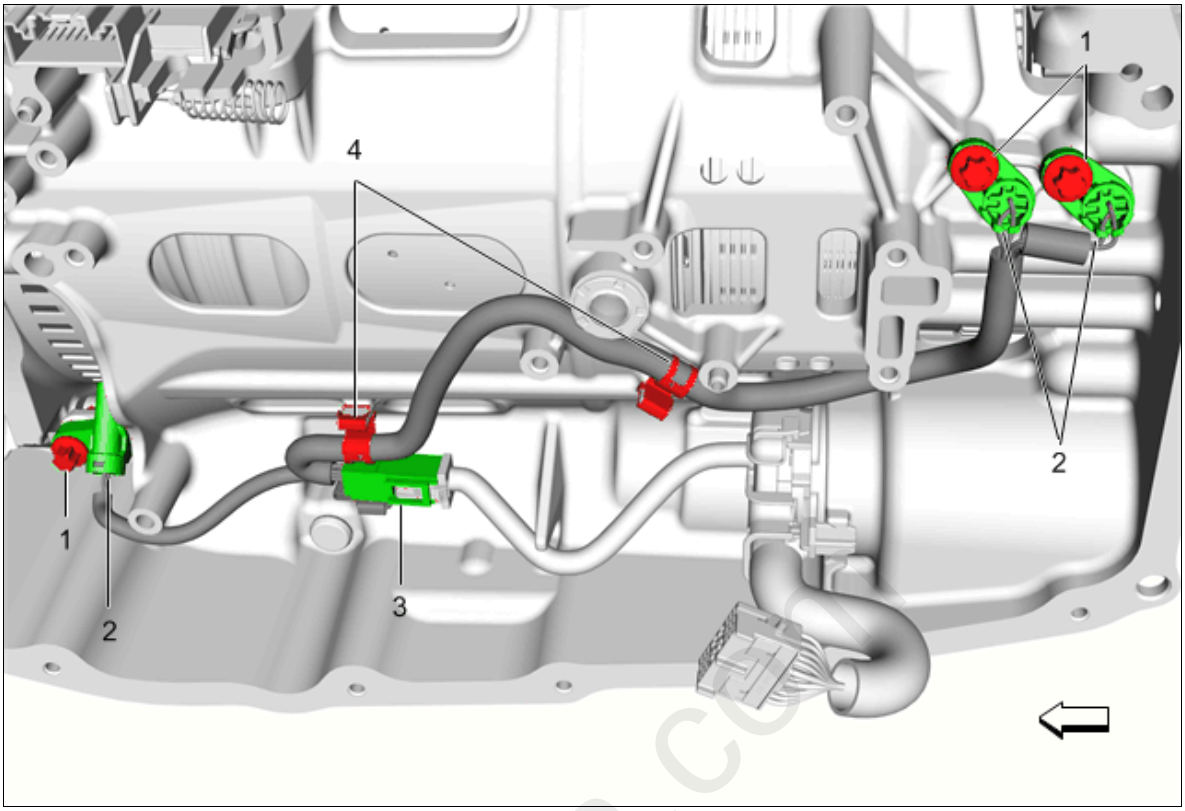


Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the electrical connector (1).

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Fig 2: Input And Output Speed Sensor Wiring Harness Bolts



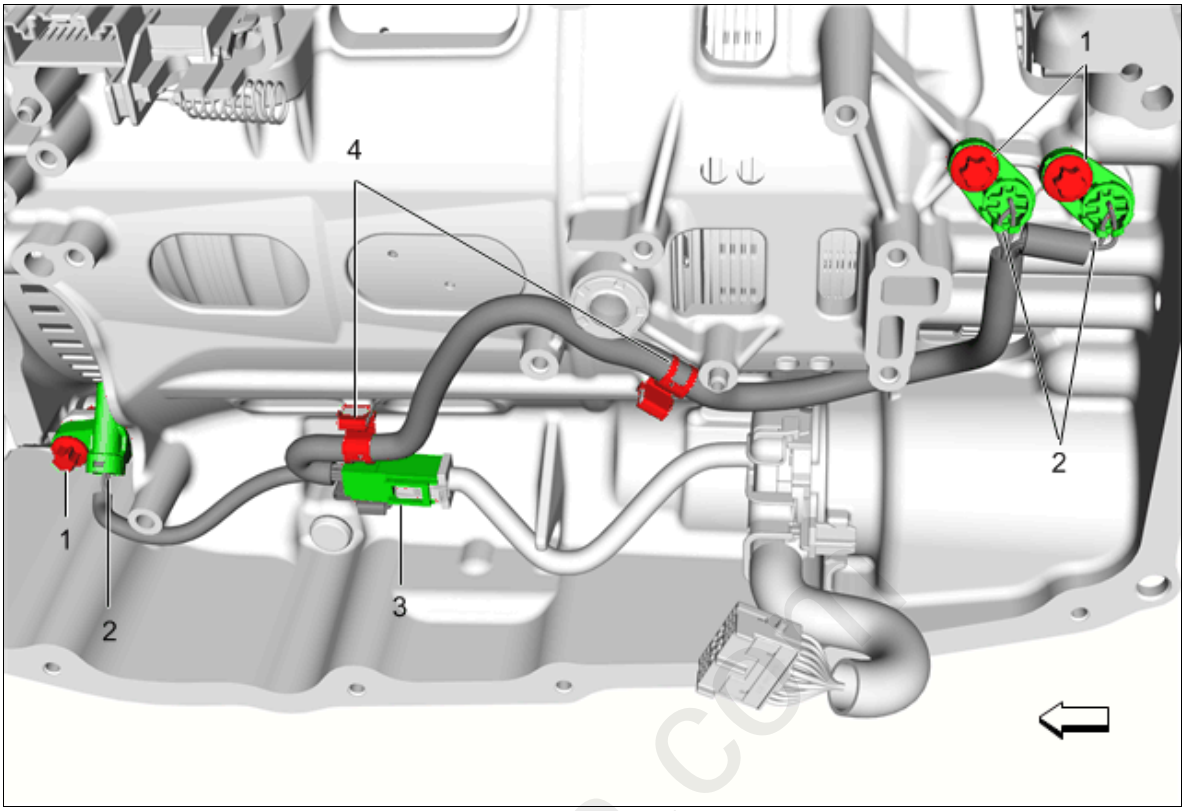
Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.*

3. Remove the input and output speed sensor wiring harness bolts and Discard (1).
4. Disconnect the input and output speed sensor wiring harness retainers (4).
5. Remove the automatic transmission input and output speed sensor wiring harness (3) from the transmission.

REPAIR INSTRUCTIONS - ON VEHICLE > INPUT AND OUTPUT SPEED SENSOR REPLACEMENT > INSTALLATION PROCEDURE

Fig 1: Input And Output Speed Sensor Wiring Harness Bolts



Courtesy of GENERAL MOTORS COMPANY

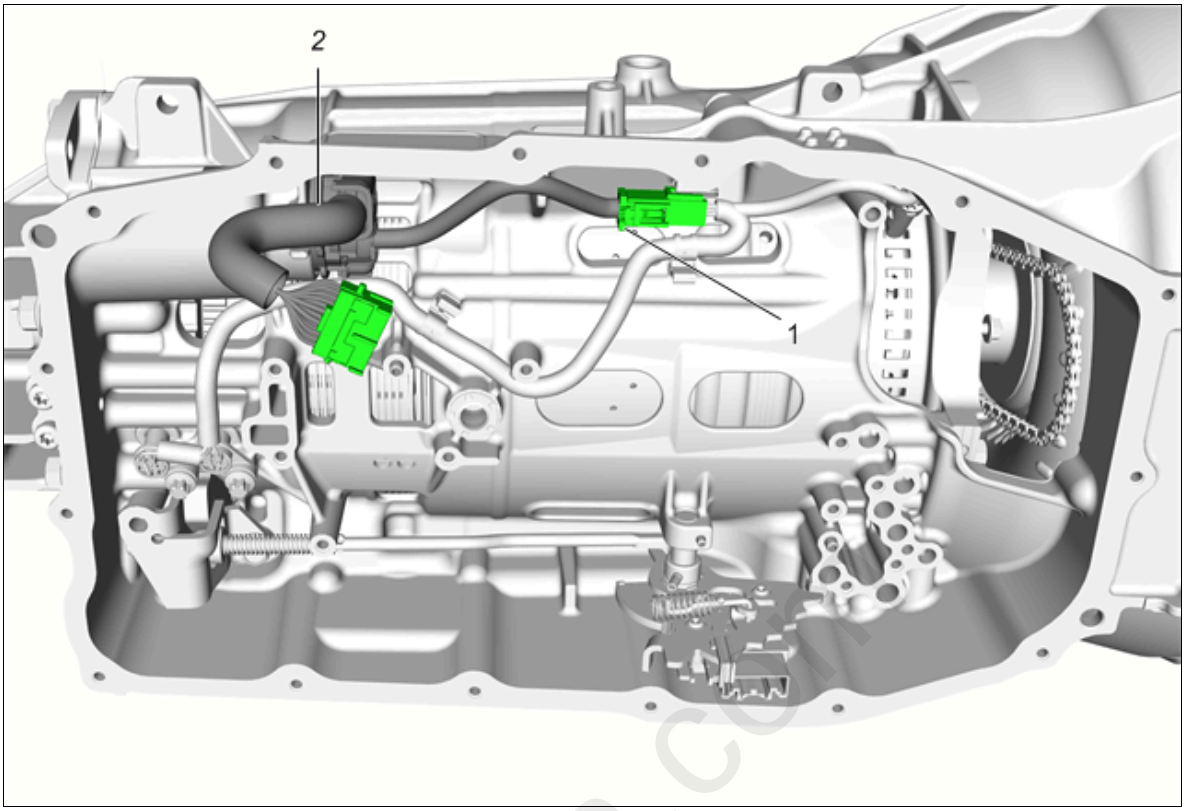
1. Position the automatic transmission input and output speed sensor wiring harness (3) to the transmission.
2. Connect the input and output speed sensor wiring harness retainers (4).

> ⚠ *CAUTION:*
>
> *This vehicle is equipped with torque-to-yield or single use fasteners. Install a NEW torque-to-yield or single use fastener when installing this component. Failure to replace the torque-to-yield or single use fastener could cause damage to the vehicle or component.*

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install the NEW input and output speed sensor wiring harness bolts (1) and tighten the bolts to 4 N.m (35 lb in) plus 45 degrees.

Fig 2: Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

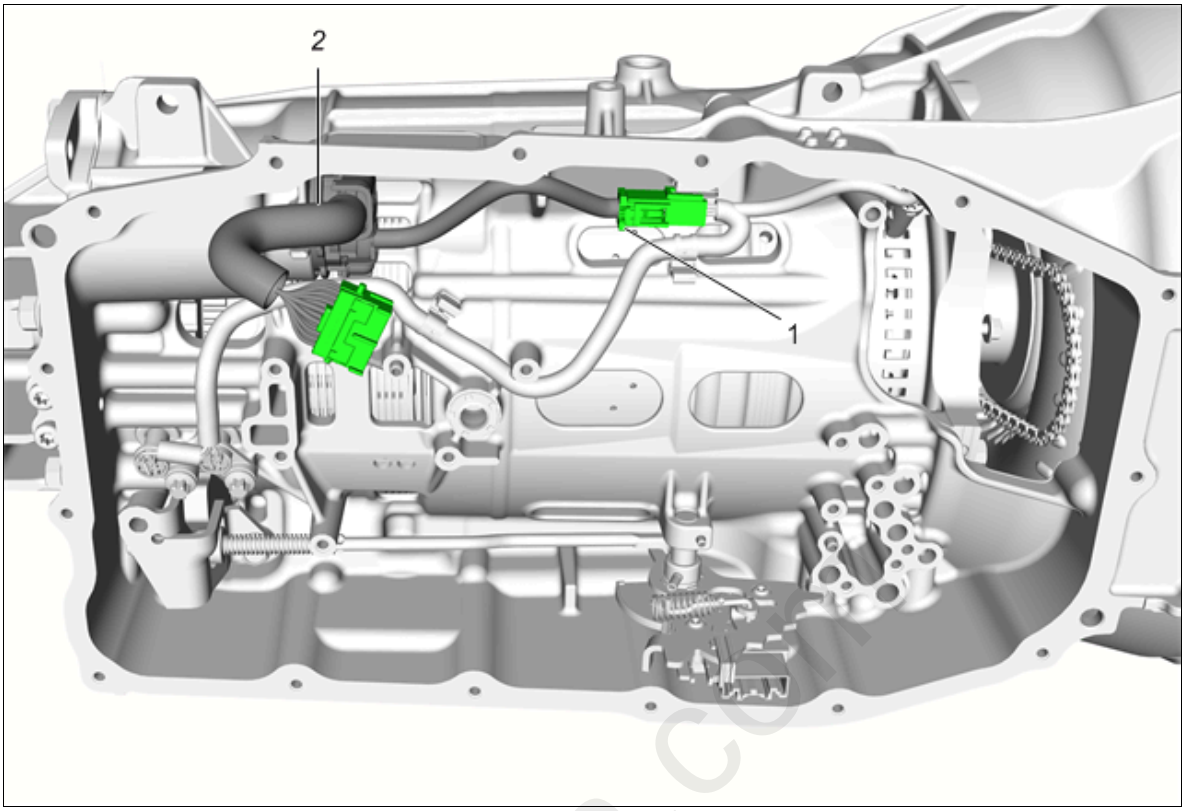
4. Connect the electrical connector (1).
5. Install the control valve body to the transmission. Refer to Control Valve Body Replacement .
6. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION WIRING HARNESS REPLACEMENT (ELECTRICAL CONNECTOR PASSAGE SLEEVE) > REMOVAL PROCEDURE

1. Remove the control valve body. Control Valve Body Replacement .
2. Disconnect the chassis wiring harness from the transmission electrical connector.

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Fig 1: Electrical Connector

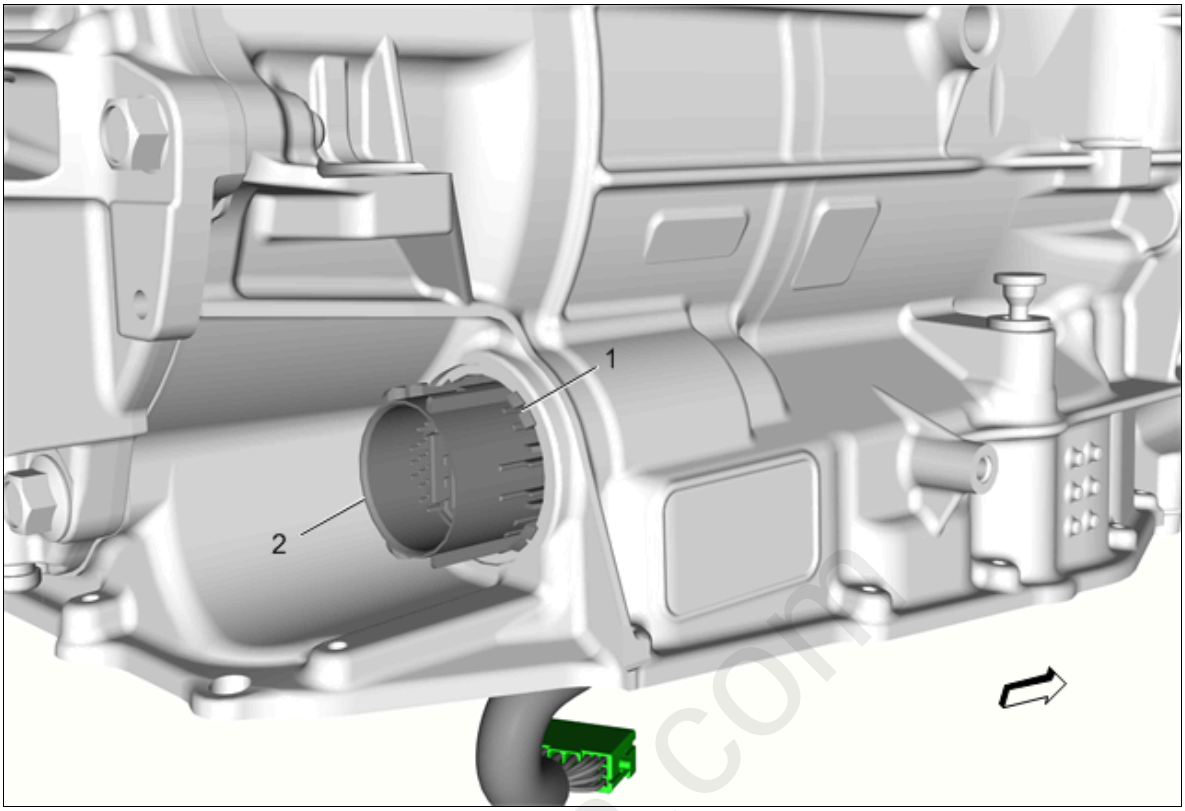


Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the electrical connector (1).

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Fig 2: Retaining Tabs



Courtesy of GENERAL MOTORS COMPANY

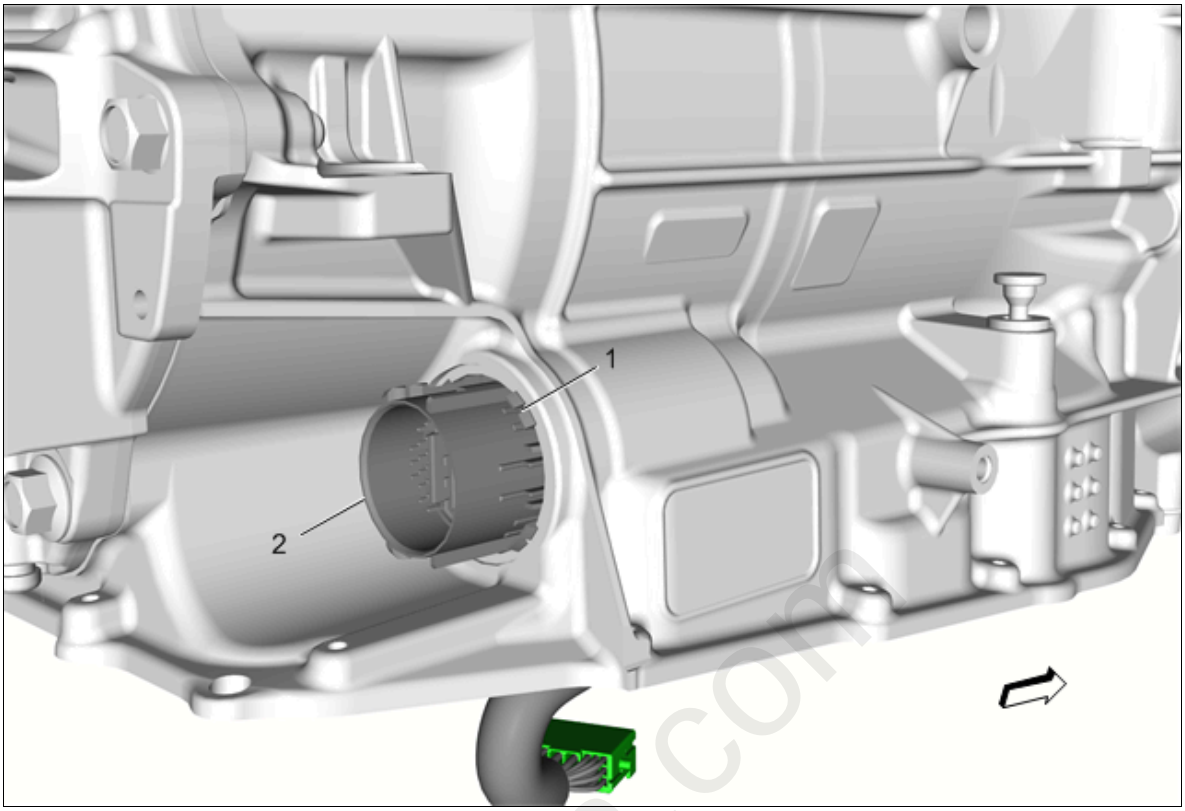
4. Using a flat-bladed tool, press inward the four retaining tabs (1) around the main connector, then slide the main connector (2) inward into the transmission case.
5. Remove the automatic transmission wiring harness from the transmission.

REPAIR INSTRUCTIONS - ON VEHICLE > AUTOMATIC TRANSMISSION WIRING HARNESS REPLACEMENT (ELECTRICAL CONNECTOR PASSAGE SLEEVE) > INSTALLATION PROCEDURE

1. Position the automatic transmission wiring harness into the transmission.

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Fig 1: Retaining Tabs

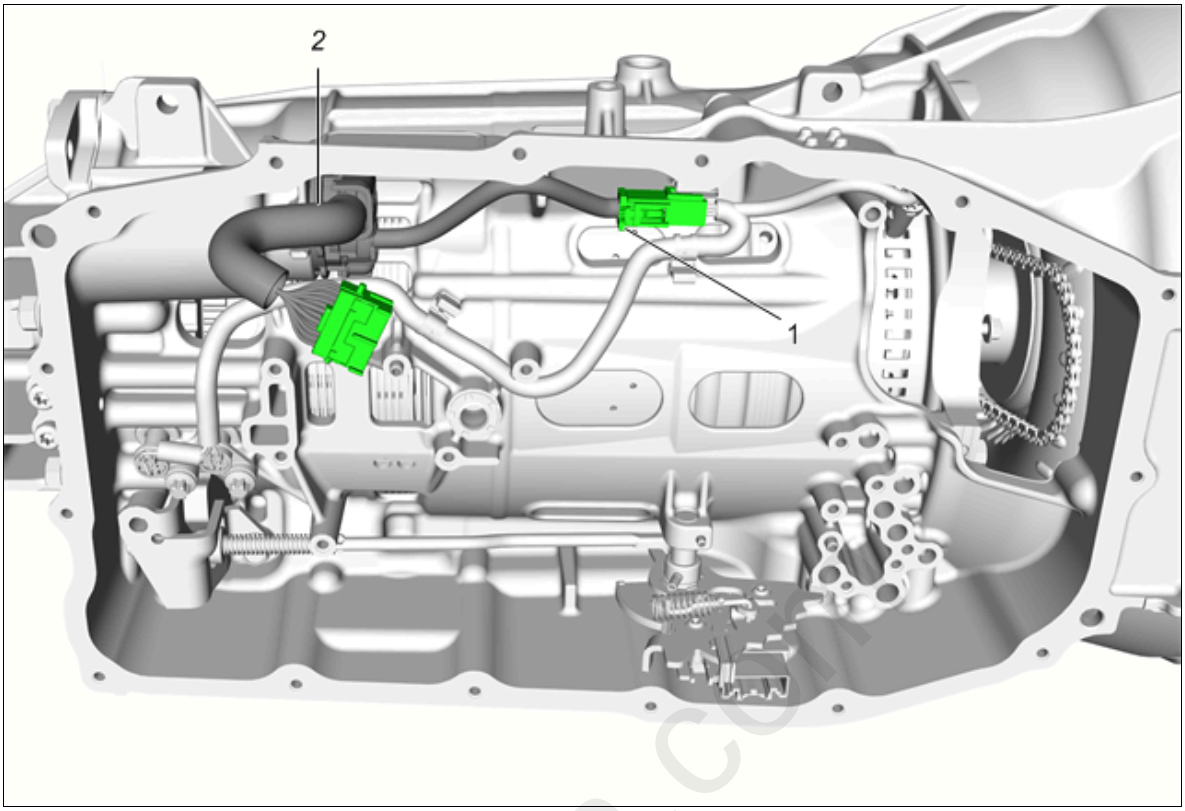


Courtesy of GENERAL MOTORS COMPANY

2. Press the main connector into the transmission case until the four retaining tabs (1) around the main connector, lock into place.

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Fig 2: Electrical Connector



Courtesy of GENERAL MOTORS COMPANY

3. Connect the electrical connector (1).
4. Install the control valve body. Control Valve Body Replacement .
5. Connect the chassis wiring harness from the transmission electrical connector.
6. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > CONTROL VALVE BODY REPLACEMENT

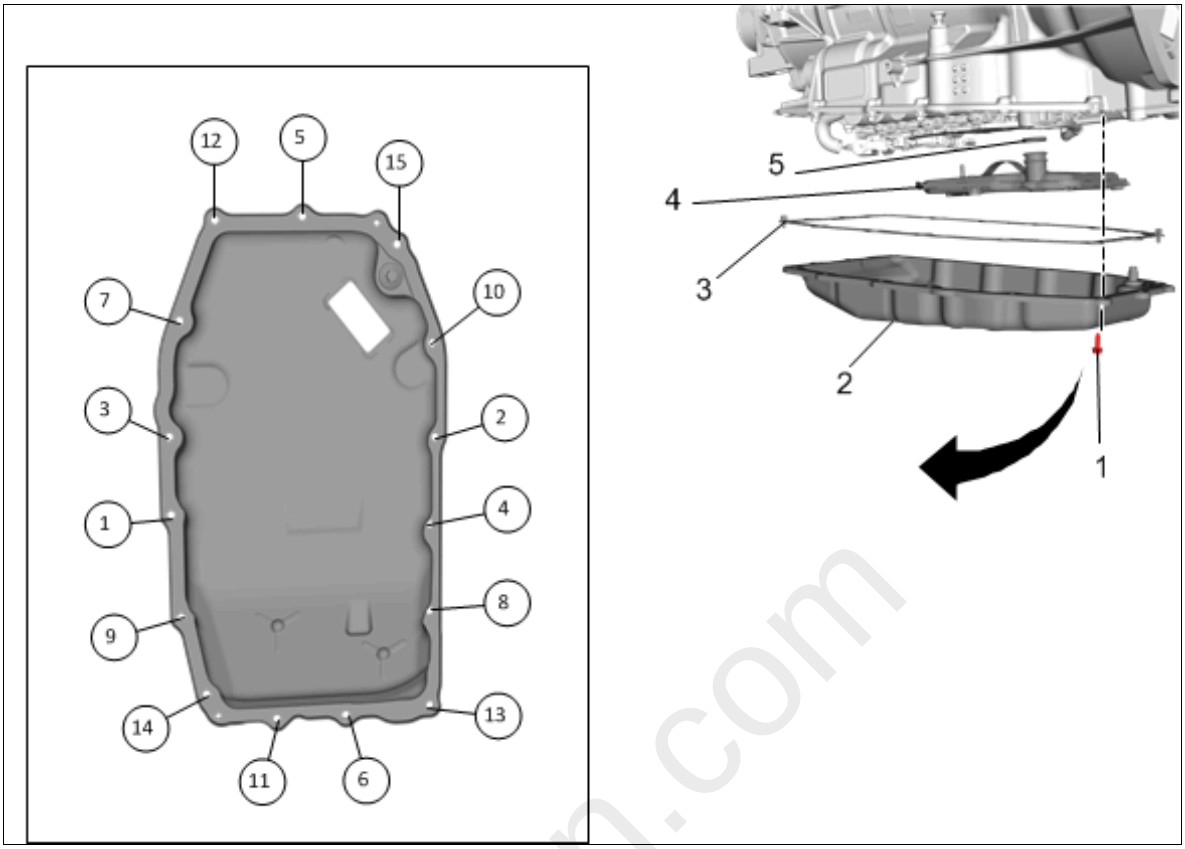
Special Tools

- **DT-48285** Valve Body Torx Plus Socket

For equivalent tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > CONTROL VALVE BODY REPLACEMENT > REMOVAL PROCEDURE

Fig 1: Transmission Fluid Filter

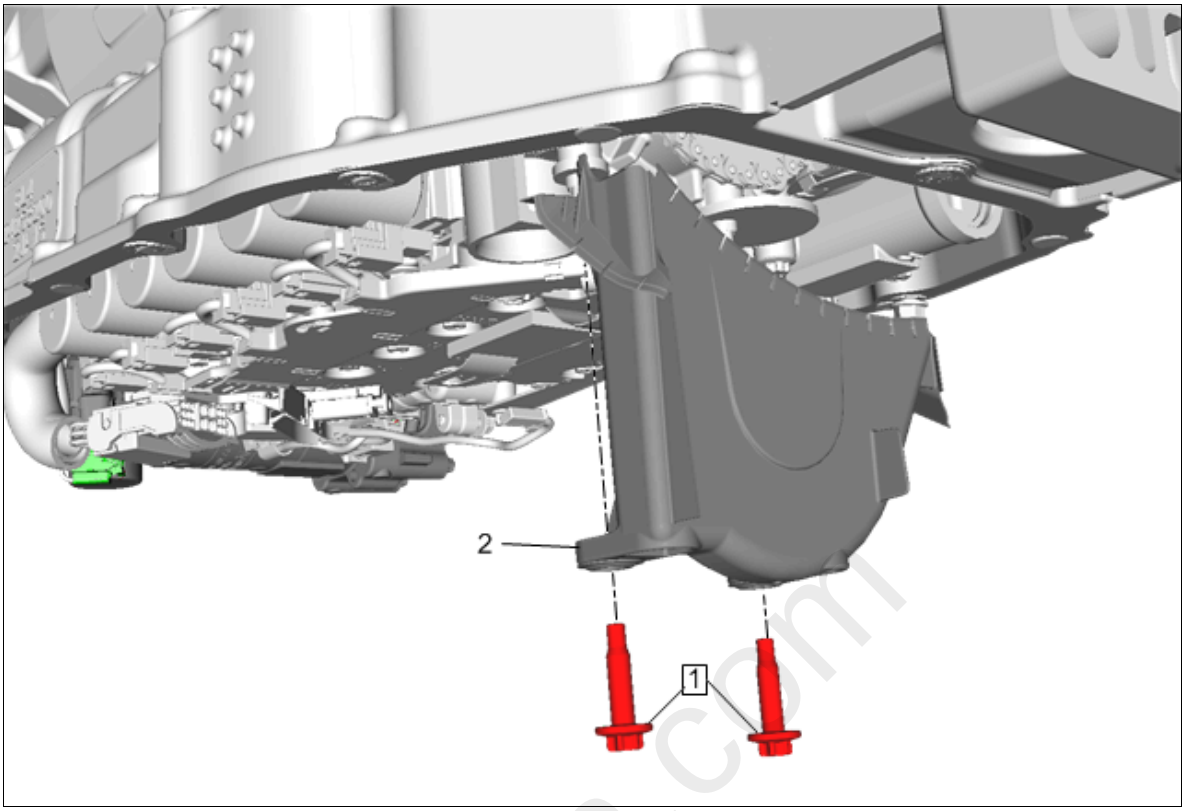


Courtesy of GENERAL MOTORS COMPANY

1. Remove the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .

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Fig 2: Transmission Fluid Baffle

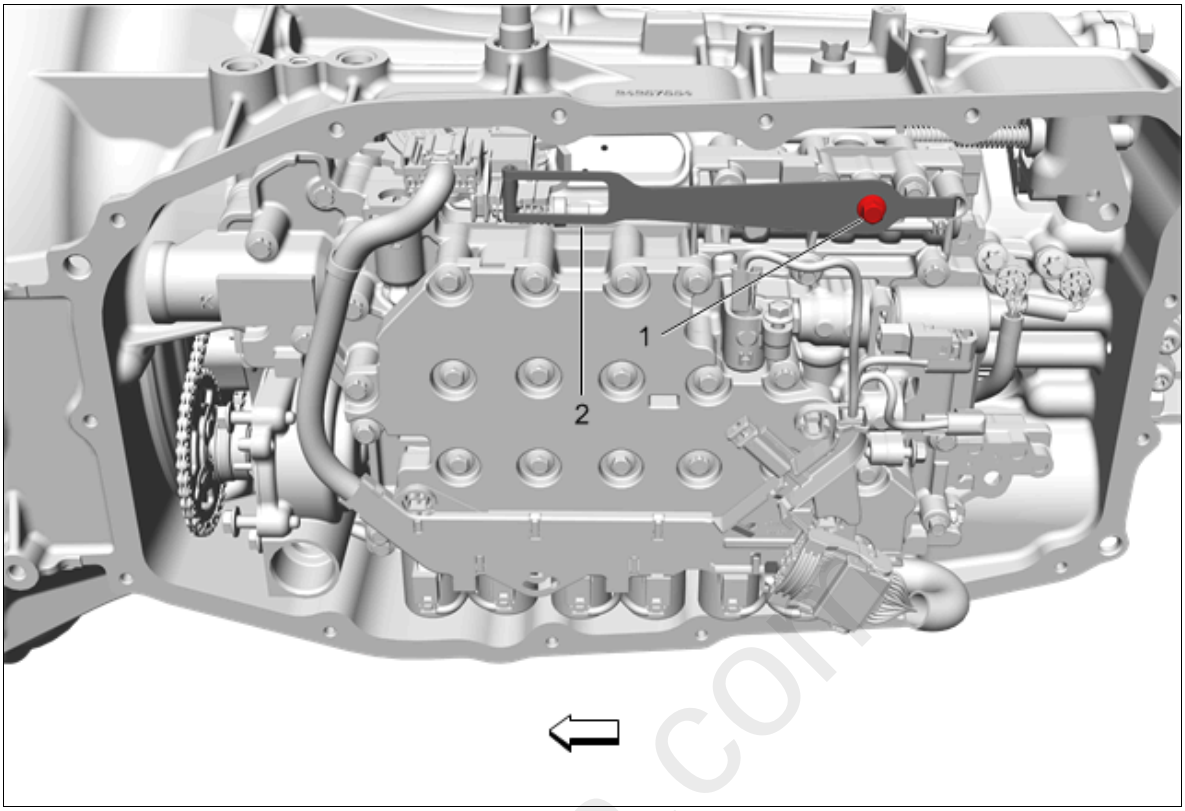


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2. Remove and DISCARD the transmission fluid baffle bolts, then remove the fluid baffle from the transmission. Refer to Transmission Fluid Baffle Replacement .
3. Remove the transmission control wiring harness. Refer to Transmission Control Wiring Harness Replacement .

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Fig 3: Manual Shaft Detent Lever Spring

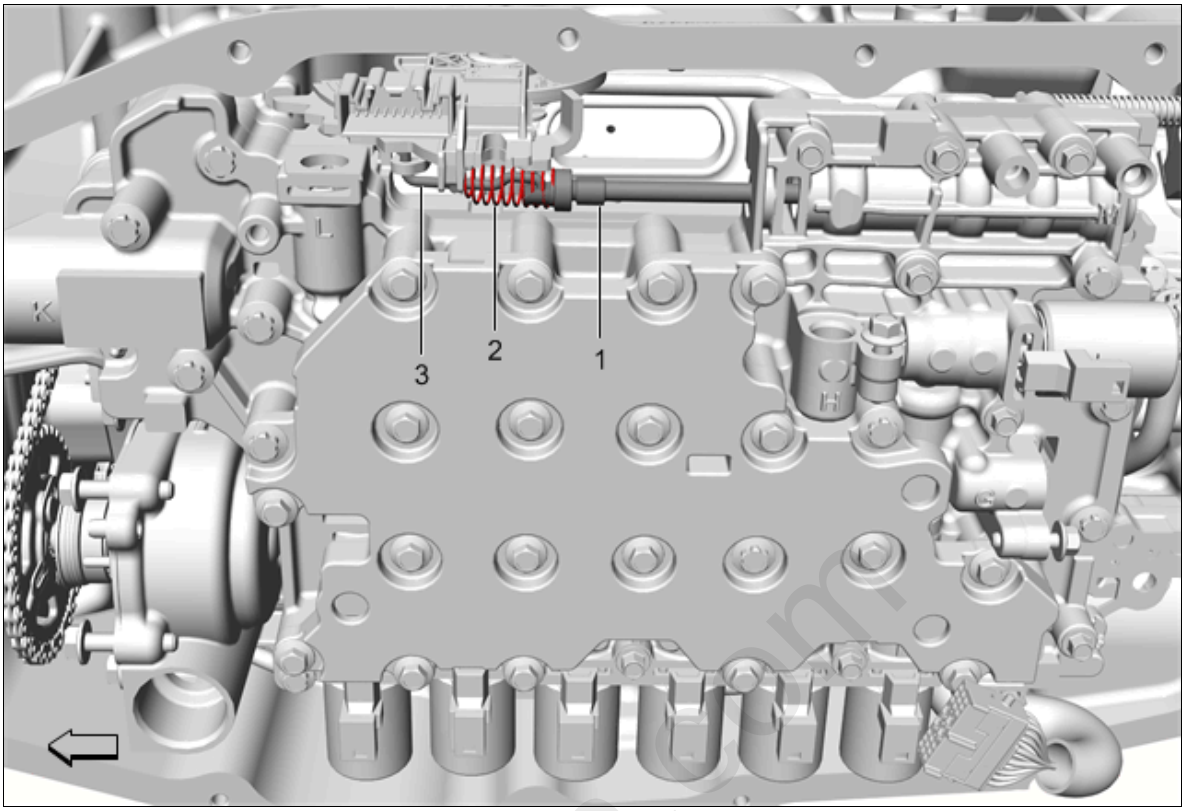


Courtesy of GENERAL MOTORS COMPANY

4. Remove the manual shaft detent lever spring retaining bolt (1) and the manual shaft detent lever spring (2).

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Fig 4: Manual Valve

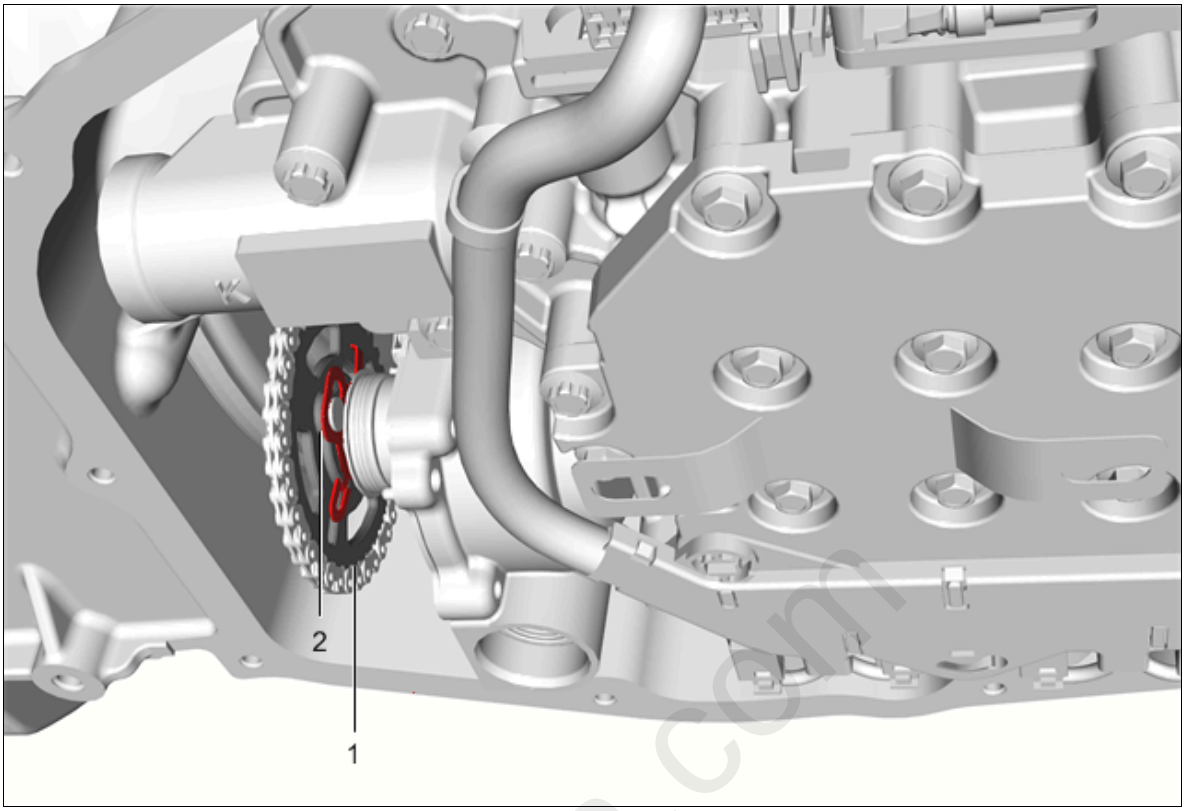


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5. Disconnect the manual valve (1) from the manual shift shaft position switch assembly linkage (2).

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Fig 5: Retainer



Courtesy of GENERAL MOTORS COMPANY

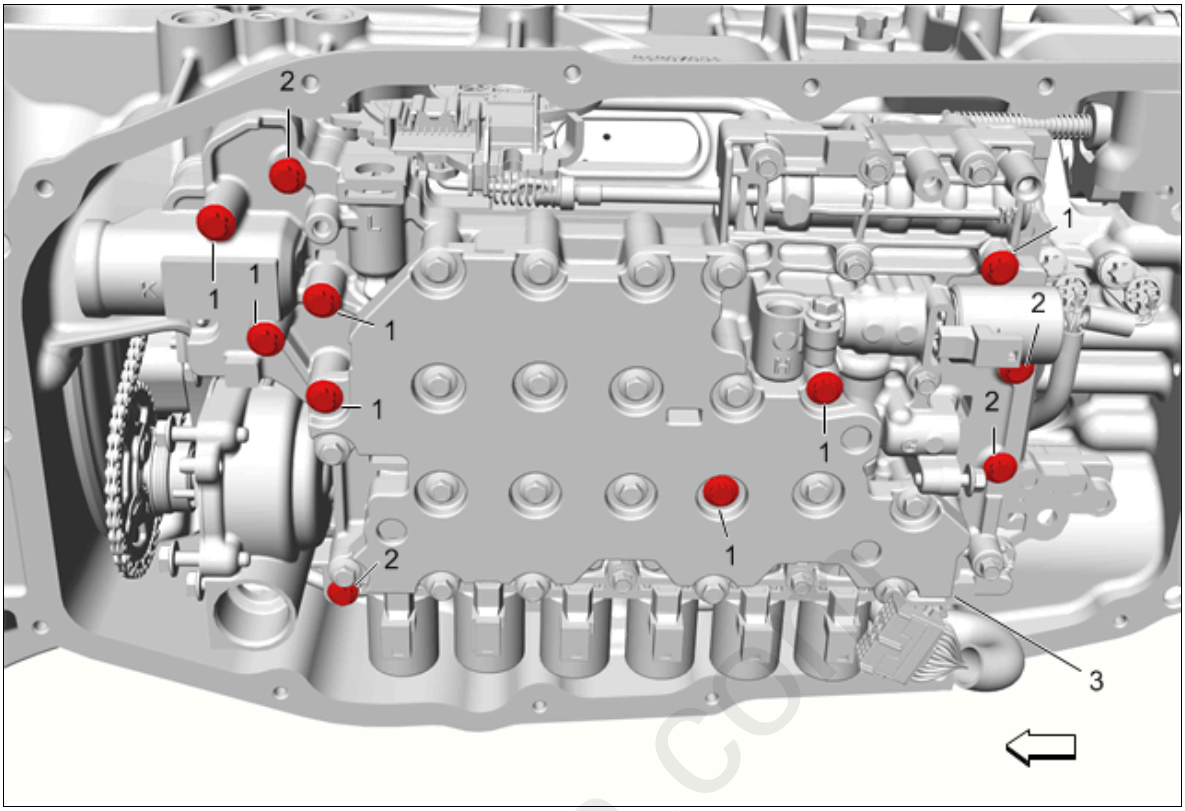
NOTE:

Using a suitable pry tool, unlock the retainer (2).

6. Remove the transmission fluid pump driven sprocket (1). Refer to transmission fluid baffle and driven sprocket in Control Valve Assembly and Transmission Wiring Harness Removal .

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Fig 6: Valve Body Torx Plus Bolts



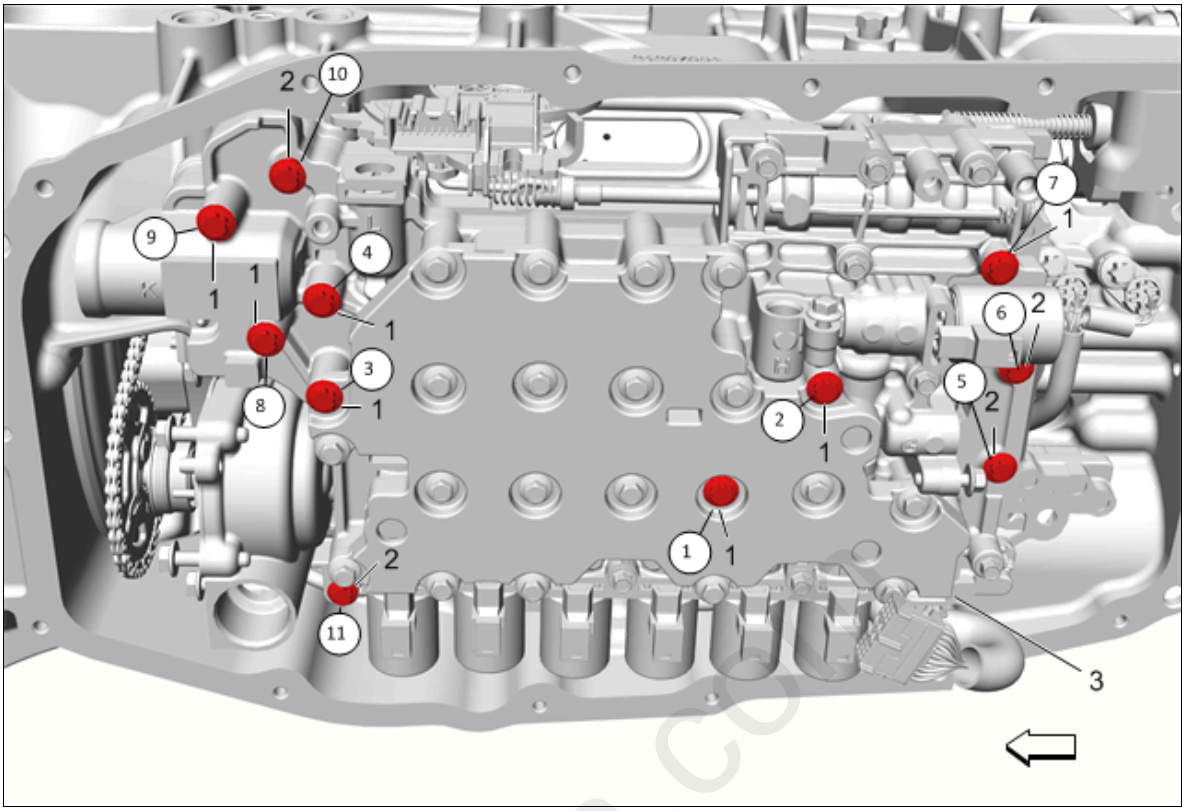
Courtesy of GENERAL MOTORS COMPANY

7. Using **DT-48285** Valve Body Torx Plus Socket remove the valve body bolts (1, 2) and the vale body assembly (3) from the transmission.

REPAIR INSTRUCTIONS - ON VEHICLE > CONTROL VALVE BODY REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Valve Body Torx Plus Bolt Tightening Sequence

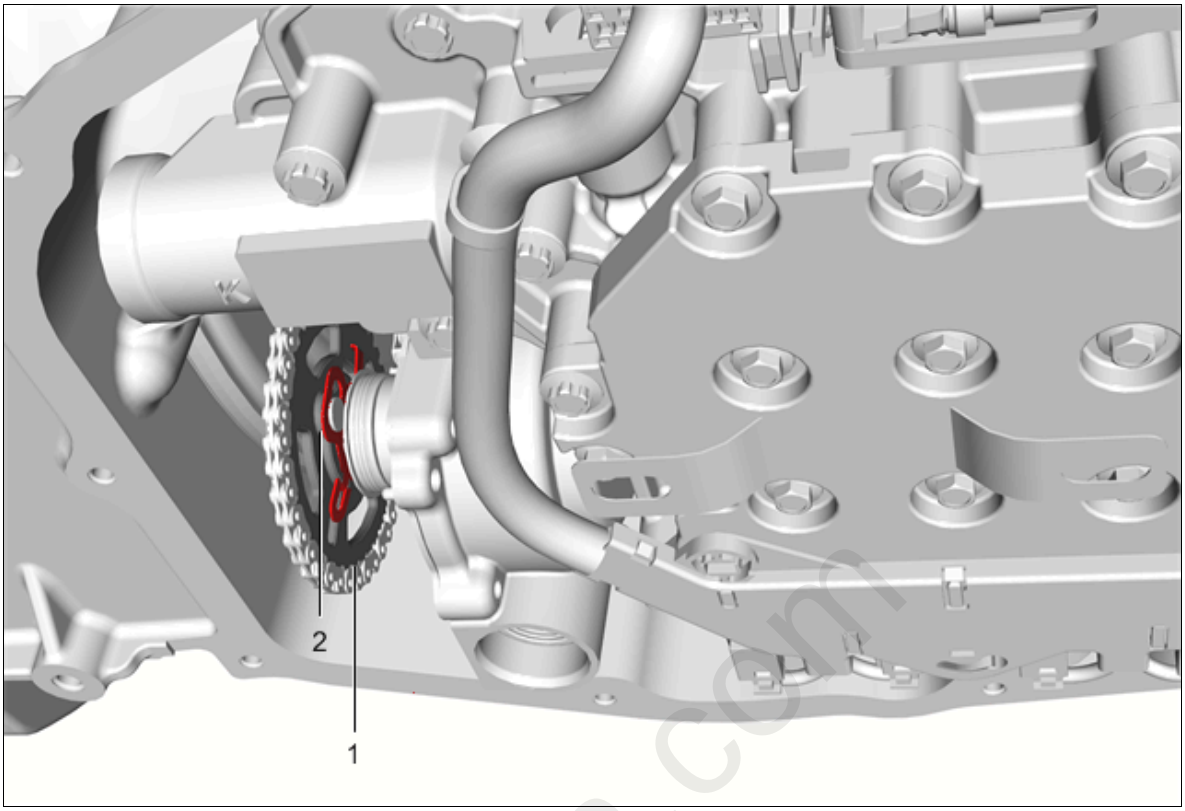


Courtesy of GENERAL MOTORS COMPANY

1. Using **DT-48285** Valve Body Torx Plus Socket install the valve body (3) and the valve body assembly bolts (1, 2) in the transmission.
2. Tighten the bolts (1 - M6 x 68) and bolts (2 - M6 x 45) to 9 N.m (80 lb in) in the sequence shown.

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Fig 2: Retainer



Courtesy of GENERAL MOTORS COMPANY

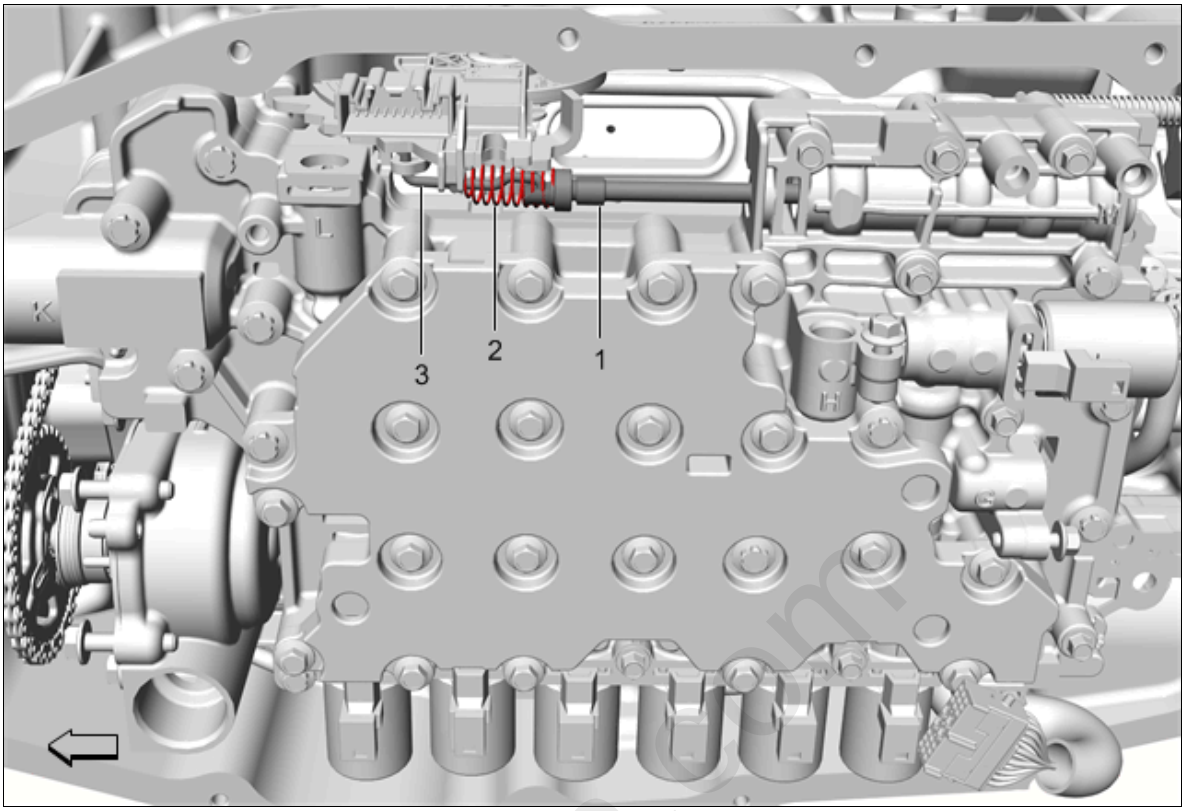
NOTE:

Using a suitable pry tool, lock the retainer (2).

3. Install the transmission fluid pump driven sprocket (1). Refer to automatic transmission fluid baffle and driven sprocket in Control Valve Assembly and Transmission Wiring Harness Installation .
4. Install the transmission control wiring harness. Refer to Transmission Control Wiring Harness Replacement .

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Fig 3: Manual Valve

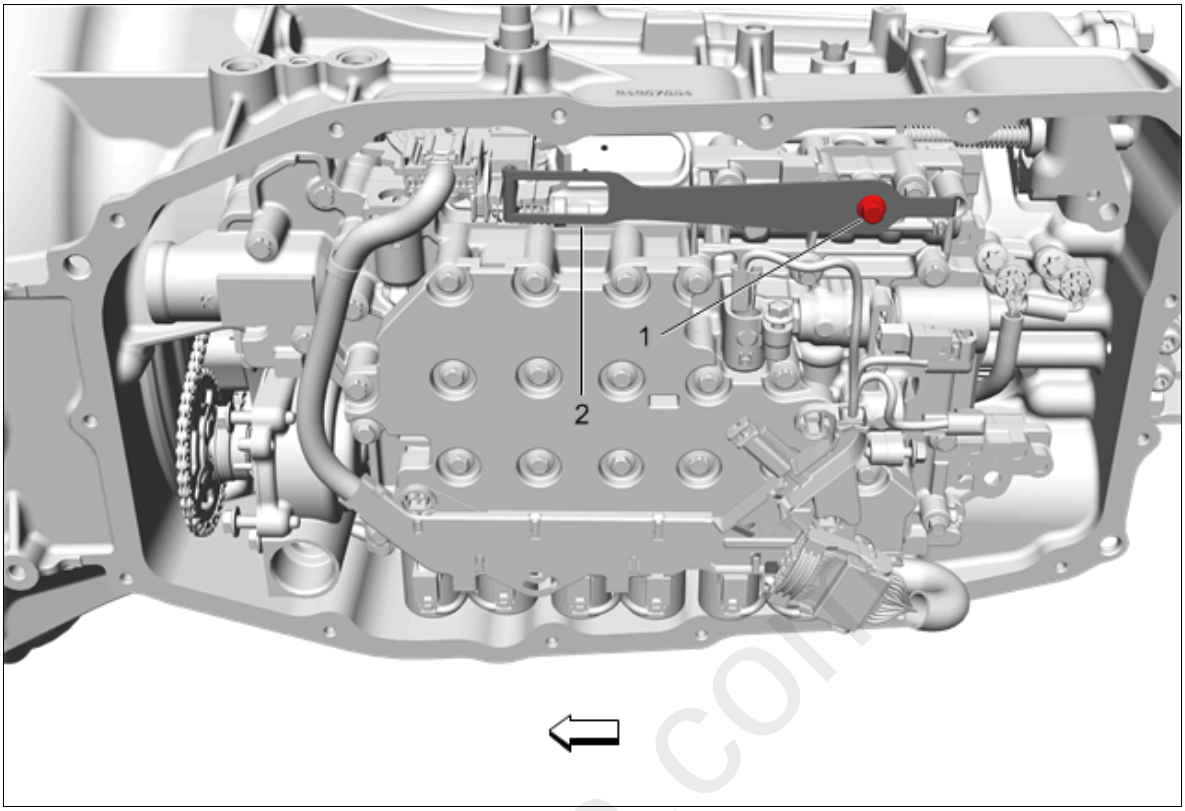


Courtesy of GENERAL MOTORS COMPANY

5. Connect the manual valve (1) to the manual shift shaft position switch assembly linkage (2).

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Fig 4: Manual Shaft Detent Lever Spring

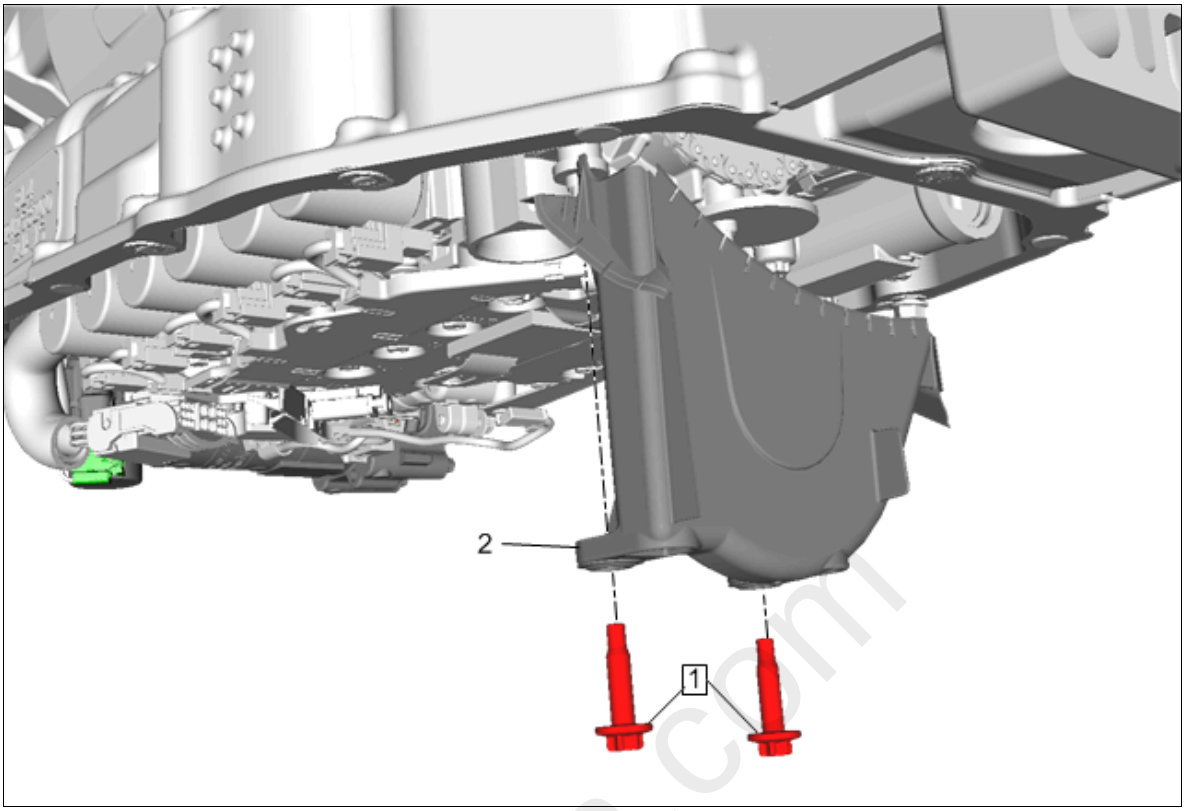


Courtesy of GENERAL MOTORS COMPANY

6. Install the manual shaft detent lever spring (2) and the manual shaft detent lever spring retaining bolt (1) then tighten to 12 N.m (106 lb in).

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Fig 5: Transmission Fluid Baffle

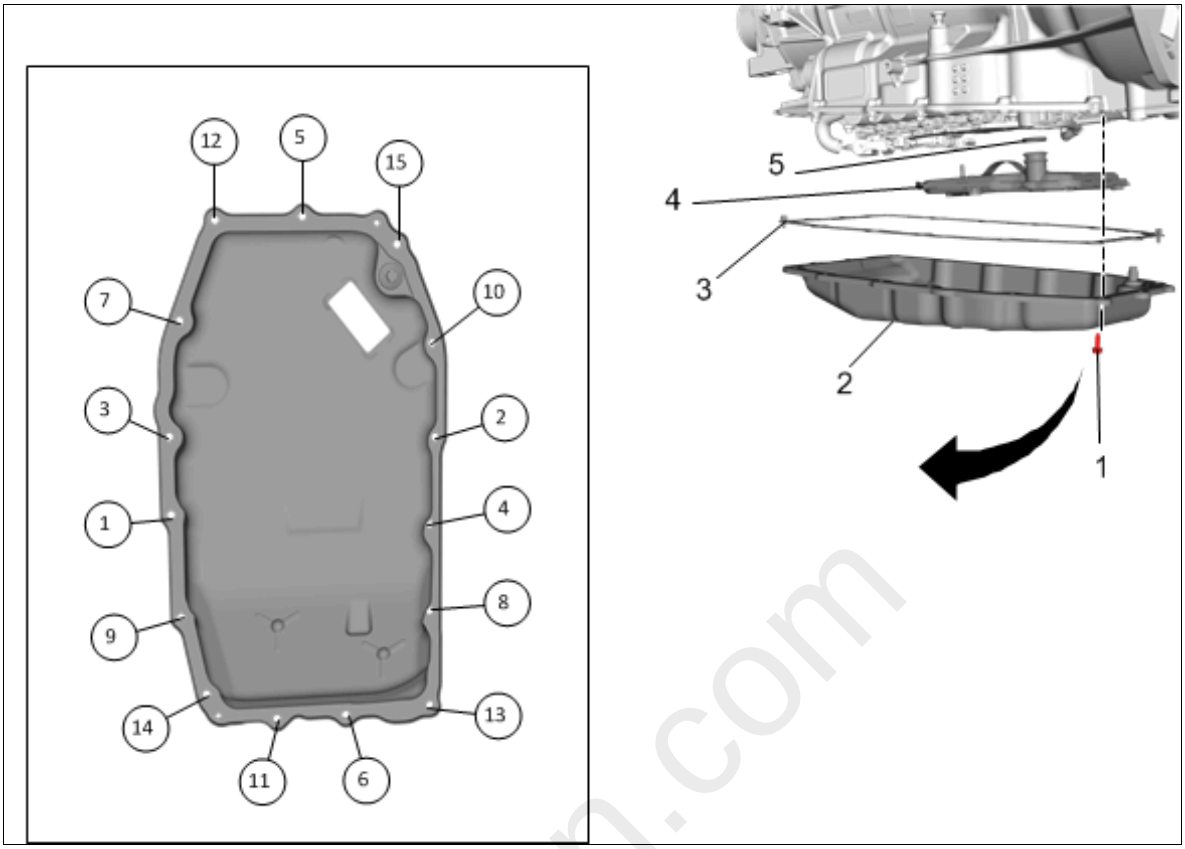


Courtesy of GENERAL MOTORS COMPANY

7. Install the transmission fluid baffle, then install NEW fluid baffle bolts. Refer to Transmission Fluid Baffle Replacement .

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Fig 6: Transmission Fluid Filter



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8. Install the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .
9. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

NOTE:

The Service Fast 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:

The service fast learn procedure must be performed when any of the following repairs has been made to the transmission.

1. *Pressure regulating solenoid replacement*
2. *Valve body repair or replacement*
3. *Any service/repair in response to a shift quality concern*
4. *Any internal transmission service, repair, overhaul, or replacement*
5. *Torque converter replacement*

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6. TCM replacement

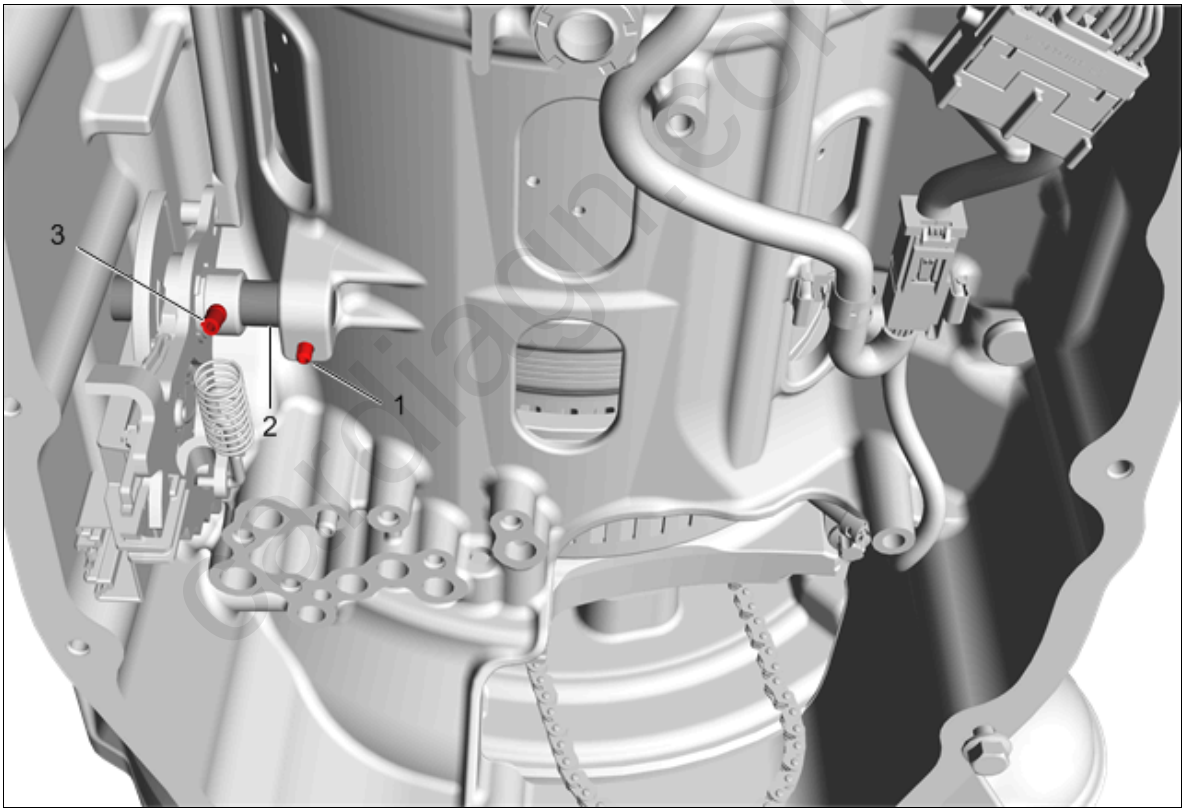
7. Transmission assembly replacement

10. Perform the service fast learn procedure. Refer to Transmission Service Fast Learn Procedure .

REPAIR INSTRUCTIONS - ON VEHICLE > PARK PAWL ACTUATOR REPLACEMENT > REMOVAL PROCEDURE

1. Remove the automatic transmission range selector lever. Refer to Automatic Transmission Range Selector Lever Replacement (M5T) Automatic Transmission Range Selector Lever Replacement (M5U) .
2. Remove the control valve body. Refer to Control Valve Body Replacement .

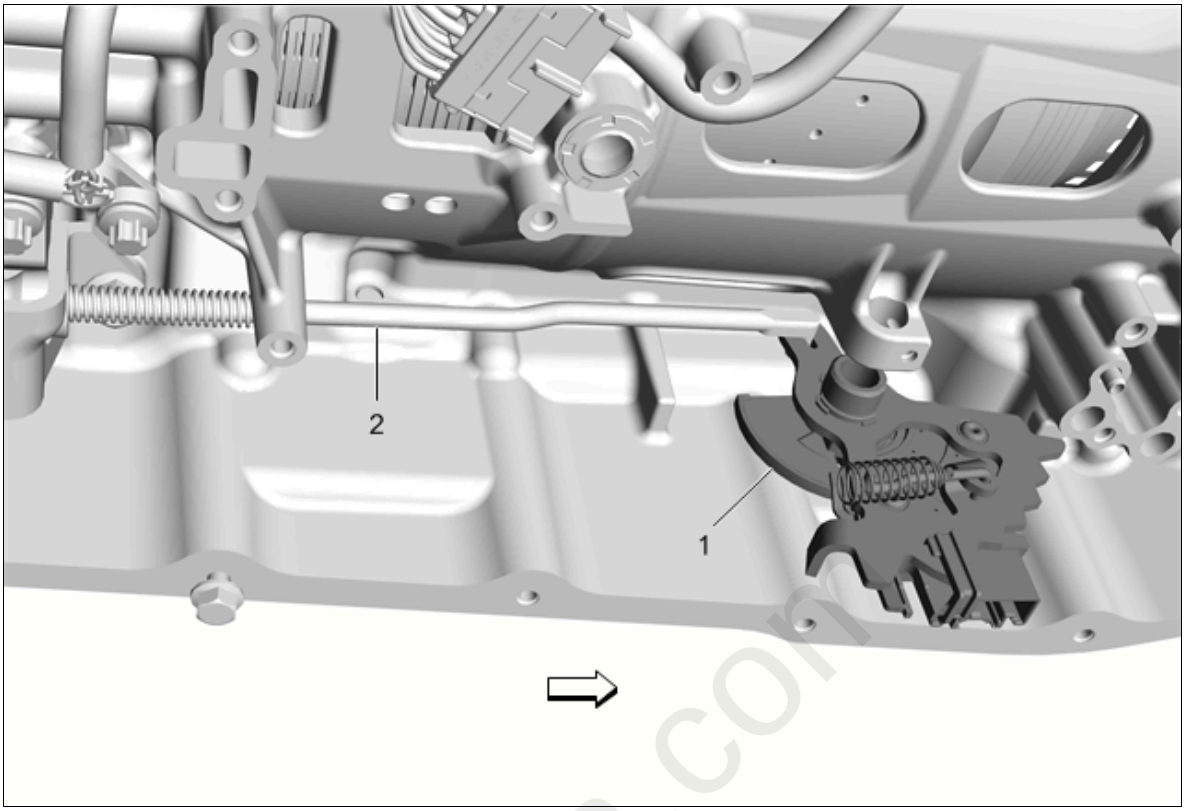
   Fig 1: Manual Shift Shaft And Pins



Courtesy of GENERAL MOTORS COMPANY

3. Remove and Discard the manual shift shaft detent lever hub pin (3).
4. Remove and Discard the manual shift shaft pin (1).
5. Remove the manual shift shaft (2).
6. Remove or reposition the manual shift shaft position switch assembly as necessary.

Fig 2: Manual Shift Shaft Position Switch And Park Pawl Actuator Rod



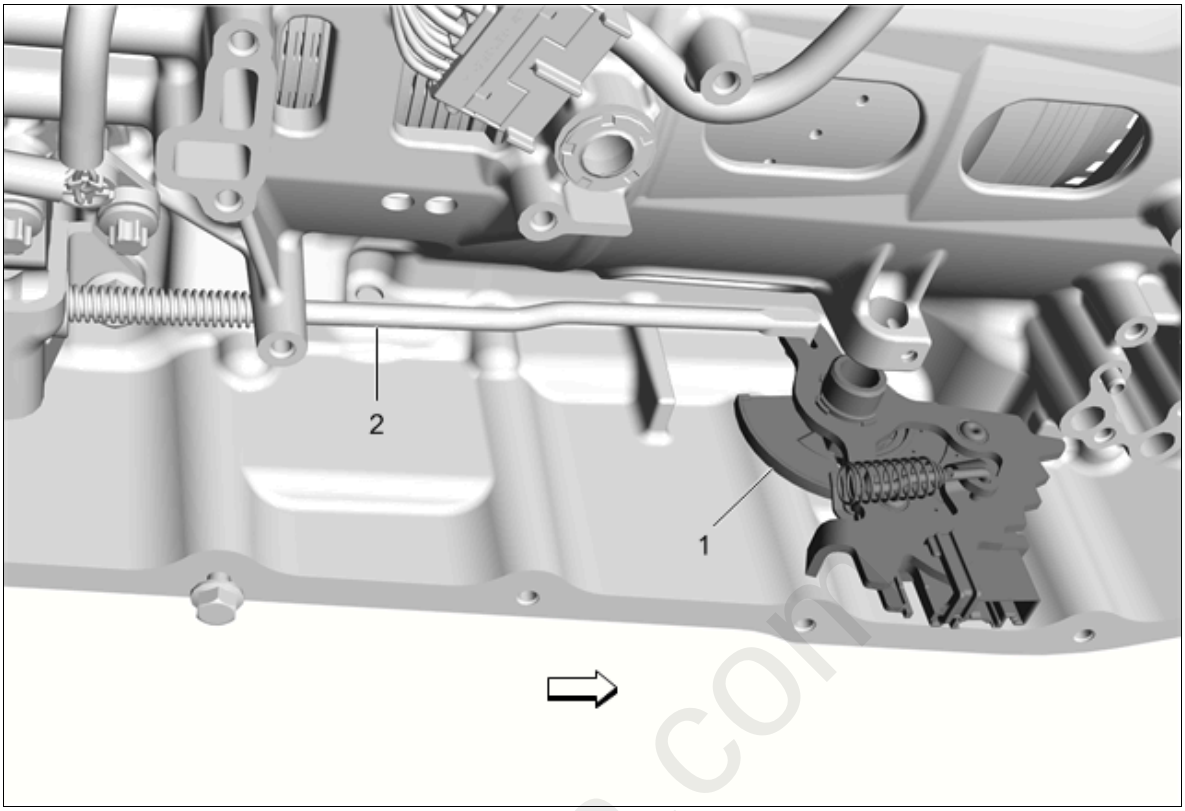
Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the park pawl actuator rod (2) from the manual shift shaft position switch (1).
8. Remove the park pawl actuator rod.

REPAIR INSTRUCTIONS - ON VEHICLE > PARK PAWL ACTUATOR REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Manual Shift Shaft Position Switch And Park Pawl Actuator Rod

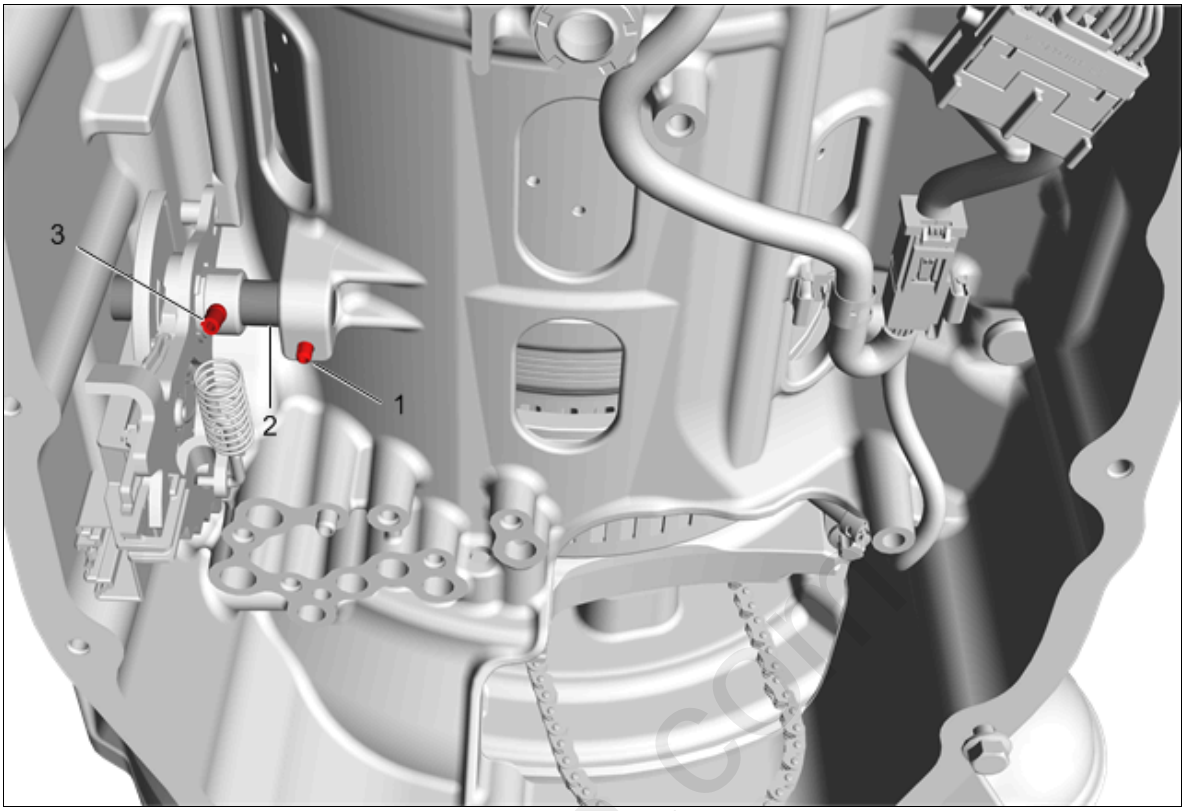


Courtesy of GENERAL MOTORS COMPANY

1. Connect the park pawl actuator rod (2) to the manual shift shaft position switch (1).
2. Install the manual shift shaft position switch and park pawl assembly (1).

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Fig 2: Manual Shift Shaft And Pins

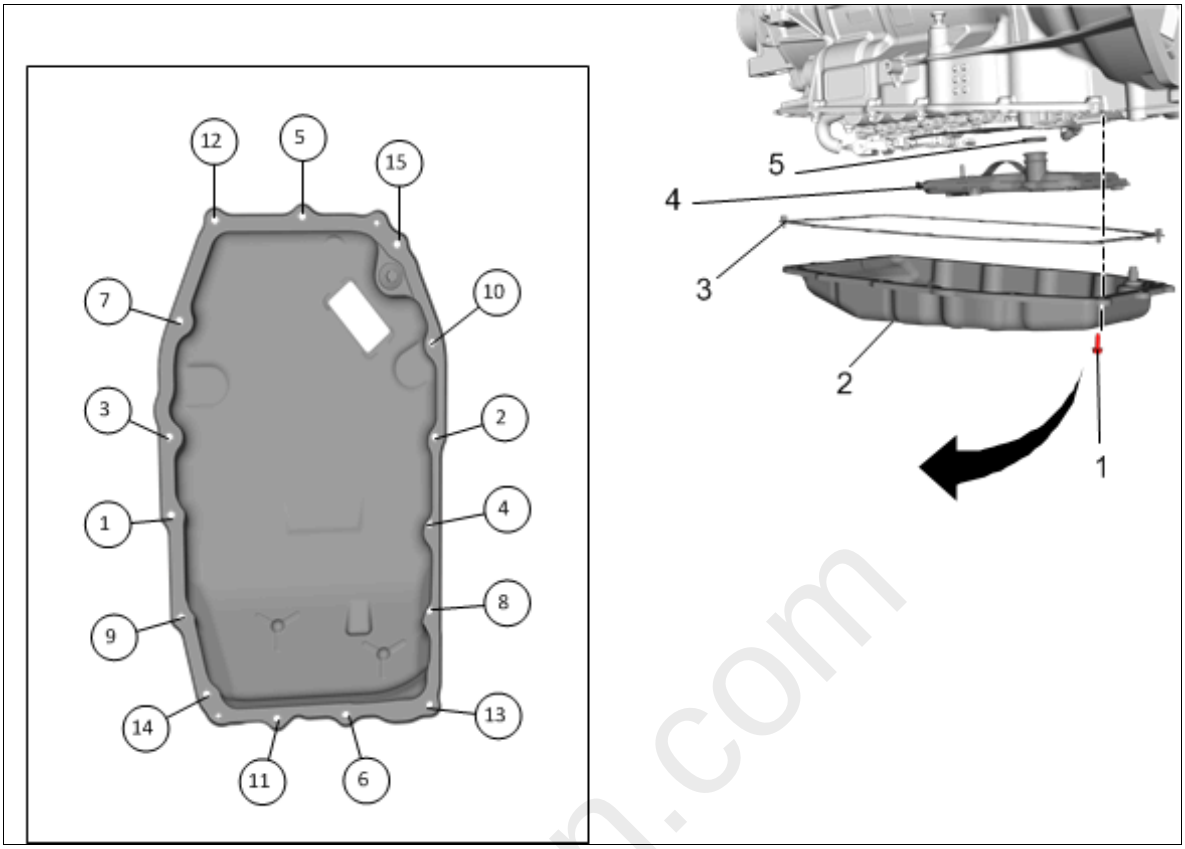


Courtesy of GENERAL MOTORS COMPANY

3. Install the manual shift shaft (2) aligning the position switch assembly onto the shaft.
4. Install the NEW manual shift shaft pin (1).
5. Install the NEW manual shift shaft detent lever hub pin (3).
6. Install the control valve body. Refer to Control Valve Body Replacement .
7. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION FLUID BAFFLE REPLACEMENT > REMOVAL PROCEDURE

Fig 1: Transmission Fluid Filter

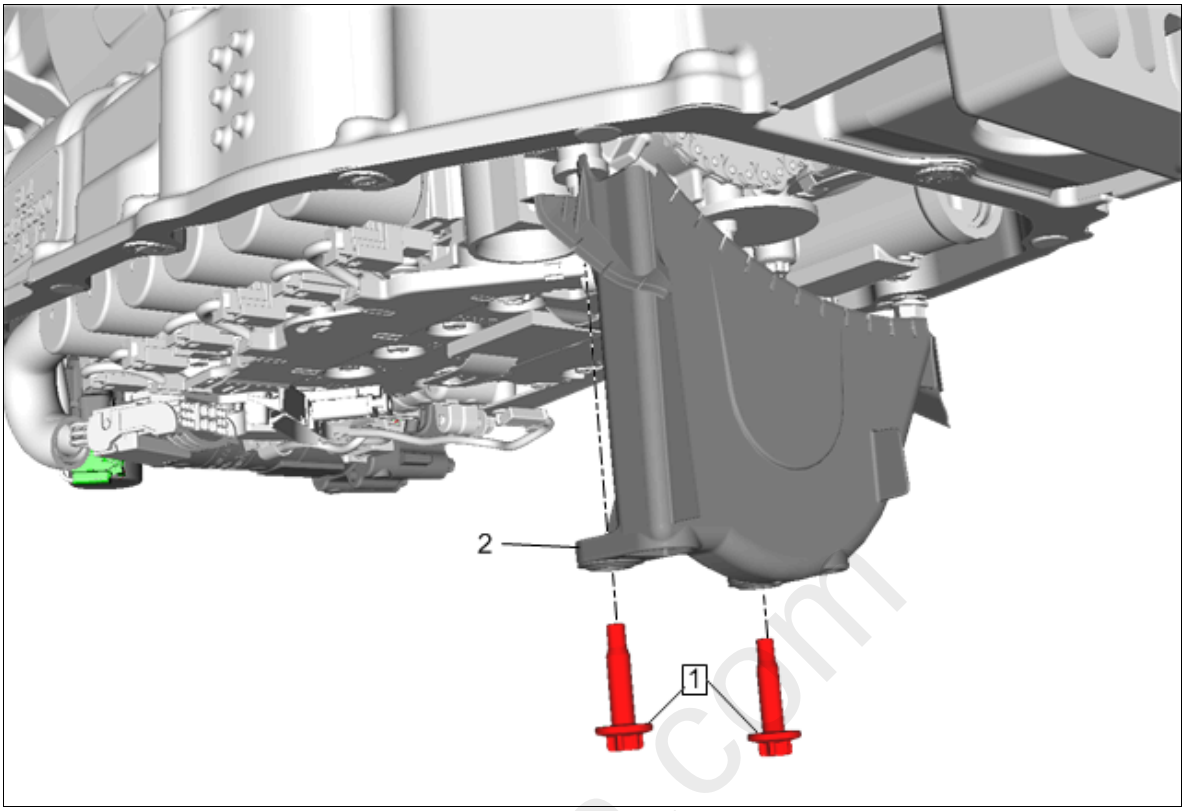


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1. Remove the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .

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Fig 2: Transmission Fluid Baffle



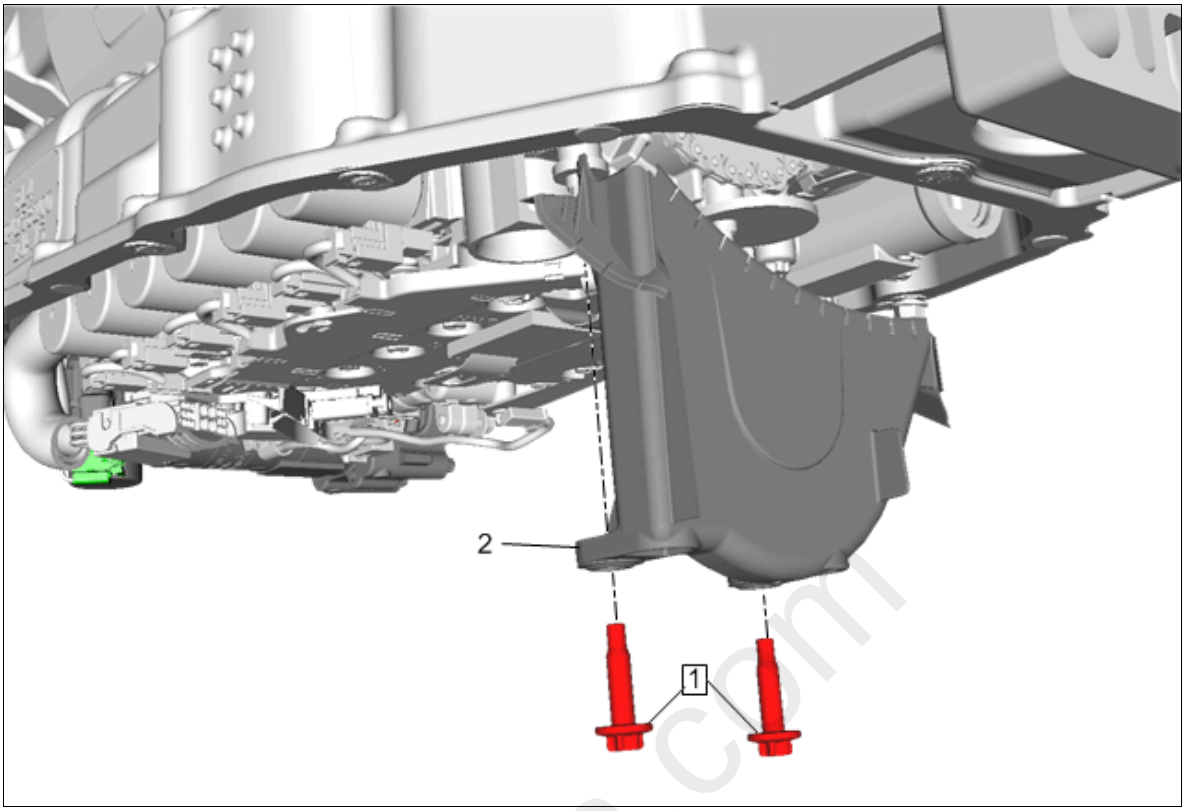
Courtesy of GENERAL MOTORS COMPANY

2. Remove the transmission fluid baffle bolts (1) and discard.
3. Remove the transmission fluid pump baffle (2).

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION FLUID BAFFLE REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Transmission Fluid Baffle

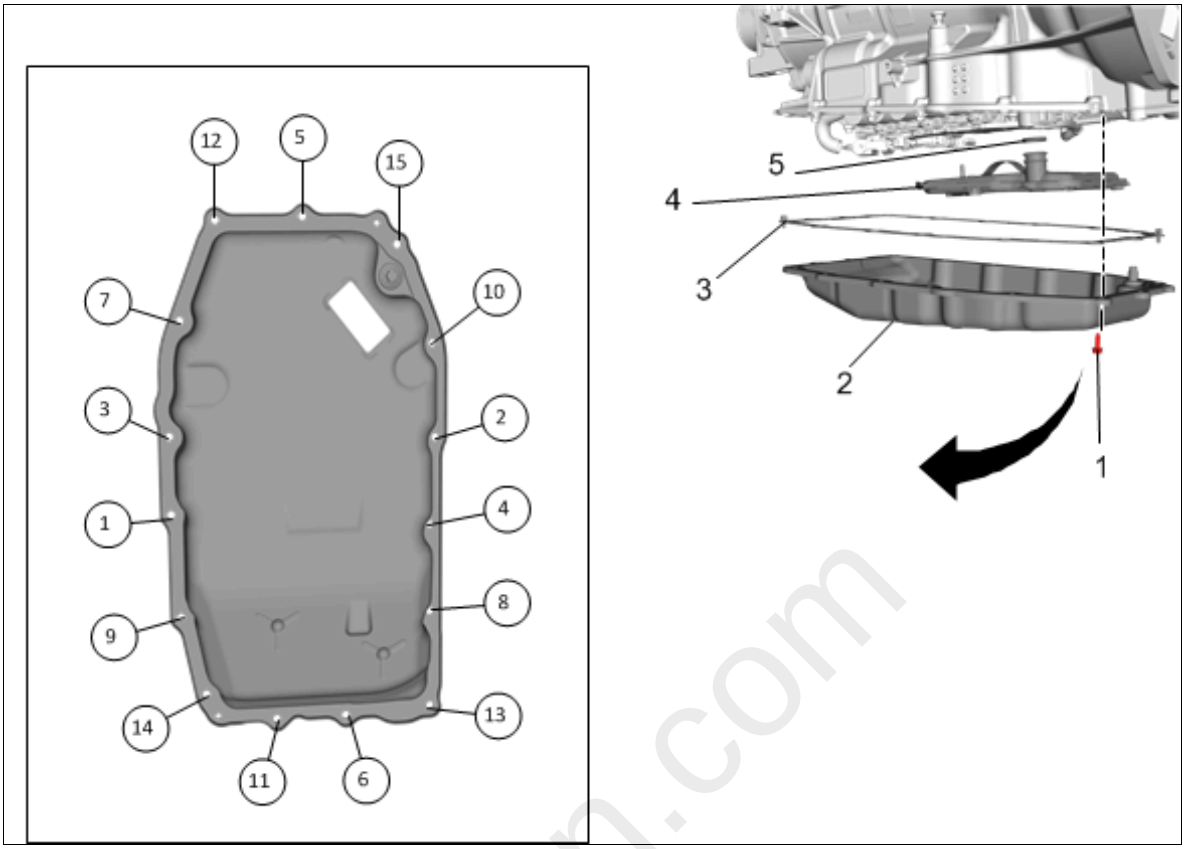


Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission fluid pump baffle (2).
2. Install the NEW transmission fluid baffle bolts (1) and tighten to 4 N.m (35 lb in) plus 45 degrees.

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Fig 2: Transmission Fluid Filter



Courtesy of GENERAL MOTORS COMPANY

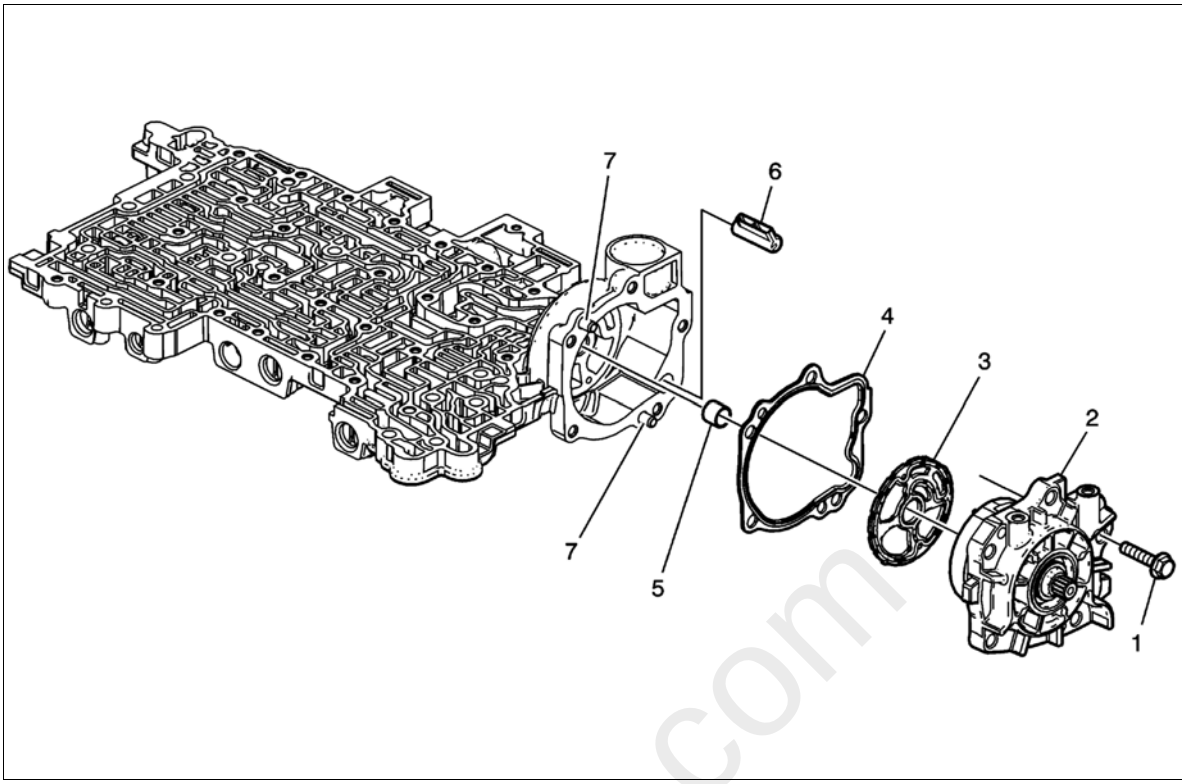
3. Install the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION FLUID PUMP REPLACEMENT > REMOVAL PROCEDURE

1. Remove the control valve body. Refer to Control Valve Body Replacement .

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Fig 1: Automatic Transmission Fluid Pump Assembly



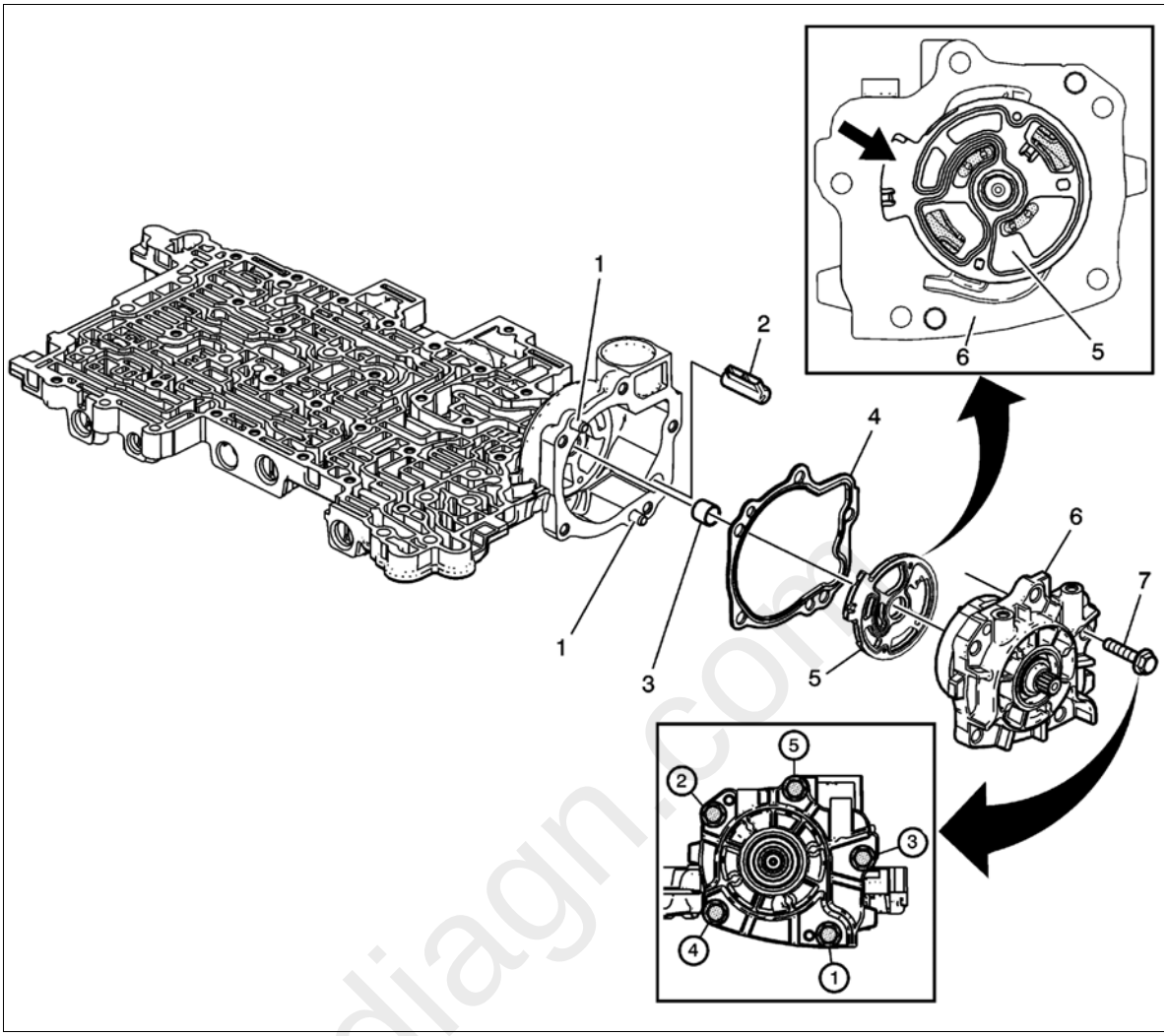
Courtesy of GENERAL MOTORS COMPANY

2. Remove the automatic transmission fluid pump (2). Refer to automatic transmission fluid pump assembly removal in Control Valve Body Assembly Disassemble .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION FLUID PUMP REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Automatic Transmission Fluid Pump Assembly



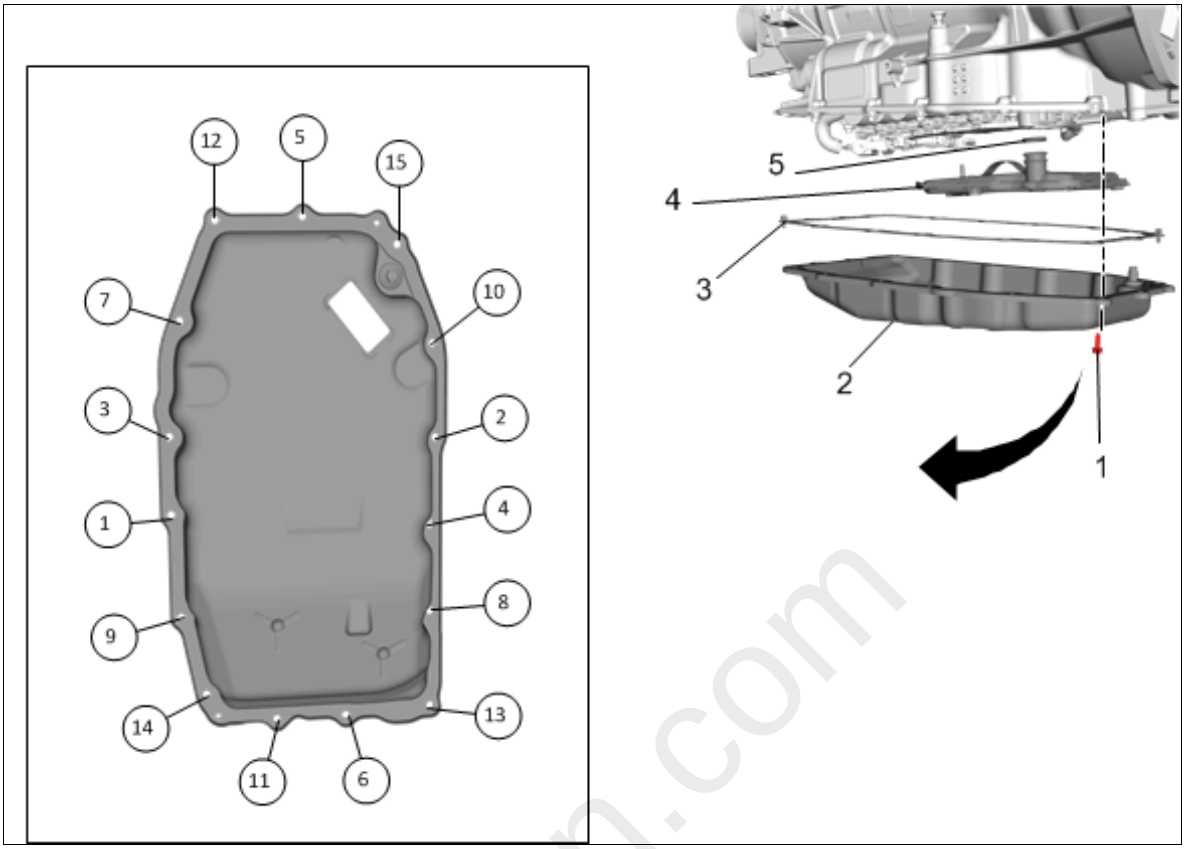
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1. Install the automatic transmission fluid pump (2). Refer to automatic transmission fluid pump assembly installation in Control Valve Body Assembly Assemble .
2. Install the control valve body. Refer to Control Valve Body Replacement .
3. Reprogram the transmission. Solenoid Valve Characterization Reprogramming

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONTROL WIRING HARNESS REPLACEMENT > REMOVAL PROCEDURE

Fig 1: Transmission Fluid Filter

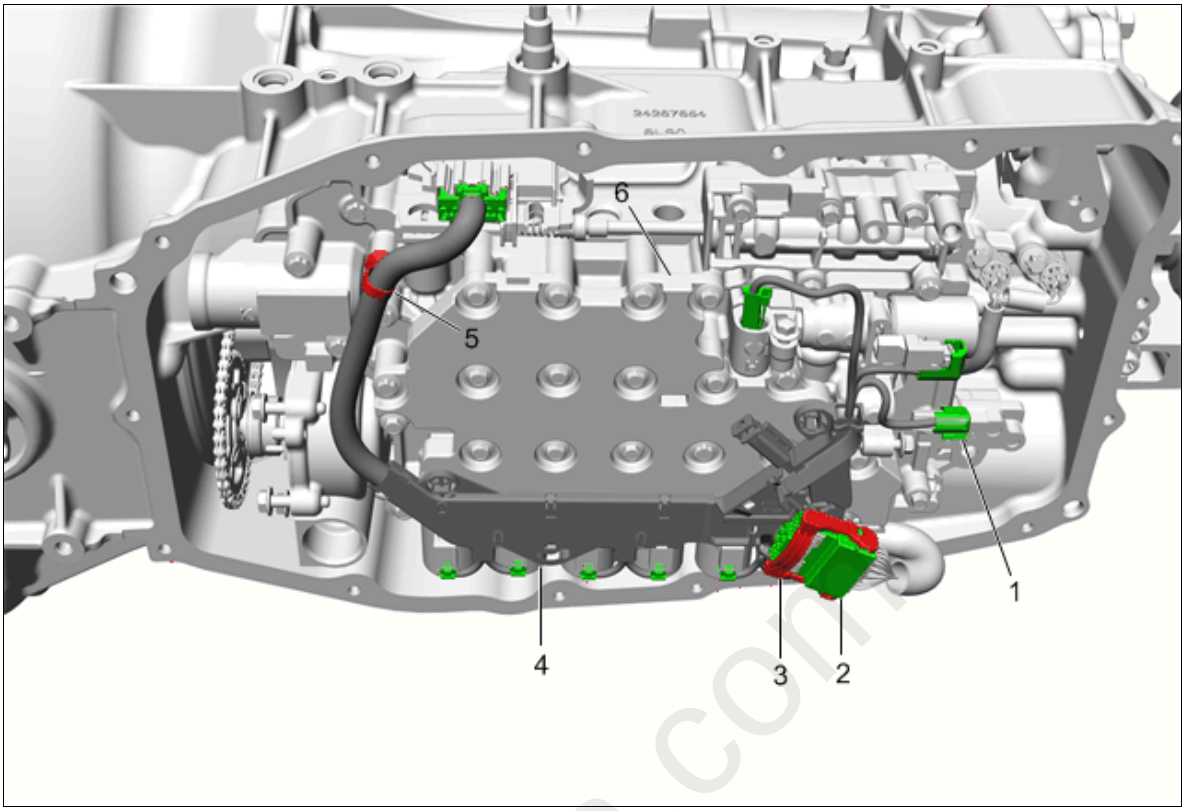


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1. Remove the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .

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Fig 2: Transmission Control Wiring Harness Connectors



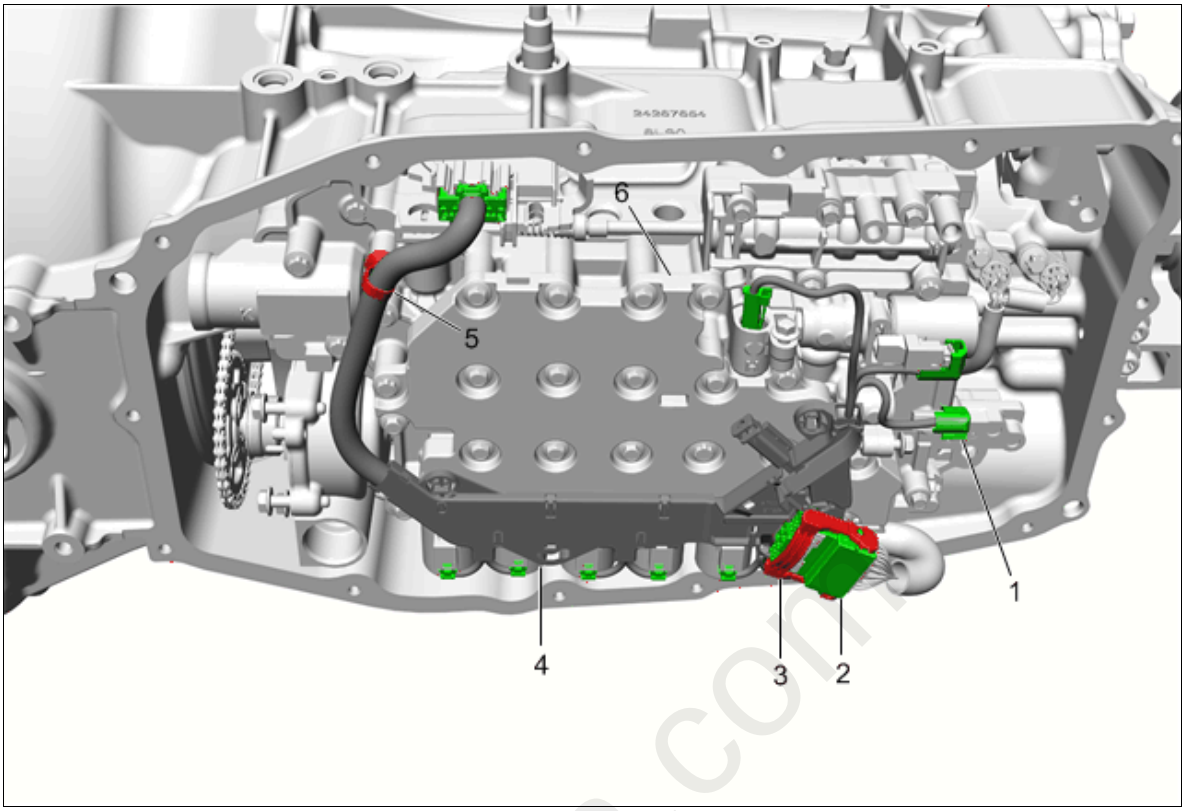
Courtesy of GENERAL MOTORS COMPANY

2. Release the transmission control wiring harness connectors.
3. Carefully disconnect the wiring harness clips from the valve body and case.
4. Remove the transmission control wiring harness (4).

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION CONTROL WIRING HARNESS REPLACEMENT > INSTALLATION PROCEDURE

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Fig 1: Transmission Control Wiring Harness Connectors

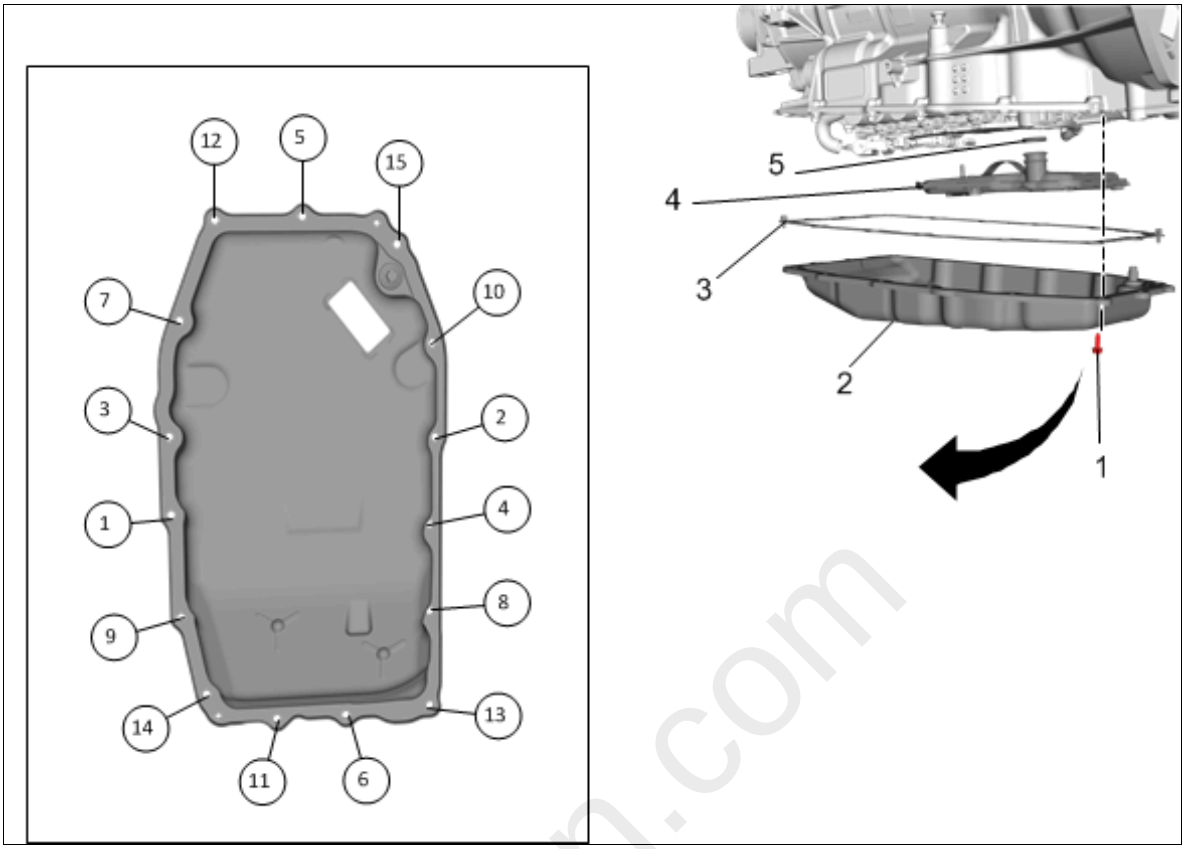


Courtesy of GENERAL MOTORS COMPANY

1. Install automatic transmission control wiring harness (4).
2. Connect the wiring harness clips to the valve body and case.
3. Connect the transmission control wiring harness connectors, ensure the valve body connector retainer is latched (3).

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Fig 2: Transmission Fluid Filter



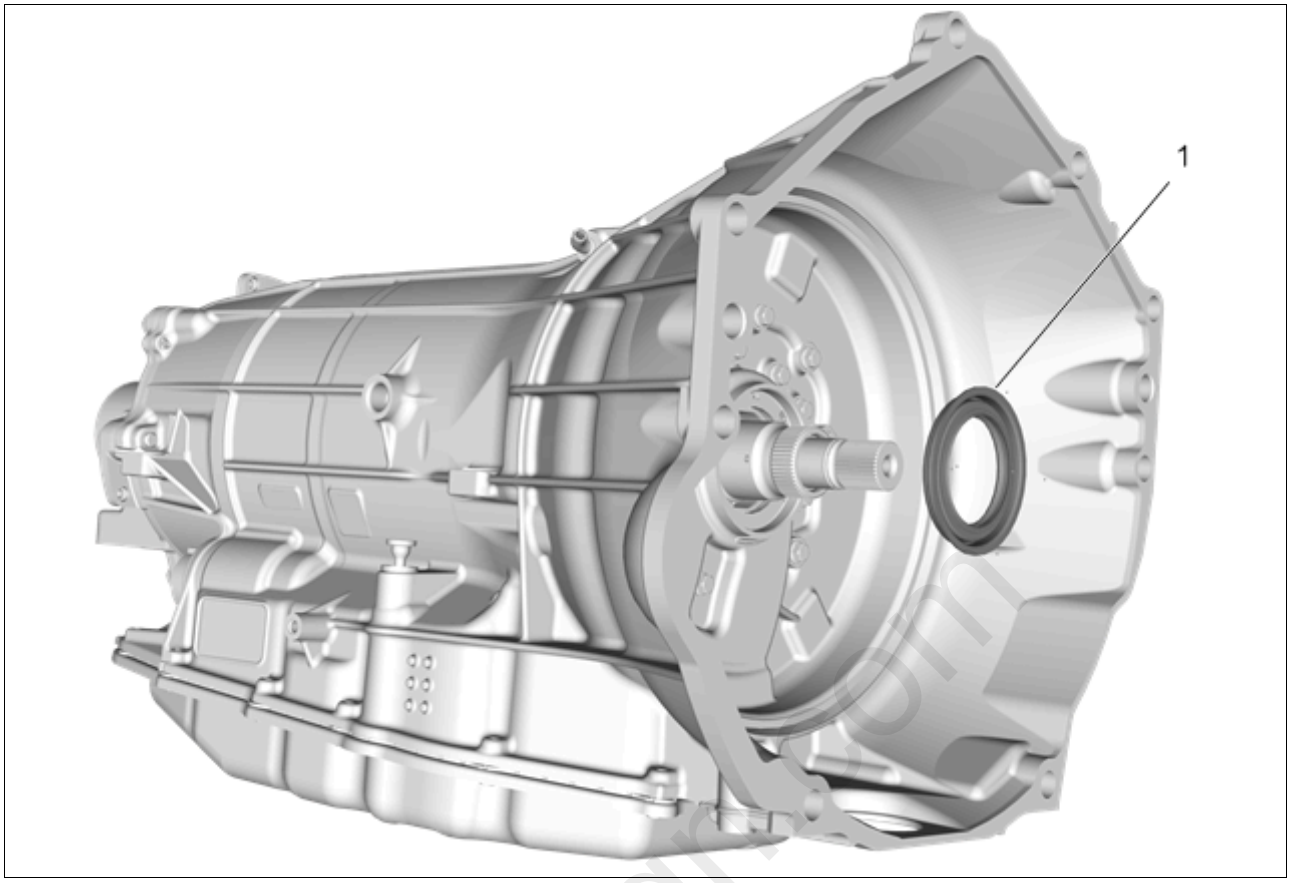
Courtesy of GENERAL MOTORS COMPANY

4. Install the transmission fluid filter (4). Refer to Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement .

REPAIR INSTRUCTIONS - ON VEHICLE > TORQUE CONVERTER FLUID SEAL REPLACEMENT

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Fig 1: Torque Converter Fluid Seal



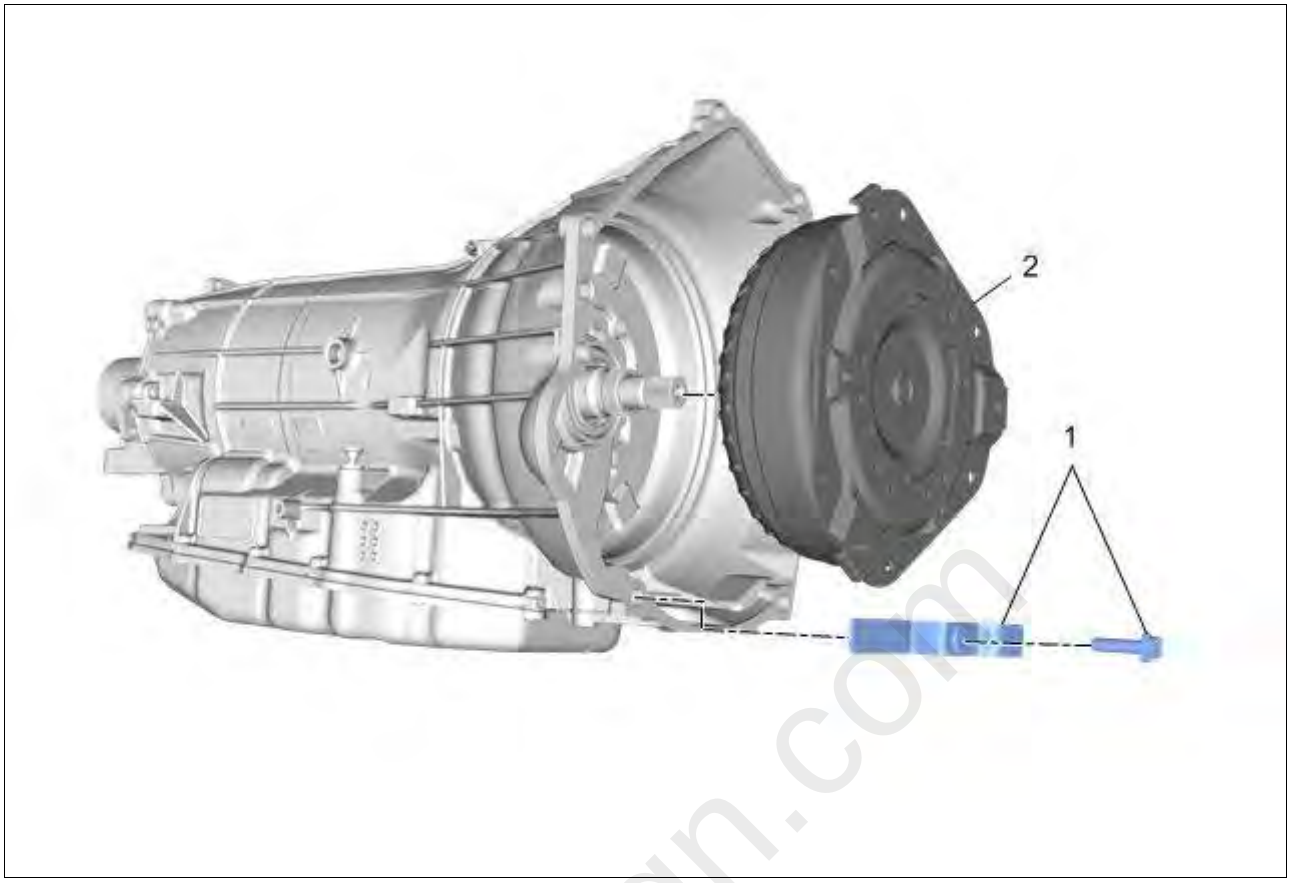
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the torque converter. Refer to Torque Converter Replacement .	
1	Torque Converter Fluid Seal Assembly Special Tools • **DT-45000** Seal Remover • **DT-43772** Torque Converter Seal Installer For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > TORQUE CONVERTER REPLACEMENT

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Fig 1: Torque Converter



Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the transmission. Refer to Transmission Replacement (M5U with LT1 Engine) Transmission Replacement (M5T with LTG Engine) Transmission Replacement (M5T with LGX Engine) .	
1	Converter Holding Strap *WARNING:* *The torque converter must be held to the torque converter housing by a retaining device such as shipping brackets. Without the retaining device, the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing personal injury and/or property damage.* **Special Tools** **DT-21366** Converter Holding Strap For equivalent region tools, refer to Special Tools .

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2	Torque Converter Assembly Procedure 1. Place a drain pan under the front of the transmission. 2. Use care not to damage the torque converter seal during the installation procedure. 3. Spin the torque converter to engage the turbine shaft splines in the torque converter hub, the stator shaft splines in the stator race and to engage the drive flats on the converter pump hub with the oil pump drive gear. *NOTE:* *Lubricate the converter pump hub OD and the torque converter seal with clean transmission fluid.*

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5U WITH LT1 ENGINE)

Special Tools

J-21366 Torque Converter Holding Strap

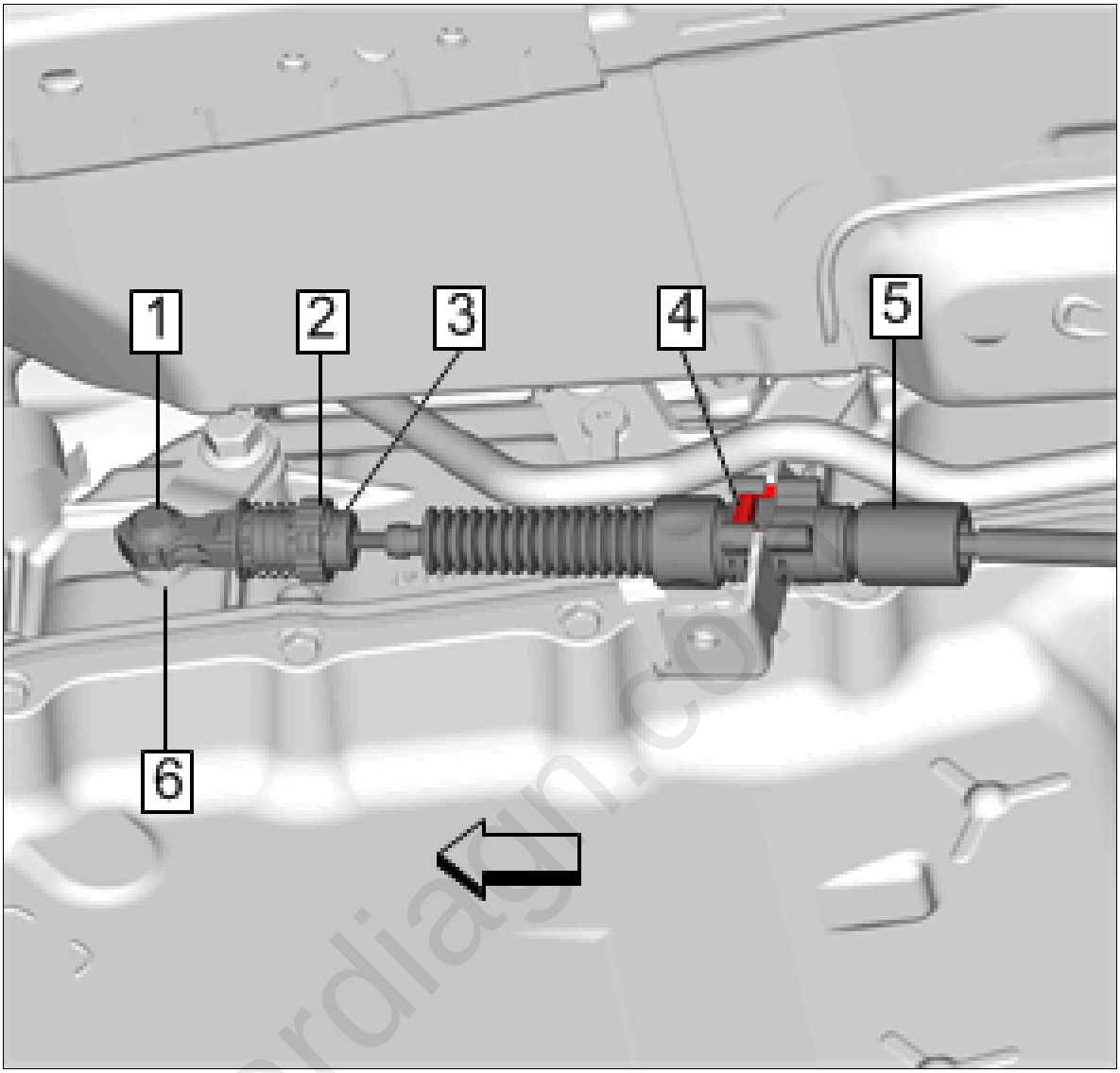
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5U WITH LT1 ENGINE) > REMOVAL PROCEDURE

1. Raise and suitably support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
2. Remove Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U)
3. Remove Transmission Heat Shield Replacement

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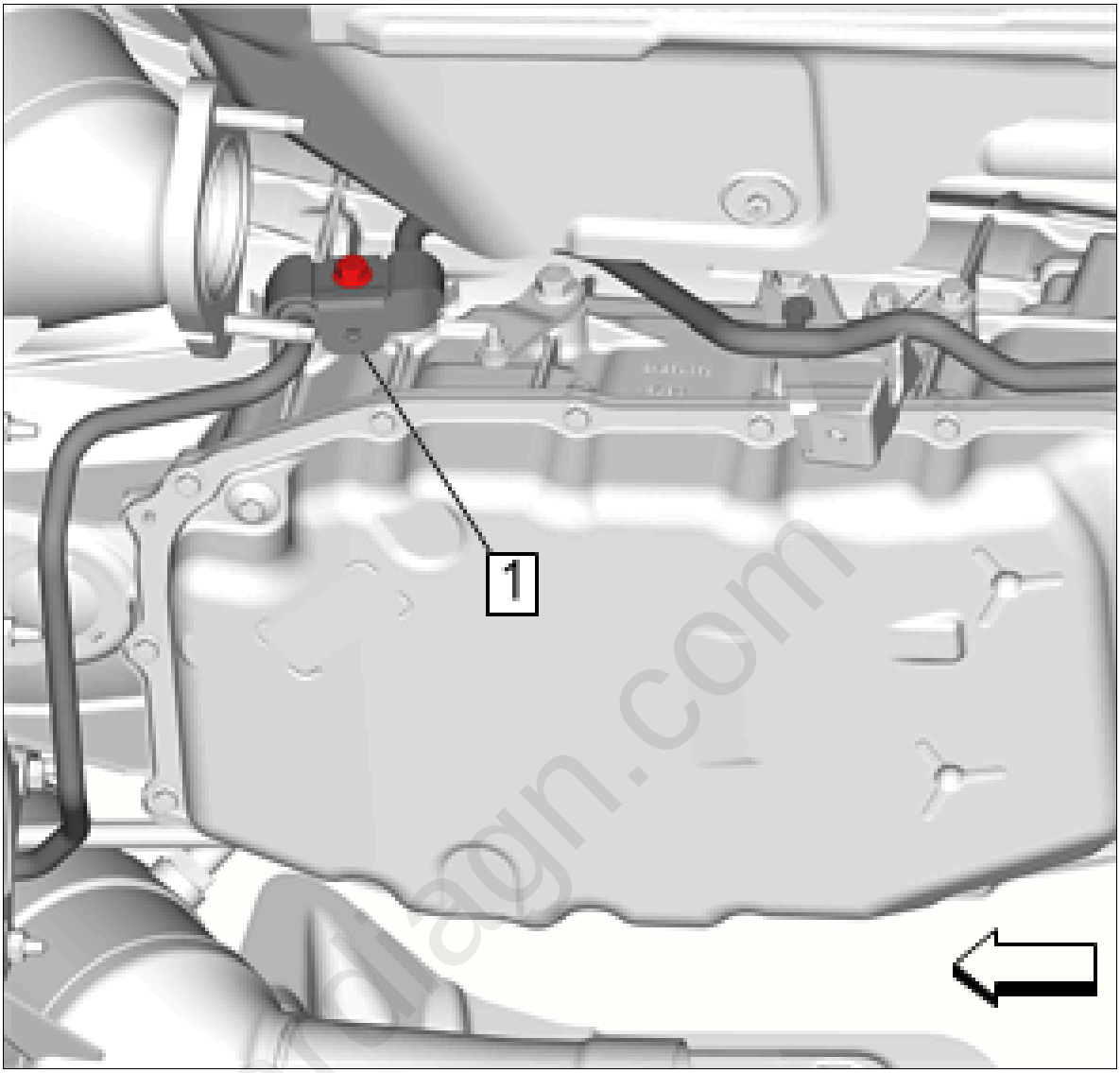
Fig 1: Transmission Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (6).
5. Slide the retainer (4) forward to release the transmission range selector lever cable (5) from the bracket.

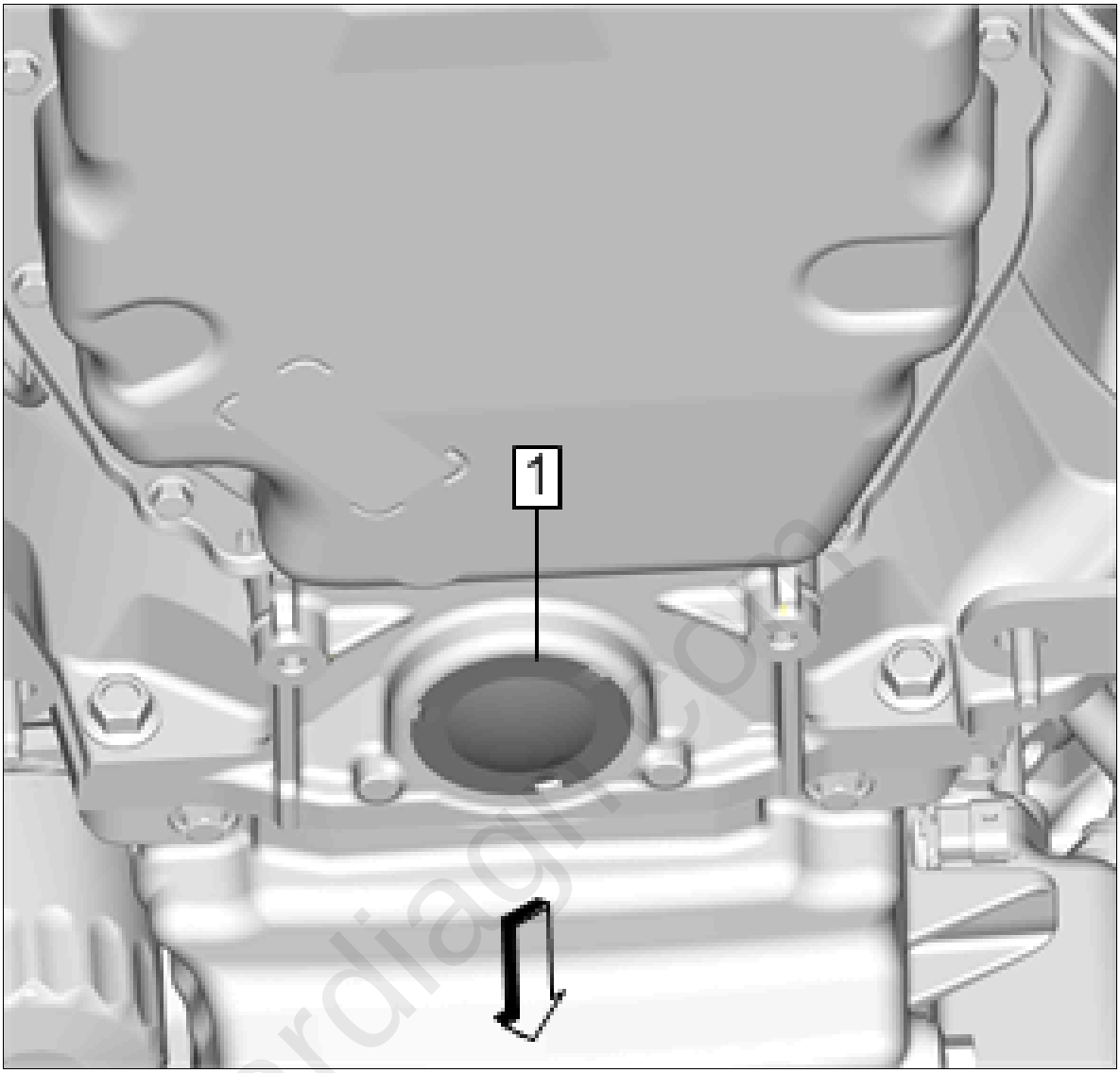
Fig 2: Transmission Fluid Cooler Pipes



Courtesy of GENERAL MOTORS COMPANY

6. Place an oil drain pan under the transmission fluid cooler pipes (1).
7. Remove the transmission fluid cooler inlet and outlet pipes (1) from the transmission, and position aside, or remove from the vehicle as necessary. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, Without KNR) .
8. Plug the open fluid ports to prevent fluid loss and contamination.
9. Remove Starter Replacement (LT1)Starter Replacement (LGX)Starter Replacement (LTG)
10. Remove Transmission Converter Cover Replacement (Right Side M5U) Transmission Converter Cover Replacement (Left Side M5U)

Fig 3: Transmission Close Out Plug

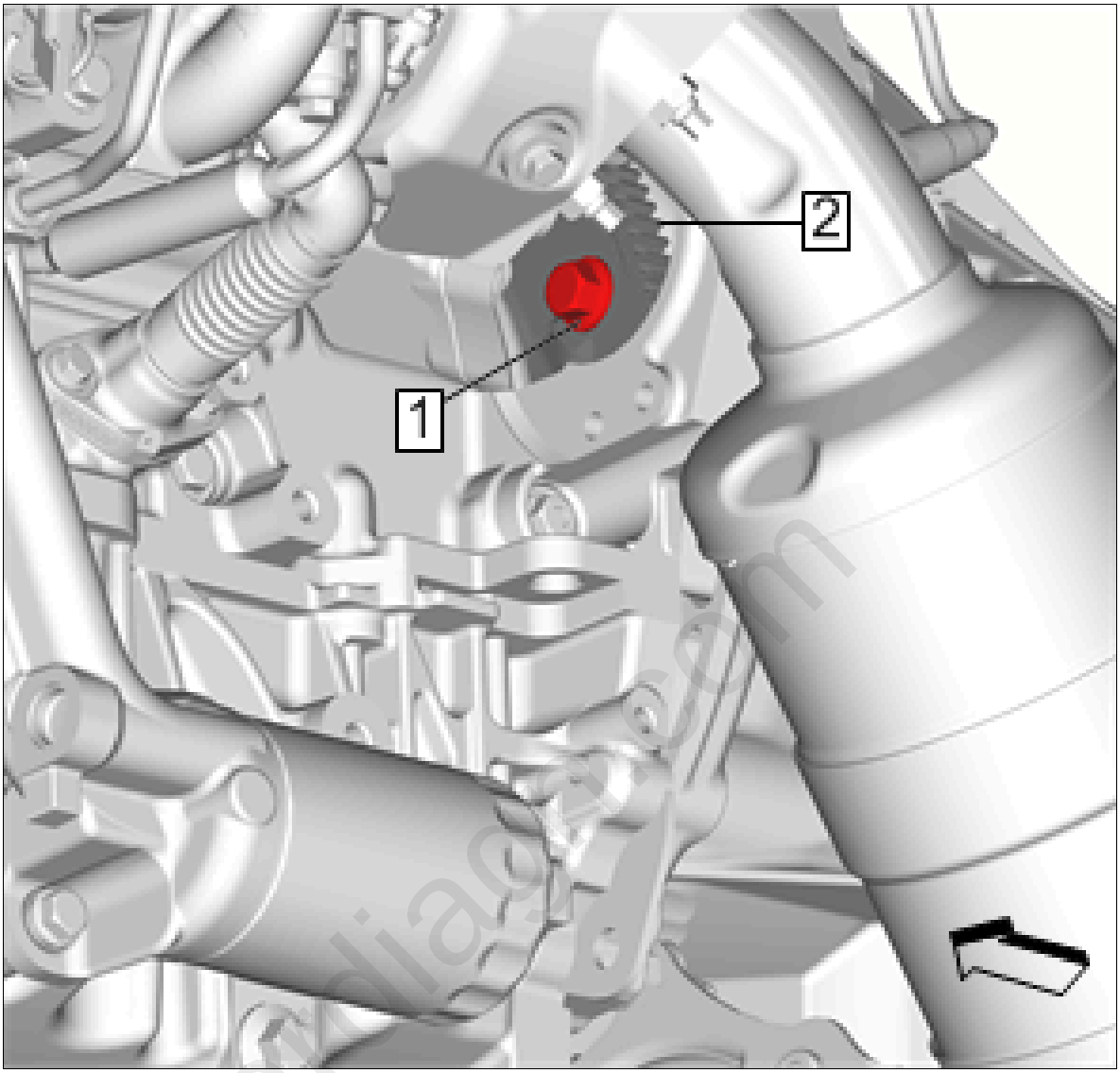


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11. Remove the transmission close out plug (1).
12. Mark the torque converter to flexplate orientation to ensure proper realignment.

Fig 4: Torque Converter Bolts



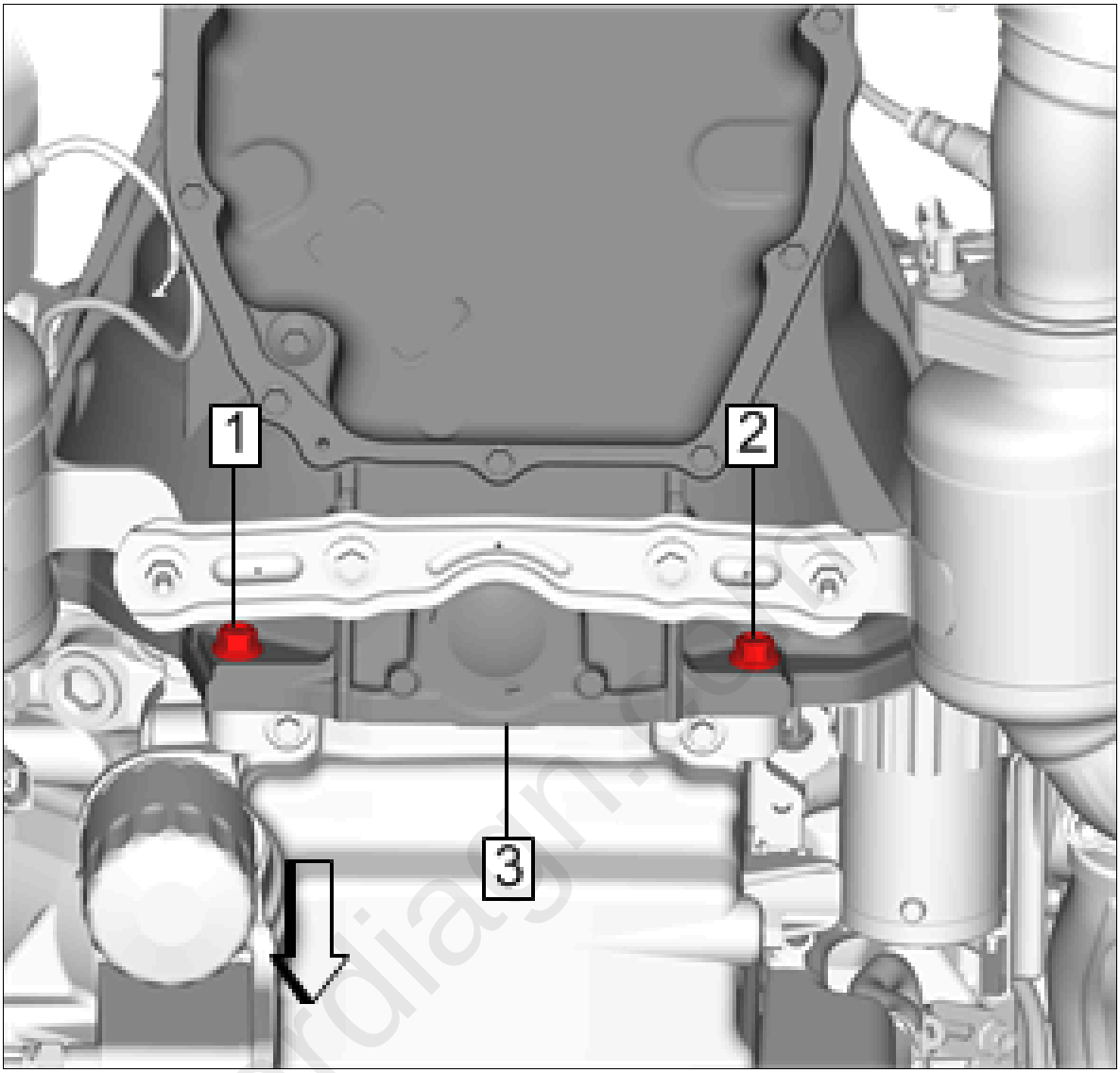
Courtesy of GENERAL MOTORS COMPANY

13. Repeat the following steps for all torque converter bolts (1):

    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt with the starter opening.

    2. Remove and Discard the torque converter bolt.

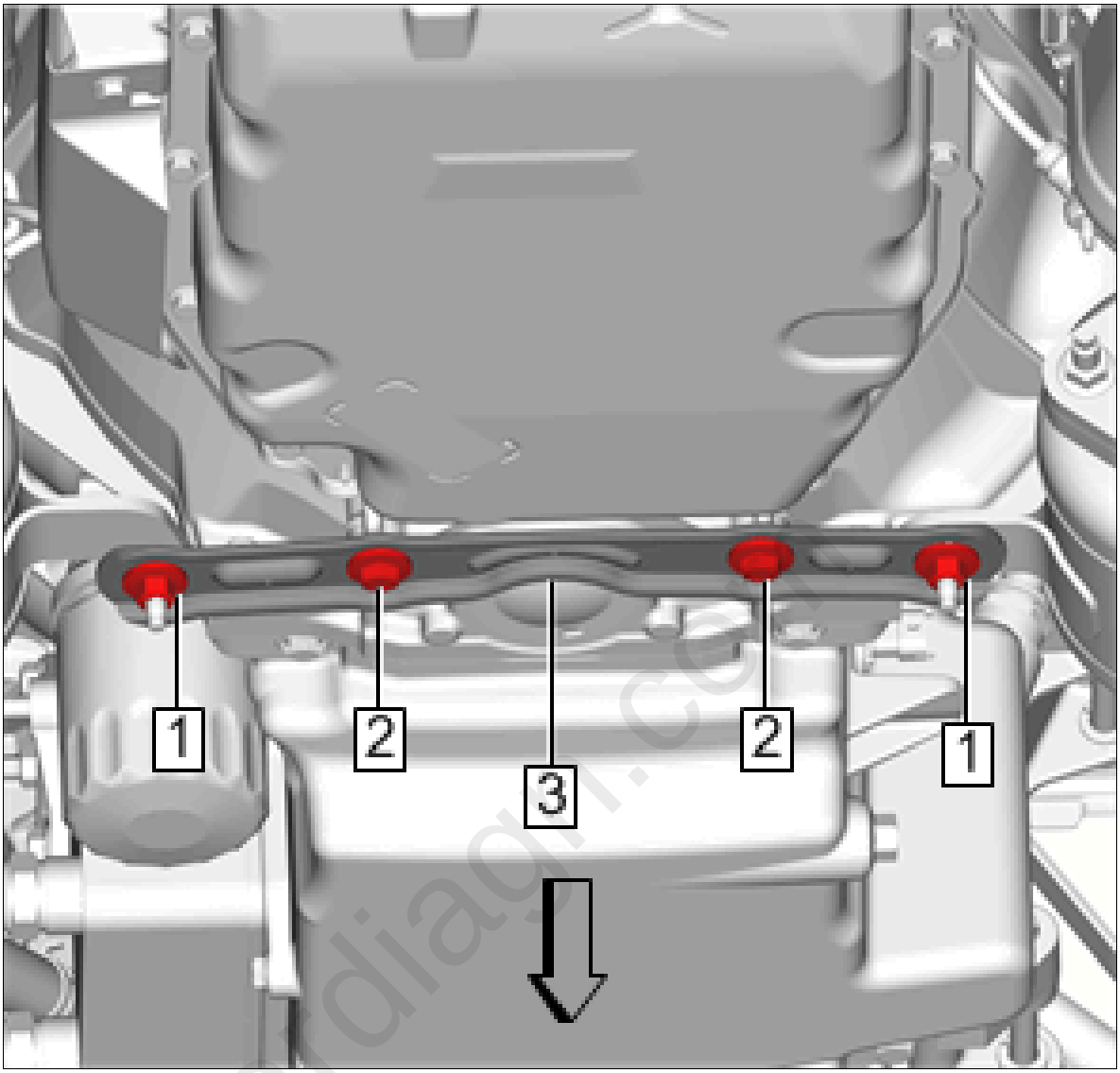
Fig 5: Lower Transmission To Engine Bolts



Courtesy of GENERAL MOTORS COMPANY

14. Remove the lower transmission to engine bolts (1, 2).

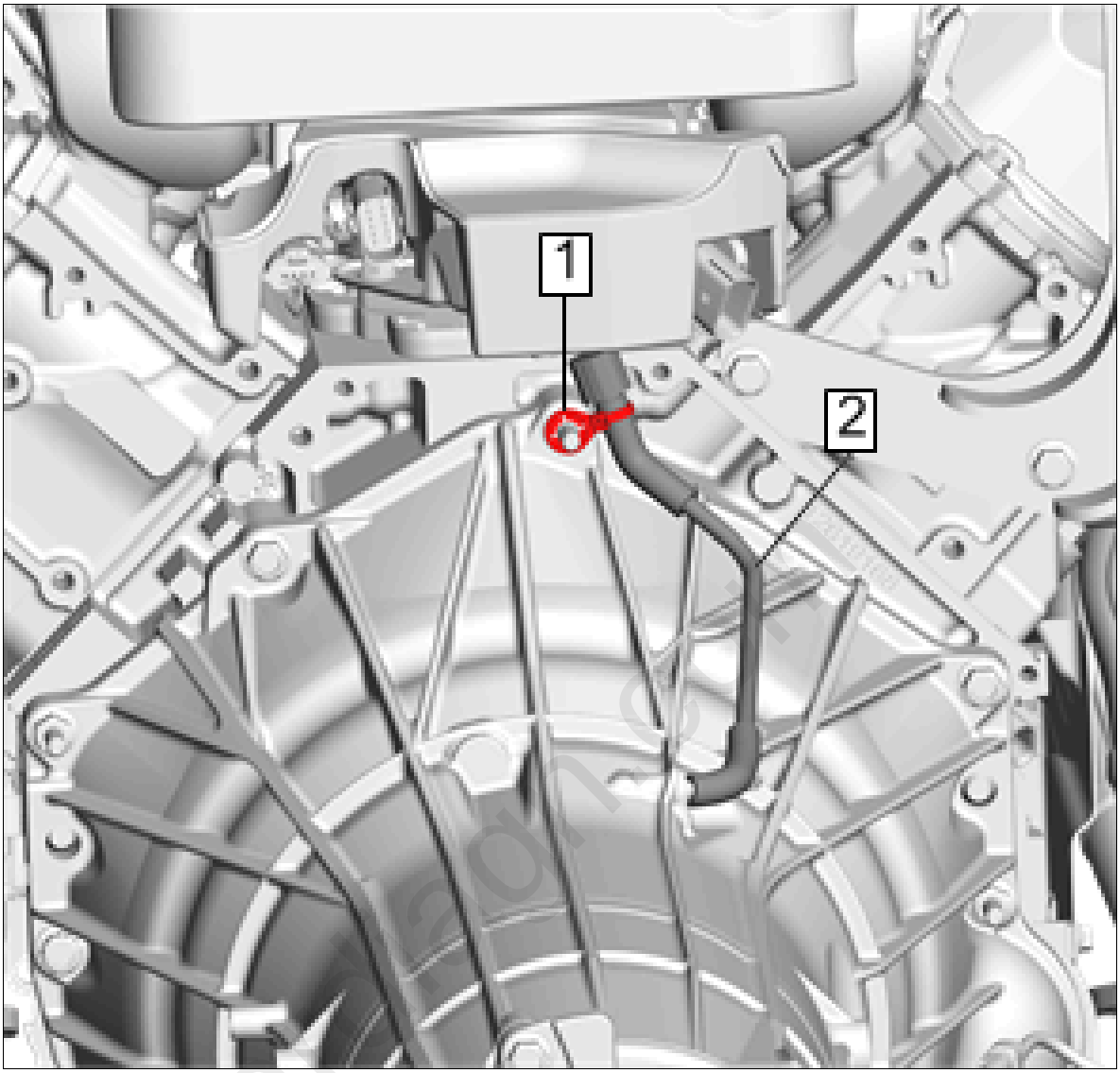
Fig 6: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

15. Remove the catalytic converter brace bracket (3) from the transmission.
16. Remove the left side catalytic converter. Catalytic Converter Replacement - Left Side (LT1)
17. Support the transmission with a suitable transmission jack.
18. Remove Transmission Support Replacement (MM6 Manual Transmission)Transmission Support Replacement (M13 Manual Transmission)Transmission Support Replacement (Automatic Transmission)
19. Tilt the transmission downward just enough to gain access to the upper transmission fasteners.

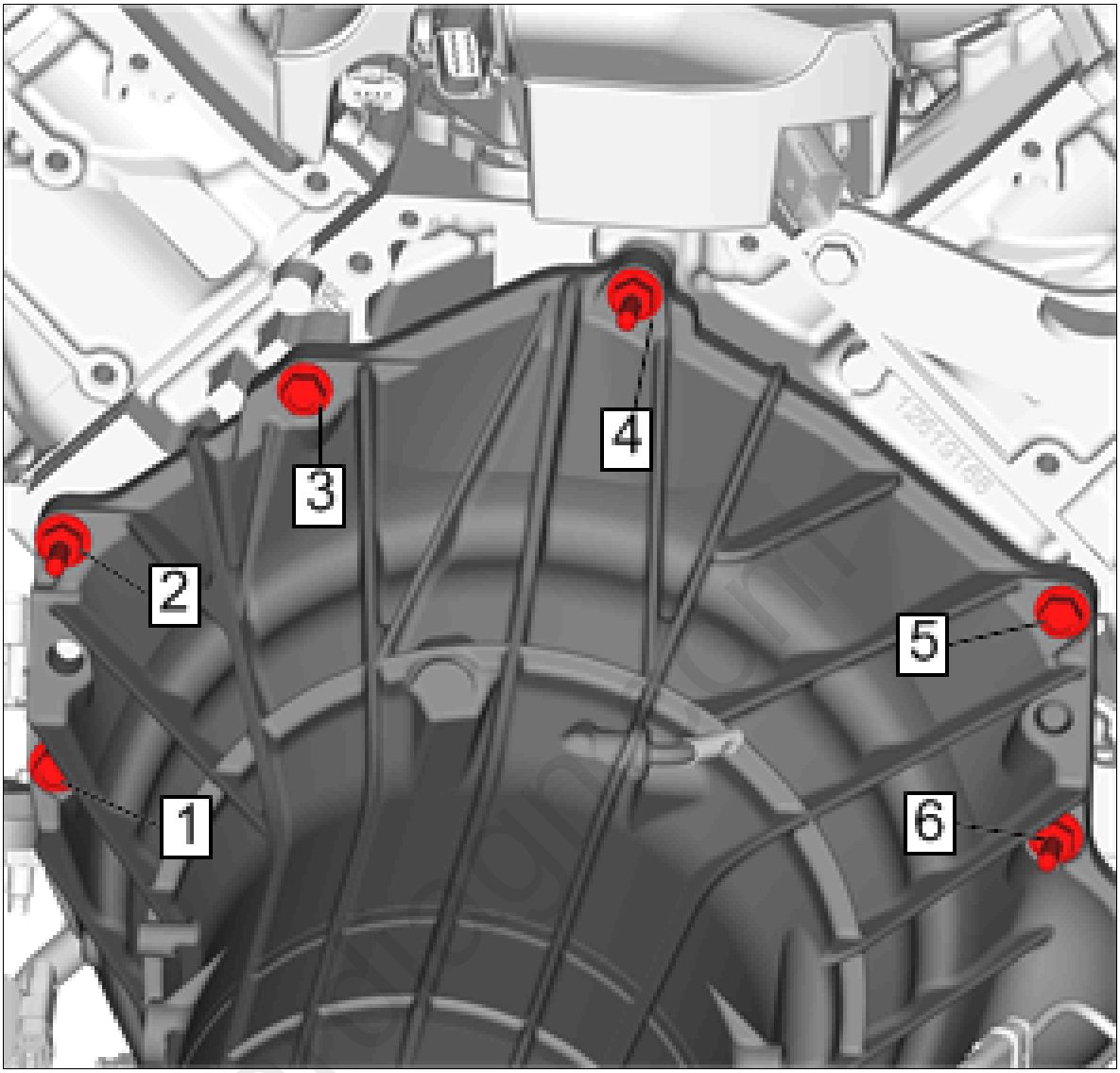
Fig 7: Transmission Vent Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

20. Disconnect the transmission vent hose retainer (1) from the transmission bolt
21. Disconnect the electrical wiring harness retainers from the transmission to engine fasteners and from the transmission case.

Fig 8: Transmission To Engine Bolts



Courtesy of GENERAL MOTORS COMPANY

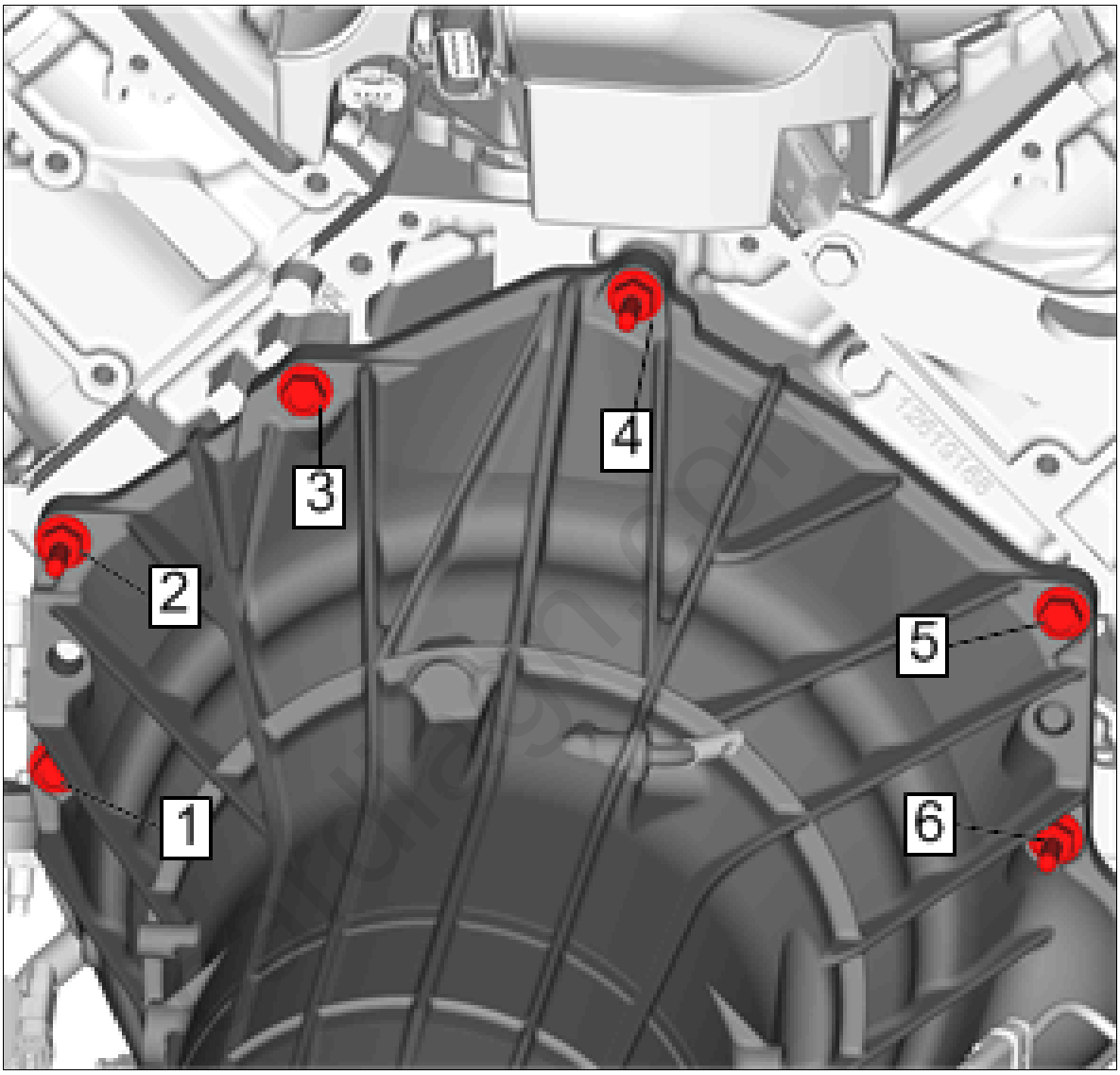
22. Remove the transmission to engine bolts (1, 2, 3, 4, 5, 6).
23. Pull the transmission straight back.
24. Install the **J-21366** strap onto the transmission bell housing to retain the torque converter.
25. Remove the transmission from the vehicle.
26. Transfer components as necessary.
27. Flush and flow test the transmission cooler and transmission pipes. Transmission Fluid Cooler Flushing and Flow Test (Tremec 6-Speed)Transmission Fluid Cooler Flushing and Flow Test (8L90)

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5U

WITH LT1 ENGINE) > INSTALLATION PROCEDURE

1. Remove the **J-21366** strap from the transmission bell housing.
2. Install the transmission to the vehicle.

   Fig 1: Transmission To Engine Bolts

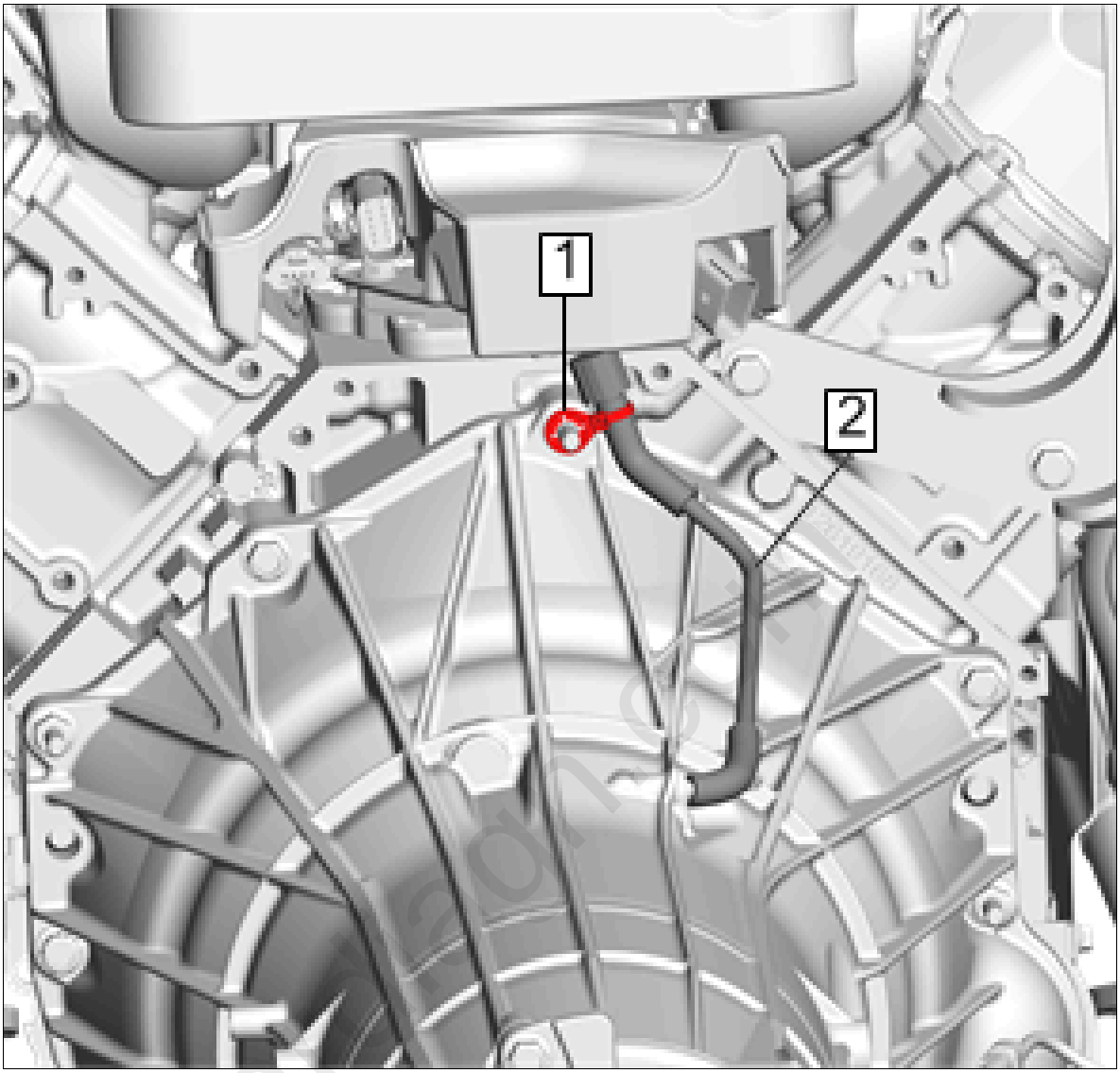


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install the six transmission to engine bolts (1, 2, 3, 4, 5, 6) and tighten to 58 N.m (43 lb ft).

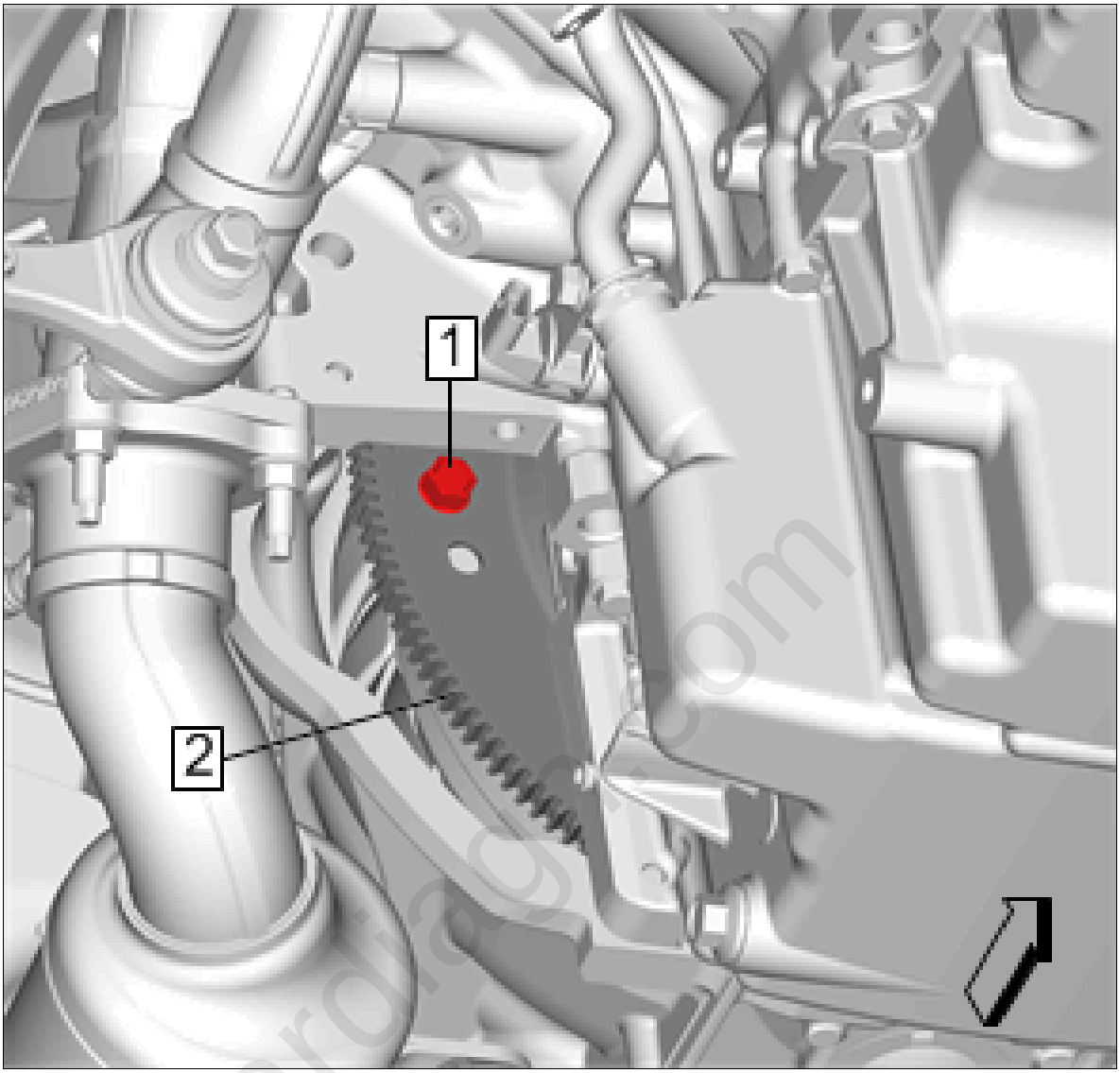
Fig 2: Transmission Vent Hose Retainer



Courtesy of GENERAL MOTORS COMPANY

4. Connect the transmission vent hose retainer (1) to the transmission bolt.
5. Connect the electrical wiring harness retainers to the transmission to engine fasteners and to the transmission case.
6. Install the transmission support. Transmission Support Replacement (MM6 Manual Transmission)Transmission Support Replacement (M13 Manual Transmission)Transmission Support Replacement (Automatic Transmission) .
7. Remove the transmission jack from under the vehicle.
8. Align the torque converter to flexplate orientation marks made during the removal procedure.

Fig 3: Converter And Converter Bolts



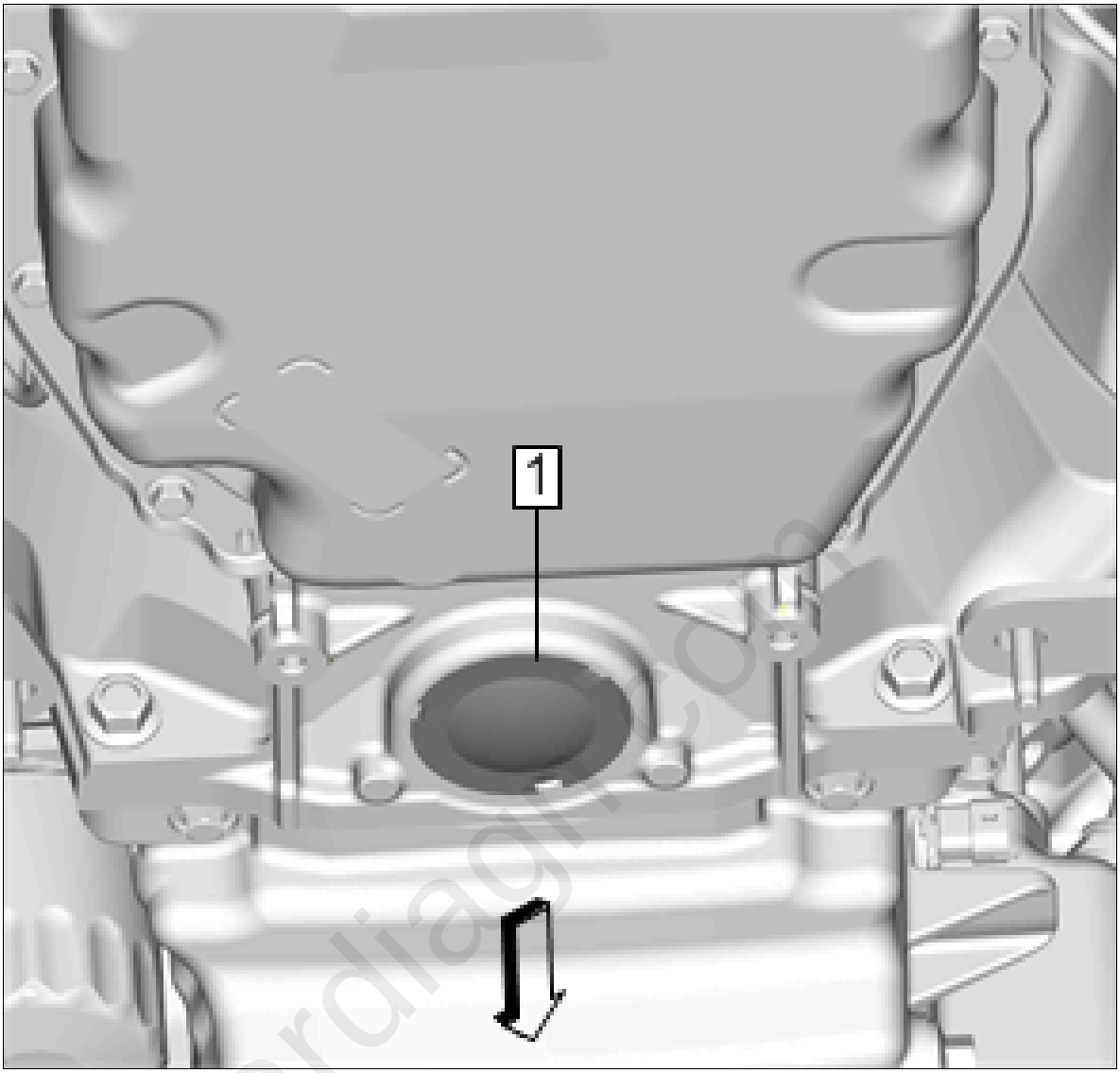
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Torque converter bolts are self-locking and must be replaced with NEW torque converter bolts every time the bolts are removed.

9. Complete the following steps for all torque converter bolts (1):
    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt holes in the flexplate with the starter opening in the engine block.
    2. Install all NEW torque converter bolts (1) and tighten to 63 N.m (46 lb ft).

Fig 4: Transmission Close Out Plug

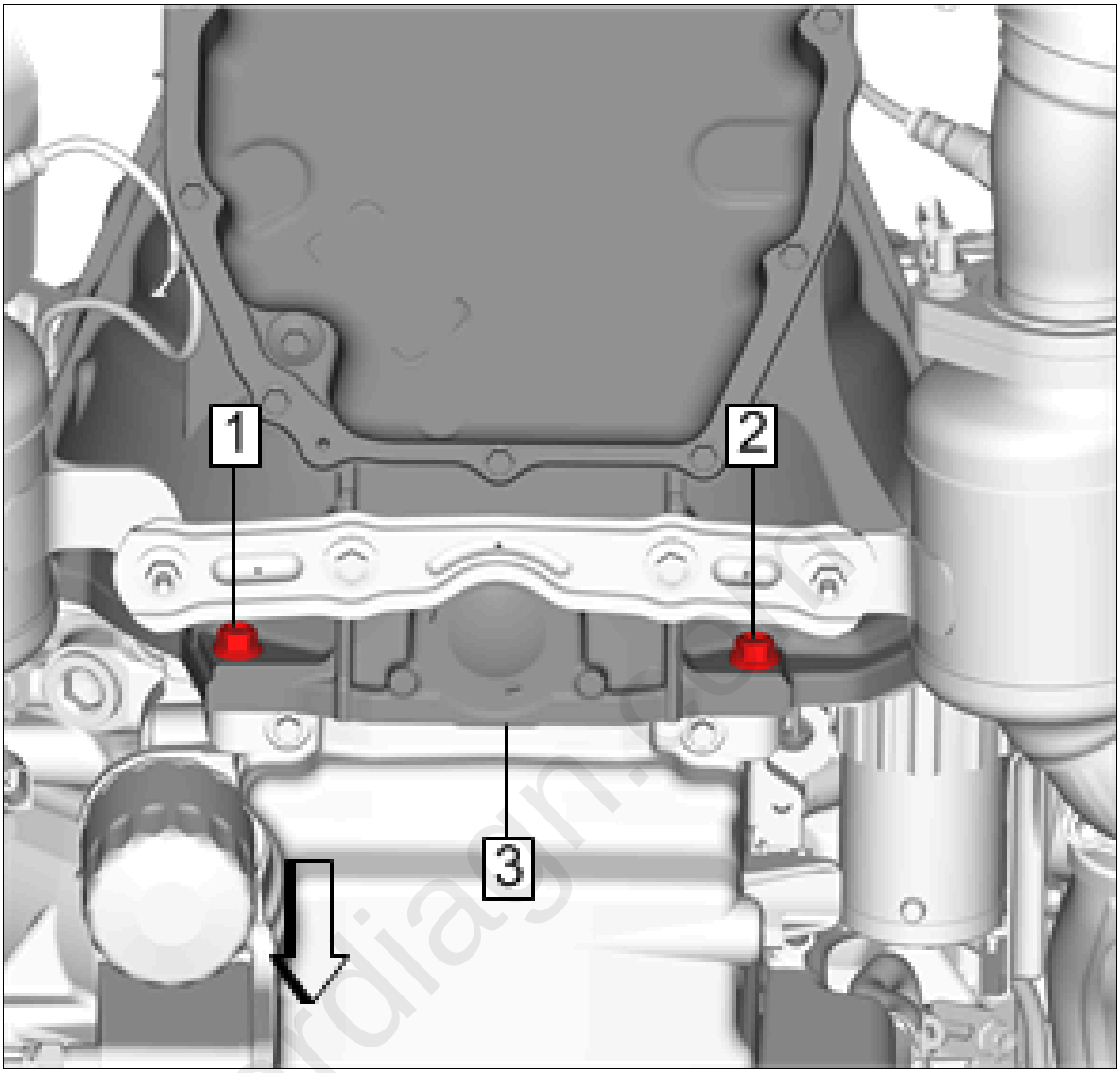


Courtesy of GENERAL MOTORS COMPANY

cardiagn.com

10. Install the transmission close out plug (1).
11. Install Transmission Converter Cover Replacement (Right Side M5U) Transmission Converter Cover Replacement (Left Side M5U)
12. Install the starter motor. Starter Replacement (LT1) .

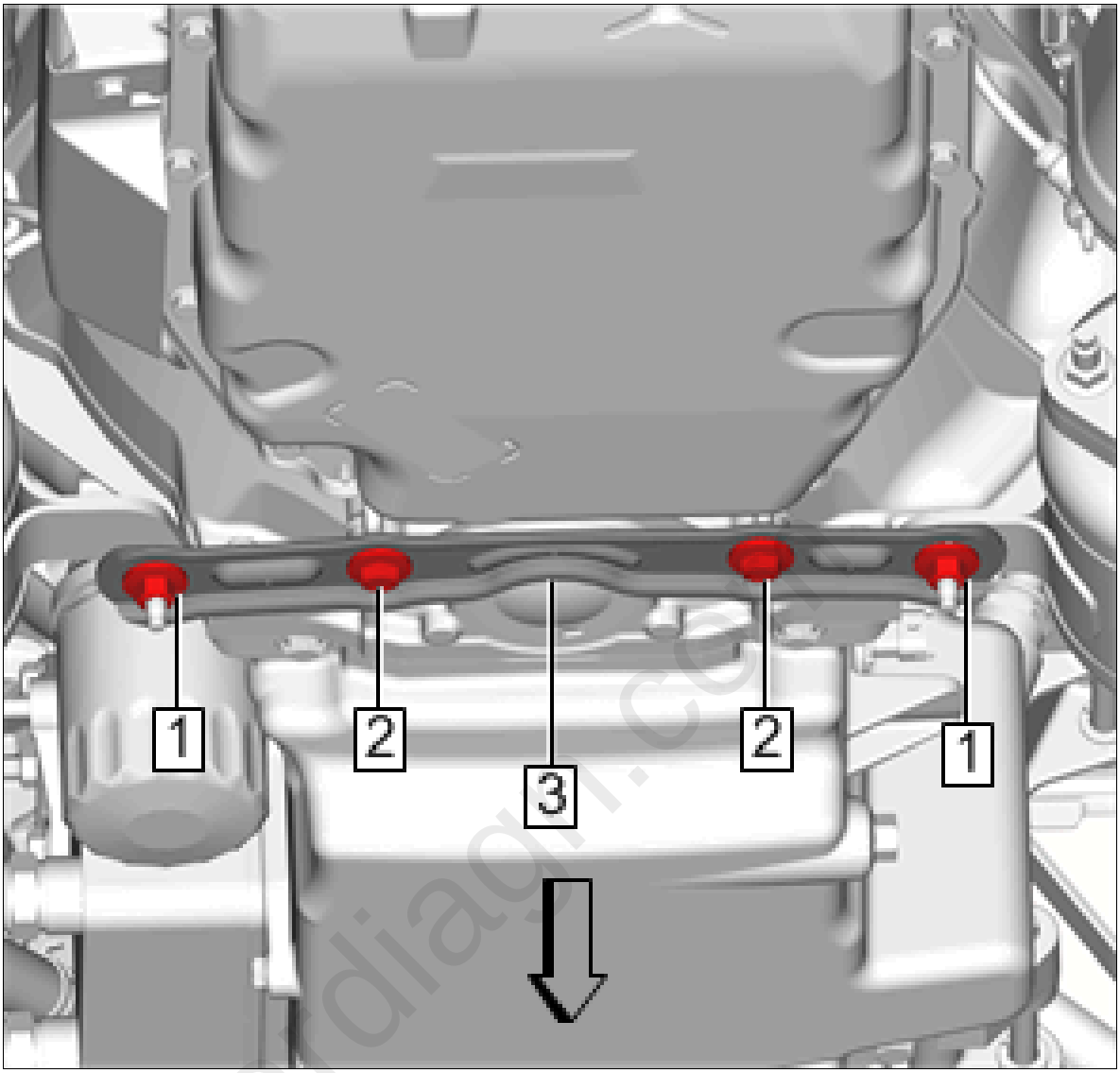
Fig 5: Lower Transmission To Engine Bolts



Courtesy of GENERAL MOTORS COMPANY

13. Install the lower transmission to engine bolts (1, 2) and tighten to 58 N.m (43 lb ft).
14. Install the left side catalytic converter. Catalytic Converter Replacement - Left Side (LT1)

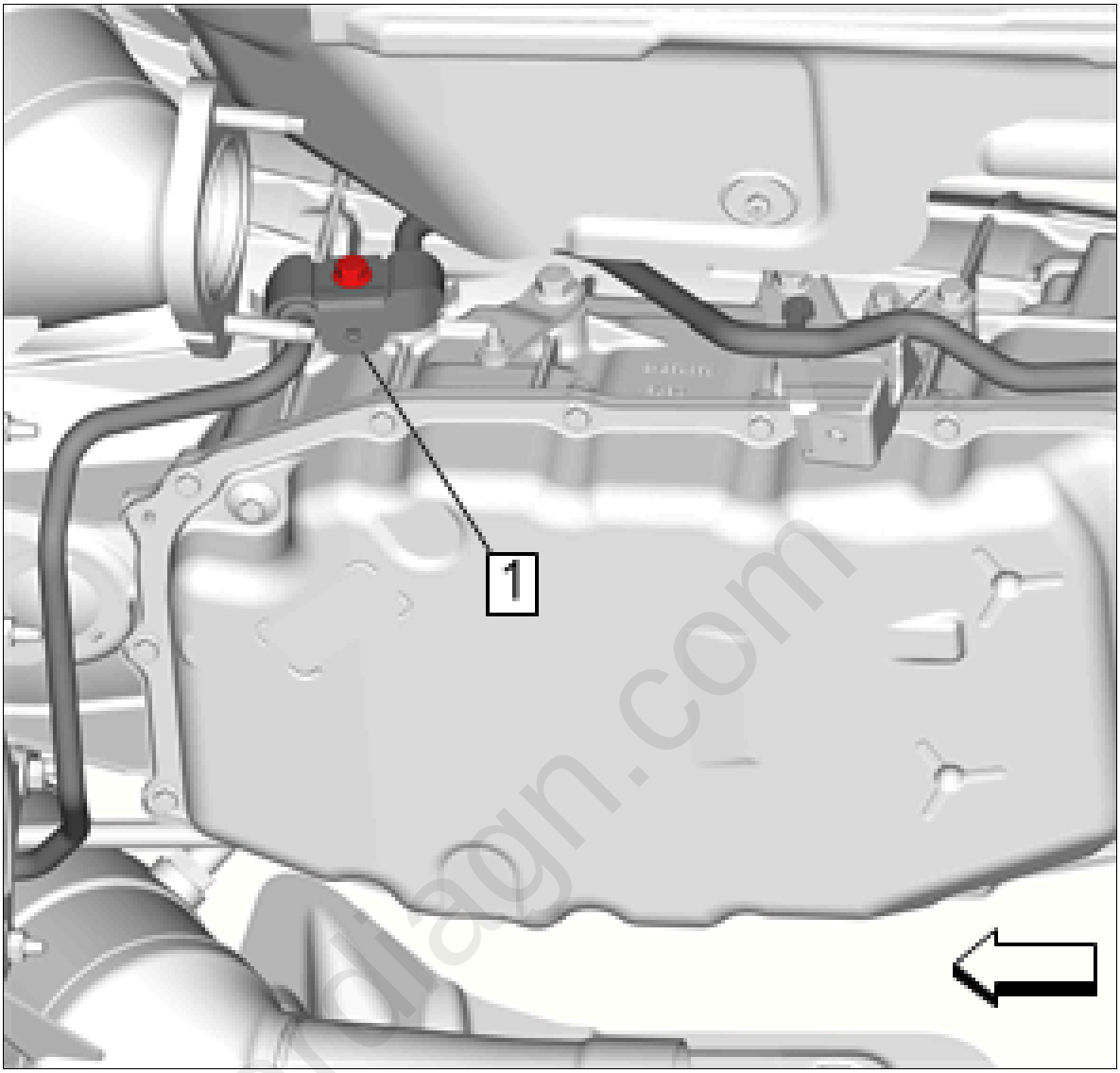
Fig 6: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

15. Install the catalytic converter brace bracket (3) to the transmission.
16. Install the two retaining nuts (1) and tighten to 22 N.m (16 lb ft).
17. Install the two retaining bolts (2) and tighten to 22 N.m (16 lb ft).

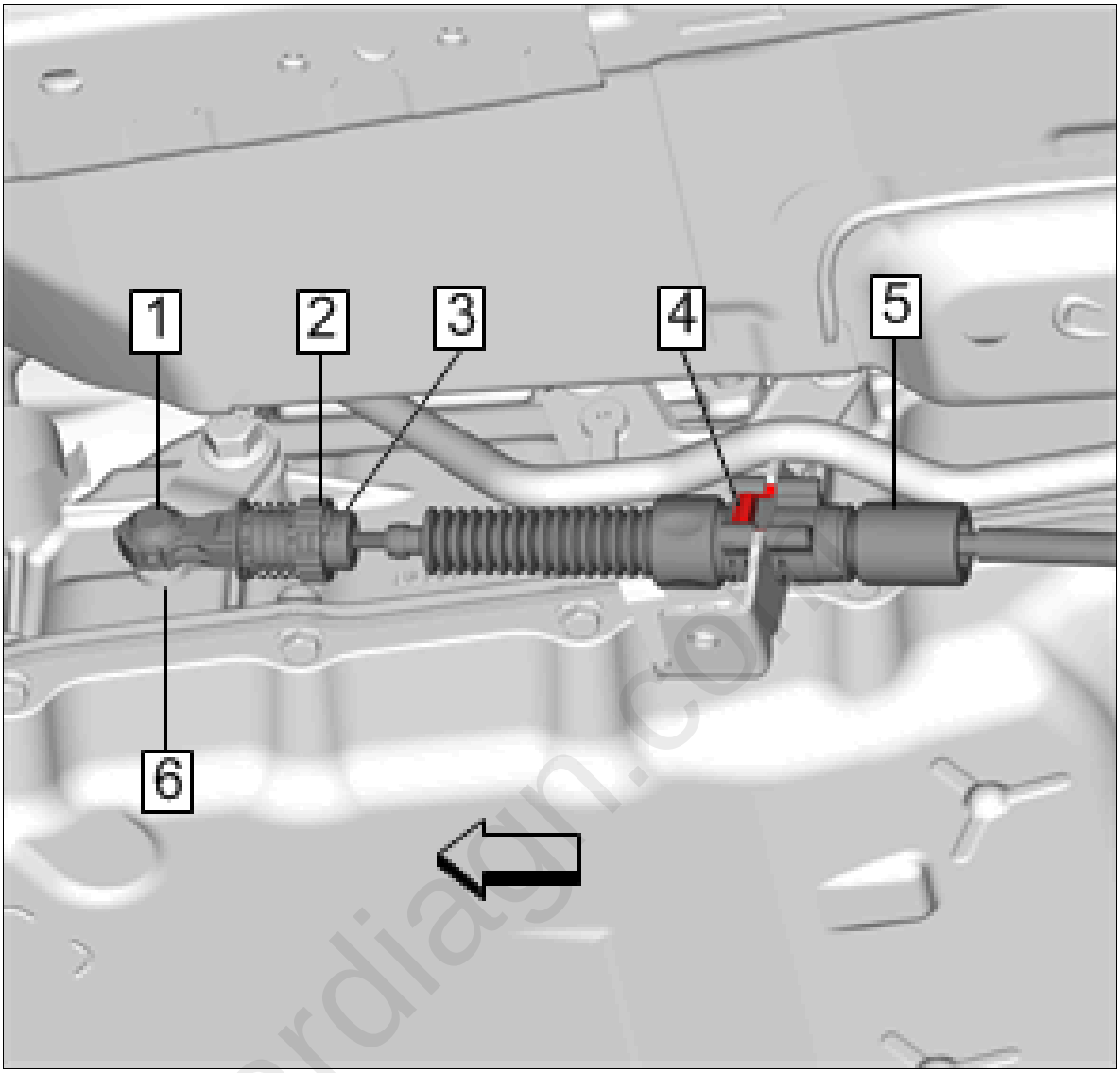
Fig 7: Transmission Fluid Cooler Pipes



Courtesy of GENERAL MOTORS COMPANY

18. Install the transmission fluid cooler inlet and outlet pipe (1) to the transmission. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, With KNR)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, Without KNR) .
19. Connect the wiring harness retainers and connectors to the transmission.

Fig 8: Transmission Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

20. Install the cable in the bracket, then slide the retainer (4) rearward to lock the transmission range selector lever cable in the bracket.
21. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (2).
22. Adjust the cable. Range Selector Lever Cable Adjustment .
23. Install Transmission Heat Shield Replacement
24. Install the propeller shaft. Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U) .
25. Lower the vehicle.
26. Check the transmission fluid level and fill if necessary. Transmission Fluid Level and Condition Check .

27. Perform the solenoid valve characterization. Refer to Solenoid Valve Characterization Reprogramming .

> *NOTE:*
>
> *The Service Fast 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:*
>
> *The service fast learn procedure must be performed when any of the following repairs has been made to the transmission.*
>
> 1. *Pressure regulating solenoid replacement*
> 2. *Valve body repair or replacement*
> 3. *Any service/repair in response to a shift quality concern*
> 4. *Any internal transmission service, repair, overhaul, or replacement*
> 5. *Torque converter replacement*
> 6. *TCM replacement*
> 7. *Transmission assembly replacement*

28. Perform the service fast learn procedure. Refer to Transmission Service Fast Learn Procedure .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T WITH LTG ENGINE)

Special Tools

J-21366 Torque Converter Holding Strap

For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T WITH LTG ENGINE) > REMOVAL PROCEDURE

1. Disconnect the charge air cooler outlet air tube from the throttle body. Charge Air Cooler Outlet Air Tube Replacement
2. Remove Starter Replacement (LTG)
3. Raise and suitably support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP)

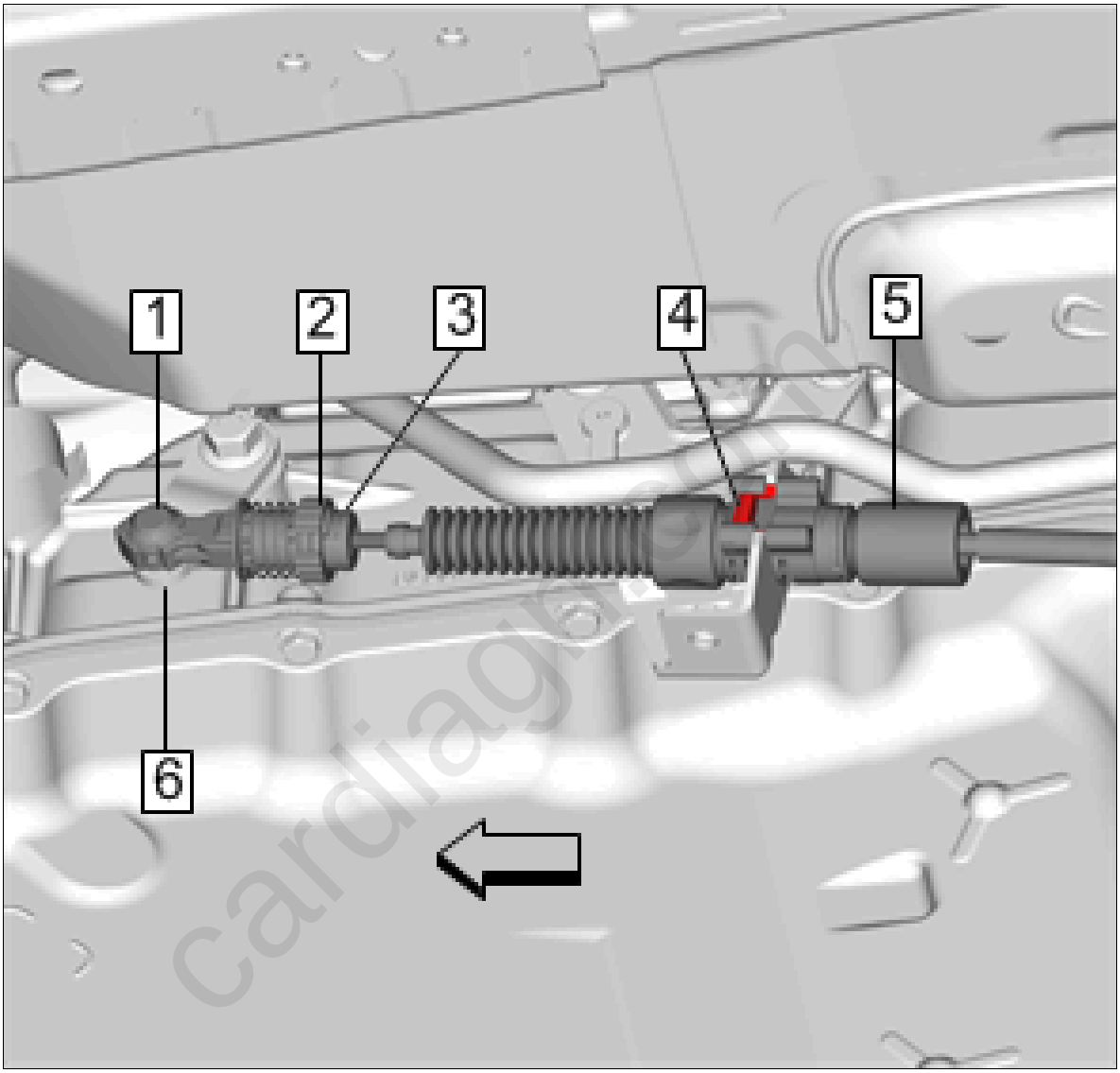
cardiagn.com

4. Remove Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U)

5. Remove {If equipped}

6. Remove

Fig 1: Transmission Range Selector Lever Cable

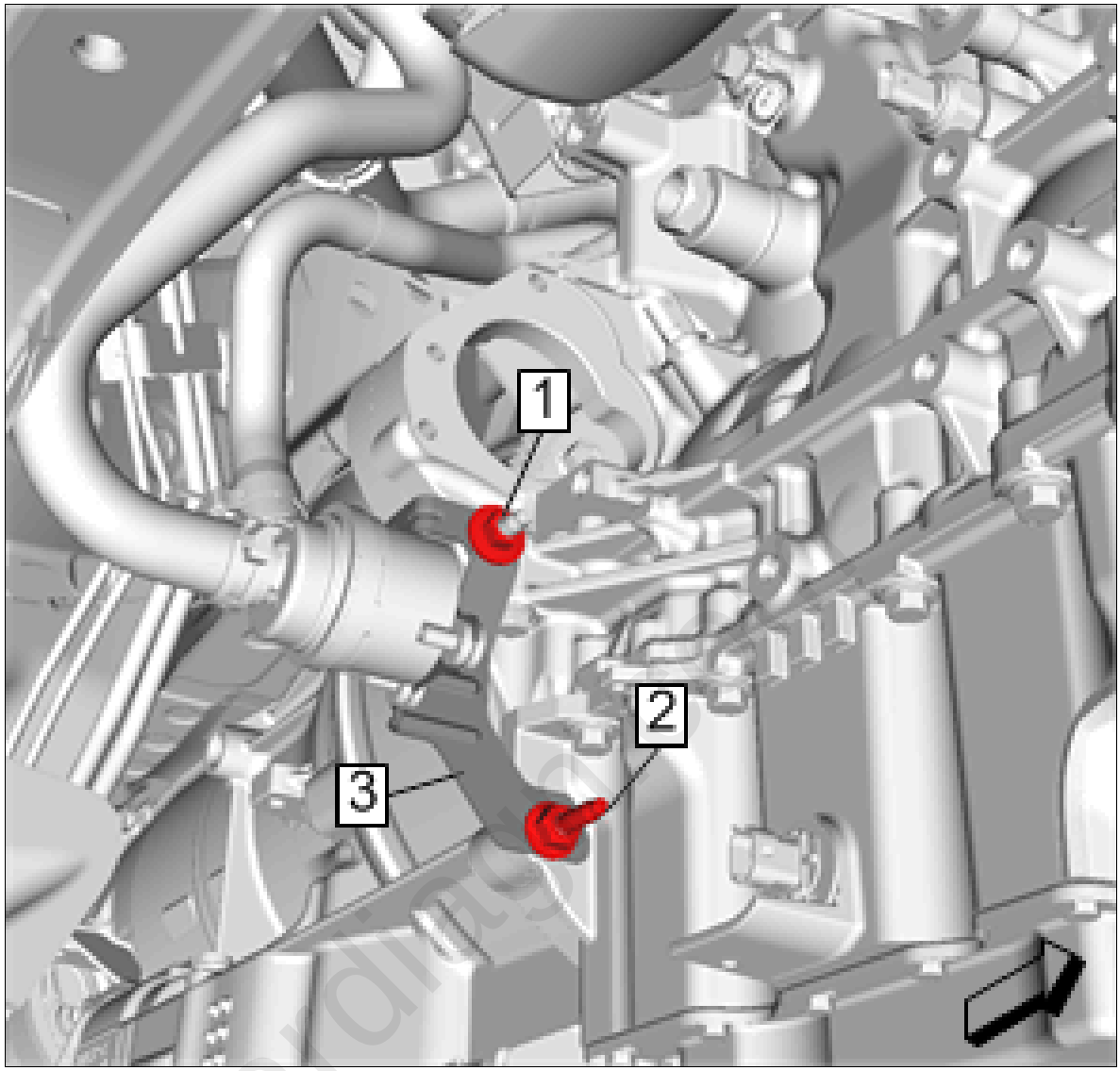


Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (6).

8. Slide the retainer (4) forward to release the transmission range selector lever cable (5) from the bracket.

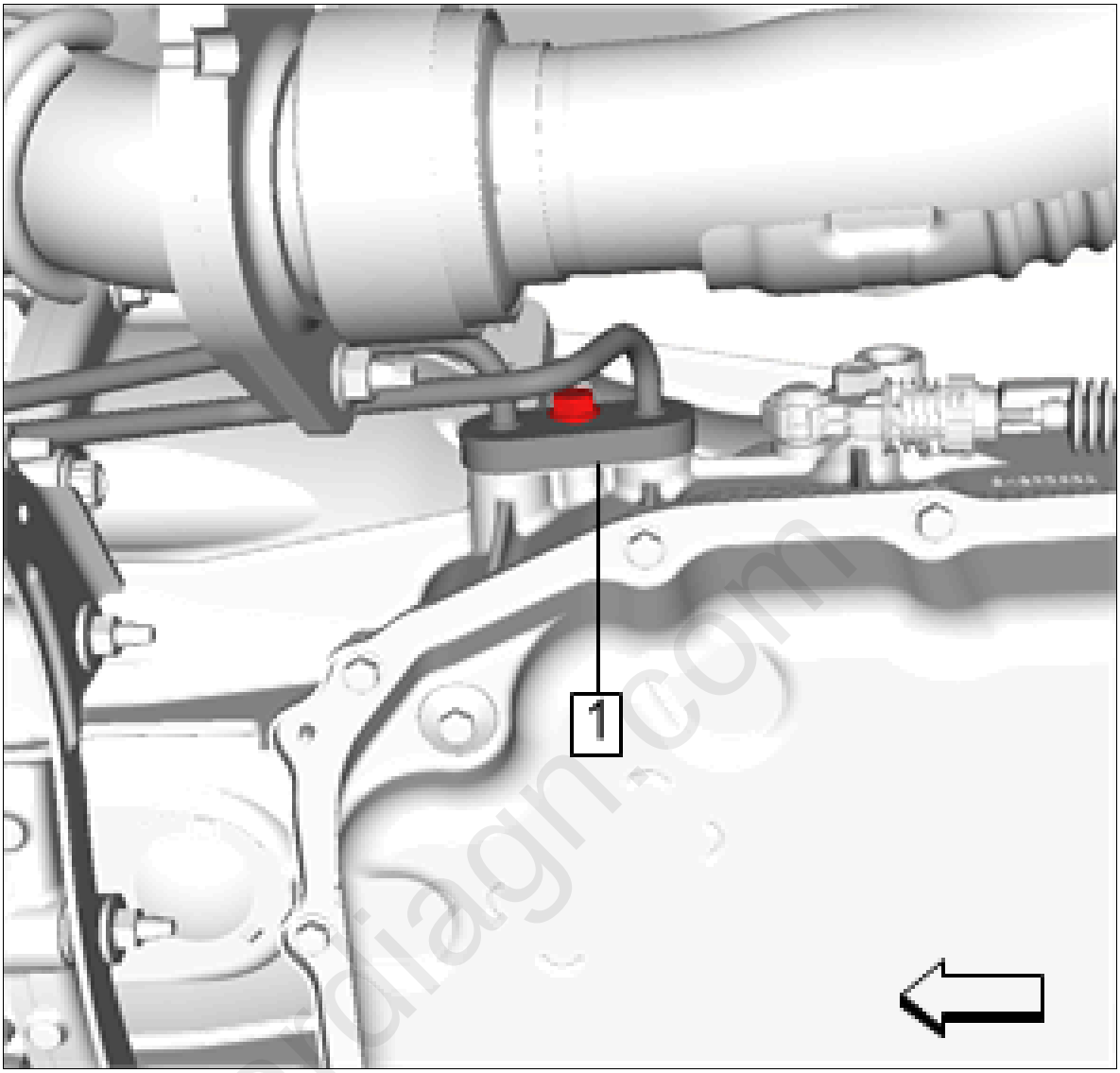
Fig 2: Auxiliary Heater Pump Bracket



Courtesy of GENERAL MOTORS COMPANY

9. Remove the auxiliary heater pump bracket (3) from the transmission and position aside.

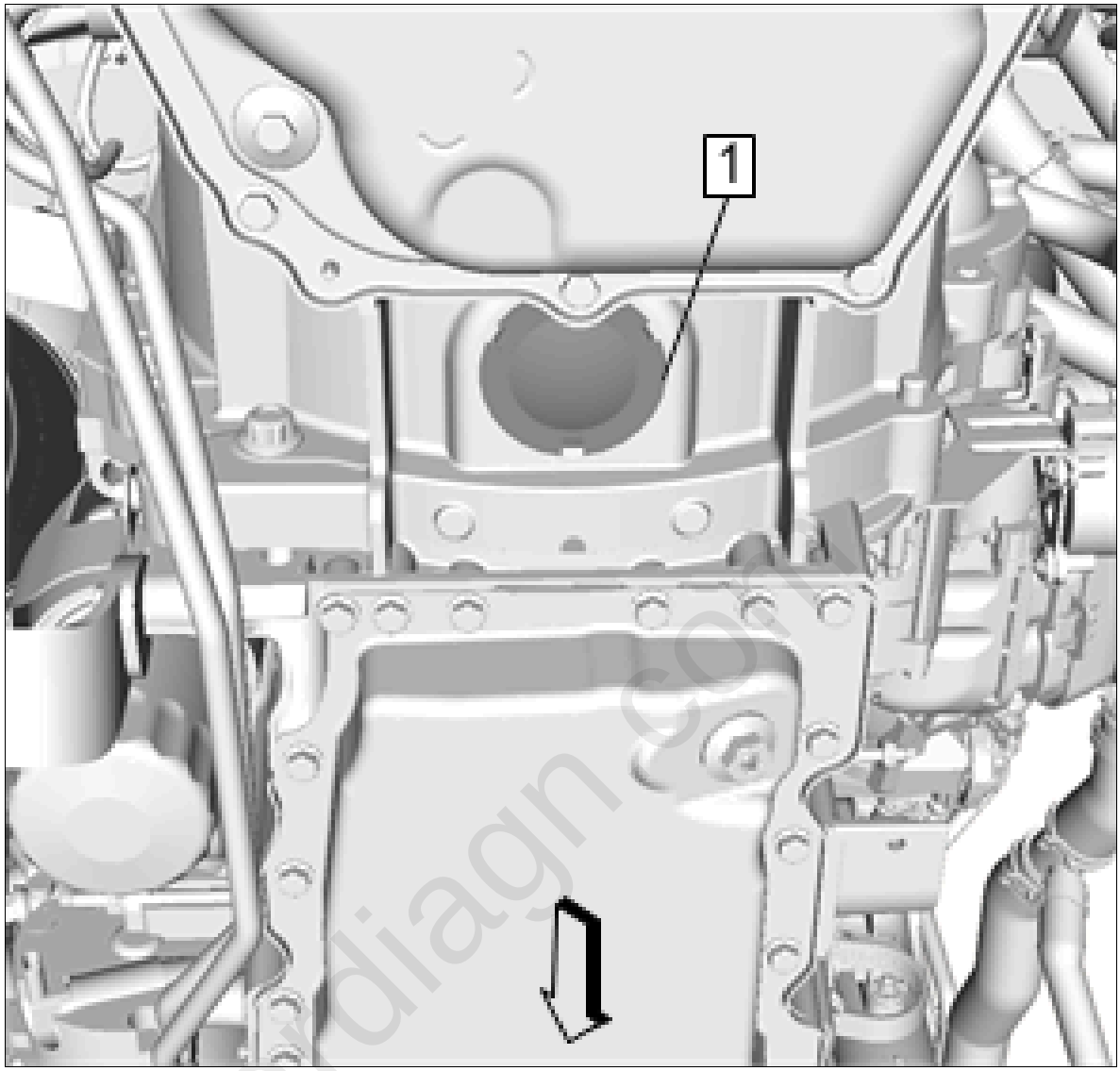
Fig 3: Transmission Fluid Cooler Pipes



Courtesy of GENERAL MOTORS COMPANY

10. Place an oil drain pan under the transmission fluid cooler pipes (1).
11. Remove the transmission fluid cooler inlet and outlet pipes (1) from the transmission, and position aside, or remove from the vehicle as necessary. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)
12. Plug the open fluid ports to prevent fluid loss and contamination.
13. Remove Transmission Converter Cover Replacement (M5T, LGX Engine)

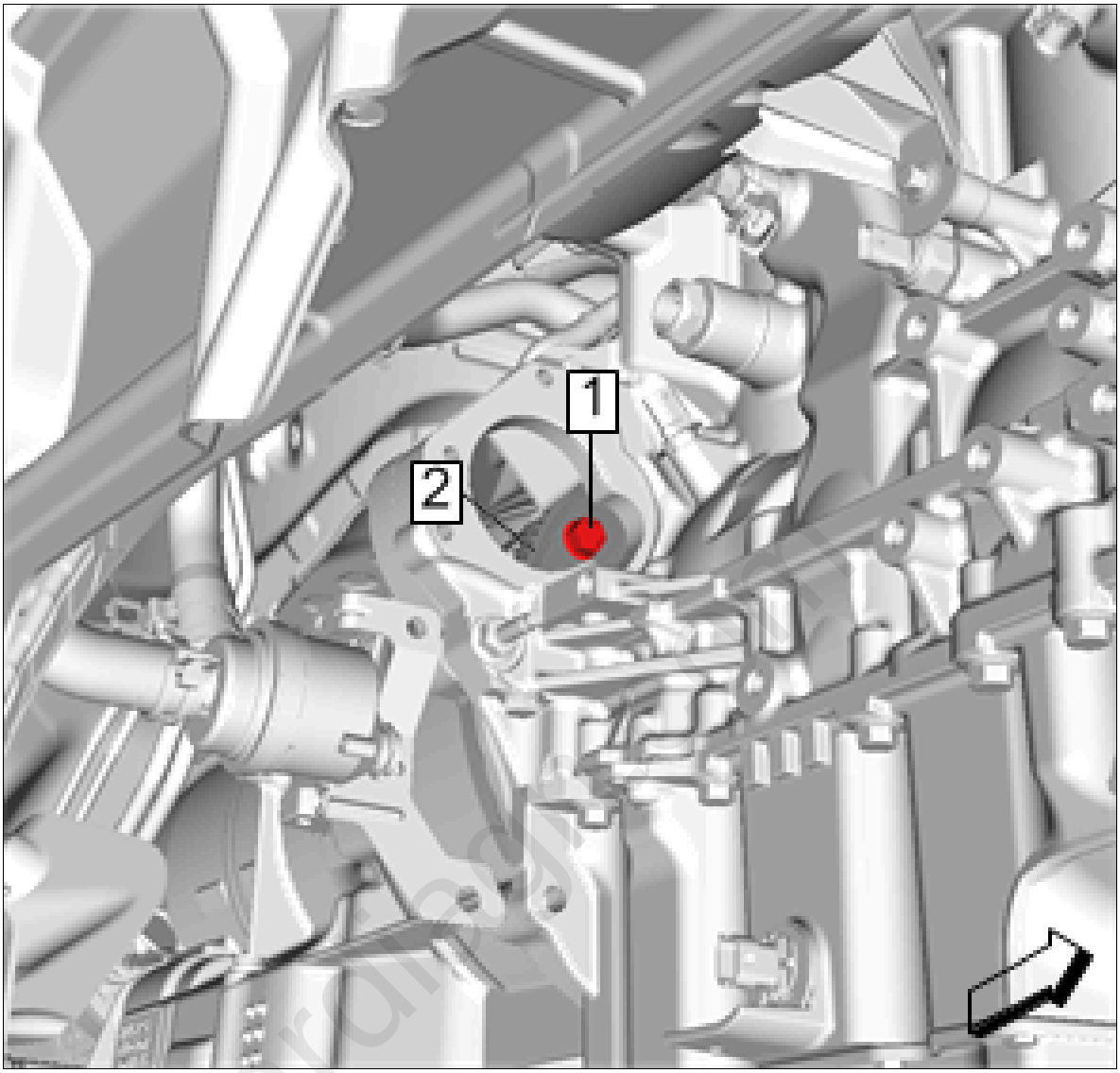
Fig 4: Transmission Close Out Plug



Courtesy of GENERAL MOTORS COMPANY

14. Remove the transmission close out plug (1).
15. Mark the torque converter to flexplate orientation to ensure proper realignment.

Fig 5: Torque Converter Bolts



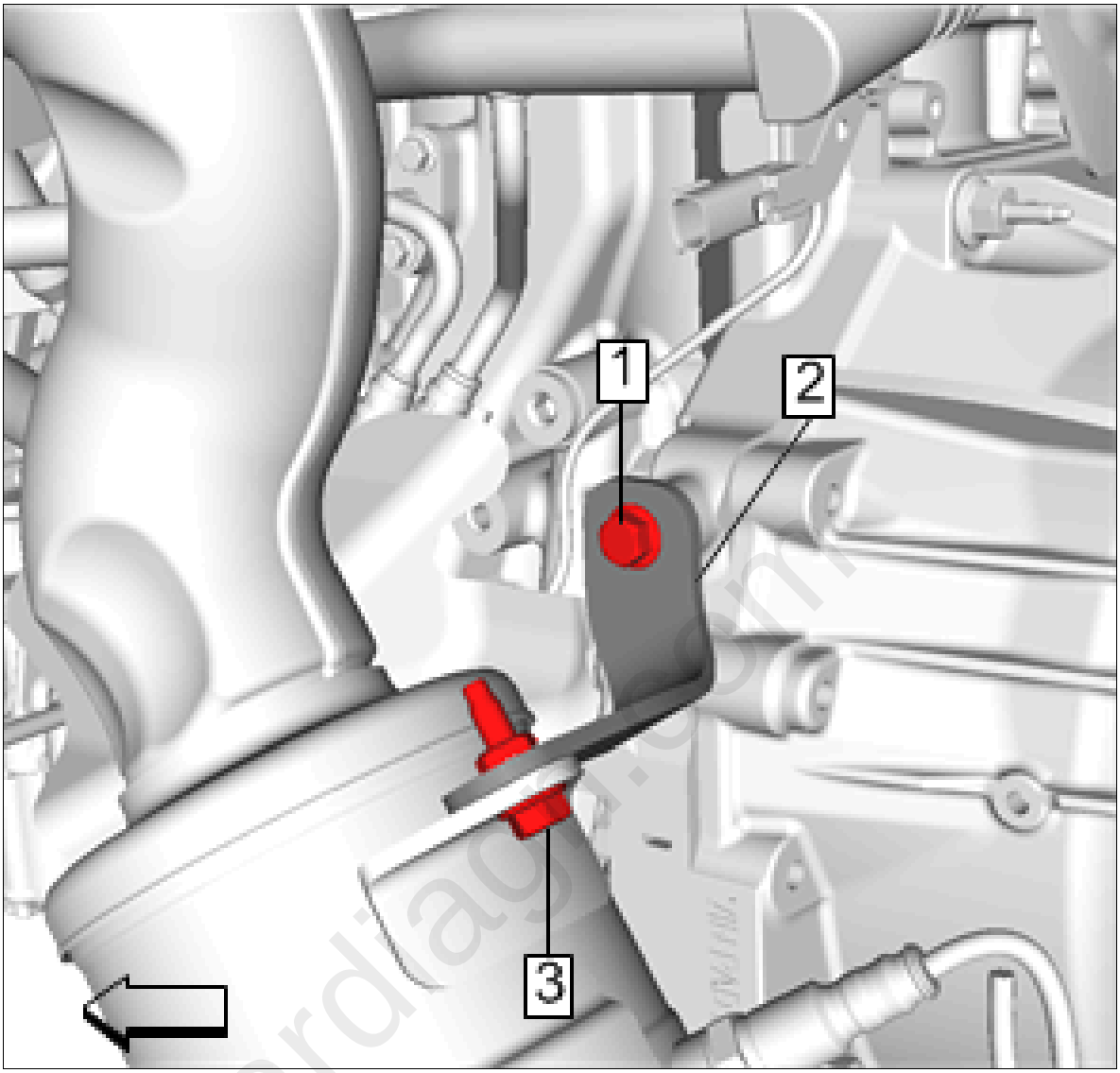
Courtesy of GENERAL MOTORS COMPANY

16. Repeat the following steps for all torque converter bolts (1):

    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt with the starter opening.

    2. Remove and Discard the torque converter bolt.

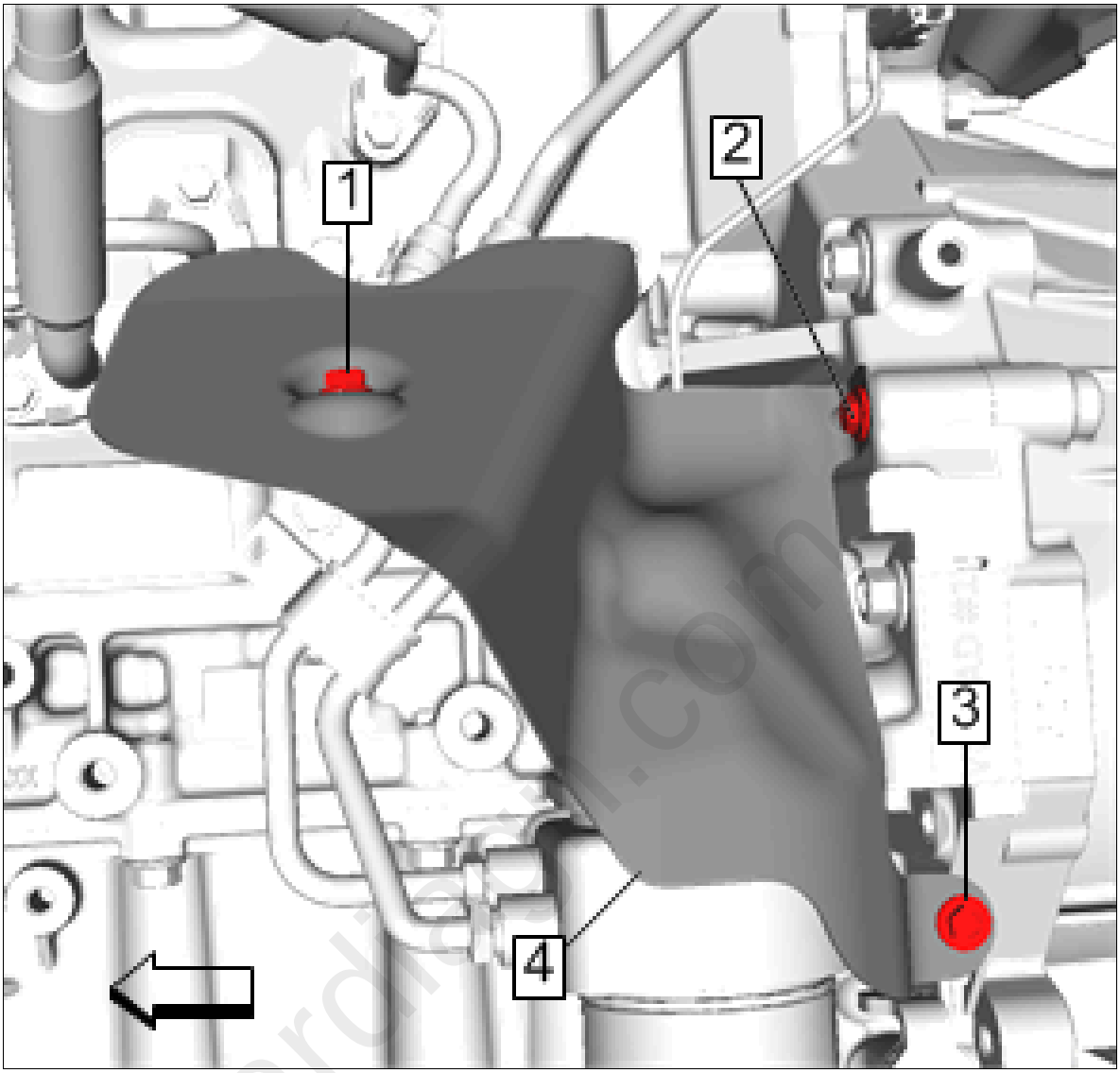
Fig 6: Catalytic Converter Bracket



Courtesy of GENERAL MOTORS COMPANY

17. Remove the catalytic converter bracket (2) from the transmission.

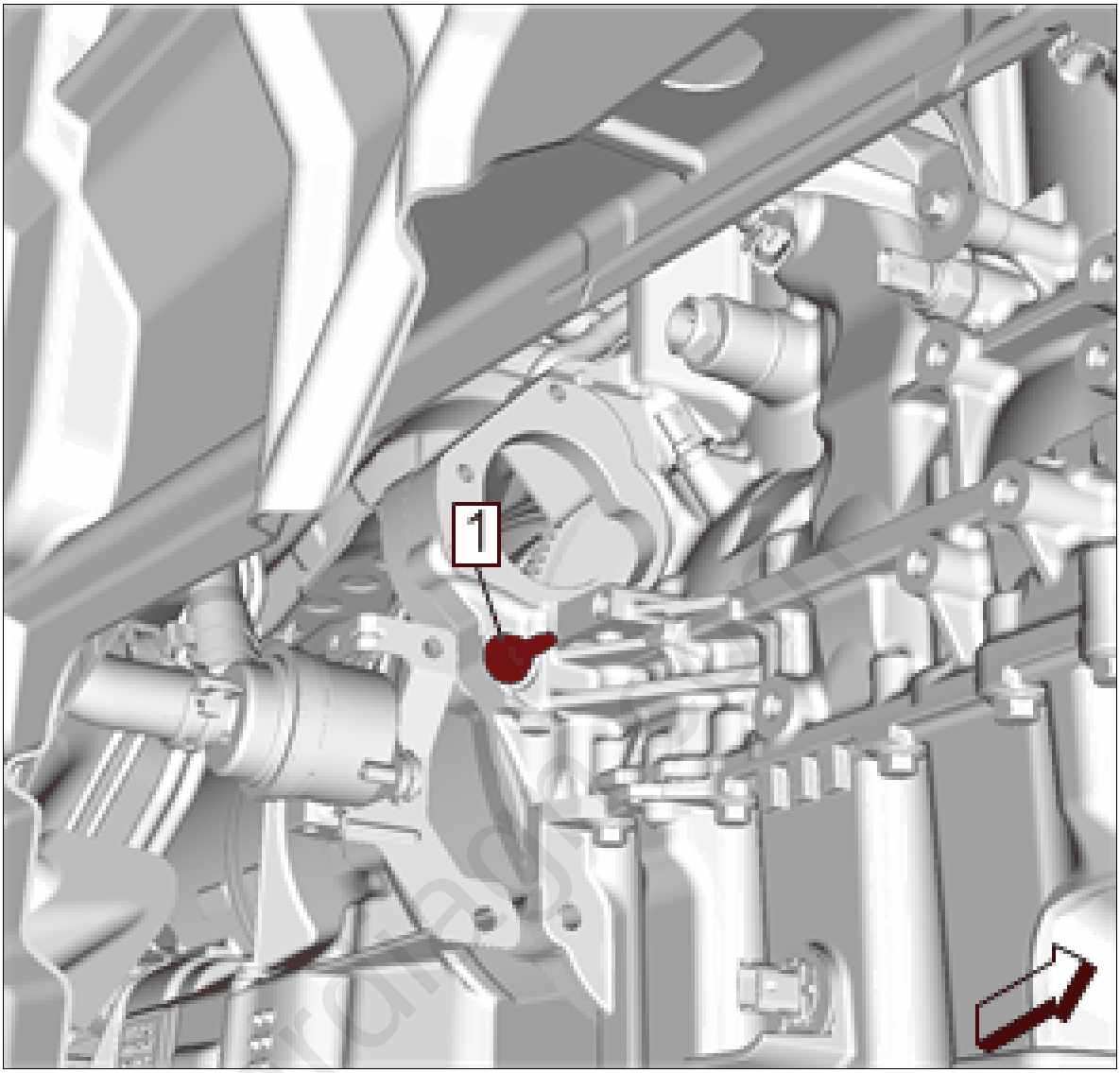
Fig 7: Catalytic Converter Shield



Courtesy of GENERAL MOTORS COMPANY

18. Remove the catalytic converter shield (4) from the engine assembly.
19. Disconnect the electrical wiring harness retainers from the transmission to engine fasteners and from the transmission case.
20. Support the transmission with a suitable transmission jack.

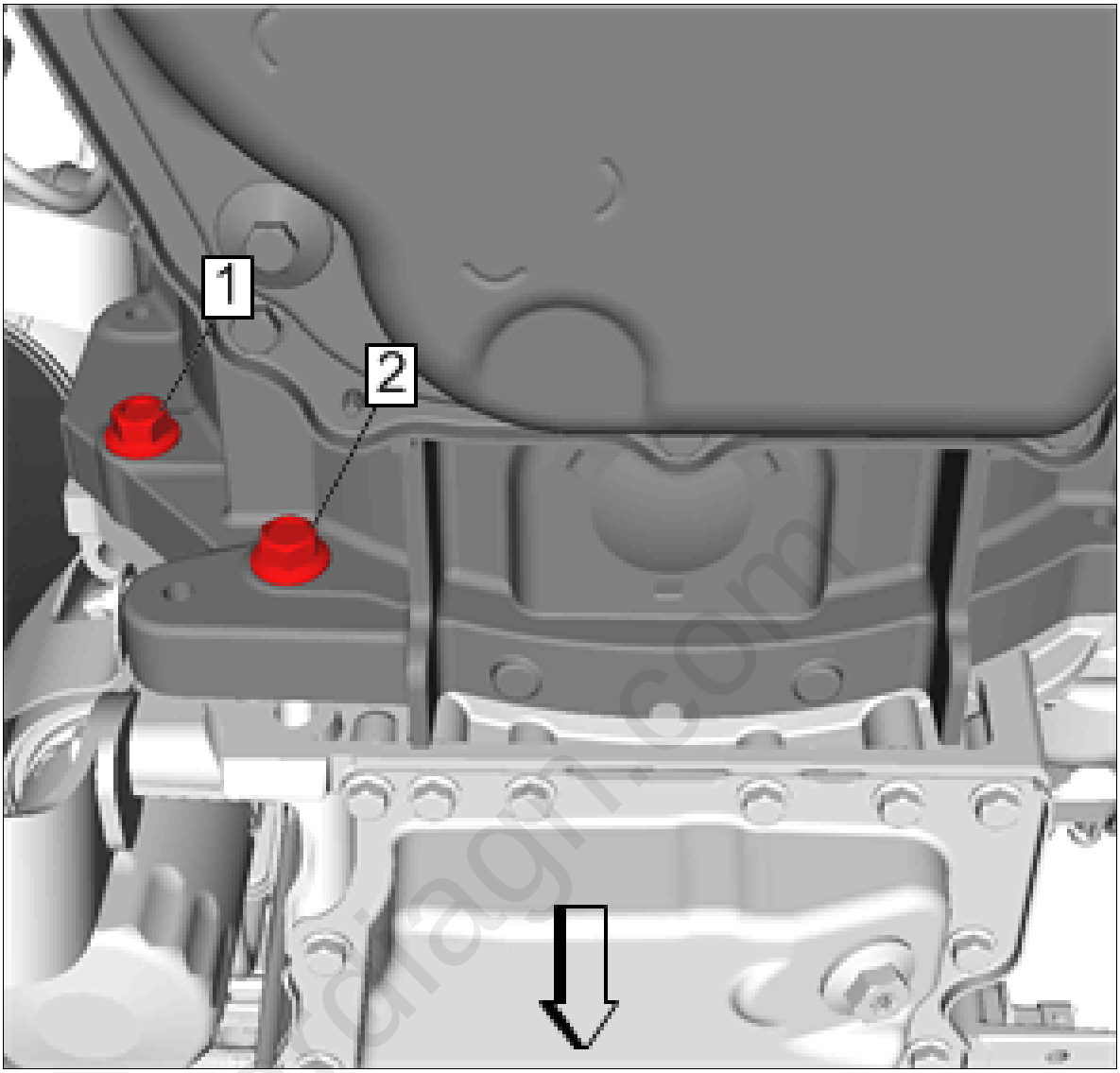
Fig 8: Lower Right Transmission Bolt



Courtesy of GENERAL MOTORS COMPANY

21. Remove the lower right transmission to engine bolt (1).

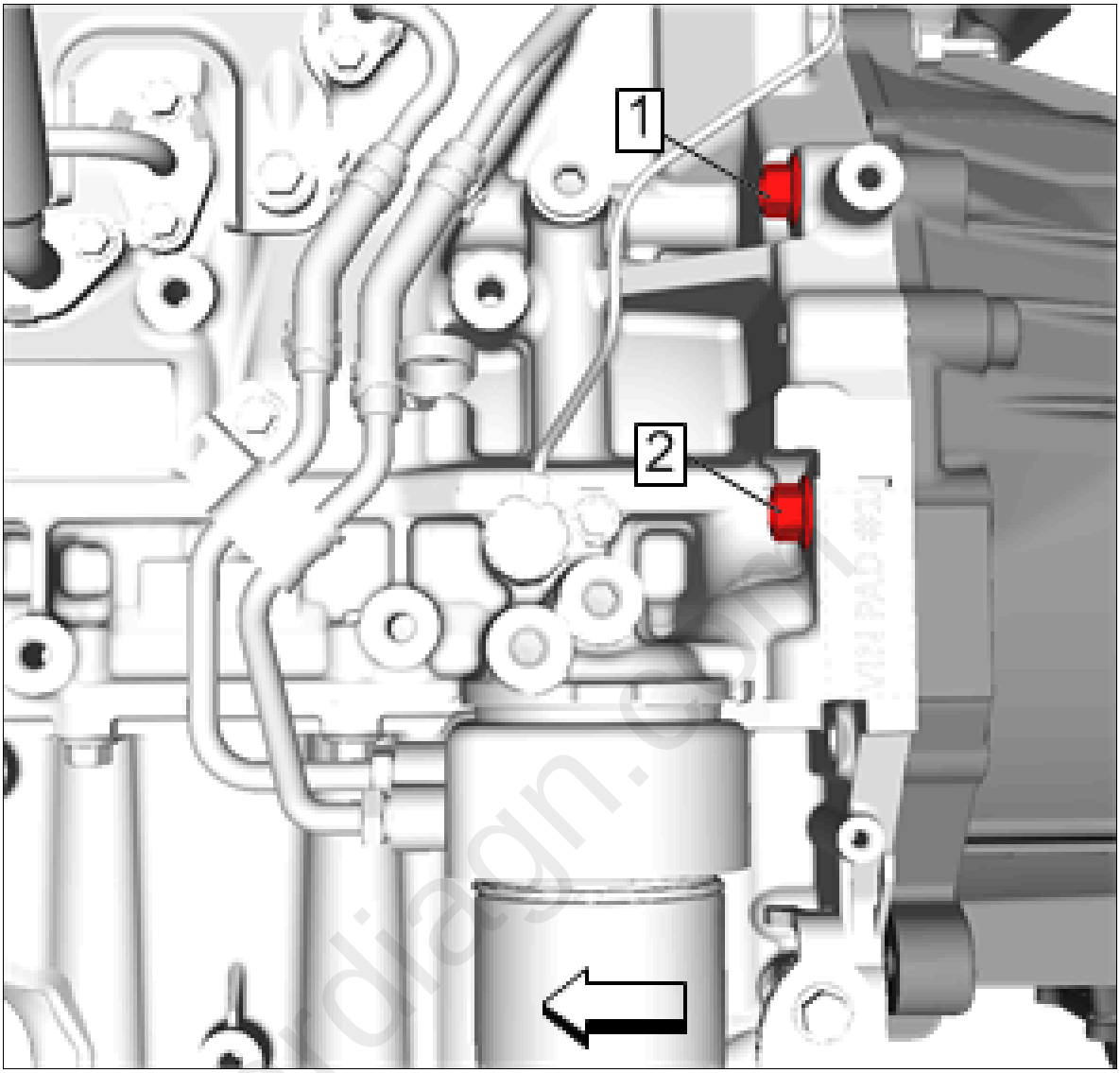
Fig 9: Lower Left Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

22. Remove the lower left transmission to engine bolts (1, 2).

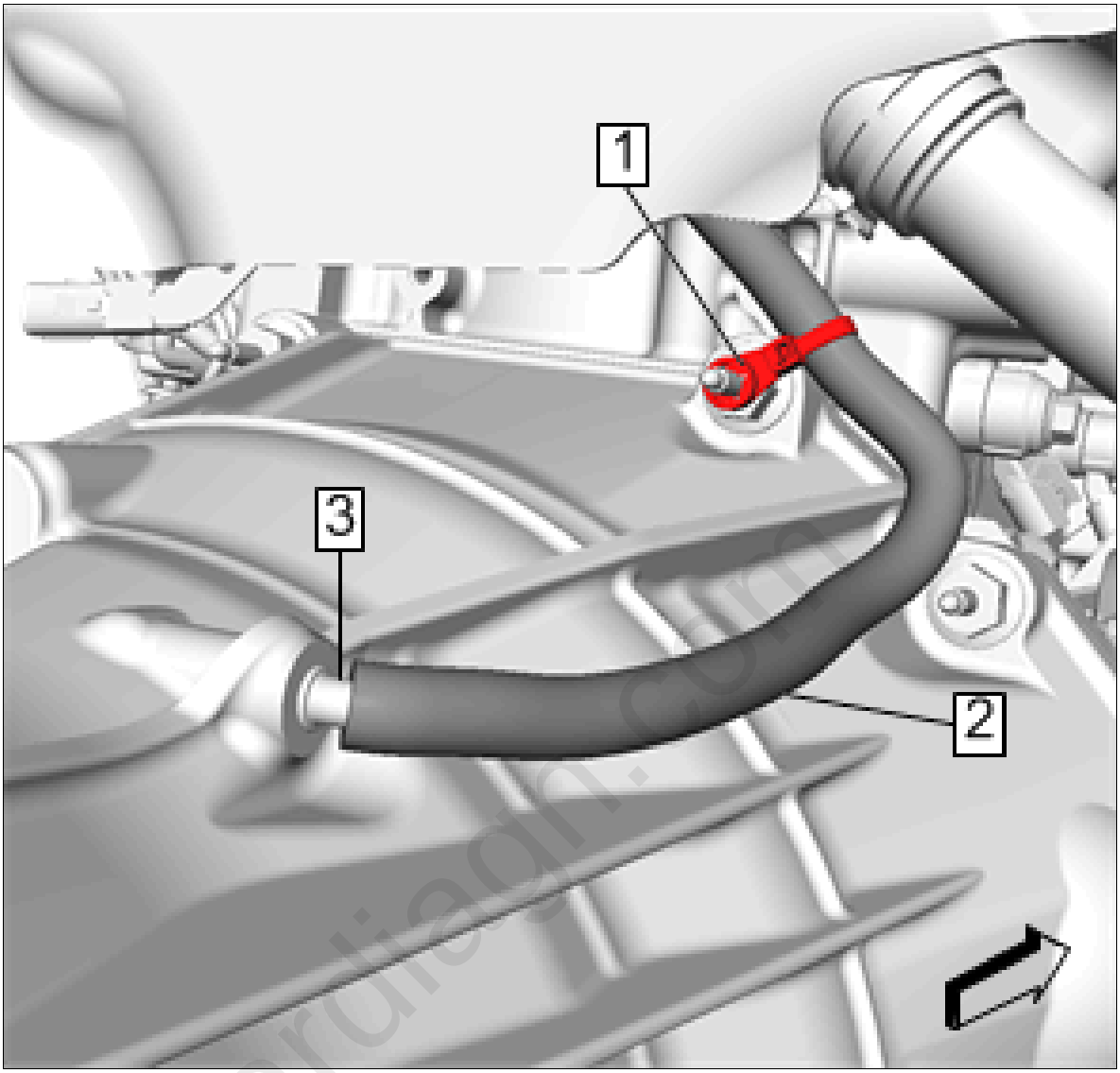
Fig 10: Left Upper Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

23. Remove the left upper transmission to engine bolts (1, 2).
24. Support the transmission with a suitable transmission jack.
25. Remove Transmission Support Replacement (MM6 Manual Transmission)Transmission Support Replacement (M13 Manual Transmission)Transmission Support Replacement (Automatic Transmission)
26. Tilt the transmission downward just enough to gain access to the upper transmission fasteners.

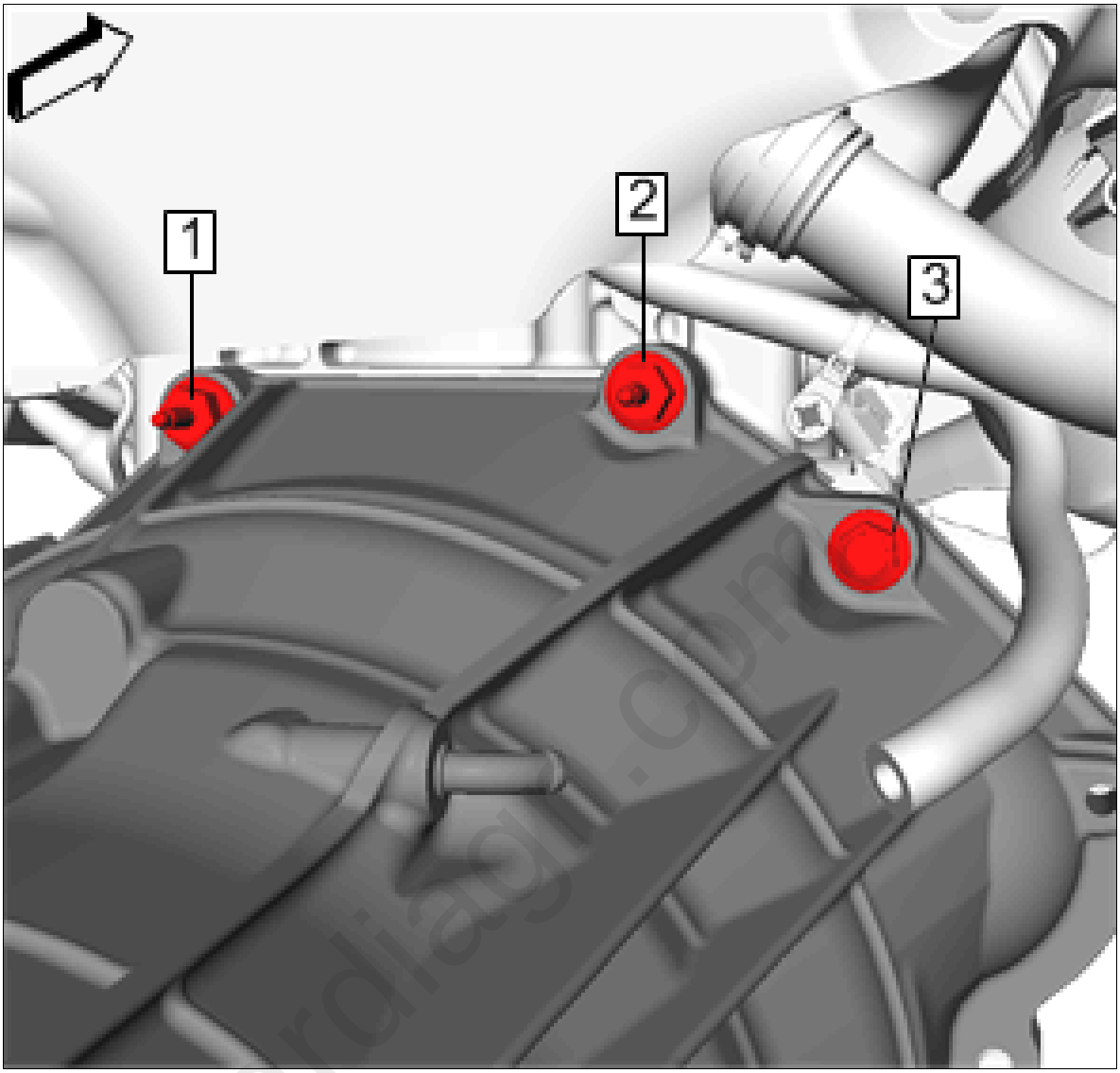
Fig 11: Transmission Vent Hose And Retainer



Courtesy of GENERAL MOTORS COMPANY

27. Disconnect the transmission vent hose (2) and retainer (1) from the transmission, then position aside.

Fig 12: Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

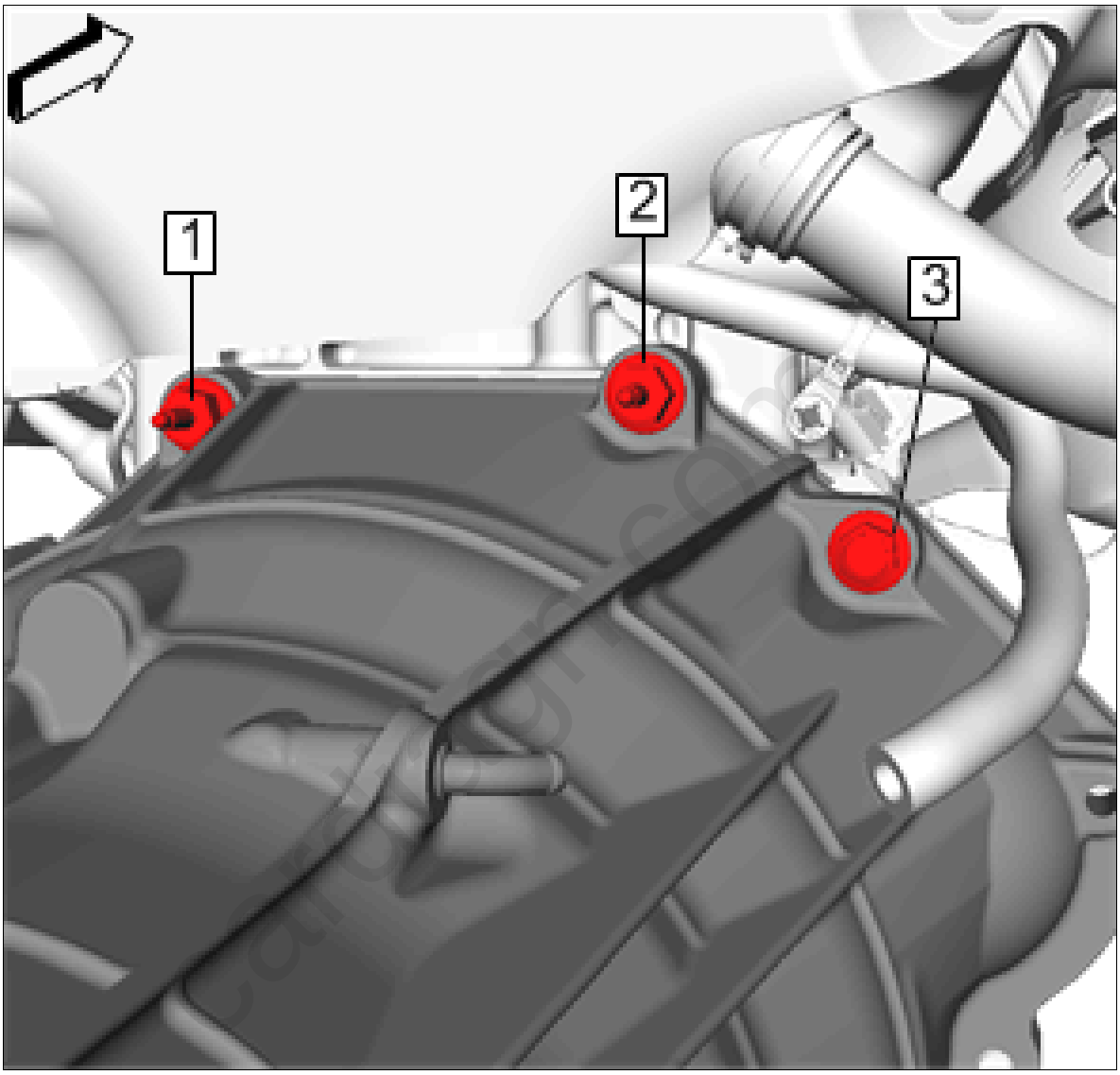
28. Remove the transmission to engine bolts (1, 2, 3).
29. Pull the transmission straight back.
30. Install the **J-21366** strap onto the transmission bell housing to retain the torque converter.
31. Remove the transmission from the vehicle.
32. Transfer components as necessary.
33. Flush and flow test the transmission cooler and transmission pipes. Transmission Fluid Cooler Flushing and Flow Test (Tremec 6-Speed)Transmission Fluid Cooler Flushing and Flow Test (8L90)

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T

WITH LTG ENGINE) > INSTALLATION PROCEDURE

1. Remove the **J-21366** strap from the transmission bell housing.
2. Install the transmission to the vehicle.

   Fig 1: Transmission Bolts

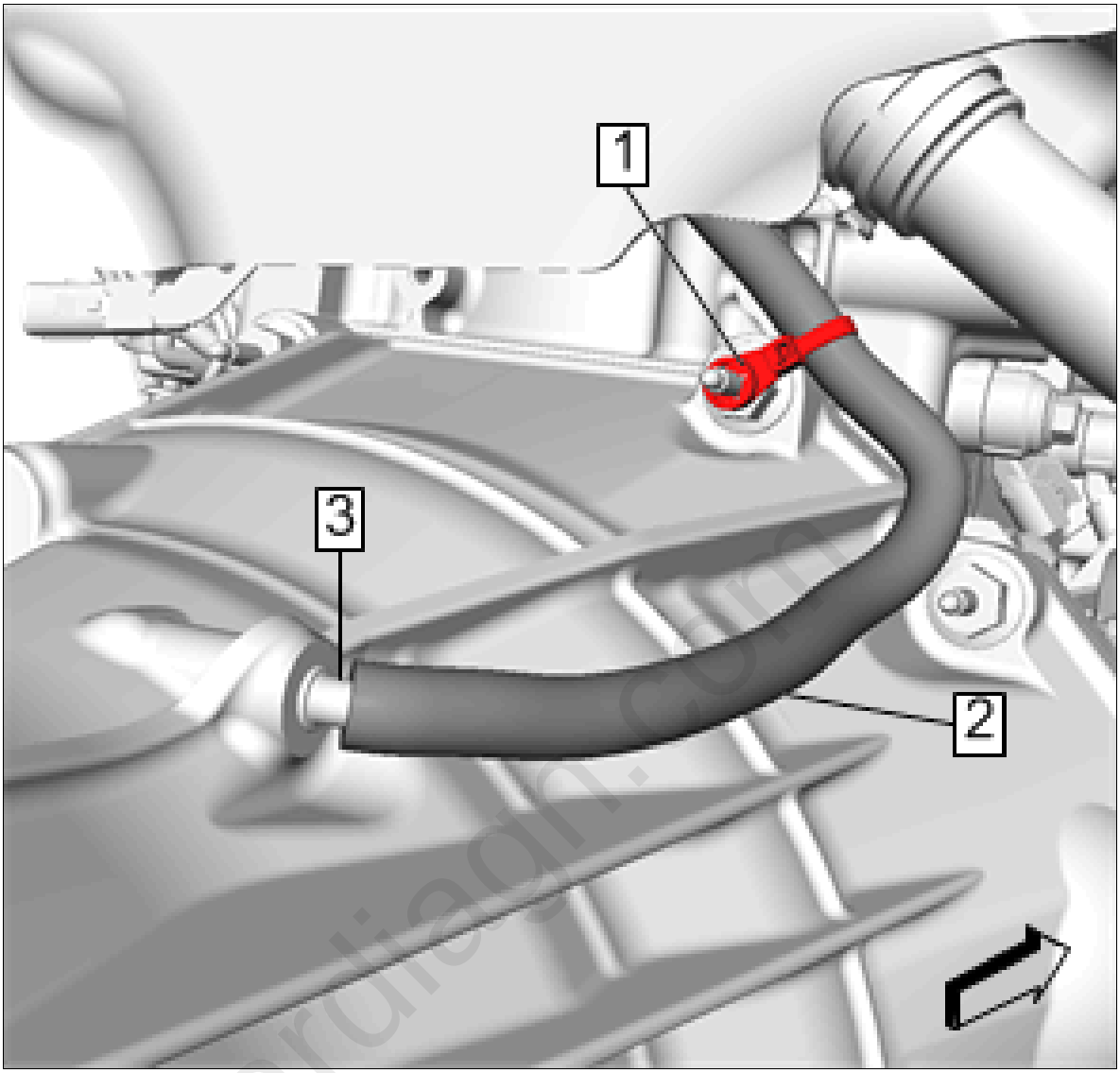


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install the transmission to engine bolts (1, 2, 3) and tighten to 58 N.m (43 lb ft).

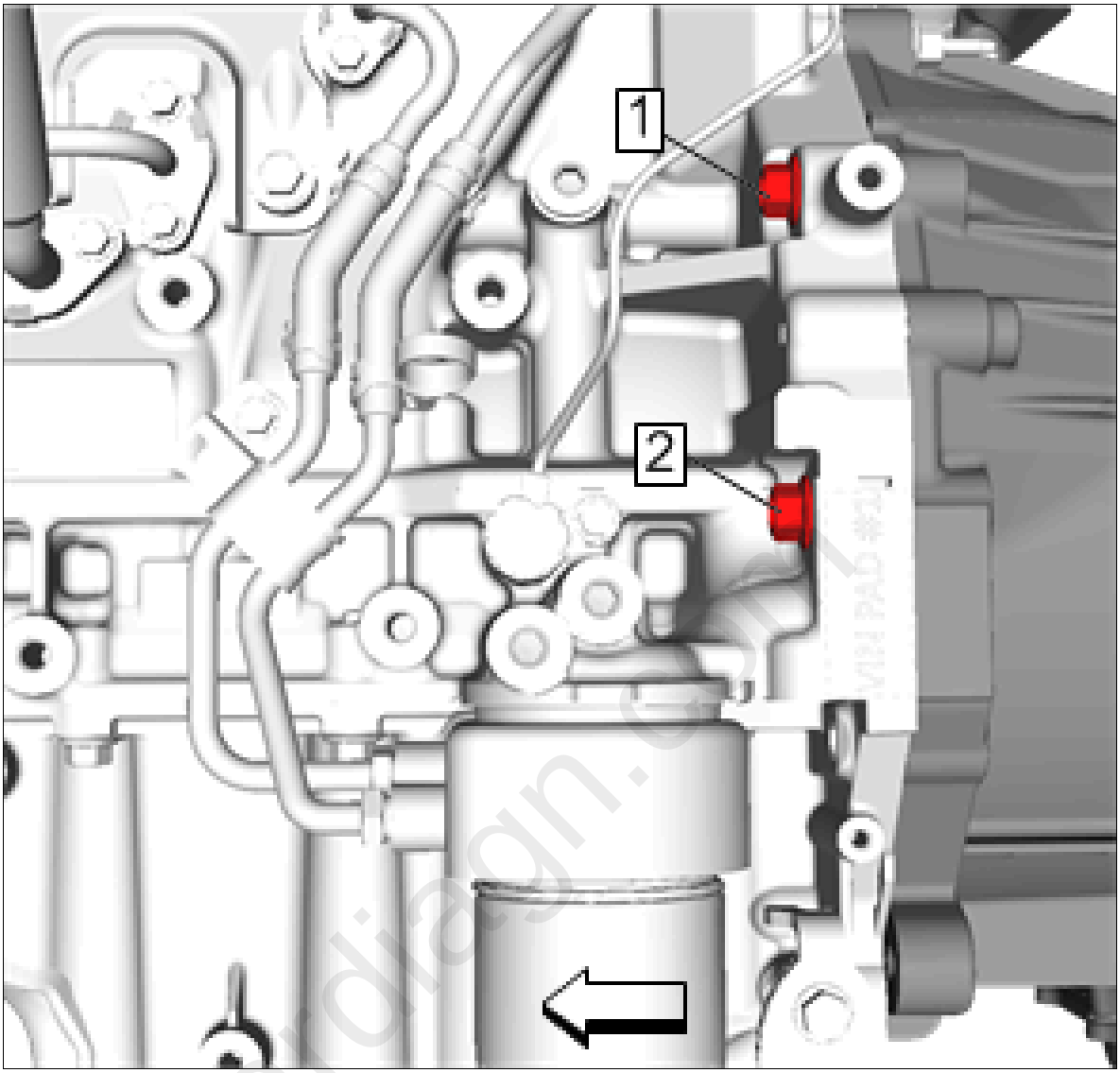
Fig 2: Transmission Vent Hose And Retainer



Courtesy of GENERAL MOTORS COMPANY

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Fig 3: Left Upper Transmission Bolts

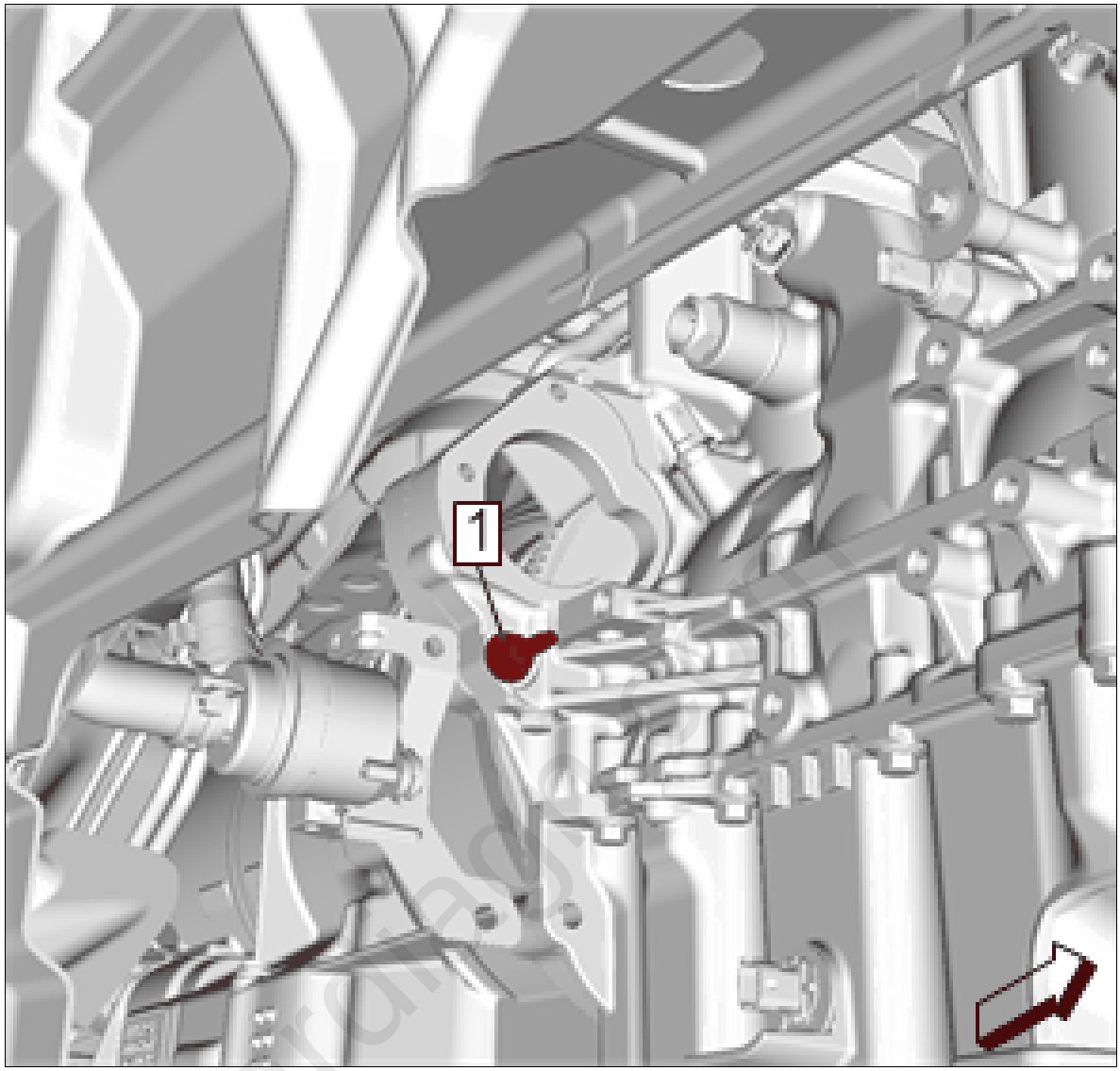


Courtesy of GENERAL MOTORS COMPANY

4. Connect the transmission vent hose (2) and retainer (1).

   Install the left upper transmission to engine bolts (1, 2) and tighten to 58 N.m (43 lb ft).

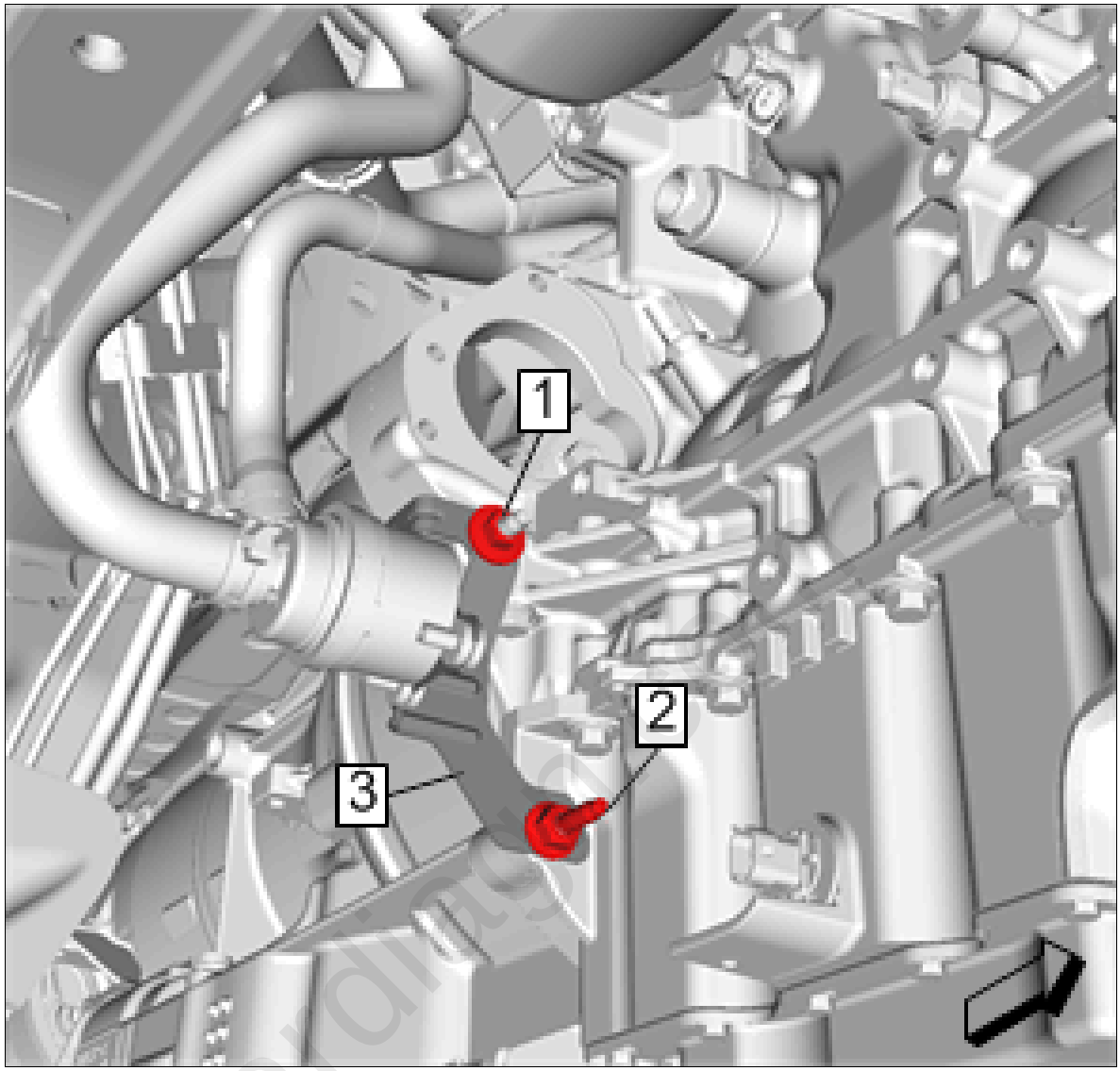
Fig 4: Lower Right Transmission Bolt



Courtesy of GENERAL MOTORS COMPANY

5. Install the lower right transmission to engine bolt (1) and tighten to 58 N.m (43 lb ft).

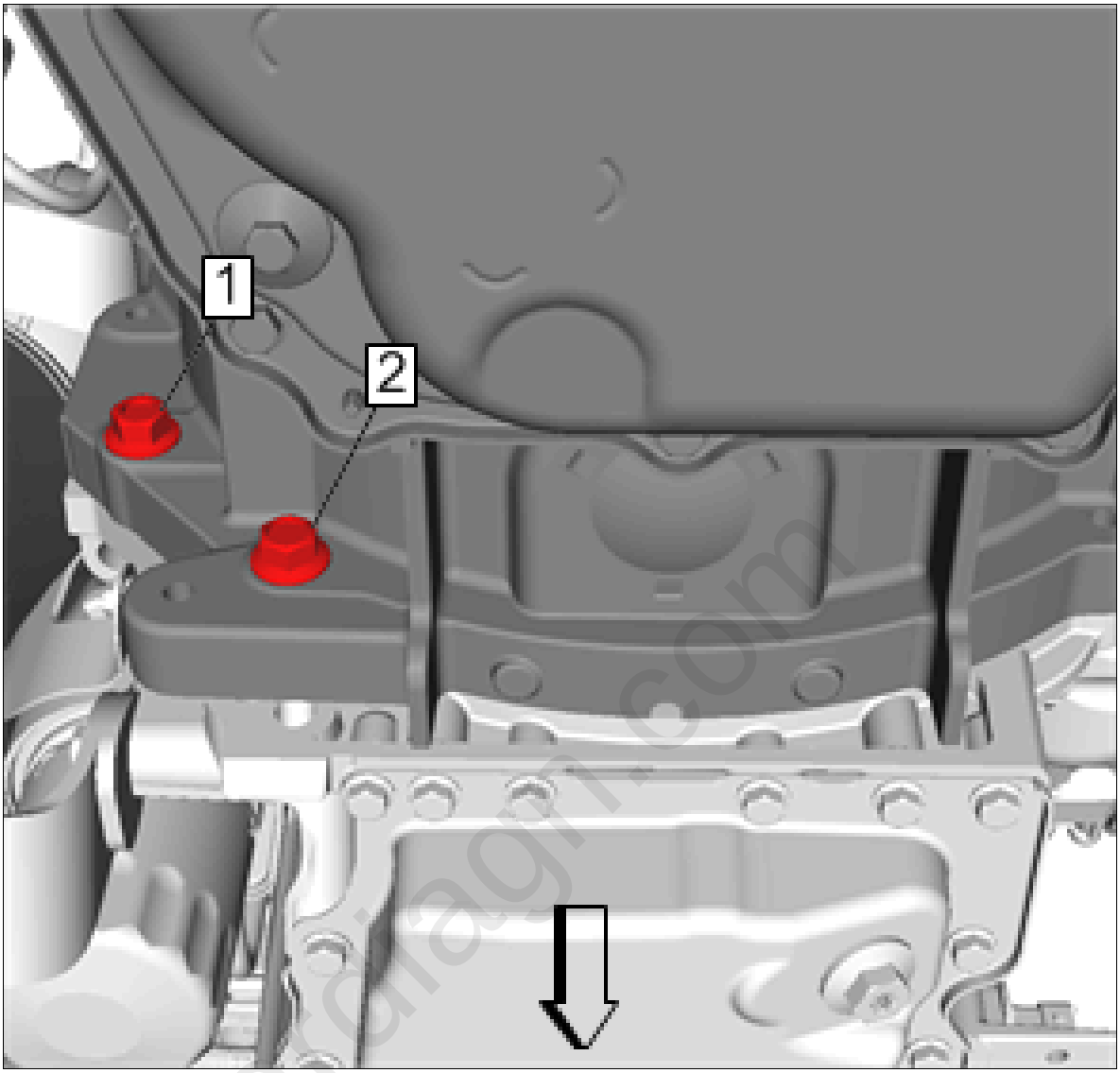
Fig 5: Auxiliary Heater Pump Bracket



Courtesy of GENERAL MOTORS COMPANY

6. Install the auxiliary heater pump bracket (3) to the transmission and tighten the fastener (1) to 10 N.m (89 lb in).
7. Install the lower right transmission to engine bolt (2) and tighten to 58 N.m (43 lb ft).

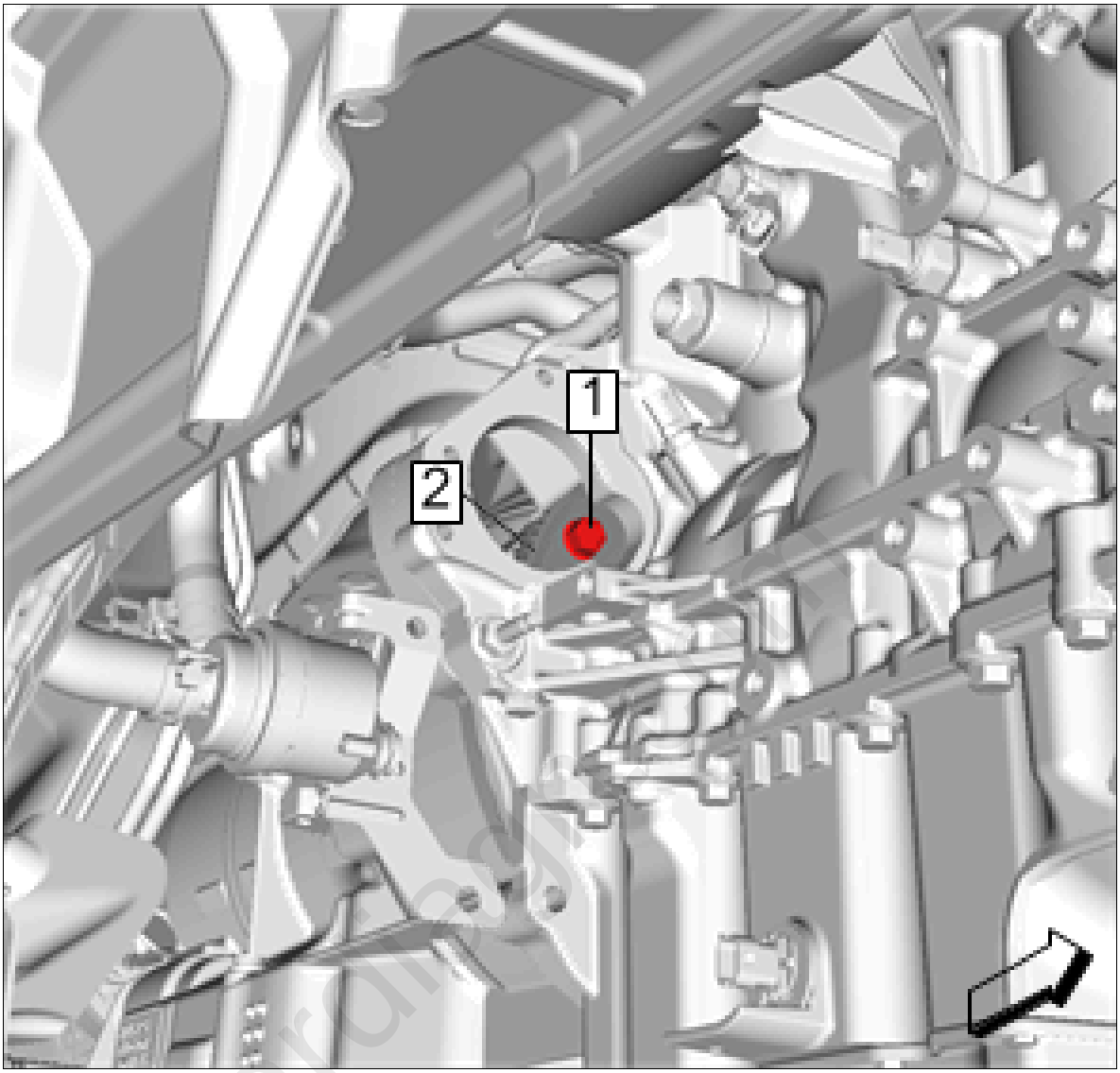
Fig 6: Lower Left Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

8. Install the lower left transmission to engine bolts (1, 2) and tighten to 58 N.m (43 lb ft).
9. Connect the electrical wiring harness retainers to the transmission to engine fasteners and to the transmission case.
10. Install the transmission support. Transmission Support Replacement (MM6 Manual Transmission)Transmission Support Replacement (M13 Manual Transmission)Transmission Support Replacement (Automatic Transmission)
11. Remove the transmission jack from under the vehicle.
12. Align the torque converter to flexplate orientation marks made during the removal procedure.

Fig 7: Torque Converter Bolts



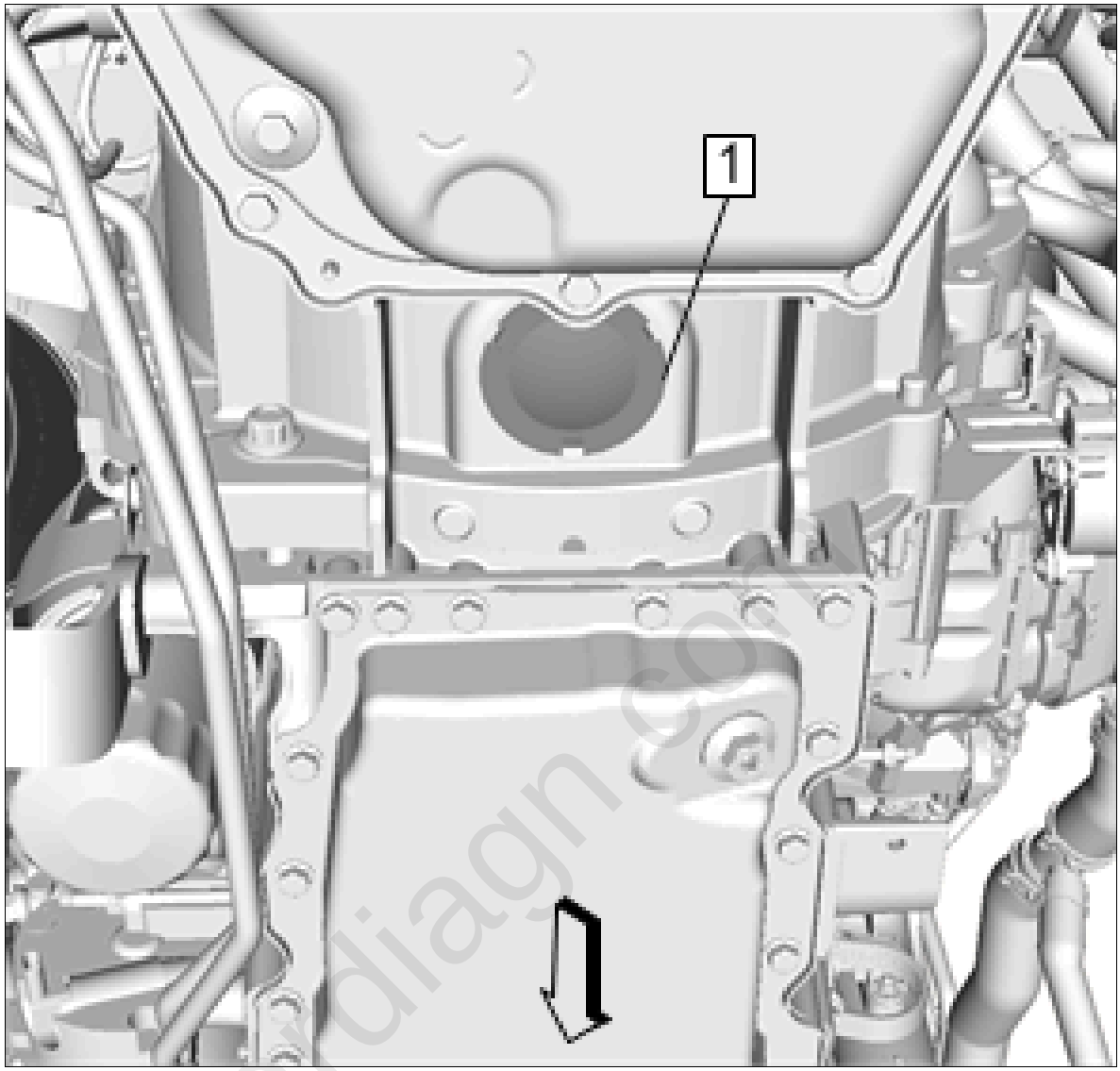
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Torque converter bolts are self-locking and must be replaced with NEW torque converter bolts every time the bolts are removed.

13. Complete the following steps for all torque converter bolts (1):
    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt holes in the flexplate with the starter opening in the engine block.
    2. Install all NEW torque converter bolts (1) and tighten to 63 N.m (46 lb ft).

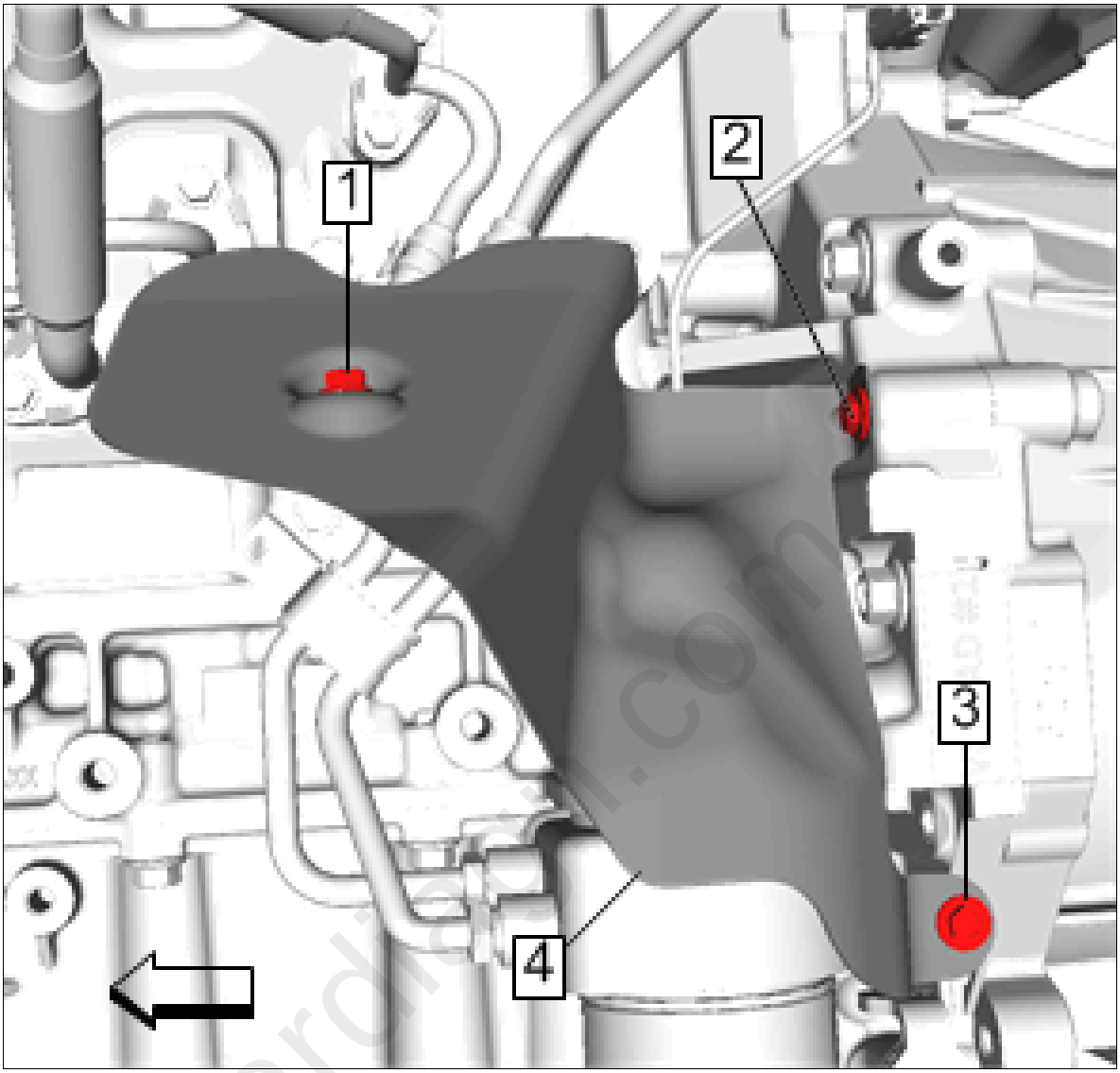
Fig 8: Transmission Close Out Plug



Courtesy of GENERAL MOTORS COMPANY

14. Install the transmission close out plug (1).

Fig 9: Catalytic Converter Shield

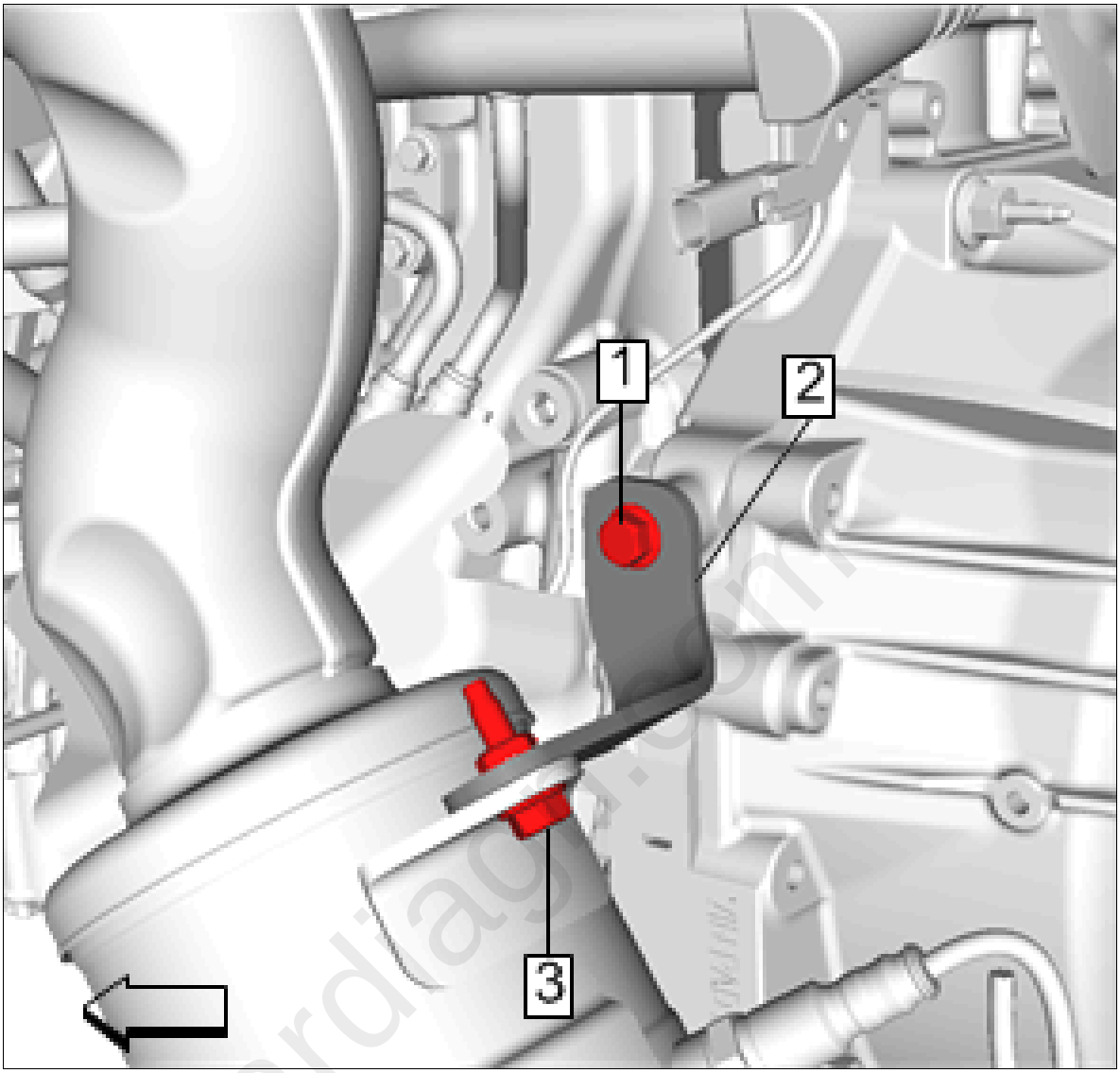


Courtesy of GENERAL MOTORS COMPANY

15. Install the catalytic converter shield (4) to the engine assembly and tighten the fasteners (1, 2, 3) to 10 N.m (89 lb in)..

16. » Install

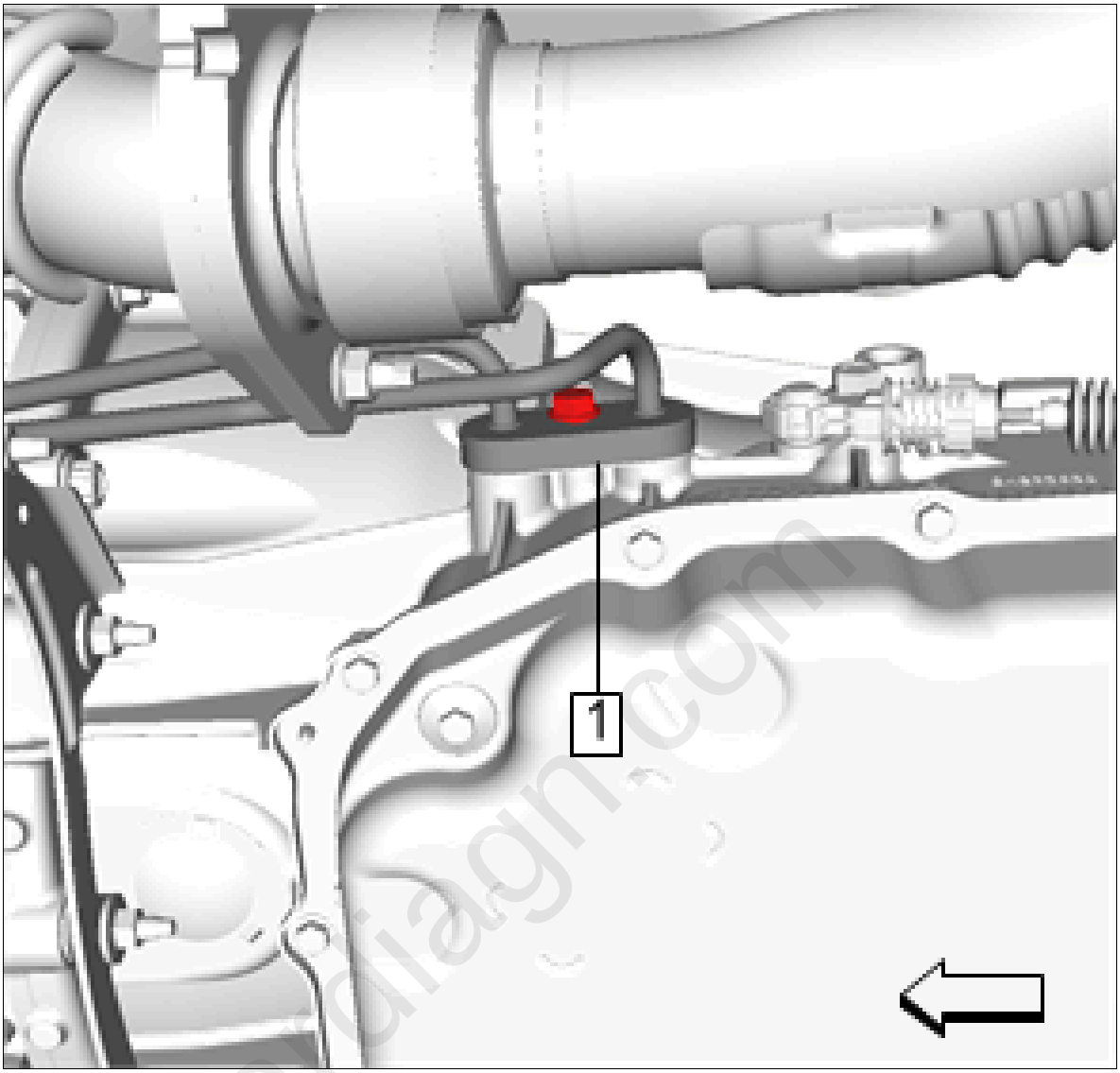
Fig 10: Catalytic Converter Bracket



Courtesy of GENERAL MOTORS COMPANY

17. Install the catalytic converter bracket (2) to the transmission.
18. Install the fasteners (1, 3) and tighten to 22 N.m (16 lb ft).

Fig 11: Transmission Fluid Cooler Pipes

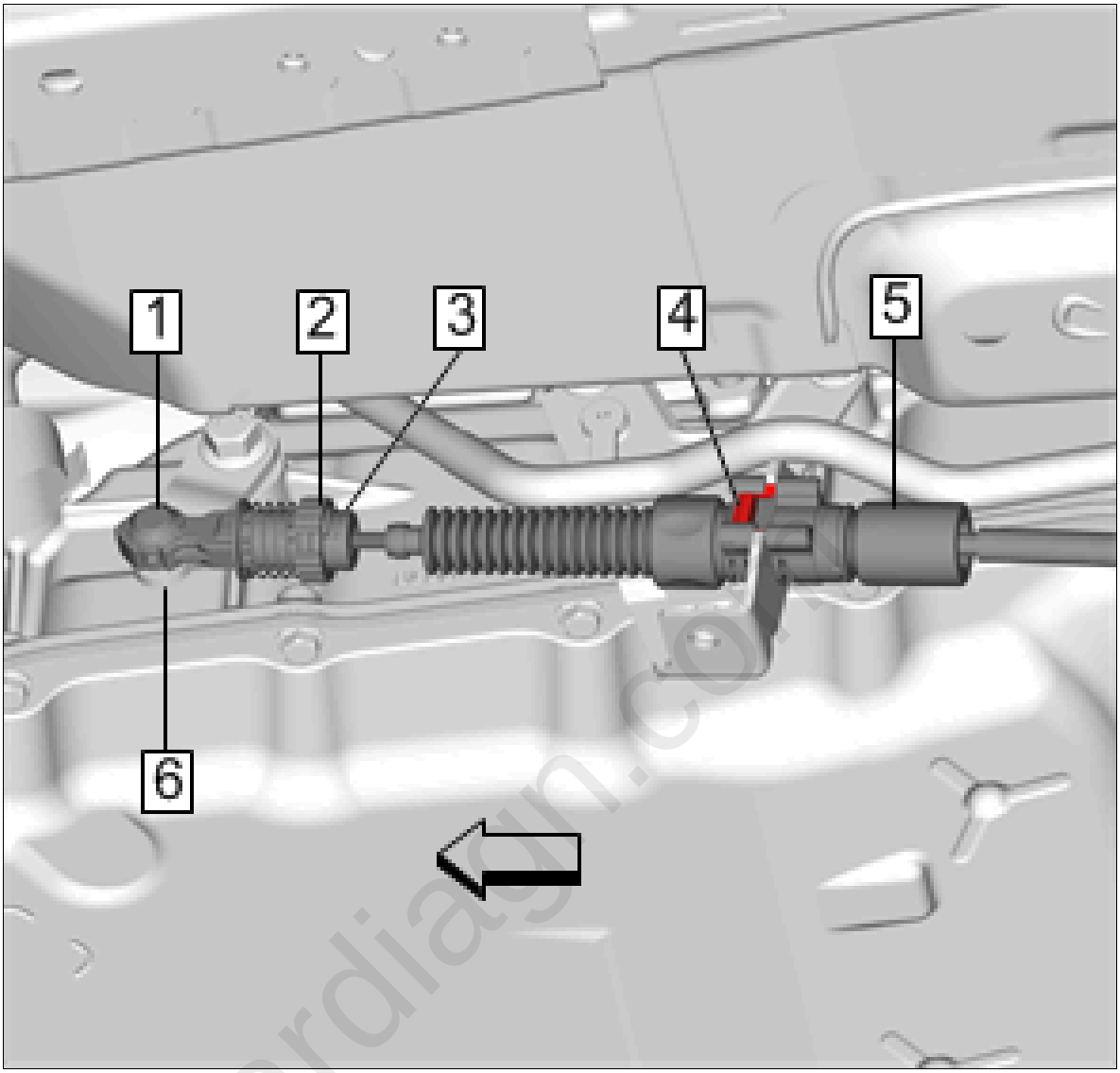


Courtesy of GENERAL MOTORS COMPANY

19. Install the transmission fluid cooler inlet and outlet pipe (1) to the transmission. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LTG With M5T, With V03)

20. Connect the wiring harness retainers and connectors to the transmission.

Fig 12: Transmission Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

21. Install the cable in the bracket, then slide the retainer (4) rearward to lock the transmission range selector lever cable in the bracket.
22. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (2).
23. Adjust the cable. Range Selector Lever Cable Adjustment
24. Install Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U)Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U)
25. Install {If equipped}
26. Install Starter Replacement (LTG)
27. Connect the charge air cooler outlet air tube to the throttle body. Charge Air Cooler Outlet Air Tube Replacement

28. Check the transmission fluid level and fill if necessary. Transmission Fluid Level and Condition Check
29. Lower the vehicle.
30. Perform the solenoid valve characterization. Solenoid Valve Characterization Reprogramming

> *NOTE:*
>
> *The Service Fast 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:*
>
> *The service fast learn procedure must be performed when any of the following repairs has been made to the transmission.*
>
> 1. *Pressure regulating solenoid replacement*
> 2. *Valve body repair or replacement*
> 3. *Any service/repair in response to a shift quality concern*
> 4. *Any internal transmission service, repair, overhaul, or replacement*
> 5. *Torque converter replacement*
> 6. *TCM replacement*
> 7. *Transmission assembly replacement*

31. Perform the service fast learn procedure. Transmission Service Fast Learn Procedure

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T WITH LGX ENGINE)

Special Tools

J-21366 Torque Converter Holding Strap

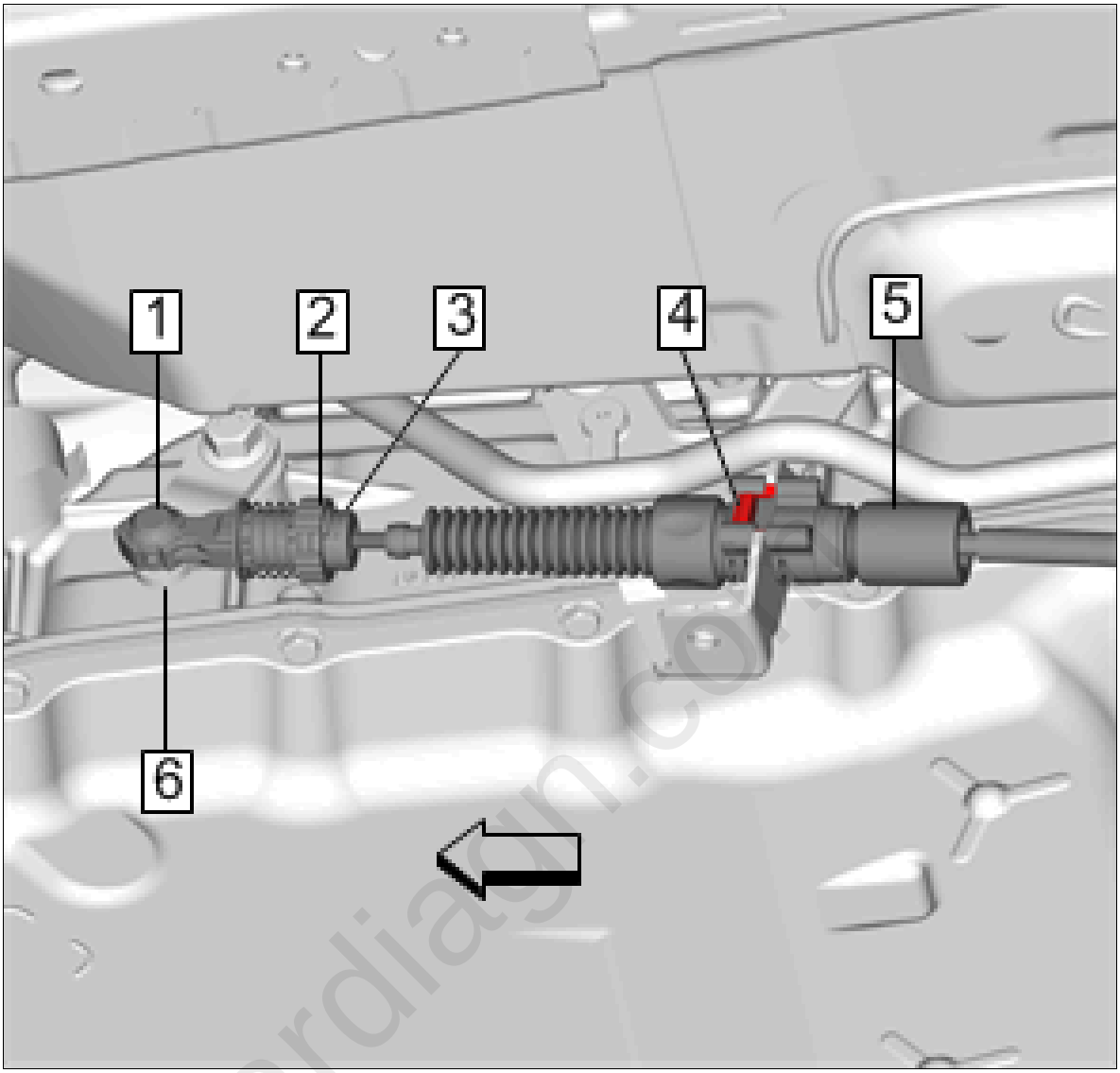
For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T WITH LGX ENGINE) > REMOVAL PROCEDURE

1. Raise and suitably support the vehicle. Lifting and Jacking the Vehicle (Base)Lifting and Jacking the Vehicle (HP) .
2. Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U) Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U) »Remove

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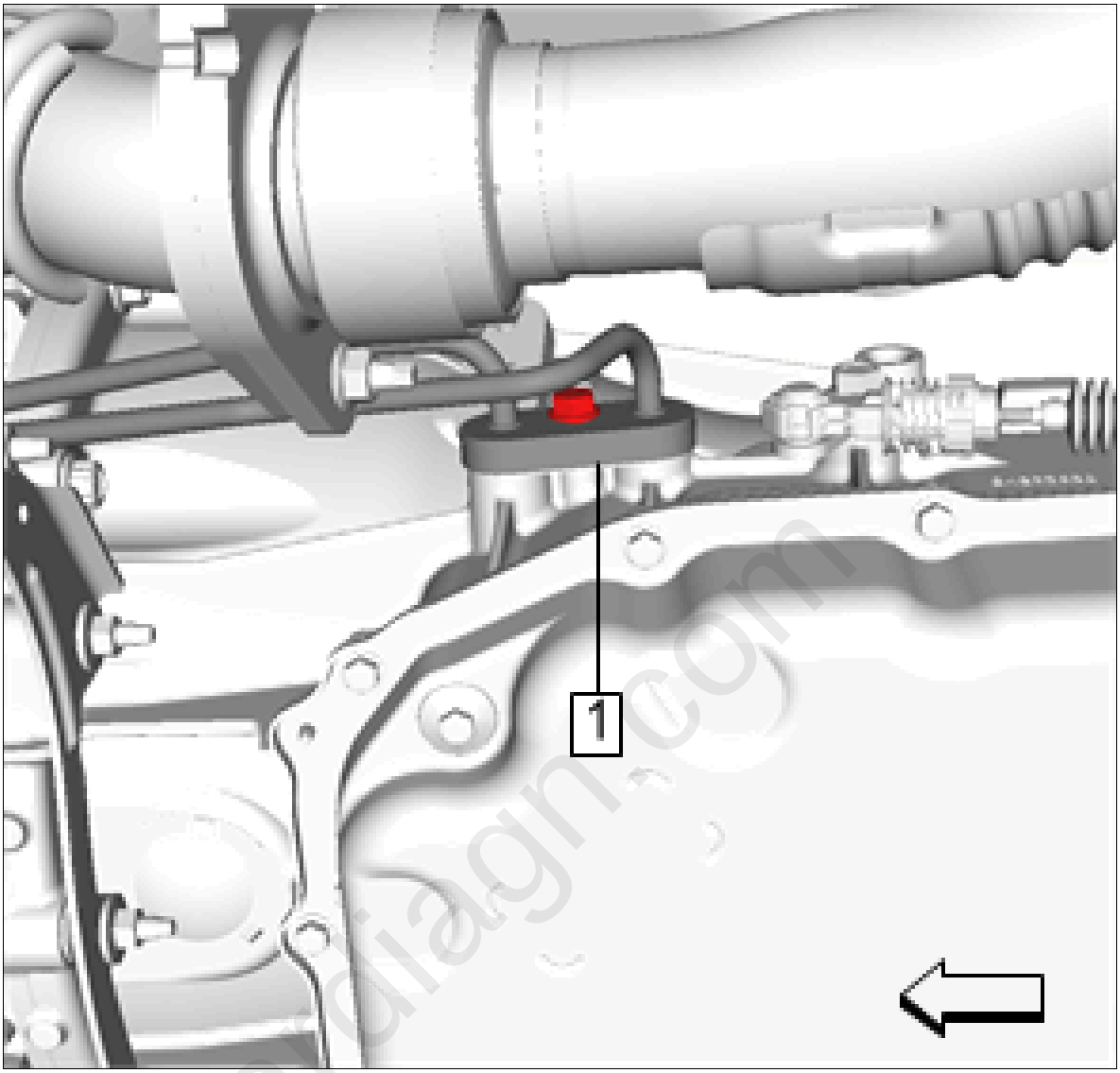
Fig 1: Transmission Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (6).
4. Slide the retainer (4) forward to release the transmission range selector lever cable (5) from the bracket.

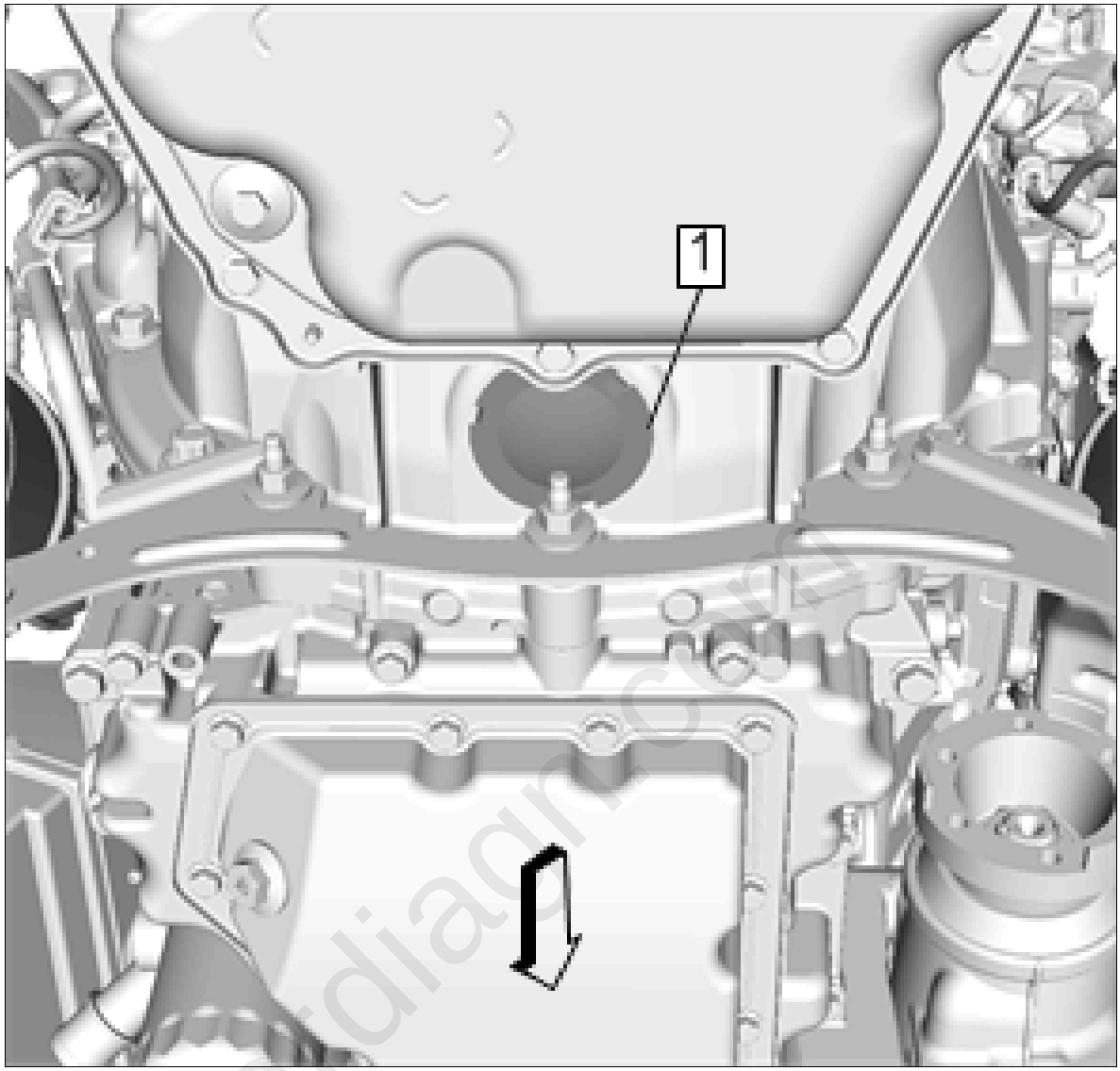
Fig 2: Transmission Fluid Cooler Pipes



Courtesy of GENERAL MOTORS COMPANY

5. Place an oil drain pan under the transmission fluid cooler pipes (1).
6. Remove the transmission fluid cooler inlet and outlet pipes (1) from the transmission, and position aside, or remove from the vehicle as necessary. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, Without V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LT1 With M5U, With KNR) .
7. Plug the open fluid ports to prevent fluid loss and contamination.
8. Remove Starter Replacement (LGX)
9. Remove Transmission Converter Cover Replacement (M5T, LGX Engine)

Fig 3: Transmission Close Out Plug

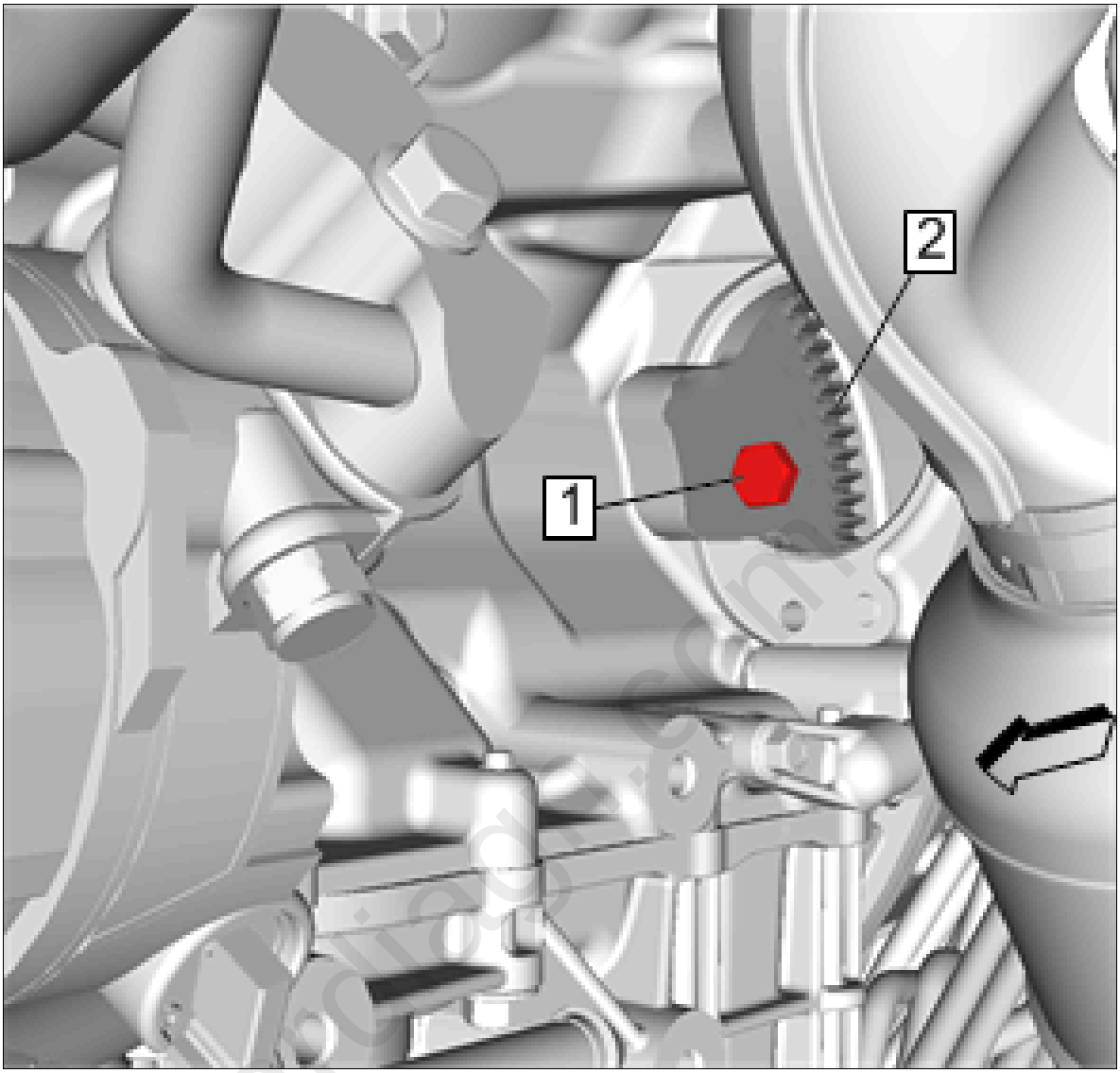


Courtesy of GENERAL MOTORS COMPANY

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10. Remove the transmission close out plug (1).
11. Mark the torque converter to flexplate orientation to ensure proper realignment.

Fig 4: Torque Converter Bolts



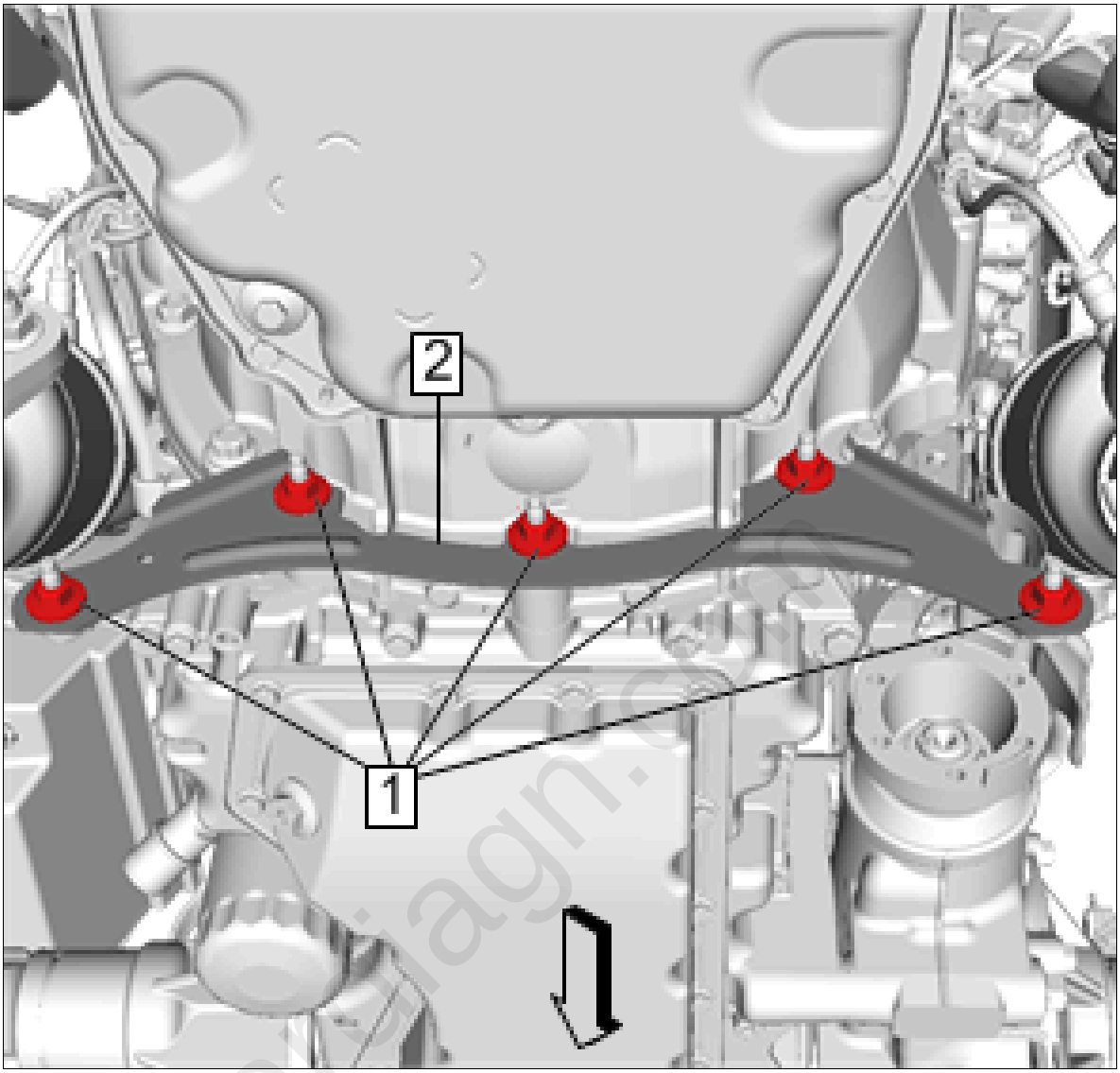
Courtesy of GENERAL MOTORS COMPANY

12. Repeat the following steps for all torque converter bolts (1):

    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt with the starter opening.

    2. Remove and Discard the torque converter bolt.

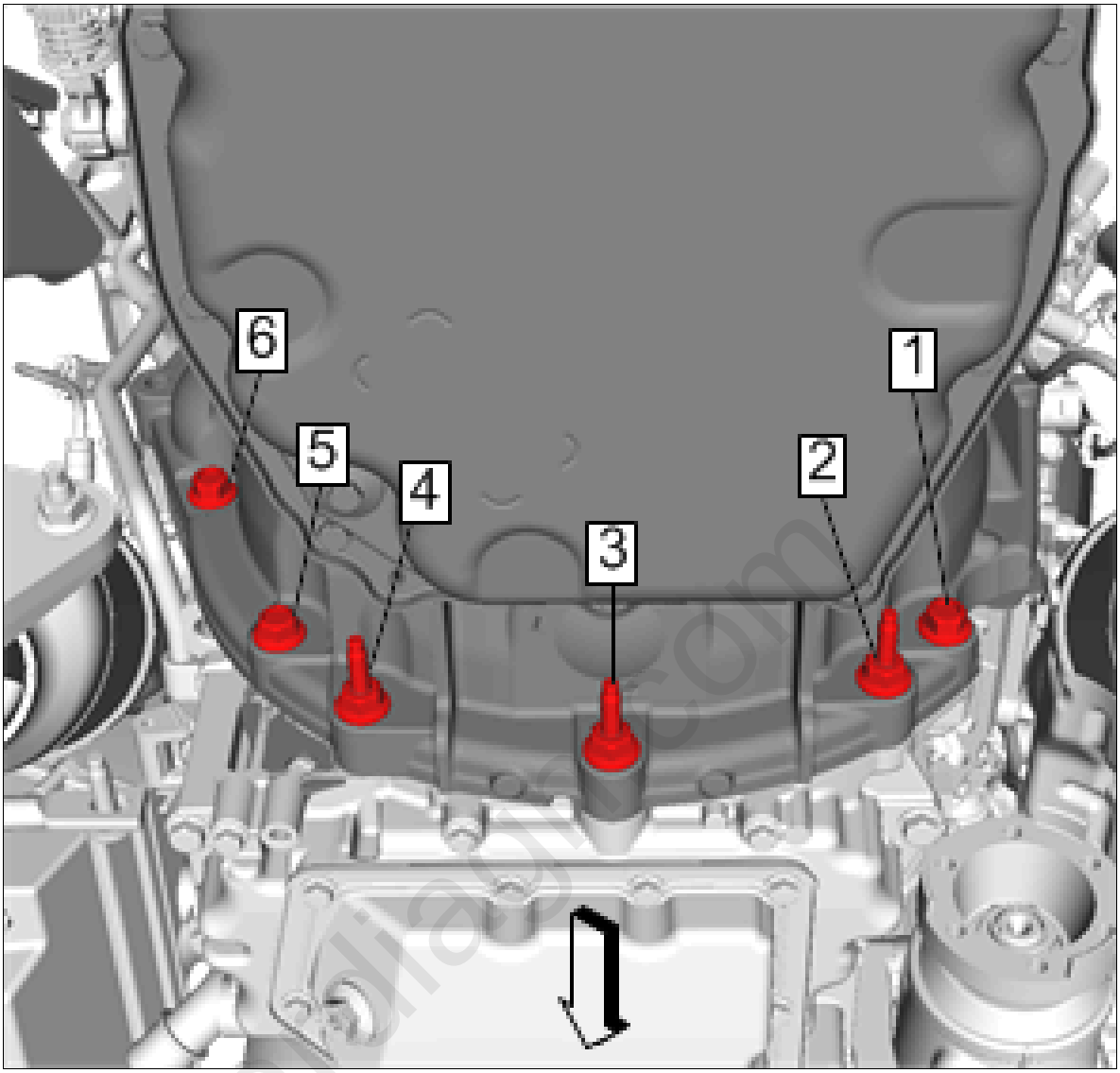
Fig 5: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

13. Remove the catalytic converter brace bracket (2) from the transmission.

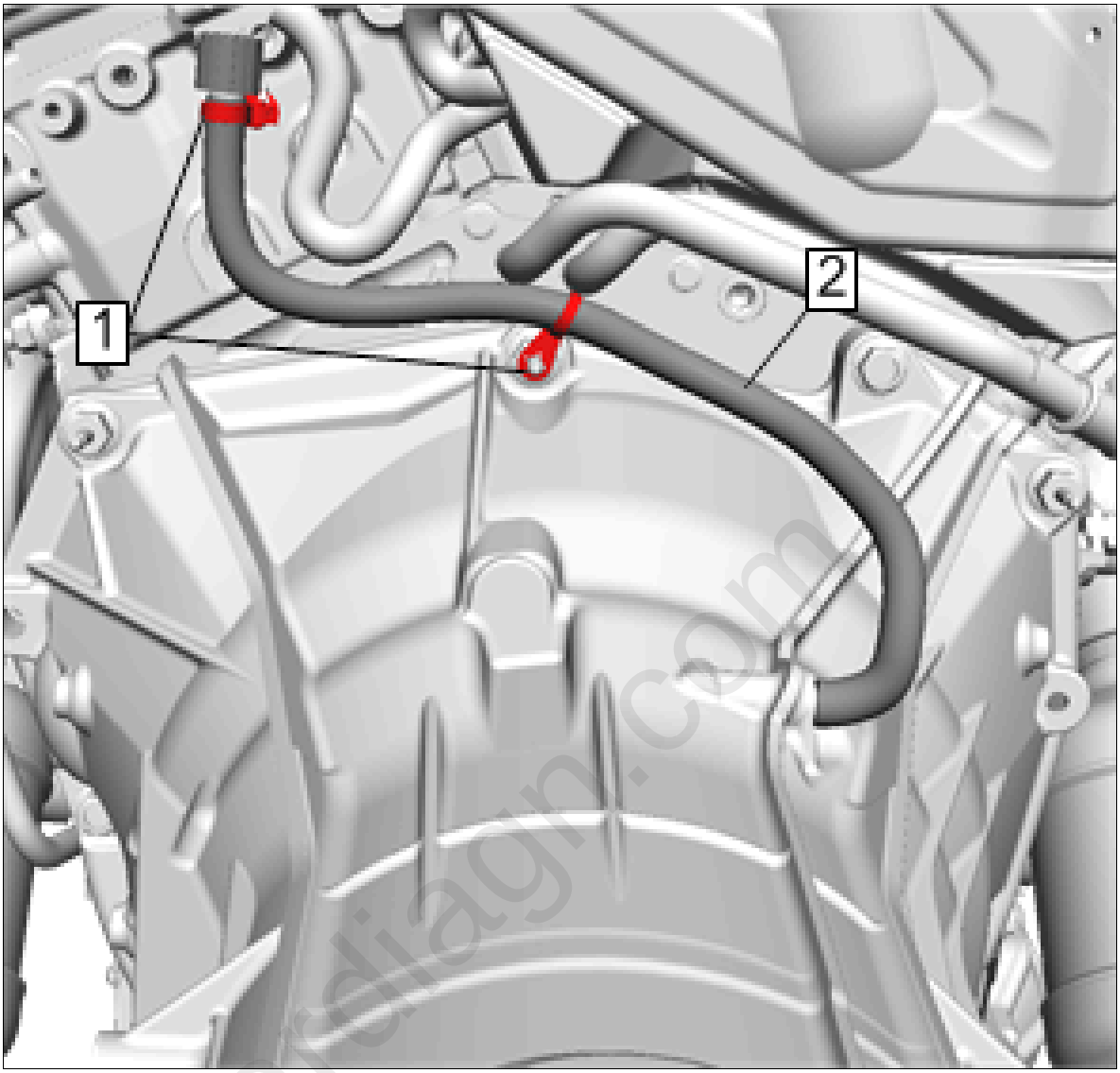
Fig 6: Lower Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

14. Remove the lower transmission to engine bolts (1, 2, 3, 4, 5, 6).
15. Remove the right side engine to transmission bolt.
16. Support the transmission with a suitable transmission jack.
17. Remove Transmission Mount Replacement
18. Tilt the transmission downward just enough to gain access to the upper transmission fasteners.

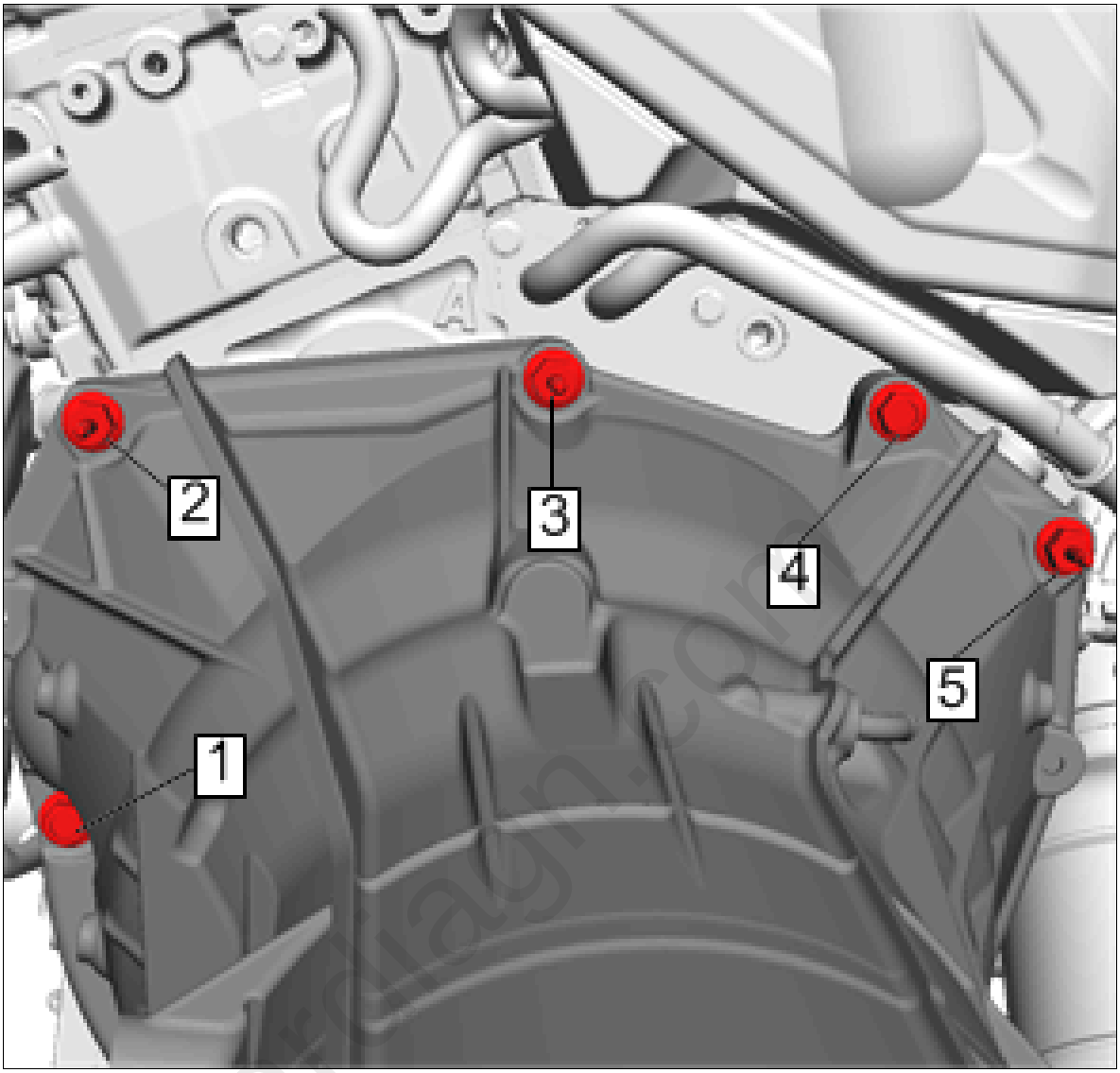
Fig 7: Transmission Vent Hose Retainers



Courtesy of GENERAL MOTORS COMPANY

19. Disconnect the transmission vent hose retainers (1).
20. Disconnect the electrical wiring harness retainers from the transmission to engine fasteners and from the transmission case.
21. Position a suitable block of wood between the front of the engine and the frame.
22. Using a suitable strap, secure the transmission to the transmission jack.

Fig 8: Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

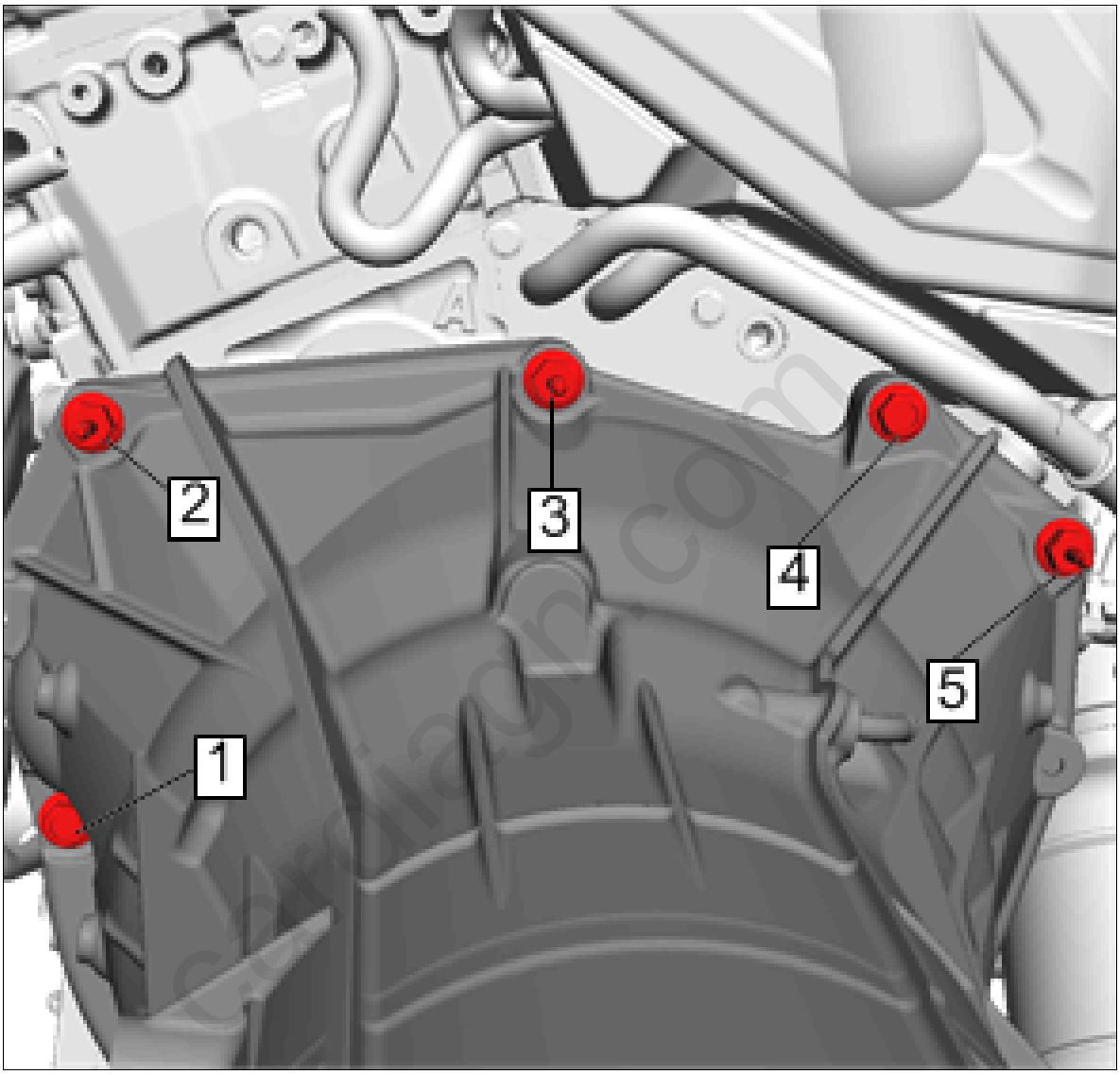
23. Remove the transmission to engine bolts (1, 2, 3, 4, 5).
24. Pull the transmission straight back.
25. Install the **J-21366** strap onto the transmission bell housing to retain the torque converter.
26. Remove the transmission from the vehicle.
27. Transfer components as necessary.
28. Flush and flow test the transmission cooler and transmission pipes. Transmission Fluid Cooler Flushing and Flow Test (Tremec 6-Speed)Transmission Fluid Cooler Flushing and Flow Test (8L90)

REPAIR INSTRUCTIONS - ON VEHICLE > TRANSMISSION REPLACEMENT (M5T

WITH LGX ENGINE) > INSTALLATION PROCEDURE

1. Remove the **J-21366** strap from the transmission bell housing.
2. Install the transmission to the vehicle.

   Fig 1: Transmission Bolts

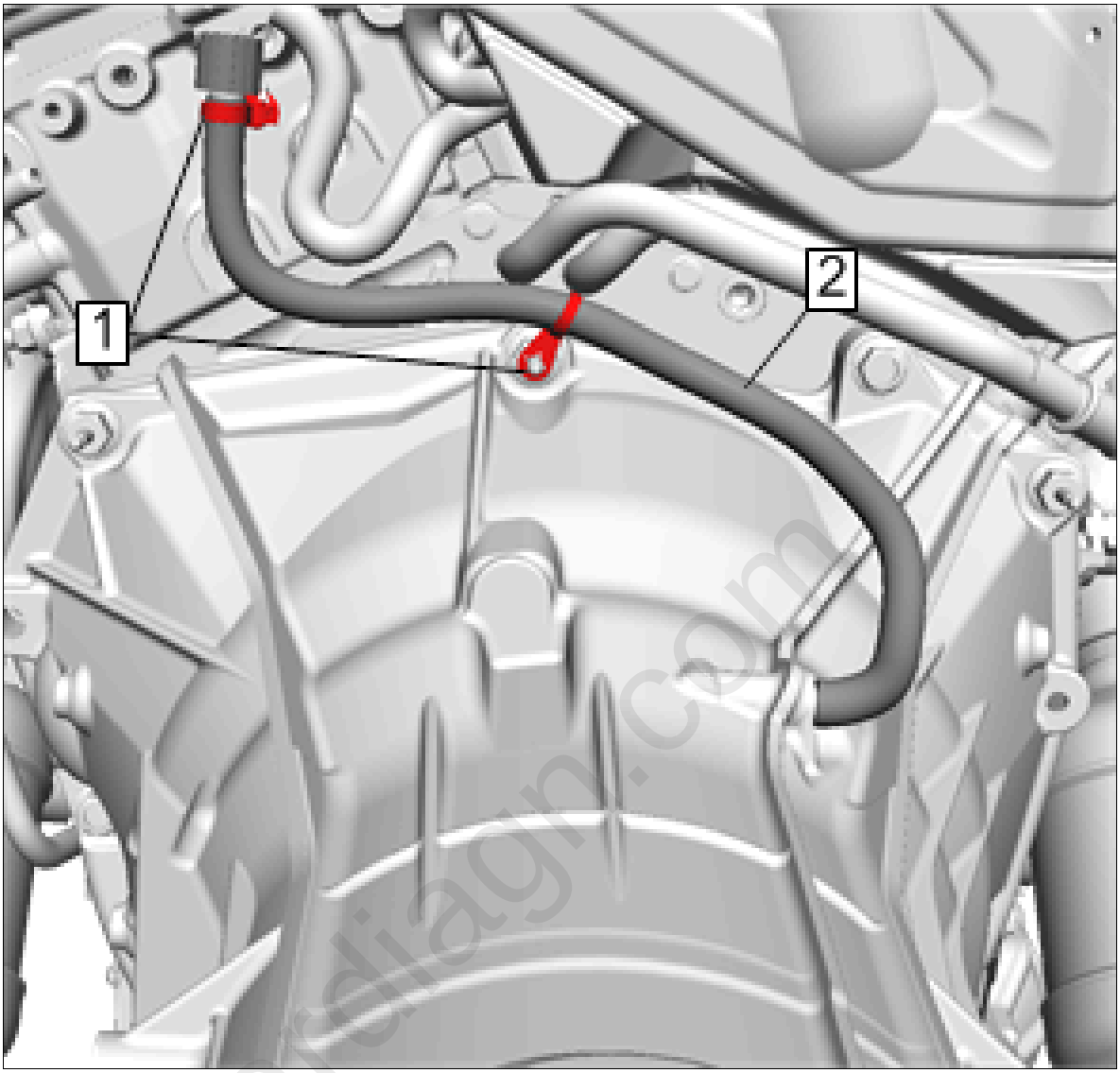


Courtesy of GENERAL MOTORS COMPANY

> ⚠ *CAUTION:*
>
> *Refer to Fastener Caution .*

3. Install the six transmission to engine bolts (1, 2, 3, 4, 5) and tighten to 58 N.m (43 lb ft).
4. Install the right side engine to transmission bolt and tighten to 58 N.m (43 lb ft).

Fig 2: Transmission Vent Hose Retainers

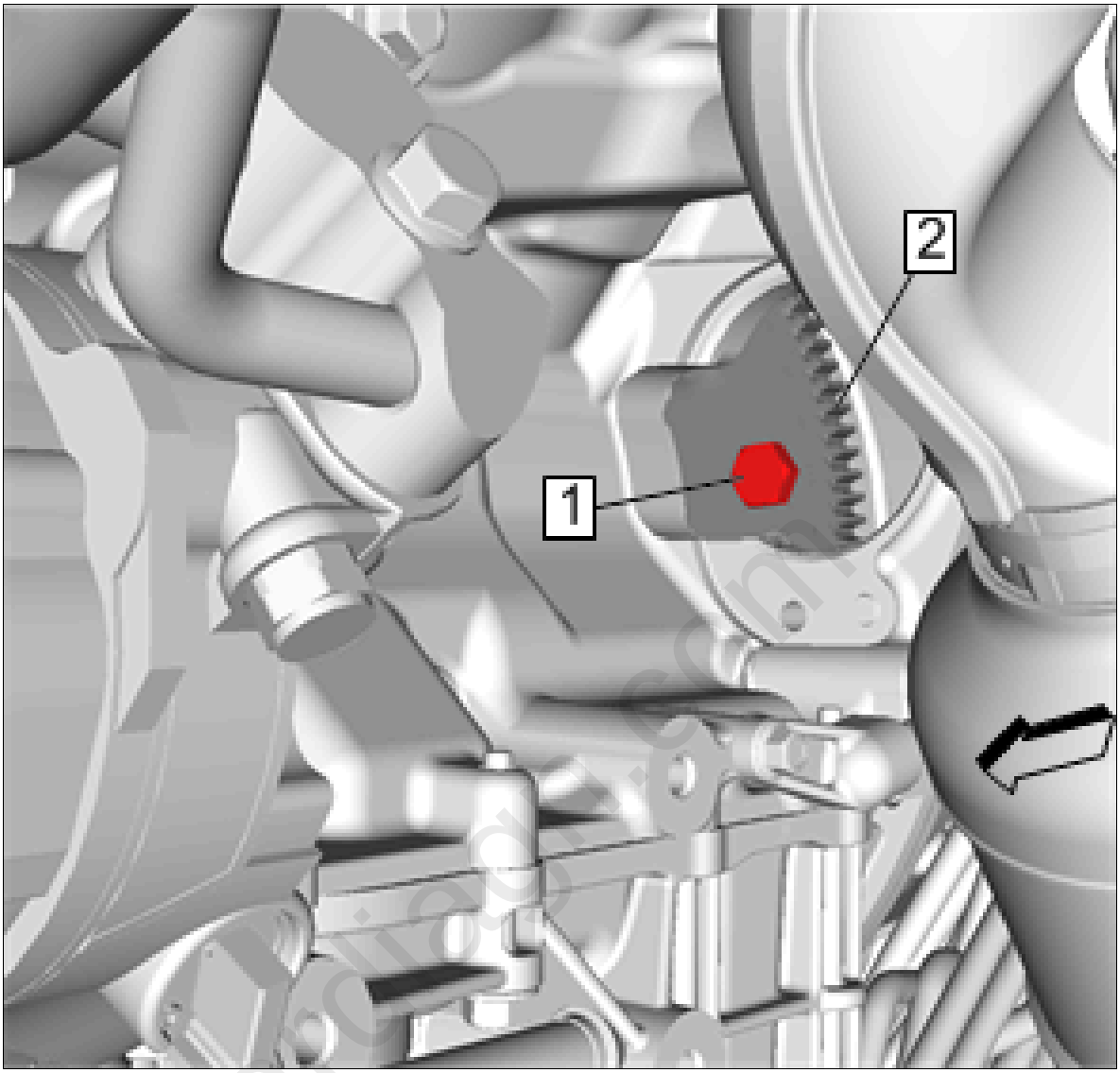


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5. Connect the transmission vent hose retainers (1).
6. Connect the electrical wiring harness retainers to the transmission to engine fasteners and to the transmission case.
7. Install the transmission support. Transmission Mount Replacement .
8. Remove the transmission jack from under the vehicle.
9. Remove the block of wood.
10. Align the torque converter to flexplate orientation marks made during the removal procedure.

Fig 3: Torque Converter Bolts



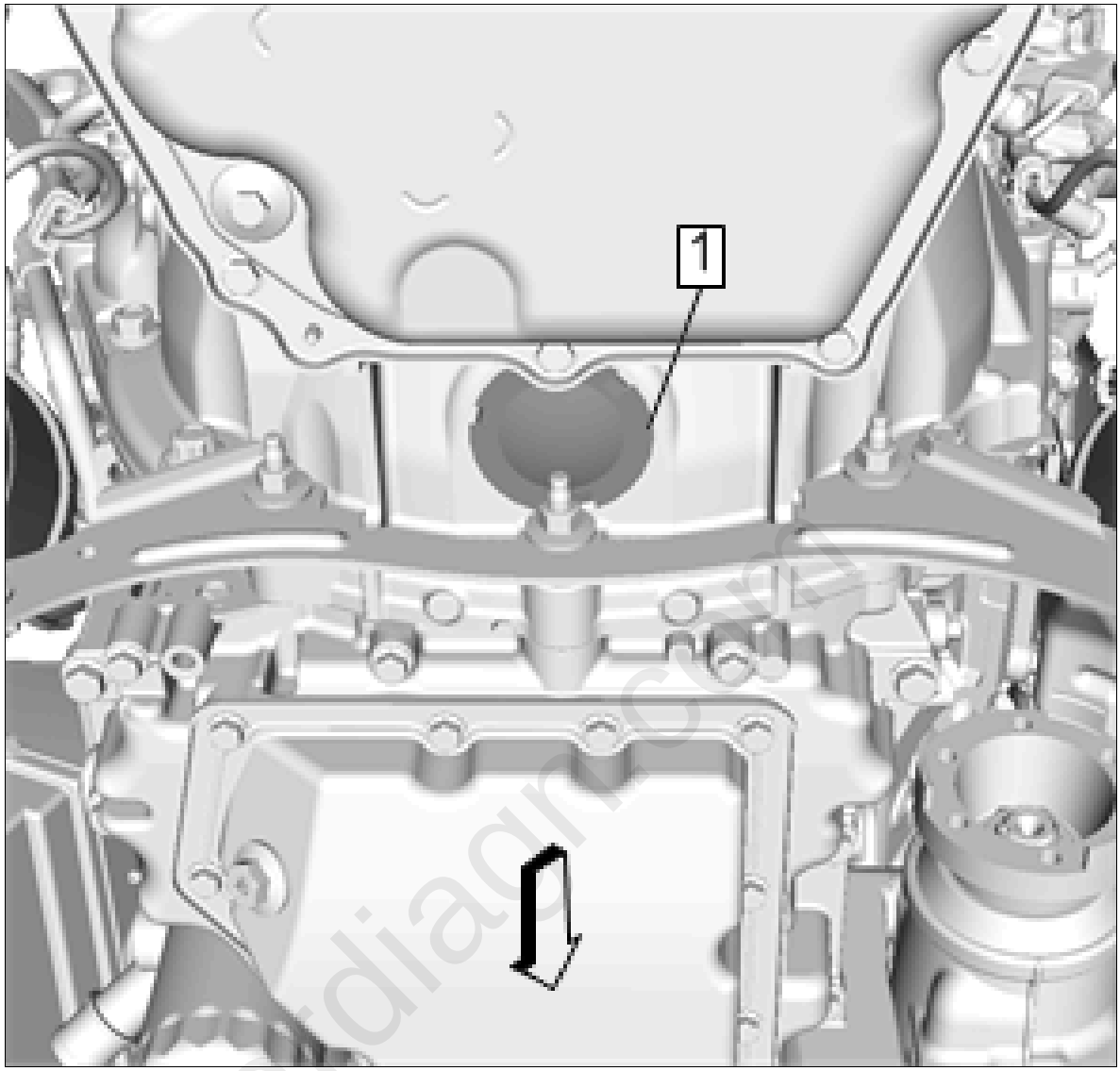
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Torque converter bolts are self-locking and must be replaced with NEW torque converter bolts every time the bolts are removed.

11. Complete the following steps for all torque converter bolts (1):
    1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt holes in the flexplate with the starter opening in the engine block.
    2. Install all NEW torque converter bolts (1) and tighten to 63 N.m (46 lb ft).

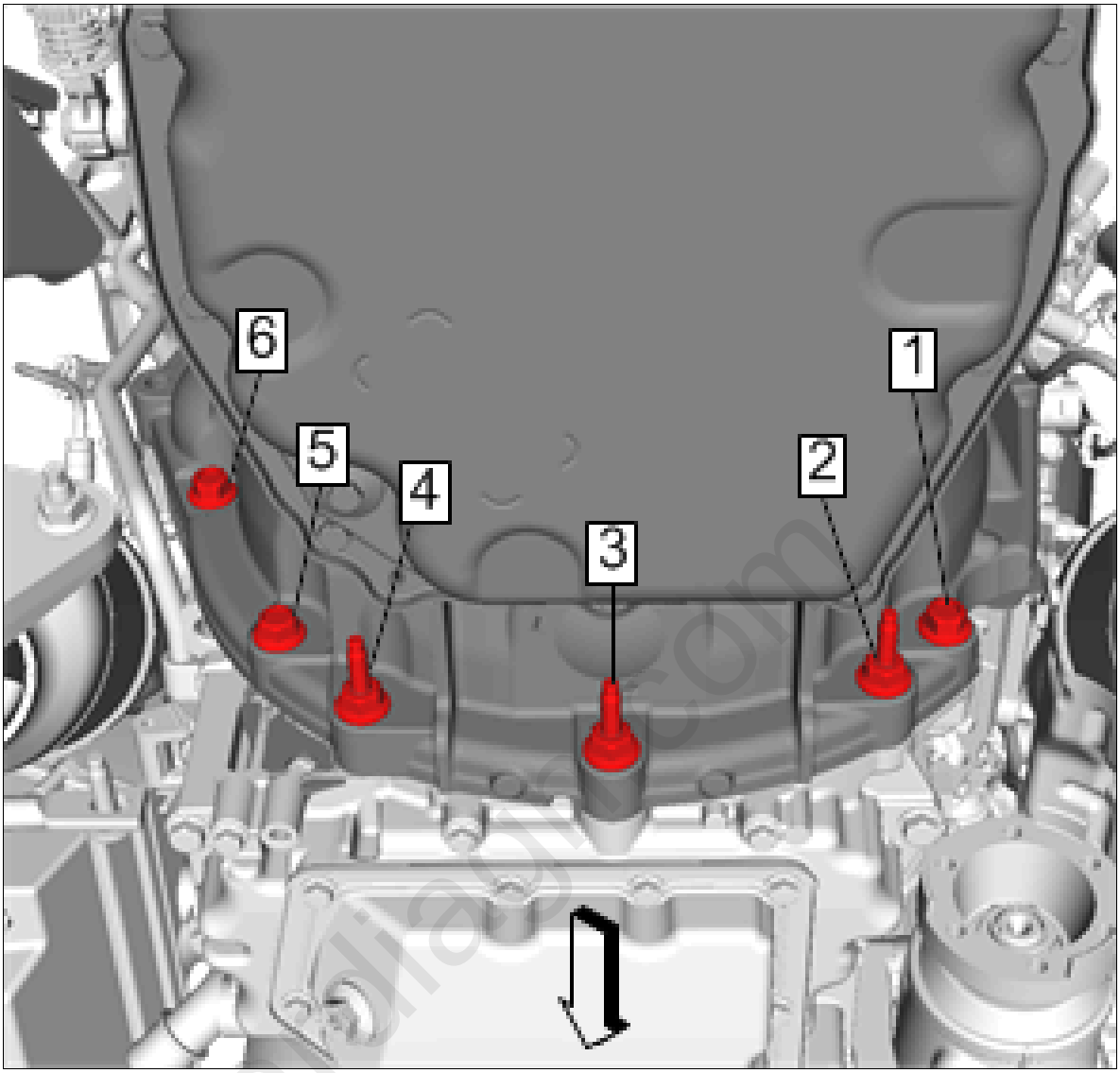
Fig 4: Transmission Close Out Plug



Courtesy of GENERAL MOTORS COMPANY

12. Install the transmission close out plug (1).
13. Install Transmission Converter Cover Replacement (M5T, LGX Engine)
14. Install the starter motor. Starter Replacement (LGX) .

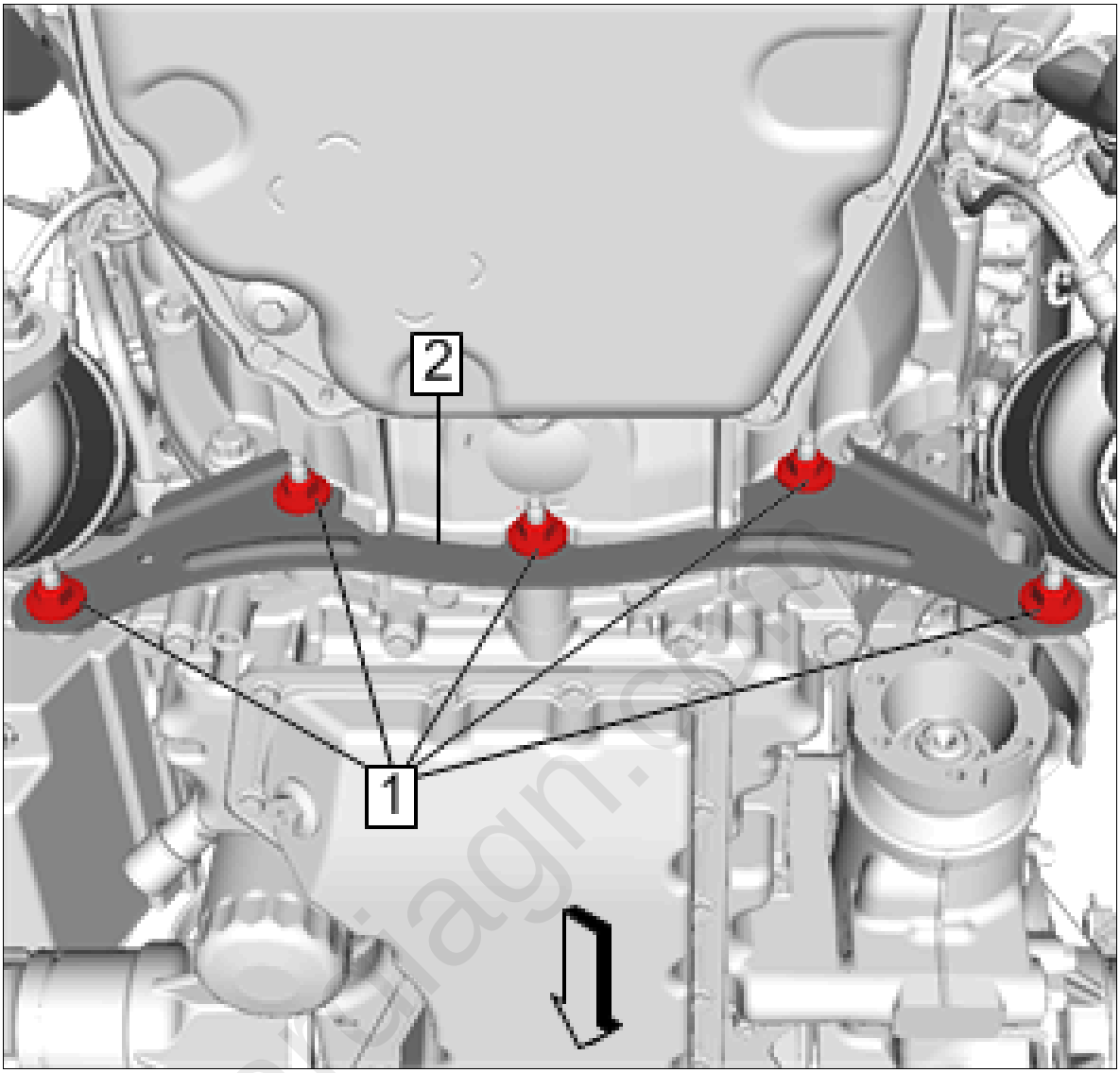
Fig 5: Lower Transmission Bolts



Courtesy of GENERAL MOTORS COMPANY

15. Install the lower transmission to engine bolts (1, 2, 3, 4, 5, 6) and tighten to 58 N.m (43 lb ft).

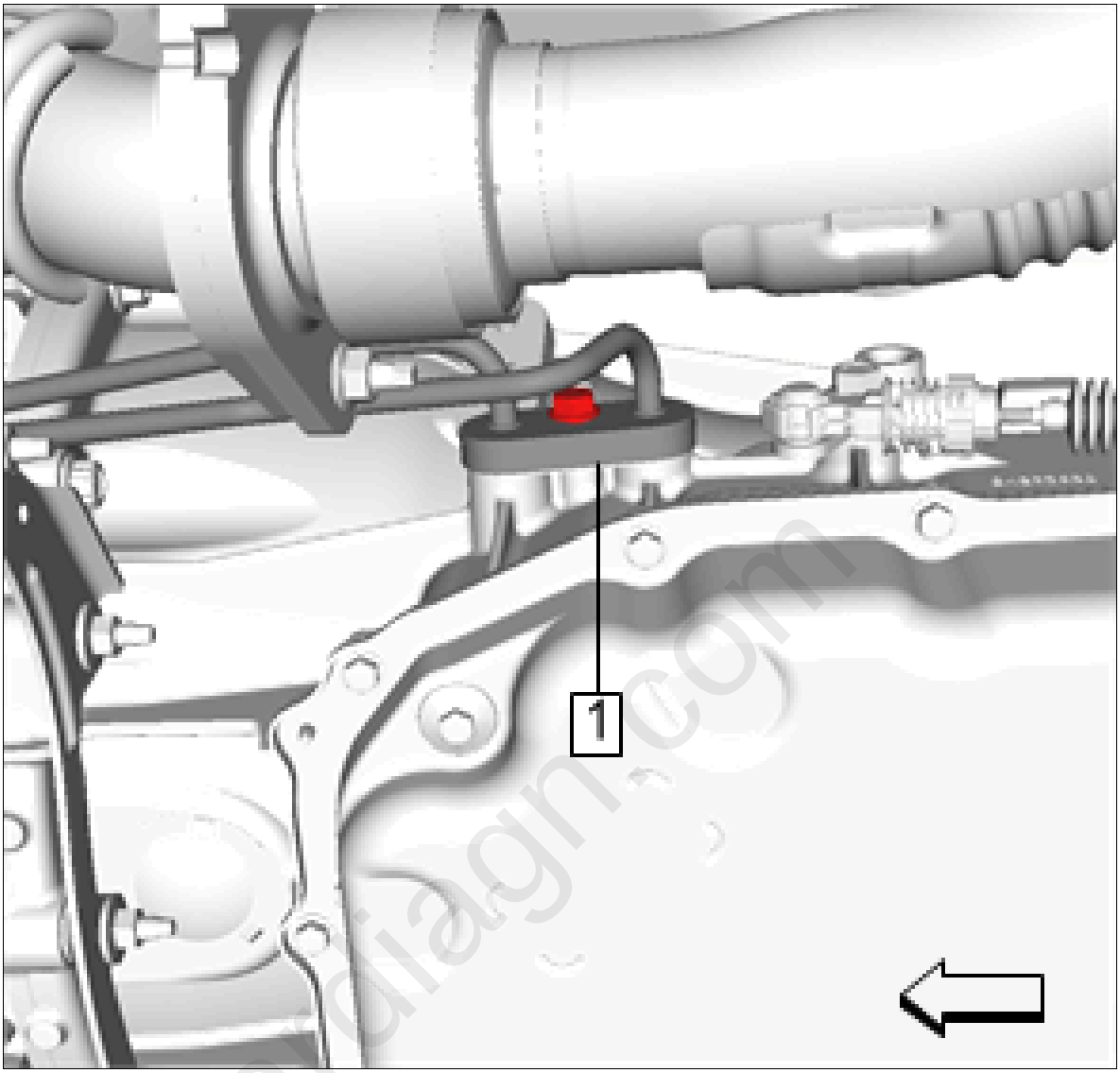
Fig 6: Catalytic Converter Brace Bracket



Courtesy of GENERAL MOTORS COMPANY

16. Install the catalytic converter brace bracket (2) to the transmission.
17. Install the five retaining nuts (1) and tighten to 22 N.m (16 lb ft).

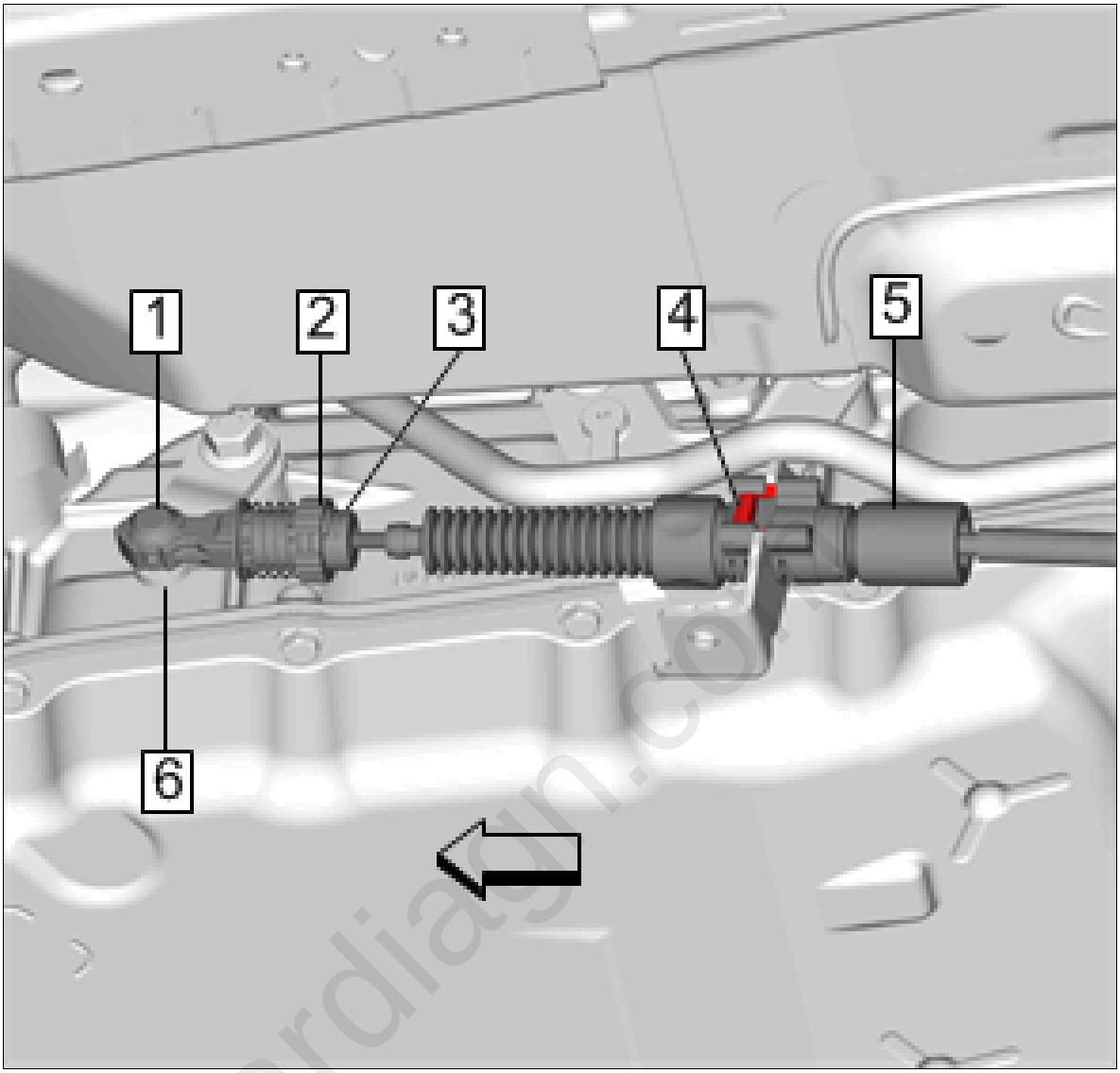
Fig 7: Transmission Fluid Cooler Pipes



Courtesy of GENERAL MOTORS COMPANY

18. Install the transmission fluid cooler inlet and outlet pipe (1) to the transmission. Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, With V03)Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LGX With M5T, Without V03) .
19. Connect the wiring harness retainers and connectors to the transmission.

Fig 8: Transmission Range Selector Lever Cable



Courtesy of GENERAL MOTORS COMPANY

20. Install the cable in the bracket, then slide the retainer (4) rearward to lock the transmission range selector lever cable in the bracket.
21. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (2).
22. Adjust the cable. Range Selector Lever Cable Adjustment .
23. Two-Piece Propeller Shaft Replacement (Coupe M5T, M5U) Two-Piece Propeller Shaft Replacement (Convertible M5T, M5U) » Install
24. Check the transmission fluid level and fill if necessary. Transmission Fluid Level and Condition Check .
25. Lower the vehicle.
26. Perform the solenoid valve characterization. Refer to Solenoid Valve Characterization Reprogramming .

NOTE:

The Service Fast 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:

The service fast learn procedure must be performed when any of the following repairs has been made to the transmission.

1. *Pressure regulating solenoid replacement*
2. *Valve body repair or replacement*
3. *Any service/repair in response to a shift quality concern*
4. *Any internal transmission service, repair, overhaul, or replacement*
5. *Torque converter replacement*
6. *TCM replacement*
7. *Transmission assembly replacement*

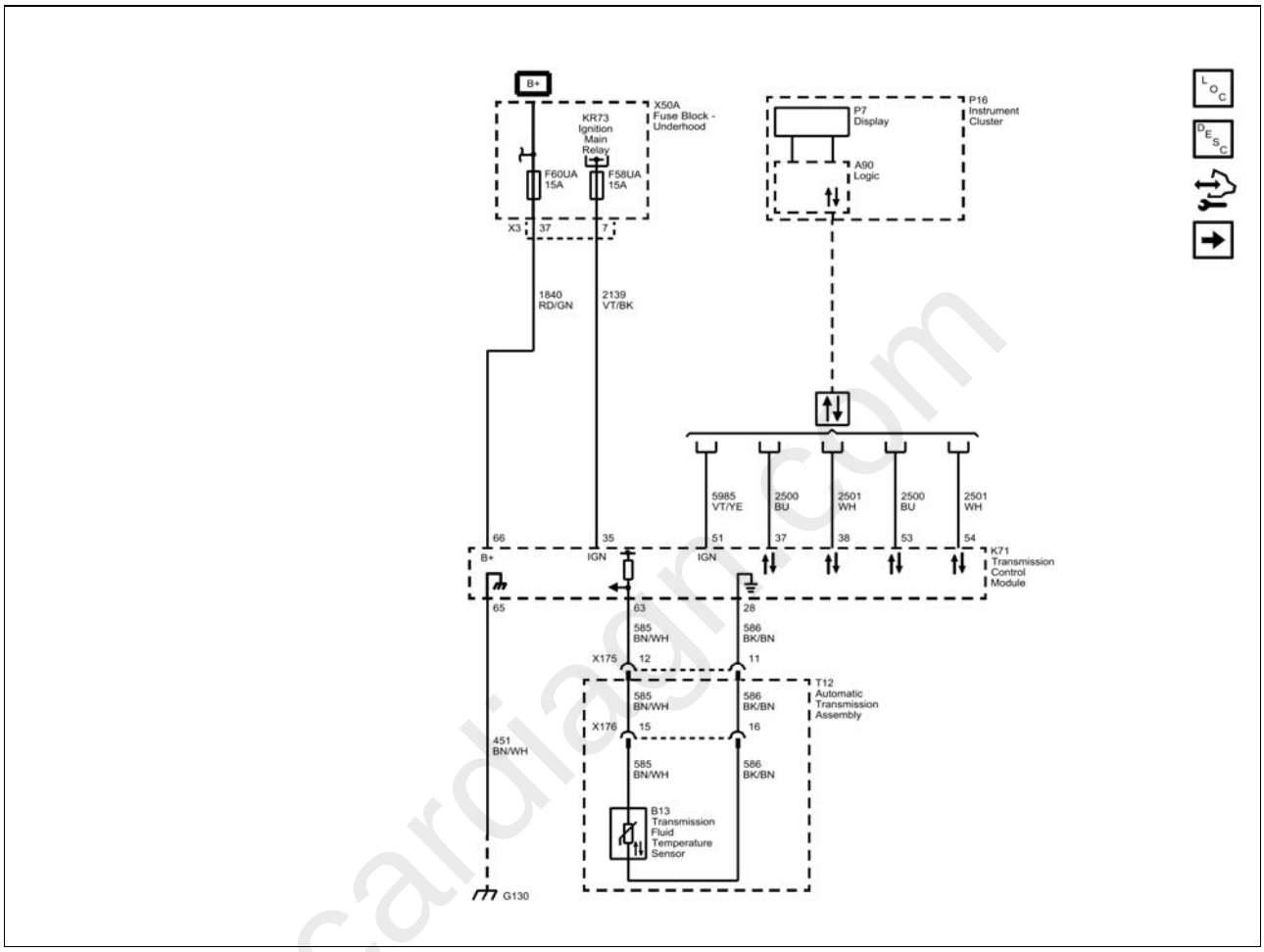
27. Perform the service fast learn procedure. Refer to Transmission Service Fast Learn Procedure .

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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - SCHEMATIC WIRING DIAGRAMS

SCHEMATIC WIRING DIAGRAMS > AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS > POWER, GROUND, SERIAL DATA, MIL AND FLUID TEMPERATURE

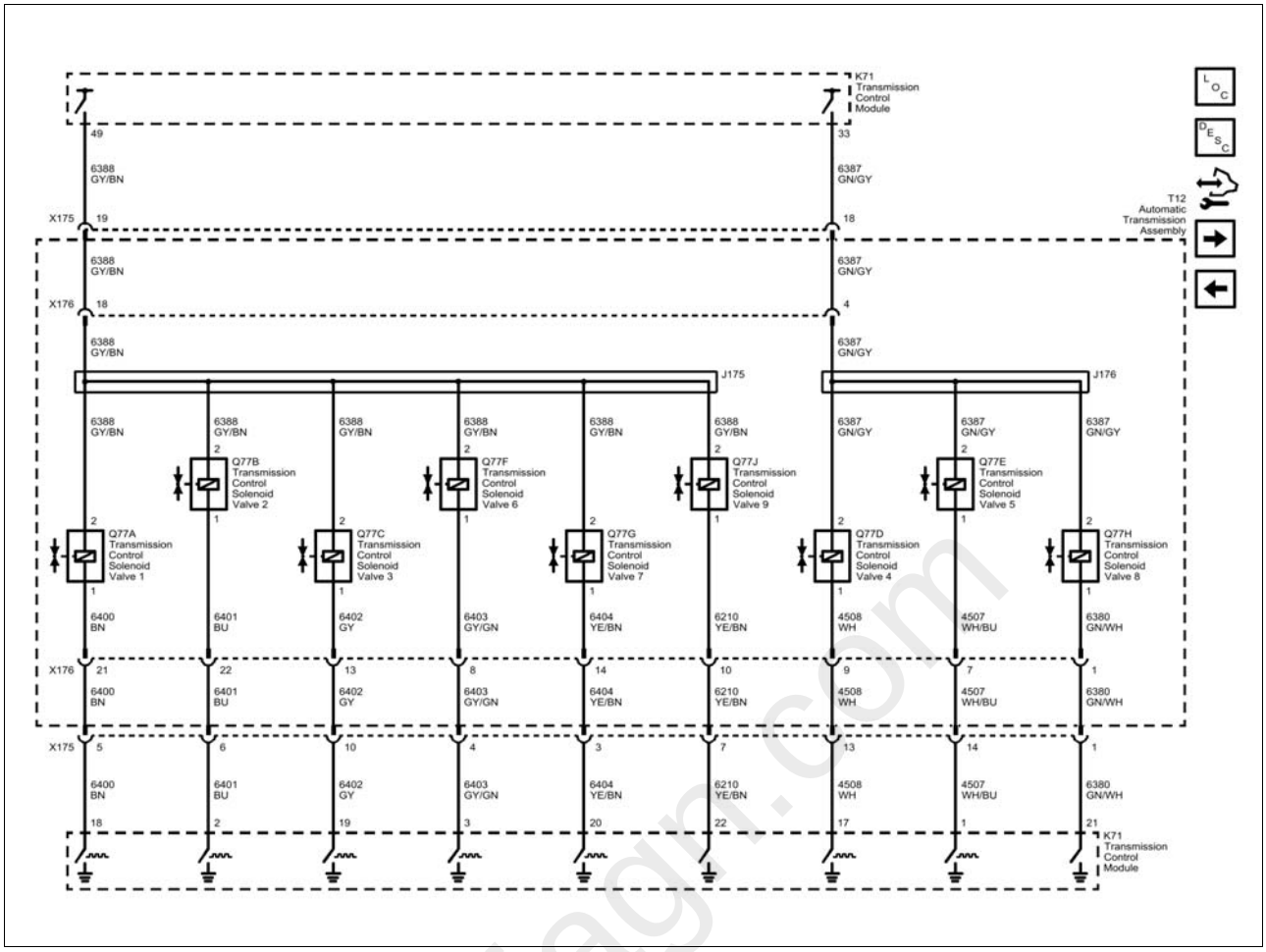
Fig 1: Power, Ground, Serial Data, MIL and Fluid Temperature



Courtesy of GENERAL MOTORS COMPANY

SCHEMATIC WIRING DIAGRAMS > AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS > PRESSURE AND SHIFT CONTROLS

Fig 1: Pressure and Shift Controls

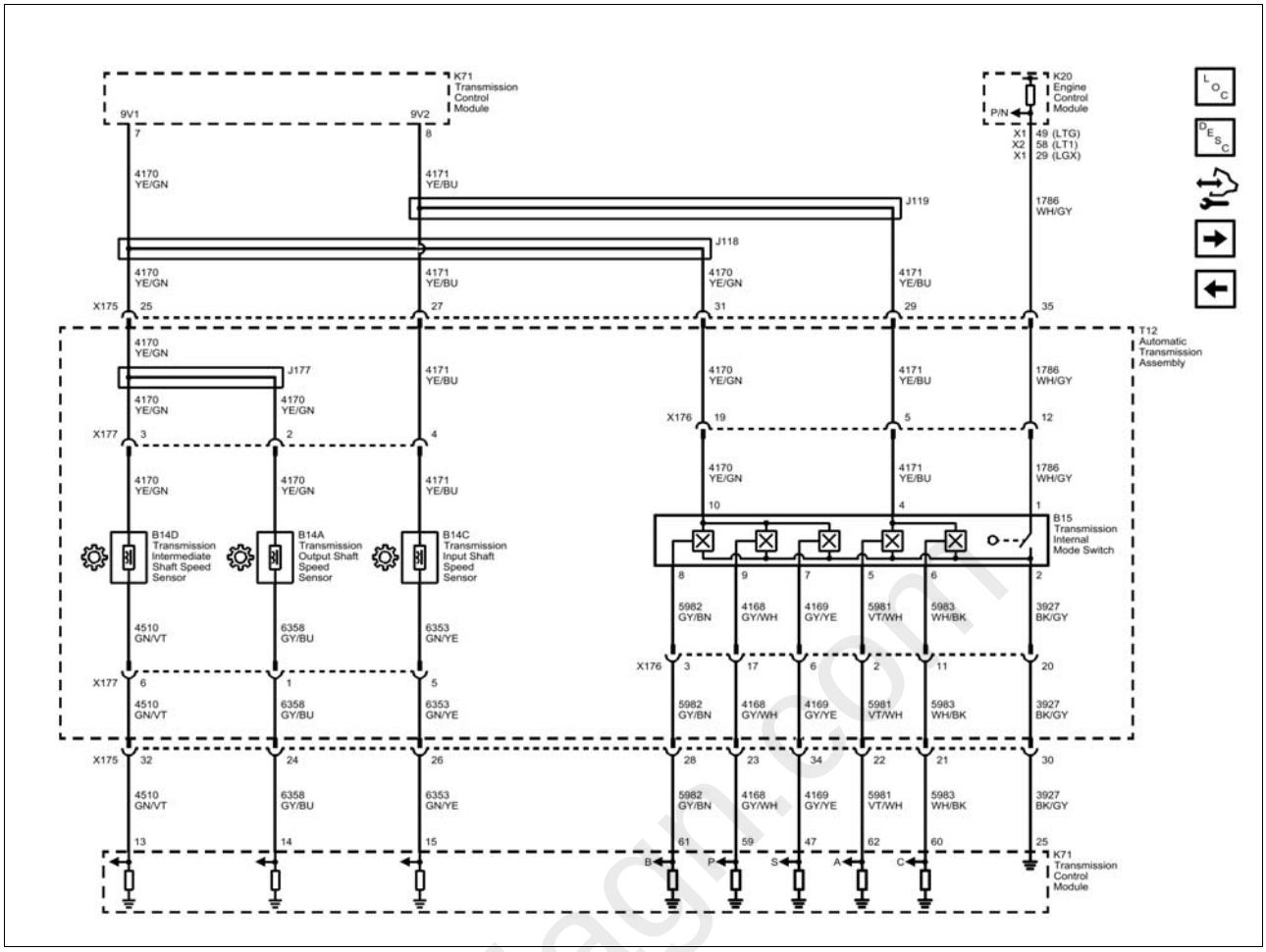


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SCHEMATIC WIRING DIAGRAMS > AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS > SPEED SENSORS AND INTERNAL MODE SWITCH

Fig 1: Speed Sensors and Internal Mode Switch

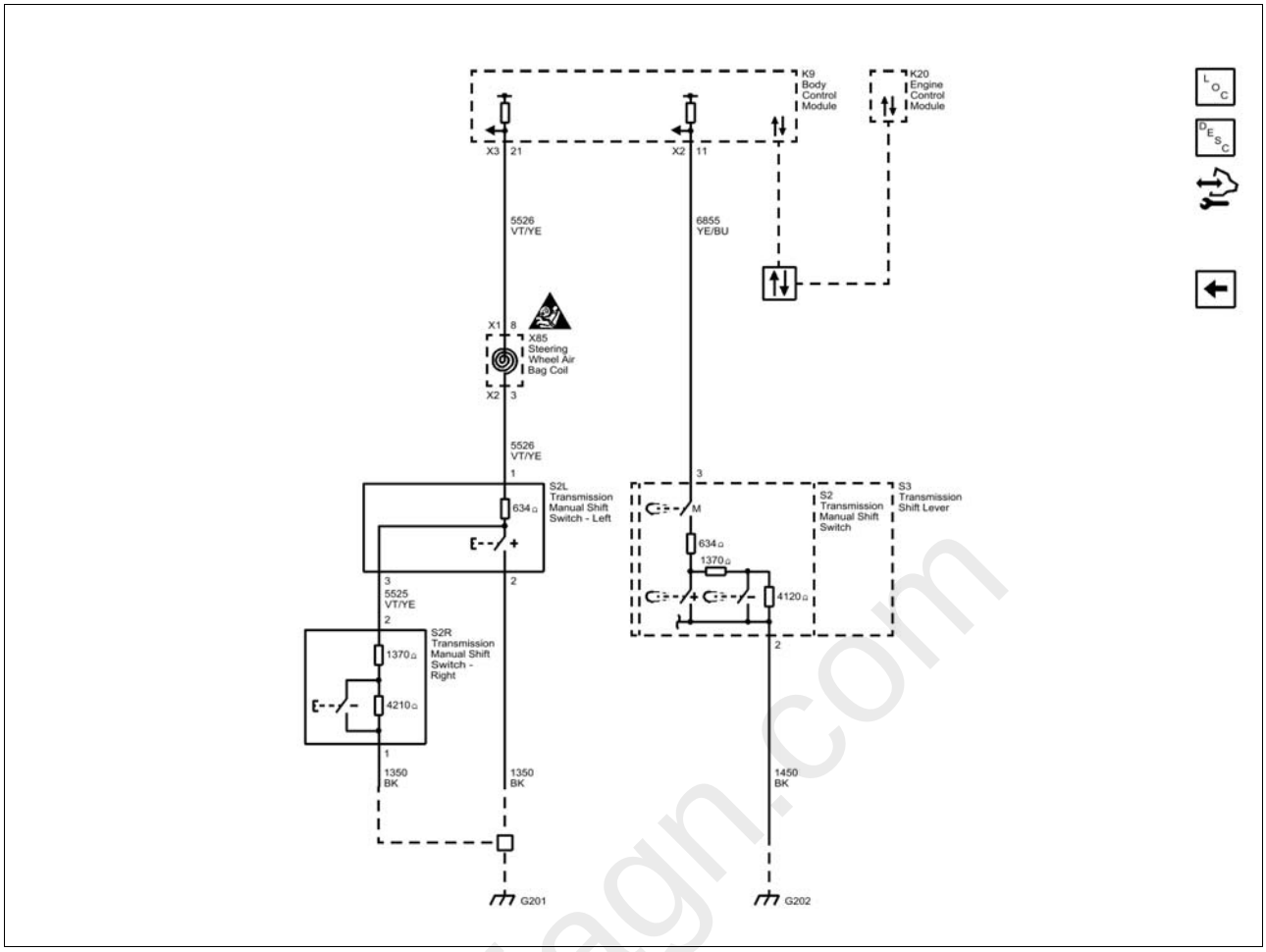


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SCHEMATIC WIRING DIAGRAMS > AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS > TAP UP/TAP DOWN SWITCHES

Fig 1: Tap Up/Tap Down Switches

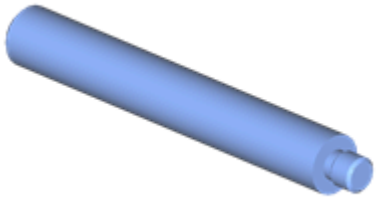
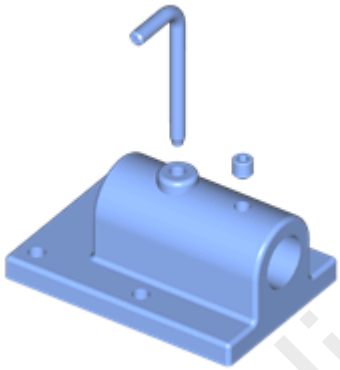
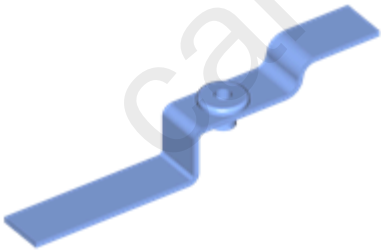


Courtesy of GENERAL MOTORS COMPANY

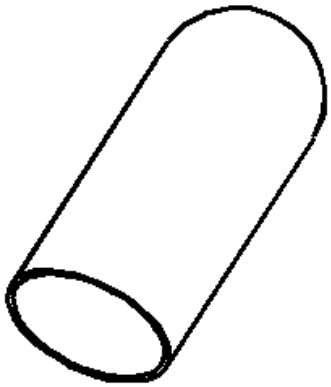
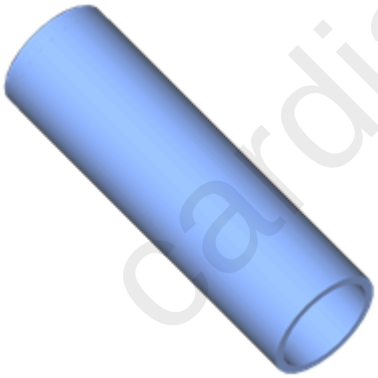
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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - SPECIAL TOOLS AND EQUIPMENT

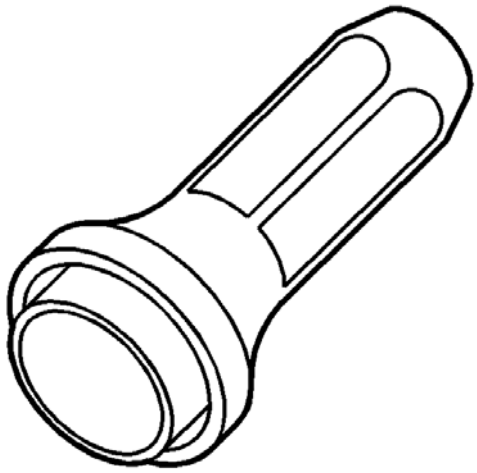
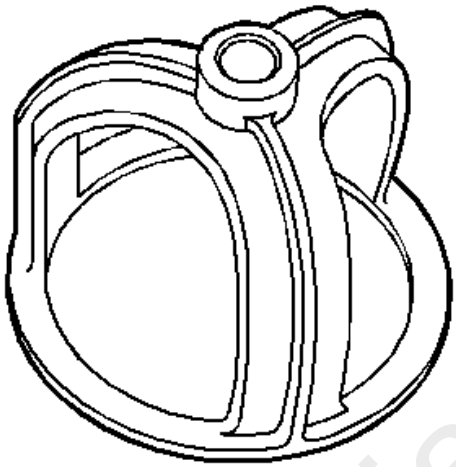
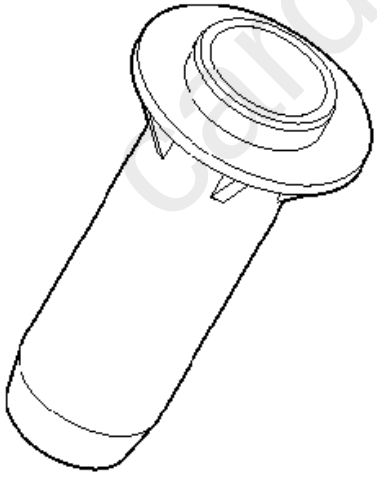
SPECIAL TOOLS AND EQUIPMENT > SPECIAL TOOLS

Illustration	Tool Number/Description
	DT-8092 GE-8092 J-8092 Driver Handle
	DT-03289-20 J-3289-20 Holding Fixture (Base)
	DT-21366 J-21366 Converter Holding Strap

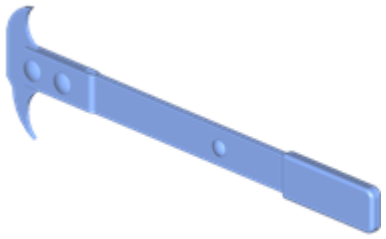
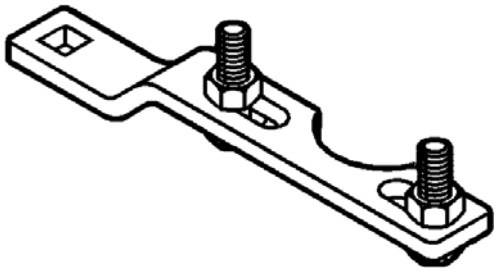
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	DT-22828 J-22828 Input and Countershaft Race Installer
	DT-26941 J-26941 Bushing and Bearing Remover
	DT-35512 J-35512 Bearing Installer

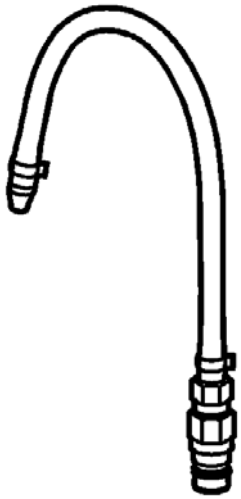
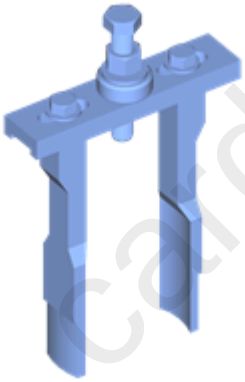
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	DT-37212 J-37212 Front Output Shaft Seal Installer
	DT-38734 J-38734 Intermediate Spring Compressor Adapter
	DT-43772 J-43772 Torque Converter Seal Installer

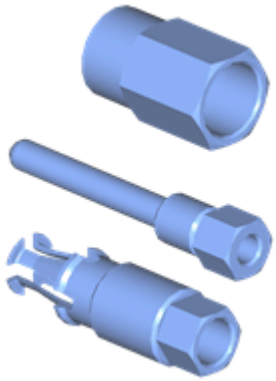
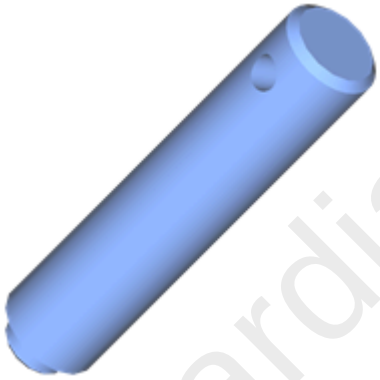
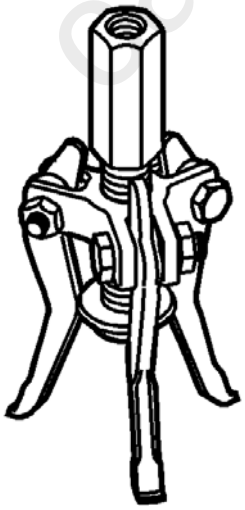
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	DT-45000 J-45000 Seal Remover
	DT-45012 J-45012 Holding Fixture
	DT-45096 J-45096 Transmission Oil Cooling System Flush and Flow Test Tool

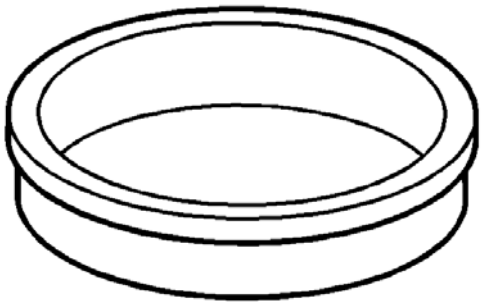
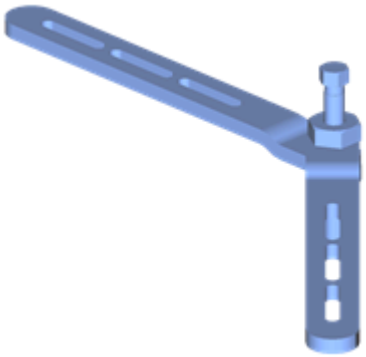
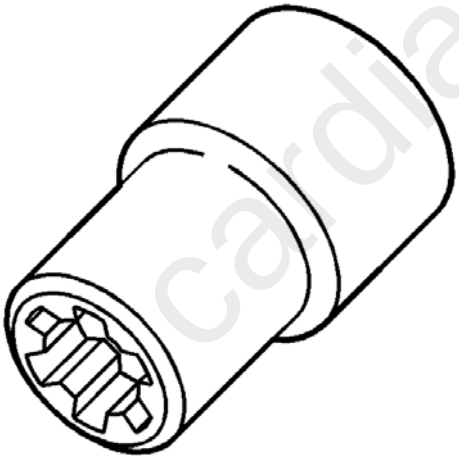
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	DT-45096-30 J-45096-30 Transmission Cooler Flusher Adapters
	DT-45096-40 J-45096-40 Transflow Oil Fill Adapter
	DT-45124 J-45124 Removal Bridge
	DT-45124-9 J-45124-9 Puller Leg

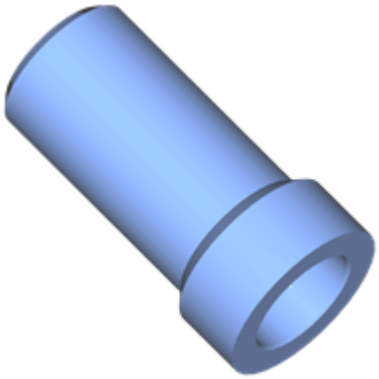
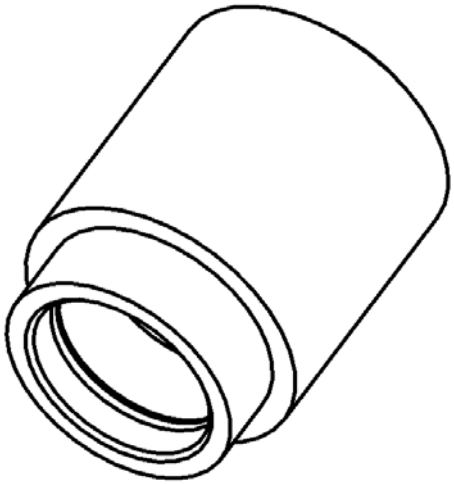
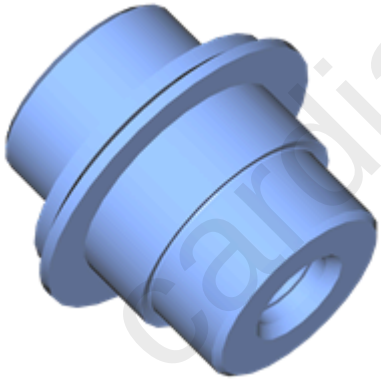
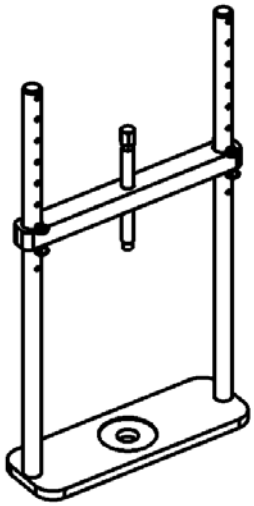
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	DT-45201 J-45201 Cooler Line Seal Remover
	DT-47693-2 Compressor
	DT-47770 Seal Installer
	DT-47865 Bearing Remover

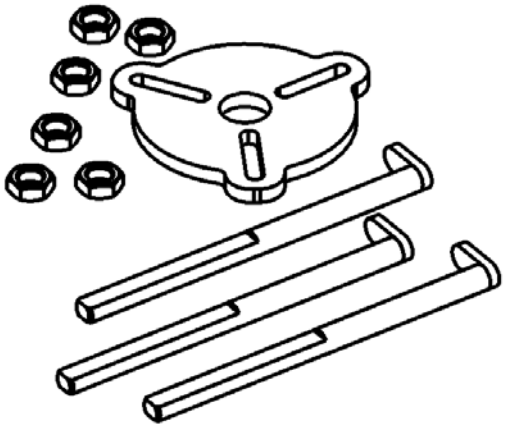
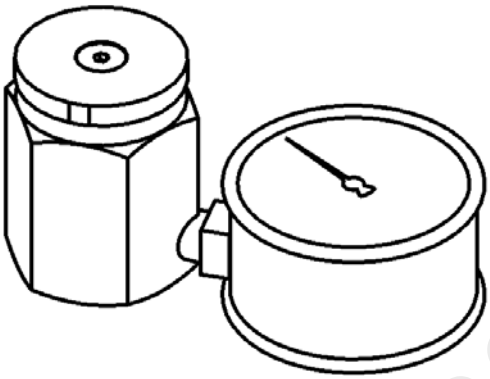
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	DT-47868-4 Clutch Travel Weight Adapter
	DT-48056 Spring Compressor Bridge
	DT-48285 Valve Body Torx Plus Socket
	DT-48989 Holding Fixture

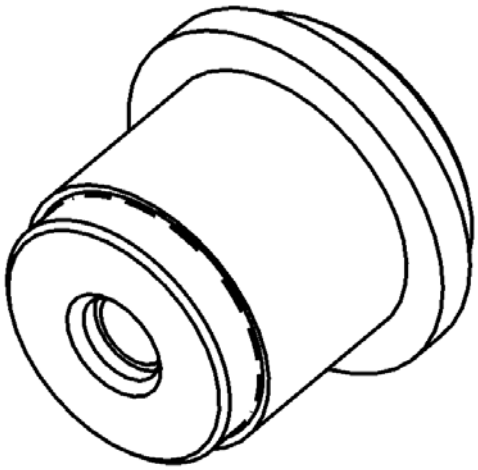
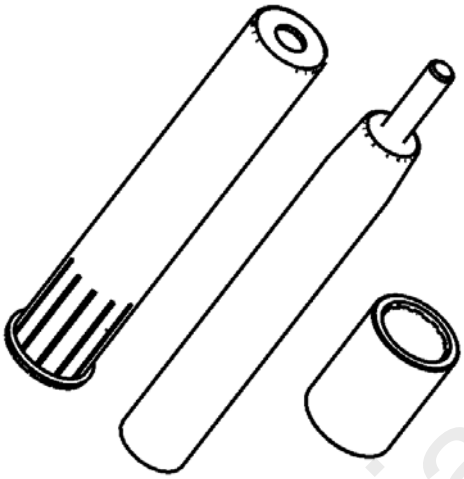
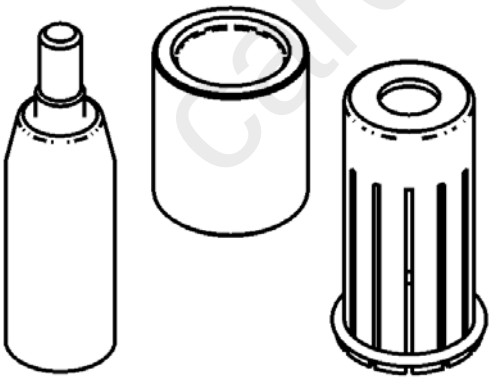
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	DT-50648 Case Seal Installer
	DT-50896 Seal Installer
	DT-50897 Bearing Installer
	DT-50900 Clutch Travel Support Fixture

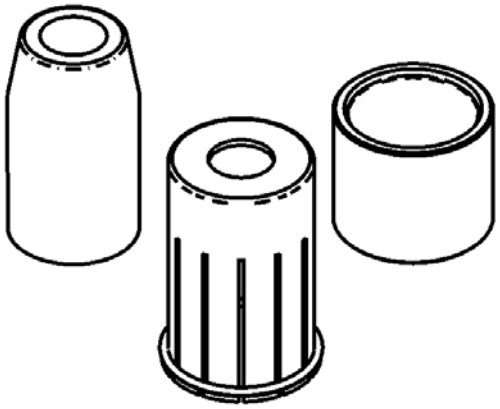
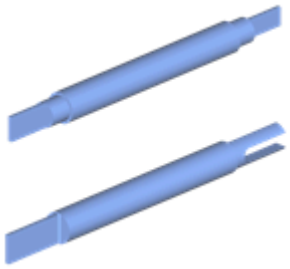
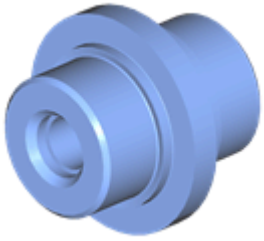
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	DT-50902 Adjustable Clutch Spring Compressor
	DT-50903 Clutch Travel Load Gauge
	DT-50905 Clutch Air Travel Adapter

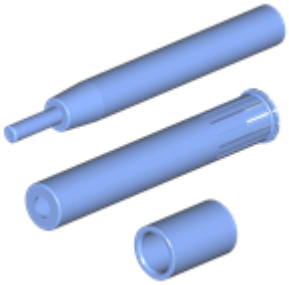
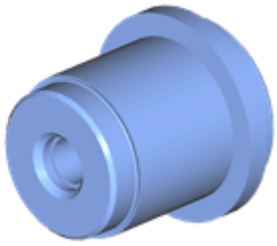
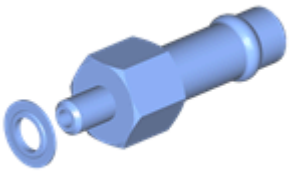
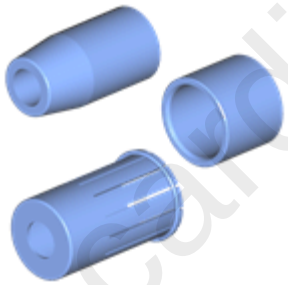
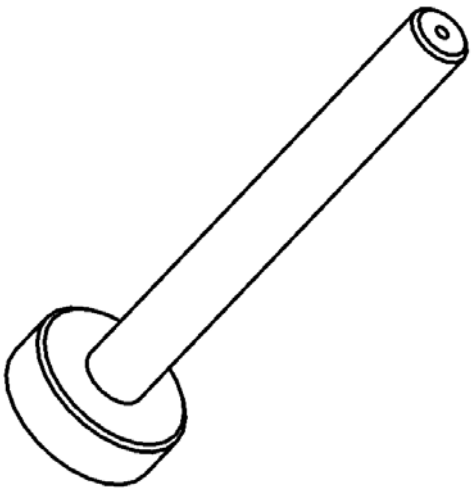
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	DT-50906 Bearing Installer
	DT-50910 Seal Installer
	DT-50911 Seal Installer

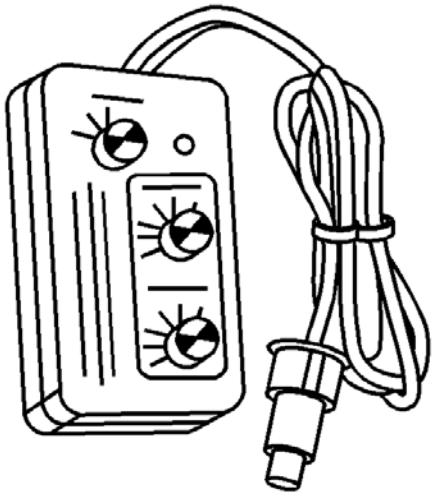
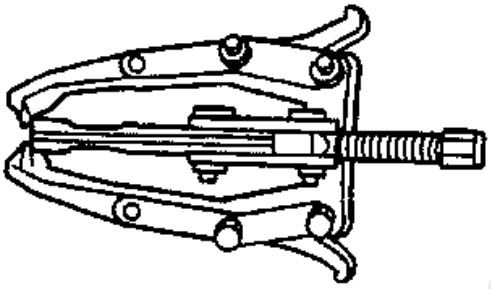
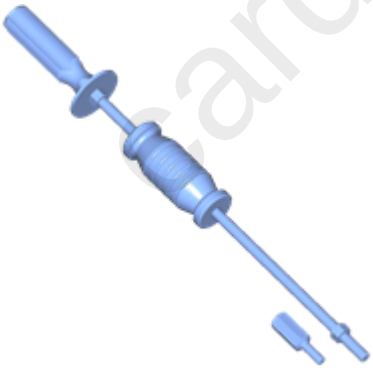
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	DT-50912 Seal Installer
	DT-50914 Solenoid Valve Retainer Remover/Installer
	DT-50921 Output Carrier/Shaft Lifting Tool
	DT-51087 Bearing Installer

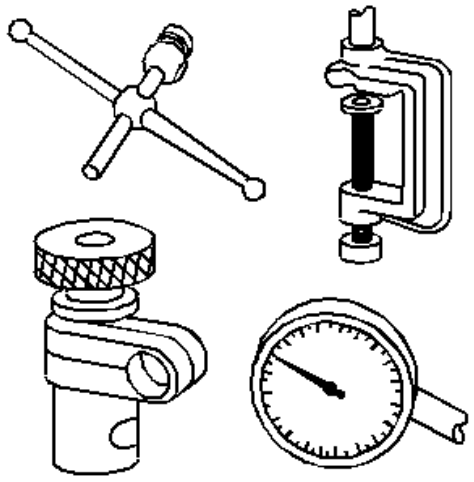
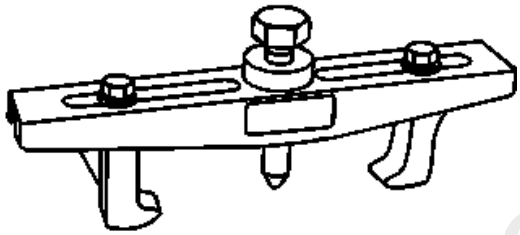
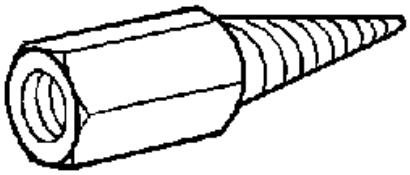
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	DT-51088 Seal Installer
	DT-51089 Bearing Installer
	DT-51190 Fluid Fill Pan Adapter
	DT-51196 Seal Installer
	DT-51328 Clutch Compressor and Air Travel Check Rod Extension

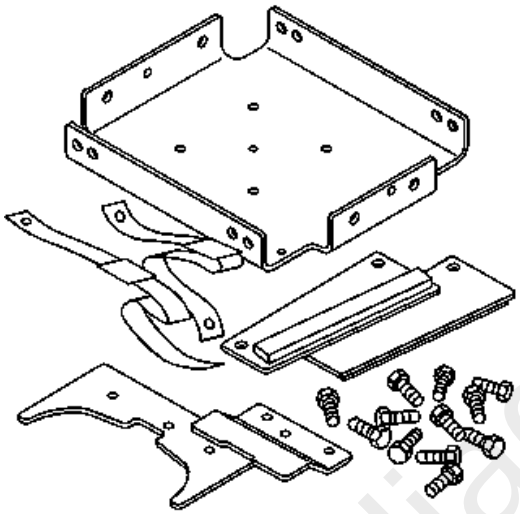
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	EL-38522 J-38522 Variable Signal Generator
	EN-38416-B J-38416-B Harmonic Balancer Remover
	GE-6125-B J-6125-B Slide Hammer with Adapters

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	GE-8001 J-8001 Dial Indicator Set
	GE-8433 J-8433 Puller Bar
	GE-36825-A J-36825-A Output Shaft Oil Seal Remover

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	J-35616 GM-Approved Terminal Test Kit
	J-42055 Drivetrain Support Fixture

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Service Manual: AUTOMATIC TRANSMISSION - 8L45 (M5T)
OR 8L90 (M5U) - SPECIFICATIONS

SPECIFICATIONS > FASTENER SPECIFICATIONS (OFF VEHICLE)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
Automatic Transmission Auxiliary Fluid Accumulator Bolt	321	3	M5 x 45	8 N.m	71 lb in
Automatic Transmission Auxiliary Fluid Accumulator Bleeder Valve	399	1	-	11 N.m	97 lb in
Automatic Transmission Auxiliary Fluid Accumulator Solenoid Bolt	398	2	M4 x 15	3 N.m	27 lb in
Automatic Transmission Case Extension Bolt					
• First Pass	23	6	M10 x 40	20 N.m	15 lb ft
• Final Pass	23	6	M10 x 40	55 degrees	
Automatic Transmission Case Extension Hole Plug	407	2	-	11 N.m	97 lb in
Automatic Transmission Case Extension Studs	412	2	-	15 N.m	11 lb ft
Automatic Transmission Fluid Baffle Bolt (1)					
• First Pass	12	2	M6 x 25	4 N.m	35 lb in
• Final Pass	12	2	M6 x 25	45 degrees	
Automatic Transmission Fluid Pan Bolt	51	15	M6 x 20	10 N.m	89 lb in
Automatic Transmission Fluid Pump Bolt	300	5	M6 x 28	9 N.m	80 lb in
Automatic Transmission Front Cover Bolt (1)					
• First Pass	3	11	M6 x 30	6.5 N.m	58 lb in

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• Final Pass	3	11	M6 x 30	30 degrees	
Control Valve Channel Plate Bolt	314	19	M5 x 55	8 N.m	71 lb in
Control Valve Solenoid Body Bolt	44	4	M6 x 45	9 N.m	80 lb in
Control Valve Solenoid Body Bolt	43	7	M6 x 68	9 N.m	80 lb in
Control Valve Solenoid Body Bolt	321	8	M5 x 45	8 N.m	71 lb in
Manual Shaft Detent Lever Spring Bolt	42	1	M6 x 25	12 N.m	106 lb in
Output Speed Sensor Wiring Harness Bolt (1)					
• First Pass	38	3	M6 x 25	4 N.m	35 lb in
• Final Pass	38	3	M6 x 25	45 degrees	
Park Pawl Actuator Bracket Bolt	606	2	M8 x 35	31 N.m	23 lb ft
Propeller Shaft Transmission Flange Nut	25	1	-	105 N.m	77 lb ft
Stator Shaft Support Bolt	17	9	M8 x 33	35 N.m	26 lb ft
Transmission Oil Level Check Plug	50	1	-	9 N.m	80 lb in
*Reference number refers to the component callout number in Disassembled Views 1. Use NEW fastener.					

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SPECIFICATIONS > 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
Manual Shaft Shift Pin
Manual Shift Shaft Seal
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)
Input Speed Sensor Wiring Harness Bolt	
• First Pass:	4 N.m (35 lb in)
• Final Pass:	45 Degrees
Output Speed Sensor Wiring Harness Bolt	
• First Pass:	4 N.m (35 lb in)
• Final Pass:	45 Degrees
Torque Converter Bolts	63 N.m (46 lb ft)
Transmission Fluid Baffle Bolts	
• First Pass:	4 N.m (35 lb in)
• Final Pass:	45 Degrees

Reusable Threaded Fastener Tightening Specifications

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NOTE:

All fasteners listed in this table can be reused after removal

Application	Specification
	Metric (English)
Automatic Transmission Auxiliary Fluid Accumulator Bolt	8 N.m (71 lb in)
Automatic Transmission Control Indicator Screws	2.5 N.m (22 lb in)
Automatic Transmission Range Selector Lever	25 N.m (18 lb ft)
Auxiliary Heater Pump Bracket to the Transmission	10 N.m (89 lb in)
Flywheel Inspection Cover/Converter Cover Fasteners	10 N.m (89 lb in)
Oil Pressure Test Plug	11 N.m (97 lb in)
Propeller Shaft Transmission Flange Nut	105 N.m (77 lb ft)
Range Selector Lever Cable Bracket	22 N.m (16 lb ft)
Transmission Control Fasteners	9 N.m (80 lb in)
Transmission Fluid Pan Fasteners	10 N.m (89 lb in)
Transmission Heat Shield Fasteners	9 N.m (80 lb in)
Transmission to Engine Bolts	58 N.m (43 lb ft)
Valve Body Assembly Bolts (1, 2) (1 - M6 x 68) and Bolts (2 - M6 x 45)	9 N.m (80 lb in)

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SPECIFICATIONS > TRANSMISSION GENERAL SPECIFICATIONS

Name	8L45	8L90
RPO Codes	M5N, M5T	M5U, M5X
Production Location	Toledo, OH (USA) Silao (Mexico)	Toledo, OH (USA)
Transmission Drive	Rear Wheel Drive	Rear Wheel Drive
1st Gear Ratio	4.62	4.560
2nd Gear Ratio	3.04	2.971
3rd Gear Ratio	2.07	2.075
4th Gear Ratio	1.66	1.688

5th Gear Ratio	1.26	1.270
6th Gear Ratio	1.000	1.000
7th Gear Ratio	0.85	0.845
8th Gear Ratio	0.66	0.652
Reverse	3.93	3.818
Torque Converter Size - Diameter of Torque Converter Turbine	238 mm	258 mm
Pressure Taps	Line Pressure	Line Pressure
Transmission Fluid Type	DEXRON® HP	DEXRON® HP
Transmission Type: 8	Eight Forward Gears	Eight Forward Gears
Transmission Type: L	Longitude Mount	Longitude Mount
Transmission Type: 45/90	Product Series	Product Series
Position Quadrant	P, R, N, D, M	P, R, N, D, M
Case Material	Die Cast Aluminum	Die Cast Aluminum
Transmission Net Weight (Approximate)	80 kg (176 lb)	95 kg (210 lb)
Maximum Trailer Towing Capacity	Refer to applicable owner's manual	Refer to applicable owner's manual

SPECIFICATIONS > ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Automatic Transmission Fluid	DEXRON®HP	19353429	19353430
Propeller Shaft Transmission Flange	Adhesive	89021297	10953488
Propeller Shaft Transmission Flange Nut	Adhesive	89021297	10953488

SPECIFICATIONS > APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
8L45 or 8L90		
Pan Removal and Filter Replacement- Approximate Capacity	7.0 liters	7.4 quarts

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Overhaul- Approximate Capacity (Transmission Volume Only)	10.3 liters	10.88 quarts
Complete Trans System- Approximate Capacity (Including Cooler Volume)	10.8 liters	11.41 quarts

SPECIFICATIONS > CLUTCH BACKING PLATE RETAINING RING SPECIFICATIONS (8L90)

2-3-4-6-8 Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 1.54-2.20 mm (0.061-0.087 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	
NOTE: *After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.*		
1.75-1.85 mm	0.069-0.073 in	Light Green
2.11-2.21 mm	0.083-0.087 in	No Color
2.46-2.56 mm	0.097-0.101 in	Yellow
2.82-2.92 mm	0.111-0.115 in	Light Blue
3.18-3.28 mm	0.125-0.129 in	Orange
3.54-3.64 mm	0.139-0.143 in	Dark Green
3.89-3.99 mm	0.153-0.157 in	Silver

4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 1.24-1.90 mm (0.049-0.075 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	

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NOTE:

After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.

1.75-1.85 mm	0.069-0.073 in	Light Green
2.11-2.21 mm	0.083-0.087 in	No Color
2.46-2.56 mm	0.097-0.101 in	Yellow
2.82-2.92 mm	0.111-0.115 in	Light Blue
3.18-3.28 mm	0.125-0.129 in	Orange
3.54-3.64 mm	0.139-0.143 in	Dark Green
3.89-3.99 mm	0.153-0.157 in	Silver

1-3-5-6-7 Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 4 Plates - 1.82-2.30 mm (0.072-0.091 in) Clutch Pack Travel Specification - 5 Plates - 1.50-2.10 mm (0.059-0.083 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	

NOTE:

After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.

2.45-2.55 mm	0.096-0.100 in	Light Green
2.79-2.89 mm	0.110-0.114 in	Silver
3.13-3.23 mm	0.123-0.127 in	Yellow
3.47-3.57 mm	0.137-0.141 in	Light Blue
3.81-3.91 mm	0.150-0.154 in	Orange

1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring

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Clutch Pack Travel Specification - 0.93-1.82 mm (0.037-0.072 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	
NOTE: *After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.*		
1.91-2.01 mm	0.075-0.079 in	Light Blue
2.25-3.35 mm	0.089-0.132 in	Orange
2.59-2.69 mm	0.102-0.106 in	Dark Green
2.92-3.02 mm	0.115-0.119 in	Yellow
3.26-3.36 mm	0.128-0.132 in	Purple

SPECIFICATIONS > CLUTCH BACKING PLATE RETAINING RING SPECIFICATIONS (8L45)

2-3-4-6-8 Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 1.24-1.86 mm (0.049-0.073 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	
NOTE: *After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.*		
1.88-1.98 mm	0.074-0.078 in	Light Green

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2.20-2.30 mm	0.087-0.090 in	Yellow
2.53-2.63 mm	0.100-0.104 in	Light Blue
2.85-2.95 mm	0.112-0.116 in	No Color
3.17-3.27 mm	0.125-0.129 in	Orange
3.49-3.59 mm	0.137-0.141 in	Dark Green
3.82-3.92 mm	0.150-0.154 in	White

4-5-6-7-8 Reverse Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 1.24-1.86 mm (0.049-0.073 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	
NOTE: *After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.*		
1.88-1.98 mm	0.074-0.078 in	Light Green
2.20-2.30 mm	0.087-0.090 in	Yellow
2.53-2.63 mm	0.100-0.104 in	Light Blue
2.85-2.95 mm	0.112-0.116 in	No Color
3.17-3.27 mm	0.125-0.129 in	Orange
3.49-3.59 mm	0.137-0.141 in	Dark Green
3.82-3.92 mm	0.150-0.154 in	White

1-3-5-6-7 Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 1.50-2.10 mm (0.059-0.083 in)		
Retaining Ring Thickness		Ring Identification Color
Metric	English	
NOTE:		

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After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.

2.42-2.52 mm	0.095-0.099 in	Light Green
2.76-2.86 mm	0.109-0.113 in	Silver
3.10-3.20 mm	0.122-0.126 in	Yellow
3.44-3.54 mm	0.135-0.139 in	Light Blue
3.78-3.88 mm	0.149-0.153 in	Orange

1-2-3-4-5 Reverse Clutch Backing Plate Retaining Ring

Clutch Pack Travel Specification - 0.93-1.80 mm (0.037-0.071 in)		
Retaining Ring Thickness		
Metric	English	Ring Identification Color

NOTE:

After measuring clutch pack travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing retaining ring, and then choose a thicker or thinner retaining ring that will bring the measurement within specification.

3.06-3.16 mm	0.120-0.124 in	Light Blue
3.39-3.49 mm	0.133-0.137 in	Orange
3.71-2.81 mm	0.146-0.111 in	Dark Green
4.04-4.14 mm	0.159-0.163 in	Yellow
4.36-4.46 mm	0.172-0.176 in	Purple

SPECIFICATIONS > 1-3-5-6-7 CLUTCH THRUST BEARING WASHER SPECIFICATIONS

Transmission End Play Specification - 0.20-0.79 mm (0.008-0.031 in)		
1-3-5-6-7 Clutch Thrust Bearing Washer Thickness		
Metric	English	Ring Identification Color

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NOTE:

After measuring end play travel, determine if the measurement is within the specification. If the measurement is not within the specification, measure the thickness of the existing washer, and then choose a thicker or thinner washer that will bring the measurement within specification.

2.277-2.377 mm	0.090-0.094 in	Brown
2.463-2.563 mm	0.097-0.101 in	Purple
2.649-2.749 mm	0.104-1.108 in	Black
2.835-2.935 mm	0.112-0.116 in	Pink
3.021-3.121 mm	0.119-0.123 in	Plain
3.207-3.307 mm	0.127-0.130 in	Dark Blue
3.393-3.493 mm	0.134-0.138 in	Light Green
3.579-3.679 mm	0.141-0.145 in	White
3.769-3.865 mm	0.148-0.152 in	Light Blue

SPECIFICATIONS > RANGE REFERENCE

Range Reference Table

Range	Park	Rev	Neu	D							
Gear	P	R	N	1st	2nd	3rd	4th	5th	6th	7th	8th
4-5-6-7-8 Reverse S5 N.H.	Off	On	Off	Off	Off	Off	On	On	On	On	On
1-2-7-8 Reverse S1 N.H.	On	On	On	On	On	Off	Off	Off	Off	On	On
1-2-3-4-5 Reverse S2 N.L.	On	On	On	On	On	On	On	On	Off	Off	Off
1-3-5-6-7 S3 N.L.	Off	Off	Off	On	Off	On	Off	On	On	On	Off
2-3-4-6-8 S4 N.H.	Off	Off	Off	Off	On	On	On	Off	On	Off	On

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1-2-3-4-5 Rev BST S9	Off	Off	Off	Off	Off	Off	Off	Off	On	On	On
Default Control S8	Off	Off	Off	Off/On	Off/On	Off**	Off**	Off**	Off**	Off**	Off**
1-3-5-6-7 Clutch	-	-	-	Applied	-	Applied	-	Applied	Applied	Applied	-
4-5-6-7-8 Reverse Clutch	-	Applied	-	-	-	-	Applied	Applied	Applied	Applied	Applied
2-3-4-6-8 Clutch	-	-	-	-	Applied	Applied	Applied	-	Applied	-	Applied
1-2-7-8 Reverse Clutch	Applied*	Applied	Applied*	Applied	Applied	-	-	-	-	Applied	Applied
1-2-3-4-5 Reverse Clutch	Applied*	Applied	Applied*	Applied	Applied	Applied	Applied	Applied	-	-	-

NOTE:

For solenoids S8 and S9, "On" = Solenoid energized (pressurized), "Off" = Solenoid De-energized (no pressure).

NOTE:

For pressure control (PC) solenoids (S1, S2, S3, S5, S6), "On" = Pressurized, "Off" = No pressure.

*Applied with no load.**Default valve is hydraulically latched in the stroked position in this state. Default solenoid can be commanded ON for lube override.

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SPECIFICATIONS > TRANSMISSION INTERNAL MODE SWITCH VOLTAGE

NOTE:

Verify the voltages with a scan tool.

Shift Lever Position	Internal Mode Switch A Circuit	Internal Mode Switch B Circuit	Internal Mode Switch C Circuit	Internal Mode Switch P Circuit	Internal Mode Switch S Circuit
Park	1.68-2.38 V	0.70-0.96 V	1.68-2.38 V	0.70-0.96 V	0.70-0.96 V
Reverse	0.70-0.96 V	1.68-2.38 V	1.68-2.38 V	0.70-0.96 V	1.68-2.38 V
Neutral	0.70-0.96 V	1.68-2.38 V	0.70-0.96 V	1.68-2.38 V	0.70-0.96 V
Drive	1.68-2.38 V	0.70-0.96 V	0.70-0.96 V	1.68-2.38 V	1.68-2.38 V
Manual Mode	1.68-2.38 V	0.70-0.96-V	0.70-0.96 V	1.68-2.38 V	0.70-0.96 V

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