

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Component Locator - Impala

COMPONENT LOCATOR

DISASSEMBLED VIEWS

Case and Associated Parts - Gen 3

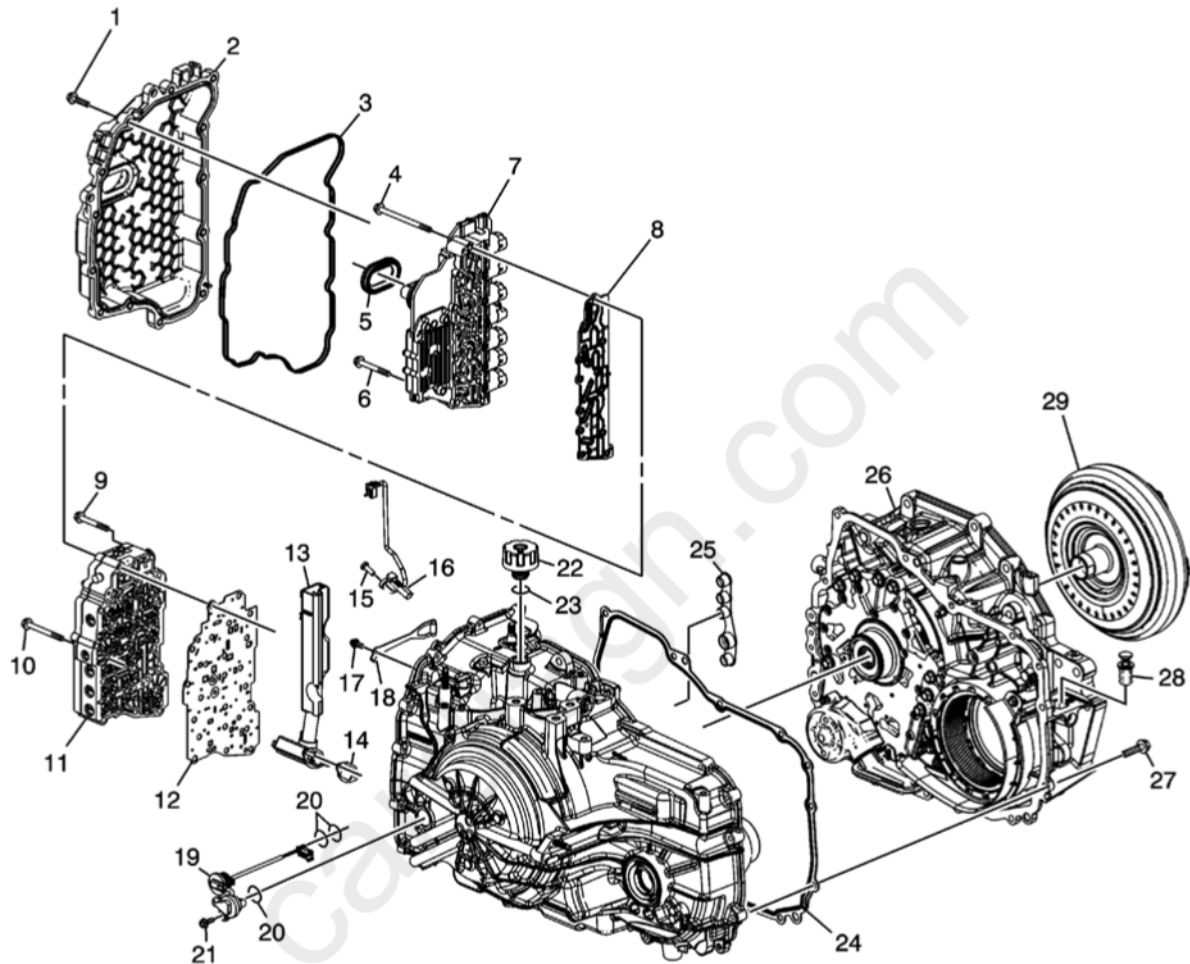


Fig. 1: Case and Associated Parts - Gen 3

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Control Valve Body Cover Bolt
2	Control Valve Body Cover Assembly
3	Control Valve Body Cover Gasket
4	Control Valve Body Bolt
5	Control Valve Body Cover Hole Seal
6	Control Solenoid Valve Heat Sink Bolt
7	Control Solenoid (w/Body and TCM) Valve Assembly
8	Control Valve Body Filter Plate Assembly
9	Control Valve Body Bolt
10	Control Valve Body Bolt
11	Control Valve Body Assembly
12	Control Valve Body Spacer Plate Assembly

Callout	Component Name
13	A/Trans Fluid Level Control Valve
14	A/Trans Fluid Level Control Valve Gasket
15	A/Trans Output Speed Sensor Bolt
16	A/Trans Output Speed Sensor Assembly
17	Manual Shaft Detent Spring Bolt
18	Manual Shaft Detent Lever Spring Assembly
19	A/Trans Input Speed Sensor Assembly
20	A/Trans Input Speed Sensor Assembly O-Ring Seal
21	A/Trans Input Speed Sensor Bolt
22	Fill Cap
23	Fill Cap Seal
24	Torque Converter Housing Gasket
25	A/Trans Fluid Pump Seal Assembly
26	Torque Converter with Fluid Pump Housing Assembly
27	Torque Converter and Differential Housing Bolt
28	A/Trans Fluid Fill Tube Plug Assembly
29	Torque Converter Assembly

Transmission Case Assembly - Gen 3

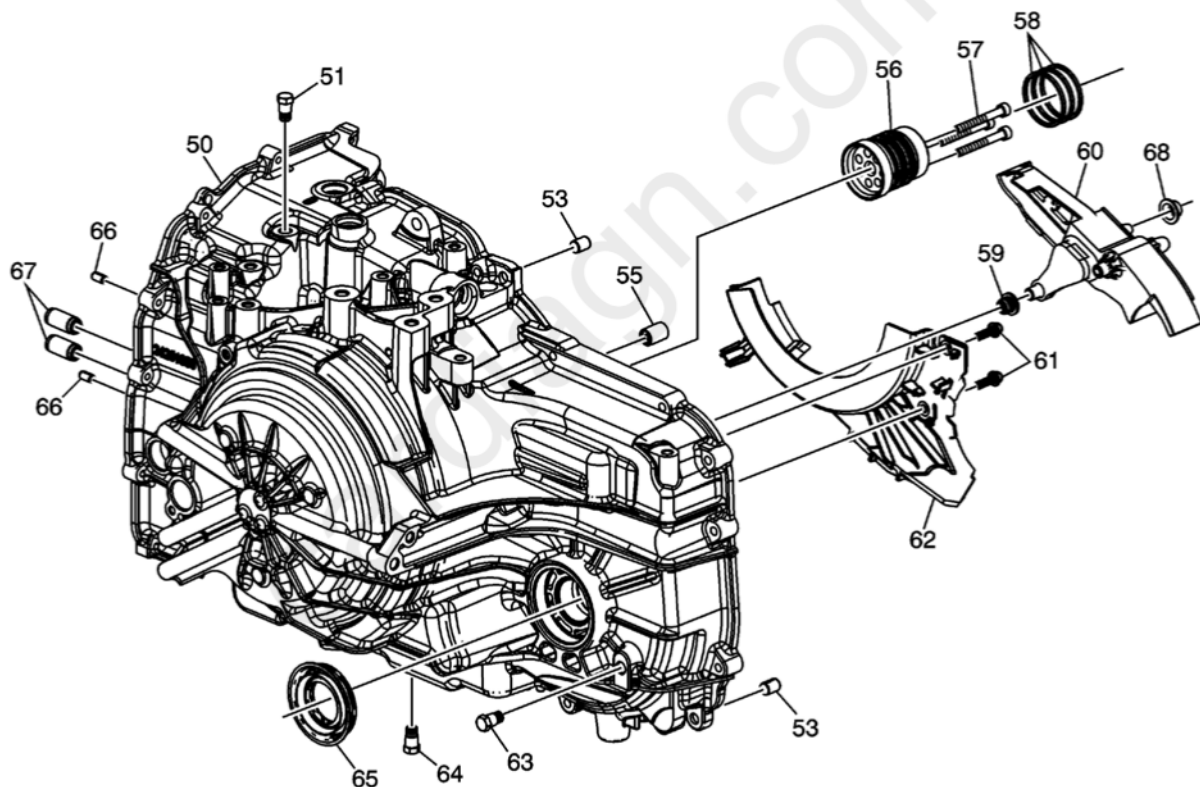


Fig. 2: Transmission Case Assembly Components - Gen 3

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
50	A/Trans Case Assembly
51	A/Trans Fluid Pressure Test Hole Plug
53	Transmission Case Cover Locator Pin
55	A/Trans Fluid Check Ball
56	Input Shaft Support
57	Input Shaft Support Bolt
58	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring (Qty: 3)
59	Drive Link Lube Fluid Seal
60	Drive Link Lube Scoop

Callout	Component Name
61	Front Differential Carrier Baffle Bolt
62	Front Differential Carrier Baffle
63	Oil Level Plug
64	Drain Plug
65	Drive Shaft Oil Seal Assembly
66	Control Valve Body Locator Pin
67	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
68	Drive Link Lube Fluid Seal

Torque Converter and Fluid Pump Housing Assembly - Gen 3

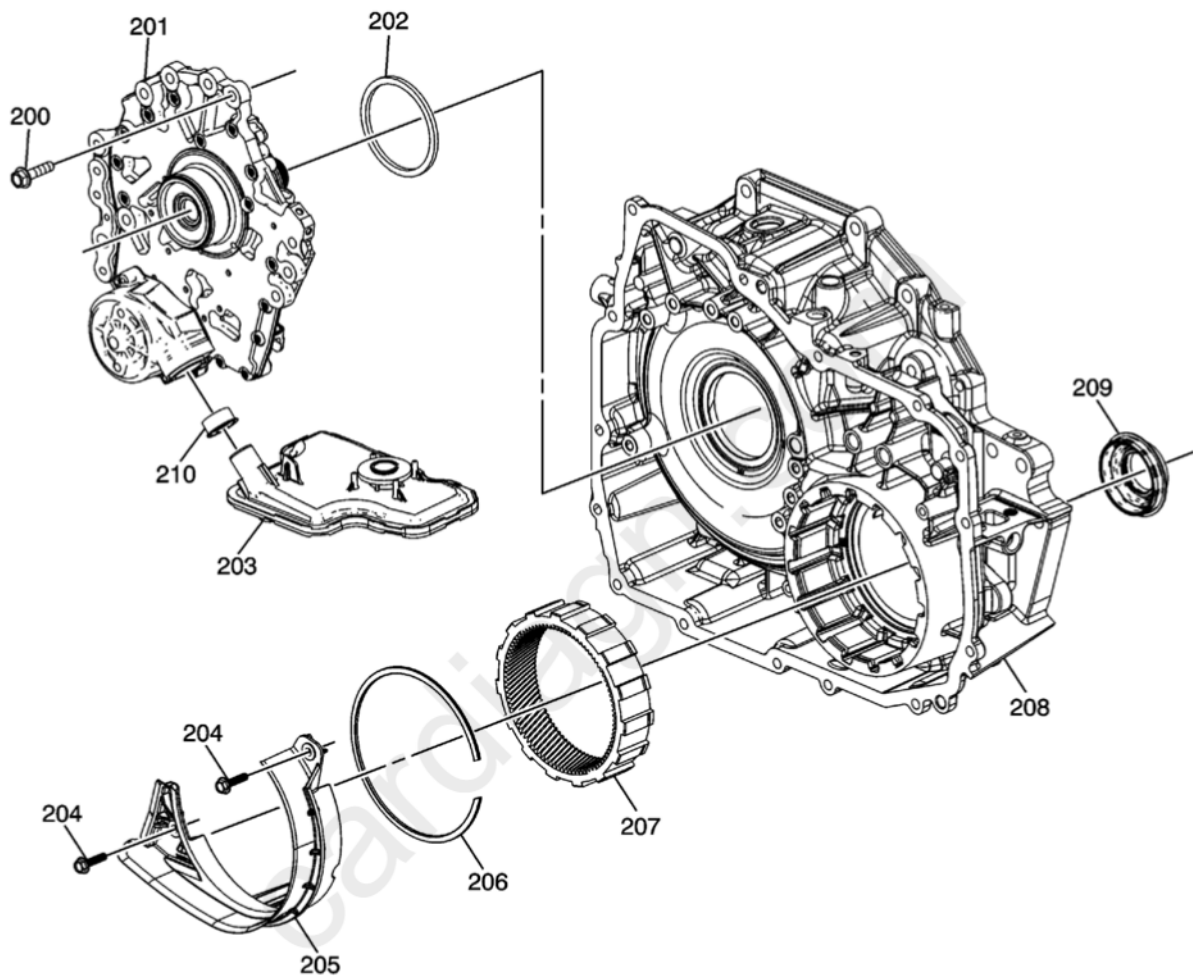


Fig. 3: Torque Converter and Fluid Pump Housing Assembly Components - Gen 3
 Courtesy of GENERAL MOTORS COMPANY

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

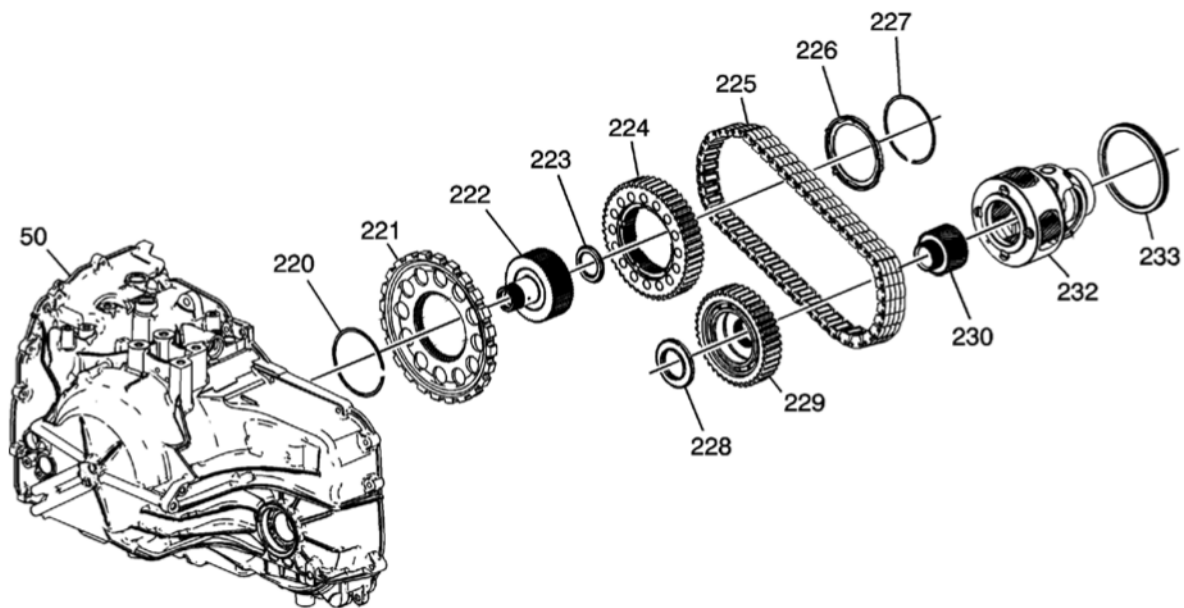


Fig. 4: Drive Link Assembly Components

Courtesy of GENERAL MOTORS COMPANY

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

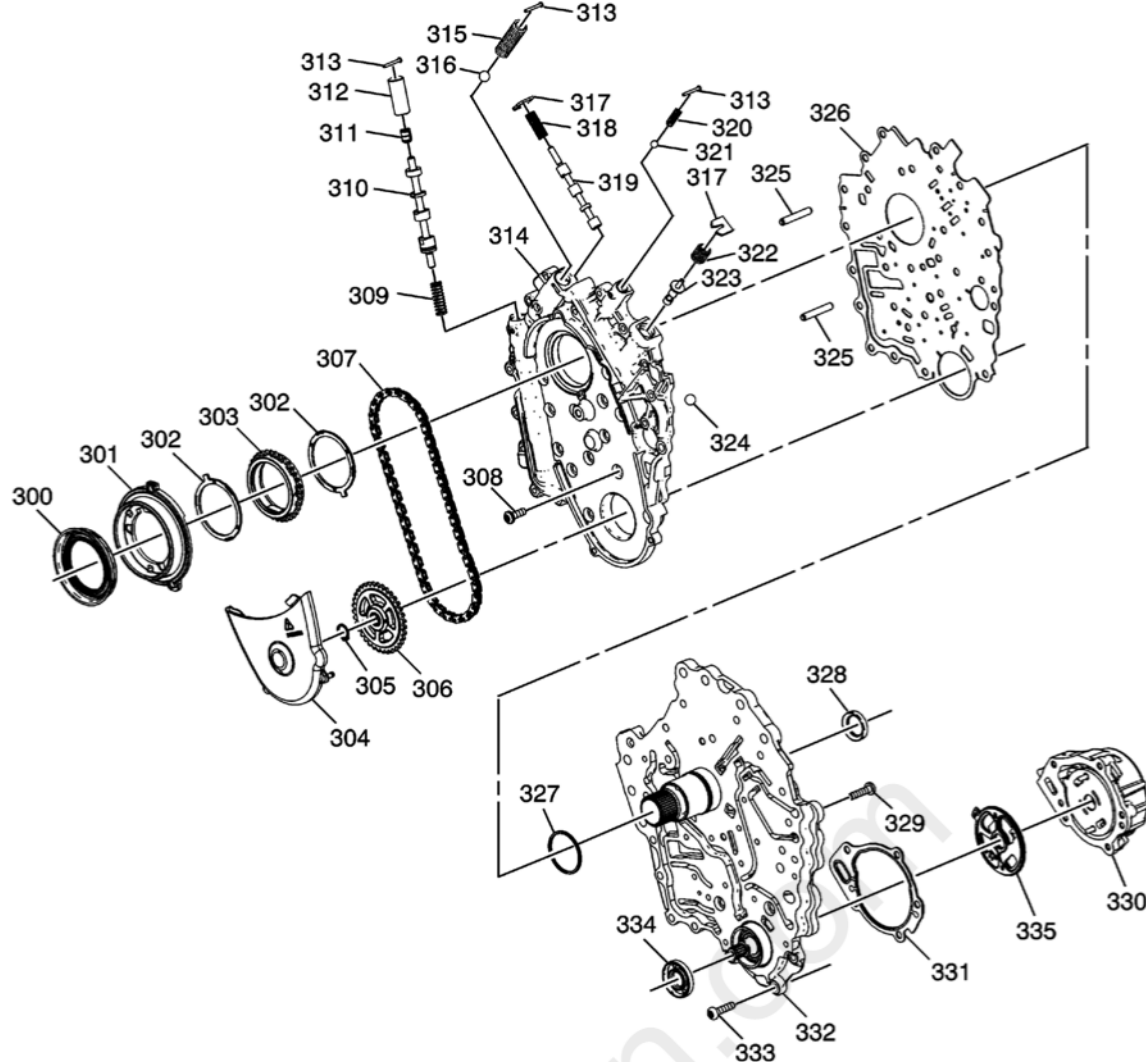


Fig. 5: Oil Pump Assembly Components - Gen 3
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
300	Torque Converter Fluid Seal
301	Drive Sprocket Cover
302	Drive Sprocket Thrust Washer
303	Drive Sprocket
304	Pump Sprocket Baffle
305	Driven Sprocket Retainer
306	Driven Sprocket
307	Drive Link Assembly
308	A/Trans Fluid Pump Body Bolt
309	Pressure Regulator Valve Spring
310	Pressure Regulator Valve
311	Pressure Regulator Valve Isolator
312	Pressure Regulator Valve Sleeve
313	Valve Retainer
314	A/Trans Fluid Pump Body
315	Pump Blowoff Ball Valve Spring
316	Pump Blowoff Ball Valve
317	Valve Retainer
318	TCC Control Valve Spring
319	TCC Control Valve
320	TCC Blowoff Ball Valve Spring
321	TCC Blowoff Ball Valve
322	Lube On Demand Valve Spring

Callout	Component Name
323	Lube On Demand Valve
324	Ball Valve
325	A/Trans Fluid Pump Locating Pin
326	A/Trans Fluid Pump Transfer Plate Body Assembly
327	Fluid Seal Ring
328	A/Trans Fluid Pump Seal
329	A/Trans Fluid Pump Assembly Bolt
330	A/Trans Fluid Pump Assembly
331	Pump Body Gasket
332	A/Trans Fluid Pump Cover Assembly
333	A/Trans Fluid Pump Cover Bolt
334	A/Trans Fluid Pump Seal
335	A/Trans Fluid Pump Pressure Plate Seal

Auxiliary Fluid Accumulator and Hybrid Components - Hybrid Models

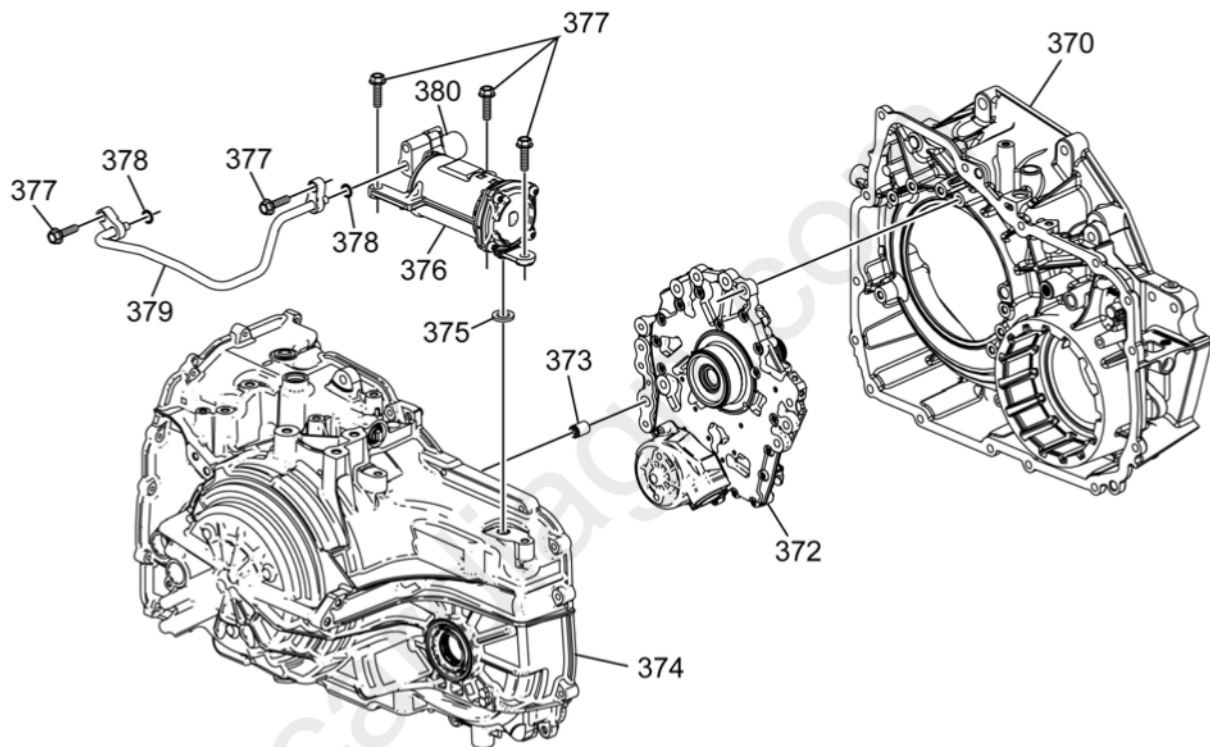


Fig. 6: Auxiliary Fluid Accumulator and Hybrid Components - Hybrid Models

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
370	Torque Converter and Differential Housing
372	Automatic Transmission Fluid Pump Assembly
373	Automatic Transmission Fluid Trough Check Ball
374	Automatic Transmission Case
375	Accumulator Bypass Valve Seal
376	Automatic Transmission Auxiliary Fluid Accumulator
377	Automatic Transmission Auxiliary Fluid Accumulator Bolt
378	Automatic Transmission Fluid Accumulator Pipe Seal
379	Automatic Transmission Fluid Accumulator Pipe
380	Automatic Transmission Auxiliary Fluid Accumulator Solenoid

Control Valve Body Assembly (1 of 2)

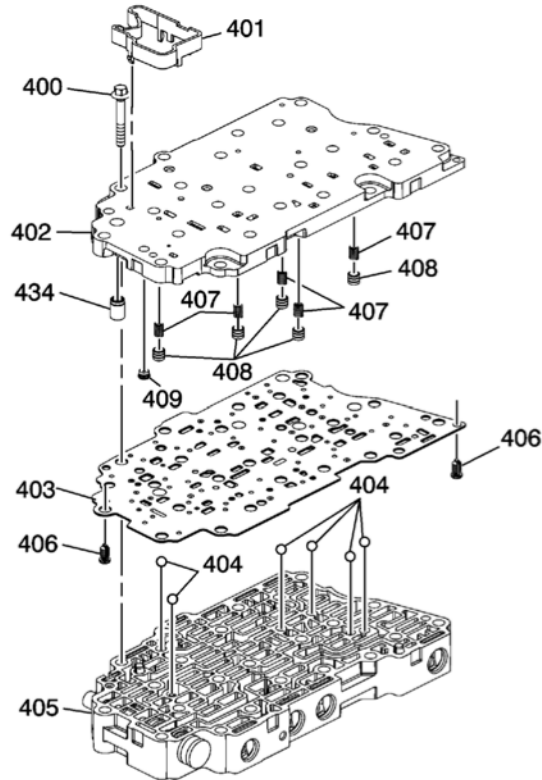


Fig. 7: Control Valve Body Assembly (1 Of 2)
Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Assembly (2 of 2)

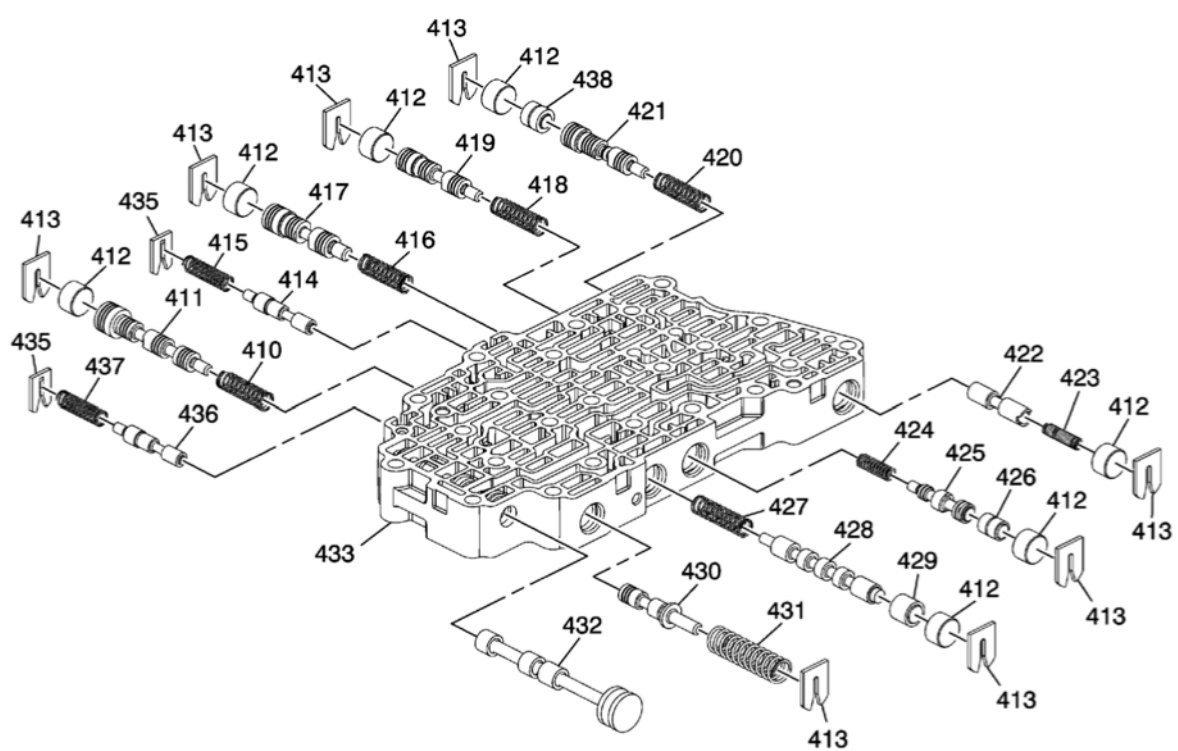


Fig. 8: Control Valve Body Assembly (2 Of 2)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
410	Low-Reverse and 4-5-6 Clutch Regulator Valve Spring
411	Low-Reverse and 4-5-6 Clutch Regulator Valve
412	Clutch Valve Bore Plug
413	Valve Spring Retainer
414	1-2-3-4 Clutch Boost Valve
415	1-2-3-4 Clutch Boost Valve Spring
416	1-2-3-4 Clutch Regulator Valve Spring
417	1-2-3-4 Clutch Regulator Valve
418	2-6 Clutch Regulator Valve Spring
419	2-6 Clutch Regulator Valve
420	3-5-Reverse Clutch Regulator Valve Spring
421	3-5-Reverse Clutch Regulator Valve
422	Default Override Valve
423	Default Override Valve Spring
424	Torque Converter Clutch Regulator Apply Valve Spring
425	Torque Converter Clutch Regulator Apply Valve
426	Torque Converter Clutch Regulator Apply Shuttle Valve
427	Clutch Select Valve Spring
428	Clutch Select Valve
429	Clutch Select (Shuttle) Valve
430	Actuator Feed Limit Valve
431	Actuator Feed Limit Valve Spring
432	Manual Valve
433	Control Valve Body Assembly
435	Control Valve Body Bore Plug Retainer
436	Low-Reverse and 4-5-6 Clutch Boost Valve
437	Low-Reverse and 4-5-6 Clutch Boost Valve Spring
438	3-5 Reverse Clutch Regulator (Shuttle) Valve

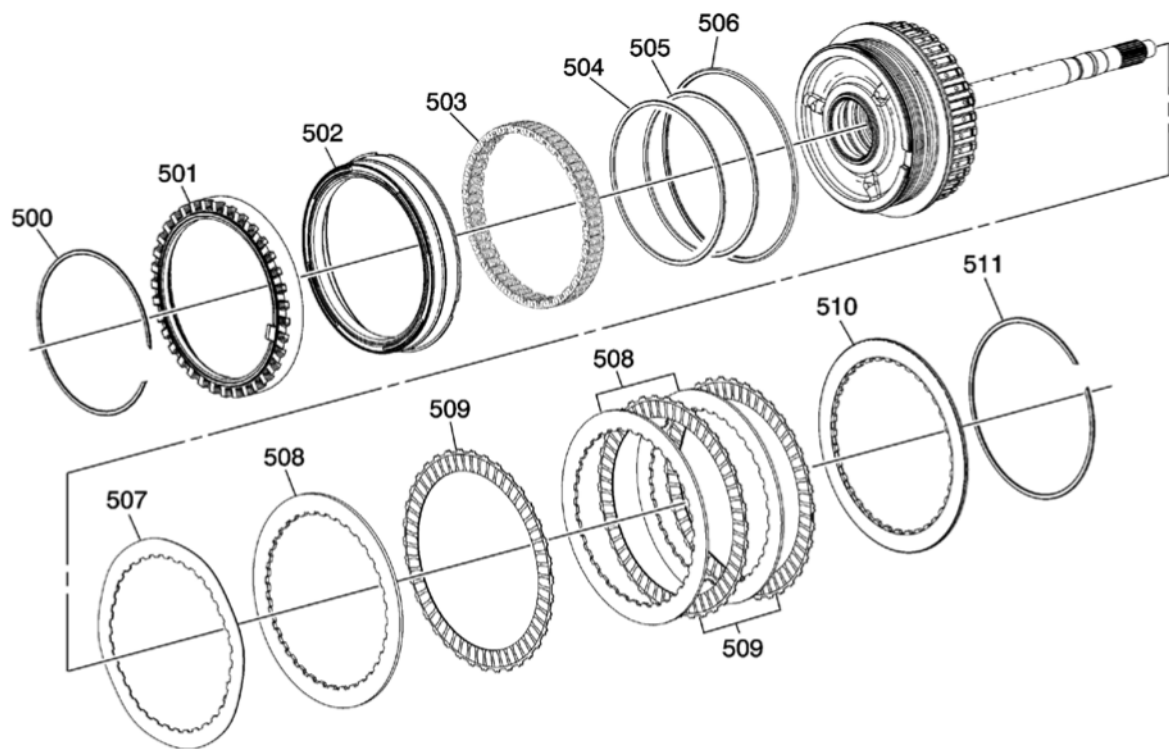


Fig. 9: 3-5 Reverse Clutch Assembly

Courtesy of GENERAL MOTORS COMPANY

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

4 - 5 - 6 Clutch Assembly

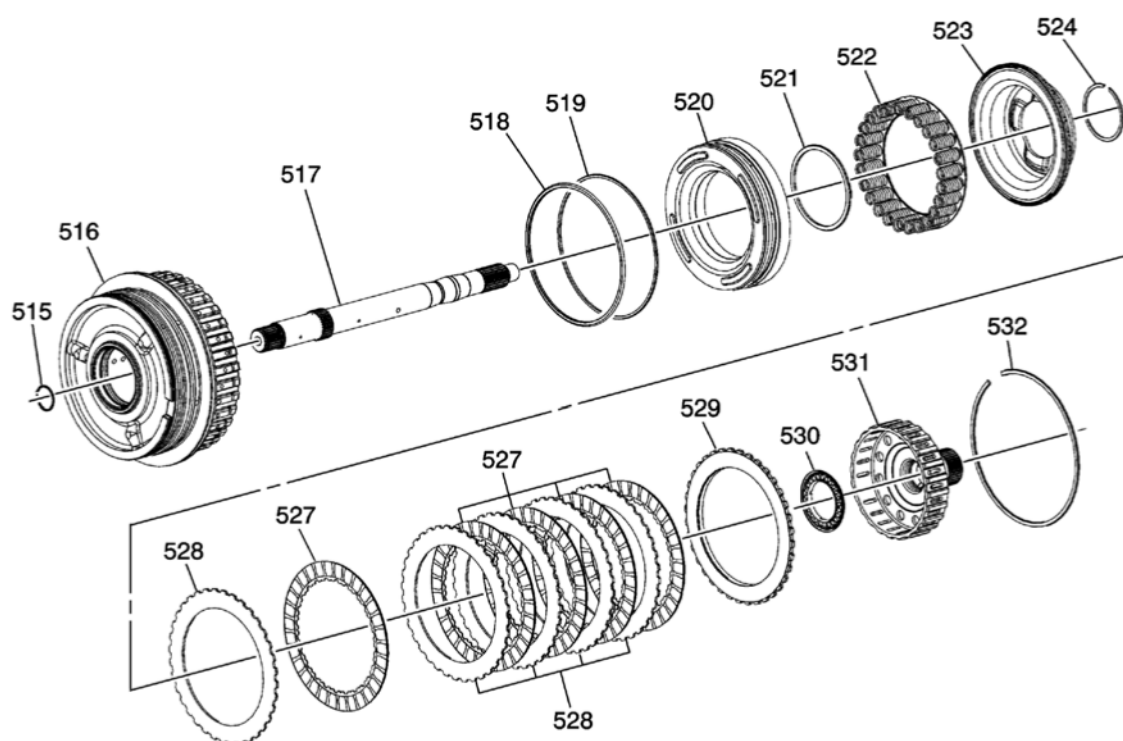


Fig. 10: 4-5-6 Clutch Assembly

Courtesy of GENERAL MOTORS COMPANY

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

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

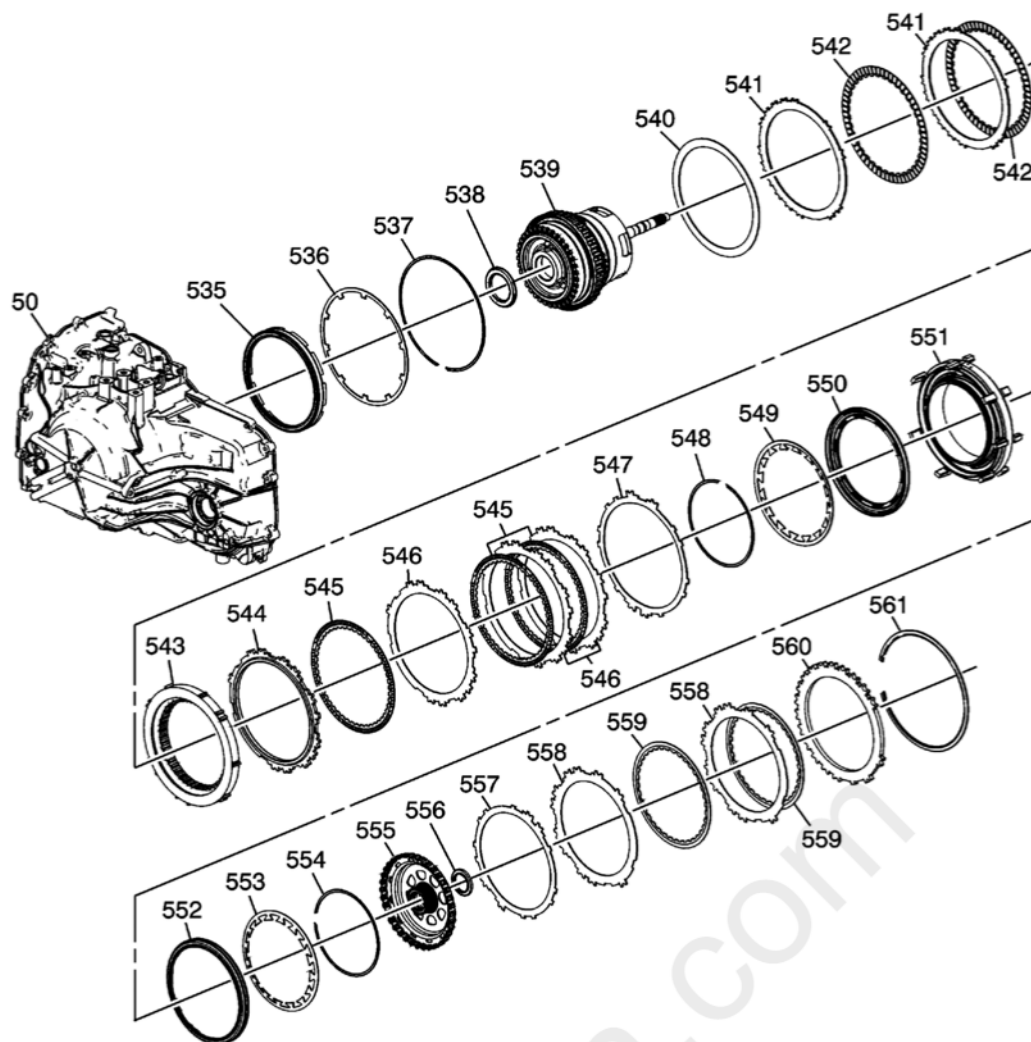


Fig. 11: 2-6, Low and Reverse and 1-2-3-4 Clutch Plate Assemblies
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
50	A/Trans Case
535	2-6 Clutch Piston Assembly
536	2-6 Clutch Spring
537	2-6 Clutch Spring Retainer Ring
538	3-5-Reverse and 4-5-6 Clutch Housing Thrust Bearing
539	3-5-Reverse and 4-5-6 Clutch Housing Assembly
540	2-6 Clutch Apply (Waved) Plate
541	2-6 Clutch Plate (Qty: 2)
542	2-6 Clutch (w/Friction Material) Plate Assembly (Qty: 2) - Model Dependent
543	Low and Reverse Clutch Assembly
544	Low and Reverse Clutch Backing Plate
545	Low and Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 3)
546	Low and Reverse Clutch Plate (Qty: 3)
547	Low and Reverse Clutch Apply (Waved) Plate
548	Low and Reverse Clutch Spring Retainer
549	Low and Reverse Clutch Spring
550	Low and Reverse Clutch Piston
551	Low and Reverse and 1-2-3-4 Clutch Housing
552	1-2-3-4 Clutch Piston
553	1-2-3-4 Clutch Spring
554	1-2-3-4 Clutch Piston Retainer
555	Output Sun Gear Assembly
556	Output Sun Thrust Bearing Assembly

Callout	Component Name
557	1-2-3-4 Clutch (Waved) Plate
558	1-2-3-4 Clutch Plate (Qty: 2)
559	1-2-3-4 Clutch (w/Friction Material) Plate Assembly (Qty: 2)
560	1-2-3-4 Clutch Backing Plate
561	1-2-3-4 Clutch Backing Plate Retainer Ring

Input, Output and Reaction Gearsets

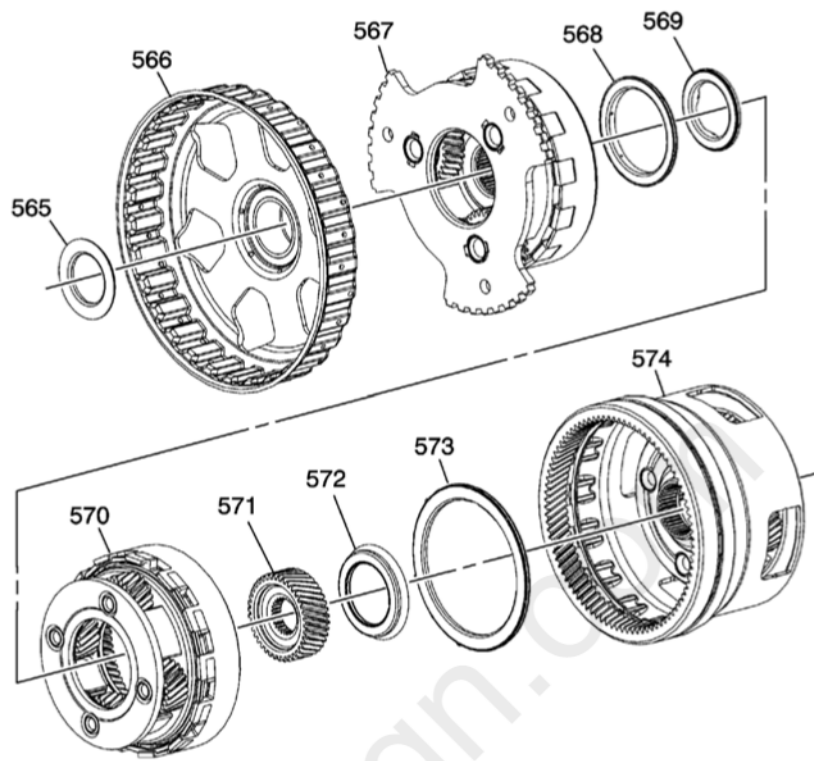


Fig. 12: Input, Output and Reaction Gearsets
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
565	Reaction Sun Gear Thrust Bearing Assembly
566	Reaction Sun Gear Assembly
567	Reaction Carrier Assembly
568	Input Carrier Thrust Bearing Assembly
569	Input Sun Gear Thrust Bearing Assembly
570	Input Carrier Assembly
571	Input Sun Gear
572	Input Sun Gear Thrust Bearing Assembly
573	Output Carrier Thrust Bearing Assembly
574	Output Carrier Assembly

Front Differential Carrier Assembly (2 Pinion)

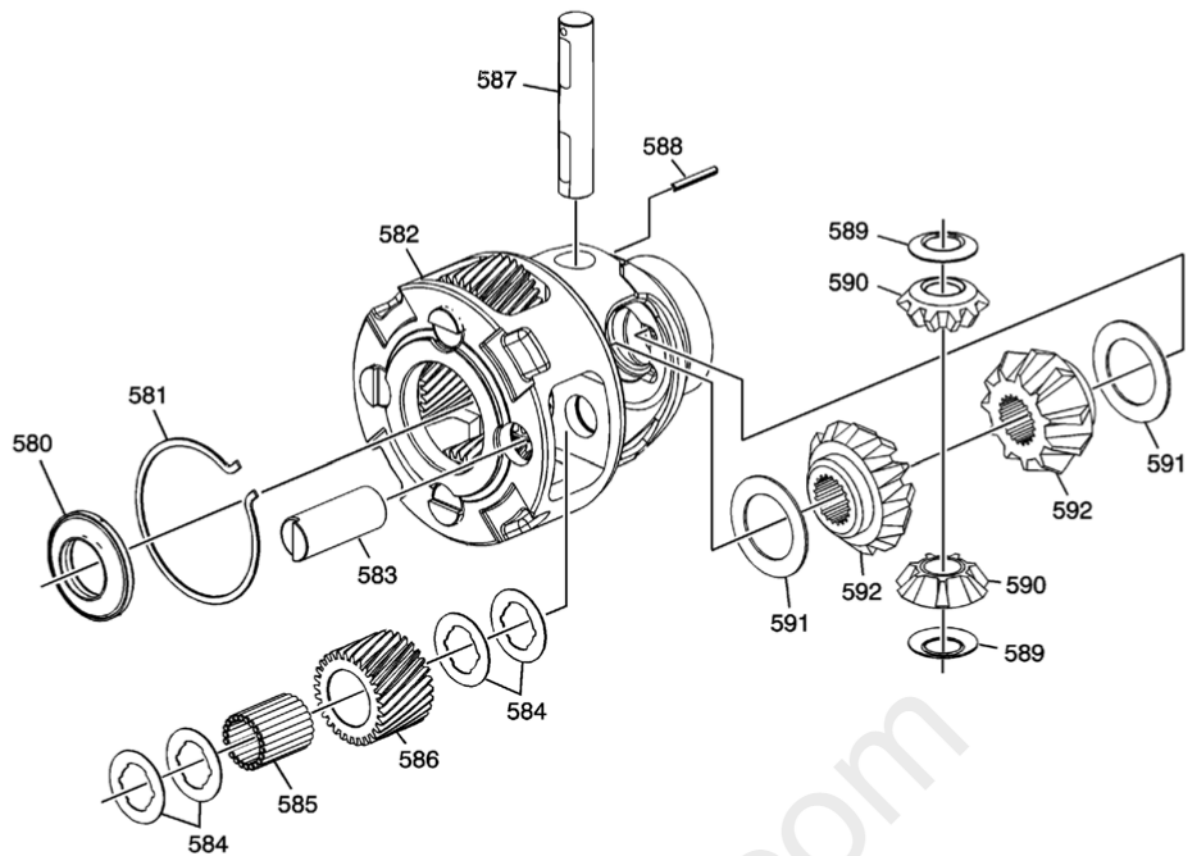


Fig. 13: Front Differential Carrier Assembly (2 Pinion)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
580	Differential Sun Gear to Differential Housing Bearing Assembly
581	Final Drive Retainer
582	Differential Carrier Assembly
583	Final Drive Pinion Pin
584	Final Drive Inner and Outer Washer
585	Final Drive Roller
586	Pinion Final Drive Gear
587	Front Differential Pinion Gear Shaft
588	Front Differential Pinion Gear Shaft Pin
589	Front Differential Pinion Gear Thrust Washer
590	Front Differential Pinion Gear
591	Front Differential Side Gear Thrust Washer
592	Front Differential Side Gear

Park System Components

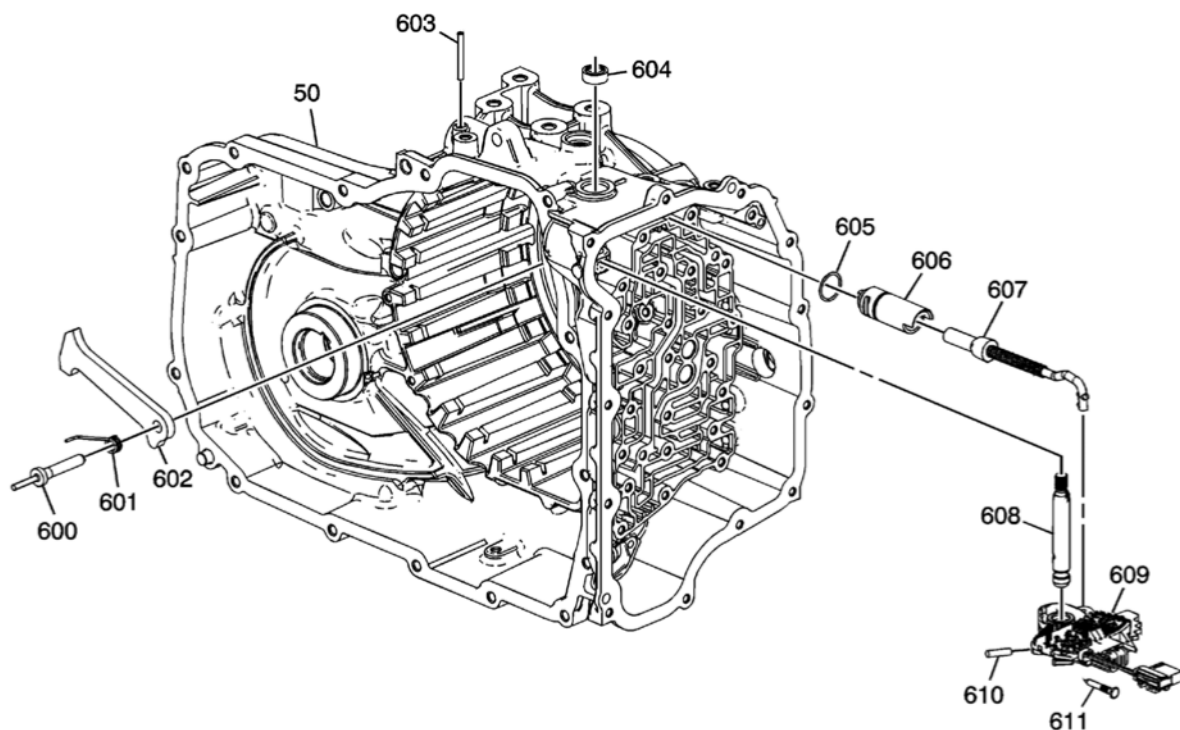


Fig. 14: Park System Components

Courtesy of GENERAL MOTORS COMPANY

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

COMPONENT LOCATION

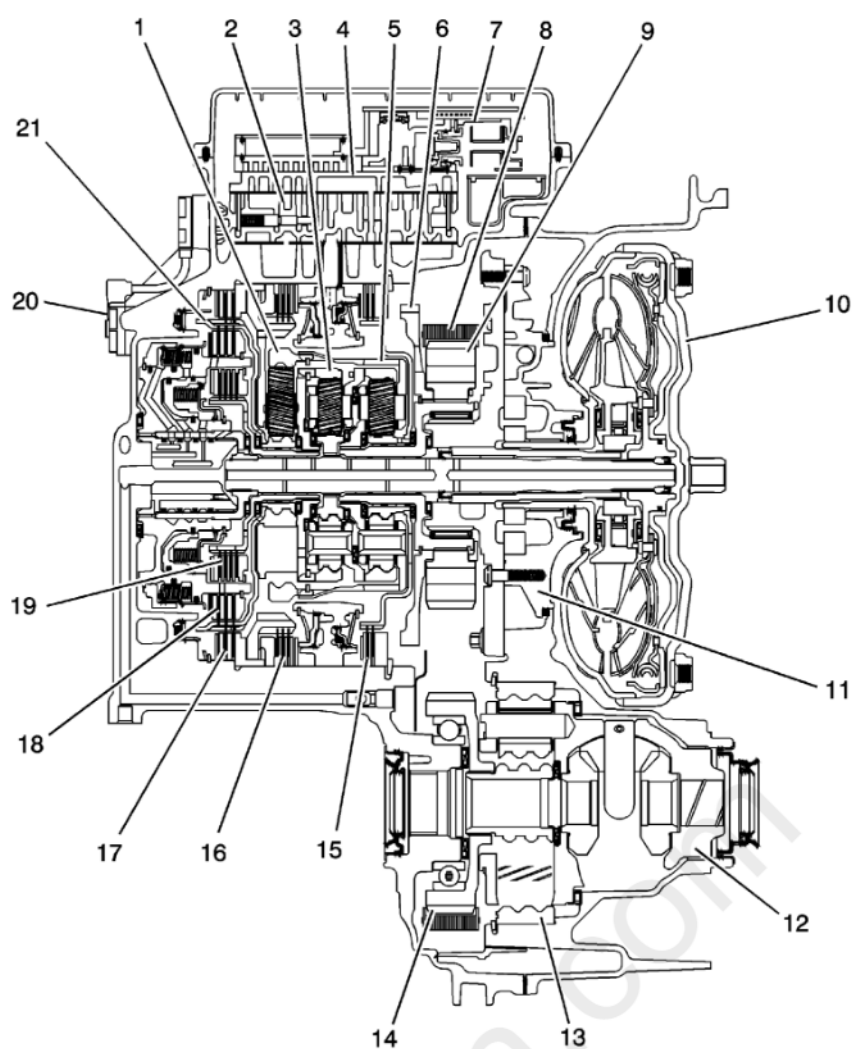


Fig. 15: A/T Component Locations

Courtesy of GENERAL MOTORS COMPANY

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

BUSHING, BEARING, AND WASHER LOCATIONS

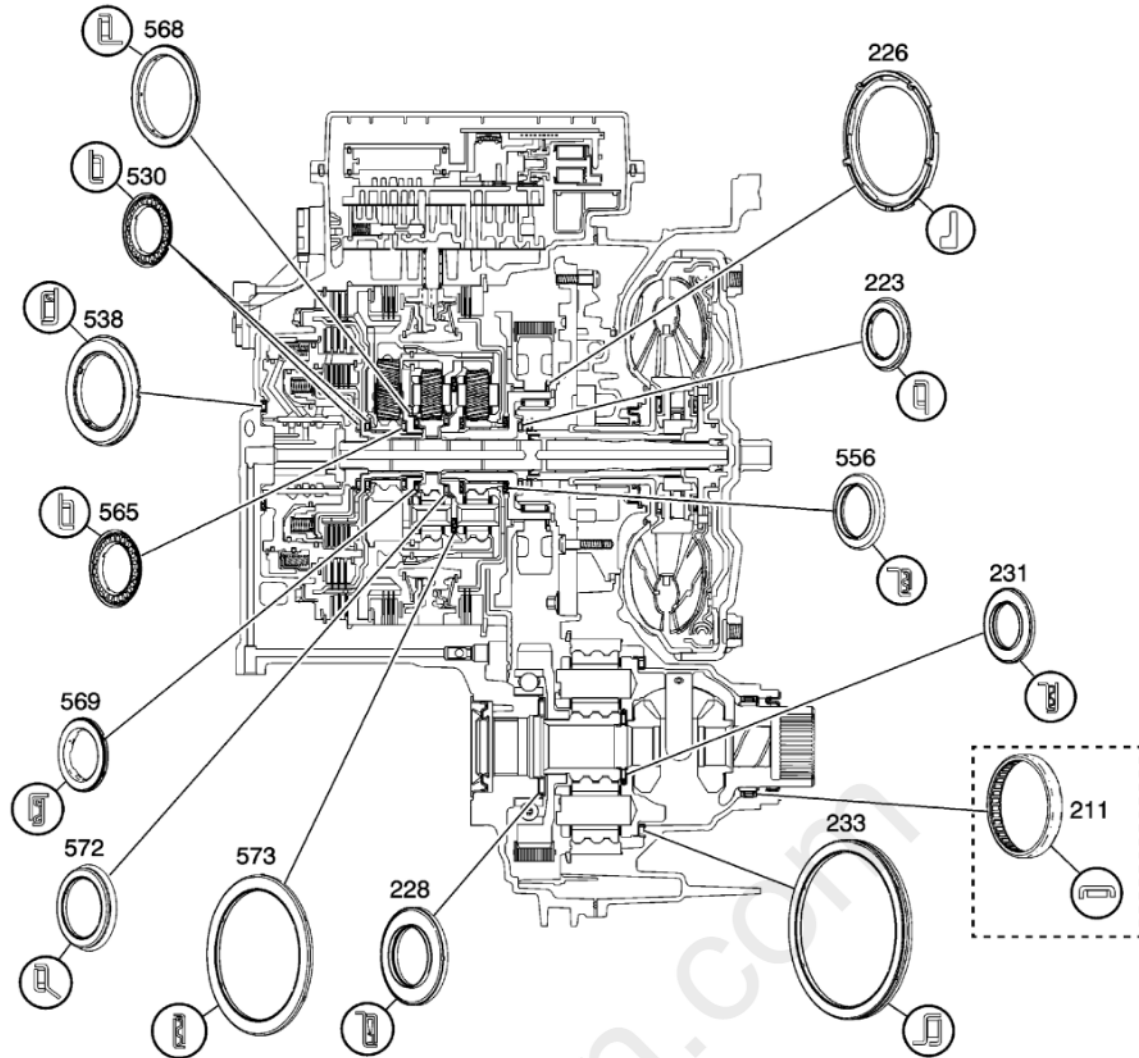


Fig. 16: Bushing, Bearing, And Washer Locations
 Courtesy of GENERAL MOTORS COMPANY

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

SEAL LOCATIONS

Seal Locations (1 of 2)

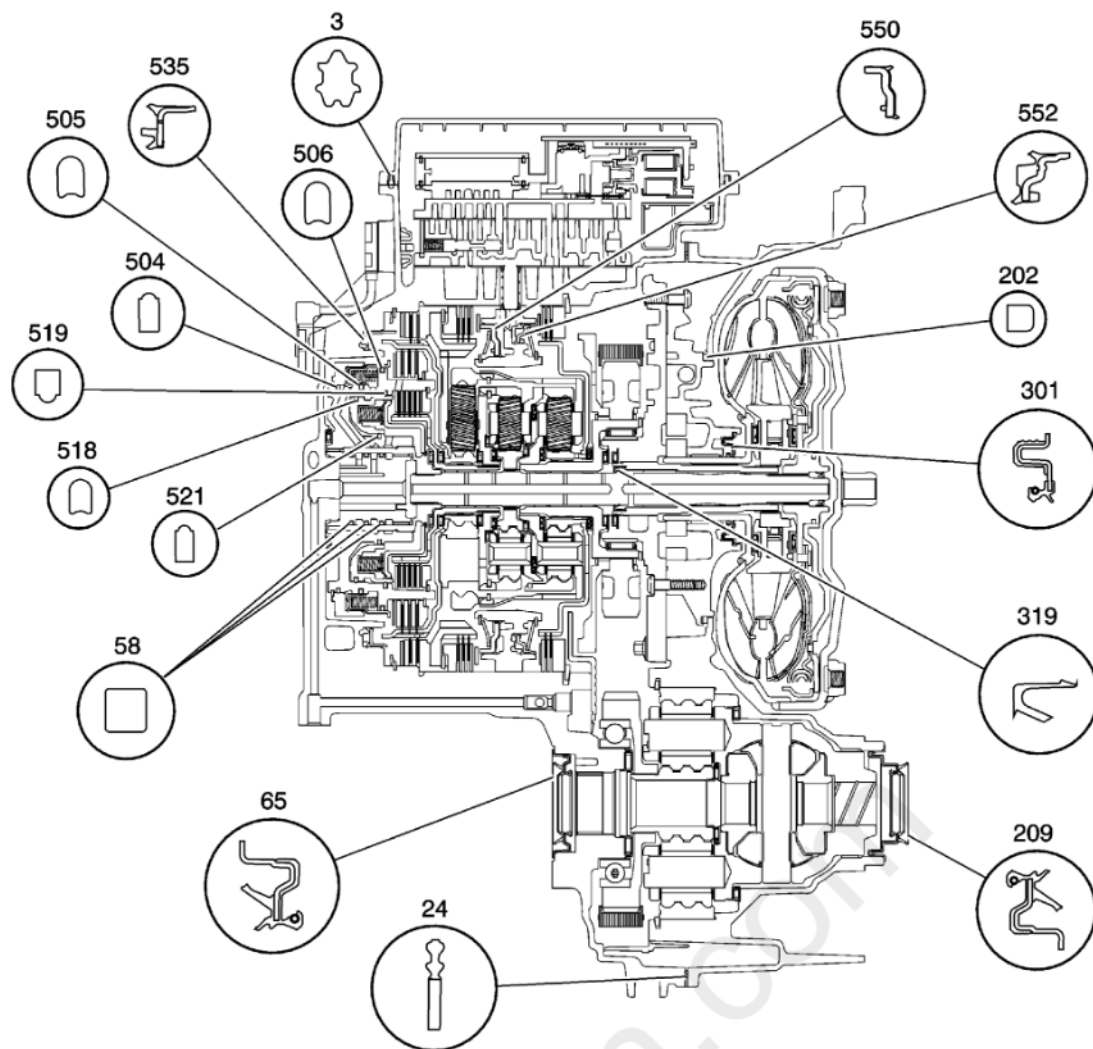


Fig. 17: Seal Locations (1 Of 2)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
3	Control Valve Body Cover Gasket
24	Torque Converter Housing Gasket
58	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring (Qty: 3)
65	Drive Shaft Oil Seal Assembly
202	Torque Converter and Differential Housing Seal
209	Front Wheel Drive Shaft Oil Seal Assembly
301	Torque Converter Fluid Seal Assembly
319	Torque Converter Fluid Seal Assembly
504	3-5-Reverse Clutch Piston Inner Seal
505	3-5-Reverse Clutch Piston Inner Seal
506	3-5-Reverse Clutch Piston Dam Seal
518	4-5-6 Clutch Piston Outer Seal
519	4-5-6 Clutch Piston Outer Seal
521	4-5-6 Clutch Piston Inner Seal
535	2-6 Clutch Piston Assembly
550	Low and Reverse Clutch Piston
552	1-2-3-4 Clutch Piston

Seal Locations (2 of 2)

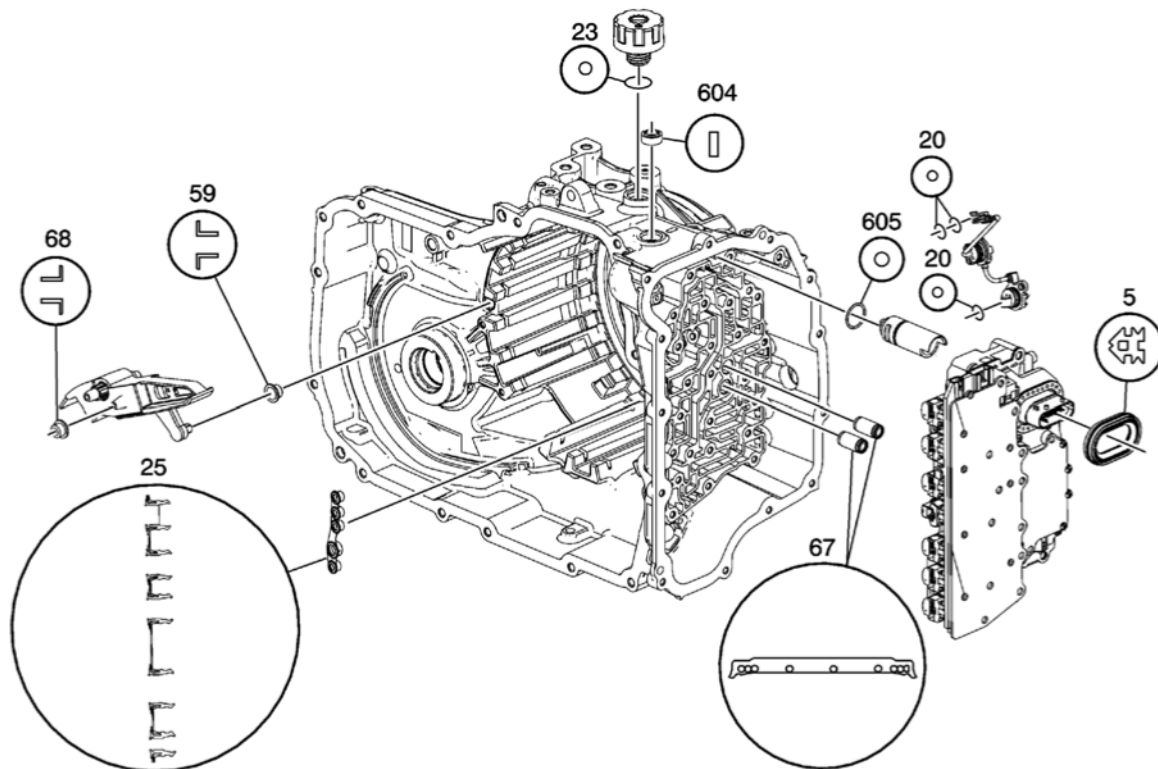


Fig. 18: Seal Locations (2 Of 2)

Courtesy of GENERAL MOTORS COMPANY

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

Auxiliary Fluid Pump and Hybrid Seals - Hybrid Models

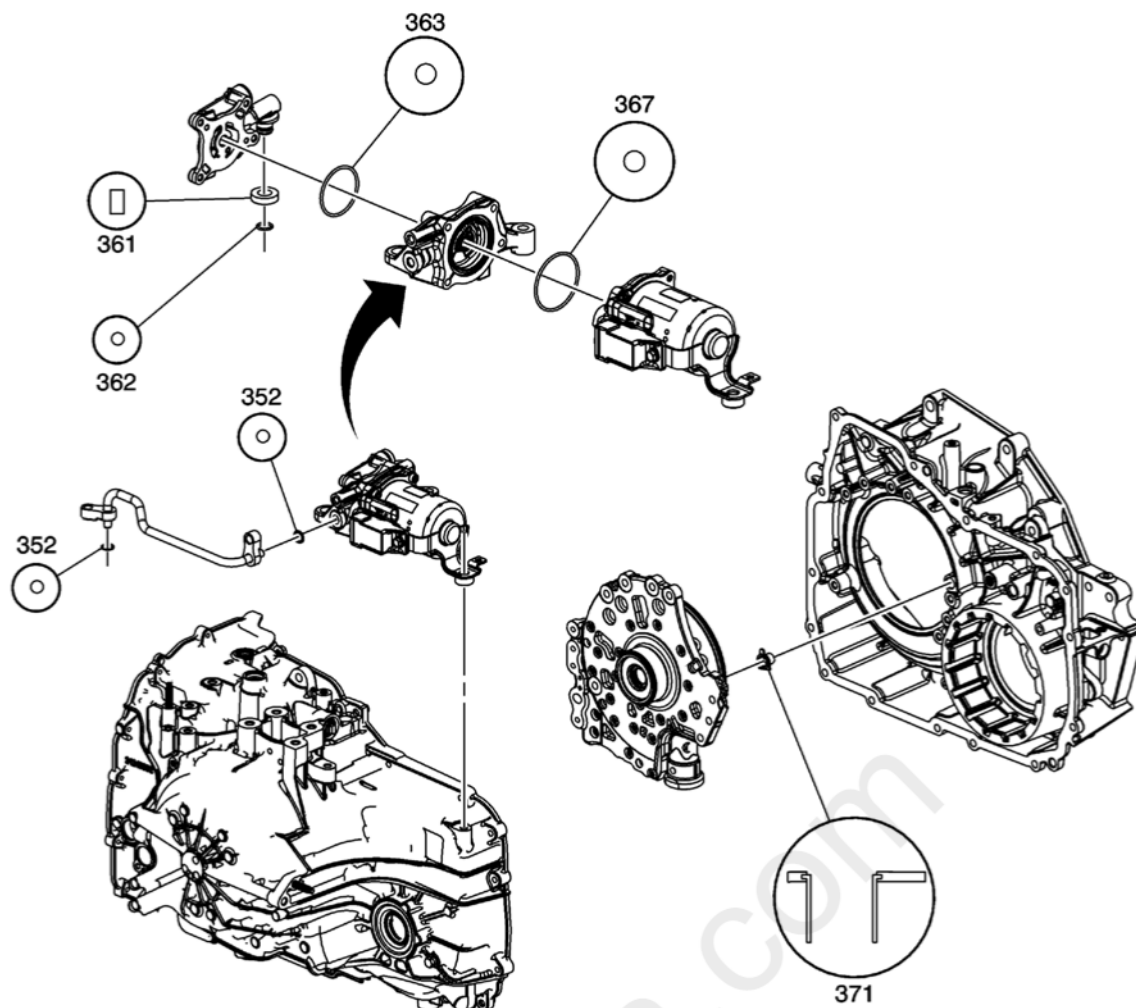


Fig. 19: Auxiliary Fluid Pump And Hybrid Seals - Hybrid Models

Courtesy of GENERAL MOTORS COMPANY

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

BALL CHECK VALVE LOCATIONS (GEN 3)

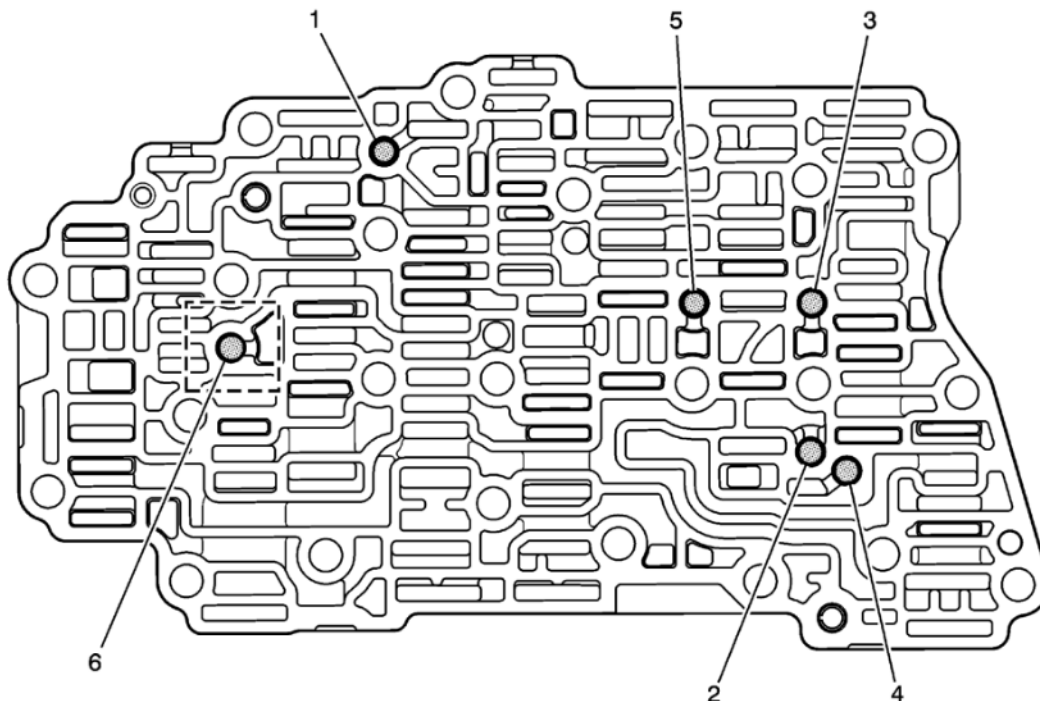


Fig. 20: Ball Check Valve Locations (Gen 3)
 Courtesy of GENERAL MOTORS COMPANY

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

NOTE:

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

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Description and Operation - Impala

DESCRIPTION AND OPERATION

DEFINITIONS AND ABBREVIATIONS

Throttle Positions

Engine Braking

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

Full Throttle Downshift

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

Heavy Throttle

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

Light Throttle

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

Medium Throttle

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

Minimum Throttle

The least amount of throttle opening required for an upshift.

Wide Open Throttle (WOT)

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

Zero Throttle Coastdown

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

Shift Condition Definitions

Bump

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

Chuggle

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

Delayed

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

Double Bump - Double Feel

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

Early

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

End Bump

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

Firm

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

Flare

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

Harsh - Rough

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

Hunting

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

Initial Feel

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

Late

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

Shudder

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

Slipping

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

Soft

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

Surge

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

Tie-Up

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

Noise Conditions

Drive Link Noise

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

Final Drive Noise

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

Planetary Gear Noise

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

Pump Noise

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

Torque Converter Noise

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

Driver Shift Control

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

Transmission Abbreviations

A/C

Air Conditioning

AC

Alternating Current

AT

Automatic Transmission

CC

Climate Control

DC

Direct Current

DIC

Driver Information Center

DLC

Data Link Connector

DMM

Digital Multimeter

DSC

Driver Shift Control

DTC

Diagnostic Trouble Code

EBTCM

Electronic Brake/Traction Control Module

ECCC

Electronically-Controlled Capacity Clutch

ECT

Engine Coolant Temperature

EMI

Electromagnetic Interference

IAT

Intake Air Temperature

IGN

Ignition

IMS

Internal Mode Switch

ISS

Input Speed Sensor

MAP

Manifold Absolute Pressure

MIL

Malfunction Indicator Lamp

NC

Normally Closed

NO

Normally Open

OBD

On Board Diagnostic

OSS

Output Speed Sensor

PC

Pressure Control

PCM

Powertrain Control Module

PCS

Pressure Control Solenoid

PS

Pressure Switch

PWM

Pulse Width Modulation

RPM

Revolutions Per Minute

SS

Shift Solenoid

STL

Service Transmission Lamp

TAP

Transmission Adaptive Pressure

TCC

Torque Converter Clutch

TFP

Transmission Fluid Pressure

TFT

Transmission Fluid Temperature

TP

Throttle Position

VSS

Vehicle Speed Sensor

WOT

Wide Open Throttle

TRANSMISSION IDENTIFICATION INFORMATION

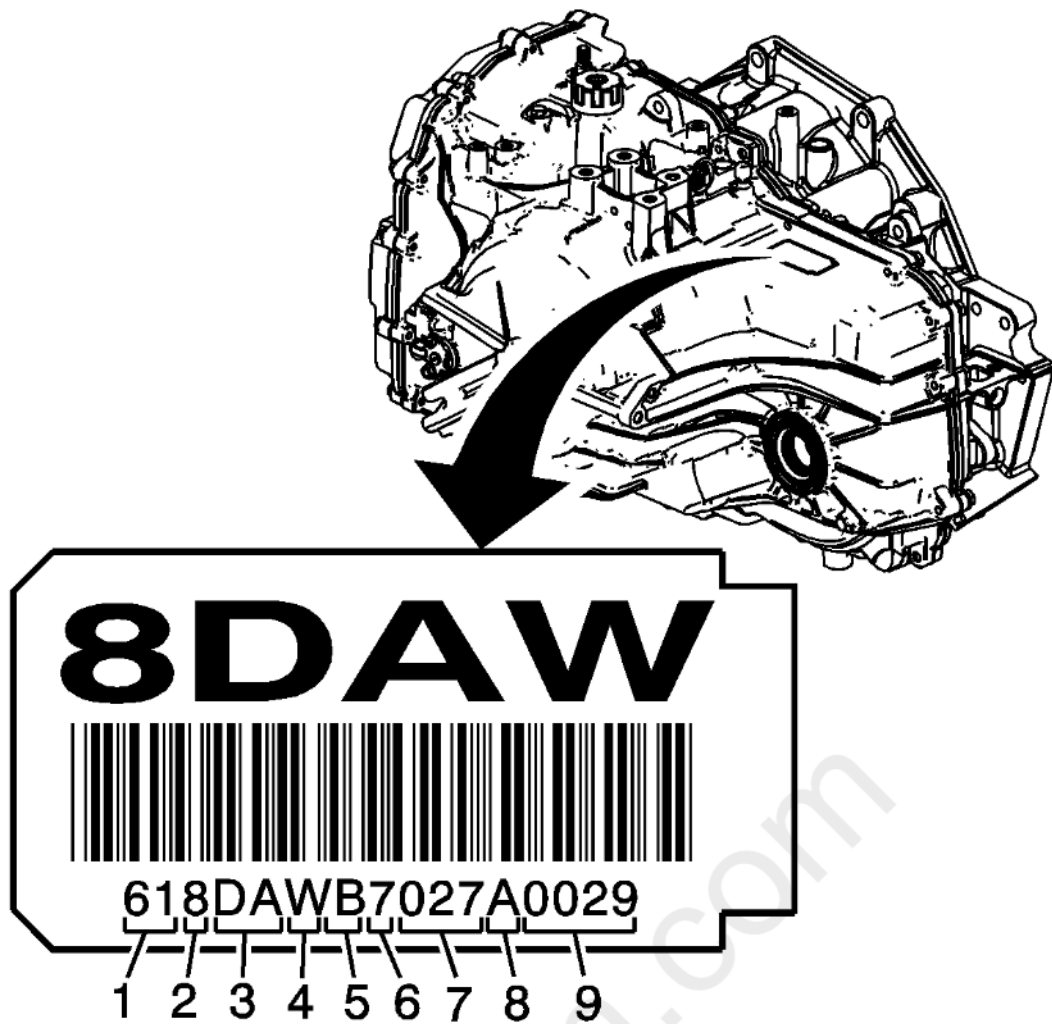


Fig. 1: Transmission Identification Information Plate

Courtesy of GENERAL MOTORS COMPANY

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

Source Code for Plant

- 4 - Ramos Arizpe, Mexico
- H - Ypsilanti, Michigan
- J - Windsor, Ontario
- K - St. Catharines, Ontario
- S - Strasbourg, France
- W - Warren, Michigan
- Y - Toledo, Ohio
- R - Boryeong, Korea
- M - Yan Tai, Shan Dong, China
- P - San Luis Potosi, Mexico

TRANSMISSION GENERAL DESCRIPTION (GEN 3)

The Hydra-matic 6T30/35/40/45/50 is a fully automatic, 6-speed, transverse mounted, electronic-controlled transmission. It consists primarily of a 4-element torque converter, a compound planetary gear set, friction and mechanical clutch assemblies, and a hydraulic pressurization and control system. There are 2 variants of the transmission, based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

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

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

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

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

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

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

PARK (P)

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

REVERSE (R)

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

NEUTRAL (N)

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

DRIVE (D)

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

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

This position (M - Manual/L - Low) allows the driver to utilize the DSC/ERS system. When the shift selector lever is moved to this position, the driver may select upshifts or downshifts by using

the paddle switches located on the steering wheel/shifter. An upshift is requested by pushing either + button. Refer to the vehicle owner's manual for more specific DSC/ERS information.

TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION (GEN 3)

The mechanical components of the 6T30/40/45/50 are as follows:

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

The electrical components of the 6T30/40/45/50 are as follows:

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

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

TRANSMISSION ADAPTIVE FUNCTIONS

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

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

TRANSMISSION INDICATORS AND MESSAGES

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

"TRANSMISSION HOT IDLE ENGINE"

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

"SERVICE TRANSMISSION"

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

ELECTRONIC COMPONENT DESCRIPTION

The control solenoid valve assembly contains the following components:

- Transmission control module (TCM)
- Clutch pressure control solenoids (Clutch PC Sol)
- Shift solenoids (SS)
- Line pressure control solenoid (Line PC Sol)
- Torque converter clutch pressure control solenoid (TCC PC Sol)
- Transmission fluid temperature sensor (TFT Sensor)
- TCM temperature sensor
- Power-up temperature sensor
- Transmission fluid pressure switches (TFP Sw)

These components are not serviced separately. The control solenoid valve assembly utilizes a lead-frame system to connect these components electrically to the TCM. No wires are used for these components. The control solenoid valve assembly bolts directly to the lower and upper valve body assemblies inside the transmission. The control solenoid valve assembly connects to the engine harness 14-way connector.

Control Solenoid Valve Assembly

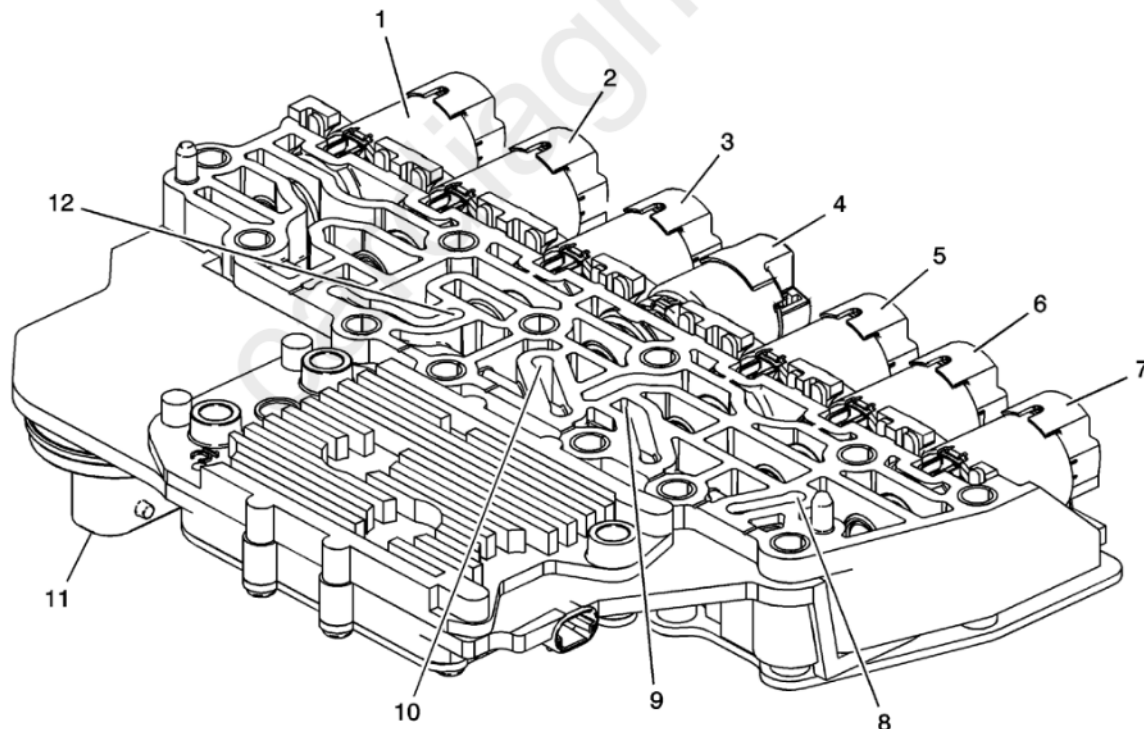


Fig. 2: Control Solenoid (W/Body And TCM) Valve Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Pressure Control Solenoid 3 (R-1/4-5-6)
2	(GEN 1) Pressure Control Solenoid 2 (3-5-R)
2	(GEN 2) Pressure Control Solenoid 5 (1-2-3-4)
3	Torque Converter Clutch (TCC) Pressure Control Solenoid
4	Shift Solenoid 1 (On/Off)

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

Manual Shift Detent Lever with Shaft Position Switch Assembly

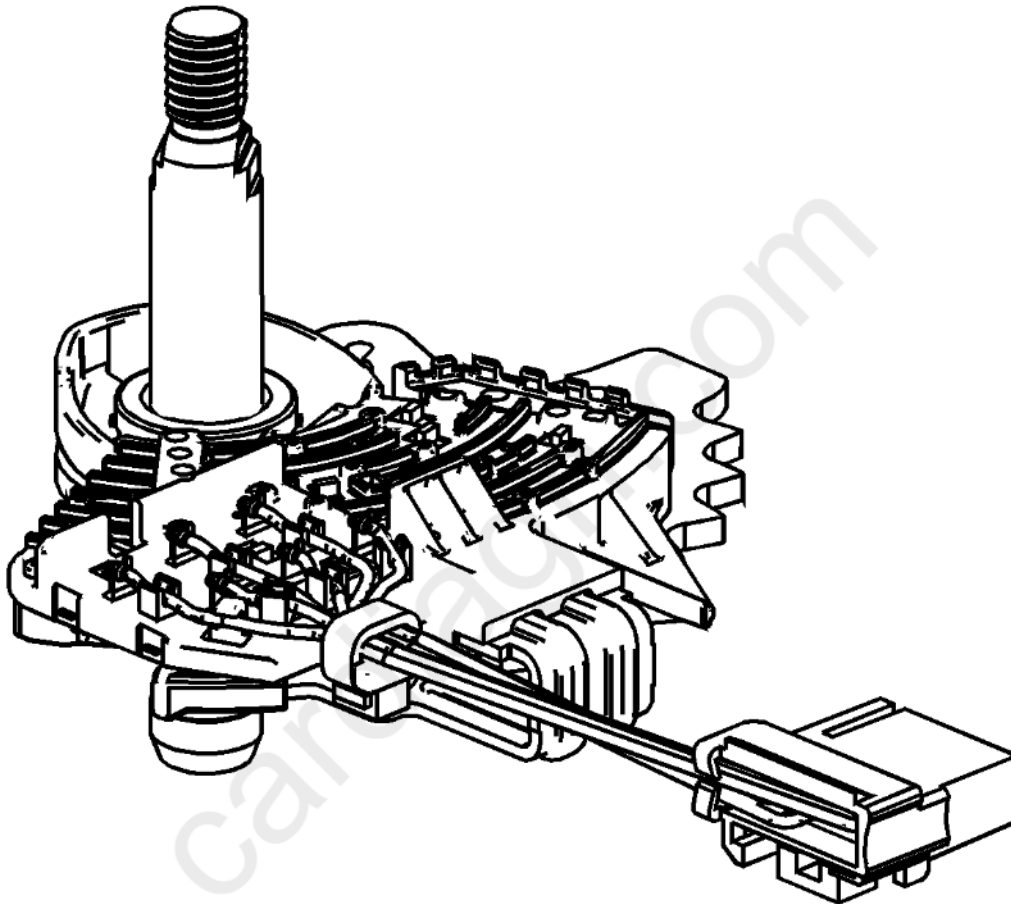


Fig. 3: Manual Shift Detent Lever And Shaft Position Switch Assembly

Courtesy of GENERAL MOTORS COMPANY

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

Input Speed Sensor (ISS)

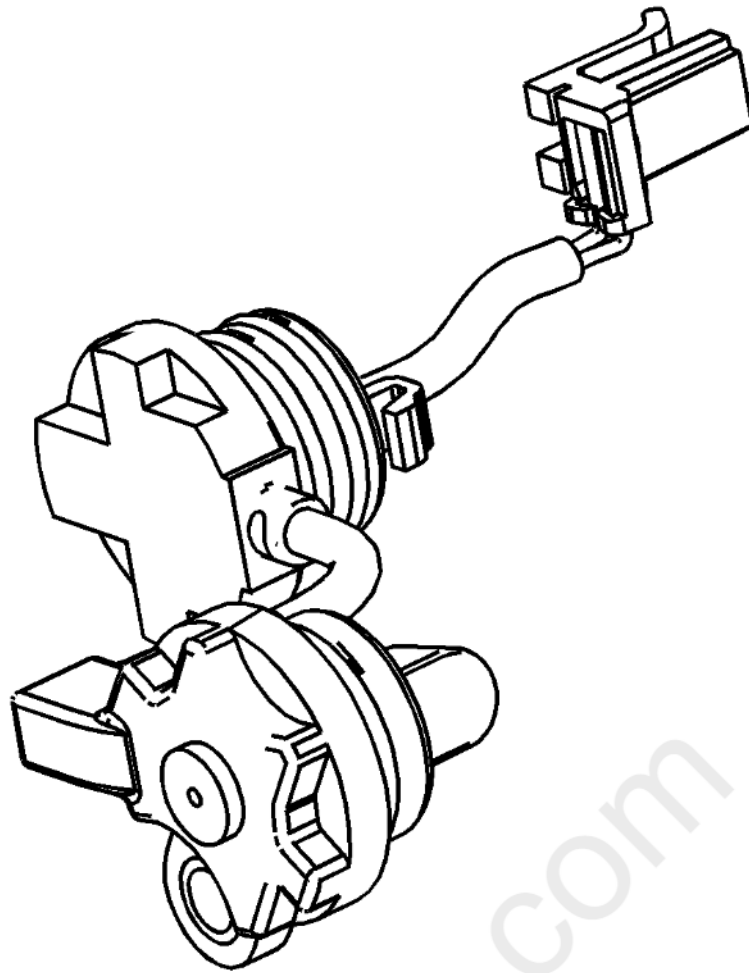


Fig. 4: Input Speed Sensor (ISS)

Courtesy of GENERAL MOTORS COMPANY

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

Output Speed Sensor (OSS)

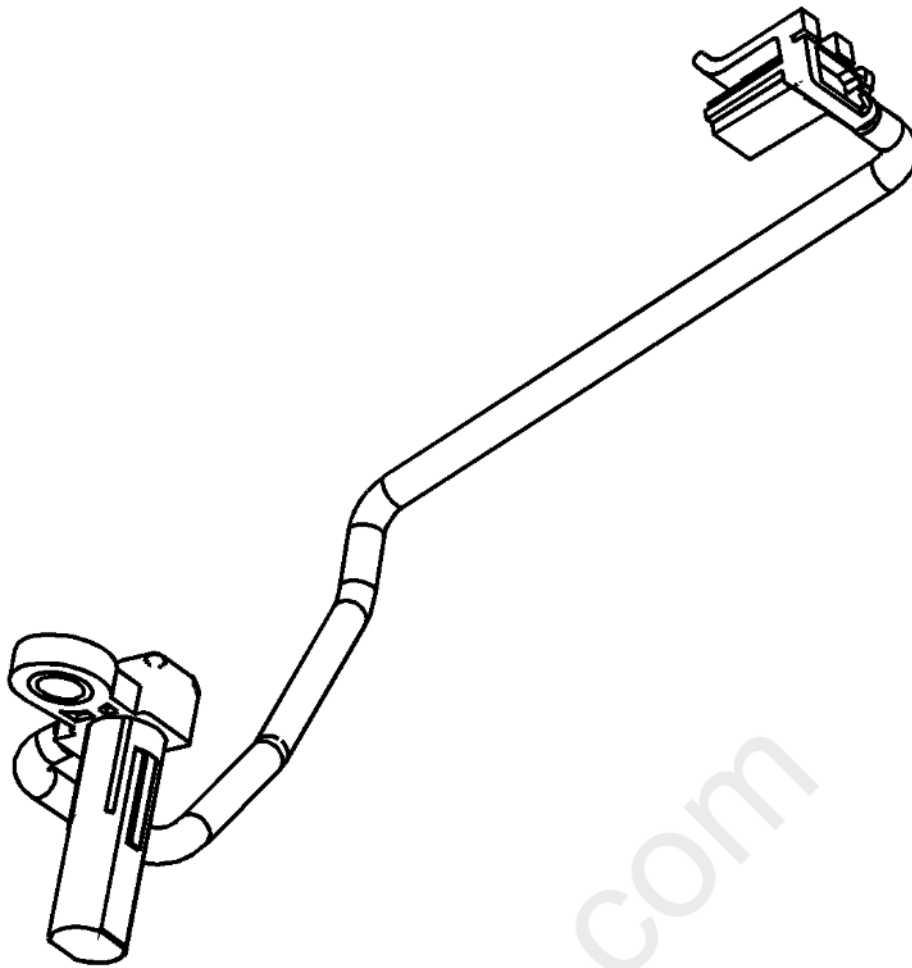


Fig. 5: Output Speed Sensor (OSS)

Courtesy of GENERAL MOTORS COMPANY

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

Transmission Fluid Pump - Auxiliary

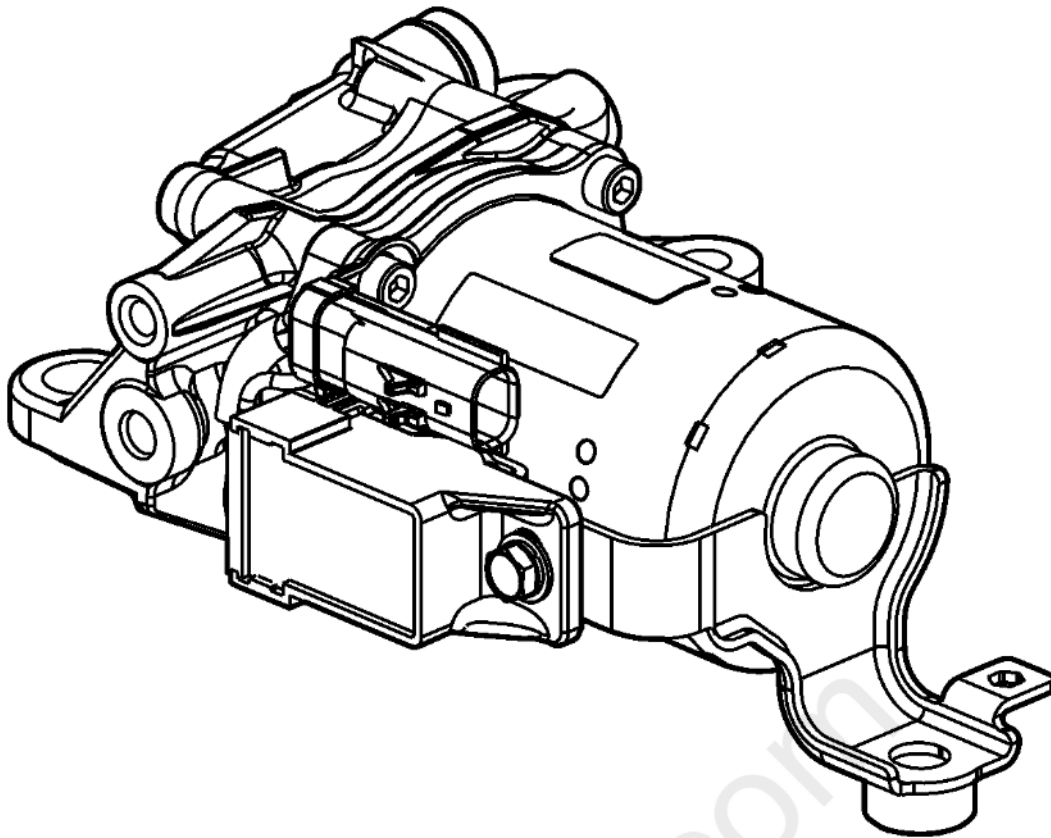


Fig. 6: Transmission Fluid Pump - Auxiliary
Courtesy of GENERAL MOTORS COMPANY

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

NON-SHIFTING CLUTCH FUNCTION VERIFICATION DESCRIPTION

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

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

When a clutch function verification is occurring, a slight bump or drag may be detected momentarily. The clutch function verification will occur a few times over several minutes and will not repeat again for a thousand or more miles. This is a normal condition and no repair attempts should be performed.

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

PARK - ENGINE RUNNING (GEN 3)

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

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

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

Actuator Feed Limit Valve

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

TCC Regulated Apply Valve

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

Default Override Valve

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

Low and Reverse Clutch Applies

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

PCS R1/456 clutch fluid at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator spring force and orificed R1/456 clutch feedback fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is routed to the R1/4-5-6 clutch boost valve and to the clutch select valve.

R1/4-5-6 Clutch Boost Valve

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

Shift Solenoid

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

Clutch Select Valve

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

Low and Reverse Clutch

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

Accumulator

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

Park - Engine Running - Gen 3

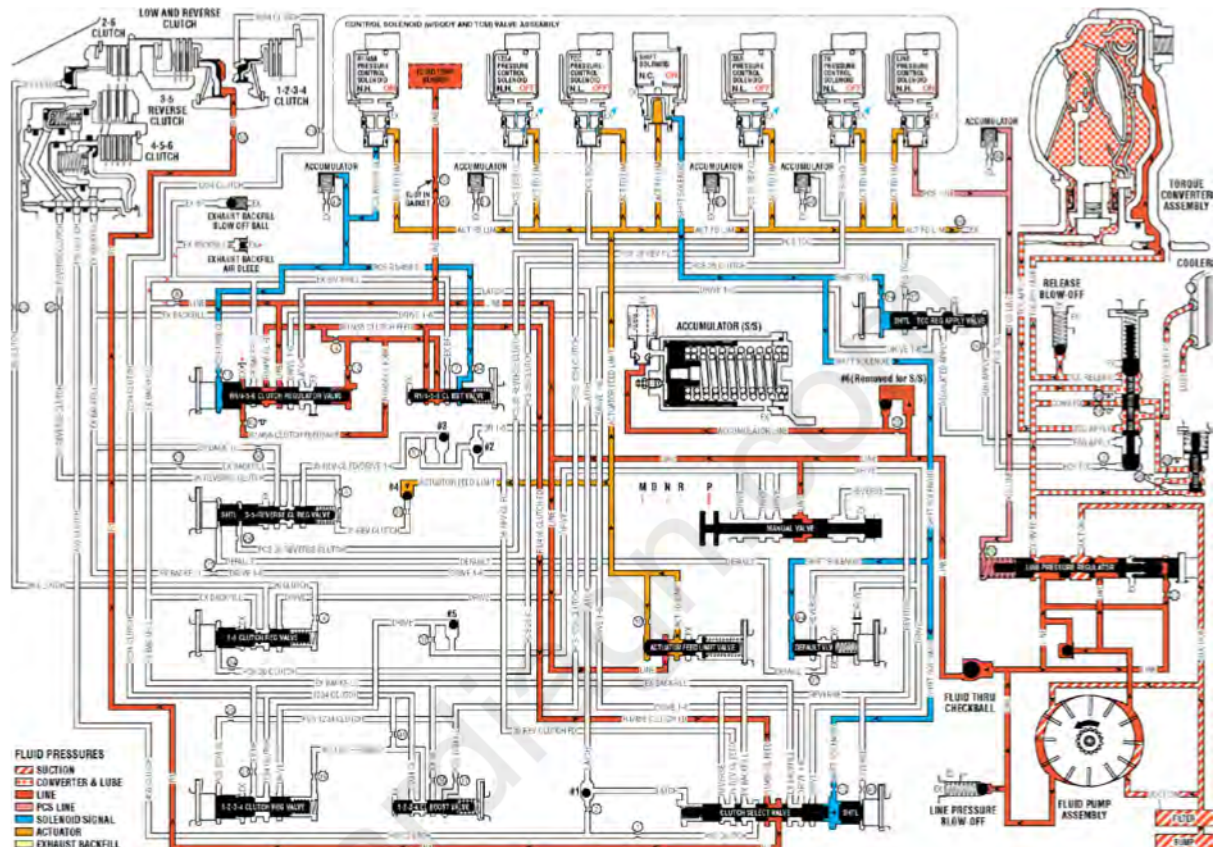


Fig. 7: Park - Engine Running - Gen 3 Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

REVERSE (GEN 3)

When the gear selector lever is moved to the Reverse (R) position (from the Park position) the normally-low 35R pressure control solenoid is commanded ON and the following changes occur in the transmission's hydraulic and electrical systems:

3-5-Reverse Clutch Applies

Manual Valve

With the manual valve in the reverse position, line pressure is directed into the reverse fluid circuit. Reverse fluid is then routed to the clutch select valve and to the default override valve.

Clutch Select Valve

Reverse fluid is routed to a differential area of the clutch select shuttle valve and assists shift solenoid fluid, present at the valve from Park position, in holding the clutch select valve against clutch select valve spring force. Reverse fluid passes through the clutch select valve into the 35 reverse clutch feed circuit and is routed to the #2 ball check valve. R1/456 clutch feed fluid, present at the valve from Park position, continues to pass through the valve into the R1 circuit in order to keep the low and reverse clutch applied.

#2 Ball Check Valve

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

#3 Ball Check Valve

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

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

Accumulator

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

Fluid Pressure Directed in Preparation for a Possible Default Action

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

Reverse - Gen 3

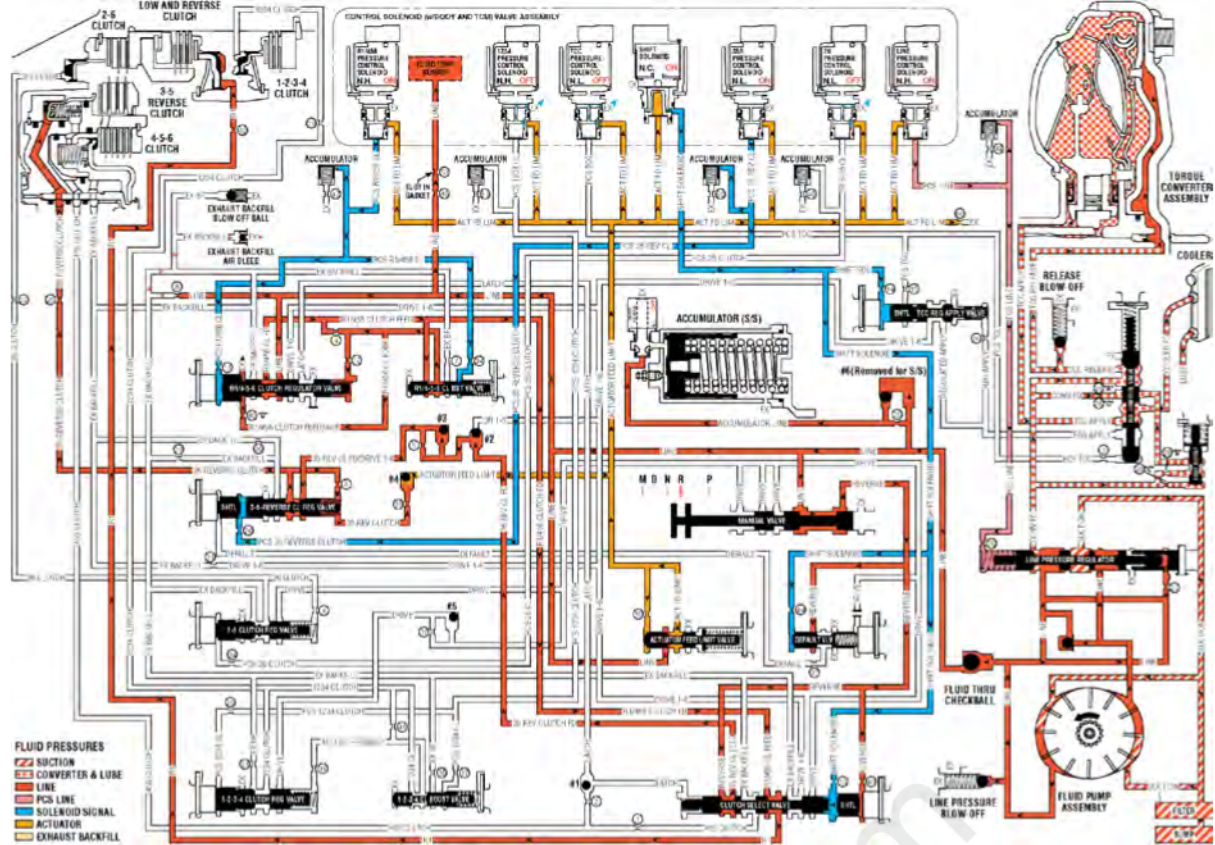


Fig. 8: Reverse - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

NEUTRAL - ENGINE RUNNING (GEN 3)

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-low 35R pressure control solenoid is commanded OFF and the following changes would occur in the hydraulic system.

3-5 Reverse Clutch Releases

Manual Valve

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

35R Pressure Control Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

Clutch Select Valve

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

Neutral - Engine Running - Gen 3

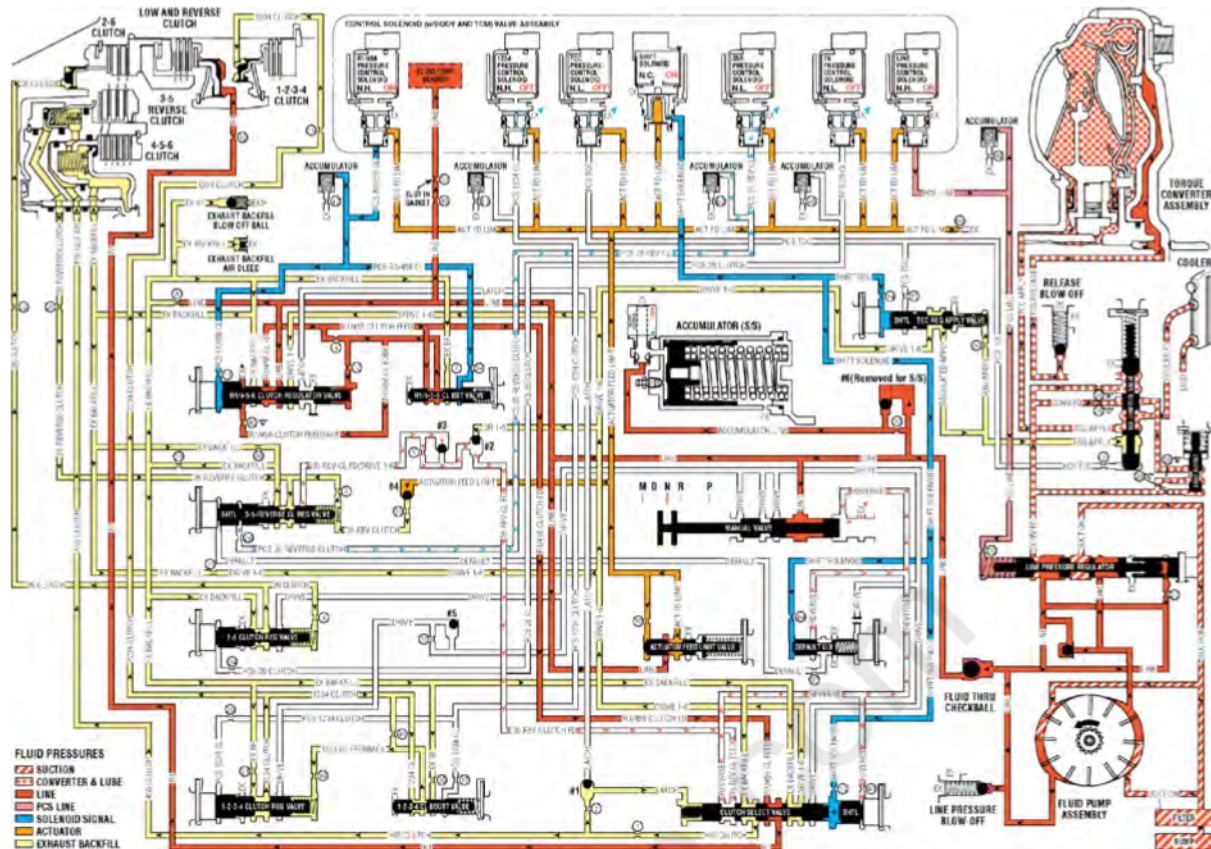


Fig. 9: Neutral - Engine Running - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR ENGINE BRAKING (GEN 3)

Note: Some models of the 6T30/40/45/50 automatic transmission are equipped with an electric auxiliary fluid pump for use in hybrid vehicles (BAS+). Hybrid vehicles do not require internal combustion engine (ICE) operation at all times. After a successful engine start, the hybrid powertrain control module (HPCM) may turn OFF the engine (Auto Stop) when not required for the current vehicle conditions. The engine will remain OFF while in Auto Stop mode, until such time that vehicle conditions require the engine to run. During Auto Stop mode the main fluid pump is no longer driven by the engine, and the auxiliary fluid pump is commanded ON to provide hydraulic fluid pressure to operate the transmission. This functional description of Drive Range - First Gear (Engine Braking), and its accompanying hydraulic circuit, is written for a non-hybrid transmission. For a hybrid (BAS+) transmission, the description and illustration are the same, with the exception that, when the engine is OFF, the main fluid pump is not operating and the auxiliary fluid pump is ON.

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

1-2-3-4 Clutch Applies

Manual Valve

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

#5 Ball Check Valve

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

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

Accumulator

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

Low and Reverse Clutch Remains Applied to Provide Engine Braking

Clutch Select Valve

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

Low and Reverse Clutch

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

Drive Range, First Gear Engine Braking - Gen 3

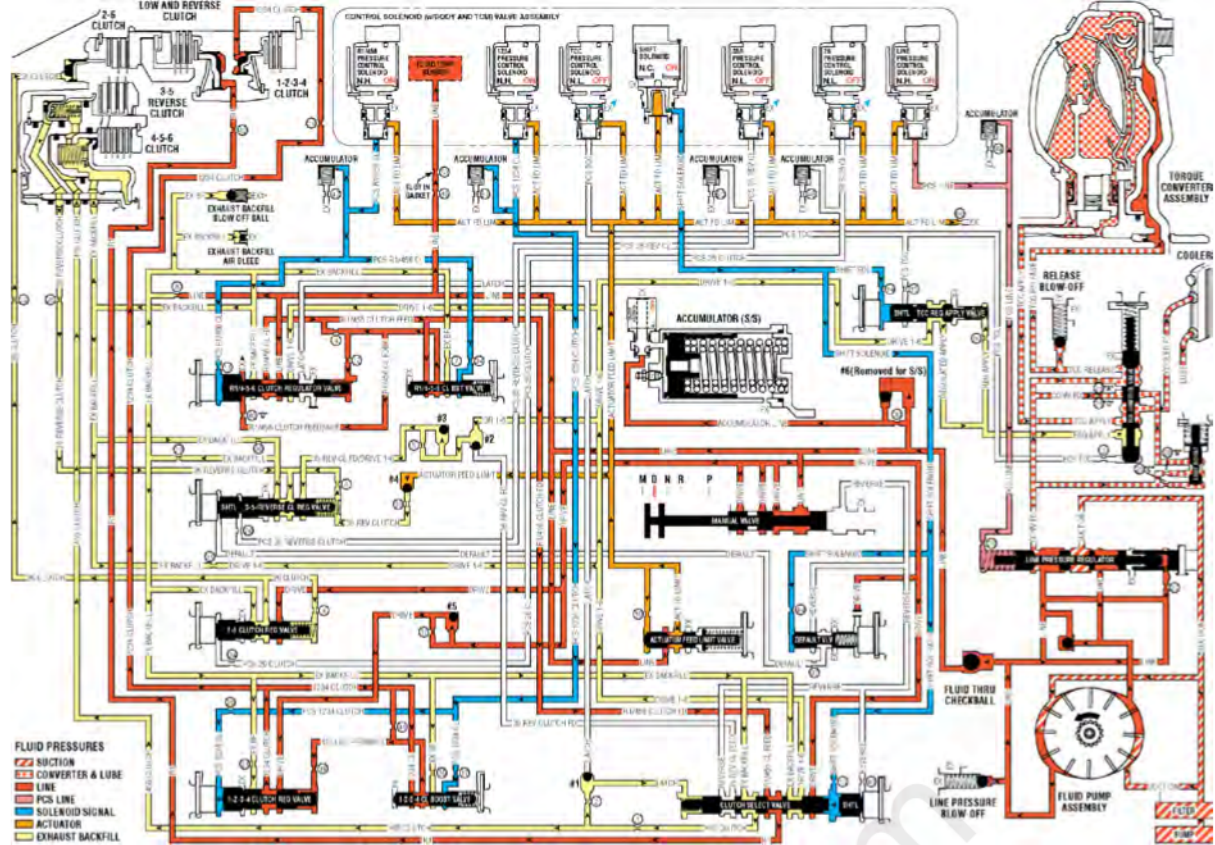


Fig. 10: Drive Range, First Gear Engine Braking - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR (GEN 3)

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

Low & Reverse Clutch Releases

Shift Solenoid

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

Clutch Select Valve

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

Low and Reverse Clutch

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

Fluid Pressure Directed in Preparation for a Shift

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

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

#1 Ball Check Valve

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

#2 Ball Check Valve

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

#3 Ball Check Valve

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

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

TCC Regulator Apply Valve

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

Drive Range, First Gear - Gen 3

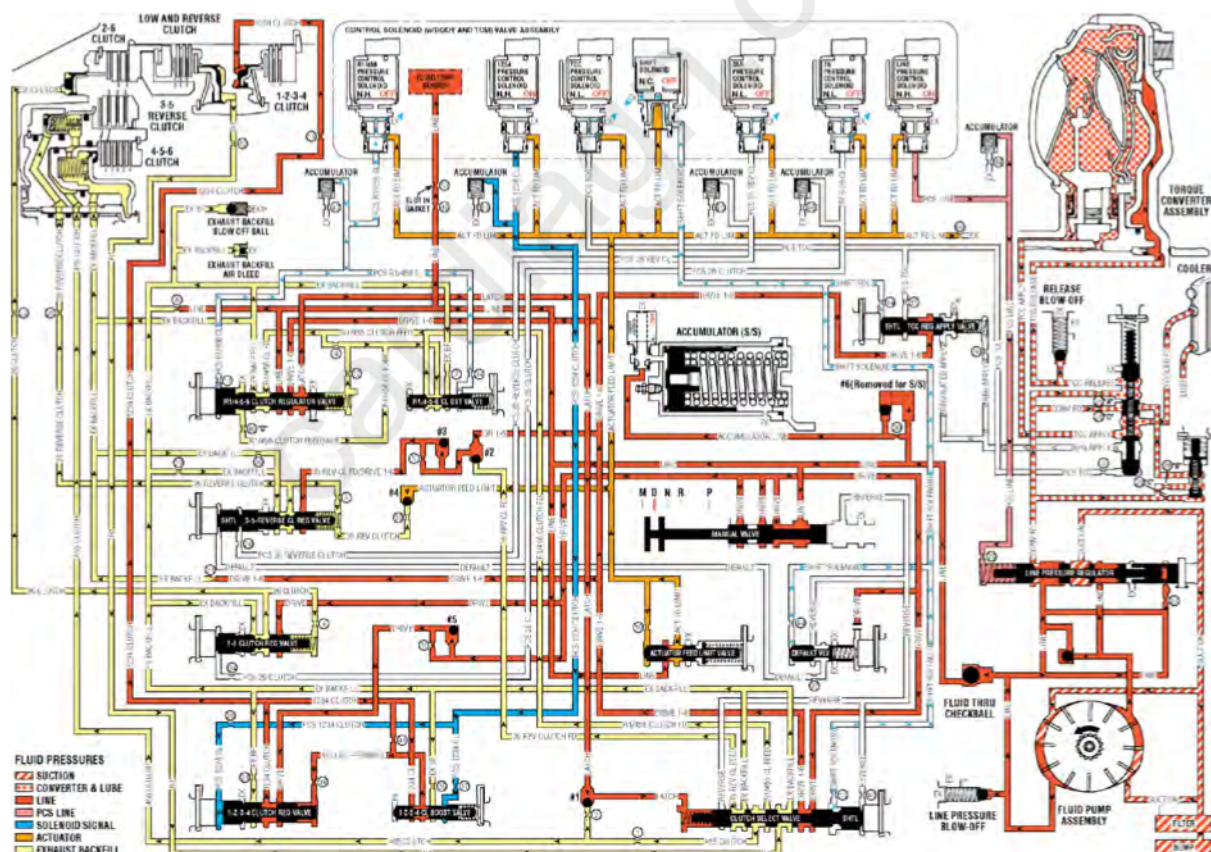


Fig. 11: Drive Range, First Gear - Gen 3 Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SECOND GEAR (GEN 3)

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

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

Accumulator

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid

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

2-6 Clutch Regulator Valve

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

2-6 Clutch

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

Drive Range, Third Gear - Gen 3

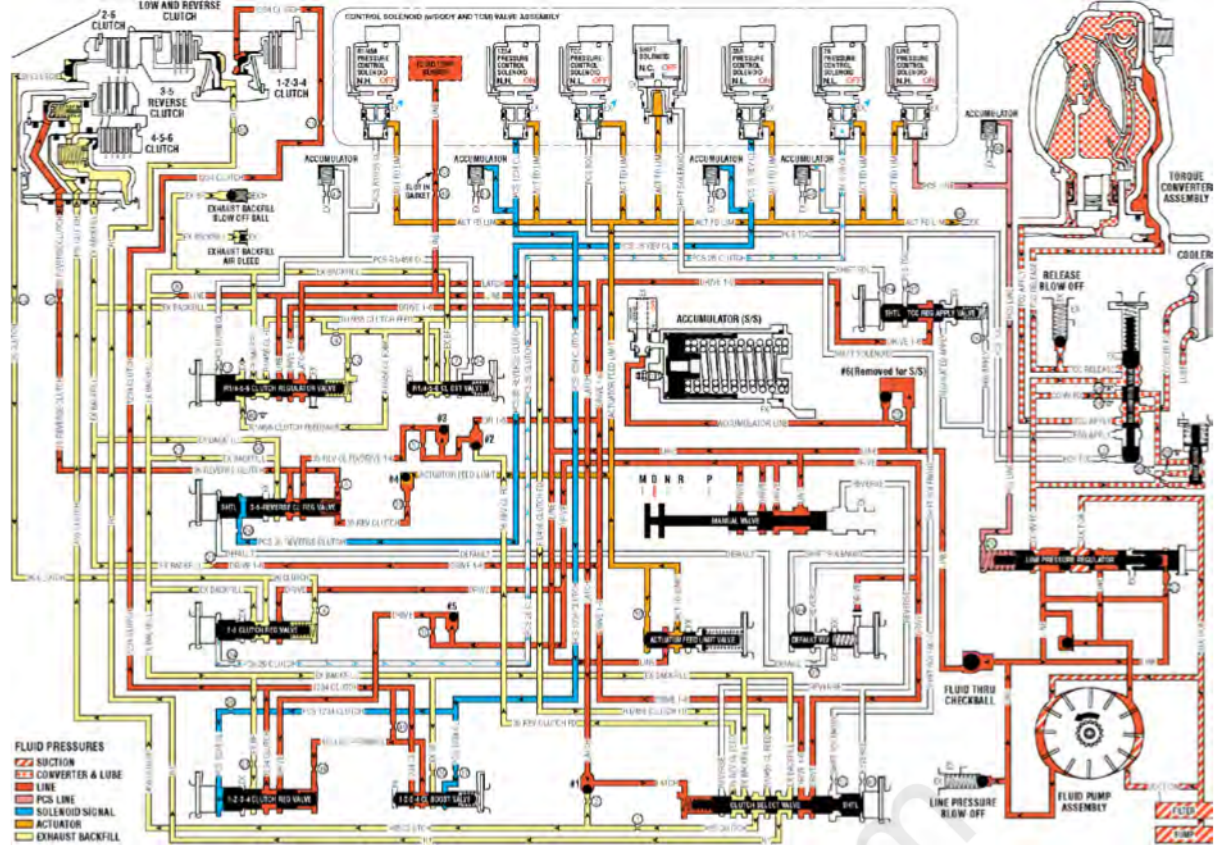


Fig. 13: Drive Range, Third Gear - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR (GEN 3)

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

4-5-6 Clutch Applies

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

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

R1/4-5-6 Clutch Boost Valve

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

#1 Ball Check Valve

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

Clutch Select Valve

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

4-5-6 Clutch

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

Accumulator

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

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

Torque Converter Clutch (TCC) Applies

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

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

TCC Regulator Apply Valve

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

TCC Control Valve

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

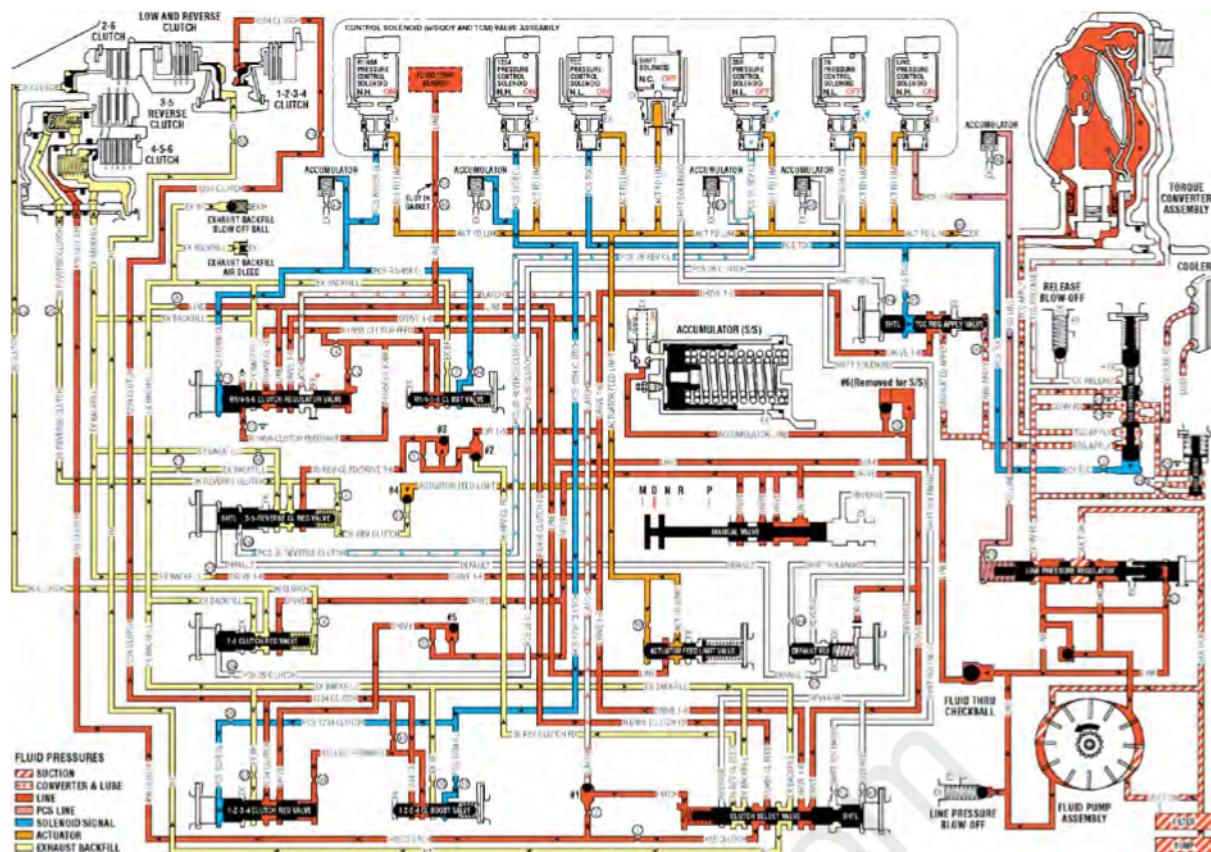


Fig. 14: Drive Range, Fourth Gear - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR DEFAULT (GEN 3)

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

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

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch

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

Accumulator

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

4-5-6 Clutch Applies or Remains Applied

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Boost Valve

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

R1/4-5-6 Clutch Regulator Valve

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

#1 Ball Check Valve

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

Clutch Select Valve

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

4-5-6 Clutch

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

Accumulator

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

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid

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

Torque Converter Clutch (TCC) Releases

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

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

Drive Range, Fourth Gear Default - Gen 3

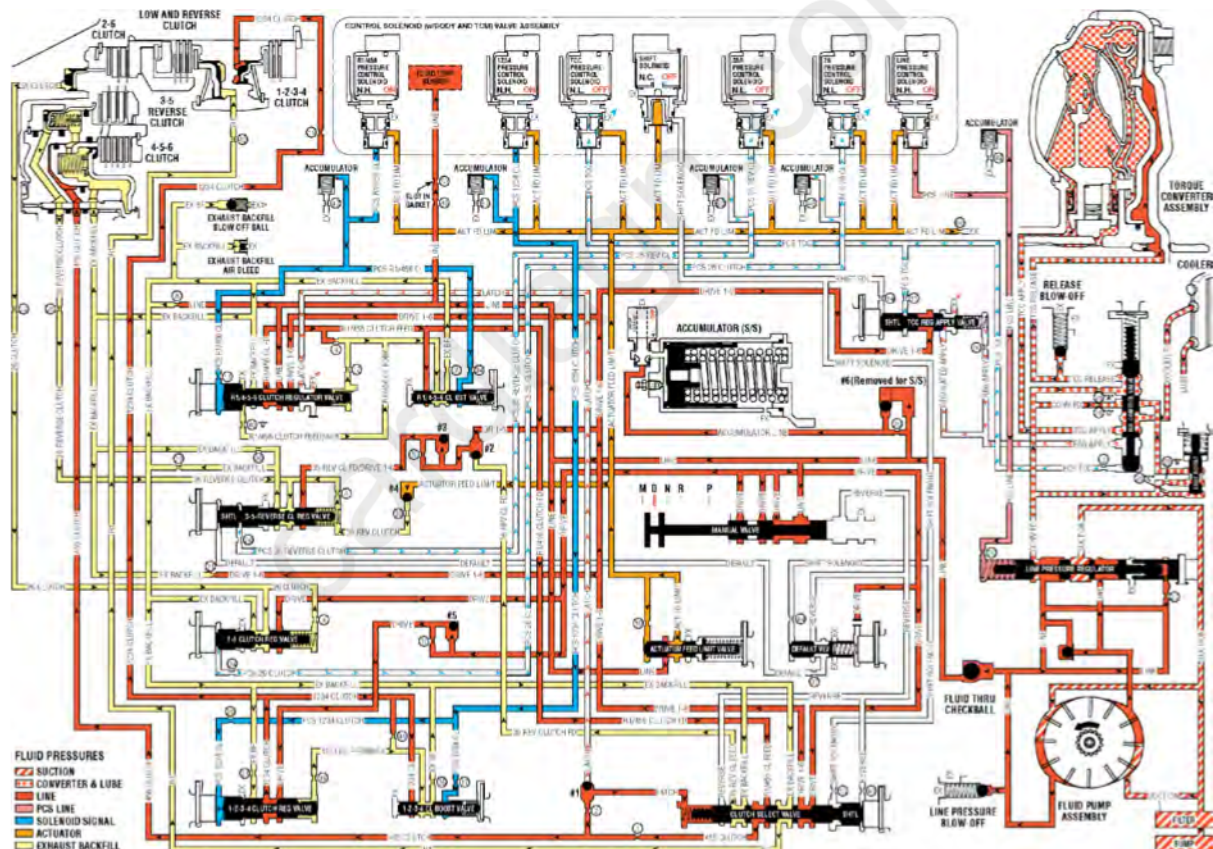


Fig. 15: Drive Range, Fourth Gear Default - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR (GEN 3)

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

Accumulator

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

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

Drive Range, Fifth Gear - Gen 3

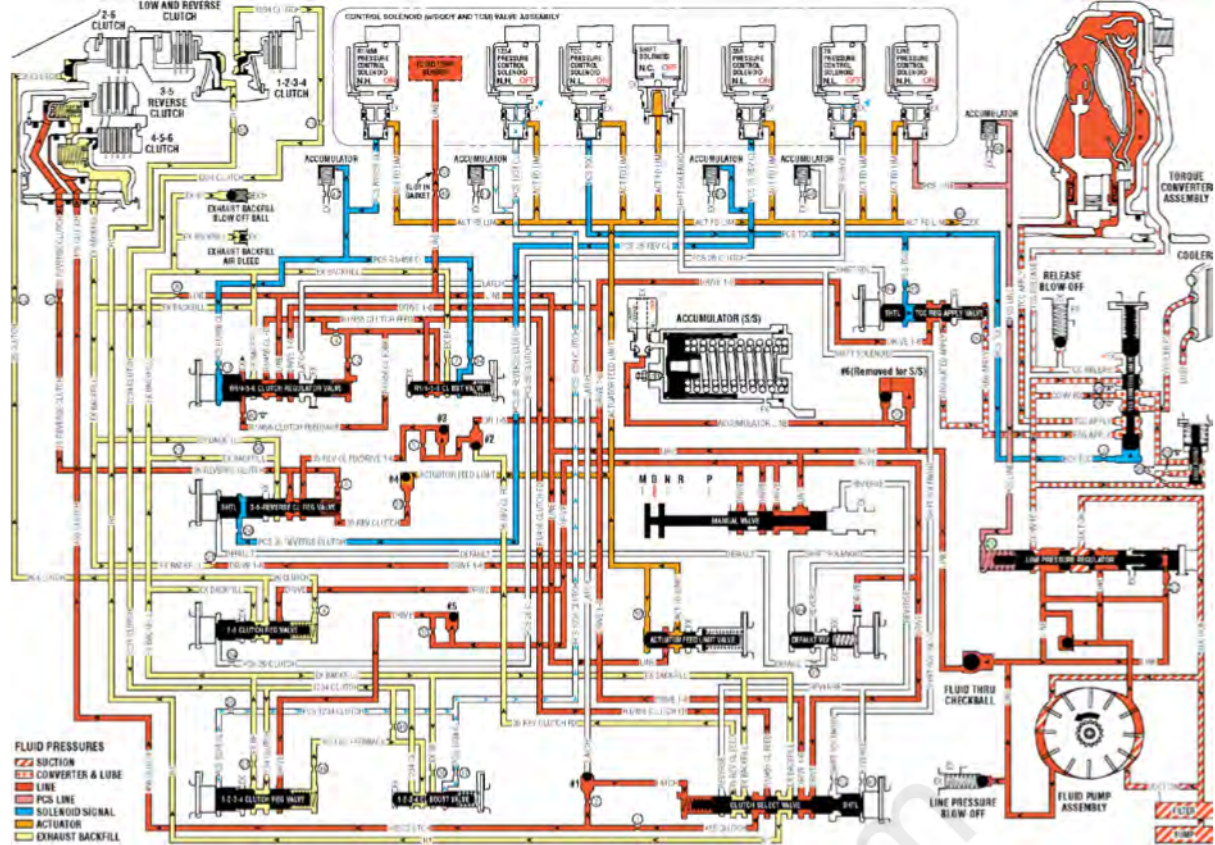


Fig. 16: Drive Range, Fifth Gear - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SIXTH GEAR (GEN 3)

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

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid

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

2-6 Clutch Regulator Valve

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

2-6 Clutch

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

Accumulator

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

3-5 Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

Drive Range, Sixth Gear - Gen 3

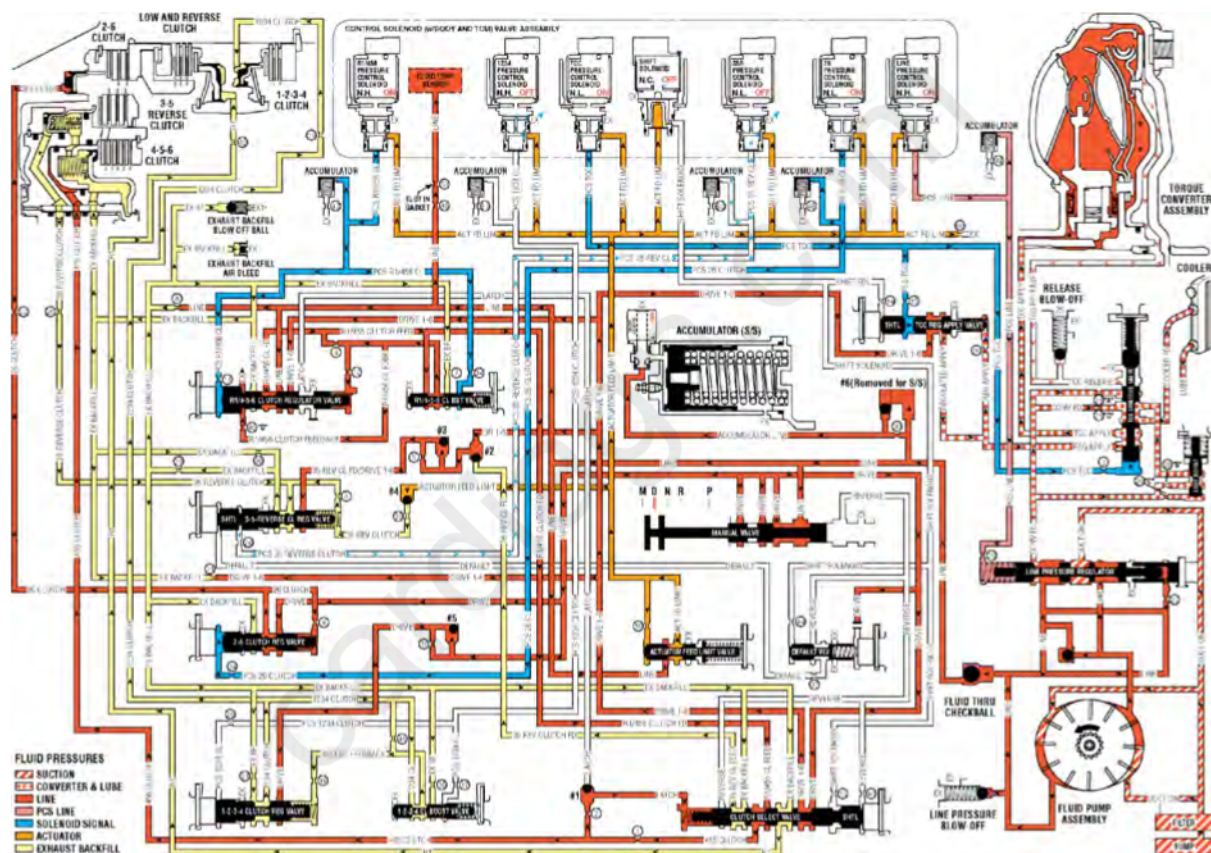


Fig. 17: Drive Range, Sixth Gear - Gen 3 Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

FLUID PASSAGES (GEN 3)

Torque Converter and Differential Housing - Case Side

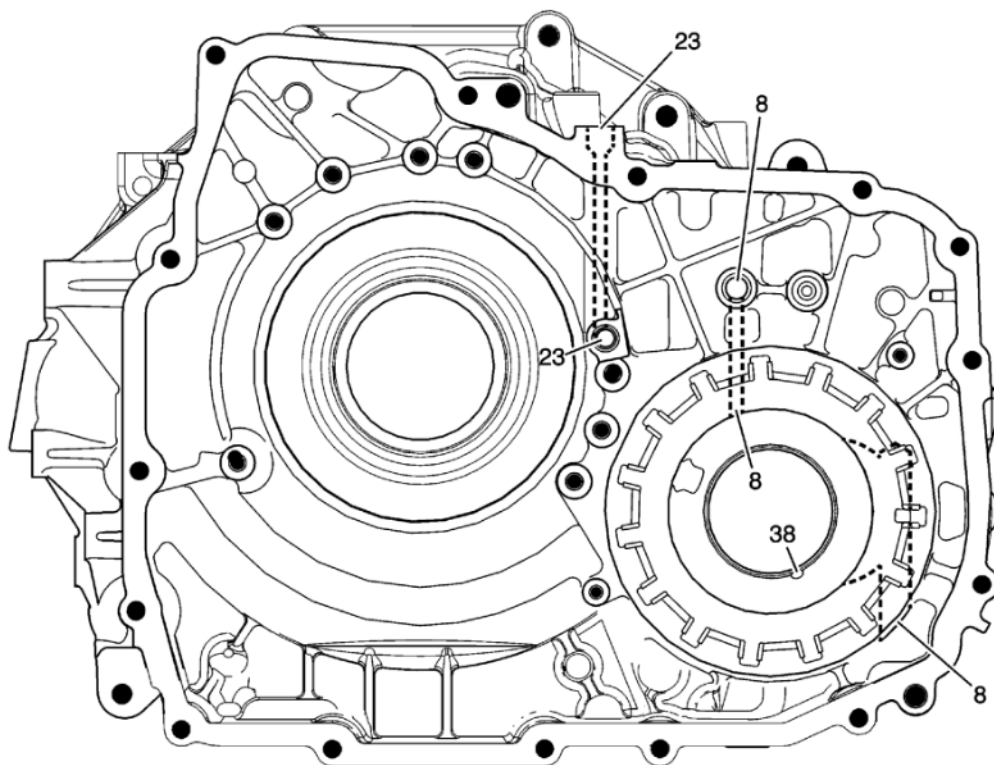


Fig. 18: Torque Converter and Differential Housing - Case Side

Courtesy of GENERAL MOTORS COMPANY

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

Fluid Pump Body - Fluid Pump Cover Side

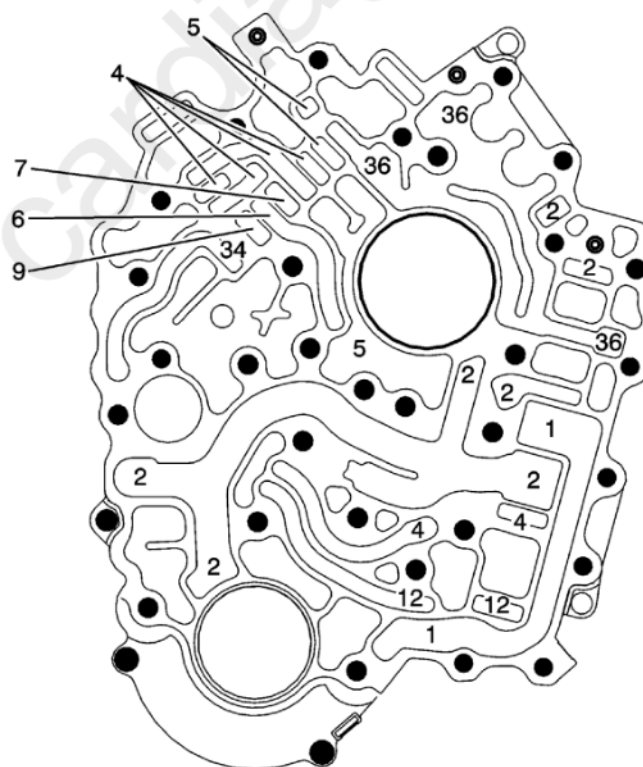


Fig. 19: Fluid Pump Body - Fluid Pump Cover Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	
4	
5	
6	
7	
9	
12	
34	
36	

Callout	Component Name
2	Line
4	Converter Feed
5	TCC Release
6	TCC Apply
7	Cooler Feed
9	Regulated Apply
12	PCS Line
34	PCS TCC
36	Exhaust

Fluid Pump Cover - Fluid Pump Side

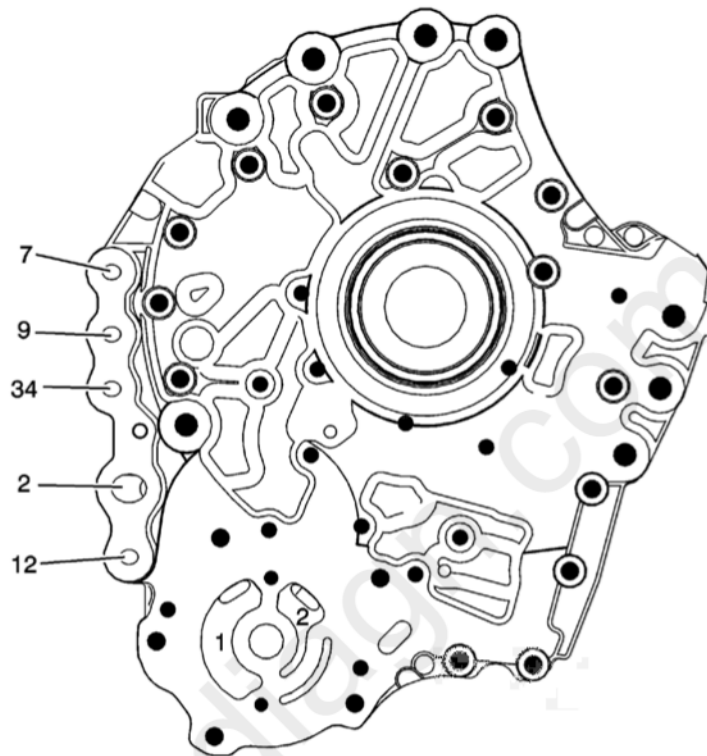


Fig. 20: Fluid Pump Cover - Fluid Pump Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
7	Cooler Feed
9	Regulated Apply
12	PCS Line
34	PCS TCC

Fluid Pump Cover - Fluid Pump Body Side

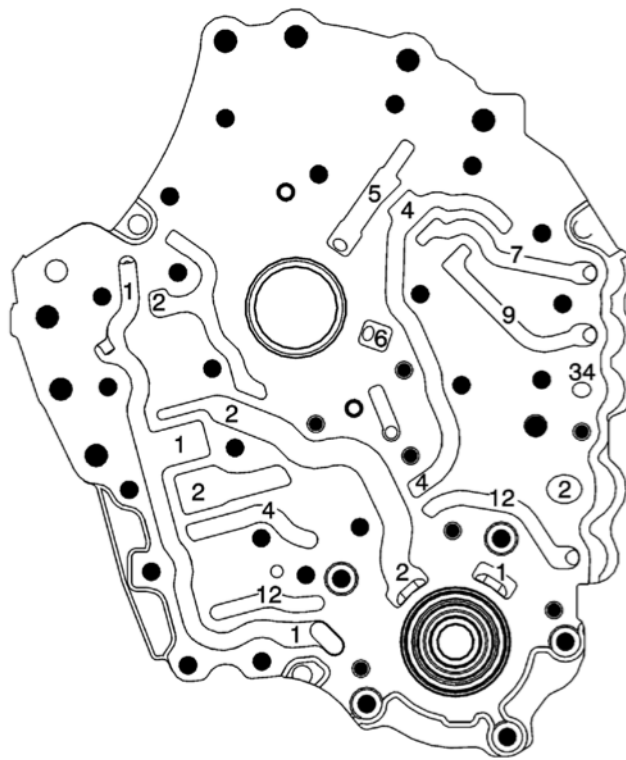


Fig. 21: Fluid Pump Cover - Fluid Pump Body Side

Courtesy of GENERAL MOTORS COMPANY

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

Fluid Pump Transfer Plate Body

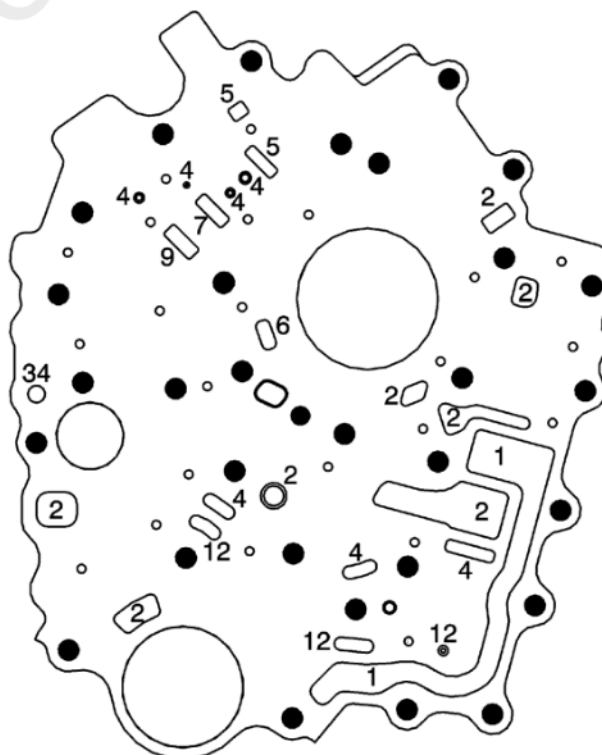


Fig. 22: Fluid Pump Transfer Plate Body
 Courtesy of GENERAL MOTORS COMPANY

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

Case - Torque Converter and Differential Housing Side

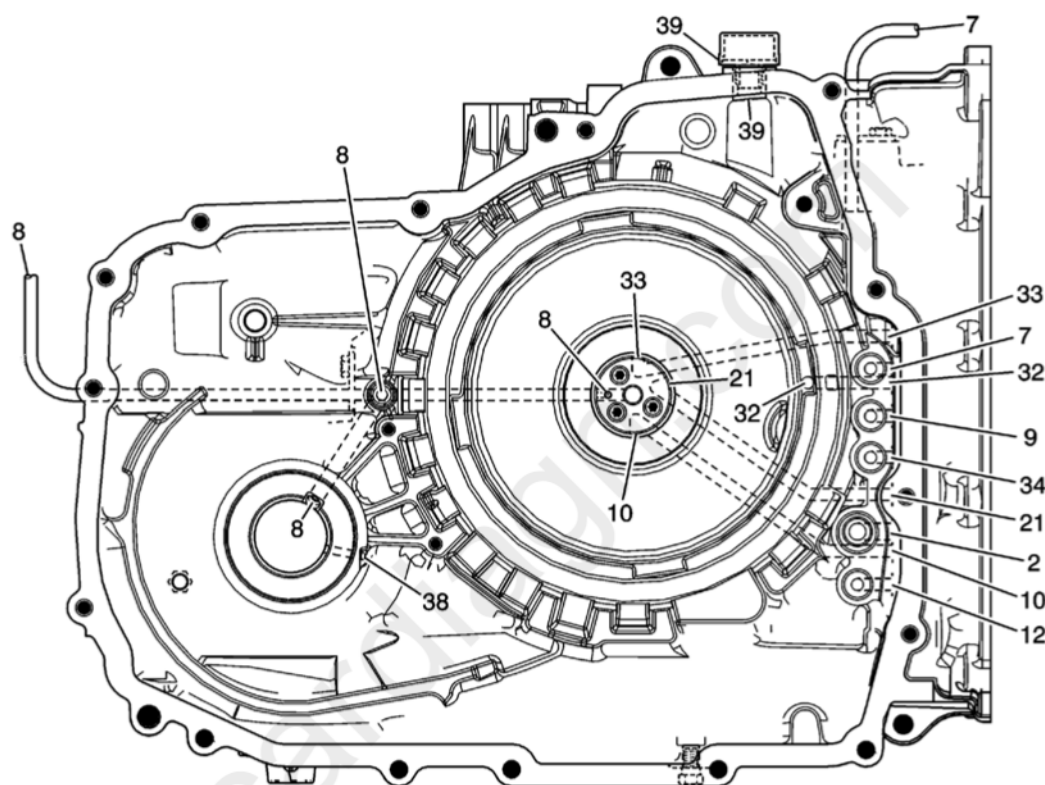


Fig. 23: Case - Torque Converter and Differential Housing Side
 Courtesy of GENERAL MOTORS COMPANY

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

Case - Control Valve Body Side

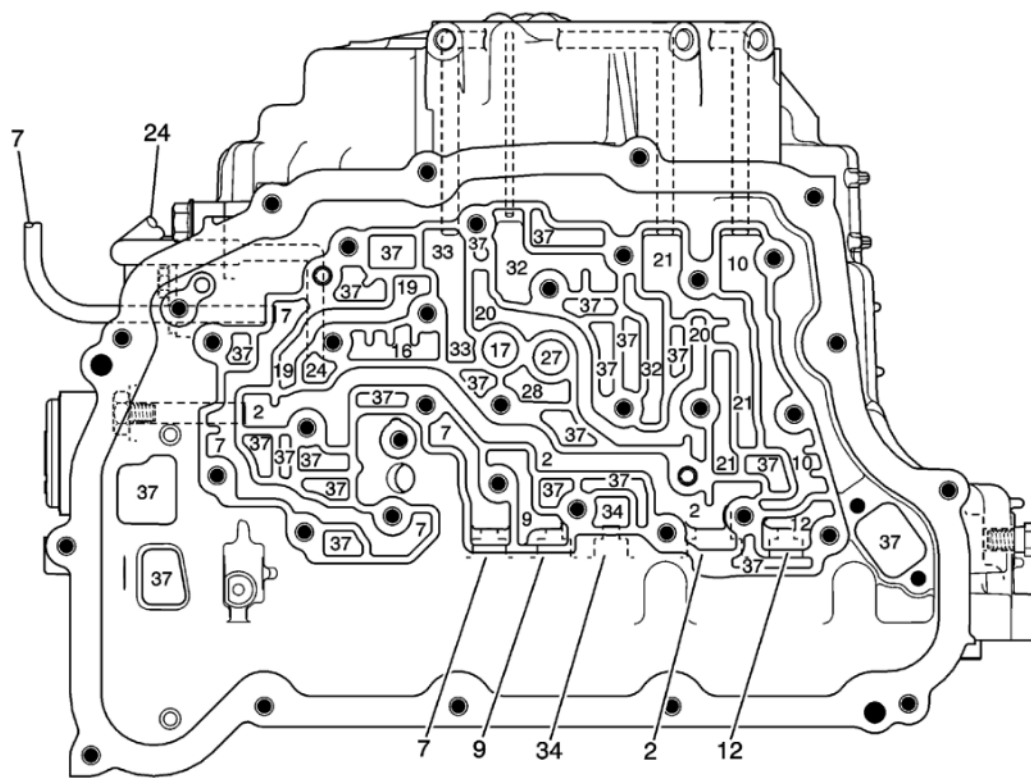


Fig. 24: Case - Control Valve Body Side
Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Spacer Plate Assembly - Case Side

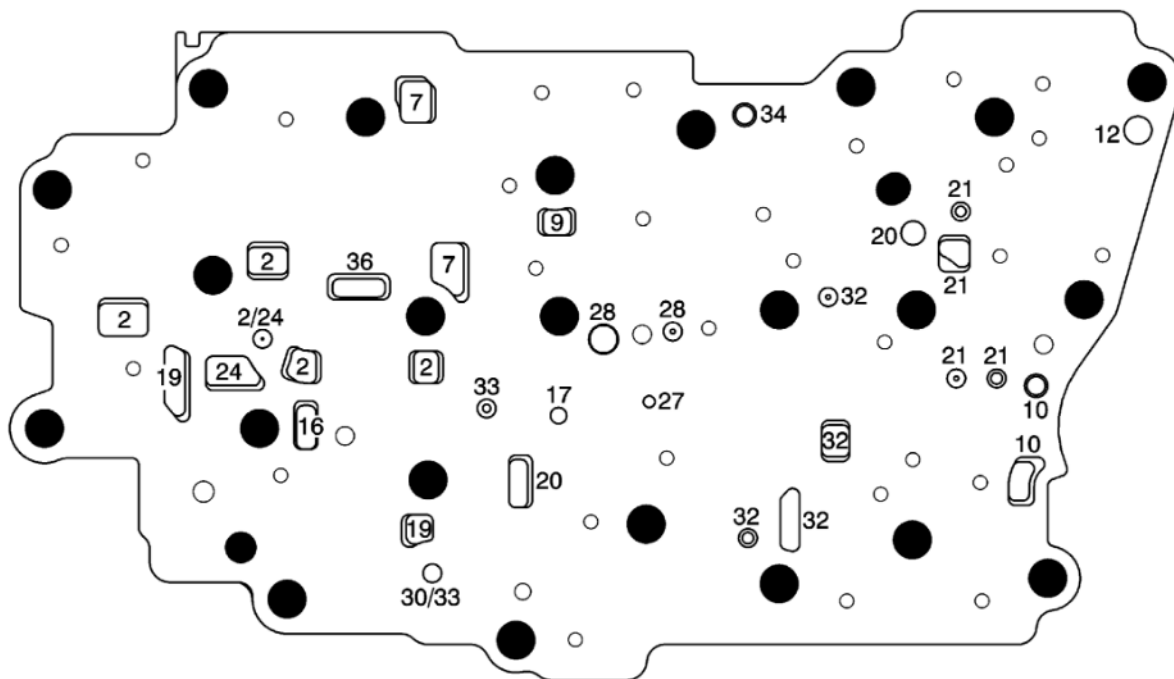


Fig. 25: Control Valve Body Spacer Plate Assembly - Case Side

Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body - Case Side

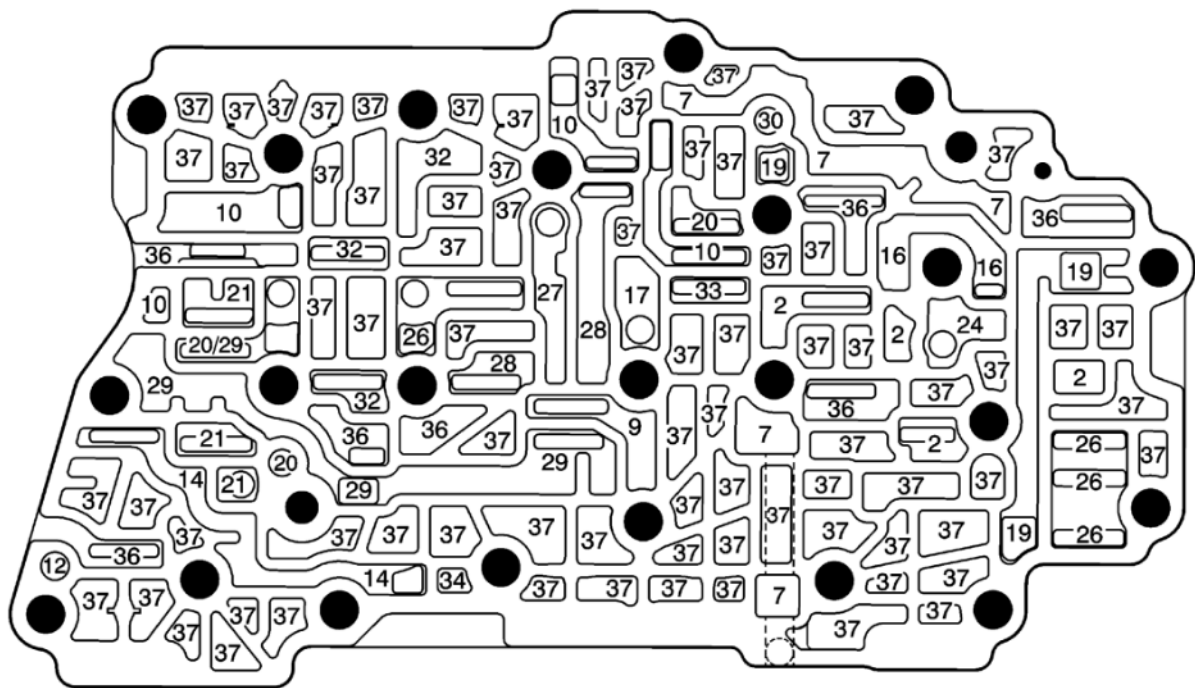


Fig. 26: Control Valve Body - Case Side
Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body - Channel Plate Side

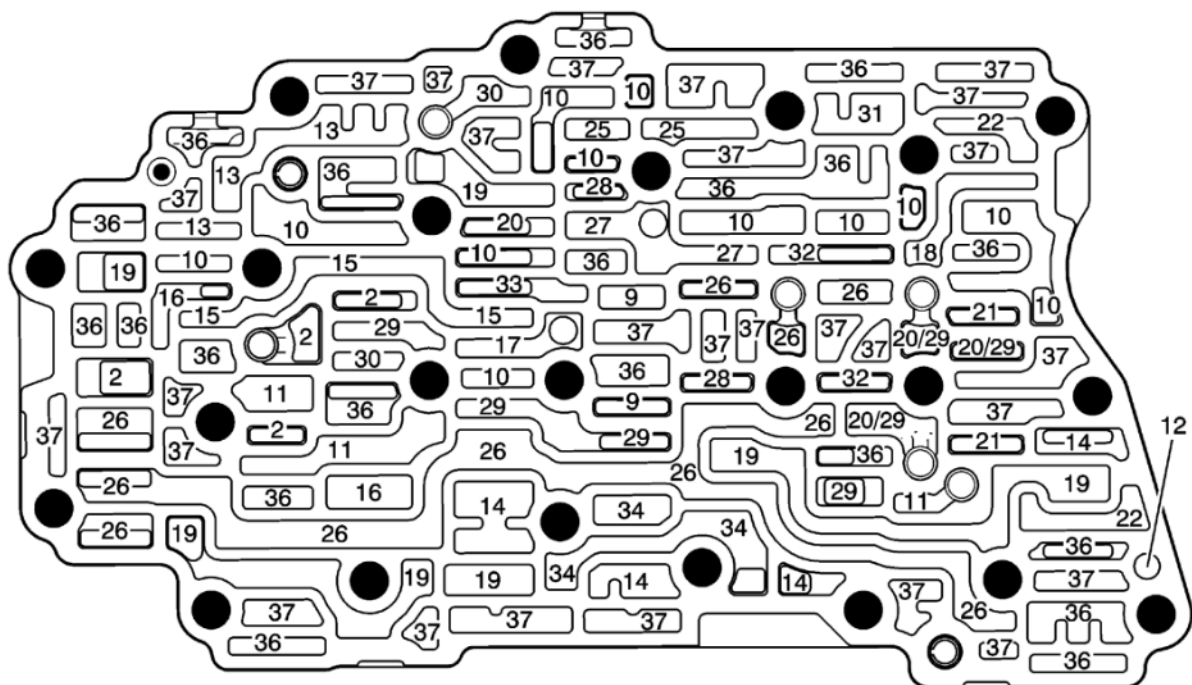


Fig. 27: Control Valve Body - Channel Plate Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
9	Regulated Apply
10	Exhaust Backfill
11	Actuator Feed Limit
12	PCS Line
13	PCS R1/456 Clutch
14	Shift Solenoid
15	R1/456 Clutch Feed
16	R1/456 Clutch Feedback
17	R1
18	PCS 35 Reverse Clutch
19	Reverse
20	35 Reverse Clutch Feed
21	35 Reverse Clutch
22	Default
25	PCS 1234 Clutch
26	Drive
27	1234 Clutch
28	1234 Clutch Feedback
29	Drive 1-6
30	Latch
31	PCS 26 Clutch
32	26 Clutch
33	456 Clutch
34	PCS TCC
36	Exhaust
37	Void

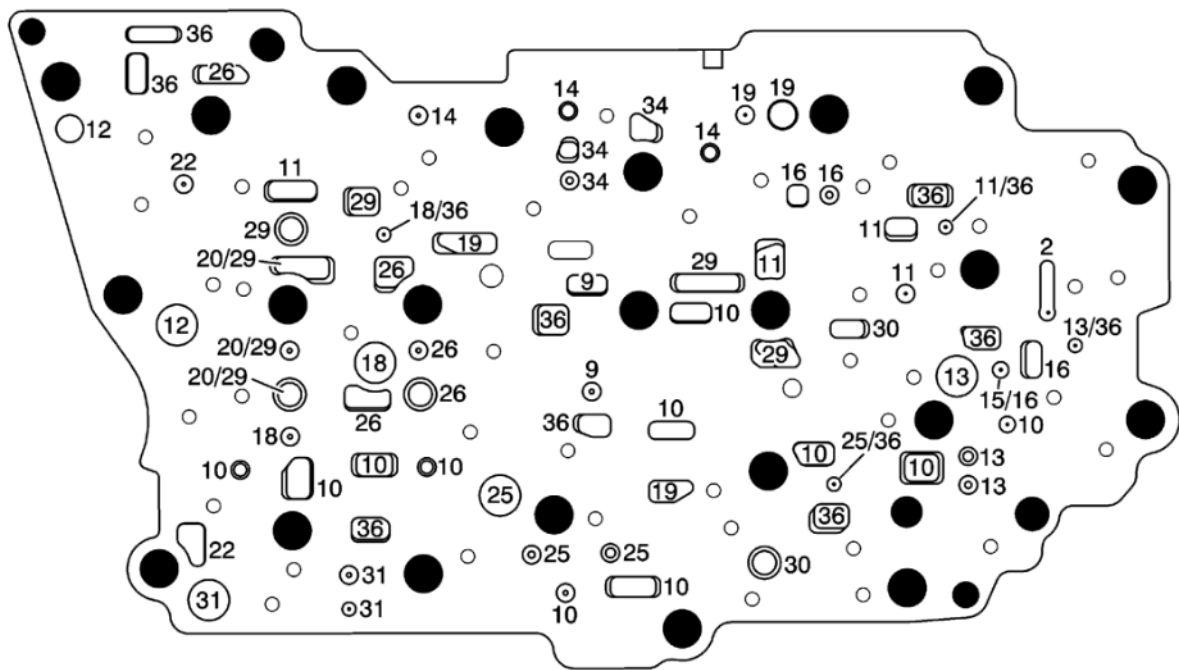


Fig. 28: Channel Plate to Valve Body Spacer Plate Assembly - Channel Plate Side

Courtesy of GENERAL MOTORS COMPANY

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

Channel Plate - Control Valve Body Side

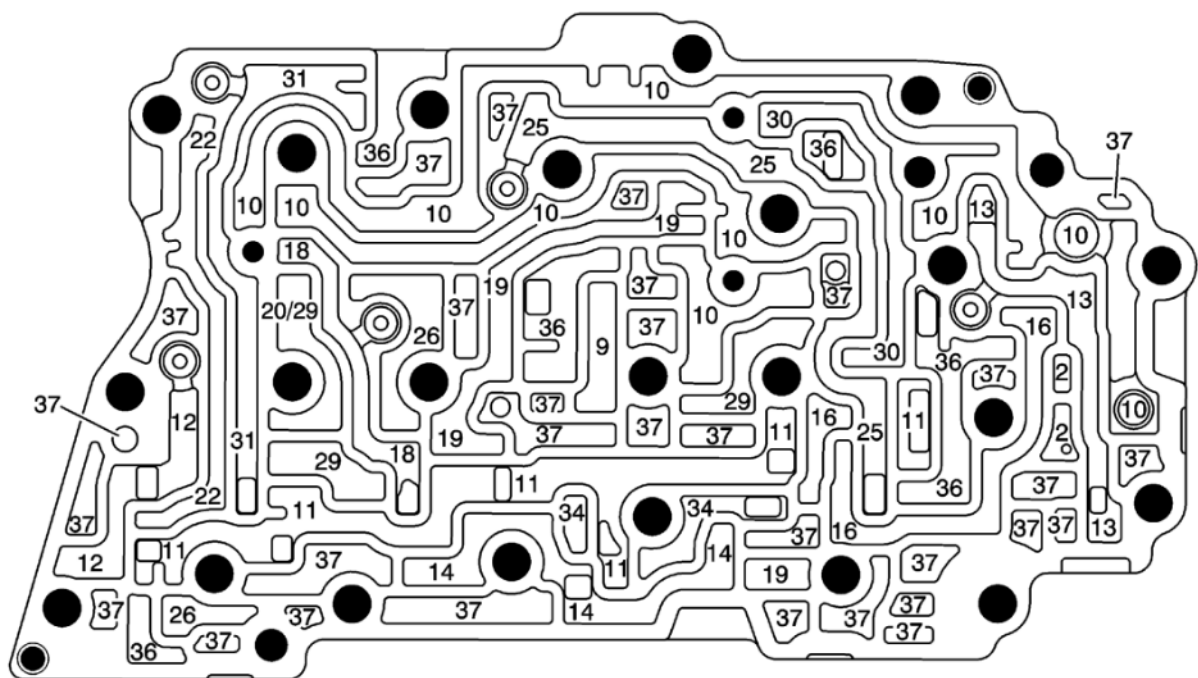


Fig. 29: Channel Plate - Control Valve Body Side
 Courtesy of GENERAL MOTORS COMPANY

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

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

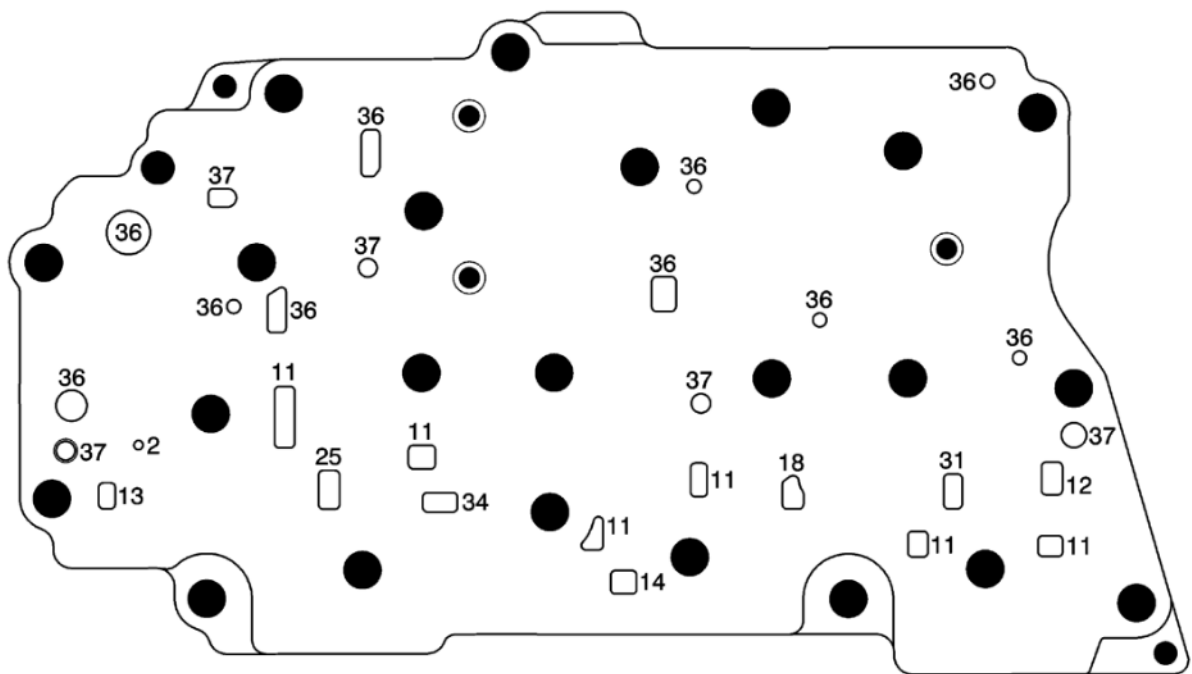


Fig. 30: Channel Plate - Control Solenoid (W/Body And TCM) Valve Assembly Side
Courtesy of GENERAL MOTORS COMPANY

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

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

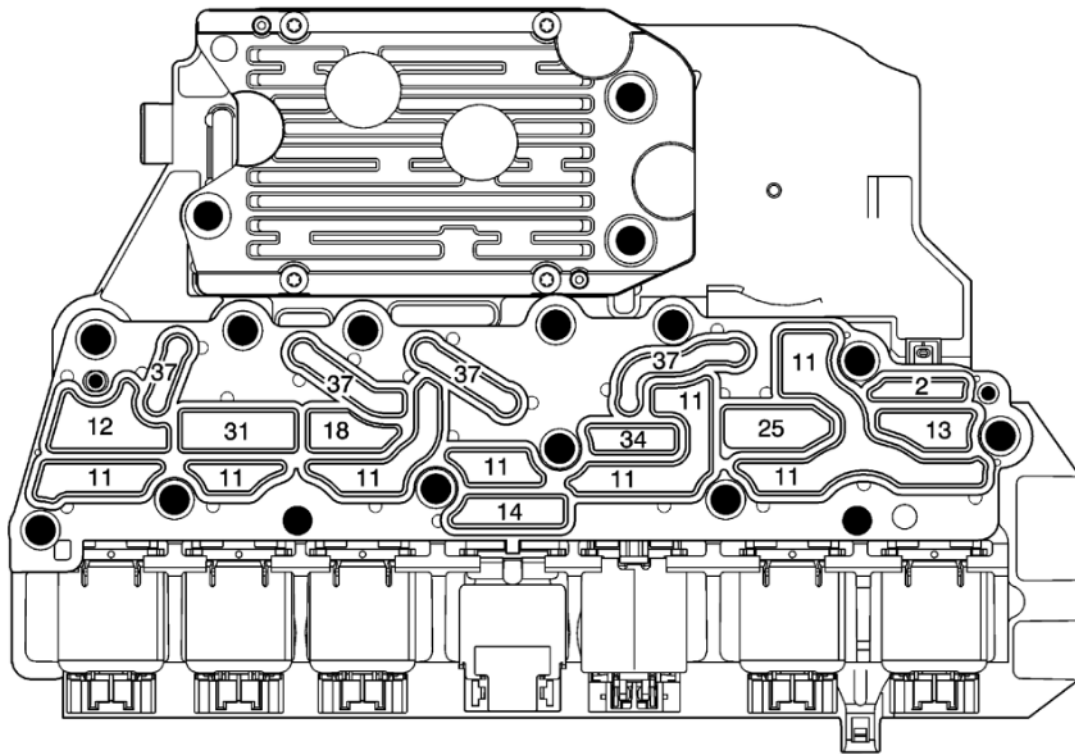


Fig. 31: Control Solenoid (W/Body And TCM) Valve Assembly - Channel Plate Side
Courtesy of GENERAL MOTORS COMPANY

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

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Diagnostic Information and Procedures - Impala

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0601, P0603, P0604, OR P062F: TRANSMISSION 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P0601

Control Module Read Only Memory Performance

DTC P0603

Control Module Long Term Memory Reset

DTC P0604

Control Module Random Access Memory Performance

DTC P062F

Control Module Long Term Memory Performance

Circuit/System Description

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

Conditions for Running the DTC

P0601 or P0604

Runs continuously when TCM is powered up.

P0603

One time at TCM power up.

P062F

One time at TCM power down.

Conditions for Setting the DTC

P0601

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

P0603

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

P0604

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

P062F

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description (Gen 3)**
- **Transmission General Description (Gen 3)**

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

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

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

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

2. Ignition ON.

3. Verify that DTC P0601, P0603, P0604, or P062F is not set.

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

Replace the Q8 Control Solenoid Valve Assembly.

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

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

5. Verify the DTC does not set.

- **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the DTC does not set**

6. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0634: TRANSMISSION CONTROL MODULE OVERTEMPERATURE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC P0634

Control Module Overtemperature

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

Condition 1

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

Condition 2

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P0634 is a Type A DTC.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Engine Coolant Temperature parameter was less than 125°C (257°F) when DTC set by reviewing the scan tool Freeze Frame/Failure Records.
 - **If 125°C (257°F) or greater**
Refer to **Engine Overheating** .
 - **If less than 125°C (257°F)**
3. Verify the scan tool TCM Temperature parameter is less than 146°C (295°F).
 - **If 146°C (295°F) or greater**
Replace the Q8 Control Solenoid Valve assembly.
 - **If less than 146°C (295°F)**
4. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
 - **If the transmission fluid level and condition is not correct**
Repair as necessary.
 - **If the transmission fluid level and condition is correct**
5. Clear the TCM DTCs with a scan tool.
6. Operate the vehicle until normal engine temperature is reached.
7. Verify the scan tool Transmission Fluid Temperature parameter is less than 140°C (284°F).
 - **If 140°C (284°F) or greater**
 1. Ignition OFF.
 2. Verify the conditions listed below do not exist:
 - Obstructions to the airflow to the radiator or transmission
 - Radiator damage
 - Transmission cooler damage
 - Transmission cooler pipe kinked or damaged
 - If a condition exists, repair or replace as necessary.
 - If none of the conditions exist, refer to **Transmission Fluid Cooler Flow Test and Flushing (6T40/6T45)** .
 - **If less than 140°C (284°F)**
8. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
9. Verify the DTC does not set.
 - **If the DTC sets**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the DTC does not set**
10. All OK.

Repair Instructions

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

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

DTC P0658 OR P0659: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 LOW/HIGH 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0658

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

Circuit/System Description

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

Conditions for Running the DTC

P0658

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

P0659

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

Conditions for Setting the DTC

P0658

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

P0659

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

Action Taken When the DTC Sets

P0658

- P0658 is a Type A DTC.
- TCM turns the high side driver OFF.

- TCM commands all solenoids OFF.
- TCM commands the TCC OFF.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM defaults the transmission to 4th gear and reverse.
- TCM enables torque management.

P0659

P0659 is a Type C DTC.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description (Gen 3)**
- **Transmission General Description (Gen 3)**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10 Adapter Harness

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

Circuit/System Verification

1. Engine Running and the gear selector lever in the Park position.

2. Verify the scan tool High Side Driver 1 parameter displays On.

- **If On is not displayed**

Refer to Circuit/System Testing.

- **If On is displayed**

3. Verify the scan tool parameters listed below do not display Malfunction:

- High Side Driver 1 Circuit Low Voltage Test Status
- High Side Driver 1 Circuit Open Test Status
- High Side Driver 1 Circuit High Voltage Test Status

- **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

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

- **If contaminated**

Repair as necessary.

- **If not contaminated**

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

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.

5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector, and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

6. Command the High Side Driver 1 ON with a scan tool.

7. Verify the scan tool High Side Driver 1 parameter displays On.

- **If On is not displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If On is displayed**

8. Verify the scan tool parameters listed below do not display Malfunction:

- High Side Driver 1 Circuit Low Voltage Test Status

- High Side Driver 1 Circuit Open Test Status
- High Side Driver 1 Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

9. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P0667, P0668, OR P0669: TRANSMISSION CONTROL MODULE 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0667

Control Module Temperature Sensor Performance

DTC P0668

Control Module Temperature Sensor Circuit Low Voltage

DTC P0669

Control Module Temperature Sensor Circuit High Voltage

Circuit/System Description

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

Conditions for Running the DTC

P0667

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

P0668

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

P0669

- DTC P0669, P0716, P0717, P0722, or P0723 is not set.
- Ignition voltage is 9 - 32 V.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0667

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

P0668

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

P0669

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P0667, P0668, and P0669 are Type B DTCs.

Diagnostic Aids

The TCM temperature sensor is located inside of the control solenoid valve assembly and its output should resemble that of the transmission fluid temperature sensor output. During a road test, the TCM temperature should steadily increase to a normal operating temperature, and then stabilize.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **[Electronic Component Description](#)**

- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool TCM Temperature parameter increases greater than 2Â°C (3.6Â°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.
 - **If the temperature does not increase greater than 2Â°C (3.6Â°F)**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the temperature increases greater than 2Â°C (3.6Â°F)**
3. Verify the scan tool Transmission Fluid Temperature and TCM Temperature parameters are within 20Â°C (36Â°F) of each other.
 - **If the temperatures are not within 20Â°C (36Â°F)**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the temperatures are within 20Â°C (36Â°F)**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
 - **If the DTC sets**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the DTC does not set**
6. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P06AC, P06AD, OR P06AE: TRANSMISSION CONTROL MODULE POWER UP 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.

- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P06AC

Control Module Power Up Temperature Sensor Performance

DTC P06AD

Control Module Power Up Temperature Sensor Circuit Low Voltage

DTC P06AE

Control Module Power Up Temperature Sensor Circuit High Voltage

Circuit/System Description

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

Conditions for Running the DTC

P06AC

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

P06AD

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

P06AE

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

Conditions for Setting the DTC

P06AC

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

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

P06AD

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

P06AE

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P06AC, P06AD, and P06AE are Type B DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description (Gen 3)**
- **Transmission General Description (Gen 3)**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

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

Replace the Q8 Control Solenoid Valve Assembly.

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

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

5. Verify the DTC does not set.

- **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the DTC does not set**

6. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0711

Transmission Fluid Temperature Sensor Performance

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

Circuit/System Description

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

Conditions for Running the DTC

P0711

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

- Engine torque signal is valid.
- Brake torque is not active.
- DTC runs continuously when above conditions are met.

P0712

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

P0713

- DTC P0713, P0716, P0717, P0722, or P0723 is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- DTC runs continuously when above conditions are met.

Conditions for Setting the DTC

P0711

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

P0712

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

P0713

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P0711, P0712, and P0713 are Type B DTCs.

Diagnostics Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Engine idling at the normal operating temperature.
2. Verify the scan tool Transmission Fluid Temperature parameter increases greater than 2Â°C (3.6Â°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.
 - **If the temperature does not increase greater than 2Â°C (3.6Â°F)**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the temperature increases greater than 2Â°C (3.6Â°F)**
3. Verify the scan tool Transmission Fluid Temperature and the TCM Temperature parameters are within 20Â°C (36Â°F).
 - **If the temperatures are not within 20Â°C (36Â°F)**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the temperatures are within 20Â°C (36Â°F)**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
 - **If the DTC sets**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the DTC does not set**
6. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) for Control Solenoid Valve Assembly replacement, programming and setup

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0716

Input Speed Sensor Performance

DTC P0717

Input Speed Sensor Circuit No Signal

DTC P07BF

Input Speed Sensor Circuit Low Voltage

DTC P07C0

Input Speed Sensor Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Transmission ISS

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

ISS/OSS Supply Voltage

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

Circuit/System Description

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

calculate input shaft speed to determine commanded line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

Conditions for Running the DTC

P0716

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

P0717

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

P07BF or P07C0

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

Conditions for Setting the DTC

P0716

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

P0717 - Condition 1

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

P0717 - Condition 2

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

P07BF

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

P07C0

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

Action Taken When the DTC Sets

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

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

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 \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

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

3. Engine idling, transmission in Park.
4. Verify the scan tool Transmission ISS parameter changes without spikes or dropouts, while varying the engine speed.
 - **If the Transmission ISS does not change with engine speed or has spikes or dropouts**
Refer to Circuit/System Testing.
 - **If the Transmission ISS changes with engine speed and there are no spikes or dropouts**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
 - **If the DTC sets**
Refer to Circuit/System Testing.
 - **If the DTC does not set**
7. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
3. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
4. Test for 11 - 13 V between the ISS 12 V circuit terminal B on the Q8 Control Solenoid Valve Assembly X3 connector and ground.
 - **If not between 11 - 13 V**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If between 11 - 13 V**
5. Verify the scan tool Transmission ISS parameter is between 495 - 505 RPM when performing the input shaft speed test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test](#).
 - **If not between 495 - 505 RPM**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If between 495 - 505 RPM**
6. Verify there is no damage to the reluctor, which is attached to the 4-5-6 clutch and 3-5-R clutch housing assembly, or misalignment between the B14C Transmission Input Shaft Speed Sensor and reluctor.
 - **If the reluctor is damaged or misaligned**
Repair or replace as necessary.
 - **If the reluctor is not damaged or misaligned**
7. Replace the B14C Transmission Input Shaft Speed Sensor.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Input and Output Speed Sensor Installation](#)
- Refer to [Input and Output Speed Sensor Removal](#)

- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0722, P0723, P077C, OR P077D: OUTPUT 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P0723

Output Speed Sensor Circuit Intermittent

DTC P077C

Output Speed Sensor Circuit Low Voltage

DTC P077D

Output Speed Sensor Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Transmission OSS

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

ISS/OSS Supply Voltage

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

Circuit/System Description

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

rotates, the sensor produces a signal frequency based on the park gear teeth. This signal is transmitted through the OSS sensor signal circuit to the TCM. The TCM uses the OSS sensor signal to calculate output shaft speed to determine commanded line pressure, transmission shift patterns, vehicle speed and gear ratio.

Conditions for Running the DTC

P0722

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

P0723

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

P077C

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

P077D

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

Conditions for Setting the DTC

P0722

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

P0723

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

P077C

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

P077D

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

P0722

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

P0723, P077C or P077D

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

Conditions for Clearing the DIC/DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)

- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

[Circuit/System Verification](#)

1. Ignition ON.
2. Verify the scan tool ISS/OSS Supply Voltage parameter displays OK.
 - **If OK is not displayed**
Refer to Circuit/System Testing.
 - **If OK is displayed**
3. Verify the scan tool Transmission OSS parameter changes with vehicle speed or does not drop out, while operating the vehicle at 16 - 32 km/h (10 - 20 mph).
 - **If the Transmission OSS does not vary with vehicle speed or drops out**
Refer to Circuit/System Testing.
 - **If the Transmission OSS varies with vehicle speed and does not drop out**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
 - **If the DTC sets**
Refer to Circuit/System Testing.
 - **If the DTC does not set**
6. All OK.

[Circuit/System Testing](#)

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

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 11 - 13 V**

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

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If between 745 - 825 RPM**

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

- **If the park gear is damaged or misaligned**

Repair or replace as necessary.

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

7. Replace the B14A Transmission Output Shaft Speed Sensor.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Input and Output Speed Sensor Installation](#)
- Refer to [Input and Output Speed Sensor Removal](#)
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0741 OR P0742: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P0741

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

DTC P0742

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

Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The TCC pressure control solenoid valve is normally low and regulates transmission fluid pressure to the TCC regulator valve in the lower valve body and the TCC control valve in the fluid pump assembly. When vehicle operating conditions are appropriate to

apply the torque converter clutch, the transmission control module (TCM) will increase TCC pressure control solenoid valve current flow, thereby increasing pressure to move the TCC control valve into the apply position. When the TCC is fully applied, the engine is coupled directly to the transmission. TCC release is accomplished by the TCM decreasing current flow to the TCC pressure control solenoid valves, which decreases the apply pressure and allows the TCC control valve to move to the release position. The TCM calculates torque converter slip speed based on the speed signal from the input shaft speed sensor and engine RPM provided by the engine control module (ECM).

Conditions for Running the DTC

P0741

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

P0742

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

Conditions for Setting the DTC

P0741

- TCC pressure command is 500 kPa (73 PSI) or greater for 2 s.

- TCM detects TCC slip is 130 RPM or greater for 5 s.
- The above conditions must occur 2 times.

P0742

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

Action Taken When the DTC Sets

P0741

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

P0742

- P0742 is a Type A DTC.
- TCM initiates Hot Mode shift pattern.
- TCM freezes transmission adaptive functions.
- TCM commands the TCC ON.
- TCM inhibits neutral idle.

Conditions for Clearing the DIC/DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **[Electronic Component Description](#)**
- **[Transmission Component and System Description \(Gen 3\)](#)**
- **[Transmission General Description \(Gen 3\)](#)**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Ignition ON, engine OFF.
2. Verify DTC P0659, P0716, P0717, P07BF, or P07C0 was not set by reviewing the scan tool TCM Failure Records.
 - **If any of the DTCs were set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .
 - **If none of the DTCs were set**
3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).
 - **If the transmission fluid level and condition is not correct**

Repair as necessary.
 - **If the transmission fluid level and condition is correct**
5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0741 or P0742 does not set while performing a road test. Refer to [Road Test](#).
 - **If DTC P0741 or P0742 sets**

Refer to Circuit/System Testing.
 - **If DTC P0741 or P0742 does not set**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
8. Verify the DTC does not set.
 - **If the DTC sets**

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

Circuit/System Testing

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to [Line Pressure Check](#), and [Solenoid Valve Pressure \(Gen 3\)](#) .
 - **If the pressures are not within range**

Refer to [Fluid Pressure High or Low](#).
 - **If the pressures are within range**
3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).
 - **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- If the pressure changes

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

P0741 Upper Valve Body

Release exhaust port/orifice plugged or blocked.

P0741 or P0742 - Upper Valve Body

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

P0741 - Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P0741 or P0742 - Fluid Pump Assembly

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

P0741 - Torque Converter

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

P0741 - Support

Damaged seal.

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

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

P0741 - Turbine Shaft O-ring Seal

Cut or damaged.

P0741 or P0742 - Q8 Control Solenoid Valve Assembly

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

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs.
- Refer to [Control Valve Body Assembly Removal](#)
- Refer to [Control Module References](#) for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0751 OR P0752: SHIFT SOLENOID VALVE 1 PERFORMANCE - STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

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

DTC P0751

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

DTC P0752

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

Circuit/System Description

Shift solenoid valve 1 is part of the control solenoid valve assembly, which has no serviceable components. The solenoid operates by the transmission control module (TCM) turning the low side driver ON or OFF. When the shift solenoid valve 1 is commanded OFF, the plunger forces the metering ball against the actuator feed limit seat, blocking the flow and any existing pressure is exhausted through the exhaust port. When the shift solenoid valve 1 is commanded ON, the internal plunger moves, allowing the metering valve to move away from the actuator feed limit seat and against the exhaust seat, creating signal fluid pressure. The signal fluid pressure acts against the clutch select valve 2 to overcome the valve spring force, moving the valve to the apply position. Fluid pressure from the R1/4-5-6 regulator valve flows through clutch select valve 2 and is directed to either the low and reverse clutch or the 4-5-6 clutch, depending on the position of clutch select valve 2.

Conditions for Running the DTC

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

Conditions for Setting the DTC

P0751

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

P0752

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

- Conditions listed above have to occur 5 times.

Action Taken When the DTC Sets

P0751

- P0751 is a type B DTC.
- TCM inhibits 1st gear.
- TCM inhibits Neutral idle.

P0752

- P0752 is a type A DTC.
- TCM limits the transmission to 2nd range and reverse.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM disables neutral idle.
- TCM freezes adapts.
- TCM commands maximum line pressure.
- TCM commands 2nd gear if transmission is in a forward range and the output speed is less than 1,350 RPM, or neutral if the output speed is 1,350 RPM or greater.

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Drive Range, First Gear Engine Braking \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

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

1. Ignition ON, engine OFF.

2. Verify no other TCM DTCs are set using a scan tool.

- **If another DTC is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).

- **If no other DTCs are set**

3. Engine idling at the normal operating temperature, transmission in Park, with parking brake applied and drive wheels chocked.

4. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).

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

Repair as necessary.

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

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

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

7. Verify DTC P0751 or P0752 did not set.

- **If DTC P0751 or P0752 sets**

Refer to Circuit/System Testing.

- **If DTC P0751 or P0752 does not set**

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

9. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

10. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.

2. Verify the transmission line pressures are within the specified range. Refer to [Line Pressure Check](#), and [Solenoid Valve Pressure \(Gen 3\)](#).

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

Refer to [Fluid Pressure High or Low](#).

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

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

P0751 - Control Valve Body

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

P0751 or P0752 - Control Valve Body

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

P0751 or P0752 - Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P0752 Output Carrier Assembly

Output carrier pinion pins too high or too low.

P0751 or P0752 - Q8 Control Solenoid Valve Assembly

- Not pressurizing due to shift solenoid valve 1 being stuck OFF or leaking.
- Pressure not exhausting due to shift solenoid valve 1 being stuck ON.
- Control signal fluid supply leak due to valve body filter plate assembly cracked, blocked, or damaged gasket seal.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0776 OR P0777: PRESSURE CONTROL SOLENOID VALVE 2 STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P0776

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

DTC P0777

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

Circuit/System Description

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

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

Conditions for Running the DTC

P0776

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

P0777

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

Conditions for Setting the DTC

P0776 - Condition 1

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

P0776 - Condition 2

- Commanded gear is 5th.
- Gearbox slip of 400 RPM or greater is detected for 3 s.
- TCM commands 6th gear if the above conditions exist and detects 6th gear ratio for 3.5 s.
- Conditions listed above have to occur 3 times.

P0777

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

P0776

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

P0777

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

Conditions for Clearing the DTC

P0776 and P0777 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Drive Range, Third Gear \(Gen 3\)](#)
- [Drive Range, Fourth Gear \(Gen 3\)](#)
- [Drive Range, Fifth Gear \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

WARNING: Refer to Parking Brake and Drive Wheels Warning .

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

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

Refer to Diagnostic Trouble Code (DTC) List - Vehicle .
 - **If none of the DTCs were set**
3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check.
 - **If the transmission fluid level and condition is not correct**

Repair as necessary.
 - **If the transmission fluid level and condition is correct**
5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0776 or P0777 does not set while performing a road test. Refer to Road Test.
 - **If DTC P0776 or P0777 sets**

Refer to Circuit/System Testing.
 - **If DTC P0776 or P0777 does not set**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
8. Verify the DTC does not set.
 - **If the DTC sets**

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

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to Line Pressure Check, and Solenoid Valve Pressure (Gen 3) .
 - **If the pressures are not within range**

Refer to Fluid Pressure High or Low.
 - **If the pressures are within range**
3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).

- If the pressure does not change

Replace the Q8 Control Solenoid Valve Assembly.

- If the pressure changes

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

DTC P0776 or P0777 - Control Valve Body Assembly

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

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

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

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

Fluid pump housing/gear damaged/scored.

DTC P0776 - Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

DTC P0776 or P0777 - Q8 Control Solenoid Valve Assembly

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

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0796 OR P0797: PRESSURE CONTROL SOLENOID VALVE 3 STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P0796

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

DTC P0797

Circuit/System Description

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

Conditions for Running the DTC

P0796

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

P0797

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Transmission output speed is 100 RPM or greater or the throttle position is 0.5% or greater.
- Throttle position signal is valid.
- Ignition voltage is 9 - 32 V.
- Transmission fluid temperature is -6.7°C (20°F) or greater.
- High side driver is enabled.
- The throttle position is 10% or greater and the engine torque is 45 N.m (33 lb ft) or greater if attained gear is 1st free wheel.
- DTC runs continuously during shift when the 4-5-6 clutch is commanded OFF, until commanded range is attained.

Conditions for Setting the DTC

P0796

The TCM detects an incorrect gear ratio when the 4-5-6 clutch is commanded ON. This condition must occur 3 times.

P0797

The TCM detects an incorrect gear ratio change when the 4-5-6 clutch is commanded OFF during a shift. This must occur 3 times.

Action Taken When the DTC Sets

- P0796 and P0797 are Type A DTCs.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down functions.

- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 3rd gear - DTC P0796 only.
- TCM limits the transmission to reverse and 4th gear - DTC P0797 only.

Conditions for Clearing the DIC/DTC

P0796 and P0797 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Drive Range, Fourth Gear \(Gen 3\)](#)
- [Drive Range, Fifth Gear \(Gen 3\)](#)
- [Drive Range, Sixth Gear \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

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

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

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

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

4. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).

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

Repair as necessary.

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

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

6. Verify DTC P0796 or P0797 does not set while performing a road test. Refer to [Road Test](#).

- **If DTC P0796 or P0797 sets**

Refer to Circuit/System Testing.

- **If DTC P0796 or P0797 does not set**

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

8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.

2. Verify the transmission line pressures are within the specified range. Refer to [Line Pressure Check](#), and [Solenoid Valve Pressure \(Gen 3\)](#) .

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

Refer to [Fluid Pressure High or Low](#).

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

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

P0796 or P0797 - Control Valve Body Assembly

4-5-6 Regulator Valve stuck/sticking - debris, binding, damaged valve, or scored bore.

P0796 - Transmission Cooling/Lubrication

- Restriction/leak in OAC, oil to air, cooler/radiator.
- Restricted/leaking/kinked/damaged transmission oil cooler lines.
- Restriction/leak in transmission fluid pump assembly.

P0796 - Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P0796 - Input Shaft Support

Input shaft tower seals damaged or leaking.

P0796 - 4-5-6 Clutch Housing Assembly

4-5-6 Clutch Piston Assembly damaged/leaking.

P0796 - Torque Converter (w/Fluid Pump) Housing Assembly

- Fluid pump housing vanes/rotor/slide damaged/scored.
- Fluid pump or torque converter overstressed due to high temperature.

P0796 - 4-5-6 Reaction Carrier Hub Assembly

4-5-6 Reaction Carrier Hub/Shaft - broken hub weld.

P0796 - 3-5-R and 4-5-6 Clutch Housing Assembly

4-5-6 Clutch Backing Plate Retaining Ring not seated/oriented, causing clutch pack/piston overtravel.

P0796 Output Carrier Assembly

Output carrier pinion pins too high or too low.

P0796 or P0797 - Q8 Control Solenoid Valve Assembly

- Clutch Pressure Control Solenoid 3 stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damaged gasket seal.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0815, P0816, OR P0826: SHIFT SWITCH CIRCUITS

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0826	-	P0826	-
Ground	-	-	-	-

Typical Scan Tool Data

Driver Shift Request

Circuit	Short to Ground	Open	Short to Voltage
Ground	-	Inactive	-
Signal	Invalid	Inactive	Invalid/Inactive

Circuit/System Description

When the shift lever is placed in manual mode (M), the driver shift request, also known as the tap shift function is activated. Manual mode allows the vehicle operator to shift gears by pushing the plus (+) button for an upshift or minus (-) button for a downshift. The body control module (BCM) supplies battery voltage, ground, and a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. A voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to perform the upshift or downshift. The TCM will not allow a downshift if the engine would be compromised by overspeeding.

Conditions for Running the DTC

P0815 or P0816

- DTC P0815, P0816, P0826, P1761, P182E, P1876, P1877, or P1915 is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- Time since the last gear range change is greater than 1 s.
- Runs continuously when above conditions are met.

P0826

- DTC P0826 or P1761 is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0815 - Condition 1

TCM detects an upshift request for 1 s with the shift lever in Park or Neutral.

P0815 - Condition 2

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

P0816 - Condition 1

TCM detects a downshift request for 1 s with the shift lever in Park or neutral.

P0816 - Condition 2

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

P0826

TCM detects an invalid voltage on the TAP Up/Down signal circuit for 1 min.

Action Taken When the DTC Sets

- P0815, P0816, and P0826 are Type C DTCs.
- TCM inhibits Tap Up/Down function.

Conditions for Clearing the DTC

P0815, P0816, and P0826 are Type C DTCs.

Diagnostic Aids

A high resistance in the signal circuit may not set a DTC. Symptoms could include an inoperative manual mode Tap Up/Down, or a Tap Down shift when the Tap/Up button is pressed.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

NOTE: The engine may have to be started to move the shift lever out of the Park position. Once out of the Park position, the engine can be turned OFF.

1. Verify DTC P182E or P1915 was not set by reviewing the scan tool Freeze Frame/Failure Records.

- If DTC P182E or P1915 was set

Refer to **DTC P182E or P1915**.

- **If DTC P182E or P1915 was not set**

2. Ignition ON, engine OFF, S3 Transmission Shift Lever in the M or manual mode position.
3. Verify the scan tool Driver Shift Request parameter displays Upshift when the plus (+) button is pressed, Downshift when the minus (-) button is pressed, and Inactive when neither switch is pressed.

- **If the parameter does not display the correct values**

Refer to Circuit/System Testing.

- **If the parameter displays the correct values**

4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the vehicle harness connector ground circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF, disconnect the vehicle harness at the ground connection.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the ground connection.
 - **If less than 10 Ω**
3. Ignition ON.
4. Test for 11 - 13 V at the vehicle harness connector between signal circuit terminal 3 and ground.
 - **If not between 11 - 13 V**
 1. Ignition OFF, disconnect the connector at the BCM.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance.
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the BCM.
 - **If between 11 - 13 V**
5. Ignition OFF, connect the harness connector at the S3 Transmission Shift Lever.
6. Ignition ON, S3 Transmission Shift Lever in the M or manual mode position.
7. Test for voltage between the S3 Transmission Shift Lever connector signal circuit terminal 3 and ground, by back probing the connector, for the conditions listed below.
 - 2.0 - 4.6 V - Plus button pressed
 - 5.1 - 7.3 V - Minus button pressed
 - 8.0 - 10.6 V - Neither button pressed
 - **If voltage values are not correct**

Replace the S3 Transmission Shift Lever.

- If voltage values are correct

8. Replace the K9 Body Control Module.

Repair Instructions

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

- Refer to [Transmission Control Replacement](#) - for Transmission Shift Lever Replacement
- Refer to [Control Module References](#) - for BCM replacement, setup, and programming

DTC P0850-P0852: PARK/NEUTRAL POSITION SWITCH 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0850

Park/Neutral Position Switch Circuit

DTC P0851

Park/Neutral Position Switch Circuit Low Voltage

DTC P0852

Park/Neutral Position Switch Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Park/Neutral Position Switch

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

Circuit/System Description

The transmission manual shift shaft switch assembly, also known as the transmission internal mode switch is a sliding contact switch attached to the manual shift shaft inside the transmission case. The park/neutral position switch is integrated into the transmission internal mode switch and connects to the transmission control module (TCM) lead-frame through a short wire harness. The park/neutral signal circuit uses the TCM as a pass-through connector only. The TCM provides the low reference circuit to the park/neutral position switch.

The Park/Neutral Signal is sent from the park/neutral switch directly to the Engine Control Module (ECM) and is used for engine start enable.

Conditions for Running the DTC

- Ignition voltage is between 8 - 18 V.

- Engine speed is 1000 RPM or greater.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0850 and P0851

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

P0852

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Transmission General Description \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)

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

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC P182E or P1915 is not set.
 - **If any of the DTCs are set**

Refer to [DTC P182E or P1915](#).
 - **If none of the DTCs are set**
3. Verify the range selector lever cable is adjusted properly. Refer to [Range Selector Lever Cable Adjustment](#) .
 - **If the cable adjustment is not OK**

Adjust, repair or replace as necessary.
 - **If the cable adjustment is OK**
4. Verify the scan tool TCM Internal Mode Switch parameter matches the gear shift lever position while slowly moving the gear shift lever from Park through all gear ranges.
 - **If any gear shift lever position does not match**

Refer to [DTC P182E or P1915](#).
 - **If all gear positions match**
5. Verify the scan tool Park/Neutral Position Switch parameter displays Park/Neutral when in Park or Neutral and In Gear when in Reverse or Drive.
 - **If Park/Neutral or In Gear is not displayed**

Refer to Circuit/System Testing.
 - **If Park/Neutral and In Gear is displayed**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
 - **If the DTC sets**

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

Circuit/System Testing

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

1. Ignition OFF, disconnect the X1 Q8 Control Solenoid Valve Assembly harness connector at the automatic transmission.
2. Install the **DT-48616-10** adapter harness to the vehicle harness connector.

NOTE: All testing in steps 3 through 5 will be performed at the DT-48616-10 adapter harness connector.

3. Test for less than 5 Ω between the ground circuit terminal 2 and ground.
 - **If 5 Ω or greater**
 1. Disconnect the ground circuit at the ground connection.
 2. Test for less than 2 Ω in the ground circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 5 Ω**
4. Ignition ON.
 5. Test for 11 - 13 V between signal circuit terminal 3 and ground.
 - **If not between 11 - 13 V**
 1. Ignition OFF, remove the harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between signal circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground in the circuit.
 - If infinite resistance.
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If between 11 - 13 V**
 6. Ignition OFF, disconnect the **DT-48616-10** adapter harness from the vehicle wire harness.
 7. Remove the transmission control valve body cover.
 8. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
 9. Disconnect the B15 Transmission Internal Mode Switch X2 electrical connector from the Q8 Control Solenoid Valve Assembly.
 10. Ignition ON.
 11. Verify the scan tool ECM Park/Neutral Position Switch parameter displays In Gear.
 - **If In Gear is not displayed**
 1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.
 2. Install the **DT-48616-10** adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.
 3. Test for infinite resistance between the **DT-48616-10** adapter harness connector terminals 2 and 3.
 - If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If In Gear is displayed**
 12. Connect a 3A fused jumper between the Q8 Control Solenoid Valve Assembly X2 connector signal circuit terminal A and ground. Ignition ON.
 13. Verify the scan tool ECM Park/Neutral Position Switch parameter displays Park/Neutral.
 - **If Park/Neutral is not displayed**
 1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.
 2. Install the **DT-48616-10** adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.
 3. Test for less than 2 Ω between adapter harness connector terminal 3 and the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A.
 - If 2 Ω or greater, replace the Q8 Control Solenoid Valve Assembly.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If Park/Neutral is displayed**
 14. Replace the B15 Transmission Internal Mode Switch.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs.
- Refer to [Range Selector Lever Cable Adjustment](#)

- Refer to [Control Valve Body Cover Replacement](#)
- Refer to [Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement](#)
- Refer to [Control Valve Body Cover Replacement](#)
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P0961-P0963: LINE PRESSURE CONTROL SOLENOID VALVE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0961

Line Pressure Control Solenoid Valve Performance

DTC P0962

Line Pressure Control Solenoid Valve Control Circuit Low Voltage

DTC P0963

Line Pressure Control Solenoid Valve Control Circuit High Voltage

Circuit/System Description

The line pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The normally high line pressure control solenoid valve regulates and directs oil pressure to the pressure regulator valve. Increasing line pressure control solenoid valve pressure increases transmission line pressure. The transmission control module (TCM) varies the current to the line pressure control solenoid valve by controlling the amount of time the low side driver is ON and OFF. Decreasing the ON time, decreases the current to the line pressure control solenoid, which increases line pressure control solenoid oil pressure by closing OFF the solenoid exhaust port. Increasing the current to the line pressure control solenoid decreases line pressure control oil pressure by opening the solenoid exhaust port. Line pressure control solenoid power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0961

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

P0962

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

P0963

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

Action Taken When the DTC Sets

P0961 or P0963

- P0961 and P0963 are Type B DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.

P0962

- P0962 is a Type A DTC.
- TCM limits the transmission to 4th gear and reverse.
- TCM inhibits the torque converter clutch (TCC).
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM turns the high side driver OFF.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

1. Engine idling, transmission in Park, with service brake applied. Move the S3 Transmission Shift Lever into each gear position for 2 - 3 s and back into the Park position.
2. Verify the scan tool parameters listed below do not display Malfunction:
 - Line Pressure Control Solenoid Valve Performance Test Status
 - Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
 - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

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

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

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If contaminated**

Repair as necessary.
 - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.
 - **If the resistance is within range**
4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

NOTE: If the Line Pressure Control Solenoid Valve is not commanded from

the Transmission Solenoid Performance Test, High Side Driver 1 will not be commanded On and the circuit test status will not run.

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

- Line Pressure Control Solenoid Valve Performance Test Status
- Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
- Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P0965-P0967: PRESSURE CONTROL SOLENOID VALVE 2

Diagnostic Instructions

- Perform the [Diagnostic System Check - Vehicle](#) prior to using this diagnostic procedure.
- Review [Strategy Based Diagnosis](#) for an overview of the diagnostic approach.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0965

Pressure Control Solenoid Valve 2 Performance

DTC P0966

Pressure Control Solenoid Valve 2 Control Circuit Low Voltage

DTC P0967

Pressure Control Solenoid Valve 2 Control Circuit High Voltage

Circuit/System Description

Pressure control solenoid valve 2 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid valve 2 regulates and directs fluid pressure to the 3-5 reverse clutch regulator valve. Increasing pressure control solenoid valve 2 pressure increases pressure to the 3-5 reverse clutch. The transmission control module (TCM) varies the current to the pressure control solenoid valve 2 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to the pressure control solenoid valve 2 increases pressure control solenoid valve 2 fluid pressure by closing OFF the solenoid valve exhaust port. Decreasing the current to the pressure control solenoid valve 2 decreases clutch pressure control solenoid valve 2 fluid pressure by opening the solenoid valve exhaust port. Power to pressure control solenoid valve 2 is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

- Engine speed is 400 - 7,500 RPM for 5 s.

- Ignition voltage is 9 - 32 V.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0965

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

P0966

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

P0967

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

Action Taken When the DTC Sets

P0965

- P0965 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 3-5 Reverse clutch.

P0966 or P0967

- P0966 and P0967 are Type A DTCs.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM forces the high side driver OFF.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

[Circuit/System Verification](#)

1. Operate the vehicle in second gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature, then operate the vehicle with the transmission in Park for 5 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
 - Pressure Control Solenoid Valve 2 Performance Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**
Refer to Circuit/System Testing.
 - **If Malfunction is not displayed**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.
 - **If the DTC sets**
Refer to Circuit/System Testing.
 - **If the DTC does not set**
6. All OK.

[Circuit/System Testing](#)

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If contaminated**
Repair as necessary.
 - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 2 On and Off:
 - Pressure Control Solenoid Valve 2 Performance Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0969-P0971: PRESSURE CONTROL SOLENOID VALVE 3

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0969

Pressure Control Solenoid Valve 3 Performance

DTC P0970

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage

DTC P0971

Pressure Control Solenoid Valve 3 Control Circuit High Voltage

Circuit/System Description

Pressure control solenoid valve 3 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid valve 3 regulates and directs fluid pressure to the R1/4-5-6 regulator valve. Increasing pressure control solenoid valve 3 pressure increases pressure to the low and reverse clutch or 4-5-6 clutch, depending on the position of the clutch select valve. The

transmission control module (TCM) varies current to pressure control Solenoid valve 3 by controlling the time the low side driver is ON and OFF. Decreasing the current to pressure control solenoid valve 3 increases fluid pressure by closing off the solenoid valve exhaust port. Increasing the current to the pressure control solenoid valve 3 decreases fluid pressure by opening the exhaust port. Power is supplied to the pressure control solenoid valve 3 by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P0969

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

P0970

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

P0971

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

Action Taken When the DTC Sets

P0969

- P0969 is a Type C DTC.
- TCM freezes transmission adaptive functions on the low and reverse clutch and the 4-5-6 clutch.

P0970 or P0971

- P0970 and P0971 are Type A DTCs.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM enables torque management.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits auto grade braking.
- TCM forces the high side driver OFF - P0970 only.
- TCM forces the torque converter clutch (TCC) OFF - P0970 only.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#).

Circuit/System Verification

1. Operate the vehicle in second gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature, then operate the vehicle with the transmission in Park for 5 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
 - Pressure Control Solenoid Valve 3 Performance Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

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

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

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If contaminated**

Repair as necessary.
 - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.
 - **If the resistance is within range**
4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 3 On and Off:
 - Pressure Control Solenoid Valve 3 Performance Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.
 - **If Malfunction is not displayed**
7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P0973 OR P0974: SHIFT SOLENOID VALVE 1 CONTROL CIRCUIT LOW/HIGH 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P0973

Shift Solenoid Valve 1 Control Circuit Low Voltage

DTC P0974

Circuit/System Description

The shift solenoid valve 1 is part of the control solenoid valve assembly which has no serviceable components. Shift solenoid valve 1 is a normally closed ON/OFF solenoid and is controlled by the transmission control module (TCM) through a low side driver. When the shift solenoid valve 1 is energized (ON), fluid pressure is directed to the clutch select valve. Power to shift solenoid valve 1 is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

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

Conditions for Setting the DTC**P0973**

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

P0974

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

Action Taken When the DTC Sets**P0973**

- DTC P0973 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM limits the transmission to neutral or 2nd gear and reverse.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.

P0974

- DTC P0974 is a Type B DTC.
- TCM inhibits 1st gear.
- TCM inhibits neutral idle.

Conditions for Clearing the DIC/DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature.
2. Place the gear selector in Reverse for 5 s and then idle vehicle for 5 s.
3. Verify the scan tool parameters listed below do not display Malfunction:
 - Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status
 - Shift Solenoid Valve 1 Control Circuit Open Test Status
 - Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

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

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

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid valve listed in the [**Control Solenoid Valve and Transmission Control Module Assembly Inspection**](#).

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.

5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

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

- Shift Solenoid Valve 1 Control Circuit Low Voltage Test
- Shift Solenoid Valve 1 Control Circuit Open Test
- Shift Solenoid Valve 1 Control Circuit High Voltage Test
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

Repair Instructions

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

- Perform the [**Transmission Adaptive Values Learn**](#) following all transmission repairs
- Refer to [**Control Module References**](#) - for control module replacement, programming and setup

DTC P171A-P171C: TRANSMISSION FLUID PRESSURE ACCUMULATOR SOLENOID VALVE 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.
- Refer to [**Diagnostic Procedure Instructions**](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P171A

Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit

DTC P171B

Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Low Voltage

DTC P171C

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Ignition	P0030, P0036, P0132, P0134, P0135, P0138, P0140, P0141, P171B *	P0030, P0036, P0132, P0134, P0135, P0138, P0140, P0141, P171A	-
Control	P171B	P171A	P171C
*Will open the fuse			

Typical Scan Tool Data**Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Low Voltage Test Status**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK or Not Run			
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Low Voltage Test Status	Malfunction	OK/Not Run	OK/Not Run

Transmission Fluid Pressure Accumulator Solenoid Valve 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			
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit High Voltage Test Status	OK/Not Run	OK/Not Run	Malfunction

Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK or Not Run			
Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Open Test Status	Malfunction	OK/Not Run	OK/Not Run

Circuit/System Description

The automatic transmission auxiliary fluid accumulator is used to supply transmission fluid line pressure following an Autostop event. The accumulator is externally mounted to the transmission case assembly. The accumulator has a solenoid valve which controls the charging and discharge of the accumulator pressure. Power to the solenoid is provided from an ignition circuit. The engine control module (ECM) controls the accumulator solenoid by providing the ground path to the control circuit.

Conditions for Running the DTC

- Ignition voltage is 6.41 V or greater.
- Runs continuously when above condition is met.

Conditions for Setting the DTC**P171A**

The ECM detects an open circuit on the transmission surge solenoid circuit for 1 s.

P171B

The ECM detects a short to ground on the transmission surge solenoid circuit for 1 s.

P171C

The ECM detects a short to power on the transmission surge solenoid circuit for 1 s.

Action Taken When the DTC Sets

- P171A, P171B, and P171C are type B DTCs.
- Autostop is disabled.

Conditions for Clearing the DTC

P171A, P171B, and P171C are type B DTCs.

Diagnostic Aids

- The Autostart/Autostop command is located in the scan tool ECM control functions menu.
- The hood must be closed when commanding Autostart/Autostop, or an error message will be displayed on the scan tool.
- The automatic transmission accumulator solenoid valve is part of the auxiliary fluid accumulator and is serviced as an assembly.

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 \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction when commanding the Transmission Fluid Pressure Accumulator Solenoid Valve On and Off with a scan tool.
 - Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit High Voltage Test Status
 - Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Low Voltage Test Status
 - Transmission Fluid Pressure Accumulator Solenoid Valve Control Circuit Open Test Status

- **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

4. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

NOTE: You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.

1. Ignition ON.

2. Verify a test lamp illuminates on both test points of the ignition circuit fuse that provides power to the B280 Automatic Transmission Accumulator Solenoid Valve.

- **If the test lamp does not illuminate on either test point of the fuse**

Refer to **DTC P0685-P0687, P0689, P0690, or P1682**.

- **If the test lamp illuminates on 1 test point and the fuse is open**

1. Ignition OFF.

NOTE: There are multiple ignition circuits protected by this fuse.

2. Disconnect all components protected by this fuse.

3. Test for infinite resistance between the ignition circuit and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, determine which component on the ignition circuit is causing the fuse to open, and replace the component.

- **If the test lamp illuminates on both test points**

3. Ignition OFF, disconnect the harness connector at the B280 Automatic Transmission Accumulator Solenoid Valve. Ignition ON.

4. Verify a test lamp illuminates between the ignition circuit terminal 1 and ground.

- **If the test lamp does not illuminate and the circuit fuse is good**

1. Ignition OFF, remove the test lamp.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , replace the X50A Fuse Block - Underhood.

- **If the test lamp illuminates**

5. Connect a test lamp between the ignition circuit terminal 1 and the control circuit terminal 2.

6. Verify the test lamp turns ON and OFF when commanding the Transmission Fluid Pressure Accumulator Solenoid Valve On and Off with a scan tool.

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

1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module, Ignition ON.

2. Test for less than 1 V between the control circuit and ground.

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

- If less than 1 V.
3. Ignition OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF, disconnect the X3 harness connector at the K20 Engine Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If the test lamp turns ON and OFF**
 7. Test or replace the B280 Automatic Transmission Accumulator Solenoid Valve. Refer to Component Testing.

Component Testing

1. Perform the Circuit/System Verification and Circuit/System Testing first.
2. Ignition OFF, disconnect the harness connector at the B280 Automatic Transmission Accumulator Solenoid Valve.
3. Test for 16 - 20 Ω between ignition circuit terminal 1 and control circuit 2.
 - **If not between 16 - 20 Ω**
Replace the B280 Automatic Transmission Accumulator Solenoid Valve.
 - **If between 16 - 20 Ω**
4. Test for infinite resistance between each terminal and the B280 Automatic Transmission Accumulator Solenoid Valve case.
 - **If less than infinite resistance**
Replace the B280 Automatic Transmission Accumulator Solenoid Valve.
 - **If infinite resistance**
5. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Auxiliary Fluid Accumulator Installation \(MHG\)](#) - for B280 Automatic Transmission Accumulator Solenoid Valve installation
- Refer to [Auxiliary Fluid Accumulator Removal \(MHG\)](#) - for B280 Automatic Transmission Accumulator Solenoid Valve removal
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P171D: TRANSMISSION FLUID PRESSURE ACCUMULATOR SYSTEM PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptor

DTC P171D

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Automatic Transmission Auxiliary Fluid Accumulator	P171D	Damaged component: • Transmission Accumulator Solenoid Valve - Stuck • Seal Ring - Worn The Automatic Transmission Auxiliary Fluid Accumulator is only serviced as an assembly
1234 Clutch Assembly	P171D, P2714	Damaged component: • Seal Ring - Worn • Clutch Plates - Worn
Check Valve	P171D	Stuck or Leaking
Automatic Transmission Case	P171D, P2714	Damaged component: Worn or broken - 1234 Clutch Retainer Spring retaining tabs

Circuit/System Description

The automatic transmission auxiliary fluid accumulator is used to provide transmission fluid line pressure to the transmission during an autostart event. The accumulator is externally mounted to the transmission case assembly. The engine control module (ECM) controls the automatic transmission auxiliary fluid accumulator solenoid valve by providing a ground path to the solenoid valve control circuit.

When the engine is shut off during an autostop event, there is no transmission line pressure. During an autostart event, the ECM commands the automatic transmission auxiliary fluid accumulator solenoid valve on, allowing transmission fluid to discharge from the accumulator, supplying line pressure to the transmission. The accumulator will start to recharge when the transmission fluid pump increases line pressure higher than accumulator pressure. Transmission fluid will flow through the solenoid valve until the ECM turns the solenoid off and also flow through a check valve.

The TCM monitors clutch slip during an autostart event. The DTC will set if the TCM detects that the accumulator system is not capable of supplying adequate pressure during autostart.

Conditions for Running the DTC

- DTCs P171A, P171B, P171C, P182E, P1915 or U0101 is not set.
- Transmission shift lever is in a forward range.
- Ignition voltage is 9 - 32 V.
- Transmission fluid temp is 0 - 110°C (32 - 230°F).
- Engine is OFF for 1.2 s or greater.
- During auto stop, engine speed was 5 RPM or less.
- Runs during auto start event.

Conditions for Setting the DTC

TCM detects excessive transmission slip during an autostart. This must occur 7 times on separate autostart events.

Action Taken When the DTC Sets

- P171D is a type B DTC.

- Autostop is disabled.

Conditions for Clearing the DTC

P171D is a type B DTC.

Diagnostic Aids

- The Autostart/Autostop command is located in the scan tool ECM control functions menu.
- The hood must be closed when commanding Autostart/Autostop, or an error message will be displayed on the scan tool.

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 \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

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

1. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).

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

Repair as necessary.

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

3. Clear the ECM and TCM DTCs with a scan tool.
4. Verify DTC P171D does not set while performing a road test. Refer to [Road Test](#).

- **If DTC P171D sets**

1. Replace the Transmission Fluid Pressure Accumulator.
2. Verify DTC P171D does not set while performing a road test. Refer to: [Road Test](#)
 - If the DTC sets - Inspect the transmission for mechanical conditions listed in Diagnostic Fault Information.
 - If the DTC does not set

3. All OK.

- If DTC P171D does not set

5. All OK.

Repair Instructions

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

- Refer to **Auxiliary Fluid Accumulator Removal (MHG)**
- Perform the **Transmission Adaptive Values Learn** following all transmission repairs
- Refer to **Control Module References** - for Engine Control Module replacement, programming and setup

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptor

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

Circuit/System Description

When the shift lever is placed in the M position, the transmission will enter manual mode, also known as tap shift. The manual mode allows the vehicle operator to select an upshift by pressing the plus (+) button or downshift by pressing the minus (-) button. The body control module (BCM) supplies a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. A voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) for an upshift or downshift. The BCM internal counter increments each time the tap shift signal status is sent and the BCM sends the rolling count with the tap shift signal status. The TCM counter increments each time the tap shift signal status is received. The DTC will set if the rolling count value of the TCM does not match the rolling count sent from the BCM.

Conditions for Running the DTC

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

Conditions for Setting the DTC

TCM detects the internal rolling count value does not match the expected BCM count, 3 times within 10 s.

Action Taken When the DTC Sets

- P1761 is a Type C DTC.
- TCM inhibits the Tap Up Tap Down function.
- TCM inhibits manual shifting of forward gears.

Conditions for Clearing the DTC

P1761 is a Type C DTC.

Reference Information

Schematic Reference

- [Automatic Transmission Controls Schematics](#)
- [Body Control System Schematics](#)
- [Data Communication 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 \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Circuit/System Verification

NOTE:

- DTC P1761 is an informational DTC.
- Diagnose all other body control module DTCs prior to DTC P1761.

1. Verify there are no other body control module or communication DTCs set.

- If a DTC is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- If a DTC is not set

2. Complete the diagnosis by looking for a GMLAN circuit fault. Refer to [Scan Tool Does Not Communicate with High Speed GMLAN Device](#) .

- If a GMLAN circuit fault is found

Repair as necessary.

- If a GMLAN circuit fault is not found

3. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Body Control Module and Control Solenoid Valve Assembly replacement, programming and setup

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P182E

Internal Mode Switch Indicates Invalid Range

DTC P1915

Internal Mode Switch Does Not Indicate Park/Neutral During Start

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal A	P182E	P1915	P1915	P182E, P1915
Signal B	P1915	P182E	P182E	P182E, P1915
Signal C	P1915	P182E	P182E	P182E, P1915
Signal P	P182E	P1915	P1915	P182E, P1915
Low Reference	-	P182E	P182E	P182E, P1915

Typical Scan Tool Data

Internal Mode Switch A/B/C/P

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, range selector in Park			
Parameter Normal Range Low High High Low			
Signal A	Low	High	High
Signal B	Low	High	High
Signal C	Low	High	High
Signal P	Low	High	High
High = 12 volts			
Low = 0 volts			

Circuit/System Description

The manual shift detent lever with shaft position switch assembly, also known as the transmission internal mode switch assembly, is a sliding contact switch attached to the manual shift detent lever shaft inside the transmission. The 4 inputs to the transmission control module (TCM) from the switch indicate the position selected by the transmission manual shaft. The input voltage at the TCM is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool TCM Internal Mode Switch A/B/C/P parameter. The Internal Mode Switch A/B/C/P parameter represents transmission range Signal A, Signal B, Signal C, and Signal P.

The park/neutral position switch is integrated into the transmission internal mode switch. The circuit uses the TCM as a pass-through connector only.

The park/neutral signal is sent from the park/neutral switch directly to the engine control module (ECM) and is used for engine start enable.

Conditions for Running the DTC

P182E

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306,

P0307, P0308, P0401, P042E, P0722, or P0723 is not set.

- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- Engine torque signal is valid.
- DTC runs continuously when the above conditions are met.

P1915

- DTC P0722, P0723, or P1915 is not set.
- Transmission output shaft speed is 90 RPM or less.
- Ignition voltage is 6 - 32 V.
- DTC runs when conditions above are met during engine start sequence.

Conditions for Setting the DTC

P182E

Internal mode switch does not indicate a valid Park, Reverse, Neutral, or Drive Range position for 7 s.

P1915

Internal mode switch does not indicate Park or Neutral during the following sequence:

- Engine speed is less than 50 RPM for greater than 0.10 s.
- Engine speed is 50 - 480 RPM for greater than 0.07 s.
- Engine speed is greater than 500 RPM and the transmission input speed is greater than 100 RPM for greater than 1.25 s.

Action Taken When the DTC Sets

- P182E and P1915 are Type A DTCs.
- TCM commands maximum line pressure.
- TCM turns OFF all solenoids.
- TCM freezes transmission adaptive functions.
- TCM limits the transmission to reverse and 4th gear.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits manual shifting of forward gears.
- TCM turns the high side driver OFF.
- TCM enables torque management.

Conditions for Clearing the DTC

P182E and P1915 are Type A DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Verify the range selector lever cable is adjusted properly. Refer to [Range Selector Lever Cable Adjustment](#) .
 - **If cable adjustment is not OK**
Repair as necessary.
 - **If cable adjustment is OK**
2. Ignition ON.
3. Verify the scan tool TCM Internal Mode Switch A/B/C/P parameter matches the [Transmission Internal Mode Switch Logic](#) table for each transmission shift lever position.
 - **If the parameter does not match**
Refer to Circuit/System Testing.
 - **If the parameter matches**
4. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral with the gear shift lever in Park or Neutral and In Gear in Reverse or Drive.
 - **If Park/Neutral or In Gear is not displayed**
Refer to Circuit/System Testing.
 - **If Park/Neutral and In Gear is displayed**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
6. Verify the DTC does not set.
 - **If the DTC sets**
Refer to Circuit/System Testing.
 - **If the DTC does not set**
7. All OK.

NOTE: You must perform Circuit/System Verification first.

1. Ignition OFF, remove the control valve body cover.
2. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
3. Disconnect the B15 Transmission Internal Mode Switch connector at the Q8 Control Solenoid Valve Assembly.
4. Ignition ON.
5. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays In Gear.
 - **If In Gear is not displayed**
 1. Ignition OFF, disconnect the vehicle harness X1 connector at the Q8 Control Solenoid Valve Assembly.
 2. Install the **DT-48616-10** adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.
 3. Test for infinite resistance between the **DT-48616-10** adapter harness connector terminals 2 and 3.
 - If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.
 - If infinite resistance.
 4. Disconnect the harness connector at the K20 Engine Control Module.
 5. Test for infinite resistance between the signal circuit and ground at the vehicle harness K20 Engine Control Module connector.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K20 Engine Control Module.
 - **If In Gear is displayed**
6. Verify the scan tool transmission control module Internal Mode Switch A/B/C/P parameter displays High High High High.
 - **If High High High High is not displayed**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If High High High High is displayed**
7. Install a 3 A fused jumper wire between the low reference circuit terminal F and each signal circuit listed below one at a time at the Q8 Control Solenoid Valve Assembly.
 - Signal A - terminal B
 - Signal B - terminal C
 - Signal C - terminal D
 - Signal P - terminal E
8. Verify the scan tool transmission control module A/B/C/P parameter displays 1 Low and 3 High when a signal circuit is grounded.
 - **If 1 Low and 3 High is not displayed**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If 1 Low and 3 High is displayed**
9. Connect a 3-amp fused jumper wire between terminal A and terminal F.
10. Verify the ECM Park/Neutral Position Switch parameter displays Park/Neutral.
 - **If Park/Neutral is not displayed**
 1. Ignition OFF, remove the jumper wire and disconnect the X1 connector at the Q8 Control Solenoid Valve Assembly.
 2. Install the **DT-48616-10** adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.

3. Test for less than 2 Ω between the adapter harness terminal 2 and the X2 connector terminal F at the Q8 Control Solenoid Valve Assembly.
 - If greater than 2 Ω , replace the Q8 Control Solenoid Valve Assembly.
 - If less than 2 Ω .
4. Disconnect the connector at the K20 Engine Control Module.
5. Test for less than 2 Ω in the vehicle harness park/neutral signal circuit, end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K20 Engine Control Module.
 - **If Park/Neutral is displayed**

11. Replace the B15 Transmission Internal Mode Switch.

Repair Instructions

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

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

DTC P2714 OR P2715: PRESSURE CONTROL SOLENOID VALVE 4 STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P2714

Pressure Control Solenoid Valve 4 Stuck Off - Transmission Hydraulic/Mechanical Performance

DTC P2715

Pressure Control Solenoid Valve 4 Stuck On - Transmission Hydraulic/Mechanical Performance

Circuit/System Description

Pressure control solenoid valve 4 is part of the control solenoid valve assembly which has no serviceable components. Pressure control solenoid valve 4 regulates transmission fluid pressure to the 2-6 regulator valve which controls pressure to the 2-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

P2714

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

- High side driver is enabled.
- Throttle position signal is valid.
- Ignition voltage is 9 - 32 V.
- Transmission fluid temperature is -6.6Â°C (20Â°F) or greater.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Pressure control solenoid 4 is commanded ON, applying the 2-6 clutch.
- Output speed is 100 RPM or greater, or the throttle position is greater than 0.5%.
- Runs continuously when above conditions are met.

P2715

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Ignition voltage is 9 - 32 V.
- Transmission output shaft speed is 100 RPM or greater, or throttle position is 0.5% or greater.
- Pressure control solenoid 4 is commanded OFF, releasing the 2-6 clutch.
- Transmission fluid temperature is -6.6Â°C (20Â°F) or greater.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Engine torque is 45 N.m (33 lb ft) or greater.
- The attained range is not 1st gear.
- High side driver is enabled.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P2714

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

P2715

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

Action Taken When the DTC Sets

P2714

- P2714 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM limits the transmission to reverse and 3rd gear.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.

P2715

- P2715 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.

- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.
- TCM inhibits neutral idle.
- TCM commands 2nd gear if the output speed is less than 700 RPM.
- TCM commands neutral if the output speed is 700 RPM or greater.

Conditions for Clearing the DTC

P2714 and P2715 are Type A DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Drive Range, Second Gear \(Gen 3\)](#)
- [Drive Range, Sixth Gear \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

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

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

- If any of the DTCs were set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#) .

- If none of the DTCs were set

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

4. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).

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

Repair as necessary.

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

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

6. Verify DTC P2714 or P2715 does not set while performing a road test. Refer to [Road Test](#).

- **If DTC P2714 or P2715 sets**

Refer to Circuit/System Testing.

- **If DTC P2714 or P2715 does not set**

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

8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.

2. Verify the transmission line pressures are within the specified range. Refer to [Line Pressure Check](#), and [Solenoid Valve Pressure \(Gen 3\)](#).

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

Refer to [Fluid Pressure High or Low](#).

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

4. Verify the pressure changes for all solenoid valves when performing the solenoid valve test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

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

P2714 Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2714 or P2715 Control Valve Body Assembly

2-6 clutch regulator valve stuck/sticking, debris, binding, damaged valve, or scored bore.

P2714 Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2714 Torque Converter (w/fluid pump) Housing Assembly

Fluid pump housing/gear damaged/scored.

P2714 Trans case and 1-2-3-4 clutch backing plate retainer ring

1-2-3-4 clutch backing plate retaining ring not seated/oriented correctly at trans case groove.

P2714 or P2715 Transmission case, 2-6 clutch piston, spring retaining ring, reaction sun gear

- 2-6 clutch return spring retaining ring not seated in groove
- 2-6 clutch piston assembly - seal damaged or leaking
- 2-6 clutch plates worn or damaged
- 2-6 clutch plates will not slide over the reaction sun gear shell freely

P2714 or P2715 Q8 Control Solenoid Valve Assembly

- Pressure Control Solenoid Valve 4 Stuck ON/OFF.
- Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal.
- O-ring seals leaking.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P2719-P2721: PRESSURE CONTROL SOLENOID VALVE 4

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P2719

Pressure Control Solenoid Valve 4 Performance

DTC P2720

Pressure Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Pressure Control Solenoid Valve 4 Control Circuit High Voltage

Circuit/System Description

Pressure control solenoid valve 4 is part of the control solenoid valve assembly which has no serviceable components. The normally low pressure control solenoid valve 4 regulates and directs oil pressure to the 2-6 clutch regulator valve. Increasing pressure control solenoid valve 4 pressure increases pressure to the 2-6 clutch. The transmission control module (TCM) varies current to the pressure control solenoid valve 4 by controlling the amount of time the low side driver is ON and OFF. Increasing the ON time increases current to the pressure control solenoid valve 4. Increasing current to pressure control solenoid valve 4 increases oil pressure by closing off the solenoid valve exhaust port. Decreasing the current to the pressure control solenoid valve 4 decreases oil pressure by opening the exhaust port. Pressure control solenoid valve 4 power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- DTC runs continuously when above conditions are met.

Conditions for Setting the DTC

P2719

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

P2720

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

P2721

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

Action Taken When the DTC Sets

P2719

- P2719 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 2-6 clutch.

P2720

- P2720 is a Type A DTC.
- TCM limits the transmission to 2nd gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM commands 2nd gear if the transmission is in a forward gear and the output speed is less than 700 RPM, or neutral if the output speed is 700 RPM or greater.

P2721

- P2721 is a Type A DTC.
- TCM limits the transmission to 3rd gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.

Conditions for Clearing the DTC

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

Reference Information

[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 \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Operate the vehicle in second gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Ignition ON.
4. Verify the scan tool parameters listed below do not display Malfunction:
 - Pressure Control Solenoid Valve 4 Performance Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

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

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If contaminated**
Repair as necessary.
 - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If the resistance is not within range**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If the resistance is within range**
4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 4 On and Off:
 - Pressure Control Solenoid Valve 4 Performance Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**
Replace the Q8 Control Solenoid Valve Assembly.
 - **If Malfunction is not displayed**
7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for control module replacement, programming and setup

DTC P2723 OR P2724: PRESSURE CONTROL SOLENOID VALVE 5 STUCK OFF/ON - TRANSMISSION HYDRAULIC/MECHANICAL PERFORMANCE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

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

DTC P2723

Pressure Control Solenoid Valve 5 Stuck Off - Transmission Hydraulic/Mechanical Performance

DTC P2724

Pressure Control Solenoid Valve 5 Stuck On - Transmission Hydraulic/Mechanical Performance

Circuit/System Description

Pressure control solenoid valve 5 is part of the control solenoid valve assembly, which has no serviceable components. The pressure control solenoid valve 5 regulates transmission fluid pressure to the 1-2-3-4 regulator valve which controls pressure to the 1-2-3-4 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed sensor and the output shaft speed sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

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

Conditions for Setting the DTC

P2723

TCM detects an incorrect on-coming clutch gear ratio, or shift flare when the 1-2-3-4 clutch is commanded ON. This condition must occur 3 times.

P2724

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up when the 1-2-3-4 clutch is commanded OFF. This condition must occur 3 times.

Action Taken When the DTC Sets

- P2723 and P2724 are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits Manual Up/Manual Down with the gear selector.
- Torque management is enabled.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 5th range - P2723 only.
- TCM limits the transmission to reverse and 3rd range - P2724 only.

Conditions for Clearing the DIC/DTC

P2723 and P2724 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- [Drive Range, First Gear \(Gen 3\)](#)
- [Drive Range, Second Gear \(Gen 3\)](#)
- [Drive Range, Third Gear \(Gen 3\)](#)
- [Drive Range, Fourth Gear \(Gen 3\)](#)
- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

Circuit/System Verification

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

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

1. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to [Transmission Fluid Level and Condition Check](#).
 - If the transmission fluid level and condition is not correct
Repair as necessary.
 - If the transmission fluid level and condition is correct
3. Ignition ON, clear the TCM DTCs with a scan tool.

4. Verify DTC P2723 or P2724 does not set while performing a road test. Refer to [Road Test](#).

- **If DTC P2723 or P2724 sets**

Refer to Circuit/System Testing.

- **If DTC P2723 or P2724 does not set**

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

6. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.

2. Verify the transmission line pressures are within the specified range. Refer to [Line Pressure Check](#), and [Solenoid Valve Pressure \(Gen 3\)](#).

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

Refer to [Fluid Pressure High or Low](#).

- **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.

4. Verify the pressure changes for all solenoid valves when performing the solenoid valve test. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test](#).

- **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure changes**

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

P2723 or P2724 - Control Valve Body Assembly

1-2-3-4 clutch regulator valve stuck/sticking - debris, binding, damaged valve, or scored bore.

P2723 - Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2723 - Torque Converter (w/Fluid Pump) Housing Assembly

- Fluid pump housing/gear damaged/scored.
- Fluid pump or torque converter overstressed due to high temperatures.

P2723 - Trans Case and 1-2-3-4 Clutch Backing Plate Retaining Ring

1-2-3-4 clutch backing plate retaining ring not seated/oriented, causing clutch pack/piston over travel.

P2723 - Output Sun Gear Assembly

Housing/hub weld cracked/leaking.

P2723 - Lo and Reverse and 1-2-3-4 Clutch Housing Assembly

1-2-3-4 clutch piston cracked/damaged/leaking.

P2723 - Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2723 or P2724 - Q8 Control Solenoid Valve Assembly

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

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for Control Solenoid Valve Assembly replacement, programming and setup

DTC P2728-P2730: PRESSURE CONTROL SOLENOID VALVE 5

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P2728

Pressure Control Solenoid Valve 5 Performance

DTC P2729

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage

DTC P2730

Pressure Control Solenoid Valve 5 Control Circuit High Voltage

Circuit/System Description

Pressure control solenoid valve 5 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid valve 5 regulates and directs oil pressure to the 1-2-3-4 clutch regulator valve. Increasing pressure control solenoid valve 5 pressure increases pressure to the 1-2-3-4 clutch. The transmission control module (TCM) varies the current to the pressure control solenoid valve 5 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to pressure control solenoid valve 5 decreases pressure control solenoid valve 5 oil pressure by opening the solenoid valve exhaust port. Decreasing the current to pressure control solenoid valve 5 increases pressure control solenoid valve 5 oil pressure by closing OFF the solenoid valve exhaust port. Pressure control solenoid valve 5 power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- DTC runs continuously when above conditions are met.

Conditions for Setting the DTC

P2728

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

P2729

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

P2730

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

Action Taken When the DTC Sets

P2728

- P2728 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 1-2-3-4 clutch.

P2729

- P2729 is a Type A DTC.
- TCM commands the high side driver OFF.
- TCM forces the torque converter clutch OFF.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits manual up, manual down with the shift selector.
- TCM inhibits neutral idle.
- TCM inhibits powertrain braking.

P2730

- P2730 is a Type A DTC.
- TCM limits the transmission to reverse and 4th gear.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description \(Gen 3\)](#)
- [Transmission General Description \(Gen 3\)](#)

Electrical Information Reference

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

DTC Type Reference

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

Scan Tool Reference

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

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#) .

Circuit/System Verification

1. Operate the vehicle in second gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
 - Pressure Control Solenoid Valve 5 Performance Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

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

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

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If contaminated**

Repair as necessary.
 - **If not contaminated**
3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).
 - **If the resistance is not within range**

Replace the Q8 Control Solenoid Valve Assembly.
 - **If the resistance is within range**
4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the **DT-48616-10** adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

6. Verify the scan tool parameters listed below do not display Malfunction when commanding the Pressure Control Solenoid Valve 5 On and Off:
 - Pressure Control Solenoid Valve 5 Performance Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.
 - **If Malfunction is not displayed**
7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) for control module replacement, programming and setup

DTC P2762, P2763, OR P2764: TORQUE CONVERTER CLUTCH (TCC) PRESSURE CONTROL SOLENOID VALVE

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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

DTC Descriptors

DTC P2762

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Performance

DTC P2763

DTC P2764**Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit Low Voltage****Circuit/System Description**

The torque converter clutch (TCC) pressure control solenoid valve is part of the control solenoid valve assembly which has no serviceable components. The normally low TCC pressure control solenoid valve regulates oil pressure to the TCC regulator valve and TCC control valve. Increasing TCC pressure control solenoid valve oil pressure increases oil pressure to the torque converter to apply the clutch. The transmission control module (TCM) varies the current to the TCC pressure control solenoid valve by controlling the amount of time the low side driver is ON and OFF. Increasing current to the TCC pressure control solenoid valve increases oil pressure by closing OFF the solenoid valve exhaust port. Decreasing current to the TCC pressure control solenoid valve decreases oil pressure by opening up the solenoid valve exhaust port. TCC pressure control solenoid valve power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC**P2762**

- P2762 is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- DTC runs continuously when above conditions are met.

P2763 or P2764

- P0658 or P0659 is not set.
- Engine speed is 400 - 7,500 RPM for 5 s.
- Ignition voltage is 9 - 32 V.
- High side driver is enabled.
- DTC runs continuously when above conditions are met.

Conditions for Setting the DTC**P2762**

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

P2763

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

P2764

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

Action Taken When the DTC Sets**P2762**

P2762 is a Type C DTC.

P2763

- P2763 is a Type B DTC.
- TCM inhibits 6th gear.
- TCM forces TCC OFF.
- TCM changes to a Hot Mode shift pattern.

P2764

- P2764 is a Type A DTC.
- TCM inhibits TCC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM defaults the transmission to 4th gear and reverse.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM forces the high side driver OFF.
- TCM enables torque management.
- TCM inhibits auto grade braking.
- TCM inhibits powertrain braking.

Conditions for Clearing the DIC/DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description (Gen 3)**
- **Transmission General Description (Gen 3)**

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

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to [Special Tools](#).

Circuit/System Verification

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3Â°C (5Â°F) rise in TCM temperature.
2. Operate the vehicle in drive range and ensure TCC is commanded ON for 1 min.
3. Verify the scan tool parameters listed below do not display Malfunction:

- TCC Pressure Control Solenoid Valve Performance Test Status
- TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
- TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.
5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).

- **If contaminated**

Repair as necessary.

- **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid valve listed in the [Control Solenoid Valve and Transmission Control Module Assembly Inspection](#).

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

Replace the Q8 Control Solenoid Valve Assembly.

- **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the DT-48616-10 adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.

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

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

- TCC Pressure Control Solenoid Valve Performance Test Status
- TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
- TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

- **If Malfunction is not displayed**

7. All OK.

Repair Instructions

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

- Perform the [Transmission Adaptive Values Learn](#) following all transmission repairs
- Refer to [Control Module References](#) - for control module replacement, programming and setup

SYMPTOMS - AUTOMATIC TRANSMISSION

NOTE: Use the symptom tables only if the following conditions are met:

- Refer to [Diagnostic Starting Point - Vehicle](#) .
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to [Transmission General Description \(Gen 3\)](#) , and [Transmission Component and System Description \(Gen 3\)](#) .

Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#) .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
 - [Transmission Fluid Level and Condition Check](#)
 - [Fluid Pressure High or Low](#)
 - [Automatic Transmission Fluid Leaks](#)
 - [Fluid Leak Diagnosis](#)
- Noise and Vibration Diagnosis
 - [Whine/Growl Noise](#)
 - [Noise and Vibration Analysis](#)
 - [Torque Converter Diagnosis](#)
 - [Non-Shifting Clutch Function Verification Description](#) for bump
- Range Performance Diagnosis
 - [No Park](#)
 - [No Drive in All Ranges](#)

- No Reverse Gear
- Shift Quality Feel Diagnosis
 - Harsh Garage Shift
 - Harsh or Late First, Second, Third, and Fourth Shift
 - Harsh First and Reverse Shift
 - Harsh or Late Second and Sixth Shift
 - Harsh or Late Third, Fifth, and Reverse Shift
 - Harsh Fourth, Fifth, and Sixth Shift
 - Harsh Downshift
 - Non-Shifting Clutch Function Verification Description for bump
- Shift Pattern
 - No First and Reverse Gears
 - No First, Second, Third, and Fourth Gear
 - No Second and Sixth Gear
 - No Fourth, Fifth, and Sixth Gear
 - No Third, Fifth, and Reverse Gear
- Torque Converter Diagnosis
 - Torque Converter Diagnosis
 - No Torque Converter Clutch Apply
 - No Torque Converter Clutch Release
- Symptom Not Found or No Symptom Detected
 - Transmission Fluid Level and Condition Check
 - Road Test
 - Line Pressure Check
 - Non-Shifting Clutch Function Verification Description for bump

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INSPECTION

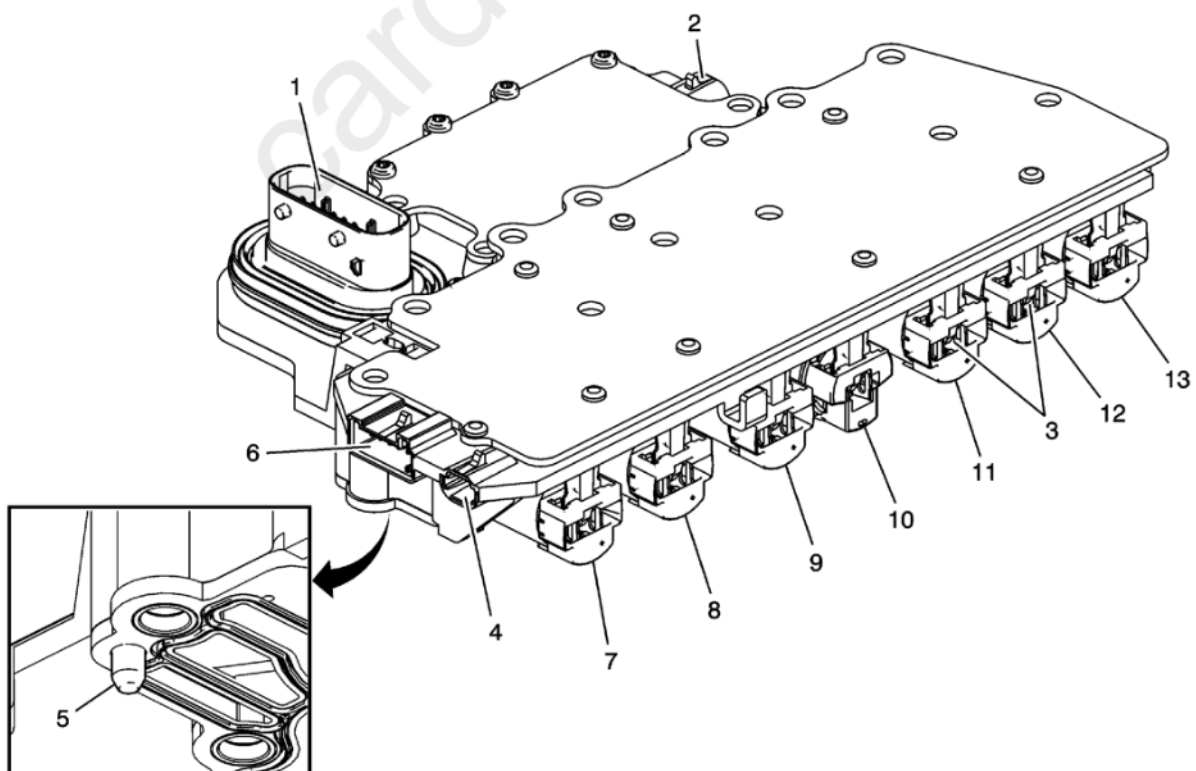


Fig. 1: Control Solenoid Valve And Transmission Control Module Assembly
 Courtesy of GENERAL MOTORS COMPANY

1. Verify the conditions listed below do not exist. Carefully inspect the control solenoid valve assembly connectors and pins (1, 2, 4, 6) for the condition. Repair or replace as necessary.
 - Damage
 - Bent pins
 - Debris
 - Broken retaining tab
 - Contamination
2. Verify there is no metallic debris inside the connectors near the terminal pins. Clean as necessary.
3. Verify the control solenoid valve assembly solenoid leads (3) do not have contamination or metallic debris. Clean as necessary.
4. Verify the resistance between the leads of each solenoid valve is within the range in the table below, with the solenoid valves at room temperature. If the resistance of any solenoid valve is not within range, replace the Control Valve Body Assembly.
5. Inspect the 2 control solenoid valve assembly filter plate retaining tabs (5) for cracks and ensure proper tension when filter plate is attached.

NOTE: The connector on the TCC pressure control solenoid valve (8) will be either clear/transparent or yellow. The clear/transparent connector will have a color contrast when compared to the connectors on pressure control solenoid valve 2 (11) and pressure control solenoid valve 4 (12).

Solenoid Resistance

Solenoid Name	Illustration Number	Expected Resistance Ω
Pressure Control Solenoid Valve 3	7	4.55 - 5.75
Pressure Control Solenoid Valve 5	8	4.55 - 5.75
TCC Pressure Control Solenoid Valve	9	3.42 - 4.18 Clear/transparent Connector 4.55 - 5.75 Yellow Connector
Shift Solenoid Valve 1	10	16.2 - 19.8
Pressure Control Solenoid Valve 2	11	4.55 - 5.75
Pressure Control Solenoid Valve 4	12	4.55 - 5.75
Line Pressure Control Solenoid Valve	13	4.55 - 5.75

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INPUT SHAFT SPEED/OUTPUT SHAFT SPEED INPUT TEST

Special Tools

- **EL 35616** GM-Approved Terminal Test Kit
- **EL 38522** Variable Signal Generator

For equivalent regional tools, refer to [Special Tools](#) .

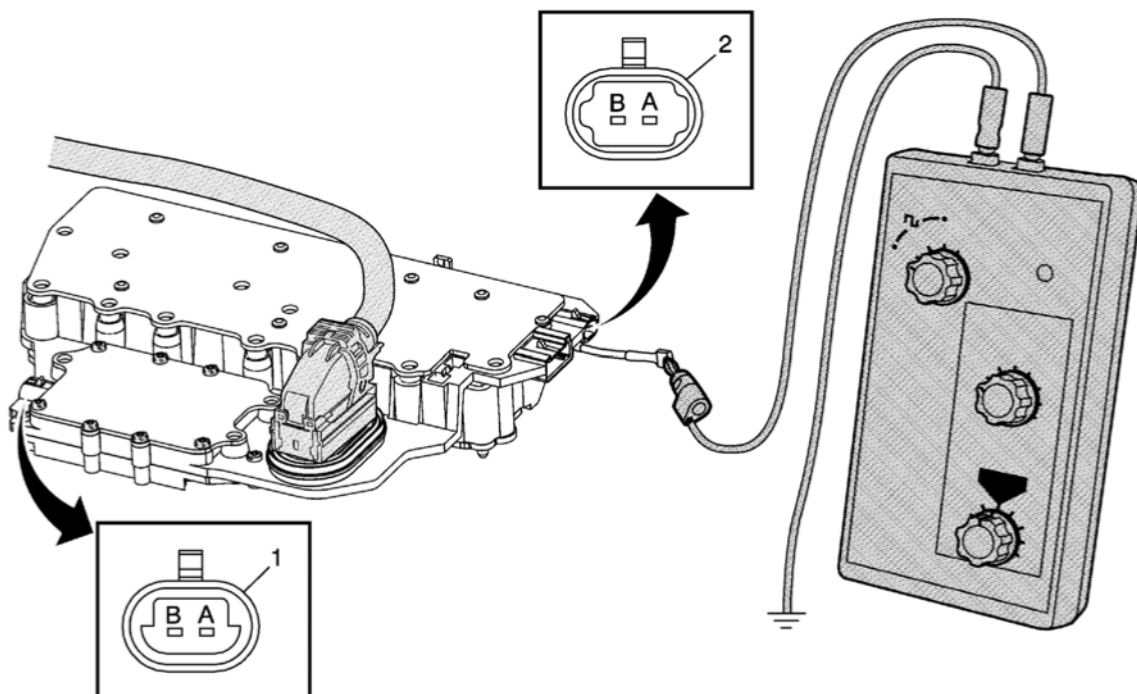


Fig. 2: Special Tool, Control Solenoid Valve And Transmission Control Module Assembly
Courtesy of GENERAL MOTORS COMPANY

The purpose of this test is to provide a simulated input/output speed sensor (ISS/OSS) signal to the control solenoid valve assembly ISS/OSS input circuits.

Transmission Input Speed Sensor

1. Ignition OFF, disconnect the ISS wiring harness connector X3 (1) from the control solenoid valve assembly.
2. Ignition ON, test for 11 - 14 volts at terminal B.
 - If not within the specified range, replace the control solenoid valve assembly. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).
3. Ignition OFF, using the **EL 35616** terminal test kit, connect the **EL 38522** variable signal generator red lead to the ISS signal circuit terminal A on the TCM.
4. Connect the black lead from the **EL 38522** variable signal generator to ground.
5. Set the **EL 38522** variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission ISS parameter is between 495 - 505 RPM.
 - If not within the specified range, replace the control solenoid valve assembly. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).

Transmission Output Speed Sensor

1. Ignition OFF, disconnect the OSS wiring harness connector X4 (2) from the control solenoid valve assembly.
2. Ignition ON, test for 11 - 14 volts at terminal B.
 - If not within the specified range, replace the control solenoid valve assembly. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).
3. Ignition OFF, using the **EL 35616** terminal test kit, connect the **EL 38522** variable signal generator red lead to the OSS signal circuit terminal A on the TCM.
4. Connect the black lead from the **EL 38522** variable signal generator to ground.
5. Set the **EL 38522** variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission OSS parameter is between 745 - 825 RPM.

- If not within the specified range, replace the control solenoid valve assembly. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY SOLENOID PERFORMANCE TEST

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness

For equivalent regional tools, refer to [Special Tools](#).

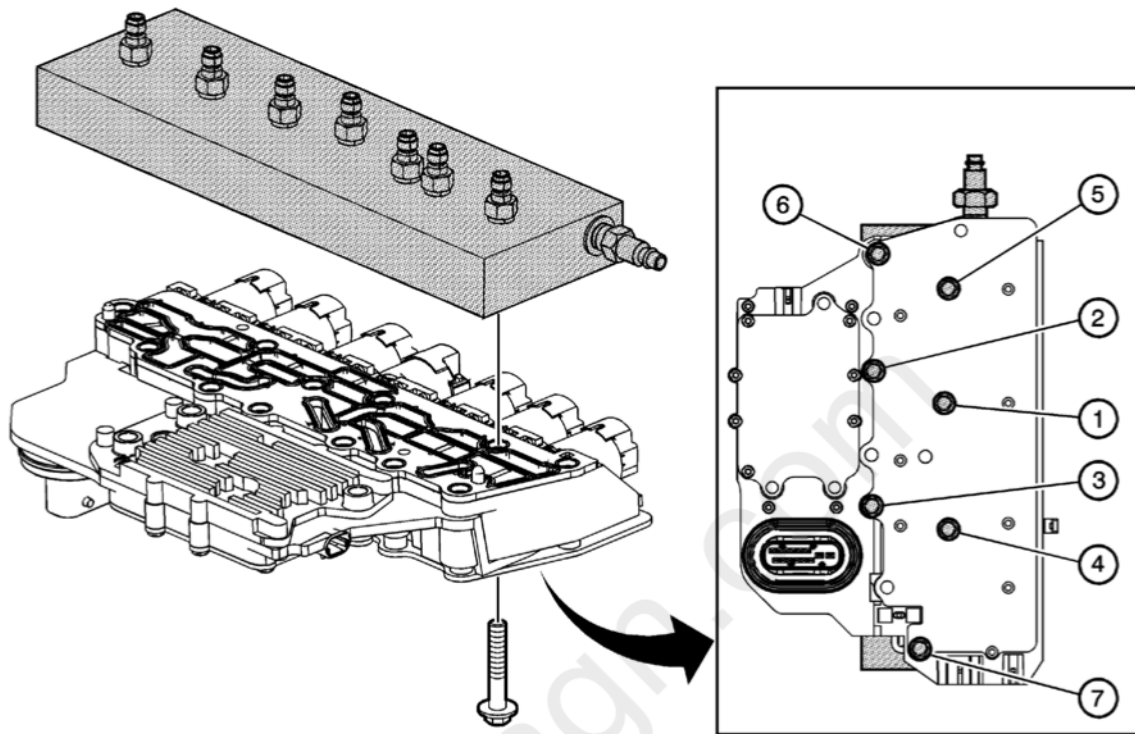


Fig. 3: Control Solenoid (W/Body And TCM) Valve Assembly Test Points (With Tightening Sequence)

Courtesy of GENERAL MOTORS COMPANY

NOTE: Air inlet may be installed at either end of the DT-48616-1 test plate.

The purpose of this procedure is to test the functionality of the control solenoid valve assembly solenoids for a gross stuck open or stuck closed condition. The **DT-48616-1** test plate is bolted to the control solenoid valve assembly on the valve body mounting surface. Pressurized air is passed into the aluminum test block, through the control solenoid valve assembly solenoid passage and back to a pressure gauge on the test block. The pressure gauge indicates open if air pressure is passed through the solenoid, or closed if the solenoid is unable to pass air through. A scan tool is used to command the solenoids ON and OFF. While watching the pressure gauge, one can determine the valve functionality.

1. Ignition Off
2. Remove the Q8 Control Solenoid Valve Assembly and filter plate from the transmission. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Replacement](#).

CAUTION: Refer to [Fastener Caution](#).

NOTE: Drain the Q8 Control Solenoid Valve Assembly of excess transmission fluid before attaching to test block and use caution when attaching air to test block air inlet.

3. Bolt the **DT-48616-1** test plate to the filter plate, and Q8 Control Solenoid Valve Assembly. Use the bolts and washers supplied with the tool to attach the test block. Tighten the bolts to 5 N.m (44 lb in) using a center out alternating torque sequence.

4. Install the pressure gauge to the affected solenoid air port. Reference the Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification for test plate port identification.

NOTE: If air pressure greater than 345 kpa (50 psi) is applied, an accurate test of the shift solenoid cannot be performed.

5. Regulate the shop air pressure to 310 - 345 kpa (45 - 50 psi) and connect the line to the **DT-48616-1** test plate air inlet port.

NOTE: MY 2017 and later software will not allow the transmission control module to control the pressure control solenoid valves without a valid park or neutral signal indicated by the signal circuits for the B15 Internal Mode Switch.

6. Connect a 3 A fused jumper from signal circuit terminal B X2 to low reference terminal F X2 or chassis ground and another 3 A fused jumper from signal circuit terminal E X2 to low reference terminal F X2 or chassis ground.
7. Connect the **DT-48616-10** harness to the vehicle harness and the Q8 Control Solenoid Valve Assembly.

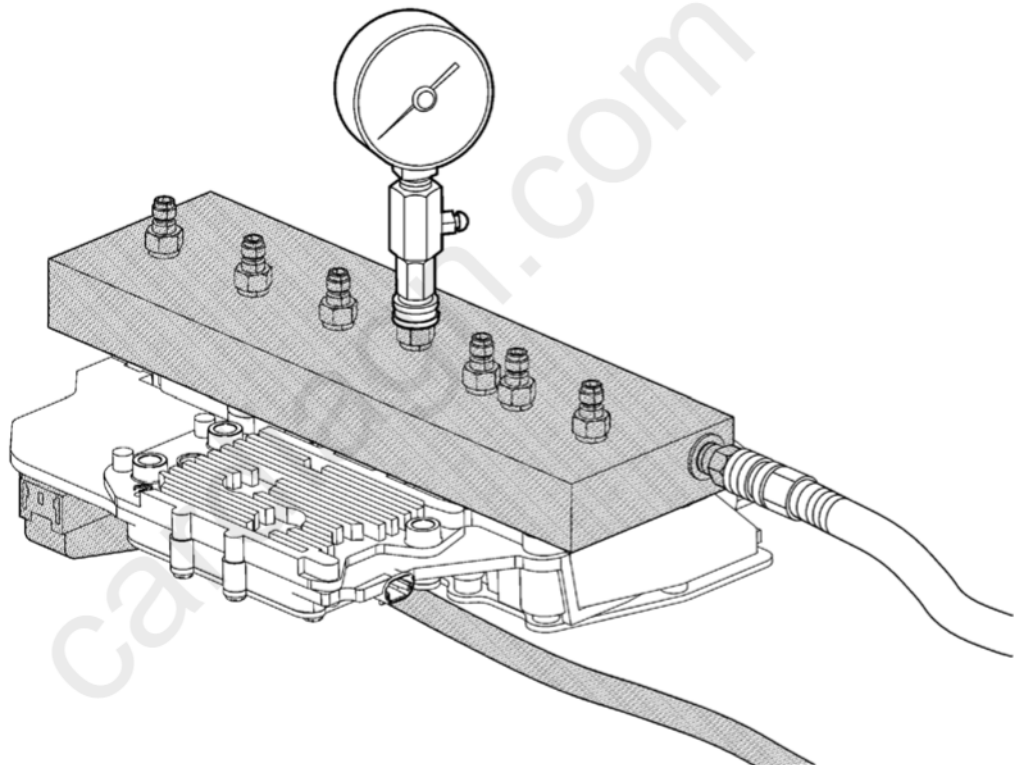


Fig. 4: Control Solenoid Valve Test Plate
Courtesy of GENERAL MOTORS COMPANY

NOTE: The TCM limits the time the solenoids are commanded on to prevent overheating of the solenoids. Once the time limit is reached, the TCM prevents the test from being continued for 5 min. The ignition must remain ON during the 5 min countdown period.

8. Ignition - On/Vehicle - In Service Mode
9. Verify the scan tool parameter: Internal Mode Switch A/B/C/P = Low High High Low
 - **If not the specified state**

Verify the connection of the jumper wires
 - **If the specified state**
10. Verify DTC P182E is not set.
 - **If DTC P182E is set**

1. Clear the DTCs
 2. Ignition Off
 3. Wait for transmission control module to power down.
 4. Ignition - On/Vehicle - In Service Mode
 5. Verify DTC P182E is not set.
- **If DTC P182E is not set**

NOTE:

- **If the solenoid valve is stuck, no pressure change will occur.**
- **Release the air pressure in the gauge between pressurization tests.**
- **Some solenoids will leak air during the test. Only pay attention to the pressure gauge change during the test.**

11. Verify the pressure gauge changes when commanding the appropriate solenoid On and Of with a scan tool. Repeat test as necessary.

- **If the pressure gauge does not change**

Replace the Q8 Control Solenoid Valve Assembly.

- **If the pressure gauge changes**

12. Solenoids are not grossly stuck.

Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification

Component	Port On Test Plate	Commanded State	
		ON	OFF
Pressure Control Solenoid Valve 2, 35R	GEN 2 - C	Full pressure to gauge	No pressure to gauge
Pressure Control Solenoid Valve 3, R1/456	G	Full pressure to gauge	No pressure to gauge
Pressure Control Solenoid Valve 4, 2-6	B	Full pressure to gauge	No pressure to gauge
Pressure Control Solenoid Valve 5, 1234	GEN 2 - F	Full pressure to gauge	No pressure to gauge
Shift Solenoid Valve	D	Full pressure to gauge	Below full pressure to gauge
Line Pressure Control Solenoid Valve	A	Command to highest setting, full pressure to gauge	Command to lowest setting, below full pressure to gauge
TCC Pressure Control Solenoid Valve	E	Full pressure to gauge	No pressure to gauge

NOTE:

With the key on engine off, the TCM will normally cycle some of the transmission solenoids On and Off to facilitate keeping the ports and solenoids clean and free of debris. This dither function is a normal activity and will cause the valves to cycle open and closed quickly when the TCM is powered up. This can cause the psi gauge to flicker high and low as the valves open and close. This may cause some air to exit the ports where the psi gauge is not connected as those solenoids cycle on and off.

TRANSMISSION ADAPTIVE VALUES LEARN

Transmission Adaptive Values Learn is a procedure for 6 speed automatic transmissions in which a series of tests are run to allow the transmission control module (TCM) to learn individual clutch characteristics. Once the clutch data is learned, Transmission Adaptive Values Learn translates it into the adaptive data cells, which the TCM uses for clutch control during shifts. The scan tool provides

initiation of the Transmission Adaptive Values Learn procedure. This procedure is to be used following transmission repair.

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

NOTE: Ensure the following conditions are met before performing the Transmission Adaptive Values Learn procedure:

- Drive wheels are blocked
- Parking brake is applied
- Service brake is applied
- Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches.
- Zero percent throttle and no external engine RPM control
- Transmission fluid temperature is between values listed below, if you attempt to run the test above or below these temperatures, the test will not start:
 - MY 2011 and prior 70 - 95°C (158 - 203°F)
 - MY 2012 Gen 1 70 - 95°C (158 - 203°F)
 - MY 2012 Gen 2 64 - 95°C (147 - 203°F)
 - MY 2013 Gen 1 70 - 95°C (158 - 203°F)
 - MY 2013 Gen 2 70 - 76°C (158 - 169°F)
 - MY 2014 Gen 2 70 - 76°C (158 - 169°F)
 - MY 2014 Gen 3 86 - 106°C (187 - 223°F) MNH with LKW
 - MY 2015 - MY 2017 Gen 2 64 - 76°C (147 - 169°F)
 - MY 2015 - MY 2017 Gen 3 86 - 106°C (187 - 223°F)
- Transmission Adaptive Values Learn will abort if the transmission fluid temperature increases to the values listed below:
 - MY 2011 and prior 110°C (230°F)
 - MY 2012 Gen 1 110°C (230°F)
 - MY 2012 Gen 2 100°C (212°F)
 - MY 2013 Gen 1 110°C (230°F)
 - MY 2013 Gen 2 86°C (187°F)
 - MY 2014 Gen 2 86°C (187°F)
 - MY 2014 Gen 3 126°C (259°F)
 - MY 2015 - MY 2017 Gen 2 86°C (187°F)
 - MY 2015 - MY 2017 Gen 3 126°C (259°F)

NOTE: If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn Adapts may abort and the process may need to be started again from the beginning. If this occurs, the transmission will be left in a neutral state until the controller is shut down, key OFF and remove the scan tool and wait for more than 30 seconds prior to re-try procedure. If the procedure repeatedly fails, a limit that engineering set is being exceeded and

there is possibly a transmission hardware issue. Starting the procedure at the minimum temperature will help prevent the procedure from aborting due to an over temperature condition.

1. Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:
 1. Module Diagnostics
 2. Transmission Control Module
 3. Configurations/Reset Functions
 4. Transmission Adaptive Values Learn

NOTE: If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn may abort and the process may need to be started again from the beginning.

2. Use the scan tool to perform the Transmission Adaptive Values Learn procedure. As the procedure is being performed, the scan tool data display will provide operator instructions. Follow the scan tool instructions, as required.
3. Once the procedure is complete, shut OFF the engine and power down the TCM. You will lose communication to the scan tool.

NOTE: When the Transmission Adaptive Values Learn procedure is completed, the transmission will remain in a neutral state until the controller shuts down. If after 1 - 2 minutes of sitting, with the key OFF and scan tool removed, the vehicle remains in a neutral state, disconnect the battery and wait 5 - 10 minutes and then hook the battery back up. Reverse and drive should return.

4. Restart the engine. This will complete the Transmission Adaptive Values Learn procedure.

Troubleshooting

If the Transmission Adaptive Values Learn will not run and the above stated conditions have been met, ensure the following:

NOTE: Gen 1 and Gen 2 may have the same RPO code. The generation of transmission can be determined by using a scan tool to check for Specific DTC P0842. If DTC does not show Invalid, the transmission is Gen 1. If DTC shows Invalid, transmission is Gen 2.

- Determine if transmission is Gen 1, Gen 2, or Gen 3.
- Verify vehicle model year.
- Verify transmission fluid temperature is between the temperatures listed above for the vehicle model year and generation of transmission.
- Brakes and brake switch are functioning properly
- No active DTCs
- Closed throttle and engine RPM increases above 1,500 RPM while at entrance of the test
- Park/Neutral position switch is properly adjusted and functioning
- Line pressure control is able to provide 1,000 kPa and is within specifications
- Vehicle is not moving or vibrating excessively
- Clutches are properly assembled

MANUAL MODE OR TAP UP/DOWN DIAGNOSIS

1. If any DTCs are set, diagnose those DTCs first. Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#).
2. If the Manual Mode or Tap Up/Down does not function, refer to the Circuit/System Verification for [DTC P0815, P0816, or P0826](#).

TRANSMISSION FLUID LEVEL AND CONDITION CHECK

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself.

CAUTION: Use Dexron® VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.

NOTE: Ensure the transmission has enough fluid in it to safely start the vehicle without damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20 - 25°C (68 - 77°F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

NOTE: If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

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

CAUTION: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95°C (185 - 203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.

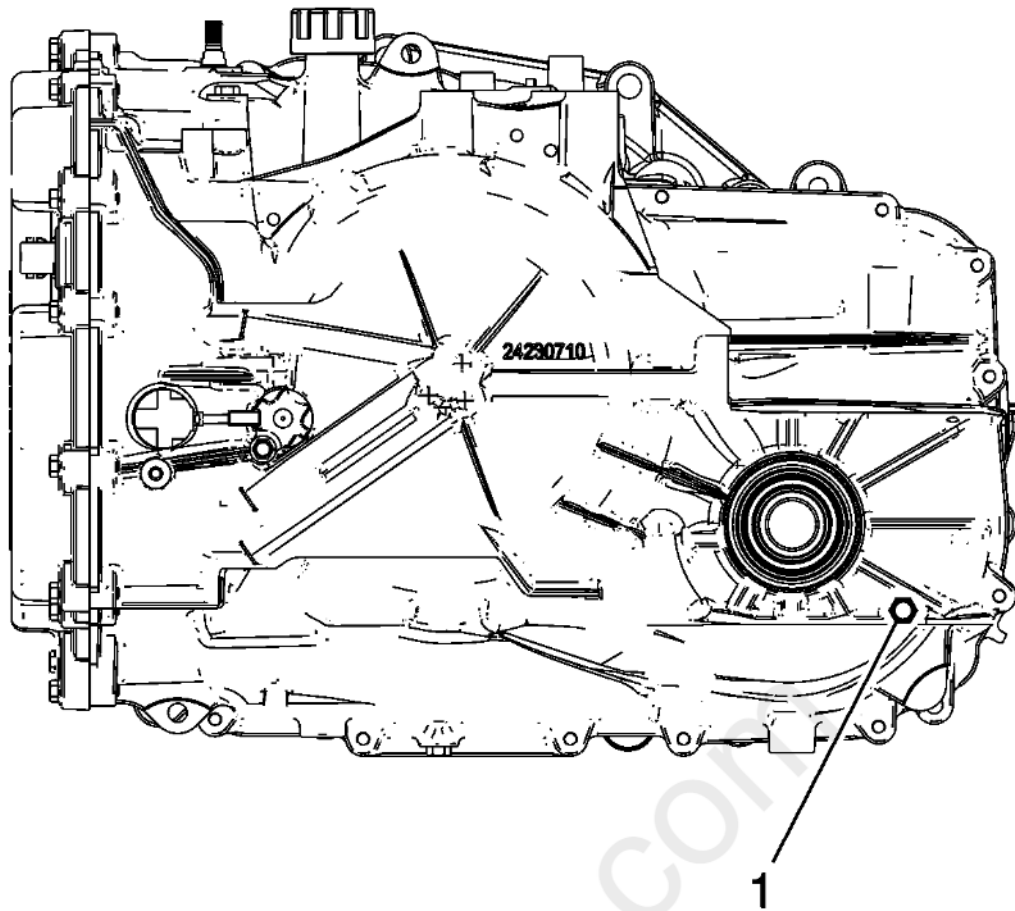


Fig. 5: Oil Level Plug

Courtesy of GENERAL MOTORS COMPANY

6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.

Oil Level Plug (1)

- If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
 - If no fluid comes out, add fluid until fluid drips out.
7. Inspect the fluid color. The fluid should be red or dark brown.
 - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
 - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).
 8. Inspect for external leaks. Refer to [Fluid Leak Diagnosis](#).
 9. If the fluid was changed, reset the transmission oil life monitor if applicable.

Dipstick Level Checking Procedure (If equipped)

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P). Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

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

CAUTION: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95°C (185 - 203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

NOTE:

- If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
- Check the transmission fluid level when the TFT is at between 85 - 95°C (185 - 203°F). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is at the specified temperature.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

5. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. Remove the dipstick and wipe it with a clean rag or paper towel.
7. Inspect the fluid color. The fluid should be red or dark brown.
- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
 - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).
8. Install the dipstick. Wait three seconds and then remove it again.

NOTE: Always check the fluid level at least twice. Consistent readings are important to maintaining proper fluid level. If inconsistent readings are noted, inspect the transmission vent cap to ensure it is clean and unclogged.

NOTE: It is not necessary to get the fluid level all the way up to the MAX mark. Anywhere within the crosshatch band is acceptable.

9. Check both sides of the dipstick and read the lower level.
10. Install and remove the dipstick again to verify the reading.

NOTE: Do not add more than one half pint (0.25L) at a time without rechecking the level. Once the oil is on the dipstick bullet, it will not take much more fluid to raise the fluid level into the crosshatch band. Do not overfill. Also, if the fluid level is low, inspect the transmission for leaks. Refer to [Fluid Leak Diagnosis](#).

11. If the fluid level is not within the crosshatch band, and the transmission temperature is at 90°C (194°F), add or drain fluid as necessary to bring the level into the crosshatch band. If the fluid level is low, add only enough fluid to bring the level into the crosshatch band.

12. If the fluid level is in the acceptable range, install the dipstick.
13. If the fluid was changed, reset the transmission oil life monitor if applicable.

Fluid Condition Inspection

- Inspect the fluid color. The fluid should be red in color. The fluid may also turn brown from normal use, and does not always indicate contamination.

NOTE: Fluid that is very dark or black and has a burnt odor usually indicates contamination or overheating.

- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission damage. Refer to [Road Test](#) to verify transmission operation. Change the transmission fluid if no other conditions are found.
- Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to [Engine Coolant/Water in Transmission](#).

LINE PRESSURE CHECK

Special Tools

GE-21867-A Oil Pressure Gauge Kit

For equivalent regional tools, refer to [Special Tools](#).

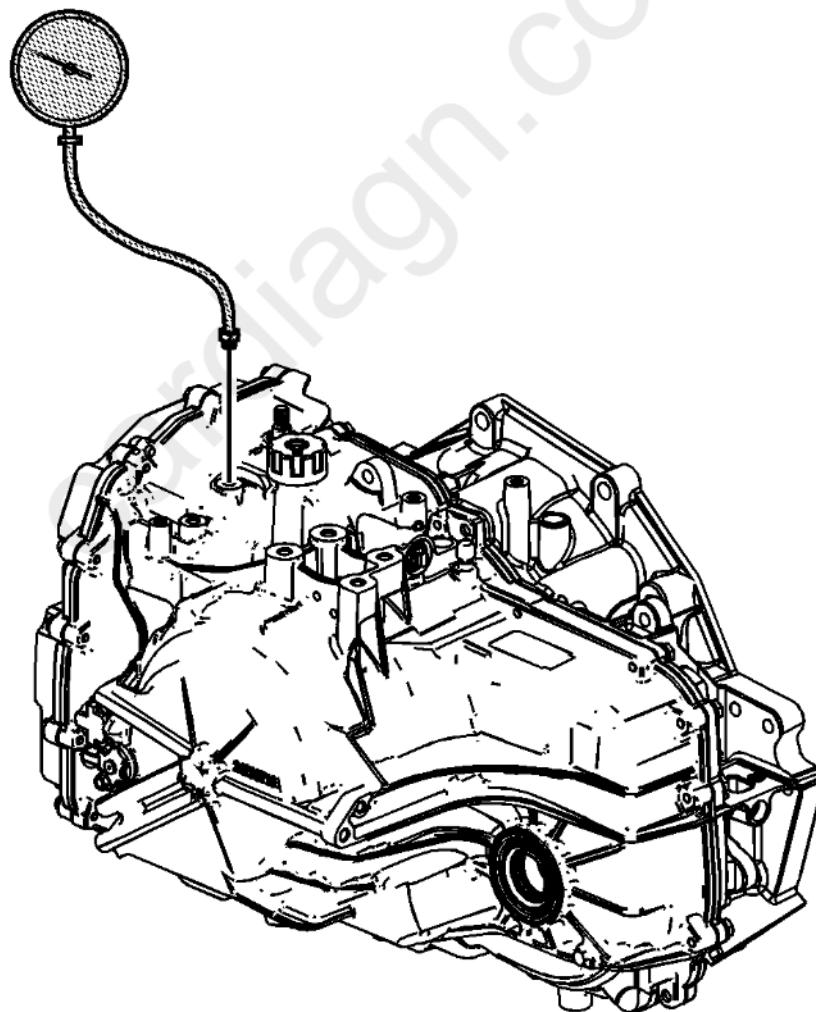


Fig. 6: Checking Line Pressure

Courtesy of GENERAL MOTORS COMPANY

WARNING: Keep the brakes applied at all times in order to prevent unexpected vehicle motion. Personal injury may result if the vehicle moves unexpectedly.

1. Install a scan tool.
2. Start the engine.
3. Inspect the transmission for the proper fluid level. Refer to [Transmission Fluid Level and Condition Check](#).
4. Use the scan tool to inspect for any active or stored diagnostic trouble codes.
5. Inspect the manual linkage at the transmission for proper function.
6. Turn the engine OFF.
7. Remove the line pressure test hole plug.
8. Install the **GE-21867-A** pressure gauge.
9. Access the Scan Tool Transmission Output Controls for the Line PC Solenoid.
10. Start the engine.

NOTE:

- In order to achieve accurate line pressure readings, the following procedure must be performed at least 3 times in order to gather uniform pressure readings.
- The scan tool is only able to control the line PC solenoid in **PARK** and **NEUTRAL** with engine speeds below 1500 RPM. This protects the clutches from extreme high or low line pressures.

11. Use the scan tool to increase and decrease the Line PC Solenoid in increments of approximately 100 KPa (15 psi). The scan tool commands the increment values automatically.
12. Allow the pressure to stabilize between increments.
13. Compare the pressure readings on the scan tool to those indicated on the **GE-21867-A** pressure gauge. Refer to [Solenoid Valve Pressure \(Gen 3\)](#).
14. If the pressure readings vary greatly, refer to [Fluid Pressure High or Low](#).
15. Turn the engine OFF.
16. Remove the **GE-21867-A** pressure gauge.

CAUTION: Refer to [Fastener Caution](#).

17. Install the line pressure test hole plug. Tighten the pressure test hole plug to 12 N.m (106 lb in).

ROAD TEST

NOTE: The Road Test Procedure should be performed only as part of the Symptom Diagnosis.

Perform the road test in conjunction with the symptom diagnosis. Refer to [Symptoms - Automatic Transmission](#).

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Step-In Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
 - REVERSE
 - Driver Shift Control

NOTE: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to [Transmission Fluid Level and Condition Check](#).
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.
- Ensure the transmission fluid temperature is at least 90°C (194°F).

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#).
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to [Fluid Leak Diagnosis](#).

Electrical Function Check

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.

Refer to [Control Module References](#) for typical data values. Data that is questionable may indicate a concern.

- Engine Speed
- Transmission ISS
- Transmission OSS
- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Line PC Sol. Pressure Cmd.
- Brake Switch
- ECT, Engine Data List
- Trans. Fluid Temp.
- TCM Temperature
- Calc. Throttle Position
- Ignition Voltage
- TFP Switch 1
- TFP Switch 3

- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1
- Shift Solenoid 2
- TCC PC Sol. Duty Cycle
- TCC Slip Speed

5. Check the garage shifts.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through the following ranges:
 1. PARK to REVERSE
 2. REVERSE to NEUTRAL
 3. NEUTRAL to DRIVE
 4. DRIVE to REVERSE
 5. REVERSE to DRIVE
3. Pause 2 to 3 seconds in each gear position.
4. Verify the gear engagements are immediate (less than 2 seconds to complete if transmission fluid temperature is above 20°C (68°F) and not harsh. Note that these shifts may be almost imperceptible in some applications. Using the scan tool to monitor Transmission ISS achieving 0 RPM can be used to check delay in these cases.

NOTE: Harsh engagement may be caused by any of the following conditions:

- High engine idle speed - Compare engine idle speed to desired idle speed.
- Incorrect line pressure - Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform [Line Pressure Check](#).
- A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.
- Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if shift quality improves. If it does not, refer to the service procedures for [Harsh Garage Shift](#).

NOTE: Delayed engagement may be caused by any of the following conditions:

- Low idle speed - Compare engine idle speed to desired idle speed.
- Low fluid level
- Incorrect line pressure - Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform [Line Pressure Check](#).
- Cold transmission fluid temperature (TFT) - Use the scan tool to determine TFT.
- Selector linkage - Inspect and adjust as necessary.
- Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if delay improves. If it does not, refer to the service procedures for [Harsh First and Reverse Shift](#).

6. Monitor transmission range on the scan tool, transmission data list.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through all ranges.
3. Pause 2 to 3 seconds in each range.
4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
 1. Apply the brake pedal and ensure the parking brake is set.
 2. Ensure the gear selector is in PARK.
 3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

Upshift Control and Torque Converter Clutch (TCC) Apply

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:
 - Calc. Throttle Position
 - Vehicle Speed
 - Engine Speed
 - Transmission ISS
 - Transmission OSS
 - Commanded Gear
 - TCC PC Sol. Pressure Cmd.
 - TCC Slip Speed
 - TFP Switch 1
 - TFP Switch 3
 - TFP Switch 4
 - TFP Switch 5
 - PC Sol. 2 Pressure Cmd.
 - PC Sol. 3 Pressure Cmd.
 - PC Sol. 4 Pressure Cmd.
 - PC Sol. 5 Pressure Cmd.
 - Shift Solenoid 1 and 2
2. Place the gear selector in the DRIVE position.
3. Accelerate the vehicle using a steady throttle position between 15 and 20 percent. Hold the throttle steady.
4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.
5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.
6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

NOTE: This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without

fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Full lockup is available at highway speeds on some applications.

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

- Check for DTCs.
- Refer to [Torque Converter Diagnosis](#).

Part Throttle Step-In Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle at light throttle (5 - 15 percent) until 3rd gear is just achieved.
3. Quickly increase throttle angle until commanded gear indicates that a downshift to 2nd gear is commanded.
4. Verify that the transmission downshifts within 2 seconds of the throttle movement.
5. Repeat steps 2 to 4 at higher speed to achieve 4th gear and then step in to command a 4th gear to 3rd gear downshift.
6. Repeat steps 2 to 4 at higher speed to achieve 5th gear and then step in to command a 5th to 4th gear downshift.
7. Repeat steps 2 to 4 at higher speed to achieve 6th gear and then step in to command a 6th gear to 5th gear downshift.
8. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

Manual Downshifts

Manual downshift testing is not required since all vehicles equipped are also equipped with some form of Driver Shift Control (DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

Coasting Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 6th gear with the TCC applied.
3. Release the throttle and apply the brakes
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

Manual Gear Range Selection

This application does not utilize manual forward gear ranges.

Reverse

Perform the following test using a 10 - 15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will upshift automatically when maximum engine speed is achieved and will protect from any downshift which may cause excessive engine RPMs.

TORQUE CONVERTER DIAGNOSIS

Torque Converter Stator

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

Poor Acceleration at Low Speed - Stator Roller Clutch Freewheels at All Times

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48-55 km/h (30-34 mph). At speeds above 48-55 km/h (30-34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

Poor Acceleration at High Speed - Stator Roller Clutch is Locked Up at All Times

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48-55 km/h (30-34 mph). Visual examination of the converter may reveal a blue color from overheating.

Torque Converter Bearing Noise

NOTE: Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.
3. Depress the accelerator to approximately 1,200 RPM for no more than six seconds.

CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.

A torque converter noise will increase under this load.

Torque Converter Clutch

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

Torque Converter Clutch Shudder

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

If Shudder Occurs During TCC Apply, Release and ECCC

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

If Shudder Occurs After TCC has Locked

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

Refer to **Symptoms - Engine Controls** 2.5L in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

Torque Converter Vibration Test

The **Noise and Vibration Analysis** procedure should be performed prior to performing this test.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.
3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts and tighten according to **Fastener Specifications (On Vehicle)** and **Fastener Specifications (Off Vehicle)** .

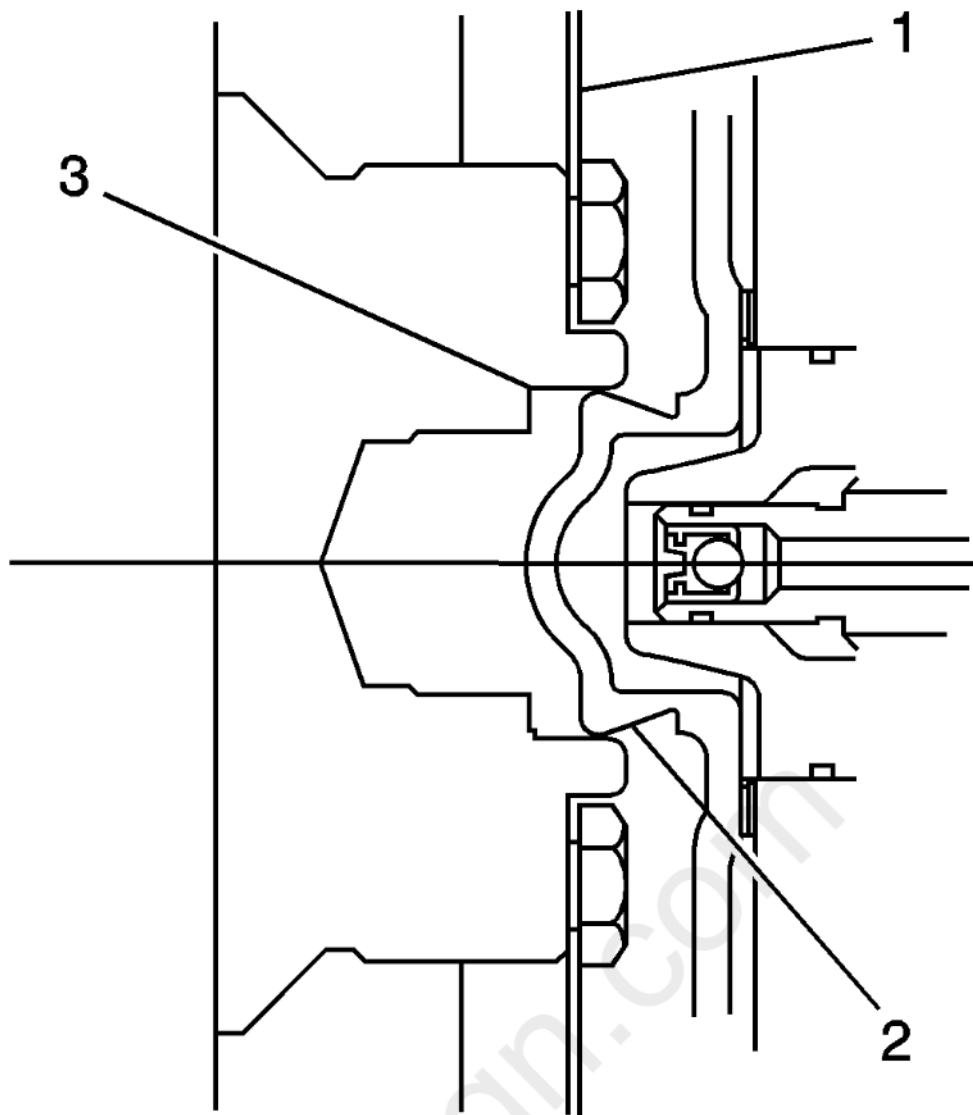


Fig. 7: Aligning Torque Converter Hub In Engine Crankshaft
 Courtesy of GENERAL MOTORS COMPANY

CAUTION: When installing the torque converter to the flexplate, make sure to use specified bolts. **DO NOT** use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.

CAUTION: Refer to [Fastener Caution](#) .

4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to [Fastener Specifications \(On Vehicle\)](#) and [Fastener Specifications \(Off Vehicle\)](#) .

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 .

Condition	Action
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 2.5L.
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 2.5L.
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 2.5L.
DTC P0741 - TCC Stuck OFF/High Slip - Intermittent Only	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
DTC P0741 - TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
DTC P0742 - TCC Stuck ON	Do not replace the torque converter. Refer to DTC P0741 or P0742 diagnostic table.
Transmission Fluid Contaminated with Sludge/Metal Particles as a result of: - Engine Coolant/Oil - Pump damage - Drive sprocket support damage - Turbine/stator shaft damage - Internal converter damage with no damage found in the transmission	Replace the torque converter.
Poor Acceleration above 48 km/h (30 mph) - Good Launch	Do not replace the torque converter until completing all engine and transmission diagnostics. - Refer to Torque Converter Stator in this procedure. - Refer to Symptoms - Engine Controls 2.5L.

Condition	Action
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 2.5L.
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to Lower Engine Noise, Regardless of Engine Speed 2.5L.
Torque Converter Pilot Damaged	Replace the torque converter.
Torque Converter Hub surface is damaged - scored, raised/transferred metal.	Replace the torque converter.
External Leaks in the weld areas - hub, lug or closure weld.	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

CLUTCH PLATE DIAGNOSIS

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Delamination - splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
 - The valve body face is not flat.
 - Porosity in between channels.

- The valve train retainers are improperly installed.
- The checkballs are misplaced.
- Malfunctioning valves.
- The Teflon® seal rings are worn or damaged.

ENGINE COOLANT/WATER IN TRANSMISSION

CAUTION: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts - washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to [Transmission Fluid Cooler Flow Test and Flushing \(6T40/6T45\)](#).

FLUID LEAK DIAGNOSIS

General Method

1. Verify that the leak is transmission fluid.

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

2. Thoroughly clean the suspected leak area using a rag.

NOTE: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15 - 20 minutes under city driving conditions until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

Powder Method

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type leak tracing powder to the suspected leak area.

NOTE: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil

inhibiting leak diagnosis.

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

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Valve Body Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face

- Incorrect gasket seal

Case Leak

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

Leak at the Torque Converter End

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

Leak Inspection Points - Hybrid

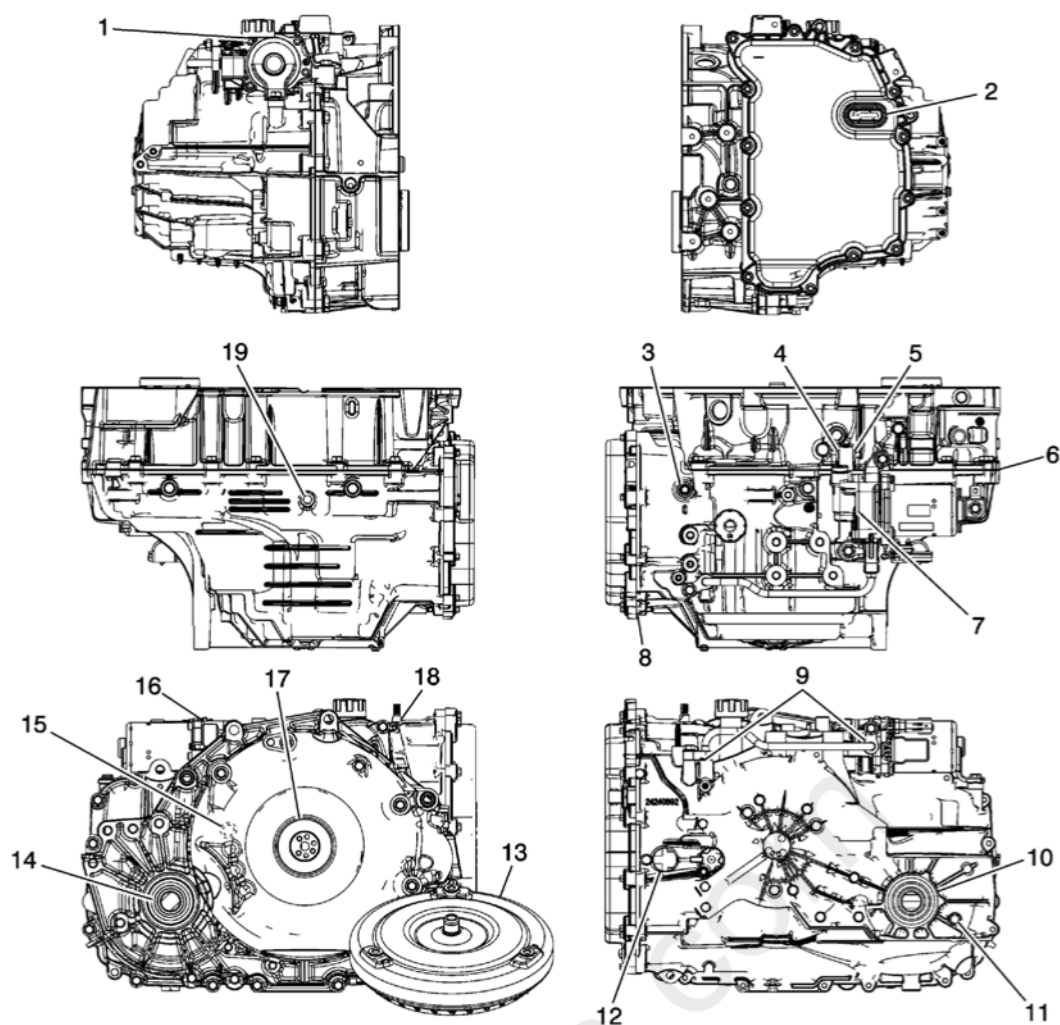


Fig. 8: Leak Inspection Points - Hybrid
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Fill Cap Seal
2	Control Valve Body Cover Hole Seal
3	Line Pressure Tap Plug
4	A/Trans Auxiliary Fluid Pump Gasket
5	A/Trans Auxiliary Fluid Pump Seal
6	Converter Housing to Case Joint
7	A/Trans Auxiliary Fluid Pump Cover Seal
8	Control Valve Body Cover Gasket
9	A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
10	Drive Shaft Oil Seal Assembly
11	Oil Level Plug
12	A/Trans Input Speed Sensor Assembly O-Ring Seal
13	Torque Converter Assembly
14	Front Wheel Drive Shaft Oil Seal Assembly
15	A/Trans Auxiliary Fluid Inlet Pump Seal
16	A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-Ring
17	Torque Converter Fluid Seal Assembly
18	Manual Shift Shaft Seal
19	Drain Plug

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

WARNING: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. Apply the epoxy. A clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before assembling the components.
5. Repeat the fluid leak diagnosis procedures.

BUSHING AND MATING SHAFT INSPECTION

NOTE: Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the vibration may be a result of poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
 - Missing bolts, nuts, and studs
 - Stripped threads
 - Cracks
- Inspect the flywheel for the following conditions:
 - Missing or loose bolts
 - Cracks
 - Imbalance
- Inspect the torque converter for the following conditions:

- Missing or loose bolts or lugs
- Missing or loose balance weights
- Imbalance caused by heat distortion or fluid contamination
- If the noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is more noticeable as RPM increases, the vibration may be an engine imbalance or a transmission imbalance. Refer to [Torque Converter Diagnosis](#).

WHINE/GROWL NOISE

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

Checks	Causes
Input Carrier Assembly (570)	• Inspect for pitted/spalled Pinion Gear teeth • Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose or broken Hub and Ring Gear • Inspect for loose or broken Output Internal Gear Retainer • Inspect for loose or worn Sun Gear Thrust Bearings (569, 572)
Output Carrier Assembly (574)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose Hub and Ring Gear
Output Sun Gear Assembly (555)	• Inspect for worn or damaged Output Sun Gear Thrust Bearing (556) • Inspect for loose, worn or damaged Output Sun Gear bushing • Inspect for worn or damaged Output Sun Gear teeth
Reaction Carrier Assembly (567)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose hub and Ring Gear • Inspect for worn or damaged Reaction Carrier Thrust Bearings (565)
Reaction Sun Gear Assembly (566)	Inspect for loose, worn or damaged Reaction Sun Gear Assembly bushing
Fluid Pump Assembly (201)	1. Inspect for proper fluid level 2. Inspect for leaking Pump Fluid Outlet Seal Assembly (24) or Filter Seal
3-5 - Reverse Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (508 - 510) • Inspect for loose or worn Backing Plate Retainer (511) • Inspect for loose Speed Sensor Reluctor Wheel (501) or Retainer (500)

Checks	Causes
4-5-6 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (425 - 428) • Inspect for loose or worn Clutch Dam Retainer (524) • Inspect for loose or worn 3-5 - Reverse/4-5-6 Clutch Housing Bushing
1-2-3-4 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (557 - 559) • Inspect for loose or worn Clutch Spring Retainer (561)
Low and Reverse Clutch Assembly (OWC) (543)	• Inspect for stripped or sheared Low and Reverse Clutch Assembly (543) splines • Inspect for non-rotating Low and Reverse Clutch Assembly (543)
Low and Reverse Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (545 - 547) • Inspect for loose or worn Clutch Spring Retainer (548)
2-6 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (540 - 542) • Inspect for loose or worn Clutch Spring Retainer (537)
Case Assembly (50)	• Inspect for loose or broken Transmission Mount Bolts • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for loose, worn or damaged differential bushing • Inspect for loose or broken Input Shaft Support Bolts (57) • Inspect for loose or broken Front Differential Carrier Baffle Bolts (61) • Inspect for stripped or sheared splines • Inspect for loose, worn or damaged bushing

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

AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (28)	Inspect for damage

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

SHIFT INDICATOR INDICATES WRONG GEAR SELECTION

Checks	Causes

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

NO PARK

Checks	Causes
Differential Carrier Assembly (232)	- Inspect for damaged or broken Front Differential Assembly (232). - Inspect for damaged or broken Front Differential Side Gear or Pinion Gear. - Inspect for damaged or broken Front Differential Pinion Gear Shaft. - Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin. - Inspect for worn, stripped or sheared Front Differential Side Gear splines. - Inspect for damaged or broken Final Drive Sun, Pinion or Ring Gear. - Inspect for worn, stripped or sheared Final Drive Sun Gear splines.
Output Carrier Transfer Drive Gear Hub Assembly (222)	- Inspect for broken Drive Gear Hub (222). - Inspect for worn, stripped or sheared Drive Gear hub (222) splines. - Inspect for disengaged or broken Park Gear Retainer Ring (220). - Inspect for damaged or broken park Gear (221). - Inspect for disengaged or broken Drive Sprocket Retainer Ring (227).

Checks	Causes
Drive Link Assembly (225)	- Inspect for broken, worn or damaged Drive Link Assembly (225). - Inspect for broken, worn or damaged Drive Sprocket (224). - Inspect for broken, worn or damaged Driven Sprocket Assembly (229). - Inspect for worn, stripped or sheared Driven Sprocket splines. - Inspect for broken Drive Gear Hub (222).
Case Assembly (50)	- Inspect for broken or damaged Case. - Inspect for broken or bent Park Pawl Shaft (600). - Inspect for broken or missing Park Pawl Actuator Guide Pin (603) or Manual Shaft Pin (611). - Inspect for broken or missing Manual Shaft Detent Lever Pin (610). - Inspect for broken or missing Manual Shift Shaft Pin (611). - Inspect for damaged or broken Manual Shift Detent Lever Shaft (608). - Inspect for loose, damaged or broken Detent Lever Spring Assembly (17). - Inspect for broken, loose or misaligned Park Pawl Actuator Guide (606). - Inspect for binding, bent or broken Park Pawl (602) or Actuator Assembly (607).

HARSH GARAGE SHIFT

Checks	Causes
Input Carrier Assembly (570)	Inspect for worn or stripped Output Internal Gear Splines.
Low-Reverse and 1-2-3-4 Clutch Housing (551)	- Inspect for damaged or fatigued 1-2-3-4 Clutch Wave Plate (557) and Low and Reverse Clutch Wave Plate (547). Refer to Clutch Plate Diagnosis. - Inspect for stripped or sheared splines on 1-2-3-4 Clutch Plate (546). Refer to Clutch Plate Diagnosis. - Inspect for improperly positioned or plugged Low Reverse Piston (550) air bleed. - Inspect for correct fluid level.
Low and Reverse Clutch Assembly (OWC) (543)	Inspect for stripped or sheared internal and external splines on Low and Reverse Clutch Assembly (543).

NO DRIVE IN ALL RANGES

Checks	Causes

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

Checks	Causes
Input Carrier Assembly (570)	• Inspect for stripped or sheared castle splines to ring gear. • Inspect for improperly installed carrier pinion gear pins. • Inspect for damaged or broken Pinion Gears. • Inspect for stripped or sheared splines on the Input Sun Gear (571). • Inspect for damaged or broken Output Internal Gear. • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing Assembly (568) and Output Carrier Thrust Bearing Assembly (573). • Inspect for damaged or broken Input Carrier Thrust Bearings (569, 572).
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared Reaction Carrier Assembly (567) splines. • Inspect for damaged or broken Input Carrier Thrust Bearings (568). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Reaction Internal Gear teeth. • Inspect for disengaged or broken Reaction Internal Gear retainer ring.
Reaction Sun Gear Assembly (566)	• Inspect for damaged or broken weld at Sun Gear. • Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Output Carrier Assembly (574)	• Inspect for stripped or sheared splines to reaction internal ring gear. • Inspect for damaged or broken Input Sun Gear Thrust Bearings (572). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Input Carrier Thrust Bearings (573). • Inspect for broken or damaged Output Internal Gear.
Output Sun Gear Assembly (555)	• Inspect for stripped or sheared Output Sun Gear Assembly (555) splines. • Inspect for broken Output Sun Gear Assembly (555) hub or weld.
Low-Reverse and 1-2-3-4 Clutch Housing (551)	Inspect for disengaged or broken 1-2-3-4 Clutch Piston Spring Retainer (554).

Checks	Causes
Drive Link Assembly (225)	- Inspect for broken, worn or damaged Drive Link Assembly (225). - Inspect for broken, worn or damaged Drive Sprocket (224). - Inspect for broken, worn or damaged Driven Sprocket Assembly (229). - Inspect for broken Drive Gear Hub (222).
Differential Carrier Assembly (232)	- Inspect for stripped or sheared splines on Differential Side Gear. - Inspect for stripped or sheared splines Final Drive Sun Gear (230). - Inspect for stripped or sheared splines Differential Carrier to PTU (AWD only). - Inspect for stripped broken or disengaged Final Drive Retainer (581). - Inspect for damaged or broken Pinion Gear teeth. - Inspect for damaged or broken Final Drive Rollers (585). - Inspect for broken, worn or damaged Final Drive Inner and Outer Thrust Washers (584).
Control Solenoid (w/Body and TCM) Valve Assembly	- Check that the Manual Valve (432) is engaged with Manual Shift Detent Lever Assembly (609). - Inspect the Control Solenoid (w/Body and TCM) Valve Assembly (7) and verify that it is functioning properly.

NO FIRST AND REVERSE GEARS

Checks	Causes
Low and Reverse Clutch Assembly (543)	- Inspect for stripped or sheared internal or external splines on Low and Reverse Clutch Assembly (543) - Inspect for broken or disengaged retainer ring
Low and Reverse Clutch	- Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545 - 547) - Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545 - 547) - Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544) - Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550) - Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)

Checks	Causes
Low-Reverse and 1-2-3-4 Clutch Housing (551)	- Inspect for disengaged or broken Low and Reverse Clutch Piston Spring Retainer (548) - Inspect for broken or deformed Low and Reverse Clutch Piston (550) - Inspect for damaged or improper surface finish in the piston bore

NO FIRST, SECOND, THIRD, AND FOURTH GEAR

Checks	Causes
Control Solenoid (w/Body and TCM) Valve Assembly	Check 1234 PC Solenoid 5 for proper operation. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.</u>
Control Valve Body Assembly	Inspect 1-2-3-4 Clutch Regulator Valve (417) and 1-2-3-4 Clutch Boost Valve (414) for debris and stickiness.
1-2-3-4 Clutch Assembly	- Inspect for damaged, stripped or sheared splines on 1-2-3-4 Clutch Plates (557 - 559), Backing Plate (560). - Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and Piston Seals damaged, worn or delaminating. - Inspect for broken or fatigued 1-2-3-4 Clutch Piston Return Spring (553). - Inspect for broken or disengaged 1-2-3-4 Clutch Piston Return Spring Retainer (554). - Inspect for broken or fatigued 1-2-3-4 Clutch Waved Plate (557). - Inspect for disengaged or broken 1-2-3-4 Clutch Backing Plate Retainer (561). - Inspect for broken, porous or improper surface finish or plugged oil passages of the Low-Reverse/1-2-3-4 Clutch Housing (551). - Inspect for worn or damaged Low-Reverse/ 1-2-3-4 Clutch Housing (551) splines.
Output Sun Gear Assembly (555)	Inspect for stripped or sheared splines on the Output Sun Gear shell.
Reaction Carrier Assembly (567)	- Inspect for stripped or sheared splines on the Input Ring Gear - Inspect for disengaged or broken Input Ring Gear Retainer.
Output Carrier Assembly (574)	- Low/Reverse Clutch Assembly (OWC) (543) splines stripped or sheared. - Inspect for disengaged or broken Reaction Ring Gear Retainer.
Case Assembly (50)	- Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67). - Inspect for worn or damaged case splines or retainer ring grooves.
Input Sun Gear (571)	Inspect for damaged gear teeth and damaged splines.

Checks	Causes
Turbine Shaft (517)	Inspect for damaged splines to the Input Shaft Sun Gear.

NO SECOND AND SIXTH GEAR

Checks	Causes
2-6 Clutch Assembly	- Inspect for damaged or worn 2-6 Clutch Plates (540 - 542). - Inspect for damaged, worn, broken, improper surface finish or sheared splines on the Low-Reverse Clutch Assembly (543). - Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating. - Inspect for broken or binding 2-6 clutch Piston Return Spring (536).
Reaction Carrier Assembly (567)	- Inspect for stripped or sheared splines on the Input Ring Gear. - Inspect for disengaged or broken Input Ring Gear Retainer.
Reaction Sun Gear Assembly (566)	- Inspect for damaged or broken Reaction Sun Gear Assembly hub. - Inspect for damaged or broken sun gear weld. - Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Case Assembly (50)	- Inspect for stripped or sheared splines. - Inspect for broken or disengaged 2-6 Clutch Piston Return Spring Retainer (537). - Inspect for damaged, worn, or improper surface finish in the piston bore.
Output Carrier Assembly (574)	Inspect for reaction ring gear damage or missing ring gear snap ring.
Control Valve Body Assembly	Inspect 2-6 Clutch Regulator Valve (419) for debris and stickiness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check 2-6 PC Solenoid 4 for proper operation. Refer to Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test.

HARSH OR LATE FIRST, SECOND, THIRD, AND FOURTH SHIFT

Checks	Causes

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

HARSH FIRST AND REVERSE SHIFT

Checks	Causes
Low-Reverse and 1-2-3-4 Clutch Housing (551)	Inspect for plugged or restricted Low-Reverse/1-2-3-4 Clutch Piston Housing (551) air bleed
Low and Reverse Clutch	- Inspect for improper surface finish on Low and Reverse Clutch Plates (545 - 547) - Inspect for broken or fatigued Low and Reverse Clutch Apply Plate (547) - Inspect for damaged or broken Low and Reverse Clutch Piston (550) and piston seals damaged, worn or leaking - Inspect for fatigued or binding Low and Reverse Clutch Piston Return Spring (549)

NO THIRD, FIFTH, AND REVERSE GEAR

Checks	Causes

Checks	Causes
3-5 Reverse Clutch Assembly	- Inspect for damaged, stripped or sheared splines on 3-5 Reverse Clutch Plates (507 - 509), Backing Plate (510) - Inspect for sheared or stripped splines on 3-5 Rev/4-5-6 Housing (516) to Turbine Shaft (517) - Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516) - Inspect for damaged, worn, loose or seized hub bushing in the 3-5 Rev/4-5-6 Housing - Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516) - Inspect for failure of the Input Shaft Thrust Bearing (538) - Inspect for disengaged or broken 3-5 Reverse Clutch Backing Plate (511) - Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504 - 506) - Inspect for damaged or broken 3-5 Rev/4-5-6 Clutch Housing (516) - Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (502) - Inspect for broken or fatigued 3-5 Reverse Clutch Spring (503) - Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500) - Inspect for worn, broken or damaged Speed Sensor Reluctor Wheel (501)
Reaction Sun Gear Assembly (566)	Inspect for stripped or sheared splines
Reaction Carrier (567)	- Inspect for broken or disengaged Input Internal Gear Retainer - Inspect for stripped or sheared splines on the Input Internal Gear
Output Carrier (574)	Inspect for stripped or sheared splines for the Reaction Internal Ring Gear
4-5-6 Clutch Assembly	- Inspect for plugged or missing 4-5-6 Piston Dam Oil Feed hole - Inspect for leaking 4-5-6 Piston Dam

HARSH OR LATE SECOND AND SIXTH SHIFT

Checks	Causes
2-6 Clutch Assembly	- Inspect for worn or improper surface finish on the 2-6 Clutch Plates (540 - 542) - Inspect for fatigued 2-6 Clutch Piston Apply Plate (540) - Inspect for plugged, restricted or incorrect orientation of the 2-6 Clutch Piston (535) air bleed

Checks	Causes
Case Assembly (50)	- Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating - Inspect for fatigued 2-6 Clutch Piston Return Spring (536)

NO FOURTH, FIFTH, AND SIXTH GEAR

Checks	Causes
4-5-6 Clutch Assembly	- Inspect for damaged, stripped or sheared splines on 4-5-6 Clutch Plates (526 - 528), Backing Plate (529) - Inspect for broken or fatigued 4-5-6 Clutch Waved Plate (525) - Inspect for damaged or broken 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521) - Inspect for broken or fatigued 4-5-6 Piston Return Spring (522) - Inspect for broken or disengaged 4-5-6 Backing Plate Retainer (532) - Inspect for damaged or broken 4-5-6 Clutch Dam Piston (523) and piston seals damaged, worn or delaminating - Inspect for broken or disengaged 4-5-6 Clutch Dam Retainer (524) - Inspect for stripped or sheared splines on the Reaction Carrier Hub (531) - Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516) - Inspect for loose, worn or damaged 3-5 Rev/4-5-6 Housing Bushing - Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516)
Transmission Case Assembly	Inspect the input shaft support (56) for missing or damaged fluid ring seals (58).
Control Valve Body Assembly	Inspect the reverse and 4-5-6 regulator valve (411) and ball check valve (404) for debris and stickiness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check the pressure control solenoid 3 (R1/456) for proper operation. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u> .

HARSH OR LATE THIRD, FIFTH, AND REVERSE SHIFT

Checks	Causes

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

HARSH FOURTH, FIFTH, AND SIXTH SHIFT

Checks	Causes
4-5-6 Clutch Assembly	- Inspect for leaking or damaged 4-5-6 Clutch Piston (520) and Piston Seals (518, 519, 521) - Inspect for plugged or restricted 4-5-6 Piston Dam air bleed - Inspect for leaking or damaged 4-5-6 Clutch Dam (523) - Inspect for plugged or restricted Dam oil feed hole in the 4-5-6 Piston (520) - Inspect for fatigued 4-5-6 Clutch Piston Spring (522) - Inspect for leaking 4-5-6 Clutch Dam Seals (523) - Inspect for improper surface finish on 4-5-6 Clutch Plates (525 - 528) - Inspect for fatigued 4-5-6 Clutch Waved Plate (525) - Inspect for porous, improper surface finish, seal groove damage or plugged or restricted oil passages of the 3-5 Rev/4-5-6 Housing (516)

HARSH DOWNSHIFT

Checks	Causes

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

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter Assembly (28)	• Inspect for damaged Torque Converter Clutch Seal (inside converter assembly). • Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves. Refer to Control Solenoid Valve and Transmission Control Module Assembly Inspection .
Oil Pump Assembly (201)	Inspect for worn or damaged Torque Converter Fluid Seal Assembly (301).
Torque Converter Housing Assembly (29)	Inspect for leaking or damaged Torque Converter Fluid Seal Assembly (301), Torque Converter Fluid Seal Assembly (319) and A/Trans Fluid Pump Assembly (201).

NO TORQUE CONVERTER CLUTCH RELEASE

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

NO REVERSE GEAR

Checks	Causes
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Checks	Causes
Control Solenoid (w/Body and TCM) Valve Assembly	Check the 35R PC Solenoid 2 for proper operation. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u> .
Control Valve Body Assembly	- Inspect the 3-5-Reverse Clutch Regulator Valve (421) and Control Valve Body Ball Check Valve (404) for debris and stickiness. - Inspect the Clutch Select Valve (428) and the Actuator Feed Limit Valve (430) for debris and stickiness.
Low and Reverse Clutch	- Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545 - 547) - Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545 - 547) - Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544) - Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550) - Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)
Transmission Case Assembly	Inspect the Input Shaft Support (56) for missing or damaged Fluid Seal Rings (58).
3-5 Reverse Clutch Assembly	- Inspect for damaged, stripped or sheared splines on 3-5 Reverse Clutch Plates (507 - 509), Backing Plate (510). - Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516). - Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516). - Inspect for damaged, worn, loose or seized hub bushing in the 3-5 Rev/4-5-6 Housing. - Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516). - Inspect for failure of the Input Shaft Thrust Bearing (538). - Inspect for disengaged or broken 3-5 Reverse Clutch Backing Plate Retainer (511). - Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504 - 506). - Inspect for damaged or broken 3-5 Rev/4-5-6 Clutch Housing (516). - Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (502). - Inspect for broken or fatigued 3-5 Reverse Clutch Spring (503). - Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500). - Inspect for broken Speed Sensor Reluctor Wheel (501).

FLUID PRESSURE HIGH OR LOW

Checks	Causes
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Checks	Causes
Fluid Pump Assembly (201)	• Inspect for loose fluid pump bolts (204). • Inspect for leaking or damaged fluid pump outlet seals (24) and oil filter seal. • Inspect for improperly installed, restricted or damaged oil filter (203). • Inspect for sticking line pressure blow off valve (304). • Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308). • Inspect for damaged or restricted oil ports in the oil pump body (303). • Inspect for missing, leaking, or damaged auxiliary fluid inlet pump seal (371) - Hybrid Models.
Torque Converter Housing (208)	• Inspect for missing or restricted differential lube oil circuit orifice. • Inspect for missing front differential carrier baffle (205).
Control Solenoid Valve Assembly (w/Body and TCM) (7)	• Inspect for leaking or damaged filter plate assembly seals (8). • Verify VBS operation is not stuck high or low.
Case Assembly (50)	• Inspect for proper fluid level. • Inspect for missing lube oil circuit orifice or front differential carrier baffle (62). • Inspect for leaking or damaged valve body spacer plate assembly (12). • Inspect for damaged or leaking fluid check valve (55). • Inspect for leaking, damaged or broken fluid level control valve (13).
Torque Converter Assembly (28)	• Inspect for damaged torque converter clutch seal (inside converter assembly). • Inspect for damaged or disengaged torque converter hub to oil pump drive gear.

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Repair Instructions - Off Vehicle - Impala

REPAIR INSTRUCTIONS - OFF VEHICLE

LIFT PLATE AND HOLDING FIXTURE INSTALLATION

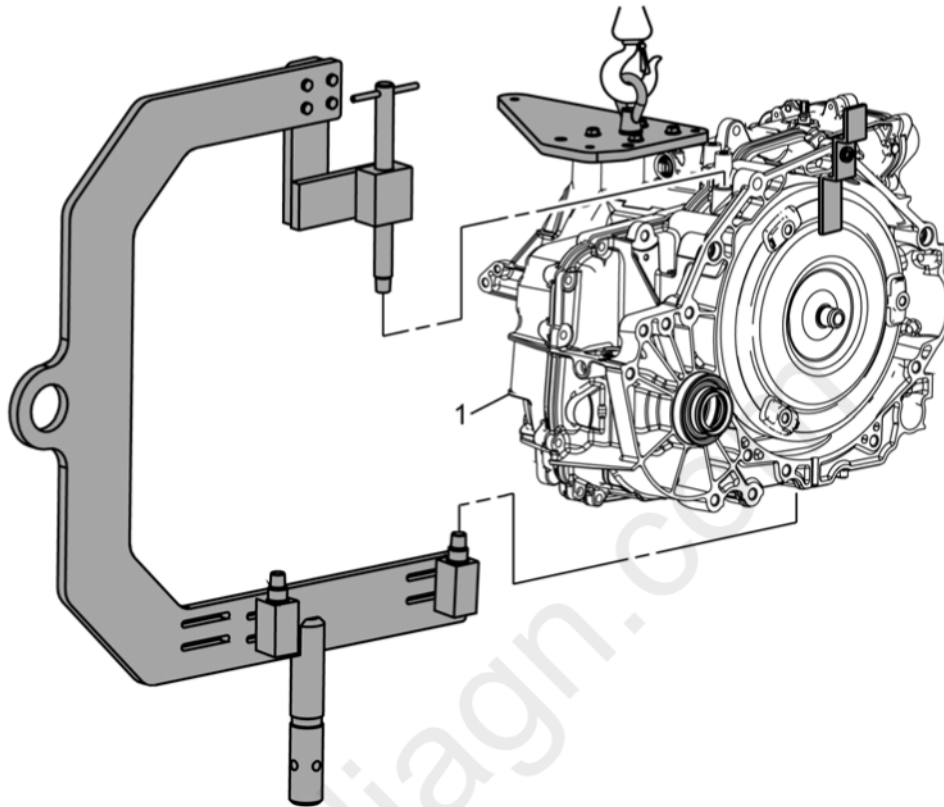


Fig. 1: Identifying Lift Plate & Holding Fixture

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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

TORQUE CONVERTER REMOVAL

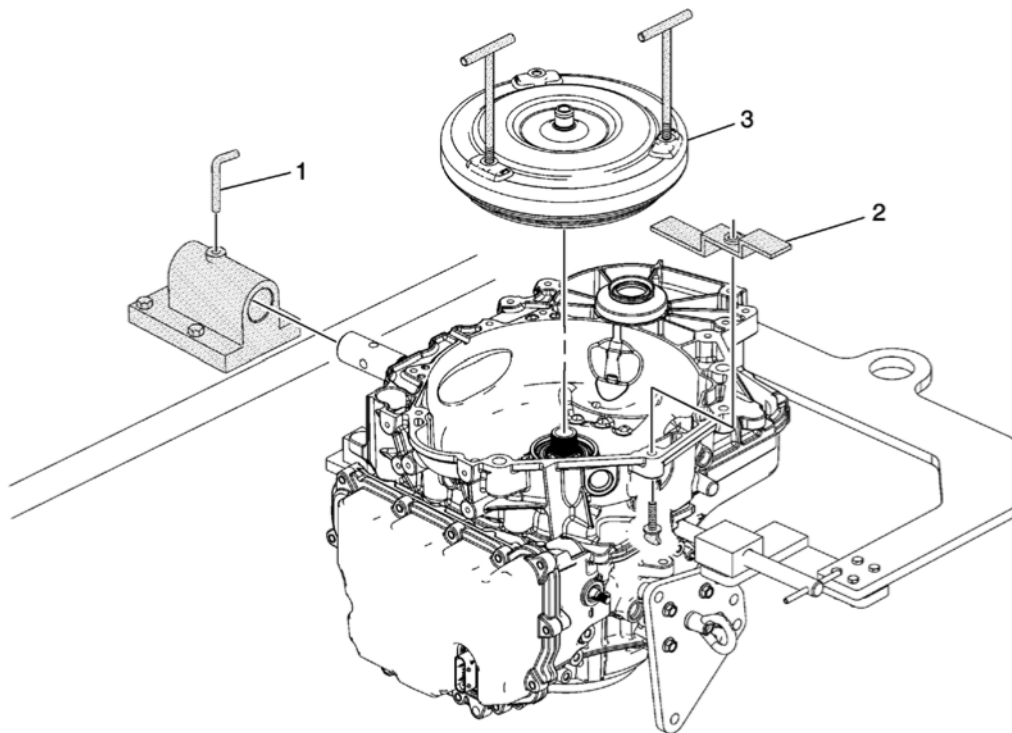


Fig. 2: Torque Converter, Holding Strap & Lock Pin
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Lock Pin WARNING: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury. NOTE: Ensure the DT-3289-20 holding fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. DT-39890 holding fixture adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. Special Tools • DT-3289-20 Holding Fixture • DT-39890 Transmission Holding Fixture Adapter For equivalent regional tools, refer to Special Tools .
2	DT-21366 Torque Converter Holding Strap

Callout	Component Name
3	Torque Converter Assembly CAUTION: Only install the lift assist handles until it stops. Do not tighten. Over tightening the lift assist handles can cause damage to the torque converter. NOTE: Failure to raise the torque converter straight up could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tool DT-46409 Torque Converter Lifting Handles For equivalent regional tools, refer to Special Tools .

AUXILIARY FLUID ACCUMULATOR REMOVAL (MHG)

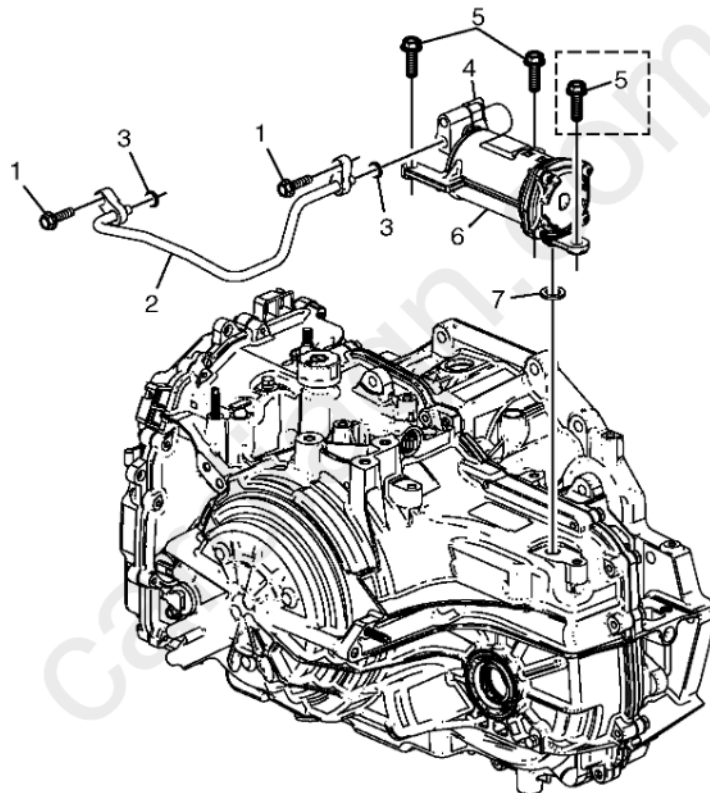


Fig. 3: Auxiliary Fluid Accumulator Components
Courtesy of GENERAL MOTORS COMPANY

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.	
1	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 2)
2	A/Trans Fluid Accumulator Pipe

Callout	Component Name
3	A/Trans Fluid Accumulator Pipe Seal (Qty: 2) NOTE: Discard the seals, they are not reusable.
4	A/Trans Auxiliary Fluid Accumulator Solenoid Connector Procedure Disconnect the connector.
5	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 3) NOTE: Models equipped with a range selector actuator only use (Qty: 2) auxiliary fluid accumulator bolts.
6	A/Trans Auxiliary Fluid Accumulator Procedure 1. Secure the auxiliary fluid accumulator to a vise. 2. Securely attach a hose from the bleeder screw into an approved container. 3. Slowly loosen bleeder screw until pressure begins to release. 4. Allow all pressure and fluid to be released from the auxiliary fluid accumulator.
7	Accumulator Bypass Valve Seal NOTE: Discard the seal, it not reusable.

CONTROL VALVE BODY ASSEMBLY REMOVAL

Control Valve Body Cover Removal

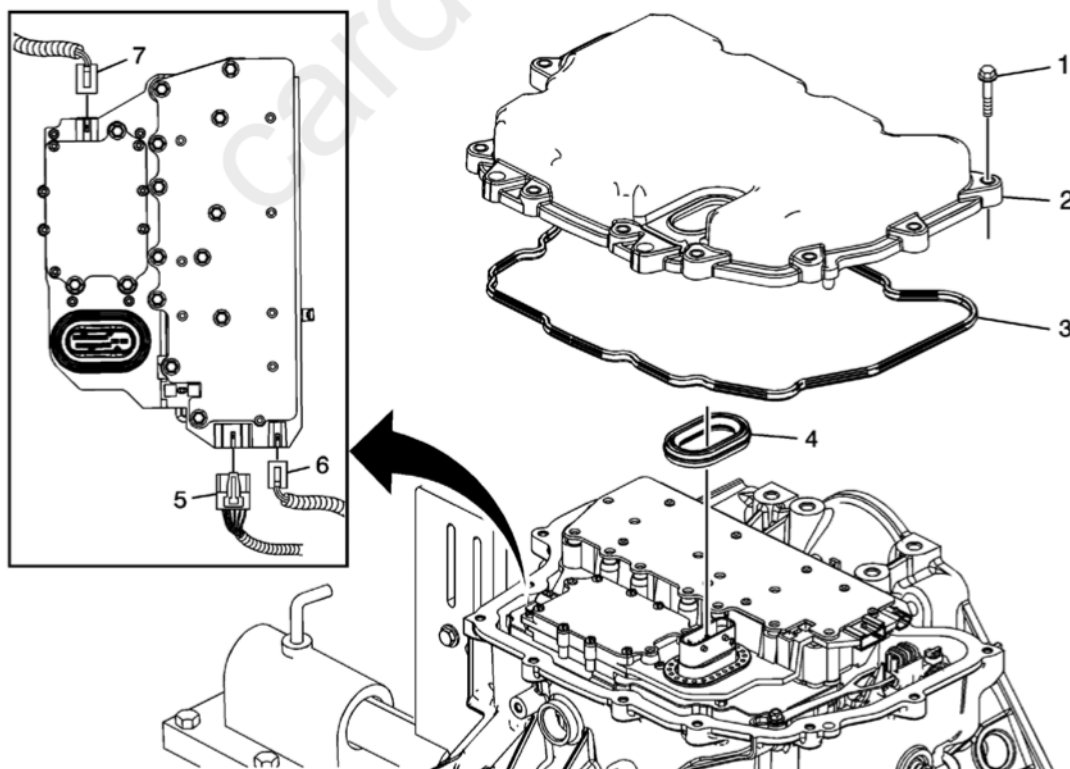


Fig. 4: View Of Control Valve Body Cover

Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Cover Removal

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

Control Solenoid (With Body and TCM) Valve Assembly Removal

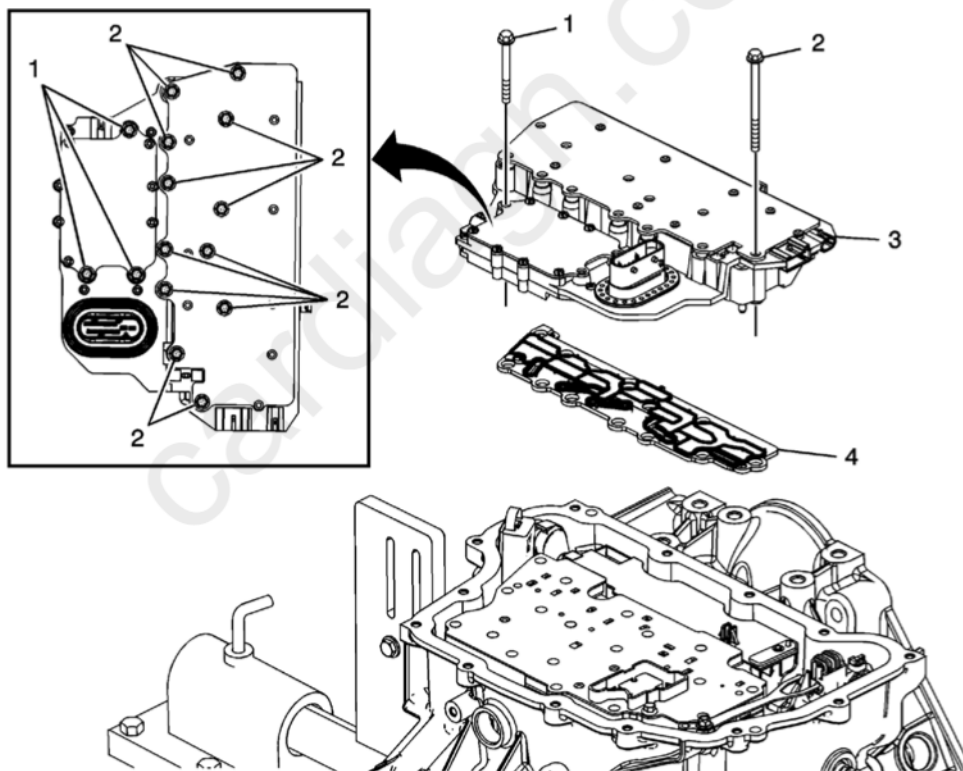


Fig. 5: View Of Control Solenoid (w/Body & TCM) Valve Assembly
Courtesy of GENERAL MOTORS COMPANY

Control Solenoid (With Body and TCM) Valve Assembly Removal

Callout	Component Name
1	Control Valve Body M5 x 40.5 (Qty: 3)
2	Control Valve Body Bolt M6 x 30 (Qty: 12)
3	Control Solenoid (with Body and TCM) Valve Assembly

Callout	Component Name
4	Control Solenoid Valve Assembly Filter Plate CAUTION: Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination. NOTE: Discard the filter plate. It is not reusable.

Control Valve Body Assembly Removal

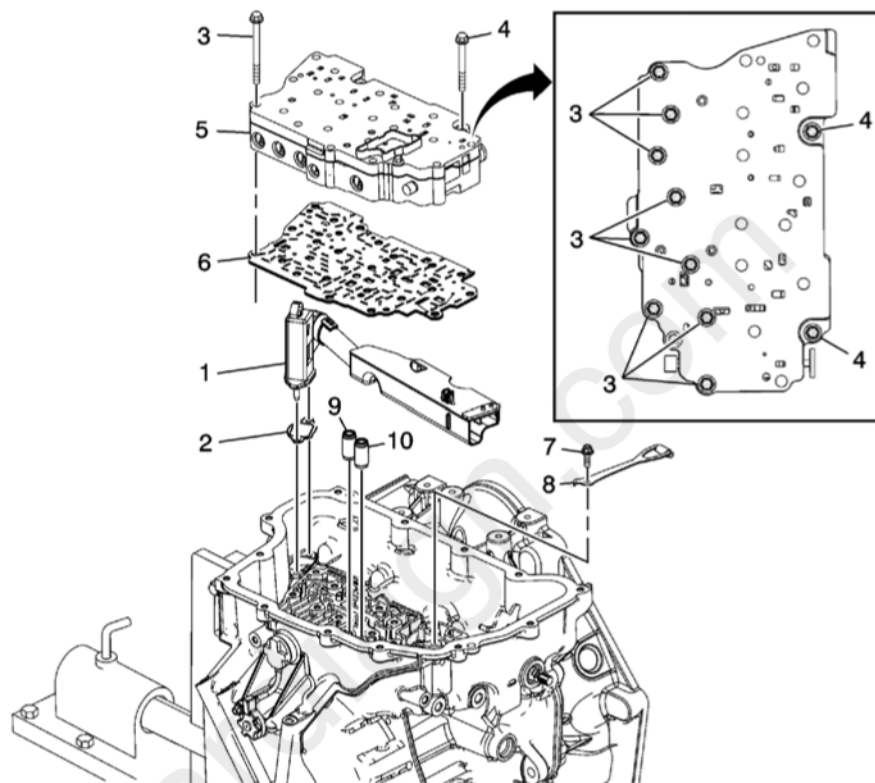


Fig. 6: View Of Control Valve Body Assembly
 Courtesy of GENERAL MOTORS COMPANY

Control Valve Body Assembly Removal

Callout	Component Name
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket
3	Control Valve Body Bolt M6 x 60 (Qty: 9)
4	Control Valve Body Bolt M6 x 53 (Qty: 2)
5	Control Valve Body Assembly
6	Control Valve Body Spacer Plate Assembly
7	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1)
8	Manual Shaft Detent Lever Spring Assembly
9	1-2-3-4 Clutch Fluid Passage Seal NOTE: Discard the seal. It is not reusable.

Callout	Component Name
10	Low/Reverse Clutch Fluid Passage Seal NOTE: Discard the seal. It is not reusable.

INPUT AND OUTPUT SPEED SENSOR REMOVAL

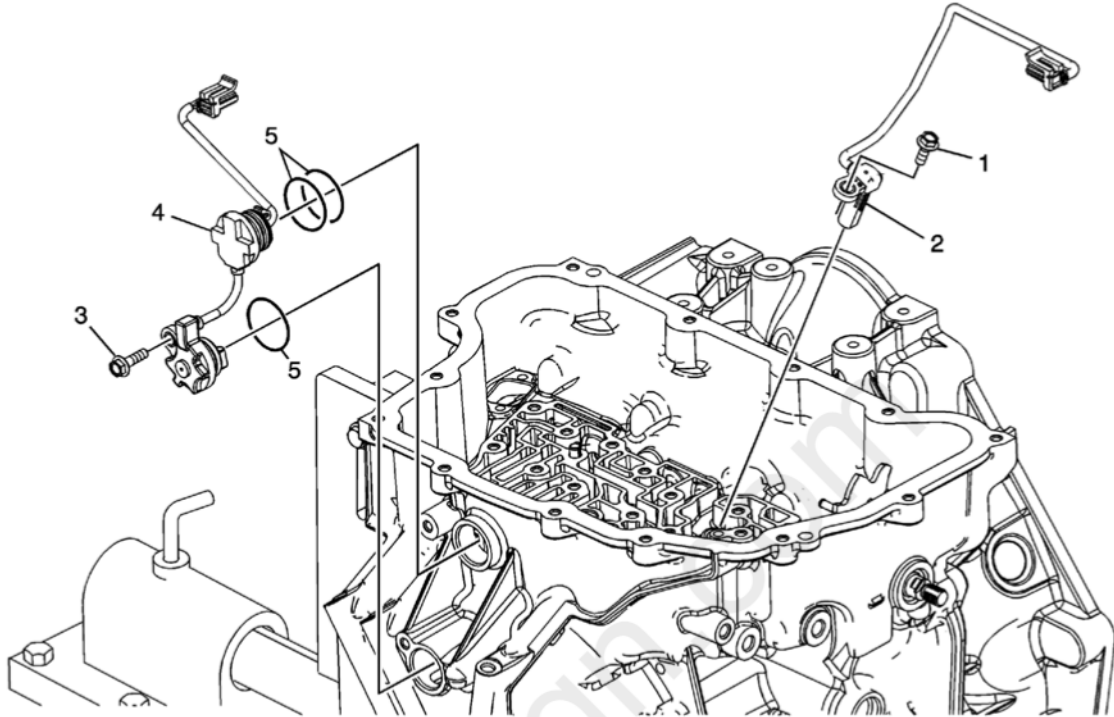


Fig. 7: View Of Input & Output Speed Sensor
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1)
2	A/Trans Output Speed Sensor Assembly
3	Input Speed Sensor Bolt M6 x 23 (Qty: 1)
4	Input Speed Sensor Assembly NOTE: Compress the locking tabs on the plug to release it from the case and to avoid damaging the retainers.
5	Input Speed Sensor Assembly Seals (Qty: 3) NOTE: Discard the seals. They are not reusable.

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY REMOVAL

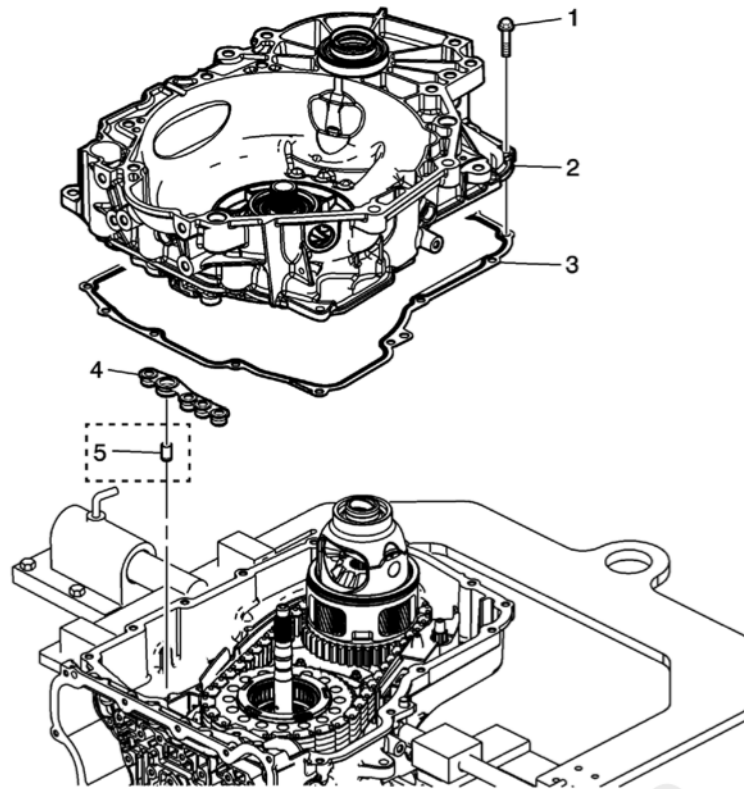


Fig. 8: Torque Converter Housing with Fluid Pump Assembly.
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter and Differential Housing Bolt (Qty: 15)
2	Torque Converter with Fluid Pump Housing Assembly
3	Torque Converter Housing Gasket NOTE: DISCARD the gasket.
4	Automatic Transmission Fluid Pump Seal NOTE: Discard the seal.
5	Automatic Transmission Fluid Trough Check Ball - Hybrid Models

DIFFERENTIAL CARRIER REMOVAL

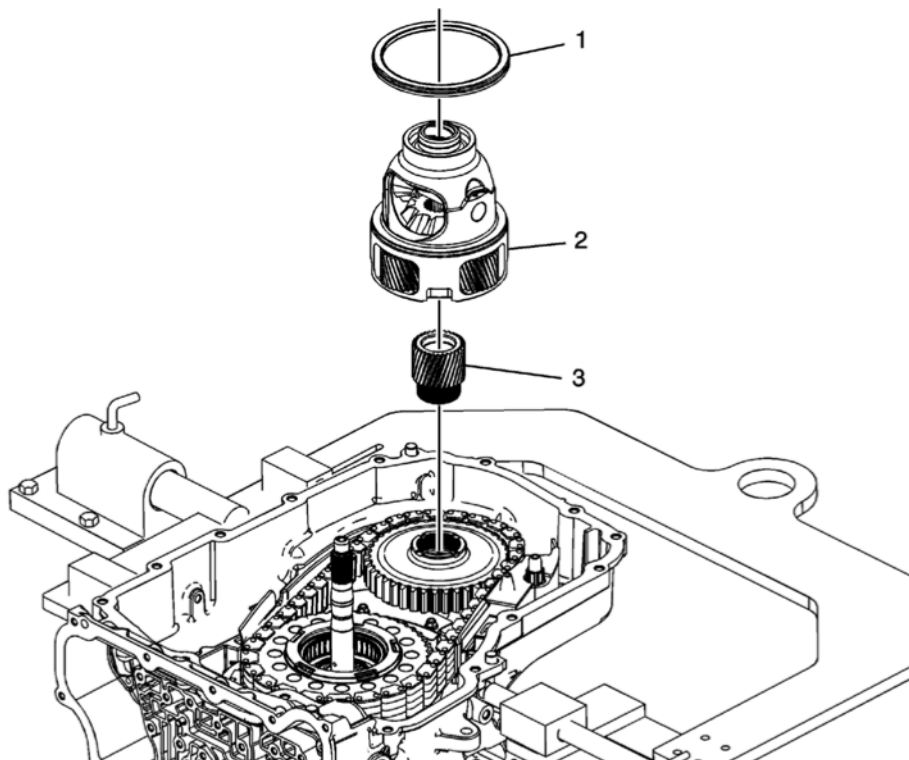


Fig. 9: View Of Front Differential Carrier Assembly
 Courtesy of GENERAL MOTORS COMPANY

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

DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL REMOVAL

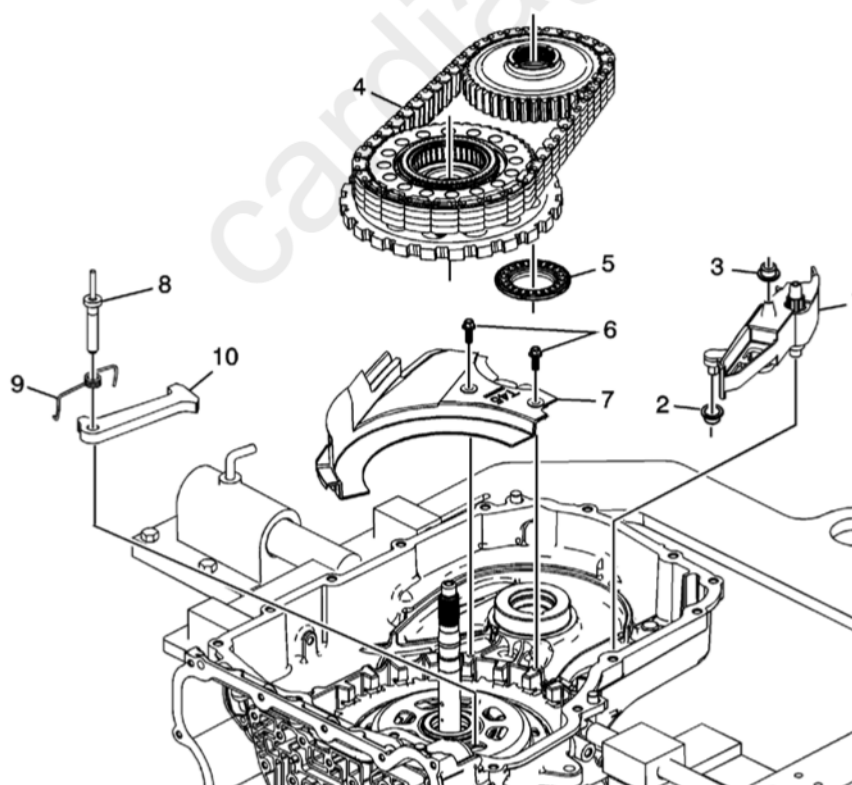


Fig. 10: View Of Drive and Driven Sprocket, Drive Link & Park Pawl
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Drive Link Lube Scoop

Callout	Component Name
1	1 - 2 - 3 - 4 Clutch Backing Plate Retainer Ring WARNING: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result. CAUTION: Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear. NOTE: Remove one end of the retainer using DT-28585 snap ring remover or equivalent and work the retainer out of the case groove. Special Tool DT-28585 Snap Ring Remover or equivalent For equivalent regional tools, refer to Special Tools.
2	3 - 5 Reverse and 4 - 5 - 6 Clutch Housing Assembly, Gearset, Low-Reverse Clutch Assembly and Low-Reverse and 1 - 2 - 3 - 4 Clutch Housing NOTE: This unit is heavy - weighs 40 lbs. (18 Kg).
3	2 - 6 Clutch Plate (Qty: 1)
4	2 - 6 Clutch Apply Plate (Waved)
5	35R and 456 Clutch Housing Thrust Bearing Assembly

2-6 CLUTCH PISTON REMOVAL

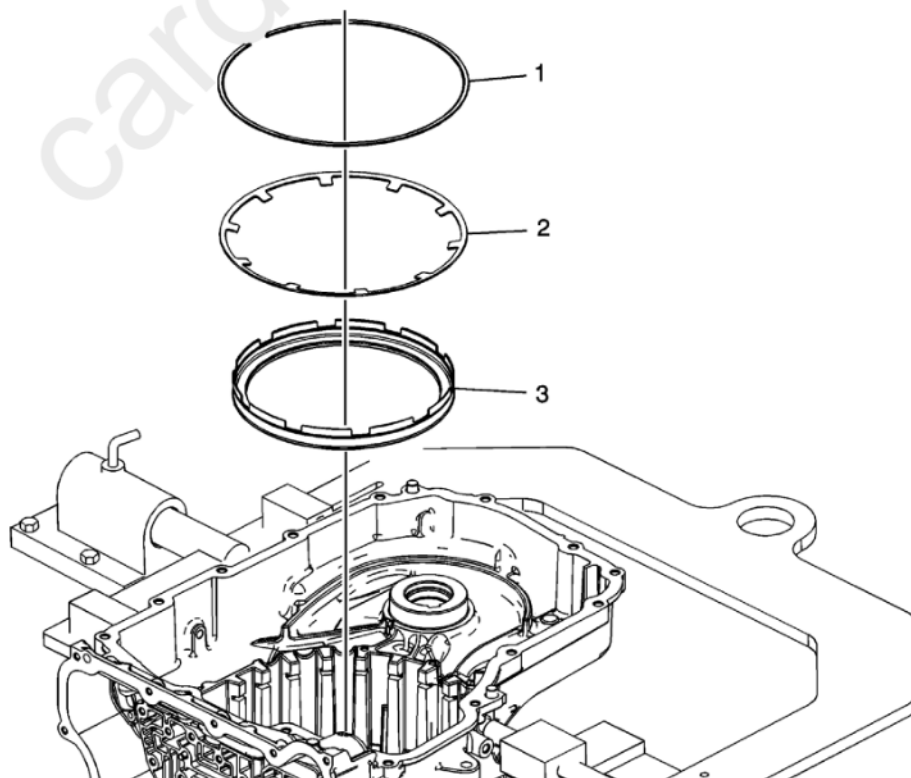


Fig. 12: View Of 2-6 Clutch Piston & Attached Components
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2 - 6 Clutch Spring Retainer Special Tool DT-28585 Snap Ring Remover or equivalent For equivalent regional tools, refer to Special Tools .
2	2 - 6 Clutch Spring
3	2 - 6 Clutch Piston Assembly NOTE: • Use pliers to remove the piston. • Inspect the piston seals for damage and/or wear. The piston is reusable.

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR REMOVAL

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

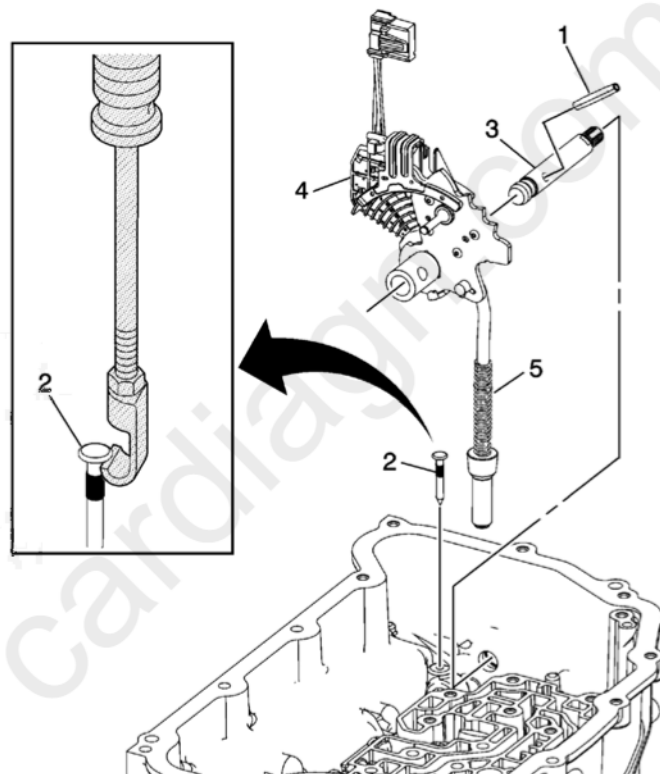


Fig. 13: Identifying Manual Shaft Detent Lever Assembly.

Courtesy of GENERAL MOTORS COMPANY

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

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin NOTE: Use side cutter to remove the pin (1) and discard.

Callout	Component Name
	Manual Shift Shaft Pin
	NOTE: Discard the pin. It is not reusable.
2	Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer For equivalent regional tools, refer to Special Tools .
3	Manual Shaft
4	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly
5	Park Pawl Actuator Assembly

Park Pawl Actuator Guide Removal

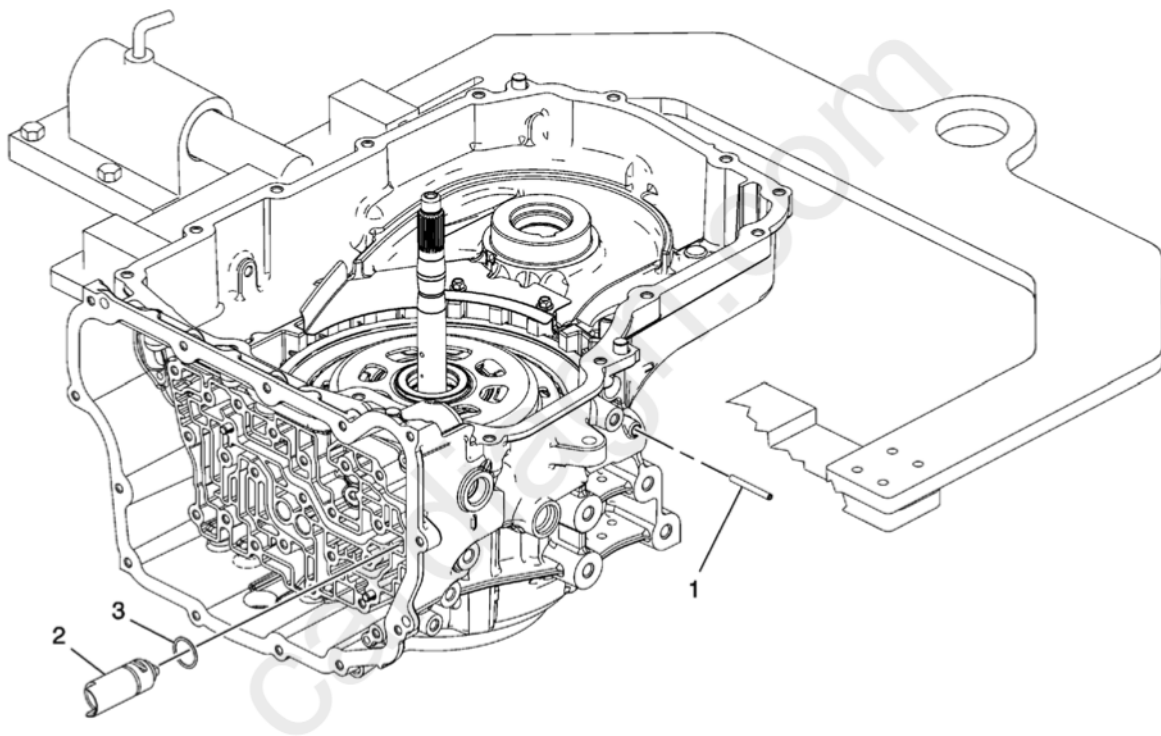


Fig. 14: Identifying Park Pawl Actuator Guide Components
 Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Guide Removal

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

MANUAL SHIFT SHAFT SEAL REMOVAL

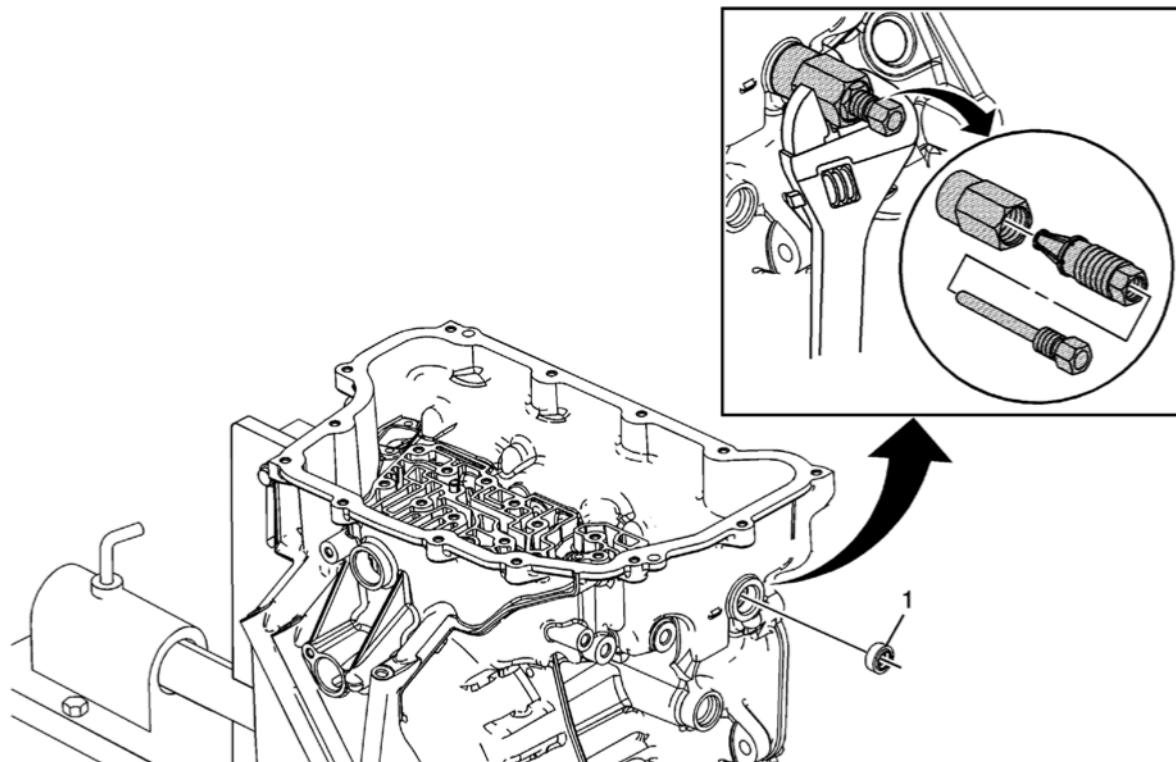


Fig. 15: Manual Shift Shaft Seal

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Shift Shaft Seal NOTE: Use the DT-45201 seal remover to remove the seal to prevent damage to the case surface. Special Tools DT-45201 Seal Remover For equivalent regional tools, refer to Special Tools .

INPUT SHAFT SUPPORT REPLACEMENT

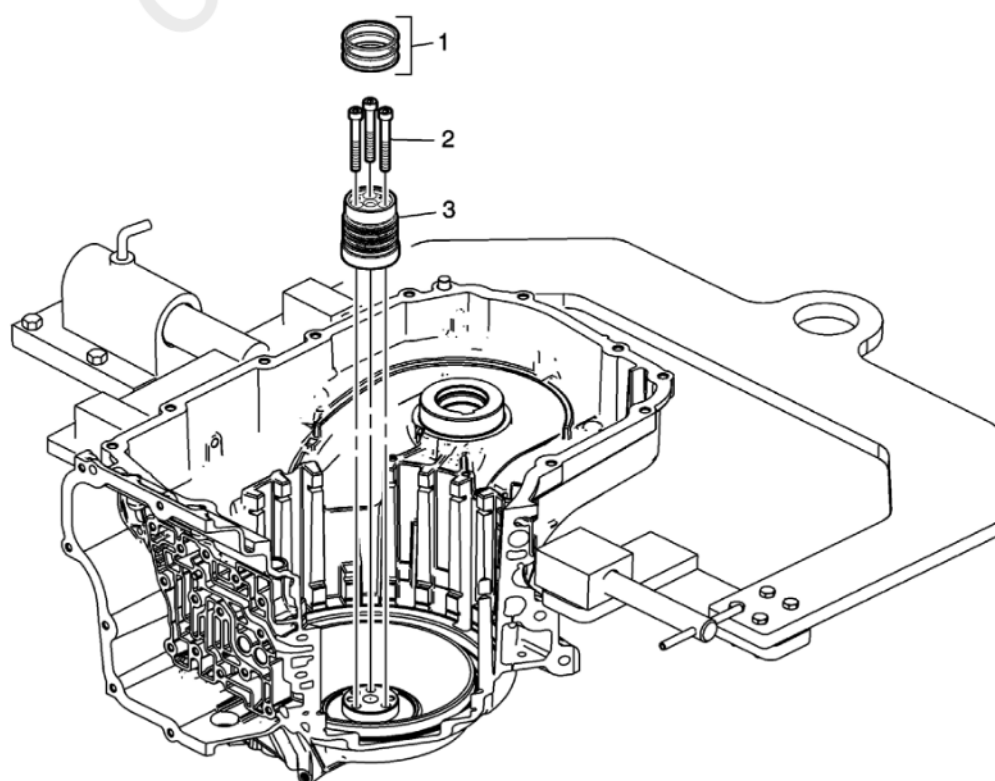


Fig. 16: Input Shaft Support
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3) NOTE: • Discard the fluid seals. They are not reusable. • Refer to 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement.
2	Input Shaft Support Bolts M6 x 50 (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
3	Input Shaft Support NOTE: Inspect the support for wear, damage or porosity.

3-5-REVERSE AND 4-5-6 CLUTCH FLUID SEAL RING REPLACEMENT

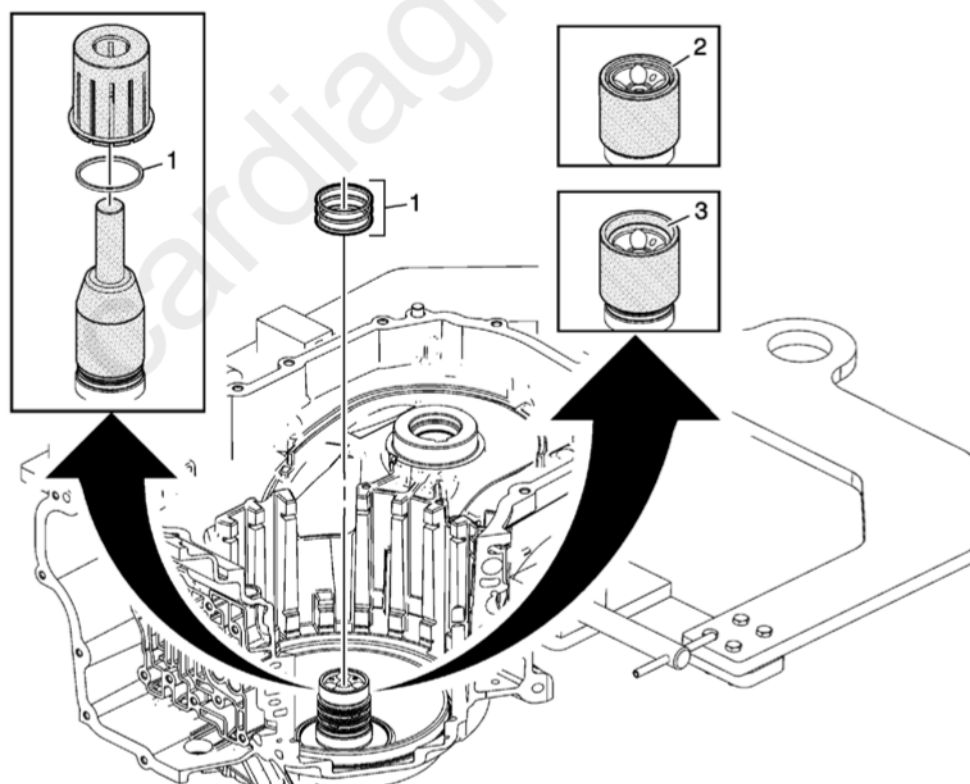


Fig. 17: 3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Special Tools DT-46620 Seal Installer For equivalent regional tools, refer to Special Tools .	

Callout	Component Name
1	3 - 5 Reverse and 4 - 5 - 6 Clutch Fluid Seals (Qty: 3) Procedure 1. Place DT-46620-3 which is part of DT-46620 seal installer over the case hub and adjust it so that only the bottom seal ring is exposed. 2. Place a NEW fluid seal ring onto DT-46620-3 which is part of DT-46620 seal installer. 3. Use DT-46620-2 which is part of DT-46620 seal installer to push the fluid seal ring down over DT-46620-3 which is part of DT-46620 seal installer into the hub ring groove. 4. Repeat the above steps to install all 3 seal rings, adjusting DT-46620-3 which is part of DT-46620 seal installer to the appropriate ring groove.
2	Small Chamfer Up CAUTION: Do not force the seal installer down over the seals as this will roll and damage the seals. The large chamfer is designed to fit over the over stretched seal. Use a hand to help shrink the seal if the seal installer is difficult to install over the seal rings. Procedure Install DT-46620-1 which is part of DT-46620 seal installer with the large chamfer end down over the fluid seal rings and leave DT-46620-1 which is part of DT-46620 seal installer on the seals for at least 60 seconds.
3	Large Chamfer Up Procedure 1. Install DT-46620-1 which is part of DT-46620 seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. 2. Leaving DT-46620-1 which is part of DT-46620 seal installer on the fluid seal rings for an extended period of time could cause a fluid leak on the initial clutch piston circuit until the seal rings warm up and expand to the proper dimension.

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - CASE SIDE

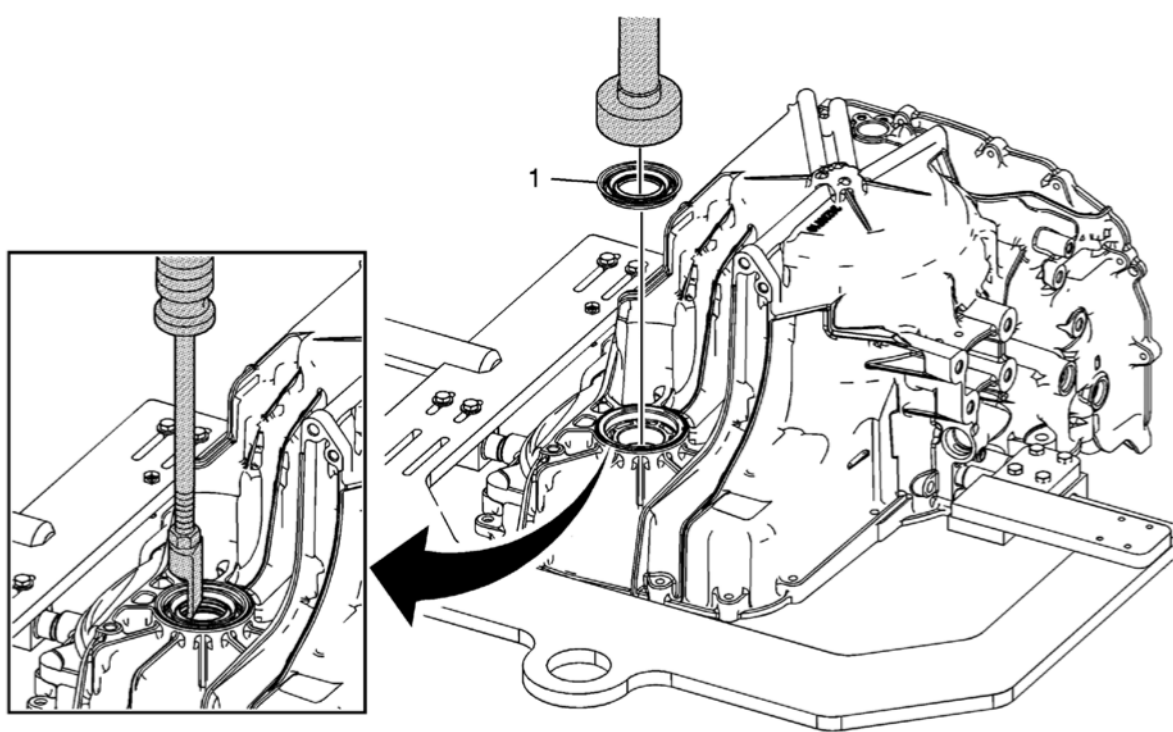


Fig. 18: View Of Case Side Front Wheel Drive Shaft Seal

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-1B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, refer to Special Tools .

TRANSMISSION CASE CLEANING AND INSPECTION

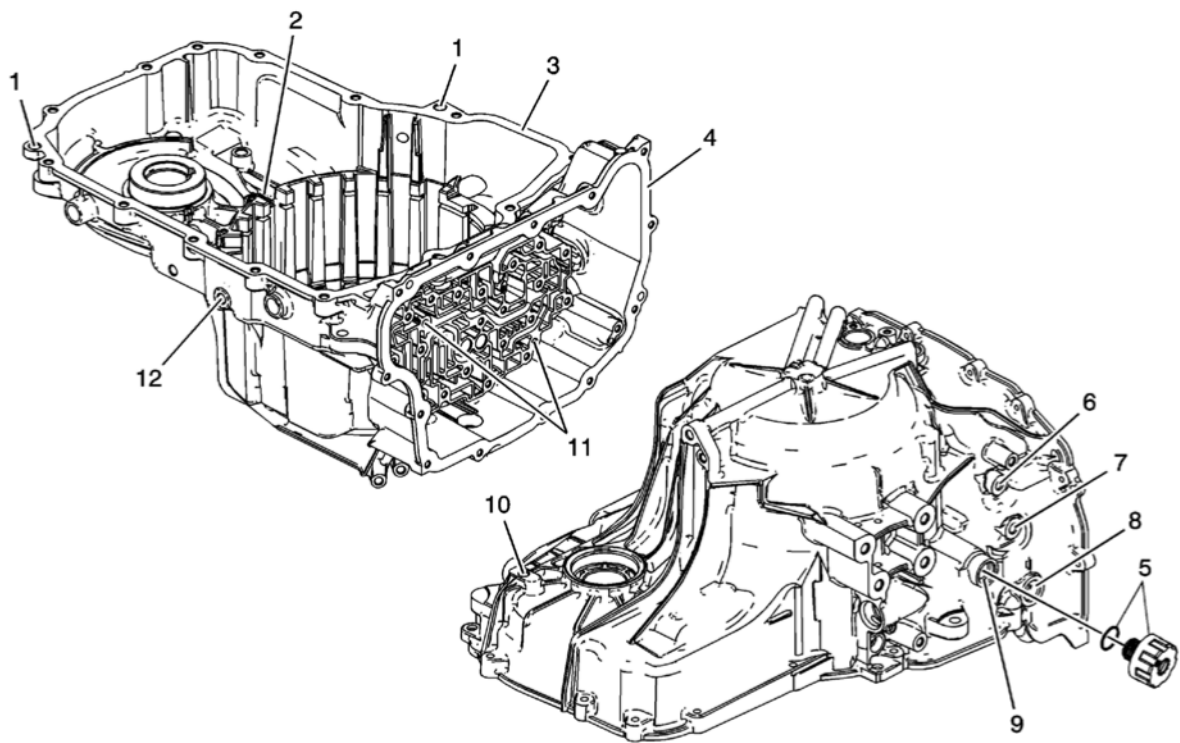


Fig. 19: Transmission Case Cleaning And Inspection Points
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks. CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. Preliminary Procedures 1. Thoroughly clean the transmission case assembly, including case threads, with clean solvent. 2. Clean gasket sealing surfaces. Remove all residual gasket material. 3. Inspect all threaded holes. If necessary, repair any thread damage.	
1	Torque Converter Housing Locating Pin Procedure Inspect the torque converter housing locating pins. NOTE: The locating pins installed height is 7.4 mm (0.29 in).

Callout	Component Name
2	Fluid Trough Check Ball NOTE: The check ball installed depth is 11 mm (0.43 in).
3	Converter Housing Sealing Surface
4	Control Valve Body Cover Sealing Surface
5	Fill Cap Seal
6	Transmission Fluid Cooler Pipe Sealing Surface
7	Fluid Pressure Test Hole Plug CAUTION: Refer to <u>Fastener Caution</u> . Tighten 12 N.m (106 lb in)
8	Manual Shift Shaft Seal Surface
9	Fluid Fill Cap Sealing Surface
10	Fluid Level Hole Plug Tighten 12 N.m (106 lb in)
11	Valve Body Locating Pin Procedure Inspect the valve body locating pins. NOTE: The locating pins installed height is 5.8 mm (0.22 in).
12	Drain Plug Tighten 12 N.m (106 lb in)

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

Park Pawl Actuator Guide Installation

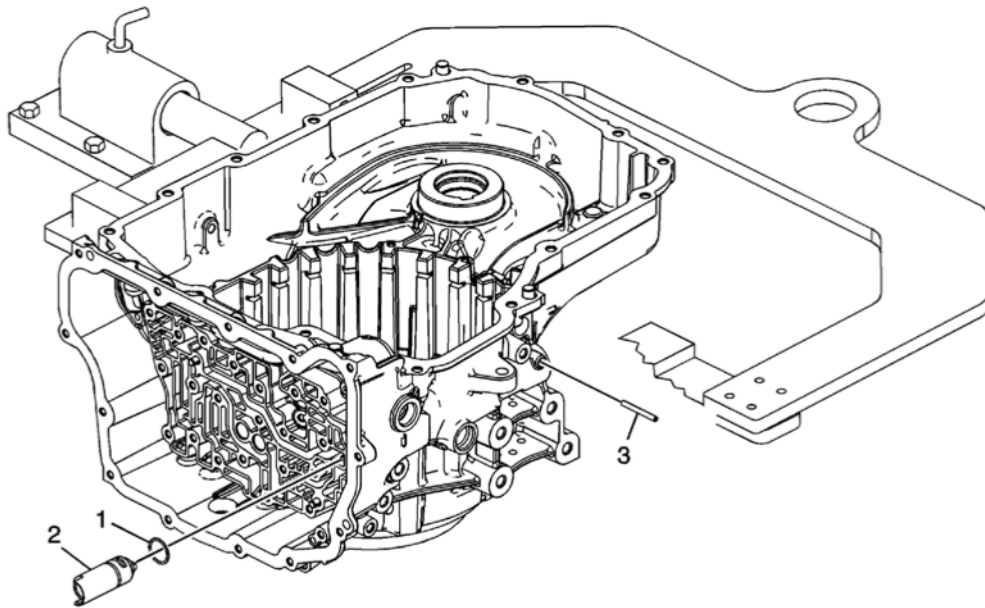


Fig. 20: View Of Park Pawl Actuator Guide & Seal
 Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Guide Installation

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

Park Pawl Actuator Installation

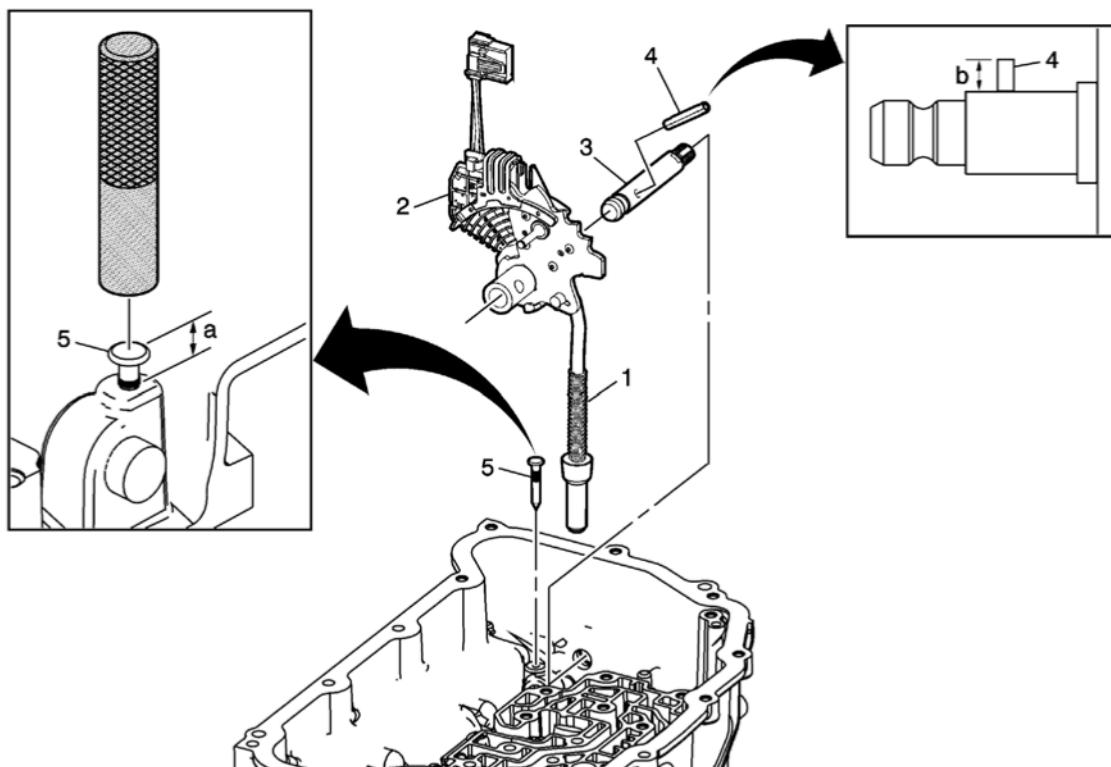


Fig. 21: Identifying Manual Shift Detent Lever with Shaft Position Switch Assembly & Park Pawl Actuator

Courtesy of GENERAL MOTORS COMPANY

Park Pawl Actuator Installation

Callout	Component Name
1	Park Pawl Actuator Assembly
2	Manual Shift Detent (w/Shaft Position Switch) Lever Assembly
3	Manual Shaft NOTE: Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
4	Manual Shaft Detent Lever Hub Pin CAUTION: Refer to Fastener Caution . Procedure Install the manual shaft detent lever hub pin to correct height. NOTE: Use a NEW pin to ensure proper engagement with the shaft. Specification 7.9 mm (0.38 in) (b) Special Tools DT-48550 Detent Lever Pin Remover For equivalent regional tools, refer to Special Tools .

Callout	Component Name
5	Manual Shift Shaft Pin CAUTION: Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack. Procedure Inspect pin installed height is within specifications. NOTE: Use a NEW pin to ensure proper engagement with the case. Specification 7.2 - 8.2 mm (0.28 - 0.32 in) (a) Special Tools DT-41229 Manual Shaft Pin Installer For equivalent regional tools, refer to Special Tools.

MANUAL SHIFT SHAFT SEAL INSTALLATION

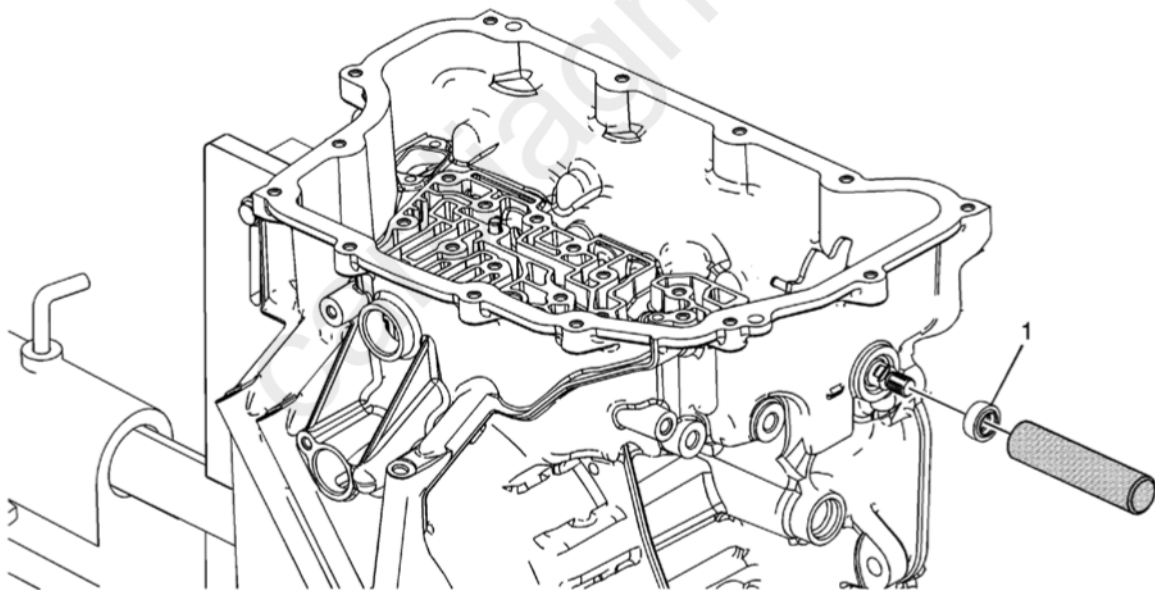


Fig. 22: Identifying Manual Shift Shaft Seal
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Shift Shaft Seal Special Tool DT-49101 Seal Installer For equivalent regional tools, refer to Special Tools.

2-6 CLUTCH PISTON INSTALLATION

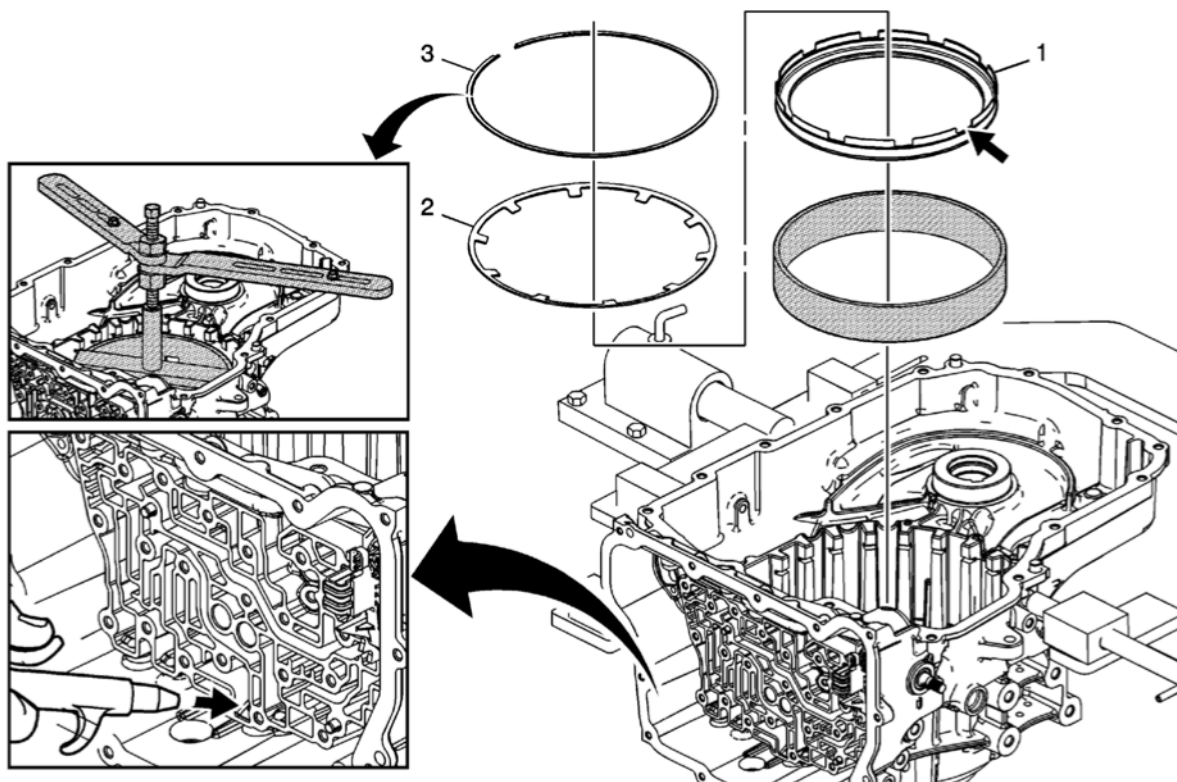


Fig. 23: 2-6 Clutch Piston

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	2 - 6 Clutch Piston Assembly NOTE: • Position the 2 - 6 piston air bleed and large slot toward the top of the case. • DT-47796 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the DT-47796 seal protector to ease installation of the piston. Special Tool DT-47796 Seal Protector For equivalent regional tools, refer to Special Tools .
2	2 - 6 Clutch Spring

Callout	Component Name
3	2 - 6 Clutch Spring Retainer CAUTION: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. NOTE: - Place the retainer on the 2-6 clutch spring and align the retainer opening with the largest gap in the case splines toward the bottom of the case. The retainer opening should be supported by a spline tooth of the case. - Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. Special Tools - DT-47797 Spring Installer - DT-48056 Spring Compressor Bridge For equivalent regional tools, refer to Special Tools.

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING, LOW AND REVERSE CLUTCH ASSEMBLY, OUTPUT SUN GEAR, AND 2-6 CLUTCH PLATE DISASSEMBLE

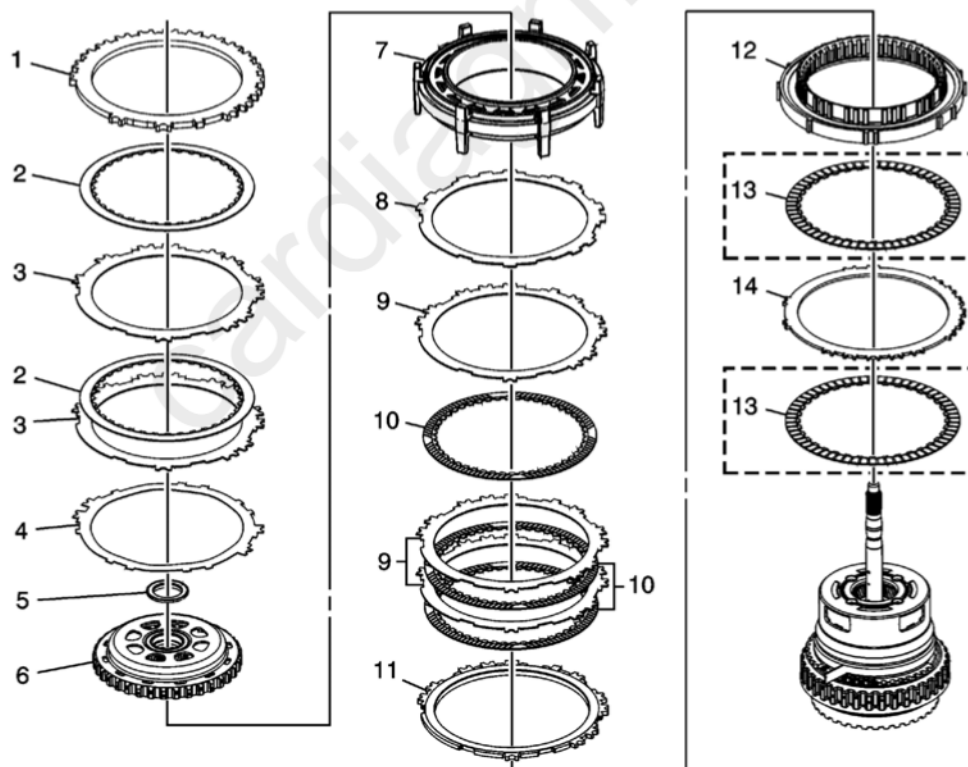


Fig. 24: 1-2-3-4 Clutch Housing And Clutch Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	1 - 2 - 3 - 4 Clutch Backing Plate
2	1 - 2 - 3 - 4 Clutch Plate Assembly (Qty: 2)
3	1 - 2 - 3 - 4 Clutch Plate (Qty: 2)
4	1 - 2 - 3 - 4 Clutch Waved Plate

Callout	Component Name
5	Output Sun Gear Thrust Bearing Assembly NOTE: The sun gear thrust bearing may be stuck to the driven sprocket hub.
6	Output Sun Gear Assembly
7	Low-Reverse and 1 - 2 - 3 - 4 Clutch Housing Assembly
8	Low and Reverse Clutch Apply Plate
9	Low and Reverse Clutch Plate (Qty: 3)
10	Low and Reverse Clutch Plate Assembly (Qty: 3)
11	Low and Reverse Clutch Backing Plate
12	Low and Reverse Clutch Assembly (OWC)
13	2 - 6 Clutch Plate Assembly (Qty: 2) - Model Dependent NOTE: The number of grooves in the clutch plate friction material varies depending on model.
14	2 - 6 Clutch Plate (Qty: 1)

INPUT, REACTION, AND OUTPUT CARRIER DISASSEMBLE

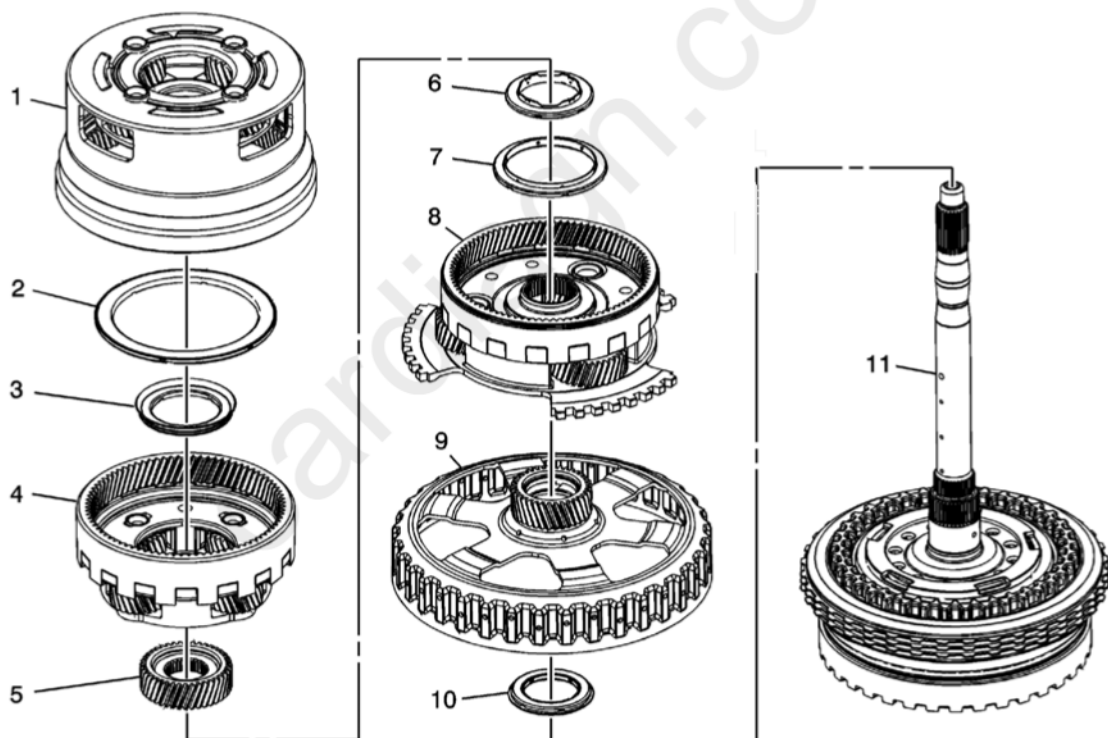


Fig. 25: Disassembled View Of Input, Reaction & Output Carrier
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Output Carrier Assembly NOTE: - The 6T30 and 6T40 have 4 pinions. - The 6T45 and 6T50 have 5 pinions.
2	Output Carrier Thrust Bearing Assembly

Callout	Component Name
3	Input Sun Gear Thrust Bearing Assembly
4	Input Carrier Assembly NOTE: • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
5	Input Sun Gear
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Thrust Bearing Assembly
8	Reaction Carrier Assembly NOTE: Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models. Original Configuration: • The 6T30 and 6T40 had 3 pinions. • The 6T45 and 6T50 had 4 pinions.
9	Reaction Carrier Sun Gear Assembly
10	Reaction Carrier Sun Gear Thrust Bearing NOTE: The sun gear thrust bearing may be stuck to the sun gear.
11	3 - 5 Reverse and 4 - 5 - 6 Clutch Housing Assembly

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING DISASSEMBLE

Turbine Shaft, Reluctor Wheel and Piston Removal

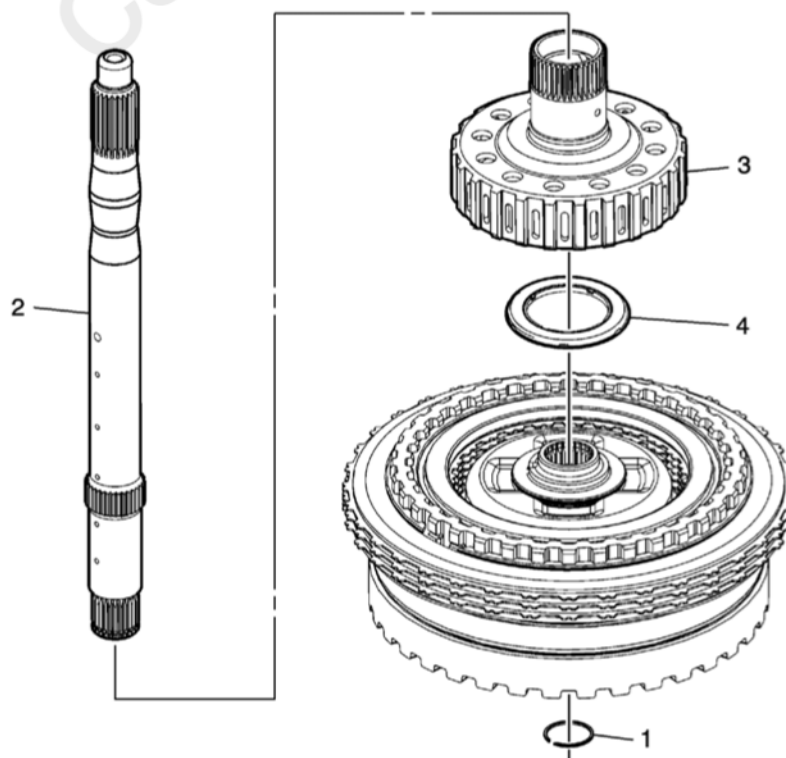


Fig. 26: Turbine Shaft, Reluctor Wheel And Piston
 Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft, Reluctor Wheel and Piston Removal

Callout	Component Name
1	Turbine Shaft Retainer Ring NOTE: Discard the retainer ring. It is not re-usable. Special Tools GE 5586-A Snap Ring Pliers or equivalent For equivalent regional tools, refer to Special Tools .
2	Turbine Shaft
3	Reaction Carrier Hub Assembly
4	Reaction Carrier Hub Thrust Bearing Assembly

4 - 5 - 6 Clutch Plate Removal

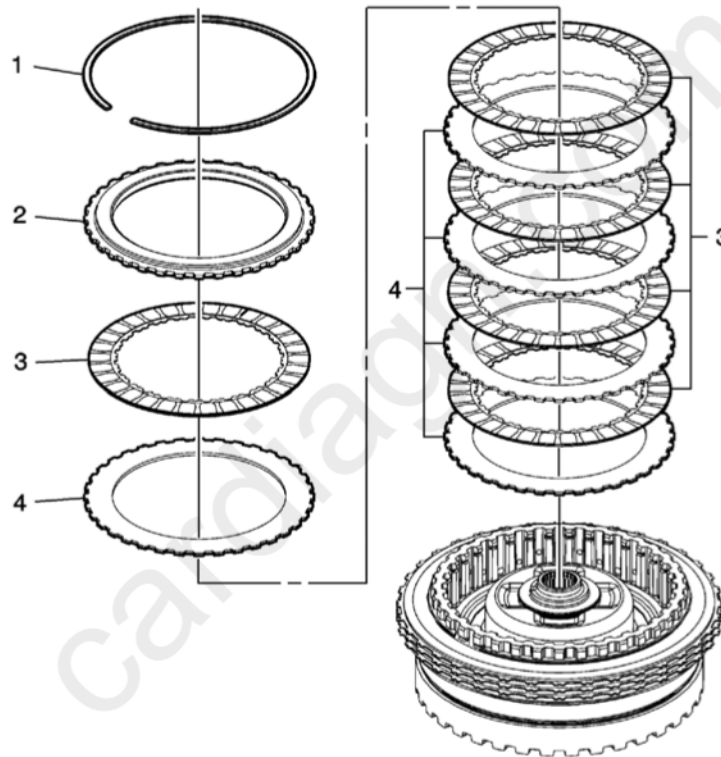


Fig. 27: 4--5--6 Clutch Plate Components
 Courtesy of GENERAL MOTORS COMPANY

4 - 5 - 6 Clutch Plate Removal

Callout	Component Name
1	4 - 5 - 6 Clutch Backing Plate Retaining Ring
2	4 - 5 - 6 Clutch Backing Plate
3	4 - 5 - 6 Clutch Plate Assembly (Qty: 5)
4	4 - 5 - 6 Clutch Plate (Gen 2 - Qty: 5)

4 - 5 - 6 Clutch Piston Removal

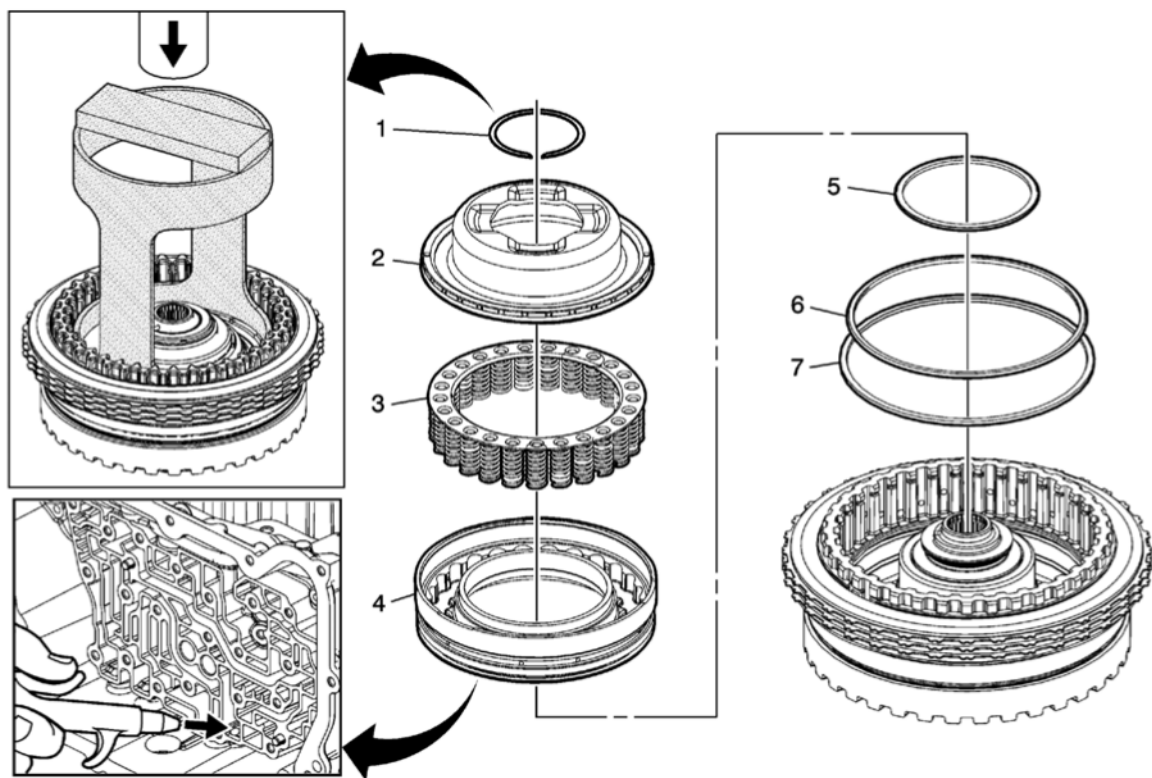


Fig. 28: 4--5--6 Clutch Piston & Components
 Courtesy of GENERAL MOTORS COMPANY

4 - 5 - 6 Clutch Piston Removal

Callout	Component Name
1	4 - 5 - 6 Clutch Dam Retaining Ring NOTE: The 4-5-6 clutch dam retaining ring is not reusable. Special Tools • DT-47951-2 Spring Compressor • GE 5586-A Snap Ring Pliers or equivalent For equivalent regional tools, refer to Special Tools .
2	4 - 5 - 6 Clutch Piston Fluid Dam Assembly Procedure 1. Place the 3 - 5 reverse and 4 - 5 - 6 clutch housing onto the support hub in the case. 2. Apply shop air to the 4 - 5 - 6 clutch feed hole using a rubber tipped air gun to dislodge the dam piston and the 4 - 5 - 6 clutch piston from the clutch housing.
3	4 - 5 - 6 Clutch Piston Return Spring Assembly
4	4 - 5 - 6 Clutch Piston NOTE: Apply shop air to the 4 - 5 - 6 clutch feed hole using a rubber tipped air gun to dislodge the clutch piston.
5	4 - 5 - 6 Clutch Piston Inner Seal
6	4 - 5 - 6 Clutch Piston Outer Seal (Dark Blue) (Stepped)
7	4 - 5 - 6 Clutch Piston Outer Seal (Large) (Rounded)

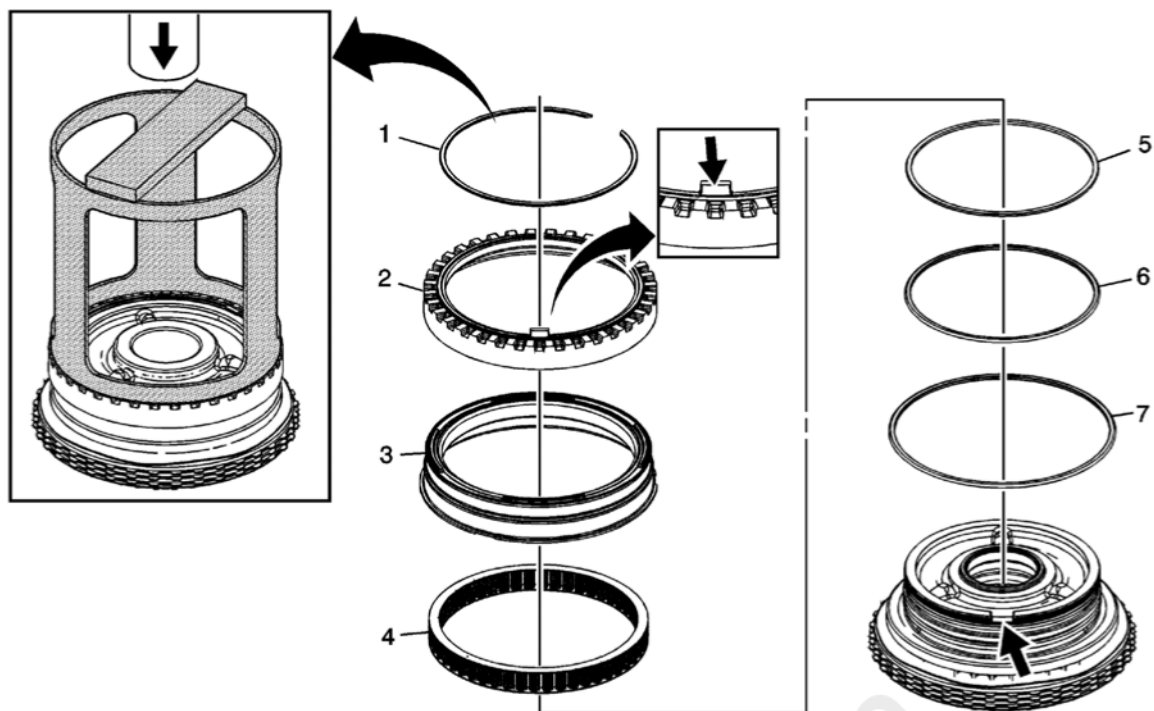


Fig. 29: Disassembled View Of Reluctor Wheel & Piston
 Courtesy of GENERAL MOTORS COMPANY

Reluctor Wheel and Piston Removal

Callout	Component Name
1	Input Shaft Speed Sensor Reluctor Ring Retainer Ring CAUTION: Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. Special Tool DT-47694 Piston Spring Compressor For equivalent regional tools, refer to Special Tools .
2	Input Shaft Speed Sensor Reluctor Wheel
3	3 - 5 Reverse Clutch Piston
4	3 - 5 Reverse Clutch Piston Return Spring Assembly
5	3 - 5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
6	3 - 5 Reverse Clutch Piston Inner Seal
7	3 - 5 Reverse Clutch Piston Dam Seal (Black)

3 - 5 Reverse Clutch Plate Removal

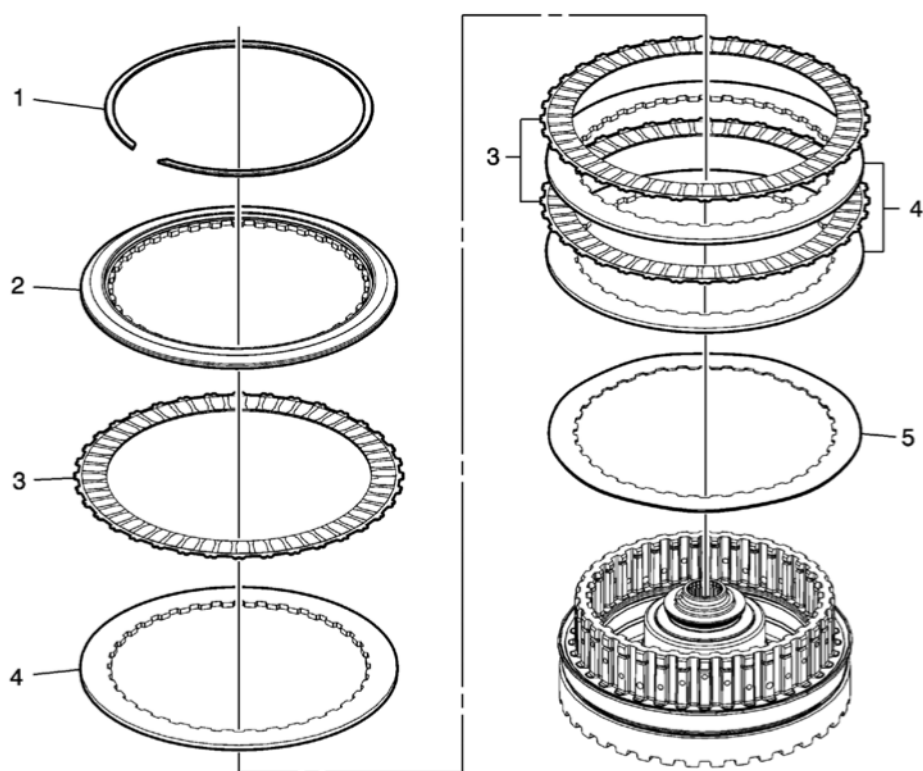


Fig. 30: 3--5 Reverse Clutch Plate Components
 Courtesy of GENERAL MOTORS COMPANY

3 - 5 Reverse Clutch Plate Removal

Callout	Component Name
1	3 - 5 Reverse Clutch Backing Plate Ring Retainer Ring NOTE: Gently push down on the backing plate to get enough clearance between the backing plate and retainer.
2	3 - 5 Reverse Clutch Backing Plate
3	3 - 5 Reverse Clutch Plate Assembly (Qty: 3)
4	3 - 5 Reverse Clutch Plate (Qty: 3)
5	3 - 5 Reverse Clutch Apply Plate (Waved)

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING ASSEMBLE

4 - 5 - 6 Clutch Piston Installation

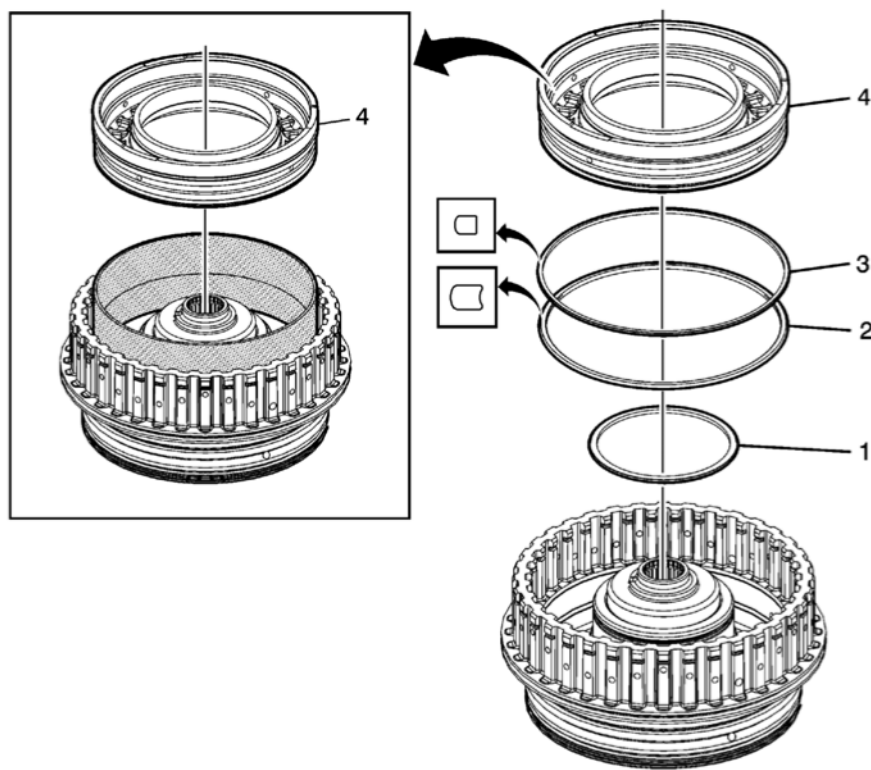


Fig. 31: 4-5-6 Clutch Piston

Courtesy of GENERAL MOTORS COMPANY

4 - 5 - 6 Clutch Piston Installation

Callout	Component Name
1	4 - 5 - 6 Clutch Piston Inner Seal
2	4 - 5 - 6 Clutch Piston Outer Seal (Large) (Rounded)
3	4 - 5 - 6 Clutch Piston Outer Seal (Dark Blue) (Stepped)
4	4 - 5 - 6 Clutch Piston NOTE: - DT-47805 seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT-47805 seal protector to ease the installation of the piston. - DT-47951-2 spring compressor can be used as a pusher if necessary. Special Tools - DT-47805 Seal Protector - DT-47951-2 Spring Compressor For equivalent regional tools, refer to Special Tools .

4 - 5 - 6 Clutch Fluid Dam Installation

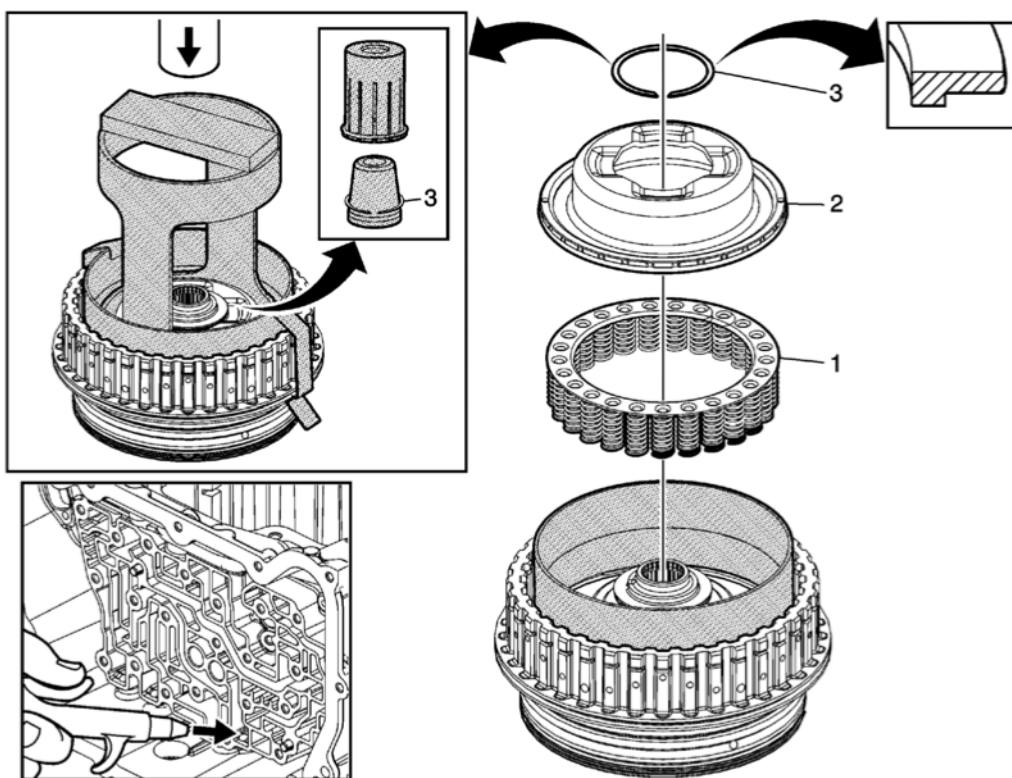


Fig. 32: 4-5-6 Clutch Fluid Dam

Courtesy of GENERAL MOTORS COMPANY

4 - 5 - 6 Clutch Fluid Dam Installation

Callout	Component Name
1	4 - 5 - 6 Clutch Piston Return Spring Assembly
2	4 - 5 - 6 Clutch Piston Fluid Dam Assembly NOTE: The seal protector prevents the dam seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the seal protector to ease the installation of the dam. Special Tools • DT-47951-1 Seal Protector for 6T40/45 applications • DT-50117 Seal Protector for 6T50 applications For equivalent regional tools, refer to Special Tools .

Callout	Component Name
3	4 - 5 - 6 Clutch Dam Retaining Ring CAUTION: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure 1. Leave the seal protector on the clutch housing while installing the retaining ring. Install the dam retainer clips DT 50117-1 seal protector to hold the seal protector in place. 2. Use DT 46620-2 retaining clips and DT 50573 ring guide to install a NEW 4-5-6 clutch dam retaining ring. Assemble the ring "L" leg facing down, DT 50573 and DT 46620 and insert as an assembly onto the clutch hub to install the ring. 3. Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. Special Tools • DT-47951-2 Spring Compressor • DT 46620 Seal Installer • DT 50117-1 Seal Protector • DT 50117-2 Seal Protector Retaining Clips • DT 50573 Retaining Ring Installer For equivalent regional tools, refer to Special Tools.

3 - 5 Reverse Clutch Plates Installation

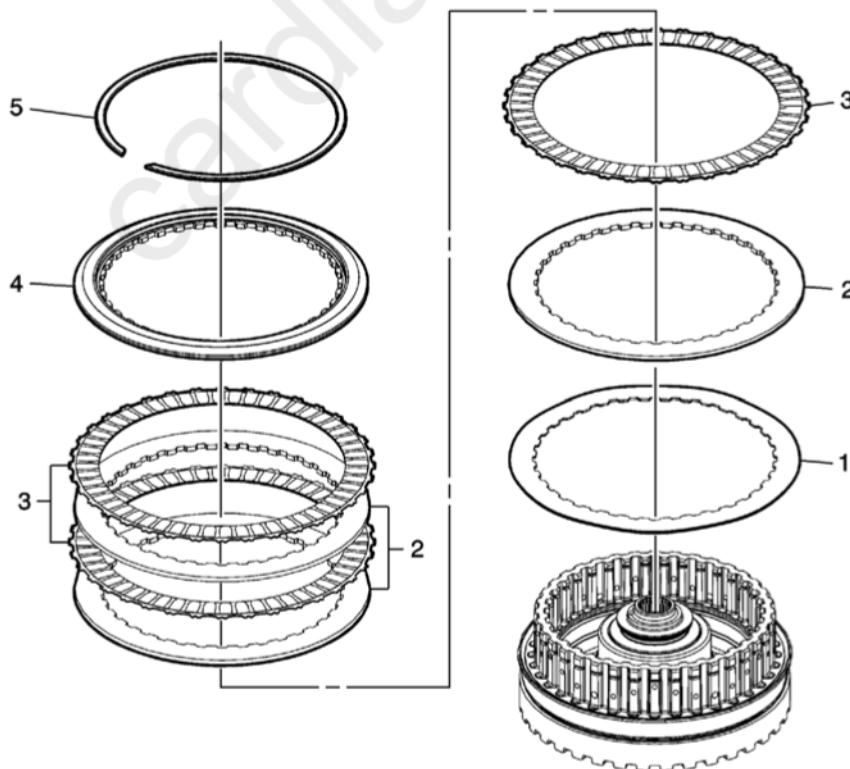


Fig. 33: 3--5 Reverse Clutch Plates & Components
Courtesy of GENERAL MOTORS COMPANY

3 - 5 Reverse Clutch Plates Installation

Callout	Component Name

Callout	Component Name
1	3 - 5 Reverse Clutch Apply Plate (Waved)
2	3 - 5 Reverse Clutch Plate (Qty: 3)
3	3 - 5 Reverse Clutch Plate Assembly (Qty: 3)
4	3 - 5 Reverse Clutch Backing Plate
5	3 - 5 Reverse Clutch Backing Plate Ring Retainer Ring

Reluctor Wheel and Piston Installation

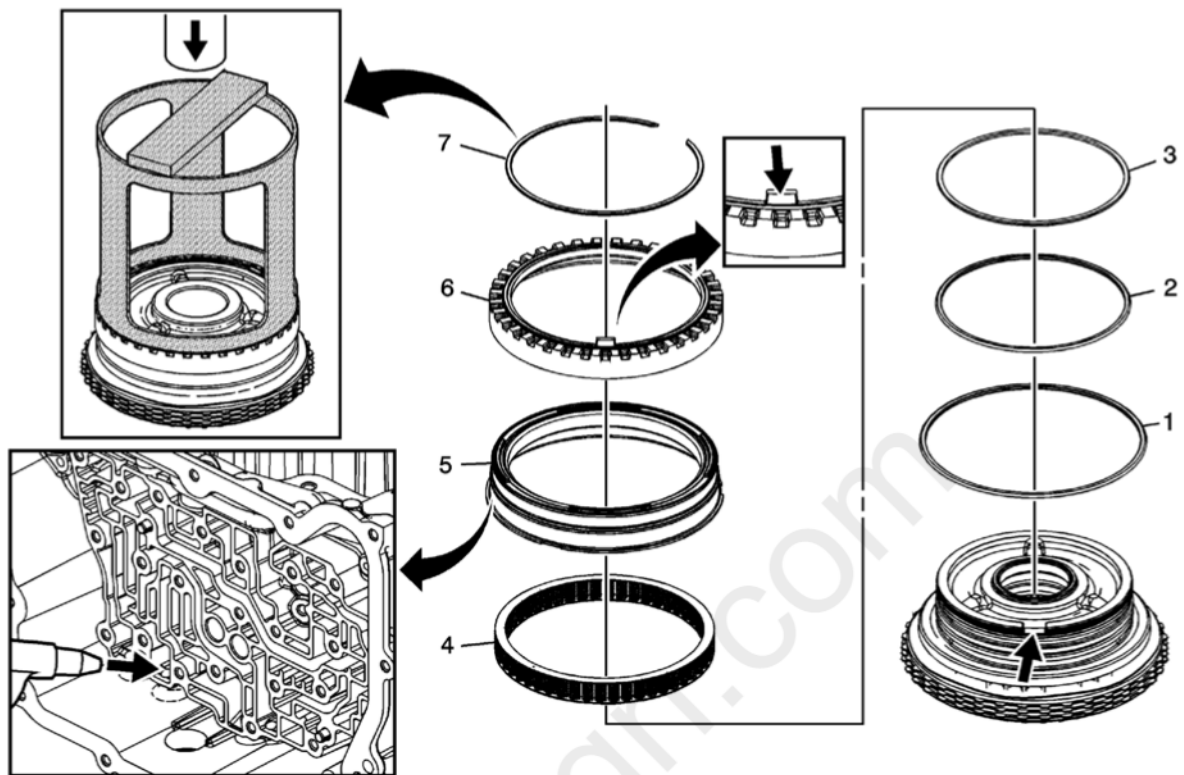


Fig. 34: Exploded View Of Reluctor Wheel & Piston
Courtesy of GENERAL MOTORS COMPANY

Reluctor Wheel and Piston Installation

Callout	Component Name
1	3 - 5 Reverse Clutch Piston Dam Seal (Black)
2	3 - 5 Reverse Clutch Piston Inner Seal
3	3 - 5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
4	3 - 5 Reverse Clutch Piston Return Spring Assembly
5	3 - 5 Reverse Clutch Piston
6	Input Shaft Speed Sensor Reluctor Wheel

Callout	Component Name
7	Input Shaft Speed Sensor Reluctor Ring Retainer Ring CAUTION: Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. CAUTION: Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. Special Tools DT-47694 Piston Spring Compressor For equivalent regional tools, refer to Special Tools.

4 - 5 - 6 Clutch Plates Installation

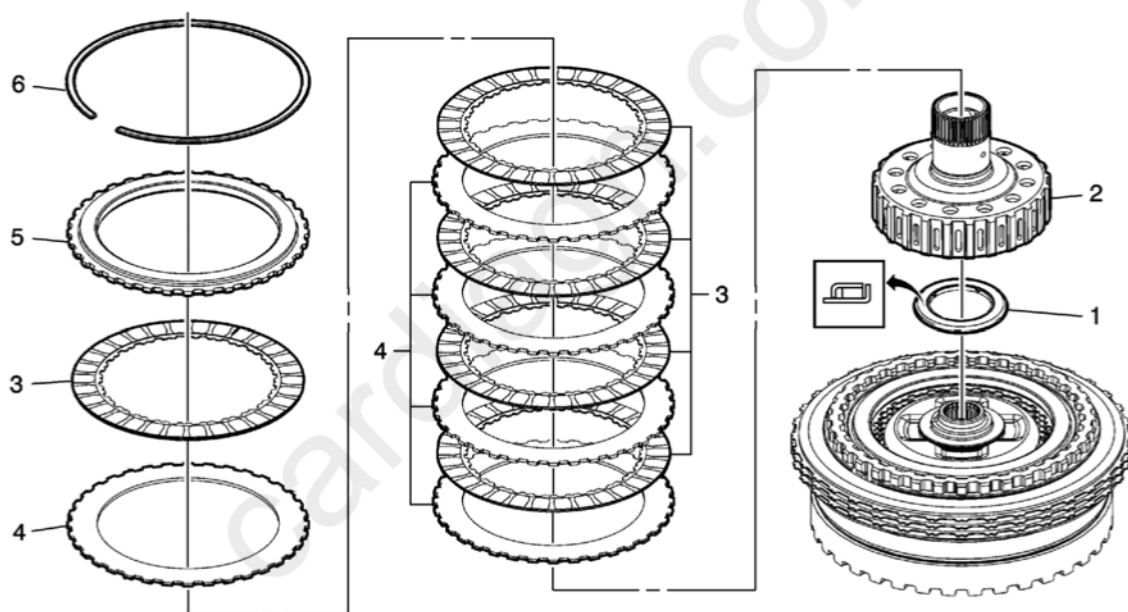


Fig. 35: 4--5--6 Clutch Plates & Components

Courtesy of GENERAL MOTORS COMPANY

4 - 5 - 6 Clutch Plates Installation

Callout	Component Name
1	Reaction Carrier Hub Thrust Bearing Assembly
2	Reaction Carrier Hub Assembly
3	4 - 5 - 6 Clutch Plate Assembly (Qty: 5)
4	4 - 5 - 6 Clutch Plate (Qty: 5)
5	4 - 5 - 6 Clutch Backing Plate
6	4 - 5 - 6 Clutch Backing Plate Retaining Ring

Turbine Shaft Installation

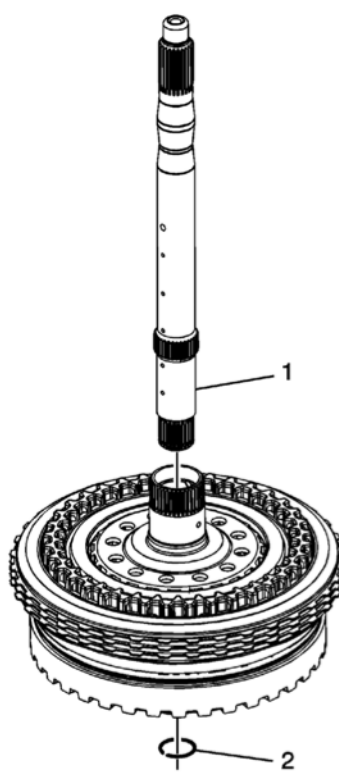


Fig. 36: View Of Turbine Shaft

Courtesy of GENERAL MOTORS COMPANY

Turbine Shaft Installation

Callout	Component Name
1	Turbine Shaft
2	Turbine Shaft Retainer Ring NOTE: Do not re-use the turbine shaft retainer ring. Special Tools GE 5586-A Snap Ring Pliers or equivalent For equivalent regional tools, refer to Special Tools .

INPUT, REACTION, AND OUTPUT CARRIER ASSEMBLE

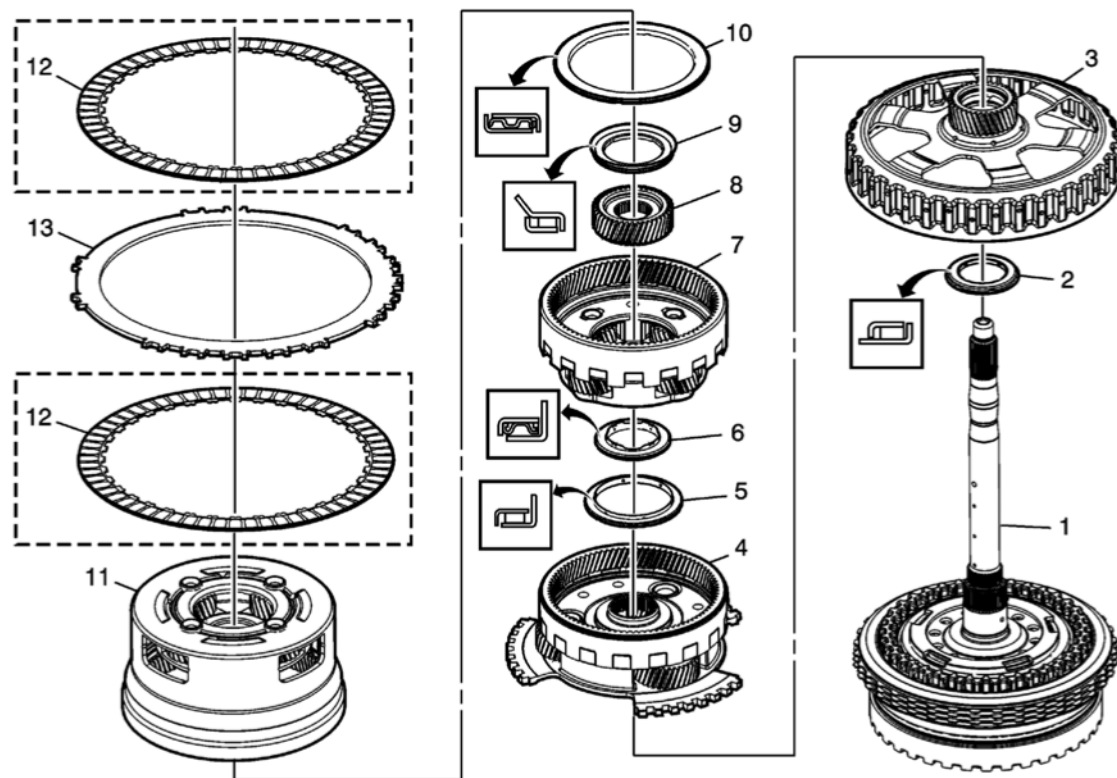


Fig. 37: Input, Reaction, and Output Carrier Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3 - 5 Reverse and 4 - 5 - 6 Clutch Housing Assembly
2	Reaction Carrier Sun Gear Thrust Bearing
3	Reaction Carrier Sun Gear Assembly
4	Reaction Carrier Assembly NOTE: Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models. Original Configuration: • The 6T30 and 6T40 had 3 pinions. • The 6T45 and 6T50 had 4 pinions.
5	Input Carrier Thrust Bearing Assembly
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Assembly NOTE: • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
8	Input Sun Gear
9	Input Sun Gear Thrust Bearing Assembly
10	Output Carrier Thrust Bearing Assembly

Callout	Component Name
11	Output Carrier Assembly NOTE: • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
12	2 - 6 Clutch Plate Assembly (Qty: 2) - Model Dependent NOTE: • Begin with the clutch plate assembly and alternate with the clutch plate. • The number of grooves in the clutch plate friction material varies depending on model.
13	2 - 6 Clutch Plate (Qty: 1) NOTE: Only install one 2 - 6 Clutch Plate at this time. The remaining clutch plate is installed into the case.

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING, AND INPUT, REACTION, AND OUTPUT CARRIER INSTALLATION

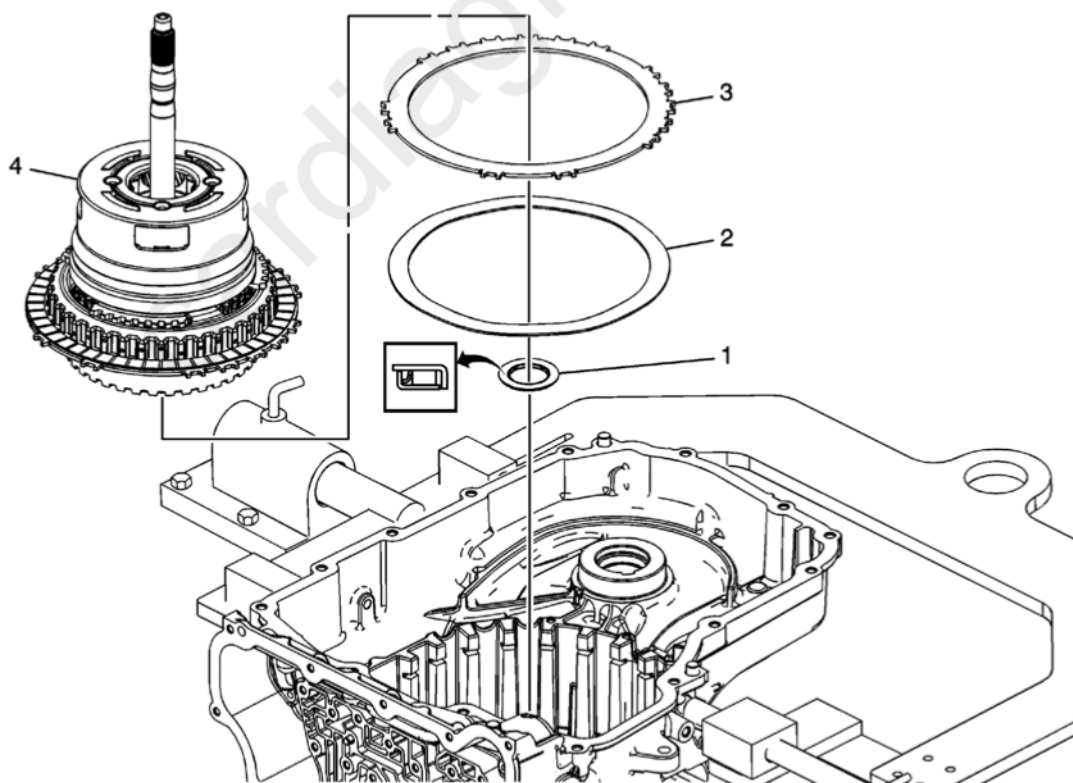


Fig. 38: View Of 3-5-Reverse, 4-5-6 Clutch Housing, Input, Reaction & Output Carrier Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	3 - 5 Reverse and 4 - 5 - 6 Clutch Housing Thrust Bearing
2	2 - 6 Clutch Apply Plate (Waved)

Callout	Component Name
3	2 - 6 Clutch Plate (Qty: 1) NOTE: • Only install one 2 - 6 Clutch Plate. The remaining clutch plate is installed with the gearset assembly. • Align the large flat areas with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.
4	3 - 5 Reverse and 4 - 5 - 6 Clutch Housing Assembly and Gearset NOTE: Align the large flat areas of the 2 - 6 Clutch Plate with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.

LOW AND REVERSE CLUTCH ASSEMBLY AND LOW AND REVERSE CLUTCH PLATE INSTALLATION

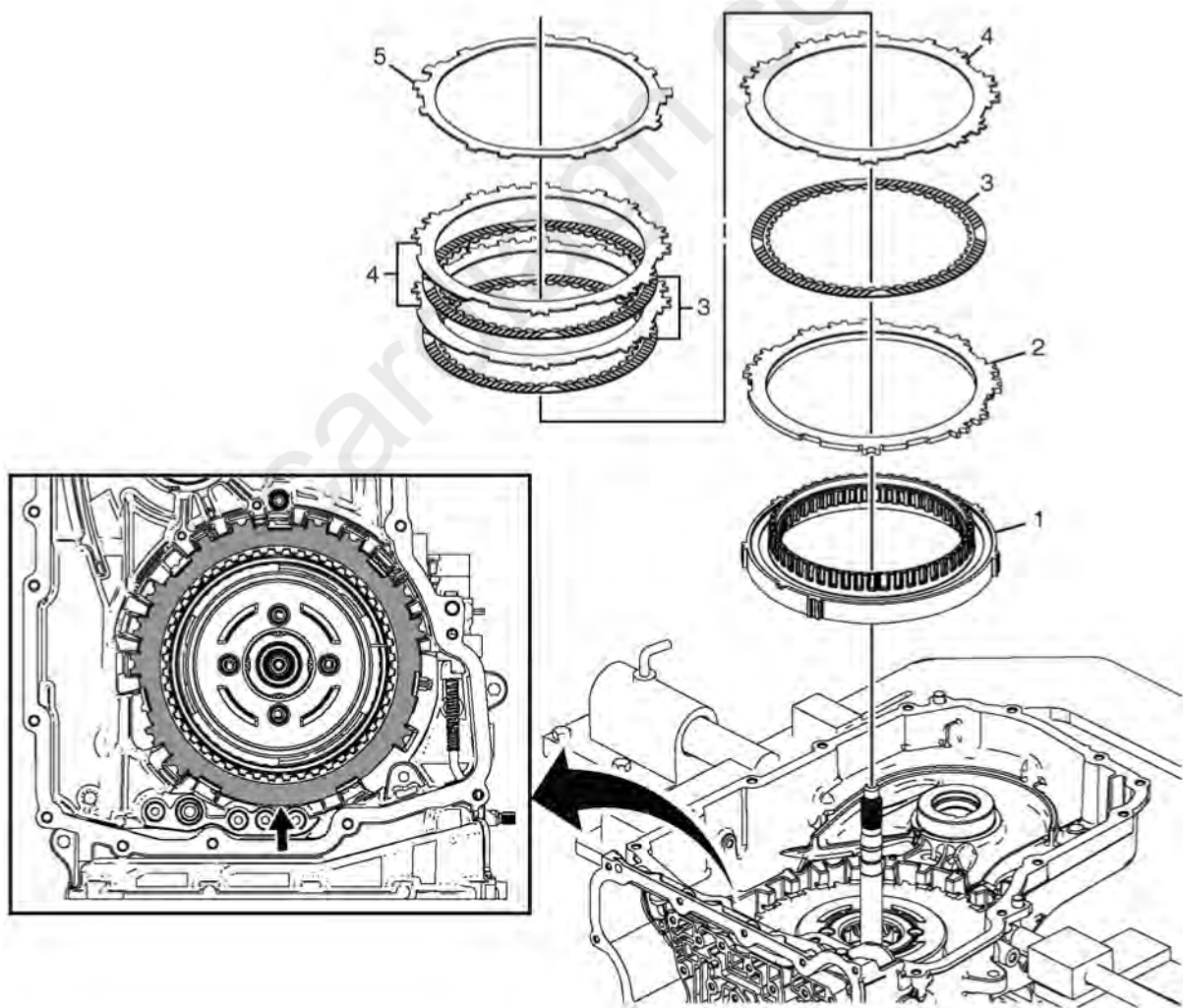


Fig. 39: View Of Low and Reverse Clutch Assembly
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

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

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING DISASSEMBLE

Low and Reverse Clutch Piston Removal

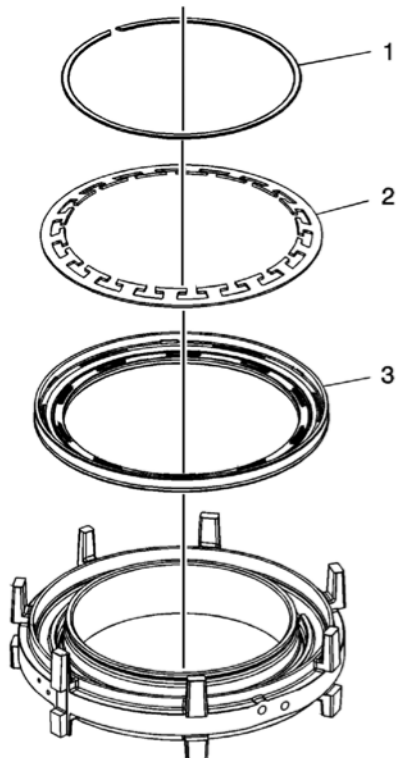


Fig. 40: View Of Low & Reverse Clutch Piston
Courtesy of GENERAL MOTORS COMPANY

Low and Reverse Clutch Piston Removal

Callout	Component Name
1	Low and Reverse Clutch Spring Retainer Special Tool GE-8059 Snap Ring Pliers - Parallel Jaw For equivalent regional tools, refer to Special Tools .
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Piston

1 - 2 - 3 - 4 Clutch Piston Removal

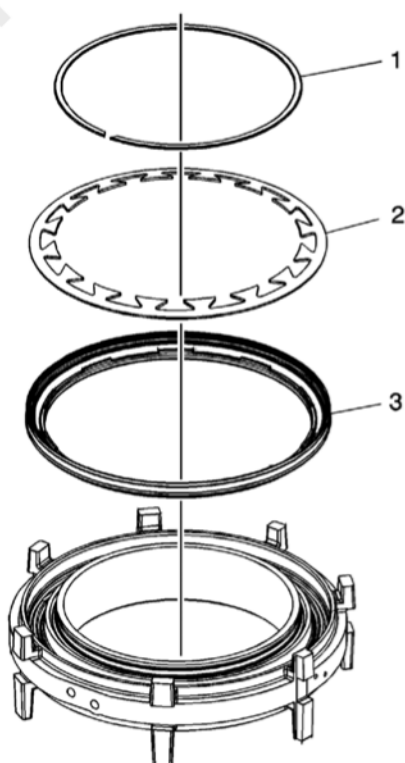
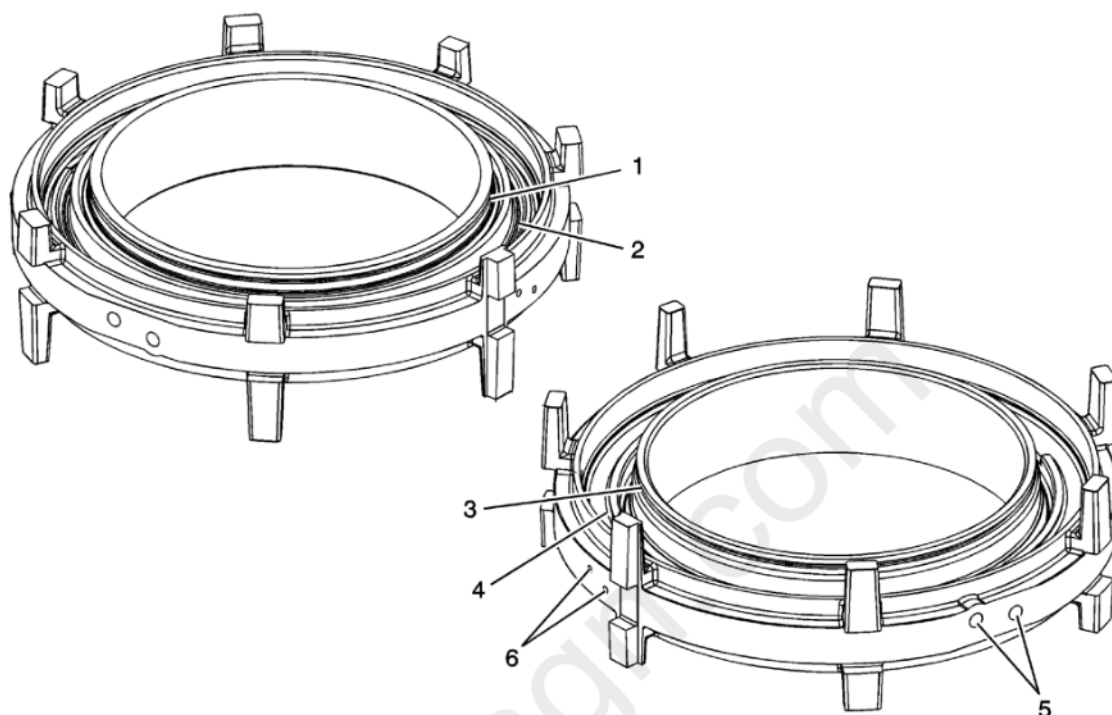


Fig. 41: View Of 1-2-3-4 Clutch Piston
Courtesy of GENERAL MOTORS COMPANY

1 - 2 - 3 - 4 Clutch Piston Removal

Callout	Component Name
1	1 - 2 - 3 - 4 Clutch Spring Retainer Special Tool GE-8059 Snap Ring Pliers - Parallel Jaw For equivalent regional tools, refer to Special Tools .
2	1 - 2 - 3 - 4 Clutch Spring
3	1 - 2 - 3 - 4 Clutch Piston

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING CLEANING AND INSPECTION**Fig. 42: Identifying Low and Reverse & 1-2-3-4 Clutch Housing**

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedures 1. Thoroughly clean the housing with clean solvent. 2. Inspect the piston bores and retainer ring grooves for wear, damage or porosity.	
1	1 - 2 - 3 - 4 Clutch Spring Retainer Groove
2	1 - 2 - 3 - 4 Clutch Piston Bore
3	Low and Reverse Clutch Spring Retainer Groove
4	Low and Reverse Clutch Piston Bore
5	Clutch Oil Passages
6	Air Bleed Passages

1-2-3-4 Clutch Piston Installation

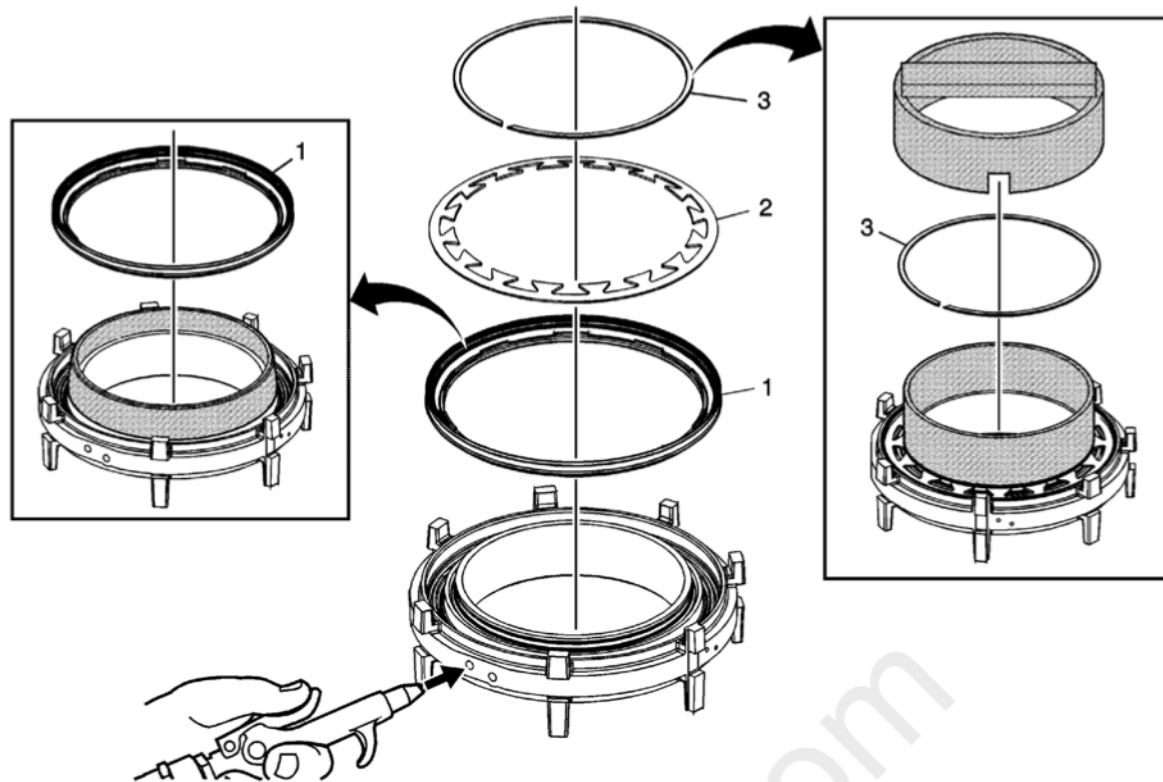


Fig. 43: View Of 1-2-3-4 Clutch Piston

Courtesy of GENERAL MOTORS COMPANY

1-2-3-4 Clutch Piston Installation

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

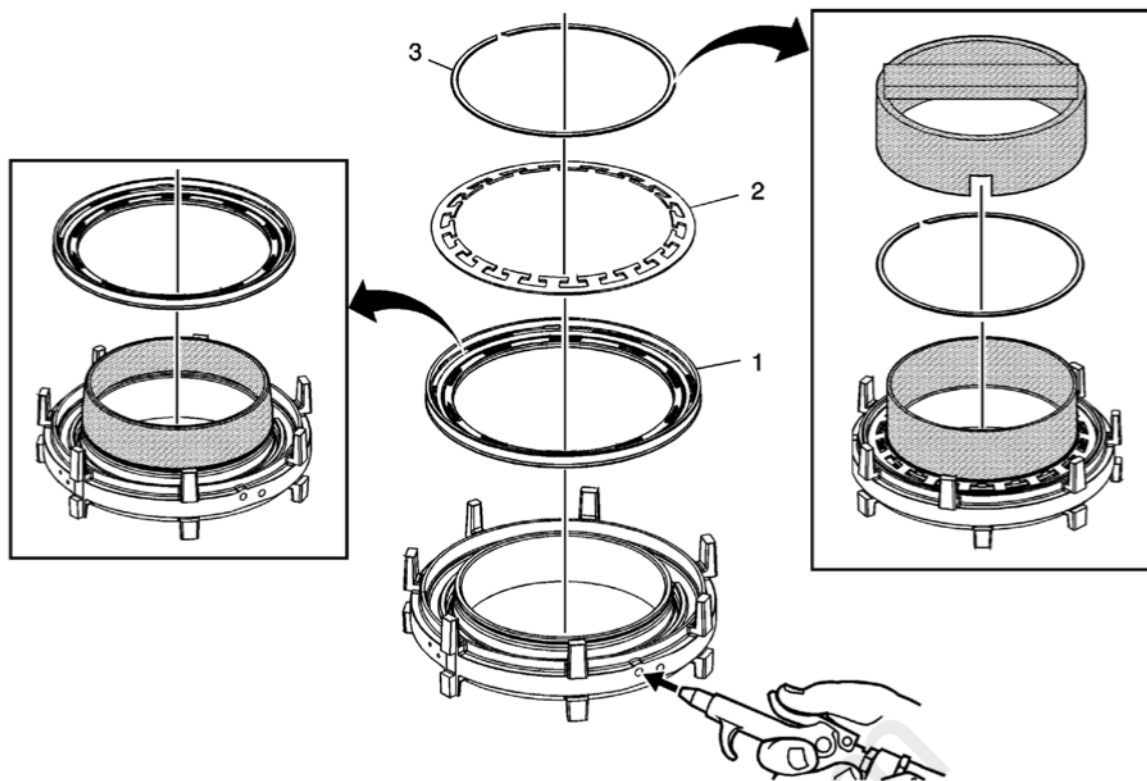


Fig. 44: View Of Low & Reverse Clutch Piston
Courtesy of GENERAL MOTORS COMPANY

Low and Reverse Clutch Piston Installation

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

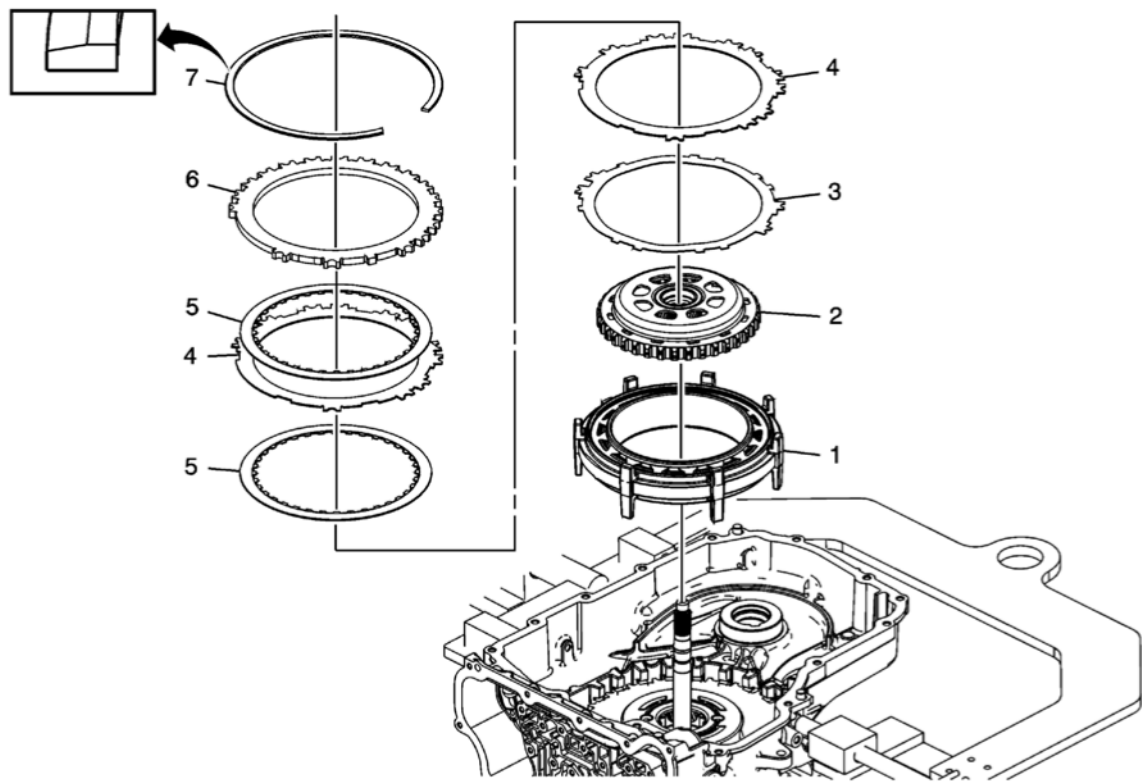


Fig. 45: View Of Low and Reverse & 1-2-3-4 Clutch Housing & Attached Components
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Low and Reverse and 1 - 2 - 3 - 4 Clutch Housing NOTE: The longer legs face the bottom of the case and the oil passages face the valve body end of the case.
2	Output Sun Gear Assembly
3	1 - 2 - 3 - 4 Clutch Waved Plate NOTE: - Align the single pair of tabs with the bottom valve body end of the case. - Ensure the correct waved plate is being installed. The 1 - 2 - 3 - 4 clutch and low and reverse clutch waved plates are visually similar, however the low and reverse clutch waved plate is thicker.
4	1 - 2 - 3 - 4 Clutch Plate (Qty: 2)
5	1 - 2 - 3 - 4 Clutch Plate Assembly (Qty: 2)
6	1 - 2 - 3 - 4 Clutch Backing Plate NOTE: Align the single skinny tab with the case spline facing the top of the case.

Callout	Component Name
7	1 - 2 - 3 - 4 Clutch Backing Plate Retainer Ring WARNING: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result. CAUTION: Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear. NOTE: • Install the retainer with the taper facing away from the backing plate. • Align the retainer opening with the largest gap in the case splines toward the bottom of the case. • Install one end of the retainer into the retainer ring groove. Use DT-28585 snap ring remover and work the retainer into the case groove. Use a screwdriver to hold the retainer away from the case while pushing down on the retainer with DT-28585 snap ring remover. Special Tool DT-28585 Snap Ring Remover or equivalent For equivalent regional tools, refer to Special Tools.

DRIVE SPROCKET, DRIVEN SPROCKET, AND DRIVE LINK CLEANING AND INSPECTION

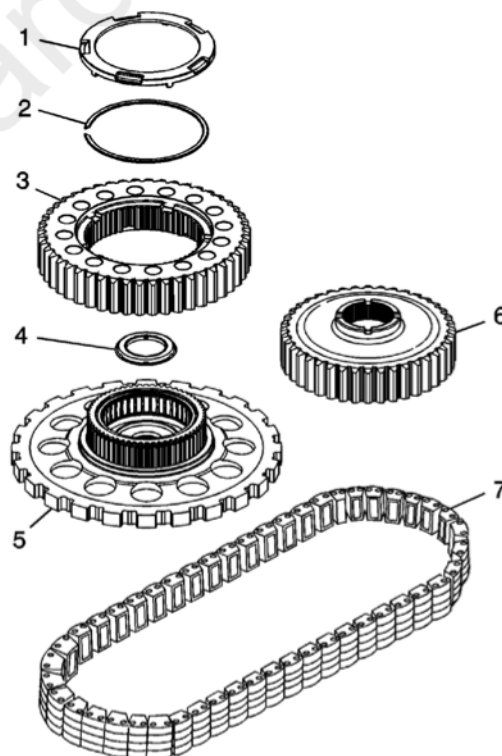


Fig. 46: View Of Drive Sprocket, Driven Sprocket & Drive Link

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
CAUTION: Keep thrust washers with the gear it was matched to. The thrust washers are selective sizes and it is difficult to identify the proper washer thickness. Improper assembly can cause premature failure of the differential assembly.	
Preliminary Procedures Clean and inspect the differential assembly, pinion gears and thrust washers for scoring, wear or damage.	
NOTE: The differential assembly is only serviced as an assembly.	
1	Front Differential Pinion Gear Shaft Retainer
2	Front Differential Pinion Gear Pin
3	Sun Gear to Differential Housing Bearing Assembly
4	Front Differential Pinion Gear Washer
5	Front Differential Pinion Gear
6	Front Differential Planetary Pinion Gear Bearing Roller

FRONT DIFFERENTIAL CARRIER INSTALLATION

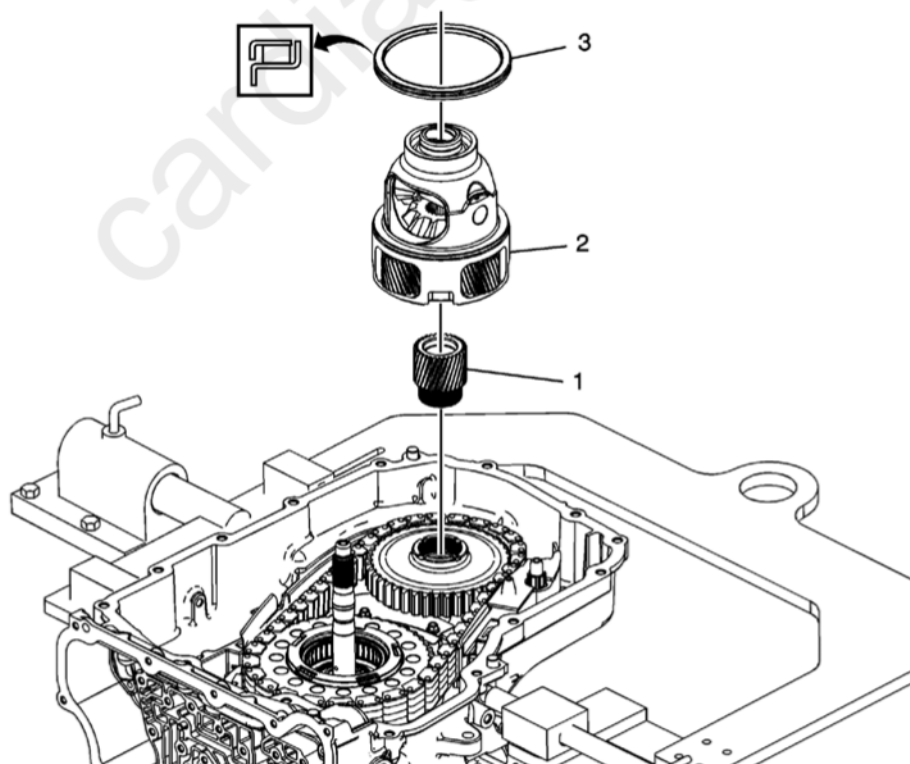


Fig. 49: View Of Front Differential Carrier Components
 Courtesy of GENERAL MOTORS COMPANY

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

Callout	Component Name
3	Front Differential Carrier Bearing Assembly

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR REMOVAL (GEN 3)

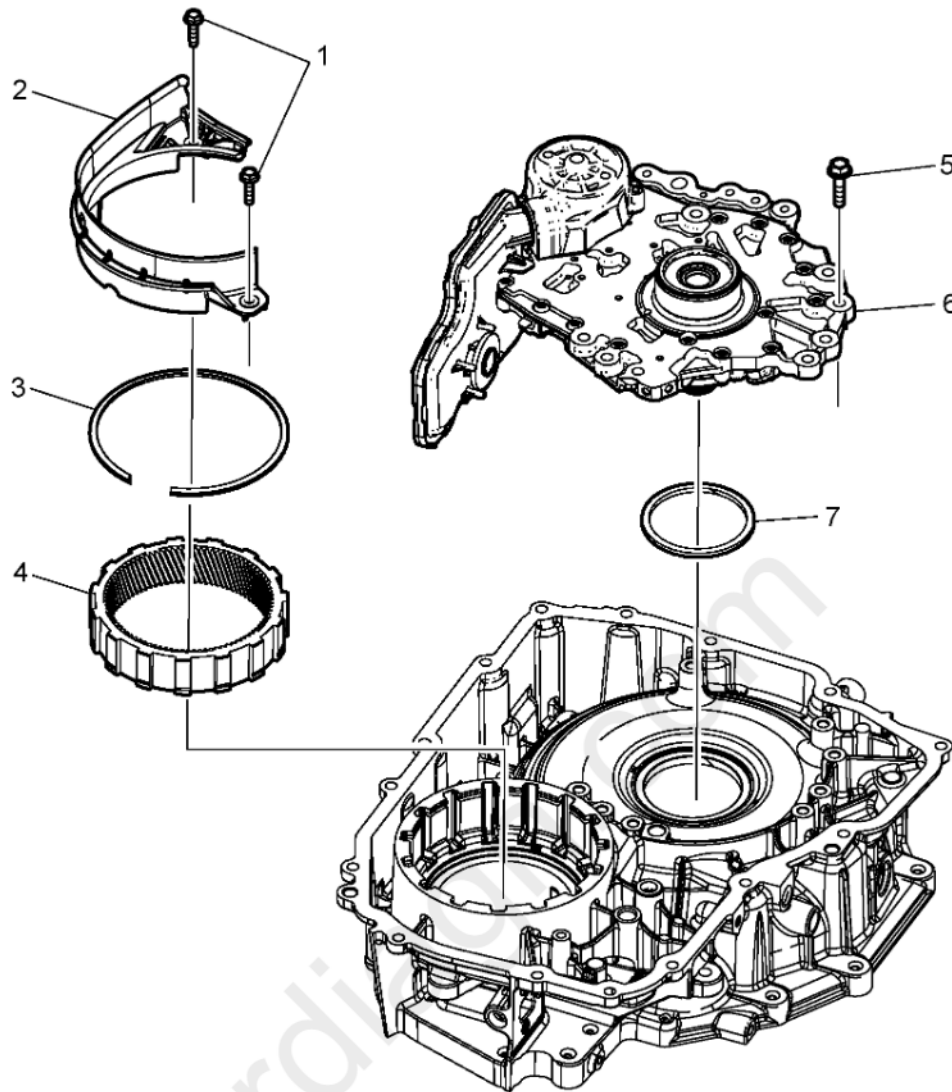


Fig. 50: Transmission Fluid Pump, Front Differential Carrier Baffle and Front Differential Ring Gear

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)
2	Front Differential Carrier Baffle
3	Front Differential Ring Gear Retainer NOTE: Note the direction of the taper to ensure proper installation.
4	Front Differential Ring Gear
5	Automatic Transmission Fluid Pump Bolts M8 x 33 (Qty: 8)
6	Automatic Transmission Fluid Pump
7	Torque Converter and Differential Housing Seal

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - TORQUE CONVERTER HOUSING SIDE

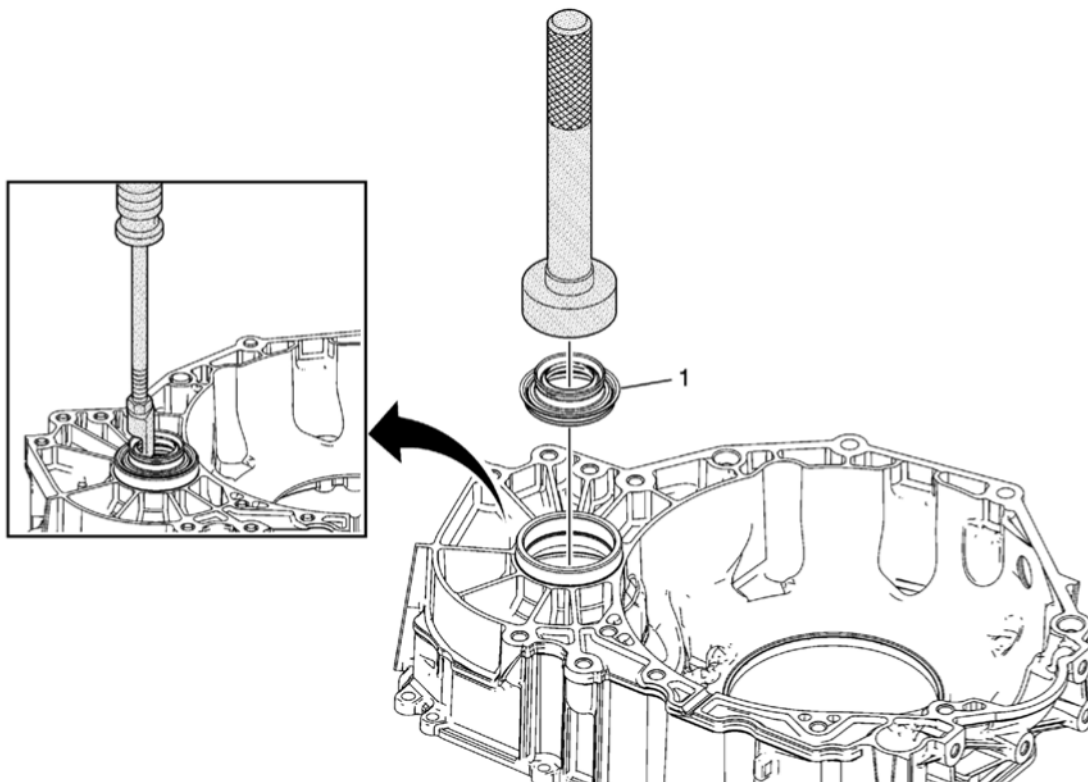


Fig. 51: View Of Front Wheel Drive Shaft Seal - Torque Converter Housing Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-1B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, refer to Special Tools .

TORQUE CONVERTER HOUSING CLEANING AND INSPECTION

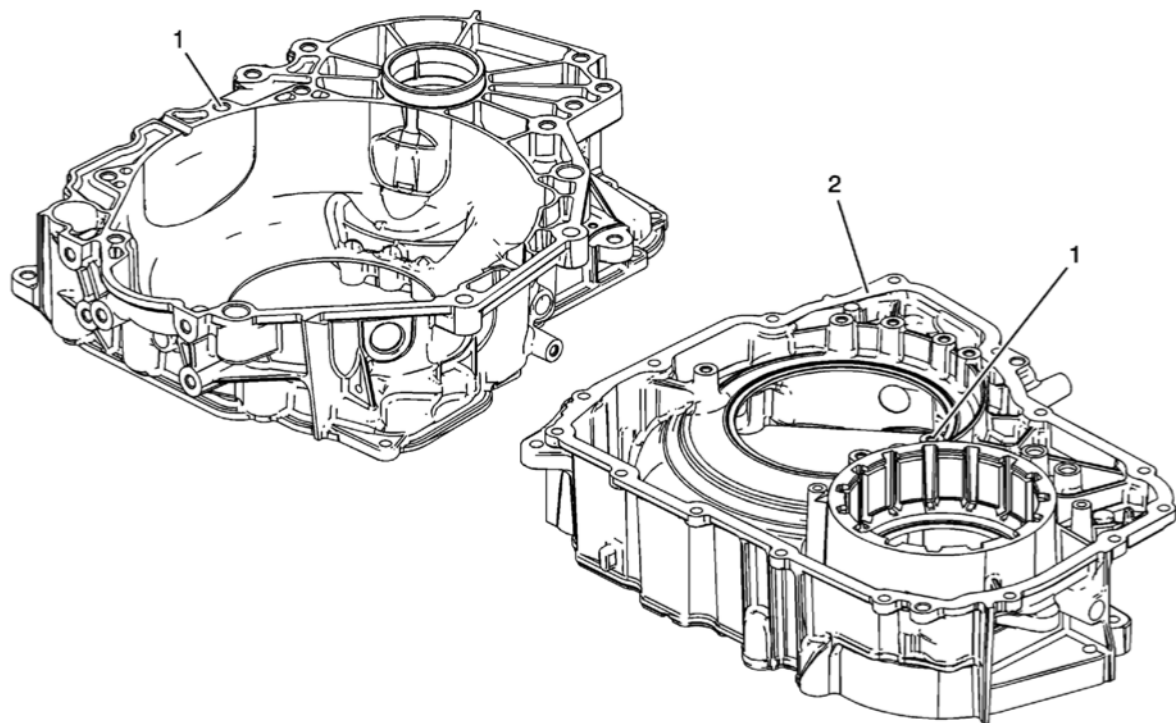


Fig. 52: Identifying Torque Converter Housing Inspection Areas

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
CAUTION: Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks.	
Preliminary Procedure Thoroughly clean the torque converter housing, including case threads with clean solvent.	
1	Threaded Hole
2	Gasket Sealing Surface

TRANSMISSION FLUID PUMP DISASSEMBLE (GEN 3)

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

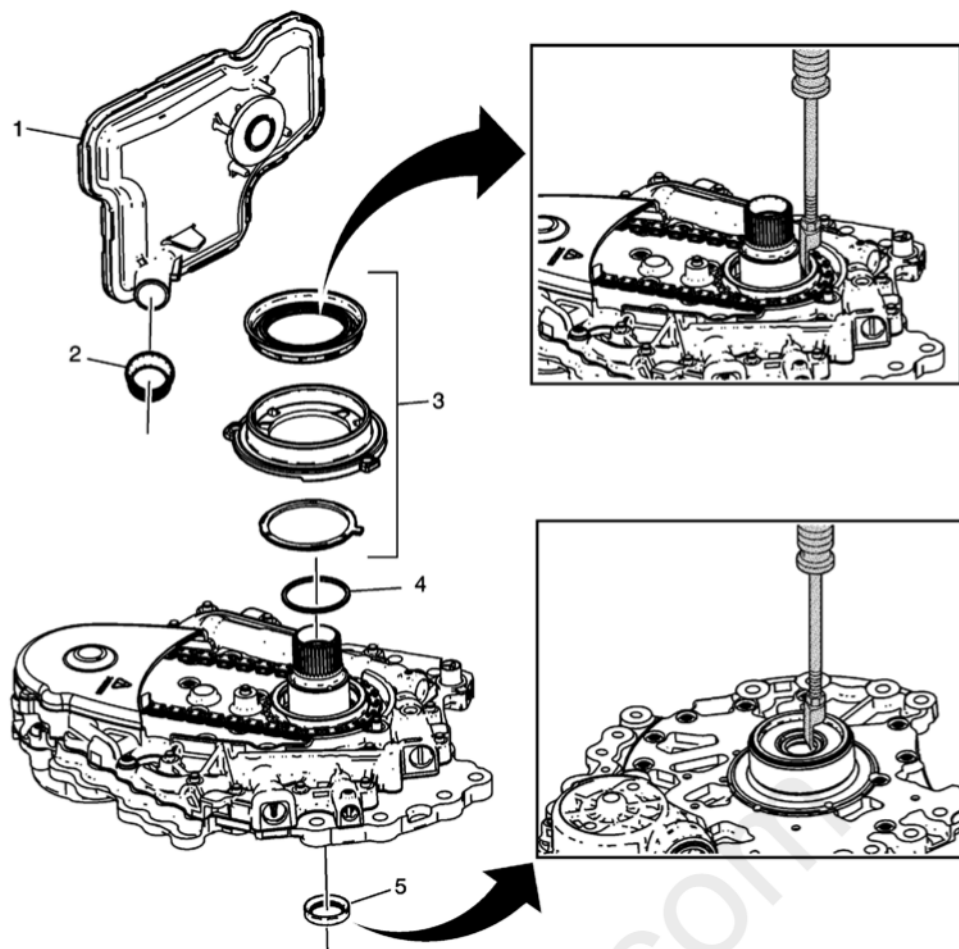


Fig. 53: Fluid Filter Assembly and Torque Converter Fluid Seal (Gen 3)
 Courtesy of GENERAL MOTORS COMPANY

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Callout	Component Name
1	Automatic Transmission Fluid Filter NOTE: DISCARD the fluid filter assembly. It is not reusable.
2	Automatic Transmission Fluid Filter Seal
3	Torque Converter Fluid Seal, Drive Sprocket Cover Assembly, and Drive Sprocket Thrust Washer Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer For equivalent regional tools, refer to Special Tools .
4	Torque Converter Fluid Seal Ring
5	Torque Converter Fluid Seal Assembly Special Tools • DT-23129 Universal Seal Remover • GE-6125-1B Slide Hammer For equivalent regional tools, refer to Special Tools .

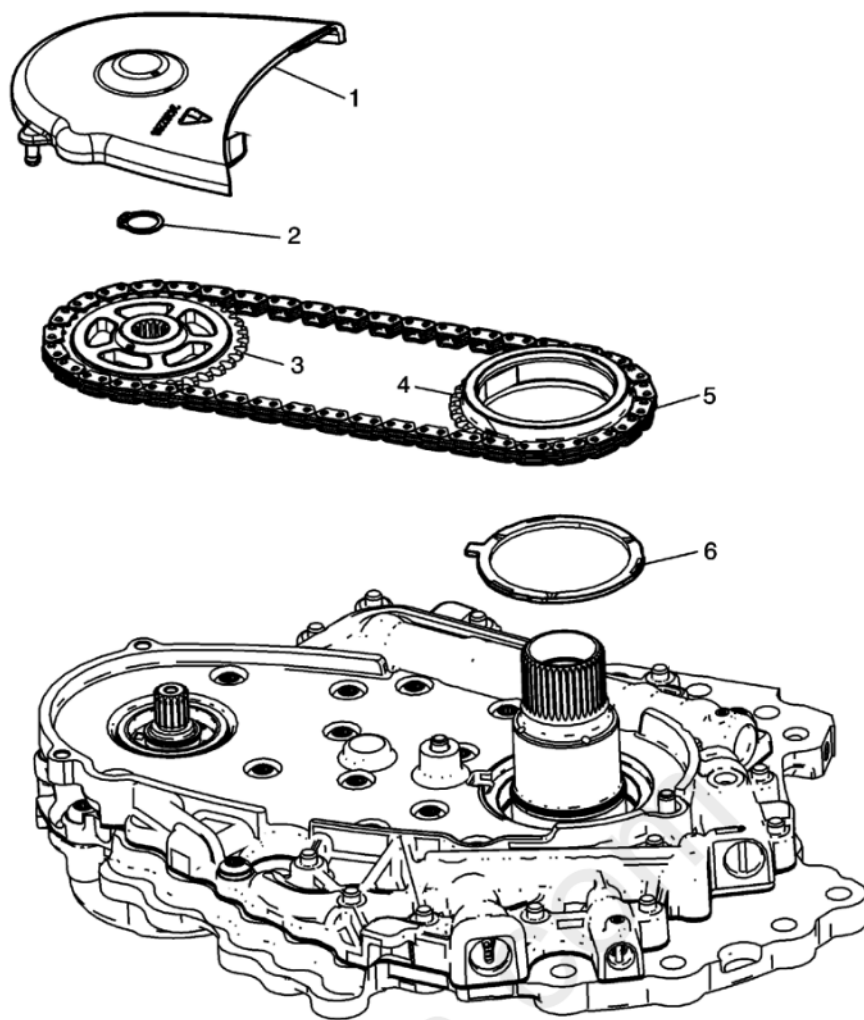


Fig. 54: Transmission Fluid Pump Drive Chain, Drive Sprocket and Driven Sprocket
 Courtesy of GENERAL MOTORS COMPANY

Drive Chain, Drive Sprocket, and Driven Sprocket Disassemble

Callout	Component Name
1	Transmission Fluid Baffle
2	Drive Sprocket Retaining Ring Retainer
3	Driven Sprocket NOTE: Remove the sprockets and chain at the same time.
4	Drive Sprocket
5	Drive Link
6	Drive Sprocket Thrust Washer

Automatic Transmission Fluid Pump Assembly Disassemble

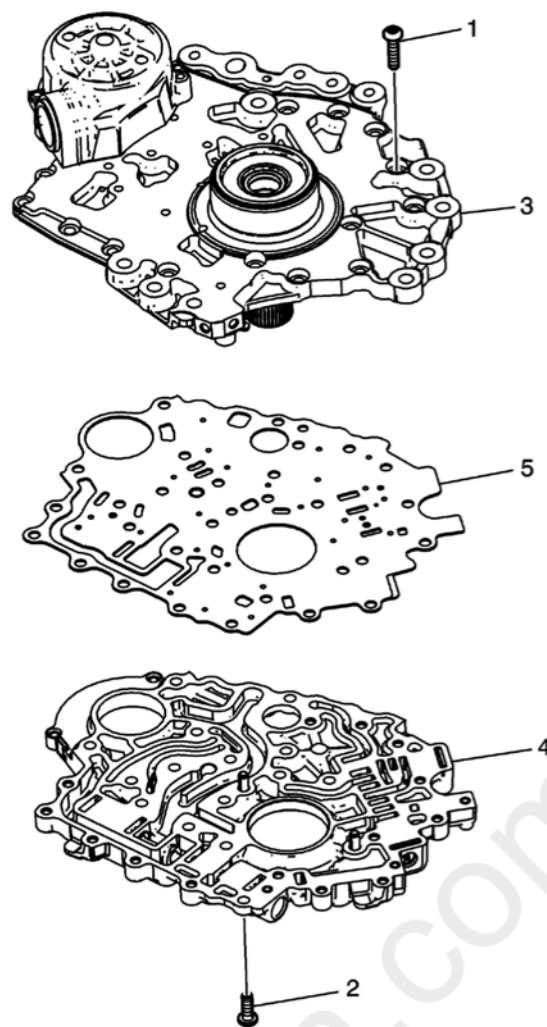


Fig. 55: Transmission Fluid Pump Components

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Assembly Disassemble

Callout	Component Name
1	Automatic Transmission Fluid Pump Cover Bolts M6 x 25 (Qty: 14)
2	Automatic Transmission Fluid Pump Bolts M6 x 18 (Qty: 15)
3	Automatic Transmission Fluid Pump Cover
4	Automatic Transmission Fluid Pump Body
5	Automatic Transmission Fluid Pump Plate

Automatic Transmission Fluid Pump Cover Disassemble

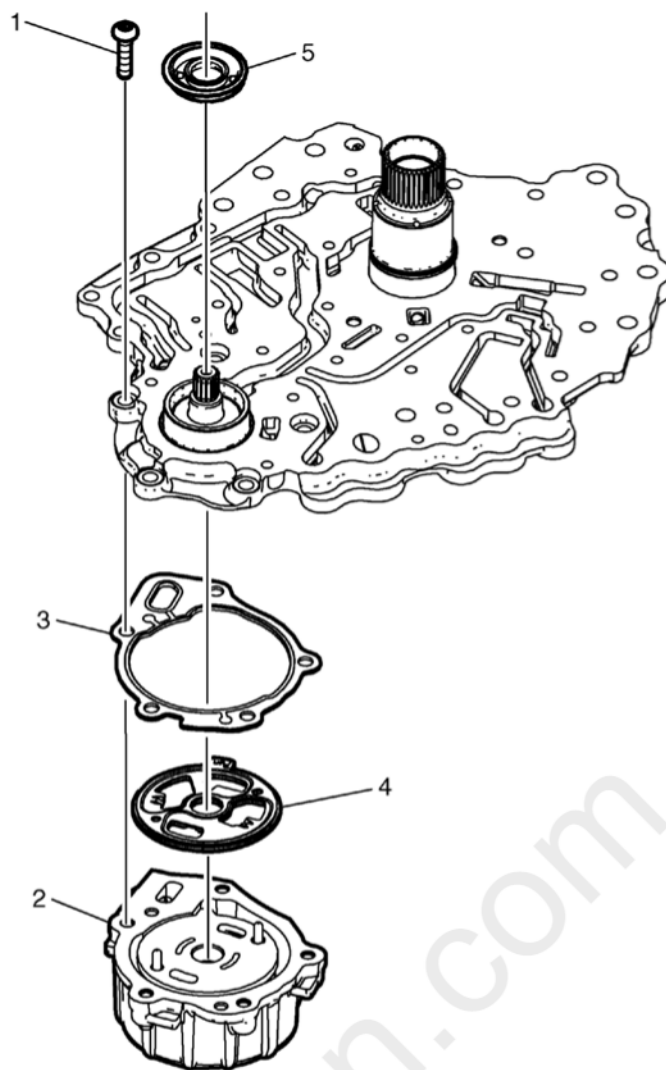


Fig. 56: Automatic Transmission Fluid Pump Cover
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Cover Disassemble

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 Procedure Clean and inspect all components for wear and/or damage.	
1	Automatic Transmission Fluid Pump Cover Bolt M6 x 25 (Qty: 5)
2	Automatic Transmission Fluid Pump Assembly
3	Automatic Transmission Fluid Pump Gasket NOTE: DISCARD the gasket.
4	Automatic Transmission Fluid Pump Pressure Plate Seal NOTE: DISCARD the seal.
5	Automatic Transmission Fluid Pump Seal

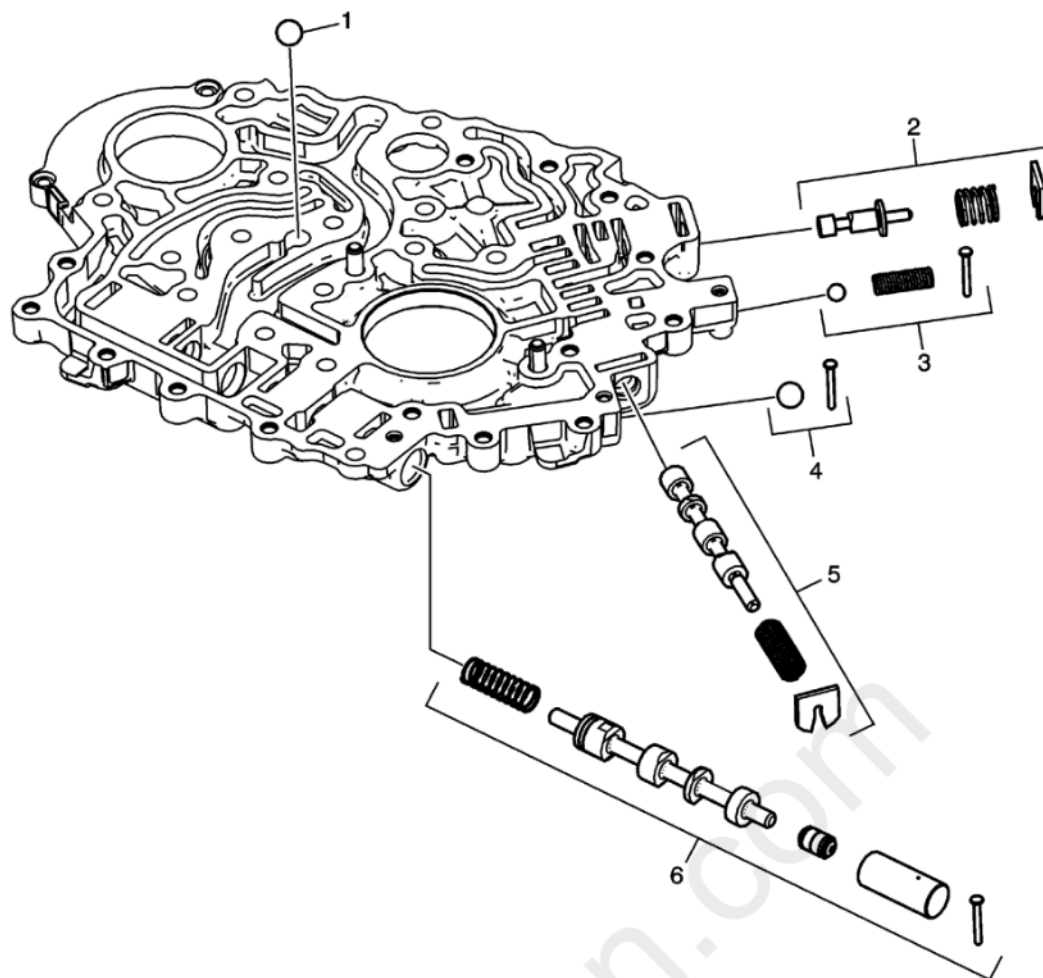


Fig. 57: Automatic Transmission Fluid Pump Body Components (Gen 3)

Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Disassemble

Callout	Component Name
WARNING: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components for wear and/or damage.	
1	Direct Clutch Exhaust Valve
2	Lube Boost Valve Train
3	Torque Converter Clutch Blow Off Ball Valve Train
4	Automatic Transmission Fluid Pump Blow Off Ball Valve Train
5	Torque Converter Clutch Control Valve Train
6	Pressure Regulator Valve Train

Automatic Transmission Fluid Pump Body Assemble

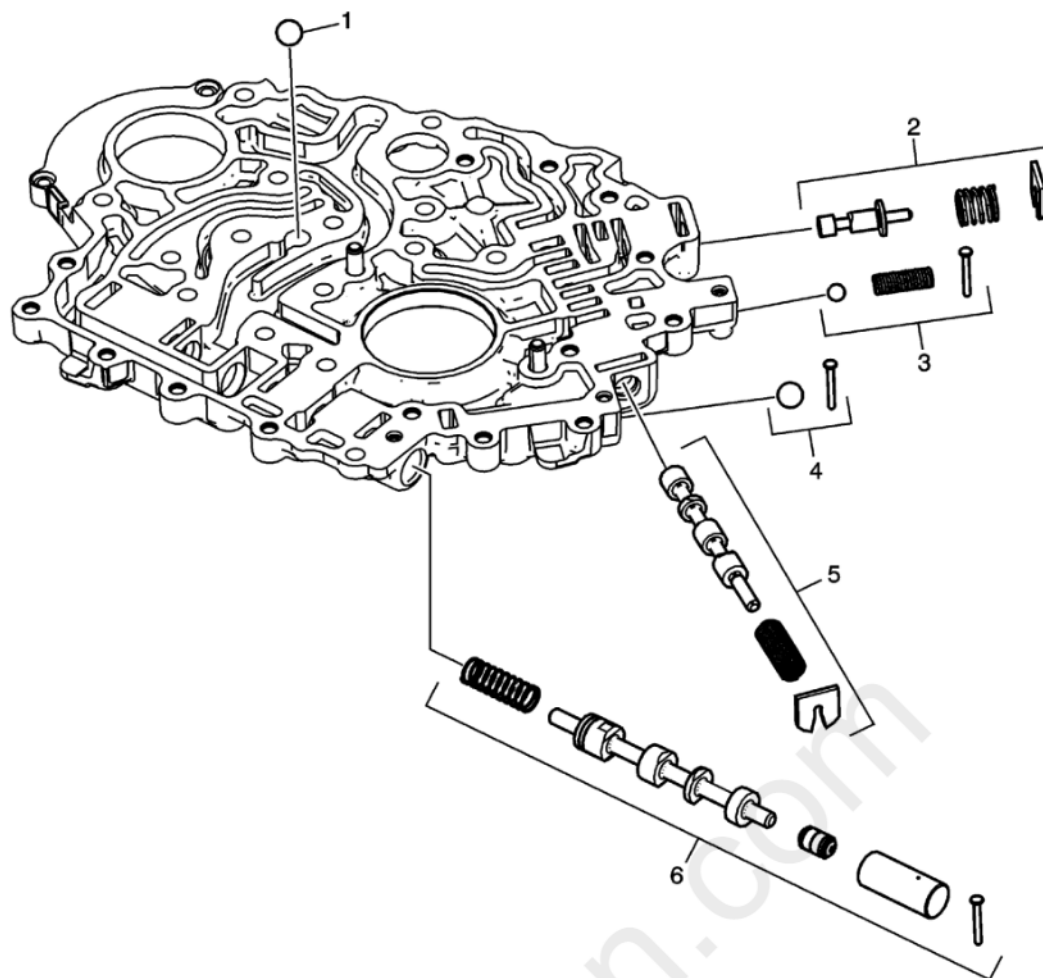


Fig. 58: Automatic Transmission Fluid Pump Body Components (Gen 3)
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Body Assemble

Callout	Component Name
1	Direct Clutch Exhaust Valve
2	Lube Boost Valve Train
3	Torque Converter Clutch Blow Off Ball Valve Train
4	Automatic Transmission Fluid Pump Blow Off Ball Valve Train
5	Torque Converter Clutch Control Valve Train
6	Pressure Regulator Valve Train

Automatic Transmission Fluid Pump Cover Assemble

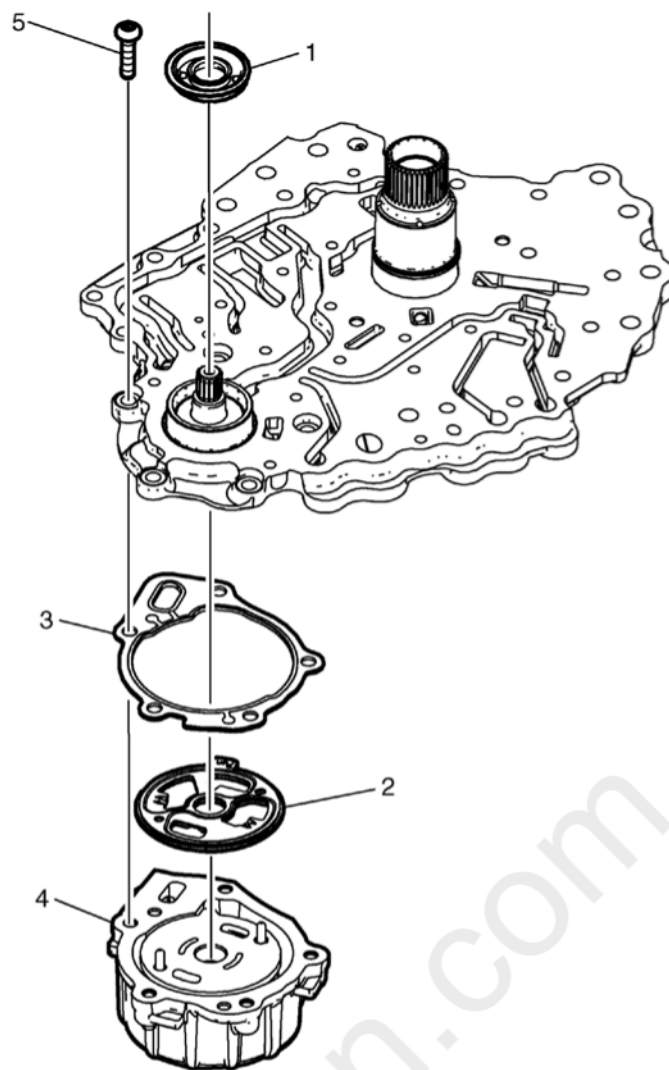


Fig. 59: Automatic Transmission Fluid Pump Cover Components
 Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Cover Assemble

Callout	Component Name
1	Automatic Transmission Fluid Pump Seal
2	Automatic Transmission Fluid Pump Pressure Plate Seal NOTE: • The 1st and 2nd design automatic transmission fluid pump pressure plate seals are not interchangeable. • Install a NEW seal.
3	Automatic Transmission Fluid Pump Gasket NOTE: Install a NEW gasket.
4	Automatic Transmission Fluid Pump Assembly

Callout	Component Name
5	Automatic Transmission Fluid Pump Cover Bolt M6 x 25 (Qty: 5) CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)

Automatic Transmission Fluid Pump Assembly Assemble

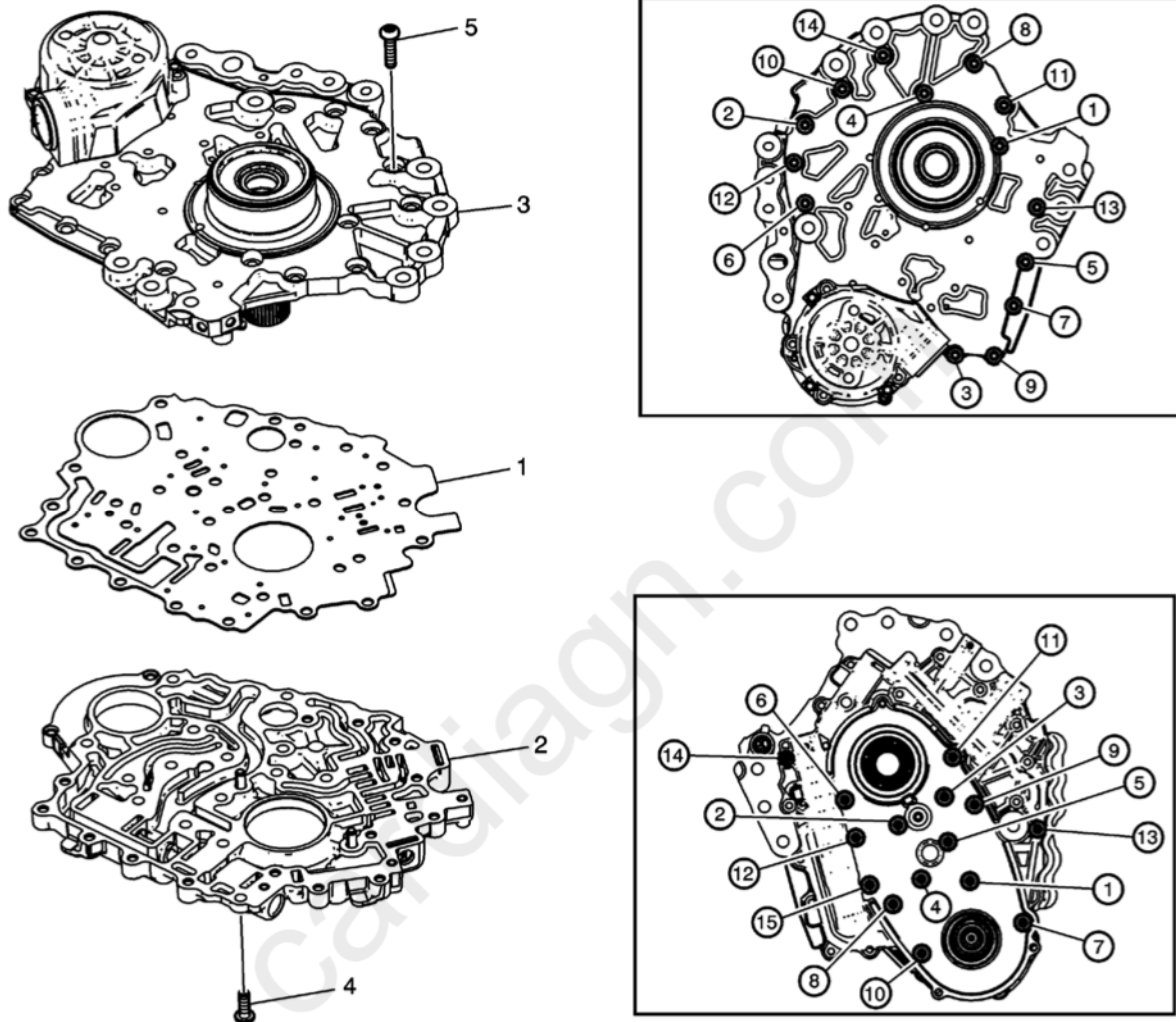


Fig. 60: Automatic Transmission Fluid Pump Assembly Components
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Fluid Pump Assembly Assemble

Callout	Component Name
1	Automatic Transmission Fluid Pump Plate
2	Automatic Transmission Fluid Pump Body
3	Automatic Transmission Fluid Pump Cover
4	Automatic Transmission Fluid Pump Bolts M6 x 18 (Qty: 15) CAUTION: Refer to Fastener Caution . Procedure Tighten the bolts in the sequence shown. Tighten 10 N.m (89 lb in)

Callout	Component Name
5	Automatic Transmission Fluid Pump Cover Bolts M6 x 25 (Qty: 14) Procedure Tighten the bolts in the sequence shown. Tighten 10 N.m (89 lb in)

Drive Chain, Drive Sprocket, and Driven Sprocket Assemble

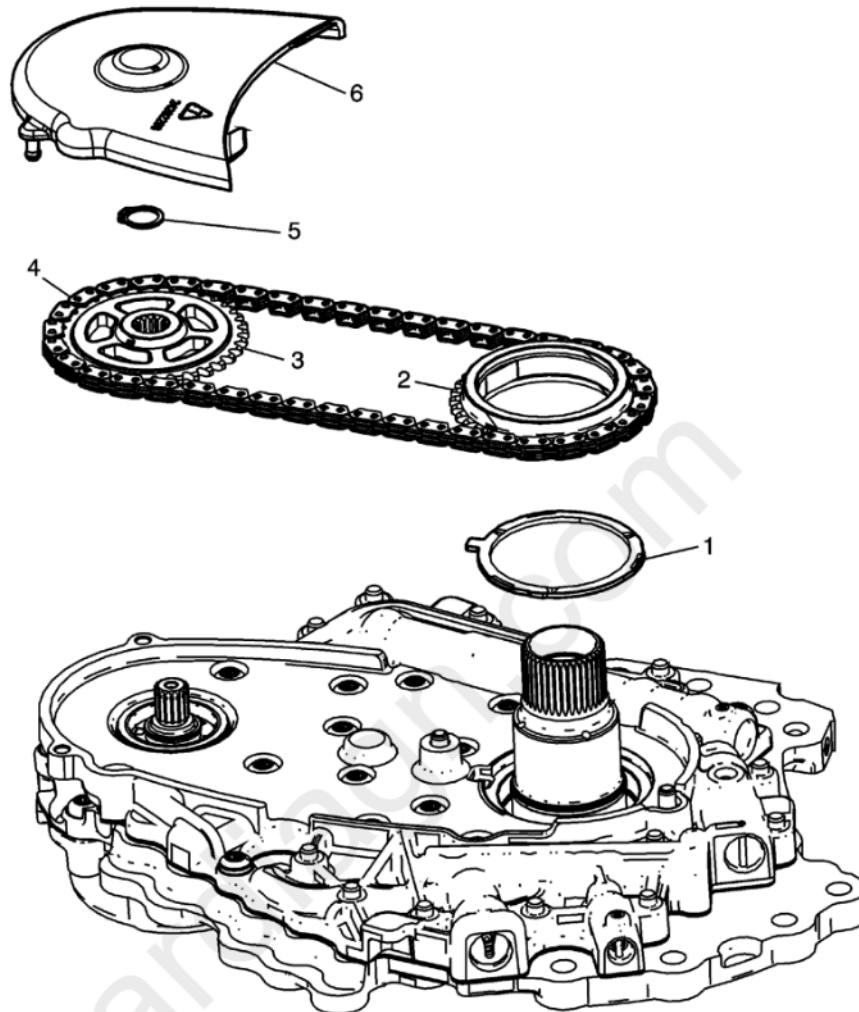


Fig. 61: Drive Chain, Drive Sprocket and Driven Sprocket
Courtesy of GENERAL MOTORS COMPANY

Drive Chain, Drive Sprocket, and Driven Sprocket Assemble

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Drive Sprocket NOTE: Install the sprockets and chain together as an assembly..
3	Driven Sprocket
4	Drive Link
5	Drive Sprocket Retaining Ring Retainer
6	Transmission Fluid Baffle

Fluid Filter Assembly and Torque Converter Fluid Seal Assemble

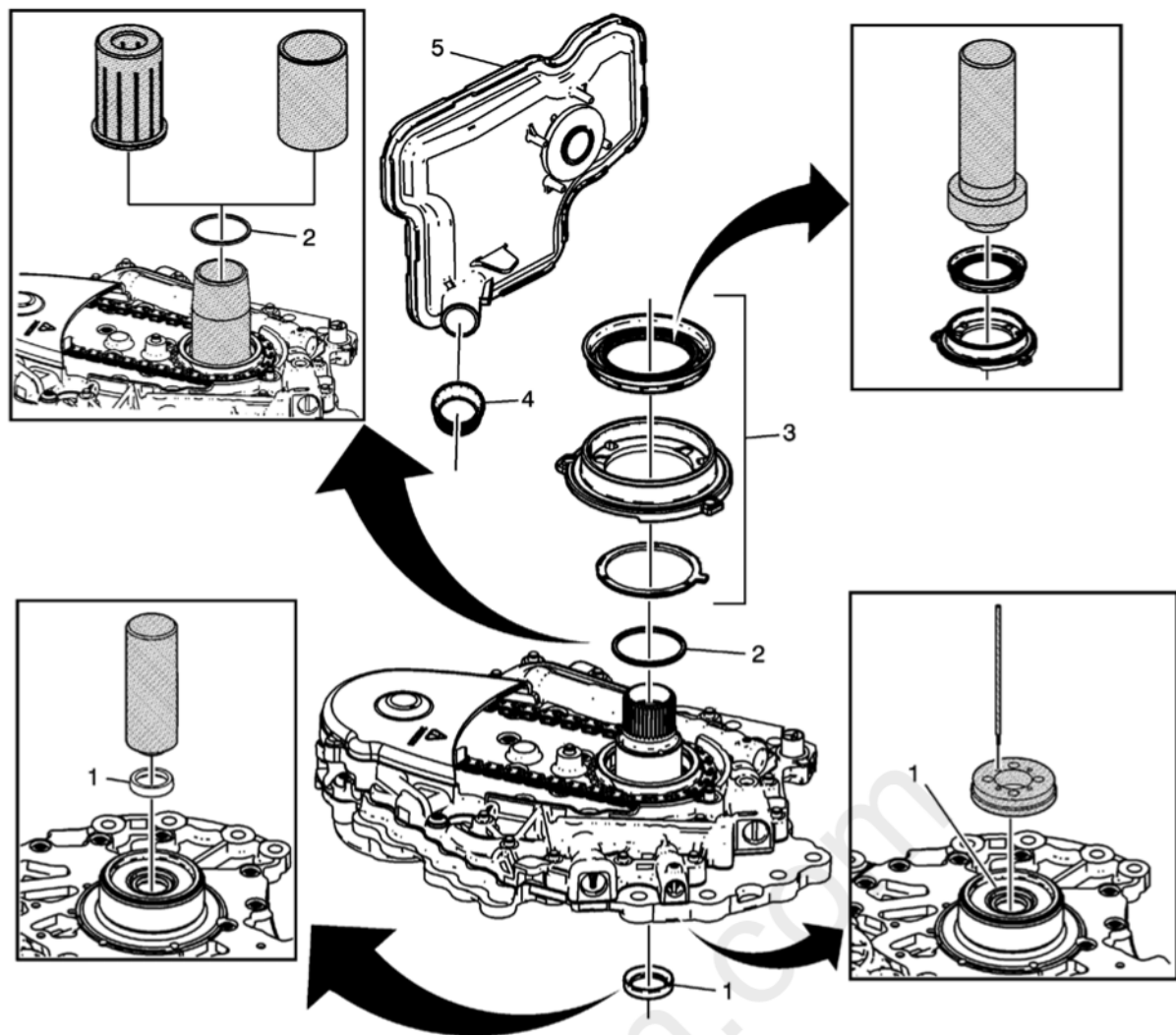


Fig. 62: Fluid Filter Assembly and Torque Converter Fluid Seal Components
 Courtesy of GENERAL MOTORS COMPANY

Fluid Filter Assembly and Torque Converter Fluid Seal Assemble

Callout	Component Name
1	Torque Converter Fluid Seal Assembly NOTE: The fluid seal assembly must be staked in place using DT-49131 seal staking tool to ensure proper seal retention. Special Tool • DT-47792 Seal Installer • DT-49131 Seal Staking Tool For equivalent regional tools, refer to Special Tools .
2	Torque Converter Fluid Seal Ring Special Tools DT-51191 Pump Seal Installer Set For equivalent regional tools, refer to Special Tools .

Callout	Component Name
3	Torque Converter Fluid Seal, Drive Sprocket Cover Assembly, and Drive Sprocket Thrust Washer Procedure 1. Install the torque converter fluid seal into the drive sprocket cover assembly using DT-24384-A seal installer and DT-5590 . 2. Install the drive sprocket thrust washer into the drive sprocket cover assembly. Special Tools • DT-5590 Bearing Installer • DT-24384-A Oil Seal Installer For equivalent regional tools, refer to Special Tools .
4	Automatic Transmission Fluid Filter Seal
5	Automatic Transmission Fluid Filter NOTE: Install a NEW fluid filter assembly. It is not reusable.

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR INSTALLATION (GEN 3)

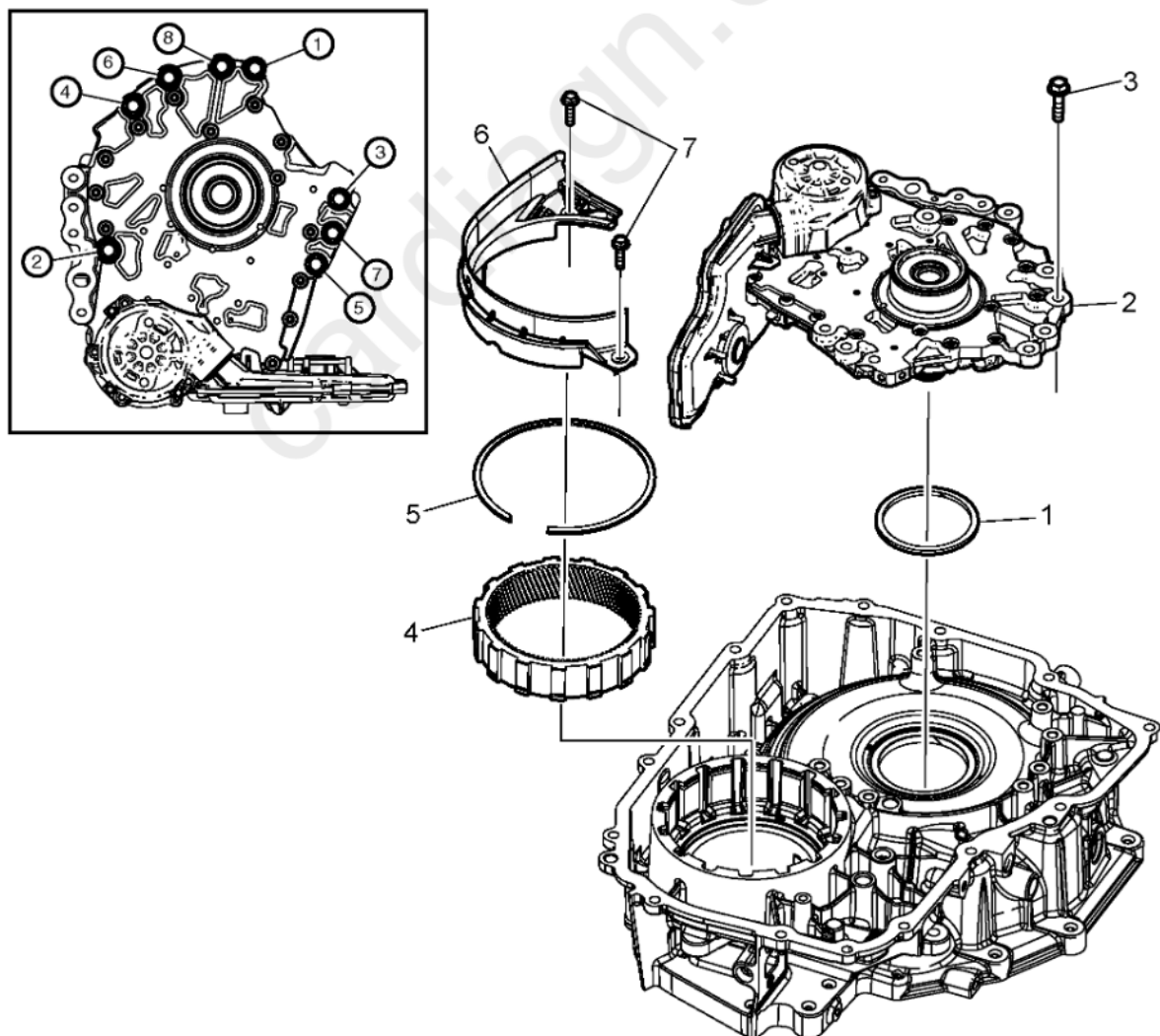


Fig. 63: Transmission Fluid Pump, Front Differential Carrier Baffle and Front Differential Ring Gear

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter and Differential Housing Seal
2	Automatic Transmission Fluid Pump
3	Automatic Transmission Fluid Pump Bolts M8 x 33 (Qty: 8)
	CAUTION: Refer to Fastener Caution .
	Procedure Tighten the bolts in the sequence shown. 1. Tighten the bolts as first pass to 10 N.m (89 lb in). 2. Tighten the bolts a final pass an additional 45 degrees.
4	Special Tool EN-45059 Angle Meter or equivalent For equivalent regional tools, refer to Special Tools .
	Front Differential Ring Gear
	Front Differential Ring Gear Retainer
5	NOTE: Install the retainer with the taper facing away from the ring gear.
6	Front Differential Carrier Baffle
7	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2) Tighten 12 N.m (106 lb in)

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY INSTALLATION

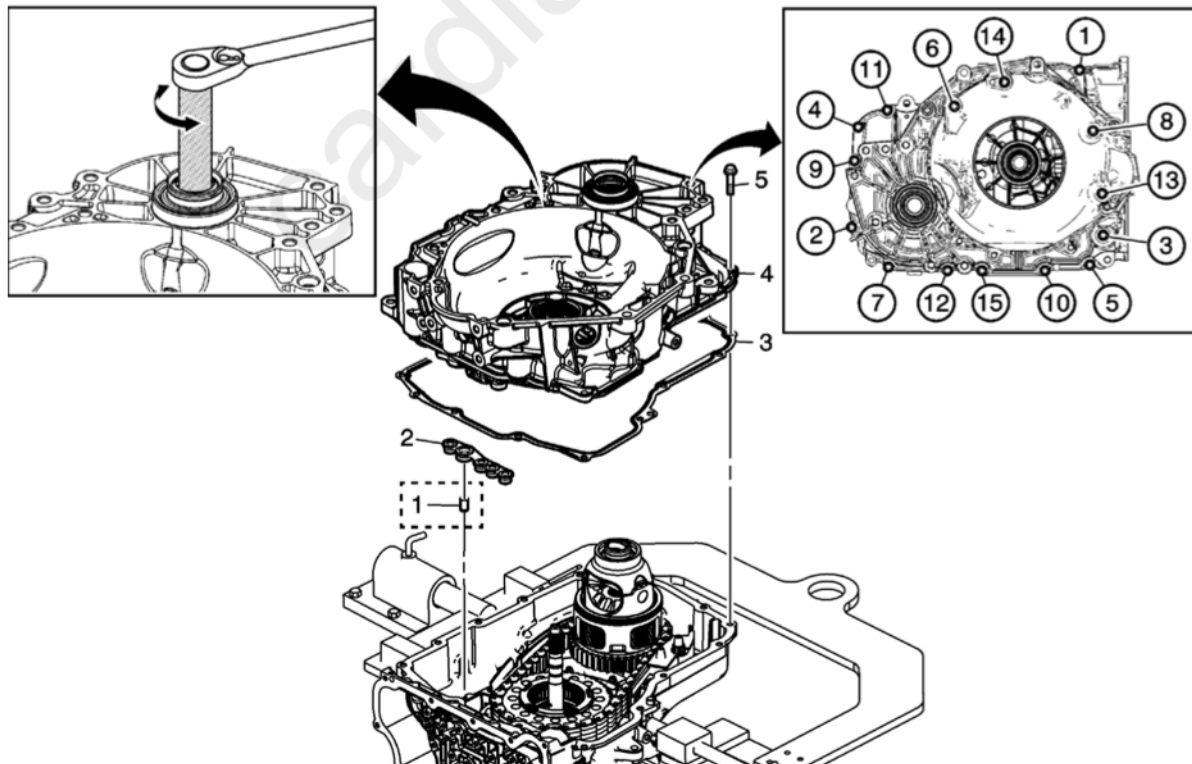


Fig. 64: Torque Converter Housing with Fluid Pump Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	A/Trans Fluid Trough Check Ball - Hybrid Models

Callout	Component Name
2	Fluid Pump Seal Assembly
3	Torque Converter Housing Gasket
4	Torque Converter (w/Fluid Pump) Housing Assembly NOTE: Rotate the differential slightly in each direction using the rotating tool to align the Differential Pinion Gears with the Differential Ring Gear in the Torque Converter Housing. • DT-47793 Differential Rotating Tool for 6T40/45 applications • DT-49938 Differential Rotating Tool for 6T50 applications Special Tools • DT-47793 Differential Rotating Tool • DT-49938 Differential Rotating Tool For equivalent regional tools, refer to Special Tools .
5	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15) CAUTION: Refer to Fastener Caution . Procedure Tighten the bolts in sequence shown. Tighten 10 N.m (89 lb in) then rotate the bolt an additional 50 degrees Special Tool EN-45059 Angle Meter or equivalent For equivalent regional tools, refer to Special Tools .

INPUT AND OUTPUT SPEED SENSOR INSTALLATION

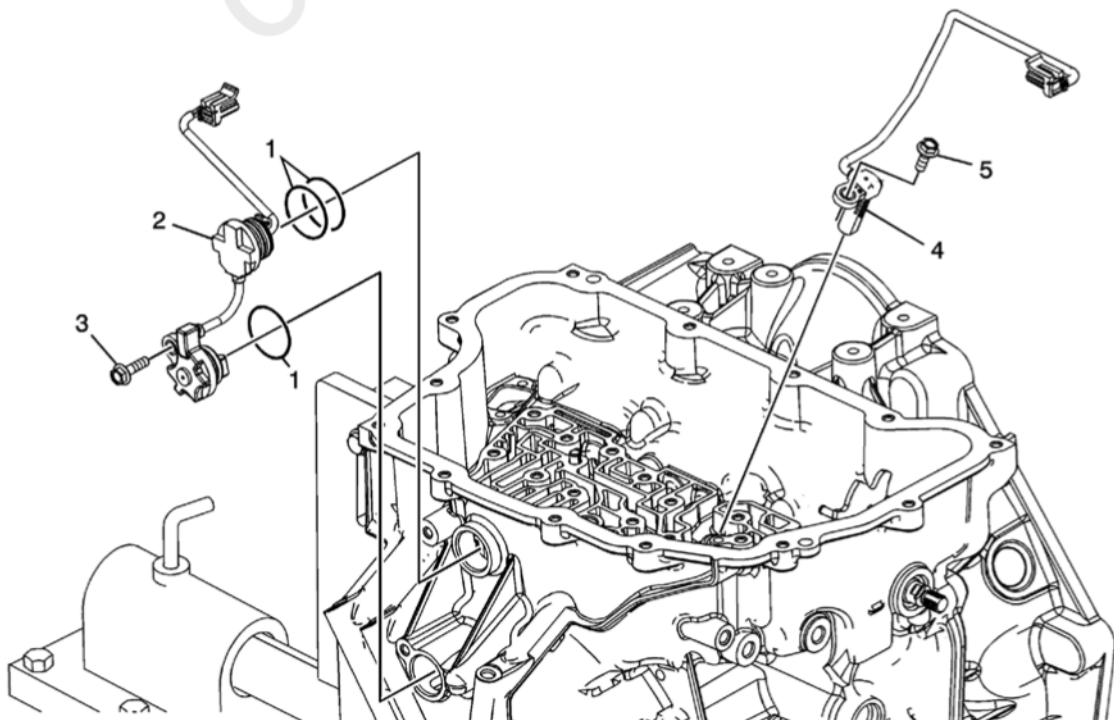


Fig. 65: Identifying Input & Output Speed Sensor
 Courtesy of GENERAL MOTORS COMPANY

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

CONTROL VALVE BODY ASSEMBLY DISASSEMBLE (GEN 3)

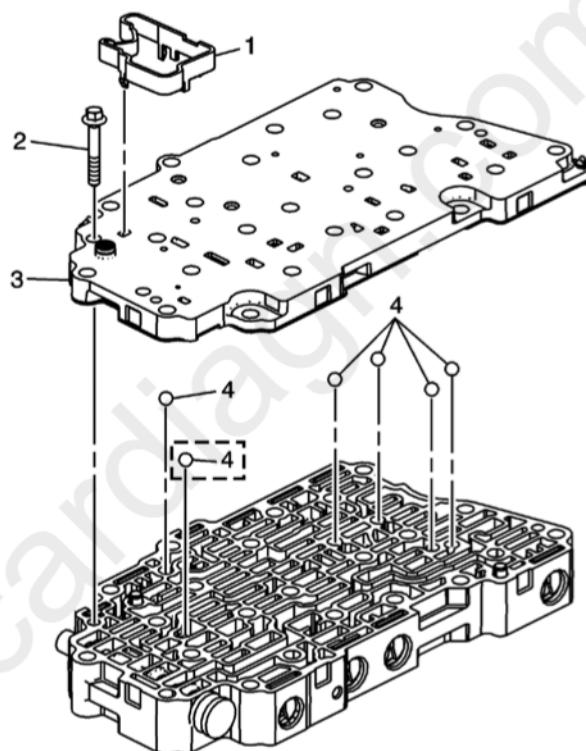


Fig. 66: Control Valve Body Assembly (Gen 3)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Control Solenoid Valve Support
2	Control Valve Body Bolt M5 x 40.5 (Qty: 1)
3	Valve Channel Plate NOTE: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
4	Valve Body Ball Check Valves - with S/S (Qty: 5), without S/S (Qty: 6)

CONTROL VALVE BODY CLEANING AND INSPECTION

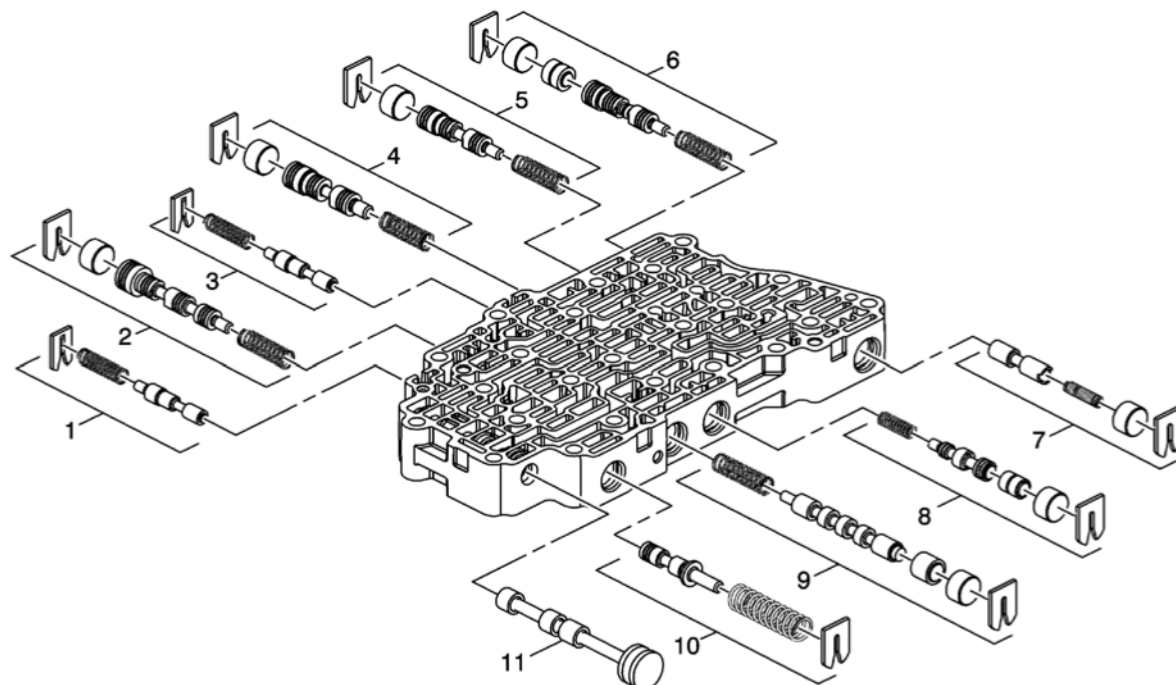


Fig. 67: Control Valve Body Cleaning and Inspection (Gen 2)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
WARNING: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
CAUTION: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
CAUTION: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components and the valve body. The control valve body assembly is only replaceable as an assembly.	
1	Low-Reverse and 4 - 5 - 6 Clutch Boost Valve Train
2	Low-Reverse and 4 - 5 - 6 Clutch Regulator Valve Train
3	1 - 2 - 3 - 4 Clutch Boost Valve Train
4	1 - 2 - 3 - 4 Clutch Regulator Valve Train
5	2 - 6 Clutch Regulator ValveTrain
6	3 - 5 Reverse Clutch Regulator Valve Train
7	Default Override Valve Train
8	TCC Regulator Apply Valve Train
9	Clutch Select Valve Train
10	Actuator Feed Limit Valve Train
11	Manual Valve

CONTROL VALVE CHANNEL PLATE CLEANING AND INSPECTION

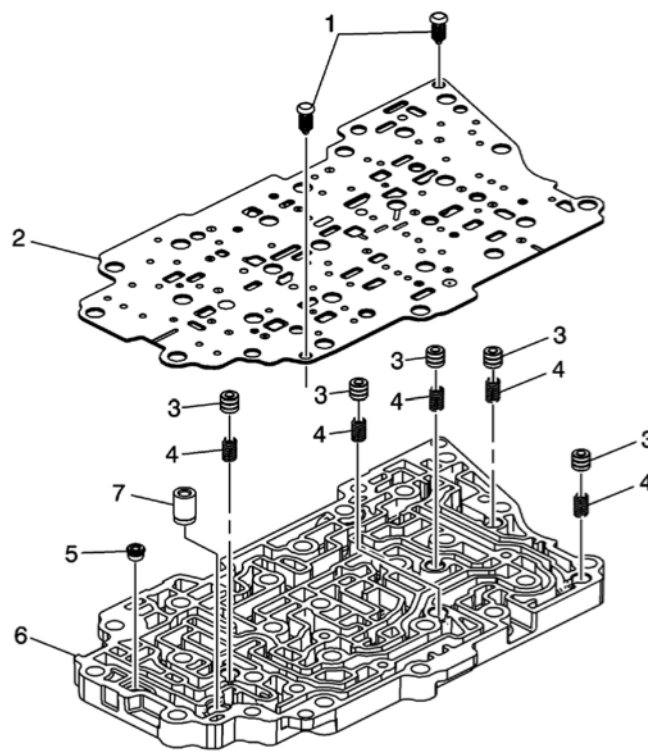


Fig. 68: Control Valve Channel Plate Cleaning and Inspection
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Control Valve Body Spacer Plate Retainer
2	Channel Plate to Valve Body Spacer Plate Assembly
3	Actuator Feed Accumulator Piston (Qty: 5)
4	Actuator Feed Accumulator Spring (Qty: 5)
5	Variable Hi and 2-3-4 Clutch Housing Valve Ball
6	Valve Channel Plate NOTE: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
7	Control Valve Channel Plate Ball Spring Assembly

CONTROL VALVE BODY ASSEMBLY ASSEMBLE (GEN 3)

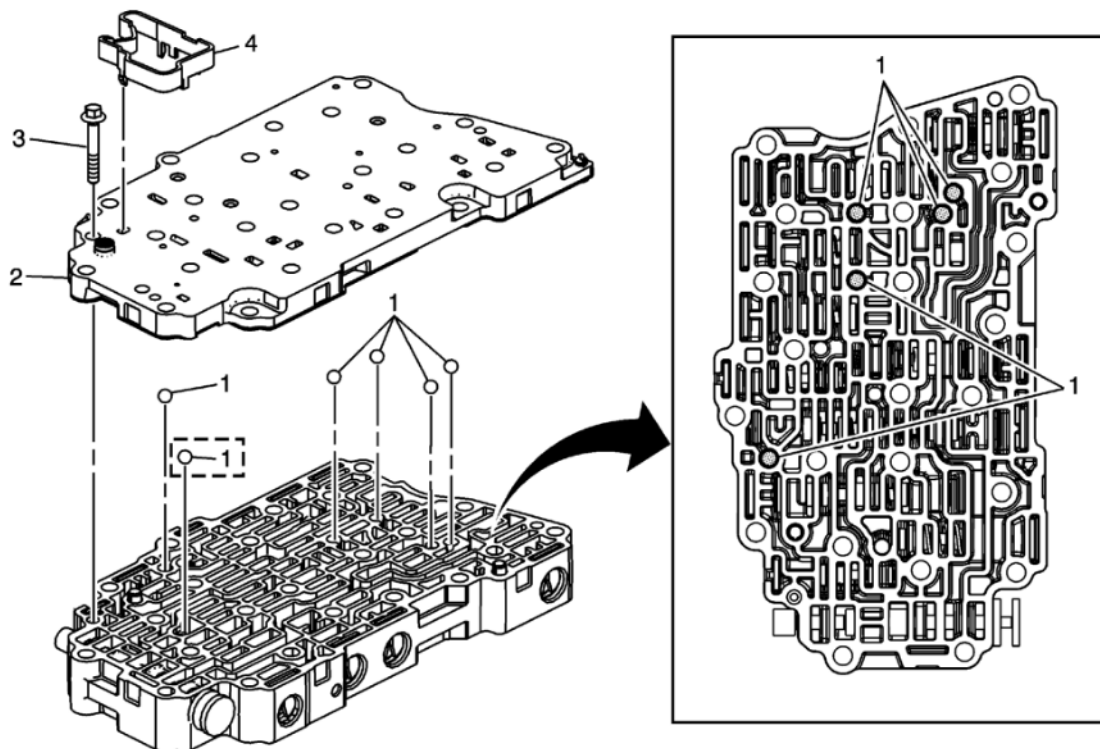


Fig. 69: Control Valve Body Assembly (Gen 3)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Valve Body Ball Check Valves NOTE: For application specific ball check valve location and quantity, refer to Ball Check Valve Locations (Gen 3) .
2	Valve Channel Plate
3	Control Valve Body Bolt M5 x 40.5 (Qty: 1) CAUTION: Refer to Fastener Caution . Tighten 7 N.m (62 lb in)
4	Control Solenoid Valve Support

CONTROL VALVE BODY ASSEMBLY INSTALLATION

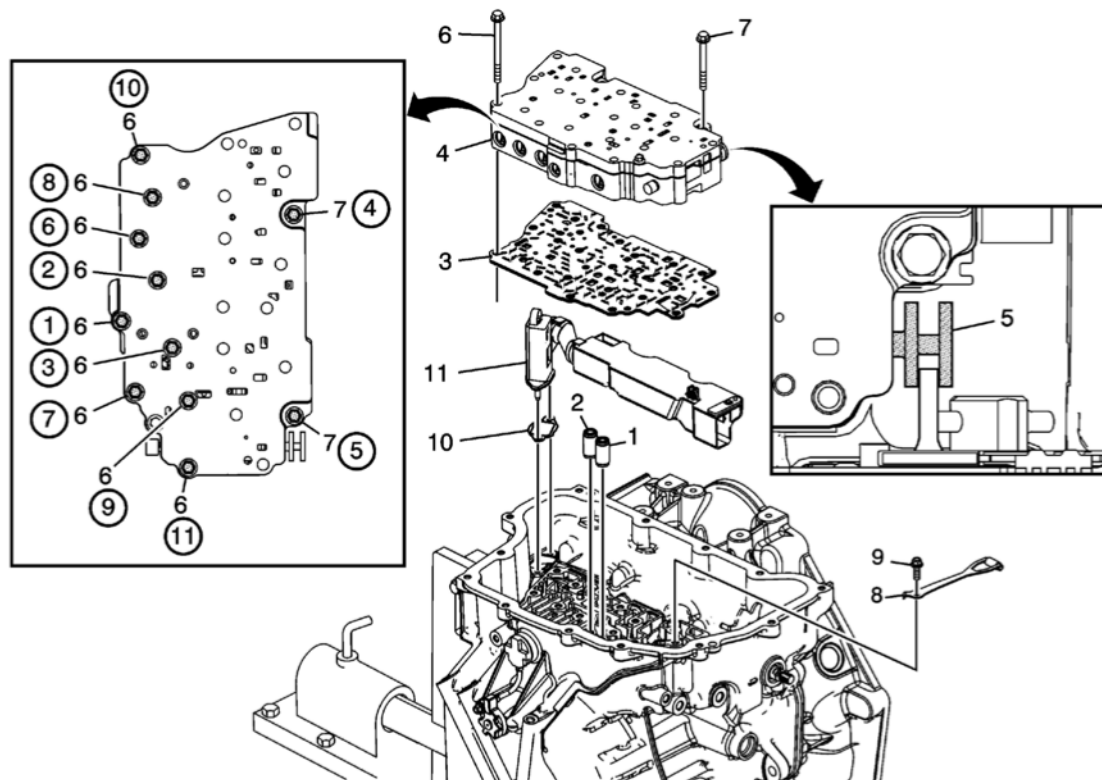


Fig. 70: View Of Control Valve Body Assembly Attachments
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Low and Reverse Clutch Fluid Passage Seal
2	1-2-3-4 Clutch Fluid Passage Seal
3	Control Valve Body Spacer Plate Assembly
4	Control Valve Body Assembly
5	Manual Valve NOTE: Align the manual valve to the rod on the manual shift detent lever.
6	Control Valve Body Bolt M6 x 60 (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 11 N.m (97 lb in)
7	Control Valve Body Bolt M6 x 53 (Qty: 2) Tighten 11 N.m (97 lb in)
8	Manual Shaft Detent Lever Spring Assembly
9	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) Tighten 12 N.m (106 lb in)
10	Fluid Level Control Valve Gasket
11	Fluid Level Control Valve

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INSTALLATION

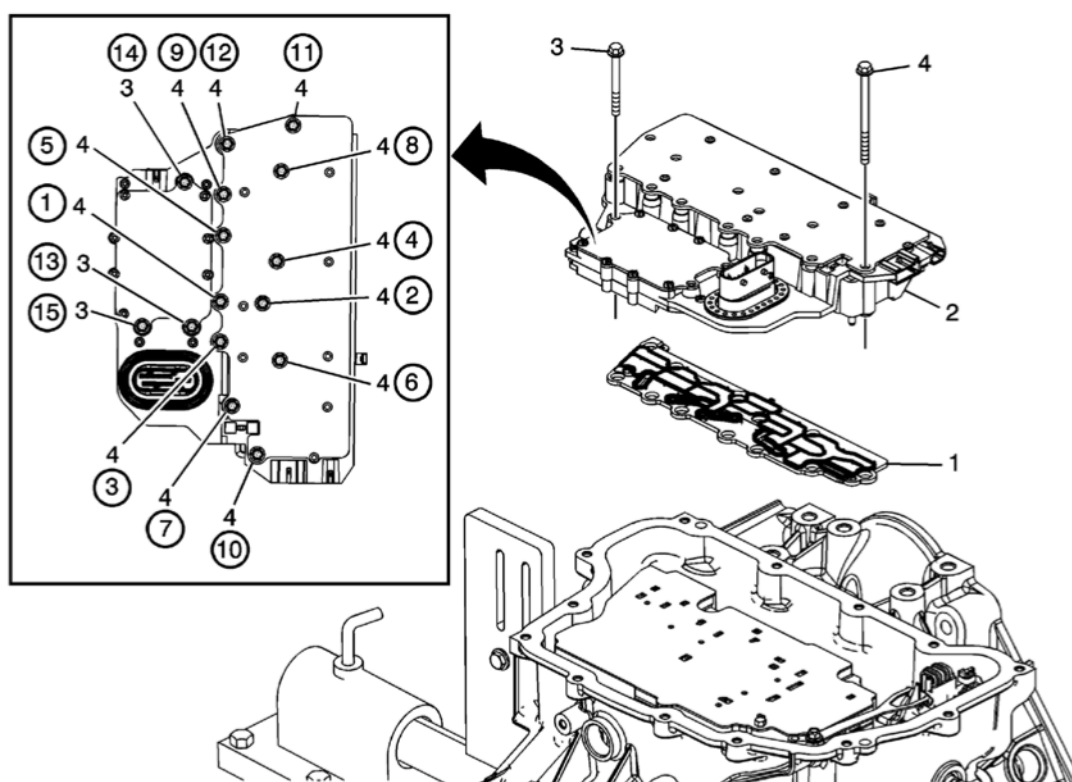


Fig. 71: Identifying Control Solenoid Valve & TCM Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Control Solenoid Valve Assembly Filter Plate CAUTION: Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination. NOTE: Install a NEW filter plate to prevent fluid leaks past the fluid seals.
2	Control Solenoid (w/Body and TCM) Valve Assembly
3	Control Valve Body Bolt M5 x 40.5 (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 7 N.m (62 lb in)
4	Control Valve Body Bolt M6 x 97 (Qty: 12) Tighten 11 N.m (97 lb in)

CONTROL VALVE BODY COVER INSTALLATION

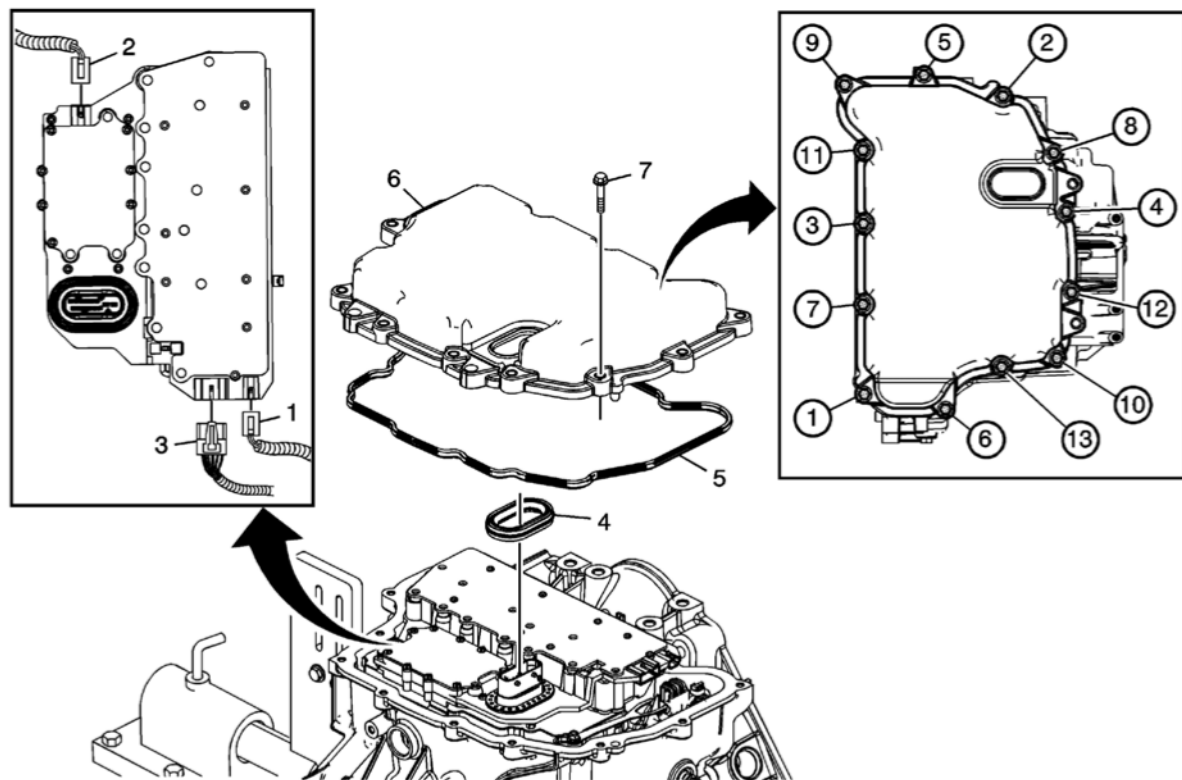


Fig. 72: Identifying Control Valve Body Cover Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Input Speed Sensor Connector
2	Output Speed Sensor Connector
3	Shift Position Switch Connector
4	Control Valve Body Cover Wiring Connector Hole Seal NOTE: Do not re-use the valve body cover wiring connector hole seal.
5	Control Valve Body Cover Gasket NOTE: Do not re-use the valve body cover gasket.
6	Control Valve Body Cover
7	Control Valve Body Cover Bolts M6 x 30 (Qty: 13) CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)

AUXILIARY FLUID ACCUMULATOR INSTALLATION (MHG)

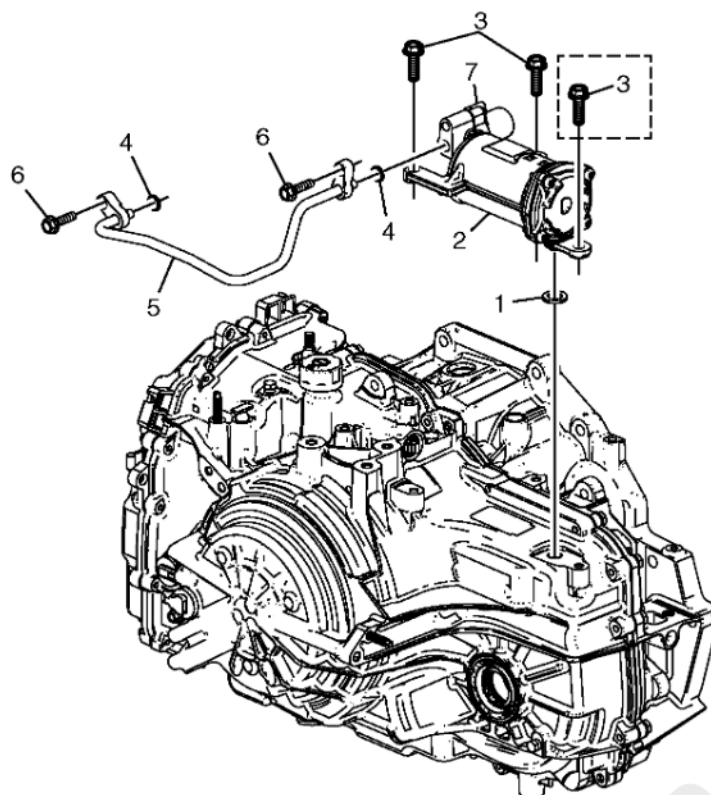


Fig. 73: Transmission Fluid Accumulator Pipe (MHG)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Accumulator Bypass Valve Seal NOTE: Install a NEW seal.
2	A/Trans Auxiliary Fluid Accumulator
3	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 3) CAUTION: Refer to Fastener Caution . NOTE: Models equipped with a range selector actuator only use (Qty: 2) auxiliary fluid accumulator bolts. Tighten 22 N.m (16 lb ft)
4	A/Trans Fluid Accumulator Pipe Seal (Qty: 2) NOTE: Install NEW seals.
5	A/Trans Fluid Accumulator Pipe
6	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 2) Tighten 22 N.m (16 lb ft)
7	A/Trans Auxiliary Fluid Accumulator Solenoid Connector Procedure Connect the connector.

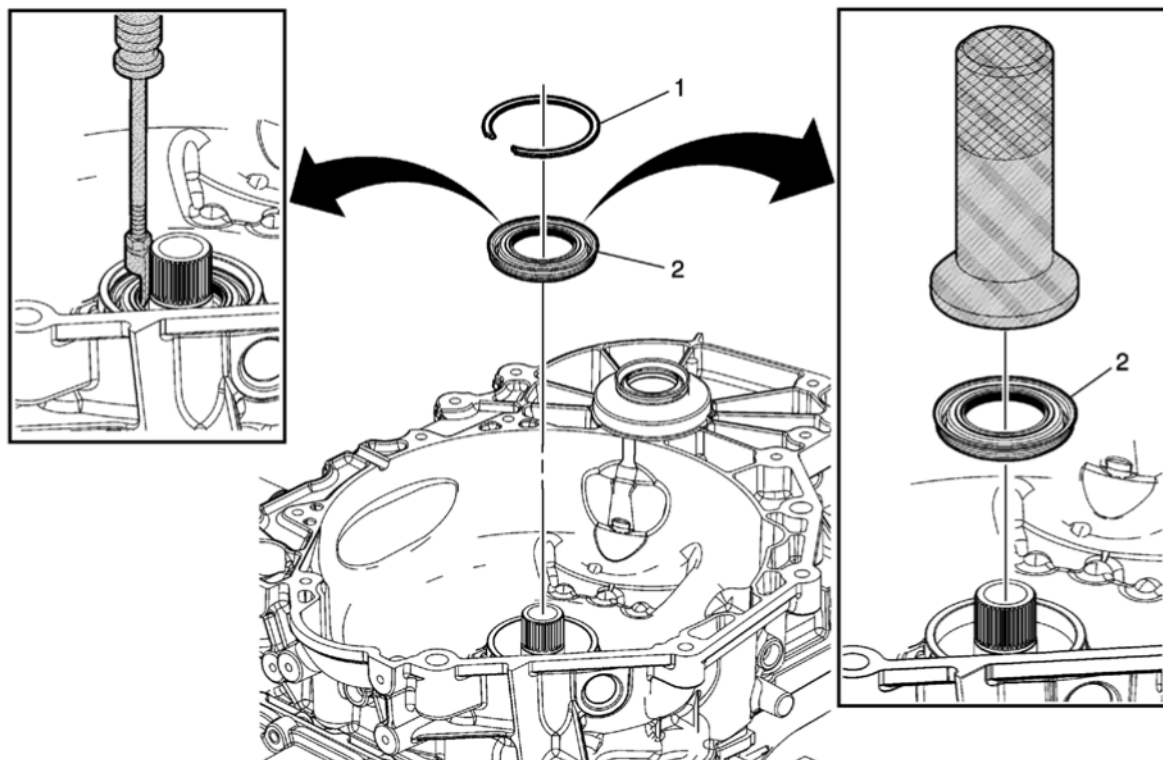


Fig. 74: Torque Converter Fluid Seal
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter Fluid Seal Retainer
2	Torque Converter Fluid Seal Special Tools • DT-47791-B Seal Installer • DT-6125-B Slide Hammer • EN-23129 Universal Seal Remover For equivalent regional tools, refer to Special Tools .

TORQUE CONVERTER INSTALLATION

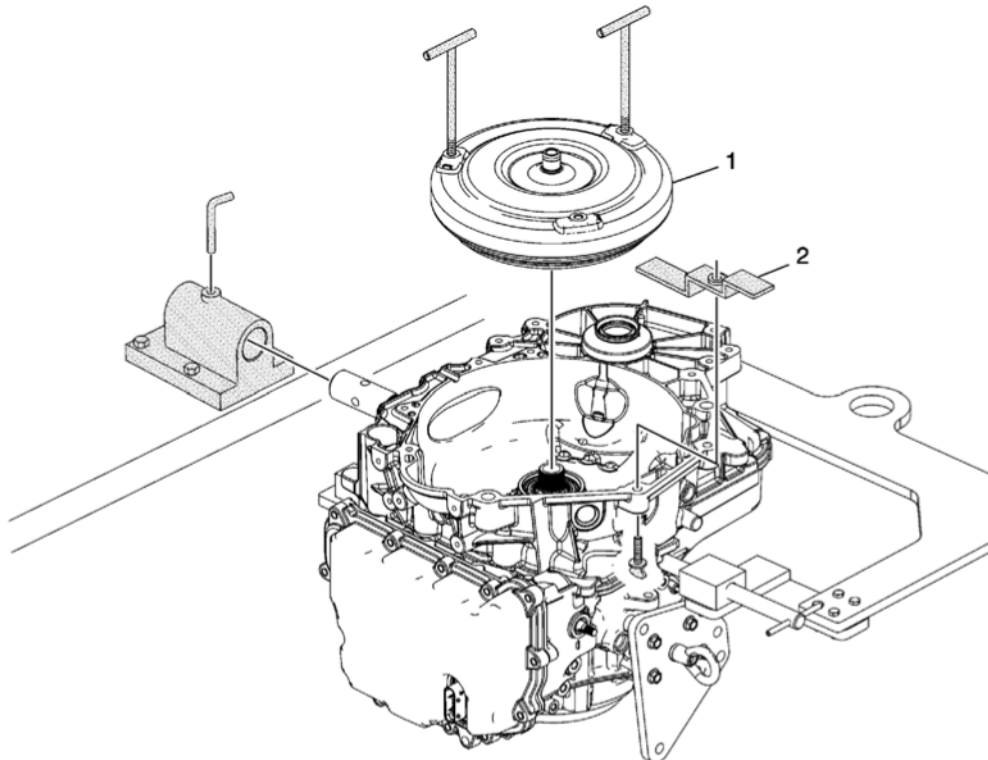


Fig. 75: View Of Torque Converter & Holding Strap

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter Assembly CAUTION: Lower the torque converter straight down. Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tool DT-46409 Torque Converter Lifting Handles For equivalent regional tools, refer to Special Tools .
2	DT-21366 Converter Holding Strap WARNING: The torque converter must be held to the torque converter housing by a retaining device such as shipping brackets. Without the retaining device, the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing personal injury and/or property damage.

LIFT PLATE AND HOLDING FIXTURE REMOVAL

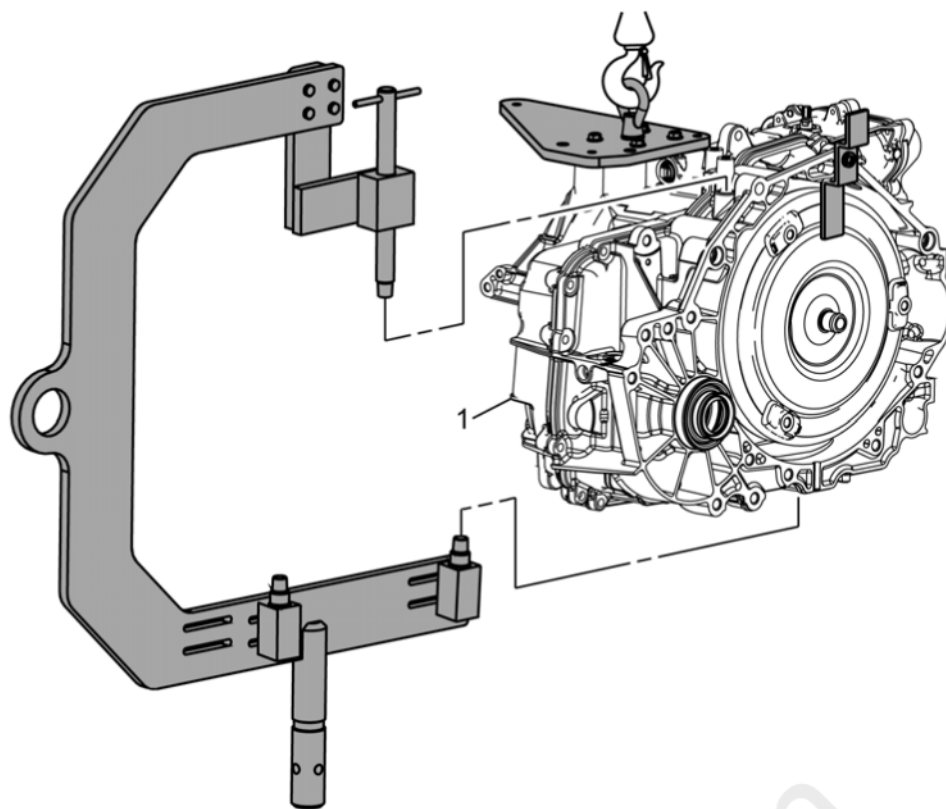


Fig. 76: Identifying Lift Plate & Holding Fixture
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
1	A WARNING: Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly. CAUTION: Refer to Fastener Caution . Procedure 1. Install DT-47811-A Transmission Lift Plate. 2. Tighten bolts and nut to 12 N.m (106 lb in). 3. Remove lock pin from DT-46625 Transmission Holding Fixture. 4. Raise the transmission with an overhead hoist in order to remove the DT-46625 Transmission Holding Fixture. 5. Lower the transmission assembly onto the transmission jack in order to remove the DT-47811-A Transmission Lift Plate. NOTE: Only 2 bolt holes on the lift plate will align with the bosses on the transmission case. This is sufficient for lifting the transmission to remove the holding fixture. Special Tools • DT-3289-20 Holding Fixture • DT-46625 Transmission Holding Fixture • DT-46625-10 Transmission Holding Fixture Adapter • DT-47811-A Transmission Lift Plate For equivalent regional tools, refer to Special Tools .

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Repair Instructions - On Vehicle - Impala

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:

- Loose, corroded, or painted terminal stud/fastener
- Wiring broken inside the insulation
- Poor connection between the male and female terminal at a connector
- A terminal not seated all the way into the connector body
- 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.

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.

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.

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 (screw or stud). 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](#) .

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.

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.

Incorrect Control Module

- There are only a few situations where reprogramming a control module is appropriate:
 - 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.

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY REPLACEMENT

Special Tools

- DT-41229 Manual Shaft Pin Installer
- DT-48550 Detent Lever Pin Remover

For equivalent regional tools, refer to [Special Tools](#) .

Removal Procedure

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

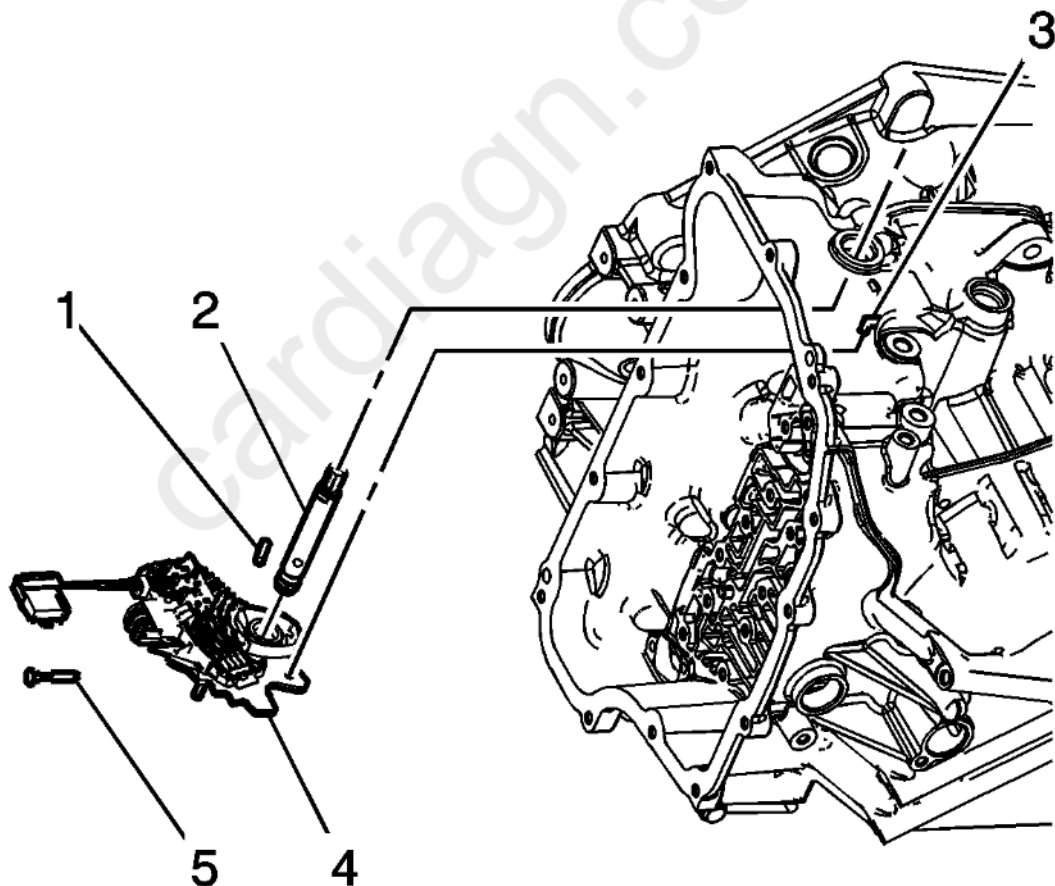


Fig. 1: Manual Shift Detent Lever And Shaft Position Switch Assembly Components
Courtesy of GENERAL MOTORS COMPANY

3. Remove the manual shaft detent lever hub pin (1) using DT-48550 remover.
4. Remove the manual shift shaft pin (5) using diagonal pliers or equivalent tool. Discard the pin.
5. Remove the manual shaft (2).

NOTE:

- Disconnect the actuator rod (3) from the detent lever assembly. Do not remove the actuator rod from the transmission case.
- Do not pull the park actuator rod end out beyond the machined oil passage surface in the case. A no park condition will exist if the park pawl actuator assembly is pulled out of the transmission too far and the actuator rod disengages from the park pawl. The transmission assembly will require disassembly to reinstall the actuator rod over the park pawl.

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

Installation Procedure

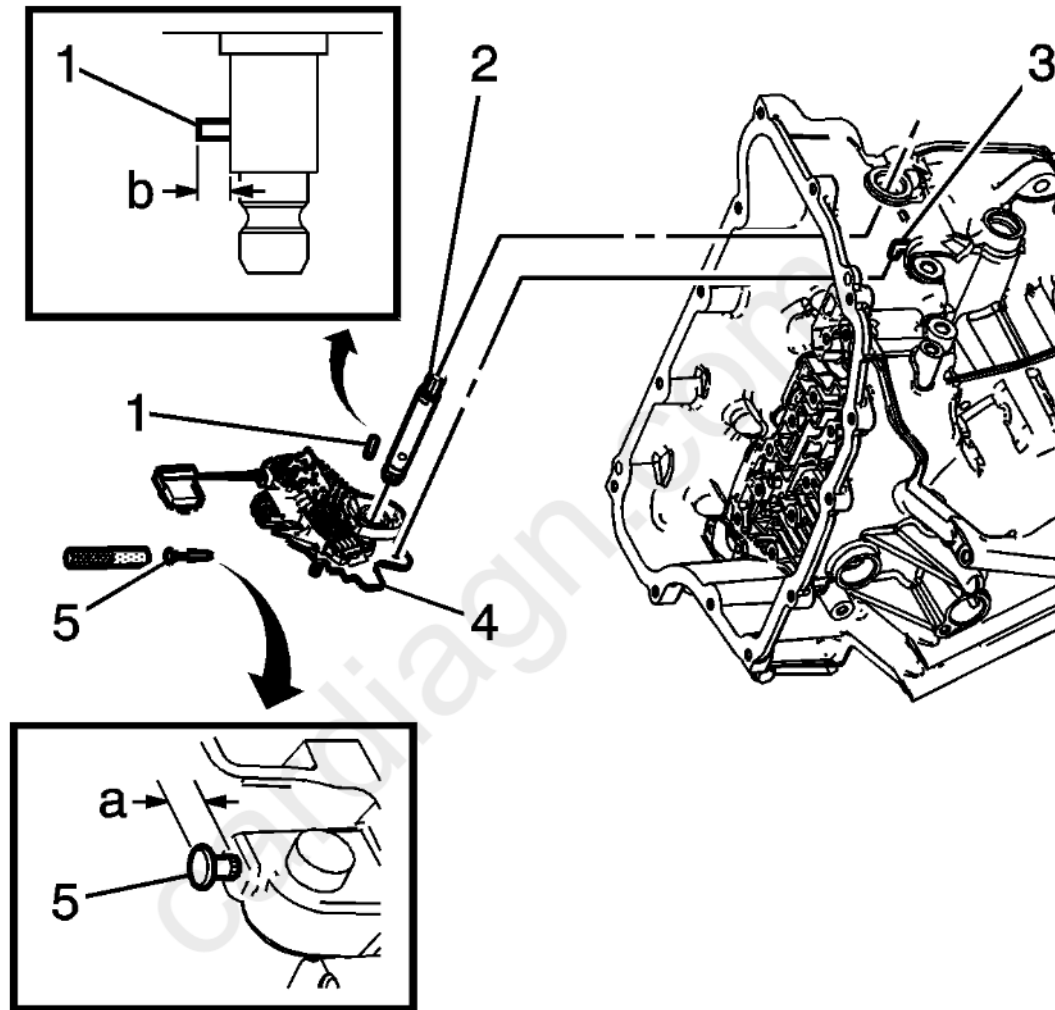


Fig. 2: Manual Shaft Detent (W/Shift Position Switch) Lever Assembly Components
Courtesy of GENERAL MOTORS COMPANY

NOTE:

Connect the actuator rod (3) to the detent lever assembly.

1. Install the manual shaft detent (w/shift position switch) lever assembly (4).

NOTE:

Lubricate the shaft with automatic transmission fluid to prevent damage to the manual shift shaft seal during installation.

2. Install the manual shaft (2).

3. Install the manual shaft detent lever hub pin (1) using **DT-48550** remover.

Specification

Install the Manual Shaft Detent Lever Hub Pin to height of (b) 7.9 mm (0.38 in).

CAUTION:

Use the manual shift pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack.

4. Install the NEW manual shift shaft pin (5) using **DT-41229** installer. Use a NEW pin to ensure proper engagement with the case.

Specification

Inspect pin installed height is within (a) 7.2-8.2 mm (0.28-0.32 in).

5. Install the control valve body. Refer to [Control Valve Body Replacement](#).
6. Install the control valve body cover. Refer to [Control Valve Body Cover Replacement](#).
7. Perform the service fast learn adapt procedure.

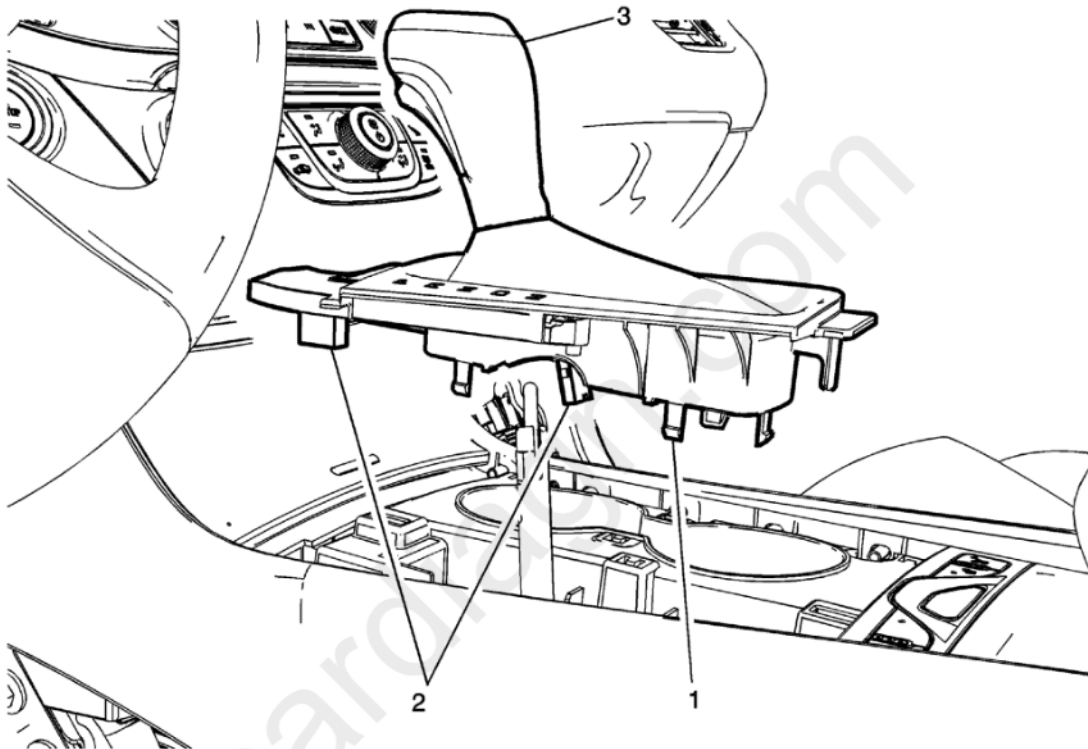
TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

Fig. 3: Transmission Control Lever Knob, Retainers & Electrical Connectors

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Chock the wheels, then place the transmission in Neutral. Remove the front floor console cup holder trim plate. Refer to Front Floor Console Cup Holder Plate Replacement .	
1	Transmission Control Lever Knob Retainer (Qty: 6) Procedure Using a flat-bladed plastic trim tool, release the retaining clips securing the control lever boot.
2	Electrical connector (Qty: 2)

Callout	Component Name
3	Transmission Control Lever Knob NOTE: • The control lever boot and knob are replaced as an assembly. • To remove the knob, pull upward and twist. NOTE: If the knob cannot be released by twisting and pulling, perform the following steps: 1. Raise the shift boot, then pull out the tabs on both sides to release the boot from the shift knob. 2. Using a pick tool, remove the chrome ring from the shift knob. 3. Using a pick tool, remove the shift knob U-clip, then remove the knob.

TRANSMISSION CONTROL REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Remove the shift knob from the transmission control. Refer to [Transmission Control Lever Knob Replacement](#).
3. Remove the left front floor console extension panel. Refer to [Front Floor Console Extension Replacement - Left Side](#).

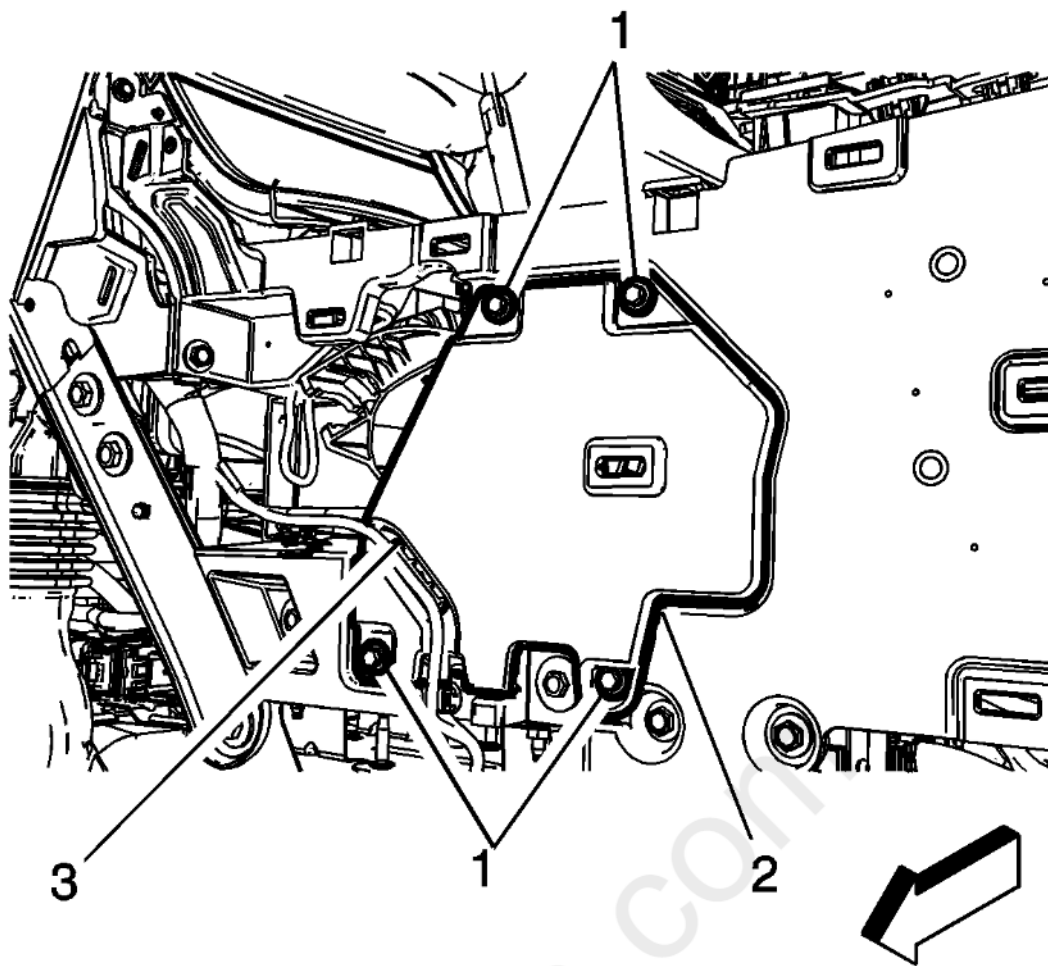


Fig. 4: Access Plate, Fasteners & Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the wiring harness (3) from the access plate.
5. Remove the access plate fasteners (1), then the access plate (2) from the console.

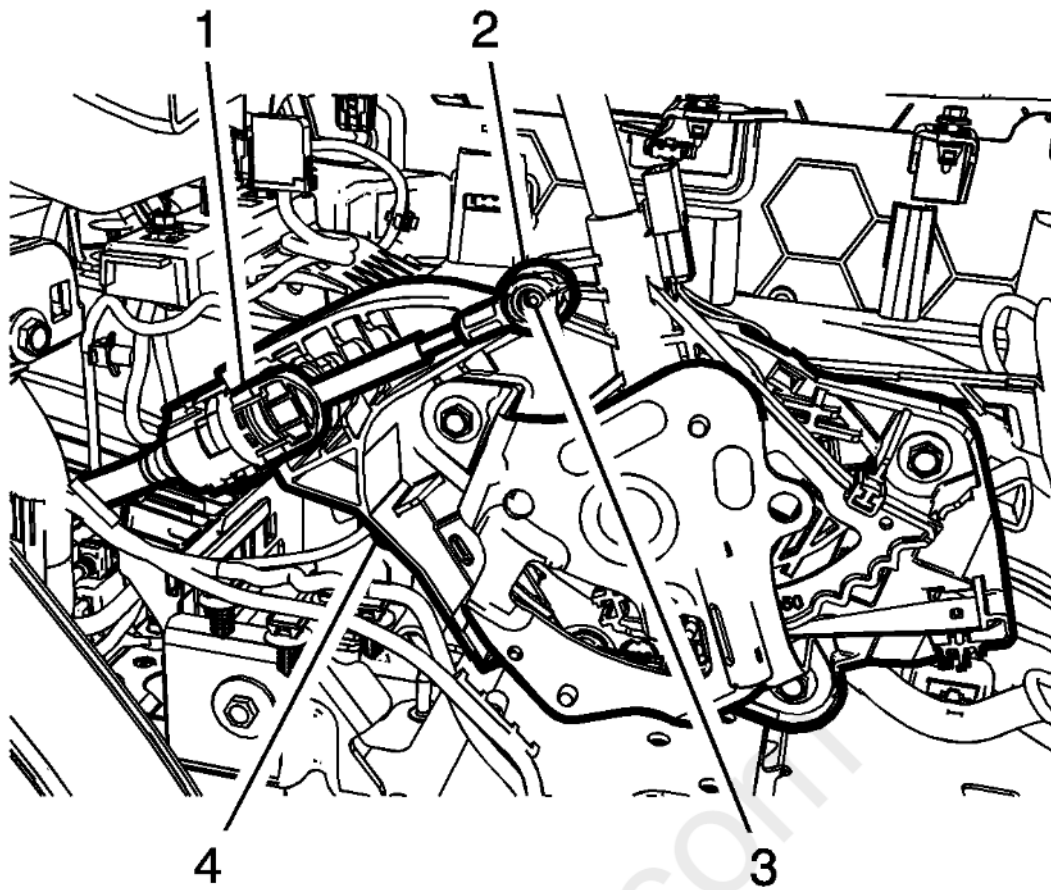


Fig. 5: Range Selector Lever Cable Terminal, Retainer, Shift Lever Pin & Control Lever Base

Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin (3).
7. Release the transmission range selector lever cable retainer (1) and remove the transmission range selector cable from the transmission control lever base (4).

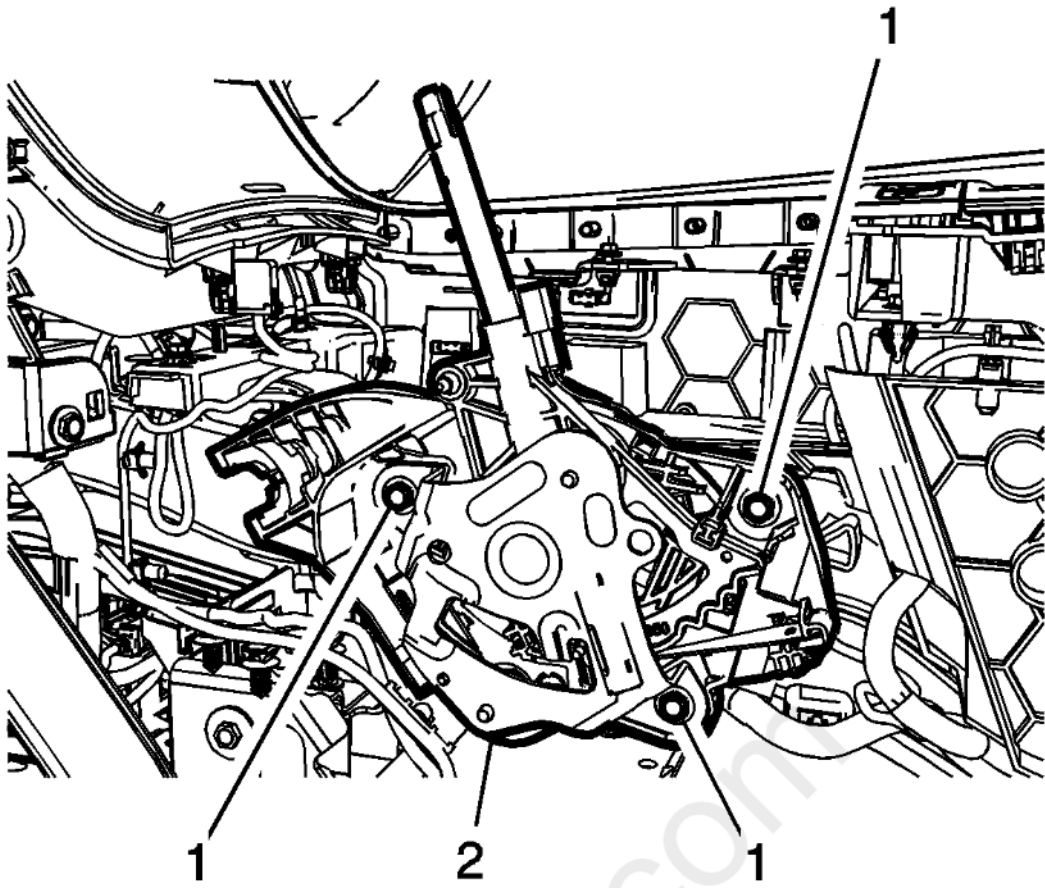


Fig. 6: Transmission Shift Control & Fasteners

Courtesy of GENERAL MOTORS COMPANY

8. Remove the transmission shift control fasteners (1).
9. Remove the transmission shift control (2).
10. Disconnect the electrical connector from the rear of the transmission control.

Installation Procedure

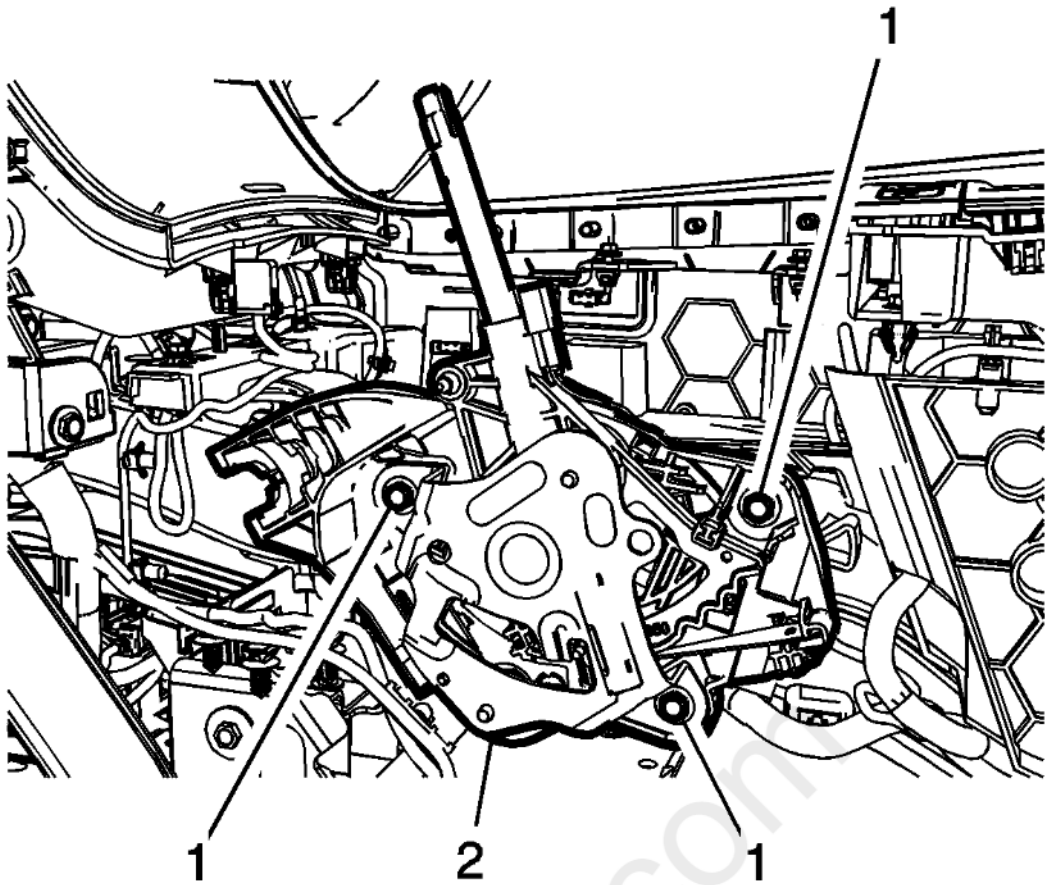


Fig. 7: Transmission Shift Control & Fasteners

Courtesy of GENERAL MOTORS COMPANY

1. Connect the electrical connector to the rear of the transmission control.
2. Install the transmission shift control (2).

CAUTION: Refer to **Fastener Caution** .

3. Install the transmission shift control bolts (1) and tighten to 25 N.m (18 lb ft).

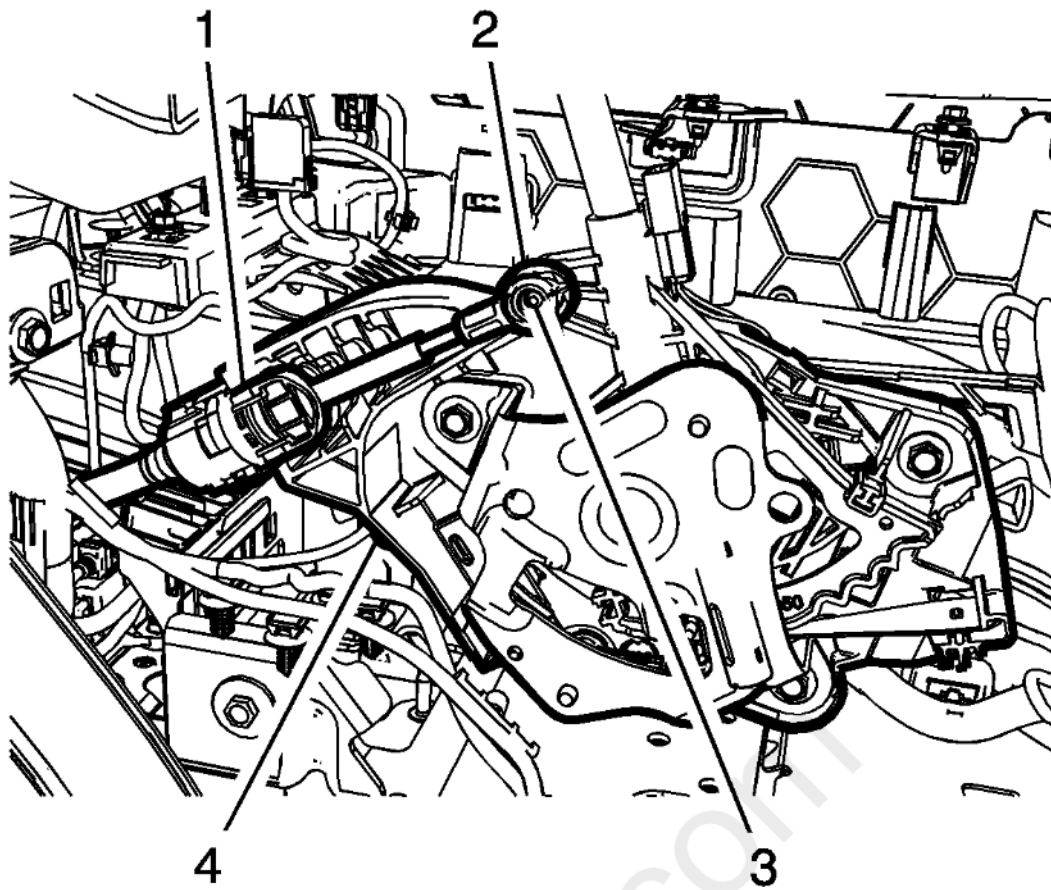


Fig. 8: Range Selector Lever Cable Terminal, Retainer, Shift Lever Pin & Control Lever Base

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.

4. Install the transmission range selector lever cable retainer (1) to the shift lever base. (4).
5. Install the transmission range selector lever cable terminal (2) to the shift lever pin (3).

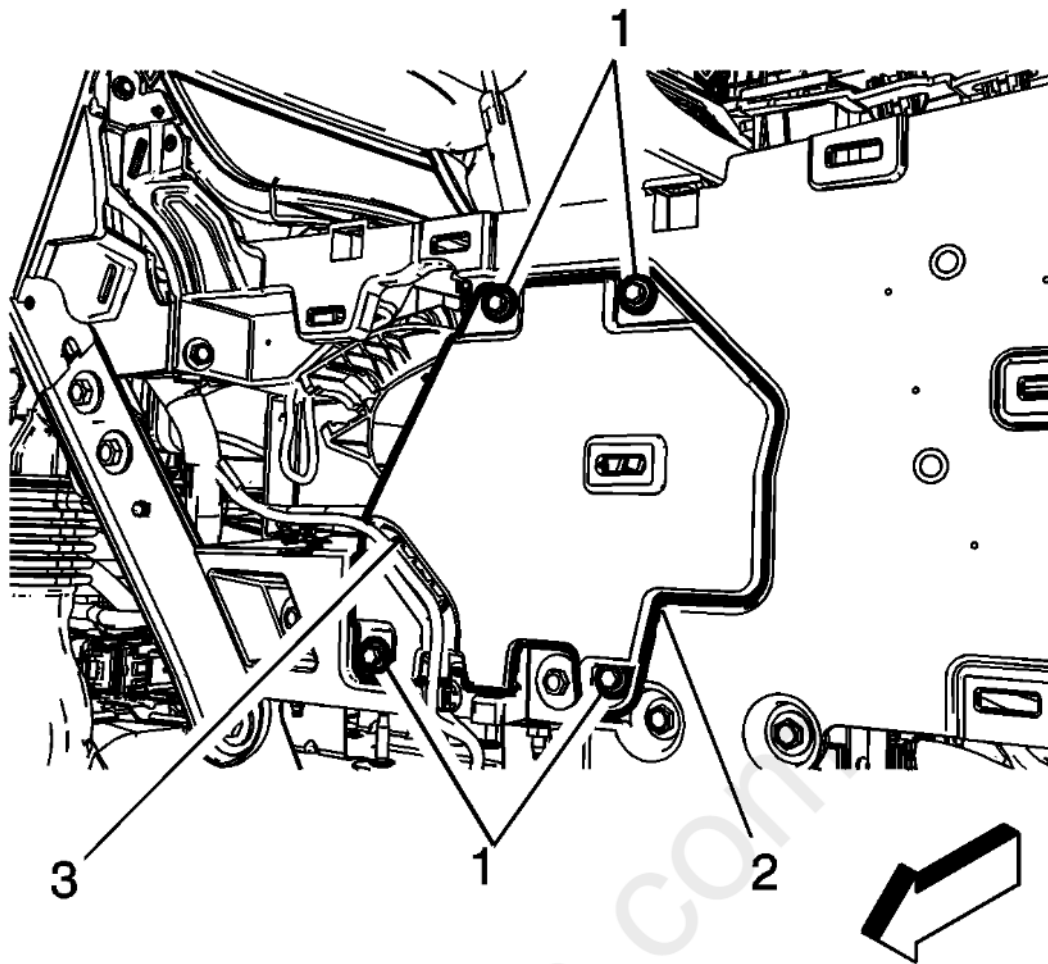


Fig. 9: Access Plate, Fasteners & Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

6. Position the access plate (2) to the console, then install the fasteners (1).
7. Connect the wiring harness (3) to the access plate.
8. Install the left front floor console extension panel. Refer to [Front Floor Console Extension Replacement - Left Side](#).
9. Install the shift knob to the transmission control. Refer to [Transmission Control Lever Knob Replacement](#).

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Reposition the engine control module out of the way without disconnecting the electrical connector(s). Refer to [Engine Control Module Replacement](#).

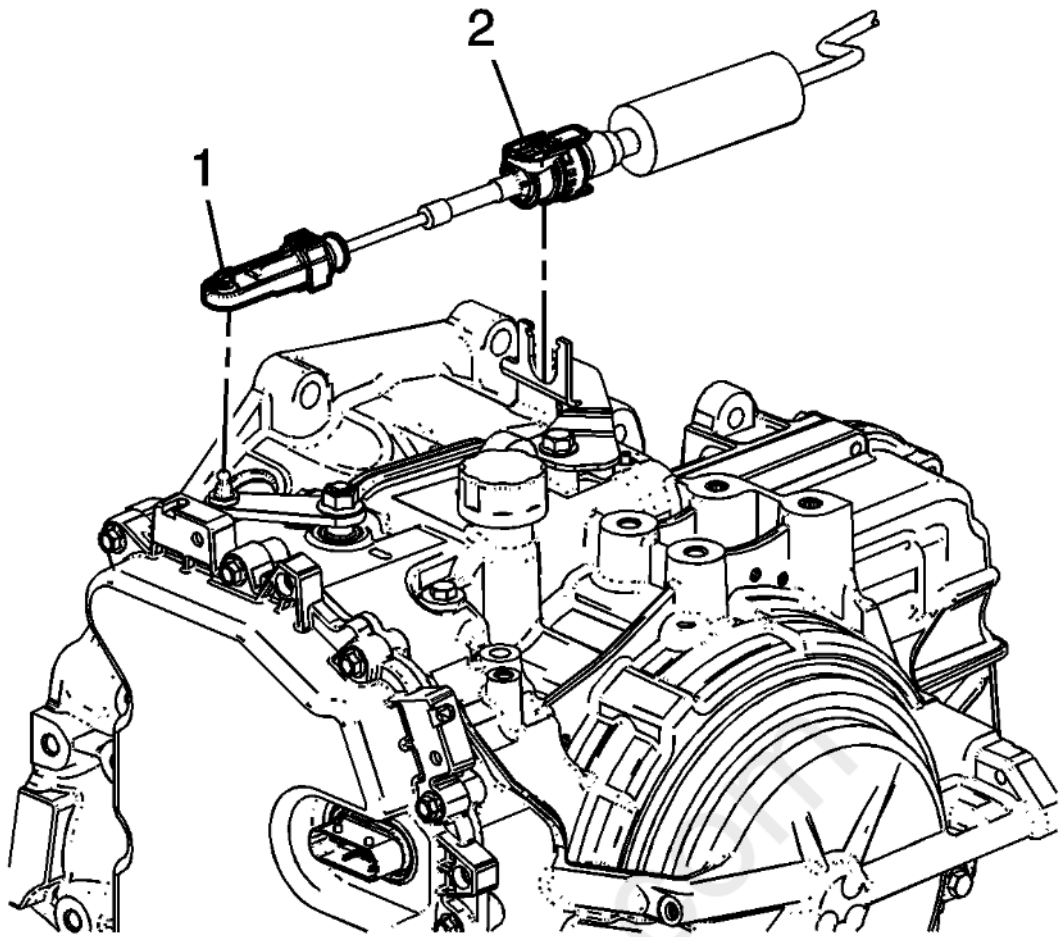


Fig. 10: Transmission Range Selector Lever And Cable Connection

Courtesy of GENERAL MOTORS COMPANY

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

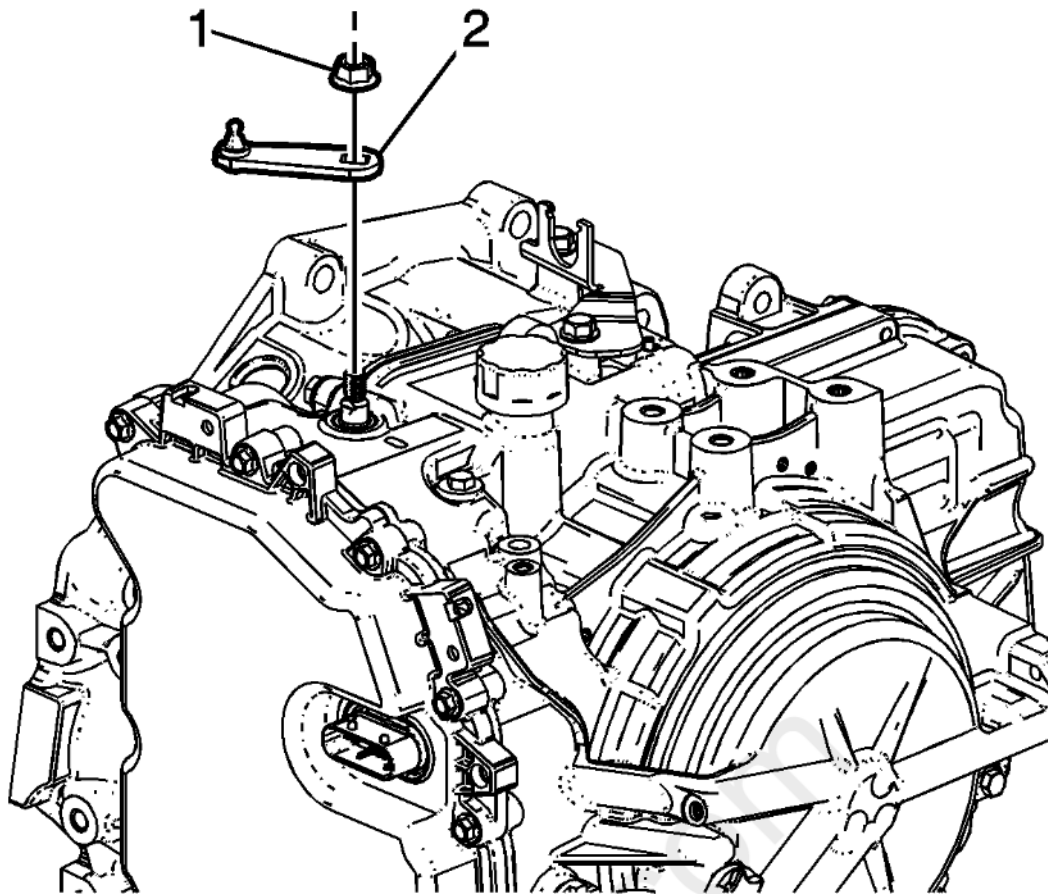


Fig. 11: Transmission Range Selector Lever And Nut

Courtesy of GENERAL MOTORS COMPANY

WARNING: Hold the transmission range selector lever while removing or installing the lever retaining nut. Excessive torque on the manual shaft can damage the detent lever hub retainer which could allow the vehicle to roll when placed in the park position.

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

Installation Procedure

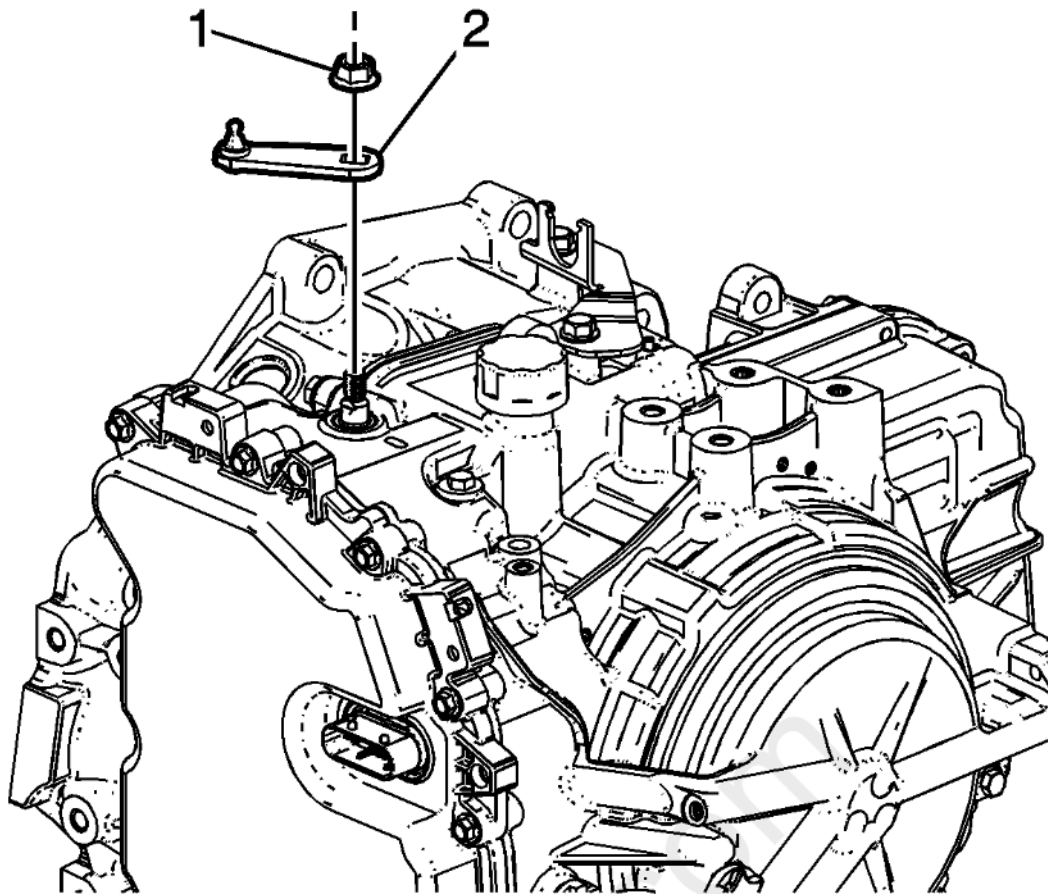


Fig. 12: Transmission Range Selector Lever And Nut

Courtesy of GENERAL MOTORS COMPANY

WARNING: Hold the transmission range selector lever while removing or installing the lever retaining nut. Excessive torque on the manual shaft can damage the detent lever hub retainer which could allow the vehicle to roll when placed in the park position.

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

CAUTION: Refer to [Fastener Caution](#) .

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

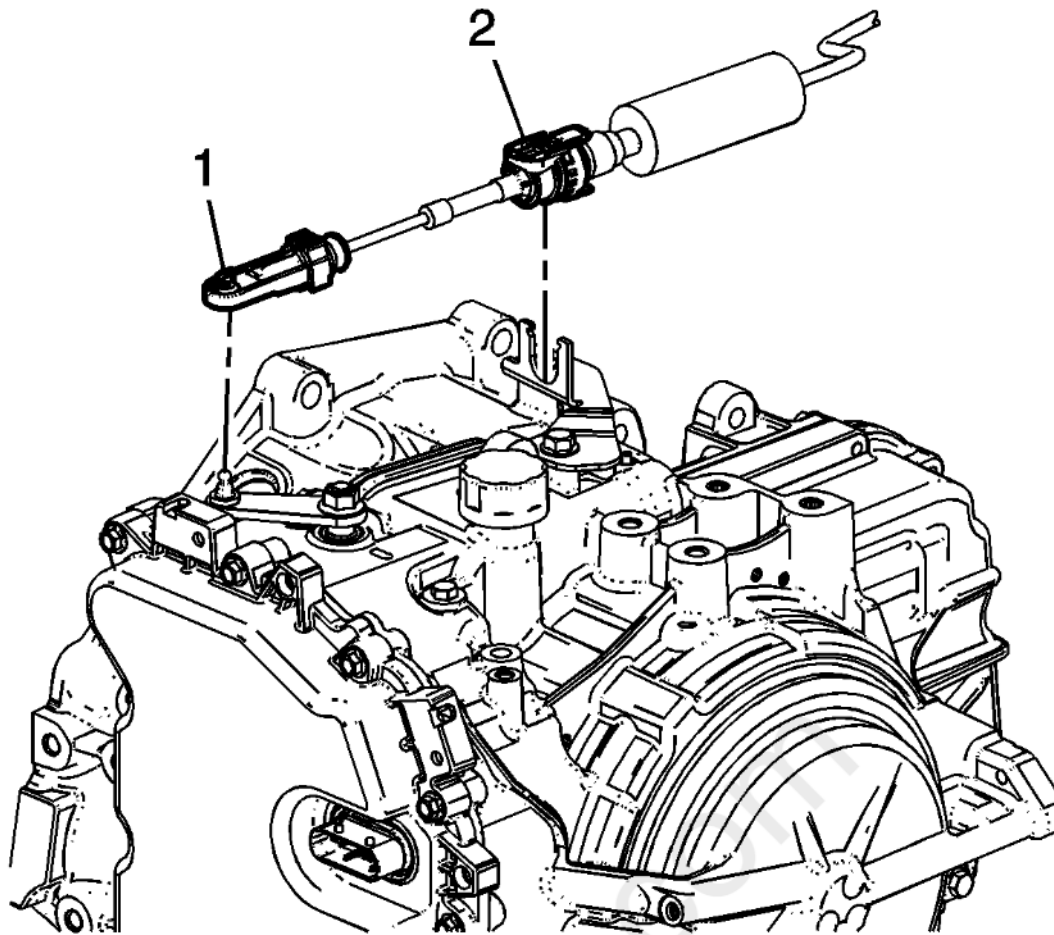


Fig. 13: Transmission Range Selector Lever And Cable Connection
Courtesy of GENERAL MOTORS COMPANY

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

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

4. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin.
5. Check the range selector cable adjustment. Refer to [Range Selector Lever Cable Adjustment](#).
6. Place the engine control module back to its installed position. Refer to [Engine Control Module Replacement](#).

RANGE SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Reposition the engine control module out of the way without disconnecting the electrical connector(s). Refer to [Engine Control Module Replacement](#).

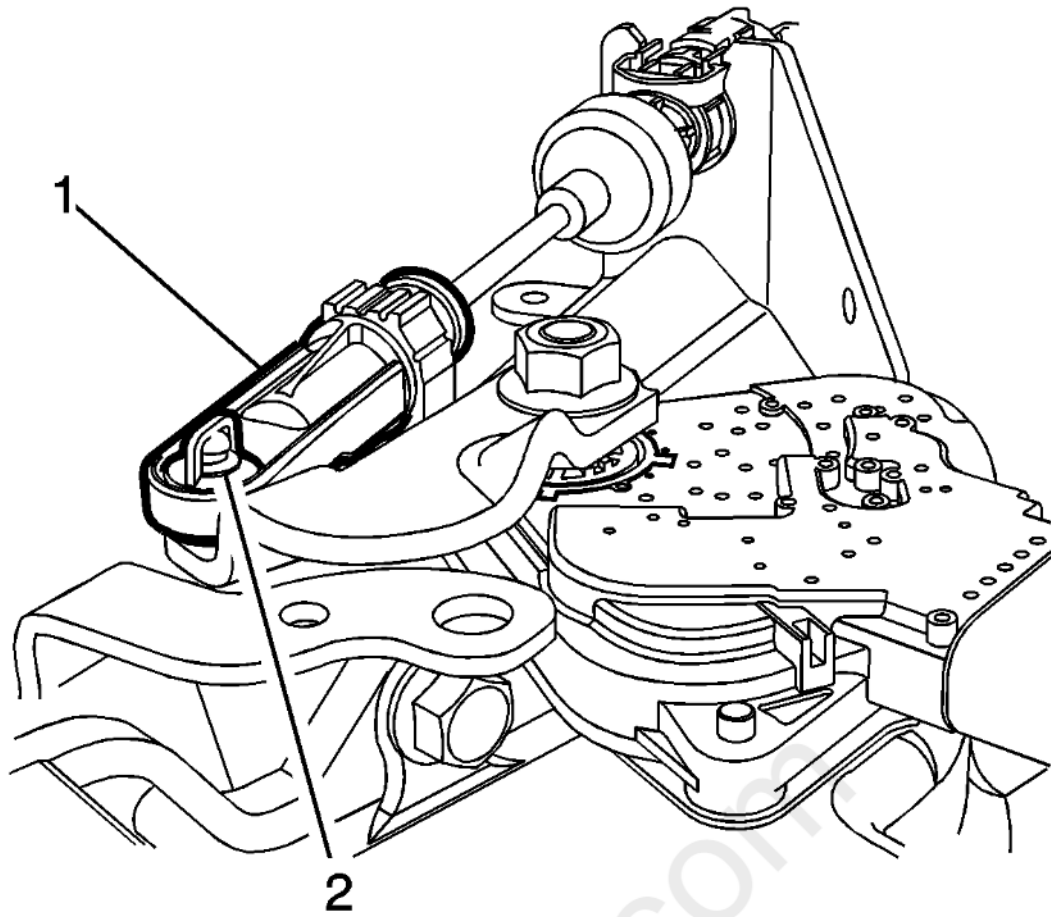


Fig. 14: Transmission Range Selector Lever Cable Terminal And Lever Pin
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (2).

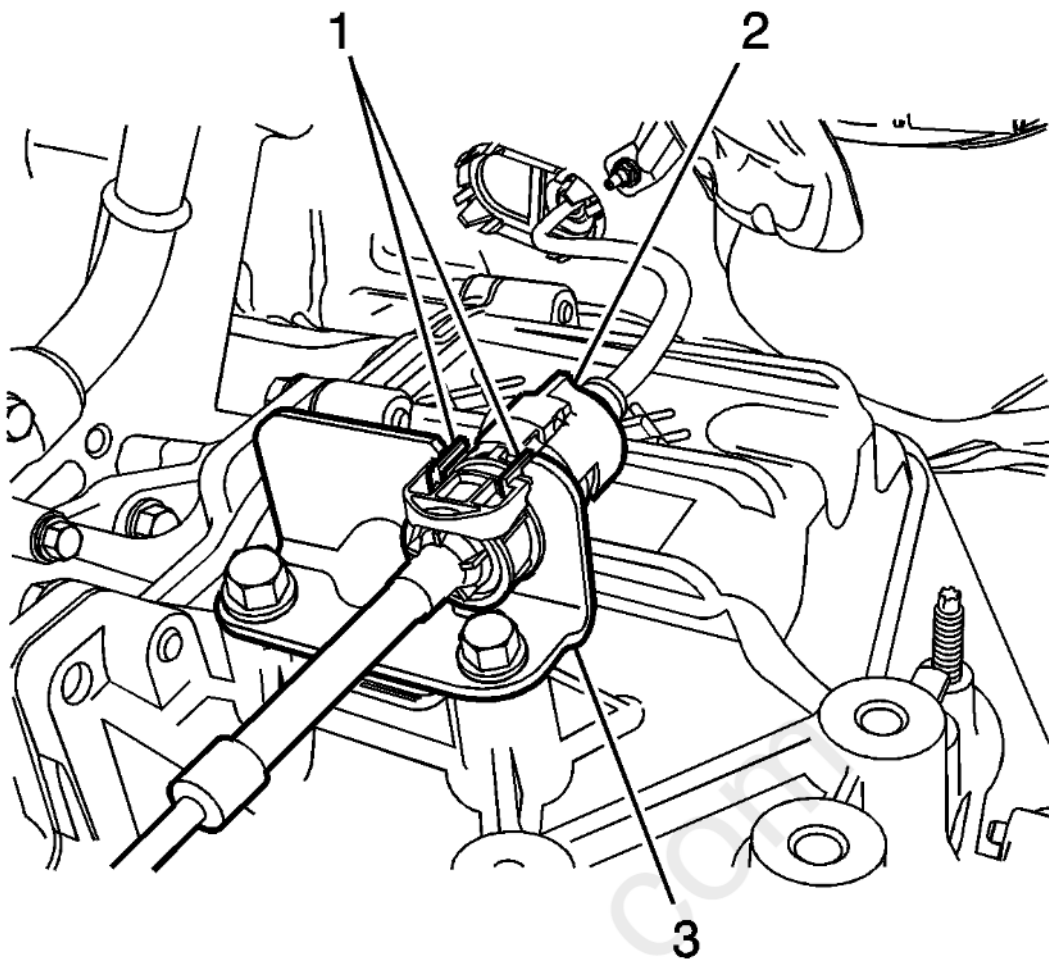


Fig. 15: Transmission Range Selector Lever Cable And Cable Bracket

Courtesy of GENERAL MOTORS COMPANY

4. Press the locking tabs inward (1) in order to release the transmission range selector lever cable (2) from the cable bracket (3).
5. Remove the left front floor console extension panel. Refer to **Front Floor Console Extension Replacement - Left Side**.

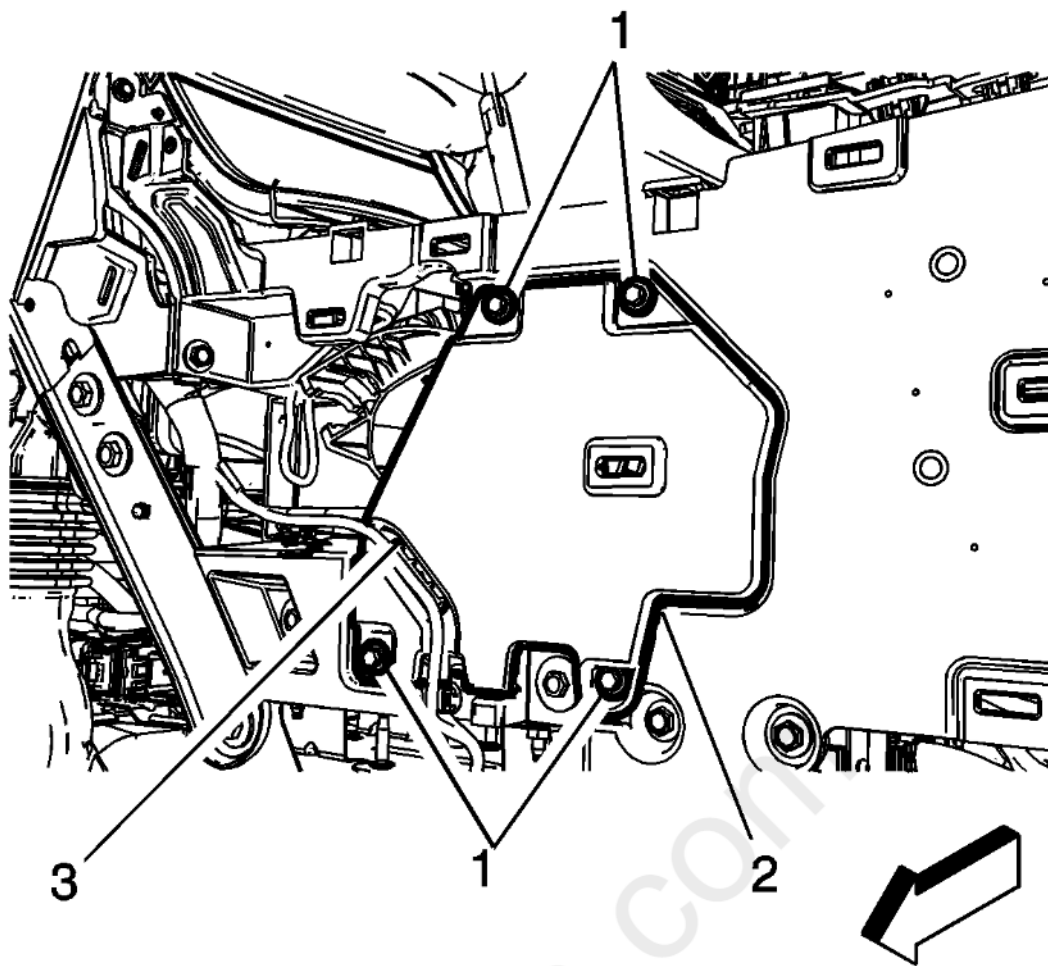


Fig. 16: Access Plate, Fasteners & Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

6. Disconnect the wiring harness (3) from the access plate.
7. Remove the access plate fasteners (1), then the access plate (2) from the console.

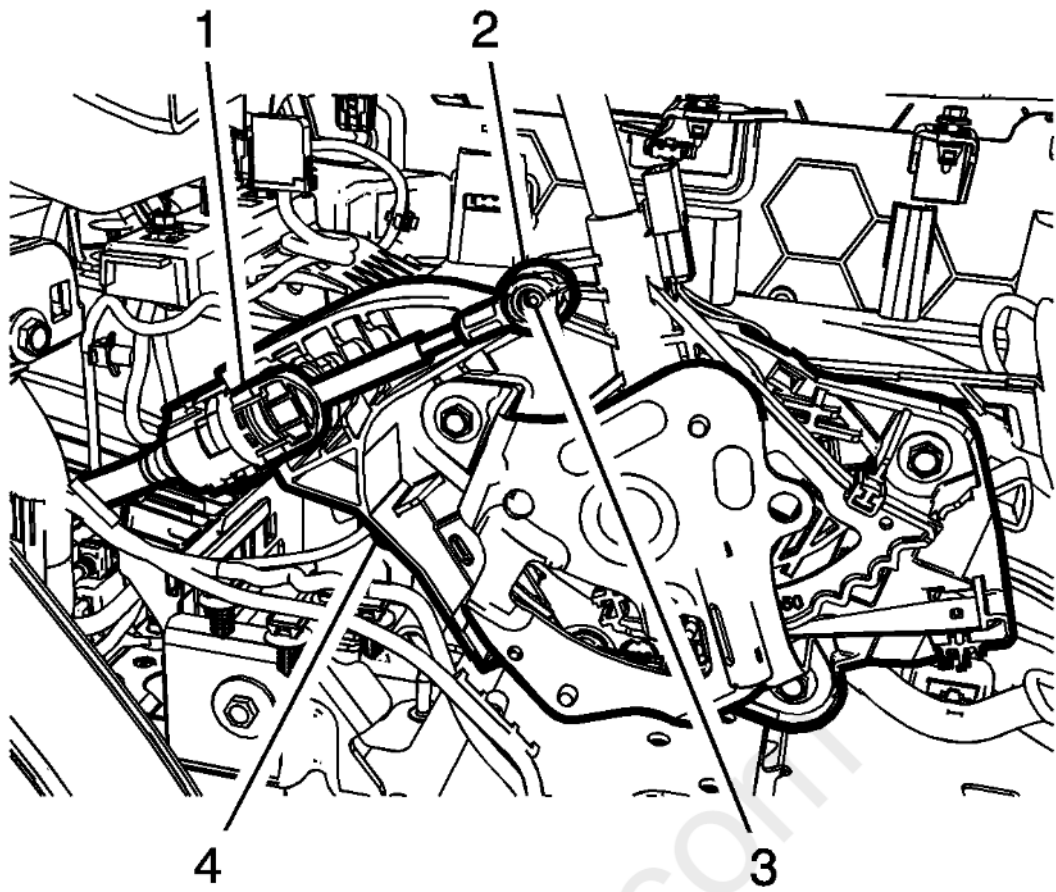


Fig. 17: Range Selector Lever Cable Terminal, Retainer, Shift Lever Pin & Control Lever Base

Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin (3).

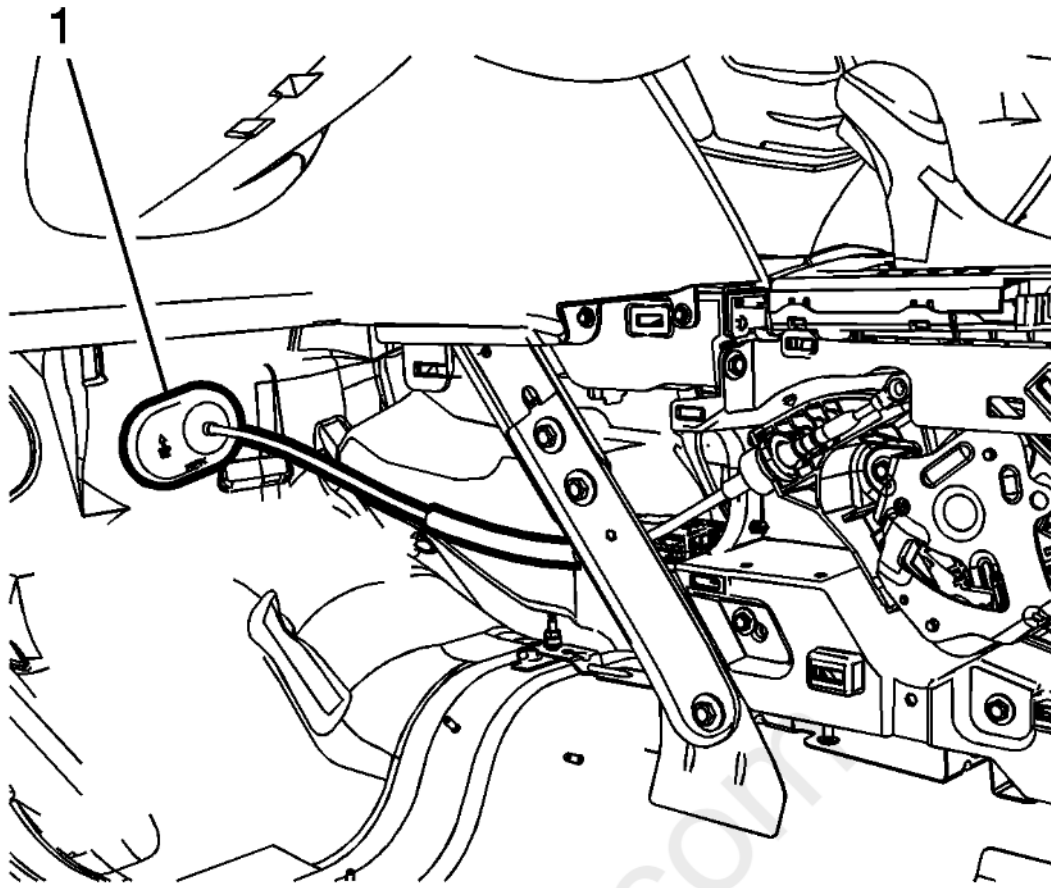


Fig. 18: Transmission Range Selector Lever Cable Grommet
Courtesy of GENERAL MOTORS COMPANY

9. Remove the transmission range selector lever cable grommet (1) from the cowl panel.
10. Remove the transmission range selector lever cable from the vehicle.

Installation Procedure

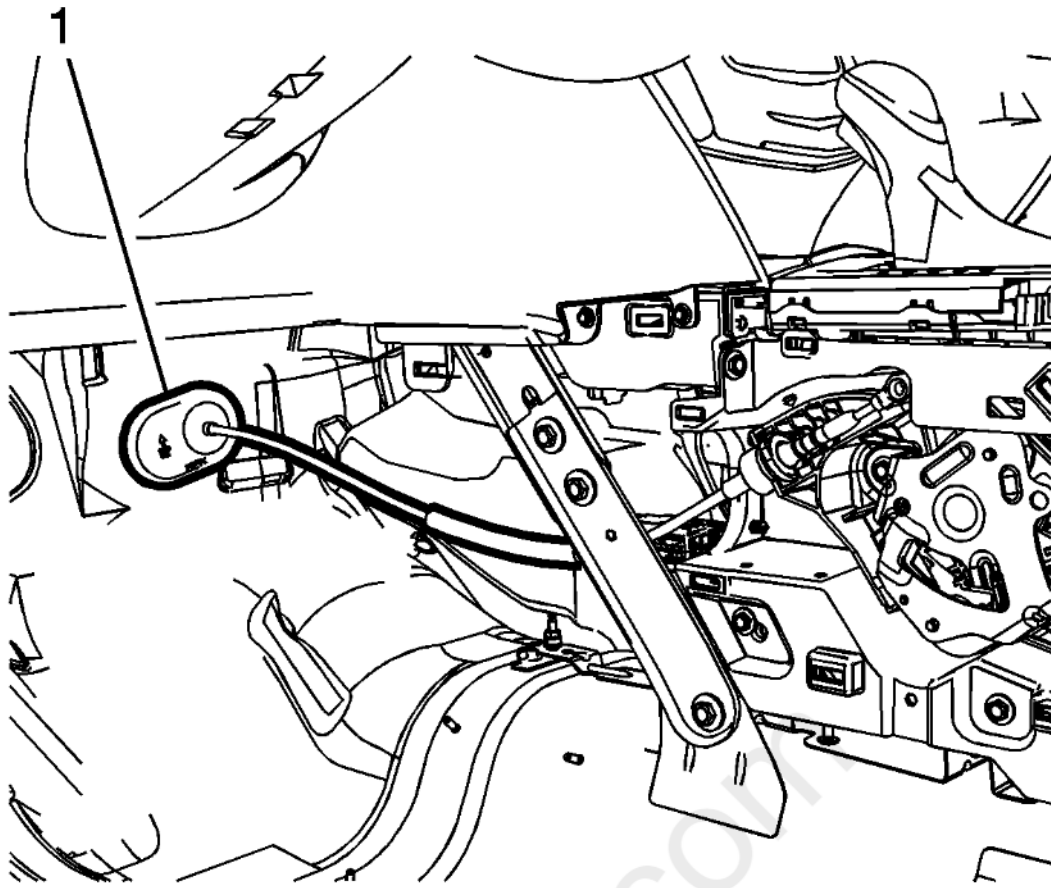


Fig. 19: Transmission Range Selector Lever Cable Grommet

Courtesy of GENERAL MOTORS COMPANY

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

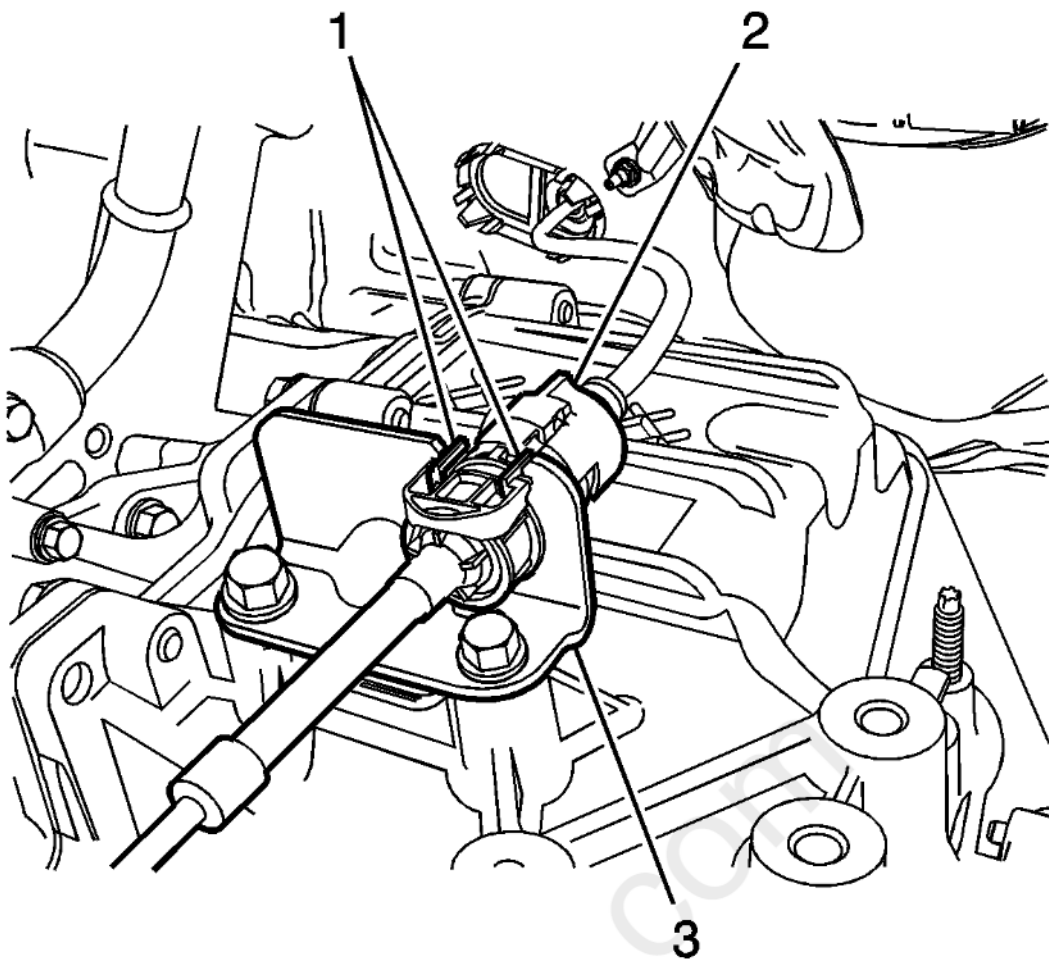


Fig. 20: Transmission Range Selector Lever Cable And Cable Bracket
Courtesy of GENERAL MOTORS COMPANY

Courtesy of GENERAL MOTORS COMPANY

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

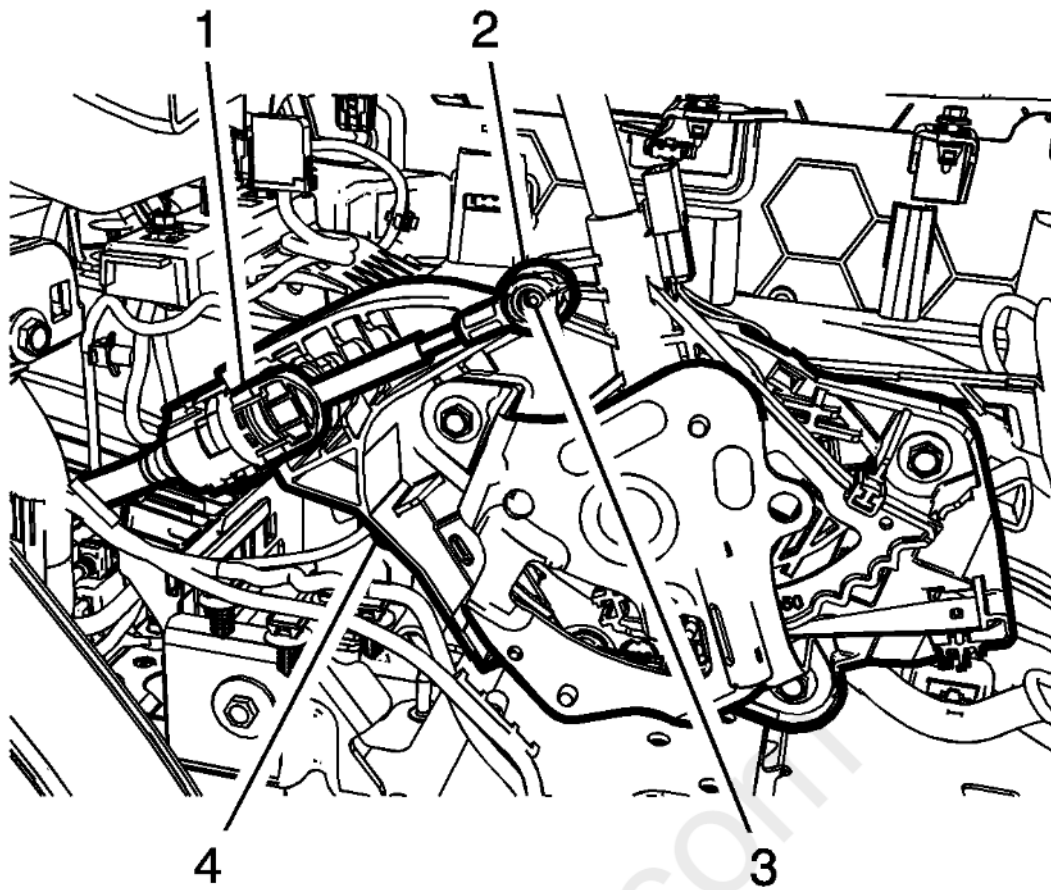


Fig. 21: Range Selector Lever Cable Terminal, Retainer, Shift Lever Pin & Control Lever Base

Courtesy of GENERAL MOTORS COMPANY

4. Install the transmission range selector lever cable retainer (1) to the shift lever base. (4).
5. Ensure the transmission control is in the Park position, then install the transmission range selector lever cable terminal (2) to the shift lever pin (3).

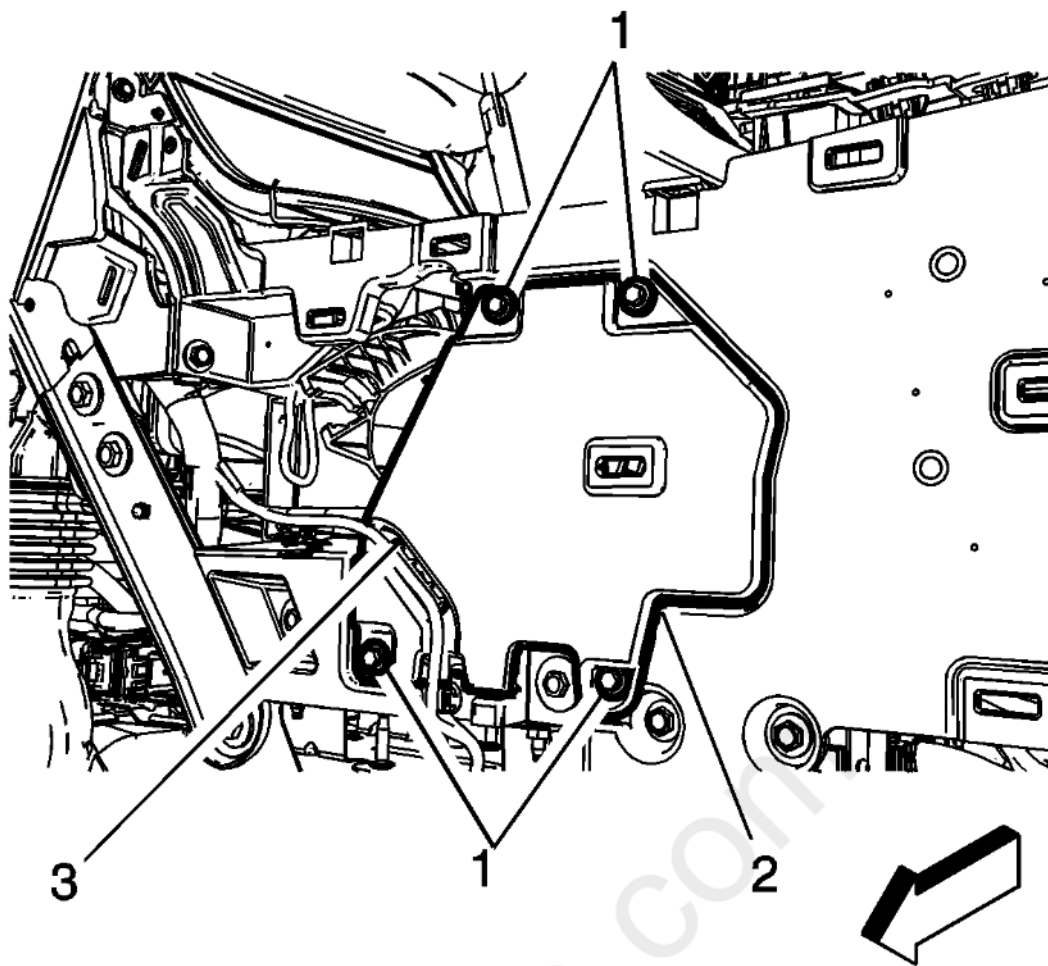


Fig. 22: Access Plate, Fasteners & Wiring Harness

Courtesy of GENERAL MOTORS COMPANY

6. Position the access plate (2) to the console, then install the fasteners (1).
7. Connect the wiring harness (3) to the access plate.

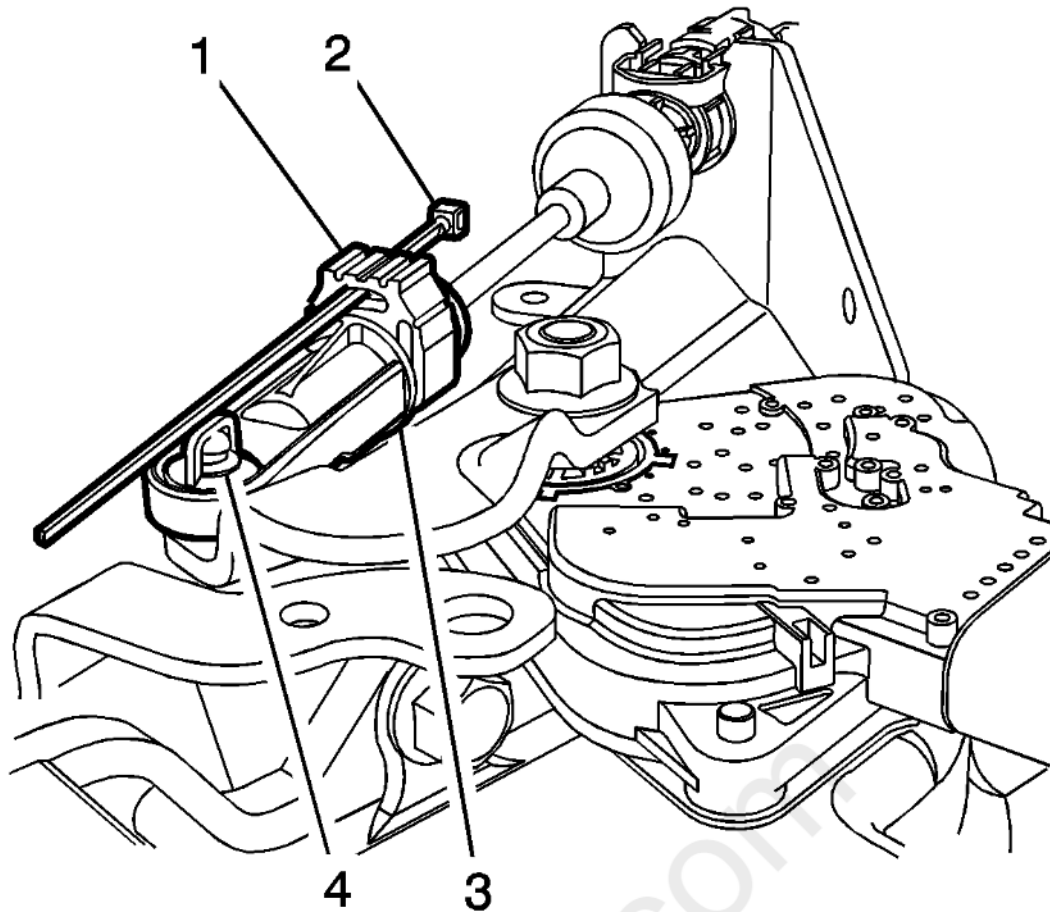


Fig. 23: Range Selector Lever Cable Terminal And Transmission Manual Shift Lever Pin
Courtesy of GENERAL MOTORS COMPANY

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.

8. Connect the transmission range selector lever cable terminal (4) to the transmission manual shift lever pin.

NOTE: Ensure that the shift lever and the transmission control are in the Park positions.

9. Secure the shift cable lock into place. Remove the lock retainer (2), if installing a NEW cable. Ensure that the lock (1) is properly seated.
10. Place the engine control module back to it's installed position. Refer to [Engine Control Module Replacement](#) .
11. Install the left front floor console extension panel. Refer to [Front Floor Console Extension Replacement - Left Side](#) .

RANGE SELECTOR LEVER CABLE ADJUSTMENT

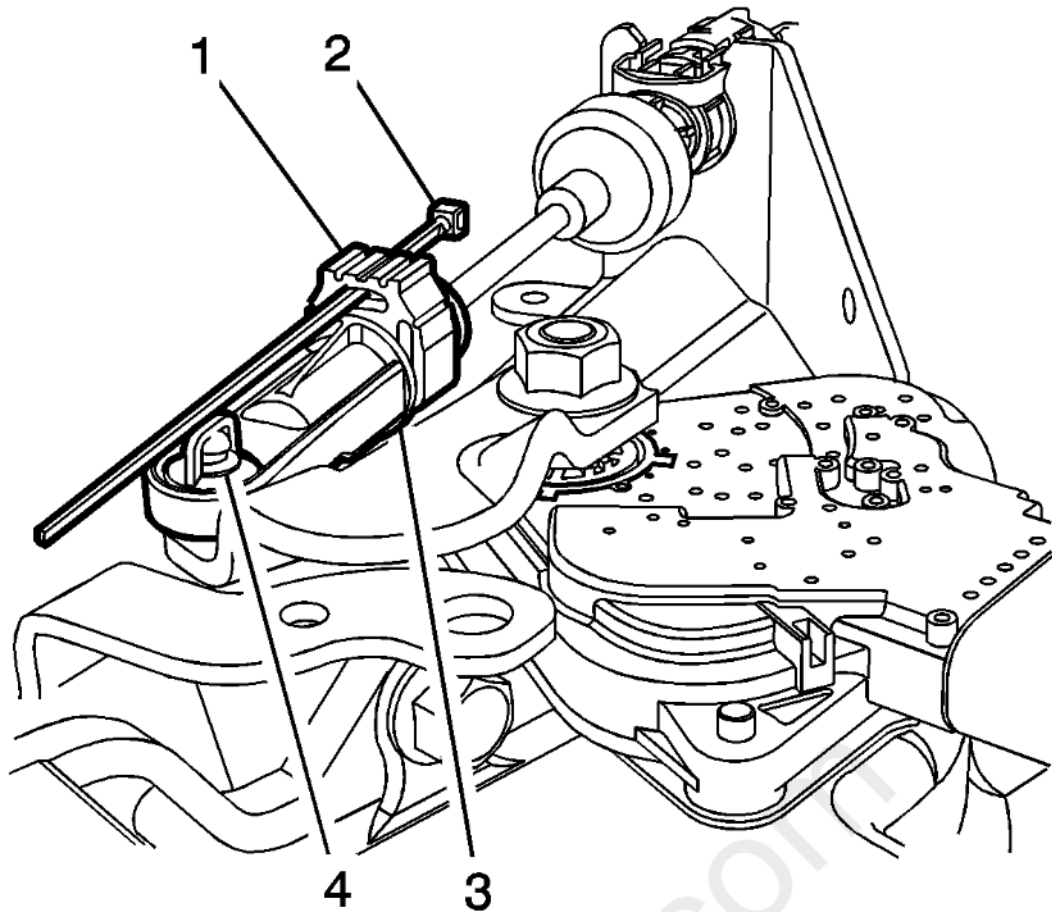


Fig. 24: Range Selector Lever Cable Terminal And Transmission Manual Shift Lever Pin
Courtesy of GENERAL MOTORS COMPANY

NOTE: **NEW CABLE.** To properly ensure the cable is installed correctly, ensure that the transmission shift lever and the transmission control are both in their Park positions. Remove the lock retainer (2) from the shift cable lock. Secure the cable by seating the lock mechanism (2) firmly downward. Ensure that the lock is properly seated.

NOTE: **EXISTING CABLE.** To properly ensure the cable is installed correctly, unlock the shift cable lock, by lifting the lock upward. Ensure that the transmission shift lever and the transmission control are both in their Park positions. Secure the cable by seating the lock mechanism (2) firmly downward. Ensure that the lock is properly seated.

The shift cable on this vehicle does not require an adjustment.

RANGE SELECTOR LEVER CABLE BRACKET REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Reposition the engine control module out of the way without disconnecting the electrical connector(s). Refer to [Engine Control Module Replacement](#) .

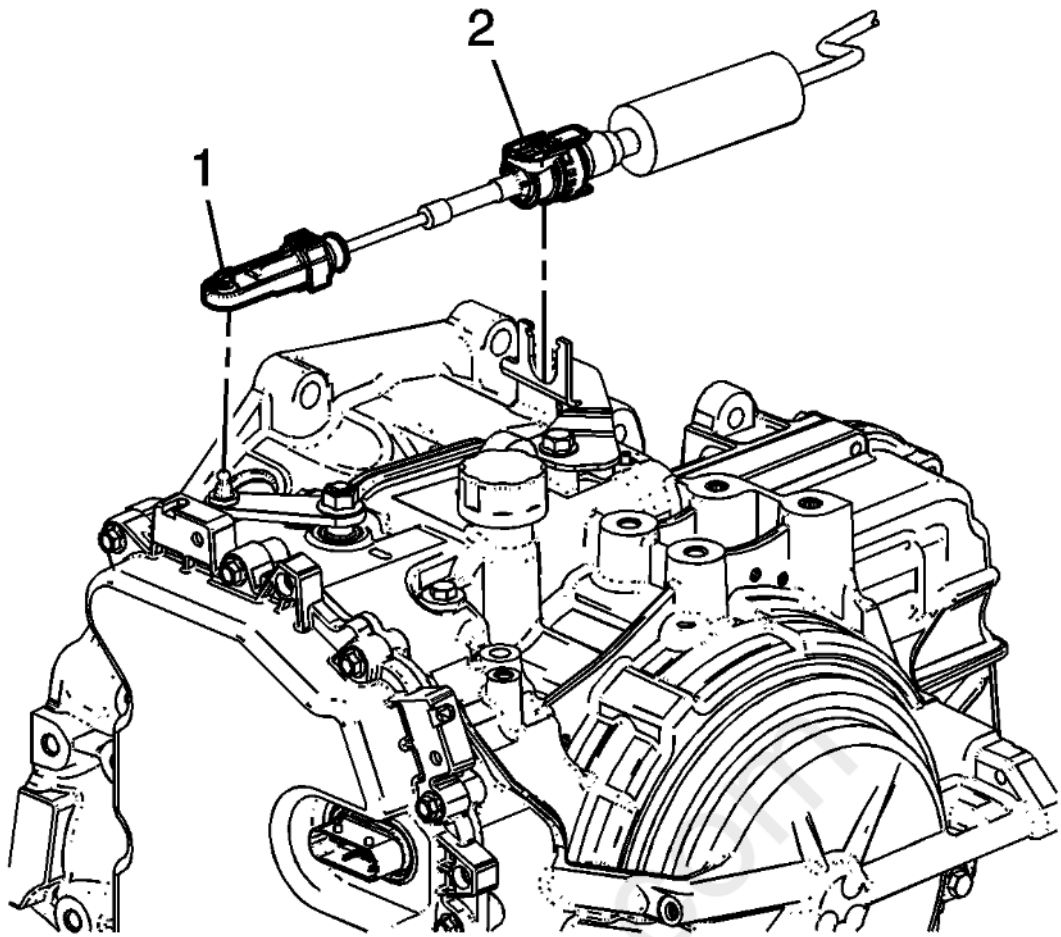


Fig. 25: Transmission Range Selector Lever And Cable Connection

Courtesy of GENERAL MOTORS COMPANY

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

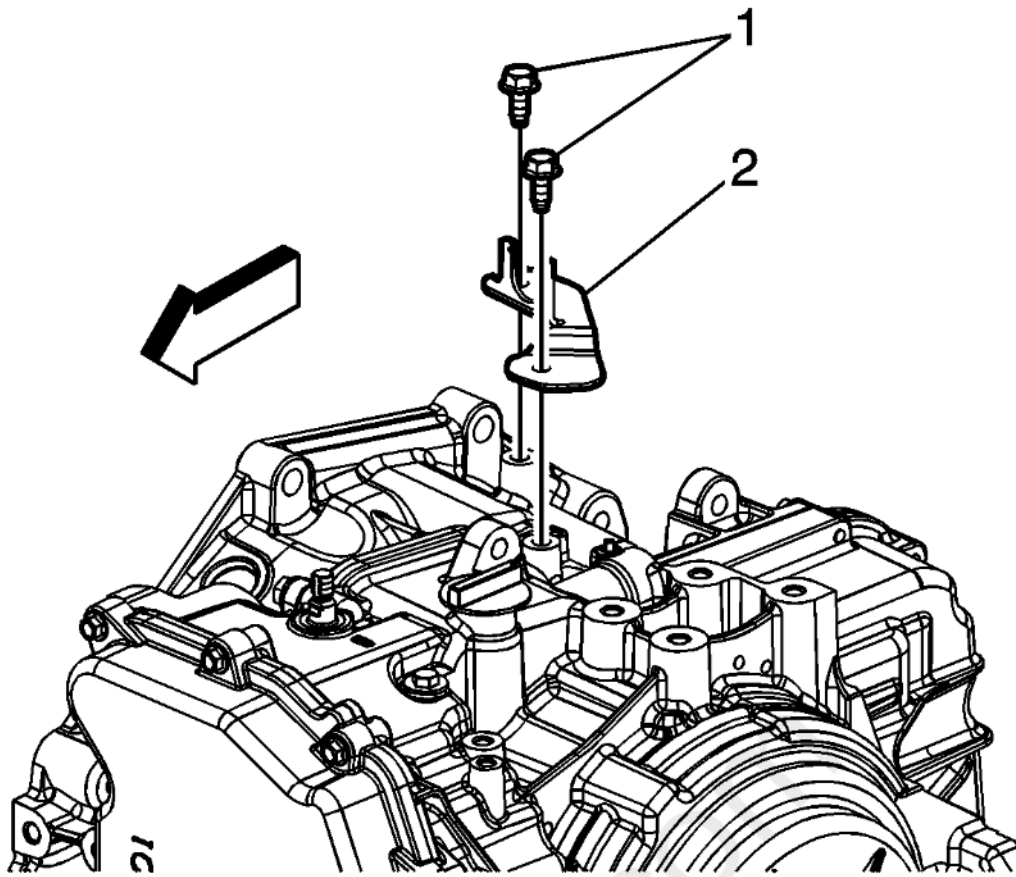


Fig. 26: Selector Cable Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

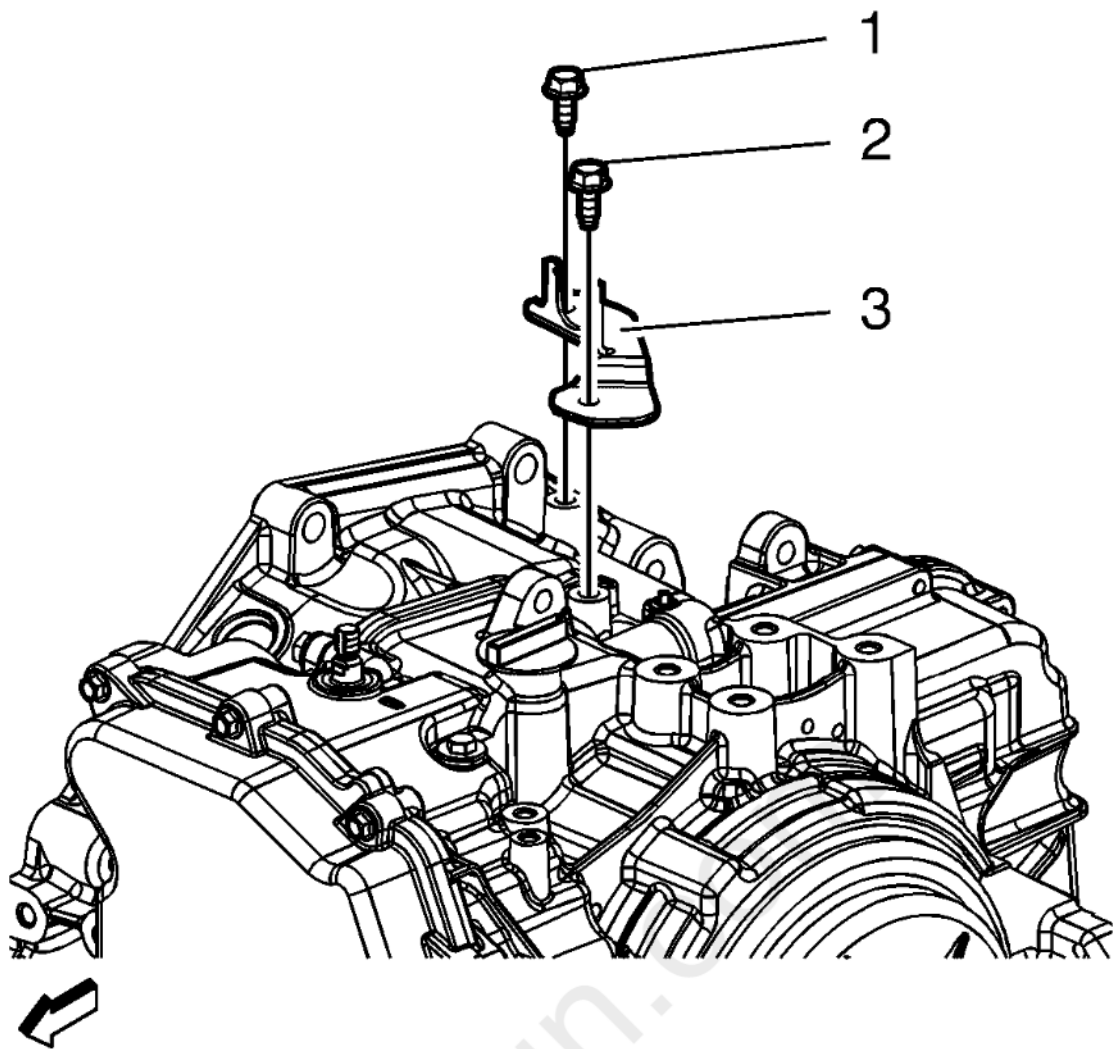


Fig. 27: Transmission Range Selector Cable Bracket And Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the transmission range selector cable bracket (3).

CAUTION: Refer to **Fastener Caution** .

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

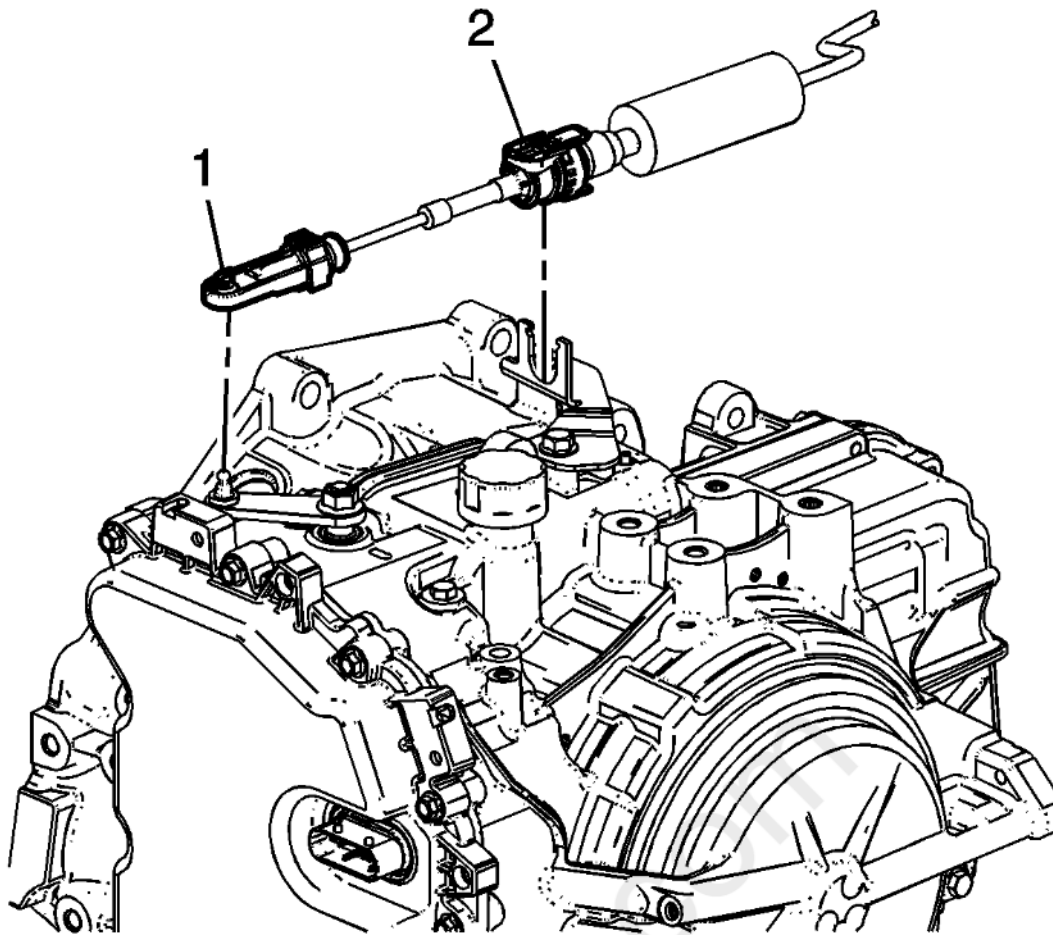


Fig. 28: Transmission Range Selector Lever And Cable Connection

Courtesy of GENERAL MOTORS COMPANY

3. Connect the range selector cable (2) to the range selector cable bracket.
4. Connect the range selector cable end (1) to the range selector lever.
5. Check the range selector cable adjustment. Refer to [Range Selector Lever Cable Adjustment](#).
6. Place the engine control module back to its installed position. Refer to [Engine Control Module Replacement](#).

TRANSMISSION FLUID DRAIN AND FILL

Removal Procedure

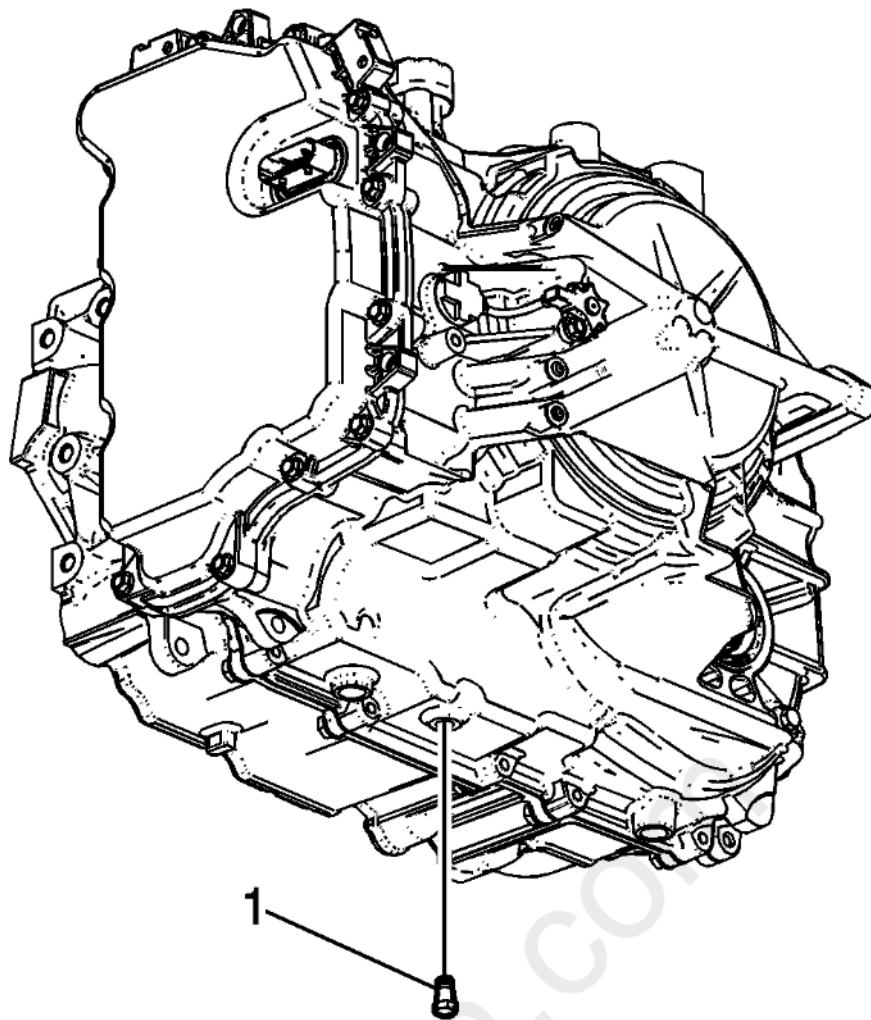


Fig. 29: Fluid Drain Hole Plug

Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the fluid drain plug (1).
3. Drain transmission fluid into a suitable container.

CAUTION: Refer to [Fastener Caution](#) .

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

Installation Procedure

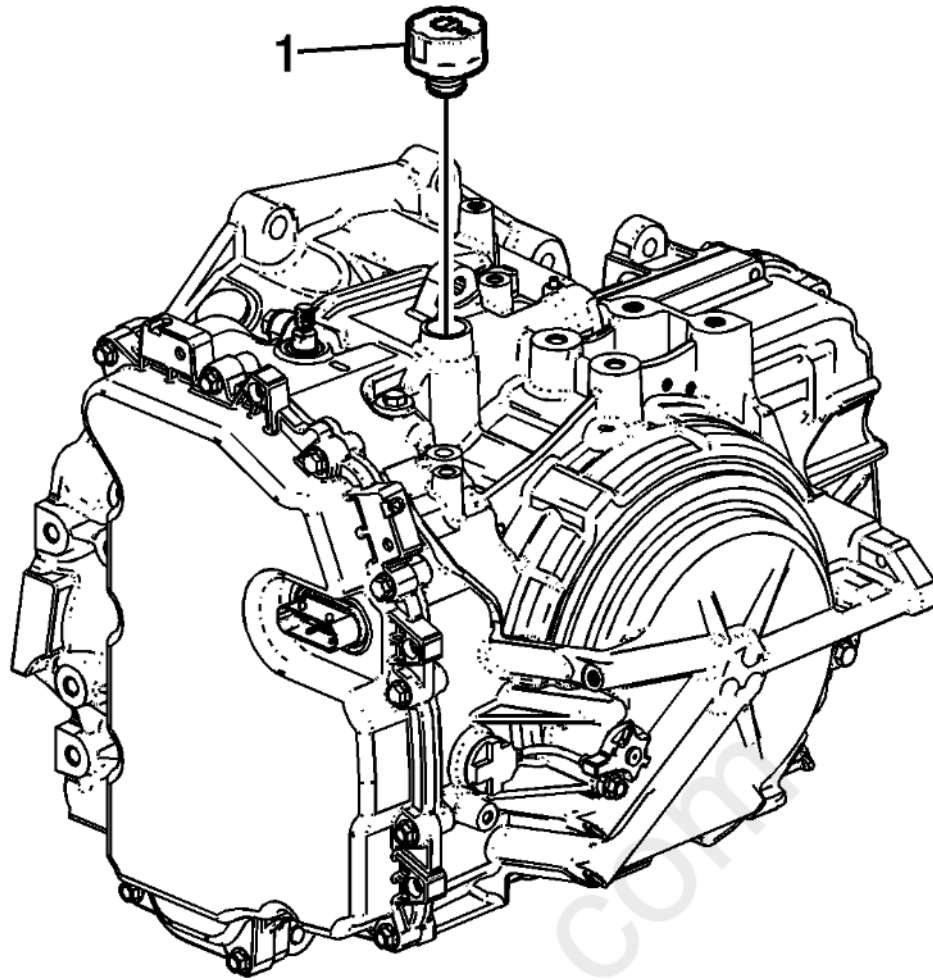


Fig. 30: Fluid Fill Cap

Courtesy of GENERAL MOTORS COMPANY

1. Lower the vehicle.
2. Remove the fluid fill cap (1).
3. Fill the transmission to the proper level with the correct fluid. Refer to **Transmission Fluid Level and Condition Check** , and **Approximate Fluid Capacities** .
4. Install the fluid fill cap (1).

AUXILIARY FLUID ACCUMULATOR REPLACEMENT

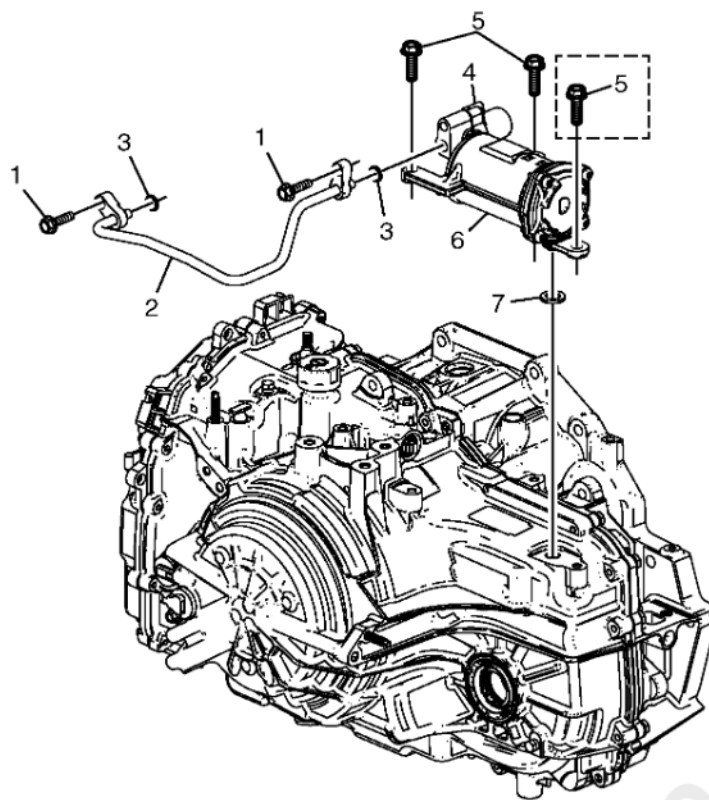


Fig. 31: Auxiliary Fluid Accumulator Components

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Set the park brake and chock the wheels. 2. Remove the battery tray. Refer to Battery Tray Replacement. 3. Disconnect the range selector cable from the range selector lever. Refer to Range Selector Lever Cable Replacement.	
1	A/Trans Auxiliary Fluid Accumulator Pipe Bolt (Qty: 2) NOTE: Check the fluid. Tighten 22 N.m (16 lb ft)
2	A/Trans Auxiliary Fluid Accumulator Pipe Procedure 1. Fasten pipe to auxiliary accumulator and tighten bolt just enough to hold in place. 2. Align pipe to case and tighten bolt just enough to hold in place.
3	A/Trans Auxiliary Fluid Accumulator Pipe Seal (Qty: 2) NOTE: Install a NEW seal.
4	A/Trans Auxiliary Fluid Accumulator Solenoid Connector Procedure Disconnect the connector.

Callout	Component Name
5	A/Trans Auxiliary Fluid Accumulator Bolt (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
6	A/Trans Auxiliary Fluid Accumulator
7	Accumulator Bypass Valve Seal NOTE: Install a NEW seal.

TRANSMISSION FLUID ACCUMULATOR PIPE REPLACEMENT (HYBRID)

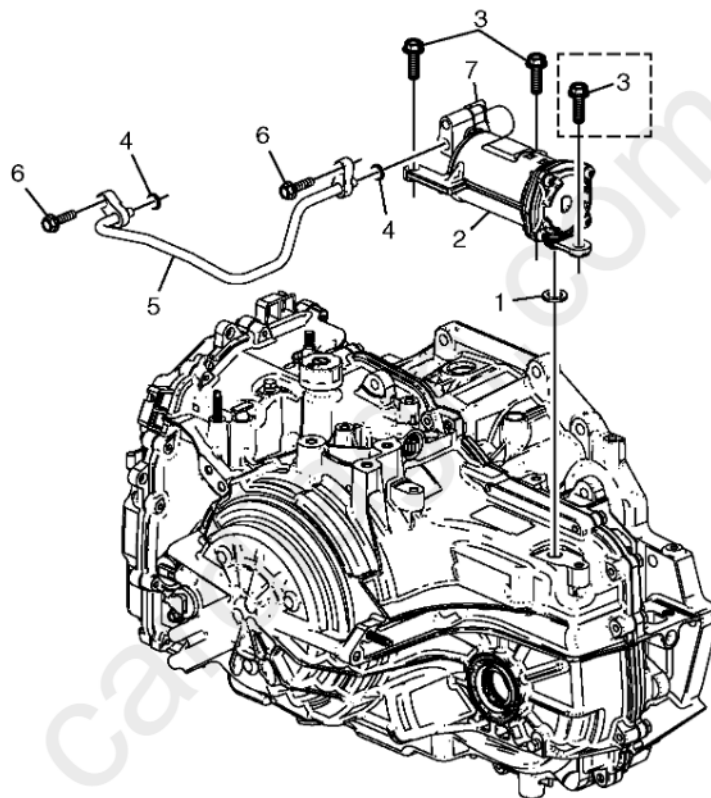


Fig. 32: Transmission Fluid Accumulator Pipe
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the battery tray. Refer to Battery Tray Replacement .	
1	Accumulator Bypass Valve Seal NOTE: Install a NEW seal.
2	A/Trans Auxiliary Fluid Accumulator

Callout	Component Name
3	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 3) CAUTION: Refer to Fastener Caution . Tighten 22 N.m (16 lb ft)
4	A/Trans Fluid Accumulator Pipe Seal (Qty: 2) NOTE: Install NEW seals.
5	A/Trans Fluid Accumulator Pipe
6	A/Trans Auxiliary Fluid Accumulator Bolt M8 x 30 (Qty: 2) Procedure 1. Fasten pipe to accumulator and tighten bolt just enough to hold in place. 2. Align pipe to case and tighten bolt just enough to hold in place. 3. Check the transmission fluid level. Refer to Transmission Fluid Level and Condition Check . Tighten 22 N.m (16 lb ft)
7	A/Trans Auxiliary Fluid Accumulator Solenoid Connector Procedure Connect the connector.

AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

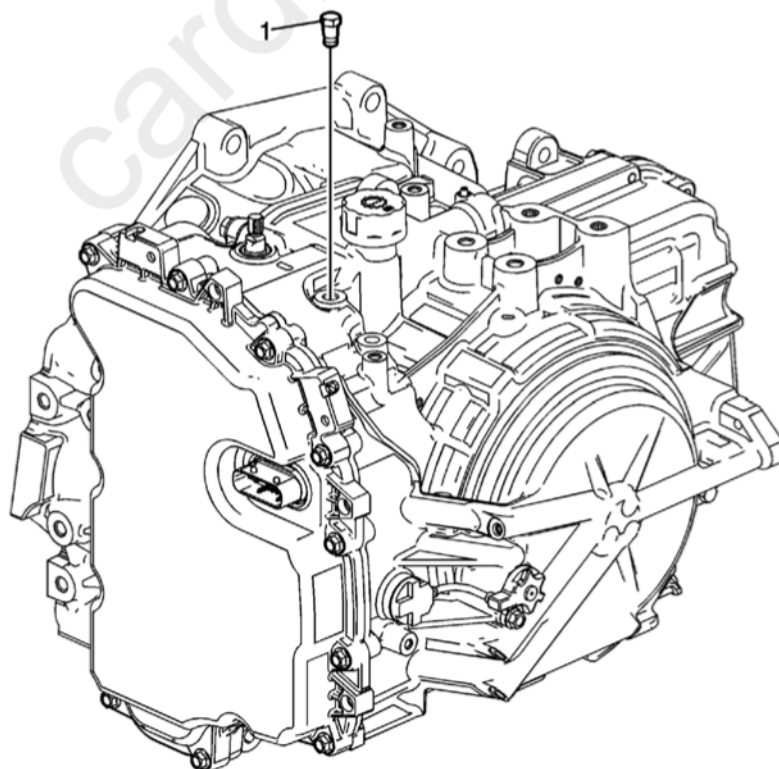


Fig. 33: Automatic Transmission Fluid Pressure Test Hole Plug
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Reposition the engine control module without disconnecting the electrical connectors. Refer to Engine Control Module Replacement .	
1	Fluid Pressure Test Plug CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE

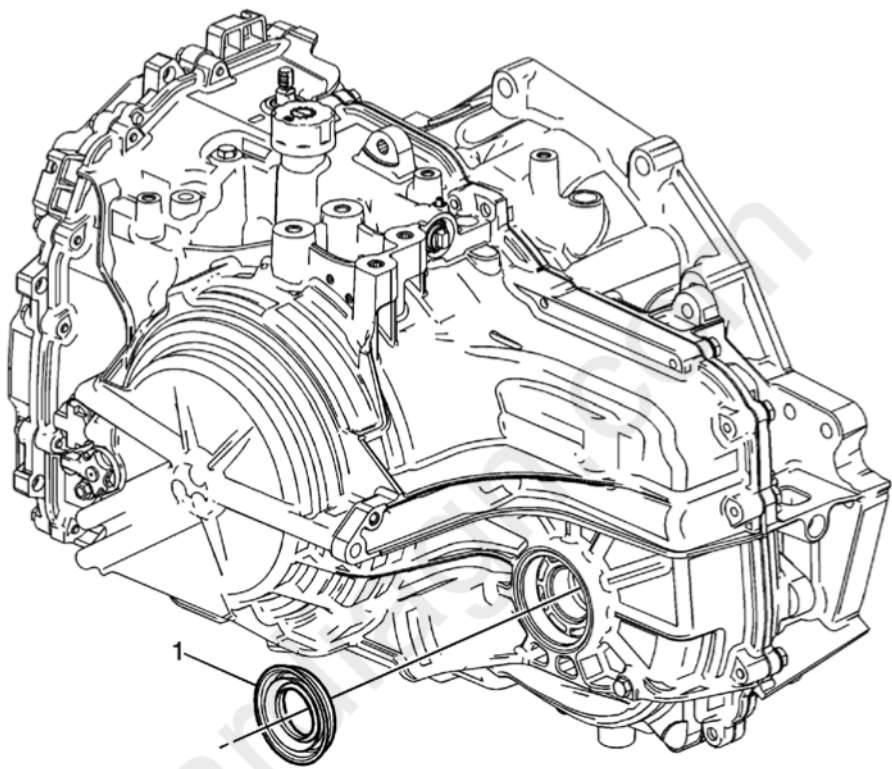


Fig. 34: Front Wheel Drive Shaft Seal - Left Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the left wheel drive shaft. Refer to Front Wheel Drive Shaft Replacement - Left Side .	
Empty space for additional callouts	

Callout	Component Name
	Left Front Wheel Drive Shaft Oil Seal
	NOTE: • For seal removal use GE-6125-B hammer with DT-23129 remover. • For seal installation use GE-8092 handle with DT-47790 installer.
1	Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, refer to Special Tools .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE

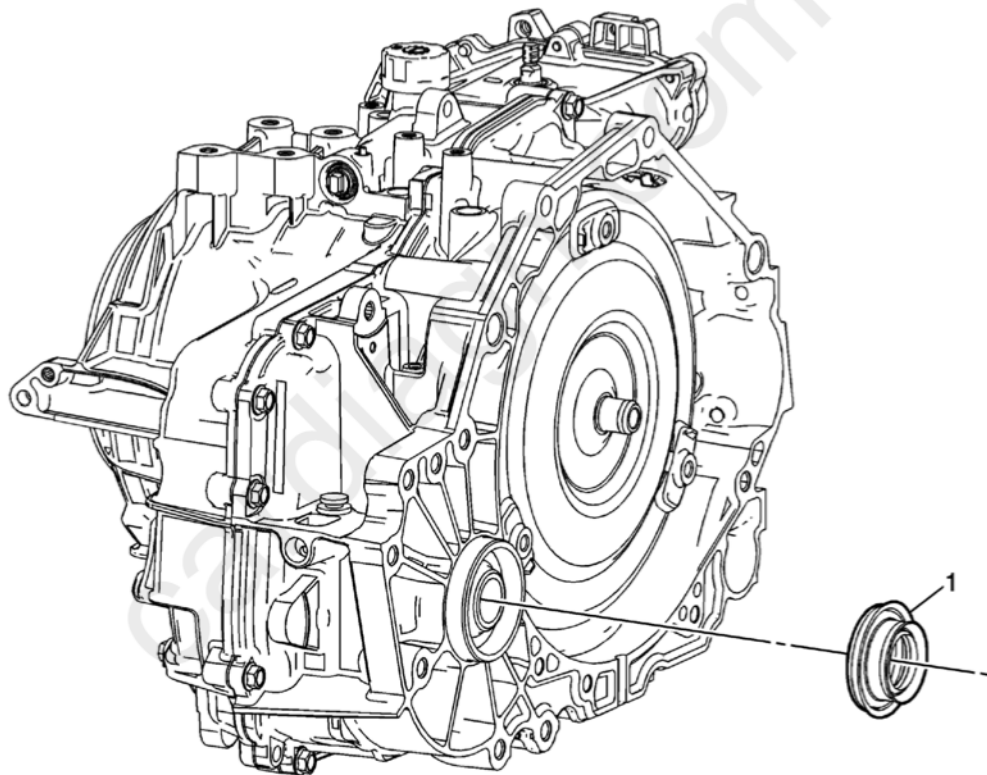


Fig. 35: Front Wheel Drive Shaft Seal - Right Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the intermediate drive shaft. Refer to Front Wheel Drive Intermediate Shaft Replacement (LCV with MHG) .	

Callout	Component Name
1	Right Front Wheel Drive Shaft Oil Seal NOTE: • For seal removal use GE-6125-B hammer with DT-23129 remover. • For seal installation use GE-8092 handle with DT-47790 installer. Special Tools • DT-23129 Universal Seal Remover • DT-47790 Seal Installer • GE-6125-B Slide Hammer • GE-8092 Driver Handle For equivalent regional tools, refer to Special Tools .

MANUAL SHIFT SHAFT AND SEAL REPLACEMENT

Special Tools

- **DT-45201** Cooler Line Seal Remover
- **DT-46626** Seal Installer

For equivalent regional tools, refer to [Special Tools](#) .

Removal Procedure

1. Remove the manual shaft and position switch assembly. Refer to [Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement](#).

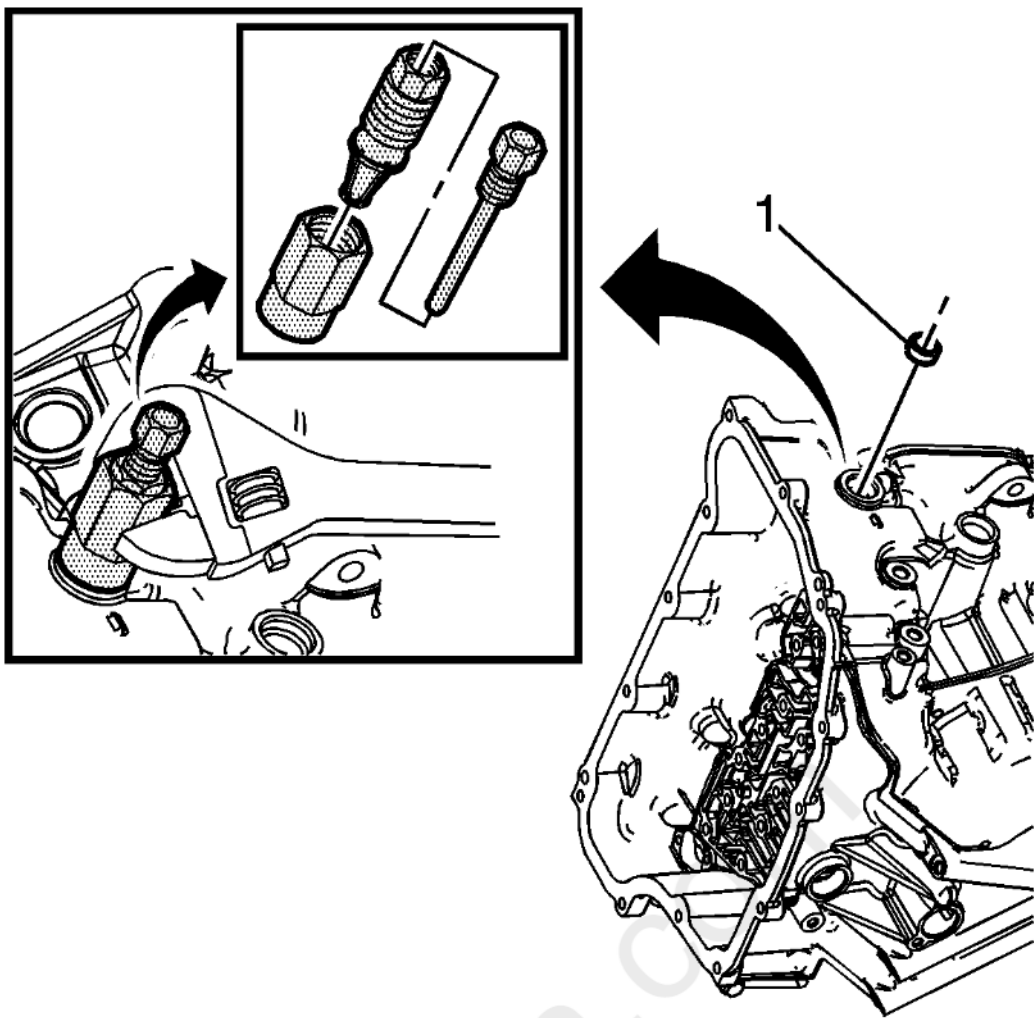


Fig. 36: Manual Shaft Seal And Special Tool
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

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

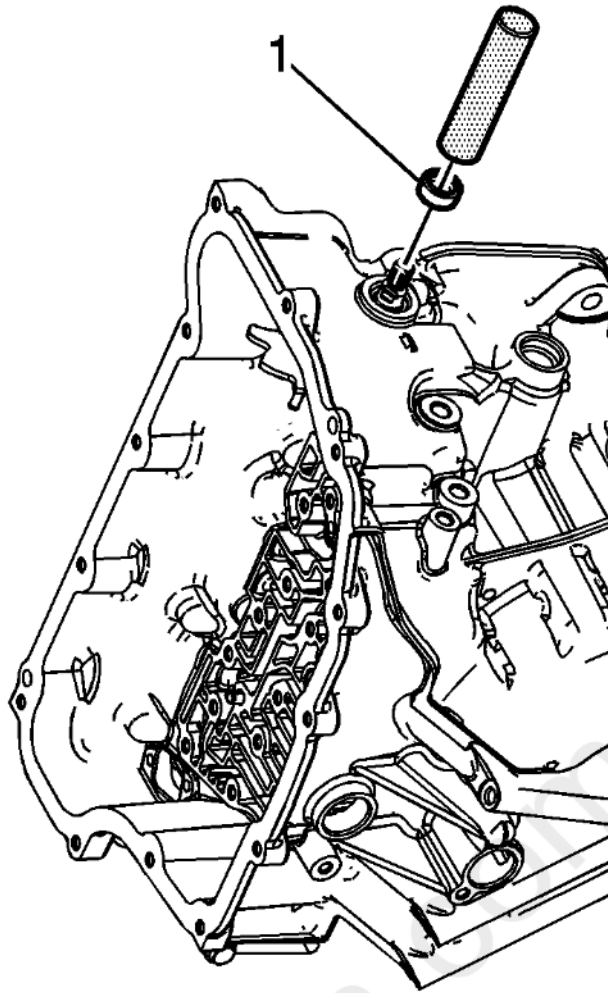


Fig. 37: Manual Shaft Seal And Special Tool
Courtesy of GENERAL MOTORS COMPANY

2. Install the manual shaft seal (1) using **DT-46626** installer.

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the transmission control valve body cover. Refer to **Control Valve Body Cover Replacement**.

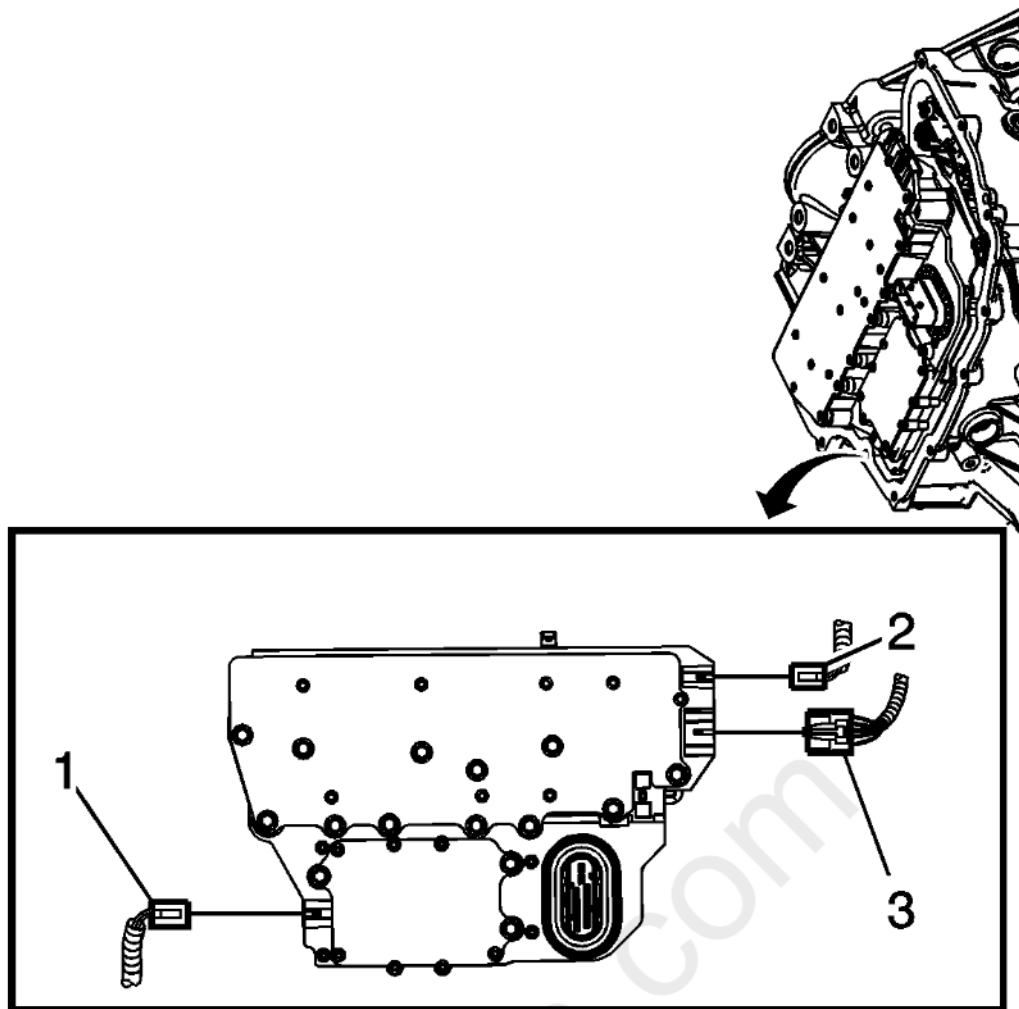


Fig. 38: Speed Sensor And Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS COMPANY

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

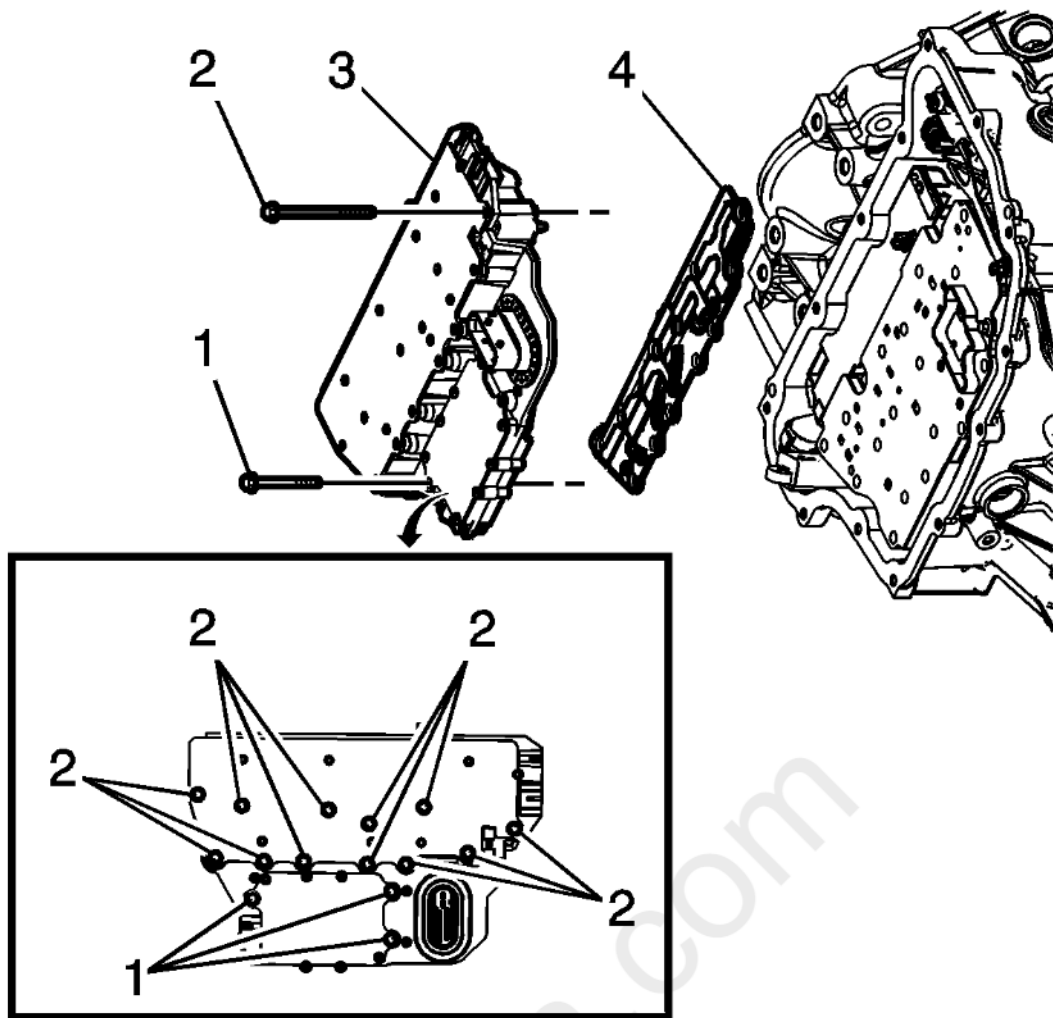


Fig. 39: Control Valve Body And Bolts

Courtesy of GENERAL MOTORS COMPANY

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

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

8. Remove the control solenoid valve assembly filter plate (4). Discard the filter plate. It is not reusable.
9. Inspect the pressure switch seals for damage or contamination. Replace the control solenoid valve assembly as necessary.
10. Inspect the channel plate bolt pass through holes for damage or burnelling. Any damage could cause leaking. Replace as necessary.

Installation Procedure

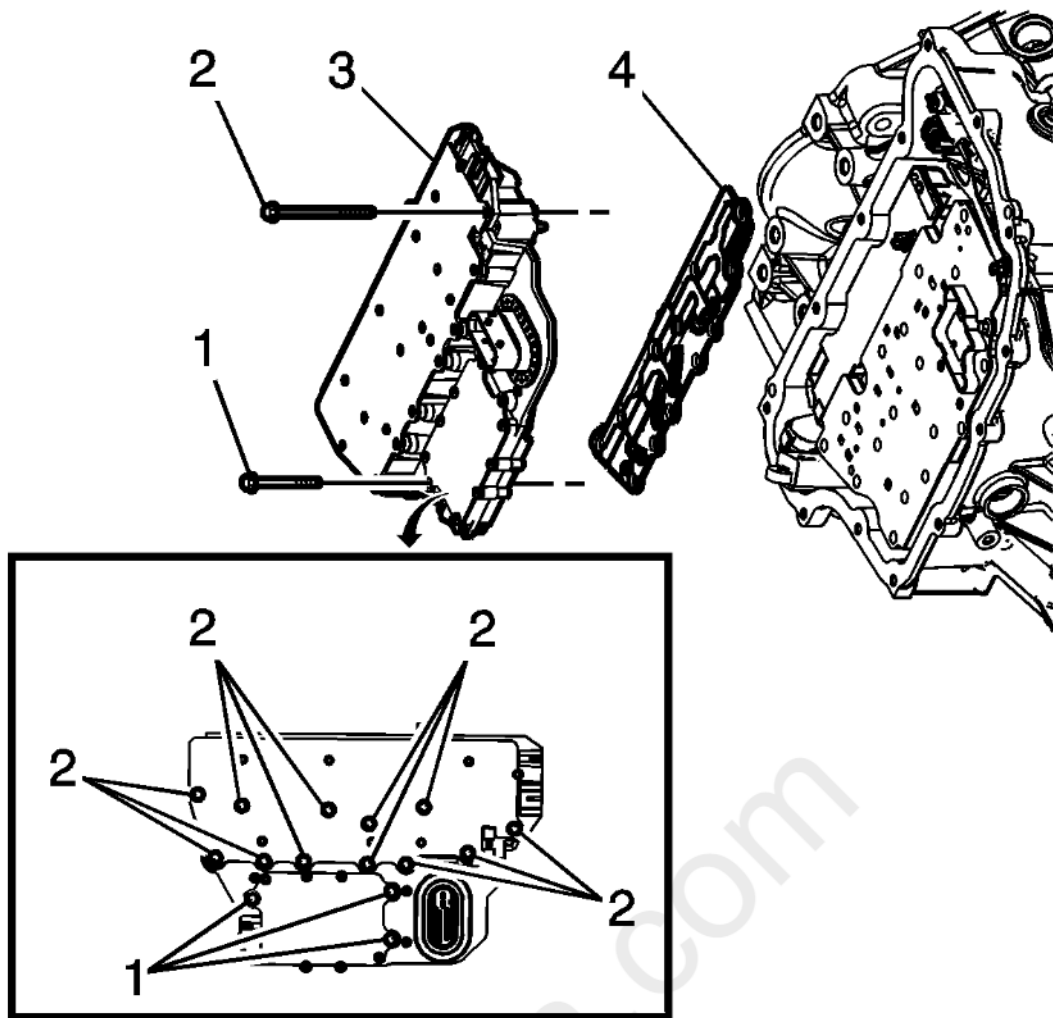


Fig. 40: Control Valve Body And Bolts

Courtesy of GENERAL MOTORS COMPANY

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

1. Install a NEW control solenoid valve assembly filter plate (4) to prevent fluid leaks past the fluid seals.
2. Install the control solenoid valve assembly (3) with transmission control module.
3. Hand start the control valve body bolts (1, 2).

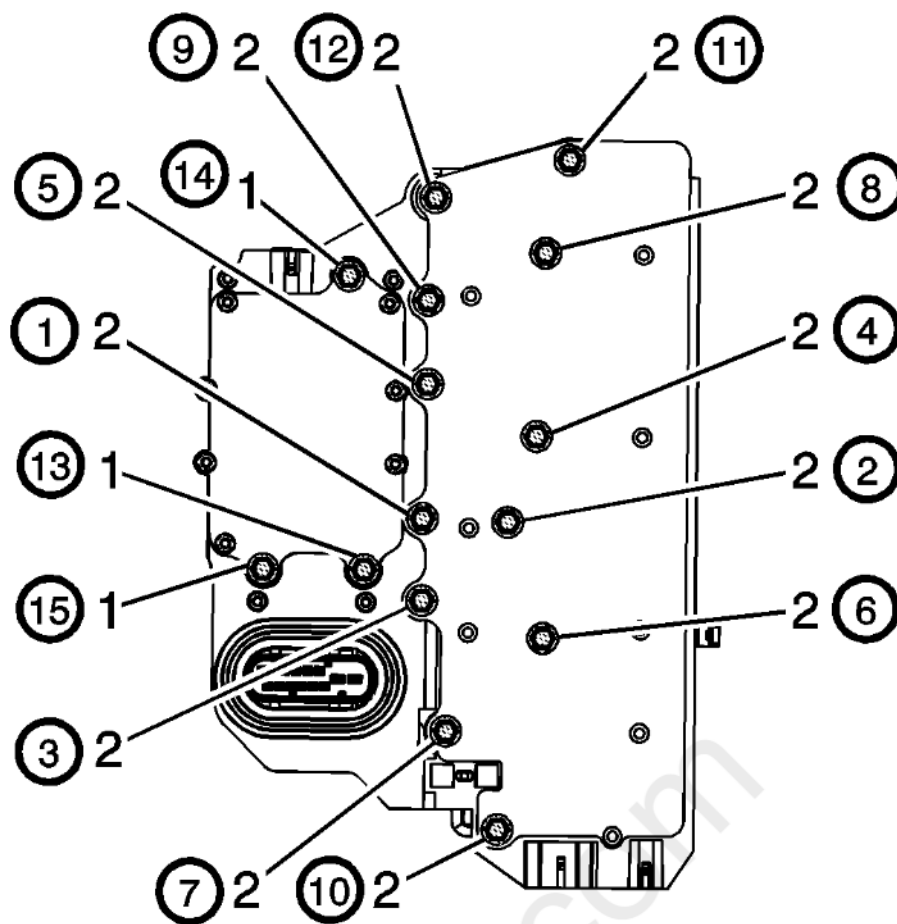


Fig. 41: Control Valve Body Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

4. Secure the 12 control valve body bolts (2) M6 x 97 and tighten in sequence to 10 N.m (89 lb in).
5. Secure the 3 control valve body bolts (1) M5 x 40.5 and tighten in sequence to 8 N.m (71 lb in).

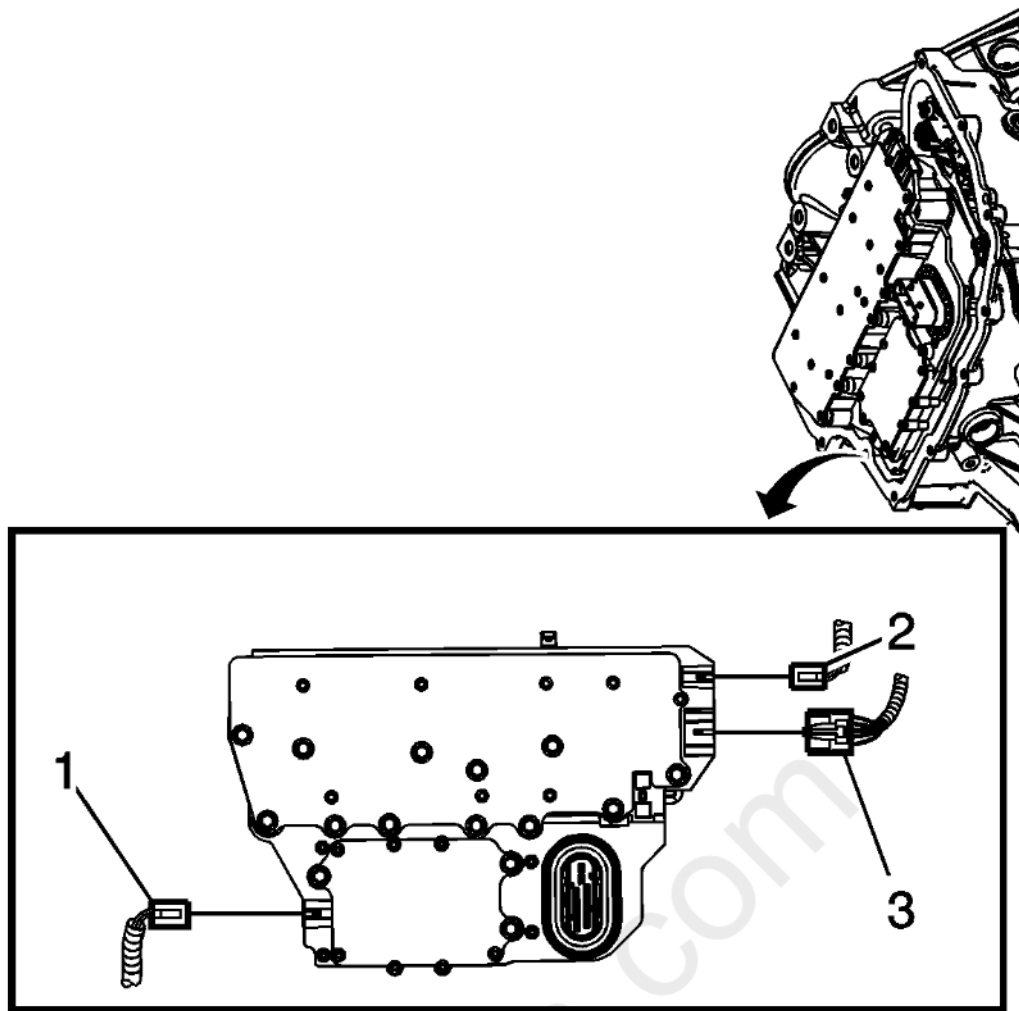


Fig. 42: Speed Sensor And Shift Position Switch Electrical Connectors

Courtesy of GENERAL MOTORS COMPANY

6. Connect the input speed sensor electrical connector (1).
7. Connect the output speed sensor electrical connector (2).
8. Connect the shift position switch electrical connector (3).
9. Install the transmission control valve body cover. Refer to [Control Valve Body Cover Replacement](#).
10. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to [Control Solenoid Valve and Transmission Control Module Assembly Programming and Setup \(6T30/6T40/6T45/6T50\)](#).

NOTE: The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

11. Perform the Transmission Adaptive Values Learn procedure. Refer to [Transmission Adaptive Values Learn](#).

CONTROL VALVE BODY COVER REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#) .

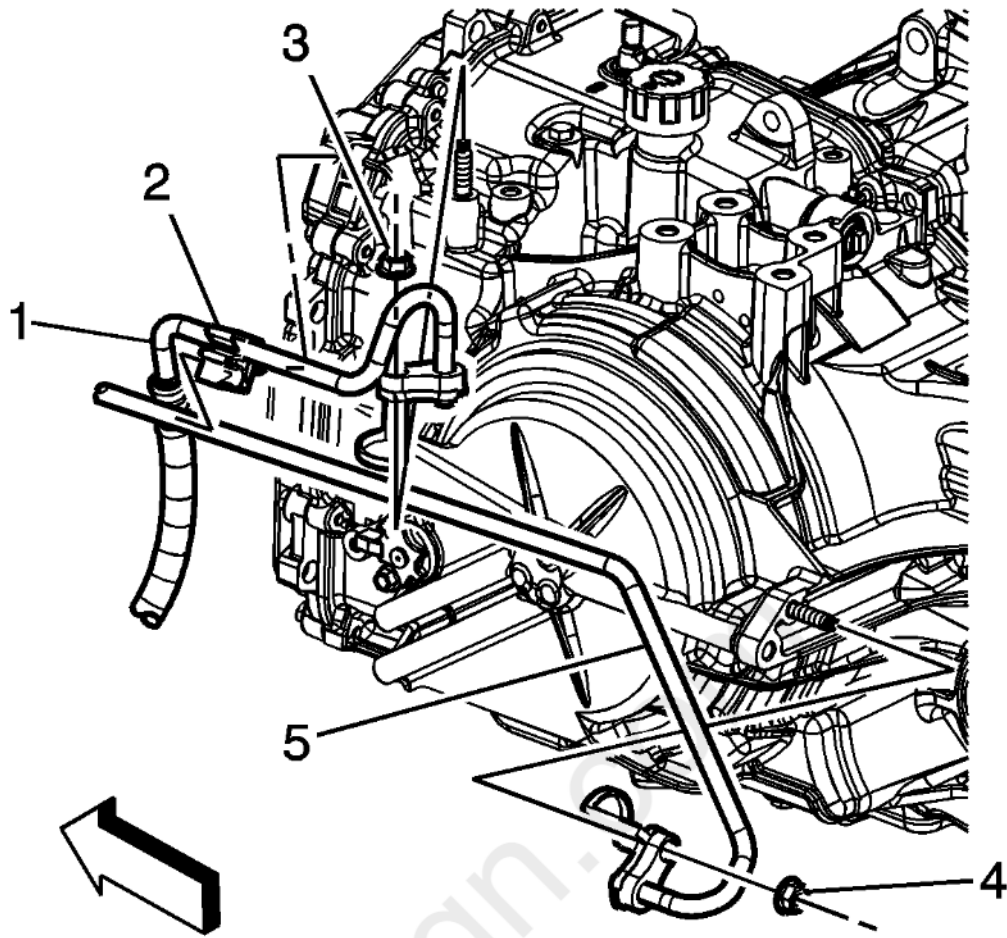


Fig. 43: Fluid Cooler Inlet Hose, Outlet Hose, Retainer And Nuts

Courtesy of GENERAL MOTORS COMPANY

2. Remove the oil cooler inlet (1) and outlet (5) hoses from the retainer (2) on the control valve body cover.
3. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
4. Remove the front transmission mount. Refer to [Transmission Front Mount Replacement](#).
5. Drain the transmission. Refer to [Transmission Fluid Drain and Fill](#).

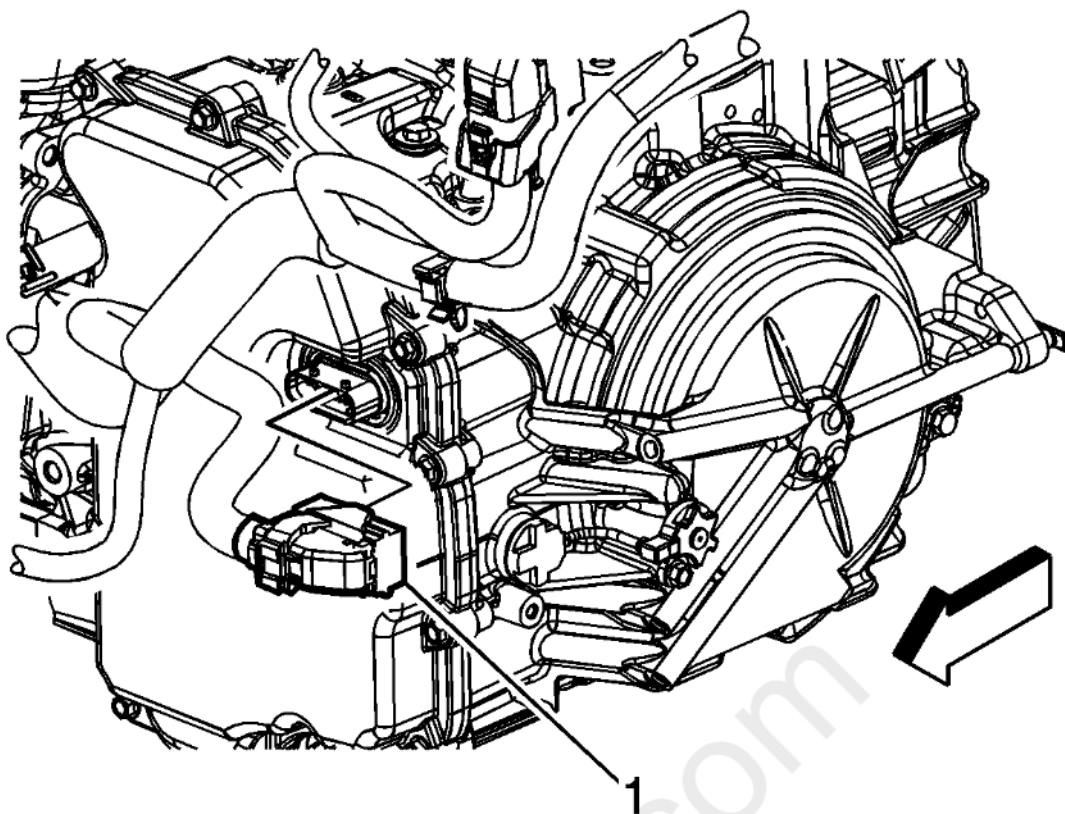


Fig. 44: Control Valve Body Transmission Control Module (TCM) Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

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

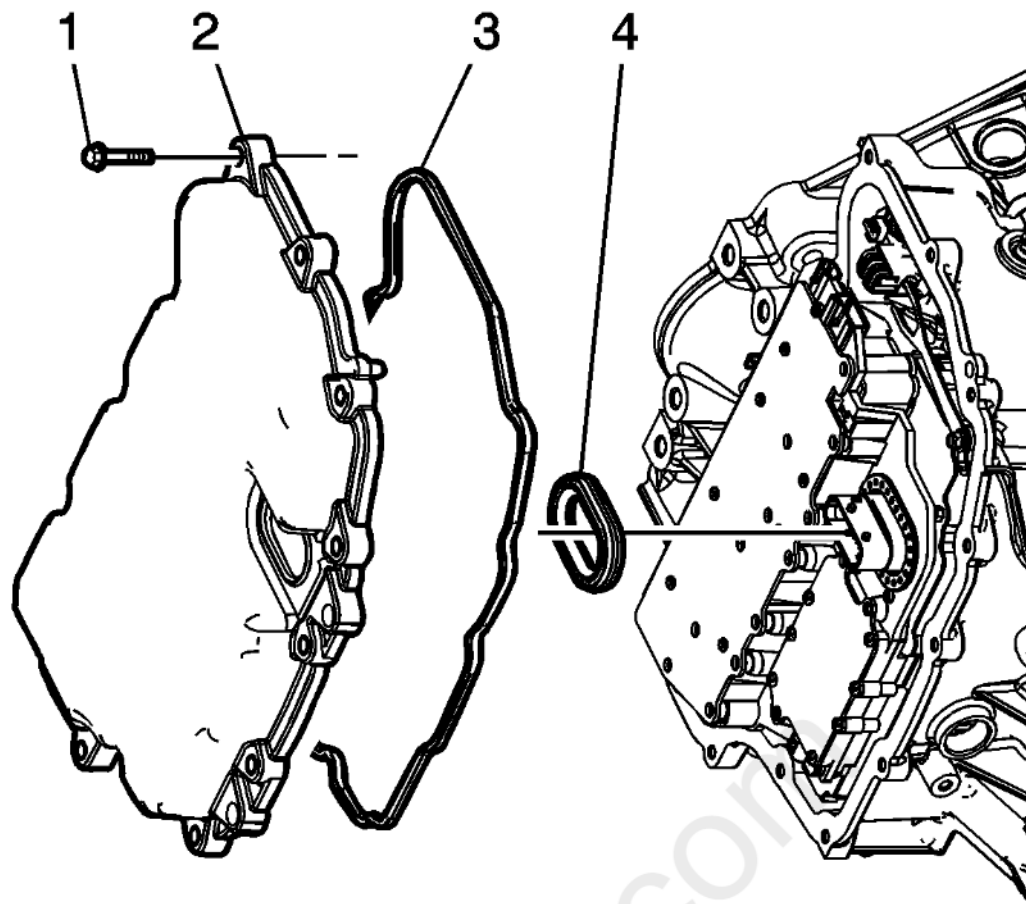


Fig. 45: Control Valve Body Cover Components
 Courtesy of GENERAL MOTORS COMPANY

7. Remove the control valve body cover bolts (1).
8. Support the transmission with a transmission jack.
9. Using the transmission jack raise the transmission to gain clearance for removal of the control valve body cover.
10. Remove the control valve body cover.
11. Remove the control valve body cover gasket.

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

12. Remove the control valve body cover wiring connector hole seal.
13. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

Installation Procedure

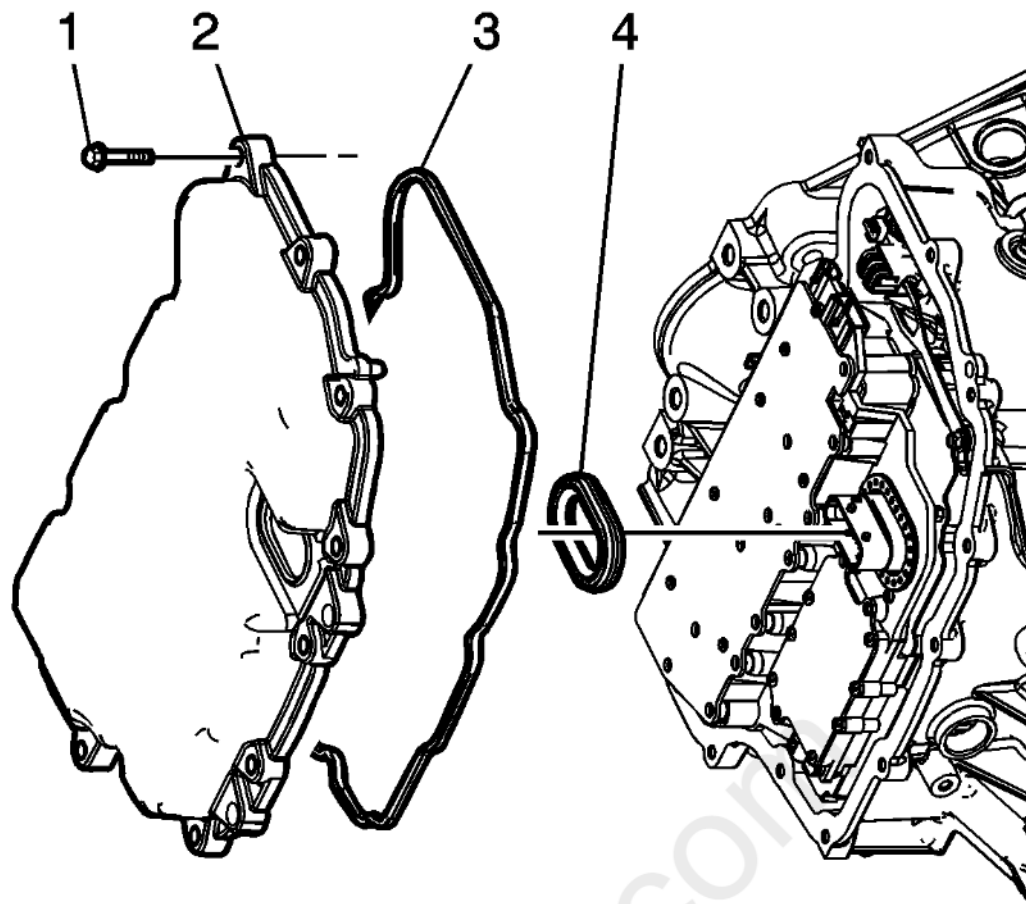


Fig. 46: Control Valve Body Cover Components

Courtesy of GENERAL MOTORS COMPANY

1. Install the control valve body cover wiring connector hole seal (4).
2. Install the control valve body cover gasket (3) to the control valve body cover.
3. Install the control valve body cover (2).
4. Lower the transmission and remove the transmission jack.
5. Hand start the control valve body cover bolts (1).

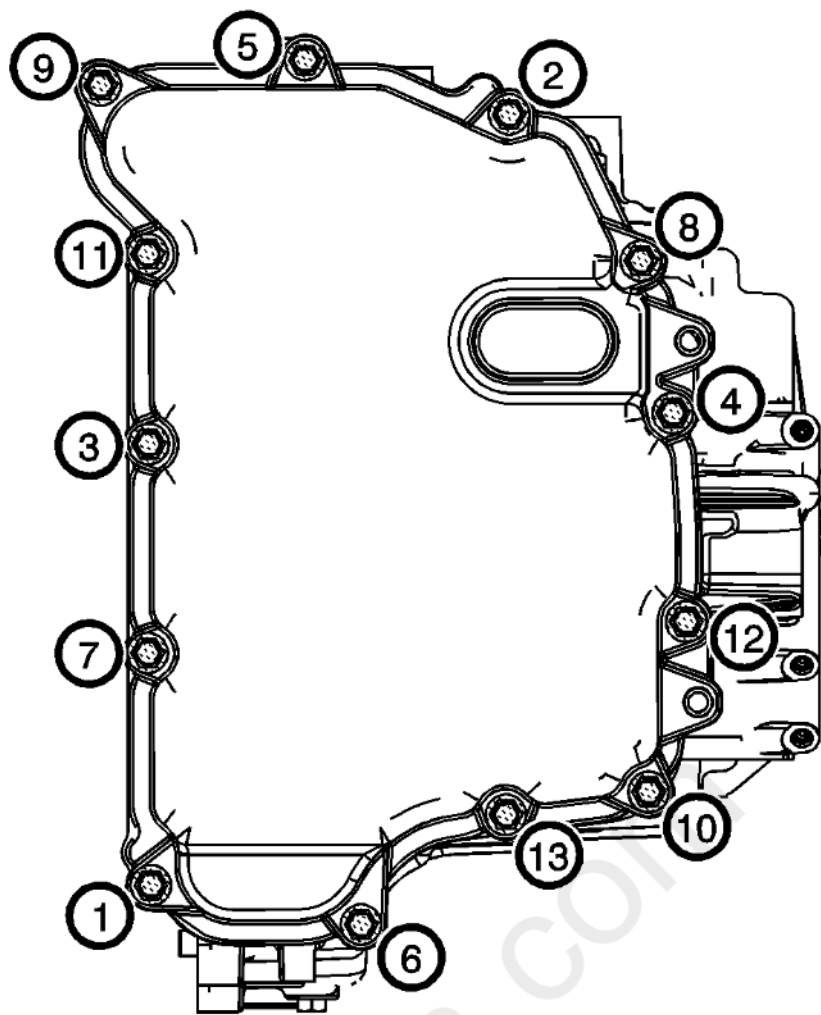


Fig. 47: Control Valve Body Cover Bolt Tightening Sequence

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to [Fastener Caution](#) .

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

6. Install the control valve body cover bolts. Tighten the bolts in sequence to 12 N.m (106 lb in).

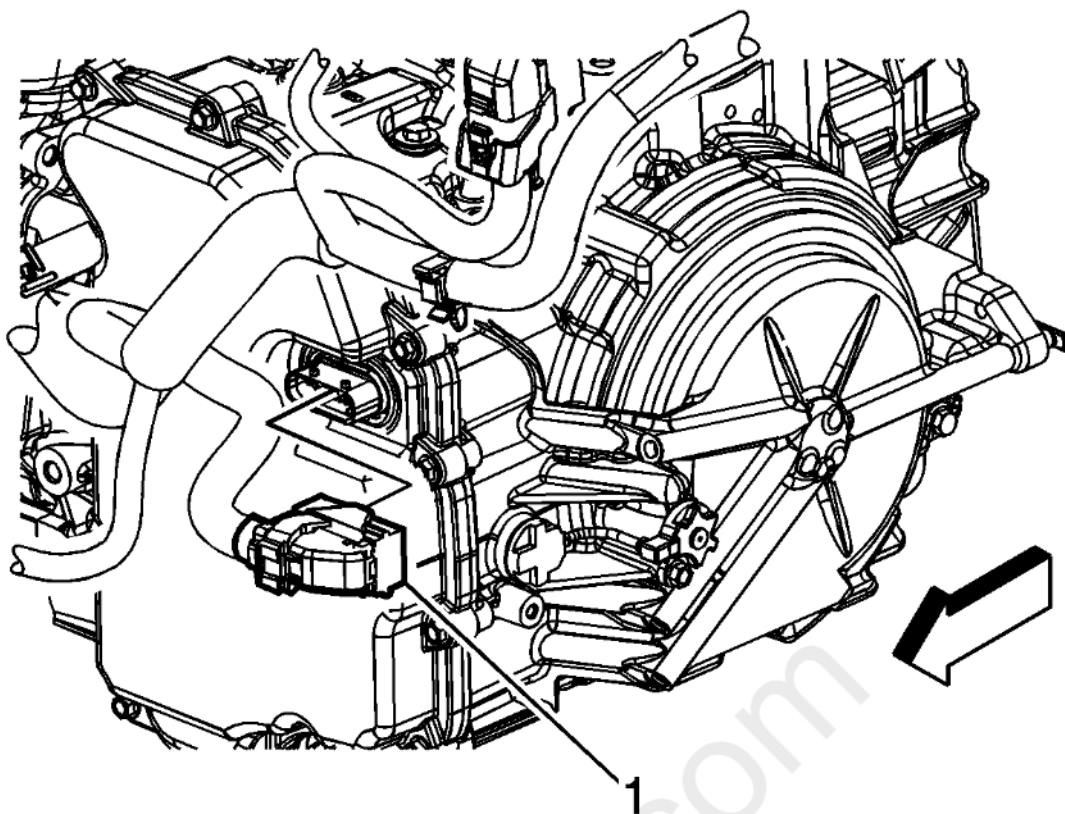


Fig. 48: Control Valve Body Transmission Control Module (TCM) Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

7. Connect the control valve body TCM electrical connector (1), then clip the wiring harness to the cover.
8. Install the front transmission mount. Refer to [**Transmission Front Mount Replacement**](#).
9. Lower the vehicle.

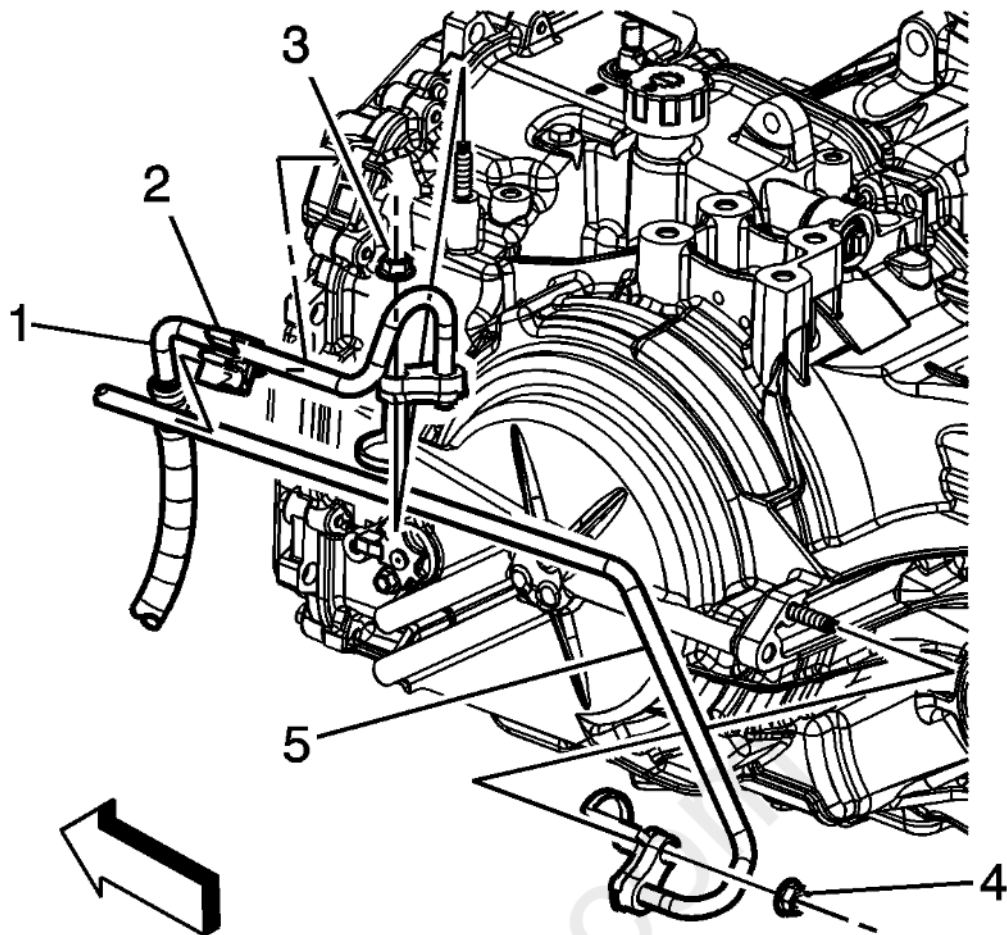


Fig. 49: Fluid Cooler Inlet Hose, Outlet Hose, Retainer And Nuts

Courtesy of GENERAL MOTORS COMPANY

10. Install the oil cooler inlet (1) and outlet (5) hoses to the retainer (2) on the control valve body cover.
11. Fill the transmission. Refer to [Transmission Fluid Drain and Fill](#).
12. Install the battery tray. Refer to [Battery Tray Replacement](#).
13. Check for leaks.

CONTROL VALVE BODY REPLACEMENT

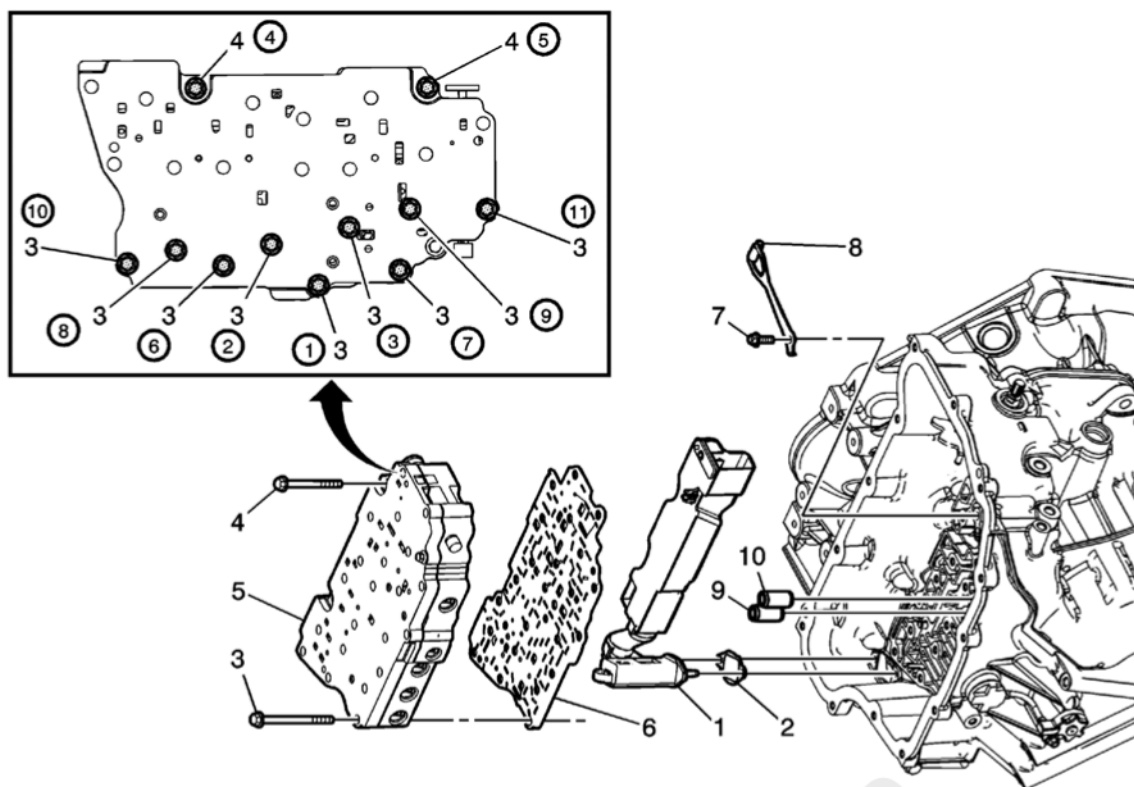


Fig. 50: Control Valve Body Components And Control Valve Body Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Remove the control solenoid valve and transmission control module assembly. Refer to Control Solenoid Valve and Transmission Control Module Assembly Replacement .	
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket
3	Control Valve Body Bolt M6 x 60 (Qty: 9) CAUTION: Refer to Fastener Caution . NOTE: Tighten in specified sequence.
	Tighten 12 N.m (106 lb in)
4	Control Valve Body Bolt M6 x 53 (Qty: 2) NOTE: Tighten in specified sequence.
	Tighten 12 N.m (106 lb in)
5	Control Valve Body Assembly
6	Control Valve Body Spacer Plate Assembly

Callout	Component Name
7	Manual Shaft Detent Spring Bolt M6 x 16 NOTE: Tighten in specified sequence. Tighten 12 N.m (106 lb in)
8	Manual Shaft Detent Lever Spring Assembly
9	1-2-3-4 Clutch Fluid Passage Seal NOTE: Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal NOTE: Discard the seal. It is not reusable.

OUTPUT SPEED SENSOR REPLACEMENT

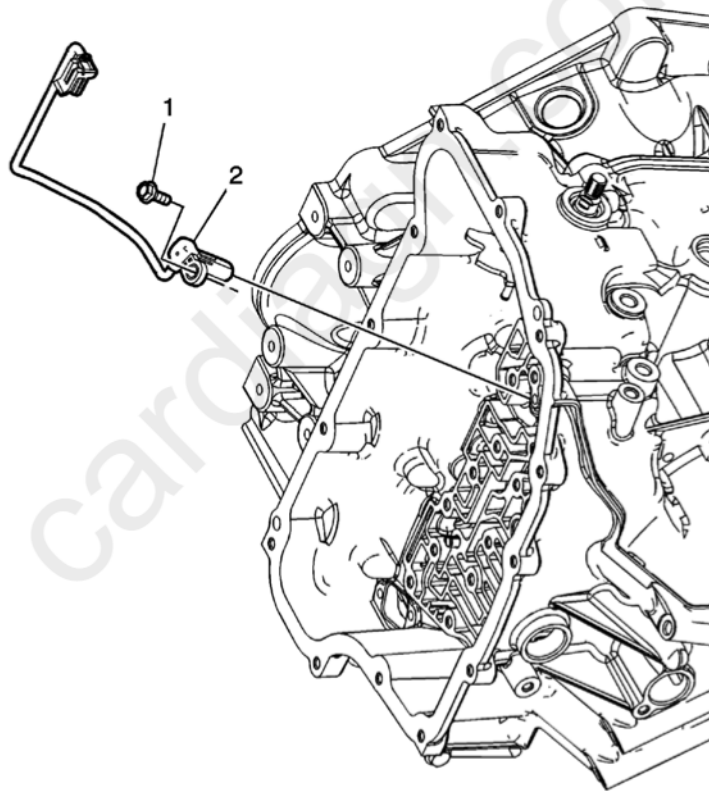


Fig. 51: Output Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures	
1. Remove the control solenoid valve and transmission control module assembly. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Replacement.</u> 2. Perform the service fast learn adapt procedure.	

Callout	Component Name
1	Output Speed Sensor Bolt M6 x 18 CAUTION: Refer to Fastener Caution . Tighten 12 N.m (106 lb in)
2	Output Speed Sensor

INPUT SPEED SENSOR REPLACEMENT

Removal Procedure

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

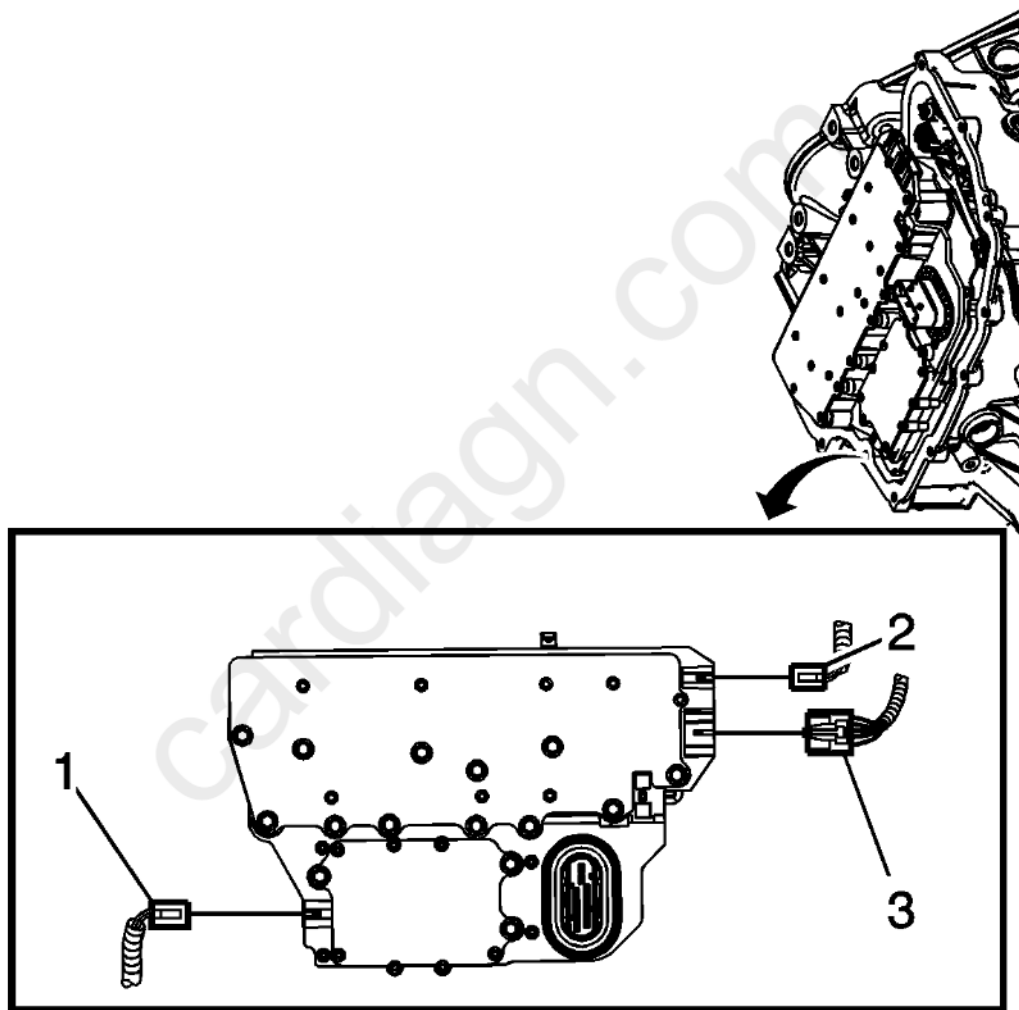


Fig. 52: Input Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the input speed sensor electrical connector (1).

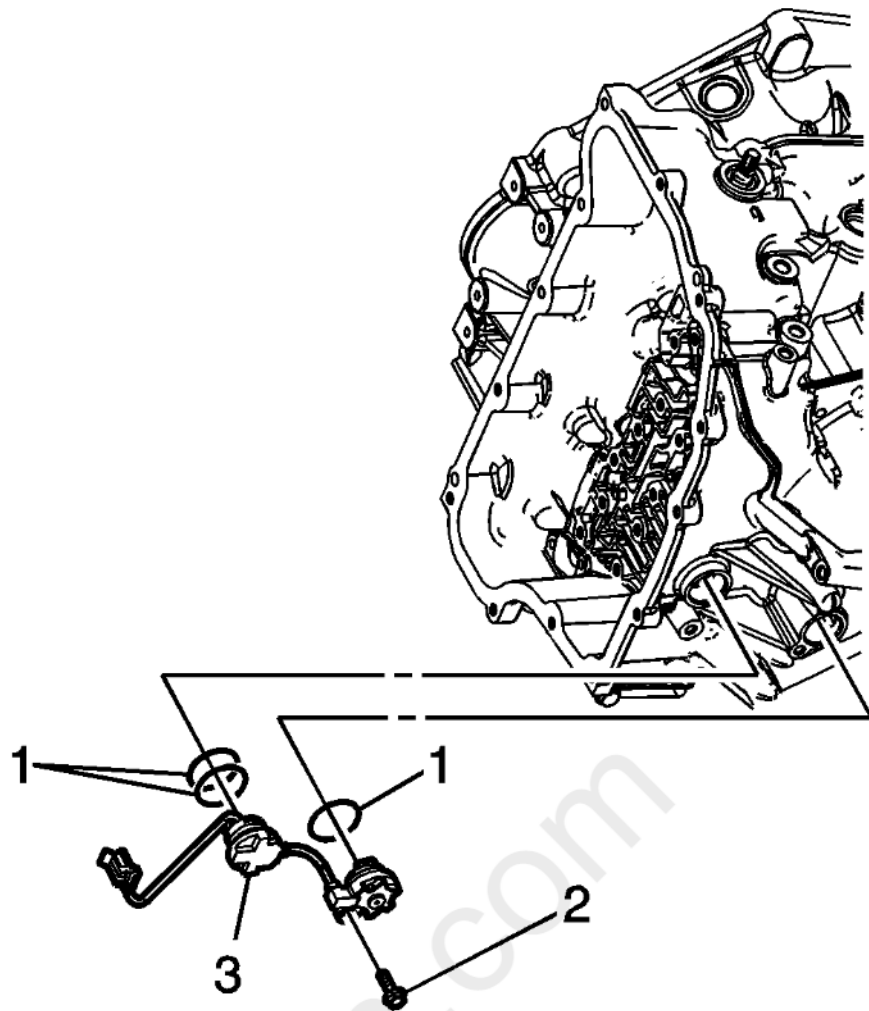


Fig. 53: Input Speed Sensor, Mounting Bolt And Seals

Courtesy of GENERAL MOTORS COMPANY

3. Remove the input speed sensor bolt (2) M6 x 23.
4. Remove the input speed sensor (3).
5. Remove the 3 input speed sensor seals (1).

Installation Procedure

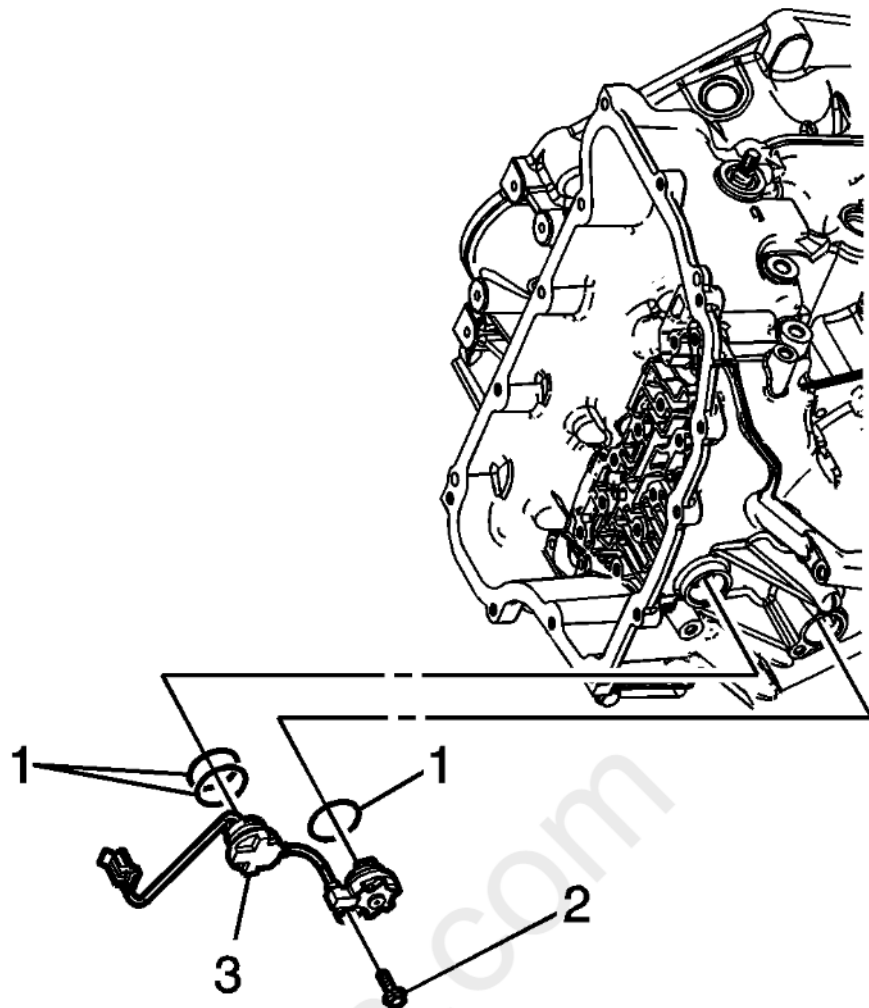


Fig. 54: Input Speed Sensor, Mounting Bolt And Seals

Courtesy of GENERAL MOTORS COMPANY

1. Install the 3 input speed sensor seals (1).
2. Install the input speed sensor (3).

CAUTION: Refer to **Fastener Caution** .

3. Install the input speed sensor bolt (2) M6 x 23 and tighten to 12 N.m (106 lb in).

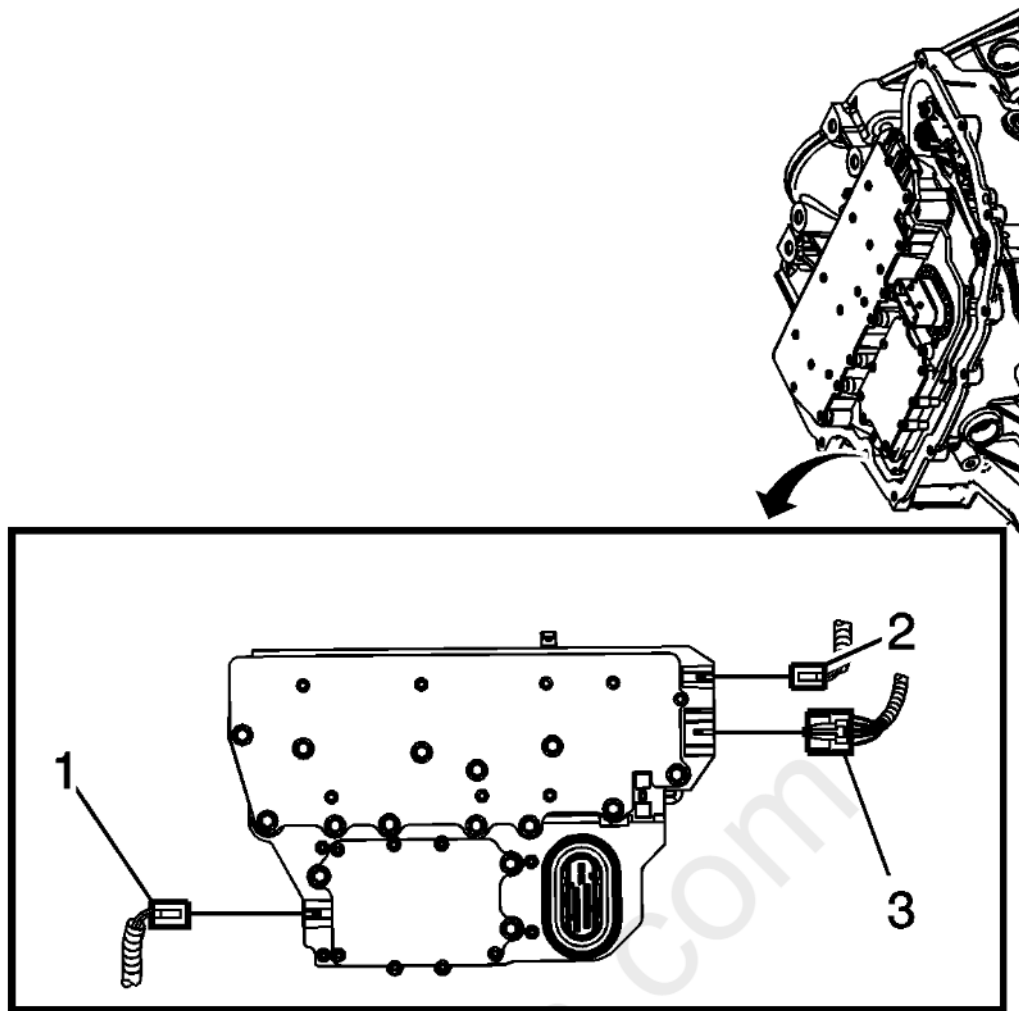


Fig. 55: Input Speed Sensor Electrical Connector

Courtesy of GENERAL MOTORS COMPANY

4. Connect the input speed sensor electrical connector (1).
5. Install the control solenoid valve and transmission control module assembly. Refer to [**Control Solenoid Valve and Transmission Control Module Assembly Replacement**](#).
6. Perform the service fast learn adapt procedure.

TRANSMISSION BRACE REPLACEMENT

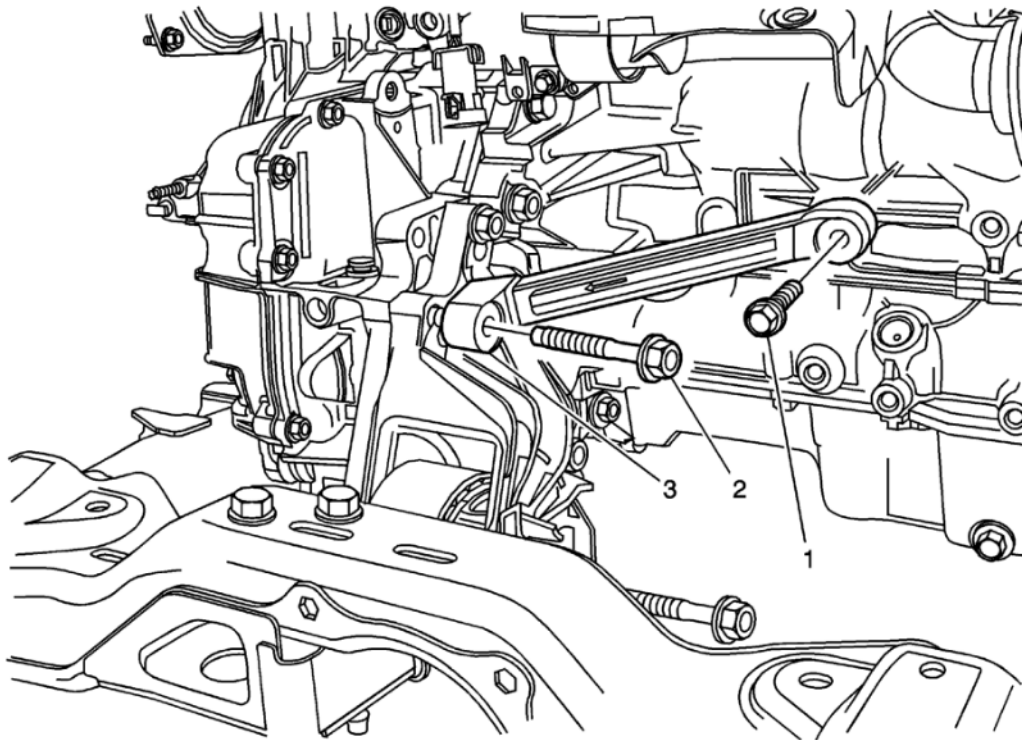


Fig. 56: Transmission Brace

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle . 2. Remove the catalytic converter. Refer to Catalytic Converter Replacement .	
1	Rear Transaxle Brace Bolt CAUTION: Refer to Fastener Caution . Tighten 50 N.m (37 lb ft)
2	Rear Transaxle Brace Bolt Tighten 100 N.m (74 lb ft)
3	Rear Transaxle Brace

TRANSMISSION MOUNT REPLACEMENT - LEFT SIDE

Removal Procedure

1. Remove the battery box. Refer to [Battery Tray Replacement](#) .
2. Prior to removing the mount, mark mount to transmission, mount to body interfaces and fasteners to mount interfaces using spray paint or a marker for correct positioning during installation.
3. Install the engine support fixture. Refer to [Engine Support Fixture](#) .
4. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .

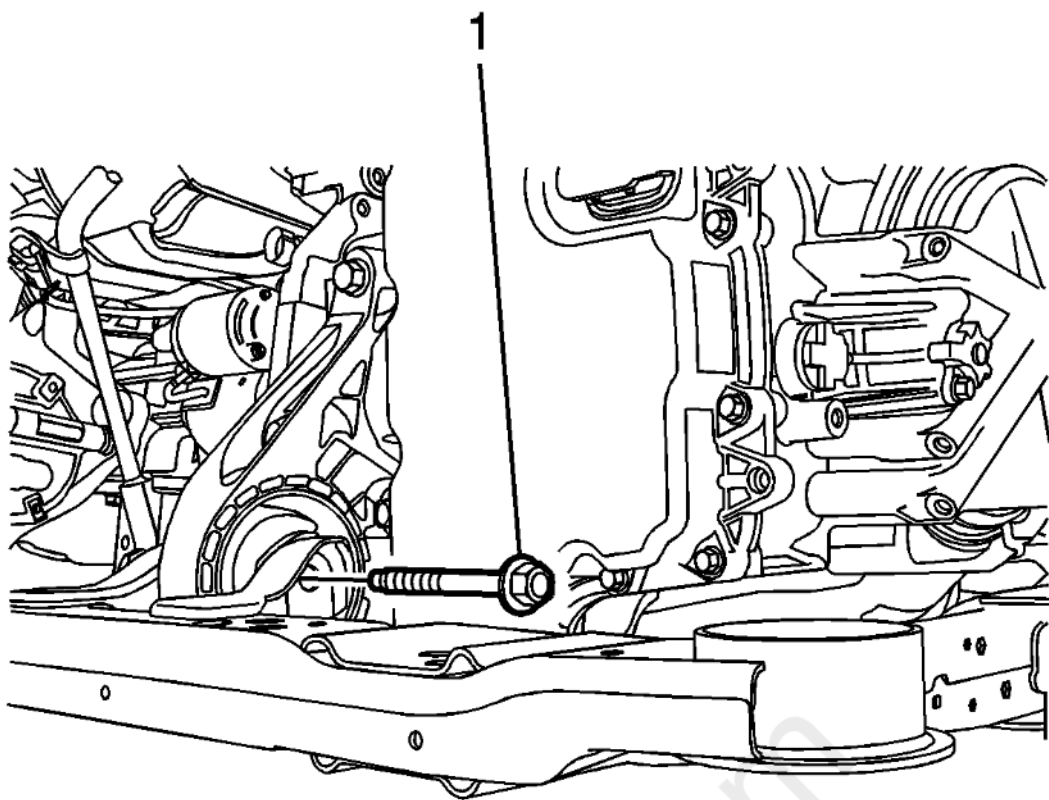


Fig. 57: Front Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Remove the front transmission mount through bolt (1).

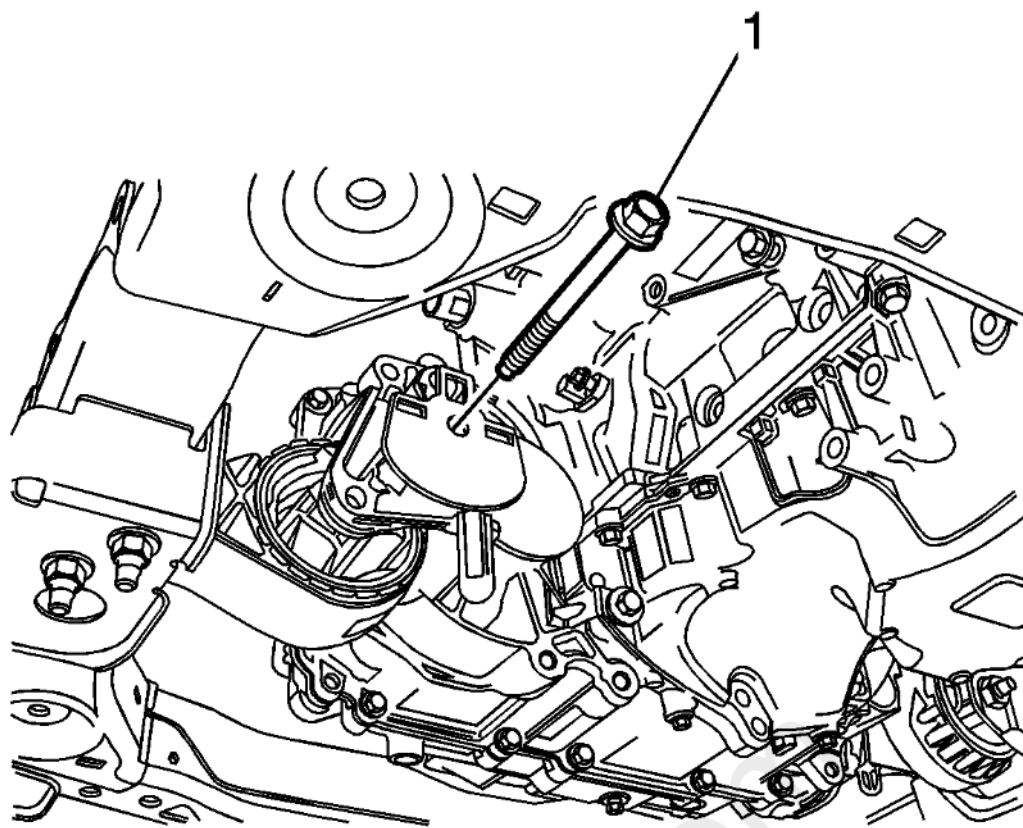


Fig. 58: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

6. Remove the rear transmission mount through bolt (1).
7. Lower the vehicle.

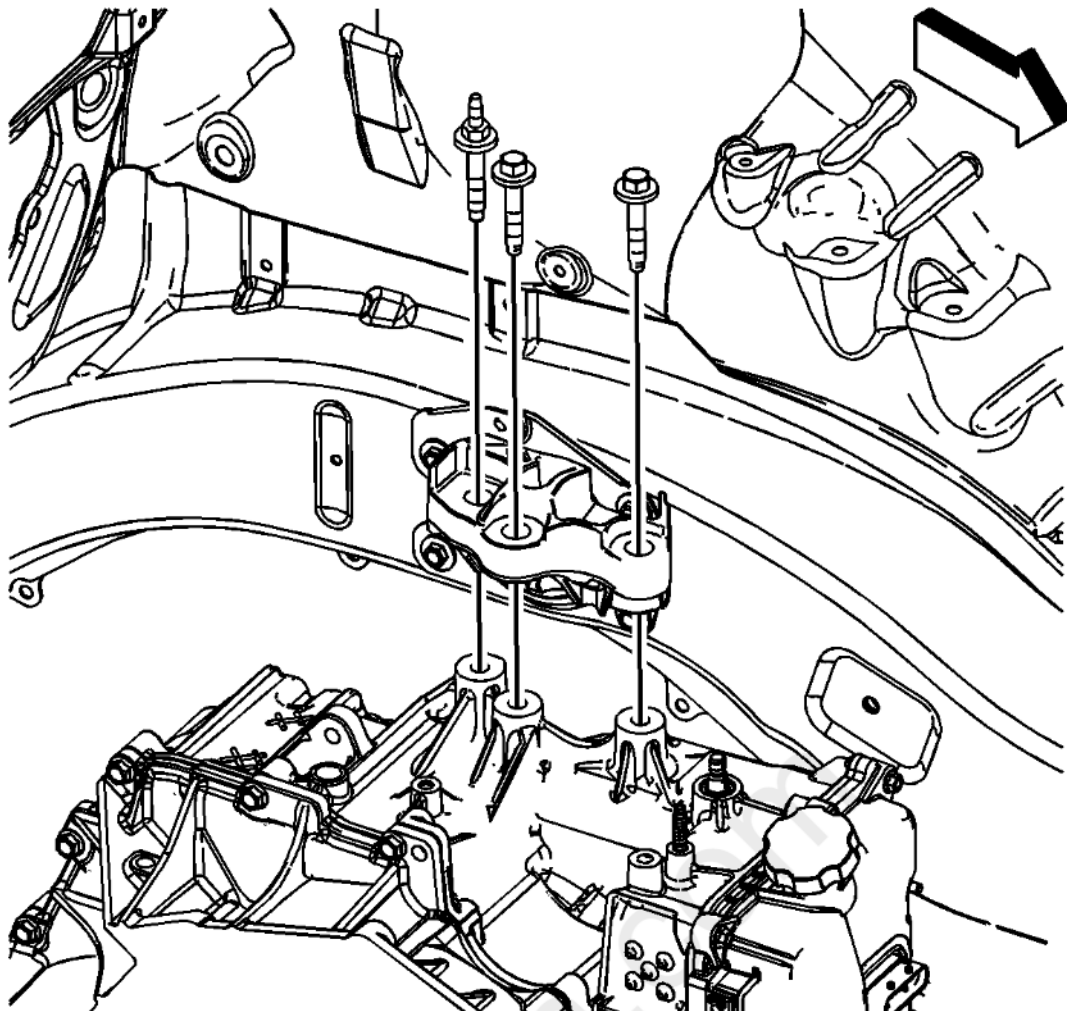


Fig. 59: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

8. Remove the transmission mount to transmission bolts.

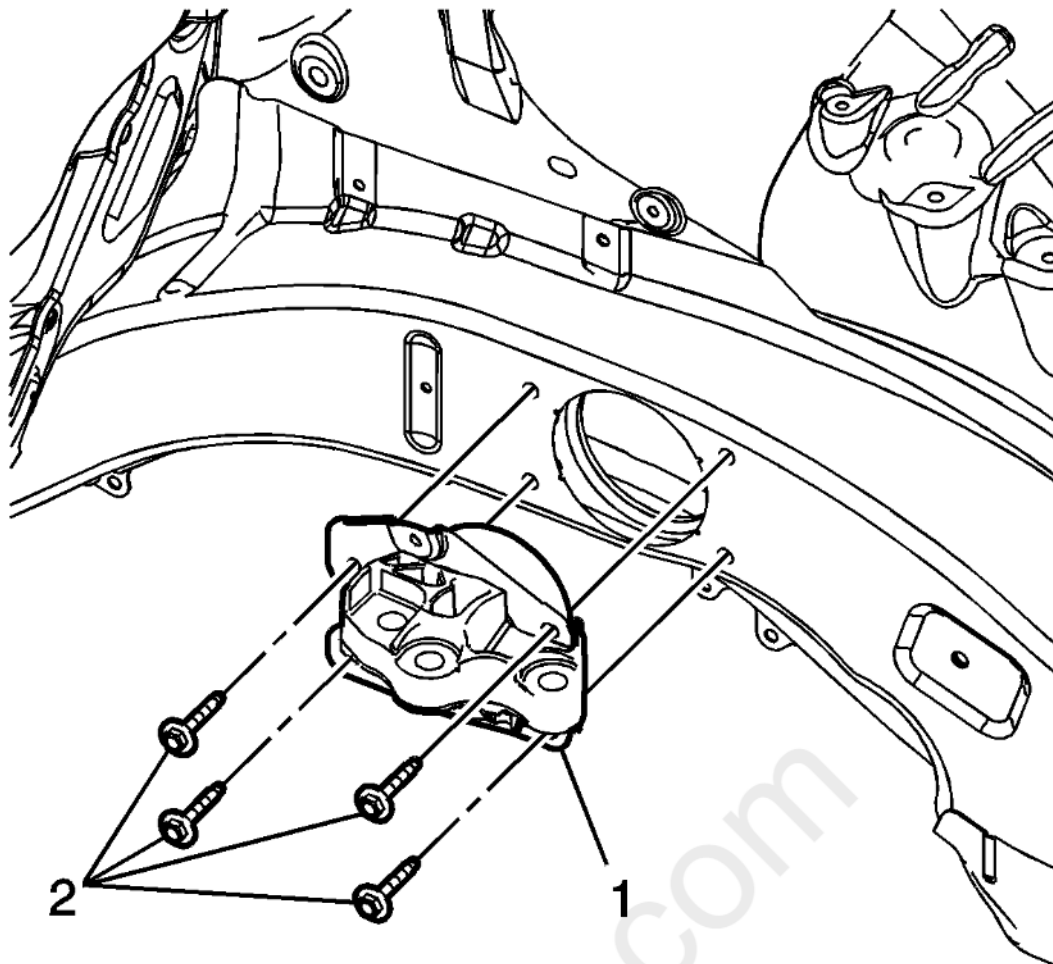


Fig. 60: Transmission Mount And Bolts

Courtesy of GENERAL MOTORS COMPANY

9. Using the engine support, lower the transmission enough to provide clearance for the left transmission mount.
10. Remove the transmission mount to frame rail bolts (2).
11. Remove the left transmission mount (1).

Installation Procedure

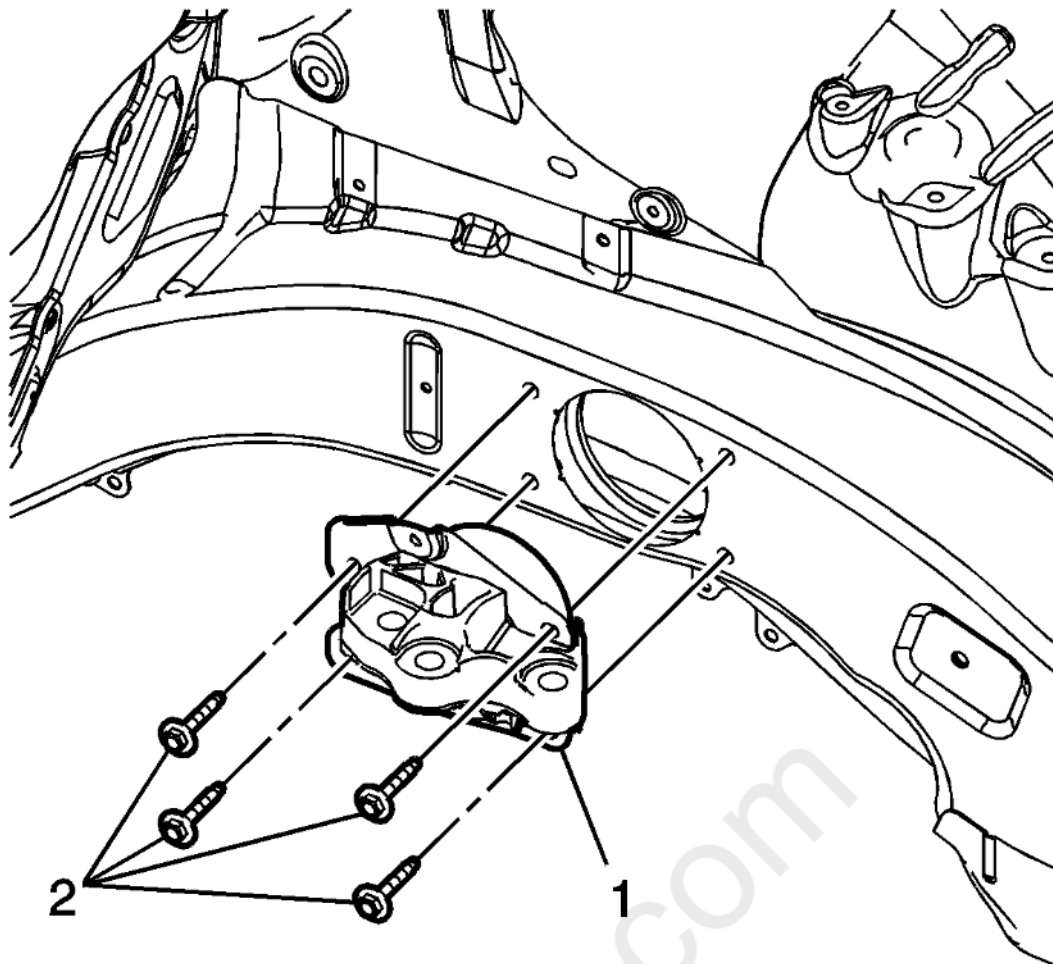


Fig. 61: Transmission Mount And Bolts

Courtesy of GENERAL MOTORS COMPANY

1. Using the outline made by the spray paint or marker, install the left transmission mount (1).

CAUTION: Refer to **Fastener Caution** .

2. Install the transmission mount to frame rail bolts (2) and tighten to 22 N.m (16 lb ft).
3. Using the engine support, raise the transmission until the transmission contacts the left transmission mount.

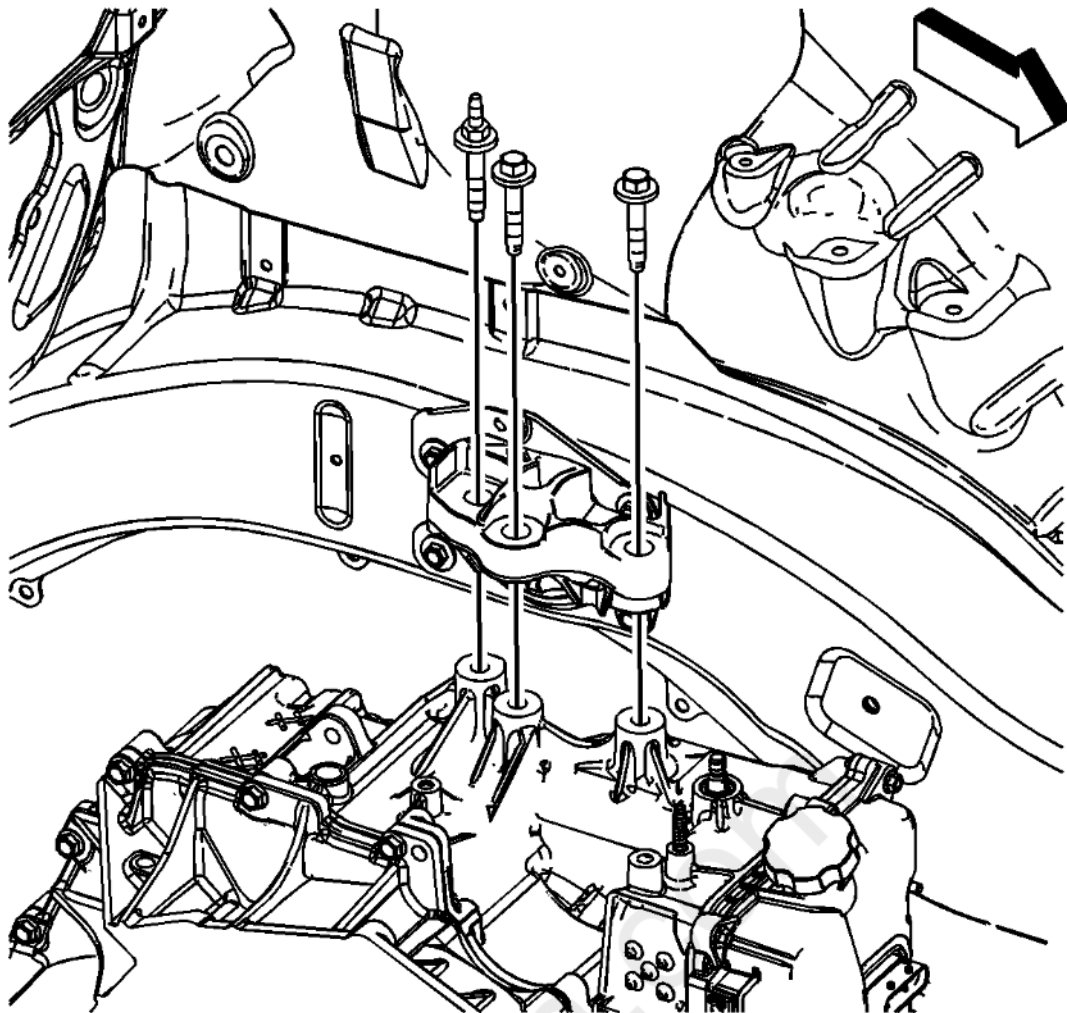


Fig. 62: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

4. Install the transmission mount to transmission bolts and tighten to 50 N.m (37 lb ft) plus 60 - 75 degrees.
5. Install the wheel and tire assembly. Refer to [Tire and Wheel Removal and Installation](#) .
6. Raise the vehicle.

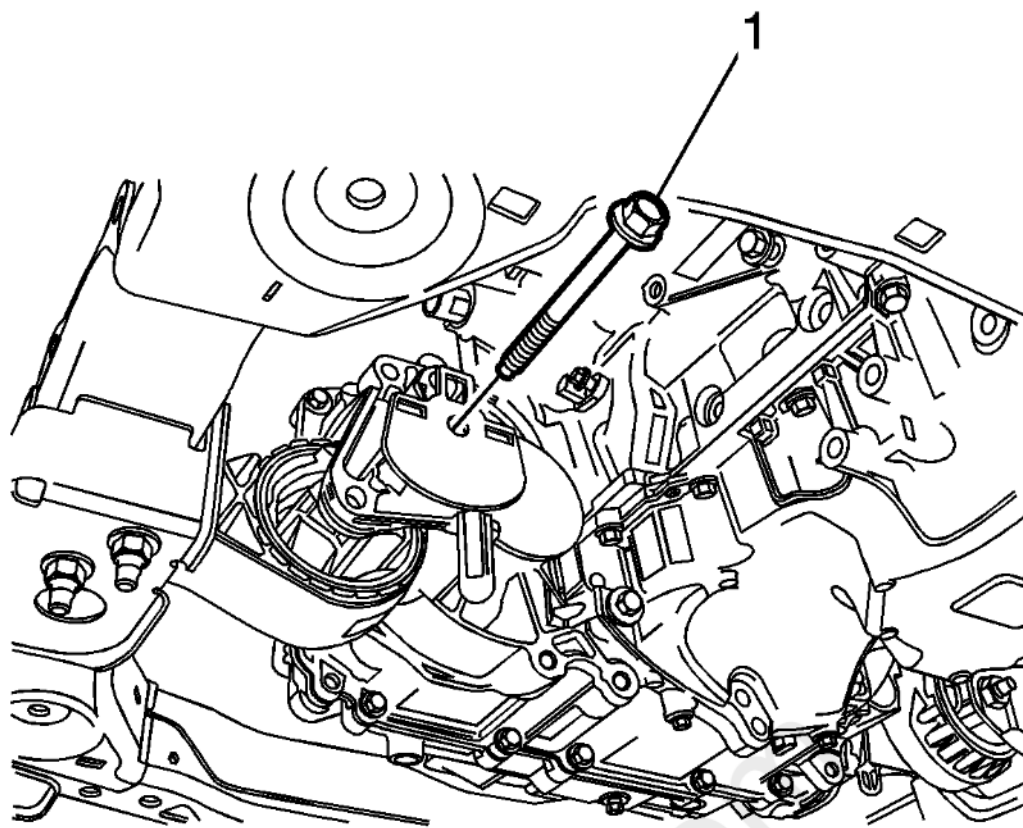


Fig. 63: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Install the rear transmission mount through bolt (1) and tighten to 105 N.m (77 lb ft).

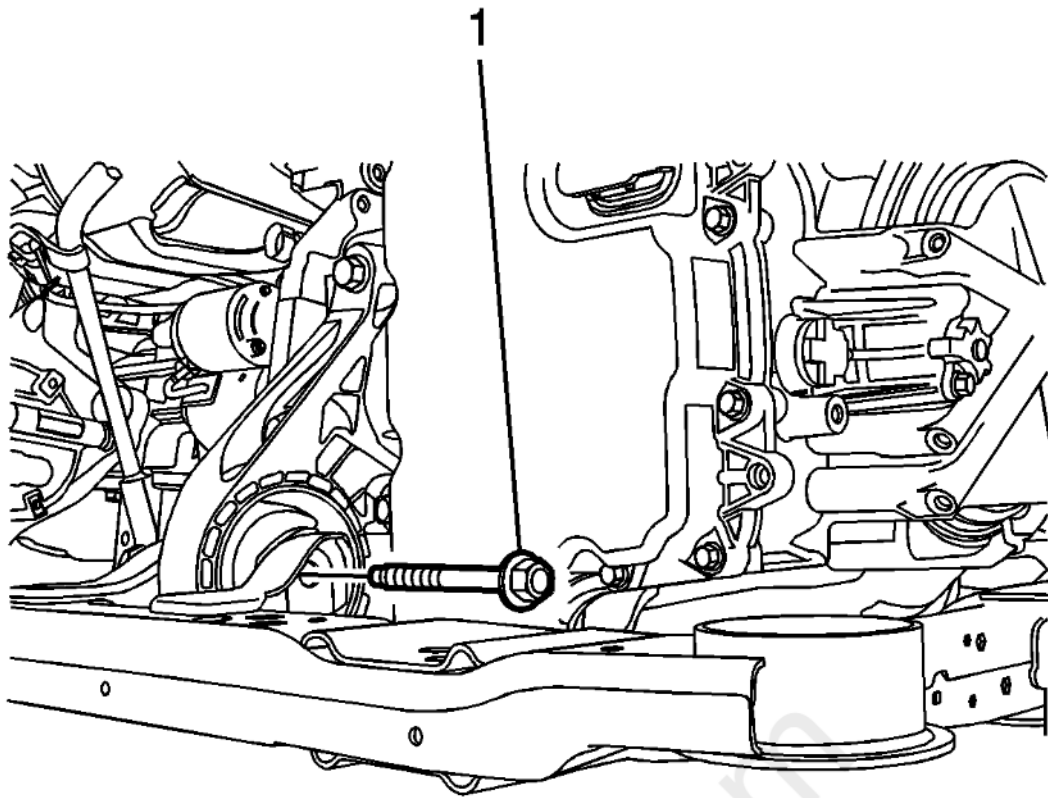


Fig. 64: Front Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

8. Install the front transmission mount through bolt (1) and tighten to 100 N.m (74 lb ft).
9. Perform the Powertrain Mount Balancing - Lower. Refer to the appropriate engine section.
10. Lower the vehicle.
11. Remove the engine support fixture.
12. Install the battery box. Refer to [Battery Tray Replacement](#) .

TRANSMISSION FRONT MOUNT REPLACEMENT

Removal Procedure

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

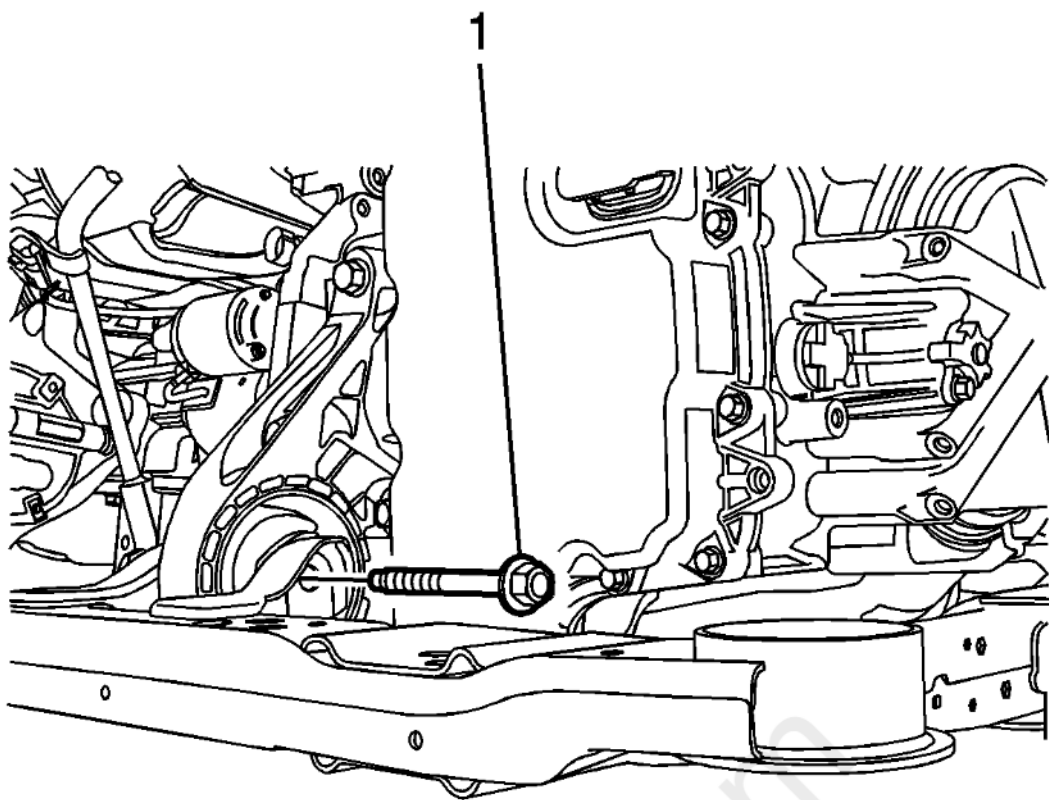


Fig. 65: Front Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

2. Remove the front transaxle mount through bolt (1).

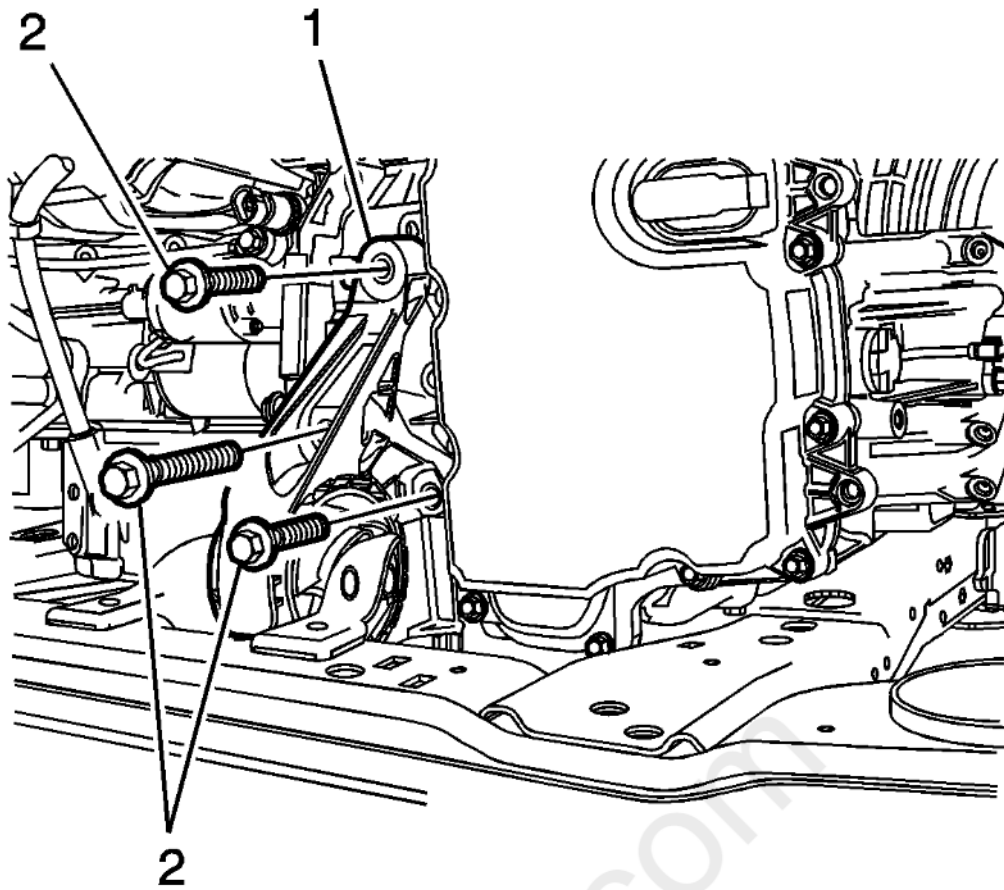


Fig. 66: Transmission Mount And Attachment Bolts

Courtesy of GENERAL MOTORS COMPANY

3. Remove the three transaxle mount-to-transaxle attachment bolts (2).
4. Remove the transaxle mount (1) from the vehicle.

Installation Procedure

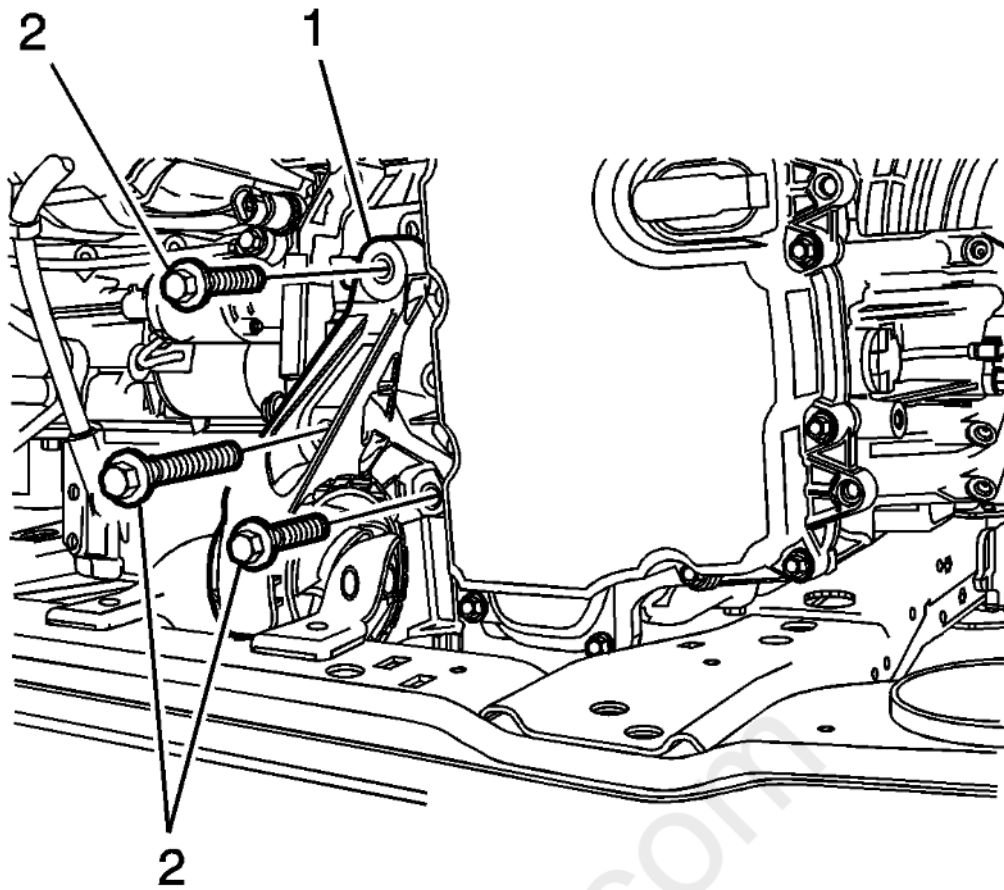


Fig. 67: Transmission Mount And Attachment Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the transaxle mount (1).

CAUTION: Refer to **Fastener Caution** .

2. Install the transaxle mount bolts (2) and tighten to 62 N.m (46 lb ft).

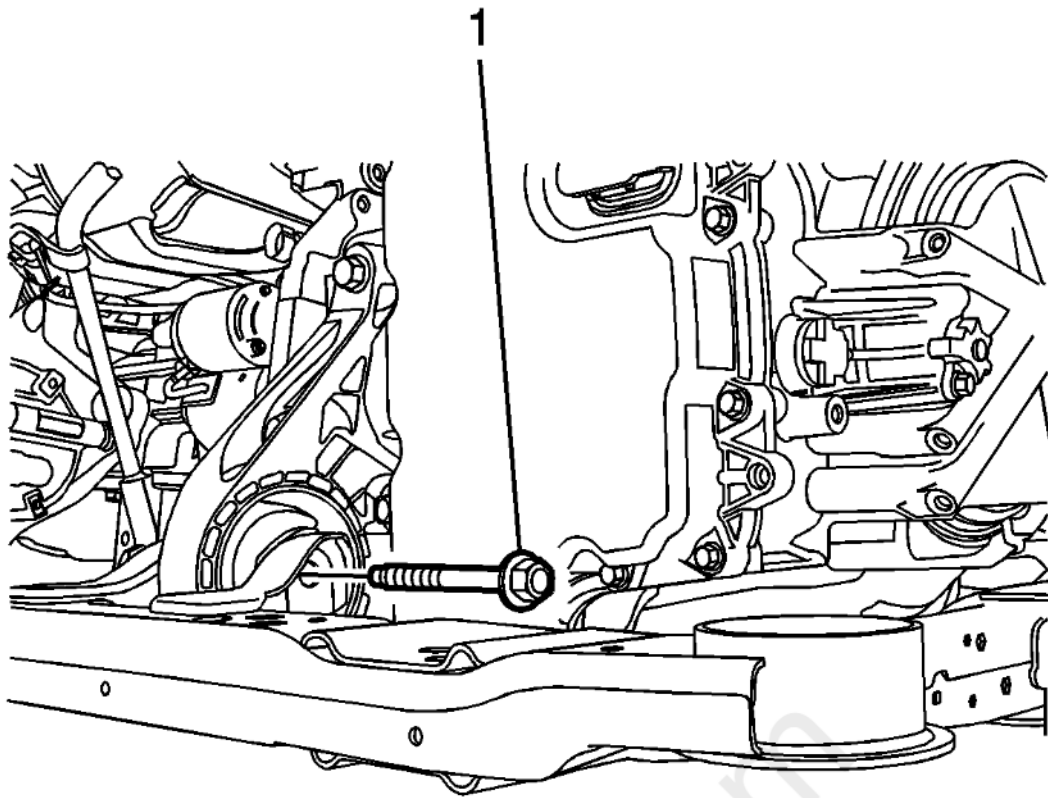


Fig. 68: Front Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

3. Install the transaxle mount through bolt (1) and tighten to 100 N.m (74 lb ft).
4. Perform the Powertrain Mount Balancing - Lower procedure. Refer to the appropriate engine section.
5. Lower the vehicle.

TRANSMISSION REAR MOUNT BRACKET REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Remove the catalytic converter. Refer to [Catalytic Converter Replacement](#) .
3. Using a suitable jack stand, support the rear of the powertrain.

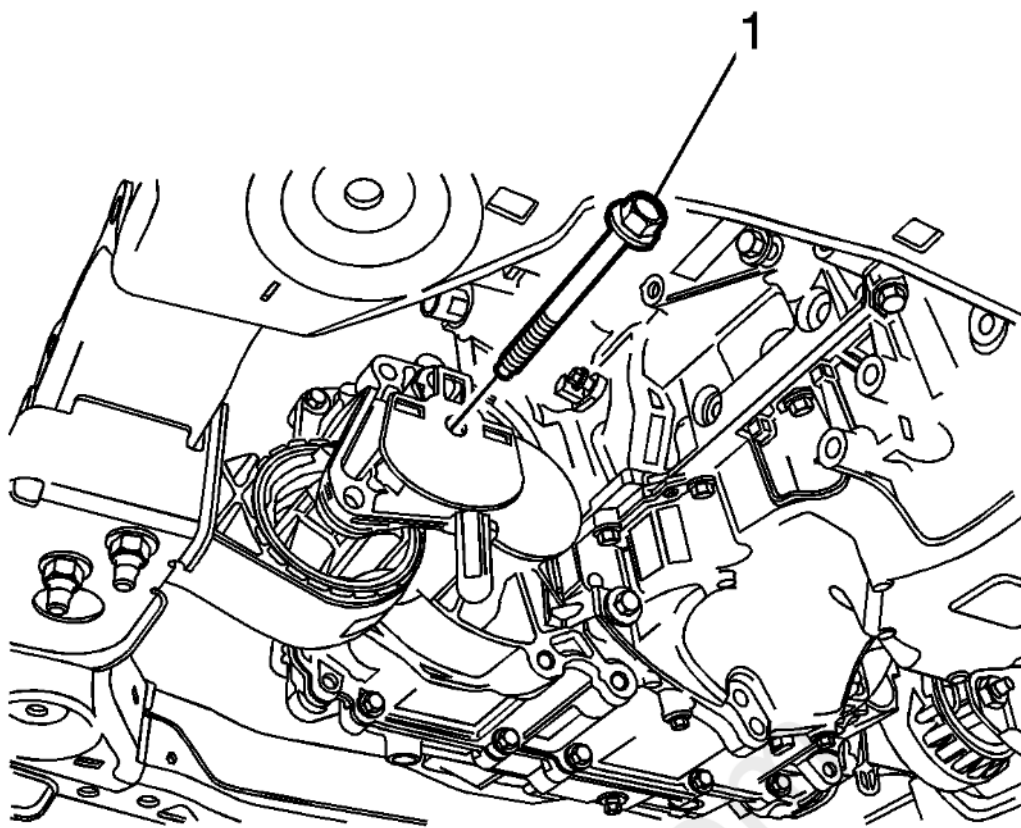


Fig. 69: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove the transmission mount to bracket through bolt (1).

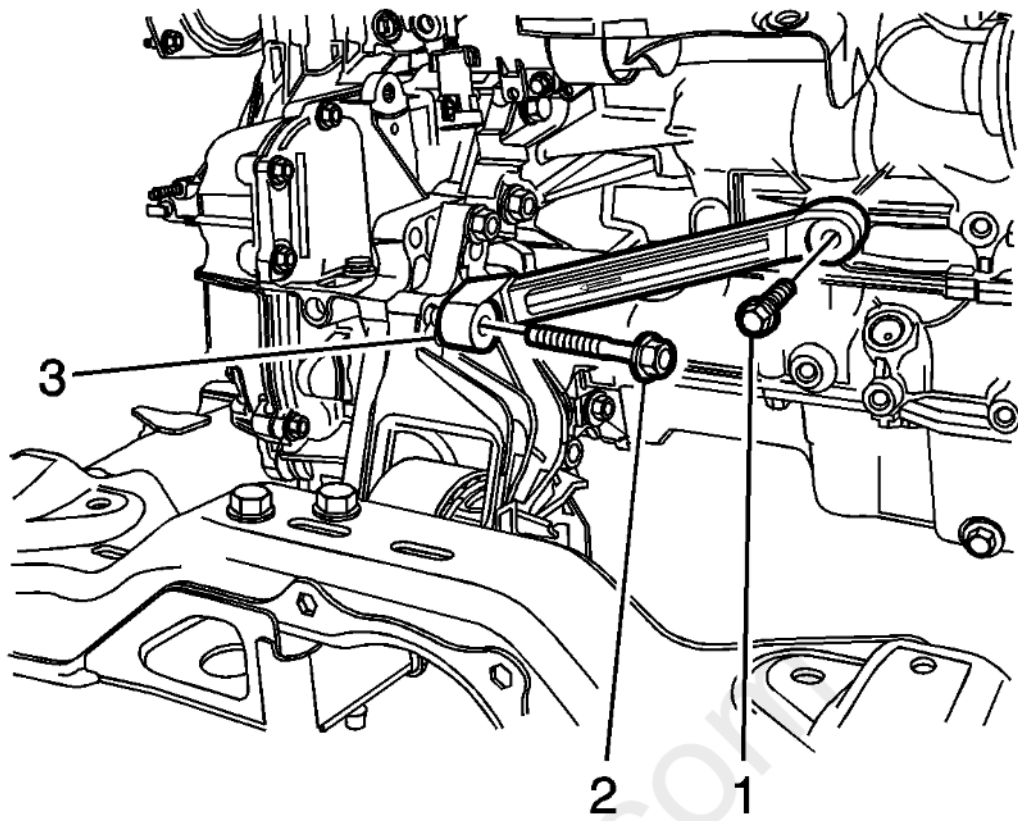


Fig. 70: Transmission Brace And Bolts

Courtesy of GENERAL MOTORS COMPANY

5. Remove the transaxle brace bolt (1), then loosen bolt (2) until it no longer engages the transaxle.
6. Remove the transaxle brace (3) with bolt (2) still retained in the brace.

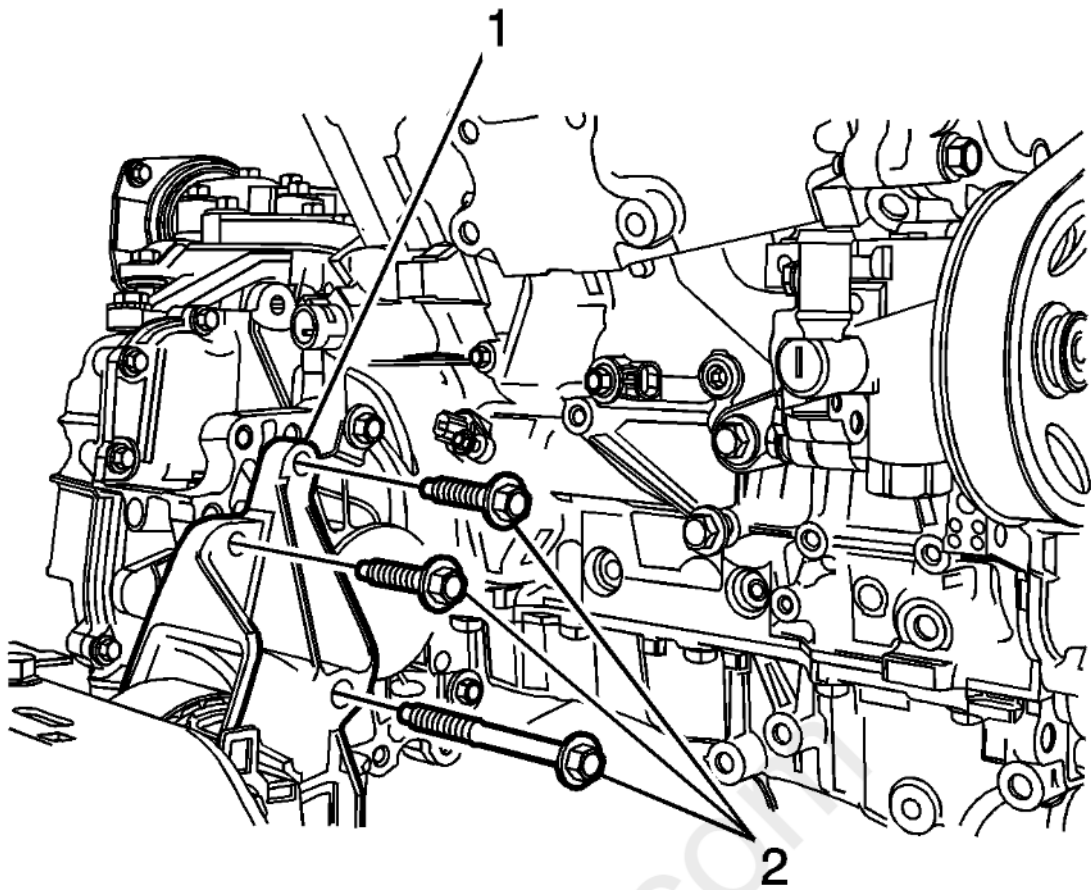


Fig. 71: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Remove the three transmission mount to transmission bolts (2).

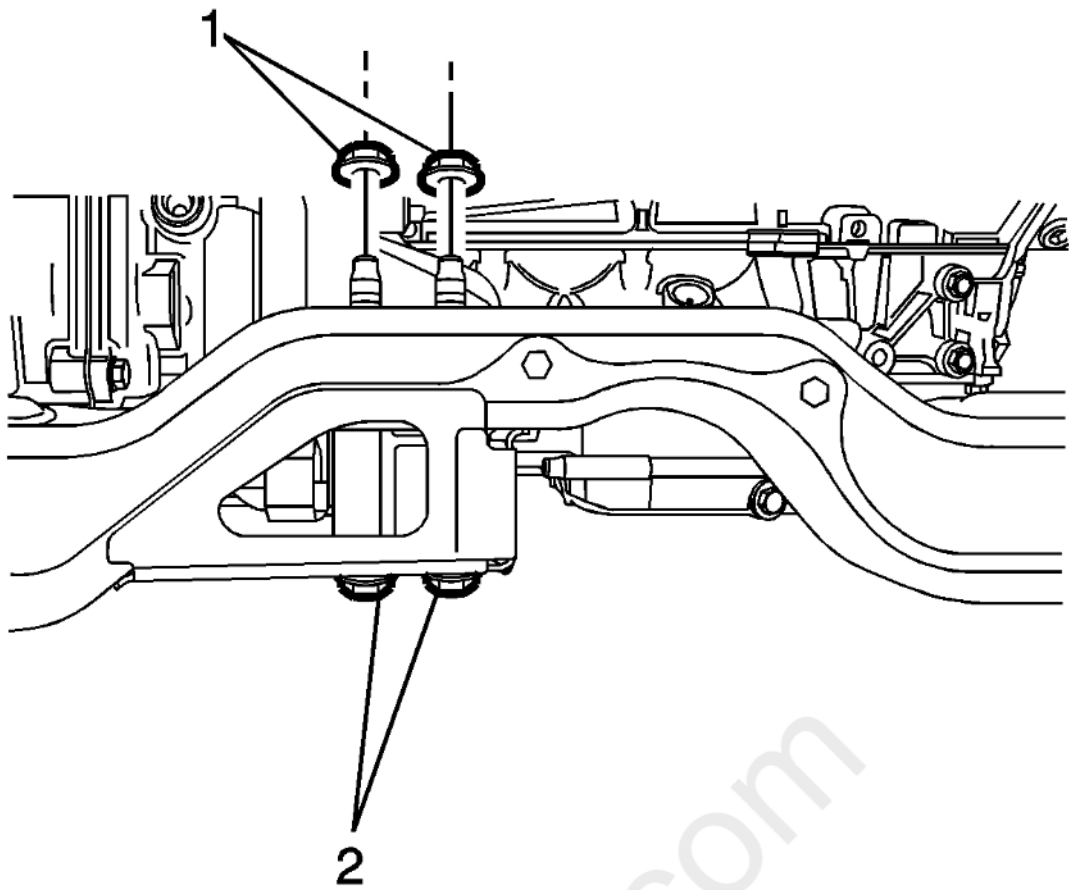


Fig. 72: Rear Mount To Frame Fasteners

Courtesy of GENERAL MOTORS COMPANY

8. Remove the rear mount to frame fasteners (1, 2), then remove the mount and bracket from the vehicle.

Installation Procedure

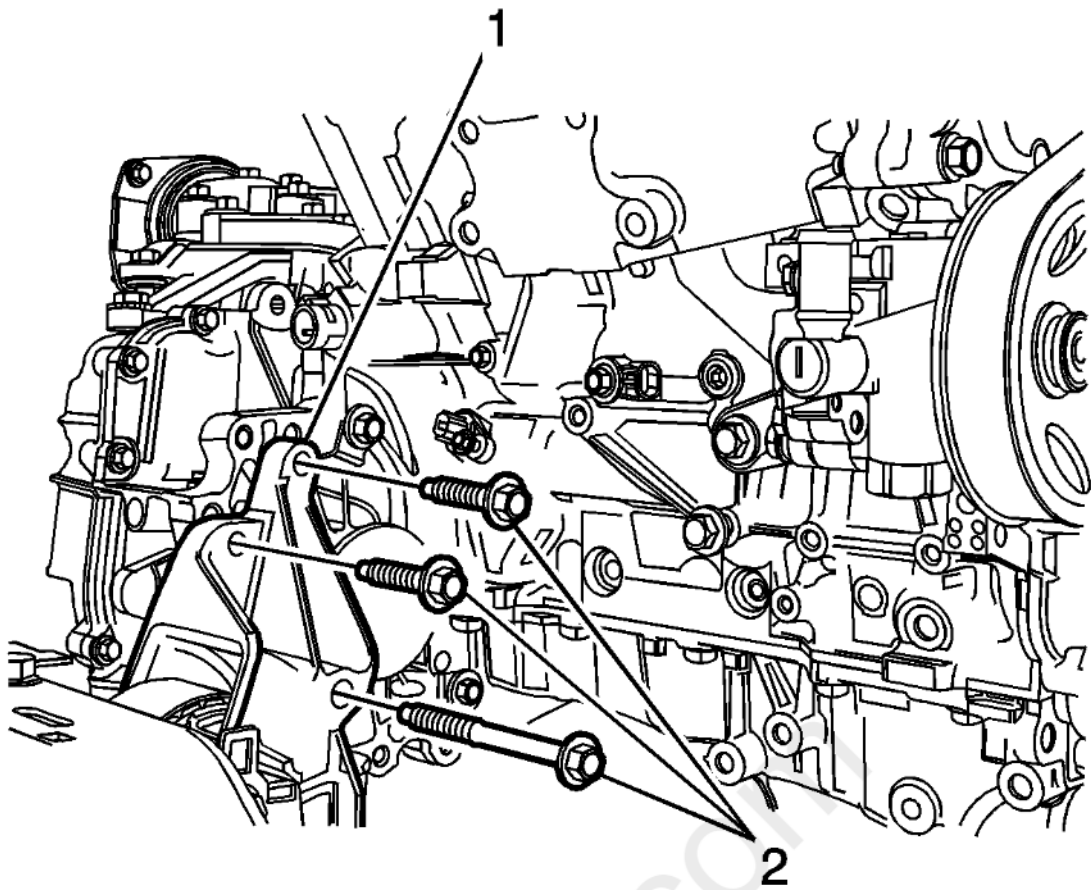


Fig. 73: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

1. Install the three transmission mount bracket to transmission bolts (2) and tighten to 100 N.m (74 lb ft).

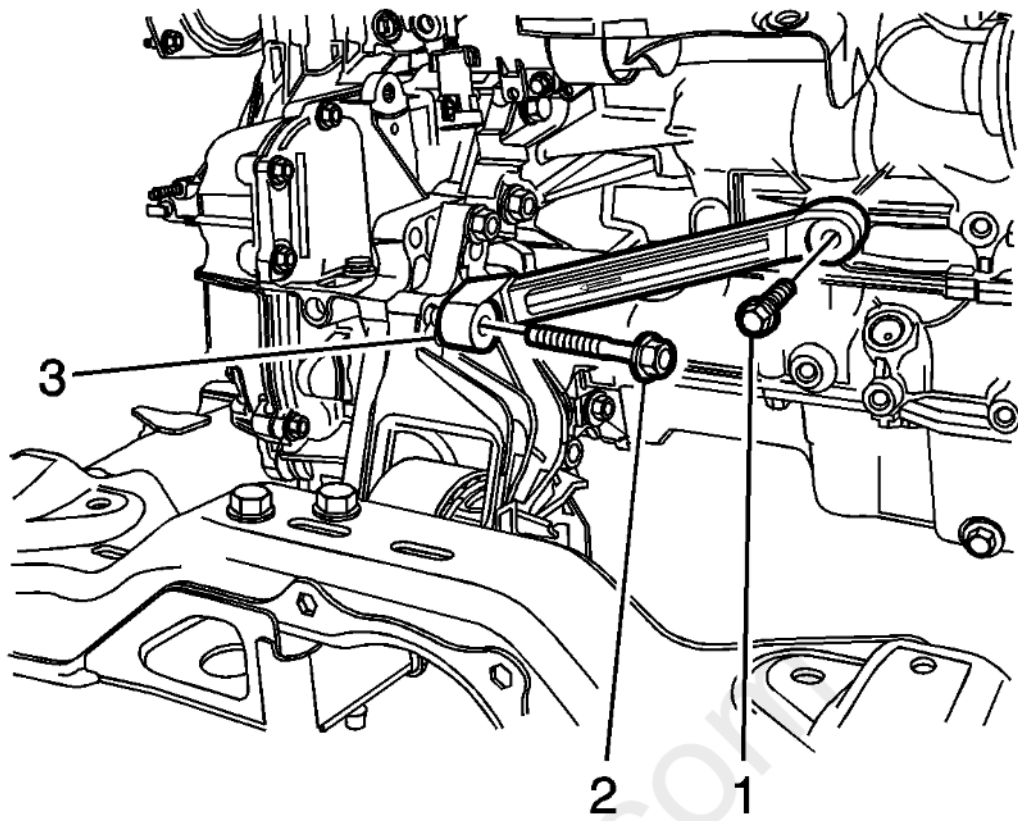


Fig. 74: Transmission Brace And Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Install the transaxle brace (3) with bolt (2) seated in the brace.
3. Install the transaxle brace bolt (1) and tighten to 50 N.m (37 lb ft).
4. Tighten brace bolt (2) to 100 N.m (74 lb ft).

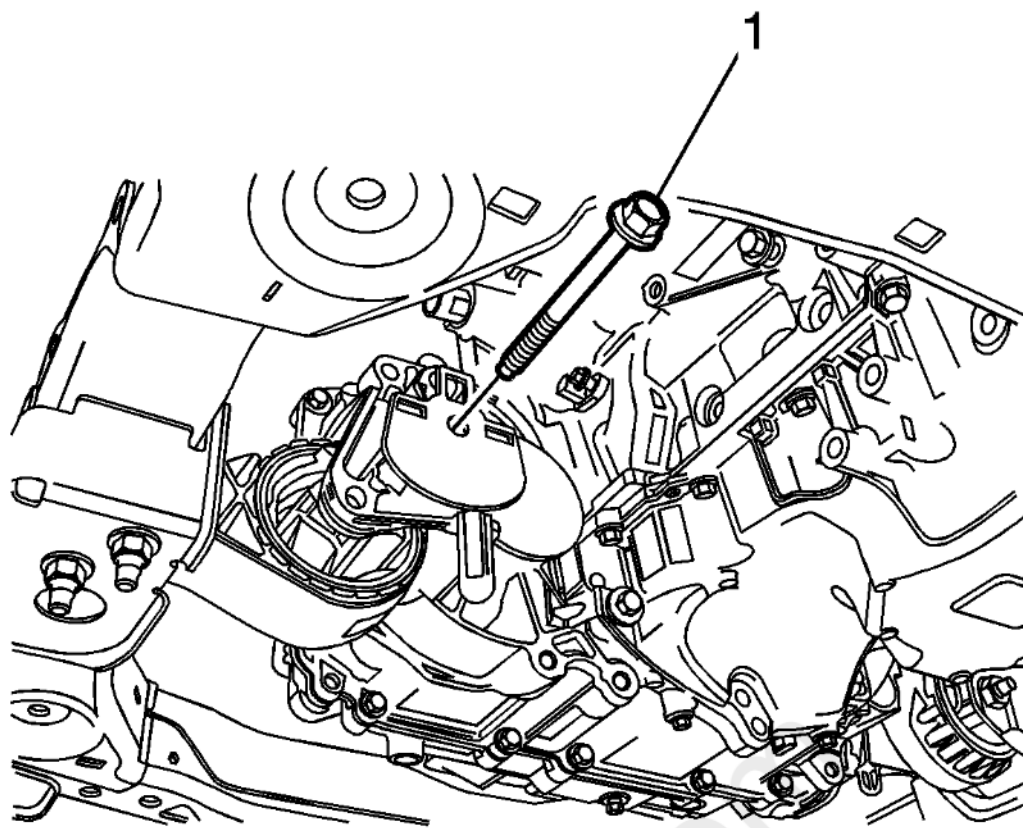


Fig. 75: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Install the transmission mount to bracket through bolt (1) and tighten to 105 N.m (77 lb ft).

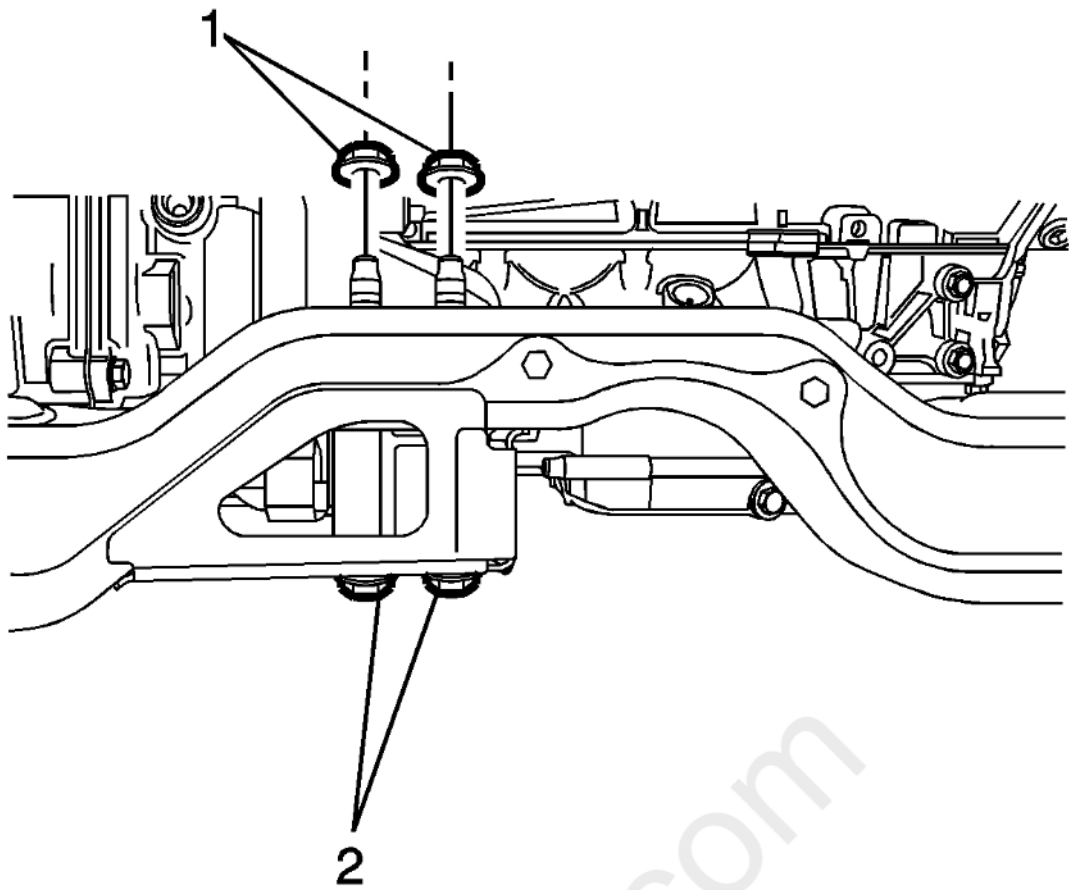


Fig. 76: Rear Mount To Frame Fasteners
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use NEW bolts only.

6. Install the rear mount to frame fasteners (1, 2) and tighten to 100 N.m (74 lb ft) plus 120 - 130 degrees.
7. Remove the jack stand.
8. Install the catalytic converter. Refer to [Catalytic Converter Replacement](#) .
9. Lower the vehicle.

TRANSMISSION REAR MOUNT REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#) .
2. Prior to removing the mount, mark the mount fasteners to mount and mount to sub frame interfaces using spray paint or a marker for correct positioning during installation.
3. Remove the catalytic converter. Refer to [Catalytic Converter Replacement](#) .
4. Using a suitable jack stand, support the rear of the powertrain.

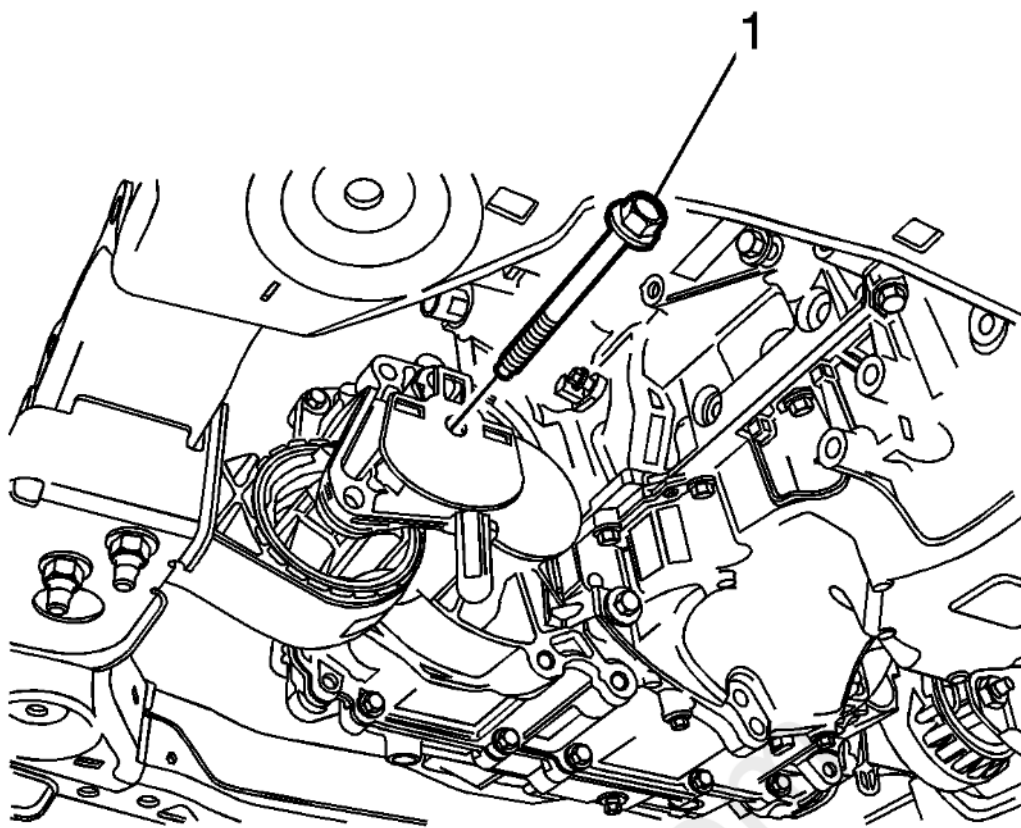


Fig. 77: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission mount to bracket through bolt (1).

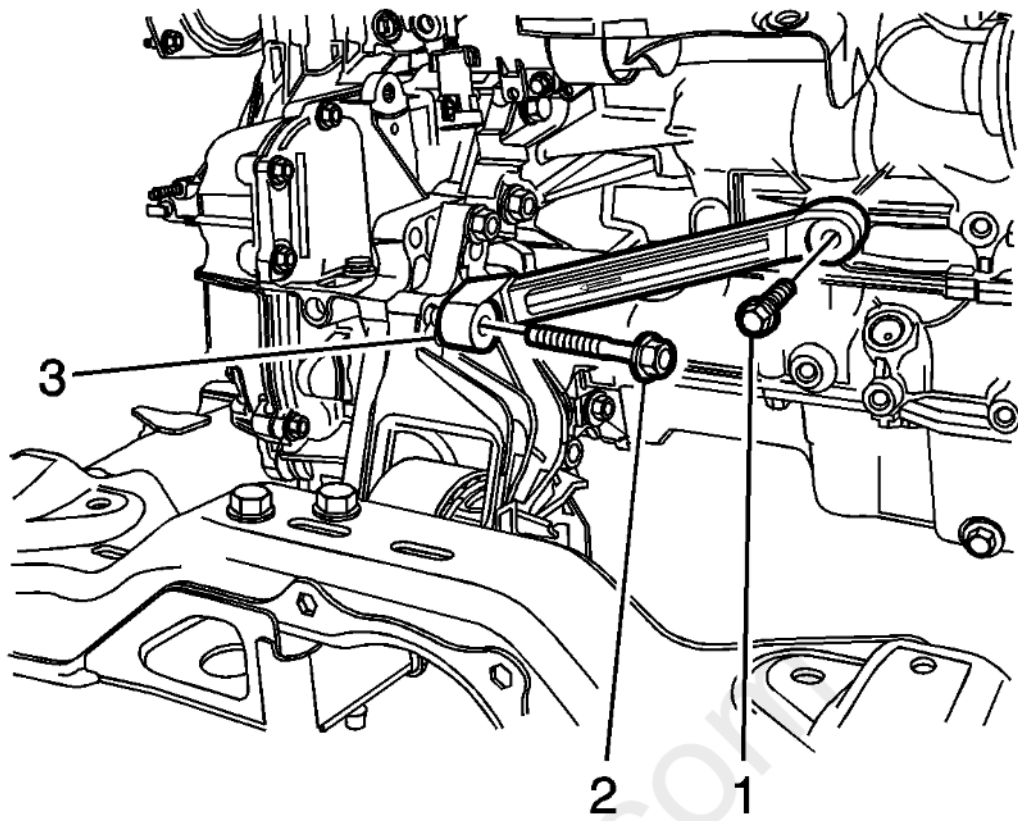


Fig. 78: Transmission Brace And Bolts

Courtesy of GENERAL MOTORS COMPANY

6. Remove the transaxle brace bolt (1), then loosen bolt (2) until it no longer engages the transaxle.
7. Remove the transaxle brace (3) with bolt (2) still retained in the brace.

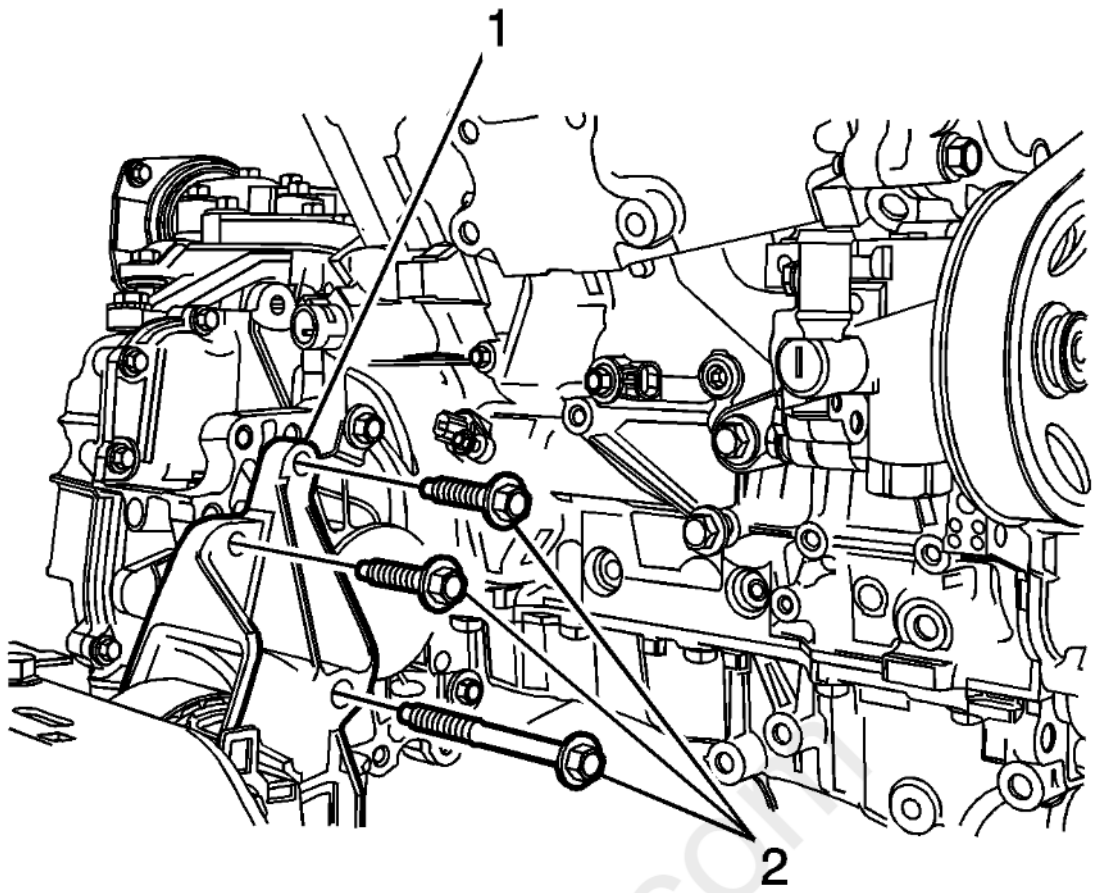


Fig. 79: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

8. Remove the transmission mount to transmission bolts (2).

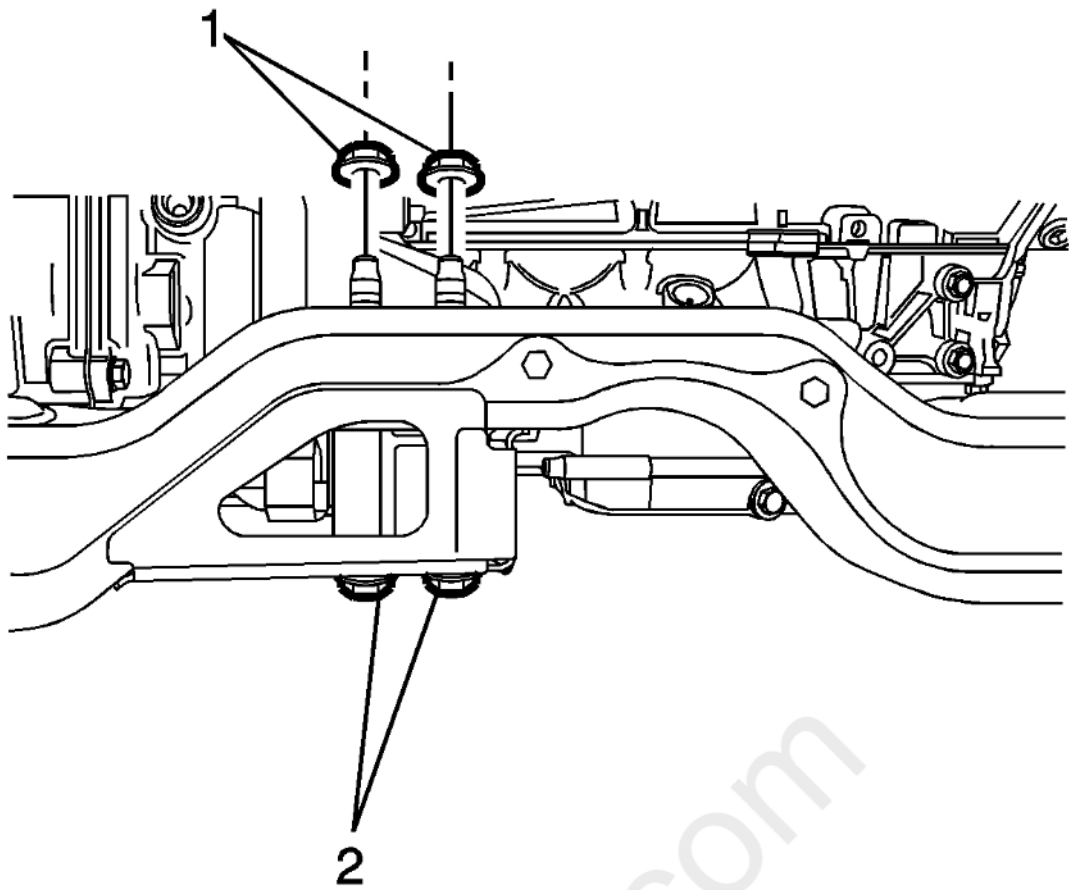


Fig. 80: Rear Mount To Frame Fasteners
Courtesy of GENERAL MOTORS COMPANY

9. Remove the rear mount to frame fasteners (1, 2), then remove the mount from the vehicle.

Installation Procedure

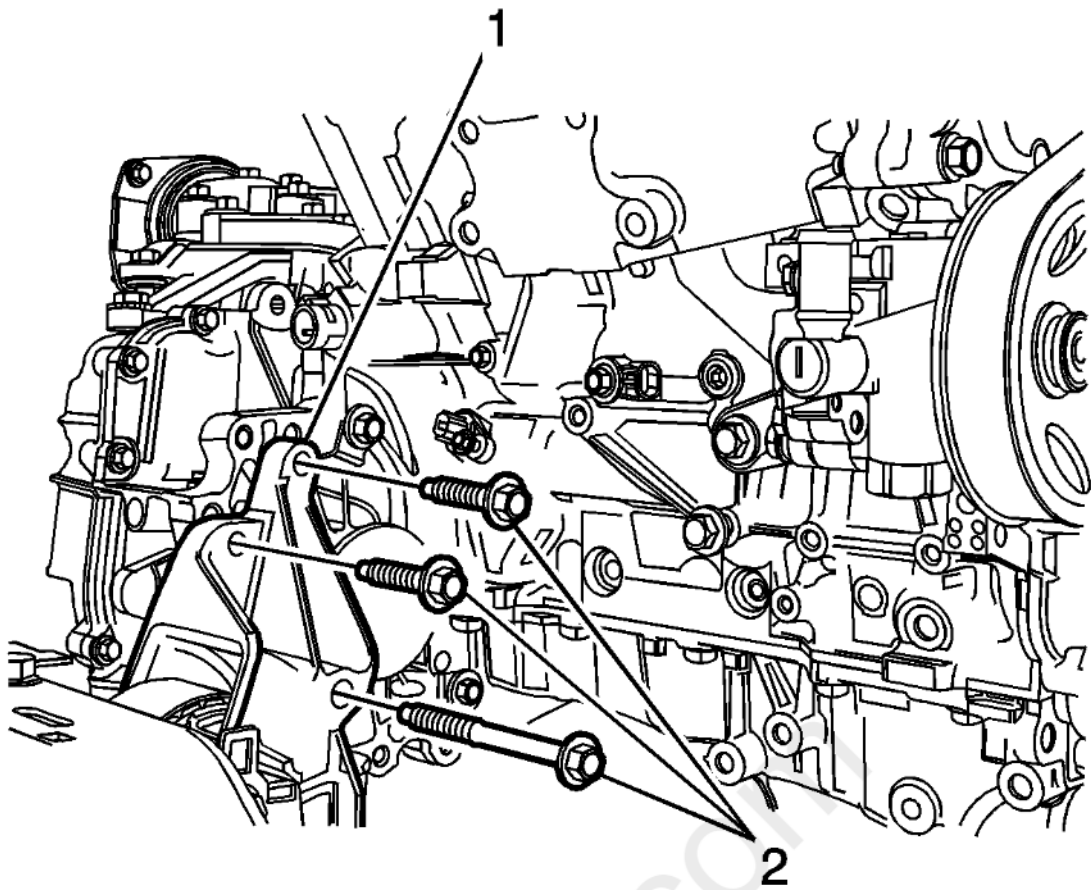


Fig. 81: Transmission Mount To Transmission Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

1. Using the outline made by the spray paint or marker, install the transmission mount to transmission bolts (2) and tighten to 100 N.m (74 lb ft).

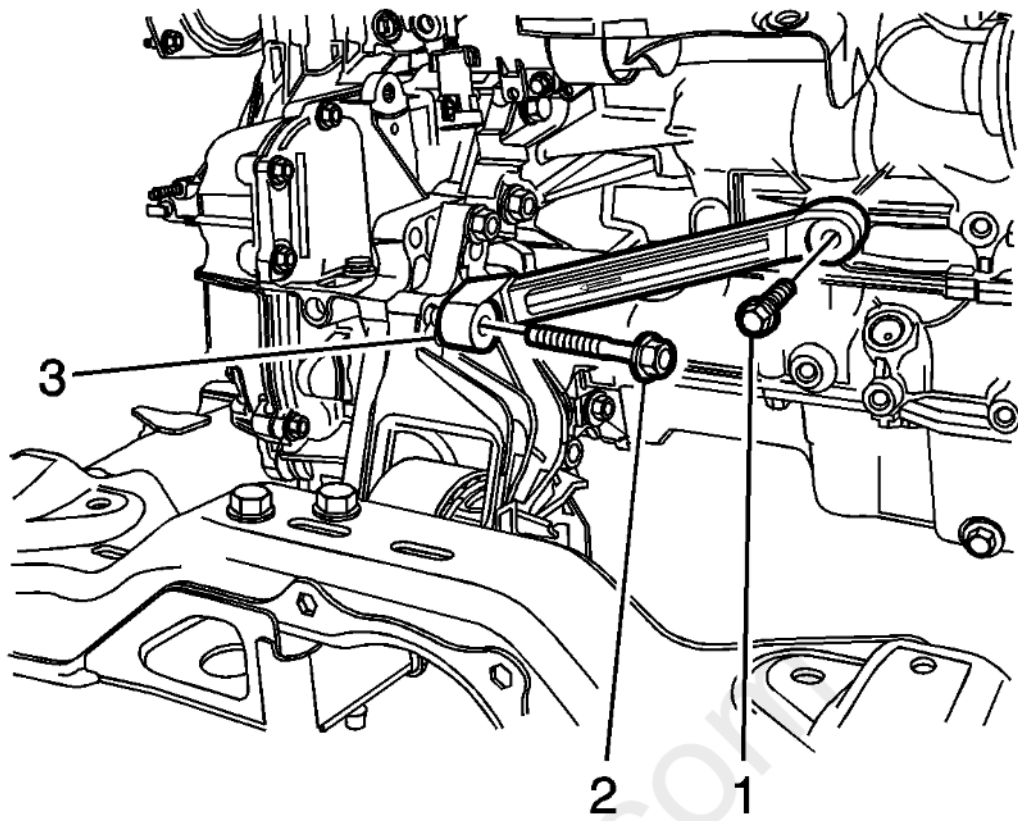


Fig. 82: Transmission Brace And Bolts

Courtesy of GENERAL MOTORS COMPANY

2. Install the transaxle brace (3) with bolt (2) seated in the brace.
3. Install the transaxle brace bolt (1) and tighten to 50 N.m (37 lb ft).
4. Tighten the brace bolt (2) to 100 N.m (74 lb ft).

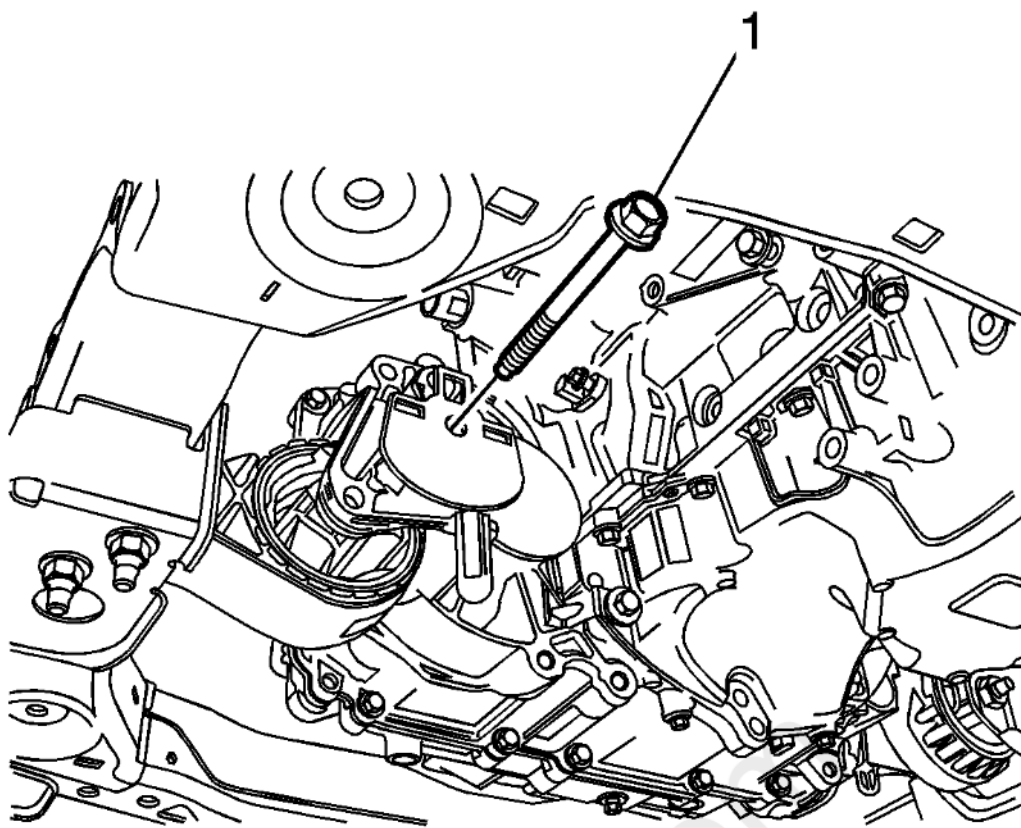


Fig. 83: Rear Transmission Mount Through Bolt
Courtesy of GENERAL MOTORS COMPANY

5. Install the transmission mount to bracket through bolt (1) and tighten to 100 N.m (74 lb ft).

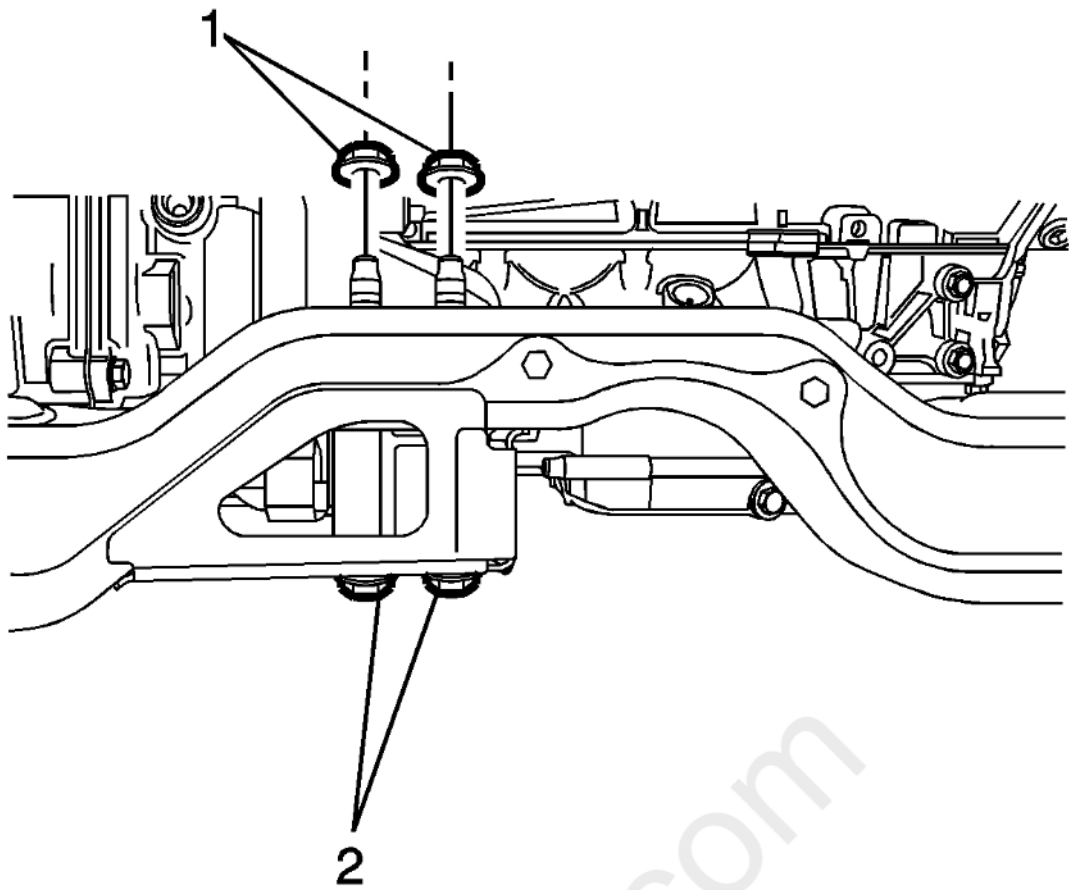


Fig. 84: Rear Mount To Frame Fasteners
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use NEW bolts only.

6. Install the rear mount to frame fasteners (1, 2) and tighten to 100 N.m (74 lb ft) plus 120 - 130 degrees.
7. Install the catalytic converter. Refer to [Catalytic Converter Replacement](#) .
8. Perform the Powertrain Mount Balancing - Lower procedure. Refer to the appropriate engine section.
9. Remove the jack stand.
10. Lower the vehicle.

TRANSMISSION REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to [Battery Tray Replacement](#) .
2. Remove the transmission range select lever cable and bracket from the transmission.
3. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#).

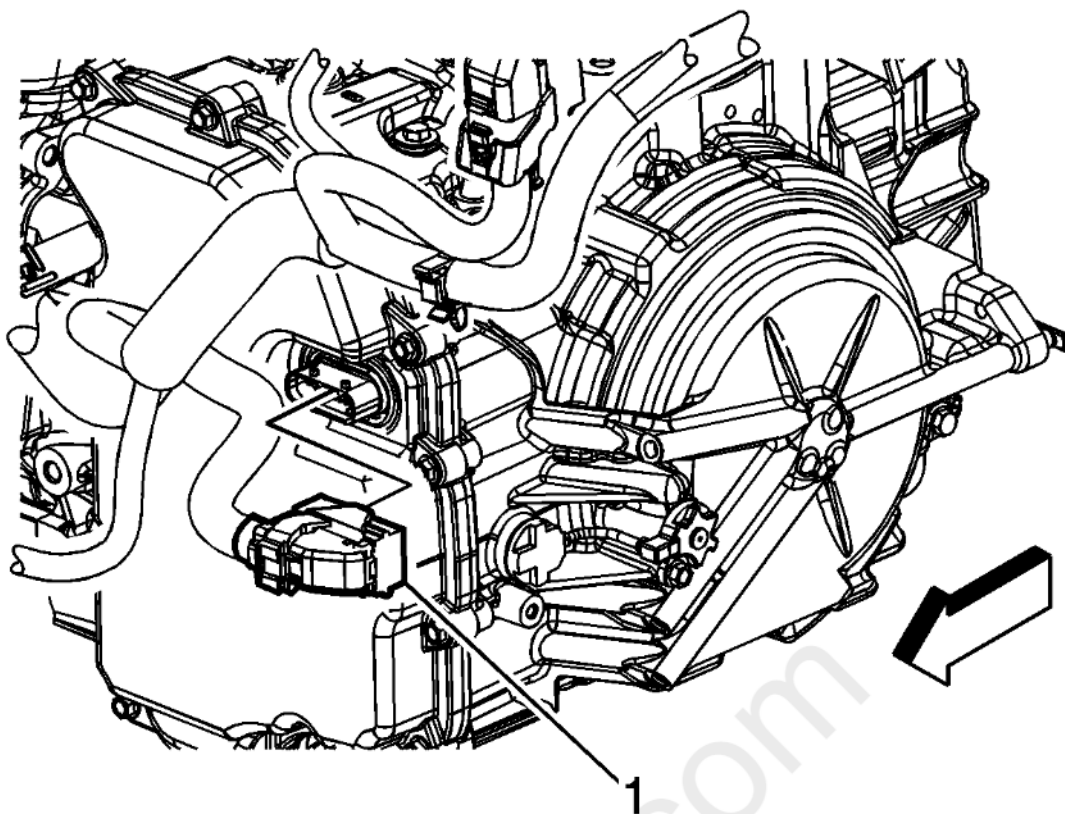


Fig. 85: Control Valve Body Transmission Control Module (TCM) Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the control valve body transmission control module (TCM) electrical connector (1) then unclip the connector from the transmission.

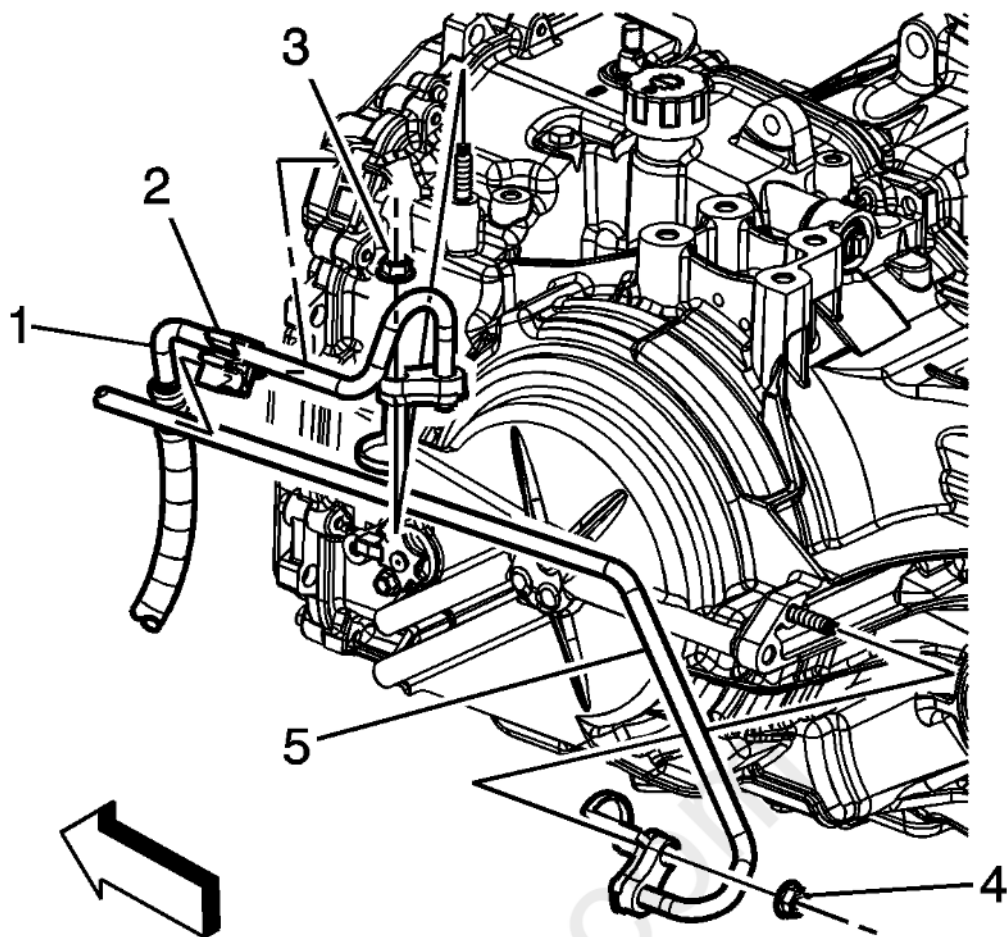


Fig. 86: Fluid Cooler Inlet Hose, Outlet Hose, Retainer And Nuts

Courtesy of GENERAL MOTORS COMPANY

5. Remove the transmission fluid cooler inlet (1) and outlet (5) hoses from the retainer (2) on the control valve body cover.
6. Remove the transmission fluid cooler inlet hose nut (3) from the transmission.
7. Remove the transmission fluid cooler inlet hose (1) from the transmission.
8. Remove the transmission fluid cooler outlet hose nut (4) from the transmission.
9. Remove the transmission fluid cooler outlet hose (5) from the transmission.
10. Plug and/or cap the hose and transmission to prevent contamination.

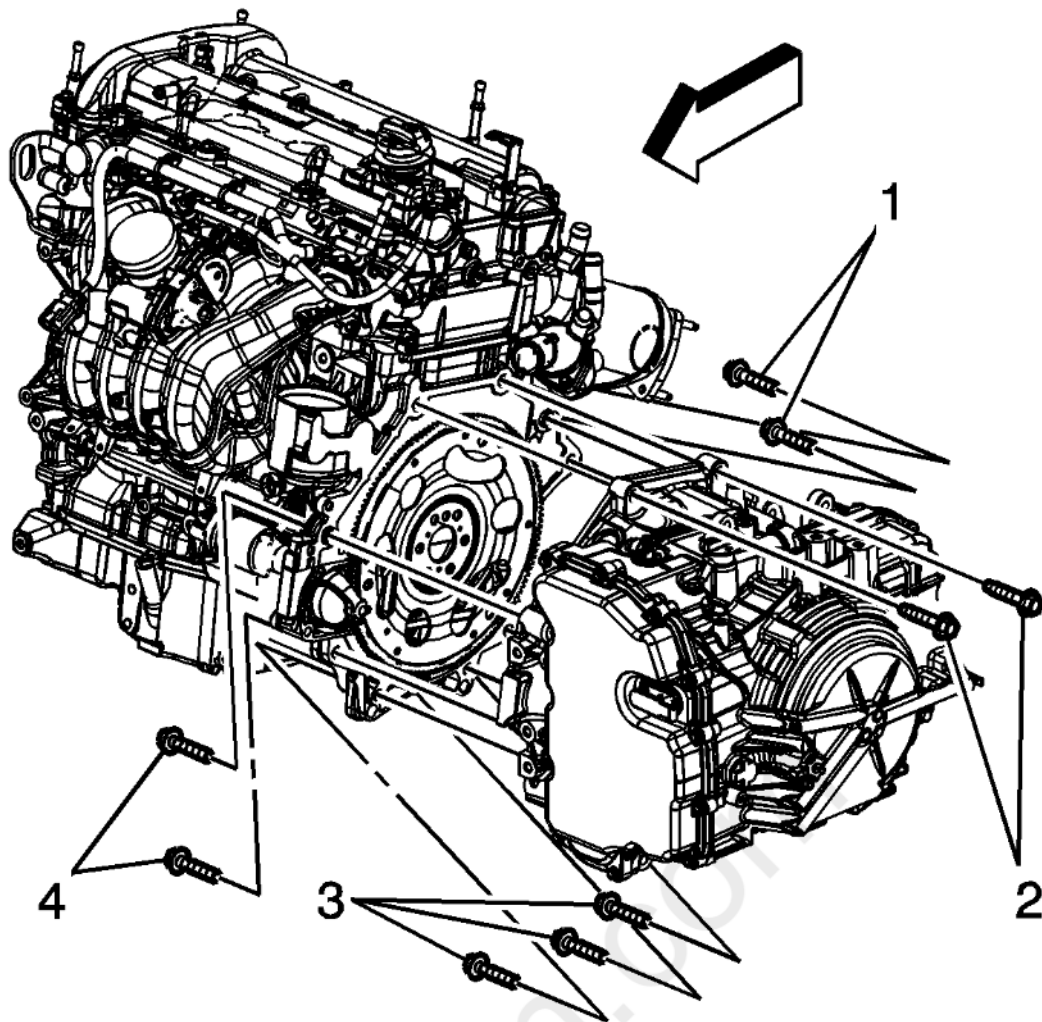


Fig. 87: Transmission To Engine Bolts

Courtesy of GENERAL MOTORS COMPANY

11. Remove the upper transmission to engine bolts (2).
12. Remove the frame. Refer to [Drivetrain and Front Suspension Frame Replacement](#).
13. Disconnect the left wheel drive shaft from the transmission. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#).
14. Disconnect the right wheel drive shaft from the transmission. Refer to [Front Wheel Drive Shaft Replacement - Right Side](#).
15. Remove the intermediate drive shaft. Refer to [Front Wheel Drive Intermediate Shaft Replacement \(LCV with MHG\)](#).
16. Remove the rear transmission mount from the transmission. Refer to [Transmission Rear Mount Replacement](#).
17. Remove the front transmission mount from the transmission. Refer to [Transmission Front Mount Replacement](#).

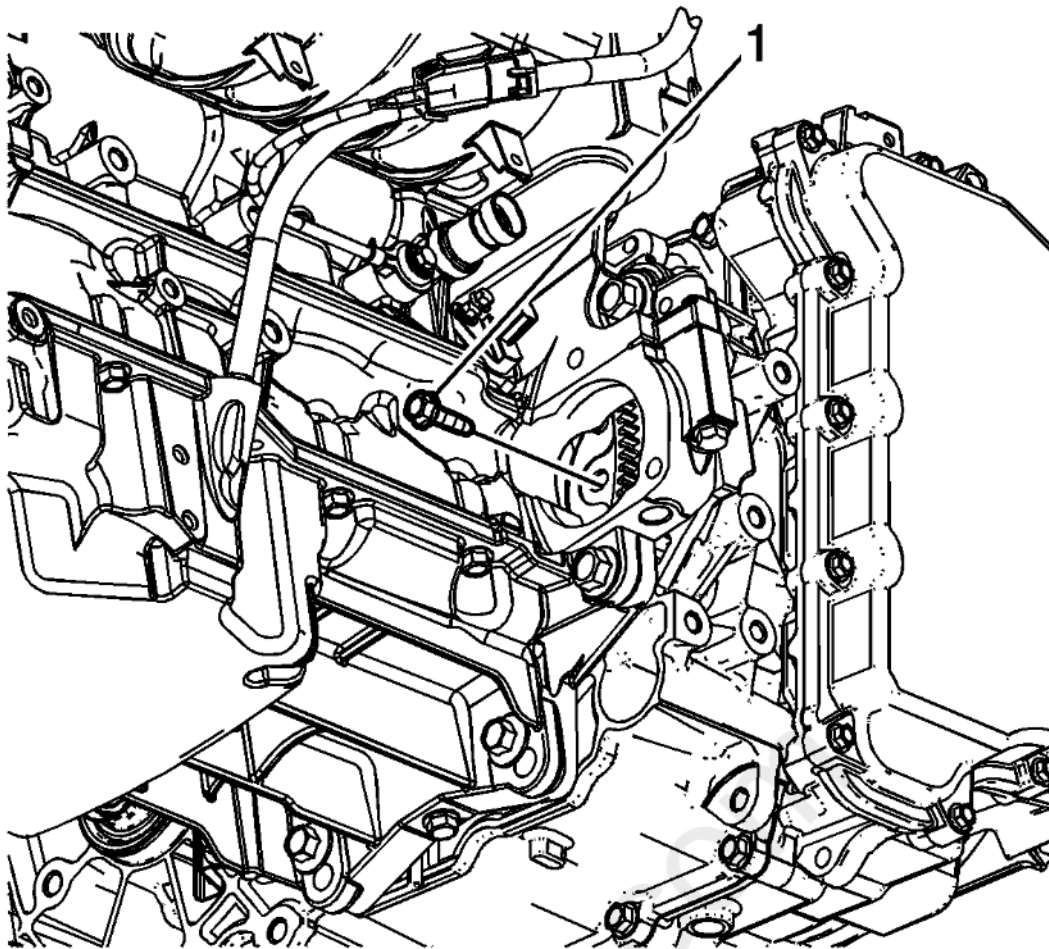


Fig. 88: Torque Converter To Flywheel Bolts

Courtesy of GENERAL MOTORS COMPANY

18. Remove the starter. Refer to [Starter Replacement \(LCV\)](#) .
19. Mark the relationship of the flywheel to the torque converter for reassembly.
20. Remove the torque converter to flywheel bolts (1).
21. Lower the vehicle.
22. Remove the three left transmission mount bolts from the transmission. Refer to [Transmission Mount Replacement - Left Side](#).
23. Lower the transmission side with the support fixture to allow clearance for removal.
24. Unclip the engine wiring harness from the transmission.
25. Raise the vehicle.
26. Use a transmission jack in order to support the transmission.

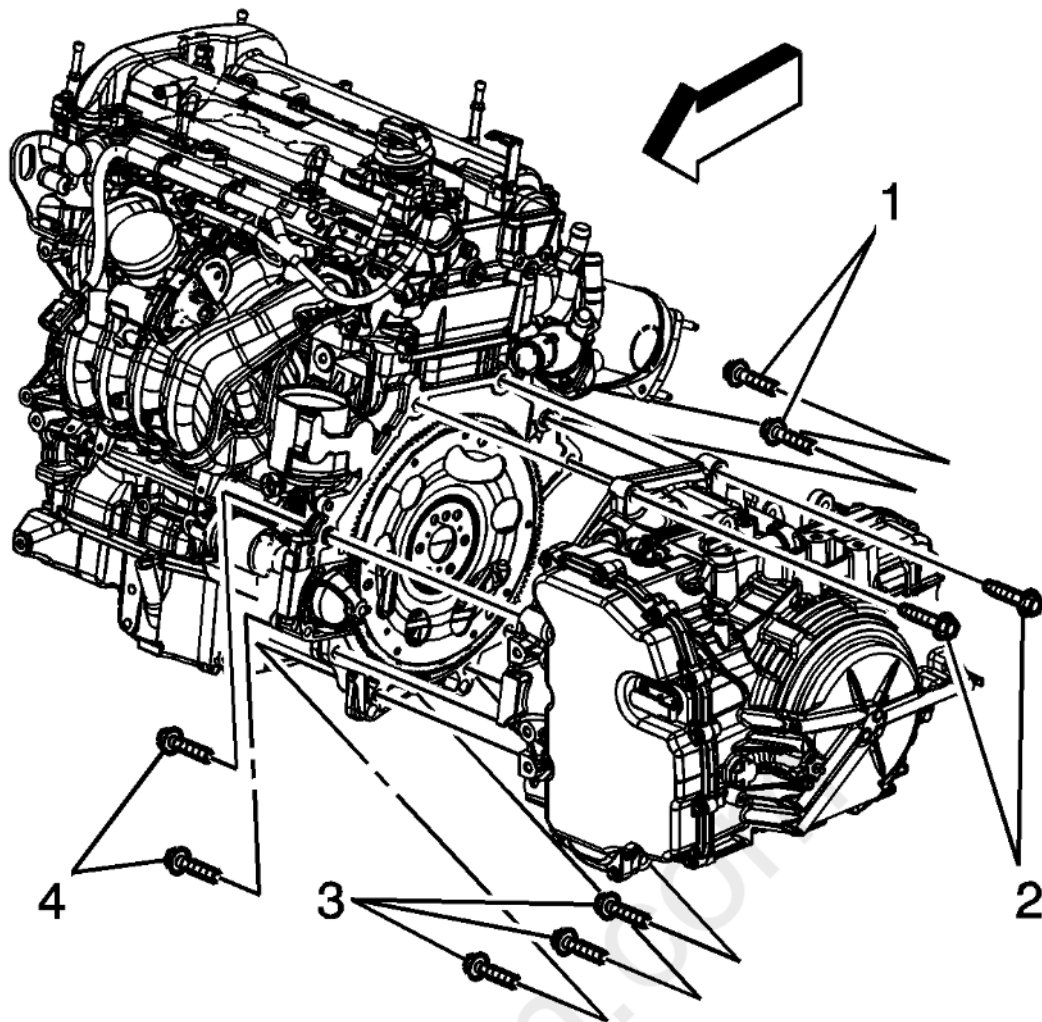


Fig. 89: Transmission To Engine Bolts

Courtesy of GENERAL MOTORS COMPANY

27. Remove the remaining transmission fasteners (1, 3, 4).

NOTE: Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

28. Separate the transmission from the engine.

29. Lower the transmission with the transmission jack far enough to remove the transmission.

30. Flush and flow test the transmission oil cooler and lines. Refer to [Transmission Fluid Cooler Flow Test and Flushing Transmission Fluid Cooler Flow Test and Flushing \(6T40/6T45\)](#).

Installation Procedure

1. Raise the transmission with the transmission jack and position the transmission to the engine.

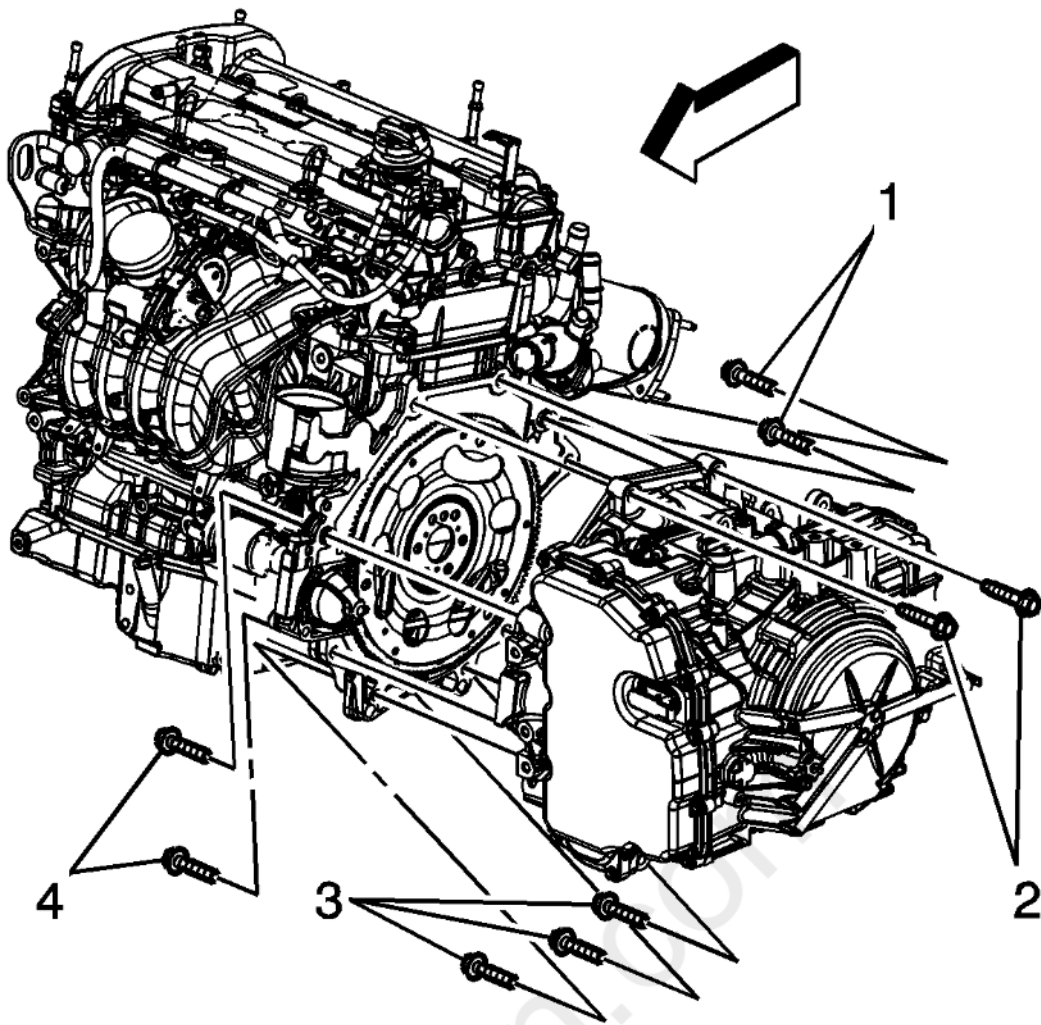


Fig. 90: Transmission To Engine Bolts

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to **Fastener Caution** .

2. Install the transmission bolts (1, 3, 4) and tighten to 58 N.m (43 lb ft).
3. Remove the transmission jack.

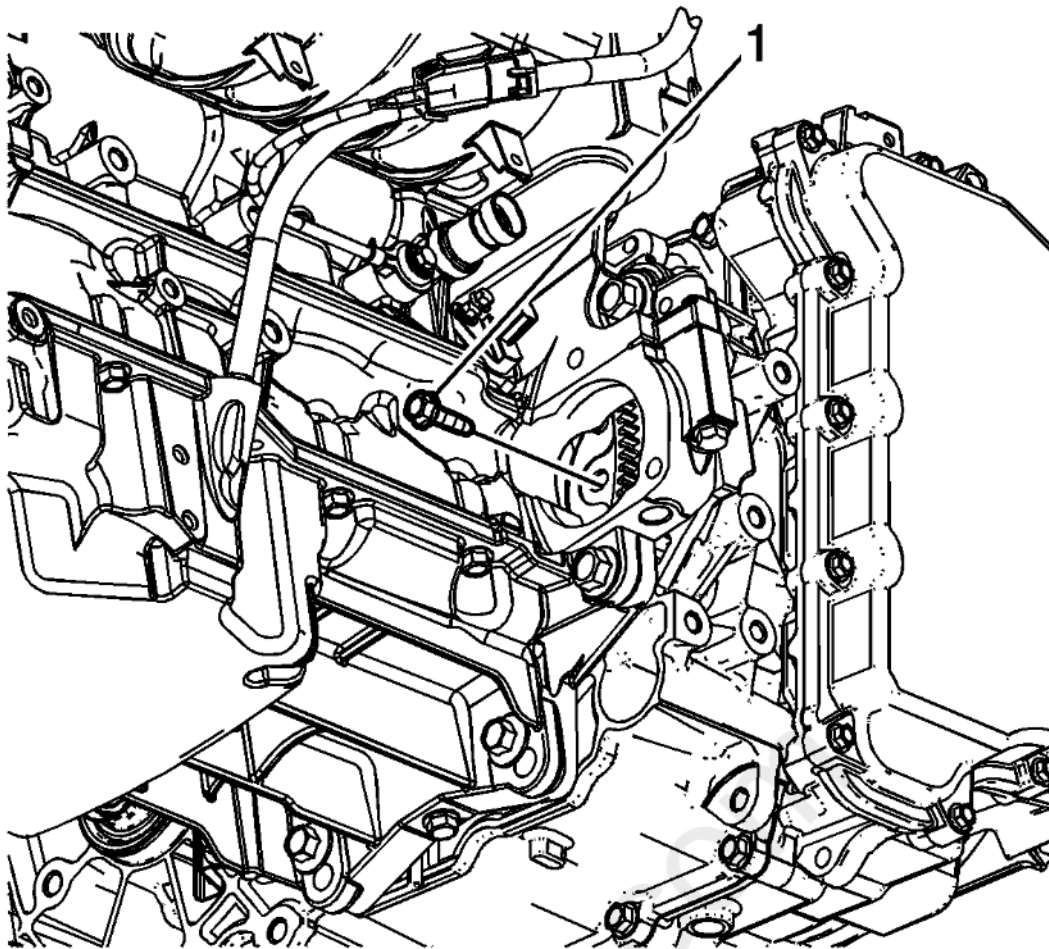


Fig. 91: Torque Converter To Flywheel Bolts

Courtesy of GENERAL MOTORS COMPANY

NOTE: If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#) for the recommended threadlock material.

4. Install the torque converter to flywheel bolts (1) and tighten to 62 N.m (46 lb ft).
5. Install the starter. Refer to [Starter Replacement \(LCV\)](#).
6. Install the front transmission mount to the transmission. Refer to [Transmission Front Mount Replacement](#).
7. Install the rear transmission mount to the transmission. Refer to [Transmission Rear Mount Replacement](#).
8. Install the left transmission mount to the transmission. Refer to [Transmission Mount Replacement - Left Side](#).
9. Install the intermediate drive shaft. Refer to [Front Wheel Drive Intermediate Shaft Replacement \(LCV with MHG\)](#).
10. Install the left wheel drive shaft to the transmission. Refer to [Front Wheel Drive Shaft Replacement - Left Side](#).
11. Install the right wheel drive shaft to the transmission. Refer to [Front Wheel Drive Shaft Replacement - Right Side](#).
12. Install the frame. Refer to [Drivetrain and Front Suspension Frame Replacement](#).

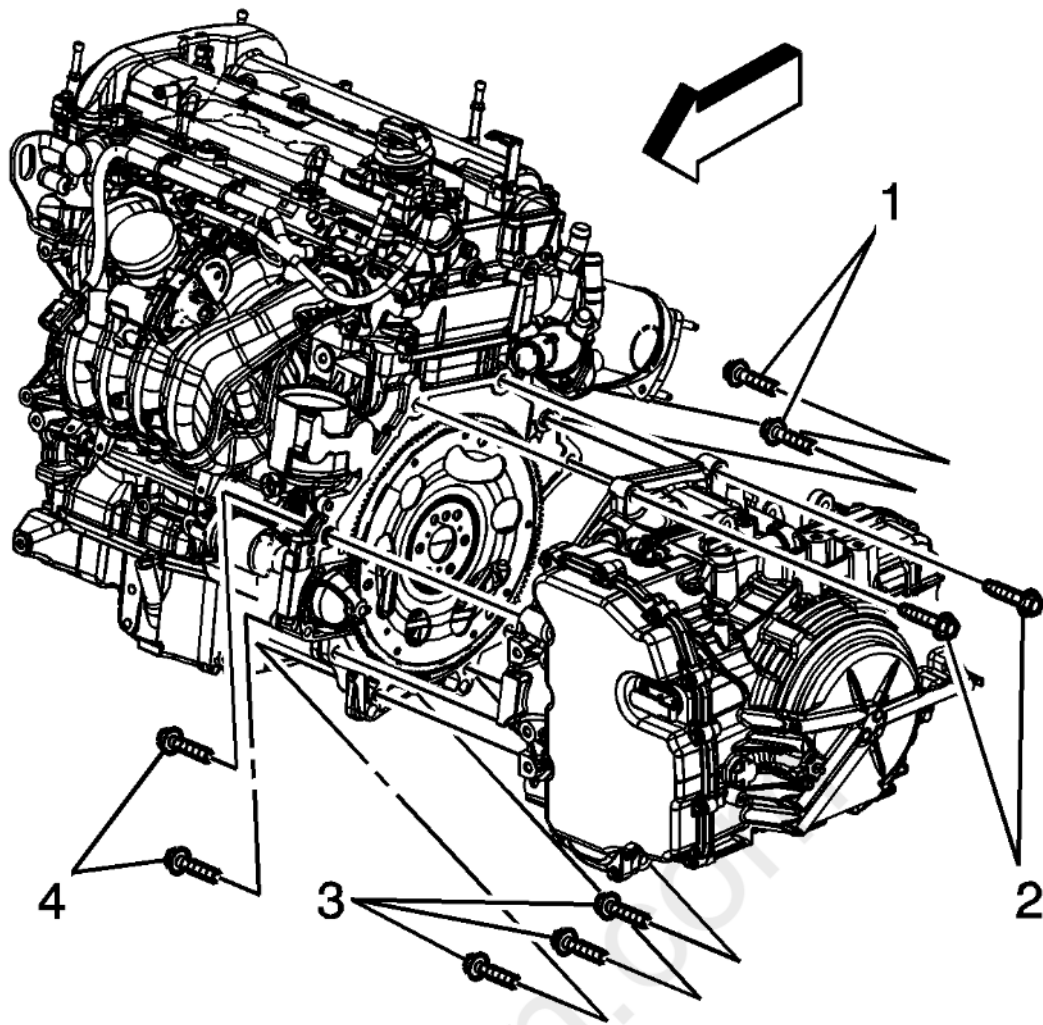


Fig. 92: Transmission To Engine Bolts

Courtesy of GENERAL MOTORS COMPANY

13. Install the upper transmission to engine bolt (2) and tighten to 58 N.m (43 lb ft).
14. Remove the engine support fixture.

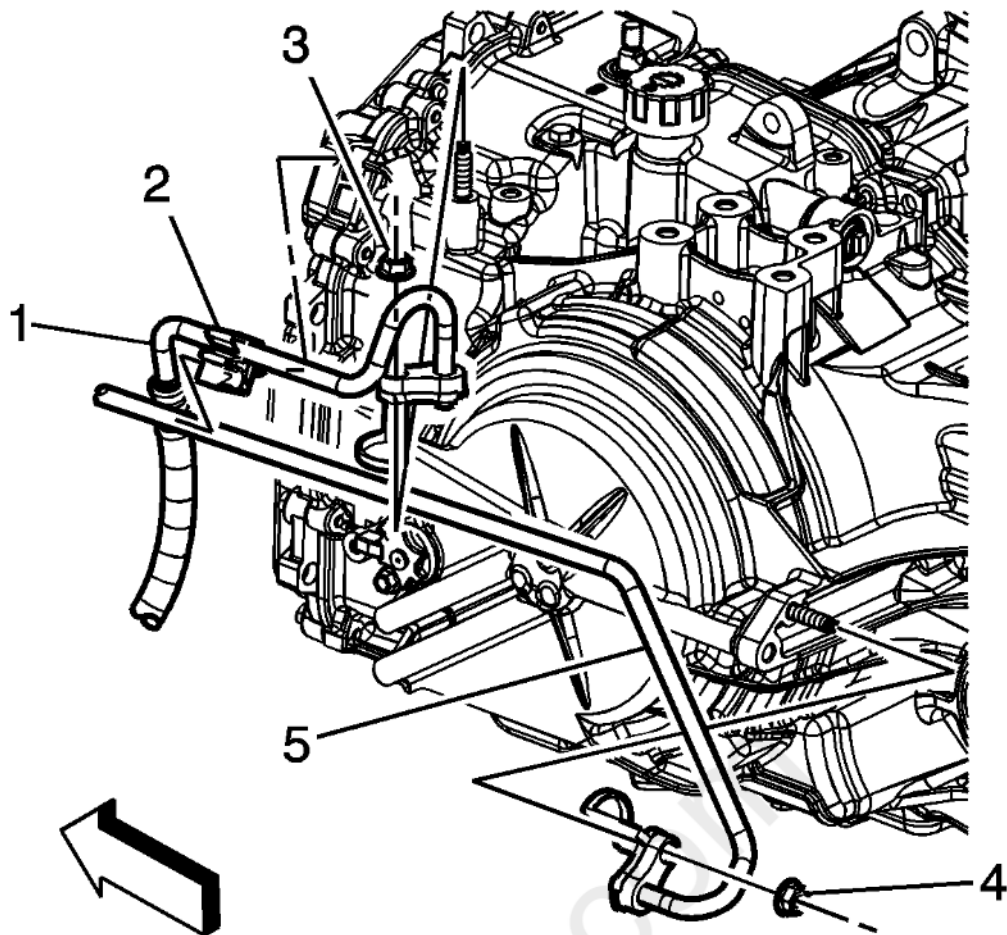


Fig. 93: Fluid Cooler Inlet Hose, Outlet Hose, Retainer And Nuts

Courtesy of GENERAL MOTORS COMPANY

15. Install the transmission fluid cooler outlet hose (5) to the transmission.
16. Install the transmission fluid cooler pipe retainer nut (4) and tighten to 22 N.m (16 lb ft).
17. Install the transmission fluid cooler inlet hose (1) to the transmission.
18. Install the transmission fluid cooler pipe retainer nut (3) and tighten to 22 N.m (16 lb ft).

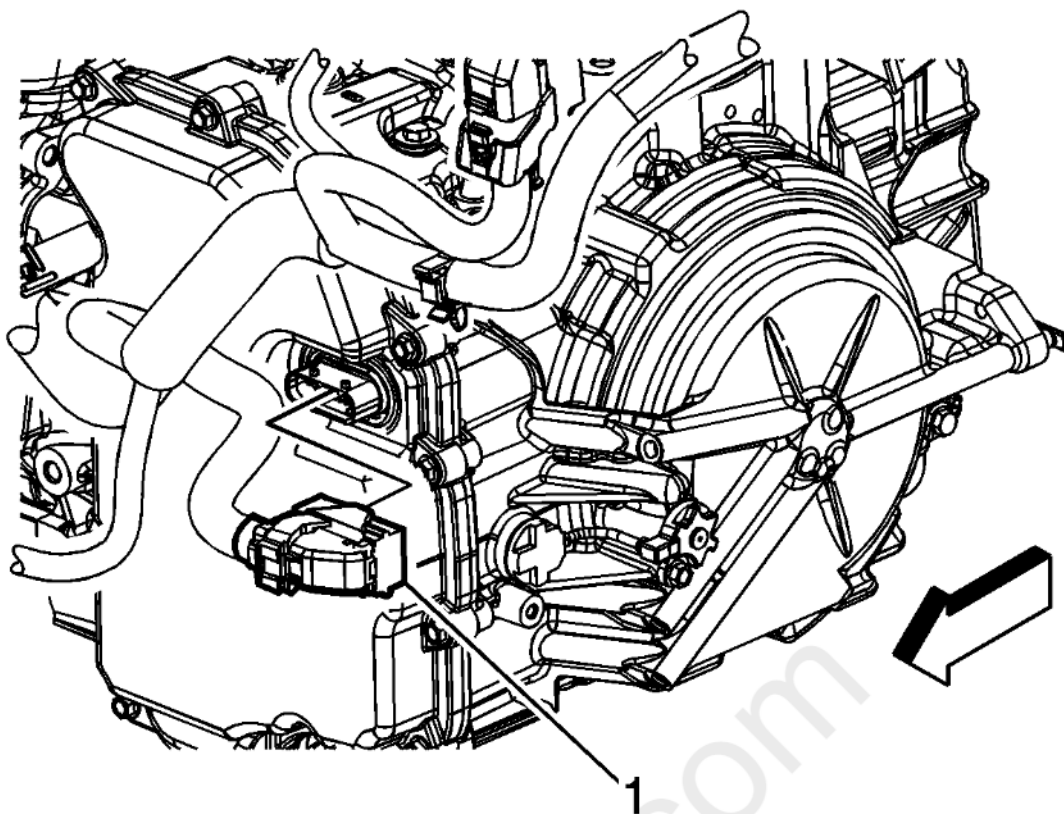


Fig. 94: Control Valve Body Transmission Control Module (TCM) Electrical Connector
Courtesy of GENERAL MOTORS COMPANY

19. Connect the control valve body TCM electrical connector (1).
20. Install the transmission range select lever cable and bracket on the transmission.
21. Install the battery tray. Refer to [Battery Tray Replacement](#).
22. Adjust the automatic transmission range selector lever cable. Refer to [Range Selector Lever Cable Adjustment](#).
23. Fill the transmission with fluid. Refer to [Transmission Fluid Drain and Fill](#).
24. If a NEW TCM has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to [Service Programming System \(SPS\)](#).

NOTE: The Reset Transmission Adapts procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

25. Perform the Reset Transmission Adapts. Refer to [Transmission Adaptive Values Learn](#).

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Schematic and Routing Diagrams - Automatic Transmission Controls Schematics - Impala

SCHEMATIC WIRING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS WIRING SCHEMATICS

Power, Ground, Serial Data, and MIL

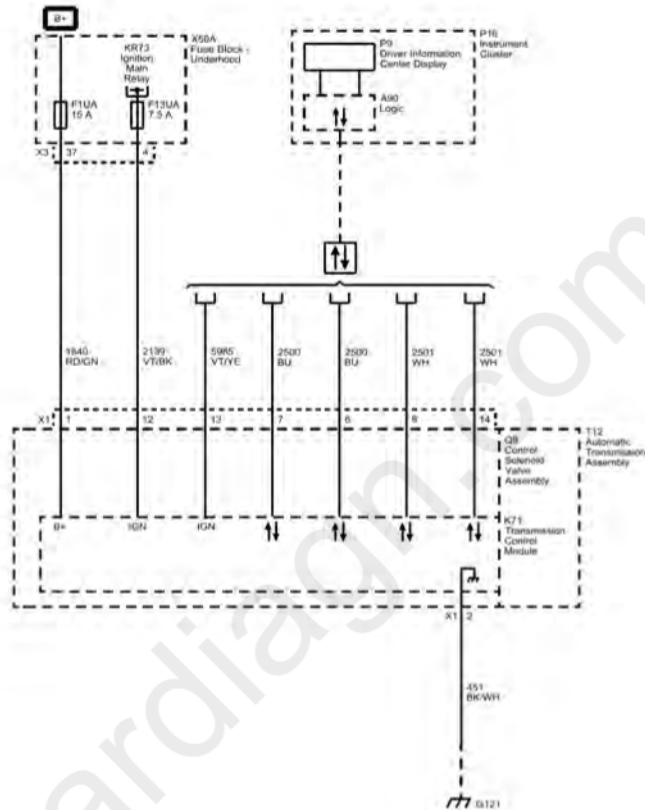


Fig. 1: Power, Ground, Serial Data, and MIL
Courtesy of GENERAL MOTORS COMPANY

Speed and Temperature Sensors, Valve Position, Pressure and Shift Controls

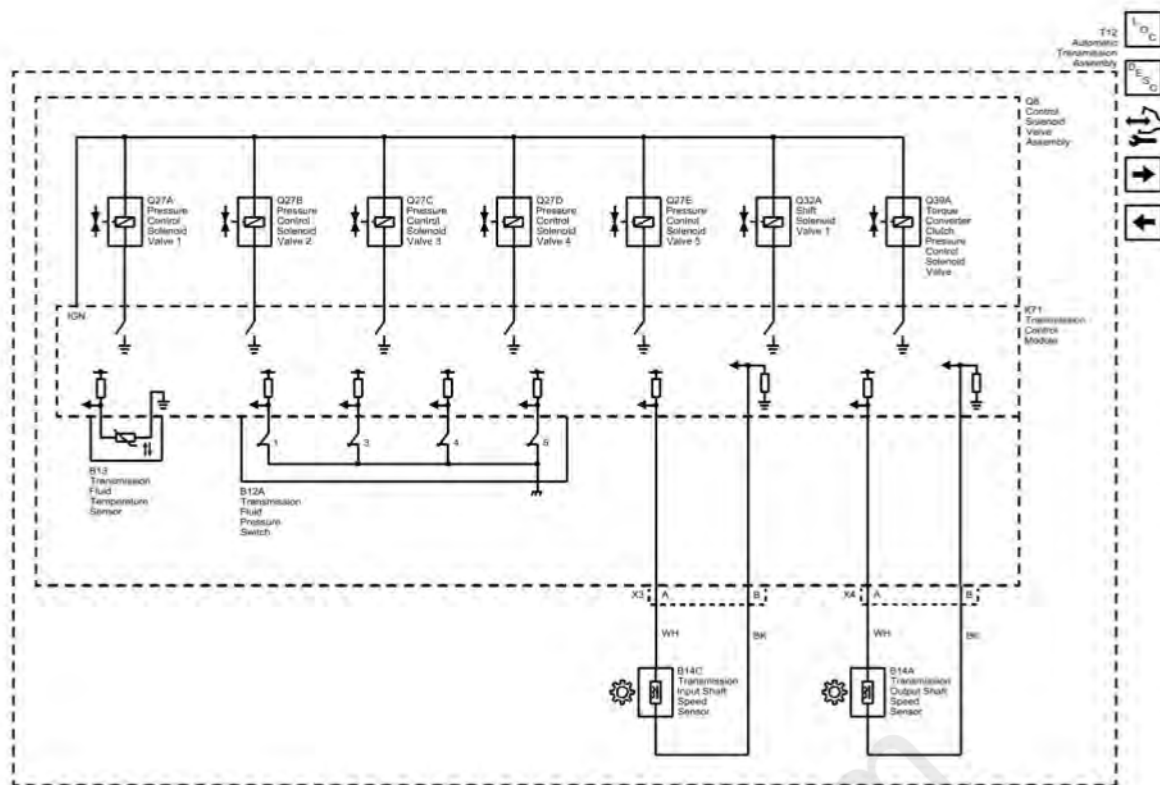


Fig. 2: Speed and Temperature Sensors, Valve Position, Pressure and Shift Controls
 Courtesy of GENERAL MOTORS COMPANY

Internal Mode Switch and Manual Shift Controls

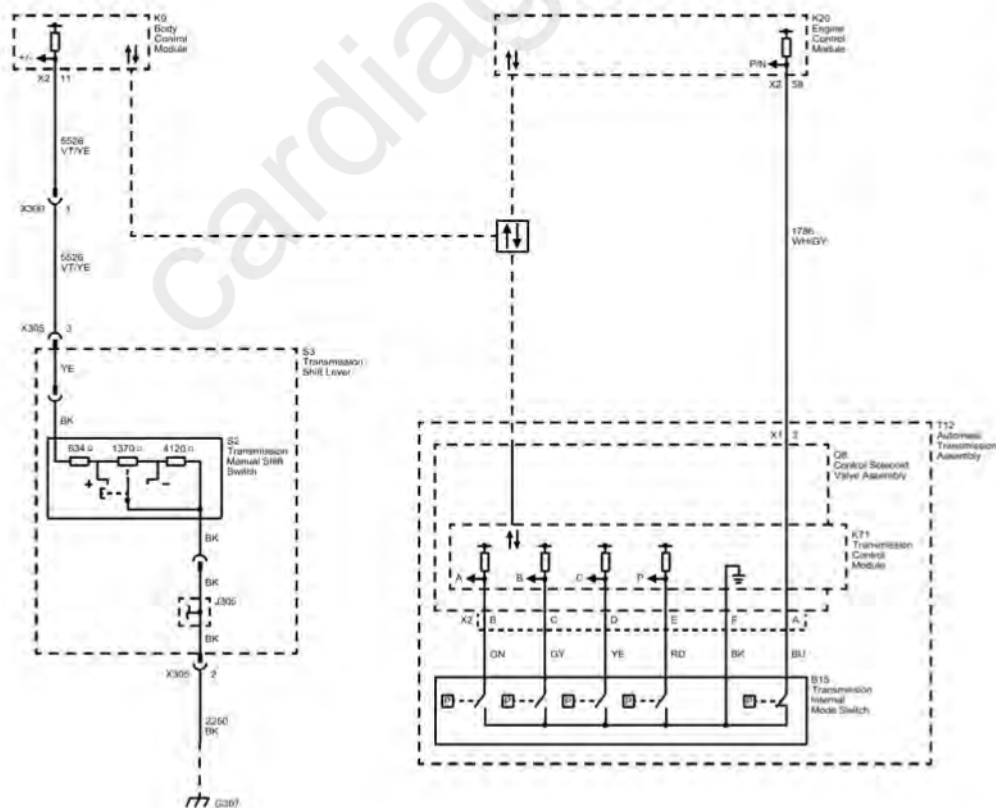


Fig. 3: Internal Mode Switch and Manual Shift Controls
 Courtesy of GENERAL MOTORS COMPANY

Transmission Fluid Accumulator (KL9)

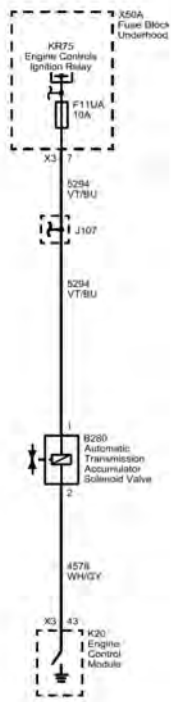


Fig. 4: Transmission Fluid Accumulator (KL9)
 Courtesy of GENERAL MOTORS COMPANY

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Special Tools and Equipment - Special Tools - Impala

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description
	DT-3289-20 J-3289-20 KM-113-2-A Holding Fixture

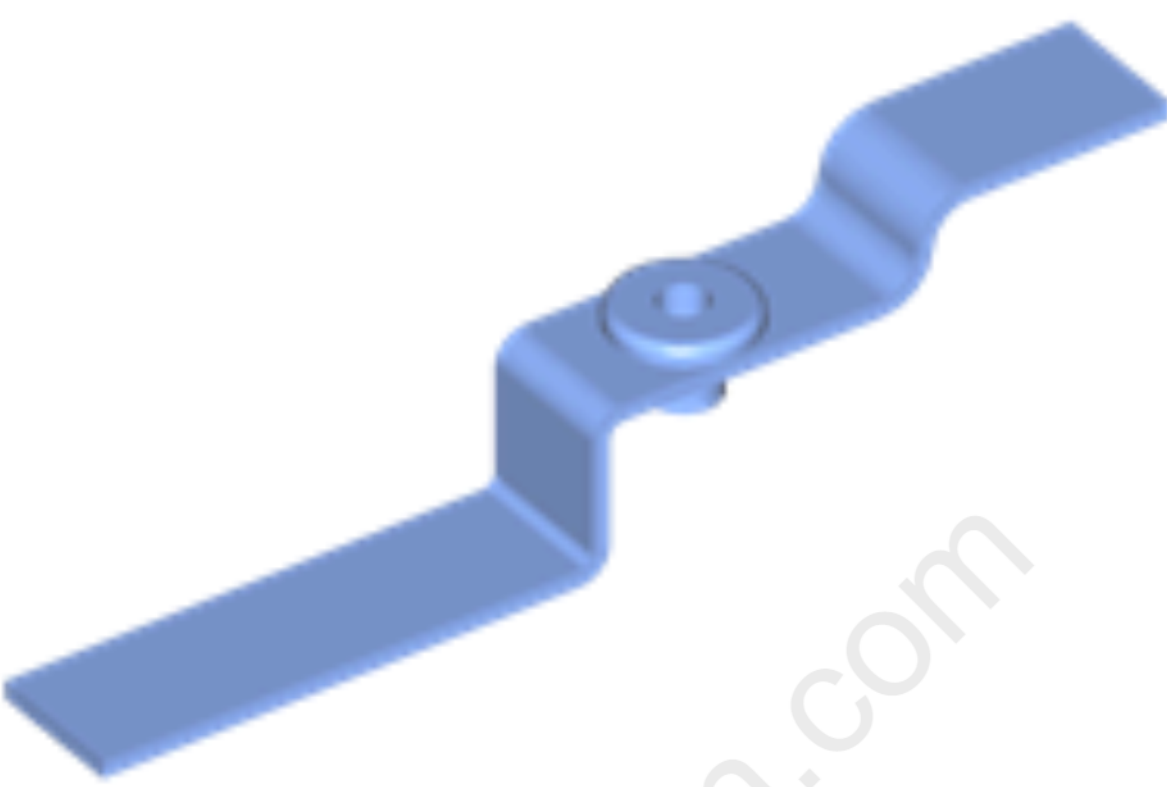
Illustration	Tool Number/Description
 cardiagn.com	DT-21366 J-21366 Converter Holding Strap

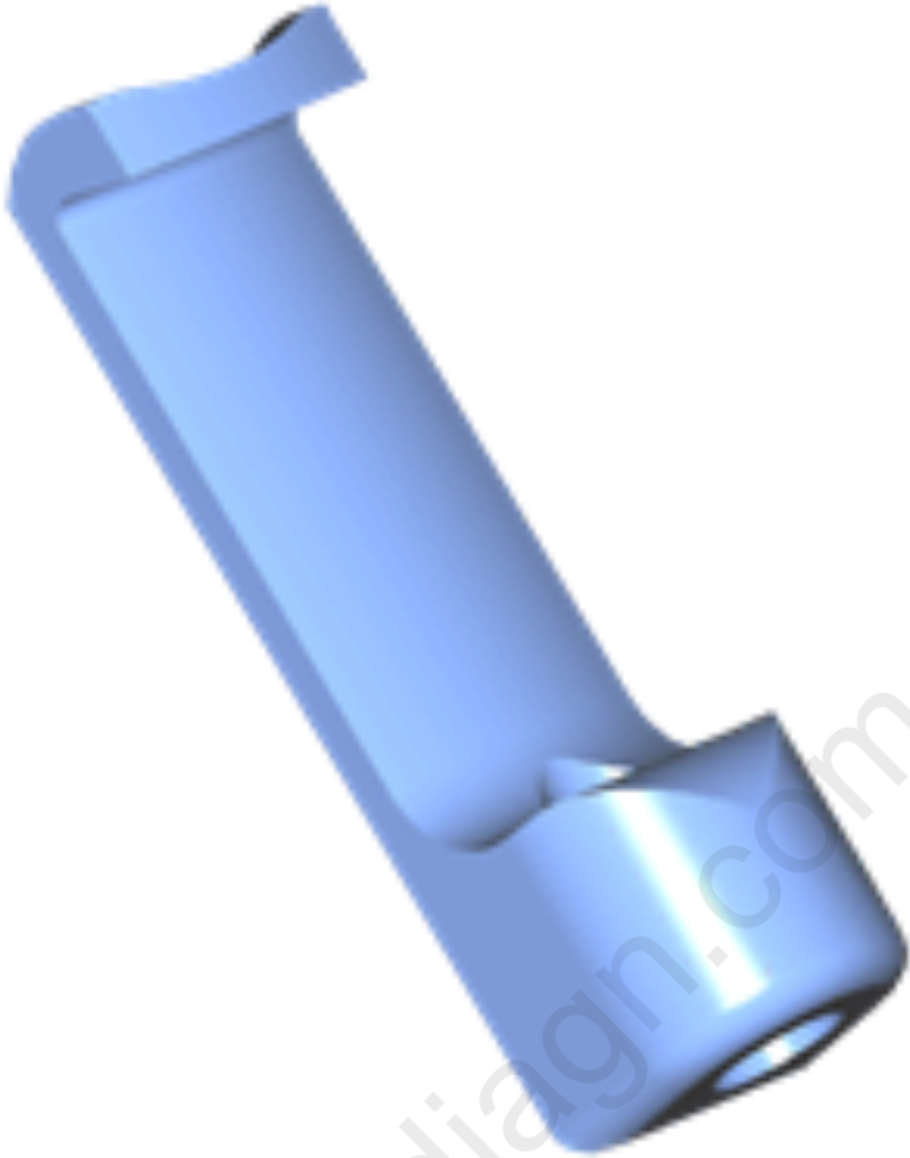
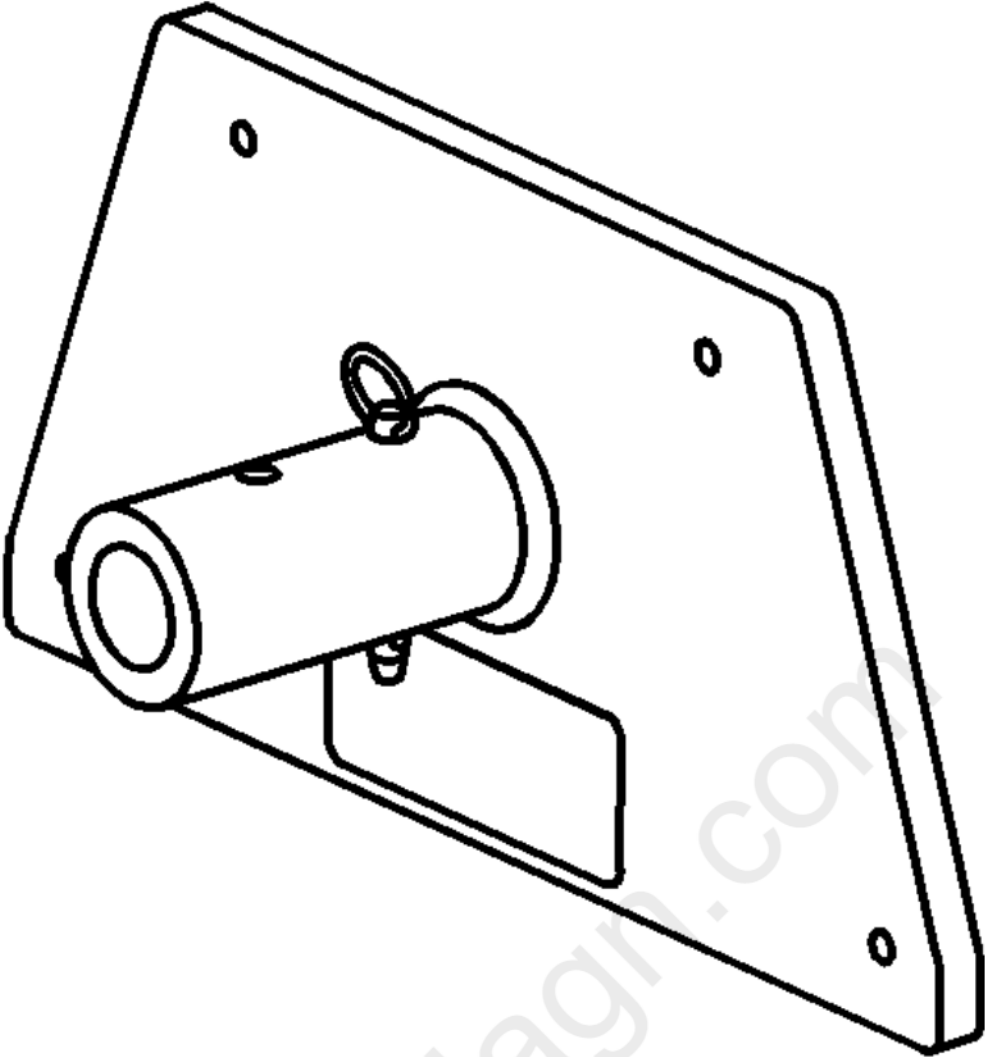
Illustration	Tool Number/Description
	DT-23129 J-23129 KM-586 T-0207928 Universal Seal Remover

Illustration	Tool Number/Description
	DT-28585 J-28585 KM-J-28585 Snap Ring Remover

Illustration	Tool Number/Description
	DT-39890 J-39890 Transmission Holding Fixture Adapter

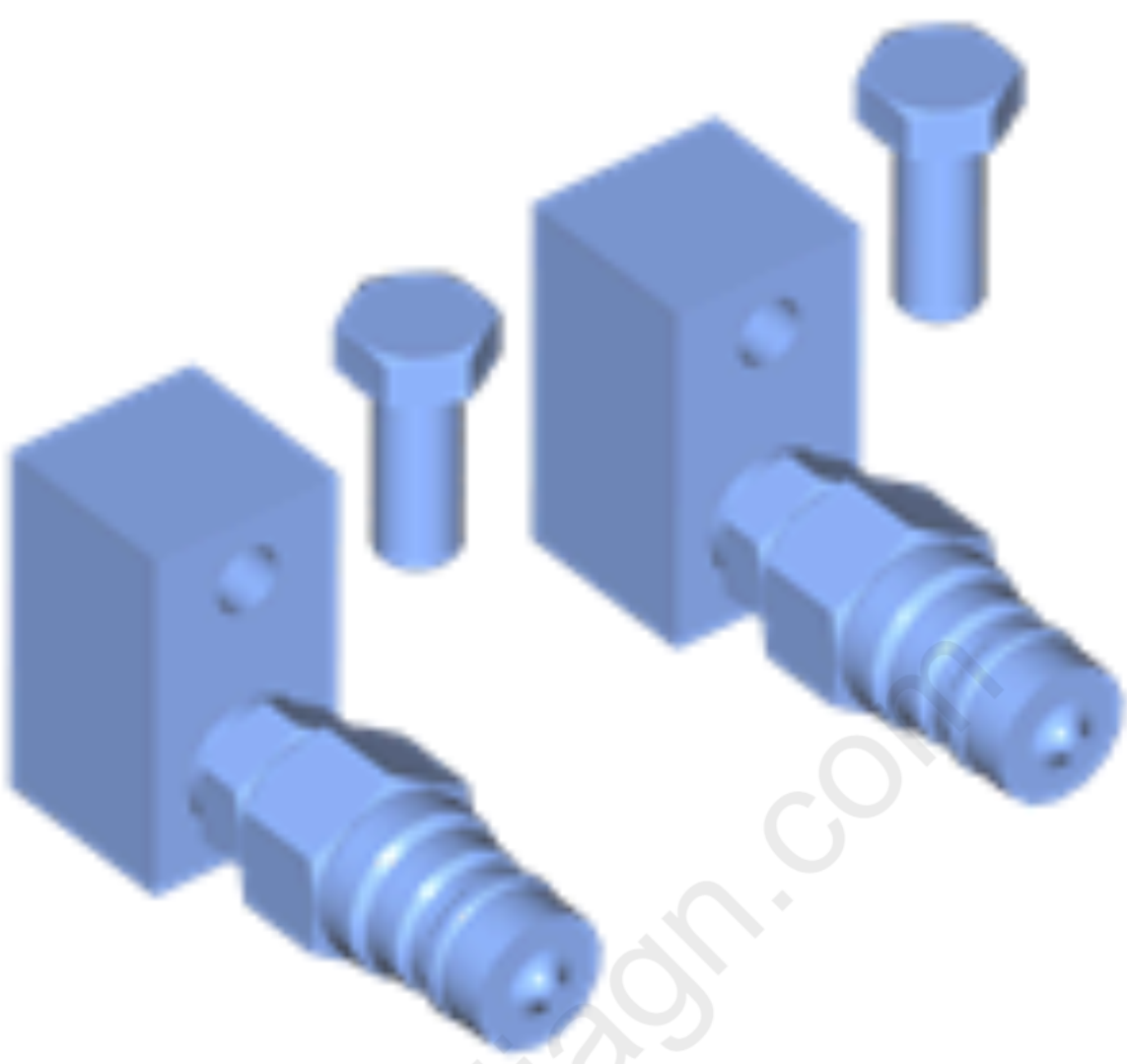
cardiagn.com

Illustration	Tool Number/Description
 A blue cylindrical tool, likely a shaft pin installer, shown at an angle. The tool is a solid blue cylinder with a slightly flared end. A large, light gray watermark 'cardiagn.com' is diagonally across the image.	DT-41229 J-41229 Manual Shaft Pin Installer
	DT-45096 J-45096 Transmission Oil Cooling System Flush and Flow Test Tool

Illustration

Tool
Number/Description



Illustration	Tool Number/Description
 The illustration shows a 3D model of a transmission cooling flush adapter. It consists of two rectangular blocks, each with a circular port on one side. Two hexagonal bolts are shown, one for each block. Two flexible hoses with quick-connect fittings are attached to the ports of the blocks. A large, diagonal watermark reading 'cardiagn.com' is overlaid across the image.	DT-45096-50 J-45096-50 Transmission Cooling Flush Adapter

cardiagn.com

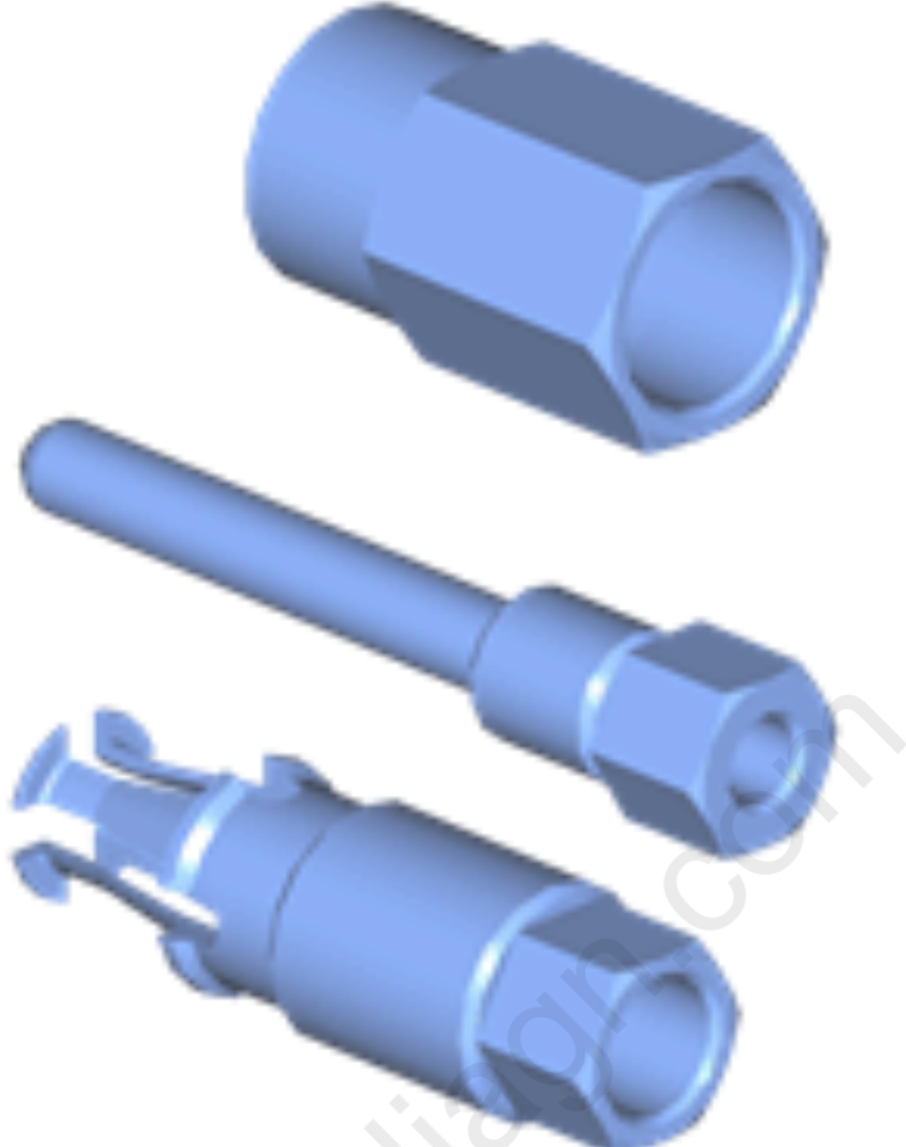
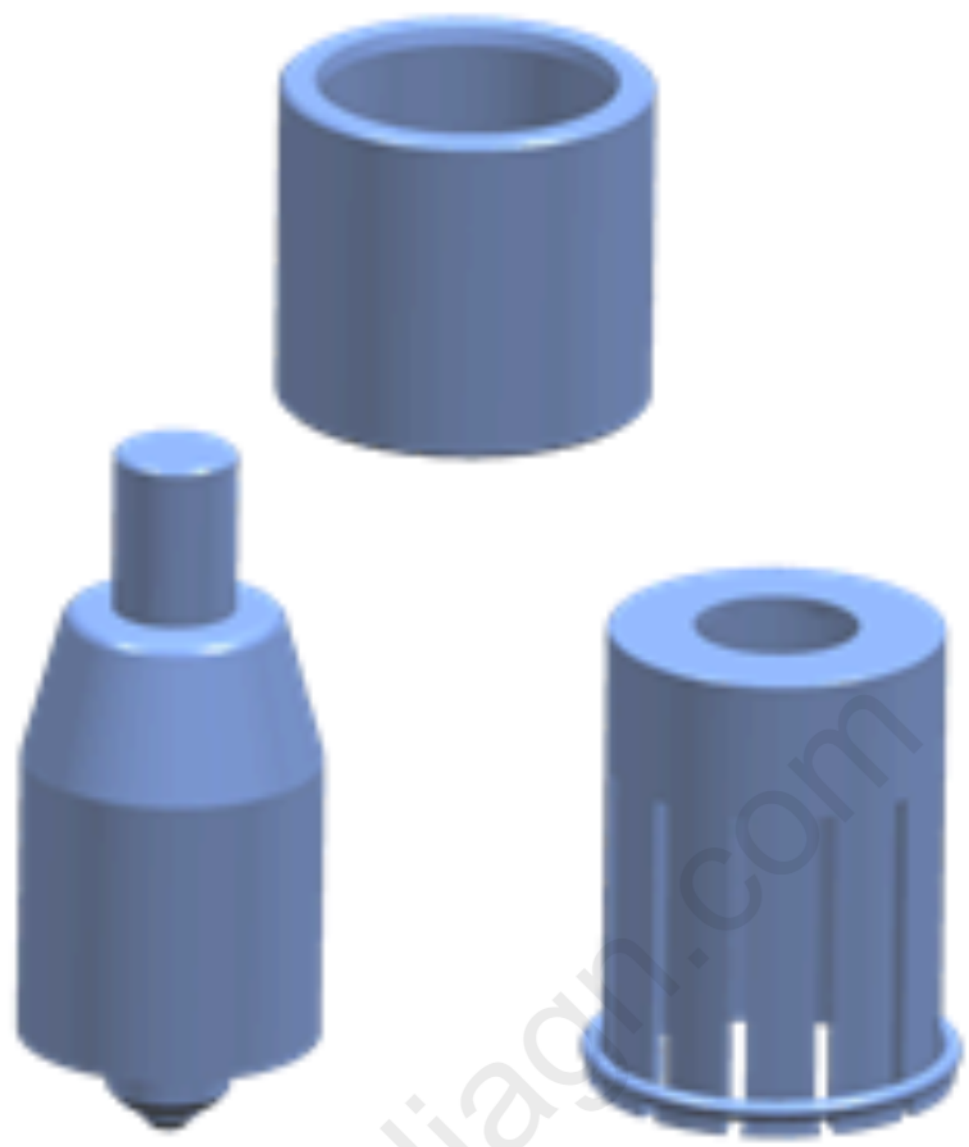
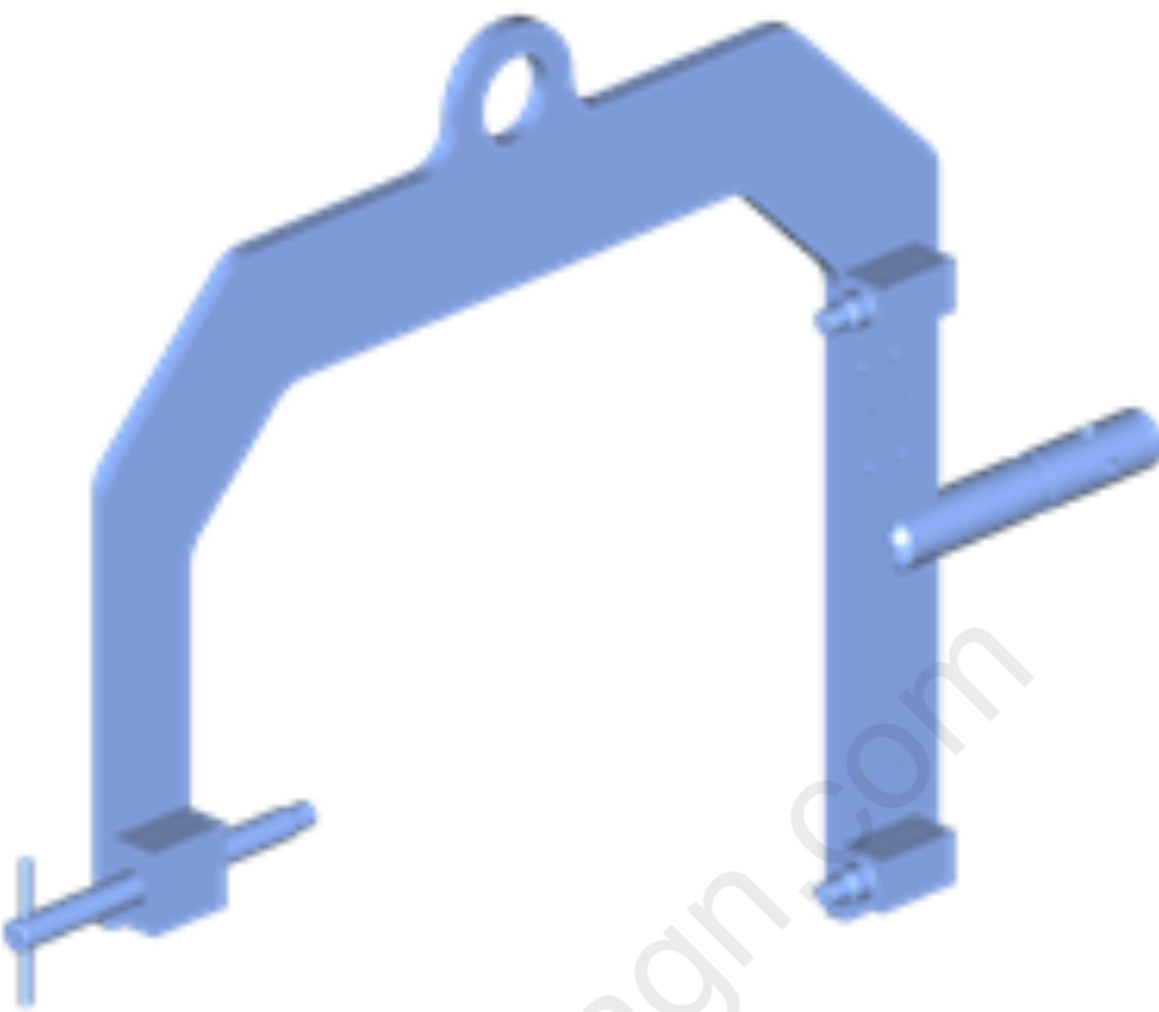
Illustration	Tool Number/Description
	DT-45201 DT-48203 J-45201 Cooler Line Seal Remover

Illustration	Tool Number/Description
 The illustration shows two identical blue T-shaped lifting handles. Each handle consists of a long, cylindrical shaft and a shorter, wider cylindrical crossbar at one end. They are positioned diagonally, with one handle slightly behind and to the right of the other. A large, light gray watermark 'cardiacsn.com' is oriented diagonally across the lower half of the image.	DT-46409 J-46409 KM-922 Torque Converter Lifting Handles

Illustration	Tool Number/Description
	DT-46620 J-46620 Seal Installer

cardiacm.com

Illustration	Tool Number/Description
	DT-46625 J-46625 Holding Fixture

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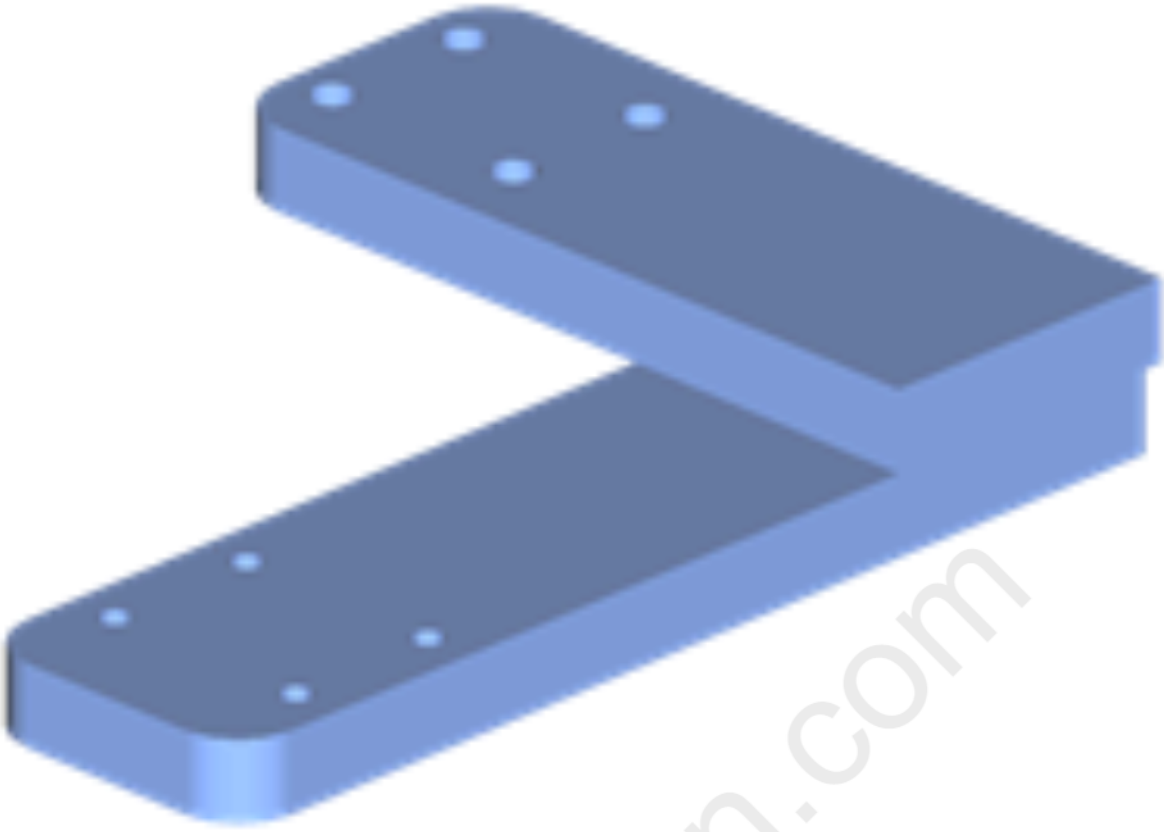
Illustration	Tool Number/Description
 A 3D perspective rendering of a blue, L-shaped metal component. The component consists of two rectangular arms joined at a 90-degree angle. Each arm has four circular mounting holes arranged in a 2x2 grid. The component is shown against a white background with a faint 'cardiagn.com' watermark.	DT-46625-10 J-46625-10 Holding Fixture Adapter

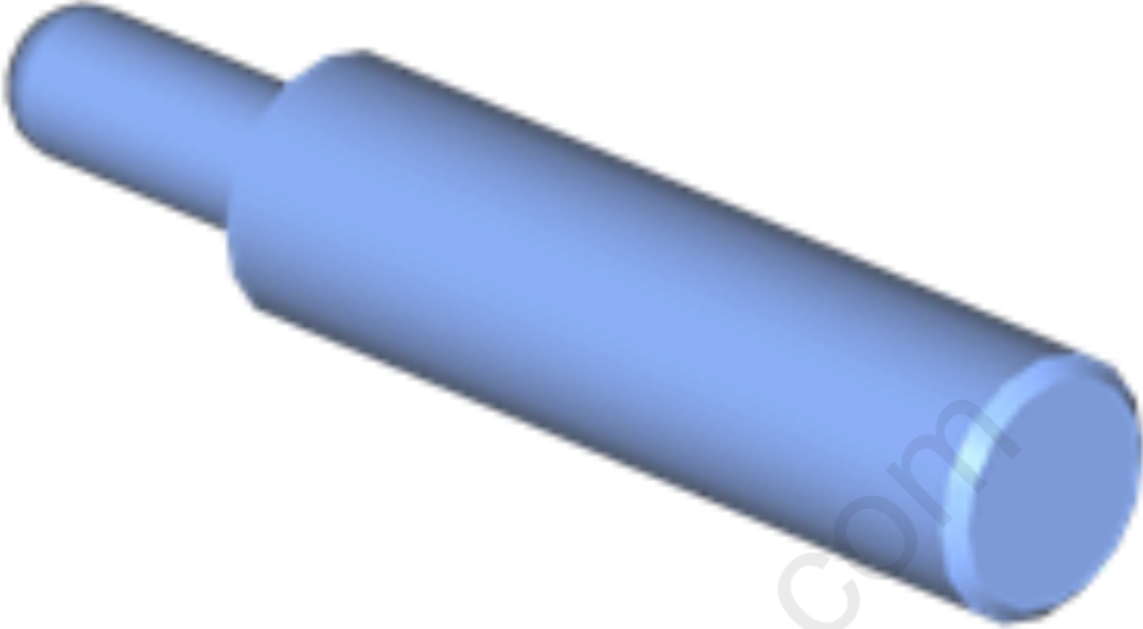
Illustration	Tool Number/Description
	DT-46626 J-46626 Seal Installer

Illustration	Tool Number/Description
	DT-47694 Spring Compressor

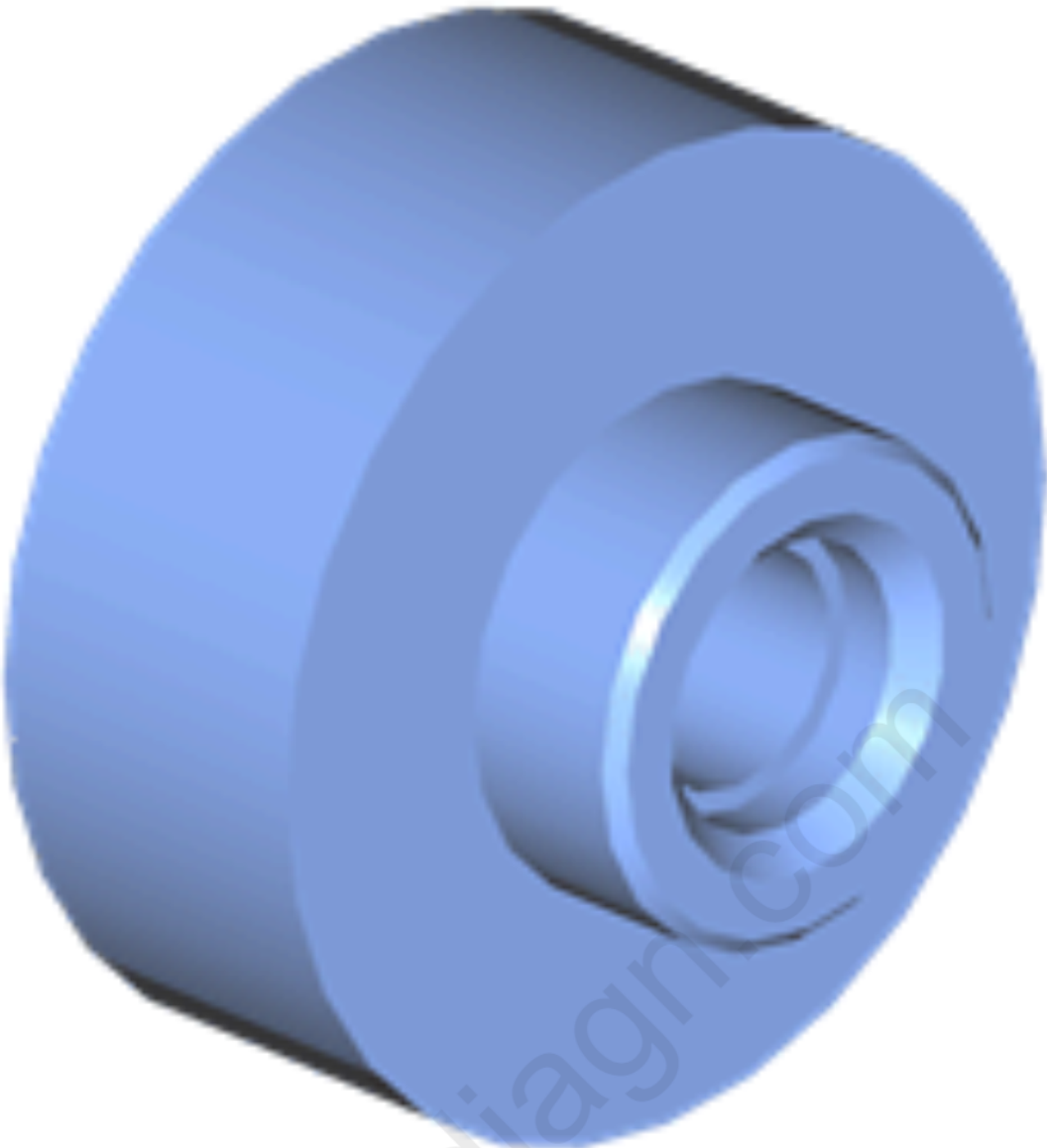
Illustration	Tool Number/Description
	DT-47790 Seal Installer

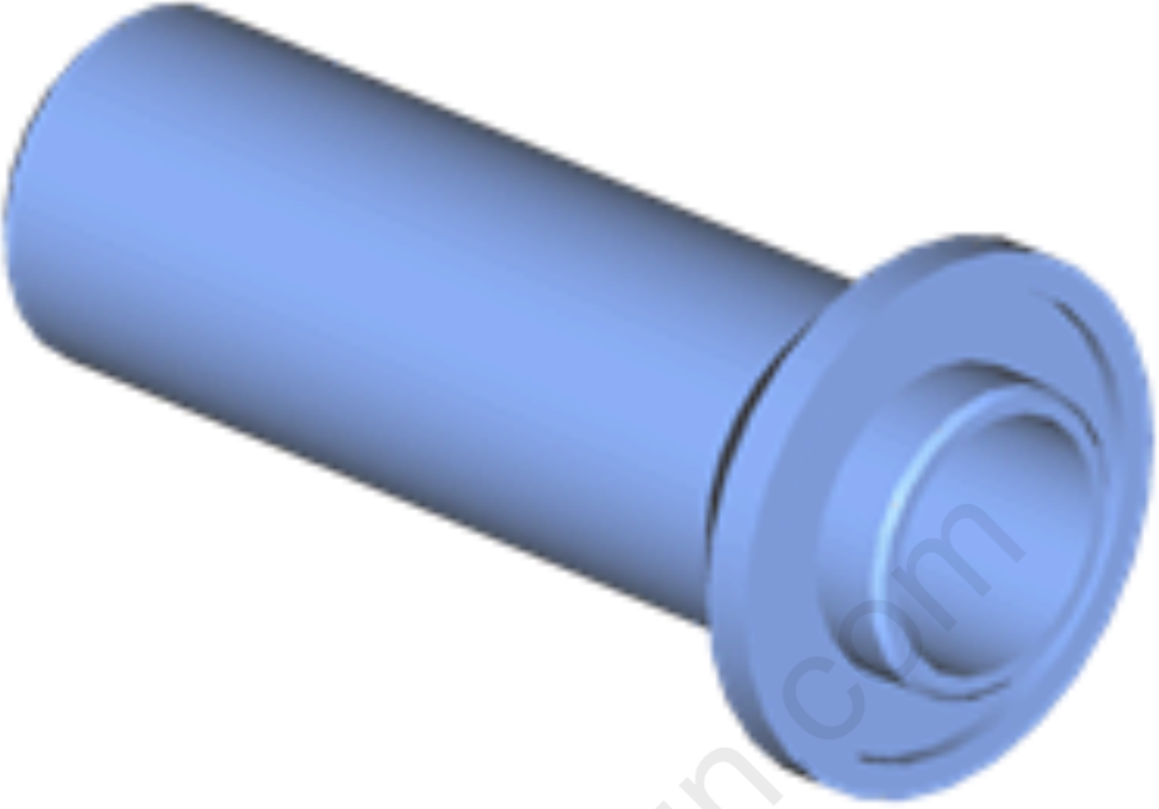
Illustration	Tool Number/Description
	DT-47791-B Seal Installer

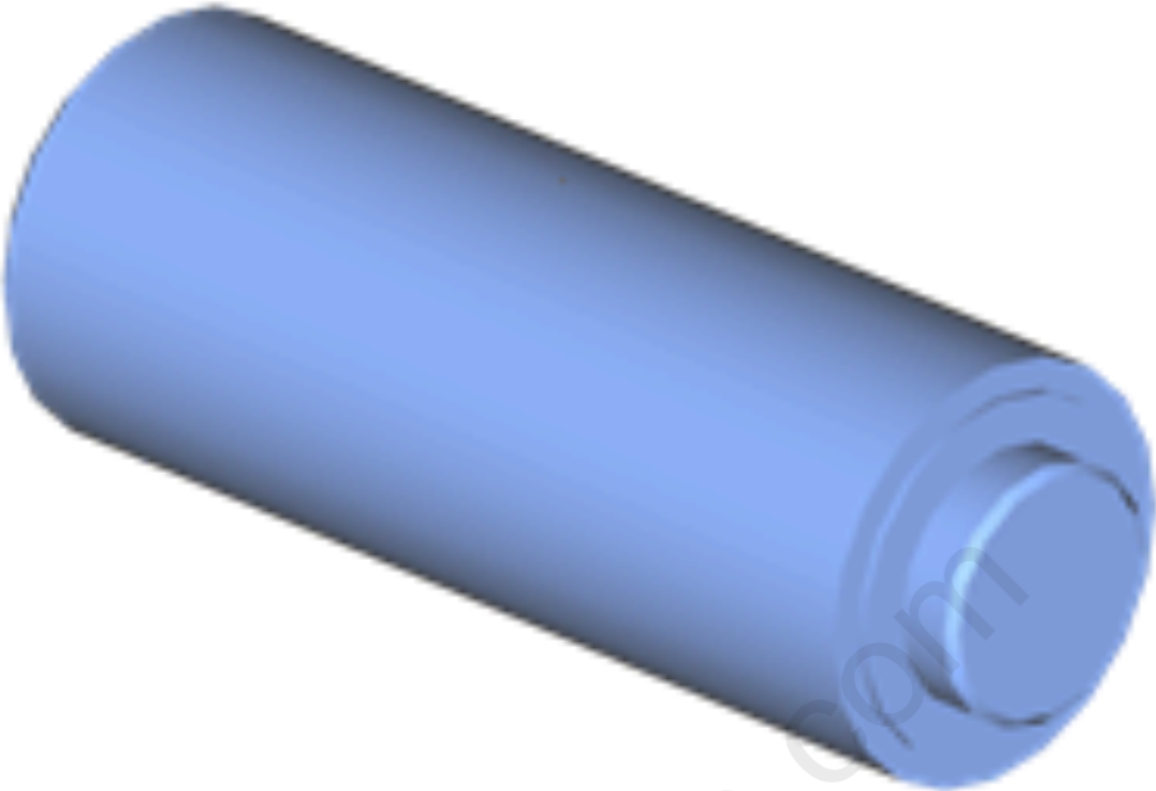
Illustration	Tool Number/Description
 A 3D rendering of a blue cylindrical tool, likely a seal installer. It has a smooth, slightly tapered body and a flat, circular end face. The tool is oriented diagonally, showing its length and the circular end. A faint watermark "cardiagn.com" is visible across the image.	DT-47792 Seal Installer

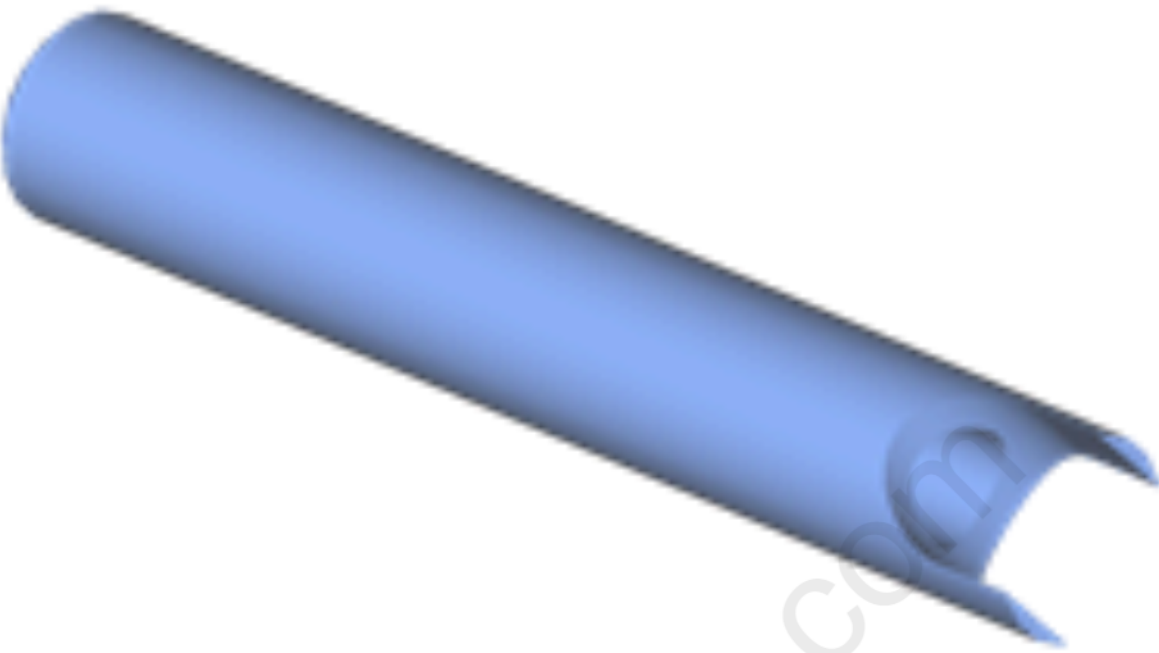
Illustration	Tool Number/Description
 A 3D rendering of a blue, cylindrical medical instrument. The instrument is long and tapers slightly towards the tip. The tip is curved and features two sharp, pointed prongs or blades that are slightly separated from each other. The surface of the cylinder appears smooth with a slight gradient of blue. A faint watermark 'cardiagn.com' is visible diagonally across the image.	DT-47793 Differential Rotating Tool

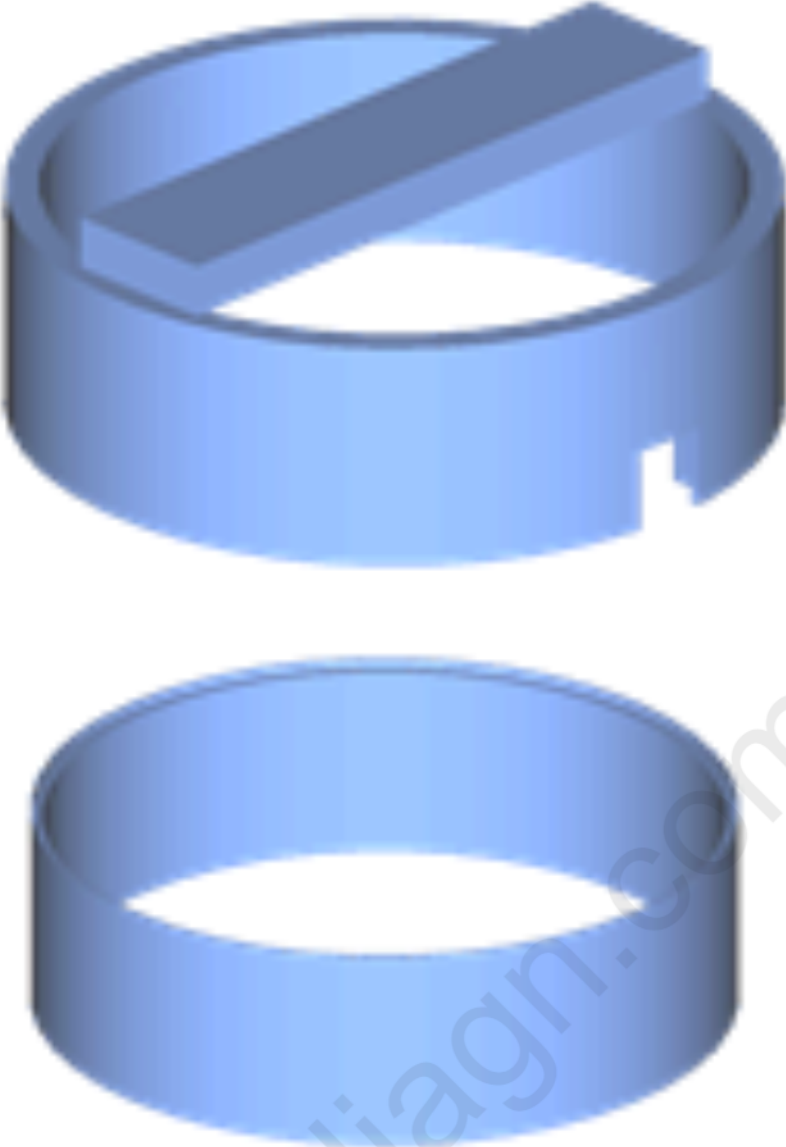
Illustration	Tool Number/Description
	DT-47794 Spring Compressor

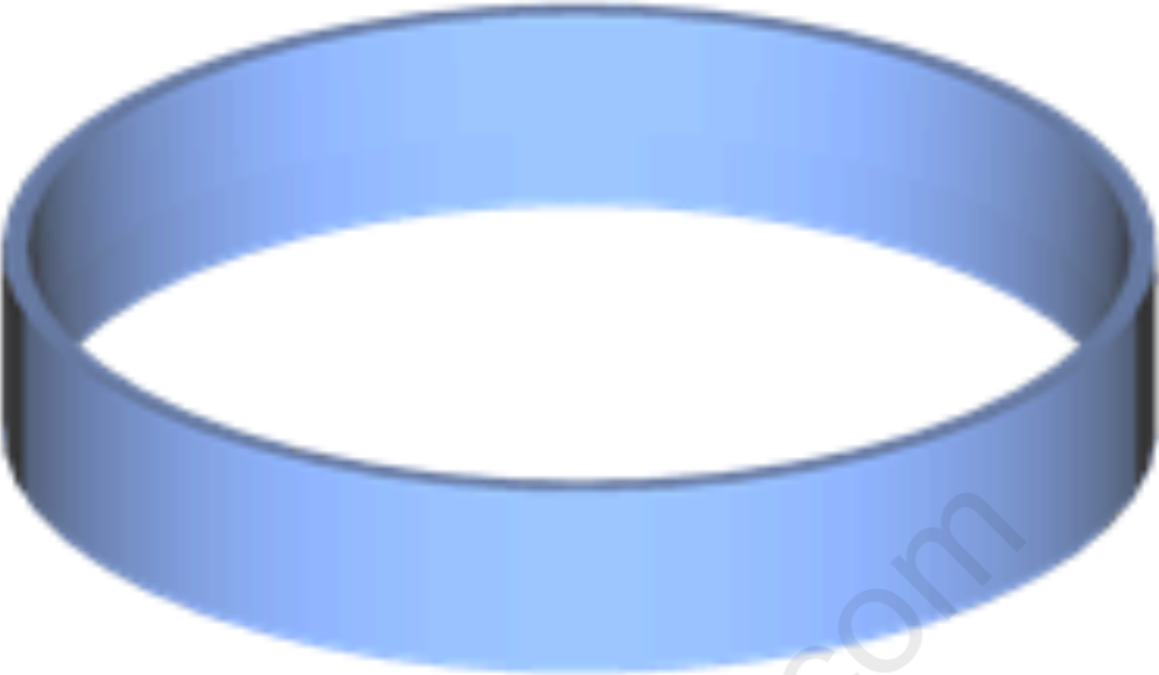
Illustration	Tool Number/Description
 A 3D rendering of a blue, toroidal (donut-shaped) seal protector. The object is a thick, continuous ring with a smooth, slightly glossy surface. It is shown from a perspective view, highlighting its circular shape and uniform thickness. A faint, diagonal watermark reading 'cardiagn.com' is visible across the lower portion of the ring.	DT-47796 Seal Protector

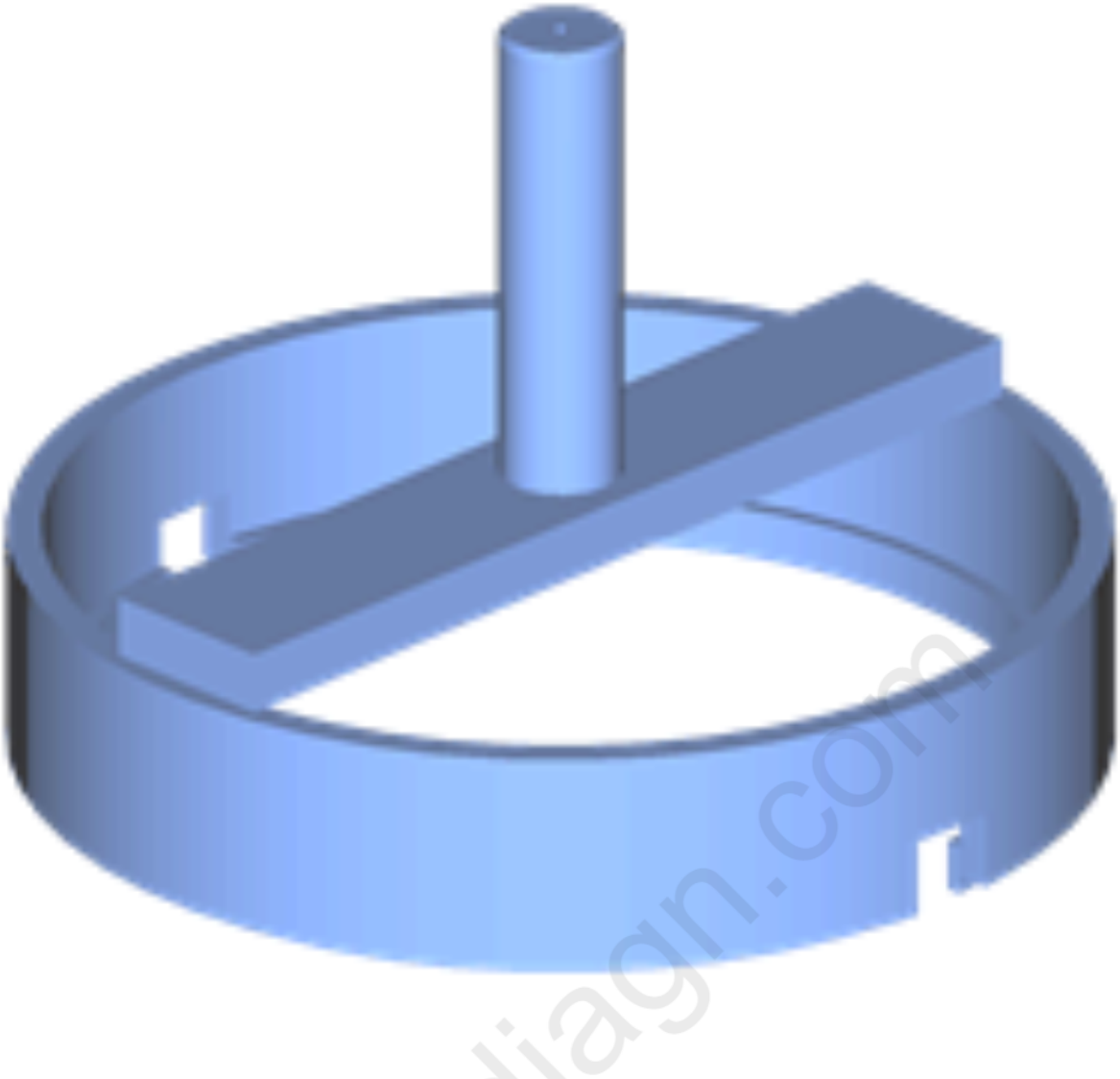
Illustration	Tool Number/Description
 A 3D rendering of a blue, circular spring installer tool. The tool consists of a thick, circular ring with a central vertical rod passing through its center. A horizontal bar is attached to the inner surface of the ring, intersecting the central rod. The bar has a rectangular cross-section and is positioned at the top of the ring. The entire tool is shown from a perspective view, highlighting its circular shape and the central rod.	DT-47797 Spring Installer

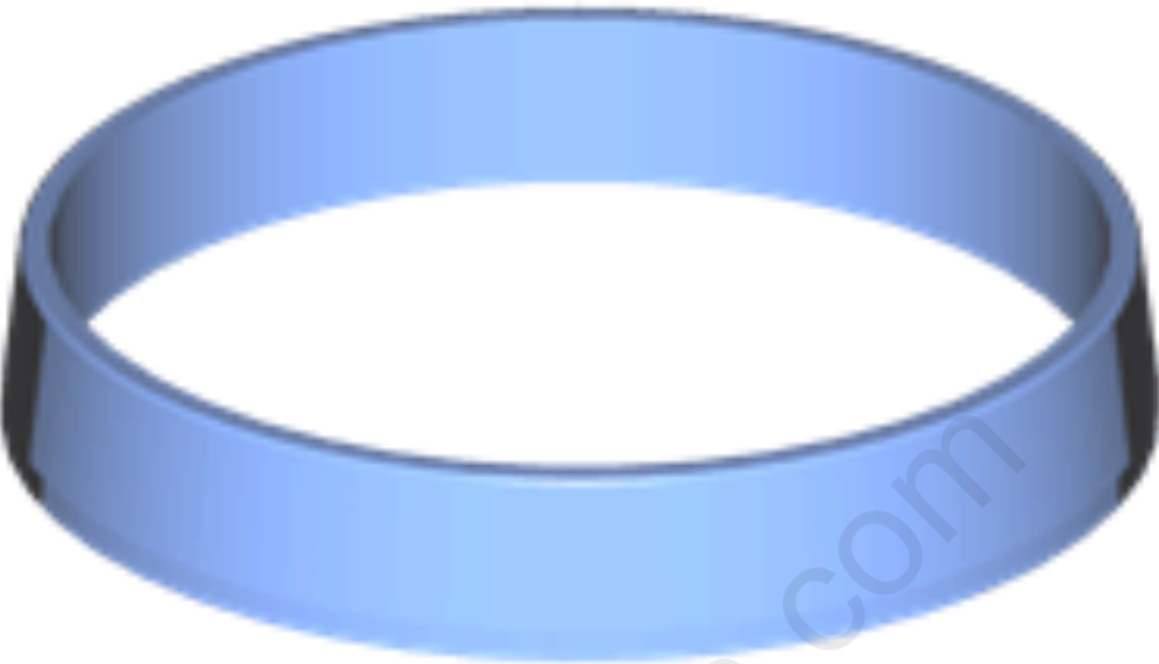
Illustration	Tool Number/Description
 A 3D rendering of a blue, toroidal-shaped seal protector. It is a thick, hollow ring with a uniform blue color and a slight gradient. The ring is shown from a perspective view, highlighting its circular shape and thickness. A large, light gray watermark "cardiagn.com" is diagonally across the image.	DT-47798 Seal Protector

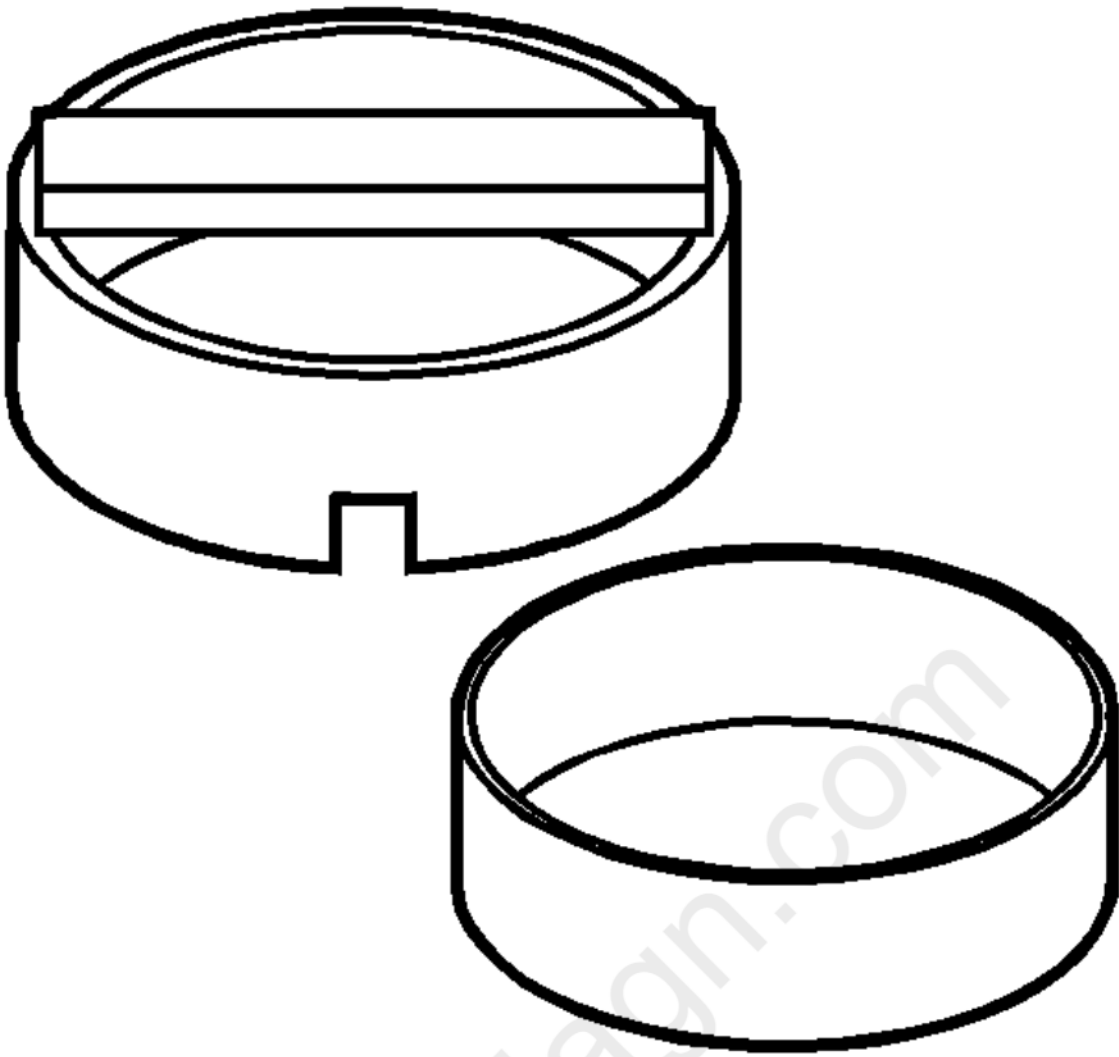
Illustration	Tool Number/Description
	DT-47799 Clutch Piston Spring Compressor

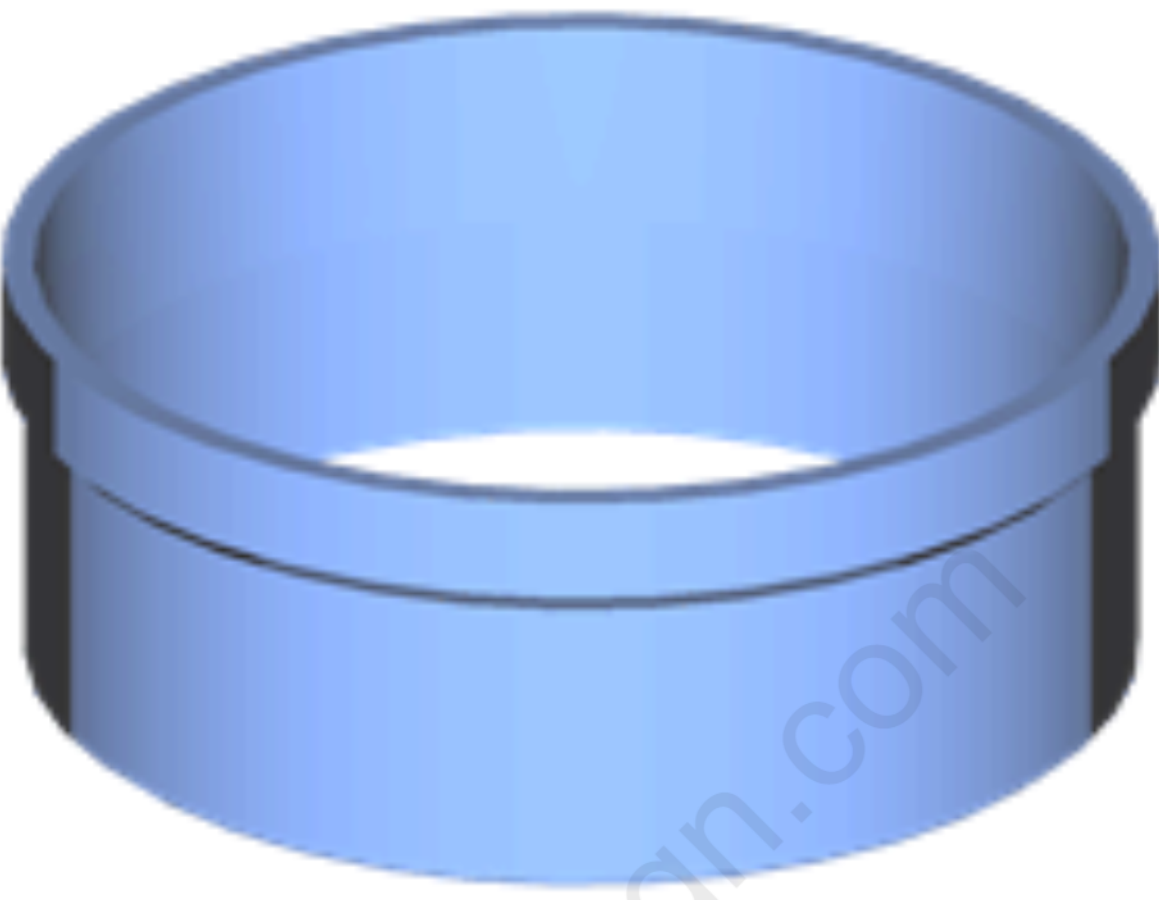
Illustration	Tool Number/Description
	DT-47805 Seal Protector

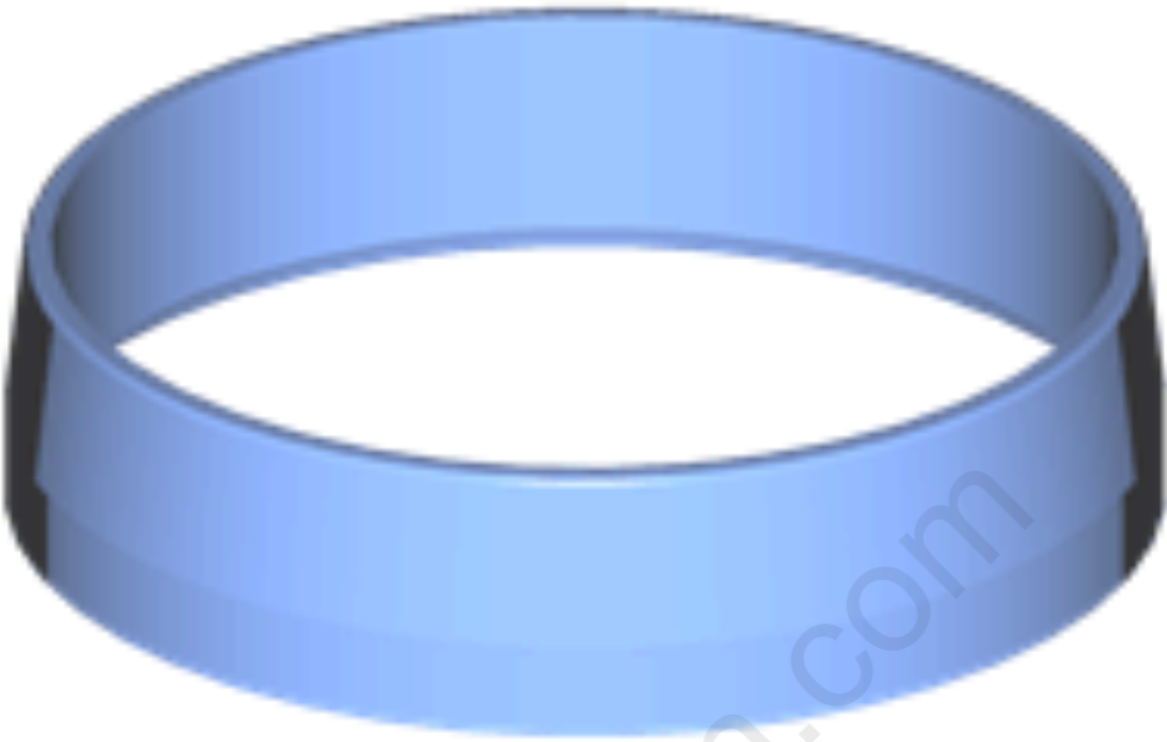
Illustration	Tool Number/Description
	DT-47807 Clutch Piston Seal Installer

Illustration	Tool Number/Description
	DT-47811-A Lift Plate

Illustration	Tool Number/Description
	DT-47951-1 Seal Protector

Illustration	Tool Number/Description
	DT-47951-2 Spring Compressor

Illustration	Tool Number/Description
 A 3D rendering of a blue metal tool, identified as a Spring Compressor Bridge. The tool consists of a long, angled handle with three finger loops and a vertical bridge component. The bridge has a central threaded rod with a nut at the top. The tool is shown against a white background.	DT-48056 Spring Compressor Bridge

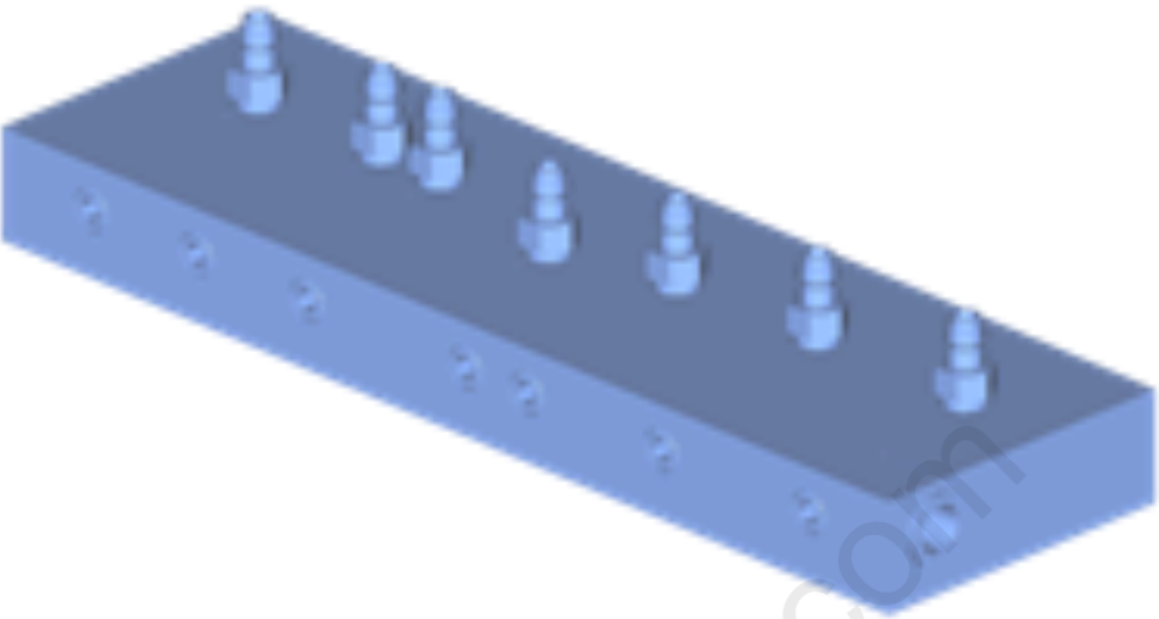
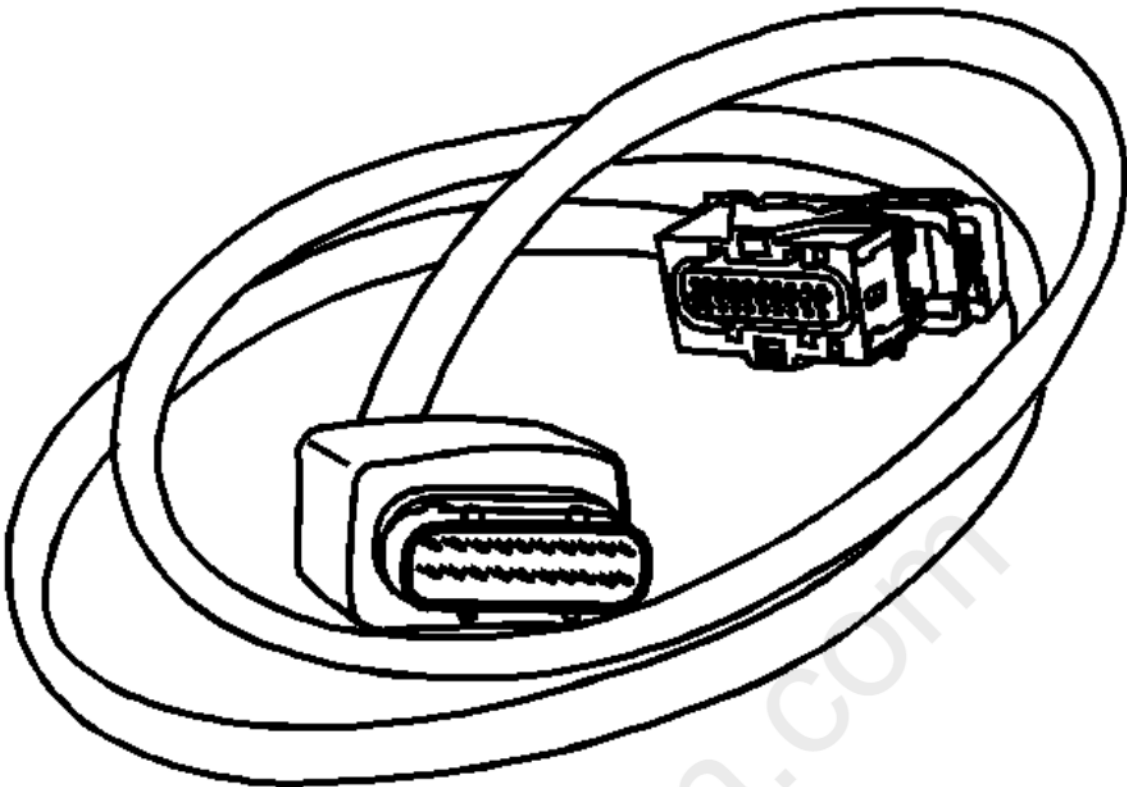
Illustration	Tool Number/Description
	DT-48616 Control Solenoid Test Plate

Illustration	Tool Number/Description
	DT-48616-10 Adapter Harness

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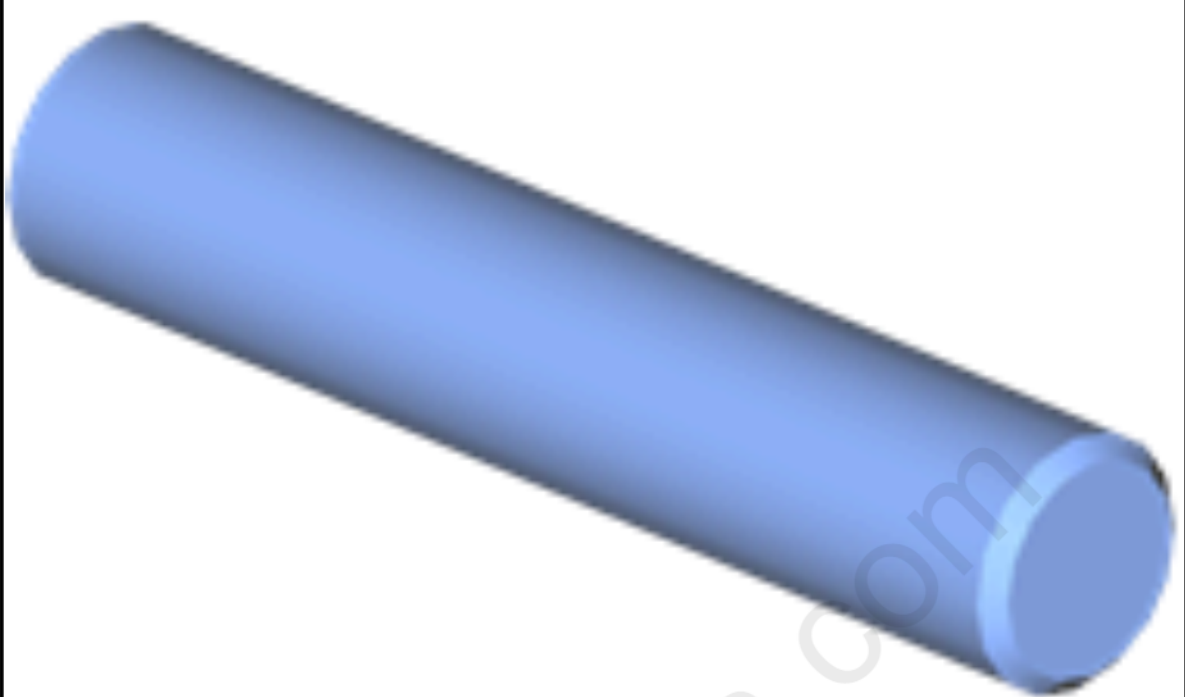
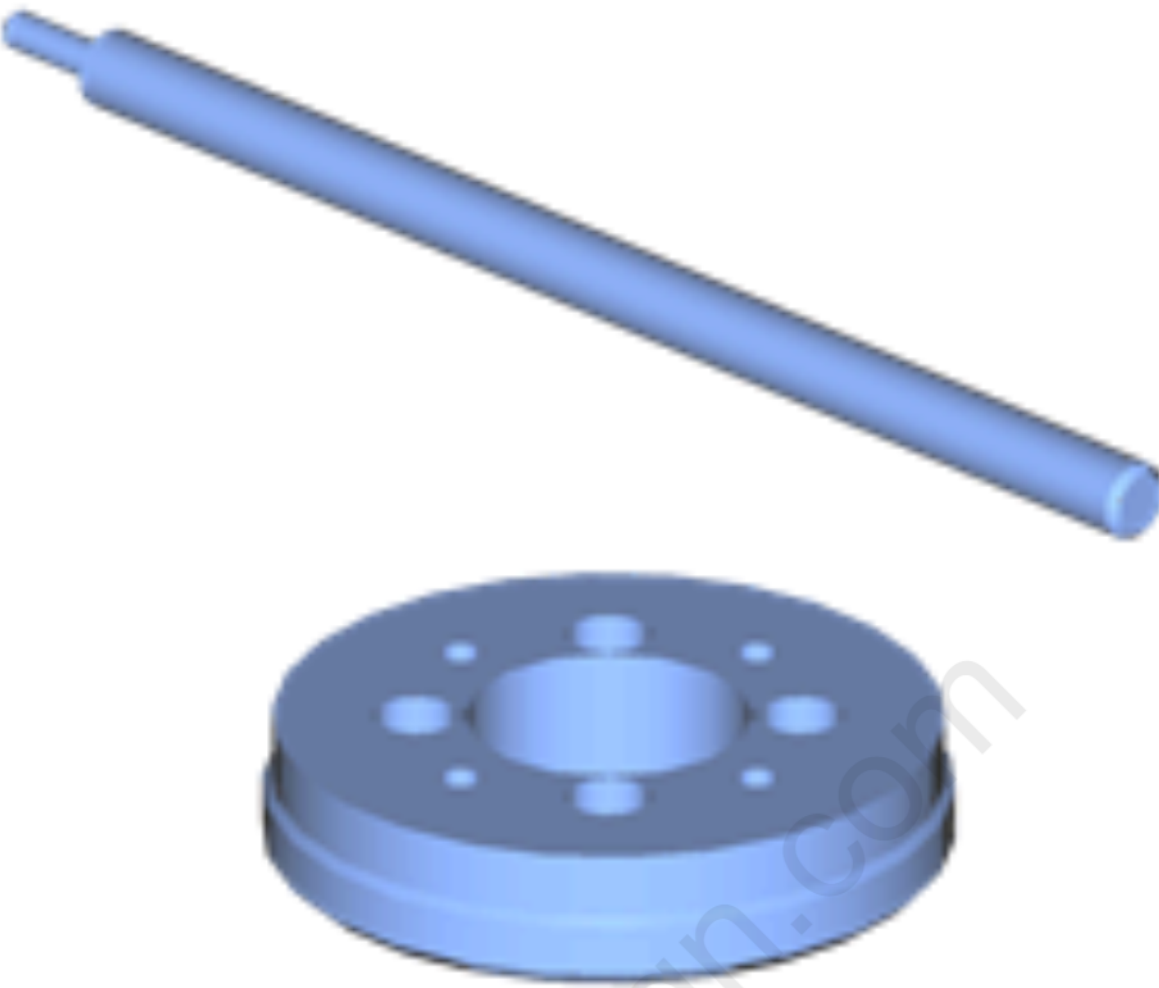
Illustration	Tool Number/Description
 A 3D rendering of a blue cylindrical tool, likely a seal installer, shown at an angle. The tool is a solid blue cylinder with a slightly darker blue circular face at the right end. A faint, diagonal watermark reading 'cardiagn.com' is visible across the lower half of the image.	DT-49101 Seal Installer

Illustration	Tool Number/Description
	DT-49131 Seal Staking Tool

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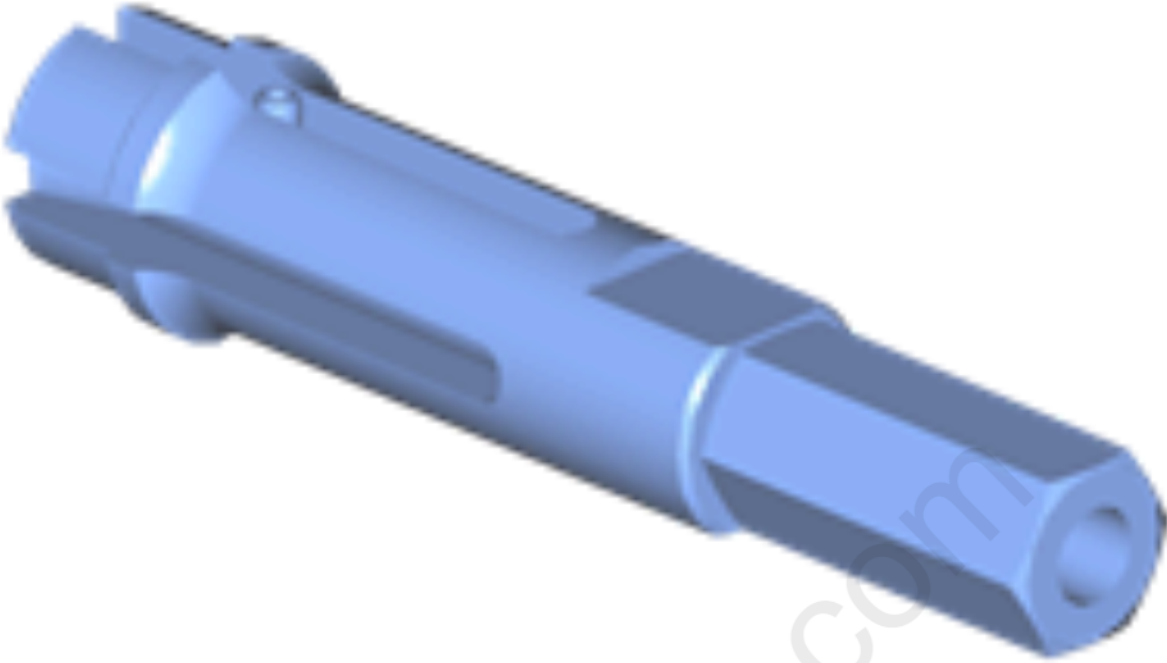
Illustration	Tool Number/Description
	DT-49938 Differential Rotating Tool

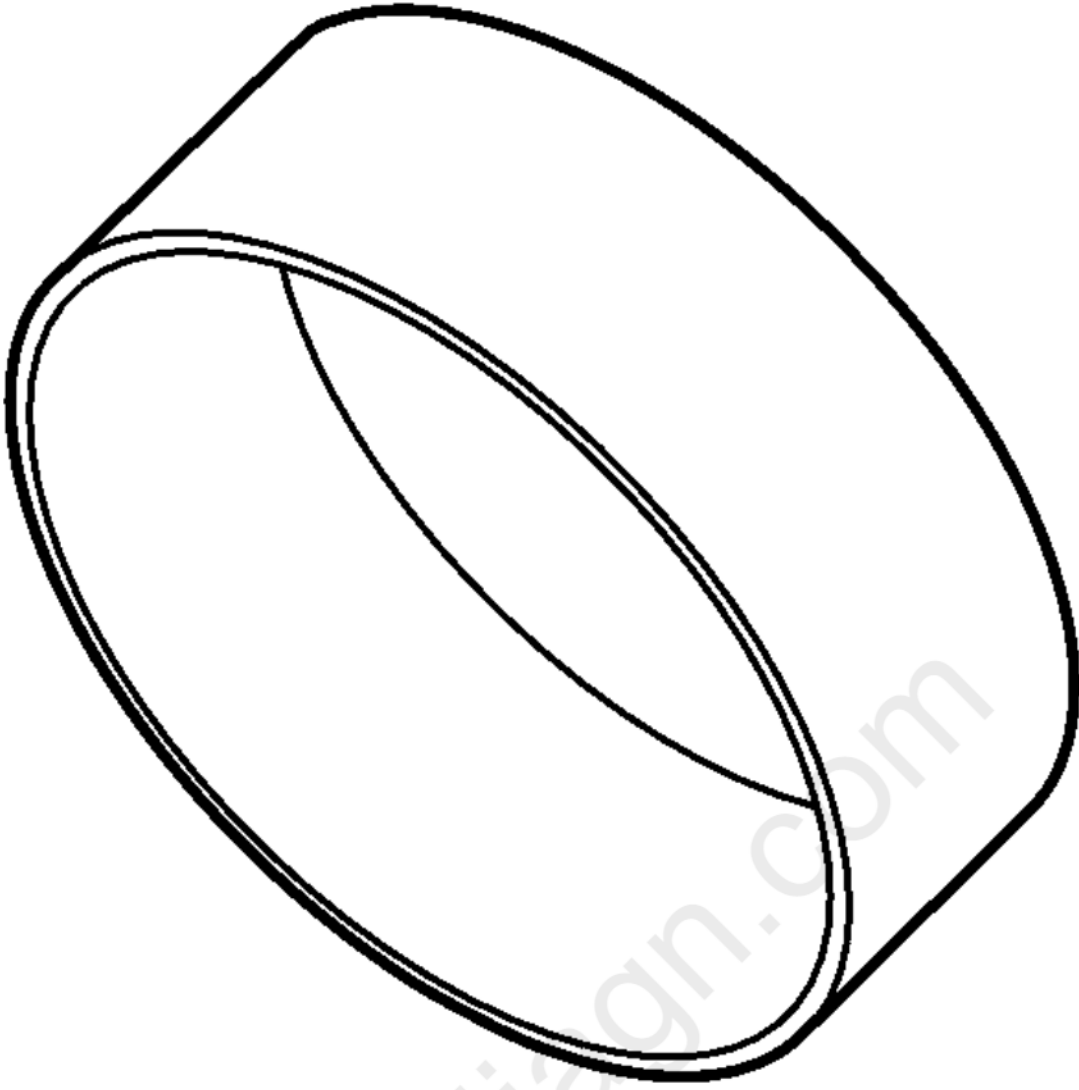
Illustration	Tool Number/Description
	DT-50117 Seal Installer

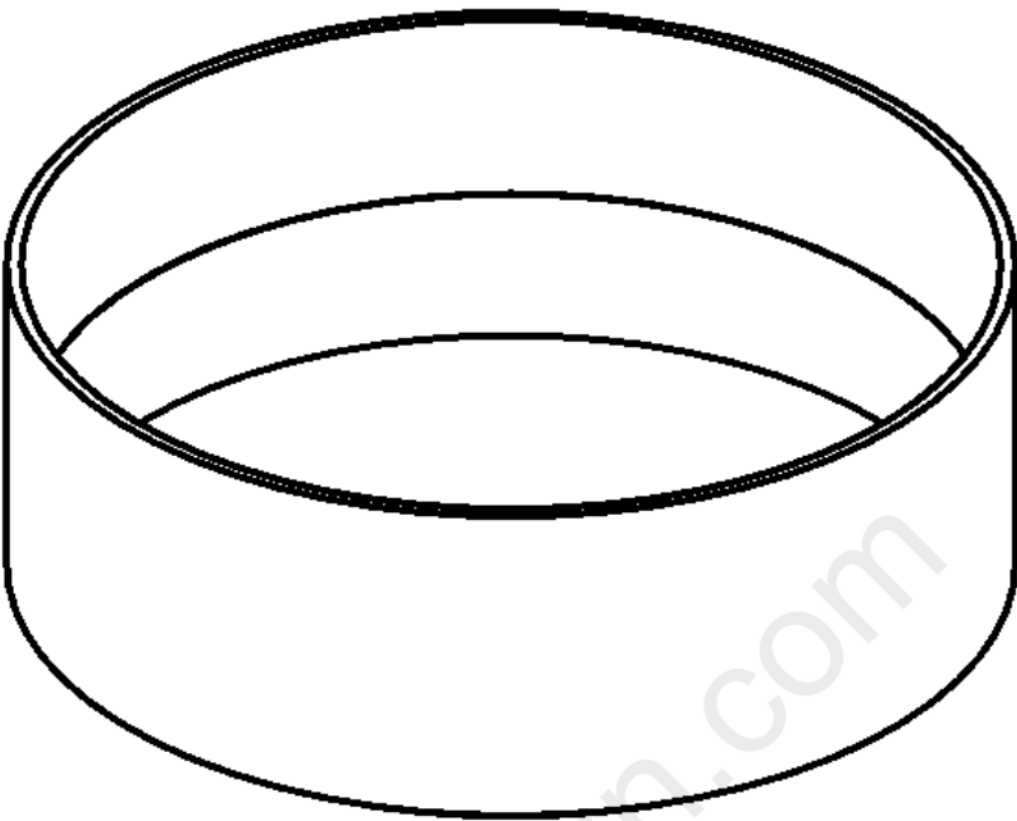
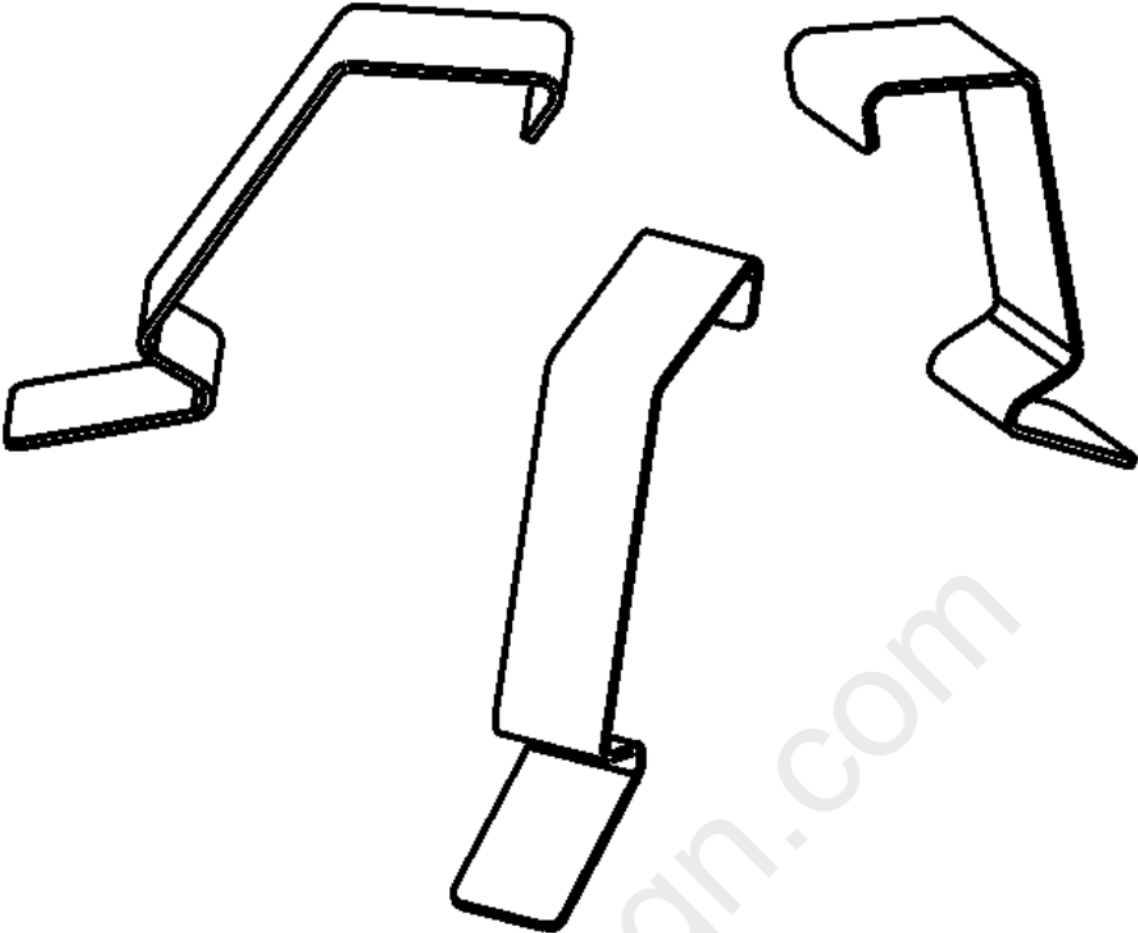
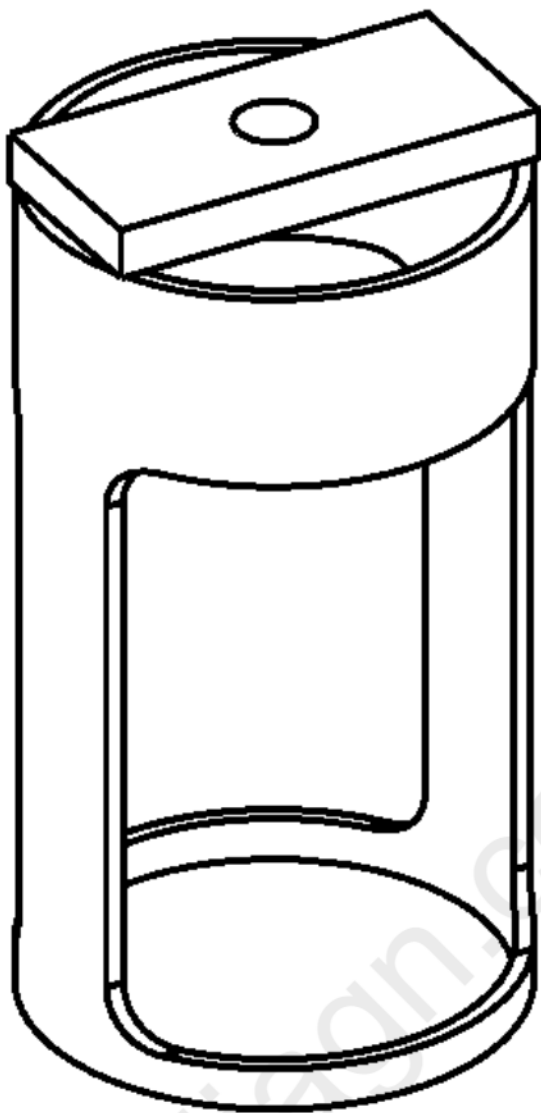
Illustration	Tool Number/Description
 A line drawing of a cylindrical seal protector. It is a simple cylinder with a flat top and bottom. The drawing uses perspective, showing the top edge and the side. A faint watermark 'cardiagn.com' is visible across the cylinder.	DT-50117-1 Seal Protector

Illustration	Tool Number/Description
 The illustration shows three identical L-shaped retaining clips. Each clip is formed from a single piece of material bent at a 90-degree angle. One end of the clip is a flat, rectangular flange, and the other end is a curved, hook-like shape designed to grip onto a surface. The three clips are arranged in a triangular pattern: one on the left, one on the right, and one centered below them. A faint, diagonal watermark reading 'cardiagn.com' is visible across the lower half of the illustration area.	DT-50117-2 Seal Protector Retaining Clips

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Illustration	Tool Number/Description
	DT-50573 Retaining Ring Installer

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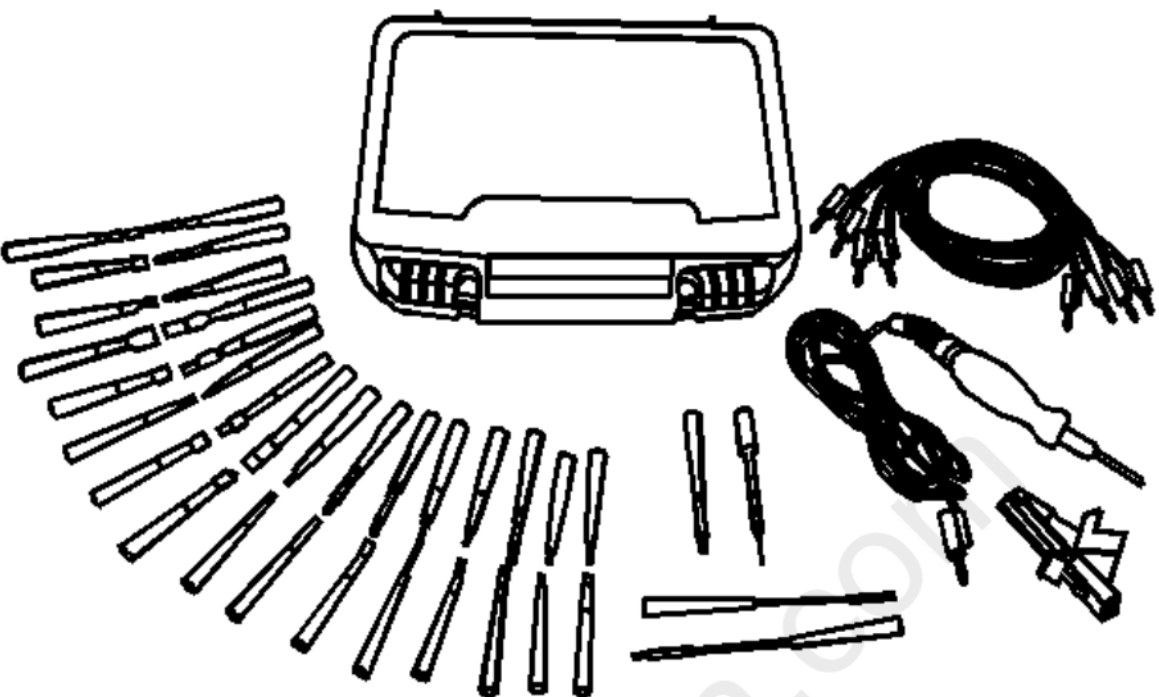
Illustration	Tool Number/Description
	EL-35616 J-35616 GM-Approved Terminal Test Kit
	EL-38522 J-38522 Variable Signal Generator

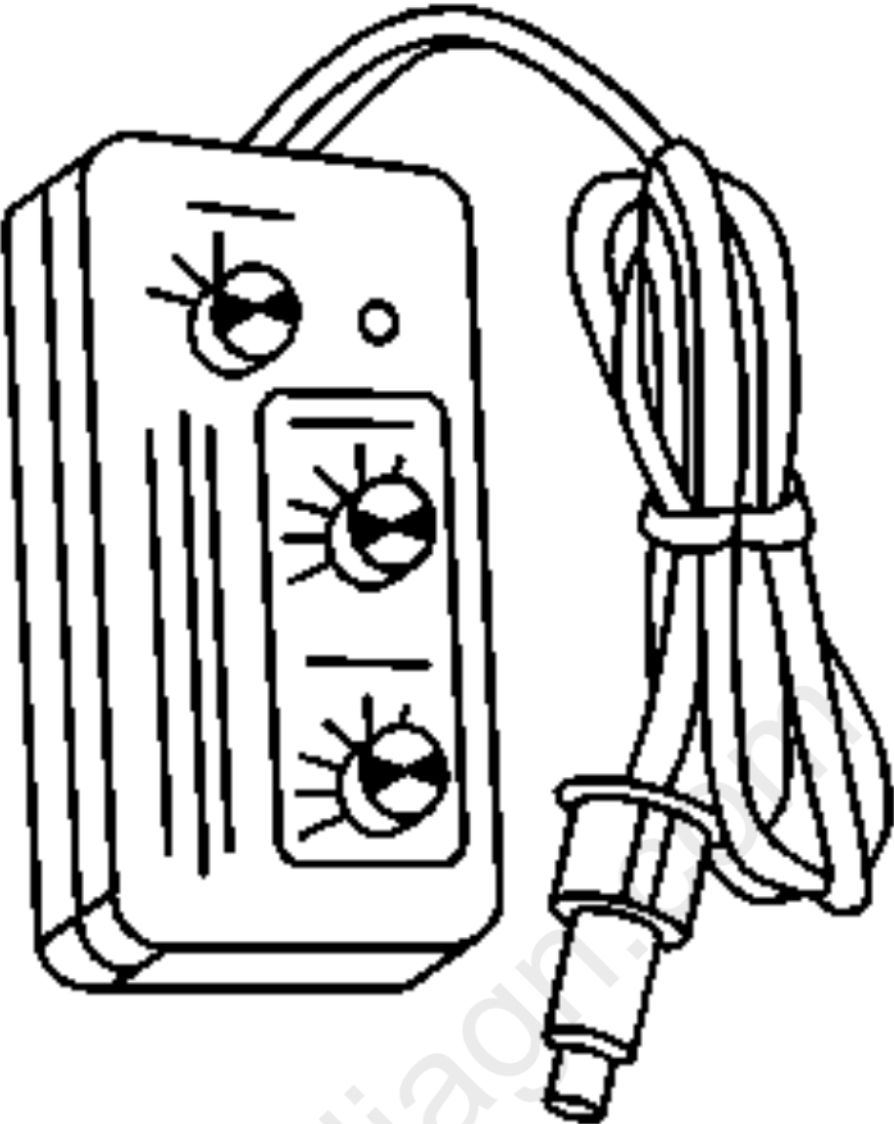
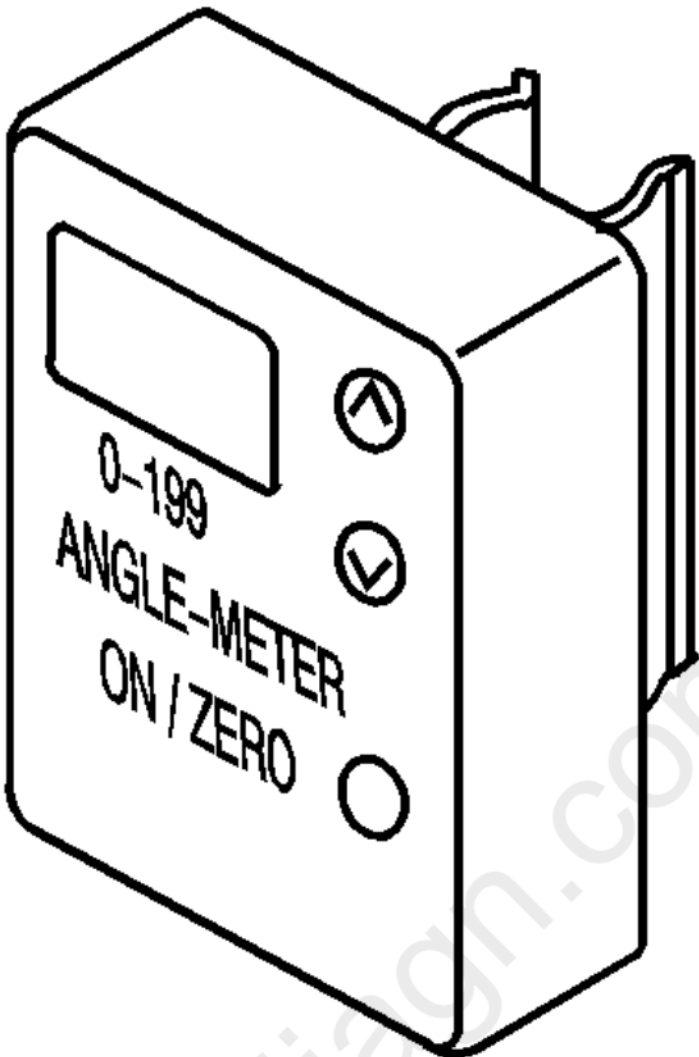
Illustration	Tool Number/Description
	

Illustration	Tool Number/Description
	EN-45059 J-45059 J-840902 KM-470-B Angle Meter

cardigan.com

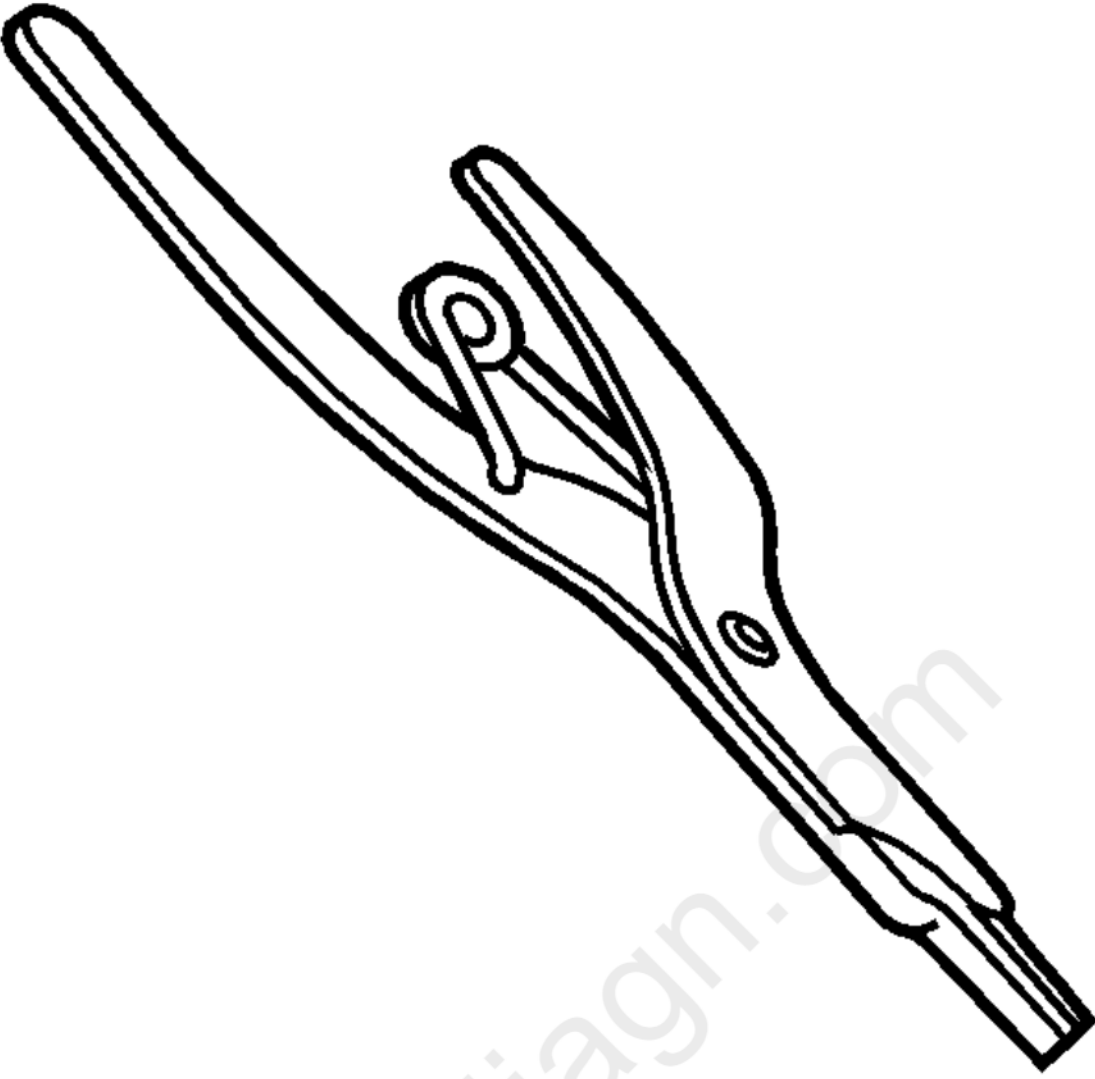
Illustration	Tool Number/Description
	GE-5586-A J-5586-A Snap Ring Pliers

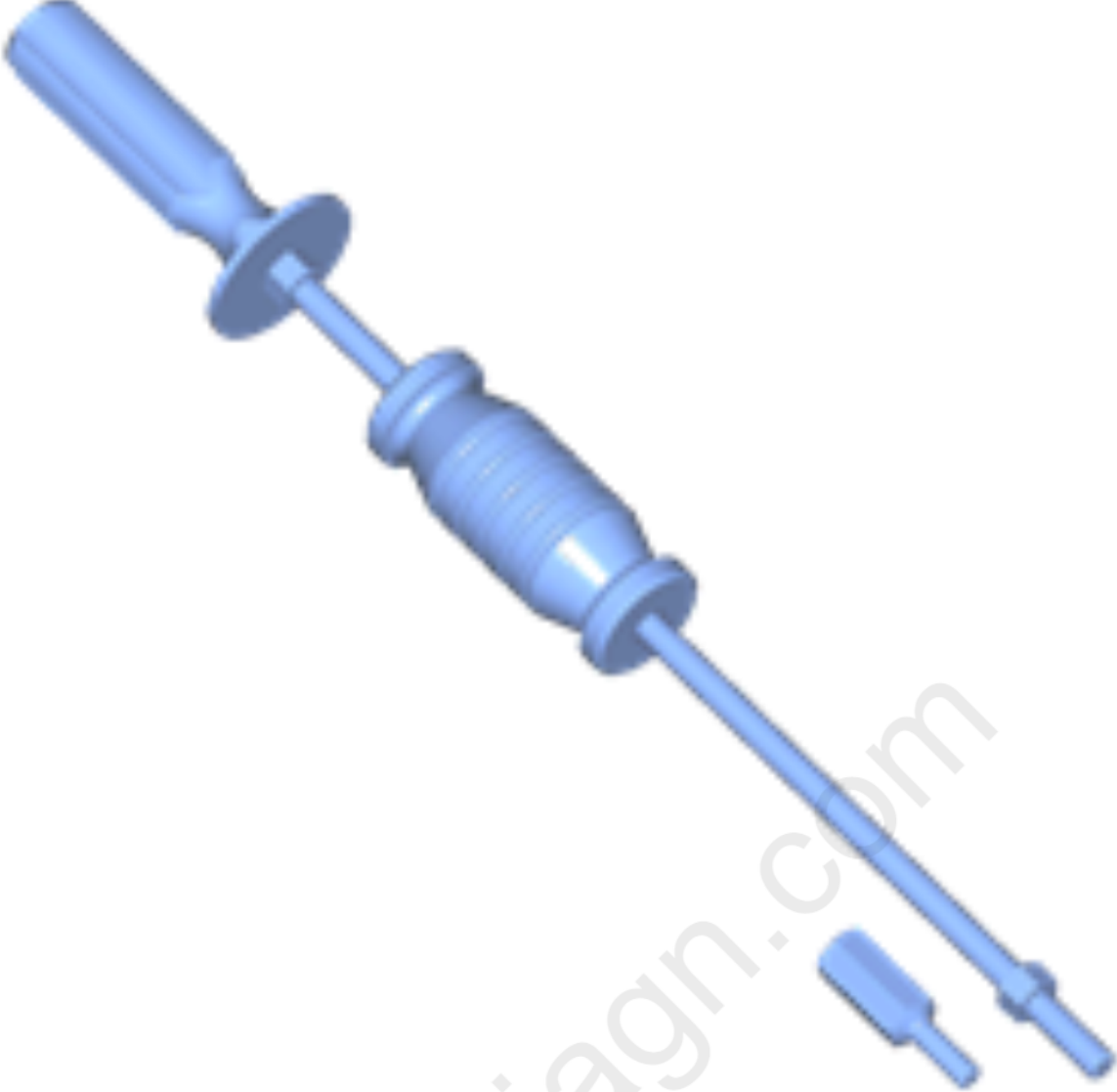
Illustration	Tool Number/Description
	GE-6125-1B J-6125-1B KM-J-7004 M-680770 Slide Hammer
	GE-8059 J-8059 KM-396 Snap Ring Pliers- Parallel Jaw

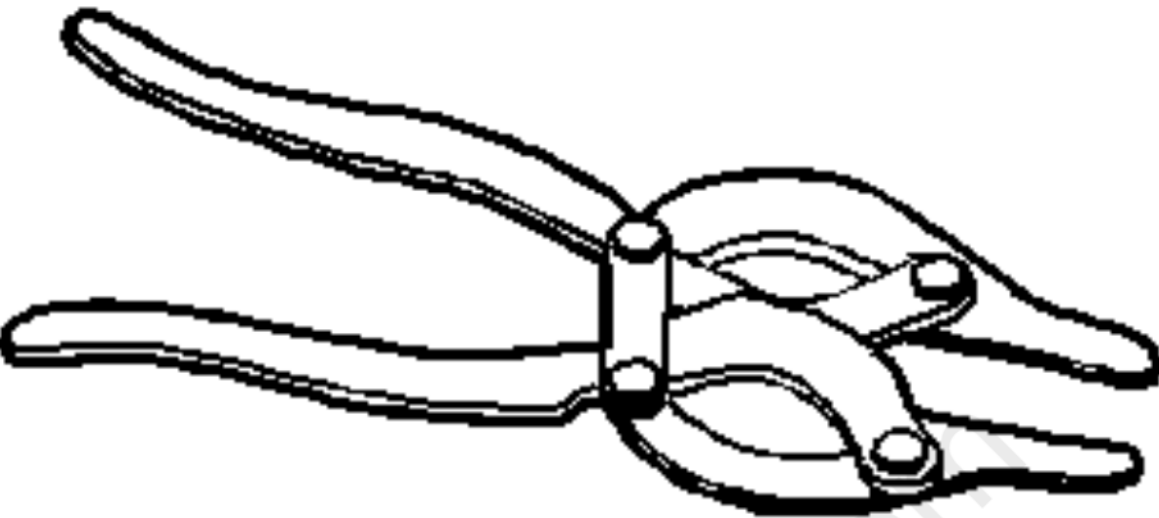
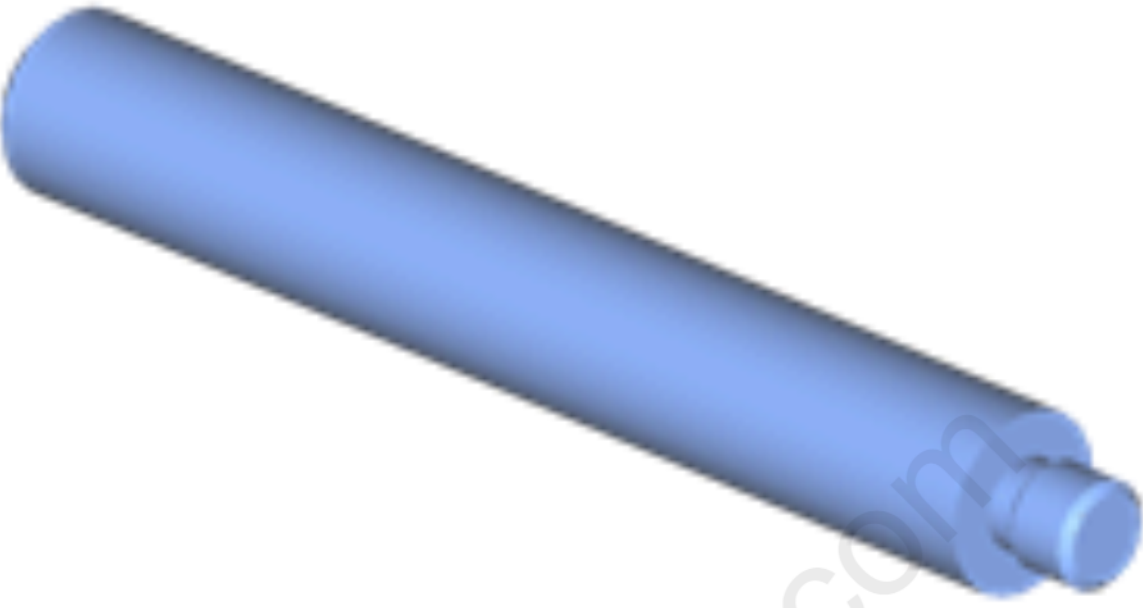
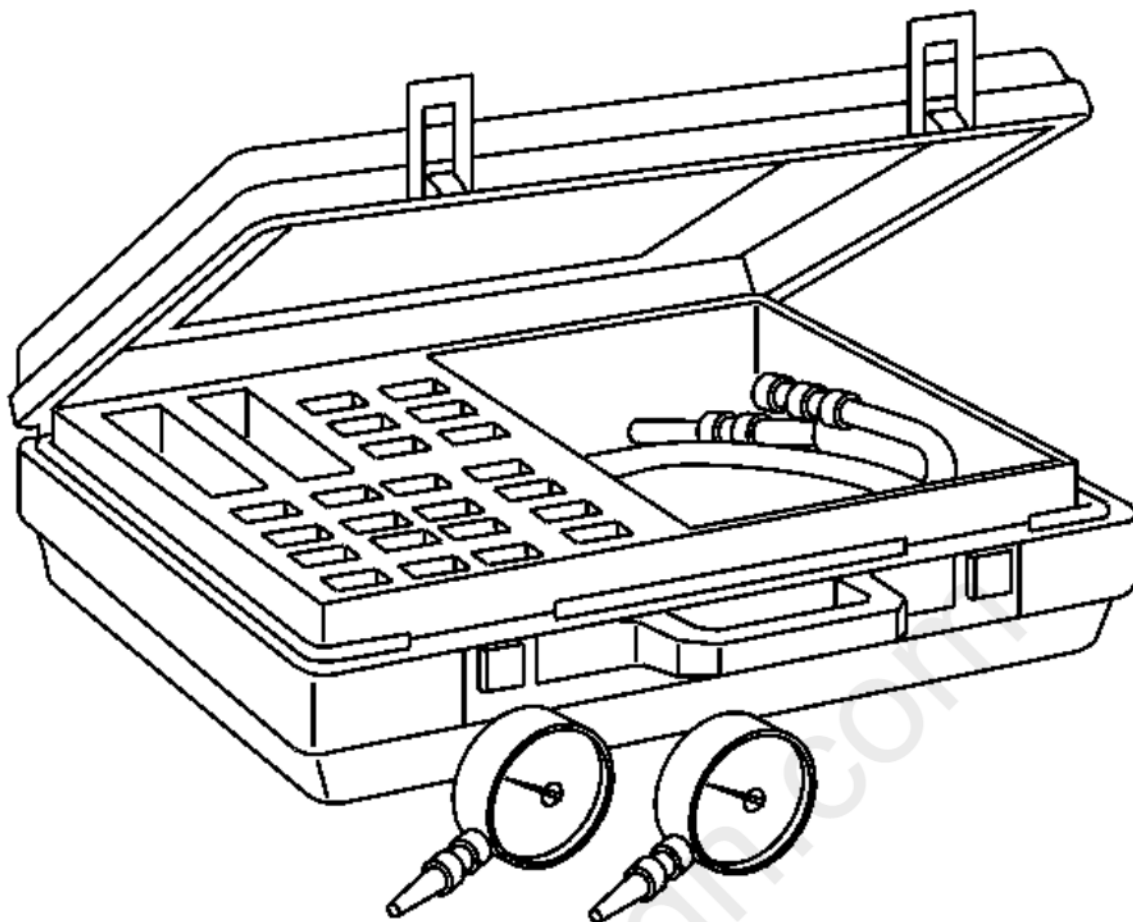
Illustration	Tool Number/Description
 A line drawing of a medical instrument, likely a hemostat or forceps. It features two long, curved jaws that taper to pointed tips. The jaws are connected at the base by a central locking mechanism consisting of a cylindrical handle with two small circular knobs or buttons on its sides. The instrument is shown in a slightly open position. A faint watermark "cardiagn.com" is visible diagonally across the lower half of the image.	

Illustration	Tool Number/Description
	GE-8092 J-8092 KM-J-8092 740463-A Driver Handle

Illustration

Tool Number/Description



GE-21867-A
J-21867-A
7-0006833
Oil Pressure Gauge
Kit

Illustration	Tool Number/Description
	GE-34673 J-34673 Flat Gauge Bar

2017 TRANSMISSION

Automatic Transmission - 6T45 (MHG) - Specifications - Impala

SPECIFICATIONS

FASTENER SPECIFICATIONS (ON VEHICLE)

Single Use Threaded Fastener/Component Tightening Specifications

NOTE: <i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i>	
Application	Specification
	Metric (English)
Transmission Mount Bolt - Left Side to Transmission	
• First Pass:	50 N.m (37 lb ft)
• Final Pass:	60 - 75 Degrees
Transmission Rear Mount to Cradle	
• First Pass:	100 N.m (74 lb ft)
• Final Pass:	120 - 130 Degrees

Reusable Threaded Fastener Tightening Specifications

NOTE: <i>All fasteners listed in this table can be reused after removal.</i>	
Application	Specification
	Metric (English)
A/Trans Control Bolt	9 N.m (80 lb in)
A/Trans Flex Plate Bolt	60 N.m (45 lb ft)
Rear Trans Brace Bolt - Inboard	50 N.m (37 lb ft)
Rear Trans Brace Bolt - Outboard	100 N.m (74 lb ft)
Torque Converter to Flywheel Bolt	60 N.m (45 lb ft)
Transmission Bolt (1, 2, 3) - 6T40	75 N.m (55 lb ft)
Transmission Bolt (4, 5) - 6T40	50 N.m (37 lb ft)
Transmission Bolt (1, 2, 3, 4) - 6T45	75 N.m (55 lb ft)
Transmission Bolt (5) - 6T45	50 N.m (37 lb ft)
Transmission Fluid Cooler Outlet Pipe Nut	22 N.m (16 lb ft)
Transmission Fluid Cooler Pipe Inlet Nut	22 N.m (16 lb ft)
Transmission Front Mount Through Bolt	100 N.m (74 lb ft)
Transmission Front Mount to Transmission Bolts	62 N.m (46 lb ft)
Transmission Mount Bolt - Left Side to Frame Rail	22 N.m (16 lb ft)
Transmission Mount Nut - Left Side to Body	22 N.m (16 lb ft)
Transmission Rear Mount Through Bolt	105 N.m (77 lb ft)
Transmission Rear Mount to Transmission	100 N.m (74 lb ft)

NOTE:

All fasteners listed in this table can be reused after removal.

Application	Specification
	Metric (English)
Transmission Range Selector Cable Bracket Bolt	18 N.m (14 lb ft)
Transmission Range Selector Lever Nut	20 N.m (15 lb ft)

FASTENER SPECIFICATIONS (OFF VEHICLE)

Single Use Non-Threaded Fasteners/Components

NOTE:

All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.

Application
1-2-3-4 Clutch Fluid Passage Seal
3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
4-5-6 Clutch Dam Retaining Ring
Accumulator Bypass Valve Seal
Automatic Transmission Fluid Accumulator Pipe Seal
Automatic Transmission Fluid Filter
Automatic Transmission Fluid Pump Gasket
Automatic Transmission Fluid Pump Pressure Plate Seal
Automatic Transmission Fluid Pump Seal
Control Solenoid Valve Assembly Filter Plate
Control Valve Body Cover Wiring Connector Hole Seal
Control Valve Body Gasket
Input Speed Sensor Assembly Seal
Low and Reverse Clutch Fluid Passage Seal
Manual Shaft Detent Lever Hub Pin
Manual Shift Shaft Pin
Park Pawl Actuator Guide Assembly Seal
Park Pawl Actuator Guide Pin
Torque Converter Housing Gasket
Transfer Case Adapter Seal
Turbine Shaft Retainer Ring

Reusable Threaded Fastener Tightening Specifications

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Automatic Transmission Auxiliary Fluid Accumulator Bolt	377	5	M8x30	22 N.m (16 lb ft)
A/Trans Fluid Pump Bolt to Converter Housing				
• First Pass:	200	8	M8x33	10 N.m (89 lb in)
• Final Pass:				45°
Automatic Transmission Fluid Pump Cover Bolt (Gen 3)	308	15	M6x18	10 N.m (89 lb in)

Application	Ref No.*	Quantity	Size	Specification
				Metric (English)
Automatic Transmission Fluid Pump Cover Bolt (Gen 3)	329	19	M6x25	10 N.m (89 lb in)
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	4	12	M6x97	10 N.m (89 lb in)
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	6	3	M5x40.5	7 N.m (62 lb in)
Control Valve Body Assembly (Complete) Bolt	400	1	M5x40.5	7 N.m (62 lb in)
Control Valve Body to Case Bolt	9	2	M6x53	11 N.m (97 lb in)
Control Valve Body to Case Bolt	10	9	M6x60	11 N.m (97 lb in)
Control Valve Body Cover Bolt	1	13	M6x30	12 N.m (106 lb in)
Drain Plug	64	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Fluid Level Hole Plug	63	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Fluid Pressure Test Hole Plug	51	1	1/8" - 27 NPTF	12 N.m (106 lb in)
Front Differential Carrier Baffle Bolt - Converter Housing	204	2	M6x25	12 N.m (106 lb in)
Front Differential Carrier Baffle Bolt - Case	61	2	M6x16	12 N.m (106 lb in)
Input Shaft Support Bolt	57	3	M6x50	12 N.m (106 lb in)
Input Speed Sensor Bolt	21	1	M6x23	9 N.m (80 lb in)
Manual Shift Detent Spring Bolt	17	1	M6x16	12 N.m (106 lb in)
Output Speed Sensor Bolt	15	1	M6x18	9 N.m (80 lb in)
Torque Converter and Differential Housing Bolt				
• First Pass:	27	15	M8x30	10 N.m (89 lb in)
• Final Pass:				50Â°
*Reference number refers to the component callout number in Disassembled Views				

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
6T40/6T45/6T50		
• Valve Body Cover Removal - Approximate Capacity	5.0 - 7.0 liters	5.3 - 7.4 quarts
• Fluid Change - Drain Plug - Approximate Capacity	4.0 - 6.0 liters	4.2 - 6.3 quarts
• Overhaul - Approximate Capacity	8.0 - 8.5 liters	8.5 - 9.0 quarts

TRANSMISSION GENERAL SPECIFICATIONS

Name	6T40/6T45/6T50
RPO Codes	MH8, MH7, MHK, MHH, MHC, MHJ, MHB, MNH, MNP, MNK, MHG, M2D
Production Location	Korea/China/Mexico/Toledo
Transmission Drive	Front Wheel Drive
Reverse Gear Ratio	2.94
1st Gear Ratio	4.584
2nd Gear Ratio	2.964
3rd Gear Ratio	1.912
4th Gear Ratio	1.446
5th Gear Ratio	1.000
6th Gear Ratio	0.746
Effective Final Drive Gear Ratio	2.64/2.89/3.17/3.23/3.53/3.87
Torque Converter Size - Diameter of Torque Converter Turbine	236 mm
Pressure Taps Line	Pressure
Transmission Fluid Type	DEXRON VI [®]
Transmission Fluid Capacity	8.0 L/8.5 Quarts
Transmission Type: 6	Six Forward Gears
Transmission Type: T	Transverse Mount
Transmission Type: 40/45/50	Product Series
Position Quadrant	P, R, N, D, * *(Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transmission Net Weight	81/86 kg (178/190 lbs)
Maximum Trailer Towing Capacity	N/A
Maximum Gross Vehicle Weight (GVW)	6T40 - 2000 kg (4, 409 lbs) 6T45 - 2200 kg (4, 850 lbs) 6T50 - 2500 kg (5, 511 lbs)

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Automatic Transmission Fluid	DEXRON VI [®]	88861037	19264717
Torque Converter Bolts	Threadlock	12345382	10953489

RANGE REFERENCE

Range	Park	Reverse	Neutral	Drive						
				1st Braking	1st	2nd	3rd	4th	5th	6th
1 - 2 - 3 - 4 Clutch	-	-	-	Applied	Applied	Applied	Applied	Applied	-	-
3 - 5 Reverse Clutch	-	Applied	-	-	-	-	Applied	-	Applied	-
4 - 5 - 6 Clutch	-	-	-	-	-	-	-	Applied	Applied	Applied
2 - 6 Clutch	-	-	-	-	-	Applied	-	-	-	Applied
Low and Reverse Clutch	Applied*	Applied	Applied*	Applied	-	-	-	-	-	-

Range	Park	Reverse	Neutral	Drive						
				1st Braking	1st	2nd	3rd	4th	5th	6th
Low Clutch Assembly (OWL)	-	-	-	Holding	Holding	-	-	-	-	-
* = Applied with NO load										

SHIFT SOLENOID VALVE STATE AND GEAR RATIO

Gear	Shift SOL 1	1-2-3-4 CL PC SOL 5 N.L.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.H.	LOW REV 4-5-6 CL PC SOL 3 N.H.	Gear Ratio 6T30	Gear Ratio 6T40/45/50
Park	ON	OFF	OFF	OFF	ON	-	-
Reverse	ON	OFF	OFF	ON	ON	2.87	2.940
Neutral	ON	OFF	OFF	OFF	ON	-	-
1st Braking	ON	ON	OFF	OFF	ON	4.449	4.584
1st	OFF	ON	OFF	OFF	OFF	4.449	4.584
2nd	OFF	ON	ON	OFF	OFF	2.908	2.964
3rd	OFF	ON	OFF	ON	OFF	1.893	1.912
4th	OFF	ON	OFF	OFF	ON	1.446	1.446
5th	OFF	OFF	OFF	ON	ON	1.000	1.000
6th	OFF	OFF	ON	OFF	ON	0.742	0.746
For shift solenoid 1, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure).							
For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure							

TRANSMISSION INTERNAL MODE SWITCH LOGIC

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park	LOW	HI	HI	LOW
Park/Reverse	LOW	LOW	HI	LOW
Reverse	LOW	LOW	HI	HI
Reverse/Neutral	HI	LOW	HI	HI
Neutral	HI	LOW	HI	LOW
Neutral/Drive 6	HI	LOW	LOW	LOW
Drive 6	HI	LOW	LOW	HI
Drive 6/Drive 4	LOW	LOW	LOW	HI
Drive 4/M	LOW	LOW	LOW	LOW
Drive 4/Drive 3	LOW	HI	LOW	LOW
Drive 3	LOW	HI	LOW	HI
Drive 3/Drive 2	HI	HI	LOW	HI
Drive 2	HI	HI	LOW	LOW
Open	HI	HI	HI	HI
Invalid	HI	HI	HI	LOW
Invalid	LOW	HI	HI	HI
HI = Ignition voltage LOW = 0 volts				

SOLENOID VALVE PRESSURE (GEN 3)

Line Pressure Control Solenoid Valve Pressure

Requested Pressure (kPa)	Actual Pressure

Requested Pressure (kPa)	Metric	Actual Pressure	English
	Metric		English
0	50 - 256 kPa		7 - 37 psi
200	578 - 784 kPa		84 - 114 psi
400	1105 - 1311 kPa		160 - 190 psi
600	1634 - 1841 kPa		237 - 267 psi
800	2117 - 2324 kPa		307 - 337 psi
1000	2117 - 2324 kPa		307 - 337 psi
1200	2117 - 2324 kPa		307 - 337 psi
1400	2117 - 2324 kPa		307 - 337 psi
1600	2117 - 2324 kPa		307 - 337 psi
1800	2117 - 2324 kPa		307 - 337 psi

TRANSMISSION PARTS KIT SPECIFICATIONS

A/Trans Seal Kit (Gen 1& 2)

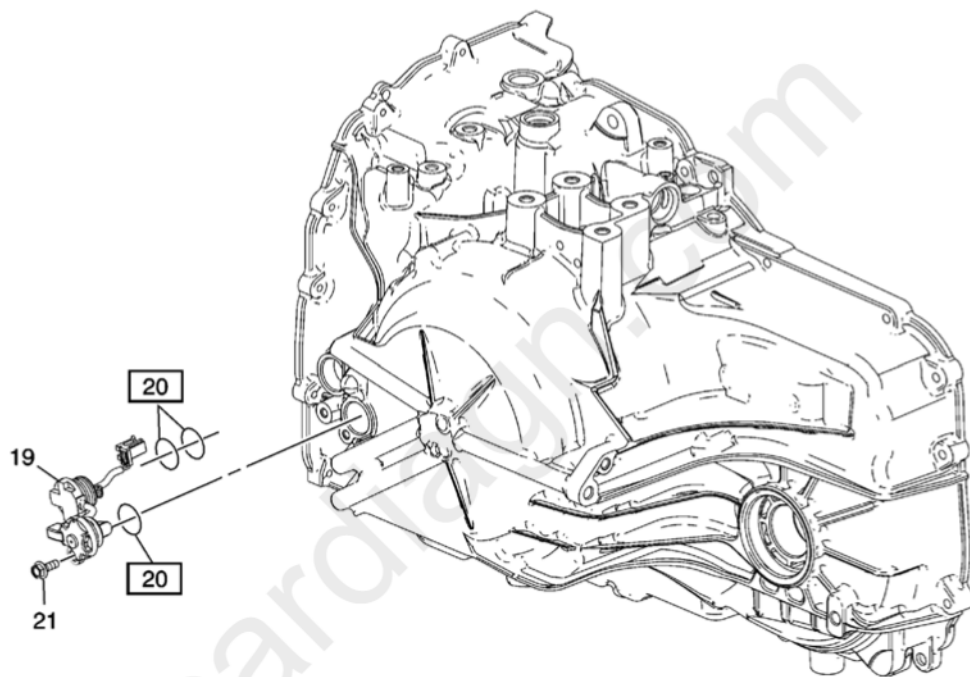


Fig. 1: Automatic Trans Seal Kit (Gen 1 And 2)

Courtesy of GENERAL MOTORS COMPANY

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

A/Trans Seal Kit (Gen 1& 2)

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

Front Wheel Drive Shaft Seal Kit (Right Hand Side) (Gen 1 & 2)

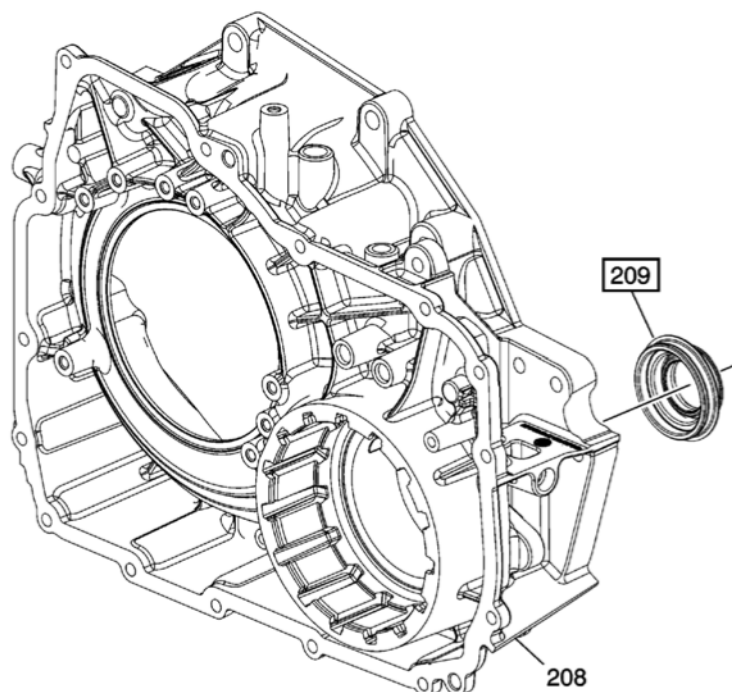


Fig. 2: Front Wheel Drive Shaft Seal Kit (Right Hand Side) (Gen 1 & 2)
 Courtesy of GENERAL MOTORS COMPANY

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

Front Wheel Drive Shaft Seal Kit (Right Hand Side) (Gen 1 & 2)

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

Front Wheel Drive Shaft Seal Kit (Left Hand Side) (Gen 1 & 2)

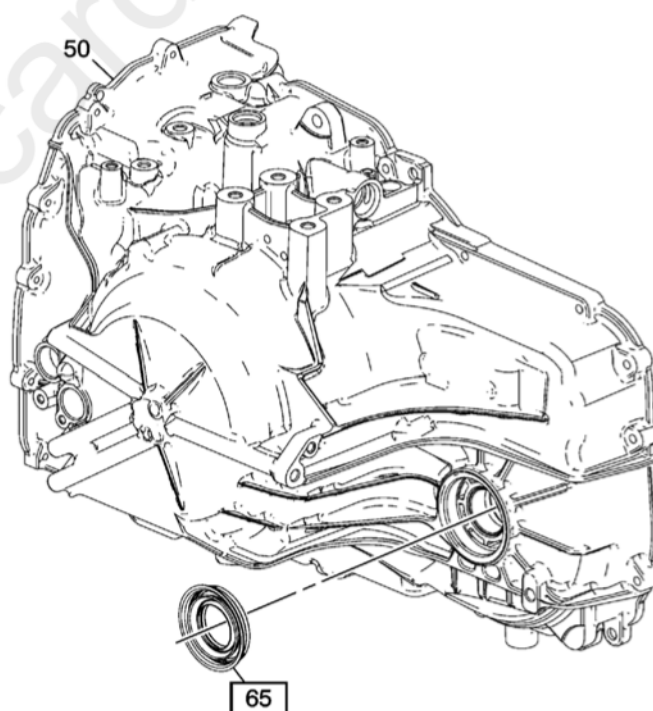


Fig. 3: Front Wheel Drive Shaft Seal Kit (Left Hand Side) (Gen 1 & 2)
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Callouts with boxes around them indicate part is included in the service

Front Wheel Drive Shaft Seal Kit (Left Hand Side) (Gen 1 & 2)

Callout	Quantity	Component Name
65	1	Drive Shaft Oil Seal Assembly

A/Trans Seal Kit (Gen 1) (1 of 2)

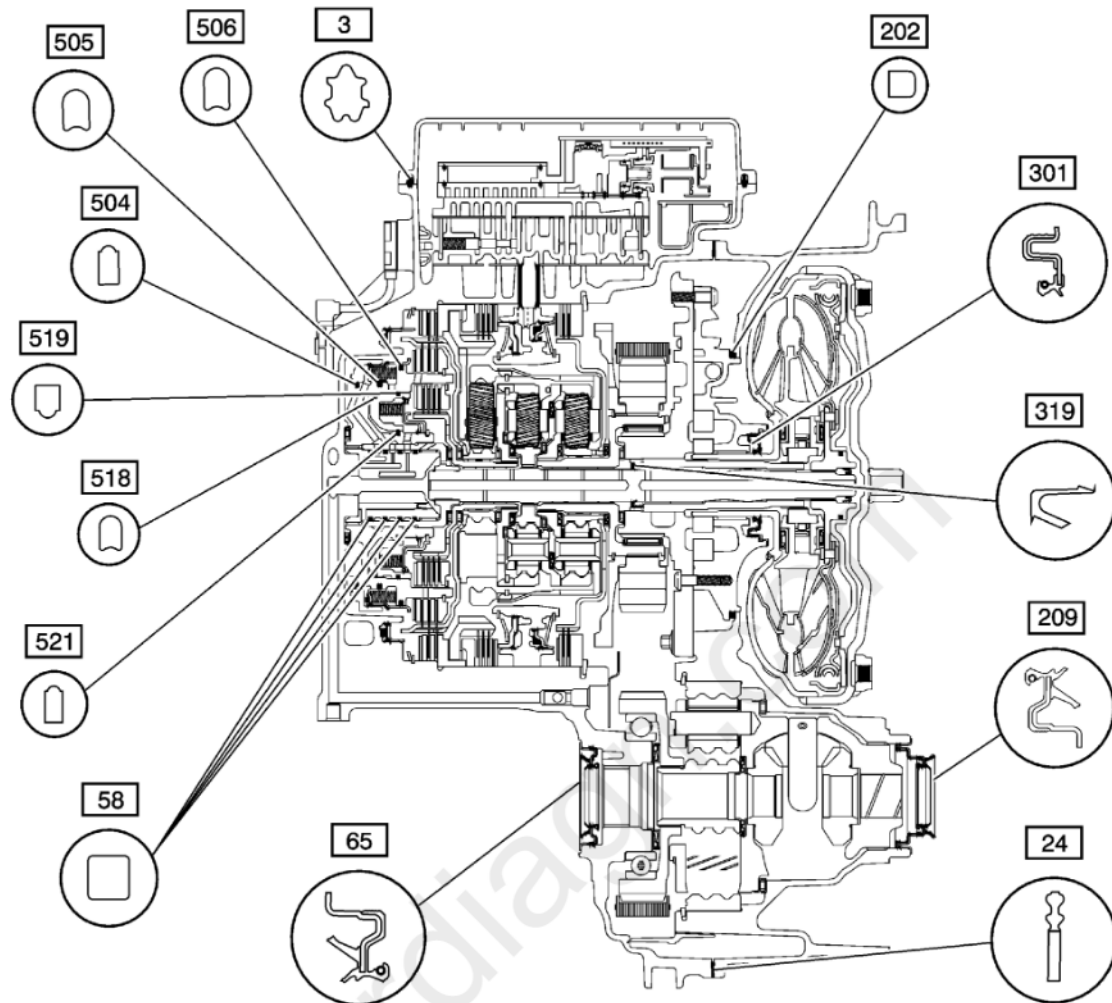


Fig. 4: A/Trans Seal Kit (Gen 1) (1 of 2)

Courtesy of GENERAL MOTORS COMPANY

A/Trans Seal Kit (Gen 1) (1 of 2)

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
24	1	Torque Converter Housing Gasket
58	4	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
65	1	Drive Shaft Oil Seal Assembly
202	1	Torque Converter and Differential Housing Seal
209	1	Front Wheel Drive Shaft Oil Seal Assembly
301	1	Torque Converter Fluid Seal Assembly
319	1	Torque Converter Fluid Seal Assembly
504	1	3-5-Reverse Clutch Piston Inner Seal
505	1	3-5-Reverse Clutch Piston Inner Seal
506	1	3-5-Reverse Clutch Piston Dam Seal
518	1	4-5-6 Clutch Piston Outer Seal
519	1	4-5-6 Clutch Piston Outer Seal
521	1	4-5-6 Clutch Piston Inner Seal

A/Trans Seal Kit (Gen 1) (2 of 2)

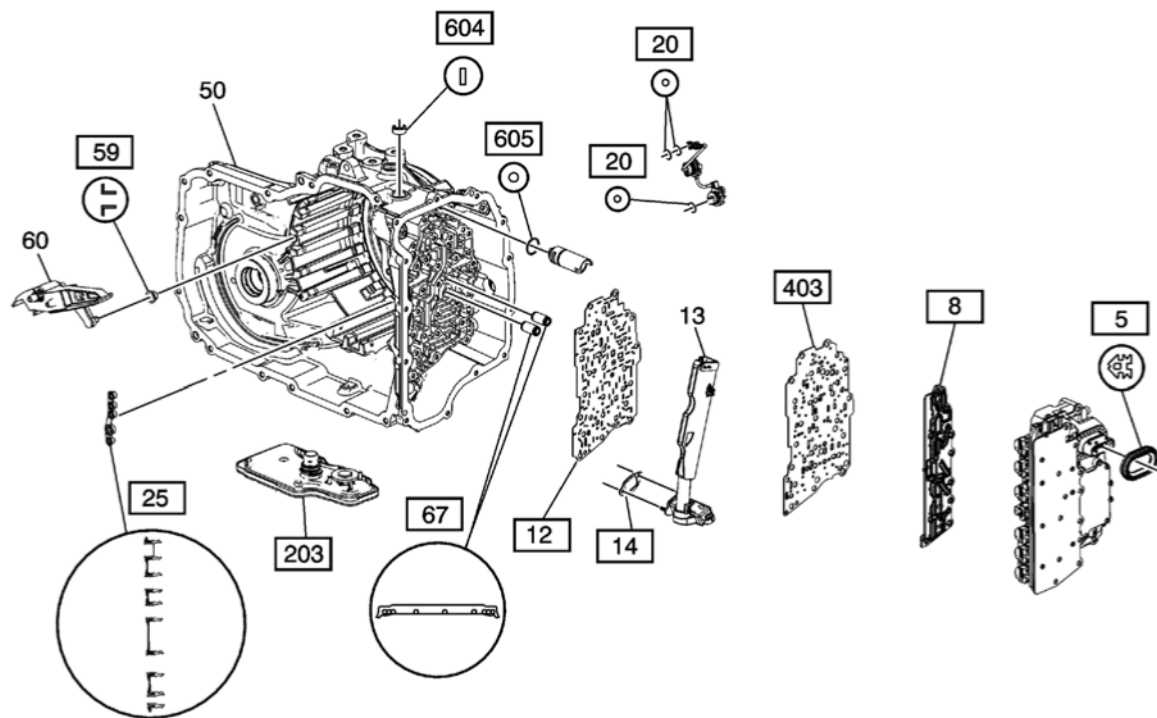


Fig. 5: A/Trans Seal Kit (Gen 1).(2 of 2)
 Courtesy of GENERAL MOTORS COMPANY

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

A/Trans Seal Kit (Gen 1) (2 of 2)

Callout	Quantity	Component Name
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal
25	1	A/Trans Fluid Pump Seal Assembly
59	1	Drive Link Lube Fluid Seal
67	1	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
203	1	A/Trans Fluid Filter Assembly
403	1	Channel Plate to Valve Body Spacer Plate Assembly
604	1	Manual Shift Shaft Seal
605	1	Park Pawl Actuator Guide Seal

A/Trans Seal Kit (Gen 2) (1 of 2)

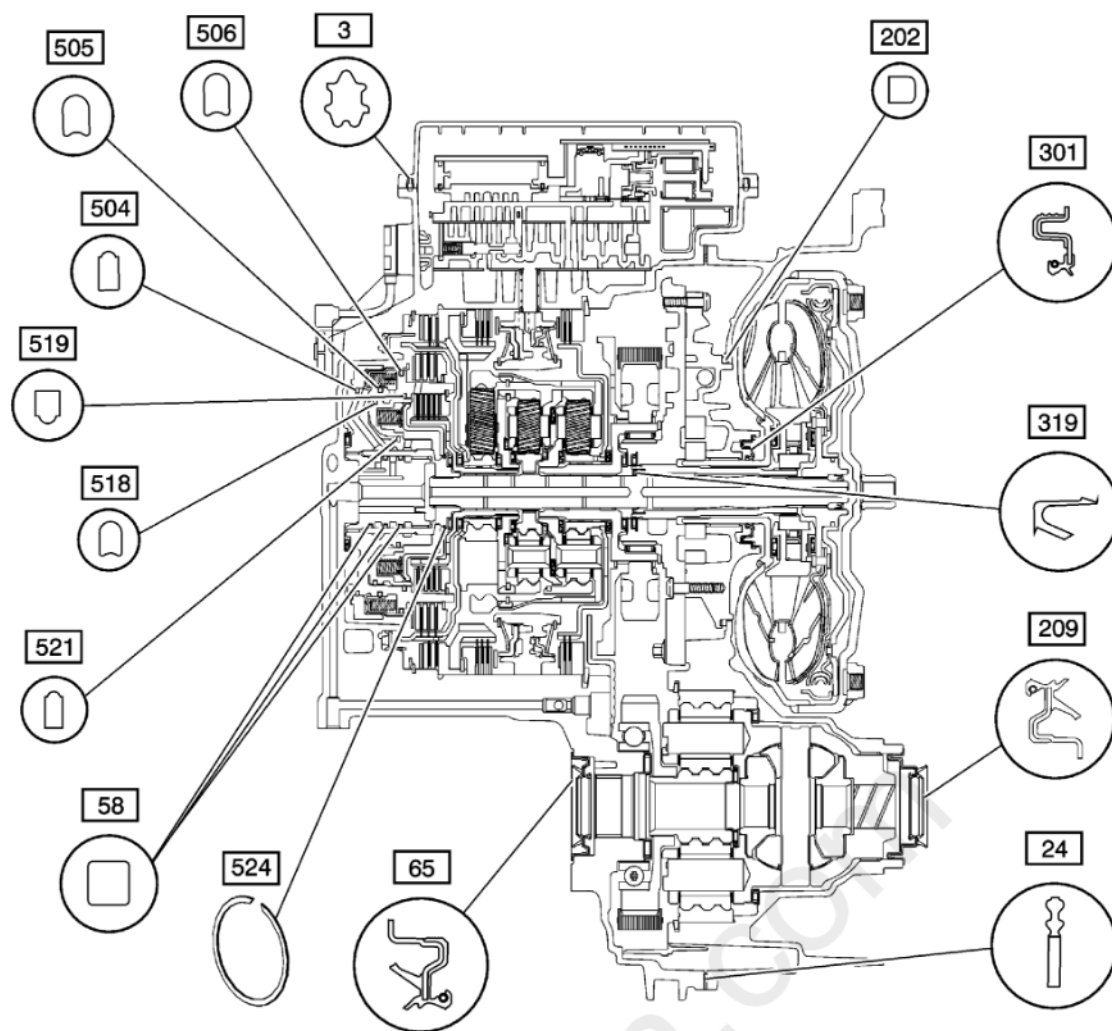


Fig. 6: A/Trans Seal Kit (Gen 2).(1 of 2)

Courtesy of GENERAL MOTORS COMPANY

A/Trans Seal Kit (Gen 2) (1 of 2)

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
24	1	Torque Converter Housing Gasket
58	3	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
65	1	Drive Shaft Oil Seal Assembly
202	1	Torque Converter and Differential Housing Seal
209	1	Front Wheel Drive Shaft Oil Seal Assembly
301	1	Torque Converter Fluid Seal Assembly
319	1	Torque Converter Fluid Seal Assembly
504	1	3-5-Reverse Clutch Piston Inner Seal
505	1	3-5-Reverse Clutch Piston Inner Seal
506	1	3-5-Reverse Clutch Piston Dam Seal
518	1	4-5-6 Clutch Piston Outer Seal
519	1	4-5-6 Clutch Piston Outer Seal
521	1	4-5-6 Clutch Piston Inner Seal
524	1	4-5-6 Clutch Piston Fluid Dam Retainer Ring

A/Trans Seal Kit (Gen 2) (2 of 2)

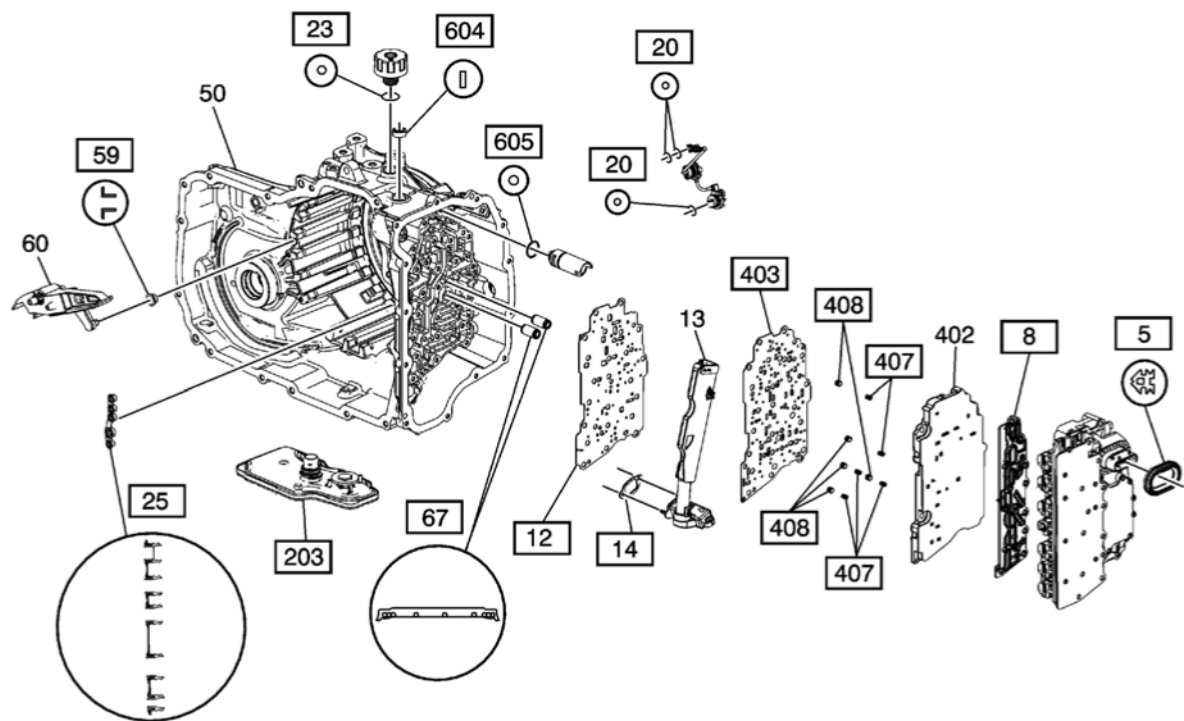


Fig. 7: Automatic Trans Seal Kit (Gen 2) (2 Of 2)
Courtesy of GENERAL MOTORS COMPANY

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

A/Trans Seal Kit (Gen 2) (2 of 2)

Callout	Quantity	Component Name
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal
23	1	Fill Cap Seal
25	1	A/Trans Fluid Pump Seal Assembly
59	1	Drive Link Lube Fluid Seal
67	1	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
203	1	A/Trans Fluid Filter Assembly
403	1	Channel Plate to Valve Body Spacer Plate Assembly
407	5	Actuator Feed Accumulator Spring
408	5	Actuator Feed Accumulator Piston
604	1	Manual Shift Shaft Seal
605	1	Park Pawl Actuator Guide Seal

Transmission Kit (Gen 1)

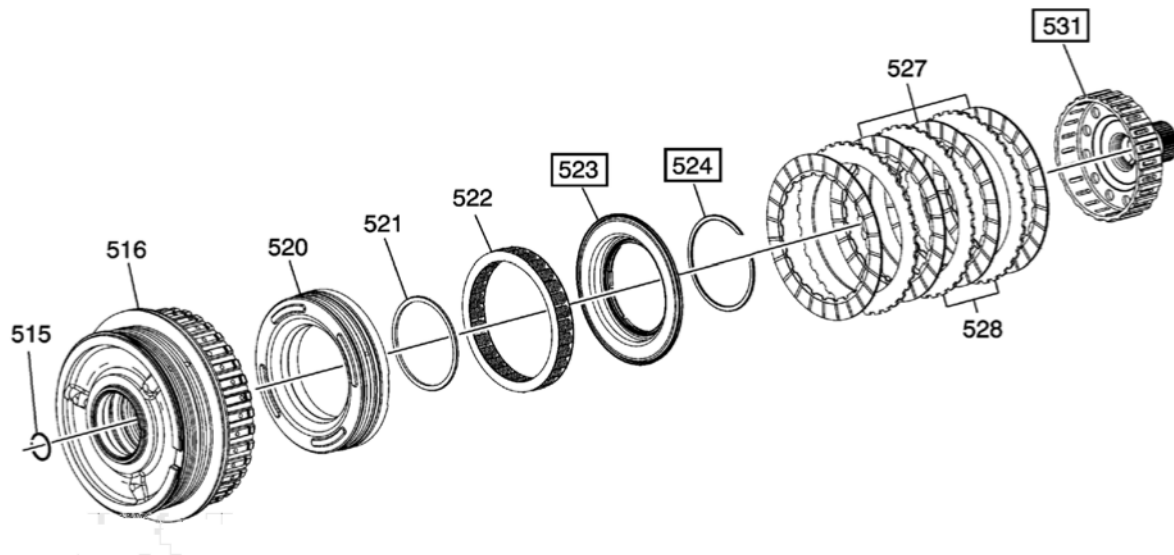


Fig. 8: Transmission Kit (Gen 1)

Courtesy of GENERAL MOTORS COMPANY

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

Transmission Kit (Gen 1)

Callout	Quantity	Component Name
523	1	4-5-6 Clutch Piston Fluid Dam Assembly
524	1	4-5-6 Clutch Piston Fluid Dam Retainer Ring
531	1	Reaction Carrier Hub Assembly

Control Valve Body Kit (Gen 1)

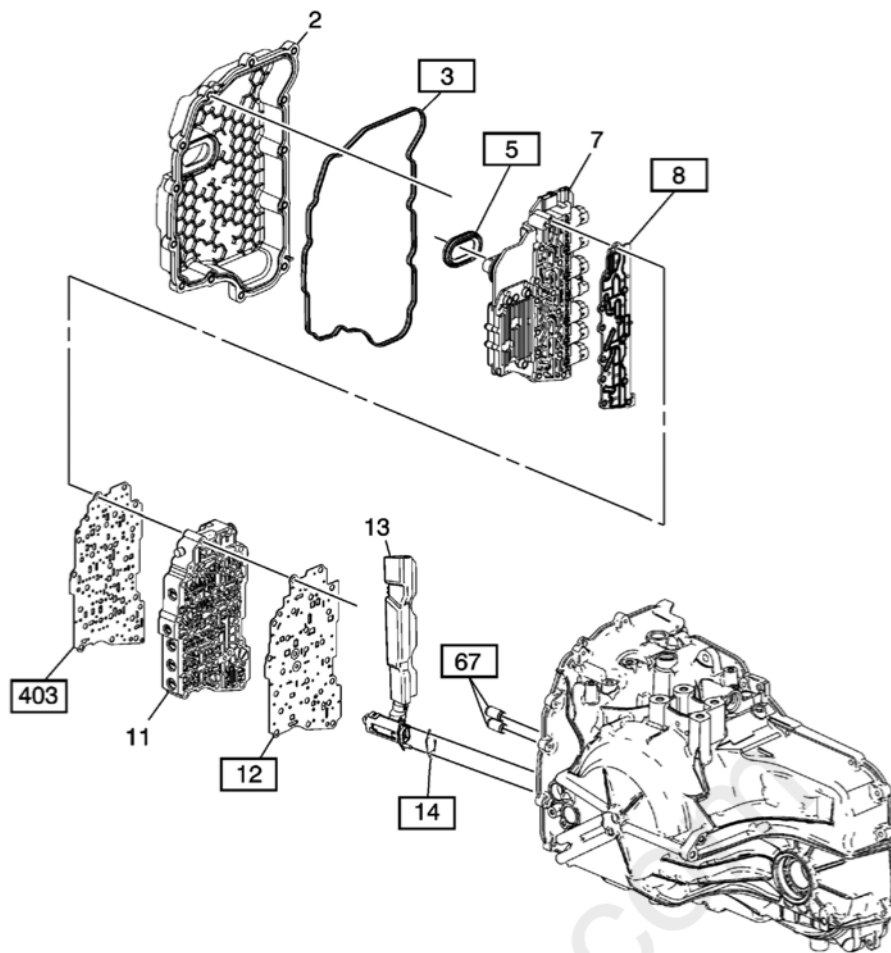


Fig. 9: Control Valve Body Kit (Gen 1)

Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Kit (Gen 1)

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
67	2	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
403	1	Channel Plate to Valve Body Spacer Plate Assembly

Control Valve Body Kit (Gen 2)

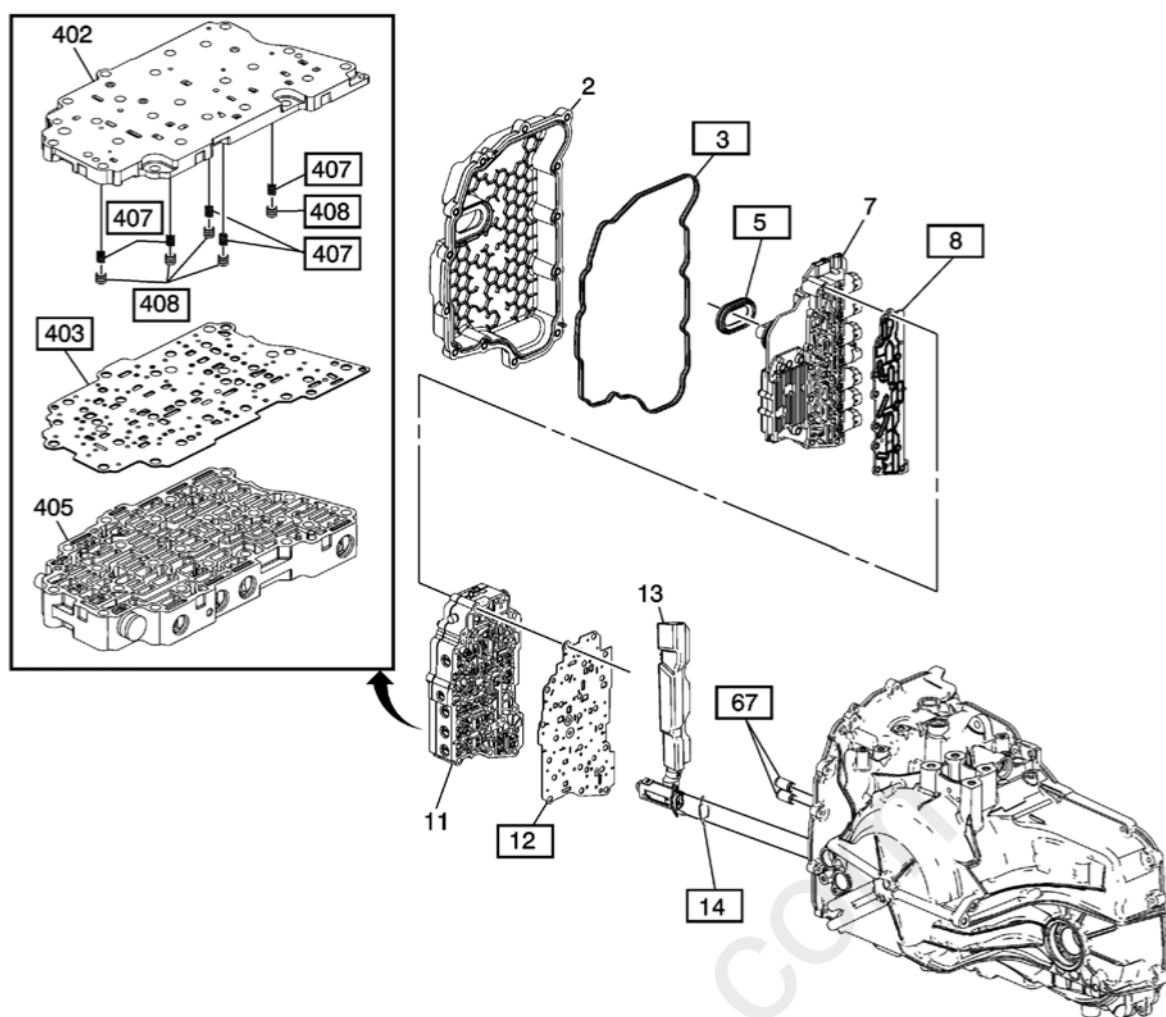


Fig. 10: Control Valve Body Kit (Gen 2)

Courtesy of GENERAL MOTORS COMPANY

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

Control Valve Body Kit (Gen 2)

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
67	2	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
403	1	Channel Plate to Valve Body Spacer Plate Assembly
407	5	Actuator Feed Accumulator Spring
408	5	Actuator Feed Accumulator Piston

Clutch Plate Package (Gen 1)

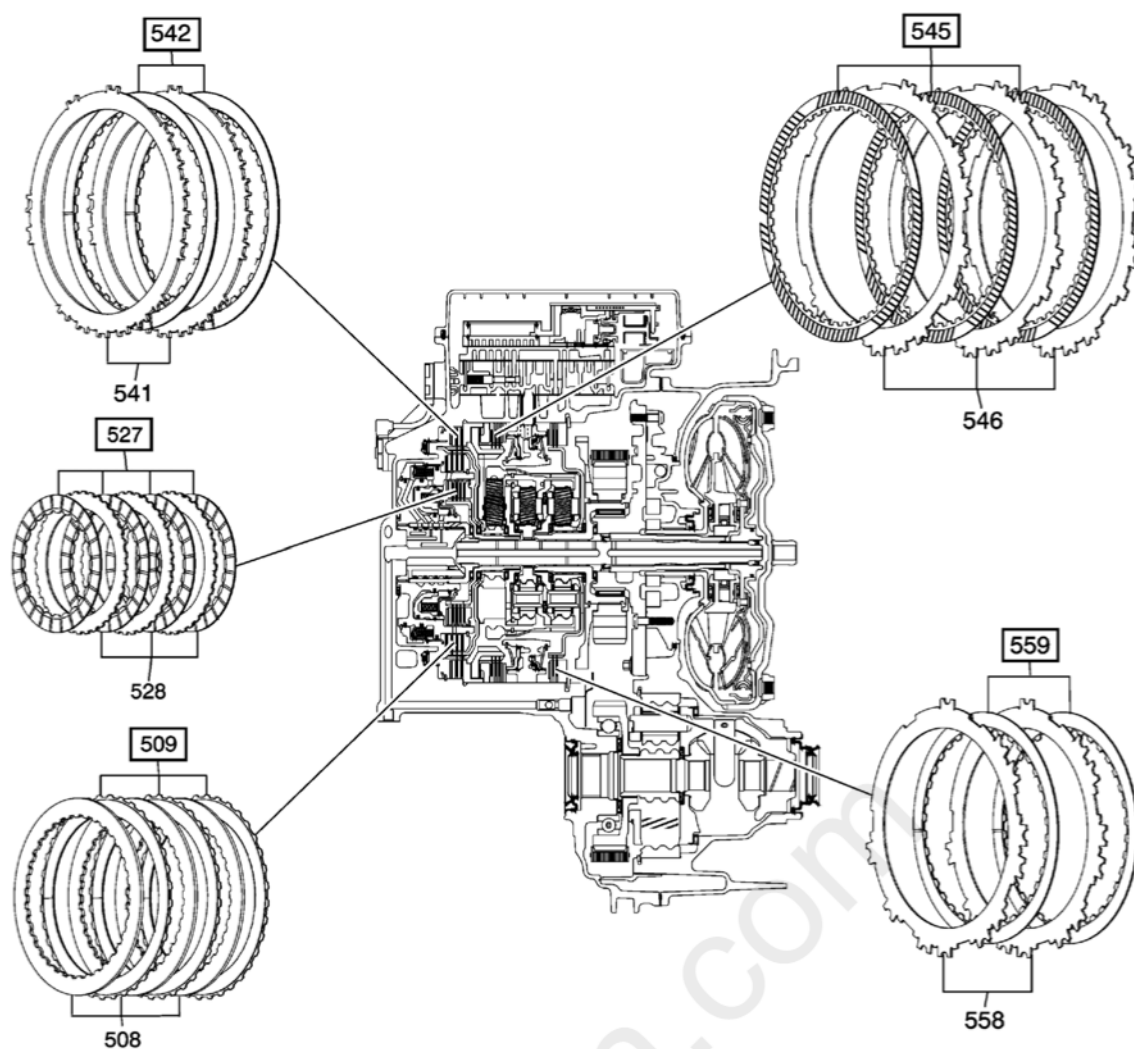


Fig. 11: Clutch Plate Package (Gen 1)

Courtesy of GENERAL MOTORS COMPANY

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

Clutch Plate Package (Gen 1)

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly
527	4	4-5-6 Clutch (w/Friction Material) Plate Assembly
542	2	2-6 Clutch (w/Friction Material) Plate Assembly
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

Clutch Plate Package (Gen 2)

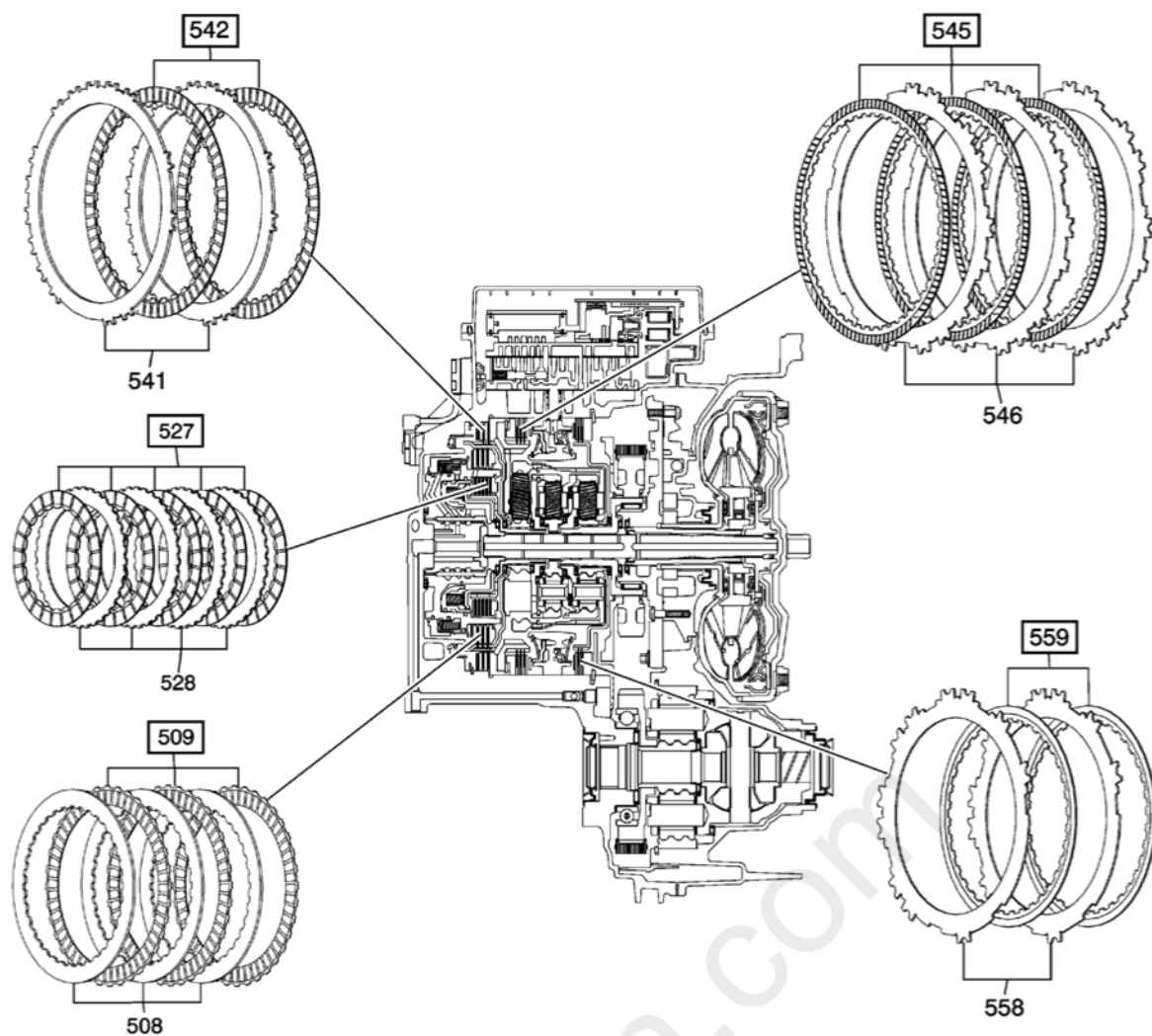


Fig. 12: Clutch Plate Package (Gen 2)

Courtesy of GENERAL MOTORS COMPANY

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

Clutch Plate Package (Gen 2)

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly
527	5	4-5-6 Clutch (w/Friction Material) Plate Assembly
542	2	2-6 Clutch (w/Friction Material) Plate Assembly
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

4-5-6 Plate Assembly (Gen 2)

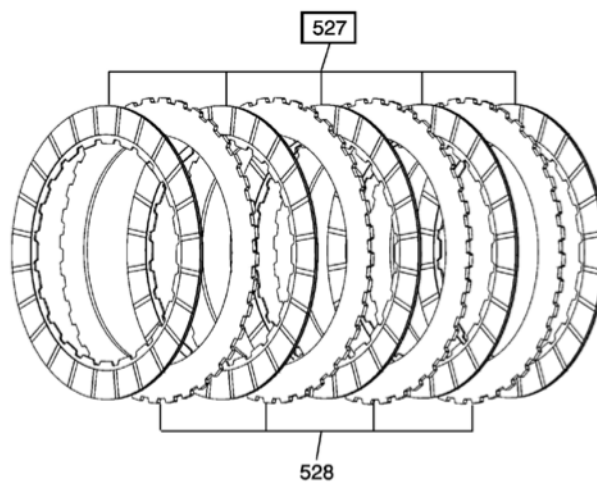


Fig. 13: 4-5-6 Plate Assembly (Gen 2)
 Courtesy of GENERAL MOTORS COMPANY

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

4-5-6 Plate Assembly (Gen 2)

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

Low and Reverse Plate Assembly (Gen 2)

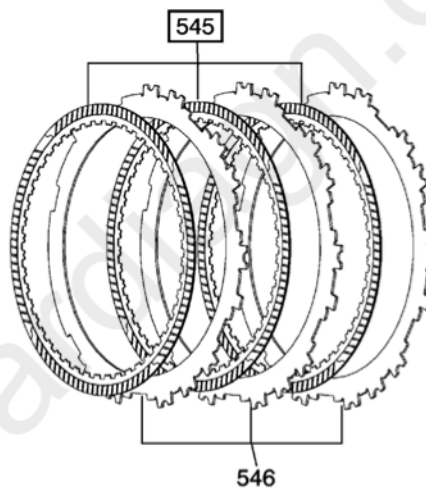


Fig. 14: Low And Reverse Plate Assembly (Gen 2)
 Courtesy of GENERAL MOTORS COMPANY

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

Low and Reverse Plate Assembly (Gen 2)

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

3-5 Reverse Plate Assembly (Gen 2)

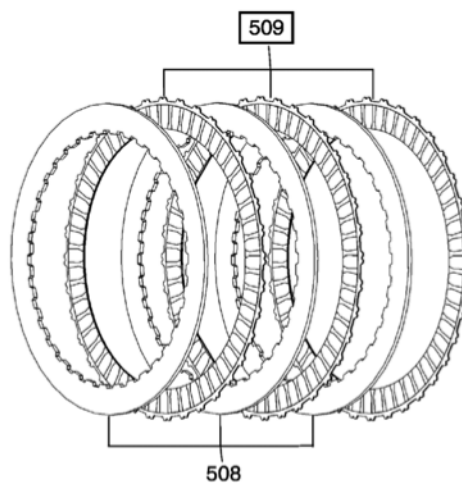


Fig. 15: 3-5 Reverse Plate Assembly (Gen 2)
 Courtesy of GENERAL MOTORS COMPANY

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

3-5 Reverse Plate Assembly (Gen 2)

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

2-6 Plate Assembly (Gen 2)

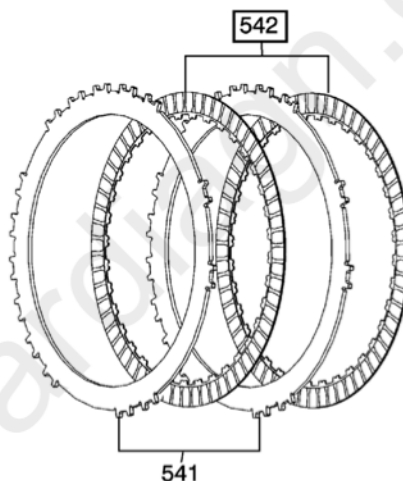


Fig. 16: 2-6 Plate Assembly (Gen 2)
 Courtesy of GENERAL MOTORS COMPANY

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

2-6 Plate Assembly (Gen 2)

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

1-2-3-4 Plate Assembly (Gen 2)

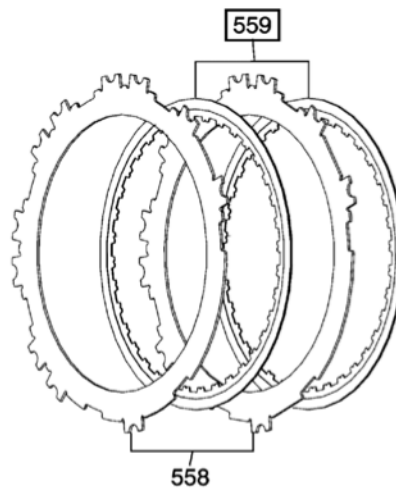


Fig. 17: 1-2-3-4 Plate Assembly (Gen 2)

Courtesy of GENERAL MOTORS COMPANY

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

1-2-3-4 Plate Assembly (Gen 2)

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

A/Trans Seal Kit (Gen 2)

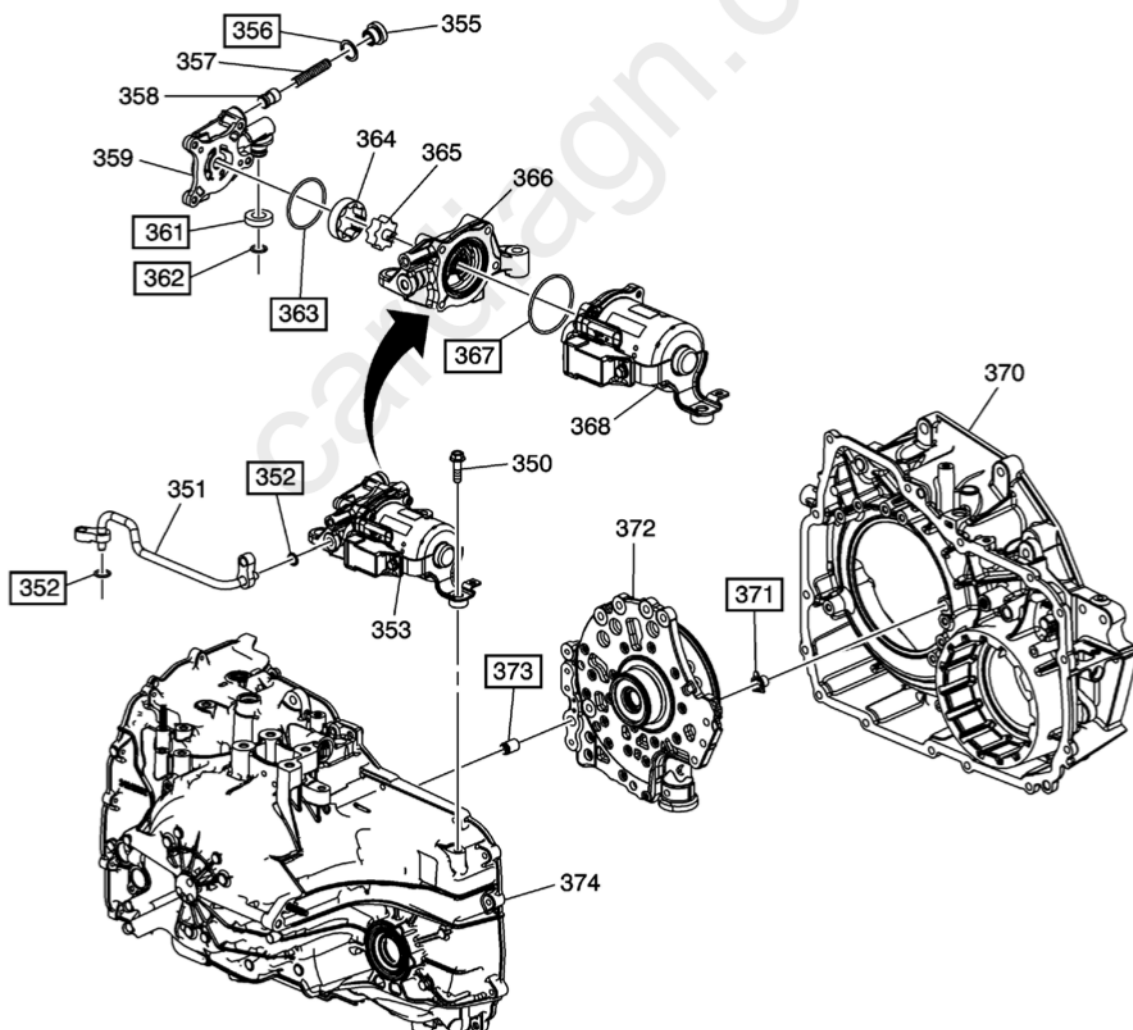


Fig. 18: Automatic Trans Seal Kit (Gen 2)

Courtesy of GENERAL MOTORS COMPANY

NOTE: Callouts with boxes around them indicate part is included in the service

kit. Callouts without boxes are shown for relationship purposes only.

A/Trans Seal Kit (Gen 2)

Callout	Quantity	Component Name
352	2	A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
356	1	Pressure Regulator Valve Spring Spacer
361	1	A/Trans Auxiliary Fluid Pump Gasket
362	1	A/Trans Auxiliary Fluid Pump Seal
363	1	A/Trans Auxiliary Fluid Pump Cover Seal
367	1	A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-Ring
371	1	A/Trans Auxiliary Fluid Inlet Pump Seal
373	1	A/Trans Fluid Trough Check Ball

A/Trans Auxiliary Seal Kit (Gen 2)

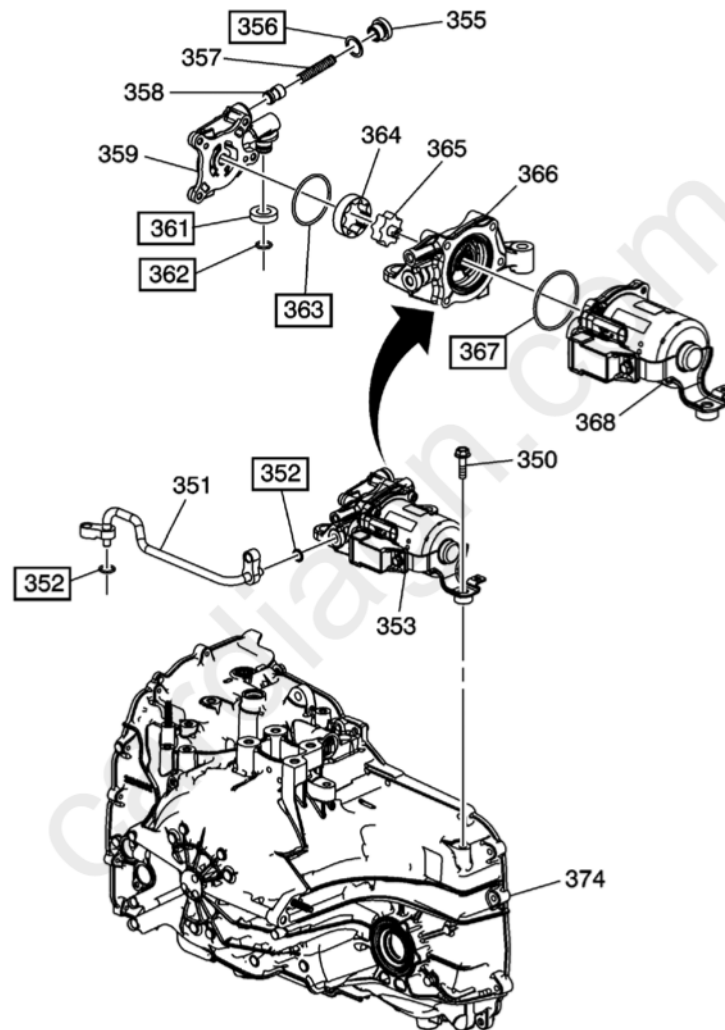


Fig. 19: Automatic Trans Auxiliary Seal Kit (Gen 2)

Courtesy of GENERAL MOTORS COMPANY

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

A/Trans Auxiliary Seal Kit (Gen 2)

Callout	Quantity	Component Name
352	2	A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
356	1	Pressure Regulator Valve Spring Spacer
361	1	A/Trans Auxiliary Fluid Pump Gasket
362	1	A/Trans Auxiliary Fluid Pump Seal
363	1	A/Trans Auxiliary Fluid Pump Cover Seal
367	1	A/Trans Auxiliary Fluid Pump Motor Cover Seal - O-Ring

