

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

COMPONENT LOCATOR

DISASSEMBLED VIEWS

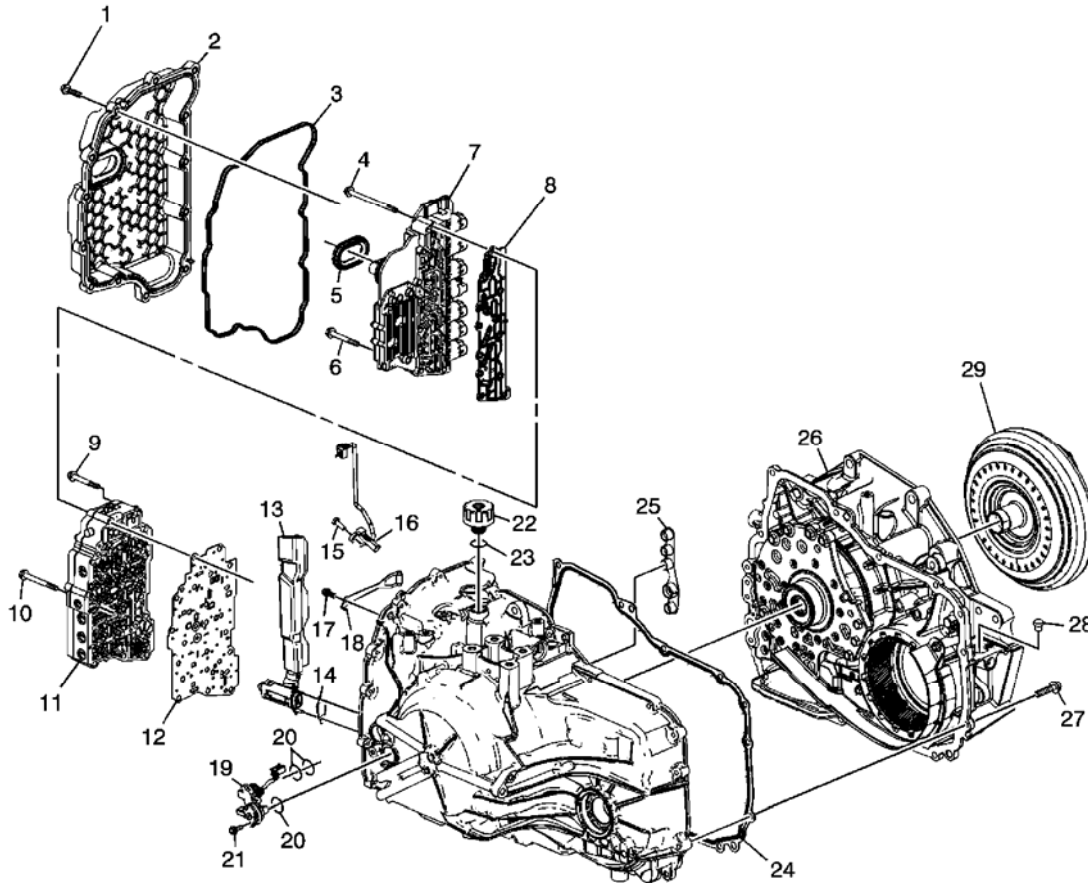


Fig. 1: Case and Associated Parts

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Cover Bolt
2	Control Valve Body Cover Assembly
3	Control Valve Body Cover Gasket
4	Control Valve Body Bolt
5	Control Valve Body Cover Hole Seal
6	Control Solenoid Valve Heat Sink Bolt
7	Control Solenoid (w/Body and TCM) Valve Assembly

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

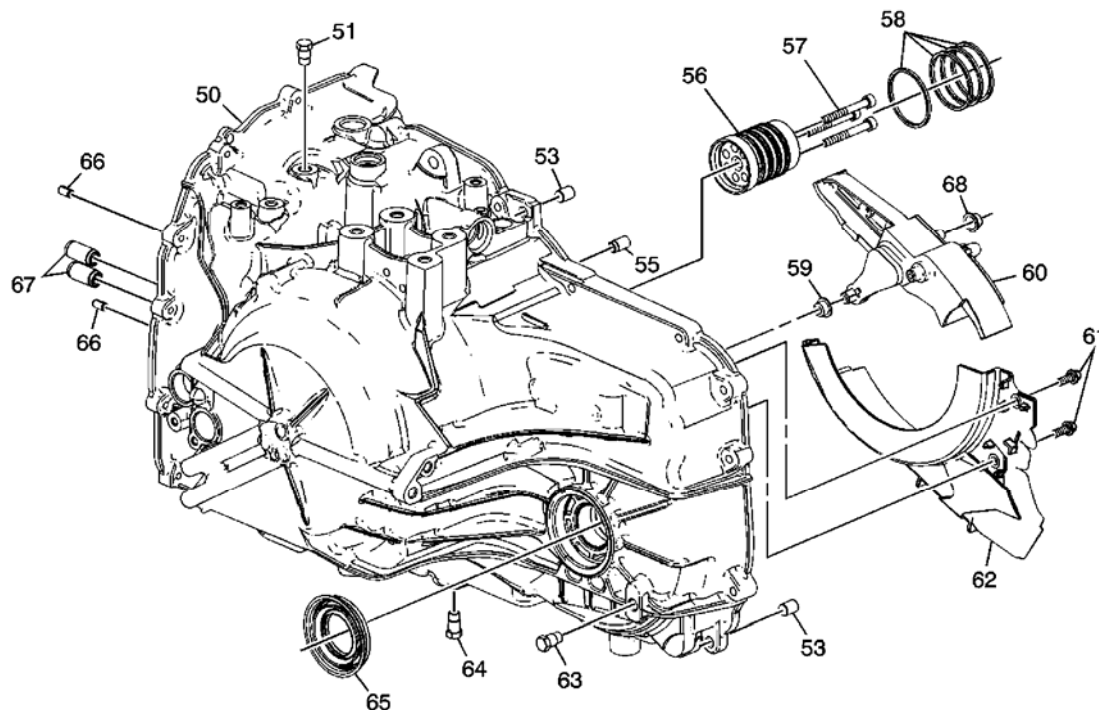


Fig. 2: Transmission Case Assembly
 Courtesy of GENERAL MOTORS CORP.

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

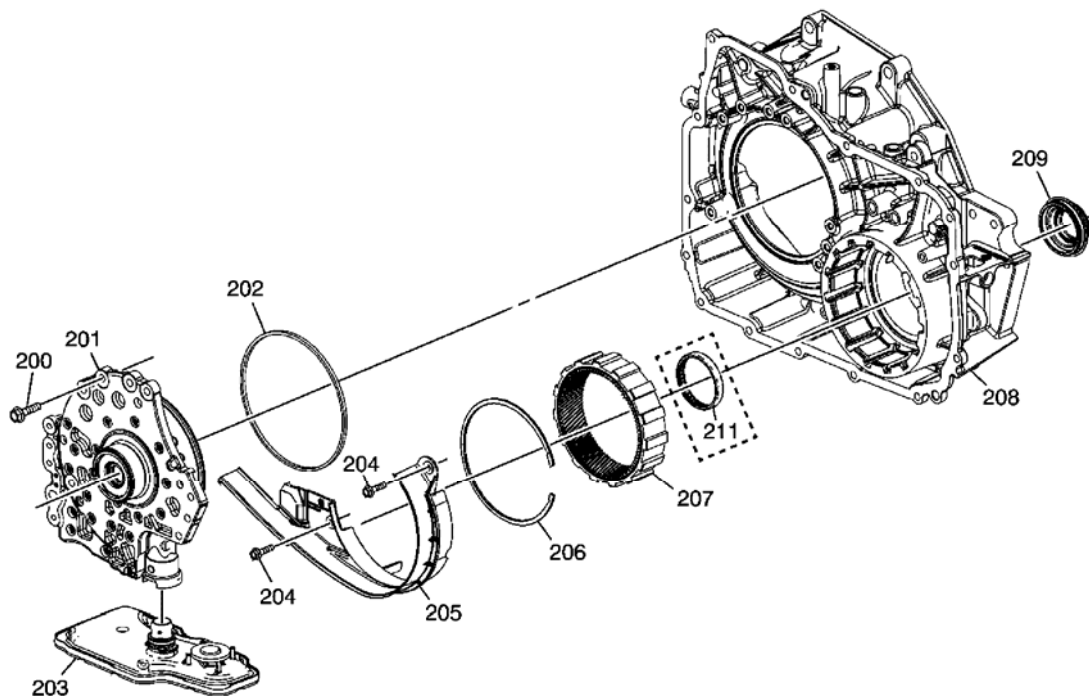


Fig. 3: Torque Converter & Fluid Pump Housing Assembly
Courtesy of GENERAL MOTORS CORP.

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
211	Front Differential Carrier Bearing Assembly AWD Models

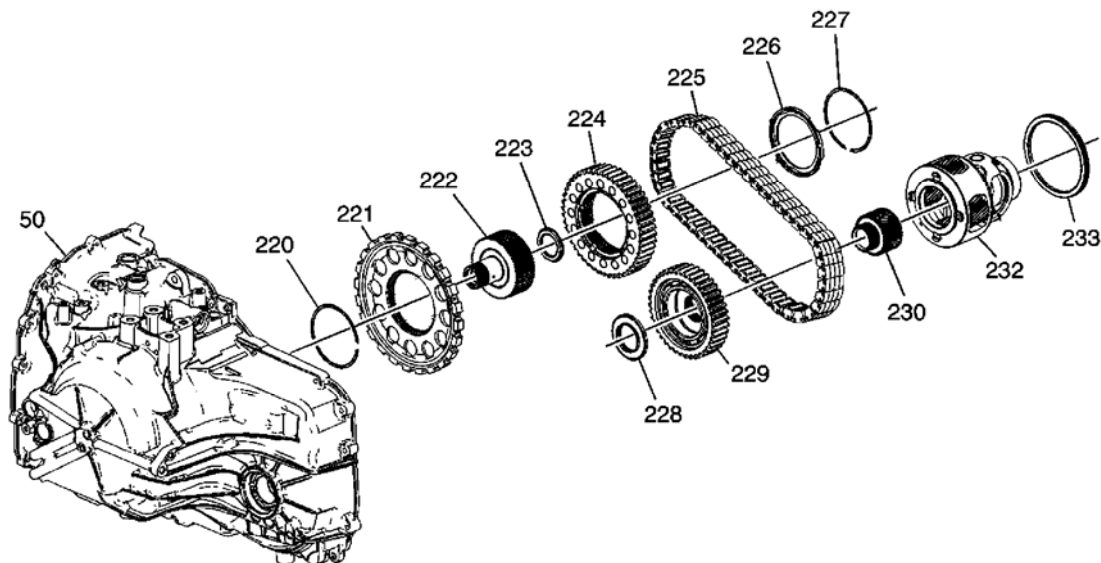


Fig. 4: Drive Link Assembly
 Courtesy of GENERAL MOTORS CORP.

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

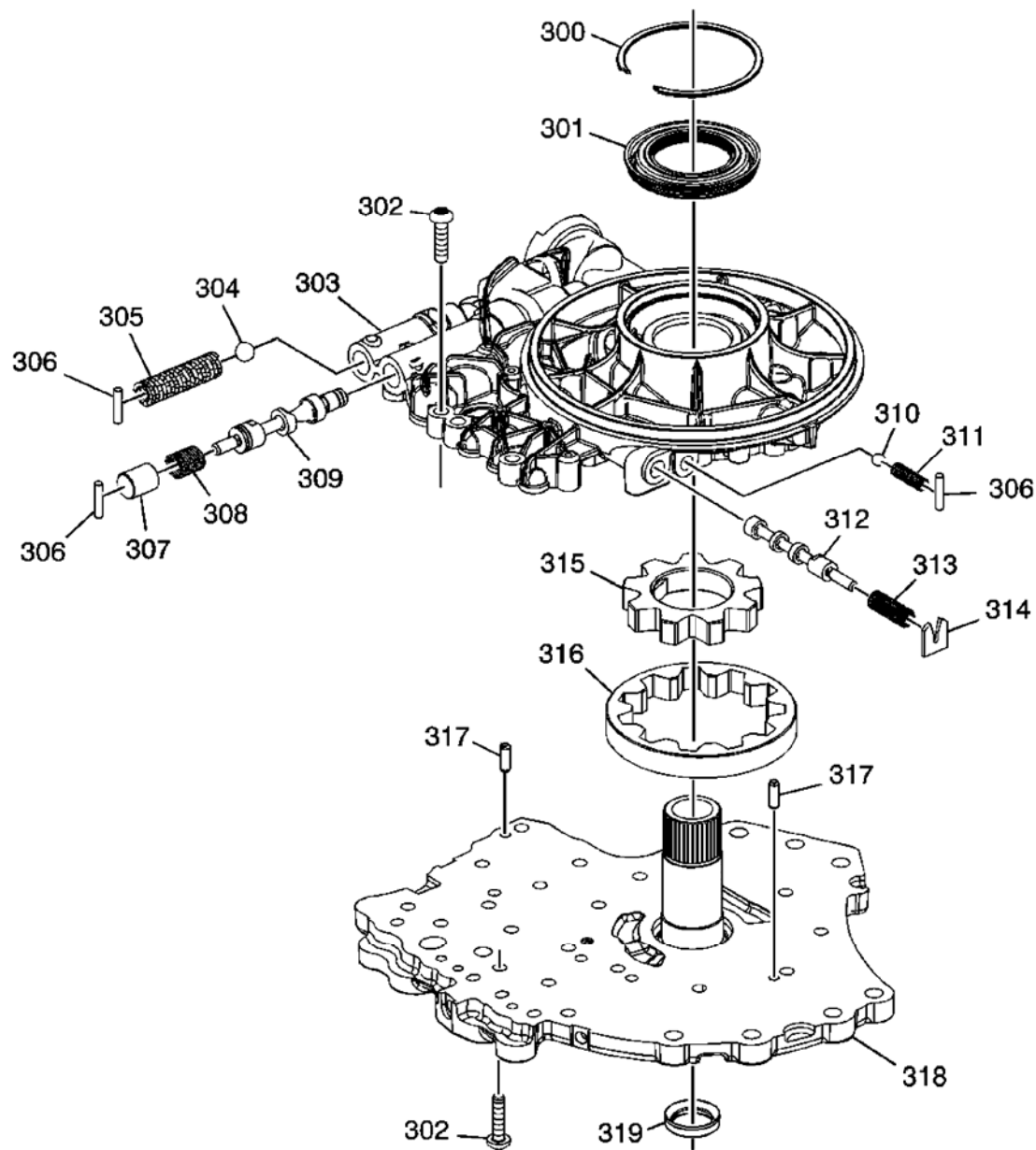


Fig. 5: Oil Pump Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
300	Torque Converter Fluid Seal Retainer
301	Torque Converter Fluid Seal Assembly
302	A/Trans Fluid Pump Cover Bolt
303	A/Trans Fluid Pump Body
304	Pump Blowoff Ball Valve
305	Pump Blowoff Valve Spring

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

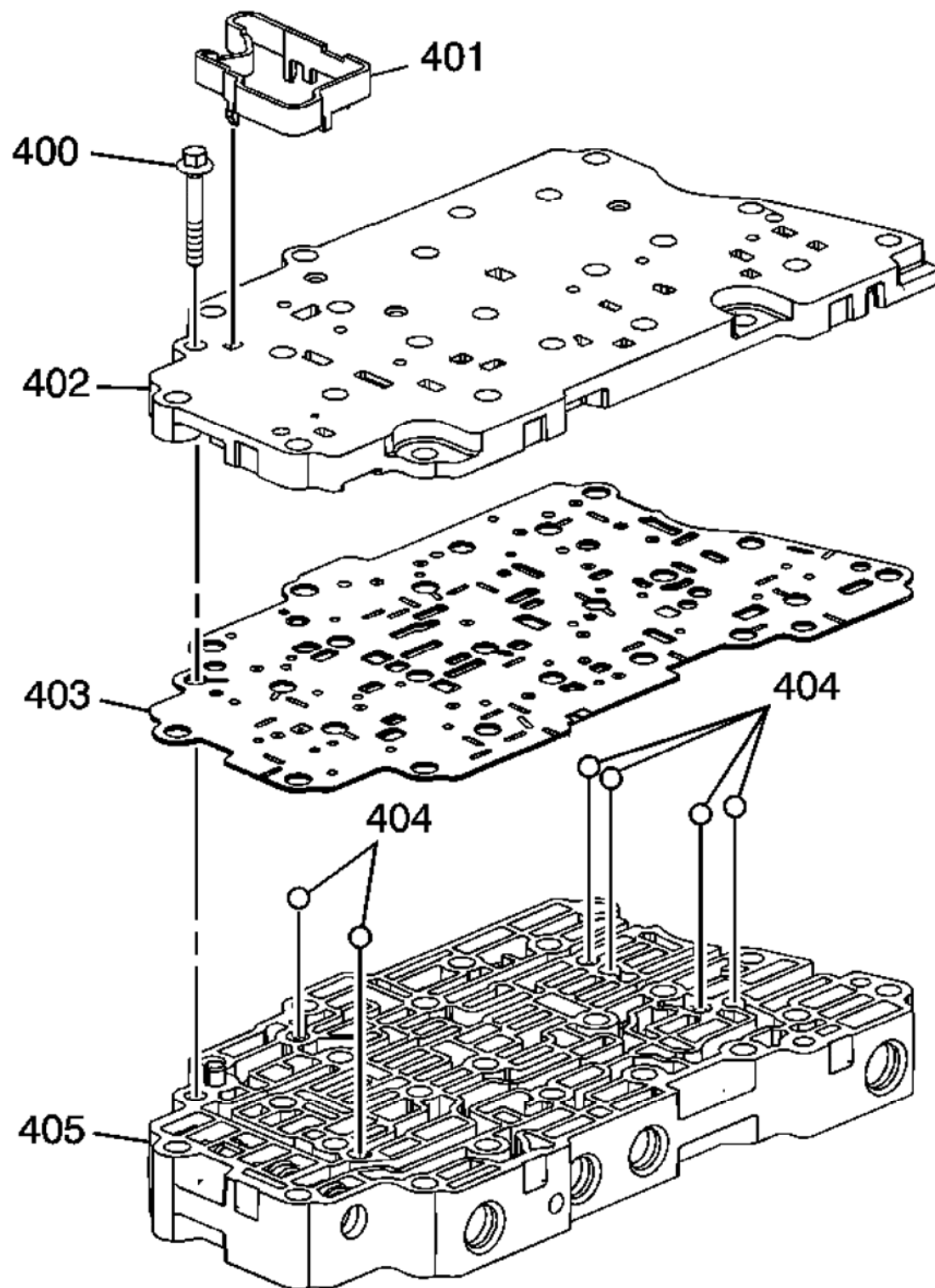


Fig. 6: Control Valve Body Assembly (1 of 2)
Courtesy of GENERAL MOTORS CORP.

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

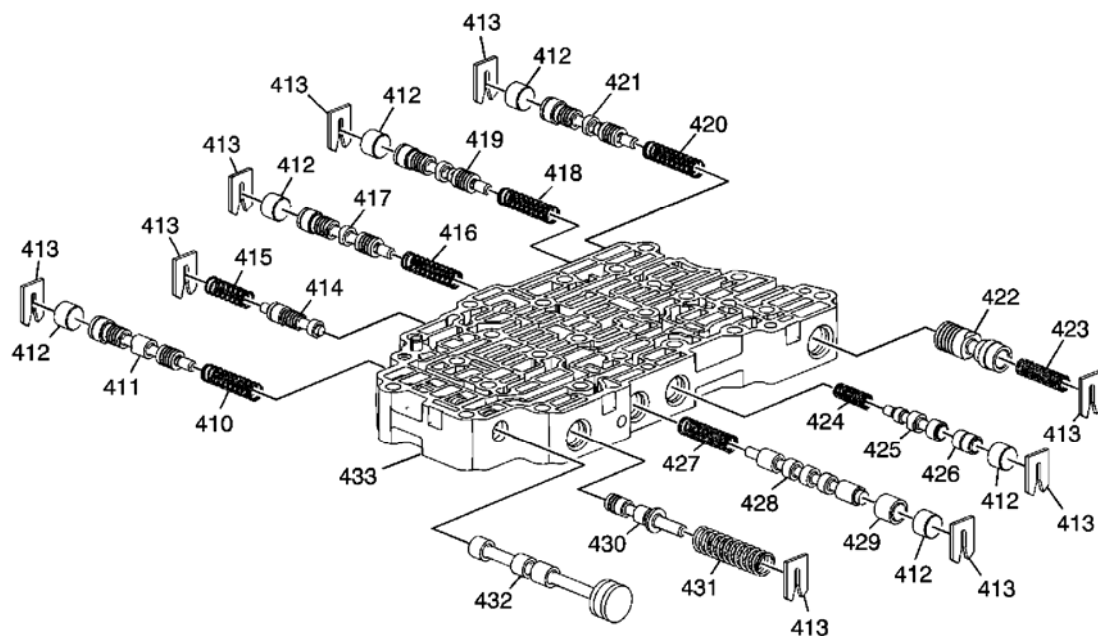


Fig. 7: Control Valve Body Assembly (2 of 2)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
410	Reverse and 4-5-6 Clutch Regulator Valve Spring
411	Reverse and 4-5-6 Clutch Regulator Valve
412	Clutch Valve Bore Plug
413	Valve Spring Retainer
414	1-2-3-4 Clutch Boost Valve
415	1-2-3-4 Clutch Boost Valve Spring
416	1-2-3-4 Clutch Regulator Valve Spring
417	1-2-3-4 Clutch Regulator Valve
418	2-6 Clutch Regulator Valve Spring
419	2-6 Clutch Regulator Valve
420	3-5-Reverse Clutch Regulator Valve Spring
421	3-5-Reverse Clutch Regulator Valve

422	Clutch Piston Dam Feed Regulator Valve
423	Clutch Piston Dam Feed Regulator Valve Spring
424	Torque Converter Clutch Regulator Apply Valve Spring
425	Torque Converter Clutch Regulator Apply Valve
426	Torque Converter Clutch Regulator Apply Shuttle Valve
427	Clutch Select Valve Spring
428	Clutch Select Valve
429	Default Override Shuttle Valve
430	Actuator Feed Limit Valve
431	Actuator Feed Limit Valve Spring
432	Manual Valve
433	Control Valve Body Assembly

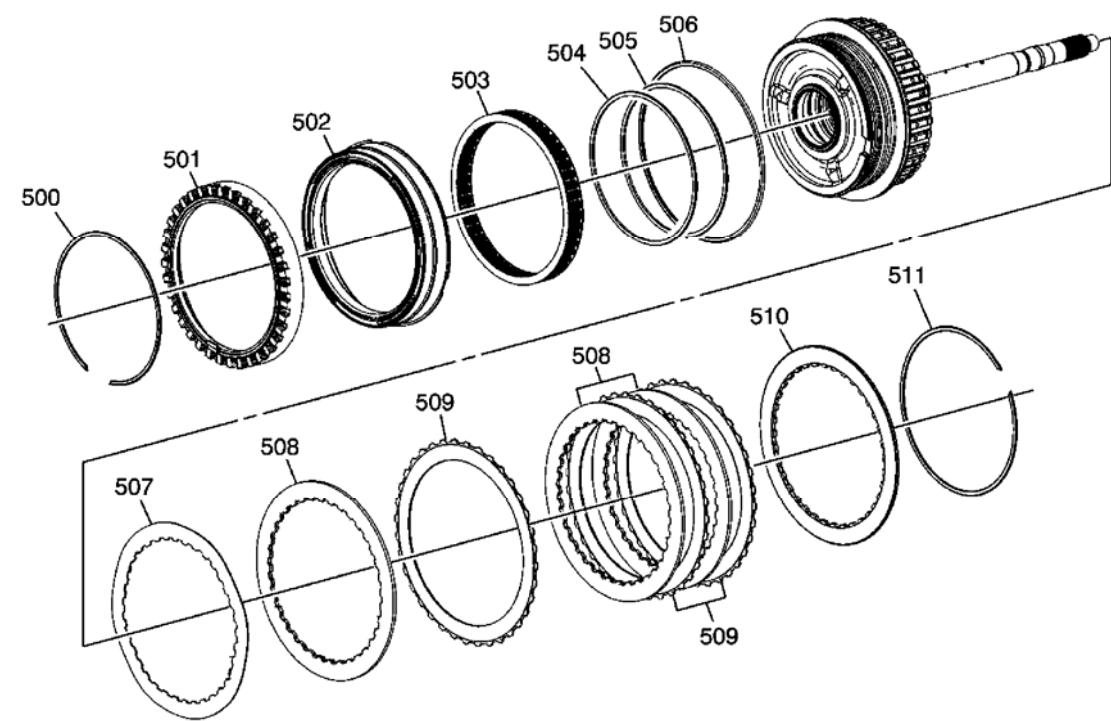


Fig. 8: 3-5 Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

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

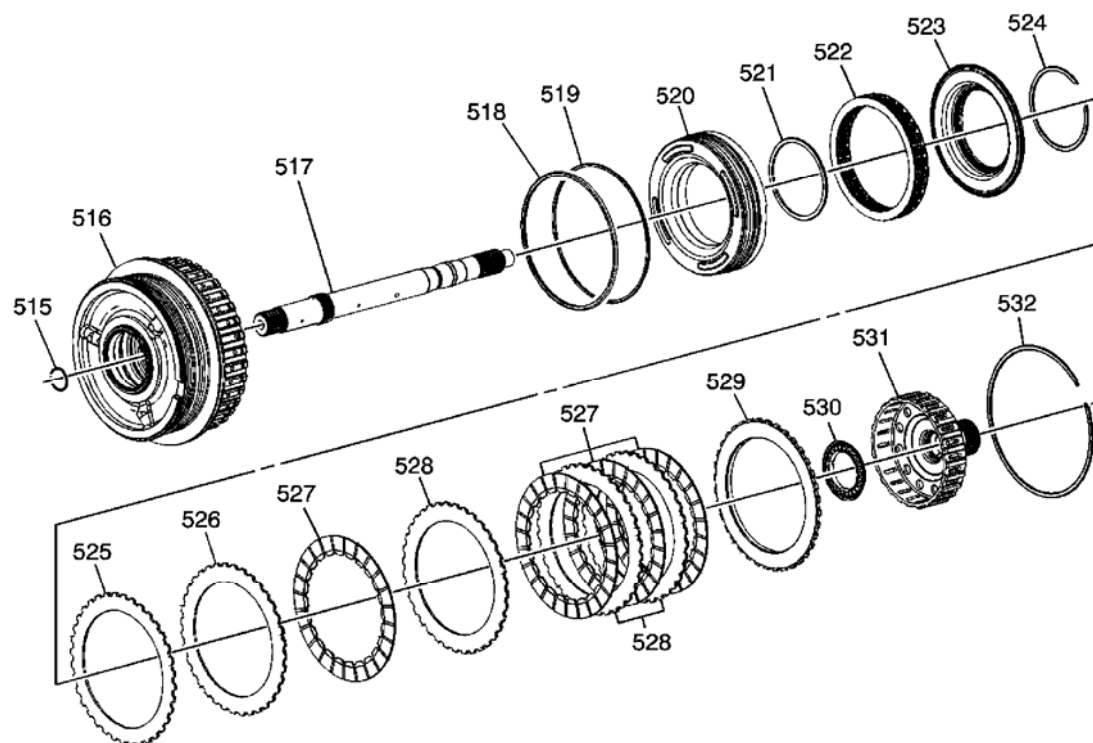


Fig. 9: 4-5-6 Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
515	Turbine Shaft Retainer Ring
516	3-5-Reverse and 4-5-6 Clutch Housing Assembly
517	Turbine Shaft
518	4-5-6 Clutch Piston Outer Seal
519	4-5-6 Clutch Piston Outer Seal
520	4-5-6 Clutch Piston
521	4-5-6 Clutch Piston Inner Seal
522	4-5-6 Clutch Piston Return Spring Assembly
523	4-5-6 Clutch Piston Fluid Dam Assembly
524	4-5-6 Clutch Piston Fluid Dam Retainer Ring

525	4-5-6 Clutch (Waved) Plate
526	4-5-6 Clutch Apply Plate
527	4-5-6 Clutch (w/Friction Material) Plate Assembly
528	4-5-6 Clutch Plate
529	4-5-6 Clutch Backing Plate
530	Reaction Carrier Hub Thrust Bearing Assembly
531	Reaction Carrier Hub Assembly
532	4-5-6 Clutch Backing Plate Retainer Ring

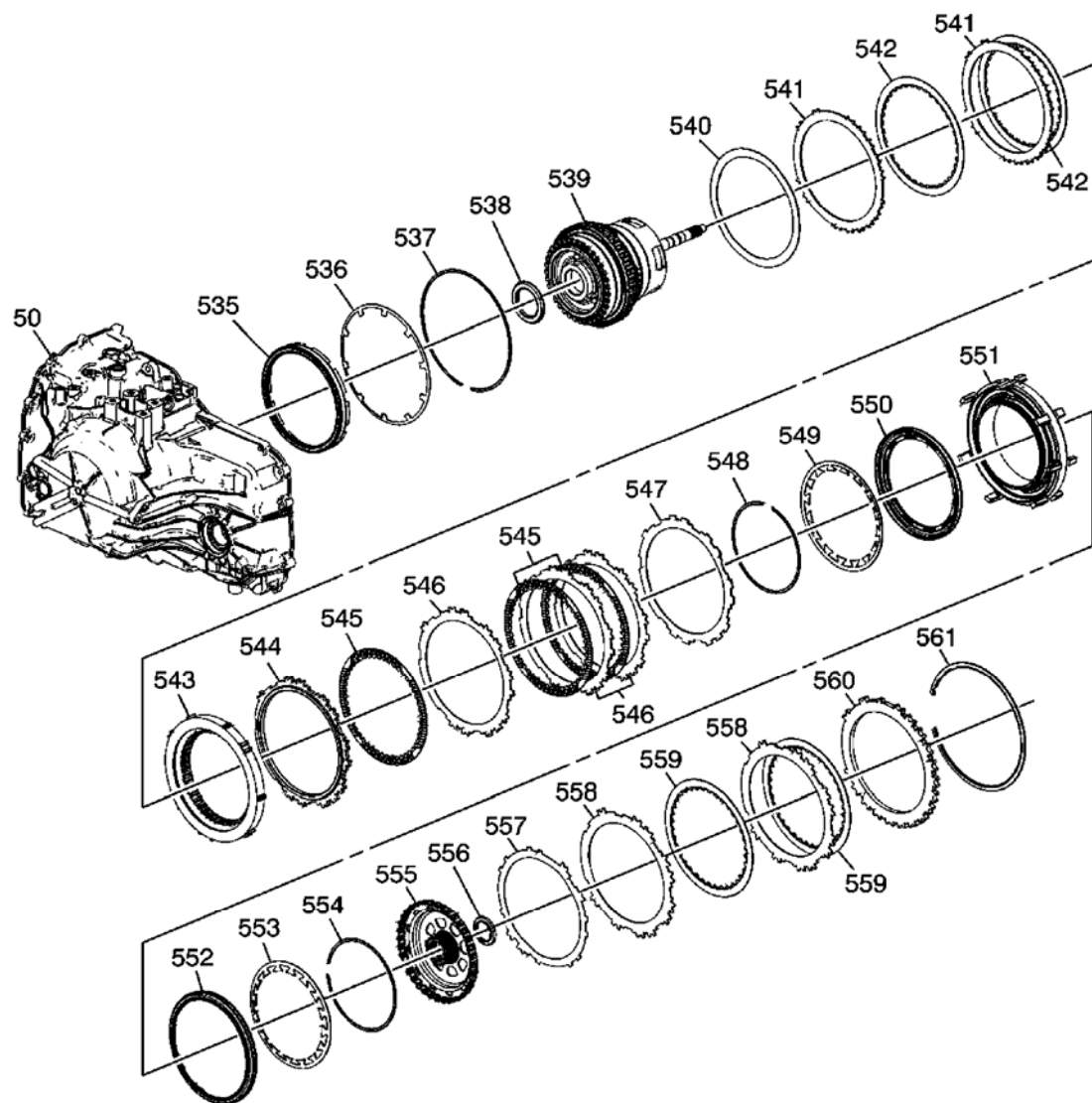


Fig. 10: 2-6, Low & Reverse and 1-2-3-4 Clutch Plate Assemblies
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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50	A/Trans Case
535	2-6 Clutch Piston Assembly
536	2-6 Clutch Spring
537	2-6 Clutch Spring Retainer Ring
538	3-5-Reverse and 4-5-6 Clutch Housing Thrust Bearing
539	3-5-Reverse and 4-5-6 Clutch Housing Assembly
540	2-6 Clutch Apply (Waved) Plate
541	2-6 Clutch Plate
542	2-6 Clutch (w/Friction Material) Plate Assembly
543	Low and Reverse Clutch Assembly
544	Low and Reverse Clutch Backing Plate
545	Low and Reverse Clutch (w/Friction Material) Plate Assembly
546	Low and Reverse Clutch Plate
547	Low and Reverse Clutch Apply (Waved) Plate
548	Low and Reverse Clutch Spring Retainer
549	Low and Reverse Clutch Spring
550	Low and Reverse Clutch Piston
551	Low and Reverse and 1-2-3-4 Clutch Housing
552	1-2-3-4 Clutch Piston
553	1-2-3-4 Clutch Spring
554	1-2-3-4 Clutch Piston Retainer
555	Output Sun Gear Assembly
556	Output Sun Thrust Bearing Assembly
557	1-2-3-4 Clutch (Waved) Plate
558	1-2-3-4 Clutch Plate
559	1-2-3-4 Clutch (w/Friction Material) Plate Assembly
560	1-2-3-4 Clutch Backing Plate
561	1-2-3-4 Clutch Backing Plate Retainer Ring

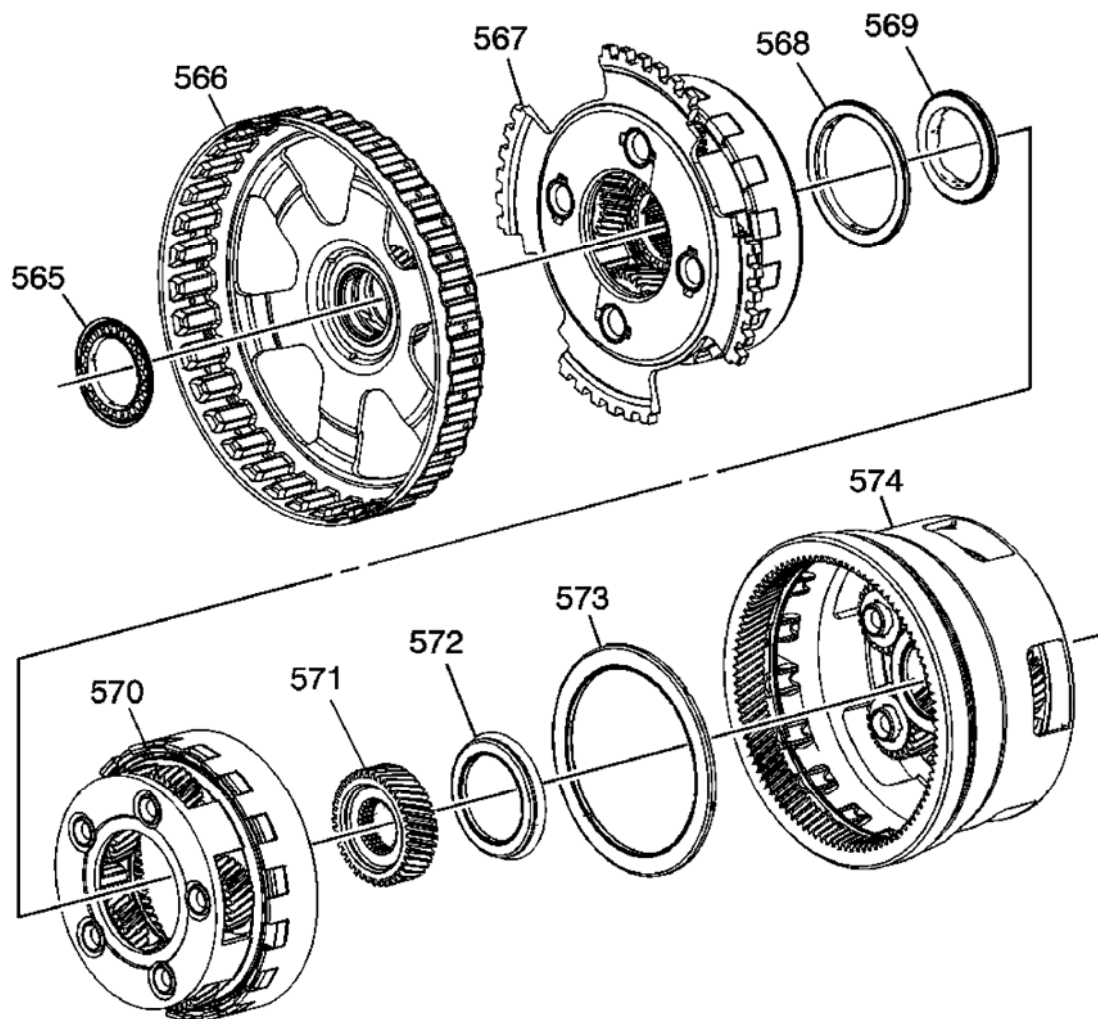


Fig. 11: Input, Output & Reaction Gearsets
 Courtesy of GENERAL MOTORS CORP.

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

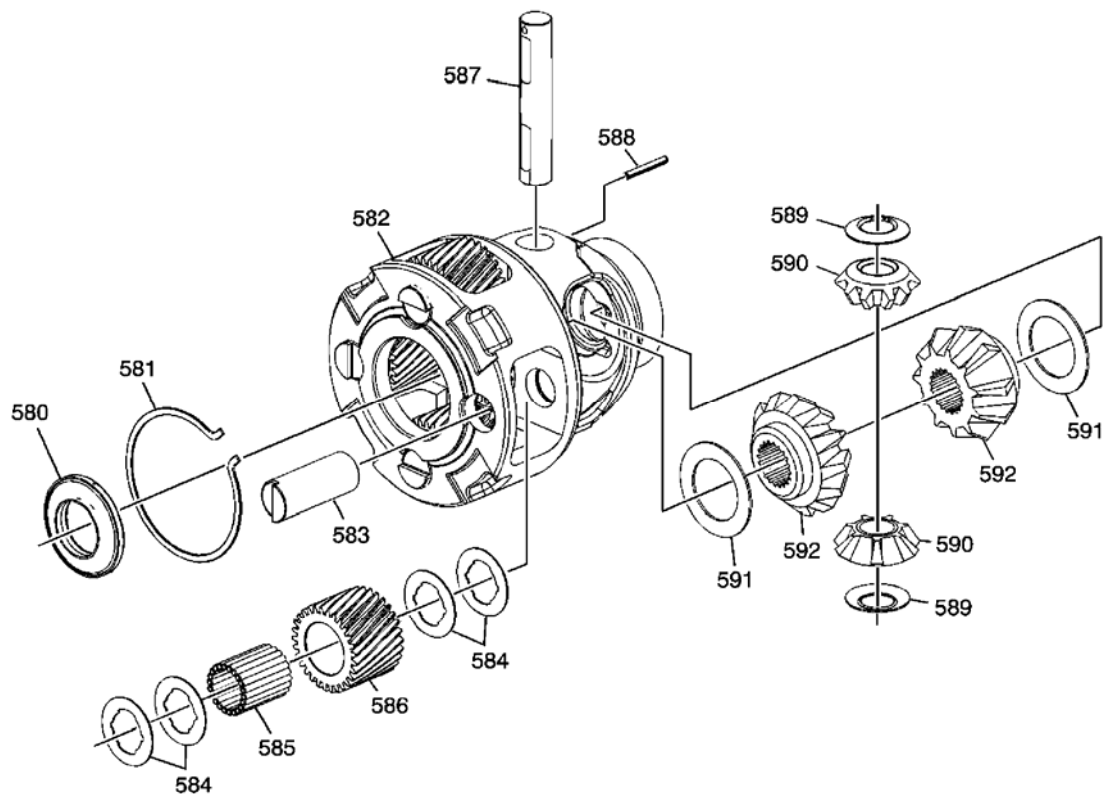


Fig. 12: Front Differential Carrier Assembly (2 Pinion)
Courtesy of GENERAL MOTORS CORP.

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

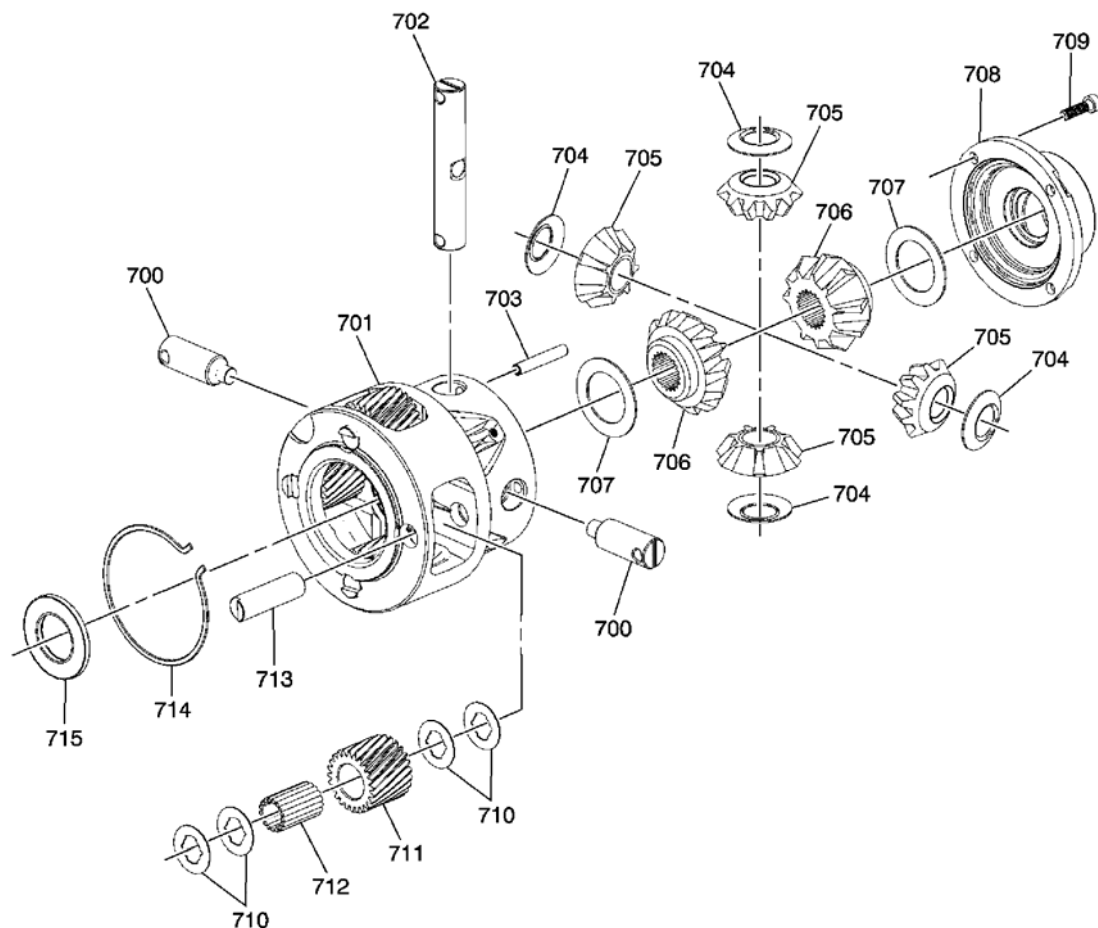


Fig. 13: Front Differential Carrier Assembly (4 Pinion)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
700	Front Differential Pinion Gear Shaft
701	Differential Carrier Assembly
702	Front Differential Pinion Gear Shaft
703	Front Differential Pinion Gear Shaft
704	Front Differential Pinion Thrust Washer
705	Front Differential Pinion Gear
706	Front Differential Side Gear
707	Front Differential Side Gear Thrust Washer
708	Front Differential Carrier Cover
709	Front Differential Carrier Cover Bolts
710	Front Differential Pinion Gear Shaft Washer
711	Front Differential Drive Pinion Gear
712	Front Differential Carrier Pinion Gear Bearing Rollers

713	Front Differential Pinion Gear Shaft Pin
714	Front Differential Pinion Gear Shaft Retainer
715	Front Differential Bearing

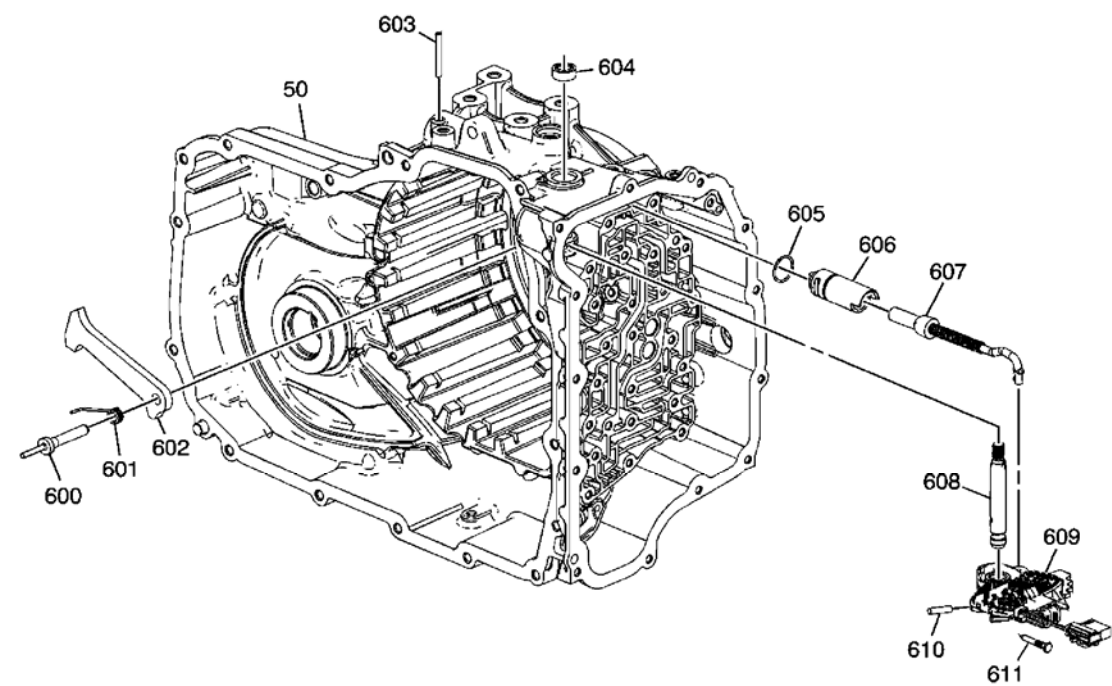


Fig. 14: Park System Components
 Courtesy of GENERAL MOTORS CORP.

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

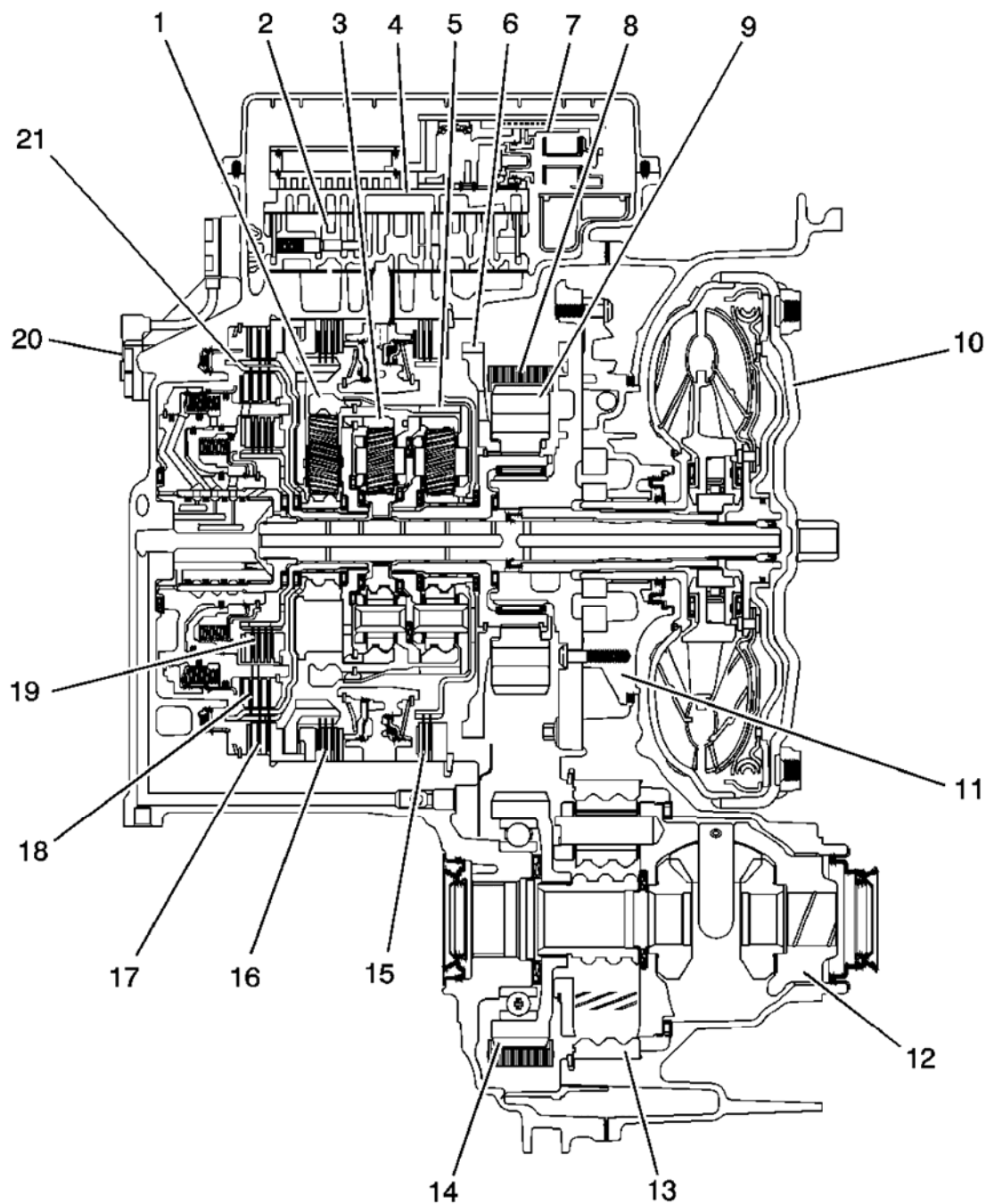


Fig. 15: Component Location

Courtesy of GENERAL MOTORS CORP.

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

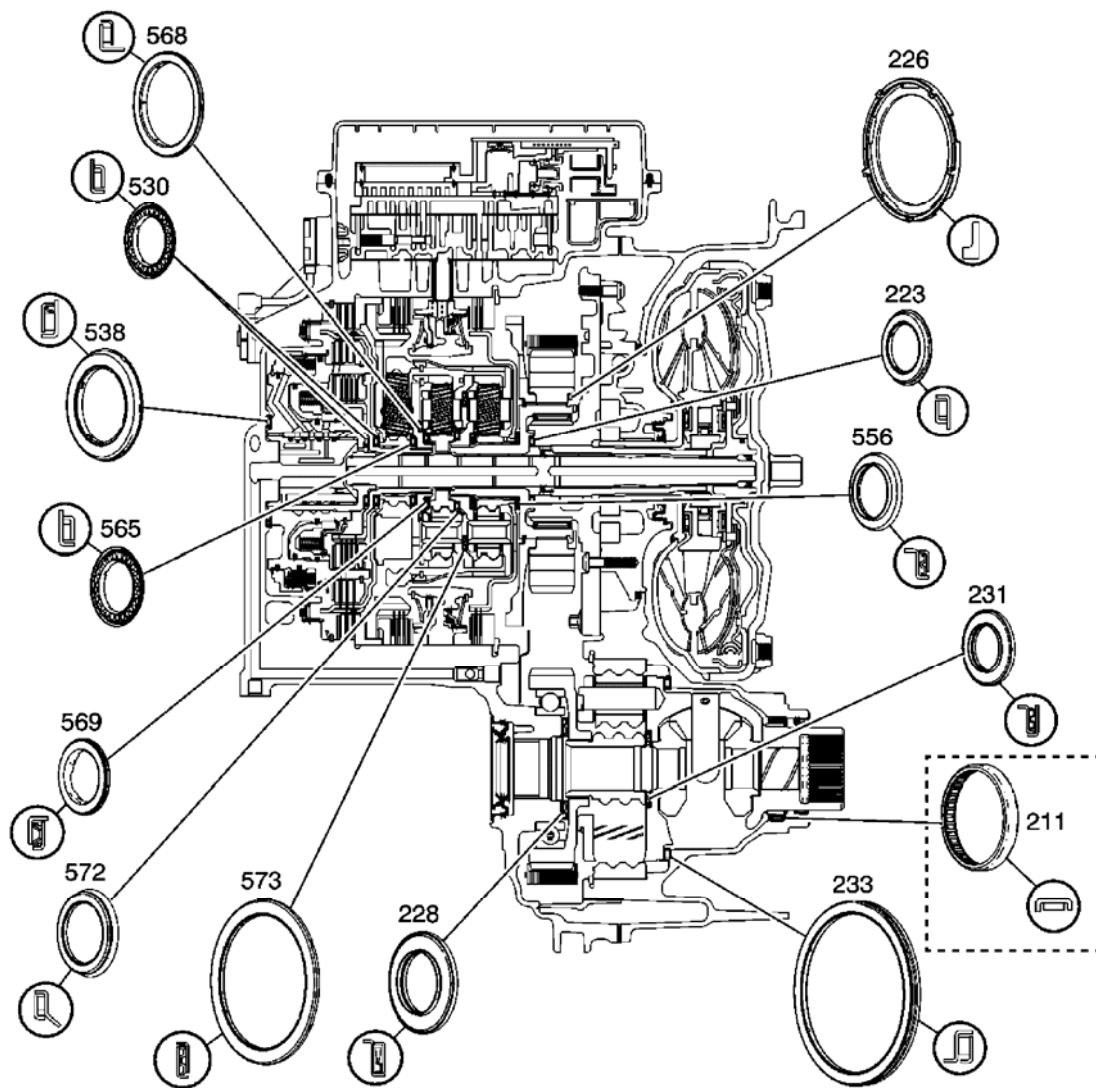


Fig. 16: Bushing, Bearing, & Washer Locations
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
211	Front Differential Carrier Bearing Assembly AWD Models
223	Drive Spocket 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

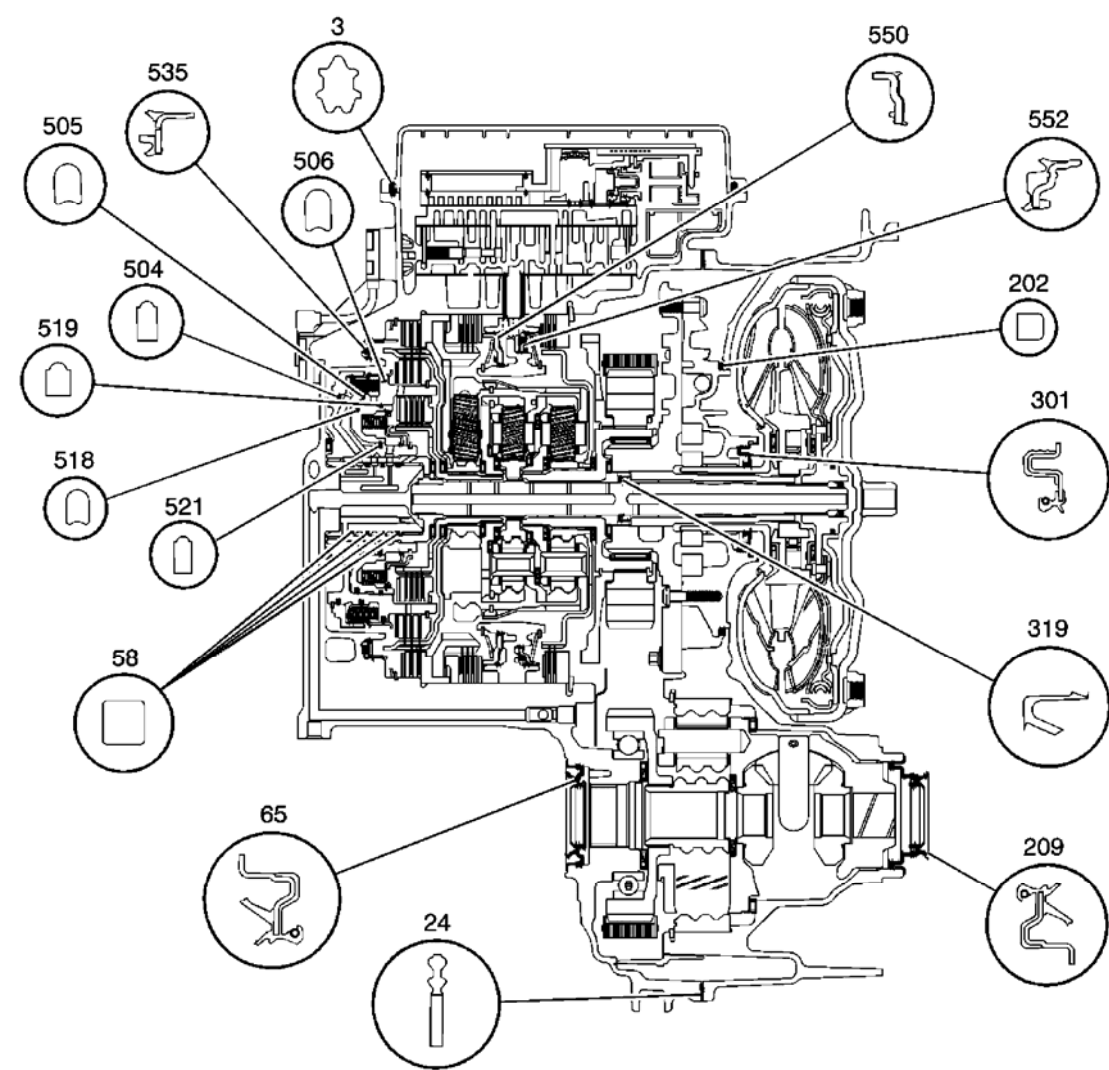


Fig. 17: Seal Locations (1 of 2)
 Courtesy of GENERAL MOTORS CORP.

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
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

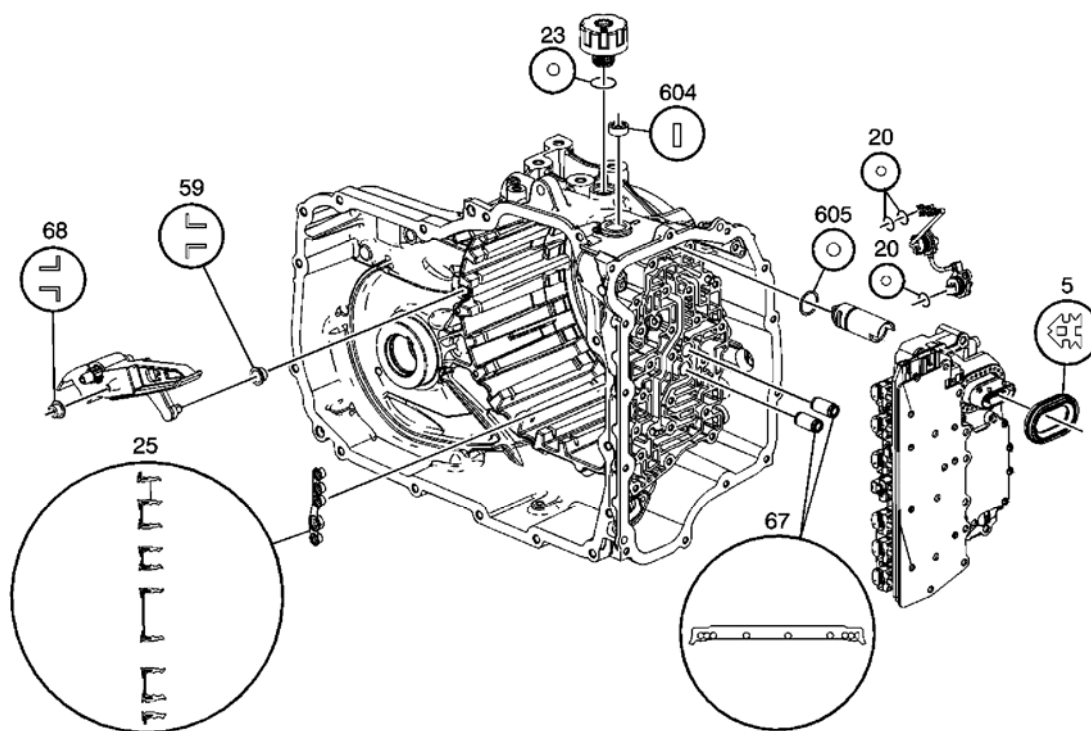


Fig. 18: Seal Locations (2 of 2)
 Courtesy of GENERAL MOTORS CORP.

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

BALL CHECK VALVE LOCATIONS

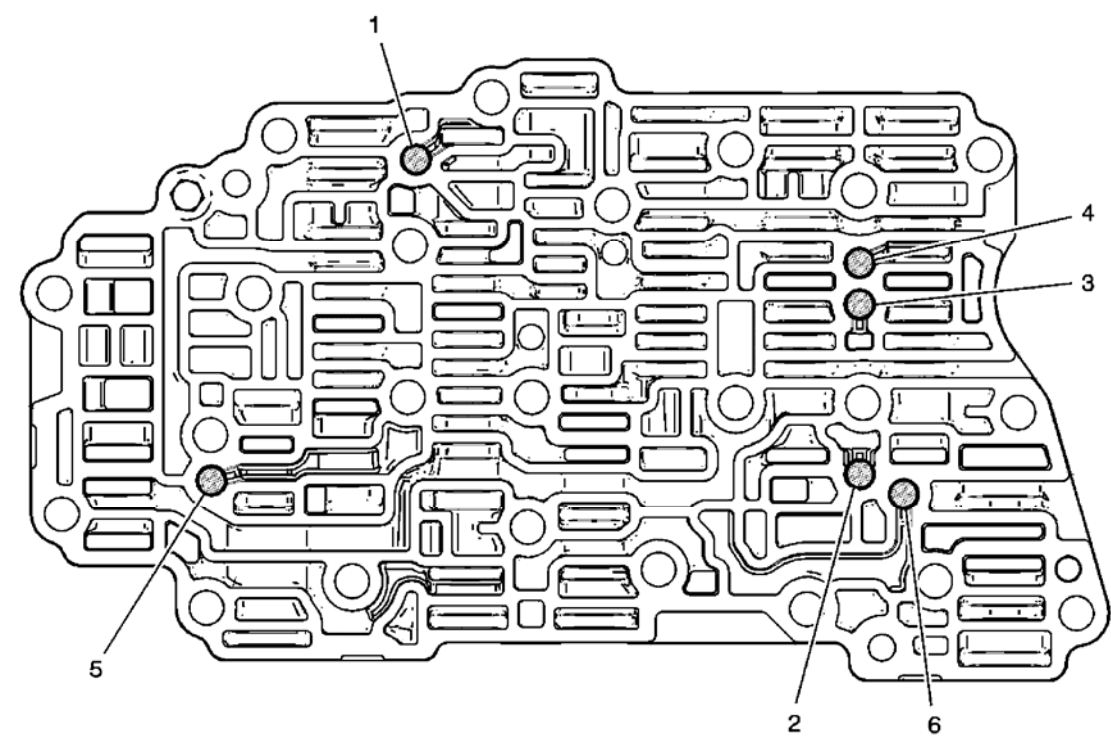


Fig. 19: Identifying Ball Check Valve Locations
 Courtesy of GENERAL MOTORS CORP.

I.D.	Input Oil	Input Oil	Output Oil
1	PS4	456 CL FD	CSV2 Latch
2	35 Rev FD/Drive 1-6	Drive 1-6	35 Rev FD
3	35 Rev FD	-	35 Rev FD
4	Comp FD	35 Rev FD	35 Rev CL FD/Exh BF
5	Act FD LM	-	R1/456 CL FD
6	Act FD LM	-	35 Rev CL

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

DESCRIPTION AND OPERATION

DEFINITIONS AND ABBREVIATIONS

Throttle Positions

Engine Braking

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

Full Throttle Downshift

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

Heavy Throttle

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

Light Throttle

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

Medium Throttle

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

Minimum Throttle

The least amount of throttle opening required for an upshift.

Wide Open Throttle (WOT)

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

Zero Throttle Coastdown

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

Shift Condition Definitions

Bump

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

Chuggle

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

Delayed

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

Double Bump - Double Feel

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

Early

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

End Bump

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

Firm

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

Flare

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

Harsh - Rough

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

Hunting

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

Initial Feel

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

Late

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

Shudder

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

Slipping

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

Soft

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

Surge

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

Tie-Up

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

Noise Conditions

Drive Link Noise

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

Final Drive Noise

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

Planetary Gear Noise

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

Pump Noise

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

Torque Converter Noise

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

Driver Shift Control

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

Transmission Abbreviations

A/C

Air Conditioning

AC

Alternating Current

AT

Automatic Transmission

CC

Climate Control

DC

Direct Current

DIC

Driver Information Center

DLC

Diagnostic Link Connector

DMM

Digital Multimeter

DSC

Driver Shift Control

DTC

Diagnostic Trouble Code

EBTCM

Electronic Brake/Traction Control Module

ECCC

Electronically-Controlled Capacity Clutch

ECT

Engine Coolant Temperature

EMI

Electromagnetic Interference

IAT

Intake Air Temperature

IGN

Ignition

IMS

Internal Mode Switch

ISS

Input Speed Sensor

MAP

Manifold Absolute Pressure

MIL

Malfunction Indicator Lamp

NC

Normally Closed

NO

Normally Open

OBD

On Board Diagnostic

OSS

Output Speed Sensor

PC

Pressure Control

PCM

Powertrain Control Module

PCS

Pressure Control Solenoid

PS

Pressure Switch

PWM

Pulse Width Modulation

RPM

Revolutions Per Minute

SS

Shift Solenoid

STL

Service Transmission Lamp

TAP

Transmission Adaptive Pressure

TCC

Torque Converter Clutch

TFP

Transmission Fluid Pressure

TFT

Transmission Fluid Temperature

TP

Throttle Position

VSS

Vehicle Speed Sensor

WOT

Wide Open Throttle

TRANSMISSION IDENTIFICATION INFORMATION

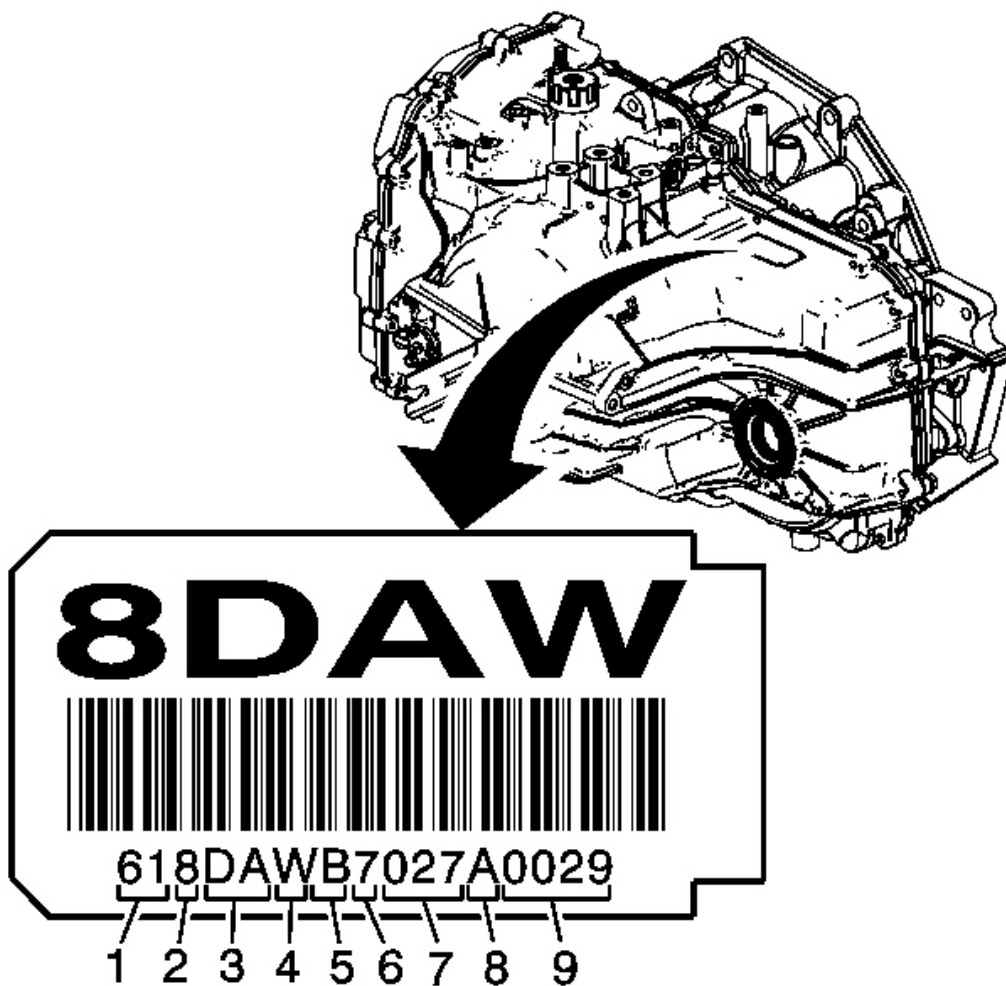


Fig. 1: Identifying Transmission Identification Information Plate
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Code for Automatic Transmission
2	Model Year
3	Model for Transmission
4	Transmission Family
5	Source Code for Plant
6	Calender Year
7	Julian Date
8	Shift/Line (A/B)

Source Code for Plant

- 4 - Ramos Arizpe, Mexico
- H - Ypsilanti, Michigan
- J - Windsor, 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

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

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

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

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

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

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

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

PARK (P)

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

REVERSE (R)

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

NEUTRAL (N)

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

DRIVE (D)

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

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

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

TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION

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

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

- Front differential carrier assembly
- Input Carrier Assembly
- Reaction Carrier Assembly
- Output Carrier Assembly

The electrical components of the 6T40/45 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 6T40/45 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 130°C (266°F) for 5 seconds.

"SERVICE TRANSMISSION"

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

ELECTRONIC COMPONENT DESCRIPTION

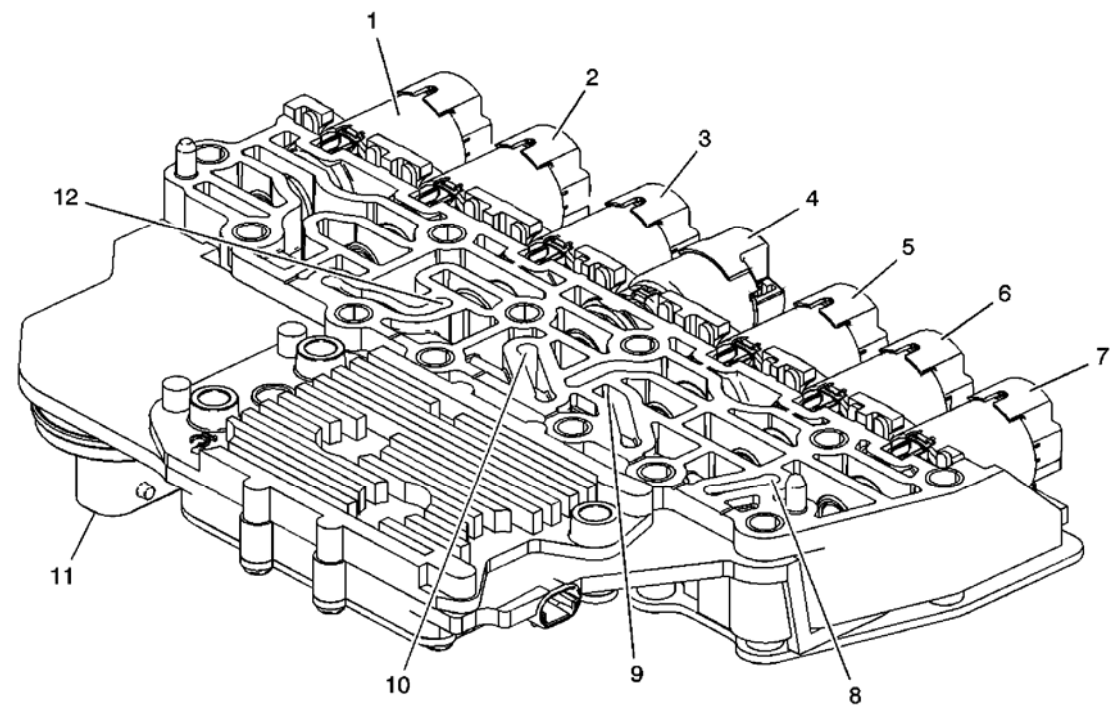


Fig. 2: View Of Control Solenoid (W/Body & TCM) Valve Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Pressure Control Solenoid 3 (R1/456)
2	Pressure Control Solenoid 2 (35R)
3	Torque Converter Clutch (TCC) Pressure Control Solenoid
4	Shift Solenoid 1 (On/Off)
5	Pressure Control Solenoid 5 (1234)
6	Pressure Control Solenoid 4 (26)
7	Line Pressure Control Solenoid
8	Transmission Fluid Pressure (TFP) Switch 3 (26)
9	Transmission Fluid Pressure (TFP) Switch 2 (35R)
10	Transmission Fluid Pressure (TFP) Switch 1 (1234)
11	Pass Through Connector

The control solenoid (w/body and TCM) 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 (w/body and TCM) 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 (w/body and TCM) valve assembly bolts directly to the lower and upper valve body assemblies inside the transmission. The control solenoid (w/body and TCM) valve assembly connects to the engine harness 14-way connector.

Manual Shift Detent Lever with Shaft Position Switch Assembly

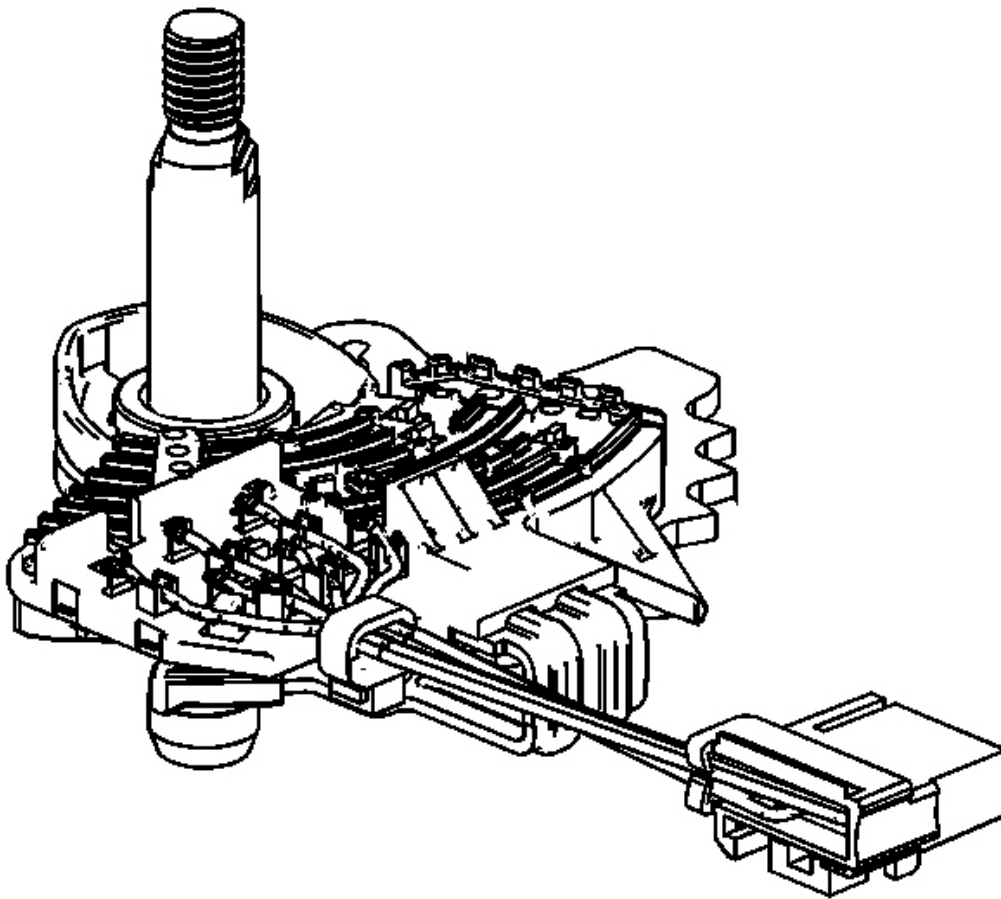


Fig. 3: View Of Manual Shift Detent Lever W/ Shaft Position Switch Assembly
Courtesy of GENERAL MOTORS CORP.

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

Input Speed Sensor (ISS)

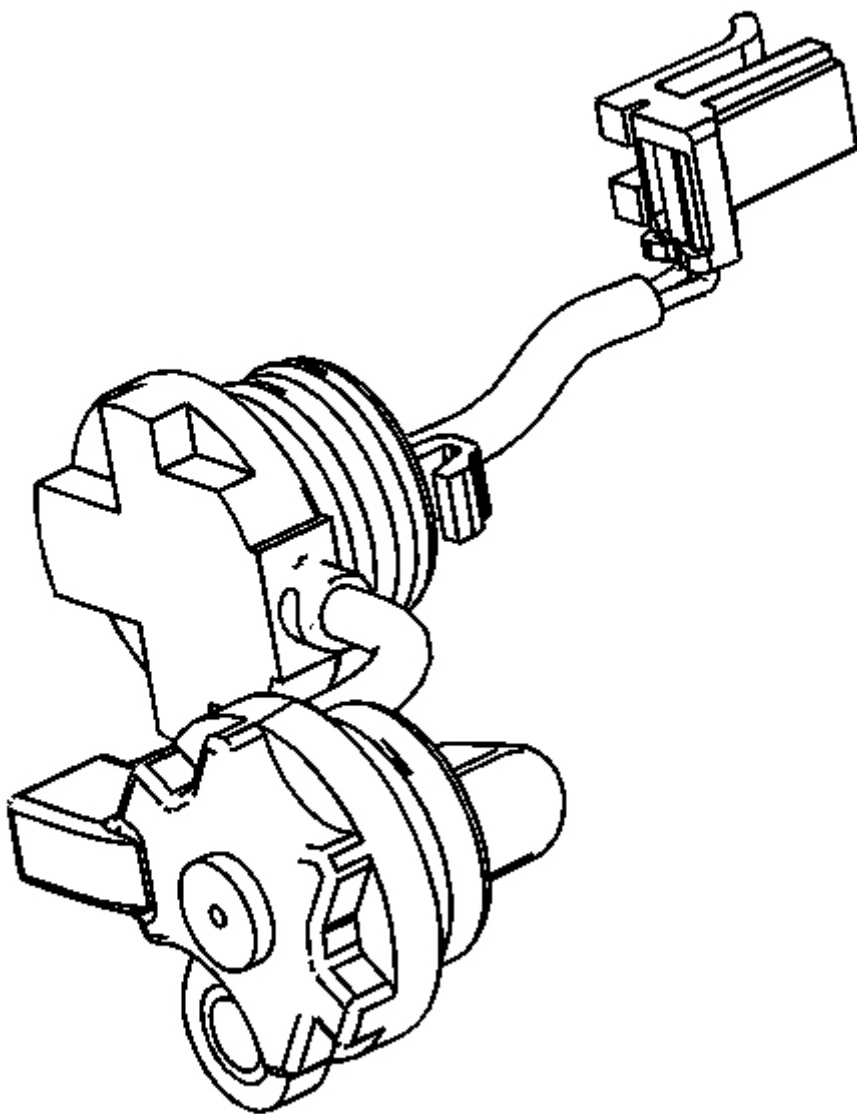


Fig. 4: View Of Input Speed Sensor (ISS)
Courtesy of GENERAL MOTORS CORP.

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

signal is transmitted through the ISS signal circuit to the control solenoid (w/body and TCM) valve assembly. The TCM uses the ISS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

Output Speed Sensor (OSS)

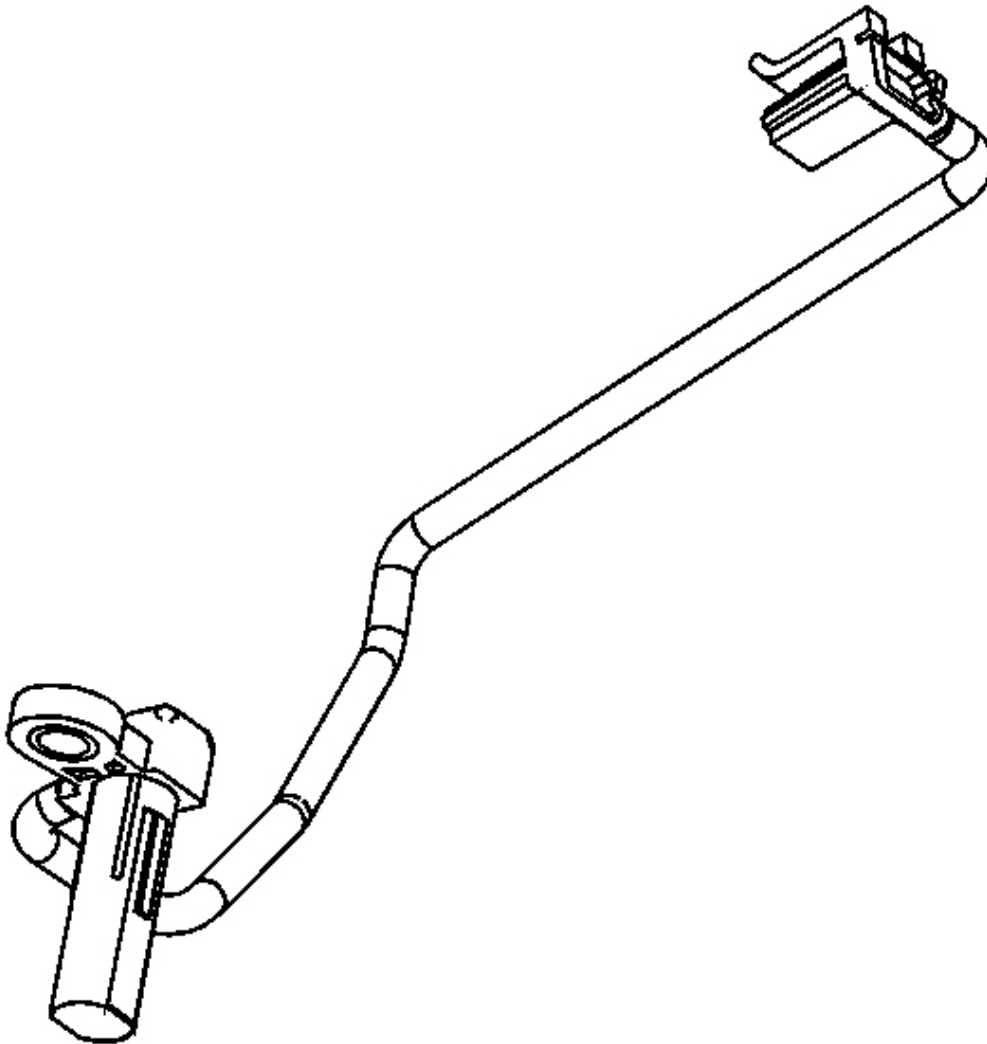


Fig. 5: View Of Output Speed Sensor (OSS)
Courtesy of GENERAL MOTORS CORP.

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.

PARK - ENGINE RUNNING

When the gear selector lever is in the Park (P) position, fluid is drawn into the pump through the transmission fluid filter assembly. 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 #5 and #6 ball check valves.

Compensator Feed Regulator Valve

Line pressure is regulated through the valve into the compensator feed fluid circuit. Compensator feed fluid pressure is routed through orifice #30 to the 3-5-reverse clutch regulator valve, and also fills the 3-5-reverse clutch and 4-5-6 clutch piston dam areas.

3-5-Reverse Clutch Regulator Valve

35 reverse clutch feed/compensator feed fluid is routed through the valve into the 35 reverse clutch fluid circuit. 35 reverse clutch fluid passes through orifice #6 to assist spring pressure in keeping the valve open. 35 reverse clutch fluid is routed to the 3-5-reverse clutch, and through orifice #33 to the #6 ball check valve.

3-5-Reverse Clutch Assembly

35 reverse clutch fluid fills the 3-5-reverse clutch piston apply cavity in preparation for a shift to Reverse range. However, in Park range, 35 reverse clutch pressure is limited to compensator feed pressure of 9 PSI and is not strong enough to apply the clutch.

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.

Low and Reverse Clutch Applies

R1/456 Pressure Control (PC) Solenoid 3

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.

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 R1/456 clutch feed fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is routed to the clutch select valve and through orifice #34 to the #5 ball check valve.

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, and to the TCC regulated apply valve through orifice #14.

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 #38 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 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.

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 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.

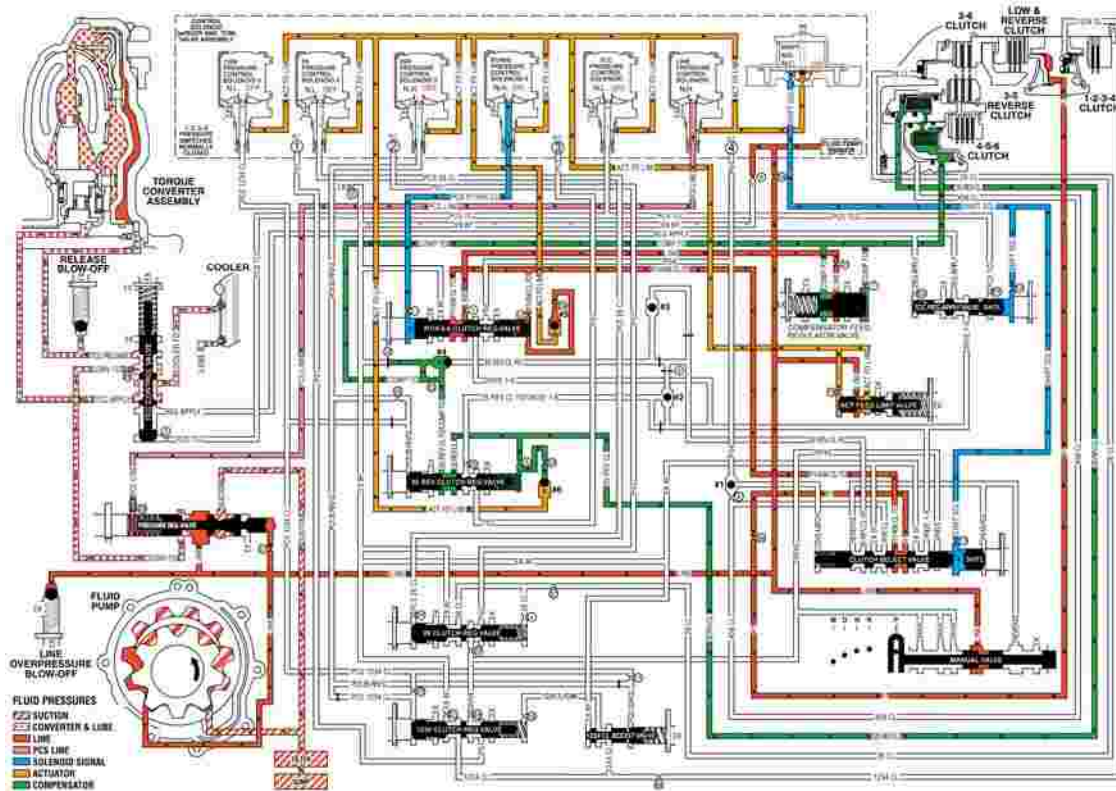


Fig. 6: Park - Engine Running Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

REVERSE

When the gear selector lever is moved to the Reverse (R) position (from the Park position) the normally-high 35R pressure control solenoid 2 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 and routed to the clutch select valve.

Clutch Select Valve

Reverse fluid is routed to a differential area of the default override 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 passes through orifice #5, 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 through orifice #25 to the 3-5-reverse clutch regulator valve.

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 is energized (ON), allowing actuator feed limit fluid to enter the PCS 35 reverse clutch 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 to the 3-5-reverse clutch, and through orifice #33 to the #6 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 compensator feed fluid pressure to apply the 3-5-reverse clutch plates.

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 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.

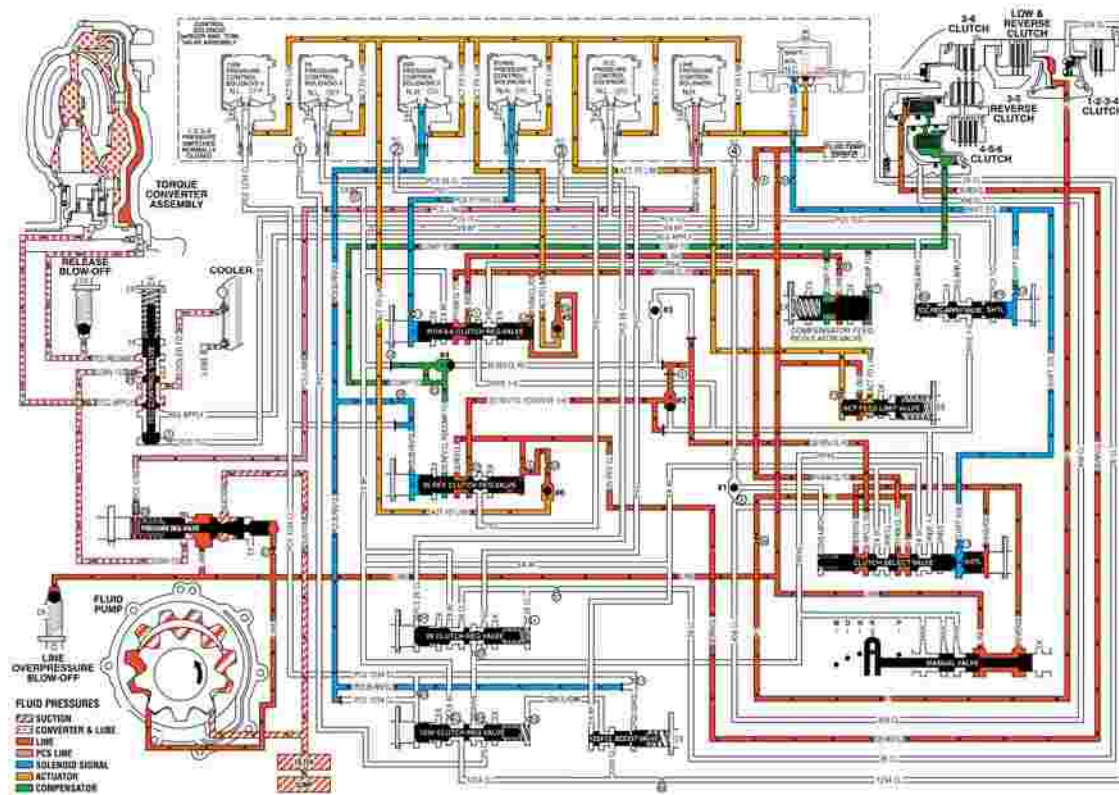


Fig. 7: Reverse Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

NEUTRAL - ENGINE RUNNING

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the normally-high 35R pressure control solenoid 2 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 and the clutch select valve, is opened to an exhaust passage at the manual valve.

35R Pressure Control Solenoid 2

The 35R PC solenoid 2 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 35 reverse clutch fluid pressure to exhaust into the compensator feed 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 compensator feed 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 35 reverse clutch feed/compensator feed circuit.

Clutch Select Valve

When reverse fluid exhausts from the default override 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.

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 1234 clutch boost valve and through orifice #36 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 1234 clutch boost valve against 1234 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 1234 clutch boost valve opens the 1234 clutch feedback circuit to exhaust. This results in the 1234 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 1234 clutch piston against spring force to apply the 1-2-3-4 clutch plates.

2-6 Clutch Regulator Valve

Drive fluid passes through the 2-6 clutch regulator valve into the PS2 circuit.

#2 Pressure Switch

PS2 fluid is routed to the normally-closed #2 pressure switch and opens the switch.

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.

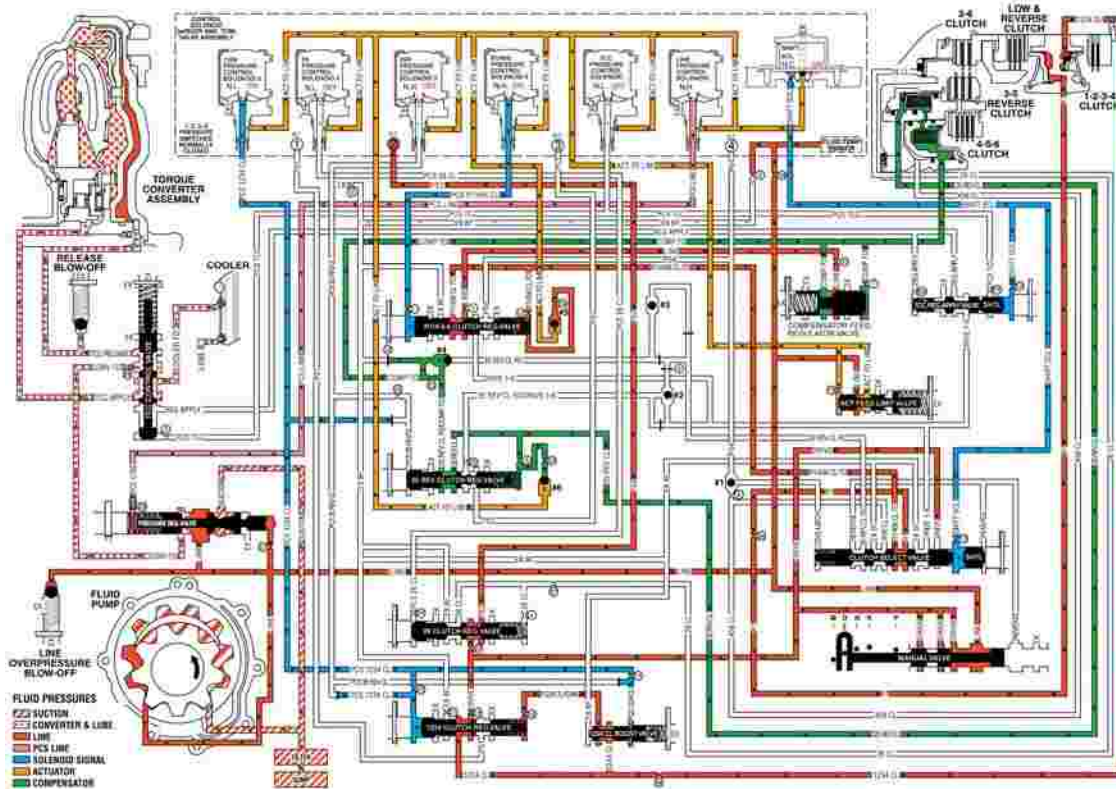


Fig. 9: Drive Range, First Gear Engine Braking Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, FIRST GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, throttle position sensor and other vehicle sensors to determine the precise moment to deenergize or "turn OFF" the shift solenoid, and to command OFF the normally-high R1/456 pressure control solenoid 3.

Low & Reverse Clutch Releases

Shift Solenoid

The shift solenoid is "commanded OFF" allowing shift solenoid fluid pressure to exhaust from the clutch select 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 where it exhausts. 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 R1/456 clutch regulator valve, the 35 reverse clutch regulator valve, and the TCC regulator 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 3

The R1/456 PC solenoid 3 is commanded OFF allowing PCS R1/456 clutch fluid to exhaust from the R1/456 clutch regulator valve.

R1/456 Clutch Regulator Valve

R1/456 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 PS4 fluid circuit. PS4 fluid is then routed to the normally-closed #4 pressure switch and opens the switch. PS4 fluid is also routed to the #1 ball check valve and flows into the CSV2 latch fluid circuit.

#1 Ball Check Valve

PS4 fluid pressure seats the #1 ball check valve against the 456 clutch fluid circuit. PS4 fluid is then directed into the CSV2 latch circuit and routed to the clutch select valve. CSV2 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 through orifice #25 to the 35 Reverse clutch regulator valve.

3-5-Reverse Clutch Regulator Valve

35 reverse clutch feed/drive 1-6 fluid passes through the 3- 5-reverse clutch regulator valve into the PS3 fluid circuit. PS3 fluid is then routed to the normally-closed #3 pressure switch and opens the switch.

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.

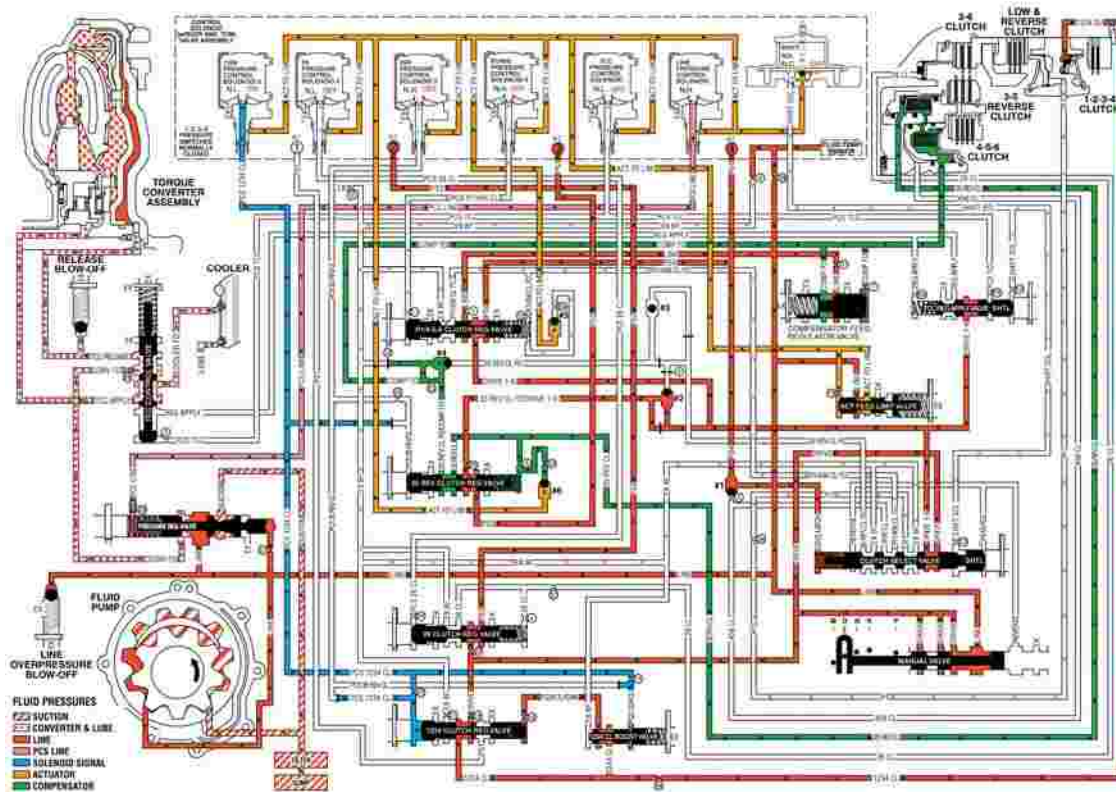


Fig. 10: Drive Range, First Gear Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, SECOND GEAR

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 2-6 pressure control solenoid 4 and shift the transmission into Second gear. The manual valve remains in the Drive (D) position and line pressure continues to feed the drive fluid circuit.

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid 4

The 26 PC solenoid 4 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 #37 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. With the 2-6 clutch regulator valve in this position, PS2 fluid is allowed to exhaust and the normally-closed PS2 switch closes.

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.

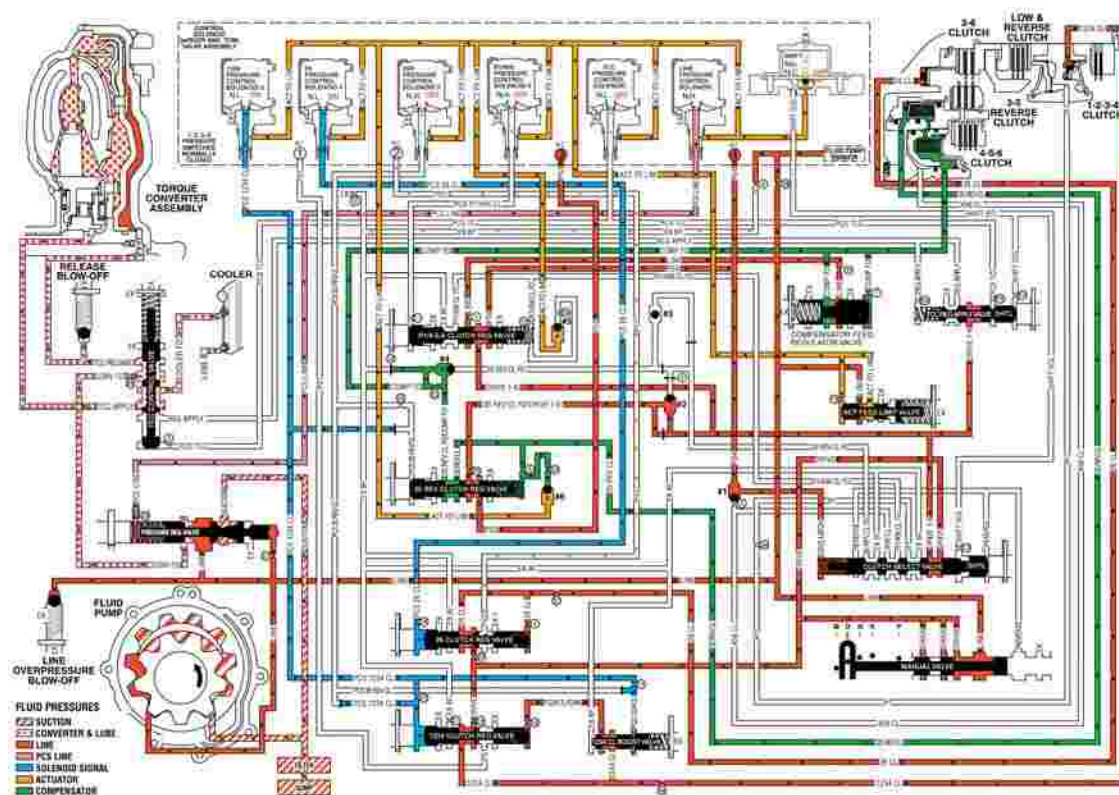


Fig. 11: Drive Range, Second Gear Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, THIRD GEAR

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 4. At the same time the 35R pressure control solenoid 2 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 2

The 35R PC solenoid 2 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 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 #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

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 compensator feed fluid pressure to apply the 3-5-reverse clutch plates.

#6 Ball Check Valve

#6 Ball Check Valve 35 reverse clutch feed fluid unseats the #6 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.

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid 4

The 26 PC solenoid 4 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. With the 2-6 clutch regulator valve in this position, drive fluid passes through the valve into the PS2 circuit. PS2 fluid is routed to the normally-closed #2 pressure switch and opens the switch.

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.

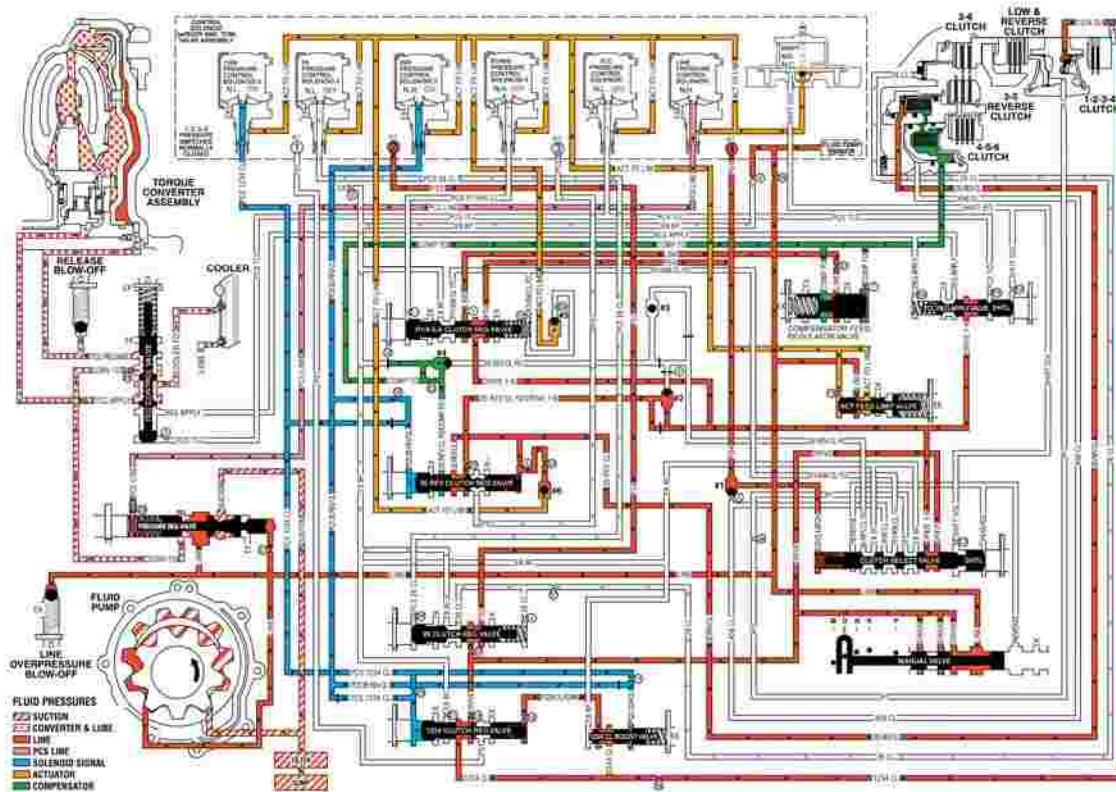


Fig. 12: Drive Range, Third Gear Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE - FOURTH GEAR

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-high 35R pressure control solenoid 2. At the same time, the normally-low R1/456 pressure control solenoid 3 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 3

The R1/456 PC solenoid 3 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 R1/456 clutch regulator 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, through orifice #12 to the spring end of the R1/4-5-6 clutch regulator valve, and through orifice #34 to ball check valve #5. When the R1/4-5-6 clutch regulator valve is in this position, PS4 fluid exhausts through the valve allowing the normally-closed #4 pressure switch to close.

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.

#1 Ball Check Valve

Orificed 456 clutch fluid pressure seats the #1 ball check valve against the exhausting PS4 fluid passage. 456 clutch fluid is then directed into the CSV2 latch circuit to replace the exhausting PS4 pressure and is routed to the clutch select valve. CSV2 latch fluid combines with clutch select valve spring force and holds the valve in this position during all six forward gear ranges.

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 compensator feed pressure to apply the 4- 5-6 clutch plates.

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 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.

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 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 35 reverse clutch fluid pressure to exhaust into the compensator feed circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch. With the 3-5-reverse clutch regulator valve in this position, orificed (#25) 35 reverse clutch feed/drive 1-6 fluid passes through the valve into the PS3 circuit. PS3 fluid is routed to the normally-closed #3 pressure switch and opens the switch.

3-5-Reverse Clutch

3-5-reverse clutch spring force, assisted by compensator feed 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 35 reverse clutch feed/compensator feed circuit.

Torque Converter Clutch (TCC) Applies

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 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 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 #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

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 compensator feed fluid pressure to apply the 3-5-reverse clutch plates.

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 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.

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid 5

The 1234 PC solenoid 5 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. With the 1-2-3-4 clutch regulator valve in this position, drive fluid passes through the valve into the PS1 circuit. PS1 fluid is routed to the #1 pressure switch and opens the normally-closed switch.

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.

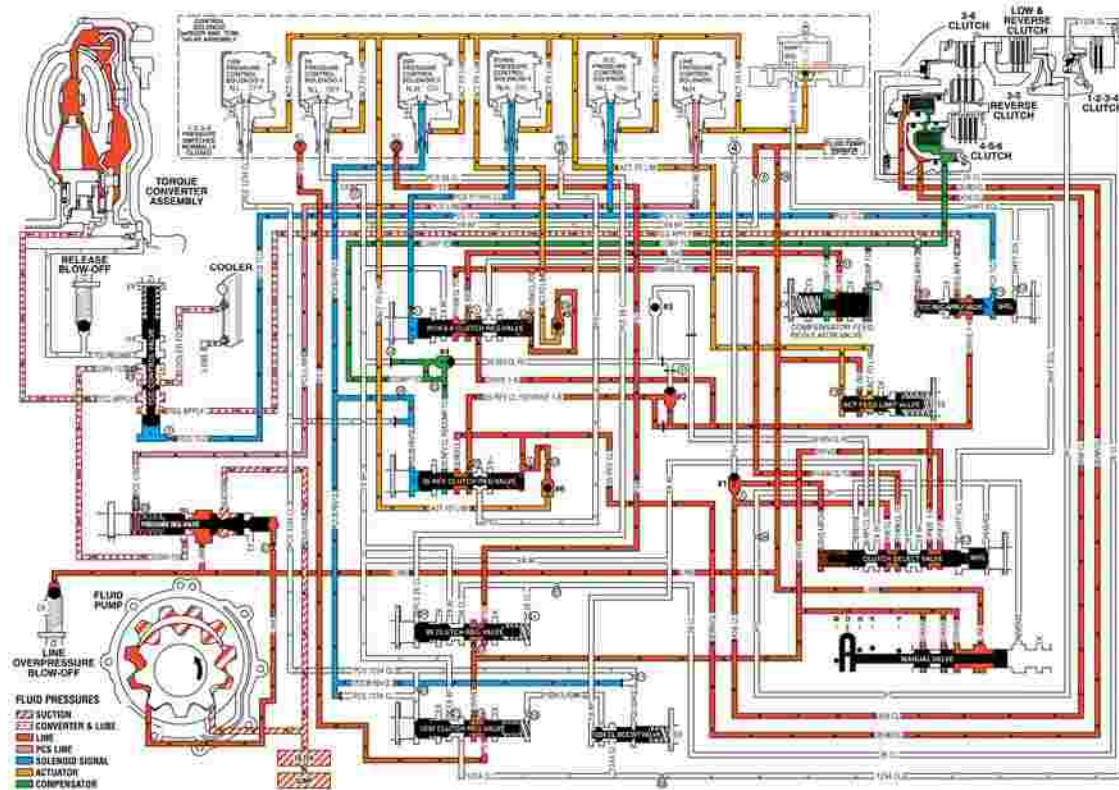


Fig. 14: Drive Range, Fifth Gear Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, FIFTH GEAR DEFAULT

If the transmission encounters an electrical component malfunction, the transmission will default to Fifth 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 - Fifth 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.

3-5 Reverse Clutch Applies or Remains Applied

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 defaults to its normally-high state (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. If the transmission is operating in First, Second, Fourth or Sixth gear when an electrical malfunction occurs, the 3-5-reverse clutch will apply. If the transmission is operating in Third or Fifth gear when the electrical malfunction occurs, the 3-5-reverse clutch remains applied.

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 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 #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

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 compensator feed fluid pressure to apply the 3-5-reverse clutch plates.

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 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.

4-5-6 Clutch Applies or Remains Applied

R1/456 Pressure Control (PC) Solenoid 3

The R1/456 PC solenoid 3 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 R1/456 clutch regulator 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 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, through orifice #12 to the spring end of the R1/4-5-6 clutch regulator valve, and through orifice #34 to ball check valve #5. When the R1/4-5-6 clutch regulator valve is in this position, PS4 fluid exhausts through the valve allowing the normally-closed #4 pressure switch to close.

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.

#1 Ball Check Valve

Orificed 456 clutch fluid pressure seats the #1 ball check valve against the exhausting PS4 fluid passage. 456 clutch fluid is then directed into the CSV2 latch circuit to replace the exhausting PS4 pressure and is routed to the clutch select valve. CSV2 latch fluid combines with clutch select valve spring force and holds the valve in this position during all six forward gear ranges.

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 compensator feed pressure to apply the 4-5-6 clutch plates.

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 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.

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid 5

If the transmission is in First, Second, Third or Fourth gear when an electrical condition commands a protection mode, the 1234 PC solenoid 5 defaults to its normally-low state (OFF), allowing PCS 1234 clutch fluid pressure to exhaust and the 1-2-3-4 clutch to release.

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid 4

If the transmission is in Second or Sixth gear when an electrical condition commands a protection mode, the 26 PC solenoid 4 defaults to its normally-low state (OFF), allowing PCS 26 clutch fluid pressure to exhaust and the 2-6 clutch to 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.

Drive Range - Fourth Gear Default (Some Models)

The transmission default gear may be Fourth, rather than Fifth gear, depending on engine size and effective final drive ratio. 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 has been corrected. Reverse (R) range can also still be selected. This default action enables the vehicle to be safely driven to a service center.

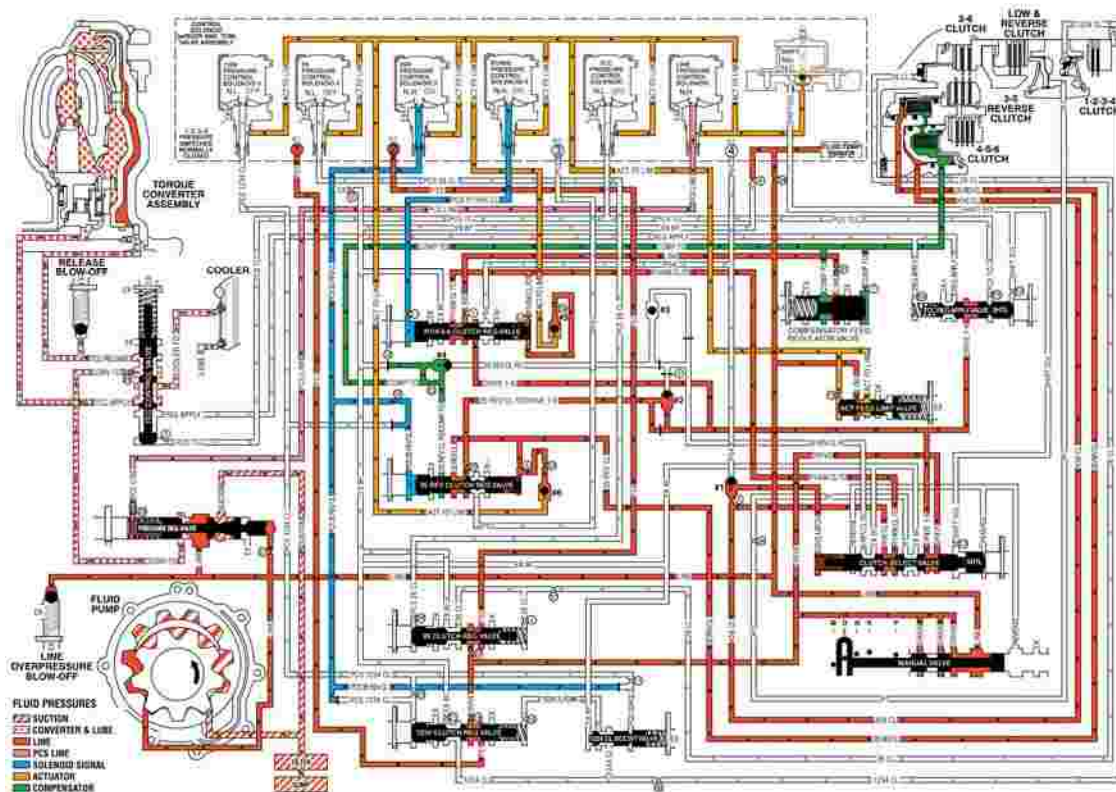


Fig. 15: Drive Range, Fifth Gear Default Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, SIXTH GEAR

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 4. At the same time, the normally-high 35R pressure control solenoid 2 is commanded OFF and the transmission shifts into Sixth gear.

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid 4

The 26 PC solenoid 4 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 #37 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. With the 2-6 clutch regulator valve in this position, PS2 fluid is allowed to exhaust and the normally-closed PS2 switch closes.

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.

3-5 Reverse Clutch Releases

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 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 35 reverse clutch fluid pressure to exhaust into the compensator feed circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch. With the 3-5-reverse clutch regulator valve in this position, orificed (#25) 35 reverse clutch feed/drive 1-6 fluid passes through the valve into the PS3 circuit. PS3 fluid is routed to the normally-closed #3 pressure switch and opens the switch.

3-5-Reverse Clutch

3-5-reverse clutch spring force, assisted by compensator feed 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 35 reverse clutch feed/compensator feed circuit.

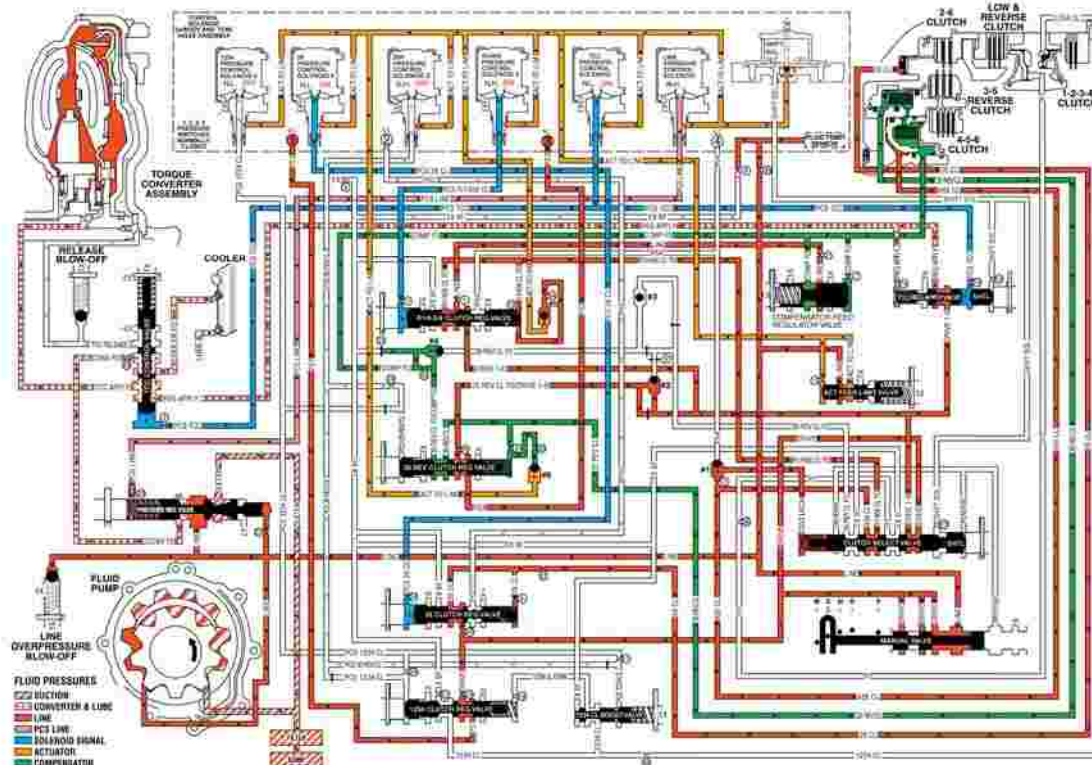


Fig. 16: Drive Range, Sixth Gear Fluid Flow Diagram
Courtesy of GENERAL MOTORS CORP.

FLUID PASSAGES

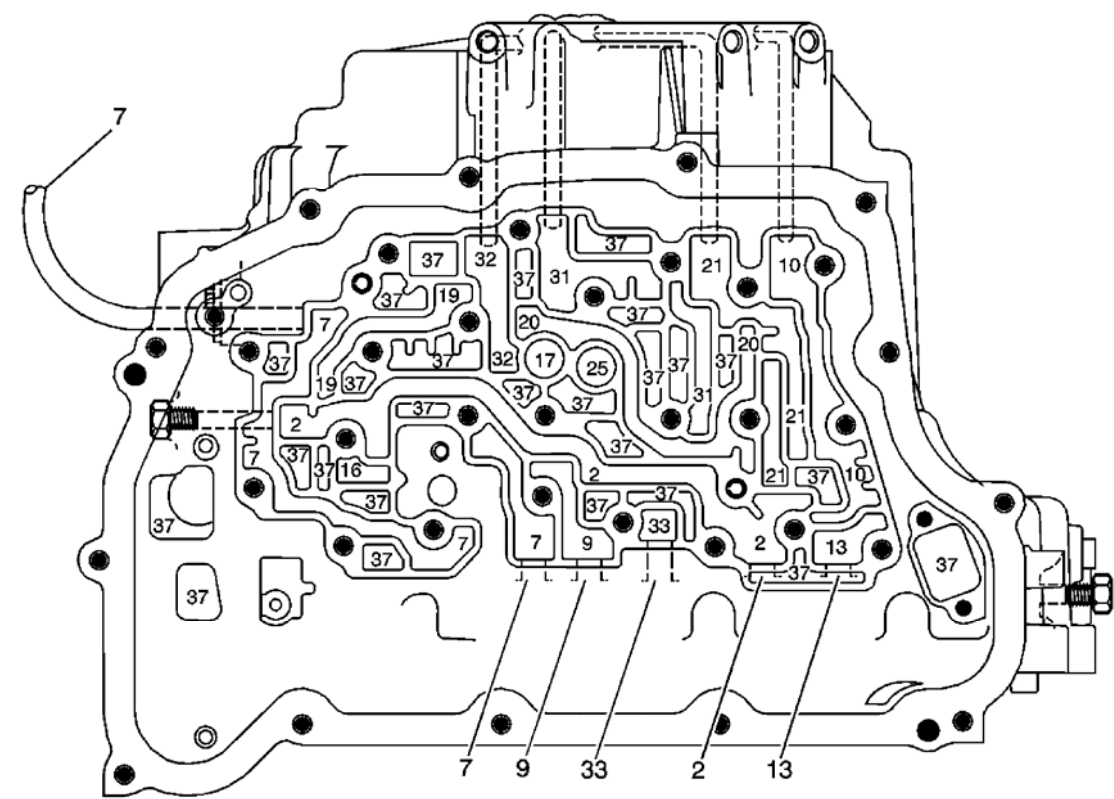


Fig. 17: Case - Control Valve Body Side (Left)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
7	Cooler Feed
9	Regulated Apply
10	Compensator Feed
13	PCS Line
16	R1/456 Clutch Feed
17	R1
19	Reverse
20	35 Reverse Clutch Feed
21	35 Reverse Clutch
25	1234 Clutch
31	26 Clutch

32	456 Clutch
33	PCS TCC
37	Void

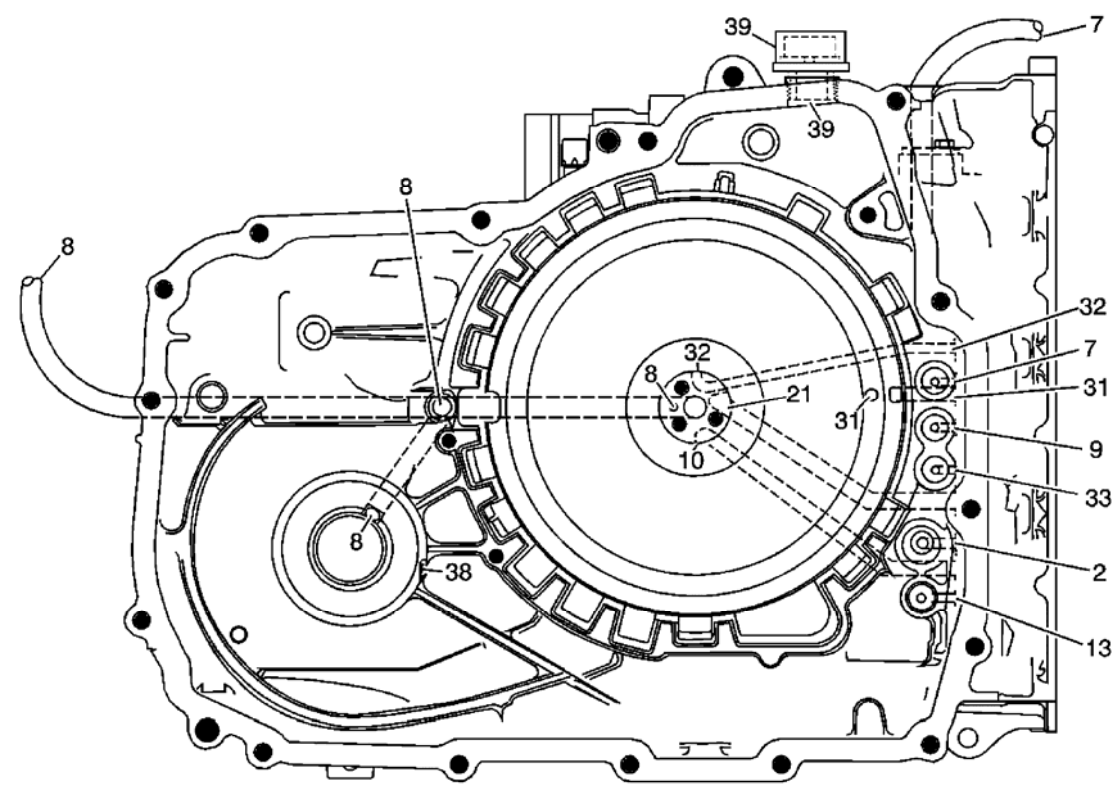


Fig. 18: Case - Pump Side (Back)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
7	Cooler Feed
8	Lube
9	Regulated Apply
10	Compensator Feed
13	PCS Line
21	35 Reverse Clutch
31	26 Clutch
32	456 Clutch
33	PCS TCC
38	Seal Drainback
39	Vent

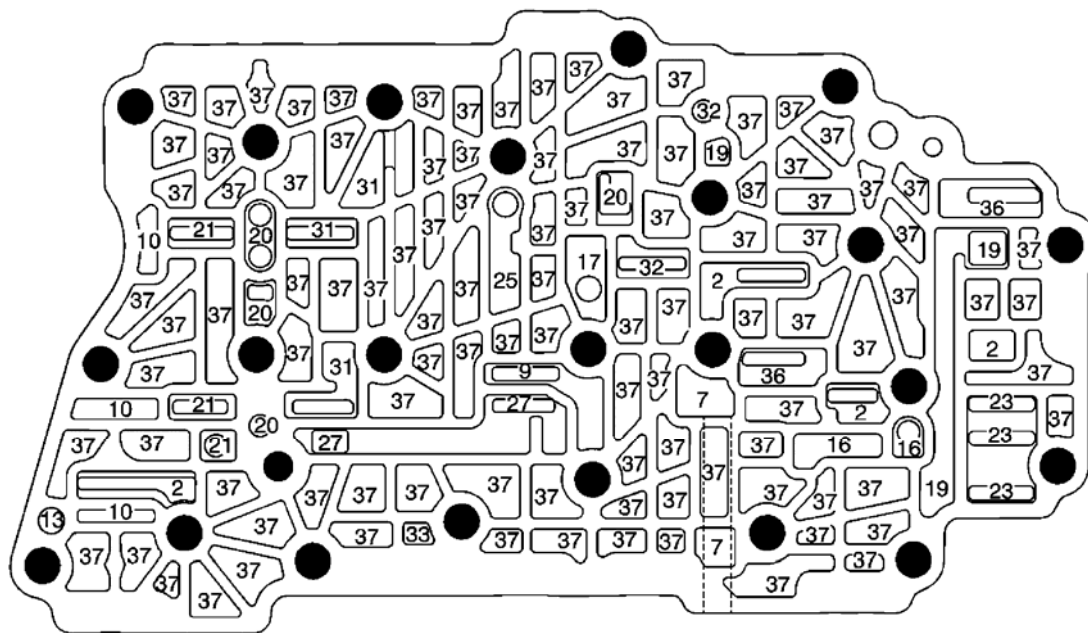


Fig. 19: Control Valve Body - Case Side (Left)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
7	Cooler Feed
9	Regulated Apply
10	Compensator Feed
13	PCS Line
16	R1/456 Clutch Feed
17	R1
19	Reverse
20	35 Reverse Clutch Feed
21	35 Reverse Clutch
23	Drive
25	1234 Clutch
27	Drive 1-6
31	26 Clutch
32	456 Clutch
33	PCS TCC
36	Exhaust
37	Void

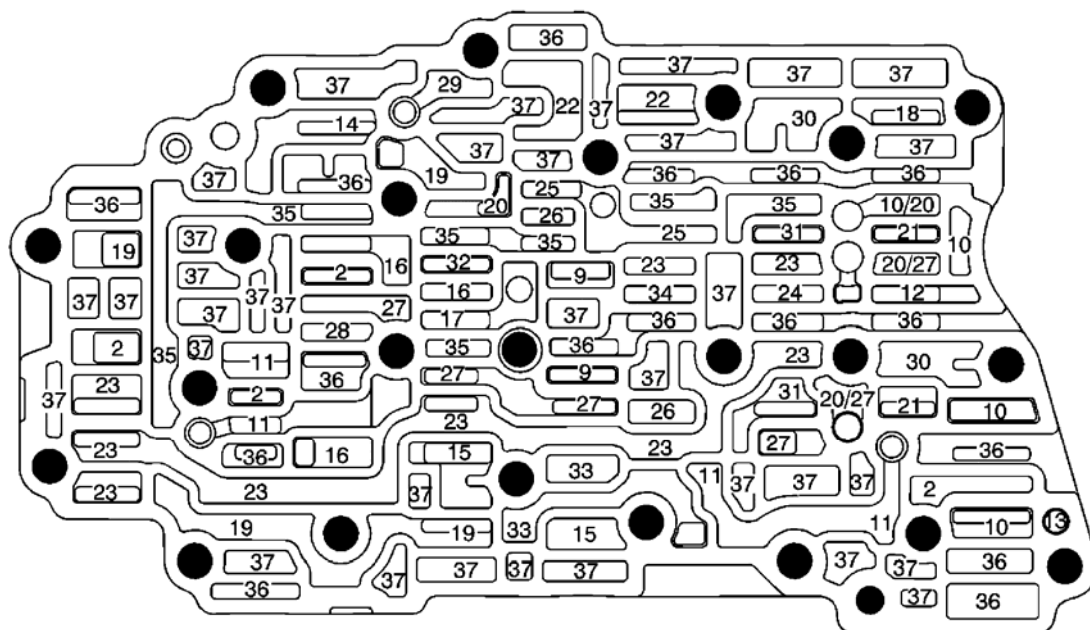


Fig. 20: Control Valve Body - Channel Plate Side (Right - No Valves)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
9	Regulated Apply
10	Compensator Feed
11	Actuator Feed Limit
12	PS3
13	PCS Line
14	PCS R1/456 Clutch
15	Shift Solenoid
16	R1/456 Clutch Feed
17	R1
18	PCS 35 Reverse Clutch
19	Reverse
20	35 Reverse Clutch Feed
21	35 Reverse Clutch
22	PCS 1234 Clutch
23	Drive
24	PS2
25	1234 Clutch
26	1234 Clutch Feedback
27	Drive 1-6

28	PS4
29	CSV2 Latch
30	PCS 26 Clutch
31	26 Clutch
32	456 Clutch
33	PCS TCC
34	PS1
35	Exhaust Backfill
36	Exhaust
37	Void

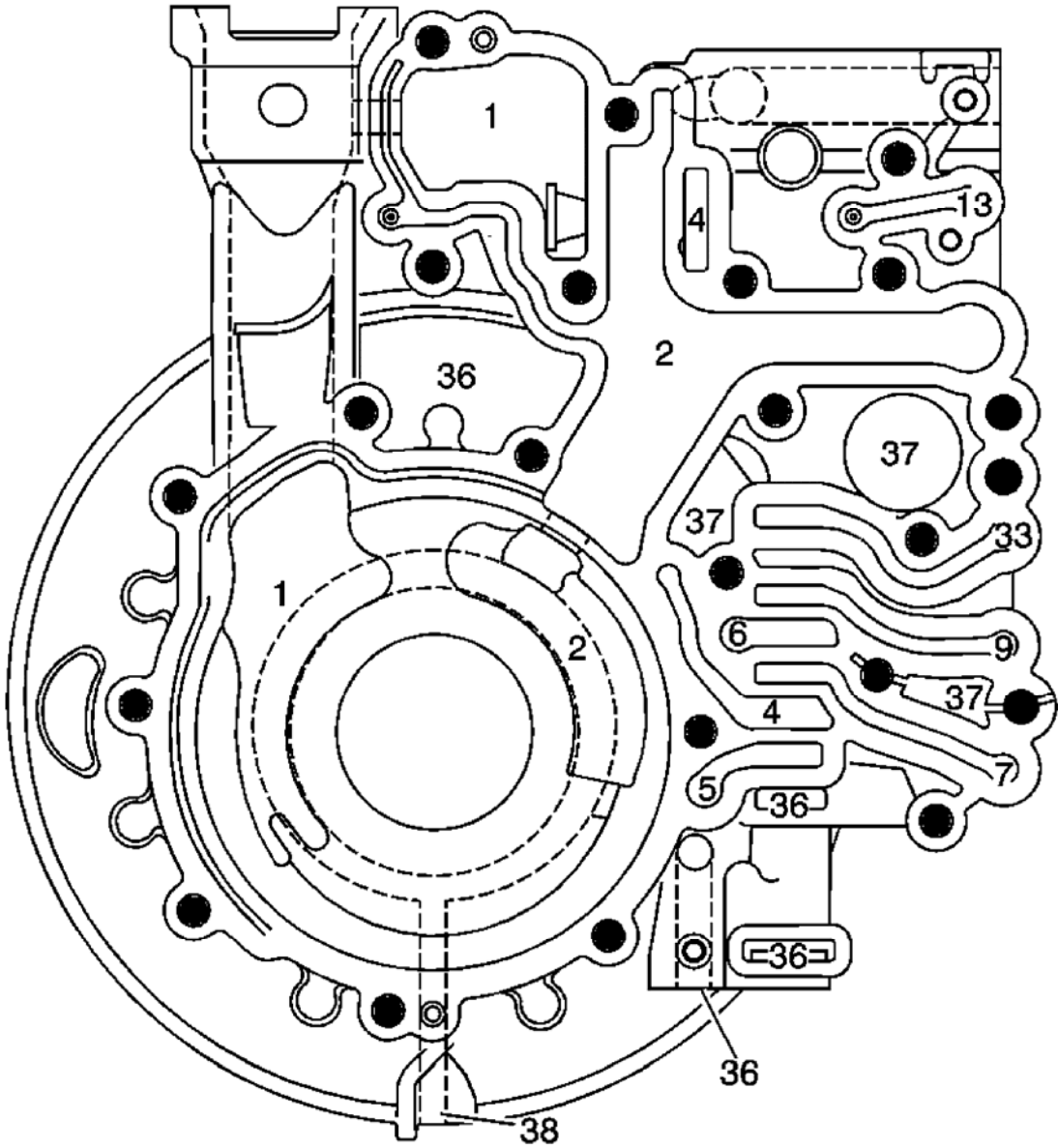


Fig. 21: Pump Body - Pump Cover Side (Front)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Suction
2	Line
4	Converter Feed
5	TCC Released
6	TCC Apply
7	Cooler Feed
9	Regulated Apply
13	PCS Line
33	PCS TCC
36	Exhaust
37	Void
38	Seal Drainback

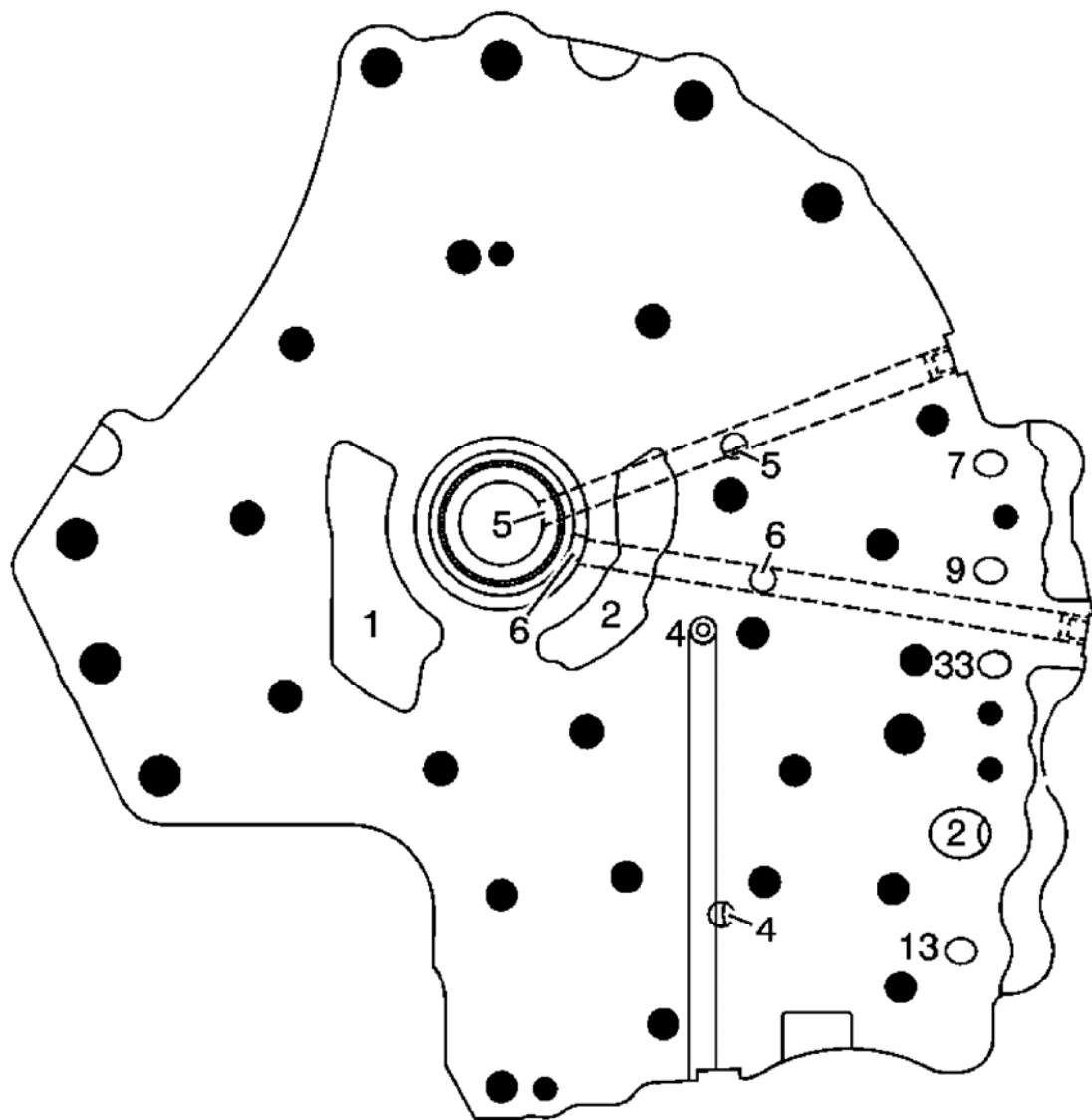


Fig. 22: Pump Cover - Pump Body Side (Back)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Suction
2	Line
4	Converter Feed
5	TCC Released
6	TCC Apply
7	Cooler Feed
9	Regulated Apply
13	PCS Line

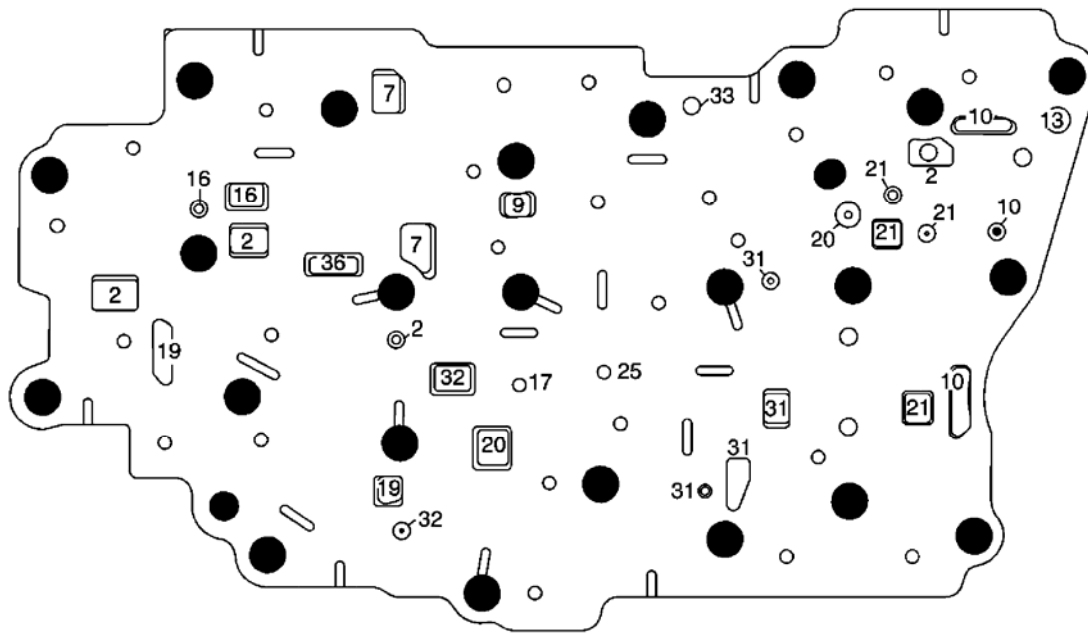


Fig. 23: Spacer Plate (12) - Case Side (Left)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
7	Cooler Feed
9	Regulated Apply
10	Compensator Feed
13	PCS Line
16	R1/456 Clutch Feed
17	R1
19	Reverse
20	35 Reverse Clutch Feed
21	35 Reverse Clutch
25	1234 Clutch
31	26 Clutch
32	456 Clutch
33	PCS TCC
36	Exhaust

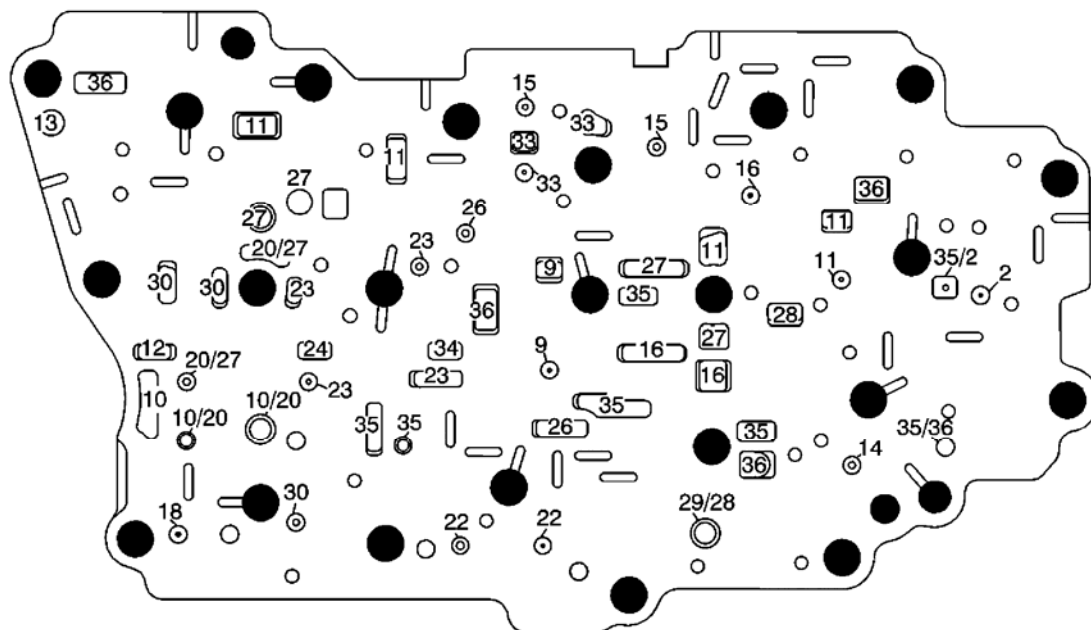


Fig. 24: Spacer Plate (402) - Channel Plate Side (Right)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
9	Regulated Apply
10	Compensator Feed
11	Actuator Feed Limit
12	PS3
13	PCS Line
14	PCS R1/456 Clutch
15	Shift Solenoid
16	R1/456 Clutch Feed
18	PCS 35 Reverse Clutch
20	35 Reverse Clutch Feed
22	PCS 1234 Clutch
23	Drive
24	PS2
26	1234 Clutch Feedback
27	Drive 1-6
28	PS4
29	CSV2 Latch
30	PCS 26 Clutch
33	PCS TCC

34	PS1
35	Exhaust Backfill
36	Exhaust

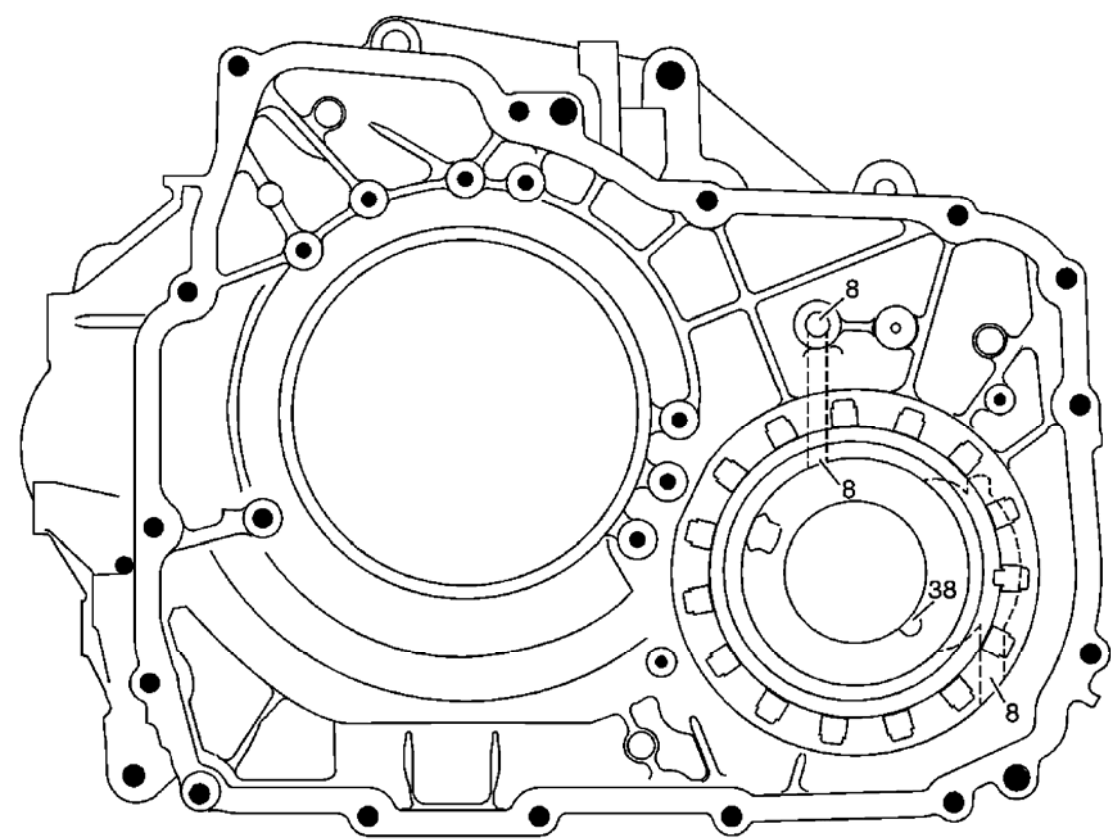


Fig. 25: Torque Converter Clutch Housing - Pump Side (Front)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
8	Lube
38	Seal Drainback

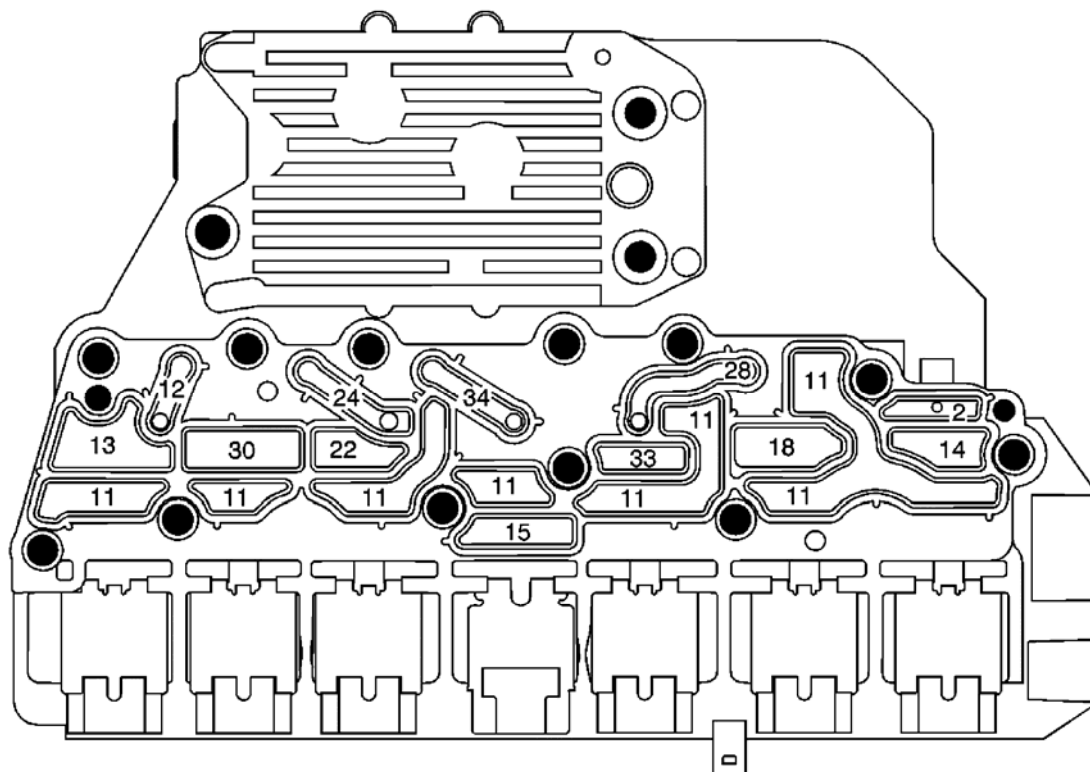


Fig. 26: Control Solenoid Valve Assembly with Filter Plate - Channel Plate Side (Front)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
11	Actuator Feed Limit
12	PS3
13	PCS Line
14	PCS R1/456 Clutch
15	Shift Solenoid
18	PCS 35 Reverse Clutch
22	PCS 1234 Clutch
24	PS2
28	PS4
30	PCS 26 Clutch
33	PCS TCC
34	PS1

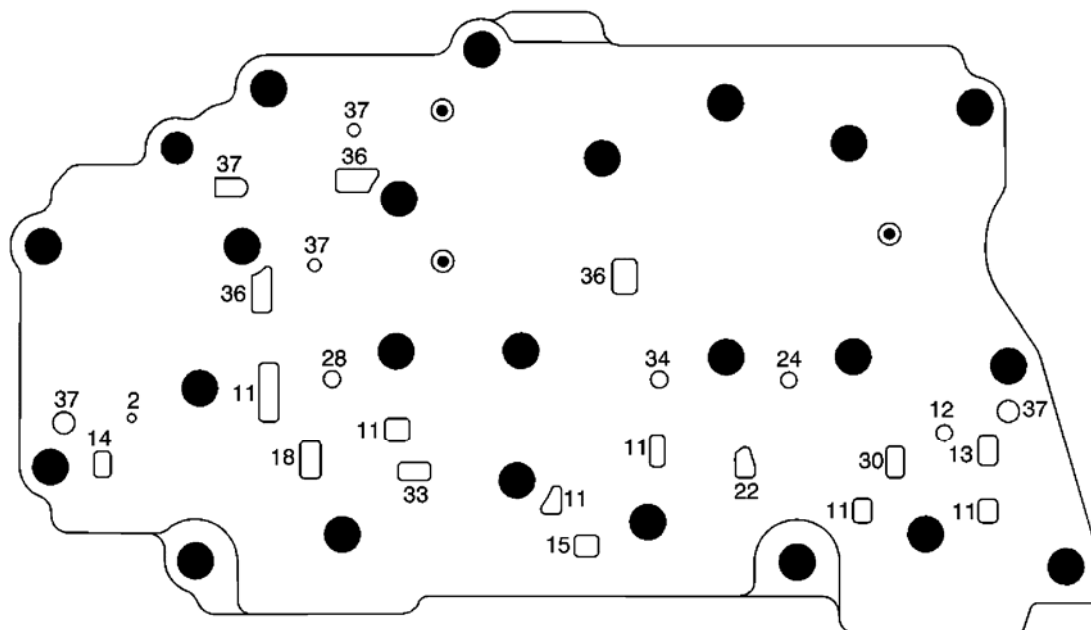


Fig. 27: Channel Plate - Control Solenoid Valve Assembly Side (Right)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
11	Actuator Feed Limit
12	PS3
13	PCS Line
14	PCS R1/456 Clutch
15	Shift Solenoid
18	PCS 35 Reverse Clutch
22	PCS 1234 Clutch
24	PS2
28	PS4
30	PCS 26 Clutch
33	PCS TCC
34	PS1
36	Exhaust
37	Void

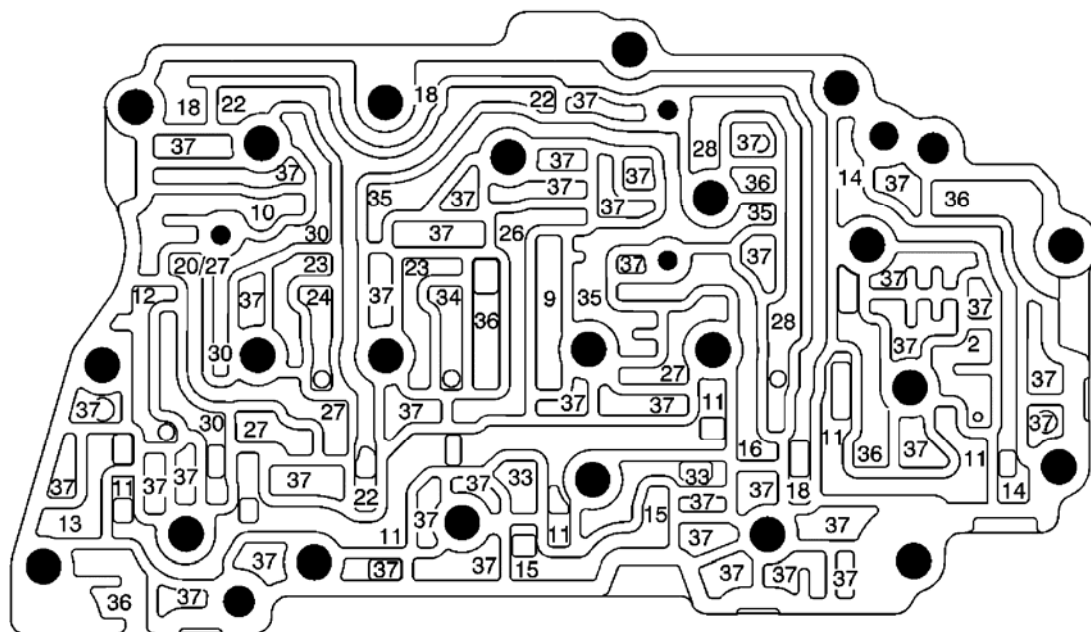


Fig. 28: Channel Plate - Control Valve Body Side (Left)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
9	Regulated Apply
10	Compensator Feed
11	Actuator Feed Limit
12	PS3
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid
16	R1/456 Clutch Feed
18	PCS 35 Reverse Clutch
20	35 Reverse Clutch Feed
22	PCS 1234 Clutch
23	Drive
24	PS2
26	1234 Clutch Feedback
27	Drive 1-6
28	PS4
30	PCS 26 Clutch
33	PCS TCC
34	PS1

35	Exhaust Backfill
36	Exhaust
37	Void

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC P0218</u>	P0218: Transmission Fluid Overtemperature
<u>DTC P0562 or P0563</u>	P0562: System Voltage Low Voltage P0563: System Voltage High Voltage
<u>DTC P0601-P0604 or P062F</u>	Internal Fault Detection Of Control Solenoid Valve Assembly
<u>DTC P0634</u>	P0634: Control Module Overtemperature
<u>DTC P0658 or P0659</u>	P0658: Actuator High Control Circuit Group 1 Low Voltage P0659: Actuator High Control Circuit Group 1 High Voltage
<u>DTC P0667, P0668, or P0669</u>	P0667: Control Module Temperature Sensor Performance P0668: Control Module Temperature Sensor Circuit Low Voltage P0669: Control Module Temperature Sensor Circuit High Voltage
<u>DTC P06AC, P06AD, or P06AE</u>	P06AC: Transmission Control Module Power Up Temperature Sensor Performance P06AD: Transmission Control Module Power Up Temperature Sensor Circuit Low Voltage P06AE: Transmission Control Module Power Up Temperature Sensor Circuit High Voltage
<u>DTC P0711, P0712, or P0713</u>	P0711: Transmission Fluid Temperature Sensor Performance P0712: Transmission Fluid Temperature Sensor Circuit Low Voltage P0713: Transmission Fluid Temperature Sensor Circuit High Voltage
<u>DTC P0716 or P0717</u>	P0716: Input Speed Sensor Performance P0717: Input Speed Sensor Circuit No Signal
<u>DTC P071A</u>	P071A: Transmission Tow Mode Switch Circuit
<u>DTC P071D</u>	P071D: Transmission Sport Mode Switch circuit
<u>DTC P0722 or P0723</u>	P0722: Output Speed Sensor Circuit No Signal P0723: Output Speed Sensor Intermittent
<u>DTC P0741 or P0742</u>	P0741: Torque Converter Clutch (TCC) - System Stuck Off P0742: Torque Converter Clutch (TCC) - System Stuck On
<u>DTC P0751 or P0752</u>	P0751: Shift Solenoid 1 Valve Performance - Stuck Off P0752: Shift Solenoid 1 Valve Performance - Stuck On
<u>DTC P0776 or P0777</u>	P0776: Clutch Pressure Control Solenoid 2 - Stuck Off P0777: Clutch Pressure Control Solenoid 2 - Stuck On
<u>DTC P0796 or P0797</u>	P0796: Clutch Pressure Control Solenoid 3 - Stuck Off P0797: Clutch Pressure Control Solenoid 3 - Stuck On
<u>DTC P0815, P0816, or P0826</u>	P0815: Upshift Switch Circuit P0816: Downshift Switch Circuit P0826: Up and Down Shift Switch Circuit

<u>DTC P0842 or P0843</u>	P0842: Transmission Fluid Pressure Switch 1 Circuit Low Voltage P0843: Transmission Fluid Pressure Switch 1 Circuit High Voltage
<u>DTC P0850-P0852</u>	P0850: Park/Neutral Position Switch Circuit P0851: Park/Neutral Position Switch Circuit Low Voltage P0852: Park/Neutral Position Switch Circuit High Voltage
<u>DTC P0872 or P0873</u>	P0872: Transmission Fluid Pressure Switch 3 Circuit Low Voltage P0873: Transmission Fluid Pressure Switch 3 Circuit High Voltage
<u>DTC P0877 or P0878</u>	P0877: Transmission Fluid Pressure Switch 4 Circuit Low Voltage P0878: Transmission Fluid Pressure Switch 4 Circuit High Voltage
<u>DTC P0961-P0963</u>	P0961: Line Pressure Control Solenoid Valve System Performance P0962: Line Pressure Control Solenoid Valve Control Circuit Low Voltage P0963: Line Pressure Control Solenoid Valve Control Circuit High Voltage
<u>DTC P0965-P0967</u>	P0965: Pressure Control Solenoid Valve 2 System Performance P0966: Pressure Control Solenoid Valve 2 Control Circuit Low Voltage P0967: Pressure Control Solenoid Valve 2 Control Circuit High Voltage
<u>DTC P0969-P0971</u>	P0969: Pressure Control Solenoid Valve 3 Performance P0970: Pressure Control Solenoid Valve 3 Control Circuit Low Voltage P0971: Pressure Control Solenoid Valve 3 Control Circuit High Voltage
<u>DTC P0973 or P0974</u>	P0973: Shift Solenoid Valve 1 Control Circuit Low Voltage P0974: Shift Solenoid Valve 1 Control Circuit High Voltage
<u>DTC P0989 or P0990</u>	P0989: Transmission Fluid Pressure Switch 5 Circuit Low Voltage P0990: Transmission Fluid Pressure Switch 5 Circuit High Voltage
<u>DTC P150C</u>	P150C: Transmission Control Module Engine Speed Request Signal Message Counter Incorrect
<u>DTC P1751</u>	P1751: Shift Valve 1 Performance
<u>DTC P1761</u>	P1761: Up and Down Shift Switch Signal Message Counter Incorrect
<u>DTC P1763</u>	P1763: Trans Mode Switch C circuit
<u>DTC P182E or P1915</u>	P182E: Internal Mode Switch - Indicates Invalid Range P1915: Internal Mode Switch Does Not Indicate Park/Neutral During Start
<u>DTC P1876</u>	P1876: Up and Down Shift Enable Switch Circuit Low Voltage
<u>DTC P2534</u>	P2534: Ignition On/Start Switch Circuit Low Voltage
<u>DTC P2714 or P2715</u>	P2714: Clutch Pressure Control Solenoid 4 - Stuck Off P2715: Clutch Pressure Control Solenoid 4 - Stuck On
<u>DTC P2719-P2721</u>	P2719: Clutch Pressure Control Solenoid Valve 4 System Performance P2720: Clutch Pressure Control Solenoid Valve 4 Control Circuit Low Voltage P2721: Clutch Pressure Control Solenoid Valve 4 Control Circuit High Voltage
<u>DTC P2723 or P2724</u>	P2723: Pressure Control Solenoid Valve 5 - Stuck Off P2724: Pressure Control Solenoid Valve 5 - Stuck On
<u>DTC P2728-P2730</u>	P2728: Pressure Control Solenoid Valve 5 System Performance P2729: Pressure Control Solenoid Valve 5 Control Circuit Low Voltage

	P2730: Pressure Control Solenoid Valve 5 Control Circuit High Voltage
<u>DTC P2762, P2763, or P2764</u>	P2762: Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Performance
	P2763: Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit High Voltage
	P2764: Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit Low Voltage

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

DTC P0218

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P0218

Transmission Fluid Overtemperature

CIRCUIT/SYSTEM DESCRIPTION

The primary source of heat in the transmission is the torque converter. Hot oil exits the torque converter through the torque converter clutch (TCC) control valve and flows to the transmission cooler supply line. The supply line connects to the cooler, which is in the radiator. From the cooler, the oil returns through the oil cooler return line and enters the lubrication circuits. After lubricating the internal components, the oil returns to the oil pan. The transmission fluid temperature (TFT) sensor is located in the control solenoid valve assembly.

CONDITIONS FOR RUNNING THE DTC

The TFT is -39 to +149°C (-38 to +300°F) for 5 seconds.

CONDITIONS FOR SETTING THE DTC

The transmission control module (TCM) temperature is 140°C (284°F) or greater for 1 minute.

ACTION TAKEN WHEN THE DTC SETS

DTC P0218 is a Type C DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P0218 is a Type C DTC.

DIAGNOSTIC AIDS

The driver information center (DIC), if equipped, will display 'TRANSMISSION HOT- Idle Engine' when the TFT reaches 132°C (270°F). The TFT on the scan tool should rise steadily to a normal operating temperature,

and then stabilize. Ask about the customer's driving habits, trailer towing, etc. Trailer towing should occur in D4. Ensure the engine cooling system is functioning normally.

REFERENCE INFORMATION

Schematic Reference

- Park - Engine Running
- Fluid Passages

Description and Operation

- Transmission General Description
- Transmission Component and System Description

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Review the Failure Records when the DTC set. Verify the engine coolant temperature is less than 125°C (257°F).
 - If greater than the specified range, refer to Engine Overheating.
2. Inspect the transmission cooling system for restrictions or damage.
3. Perform the Transmission Fluid Level and Condition Check to verify correct fluid level and condition.
4. Perform the Transmission Fluid Cooler Flushing and Flow Test to verify proper transmission oil cooler flow.
5. Perform the Line Pressure Check to verify proper transmission line pressure.
6. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Perform the Transmission Adaptive Values Learn following all transmission related repairs.

DTC P0562 OR P0563

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0562

System Voltage Low Voltage

DTC P0563

System Voltage High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	High Resistance	Short to Voltage	Signal Performance
Battery Voltage	P2534	P0562, P2534	-	P0562, P2534
Ground	-	P0562, P2534	-	P0722, P0723

CIRCUIT/SYSTEM DESCRIPTION

The transmission control module (TCM) continuously monitors the system voltage on the Ignition 1 voltage circuits. Lower than normal voltage may be inadequate to operate the transmission control solenoids properly. Improper solenoid operation may cause erratic transmission operation, which may result in internal damage. Theses DTC detects high or low TCM voltage for an extended period.

CONDITIONS FOR RUNNING THE DTC

P0562

- Ignition voltage was greater than 6.0 volts, and has not dropped below 2.0 volts.
- Engine speed is greater than 1,200 RPM.

P0563

The ignition voltage was greater than 6.0 volts, and has not dropped below 2.0 volts.

CONDITIONS FOR SETTING THE DTC

P0562

The TCM detects system voltage is 11 volts or less for 4 seconds in a period of 12 seconds.

P0563

The TCM detects system voltage is 18 volts or greater for 10 seconds in a period of 12 seconds.

ACTION TAKEN WHEN THE DTC SETS

DTCs P0562 and P0563 are Type C DTCs.

CONDITIONS FOR CLEARING THE DTC

DTCs P0562 and P0563 are Type C DTCs.

DIAGNOSTIC AIDS

- Observe the driver information center (DIC) messaging that would indicate the electrical system requires service.
- Inspect for the following conditions:
 - Loose or damaged terminals at the generator
 - Loose or worn generator drive belt
- Running the engine with a battery charger attached may cause DTC P0563 to set.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

- **Charging System Description and Operation**
- **Transmission Component and System Description**
- **Electronic Component Description**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Engine running, accessories OFF, measure and record the battery voltage at the battery terminals with a DMM. The voltage should be between 12.6-15.0 volts.
 - If not within the specified range, or the charge indicator light is ON, refer to Charging System Test .
2. Observe the scan tool TCM Ignition Voltage parameter. The reading should be between 12.6-15.0 volts.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the 14-way harness connector at the transmission.
2. Connect the **DT-48616-10:** harness to the 14-way transmission harness connector.
3. Test for less than 5 ohms between the ground circuit terminal 2 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify that a test lamp illuminates between the B+ terminal and ground, and the ignition circuit terminals listed below and ground.
 - Terminal 1
 - Terminal 12
 - Terminal 13
 - If the test lamp does not illuminate, test the affected B+ or ignition circuit for a short to ground or an open/high resistance.
5. If all circuits test normal, replace the control solenoid valve assembly.

REPAIR PROCEDURES

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P0601-P0604 OR P062F

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

NOTE: DTCs P0601, P0602, 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 P0602

Control Module Not Programmed

DTC P0603

Control Module Long Term Memory Reset

DTC P0604

Control Module Random Access Memory Performance

DTC P062F

Control Module Long Term Memory Performance

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

Ignition voltage is between 9.0 and 18.0 volts.

CONDITIONS FOR SETTING THE DTC

P0601

The read only memory (ROM) test has failed 5 or more times.

P0602

The TCM has not been programmed and is unable to detect the start program.

P0603

The TCM has detected a memory checksum error.

P0604

The TCM random access memory (RAM) test has failed 5 or more times.

P062F

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

ACTION TAKEN WHEN THE DTC SETS

P0601, P0603, P0604, and P062F

- DTCs P0601, P0603, P0604, and P062F are Type A DTCs.
- The TCM commands maximum line pressure.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM inhibits TCC engagement.
- The TCM freezes transmission adaptive functions.
- The TCM commands the high side driver OFF.
- The TCM defaults the transmission to 5th gear and reverse.
- Torque management is enabled.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

P0602

- DTC P0602 is a type C DTC.
- The TCM commands maximum line pressure.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM inhibits TCC engagement.

- The TCM freezes transmission adaptive functions.
- The TCM defaults the transmission to 5th gear and reverse.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

- DTCs P0601, P0603, P0604, and P062F are Type A DTCs.
- DTC P0602 is a type C DTC.

REFERENCE INFORMATION

Description and Operation

Refer to **Electronic Component Description** for control solenoid valve assembly information.

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

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

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

1. Ignition OFF for 1 minute.
2. Ignition ON, with a scan tool, verify that DTC P0602 is not set.
 - If the DTC is set, program the transmission control module (TCM). Refer to **Control Solenoid Valve and Transmission Control Module Assembly Programming and Setup (6T70/6T75)** or **Control Solenoid Valve and Transmission Control Module Assembly Programming and Setup (6T30/6T40/6T45/6T50)** . If the DTC resets, replace the control solenoid valve assembly.

Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .

3. Observe the DTC information with a scan tool. DTCs P0601, P0603, P0604, and P062F should not set.
 - If a DTC P0601, P0603, P0604 or P062F are set, replace the control solenoid valve assembly.
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

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

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P0634

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P0634

Control Module Overtemperature

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

- The TCM temperature is between 0°C (32°F) and 240°C (464°F) for 0.25 second or greater.
- DTC P0634 is not set.
- The ignition voltage is greater than 9.0 volts.

CONDITIONS FOR SETTING THE DTC

Condition 1

The TCM has detected an internal temperature condition greater than 144°C (291°F) for 5 seconds or greater.

Condition 2

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

ACTION TAKEN WHEN THE DTC SETS

- DTC P0634 is a Type A DTC.
- The TCM limits the transmission to 5th gear and reverse.
- The TCM inhibits Tap Up/Down function.
- The TCM enables torque management.
- The TCM shuts down.
- The TCM commands maximum line pressure.

CONDITIONS FOR CLEARING THE DTC

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

Description and Operation

Electronic Component Description for control solenoid valve assembly information.

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 DTC P0218 is set, diagnose that DTC first.

1. Ignition ON, review the Failure Records when the DTC set. Verify the scan tool Engine Coolant Temperature parameter was less than 125°C (257°F).
 - If greater than the specified range, refer to Engine Overheating .

- 2. Perform the **Transmission Fluid Level and Condition Check** to verify correct fluid level and condition.
- 3. Perform the **Transmission Fluid Cooler Flushing and Flow Test** to verify proper transmission oil cooler flow.
- 4. Operate the vehicle within the conditions for running and setting the DTC until normal engine temperature is reached. Verify the scan tool TCM Temperature parameter is less than 146°C (295°F).
 - If greater than the specified range, inspect the transmission cooling system. Obstructions to the airflow of the radiator or transmission due to debris, kinked or damaged transmission fluid lines, or damage to the transmission cooler. If all the items test normal, replace the control solenoid valve assembly.
- 5. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

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

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

DTC P0658 OR P0659

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0658

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

DIAGNOSTIC FAULT INFORMATION

	Short to	Open/High	Short to
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Circuit	Ground	Resistance	Voltage
High Side Driver 1	P0658	P0658	P0659

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0658

- High side driver 1 is enabled.
- DTC P0658 has not set this ignition cycle.

P0659

- DTC P0659 has not set this ignition cycle.
- Ignition transitions from OFF to ON.

CONDITIONS FOR SETTING THE DTC

P0658

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

P0659

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

ACTION TAKEN WHEN THE DTC SETS

P0658

- DTC P0658 is a Type A DTC.
- The TCM turns the high side driver OFF.
- The TCM commands all solenoids OFF.
- The TCM commands the TCC OFF.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM defaults the transmission to 5th gear and reverse.

- The TCM enables torque management.

P0659

DTC P0659 is a Type C DTC.

CONDITIONS FOR CLEARING THE DTC

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

DIAGNOSTIC AIDS

When DTC P0658 sets, the line pressure control solenoid, and pressure control solenoids 2 and 3, will default to maximum pressure. This results in maximum line pressure to the 3-5 reverse clutch, and low/reverse clutch, when reverse is selected, and the 4-5-6 clutch, when forward is selected.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, verify with a scan tool the High Side Driver 1 parameter displays ON.
2. Engine Running, gear selector lever in Park position. Verify with a scan tool the following test status parameters displays OK.
 - High Side Driver 1 Circuit High Voltage Test Status
 - High Side Driver 1 Circuit Open Test Status
 - High Side Driver 1 Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
5. Ignition ON, verify with a scan tool the following test status parameters displays, OK.
 - High Side Driver 1 Circuit High Voltage Test Status
 - High Side Driver 1 Circuit Open Test Status
 - High Side Driver 1 Circuit Low Voltage Test Status
 - If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and

programming.

- Perform the Transmission Adaptive Values Learn following all transmission related repairs.

DTC P0667, P0668, OR P0669

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0667

Control Module Temperature Sensor Performance

DTC P0668

Control Module Temperature Sensor Circuit Low Voltage

DTC P0669

Control Module Temperature Sensor Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TCM Temperature Sensor	P0668	P0669	-	P0667

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

- No DTCs 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.

- The engine torque signal is valid.
- The ignition voltage is 9.0 volts or greater.
- The engine speed is greater than 500 RPM for 5 seconds or greater.
- The throttle position signal is valid.

P0668

- The ignition voltage is 9.0 volts or greater.
- The engine speed is greater than 500 RPM for 5 seconds or greater.
- DTC P0668 has not set.

P0669

- No ISS DTCs P0716 or P0717.
- No OSS DTCs P0722 or P0723.
- The ignition voltage is 9.0 volts or greater.
- The engine speed is greater than 500 RPM for 5 seconds or greater.
- DTC P0669 has not set.

CONDITIONS FOR SETTING THE DTC

P0667

- The difference between the transmission fluid temperature (TFT) and TCM substrate temperature is greater than 20-50°C (36-90°F), depending on the average of the TFT, TCM substrate, and TCM power up temperatures.
- The difference between the TCM power up temperature and TCM substrate temperature is greater than 8-10°C (14-18°F) depending on the average of the TFT, TCM substrate, and TCM power up temperatures.
- The above conditions have to be met for 5 minutes within a 6 minute period.

P0668

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

P0669

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

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0667, P0668, and P0669 are Type B DTCs.
- The TCM defaults to using the TCM power up temperature sensor value in place of the TCM temperature value.

CONDITIONS FOR CLEARING THE DTC

DTCs 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 (TFT) sensor output.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, Engine OFF. Verify the scan tool TCM Temperature parameter is between -254 and +254°C (-425 and +489°F).

- If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
- 2. Operate the vehicle at 64 km/h (40 mph) for 10 minutes. Monitor the TCM Temperature parameter and the Transmission Fluid Temperature parameter with a scan tool. The TCM Temperature parameter should increase by more than 2°C (3.5°F). Also, the TCM Temperature parameter and the Transmission Fluid Temperature parameter should be within 20°C (36°F) of each other.
 - If the TCM Temperature parameter does not increase by greater than 2°C (3.5°F) or the TCM Temperature parameter value is not within 20°C (36°F) of the Transmission Fluid Temperature parameter, then replace the control solenoid valve assembly.
- 3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P06AC, P06AD, OR P06AE

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P06AC

Transmission Control Module Power Up Temperature Sensor Performance

DTC P06AD

Transmission Control Module Power Up Temperature Sensor Circuit Low Voltage

DTC P06AE

Transmission Control Module Power Up Temperature Sensor Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TCM Temperature Sensor	P06AD	P06AE	P06AE	P06AC

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

- No DTCs ECM: 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, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730.
- The throttle position signal is valid.
- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- DTC P06AC has not set this ignition cycle.
- The engine torque signal is valid.

P06AD

- No ISS DTCs P0716 or P0717.
- No OSS DTCs P0722 or P0723.
- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- DTC P06AD has not set this ignition cycle.

P06AE

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- DTC P06AE has not set this ignition cycle.

CONDITIONS FOR SETTING THE DTC

P06AC

- The difference between the transmission fluid temperature (TFT) and TCM power up temperature is greater than 20-50°C (36-90°F), depending on the average of the TFT, TCM substrate, and TCM power up temperatures.
- The difference between the TCM power up temperature and TCM substrate temperature is greater than 8-10°C (14-18°F) depending on the average of the TFT, TCM substrate, and TCM power up temperatures.
- The above conditions have to be met for 5 minutes within a 6 minute period.

P06AD

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

P06AE

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

ACTION TAKEN WHEN THE DTC SETS

DTCs P06AC, P06AD, and P06AE are Type C DTCs.

CONDITIONS FOR CLEARING THE DTC

DTCs P06AC, P06AD, and P06AE are Type C DTCs.

DIAGNOSTIC AIDS

During a road test, the TCM Power-Up 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**
- **Inline Harness Connector End Views**

Electrical Information Reference

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

- **Wiring Repairs**

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle at 64 km/h (40 mph) for 10 minutes.
 - If the DTC resets, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P0711, P0712, OR P0713

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0711

Transmission Fluid Temperature Sensor Performance

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TFT Sensor	P0712	P0713	P0713	P0711

TYPICAL SCAN TOOL DATA

Transmission Fluid Temperature

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Drive vehicle, normal operating temperature Parameter Normal Range: -40 to 140°C (-40 to 284°F)			
Transmission Fluid Temperature	>= +254°C / +489°F	<= -254°C / -425°F	<= -254°C / -425°F

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid temperature (TFT) sensor is located inside of the transmission control solenoid valve assembly which has no serviceable components. The TFT 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

- No DTCs 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, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is greater than 9.0 volts.
- Throttle position signal is valid.
- The engine torque signal is valid.

P0712

- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is greater than 9.0 volts.
- DTC P0712 has not set this ignition cycle.
- No DTCs P0716, P0717, P0722, or P0723.

P0713

- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is greater than 9.0 volts.
- DTC P0713 has not set this ignition cycle.
- No DTCs P0716, P0717, P0722, or P0723.

CONDITIONS FOR SETTING THE DTC

P0711

The difference between the transmission fluid temperature (TFT) and TCM temperature and the difference between the TFT and TCM power up temperature are both greater than 20-50°C (36-90°F). The temperature threshold is dependent on the average temperature of the TFT, TCM temperature, and TCM power up temperature.

P0712

The TFT is greater than 254°C (489°F) for 1 minute.

P0713

The TFT is less than -254°C (-425°F) for 1 minute.

ACTION TAKEN WHEN THE DTC SETS

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

CONDITIONS FOR CLEARING THE DTC

DTCs 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 TFT sensor's output.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Electrical Information Reference

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

Description and Operation

- Electronic Component Description for control solenoid valve assembly
- Transmission General Description
- Transmission Component and System Description

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 operating temperature, verify the scan tool Trans Fluid Temp. parameter is between -254 and +254°C (-425 and +489°F).
 - If not within the specified range, replace the control solenoid valve assembly. Refer to Control Solenoid Valve and Transmission Control Module Assembly Replacement .
2. Operate the vehicle at 64 km/h (40 mph) for 10 minutes. Monitor the Transmission Fluid Temperature parameter and the TCM Temperature parameter with a scan tool. The Transmission Fluid Temperature parameter should increase by greater than 2°C (3.5°F). Also, the Transmission Fluid Temperature parameter and the TCM Temperature parameter should be within 20°C (36°F) of each other.
 - If the Transmission Fluid Temperature parameter does not increase by greater than 2°C (3.5°F) or the Transmission Fluid Temperature parameter is not within 20°C (36°F) of the TCM Temperature parameter, then replace the control solenoid valve assembly.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure

Records data.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P0716 OR P0717

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0716

Input Speed Sensor Performance

DTC P0717

Input Speed Sensor Circuit No Signal

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Input Speed Sensor Supply Voltage	P0716, P0717	P0716, P0717	P0716, P0717	P0716
Input Speed Sensor Signal	P0716, P0717	P0716, P0717	P0716, P0717	P0716

TYPICAL SCAN TOOL DATA

Transmission ISS

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature, transmission in PARK Parameter Normal Range: 500-5,800 RPM			

ISS/OSS Supply Voltage	0 RPM	0 RPM	0 RPM
ISS Signal	0 RPM	0 RPM	0 RPM

ISS/OSS Supply Voltage

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Key ON, Engine OFF or Engine running, normal operating temperature Parameter Normal Range: OK			
ISS Signal	OK	OK	OK
ISS Supply Voltage	Out of Range	Out of Range	Out of Range

CIRCUIT/SYSTEM DESCRIPTION

The input speed sensor (ISS) is a hall-effect type sensor. The ISS 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 the 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 input speed sensor ISS 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 signal circuit to the TCM. The TCM uses the ISS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

CONDITIONS FOR RUNNING THE DTC

P0716

- No DTCs P0101, P0102, P0103, P0121, P0122, P0123, P0717, P0752, P0973, or P0974.
- Vehicle speed is 10 km/h (6 mph) or greater.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- DTC P0716 has not set this ignition cycle.
- Torque signal is valid.
- Throttle position signal is valid.

P0717

- DTC P0717 has not set this ignition cycle.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- The vehicle speed is greater than 16 km/h (10 mph).
- The engine torque is greater than 50 N.m (37 lb ft).

CONDITIONS FOR SETTING THE DTC

P0716

Transmission input speed drops 1,350 RPM for greater than 1 second and does not recover.

P0717

Transmission input shaft speed is less than 50 RPM for 5 seconds when output speed is detected.

ACTION TAKEN WHEN THE DTC SETS

P0716

- P0716 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.
- The TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM commands maximum line pressure.
- The TCM enables torque management.
- The TCM limits the transmission to reverse and 5th gear.
- The TCM commands the high side driver off.

P0717

- P0717 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.
- TCM commands maximum line pressure.
- The TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- The TCM defaults the transmission to 2nd gear when a forward range is selected.

CONDITIONS FOR CLEARING THE DTC

P0716 and P0717 are Type A DTCs.

DIAGNOSTIC AIDS

Inspect the ISS, harness and connector for metallic debris and the reluctor wheel for damage or misalignment.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- **DT-48616-10:** Adapter Harness
- **J 38522:** Variable Signal Generator

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

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, verify with a scan tool the transmission ISS/OSS Supply Voltage test status parameter displays OK.
2. Engine idling in PARK, observe the scan tool Transmission ISS parameter while varying the engine speed. The Transmission ISS parameter should change with the engine speed and not drop out.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Connect the **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly.
3. Ignition ON, verify 11-13 volts between the ISS voltage circuit terminal B on the control solenoid valve assembly and ground.
 - o If not within the specified range, replace the control solenoid valve assembly.
4. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test** .
5. Inspect the reluctor for damage or misalignment. Repair or replace as necessary.
6. If all of the above test normal, replace the input speed sensor.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Input and Output Speed Sensor Removal** and the **Input and Output Speed Sensor Installation** .

DTC P071A

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P071A

Transmission Tow Mode Switch Circuit

CIRCUIT/SYSTEM DESCRIPTION

Tow/haul mode enables the operator to achieve enhanced shift performance when towing or hauling a load. When tow/haul mode is selected, the tow/haul switch input signal to the body control module (BCM) is momentarily toggled to zero volts. This signals the transmission control module (TCM) to extend the length of time between upshifts and increase transmission line pressure. Cycling the tow/haul switch again disables tow/haul mode and returns the transmission to a normal shift pattern.

CONDITIONS FOR RUNNING THE DTC

- DTC P1762 is not set.
- The engine speed is greater than 500 RPM for 5 seconds.
- The system voltage is 9-18 volts.

CONDITIONS FOR SETTING THE DTC

The Tow Mode switch remains closed, low voltage, for 10 minutes.

ACTION TAKEN WHEN THE DTC SETS

- DTC P071A is a Type C DTC.
- Tow Mode is disabled.

CONDITIONS FOR CLEARING THE DTC

DTC P071A is a Type C DTC.

DIAGNOSTIC AIDS

If the electrical circuit tests are OK and the shift pattern is not occurring, there may be a mechanical/hydraulic condition that prevents operation. Refer to **Symptoms - Automatic Transmission** .

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

Transmission General Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

EL 35616: GM-Approved Terminal Test Kit

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

CIRCUIT/SYSTEM VERIFICATION

Turn ON the ignition, with the engine OFF. Cycle the tow/haul switch while observing the Tow/Haul Mode parameter on the scan tool.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, remove connector from the tow/haul switch.
2. Ignition ON, install a fused jumper wire between the tow/haul switch signal and ground circuits of the tow/haul switch connector. Use a scan tool to verify that the Tow/Haul Mode parameter status changes.
 - If the scan tool Tow/Haul Mode indicates a status change, replace the tow/haul switch.
3. Using the **EL 35616:** kit, install a fused jumper wire from the tow/haul switch signal circuit of the tow/haul switch connector to ground. Use a scan tool to verify that the Tow/Haul Mode parameter status changes.
 - If Tow/Haul Mode status changes, test the tow haul switch ground circuit for an open/high resistance or short to ground.
 - If the Tow/Haul Mode status did not change, test the tow haul mode signal circuit for an open/high resistance or a short to ground. If the circuit tests normal, replace the BCM.

REPAIR PROCEDURES

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

DTC P071D

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P071D

Transmission Sport Mode Switch circuit

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Trans Mode Switch B Signal	P071D	-	-	P071D

CIRCUIT/SYSTEM DESCRIPTION

The sport and economy shift modes allow driver selection of 2 different shift patterns. Sport mode programming in the transmission control module (TCM) increases transmission line pressure and extends shift points for performance enhanced driving. In the economy mode, the TCM uses standard programming, permitting normal line pressure and shifting. The sport mode switch is a console mounted momentary contact switch located on or near the electronic PRNDL assembly. Accessory voltage is supplied to the electronic PRNDL assembly through the ELEC PRNDL fuse. When the sport mode switch is depressed, it momentarily contacts the switch signal circuit. The rear integration module (RIM) recognizes the voltage on the circuit and sends a class 2 serial data message to the dash integration module (DIM). The DIM sends a class 2 message to the engine control module (ECM). The ECM sends a request to the transmission control module (TCM) through the controller area network (CAN) to enable the sport mode program.

The TCM evaluates the request, and if operating conditions are correct for enabling the program, the TCM sends a confirmation message to the ECM. The ECM then requests the instrument panel cluster (IPC) to illuminate the sport mode indicator.

The sport mode feature remains enabled until the sport mode switch is pressed again. Once disabled, the TCM will return to the economy mode programming.

CONDITIONS FOR RUNNING THE DTC

- The engine speed is greater than 500 RPM for 5 seconds.
- Ignition voltage is between 9.0 volts and 19.0 volts.

CONDITIONS FOR SETTING THE DTC

The TCM detects that the Sport Mode Switch has been continuously activated for 10 minutes.

ACTION TAKEN WHEN THE DTC SETS

- DTC P071D is a type C DTC.
- The TCM inhibits the sport mode shift pattern.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

DTC P071D is a Type C DTC.

DIAGNOSTIC AIDS

Diagnose all communication and body DTCs first.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON. While observing the sport mode indicator on the IPC, press the sport mode switch several times. Does the sport mode indicator illuminate On and Off with switch operation?
 - Test the instrument panel cluster (IPC) for proper operation and lamp illumination. Refer to **Diagnostic System Check - Vehicle**.
 - Test the rear integration module (RIM) for proper sport mode switch input and output operation. Refer to **Control Module References**.
 - If the DTC resets, go to Circuit/System Testing.
2. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition ON, engine OFF. While observing the sport mode indicator on the IPC, press the sport mode switch several times. Is the sport mode indicator always ON?
 - Test the accessory voltage circuit for an open.
 - Test the sport mode switch signal circuit for an open.
 - Test the electronic PRNDL ground circuits for on open.
 - If an open circuit is found, replace the electronic PRNDL assembly.
2. While observing the sport mode indicator on the IPC, disconnect the electronic PRNDL assembly from the console wiring harness connector. Is the sport mode indicator still illuminated?
 - If the sport mode indicator is illuminated, replace the electronic PRNDL assembly.
3. Test the sport mode switch signal circuit for a short to ground. If the circuit test good replace the sport mode switch.

COMPONENT TESTING

1. Disconnect the electronic PRNDL assembly.
2. Connect a DMM, between the sport mode switch signal circuit and the ground circuit of the electronic PRNDL assembly.
3. Set the DMM to measure resistance. While observing the DMM, press the sport mode switch several times. Does the resistance toggle between very low resistance to very high resistance as the switch is pressed?
 - If the resistance toggles between very low resistance and very high resistance, replace the electronic PRNDL assembly.

REPAIR PROCEDURES

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

Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement

DTC P0722 OR P0723

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P0723

Output Speed Sensor Intermittent

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
OSS High Signal	P0722, P0723	P0722, P0723	P0722, P0723	-
OSS Supply Voltage	P0722, P0723	P0722, P0723	-	-

TYPICAL SCAN TOOL DATA

Transmission OSS

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Drive vehicle, normal operating temperature Parameter Normal Range: 0-7,000 RPM			
OSS Supply Voltage	0 RPM	0 RPM	0 RPM
Transmission OSS Signal	0 RPM	0 RPM	0 RPM

ISS/OSS Supply Voltage

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Key ON, Engine OFF or Engine running, normal operating temperature Parameter Normal Range: OK			

Transmission OSS Signal	OK	OK	OK
OSS Supply Voltage	Out of Range	Out of Range	Out of Range

CIRCUIT/SYSTEM DESCRIPTION

The output speed sensor (OSS) is a hall-effect type sensor. The OSS 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 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 signal circuit to the TCM. The TCM uses the OSS signal to determine line pressure, transmission shift patterns, vehicle speed and gear ratio.

CONDITIONS FOR RUNNING THE DTC

P0722

- No DTCs P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0722, or P0723.
- The ignition voltage is 9.0 volts or greater.
- The engine speed is greater than 500 RPM for 5 seconds.
- The engine torque signal is valid.
- The throttle position signal is valid.
- The transmission input speed is between 1,000-8,191 RPM.
- The calc. throttle position is greater than 8 percent.
- The engine torque is greater than 30 N.m (22 lb ft).
- The TFT is greater than -40°C (-40°F).

P0723

- No DTCs P0101, P0102, P0103, P0121, P0122, P0123 P0716, P0717, P0723, P0973, P0974, P0976, or P0977.
- The ignition voltage is 9.0 volts or greater.
- Greater than 5 seconds since last range change.
- The engine torque signal is valid.
- The throttle position signal is valid.

CONDITIONS FOR SETTING THE DTC

P0722

The transmission output speed is 35 RPM or less for 5 seconds.

P0723

- The transmission output speed is 105 RPM or greater.

- The transmission output speed drops 1000 RPM for greater than 3 seconds and does not recover.

ACTION TAKEN WHEN THE DTC SETS

P0722

- P0722 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM defaults the transmission to 2nd gear.
- The TCM inhibits Tap-Up/Tap-Down functions.
- The TCM inhibits manual up, manual down shifts with the shift selector.

P0723

- P0723 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.
- The TCM commands the high side driver OFF.
- The TCM commands maximum line pressure.
- The TCM enables torque management.
- The transmission defaults to reverse and 5th gear.
- The TCM inhibits Tap-Up/Tap-Down functions.
- The TCM inhibits manual up, manual down shifts with the shift selector.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P0722 and P0723 are Type A DTCs.

DIAGNOSTIC AIDS

Inspect the OSS, harness, and connector for metallic debris and proper alignment of the OSS with the park gear. Proper torque of the OSS mounting bolt is critical to proper OSS operation.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

- **Transmission General Description**
- **Transmission Component and System Description**
- **Electronic Component Description** for output speed sensor (OSS)

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
- **J 38522:** Variable Signal Generator

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

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, verify with a scan tool the transmission ISS/OSS Supply Voltage test status parameter displays OK.
2. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the Transmission OSS parameter on the scan tool. The Transmission OSS should vary with the vehicle speed and not drop out.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Connect the **DT-48616-10**: harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly.
3. Ignition ON, verify 11-13 volts between the OSS voltage circuit terminal B on the control solenoid valve assembly and ground.
 - o If not within the specified range, replace the control solenoid valve assembly.
4. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test** .
5. Inspect the park gear and OSS alignment with the gear. Repair or replace as necessary.
6. If all of the above test normal, replace the OSS.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Input and Output Speed Sensor Removal** and the **Input and Output Speed Sensor Installation** .

DTC P0741 OR P0742

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0741

Torque Converter Clutch (TCC) - System Stuck Off

DTC P0742

Torque Converter Clutch (TCC) - System Stuck On

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0741

- No DTCs 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.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature (TFT) is 20-130°C (68-266°F).
- The calc. throttle position is greater than 8 percent.
- The engine torque is greater than 50 N.m (36 lb ft).
- The 2nd gear ratio is between 2.75-3.17.
- The 3rd gear ratio is between 1.78-2.04.
- The 4th gear ratio is between 1.35-1.55.
- The 5th gear is between 0.93-1.07.
- The 6th gear is between 0.70-0.80.
- The TCC is commanded ON.
- The engine torque signal is valid.
- The throttle position signal is valid.

P0742

- No DTCs 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.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- The TFT is 20-130°C (68-266°F).
- The calc. throttle position is greater than 8 percent.
- The engine torque is greater than 80 N.m (59 lb ft).
- Vehicle speed greater than 16 km/h (10 mph).

- Commanded gear is 2nd or greater.
- The gear ratio is between 0.69-1.97.
- Solenoid A is enabled.

CONDITIONS FOR SETTING THE DTC

P0741

The TCM detects TCC slip greater than 150 RPM for 3 seconds with a TCC commanded ON pressure of 500 kPa or greater. This must occur 9 times during the same ignition cycle.

P0742

The TCM detects the TCC slip between -20 and 30 RPM for 1.2 seconds or greater when the TCC is commanded OFF 6 times during the same ignition cycle.

ACTION TAKEN WHEN THE DTC SETS

P0741

- DTC P0741 is a Type A DTC.
- The TCM inhibits high gear.
- The TCM initiates the Hot Mode shift pattern.

P0742

- DTC P0742 is a Type A DTC.
- The TCM initiates Hot Mode shift pattern.
- The TCM freezes transmission adaptive functions.

CONDITIONS FOR CLEARING THE DIC/DTC

P0741

DTC P0741 is a Type B DTC.

P0742

DTC P0742 is a Type A DTC.

DIAGNOSTIC AIDS

When attempting to set transmission performance DTCs, observe the Freeze Frame and Failure Records to assist in duplicating the failure conditions. Ensure the transmission fluid level is correct and there are no leaks.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Perform the Transmission Fluid Level and Condition Check to verify correct fluid level and condition.
2. Perform the Control Solenoid Valve and Transmission Control Module Assembly Cleaning in order to dislodge debris and free up the valves.
3. Engine idling in Park, verify with a scan tool the transmission ISS/OSS Supply Voltage parameter displays OK.
4. Engine idling in Park, observe the Transmission ISS parameter on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.

NOTE: **Perform a scan tool snapshot during the road test.**

5. Perform the Road Test . Verify the transmission operation performs as indicated in the road test instructions.
6. Review the snapshot transmission data parameters. Verify the engine and transmission data parameters display the correct values in all forward gear ranges.

- Engine Speed
 - Engine Coolant Temperature
 - Transmission ISS
 - Transmission OSS
 - Trans. Fluid Temp.
 - Brake Switch
 - TCC PC Sol. Pressure Cmd.
 - TCC Slip Speed
7. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified ranges, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the test, replace the control solenoid valve assembly.
4. Listed in the table below are conditions for each component that could set a DTC P0741 or P0742. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P0741 P0742	Upper Valve Body	TCC Control Valve • Stuck TCC control valve • Damaged valve/bore
P0741 P0742	Upper Valve Body	TCC Regulator Valve • Stuck TCC regulator valve • Damaged valve/bore
P0741 P0742	Control Solenoid Valve Assembly	TCC Pressure Control Solenoid • Not pressurizing - Stuck OFF or leaking • Not exhausting - Stuck ON • Control signal fluid supply leak - valve body filter plate assembly cracked, or damaged gasket seal

P0741	Torque Converter	• Torque converter clutch delamination or material worn off • Damaged seal • Converter bolts too long damaging the clutch apply surface
P0741	Support	Damaged seal
P0741 P0742	A/Trans Case Cover (403)	Release Blow-off • Not seating/sealing • Damaged Spring
P0741	Upper Valve Body	Release exhaust port/orifice plugged or blocked
P0741	Turbine Shaft	Turbine shaft O-ring seal cut or damaged

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Torque Converter Removal** and the **Torque Converter Installation** .

DTC P0751 OR P0752

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0751

Shift Solenoid 1 Valve Performance - Stuck Off

DTC P0752

Shift Solenoid 1 Valve Performance - Stuck On

CIRCUIT/SYSTEM DESCRIPTION

The shift solenoid (SS) valve 1 is part of the control solenoid valve assembly, which has no serviceable components. The SS valve 1 is a normally closed (NC) solenoid valve and controls fluid pressure to the clutch select valve. When SS valve 1 is commanded on, fluid pressure acts on the clutch select valve, moving the valve to another position. Fluid from the R1/4-5-6 regulator valve flows through the clutch select valve and is directed to either the low and reverse clutch or the 4-5-6 clutch, depending on the position of the clutch select valve.

CONDITIONS FOR RUNNING THE DTC

- No DTCs P0121, P0122, P0123, P0716, P0717, P0722, P0723, or P182E.
- The transmission fluid temperature (TFT) is 0°C (32°F) or greater.
- Engine speed is greater than 500 RPM for 5 seconds.
- The output shaft speed is greater than 0 RPM or the throttle is greater than 0.5 percent.
- The ignition voltage is 9.0 volts or greater.
- The shift is complete.
- The engine torque signal is valid.
- The throttle position signal is valid.
- High-Side driver is enabled.

CONDITIONS FOR SETTING THE DTC

P0751

The TCM detects gear slip greater than 200 RPM for 1.5 seconds with 1st gear commanded and the closest gear ratio is 4th gear. This must occur 8 times.

P0752

The TCM detects gear slip greater than 200 RPM for 1.5 seconds when 3rd gear is commanded and the closest gear ratio is 4th gear. This must occur 5 times.

ACTION TAKEN WHEN THE DTC SETS

P0751

- DTC P0751 is a type B DTC.
- The TCM inhibits 1st gear.
- The transmission control module (TCM) inhibits Neutral idle.

P0752

- DTC P0752 is a type A DTC.
- The TCM limits the transmission to 2nd range and reverse.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

- The TCM disables neutral idle.
- The TCM freezes adapts.
- The TCM commands maximum line pressure.

CONDITIONS FOR CLEARING THE DTC

P0751

DTC P0751 is a type B DTC.

P0752

DTC P0752 is a type A DTC.

REFERENCE INFORMATION

Schematic Reference

Drive Range, First Gear Engine Braking

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

- **DT-48616:** Control Solenoid Test Plate
- **DT-48616-10:** Adapter Harness
- **J 21867:** Pressure Gauge

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

CIRCUIT/SYSTEM VERIFICATION

1. Perform the **Transmission Fluid Level and Condition Check** to verify correct fluid level and condition.
2. From a stop, accelerate to 72 km/h (45 mph) with the calculated throttle position greater than 15 percent. Perform this test 2 times. The DTCs should not set.
3. Verify the scan tool Shift Solenoid 1 and Gear Ratio parameters are correct for each gear range. Refer to **Shift Solenoid Valve State and Gear Ratio** .
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified range, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly.
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the performance test, replace the control solenoid valve assembly.
4. Listed in the table below, are conditions for each component that could set DTC P0751 or P0752. Carefully inspect each component for that condition.

DTCs	Component	Condition
P0751 P0752	Control Valve Body	Clutch select valve stuck - debris, sediment, binding, or scored bore
P0751	Control Valve Body	Bore Plug - Clutch Select Valve - Undersized bore plug causing a leak. Plug should be a valve fit in the bore.
P0751	Control Valve Body	Check ball #1 missing, damaged/malformed, Seat in the valve body damage/leaking.
P0751 P0752	Control Solenoid Valve Assembly	• Not pressurizing - Stuck OFF or leaking • Not exhausting - Stuck On • Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal
P0751 P0752	Control Valve Body	Low and Reverse and 4-5-6 Clutch Regulator Valve Stuck or sticking - debris, sediment, binding, or scored bore

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

- Refer to Control Module References for control solenoid valve assembly replacement, setup, and programming.
- Perform the Transmission Adaptive Values Learn following all transmission related repairs.

DTC P0776 OR P0777

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0776

Clutch Pressure Control Solenoid 2 - Stuck Off

DTC P0777

Clutch Pressure Control Solenoid 2 - Stuck On

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 2 is part of the control solenoid valve assembly which has no serviceable components. PC solenoid 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 RPM signals from the input speed sensor (ISS) and the output speed sensor (OSS). The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

CONDITIONS FOR RUNNING THE DTC

P0776

- No ISS DTCs 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.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output speed is 650 RPM or greater or the throttle position is 0.5 percent or greater.
- The throttle position signal is valid.

- The high side driver (HSD) is enabled.

P0777

- No DTCs 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.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output shaft speed is 200 RPM or greater.
- The throttle position signal is valid.
- The HSD is enabled.

CONDITIONS FOR SETTING THE DTC

P0776

The TCM detects an incorrect on-coming clutch gear ratio, or flare, when the 3-5-R clutch is commanded ON for 3 seconds and the transmission input shaft speed is 200 RPM or greater from the anticipated input shaft speed.

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 second and the transmission input shaft speed is 40 RPM or less from the anticipated input shaft speed.

ACTION TAKEN WHEN THE DTC SETS

P0776

- DTC P0776 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM limits the transmission to 2nd gear operation.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits TAP Up/TAP Down function.
- The TCM inhibits manual shifting of forward gears.

P0777

- DTC P0777 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM limits the transmission to 3rd gear operation.
- The TCM freezes transmission adaptive functions.

- The TCM inhibits TAP Up/TAP Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P0776 and P0777 are Type A DTCs.

REFERENCE INFORMATION

Schematic Reference

- Drive Range, Third Gear
- Drive Range, Fifth Gear

Description and Operation

- Transmission General Description
- Transmission Component and System Description

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Apply the parking brake and block the drive wheels before performing this procedure in order to prevent bodily injury.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Perform the Transmission Fluid Level and Condition Check , to verify correct fluid level and condition.
3. Perform the Control Solenoid Valve and Transmission Control Module Assembly Cleaning , to dislodge debris and free up the valves.
4. Monitor the Transmission Fluid Pressure (TFP) switch 1 with a scan tool. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch 1 parameter states are correct for Park, Reverse, and Neutral. Refer to Transmission Fluid Pressure Switch Logic .
5. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch 1 parameter states are correct for all forward ranges. Refer to

Transmission Fluid Pressure Switch Logic

6. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage test status parameter displays OK.
7. Engine idling in Park. Observe the Transmission ISS parameter on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.
8. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the Transmission OSS parameter on the scan tool. The Transmission OSS parameter should vary with the vehicle speed and not drop out.

NOTE: **Perform a Tech 2 snapshot during the road test.**

9. Perform the **Road Test** . Verify the transmission operation performs as indicated in the road test instructions.
10. Review the Tech 2 snapshot data. Verify the following transmission data parameters display the correct values for each gear range.
 - Transmission ISS
 - Transmission OSS
 - PC Solenoid 2
 - TFP Switch 1
11. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified ranges, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the performance test, replace the control solenoid valve assembly.
4. Inspect for the following conditions and repair or replace as necessary.

DTCs	Component	Condition
P0776 P0777	Control Valve Body Assembly	3-5-R Regulator Valve stuck/sticking - debris, binding, damaged valve, or scored bore
P0776	Control Solenoid Valve Assembly	• Clutch Pressure Control Solenoid 2 • O-ring seals leaking

P0777		Valve body filter plate assembly cracked, blocked, or damaged gasket seal
P0776 P0777	Control Valve Body Assembly	- Actuator feed limit circuit supply fluid to solenoids restricted or not available - debris or sediment blockage 3-5-R clutch regulator valve not in the applied position - debris, binding, damaged valve, or scored bore - Control valve body ball check valve not seating correctly - debris
P0776 P0777	Torque Converter (w/Fluid Pump) Housing Assembly	Fluid pump housing/gear damaged/scored
P0776	3-5-R and 4-5-6 Clutch Housing Assembly	3-5-R clutch backing plate retaining ring not seated, causing clutch pack overtravel

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the:
 - Internal Components Removal**
 - 3-5-Reverse and 4-5-6 Clutch Housing Disassemble**
 - 3-5-Reverse and 4-5-6 Clutch Housing Assemble**
 - 3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation**

DTC P0796 OR P0797

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0796

Clutch Pressure Control Solenoid 3 - Stuck Off

DTC P0797

Clutch Pressure Control Solenoid 3 - Stuck On

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 3 is part of the control solenoid valve assembly which has no serviceable components. PC solenoid 3 regulates transmission fluid pressure to the reverse/4-5-6 regulator valve which controls pressure to the reverse/4-5-6 clutch. The transmission control module (TCM) calculates gear ratio based on the RPM signals from the automatic transmission input speed sensor (ISS) and the output speed sensor (OSS). 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.
- The engine speed is greater than 500 RPM for 5 seconds.
- The transmission output speed is 650 RPM or greater or the throttle position is 0.5 percent or greater.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The high side driver (HSD) is enabled.
- The 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.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The HSD is enabled.
- The transmission output shaft speed is 200 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P0796

The TCM detects an incorrect on-coming clutch gear ratio (incorrect gear ratio), or flare.

P0797

The TCM detects an incorrect off-going clutch gear ratio (incorrect gear ratio), or shift tie-up.

ACTION TAKEN WHEN THE DTC SETS

P0796

- DTC P0796 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM inhibits torque converter clutch (TCC).
- The TCM freezes transmission adaptive functions.
- The TCM inhibits TAP Up/TAP Down functions.
- The TCM inhibits manual up, manual down shifts with the shift selector.
- The TCM limits the transmission to 3rd gear operation.

P0797

- DTC P0797 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM inhibits TCC.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits TAP Up/TAP Down functions.
- The TCM inhibits manual up, manual down shifts with the shift selector.
- The TCM limits the transmission to 4th gear operation.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs 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

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

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Apply the parking brake and block the drive wheels before performing this procedure in order to prevent bodily injury.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Perform the Transmission Fluid Level and Condition Check to verify correct fluid level and condition.
3. Perform the Control Solenoid Valve and Transmission Control Module Assembly Cleaning , to dislodge debris and free up the valves.
4. Monitor the Transmission Fluid Pressure (TFP) switch 5 with a scan tool. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch 5 parameter states are correct for Park, Reverse, and Neutral. Refer to Transmission Fluid Pressure Switch Logic .
5. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch 5 parameter states are correct for all forward ranges. Refer to Transmission Fluid Pressure Switch Logic .
6. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage test status parameter displays OK.
7. Engine idling in Park. Observe the Transmission ISS parameter on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.
8. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the Transmission OSS parameter on the scan tool. The Transmission OSS parameter should vary with the vehicle speed and not drop out.

NOTE: Perform a scan tool snapshot, during the road test.

9. Perform the Road Test . Verify the transmission operation performs as indicated in the road test instructions.
10. Review the scan tool snapshot data. Verify the following transmission data parameters display the correct values for each gear range.
 - Transmission ISS

- Transmission OSS
- PC Solenoid 3
- Transmission Fluid Pressure Switch 5

11. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified range, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve body does not pass the performance test, replace the control solenoid valve assembly.
4. Inspect for the following conditions and repair/replace as necessary.

DTCs	Component	Condition
P0796 P0797	Control Valve Body Assembly	4-5-6 Regulator Valve stuck/sticking - debris, binding, damaged valve, or scored bore
P0796	Input Shaft Support	Input shaft tower seals damaged or leaking
P0796 P0797	Control Solenoid Valve Assembly	• Clutch Pressure Control Solenoid 3 • O-ring seals leaking • Valve body filter plate assembly cracked, blocked, or damaged gasket seal
P0796	4-5-6 Clutch Housing Assembly	4-5-6 Clutch Piston Assembly damaged/leaking
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	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	Automatic Transmission Fluid Filter Assembly	Oil filter or filter seal loose or damaged
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

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the:
 - **Internal Components Removal**
 - **3-5-Reverse and 4-5-6 Clutch Housing Disassemble**
 - **3-5-Reverse and 4-5-6 Clutch Housing Assemble**
 - **3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation**

DTC P0815, P0816, OR P0826

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

TYPICAL SCAN TOOL DATA

Driver Shift Request

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

CIRCUIT/SYSTEM DESCRIPTION

When the shift lever is placed in manual mode (M), the driver shift request (DSR), also known as the tap shift function is activated. The DSR allows the vehicle operator to shift gears by pushing the plus (+) button for an upshift or minus (-) button for a downshift. The body control module (BCM) supplies battery voltage, ground, and a signal circuit to the shift controller. The shift controller has Hall-effect switches connected to a resistor array. When the lever is in the M position, a voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module to perform the upshift or downshift.

CONDITIONS FOR RUNNING THE DTC

P0815 or P0816

- The engine speed is greater than 500 RPM for at least 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- No DTCs P0815, P0816, P0826, P182E, P1761, P1876, P1877, or P1915.
- The time since the last gear range change is greater than 1 second.

P0826

- The engine speed is greater than 500 RPM for at least 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- No DTCs P0826 or P1761.

CONDITIONS FOR SETTING THE DTC

P0815 - Condition 1

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

P0815 - Condition 2

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

P0816 - Condition 1

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

P0816 - Condition 2

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

P0826

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

ACTION TAKEN WHEN THE DTC SETS

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

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, observe the scan tool Driver Shift Control Mode parameter while moving the transmission shift lever through all the positions. The parameter should display Inactive in the park, reverse, neutral and drive positions, and Active in the M position.
2. Shift lever in the M position, verify the scan tool Driver Shift Request parameter changes from None to Upshift when the plus button is pressed, and from none to Downshift when the minus button is pressed.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the shift lever assembly electrical connector from the shift lever assembly.
2. Test for less than 10 ohms between the shift lever harness connector terminal 2 and ground.
 - If greater than the specified range, repair the ground circuit.
3. Ignition ON, verify the scan tool Driver Shift Control parameter displays inactive.
 - If not the expected results, test the signal circuit between shift lever assembly connector terminal 3 and the BCM for a short to voltage or ground. If the circuit tests normal, replace the BCM.
4. Ignition OFF, connect a test lamp between shift lever harness connector B+ terminal 1 and ground circuit terminal 2.
5. Ignition ON, verify the test lamp is illuminated.
 - If the light stays off, test the B+ circuit for an open/high resistance. If the circuit tests normal, replace the BCM.
6. Test for 11-13 volts at the shift lever assembly harness connector between signal circuit terminal 3 and ground.
 - If not within the specified range, test the signal circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
7. Ignition OFF, connect the shift lever harness connector.
8. Ignition ON, back probe the shift lever assembly connector and test for 11-13 volts between terminal 3 and ground with the shift lever in park, reverse, neutral, and drive.
 - If not within the specified range, replace the shift lever assembly.
9. Use a DMM to monitor the voltage between shift lever assembly connector terminal 3 and ground with the shift lever in the M position, with the tap up plus button depressed, and the M position with the tap down minus button depressed. Compare the readings and verify the voltages are correct for each position as follows:
 - Manual: 8.0-10.6 volts
 - Tap down: 5.1-7.3 volts
 - Tap up: 2.0-4.6 volts

- If not within the specified range, test the signal circuit for a short to ground or open/high resistance.
If the circuit tests normal, replace the shift lever assembly.

10. If all circuits test normal, replace the BCM.

REPAIR PROCEDURES

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

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

DTC P0842 OR P0843

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0842

Transmission Fluid Pressure Switch 1 Circuit Low Voltage

DTC P0843

Transmission Fluid Pressure Switch 1 Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TFP Switch 1 Signal	P0842	P0843	P0843	-
TFP Switch 3 Signal	P0872	P0873	P0873	-
TFP Switch 4 Signal	P0877	P0878	P0878	-
TFP Switch 5 Signal	P0989	P0990	P0990	-

TYPICAL SCAN TOOL DATA

TFP Switch 1

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature			

Parameter Normal Range: High or Low			
TFP Switch 1 Signal	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 1 assembly is part of the control solenoid valve assembly which has no serviceable components. The transmission control module (TCM) supplies a signal circuit to the TFP switch 1. The TFP switch 1 has an internal case ground. TFP switch 1 is normally closed or Low. When oil pressure is present at the TFP switch 1, the switch is open or High. The normally high clutch pressure control (PC) solenoid 2 controls pressure to the 3-5 reverse clutch regulator valve. The TCM monitors the TFP switch 1 to determine the position of the 3-5 reverse clutch regulator valve. When the 3-5 reverse clutch is commanded OFF, pressure is present on the TFP switch 1. When the 3-5 reverse clutch is commanded ON, the 3-5 reverse clutch regulator valve moves and pressure to the TFP switch 1 is exhausted through the 3-5 reverse clutch regulator valve.

CONDITIONS FOR RUNNING THE DTC

P0842 or P0843

- No DTCs P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P182E, or P1915.
- The engine speed is 500 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature (TFT) is 0-100°C (32-230°F).
- The High Side Driver is ON.
- The engine speed is 550 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P0842

The TCM detects that the TFP switch 1 signal voltage remains LOW after the 3-5-R clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 30 counts are accumulated.

P0843

The TCM detects that the TFP switch 1 signal voltage remains HIGH after the 3-5-R clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 50 counts are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0842 and P0843 are type C DTCs.
- The TCM freezes transmission adaptive functions on the 3-5-R clutch.

CONDITIONS FOR CLEARING THE DTC

DTCs P0842, P0843 are type C DTCs.

DIAGNOSTIC AIDS

A TFP switch may malfunction due to normal debris in the transmission fluid causing a TFP Switch DTC to intermittently set. This type of condition should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptive pressure and do not cause transmission symptoms unless the switch malfunctions continuously for an extended period of time.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Transmission General Description
- Electronic Component Description for control solenoid valve assembly
- Transmission Component and System Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Chock the wheels to prevent the vehicle from moving. Failure to chock the wheels can cause personal injury when the electrical system is repaired.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Monitor the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters with a scan tool.
3. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
4. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
 - If any TFP switch parameter state does not match the logic table, replace the control solenoid valve assembly.
5. Operate the vehicle within the conditions for running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

NOTE:

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

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

Control Module References for control solenoid valve assembly replacement, setup, or programming

DTC P0850-P0852

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0850

Park/Neutral Position Switch Circuit

DTC P0851

Park/Neutral Position Switch Circuit Low Voltage

DTC P0852

Park/Neutral Position Switch Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

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

TYPICAL SCAN TOOL DATA

PNP Switch

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 Volts = In-Gear, 0 Volts = Park/Neutral			
Park/Neutral Signal	Park/Neutral	In-Gear	In-Gear

CIRCUIT/SYSTEM DESCRIPTION

The transmission manual shift shaft switch assembly, also known as the internal mode switch (IMS), is a sliding contact switch attached to the manual shift shaft inside the transmission case. The park/neutral position (PNP) switch is integrated into the IMS and connects to the transmission control module (TCM) lead-frame through a short wire harness. 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

- Ignition voltage is between 8-18 volts.
- Engine speed is greater than 1000 RPM.

CONDITIONS FOR SETTING THE DTC

P0850 and P0851

- The ECM detects the Park/Neutral switch signal equals 0 volts (Park/Neutral) when the IMS reports a Drive range for 0.2 second.
- TP is equal to or greater than 10 percent.
- Engine torque is equal to or greater than 75 N.m (55 lb ft).
- Vehicle speed is equal or greater than 10 km/h (6 mph).

P0852

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

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0850, P0851, and P0852 are Type C DTCs.
- The ECM uses IMS Range 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

Description and Operation

Electronic Component Description

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. If there are any other transmission DTCs set, diagnose those DTCs first. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. Ignition ON, observe the scan tool ECM Park/Neutral Position Switch parameter while moving the gear shift lever from Park and through all ranges. The parameter should display Park/Neutral when in Park or Neutral and In-Gear when in Reverse or Drive.
3. Observe the scan tool TCM Internal Mode Switch A/B/C/P parameter while slowly moving the gear shift lever from Park through all ranges. Verify the gear shift lever position matches the scan tool Internal Mode Switch A/B/C/P parameter. Refer to **Transmission Internal Mode Switch Logic** .
 - If not the specified value, refer to **Range Selector Lever Cable Adjustment** .
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the 14-way harness connector at the transmission.
2. Install the **DT-48616-10:** harness to the 14-way harness connector to the vehicle harness.
3. Test for less than 10 ohms between the ground circuit terminal 2 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify with a scan tool the ECM Park/Neutral Position Switch parameter displays In Gear.
 - If not the expected results, test the signal circuit for a short to ground. If the circuit tests normal, replace the ECM.
5. Ignition ON, connect a 3A fused jumper wire between terminal 3 on the **DT-48616-10:** harness and ground at the transmission case. Verify with a scan tool the Park/Neutral Position Switch parameter displays Park/Neutral.
 - If not the expected results, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the ECM.
6. Ignition OFF, disconnect the **DT-48616-10:** harness from the vehicle harness connector.
7. Remove the transmission control valve body cover. Refer to **Control Valve Body Cover Replacement** .
8. Connect the vehicle harness connector to the control solenoid valve assembly.
9. Disconnect the automatic transmission internal mode switch electrical connector from the TCM.
10. Ignition ON, test for 11-13 volts between terminal F on the TCM and ground at the transmission case.
 - If not within the specified range, replace the control solenoid valve assembly.
11. If all circuits test normal, replace the automatic transmission internal mode switch.

REPAIR PROCEDURES

NOTE:

- Perform the **Transmission Adaptive Values Learn** following all

transmission related repairs.

- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

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

- **Control Module References** for ECM or control solenoid valve assembly replacement, setup, and programming
- **Range Selector Lever Cable Adjustment**
- **Control Valve Body Cover Replacement**
- **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**

DTC P0872 OR P0873

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0872

Transmission Fluid Pressure Switch 3 Circuit Low Voltage

DTC P0873

Transmission Fluid Pressure Switch 3 Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TFP Switch 1 Signal	P0842	P0843	P0843	-
TFP Switch 3 Signal	P0872	P0873	P0873	-
TFP Switch 4 Signal	P0877	P0878	P0878	-
TFP Switch 5 Signal	P0989	P0990	P0990	-

TYPICAL SCAN TOOL DATA

TFP Switch 3

Circuit	Short to Ground	Open/High Resistance	Short to Voltage

Operating Conditions: Engine running, normal operating temperature

Parameter Normal Range: High, Low

TFP Switch 3 Signal	Low	High	High
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CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 3 assembly is part of the control solenoid valve assembly which has no serviceable components. The transmission control module (TCM) supplies a signal circuit to the TFP switch 3. The TFP switch 3 has an internal case ground. TFP switch 3 is normally closed, or Low. When oil pressure is present at the TFP switch 3, the switch is open, or High. The normally low clutch pressure control (PC) solenoid 4 controls pressure to the 2-6 clutch regulator valve. The TCM monitors the TFP switch 3 to determine the position of the 2-6 clutch regulator valve. When the 2-6 clutch is commanded OFF, pressure is present on the TFP switch 3. When the 2-6 clutch is commanded ON, the 2-6 clutch regulator valve moves and pressure to the TFP switch 3 is exhausted through the 2-6 clutch regulator valve.

CONDITIONS FOR RUNNING THE DTC

- No DTCs P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P182E, or P1915.
- The engine speed is 500 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature (TFT) is 0-110°C (32-230°F).
- The High Side Driver is ON.
- The engine speed is 550 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P0872

The TCM detects that the TFP switch 3 signal voltage remains LOW after the 2-6 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 16 counts are accumulated.

P0873

The TCM detects that the TFP switch 3 signal voltage remains HIGH after the 2-6 clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 28 counts are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0872 and P0873 are type C DTCs.
- The TCM freezes transmission adaptive functions on the 2-6 clutch.

CONDITIONS FOR CLEARING THE DTC

DTCs P0872 and P0873 are type C DTCs.

DIAGNOSTIC AIDS

A TFP switch may malfunction due to normal debris in the transmission fluid causing a TFP Switch DTC to intermittently set. This type of condition should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptive pressure and do not cause transmission symptoms unless the switch malfunctions continuously for an extended period of time.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

- **Transmission General Description**
- **Electronic Component Description** for control solenoid valve assembly
- **Transmission Component and System Description**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Chock the wheels to prevent the vehicle from moving. Failure to chock the wheels can cause personal injury when the electrical

system is repaired.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Monitor the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters with a scan tool.
3. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
4. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
 - If any TFP switch parameter state does not match the logic table, replace the control solenoid valve assembly.
5. Operate the vehicle within the conditions for running the DTC to verify the TDC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

NOTE:

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

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

Control Module References for control solenoid valve assembly replacement, setup, or programming.

DTC P0877 OR P0878

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0877

Transmission Fluid Pressure Switch 4 Circuit Low Voltage

DTC P0878

Transmission Fluid Pressure Switch 4 Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TFP Switch 1 Signal	P0842	P0843	P0843	-
TFP Switch 3 Signal	P0872	P0873	P0873	-
TFP Switch 4 Signal	P0877	P0878	P0878	-
TFP Switch 5 Signal	P0989	P0990	P0990	-

TYPICAL SCAN TOOL DATA

TFP Switch 4

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature			
Parameter Normal Range: High, Low			
TFP Switch 4 Signal	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 4 assembly is part of the control solenoid valve assembly which has no serviceable components. The transmission control module (TCM) supplies a signal circuit to the TFP switch 4. The TFP switch 4 has an internal case ground. TFP switch 4 is normally closed, or Low. When oil pressure is present at the TFP switch 4, the switch is open, or High. The normally low clutch pressure control (PC) solenoid 5 controls pressure to the 1-2-3-4 clutch regulator valve. The TCM monitors the TFP switch 4 to determine the position of the 1-2-3-4 clutch regulator valve. When the 1-2-3-4 clutch is commanded OFF, pressure is present on the TFP switch 4. When the 1-2-3-4 clutch is commanded ON, the 1-2-3-4 clutch regulator valve moves and pressure to the TFP switch 4 is exhausted through the 1-2-3-4 clutch regulator valve.

CONDITIONS FOR RUNNING THE DTC

- No DTCs P0711, P0712, P0713, P0973, P0974, P0976, P0977, P182E or P1915.
- The engine speed is 500 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature (TFT) is 0-110°C (32-230°F).
- The High Side Driver is ON.
- The engine speed is 550 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P0877

The TCM detects that the TFP switch 4 signal voltage remains LOW after the 1-2-3-4 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 8 counts are accumulated.

P0878

The TCM detects that the TFP switch 4 signal voltage remains HIGH after the 1-2-3-4 clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 8 counts are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0877 and P0878 are type C DTCs.
- The TCM freezes transmission adaptive functions on the 1-2-3-4 clutch.

CONDITIONS FOR CLEARING THE DTC

DTCs P0877 and P0878 are type C DTCs.

DIAGNOSTIC AIDS

A TFP switch may malfunction due to normal debris in the transmission fluid causing a TFP Switch DTC to intermittently set. This type of condition should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptive pressure and do not cause transmission symptoms unless the switch malfunctions continuously for an extended period of time.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

- **Transmission General Description**
- **Electronic Component Description** for control solenoid valve assembly
- **Transmission Component and System Description**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Chock the wheels to prevent the vehicle from moving. Failure to chock the wheels can cause personal injury when the electrical system is repaired.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Monitor the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters with a scan tool.
3. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch parameter states are correct for each range. Refer to Transmission Fluid Pressure Switch Logic .
4. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch parameter states are correct for each range. Refer to Transmission Fluid Pressure Switch Logic .
 - If any TFP switch parameter state does not match the logic table, replace the control solenoid valve assembly.
5. Operate the vehicle within the conditions for running the DTC to verify the TDC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

NOTE:

- Perform the Transmission Adaptive Values Learn following all transmission related repairs.
- Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

Control Module References for control solenoid valve assembly replacement, setup, or programming.

DTC P0961-P0963

DIAGNOSTIC INSTRUCTIONS

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P0961

Line Pressure Control Solenoid Valve System Performance

DTC P0962

Line Pressure Control Solenoid Valve Control Circuit Low Voltage

DTC P0963

Line Pressure Control Solenoid Valve Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Line PC Solenoid Control	P0962	P0963	P0963	P0961

TYPICAL SCAN TOOL DATA

Line Pressure Control Solenoid Valve Performance Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Line Pressure Control Solenoid Valve Control	-	-	-	Fault or Malfunction

Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Line Pressure Control Solenoid Valve Control	Fault or Malfunction	-	-	-

Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature				

Parameter Normal Range: OK

Line Pressure Control Solenoid Valve Control	-	Fault or Malfunction	Fault or Malfunction	-
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CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0961, P0962, or P0963

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P0961

The TCM detects an internal electrical malfunction of the line PC solenoid where the measured line PC solenoid current does not equal the commanded line PC solenoid current for 5 seconds.

P0962

The TCM detects a short to ground on the line PC solenoid control circuit for 2 seconds.

P0963

The TCM detects an open circuit or short to voltage on the line PC solenoid control circuit for 5 seconds.

ACTION TAKEN WHEN THE DTC SETS

P0961

- DTC P0961 is a Type C DTC.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.

P0962

- DTC P0962 is a Type A DTC.
- The TCM defaults the transmission to 5th gear and reverse.
- The TCM inhibits the torque converter clutch (TCC).
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM turns the high side driver OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM enables torque management.

P0963

- DTC P0963 is a Type B DTC.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.

CONDITIONS FOR CLEARING THE DIC/DTC

- DTC P0961 is a Type C DTC.
- DTC P0962 is a Type A DTC.
- DTC P0963 is a Type B DTC.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. Engine running in PARK position. Move the gear shifter lever into each gear position and back into PARK position. Verify with a scan tool, the following test status parameters display OK.
 - Line Pressure Control Solenoid Valve Performance Test Status
 - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
 - Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
2. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
5. Ignition ON, verify with a scan tool the following test status parameters display OK.
 - Line Pressure Control Solenoid Valve Performance Test Status
 - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

- Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
 - If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: **Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .**

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Control Solenoid Valve and Transmission Control Module Assembly Cleaning** procedure.

DTC P0965-P0967

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0965

Pressure Control Solenoid Valve 2 System Performance

DTC P0966

Pressure Control Solenoid Valve 2 Control Circuit Low Voltage

DTC P0967

Pressure Control Solenoid Valve 2 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Pressure Control Solenoid Valve 2 Control	P0966	P0977	P0977	P0965

TYPICAL SCAN TOOL DATA

Pressure Control Solenoid Valve 2 Performance Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 2 Control	-	-	-	Fault or Malfunction

Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 2 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 2 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0965, P0966, or P0967

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P0965

The TCM detects an internal electrical performance malfunction of the clutch PC solenoid 2 control circuit where the measured clutch PC solenoid 2 current does not equal the commanded clutch PC solenoid 2 current for 5 seconds.

P0966

The TCM detects a short to ground on the clutch PC solenoid 2 control circuit for 1 second.

P0967

The TCM detects an open or short to voltage on the clutch PC solenoid 2 control circuit for 1 second.

ACTION TAKEN WHEN THE DTC SETS

P0965

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

P0966

- DTC P0966 is a Type A DTC.
- The TCM defaults the transmission to 5th gear or reverse.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.
- The TCM forces HSD 1 OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM enables torque management.

P0967

- DTC P0967 is a Type A DTC.
- The TCM forces TCC OFF.
- The TCM defaults the transmission to 3rd gear or reverse.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle in PARK for 5 seconds.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges. Verify with a scan tool, the following test status parameters display OK.
 - Pressure Control Solenoid Valve 2 Performance Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
 2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
 3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
 4. Connect **DT-48616-10**: harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
 5. Ignition ON, verify with a scan tool the following test status parameters display OK.
 - Pressure Control Solenoid Valve 2 Performance Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
- If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Control Solenoid Valve and Transmission Control Module Assembly Cleaning** procedure.

DTC P0969-P0971

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0969

Pressure Control Solenoid Valve 3 Performance

DTC P0970

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage

DTC P0971

Pressure Control Solenoid Valve 3 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Pressure Control Solenoid 3 Control	P0970	P0971	P0971	P0969

TYPICAL SCAN TOOL DATA

Pressure Control Solenoid Valve 3 Performance Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3 Control	-	-	-	Fault or Malfunction

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 3 is part of the control solenoid valve assembly which has no serviceable components. The normally high clutch PC solenoid 3 regulates and directs oil pressure to the R1/4-5-6 regulator valve. Increasing clutch PC solenoid 3 pressure increases pressure to the reverse low or 4-5-6 clutch, depending on the position of the clutch select valve. The transmission control module (TCM) PC Solenoid 3 low side driver varies current to the solenoid. Decreasing the current to clutch PC solenoid 3 increases oil pressure by closing off the solenoid exhaust port. Increasing the current to the clutch PC solenoid 3 decreases oil pressure by opening the exhaust port. Clutch PC solenoid 3 power is supplied by the TCM through a high side driver (HSD). The HSD protects the circuit and components from excessive current flow. If excessive current flow is detected, the HSD will turn OFF. When the fault is corrected, the HSD will reset.

CONDITIONS FOR RUNNING THE DTC

P0969, P0970, or P0971

- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P0969

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

P0970

The TCM detects a short to ground on the clutch PC solenoid 3 control circuit for 1 second.

P0971

The TCM detects an open or short to voltage on the clutch PC solenoid 3 control circuit for 1 second.

ACTION TAKEN WHEN THE DTC SETS

P0969

- DTC P0969 is a Type C DTC.

- The TCM freezes transmission adaptive functions on the low and reverse clutch and the 4-5-6 clutch.

P0970

- DTC P0970 is a Type A DTC.
- The TCM limits the transmission to 5th gear and reverse.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM forces the high side driver OFF.
- The TCM enables torque management.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

P0971

- DTC P0971 is a Type A DTC.
- The TCM limits the transmission to 4th gear and reverse.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.
- The TCM enables torque management.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- **Component Connector End Views**
- **Inline Harness Connector End Views**

Description and Operation

- **Transmission General Description**

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle in PARK for 5 seconds.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges. Verify with a scan tool, the following test status parameters display OK.
 - Pressure Control Solenoid Valve 3 Performance Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- 3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
 - 4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
 - 5. Ignition ON, verify with a scan tool the following test status parameters display OK.
 - Pressure Control Solenoid Valve 3 Performance Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
- If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: **Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .**

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Control Solenoid Valve and Transmission Control Module Assembly Cleaning** procedure.

DTC P0973 OR P0974

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0973

Shift Solenoid Valve 1 Control Circuit Low Voltage

DTC P0974

Shift Solenoid Valve 1 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

	Short to	Open/High	Short to	Signal
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Circuit	Ground	Resistance	Voltage	Performance
Shift Solenoid Valve 1 Control	P0973	P0974	P0974	-

TYPICAL SCAN TOOL DATA

Shift Solenoid Valve 1 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK			
Shift Solenoid Valve 1 Control	-	-	Fault or Malfunction

Shift Solenoid Valve 1 Control Circuit Open Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK			
Shift Solenoid Valve 1 Control	-	Fault or Malfunction	-

Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK			
Shift Solenoid Valve 1 Control	Fault or Malfunction	-	-

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0973 or P0974

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P0973

The control solenoid valve assembly detects an internal low voltage electrical malfunction of the SS 1 control circuit when the SS 1 is commanded OFF for 2 seconds.

P0974

The control solenoid valve assembly detects an internal high voltage electrical malfunction of the SS 1 control circuit when the SS 1 is commanded ON for 2 seconds.

ACTION TAKEN WHEN THE DTC SETS

P0973

- DTC P0973 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.
- The TCM defaults the transmission to 2nd gear and reverse.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.

P0974

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

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**
- **Inline Harness Connector End Views**

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Place the gear selector in Reverse for 5 seconds and then idle vehicle for 5 seconds. Verify with a scan tool, the following test status parameters displays OK.
 - Shift Solenoid Valve 1 Control Circuit Open Test Status
 - Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
 - Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to Control Solenoid Valve and Transmission Control Module Assembly Replacement .
2. Perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .
3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly.
5. Ignition ON, verify with a scan tool the following test status parameters display, OK.

- Shift Solenoid Valve 1 Control Circuit Open Test Status
- Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
- Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status

○ If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

DTC P0989 OR P0990

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P0989

Transmission Fluid Pressure Switch 5 Circuit Low Voltage

DTC P0990

Transmission Fluid Pressure Switch 5 Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Transmission Fluid Pressure Switch 1 Signal	P0842	P0843	P0843	-
Transmission Fluid Pressure Switch 3 Signal	P0872	P0873	P0873	-
Transmission Fluid Pressure Switch 4 Signal	P0877	P0878	P0878	-
Transmission Fluid Pressure Switch 5 Signal	P0989	P0990	P0990	-

TYPICAL SCAN TOOL DATA

Transmission Fluid Pressure Switch 5

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: High, Low			
Transmission Fluid Pressure Switch 5 Signal	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 5 assembly is part of the control solenoid valve assembly which has no serviceable components. The transmission control module (TCM) supplies a signal circuit to the TFP switch 5. The TFP switch 5 has an internal case ground. TFP switch 5 is normally closed, or Low. When oil pressure is present at the TFP switch 5, the switch is open, or High. The normally high clutch pressure control (PC) solenoid 3 controls pressure to the R1/4-5-6 clutch regulator valve. The TCM monitors the TFP switch 5 to determine the position of the R1/4-5-6 clutch regulator valve. When the low and reverse clutch and 4-5-6 clutch are commanded OFF, pressure is present on the TFP switch 5. When the low and reverse clutch or 4-5-6 clutch is commanded ON, the R1/4-5-6 clutch regulator valve moves and pressure to the TFP switch 5 is exhausted through the R1/4-5-6 clutch regulator valve.

CONDITIONS FOR RUNNING THE DTC

- No DTCs P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P1915, or P182E.
- The engine speed is 500 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature (TFT) is 0-110°C (32-230°F).
- The high side driver is ON.

CONDITIONS FOR SETTING THE DTC

P0989

The TCM detects that the TFP switch 5 signal voltage remains LOW after the low and reverse clutch or 4-5-6 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 15 counts are accumulated.

P0990

The TCM detects that the TFP switch 5 signal voltage remains HIGH after the low and reverse clutch or 4-5-6 clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 26 counts are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0989 and P0990 are Type C DTCs.
- The TCM freezes transmission adaptive functions on the low and reverse clutch and 4-5-6 clutch.

CONDITIONS FOR CLEARING THE DTC

DTCs P0989 and P0990 are Type C DTCs.

DIAGNOSTIC AIDS

A TFP switch may malfunction due to normal debris in the transmission fluid causing a TFP Switch DTC to intermittently set. This type of condition should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptive pressure and do not cause transmission symptoms unless the switch malfunctions continuously for an extended period of time.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

WARNING: Chock the wheels to prevent the vehicle from moving. Failure to chock the wheels can cause personal injury when the electrical system is repaired.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Monitor the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission

Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters with a scan tool.

3. Place the gear select lever in Park, Reverse, and Neutral range. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
4. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the TFP switch parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
 - If any TFP switch parameter state does not match the logic table, replace the control solenoid valve assembly.
5. Operate the vehicle within the conditions for running the DTC to verify the TDC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

NOTE:

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

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

Control Module References for control solenoid valve assembly replacement, setup, or programming.

DTC P150C

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P150C

Transmission Control Module Engine Speed Request Signal Message Counter Incorrect

CIRCUIT/SYSTEM DESCRIPTION

To improve vehicle shift feel, the transmission control module (TCM) is constantly sending the engine control module (ECM) serial data messages with information regarding its request for modifying engine speed or torque. The ECM sets this code when it detects a discrepancy in the structure of this message causing its integrity to be questioned.

An intermittent fault in the controller area network (CAN) circuits will cause DTC P150C to set.

CONDITIONS FOR RUNNING THE DTC

- The engine is running.
- No other CAN errors are present.

CONDITIONS FOR SETTING THE DTC

The ECM detects greater than 2 message count errors.

ACTION TAKEN WHEN THE DTC SETS

- The ECM Disables engine speed requests from transmission.
- DTC P150C is a Type B DTC.
- The TCM commands maximum line pressure during shifts.

CONDITIONS FOR CLEARING THE DTC

DTC P150C is a Type B DTC.

REFERENCE INFORMATION

Description and Operation

Data Link Communications Description and Operation

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

- DTC P150C is an informational DTC. Diagnose all other Engine Control DTCs prior to DTC P150C. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
- If there are no other Engine Controls DTCs, diagnosis is accomplished by looking for an intermittent CAN circuit fault. Refer to **Scan Tool Does Not Communicate with High Speed GMLAN Device** .

REPAIR PROCEDURES

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

Control Module References for control solenoid valve assembly replacement, setup, and programming.

DTC P1751

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P1751

Shift Valve 1 Performance

CIRCUIT/SYSTEM DESCRIPTION

The shift solenoid (SS) 1 is part of the control solenoid valve assembly, which has no serviceable components. SS 1 provides fluid pressure to control the operation of the clutch select valve 2, which is located in the control valve body assembly. SS 1, in conjunction with clutch select valve 2, controls fluid to the R1 and 4-5-6 clutches. A diagnostic test is performed by the transmission control module (TCM) to determine the state of the clutch select valve 2. During this diagnostic test, the TCM commands the SS 1 ON, supplying pressure to move the clutch select valve 2 toward its spring. At the same time, line pressure is elevated slightly to assist the spring side pressure. If the spring is broken, or the clutch select valve 2 cannot move due to another mechanical condition, the DTC will set.

CONDITIONS FOR RUNNING THE DTC

- No ISS DTCs P0716 or P0717.
- No OSS DTCs P0722 or P0723.
- No TCC Performance DTCs P0741 or P0742.
- No TCC Electrical DTCs P2763, P2763, or P2764.
- DTC 1751 has not failed this ignition cycle.
- The engine run time is greater than 5 seconds.
- The ignition voltage is between 8.6 volts and 19.0 volts.
- The transmission fluid temperature (TFT) is 20-130°C (68-266°F).
- The calc. throttle position is 8 percent or greater.
- The engine torque is greater than 80 N.m (59 lb ft).
- No upshift or downshift in process.
- The attained gear slip is equal to or greater than 100 RPM.
- The TCC is commanded OFF.
- Vehicle speed is greater than 16 km/h (20 mph).
- The TISS is equal to or greater than 1,100 RPM.
- Commanded gear is 2nd or greater.

- The gear ratio is between 0.69-1.97.
- Solenoid A is enabled.

CONDITIONS FOR SETTING THE DTC

The TCM detects attained gear slip is 150 RPM or greater for 0.5 second 5 times during the same ignition cycle.

ACTION TAKEN WHEN THE DTC SETS

DTC P1751 is a Type B DTC.

CONDITIONS FOR CLEARING THE DTC

DTC P1751 is a Type B DTC.

DIAGNOSTIC AIDS

DTC P1751 detects gear box slip when the mode 2 valve solenoid is commanded on as part of the P0742 TCC stuck OFF test.

REFERENCE INFORMATION

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

CIRCUIT/SYSTEM VERIFICATION

1. Perform the [Transmission Fluid Level and Condition Check](#) to verify correct fluid level and condition.

NOTE: Perform a scan tool snapshot during the road test.

2. Perform the [Road Test](#) . Verify the transmission operation performs as indicated in the road test instructions.
3. Review the scan tool snapshot transmission data parameters. Verify the following engine and

transmission data parameters display the correct values in all forward gear ranges.

- Engine Speed
 - Vehicle Speed
 - Transmission ISS
 - Transmission OSS
 - Shift Solenoid Valve 1
 - Gear Command
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Perform the **Line Pressure Check** . Verify the transmission line pressure gauge is within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified ranges, refer to **Fluid Pressure High or Low** for further diagnosis.
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the performance test, replace the control solenoid valve assembly.
4. Listed in the table below are conditions for each component that could set DTC P1751. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P1751	Control Valve Body Assembly	Clutch select valve stuck, spring broken, debris, or damage
P1751	Channel Plate to Valve Body Spacer Plate	Orifice #2 blocked, obstructed, or irregular shaped
P1751	Channel Plate to Valve Body Spacer Plate	Checkball #1 ball seat blocked, obstructed, or irregular shaped (burr or flashing on hole(s))
P1751	Control Valve Body Assembly	Checkball #1 damaged or irregular shaped

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P1761

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

CIRCUIT/SYSTEM DESCRIPTION

A 12 volt signal circuit is provided by the body control module (BCM) to the plus or minus buttons. When a plus or minus button is pressed, a corresponding voltage drop occurs across the resistor network embedded in the switches. 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 is constantly monitoring the serial data sent from the BCM for the correct number and sequence of counts for Tap Up and Tap Down function.

CONDITIONS FOR RUNNING THE DTC

The engine speed is greater than 500 RPM for 5 seconds.

CONDITIONS FOR SETTING THE DTC

The transmission control module (TCM) detects the serial data rolling count value for the Tap Up/Tap Down does not match with the expected body control module (BCM) count, 3 or greater times in 10 seconds.

ACTION TAKEN WHEN THE DTC SETS

- DTC P1761 is a Type C DTC.
- The TCM inhibits the Tap Up Tap Down function.

CONDITIONS FOR CLEARING THE DTC

DTC P1761 is a Type C DTC.

REFERENCE INFORMATION

Description and Operation

Electronic Component Description for control solenoid valve assembly information.

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. DTC P1761 is an informational DTC. Diagnose all other BCM DTCs prior to DTC P1761. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. If there are no other body control DTCs, diagnosis is accomplished by looking for an intermittent CAN circuit fault. Refer to **Scan Tool Does Not Communicate with High Speed GMLAN Device** .
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

REPAIR PROCEDURES

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

- **Control Module References** for BCM and control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P1763

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P1763

Trans Mode Switch C circuit

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Trans Mode Switch C Signal	P1763	-	-	P1763

CIRCUIT/SYSTEM DESCRIPTION

Winter mode programming in the transmission control module (TCM) will allow the driver selection of a third gear start in order to reduce wheel spin under low traction conditions. The winter mode switch is a console mounted momentary contact switch located on the electronic PRNDL assembly. Accessory voltage is supplied to the electronic PRNDL assembly through the ELEC PRNDL fuse. When the winter mode switch is depressed, it momentarily contacts the switch signal circuit. The rear integration module (RIM) recognizes the voltage on the circuit and sends a class 2 serial data message to the dash integration module (DIM). The DIM sends a class 2 message to the engine control module (ECM). The ECM sends a request to the TCM through the controller area network (CAN) to enable the winter mode program.

The TCM evaluates the request, and if operating conditions are correct for enabling the program, the TCM sends a confirmation message to the ECM. The ECM then requests the instrument panel cluster (IPC) to illuminate the winter mode indicator.

The winter mode feature remains enabled until the mode switch is pressed again, the transmission is placed in a lower gear, and certain vehicle speed, transmission fluid temperature, or accelerator pedal positions are exceeded. Once disabled, the TCM will resume a normal shift pattern.

CONDITIONS FOR RUNNING THE DTC

- The engine speed is greater than 500 RPM for 5 seconds.
- Ignition voltage is between 9.0 volts and 19.0 volts.

CONDITIONS FOR SETTING THE DTC

The TCM detects that the Winter Mode Switch has been continuously activated for 10 minutes.

ACTION TAKEN WHEN THE DTC SETS

- DTC P1763 is a Type C DTC.
- The TCM freezes transmission adaptive functions.

CONDITIONS FOR CLEARING THE DTC

DTC P1763 is a Type C DTC.

DIAGNOSTIC AIDS

- DTC P1763 detects a stuck winter pattern switch.
- Diagnose all communication and body DTCs first.
- Test the IPC for proper operation and lamp illumination. Refer to **Diagnostic System Check - Vehicle**.

- Test the RIM for proper winter mode switch input and output operation. Refer to **Control Module References** .

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, engine OFF. While observing the winter mode indicator on the IPC, press the winter mode switch several times. Does the winter mode indicator illuminate On and Off with switch operation?
 - Test the instrument panel cluster (IPC) for proper operation and lamp illumination. Refer to **Diagnostic System Check - Vehicle** .
 - Test the rear integration module (RIM) for proper winter mode switch input and output operation. Refer to **Control Module References** .
 - If the DTC resets, go to Circuit/System Testing.
2. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure

Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition ON, engine OFF. While observing the winter mode indicator on the IPC, press the winter mode switch several times. Is the winter mode indicator always ON?
 - Test the accessory voltage circuit for an open.
 - Test the winter mode switch signal circuit for an open.
 - Test the electronic PRNDL ground circuits for on open.
 - If an open circuit is found, replace the electronic PRNDL assembly.
2. While observing the winter mode indicator on the IPC, disconnect the electronic PRNDL assembly from the console wiring harness connector. Is the winter mode indicator still illuminated?
 - If the winter mode indicator is illuminated, replace the electronic PRNDL assembly.
3. Test the winter mode switch signal circuit for a short to ground. If the circuit test good replace the winter mode switch.

COMPONENT TESTING

1. Disconnect the electronic PRNDL assembly.
2. Connect a DMM, between the winter mode switch signal circuit and the ground circuit of the electronic PRNDL assembly.
3. Set the DMM to measure resistance. While observing the DMM, press the winter mode switch several times. Does the resistance toggle between very low resistance to very high resistance as the switch is pressed?
 - If the resistance toggles between very low resistance and very high resistance, replace the electronic PRNDL assembly.

REPAIR PROCEDURES

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

Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement

DTC P182E OR P1915

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P182E

Internal Mode Switch - Indicates Invalid Range

DTC P1915

Internal Mode Switch Does Not Indicate Park/Neutral During Start

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Transmission Range Signal A	P182E	P1915	P1915	P182E, P1915
Transmission Range Signal B	P1915	P182E	P182E	P182E, P1915
Transmission Range Signal C	P1915	P182E	P182E	P182E, P1915
Transmission Range Signal P	P182E	P1915	P1915	P182E, P1915
Ground	-	P182E	P182E	P182E, P1915

TYPICAL SCAN TOOL DATA

Internal Mode Switch A/B/C/P

Circuit	Normal Range	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, range selector in Park				
Transmission Range Switch Signal A	Low	Low	High	High
Transmission Range Switch Signal B	High	Low	High	High
Transmission Range Switch Signal C	High	Low	High	High
Transmission Range Switch Signal P	Low	Low	High	High
High = 12 volts				
Low = 0 volts				

CIRCUIT/SYSTEM DESCRIPTION

The internal mode switch (IMS) assembly is a sliding contact switch attached to the manual shift detent lever shaft inside the transmission. The 4 inputs to the transmission control module (TCM) from the switch indicate which position is selected by the transmission manual shaft. The input voltage at the TCM is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as IMS. The IMS input parameters represented are transmission range signal A, Signal B, signal C, and signal P.

CONDITIONS FOR RUNNING THE DTC

P182E

- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is 9.0 volts.
- No DTCs 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.

P1915

- No DTCs P0722, P0723, or P1915.
- The transmission output shaft speed is less than 90 RPM or less.
- The ignition voltage is 6.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P182E

The IMS does not indicate a valid Park, Reverse, Neutral, or Drive Range gear position for 7 seconds.

P1915

The manual shift shaft switch assembly does not indicate Park or Neutral during the following sequence:

- The engine speed is less than 50 RPM for greater than 0.10 second.
- The engine speed is 50-480 RPM for greater than 0.07 second.
- The engine speed is greater than 500 RPM for greater than 1.25 seconds.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P182E and P1915 are Type A DTCs.
- The TCM commands maximum line pressure.
- The TCM turns OFF all solenoids.
- The TCM freezes transmission adaptive functions.
- The TCM limits the transmission to reverse and 5th gear.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM turns the high side driver OFF.

CONDITIONS FOR CLEARING THE DTC

DTCs P182E and P1915 are Type A DTCs.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

- Transmission General Description
- Transmission Component and System Description
- Electronic Component Description for manual shift detent lever with shaft position switch assembly

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. Perform the Range Selector Lever Cable Adjustment procedure to verify proper adjustment.
2. Ignition ON, engine OFF, observe the scan tool Internal Mode Switch A/B/C/P parameter while moving the gear shift lever from Park, to Reverse and through all the ranges. The parameter should match each gear range that is selected. Refer to Transmission Internal Mode Switch Logic .
3. Observe the scan tool engine control module (ECM) PNP Switch parameter while moving the gear shift lever from Park, to Reverse and through all the ranges. The parameter should display Park/Neutral in the Park and Neutral positions, and In Gear in all other positions.
4. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, disconnect the 14-way harness connector at the transmission.

NOTE: **Under certain driving conditions, DTC P182E could set due to an intermittent low voltage fault on the P/N signal circuit, before conditions for setting DTC P0851 are met.**

2. Ignition ON, verify the scan tool ECM PNP Switch parameter displays In Gear.
 - If not the specified value, test the P/N signal circuit for a short to ground. If the circuit tests normal, replace the ECM.
3. Ignition OFF, remove the control valve body cover. Refer to **Control Valve Body Cover Replacement** .
4. Connect the TCM harness connector.
5. Disconnect the IMS connector at the control solenoid valve assembly.
6. Ignition ON, verify the scan tool Internal Mode Switch A/B/C/P parameter displays High for all 4 signal circuits.
 - If not the specified value, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
7. Connect a 3-amp fused jumper wire between each transmission range signal circuit terminal listed below and the IMS ground circuit, terminal A. The appropriate scan tool IMS A/B/C/P parameter should display Low when the terminal is connected to the IMS ground.
 - Switch Signal A terminal E
 - Switch Signal B terminal D
 - Switch Signal C terminal C
 - Switch Signal P terminal B
 - If not the specified value, replace the control solenoid valve assembly.
8. If all circuits test normal, replace the IMS.

REPAIR PROCEDURES

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

NOTE: **Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .**

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- For IMS replacement, perform the **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement** .

DTC P1876

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P1876

Up and Down Shift Enable Switch Circuit Low Voltage

CIRCUIT/SYSTEM DESCRIPTION

The transmission adaptive pressure (TAP) shift system allows the driver to manually shift gears by using the TAP shift switches located on the automatic transmission shifter. Pushing the Up switch will command an upshift and pushing the Down switch will command a downshift. The TAP shift system is activated when the gear selector is in the L (M) position and is deactivated in all other positions.

If the transmission control module (TCM) detects TAP enable switch Active and the internal mode switch (IMS) switch does not indicate L (M), DTC P1876 sets.

CONDITIONS FOR RUNNING THE DTC

- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is between 9.0 volts and 19.0 volts.
- No TAP system DTCs P0815, P0816, or P0826.
- No IMS DTCs P1825 or P1915.

CONDITIONS FOR SETTING THE DTC

The TCM detects a TAP Enable Switch request for 2 seconds when not in D6 range for 3 times.

ACTION TAKEN WHEN THE DTC SETS

- DTC P1876 is a Type C DTC.
- The TCM disables Tap shift functions.

CONDITIONS FOR CLEARING THE DIC/DTC

DTC P1876 is a Type C DTC.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

Component Connector End Views

Description and Operation

- **Transmission General Description**
- **Electronic Component Description**

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

1. Verify there are no IMS DTCs set.
 - If IMS DTCs are set, diagnose them first.
2. Ignition ON, transmission in Park, observe the scan tool Driver Shift Control parameter. The reading should display Inactive.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the harness connector at the transmission shift lever.
2. Ignition ON, verify that a test lamp illuminates between the ignition circuit terminal A and ground.
 - If the test lamp does not illuminate, test the IGN circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
3. Verify the scan tool Driver Shift Request parameter indicates Invalid.
 - If not the specified value, replace the BCM.

4. Ignition OFF, test for 300-600 ohms between the signal circuit terminal B and ground.
 - If less than the specified range, test the signal circuit for a short to ground. If the circuit tests normal, replace the BCM.
 - If greater than the specified range, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the BCM.
5. If all circuits test normal, test or replace the transmission shift lever.

COMPONENT TESTING

1. Ignition OFF, disconnect the harness connector at the transmission control.
2. Test for 6.74-6.94 k ohms between terminals A and B.
 - If not within the specified range, replace the transmission control.
3. Test for 1.77-1.97 k ohms between terminals A and B while pressing the upshift button.
 - If not within the specified range, replace the transmission control.
4. Test for 3.87-4.07 k ohms between terminals A and B while pressing the downshift button.
 - If not within the specified range, replace the transmission control.

REPAIR PROCEDURES

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

NOTE:

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**.
- **Transmission Control Replacement** for AT TAP shift switch replacement.
- **Control Module References** for body control module (BCM) or control solenoid valve assembly replacement, setup, and programming

DTC P2534

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTOR

DTC P2534

Ignition On/Start Switch Circuit Low Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition 1 voltage	P2534 open fuse	P2534	-	P0562, P0563

CIRCUIT/SYSTEM DESCRIPTION

The transmission control module (TCM) continuously monitors the system voltage on the TCM Ignition voltage circuit. Lower than normal voltage may be inadequate to operate the transmission control solenoids properly. Improper solenoid operation may cause erratic transmission operation, which may result in internal damage.

CONDITIONS FOR RUNNING THE DTC

The engine control module (ECM) communicates that the engine is running through the controller area network (CAN).

CONDITIONS FOR SETTING THE DTC

The TCM detects 6 volts or less on the ignition voltage circuit at the TCM for 7 seconds.

ACTION TAKEN WHEN THE DTC SETS

- DTC P2534 is a Type A DTC.
- The TCM turns OFF all high side drivers.
- The TCM turns OFF all solenoids.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM commands the torque converter clutch (TCC) OFF.
- The TCM limits the transmission to reverse and 5th gear.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

DTC P2534 is a Type A DTC.

DIAGNOSTIC AIDS

- Observe the driver information center (DIC) messaging that would indicate the electrical system requires service.
- Inspect for the following conditions:
 - Loose or damaged terminals at the generator

- Loose or worn generator drive belt

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Engine ON, accessories OFF, measure and record the battery voltage at the battery terminals. The voltage should be between 12.6-15.0 volts.
 - If the voltage is not within the specified range, or the charge indicator light is on, refer to Charging

System Test

1. Observe the scan tool TCM Ignition Voltage parameter. The reading should be between 12.6-15.0 volts.
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

1. Ignition OFF, disconnect the 14-way harness connector at the transmission.
2. Connect the **DT-48616-10:** harness to the 14-way transmission harness connector.
3. Test for less than 10 ohms between the ground circuit terminal 2 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. Ignition ON, verify that a test lamp illuminates between the B+ and ignition circuit terminals listed below and ground.
 - Terminal 1
 - Terminal 12
 - Terminal 13
 - If the test lamp does not illuminate, test the affected B+ or ignition circuit for a short to ground or an open/high resistance.
5. If all circuits test normal, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement**.

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection.

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

DTC P2714 OR P2715

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P2714

Clutch Pressure Control Solenoid 4 - Stuck Off

DTC P2715

Clutch Pressure Control Solenoid 4 - Stuck On

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. The PC solenoid 4 regulates transmission fluid pressure (TFP) 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 RPM signals from the input speed sensor (ISS) and the output speed sensor (OSS). 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.
- The high side driver is enabled.
- The throttle position signal is valid.
- The ignition voltage is 9.0 volts or greater.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission input shaft speed is 80 RPM or greater.
- The 2-6 clutch is commanded ON.
- The output speed is greater than 650 RPM or the throttle position is greater than 0.5 percent.

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.
- The ignition voltage is 9.0 volts or greater.
- The transmission output shaft speed is 200 RPM or greater.
- The 2-6 clutch is commanded OFF.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The attained range is not 1st gear.
- The high side driver is enabled.
- The transmission input speed is 200 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P2714

The TCM detects an incorrect on-coming clutch gear ratio, or shift flare.

P2715

The TCM detects an incorrect off-going clutch gear ratio, or shift tie-up.

ACTION TAKEN WHEN THE DTC SETS

P2714

- DTC P2714 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 3rd gear.

P2715

- DTC P2715 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits the Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 2nd gear.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P2714 and P2715 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

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

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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

CIRCUIT/SYSTEM VERIFICATION

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

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Perform the [Transmission Fluid Level and Condition Check](#) to verify correct fluid level and condition.
3. Perform the [Control Solenoid Valve and Transmission Control Module Assembly Cleaning](#) to dislodge debris and free up the valves.
4. Monitor the Transmission Fluid Pressure Switch 3 with a scan tool. Place the gear select lever in Park, Reverse, and Neutral range. Verify the Transmission Fluid Pressure Switch 3 parameter states are correct for Park, Reverse, and Neutral. Refer to [Transmission Fluid Pressure Switch Logic](#) .
5. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the Transmission Fluid Pressure Switch 3 parameter states are correct for all forward ranges. Refer to [Transmission Fluid Pressure Switch Logic](#) .
6. Engine idling in Park, verify with a scan tool the ISS/OSS Supply Voltage parameter displays OK.
7. Engine idling in Park. Observe the Transmission ISS parameter on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.
8. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the Transmission OSS parameter on the scan tool. The Transmission OSS parameter should vary with the vehicle speed and not drop out.

NOTE: Perform a scan tool snapshot, during the road test.

9. Perform the [Road Test](#) . Verify the transmission operation performs as indicated in the road test instructions.
10. Review the scan tool snapshot data. Verify the following transmission data parameters display the correct values for each gear range.

- Transmission ISS
- Transmission OSS
- Pressure Control Solenoid Valve 4
- Transmission Fluid Pressure Switch 3

11. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified range, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the performance test, replace the control solenoid valve assembly.
4. Inspect for the following conditions and repair/replace as necessary.

DTCs	Component	Condition
P2714 P2715	Control Valve Body Assembly	2-6 clutch regulator valve stuck/sticking, debris, binding, damaged valve, or scored bore
P2714 P2715	Control Solenoid Valve Assembly	• Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal • O-ring seals leaking
P2714 P2715	Trans 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	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	Torque Converter (w/fluid pump) Housing Assembly	Fluid pump housing/gear damaged/scored
P2714	A/Trans Fluid Filter Assembly	Oil filter or filter seal loose or damaged

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the:
 - **Internal Components Removal**
 - **2-6 Clutch Piston Removal**
 - **Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble**
 - **2-6 Clutch Piston Installation**
 - **3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation**

DTC P2719-P2721

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P2719

Clutch Pressure Control Solenoid Valve 4 System Performance

DTC P2720

Clutch Pressure Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Clutch Pressure Control Solenoid Valve 4 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

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

Clutch PC Solenoid 4 Control	P2720	P2721	P2721	P2719
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TYPICAL SCAN TOOL DATA

Pressure Control Solenoid Valve 4 Performance Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 4 Control	-	-	-	Fault or Malfunction

Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 4 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid Valve 4 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. The normally low clutch PC solenoid 4 regulates and directs oil pressure to the 2-6 clutch regulator valve. Increasing clutch PC solenoid 4 pressure increases pressure to the 2-6 clutch. The transmission control module (TCM) PC solenoid 4 low side driver varies current to the solenoid. Increasing the current to the clutch PC solenoid 4 increases oil pressure by closing off the solenoid exhaust port. Decreasing the current to the clutch PC solenoid 4 decreases oil pressure by opening the exhaust port. PC solenoid 4 power is supplied by the TCM through a high side driver (HSD). The HSD protects the circuit and components from excessive current flow. If excessive current flow is detected, the HSD will turn OFF. When the fault is corrected, the HSD will reset.

CONDITIONS FOR RUNNING THE DTC

P2719, P2720, or P2721

- The engine speed is 500 RPM or greater for 5 seconds.

- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P2719

The TCM detects an internal electrical performance malfunction of the clutch PC solenoid 4 control circuit where the measured clutch PC solenoid 4 current does not equal the commanded clutch PC solenoid 4 current for 5 seconds.

P2720

The TCM detects a short to ground on the clutch PC solenoid 4 control circuit for 1 second.

P2721

The TCM detects an open or short to voltage on the clutch PC solenoid 4 control circuit for 1 second.

ACTION TAKEN WHEN THE DTC SETS

P2719

- DTC P2719 is a Type C DTC.
- The TCM freezes transmission adaptive functions on the 2-6 clutch.

P2720

- DTC P2720 is a Type A DTC.
- The TCM defaults the transmission to 2nd gear and reverse.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Tap Down function.
- The TCM inhibits manual up, manual down shifts with the shift selector.

P2721

- The DTC P2721 is a Type A DTC.
- The TCM defaults the transmission to 3rd gear and reverse.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle in PARK for 5 seconds.

2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges. Verify with a scan tool, the following test status parameters display OK.
 - Pressure Control Solenoid Valve 4 Performance Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
 2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
 3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
 4. Connect **DT-48616-10**: harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly.
 5. Ignition ON, verify with a scan tool the following test status parameters display, OK.
 - Pressure Control Solenoid Valve 4 Performance Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
- If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection**

DTC P2723 OR P2724

DIAGNOSTIC INSTRUCTIONS

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC DESCRIPTORS

DTC P2723

Pressure Control Solenoid Valve 5 - Stuck Off

DTC P2724

Pressure Control Solenoid Valve 5 - Stuck On

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 5 is part of the control solenoid valve assembly, which has no serviceable components. The PC solenoid 5 regulates transmission fluid pressure (TFP) 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 RPM signals from the input speed sensor (ISS) and the output speed sensor (OSS). The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

CONDITIONS FOR RUNNING THE DTC

P2723

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- The ignition voltage is 9.0 volts or greater.
- The throttle position signal is valid.
- The engine speed is 500 RPM or greater for 5 seconds.
- The high side driver (HSD) is enabled.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output speed is 650 RPM or greater or the throttle position is 0.5 percent or greater.

P2724

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The high HSD is ON.
- The transmission output shaft speed is 200 RPM or greater.
- The transmission input shaft speed is 200 RPM or greater.

- The commanded range is not 1st gear.

CONDITIONS FOR SETTING THE DTC

P2723

The TCM detects an incorrect on-coming clutch gear ratio, or shift flare.

P2724

The TCM detects an incorrect off-going clutch gear ratio, or shift tie-up.

ACTION TAKEN WHEN THE DTC SETS

P2723

- DTC P2723 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Tap Down.
- The TCM inhibits Manual Up/Manual Down with the gear selector.
- Torque management is enabled.
- The TCM limits the transmission to reverse and 5th range.

P2724

- DTC P2724 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Tap Down.
- The TCM inhibits Manual Up/Manual Down with the gear selector.
- The TCM limits the transmission to reverse and 3rd range.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P2723 and P2724 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

Description and Operation

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

For Hydraulic Schematic reference and description, refer to:

- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range - Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Fifth Gear Default**
- **Drive Range, Sixth Gear**

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 DTC s first.

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Perform the **Transmission Fluid Level and Condition Check** , to verify correct fluid level and condition.
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Cleaning** , to dislodge debris and free up the valves.
4. Monitor the Transmission Fluid Pressure Switch 4 with a scan tool. Place the gear select lever in Park, Reverse, and Neutral range. Verify the Transmission Fluid Pressure Switch 4 parameter states are correct for Park, Reverse, and Neutral. Refer to **Transmission Fluid Pressure Switch Logic** .
5. Place the gear select lever in Drive range. Command the shift transmission with a scan tool through all forward ranges. Verify the Transmission Fluid Pressure Switch 4 parameter states are correct for all forward ranges. Refer to **Transmission Fluid Pressure Switch Logic** .
6. Engine idling in Park, verify with a scan tool the ISS/OSS Supply Voltage parameter displays OK.

7. Engine idling in Park. Observe the Transmission ISS parameter on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.
8. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the Transmission OSS parameter on the scan tool. The Transmission OSS parameter should vary with the vehicle speed and not drop out.

NOTE: Perform a scan tool snapshot, during the road test.

9. Perform the **Road Test** . Verify the transmission operation performs as indicated in the road test instructions.
10. Review the scan tool snapshot data. Verify the following transmission data parameters display the correct values for each gear range.
 - Transmission ISS
 - Transmission OSS
 - Pressure Control Solenoid Valve 5
 - Transmission Fluid Pressure Switch 4
11. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Perform the **Line Pressure Check** . Verify the transmission line pressures are within the range specified in the Line PC Solenoid Valve Pressure table. Refer to **Solenoid Valve Pressure** .
 - If not within the specified range, refer to **Fluid Pressure High or Low** .
2. Ignition OFF, remove the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
3. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test** .
 - If the control solenoid valve assembly does not pass the performance test, replace the control solenoid valve assembly.
4. Inspect for the following conditions and repair or replace as necessary.

DTCs	Component	Condition
P2723 P2724	Control Valve Body Assembly	1-2-3-4 clutch regulator valve stuck/sticking - debris, binding, damaged valve, or scored bore
P2723 P2724	Control Solenoid Valve Assembly (314)	• O-ring seals leaking • Valve body filter plate assembly cracked, blocked, or damaged gasket seal
P2723	Lo and Reverse and 1-2-3-4 Clutch Housing Assembly (51)	1-2-3-4 clutch piston (414) cracked/damaged/leaking

P2723	Output Sun Gear Assembly	Housing/hub weld cracked/leaking
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 overtravel
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	Automatic Transmission Fluid Filter Assembly	Oil filter or filter seal loose or damaged

REPAIR PROCEDURES

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

IMPORTANT: Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the:
 - **Internal Components Removal**
 - **Low and Reverse and 1-2-3-4 Clutch Housing Disassemble**
 - **Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection**
 - **Low and Reverse and 1-2-3-4 Clutch Housing Assemble**
 - **Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation**

DTC P2728-P2730

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P2728

Pressure Control Solenoid Valve 5 System Performance

DTC P2729

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage

DTC P2730

Pressure Control Solenoid Valve 5 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Pressure Control Solenoid 5 Control	P2729	P2730	P2730	P2728

TYPICAL SCAN TOOL DATA

Pressure Control Solenoid Valve 5 Performance Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid 5 Control	-	-	-	Fault or Malfunction

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid 5 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
Pressure Control Solenoid 5 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure (PC) solenoid 5 is part of the control solenoid valve assembly which has no serviceable components. The normally low clutch PC solenoid 5 regulates and directs the clutch PC solenoid 5 oil pressure to the 1-2-3-4 clutch regulator valve. Increasing clutch PC solenoid 5 pressure increases pressure to the 1-2-3-4 clutch. The transmission control module (TCM) varies the current to the PC solenoid 5 through a low side driver. Increasing the current to the clutch PC solenoid 5 increases clutch PC solenoid 5 oil pressure by closing

OFF the solenoid exhaust port. Decreasing the current to the clutch PC solenoid 5 decreases clutch PC solenoid 5 oil pressure by opening the solenoid exhaust port. Clutch PC solenoid 5 power is supplied by the TCM through a high side driver (HSD). The HSD protects the circuit and components from excessive current flow. If excessive current flow is detected, the HSD will turn OFF. When the fault is corrected, the HSD will reset.

CONDITIONS FOR RUNNING THE DTC

P2728, P2729, or P2730

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.

CONDITIONS FOR SETTING THE DTC

P2728

The TCM detects an internal electrical performance malfunction of the clutch PC solenoid 5 control circuit where the measured clutch PC solenoid 5 current does not equal the commanded clutch PC solenoid 5 current for 5 seconds.

P2729

The TCM detects a short to ground on the clutch PC solenoid 5 control circuit for 1 second.

P2730

The TCM detects an open or short to voltage on the clutch PC solenoid 5 control circuit for 1 second.

ACTION TAKEN WHEN THE DTC SETS

P2728

- DTC P2728 is a Type C DTC.
- The TCM freezes transmission adaptive functions on the 1-2-3-4 clutch.

P2729

- DTC P2729 is a Type A DTC.
- The TCM defaults the transmission to 3rd gear and reverse.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Tap Down.
- The TCM inhibits manual up, manual down with the shift selector.

P2730

- DTC P2730 is a Type A DTC.
- The TCM forces the High Side Driver OFF.
- The TCM defaults the transmission to reverse and 5th gear.
- The TCM Forces TCC OFF.
- The TCM enables torque management.
- The TCM inhibits Tap Up/Tap Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in second gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature, then operate the vehicle in PARK for 5 seconds.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges. Verify with a scan tool, the following test status parameters display OK.
 - Pressure Control Solenoid Valve 5 Performance Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
 2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
 3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
 4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
 5. Ignition ON, verify with a scan tool the following test status parameters display OK.
 - Pressure Control Solenoid Valve 5 Performance Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
- If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: **Before replacing the TCM, perform the Control Solenoid Valve and Transmission Control Module Assembly Inspection .**

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.

- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.
- Perform the **Control Solenoid Valve and Transmission Control Module Assembly Cleaning** procedure.

DTC P2762, P2763, OR P2764

DIAGNOSTIC INSTRUCTIONS

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

DTC DESCRIPTORS

DTC P2762

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Performance

DTC P2763

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit High Voltage

DTC P2764

Torque Converter Clutch (TCC) Pressure Control Solenoid Valve Control Circuit Low Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
TCC Pressure Control Solenoid Control	P2764	P2763	P2763	P2762

TYPICAL SCAN TOOL DATA

TCC Pressure Control Solenoid Valve Performance Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
TCC Pressure Control Solenoid Control	-	-	-	Fault or Malfunction

TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

	Short to	Open/High	Short to	Signal
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Circuit	Ground	Resistance	Voltage	Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
TCC Pressure Control Solenoid Control	-	Fault or Malfunction	Fault or Malfunction	-

TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: OK				
TCC Pressure Control Solenoid Control	Fault or Malfunction	-	-	-

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P2762

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- DTC P2762 has not set this ignition cycle.

P2763 or P2764

- The engine speed is 500 RPM or greater for 5 seconds.
- The ignition voltage is 9.0 volts or greater.
- No DTCs P0658 or P0659.
- The high side driver is enabled.

CONDITIONS FOR SETTING THE DTC

P2762

The TCM detects an internal electrical performance malfunction of the TCC PC solenoid control circuit where the measured TCC PC solenoid current does not equal the commanded TCC PC solenoid for 5 seconds.

P2763

The TCM detects an open/high resistance or short to voltage on the TCC PC solenoid control circuit for 5 seconds.

P2764

The TCM detects a short to ground on the TCC PC solenoid control circuit for 5 seconds.

ACTION TAKEN WHEN THE DTC SETS

P2762

DTC P2762 is a Type C DTC.

P2763

- DTC P2763 is a Type B DTC.
- The TCM inhibits 6th gear.
- The TCM forces TCC OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM changes to a Hot Mode shift pattern.

P2764

- DTC P2764 is a Type A DTC.
- The TCM inhibits TCC.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM defaults the transmission to 5th gear and reverse.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM forces the high side driver OFF.
- The TCM enables torque management.

CONDITIONS FOR CLEARING THE DIC/DTC

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-48616-10: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Operate the vehicle in drive range and ensure TCC is commanded ON for 1 minute. Verify with a scan tool the following parameters display OK.
 - 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
3. Operate the vehicle within the Conditions for Running the DTC to verify the DTC does not reset. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, remove the control solenoid assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
 2. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .
 3. Place the control solenoid valve assembly on a clean work surface near the transmission assembly.
 4. Connect **DT-48616-10:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
 5. Ignition ON, verify with a scan tool the following test status parameters display OK.
 - 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 any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

REPAIR PROCEDURES

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

NOTE: Before replacing the TCM, perform the **Control Solenoid Valve and Transmission Control Module Assembly Inspection** .

- Refer to **Control Module References** for control solenoid valve assembly replacement, setup, and programming.
- Perform the **Transmission Adaptive Values Learn** following all transmission related repairs.

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

REPAIR INSTRUCTIONS - OFF VEHICLE

LIFT PLATE AND HOLDING FIXTURE INSTALLATION

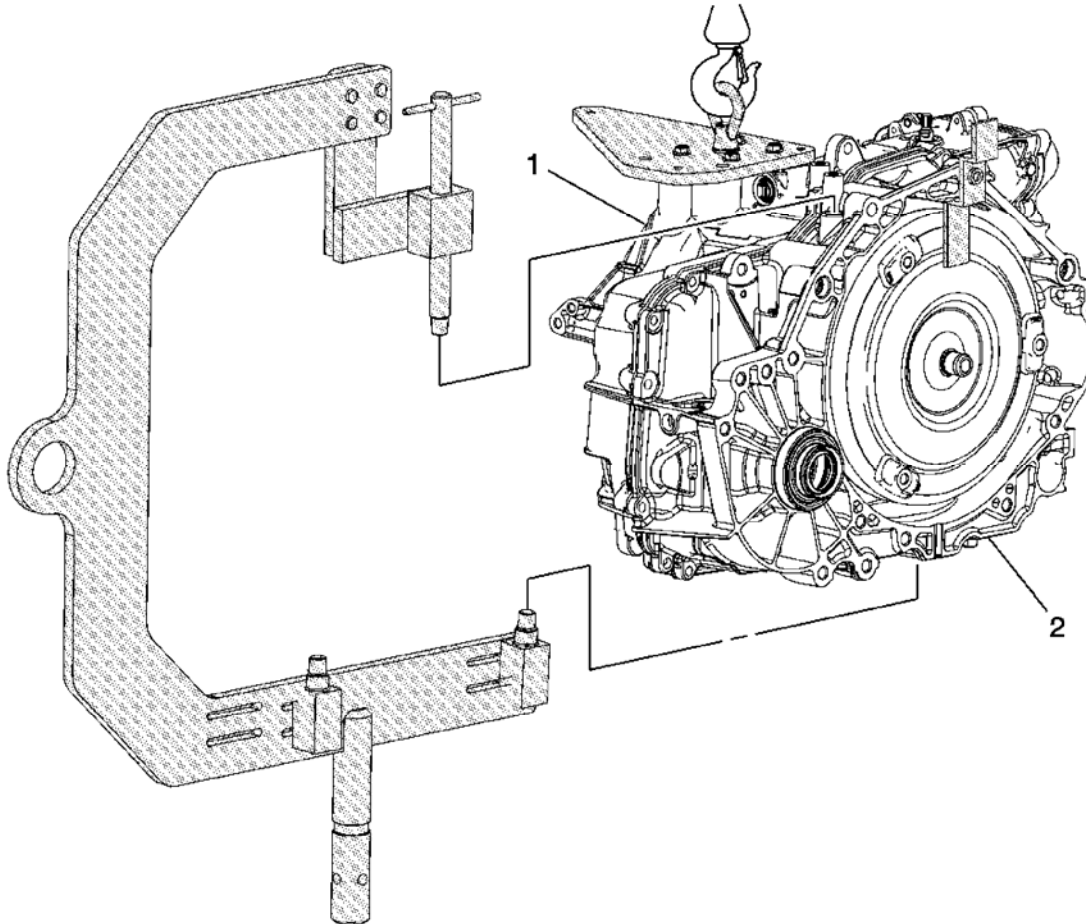


Fig. 1: Lift Plate & Holding Fixture
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	A/Trans Case assembly WARNING: Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly.

1	CAUTION: Refer to <u>Fastener Caution</u> . Tip: After installation of lift plate, raise the transmission with an overhead hoist. Tighten: 12 N.m (106 lb in) Special Tools: DT-47811-A: Transmission Lift Plate
2	Torque Converter with Fluid Pump Housing Assembly Tip: Adjust mounting block on fixture to match bosses on case. Tighten: 13 N.m (10 lb ft). Special Tools • J-46625: Transmission Holding Fixture • J-46625-10: Holding Fixture Adapter

TORQUE CONVERTER REMOVAL

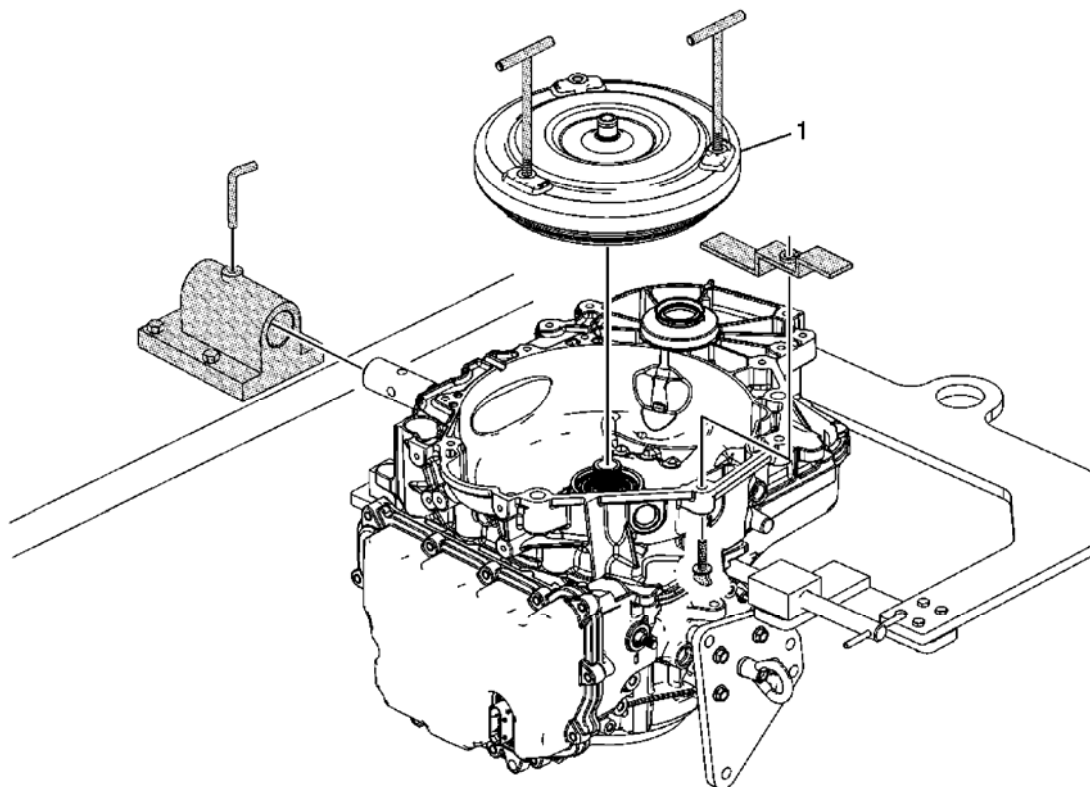


Fig. 2: Torque Converter
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter Assembly WARNING: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury. 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. Tip: Ensure the J-3289-20: holding fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. J-39890: holding fixture adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. Tip: Failure to raise the torque converter straight up could damage the torque converter clutch lip seal inside the torque converter clutch assembly.

Special Tools

- **J-3289-20:** Holding Fixture
- **J-21366:** Torque Converter Holding Strap
- **J-39890:** Transmission Holding Fixture Adapter
- **J-46409:** Torque Converter Lifting Handles

CONTROL VALVE BODY ASSEMBLY REMOVAL

Control Valve Body Cover Removal

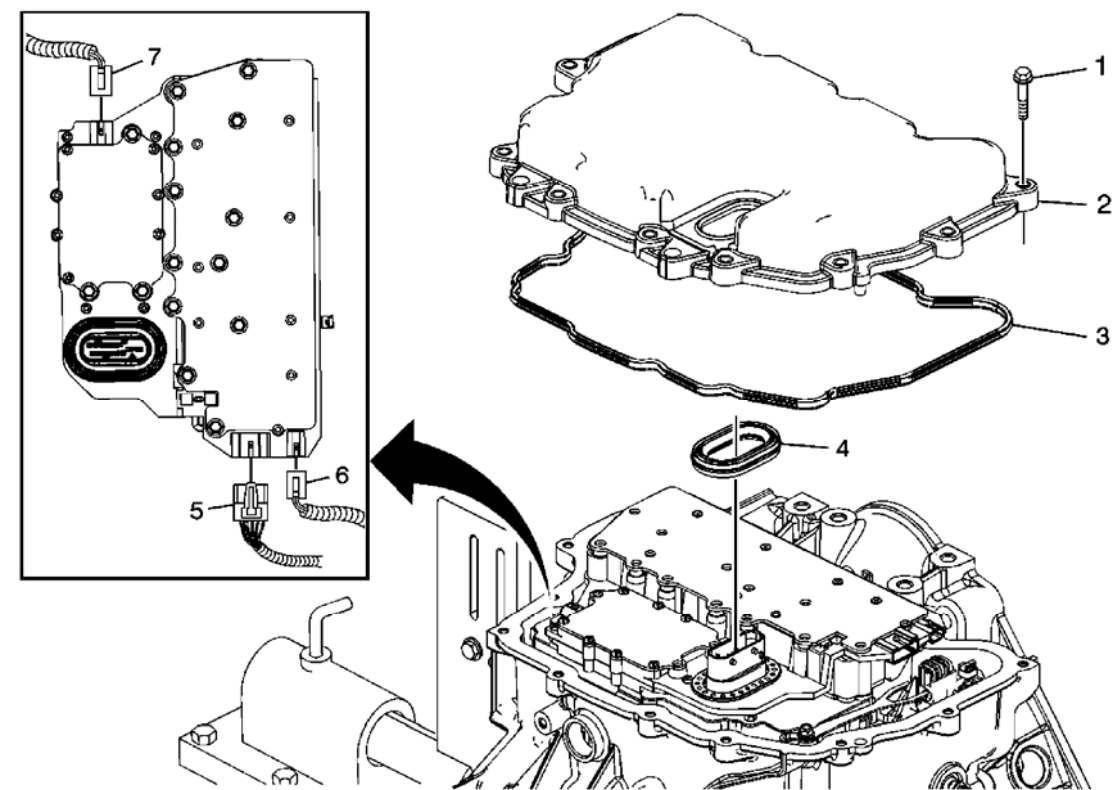


Fig. 3: Control Valve Body Cover
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Cover Bolts M6 x 30 (Qty: 13)
2	Control Valve Body Cover
3	Control Valve Body Gasket Tip: Discard the seal. It is not reusable.
	Control Valve Body Cover Wiring Connector Hole Seal

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

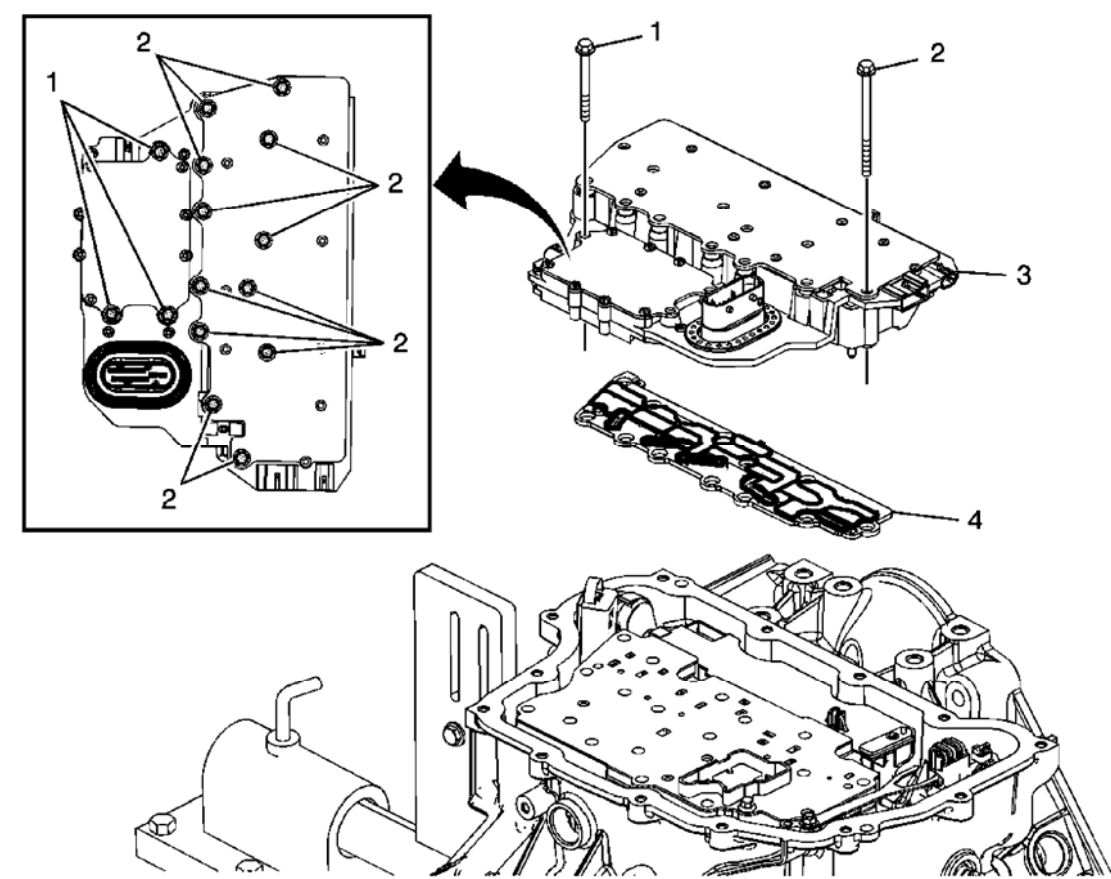


Fig. 4: Control Solenoid (W/Body & TCM) Valve Assembly
Courtesy of GENERAL MOTORS CORP.

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

Control Solenoid Valve Assembly Filter Plate

4

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.

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

Control Valve Body Assembly Removal

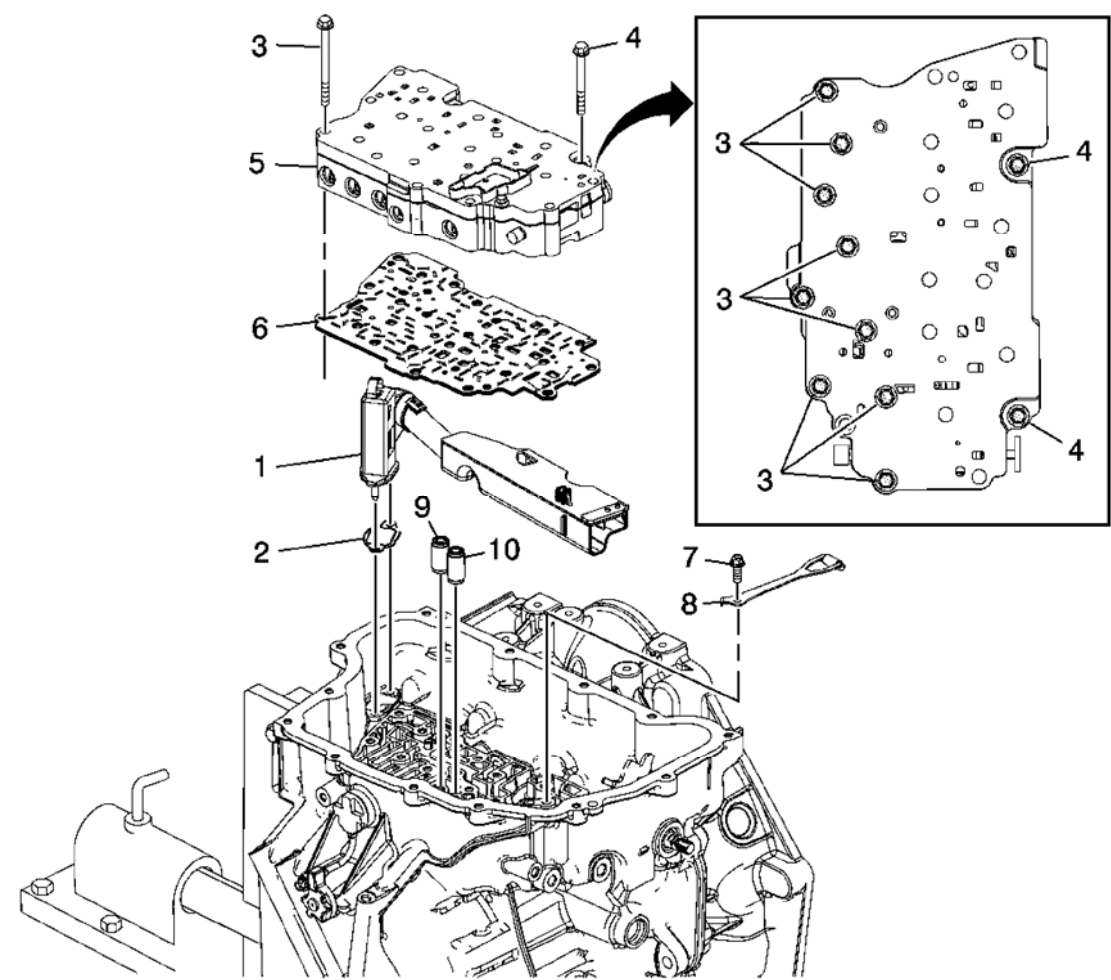


Fig. 5: Control Valve Body Assembly
Courtesy of GENERAL MOTORS CORP.

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

INPUT AND OUTPUT SPEED SENSOR REMOVAL

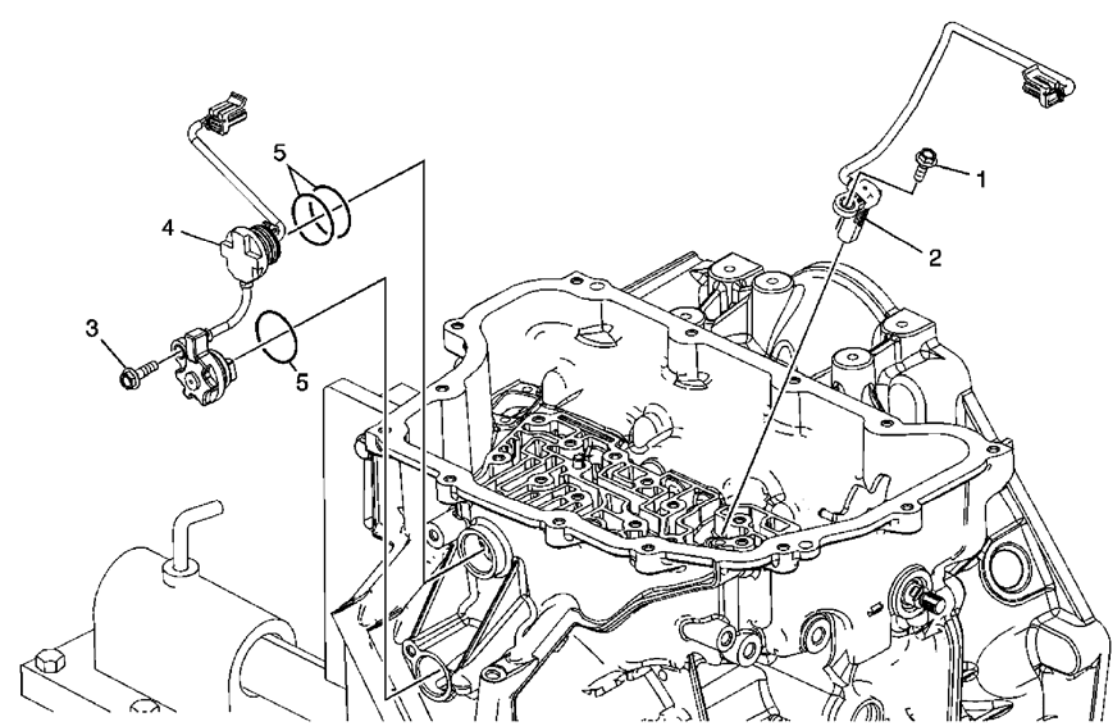


Fig. 6: Input & Output Speed Sensor
Courtesy of GENERAL MOTORS CORP.

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

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY REMOVAL

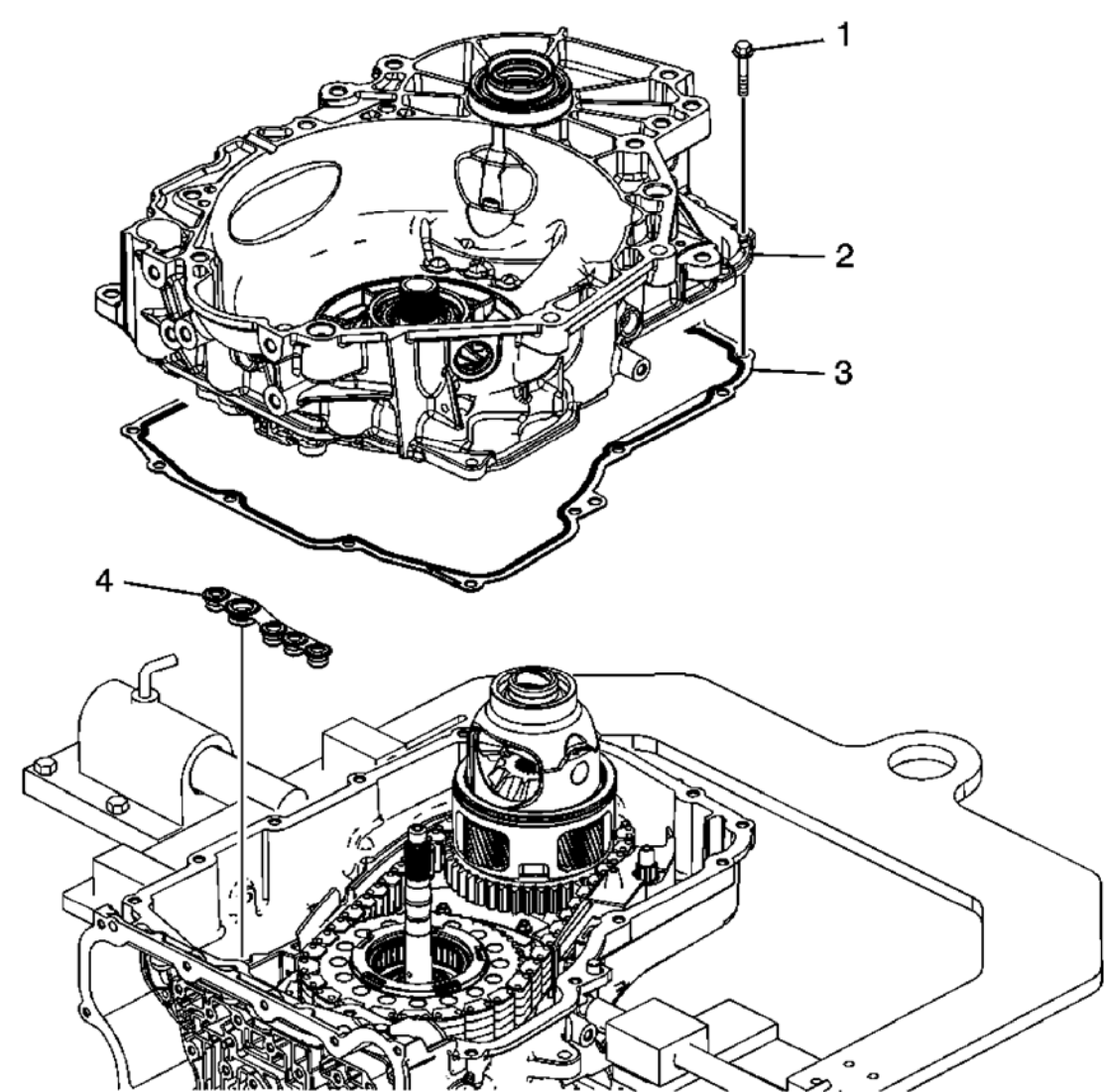


Fig. 7: Torque Converter Housing With Fluid Pump Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15)
2	Torque Converter with Fluid Pump Housing Assembly
3	Torque Converter Housing Gasket Tip: Discard the seal. It is not reusable.

FRONT DIFFERENTIAL CARRIER ASSEMBLY REMOVAL (6T40/45)

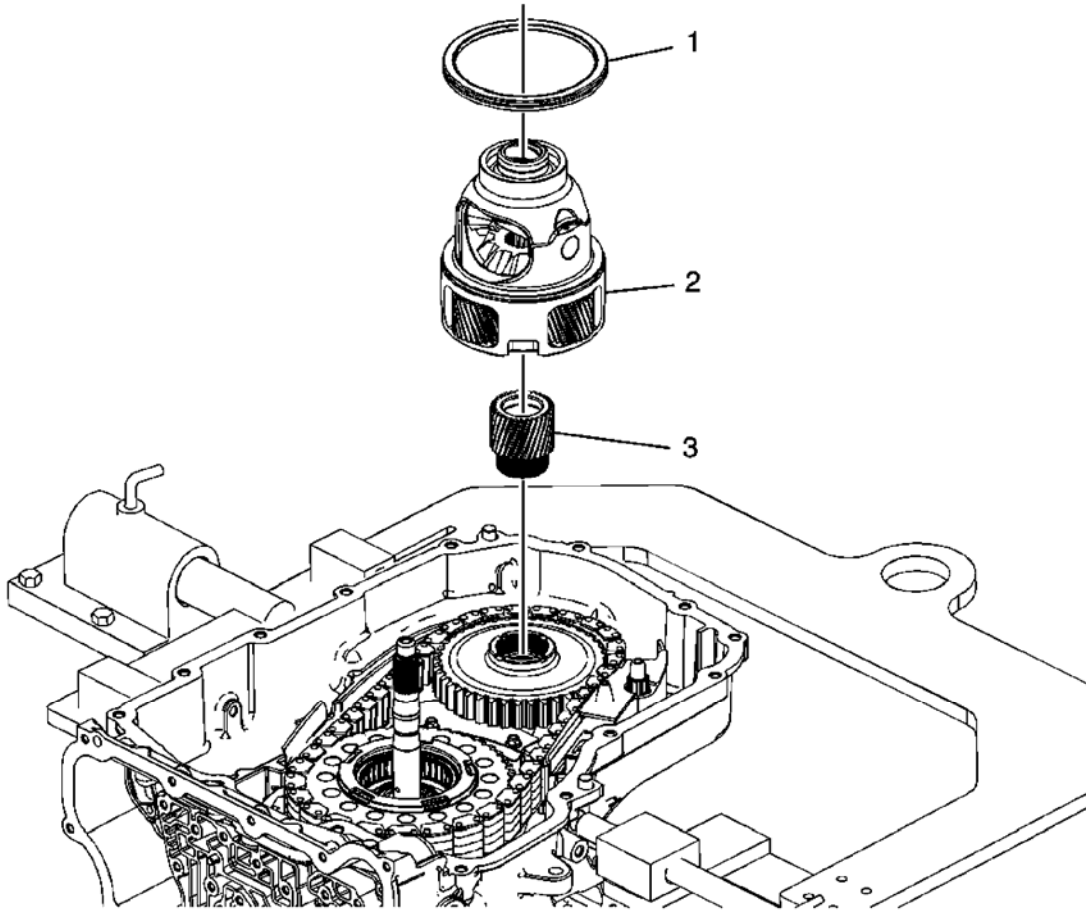


Fig. 8: Front Differential Carrier Assembly (6T40/45)
Courtesy of GENERAL MOTORS CORP.

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

DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL REMOVAL (6T40/45)

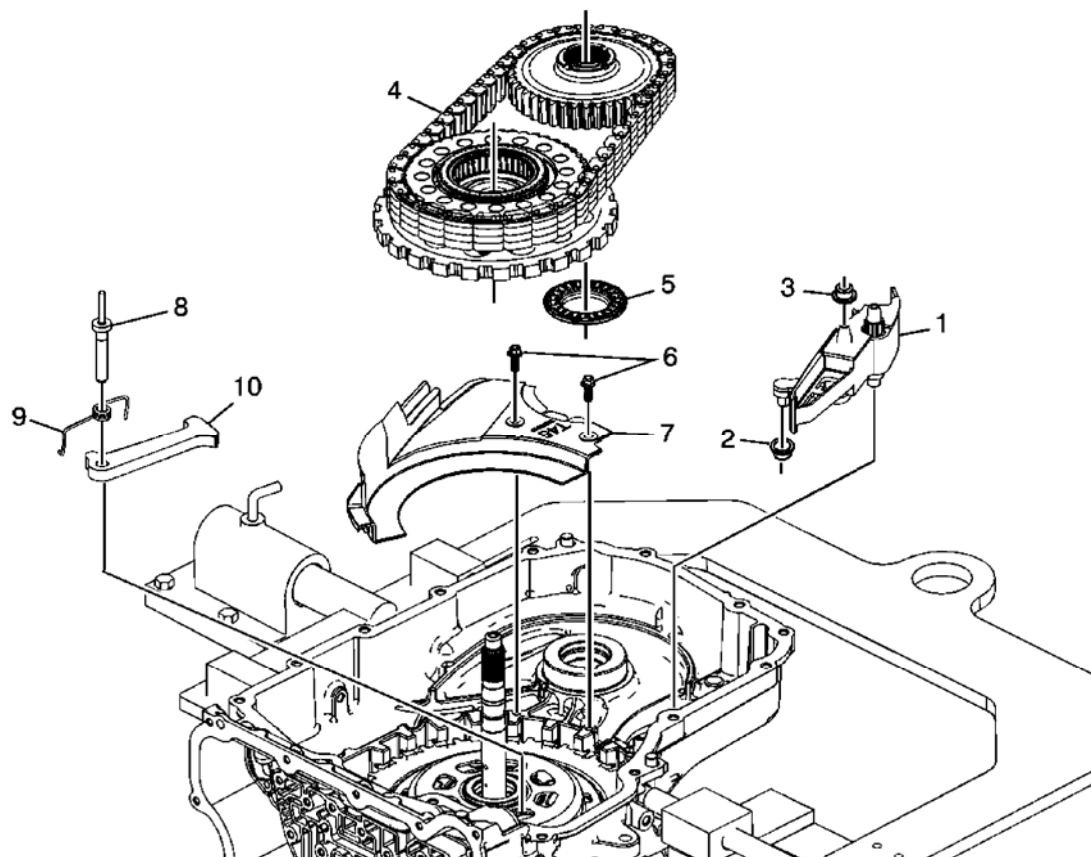


Fig. 9: Drive & Driven Sprocket, Drive Link & Park Pawl (6T40/45)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Drive Link Lube Scoop
2	Drive Link Lube Scoop Seals
3	Drive Link Lube Fluid Seal
4	Driven Sprocket Assembly, Drive Sprocket and Park Gear Assembly and Drive Link Procedure 1. The drive link, drive and driven sprocket assemblies must be removed at the same time. 2. The driven sprocket ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.
5	Driven Sprocket Bearing Assembly Tip: The driven sprocket bearing may be stuck to the driven sprocket.
6	Front Differential Carrier Baffle Bolts M6 x 16 (Qty: 2)
7	Front Differential Carrier Baffle

8	Park Pawl Shaft
9	Park Pawl Spring
10	Park Pawl

INTERNAL COMPONENTS REMOVAL

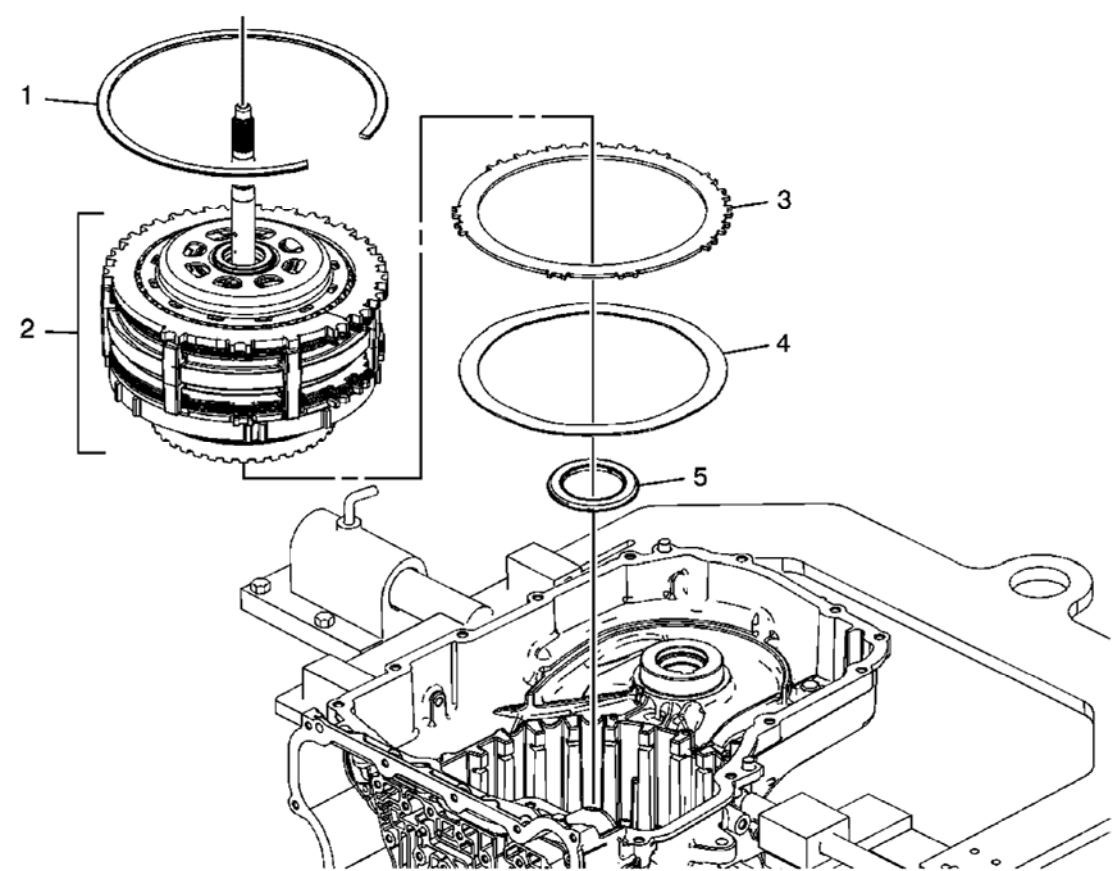


Fig. 10: Internal Components
Courtesy of GENERAL MOTORS CORP.

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. Tip: Remove one end of the retainer using J-28585: remover or equivalent and work the retainer out of the case groove. Special Tools: J-28585: Snap Ring Remover or equivalent
2	3-5 Reverse and 4-5-6 Clutch Housing Assembly, Gearset, Low-Reverse Clutch Assembly and Low-Reverse and 1-2-3-4 Clutch Housing Tip: 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

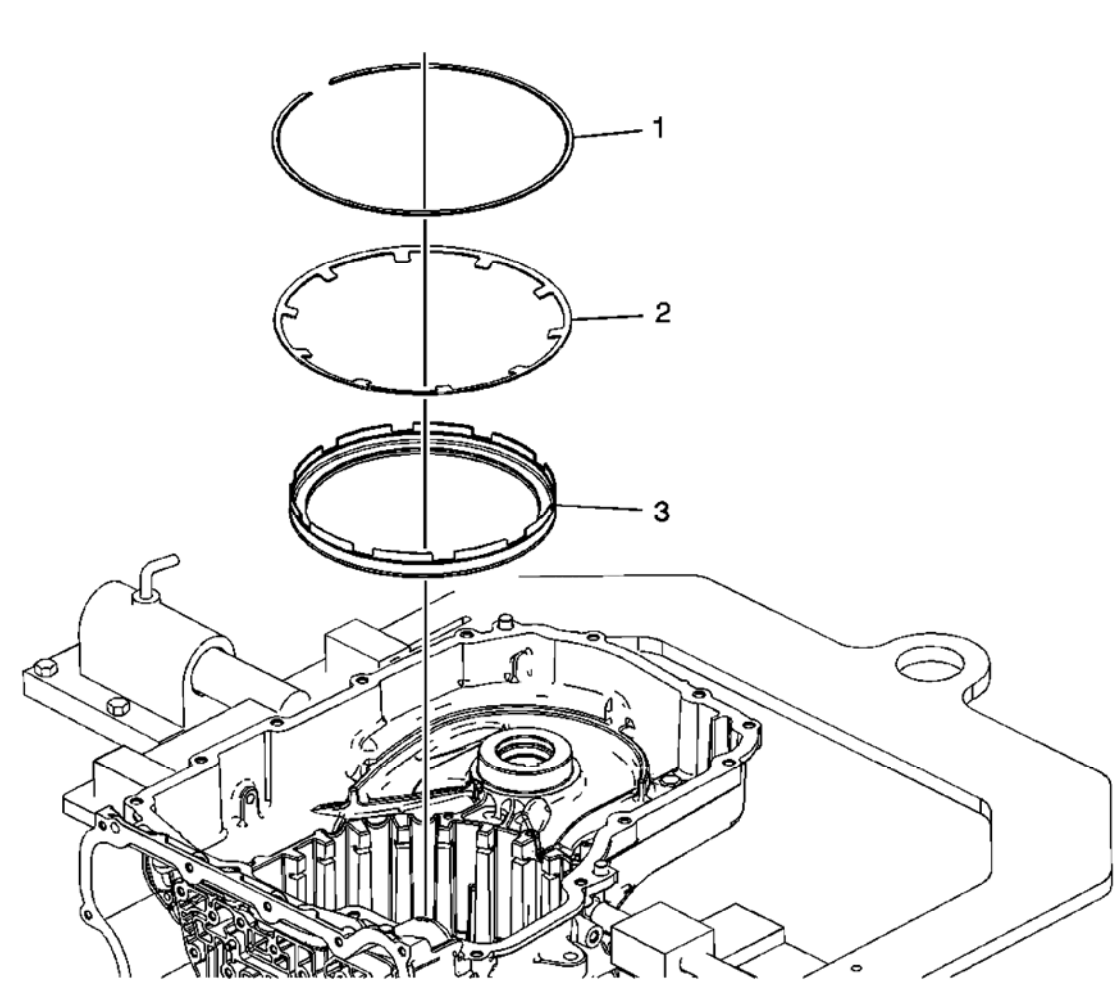


Fig. 11: 2-6 Clutch Piston
Courtesy of GENERAL MOTORS CORP.

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

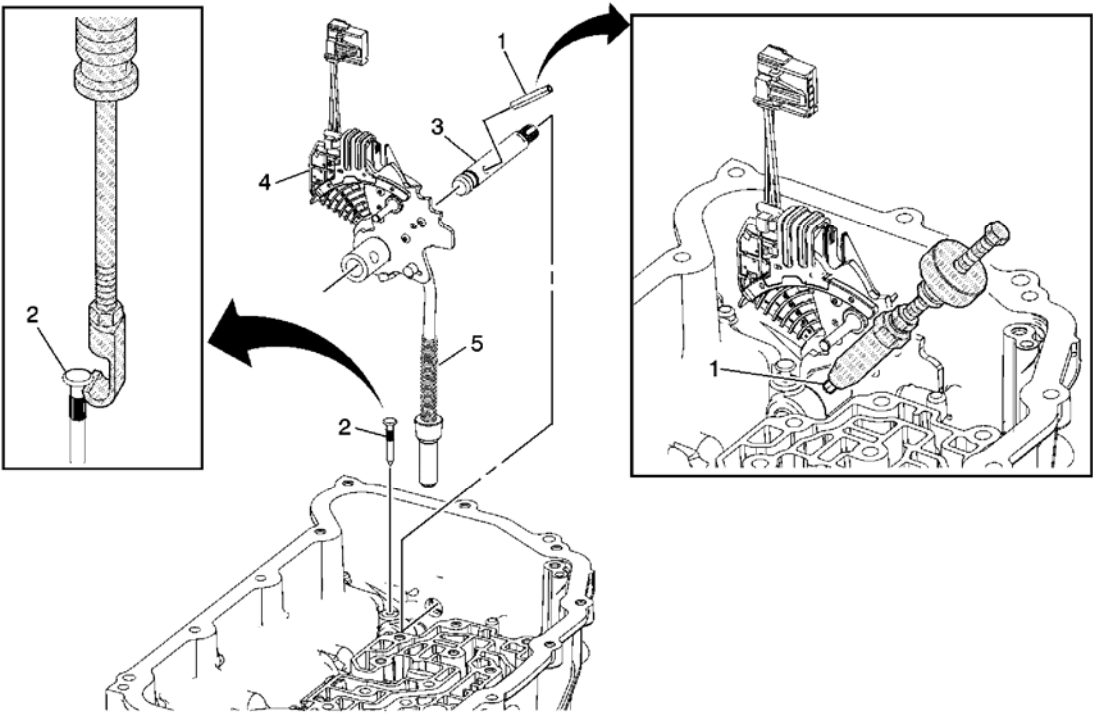


Fig. 12: Manual Shaft Detent (w/Shift Position Switch) Lever Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin Special Tool: DT-48550: Detent Lever Pin Remover
	Manual Shift Shaft Pin

	Tip: Discard the pin. It is not reusable. Special Tools • J 23129: Universal Seal Remover • J 6125-B: Slide Hammer
2	
3	Manual Shaft
4	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly
5	Park Pawl Actuator Assembly

Park Pawl Actuator Guide Removal

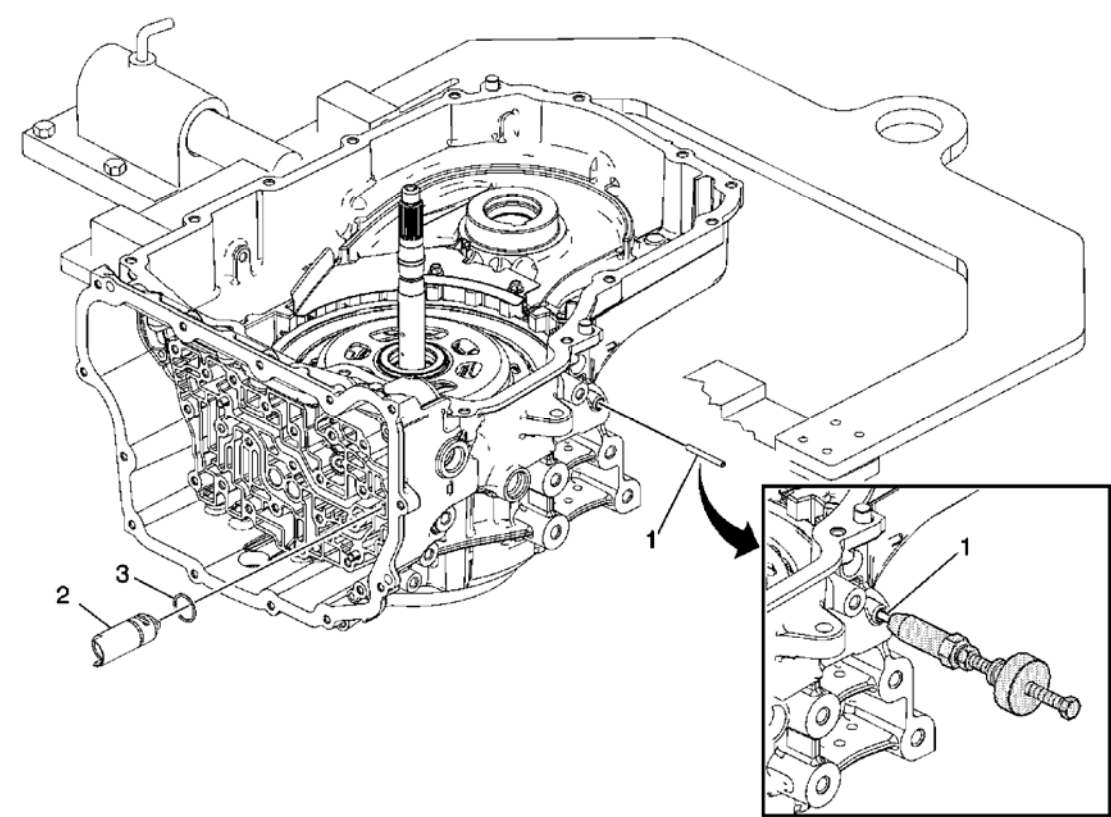


Fig. 13: Park Pawl Actuator Guide
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Park Pawl Actuator Guide Pin
2	Park Pawl Actuator Guide Assembly
3	Park Pawl Actuator Guide Assembly Seal Tip: Discard the seal. It is not reusable.

MANUAL SHIFT SHAFT SEAL REMOVAL

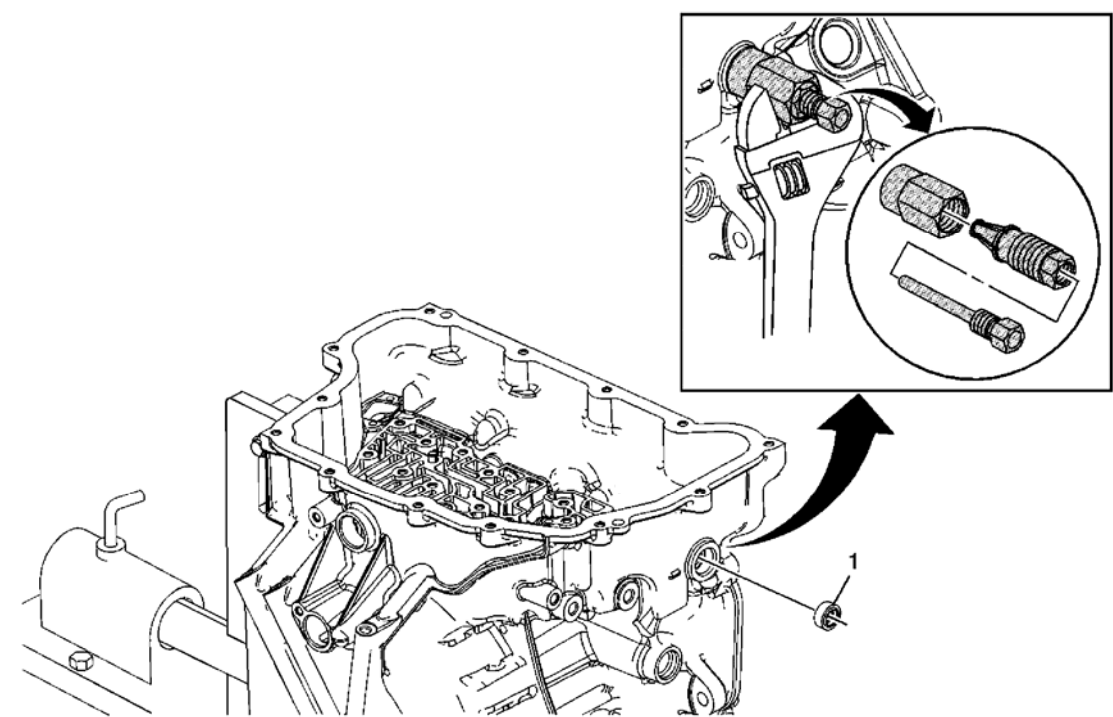


Fig. 14: Manual Shift Shaft Seal
Courtesy of GENERAL MOTORS CORP.

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

INPUT SHAFT SUPPORT REPLACEMENT

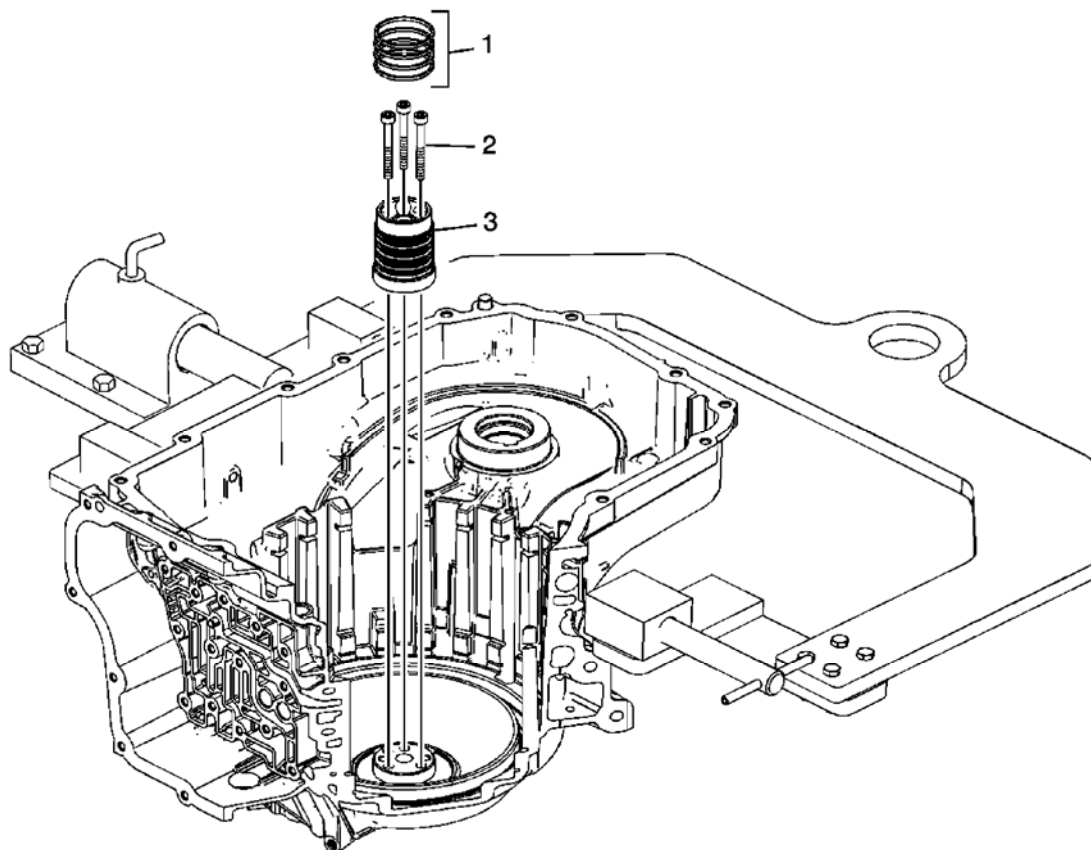


Fig. 15: Input Shaft Support
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 4) Tip: • Discard the fluid seals. They are not reusable. • Refer to <u>3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement</u>.
2	Input Shaft Support Bolts M6 x 50 (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
3	Input Shaft Support Tip: Inspect the support for wear, damage or porosity.

3-5-REVERSE AND 4-5-6 CLUTCH FLUID SEAL RING REPLACEMENT

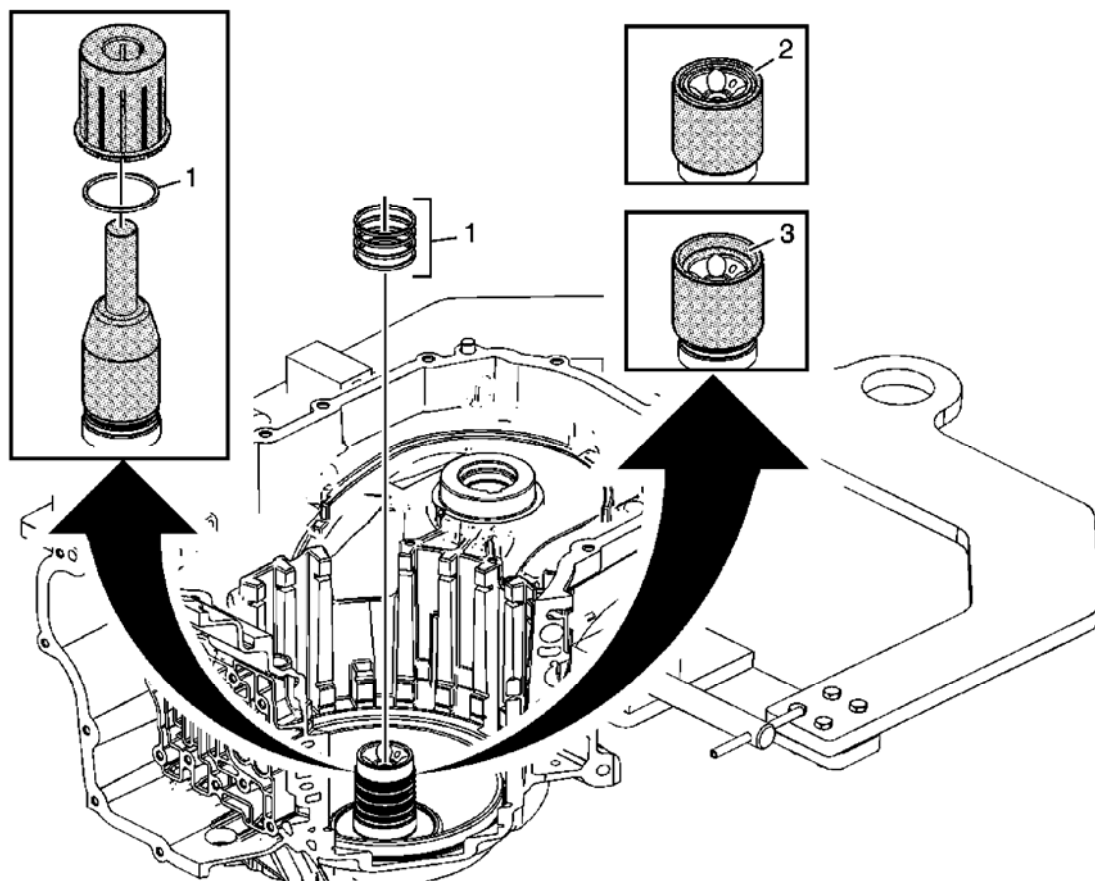


Fig. 16: 3-5-Reverse & 4-5-6 Clutch Fluid Seal Ring
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 4)
	Procudure 1. Place J-46620-3 which is part of J-46620: 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 J-46620-3 which is part of J-46620: installer. 3. Use J-46620-2 which is part of J-46620: installer to push the fluid seal ring down over J-46620-3 which is part of J-46620: installer into the hub ring groove. 4. Repeat the above steps to install all 4 seal rings, adjusting J-46620-3 which is part of J-46620: installer to the appropriate ring groove. Special Tools:

	J-46620: Seal Installer
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. Tip: Install J-46620-1 which is part of J-46620: installer with the large chamfer end down over the fluid seal rings and leave J-46620-1 which is part of J-46620: installer on the seals for at least 60 seconds. Special Tools: J-46620: Seal Installer
3	Large Chamfer Up Procedure 1. Install J-46620-1 which is part of J-46620: installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. 2. Leaving J-46620-1 which is part of J-46620: 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. Special Tools: J-46620: Seal Installer

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - CASE SIDE

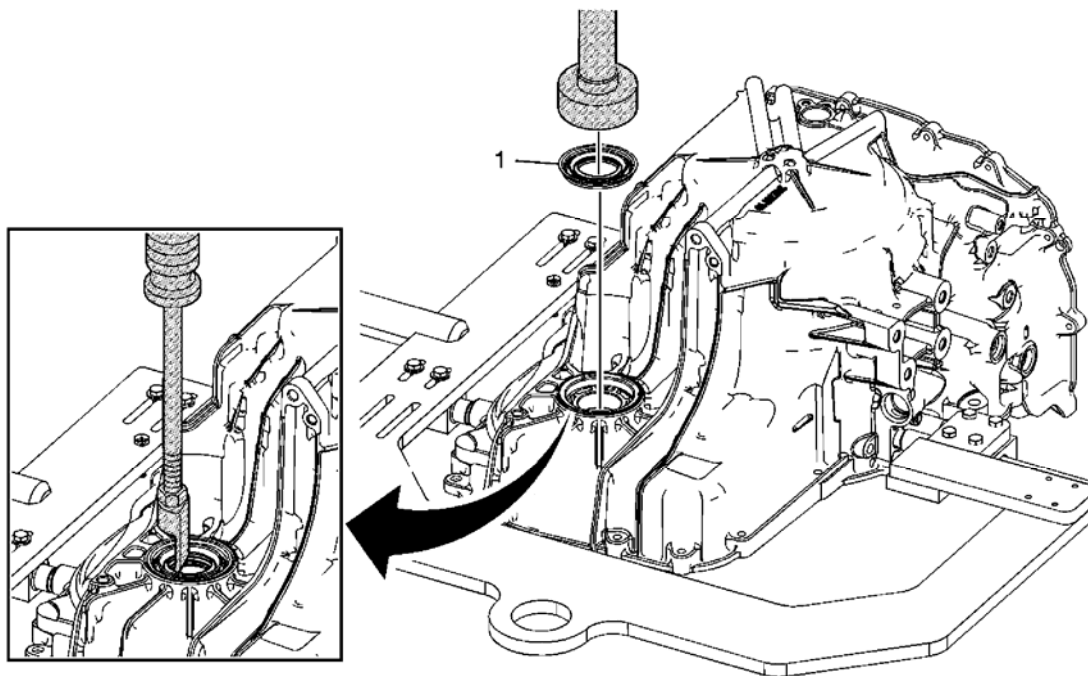


Fig. 17: Front Wheel Drive Shaft Seal - Case Side
 Courtesy of GENERAL MOTORS CORP.

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

TRANSMISSION CASE CLEANING AND INSPECTION

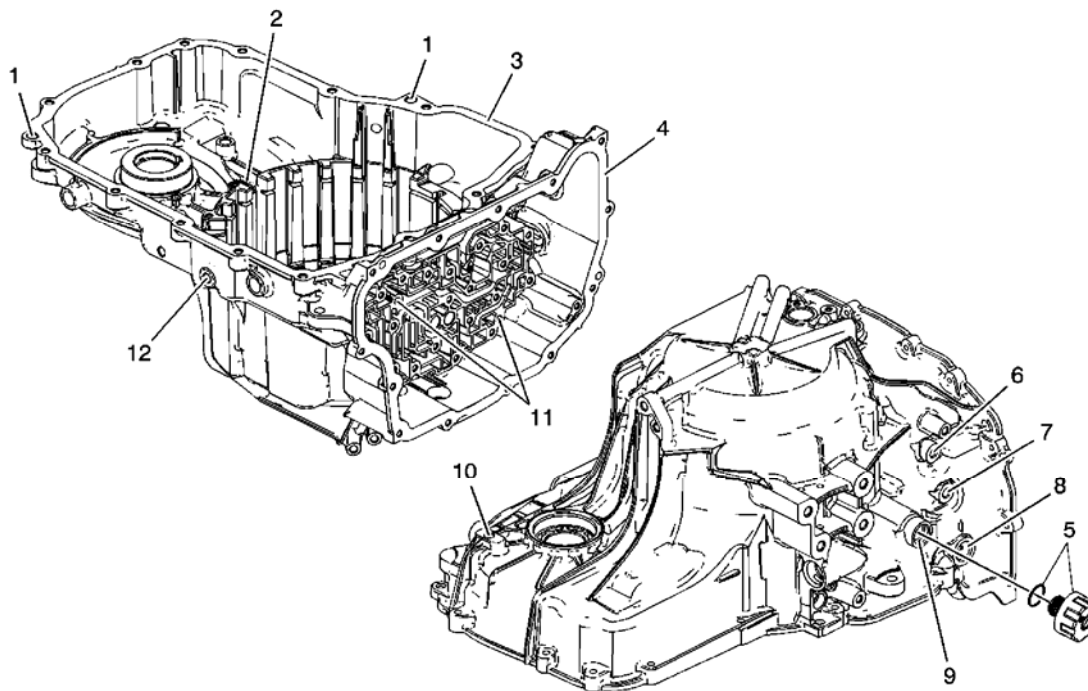


Fig. 18: Cleaning & Inspecting Transmission Case
 Courtesy of GENERAL MOTORS CORP.

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.	
	Torque Converter Housing Locating Pin Procedure:

1	Inspect the torque converter housing locating pins. Specification: The locating pins installed height is 7.4 mm (0.29 in).
2	Fluid Trough Check Ball Specification: The check ball installed depth is 11 mm (0.43 in).
3	Converter Housing Sealing Surface
4	Control Valve Body Cover Sealing Surface
5	Fill Cap Seal
6	Transmission Fluid Cooler Pipe Sealing Surface
7	Fluid Pressure Test Plug CAUTION: Refer to <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 Plug Tighten: 12 N.m (106 lb in)
11	Valve Body Locating Pin Procedure: Inspect the valve body locating pins. Specification: The locating pins installed height is 5.8 mm (0.22 in).
12	Drain Plug Tighten: 12 N.m (106 lb in)

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

Park Pawl Actuator Guide Installation

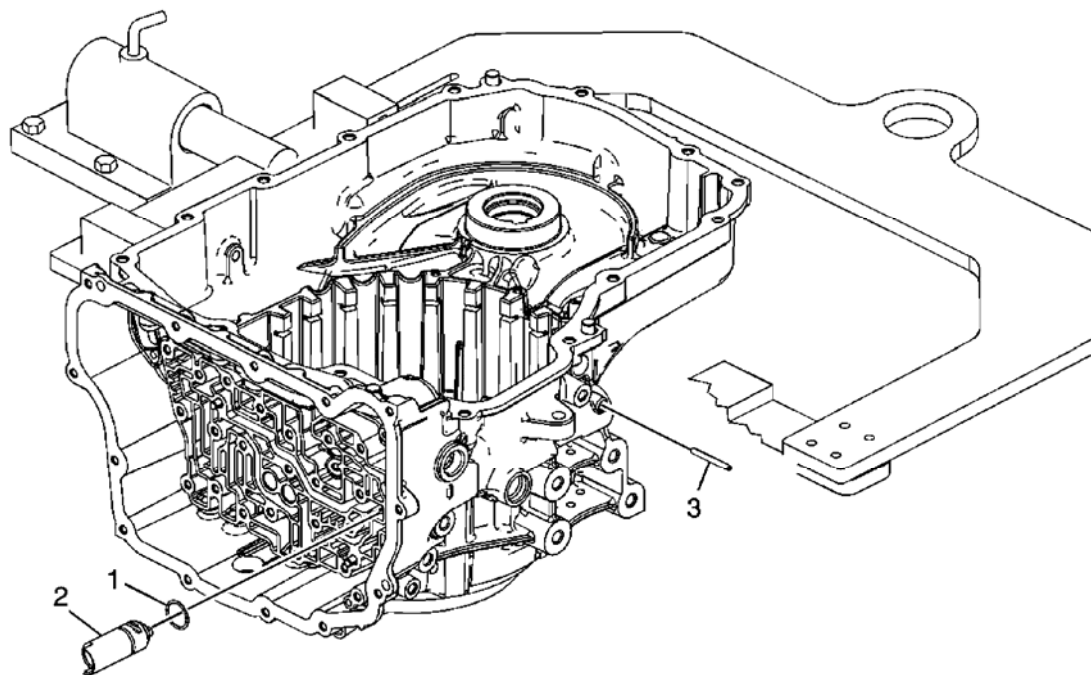


Fig. 19: Park Pawl Actuator Guide
 Courtesy of GENERAL MOTORS CORP.

Park Pawl and 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 Procedure: Install the park pawl actuator guide pin. Specification: The park pawl actuator guide pin installed height is 7.2 mm (0.28 in).

Park Pawl Actuator Assembly Installation

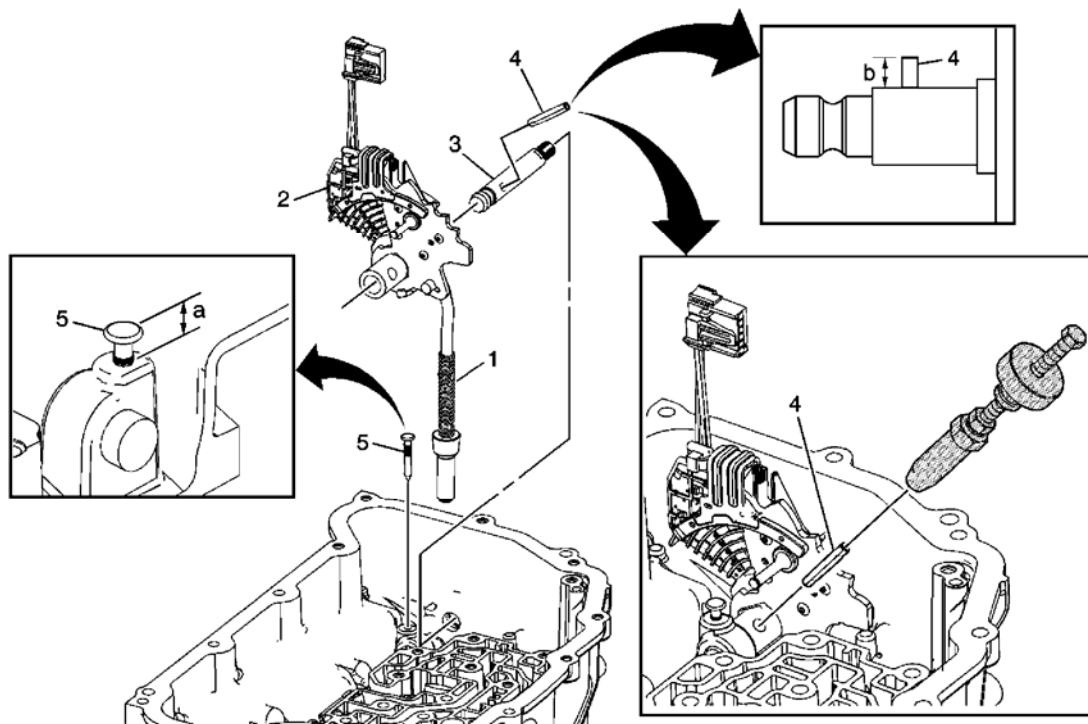


Fig. 20: Identifying Manual Shift Detent Lever with Shaft Position Switch Assembly & Park Pawl Actuator
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Park Pawl Actuator Assembly
2	Manual Shift Detent (with Shaft Position Switch) Lever Assembly
3	Manual Shaft Tip: Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
4	Manual Shaft Detent Lever Hub Pin Procedure: Use a NEW pin to ensure proper engagement with the shaft. DT-48550: remover can also be used to install the pin. Install the manual shaft detent lever hub pin. Specification: The manual shaft detent lever hub pin installed height is (b) 7.9 mm (0.38 in). Special Tools: DT-48550: Detent Lever Pin Remover
	Manual Shift Shaft Pin

5	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: Use a NEW pin to ensure proper engagement with the case. Inspect pin height. Specification: The manual shift shaft pin installed height is within (a) 7.2-8.2 mm (0.28-0.32 in). Special Tools: J-41229: Manual Shaft Pin Installer
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MANUAL SHIFT SHAFT SEAL INSTALLATION

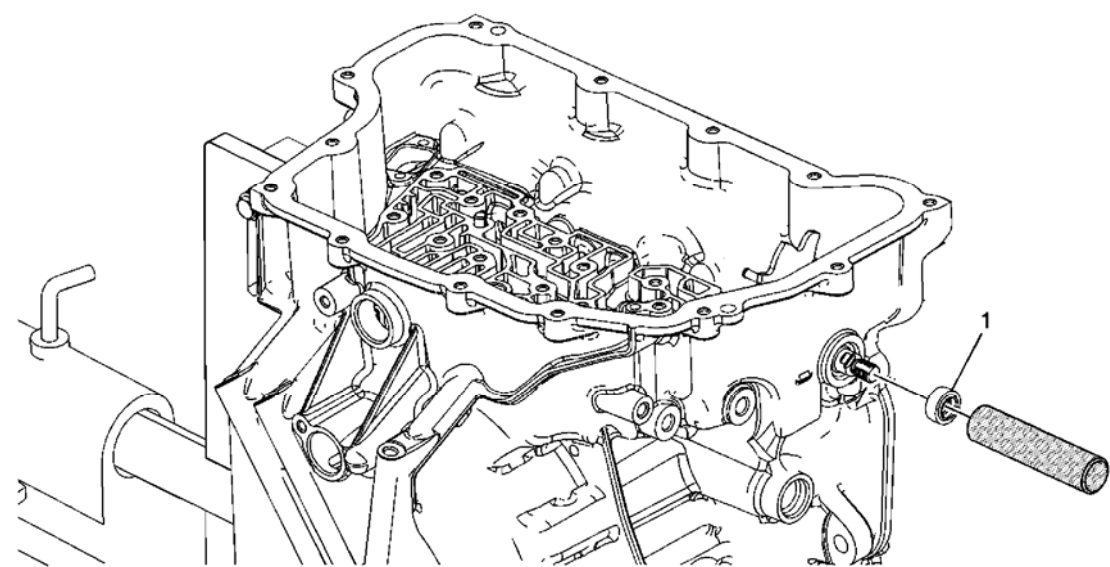


Fig. 21: Manual Shift Shaft Seal
Courtesy of GENERAL MOTORS CORP.

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

2-6 CLUTCH PISTON INSTALLATION

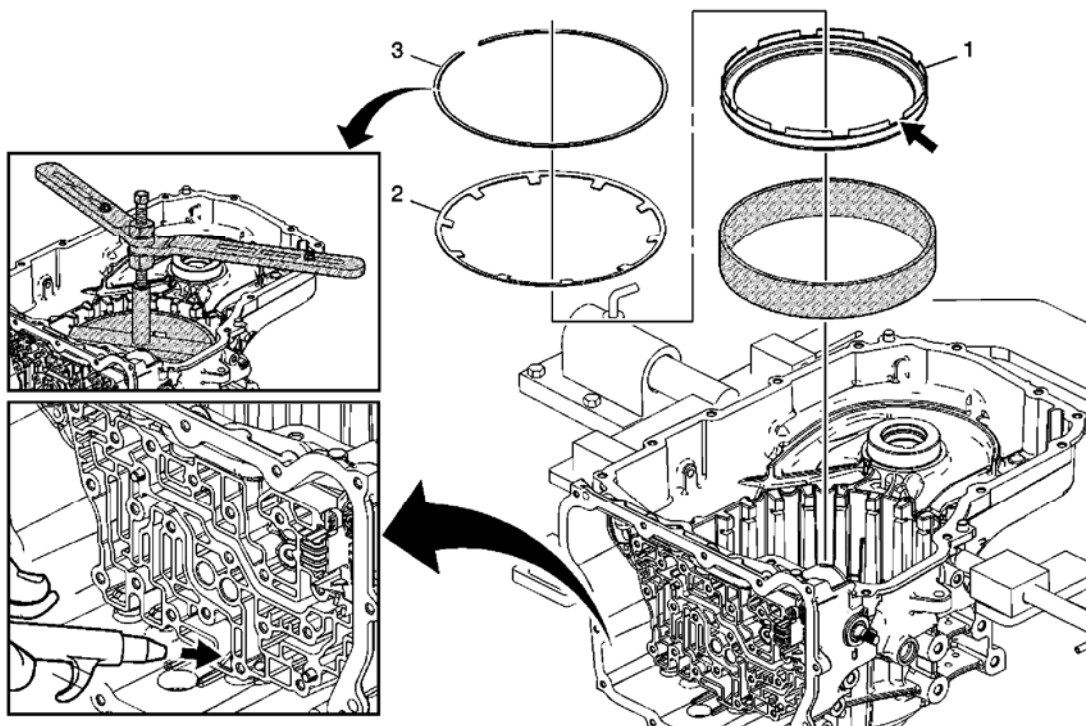


Fig. 22: 2-6 Clutch Piston

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	2-6 Clutch Piston Assembly Tip: • Position the 2-6 piston air bleed and large slot toward the top of the case. • DT-47796: seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the DT-47796: seal protector to ease installation of the piston. Special Tool: DT-47796: Seal Protector
2	2-6 Clutch Spring
	2-6 Clutch Spring Retainer CAUTION: Regulate the air pressure to 40 psi maximum. High pressure could cause the piston to over travel and damage the piston seals.

3

Tip:

- 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

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING, LOW AND REVERSE CLUTCH ASSEMBLY, OUTPUT SUN GEAR, AND 2-6 CLUTCH PLATE DISASSEMBLE

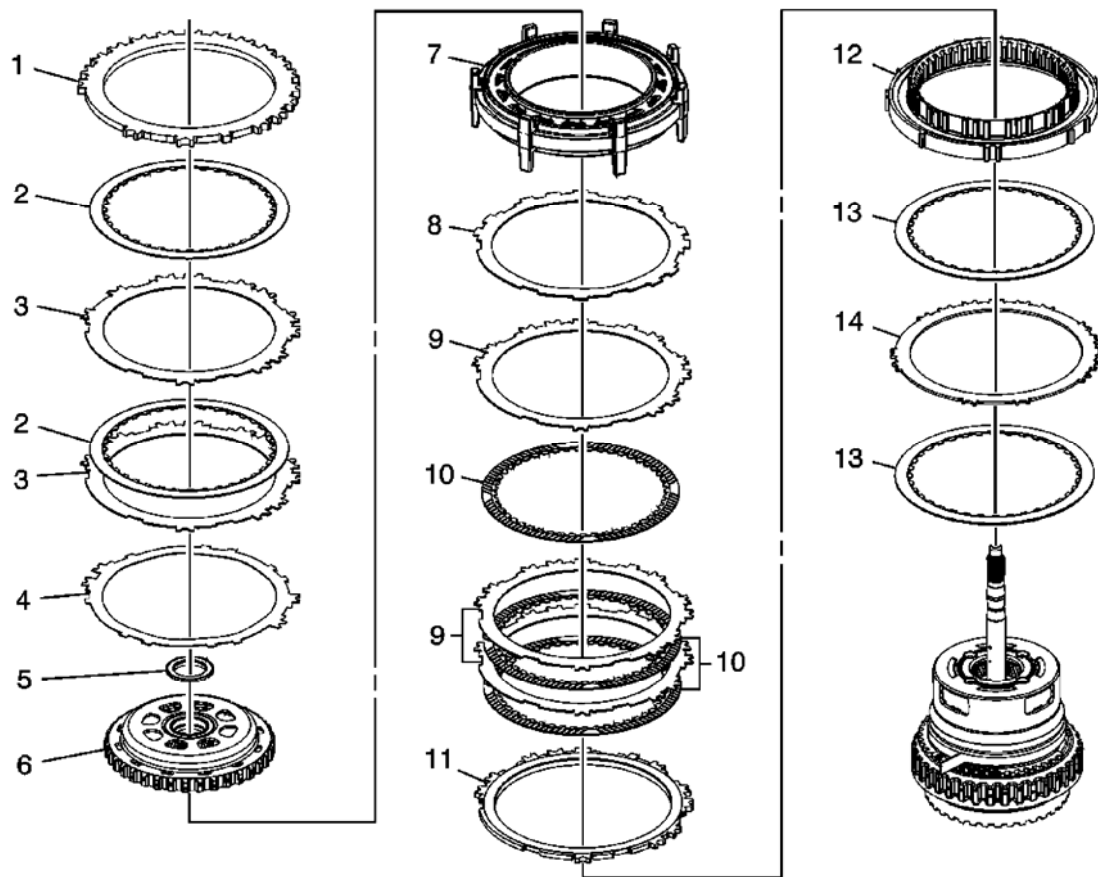


Fig. 23: Low & Reverse & 1-2-3-4 Clutch Housing, Low & Reverse Clutch Assembly, Output Sun Gear, & 2-6 Clutch Plate

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	1-2-3-4 Clutch Backing Plate
2	1-2-3-4 Clutch Plate Assembly (Qty: 2)
3	1-2-3-4 Clutch Plate (Qty: 2)
4	1-2-3-4 Clutch Waved Plate
5	Output Sun Gear Thrust Bearing Assembly Tip: 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)
14	2-6 Clutch Plate (Qty: 1)

INPUT, REACTION, AND OUTPUT CARRIER DISASSEMBLE

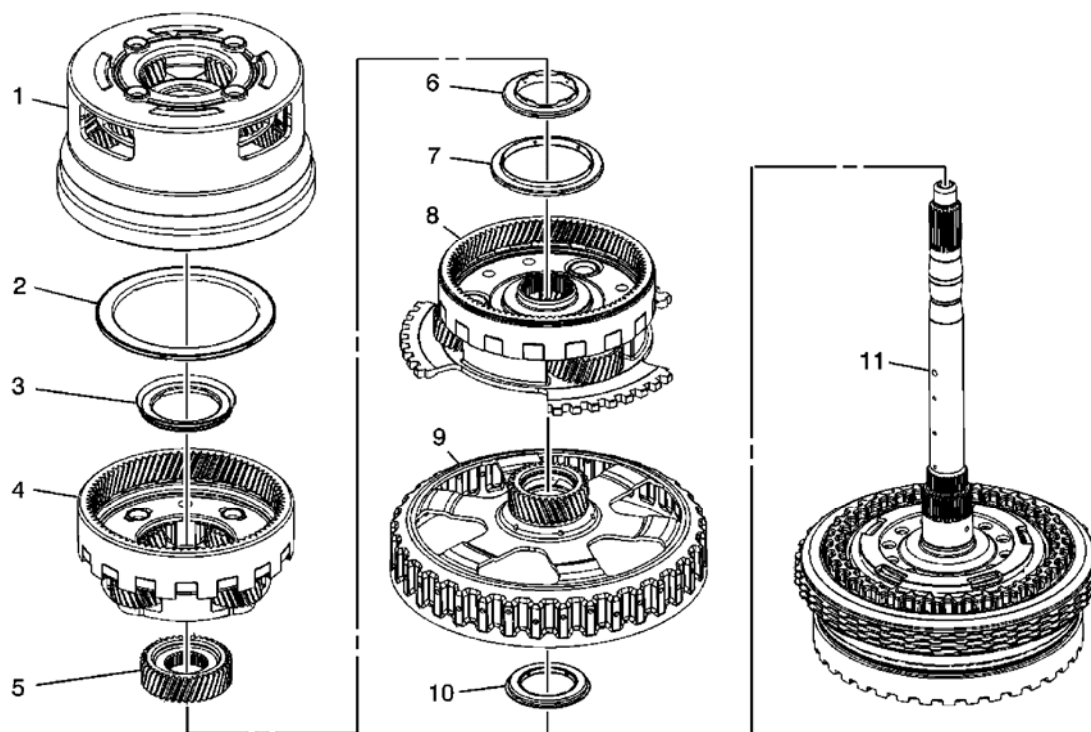


Fig. 24: Input, Reaction & Output Carrier
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Output Carrier Assembly Tip: • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
2	Output Carrier Thrust Bearing Assembly
3	Input Sun Gear Thrust Bearing Assembly
4	Input Carrier Assembly Tip: • 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 Tip: • The 6T30 and 6T40 have 3 pinions. • The 6T45 and 6T50 have 4 pinions.
9	Reaction Carrier Sun Gear Assembly
10	Reaction Carrier Sun Gear Thrust Bearing Tip: 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

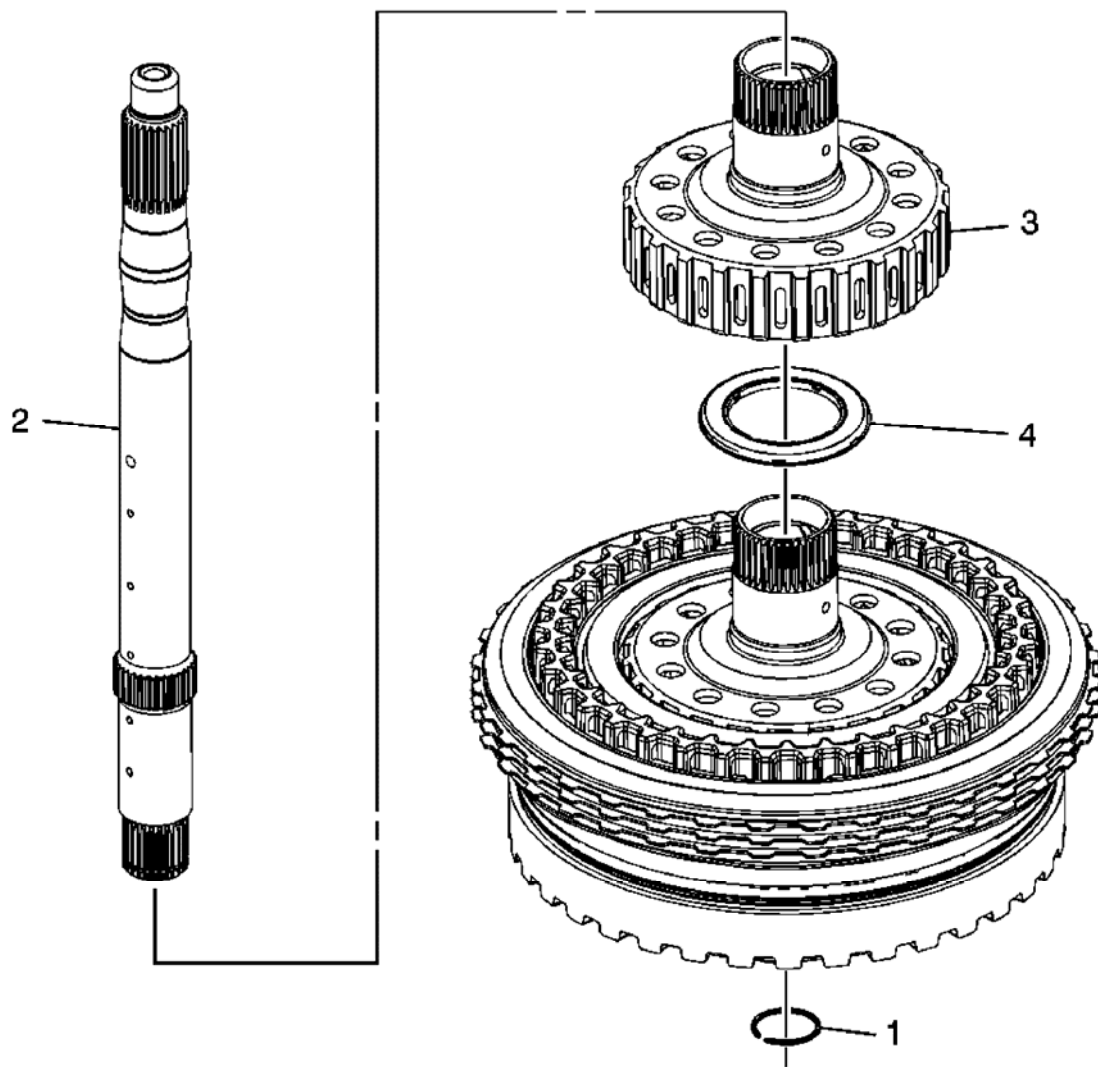


Fig. 25: Turbine Shaft, Reluctor Wheel & Piston
 Courtesy of GENERAL MOTORS CORP.

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

4-5-6 Clutch Plate Removal

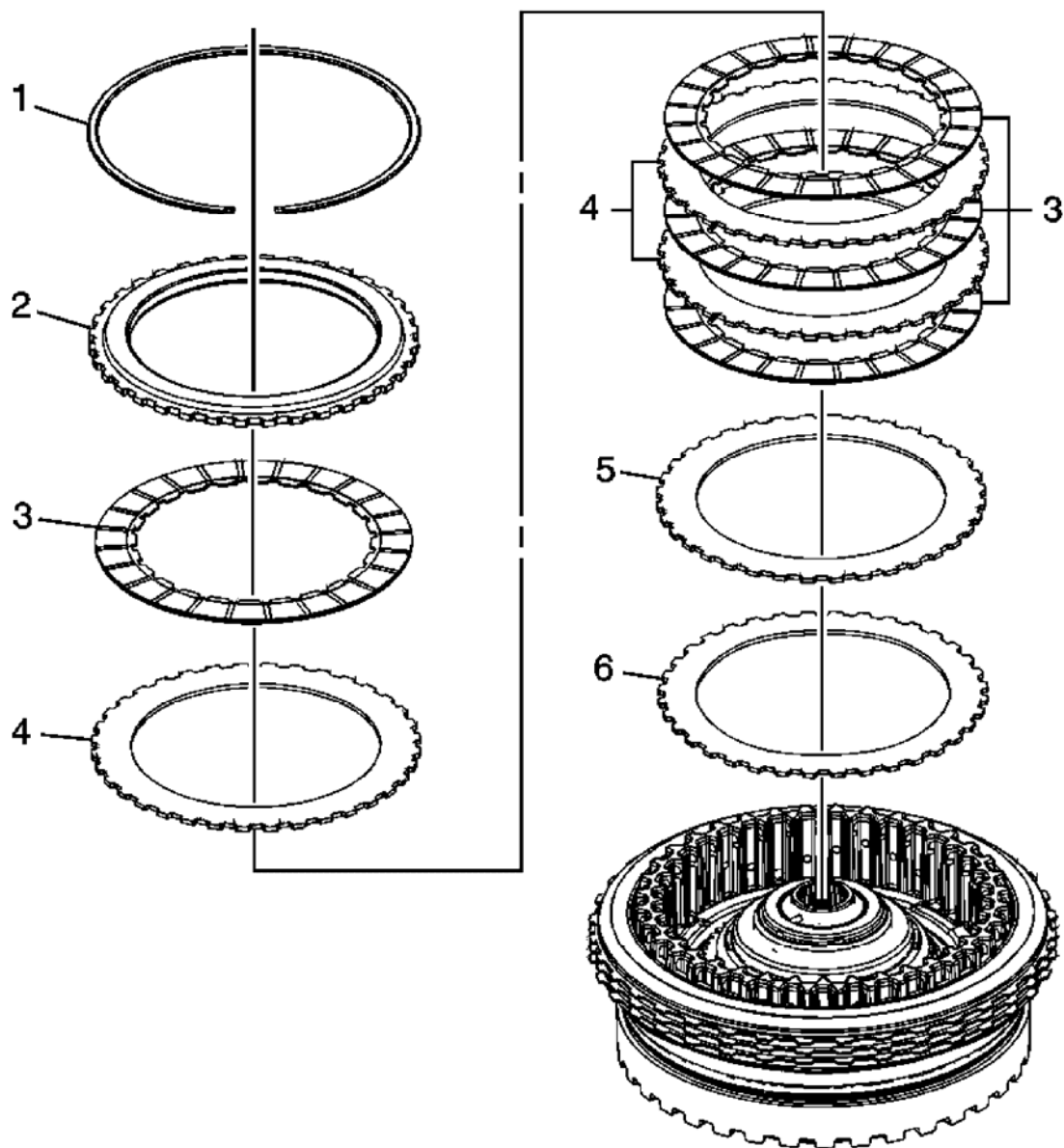


Fig. 26: 4-5-6 Clutch Plate
Courtesy of GENERAL MOTORS CORP.

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: 4)
4	4-5-6 Clutch Plate (Qty: 3)
5	4-5-6 Clutch Apply Plate
6	4-5-6 Clutch Wave Plate

4-5-6 Clutch Piston Removal

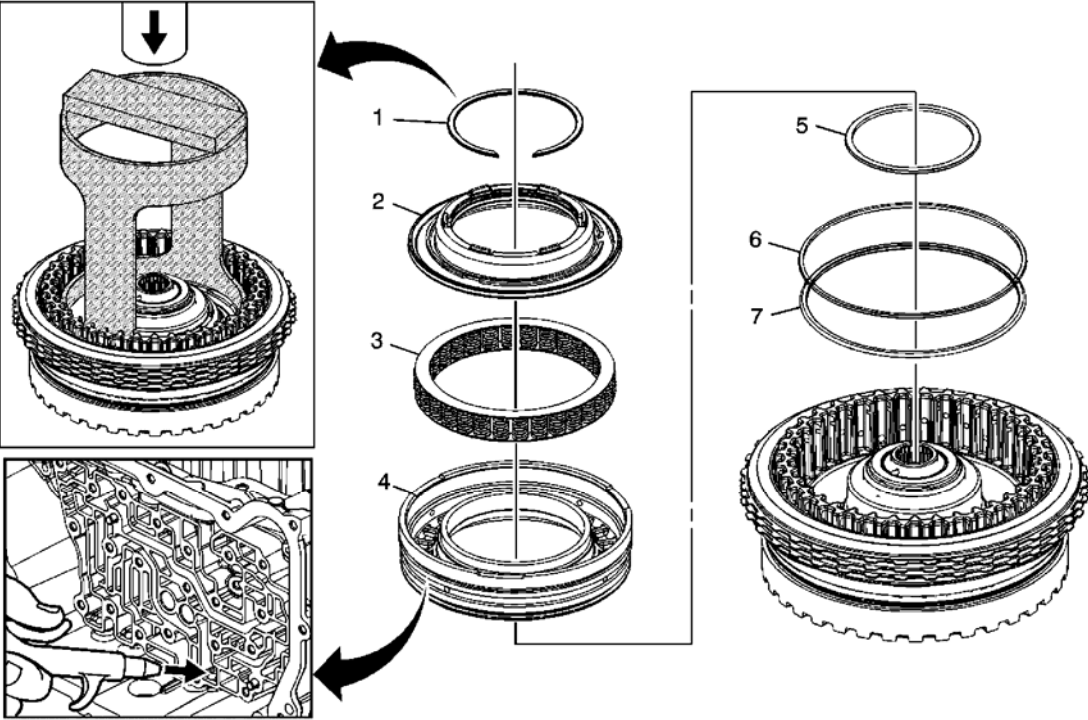


Fig. 27: 4-5-6 Clutch Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Dam Retaining Ring Tip: The 4-5-6 clutch dam retaining ring is not reusable. Special Tools • DT-47951-2: Spring Compressor • J-5586-A: Snap Ring Pliers or equivalent
2	4-5-6 Clutch Piston Fluid Dam Assembly Procedure 1. Place the 3-5 reverse and 4-5-6 clutch housing onto the support hub in the case. 2. Apply shop air to the 4-5-6 clutch feed hole using a rubber tipped air gun to dislodge the dam piston and the 4-5-6 clutch piston from the clutch housing.
3	4-5-6 Clutch Piston Return Spring Assembly
	4-5-6 Clutch Piston

4	Tip: Apply shop air to the 4-5-6 clutch feed hole using a rubber tipped air gun to dislodge the clutch piston.
5	4-5-6 Clutch Piston Inner Seal
6	4-5-6 Clutch Piston Outer Seal (Dark Blue) (Stepped)
7	4-5-6 Clutch Piston Outer Seal (Large) (Rounded)

Reluctor Wheel and Piston Removal

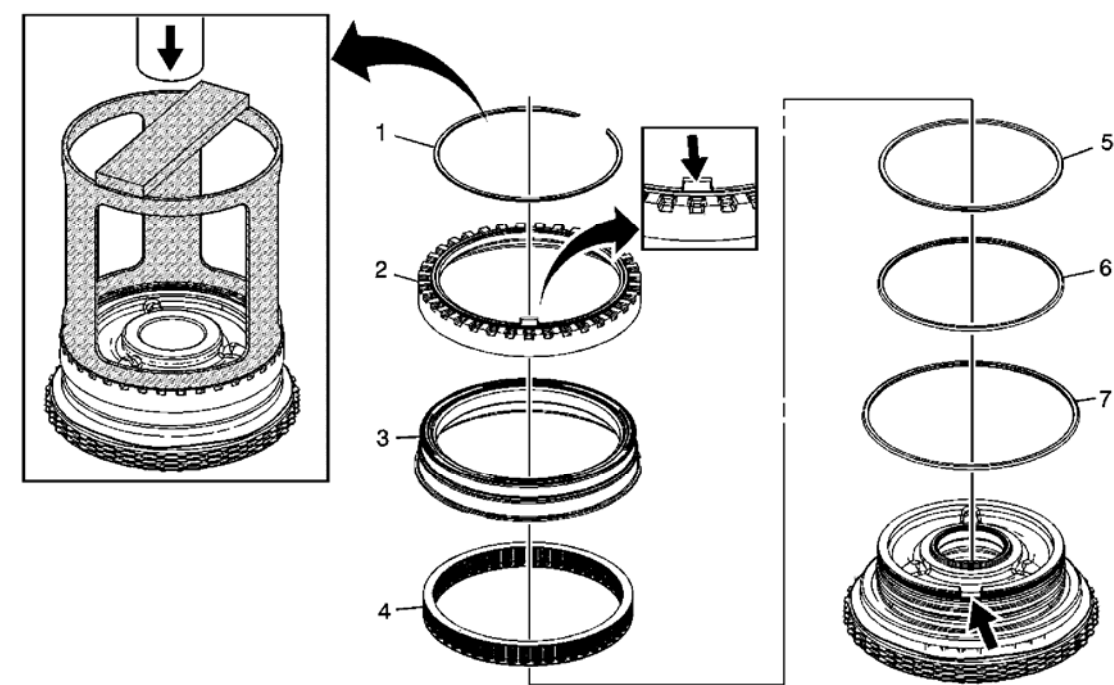


Fig. 28: Reluctor Wheel & Piston
Courtesy of GENERAL MOTORS CORP.

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 Tools: DT-47694: Piston Spring Compressor
2	Input Shaft Speed Sensor Reluctor Wheel
3	3-5 Reverse Clutch Piston
4	3-5 Reverse Clutch Piston Return Spring Assembly

5	3-5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
6	3-5 Reverse Clutch Piston Inner Seal
7	3-5 Reverse Clutch Piston Dam Seal (Black)

3-5 Reverse Clutch Plate Removal

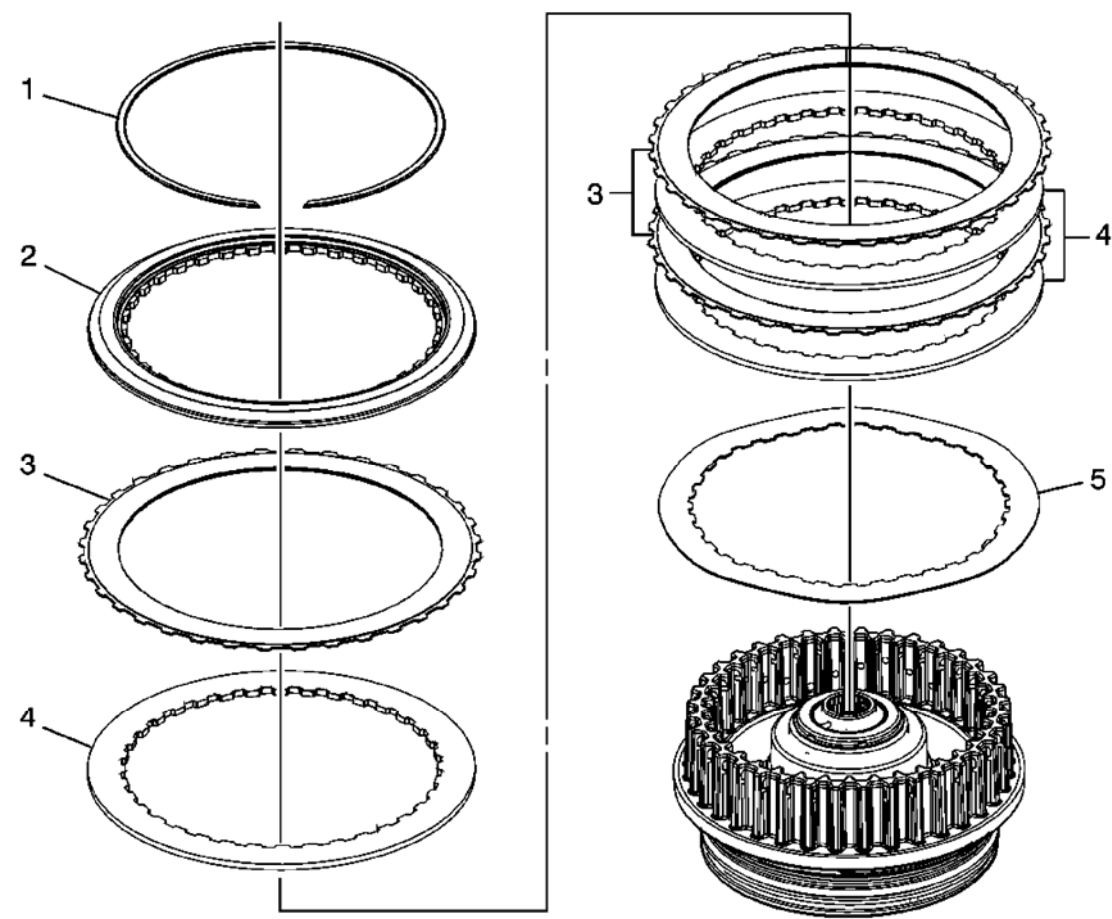


Fig. 29: 3-5 Reverse Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse Clutch Backing Plate Ring Retainer Ring Tip: 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

3-5 Reverse Clutch Plates Installation

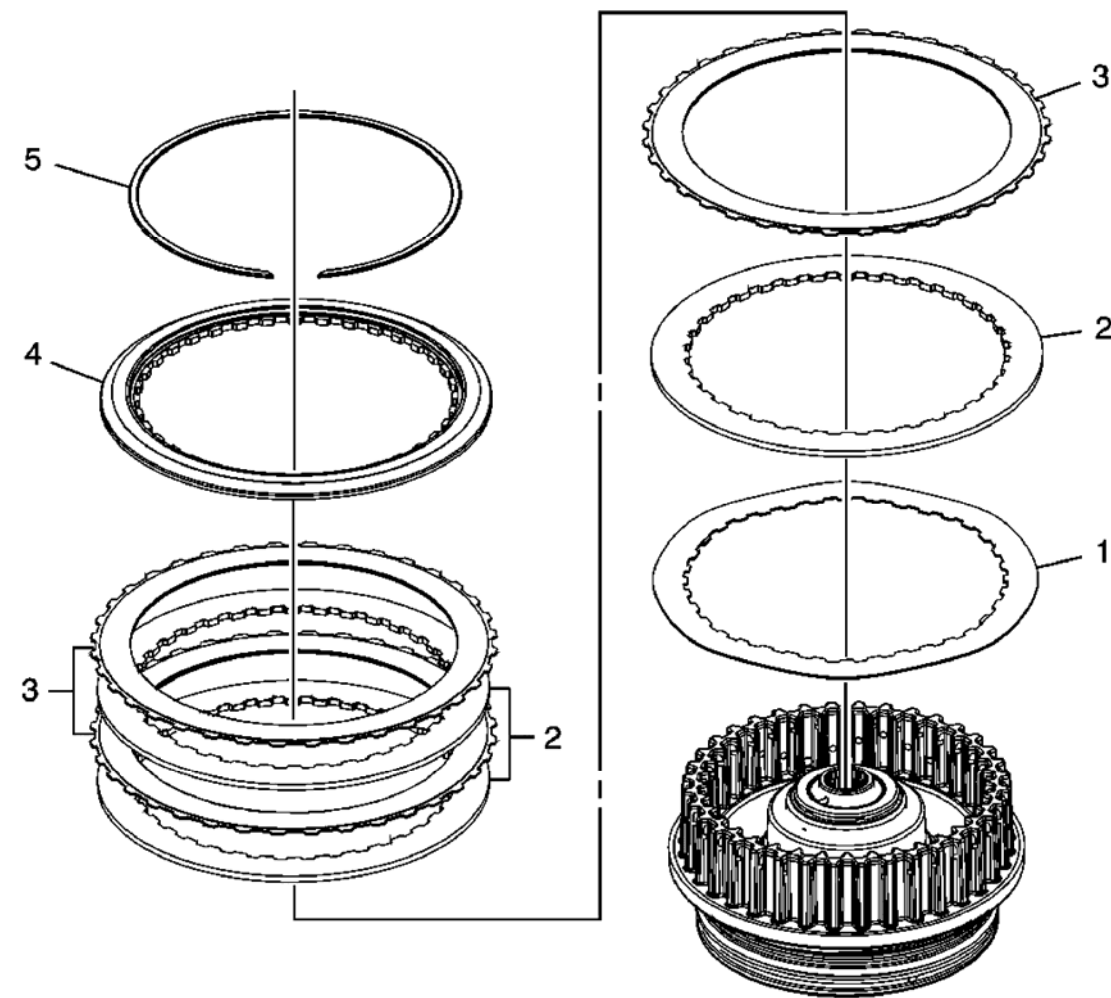


Fig. 30: 3-5 Reverse Clutch Plates
Courtesy of GENERAL MOTORS CORP.

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

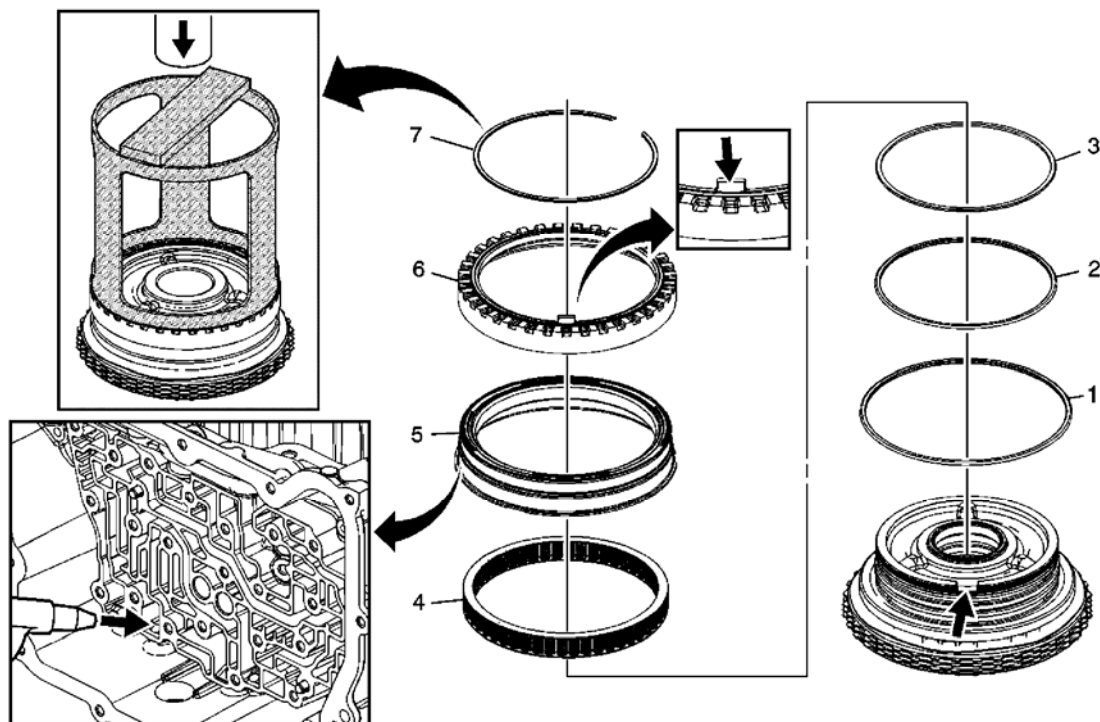


Fig. 31: Reluctor Wheel & Piston

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse Clutch Piston Dam Seal (Black)
2	3-5 Reverse Clutch Piston Inner Seal
3	3-5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
4	3-5 Reverse Clutch Piston Return Spring Assembly
5	3-5 Reverse Clutch Piston
6	Input Shaft Speed Sensor Reluctor Wheel
7	Input Shaft Speed Sensor Reluctor Ring Retainer Ring CAUTION: Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. CAUTION: Regulate the air pressure to 40 psi maximum. High pressure could cause the piston to over travel and damage the piston seals. Tip: 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

4-5-6 Clutch Piston Installation

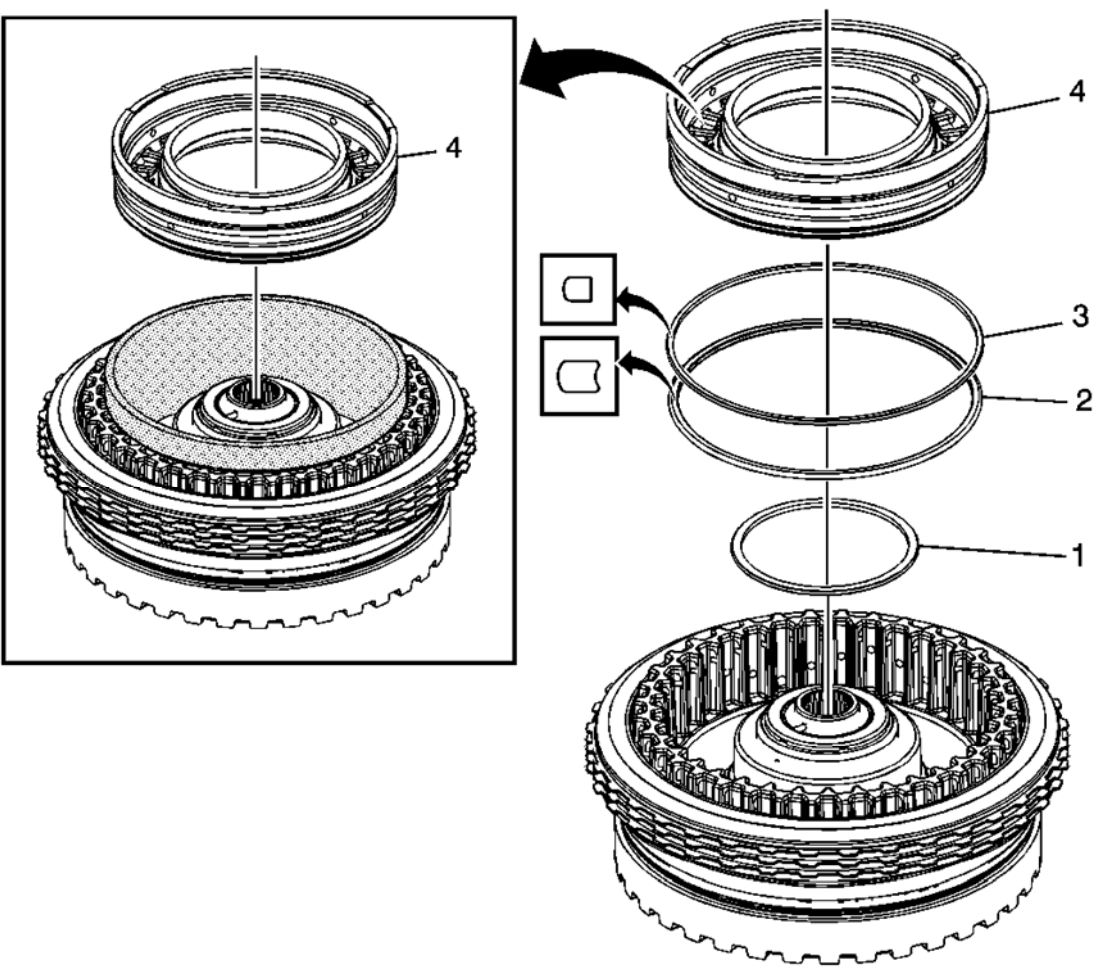


Fig. 32: 4-5-6 Clutch Piston
Courtesy of GENERAL MOTORS CORP.

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 (DK Blue) (Stepped)
	4-5-6 Clutch Piston
	Tip: • DT-47805: seal protector prevents the dam seal lip from damage during

4

installation. Apply a thin coat of ATF to the I.D. of **DT-47805**: 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

4-5-6 Clutch Fluid Dam Installation

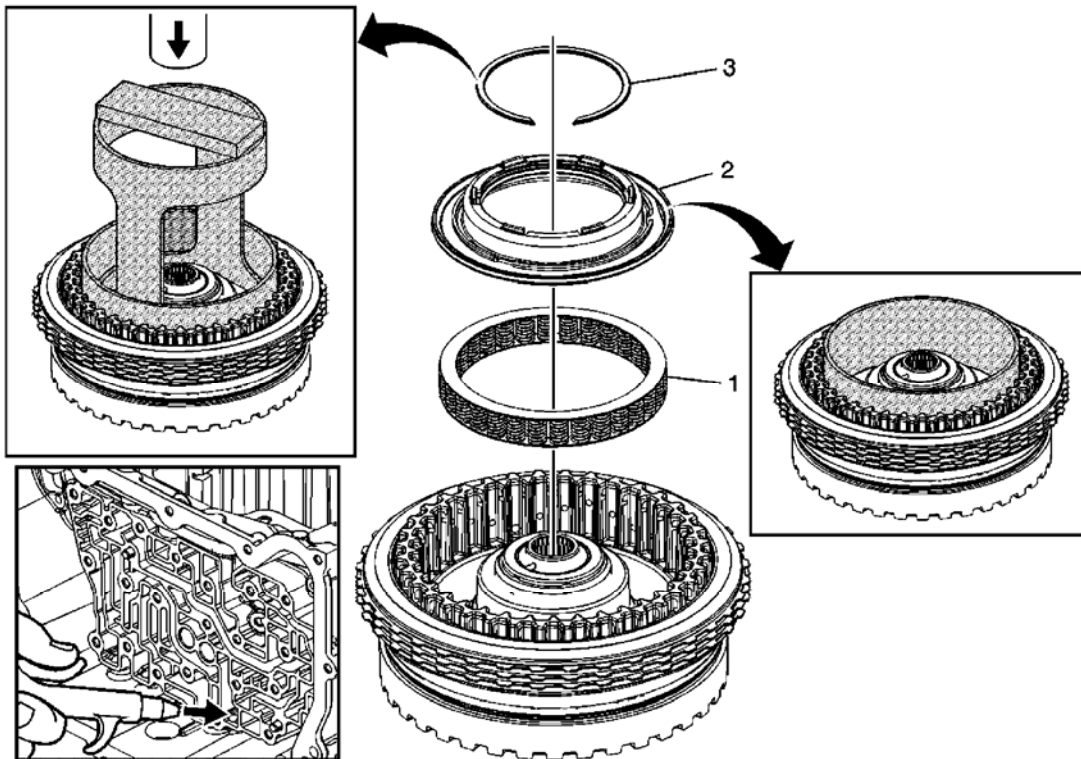


Fig. 33: 4-5-6 Clutch Fluid Dam

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Piston Return Spring Assembly
2	4-5-6 Clutch Piston Fluid Dam Assembly Tip: DT-47951-1 : seal protector prevents the dam seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT-47951-1 : protector to ease the installation of the dam. Special Tools: DT-47951-1 : Seal Protector
	4-5-6 Clutch Dam Retaining Ring

CAUTION:

Regulate the air pressure to 40 psi maximum. High pressure could cause the piston to over travel and damage the piston seals.

Procedure

- The 4-5-6 clutch dam retaining ring is not reusable, install a NEW retaining ring.
- Leave **DT-47951-1**: seal protector in place while installing the retaining ring.
- 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

4-5-6 Clutch Plates Installation

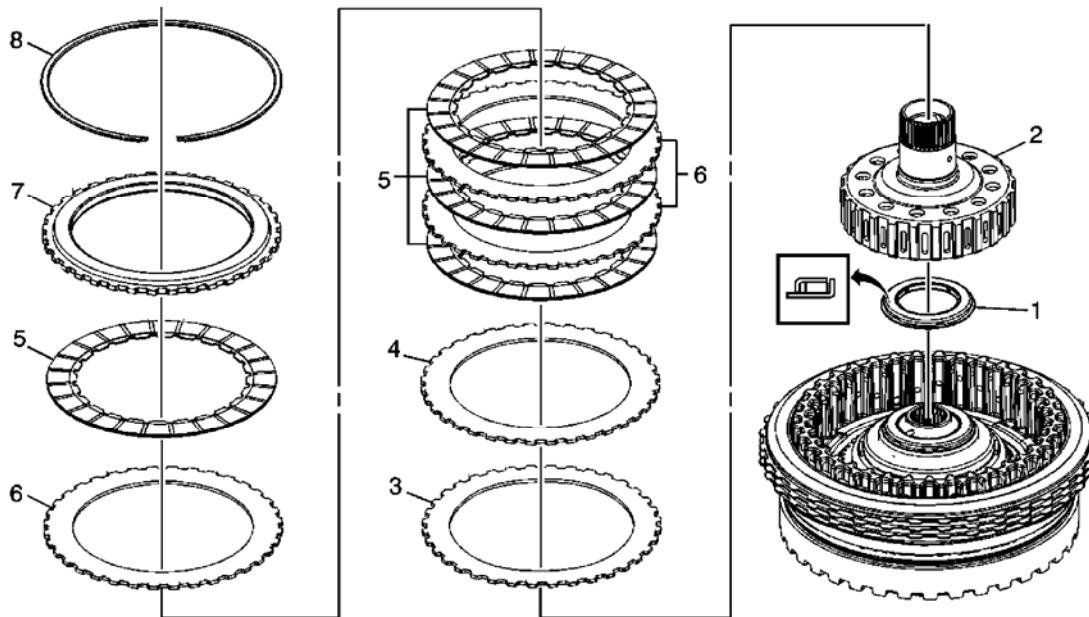


Fig. 34: 4-5-6 Clutch Plates

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Reaction Carrier Hub Thrust Bearing Assembly
2	Reaction Carrier Hub Assembly

3	4-5-6 Clutch Wave Plate
4	4-5-6 Clutch Apply Plate
5	4-5-6 Clutch Plate Assembly (Qty: 4)
6	4-5-6 Clutch Plate (Qty: 3)
7	4-5-6 Clutch Backing Plate
8	4-5- 6 Clutch Backing Plate Retaining Ring

Turbine Shaft Installation

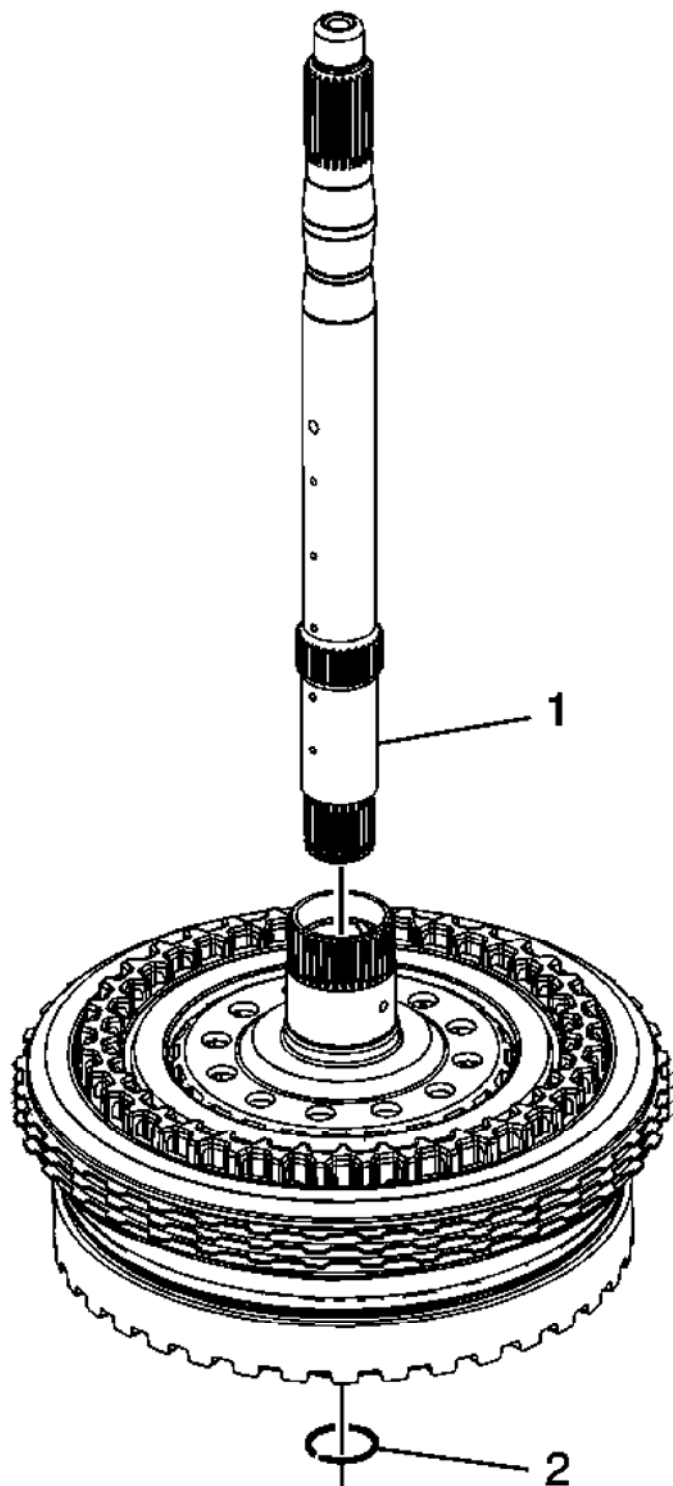


Fig. 35: Turbine Shaft
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	Turbine Shaft
2	Turbine Shaft Retainer Ring Tip: Do not re-use the turbine shaft retainer ring. Special Tools: J-5586-A: Snap Ring Pliers or equivalent

INPUT, REACTION, AND OUTPUT CARRIER ASSEMBLE

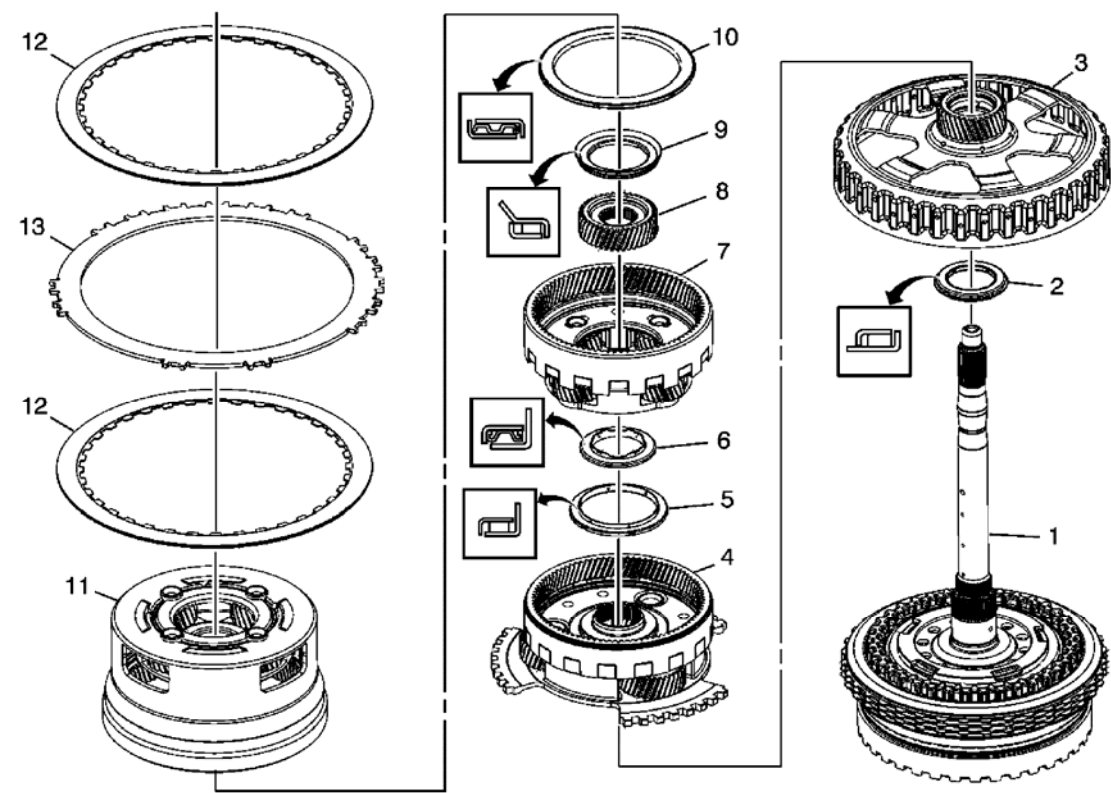


Fig. 36: Input, Reaction & Output Carrier
 Courtesy of GENERAL MOTORS CORP.

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 Tip: • The 6T30 and 6T40 have 3 pinions. • The 6T45 and 6T50 have 4 pinions.
5	Input Carrier Thrust Bearing Assembly

6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Assembly Tip: • 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
11	Output Carrier Assembly Tip: • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
12	2-6 Clutch Plate Assembly (Qty: 2) Tip: Begin with the clutch plate assembly and alternate with the clutch plate.
13	2-6 Clutch Plate (Qty: 1) Tip: 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

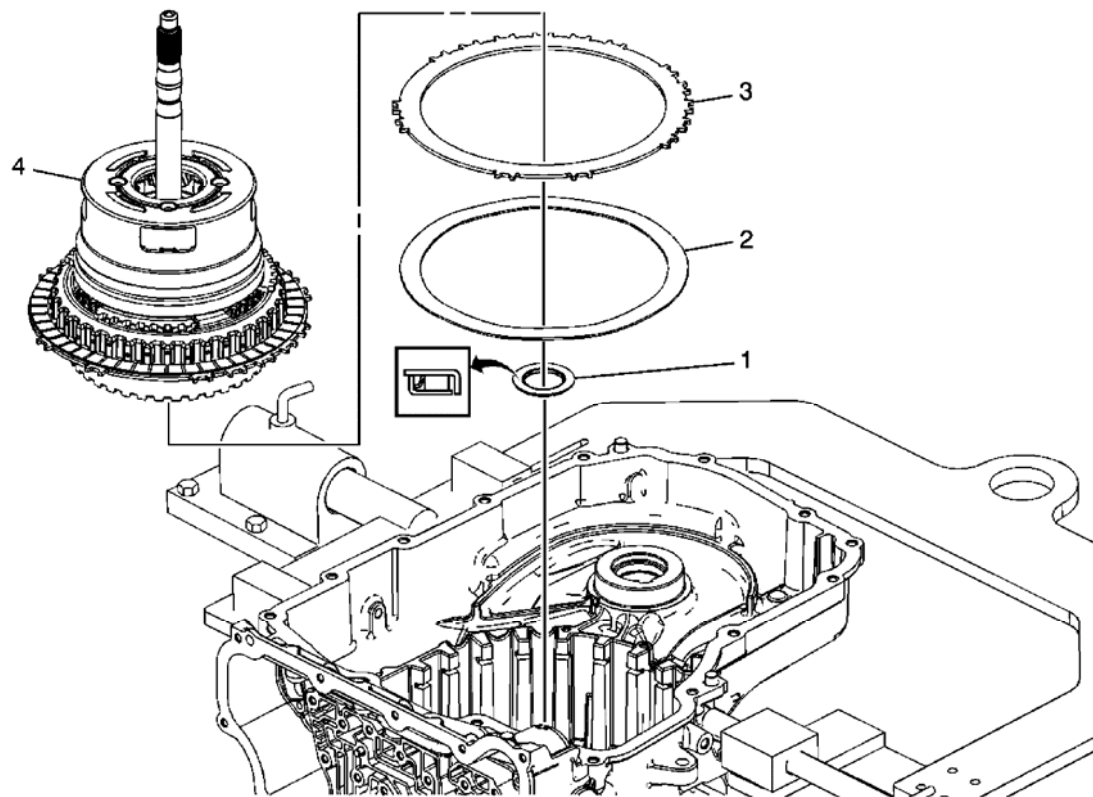


Fig. 37: 3-5-Reverse, 4-5-6 Clutch Housing, Input, Reaction & Output Carrier
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Housing Thrust Bearing
2	2-6 Clutch Apply Plate (Waved)
3	2-6 Clutch Plate (Qty: 1) Tip: - 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 Tip: 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

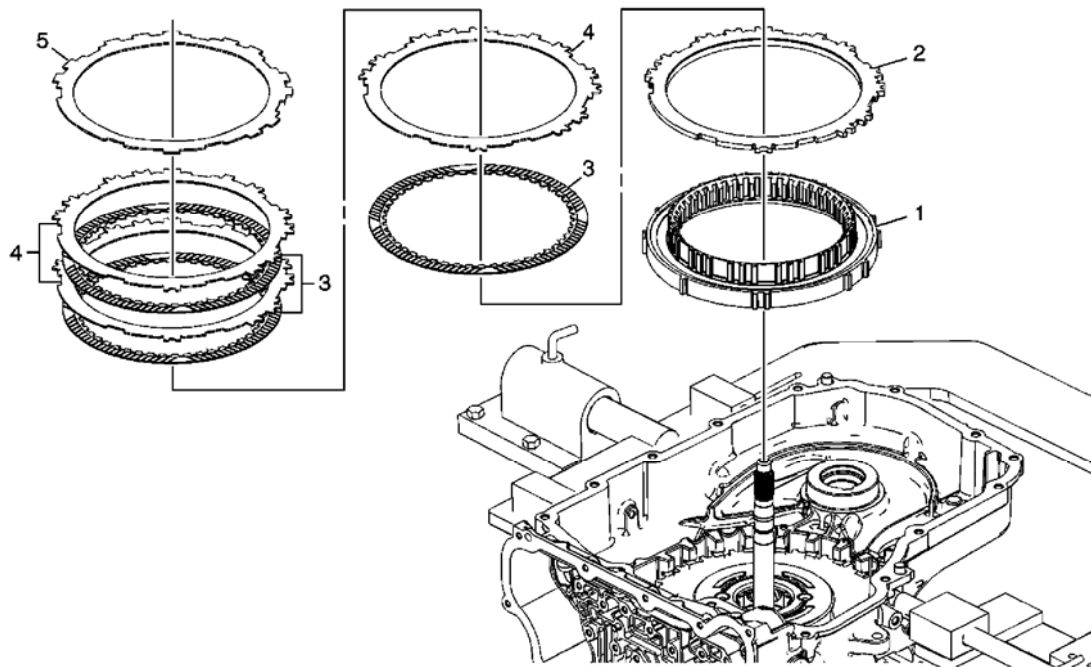


Fig. 38: Low & Reverse Clutch Assembly & Low & Reverse Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse Clutch Assembly (OWC) Tip: • The Low and Reverse Clutch Assembly should rotate freely in one direction and lock in the opposite direction. • Align the large flat areas of the Low and Reverse Clutch Assembly with the valve body end of the case.
2	Low and Reverse Clutch Backing Plate
3	Low and Reverse Clutch Plate Assembly (Qty: 3)
4	Low and Reverse Clutch Plate (Qty: 3) Tip: Align the large flat areas of the Low and Reverse Clutch Plate with the valve body end of the case.
5	Low and Reverse Clutch Apply (Waved) Plate Tip: Align the large flat areas of the Low and Reverse Clutch Apply Plate with the valve body end of the case.

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING DISASSEMBLE

Low and Reverse Clutch Piston Removal

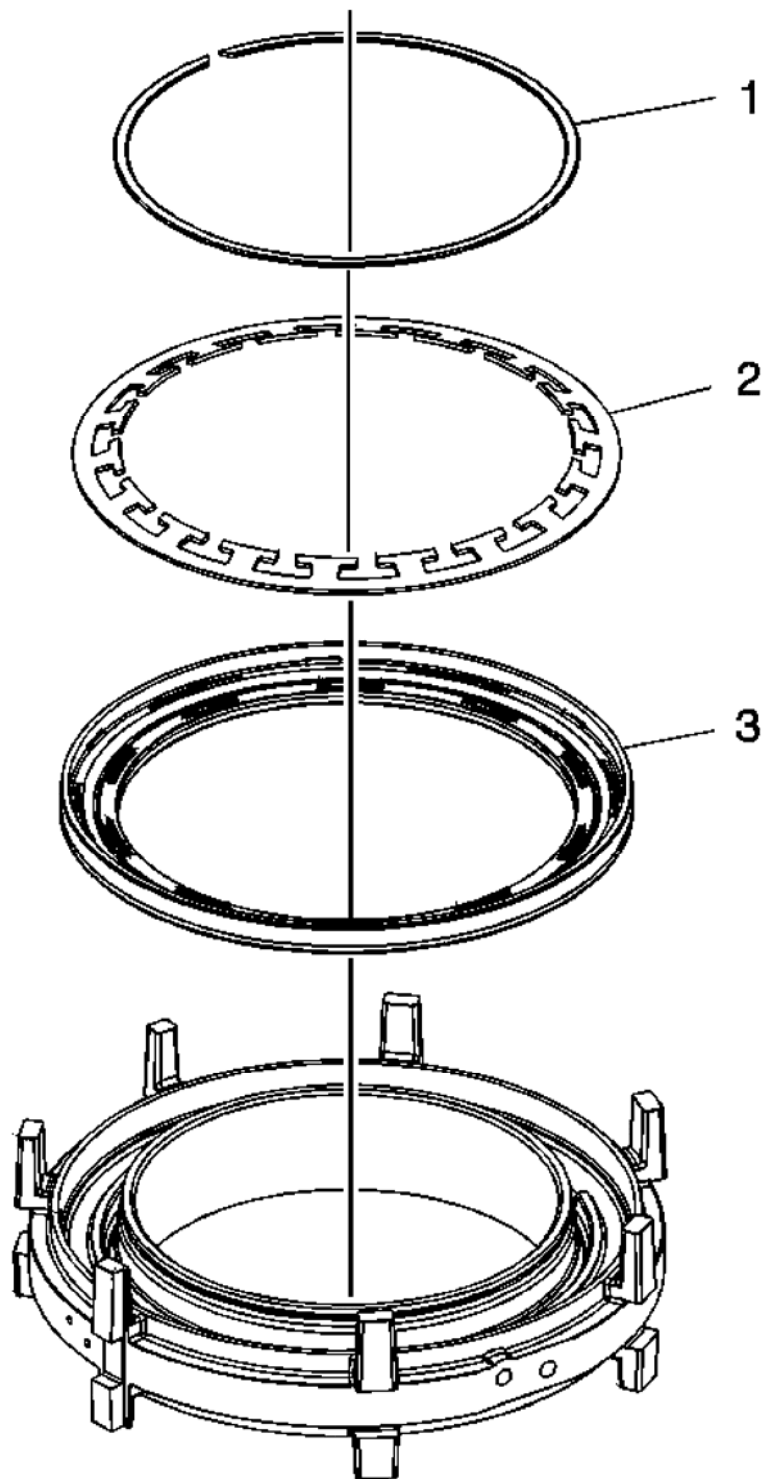


Fig. 39: Low & Reverse Clutch Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	Low and Reverse Clutch Spring Retainer Special Tools: J-8059: Snap Ring Pliers - Parallel Jaw
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Piston

1-2-3-4 Clutch Piston Removal

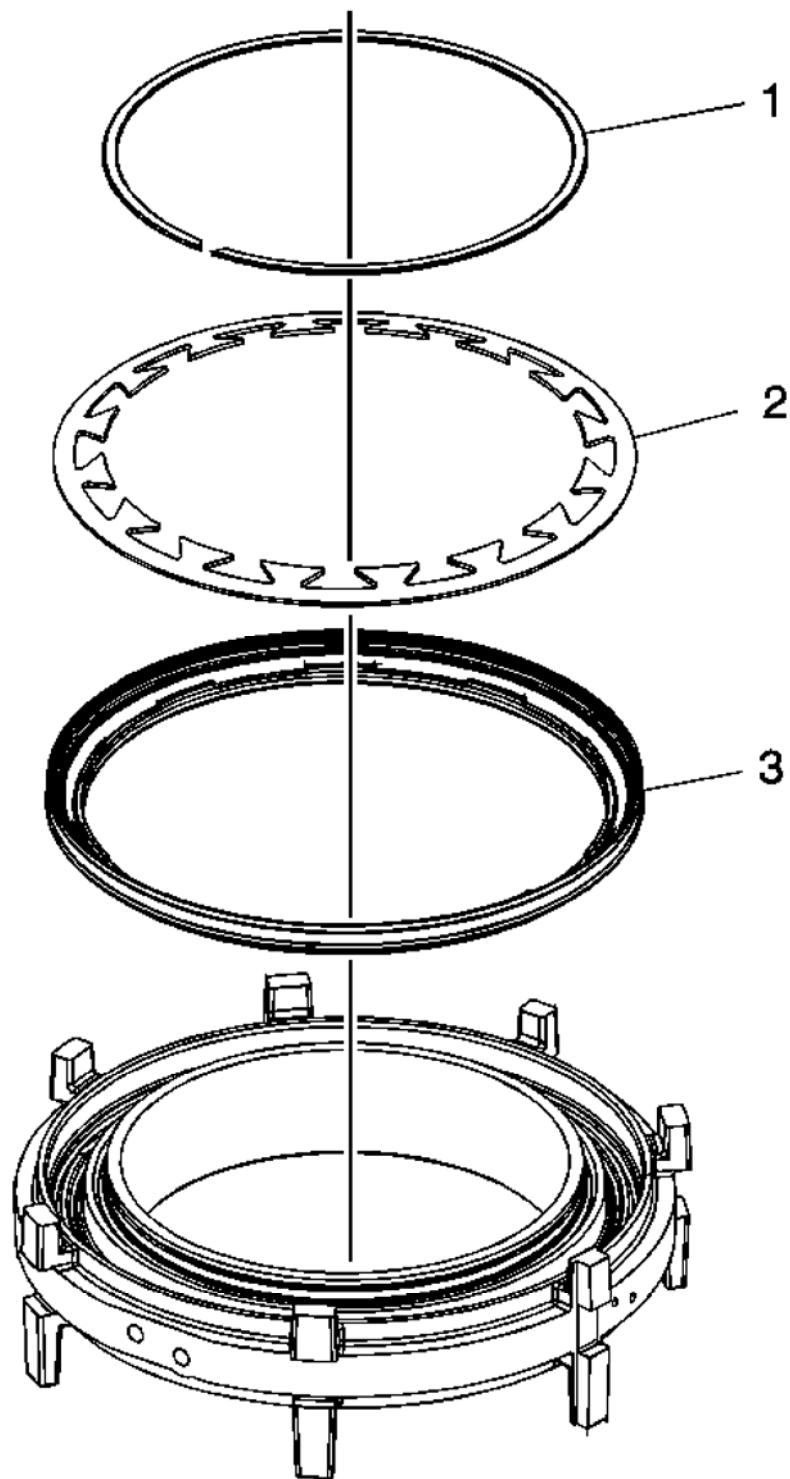


Fig. 40: 1-2-3-4 Clutch Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	1-2-3-4 Clutch Spring Retainer Special Tools: J-8059: Snap Ring Pliers - Parallel Jaw
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

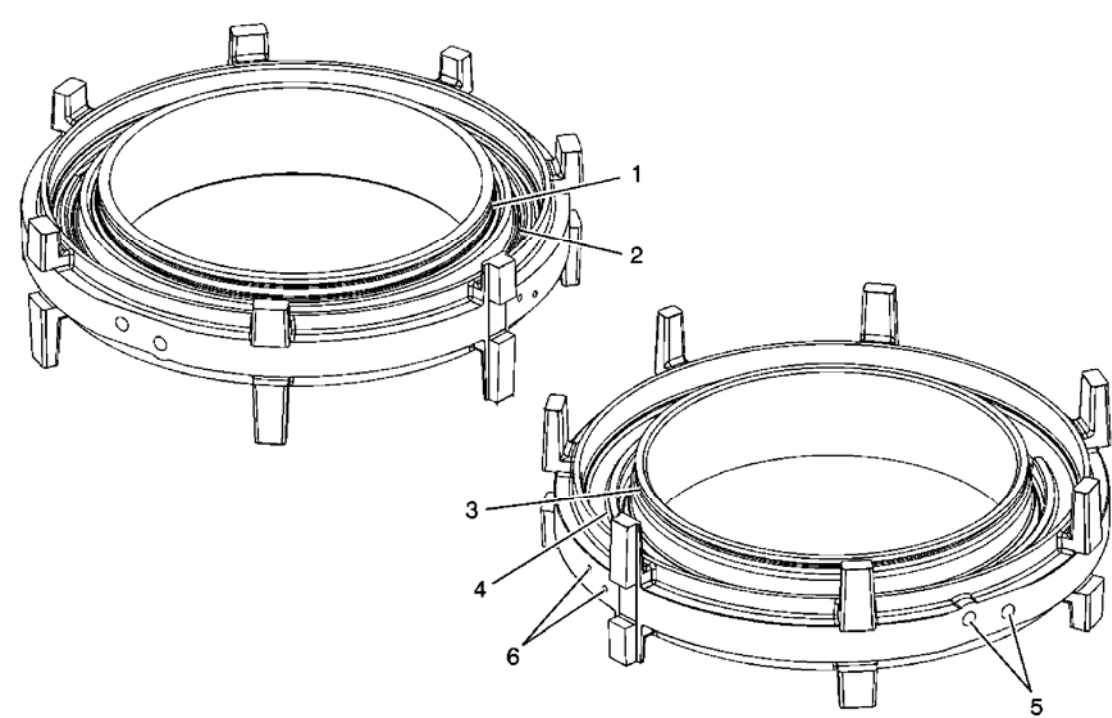


Fig. 41: Low & Reverse & 1-2-3-4 Clutch Housing
Courtesy of GENERAL MOTORS CORP.

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

LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING ASSEMBLE

1-2-3-4 Clutch Piston Installation

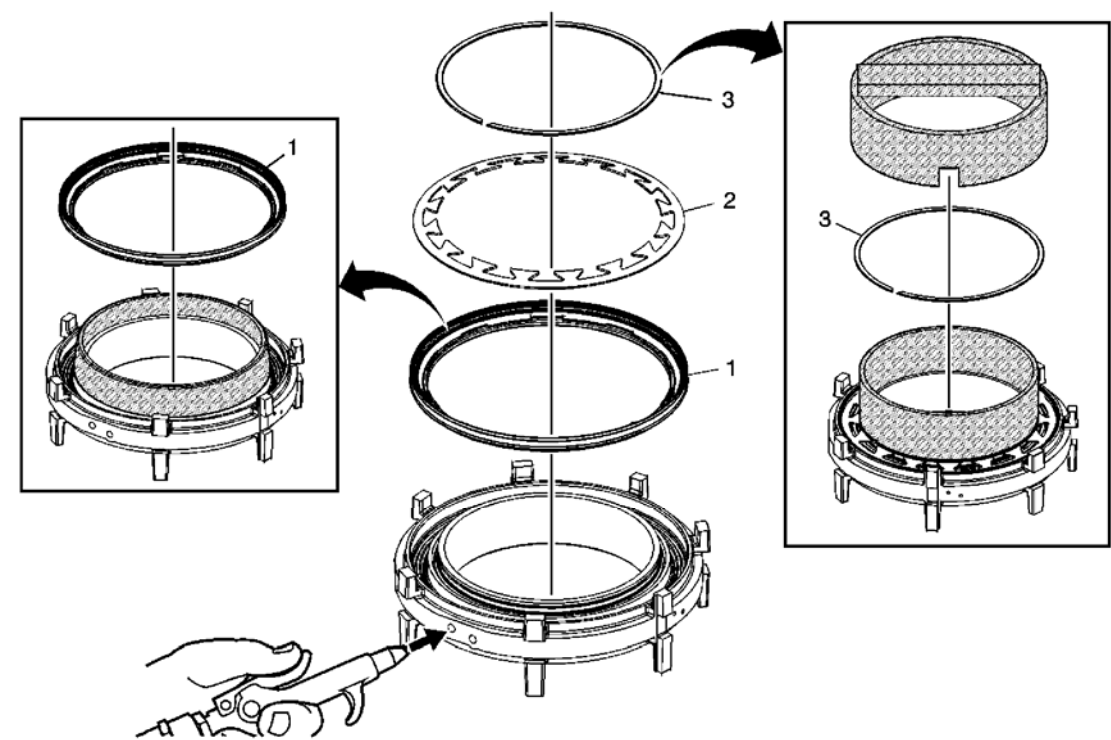


Fig. 42: 1-2-3-4 Clutch Piston
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	1-2-3-4 Clutch Piston Tip: 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 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
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Low and Reverse Clutch Piston Installation

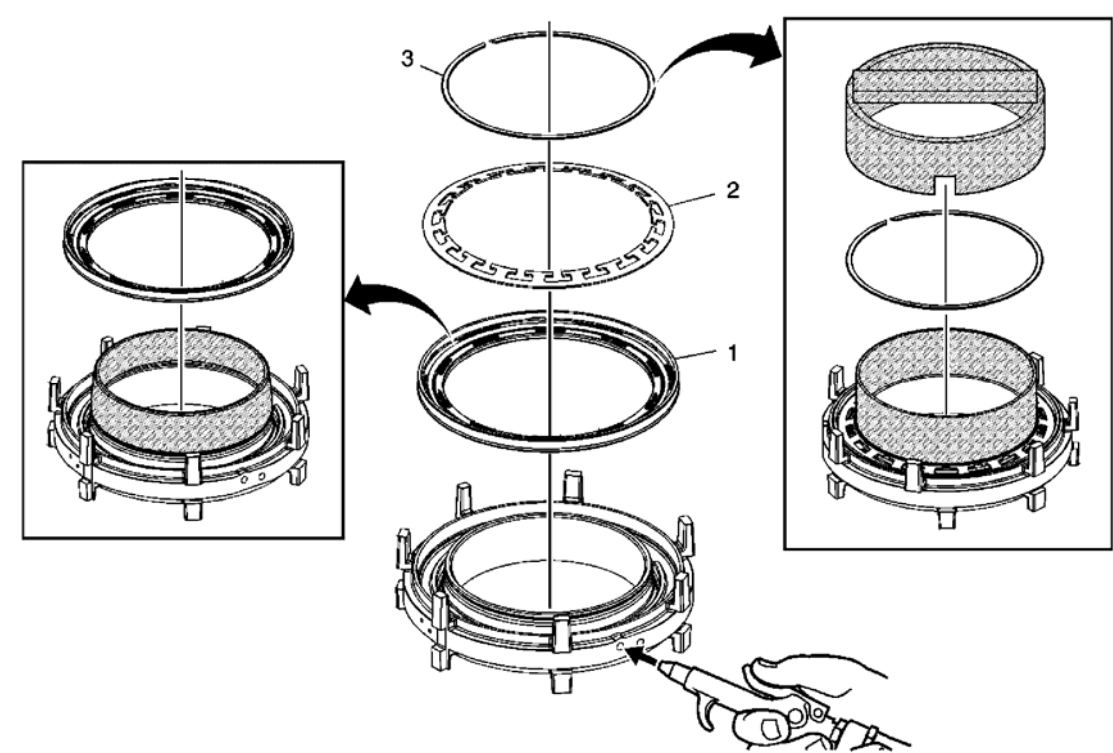


Fig. 43: Low & Reverse Clutch Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Low and Reverse Clutch Piston

1	Tip: 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
3	Low and Reverse Clutch Spring Retainer CAUTION: Regulate the air pressure to 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

**LOW AND REVERSE AND 1-2-3-4 CLUTCH HOUSING, AND 1-2-3-4 CLUTCH PLATE
INSTALLATION**

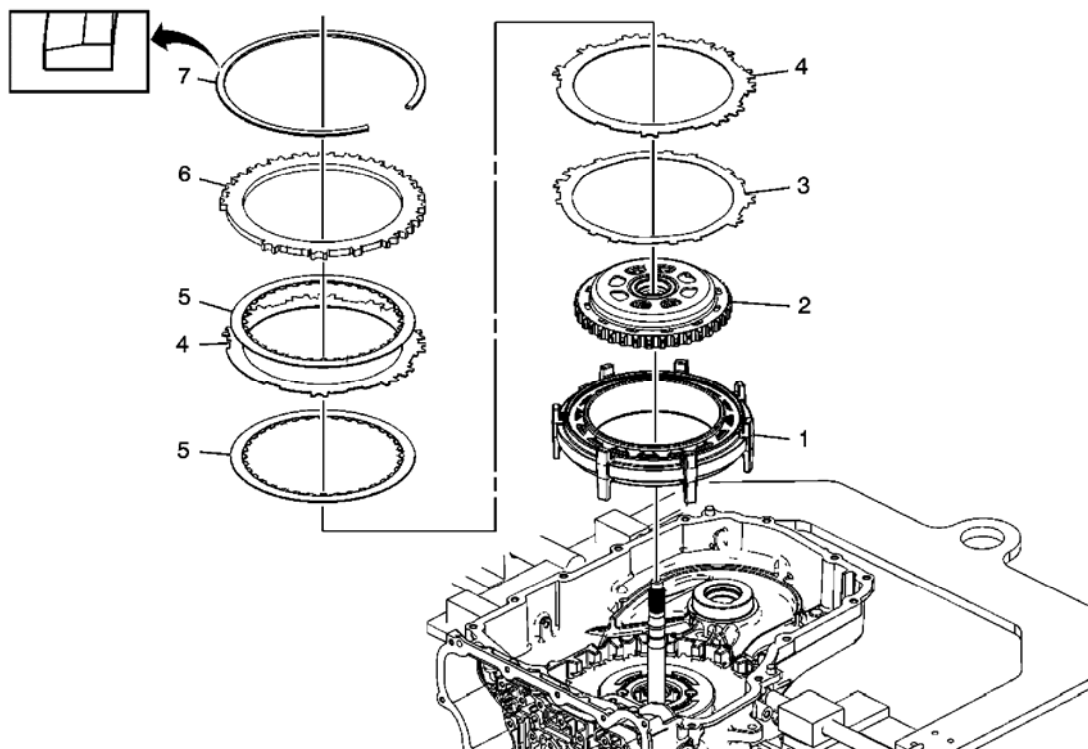


Fig. 44: Low & Reverse & 1-2-3-4 Clutch Housing, & 1-2-3-4 Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse and 1-2-3-4 Clutch Housing Tip: 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 Tip: Align the single pair of tabs with the bottom valve body end of the case.
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 Tip: Align the single skinny tab with the case spline facing the top of the case.
	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.

Tip:

- 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 **J 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 **J 28585**: snap ring remover.

Special Tool:

J 28585: Snap Ring Remover or equivalent

7

DRIVE SPROCKET, DRIVEN SPROCKET, AND DRIVE LINK CLEANING AND INSPECTION

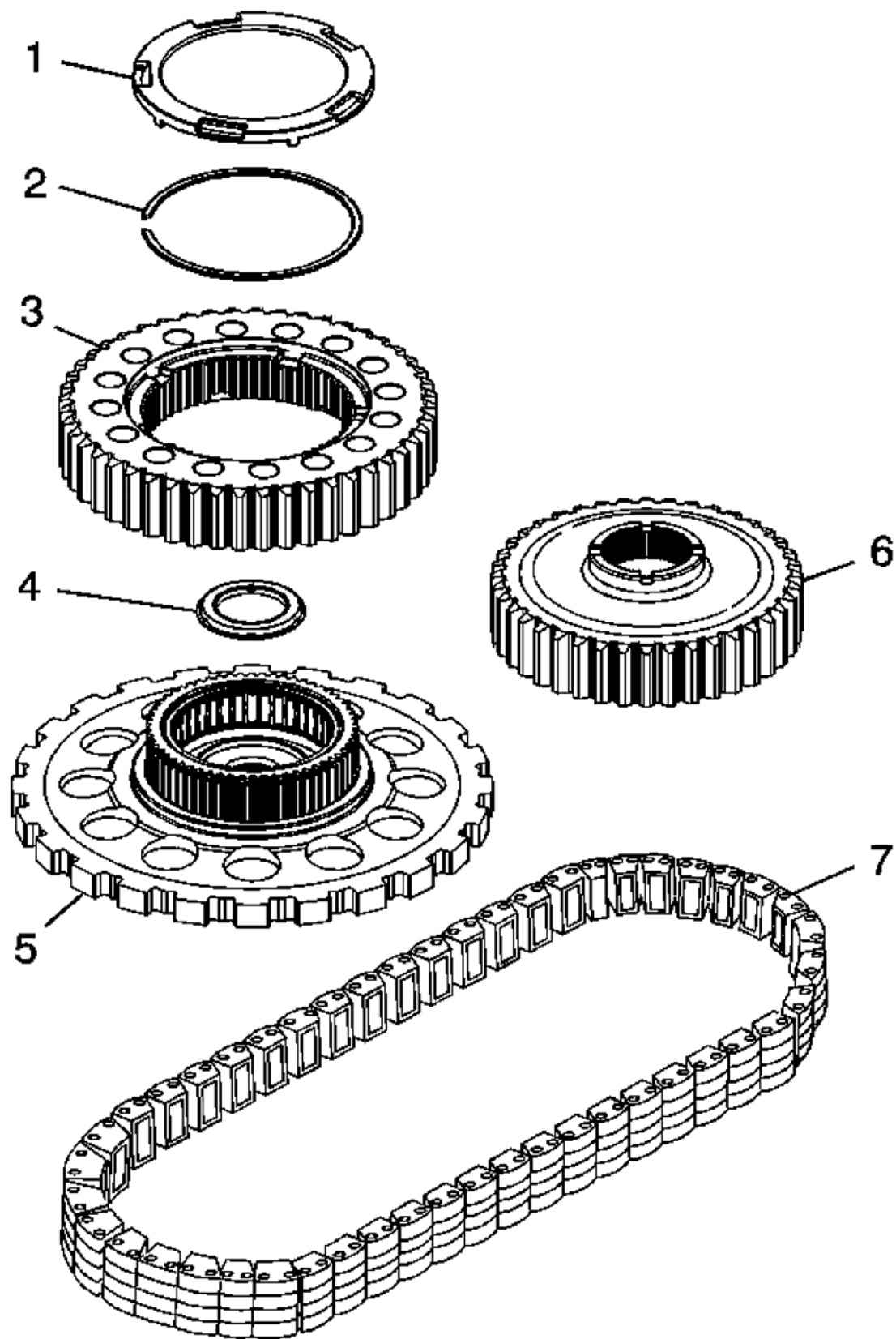


Fig. 45: Drive Sprocket, Driven Sprocket & Drive Link
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Drive Sprocket Retainer Ring
3	Drive Sprocket
4	Drive Sprocket Bearing Assembly
5	Park Gear
6	Driven Sprocket
7	Drive Link Assembly

DRIVE AND DRIVEN SPROCKET, DRIVE LINK, AND PARK PAWL INSTALLATION (6T40/45)

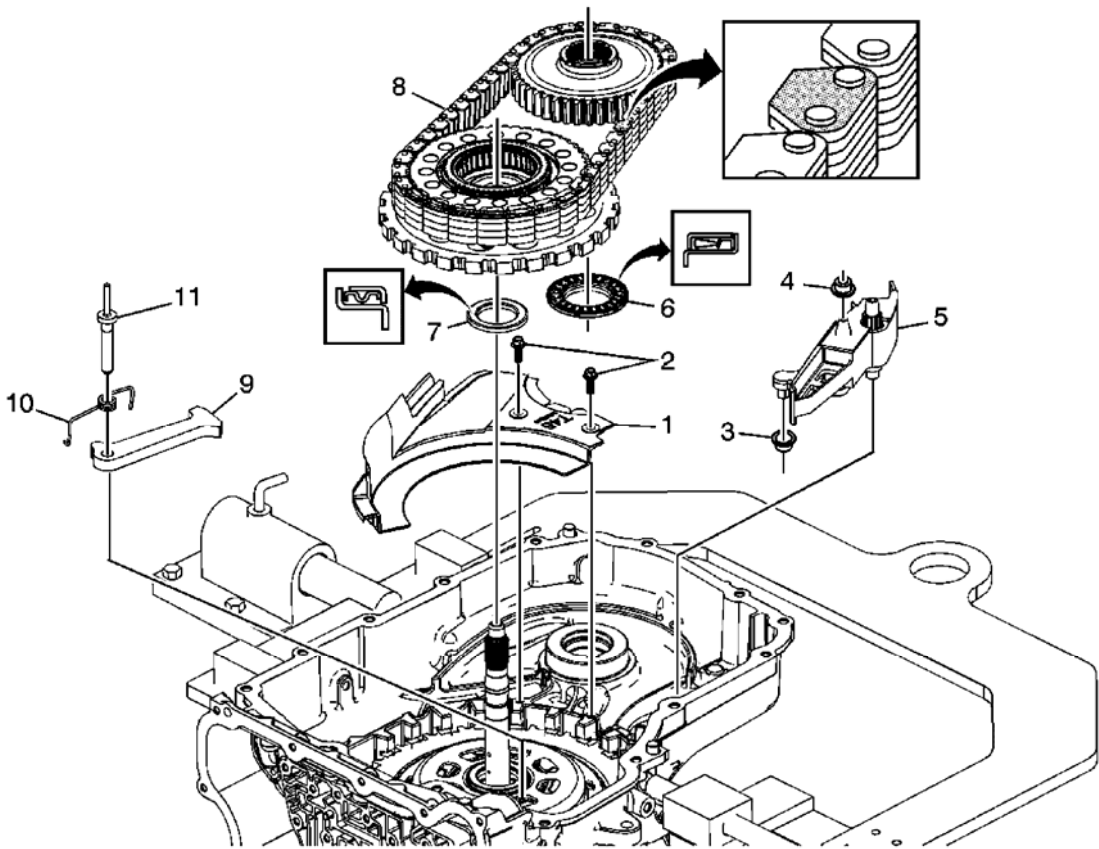


Fig. 46: Drive & Driven Sprocket, Drive Link, & Park Pawl (6T40/45)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Baffle
	Front Differential Carrier Baffle Bolt M6 x 16 (Qty: 2)

2	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
3	Drive Link Lube Scoop Seal
4	Drive Link Lube Fluid Seal
5	Drive Link Lube Scoop
6	Driven Sprocket Bearing Assembly
7	Drive Sprocket Bearing Assembly
8	Driven Sprocket Assembly, Drive Sprocket Assembly and Drive Link Tip: • Install the drive link with the colored links and/or part number facing up. • The drive link, drive, and driven sprocket assemblies must be installed at the same time. • The ball bearing should spin freely and smoothly. • The driven sprocket ball bearing inner race has a slight interference fit with the case. Tap gently with the palm of a hand or a soft tip hammer to install.
9	Park Pawl
10	Park Pawl Spring
11	Park Pawl Shaft Tip: Check to ensure that the park pawl operates freely and is not binding.

FRONT DIFFERENTIAL CARRIER CLEANING AND INSPECTION

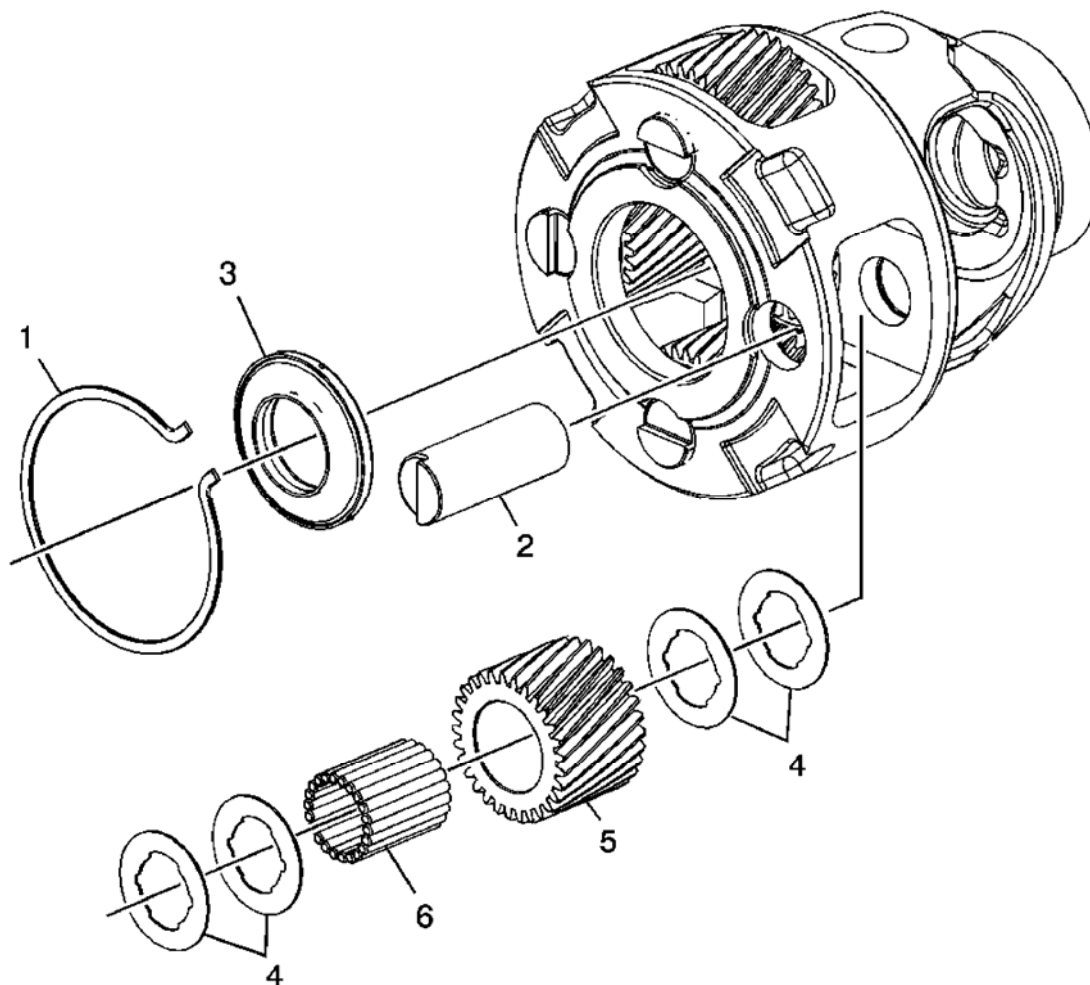


Fig. 47: Front Differential Carrier
 Courtesy of GENERAL MOTORS CORP.

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.
- The differential assembly is only serviced as an assembly.

1	Front Differential Pinion Gear Shaft Retainer
2	Front Differential Pinion Gear Pin
3	Sun Gear to Differential Housing Bearing Assembly
4	Front Differential Pinion Gear Washer
5	Front Differential Pinion Gear
6	Front Differential Planetary Pinion Gear Bearing Roller

FRONT DIFFERENTIAL CARRIER INSTALLATION (6T40/45)

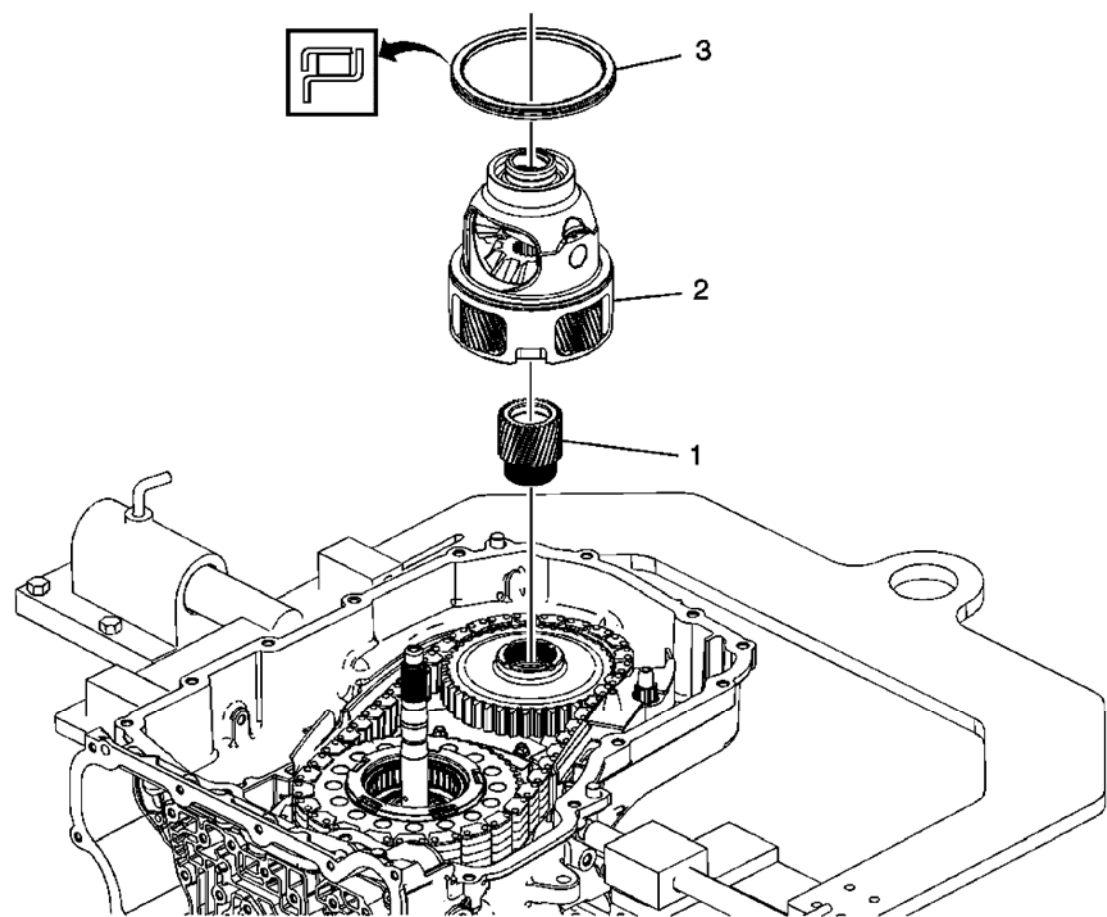


Fig. 48: Front Differential Carrier (6T40/45)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

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

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR REMOVAL (6T40/45)

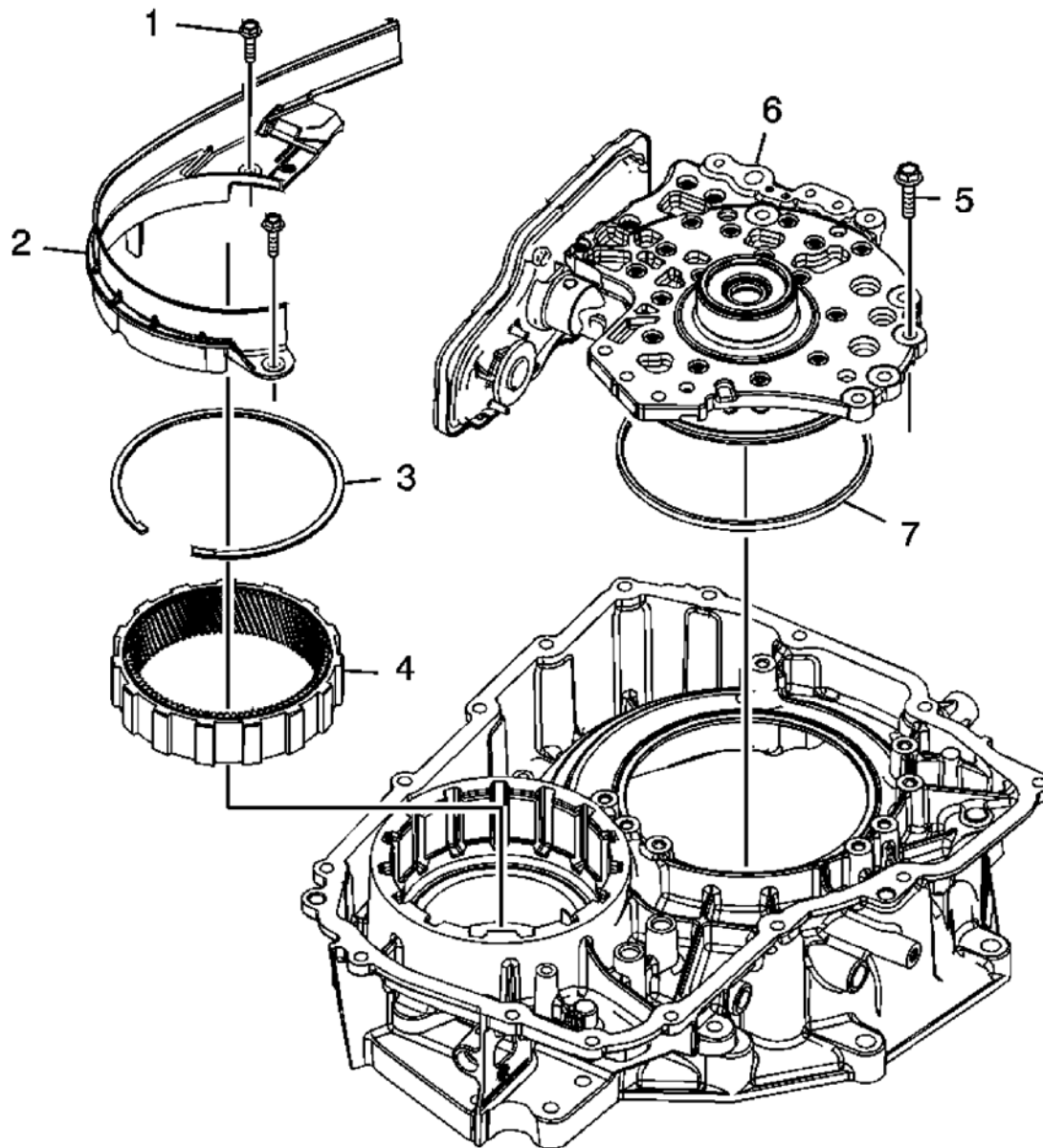


Fig. 49: View Of Transmission Fluid Pump, Front Differential Carrier Baffle & Front Differential Ring Gear (6T40/45)
Courtesy of GENERAL MOTORS CORP.

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 Tip: Note the direction of the taper to ensure proper installation.
4	Front Differential Ring Gear
5	Fluid Pump Bolts M8 x 33 (Qty: 8)
6	Fluid Pump Assembly
7	Torque Converter and Differential Housing Seal

FRONT WHEEL DRIVE SHAFT SEAL REMOVAL - TORQUE CONVERTER HOUSING SIDE

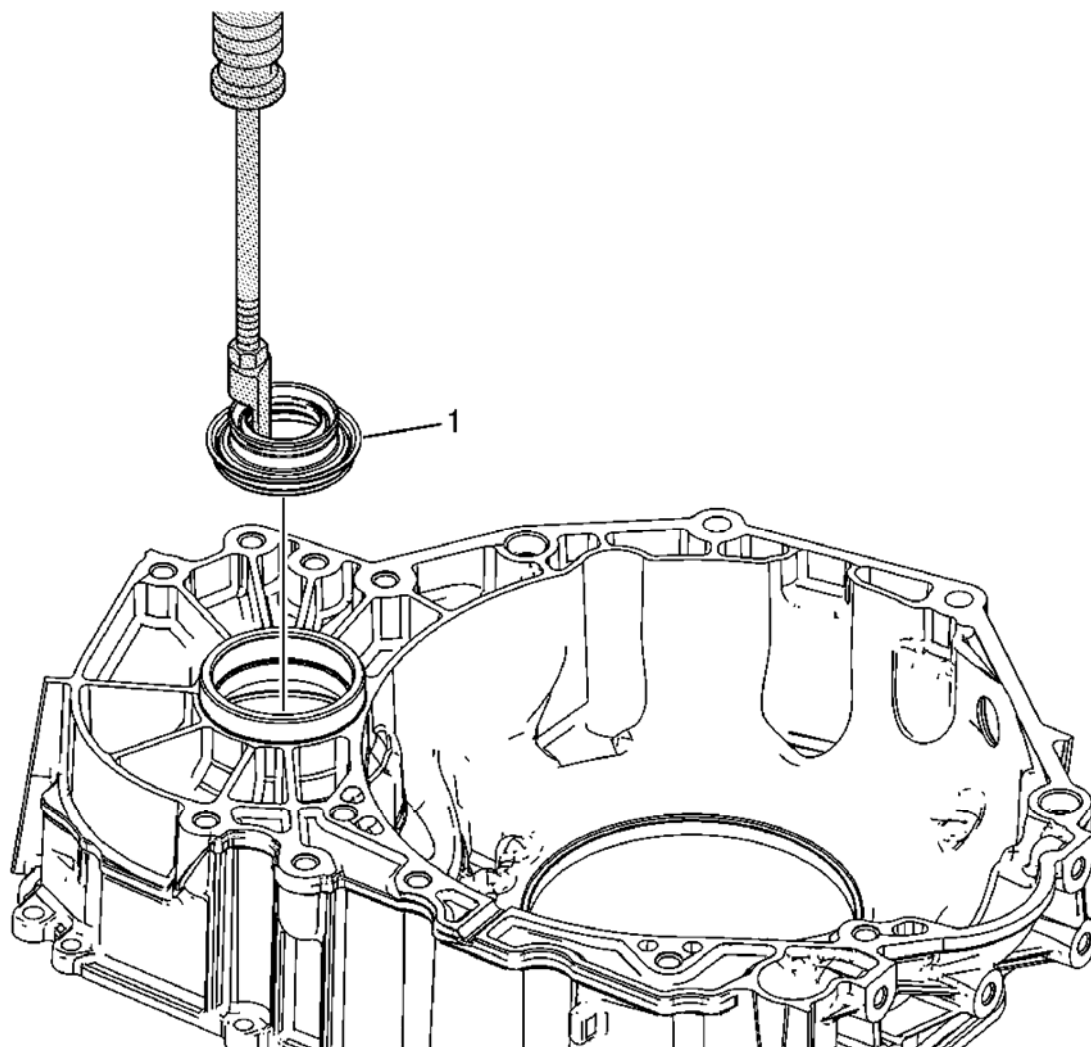


Fig. 50: Front Wheel Drive Shaft Seal - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS CORP.

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

FRONT DIFFERENTIAL CARRIER BEARING REMOVAL (AWD)

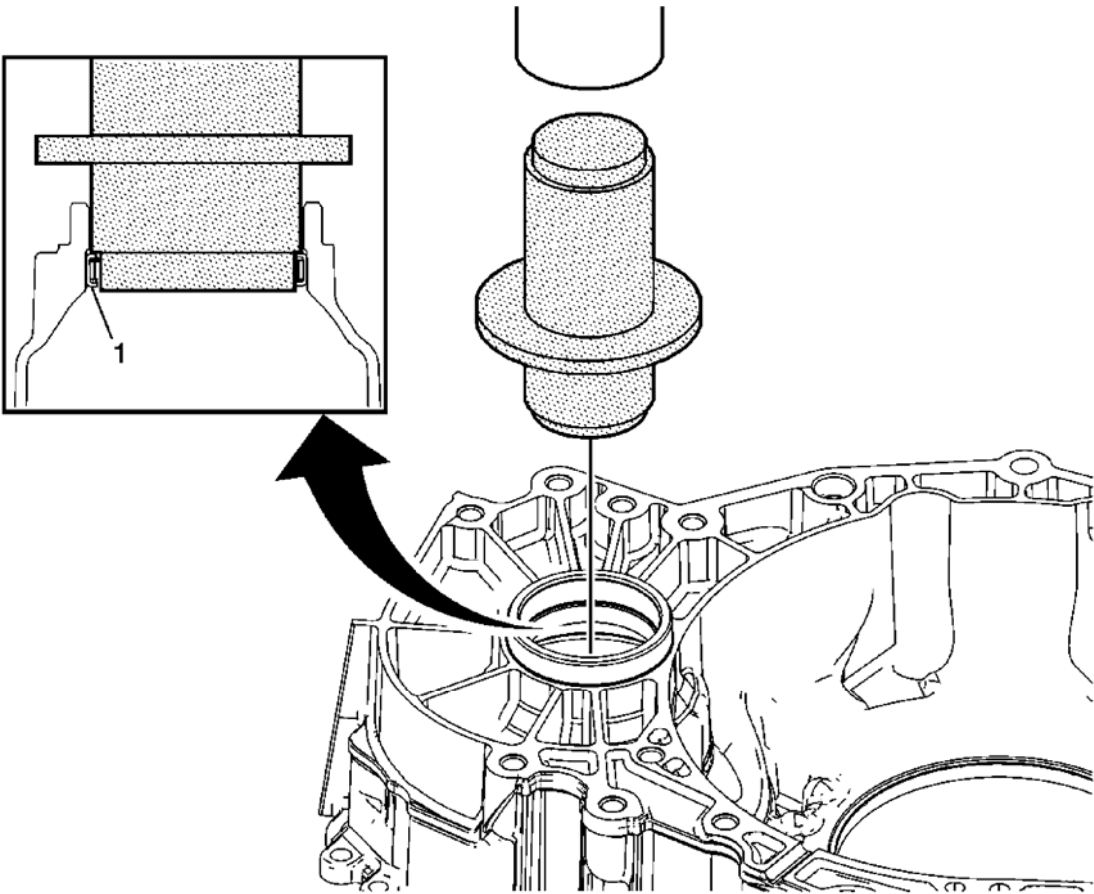


Fig. 51: Front Differential Carrier Bearing (AWD)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Bearing Special Tools • DT 49831: Differential Bearing Remover/Installer (2 Pinion Blue)

FRONT DIFFERENTIAL CARRIER BEARING INSTALLATION (AWD)

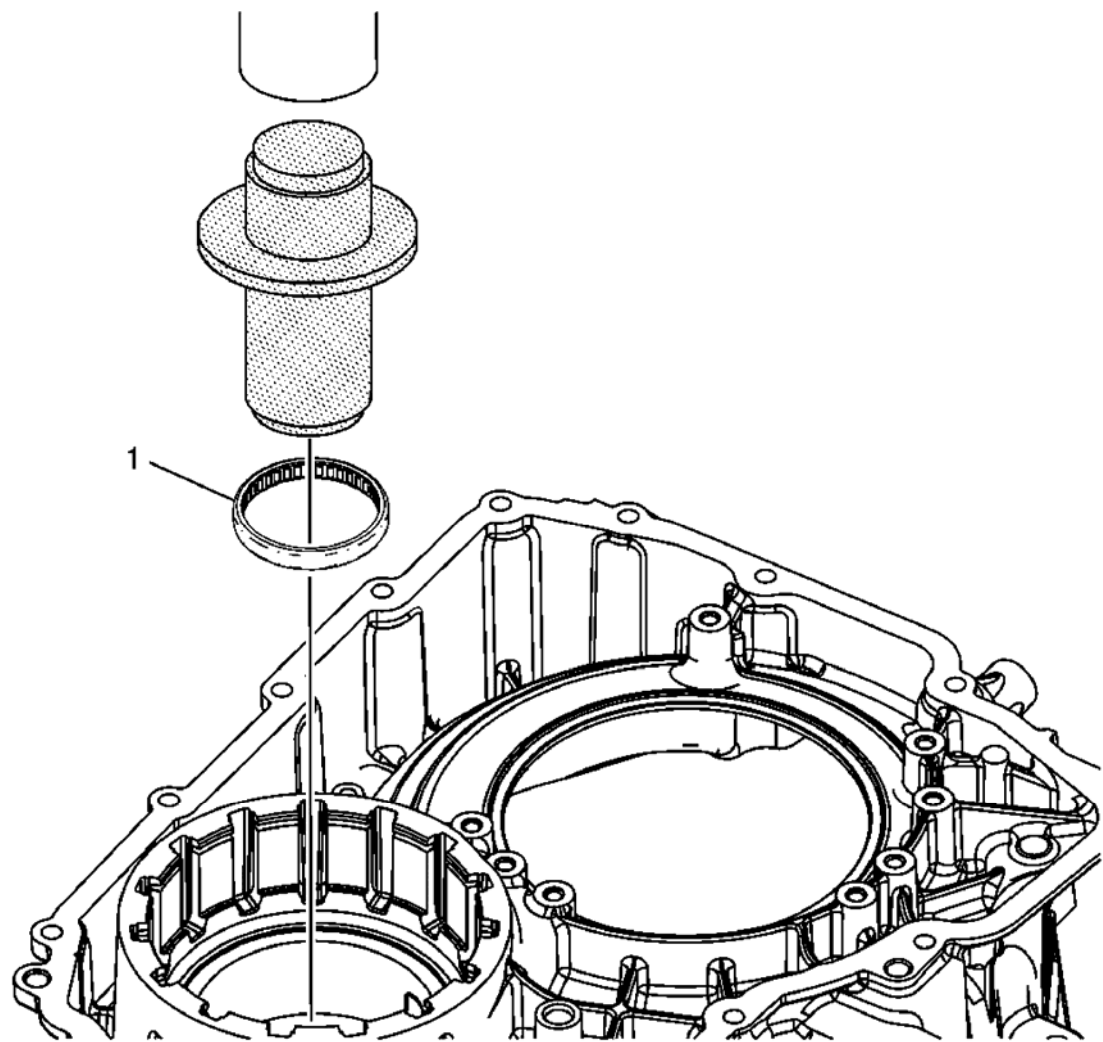


Fig. 52: Front Differential Carrier Bearing (AWD)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Bearing Tip: Press the bearing until the tool stops against the housing to ensure the bearing is installed to the correct dimension. Special Tools • DT 49831: Differential Bearing Remover/Installer (2 Pinion Blue)

FRONT WHEEL DRIVE SHAFT SEAL INSTALLATION - TORQUE CONVERTER HOUSING SIDE

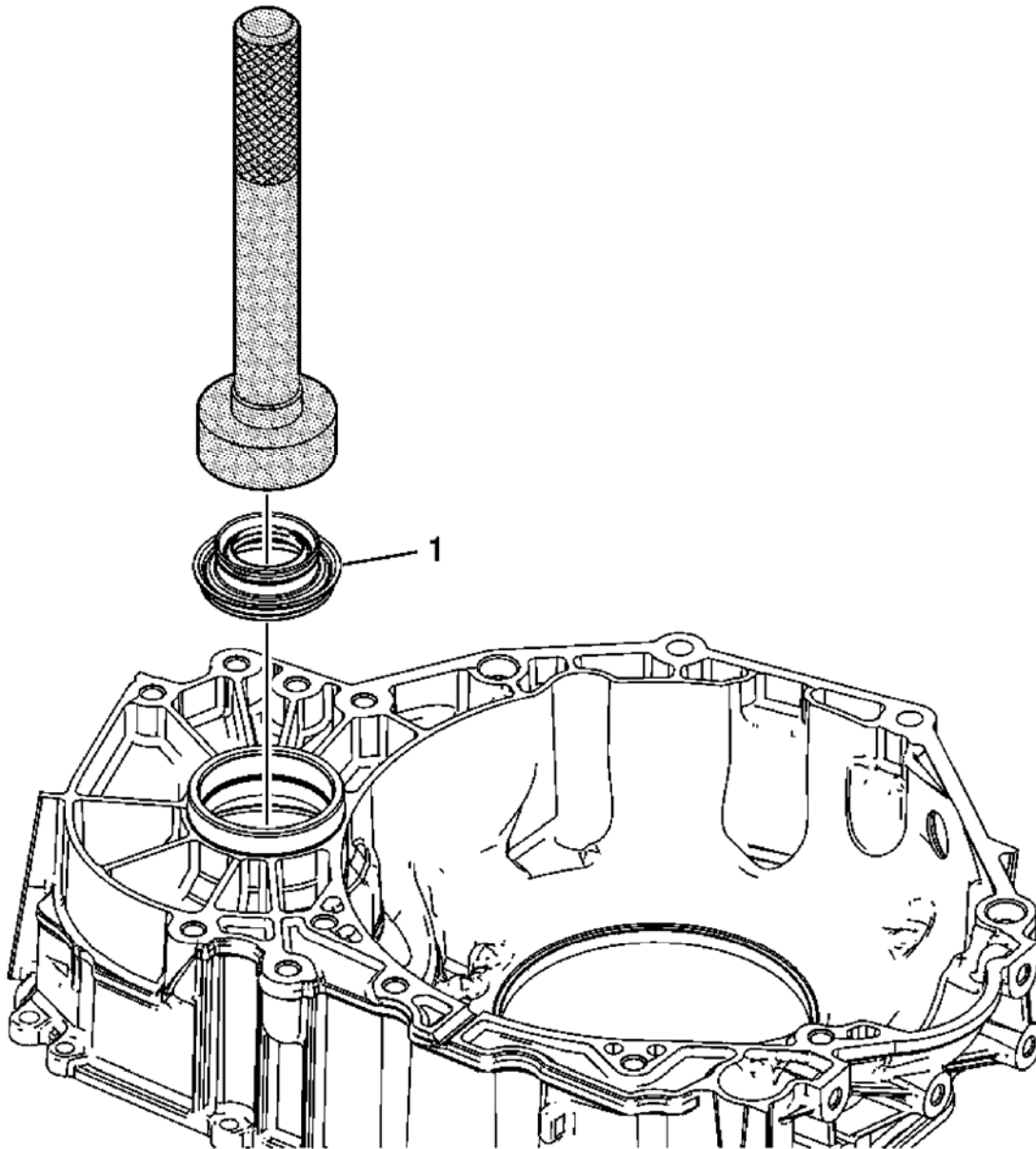


Fig. 53: Front Wheel Drive Shaft Seal - Torque Converter Housing Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Wheel Drive Shaft Oil Seal Assembly
	Special Tools

- DT-47790: Seal Installer
- GE 8092: Driver Handle

TORQUE CONVERTER HOUSING CLEANING AND INSPECTION

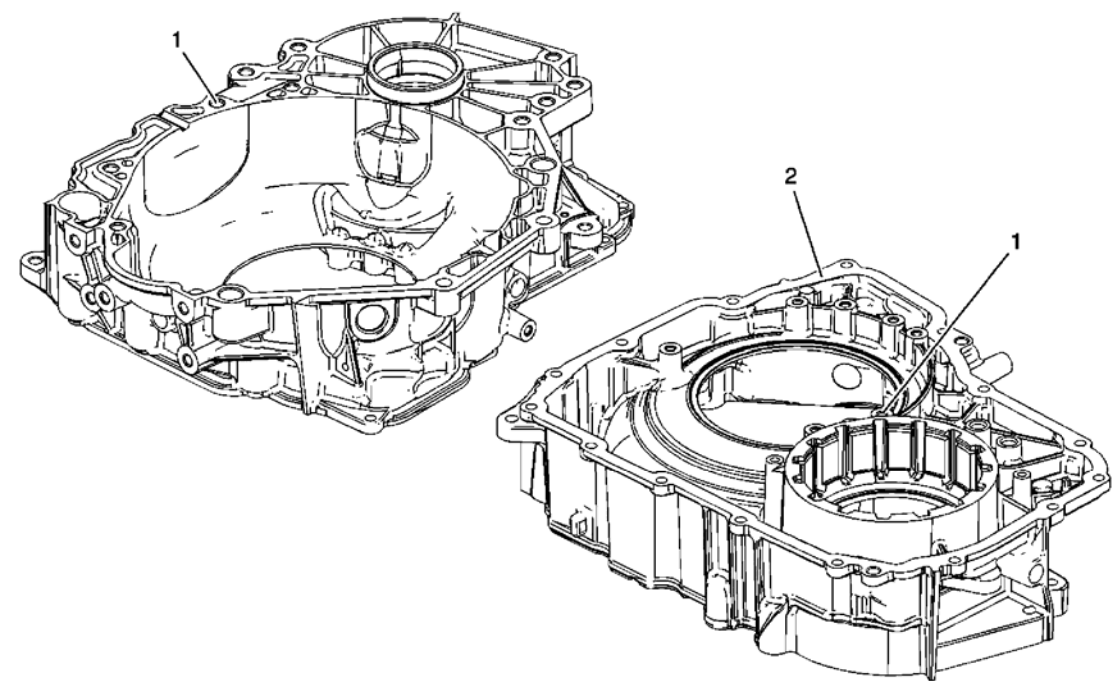


Fig. 54: Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

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

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

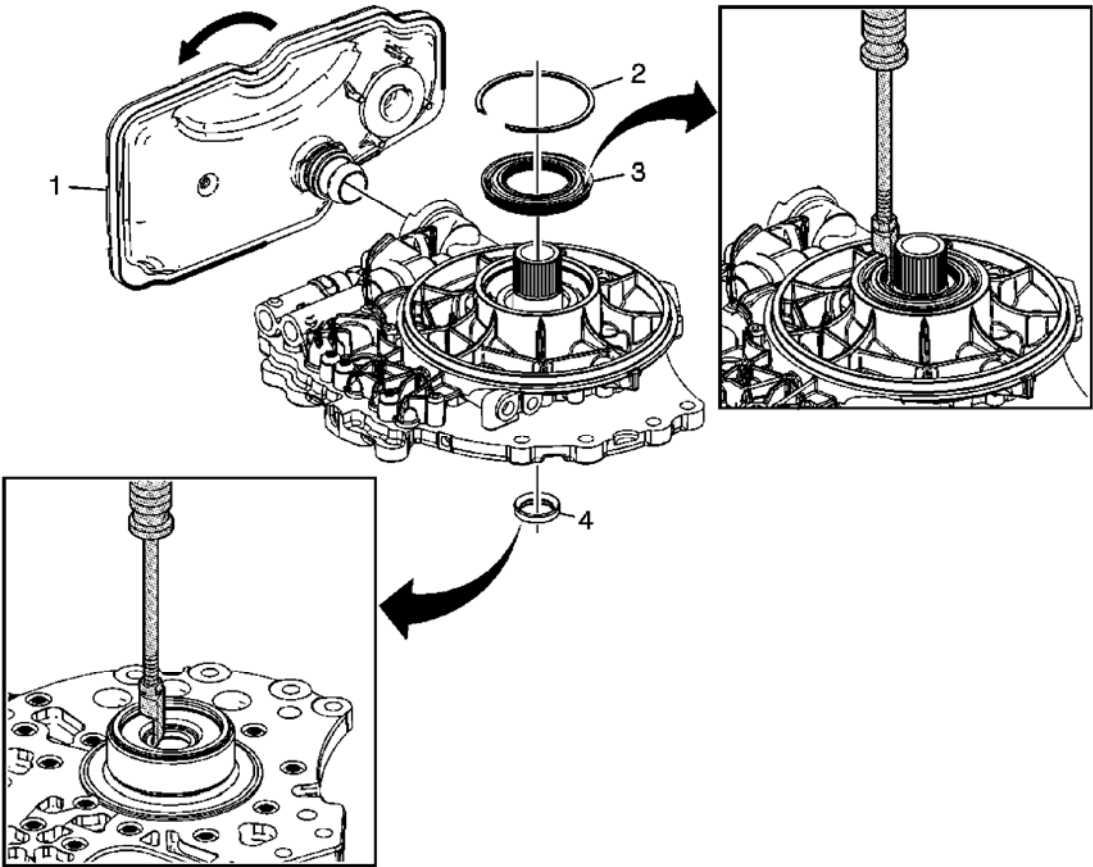
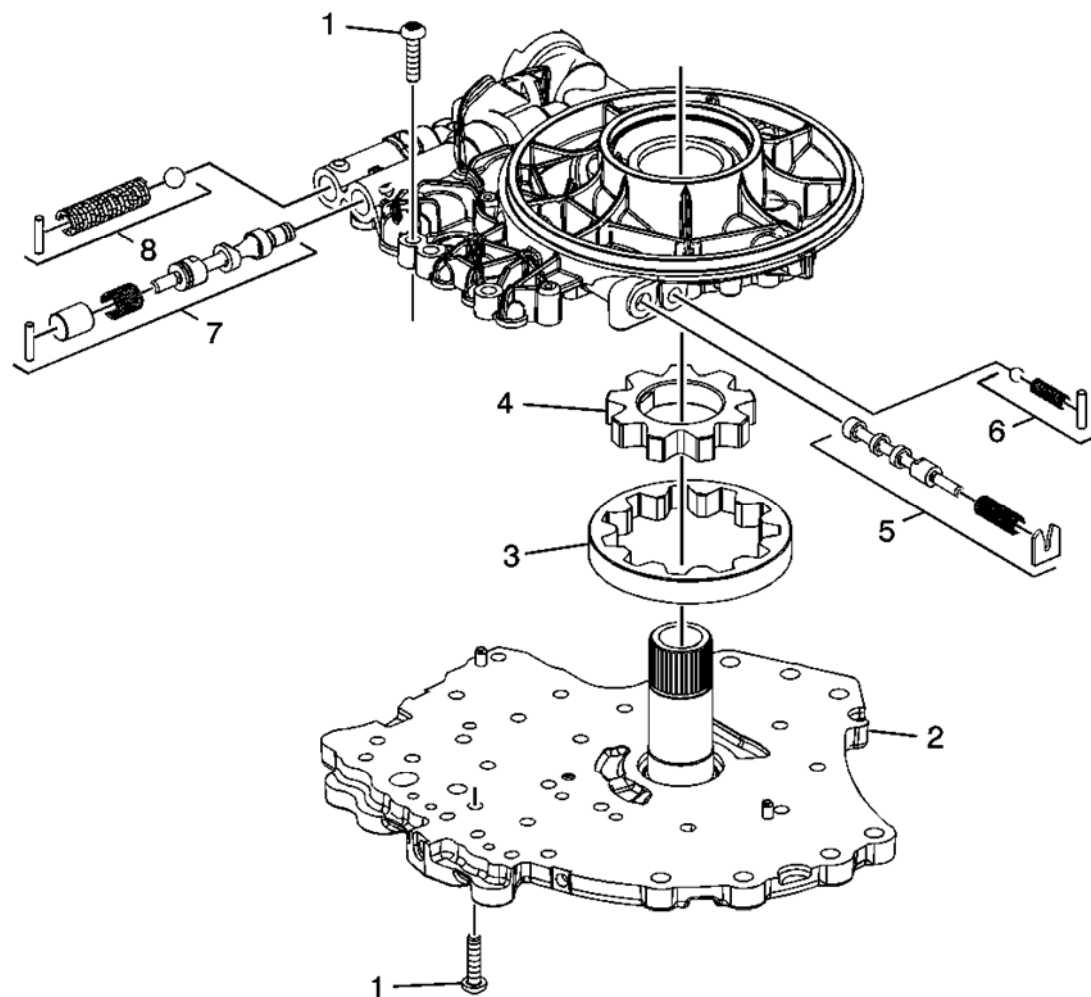


Fig. 55: Fluid Filter Assembly & Torque Converter Fluid Seal
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Fluid Filter Assembly Tip: Rotate filter 90 degrees to disengage locking tangs.
2	Torque Converter Fluid Seal Retainer
3	Torque Converter Fluid Seal Special Tools • J 6125-B: Slide Hammer • J 23129: Universal Seal Remover

Special Tools

- **J 6125-B:** Slide Hammer
- **J 23129:** Universal Seal Remover

Fluid Pump Disassemble**Fig. 56: Fluid Pump**

Courtesy of GENERAL MOTORS CORP.

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

CAUTION:

After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.

CAUTION:

Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.

Preliminary Procedure: Clean and inspect all valve components and the pump body for wear and/or damage.

1	Fluid Pump Cover Bolts M6 x 25 (Qty: 23) Tip: There are 3 bolts on the pump cover side and 20 bolts on the pump body side.
2	Fluid Pump Cover
3	Fluid Pump Driven Gear
4	Fluid Pump Drive Gear
5	TCC Control Valve Train
6	Fluid Pump Blow Off Ball Valve Train
7	Pressure Regulator Valve Train
8	TCC Blow Off Ball Valve Train

FLUID PUMP SELECTIVE MEASUREMENT

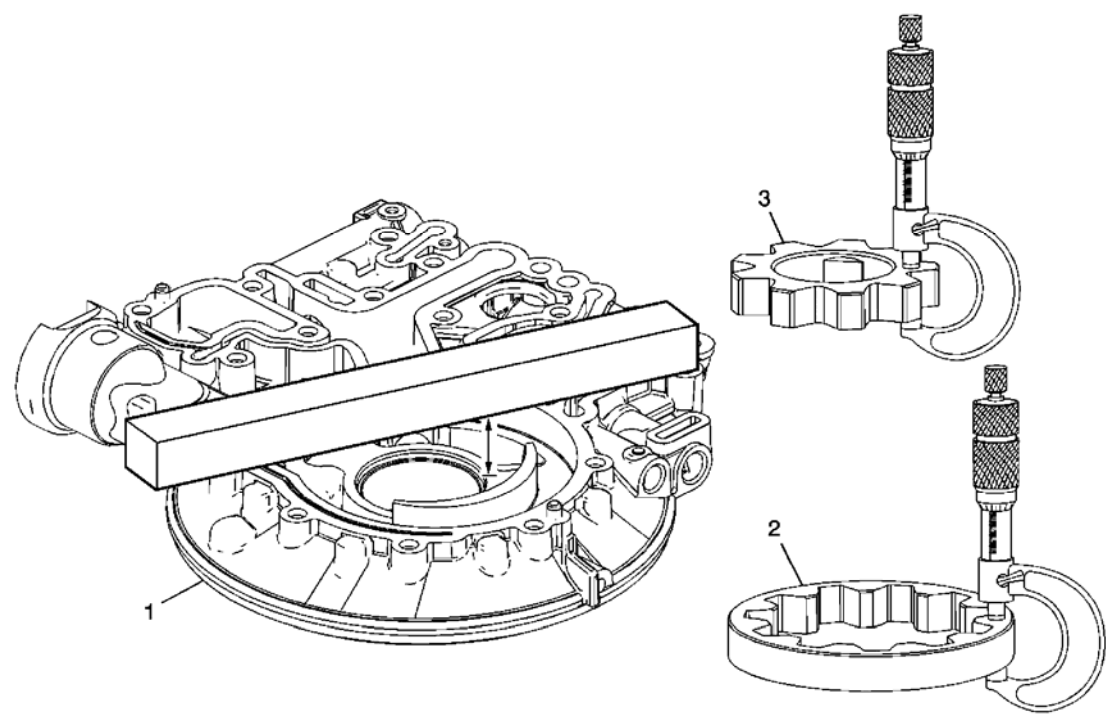


Fig. 57: Measuring Fluid Pump

Courtesy of GENERAL MOTORS CORP.

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

TRANSMISSION FLUID PUMP ASSEMBLE

Fluid Pump with Valve Trains Assemble

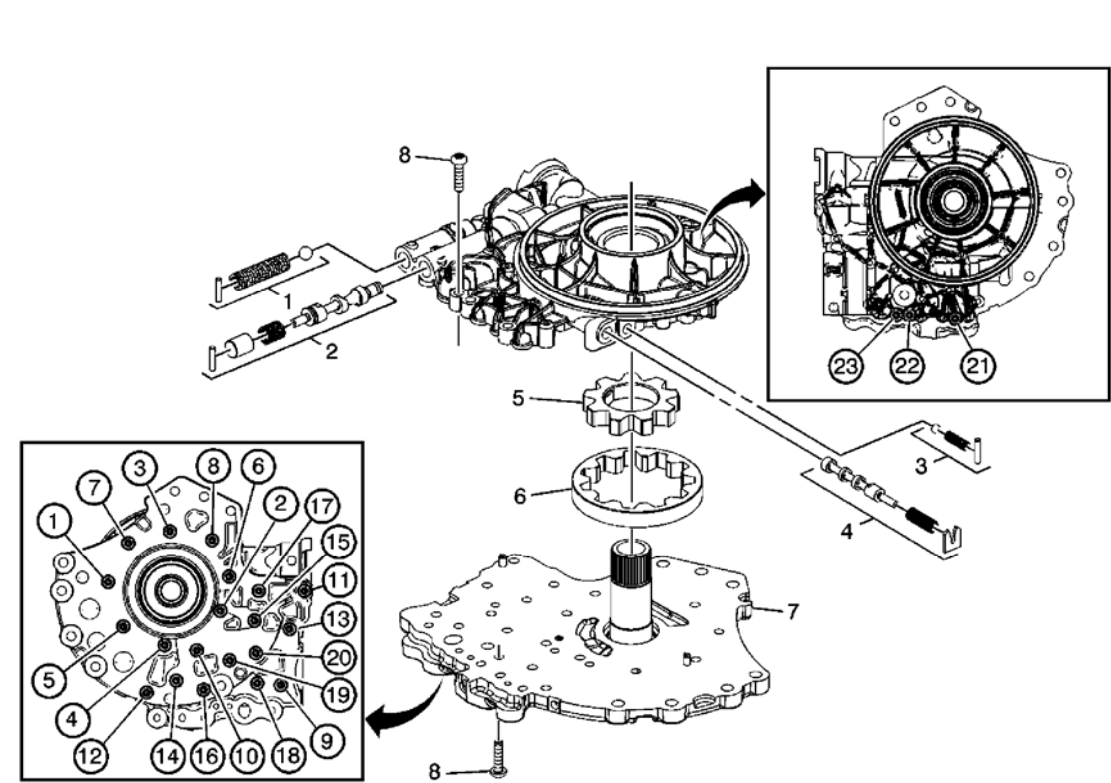


Fig. 58: Fluid Pump W/Valve Trains
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	TCC Blow Off Ball Valve Train
2	Pressure Regulator Valve Train
3	Fluid Pump Blow Off Ball Valve Train

4	TCC Control Valve Train
5	Fluid Pump Drive Gear Tip: The chamfer on the drive gear teeth face towards the pump body.
6	Fluid Pump Driven Gear Tip: The chamfer on the driven gear OD faces the pump body.
7	Fluid Pump Cover
8	Fluid Pump Cover Bolt M6 x 25 (Qty: 23) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)

Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

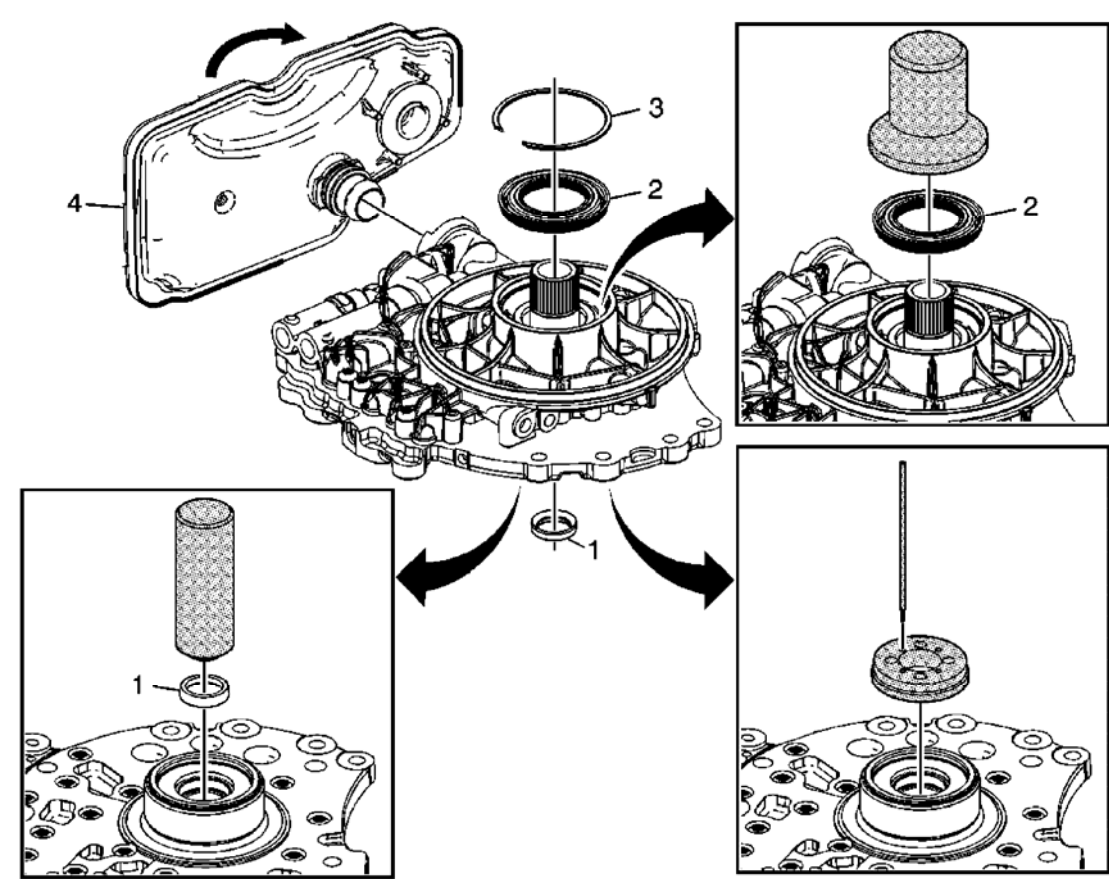


Fig. 59: Torque Converter Fluid Seal & Fluid Filter Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Torque Converter Fluid Seal Assembly

1	Tip: The fluid seal assembly must be staked in place using DT-49131: tool to ensure proper seal retention. Special Tools • DT-47792: Seal Installer • DT-49131: Seal Staking Tool
2	Torque Converter Fluid Seal Special Tools: DT-47791-A: Seal Installer
3	Torque Converter Fluid Seal Retainer
4	Fluid Filter Assembly Tip: Rotate filter 90 degrees to engage locking tangs.

TRANSMISSION FLUID PUMP, FRONT DIFFERENTIAL CARRIER BAFFLE, AND FRONT DIFFERENTIAL RING GEAR INSTALLATION

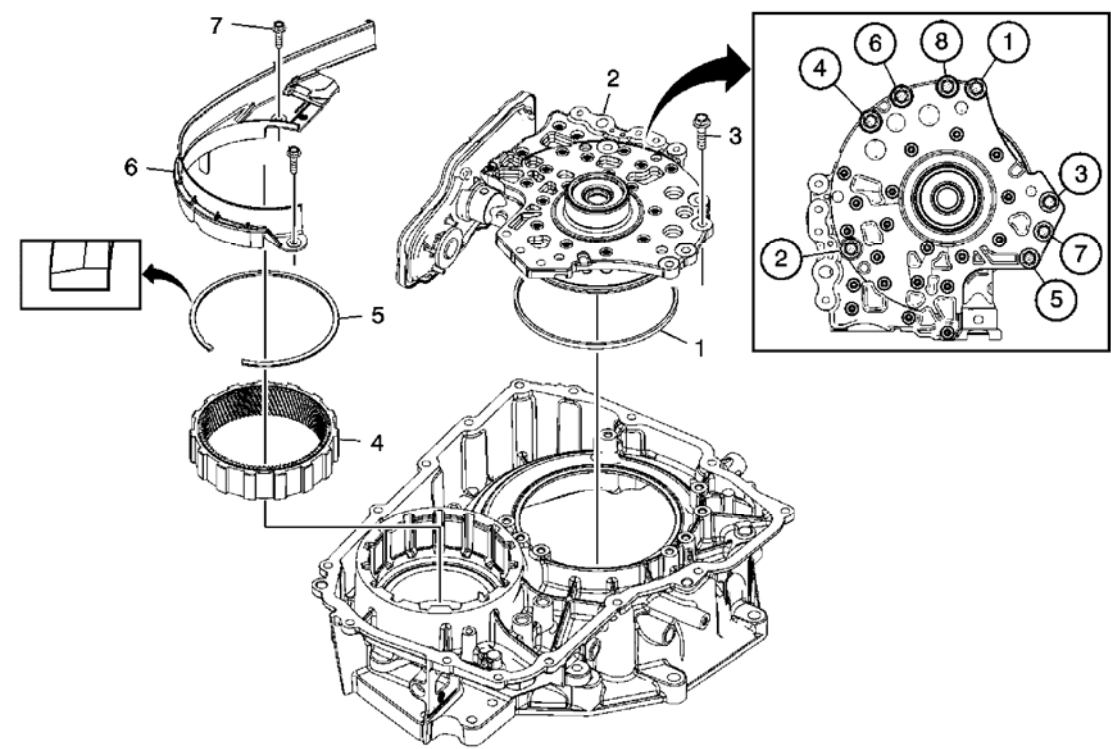


Fig. 60: Transmission Fluid Pump, Front Differential Carrier Baffle & Front Differential Ring Gear
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter and Differential Housing Seal
2	Fluid Pump Assembly

	Fluid Pump Bolt M8 x 33 (Qty: 8)
	CAUTION: Refer to <u>Fastener Caution</u> .
3	Tighten: 10 N.m (89 lb in) then rotate the bolt an additional 45 degrees. Special Tools: J-45059: Angle Meter or equivalent
4	Front Differential Ring Gear
5	Front Differential Ring Gear Retainer Tip: Install the retainer with the taper facing away from the ring gear.
6	Front Differential Carrier Baffle
7	Front Differential Carrier Baffle Bolt M6 x 25 (Qty: 2) Tighten: 12 N.m (106.21 lb in)

TORQUE CONVERTER HOUSING WITH FLUID PUMP ASSEMBLY INSTALLATION (6T40/45/50)

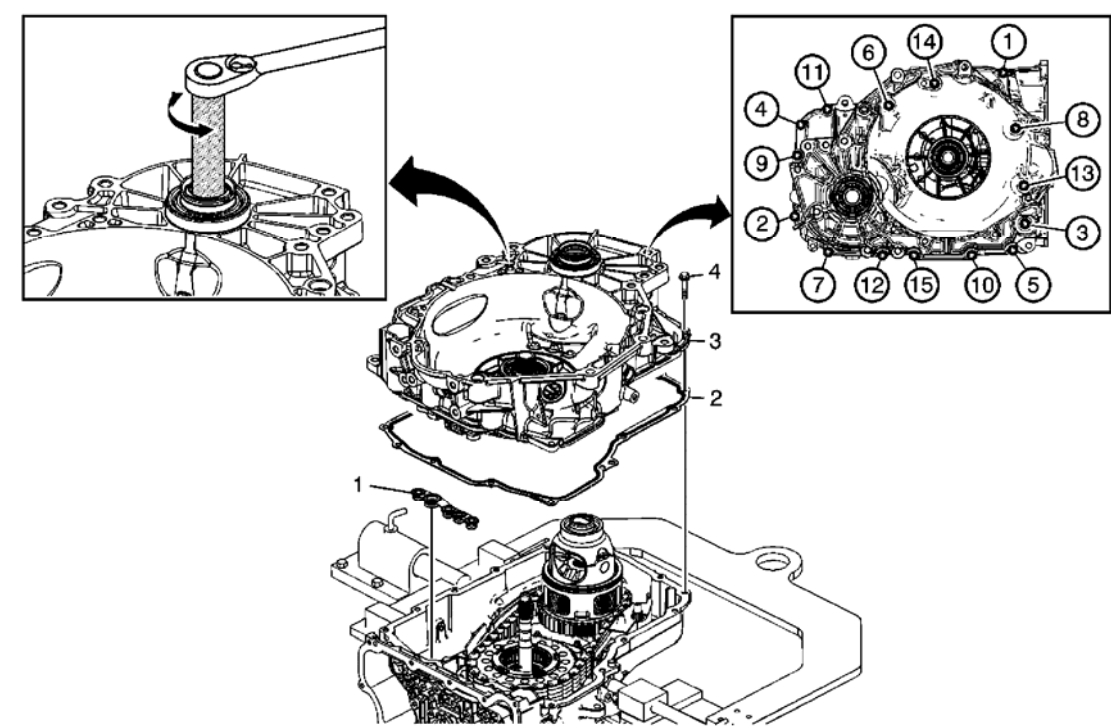


Fig. 61: Torque Converter Housing With Fluid Pump Assembly (6T40/45/50)
 Courtesy of GENERAL MOTORS CORP.

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

1	Fluid Pump Seal Assembly
2	Torque Converter Housing Gasket
3	Torque Converter (w/Fluid Pump) Housing Assembly Tip: 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 <u>Special Tools</u> .
4	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15) CAUTION: Refer to <u>Fastener Caution</u> . 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 <u>Special Tools</u> .

INPUT AND OUTPUT SPEED SENSOR INSTALLATION

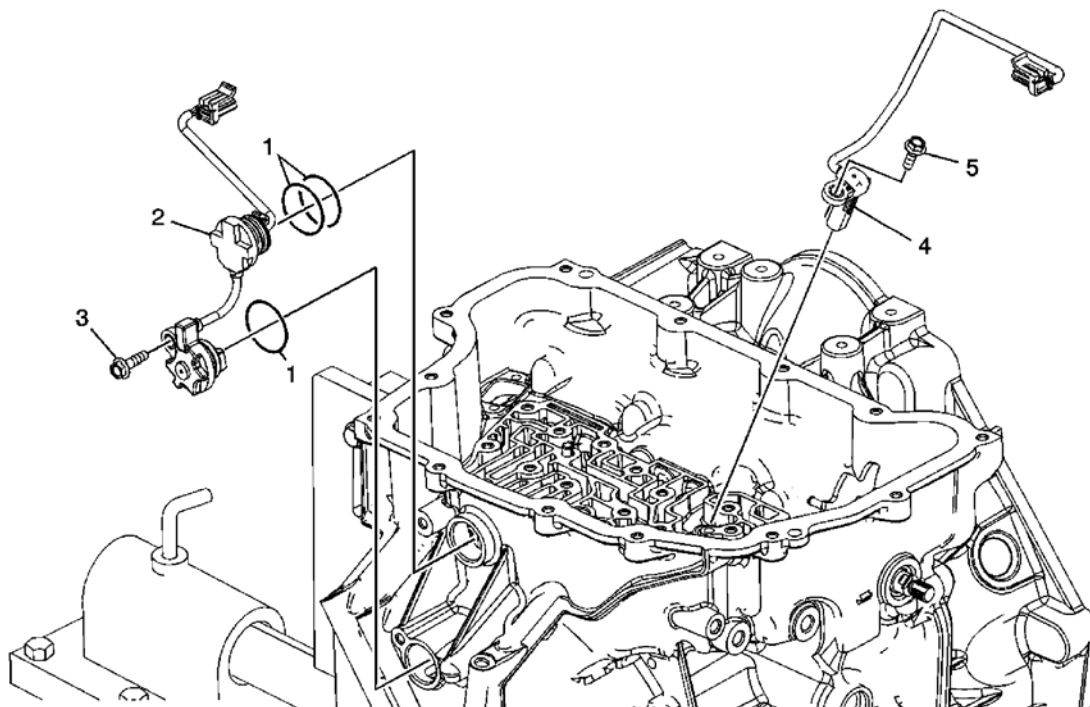


Fig. 62: Input & Output Speed Sensor
 Courtesy of GENERAL MOTORS CORP.

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 <u>Fastener Caution</u> . 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

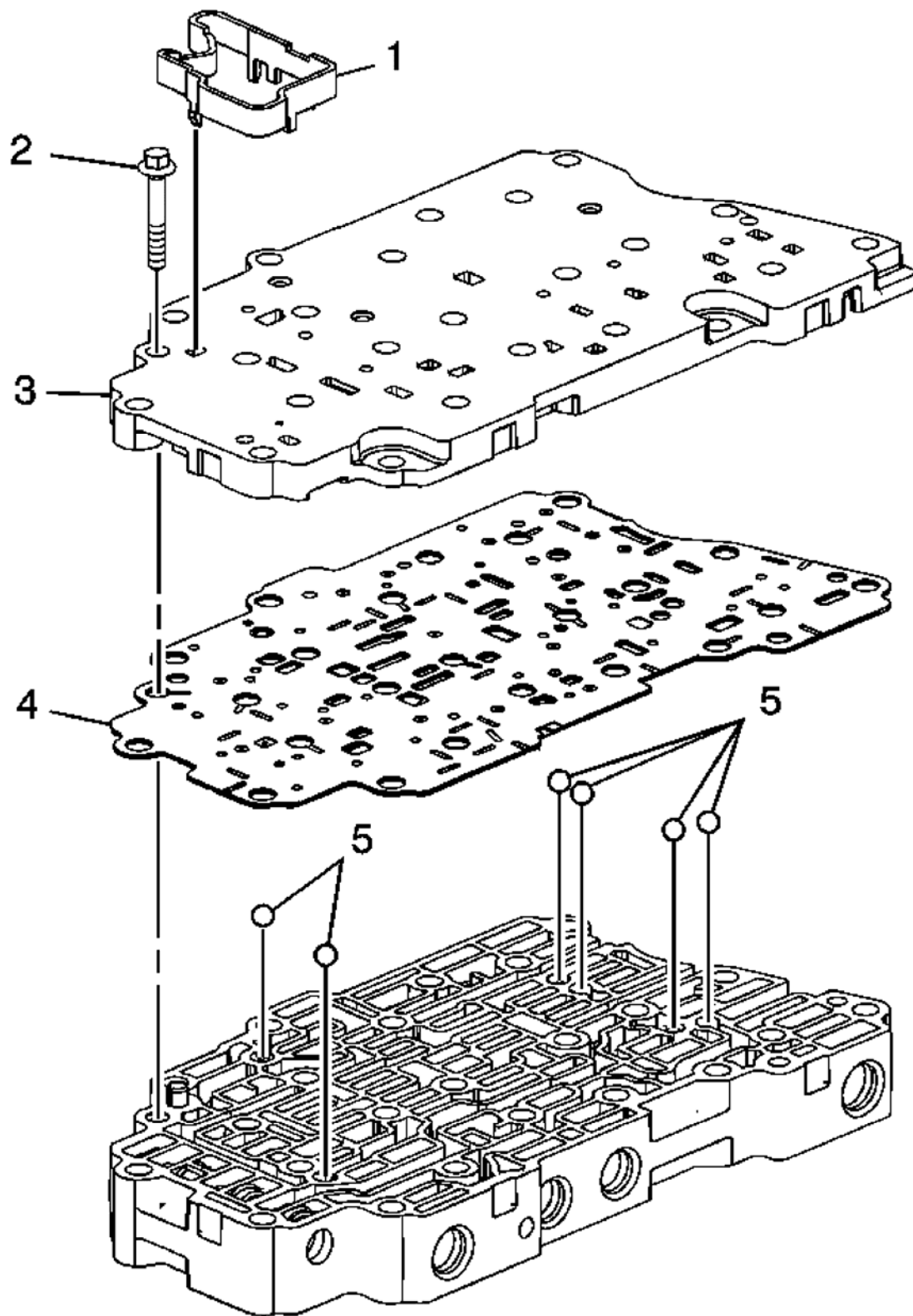


Fig. 63: Control Valve Body Assembly

Courtesy of GENERAL MOTORS CORP.

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

CONTROL VALVE BODY CLEANING AND INSPECTION

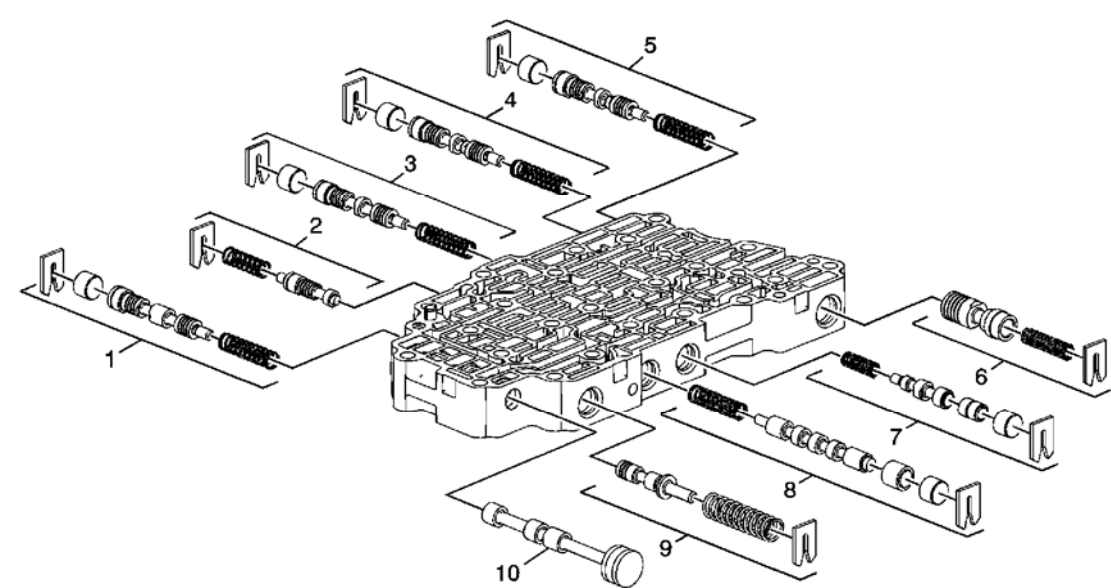


Fig. 64: Control Valve Body
Courtesy of GENERAL MOTORS CORP.

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	First-Reverse and 4-5-6 Clutch Regulator Valve Train
2	1-2-3-4 Clutch Boost Valve Train
3	1-2-3-4 Clutch Regulator Valve Train
4	2-6 Clutch Regulator ValveTrain
5	3-5 Reverse Clutch Regulator Valve Train
6	Clutch Piston Dam Feed Regulator Valve Train
7	TCC Regulator Apply Valve Train
8	Clutch Select Valve Train
9	Actuator Feed Limit Valve Train
10	Manual Valve

CONTROL VALVE CHANNEL PLATE CLEANING AND INSPECTION (6T40/45)

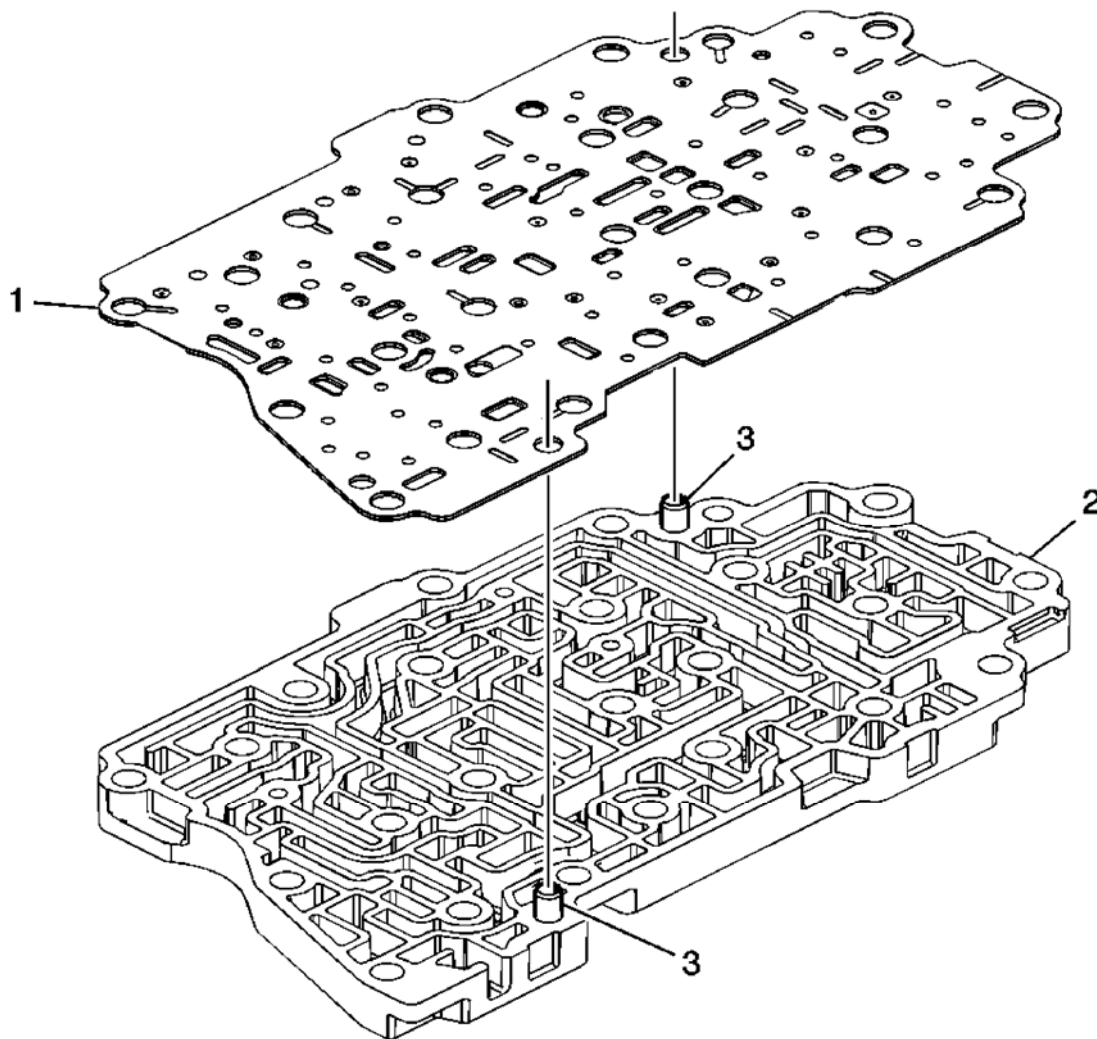


Fig. 65: Control Valve Channel Plate (6T40/45)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Channel Plate to Valve Body Spacer Plate Assembly
2	Valve Channel Plate Tip: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
3	Control Valve Body Guide Pins

CONTROL VALVE BODY ASSEMBLY ASSEMBLE

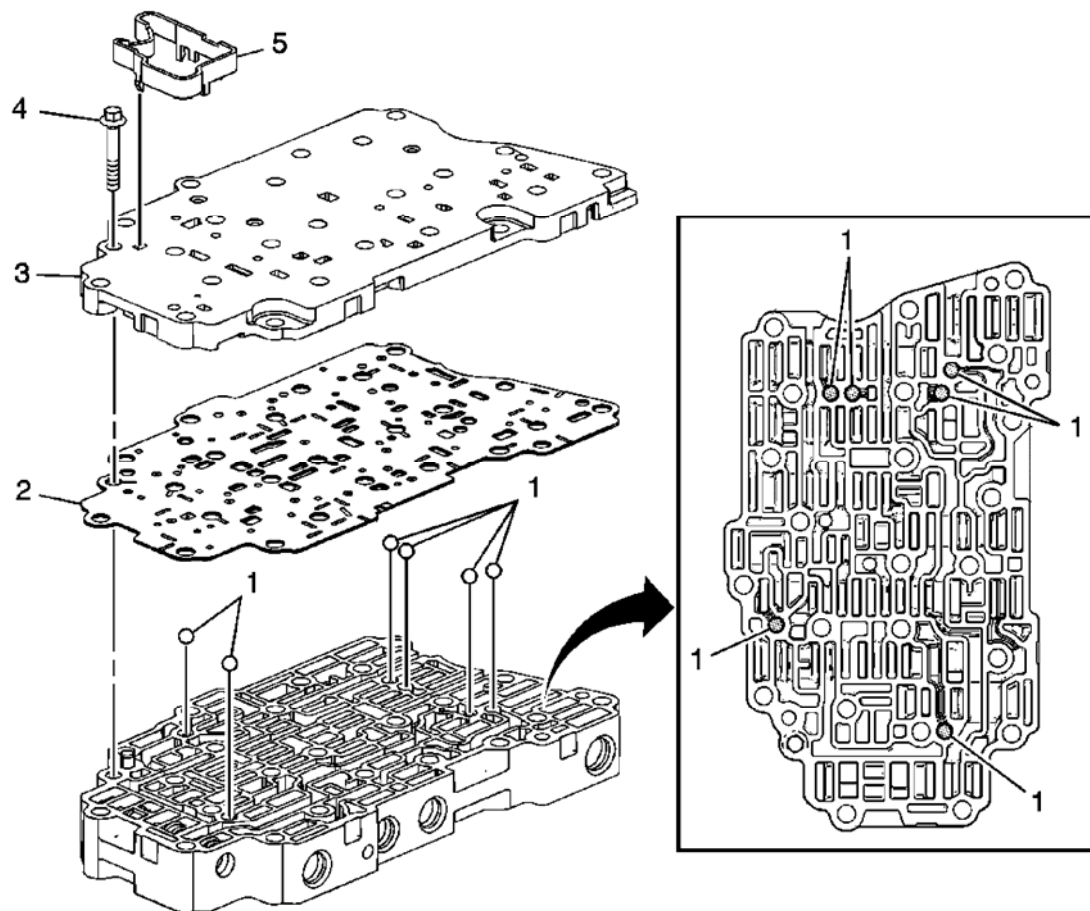


Fig. 66: Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Valve Body Ball Check Valve (Qty: 6)
2	Control Valve Channel Plate Spacer Plate Assembly
3	Valve Channel Plate Tip: Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage could cause leaking. Replace as necessary.
4	Control Valve Body Bolt M5 x 40.5 (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 7 N.m (62 lb in)
5	Control Solenoid Valve Support

CONTROL VALVE BODY ASSEMBLY INSTALLATION

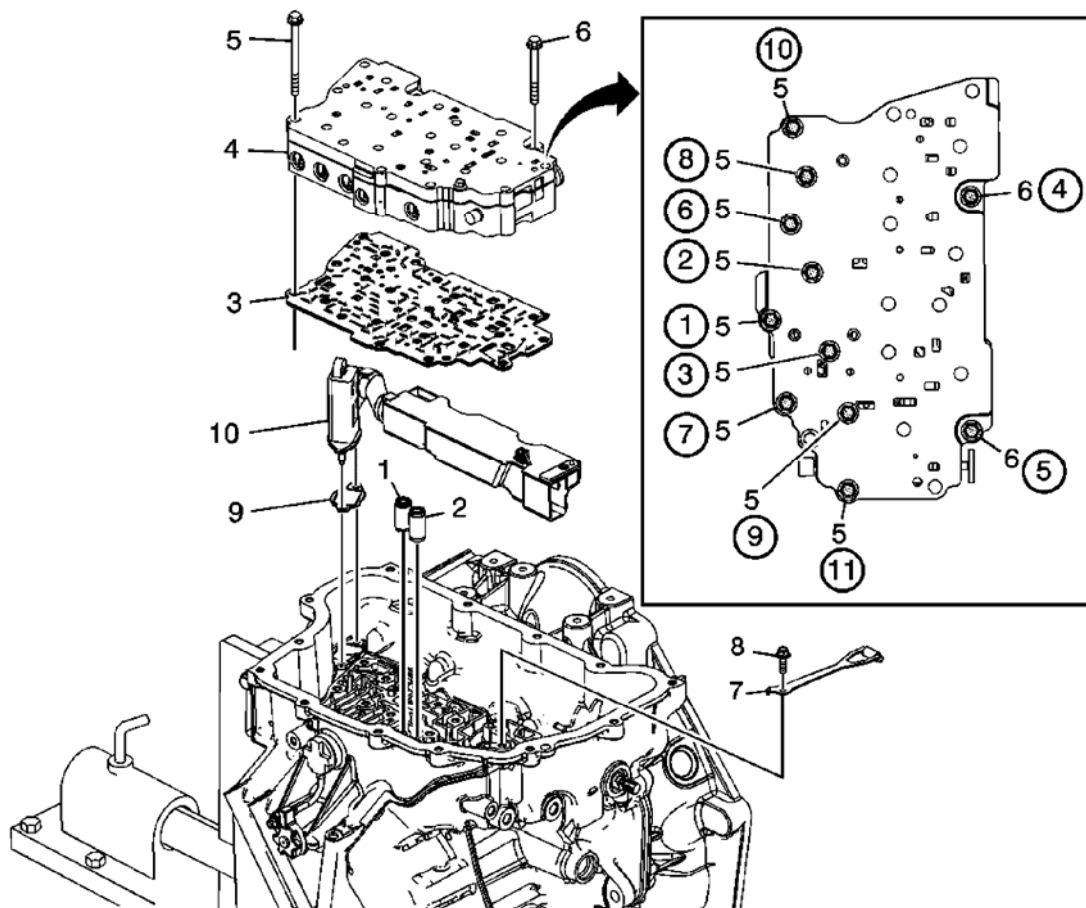


Fig. 67: Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

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 Tip: Align the manual valve to the rod on the manual shaft.
5	Control Valve Body Bolt M6 x 60 (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 11 N.m (97 lb in)
6	Control Valve Body Bolt M6 x 53 (Qty: 2) Tighten: 11 N.m (97 lb in)

7	Manual Shaft Detent Lever Spring Assembly
8	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) Tighten: 12 N.m (106 lb in)
9	Fluid Level Control Valve Gasket
10	Fluid Level Control Valve

**CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY
INSTALLATION**

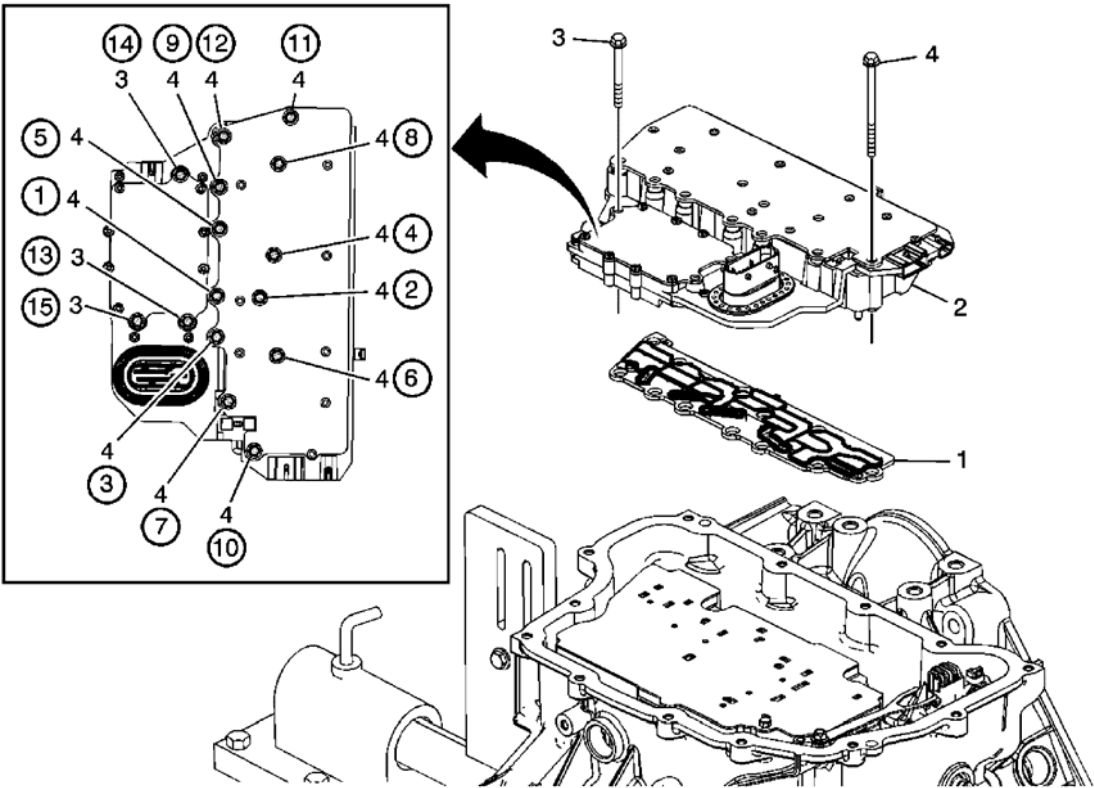


Fig. 68: Control Solenoid Valve & Transmission Control Module Assembly
 Courtesy of GENERAL MOTORS CORP.

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.

	Tip: 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 <u>Fastener Caution</u> . Tighten: 7 N.m (62 lb in)
4	Control Valve Body Bolt M6 x 97 (Qty: 12) Tighten: 10 N.m (89 lb in)

CONTROL VALVE BODY COVER INSTALLATION

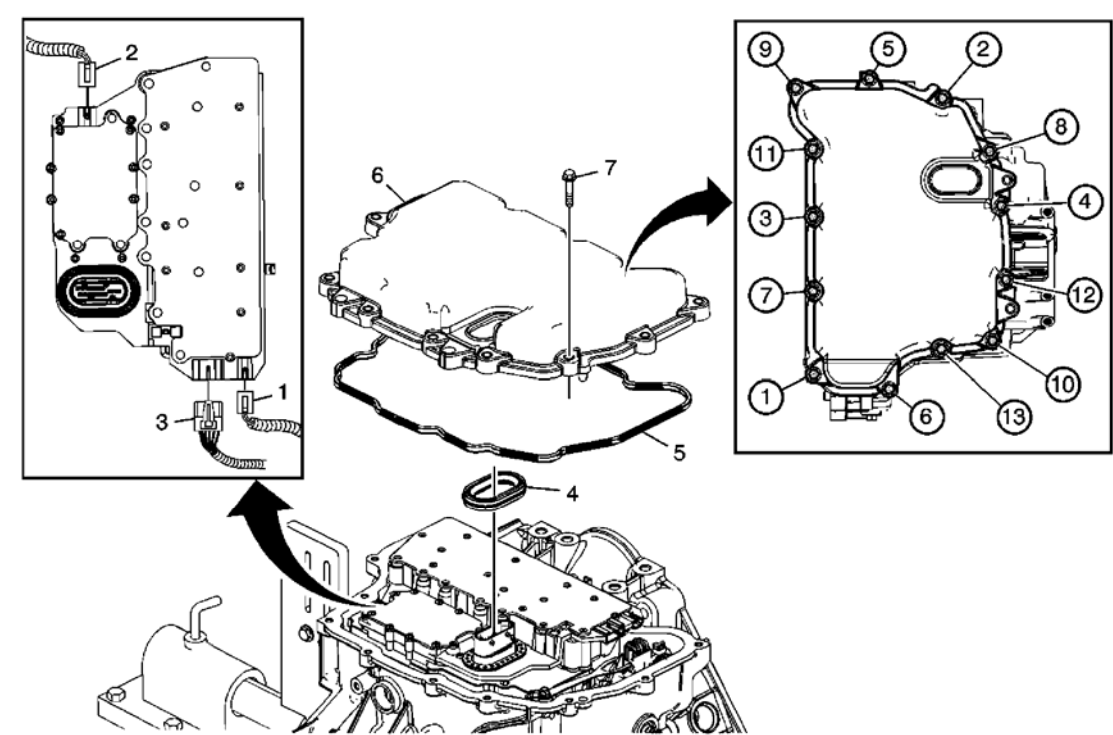


Fig. 69: Control Valve Body Cover
Courtesy of GENERAL MOTORS CORP.

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

	Tip: Do not re-use the valve body cover wiring connector hole seal.
5	Control Valve Body Cover Gasket Tip: 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 <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)

TORQUE CONVERTER FLUID SEAL REPLACEMENT

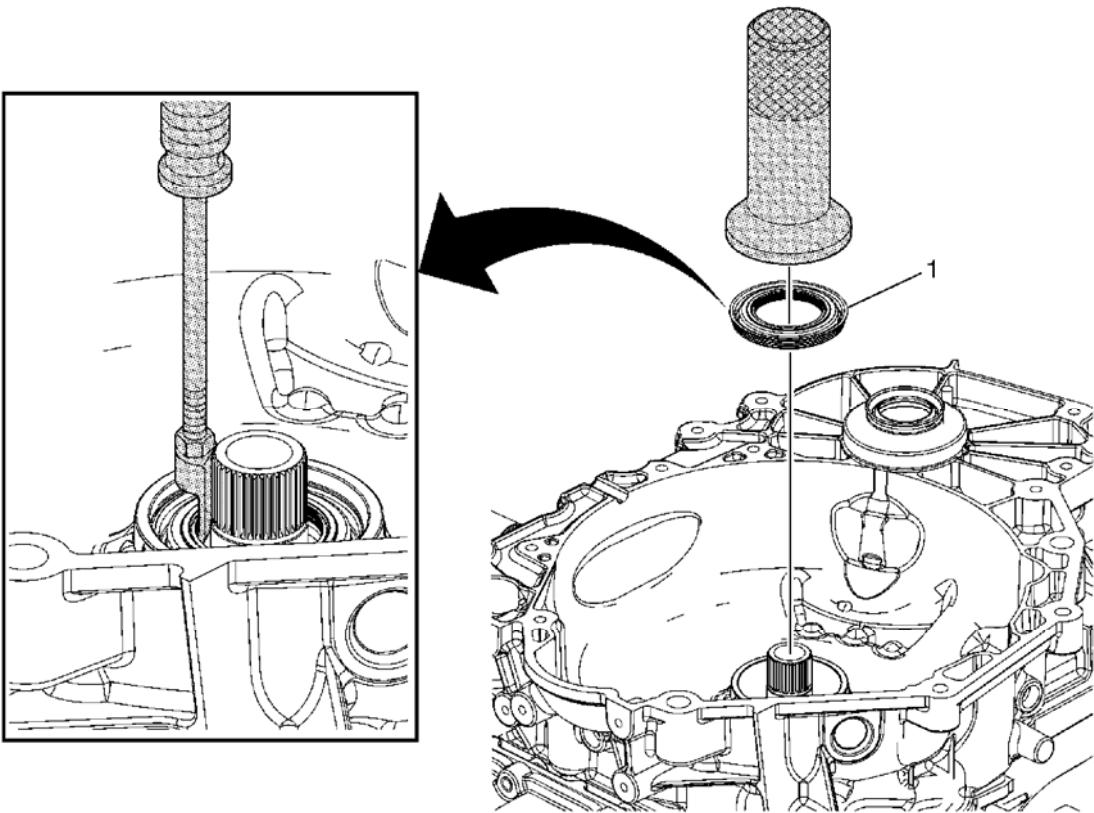


Fig. 70: Torque Converter Fluid Seal
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter Fluid Seal Retainer
	Torque Converter Fluid Seal
	Special Tools

- **DT-47791-A:** Seal Installer
- **DT-6125-B:** Slide Hammer
- **EN-23129:** Universal Seal Remover

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

TORQUE CONVERTER INSTALLATION

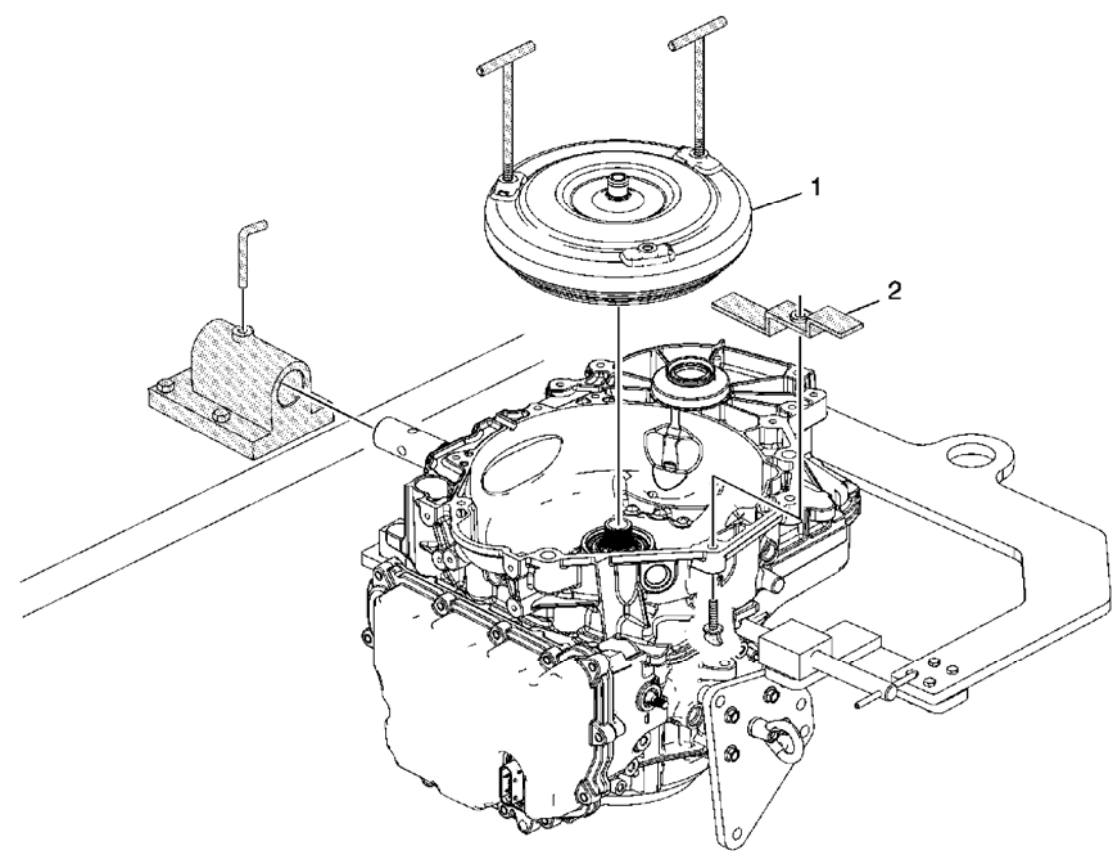


Fig. 71: Torque Converter
Courtesy of GENERAL MOTORS CORP.

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

2

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.

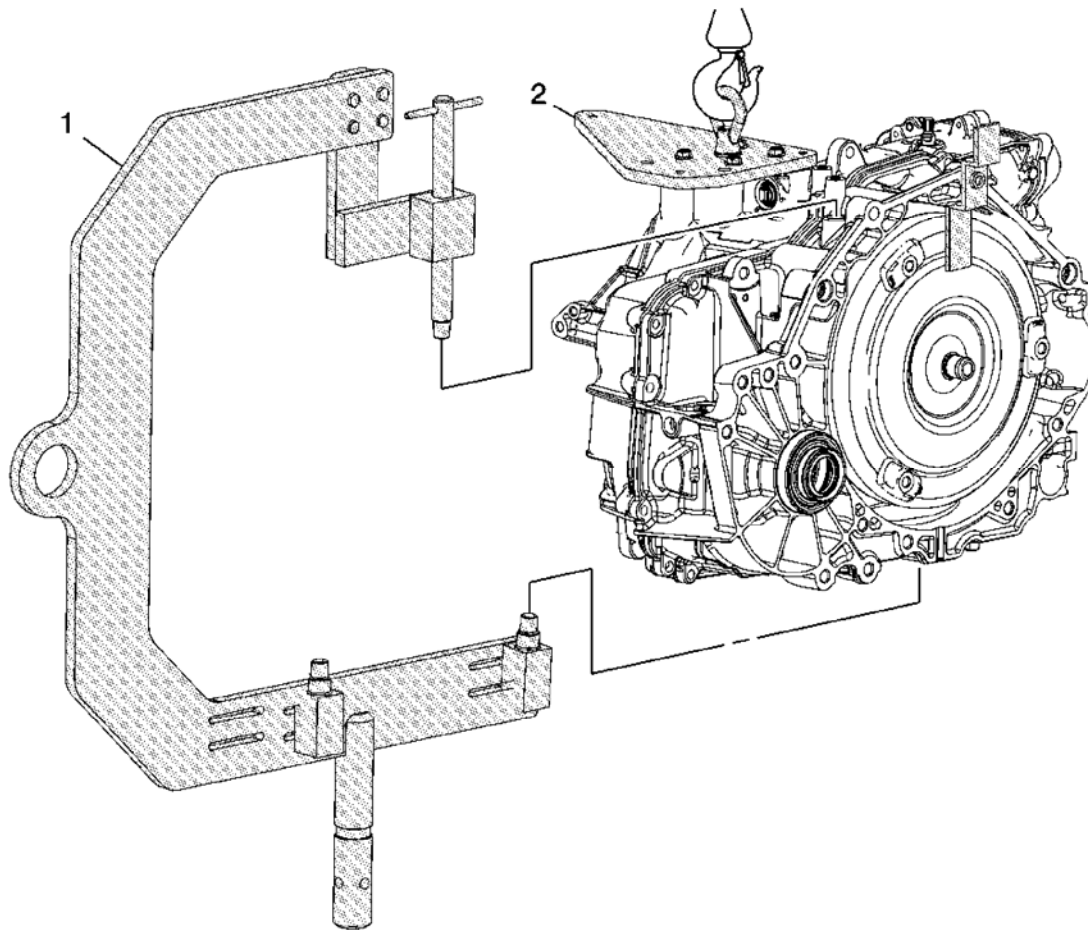
LIFT PLATE AND HOLDING FIXTURE REMOVAL

Fig. 72: Lift Plate & Holding Fixture
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	J-46625: Transmission Holding Fixture Tip: Raise the transmission in order to remove the holding fixture.
2	DT-47811-A: Transmission Lift Plate Tip: Lower the transmission assembly onto the transmission jack in order to remove the lift plate.

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

REPAIR INSTRUCTIONS - ON VEHICLE

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY REPLACEMENT

Special Tools

- **DT-48550** Detent Lever Pin Remover. See **Special Tools** .
- **J 41229** Manual Shaft Pin Installer. See **Special Tools** .

Removal Procedure

1. Remove the control valve body. Refer to **Control Valve Body Replacement**.

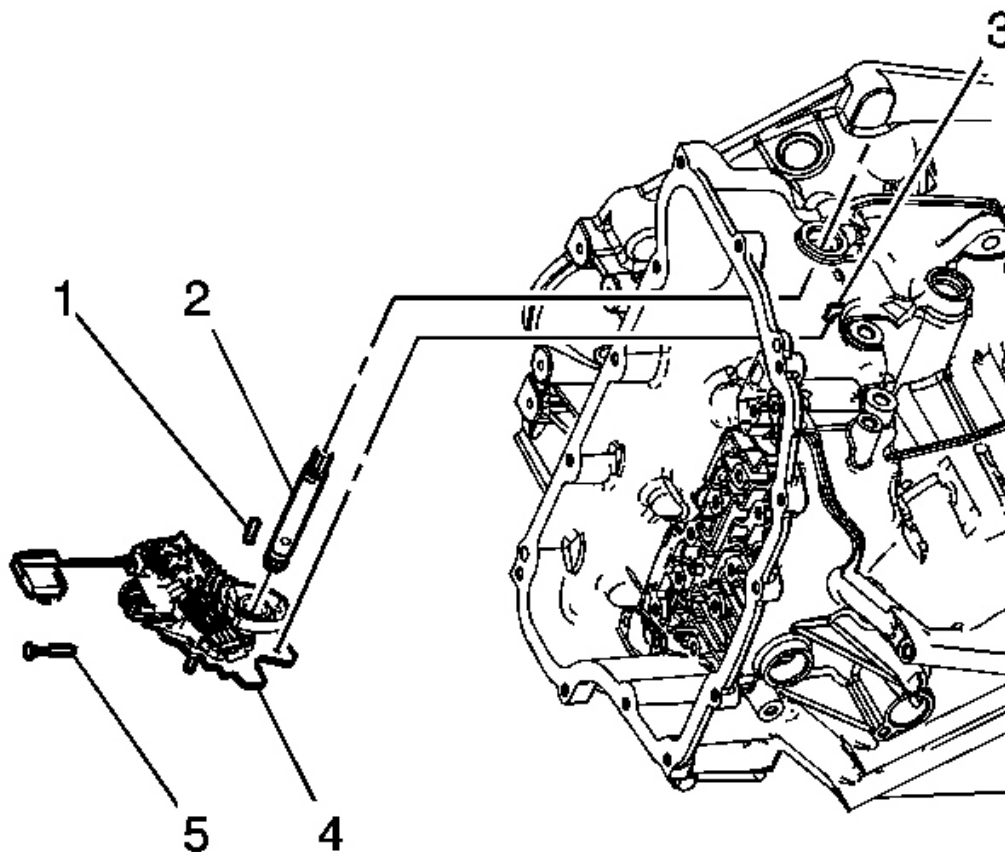


Fig. 1: View Of Manual Shift Detent Lever & Shaft Position Switch Assembly
Courtesy of GENERAL MOTORS CORP.

2. Remove the manual shaft detent lever hub pin (1) using **DT-48550** . See **Special Tools** .
3. Remove the manual shift shaft pin (5). Discard the pin.
4. 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.**

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

Installation Procedure

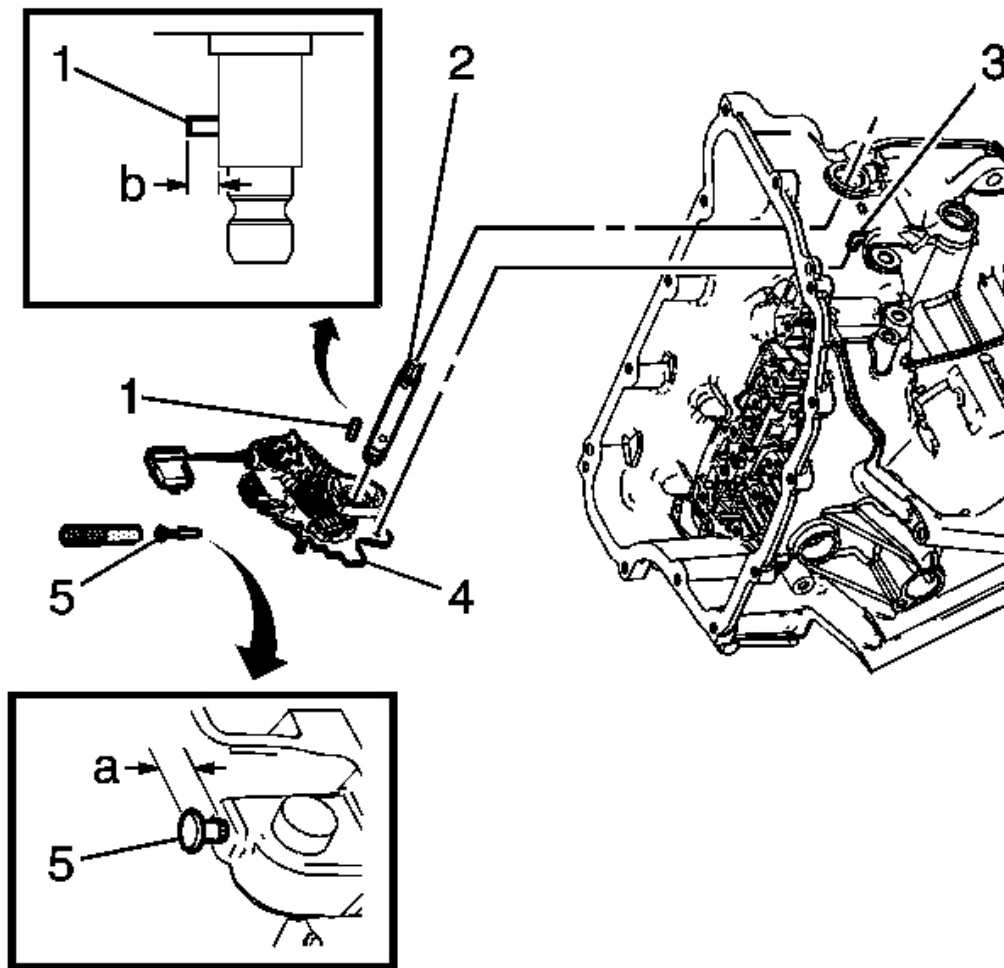


Fig. 2: Identifying Manual Shaft Detent (W/Shift Position Switch) Lever Assembly
 Courtesy of GENERAL MOTORS CORP.

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** . See **Special Tools** .

Specification: Install the Manual Shaft Detent Lever Hub Pin to height of (b) 7.9 mm (0.38 in).

CAUTION: Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack.

- 4. Install the NEW manual shift shaft pin (5) using **J 41229** . See Special Tools . 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. Perform the transmission adaptive values learn procedure. Refer to Transmission Adaptive Values Learn .

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

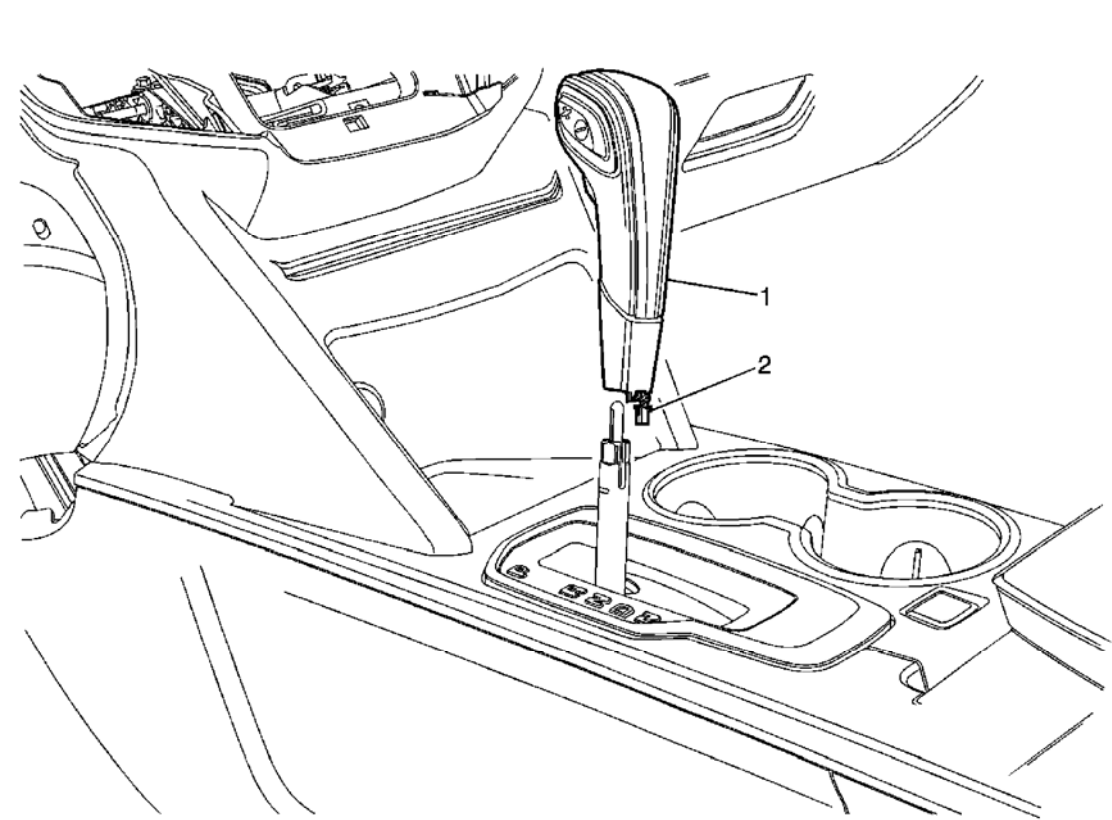


Fig. 3: Transmission Control Lever Knob
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Shift Control Knob Tip: Pull knob up off shift lever. Considerable effort may be required to remove knob from

	shift control lever. Place shift lever in the Neutral position.
2	Shift Control Connector Tip: To install, use a small flat tool to push connector into receiving connector.

TRANSMISSION CONTROL REPLACEMENT

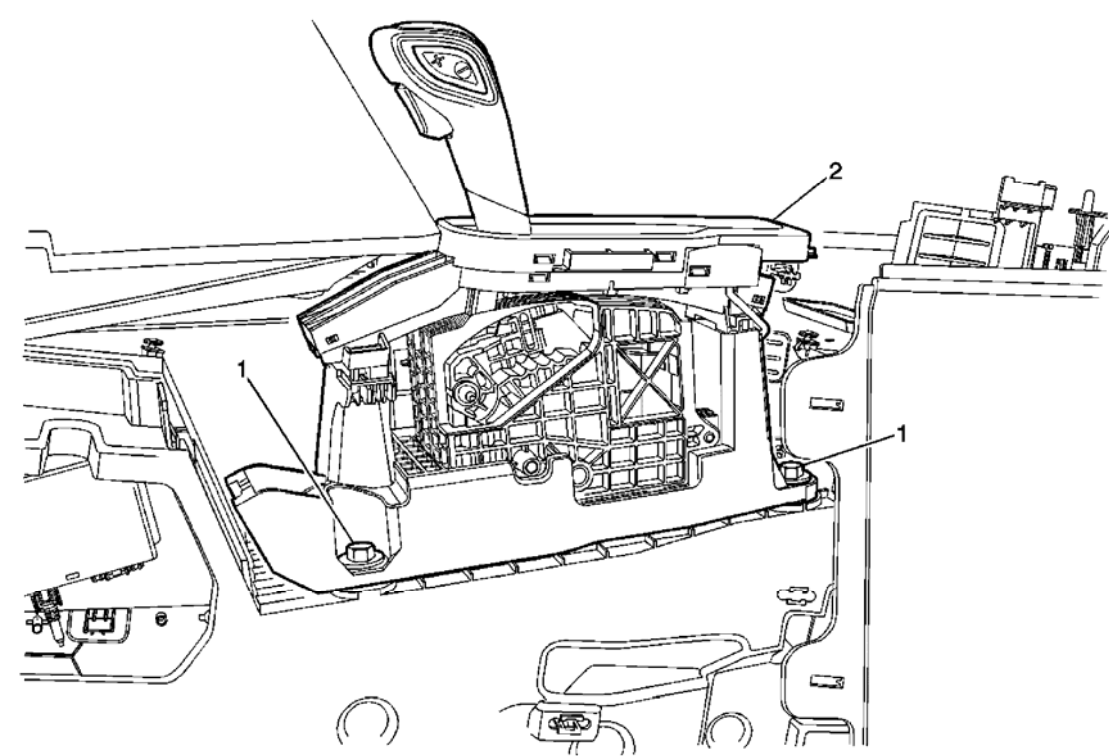


Fig. 4: Transmission Control
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the front floor console accessory trim plate. Refer to <u>Front Floor Console Accessory Trim Plate Replacement</u> . 2. Remove the left front lower console side finish cover. Refer to <u>Front Floor Lower Console Side Finish Cover Replacement - Left Side (Equinox)</u> or <u>Front Floor Lower Console Side Finish Cover Replacement - Left Side (Terrain)</u> . 3. Disconnect the range selector lever cable. Refer to <u>Range Selector Lever Cable Replacement</u>. 4. Disconnect the transmission control electrical connectors. 5. Remove the screws security upper control structures to lower console. Lift upon structure to allow shifter to clear.	
	Transmission Control Fasteners (Qty: 3)

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 25 N.m (18 lb ft).
2	Transmission Control

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

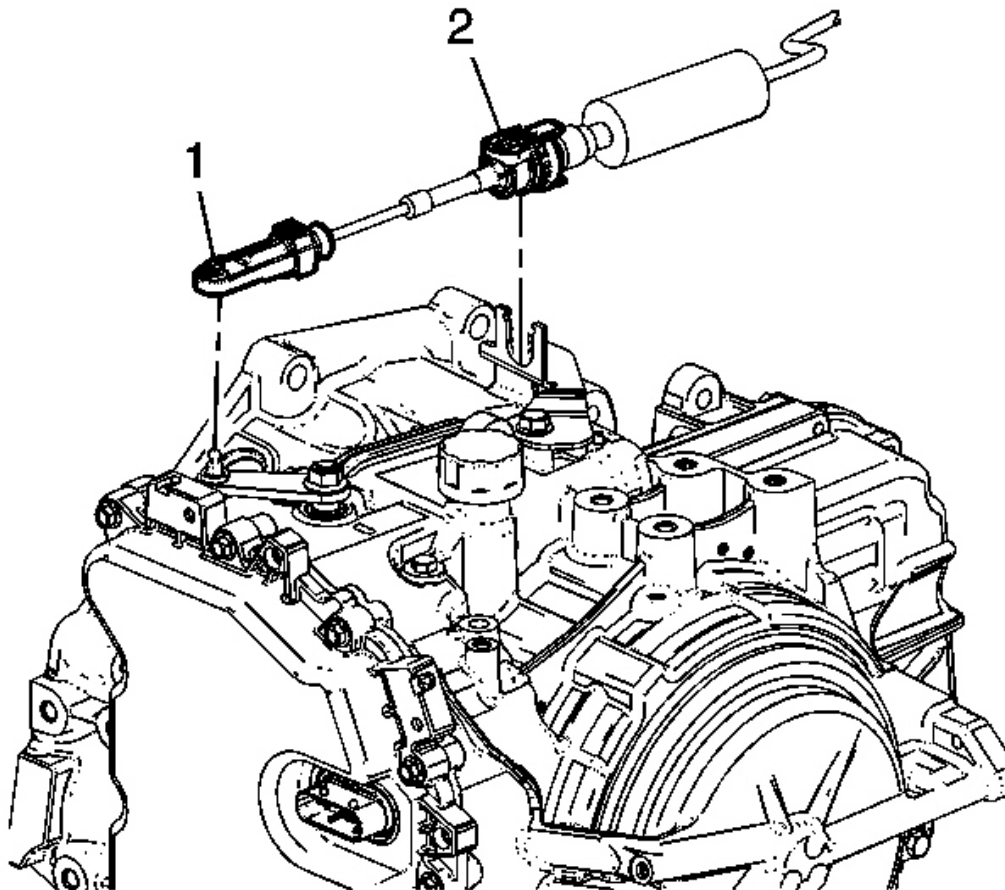


Fig. 5: View Of Transmission Range Selector Lever & Cable Connection
Courtesy of GENERAL MOTORS CORP.

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

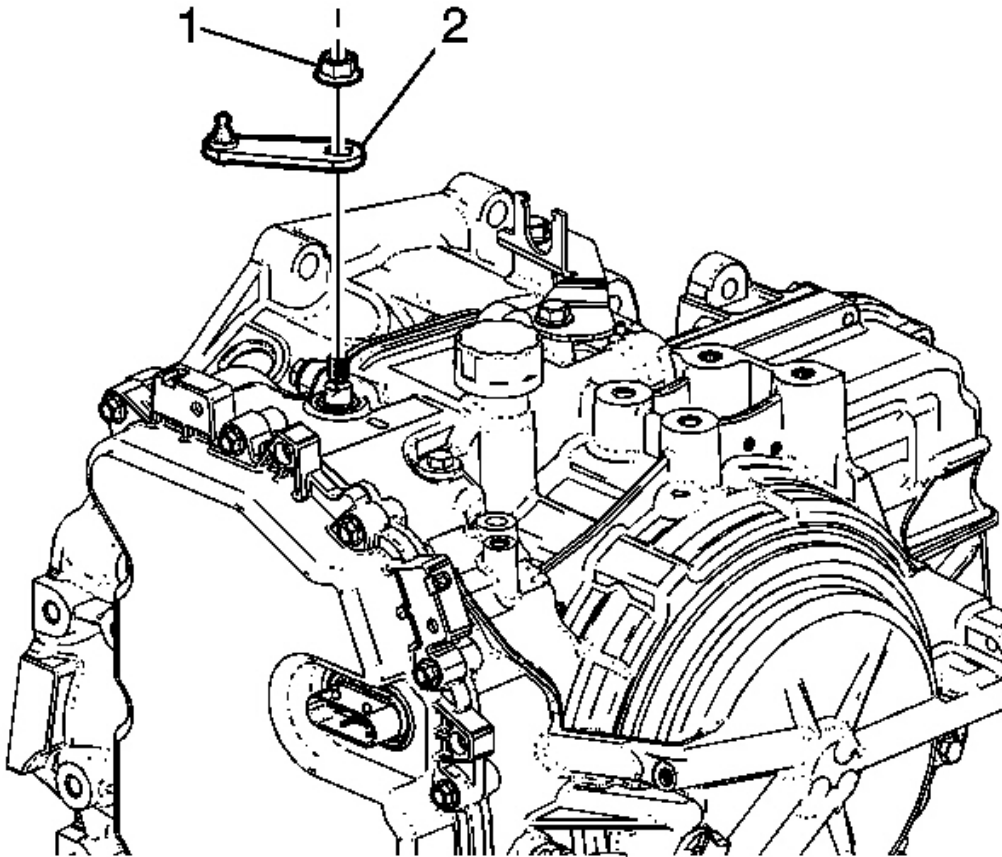


Fig. 6: View Of Transmission Range Selector Lever
Courtesy of GENERAL MOTORS CORP.

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

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

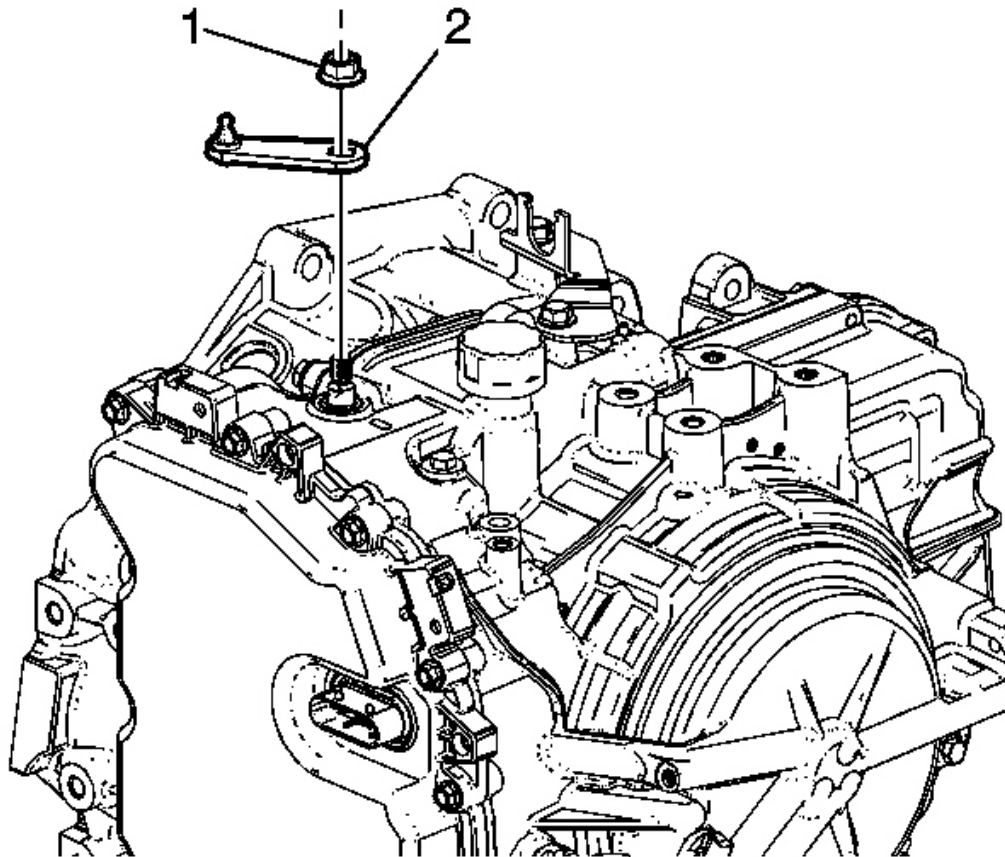


Fig. 7: View Of Transmission Range Selector Lever
Courtesy of GENERAL MOTORS CORP.

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

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

CAUTION: Refer to Fastener Caution .

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

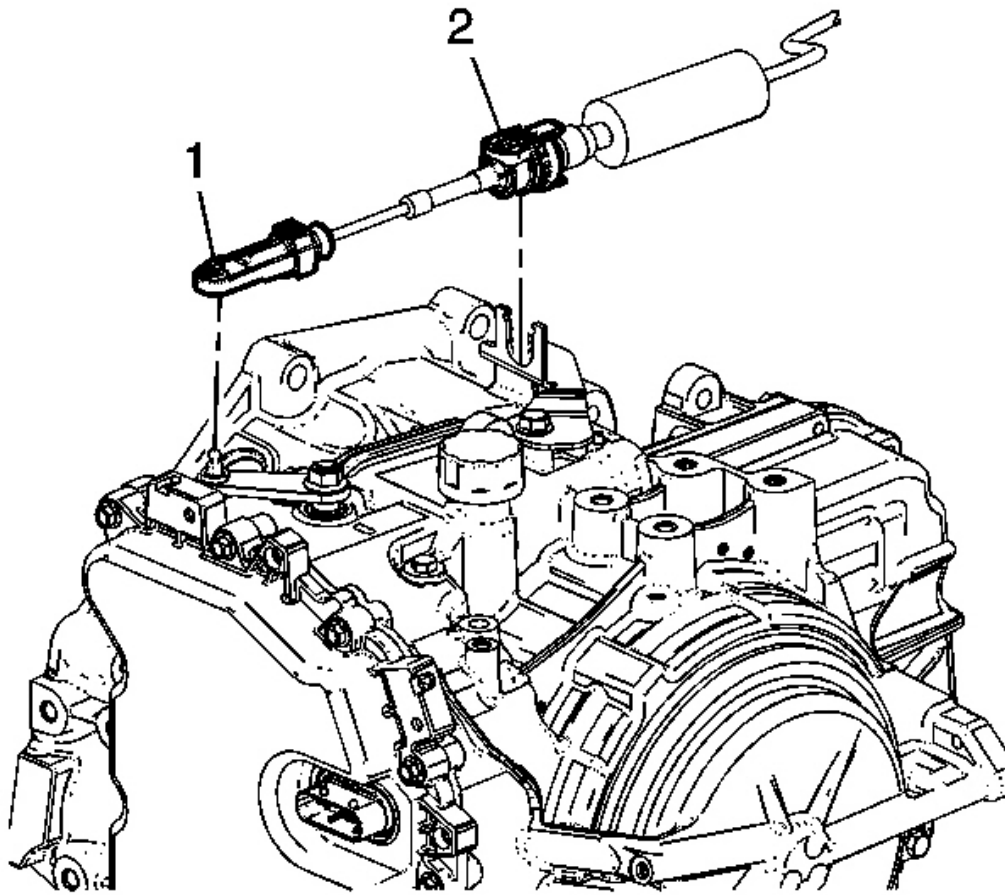


Fig. 8: View Of Transmission Range Selector Lever & Cable Connection
Courtesy of GENERAL MOTORS CORP.

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

RANGE SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

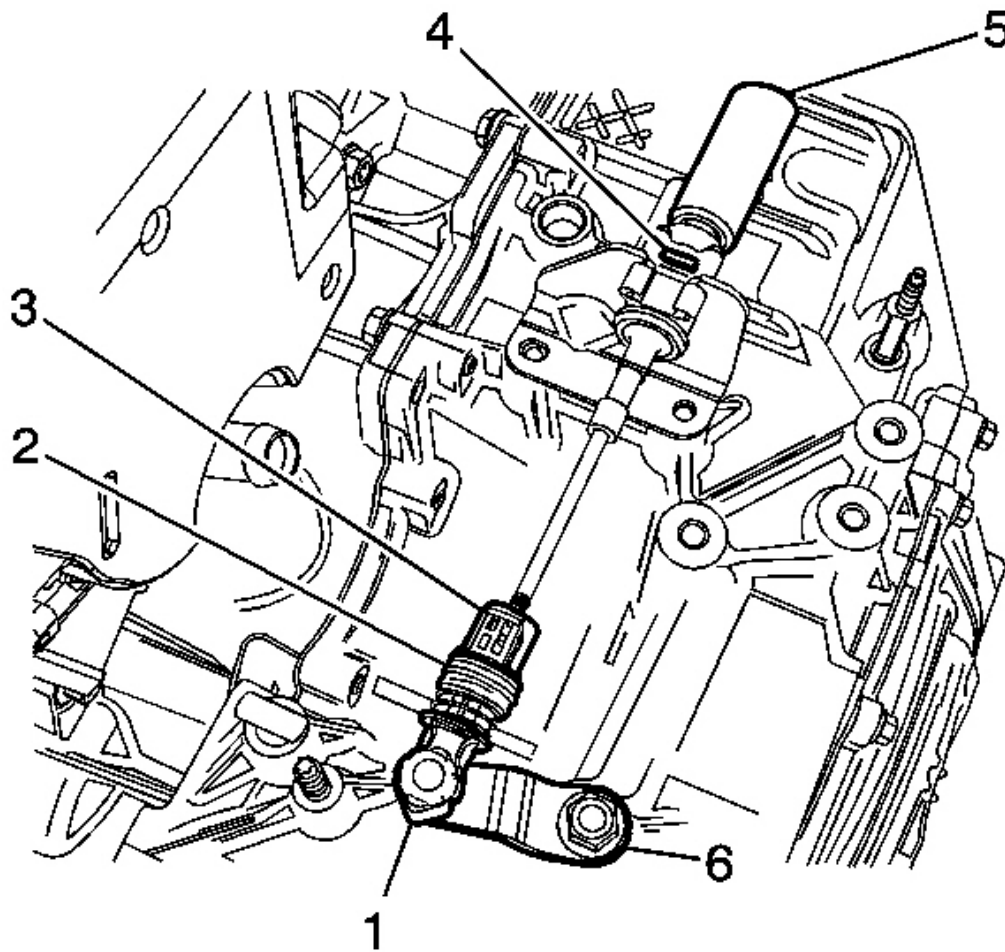


Fig. 9: Transmission Range Selector Lever Components
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (6).
3. Slide the retainer (4) rearward to release the transmission range selector lever cable from the bracket.
4. Remove the left front floor lower console extension. Refer to **Front Floor Lower Console Side Finish Cover Replacement - Left Side (Equinox)** or **Front Floor Lower Console Side Finish Cover Replacement - Left Side (Terrain)**.

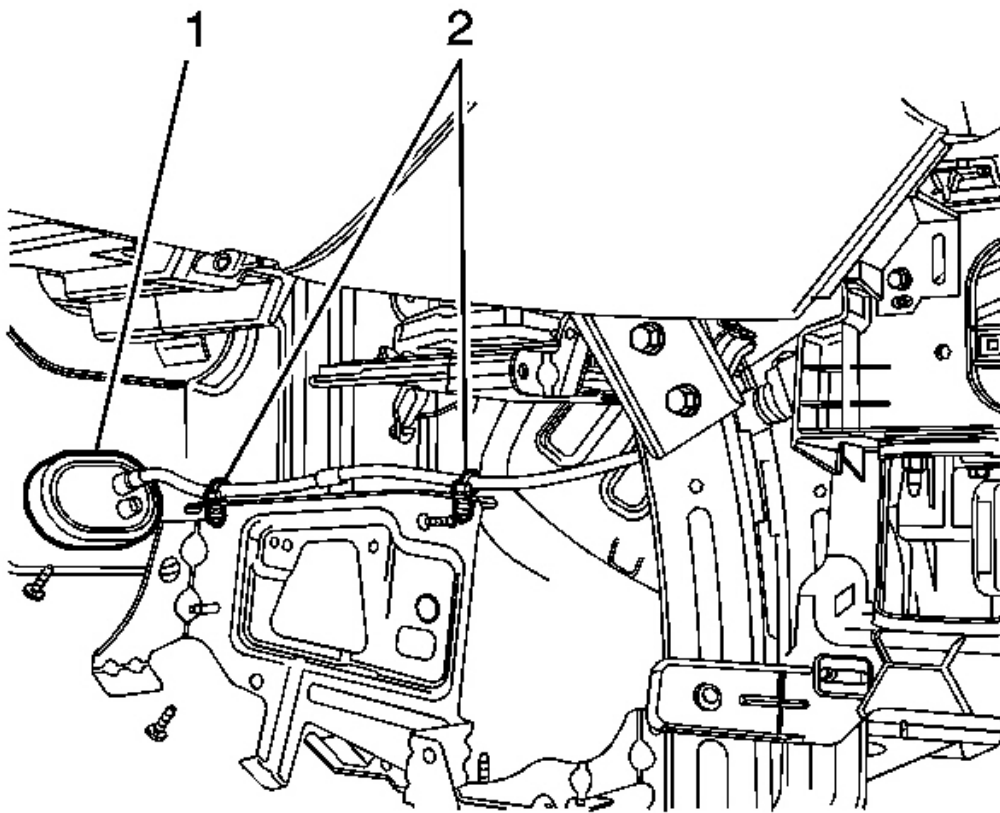


Fig. 10: Transmission Range Selector Lever Cable Retainers & Grommet
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the transmission range selector lever cable retainers (2) from the support bracket.
6. Remove the grommet (1) and cable assembly from the floor panel.

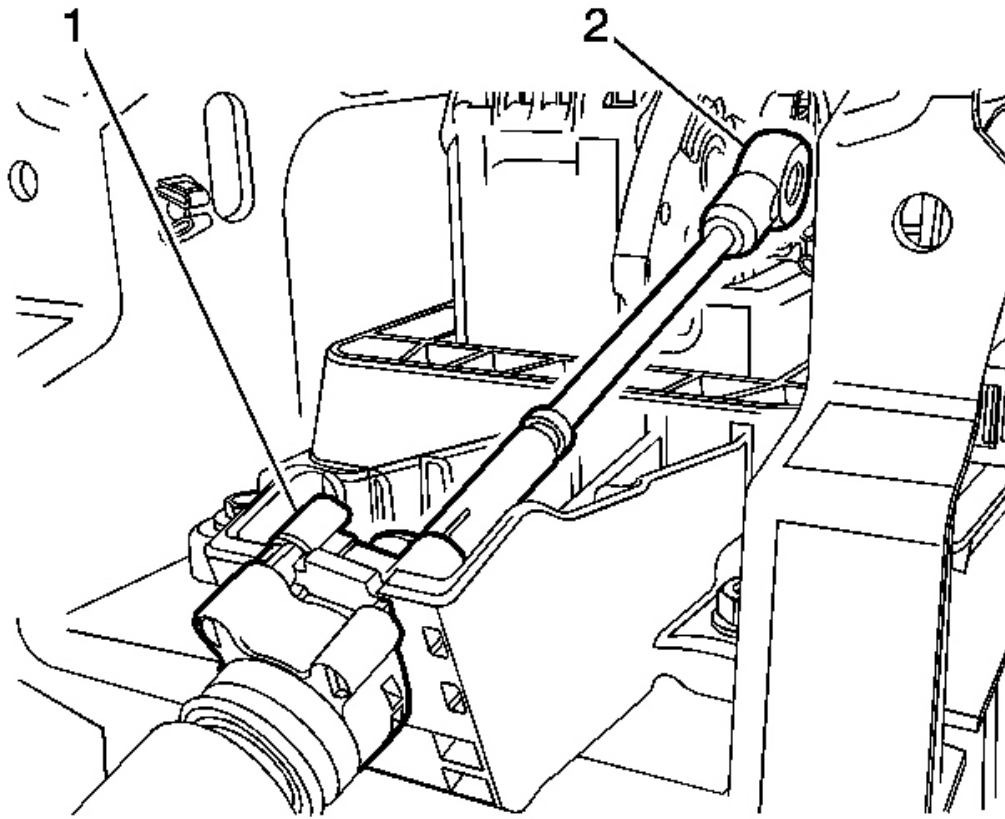


Fig. 11: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

7. Slide the transmission range selector lever cable retainer forward (1) and remove the transmission range selector cable from the transmission control base.
8. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin.
9. Remove the transmission range selector lever cable from the vehicle.

Installation Procedure

1. Install the transmission range selector lever cable in the vehicle.

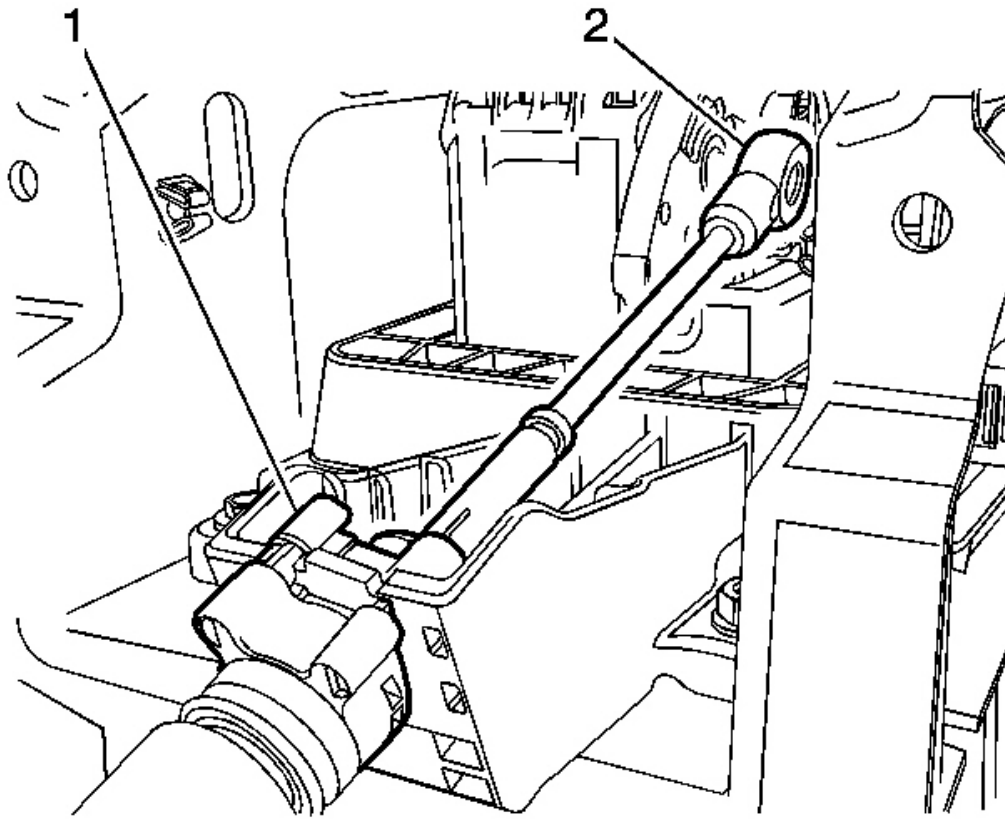


Fig. 12: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

2. Connect the transmission range selector lever cable terminal (2) to the shift lever pin.

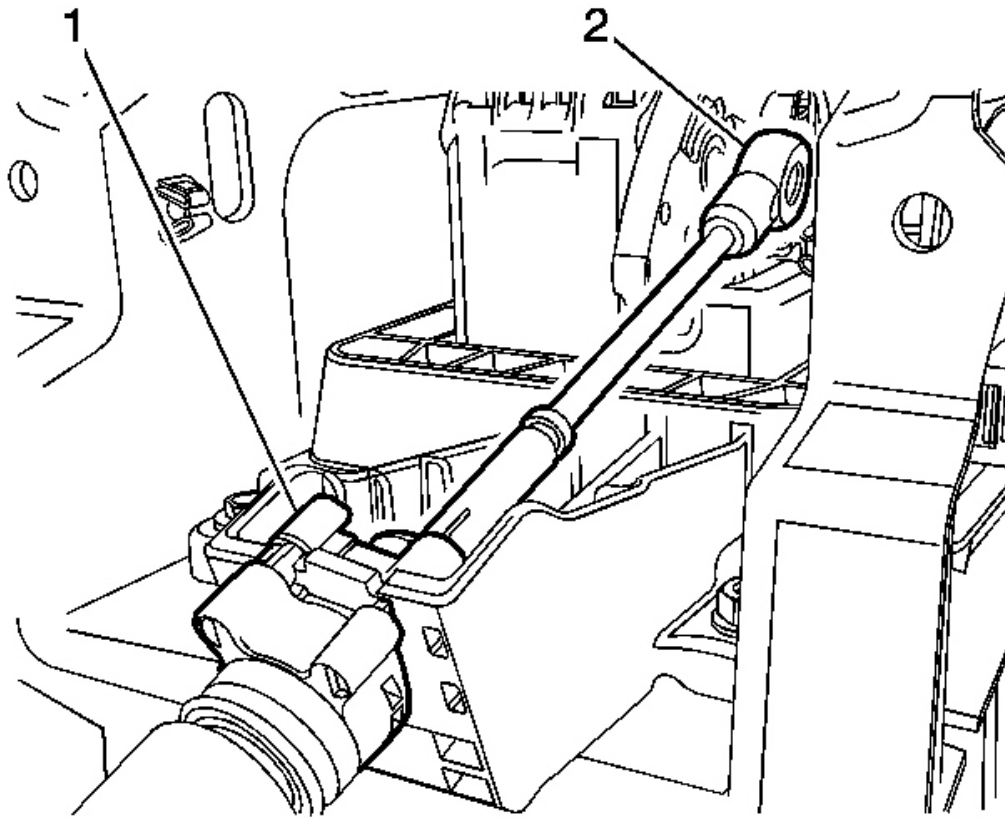


Fig. 13: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

3. Install the transmission range selector cable to the transmission control base, then slide the transmission range selector lever cable retainer rearward (1) to lock the cable in place.

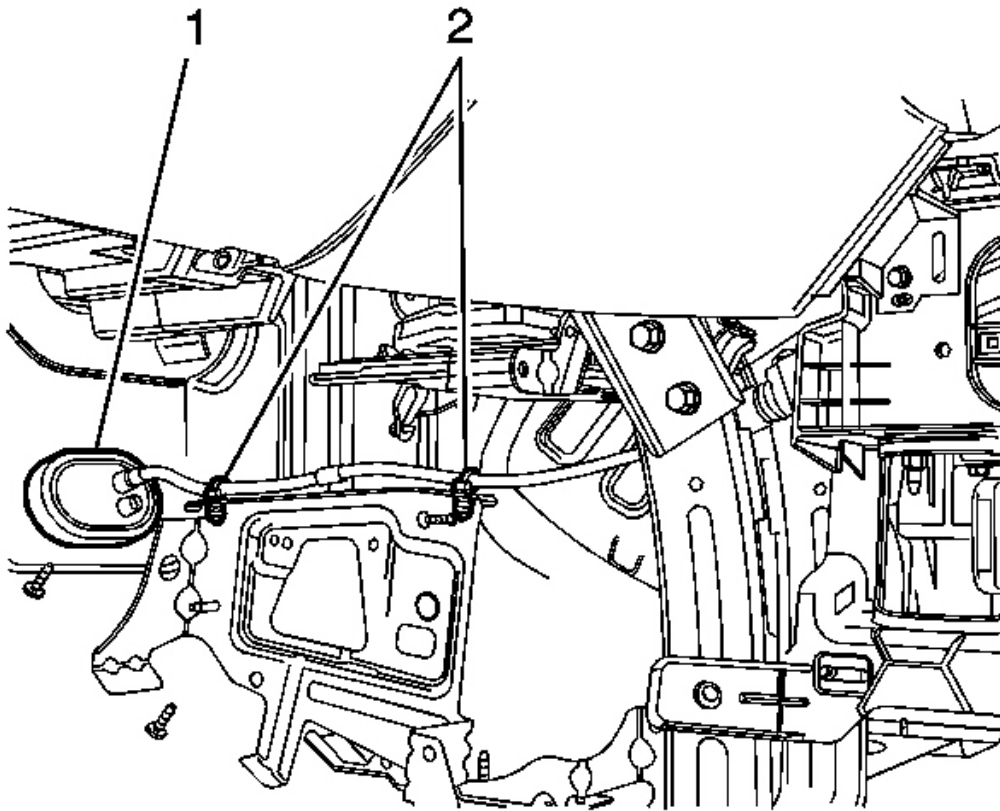


Fig. 14: Transmission Range Selector Lever Cable Retainers & Grommet
Courtesy of GENERAL MOTORS CORP.

4. Install the grommet (1) and cable assembly into the floor panel.
5. Connect the transmission range selector lever cable retainers (2) to the support bracket.
6. Install the front floor console extension. Refer to **Front Floor Lower Console Side Finish Cover Replacement - Left Side (Equinox)** or **Front Floor Lower Console Side Finish Cover Replacement - Left Side (Terrain)** .

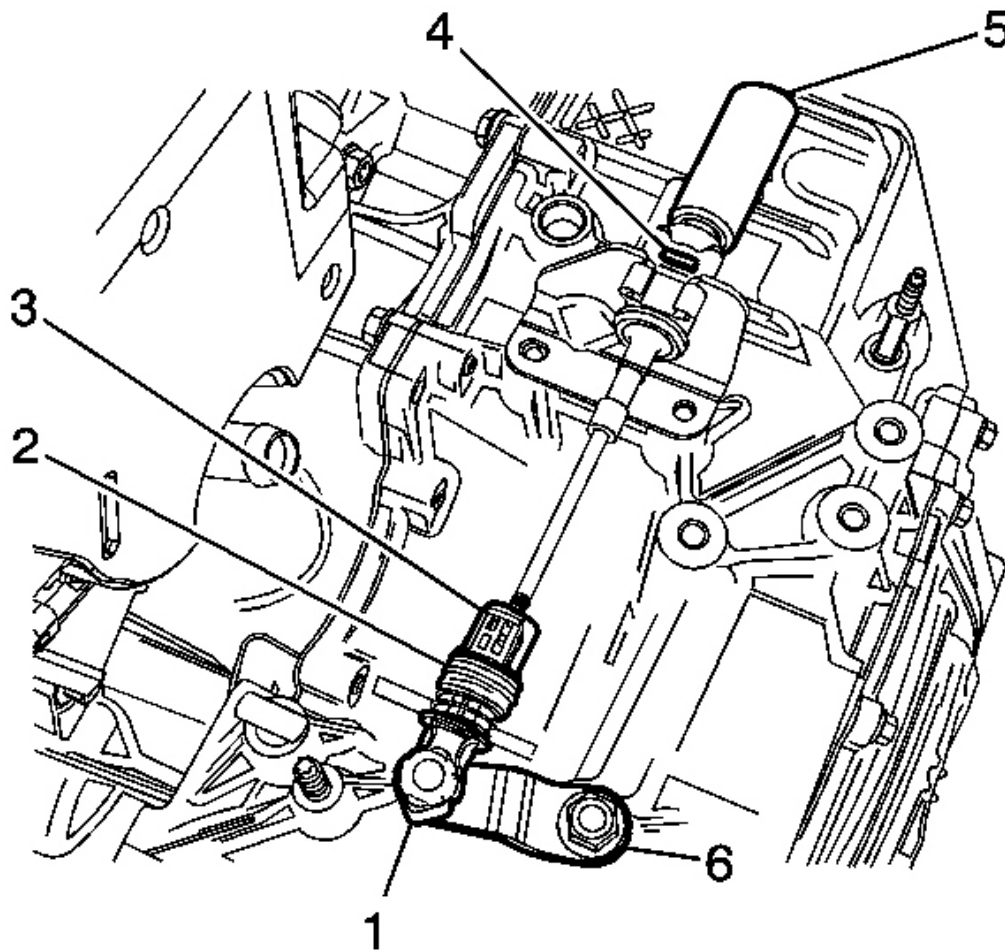


Fig. 15: Transmission Range Selector Lever Components
Courtesy of GENERAL MOTORS CORP.

7. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (6).
8. Install the cable in the bracket, then slide the retainer (4) forward to lock the transmission range selector lever cable in the bracket.
9. Adjust the cable. Refer to **Range Selector Lever Cable Adjustment**

RANGE SELECTOR LEVER CABLE ADJUSTMENT

NOTE: Adjust the automatic transmission range selector cable while the transmission and the gear selector are in the Park position only. Failure to

do so may cause mis-adjustment.

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

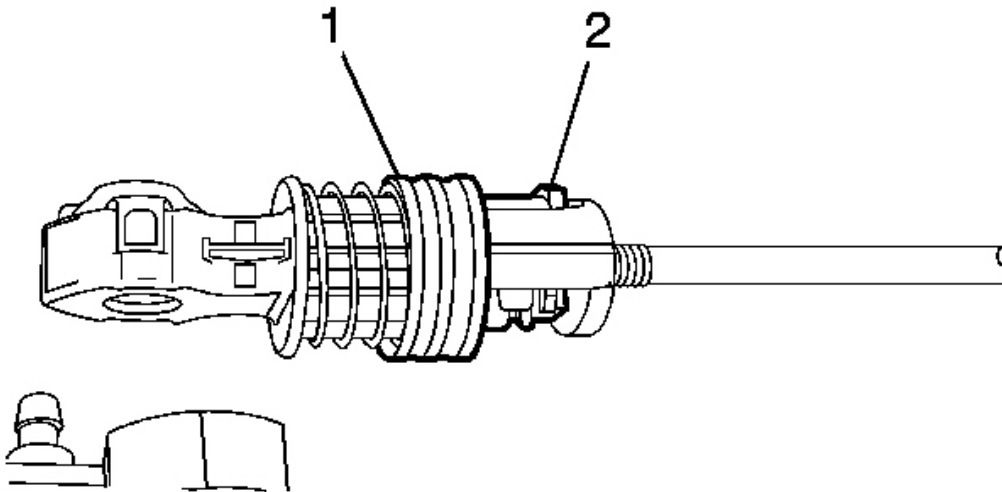


Fig. 16: Releasing Range Select Cable Adjuster Clip
Courtesy of GENERAL MOTORS CORP.

4. Pull the retaining collar (1) forward, then release the range select cable adjuster clip (2).

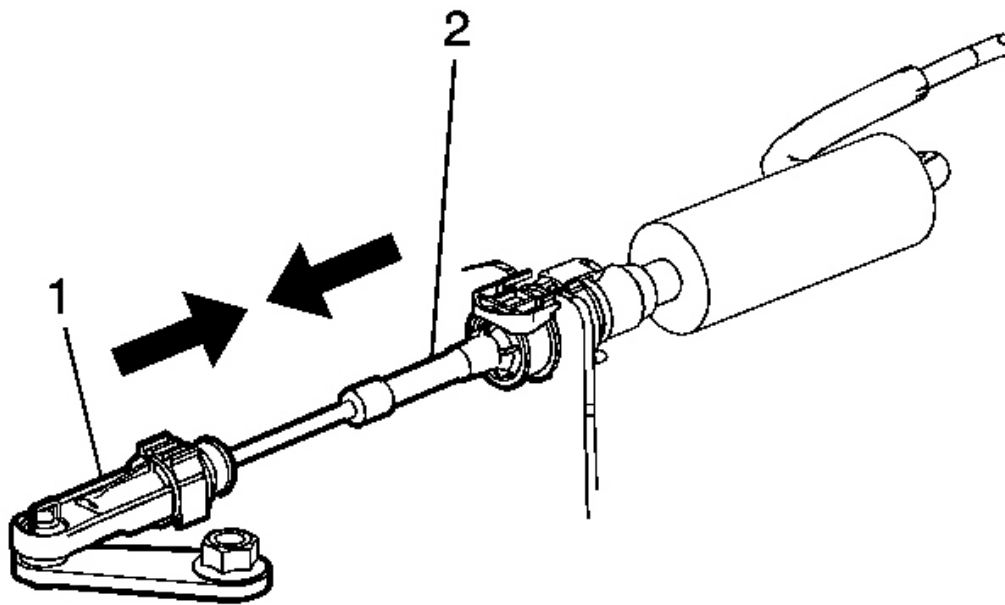


Fig. 17: Sliding Range Selector Halves Together
Courtesy of GENERAL MOTORS CORP.

5. Slide the two halves (1, 2) of the range select cable together until all free play is removed.

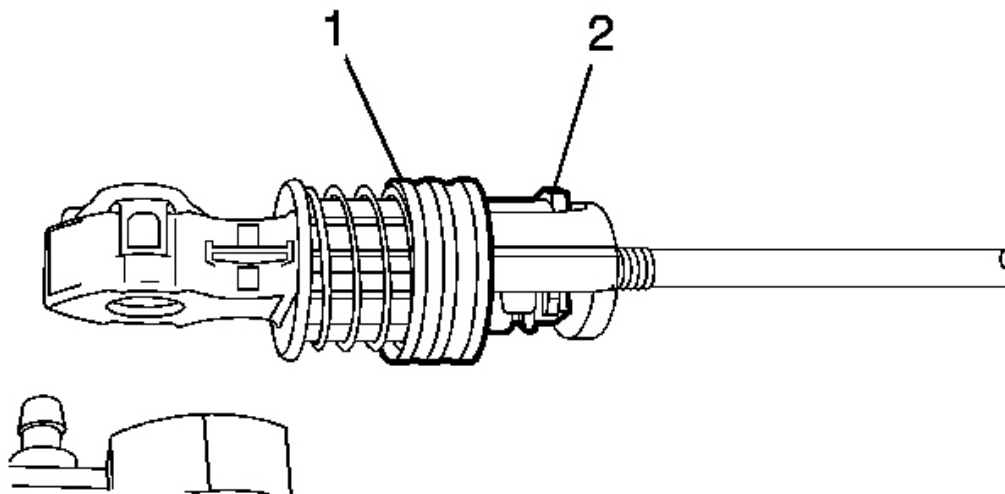


Fig. 18: Releasing Retaining Collar
Courtesy of GENERAL MOTORS CORP.

6. Depress the adjuster clip (1) locking the adjuster clip completely, then release the retaining collar.
7. Pull both halves of the range select cable in opposite directions to verify the cable adjuster is secured.
8. Check the transmission range select lever in all gear selections for proper operation.

RANGE SELECTOR LEVER CABLE BRACKET REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

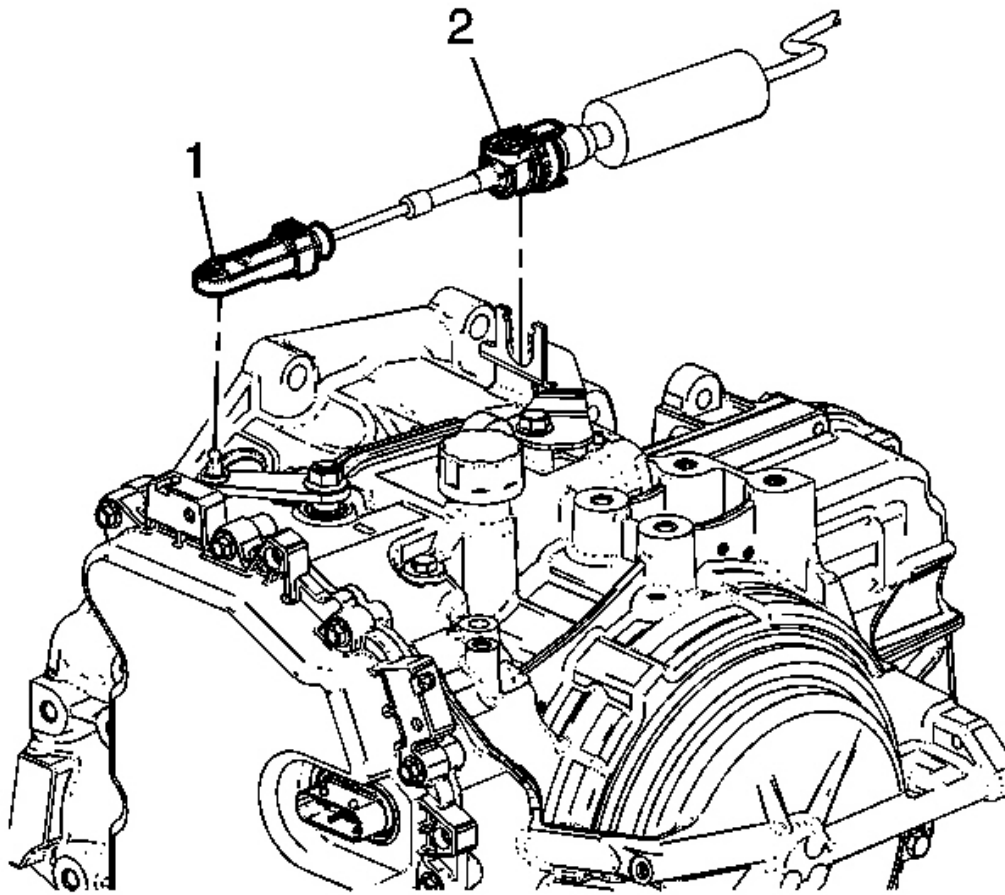


Fig. 19: View Of Transmission Range Selector Lever & Cable Connection
Courtesy of GENERAL MOTORS CORP.

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

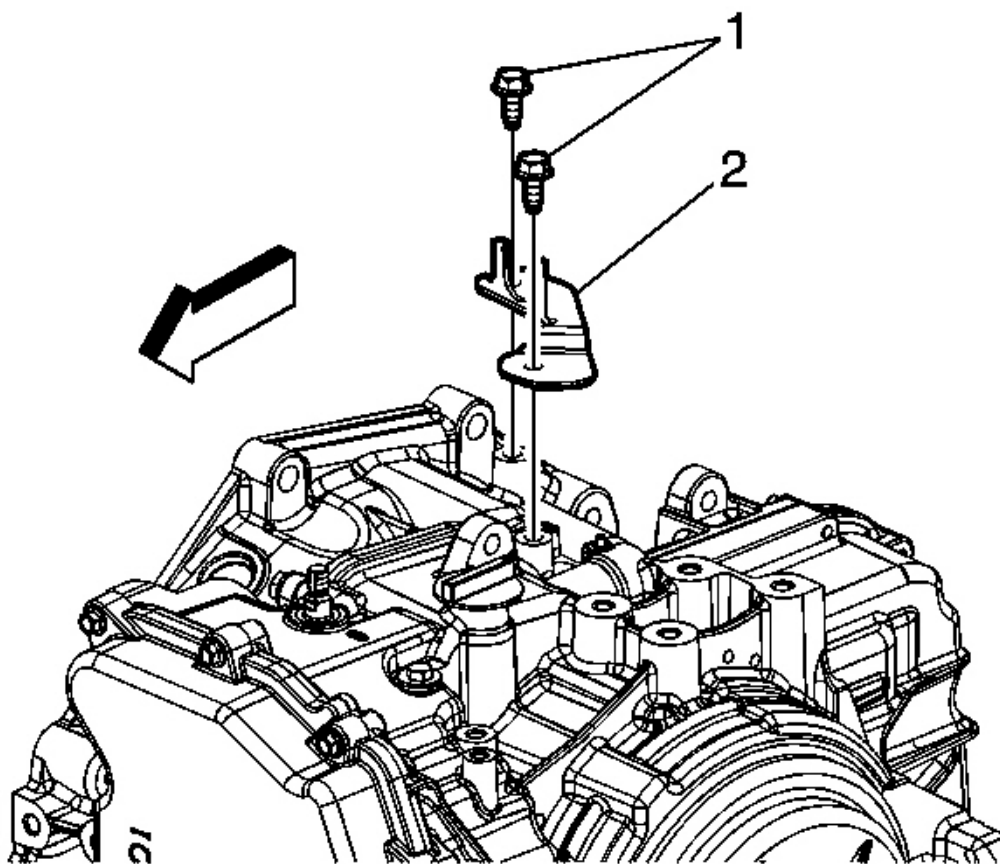


Fig. 20: Identifying Selector Cable Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

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

Installation Procedure

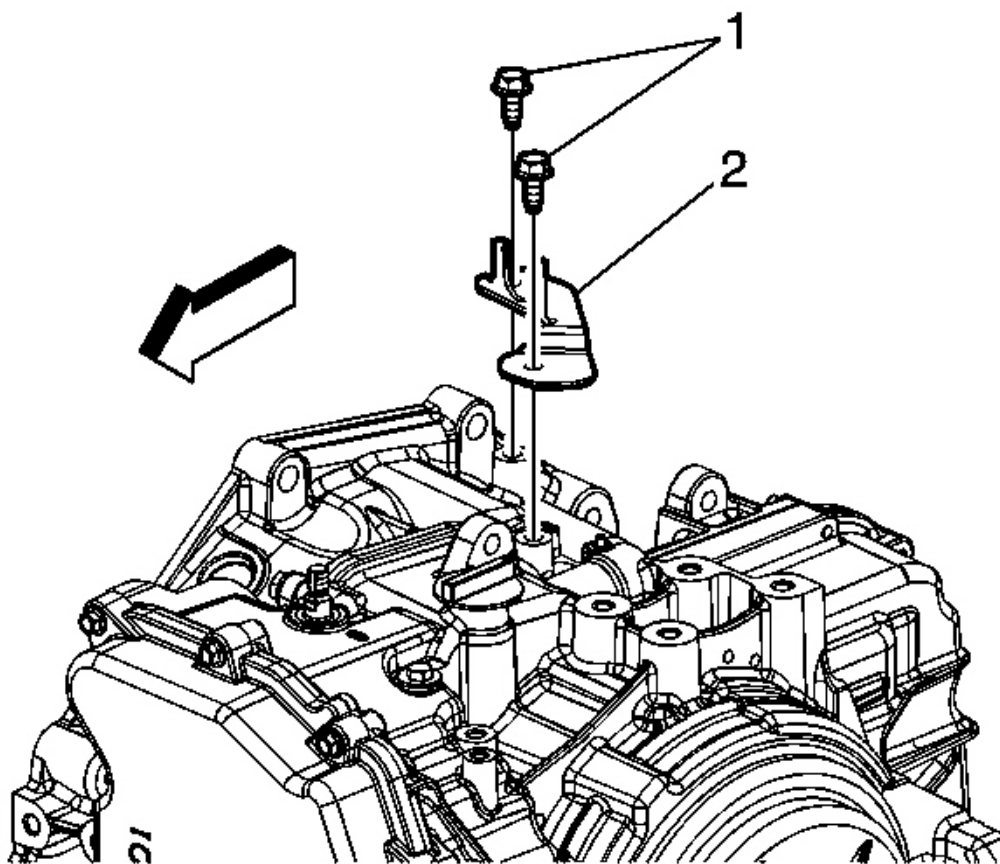


Fig. 21: Identifying Selector Cable Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

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

CAUTION: Refer to Fastener Caution .

2. Install the transmission range selector cable bracket bolts (1) and tighten to 25 N.m (18 lb ft).

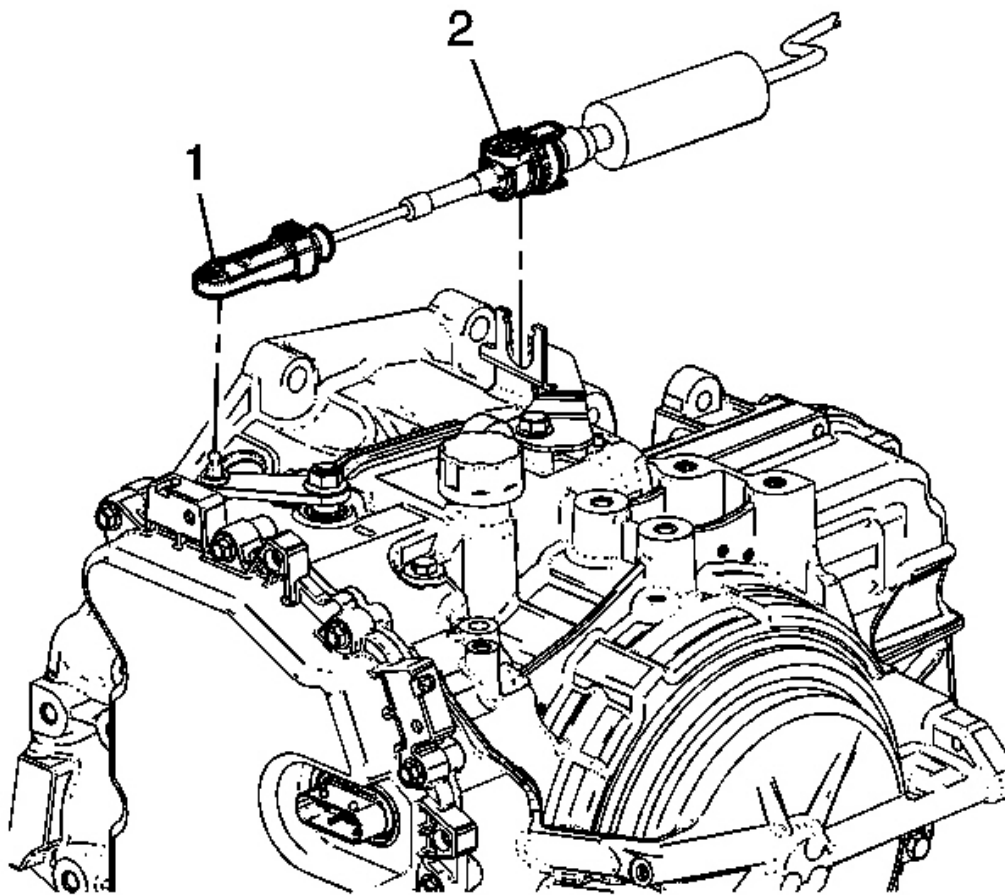


Fig. 22: View Of Transmission Range Selector Lever & Cable Connection
Courtesy of GENERAL MOTORS CORP.

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**.

TRANSMISSION FLUID REPLACEMENT

Removal Procedure

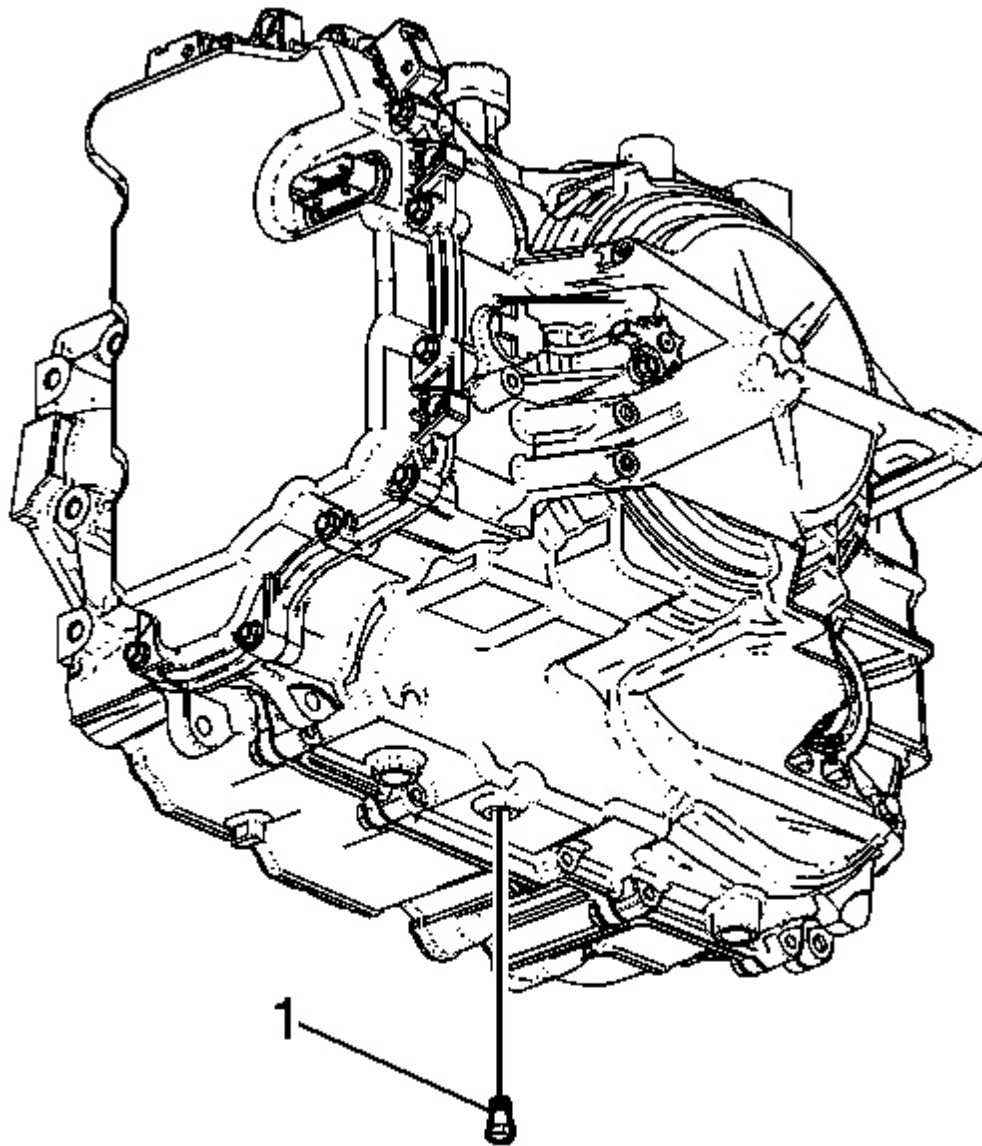


Fig. 23: Identifying Fluid Level Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the fluid drain plug (1).
3. Drain transmission fluid into a suitable container.

CAUTION: Refer to Component Fastener Tightening Caution .

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

Installation Procedure

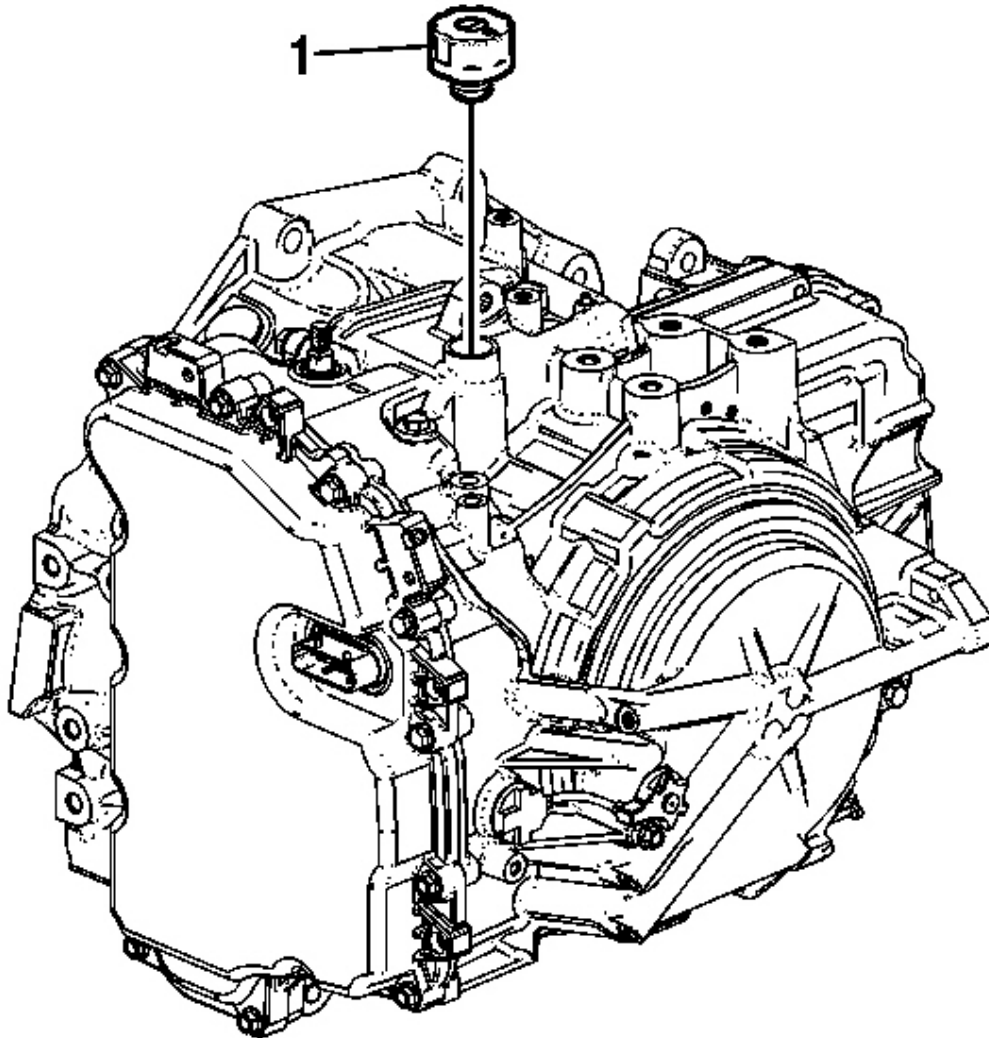


Fig. 24: Identifying Fluid Fill Cap
Courtesy of GENERAL MOTORS CORP.

1. Lower the vehicle.
2. Remove the fluid fill cap (1).
3. Fill the transmission to the proper level with the correct fluid. Refer to **Transmission Fluid Level and Condition Check** and **Fluid Capacity Specifications (6T40/45/50)** .
4. Install the fluid fill cap (1).

TRANSMISSION FLUID COOLER PIPE CONNECTOR REPLACEMENT - RADIATOR

Removal Procedure

1. Drain the cooling system. Refer to **Cooling System Draining and Filling (Static)** or **Cooling System Draining and Filling (GE 47716)** .
2. Remove the transaxle oil cooler hoses from the oil cooler fittings on the radiator. Refer to **Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection** .

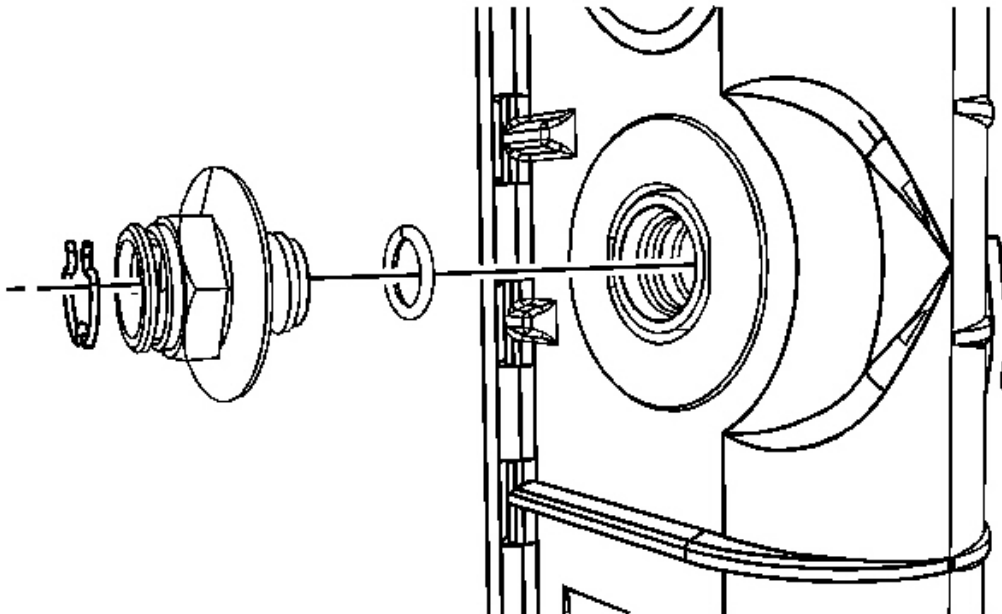


Fig. 25: View Of Oil Cooler Fitting At Radiator
Courtesy of GENERAL MOTORS CORP.

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

3. Remove the oil cooler fitting from the radiator.

Installation Procedure

1. Inspect the new O-ring seals for cracks, cuts or damage. Replace if necessary.

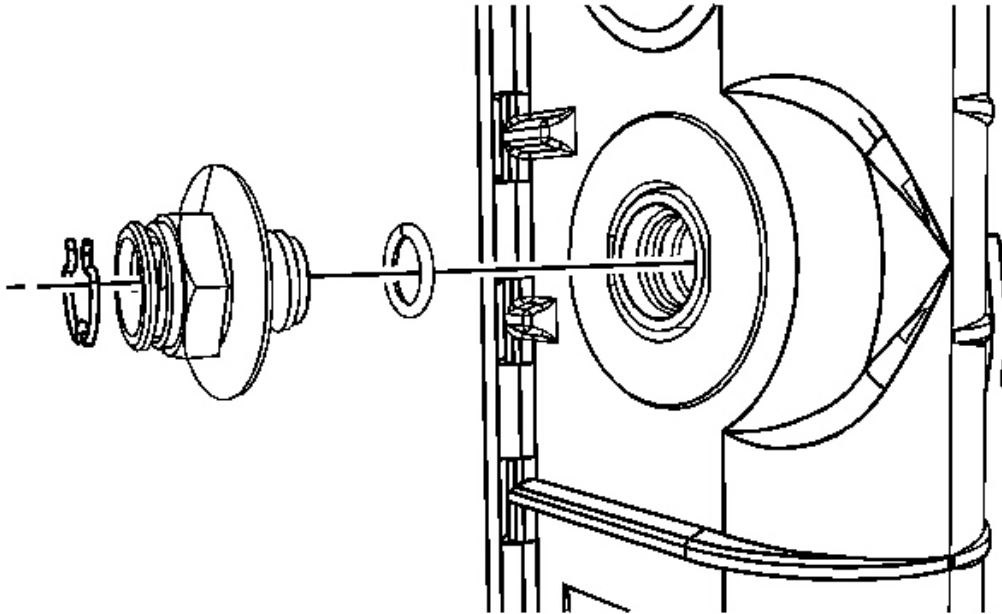


Fig. 26: View Of Oil Cooler Fitting At Radiator
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

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

2. Install the oil cooler fitting to the radiator and tighten to 38 N.m (28 lb ft).
3. Install the transaxle oil cooler hoses to the oil cooler fittings on the radiator. Refer to Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection .
4. Fill the cooling system. Refer to Cooling System Draining and Filling (Static) or Cooling System Draining and Filling (GE 47716) .
5. Adjust the transmission fluid level.

6. Inspect for fluid leaks.

TRANSMISSION FLUID COOLER HOSE/PIPE QUICK-CONNECT FITTING DISCONNECTION AND CONNECTION

Removal Procedure

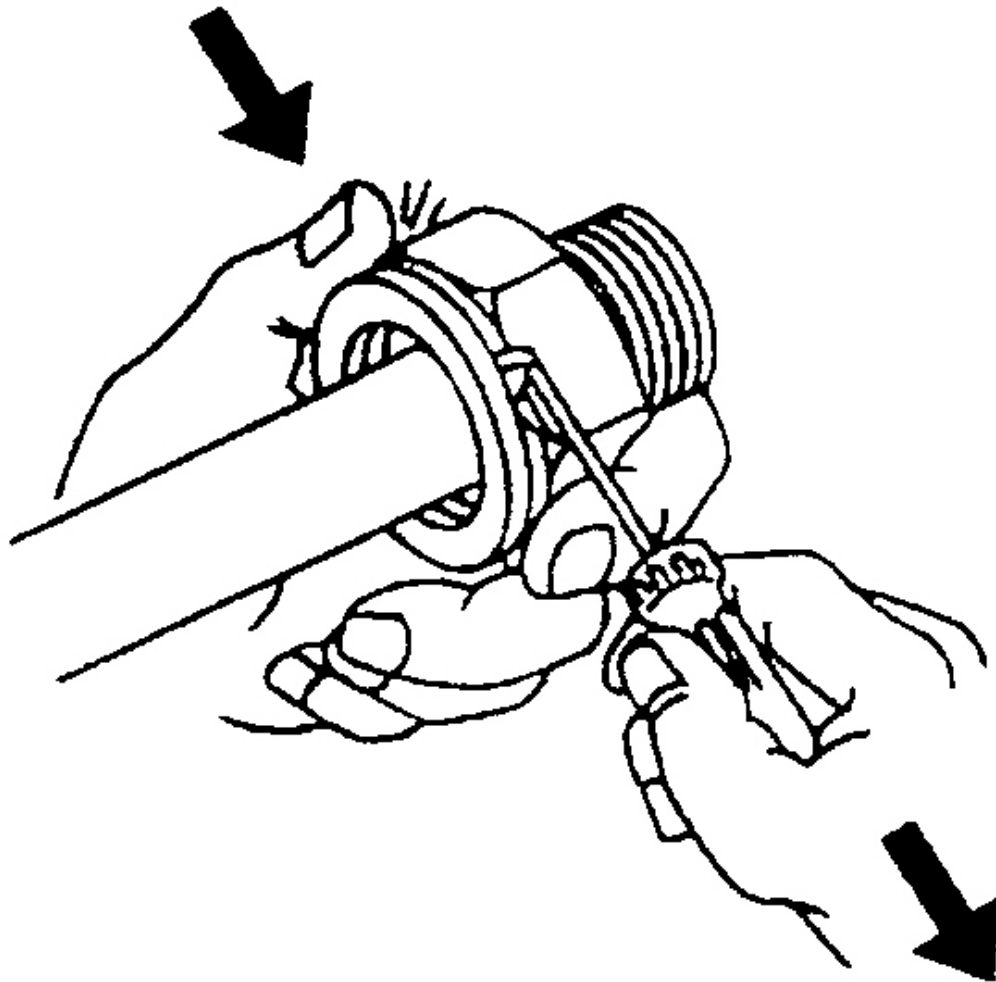


Fig. 27: Removing Retaining Ring For Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

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

the transmission.

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

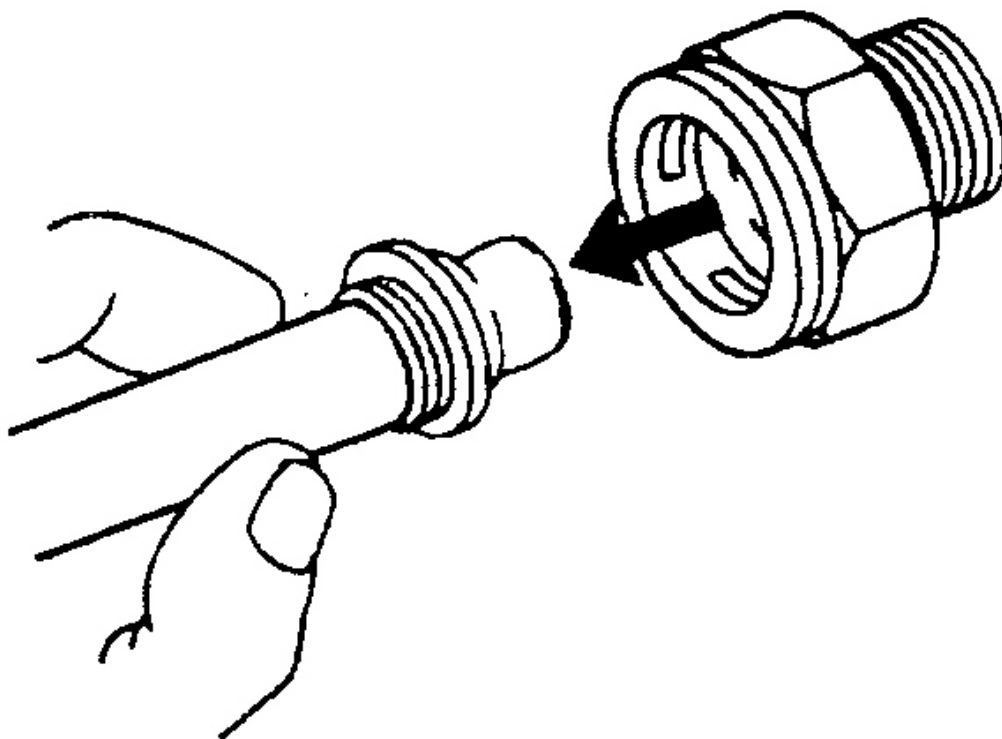


Fig. 28: Cooler Line & Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

5. Pull the cooler line straight out from the quick connect fitting.

Installation Procedure

IMPORTANT:

- Do not reuse any of the existing oil lines or oil line fittings if there is excessive corrosion.

- Do not reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.
- Ensure the following procedures are performed when installing the new retaining rings onto the fittings.

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

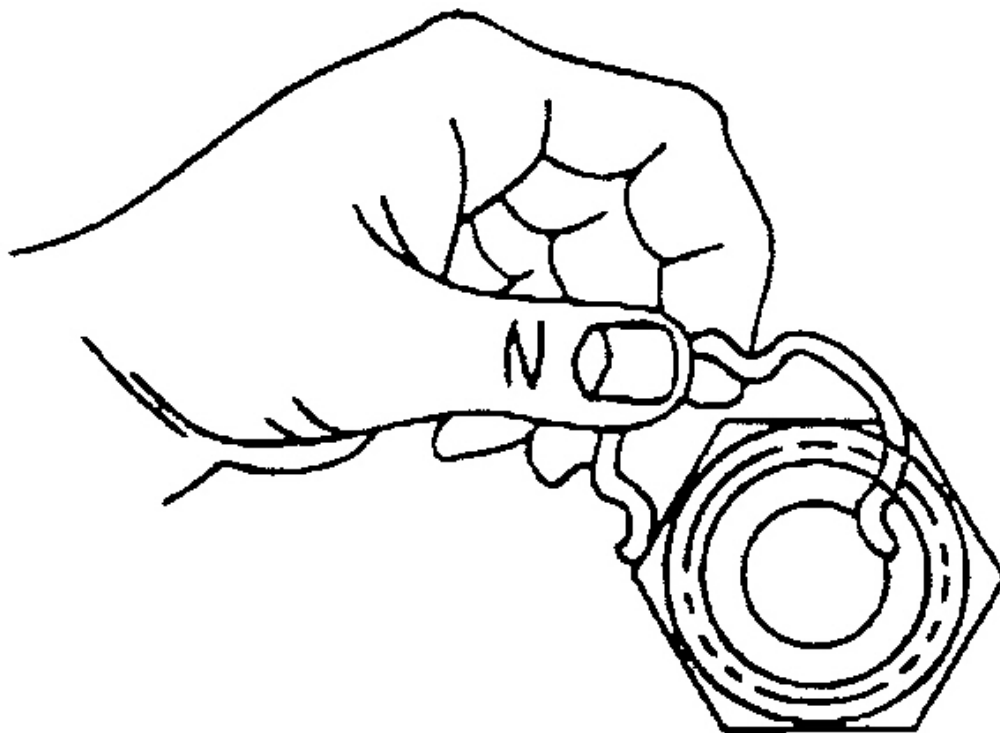


Fig. 29: Hooking Retaining Ring Into Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

2. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting.

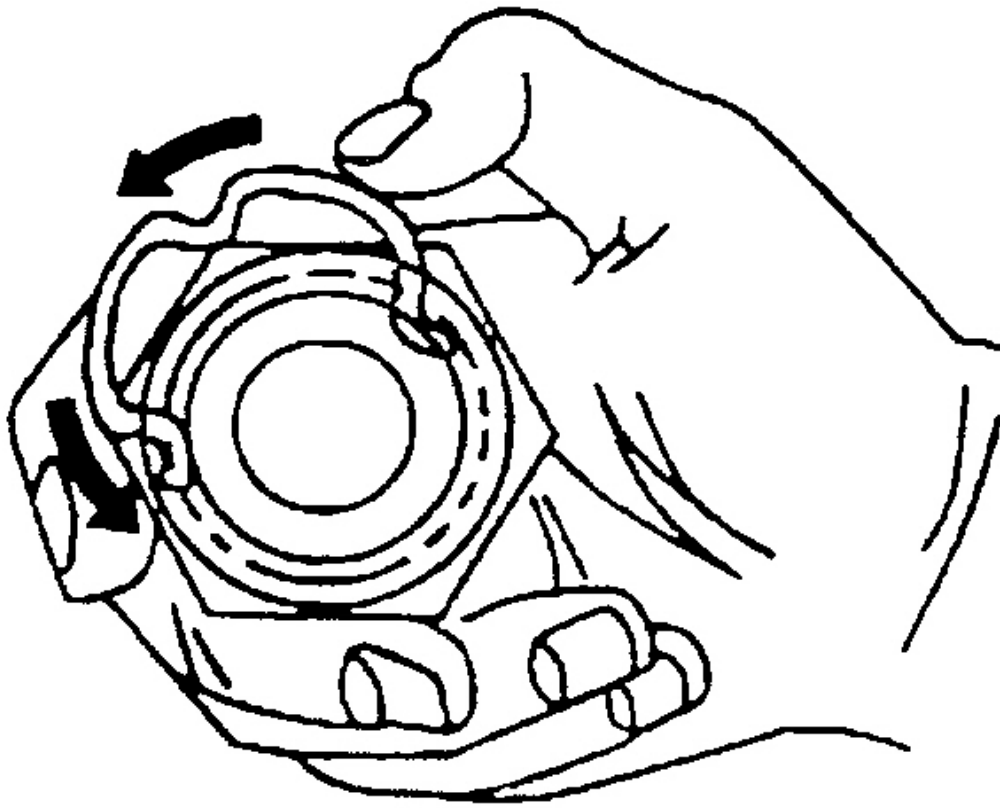


Fig. 30: Rotating Retaining Ring Around Fitting
Courtesy of GENERAL MOTORS CORP.

3. Rotate the retaining ring around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting.

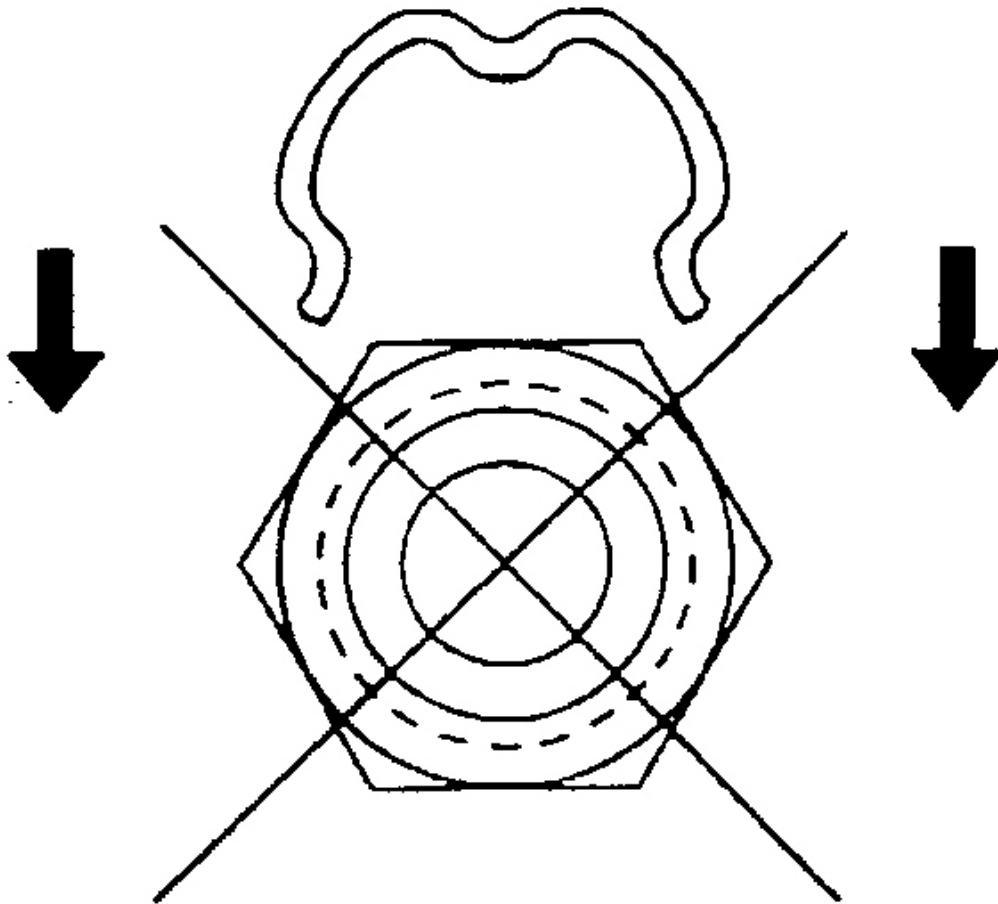


Fig. 31: Identifying Improper Engine Oil Cooler Hose/Pipe Retaining Ring Installation
Courtesy of GENERAL MOTORS CORP.

4. Do not install the new retaining ring onto the fitting by pushing the retaining ring.

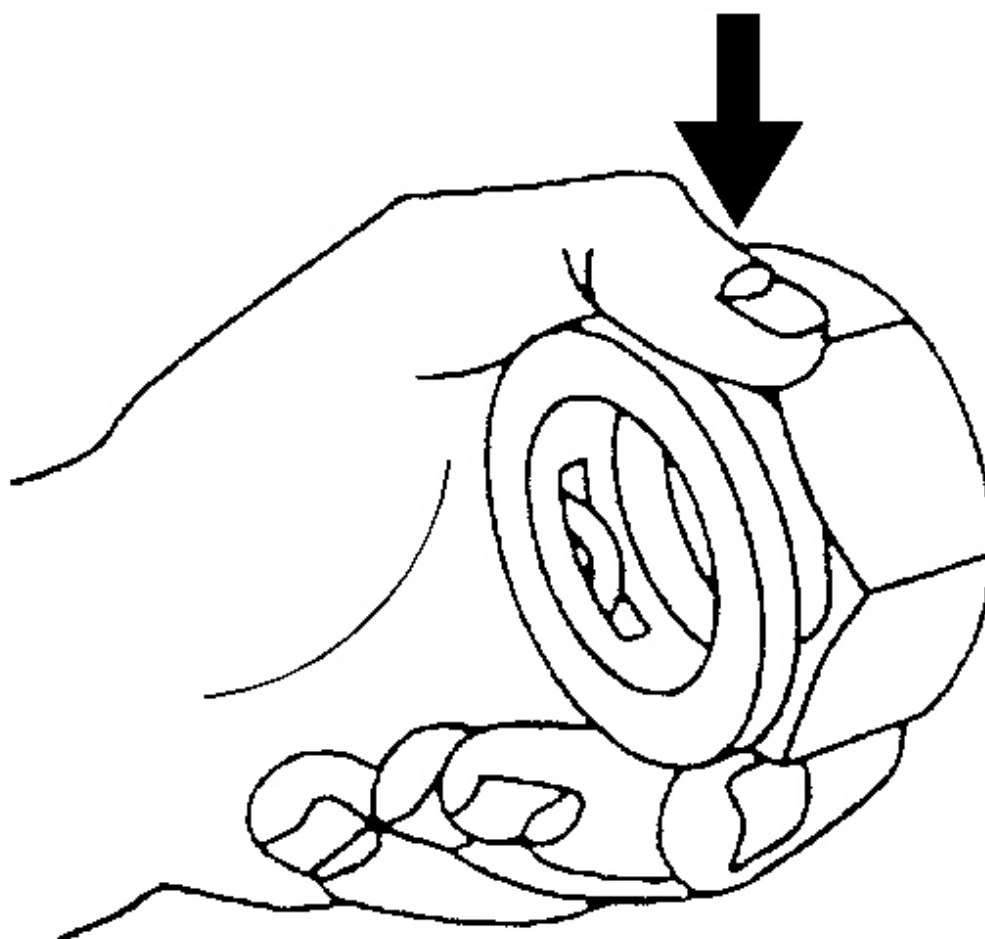


Fig. 32: Ensuring Retaining Ring Is Seated Correctly
Courtesy of GENERAL MOTORS CORP.

5. Ensure that the three retaining ring ears are seen from inside the fitting and that the retaining ring moves freely in the fitting slots.

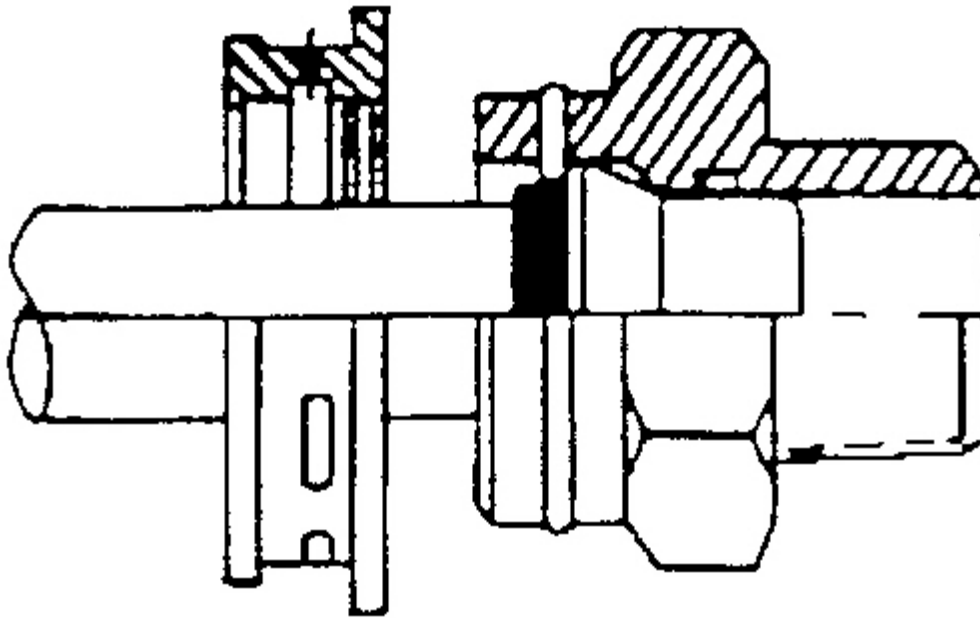


Fig. 33: View Of Cooler Line Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

6. Install the cooler line into the quick connect fitting.
7. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.

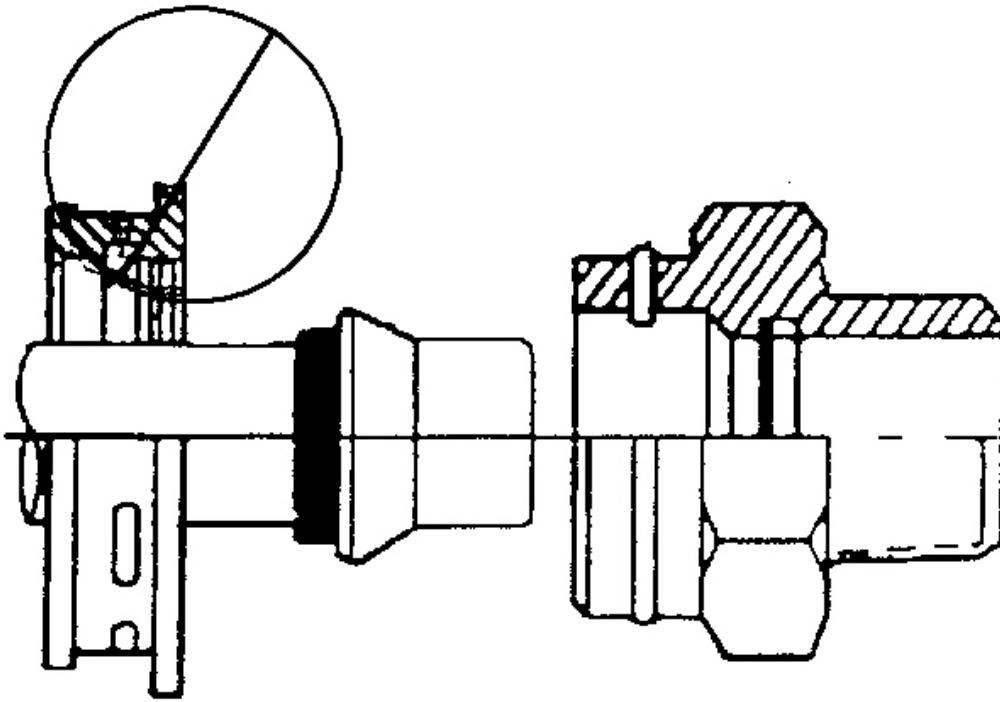


Fig. 34: Identifying Plastic Cap
Courtesy of GENERAL MOTORS CORP.

8. Do not use the plastic cap on the cooler line in order to install the cooler line into the fitting.
9. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.

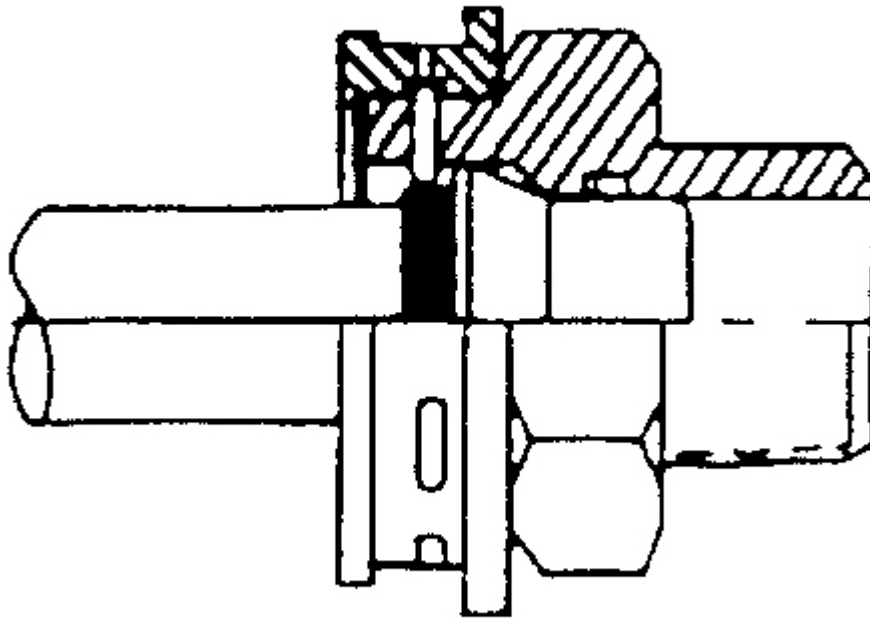


Fig. 35: View Of Cooler Line & Plastic Cap
Courtesy of GENERAL MOTORS CORP.

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

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

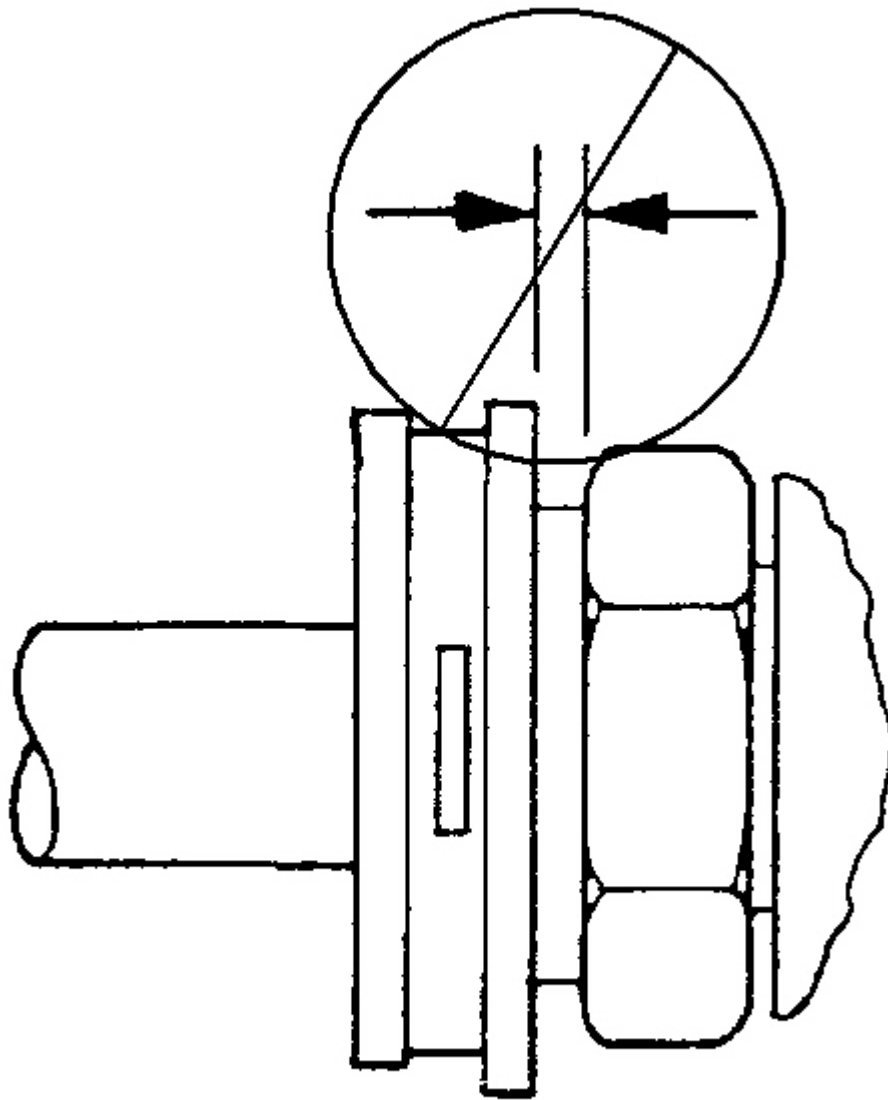


Fig. 36: Checking For Gap Between Cap & Fitting
Courtesy of GENERAL MOTORS CORP.

12. Ensure that no gap is present between the cap and the fitting.

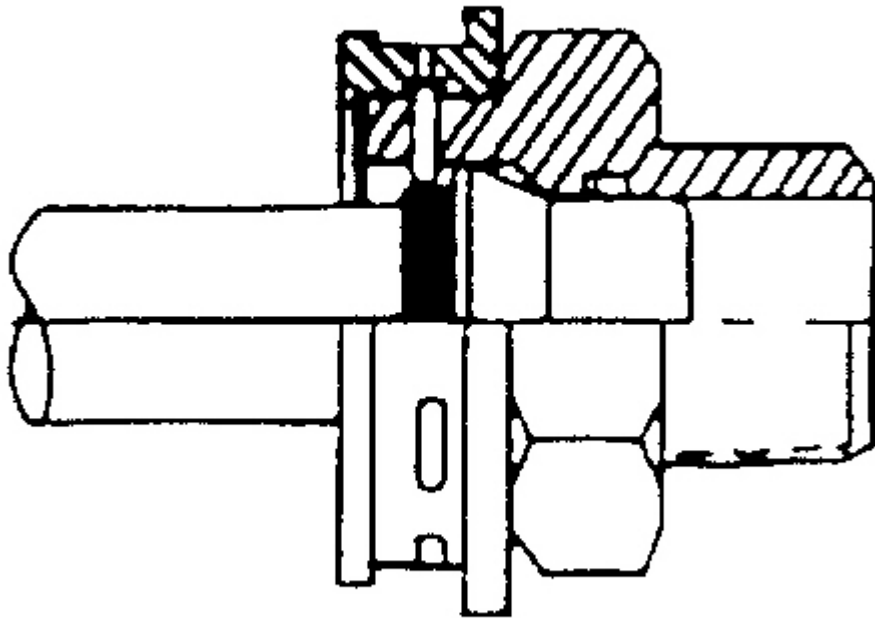


Fig. 37: View Of Cooler Line & Plastic Cap
Courtesy of GENERAL MOTORS CORP.

13. Ensure that the yellow identification band on the tube is hidden within the quick connect fitting.

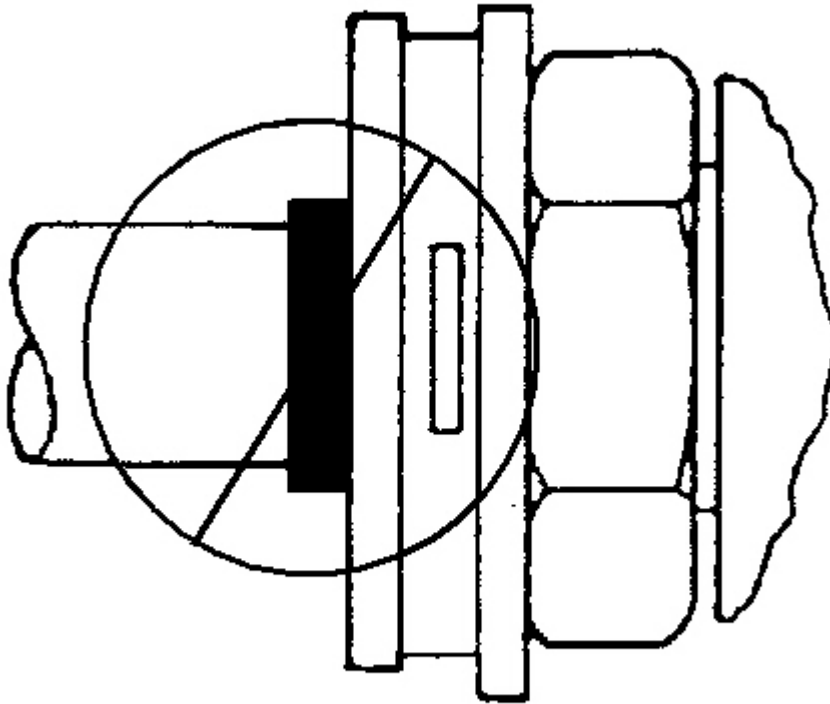


Fig. 38: Identifying Improper Joint Seating
Courtesy of GENERAL MOTORS CORP.

14. A hidden yellow identification band indicates proper joint seating.
15. Fill the transmission to the proper level with DEXRON® VI transmission fluid. Refer to **Transmission Fluid Level and Condition Check** .

TRANSMISSION FLUID COOLER OUTLET PIPE REPLACEMENT

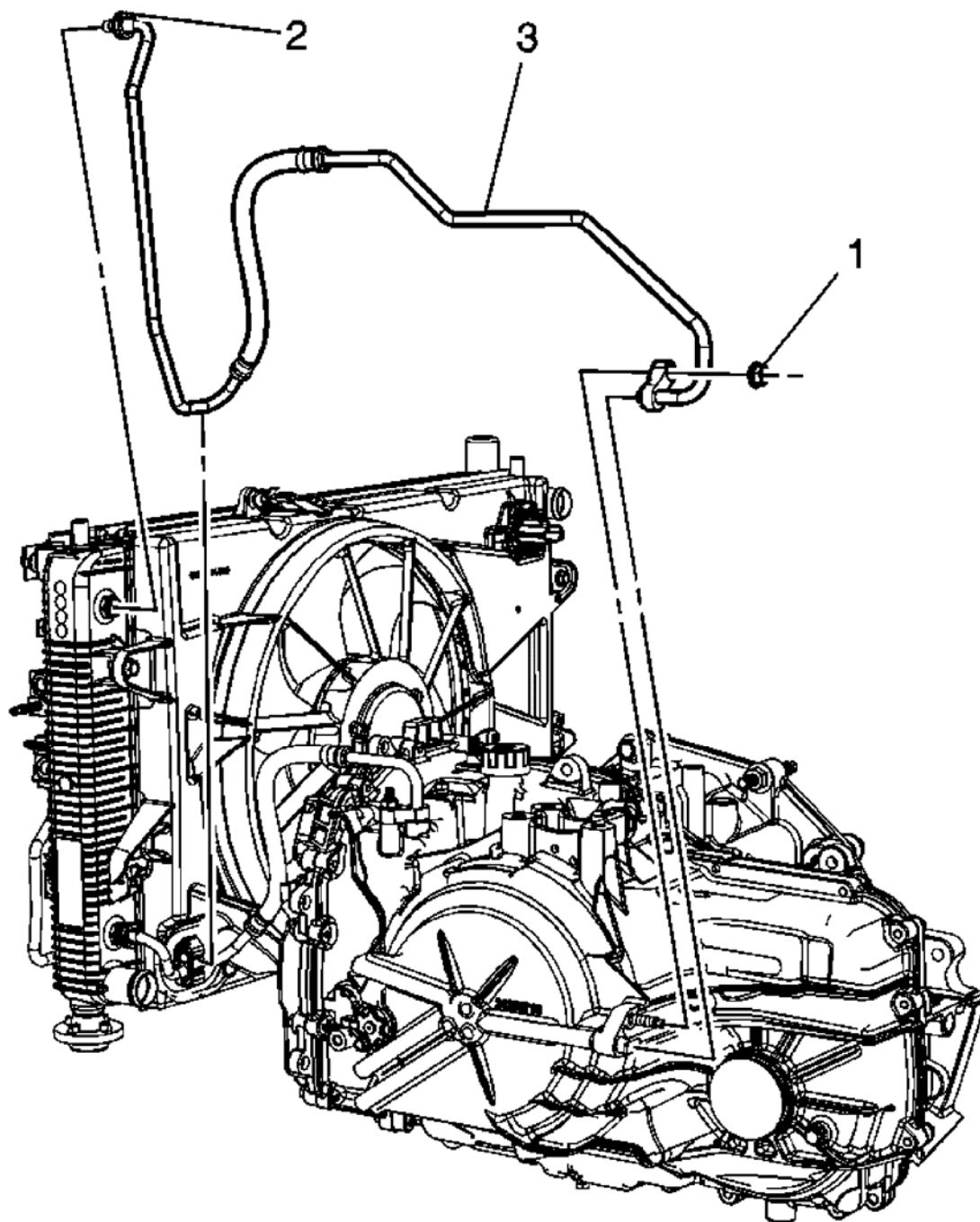


Fig. 39: Transmission Fluid Cooler Outlet Pipe
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
	Transmission Fluid Cooler Outlet Pipe Nut

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 22 N.m (16 lb ft)
2	Front Transmission Fluid Cooler Outlet Pipe Quick Disconnect Preliminary Procedure: Disconnect the transmission line from the radiator. Refer to <u>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</u> .
3	Front Transmission Fluid Cooler Outlet Pipe Procedure 1. Install new sealing washers. 2. Note the routing of the transmission line to ensure proper installation. 3. Remove the transmission line from the clips securing the line to the transmission and fan shroud. 4. Inspect the transmission fluid level. Refer to <u>Transmission Fluid Level and Condition Check</u> .

TRANSMISSION FLUID COOLER INLET PIPE REPLACEMENT

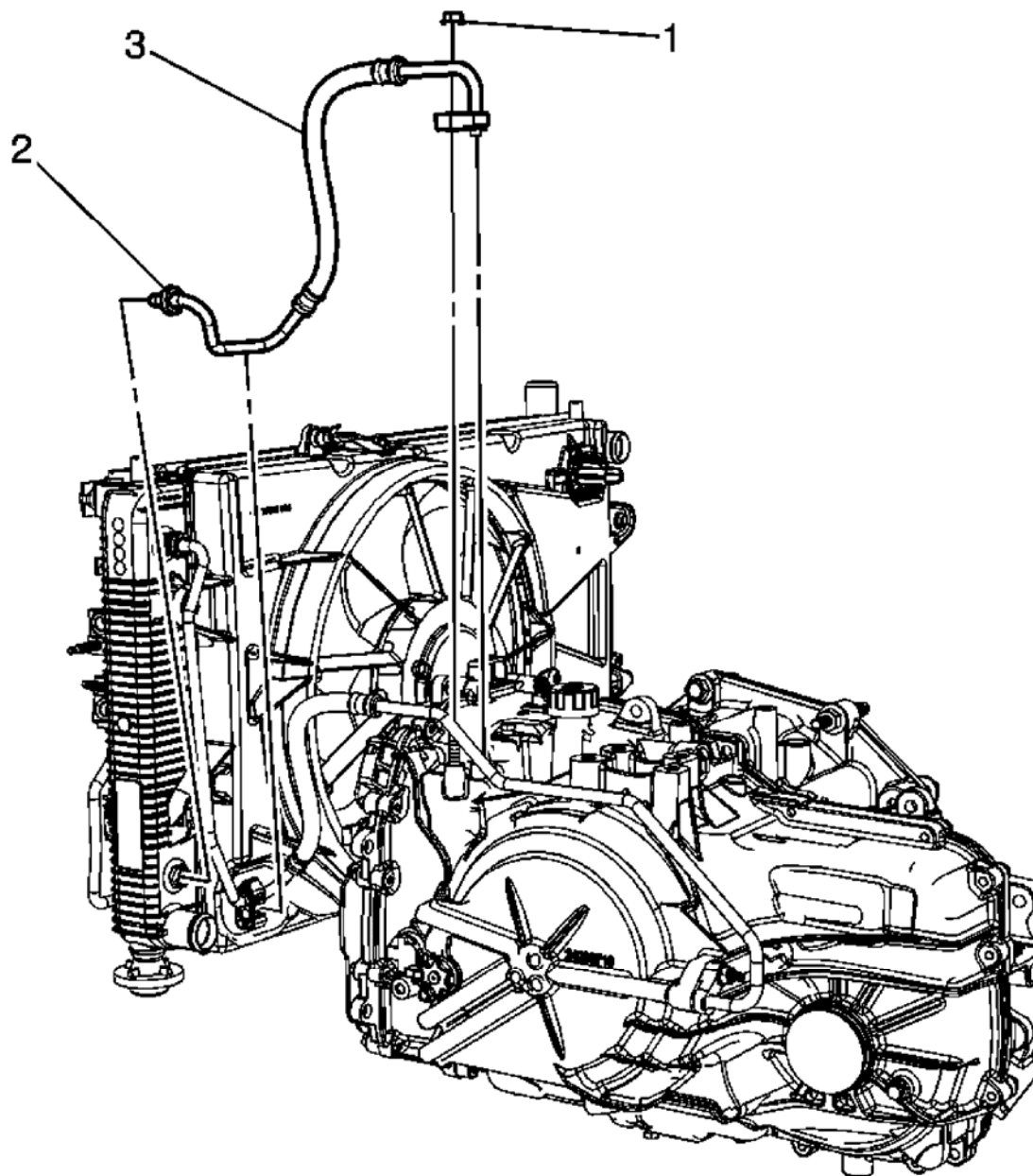


Fig. 40: Transmission Fluid Cooler Inlet Pipe
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Transmission Fluid Cooler Inlet Pipe Nut CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 22 N.m (16 lb ft)
2	Front Transmission Fluid Cooler Inlet Pipe Quick Disconnect Preliminary Procedure: Disconnect the transmission line from the radiator. Refer to <u>Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection</u> .
3	Front Transmission Fluid Cooler Inlet Pipe Procedure 1. Install new sealing washers. 2. Note the routing of the transmission line to ensure proper installation. 3. Remove the transmission line from the clips securing the line to the transmission and fan shroud. 4. Inspect the transmission fluid level. Refer to <u>Transmission Fluid Level and Condition Check</u> .

AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

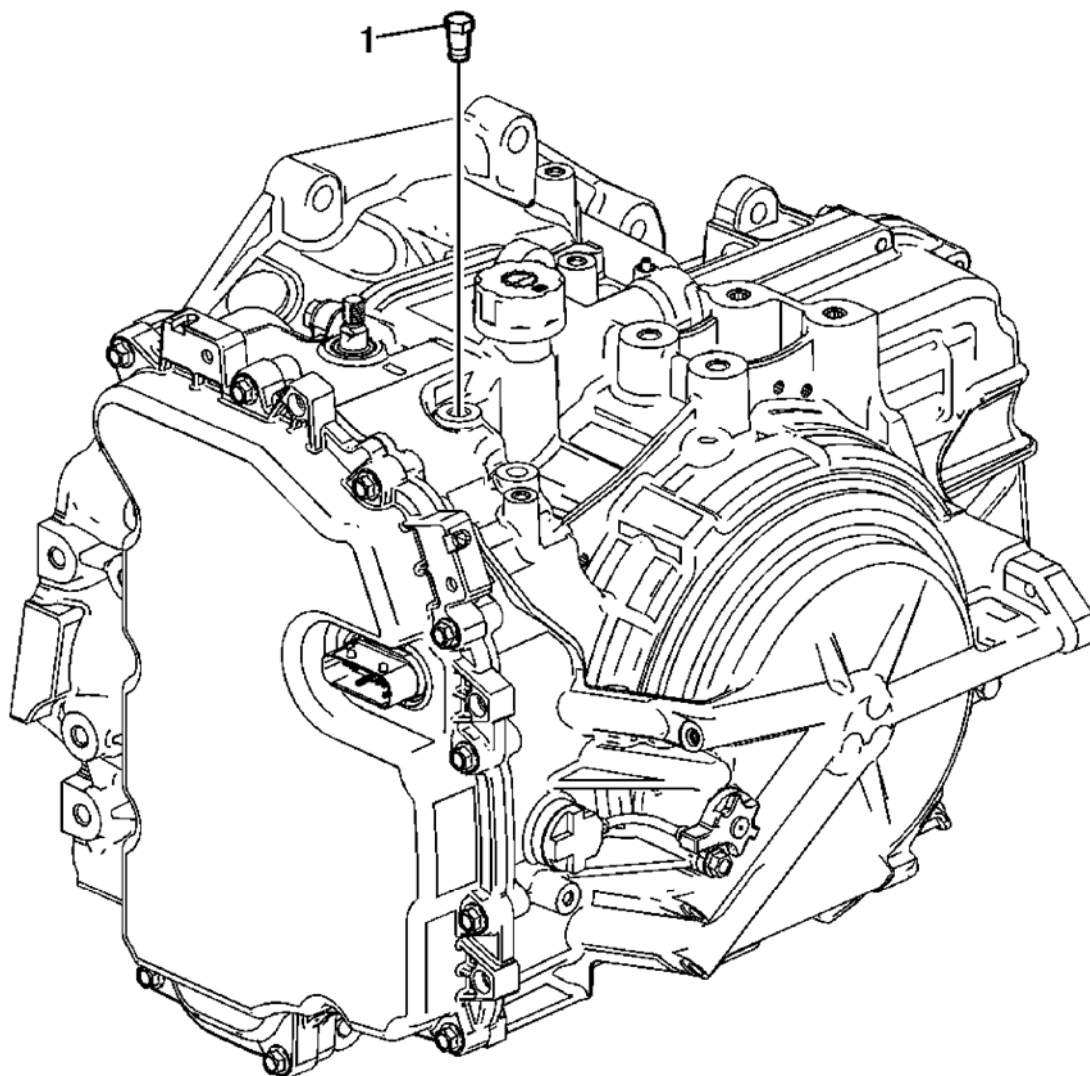


Fig. 41: Automatic Transmission Fluid Pressure Test Hole Plug
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Fluid Pressure Test Plug CAUTION: Refer to <u>Component Fastener Tightening Caution</u> . Tighten: 12 N.m (106 lb in)

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE

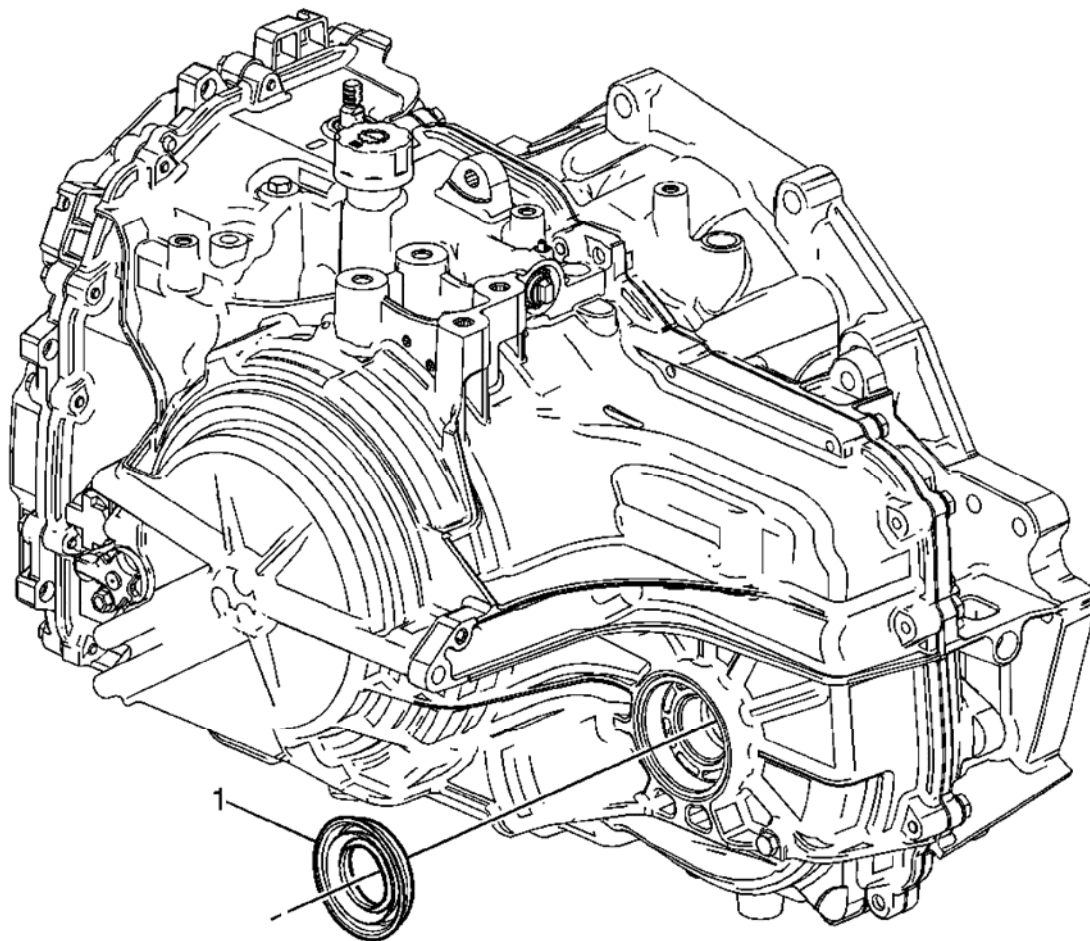


Fig. 42: Front Wheel Drive Shaft Seal - Left Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the left wheel drive shaft. Refer to <u>Front Wheel Drive Shaft Replacement</u> .	
1	Left Front Wheel Drive Shaft Oil Seal Tip: • For seal removal use J 6125-B Slide Hammer with J 23129 Universal Seal Remover. See <u>Special Tools</u> . • For seal installation use J 8092 Driver Handle with DT-47790 Seal Installer. See <u>Special Tools</u> . Special Tools

- **DT-47790** Seal Installer. See **Special Tools** .
- **J 6125-B** Slide Hammer. See **Special Tools** .
- **J 8092** Driver Handle
- **J 23129** Universal Seal Remover. See **Special Tools** .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE

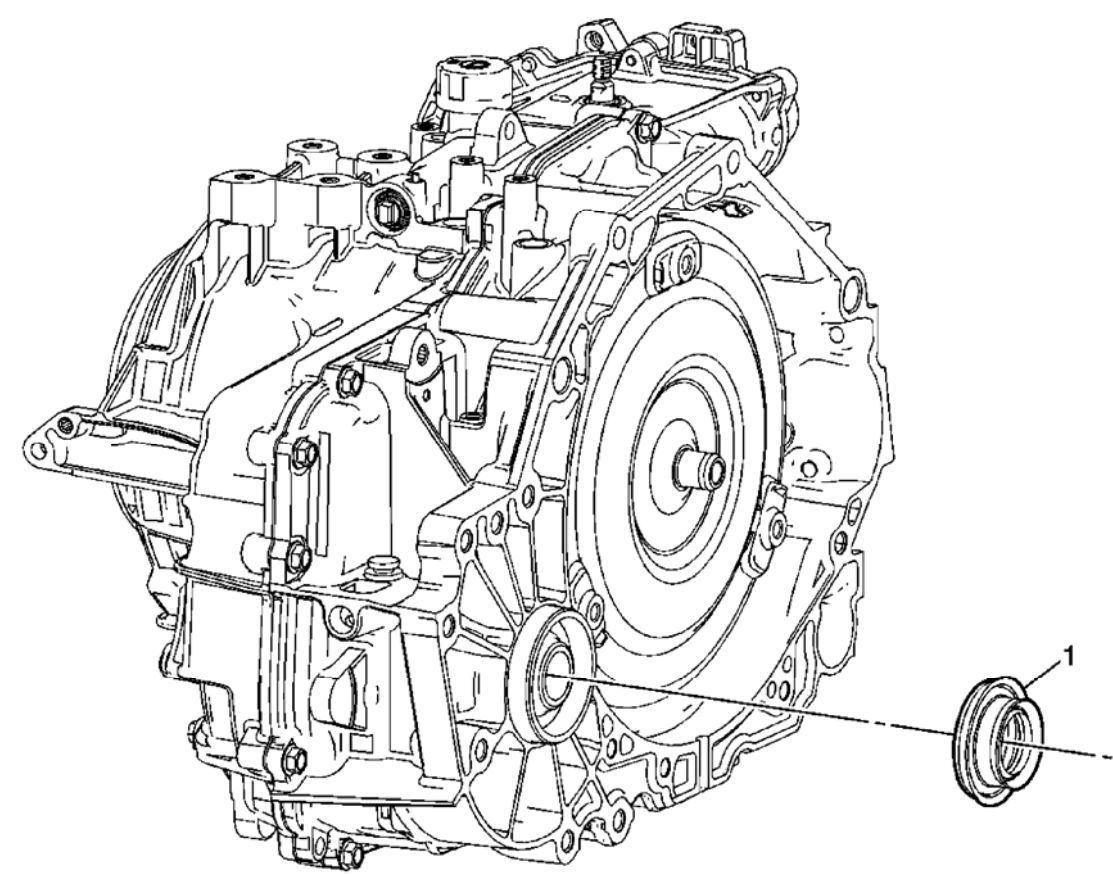


Fig. 43: Front Wheel Drive Shaft Seal - Right Side
 Courtesy of GENERAL MOTORS CORP.

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 .	
	Right Front Wheel Drive Shaft Oil Seal Tip:

1	• For seal removal use J 6125-B Slide Hammer with J 23129 Universal Seal Remover. See <u>Special Tools</u> . • For seal installation use J 8092 Driver Handle with DT-47790 Seal Installer. See <u>Special Tools</u> . Special Tools • DT-47790 Seal Installer. See <u>Special Tools</u> . • J 6125-B Slide Hammer. See <u>Special Tools</u> . • J 8092 Driver Handle • J 23129 Universal Seal Remover. See <u>Special Tools</u> .
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MANUAL SHIFT SHAFT AND SEAL REPLACEMENT

Special Tools

- **J 45201** Cooler Line Seal Remover. See **Special Tools** .
- **J-46626** Seal Installer

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement** .
2. Remove the manual shaft and position switch assembly. Refer to **Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement**.

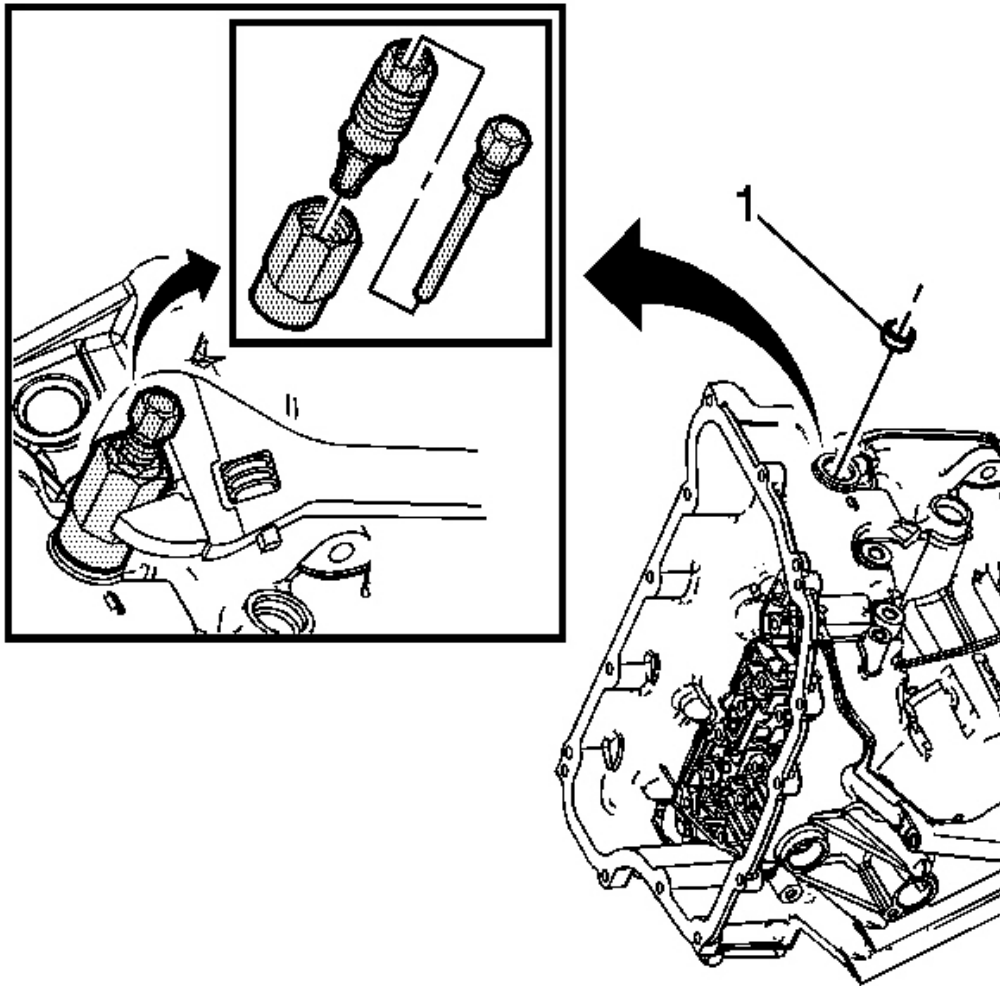


Fig. 44: Removing Manual Shaft Seal
Courtesy of GENERAL MOTORS CORP.

3. Remove the manual shaft seal (1) using **J 45201** . See **Special Tools** .

Installation Procedure

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

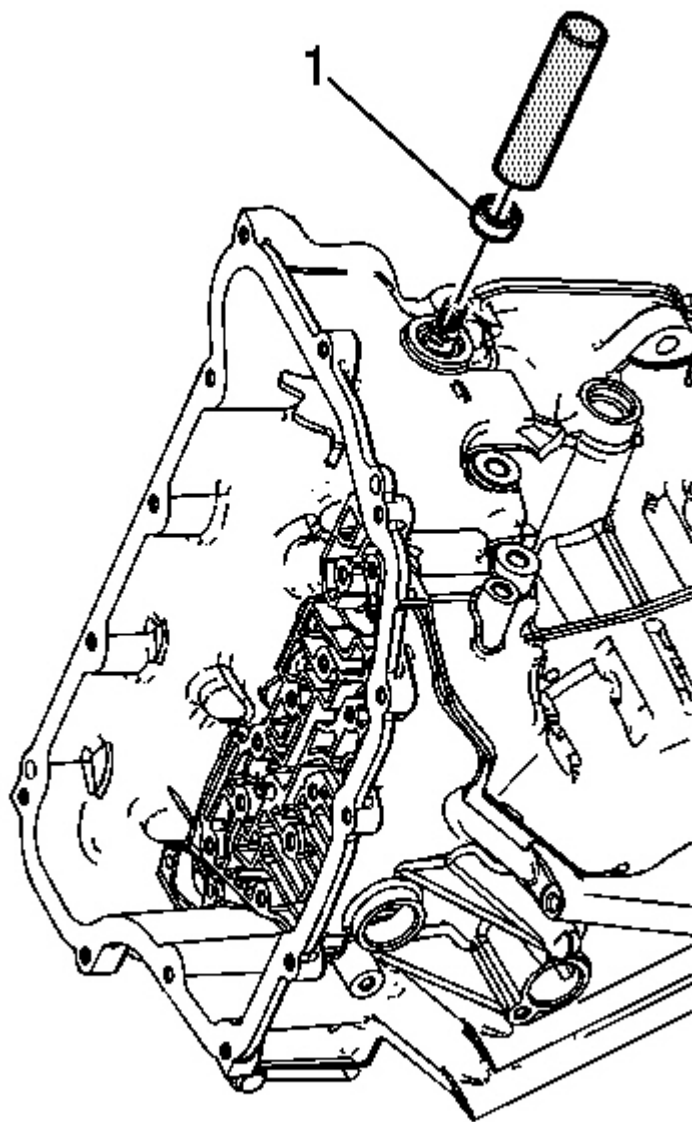


Fig. 45: Installing Manual Shaft Seal
Courtesy of GENERAL MOTORS CORP.

2. Install the manual shaft seal (1) using J-46626 .
3. Install the battery tray. Refer to **Battery Tray Replacement** .

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**.

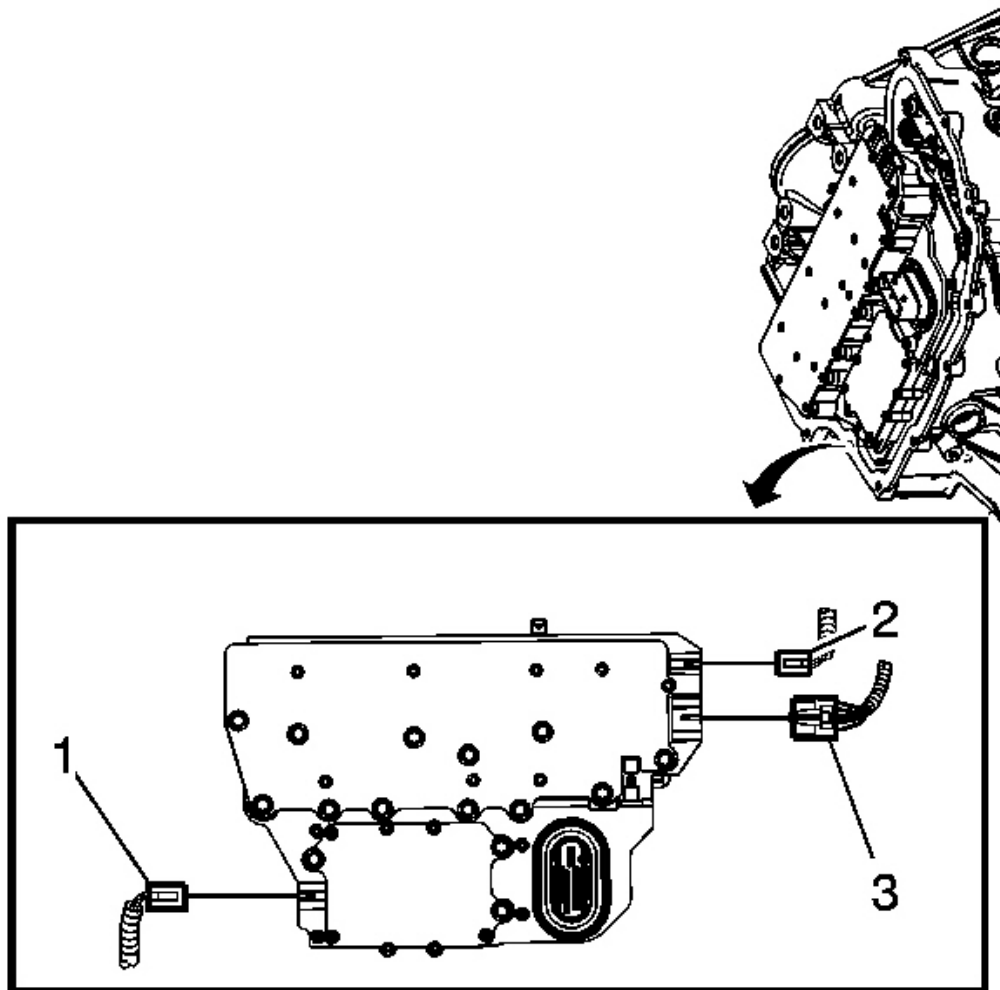


Fig. 46: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

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).

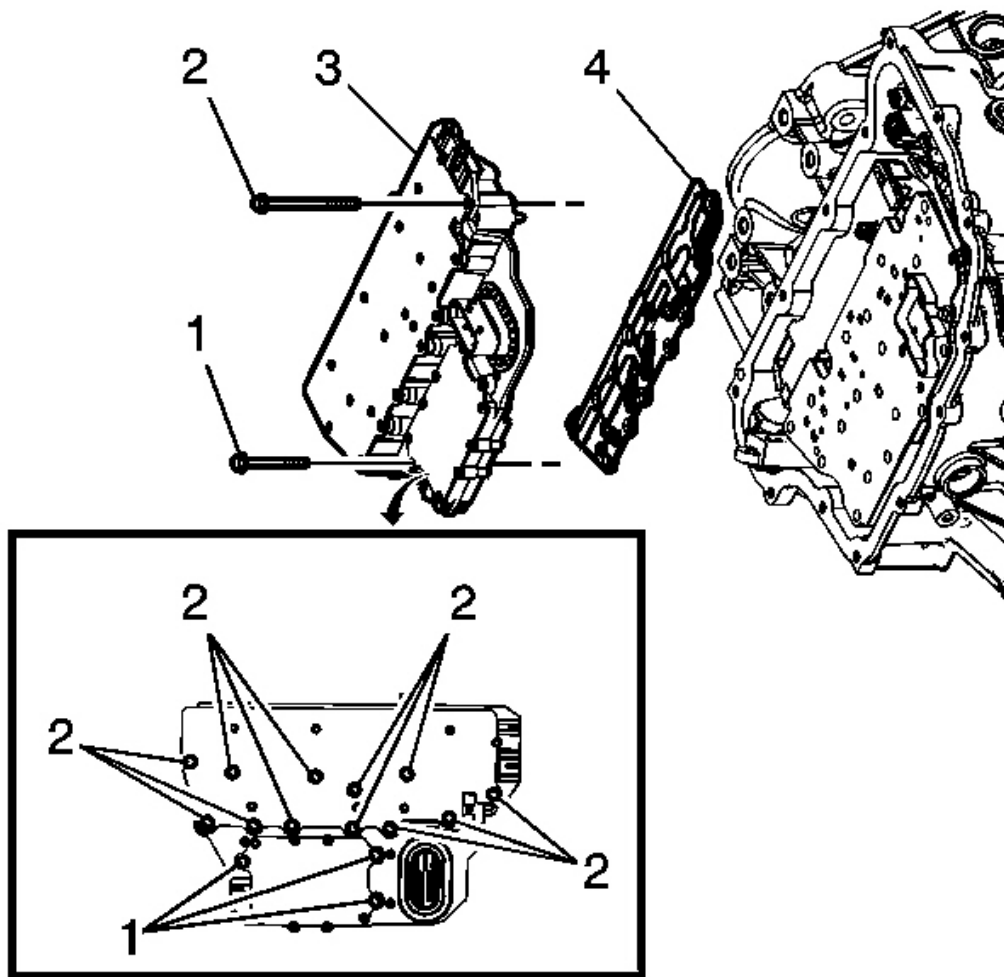


Fig. 47: Locating Control Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

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 channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.

Installation Procedure

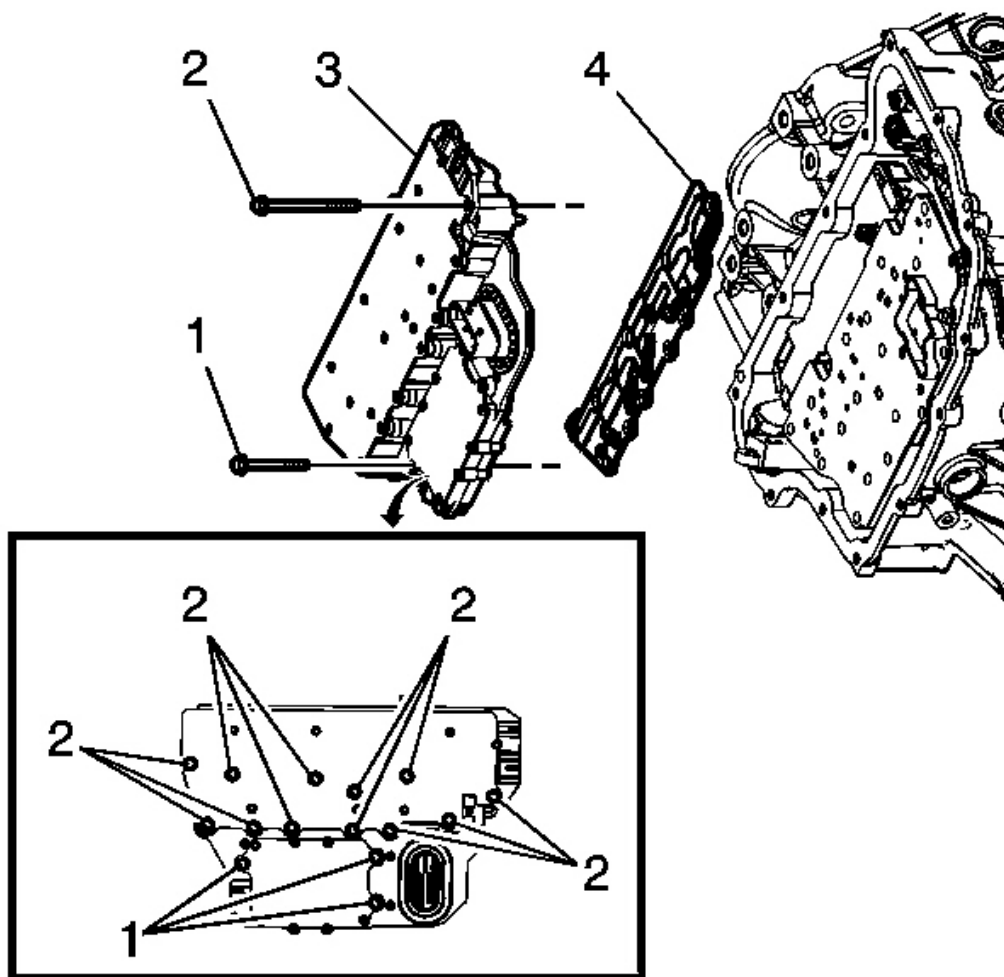


Fig. 48: Locating Control Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

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).

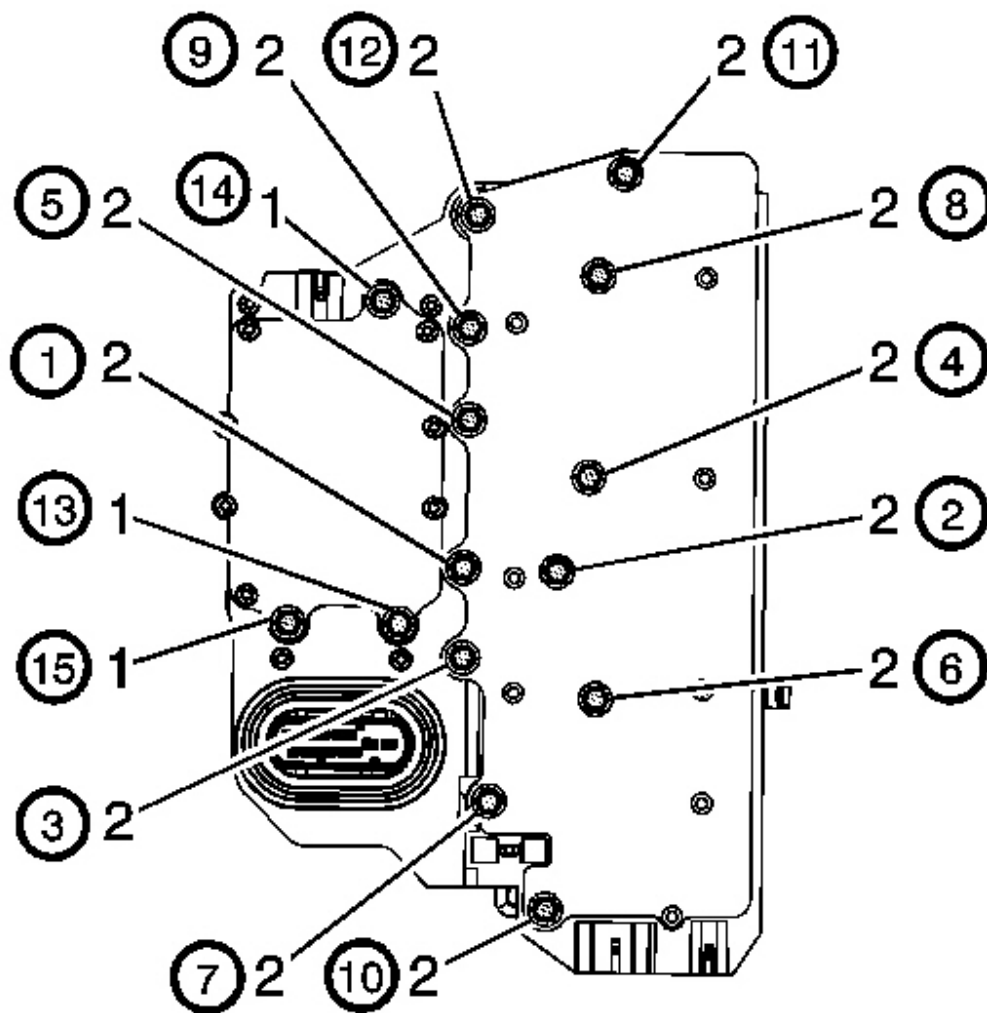


Fig. 49: Identifying Control Valve Body Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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).

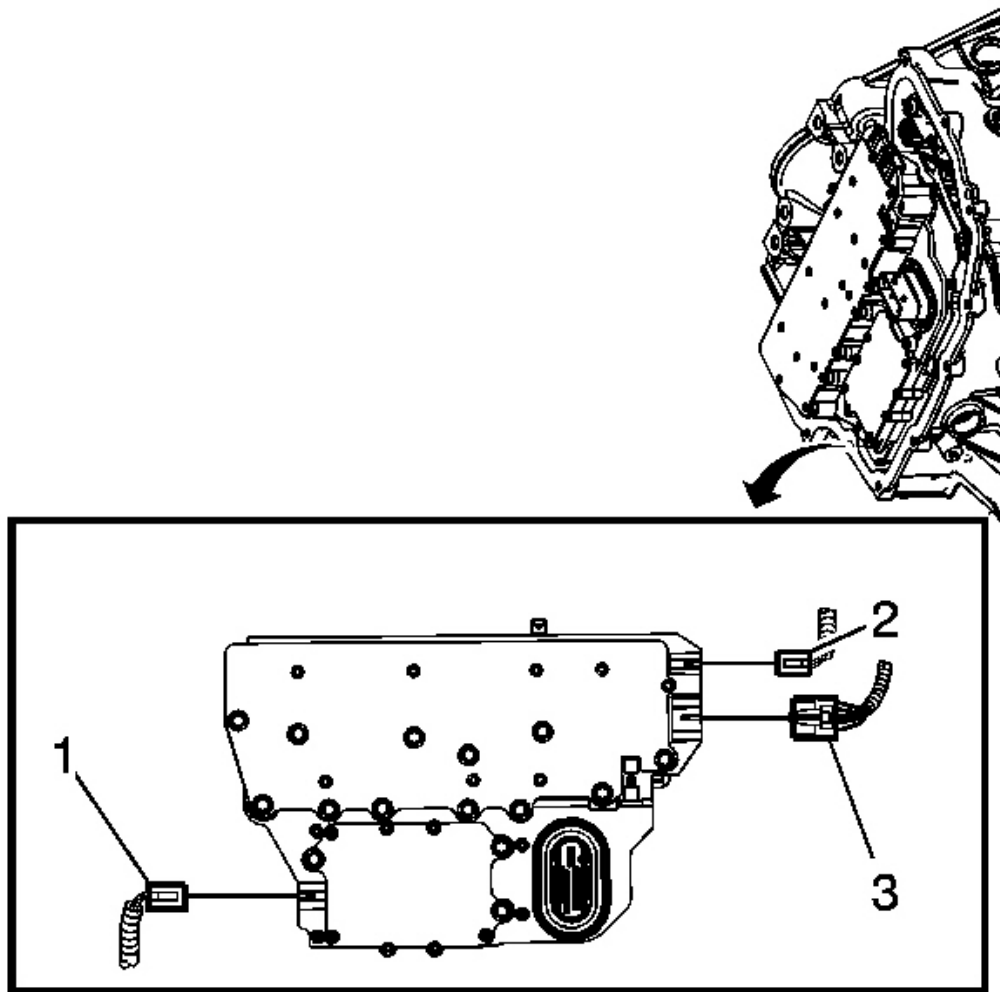


Fig. 50: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

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**.

CONTROL VALVE BODY COVER REPLACEMENT

Removal Procedure

1. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection .
2. Disconnect the radiator outlet hose from the radiator. Refer to Radiator Outlet Hose Replacement (LAF) or Radiator Outlet Hose Replacement (LF1) .

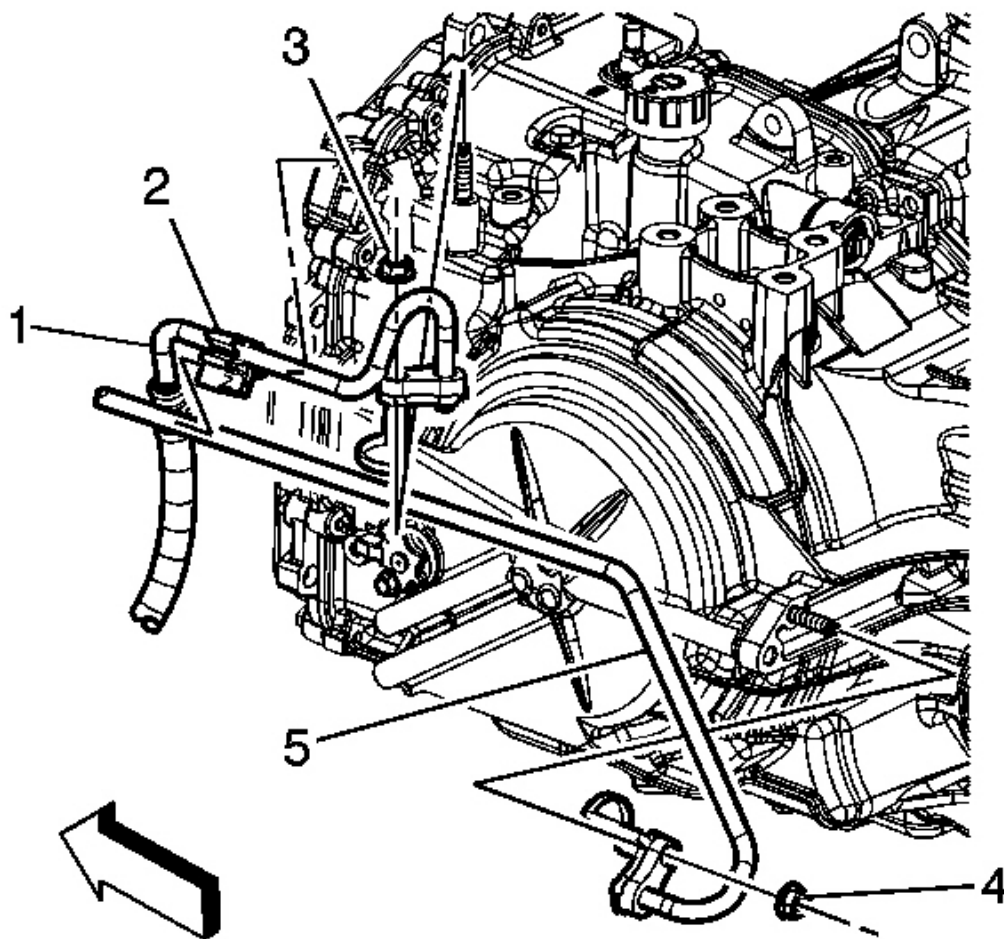


Fig. 51: Identifying Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil cooler inlet (1) and outlet (2) hoses from the retainer (2) on the control valve body cover.
4. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

5. Remove the front transmission mount. Refer to **Transmission Front Mount Replacement**.
6. Drain the transmission. Refer to **Transmission Fluid Replacement**.

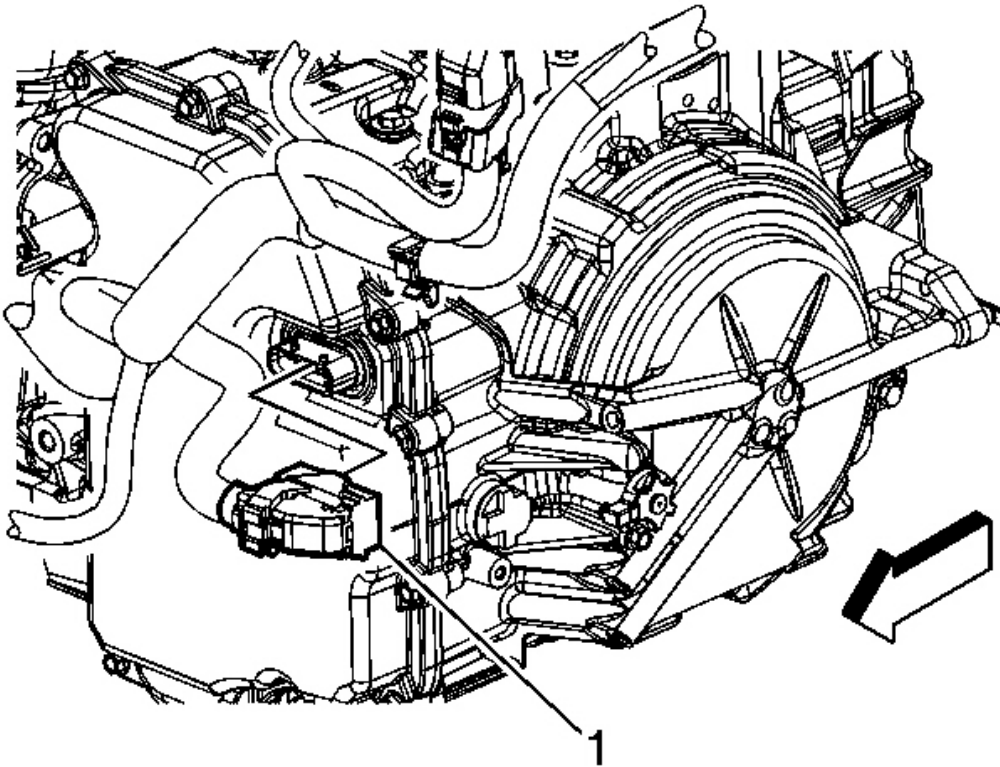


Fig. 52: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

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

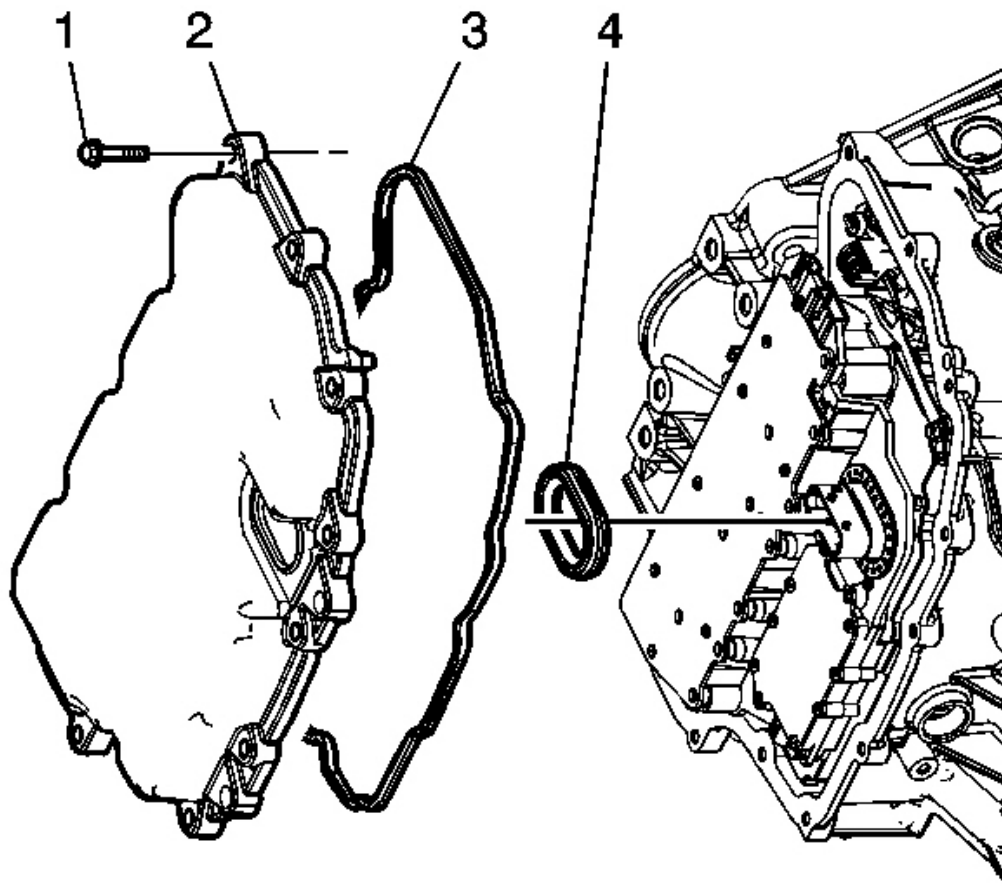


Fig. 53: View Of Control Valve Body
Courtesy of GENERAL MOTORS CORP.

8. Remove the control valve body cover bolts (1).
9. Support the transmission with a transmission jack.
10. Using the transmission jack raise the transmission to gain clearance for removal of the control valve body cover.
11. Remove the control valve body cover.
12. 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.

13. Remove the control valve body cover wiring connector hole seal.
14. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

Installation Procedure

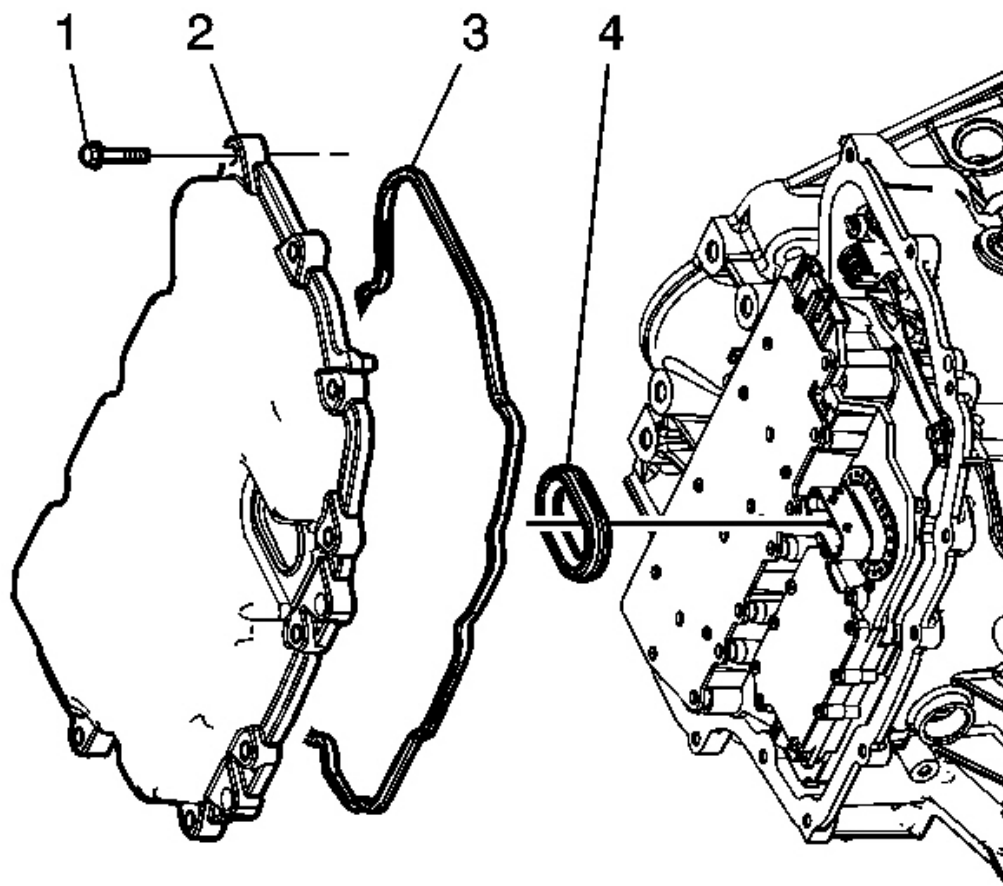


Fig. 54: View Of Control Valve Body
Courtesy of GENERAL MOTORS CORP.

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).

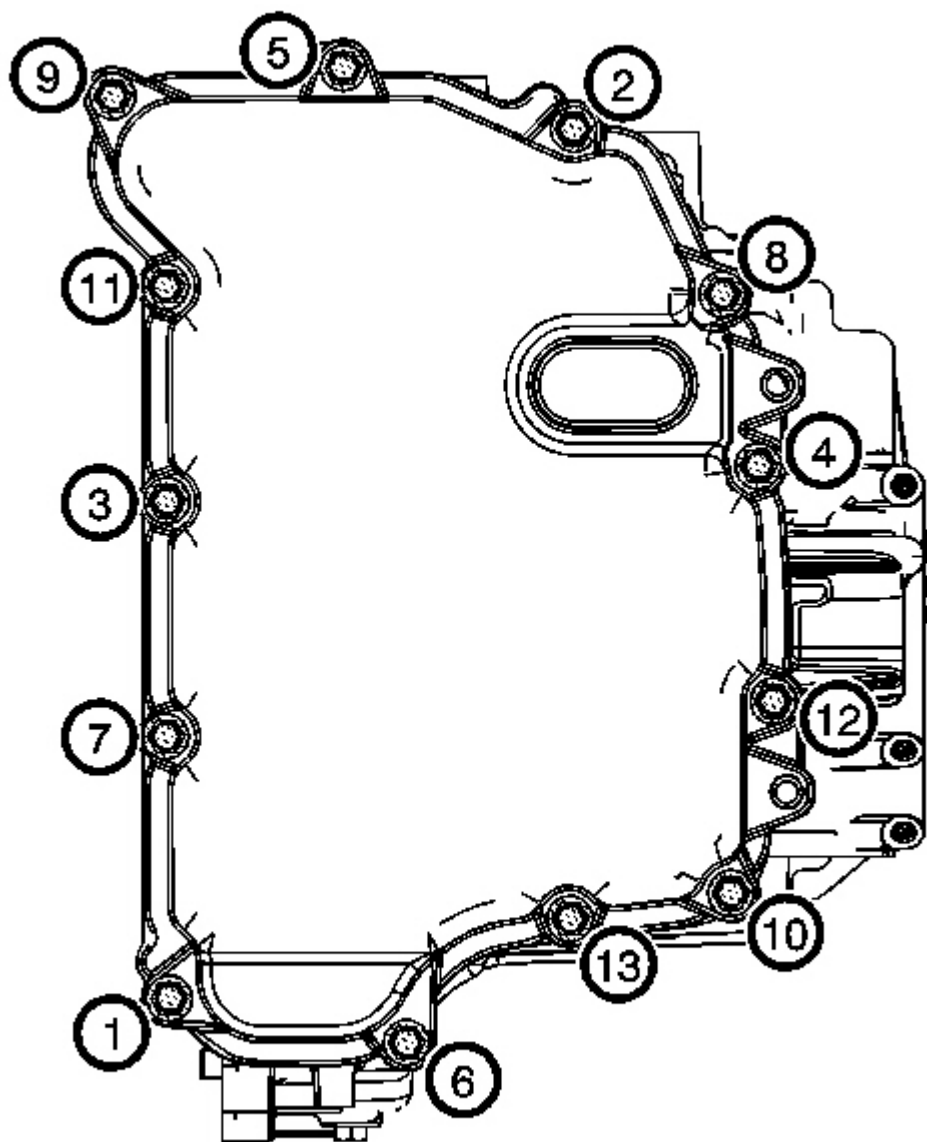


Fig. 55: Identifying Valve Body Cover Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

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).

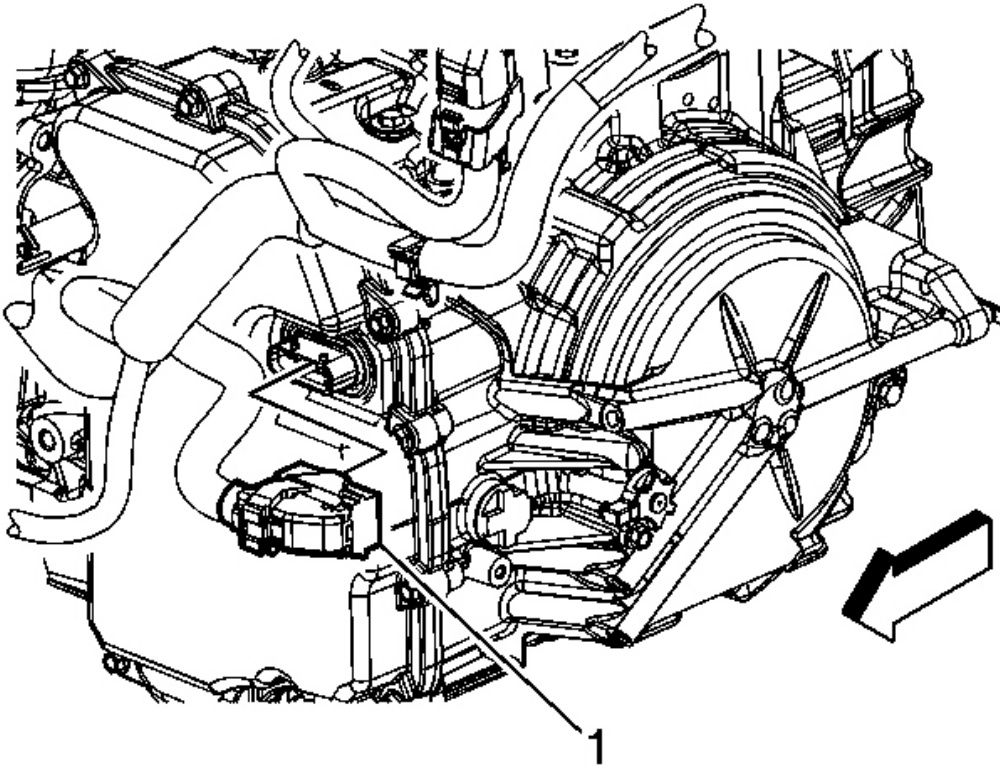


Fig. 56: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

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.

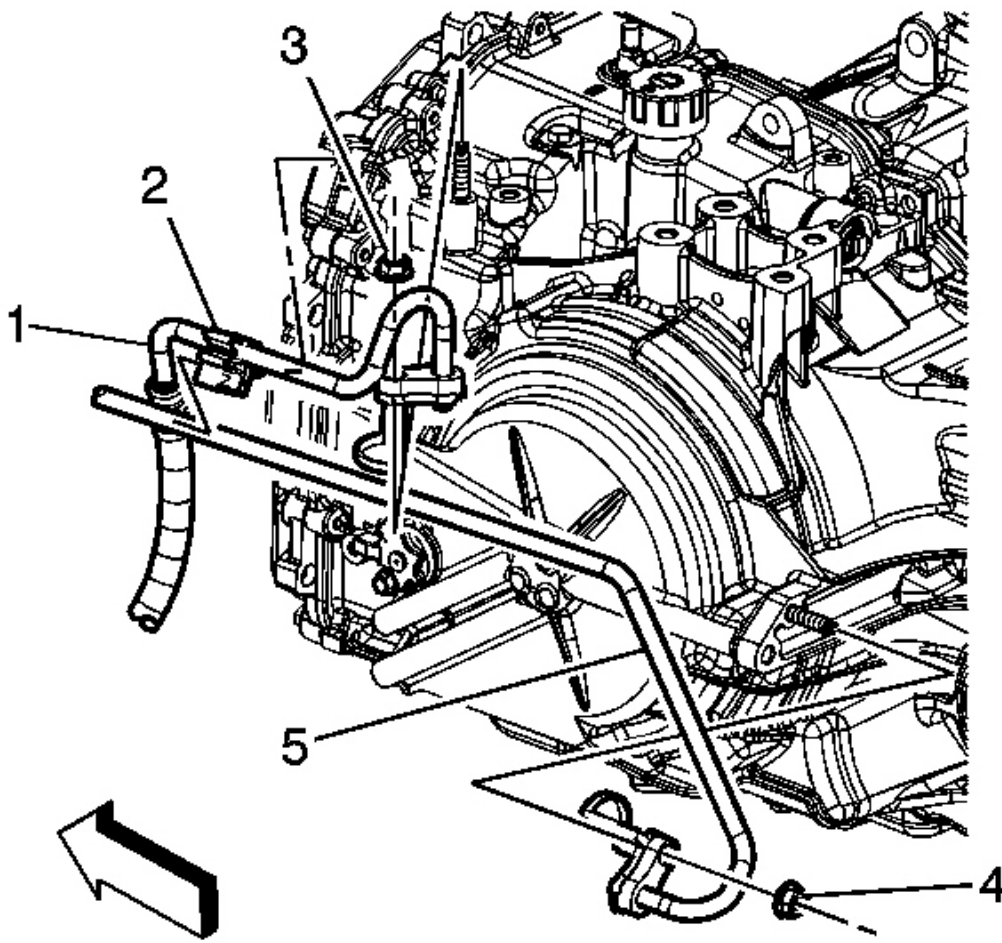


Fig. 57: Identifying Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

10. Install the oil cooler inlet (1) and outlet (5) hoses to the retainer (2) on the control valve body cover.
11. Connect the radiator outlet hose to the radiator. Refer to **Radiator Outlet Hose Replacement (LAF)** or **Radiator Outlet Hose Replacement (LF1)**.
12. Connect the negative battery cable. Refer to **Battery Negative Cable Disconnection and Connection**.
13. Fill the transmission. Refer to **Transmission Fluid Replacement**.
14. Check for leaks.

CONTROL VALVE BODY REPLACEMENT

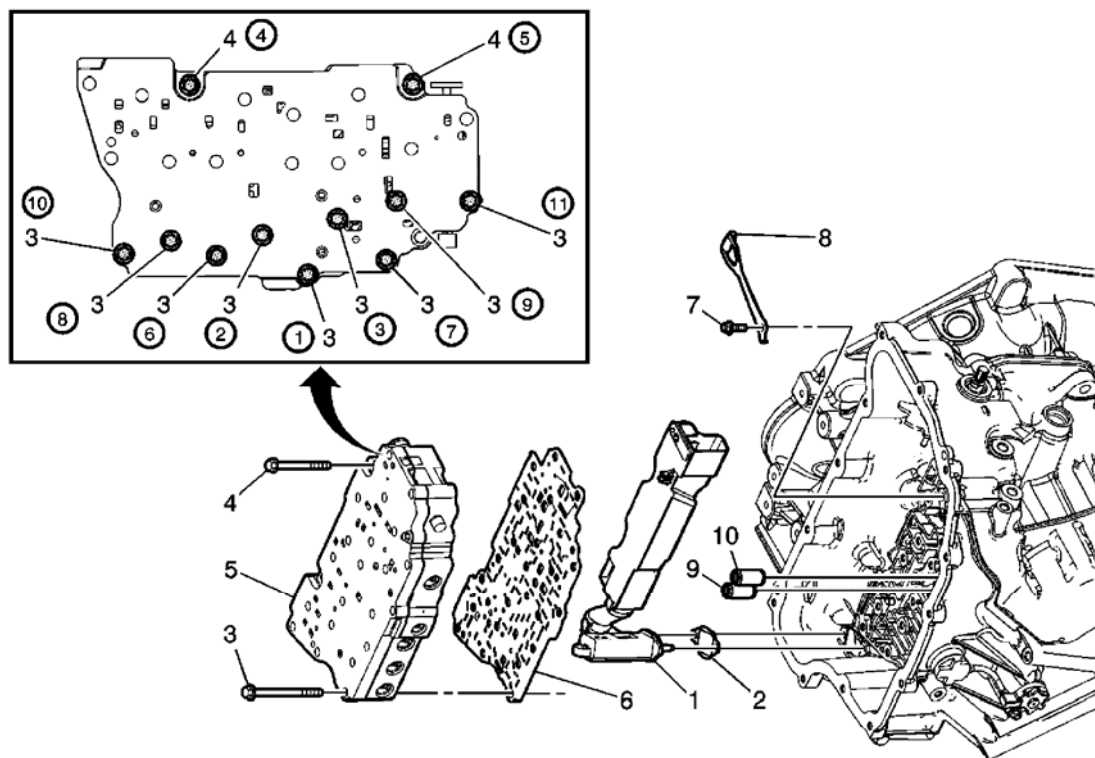


Fig. 58: Control Valve Body

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Remove the control solenoid valve and transmission control module assembly. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Replacement</u> .	
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket
3	Control Valve Body Bolt M6 x 60 (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Tip: Tighten in specified sequence. Tighten: 12 N.m (106 lb in)
4	Control Valve Body Bolt M6 x 53 (Qty: 2) Tip: Tighten in specified sequence. Tighten: 12 N.m (106 lb in)
5	Control Valve Body Assembly

6	Control Valve Body Spacer Plate Assembly
7	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) Tip: 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 Tip: Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal Tip: Discard the seal. It is not reusable.

OUTPUT SPEED SENSOR REPLACEMENT

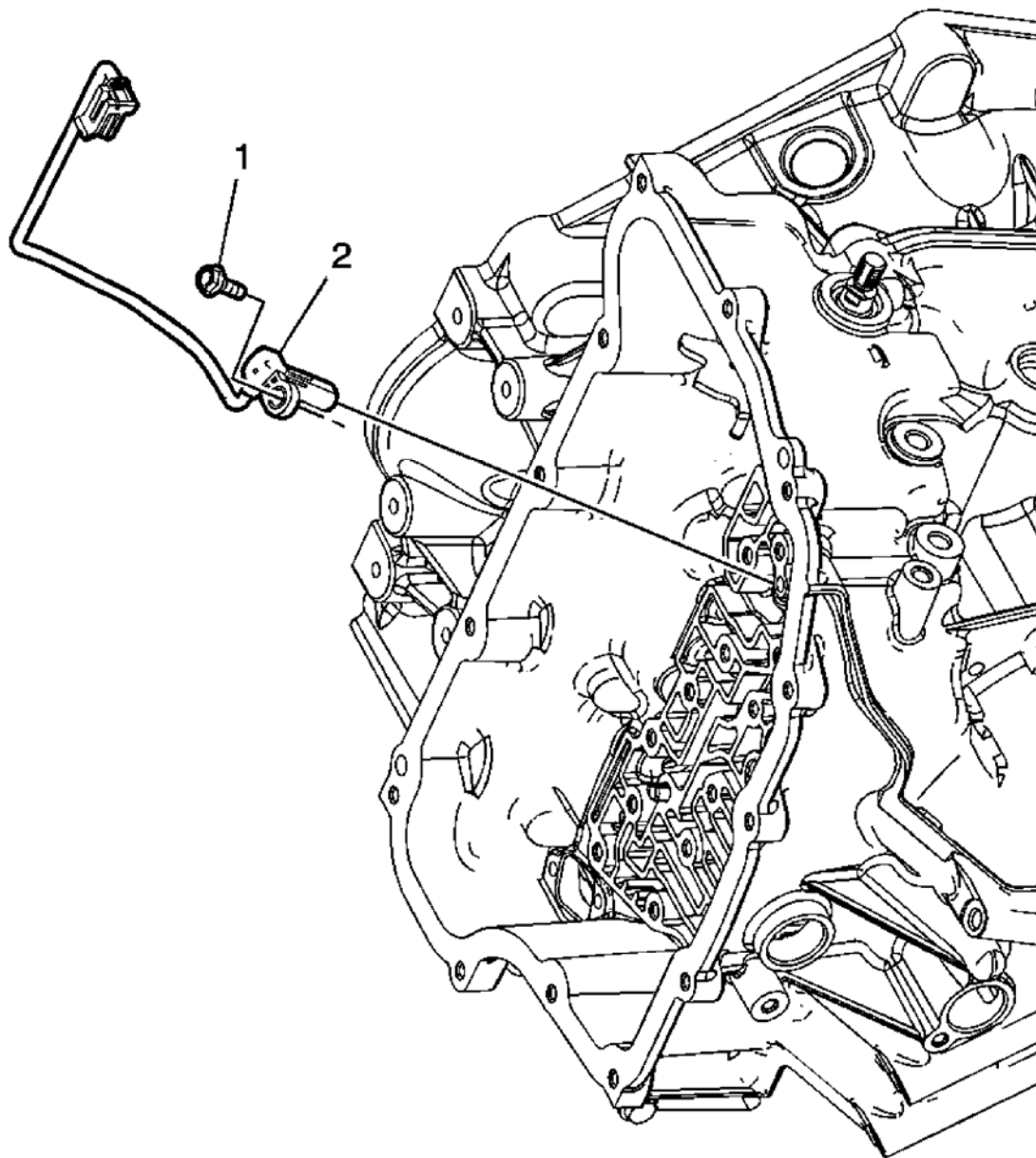


Fig. 59: Output Speed Sensor
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures 1. Remove the control solenoid valve and transmission control module assembly. Refer to <u>Control Valve Body Replacement</u>. 2. Perform the transmission adaptive values learn procedure. Refer to <u>Transmission Adaptive Values Learn</u>.	
	Output Speed Sensor Bolt M6 x 18

1	CAUTION: Refer to <u>Fastener Caution</u> . Tip: Tighten in specified sequence. Tighten: 12 N.m (106 lb in)
2	Output Speed Sensor

INPUT SPEED SENSOR REPLACEMENT

Removal Procedure

- 1. Remove the transmission control valve body cover. Refer to **Control Valve Body Cover Replacement**.

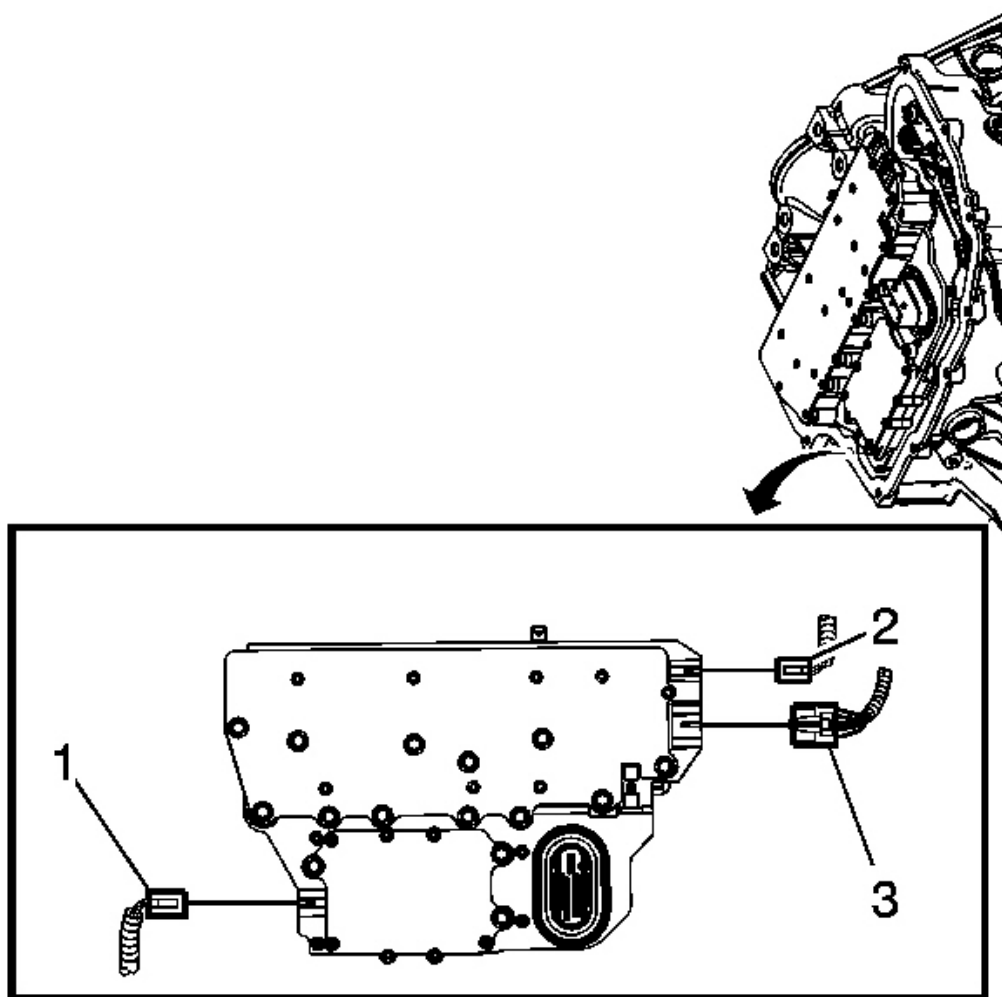


Fig. 60: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

2. Disconnect the input speed sensor electrical connector (1).

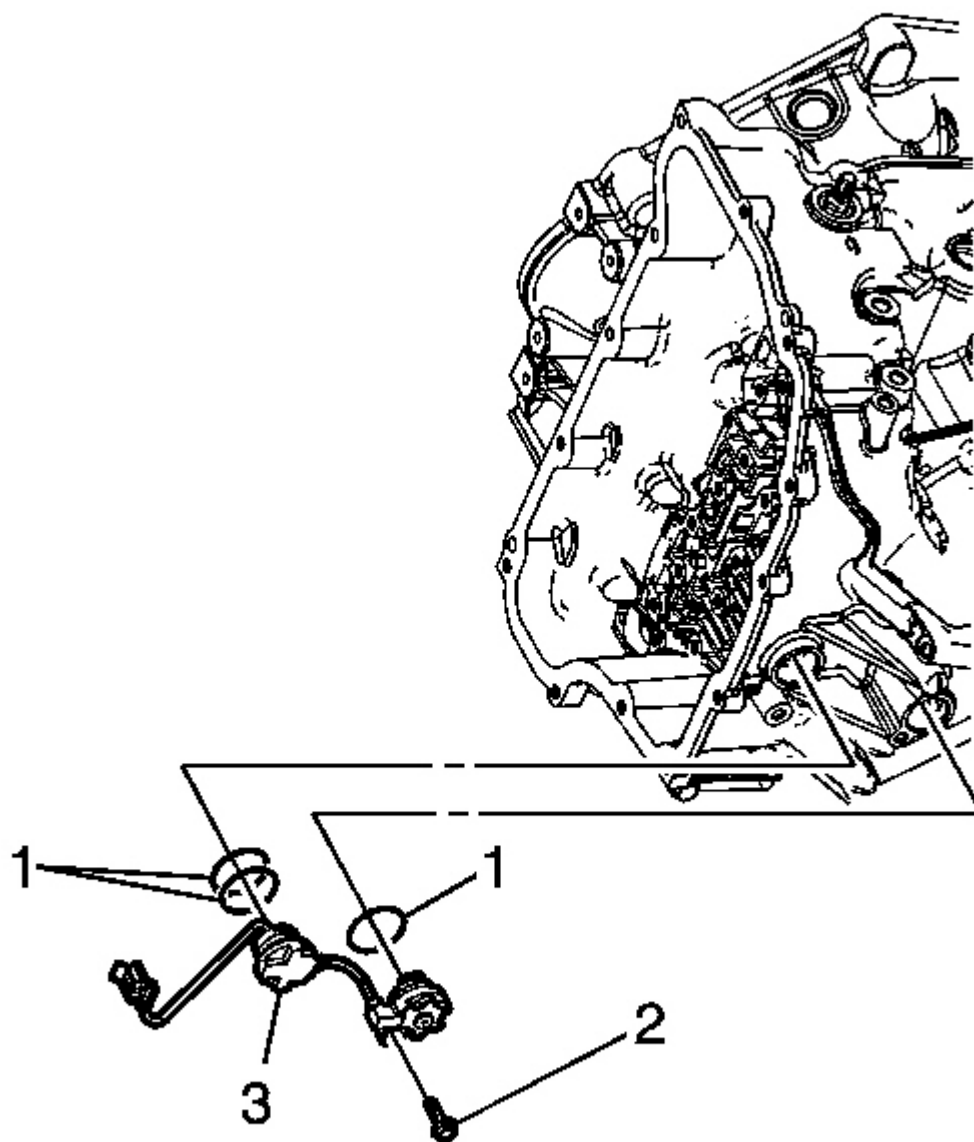


Fig. 61: Identifying Input Speed Sensor Components
Courtesy of GENERAL MOTORS CORP.

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).

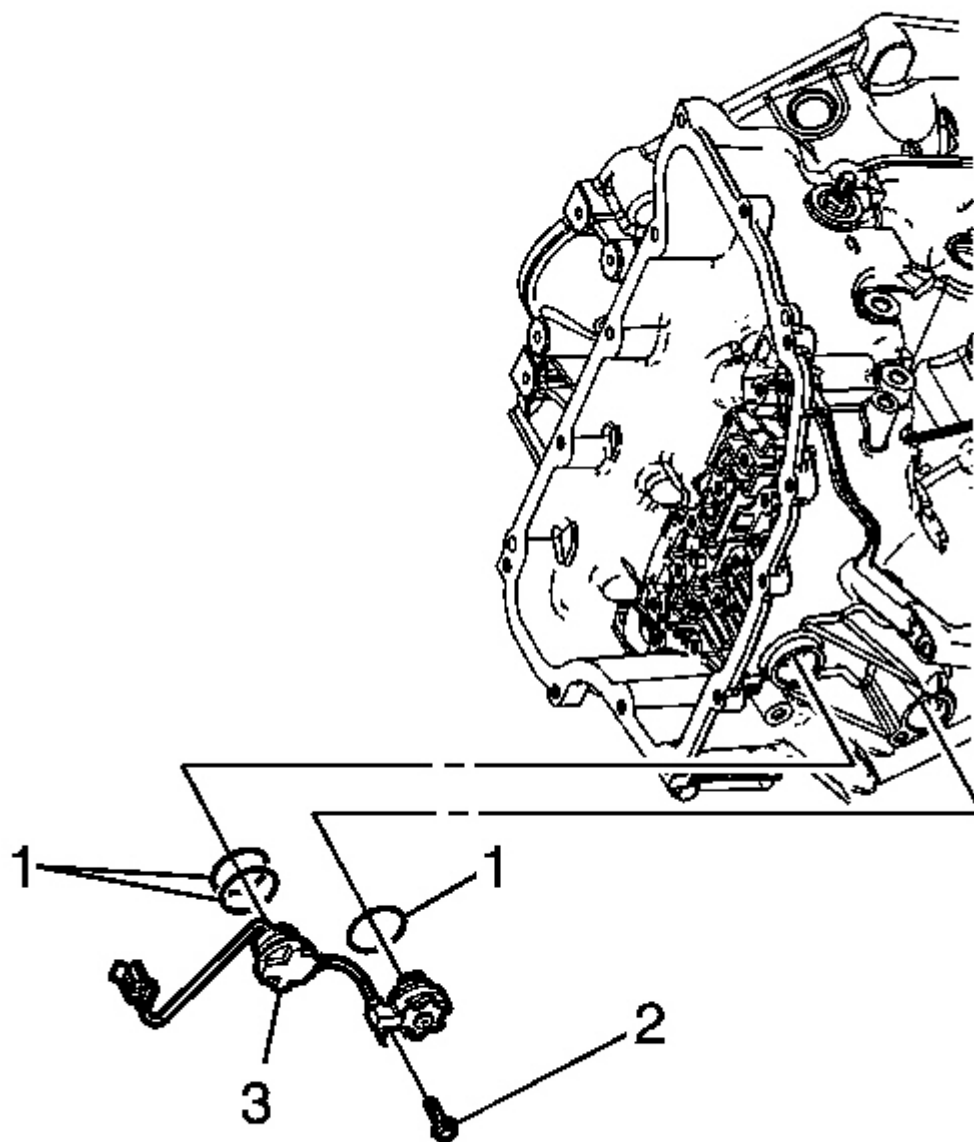


Fig. 62: Identifying Input Speed Sensor Components
Courtesy of GENERAL MOTORS CORP.

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).

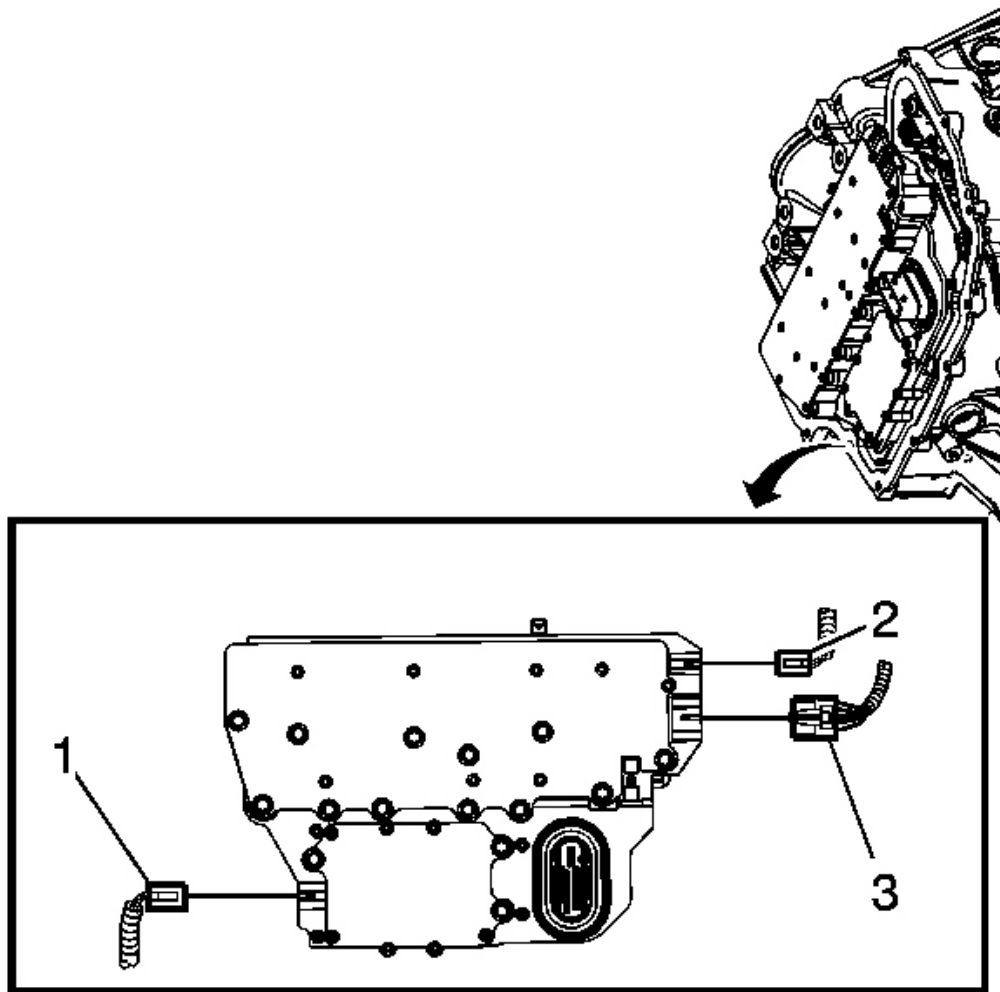


Fig. 63: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

4. Connect the input speed sensor electrical connector (1).
5. Install the transmission control valve body cover. Refer to Control Valve Body Cover Replacement.
6. Perform the transmission adaptive values learn procedure. Refer to Transmission Adaptive Values

Learn .

TRANSMISSION MOUNT REPLACEMENT - LEFT SIDE

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement** .
2. Remove the underhood electrical center.
3. Support the engine and transmission.
4. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

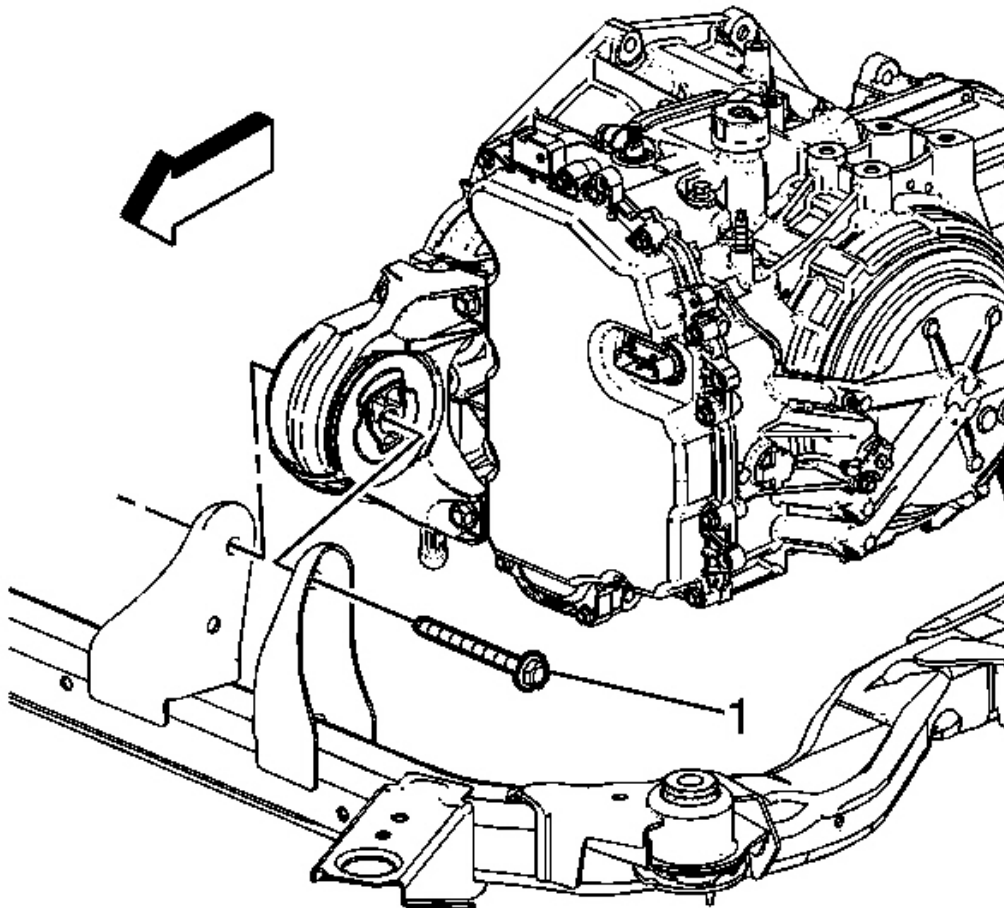


Fig. 64: Front Transmission Mount To Frame Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the front transmission mount to frame bolt (1).

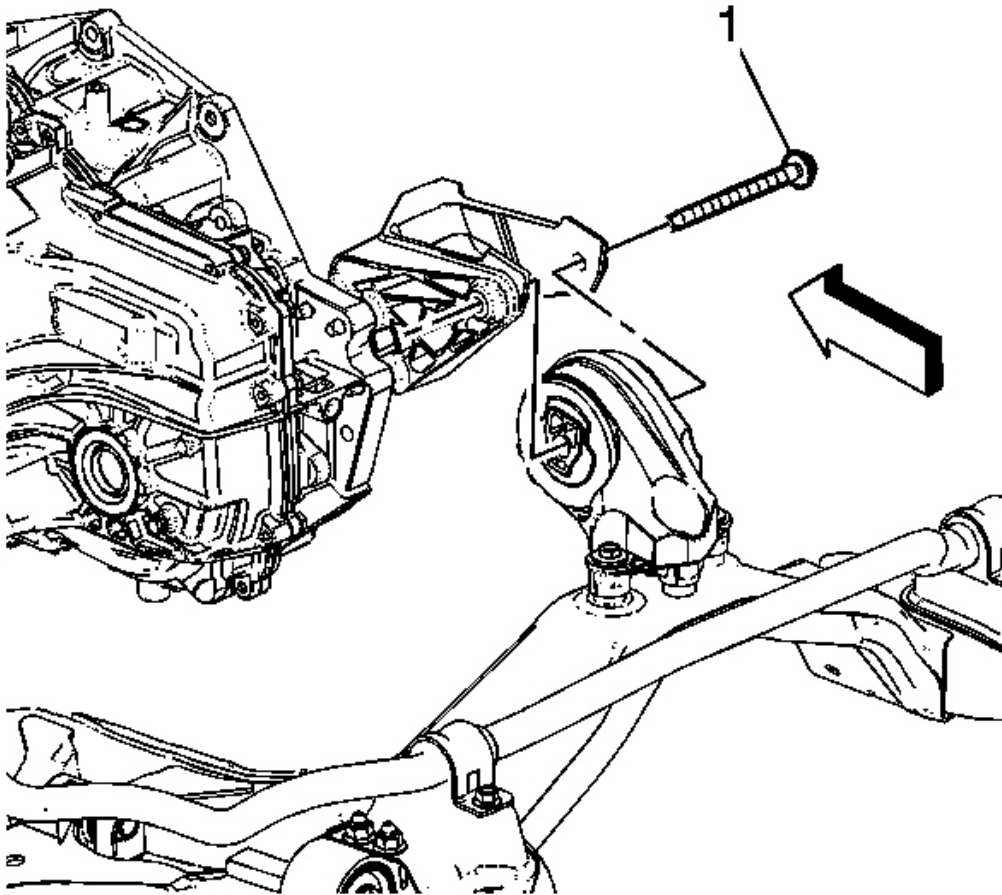


Fig. 65: Rear Transmission Mount To Rear Transmission Mount Bracket Bolt
Courtesy of GENERAL MOTORS CORP.

6. Remove the rear transmission mount to rear transmission mount bracket bolt (1).
7. Lower the vehicle.

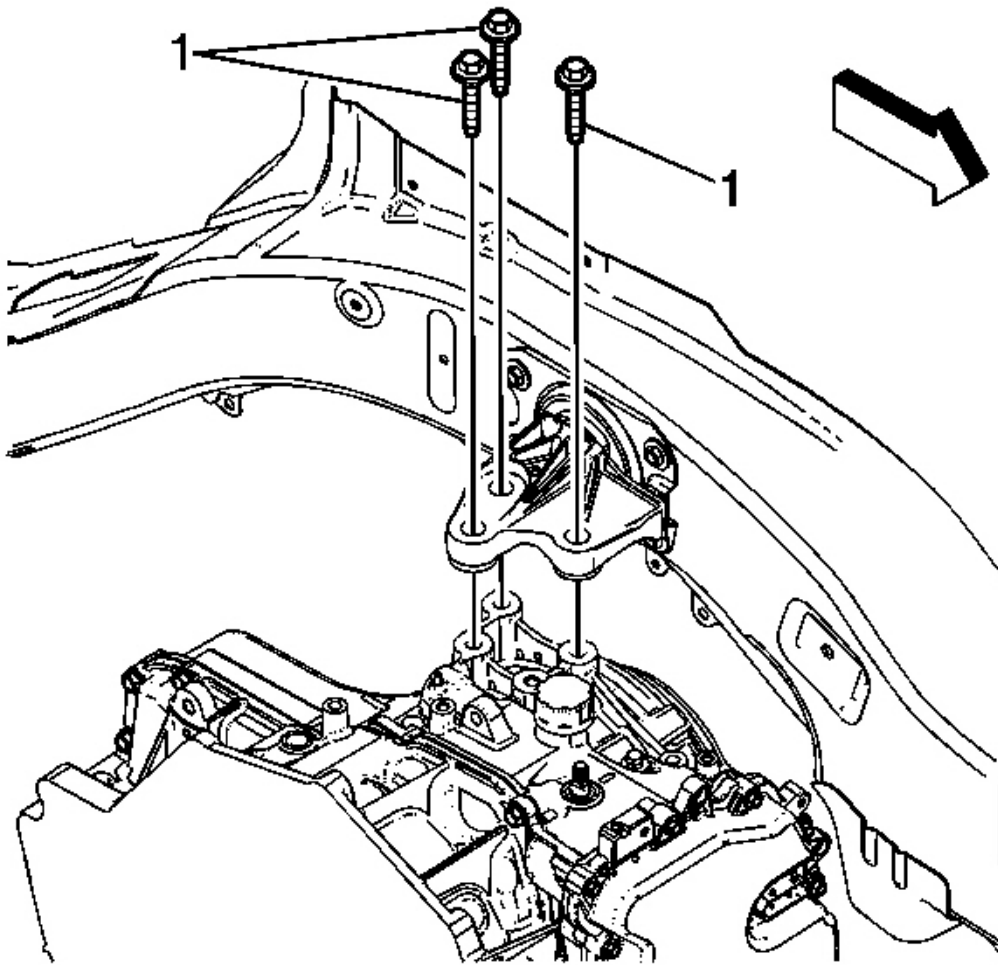


Fig. 66: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the left transmission mount to transmission bolts (1).

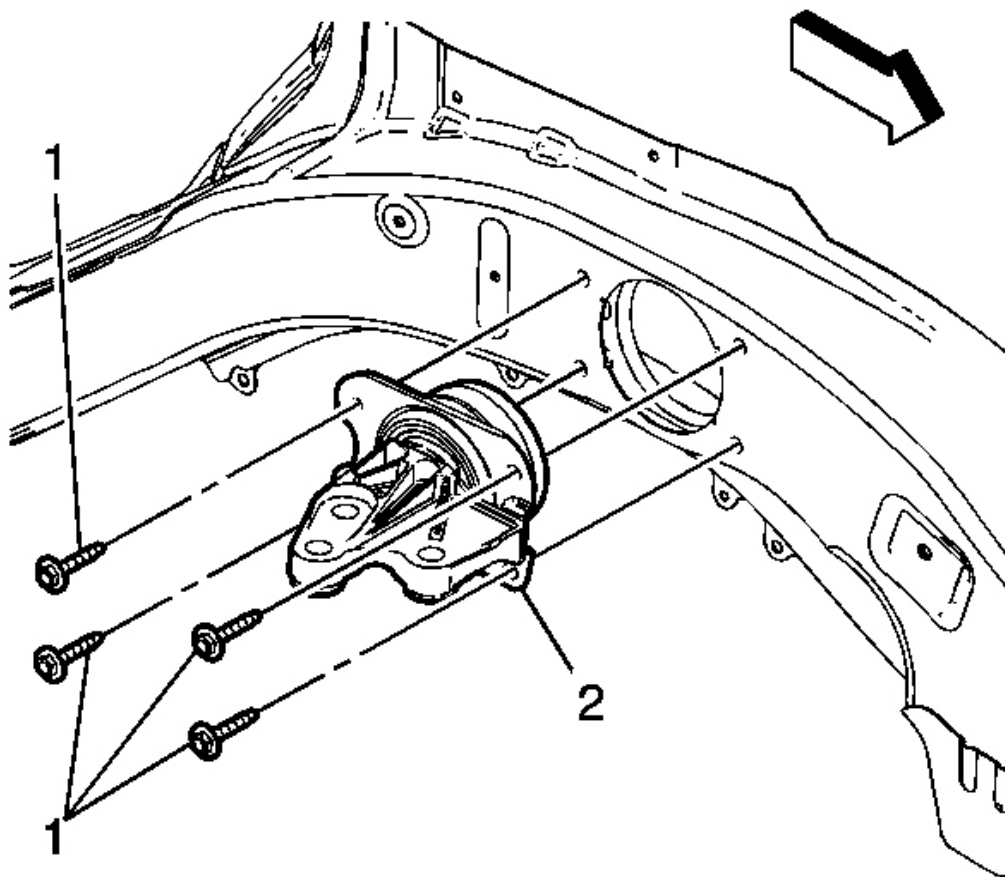


Fig. 67: Left Transmission Mount To Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the left transmission mount to frame rail bolts (1).
10. Lower the transmission enough to provide clearance for the left transmission mount.
11. Remove the left transmission mount (2).

Installation Procedure

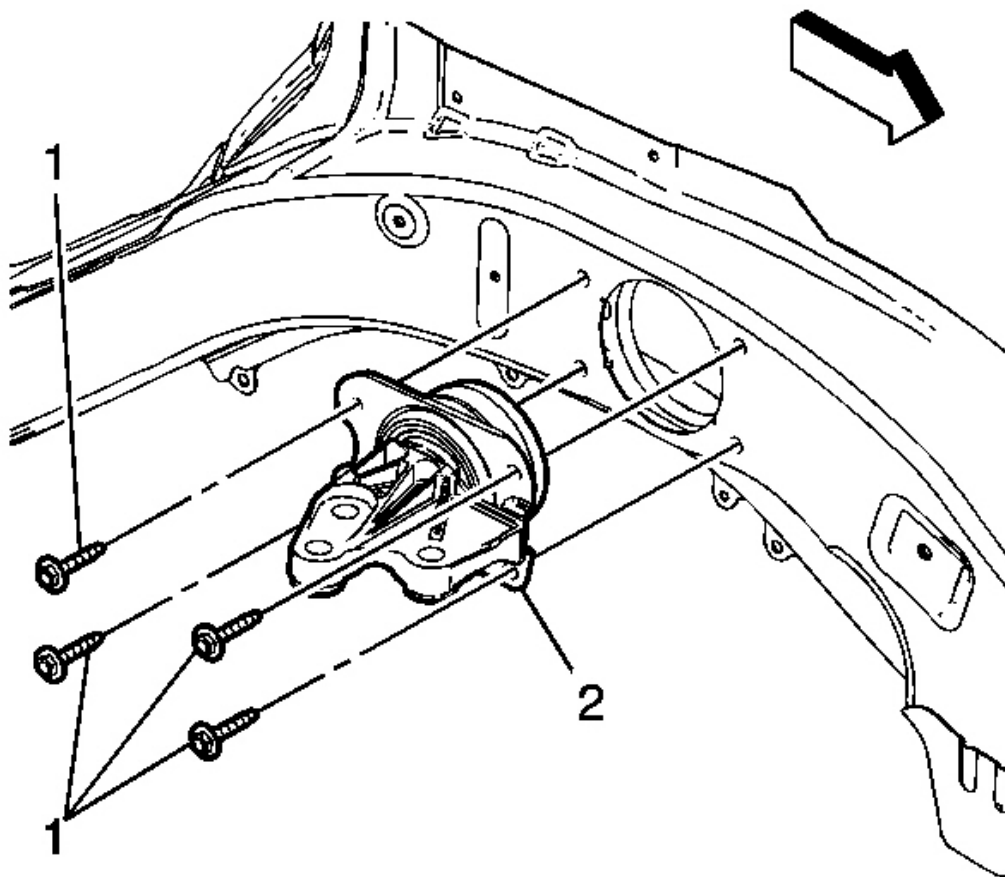


Fig. 68: Left Transmission Mount To Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

1. Install the left transmission mount (2).

CAUTION: Refer to Fastener Caution .

2. Install the left transmission mount to frame rail bolts (1) and tighten to 27 N.m (20 lb ft).
3. Raise the transmission until the transmission contacts the left transmission mount.

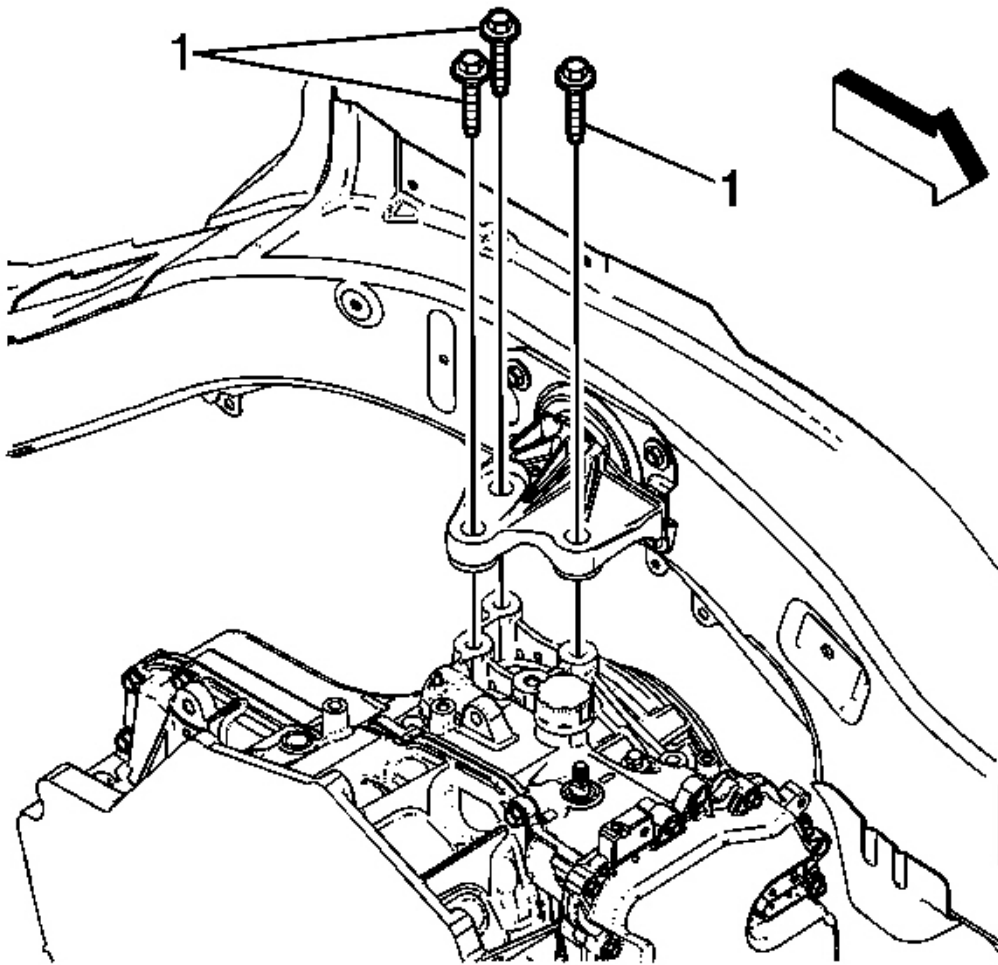


Fig. 69: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the left transmission mount to transmission bolts (1) and tighten to 50 N.m (37 lb ft).
5. Raise the vehicle.

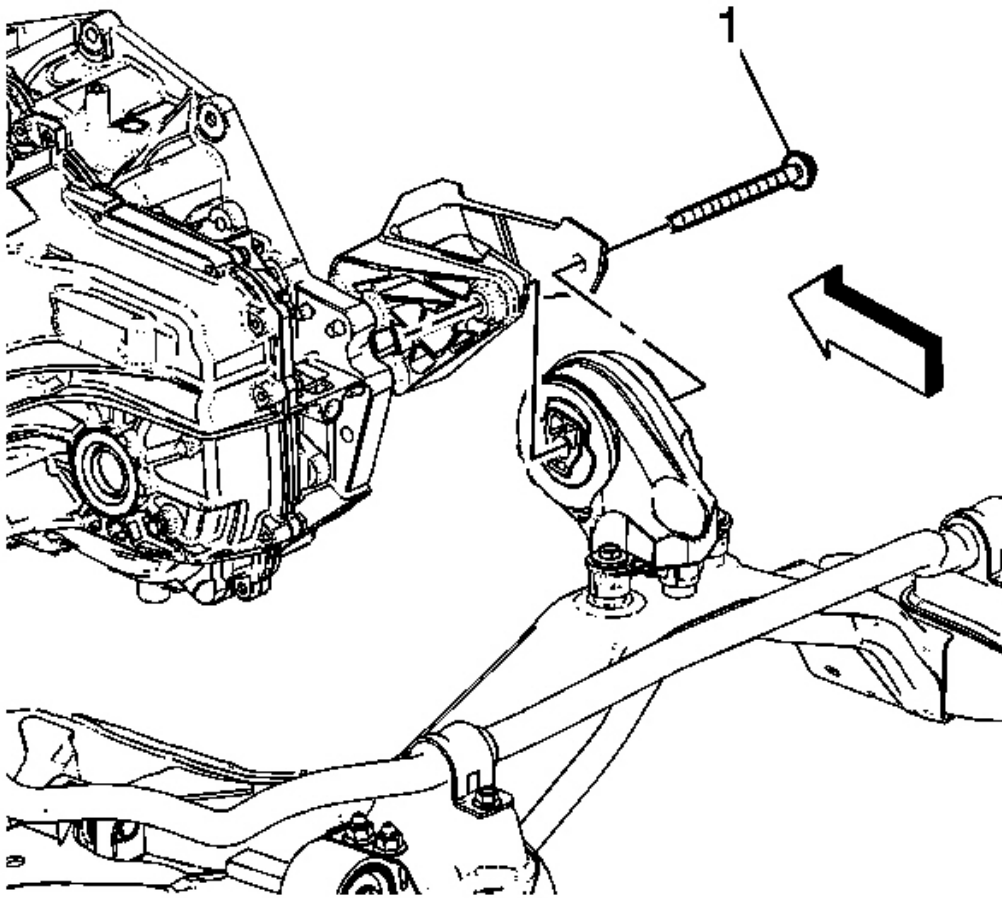


Fig. 70: Rear Transmission Mount To Rear Transmission Mount Bracket Bolt
Courtesy of GENERAL MOTORS CORP.

6. Install the rear transmission mount to rear transmission mount bracket bolt (1) and tighten to 110 N.m (81 lb ft).

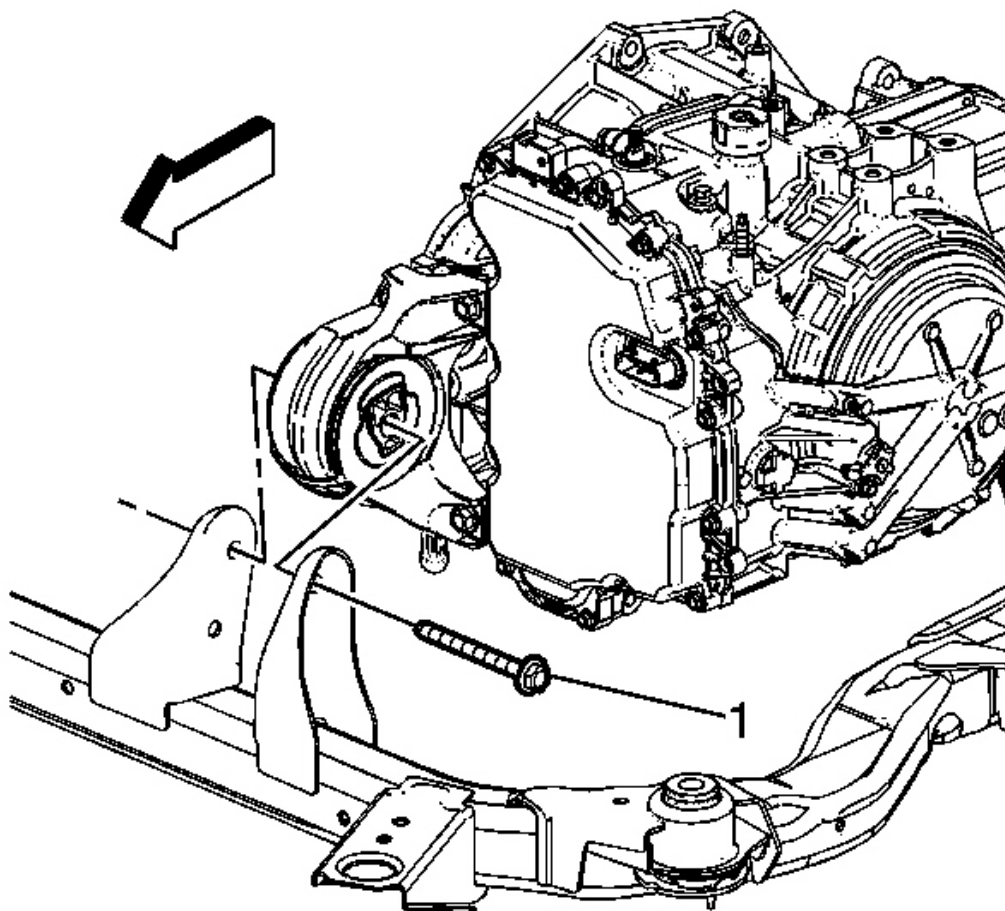


Fig. 71: Front Transmission Mount To Frame Bolt
Courtesy of GENERAL MOTORS CORP.

7. Install the front transmission mount to frame bolt (1) and tighten to 110 N.m (81 lb ft).
8. Lower the vehicle.
9. Remove the engine and transmission support.
10. Install the battery tray. Refer to **Battery Tray Replacement** .
11. Install the underhood electrical center.

TRANSMISSION FRONT MOUNT REPLACEMENT

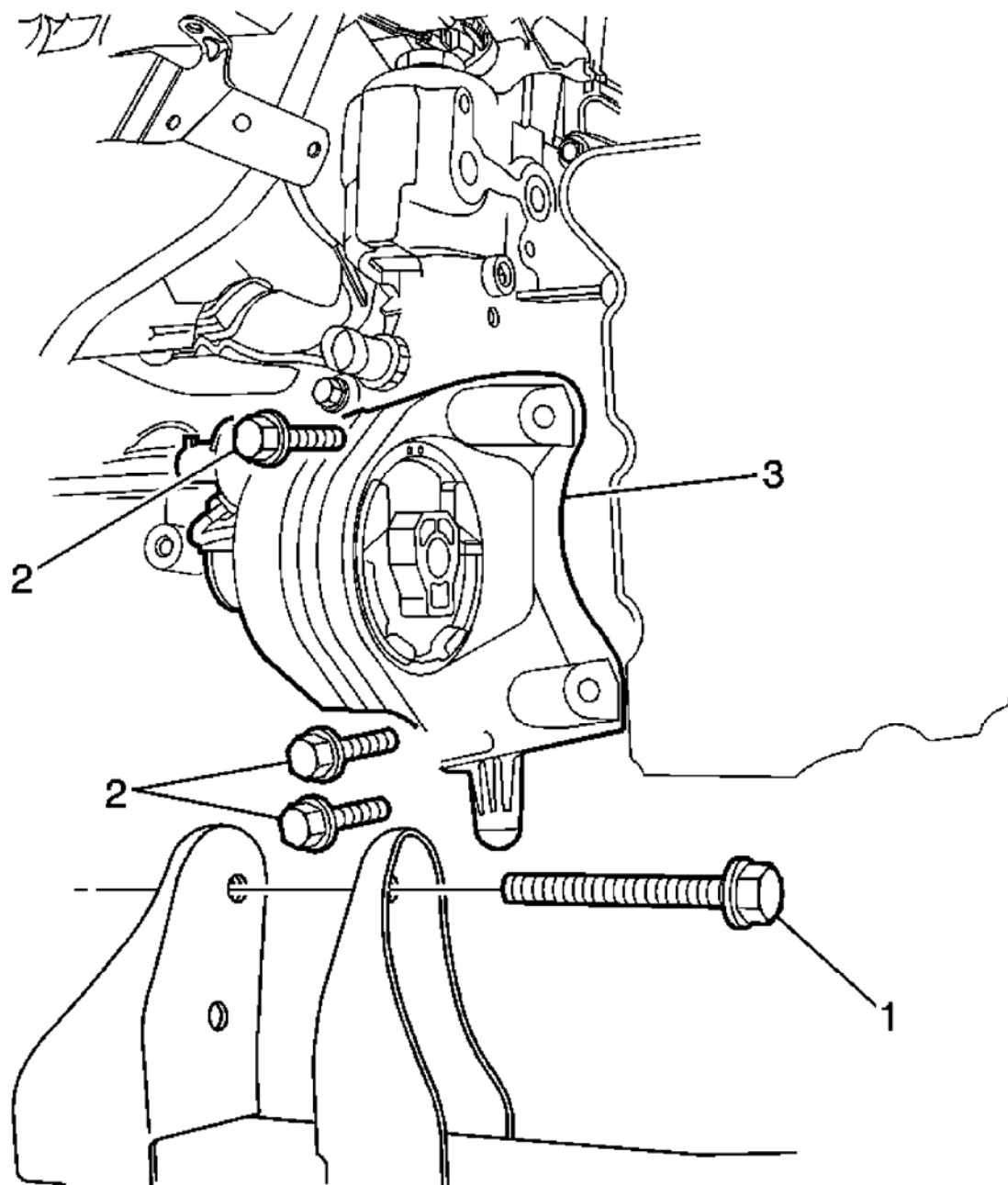


Fig. 72: Transmission Front Mount
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .
2.	Support the transmission with a transmission jack.

	Front Transmission Mount Thru Bolt
1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 110 N.m (81 lb ft)
2	Front Transmission Mount Bolt (Qty: 3) Tighten: 50 N.m (37 lb ft)
3	Front Transmission Mount

TRANSMISSION REAR MOUNT BRACKET REPLACEMENT (AWD)

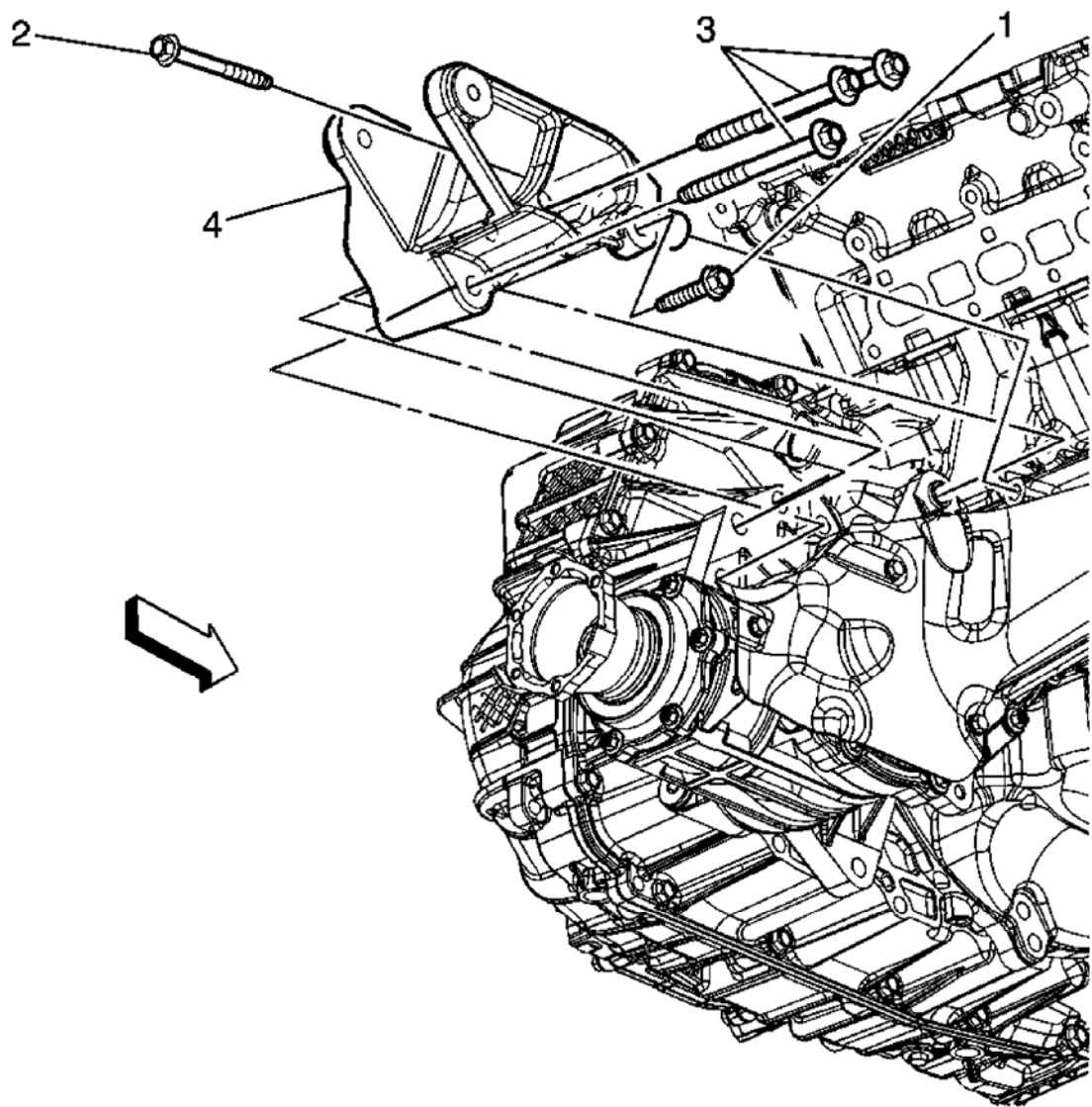


Fig. 73: Transmission Rear Mount Bracket (AWD)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures: Remove the rear transmission mount. Refer to <u>Transmission Rear Mount Replacement</u> .	
1	Rear Transmission Mount Bracket Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 50 N.m (37 lb ft)
2	Rear Transmission Mount Bracket Bolt Tighten: 50 N.m (37 lb ft)
3	Rear Transmission Mount Bracket Bolt (Qty: 3) Tighten: 110 N.m (81 lb ft)
4	Rear Transmission Mount Bracket

TRANSMISSION REAR MOUNT BRACKET REPLACEMENT (FWD)

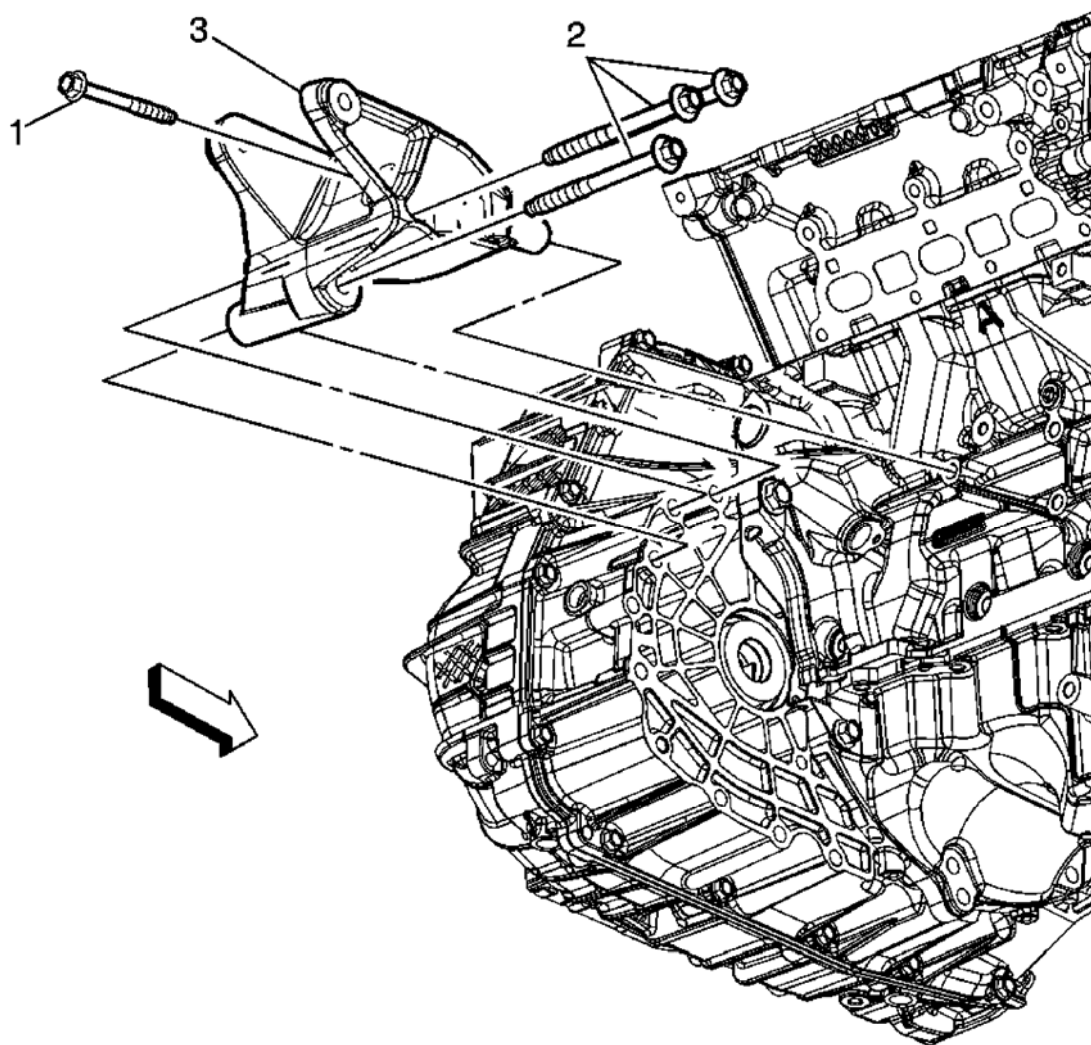
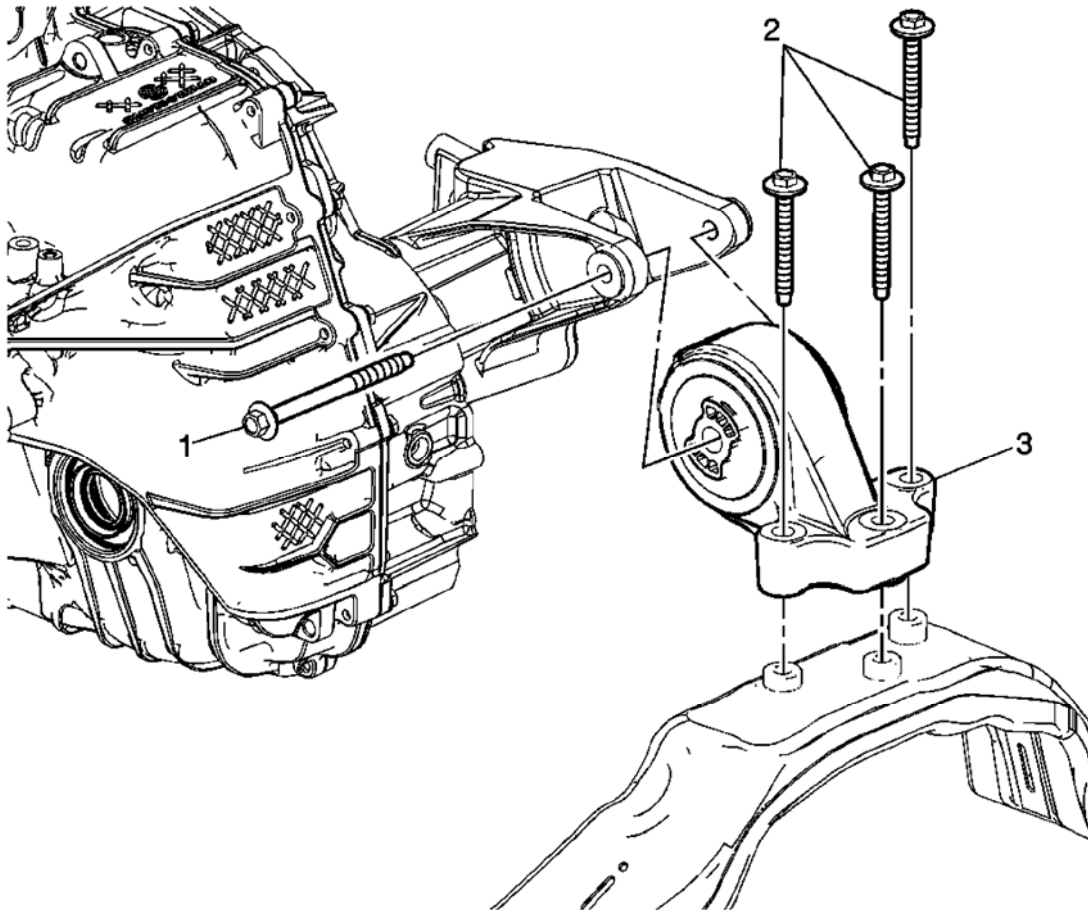


Fig. 74: Transmission Rear Mount Bracket (FWD)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures: Remove the rear transmission mount. Refer to <u>Transmission Rear Mount Replacement</u> .	
1	Rear Transmission Mount Bracket Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 50 N.m (37 lb ft)
2	Rear Transmission Mount Bracket Bolt (Qty: 3) Tighten: 110 N.m (81 lb ft)

TRANSMISSION REAR MOUNT REPLACEMENT (FWD)**Fig. 75: Transmission Rear Mount (FWD)**

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the right front tire and wheel. Refer to <u>Tire and Wheel Removal and Installation</u> . 2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 3. Support the transmission with a transmission jack.	
1	Rear Transmission Mount Thru Bolt CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 110 N.m (81 lb ft)
2	Rear Transmission Mount Bolt (Qty: 3) Tighten: 50 N.m (37 lb ft)
3	Rear Transmission Mount

TRANSMISSION REAR MOUNT REPLACEMENT (AWD)

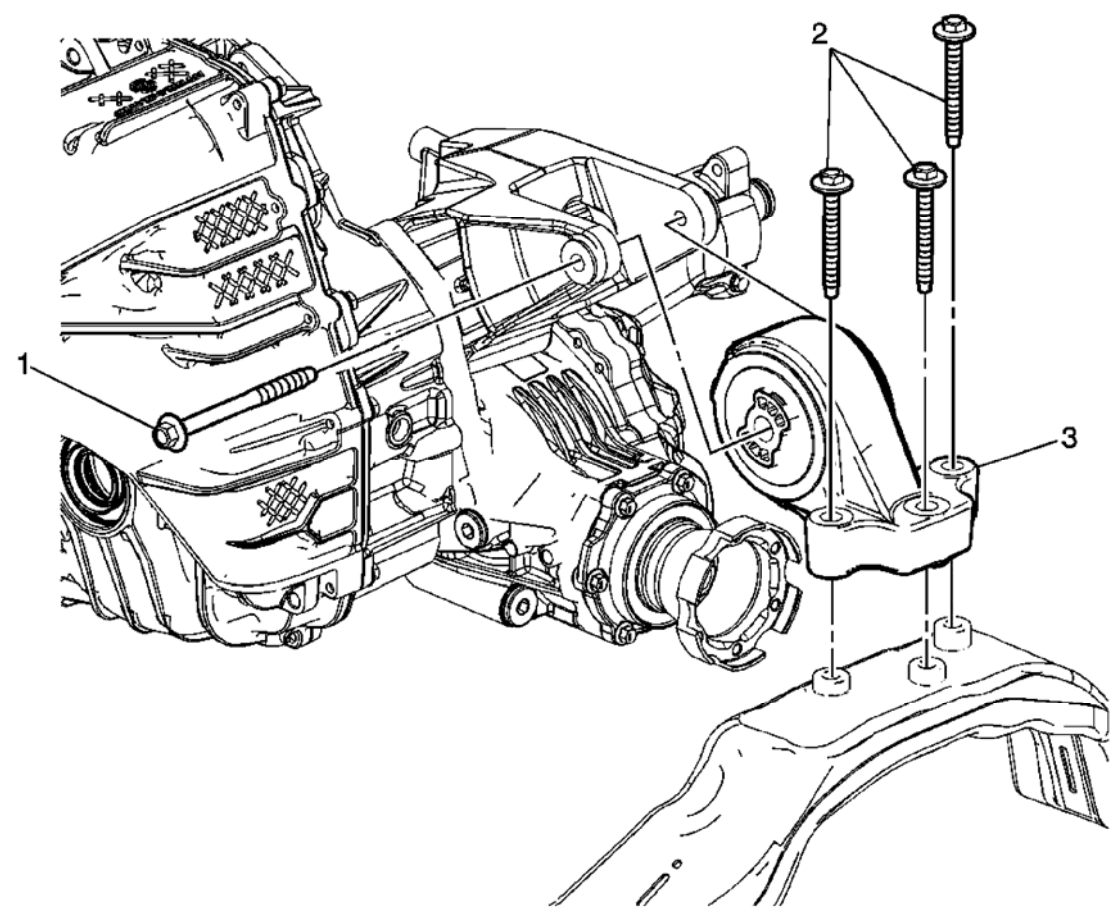


Fig. 76: Transmission Rear Mount (AWD)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the right front tire and wheel. Refer to <u>Tire and Wheel Removal and Installation</u> .	
2. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
3. Support the transmission with a transmission jack.	
	Rear Transmission Mount Thru Bolt

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 110 N.m (81 lb ft)
2	Rear Transmission Mount Bolt Tighten: 50 N.m (37 lb ft)
3	Rear Transmission Mount

TRANSMISSION REPLACEMENT

Removal Procedure

- 1. Remove the battery tray. Refer to **Battery Tray Replacement** .
- 2. Remove the transmission range select lever cable and bracket. Refer to **Range Selector Lever Cable Bracket Replacement**.

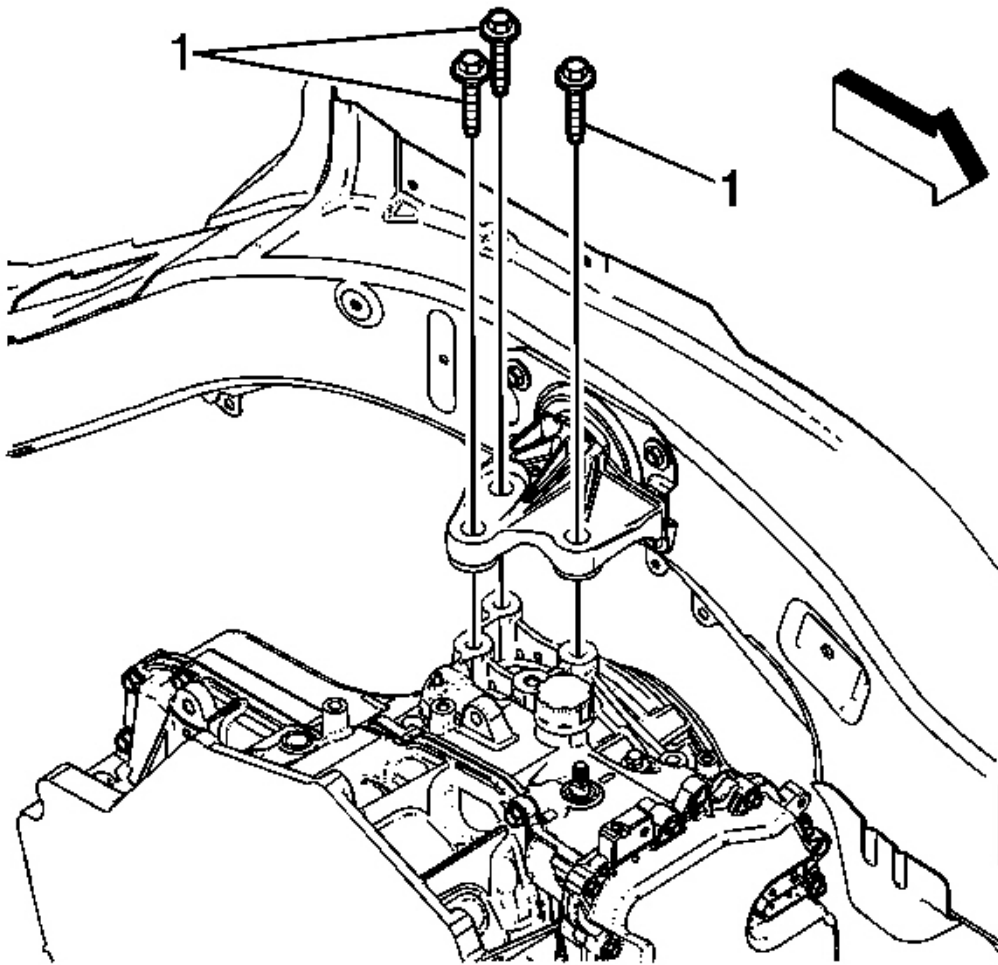


Fig. 77: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the left transmission mount bolts (1) from the transmission.
4. Drain the transmission fluid. Refer to **Transmission Fluid Replacement**.

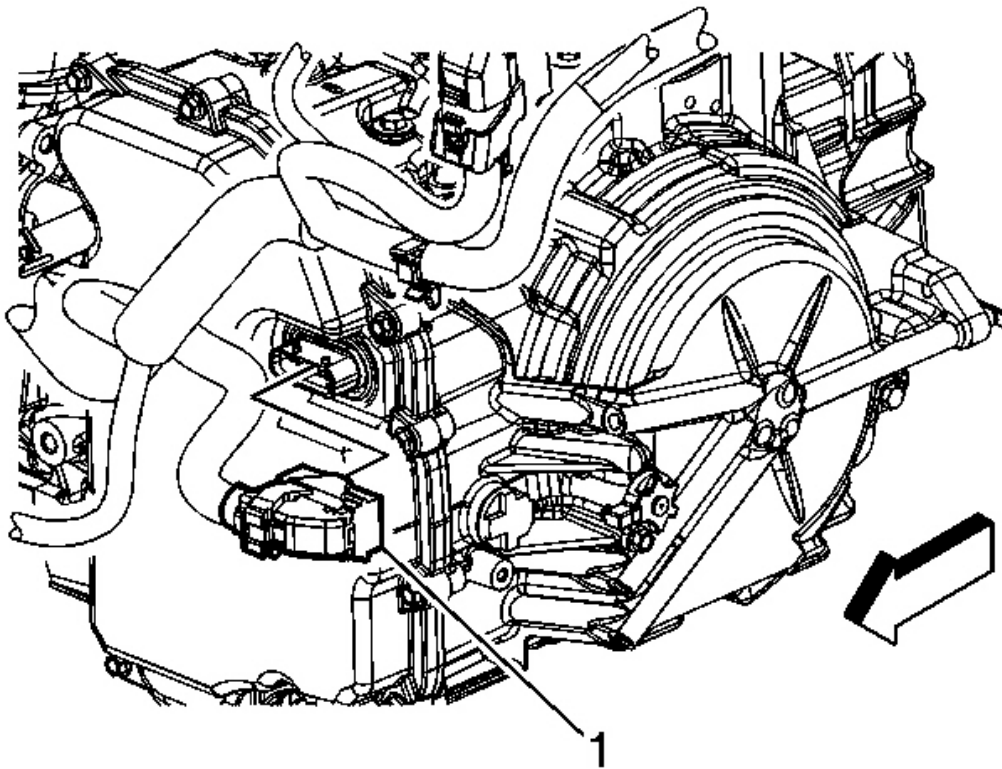


Fig. 78: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

5. Disconnect the control valve body transmission control module (TCM) electrical connector (1).

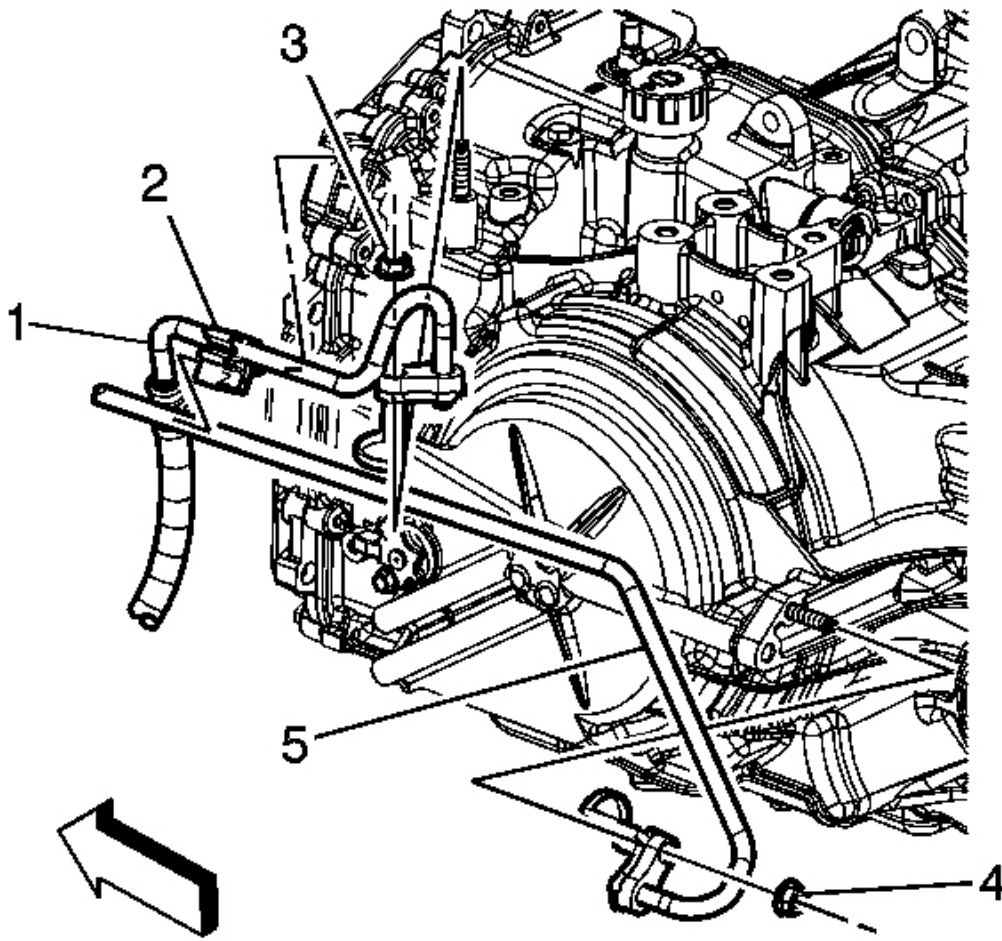


Fig. 79: Identifying Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

6. Remove the oil cooler inlet (1) and outlet (5) hoses from the retainer (2) on the control valve body cover.
7. Remove the transmission fluid cooler inlet hose nut (3) from the transmission.
8. Remove the transmission fluid cooler inlet hose (1) from the transmission.
9. Remove the transmission fluid cooler outlet hose nut (4) from the transmission.
10. Remove the transmission fluid cooler outlet hose (5) from the transmission.
11. Plug and/or cap the hose and transmission to prevent contamination.

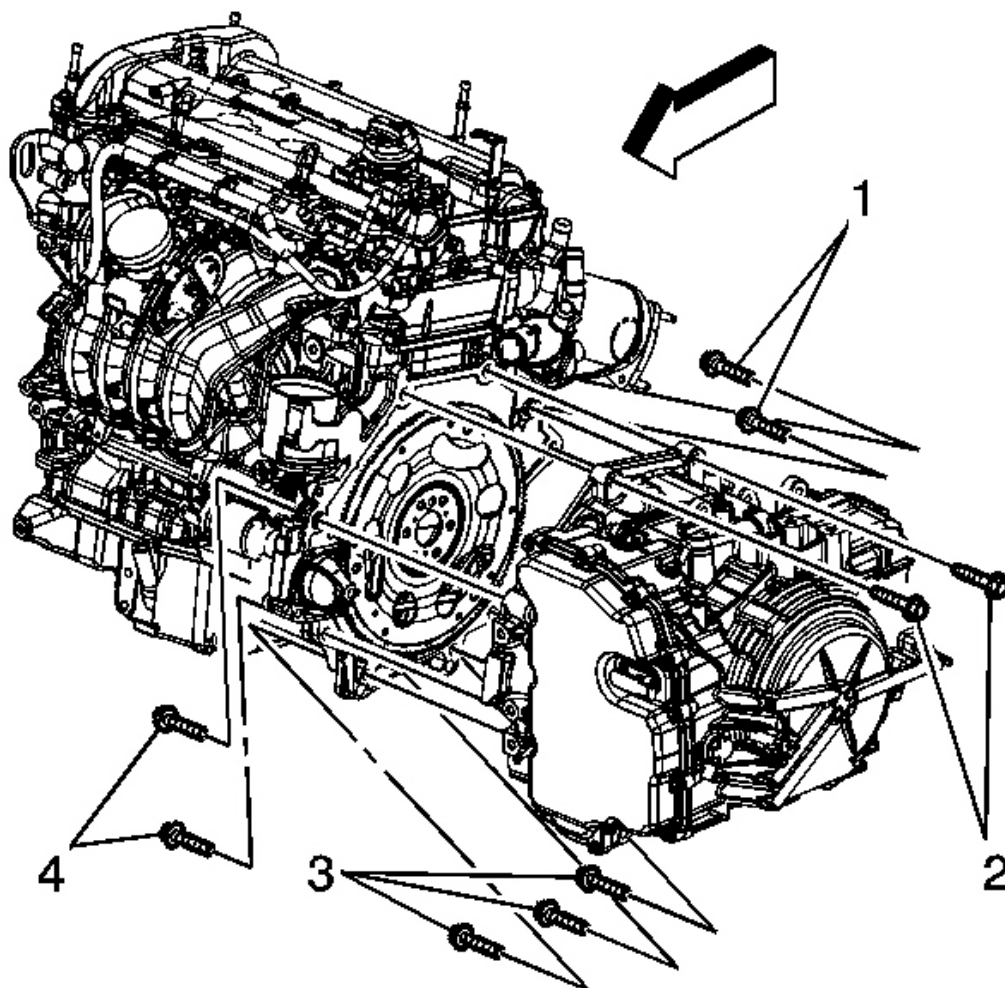


Fig. 80: Identifying Transmission-To-Engine Bolts
 Courtesy of GENERAL MOTORS CORP.

12. Remove the upper transmission to engine bolts (2).
13. Remove the frame. Refer to **Drivetrain and Front Suspension Frame Replacement** .
14. Disconnect the wheel drive shafts and intermediate shaft from the transmission. Refer to **Front Wheel Drive Shaft Replacement** .
15. On AWD equipped vehicles, remove the transfer case. Refer to **Transfer Case Assembly Replacement**
16. Remove the rear transmission mount bracket from the transmission. Refer to **Transmission Rear Mount Bracket Replacement (AWD)** or **Transmission Rear Mount Bracket Replacement (FWD)**.
17. Remove the front transmission mount from the transmission. Refer to **Transmission Front Mount Replacement**.

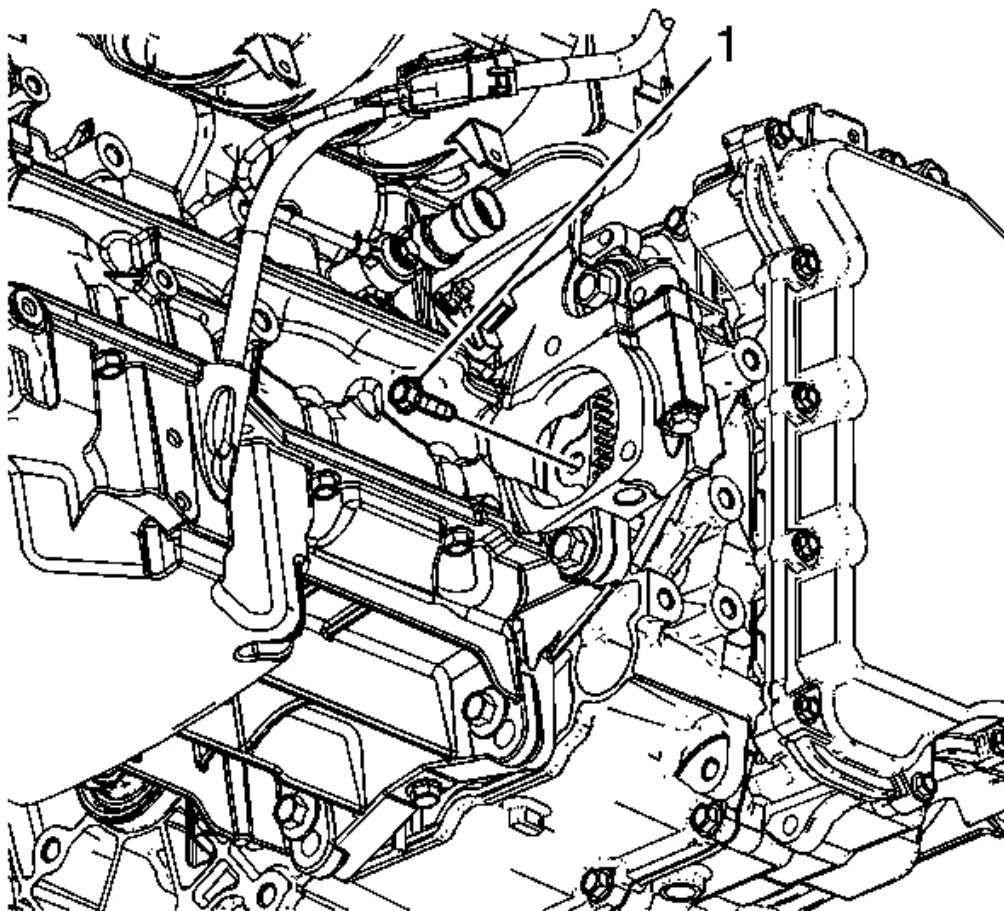


Fig. 81: Identifying Starter Bolts
Courtesy of GENERAL MOTORS CORP.

18. Remove the starter. Refer to **Starter Replacement (LAF)** or **Starter Replacement (LF1)** .
19. Mark the relationship of the flywheel to the torque converter for reassembly.
20. Remove the torque converter to flywheel bolts (1).
21. Use a transmission jack in order to support the transmission.

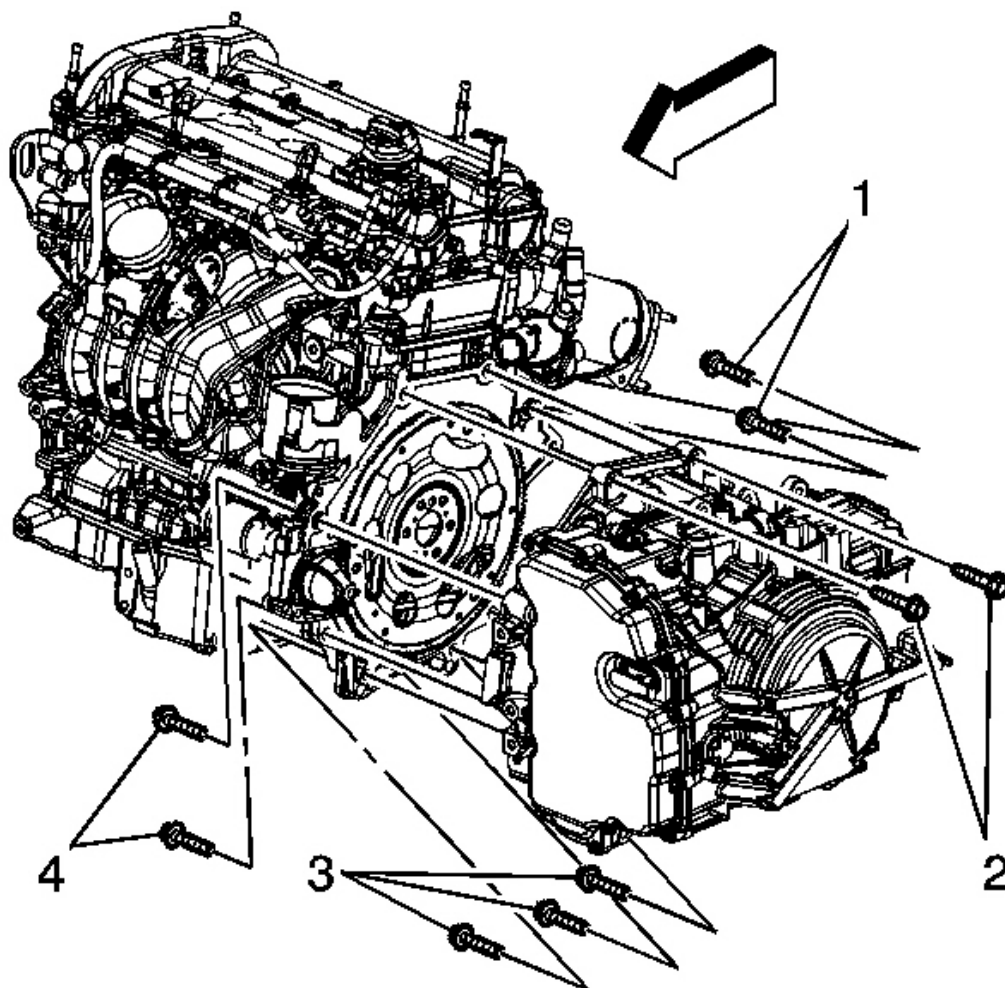


Fig. 82: Identifying Transmission-To-Engine Bolts
Courtesy of GENERAL MOTORS CORP.

22. Remove the remaining transmission bolts (1, 3, 4).

NOTE: Insure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

23. Separate the transmission from the engine.
24. Lower the transmission with the transmission jack far enough to remove the transmission.

Installation Procedure

1. Raise the transmission with the transmission jack and position the transmission to the engine.

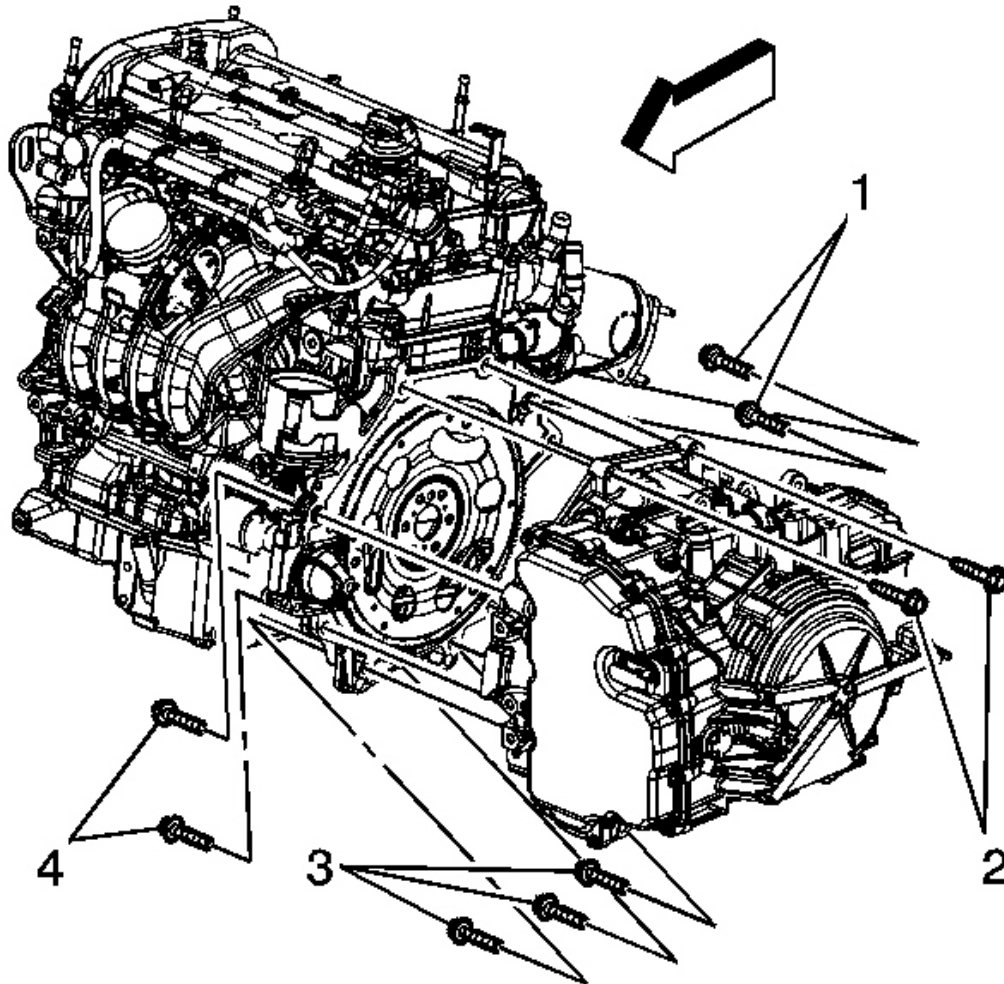


Fig. 83: Identifying Transmission-To-Engine Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the transmission bolts (1, 3, 4) and tighten to 75 N.m (55 lb ft).
3. Remove the transmission jack.

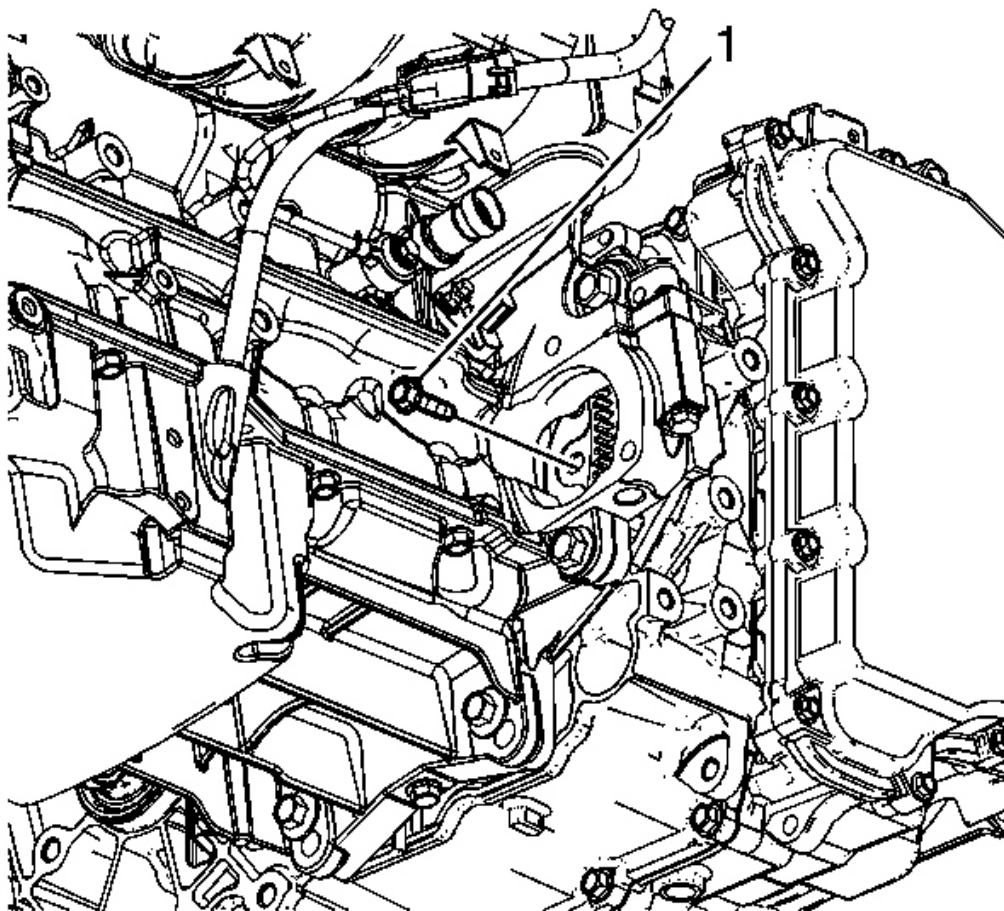


Fig. 84: Identifying Starter Bolts
Courtesy of GENERAL MOTORS CORP.

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 (LAF)** or **Starter Replacement (LF1)** .
6. Install the front transmission mount to the transmission. Refer to **Transmission Front Mount Replacement**.
7. On AWD equipped vehicles, install the transfer case. Refer to **Transfer Case Assembly Replacement** .
8. Install the rear transmission mount bracket to the transmission. Refer to **Transmission Rear Mount Bracket Replacement (AWD)** or **Transmission Rear Mount Bracket Replacement (FWD)**.
9. Install the intermediate drive shaft and wheel drive shafts to the transmission. Refer to **Front Wheel Drive Shaft Replacement** .
10. Install the frame. Refer to **Drivetrain and Front Suspension Frame Replacement** .

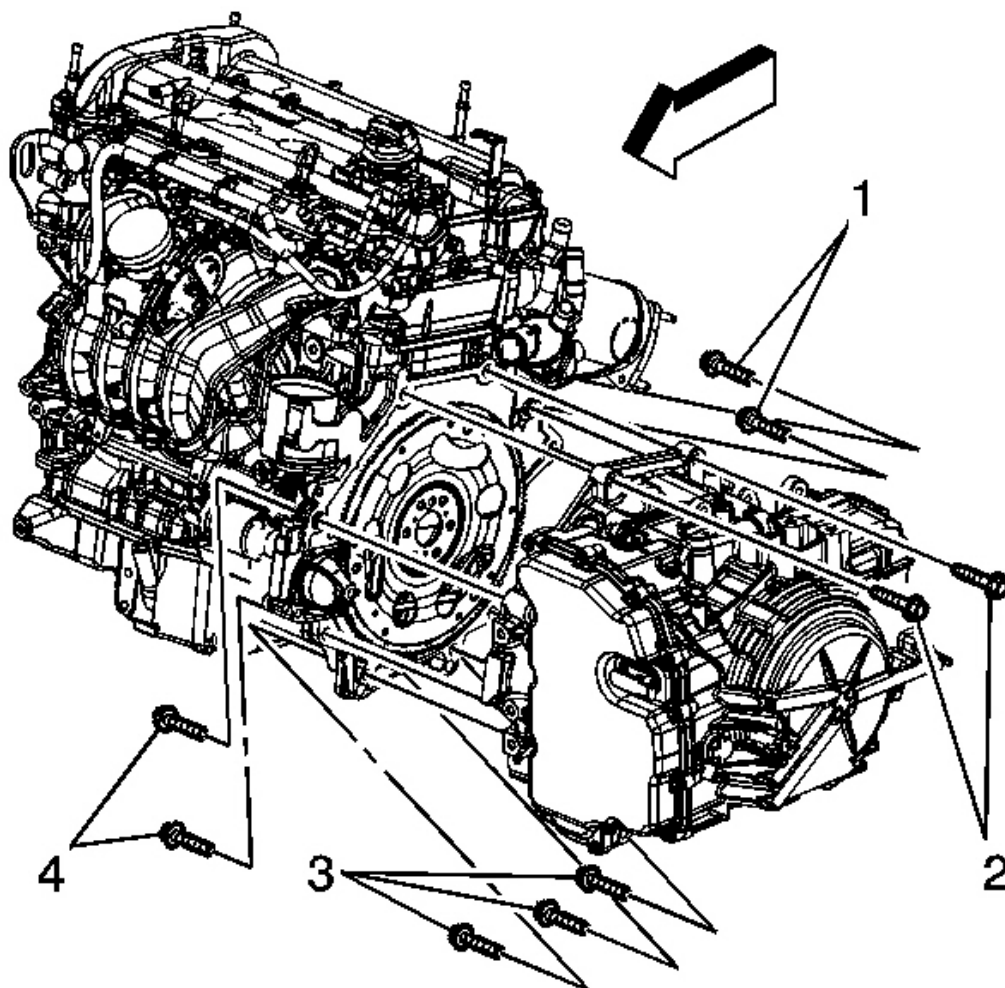


Fig. 85: Identifying Transmission-To-Engine Bolts
Courtesy of GENERAL MOTORS CORP.

11. Install the upper transmission to engine bolts (2) and tighten to 75 N.m (55 lb ft).

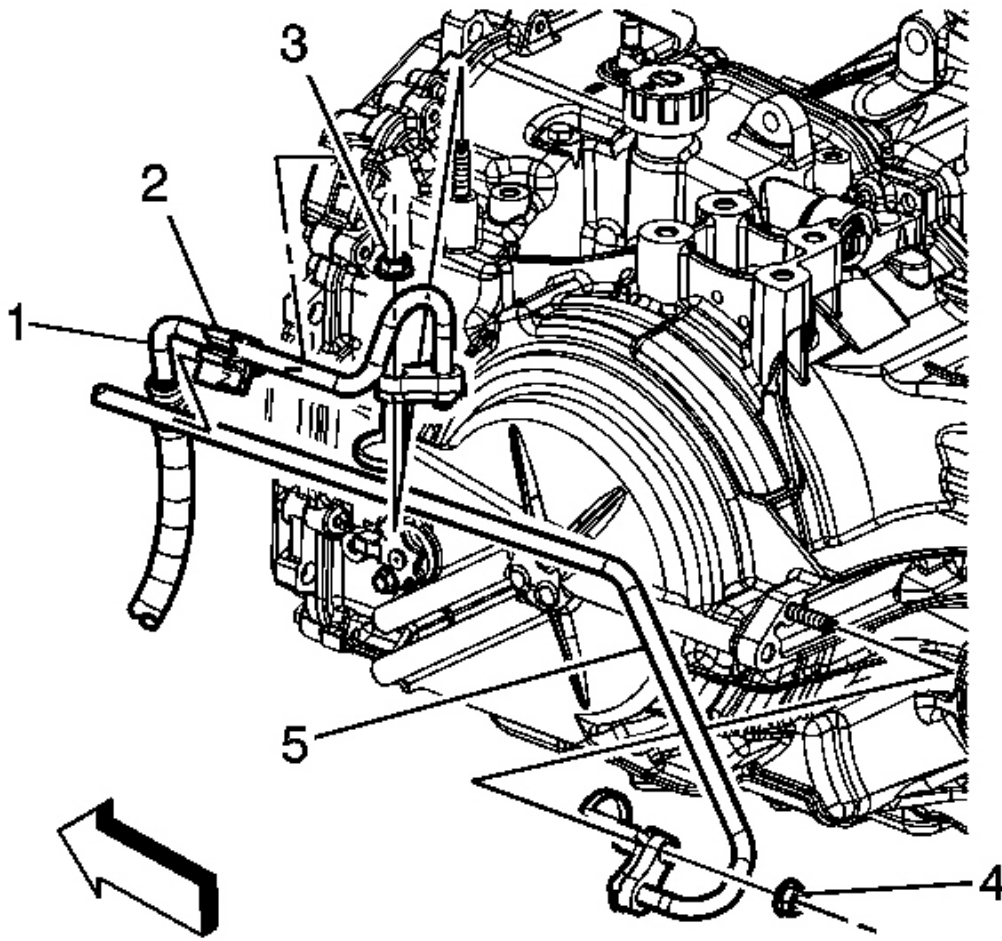


Fig. 86: Identifying Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

12. Install the transmission fluid cooler outlet hose (5) to the transmission.
13. Install the transmission fluid cooler outlet hose retainer nut (4) and tighten to 22 N.m (16 lb ft).
14. Install the transmission fluid cooler inlet hose (1) to the transmission.
15. Install the transmission fluid cooler inlet hose retainer nut (3).
16. Install the oil cooler inlet (1) and outlet (5) hoses to the retainer (2) on the control valve body cover.

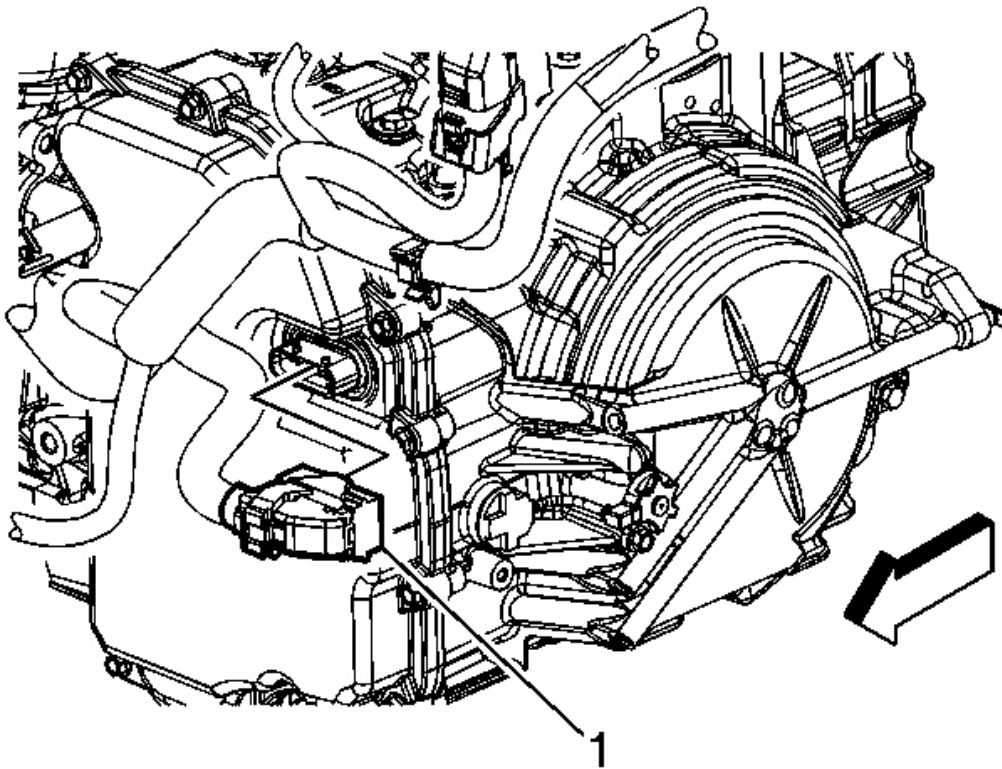


Fig. 87: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

17. Connect the control valve body TCM electrical connector (1).
18. Install the transmission range select lever cable and bracket. Refer to **Range Selector Lever Cable Bracket Replacement**.
19. Install the battery tray. Refer to **Battery Tray Replacement**.
20. Adjust the automatic transmission range selector lever cable. Refer to **Range Selector Lever Cable Adjustment**.
21. Fill the transmission with fluid. Refer to **Transmission Fluid Replacement**.

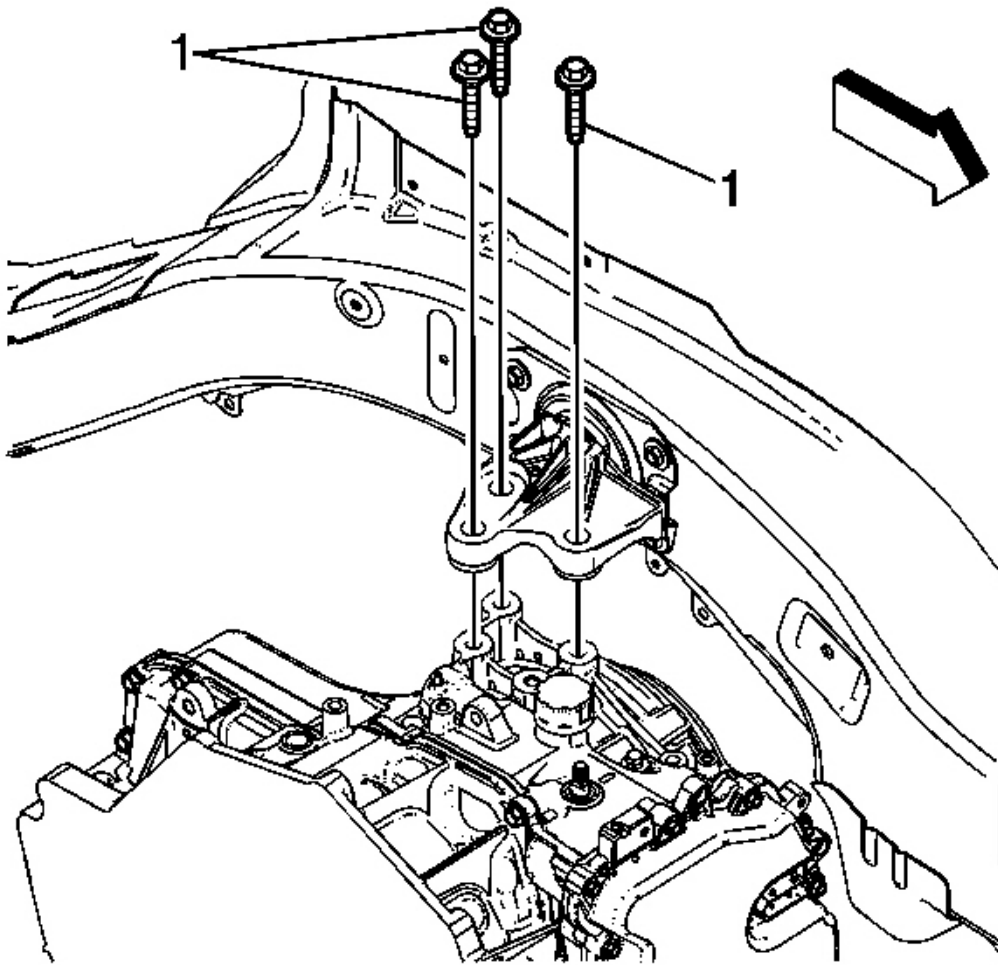


Fig. 88: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

22. Install the left transmission mount bolts (1) to the transmission and tighten to 50 N.m (37 lb ft).
23. For transmission control module programming and setup, refer to **Control Module References** .

NOTE: **After an internal transmission repair or internal part replacement the service fast learn adapt procedure should be performed.**

24. Perform the transmission adaptive values learn procedure. Refer to **Transmission Adaptive Values Learn** .
25. Road test the vehicle.

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

SCHEMATIC AND ROUTING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS

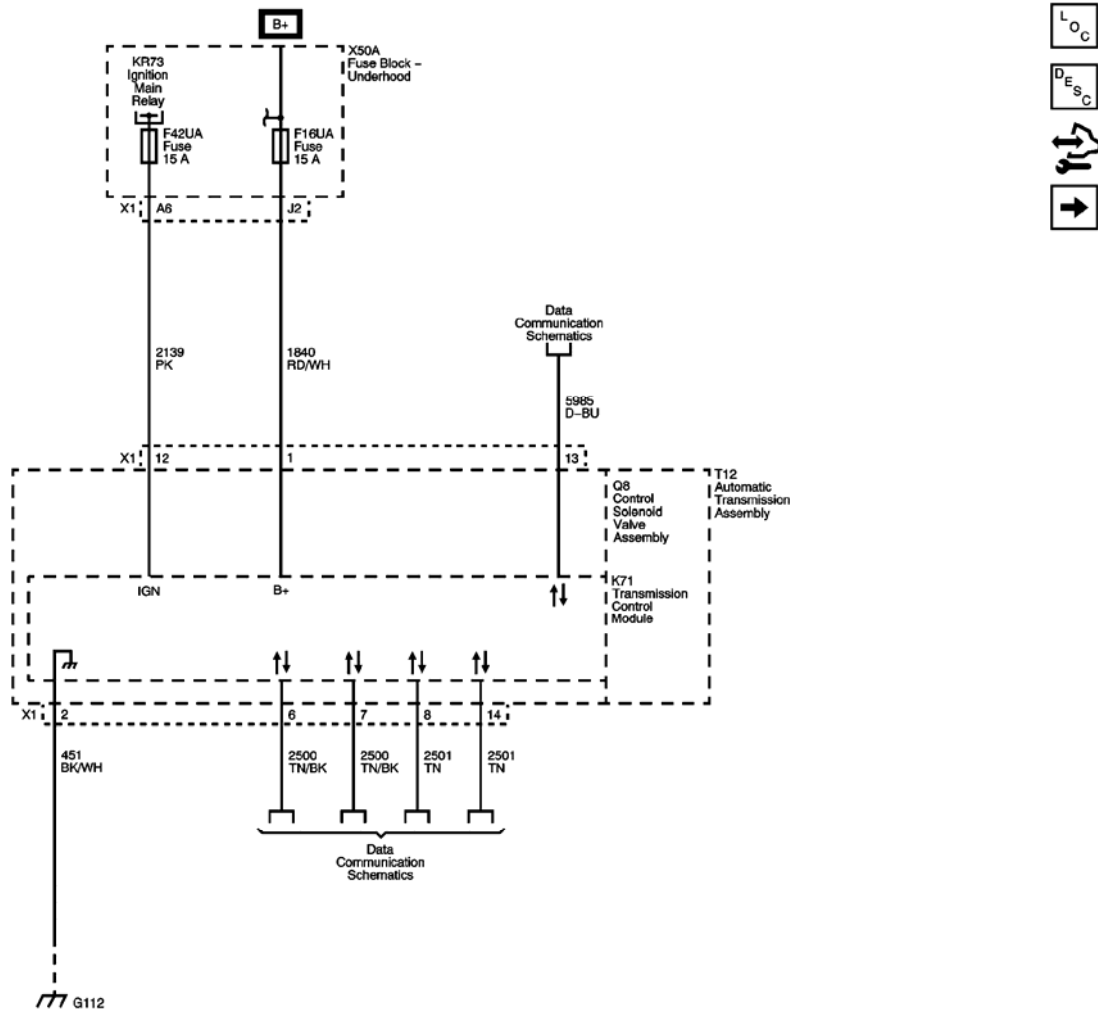


Fig. 1: Module Power, Ground, and Serial Data (MH7 or MHC)
Courtesy of GENERAL MOTORS CORP.

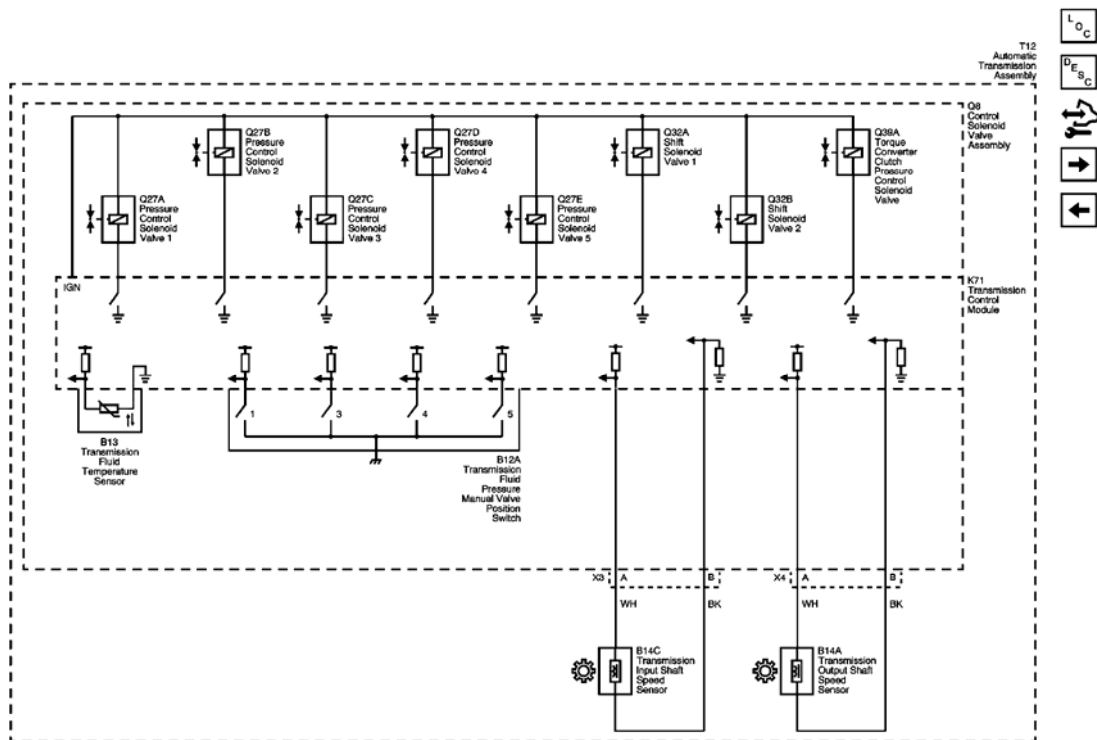
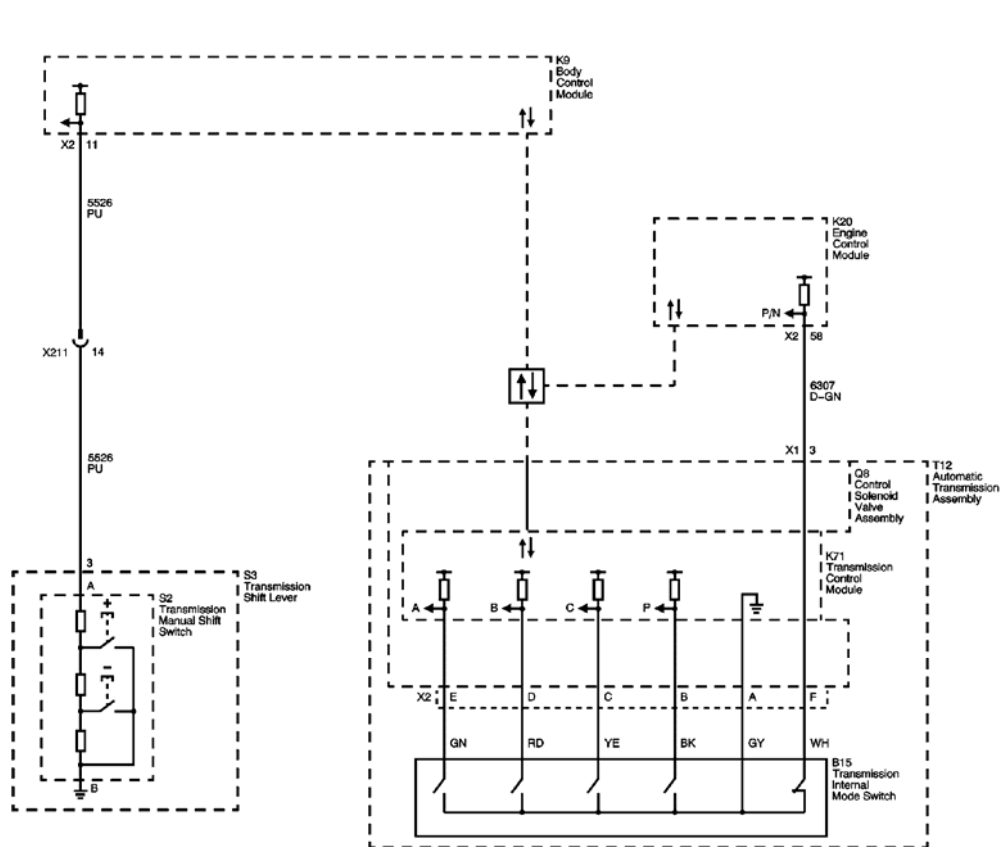


Fig. 2: ISS, OSS, TFP, TFT, Pressure Controls, and Shift Controls (MH7 or MHC)
 Courtesy of GENERAL MOTORS CORP.



LOC

DESC



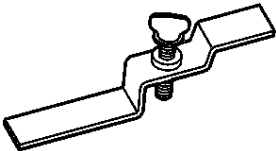
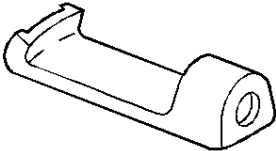
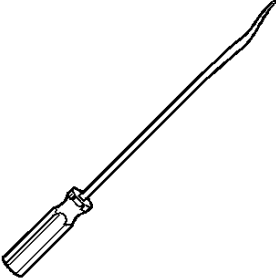
Fig. 3: IMS and Tap Up/Tap Down (MH7 or MHC)
Courtesy of GENERAL MOTORS CORP.

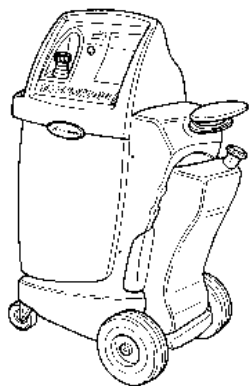
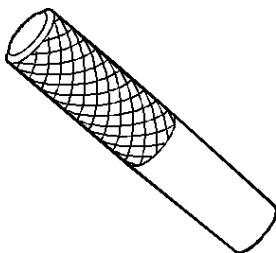
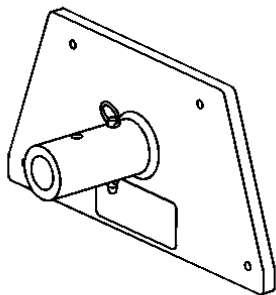
2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

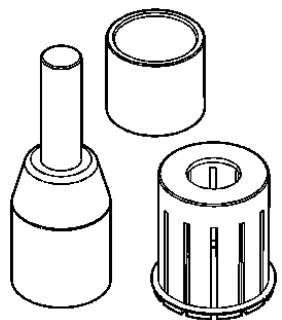
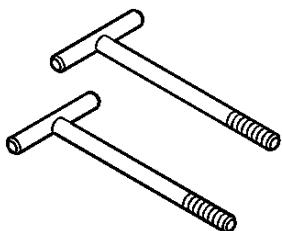
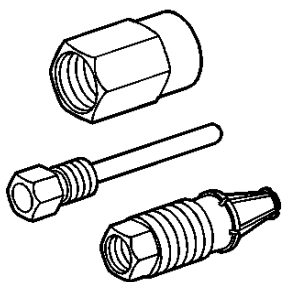
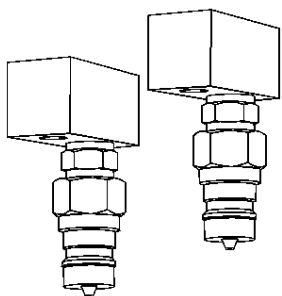
Illustration	Tool Number/Description
	DT 21366 J 21366 Converter Holding Strap
	DT 23129 J 23129 KM-586 Universal Seal Remover
	DT 28585 J 28585 KM-J-28585 Snap Ring Remover
	DT 39890 J 39890 Transmission Holding Fixture Adapter



DT 41229
J 41229
Manual Shaft Pin Installer

DT 45096
J 45096
Transmission Oil Cooling System Flush and Flow
Test Tool

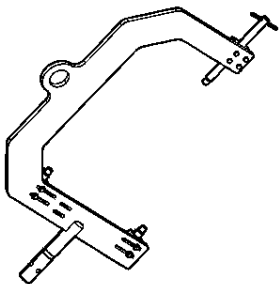
DT 45096-50
J 45096-50
Transmission Cooling Flush Adapter



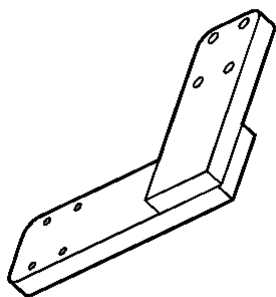
DT 45201
DT 48203
J 45201
Cooler Line Seal Remover

DT 46409
J 46409
KM-922
Torque Converter Lifting Handles

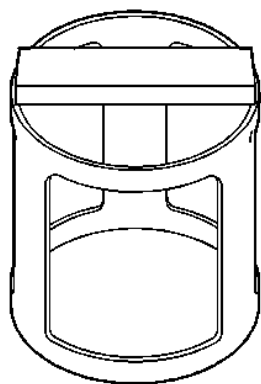
DT 46620
J 46620
Seal Installer



DT 46625
J 46625
Holding Fixture

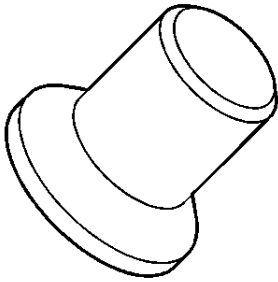
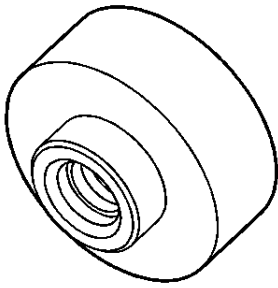


DT 46625-10
J 46625-10
Holding Fixture Adapter

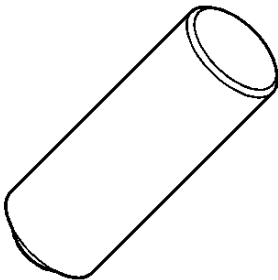


DT 47694
Spring Compressor

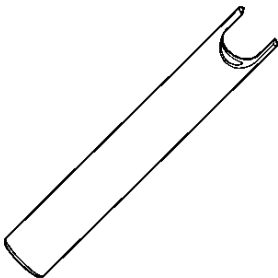
DT 47790
Seal Installer



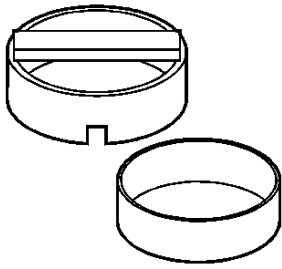
DT 47791-A
Seal Installer



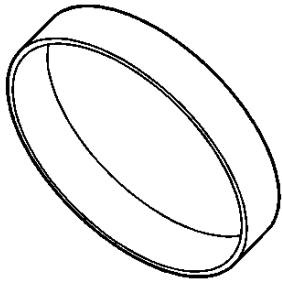
DT 47792
Seal Installer



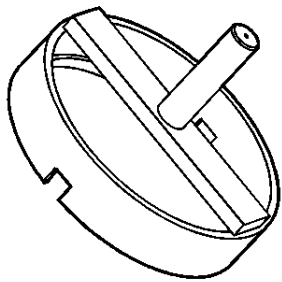
DT 47793
Differential Rotating Tool



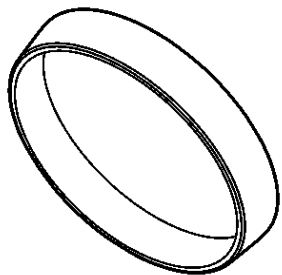
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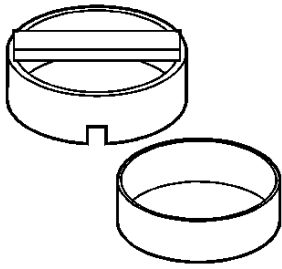
DT 47796
Seal Protector



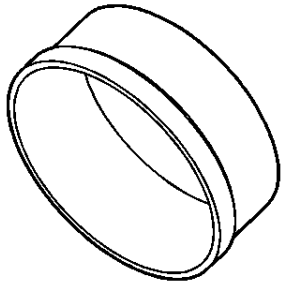
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Spring Installer



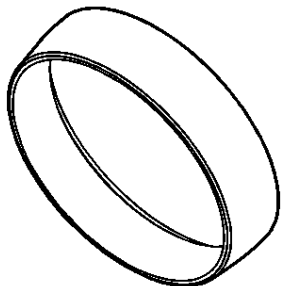
DT 47798
Seal Protector



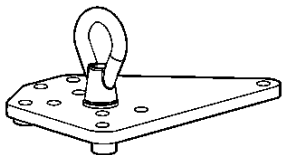
DT 47799
Clutch Piston Spring Compressor



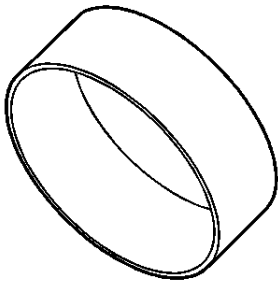
DT 47805
Seal Protector



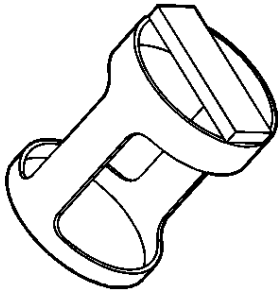
DT 47807
Clutch Piston Seal Installer



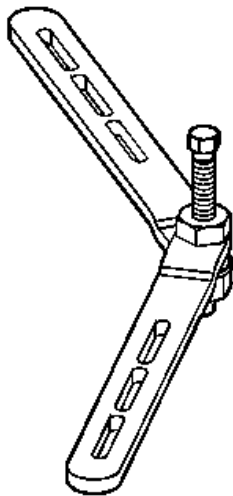
DT 47811-A
Lift Plate



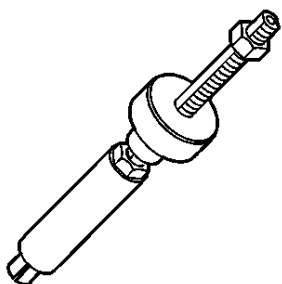
DT 47951-1
Seal Protector



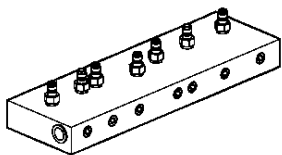
DT 47951-2
Spring Compressor



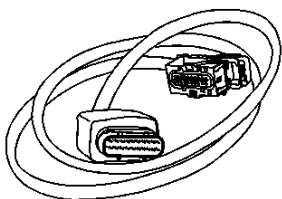
DT 48056
Spring Compressor Bridge



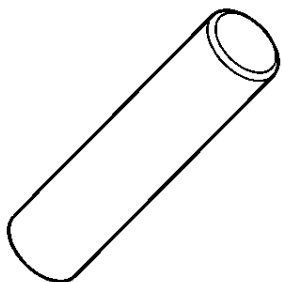
DT 48550
Detent Lever Pin Remover



DT 48616
Control Solenoid Test Plate

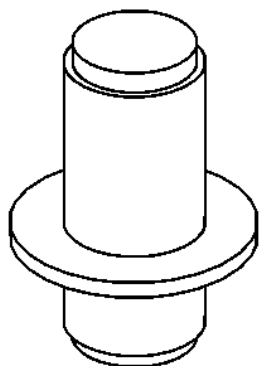
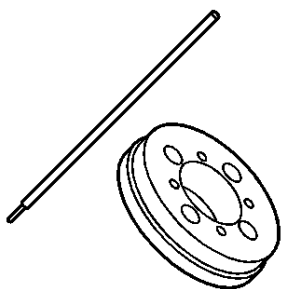


DT 48616-10
Adapter Harness

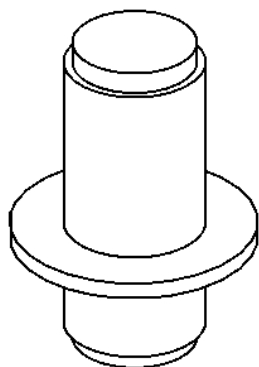


DT 49101
Seal Installer

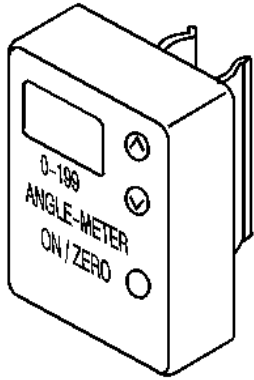
DT 49131
Seal Staking Tool



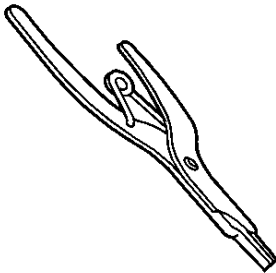
DT 49831
Differential Bearing Remover/Installer (2 Pinion
Blue)



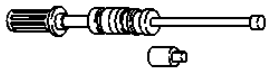
DT 50087
Differential Bearing Remover/Installer (4 Pinion
Red)



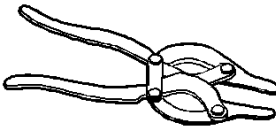
EN 45059
J 45059
Angle Meter



GE 5586-A
J 5586-A
Snap Ring Pliers

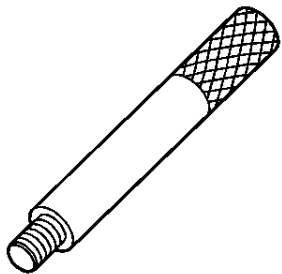


GE 6125-1B
J 6125-1B
KM-J-7004
Slide Hammer

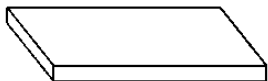


GE 8059
J 8059
KM-396
Snap Ring Pliers-Parallel Jaw

GE 8092
J 8092



KM-J-8092
Driver Handle



GE 34673
J 34673
Flat Gauge Bar

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
A/Trans Control Bolt	-	-	-	8 N.m	71 lb in
A/Trans Flex Plate Bolt	-	-	-	60 N.m	45 lb ft
A/Trans Fluid Pump Bolt to Converter Housing					
• First Pass	200	8	M8x33	10 N.m	89 lb in
• Final Pass	200	8	M8x33	45°	
A/Trans Fluid Pump Cover Bolt	302	23	M6x25	12 N.m	106 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	4	12	M6x97	10 N.m	89 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	6	3	M5x40.5	7 N.m	62 lb in
Control Valve Body Assembly (Complete) Bolt	400	1	M5x40.5	7 N.m	62 lb in
Control Valve Body to Case Bolt	9	2	M6x53	11 N.m	97 lb in
Control Valve Body to Case Bolt	10	9	M6x60	11 N.m	97 lb in
Control Valve Body Cover Bolt	1	13	M6x30	12 N.m	106 lb in
Drain Plug	64	1	1/8"-27 NPTF	12 N.m	106 lb in
Fluid Level Hole Plug	63	1	1/8"-27 NPTF	12 N.m	106 lb in
Fluid Pressure Test Hole Plug	51	1	1/8"-27 NPTF	12 N.m	106 lb in
Front Differential Carrier Baffle Bolt - Converter Housing	204	2	M6x25	12 N.m	106 lb in
Front Differential Carrier Baffle Bolt - Case	61	2	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	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	27	15	M8x30	50°	
Torque Converter to Flywheel Bolt	-	-	-	60 N.m	45 lb ft
Transmission Bolt (1, 2, 3) - 6T40	-	-	-	75 N.m	56 lb ft
Transmission Bolt (4, 5) - 6T40	-	-	-	50 N.m	37 lb ft

Transmission Bolt (1, 2, 3, 4) - 6T45	-	-	-	75 N.m	56 lb ft
Transmission Bolt (5) - 6T45	-	-	-	50 N.m	37 lb ft
Transmission Bracket Mount to Mount Through Bolt	-	-	-	100 N.m	74 lb ft
Transmission Fluid Cooler Outlet Pipe Nut	-	-	-	22 N.m	17 lb ft
Transmission Fluid Cooler Pipe Inlet Nut	-	-	-	22 N.m	17 lb ft
Transmission Mount Bolt	-	-	-	62 N.m	46 lb ft
Transmission Mount Bolt - Left Side to Body	-	-	-	62 N.m	46 lb ft
Transmission Mount Bolt - Left Side to Transmission	-	-	-	50 N.m + 60-75°	37 lb ft
Transmission Mount Nut - Left Side to Body	-	-	-	62 N.m	46 lb ft
Transmission Mount Through Bolt	-	-	-	62 N.m	46 lb ft
Transmission Mount to Transmission Bolt	-	-	-	100 N.m	74 lb ft
Transmission Range Selector Cable Bracket Bolt	-	-	-	18 N.m	14 lb ft
Transmission Range Selector Lever Nut	-	-	-	20 N.m	15 lb ft
*Reference number refers to the component callout number in Disassembled Views					

TRANSMISSION GENERAL SPECIFICATIONS (6T40/45)

Name	6T40/6T45
RPO Codes	MH8, MH7
Production Location	Korea/China
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	2.89/3.17/3.87
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	Product Series
Position Quadrant	P, R, N, D, * *(Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transmission Net Weight	81/85 kg (178/187 lbs)
Maximum Trailer Towing Capacity	N/A
Maximum Gross Vehicle Weight (GVW)	2100 kg (4,630 lbs)

FLUID CAPACITY SPECIFICATIONS (6T40/45/50)

Application	Specification	
	Metric	English
Valve Body Cover Removal - Approximate Capacity	5.0-7.0 liters	5.3-7.4 quarts
Fluid Change - Drain Plug - Approximate Capacity	4.0-6.0 liters	4.2- 6.3 quarts
Overhaul - Approximate Capacity	8.0-8.5 liters	8.5-9.0 quarts

FLUID PUMP SELECTIVE SPECIFICATIONS

Fluid Pump Body Pocket Depth		Fluid Pump Gear Thickness	
Metric	English	Metric	English
12.617-12.625 mm	0.4967-0.4970 in	12.580-12.588 mm	0.4952-0.4955 in
12.626-12.636 mm	0.4970-0.4974 in	12.589-12.599 mm	0.4956-0.4960 in
12.637-12.645 mm	0.4975-0.4978 in	12.600-12.608 mm	0.4960-0.4963 in

RANGE REFERENCE

Range	Park	Reverse	Neutral	Drive						
				1st Braking	1st	2nd	3rd	4th	5th	6th
1-2-3-4 Clutch	-	-	-	Applied	Applied	Applied	Applied	Applied	-	-
3-5 Reverse Clutch	-	Applied	-	-	-	-	Applied	-	Applied	-
4-5-6 Clutch	-	-	-	-	-	-	-	Applied	Applied	Applied
2-6 Clutch	-	-	-	-	-	Applied	-	-	-	Applied
Low and Reverse Clutch	Applied*	Applied	Applied*	Applied	-	-	-	-	-	-
Low Clutch Assembly (OWL)	-	-	-	Holding	Holding	-	-	-	-	-

* = Applied with NO load

SHIFT SOLENOID VALVE STATE AND GEAR RATIO

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
Park	ON	OFF	OFF	OFF	ON	-
Reverse	ON	OFF	OFF	ON	ON	2.940
Neutral	ON	OFF	OFF	OFF	ON	-
1st Braking	ON	ON	OFF	OFF	ON	4.584
1st	OFF	ON	OFF	OFF	OFF	4.584
2nd	OFF	ON	ON	OFF	OFF	2.964
3rd	OFF	ON	OFF	ON	OFF	1.912
4th	OFF	ON	OFF	OFF	ON	1.446
5th	OFF	OFF	OFF	ON	ON	1.000
6th	OFF	OFF	ON	OFF	ON	0.746

Effective Final Drive Ratio - 6T40/45 - 3.17/3.87
For shift solenoid 1, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure).
For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure

TRANSMISSION FLUID PRESSURE SWITCH LOGIC

Gear	TFP Switch States			
	TFP SW1	*TFP SW3	TFP SW4	TFP SW5
Park	Low	Low	Low	Low
Reverse	Low	Low	Low	Low
Neutral	Low	Low	Low	Low
Drive 1st - Engine Braking	High	Low	Low	Low
Drive 1st	High	High	Low	High
Drive 2nd	High	Low	Low	High
Drive 3rd	Low	High	Low	High
Drive 4th	High	High	Low	Low
Drive 5th	Low	High	High	Low
Drive 6th	High	Low	High	Low

High = 12V (Switch Open or Pressurized)
Low = 0V (Switch Closed or No Pressure)
Note: All TFP switches are normally closed (NC)
*TFP switch 2 does not exist

TRANSMISSION INTERNAL MODE SWITCH LOGIC

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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	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

Line PC Solenoid Valve Pressure

Requested Pressure (kPa)	Actual Pressure	
	Metric	English
None	345-550 kPa	50-80 psi
200	690-900 kPa	100-130 psi
400	1100-1310 kPa	160-190 psi
600	1520-1725 kPa	220-250 psi
800	1860-2275 kPa	270-330 psi
1000	1860-2275 kPa	270-330 psi
1200	1860-2275 kPa	270-330 psi
1400	1860-2275 kPa	270-330 psi
1600	1860-2275 kPa	270-330 psi
1800	1860-2275 kPa	270-330 psi
2000	1860-2275 kPa	270-330 psi

2010 Transmission

Automatic Transmission - 6T30/6T40/6T45 - Equinox & Terrain

SYMPTOMS - AUTOMATIC TRANSMISSION

NOTE: Use the symptom tables only if the following conditions are met:

- Refer to Diagnostic Starting Point - Vehicle .
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to Transmission General Description and Transmission Component and System Description .

VISUAL/PHYSICAL INSPECTION

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

INTERMITTENT

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

SYMPTOM LIST

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
 - Transmission Fluid Level and Condition Check
 - Fluid Pressure High or Low
 - Automatic Transmission Fluid Leaks
 - Fluid Leak Diagnosis
- Noise and Vibration Diagnosis
 - Whine/Growl Noise
 - Noise and Vibration Analysis
 - Torque Converter Diagnosis
- Range Performance Diagnosis
 - No Park
 - No Drive in All Ranges
 - No Reverse Gear

- Shift Quality Feel Diagnosis
 - Harsh Garage Shift
 - Harsh or Late First, Second, Third, and Fourth Shift
 - Harsh First and Reverse Shift
 - Harsh or Late Second and Sixth Shift
 - Harsh or Late Third, Fifth, and Reverse Shift
 - Harsh Fourth, Fifth, and Sixth Shift
- 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

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INSPECTION

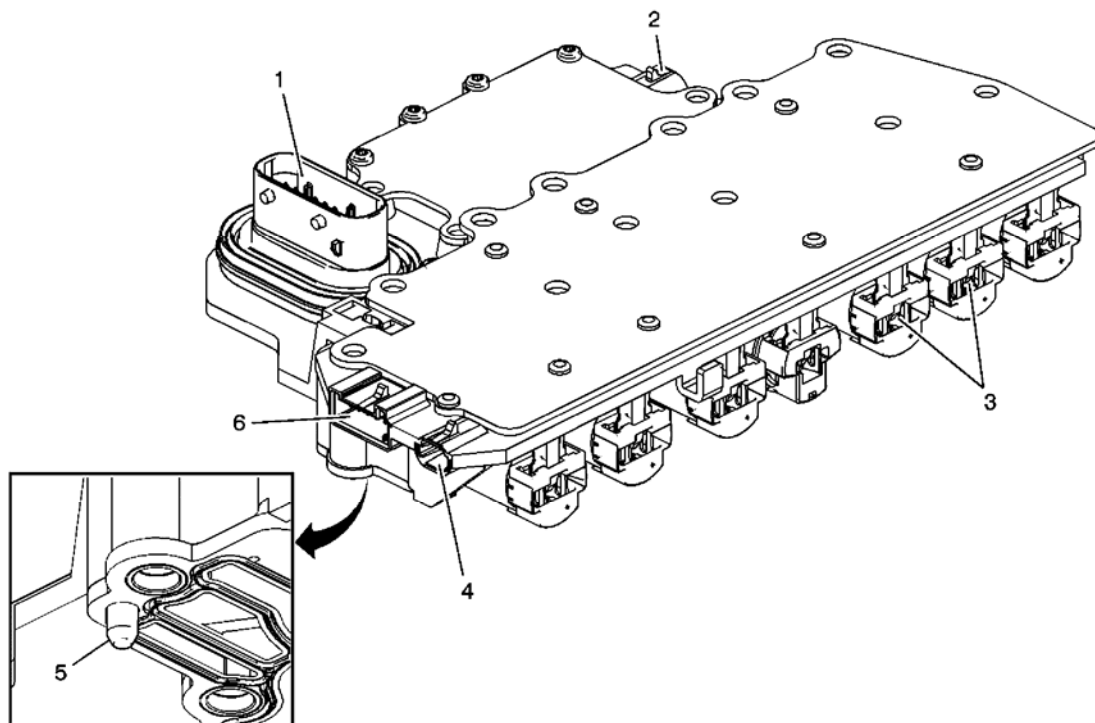


Fig. 1: View Of Control Solenoid Valve & Transmission Control Module Assembly
Courtesy of GENERAL MOTORS CORP.

1. Inspect the control solenoid valve assembly connectors and pins (1, 2, 4, 6) for the following conditions:
 - Damage
 - Bent pins
 - Debris
 - Broken retaining tab
 - Contamination
2. Ensure no metallic debris is inside the connectors near the terminal pins.
3. Inspect the control solenoid valve assembly solenoid leads (3) for contamination or metallic debris.
4. Inspect the 2 control solenoid valve assembly filter plate retaining tabs (5) for cracks and ensure proper tension when filter plate is attached.

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY INPUT SHAFT SPEED/OUTPUT SHAFT SPEED INPUT TEST

Special Tools

- **EL 35616:** GM-Approved Terminal Test Kit
- **EL 38522:** Variable Signal Generator

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

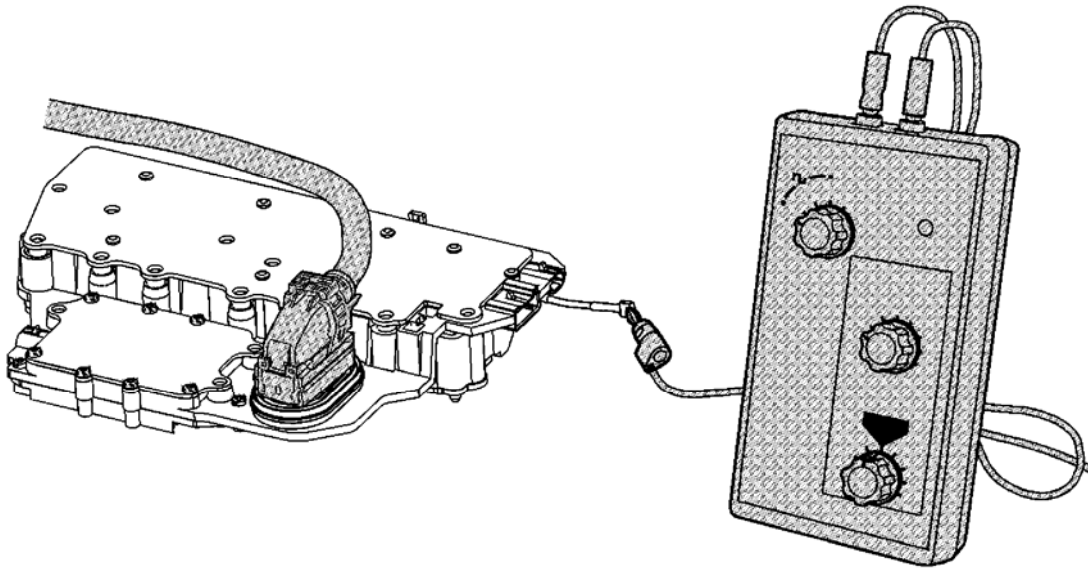


Fig. 2: View Of Special Tool & Control Solenoid Valve and Transmission Control Module Assembly
Courtesy of GENERAL MOTORS CORP.

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 CLEANING

The control solenoid valve assembly cleaning procedure is a specific software based routine, which resides in the TCM. This procedure is activated by the scan tool and is used to cycle the solenoids and valves in the control solenoid valve assembly in an attempt to dislodge debris and free up the valves after a performance diagnostic trouble code (DTC) has set. When the cleaning procedure is completed, the DTC enable criteria should be run again, to see if the DTC concern has been corrected.

1. Operate the transmission to achieve 70°-90°C (158°-194°F).
2. With a scan tool, select the Service Cleaning Procedure. Initiate the cleaning procedure.
3. When the cleaning procedure is completed, shut OFF the ignition for 30 seconds.
4. Restart the engine and operate the vehicle based on the criteria specified in Conditions for Running the DTC.
5. Observe if the applicable DTC or DTCs have run and passed to verify if the cleaning procedure was effective.

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY SOLENOID PERFORMANCE TEST

Special Tools

- **DT-48616:** Control Solenoid Test Plate
- **DT-48616-10:** Adapter Harness

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

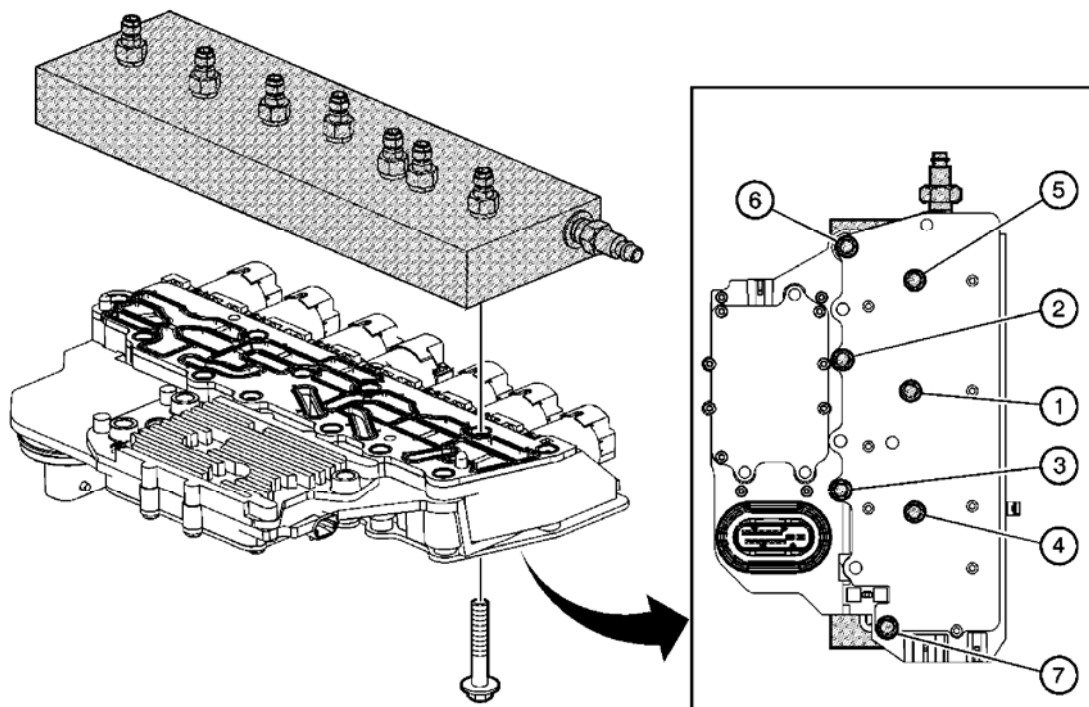


Fig. 3: Identifying Control Solenoid (W/Body & TCM) Valve Assembly Test Points
Courtesy of GENERAL MOTORS CORP.

The purpose of this procedure is to test the functionality of the control solenoid valve assembly solenoids for a gross stuck open or stuck closed condition. **DT-48616:** test plate is bolted to the control solenoid valve assembly on the valve body mounting surface. Pressurized air is passed into the aluminum test block, through the control solenoid valve assembly solenoid passage and back to a pressure gauge on the test block. The pressure gauge indicates open if air pressure is passed through the solenoid, or closed if the solenoid is unable to pass air through. A scan tool is used to command the solenoids ON and OFF. While watching the pressure gauge, one can determine the valve functionality. The recommended shop air pressure for this test is 90-100 psi.

1. Remove the control solenoid valve assembly from the transmission.

NOTE: **Drain the TCM of excess transmission fluid before attaching to test block and use caution when attaching air to test block air inlet.**

2. Bolt the **DT-48616:** test plate to the control solenoid valve assembly on the valve body mounting surface. 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.
3. Install the pressure gauge to the affected solenoid air port. Reference component to air port table.
4. Connect the shop air pressure line to the **DT-48616:** test plate air psi inlet port.
5. Connect **DT-48616-10:** harness to vehicle and control solenoid valve assembly.

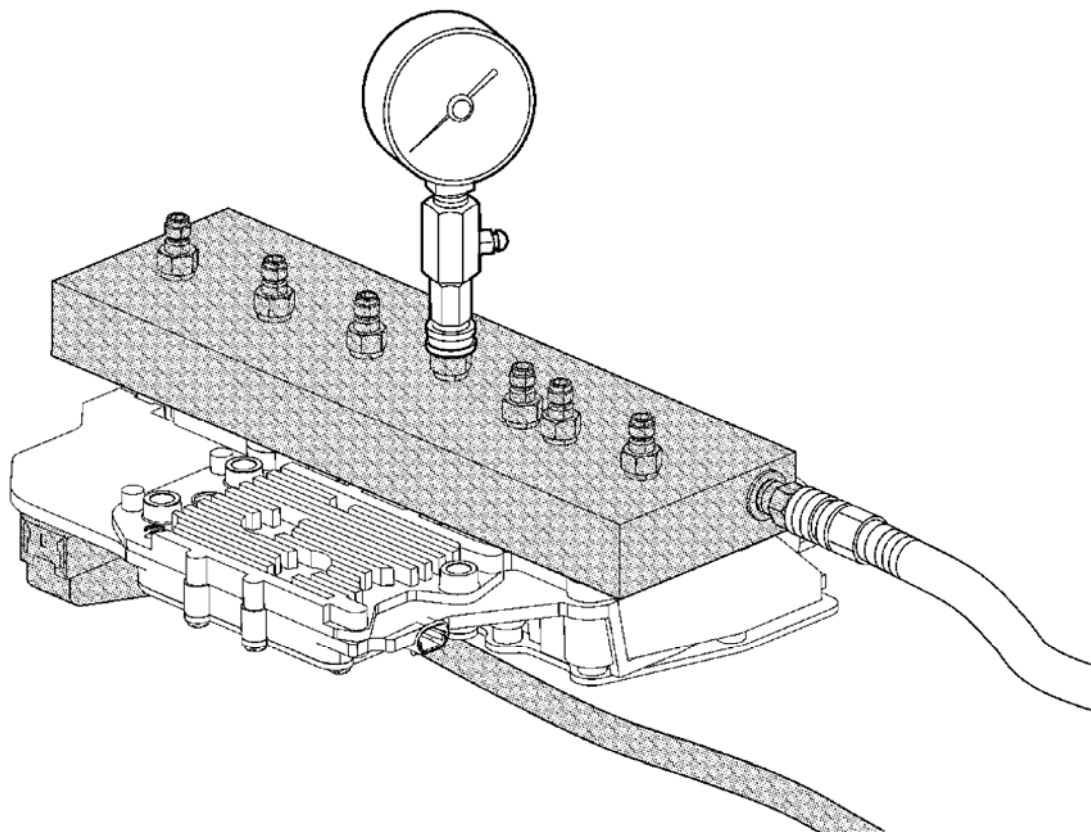


Fig. 4: Valve Pressure Test
 Courtesy of GENERAL MOTORS CORP.

CAUTION: Do not energize the solenoids for more than two minutes or the solenoids could be damaged.

6. Ignition ON, with a scan tool command the solenoid in question On and Off. Watch the air pressure gauge and look for the change in pressure as you command the valve On and Off. The valve should allow air pressure to flow through the valve port to the gauge with a result of pressure reading on the gauge. If the valve is stuck closed, no pressure change will occur. Command the solenoid valve On and Off several times to determine the state of the solenoid valve in question. Release the air pressure in the gauge between pressurization tests.

Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification

Component	Port On Test Plate	Commanded State	
		ON	OFF
PC Solenoid 2, 35R	F	Full pressure to gauge	No pressure to gauge
PC Solenoid 3, R1/456	G	Full pressure to gauge	No pressure to gauge
PC Solenoid 4, 2-6	B	Full pressure to gauge	No pressure to gauge
PC Solenoid 5, 1234	C	Full pressure to gauge	No pressure to gauge

Shift Solenoid	D	Full pressure to gauge	Below full pressure to gauge
Line Pressure Control Solenoid	A	Command to highest setting, full pressure to gauge	Command to lowest setting, below 620.5 kPa (90 psi) to gauge
TCC PC Solenoid	E	Full pressure to gauge	No pressure to gauge

NOTE: With the key on engine off (KOEO), the TCM will normally cycle some of the transmission solenoids On and Off to facilitate keeping the ports and solenoids clean and free of debris. This dither function is a normal activity and will cause the valves to cycle open and closed quickly when the TCM is powered up. This can cause the psi gauge to flicker high and low as the valves open and close. This may cause some air to exit the ports where the psi gauge is not connected as those solenoids cycle on and off.

TRANSMISSION ADAPTIVE VALUES LEARN

Transmission Adaptive Values Learn is a procedure for 6 speed automatic transmissions in which a series of tests are run to allow the transmission control module (TCM) to learn individual clutch characteristics. Once the clutch data is learned, Transmission Adaptive Values Learn translates it into the adaptive data cells, which the TCM uses for clutch control during shifts. The scan tool provides initiation of the Transmission Adaptive Values Learn procedure. This procedure is to be used following transmission repair.

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

IMPORTANT: Ensure the following conditions are met before performing the Transmission Adaptive Values Learn procedure:

- Drive wheels are blocked
- Parking brake is applied
- Service brake is applied
- Zero percent throttle and no external engine RPM control
- Transmission fluid temperature (TFT) is between 70-100°C (158-212°F)
- Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches.

1. Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:
 1. Module Diagnosis
 2. Transmission Control Module
 3. Configurations/Reset Functions
 4. Transmission Adaptive Values Learn

IMPORTANT: 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.
4. Restart the engine. This will complete the Transmission Adaptive Values Learn procedure.

IMPORTANT: When the Transmission Adaptive Values Learn procedure is completed, the transmission will remain in a neutral state.

TROUBLESHOOTING

If the Transmission Adaptive Values Learn will not run and the above stated conditions have been met, ensure the following:

- TFT is between 70-100°C (158-212°F)
- 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

TRANSMISSION FLUID LEVEL AND CONDITION CHECK

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself.

CAUTION: Use Dexron VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.

NOTE: Ensure the transmission has enough fluid in it to safely start the vehicle without

damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20-25°C (68-77°F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500-800 rpm for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

NOTE: If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

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

CAUTION: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85-95°C (185-203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.

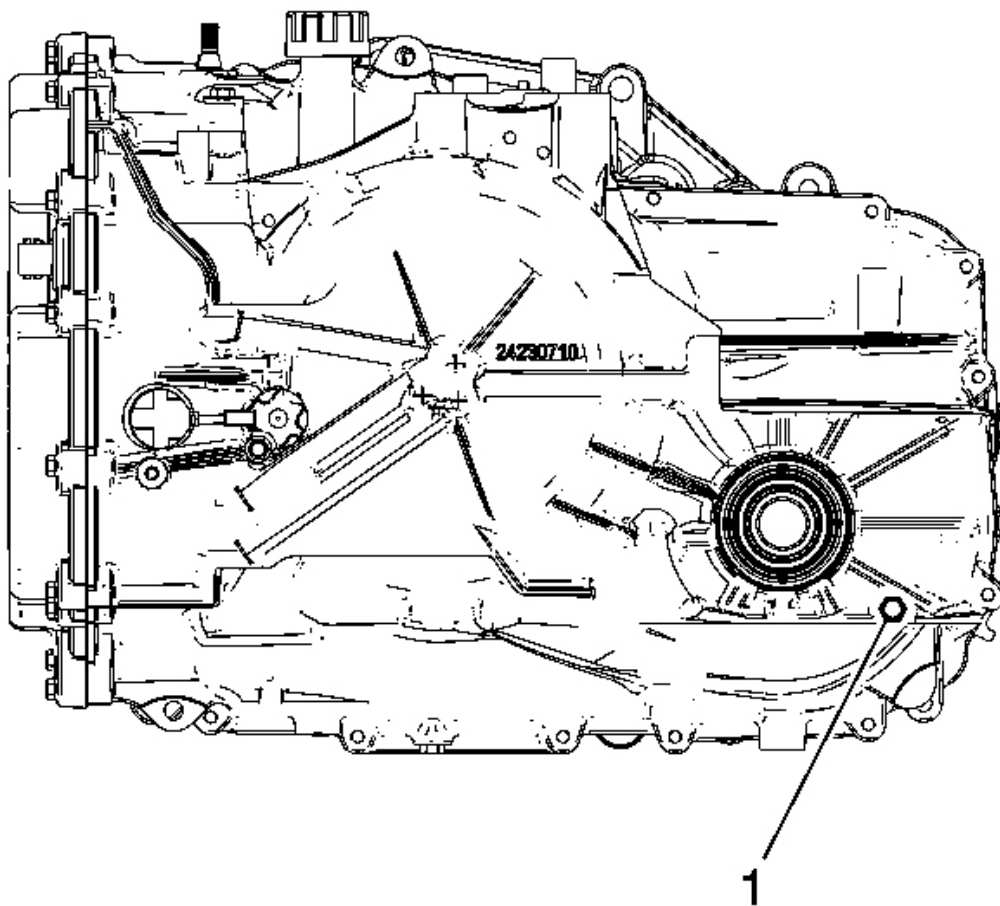


Fig. 5: View of Oil Level Plug

Courtesy of GENERAL MOTORS CORP.

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

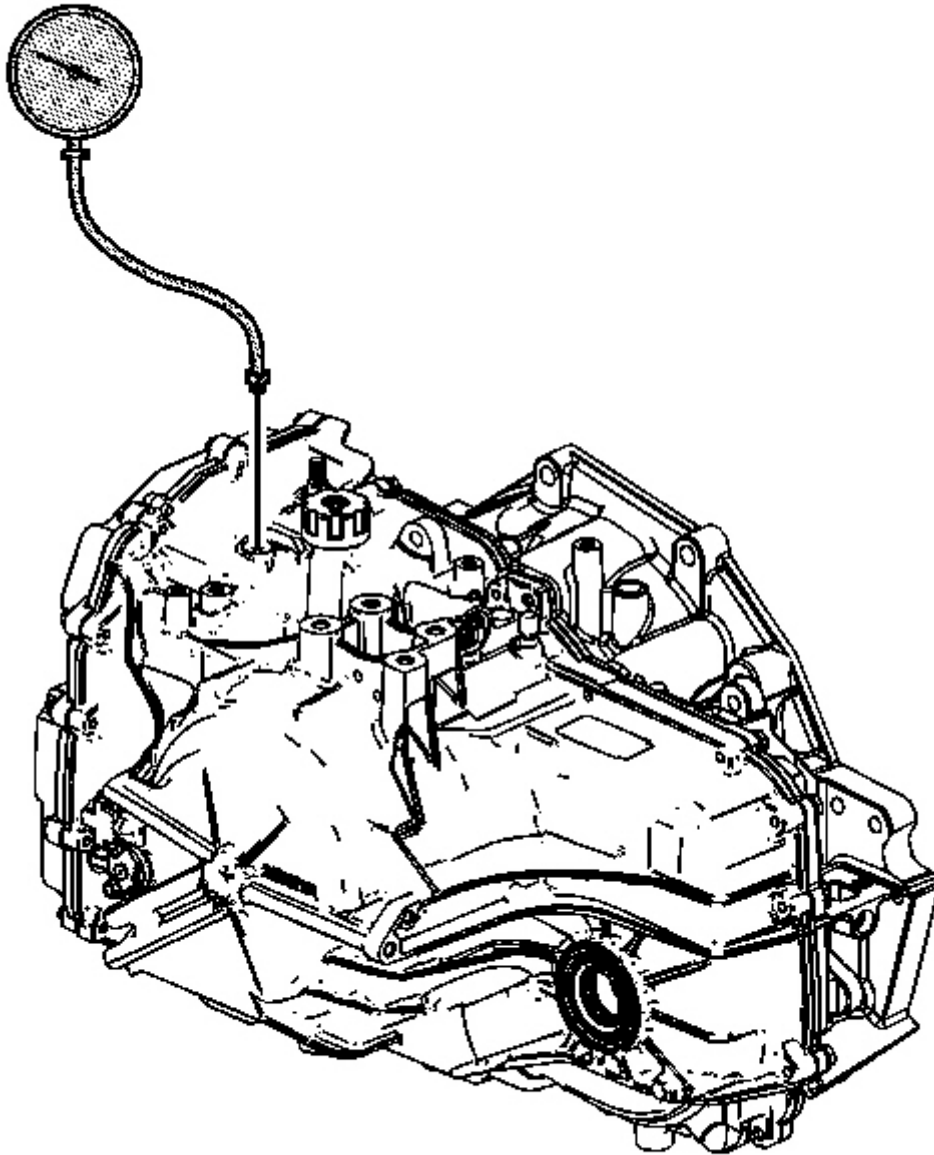


Fig. 6: Line Pressure Check
Courtesy of GENERAL MOTORS CORP.

SPECIAL TOOLS

J-21867: Pressure Gauge

CHECK

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 **J-21867**: 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 **J-21867**: gauge.
14. If the pressure readings vary greatly, refer to **Fluid Pressure High or Low**.
15. Turn the engine OFF.
16. Remove the **J-21867**: gauge.

CAUTION: Refer to **Fastener Caution** .

17. Install the line pressure test hole plug and tighten to 12 N.m (106 lb in).

ROAD TEST

NOTE: **The Road Test Procedure should be performed only as part of 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.

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 trans fluid temperature is above 20°C) and not harsh. Note that these shifts may be almost imperceptible in some applications. Using the scan tool to monitor Transmission ISS achieving 0 rpm can be used to check delay in these cases.

NOTE: Harsh engagement may be caused by any of the following conditions:

- High engine idle speed-Compare engine idle speed to desired idle speed.
- Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.
- A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.
- Incomplete adapting or incorrect adapting-Repeat maneuver multiple times to see if shift quality improves. If it does not, refer to the service procedures for Harsh Garage Shift.

NOTE: Delayed engagement may be caused by any of the following conditions:

- Low idle speed-Compare engine idle speed to desired idle speed.
- Low fluid level
- Incorrect line pressure-Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.
- Cold transmission fluid temperature (TFT)-Use the scan tool to determine TFT.
- Selector linkage-Inspect and adjust as necessary.
- Incomplete adapting or incorrect adapting-Repeat maneuver multiple times to see if delay improves. If it does not, refer to the service procedures for Harsh First and Reverse Shift.

6. Monitor transmission range on the scan tool, transmission data list.
 1. Apply the brake pedal and ensure the parking brake is set.
 2. Move the gear selector through all ranges.

3. Pause 2 to 3 seconds in each range.
4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
 1. Apply the brake pedal and ensure the parking brake is set.
 2. Ensure the gear selector is in PARK.
 3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

UPSHIFT CONTROL AND TORQUE CONVERTER CLUTCH (TCC) APPLY

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:

- Calc. Throttle Position
- Vehicle Speed
- Engine Speed
- Transmission ISS
- Transmission OSS
- Commanded Gear
- TCC PC Sol. Pressure Cmd.
- TCC Slip Speed
- TFP Switch 1
- TFP Switch 3
- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1 and 2

2. Place the gear selector in the DRIVE position.
3. Accelerate the vehicle using a steady throttle position between 15 and 20 percent. Hold the throttle

steady.

4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.
5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.
6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

NOTE: This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Full lockup is available at highway speeds on some applications.

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

- Check for DTCs.
- Refer to **Torque Converter Diagnosis.**

PART THROTTLE STEP-IN DOWNSHIFTS

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle at light throttle (5-15 percent) until 3rd gear is just achieved.
3. Quickly increase throttle angle until commanded gear indicates that a downshift to 2nd gear is commanded.
4. Verify that the transmission downshifts within 2 seconds of the throttle movement.
5. Repeat steps 2 to 4 at higher speed to achieve 4th gear and then step in to command a 4th gear to 3rd gear downshift.
6. Repeat steps 2 to 4 at higher speed to achieve 5th gear and then step in to command a 5th to 4th gear downshift.
7. Repeat steps 2 to 4 at higher speed to achieve 6th gear and then step in to command a 6th gear to 5th gear downshift.
8. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

MANUAL DOWNSHIFTS

Manual downshift testing is not required since all vehicles equipped are also equipped with some form of Driver Shift Control(DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

Coasting Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 6th gear with the TCC applied.
3. Release the throttle and apply the brakes
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

MANUAL GEAR RANGE SELECTION

This application does not utilize manual forward gear ranges.

Reverse

Perform the following test using a 10-15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will upshift automatically when maximum engine speed is achieved and will protect from any downshift which may cause excessive engine RPMs.

TORQUE CONVERTER DIAGNOSIS

TORQUE CONVERTER STATOR

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

POOR ACCELERATION AT LOW SPEED - STATOR ROLLER CLUTCH FREEWHEELS AT ALL TIMES

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48-55 km/h (30-34 mph). At speeds above 48-55 km/h (30-34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

POOR ACCELERATION AT HIGH SPEED - STATOR ROLLER CLUTCH IS LOCKED UP AT ALL TIMES

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48-55 km/h (30-34 mph). Visual examination of the converter may reveal a blue color from overheating.

TORQUE CONVERTER BEARING NOISE

NOTE: Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.

CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.

3. Depress the accelerator to approximately 1,200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

TORQUE CONVERTER CLUTCH

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

TORQUE CONVERTER CLUTCH SHUDDER

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release, or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

IF SHUDDER OCCURS DURING TCC APPLY, RELEASE, AND ECCC

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

IF SHUDDER OCCURS AFTER TCC HAS LOCKED

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

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

TORQUE CONVERTER VIBRATION TEST

NOTE: **The Noise and Vibration Analysis procedure should be performed prior to performing this test.**

INDEXING TORQUE CONVERTER

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.

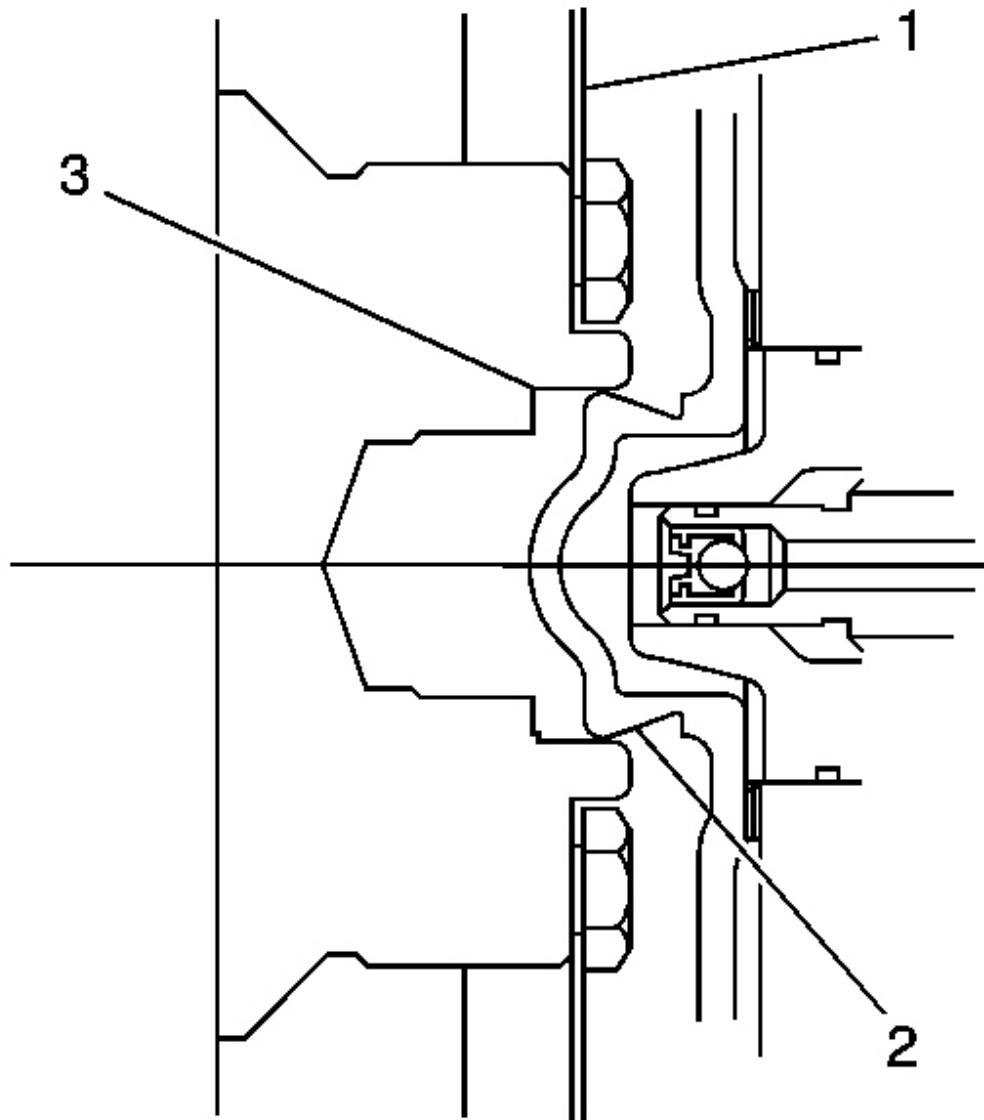


Fig. 7: View Of Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS CORP.

CAUTION: When installing the torque converter to the flexplate, make sure to use specified bolts. DO NOT use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.

CAUTION: Refer to Fastener Caution .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to **Fastener Tightening Specifications** .
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

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

Torque Converter Replacement Guide

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to <u>Transmission Fluid Level and Condition Check</u> .
Transmission Fluid Contaminated with Metal Particles	NOTE: Do not replace the torque converter for clutch system or gearset component damage. Fine metallic debris or clutch plate material that is suspended in the fluid will not cause damage to the internal torque converter components nor any internal transmission components.
Harsh Gear Shifts	Do not replace the torque converter. Refer to <u>Symptoms - Automatic Transmission</u> .
Noise-Whine	• Refer to <u>Symptoms - Automatic Transmission</u>. • Do not replace the torque converter if noise is present in Neutral/Park. Refer to <u>Symptoms - Engine Mechanical</u> .
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 <u>Symptoms - Engine Controls</u>
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 <u>Symptoms - Engine Controls</u> .
DTC P0741-TCC Stuck OFF/High Slip-Intermittent	Do not replace the torque converter.

Only	Refer to <u>DTC P0741 or P0742</u> diagnostic table.
DTC P0741-TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to <u>DTC P0741 or P0742</u> diagnostic table.
DTC P0742-TCC Stuck ON	Do not replace the torque converter. Refer to <u>DTC P0741 or P0742</u> 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 <u>Symptoms - Engine Controls</u> .
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 <u>Symptoms - Engine Controls</u> .
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to <u>Lower Engine Noise, Regardless of Engine Speed</u> .
Torque Converter Pilot Damaged	Replace the torque converter.
Torque Converter Hub surface is damaged - scored, raised/transferred metal.	Replace the torque converter.
External Leaks in the weld areas - hub, lug or closure weld.	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

CLUTCH PLATE DIAGNOSIS

COMPOSITION PLATES

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Delamination-splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

STEEL PLATES

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

CAUSES OF BURNED CLUTCH PLATES

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
 - The valve body face is not flat.
 - Porosity in between channels.
 - The valve train retainers are improperly installed.
 - The checkballs are misplaced.
 - Malfunctioning valves.
- The Teflon® seal rings are worn or damaged.

ENGINE COOLANT/WATER IN TRANSMISSION

CAUTION: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts - washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to **Transmission Fluid Cooler Flushing and Flow Test**.

FLUID LEAK DIAGNOSIS

GENERAL METHOD

1. Verify that the leak is transmission fluid.

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

2. Thoroughly clean the suspected leak area using a rag.

NOTE: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15-20 minutes under city driving conditions until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

POWDER METHOD

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type leak tracing powder to the suspected leak area.

NOTE: **Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.**

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

DYE AND BLACK LIGHT METHOD

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

FIND THE CAUSE OF THE LEAK

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high

- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

POSSIBLE POINTS OF FLUID LEAKS

Transmission Valve Body Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

Case Leak

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

Leak at the Torque Converter End

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous

- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

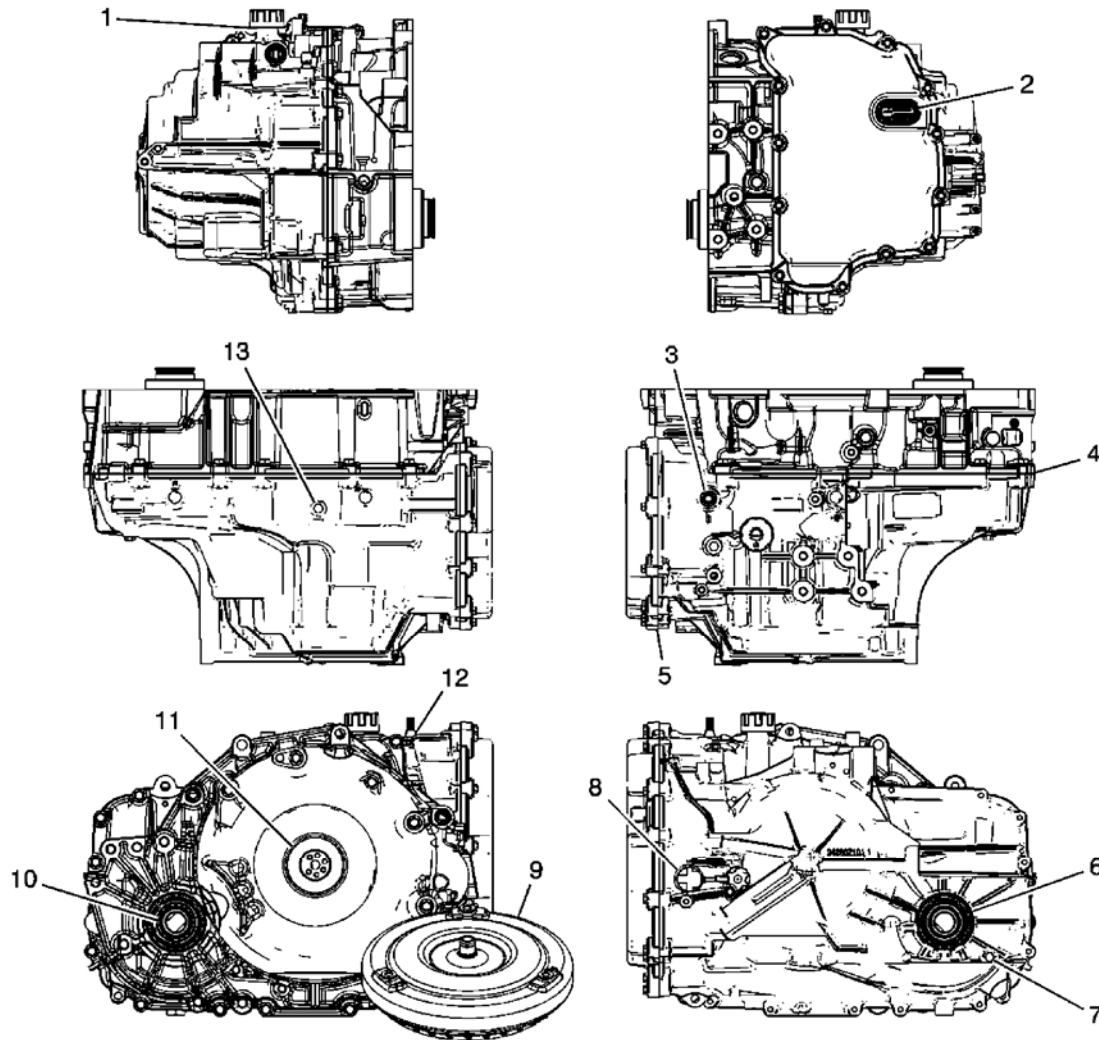


Fig. 8: Identifying Leak Inspection Points
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Fill Cap Seal
2	Control Valve Body Cover Hole Seal
3	Line Pressure Tap Plug
4	Converter Housing to Case Joint
5	Control Valve Body Cover Gasket
6	Drive Shaft Oil Seal Assembly
7	Oil Level Plug

8	A/Trans Input Speed Sensor Assembly O-Ring Seal
9	Torque Converter Assembly
10	Front Wheel Drive Shaft Oil Seal Assembly
11	Torque Converter Fluid Seal Assembly
12	Manual Shift Shaft Seal
13	Drain Plug

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

WARNING: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. Apply the epoxy. A clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before assembling the components.
5. Repeat the fluid leak diagnosis procedures.

TRANSMISSION FLUID COOLER FLUSHING AND FLOW TEST

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission failure. Many repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

NOTE: Use the J-45096: Flush and Flow Test Tool or equivalent to flush and flow test the transmission oil cooler and the oil cooler pipes after the transaxle is removed for repairs.

Only GM Goodwrench DEXRON®VI automatic transmission fluid should be used when doing a repair on a GM transmission.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing and flow testing are as follows:

COOLER FLOW CHECK AND FLUSHING STEPS

1. Machine Set-up
2. Determine Minimum Flow Rate
3. Back Flush
4. Forward Flush
5. Flow Test
6. Code Recording Procedure
7. Clean-up

Special Tools

- **J-45096:** Transmission Oil Cooling System Flush and Flow Test Tool
- **J-45096-50:** Transmission Cooler Flush Adapter
- Shop air supply with water/oil filters, regulator and pressure gauge - minimum 90 psi
- Eye protection
- Rubber gloves

MACHINE SET-UP

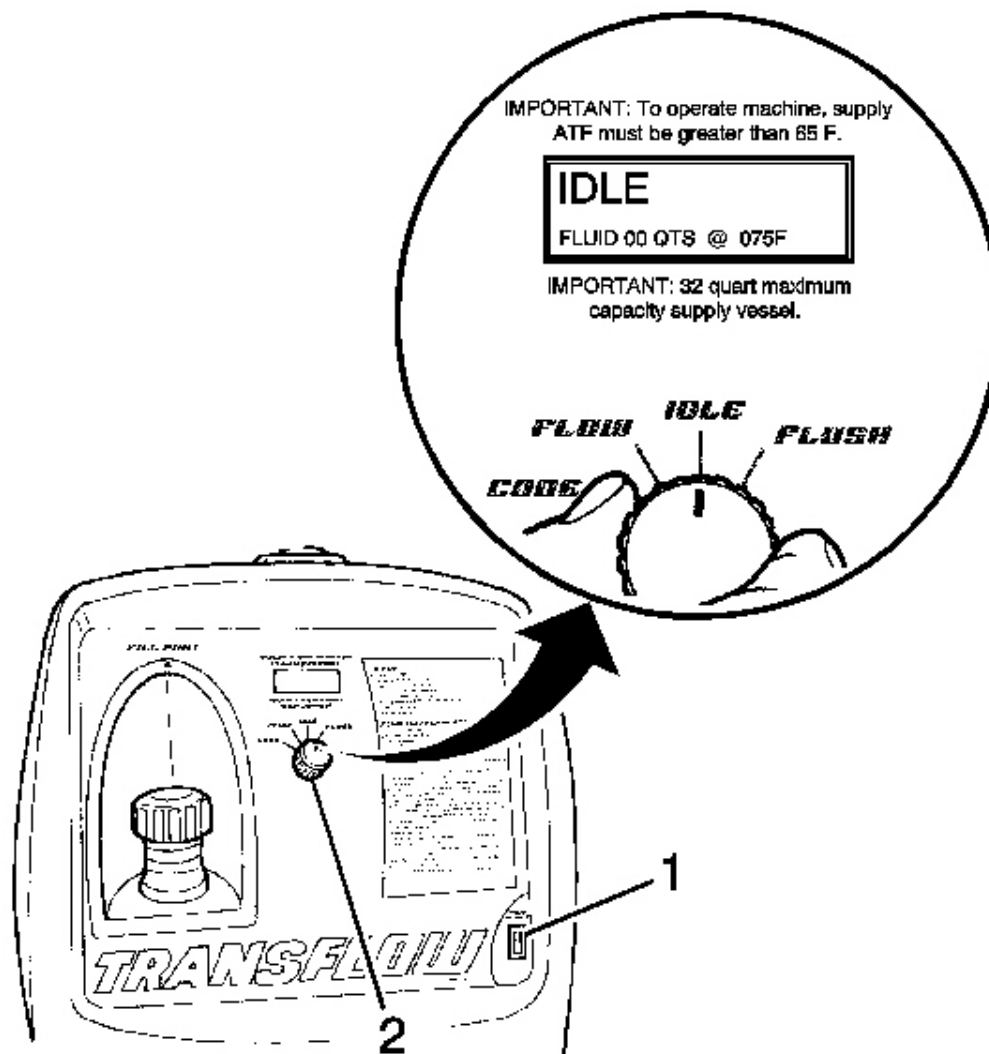


Fig. 9: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.

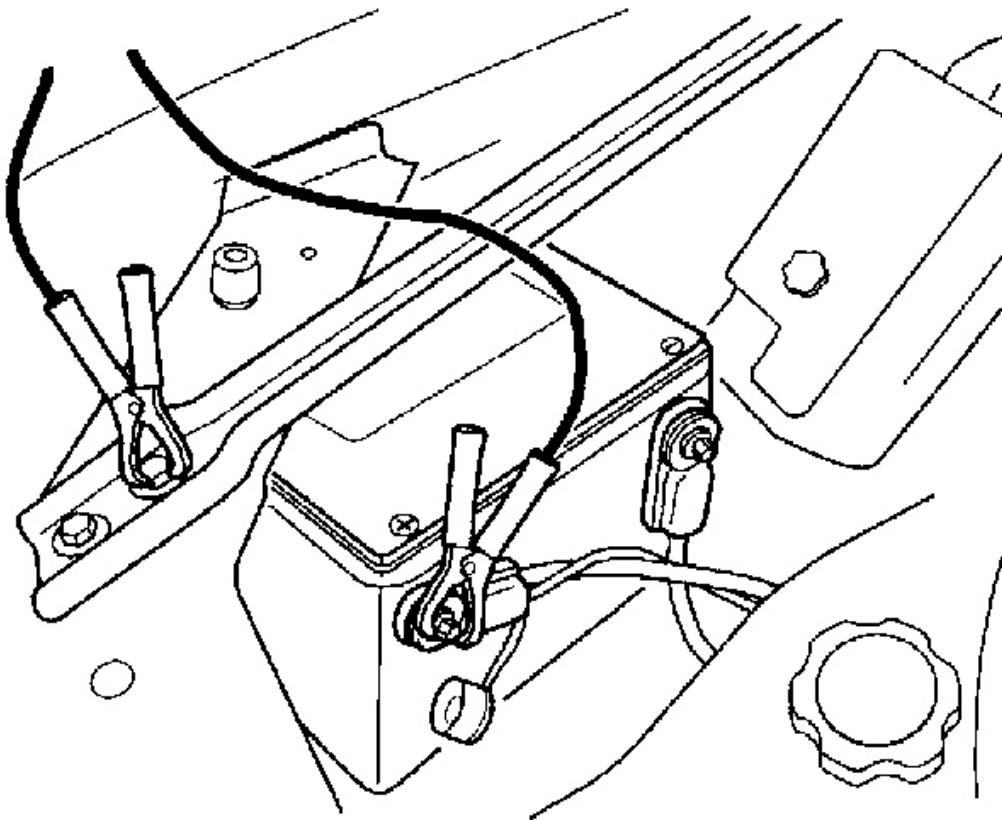


Fig. 10: Connecting To 12V DC Power Source
Courtesy of GENERAL MOTORS CORP.

3. Connect **J-45096**: tool to the vehicle 12V DC power source by connecting the red battery clip to the positive, +, battery post on the vehicle and connect the negative lead to a known good chassis ground.
4. Turn the main power switch to the ON position.

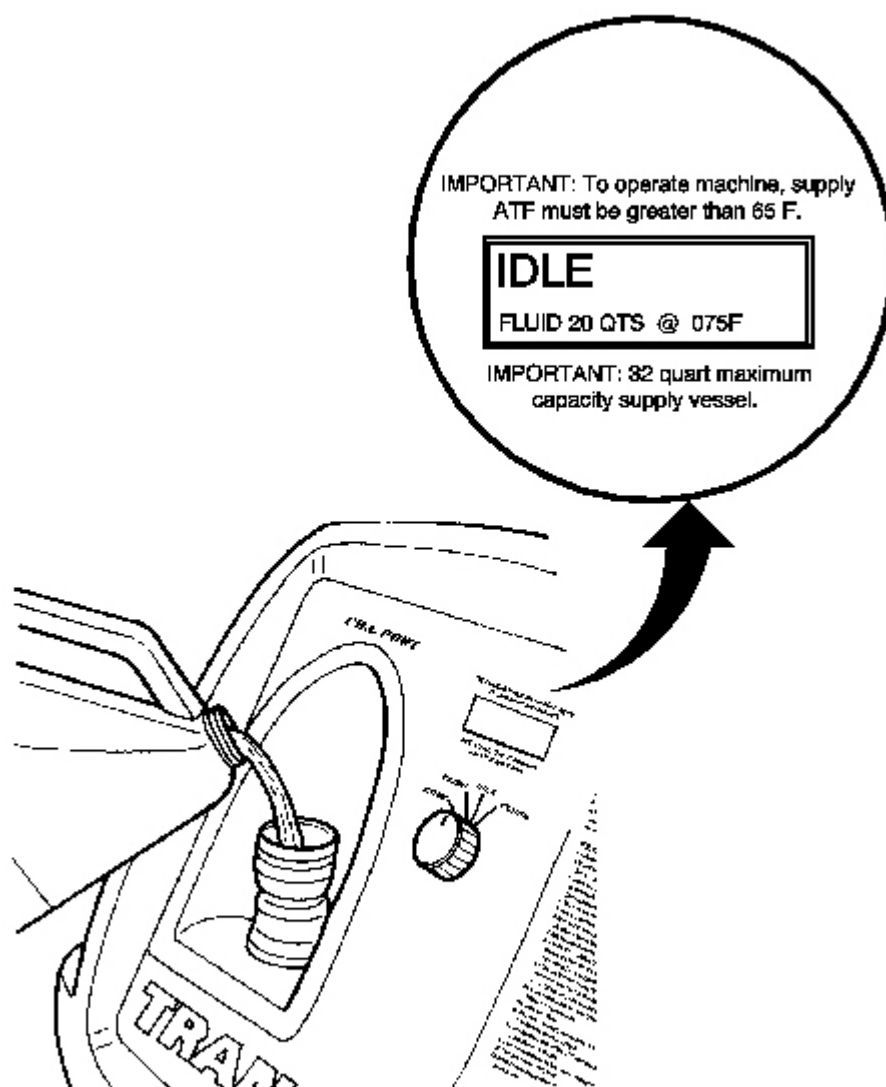


Fig. 11: Filling Supply Tank With Transmission Fluid
Courtesy of GENERAL MOTORS CORP.

CAUTION: Do not overfill the supply vessel. Damage to the unit may result. To verify the fluid level, view the LCD screen display while filling the unit, to ensure the fluid level does not exceed 30 L (32 qt).

5. Fill the supply tank with Dexron®VI through the fill port.
6. Reinstall and tighten the fill cap.

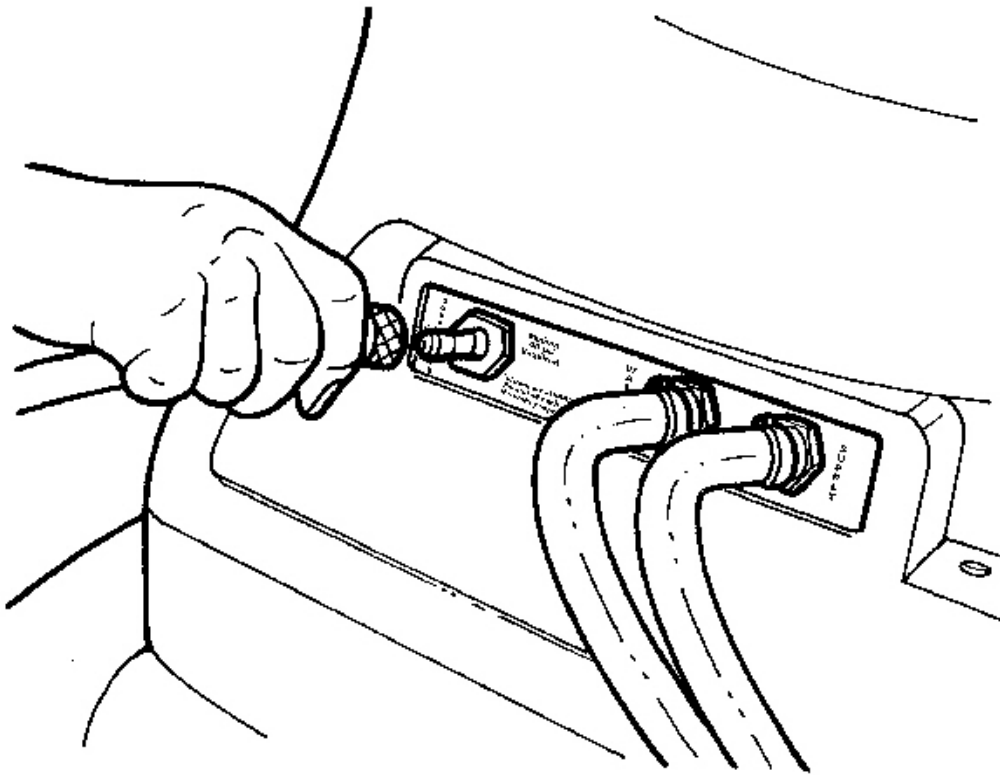


Fig. 12: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

DETERMINE MINIMUM FLOW RATE

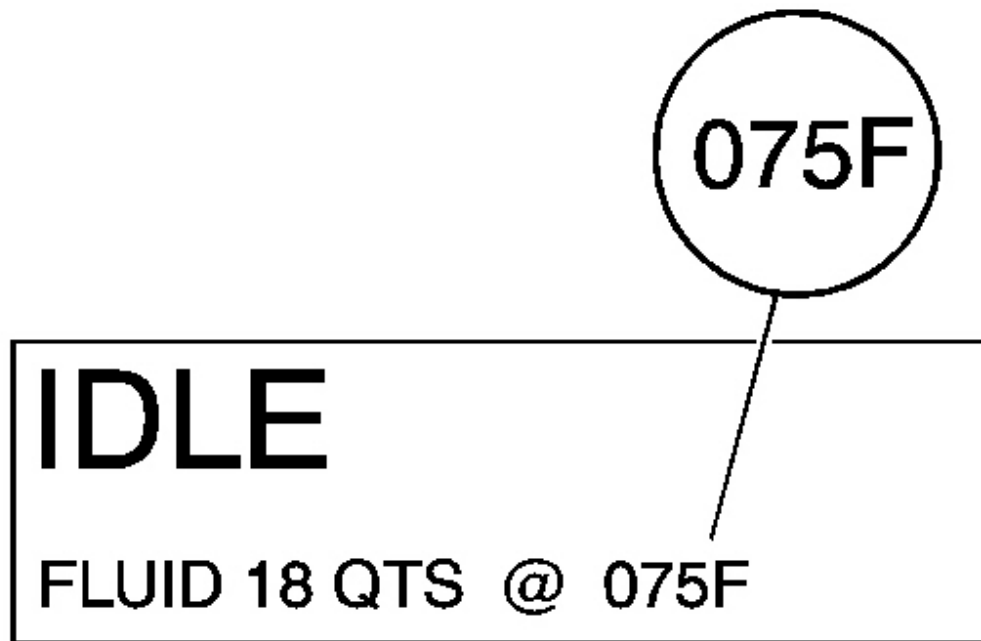


Fig. 13: Identifying Machine Display Of Automatic Transmission Fluid Temperature
Courtesy of GENERAL MOTORS CORP.

1. From the machine display, identify the temperature of the automatic transmission fluid that is stored in the supply vessel of **J-45096**: tool.

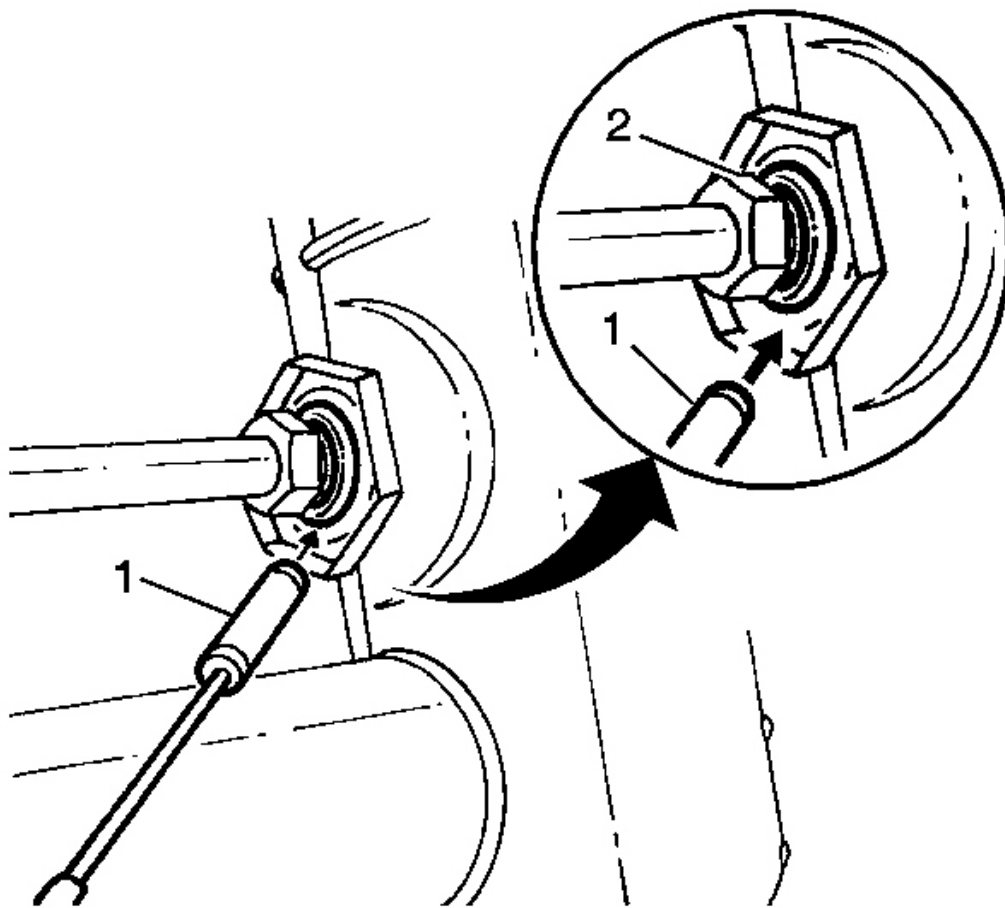


Fig. 14: Identifying Transmission Oil Cooler Metal Composition
Courtesy of GENERAL MOTORS CORP.

2. Determine whether the transmission oil cooler is steel or aluminum by using a magnet (1) at the cooler flange (2) at the radiator.
3. Refer to the table below. Using the temperature from step 1, locate on either the Steel MINIMUM Flow Rate table or the Aluminum MINIMUM Flow Rate table the minimum flow rate in gallons per minutes (GPM). Record the minimum flow rate in GPMs and the supply fluid temperature for further reference.

Example

- Fluid temperature: 75°F
- Cooler type: Steel

The MINIMUM flow rate for this example would be 0.8 GPM.

4. Inspect transmission oil cooler lines for damage or kinks that could cause restricted oil flow. Repair as needed and refer to the appropriate GM service manual procedures.

Minimum Flow Rate in Gallons Per Minute (gpm)

Temperature Range	Steel	Aluminum
65-66°F	0.6 gpm	0.5 gpm
67-70°F	0.7 gpm	0.6 gpm
71-75°F	0.8 gpm	0.7 gpm
76-80°F	0.9 gpm	0.8 gpm
81-84°F	1.0 gpm	0.9 gpm
85-89°F	1.1 gpm	1.0 gpm
90-94°F	1.2 gpm	1.1 gpm
95-98°F	1.3 gpm	1.2 gpm
99-103°F	1.4 gpm	1.3 gpm
104-108°F	1.5 gpm	1.4 gpm
109-112°F	1.6 gpm	1.5 gpm
113-117°F	1.7 gpm	1.6 gpm
118-120°F	1.8 gpm	1.7 gpm

BACK FLUSH PROCEDURE

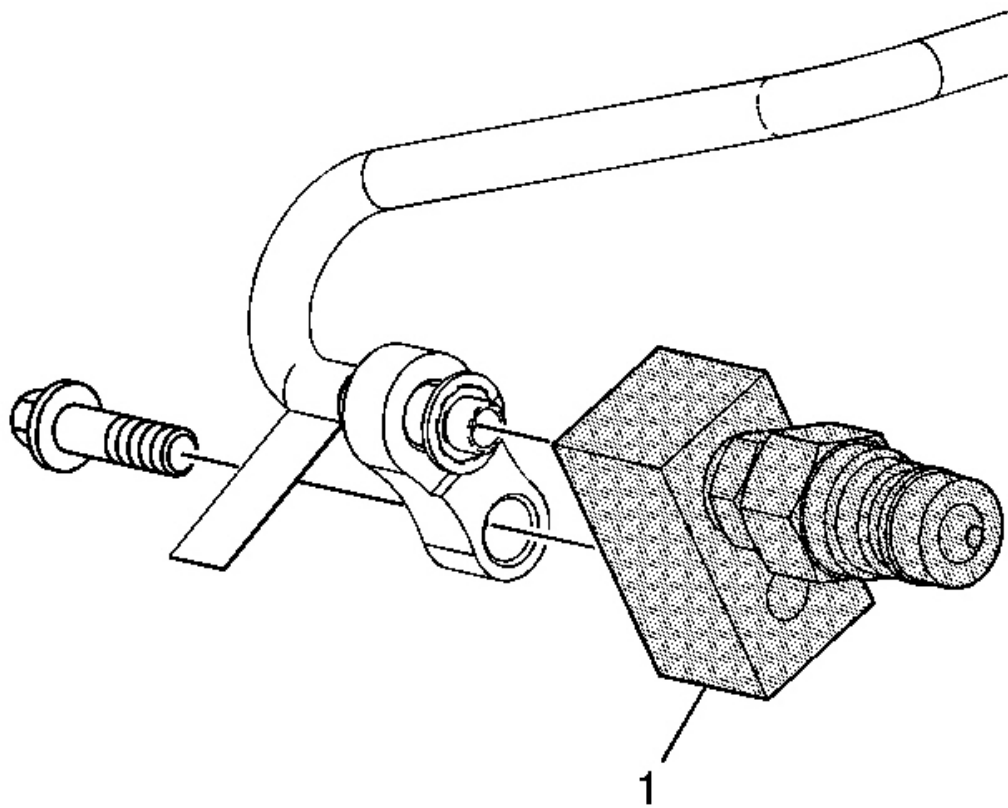


Fig. 15: Identifying Cooler Flush Adapter
Courtesy of GENERAL MOTORS CORP.

1. Connect the **J-45096-50: Cooler Flush Adapter (1)** to the vehicle transmission oil cooler supply and return lines at the transmission.

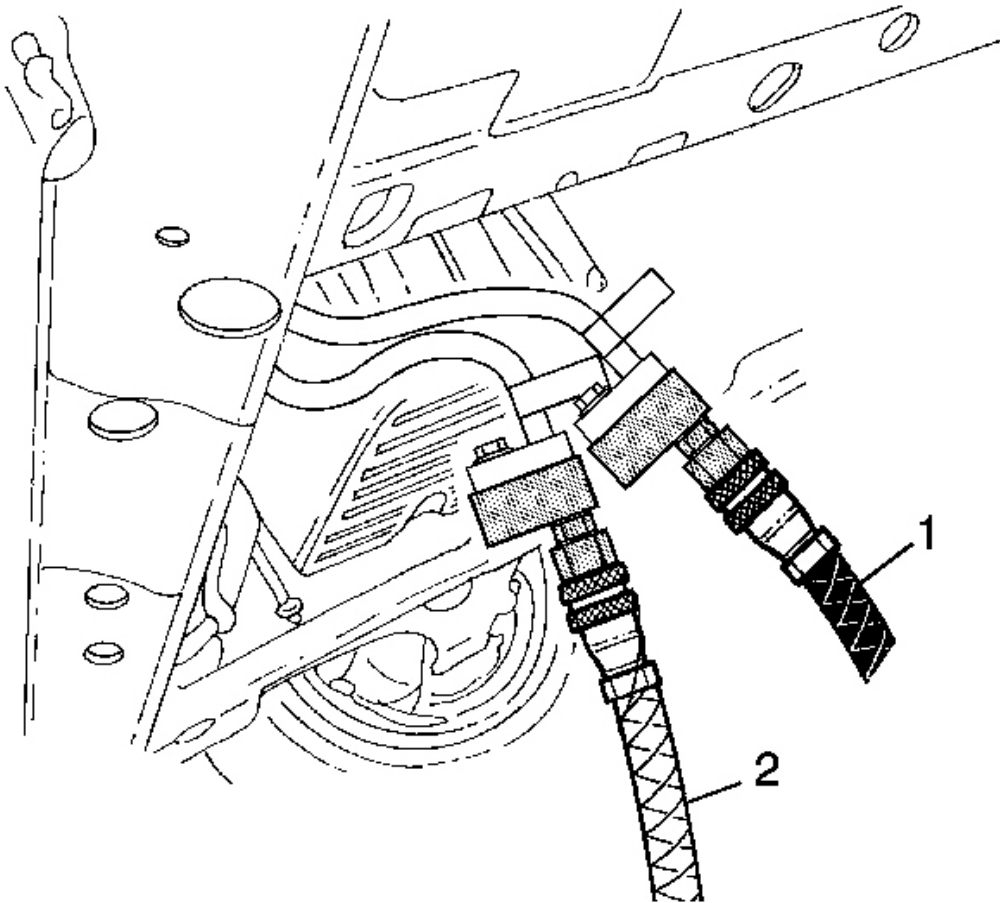


Fig. 16: View Of Black Supply Hose & Clear Waste Hose
Courtesy of GENERAL MOTORS CORP.

2. Connect the black supply hose (1) to the return line, top connector of the transmission, and the clear waste hose (2) to the feed line, bottom connector of the transmission, to the vehicle cooler lines. This is the reverse flow - backflush direction.

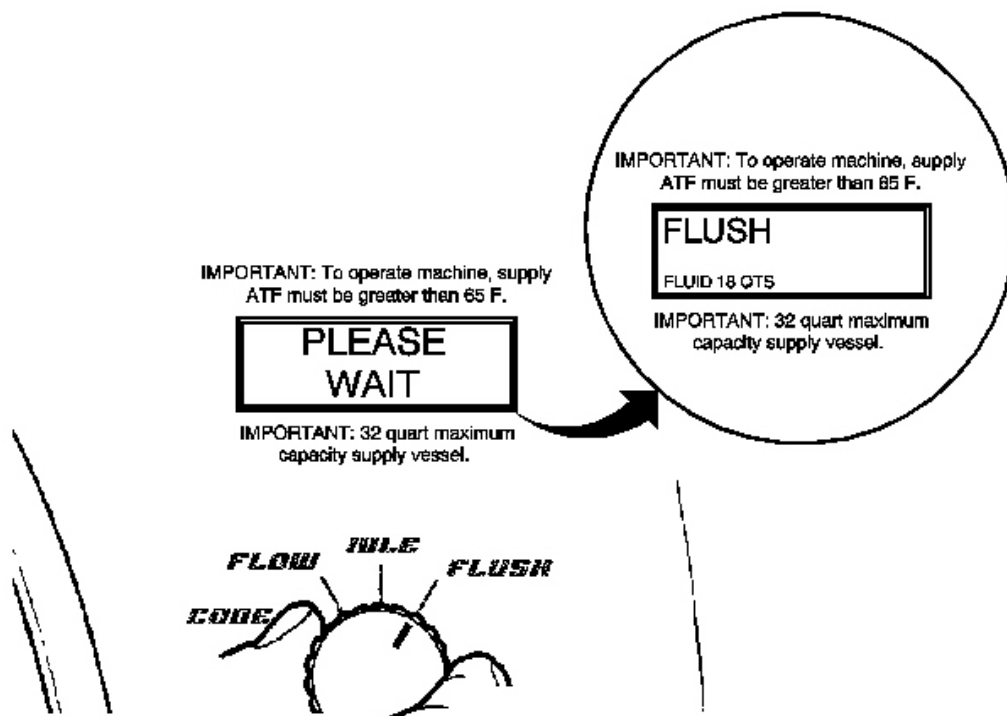


Fig. 17: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

3. Turn the main function switch to the FLUSH position. Allow the machine to operate for 30 seconds.

IMPORTANT: To operate machine, supply
ATF must be greater than 65 F.

IDLE

FLUID 16 QTS @ 075F

IMPORTANT: 32 quart maximum
capacity supply vessel.

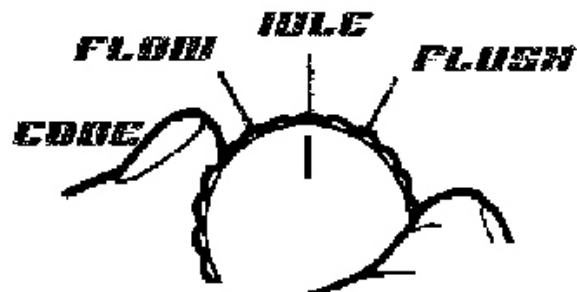


Fig. 18: Setting Main Function Switch To IDLE Position
Courtesy of GENERAL MOTORS CORP.

4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

FORWARD FLUSH

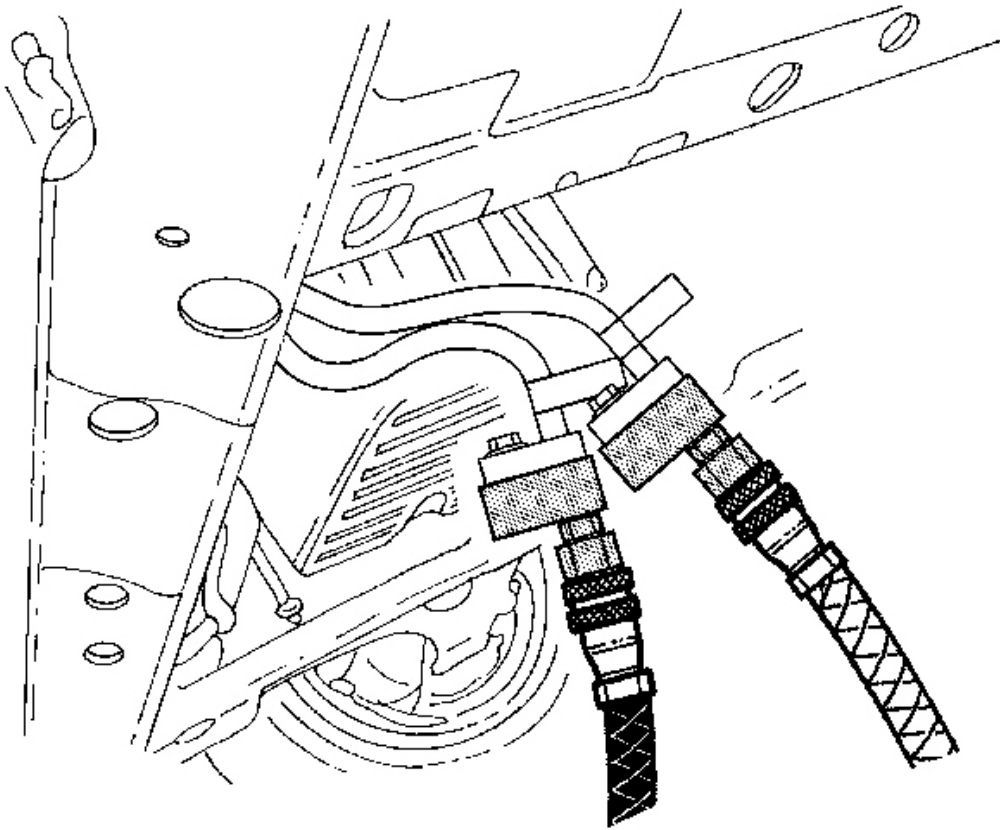


Fig. 19: View Of Supply & Waste Hoses
Courtesy of GENERAL MOTORS CORP.

1. Disconnect the supply and waste hoses from the vehicle cooler lines. Reverse the supply and waste hoses to provide a normal flow direction.

IMPORTANT: To operate machine, supply
ATF must be greater than 65 F.

FLUSH

FLUID 18 QTS

IMPORTANT: 32 quart maximum
capacity supply vessel.

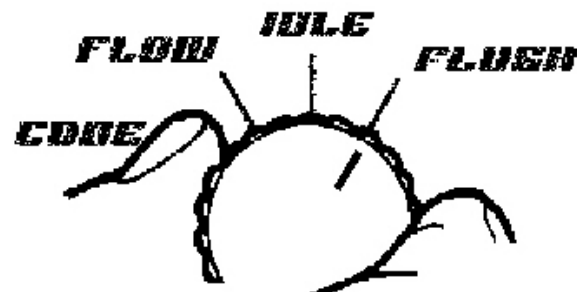


Fig. 20: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

FLOW TEST

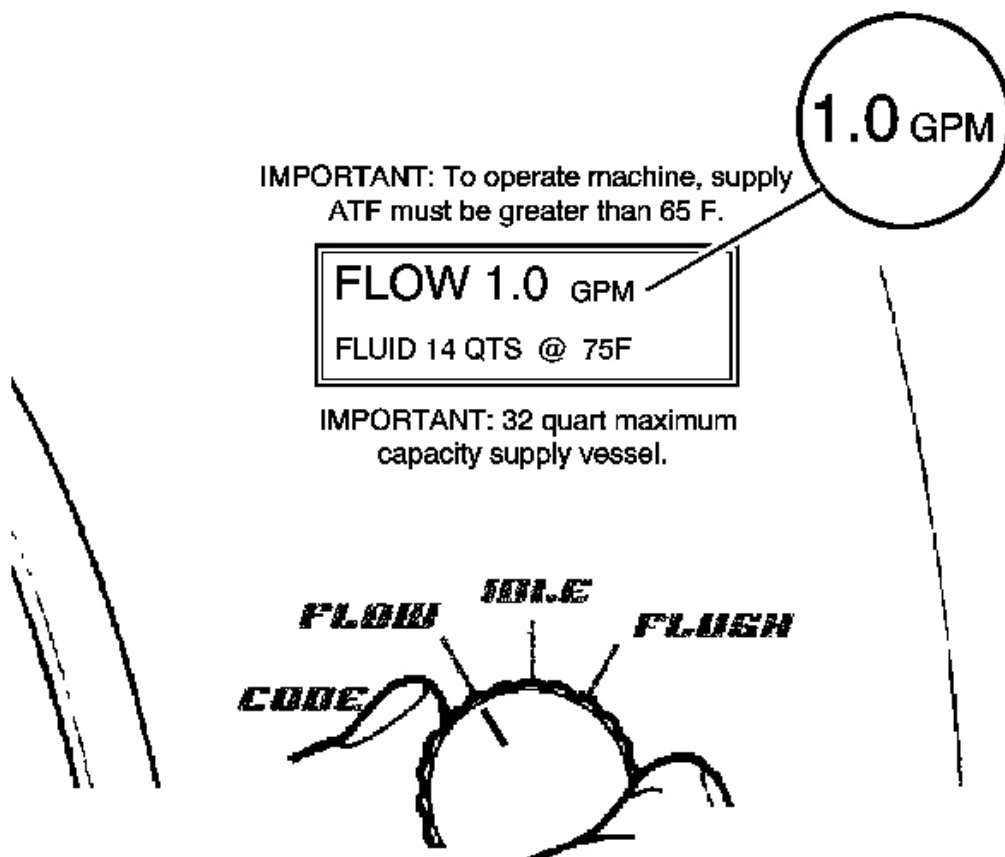


Fig. 21: Setting Main Function Switch To FLOW Position
Courtesy of GENERAL MOTORS CORP.

NOTE: If the flow rate is less than 0.5 gpm, the LCD displays an error message. Refer to the Troubleshooting section of the operation manual.

1. Turn the main function switch to the FLOW position and allow the oil to flow for 15 seconds. Observe and note the flow rate; this is the TESTED flow rate.
2. Compare the TESTED flow rate to the MINIMUM flow rate information previously recorded.
 - If the TESTED flow rate is equal to or greater than the MINIMUM flow rate recorded, the oil cooling system is functioning properly. Perform code recording procedure.
 - If the TESTED flow rate is less than the MINIMUM flow rate previously recorded, repeat the back flush and forward flush procedures.
3. If the TESTED flow rate is less than the MINIMUM flow rate after the second test, perform code recording procedure.

1. Replace the transmission oil cooler.
2. Reconnect supply and waste hoses to the cooler lines in the normal flow direction. Perform flow test.
3. Perform code recording procedure.

CODE RECORDING PROCEDURE

IMPORTANT: To operate machine, supply
ATF must be greater than 65 F.

FLOW 1.0 @ 75F CYCLE 6

A10DFB2

IMPORTANT: 32 quart maximum
capacity supply vessel.



Fig. 22: Setting Main Function Switch To CODE Position
Courtesy of GENERAL MOTORS CORP.

1. Turn the main function switch to the CODE position.

NOTE:

- If power is interrupted prior to the recording of the seven-character code, the code will be lost and the flow rate test will need to be repeated.
- The flow test must run for a minimum of 8-10 seconds and be above 0.5 GPM for a code to be generated.

2. Record TESTED flow rate, temperature, cycle and seven-character flow code information on repair order.

CLEAN-UP

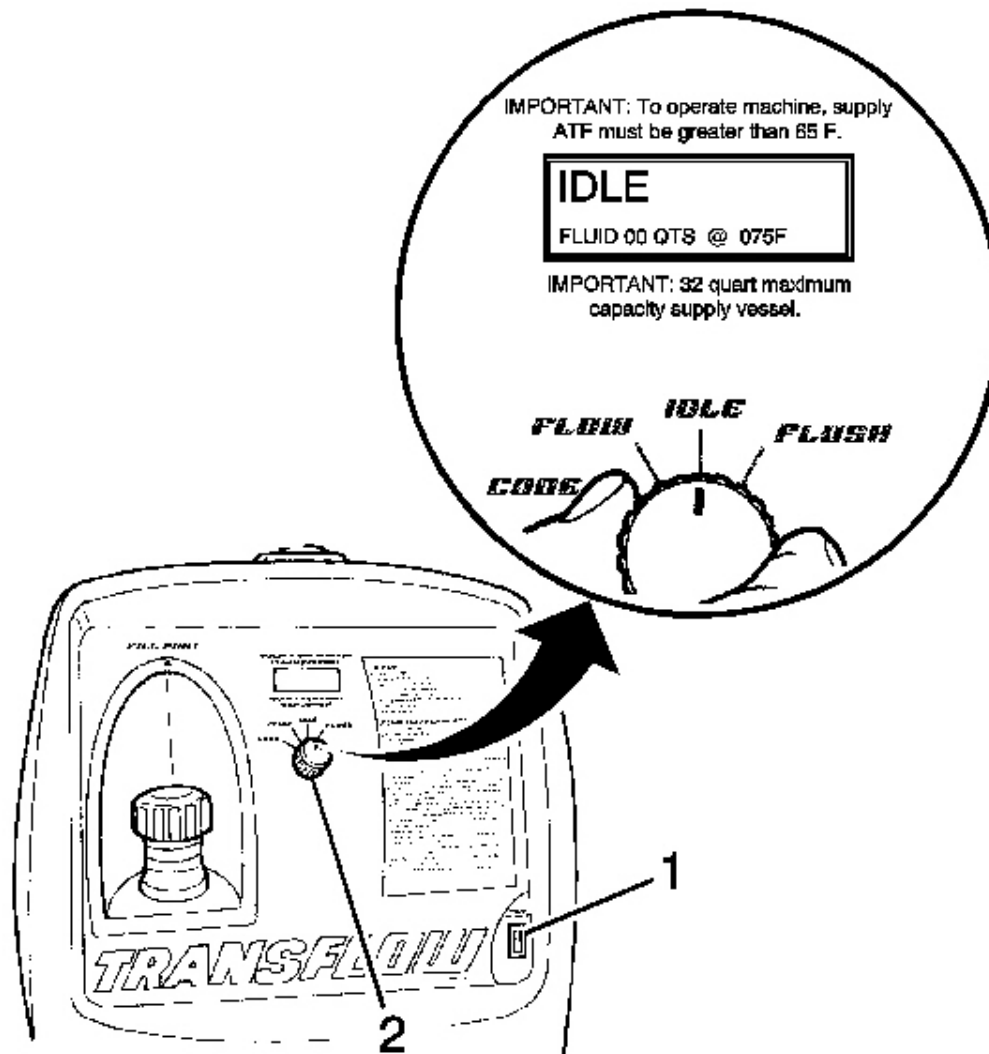


Fig. 23: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

1. Turn the main function switch (2) to the IDLE position and allow the supply vessel pressure to dissipate.
2. Turn the main power switch (1) to the OFF position.

NOTE: A small amount of water may drain from the bottom of the unit when the air supply is disconnected. This is a normal operation of the built-in water separator.

3. Disconnect the supply and waste hoses and the 12-volt power source from the vehicle.

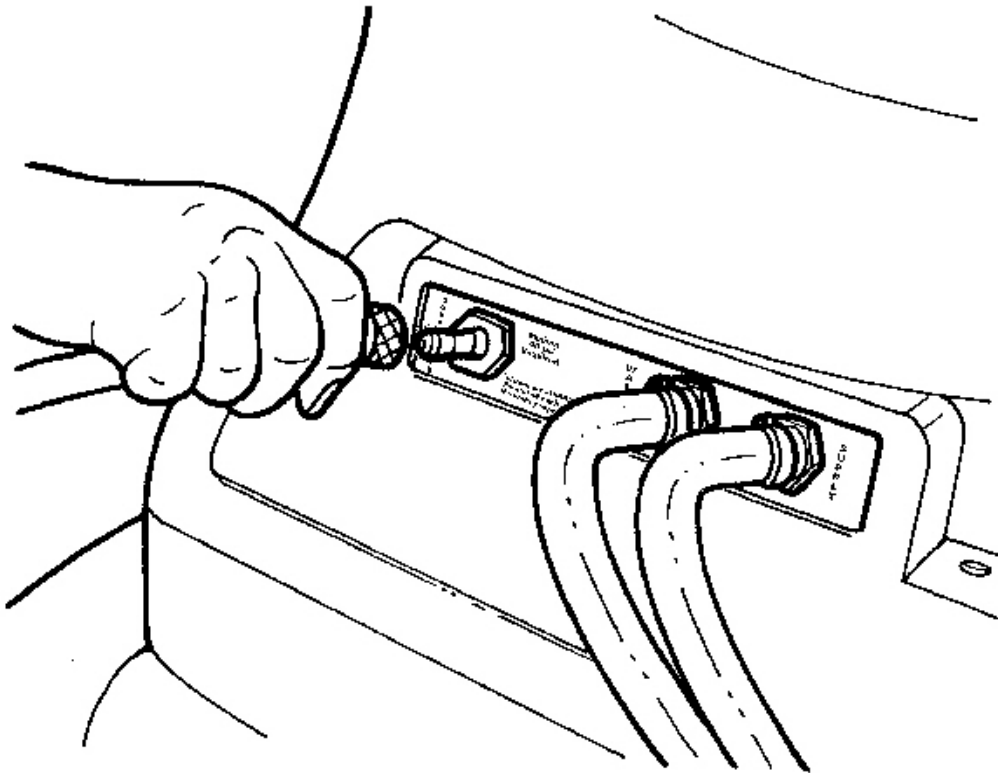


Fig. 24: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the air supply hose from J-45096: tool.
5. Dispose of the waste ATF in accordance with all applicable federal, state, and local requirements.

BUSHING AND MATING SHAFT INSPECTION

NOTE: Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

NOISE AND VIBRATION ANALYSIS

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the vibration may be a result of poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
 - Missing bolts, nuts, and studs
 - Stripped threads
 - Cracks
- Inspect the flywheel for the following conditions:
 - Missing or loose bolts
 - Cracks
 - Imbalance
- Inspect the torque converter for the following conditions:
 - Missing or loose bolts or lugs
 - Missing or loose balance weights
 - Imbalance caused by heat distortion or fluid contamination
- If the noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is more noticeable as RPM increases, the vibration may be an engine imbalance or a transmission imbalance.

Refer to **Torque Converter Diagnosis.**

WHINE/GROWL NOISE

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

	• Inspect for loose or broken Output Internal Gear Retainer • Inspect for loose or worn Sun Gear Thrust Bearings (569, 572)
Output Carrier Assembly (574)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose Hub and Ring Gear
Output Sun Gear Assembly (555)	• Inspect for worn or damaged Output Sun Gear Thrust Bearing (556) • Inspect for loose, worn or damaged Output Sun Gear bushing • Inspect for worn or damaged Output Sun Gear teeth
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)
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	• Inspect for stripped or sheared Low and Reverse Clutch Assembly (543) splines

(OWC) (543)	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
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
Case Assembly (50)	• Inspect for cracked or broken Case (50) • Inspect for porosity or damage on the sealing surfaces • Inspect for loose Oil Cooler Line Bolts or damaged Oil Cooler Line Seals • Inspect for damaged Manual Shift Shaft Seal (604) • Inspect for damaged or worn Axle Seal (65) or Axle Seal Slinger on the axle shafts • Inspect for plugged Vent Cap (52) • Inspect for loose Pressure Test Plug (51), Drain Plug (64) and Fluid Level Plug (63) • Inspect for damaged Park Pawl Actuator Guide Seal (605) • Inspect for damaged or worn Input Speed Sensor Seals (19)
Torque Converter Housing Assembly (208)	• Inspect for damaged Torque Converter Housing Assembly (208) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Seal (23) • Inspect for damaged or worn Torque Converter Fluid Seal (301) • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for damaged or worn Axle Seal (209) or Axle Seal Slings on the axle shafts • Inspect for loose, missing or damaged Fluid Fill Tube Plug Assembly (27) • Inspect for damaged Torque Converter and Differential Housing Seal (202)
Valve Body Cover Assembly (2)	• Inspect for damaged or warped Valve Body Cover Assembly (2) • Inspect for damaged or improperly installed Valve Body Cover Gasket (3)

	• Inspect for loose Valve Body Cover Bolts (1) • Inspect for damaged or improperly installed Wire Connector Hole Seal (5)
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SHIFT INDICATOR INDICATES WRONG GEAR SELECTION

Checks	Causes
Shift Cable	• Inspect for damage. • Verify proper attachment to shifter. • Verify cable is locked into shifter bracket. • Verify cable is properly attached to the transmission. • Verify that the cable is locked into the transmission bracket.
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 <u>Transmission Internal Mode Switch Logic</u> .

NO PARK

Checks	Causes
Differential Carrier Assembly (232)	• Inspect for damaged or broken Front Differential Assembly (232). • Inspect for damaged or broken Front Differential Side Gear or Pinion Gear. • Inspect for damaged or broken Front Differential Pinion Gear Shaft. • Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin. • Inspect for worn, stripped or sheared Front Differential Side Gear splines. • Inspect for damaged or broken Final Drive Sun, Pinion or Ring Gear. • Inspect for worn, stripped or sheared Final Drive Sun Gear splines.
Output Carrier Transfer Drive Gear Hub Assembly (222)	• Inspect for broken Drive Gear Hub (222). • Inspect for worn, stripped or sheared Drive Gear hub (222) splines. • Inspect for disengaged or broken Park Gear Retainer Ring (220).

	• Inspect for damaged or broken park Gear (221). • Inspect for disengaged or broken Drive Sprocket Retainer Ring (227).
Drive Link Assembly (225)	• Inspect for broken, worn or damaged Drive Link Assembly (225). • Inspect for broken, worn or damaged Drive Sprocket (224). • Inspect for broken, worn or damaged Driven Sprocket Assembly (229). • Inspect for worn, stripped or sheared Driven Sprocket splines. • Inspect for broken Drive Gear Hub (222).
Case Assembly (50)	• Inspect for broken or damaged Case. • Inspect for broken or bent Park Pawl Shaft (600). • Inspect for broken or missing Park Pawl Actuator Guide Pin (603) or Manual Shaft Pin (611). • Inspect for broken or missing Manual Shaft Detent Lever Pin (610). • Inspect for broken or missing Manual Shift Shaft Pin (611). • Inspect for damaged or broken Manual Shift Detent Lever Shaft (608). • Inspect for loose, damaged or broken Detent Lever Spring Assembly (17). • Inspect for broken, 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 <u>Clutch Plate Diagnosis</u>. • Inspect for stripped or sheared splines on 1-2-3-4 Clutch Plate (546). Refer to <u>Clutch Plate Diagnosis</u>. • 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
Case Assembly (50)	• Inspect for cracked or broken Case (50). • Inspect for stripped or sheared splines. • Inspect for binding Manual Shift Detent Lever Assembly (609). • Inspect for missing Manual Shift Shaft Pin (611). • Inspect for missing Manual Shaft Lever Pin (610). • Inspect for interference or binding Park Pawl Actuator Assembly (607). • Inspect for broken or disengaged 1-2-3-4 Clutch Backing Plate Retainer Ring (561). • Inspect for loose or damaged case bushing. • Inspect A/Trans Fluid Pump Seal Assembly (25) for damage.
Torque Converter (28)	• Inspect for stripped or sheared splines on Turbine Shaft. • Inspect for missing Torque Converter to Flywheel bolts. • Inspect for damaged or disengaged Torque Converter Hub to Oil Pump Drive Gear.
Torque Converter Housing (208)	• Inspect for stripped or sheared Differential Ring Gear splines. • Inspect for broken or disengaged Differential Ring Gear Retainer (206). • Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (26). • Inspect for loose, missing or broken Fluid Pump bolts (200).
35R/456 Housing Assembly (516)	• Inspect for damaged or broken Input Shaft Thrust Bearing Assembly (538). • Inspect for stripped or sheared splines on the Input Shaft to the 3-5 Reverse/4-5-6 Clutch Housing (516).
Oil Pump Assembly (201)	• Inspect for fluid leaks / improper fluid level. • Inspect for leaking Fluid Outlet Seal Assembly (24). • Inspect for loose or missing Oil Pump Bolts (200). • Inspect for damaged, restricted or improperly installed Oil Filter Assembly (203). • Inspect for damaged or leaking Oil Filter Neck Seal. • Inspect for broken or seized Fluid Pump Drive Gear (315) and Fluid Pump Driven Gear (316).
Low & Reverse Clutch Assembly (543)	Inspect for stripped or sheared splines to the Reaction Carrier (567).

Input Carrier Assembly (570)	• Inspect for stripped or sheared castle splines to ring gear. • Inspect for improperly installed carrier pinion gear pins. • Inspect for damaged or broken Pinion Gears. • Inspect for stripped or sheared splines on the Input Sun Gear (571). • Inspect for damaged or broken Output Internal Gear. • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing Assembly (568) and Output Carrier Thrust Bearing Assembly (573). • 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).
	• Inspect for broken, worn or damaged Drive Link Assembly (225).

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).

NO FIRST AND REVERSE GEARS

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

NO FIRST, SECOND, THIRD, AND FOURTH GEAR

Checks	Causes
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)	1. Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67). 2. Inspect for worn or damaged case splines or retainer ring grooves.
Input Sun Gear (571)	Inspect for damaged gear teeth and damaged splines.
Turbine Shaft (517)	Inspect for damaged splines to the Input Shaft Sun Gear.
Control Valve Body Assembly	Inspect 1-2-3-4 Clutch Regulator Valve (417) and 1-2-3-4 Clutch Boost Valve (414) for debris and stickyness.
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> .

NO SECOND AND SIXTH GEAR

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Checks	Causes
2-6 Clutch Assembly	• Inspect for damaged or worn 2-6 Clutch Plates (540-542). • Inspect for damaged, worn, broken, improper surface finish or sheared splines on the Low-Reverse Clutch Assembly (543). • Inspect for damaged or broken 2-6 Clutch Piston (535) and piston seals damaged, worn or delaminating. • Inspect for broken or binding 2-6 clutch Piston Return Spring (536).
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared splines on the Input Ring Gear. • Inspect for disengaged or broken Input Ring Gear Retainer.
Reaction Sun Gear Assembly (566)	• Inspect for damaged or broken Reaction Sun Gear Assembly hub. • Inspect for damaged or broken sun gear weld. • Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Case Assembly (50)	• Inspect for stripped or sheared splines. • Inspect for broken or disengaged 2-6 Clutch Piston Return Spring Retainer (537). • Inspect for damaged, worn, or improper surface finish in the piston bore.
Output Carrier Assembly (574)	Inspect for reaction ring gear damage or missing ring gear snap ring.
Control Valve Body Assembly	Inspect 2-6 Clutch Regulator Valve (419) for debris and stickyness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check 2-6 PC Solenoid 4 for proper operation. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u> .

HARSH OR LATE FIRST, SECOND, THIRD, AND FOURTH SHIFT

Checks	Causes
Low-Reverse and 1-2-3-4 Clutch Housing (551)	• Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and piston seals damaged, worn or leaking. • Inspect for fatigued or binding 1-2-3-4 Clutch Piston Return Spring (553). • Inspect for improper surface finish on 1-2-3-4 Clutch Plates (557-559). Refer to <u>Clutch Plate Diagnosis</u>. • 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
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
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 stickyness.
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
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)
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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 <u>Torque Converter Diagnosis</u>.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Inspection</u> .
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 <u>Torque Converter Diagnosis</u> .
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

HARSH TORQUE CONVERTER CLUTCH APPLY, OR INOPERATIVE OR NO ELECTRONICALLY CONTROLLED CAPACITY CLUTCH CONTROL

Checks	Causes
Torque Converter Assembly (28)	• Inspect for leaking or damaged Torque Converter Clutch Hub Seal. • Diagnose Torque Converter Assembly for possible internal damage. Refer to <u>Torque Converter Diagnosis</u>.
	Inspect for worn, damaged or sticking TCC Regulator Apply (425)

Valve Body Assembly (433) and TCC Regulator Apply Shuttle (426) Valves.

NO REVERSE GEAR

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 stickyness. • Inspect the Clutch Select Valve (428) and the Actuator Feed Limit Valve (430) for debris and stickyness.
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
Fluid Pump Assembly (201)	• Inspect for loose fluid pump bolts (204). • Inspect for leaking or damaged fluid pump outlet seals (24) and oil filter seal. • Inspect for improperly installed, restricted or damaged oil filter (203). • Inspect for sticking line pressure blow off valve (304). • Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308). • Inspect for damaged or restricted oil ports in the oil pump body (303).
Torque Converter Housing (208)	• Inspect for missing or restricted differential lube oil circuit orifice. • Inspect for missing front differential carrier baffle (205).
Control Solenoid Valve Assembly (w/Body and TCM) (7)	• Inspect for leaking or damaged filter plate assembly seals (8). • Verify VBS operation is not stuck high or low.
Case Assembly (50)	• Inspect for proper fluid level. • Inspect for missing lube oil circuit orifice or front differential carrier baffle (62). • Inspect for leaking or damaged valve body spacer plate assembly (12). • Inspect for damaged or leaking fluid check valve (55). • Inspect for leaking, damaged or broken fluid level control valve (13).
Torque Converter Assembly (28)	• Inspect for damaged torque converter clutch seal (inside converter assembly). • Inspect for damaged or disengaged torque converter hub to oil pump drive gear.