

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

COMPONENT LOCATOR

DISASSEMBLED VIEWS

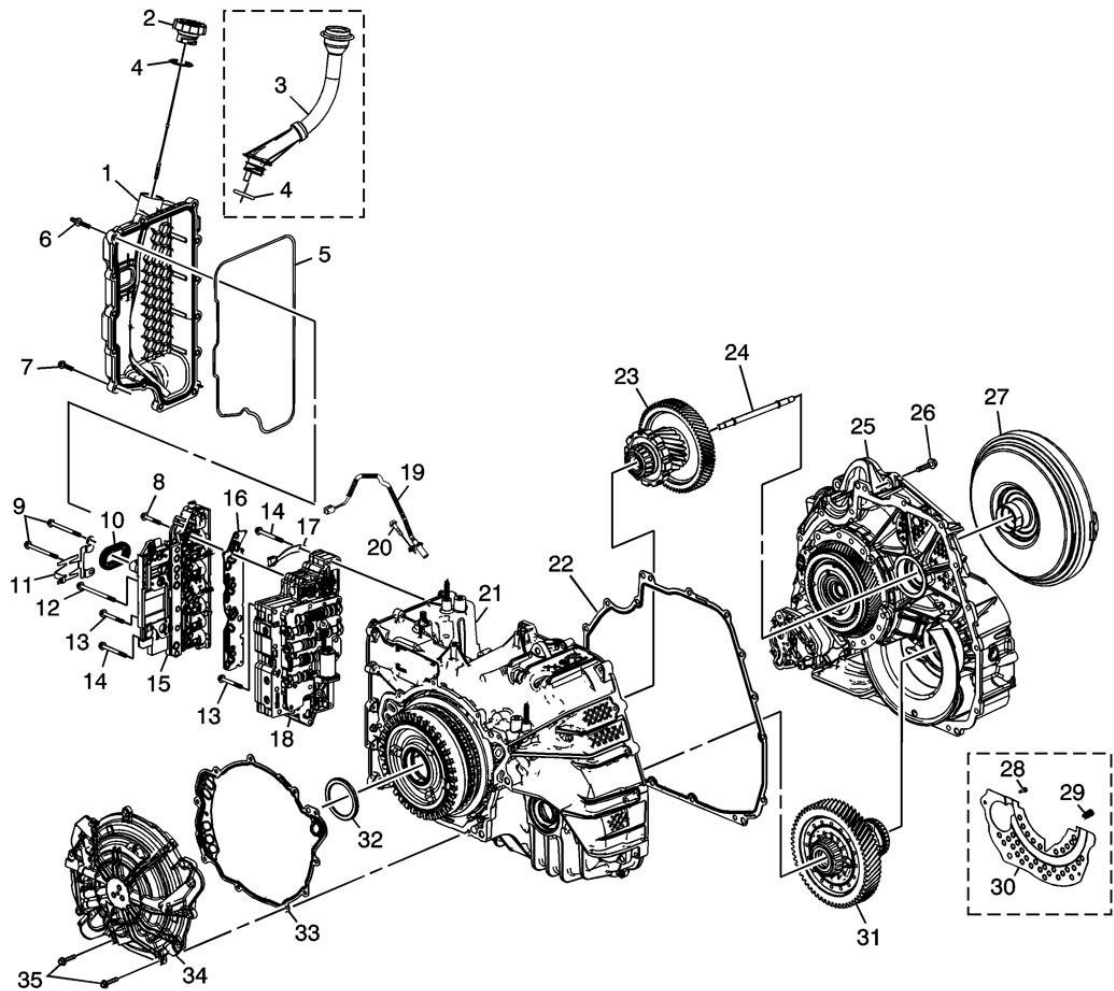


Fig. 1: Case & Associated Parts
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Cover Assembly
2	Transmission Fluid Level Indicator Assembly
3	Fluid Level Indicator Tube - Model Dependent
4	Fluid Level Indicator Tube Seal - Model Dependent
5	Control Valve Body Cover Assembly Gasket
6	Control Valve Body Cover Stud

7	Control Valve Body Cover Bolt
8	Control Valve Body Bolt
9	Control Valve Body Bolt
10	Control Valve Body Cover Wiring Connector Hole Seal
11	Control Solenoid Valve Spring
12	Control Valve Body Bolt
13	Control Valve Body Bolt
14	Control Valve Body Bolt
15	Control Solenoid (w/Body and TCM) Valve Assembly
16	Control Solenoid (w/Body and TCM) Filter Plate Assembly
17	Manual Shaft Detent Assembly
18	Control Valve Body Assembly
19	A/Trans Output Speed Sensor Assembly
20	A/Trans Output Speed Sensor Bolt
21	A/Trans Case Assembly
22	Torque Converter Housing Outer Seal
23	Front Differential Drive Pinion (w/Transfer Gear) Gear Assembly
24	Front Differential Drive Pinion Gear Lube Tube
25	Torque Converter and Support and A/Trans Fluid Pump Housing Assembly
26	Torque Converter and Differential Housing Bolt
27	Torque Converter Assembly
28	Dust Cover Push Pin - Model Dependent
29	Dust Cover Bolt - Model Dependent
30	Dust Cover - Model Dependent
31	Front Differential Carrier Assembly
32	Input Shaft Thrust Bearing Assembly
33	A/Trans Case Cover Gasket
34	A/Trans Case Cover Assembly
35	A/Trans Case Cover Assembly Bolt

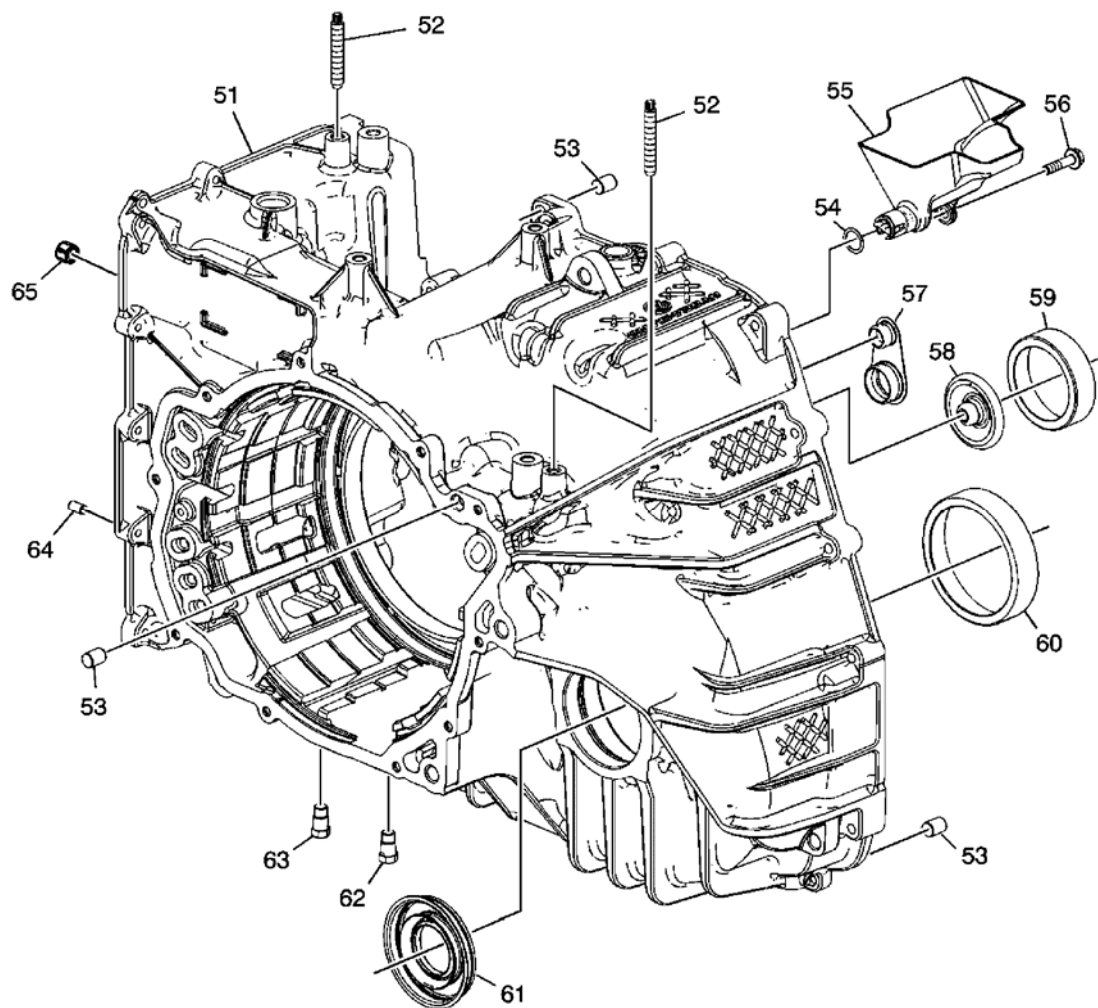


Fig. 2: Transmission Case Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
51	A/Trans Case Assembly
52	Transmission Fluid Cooler Pipe Stud
53	Transmission Case Cover Locator Pin
54	A/Trans Fluid Trough O-Ring Seal
55	A/Trans Fluid Trough Assembly
56	A/Trans Fluid Trough Bolt
57	A/Trans Pump Fluid Outlet Seal Assembly
58	Front Differential Drive Pinion Gear Lube Dam
59	Front Differential Drive Pinion Gear Bearing Cup
60	Front Differential Carrier Bearing Cup
61	Front Wheel Drive Shaft Oil Seal Assembly

62	A/Trans Fluid Press Test Hole Plug
63	A/Trans Fluid Level Hole Plug
64	Control Valve Body Locator Pin
65	1-2-3-4 Clutch Fluid Passage Seal

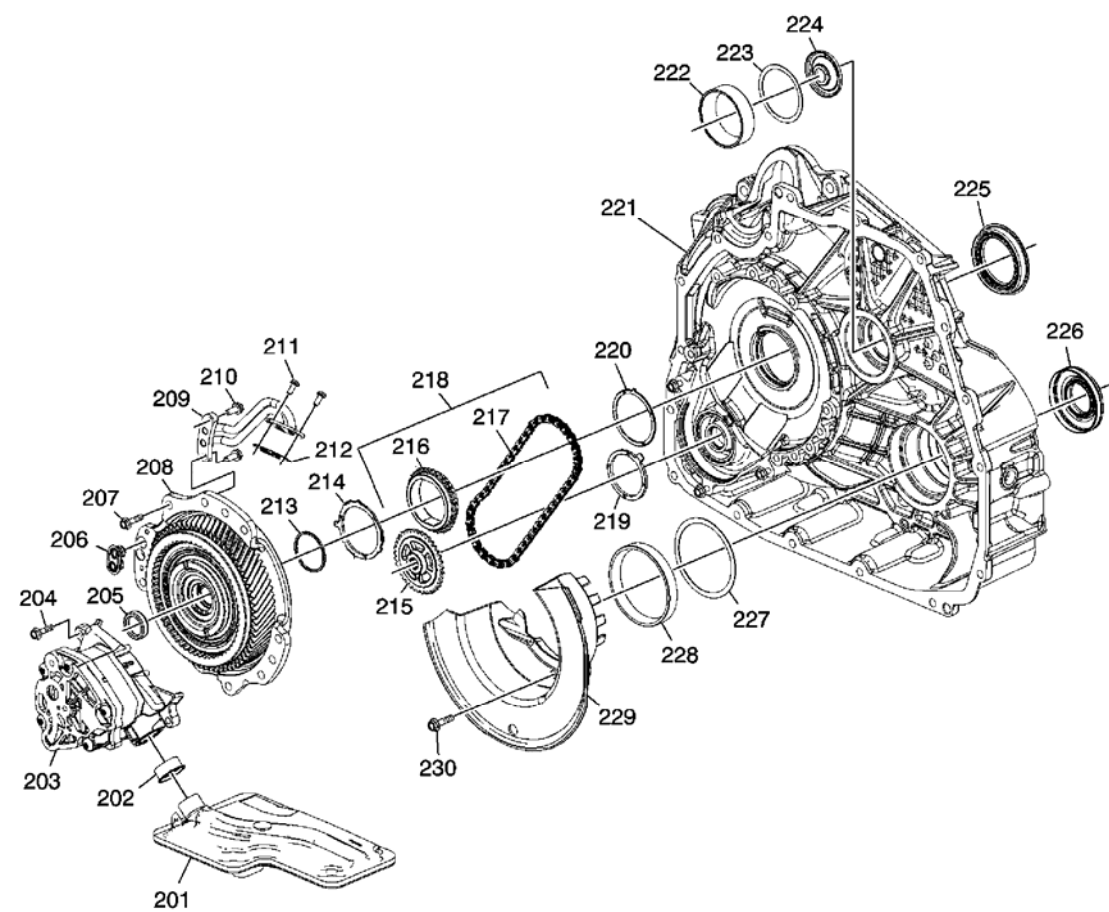


Fig. 3: Torque Converter, Support & Fluid Pump Housing Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
201	A/Trans Fluid Filter Assembly
202	Filter Neck Seal
203	A/Trans Fluid Pump Assembly
204	A/Trans Fluid Pump Bolt
205	Front Differential Transfer Drive Gear Support Seal Assembly
206	Front Differential Transfer Drive Gear Support Torque Converter Fluid Seal Assembly
207	Front Differential Transfer Drive Gear Support Bolt
208	Front Differential Transfer Drive Gear Support Assembly

209	Front Differential Transfer Drive Gear Fluid Passage Tube Assembly
210	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt
211	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt
212	Front Differential Transfer Drive Gear Support Fluid Passage Tube Gasket
213	Front Differential Transfer Drive Gear Support Seal
214	Drive Sprocket Thrust Washer
215	Oil Pump Drive Link Driven Sprocket
216	Oil Pump Drive Link Drive Sprocket
217	Drive Link
218	Drive Link Assembly
219	Drive Sprocket Thrust Washer
220	Drive Sprocket Thrust Washer
221	Torque Converter and Differential Housing Assembly
222	Front Differential Drive Pinion Gear Bearing Cup
223	Front Differential Drive Pinion Gear Bearing Thrust Washer
224	Front Differential Drive Pinion Gear Lube Dam
225	Torque Converter Fluid Seal Assembly
226	Front Wheel Drive Shaft Oil Seal Assembly
227	Front Differential Bearing Thrust Washer
228	Front Differential Carrier Bearing Cup
229	Front Differential Carrier Baffle
230	Front Differential Carrier Baffle Bolt

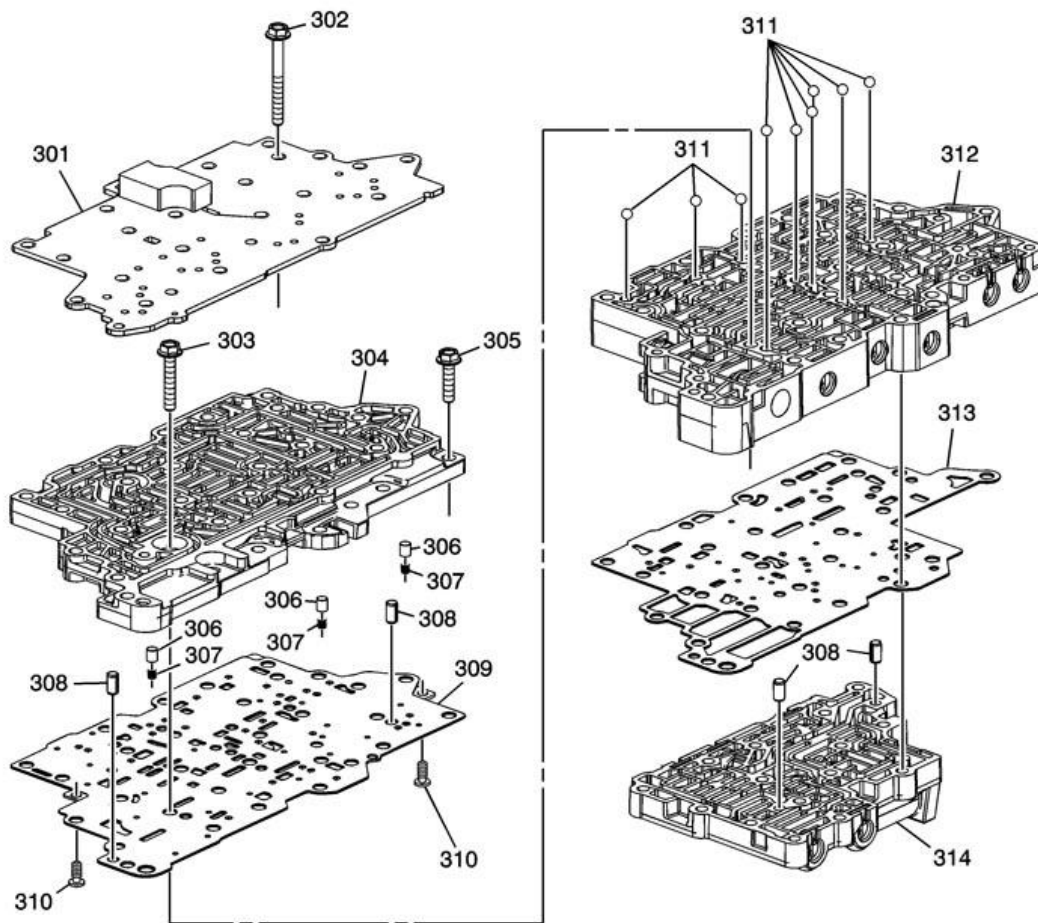


Fig. 4: Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
301	Control Valve Channel Upper Plate Assembly
302	Control Valve Body Bolt
303	Control Valve Body Bolt
304	Control Valve Channel Plate
305	Control Valve Body Bolt
306	Actuator Feed Accumulator Piston
307	Actuator Feed Accumulator Spring
308	Control Valve Body Locator Pin
309	Control Valve Upper Body Spacer Plate Assembly
310	Control Valve Body Spacer Plate Retainer
311	Control Valve Body Ball Check Valve
312	Control Valve Upper Body Assembly
313	Control Valve Lower Body Spacer Plate Assembly

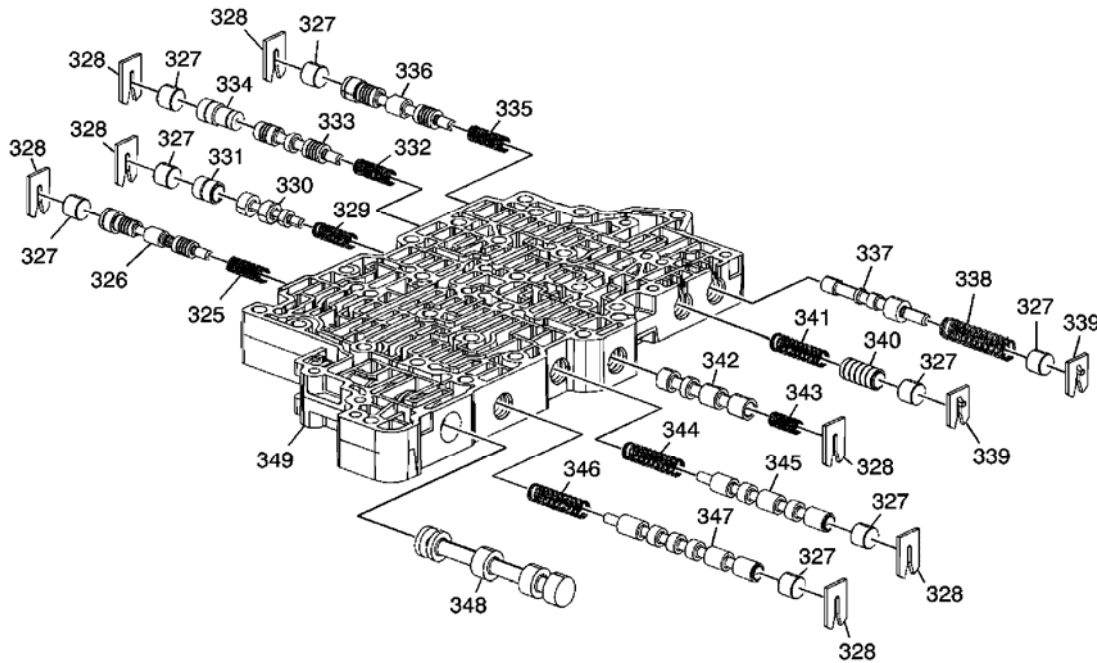


Fig. 5: Upper Valve Body Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
325	Low and Reverse and 4-5-6 Clutch Regulator Valve Spring
326	Low and Reverse and 4-5-6 Clutch Regulator Valve
327	Pressure Regulator Valve Bore Plug
328	Torque Converter Clutch Valve Spring Retainer
329	Torque Converter Clutch Regulator Apply Valve Spring
330	Torque Converter Clutch Regulator Apply Valve
331	Torque Converter Clutch Regulator Apply Shuttle Valve
332	2-6 Clutch Regulator Valve Spring
333	2-6 Clutch Regulator Valve
334	2-6 Clutch Regulator Valve Gain Valve
335	3-5-Reverse Clutch Regulator Valve Spring
336	3-5-Reverse Clutch Regulator Valve
337	Pressure Regulator Valve
338	Pressure Regulator Valve Spring
339	Pressure Regulator Valve Bore Plug Retainer
340	Isolator Valve
341	Isolator Valve Spring
342	Torque Converter Clutch Control Valve

343	Torque Converter Clutch Control Valve Spring
344	Clutch Select Solenoid Valve #3 Spring
345	Clutch Select Solenoid #3 Valve
346	Clutch Select Solenoid Valve #2 Spring
347	Clutch Select Solenoid #2 Valve
348	Manual Valve
349	Control Valve Upper Body

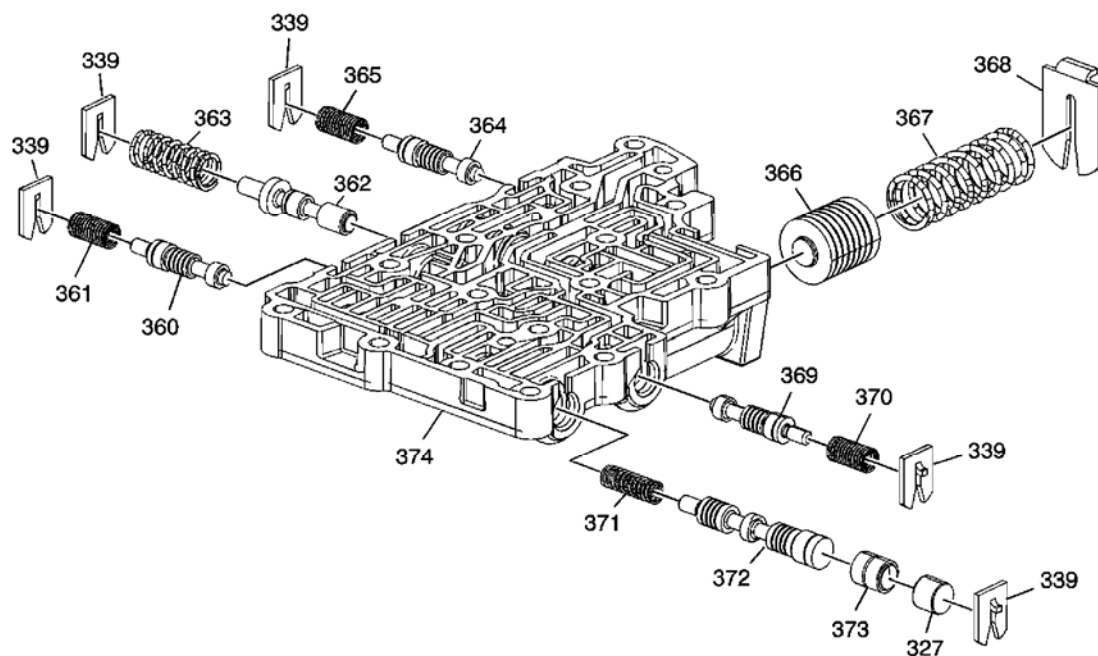


Fig. 6: Lower Valve Body Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
327	1-2-3-4 Clutch Regulator Valve Bore Plug
339	Actuator Feed Limit Valve Spring Retainer
360	4-5-6 Clutch Boost Valve
361	4-5-6 Clutch Boost Valve Spring
362	Actuator Feed Limit Valve
363	Actuator Feed Limit Valve Spring
364	3-5-Reverse Clutch Boost Valve
365	3-5-Reverse Clutch Boost Valve Spring
366	4-5-6 Clutch Accumulator Piston
367	4-5-6 Clutch Accumulator Piston Spring
368	4-5-6 Clutch Accumulator Piston Retainer
369	1-2-3-4 Clutch Boost Valve

370	1-2-3-4 Clutch Boost Valve Spring
371	1-2-3-4 Clutch Regulator Valve Spring
372	1-2-3-4 Clutch Regulator Valve
373	Default Override 1-2-3-4 Clutch Valve
374	Control Valve Lower Body

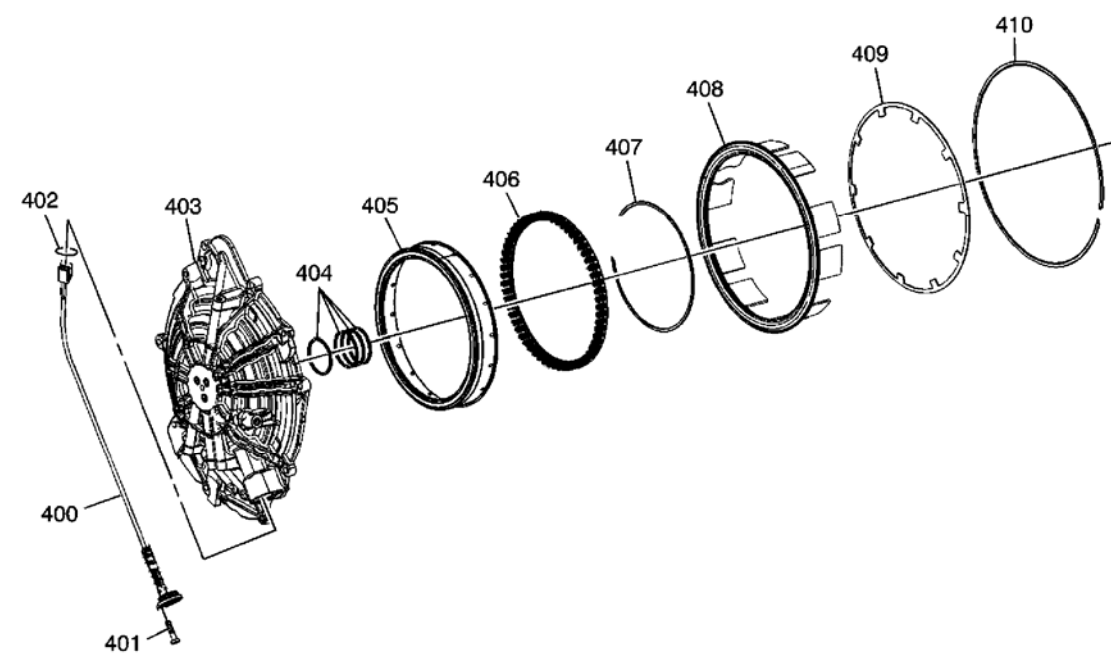


Fig. 7: A/Trans Case Cover, 2-6 & Low Reverse Pistons
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
400	A/Trans Input Speed Sensor Assembly
401	A/Trans Input Speed Sensor Bolt
402	ISS O-Ring Seal
403	A/Trans Case Cover Assembly
404	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
405	2-6 Clutch Piston
406	2-6 Clutch Spring Assembly
407	2-6 Clutch Spring Retainer Ring
408	Low and Reverse Clutch Piston Assembly
409	Low and Reverse Clutch Spring
410	Low and Reverse Clutch Spring Retainer Ring

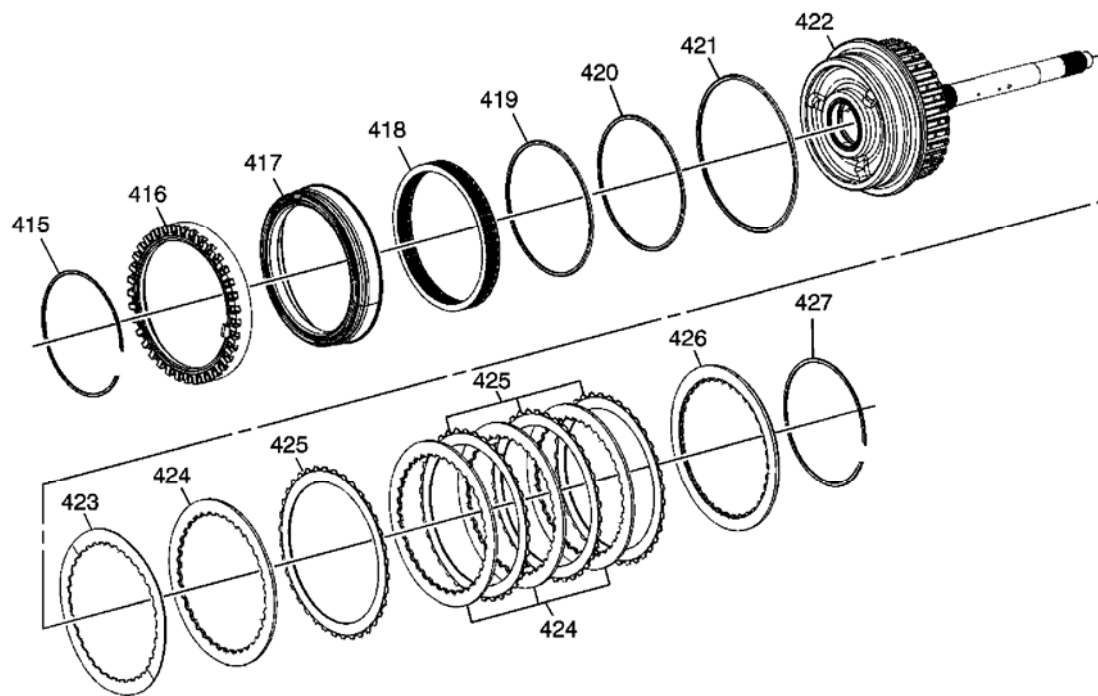


Fig. 8: 3-5 Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
415	A/Trans Input Shaft Speed Sensor Reluctor Ring Retainer Ring
416	A/Trans Input Shaft Speed Sensor Reluctor Wheel
417	3-5-Reverse Clutch Piston
418	3-5-Reverse Clutch Spring
419	3-5-Reverse Clutch Piston Inner Seal
420	3-5-Reverse Clutch Piston Inner Seal
421	3-5-Reverse Clutch Piston Dam Seal
422	3-5-Reverse and 4-5-6 Clutch Housing Assembly
423	3-5-Reverse Clutch (Waved) Plate
424	3-5-Reverse Clutch Plate
425	3-5-Reverse Clutch (w/Friction Material) Plate Assembly
426	3-5-Reverse Clutch Backing Plate
427	3-5-Reverse Clutch Backing Plate Retainer Ring

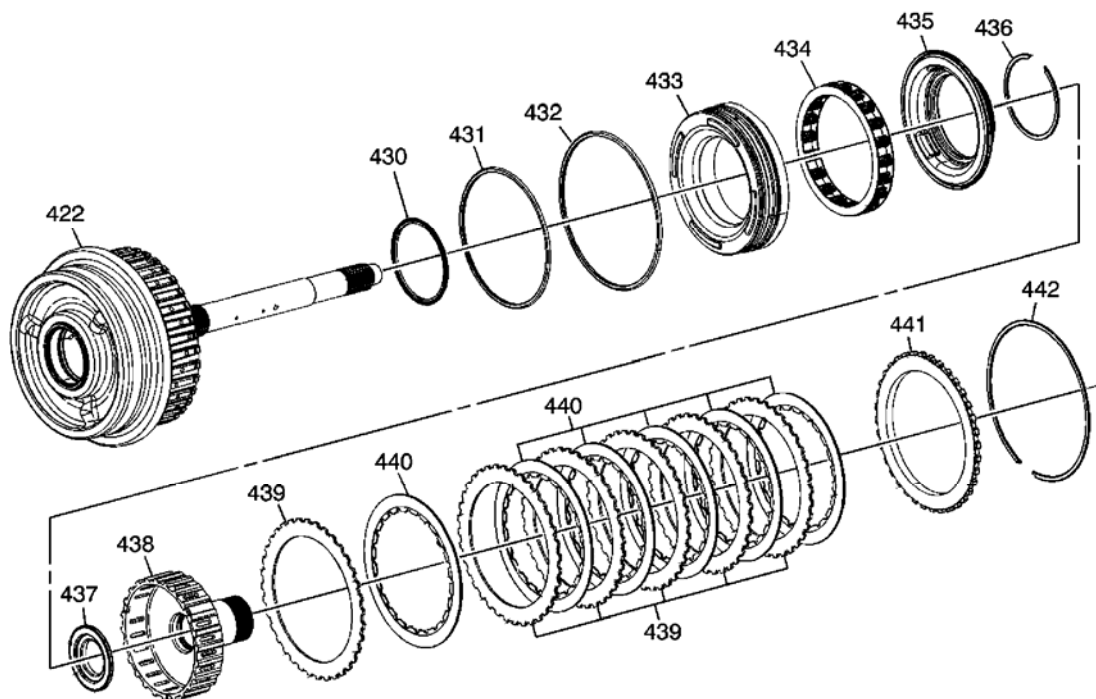


Fig. 9: 4-5-6 Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
422	3-5-Reverse and 4-5-6 Clutch Housing Assembly
430	4-5-6 Clutch Piston Inner Seal
431	4-5-6 Clutch Piston Outer Seal
432	4-5-6 Clutch Piston Outer Seal
433	4-5-6 Clutch Piston
434	4-5-6 Clutch Spring
435	4-5-6 Clutch Piston Fluid Dam
436	4-5-6 Clutch Dam Retainer Ring
437	4-5-6 Clutch Hub Thrust Bearing Assembly
438	Reaction Carrier Hub Assembly
439	4-5-6 Clutch Plate
440	4-5-6 Clutch (w/Friction Material) Plate Assembly
441	4-5-6 Clutch Backing Plate
442	4-5-6 Clutch Backing Plate Retainer Ring

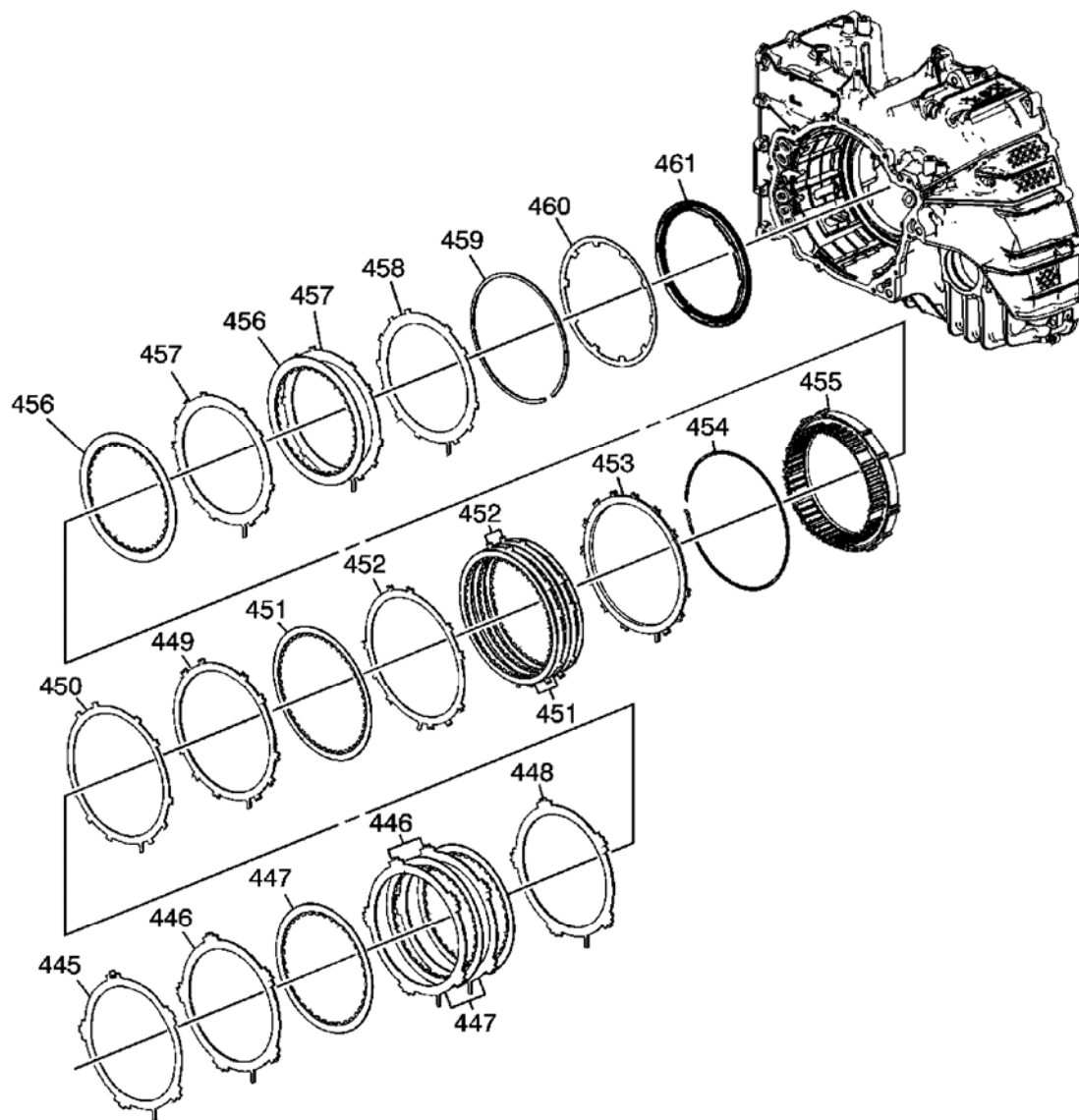


Fig. 10: 2-6, Low & Reverse & 1-2-3-4 Clutch Plate Assemblies
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
445	2-6 Clutch Cushion Spring
446	2-6 Clutch Plate
447	2-6 Clutch (w/Friction Material) Plate Assembly
448	2-6 Clutch Backing Plate
449	Low and Reverse Clutch Apply Plate
450	Low and Reverse Clutch Cushion (Waved) Spring
451	Low and Reverse Clutch (w/Friction Material) Plate Assembly
452	Low and Reverse Clutch Plate

453	Low and Reverse Clutch Backing Plate
454	Low and Reverse Clutch Retainer Ring
455	Low and Reverse Clutch Assembly (OWC)
456	1-2-3-4 Clutch (w/Friction Material) Plate Assembly
457	1-2-3-4 Clutch Plate
458	1-2-3-4 Clutch (Waved) Plate
459	1-2-3-4 Clutch Spring Retainer Ring
460	1-2-3-4 Clutch Spring
461	1-2-3-4 Clutch Piston
449	Low and Reverse Clutch Apply Plate

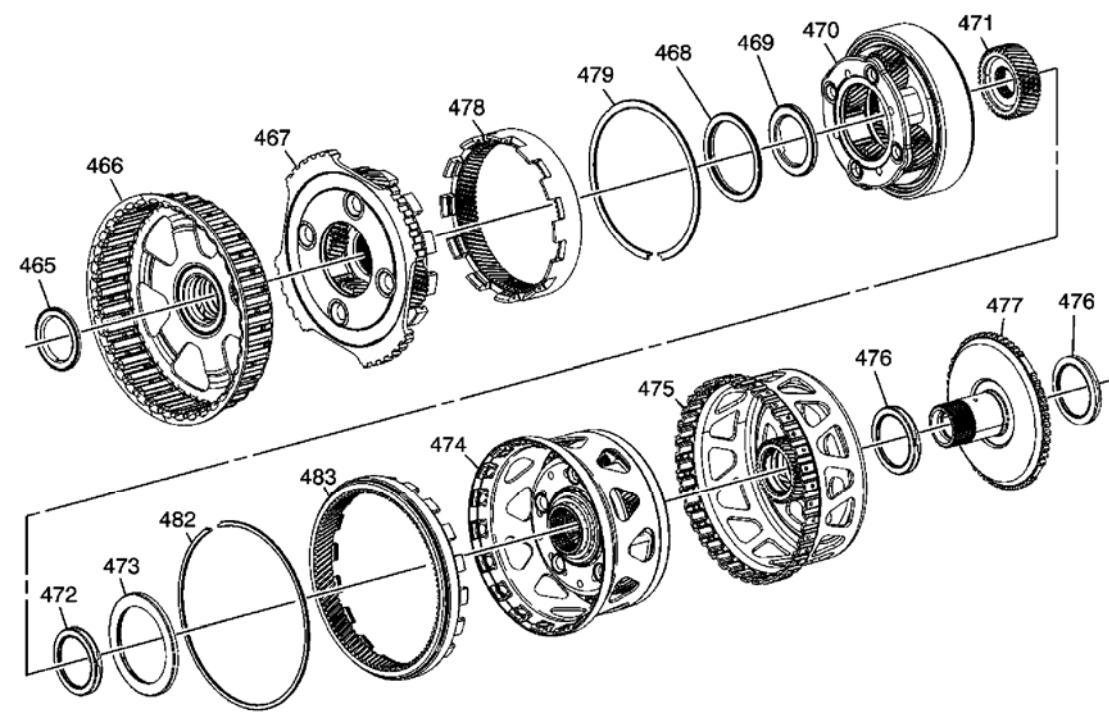


Fig. 11: Input, Output & Reaction Gearsets
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
465	2-6 Clutch Hub Thrust Bearing
466	Reaction Sun Gear Assembly
467	Reaction Carrier Assembly
468	Input Carrier Thrust Bearing Assembly
469	Input Sun Gear Thrust Bearing Assembly
470	Input Carrier Assembly
471	Input Sun Gear

472	Output Carrier Thrust Bearing Assembly
473	Output Carrier Thrust Bearing Assembly
474	Output Carrier Assembly
475	Output Sun Gear Assembly
476	Front Differential Transfer Drive Gear Input Hub Bearing Assembly
477	Output Carrier Transfer Drive Gear Hub Assembly
478	Input Internal Gear
479	Input Internal Gear Retaining Ring
482	Reaction Internal Gear Retaining Ring
483	Reaction Carrier Internal Gear

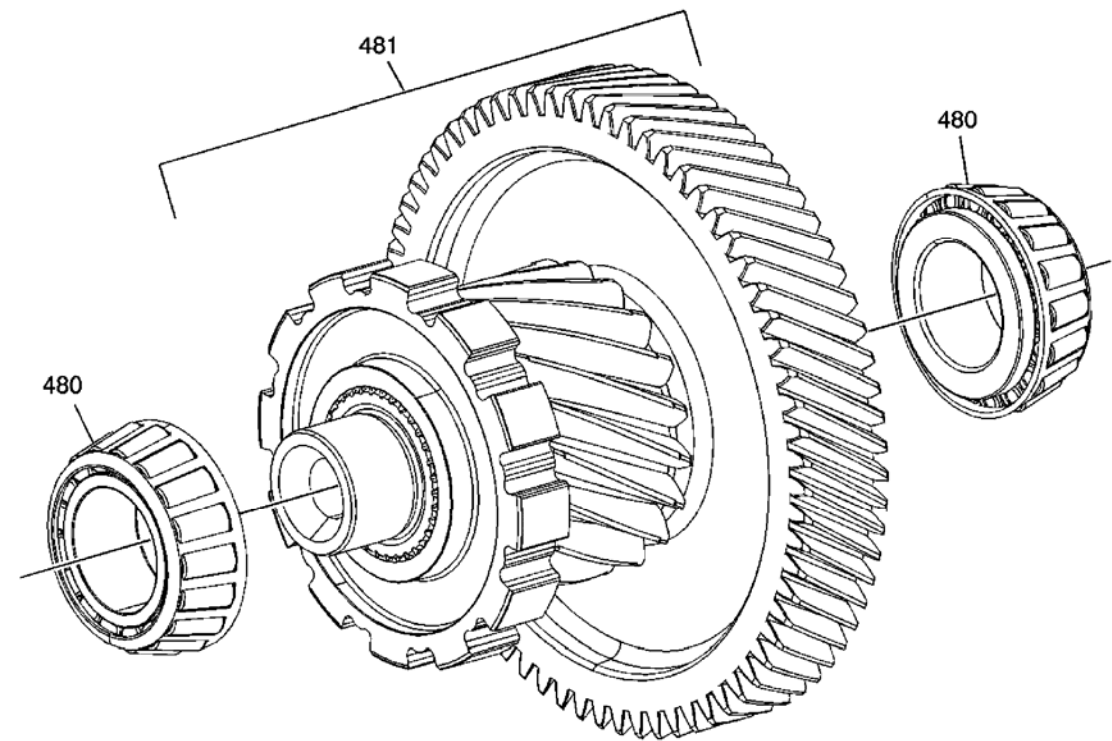


Fig. 12: Front Differential Transfer Drive Gear Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
480	Front Differential Drive Pinion Gear Bearing Assembly
481	Front Differential Drive Pinion (w/Transfer Gear) Gear Assembly

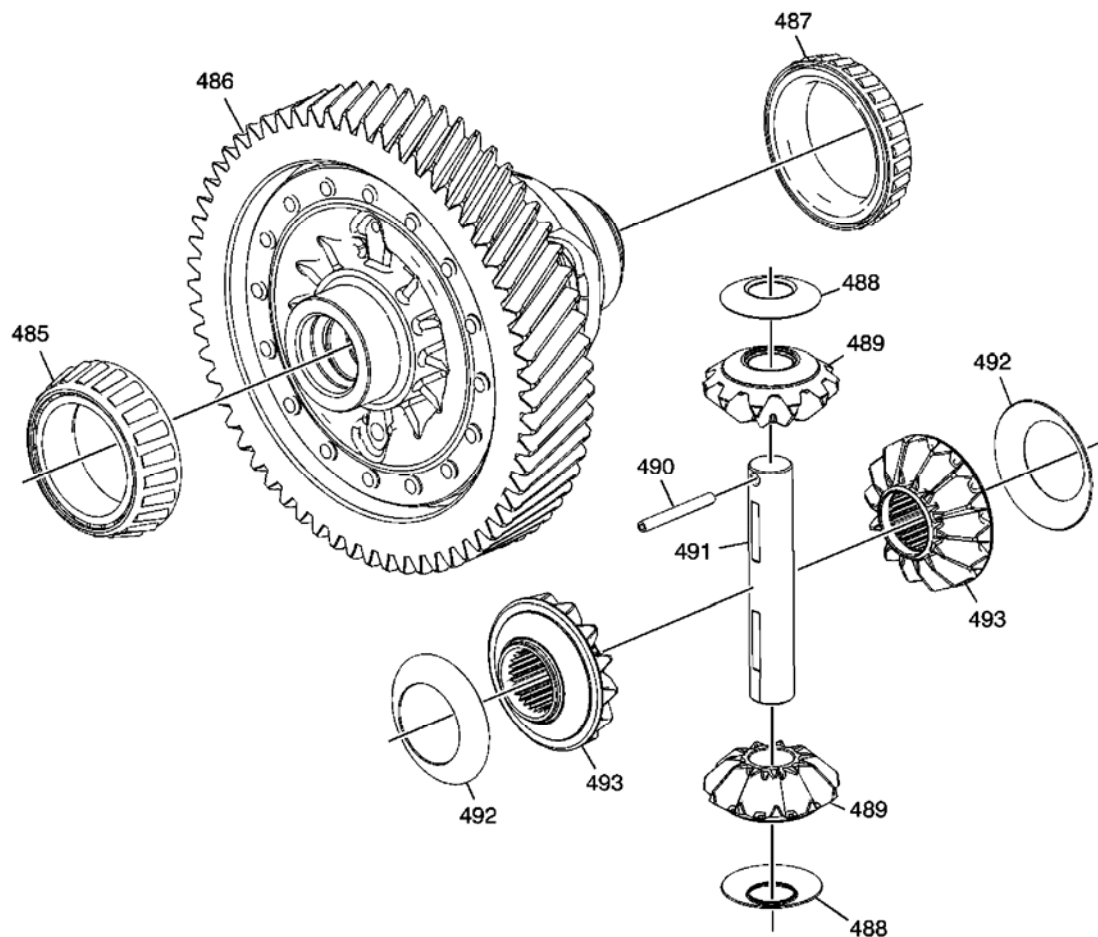


Fig. 13: Front Differential Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
485	Front Differential Carrier Bearing Assembly
486	Front Differential Carrier Assembly
487	Front Differential Carrier Bearing Assembly
488	Front Differential Carrier Thrust Washer
489	Front Differential Pinion Gear
490	Front Differential Pinion Gear Shaft Retainer
491	Front Differential Pinion Gear Shaft
492	Front Differential Side Gear Thrust Washer
493	Front Differential Side Gear

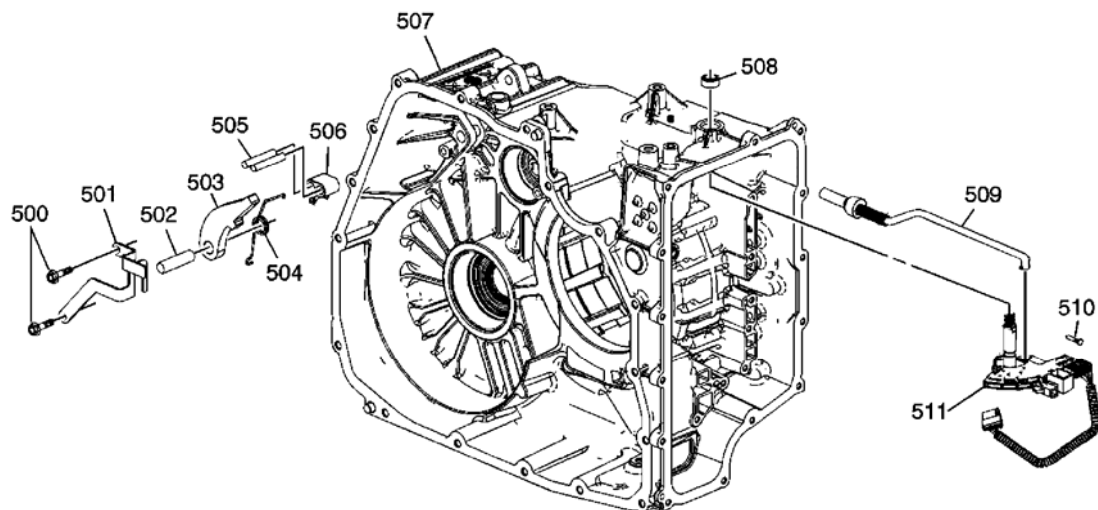


Fig. 14: Park System Components
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
500	Park Pawl Actuator Bracket Bolt
501	Park Pawl Actuator Bracket
502	Park Pawl Shaft
503	Park Pawl
504	Park Pawl Spring
505	Park Pawl Actuator Guide Pin
506	Park Pawl Actuator Guide
507	A/Trans Case Assembly
508	Manual Shift Shaft Seal
509	Park Pawl Actuator Assembly
510	Manual Shift Shaft Pin
511	Manual Shift Detent (w/Shaft Position Switch) Lever Assembly

COMPONENT LOCATION

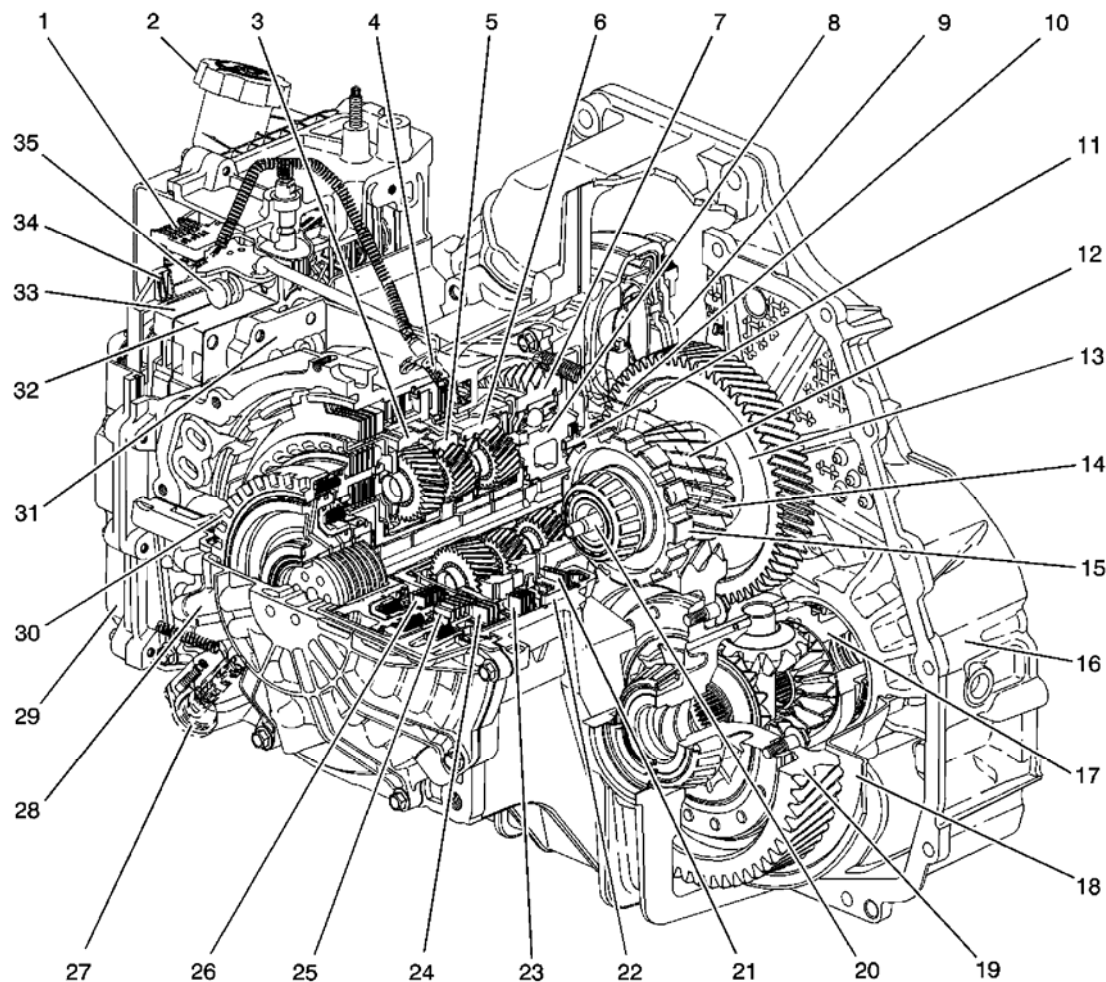


Fig. 15: Component Locations
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Manual Shift Detent Lever Assembly (w/Shaft Position Switch)
2	Trans Fluid Level Indicator
3	Reaction Carrier Assembly
4	Output Speed Sensor
5	Input Carrier Assembly
6	Output Carrier Assembly
7	Front Differential Transfer Drive Gear
8	Front Differential Transfer Drive Gear Support Assembly
9	Torque Converter Assembly
10	Park Pawl Actuator Assembly
11	Fluid Pump Drive Link Assembly
12	Park Pawl

13	Front Differential Transfer Driven Gear
14	Front Differential Drive Pinion Gear
15	Park Gear
16	Torque Converter and Support and Fluid Pump Housing Assembly
17	Front Differential Carrier Assembly
18	Front Differential Carrier Baffle
19	Front Differential Ring Gear
20	Front Differential Drive Pinion Gear Lube Tube
21	1-2-3-4 Clutch Assembly
22	Low and Reverse Clutch Assembly (OWC)
23	Low and Reverse Clutch
24	2-6 Clutch Assembly
25	3-5-Reverse Clutch Assembly
26	4-5-6 Clutch Assembly
27	Input Speed Sensor
28	Case Cover Assembly
29	Control Valve Body Cover
30	Input Shaft Speed Sensor Reluctor Wheel
31	Control Valve Lower Body Assembly
32	Control Valve Upper Body Assembly
33	Control Valve Channel Plate Assembly
34	Control Solenoid Valve Assembly (w/Body and TCM)
35	Manual Valve

BUSHING, BEARING, AND WASHER LOCATIONS

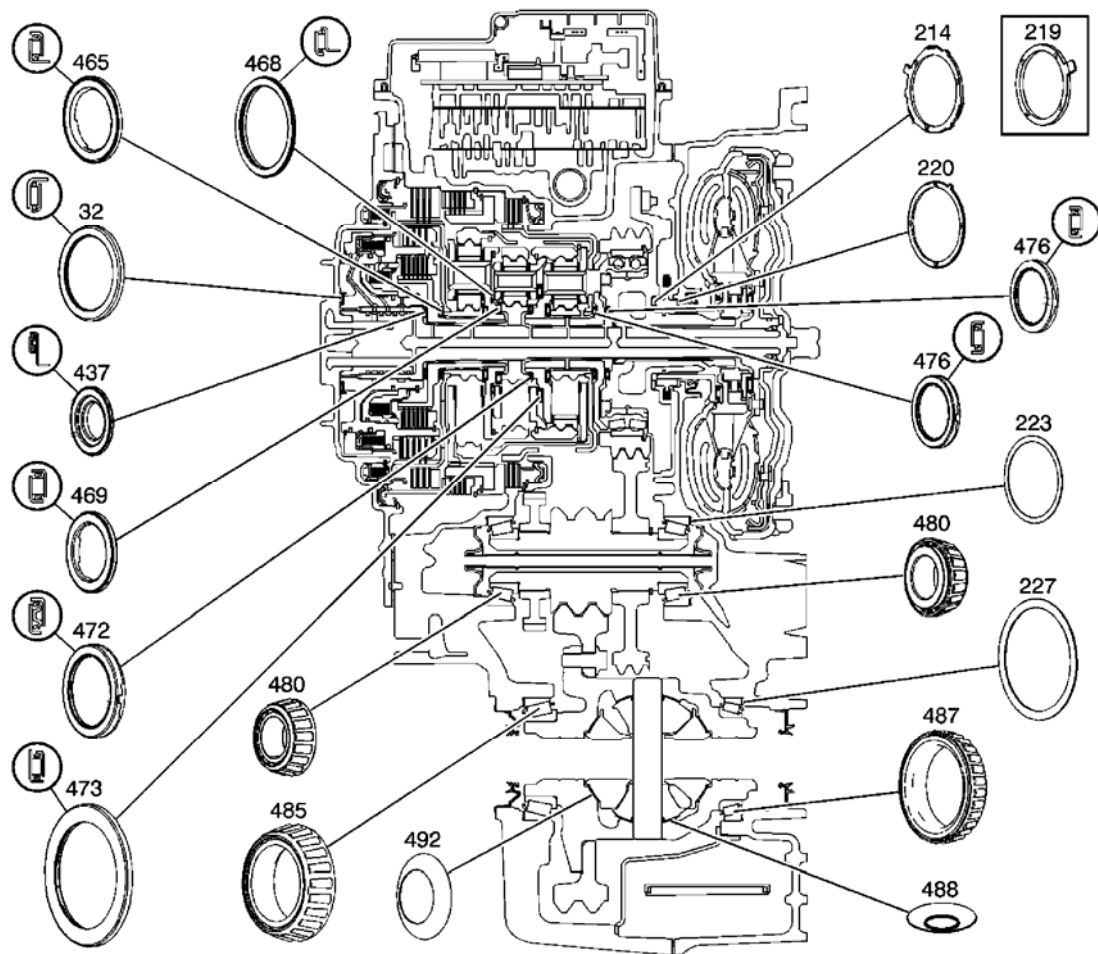


Fig. 16: Bushing & Bearing Locations
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
32	Input Shaft Thrust Bearing Assembly
214	Drive Sprocket Thrust Washer
219	Drive Sprocket Thrust Washer
220	Drive Sprocket Thrust Washer
223	Front Differential Drive Pinion Gear Bearing Thrust Washer
227	Front Differential Bearing Thrust Washer
437	4-5-6 Clutch Hub Thrust Bearing Assembly
465	2-6 Clutch Hub Thrust Bearing
468	Input Carrier Thrust Bearing Assembly
469	Input Sun Gear Thrust Bearing Assembly
472	Output Carrier Thrust Bearing Assembly
473	Output Carrier Thrust Bearing Assembly
476	Front Differential Transfer Drive Gear Input Hub Bearing Assembly

480	Front Differential Drive Pinion Gear Bearing Assembly
485	Front Differential Carrier Bearing Assembly
487	Front Differential Carrier Bearing Assembly
488	Front Differential Carrier Thrust Washer
492	Front Differential Side Gear Thrust Washer

SEAL LOCATIONS

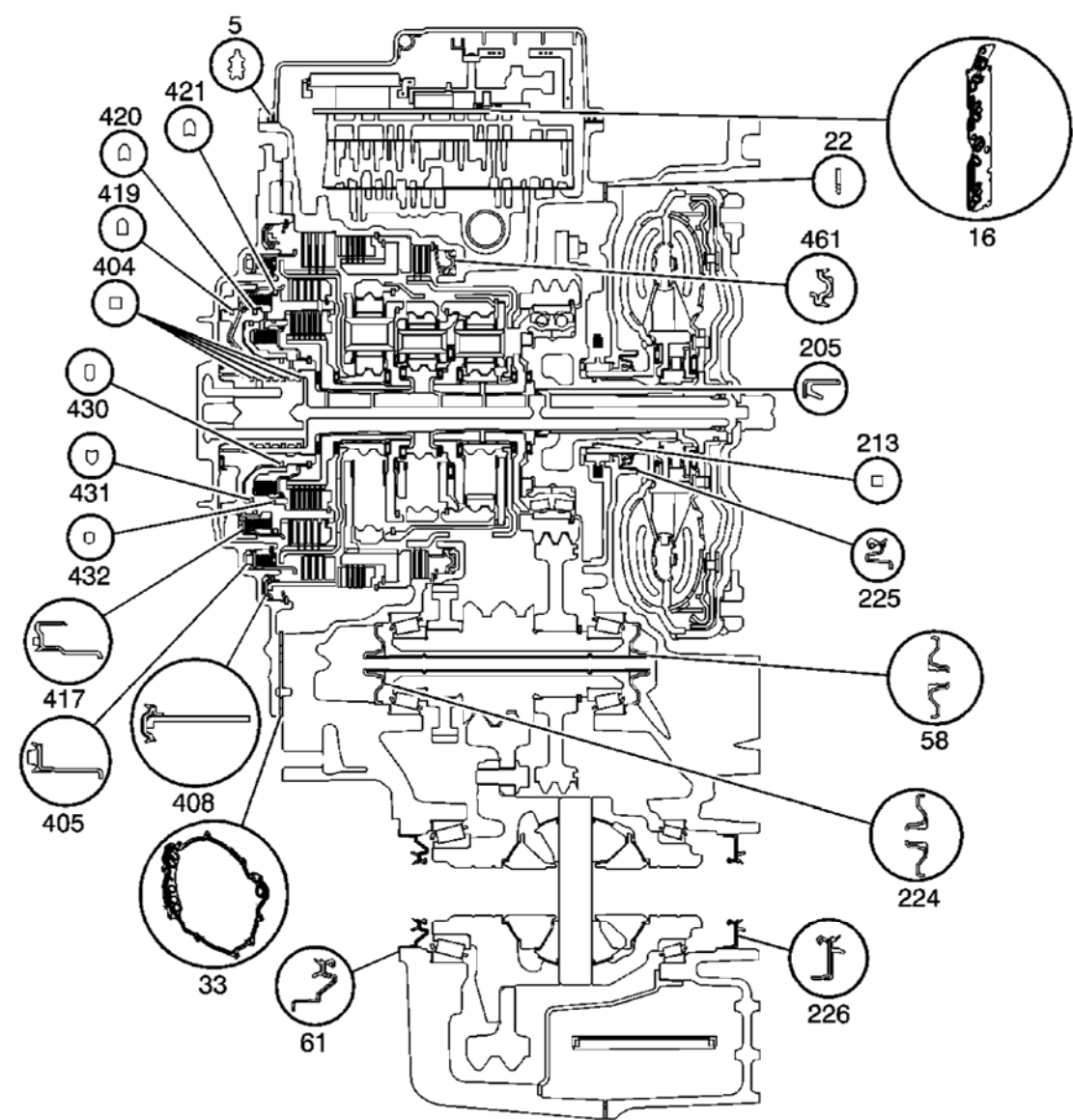


Fig. 17: Seal Locations #1
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

5	Control Valve Body Cover Assembly Gasket
16	Control Solenoid (w/Body and TCM) Filter Plate Assembly
22	Torque Converter Housing Outer Seal
33	A/Trans Case Cover Gasket
58	Front Differential Drive Pinion Gear Lube Dam
61	Front Wheel Drive Shaft Oil Seal Assembly
205	Front Differential Transfer Drive Gear Support Seal Assembly
213	Front Differential Transfer Drive Gear Support Seal
224	Front Differential Drive Pinion Gear Lube Dam
225	Torque Converter Fluid Seal Assembly
226	Front Wheel Drive Shaft Oil Seal Assembly
404	3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring
405	2-6 Clutch Piston
408	Low and Reverse Clutch Piston Assembly
417	3-5-Reverse Clutch Piston
419	3-5-Reverse Clutch Piston Inner Seal
420	3-5-Reverse Clutch Piston Inner Seal
421	3-5-Reverse Clutch Piston Dam Seal
430	4-5-6 Clutch Piston Inner Seal
431	4-5-6 Clutch Piston Outer Seal
432	4-5-6 Clutch Piston Outer Seal
461	1-2-3-4 Clutch Piston

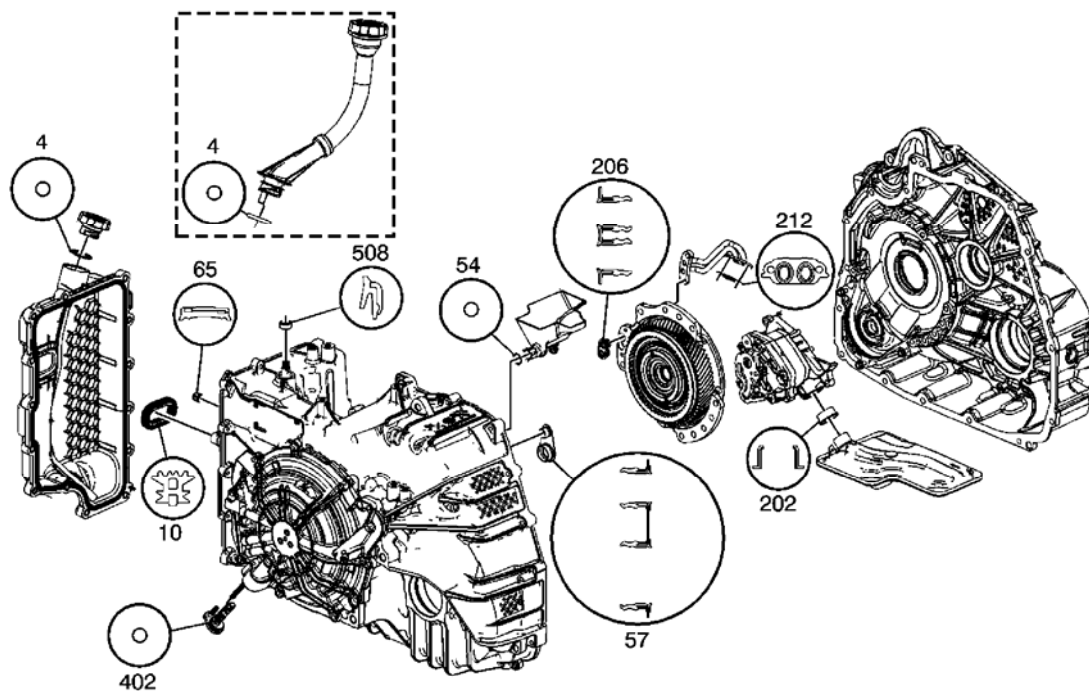


Fig. 18: Seal Locations #2
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
4	Fluid Level Indicator Tube Seal - Model Dependent
10	Control Valve Body Cover Wiring Connector Hole Seal
54	A/Trans Fluid Trough O-Ring Seal
57	A/Trans Pump Fluid Outlet Seal Assembly
65	1-2-3-4 Clutch Fluid Passage Seal
202	Filter Neck Seal
206	Front Differential Transfer Drive Gear Support Torque Converter Fluid Seal Assembly
212	Front Differential Transfer Drive Gear Support Fluid Passage Tube Gasket
402	ISS O-Ring Seal
508	Manual Shift Shaft Seal

BALL CHECK VALVE LOCATIONS

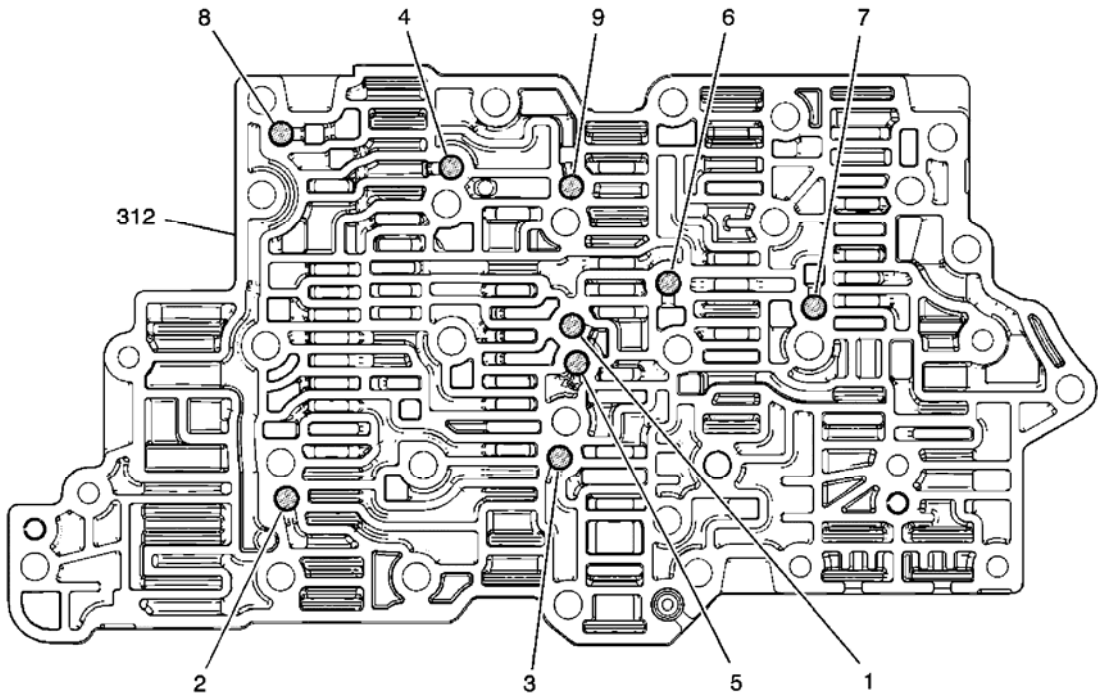


Fig. 19: Identifying Ball Check Valve Locations
Courtesy of GENERAL MOTORS CORP.

I.D.	Input Oil	Input Oil	Output Oil
1	Drive 1-6	DRV B	26/1234 CL Feed
2	Solenoid 1	Reverse	CSV2 Enable

3	Solenoid 2	456	CSV3 Enable
4	PS4	456	CSV2 Latch
5	Drive 1-6	35 Rev FD	35 Rev Supply
6	2-6/1234	-	1234 Clutch Feed
7	35R Supply	-	35R Clutch Feed
8	Low/Rev Supply	-	Low/Rev Clutch Feed
9	456 Clutch Supply	-	456 Clutch Feed

2010 Transmission

Automatic Transmission - 6T70/6T75 - 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

CCDIC

Climate Control Driver Information Center

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

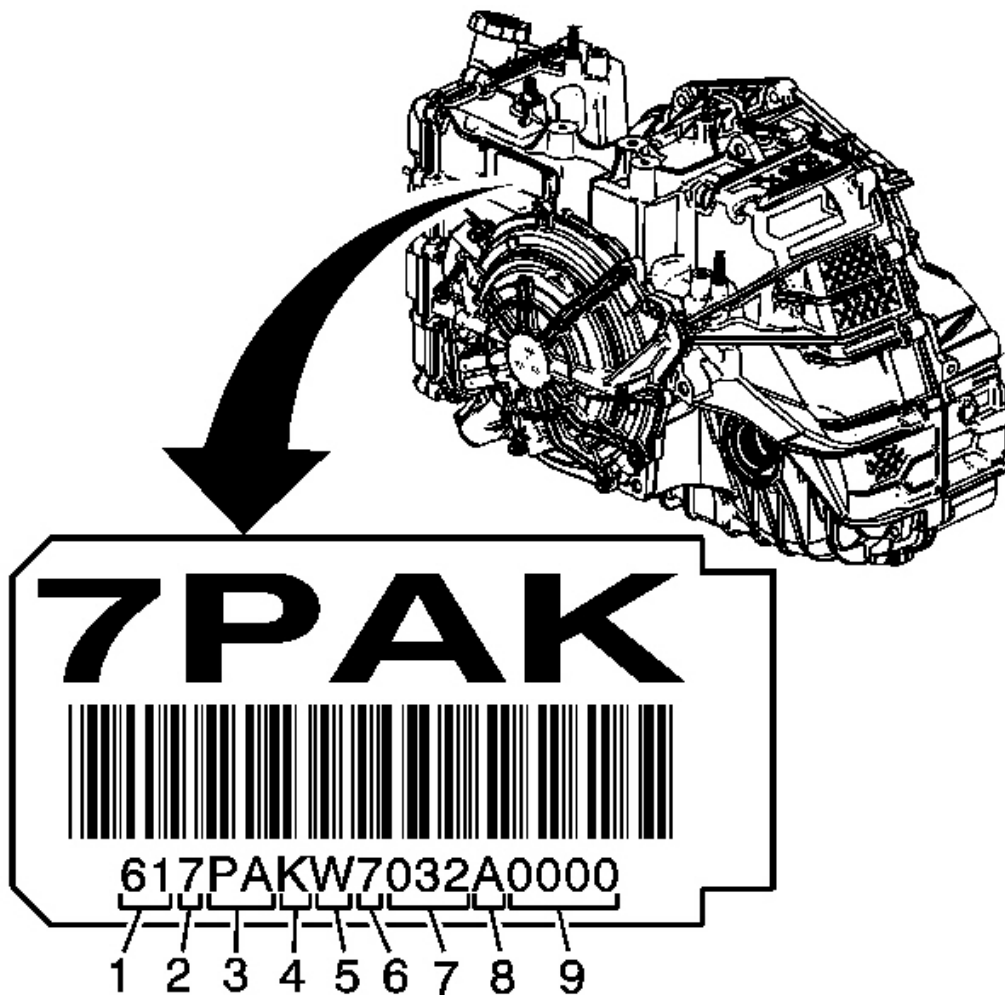


Fig. 1: Locating Transmission Identification Label
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Code for Automatic Transmission
2	Model Year
3	Model for Transmission
4	Transmission Family
5	Source Code for Plant
6	Calendar Year
7	Julian Date

8	Shift/Line (A/B)
9	Numeric sequence starting at 0001 @ 12:01 AM each day

Source Code for Plant

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

TRANSMISSION GENERAL DESCRIPTION

The Hydra-matic 6T70/75 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 vane-type pump, 2 control valve body assemblies, transfer drive gear support 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 6T70/75 are as follows:

- A torque converter with an electronically controlled capacity clutch (ECCC)
- Off axis chain driven vane-type fluid pump assembly
- Input sun gear and carrier assembly
- 4-5-6 and 3-5 reverse clutch assembly with turbine shaft
- Low and reverse clutch (one way clutch) assembly
- Control valve body assembly

- Front differential transfer drive gear support assembly
- Front differential transfer drive gear assembly
- Front differential carrier assembly
- Case cover assembly

The electrical components of the 6T70/75 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
 - 2 shift solenoids
 - Transmission fluid temperature sensor

For more information, refer to **Electronic Component Description**.

TOW/HAUL MODE DESCRIPTION AND OPERATION

Tow/haul mode is a function within the vehicle's software/calibration that optimizes transmission gear selection for operation during towing or with heavy loads. This optimization includes improving acceleration performance during launches, reducing shift busyness, assisting brake performance and speed control during engine braking situations, and improving vehicle speed control while requiring less throttle pedal activity.

In general, tow/haul mode maintains lower gears longer and increases shift pressures. It is designed to be most effective when the vehicle and trailer combined weight is at least 75% of the vehicle's Gross Combined Weight Rating (GCWR). Operation of tow/haul in a lightly loaded or non-loaded vehicle will not cause damage. However, there is no benefit to the selection of tow/haul when the vehicle is unloaded, and use of tow/haul mode during unloaded driving conditions will decrease fuel economy and may generate shift feel concerns.

TRANSMISSION ADAPTIVE FUNCTIONS

The 6T70/75 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

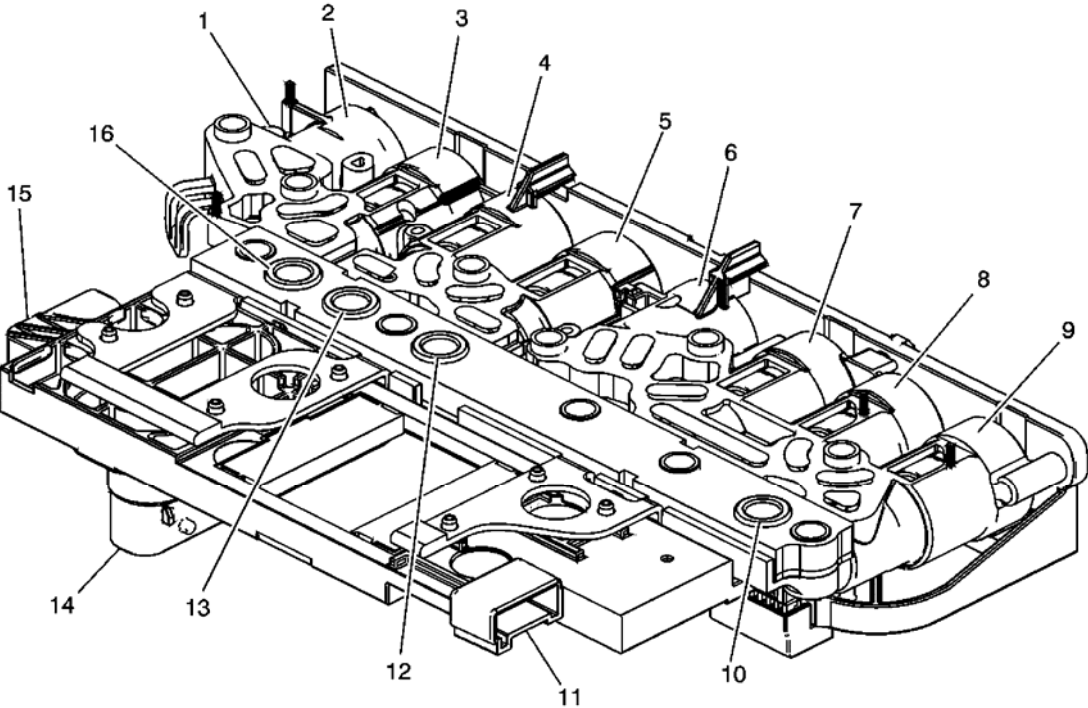


Fig. 2: Identifying Control Solenoid (W/Body & TCM) Valve Assembly Components
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	Control Solenoid Valve Assembly X3 (ISS)
2	Shift Solenoid 1
3	Pressure Control Solenoid 3 (R1/456)
4	Pressure Control Solenoid 5 (1234)
5	Torque Converter Clutch (TCC) Pressure Control Solenoid
6	Shift Solenoid 2
7	Pressure Control Solenoid 2 (35R)
8	Pressure Control Solenoid 4 (26)
9	Line Pressure Control Solenoid
10	Transmission Fluid Pressure (TFP) Switch 5 (35R)
11	Control Solenoid Valve Assembly X2 (IMS)
12	Transmission Fluid Pressure (TFP) Switch 3 (26)
13	Transmission Fluid Pressure (TFP) Switch 4 (456/R1)
14	Control Solenoid Valve Assembly X1
15	Control Solenoid Valve Assembly X4 (OSS)
16	Transmission Fluid Pressure (TFP) Switch 5 (35R)

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 20-way connector.

Manual Shift Detent Lever with Shaft Position Switch Assembly (IMS)

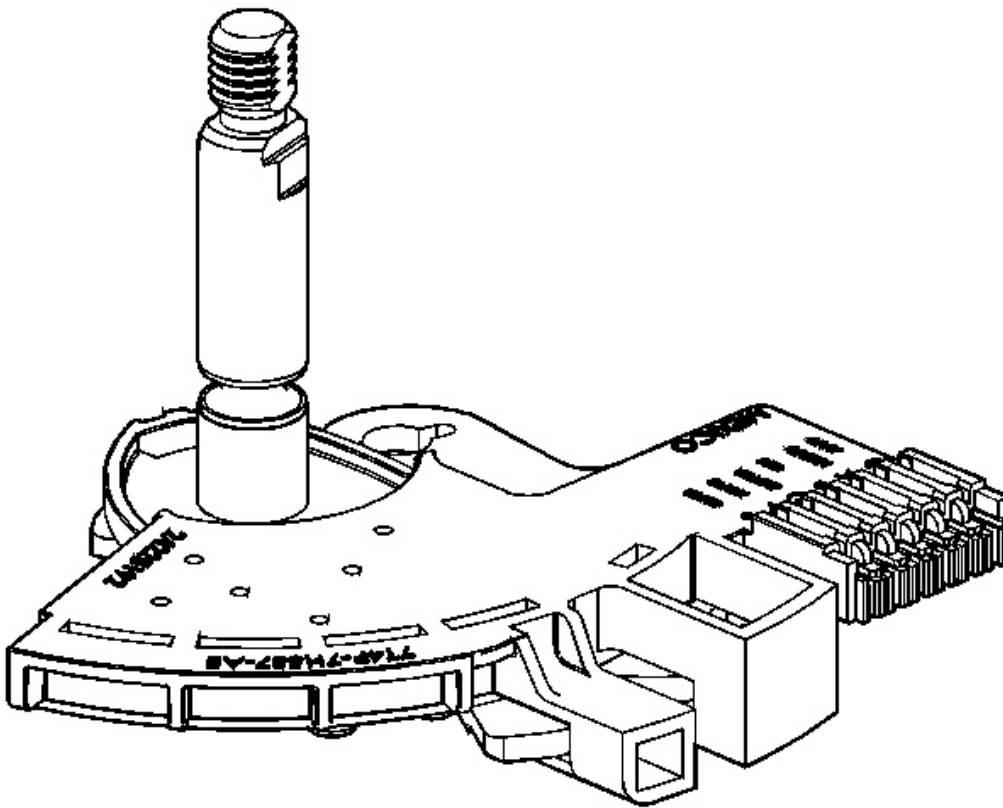


Fig. 3: View Of Manual Shift Detent Lever with Shaft Position Switch
Courtesy of GENERAL MOTORS CORP.

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). The transmission shaft position switch assembly is connected to the Control Solenoid (W/Body and TCM) Valve Assembly via the Control Solenoid Valve Assembly X2 (IMS) connector.

Input Speed Sensor (ISS)

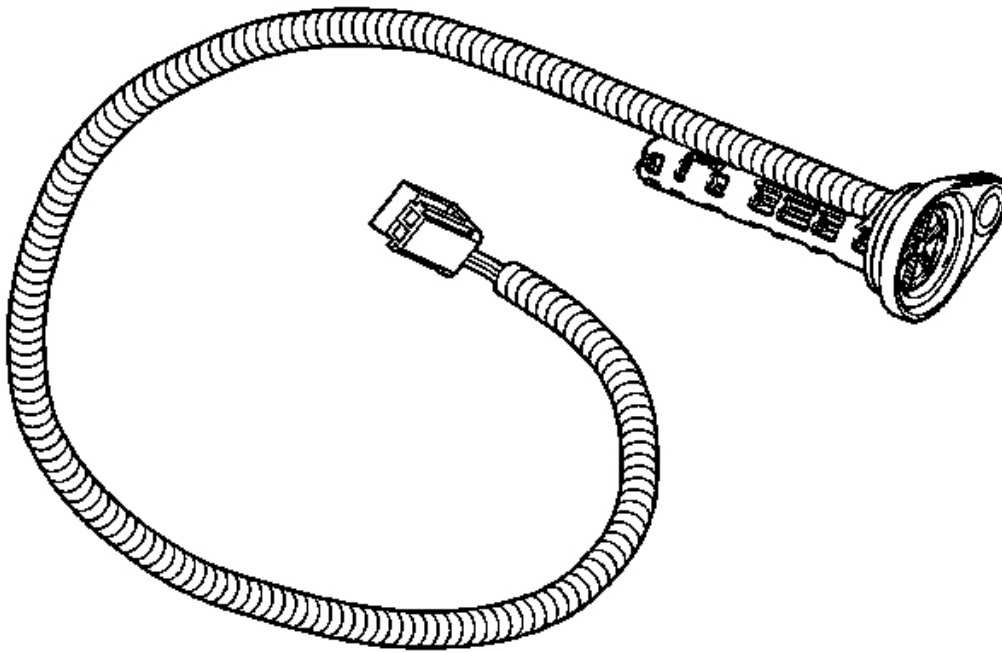


Fig. 4: View Of Input Speed Sensor (ISS)
Courtesy of GENERAL MOTORS CORP.

The input speed sensor (ISS) is a hall-effect type sensor. The ISS mounts to the transmission case cover 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. The input speed sensor (ISS) is connected to the Control Solenoid (W/Body and TCM) Valve Assembly via the Control Solenoid Valve Assembly X3 (ISS) connector.

Output Speed Sensor (OSS)

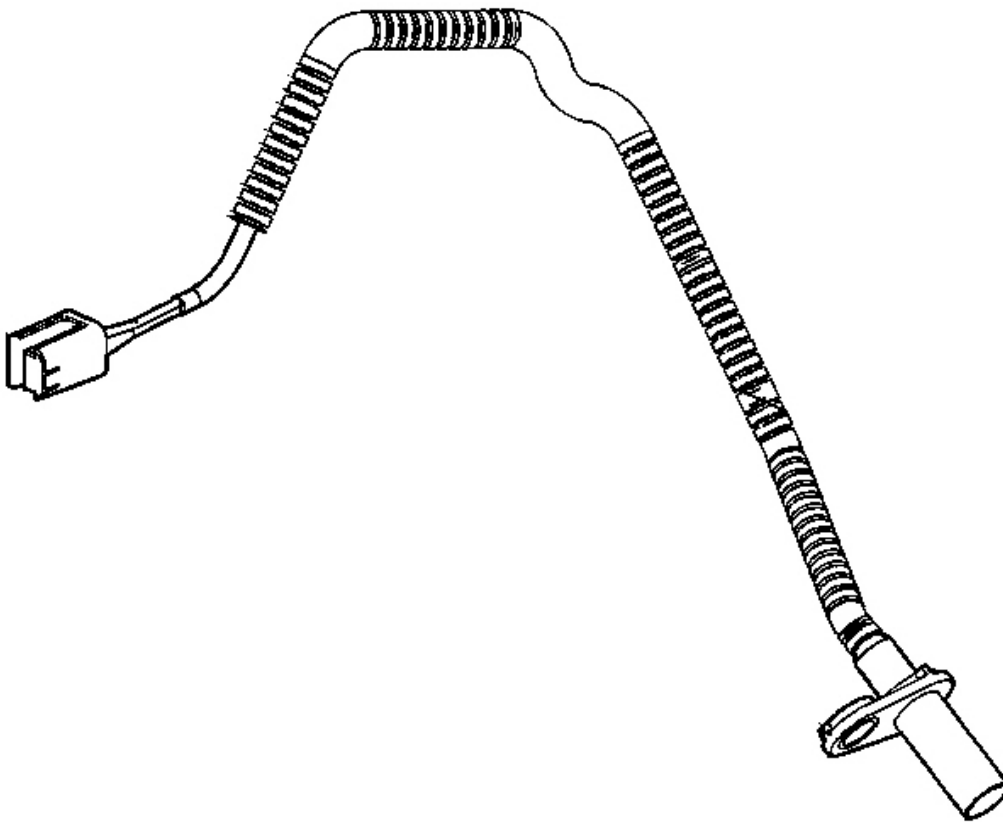


Fig. 5: View Of Output Speed Sensor (OSS)
Courtesy of GENERAL MOTORS CORP.

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. The output speed sensor (OSS) is connected to the Control Solenoid (W/Body and TCM) Valve Assembly via the Control Solenoid Valve Assembly X4 (OSS) connector.

AUTOMATIC TRANSMISSION INLINE 20-WAY CONNECTOR DESCRIPTION

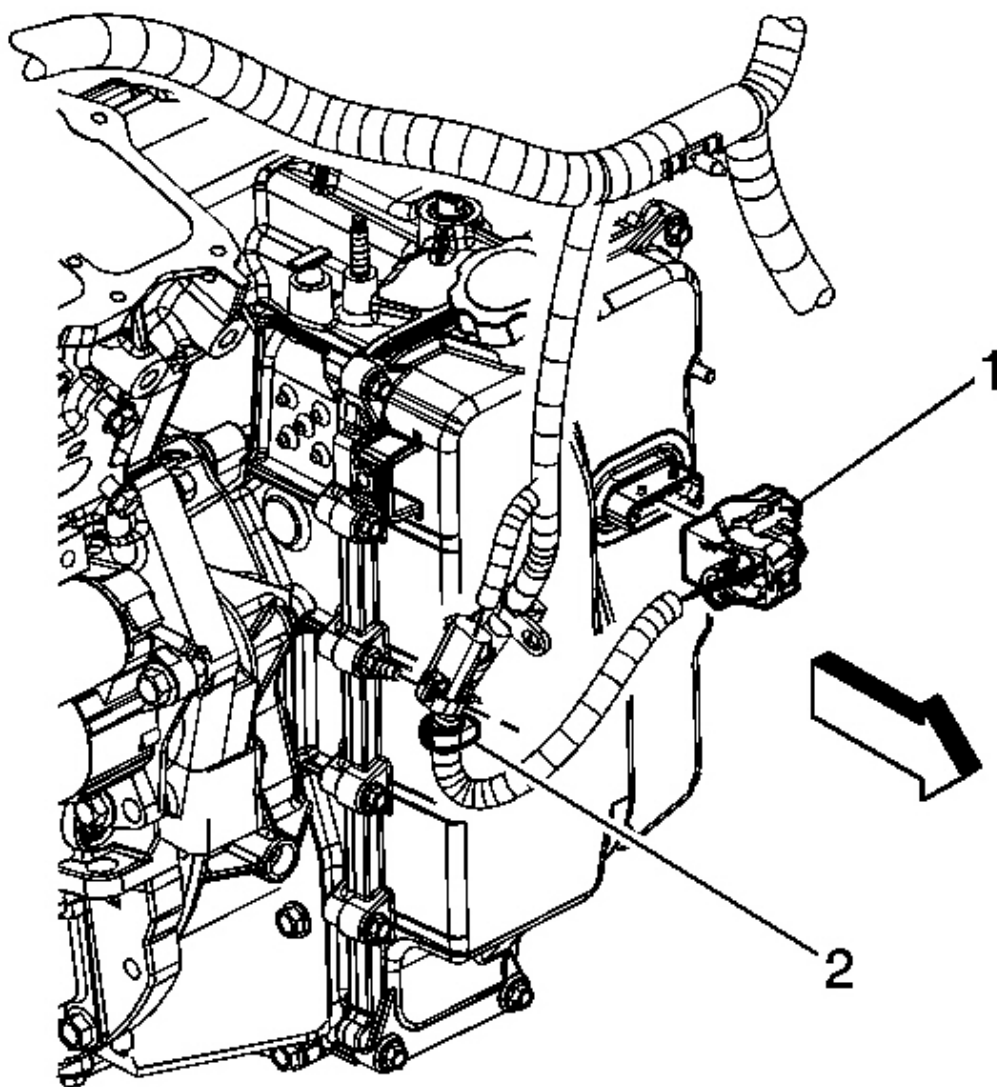


Fig. 6: Identifying Wire Harness Retainer & TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

The transmission electrical connector is an important part of the transmission operating system. Any interference with the electrical connection can cause the transmission to set diagnostic trouble codes or affect proper operation. The following items can affect the electrical connection:

- Bent pins in the connector from rough handling during connection and disconnection
- Wires backing away from the pins or coming uncrimped, in the external wiring harness

- Dirt contamination entering the connector when disconnected
- Transmission fluid leaking into the connector, wicking up into the external wiring harness and degrading the wire insulation
- Moisture intrusion in the connector
- Low pin retention in the external connector from excessive connection and disconnection of the wiring connector assembly
- Pin corrosion from contamination
- Damaged connector assembly

Remember the following points:

- Limit twisting or wiggling the connector during removal. Bent pins can occur.
- Do not pry the connector off with a screwdriver or other tool.
- Whenever the transmission external wiring connector is disconnected from the internal harness and the engine is operating, DTCs will set. Clear these DTCs after reconnecting the external connector.

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 circuits.

R1/456 Pressure Control (PC) Solenoid 3

The R1/456 pressure control solenoid (PCS) is energized (HIGH) allowing actuator feed limit fluid to enter the PCS R1/456 CL fluid circuit. PCS R1/456 CL fluid is then routed through orifice #22 to the 4-5-6 clutch boost valve and through orifice #21 to the R1/ 456 clutch regulator valve.

R1/456 Clutch Regulator Valve

PCS R1/456 CL fluid at the R1/4-5-6 clutch regulator valve moves the valve against R1/4-5-6 clutch regulator spring force and R1/FDBK fluid. This allows line pressure to pass through the valve and enter the R1/456CL FD circuit. R1/456CL FD is then routed to clutch select valve 2.

Shift Solenoid 1

Shift solenoid 1 is energized (ON) allowing actuator feed limit fluid to enter the solenoid 1 circuit. Solenoid 1 fluid is routed to the #2 ball check valve and through orifice #10 to the torque converter clutch (TCC) regulator valve and shuttle valve (SHTL).

TCC Regulator Valve and Shuttle Valve

Solenoid 1 fluid is routed to the TCC regulator valve and shuttle valve and moves the valve against TCC regulator valve spring force.

#2 Ball Check Valve

Solenoid 1 fluid seats the #2 ball check valve against the reverse fluid passage and fluid is forced through orifice #15 into the CSV2 enable fluid circuit.

Clutch Select Valve 2

CSV2 enable fluid is routed to the clutch select valve 2 and moves the valve against clutch select valve 2 spring force. This allows R1/456 CL FD fluid to pass through the valve and enter the R1 supply circuit. R1 Supply fluid is then routed into the R1 fluid circuit and, through orifice #18. R1 fluid is then routed to the low & reverse clutch assembly in preparation for a shift into low or reverse gear.

Shift Solenoid 2

Shift solenoid 2 is energized (ON) allowing actuator feed limit fluid to enter the solenoid 2 fluid circuit and is then routed to the #3 ball check valve and through orifice #13 to the clutch select valve #3.

3-5 Reverse Clutch Regulator Valve

Actuator feed limit fluid is routed through the valve and into the PS2 fluid passage. PS2 fluid is then sent to the normally closed #2 pressure switch and opens the switch.

#3 Ball Check Valve

Solenoid 2 fluid seats the #3 ball check valve against 456 CL fluid passage and fluid is forced through orifice #13 into the CSV3 enable fluid circuit. CSV3 enable fluid is then routed to the clutch select valve 3.

Clutch Select Valve #3

CSV3 enable fluid moves the clutch select valve 3 against clutch select valve 3 spring force.

Compensator Blow Off

Line pressure is routed through orifice #17 to the compensator feed circuit. Compensator feed fluid enters the compensator blow off circuit and fills the 4-5-6 dam piston area.

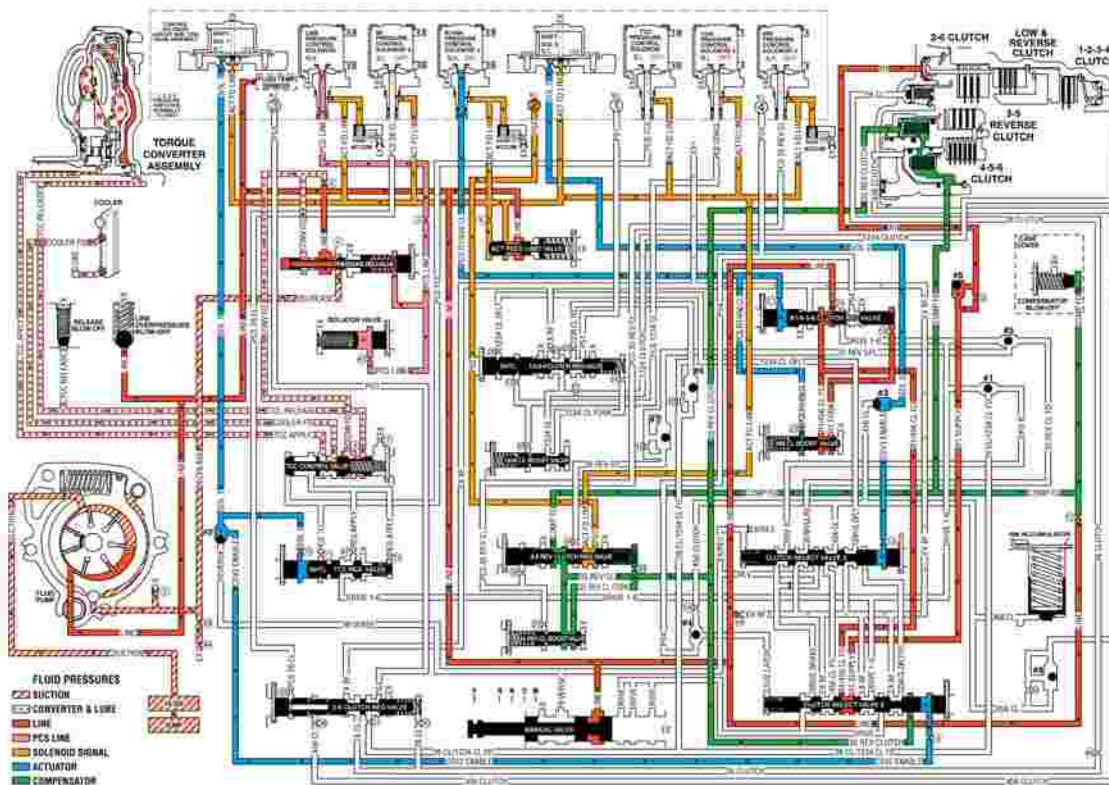


Fig. 7: Identifying Fluid Flow - Park - Engine Running
Courtesy of GENERAL MOTORS CORP.

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:

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

With the manual valve in the reverse position, line pressure is directed into the reverse fluid circuit to the #2 ball check valve and clutch select valve 3.

#2 Ball Check Valve

Reverse fluid seats the #2 ball check valve against the solenoid 1 fluid passage and fluid is forced through orifice #15 into the CSV2 enable circuit.

Clutch Select Valve 2

CSV2 enable fluid, present at the valve from Park position, continues to hold the clutch select valve 2 against clutch select valve 2 spring force.

Low & Reverse Clutch Applies

Clutch Select Valve 3

Reverse fluid from the manual valve is routed to clutch select valve 3 to combine with clutch select valve 3 spring force to keep the valve in the off position. This allows reverse fluid to pass through the valve and enter the 3-5 clutch reverse feed circuit. The 3-5 clutch reverse feed fluid from the clutch select valve 3 is also routed to #5 ball check valve.

Low & Reverse Clutch

R1 supply fluid passes through orifice #18 and unseats check ball #8. R1 supply fluid enters the low & reverse clutch piston circuit and moves the piston against the spring force to apply the low & reverse clutch plates.

#5 Ball Check Valve

The 3-5 clutch reverse feed fluid seats #5 ball check valve against the drive 1-6 circuit allowing 3-5 clutch reverse feed fluid to enter the 3-5 reverse supply circuit. The 3-5 reverse supply fluid is then routed to #7 ball check valve and through orifice #16 where it enters the 3-5 reverse feed circuit. The 3-5 reverse feed passes through orifice #34 and then is routed to the 3-5 reverse clutch regulator valve.

3-5 Reverse Clutch Applies

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 is energized (HIGH) allowing actuator feed limit fluid to enter the PCS 3-5 reverse clutch circuit. PCS 3-5 reverse clutch fluid is then routed through orifice #36 to the 3-5 reverse clutch regulator valve and through orifice #37 to the 3-5 reverse boost valve.

3-5 Reverse Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch and the 3-5 reverse boost valve. PS2 fluid from pressure switch 2 exhausts through the valve allowing the switch to close.

3-5 Reverse Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 clutch reverse feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 3-5R/456 clutch housing to move the piston against spring force and

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

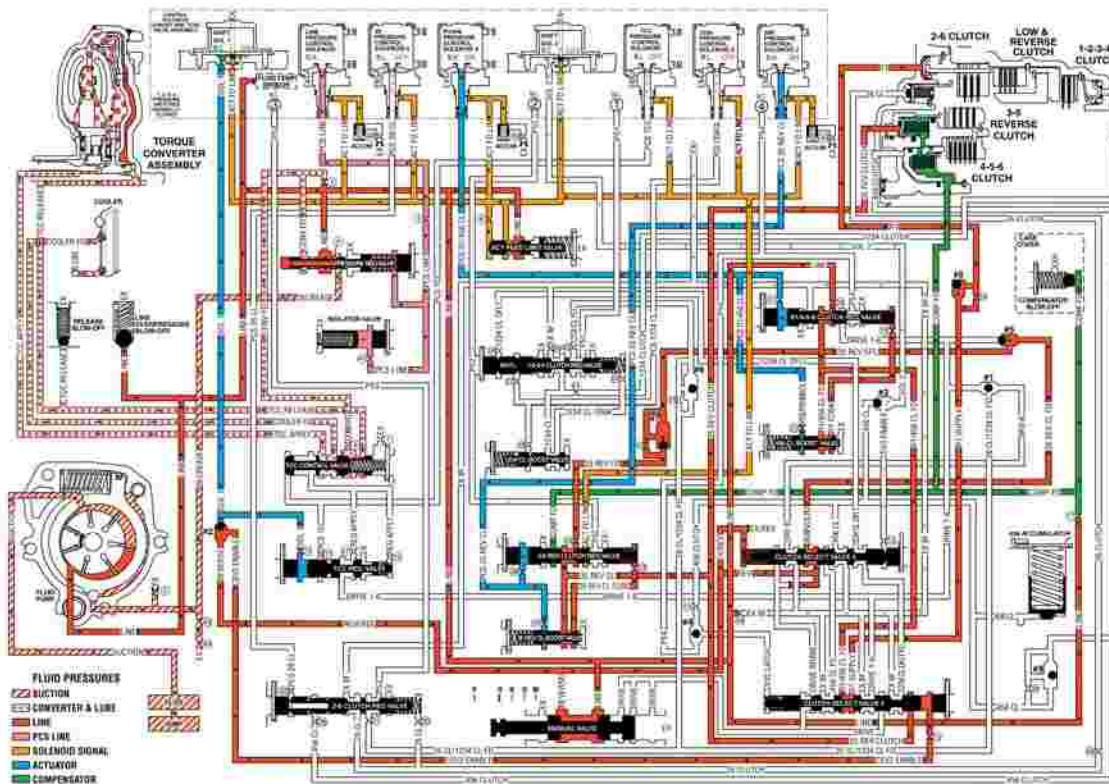


Fig. 8: Identifying Fluid Flow - Reverse
Courtesy of GENERAL MOTORS CORP.

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 and drive fluid circuits. The reverse fluid from the #2 ball check valve and clutch select valve 3 is opened to an exhaust passage at the manual valve.

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 is commanded OFF allowing PCS 3-5 reverse clutch fluid from the 3-5 reverse clutch boost valve and 3-5 reverse clutch regulator valve to exhaust.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 3-5 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 3-5 reverse clutch circuit and exhaust.

3-5 Reverse Clutch Regulator Valve

The 3-5 reverse clutch regulator valve spring force moves the valve to allow 3-5 reverse clutch fluid from the 3-5 reverse clutch and clutch select valve 2 to pass through the valve and enter the 3-5 reverse clutch feed circuit through orifice #16 past check ball #5 to clutch select valve 3 to exhaust back fill circuit to exhaust.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force moves the 3-5 reverse clutch piston to release the 3-5 reverse clutch plates and force 3-5 reverse clutch fluid to exhaust from the 3-5/4-5-6 reverse clutch housing. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve allowing the 3-5 reverse clutch to release.

Clutch Select Valve 3

When reverse fluid exhausts through the manual valve, CSV3 enable fluid moves the valve against clutch select valve 3 spring force. The 3-5 reverse feed fluid is routed into the exhaust back fill circuit and exhausts.

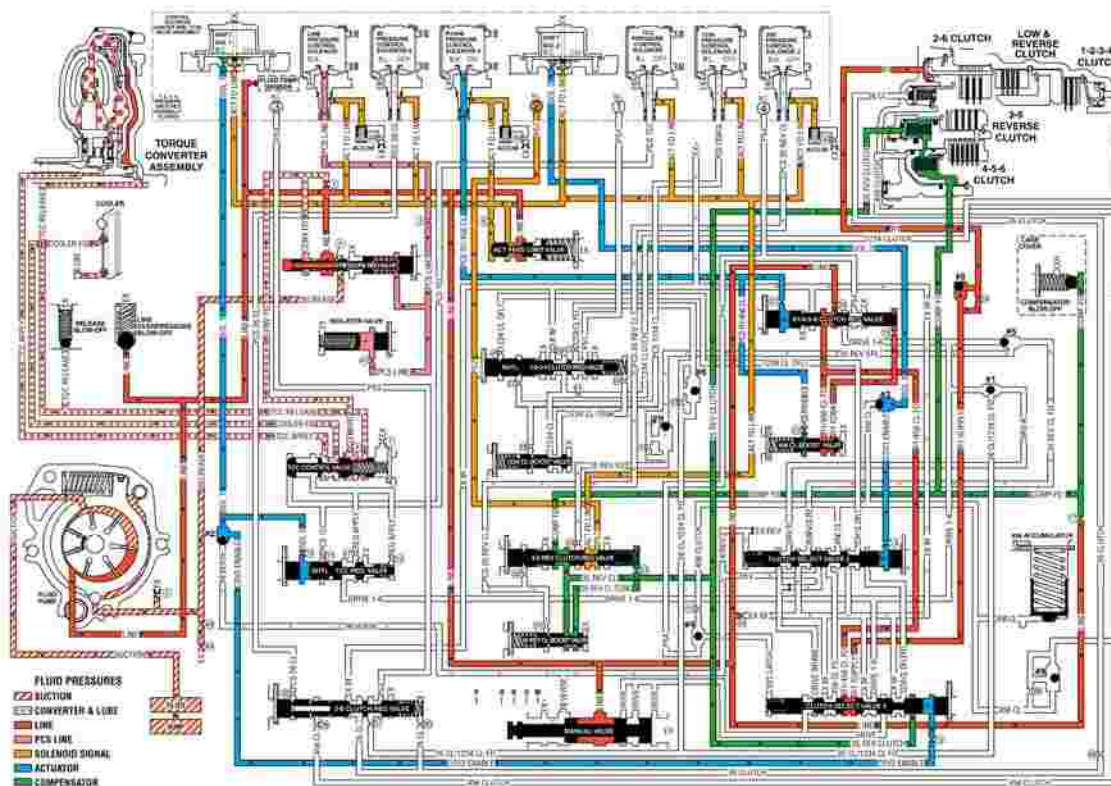


Fig. 9: Identifying Fluid Flow - Neutral - Engine Running
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, FIRST GEAR ENGINE BRAKING

When the gear selector lever is moved to the Drive (D) range from the Neutral (N) position, the transmission

will provide engine braking. In this operating range, the normally-low 1234 pressure control solenoid 5 is commanded ON and in the engine braking mode the following changes occur within the hydraulic circuits:

Fluid Pressure is Directed to the 1-2-3-4 Clutch and the Low & Reverse Clutch to Provide Engine Braking

Manual Valve

The manual valve is moved to the Drive (D) position and allows line fluid pressure to enter the drive fluid circuit. Drive fluid is then routed to the clutch select valve 2.

Clutch Select Valve 2

Drive fluid at the clutch select valve 2 passes through the valve and enters the drive brake circuit. Drive brake fluid is then routed to the clutch select valve 3.

Clutch Select Valve 3

Drive brake fluid at the clutch select valve 3 passes through the valve and enters the Drive B fluid circuit. Drive B fluid is then routed to #1 ball check valve.

#1 Ball Check Valve

Drive B fluid seats the #1 ball check valve against drive 1-6 fluid to force drive B fluid into the 26/1234 feed passage. The 26/ 1234 feed fluid is routed through orifice #31 and, to the 2-6 clutch regulator valve. The 26/1234 feed fluid passes through the 2-6 clutch regulator valve and enters the pressure switch 3 (PS3) fluid circuit. PS3 fluid is then routed to the normally closed pressure switch 3 and opens the switch.

#6 Ball Check Valve

26/1234 feed fluid unseats the #6 ball check valve allowing 26/1234 feed fluid to enter the 1234 clutch feed circuit. The 1234 clutch feed fluid is routed through orifice #25 and then to the 1-2-3-4 clutch regulator valve.

1-2-3-4 Clutch Applies

1234 Pressure Control Solenoid 5

The 1234 pressure control solenoid 5 is commanded ON allowing actuator feed limit to enter the PCS 1234 clutch fluid circuit. PCS 1234 clutch fluid is then routed through orifice #27 to the 1-2-3-4 clutch regulator valve. PCS1234 clutch fluid is also routed through orifice #29 and then to the 1-2-3-4 clutch boost valve.

1-2-3-4 Clutch Regulator Valve

PCS1234 clutch fluid moves the 1-2-3-4 clutch regulator valve against 1-2-3-4 clutch regulator valve spring force to allow 1234 clutch feed fluid to pass through the valve and enter the 1234 clutch fluid circuit. The 1234 clutch fluid is then routed to the 1234 clutch boost valve and the 1-2-3-4 clutch.

1-2-3-4 Clutch Boost Valve

PCS1234 clutch fluid pressure acts on a differential area moving the 1234 clutch boost valve against the 1234

clutch boost valve spring. The 1234 clutch fluid passes through the valve and enters 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 26 CL/1234 CL feed pressure (full line pressure) to the clutch.

1-2-3-4 Clutch

The 1234 clutch fluid enters the 1234 clutch to move the piston against spring force to apply the 1-2-3-4 clutch plates.

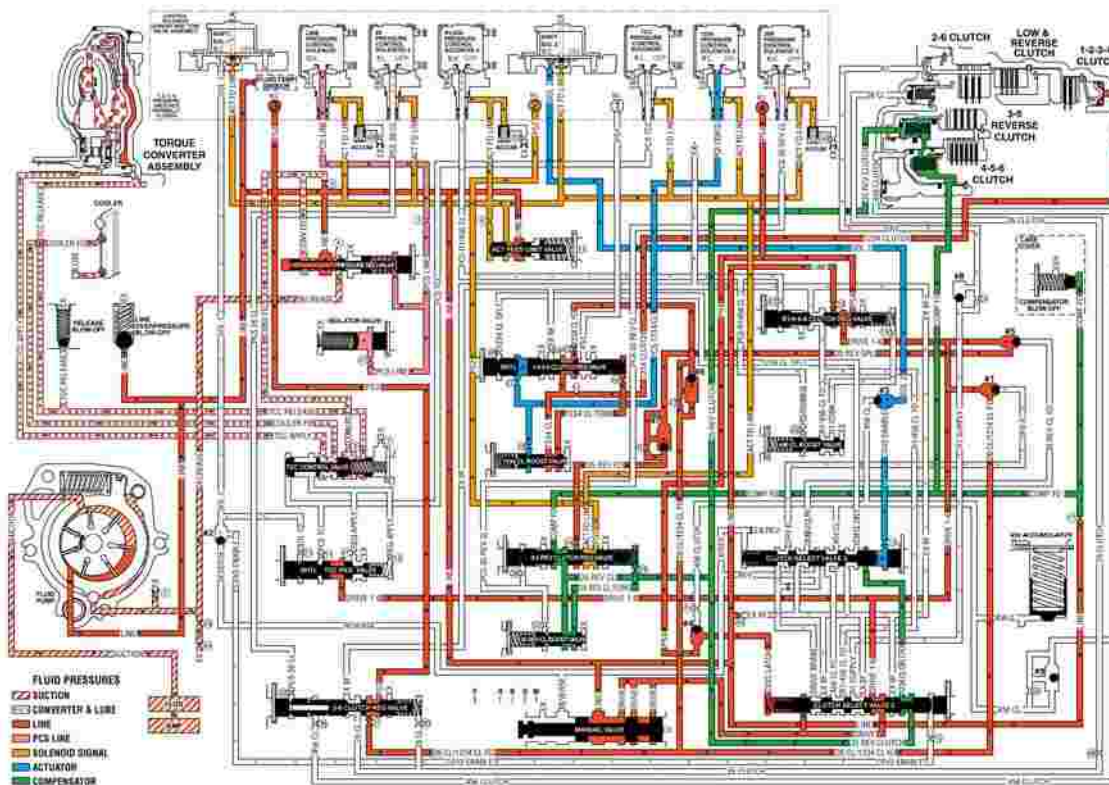


Fig. 10: Identifying Fluid Flow - Drive Range, First Gear Engine Braking
Courtesy of GENERAL MOTORS CORP.

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" shift solenoid 1 and command OFF the normally-high R1/456 pressure control solenoid 3.

Low & Reverse Clutch Releases

Shift Solenoid 1

When shift solenoid 1 is "turned OFF", CSV2 enable fluid from the clutch select valve 2 passes by the #2 ball check valve and enters the solenoid 1 fluid circuit. Solenoid 1 fluid from the #2 ball check valve and TCC

regulator valve is then routed to the solenoid where it exhausts.

Clutch Select Valve 2

Clutch select valve 2 (CSV2) enable fluid is exhausted from the clutch select valve 2 and clutch select valve 2 spring force moves the valve to the released position. With clutch select valve 2 in the released position, drive fluid from the manual valve passes through the valve and enters the drive 1-6 fluid circuit. Drive 1-6 fluid then feeds the R1/456 and 35 reverse clutch regulator valves and the TCC regulator valve.

R1/456 Pressure Control Solenoid 3

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

R1/456 Clutch Regulator Valve

R1/456 clutch regulator valve spring force moves the valve to exhaust the R1/456 clutch feed circuit and allow drive 1-6 fluid to enter the PS4 fluid circuit. PS4 fluid is then routed to the normally-closed pressure switch 4 and opens the switch. PS4 fluid is also routed to the #4 ball check valve and flows into the CSV2 latch fluid circuit.

#4 Ball Check Valve

PS4 fluid pressure seats the #4 ball check valve against the 456 clutch fluid circuit. PS4 fluid is then directed into the CSV2 latch fluid circuit and routed to the clutch select valve 2. CSV2 latch fluid combines with clutch select valve 2 spring force and holds the valve in this position during all 6 forward gear ranges.

#5 Ball Check Valve

Drive 1-6 fluid pressure seats the #5 ball check valve against the 35 reverse clutch feed fluid passage. Drive 1-6 fluid is then directed into the 35R supply fluid circuit which is routed to the #7 ball check valve and orifice #16.

#7 Ball Check Valve

The 35R supply fluid seats the #7 ball check valve against the 35R feed fluid passage to force 35R supply fluid through orifice #16 before entering the 35R feed circuit. The 35R feed fluid is then routed to the 3-5 reverse clutch regulator valve.

Low and Reverse Clutch

Low and reverse clutch spring force moves the low and reverse clutch piston which forces R1 fluid out. R1 fluid is routed to the clutch select valve 2 where it enters the exhaust backfill circuit. The low and reverse clutch is in the released position.

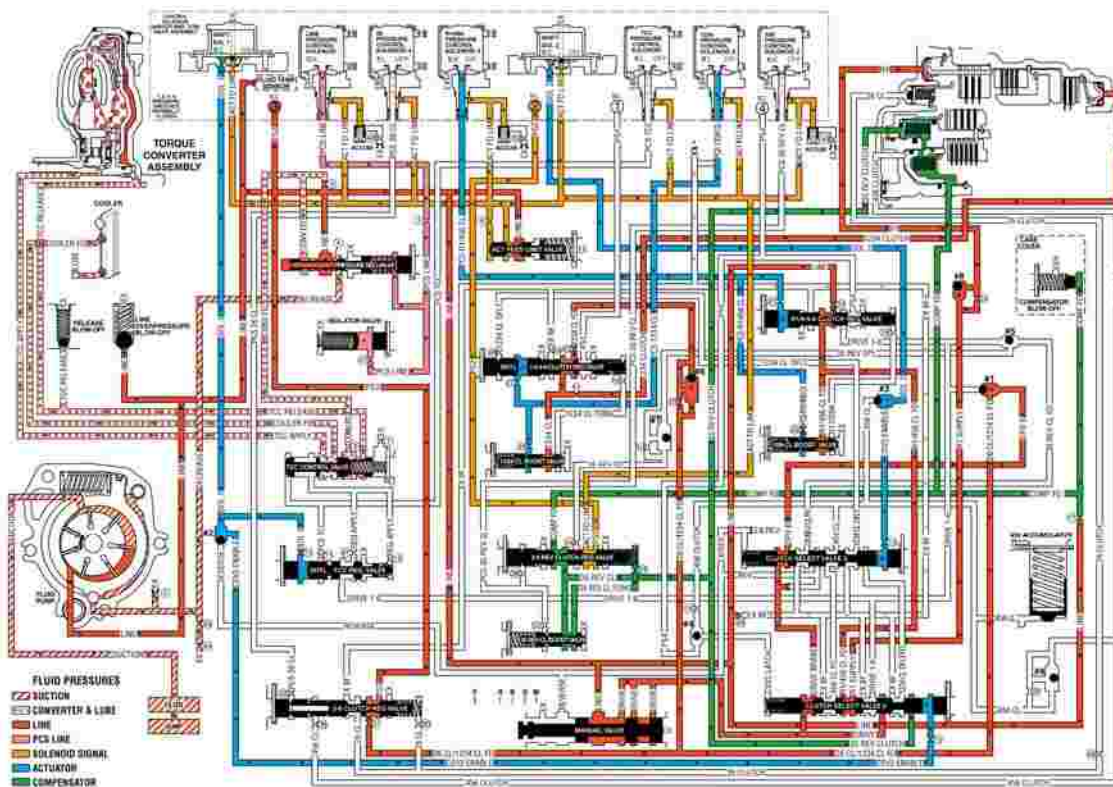


Fig. 11: Identifying Fluid Flow - Drive Range, First Gear
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, SECOND GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low pressure control solenoid 4.

Second Clutch Applies

26 Pressure Control Solenoid 4

The 26 pressure control solenoid 4 is commanded ON, allowing actuator feed limit fluid to enter the pressure control solenoid (PCS) 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #32 to the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid moves the 2-6 clutch regulator valve assembly against the 2-6 clutch regulator valve spring force to allow 26 clutch/1234 clutch feed fluid to pass through the valve. The 26 clutch/1234 clutch feed fluid is routed into the 26 clutch fluid circuit where it passes through orifice #46 and then to the spring end of the 2-6 clutch regulator valve, and to the 2-6 clutch within the case cover.

2-6 Clutch

against the 3-5 reverse clutch boost valve spring. The 35 reverse clutch fluid passes through the valve and enters the 35 reverse clutch feedback circuit. As PCS 35 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 35 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 35 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid. This allows 35 reverse feed to pass through the valve and enter the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS2 fluid from the pressure switch 2 exhausts through the valve allowing the switch to close.

3-5 Reverse Clutch

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

2-6 Clutch Releases

26 Pressure Control Solenoid 4

The 26 pressure control solenoid 4 is commanded OFF allowing PCS 26 clutch fluid from the 2-6 clutch regulator valve to exhaust. The 26 clutch/1234 clutch feed fluid at the 2-6 clutch regulator valve passes through the valve and enters the PS3 fluid circuit. PS3 fluid is then routed to pressure switch 3 and opens the normally-closed switch.

2-6 Clutch Regulator Valve

The 2-6 clutch regulator valve spring force moves the valve to allow 26 clutch fluid from the 2-6 clutch to pass through the valve and enter the exhaust backfill fluid circuit.

2-6 Clutch

The 2-6 clutch spring force moves the 2-6 clutch piston to release the 2-6 clutch plates and forces 26 clutch fluid to exhaust. The 26 clutch fluid is routed through the 2-6 clutch regulator valve where it enters the exhaust backfill fluid circuit and is exhausted.

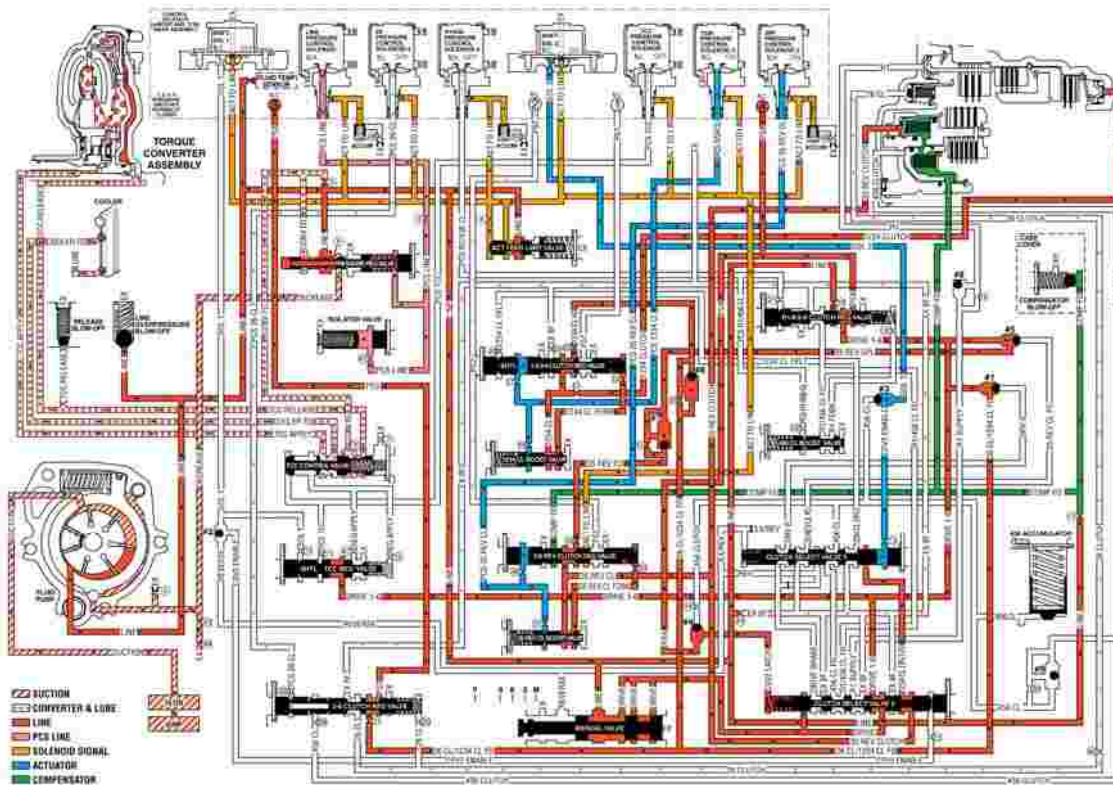


Fig. 13: Identifying Fluid Flow - Drive Range, Third Gear
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, THIRD GEAR DEFAULT

If the transmission is in 1st, 2nd or 3rd gear during a transmission electrical component failure, the transmission will default to 3rd gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release. This default action will enable the vehicle to be safely driven to a service center.

1-2-3-4 Clutch Stays Applied

Shift Solenoid 2

Shift solenoid 2 defaults to it's normally-closed state (OFF), and SOL 2 fluid exhausts through the solenoid.

Clutch Select Valve 3

Solenoid 2 fluid pressure no longer holds the clutch select valve 3 open. When the valve moves back to the closed position, it opens the 1234 clutch default fluid circuit, and 1234 default fluid is routed to the 1-2-3-4 clutch regulator valve.

1-2-3-4 Clutch Regulator Valve

With the absence of PCS 1234 clutch fluid, due to the default state of the 1234 pressure control solenoid 5, the 1-2-3-4 regulator valve would close from spring force. However, the 1234 clutch default fluid enters behind the 1-2-3-4 regulator shuttle valve and keeps the valve in the open position.

1-2-3-4 Clutch

With the 1-2-3-4 clutch regulator valve still held in the open position, the 1-2-3-4 clutch will stay applied.

3-5 Reverse Clutch Applied or Applies

35R Pressure Control Solenoid 2

The normal state for the 35R pressure control solenoid 2 is ON, therefore PSC 35 reverse clutch fluid will still be routed to the 3-5 reverse clutch regulator valve and the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS2 fluid from the pressure switch 2 exhausts through the valve, allowing the switch to close.

3-5 Reverse Clutch Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 3-5 reverse/456 clutch housing to move the piston against spring force to apply the 3-5 reverse clutch plates.

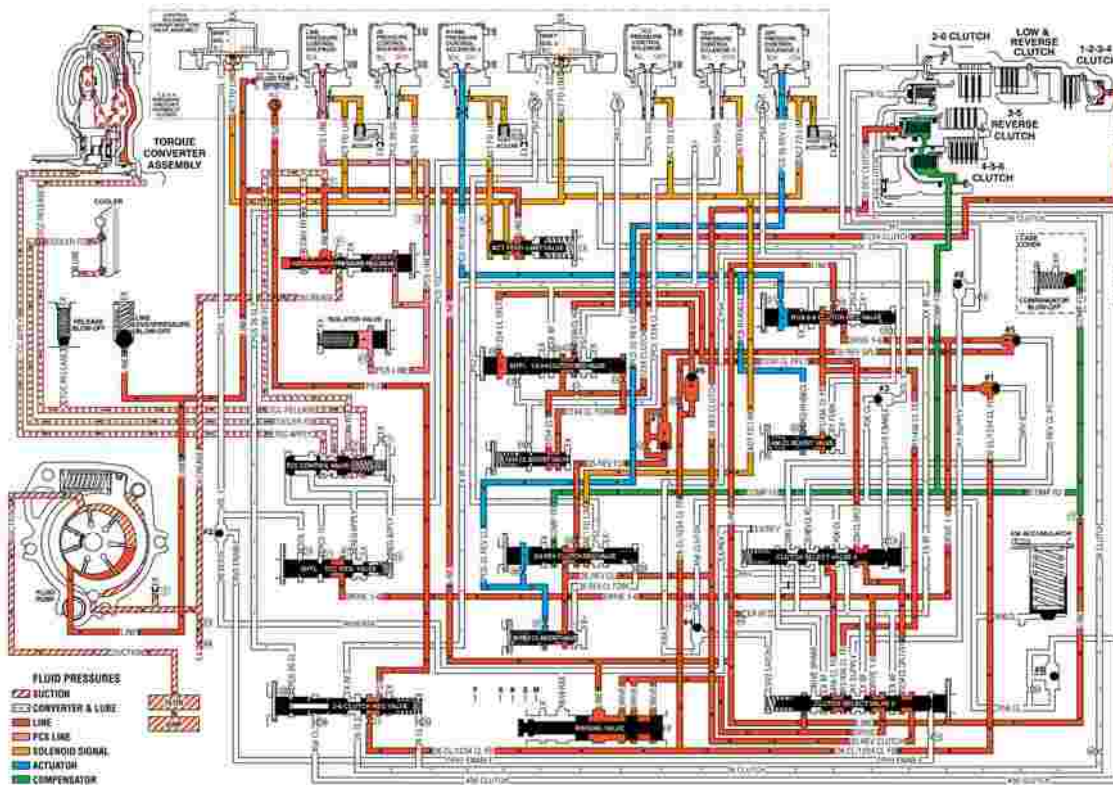


Fig. 14: Identifying Fluid Flow - Drive Range, Third Gear Default
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE - FOURTH GEAR

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

4-5-6 Clutch Applies

R1/456 Pressure Control Solenoid 3

The R1/456 pressure control solenoid 3 (PCS) is commanded ON allowing actuator feed fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is routed through orifice #21 to the R1/456 clutch regulator valve and, through orifice #22 to the R1/456 clutch boost valve.

R1/456 Clutch Regulator Valve

PCS R1/456 clutch fluid moves the R1/456 clutch regulator valve against R1/456 clutch regulator valve spring force to allow line fluid to pass through the valve and enter the R1/456 clutch feed circuit. R1/456 clutch feed is then routed to the 4-5-6 clutch boost valve and clutch select valve 2.

4-5-6 Clutch Boost Valve

PCS R1/456 clutch fluid pressure acts on a differential area moving the R1/456 clutch boost valve against the R1/456 clutch boost valve spring. R1/456 clutch fluid passes through the valve and enters the R1/456 clutch feedback circuit. As PCS R1/456 clutch fluid pressure is increased to a given value, the R1/456 clutch boost valve opens the R1/456 clutch feedback circuit to exhaust. This results in the R1/456 clutch regulator valve moving to the full feed position, sending full line pressure to the clutch.

Clutch Select Valve 2

R1/456 clutch feed fluid passes through the clutch select valve 2 and enters the 456 clutch feed circuit. The 456 clutch feed fluid is routed to the clutch select valve 3 where it passes through the valve and enters the 456 clutch fluid circuit. The 456 clutch fluid is routed to the 4-5-6 clutch, the 4-5-6 accumulator, #9 ball check valve and to the #4 ball check valve. The 456 clutch fluid seats the #9 ball check valve and routes fluid through orifice #39. The 456 clutch fluid passes through orifice #14, seats #4 ball check valve against the PS4 fluid circuit and routes fluid to the CSV2 latch circuit.

4-5-6 Clutch

The 456 clutch fluid enters the 4-5-6 clutch housing to move the piston against spring force, combined with force from the compensator to apply the 4-5-6 clutch plates.

3-5 Reverse Clutch Releases

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 is commanded OFF, allowing PCS 35 reverse clutch fluid from the 3-5 reverse clutch boost valve and the 3-5 reverse clutch regulator valve to exhaust through the solenoid.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 35 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 35 reverse clutch fluid circuit and exhaust.

#9 Ball Check Valve

The 456 clutch fluid pressure seats #9 ball check valve to force fluid through orifice #39 and applies the 456 clutch.

3-5 Reverse Clutch Regulator Valve

The 3-5 reverse clutch regulator valve spring force moves the valve to allow 35 reverse clutch fluid from the 3-5 reverse clutch to pass through the valve and enter the exhaust backfill fluid circuit. The 35 reverse clutch fluid then enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force combined with force from the compensator move the 3-5 reverse clutch piston to release the 3-5 clutch plates and forces 35 reverse clutch fluid to exhaust from 3-5 reverse/456 clutch housing. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve and exhausted.

#4 Ball Check Valve

The 456 clutch fluid pressure passes through orifice #14 to seat #4 ball check valve against PS4 fluid passage. The 456 clutch fluid is then directed into the CSV2 latch circuit.

456 Accumulator

The 456 clutch fluid enters the 456 accumulator to move the piston against spring force to cushion the 456 clutch piston apply.

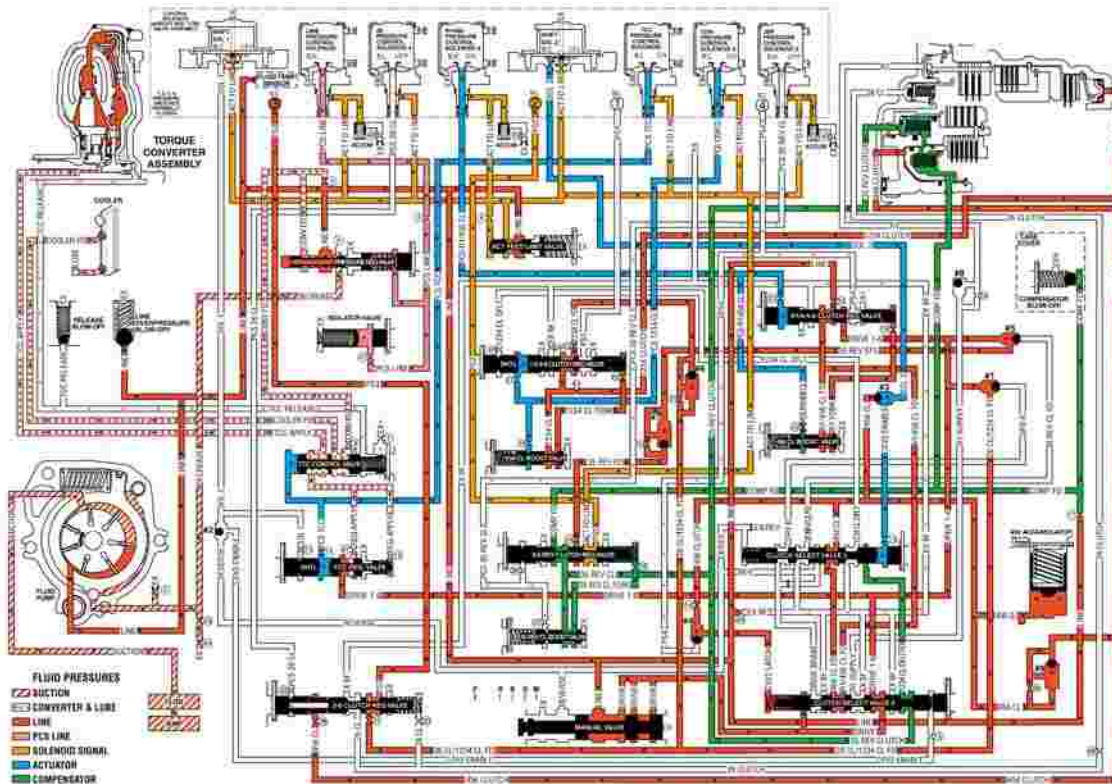


Fig. 15: Identifying Fluid Flow - Drive Range, Fourth Gear
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, FIFTH GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-high 35R pressure control solenoid 2. At the same time the normally-low 1234 pressure control solenoid 5 is commanded OFF.

3-5 Reverse Clutch Applies

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 is commanded ON, allowing actuator feed fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #36 and then to the 3-5 reverse

clutch regulator valve. PCS 35 reverse clutch fluid is also routed through orifice #37 and then to the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Boost Valve

PCS 35 reverse clutch fluid pressure acts on a differential area moving the PCS 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 35 reverse clutch fluid passes through the valve and enters the 35 reverse clutch feedback circuit. As PCS 35 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 35 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 35 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid. This allows 35 reverse feed to pass through the valve and enter the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS2 fluid from the pressure switch 2 exhausts through the valve allowing the switch to close.

Clutch Select Valve 2

The 35 reverse clutch fluid passes through the clutch select valve 2 and enters the 1234 clutch default feed fluid circuit. The 1234 clutch default feed fluid is then routed to the clutch select valve 3.

3-5 Reverse Clutch

The 35 reverse clutch fluid enters the 3-5 reverse/456 clutch housing to move the piston against spring force combined with force from the compensator to apply the 3-5 reverse clutch plates.

1-2-3-4 Clutch Releases

1234 Pressure Control Solenoid 5

The 1234 pressure control solenoid 5 is commanded OFF, allowing PCS 1234 clutch fluid from the 1-2-3-4 clutch regulator valve and 1-2-3-4 clutch boost valve to exhaust.

1-2-3-4 Clutch Regulator Valve

The 1-2-3-4 clutch regulator valve spring force moves the valve to allow 1234 clutch feed fluid from the 1-2-3-4 clutch to pass through the valve and enter the exhaust backfill fluid circuit. The 1234 clutch fluid enters the exhaust backfill fluid circuit and is routed through orifice #26 where excess pressure is exhausted. Also, 1234 clutch regulator valve spring force moves the valve to allow 1234 clutch feed fluid to pass through the valve and enter the PS1 fluid circuit. PS1 fluid is then routed to pressure switch 1 and opens the normally-closed switch.

1-2-3-4 Clutch Boost Valve

The 1-2-3-4 clutch boost valve spring force moves the valve to allow 1234 clutch feedback fluid from the 1-2-3-

4 clutch regulator valve to enter the 1234 clutch circuit and exhaust.

1-2-3-4 Clutch

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

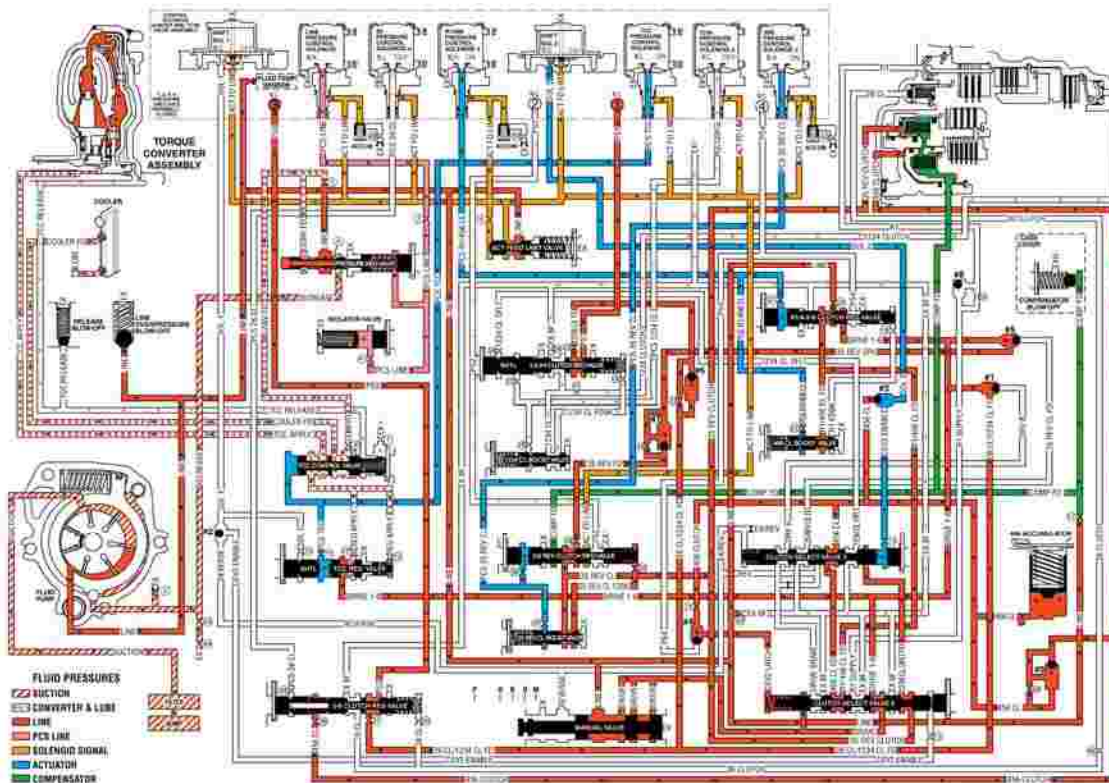


Fig. 16: Identifying Fluid Flow - Drive Range, Fifth Gear
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, FIFTH GEAR DEFAULT

If the transmission is in 4th, 5th or 6th gear during a transmission electrical component failure, the transmission will default to 5th gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release. The transmission will stay in 5th gear default range until the ignition has been turned off or transmission shifted to reverse. When the vehicle is restarted, and shifted back into drive, the transmission will then operate in the 3rd gear default range. This default action will enable the vehicle to be safely driven to a service center.

3-5 Reverse Clutch Applies

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 defaults to ON, allowing actuator feed fluid to enter the pressure control solenoid (PCS) 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #36 and then

to the 3-5 reverse clutch regulator valve. PCS 35 reverse clutch fluid is also routed through orifice #37 and then to the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the PCS 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS2 fluid from the pressure switch 2 exhausts through the valve, allowing the switch to close.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 3-5 reverse/456 clutch housing to move the piston against spring force to apply the 3-5 reverse clutch plates.

Clutch Select Valve 3

Once the clutch select valve 3 is moved to the ON position in 4th gear, it will remain in this position throughout the 5th gear default range, until the ignition has been turned OFF. When the ignition is OFF, fluid will exhaust from the valve, thus when the vehicle is restarted, the transmission will then be in the 3rd gear default range.

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

1234 Pressure Control Solenoid 5

If the transmission was in 4th gear when an electrical condition commands a protection mode, the 1234 pressure control solenoid 5 defaults to the OFF position, allowing PCS 1234 clutch fluid from the 1-2-3-4 clutch, the 1-2-3-4 clutch regulator valve and 1-2-3-4 clutch boost valve to exhaust.

2-6 26 Pressure Control Solenoid 4

If the transmission was in 6th gear when an electrical condition commands a protection mode, the 26 pressure control solenoid 4 defaults to the OFF position, allowing PCS 26 clutch fluid from the 2-6 clutch regulator valve, and the 2-6 clutch to exhaust.

Torque Converter Clutch Releases

TCC Pressure Control Solenoid

The torque converter clutch (TCC) pressure control solenoid will default to it's normal state, OFF. PCS TCC fluid will exhaust from the TCC control valve, and spring force will shuttle the valve to the off position. TCC apply fluid will then be routed to the cooler, and TCC release fluid will be routed to the torque converter for complete TCC release.

1234 Clutch Regulator Valve

The 1234 clutch regulator valve spring force moves the valve to allow 1234 clutch feed fluid to enter the PS1 fluid circuit which opens PS1 switch. The 1234 clutch fluid passes through orifice #51 to the 1234 clutch regulator valve, through orifice #26 and enters the exhaust backfill circuit.

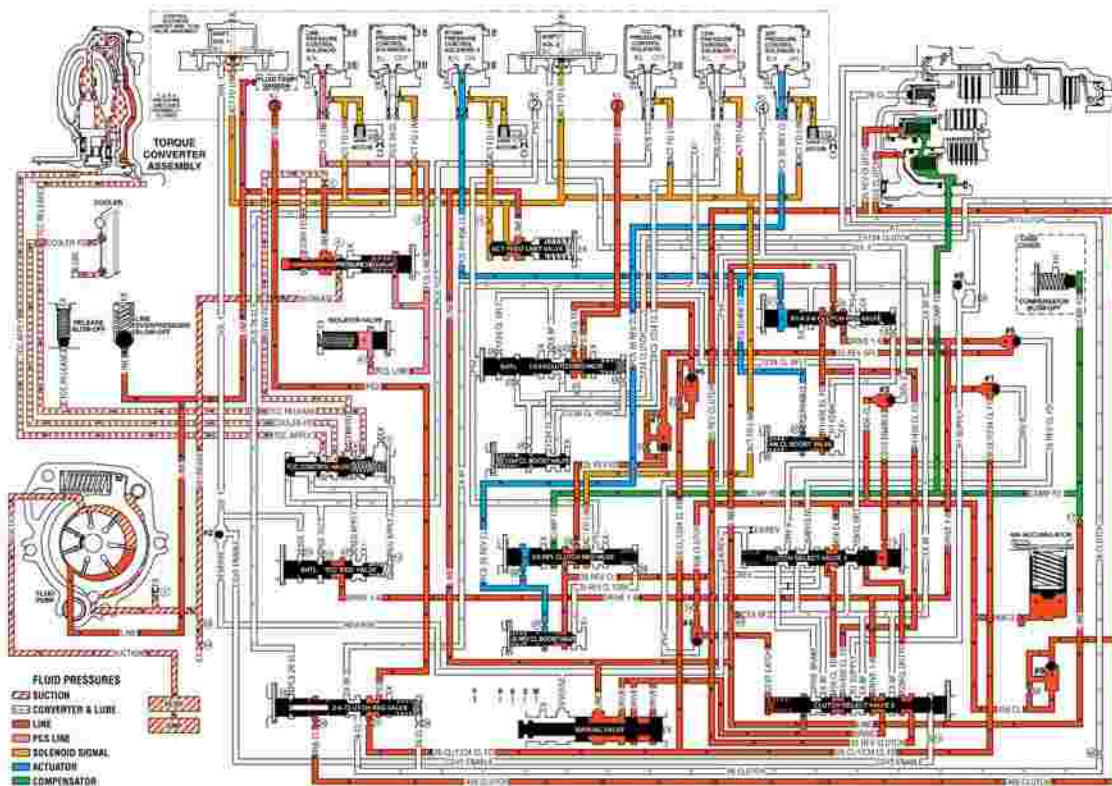


Fig. 17: Identifying Fluid Flow - Drive Range, Fifth Gear Default
Courtesy of GENERAL MOTORS CORP.

DRIVE RANGE, SIXTH GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low 26 pressure control solenoid 4 (PCS). At the same time the normally-high 35R pressure control solenoid 2 is commanded OFF.

2-6 Clutch Applies

26 Pressure Control Solenoid 4

The 26 pressure control solenoid 4 is commanded ON, allowing actuator feed fluid to enter the PCS 26 clutch

fluid circuit. PCS 26 fluid is routed through orifice #32 and then to the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid moves the 2-6 clutch regulator valve assembly against the 2-6 clutch regulator valve spring force to allow 26 clutch/1234 clutch feed fluid to pass through the valve. The 26 clutch/1234 clutch feed fluid is routed into the 26 clutch fluid circuit where it passes through orifice #46 and then to the spring end of the 2-6 clutch regulator valve, and to the 2-6 clutch.

2-6 Clutch

The 26 clutch fluid from the 2-6 clutch regulator valve is routed 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 Clutch Releases

35R Pressure Control Solenoid 2

The 35R pressure control solenoid 2 is commanded OFF, allowing PCS 35 reverse clutch fluid from the 3-5 reverse clutch boost valve and the 3-5 reverse clutch regulator valve to exhaust through the solenoid.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 35 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 35 reverse clutch circuit and exhaust.

3-5 Reverse Clutch Regulator Valve

The 3-5 reverse clutch regulator valve spring force moves the valve to allow actuator feed limit fluid to pass through the valve and enter the PS2 fluid circuit which opens PS2. The 35 reverse clutch fluid then enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force moves the 3-5 reverse clutch piston to release the 3-5 clutch plates and forces 35 reverse clutch fluid to exhaust from 3-5 reverse/456 clutch housing. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve where it exhaust excess pressure.

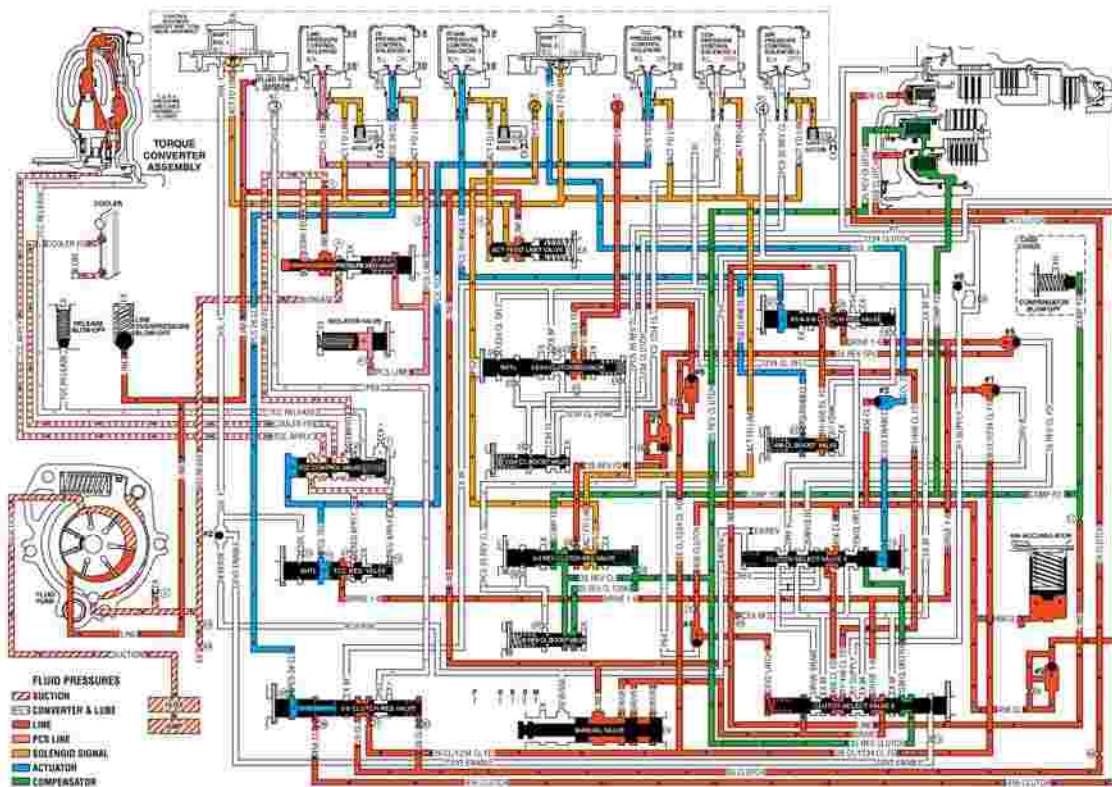


Fig. 18: Identifying Fluid Flow - Drive Range, Sixth Gear
 Courtesy of GENERAL MOTORS CORP.

FLUID PASSAGES

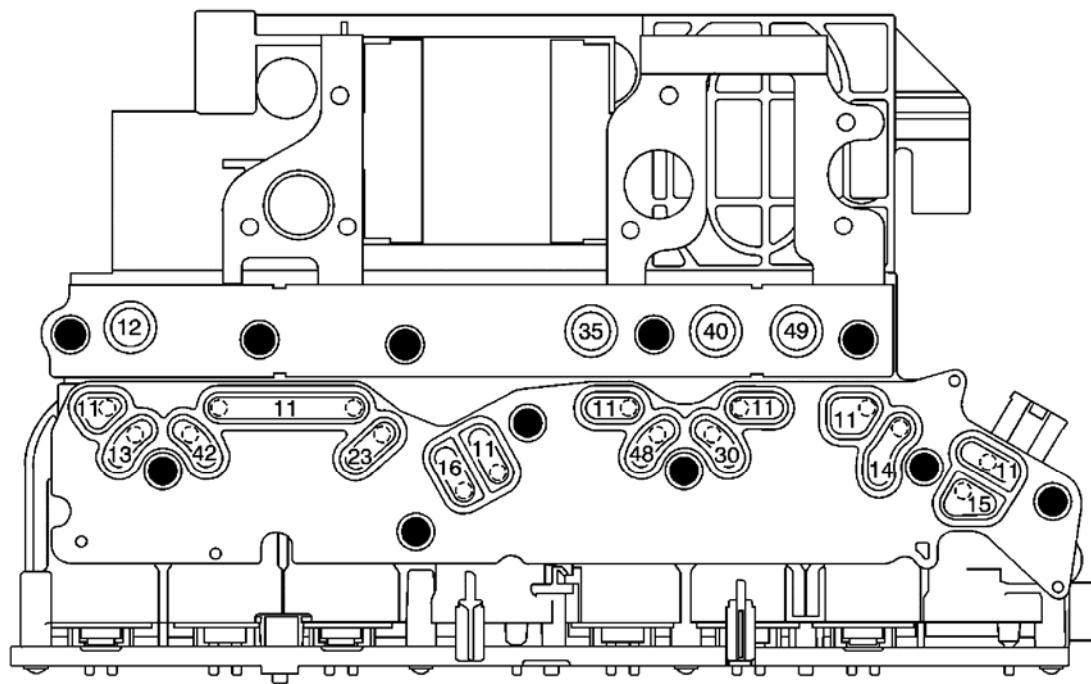


Fig. 19: Control Solenoid (w/Body and TCM) Valve Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
11	Actuator Feed Limit
12	PS2
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
16	Solenoid 2
23	PCS 35 Reverse Clutch
30	PCS 1234 Clutch
35	PS3
40	PS4
42	PCS 26 Clutch
48	PCS TCC
49	PS1

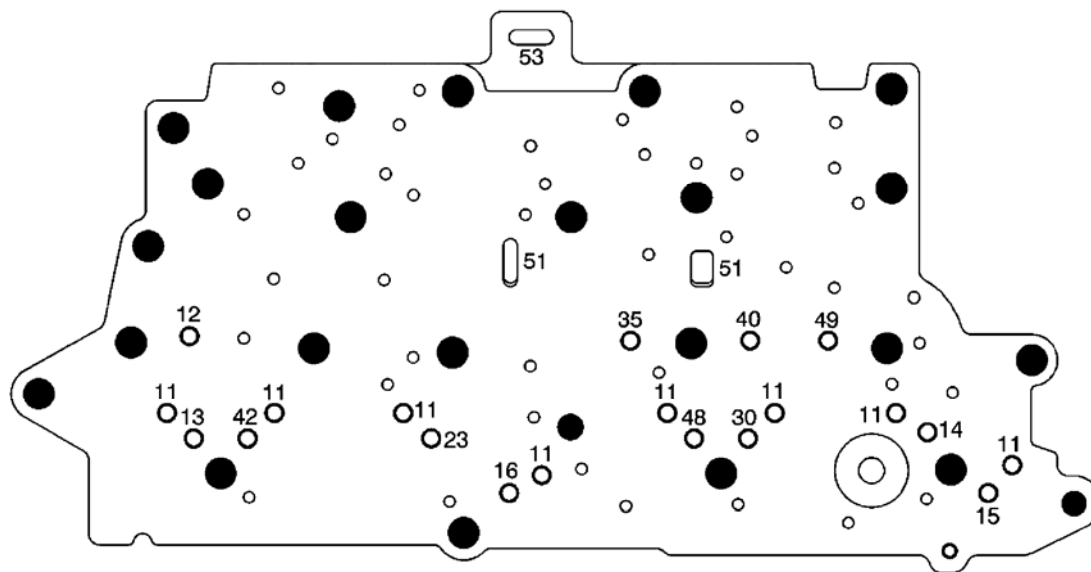


Fig. 20: Control Valve Channel Upper Plate Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
11	Actuator Feed Limit
12	PS2
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
16	Solenoid 2
23	PCS 35 Reverse Clutch
30	PCS 1234 Clutch
35	PS3
40	PS4
42	PCS 26 Clutch
48	PCS TCC
49	PS1
51	Exhaust
53	Void

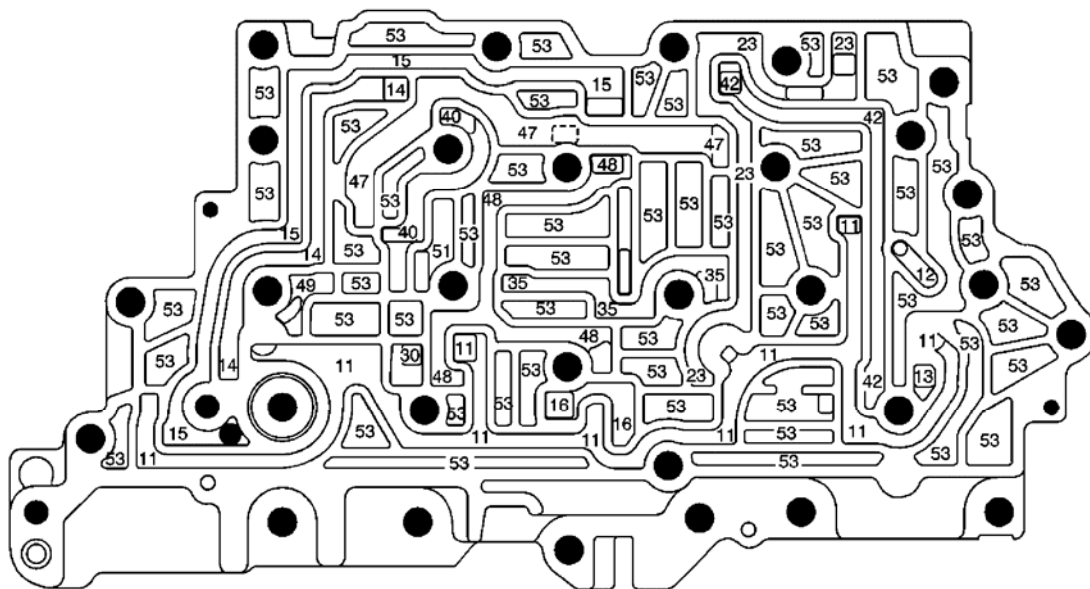


Fig. 21: Control Valve Channel Plate - Upper Plate Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
11	Actuator Feed Limit
12	PS2
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
16	Solenoid 2
23	PCS 35 Reverse Clutch
30	PCS 1234 Clutch
35	PS3
40	PS4
42	PCS 26 Clutch
47	456 Clutch
48	PCS TCC
49	PS1
51	Exhaust
53	Void

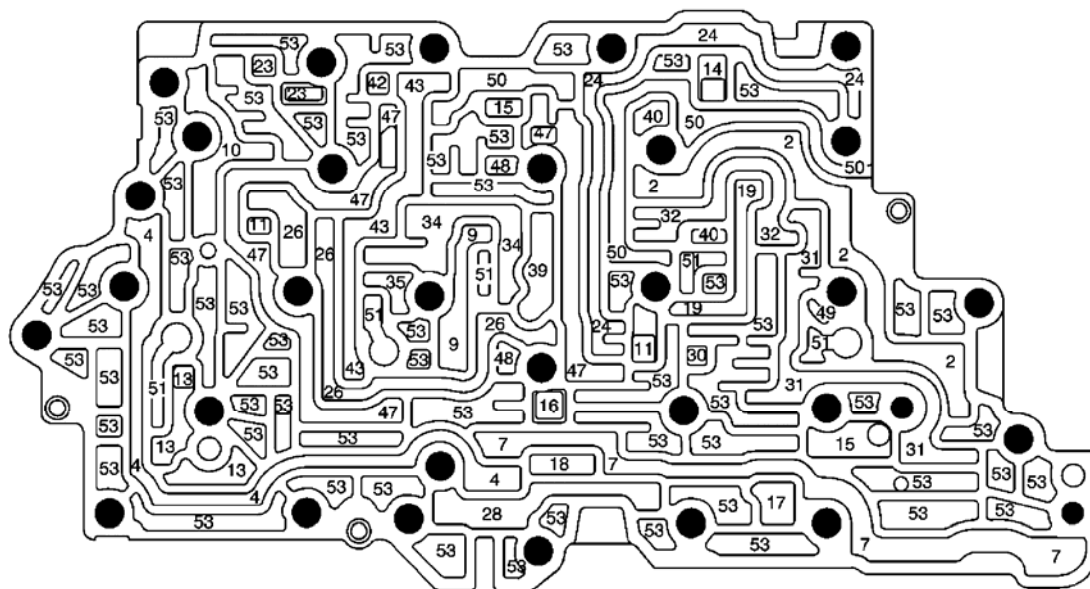


Fig. 22: Control Valve Channel Plate - Upper Body Spacer Plate Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
4	Converter Feed
7	Cooler Feed
9	Regulated Apply
10	Compensator Feed
11	Actuator Feed Limit
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
16	Solenoid 2
17	CSV2 Enable
18	CSV3 Enable
19	R1/456 Clutch Feed
23	PCS 35 Reverse Clutch
24	Reverse
26	35 Reverse Supply
27	35 Reverse Feed
28	35 Reverse Clutch
30	PCS 1234 Clutch
31	Drive
32	Drive Brake

34	26 Clutch/1234 Clutch Feed
35	PS3
39	Drive 1-6
40	PS4
42	PCS 26 Clutch
43	26 Clutch
47	456 Clutch
48	PCS TCC
49	PS1
50	Exhaust Backfill
51	Exhaust
53	Void

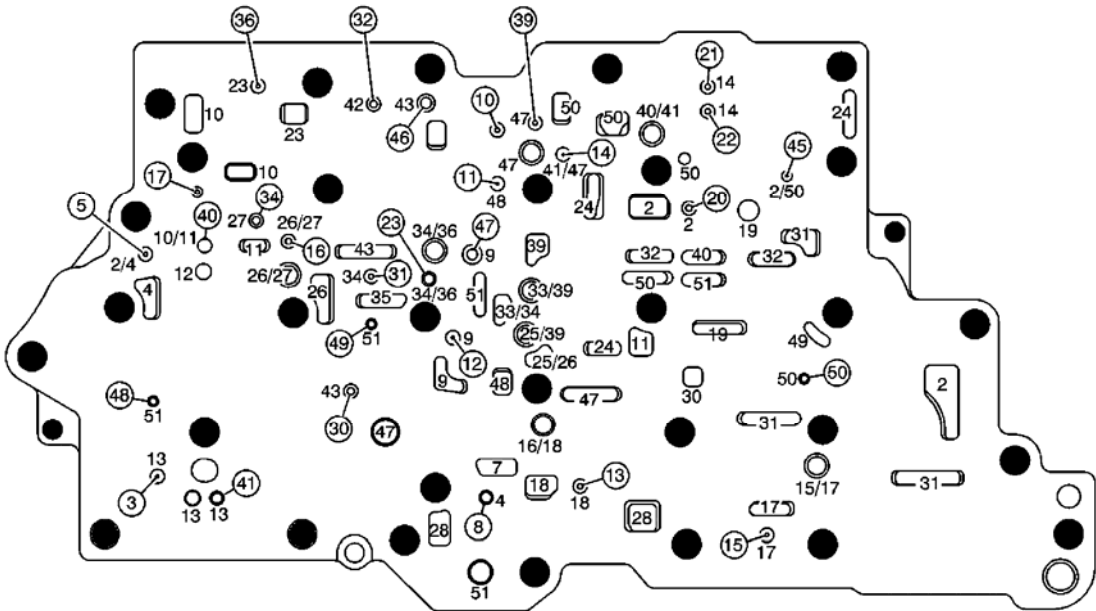


Fig. 23: Control Valve Upper Body Spacer Plate Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
4	Converter Feed
5	TCC Release
7	Cooler Feed
8	Lube
9	Regulated Apply
10	Compensator Feed

11	Actuator Feed Limit
12	PS2
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
16	Solenoid 2
17	CSV2 Enable
18	CSV3 Enable
19	R1/456 Clutch Feed
20	R1 Feedback
21	R1 Supply
22	R1
23	PCS 35 Reverse Clutch
24	Reverse
25	35 Reverse Clutch Feed
26	35 Reverse Supply
27	35 Reverse Feed
28	35 Reverse Clutch
30	PCS 1234 Clutch
31	Drive
32	Drive Brake
33	Drive B
34	26 Clutch/1234 Clutch Feed
35	PS3
36	1234 Clutch Feed
39	Drive 1-6
40	PS4
41	CSV2 Latch
42	PCS 26 Clutch
43	26 Clutch
45	1234 Clutch Default
46	456 Clutch Feed
47	456 Clutch
48	PCS TCC
49	PS1
50	Exhaust Backfill
51	Exhaust

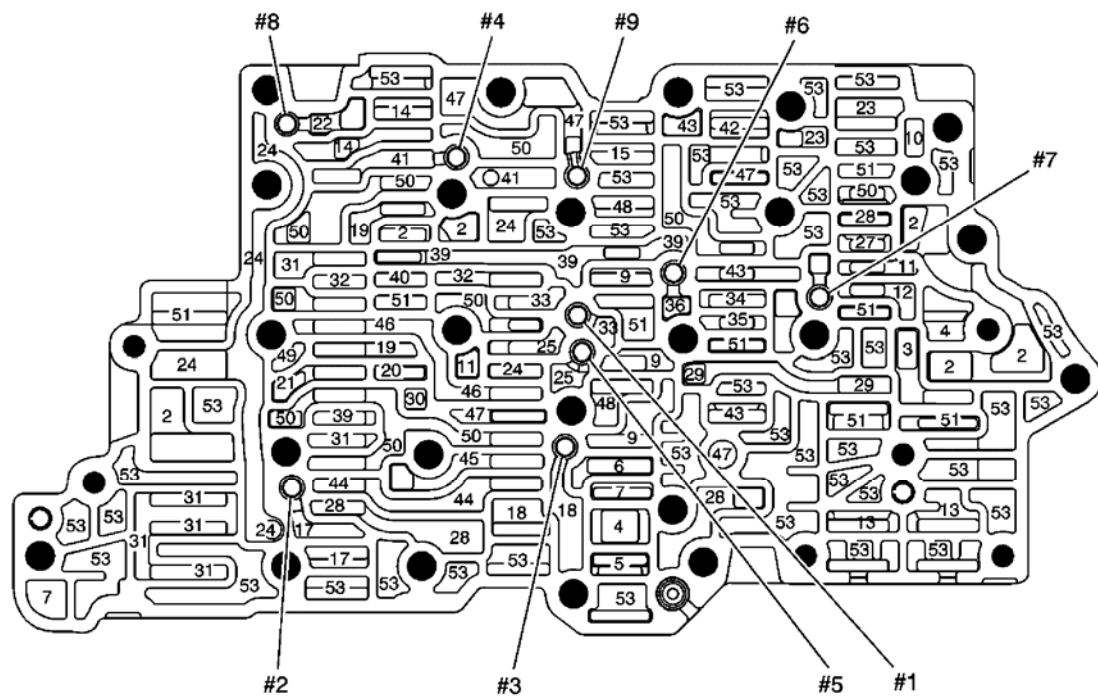


Fig. 24: Control Valve Upper Body Assembly - Upper Body Spacer Plate Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
4	Converter Feed
5	TCC Release
6	TCC Apply
7	Cooler Feed
9	Regulated Apply
10	Compensator Feed
11	Actuator Feed Limit
12	PS2
13	PCS Line
14	PCS R1/456 Clutch
15	Solenoid 1
17	CSV2 Enable
18	CSV3 Enable
19	R1/456 Clutch Feed
20	R1 Feedback
21	R1 Supply
22	R1

23	PCS 35 Reverse Clutch
24	Reverse
25	35 Reverse Clutch Feed
27	35 Reverse Feed
28	35 Reverse Clutch
29	35 Reverse Clutch Feedback
30	PCS 1234 Clutch
31	Drive
32	Drive Brake
33	Drive B
34	26 Clutch/1234 Clutch Feed
35	PS3
36	1234 Clutch Feed
39	Drive 1-6
40	PS4
41	CSV2 Latch
42	PCS 26 Clutch
43	26 Clutch
44	1234 Clutch Default Feed
45	1234 Clutch Default
46	456 Clutch Feed
47	456 Clutch
48	PCS TCC
49	PS1
50	Exhaust Backfill
51	Exhaust
53	Void

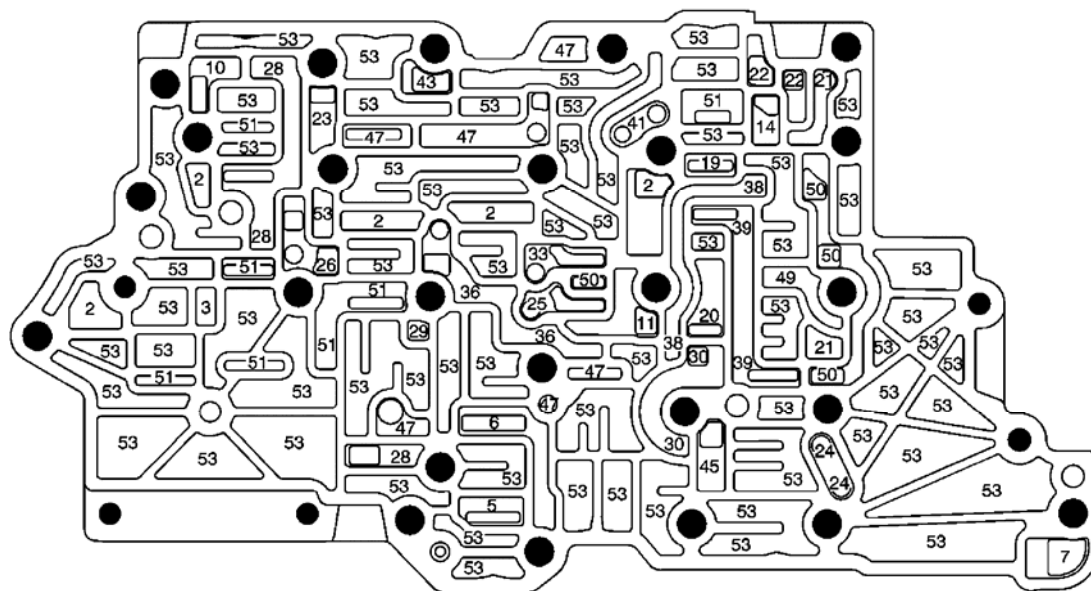


Fig. 25: Control Valve Upper Body Assembly - Lower Body Spacer Plate Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
5	TCC Release
6	TCC Apply
7	Cooler Feed
10	Compensator Feed
11	Actuator Feed Limit
14	PCS R1/456 Clutch
19	R1/456 Clutch Feed
20	R1 Feedback
21	R1 Supply
22	R1
23	PCS 35 Reverse Clutch
24	Reverse
25	35 Reverse Clutch Feed
26	35 Reverse Supply
28	35 Reverse Clutch
29	35 Reverse Clutch Feedback
30	PCS 1234 Clutch
33	Drive B
36	1234 Clutch Feed

38	1234 Clutch Feedback
39	Drive 1-6
41	CSV2 Latch
43	26 Clutch
45	1234 Clutch Default
47	456 Clutch
49	PS1
50	Exhaust Backfill
51	Exhaust
53	Void

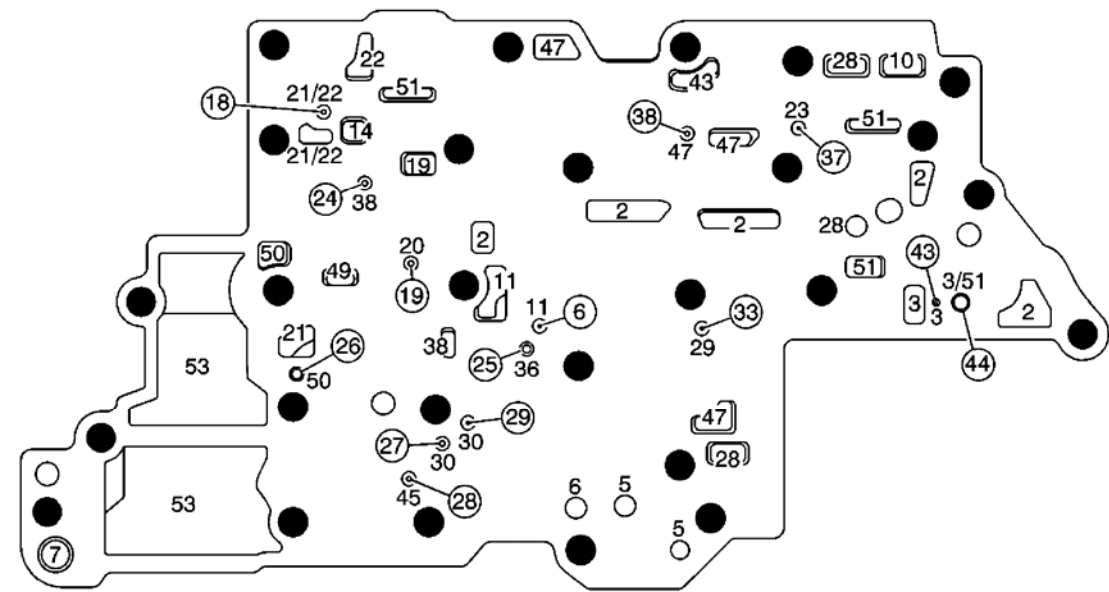


Fig. 26: Control Valve Lower Body Spacer Plate Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
5	TCC Release
6	TCC Apply
10	Compensator Feed
11	Actuator Feed Limit
14	PCS R1/456 Clutch
18	CSV3 Enable
19	R1/456 Clutch Feed
20	R1 Feedback

21	R1 Supply
22	R1
23	PCS 35 Reverse Clutch
24	Reverse
25	35 Reverse Clutch Feed
26	35 Reverse Supply
27	35 Reverse Feed
28	35 Reverse Clutch
29	35 Reverse Clutch Feedback
30	PCS 1234 Clutch
33	Drive B
36	1234 Clutch Feed
37	1234 Clutch
38	1234 Clutch Feedback
43	26 Clutch
44	1234 Clutch Default Feed
45	1234 Clutch Default
47	456 Clutch
49	PS1
50	Exhaust Backfill
51	Exhaust
53	Void

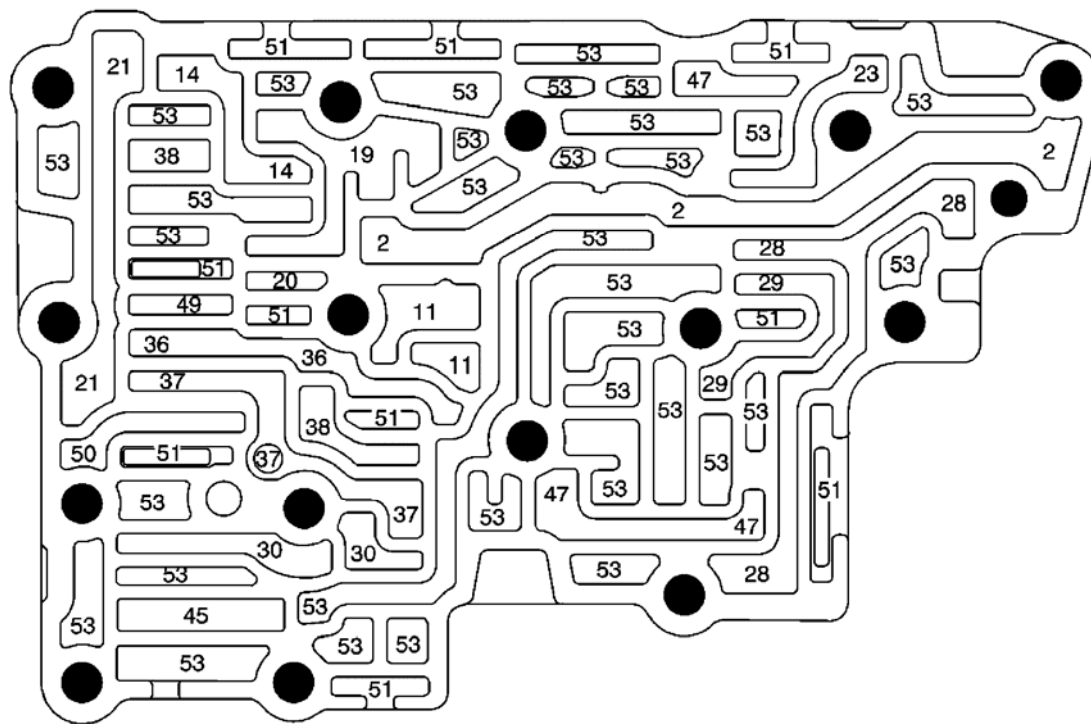


Fig. 27: Control Valve Lower Body
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
11	Actuator Feed Limit
14	PCS R1/456 Clutch
19	R1/456 Clutch Feed
20	R1 Feedback
21	R1 Supply
23	PCS 35 Reverse Clutch
28	35 Reverse Clutch
29	35 Reverse Clutch Feedback
30	PCS 1234 Clutch
36	1234 Clutch Feed
37	1234 Clutch
38	1234 Clutch Feedback
45	1234 Clutch Default
47	456 Clutch
49	PS1
50	Exhaust Backfill
51	Exhaust

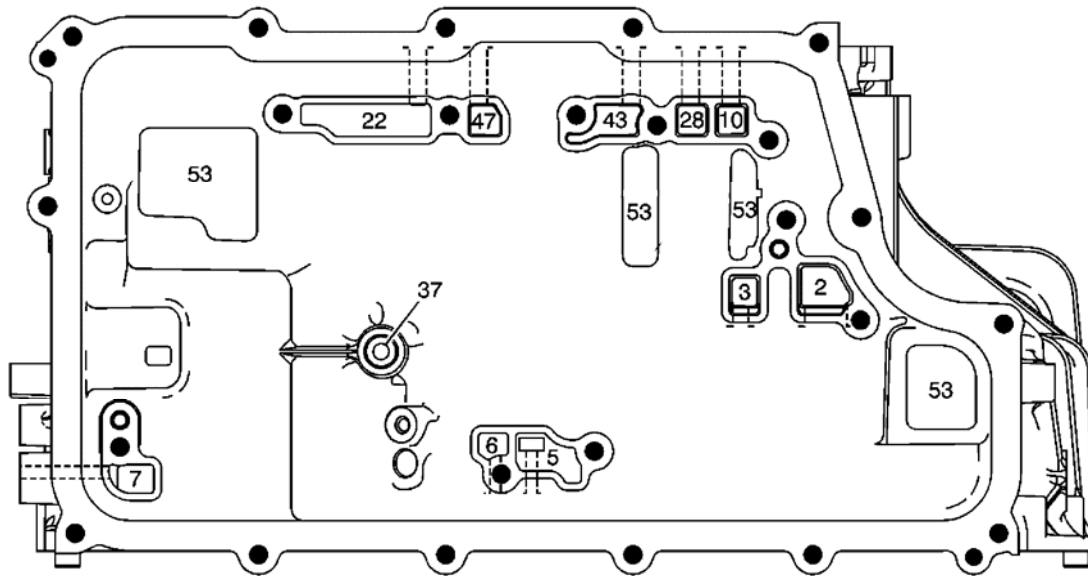


Fig. 28: A/Trans Case Assembly - Control Valve Body Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
5	TCC Release
6	TCC Apply
7	Cooler Feed
10	Compensator Feed
22	R1
28	35 Reverse Clutch
37	1234 Clutch
43	26 Clutch
47	456 Clutch
53	Void

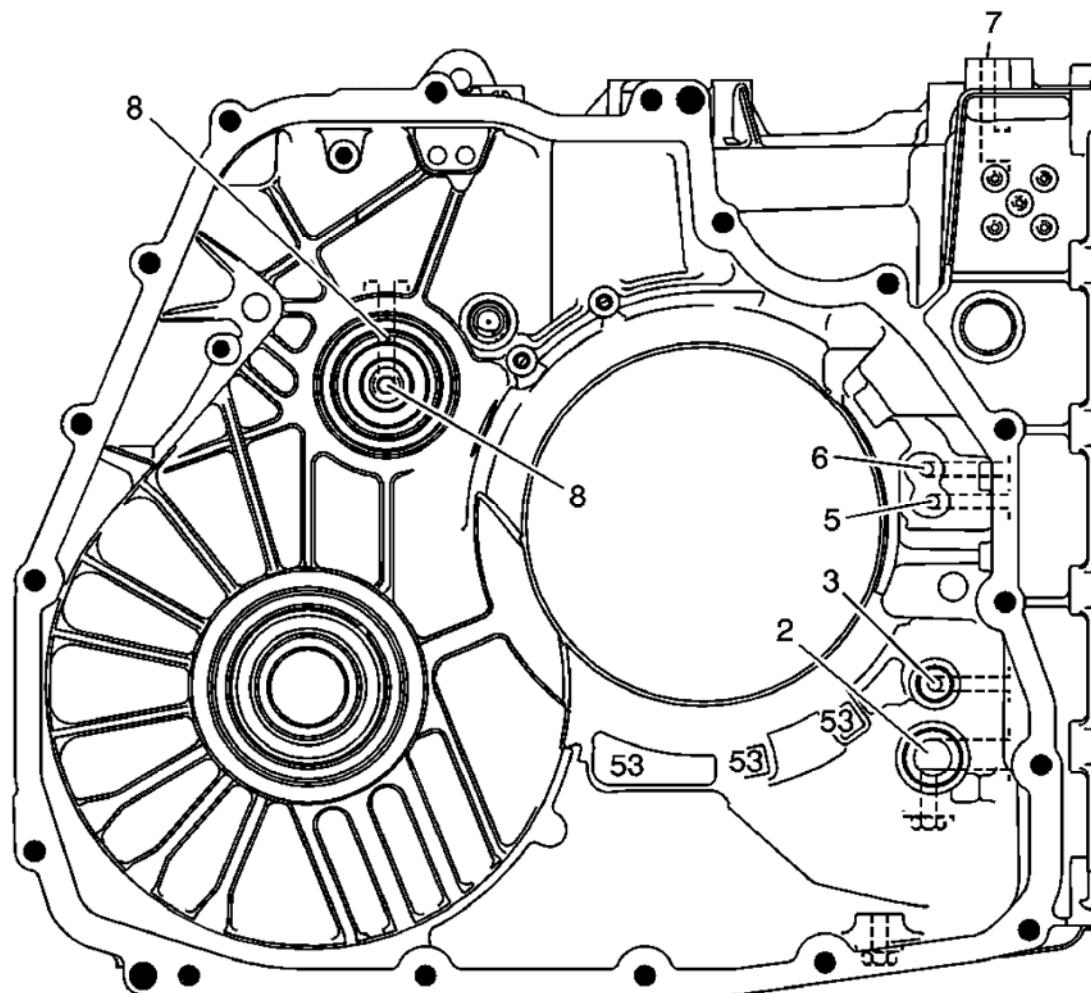


Fig. 29: A/Trans Case Assembly - Torque Converter & Differential Housing Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
3	Decrease
5	TCC Release
6	TCC Apply
7	Cooler Feed
8	Lube
53	Void

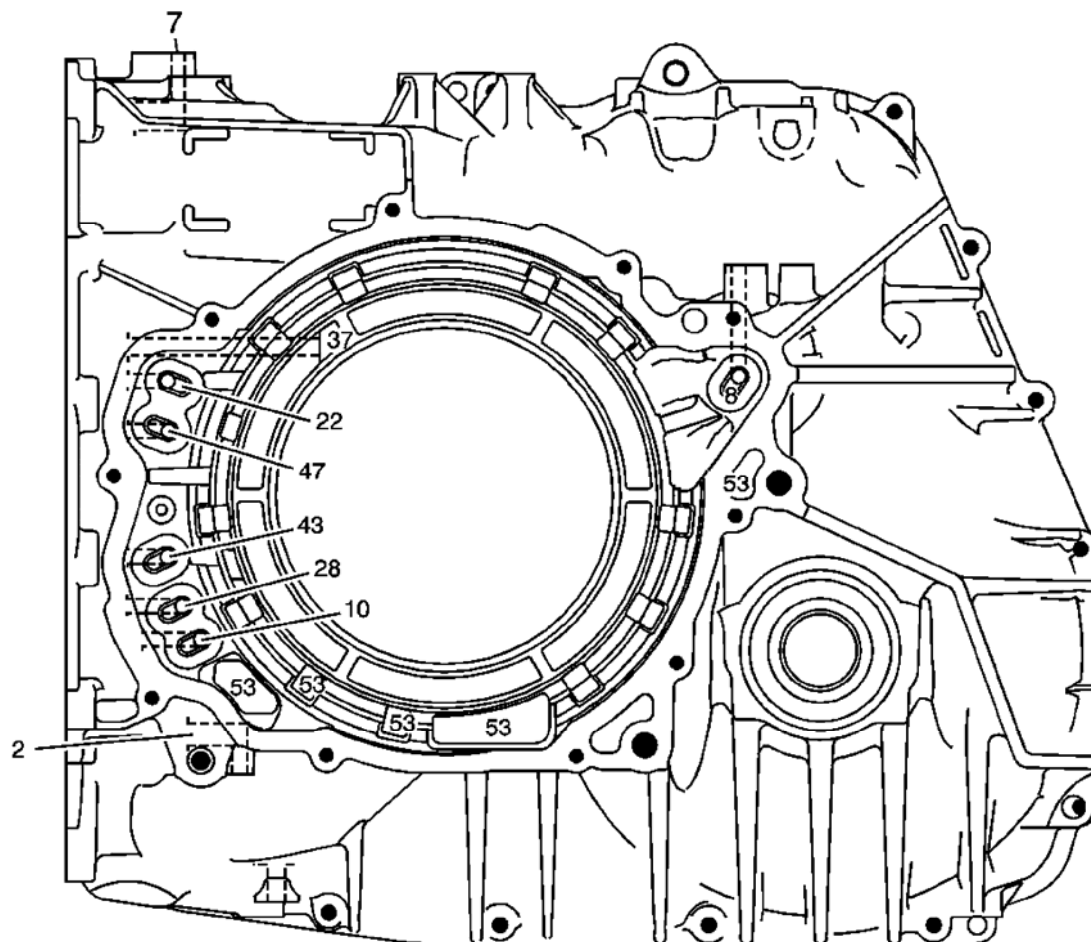


Fig. 30: A/Trans Case Assembly Case Cover Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
2	Line
7	Cooler Feed
8	Lube
10	Compensator Feed
22	R1
28	35 Reverse Clutch
37	1234 Clutch
43	26 Clutch
47	456 Clutch
53	Void

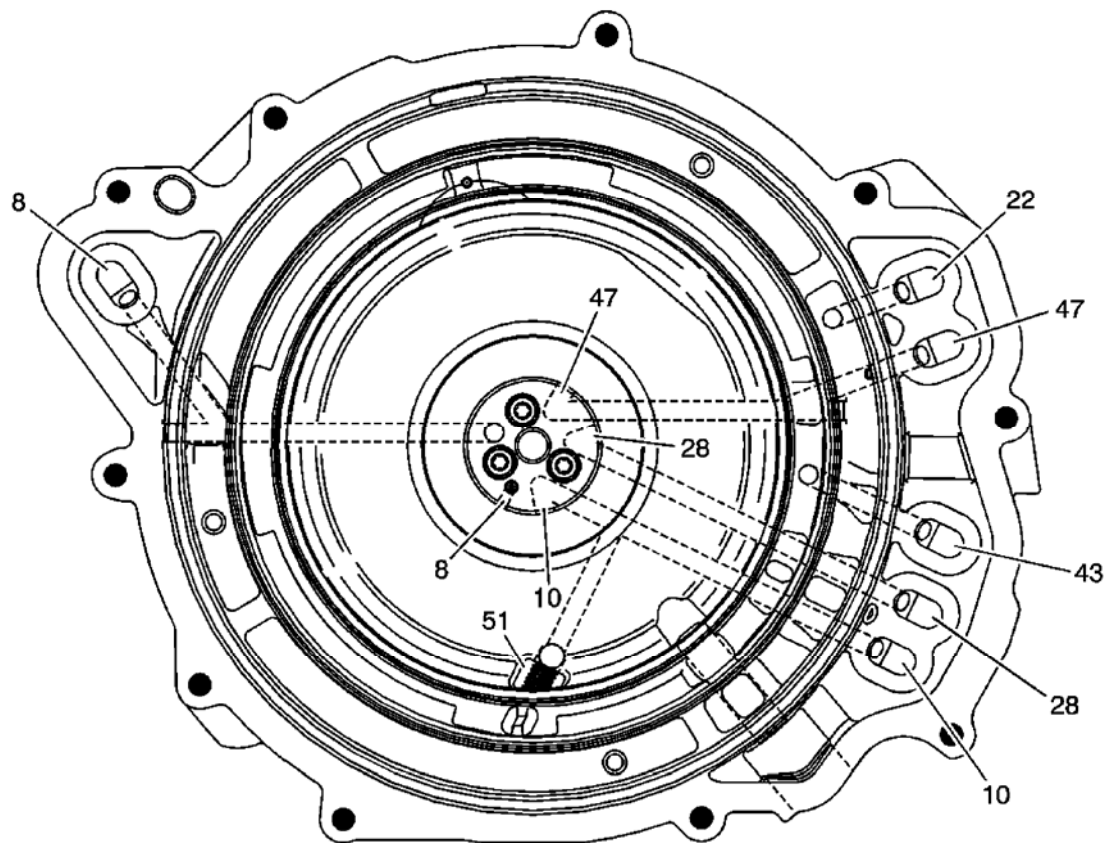


Fig. 31: A/Trans Case Cover Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
8	Lube
10	Compensator Feed
22	R1
28	35 Reverse Clutch
43	26 Clutch
47	456 Clutch
51	Exhaust

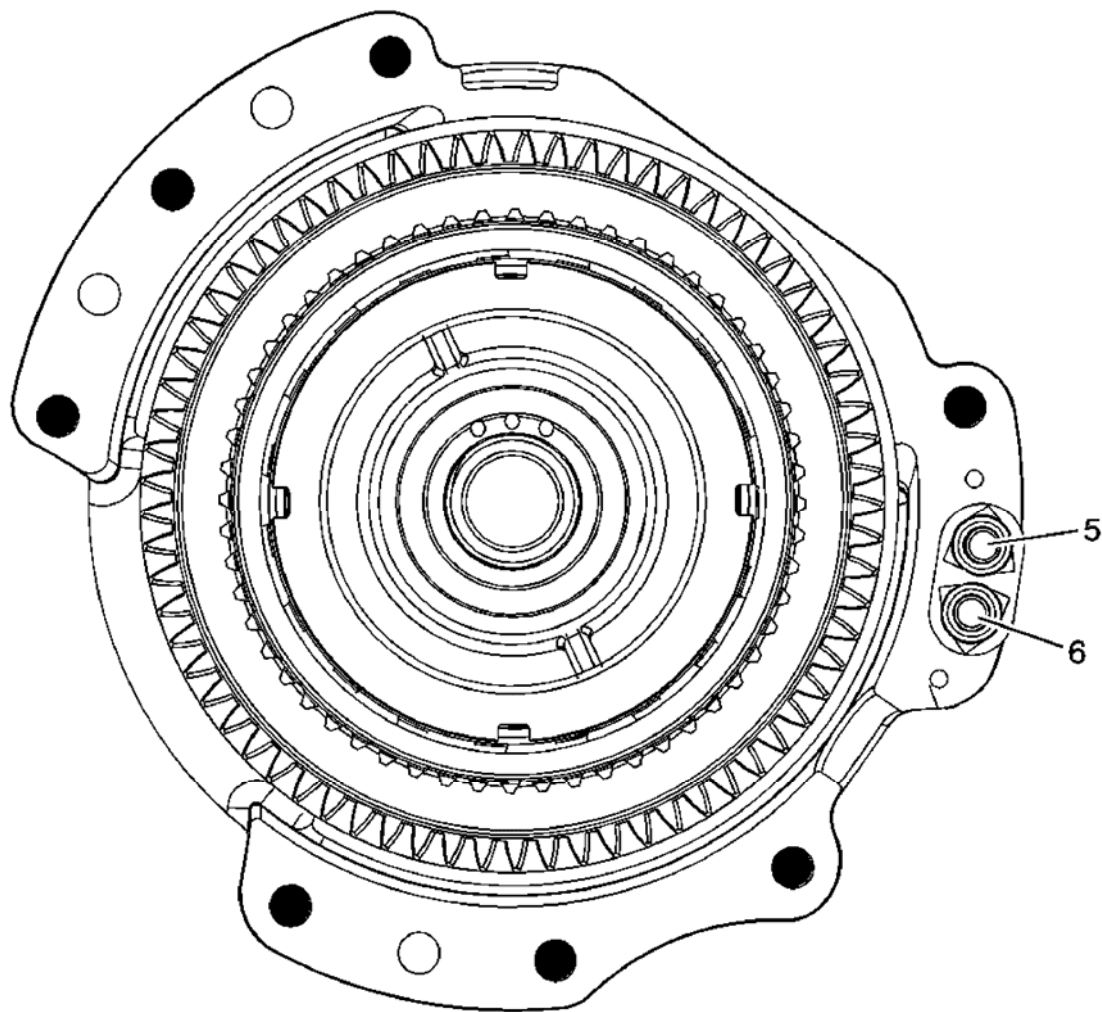


Fig. 32: Front Differential Transfer Drive Gear Support - Case Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
5	TCC Release
6	TCC Apply

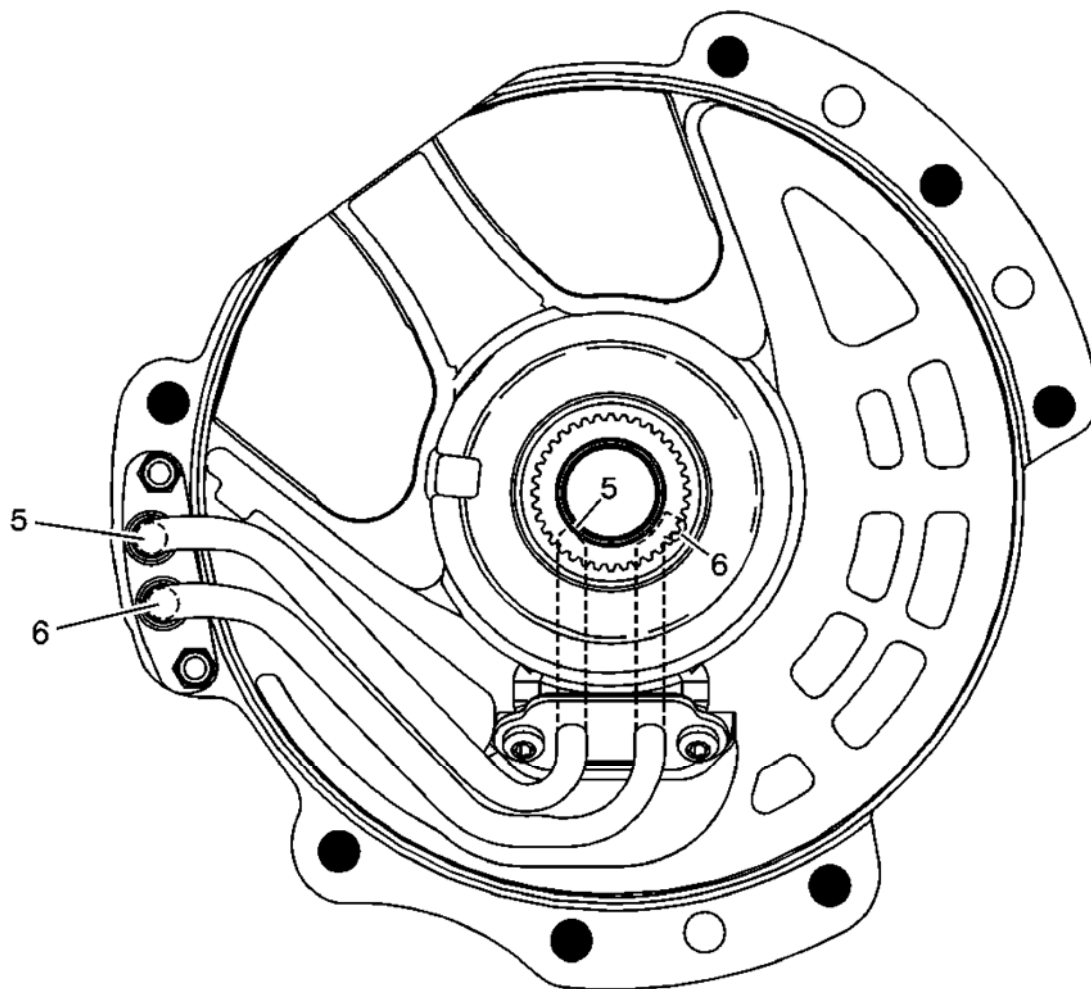


Fig. 33: Front Differential Transfer Drive Gear Support - Torque Converter & Differential Housing Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
5	TCC Release
6	TCC Apply

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC P0218</u>	P0218: Transmission Fluid Overtemperature
<u>DTC P0562, P0563, or P2534</u>	P0562: System Voltage Low Voltage P0563: System Voltage High Voltage P2534: Ignition On/Start Switch Circuit Low 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-P06AE</u>	P06AC: Control Module Power Up Temperature Sensor Performance P06AD: Control Module Power Up Temperature Sensor Circuit Low Voltage P06AE: 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 P0722 or P0723</u>	P0722: Output Speed Sensor Circuit No Signal P0723: Output Speed Sensor Circuit 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 Valve 1 Performance - Stuck Off P0752: Shift Solenoid Valve 1 Performance - Stuck On
<u>DTC P0756</u>	P0756: Shift Solenoid Valve 2 Performance - Stuck Off
<u>DTC P0776 or P0777</u>	P0776: Clutch Pressure Control (PC) Solenoid 2 - Stuck Off P0777: Clutch Pressure Control (PC) Solenoid 2 - Stuck On
<u>DTC P0796 or P0797</u>	P0796: Pressure Control Solenoid Valve 3 Stuck Off P0797: Pressure Control Solenoid Valve 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 (PNP) Switch Circuit P0851: Park/Neutral Position (PNP) Switch Circuit Low Voltage P0852: Park/Neutral Position (PNP) 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 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 P0976 or P0977</u>	P0976: Shift Solenoid Valve 2 Control Circuit Low Voltage P0977: Shift Solenoid Valve 2 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 P1751</u>	P1751: Shift Valve 1 Performance
<u>DTC P1761</u>	P1761: Up and Down Shift Switch Signal Message Counter
<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 P2714 or P2715</u>	P2714: Clutch Pressure Control Solenoid Valve 4 Stuck Off P2715: Clutch Pressure Control Solenoid Valve 4 Stuck On
<u>DTC P2719-P2721</u>	P2719: Pressure Control Solenoid Valve 4 Performance P2720: Pressure Control Solenoid Valve 4 Control Circuit Low Voltage P2721: 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 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 - 6T70/6T75 - 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 ignition voltage is 8.6 volts or greater.
- The TFT is -39 to +149°C (-38 to +300°F) for 5 seconds.

CONDITIONS FOR SETTING THE DTC

The TFT 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

- **Automatic Transmission Controls Schematics**
- **Park - Engine Running**
- **Fluid Passages**

Description and Operation

- **Transmission General Description**
- **Transmission Indicators and Messages**

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

NOTE: Perform the **Transmission Adaptive Values Learn** any time a transmission related component is serviced.

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

DTC P0562, P0563, OR 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 DESCRIPTORS

DTC P0562

System Voltage Low Voltage

DTC P0563

System Voltage High Voltage

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	P0562, P2534	P0562, P2534	P0563	-
Ground	-	P0562, P2534	-	-

CIRCUIT/SYSTEM DESCRIPTION

The transmission control module (TCM) within the control solenoid valve assembly continuously monitors the system voltage on the 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. These DTCs detect high or low TCM voltage for an extended period.

CONDITIONS FOR RUNNING THE DTC

P0562

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

P0563

Ignition voltage was 6.0 volts or greater and has not dropped below 2.0 volts.

P2534

- The engine is running.
- Normal CAN communication is enabled.

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.

P2534

The TCM detects ignition voltage between 2.0 volts and 6.0 volts for 7 seconds or greater with the engine running.

ACTION TAKEN WHEN THE DTC SETS

P0562 and P0563

DTCs P0562 and P0563 are Type C DTCs.

P2534

- DTC P2534 is a Type A DTC.
- The TCM turns the high side driver OFF.
- 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 fifth gear operation.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

- DTCs P0562 and P0563 are Type C DTCs.
- DTC P2534 is a Type A DTC.

DIAGNOSTIC AIDS

- Observe the driver information center (DIC) messaging that would indicate the electrical system requires service.

- Running the engine with a battery charger attached may cause DTC P0563 to set.
- 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

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-47825-20: 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. 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**.
- 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 20-way harness connector at the transmission.
2. Connect the **DT-47825-20** to the 20-way transmission harness connector. See **Special Tools**.
3. Test for less than 10 ohms between the ground circuit terminals listed below and ground.
 - Terminal 1
 - Terminal 18
 - 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 ignition and B+ circuit terminals listed below and ground.
 - Terminal 10
 - Terminal 13
 - Terminal 15
 - If the test lamp does not illuminate, test the affected ignition or B+ 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

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, and programming

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 8.6 volts and 18.0 volts.

CONDITIONS FOR SETTING THE DTC

P0601

The read only memory (ROM) test has failed 5 or greater 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 has detected a random access memory (RAM) test error 5 or greater times.

P062F

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

ACTION TAKEN WHEN THE DTC SETS

P0601, P0602, P0603, P0604, or P062F

- DTCs P0601, P0602, P0603, P0604, and P062F are Type A DTCs.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM commands maximum line pressure.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM freezes transmission adaptive functions.
- The TCM commands the high side driver OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

DTCs P0601, P0602, P0603, P0604, and P062F are Type A DTCs.

REFERENCE INFORMATION

Description and Operation

Electronic Component Description for control solenoid valve assembly

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 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 DTC P0601, P0603, P0604, or P062F sets, 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

NOTE: Perform the **Transmission Adaptive Values Learn** any time a transmission related component is serviced.

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

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

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 ignition voltage is 8.6 volts or greater.
- The TCM temperature is between 0-170°C (32-338°F) for 0.25 second or greater.
- DTC P0634 is not set.

CONDITIONS FOR SETTING THE DTC

Condition 1

The TCM detects an internal temperature condition of 146°C (295°F) or greater for 5 seconds.

Condition 2

The ignition voltage is 18 volts or greater and the TCM detects an internal temperature condition of 50°C (122°F) or greater for 2 seconds.

ACTION TAKEN WHEN THE DTC SETS

- DTC P0634 is a Type A DTC.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM commands maximum line pressure.
- The TCM shuts down.

CONDITIONS FOR CLEARING THE DTC

DTC P0634 is a Type A DTC.

REFERENCE INFORMATION

Description and Operation

Electronic Component Description for control solenoid valve assembly

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 is less than 125°C (257°F).
 - If greater than the specified range, refer to **Engine Overheating** .
2. 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** .
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. 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 for 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.
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

- 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, and programming

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

CIRCUIT/SYSTEM DESCRIPTION

The transmission control module (TCM) high side driver 1 is located inside of the control solenoid valve assembly, which has no serviceable components. The high side driver 1 provides power to the 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 is not set.

P0659

DTC P0659 is not set.

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

During TCM power-up and prior to the high side driver being enabled, the TCM detects an internal short to voltage on the high side driver 1 circuit a total of 3 times out of 5 consecutive readings.

ACTION TAKEN WHEN THE DTC SETS

P0658

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

- 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 inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 5th gear operation.

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.

REFERENCE INFORMATION

Connector End View Reference

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

DT-47825-20: 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 Enabled.
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 Low Voltage Test Status
 - High Side Driver 1 Circuit Open Test Status
 - High Side Driver 1 Circuit High Voltage Test Status
3. Operate the vehicle within the Conditions for Running and Setting the DTC. The DTCs should not set. 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. 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-47825-20**: adapter 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:
 - High Side Driver 1 Circuit Low Voltage Test Status
 - High Side Driver 1 Circuit Open Test Status
 - High Side Driver 1 Circuit High Voltage Test Status
- If any test status parameter displays Fault or Malfunction, replace the control solenoid valve assembly.

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, and programming

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

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0667

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0667, P0668, P0669, P06AD, P06AE, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.
- Brake torque is not active.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- The engine torque signal is valid.
- The throttle position signal is valid.

P0668

- DTC P0668 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P0669

- DTC P0669, P0716, P0717, P0722, or P0723 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

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 temperature is -249°C (-416°F) or lower for 1 minute.

P0669

The TCM temperature is 249°C (480°F) or greater for 1 minute.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0667, P0668, and P0669 are Type B DTCs.
- The TCM defaults the TCM substrate temperature to the TCM power up temperature.

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 TFT sensor output.

REFERENCE INFORMATION

Connector End View Reference

- Component Connector End Views
- Inline Harness Connector End Views

Description and Operation

Electronic Component Description for control solenoid valve 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. Engine idling at normal operating temperature, verify the scan tool TCM Temperature parameter is between -247 and +247°C (-412 and +477°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 and the Transmission Fluid Temperature parameters with a scan tool. The TCM Temperature parameter should increase by greater than 2°C (3.5°F). Also, the TCM Temperature and the Transmission Fluid Temperature parameters 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 and Transmission Fluid Temperature parameters are not within 20°C (36°F), 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

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, and programming

DTC P06AC-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

Control Module Power Up Temperature Sensor Performance

DTC P06AD

Control Module Power Up Temperature Sensor Circuit Low Voltage

DTC P06AE

Control Module Power Up Temperature Sensor Circuit High Voltage

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P06AC

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0668, P0669, P06AC, P06AD, P06AE, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- Brake torque is not active.
- The engine torque signal is valid.
- The throttle position signal is valid.

P06AD

- DTC P06AD, P0716, P0717, P0722, or P0723 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P06AE

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P06AE is not set.

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 substrate temperature and TCM power up 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 -59°C (-74°F) or lower for 1 minute.

P06AE

The TCM power up temperature is 164°C (327°F) or greater for 1 minute.

ACTION TAKEN WHEN THE DTC SETS

- DTC P06AC, P06AD, P06AE are Type B DTCs.
- The TCM defaults the TCM power up temperature to the TCM substrate temperature.

CONDITIONS FOR CLEARING THE DTC

DTC P06AC, P06AD, P06AE are Type B DTCs.

REFERENCE INFORMATION

Connector End View Reference

Component Connector End Views

Description and Operation

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

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

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, and programming

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

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0711

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0658, P0668, P0669, P06AD, P06AE, P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0962, P0963, P0966, P0967, P0970, P0971, P215C, P2720, P2721, P2729, or P2730 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- Brake torque is not active.
- The engine torque signal is valid.
- The throttle position signal is valid.

P0712

- DTC P0712, P0716, P0717, P0722, or P0723 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P0713

- DTC P0713, P0716, P0717, P0722, or P0723 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

CONDITIONS FOR SETTING THE DTC

P0711

The difference between the 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. The conditions have to be met for 5 minutes within a 6 minute period.

P0712

The TFT is -74°C (-101°F) or lower for 1 minute.

P0713

The TFT is 174°C (345°F) or greater for 1 minute.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0711, P0712, and P0713 are Type B DTCs.
- The TCM defaults the TFT to the TCM Temperature.

CONDITIONS FOR CLEARING THE DTC

DTCs P0711, P0712, and P0713 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 TFT sensor output.

REFERENCE INFORMATION

Connector End View Reference

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

Description and Operation

Electronic Component Description for control solenoid valve 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. Engine idling at operating temperature, verify the scan tool Transmission Fluid Temperature parameter is between -74 and +174°C (-101 and +345°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 and the Transmission Fluid Temperature parameters with a scan tool. The TCM Temperature and Transmission Fluid Temperature parameters should be within 20°C (36°F) of each other.
 - If greater than the specified range, 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

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, and programming

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	P0717	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: Engine running, normal operating temperature Parameter Normal Range: OK			
Input Speed Sensor Supply Voltage	Out of Range	OK	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.

The sensor receives 8.3-9.3 volts on the 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

- DTC P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0752, P0973, or P0974 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- The engine torque signal is valid.
- The throttle position signal is valid.

P0717

- DTC P0717 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- The vehicle speed is 16 km/h (10 mph) or greater.
- The engine torque is 50 N.m (37 lb ft) or greater.
- The engine torque signal is valid.

CONDITIONS FOR SETTING THE DTC

P0716

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

P0717

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

ACTION TAKEN WHEN THE DTC SETS

- P0716 and P0717 are Type A DTCs.
- The TCM freezes transmission adaptive functions.
- The TCM commands the high side driver OFF.
- The TCM commands TCC OFF.
- The TCM commands maximum line pressure.
- The TCM disables neutral idle.
- The TCM inhibits Tap Up/Down function.

- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 5th gear operation.

CONDITIONS FOR CLEARING THE DTC

P0716 and P0717 are Type A DTCs.

DIAGNOSTIC AIDS

Damage or misalignment of the 4-5-6 clutch and 3-5-R clutch housing reluctor machined teeth surface may cause a speed sensor malfunction.

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description for ISS

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, 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 valve body cover. Refer to **Control Valve Body Cover Replacement**.
2. Connect the TCM harness connector.
3. Disconnect the ISS wiring harness connector X3 from the control solenoid valve assembly.
4. Ignition ON, test for 8.3-9.3 volts between the ISS voltage circuit terminal A, on the TCM assembly, and ground.
 - o If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement**.
5. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test**.
6. Inspect the reluctor for damage or misalignment. Repair or replace as necessary.
7. If all of the above test normal, replace the input speed sensor.

REPAIR PROCEDURES

NOTE:

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

Input Speed Sensor Replacement

- 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, and programming

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

- No Transmission Mode Switch Signal DTC P1762.
- The engine speed is greater than 500 RPM for 5 seconds.
- The system voltage is 8-18 volts.

CONDITIONS FOR SETTING THE DTC

The Tow Mode switch remains closed, low voltage, for 600 seconds.

ACTION TAKEN WHEN THE DTC SETS

DTC P071A is a Type C DTC.

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

Electrical Information Reference

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

Description and Operation

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

With a scan tool observe the Tow/Haul switch parameter in Body Controls data list. With the ignition On or engine running, operate the Tow/Haul switch several times, and observe the parameter as you operate the switch. The parameter should toggle between Active and Inactive when the switch is operated.

CIRCUIT/SYSTEM TESTING

1. Ignition Off, transmission in Park, disconnect the Tow/Haul switch connector.
2. Test for less than 1 ohm of resistance between the Tow/Haul switch signal circuit terminal B and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
3. Ignition On, verify the scan tool Tow/Haul parameter displays Inactive.
 - If not the specified value, test the signal circuit for a short to ground. If the circuit tests normal, replace the BCM.
4. Install a fused jumper between the signal circuit and ground. Verify the scan tool parameter displays Active.
 - If not the specified value, test the signal circuit for a short to voltage or an open/high resistance. If the circuit tests normal, replace the BCM.
5. If all circuits test normal, replace the Tow/Haul switch.
6. If the electrical circuit checks are OK and the tow/haul shift pattern is not occurring, there may be a mechanical/hydraulic condition that prevents tow/haul operation. Refer to Symptoms - Automatic Transmission.

COMPONENT TESTING

Verify the Tow/Haul Mode parameter on the scan tool while cycling the tow/haul switch.

1. Ignition Off, transmission in Park, disconnect the transmission Tow/Haul switch assembly.
2. Test for infinite resistance between the Tow/Haul switch with the switch in the Open position.
 - If not the specified value, replace the Tow/Haul switch assembly.
3. Depress and hold the Tow/Haul switch.
4. Test for less than 1 ohm of resistance between the Tow/Haul switch signal circuit terminals B and A while the switch is depressed.
 - If greater than the specified value, replace the Tow/Haul switch assembly.

REPAIR PROCEDURES

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

- **Control Module References** for BCM replacement, setup, and programming.
- **Automatic Transmission Range Selector Lever 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 Circuit Intermittent

DIAGNOSTIC FAULT INFORMATION

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

TYPICAL SCAN TOOL DATA

Transmission OSS

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 0-7,000 RPM			
OSS Supply Voltage	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	OK	Out of Range

CIRCUIT/SYSTEM DESCRIPTION

The output speed sensor (OSS) is a hall-effect type sensor. The sensor faces the front differential transfer drive gear. The sensor receives 8.3-9.3 volts 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 machined surface of the output shaft. 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.

CONDITIONS FOR RUNNING THE DTC

P0722

- No DTCs P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0722, or P0723.
- The selected range is not PARK or NEUTRAL.
- The transmission input speed is between 1,000-6,500 RPM.
- The engine speed is between 3,200-5,000 RPM.
- The calc. throttle position is greater than 5 percent.
- The throttle position signal is valid.
- The engine torque is greater than 35 N.m (26 lb ft).
- The engine torque signal is valid.
- The TFT is greater than -40°C (-40°F).
- The engine speed is greater than 400 RPM for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P0723

- No DTCs P0101, P0102, P0103, P0121, P0122, P0123, P0723, P0973, P0974, P0976, P0977.
- Greater than 5 seconds since last range change.
- The engine speed is greater than 400 RPM for 5 seconds.
- The ignition voltage is greater than 8.6 volts.
- The engine torque signal is valid.
- The throttle position signal is valid.

CONDITIONS FOR SETTING THE DTC

P0722

The transmission output speed is 70 RPM or less for 4.5 seconds.

P0723

- The transmission output speed is 210 RPM or greater for 0.2 second.
- The transmission output speed drops 650 RPM for greater than 1.5 seconds and does not recover.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0722 and P0723 are Type A DTCs.
- The TCM freezes transmission adaptive functions.
- The TCM turns OFF the high sided driver, which turns OFF all solenoids.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 5th gear operation.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P0722 and P0723 are Type A DTCs.

DIAGNOSTIC AIDS

- Damage or misalignment of the front differential transfer drive gear teeth surface or metallic debris on the face of the sensor may cause a speed sensor malfunction.
- 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

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

CIRCUIT/SYSTEM VERIFICATION

1. Ignition ON, verify with a scan tool the transmission ISS/OSS Supply Voltage parameter displays OK.
2. Operate the vehicle at 16-32 km/h (10-20 mph) while observing the scan tool Transmission OSS parameter. The Transmission OSS parameter 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 valve body cover. Refer to **Control Valve Body Cover Replacement** .
2. Connect the TCM harness connector.
3. Disconnect the OSS harness connector X4 from the control solenoid valve assembly.
4. Ignition ON, test for 8.3-9.3 volts between the OSS voltage circuit terminal A on the control solenoid valve assembly and ground at the transmission case.
 - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .

5. Perform the **Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test** .
6. Inspect the front differential transfer drive gear teeth surface for damage or misalignment and for metallic debris on the face of the sensor. Repair or replace as necessary.
7. If all circuits test normal, replace the output speed sensor.

REPAIR PROCEDURES

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

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

- **Output Speed Sensor Replacement**

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

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

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 to the TCC regulator valve in the lower valve body and the TCC control valve in the pump cover. When vehicle operating conditions are appropriate to apply the converter clutch, the transmission control module (TCM) will increase TCC PC current flow, duty cycle, to the TCC

solenoid. The TCC PC solenoid directs fluid pressure to move the TCC control valve to the apply position, and moves the TCC regulator apply valve to the regulating position. The TCC regulator valve regulates TCC apply fluid pressure proportional to TCC solenoid pressure. When the TCC is fully applied, the engine is coupled directly to the transmission. TCC release is accomplished by the TCM decreasing current flow to the TCC PC solenoid. This results in decreasing the apply pressure which allows the TCC control valve to move to the release position. The TCM calculates torque converter slip speed based on engine speed and transmission input shaft speed.

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 400 RPM for 5 seconds.
- The ignition voltage is greater than 8.6 volts.
- The transmission fluid temperature (TFT) is 20-130°C (68-266°F).
- The 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 2.67-3.07.
- The 3rd gear ratio is between 1.71-1.97.
- The 4th gear ratio is between 1.32-1.51.
- The 5th gear is between 0.93-1.07.
- The 6th gear is between 0.69-0.79.
- 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 commanded range is 2nd gear or higher.
- The ignition voltage is greater than 8.6 volts.
- 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).
- The engine speed is greater than 500 RPM.
- The vehicle speed is greater than 16 km/h (10 mph).
- The gear ratio is between 0.69-3.07.

- The engine torque signal is valid.
- The throttle position signal is valid.
- The TCC is commanded OFF.

CONDITIONS FOR SETTING THE DTC

P0741

- The TCC Pressure command is greater than 500 kPa (73 psi) for 2 seconds.
- The TCM detects TCC slip greater than 50 RPM for 4 seconds when the TCC is commanded ON. This must occur 3 times.

P0742

The TCM detects the TCC slip between -20 and +30 RPM for 2.5 seconds or greater when the TCC is commanded OFF. This must occur 6 times.

ACTION TAKEN WHEN THE DTC SETS

P0741

- DTC P0741 is a Type B DTC.
- The TCM inhibits high gear.
- The TCM inhibits TCC.
- The TCM forces hot mode shift pattern.

P0742

- DTC P0742 is a Type A DTC.
- The TCM freezes transmission adaptive functions.
- The TCM forces hot mode shift pattern.

CONDITIONS FOR CLEARING THE DIC/DTC

P0741

DTC P0741 is a Type B DTC.

P0742

DTC P0742 is a Type A DTC.

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

CIRCUIT/SYSTEM VERIFICATION

1. Perform the Transmission Fluid Level and Condition Check to verify correct fluid level and condition.
2. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage parameter displays OK.
3. Engine idling in Park. Observe the Engine Speed and Transmission ISS parameters on the scan tool, while varying the engine speed. The Transmission ISS parameter should vary with engine speed and not drop out.
4. 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.**

5. Perform the Road Test . Verify the transmission operation performs as indicated, in the road test instructions.
6. Review the scan tool 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
 - Vehicle Speed
 - Transmission Fluid Temperature
 - TCC Pressure Control Solenoid Valve Pressure Command
 - 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 specified ranges.
 - 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** . Test all solenoids on the control solenoid valve assembly. A pressure change should occur for each solenoid.
 - 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 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
		• Torque converter clutch delamination or material worn off

P0741	Torque Converter	• 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

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 Valve Lower Body and Upper Body Replacement
- Torque Converter Removal
- Torque Converter Installation
- Torque Converter and Differential Housing, Front Differential Transfer Drive Gear, and Front Differential Carrier Removal and Torque Converter and Differential Housing Installation
- Control Module References for control solenoid valve assembly replacement, setup, and programming

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 DESCRIPTOR

DTC P0751

Shift Solenoid Valve 1 Performance - Stuck Off

DTC P0752

CIRCUIT/SYSTEM DESCRIPTION

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

CONDITIONS FOR RUNNING THE DTC

P0751

- The ignition voltage is greater than 8.6 volts.
- The engine speed is 400 RPM or greater for 5 seconds.
- The throttle position signal is valid.
- The engine torque signal is valid.
- The high side driver (HSD) is enabled.
- The output shaft speed is greater than 0 RPM or the throttle position is greater than 0.4 percent.
- The transmission fluid temperature is 0°C (32°F) or greater.
- 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.

P0752

- The ignition voltage is greater than 8.6 volts.
- The engine speed is 400 RPM or greater for 5 seconds.
- The HSD is enabled.
- The throttle position signal is valid.
- The output shaft speed is greater than 0 RPM, or the throttle position is greater than 0.4 percent.
- The transmission fluid temperature is 0°C (32°F) or greater.
- 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.

CONDITIONS FOR SETTING THE DTC

P0751

Commanded gear equals first lock, the gear ratio is 1.34-1.48, and gear box slip is greater than 200 RPM for 0.3 second, 8 times.

P0752

The transmission has achieved 1st Locked, 1st Free-Wheel, or 2nd, the 456/R1 pressure switch is pressurized, and gear box slip is greater than 200 RPM for 2 seconds, 5 times.

ACTION TAKEN WHEN THE DTC SETS

P0751

- DTC P0751 is a Type B DTC.
- The TCM inhibits first range.

P0752

- DTC P0752 is a Type A DTC.
- 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.
- The TCM limits the transmission to reverse, first, and third range operation.

CONDITIONS FOR CLEARING THE DTC

P0751

DTC P0751 is a Type B DTC.

P0752

DTC P0752 is a Type A DTC.

DIAGNOSTIC AIDS

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

CIRCUIT/SYSTEM VERIFICATION

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

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 engine and transmission data parameters display the correct values in all forward gear ranges:
 - Engine Speed
 - Transmission ISS
 - Transmission OSS
 - Vehicle Speed
 - Shift Solenoid Valve 1
 - TRANSMISSION FLUID PRESSURE Switch 1
 - TRANSMISSION FLUID PRESSURE Switch 3
 - TRANSMISSION FLUID PRESSURE Switch 4
 - TRANSMISSION FLUID PRESSURE Switch 5

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 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 range, repair as necessary. 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** . Test all solenoids on the control solenoid valve assembly. A pressure change should occur for each solenoid.
 - 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. Repair or replace as necessary.

DTCs	Component	Condition
P0751 P0752	Upper Control Valve Body	Clutch select valve 2 stuck - debris, sediment, binding, or scored bore
P0751	Upper Control Valve Body	Bore plug - clutch select valve 2 - undersized bore plug causing a leak - plug should be a valve fit in the bore.
P0751	Upper Control Valve Body	Check ball #2 - missing, damaged/malformed, seat in the valve body damage/leaking.
P0751 P0752	Control Solenoid Valve Assembly	Shift Solenoid 1 • 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 Pressure control solenoid 3 - Stuck ON or OFF or leaking
P0751	Lower Control Valve Body	Low and reverse, and 4-5-6 clutch regulator valve - stuck or sticking - debris, sediment, binding, or scored bore

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 P0756

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 P0756

Shift Solenoid Valve 2 Performance - Stuck Off

CIRCUIT/SYSTEM DESCRIPTION

The shift solenoid (SS) valve 2 is part of the control solenoid valve assembly, which has no serviceable components. The SS valve 2 is a normally closed (NC) solenoid valve and controls fluid to the clutch select valve 3. The solenoid operates by the transmission control module (TCM) opening or closing the ground circuit. With the solenoid circuit grounded, solenoid on, the internal plunger moves and allows the metering ball to move away from the feed seat and against the exhaust seat, creating signal fluid pressure. The signal fluid acts against the clutch select valve 3 to overcome the valve spring force, moving it to the apply position.

CONDITIONS FOR RUNNING THE DTC

- 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 400 RPM or greater for 5 seconds.
- The high side driver (HSD) is enabled.
- The ignition voltage is 8.6 volts or greater.
- Throttle position signal is valid.
- Transmission fluid temperature (TFT) is 0°C (32°F) or greater.

CONDITIONS FOR SETTING THE DTC

- Commanded Gear is 1st locked.
- Gearbox Slip is 200 RPM up or greater for 3 seconds.
- If above conditions exist, the TCM will command second range. If the gear ratio is between 2.7 and 3.0 for 1 second, the counter will increment, and the DTC will set after 5 occurrences.

ACTION TAKEN WHEN THE DTC SETS

- DTC P0756 is a Type A DTC.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM limits the transmission to reverse, first, and third range operation.

CONDITIONS FOR CLEARING THE DTC

DTC P0756 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

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

CIRCUIT/SYSTEM VERIFICATION

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

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 engine and transmission data parameters display the correct values in all forward gear ranges:
 - Engine Speed
 - Transmission ISS
 - Transmission OSS
 - Vehicle Speed
 - Shift Solenoid Valve 2
 - Transmission Fluid Pressure Switch 1
 - Transmission Fluid Pressure Switch 3
 - Transmission Fluid Pressure Switch 4
 - Transmission Fluid Pressure Switch 5
4. Record the Freeze Frame/Failure Records data. Clear the DTCs.
5. Engine running, brakes applied, transmission gear shift selector in reverse. Shift to drive and accelerate to 56 km/h (35 mph) with calculated throttle position greater than 15 percent. Perform this test 5 consecutive times. The DTC should not set.
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.

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** . Test all solenoids on the control solenoid valve assembly. A pressure change should occur for each solenoid valve.

- 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 P0756. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P0756	Upper Control Valve Body	• Clutch select valve 3 stuck OFF- debris, sediment, binding or scored bore • Bore plug - clutch select valve 3 - undersized bore plug causing a leak - plug should be a valve fit in the bore. • Check ball #3 - missing, damaged/malformed, Seat in the valve body damage/leaking.
P0756	Control Solenoid Valve Assembly	• Shift solenoid 2 not pressurizing - Stuck OFF or leaking • Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal
P0756	Pump Assembly	Fluid pump vanes and fluid pump rotor broken
P0756	Pump Seal	Seal is torn or cut, causing a small leak that is overcome with enough speed and pump capacity.
P0756	Mechanical Diode	Broken or not capable of holding torque

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 Valve Upper Body Assembly Cleaning and Inspection**
- **Control Module References** for control solenoid valve assembly replacement, setup, or programming

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 (PC) Solenoid 2 - Stuck Off

DTC P0777

Clutch Pressure Control (PC) 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. The PC solenoid 2 regulates transmission fluid pressure to the 3-5-Reverse clutch regulator valve which controls pressure to the 3-5-Reverse 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 ignition voltage is greater than 8.6 volts.
- The engine speed is greater than 400 RPM for 5 seconds.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output speed is 16 RPM or greater, or the throttle position is 0.4 percent or greater.
- The throttle position signal is valid.
- The high side driver (HSD) is commanded ON.

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 transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output shaft speed is 350 RPM or greater.
- The transmission input speed is 200 RPM or greater.
- The commanded gear is not 1st range.
- 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 1.2 seconds 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 inhibits Tap Up/Down function.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to 2nd, 4th, or reverse operation.

P0777

- DTC P0777 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM freezes transmission adaptive functions.
- The TCM limits the transmission to 3rd and reverse operation.

CONDITIONS FOR CLEARING THE DIC/DTC

DTCs P0776 and P0777 are Type A DTCs.

DIAGNOSTIC AIDS

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

REFERENCE INFORMATION

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

- Component Connector End Views
- Inline Harness 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

CIRCUIT/SYSTEM VERIFICATION

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. 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** .
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 1 parameter states are correct for all forward ranges. Refer to **Transmission Fluid Pressure Switch Logic** .
5. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage parameter displays OK.
6. 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.
7. 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.**

8. Perform the **Road Test** . Verify the transmission operation performs as indicated in the road test

instructions.

9. 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 2
 - TFP Switch 1
10. 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** .
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** . A pressure change should occur for each solenoid valve.
 - 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 P0776 or P0777. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P0776 P0777	Upper Control Valve Body Assembly (349)	3-5-R regulator valve (336) stuck/sticking - debris, binding, damaged valve, or scored bore
P0776	Lower Control Valve Body Assembly (374)	• Actuator feed limit circuit supply fluid to solenoid restricted or not available - debris, stuck limit valve (362) or sediment blockage • 3-5-R clutch boost valve (364) - binding or scored bore - can cause harsh shifts
P0776 P0777	Control Solenoid Valve Assembly	• Clutch pressure control solenoid 2 stuck ON or stuck OFF • Control solenoid valve filter plate assembly, blocked or damaged gasket seal
P0776 P0777	A/Trans Fluid Pump (203)	• Fluid pump housing vanes/rotor/slide damaged/scored • A/Trans pump fluid outlet seal assembly (57)

		damaged/leaking
P0776	A/Trans Fluid Filter Assembly (201)	Oil filter (201) or filter seal (202) loose or damaged
P0776	Transmission Cooling/Lubrication	• Restriction/leak in oil to air (OAC) cooler/radiator • Restricted/leaking/kinked/damaged transmission oil cooler lines • Restriction/leak in transmission fluid pump assembly
P0776	Torque Converter Assembly (27)	Torque converter overstressed due to high temperature, fluid boiled out
P0776	Automatic Transmission Fluid Filter Assembly (201)	Oil filter (201) or filter seal (202) loose, plugged, or damaged
P0776	4-5-6 and 3-5-R Clutch Housing Assembly	• 3-5-R clutch backing plate retaining ring not seated or wave plate broken • Torn, cut, or rolled 3-5-R piston seal (417) • Inner/outer seal damaged • Dam pressure too high
P0776	A/Trans Case Cover (403)	Blow off regulator ball stuck.
P0776 P0777	Input shaft support	3-5-R and 4-5-6 clutch fluid seal rings (404) damaged, worn, or leaking

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 Valve Lower Body and Upper Body Replacement**
- **Low and Reverse Clutch and 1-2-3-4 Clutch Plate Removal**
- **Control Module References** for control solenoid valve assembly replacement, setup, and programming

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

Pressure Control Solenoid Valve 3 Stuck Off

DTC P0797

Pressure Control Solenoid Valve 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. The PC solenoid 3 regulates transmission fluid pressure (TFP) to the R1/4-5-6 clutch regulator valve which controls pressure to the low and reverse clutch and the 4-5-6 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

P0796 or P0797

- 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 ignition voltage is greater than 8.6 volts.
- The engine speed is greater than 400 RPM for 5 seconds.
- The output speed is 16 RPM or greater, or the throttle position is 0.4 percent or greater.
- The throttle position signal is valid.
- The high side driver (HSD) is commanded ON.
- The transmission fluid temperature is 0°C (32°F) or greater.

CONDITIONS FOR SETTING THE DTC

P0796

The TCM detects an incorrect ON-coming clutch gear ratio or shift flare when the R1 or 4-5-6 clutch is commanded ON.

P0797

The TCM detects an incorrect OFF-going clutch gear ratio or shift tie-up when the R1 or 4-5-6 clutch is commanded OFF.

ACTION TAKEN WHEN THE DTC SETS

P0796

- DTC P0796 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to 1st, 3rd, or reverse operation.

P0797

- DTC P0797 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to 4th and reverse 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 will allow you to display, monitor, and verify multiple transmission data parameters at one time, after the road test.

REFERENCE INFORMATION

Connector End View Reference

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

CIRCUIT/SYSTEM VERIFICATION

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Monitor the Transmission Fluid Pressure Switch 5 parameter with a scan tool. Place the gear select lever in Park, Reverse, and Neutral range. Verify the Transmission Fluid Pressure Switch 5 parameter states are correct for Park, Reverse, and Neutral. Refer to Transmission Fluid Pressure Switch Logic .
3. 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 5 parameter states are correct for all forward ranges. Refer to Transmission Fluid Pressure Switch Logic .
4. Engine idling in Park, verify with a scan tool the transmission ISS/OSS Supply Voltage parameter displays OK.
5. 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.
6. 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.

7. Perform the Road Test . Verify the transmission operation performs as indicated in the road test instructions.
8. 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 3
 - Transmission Fluid Pressure Switch 5
9. 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 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** .
- 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** . A pressure change should occur for each solenoid valve.
 - 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 P0776 or P0777. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P0796 P0797	Control Valve Upper Body Assembly (349)	4-5-6 regulator valve (326) stuck/sticking - debris, binding, damaged valve, or scored bore
P0796	Lower Control Valve Body Assembly (374)	• Actuator feed limit circuit supply fluid to solenoid restricted or not available, debris, stuck limit valve (362), or sediment blockage • 4-5-6 clutch boost valve (360) - binding or scored bore - can cause harsh shifts • 4-5-6 clutch accumulator piston (366) - leaking, cracked, or broken
P0796 P0797	Input shaft support	3-5-R and 4-5-6 clutch fluid seal rings (404) damaged, worn, or leaking
P0796 P0797	Control Solenoid Valve Assembly (314)	• Clutch pressure control solenoid 3 stuck ON or stuck OFF • Control solenoid filter plate assembly cracked, blocked, or damaged gasket seal
P0796	4-5-6 Clutch Housing Assembly (441)	• 4-5-6 clutch piston assembly (439) damaged/leaking • Inner/outer seal damaged • Dam pressure too high
P0796	A/Trans Case Cover (403)	Blow off regulator ball stuck
P0796	Transmission Cooling/Lubrication	• Restriction/leak in oil to air (OAC) cooler/radiator • Restricted/leaking/kinked/damaged transmission oil cooler lines • Restriction/leak in transmission fluid pump assembly
P0796	Torque Converter Assembly (27)	Fluid pump or torque converter overstressed due to high temperature, fluid boiled out
P0796	4-5-6 Reaction Carrier Hub Assembly	4-5-6 reaction carrier hub/shaft - broken hub weld
	A/Trans Fluid Filter Assembly	Oil filter (201) or filter seal (202) loose or damaged

P0796	(201)	
P0796	A/Trans Fluid Pump (203)	A/Trans pump fluid outlet seal assembly (57) damaged/leaking

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 Valve Lower Body and Upper Body Replacement
- Low and Reverse Clutch and 1-2-3-4 Clutch Plate Removal and 3-5-Reverse and 4-5-6 Clutch Housing Disassemble
- Control Module References for control solenoid valve assembly replacement, setup, and programming

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

Up and Down Shift Switch Circuit

DIAGNOSTIC FAULT INFORMATION

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

Tap Up/Tap Down Shift Signal	P0826	P0826	P0826	-
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TYPICAL SCAN TOOL DATA

Driver Shift Request

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

CIRCUIT/SYSTEM DESCRIPTION

When the shift lever is placed in manual mode (M) this activates the driver shift request (DSR), also known as the tap shift function. The DSR allows the vehicle operator to shift gears by pressing the plus (+) button for an upshift or the minus (-) button for a downshift. 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.

CONDITIONS FOR RUNNING THE DTC

P0815 or P0816

- DTC P0815, P0816, P0826, P1761, P182E, P1876, P1877, or P1915 is not set.
- The time since the range change is 1 second or greater.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P0826

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0826 or P1761 is not set.

CONDITIONS FOR SETTING THE DTC

P0815 - Condition 1

The TCM detects an upshift request for 1 second in PARK or neutral.

P0815 - Condition 2

The TCM detects an upshift request for 10 minutes in any forward range.

P0816 - Condition 1

The TCM detects a downshift request for 1 second in PARK or neutral.

P0816 - Condition 2

The TCM detects a downshift request for 10 minutes in any forward range.

P0826

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

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0815, P0816, and P0826 are Type C DTCs.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

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**
- **Inline Harness 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

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 Mode 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

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 BCM or control solenoid valve assembly replacement, setup and programming
- Transmission Control 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	-

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 1 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, P1915, P182E.
- The high side driver (HSD) is ON.
- The engine speed is 400 RPM or greater for 5 seconds.
- The engine speed is 550 RPM or greater.
- Ignition voltage is 8.6 volts or greater.
- The transmission fluid temperature (TFT) is 0-120°C (32-248°F).

CONDITIONS FOR SETTING THE DTC

P0842

The TCM detects that the TFP switch 1 signal voltage remains LOW after the 3-5-Reverse clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 25 counts are accumulated.

P0843

The TCM detects that the TFP switch 1 signal voltage remains HIGH after the 3-5-Reverse clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 35 counts are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0842 and P0843 are Type C DTCs.
- The TCM freezes transmission adaptive functions for the 3-5-Reverse clutch.

CONDITIONS FOR CLEARING THE DTC

DTCs P0842 and 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 failure should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptives 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

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-47825-20: Adapter Harness

For equivalent regional tools, refer to Special Tools .

CIRCUIT/SYSTEM VERIFICATION

1. If there are any other transmission related DTCs set, diagnose those DTCs first. Refer to Diagnostic Trouble Code (DTC) List - Vehicle .

2. Engine idling in Park with parking brake applied, and drive wheels chocked.
3. 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.
4. 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** .
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 parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
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.

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. 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-47825-20**: harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
5. Ignition ON, verify with a scan tool that the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters change states when gently pushing on each TFP switch with the eraser end of a pencil.
 - If any TFP Switch parameter does not change states, replace the control solenoid valve assembly.

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 (PNP) Switch Circuit

DTC P0851

Park/Neutral Position (PNP) Switch Circuit Low Voltage

DTC P0852

Park/Neutral Position (PNP) 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 1,000 RPM.

CONDITIONS FOR SETTING THE DTC

P0850 and P0851

- The ECM detects the park/neutral switch signal equals 0 volts 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
- Inline Harness 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-47825-20: 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. Perform the Range Selector Lever Cable Adjustment procedure to verify proper adjustment.
3. Ignition ON, observe the scan tool ECM PNP 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.
4. Observe the scan tool TCM IMS A/B/C/P parameter while slowly moving the gear shift lever from Park through all ranges. The parameter should match each gear range that is selected. Refer to Transmission Internal Mode Switch Logic .
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.

CIRCUIT/SYSTEM TESTING

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

1. Ignition OFF, disconnect the 20-way harness connector at the transmission.
2. Install the **DT-47825-20:** harness to the 20-way harness connector to the engine harness.
3. Test for less than 10 ohms between the ground circuit terminal 18 and ground.
 - If greater than the specified range, test the ground circuit for an open/high resistance.
4. 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 engine control module.
5. Connect a 3-amp fused jumper wire between the TCM harness connector terminal 3 and terminal 18. Verify the PNP Switch parameter changes to Park/Neutral.
 - If not the specified value, test the P/N signal circuit for an open/high resistance. If the circuit tests normal, replace the engine control module.

6. Ignition OFF, remove the control valve body cover. Refer to **Control Valve Body Cover Replacement** .
7. Connect the TCM harness connector.
8. Disconnect the IMS connector at the control solenoid valve assembly.
9. Ignition ON, verify the scan tool IMS A/B/C/P parameter displays HI for all four signal circuits.
 - If not the specified value, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
10. Verify the scan tool ECM PNP Switch parameter displays In Gear.
 - If not the specified value, replace the control solenoid valve assembly.
11. Connect a 3-amp fused jumper wire between each transmission range signal circuit terminal listed below and the IMS ground circuit, terminal A. Verify the corresponding scan tool IMS A/B/C/P parameter displays LOW when terminals E, D, C, and B are connected to the IMS ground and the ECM PNP Switch parameter displays Park/Neutral when terminal F is connected to ground.
 - Switch Signal A terminal E
 - Switch Signal B terminal D
 - Switch Signal C terminal C
 - Switch Signal P terminal B
 - PNP Switch Signal terminal F
 - If not the specified value, replace the control solenoid valve assembly.
12. If all circuits test normal, replace the IMS.

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

Transmission Fluid Pressure Switch 1

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 1 Control	Low	High	High

Transmission Fluid Pressure Switch 3

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 3 Control	Low	High	High

Transmission Fluid Pressure Switch 4

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			

Transmission Fluid Pressure Switch 4 Control	Low	High	High
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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: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 5 Control	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 3 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. The 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

P0872 or P0873

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P1915, or P182E is not set.
- The high side driver (HSD) is ON.
- The engine speed is 400 RPM or greater for 5 seconds.
- The engine speed is 550 RPM or greater.
- Ignition voltage is 8.6 volts or greater.
- The transmission fluid temperature (TFT) is 0-120°C (32-248°F).

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 18 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 20 counts

are accumulated.

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0872 and P0873 are Type C DTCs.
- The TCM freezes transmission adaptive functions for 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 failure should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptives 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

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-47825-20: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. If there are any other transmission related DTCs set, diagnose those DTCs first. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. Engine idling in Park with parking brake applied, and drive wheels chocked.
3. 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.
4. 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** .
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 parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
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.

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. 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-47825-20:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
5. Ignition ON, verify with a scan tool that the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters change states when gently pushing on each TFP switch with the eraser end of a pencil.
 - If any TFP Switch parameter does not change states, replace the control solenoid valve assembly.

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

Transmission Fluid Pressure Switch 1

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 1 Control	Low	High	High

Transmission Fluid Pressure Switch 3

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 3 Control	Low	High	High

Transmission Fluid Pressure Switch 4

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 4 Control	Low	High	High

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: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 5 Control	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 4 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 pressure control 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

P0877 or P0878

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P1915, P182E is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The engine speed is 550 RPM or greater.
- Ignition voltage is 8.6 volts or greater.
- The transmission fluid temperature (TFT) is 0-120°C (32-248°F).

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 5 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 for 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 failure should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptives 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

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-47825-20: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. If there are any other transmission related DTCs set, diagnose those DTCs first. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. Engine idling in Park with parking brake applied, and drive wheels chocked.
3. 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.
4. 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** .
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 parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
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.

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. 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-47825-20:** harness between the vehicle wire harness electrical connector, and the control

solenoid valve assembly electrical connector.

- 5. Ignition ON, verify with a scan tool that the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters change states when gently pushing on each TFP switch with the eraser end of a pencil.
 - If any TFP Switch parameter does not change states, replace the control solenoid valve assembly.

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: Ignition ON Parameter Normal Range: OK				
Line PC Solenoid 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: Ignition ON Parameter Normal Range: OK				
Line PC Solenoid 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: Ignition ON Parameter Normal Range: OK				
Line PC Solenoid Control	-	Fault or Malfunction	Fault or Malfunction	-

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 and isolator 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

- The engine speed is greater than 400 RPM for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

CONDITIONS FOR SETTING THE DTC

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 or an open/high resistance on the line PC solenoid control circuit for 1 second.

P0963

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

ACTION TAKEN WHEN THE DTC SETS

P0961 or P0963

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

P0962

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

CONDITIONS FOR CLEARING THE DIC/DTC

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

REFERENCE INFORMATION

Connector End View Reference

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

DT-47825-20: 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 valve 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-47825-20**: 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

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, and programming

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 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/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON 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/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON 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/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON 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 and 3-5 reverse clutch boost 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

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0965 is not set.

P0966

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0966 is not set.

P0967

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0967 is not set.

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 limits the transmission to reverse and 5th gear operation.

- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM turns the HSD OFF.
- The TCM forces the torque converter clutch (TCC) OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

P0967

- DTC P0967 is a Type A DTC.
- The TCM limits the transmission to reverse and 3rd gear operation.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- 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

Connector End View Reference

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

DT-47825-20: 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 valve 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-47825-20:** 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

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, and programming

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 Valve 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: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3				Fault or

Control	-	-	-	Malfunction
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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: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 3 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure (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 the clutch PC solenoid 3 oil pressure to the R1/4-5-6 clutch regulator valve and 4-5-6 clutch boost valve. Increasing clutch PC solenoid 3 oil pressure increases oil pressure to the low and reverse clutch or the 4-5-6 clutch, depending on the position of the clutch select valve 2. The transmission control module (TCM) varies the current to the PC solenoid 3 through a low side driver. Decreasing the current to the clutch PC solenoid 3 increases clutch PC solenoid 3 oil pressure by closing OFF the solenoid exhaust port. Increasing the current to the clutch PC solenoid 3, decreases clutch PC solenoid 3 oil pressure by opening the solenoid 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

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0969 is not set.

P0970

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0970 is not set.

P0971

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0971 is not set.

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 to the low and reverse clutch and 4-5-6 clutch.

P0970 or P0971

- DTCs P0970 and P0971 are Type A DTCs.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM inhibits the torque converter clutch (TCC).
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM turns the HSD OFF.
- 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

Connector End View Reference

- Component Connector End Views
- Inline Harness 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

DT-47825-20: 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 valve 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-47825-20**: 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

- 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, and programming

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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Shift Solenoid 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: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 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: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 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: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 1 Control	Fault or Malfunction	-	-

CIRCUIT/SYSTEM DESCRIPTION

The shift solenoid (SS) 1 is part of the control solenoid valve assembly, which has no serviceable components. SS 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 1 is energized (ON), SS 1 fluid pressure is directed to the clutch select valve 2, which allows the valve to overcome the spring pressure and move to the applied position. 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

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0973 is not set.

P0974

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0974 is not set.

CONDITIONS FOR SETTING THE DTC

P0973

The control solenoid valve assembly detects a short to ground on the SS 1 control circuit for 2 seconds.

P0974

The control solenoid valve assembly detects an open or a short to power on the SS 1 control circuit for 2 seconds.

ACTION TAKEN WHEN THE DTC SETS

P0973

- DTC P0973 is a Type A DTC.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM inhibits torque converter clutch (TCC) engagement.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM commands the HSD OFF.
- The TCM inhibits Tap Up/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

Connector End View Reference

- [Component Connector End Views](#)
- [Inline Harness 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

DT-47825-20: 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. Place the gear selector in Reverse for 5 seconds and then idle the vehicle in Park for 5 seconds. Verify with a scan tool the following test status parameters display OK:
 - Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
 - Shift Solenoid Valve 1 Control Circuit Open 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 valve 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-47825-20**: 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:
 - Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
 - Shift Solenoid Valve 1 Control Circuit Open 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

- 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, and programming

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

DTC P0976 OR P0977

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 P0976

Shift Solenoid Valve 2 Control Circuit Low Voltage

DTC P0977

Shift Solenoid Valve 2 Control Circuit High Voltage

DIAGNOSTIC FAULT INFORMATION

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Shift Solenoid (SS) 2 Control	P0976	P0977	P0977	-

TYPICAL SCAN TOOL DATA

Shift Solenoid Valve 2 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 2 Control	-	-	Fault or Malfunction

Shift Solenoid Valve 2 Control Circuit Open Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 2 Control	-	Fault or Malfunction	-

Shift Solenoid Valve 2 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK			
Shift Solenoid 2 Control	Fault or Malfunction	-	-

CIRCUIT/SYSTEM DESCRIPTION

The shift solenoid (SS) 2 is part of the control solenoid valve assembly, which has no serviceable components. SS 2 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 2 is energized, ON, SS 2 fluid pressure is directed to the clutch select valve 3, which allows the valve to overcome the spring pressure and move to the applied position. Power to the SS 2 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

P0976

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0976 is not set.

P0977

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P0977 is not set.

CONDITIONS FOR SETTING THE DTC

P0976

The TCM detects a short to ground on the SS 2 control circuit for 2 seconds.

P0977

The TCM detects an open or short to power on the SS 2 control circuit for 2 seconds.

ACTION TAKEN WHEN THE DTC SETS

P0976

- DTC P0976 is a Type B DTC.
- The TCM freezes transmission adaptive functions.

- The TCM commands maximum line pressure.

P0977

- DTC P0977 is a Type A DTC.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM inhibits the torque converter clutch (TCC).
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM turns the HSD OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DIC/DTC

- DTC P0976 is a Type B DTC.
- DTC P0977 is a Type A DTC.

REFERENCE INFORMATION

Connector End View Reference

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

DT-47825-20: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. Operate the vehicle in 3rd 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 the vehicle in Park for 5 seconds. Verify with a scan tool the following test status parameters display OK:
 - Shift Solenoid Valve 2 Control Circuit High Voltage Test Status
 - Shift Solenoid Valve 2 Control Circuit Open Test Status
 - Shift 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 valve 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-47825-20:** 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:
 - Shift Solenoid Valve 2 Control Circuit High Voltage Test Status
 - Shift Solenoid Valve 2 Control Circuit Open Test Status
 - Shift 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

- 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, and programming

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
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

Transmission Fluid Pressure Switch 1

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 1 Control	Low	High	High

Transmission Fluid Pressure Switch 3

		Open/High	
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Circuit	Short to Ground	Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 3 Control	Low	High	High

Transmission Fluid Pressure Switch 4

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature Parameter Normal Range: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 4 Control	Low	High	High

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: 12 volts = High, 0 volts = Low			
Transmission Fluid Pressure Switch 5 Control	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The transmission fluid pressure (TFP) switch 5 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 pressure control (PC) solenoid 3 controls pressure to the R1/4-5-6 clutch regular valve. The TCM monitors the TFP switch 5 signal circuit 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 the 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

DTC P0989 or P0990

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P1915, or P182E is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The engine speed is 550 RPM or greater.
- Ignition voltage is 8.6 volts or greater.
- The transmission fluid temperature (TFT) is 0-120°C (32-248°F).

CONDITIONS FOR SETTING THE DTC

P0989

The TCM detects that the TFP switch 5 signal voltage remains LOW after the 4-5-6 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 18 counts are accumulated.

P0990

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

ACTION TAKEN WHEN THE DTC SETS

- DTCs P0989 and P0990 are Type C DTCs.
- The TCM freezes transmission adaptive functions for the reverse and low clutch and the 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 failure should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptives 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

Description and Operation

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References for scan tool information

Special Tools

DT-47825-20: Adapter Harness

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

CIRCUIT/SYSTEM VERIFICATION

1. If there are any other transmission related DTCs set, diagnose those DTCs first. Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
2. Engine idling in Park with parking brake applied, and drive wheels chocked.
3. Monitor the Transmission Pressure Switch 1, Transmission Pressure Switch 3, Transmission Pressure Switch 4, and Transmission Pressure Switch 5 parameters with a scan tool.
4. 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** .
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 parameter states are correct for each range. Refer to **Transmission Fluid Pressure Switch Logic** .
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.

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. 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-47825-20:** harness between the vehicle wire harness electrical connector, and the control solenoid valve assembly electrical connector.
5. Ignition ON, verify with a scan tool that the Transmission Pressure Switch 1, Transmission Pressure Switch 3, Transmission Pressure Switch 4, and Transmission Pressure Switch 5 parameters change states when gently pushing on each TFP switch with the eraser end of a pencil.
 - If any TFP Switch parameter does not change states, replace the control solenoid valve assembly.

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 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 lower body assembly. SS 1, in conjunction with clutch select valve 2, controls the pressure path to the reverse and low clutch and 4-5-6 clutch. 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

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P0741, P0742, P1751, P2763, or P2764 is not set.
- Current gear is not 2nd.
- The engine speed is greater than 400 RPM for greater than 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- 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).
- The transmission input speed is greater than 1,200 RPM.
- No upshift or downshift in process.

- The engine torque signal is valid.
- The throttle position signal is valid.
- The torque converter clutch (TCC) has transitioned from locked to unlocked.

CONDITIONS FOR SETTING THE DTC

The TCM detects attained gear slip is 100 RPM or greater for 1 second.

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

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

REFERENCE INFORMATION

Description and Operation

Transmission General 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 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.

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

3. Perform the Road Test . Verify the transmission operation performs as indicated in the road test instructions.
4. Review the scan tool snapshot transmission data parameters. Verify the engine and transmission data

parameters display the correct values in all forward gear ranges:

- Engine Speed
 - Transmission ISS
 - Transmission OSS
 - Shift Solenoid Valve 1
 - Gear Command
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.

CIRCUIT/SYSTEM TESTING

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** .
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 chart below, are conditions for each component that could set DTC P1751. Carefully inspect each component for that condition. Repair or replace as necessary.

DTC	Component	Condition
P1751	Upper Control Valve Body Assembly (349)	Clutch select valve 2 - spring broken, debris, valve stuck, binding, damaged valve, or scored bore
P1751	Upper Control Valve Body Assembly (349)	#4 check ball for irregularities
P1751	Upper Spacer Plate	Orifice # 14 blocked, obstructed, or irregular shaped
P1751	Control Solenoid Valve Assembly (314)	• SS1 Stuck ON/OFF • Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal

REPAIR PROCEDURES

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

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

Control Valve Upper Body Assembly Cleaning and Inspection

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

CIRCUIT/SYSTEM DESCRIPTION

A signal circuit is provided by the body control module (BCM) to the resistor network embedded in the plus or minus buttons. When a plus or minus button is pressed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to perform the upshift or downshift. The TCM 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 TCM rolling counter diagnostic is enabled.
- The Tap Up and Tap Down message health is received from the BCM.
- The engine speed is 400 RPM or greater for 5 seconds.

CONDITIONS FOR SETTING THE DTC

The TCM detects an error in the rolling count value that does not match with the BCM count, 3 times within 10 seconds.

ACTION TAKEN WHEN THE DTC SETS

- DTC P1761 is a Type C DTC.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

CONDITIONS FOR CLEARING THE DTC

DTC P1761 is a Type C DTC.

REFERENCE INFORMATION

Schematic Reference

- [Automatic Transmission Controls Schematics](#)
- [Data Communication Schematics](#)
- [Body Control System Schematics](#)

Connector End View Reference

- [Component Connector End Views](#)
- [Inline Harness 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

CIRCUIT/SYSTEM VERIFICATION

1. DTC P1761 is an informational DTC. Diagnose all other body control module 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.

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

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	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, range selector in Park			
Parameter Normal Range: High/Low			
Transmission Range Switch Signal A	Low	High	High
Transmission Range Switch Signal B	Low	High	High
Transmission Range Switch Signal C	Low	High	High
Transmission Range Switch Signal P	Low	High	High

CIRCUIT/SYSTEM DESCRIPTION

The manual shift detent lever with shaft position switch assembly, or internal mode switch (IMS) assembly, is a sliding contact switch attached to the manual shift detent lever within the transmission. The 4 inputs to the

transmission control module (TCM), from the switch, indicate the position selected by the transmission manual shaft. The input voltage at the TCM is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as IMS A/B/C/P. The IMS input parameters represented are transmission range Signal A, Signal B, Signal C, and Signal P.

CONDITIONS FOR RUNNING THE DTC

P182E

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0722, or P0723 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- The engine torque signal is valid.

P1915

- DTC P0722, P0723, or P1915 is not set.
- The transmission output shaft speed is 90 RPM or less.
- The ignition voltage was 6.0 volts or greater, and has not dropped below 2.0 volts.

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 50 RPM or less for 0.25 second or greater.
- The engine speed is 50-480 RPM for 0.07 second or greater.
- The engine speed is 525 RPM or greater and the transmission input speed is 200 RPM or greater for 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 forces the torque converter clutch (TCC) OFF.
- The TCM turns all the solenoids OFF.
- The TCM freezes transmission adaptive functions.

- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM turns the high side driver (HSD) OFF.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

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**
- **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

Special Tools

DT-47825-20: Adapter Harness

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

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 TCM 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) Park/Neutral Position Switch parameter while moving the gear shift lever from Park, to Reverse, Neutral 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 20-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 Park/Neutral Position Switch parameter displays In Gear.
 - o If not the specified value, test the Park/Neutral signal circuit for a short to ground. If the circuit tests normal, replace the engine control module (ECM).
3. Ignition OFF, install the **DT-47825-20:** harness to the 20 way harness connector on the vehicle harness.
4. Ignition ON, connect a 3-amp fused jumper wire between the Park/Neutral signal circuit terminal 3 and ground. Verify the scan tool ECM Park/Neutral Position Switch parameter displays Park/Neutral.
 - o If not the specified value, test the Park/Neutral signal circuit for an open/high resistance. If the circuit tests normal, replace the ECM.
5. Ignition OFF, disconnect the **DT-47825-20:** harness from the vehicle harness connector.
6. Remove the control valve body cover. Refer to **Control Valve Body Cover Replacement** .
7. Connect the vehicle harness connector to the control solenoid valve assembly.
8. Disconnect the IMS connector X2 at the control solenoid valve assembly.
9. Ignition ON, verify the scan tool Internal Mode Switch A/B/C/P parameter displays High for all 4 signal circuits and verify the scan tool ECM Park/Neutral Position Switch parameter displays In Gear.
 - o If not the specified value, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .
10. Connect a 3-amp fused jumper wire between each transmission range signal circuit or park/neutral circuit terminal listed below and the IMS ground circuit, terminal A on the TCM assembly. The corresponding scan tool TCM Internal Mode Switch A/B/C/P parameter should display Low and the ECM Park/Neutral parameter should display Park/Neutral 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
- Park/Neutral Signal terminal F
- If not the specified value, replace the control solenoid valve assembly.

11. If all circuits test normal, replace the IMS.

REPAIR PROCEDURES

NOTE:

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

Perform the Diagnostic Repair Verification after completing the diagnostic procedure.

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

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 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 IMS switch does not indicate L (M), DTC P1876 sets. DTC P1876 is a type C DTC.

CONDITIONS FOR RUNNING THE DTC

- No TAP system DTCs P0815, P0816, or P0826.
- No IMS DTCs P1825 or P1915.
- No Communication DTC U0100.
- The engine speed is greater than 500 RPM for 5 seconds.
- The ignition voltage is between 8.6 volts and 19.0 volts.

CONDITIONS FOR SETTING THE DTC

The Tap Up/Tap Down switch signal is Active when the IMS does not indicate L (M) for 2 seconds or greater 3 times during the same ignition cycle.

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

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.

- 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 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 Valve 4 Stuck Off

DTC P2715

Clutch Pressure Control Solenoid Valve 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 to the 2-6 clutch 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 ignition voltage is 8.6 volts or greater.
- The output speed is 16 RPM or greater, or the throttle position is 0.4 percent or greater.
- The throttle position signal is valid.
- The engine speed is greater than 400 RPM for 5 seconds.
- The transmission fluid temperature is 0°C (32°F) or greater.
- 2-6 clutch is commanded ON.
- The high side driver (HSD) is enabled.

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 8.6 volts or greater.
- The HSD is enabled.
- The transmission fluid temperature is 0°C (32°F) or greater.
- The transmission output shaft speed is 350 RPM or greater.
- The transmission input shaft speed is 200 RPM or greater.
- The 2-6 clutch is commanded OFF.
- The commanded and attained gear is not 1st.

CONDITIONS FOR SETTING THE DTC

P2714

The TCM detects an incorrect on-coming clutch gear ratio, or flare, when the 2-6 clutch is commanded ON and the transmission input shaft speed is 200 RPM or greater from the anticipated input shaft speed for 2 seconds, a total of 3 times in second gear, or a total of 3 times in sixth gear.

P2715

The TCM detects an incorrect off-going clutch gear ratio, or tie-up, when the 2-6 clutch is commanded OFF and the transmission input shaft speed is 40 RPM or less from the anticipated input shaft speed for 1.2 seconds, a total of 3 times from second gear or a total of 3 times from sixth gear.

ACTION TAKEN WHEN THE DTC SETS

P2714

- DTC P2714 is a Type A DTC.

- The TCM commands maximum line pressure.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM freezes transmission adaptive functions.
- The TCM limits the transmission to first, third, or reverse operation.

P2715

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

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 will allow you to display, monitor, and verify multiple transmission data parameters at one time, after the road test.

REFERENCE INFORMATION

Connector End View Reference

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

CIRCUIT/SYSTEM VERIFICATION

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. Monitor the Transmission Fluid Pressure Switch 3 parameter 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** .
4. 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** .
5. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage parameter displays OK.
6. 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.
7. 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.**

8. Perform the **Road Test** . Verify the transmission operation performs as indicated in the road test instructions.
9. 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 Pressure Command
 - Transmission Fluid Pressure Switch 3
10. 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 ranges 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** . A pressure change should occur for each solenoid valve.
 - 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 P2714 or P2715. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P2714 P2715	Control Valve Upper Body Assembly (349)	2-6 clutch regulator valve (334) and (333) stuck/sticking - debris, binding, damaged valve, or scored bore
P2714	Lower Control Valve Body Assembly (374)	Actuator feed limit circuit supply fluid to solenoid restricted or not available - debris or sediment blockage
P2714 P2715	Control Solenoid Valve Assembly (314)	• Clutch pressure control solenoid 4 stuck ON or stuck OFF • Control signal fluid supply leak - valve body filter plate assembly cracked or damaged gasket seal • Clutch pressure control solenoid 2 stuck OFF
P2714 P2715	A/Trans Case Cover (403)	• 2-6 clutch return spring retaining ring (407) not seated in groove • 2-6 clutch piston assembly (405) - seal damaged or leaking • 2-6 clutch plates (446-447) worn or damaged
P2714	1-2-3-4 Clutch Plate Assembly (51)	• 2-6 clutch return spring retaining ring (407) not seated in groove • 2-6 clutch piston assembly (405) - seal damaged or leaking • 2-6 clutch plates (446-447) worn or damaged • 1-2-3-4 clutch backing plate retaining ring (429) not seated/oriented correctly • 1-2-3-4 clutch piston (414) - seals damaged or leaking • 1-2-3-4 clutch piston (414) - cracked or damaged
P2714	A/Trans Fluid Pump Assembly (203)	• Fluid pump housing/vanes/rotor/slide damaged/scored

		• A/Trans pump fluid outlet seal assembly (57) damaged/leaking
P2714	A/Trans Fluid Filter Assembly (201)	Oil filter (201) or filter seal (202) loose or damaged

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 Valve Lower Body and Upper Body Replacement
- Low and Reverse Clutch and 1-2-3-4 Clutch Plate Removal
- Control Module References for control solenoid valve assembly replacement, setup, and programming

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

Pressure Control Solenoid Valve 4 Performance

DTC P2720

Pressure Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Pressure Control Solenoid Valve 4 Control Circuit High Voltage

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: Ignition ON 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: Ignition ON 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: Ignition ON 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 PC solenoid 4 regulates and directs oil pressure to the 2-6 clutch regulator valve. Increasing PC solenoid 4 pressure increases pressure to the 2-6 clutch regulator valve. The transmission control module (TCM) varies the current to the PC solenoid 4 through a low side driver. Increasing the current to PC solenoid 4 increases oil pressure by closing OFF the solenoid exhaust port. Decreasing the current to 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

- The engine speed is 400 RPM or greater for 5 seconds.

- The ignition voltage is 8.6 volts or greater.
- DTC P2719 is not set.

P2720

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P2720 is not set.

P2721

- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- DTC P2721 is not set.

CONDITIONS FOR SETTING THE DTC

P2719

The TCM detects an internal electrical malfunction on the clutch PC solenoid 4 control circuit where the measured 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 commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

- The TCM limits the transmission to reverse and 2nd gear operation.

P2721

- DTC P2721 is a Type A DTC.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse, 1st, and 3rd gear operation.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Connector End View Reference

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

DT-47825-20: 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 valve 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-47825-20:** 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 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

- 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, and programming

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 clutch PC solenoid 5 regulates the transmission fluid pressure (TFP) to the 1-2-3-4 clutch 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 8.6 volts or greater.
- The high side driver (HSD) is enabled.
- The output speed is 16 RPM or greater, or the throttle position is 0.4 percent or greater.
- The throttle position signal is valid.
- The engine speed is greater than 400 RPM for 5 seconds.
- The transmission fluid temperature (TFT) is 0°C (32°F) 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 ignition voltage is 8.6 volts or greater.
- The HSD is enabled.
- The TFT is 0°C (32°F) or greater.
- The transmission output shaft speed is 350 RPM or greater.
- The transmission input speed is 200 RPM or greater.

CONDITIONS FOR SETTING THE DTC

P2723

The TCM detects an incorrect on-coming clutch gear ratio, or flare, when the 1-2-3-4 clutch is commanded ON and the transmission input speed is 200 RPM or greater from the anticipated input shaft speed for 3.5 seconds, a total of 2 times in any one range that the 1-2-3-4 clutch is commanded ON.

P2724

The TCM detects an incorrect off-going clutch gear ratio, or tie-up, when the 1-2-3-4 clutch is commanded OFF and the transmission input speed is 40 RPM or less from the anticipated input shaft speed for 1.2 seconds, a total of 5 times.

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/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and fifth gear operation.

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/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse, first, or third gear operation.

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 will allow you to display, monitor, and verify multiple transmission data parameters at one time, after the road test.

REFERENCE INFORMATION

Connector End View Reference

- Component Connector End Views
- Inline Harness 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

CIRCUIT/SYSTEM VERIFICATION

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. Monitor the Transmission Fluid Pressure Switch 4 parameter 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.
4. 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** .

5. Engine idling in Park, verify with a scan tool the Transmission ISS/OSS Supply Voltage parameter displays OK.
6. 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.
7. 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.**

8. Perform the **Road Test** . Verify the transmission operation performs as indicated in the road test instructions
9. 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 5 Pressure Command
 - Transmission Fluid Pressure Switch 4
10. 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** . A pressure change should occur for each solenoid valve.
 - 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 P2714 or P2715. Carefully inspect each component for that condition. Repair or replace as necessary.

DTCs	Component	Condition
P2723	Control Valve Upper Body Assembly (349)	Manual shift detent (w/shaft position switch) lever assembly not engaged with manual shaft
P2723	Control Valve Upper Body Assembly (349)	Clutch select valve 3 (345) stuck OFF - debris, binding, damaged valve, or scored bore
		• Actuator feed limit circuit supply fluid to

P2723 P2724	Lower Control Valve Body Assembly (374)	solenoid restricted or not available - debris or sediment blockage • 1-2-3-4 clutch boost valve (369) - binding or scored bore - can cause harsh shifts • 1-2-3-4 clutch regulator valve (372) stuck/sticking - debris, binding, damaged valve, or scored bore
P2723 P2724	Control Solenoid Valve Assembly (314)	• Clutch pressure control solenoid 5 stuck ON or stuck OFF • Clutch pressure control solenoid 2 stuck OFF - P2724 • Control solenoid filter plate assembly blocked, or damaged gasket seal
P2723	1-2-3-4 Clutch Assembly (51)	1-2-3-4 clutch piston (414) cracked/damaged/leaking
P2723	1-2-3-4 Clutch Assembly (51)	1-2-3-4 clutch backing plate retaining ring (429) not seated/oriented, causing clutch pack/piston overtravel
P2723	Low and Reverse Clutch Assembly (OWC)	• OWC (455) will not hold torque • OWC (455) friction plate support face cracked/damaged
P2723	A/Trans Case (51)	1-2-3-4 clutch fluid passage seal (65) damaged/leaking
P2723	• A/Trans Fluid Pump (203) • Torque Converter Assembly (27)	• Fluid pump housing vanes/rotor/slide damaged/scored • A/Trans pump fluid outlet seal assembly (57) damaged/leaking • Fluid pump or torque converter overstressed due to high temperatures
P2723	A/Trans Fluid Filter Assembly (201)	Oil filter (201) or filter seal (202) loose or damaged
P2723	Reaction Sun Gear Assembly (466)	• Reaction sun gear broke away from shell • Input sun gear missing or broken

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 Valve Lower Body and Upper Body Replacement**
- **Low and Reverse Clutch and 1-2-3-4 Clutch Plate Removal**
- **Control Module References** for control solenoid valve assembly replacement, setup, and programming

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 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
Clutch PC Solenoid 5 Control	P2729	P2730	P2730	P2728

TYPICAL SCAN TOOL DATA

Pressure Control Solenoid Valve 5 Performance Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 5 Control	-	-	-	Fault or Malfunction

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status

	Short to	Open/High	Short to	Signal
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Circuit	Ground	Resistance	Voltage	Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 5 Control	Fault or Malfunction	-	-	-

Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
Pressure Control Solenoid Valve 5 Control	-	Fault or Malfunction	Fault or Malfunction	-

CIRCUIT/SYSTEM DESCRIPTION

The clutch pressure control (PC) solenoid 5 is part of the control solenoid valve assembly which has no serviceable components. The normally low PC solenoid 5 regulates and directs oil pressure to the 1-2-3-4 clutch regulator valve and 1-2-3-4 clutch boost valve. Increasing 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 PC solenoid 5 increases oil pressure by closing OFF the solenoid exhaust port. Decreasing the current to PC solenoid 5 decreases oil pressure by opening the exhaust port. 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

- DTC P2728 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P2729

- DTC P2729 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P2730

- DTC P2730 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 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 commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse, 1st and 3rd gear operation.

P2730

- DTC P2730 is a Type A DTC.
- The TCM inhibits the TCC.
- The TCM forces the HSD OFF.
- The TCM commands maximum line pressure.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.
- The TCM limits the transmission to reverse and 5th gear operation.

CONDITIONS FOR CLEARING THE DTC

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

REFERENCE INFORMATION

Connector End View Reference

- [Component Connector End Views](#)
- [Inline Harness 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

DT-47825-20: 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 valve 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-47825-20**: 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

- 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, and programming

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	P2764	P2763	P2763	P2762

TYPICAL SCAN TOOL DATA

TCC Pressure Control Solenoid Valve Control Circuit Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
TCC Pressure Control Solenoid Valve Control	-	-	-	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: Ignition ON Parameter Normal Range: OK				
TCC Pressure Control Solenoid Valve Control	Fault or Malfunction	-	-	-

TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Operating Conditions: Ignition ON Parameter Normal Range: OK				
TCC Pressure Control Solenoid Valve Control	-	Fault or Malfunction	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

- DTC P2762 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.

P2763

- DTC P0658, P0659, or P2763 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- The high side driver is enabled.

P2764

- DTC P0658, P0659, or P2764 is not set.
- The engine speed is 400 RPM or greater for 5 seconds.
- The ignition voltage is 8.6 volts or greater.
- 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 pressure solenoid control circuit for 5 seconds.

P2764

The TCM detects a short to ground on the TCC pressure 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 commands the hot mode shift pattern.
- The TCM inhibits Tap Up/Down function.
- The TCM inhibits manual shifting of forward gears.

P2764

- DTC P2764 is a Type A DTC.
- The TCM inhibits TCC.
- 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.
- The TCM limits the transmission to reverse and 5th gear operation.
- The TCM commands the HSD OFF.

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

Connector End View Reference

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

DT-47825-20: 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.
2. Operate the vehicle in drive range and ensure TCC is commanded ON for 1 minute. Verify with a scan tool the following test status parameters display OK:
 - TCC Pressure Control Solenoid Valve Control Circuit Status
 - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
 - TCC Pressure Control Solenoid Valve 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 valve 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 the **DT-47825-20:** 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 Control Circuit Status

- TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status
- TCC 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

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, and programming

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

REPAIR INSTRUCTIONS - OFF VEHICLE

LIFT PLATE AND HOLDING FIXTURE INSTALLATION

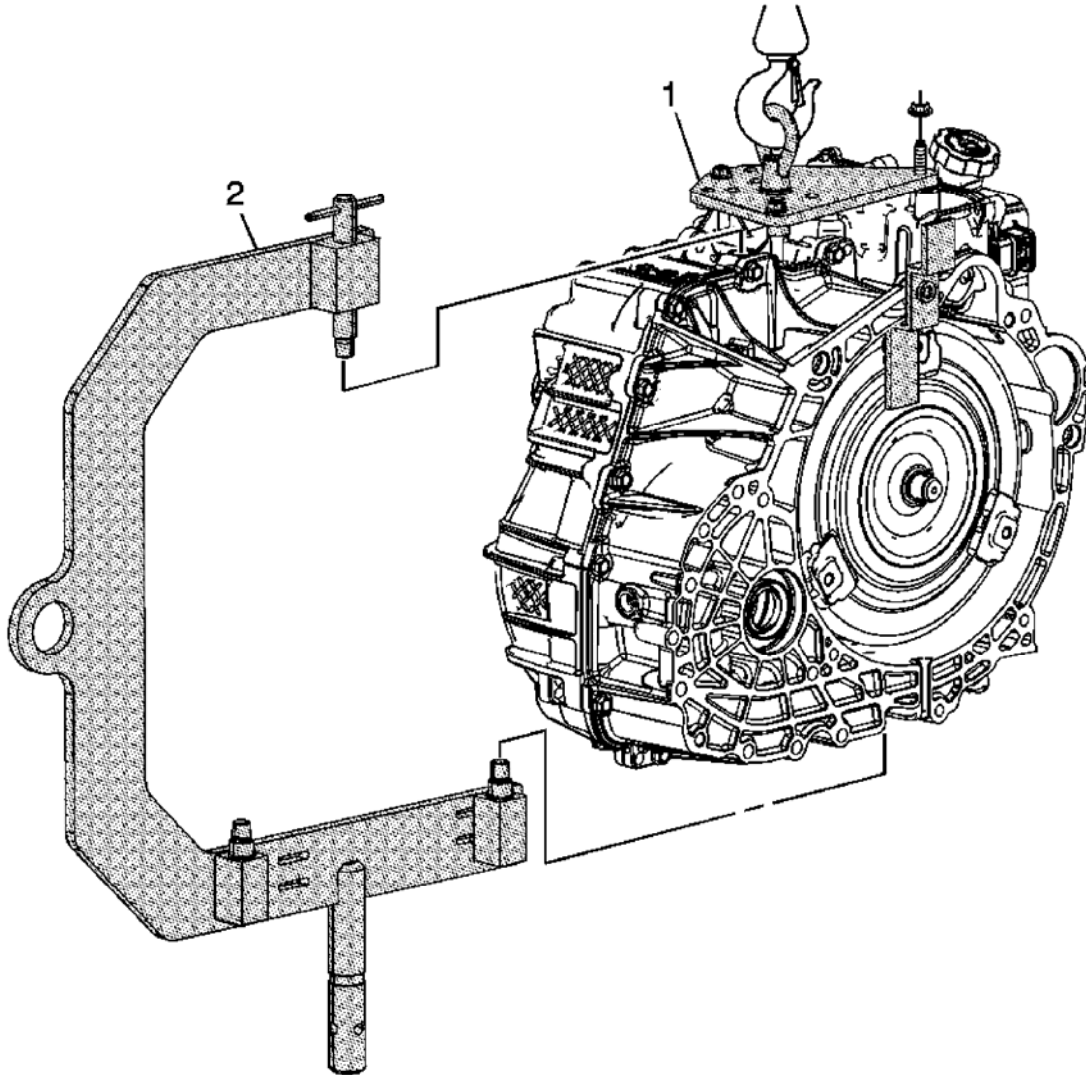


Fig. 1: Lift Plate & Holding Fixture
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	DT-47811-A: Transmission Lift Plate

1	WARNING: Handle with care, the transmission assembly weighs over 200 lbs. Bodily injury could occur if not handled properly. Tip: After Installation of lift plate, raise the transmission with an overhead hoist. Tighten: 12 N.m (9 lb ft) Special Tools: DT-47811-A: Transmission Lift Plate For equivalent regional tools, refer to <u>Special Tools</u> .
2	J-46625: Transmission Holding Fixture CAUTION: Refer to <u>Fastener Caution</u> . Tip: Adjust mounting block on fixture to match bosses on case, then tighten bolts to: Tighten: 13 N.m (10 lb ft) Special Tools: J-46625: Transmission Holding Fixture For equivalent regional tools, refer to <u>Special Tools</u> .

TORQUE CONVERTER REMOVAL

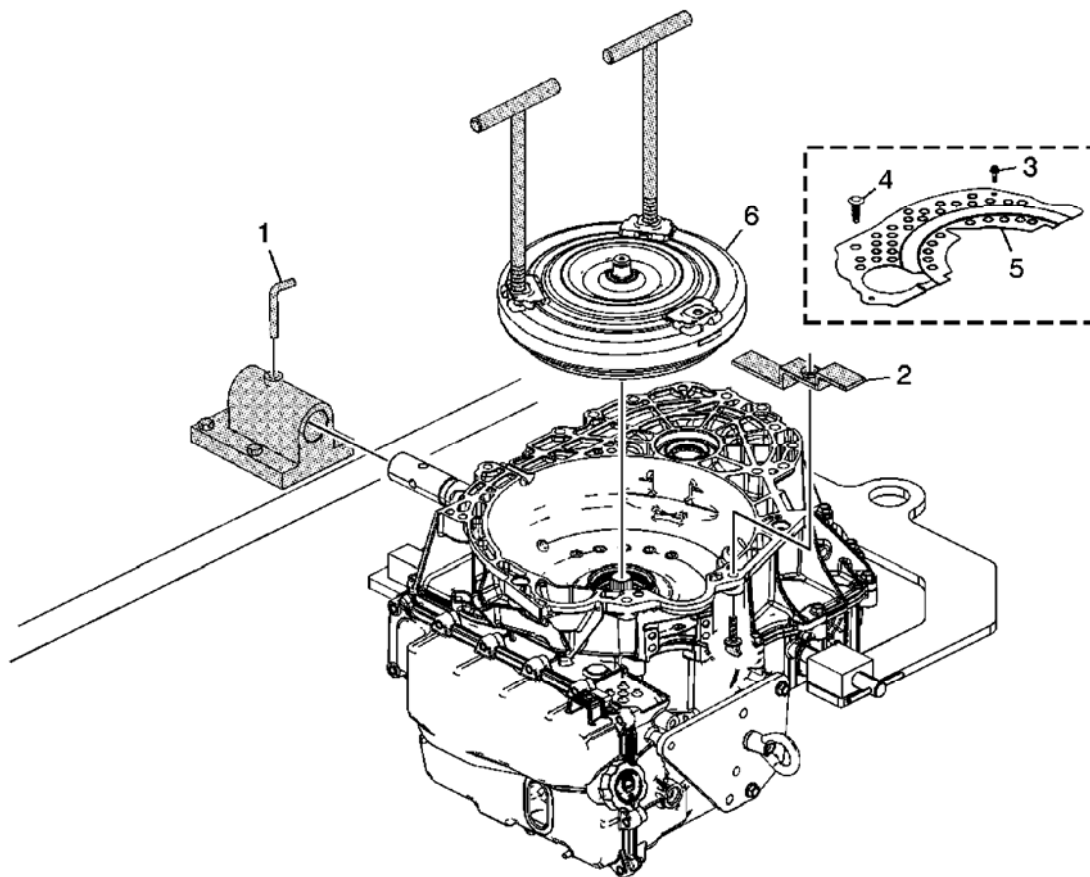


Fig. 2: Torque Converter
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Lock Pin WARNING: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury.
1	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 adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. Special Tools • J 3289-20: Holding Fixture

	• J-39890: Transmission Holding Fixture Adapter For equivalent regional tools, refer to <u>Special Tools</u> .
2	J 21366: Converter Holding Strap For equivalent regional tools, refer to <u>Special Tools</u> .
3	Dust Cover Bolts M10 x 25, model dependent (Qty: 2)
4	Dust Cover Push Pin, model dependant
5	Dust Cover, model dependant
6	Torque Converter Assembly CAUTION: Only install the lift assist handles until it stops. Do not tighten. Over tightening the lift assist handles can cause damage to the torque converter. 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 46409: Torque Converter Lifting Handles For equivalent regional tools, refer to <u>Special Tools</u> .

CONTROL VALVE BODY ASSEMBLY REMOVAL

Control Valve Body Cover Removal

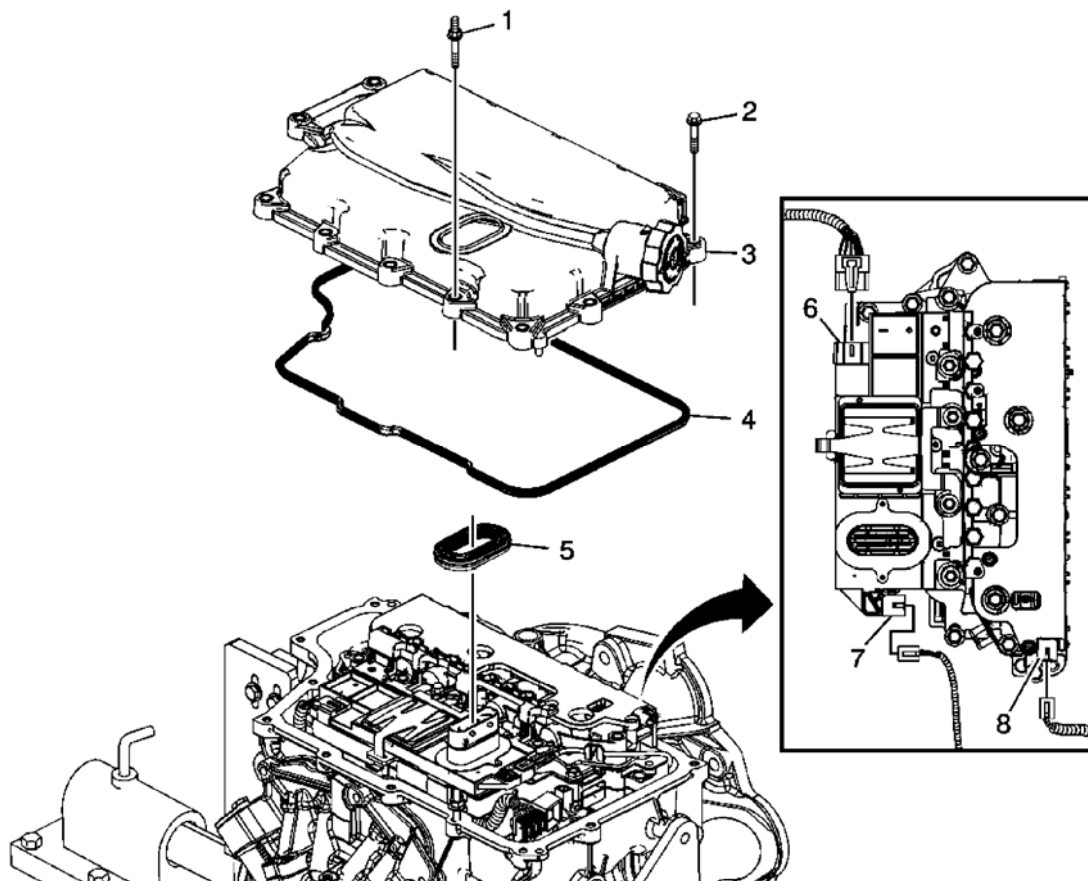


Fig. 3: Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Cover Stud M6 x 30 (Qty: 2)
2	Control Valve Body Cover Bolt M6 x 30 (Qty: 12)
3	Control Valve Body Cover
4	Control Valve Body Cover Gasket Tip: Do not re-use the valve body cover gasket.
5	Control Valve Body Cover Wiring Connector Hole Seal CAUTION: Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections.
6	Shift Position Switch Connector
7	Output Speed Sensor Connector
8	Input Speed Sensor Connector

Control Solenoid (w/Body and TCM) Valve Assembly Removal

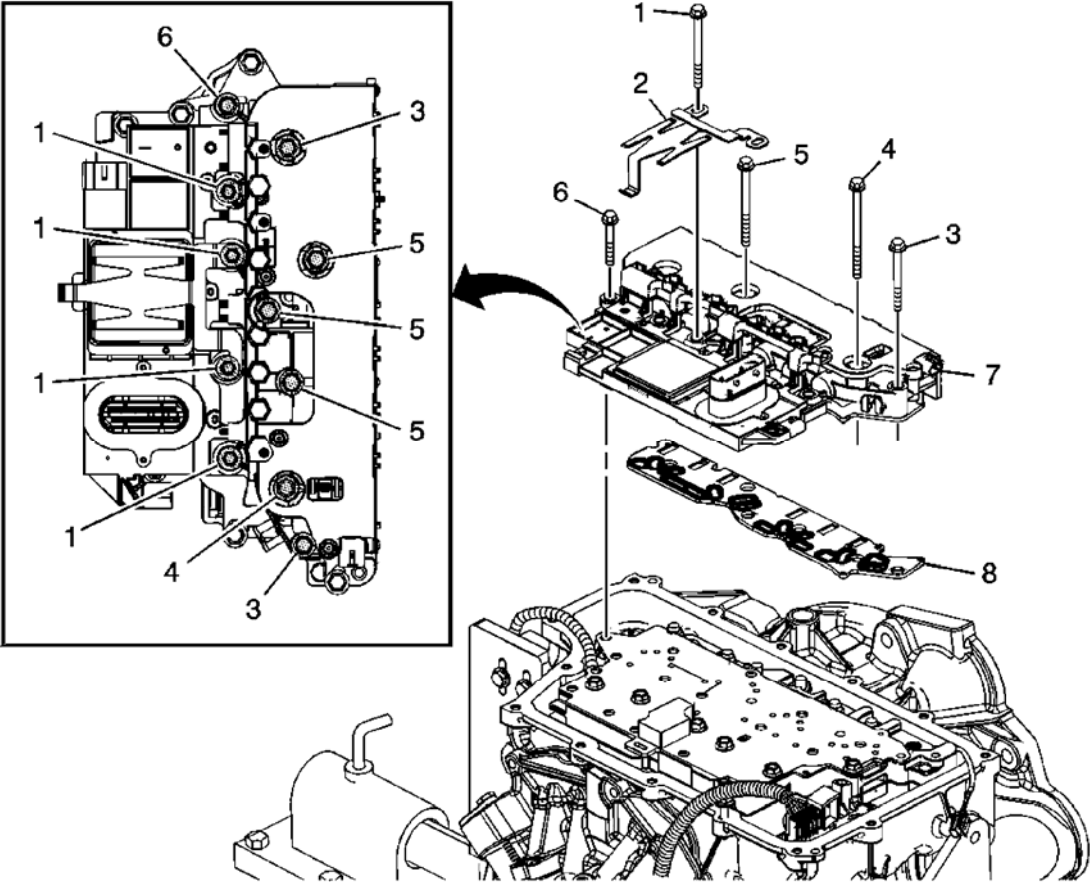


Fig. 4: Control Solenoid (w/Body & TCM) Valve Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Bolt M6 x 80 (Qty: 4)
2	Control Solenoid Valve Spring
3	Control Valve Body Bolt M6 x 65 (Qty: 2)
4	Control Valve Body Bolt M6 x 42 (Qty: 1)
5	Control Valve Body Bolt M6 x 95 (Qty: 3)
6	Control Valve Body Bolt M6 x 55 (Qty: 1)
7	Control Solenoid (w/Body and TCM) Valve Assembly
	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.

8

Tip:

- Discard the filter plate. It is not reusable.
- Inspect the pressure switch manifold seals for damage. Replace the control valve assembly as necessary.

Control Valve Body Assembly and Output Speed Sensor Removal

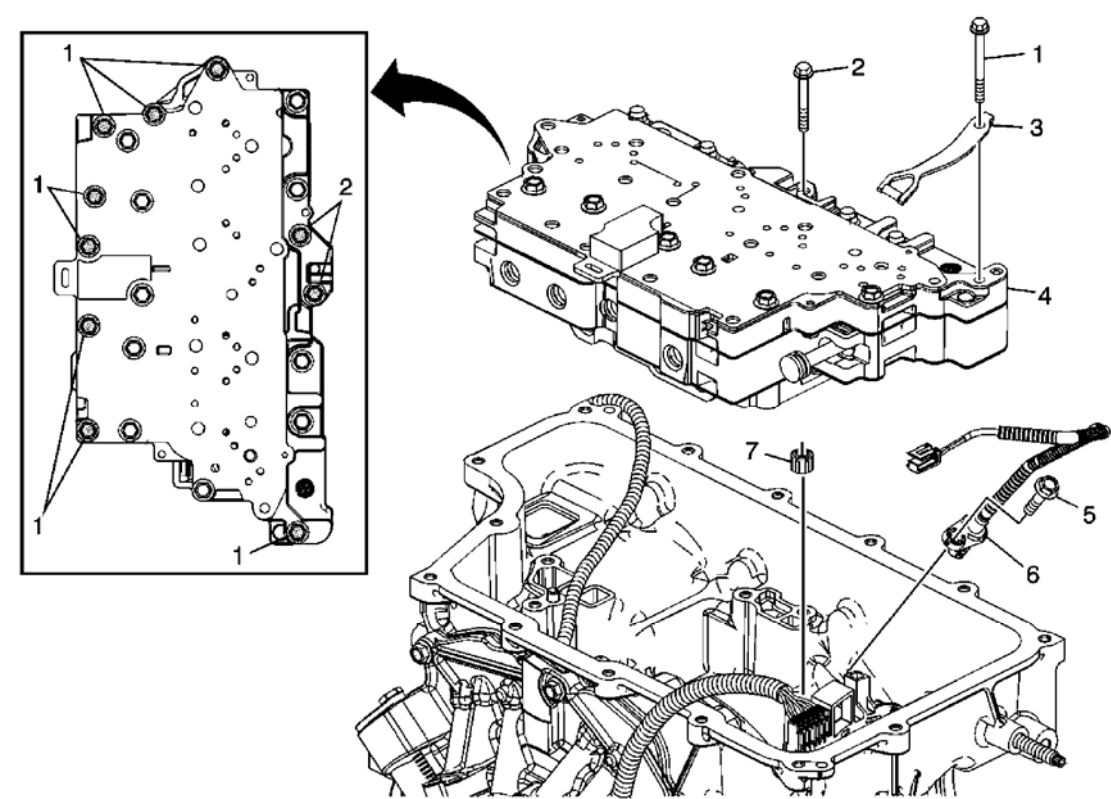


Fig. 5: Control Valve Body Assembly & Output Speed Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Bolt M6 x 65 (Qty: 8)
2	Control Valve Body Bolt M6 x 55 (Qty: 2)
3	Manual Shaft Detent Assembly
4	Control Valve Body Assembly
5	A/Trans Output Speed Sensor Bolt M6 x 25
6	A/Trans Output Speed Sensor
7	A/Trans Output Speed Sensor Bolt M6 x 25

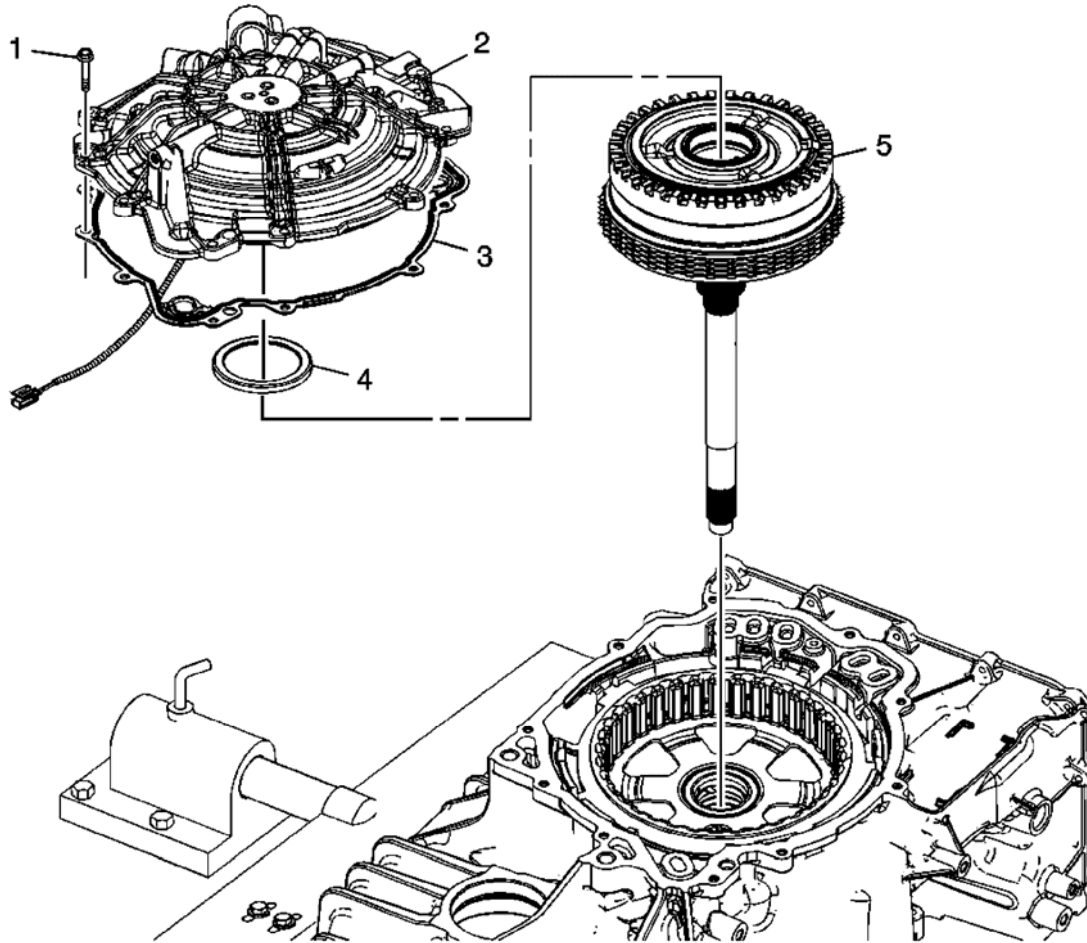
CASE COVER AND 3-5-REVERSE AND 4-5-6 CLUTCH HOUSING REMOVAL

Fig. 6: Case Cover, 3-5-Reverse & 4-5-6 Clutch Housing
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	A/Trans Case Cover Assembly Bolt M6 x 30 (Qty: 10)
2	A/Trans Case Cover Assembly CAUTION: Use care when pulling the input speed sensor wire harness through the case to avoid damaging the harness.
3	A/Trans Case Cover Gasket Tip: The gasket is not reusable.
	Input Shaft Thrust Bearing Assembly

4	Tip: The bearing may be stuck to the case cover.
5	3-5 Rev/4-5-6 Clutch Housing Assembly

REACTION CARRIER HUB AND 2-6 CLUTCH PLATE REMOVAL

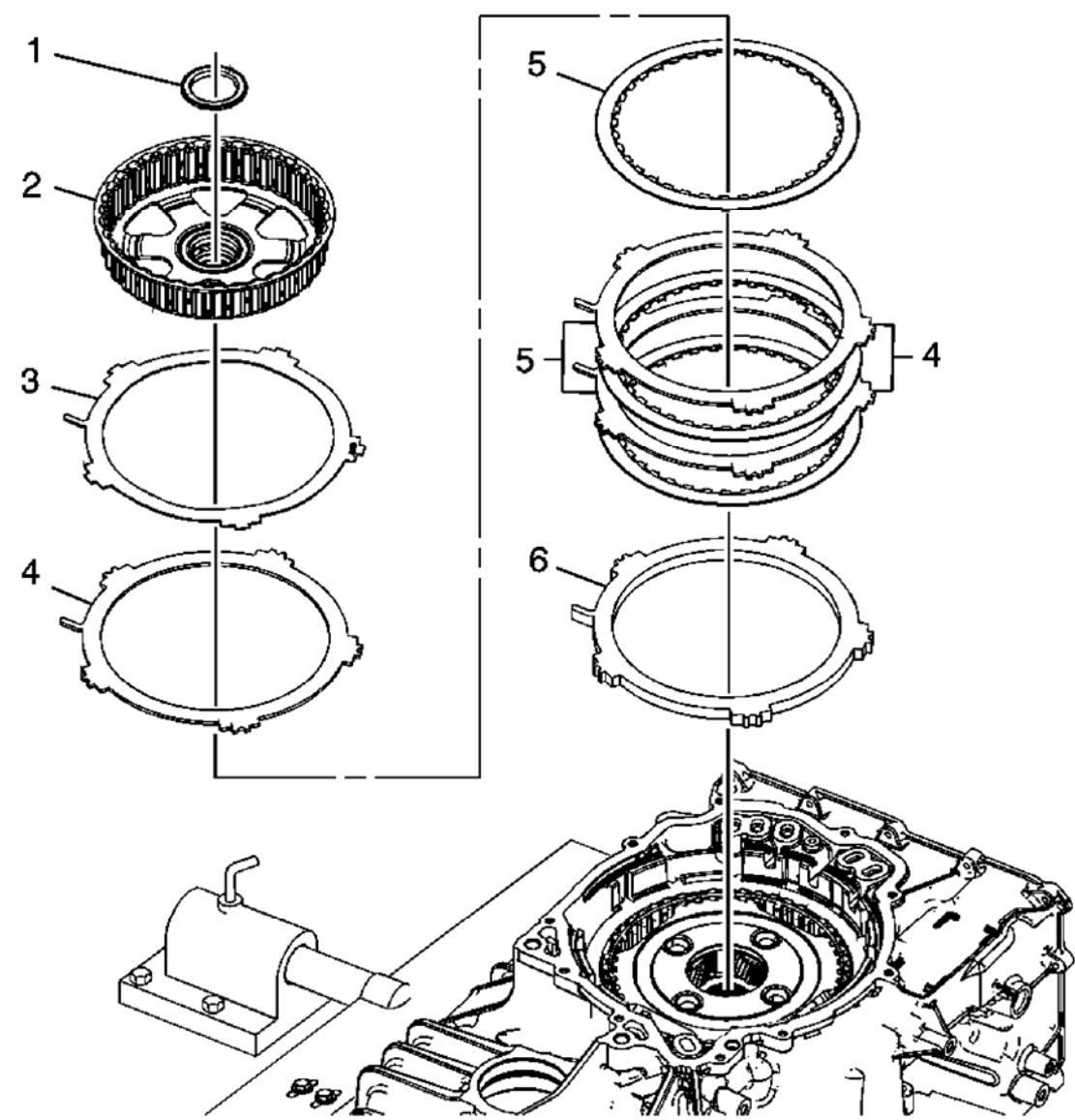


Fig. 7: Reaction Carrier Hub & 2-6 Clutch Plate
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	2-6 Clutch Hub Thrust Bearing Assembly Tip: The 2-6 clutch hub thrust bearing assembly may be stuck to the reaction carrier hub assembly.

2	Reaction Sun Gear Assembly
3	2-6 Clutch Cushion Spring
4	2-6 Clutch Plate (Qty: 3)
5	2-6 Clutch (w/Friction Material) Plate Assembly (Qty: 3)
6	2-6 Clutch Backing Plate

LOW AND REVERSE CLUTCH PLATE REMOVAL

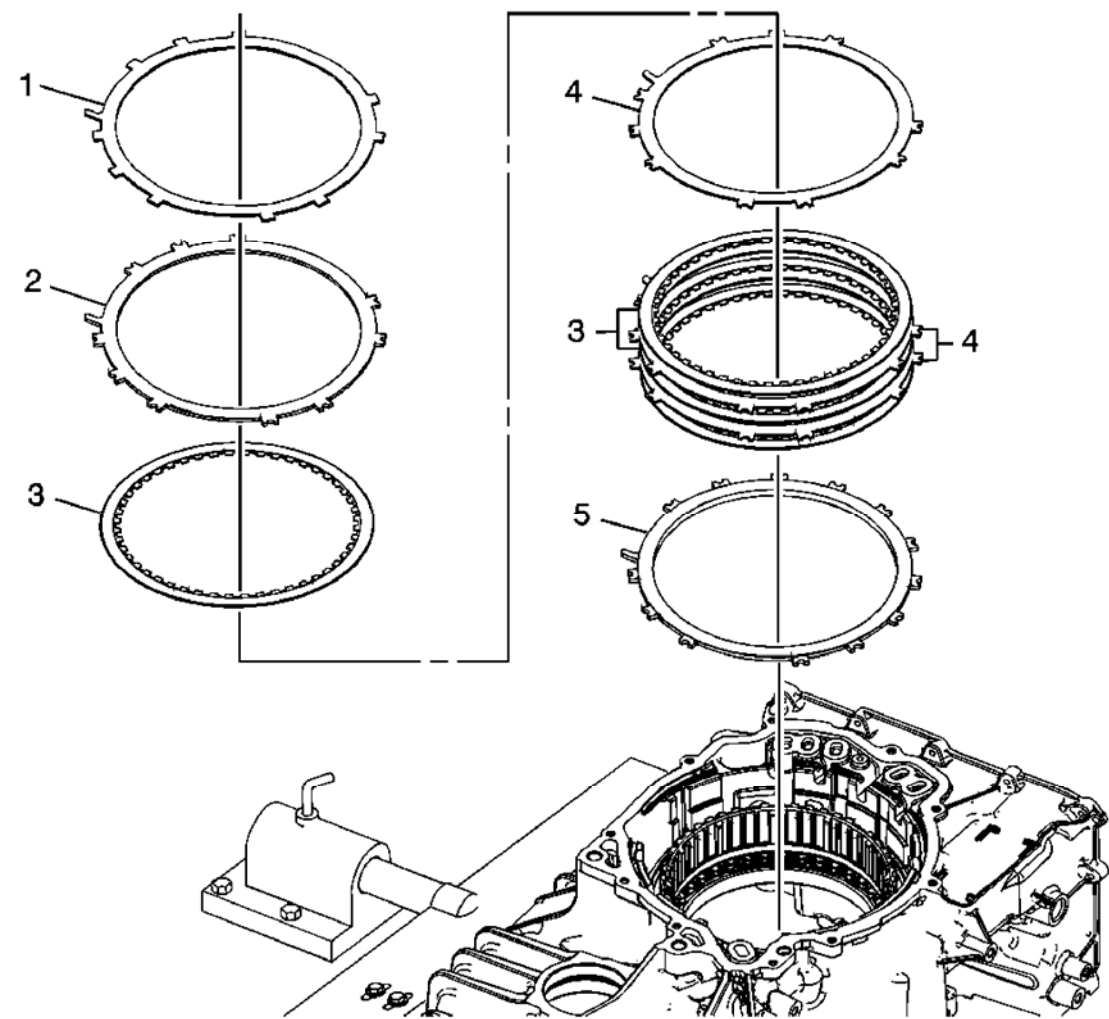


Fig. 8: Low & Reverse Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse Clutch Cushion (Waved) Spring
2	Low and Reverse Clutch Apply Plate
3	Low and Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 4)

4	Low and Reverse Clutch Plate (Qty: 3)
5	Low and Reverse Clutch Backing Plate

LOW AND REVERSE CLUTCH AND 1-2-3-4 CLUTCH PLATE REMOVAL

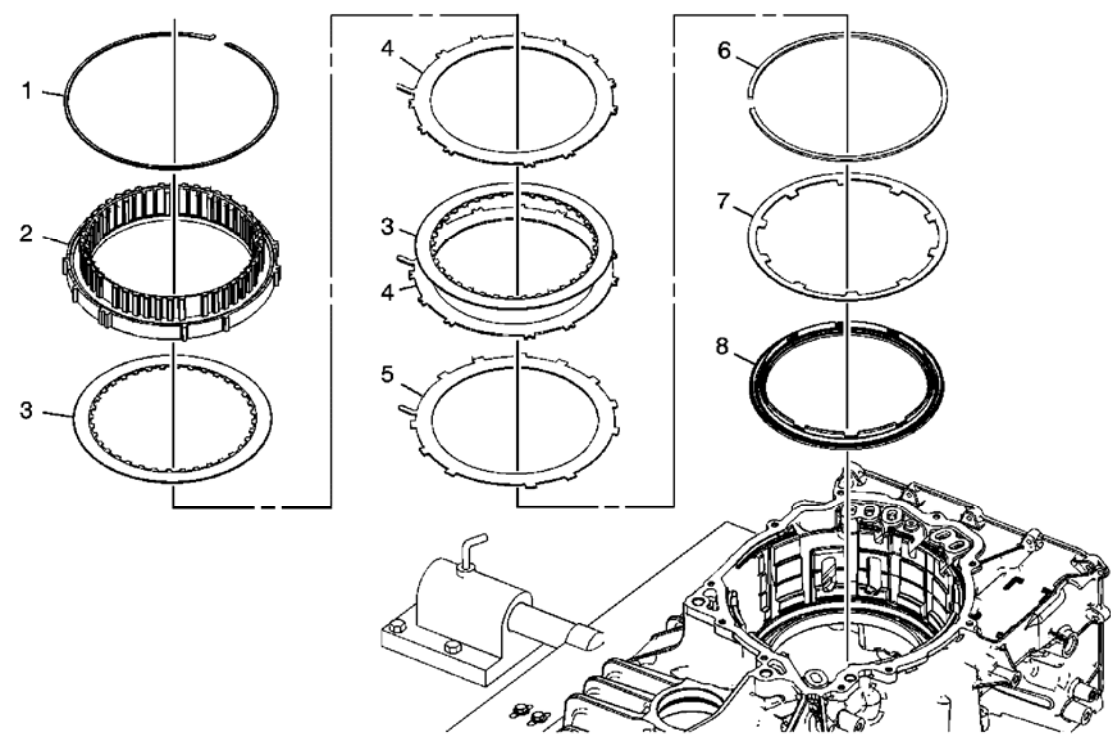


Fig. 9: Low, Reverse Clutch & 1-2-3-4 Clutch Plates
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse Clutch Retainer Ring
2	Low and Reverse Clutch Assembly
3	1-2-3-4 Clutch (w/Friction Material) Plate Assembly (Qty: 2)
4	1-2-3-4 Clutch Plate (Qty: 2)
5	1-2-3-4 Clutch (Waved) Plate
6	1-2-3-4 Clutch Spring Retainer Ring
7	1-2-3-4 Clutch Spring
8	1-2-3-4 Clutch Piston Tip: - Use pliers to remove the piston. - Inspect the piston seals for damage and/or wear. The piston is reusable.

DRIVE GEAR, AND FRONT DIFFERENTIAL CARRIER REMOVAL

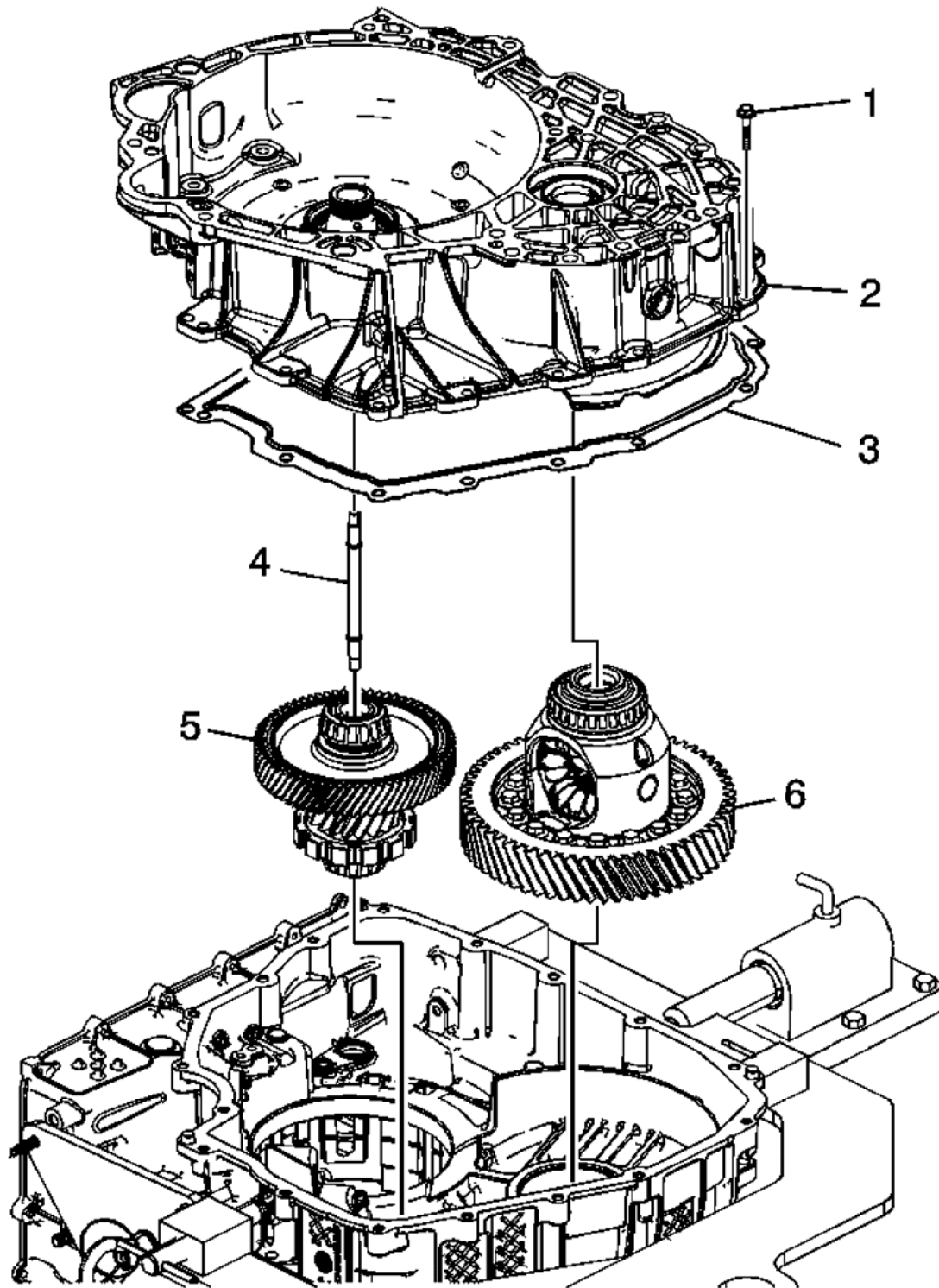


Fig. 10: Torque Converter, Differential Housing, Front Differential Transfer Drive Gear & Front Differential Carrier

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter and Differential Housing Bolt M8 x 35 (Qty: 17)
2	Torque Converter, Support and A/Trans Fluid Pump Housing Assembly
3	Torque Converter Housing Outer Seal Tip: The seal is not reusable.
4	Front Differential Drive Pinion Gear Lube Tube
5	Front Differential Drive Pinion (w/Transfer Gear) Gear Assembly
6	Front Differential Carrier Assembly

FLUID TROUGH REMOVAL

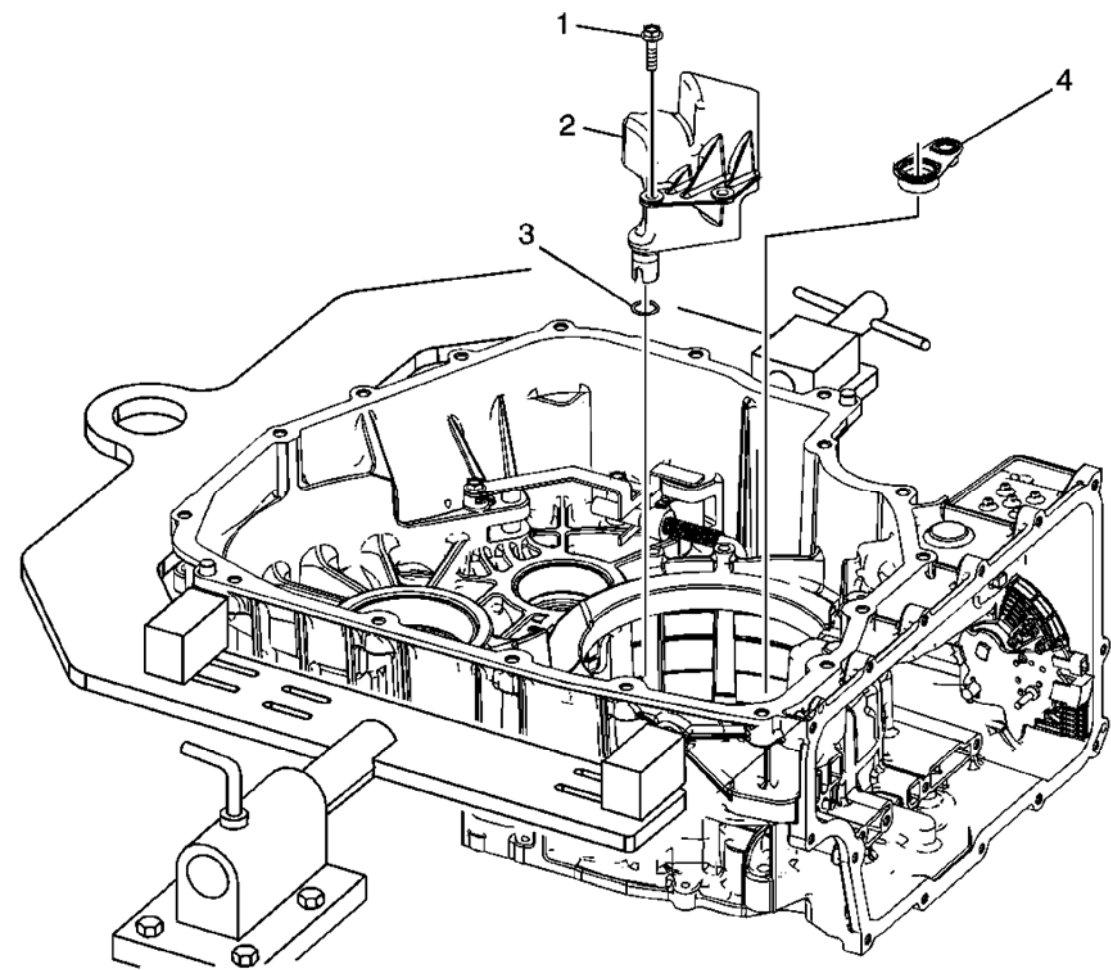


Fig. 11: Fluid Trough
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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1	A/Trans Fluid Trough Bolt M6 x 25 (Qty: 1)
2	A/Trans Fluid Trough
3	A/Trans Fluid Trough (O-Ring) Seal
4	A/Trans Fluid Pump Outlet Seal Assembly Tip: The seal assembly is not reusable.

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR REMOVAL

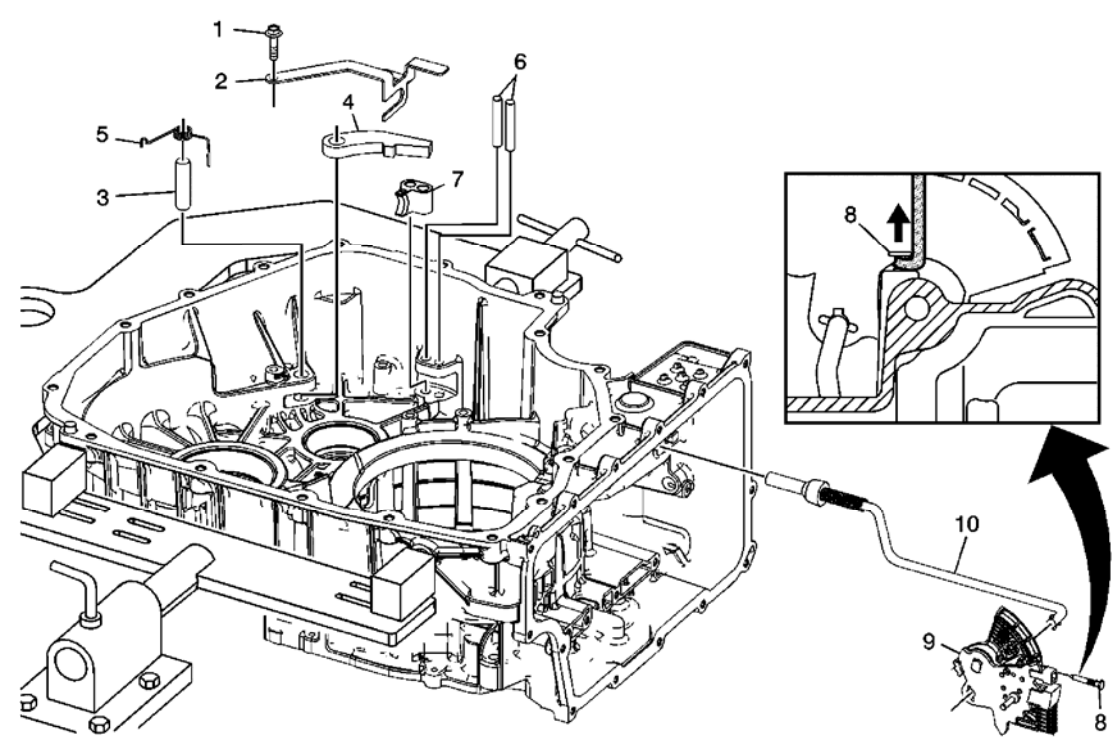


Fig. 12: Manual Shift Detent Lever With Shaft Position Switch Assembly & Park Pawl Actuator
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Park Pawl Actuator Bracket Bolt M6 x 25 (Qty: 2)
2	Park Pawl Actuator Bracket
3	Park Pawl Shaft
4	Park Pawl
5	Park Pawl Spring
6	Park Pawl Actuator Guide Pin
7	Park Pawl Actuator Guide
	Manual Shift Detent Lever Pin Tip:

8	• Use a small nail puller or other suitable tool. • Discard the pin. The pin is not reusable. Special Tools • J 6125-1B: Slide Hammer with Adapter • J 23129: Universal Seal Remover For equivalent regional tools, refer to Special Tools .
9	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Tip: Rotate the assembly counterclockwise so the actuator rod will fit through the case opening.
10	Park Pawl Actuator Assembly

MANUAL SHIFT SHAFT SEAL REPLACEMENT

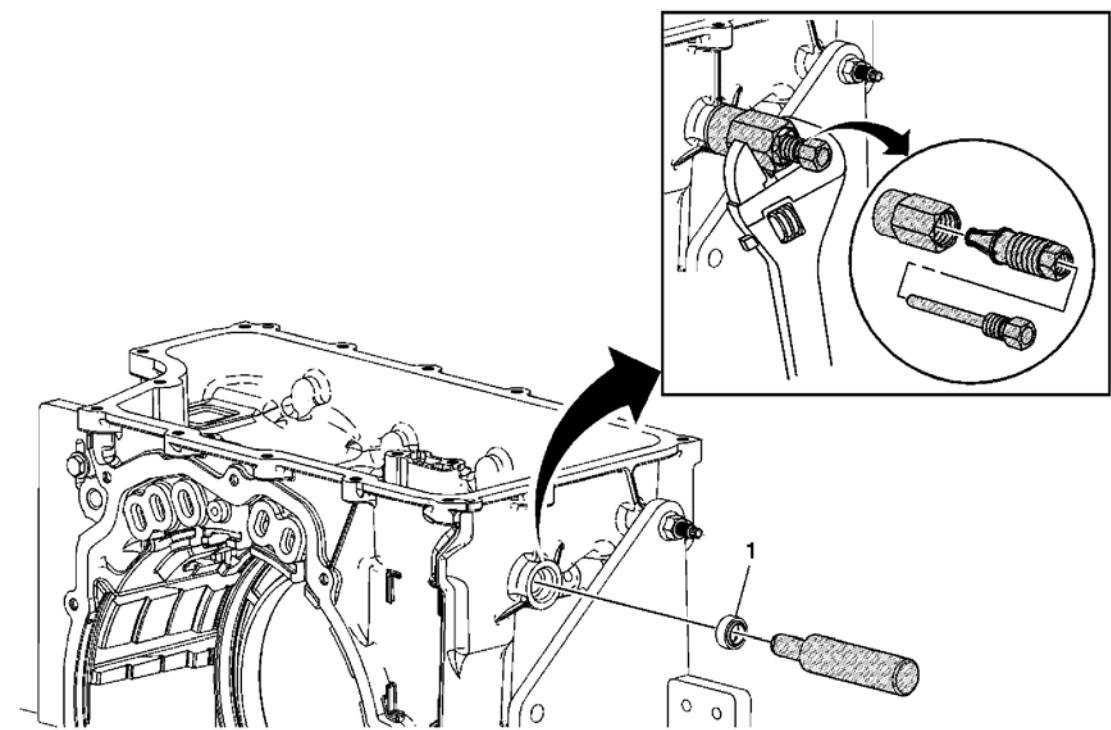


Fig. 13: Manual Shift Shaft Seal
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Manual Shift Shaft Seal

1

Special Tools

- J 45201: Cooler Line Seal Remover
- J 46626: Seal Installer

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

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - CASE SIDE

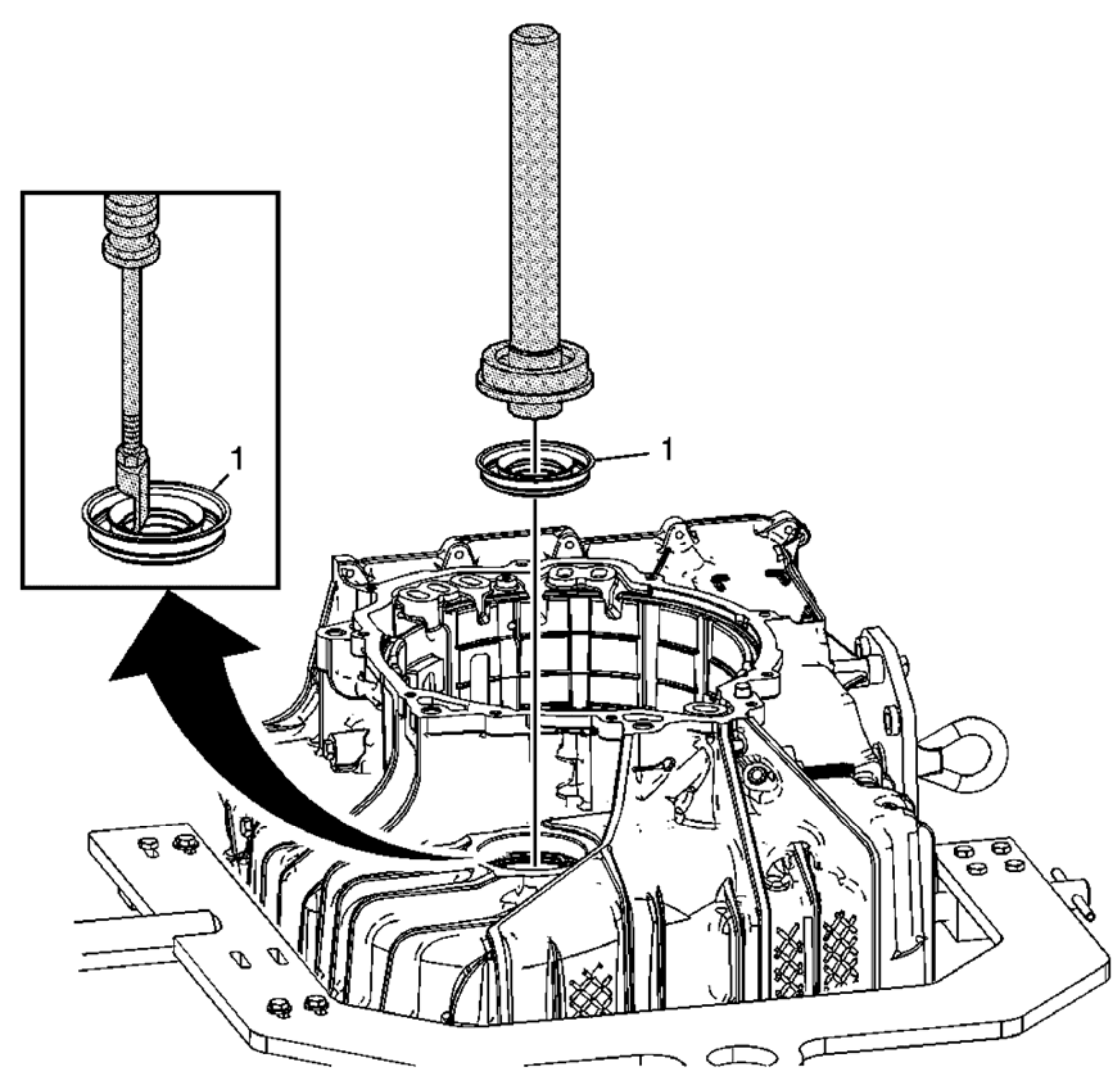


Fig. 14: Front Wheel Drive Shaft Seal (Case Side)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Wheel Drive Shaft Oil Seal Assemble

Tip: Use the flat side of **J 46629-A**: seal installer to seat the seal to the case surface.

Special Tools

- **J 6125-1B**: Slide Hammer
- **J 8092**: Driver Handle
- **J 23129**: Universal Seal Remover
- **J 46629-A**: Seal Installer

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

FRONT DIFFERENTIAL CARRIER BEARING CUP REPLACEMENT - CASE SIDE

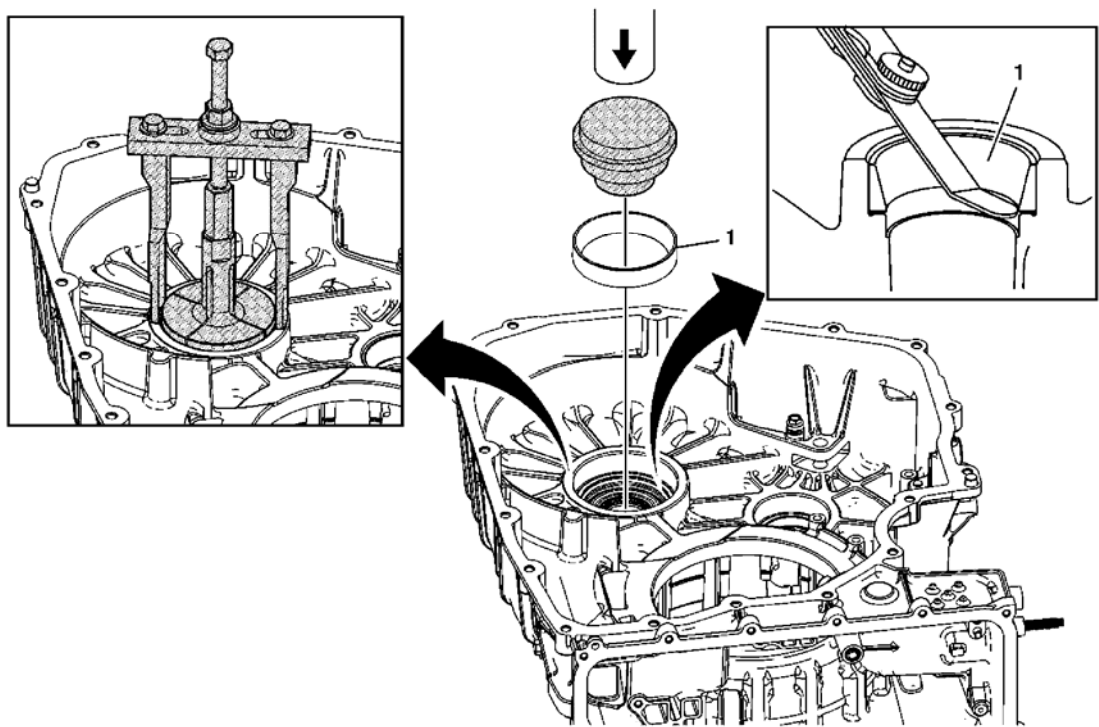


Fig. 15: Front Differential Carrier Bearing Cup (Case Side)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Differential Bearing Cup
	CAUTION: Support the back side of the case before installing the bearing cup. Apply a

light coating of transmission fluid to the bore before pressing the cup into position. Install the bearing cup until it stops moving. Applying excessive pressure to the bearing cup once it is seated could cause damage to the case casting.

CAUTION:

An unseated or improperly installed bearing cup will result in premature bearing failure. Visually inspect the bearing cup to insure there is "no gap" between the case, thrust washer, and the bearing cup. Use of a feeler gauge may assist in identifying a bearing cup that is not fully seated.

CAUTION:

Failure to apply the lubricant will cause damage to the bolt and nut threads.

Tip:

- Tighten DT-47927-2 which is part of **DT-47927**: cup remover until it fits snugly on the bearing cup.
- Adjust **J 45124**: removal bridge so it sits on the torque converter housing surface just beyond the bearing cup opening.
- Apply the extreme pressure lubricant **J 23444-A**: extreme press lubricant to the puller bolt threads to prevent damage to the bolt threads during bearing cup removal.
- Hold the puller bridge bolt and turn the nut to remove the bearing cup.

Special Tools

- **DT-47927**: Bearing Cup Remover
- **J 23444-A**: Extreme Press Lubricant - 1/4 Ounce Tube
- **J 45124**: Removal Bridge
- **J-45087**: Bearing Cup Installer

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

FRONT DIFFERENTIAL DRIVE PINION GEAR BEARING CUP AND LUBRICANT DAM REPLACEMENT

Removal

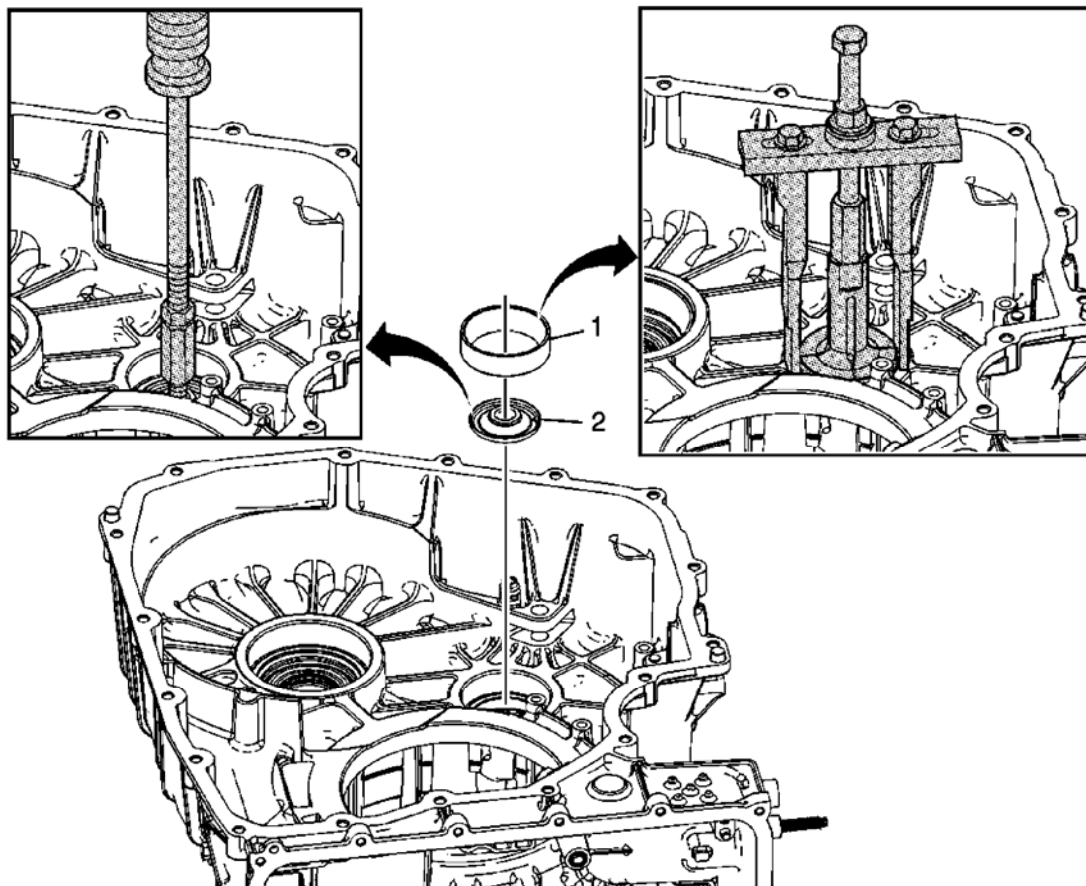


Fig. 16: Front Differential Drive Pinion Gear Bearing Cup & Lubricant Dam (Removal)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Drive Pinion Gear Bearing Cup CAUTION: Failure to apply the lubricant will cause damage to the bolt and nut threads. Tip: • Tighten J-45094: cup remover until it fits snugly on the bearing cup. • Adjust J 45124: removal bridge so it sits on the case surface just beyond the bearing cup opening. • Apply the extreme pressure lubricant J 23444-A: extreme press lubricant to the puller bolt threads to prevent damage to the bolt threads during bearing cup removal.

	• Hold the puller bridge nut and turn the bolt to remove the bearing cup. Special Tools • J 23444-A: Extreme Press Lubricant - 1/4 Ounce Tube • J-45094: Bearing Cup Remover • J 45124: Removal Bridge For equivalent regional tools, refer to Special Tools .
2	Front Differential Drive Pinion Gear Lube Dam Special Tools • J 6125-1B: Slide Hammer with Adapter • DT-48055: Lube Dam Removal For equivalent regional tools, refer to Special Tools .

Installation

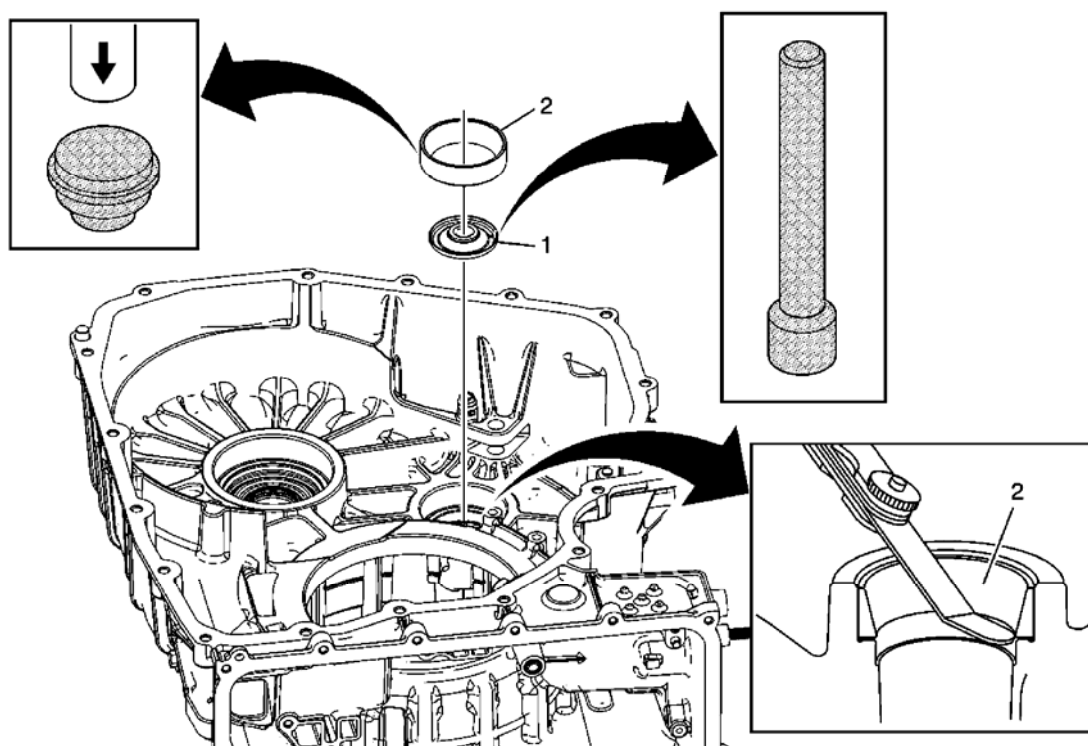


Fig. 17: Front Differential Drive Pinion Gear Bearing Cup & Lubricant Dam (Installation)

Callout	Component Name
1	Front Differential Drive Pinion Gear Lube Dam Special Tools • J 8092: Driver Handle • J-46630: Lube Dam Installer For equivalent regional tools, refer to Special Tools .
2	Front Differential Drive Pinion Gear Bearing Cup CAUTION: Support the back side of the case before installing the bearing cup. Apply a light coating of transmission fluid to the bore before pressing the cup into position. Install the bearing cup until it stops moving. Applying excessive pressure to the bearing cup once it is seated could cause damage to the case casting. CAUTION: An unseated or improperly installed bearing cup will result in premature bearing failure. Visually inspect the bearing cup to insure there is "no gap" between the case, thrust washer, and the bearing cup. Use of a feeler gauge may assist in identifying a bearing cup that is not fully seated. Special Tools: J-45087: Bearing Cup Installer For equivalent regional tools, refer to Special Tools .

TRANSMISSION CASE CLEANING AND INSPECTION

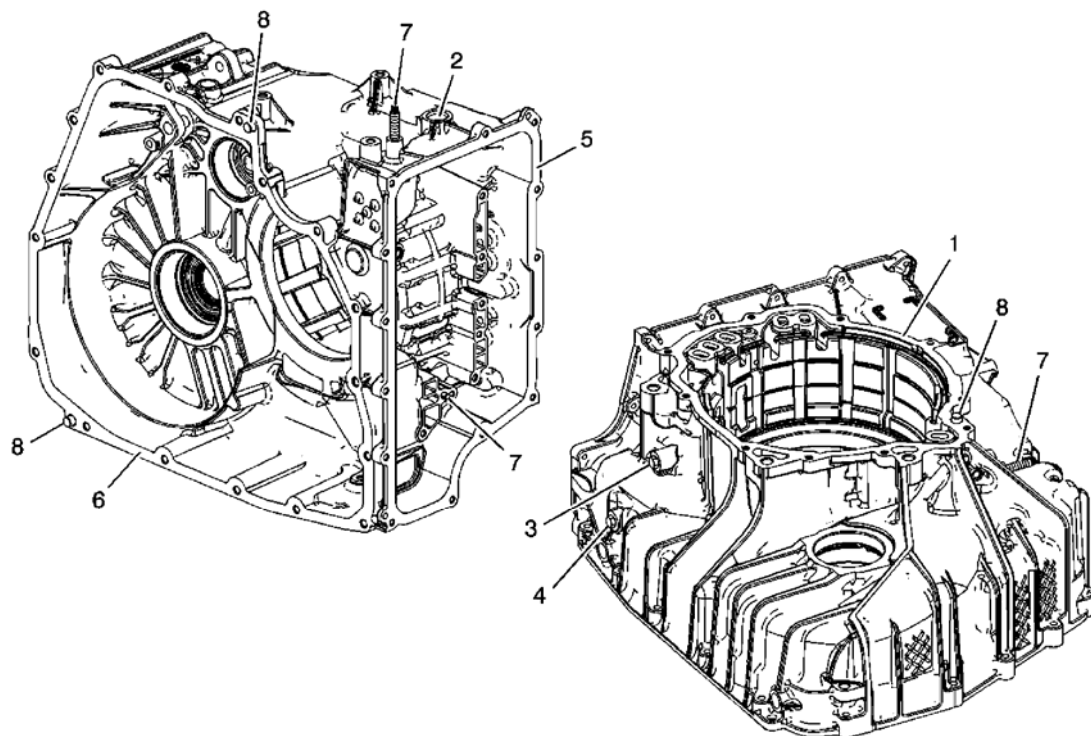


Fig. 18: Identifying Transmission Case Components
 Courtesy of GENERAL MOTORS CORP.

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.	
1	Case Cover Sealing Surface

2	Manual Shift Shaft Seal Surface Tip: Refer to <u>Manual Shift Shaft Seal Replacement</u> .
3	Fluid Pressure Test Plug
4	Fluid Drain Plug
5	Control Valve Body Cover Sealing Surface
6	Torque Converter Housing Sealing Surface
7	Transmission Fluid Cooler Pipe Stud M8 x 30.5 (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
8	Transmission Case Cover Locator Pin Procedure: Inspect the locating pins to be fully seated in case.

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY AND PARK PAWL ACTUATOR INSTALLATION

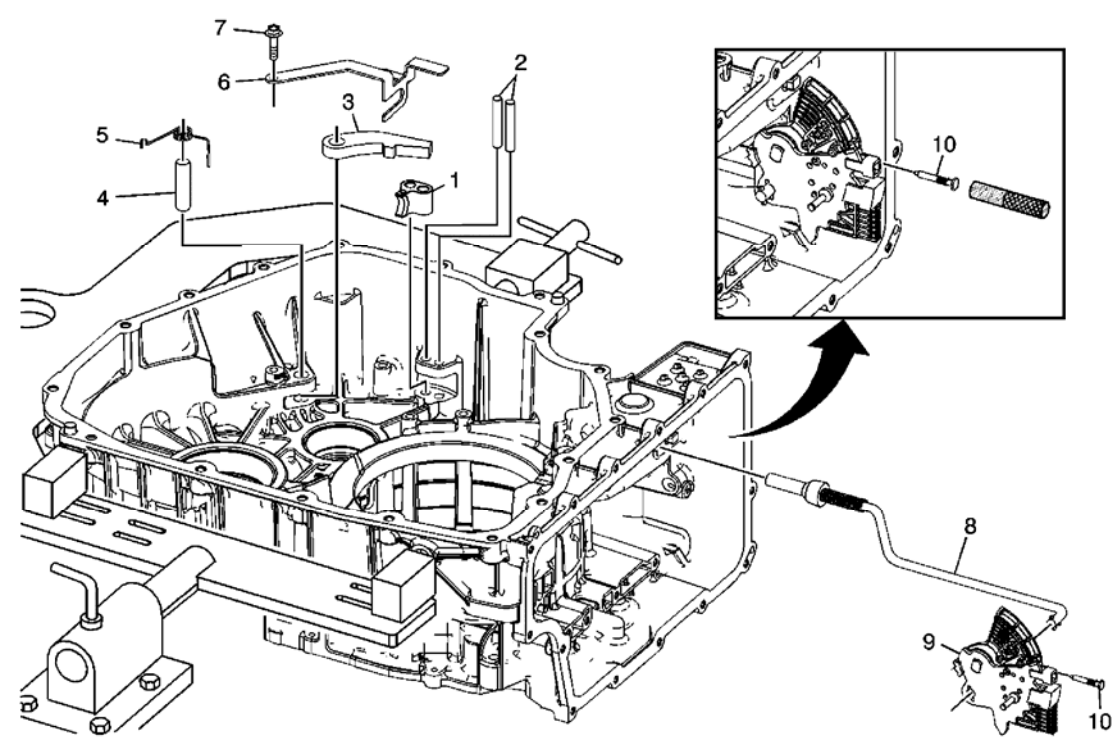


Fig. 19: Manual Shift Detent Lever With Shaft Position Switch Assembly & Park Pawl Actuator
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	Park Pawl Actuator Guide
2	Park Pawl Actuator Guide Pin
3	Park Pawl
4	Park Pawl Shaft
5	Park Pawl Spring
6	Park Pawl Actuator Bracket
7	Park Pawl Actuator Bracket Bolt M6 x 25 (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in).
8	Park Pawl Actuator Assembly Tip: Install the park pawl actuator assembly onto the detent lever assembly.
9	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Tip: • Rotate the assembly clockwise so the actuator rod will fit through the case opening. • Lubricate shaft with ATF to prevent damage to the manual shift shaft seal.
10	Manual Shift Shaft Pin CAUTION: Use J 41229 to install the manual shaft 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 1. Use a NEW pin to ensure proper engagement to the case. 2. Inspect pin installed height is within 6.5-7.5 mm (0.25-0.30 in). Special Tools: J 41229: Manual Shaft Pin Installer For equivalent regional tools, refer to <u>Special Tools</u> .

FLUID TROUGH INSTALLATION

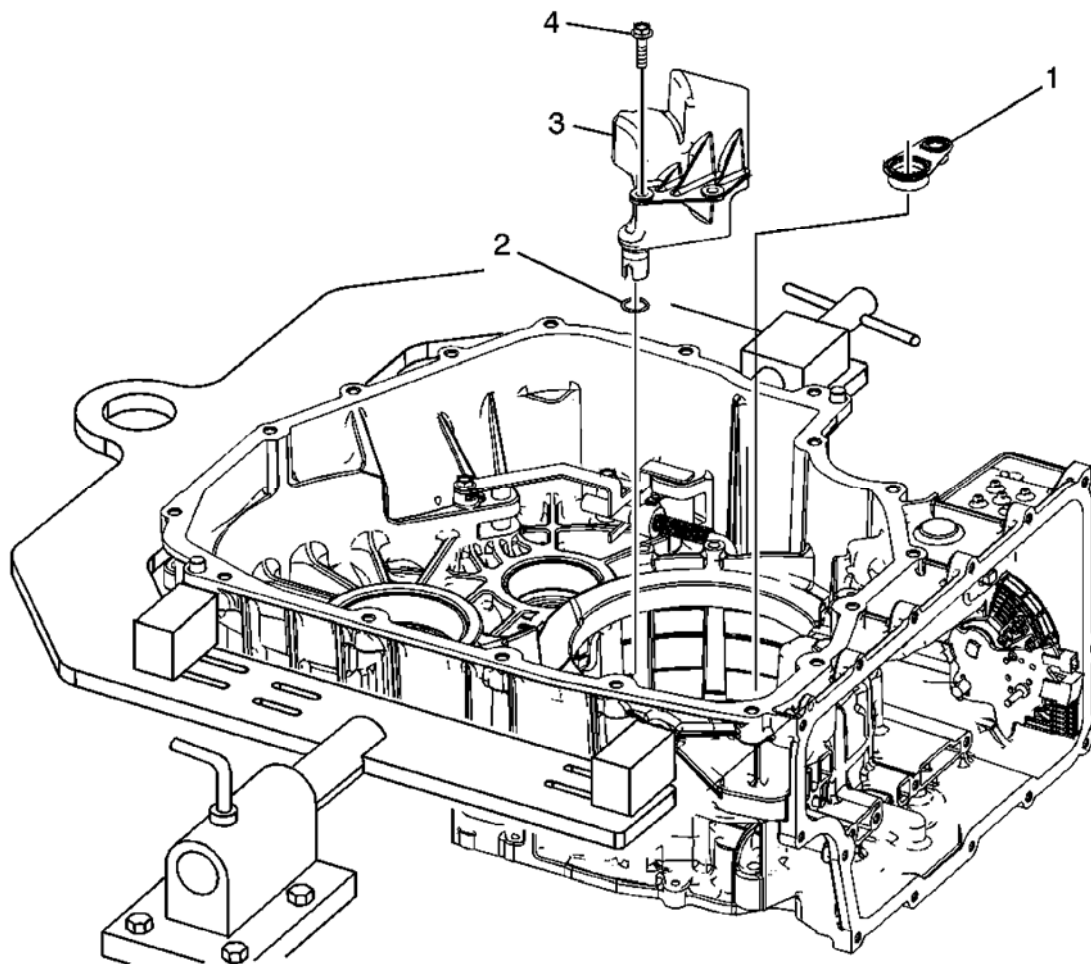


Fig. 20: Fluid Trough

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	A/Trans Fluid Pump Outlet Seal Assembly
2	A/Trans Fluid Trough (O-ring) Seal
3	A/Trans Fluid Trough
4	A/Trans Fluid Trough Bolt M6 x 25 (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in).

TORQUE CONVERTER AND DIFFERENTIAL HOUSING ASSEMBLY DISASSEMBLE

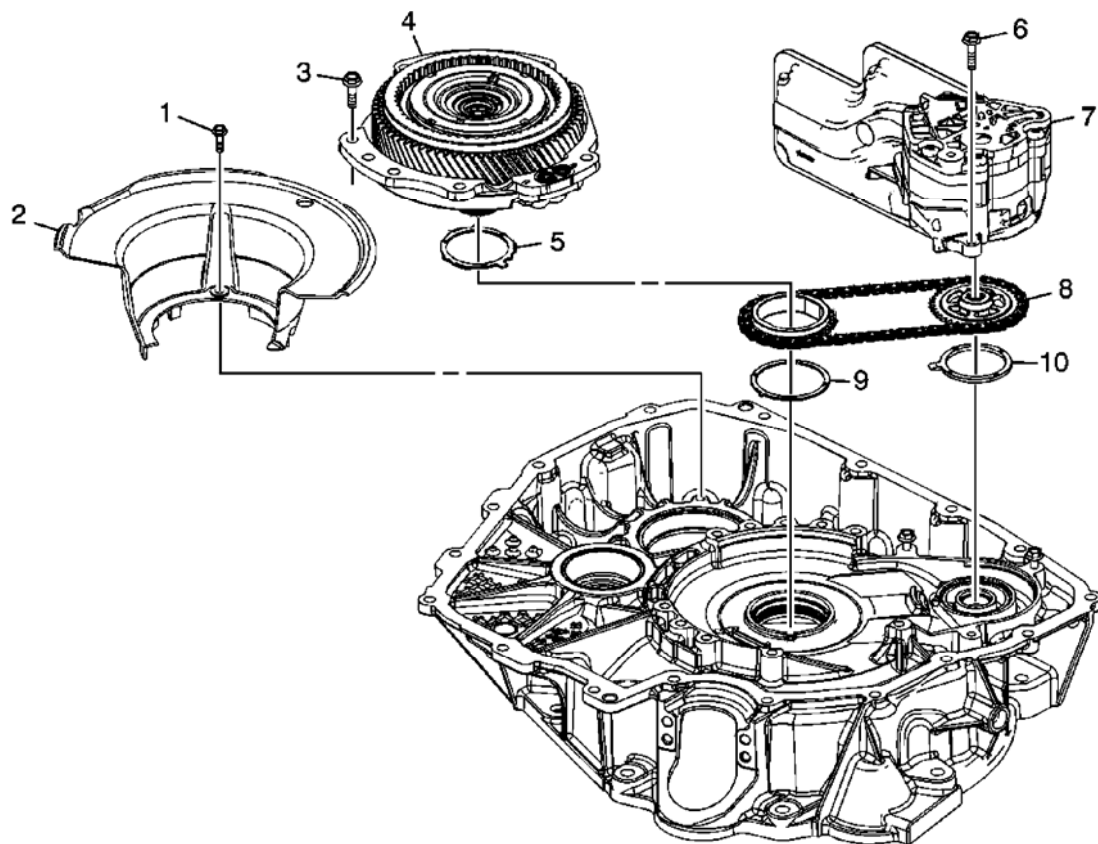


Fig. 21: Torque Converter & Differential Housing Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Baffle Bolt M6 x 25
2	Front Differential Carrier Baffle
3	Front Differential Transfer Drive Gear Support Bolt M8 x 25 (Qty: 9)
4	Front Differential Transfer Drive Gear Support Assembly
5	Drive Sprocket Thrust Washer
6	A/Trans Fluid Pump Bolt M6 x 25 (Qty: 3)
7	A/Trans Fluid Pump Assembly
8	Drive Link Assembly Tip: Link and sprockets will be removed as an assembly.
9	Drive Sprocket Thrust Washer Tip: Drive sprocket thrust washer may be stuck to the torque converter housing.
10	Driven Sprocket Thrust Washer

FRONT DIFFERENTIAL CARRIER BEARING CUP AND WASHER REPLACEMENT - TORQUE CONVERTER HOUSING SIDE

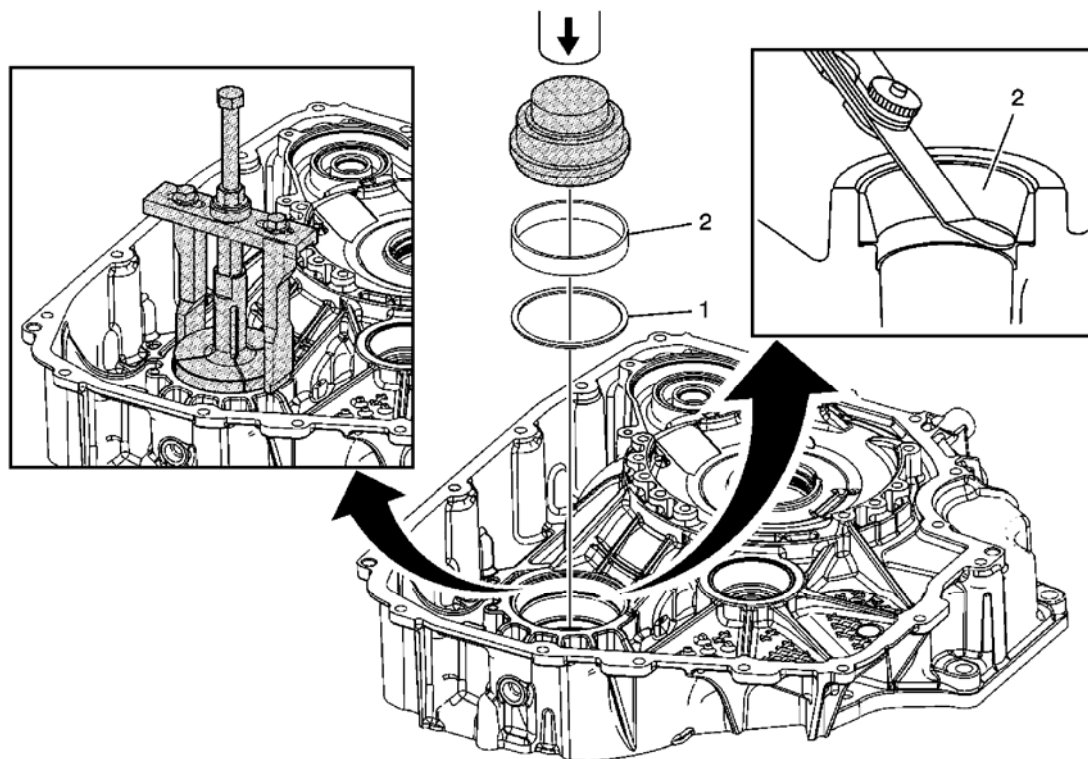


Fig. 22: Front Differential Carrier Bearing Cup & Washer - Torque Converter Housing Side
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures - Do not install the bearing cup until after the selective washer measurement has been performed. - Install the correct differential bearing washer as determined by the thrust washer measurement procedure. Refer to <u>Front Differential Drive Pinion Gear Bearing Thrust Washer and Front Differential Bearing Washer Measurement</u>.	
1	Front Differential Bearing Thrust Washer
	Front Differential Carrier Bearing Cup CAUTION: Support the back side of the torque converter housing before installing the bearing cup. Apply a light coating of transmission fluid to the bore before pressing the cup into position. Install the bearing cup until it stops moving. Applying excessive pressure to the bearing cup once it is seated could cause damage to the torque converter housing casting. CAUTION: An unseated or improperly installed bearing cup will result in premature bearing failure. Visually inspect the bearing cup to insure there is "no

gap" between the converter housing, thrust washer, and the bearing cup. Use of a feeler gauge may assist in identifying a bearing cup that is not fully seated.

CAUTION:

Failure to apply the lubricant will cause damage to the bolt and nut threads.

Procedure

1. Tighten DT 47927-1 which is part of **DT-47927**: bearing cup remover until it fits snugly on the bearing cup.
2. Adjust **J 45124**: remover bridge so it sits on the torque converter housing surface just beyond the bearing cup opening.
3. Apply the extreme pressure lubricant supplied with **J 23444-A**: extreme press lubricant to the puller bolt threads to prevent damage to the bolt threads during bearing cup removal.
4. Hold the puller bridge bolt and turn the nut to remove the bearing cup.

Special Tools

- **DT-47927**: Bearing Cup Remover
- **J 23444-A**: Extreme Press Lubricant - 1/4 Ounce Tube
- **J-45087**: Bearing Cup Installer
- **J 45124**: Remover Bridge

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

FRONT DIFFERENTIAL DRIVE PINION BEARING CUP, WASHER, AND LUBRICANT DAM REPLACEMENT - TORQUE CONVERTER HOUSING SIDE

Bearing Cup, Washer and Lubricant Dam Removal

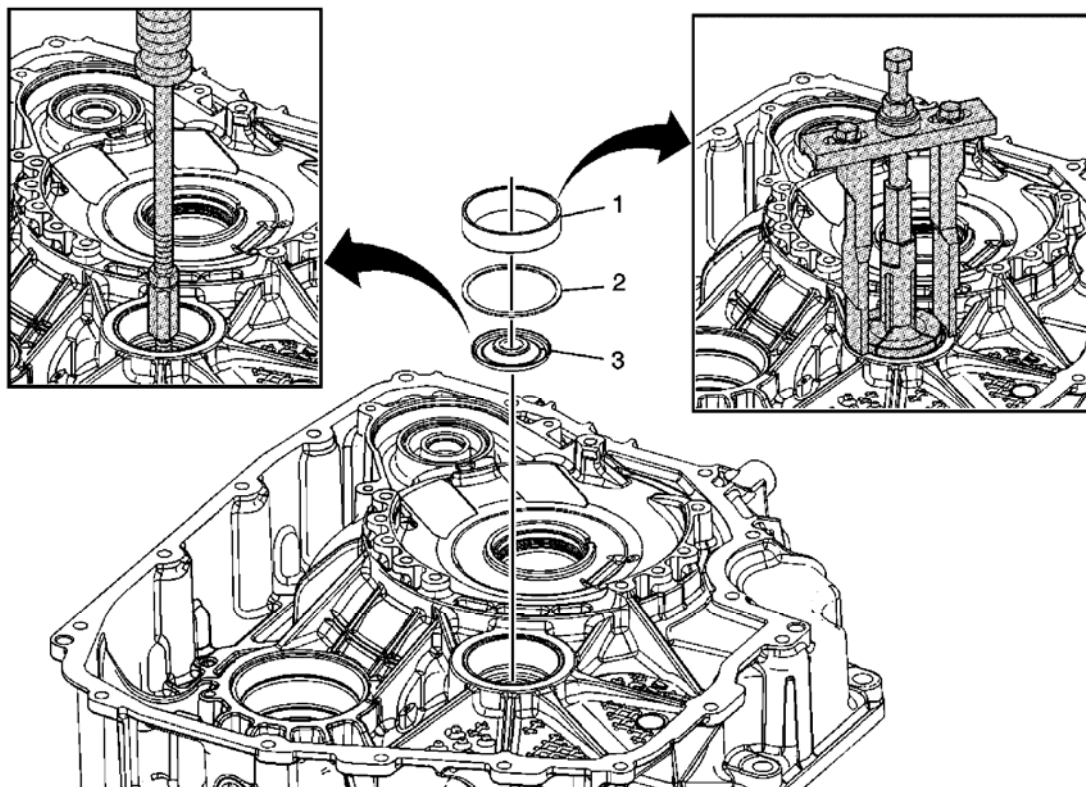


Fig. 23: Front Differential Drive Pinion Bearing Cup, Washer & Lubricant Dam - Torque Converter Housing Side

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Do not install the bearing cup until after the selective washer measurement has been performed.	
1	Front Differential Drive Pinion Gear Bearing Cup CAUTION: Failure to apply the lubricant will cause damage to the bolt and nut threads. Procedure 1. Tighten J-45094: bearing cup remover until it fits snugly on the bearing cup. 2. Adjust J 45124: removal bridge so it sits on the torque converter housing surface just beyond the bearing cup opening. 3. Apply the extreme pressure lubricant J 23444-A: extreme press lubricant to the puller bolt threads to prevent damage to the bolt threads during bearing cup removal.

	4. Hold the puller bridge bolt and turn the nut to removal the bearing cup. Special Tools • DT-47927: Bearing Cup Remover • J 23444-A: Extreme Press Lubricant - 1/4 Ounce Tube • J-45087: Transfer Shaft and Differential Bearing Cup Installer • J-45094: Bearing Cup Remover • J 45124: Removal Bridge For equivalent regional tools, refer to <u>Special Tools</u> .
2	Front Differential Drive Pinion Gear Bearing Thrust Washer
3	Front Differential Drive Pinion Gear Lube Dam Special Tools • DT-48055: Lube Dam Remover • J 6125-1B: Slide Hammer with Adapter or equivalent For equivalent regional tools, refer to <u>Special Tools</u> .

Bearing Cup, Washer and Lubricant Dam Installation

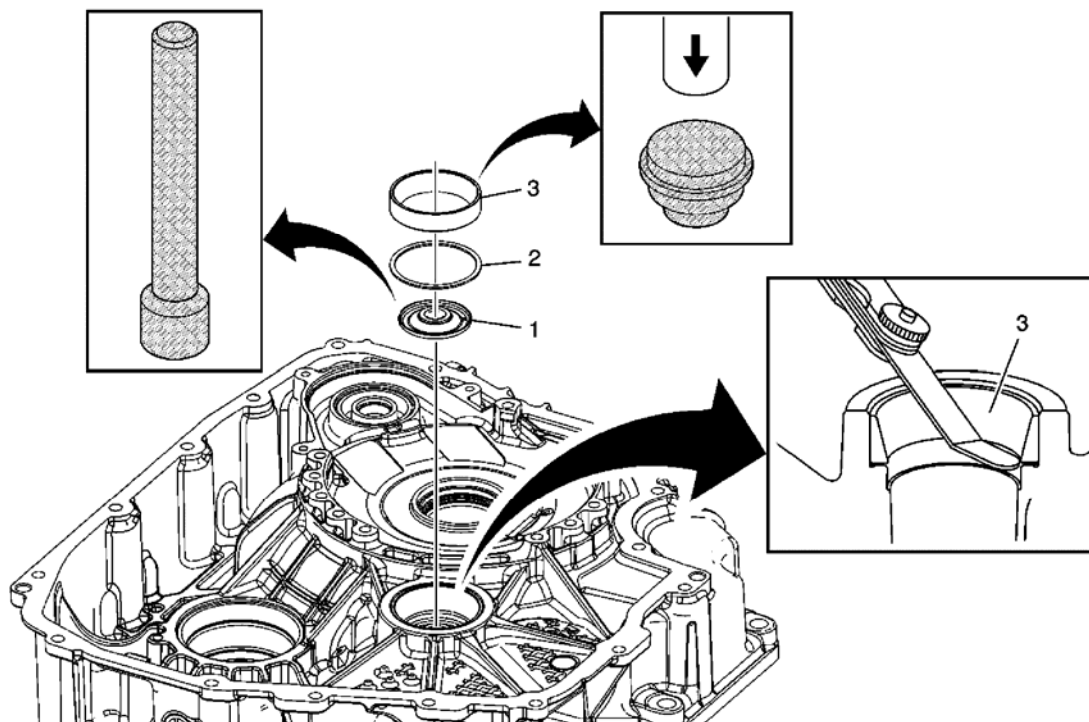


Fig. 24: Bearing Cup, Washer & Lubricant Dam
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Do not install the bearing cup until after the selective washer measurement has been performed.	
1	Front Differential Drive Pinion Gear Lube Dam Special Tools • J 8092: Driver Handle • J-46630: Lube Dam Installer For equivalent regional tools, refer to Special Tools .
2	Front Differential Drive Pinion Gear Bearing Thrust Washer Tip: Install the correct drive pinion gear bearing thrust washer as determined by the thrust washer measurement procedure. Refer to Front Differential Drive Pinion Gear Bearing Thrust Washer and Front Differential Bearing Washer Measurement .
	Front Differential Drive Pinion Gear Bearing Cup CAUTION: Support the back side of the torque converter housing before installing the

3

bearing cup. Apply a light coating of transmission fluid to the bore before pressing the cup into position. Install the bearing cup until it stops moving. Applying excessive pressure to the bearing cup once it is seated could cause damage to the torque converter housing casting.

CAUTION:

An unseated or improperly installed bearing cup will result in premature bearing failure. Visually inspect the bearing cup to insure there is "no gap" between the converter housing, thrust washer, and the bearing cup. Use of a feeler gauge may assist in identifying a bearing cup that is not fully seated.

Special Tools:

J-45087: Bearing Cup Installer

For equivalent regional tools, refer to Special Tools .

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - TORQUE CONVERTER HOUSING SIDE

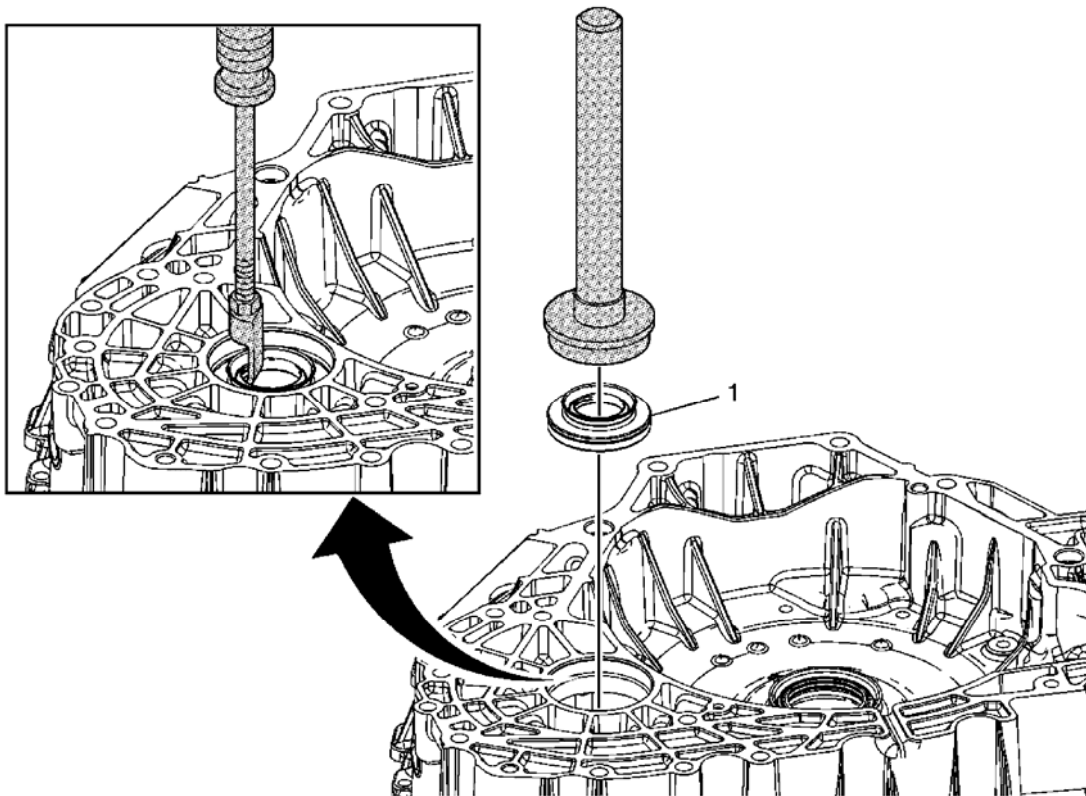


Fig. 25: Front Wheel Drive Shaft Seal - Torque Converter Housing Side
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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Torque Converter - Front Wheel Drive Shaft Oil Seal Assembly
Tip: Use the open side of **J 46629-A**: seal installer to avoid seal lip damage and to install the seal to the proper depth.

Special Tools

1

- **J 6125-1B:** Slide Hammer with Adapter
- **J 8092:** Driver Handle
- **J 23129:** Universal Seal Remover
- **J 46629-A:** Seal Installer

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

TORQUE CONVERTER HOUSING CLEANING AND INSPECTION

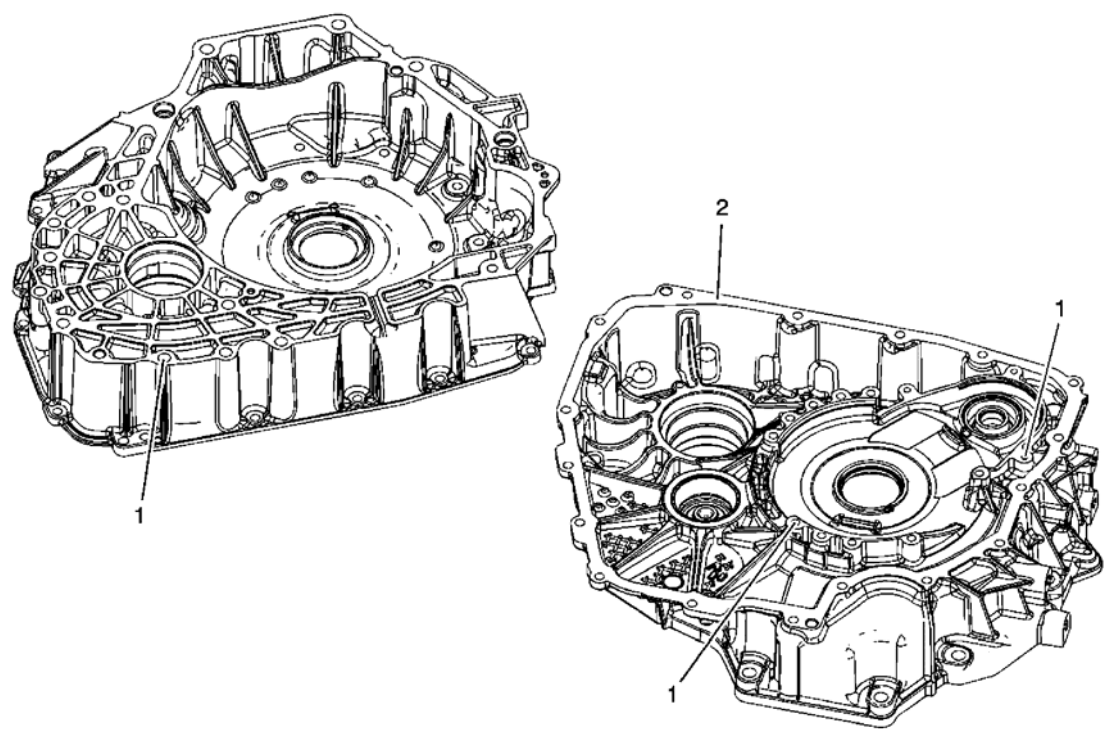


Fig. 26: Torque Converter Housing
Courtesy of GENERAL MOTORS CORP.

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 and differential housing, including threads, with clean solvent.

1	Threaded Holes
2	Gasket Sealing Surfaces

TORQUE CONVERTER FLUID SEAL REPLACEMENT

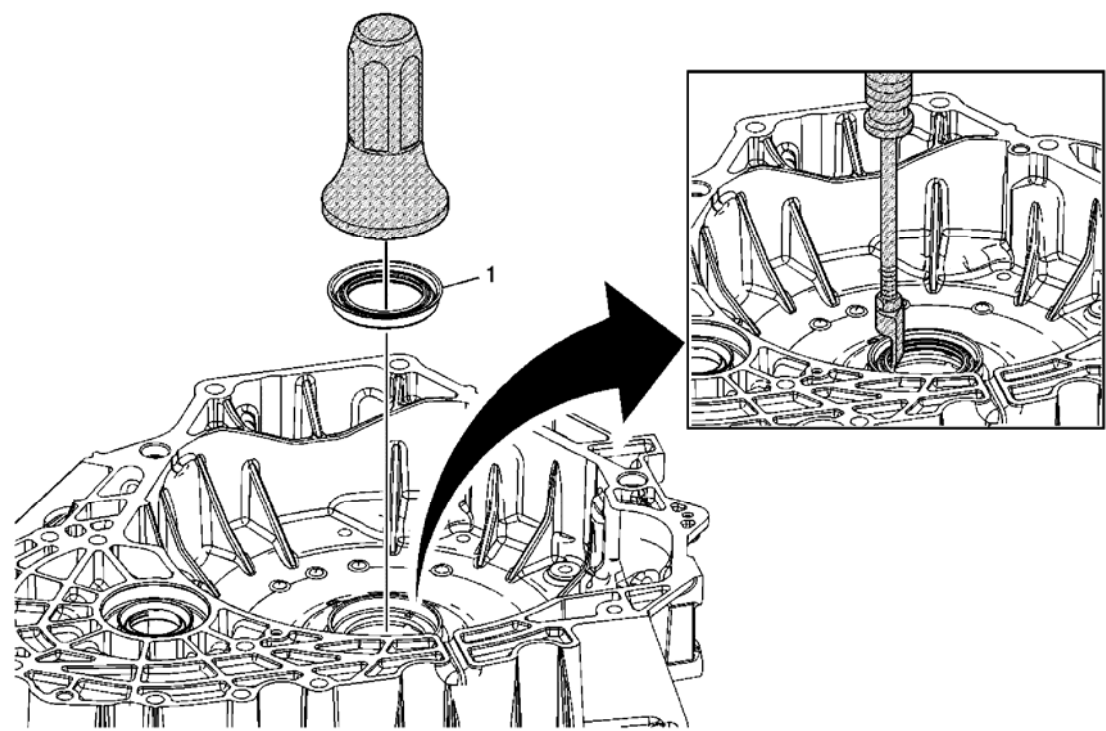


Fig. 27: Torque Converter Fluid Seal
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Torque Converter Fluid Seal
	CAUTION:

Support the back side of the torque converter housing while installing the seal. Install the seal until it stops moving. Applying excessive pressure to the seal once it is seated could cause damage to the torque converter housing casting.

Special Tools

1

- J 6125-1B: Slide Hammer with Adapter or equivalent
- J 23129: Universal Seal Remover
- DT 49861: Seal Installer

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

FRONT DIFFERENTIAL TRANSFER DRIVE GEAR SUPPORT ASSEMBLY DISASSEMBLE

Seal Removal

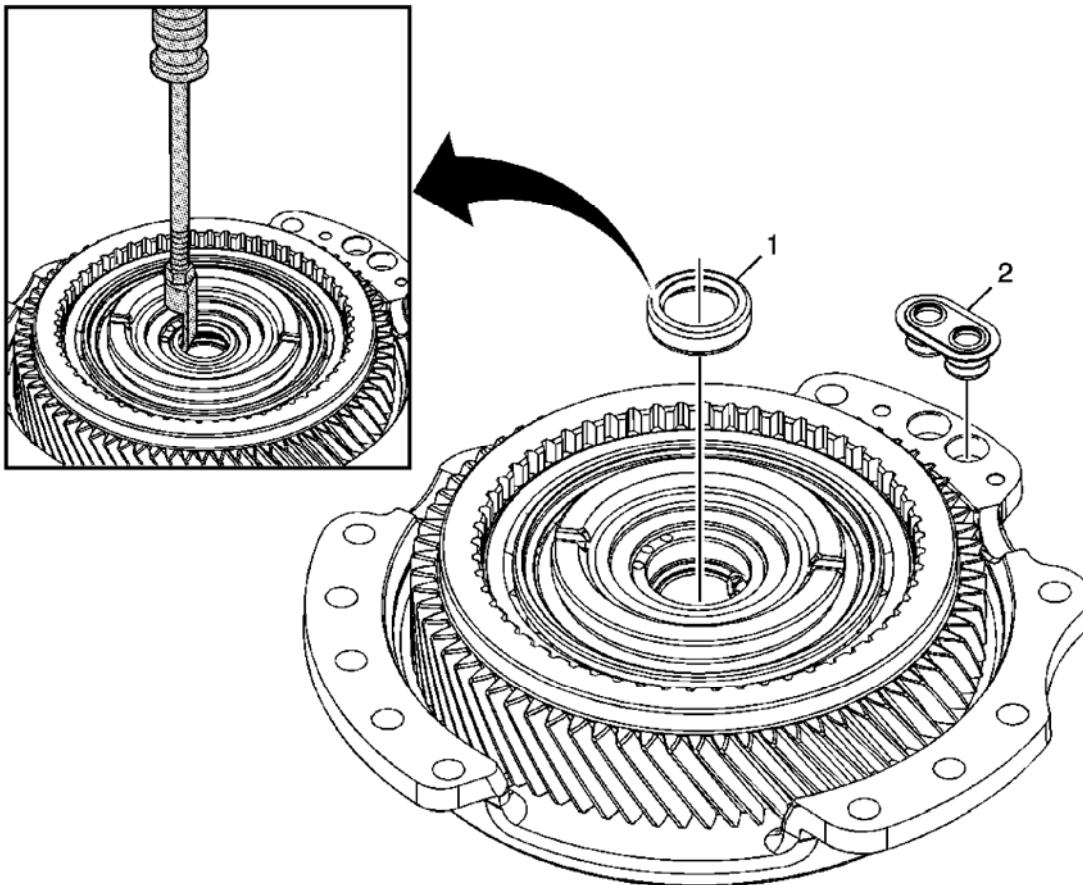


Fig. 28: Front Differential Transfer Drive Gear Support Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
CAUTION: Do not remove the transfer drive gear bearing retaining nut. The drive gear and bearing are not serviceable. Removing the retaining nut will damage the support.	
Preliminary Procedure - Inspect the support assembly for damage or wear to the splines, bushings, machined surfaces and threaded holes. - Inspect the transfer drive gear for damage or wear. - Inspect the transfer drive gear bearing assembly for proper operation. - The bearing should roll smoothly and quietly.	
1	Front Differential Transfer Drive Gear Support Seal Special Tools J 6125-1B: Slide Hammer with Adapter or equivalent J 23129: Universal Seal Remover For equivalent regional tools, refer to Special Tools .
2	Front Differential Transfer Drive Gear Support Torque Converter Fluid Seal Assembly

Fluid Passage Tube Removal

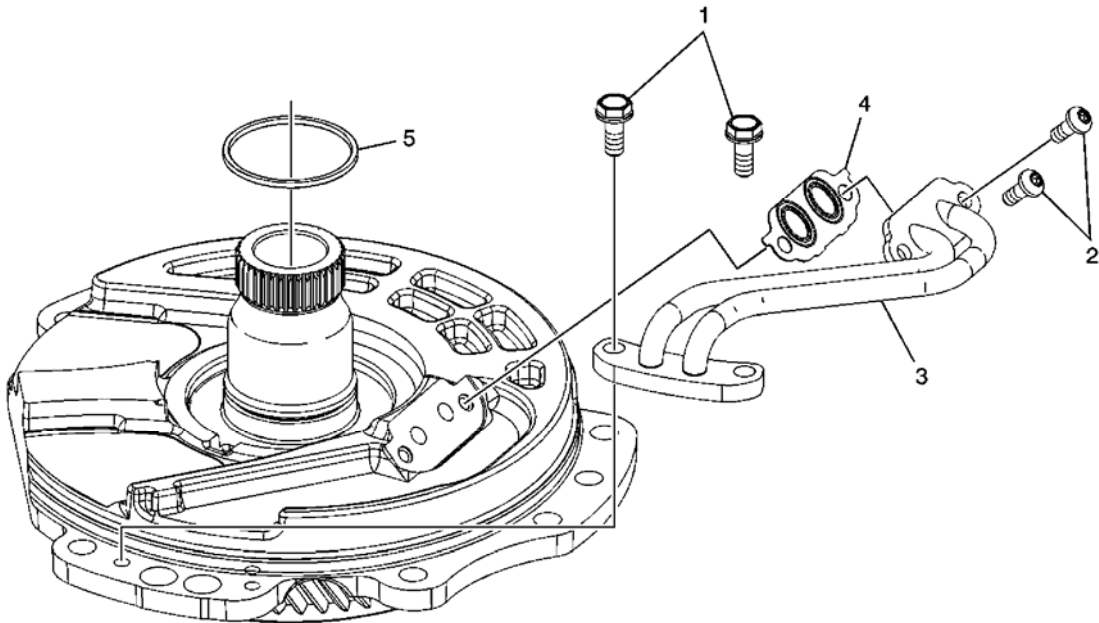


Fig. 29: Fluid Passage Tube
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
CAUTION: Do not remove the transfer drive gear bearing retaining nut. The drive gear and bearing are not serviceable. Removing the retaining nut will damage the support.	
Preliminary Procedures - Inspect the support assembly for damage or wear to the splines, bushings, machined surfaces and threaded holes. - Inspect the transfer drive gear for damage or wear. - Inspect the transfer drive gear bearing assembly for proper operation. - The bearing should roll smoothly and quietly.	
1	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt M6 x 15 (Qty: 2)
2	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt M5 x 12 (Qty: 2)
3	Fluid Passage Tube Assembly Tip: Inspect the tubes for damage, wear or cracked welds.
4	Front Differential Transfer Drive Gear Support Fluid Passage Tube Gasket
5	Front Differential Transfer Drive Gear Support Seal

FRONT DIFFERENTIAL TRANSFER DRIVE GEAR SUPPORT ASSEMBLY ASSEMBLE

Drive Support Seal Installation

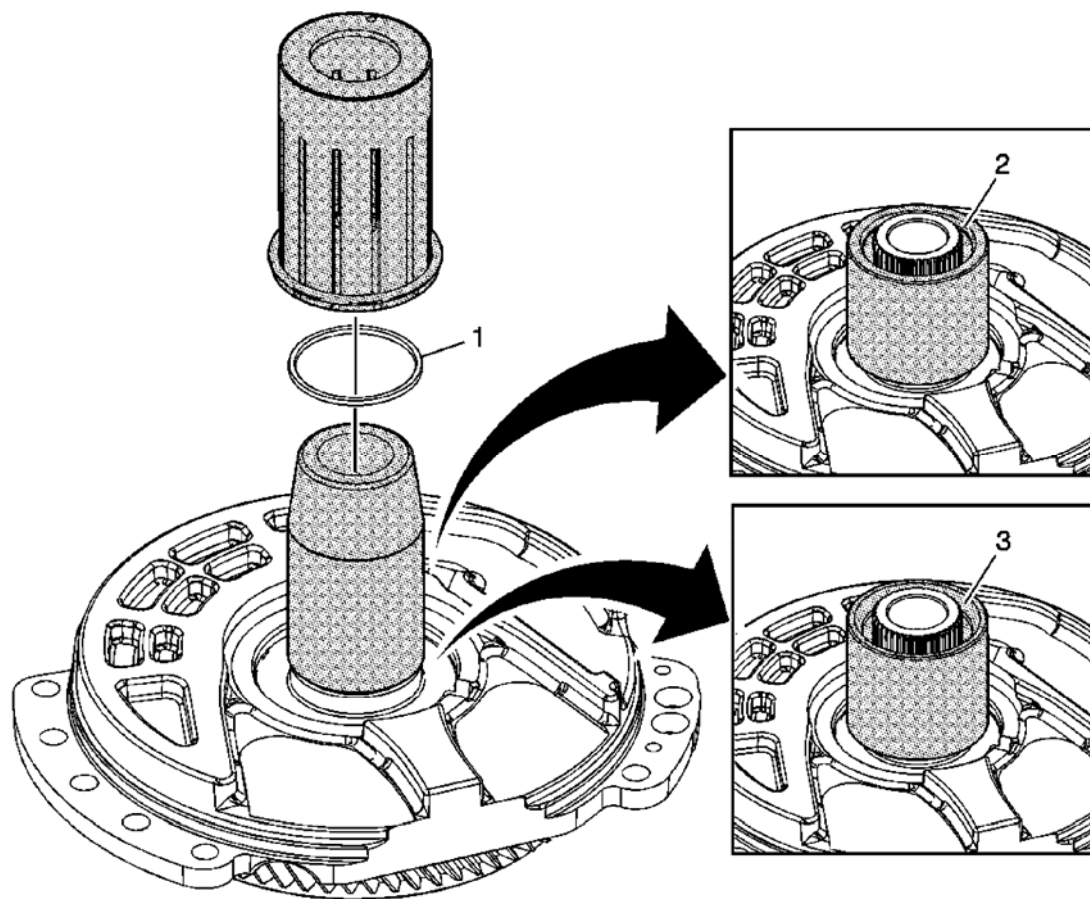


Fig. 30: Front Differential Transfer Drive Gear Support Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Transfer Drive Gear Support Seal Tip: A NEW seal must be installed. Special Tools: J-46624: Support Seal Installer For equivalent regional tools, refer to Special Tools .
2	Small Chamfer Faces Up CAUTION: To avoid damaging the seal, first place J 46624-1 with the small chamfer end facing up and leave in place for at least 60 seconds.
3	Large Chamfer Faces Up Tip: Turn J 46624-1 which is part of J-46624: seal installer, over with the large chamfer end facing up for 60 seconds to ensure that the seal has been properly sized.

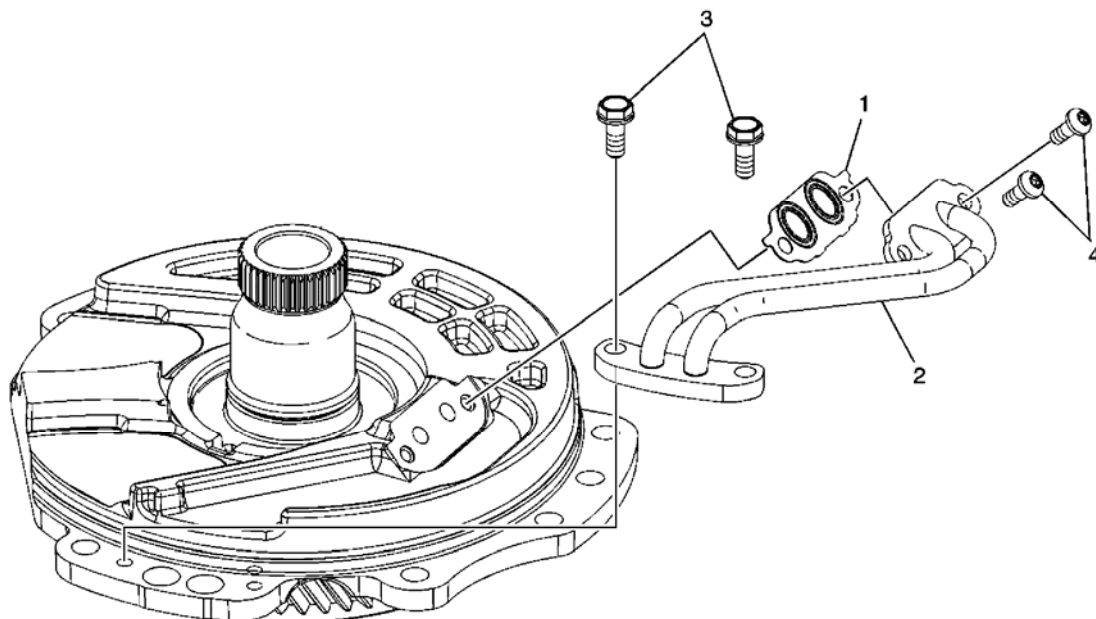


Fig. 31: Fluid Passage Tube
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Transfer Drive Gear Support Fluid Passage Tube Gasket
2	Fluid Passage Tube Assembly
3	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt M6 x 15 (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (106 lb in)
4	Front Differential Transfer Drive Gear Fluid Passage Tube Bolt M5 x 12 (Qty: 2) Tighten: 7 N.m (62 lb in)

Seal Installation

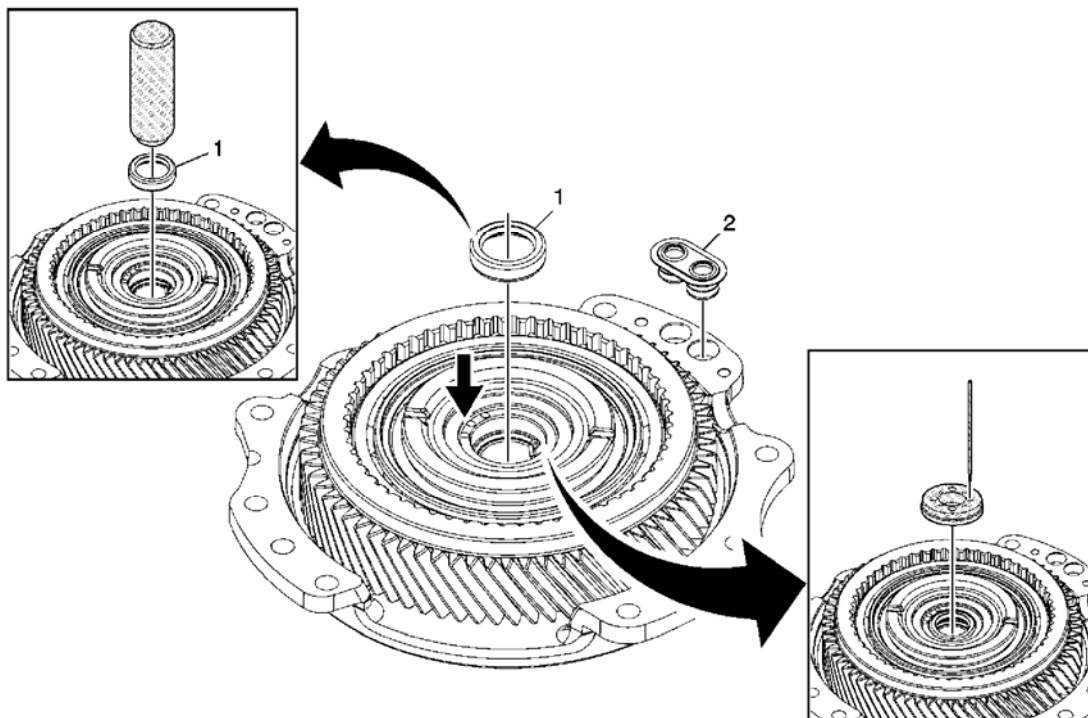


Fig. 32: Front Differential Transfer Drive Gear Support Seal
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Transfer Drive Gear Support Seal CAUTION: • Ensure staking does not line up with lubrication holes or the holes may be damaged. • Stop driving the seal once it bottoms out to avoid seal damage. Tip: The fluid seal assembly must be staked in place using DT-49131: seal staking tool to ensure proper seal retention. Special Tools • J-46627-A: Seal Installer • DT-49131: Seal Staking Tool For equivalent regional tools, refer to Special Tools .
2	Front Differential Transfer Drive Gear Support Torque Converter Fluid Seal Assembly

TRANSMISSION FLUID PUMP CLEANING AND INSPECTION

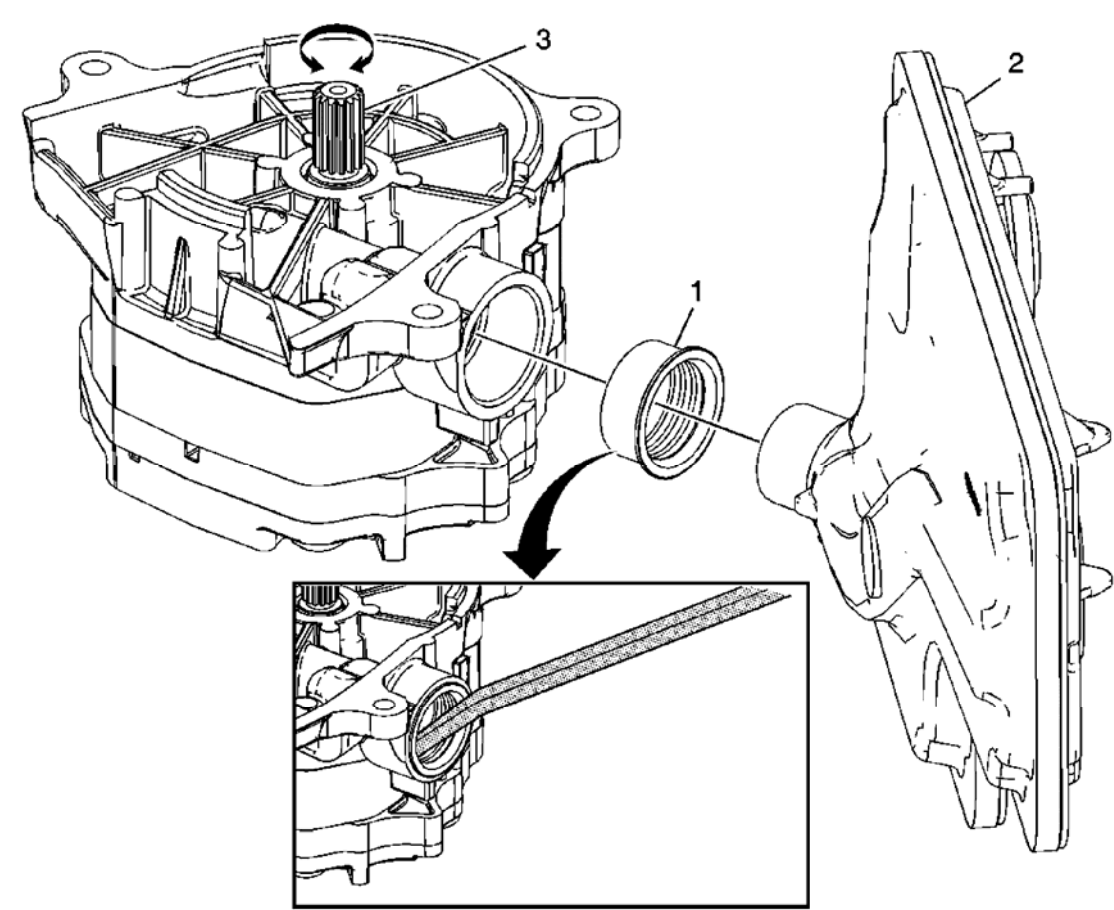


Fig. 33: Transmission Fluid Pump
Courtesy of GENERAL MOTORS CORP.

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 Procedure: The fluid pump assembly is not serviceable.	
1	Filter Neck Seal Tip: Install a NEW filter neck seal. Special Tools: 28585: Snap ring Remover or equivalent

	For equivalent regional tools, refer to <u>Special Tools</u> .
2	A/Trans Fluid Filter Assembly Tip: Install a NEW fluid filter assembly.
3	Fluid Pump Drive Shaft Tip: • Inspect the fluid pump drive shaft splines for damage or wear. • Rotate the fluid pump drive shaft for free operation.

FRONT DIFFERENTIAL DRIVE PINION GEAR BEARING THRUST WASHER AND FRONT DIFFERENTIAL BEARING WASHER MEASUREMENT

Differential Thrust Washer Gauge Installation

2	Tip: Install the differential assembly and the pinion gear assembly together to avoid interference with the gears during installation.
3	Front Differential Drive Pinion Gear Bearing Cup Tip: After placing the bearing cup on the gear, place DT 47800-2 which is part of DT-47800: selection gauge kit, onto the bearing cup. Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .
4	Front Differential Carrier Bearing Cup Tip: After placing the bearing cup on the gear, place DT 47800-1 which is part of DT-47800: selection gauge kit, onto the bearing cup. Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .
5	Torque Converter Housing Outer Seal
6	Torque Converter and Support and A/Trans Fluid Pump Housing Assembly Tip: • Install 2 DT 47800-6 which is part of DT-47800: selection gauge kit, into a case threaded hole at approximately 180 degrees apart. • Some alignment of DT 47800-1 and 2 which is part of DT-47800: selection gauge kit, may be required while lowering the TC housing onto the case. • Install DT 47800-3 which is part of DT-47800: selection gauge kit, spacer over DT 47800-6. Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .

Torque Sequence

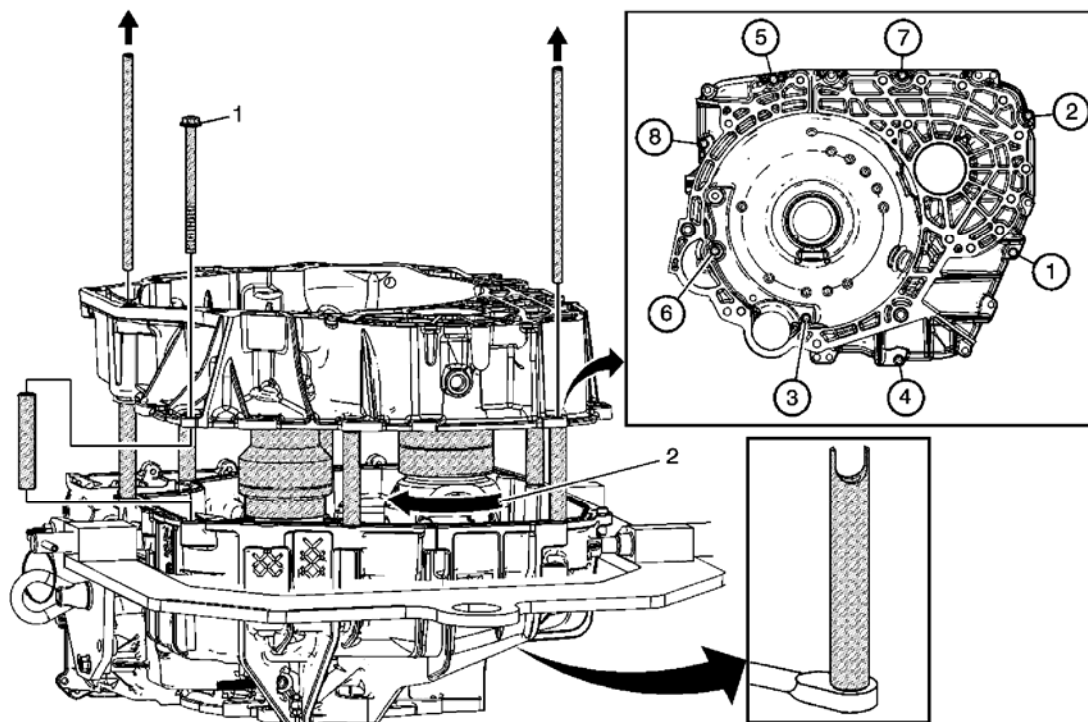


Fig. 35: Identifying Front Differential Carrier Assembly Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Spacer Bolt M8 x 127 (Qty: 8) CAUTION: Refer to <u>Fastener Caution</u> . Procedure 1. Install the remaining spacers evenly at every other bolt hole. 2. Remove the DT 47800-6 which is part of DT-47800: selection gauge kit, guide pins and install spacer bolts in all bolt holes at spacer locations. 3. Tighten the bolts in sequence. Tighten: 30 N.m (22 lb ft) Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .
	Front Differential Carrier Assembly

CAUTION:
If the bearings are not properly seated into the bearing cups, the washer selection will be inaccurate and the bearing pre-load will be set too low. Low bearing pre-load will cause premature failure of the front differential drive pinion gear.

- 2
- Rotate the differential assembly 10 revolutions to allow the bearings to seat into the cups.

Tip: Differential rotating tool **DT-47793**: differential rotating tool can be used to rotate the differential from the case side.

Special Tools:
DT-47793: Differential Rotating Tool
For equivalent regional tools, refer to **Special Tools** .

Differential Thrust Washer Selection

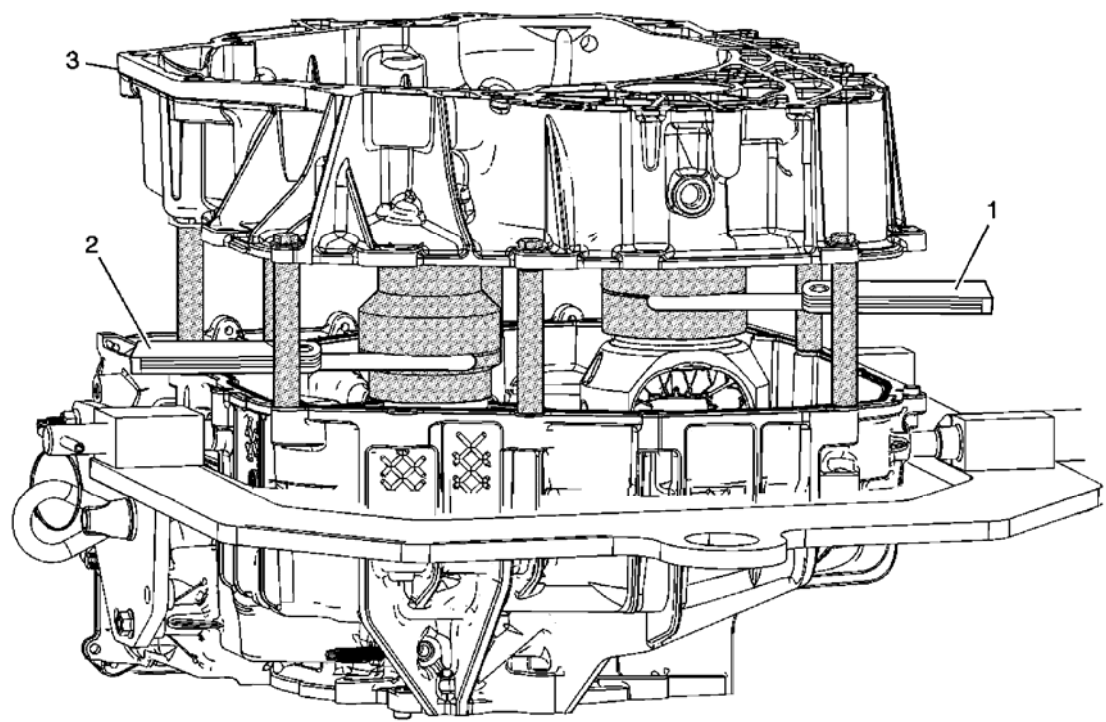


Fig. 36: Differential Thrust Washer Selection
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
CAUTION: Improper thrust washer selection can cause insufficient taper bearing pre-load which will cause premature failure of the front differential drive pinion gear.	

Front Differential Bearing Washer

Procedure:

Place DT 47800-7 in the gap in DT 47800-2 which are both part of **DT-47800**: selection gauge kit, to determine the proper thrust washer. Choose the correct thrust washer. Refer to **Taper Bearing Preload Selective Specifications** .

Tip:

- Continue trying different sizes of DT 47800-7 which is part of **DT-47800**: selection gauge kit, until the gauge will no longer fit into the gap. The correct thrust washer size is equal to the largest blade gauge that fits into the gap.
- Match the size of the correct DT 47800-7 blade which is part of **DT-47800**: selection gauge kit, to the color code in the thrust washer specification chart. The washer color coding is on the outside diameter of the washer.
- The gap in DT 47800-2 which are both part of **DT-47800**: selection gauge kit may not be even. Hold the top of the gauge and rotate the bottom of the gauge to even out the gap. Take two gap measurements 180 degrees apart. Average the two measurements and select the thrust washer that is closest to the average.
- The washer color coding is on the outside diameter of the washer.

Special Tools:

DT-47800: Thrust Washer Selection Gauge Kit

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

Front Differential Drive Pinion Gear Bearing Thrust Washer

Procedure:

Place DT 47800-7 in the gap in DT 47800-1 which are both part of **DT-47800**: selection gauge kit, to determine the proper thrust washer. Choose the correct thrust washer. Refer to **Taper Bearing Preload Selective Specifications** .

Tip:

- Continue trying different sizes of DT 47800-7 which is part of **DT-47800**: selection gauge kit, until the gauge will no longer fit into the gap. The correct thrust washer size is equal to the largest gauge that fits into the gauge.
- Match the size of the correct DT 47800-7 blade which is part of **DT-47800**: selection gauge kit to the color code in the thrust washer selection chart.
- The gap in DT 47800-1 which is part of **DT-47800**: selection gauge kit may not be even. Hold the top of the gauge and rotate the bottom of the gauge to even out the gap. Take two gap measurements 180 degrees apart. Average the two measurements and select the thrust washer that is

	closest to the average. • The washer color coding is on the outside diameter of the washer. Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .
3	Torque Converter and Support and A/Trans Fluid Pump Housing Assembly Procedure 1. Remove DT 47800-3 which are both part of DT-47800: selection gauge kit, bolts and spacers. 2. Remove the torque converter housing. 3. Remove DT 47800-1 and DT 47800-2 which are both part of DT-47800: selection gauge kit. 4. Remove the torque converter housing seal. 5. Remove the pinion gear and differential bearing cups. 6. Install the bearing cups and thrust washers into the torque converter housing per the replacement procedures. Refer to <u>Front Differential Carrier Bearing Cup and Washer Replacement - Torque Converter Housing Side</u> and <u>Front Differential Drive Pinion Bearing Cup, Washer, and Lubricant Dam Replacement - Torque Converter Housing Side</u>. Tip: DT 47800-1 and DT 47800-2 which are both part of DT-47800: selection gauge kit, may stick in the torque converter housing. Be careful not to drop the gauges. Special Tools: DT-47800: Thrust Washer Selection Gauge Kit For equivalent regional tools, refer to <u>Special Tools</u> .

TORQUE CONVERTER AND DIFFERENTIAL HOUSING ASSEMBLY ASSEMBLE

Pump Assembly Installation

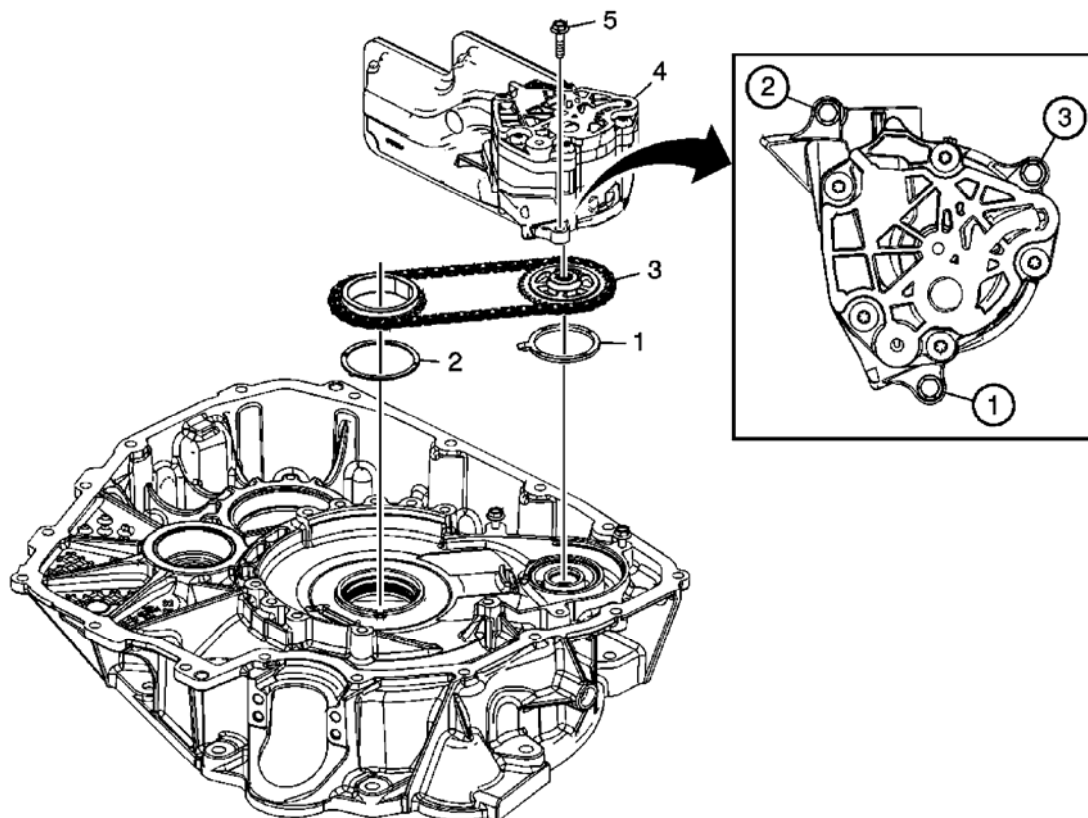


Fig. 37: Identifying Pump Assembly Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Driven Sprocket Thrust Washer
2	Drive Sprocket Thrust Washer
3	Install Drive Link Assembly Tip: Install as an assembly.
4	A/Trans Fluid Pump Assembly Tip: Rotating the drive sprocket and link assembly while installing the oil pump will aid in aligning the driven sprocket and oil pump drive shaft splines.
5	A/Trans Fluid Pump Bolt M6 x 25 (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure:: Tighten in sequence shown. Tighten: 12 N.m (106 lb in).

Transfer Drive Gear Assembly Installation

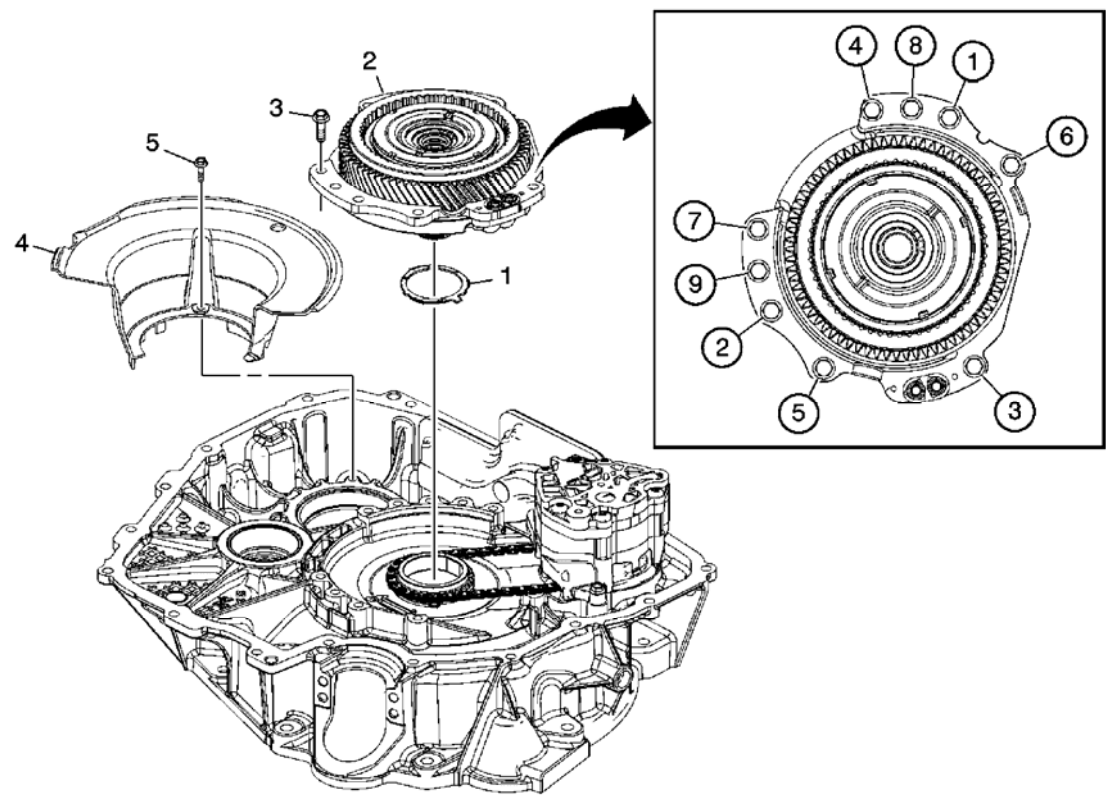


Fig. 38: Identifying Transfer Drive Gear Assembly Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Front Differential Transfer Drive Gear Support Assembly
3	Front Differential Transfer Drive Gear Support Bolt M8 x 25 (Qty: 9) CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Tighten in sequence shown. Tighten: 10 N.m (89 lb in) plus 50 degrees ± 4 degrees. Special Tools:: J 45059: Angle Meter

	For equivalent regional tools, refer to Special Tools .
4	Front Differential Carrier Baffle
5	Front Differential Carrier Baffle Bolt M6 x 25 Tighten: 12 N.m (106 lb in).

FRONT DIFFERENTIAL DRIVE PINION GEAR BEARING REPLACEMENT

Removal

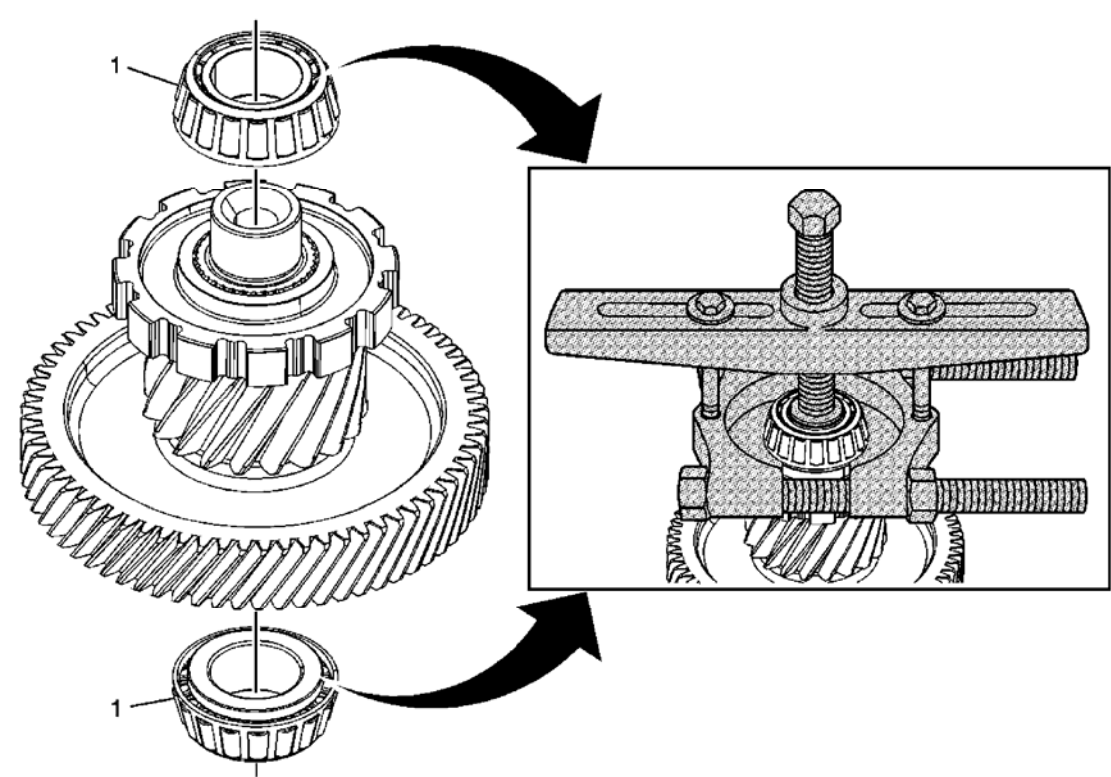


Fig. 39: Front Differential Drive Pinion Gear Bearing
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Drive Pinion Gear Bearing Tip: - When removing the front differential drive pinion gear bearing use J 41816-2: step plate. - Use J 8433-1: puller bar or equivalent with bolts 2-3/8 x 3 x 24. Special Tools

- **J 8433-1:** Puller Bar or equivalent
- **J 22912-B:** Split Plate Bearing Remover or equivalent
- **J 41816-2:** Step Plate

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

Installation

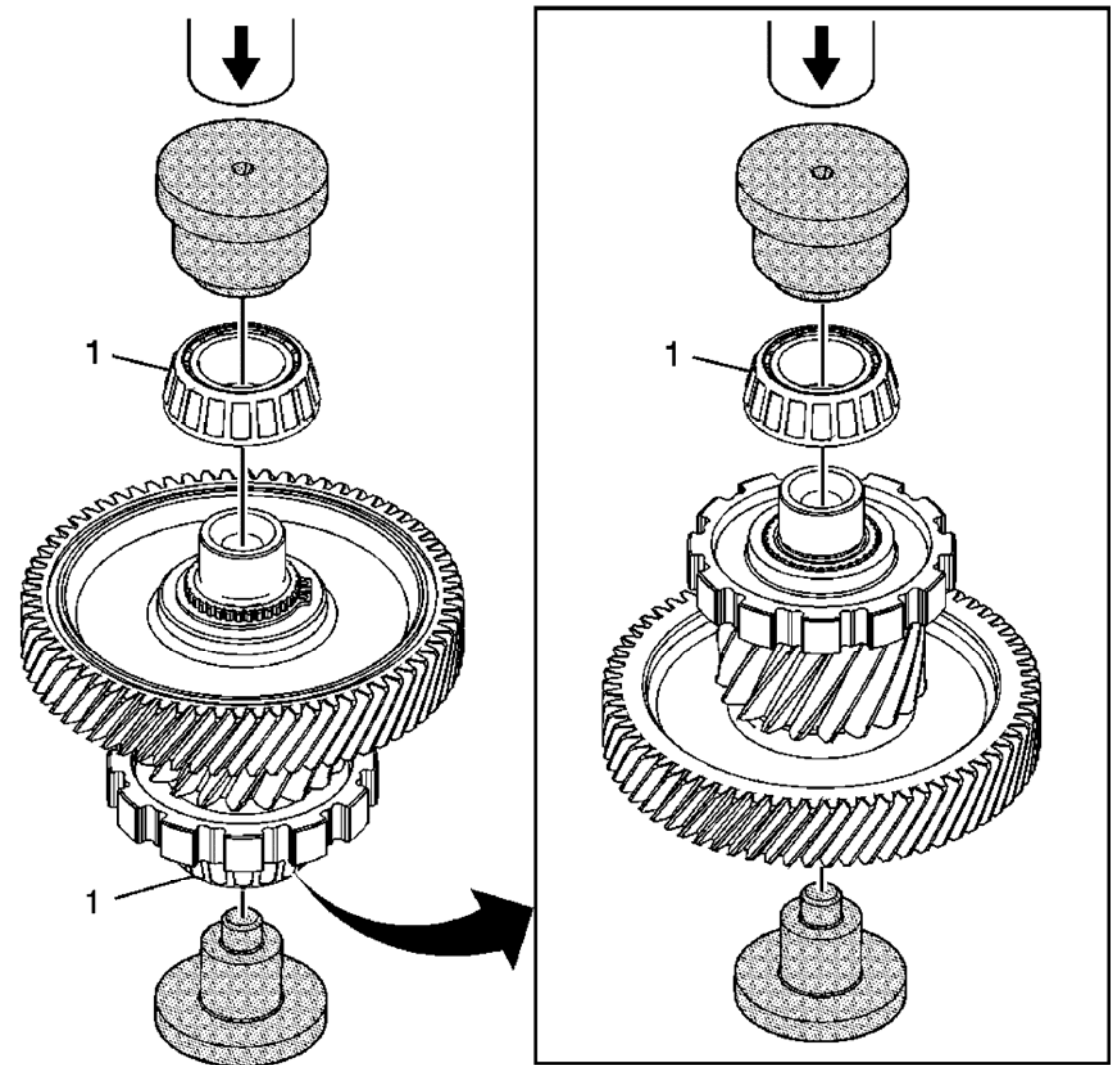


Fig. 40: Front Differential Drive Pinion Gear Bearing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Differential Drive Pinion Gear Bearing

1	CAUTION: Pressing against the bearing assembly can damage the bearing and cause premature bearing failure. Special Tools: DT-47928: Bearing Installer For equivalent regional tools, refer to <u>Special Tools</u> .
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FRONT DIFFERENTIAL CARRIER BEARING REPLACEMENT

Removal

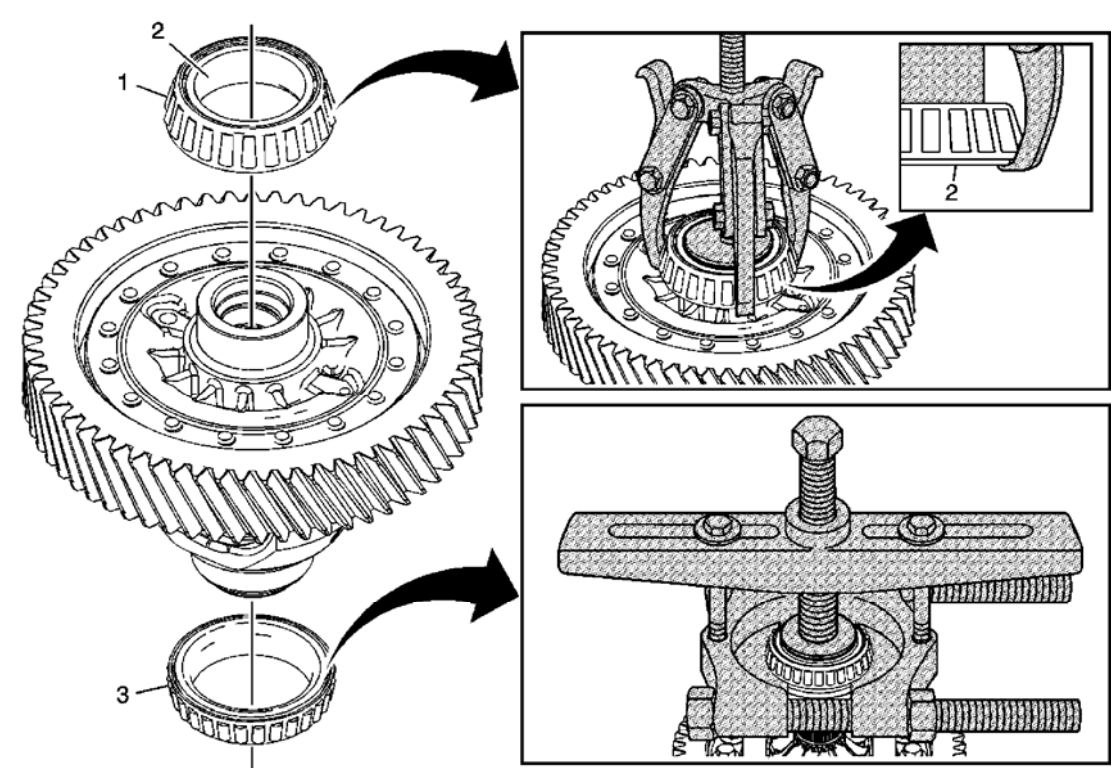


Fig. 41: Front Differential Carrier Bearing
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Bearing Assembly Special Tools • J-41816: Three Legged Puller • J 41816-2: Step Plate

	For equivalent regional tools, refer to <u>Special Tools</u> .
2	Inner Race Tip: Ensure all 3 legs of the puller make contact with the inner race of the bearing.
3	Front Differential Carrier Bearing Assembly Tip: • AWD differential may need longer bolts, 2-3/8 x 5 x 24 thread bolts. • When removing the front differential carrier bearing assembly use J 41816-2: step plate. Special Tools • J 8433-1: Puller Bar or equivalent • J 22912-B: Split Plate Bearing Remover or equivalent • J 41816-2: Step Plate For equivalent regional tools, refer to <u>Special Tools</u> .

Installation

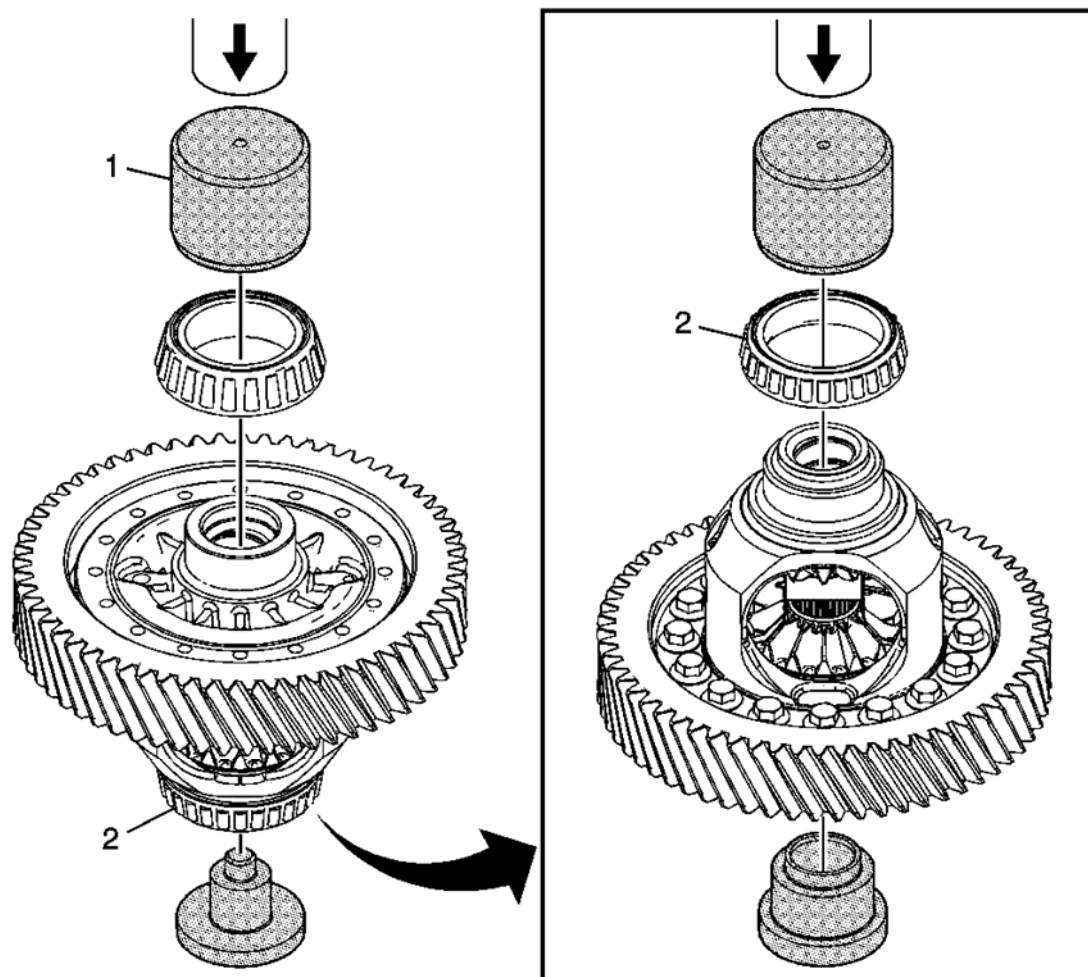


Fig. 42: Front Differential Carrier Bearing
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Bearing Assembly CAUTION: Pressing against the bearing assembly can damage the bearing and cause premature bearing failure. Special Tools: DT-47928: Bearing Installer For equivalent regional tools, refer to Special Tools .
	Front Differential Carrier Bearing Assembly CAUTION:

2

Pressing against the bearing assembly can damage the bearing and cause premature bearing failure.

Special Tools:

DT-47928: Bearing Installer

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

FRONT DIFFERENTIAL CARRIER CLEANING AND INSPECTION

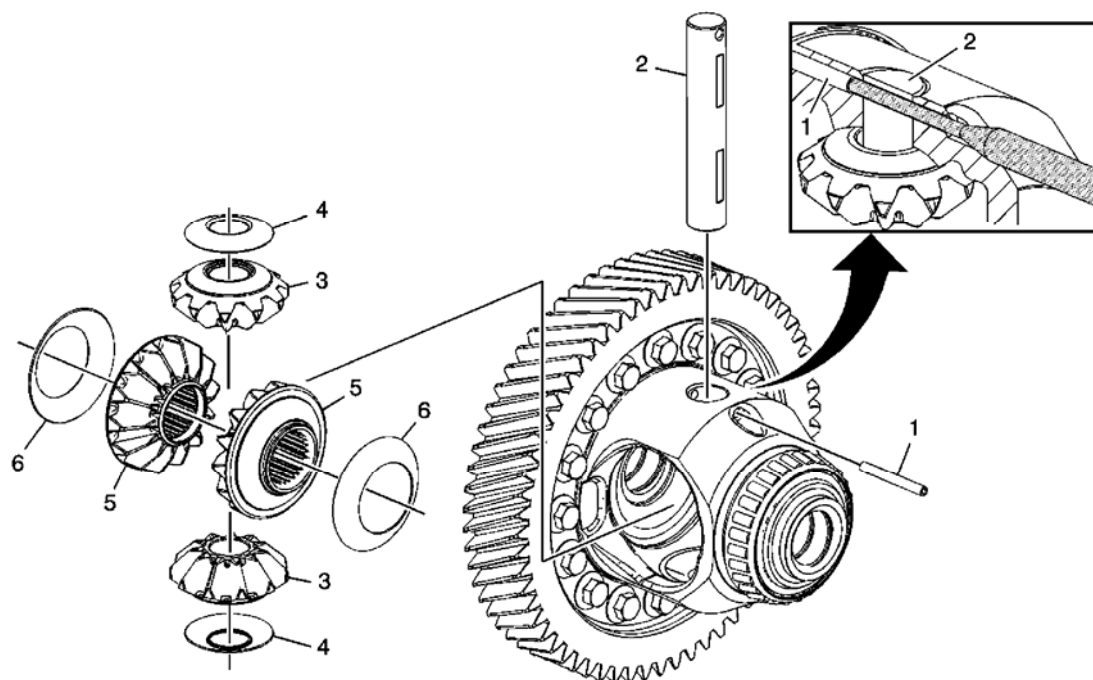


Fig. 43: Front Differential Carrier

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 the thrust washers with 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 Procedure: 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 Tip: Discard and use a new retainer. Special Tools: 3/16 in (5 mm) 7 in Punch or equivalent For equivalent regional tools, refer to Special Tools .
2	Front Differential Pinion Gear Shaft
3	Front Differential Pinion Gears
4	Front Differential Carrier Thrust Washers
5	Front Differential Pinion Side Gears
6	Front Differential Side Gear Thrust Washer

FRONT DIFFERENTIAL DRIVE PINION GEAR AND CARRIER INSTALLATION

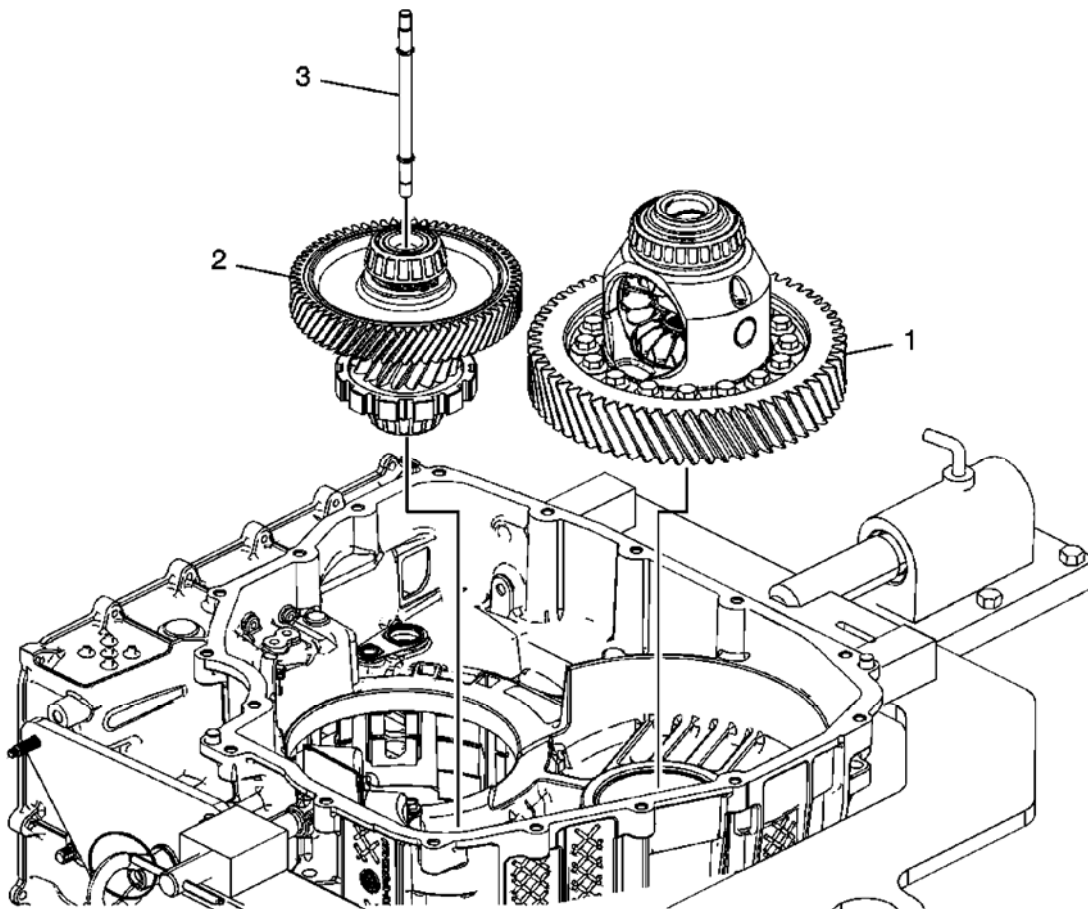


Fig. 44: Front Differential Drive Pinion Gear & Carrier
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Front Differential Carrier Assembly Tip: Install the differential assembly and the pinion gear assembly together to avoid interference with the gears during installasion.
2	Front Differential Drive Pinion (w/Transfer Gear) Gear Assembly
3	Front Differential Drive Pinion Gear Lube Tube

TORQUE CONVERTER AND DIFFERENTIAL HOUSING INSTALLATION

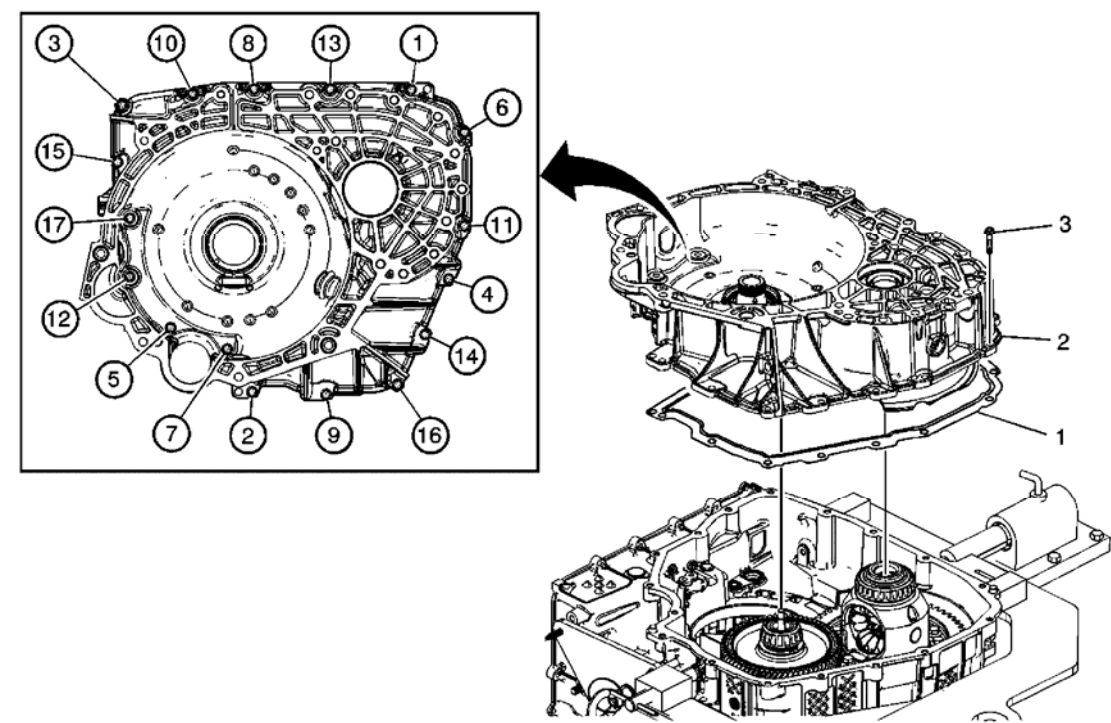


Fig. 45: Identifying Torque Converter & Differential Housing Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Torque Converter Housing Outer Seal
2	Torque Converter and Support and A/Trans Fluid Pump Housing Assembly
	Torque Converter and Differential Housing Bolts M8 x 35 (Qty: 17) CAUTION: Some bolt torques specifications are different. Over tightening the bolts at the 12, 15 and 17 positions in the sequence could cause damage to the case threads. CAUTION:

3

Refer to Fastener Caution .

Procedure::
Tighten in sequence shown.

- Tighten:**
- Bolts 1-11, 13-14 and 16 to 36N.m (27 lb ft)
 - Bolts 12, 15 and 17 to 30 N.m (22 lb ft)

FRONT DIFFERENTIAL CARRIER PRELIMINARY ROTATIONAL TORQUE MEASUREMENT

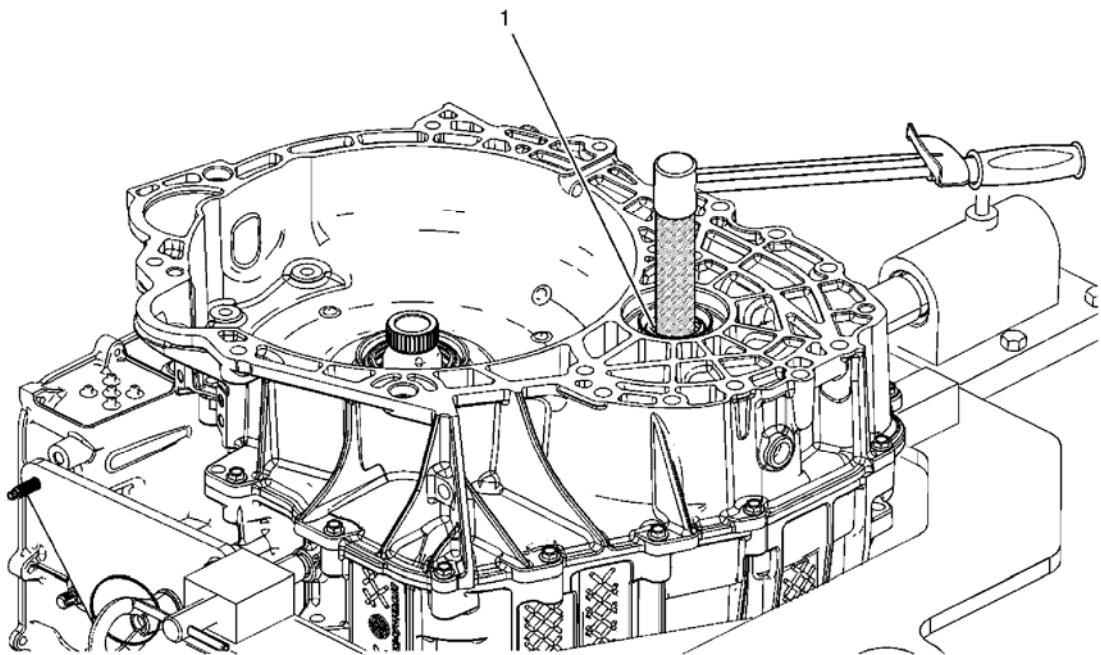


Fig. 46: Front Differential Carrier Preliminary Rotational Torque
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Differential Carrier Assembly
	CAUTION: Low bearing pre-load will cause premature failure of the front differential drive pinion gear.
	CAUTION: Refer to <u>Fastener Caution</u> .

Tip:

- If the turning torque is not within specifications, the transfer gear assembly and differential bearing thrust washer is incorrect and must be corrected. Refer to **Front Differential Drive Pinion Gear Bearing Thrust Washer and Front Differential Bearing Washer Measurement**.
- Use a dial or beam torque wrench with **DT-47793**: differential rotating tool to measure turning torque.

Tighten: 4-12 N.m (35-106 lb in)

Special Tools:

DT-47793: Differential Rotating Tool

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

1-2-3-4 CLUTCH PLATE AND LOW AND REVERSE CLUTCH INSTALLATION

Piston and Spring Installation

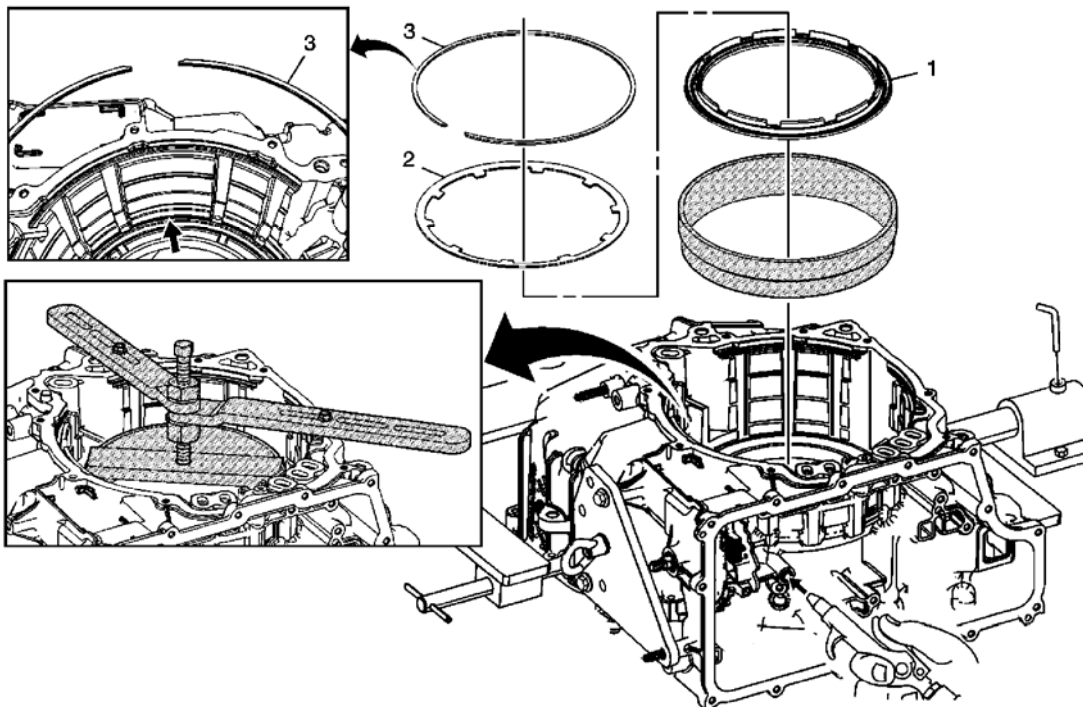


Fig. 47: Piston & Spring

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	1-2-3-4 Clutch Piston Tip: J-46623: seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of J-46623: seal protector to ease the installation of the piston. Special Tools: J-46623: Piston Seal Protector For equivalent regional tools, refer to Special Tools .
2	1-2-3-4 Clutch Spring
3	1-2-3-4 Clutch Spring Retainer Ring CAUTION: Refer to Fastener Caution . Procedure: 1. The retainer opening should be supported by a spline tooth of the case. 2. Install J-46632: spring compressor and DT-48056: spring compressor bridge and retain to the case using 2 case cover assembly bolts. Tighten: 12 N.m (9 lb ft). 3. Turn the DT-48056: spring compressor bridge compressor bolt to compress the 1-2-3-4 Clutch Spring until the retaining ring groove is exposed. 4. Push retainer ring into the groove. 5. Remove DT-48056: spring compressor bridge and J-46632: spring compressor. 6. Air check the piston operation by applying air to the 1-2-3-4 clutch feed passage in the case. 7. Excessive air leaks indicate damage to the clutch piston seal. Special Tools • DT-48056: Spring Compressor Bridge • J-46632: Piston Spring Compressor For equivalent regional tools, refer to Special Tools .

1-2-3-4 Clutch Plates and Low Reverse Clutch Installation

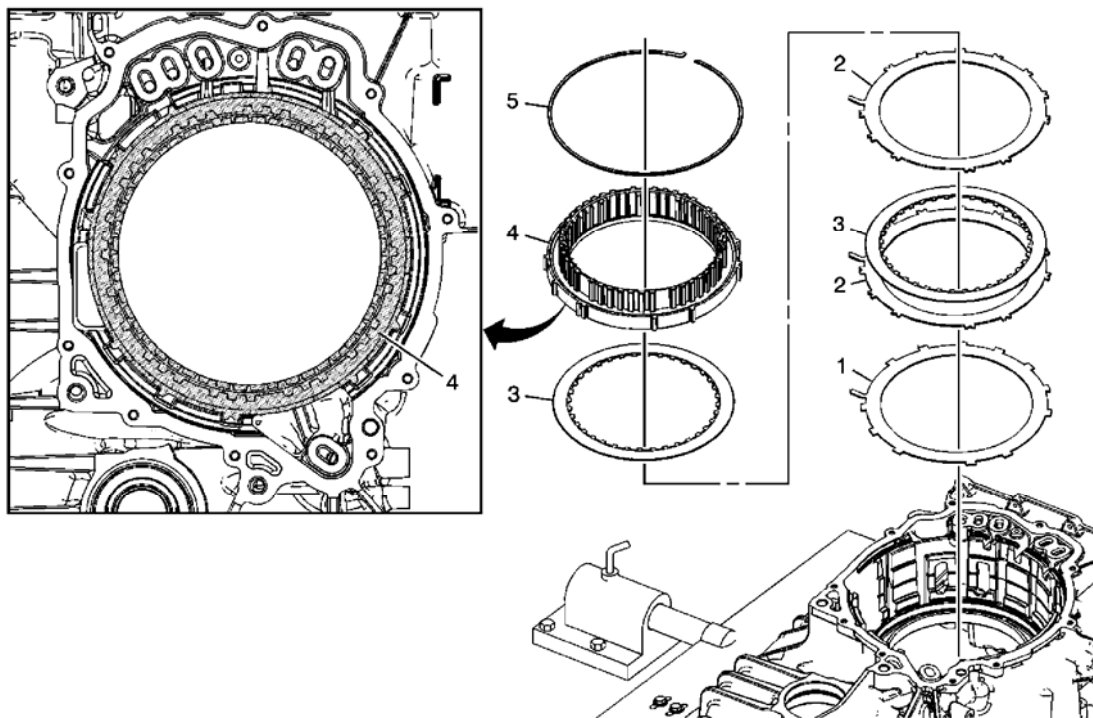


Fig. 48: 1-2-3-4 Clutch Plates & Low Reverse Clutch
 Courtesy of GENERAL MOTORS CORP.

1-2-3-4 Clutch Plates and Low Reverse Clutch Installation

Callout	Component Name
1	1-2-3-4 Clutch (Waved) Plate Tip: The tab on the clutch plate faces the bottom of the case.
2	1-2-3-4 Clutch Plate (Qty: 2) Tip: The tab on the clutch plate faces the bottom of the case.
3	1-2-3-4 Clutch (w/Friction Material) Plate Assembly (Qty: 2)
4	Low and Reverse Clutch Assembly
5	Low and Reverse Clutch Retaining Ring Tip: The retaining ring opening should face the control side of the case (9 o'clock). Do not align the retainer opening with other retaining ring openings.

Low and Reverse Clutch Plate Installation

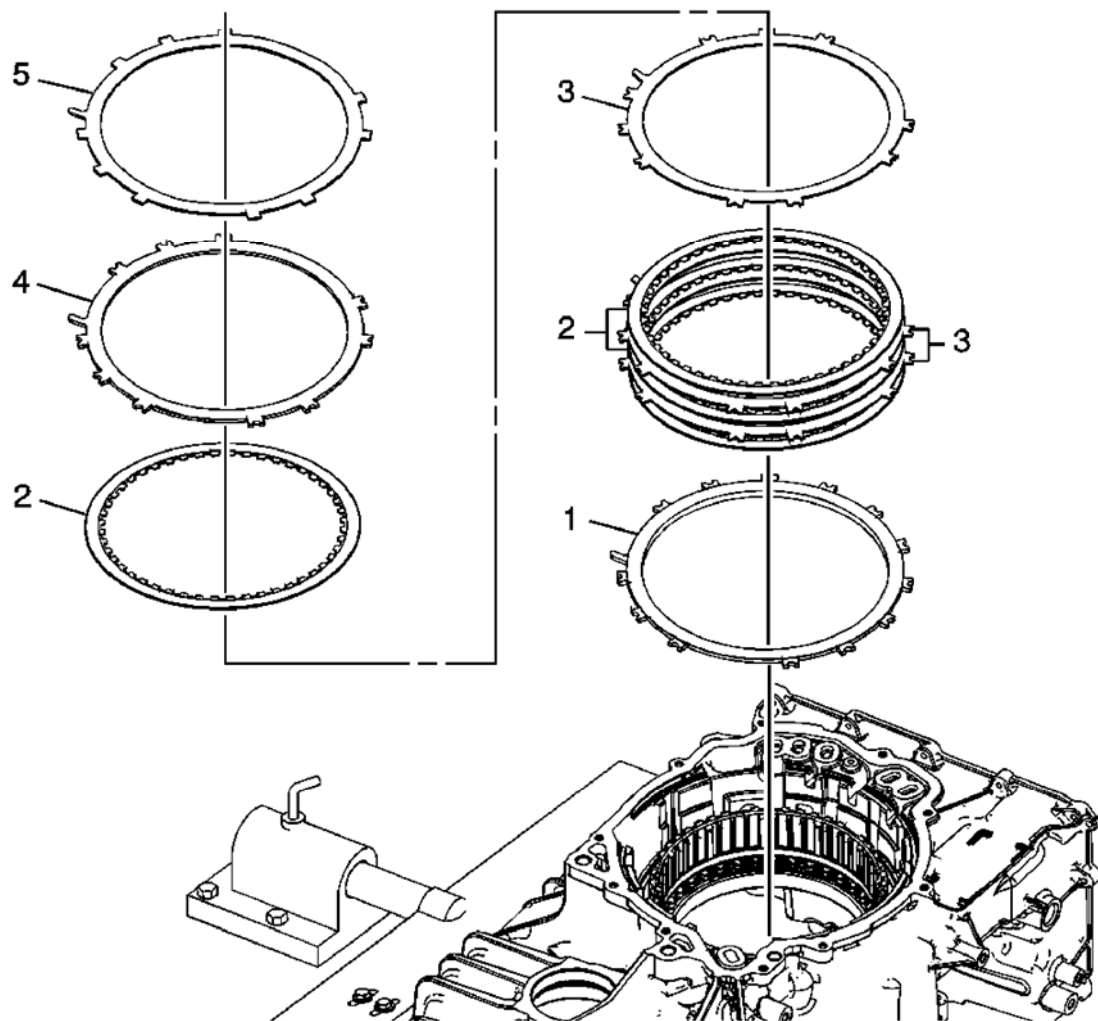


Fig. 49: Low & Reverse Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse Clutch Backing Plate Tip: The tab on the clutch plate faces the bottom of the case.
2	Low and Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 4)
3	Low and Reverse Clutch Plate (Qty: 3) Tip: The tab on the clutch plate faces the bottom of the case.
4	Low and Reverse Clutch Apply Plate Tip: The tab on the clutch plate faces the bottom of the case.
5	Low and Reverse Clutch Cushion (Waved) Spring Tip: The tab on the clutch plate faces the bottom of the case.

REACTION CARRIER CLEANING AND INSPECTION

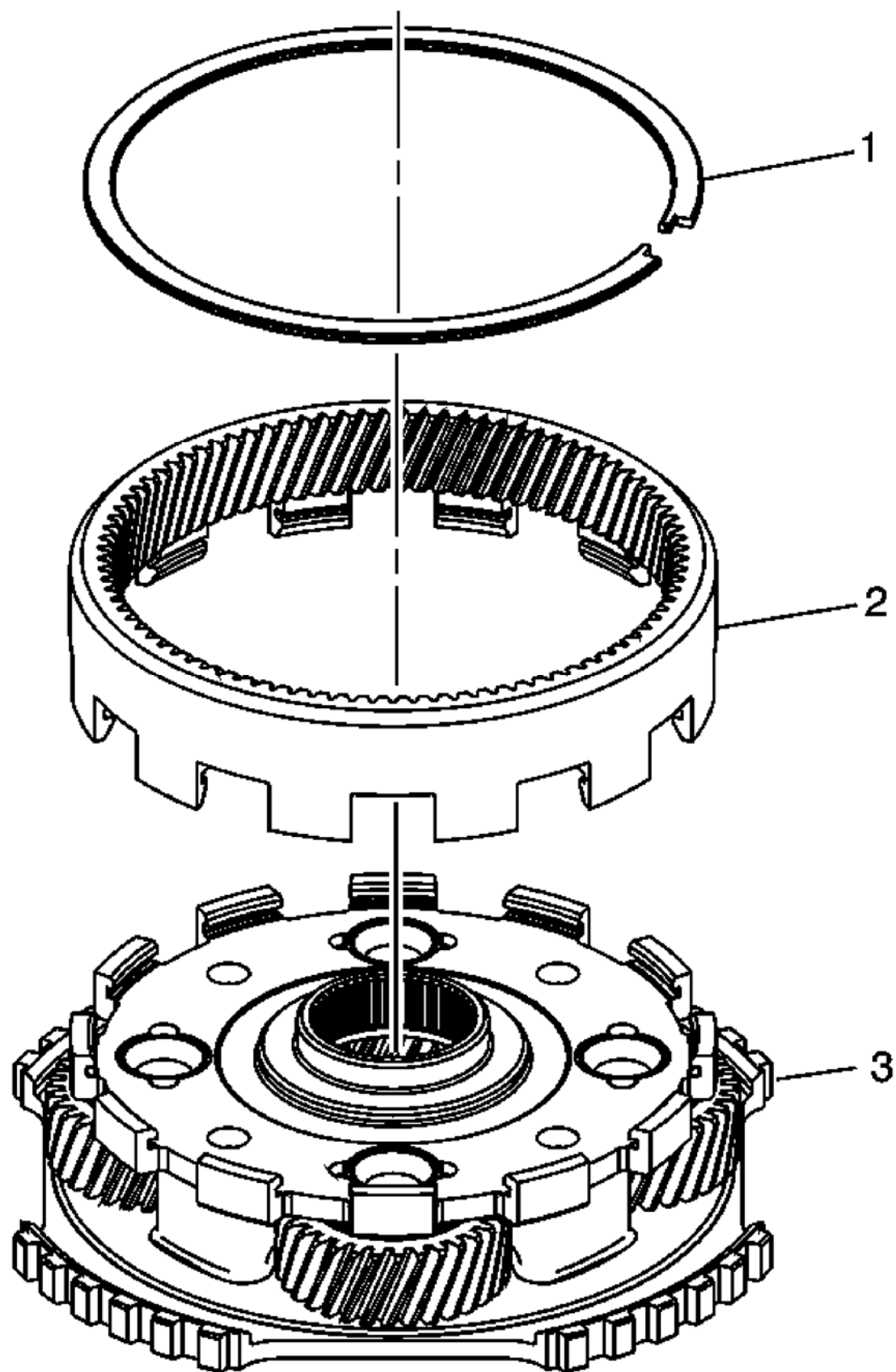


Fig. 50: Reaction Carrier
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures: Clean and Inspect the carrier as an assembly. If wear or damage is found disassemble to replace the affected component.	
1	Input Internal Gear Retaining Ring
2	Input Internal Gear
3	Reaction Carrier Assembly

OUTPUT CARRIER CLEANING AND INSPECTION

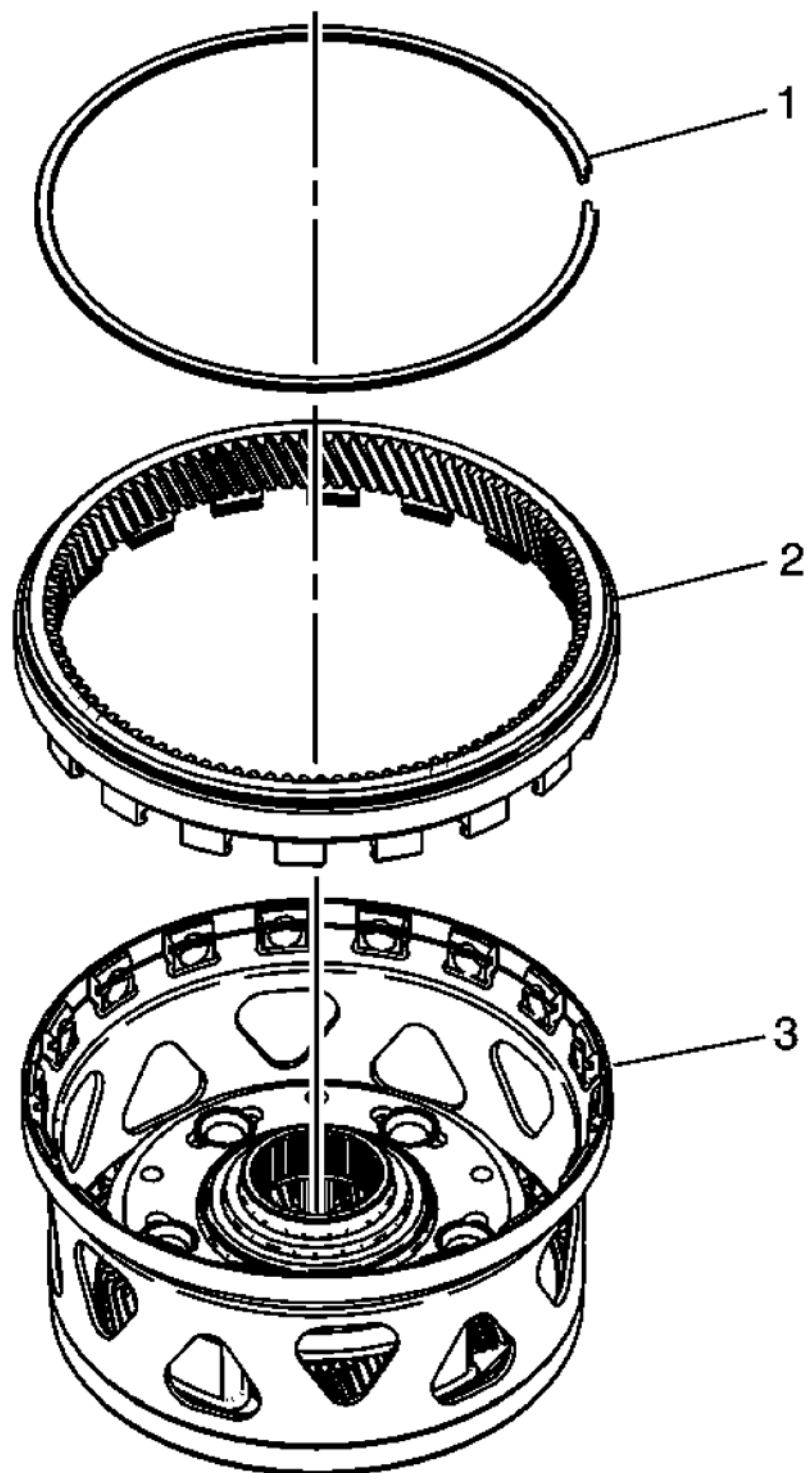


Fig. 51: Output Carrier

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

Preliminary Procedures:

Clean and Inspect the carrier as an assembly. If wear or damage is found disassemble to replace the affected component.

1	Reaction Internal Gear Retaining Ring
2	Reaction Carrier Internal Gear
3	Output Carrier Assembly

INPUT, REACTION, AND OUTPUT CARRIER INSTALLATION

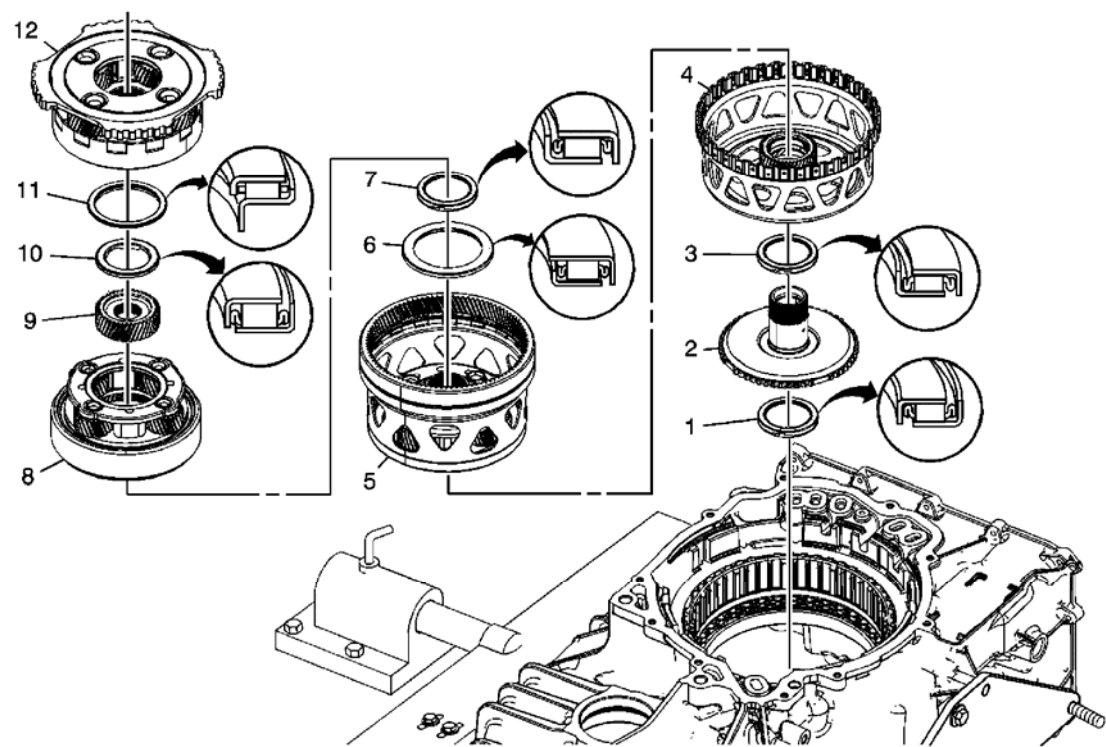


Fig. 52: Input, Reaction & Output Carrier
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Note location of the orientation lip on bearings. All thrust bearings can only be assembled one way.	
1	Input Shaft Thrust Bearing Assembly
2	Output Carrier Transfer Drive Gear Hub Assembly
3	Front Differential Transfer Drive Gear Input Hub Bearing Assembly
4	Output Sun Gear Assembly
5	Output Carrier Assembly
6	Output Carrier Thrust Bearing Assembly
7	Output Carrier Thrust Bearing Assembly

8	Input (w/Output Internal Gear) Carrier Assembly
9	Input Sun Gear
10	Input Sun Gear Thrust Bearing Assembly
11	Input Carrier Thrust Bearing Assembly
12	Reaction (w/Input Internal Gear) Carrier Assembly

2-6 CLUTCH PLATE INSTALLATION

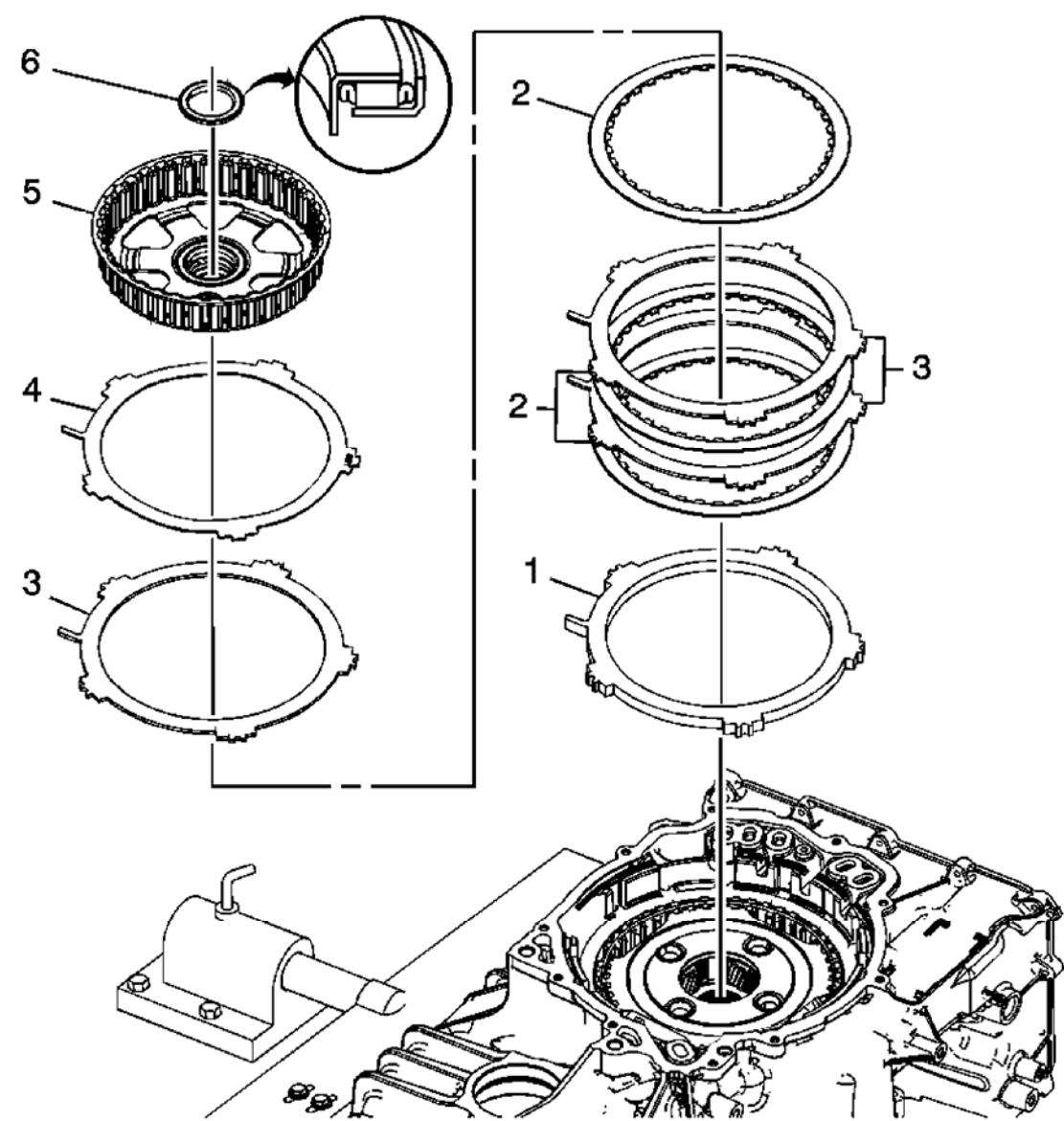


Fig. 53: 2-6 Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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1	2-6 Clutch Backing Plate Tip: The tab on the clutch plate faces the bottom of the case.
2	2-6 Clutch (w/Friction Material) Plate Assembly (Qty: 3)
3	2-6 Clutch Plate (Qty: 3) Tip: The tab on the clutch plate faces the bottom of the case.
4	2-6 Clutch Cushion Spring
5	Reaction Sun Gear Assembly
6	2-6 Clutch Hub Thrust Bearing Assembly Tip: Note location of the orientation lip on bearing. All thrust bearings can only be assembled one way.

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING DISASSEMBLE

Reluctor Wheel and Piston Removal

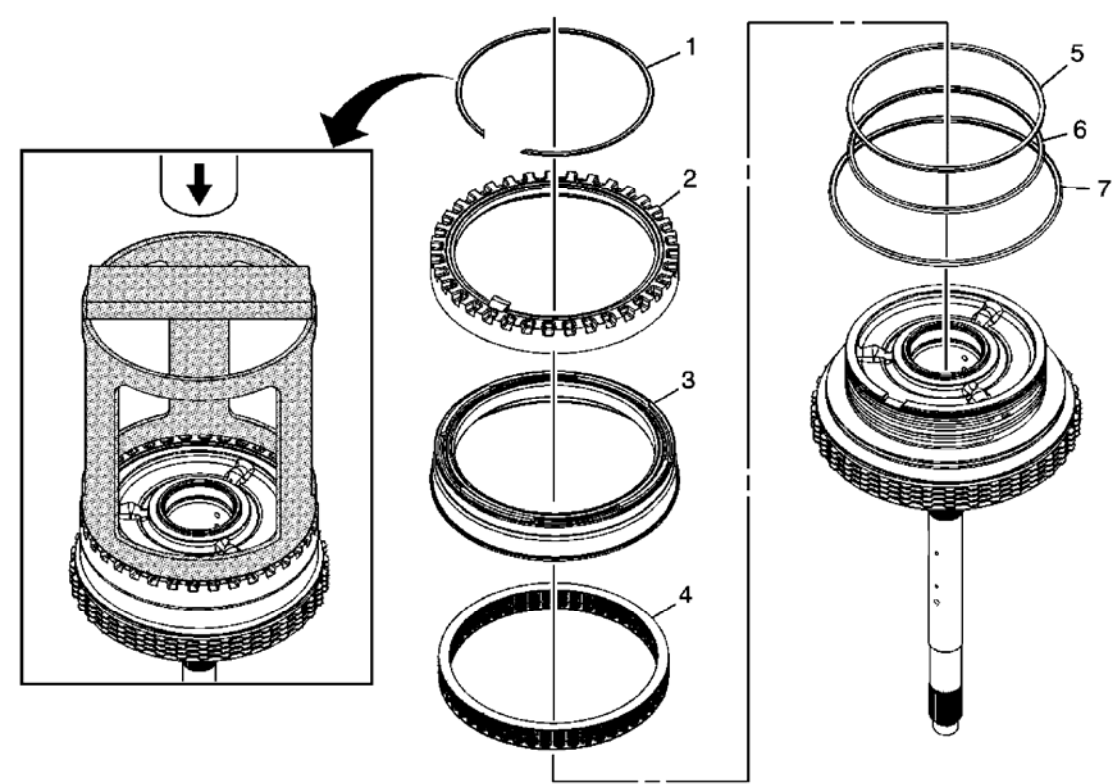


Fig. 54: Reluctor Wheel & Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	A/Trans Input Shaft Speed Sensor Reluctor Ring Retaining Ring
	CAUTION:

1	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 For equivalent regional tools, refer to <u>Special Tools</u> .
2	A/Trans Input Shaft Speed Sensor Reluctor Wheel
3	3-5 Reverse Clutch Piston Tip: Inspect piston seals for damage and/or wear. Piston is reusable.
4	3-5 Reverse Clutch Spring Assembly
5	3-5 Reverse Clutch Piston Inner Seal (Orange)
6	3-5 Reverse Clutch Piston Inner Seal (Black)
7	3-5 Reverse Clutch Piston Dam Seal

Clutch Plate Removal

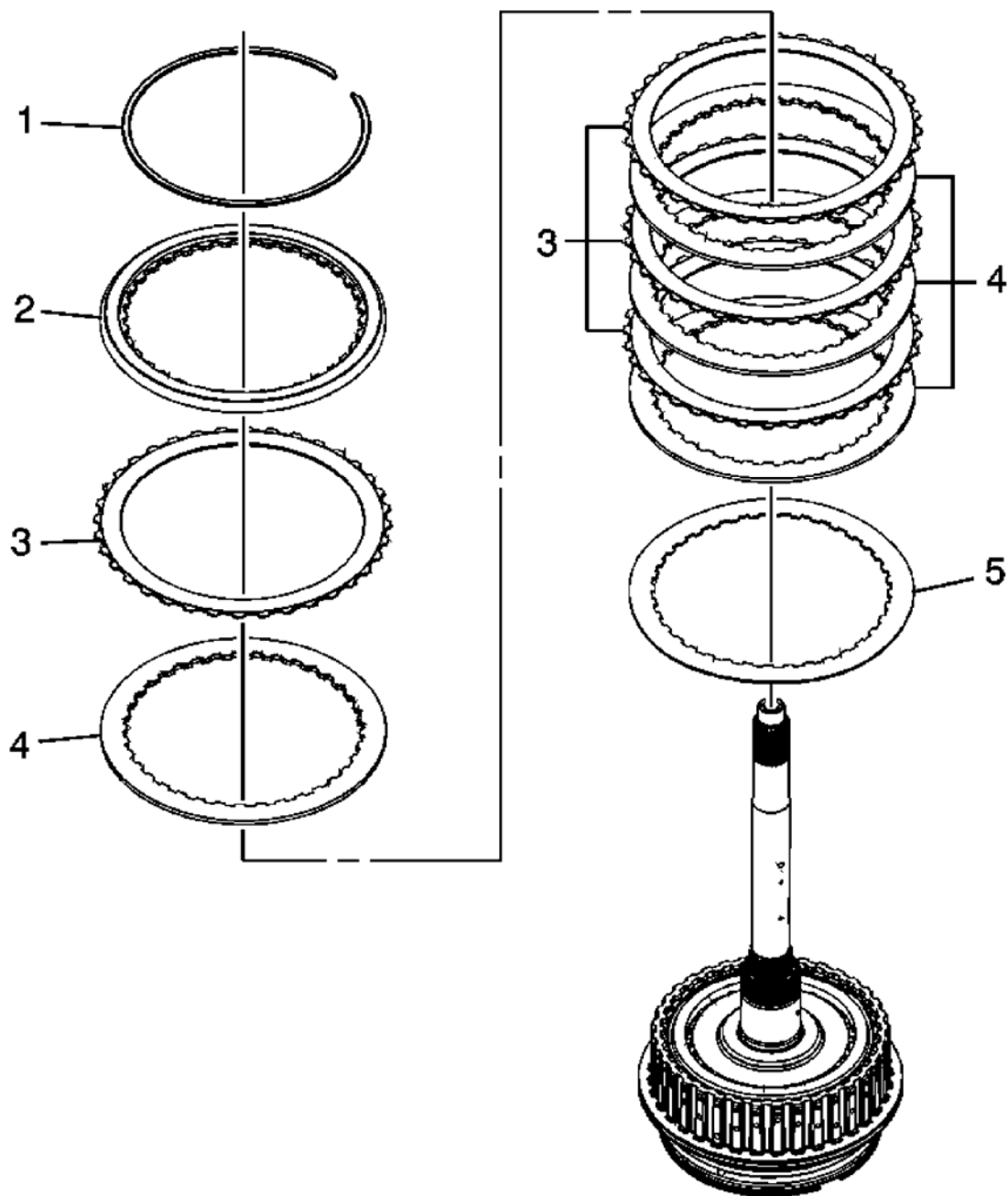


Fig. 55: Clutch Plate
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse Clutch Backing Plate Retaining Ring
2	3-5 Reverse Clutch Backing Plate
3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 4)
4	3-5 Reverse Clutch Plate (Qty: 4)

4-5-6 Clutch Hub Removal

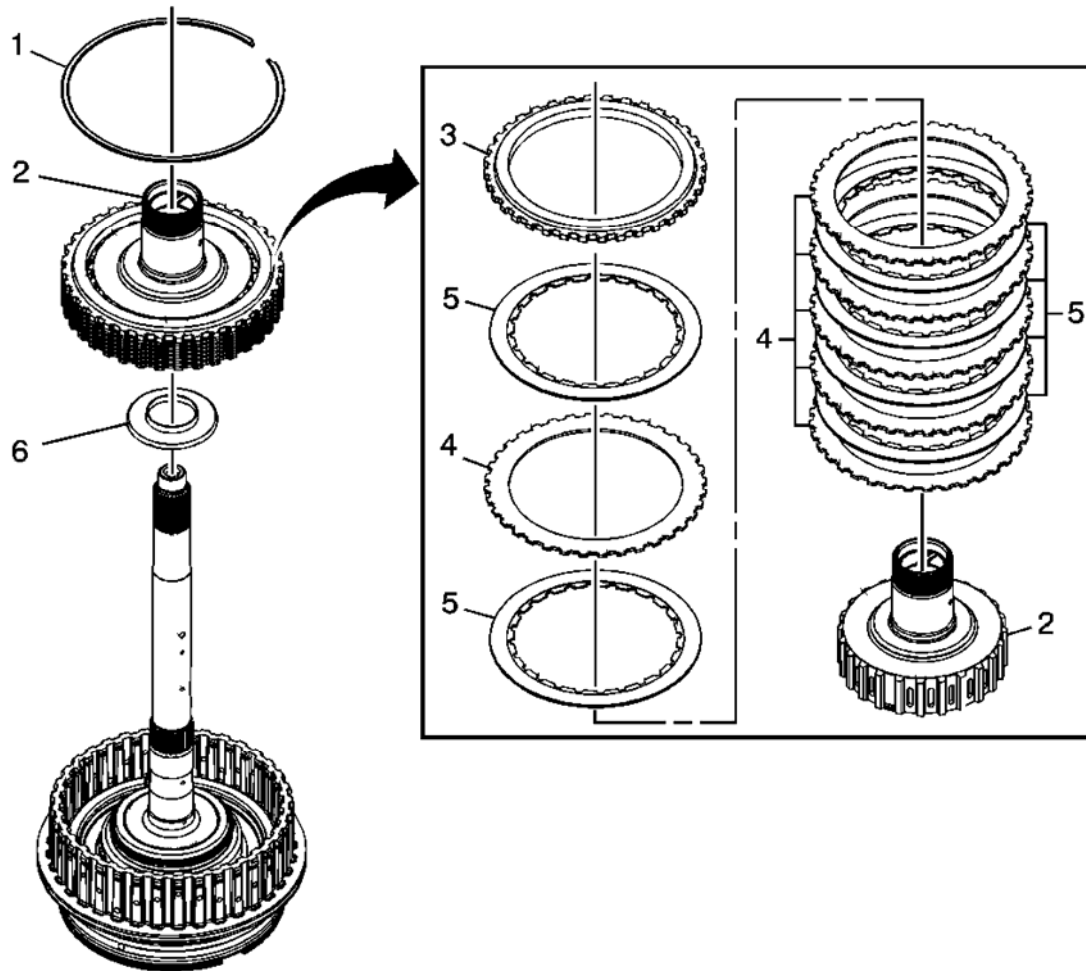
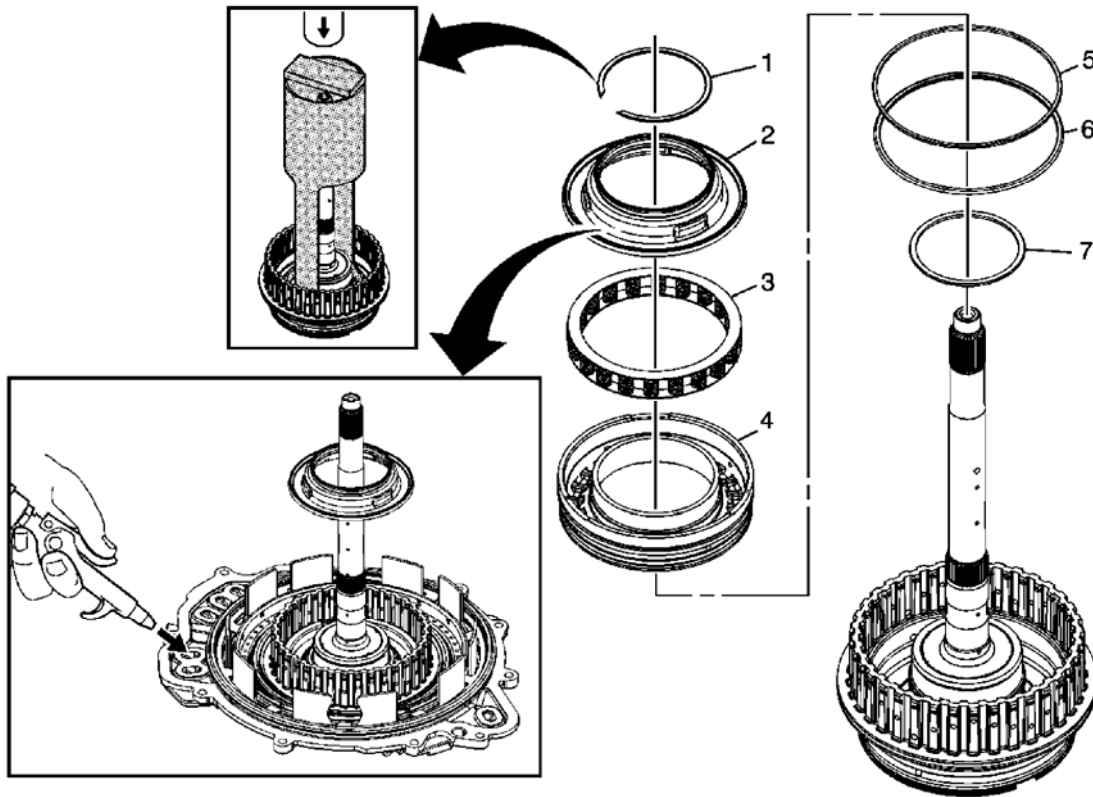


Fig. 56: 4-5-6 Clutch Hub

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Backing Plate Retaining Ring Tip: Gently push down on the backing plate to get enough clearance between the backing plate and retainer.
2	Reaction Carrier Hub Assembly Tip: The clutch plates will come out of the housing with the hub assembly.
3	4-5-6 Clutch Backing Plate
4	4-5-6 Clutch Plate (Qty: 6)
5	4-5-6 Clutch (w/Friction Material) Plate Assembly (Qty: 6)
	4-5-6 Clutch Hub Thrust Bearing Assembly

4-5-6 Clutch Piston Removal**Fig. 57: 4-5-6 Clutch Piston**

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Dam Retaining Ring Special Tools • DT-47693: Dam Protector • J 8059: Snap Ring Pliers-Parallel Jaw or equivalent For equivalent regional tools, refer to Special Tools .
2	4-5-6 Clutch Piston Fluid Dam Procedure: 1. Place the 3-5-R and 4-5-6 clutch housing onto the case cover assembly.

	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 Spring Assembly
4	4-5-6 Clutch Piston
5	4-5-6 Clutch Piston Outer Seal (Stepped)
6	4-5-6 Clutch Piston Outer Seal (Rounded)
7	4-5-6 Clutch Piston Inner Seal

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING ASSEMBLE

4-5-6 Clutch Piston Installation

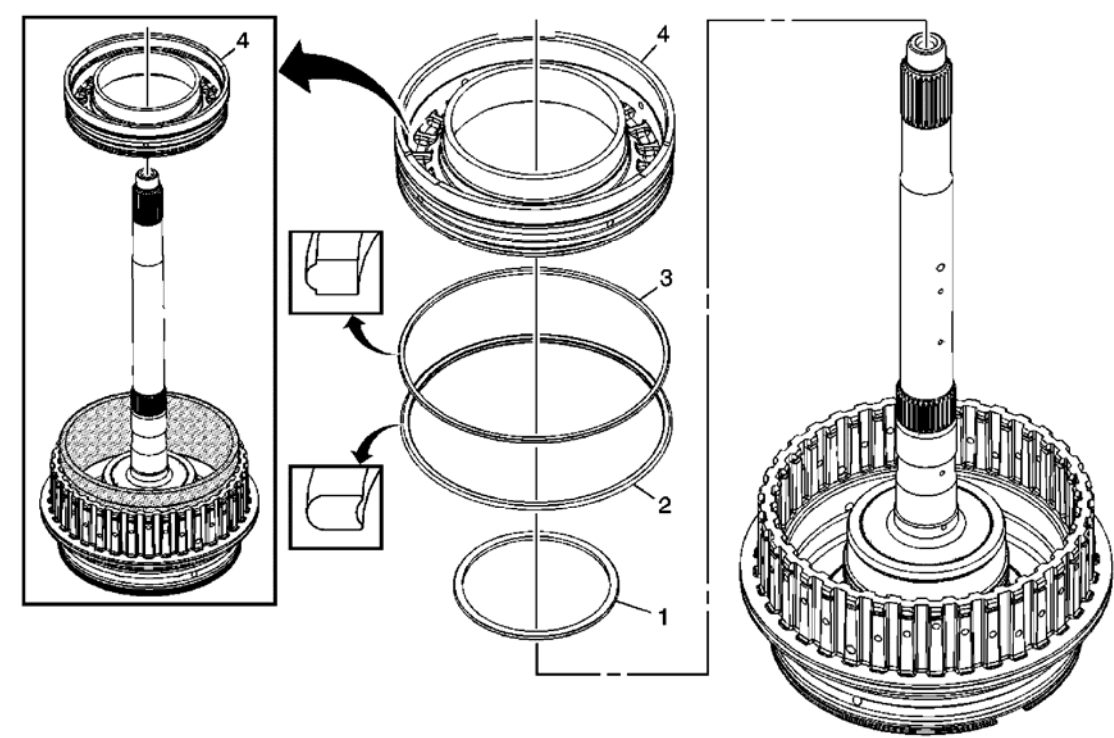


Fig. 58: 4-5-6 Clutch Piston
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Piston Inner Seal
2	4-5-6 Clutch Piston Outer Seal (Rounded)
3	4-5-6 Clutch Piston Outer Seal (Stepped) (Orange)
	4-5-6 Clutch Piston Tip: DT-47859: outer seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT-47859: outer

seal protector to ease the installation of the piston.

Special Tools:

DT-47859: Piston Outer Seal Protector

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

4-5-6 Clutch Dam Installation

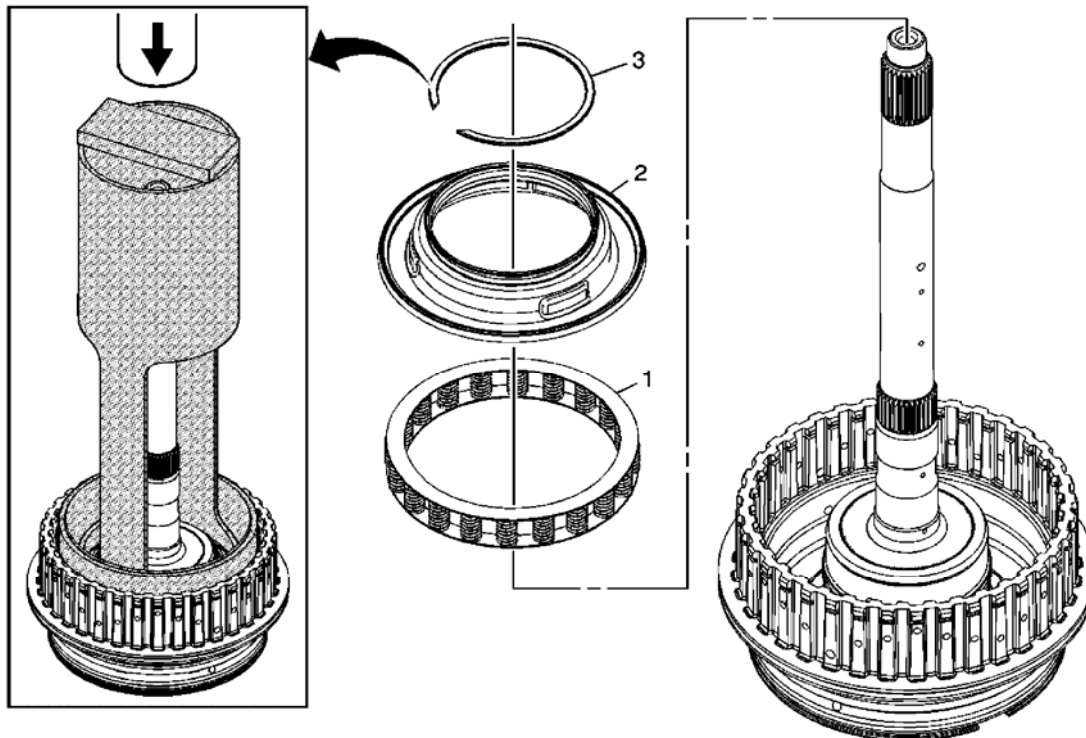


Fig. 59: 4-5-6 Clutch Dam

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Spring
2	4-5-6 Clutch Piston Fluid Dam Tip: DT 47693-1 which is part of DT-47693: dam protector prevents the dam seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of DT 47693-1 which is part of DT-47693: dam protector to ease the installation of the dam. Special Tools: DT-47693: Dam Protector For equivalent regional tools, refer to Special Tools .
	4-5-6 Clutch Dam Retaining Ring Special Tools

3

- DT 47693-2 Clutch Spring Compressor which is part of **DT-47693**: dam protector
- **J 8059**: Snap Ring Pliers-Parallel Jaw or equivalent

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

4-5-6 Clutch Plates Installation

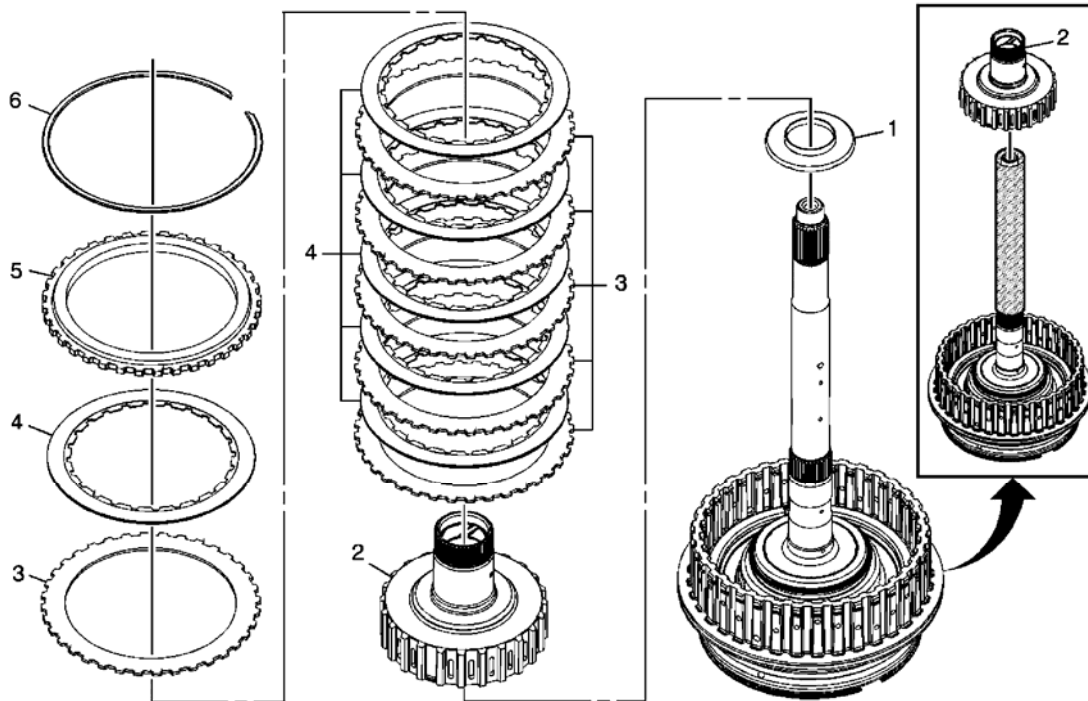


Fig. 60: 4-5-6 Clutch Plates
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	4-5-6 Clutch Hub Thrust Bearing Tip: Note location of the orientation lip on bearing. All thrust bearings can only be assembled one way.
2	Reaction Carrier Hub Assembly CAUTION: Failure to use DT 48551 could cause damage to the hub assembly bushings which could cause premature transmission failure. Special Tools:

	DT-48551: Reaction Hub Bushing Protector For equivalent regional tools, refer to <u>Special Tools</u> .
3	4-5-6 Clutch Plate (Qty: 6)
4	4-5-6 Clutch (w/Friction Material) Plate Assembly (Qty: 6)
5	4-5-6 Clutch Backing Plate
6	4-5-6 Clutch Backing Plate Retaining Ring Tip: Gently push down on the backing plate to get enough clearance between the backing plate and retainer.

3-5 Reverse Clutch Plates Installation

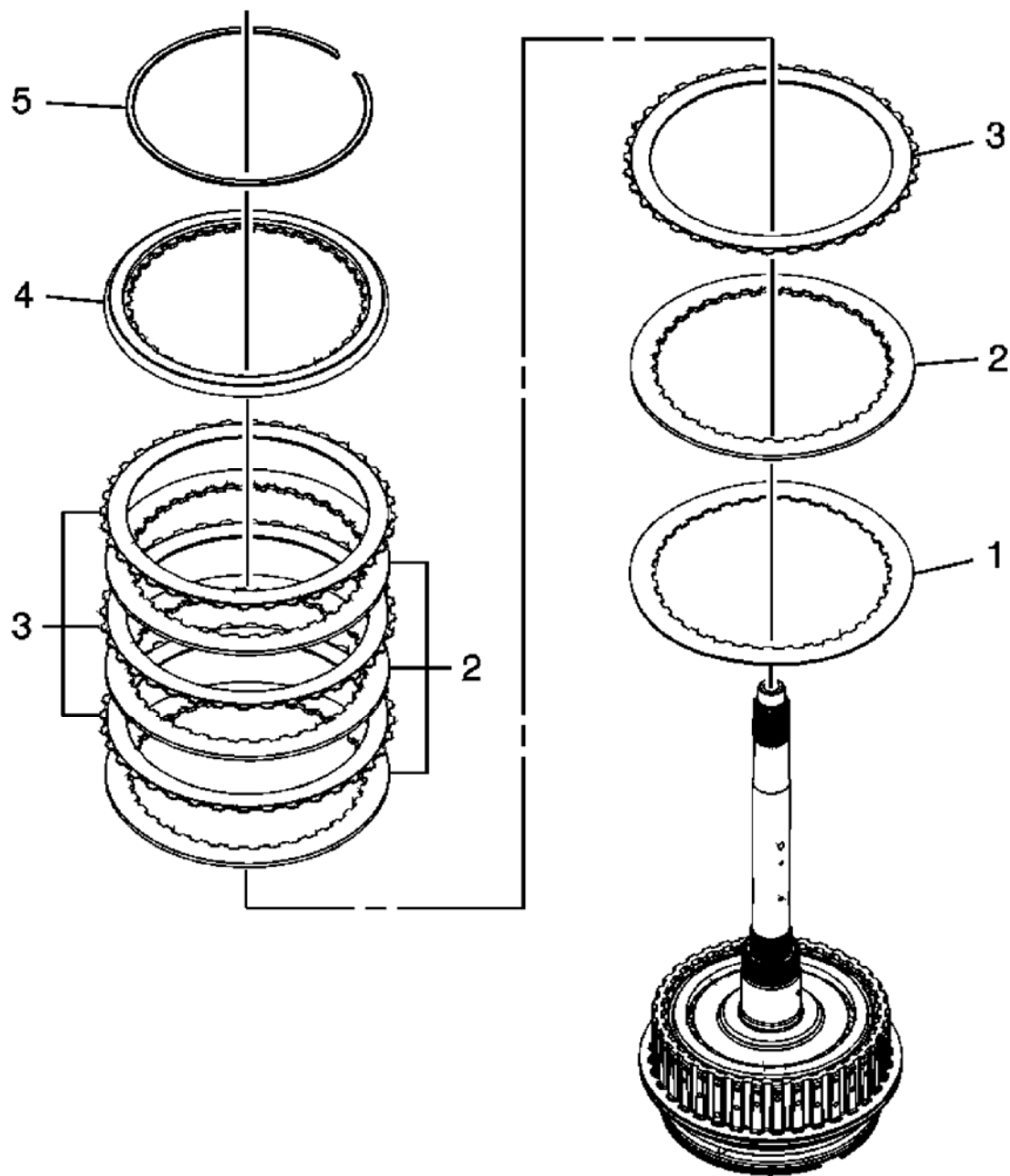


Fig. 61: 3-5 Reverse Clutch Plates
 Courtesy of GENERAL MOTORS CORP.

3-5 Reverse Clutch Plates Installation

Callout	Component Name
1	3-5 Reverse Clutch (Waved) Plate
2	3-5 Reverse Clutch Plate (Qty: 4)
3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly (Qty: 4)
4	3-5 Reverse Clutch Backing Plate

Piston and Reluctor Wheel Installation

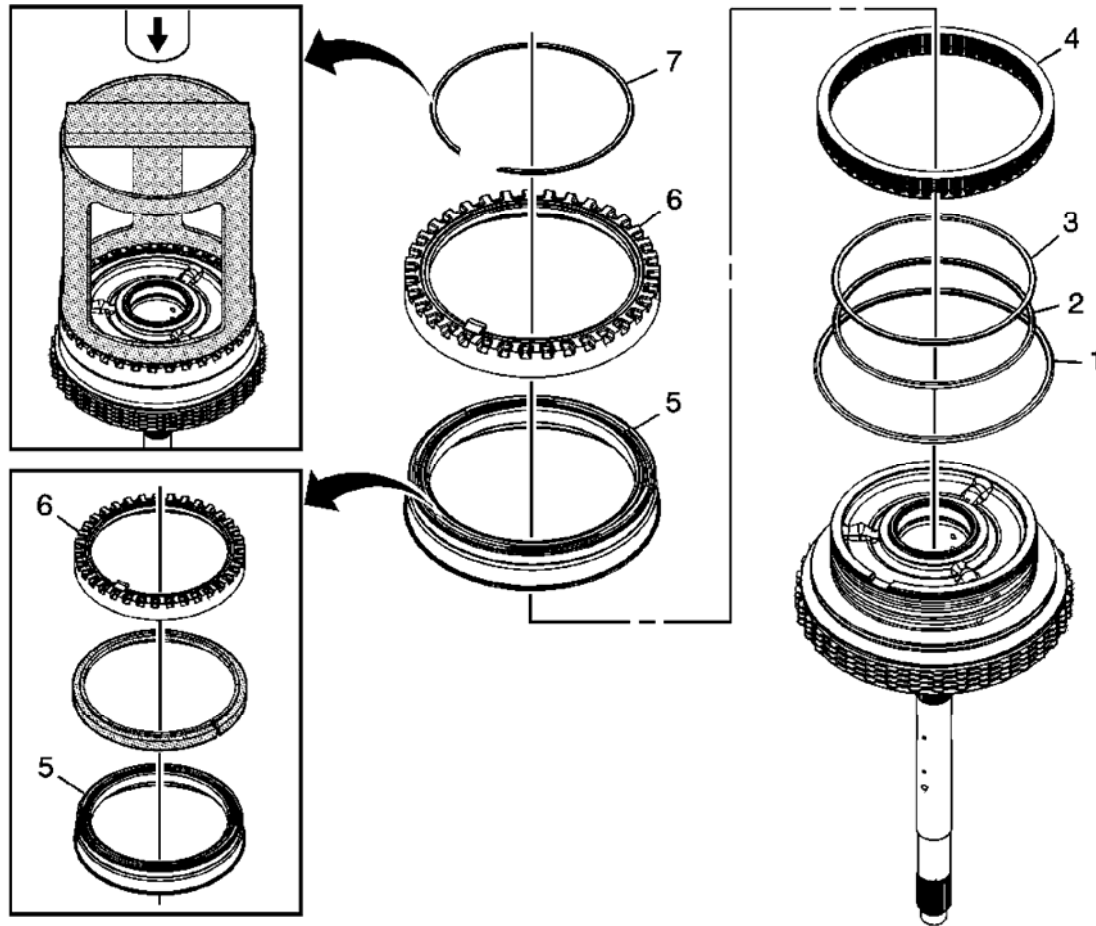


Fig. 62: Piston & Reluctor Wheel

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse Clutch Piston Dam Seal
2	3-5 Reverse Clutch Piston Inner Seal (Black) Tip: Apply a thin coat of ATF to the seal to ease the installation of the piston.
3	3-5 Reverse Clutch Piston Inner Seal (Orange) Tip: Apply a thin coat of ATF to the seal to ease the installation of the piston.
4	3-5 Reverse Clutch Spring Assembly
	3-5 Reverse Clutch Piston Tip: • J-46622: seal protector prevents the piston seal lip from damage during

5	installation. Apply a thin coat of ATF to the I.D. of J-46622: seal protector to ease the installation of the piston. • Install J-46622: seal protector onto the speed sensor reluctor wheel. Push the 3-5 Reverse Clutch piston into the reluctor wheel until it stops against J-46622: seal protector. Remove J-46622: seal protector by separating it at the opening. Special Tools: J-46622: Piston Seal Protector For equivalent regional tools, refer to Special Tools .
6	A/Trans Input Shaft Speed Sensor Reluctor Wheel
7	A/Trans Input Shaft Speed Sensor Reluctor Wheel Retaining Ring CAUTION: Compress the reluctor wheel just enough to clear the retainer ring groove. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. Special Tools: DT-47694: Piston Spring Compressor For equivalent regional tools, refer to Special Tools .

3-5-R and 4-5-6 Clutch Piston Air Check

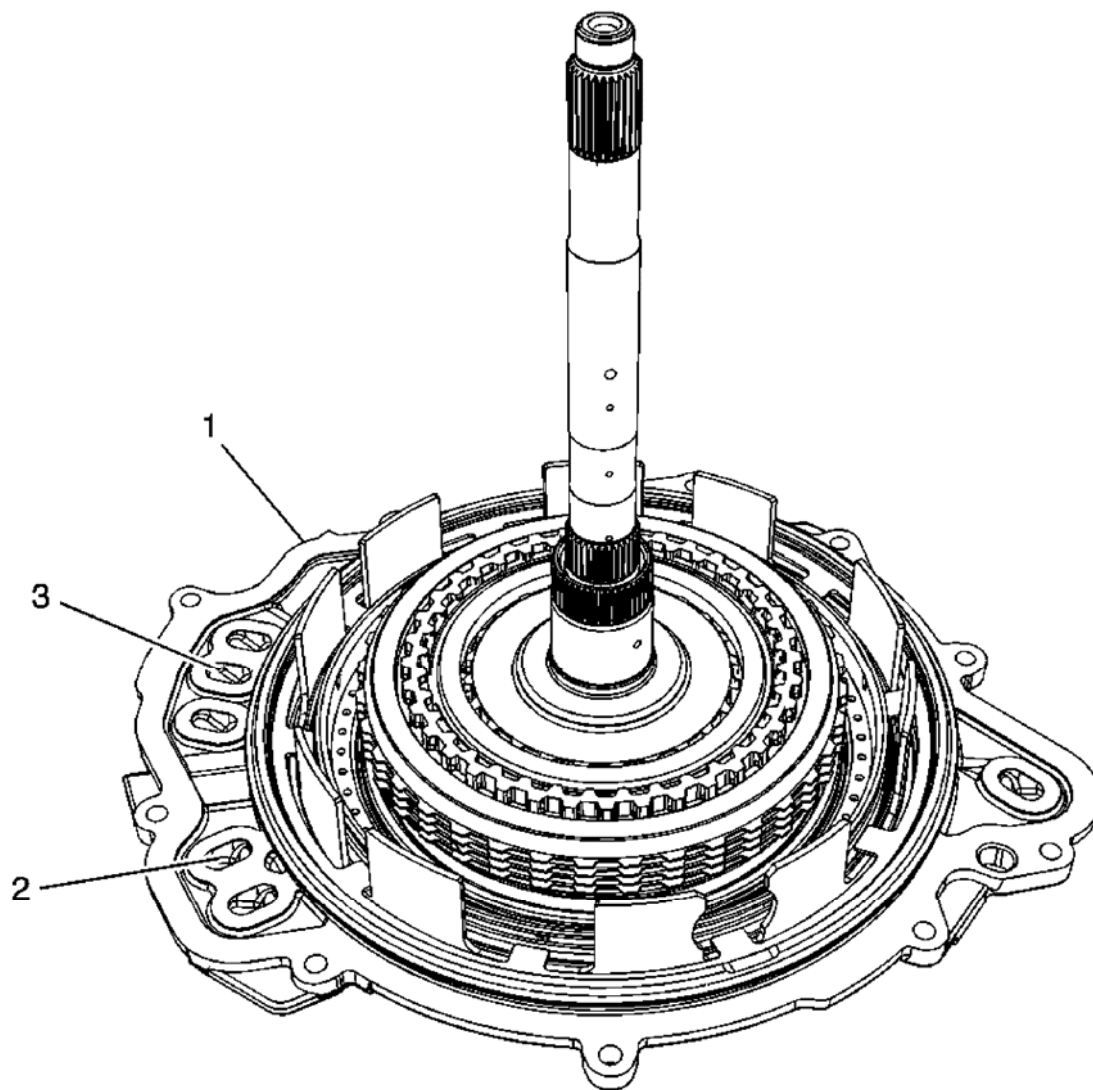


Fig. 63: 3-5-R & 4-5-6 Clutch Piston

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Case Cover Assembly Tip: The fluid seal rings should be in place and not damaged.
2	4-5-6 Clutch Feed Fluid Passage 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. Apply shop air to the 4-5-6 clutch feed passage. 2. Observe the 4-5-6 piston movement. Tip: Minimal piston movement and excessive air leaking could indicate damage to the 4-5-6 piston seals or improper assembly.
3	3-5 Rev Clutch Feed Fluid Passage 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. Apply shop air to the 3-5-Rev clutch feed passage. 2. Observe the 3-5-Rev piston movement. Tip: Minimal piston movement and excessive air leaking could indicate damage to the 3-5-Rev piston seals or improper assembly.

3-5-REVERSE AND 4-5-6 CLUTCH HOUSING INSTALLATION

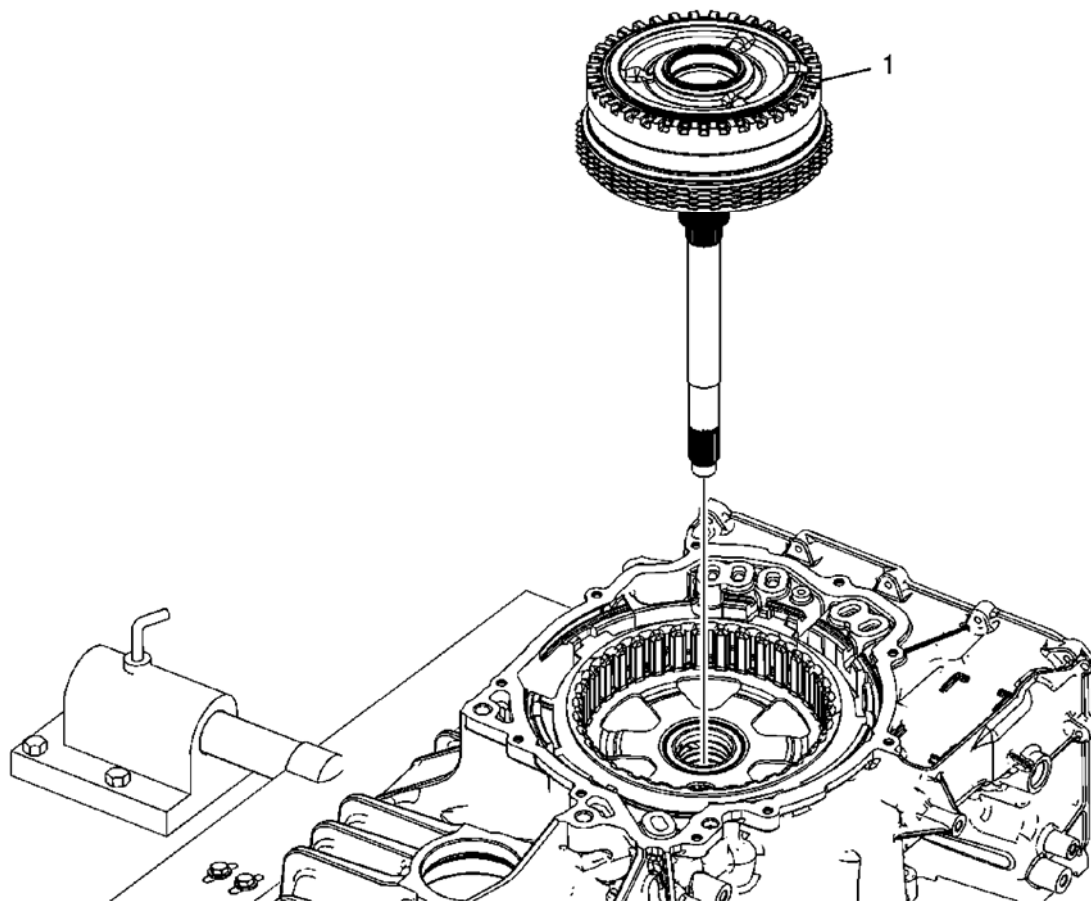


Fig. 64: 3-5 Reverse & 4-5-6 Clutch Housing
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Assembly Tip: Rotate the assembly back and forth to align the 3-5 reverse clutch plates with the reaction sun gear housing.

CASE COVER ASSEMBLY DISASSEMBLE

ISS Removal

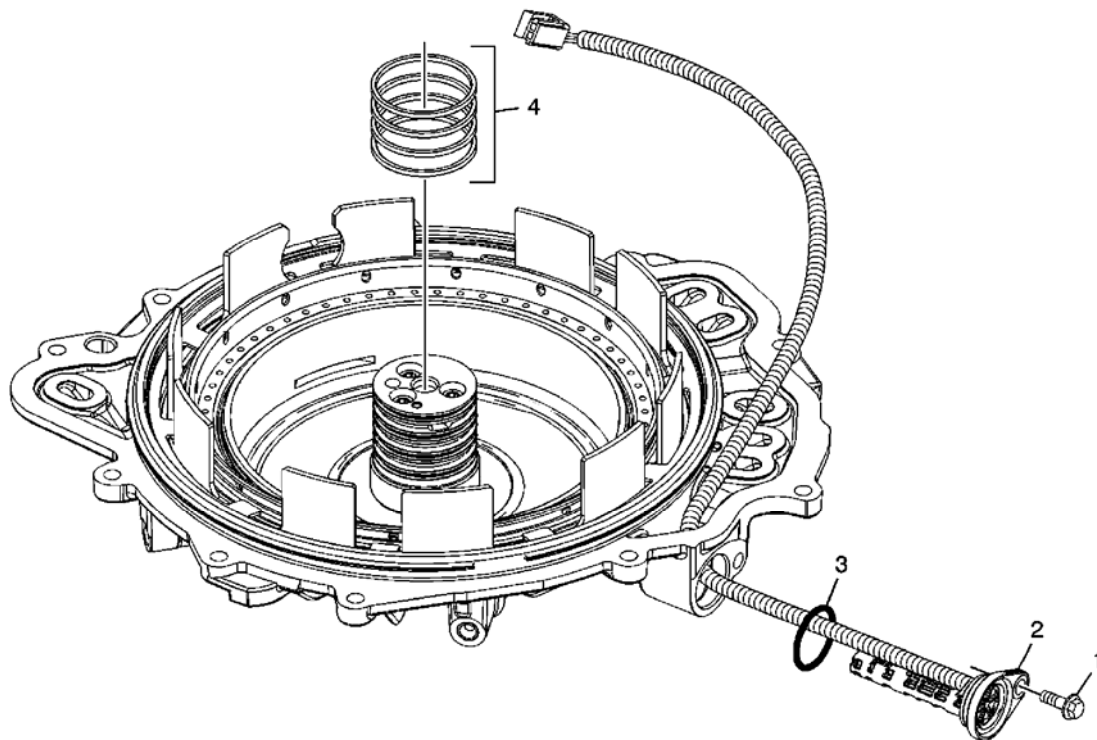


Fig. 65: ISS

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	A/Trans Input Speed Sensor Bolt M6 x 25
2	A/Trans Input Speed Sensor
3	A/Trans Input Speed Sensor Seal Tip: Discard the seal.
4	3-5 Reverse and 4-5-6 Clutch Fluid Seal Ring Tip: Discard the seals.

Low and Reverse Clutch Piston Removal

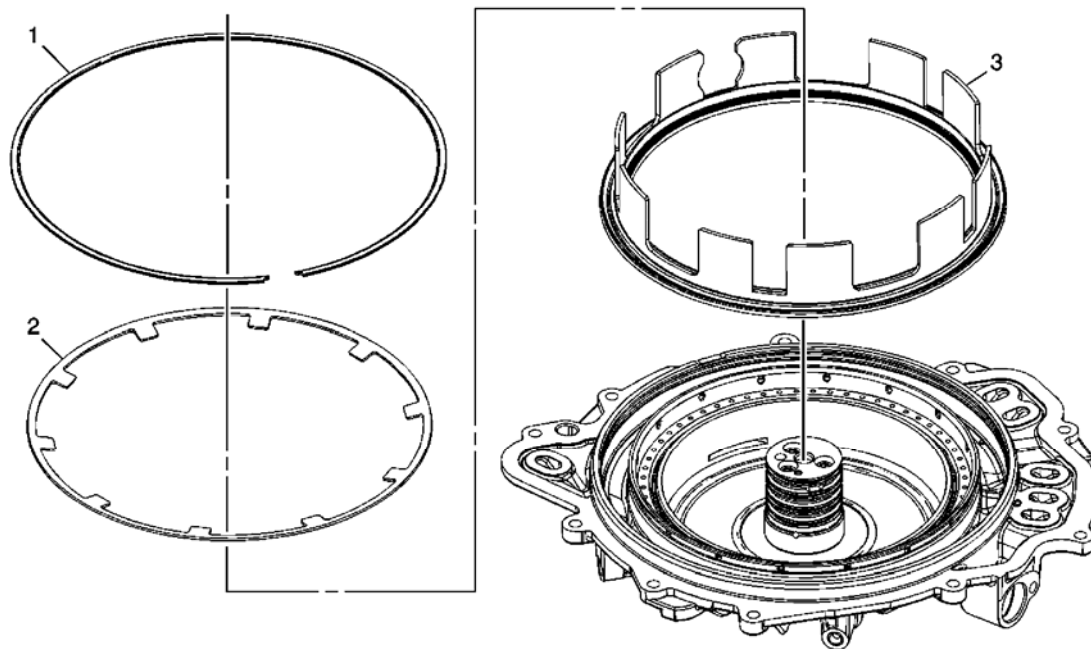


Fig. 66: Low & Reverse Clutch Piston
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Low and Reverse Clutch Spring Retaining Ring
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Piston Assembly Tip: Inspect piston seals for damage and/or wear. Piston is reusable.

2-6 Clutch Piston Removal

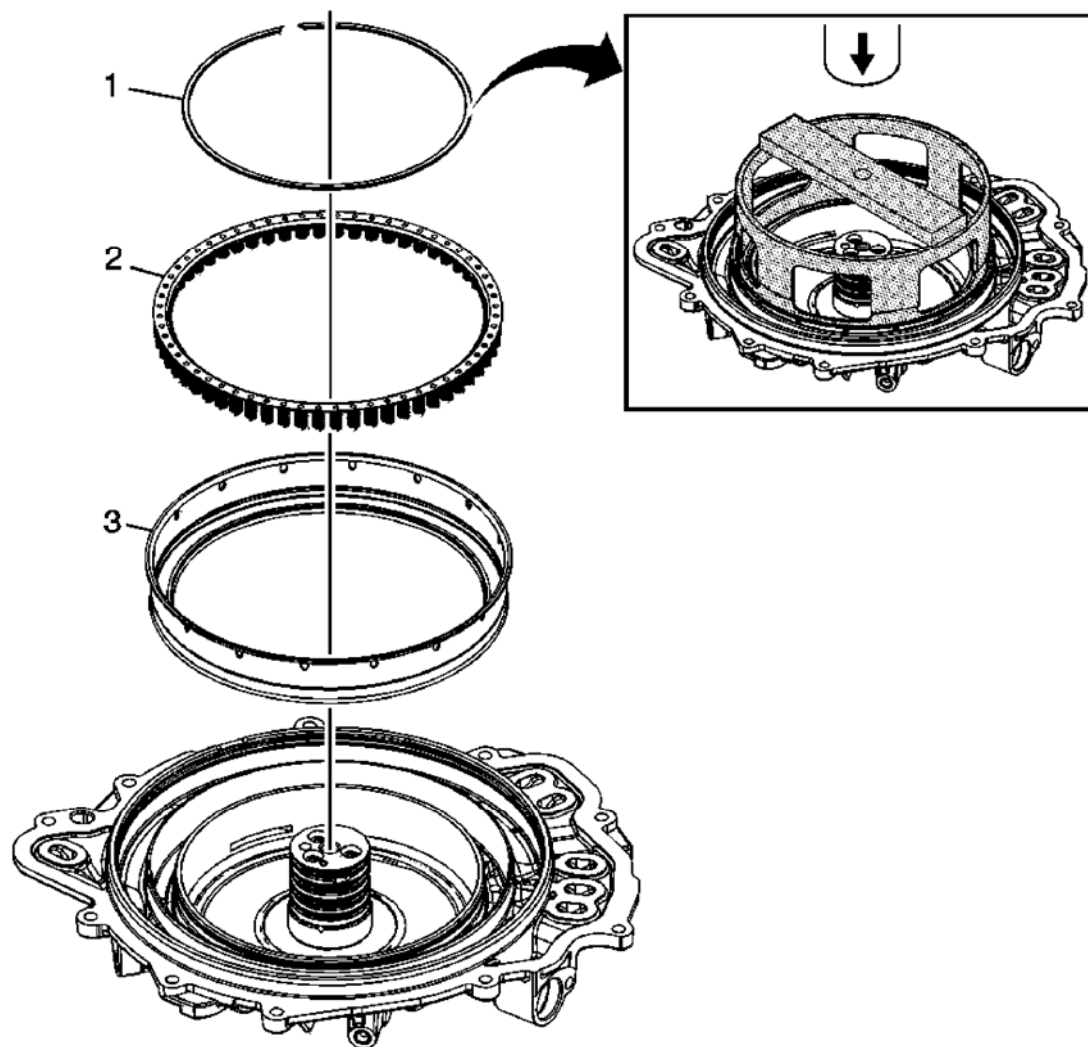


Fig. 67: 2-6 Clutch Piston

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	2-6 Clutch Spring Retaining Ring Special Tools: J-46632: Spring Compressor For equivalent regional tools, refer to Special Tools .
2	2-6 Clutch Spring Assembly
3	2-6 Clutch Piston Tip: Inspect piston seals for damage and/or wear. Piston is reusable.

Clean and Inspect

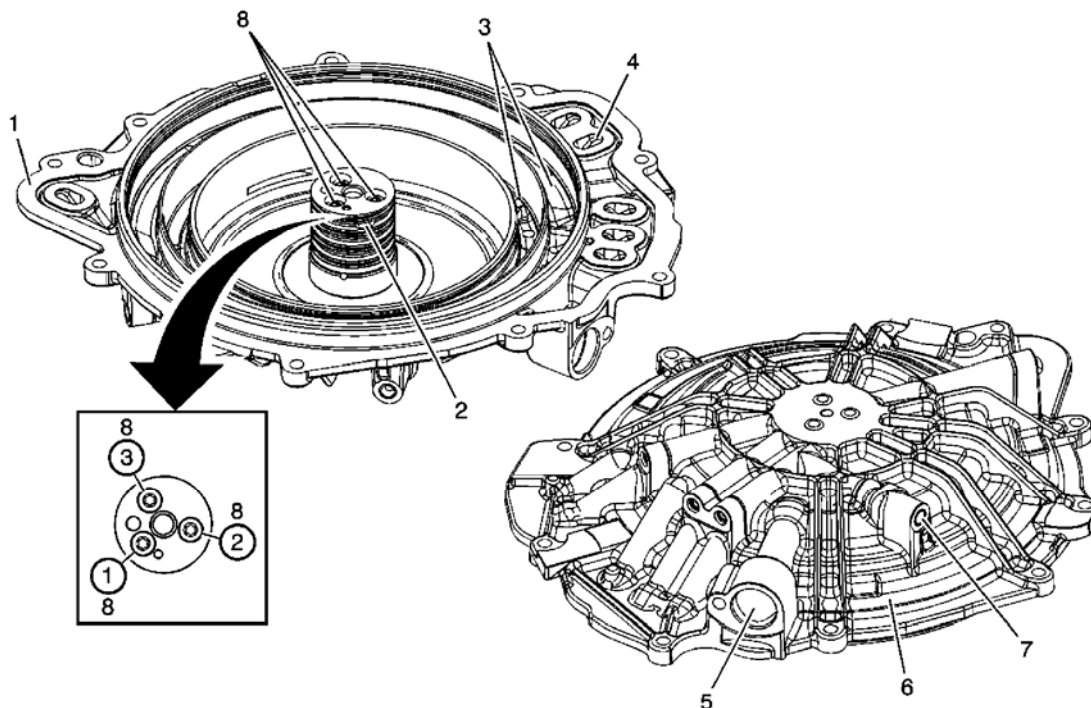


Fig. 68: Identifying Case Cover Assembly Components & Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

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 case cover assembly, including threads, with clean solvent. 2. Clean gasket sealing surfaces. Remove all residual gasket material. 3. Inspect all threaded holes. If necessary, repair any thread damage.	
1	Gasket Sealing Surface
2	Fluid Passages
3	Piston Bores
4	Cover to Case Passages
5	A/Trans Input Speed Sensor Assembly Bore
6	Cover Casting

7	Passage Cup Plugs
8	Input Shaft Support Bolts Procedure: Tightened bolts in sequence. Tighten: 12 N.m (106 lb in).

CASE COVER ASSEMBLY ASSEMBLE

Fluid Seal Ring Installation

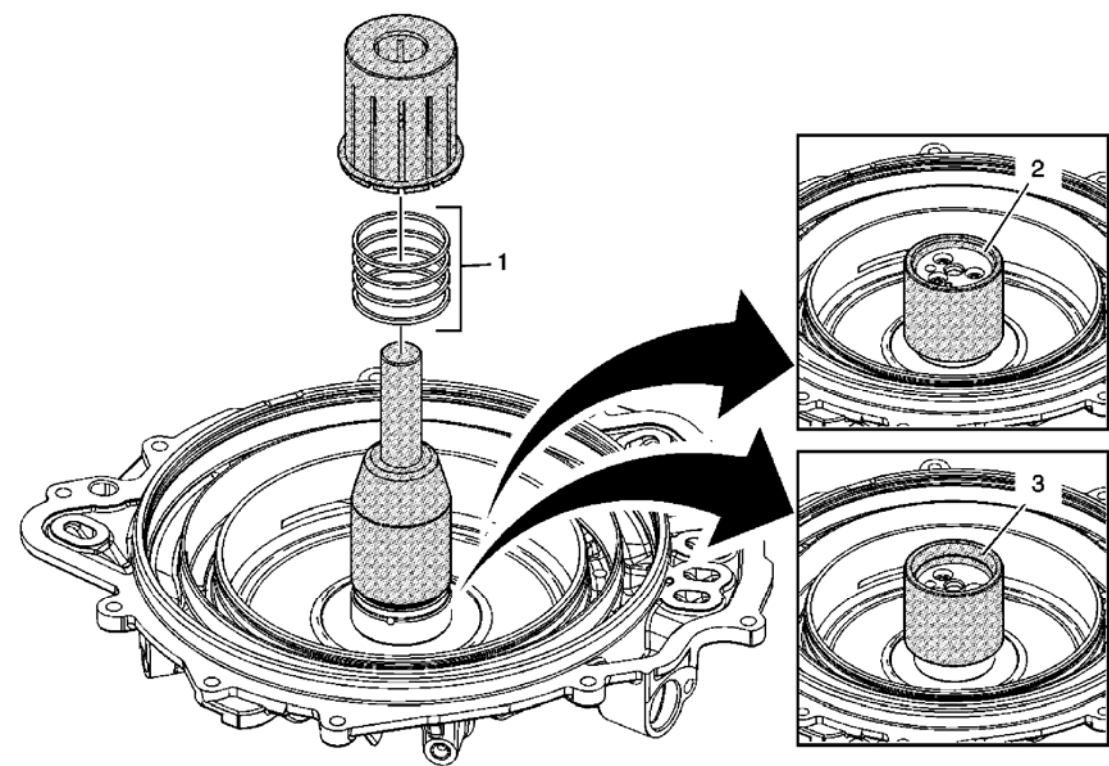


Fig. 69: Fluid Seal Ring
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	3-5 Reverse and 4-5-6 Clutch Fluid Seal Ring
	Procedure 1. Place J 46620-3 which is part of J-46620: seal installer over the case cover 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: seal installer.

1	- Use J 46620-2 which is part of J-46620: seal installer to push the fluid seal ring down over J 46620-3 which is part of J-46620: seal installer into the hub ring groove. - Repeat the above steps to install all 4 seal rings, adjusting J 46620-3 which is part of J-46620: seal installer to the appropriate ring groove. Special Tools: J-46620: Seal Installer For equivalent regional tools, refer to <u>Special Tools</u> .
2	Small Chamfer Up CAUTION: Do not force J 46620-1 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 J 46620-1 is difficult to install over the seal rings. Procedure: Install J 46620-1 which is part of J-46620: seal installer with the large chamfer end down over the fluid seal rings and leave J 46620-1 which is part of J-46620: seal installer on the seals for at least 60 seconds.
3	Large Chamfer Up Procedure - Install J 46620-1 which is part of J-46620: seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. - Leaving J 46620-1 which is part of J-46620: seal installer on the fluid seal rings for an extended period of time could cause a fluid leak on the initial clutch piston circuit until the seal rings warm up and expand to the proper dimension.

2-6 Clutch Piston Installation

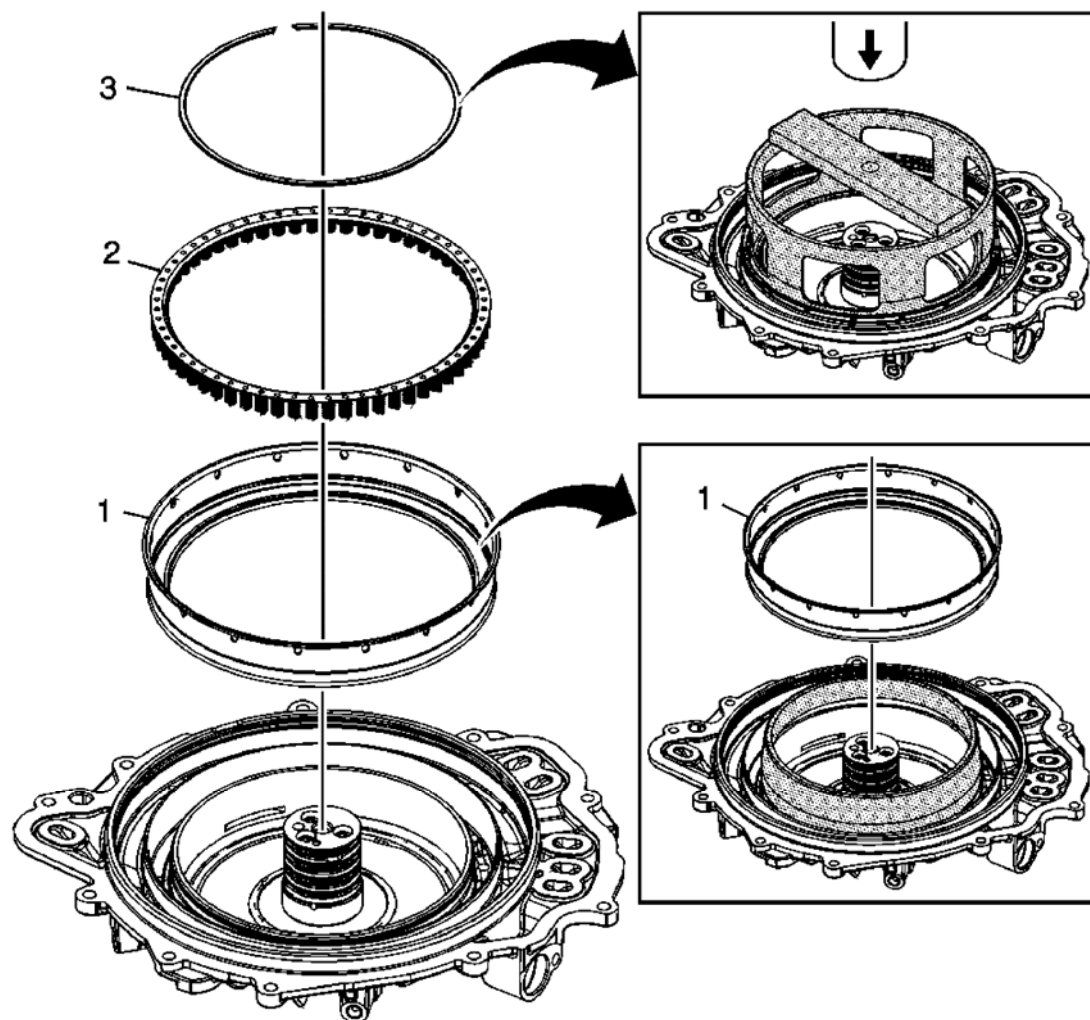


Fig. 70: 2-6 Clutch Piston

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	2-6 Clutch Piston Procedure: J-46621: seal protector prevents the piston seal lip from damage over the retaining ring groove during installation. Apply a thin coat of ATF to the O.D. of J-46621: seal protector to ease the installation of the piston. Special Tools: J-46621: Seal Protector For equivalent regional tools, refer to Special Tools .
2	2-6 Clutch Spring Assembly
	2-6 Clutch Spring Assembly Procedure

3

1. Install the retaining ring with the opening positioned to the top of the case cover.
2. Place the retainer ring inside **J-46632**: spring compressor prior to placing **J-46632**: spring compressor onto the spring.

Special Tools:

J-46632: Spring Compressor

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

Low and Reverse Clutch Piston Installation

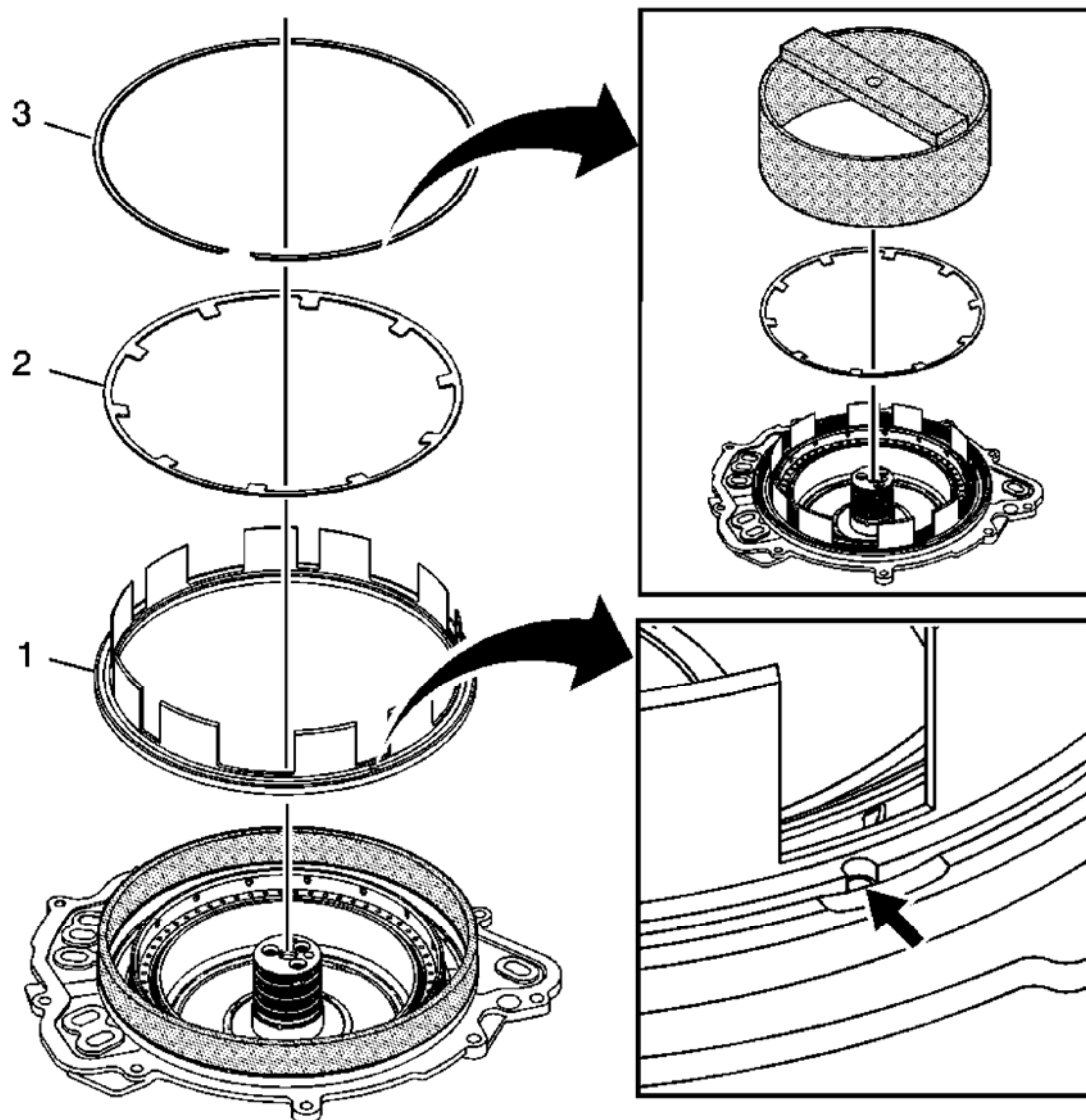


Fig. 71: Low & Reverse Clutch Piston

Callout	Component Name
1	Low and Reverse Clutch Piston Assembly Procedure 1. Install the L/R piston with the air bleed positioned at the alignment feature on the cover, using J-46628-1: seal protector. This will orient the piston fingers with the openings in the case. 2. J-46628-1: seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of J-46628-1: seal protector to ease the installation of the piston. Special Tools: J-46628-1: Piston Seal Protector For equivalent regional tools, refer to <u>Special Tools</u> .
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Spring Retaining Ring Tip: Do not align the retainer opening with other retaining ring openings. Special Tools: J-46628-2: Spring Compressor For equivalent regional tools, refer to <u>Special Tools</u> .

2-6 and Low-Reverse Piston Function Inspection

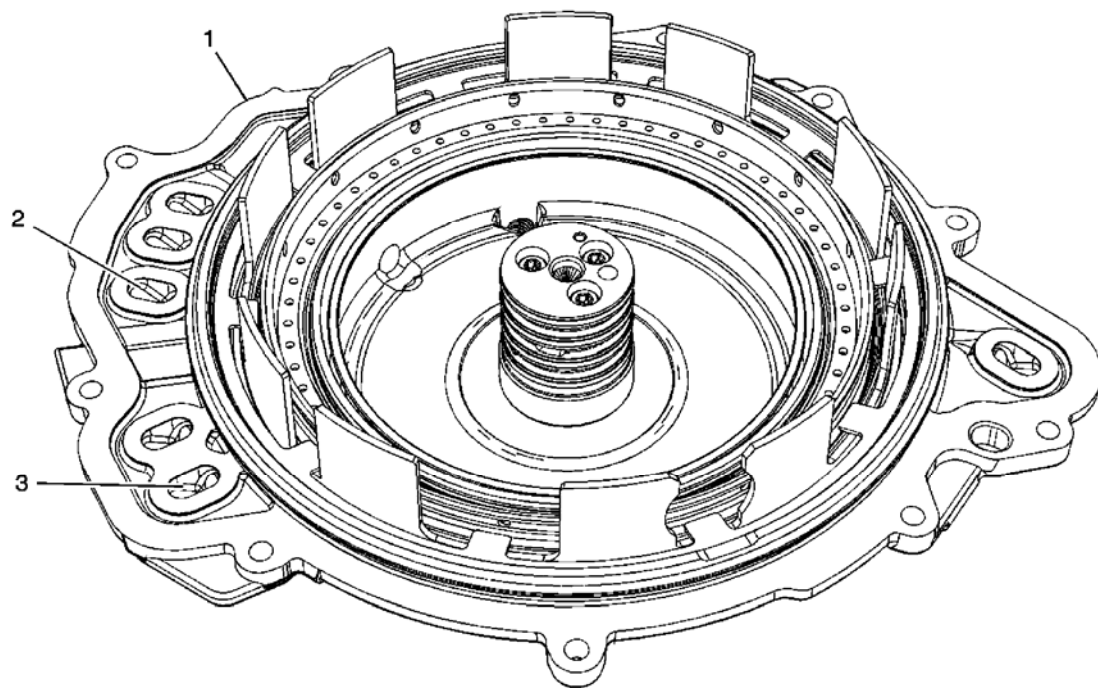


Fig. 72: 2-6 & Low-Reverse Piston
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Case Cover Assembly Tip: The fluid seal rings should be in place and not damaged.
2	2-6 Clutch Feed Passage CAUTION: Regulate the air pressure to 40 psi maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure: Apply shop air to the 2-6 clutch feed. Observe the 2-6 piston movement. Tip: Minimal piston movement and excessive air leaking could indicate damage to the 2-6 piston seals or improper assembly.
3	Low and Reverse Clutch Feed Passage CAUTION: Regulate the air pressure to 40 psi maximum. High pressure could cause the piston to over travel and damage the piston seals. Procedure:

Apply shop air to the Low and Reverse clutch feed. Observe the Low and Reverse piston movement.
Tip: Minimal piston movement and excessive air leaking could indicate damage to the Low and Reverse piston seals or improper assembly.

Input Speed Sensor Installation

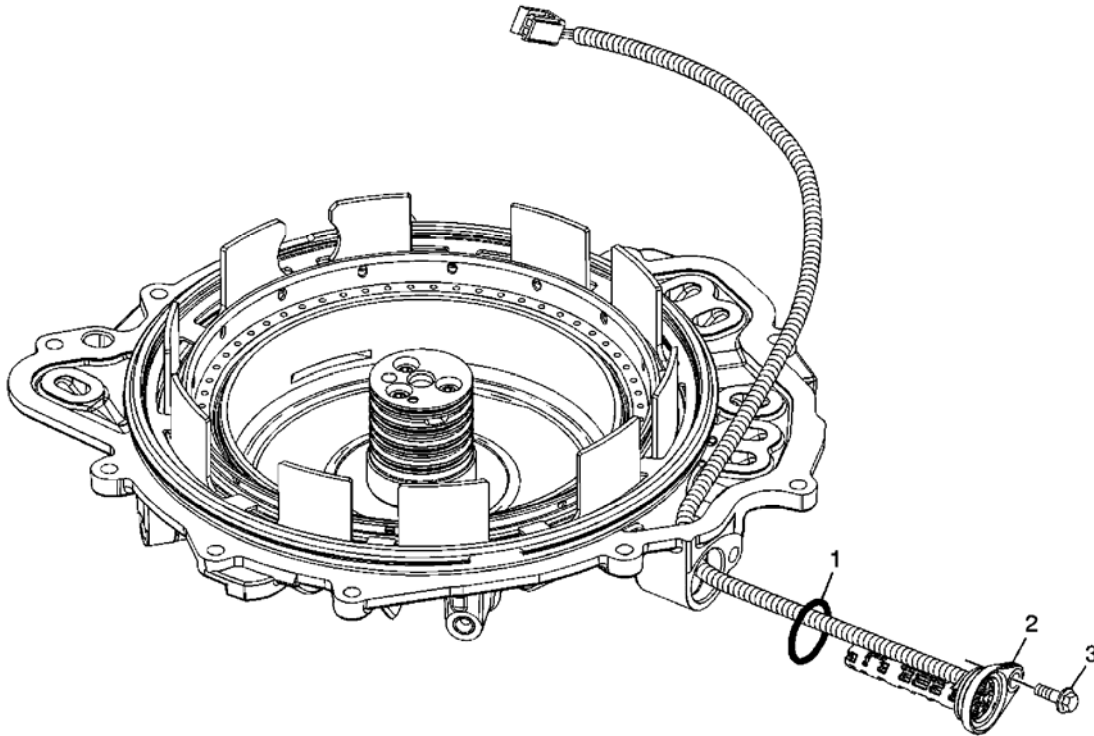


Fig. 73: Input Speed Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Input Speed Sensor Seal
2	A/Trans Input Speed Sensor Assembly
3	A/Trans Input Speed Sensor Bolt M6 x 25 CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Apply threadlocker or equivalent to the input speed sensor bolt. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> . Tip: The seal is coated with a dry lubricant. If the coating is missing, lubricate the seal with automatic transmission fluid prior to installation.

Tighten: 9 N.m (7 lb ft)

CASE COVER ASSEMBLY INSTALLATION

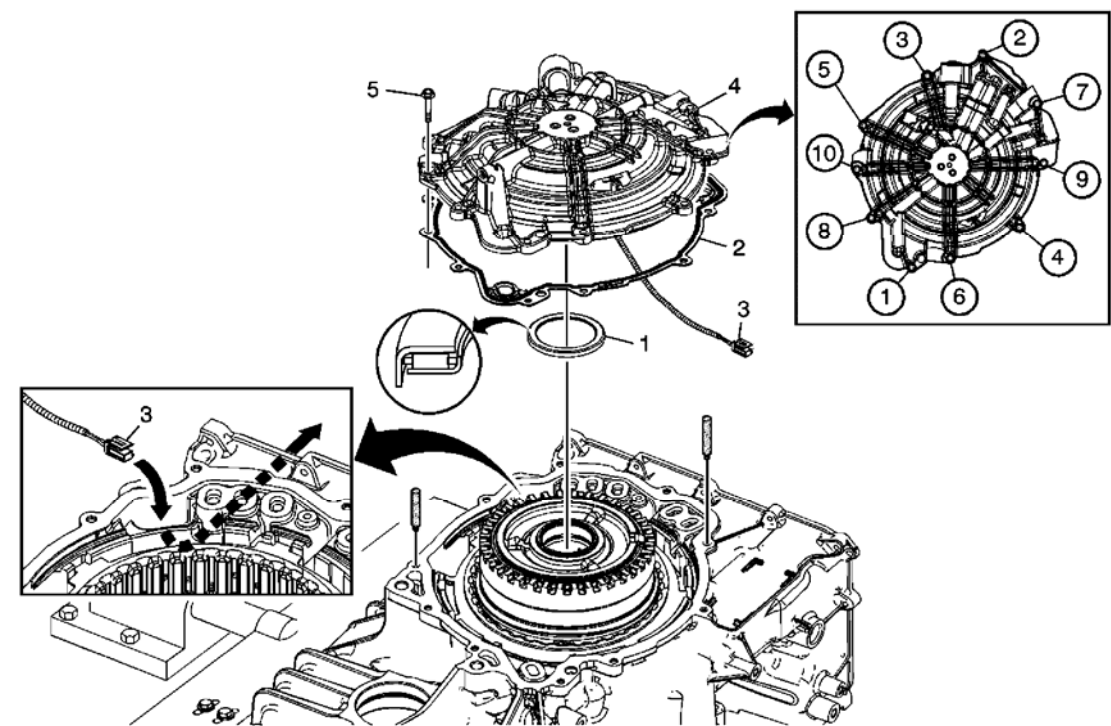


Fig. 74: Identifying Case Cover Assembly & Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Input Shaft Thrust Bearing Tip: Note location of the orientation lip on bearing. All thrust bearings can only be assembled one way.
2	A/Trans Case Cover Gasket
3	Input Speed Sensor Wire Harness Tip: Route the input speed sensor wire harness through the case passage.
4	A/Trans Case Cover Assembly Procedure 1. Use guide pins to install the case cover assembly to prevent damage to the input shaft thrust bearing. 2. Pull the input speed sensor wire harness through the case passage while lowering the cover assembly onto the case.

	Special Tools: 39068: Guide Pins For equivalent regional tools, refer to Special Tools .
5	A/Trans Case Cover Assembly Bolt M6 x 30 (Qty: 10) CAUTION: Refer to Fastener Caution . Procedure: Tighten in sequence shown. Tighten: 12 N.m (106 lb in)

FRONT DIFFERENTIAL CARRIER FINAL ROTATIONAL TORQUE MEASUREMENT

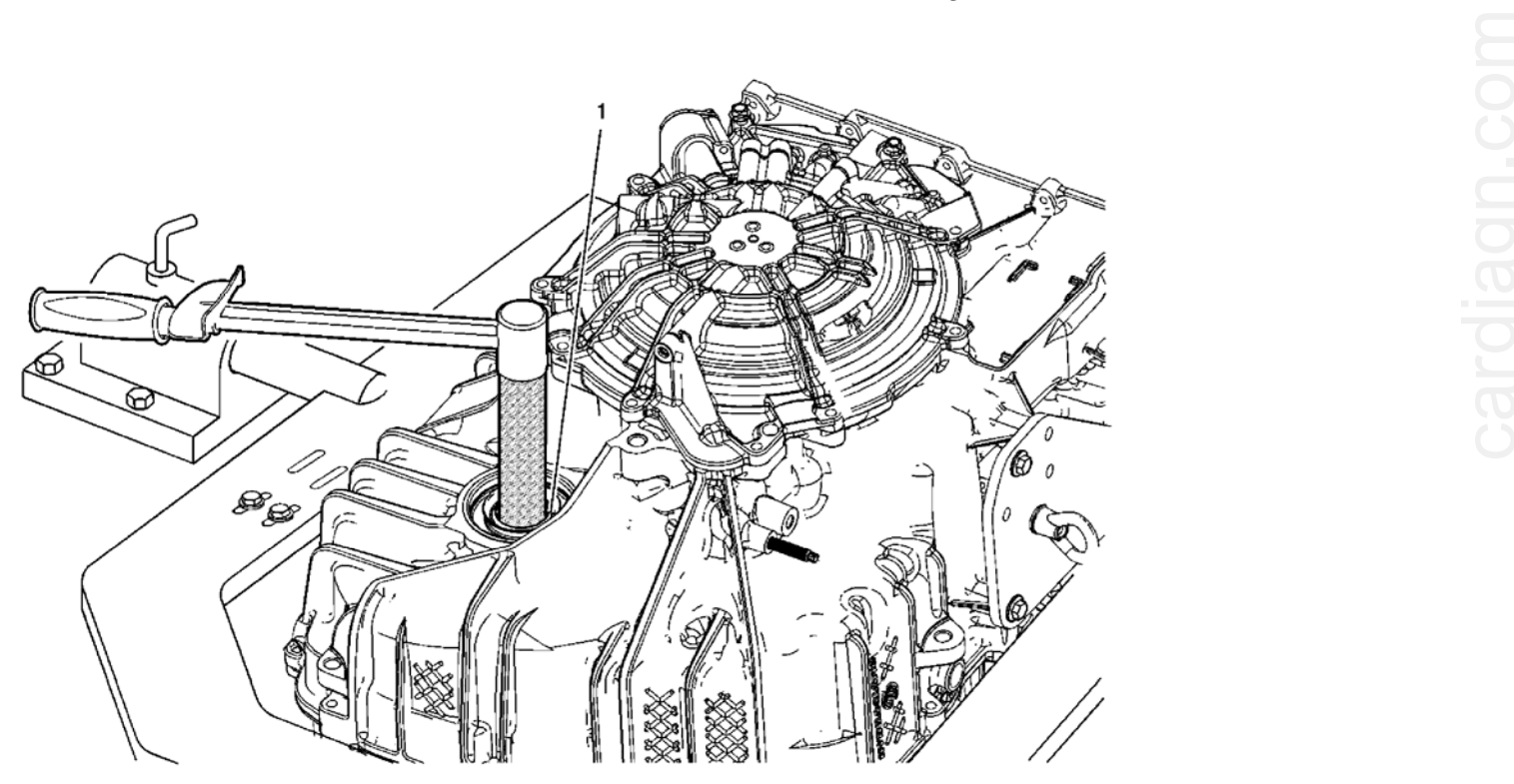


Fig. 75: Front Differential Carrier Final Rotational Torque Measurement
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
	Front Differential Carrier Assembly CAUTION:

Low bearing pre-load will cause premature failure of the front differential drive pinion gear.

CAUTION:

Refer to Fastener Caution .

Tip:

- If the turning torque is not within specifications, the transfer gear assembly and differential bearing thrust washer is incorrect and must be corrected. Refer to Front Differential Drive Pinion Gear Bearing Thrust Washer and Front Differential Bearing Washer Measurement.
- Use a dial or beam torque wrench with **DT-47793**: differential rotating tool to measure turning torque.

Tighten: 14-22 N.m (10-16 lb ft)

Special Tools:

DT-47793: Differential Rotating Tool

For equivalent regional tools, refer to Special Tools .

1

CONTROL VALVE BODY ASSEMBLY DISASSEMBLE

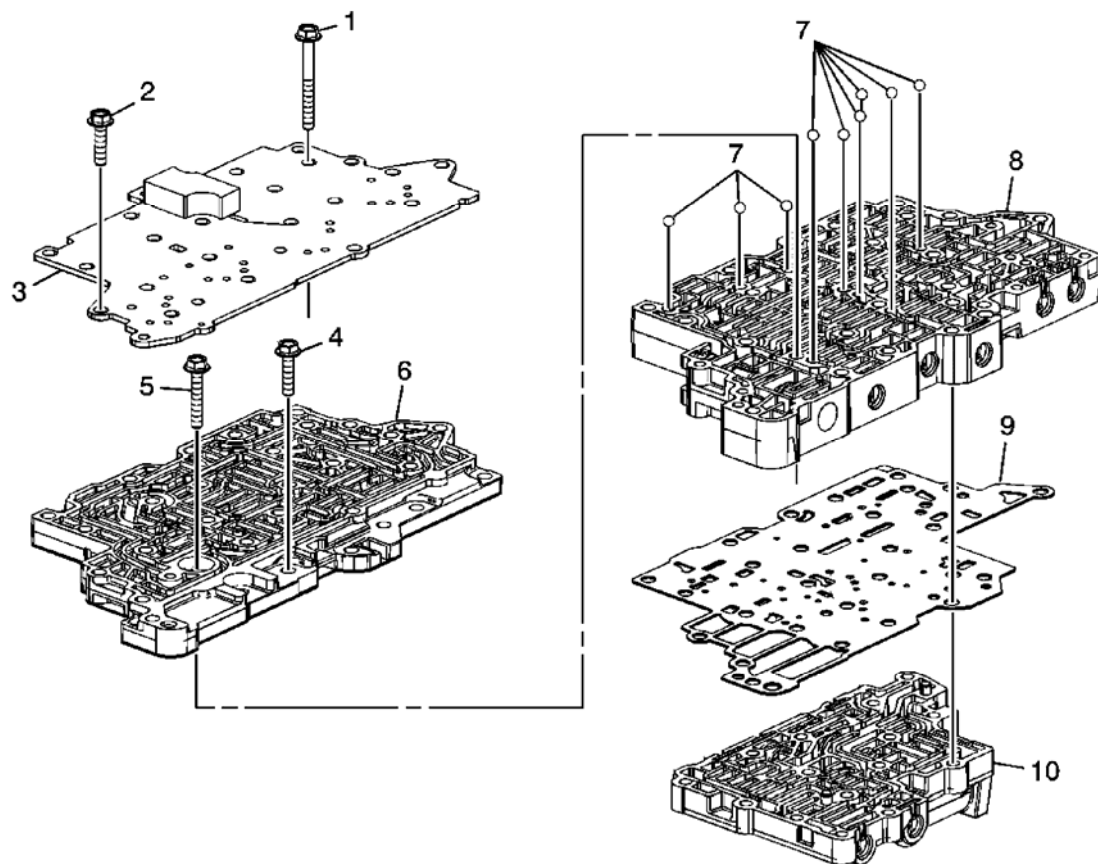


Fig. 76: Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Bolt M6 x 65 (Qty: 5)
2	Control Valve Body Bolt M6 x 35 (Qty: 3)
3	Control Valve Channel Upper Plate Assembly Tip: Inspect the upper channel plate bolt pass through holes for damage or brinelling. Any damage near the PCS feed hole will cause incorrect pressure switch operation. Replace as necessary.
4	Control Valve Body Bolt M6 x 55 (Qty: 2)
5	Control Valve Body Bolt M6 x 55 (Qty: 1)
6	Control Valve Channel Plate Assembly
7	Control Valve Body Ball Check Valve (Qty: 9)
8	Control Valve Upper Body Assembly
9	Control Valve Lower Body Spacer Plate Assembly Tip: Discard the spacer plate assembly.
10	Control Valve Lower Body Assembly

CONTROL VALVE LOWER BODY ASSEMBLY CLEANING AND INSPECTION

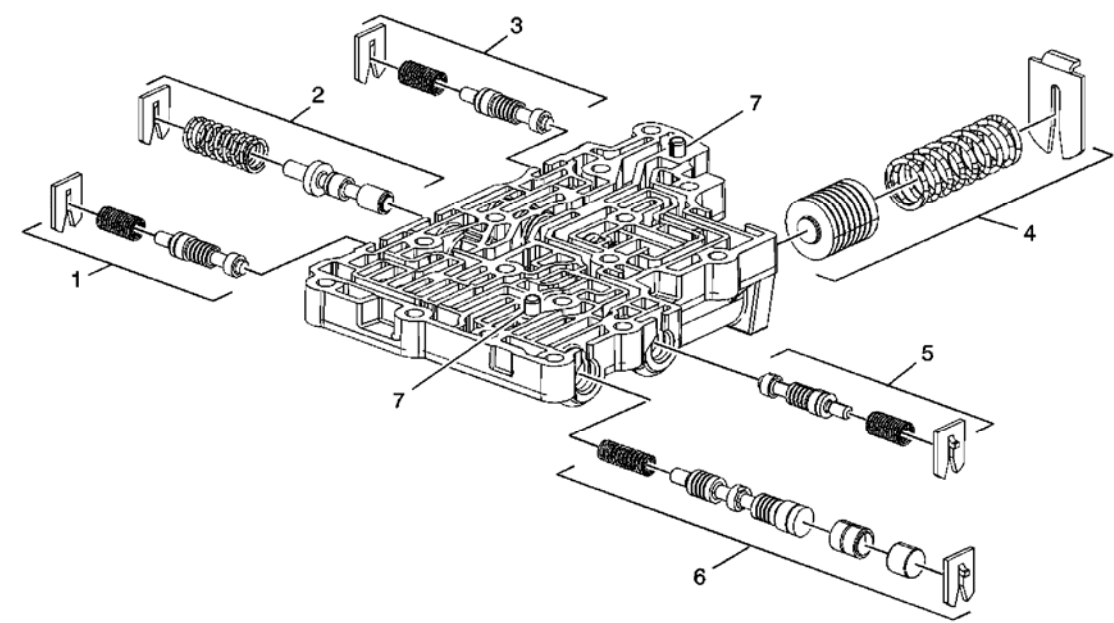


Fig. 77: Control Valve Lower Body Assembly
Courtesy of GENERAL MOTORS CORP.

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 lower body is replaceable only as an assembly.	
1	3-5 Reverse Clutch Boost Valve Train
2	Accumulator Feed Limit Valve Train
3	4-5-6 Clutch Boost Valve Train
4	4-5-6 Clutch Accumulator Piston Assembly
5	1-2-3-4 Clutch Boost Valve Train
6	1-2-3-4 Clutch Regulator Valve Train

Tip: Inspect Valve Body locating pins for proper installed height of 4.25 mm (0.17 in).

CONTROL VALVE UPPER BODY ASSEMBLY CLEANING AND INSPECTION

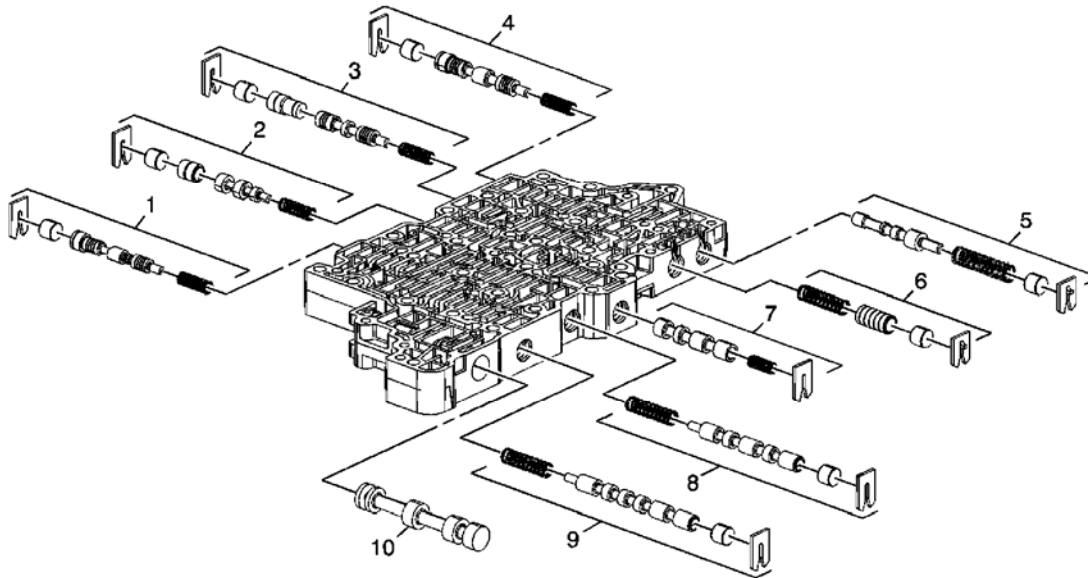


Fig. 78: Control Valve Upper Body Assembly
Courtesy of GENERAL MOTORS CORP.

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 upper body is replaceable only as an assembly.	
1	1st Reverse and 4-5-6 Clutch Regulator Valve Train
2	TCC Regulator Apply Valve Train
3	2-6 Clutch Regulator Valve Train

4	3-5 Reverse Clutch Regulator Valve Train
5	Pressure Regulator Valve Train
6	Isolator Valve Train
7	TCC Control Valve Train
8	Clutch Select Solenoid #3 Valve Train
9	Clutch Select Solenoid #2 Valve Train
10	Manual Valve

CONTROL VALVE CHANNEL PLATE CLEANING AND INSPECTION

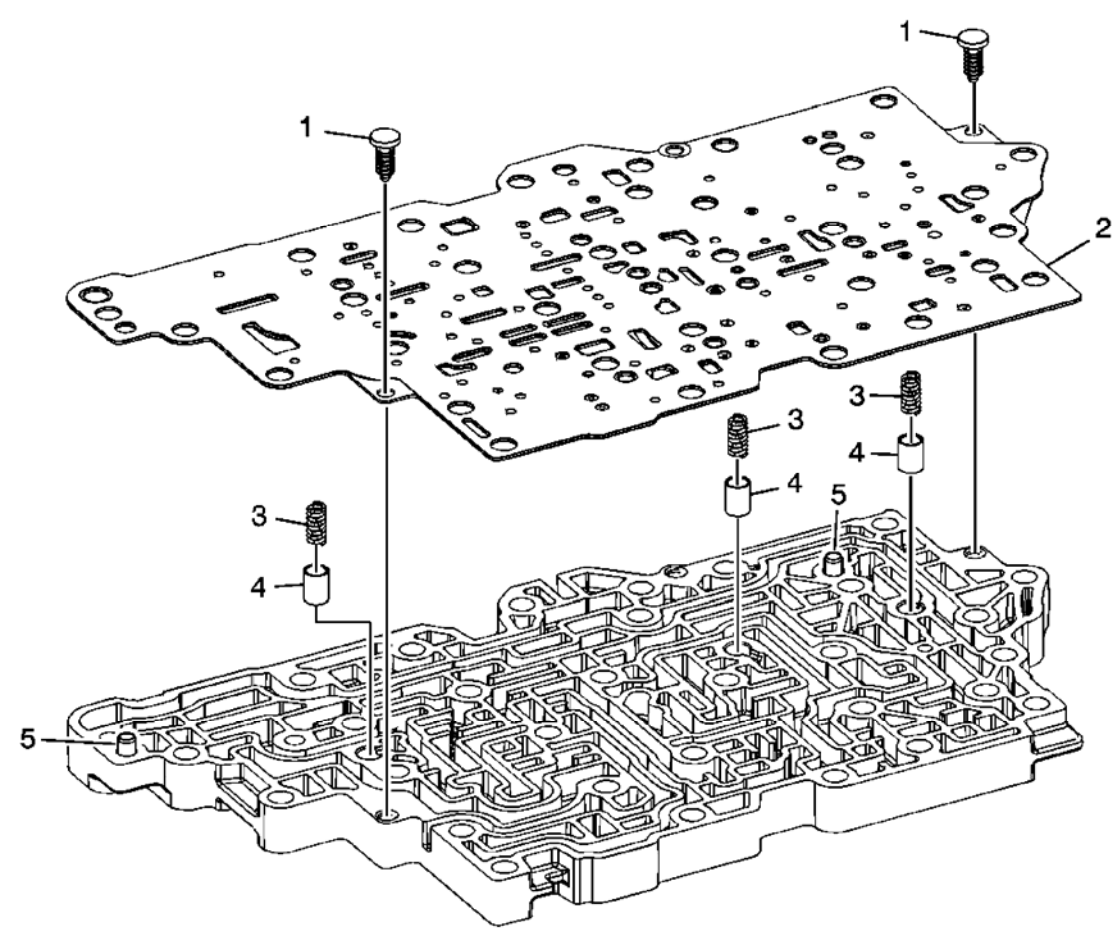


Fig. 79: Control Valve Channel Plate
 Courtesy of GENERAL MOTORS CORP.

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.

1	Control Valve Body Spacer Plate Retainer (Qty: 2)
2	Control Valve Upper Body Spacer Plate Assembly
3	Actuator Feed Accumulator Spring (Qty: 3)
4	Actuator Feed Accumulator Piston (Qty: 3)
5	Control Valve Body Locating Pin (Qty: 2) Tip: Inspect locating pins for proper installed height of 4.25 mm (0.17 in).

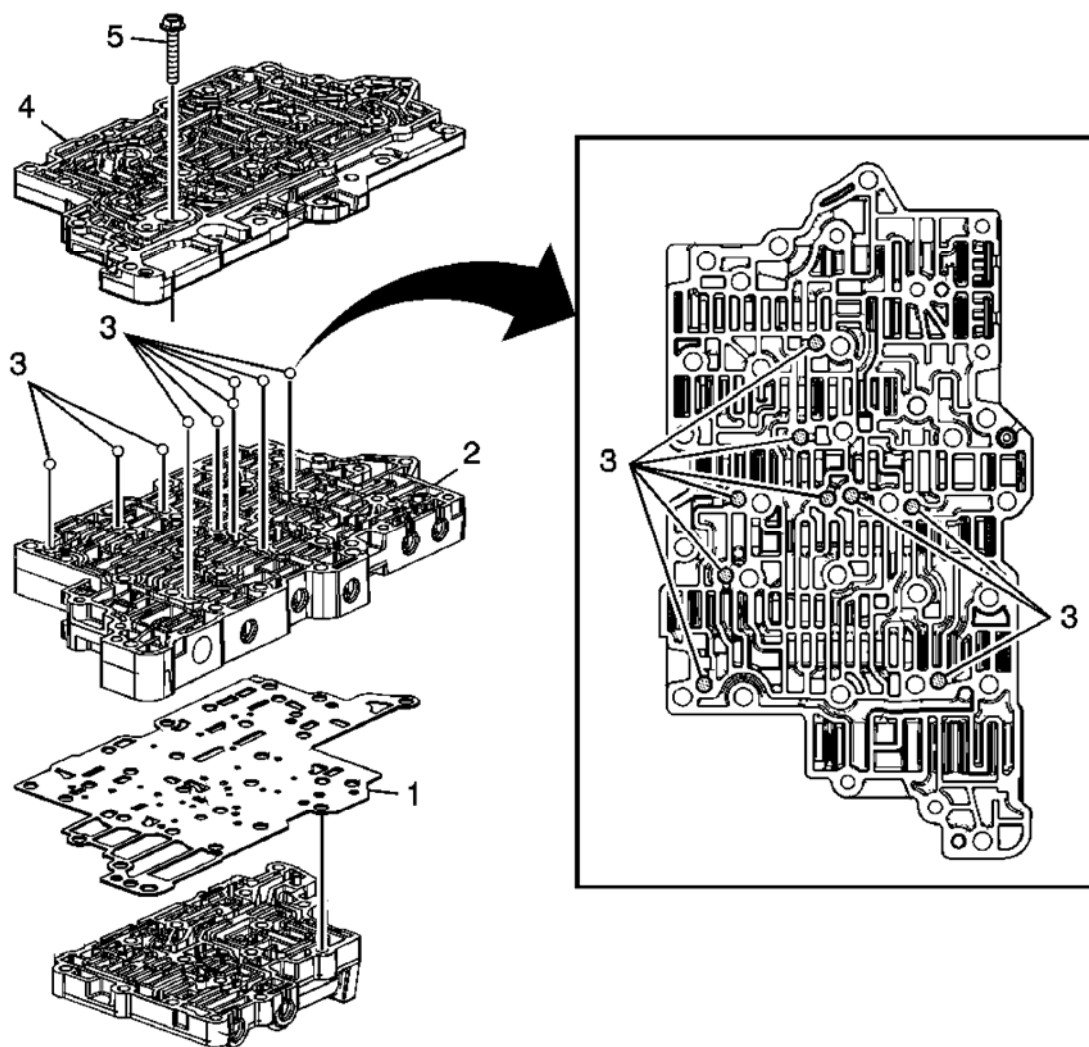
CONTROL VALVE BODY ASSEMBLY ASSEMBLE**Lower and Upper Body Assemble**

Fig. 80: Lower & Upper Body

Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Lower Body Spacer Plate Assembly CAUTION: Do not use the old spacer plate. Install a NEW spacer plate. Reusing an old spacer plate may cause internal transmission leaks and transmission damage. Tip: Inspect the upper channel plate bolt through holes for damage or brinelling. Any damage around the PCS switch feed holes could cause leakage around the PCS switch seals. Replace as necessary.
2	Control Valve Upper Body Assembly
3	Control Valve Body Ball Check Valve (Qty: 9) CAUTION: Do not use any type of grease or other material to hold the check ball valves in place during assembly. Grease will cause the valves to not operate properly, resulting in damage to the transmission.
4	Control Valve Channel Plate Assembly
5	Control Valve Body Bolt 6 x 55 (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 12 N.m (9 lb ft)

Channel Plate and Upper Channel Plate Assemble

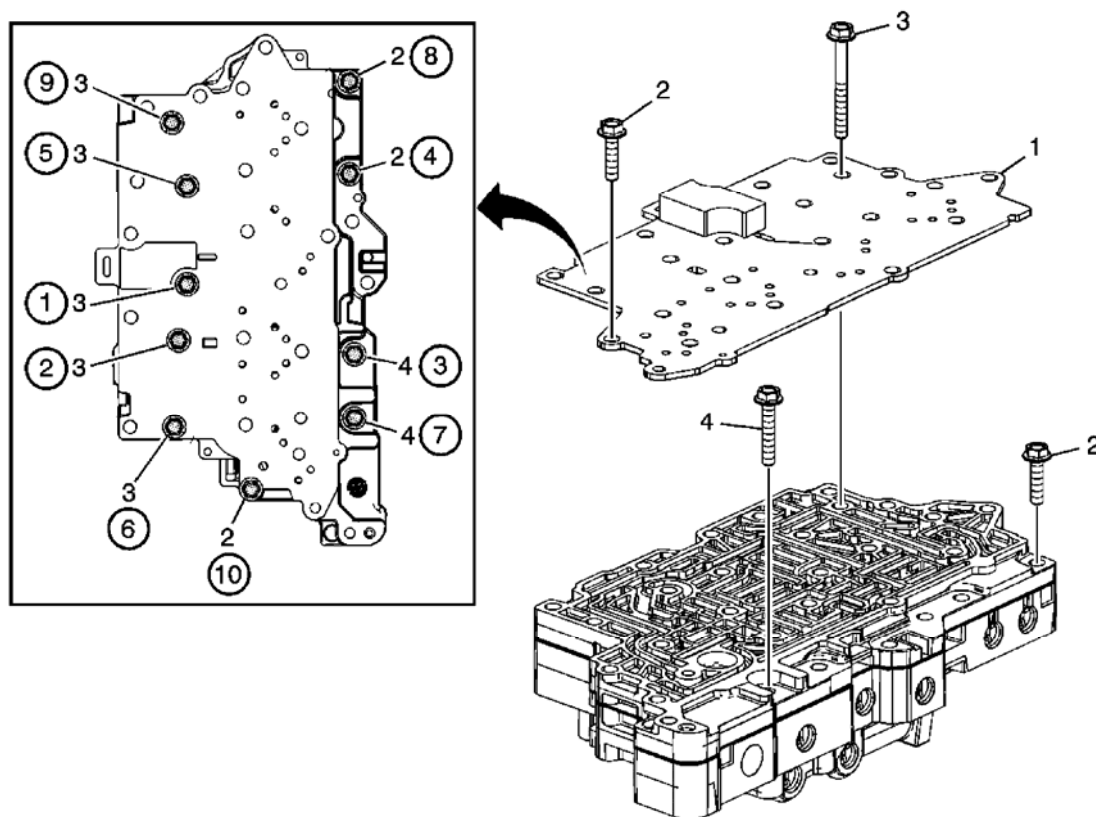


Fig. 81: Identifying Control Valve Channel Upper Plate Assembly & Bolt Tightening Sequence
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Channel Upper Plate Assembly Tip: Inspect the upper channel plate bolt pass through holes for damage or burnelling. Any damage near the PCS feed holes could cause leaking around the PCS switch seal. Replace as necessary.
2	Control Valve Body Bolt M6 x 35 (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Hand tighten for alignment, then tighten in sequence, after all bolts are installed. Tighten: 12 N.m (9 lb ft)
3	Control Valve Body Bolt M6 x 65 (Qty: 5) Procedure: Tighten in sequence.

	Tighten: 12 N.m (9 lb ft)
4	Control Valve Body Bolt M6 x 55 (Qty: 2) Procedure: Tighten in sequence. Tighten: 12 N.m (9 lb ft)

CONTROL VALVE BODY ASSEMBLY INSTALLATION

Output Speed Sensor and Valve Body Installation

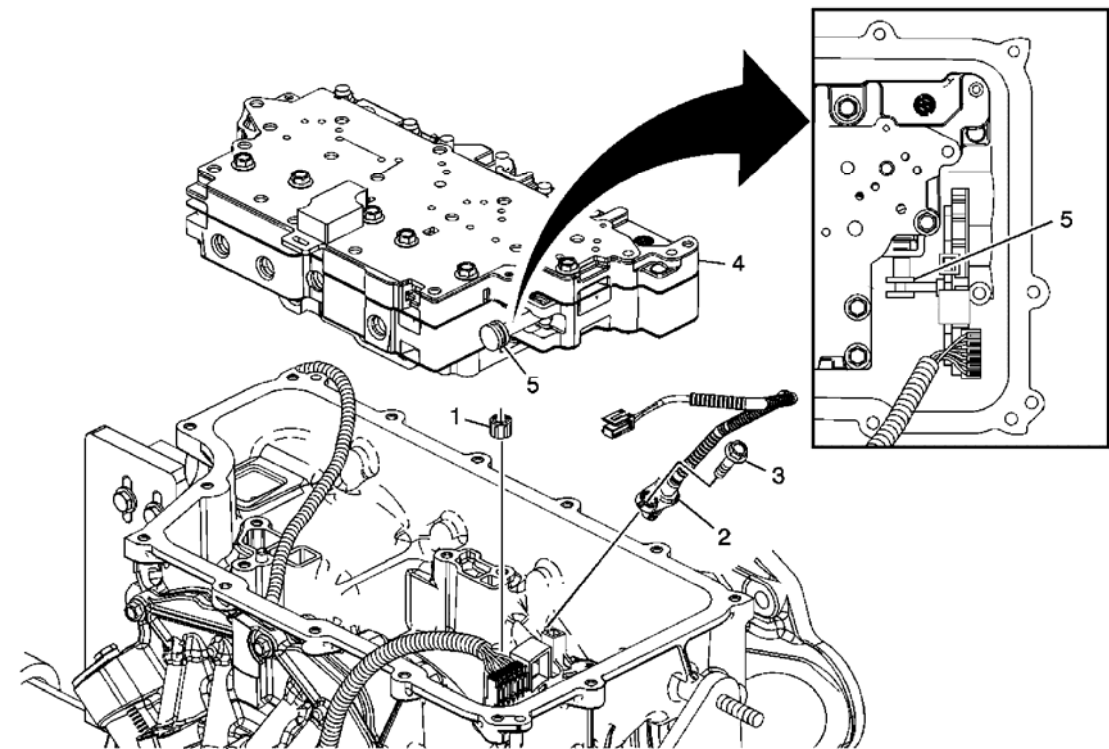


Fig. 82: Output Speed Sensor & Valve Body
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	1-2-3-4 Clutch Fluid Passage Seal
2	A/Trans Output Speed Sensor Assembly
3	A/Trans Output Speed Sensor Assembly Bolt M6 x 25 CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 12 N.m (9 lb ft)
4	Control Valve Body Assembly
5	Manual Valve Tip: - Align the manual valve to the detent lever assembly. - Removing the manual shaft assembly pin will aid in aligning the manual valve to the detent lever. Install the manual shaft pin after the valve body assembly is installed using J 41229: pin installer, if it was not installed previously. Refer to <u>Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal</u>. Special Tools: J 41229: Manual Shaft Pin Installer For equivalent regional tools, refer to <u>Special Tools</u> .

Control Valve Body Bolts Installation

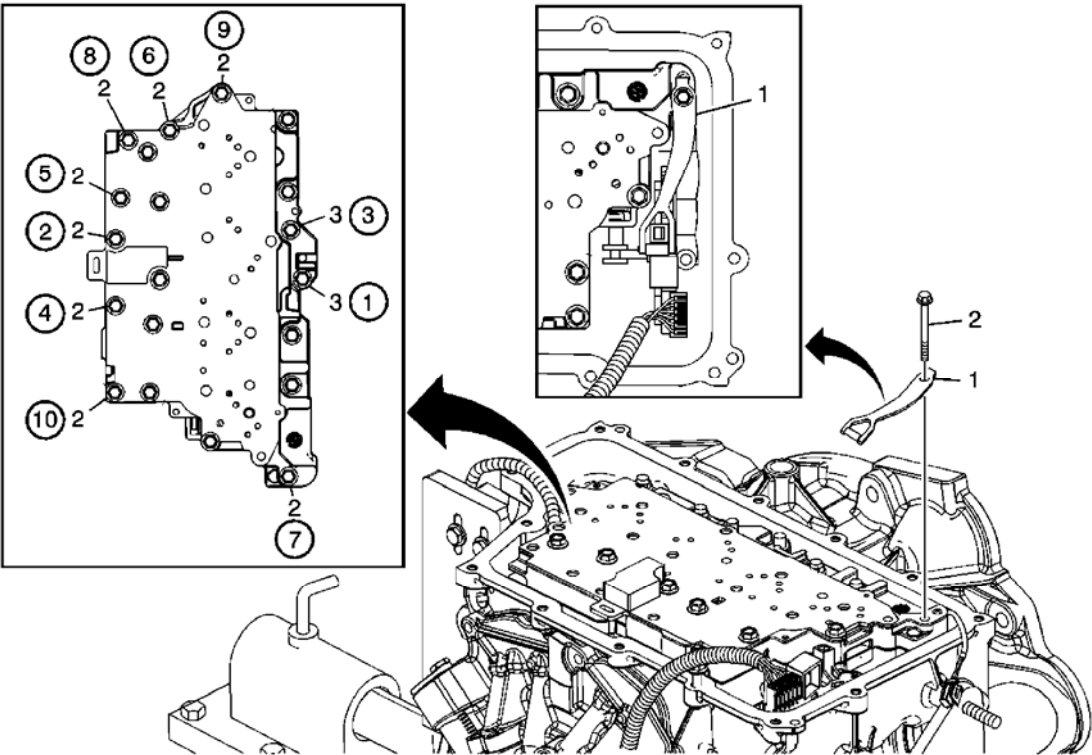


Fig. 83: Identifying Control Valve Body Bolts & Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name

1	Manual Shaft Detent Assembly Tip: Ensure proper alignment of the detent assembly to the detent lever assembly with position switch while tightening the bolt. The detent assembly can move and hit the valve body assembly that could cause improper engagement with the detent lever assembly.
2	Control Valve Body Bolt M6 x 65 (Qty: 8) CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Tighten in sequence. Tighten: 12 N.m (9 lb ft).
3	Control Valve Body Bolt M6 x 55 (Qty: 2) Procedure: Tighten in sequence. Tighten: 12 N.m (9 lb ft).

Filter Plate Installation

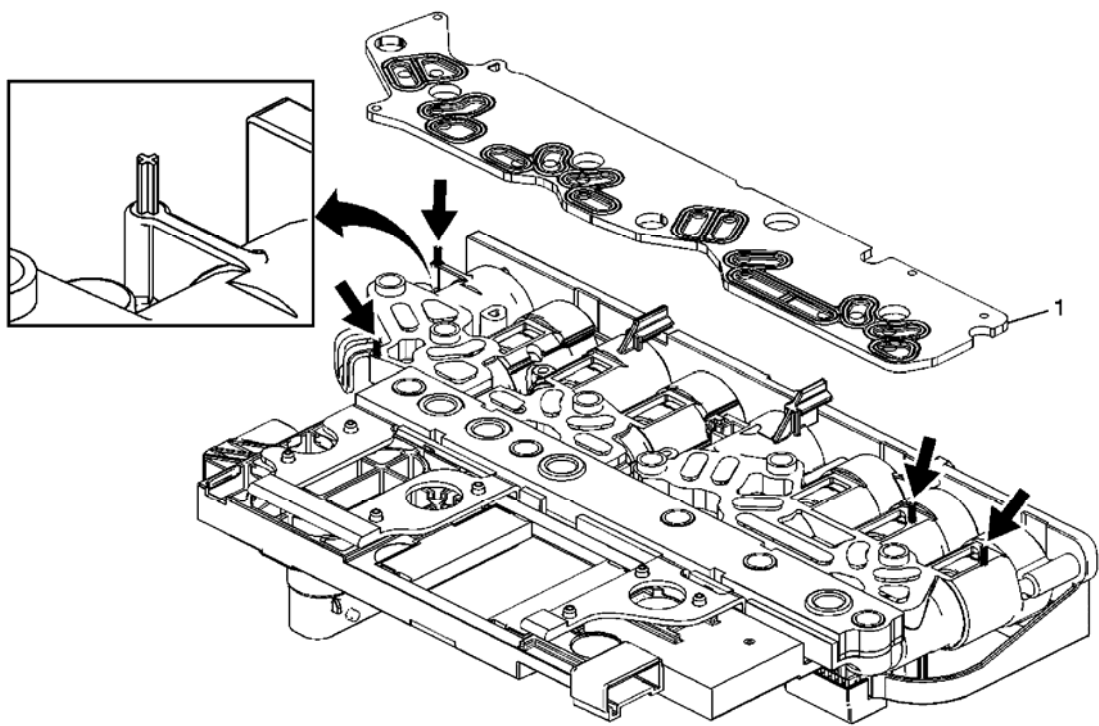


Fig. 84: Filter Plate

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 oil seals.

Control Solenoid (w/Body and TCM) Valve Assembly Installation

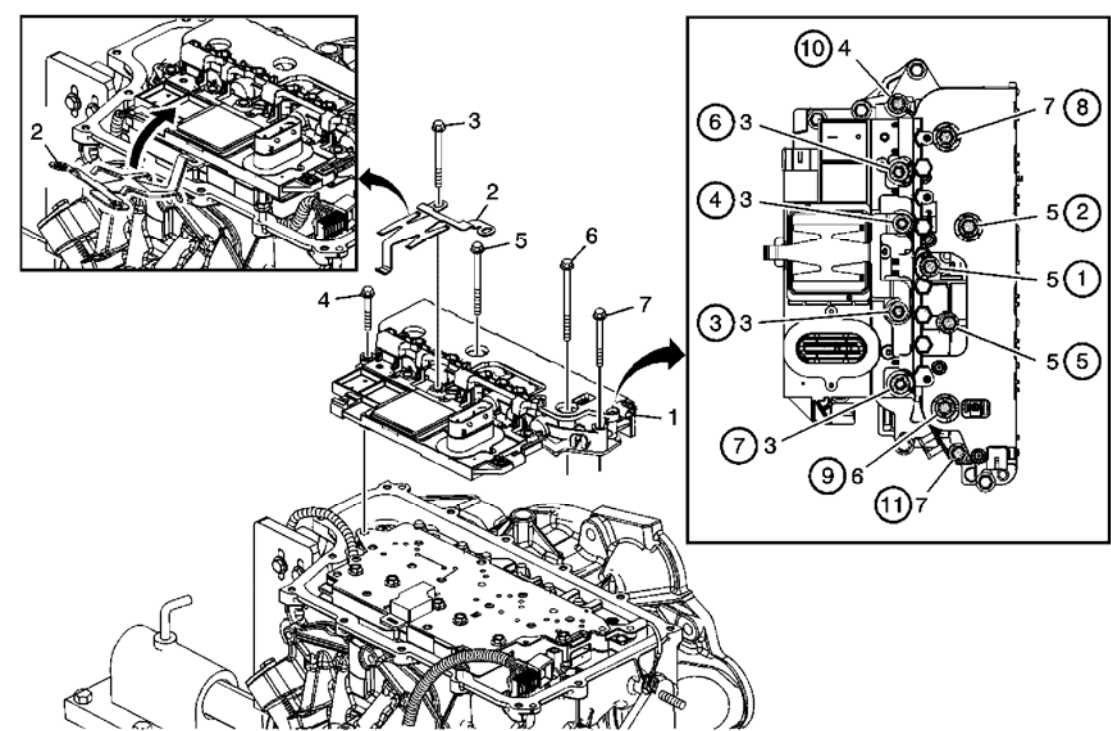


Fig. 85: Identifying Control Solenoid (w/Body & TCM) Valve Assembly & Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
CAUTION: Refer to <u>Fastener Caution</u> .	
Preliminary Procedure: Install all bolts before tightening, then tighten in sequence to 12 N.m (9 lb ft).	

1	Control Solenoid (w/Body and TCM) Valve Assembly CAUTION: Do not drop the control solenoid with body and transmission control module (TCM) valve assembly. Internal damage can occur if the control solenoid with body and TCM valve assembly is dropped. DO NOT reuse the control solenoid with body and TCM valve assembly if it is dropped.
2	Control Solenoid Valve Spring Tip: • If the control solenoid spring is missing or improperly installed, the TCM may overheat causing the TCM to shut down. The transmission will default to 3rd or 5th gear. • Insert tab of spring into slot on spacer plate, then rotate into position.
3	Control Valve Body Bolt M6 x 80 (Qty: 4)
4	Control Valve Body Bolt M6 x 55 (Qty: 1)
5	Control Valve Body Bolt M6 x 95 (Qty: 3)
6	Control Valve Body Bolt M6 x 42 (Qty: 1)
7	Control Valve Body Bolt M6 x 65 (Qty: 2)

Wire Routing and Connector Locations

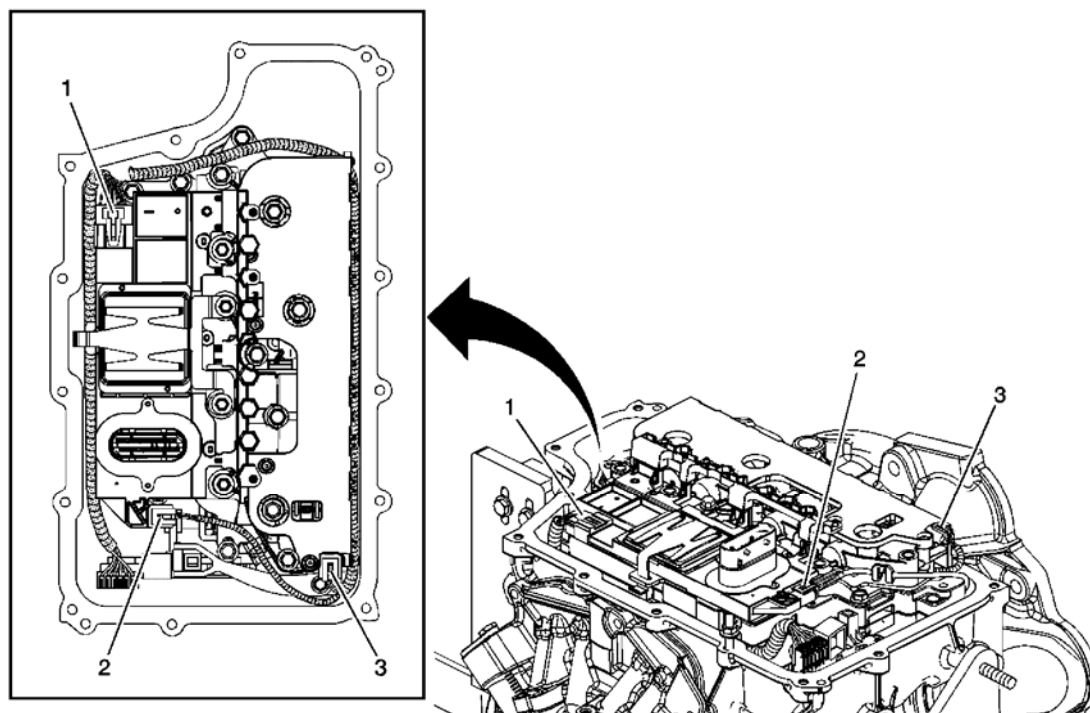


Fig. 86: Wire Routing & Connector Locations
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Route all wires as shown.	
1	Shift Position Switch Connector
2	Output Speed Sensor Connector
3	Input Speed Sensor Connector

Control Valve Body Cover Installation

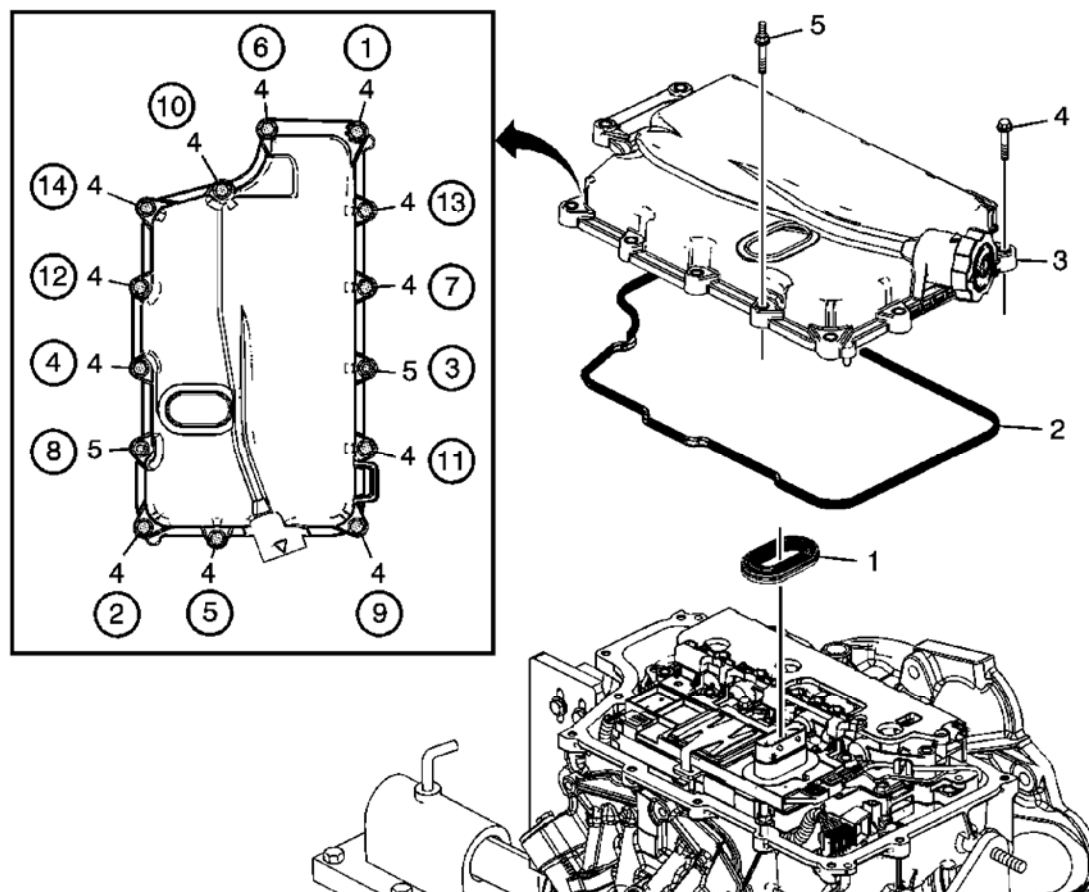


Fig. 87: Identifying Control Valve Body Cover & Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Control Valve Body Cover Wiring Connector Hole Seal Tip: Holes in the seal must face down.
2	Control Valve Body Cover Assembly Gasket
3	Control Valve Body Cover Assembly
	Control Valve Body Cover Bolt M6 x 30 (Qty: 12)

4	CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Tighten in sequence. Tighten: 12 N.m (9 lb ft).
5	Control Valve Body Cover Stud M6 x 30 (Qty: 2) Procedure: Tighten in sequence. Tighten: 12 N.m (9 lb ft).

TORQUE CONVERTER INSTALLATION

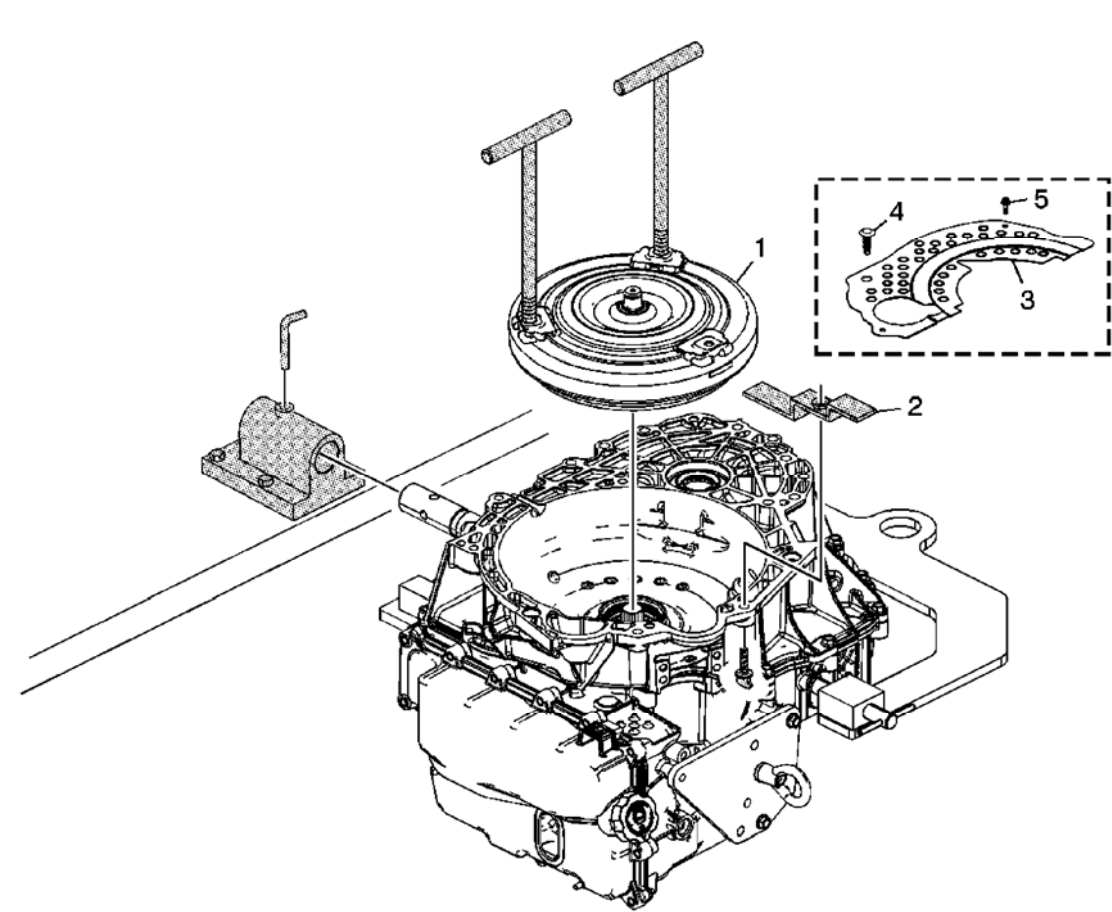


Fig. 88: Torque Converter
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
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1	Torque Converter Assembly CAUTION: Lower the torque converter straight down. Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. Special Tools: J 46409: Torque Converter Lifting Handles For equivalent regional tools, refer to <u>Special Tools</u> .
2	J 21366: Converter Holding Strap WARNING: The torque converter must be held to the torque converter housing by a retaining device such as shipping brackets. Without the retaining device, the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing personal injury and/or property damage.
3	Dust Cover - Model Dependant
4	Dust Cover Push Pin - Model Dependant (Qty: 2)
5	Dust Cover Bolt - Model Dependant CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 75 N.m (37 lb ft)

LIFT PLATE AND HOLDING FIXTURE REMOVAL

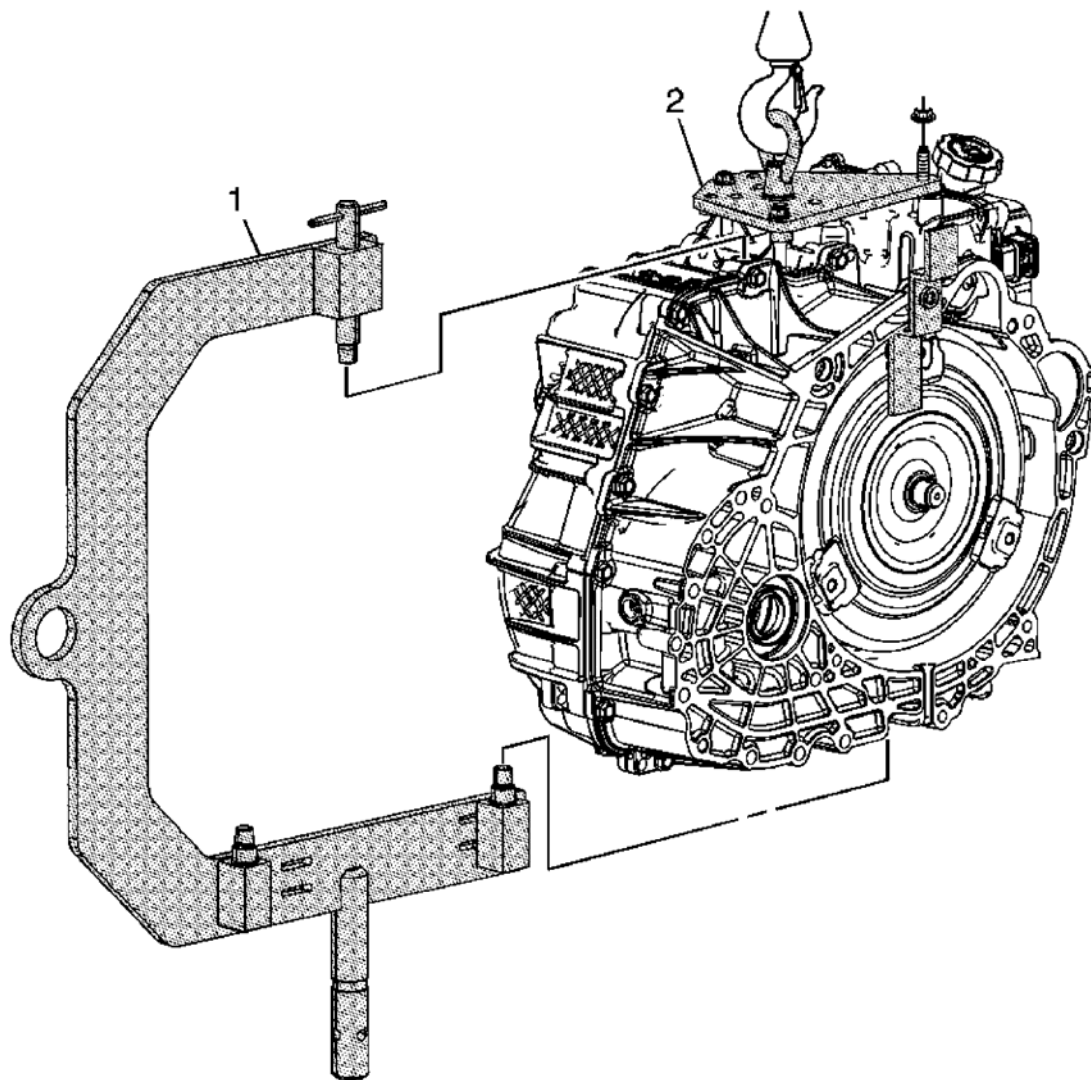


Fig. 89: Lift Plate & Holding Fixture
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	J 46625: Transmission Holding Fixture Tip: Raise the transmission in order to remove the holding fixture. For equivalent regional tools, refer to Special Tools .
2	DT-47811-A: Lift Plate Tip: Lower the transmission assembly onto the transmission jack in order to remove the lift plate. For equivalent regional tools, refer to Special Tools .

REPAIR INSTRUCTIONS - ON VEHICLE

MANUAL SHIFT DETENT LEVER WITH SHAFT POSITION SWITCH ASSEMBLY
REPLACEMENT

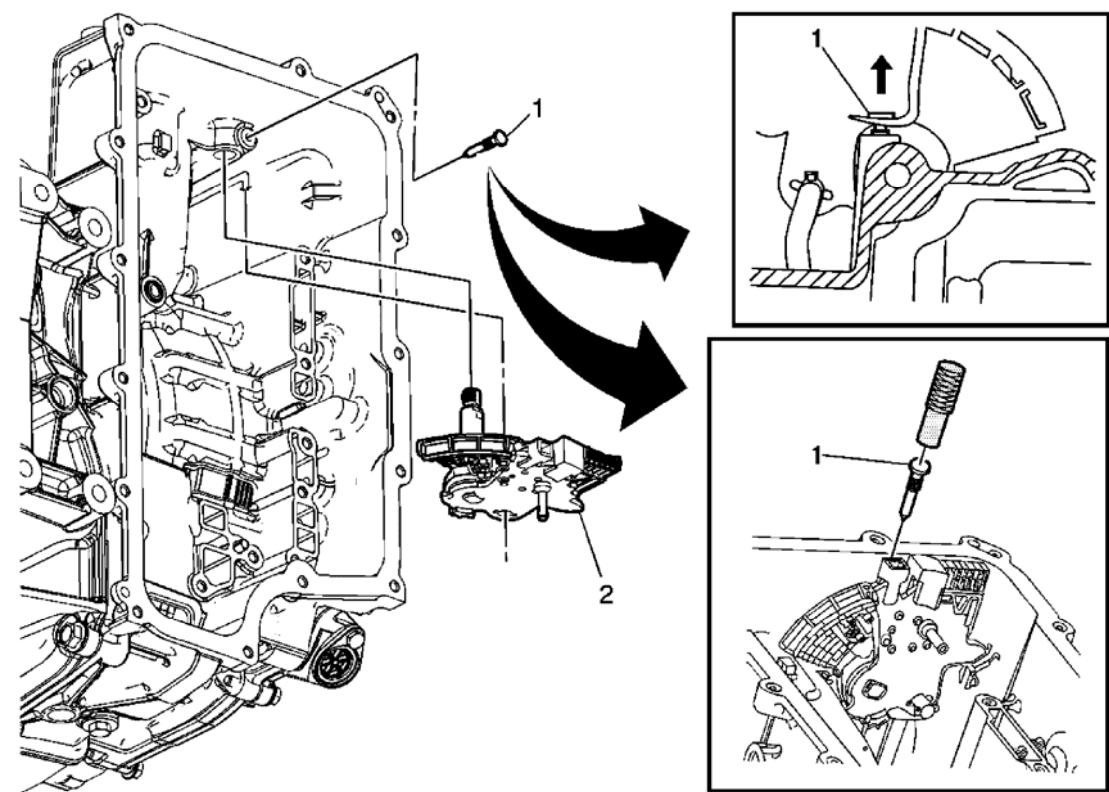


Fig. 1: Manual Shift Detent Lever With Shaft Position Switch Assembly
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Remove the transmission range selector lever. Refer to <u>Automatic Transmission Range Selector Lever Replacement</u> .	
2. Remove the lower control valve body. Refer to <u>Control Valve Lower Body and Upper Body Replacement</u> .	
	Manual Shaft Detent Lever Pin
CAUTION:	

1	Use J 41229 to install the manual shaft 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. Tip: • Use a small nail puller to remove the pin. Discard the pin. It is not reusable. • Use J 41229 Manual Shaft Pin Installer to install the pin. Inspect that the pin installed height is within 6.5 mm-7.5 mm (0.25 in-0.30 in). Special Tools: J 41229: Manual Shaft Pin Installer
2	Manual Shaft Detent Lever Assembly (w/Shift Position Switch) Procedure 1. Removal: partly lower the manual shaft detent lever assembly (w/shift position switch) in order to rotate the detent lever and disconnect the park actuator rod. Then fully remove the manual shaft detent lever assembly from the transmission case. 2. Installation: partly install the manual shaft detent lever assembly (w/shift position switch). Rotate the detent lever and connect the park actuator rod. Then fully install the manual shaft detent lever assembly in the transmission case. 3. Lubricate the manual shaft with automatic transmission fluid (ATF) to prevent damage to the manual shift shaft seal. Tip: Do not pull the park actuator rod end out beyond the machined oil passage surface in the case. A no park condition will exist if the park pawl actuator assembly is pulled out of the transmission too far and the actuator rod disengages from the park pawl. The transmission assembly will require disassembly to re-install the actuator rod over the park pawl.

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

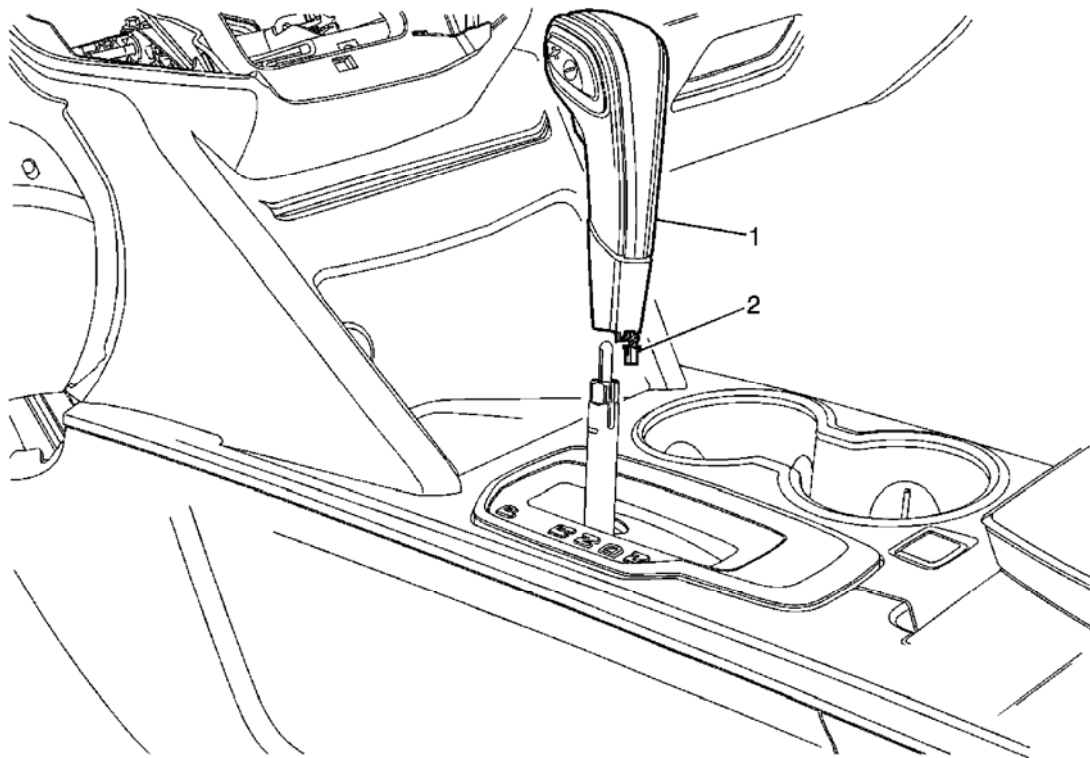


Fig. 2: Transmission Control Lever Knob
Courtesy of GENERAL MOTORS CORP.

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

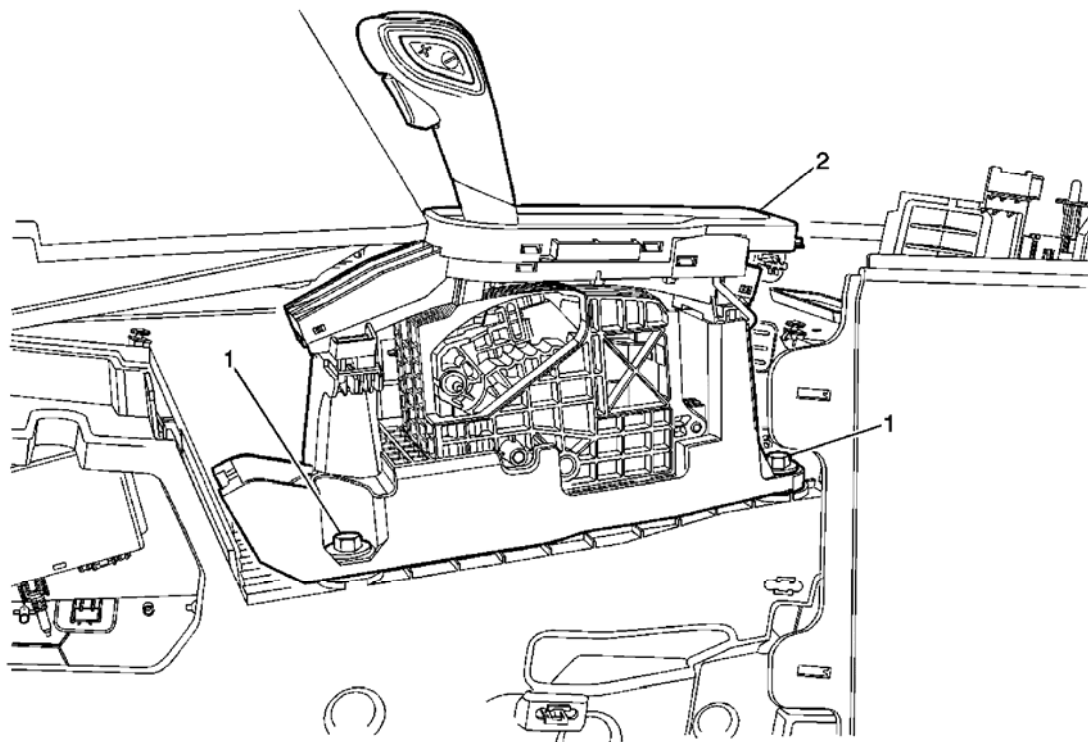


Fig. 3: Transmission Control
 Courtesy of GENERAL MOTORS CORP.

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.	
1	Transmission Control Fasteners (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 25 N.m (18 lb ft).
2	Transmission Control

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT

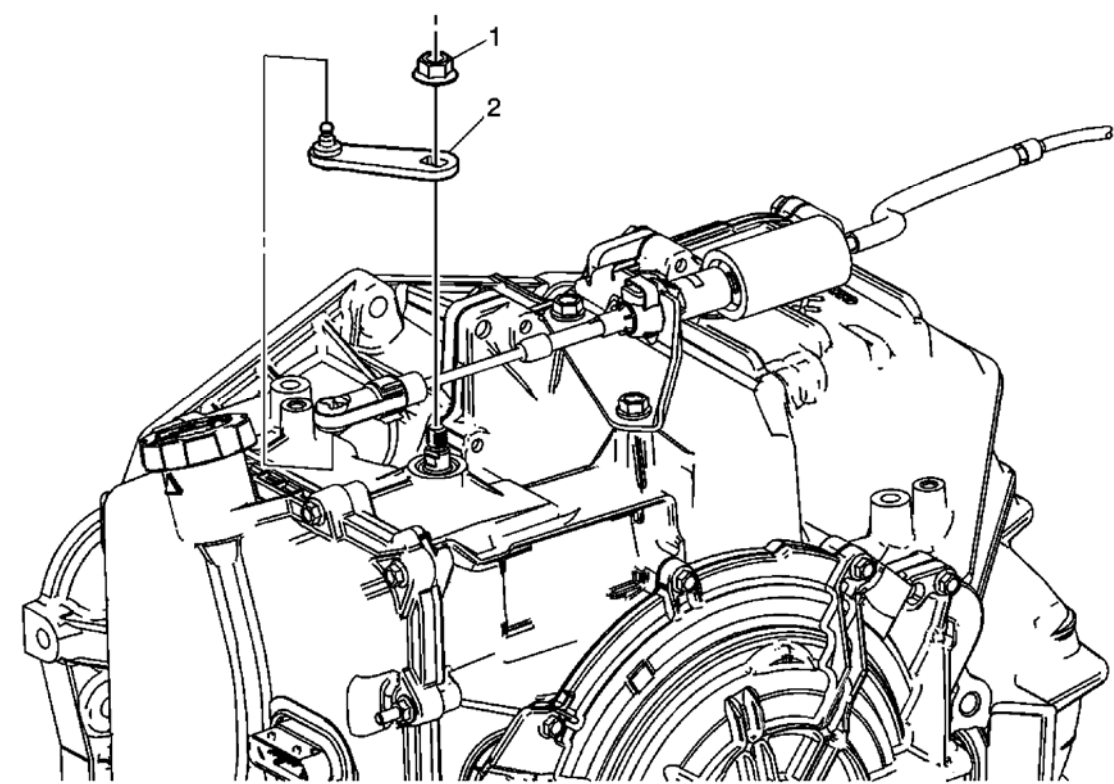


Fig. 4: Automatic Transmission Range Selector Lever
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Set the park brake and chock the wheels.	
2. Disconnect the range selector cable from the range selector lever.	
1	Transmission Range Selector Lever Nut WARNING: Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position. CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 30 N.m (22 lb ft)

RANGE SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.

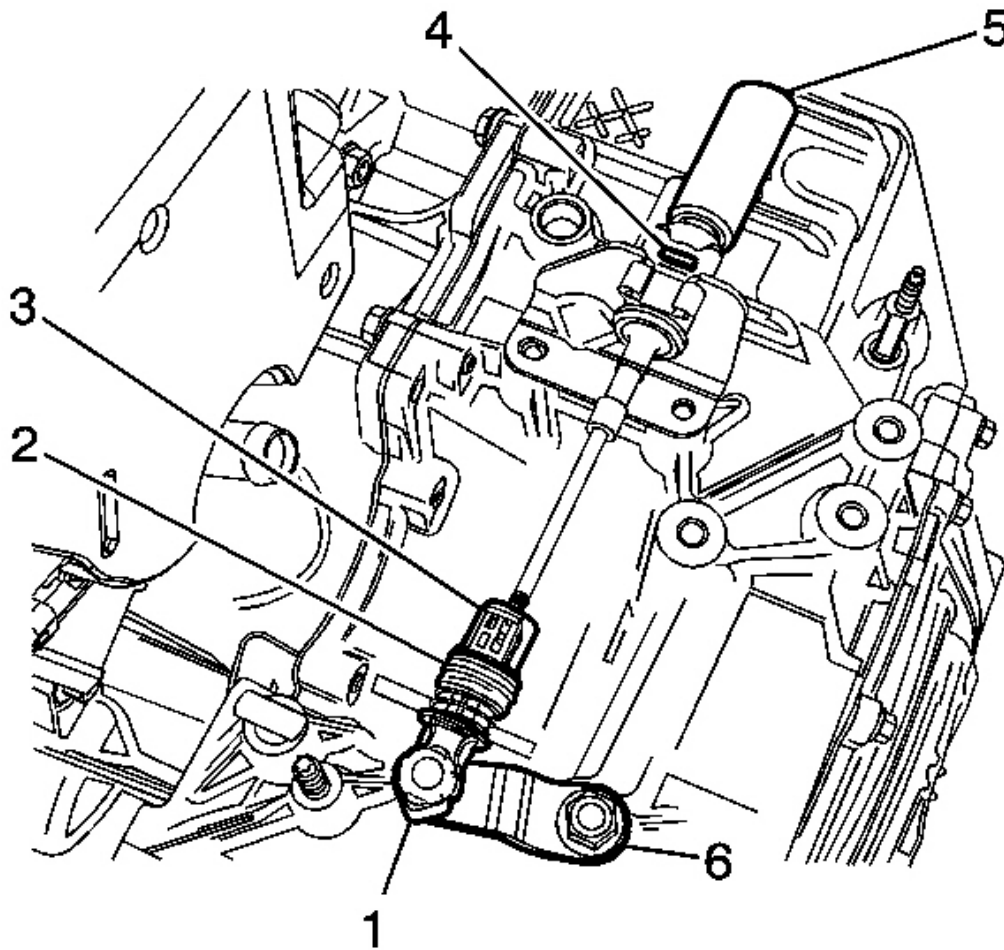


Fig. 5: Transmission Range Selector Lever Components
Courtesy of GENERAL MOTORS CORP.

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)** .

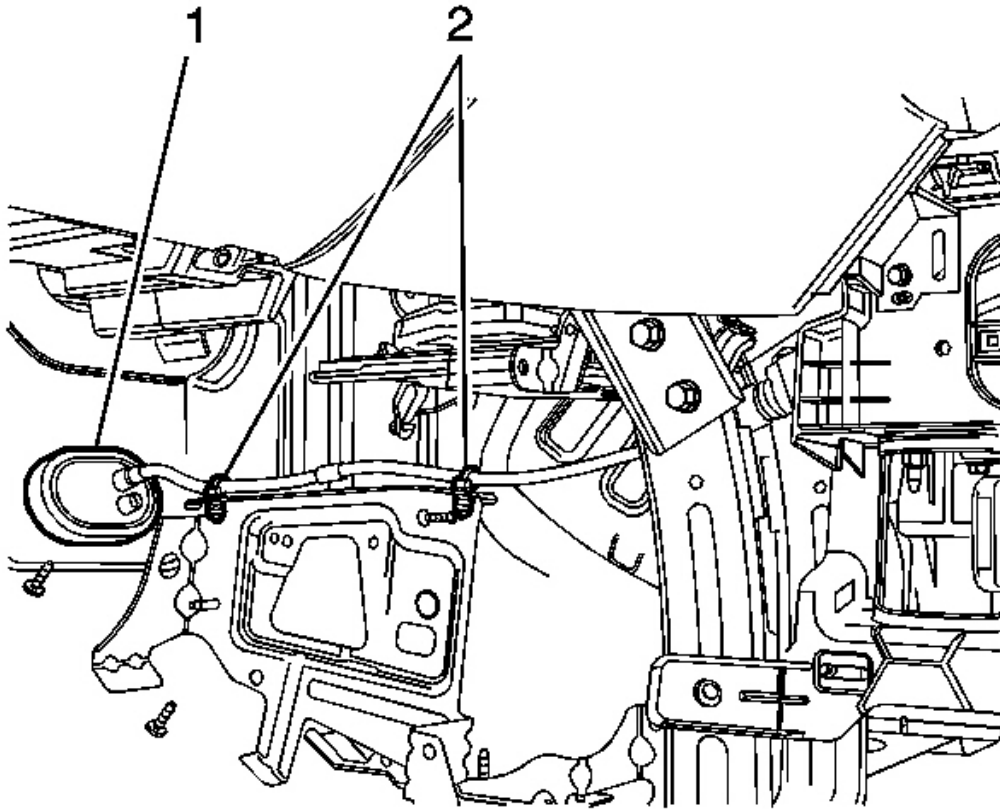


Fig. 6: Transmission Range Selector Lever Cable Retainers & Grommet
Courtesy of GENERAL MOTORS CORP.

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.

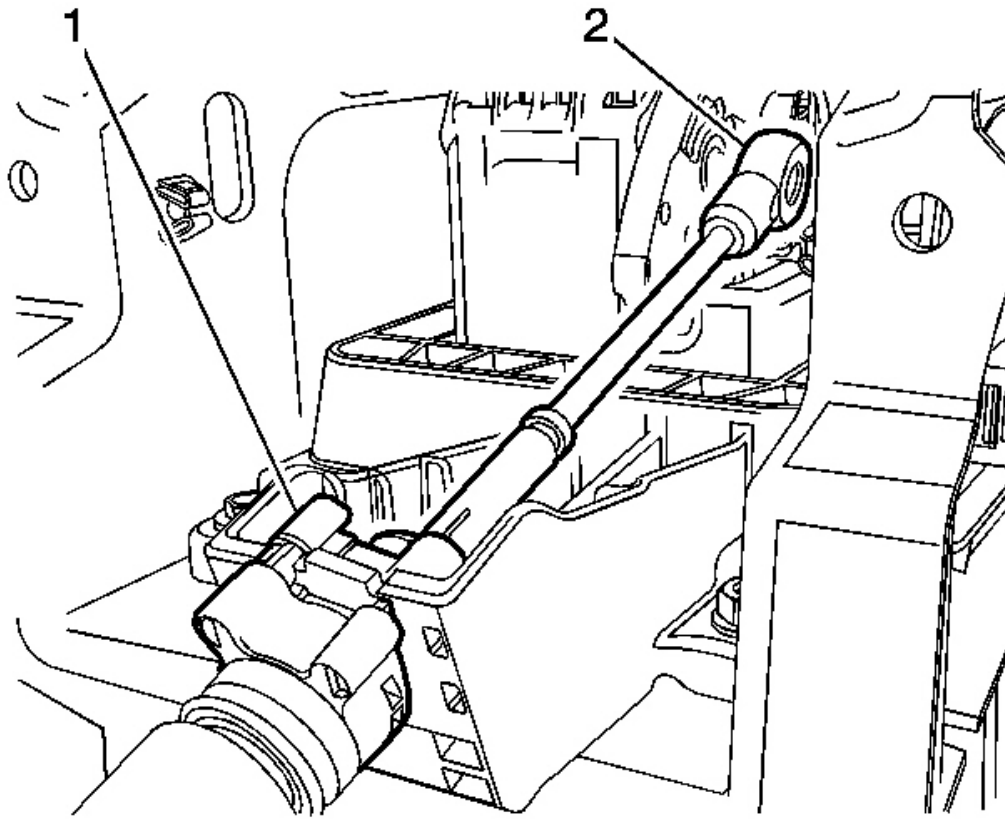


Fig. 7: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

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.

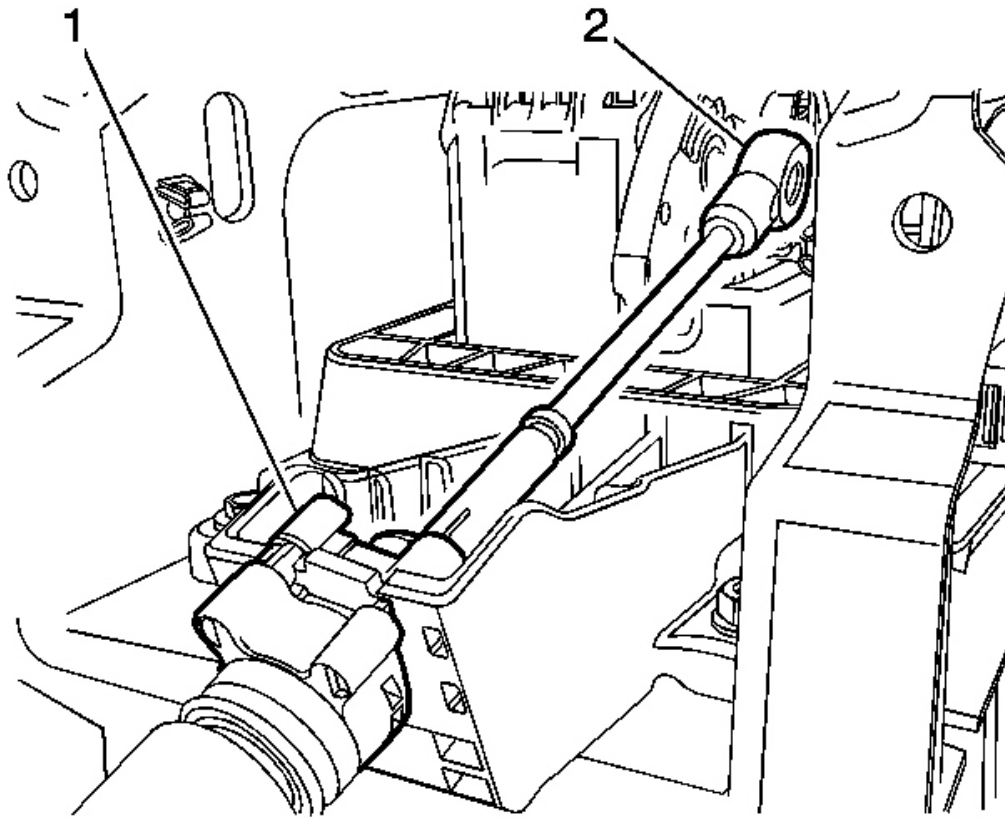


Fig. 8: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

2. Connect the transmission range selector lever cable terminal (2) to the shift lever pin.

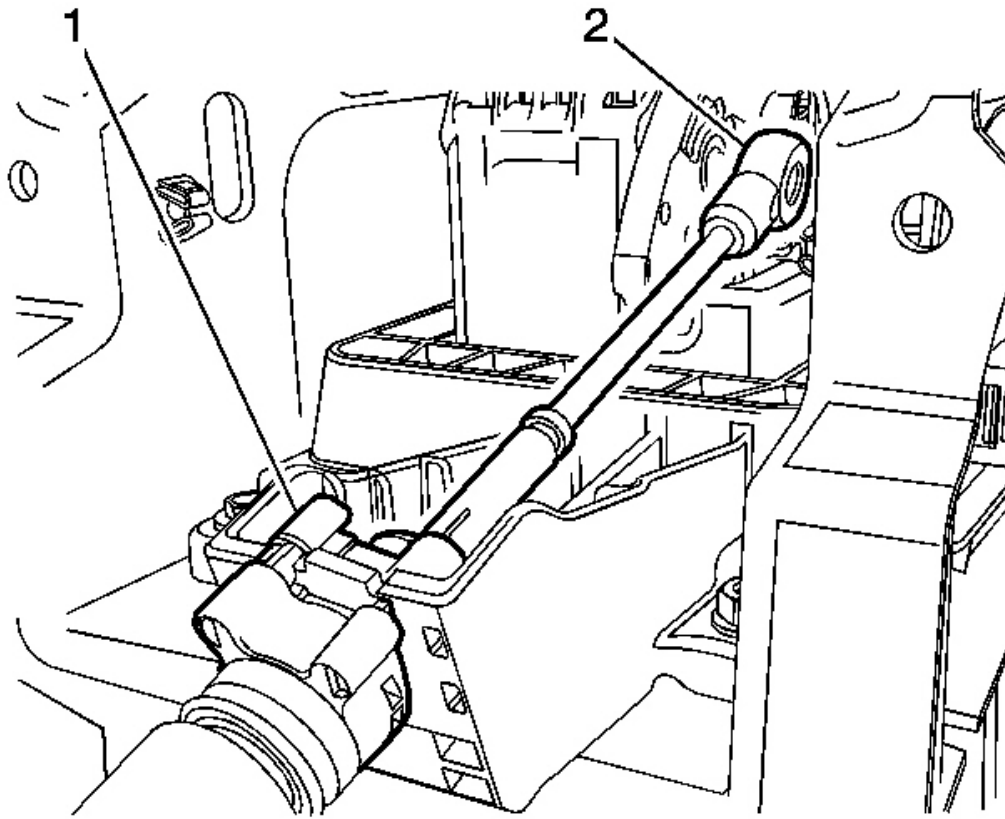


Fig. 9: Transmission Range Selector Lever Cable Retainer & Terminal
Courtesy of GENERAL MOTORS CORP.

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.

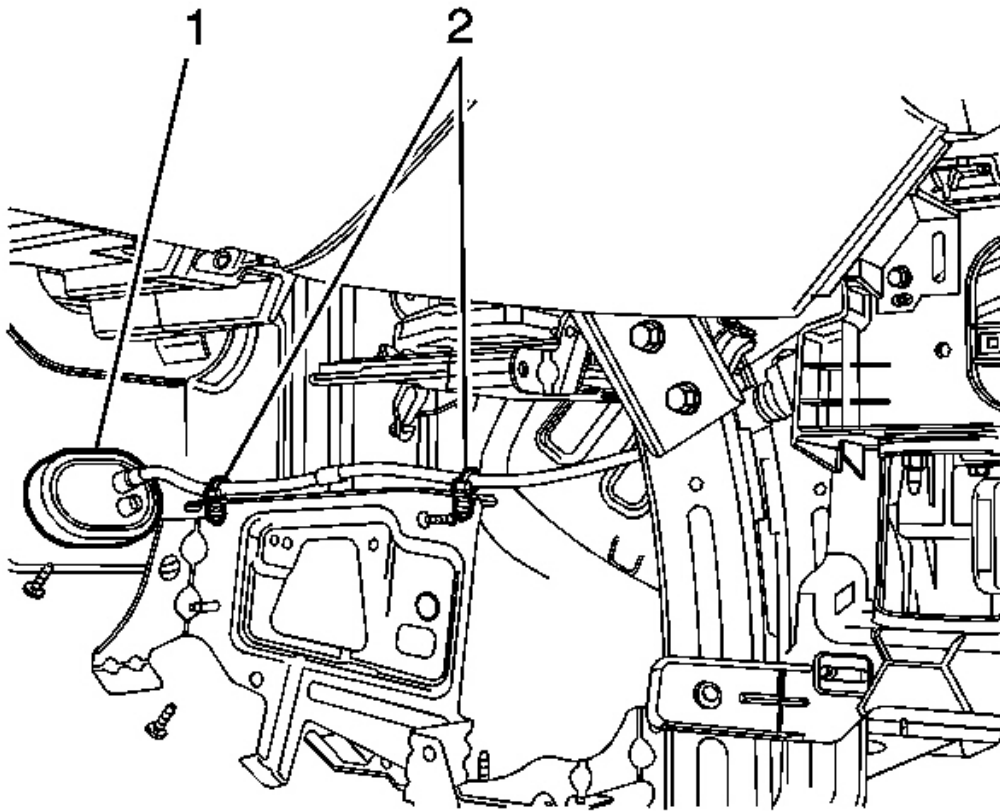


Fig. 10: Transmission Range Selector Lever Cable Retainers & Grommet
Courtesy of GENERAL MOTORS CORP.

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)** .

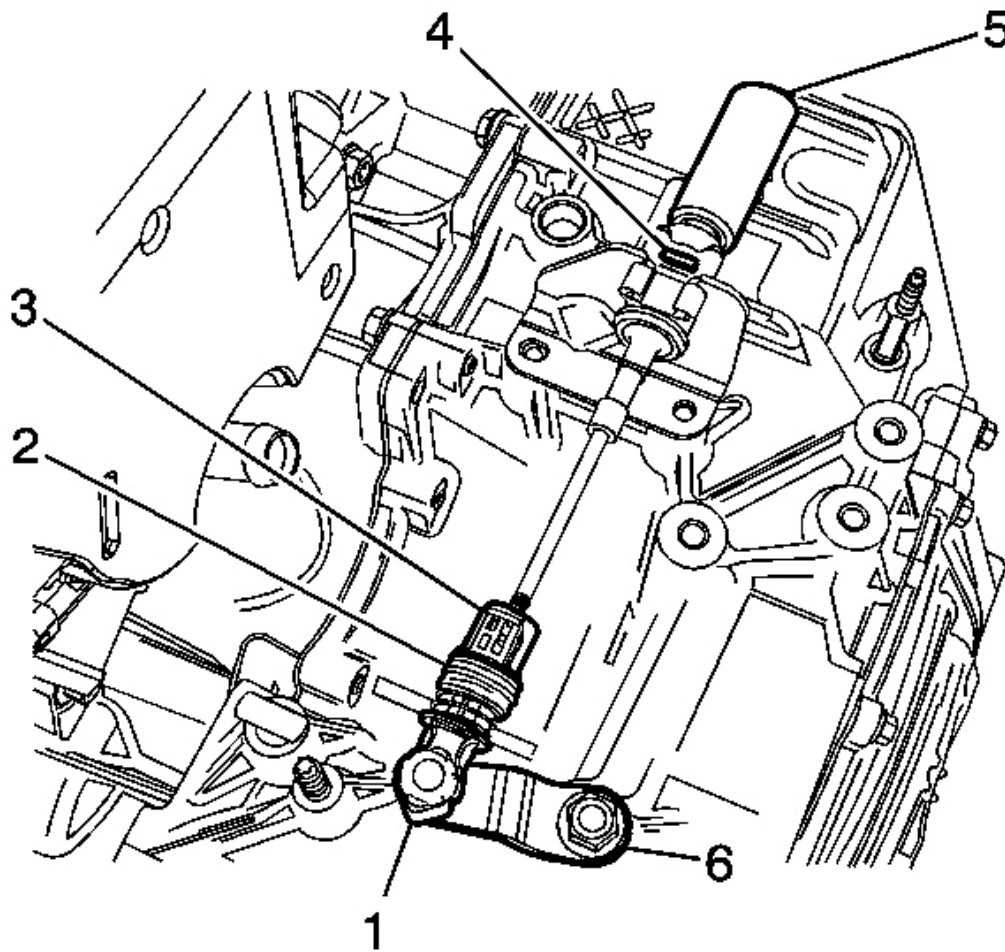


Fig. 11: Transmission Range Selector Lever Components
Courtesy of GENERAL MOTORS CORP.

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.

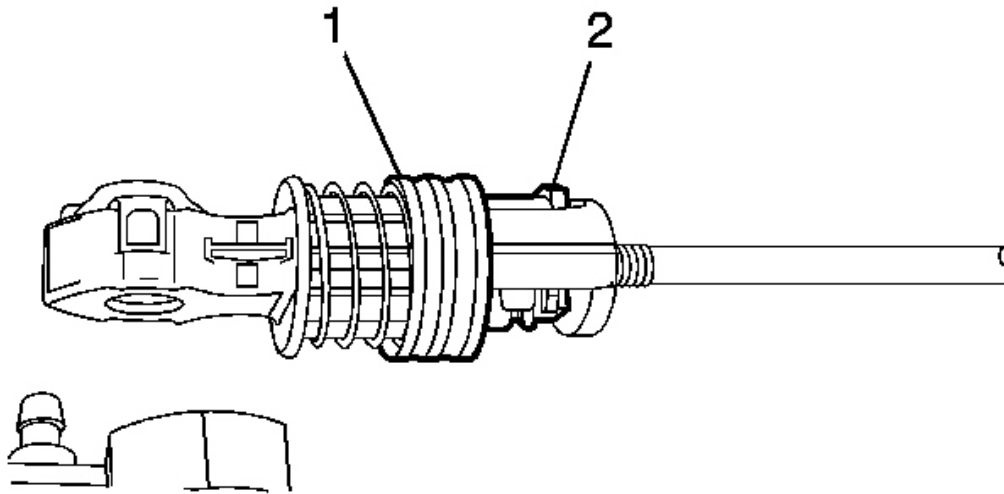


Fig. 12: Releasing Range Select Cable Adjuster Clip
Courtesy of GENERAL MOTORS CORP.

4. Pull the retaining collar (1) forward, then release the range select cable adjuster clip (2).

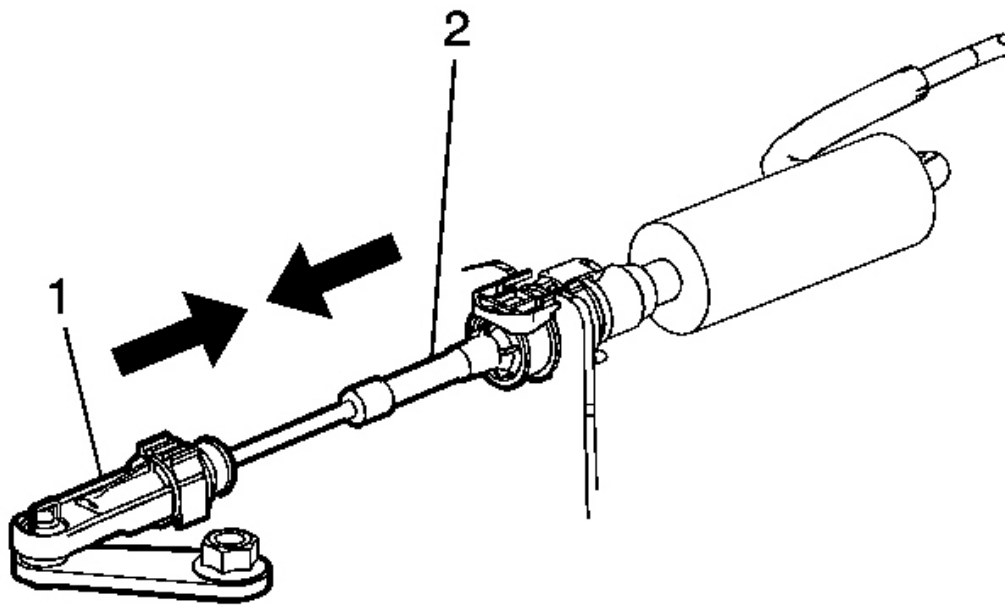


Fig. 13: Sliding Range Selector Halves Together
Courtesy of GENERAL MOTORS CORP.

5. Slide the two halves (1, 2) of the range select cable together until all free play is removed.

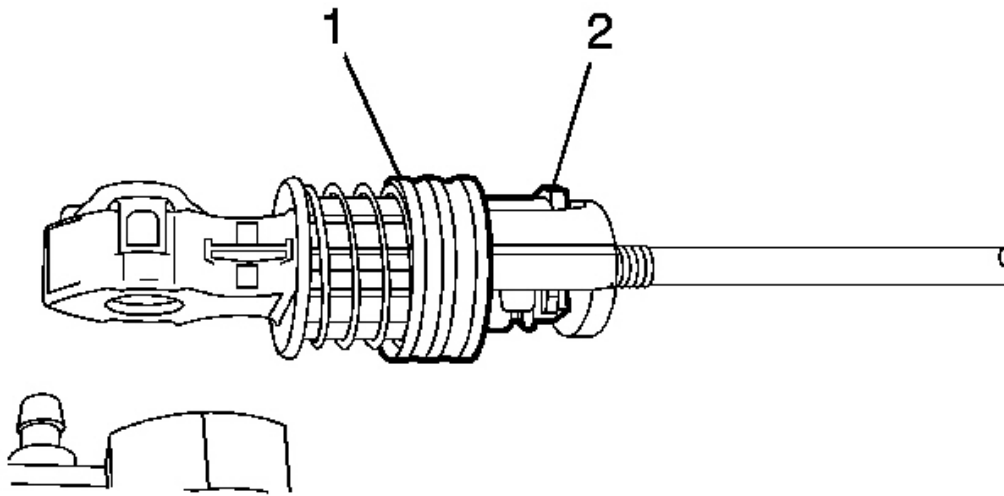


Fig. 14: Releasing Retaining Collar

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

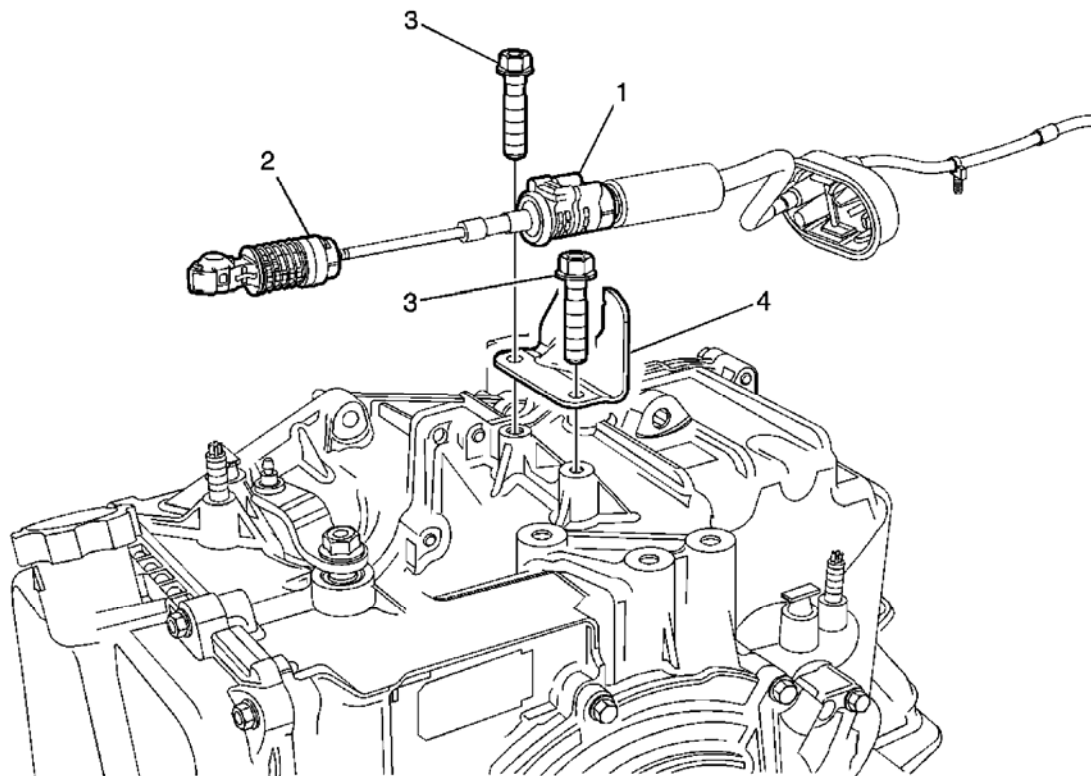


Fig. 15: Range Selector Lever Cable Bracket
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Set the park brake and chock the wheels. 2. Remove the battery tray. Refer to <u>Battery Tray Replacement</u> .	
1	Transmission Range Selector Lever Cable Retaining lock
2	Transmission Range Selector Lever Cable
3	Transmission Range Selector Lever Cable Bracket Bolt CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 25 N.m (18 lb ft)
4	Transmission Range Selector Lever Cable Bracket Procedure: Adjust the cable, if necessary. Refer to <u>Range Selector Lever Cable Adjustment</u> .

TRANSMISSION FLUID REPLACEMENT

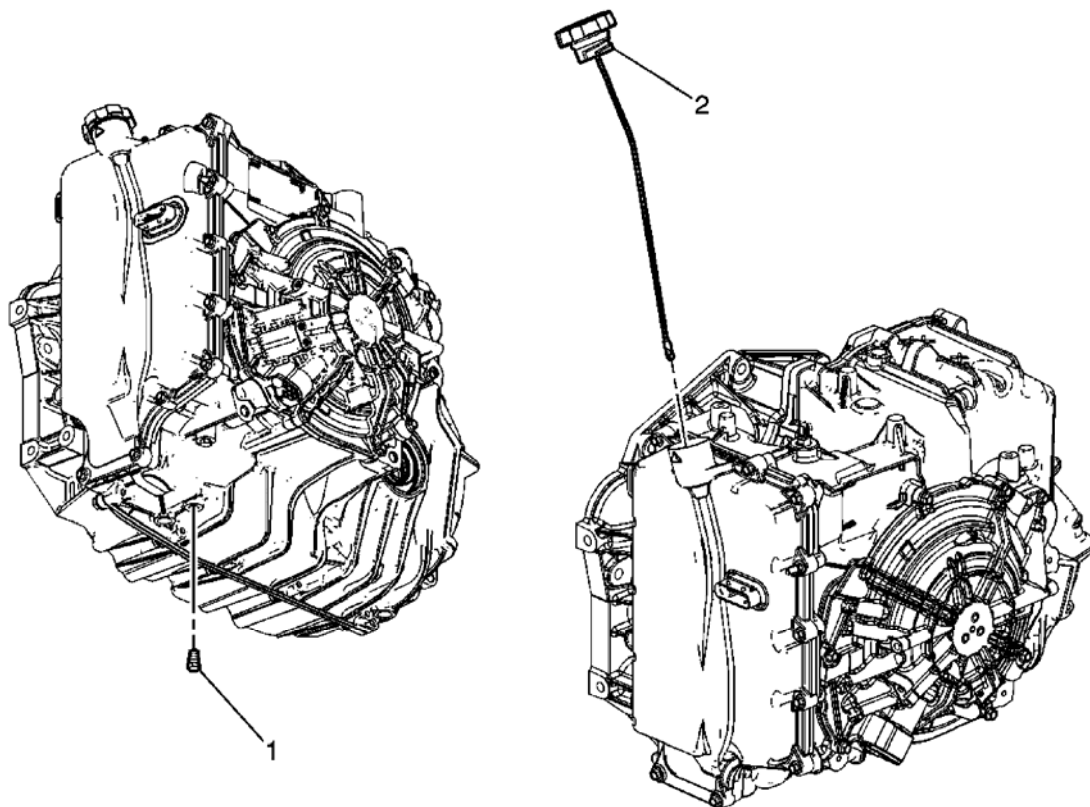


Fig. 16: Transmission Fluid
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
1	Fluid Drain Plug CAUTION: Refer to <u>Fastener Caution</u> . Tip: Place a drain pan capable of containing more than 5 quarts of fluid under the transmission before removing the plug to drain the fluid. Tighten: 12 N.m (106 lb in)
2	Fluid Level Indicator Tip: • Transmission will require approximately 5 quarts of fluid. • Fill the transmission with fluid. Refer to <u>Transmission Fluid Level and Condition</u>

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.

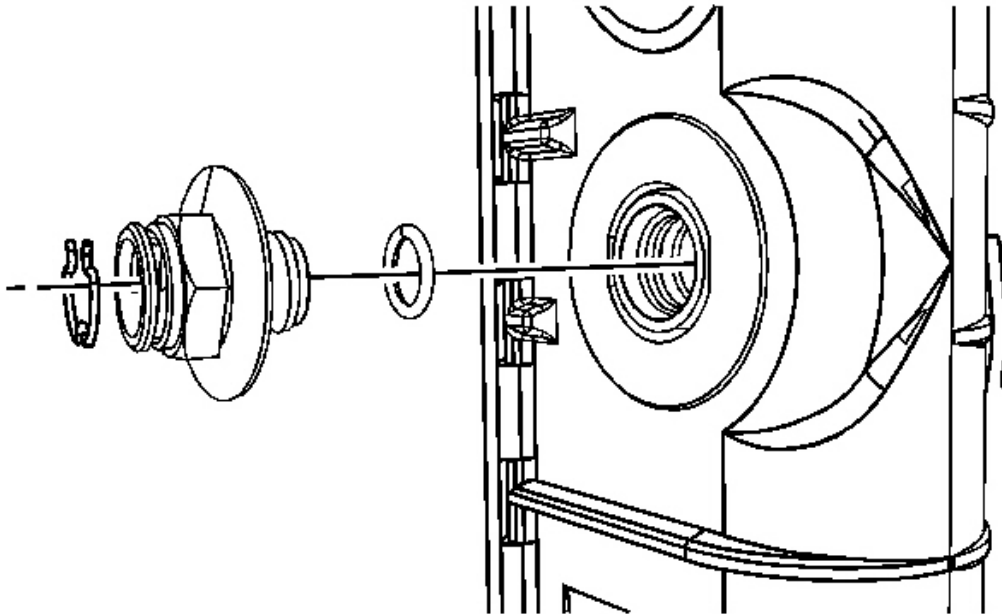


Fig. 17: View Of Oil Cooler Fitting At Radiator
Courtesy of GENERAL MOTORS CORP.

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.

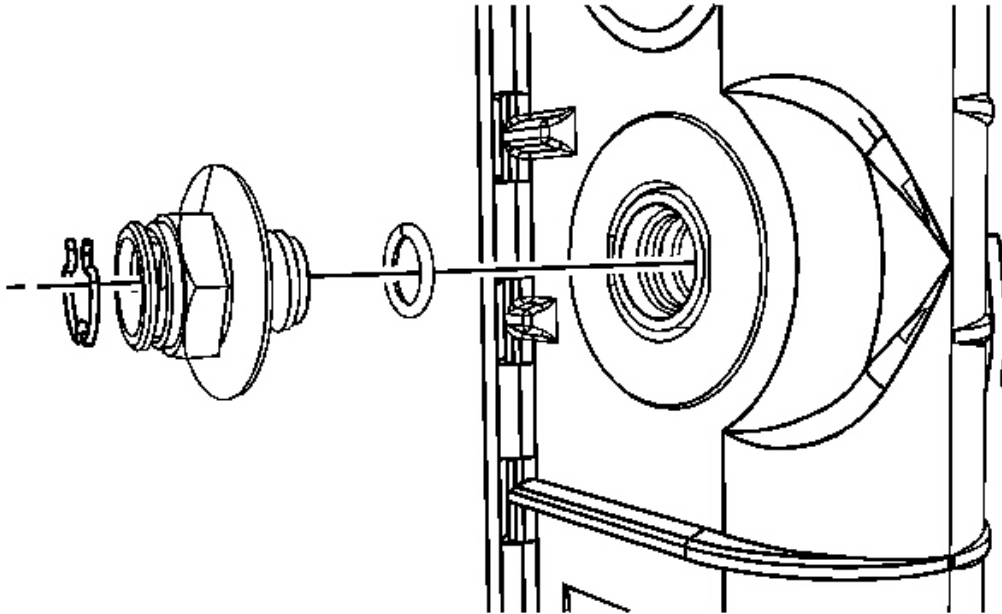


Fig. 18: View Of Oil Cooler Fitting At Radiator
Courtesy of GENERAL MOTORS CORP.

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

Special Tools

J 41623-B: Cooler Quick Connect Tool

Removal Procedure

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 J 41623-B: Cooler Quick Connect Tool to remove the retaining ring.
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.

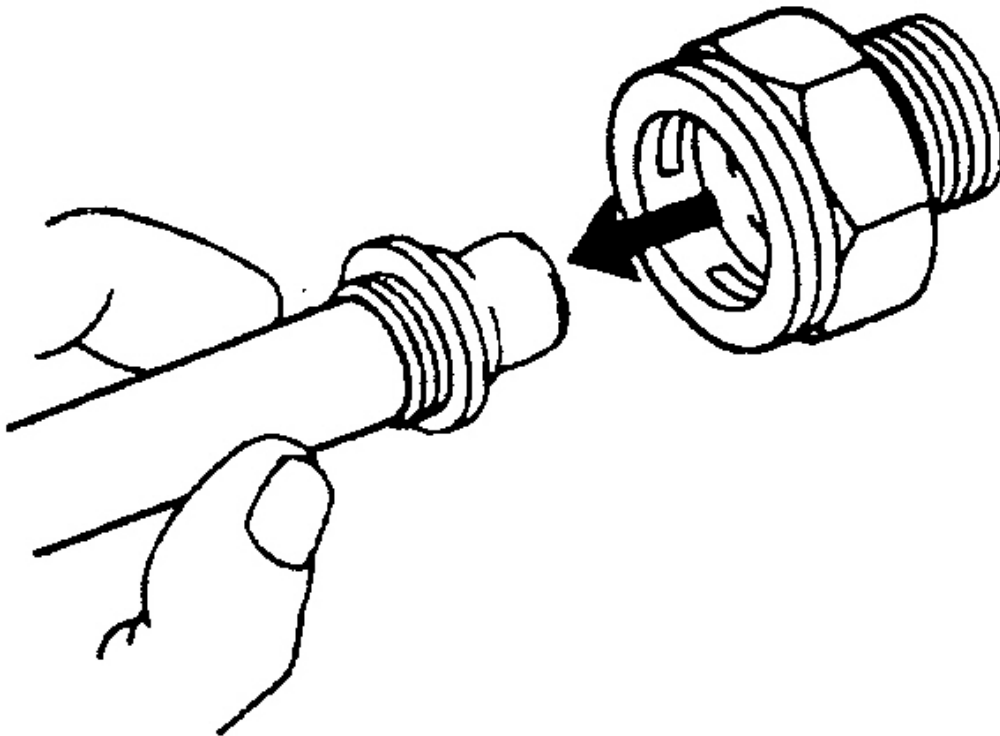


Fig. 19: Cooler Line & Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

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:

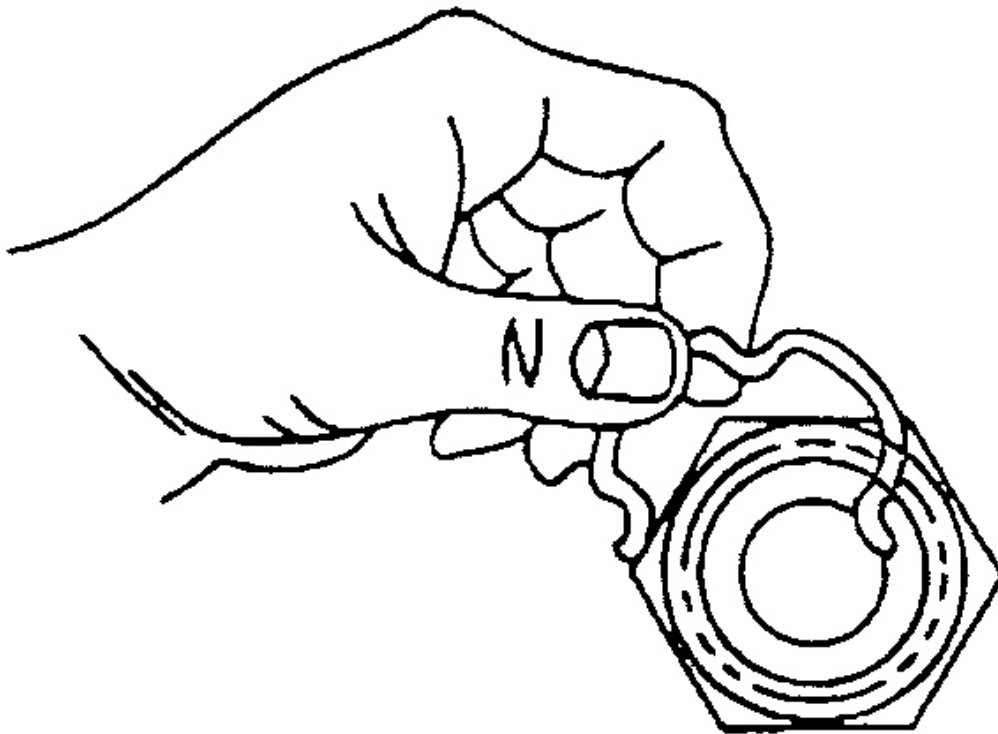


Fig. 20: Hooking Retaining Ring Into Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

2. Hook one of the open ends of the retaining ring in one of the slots in the quick connect fitting.

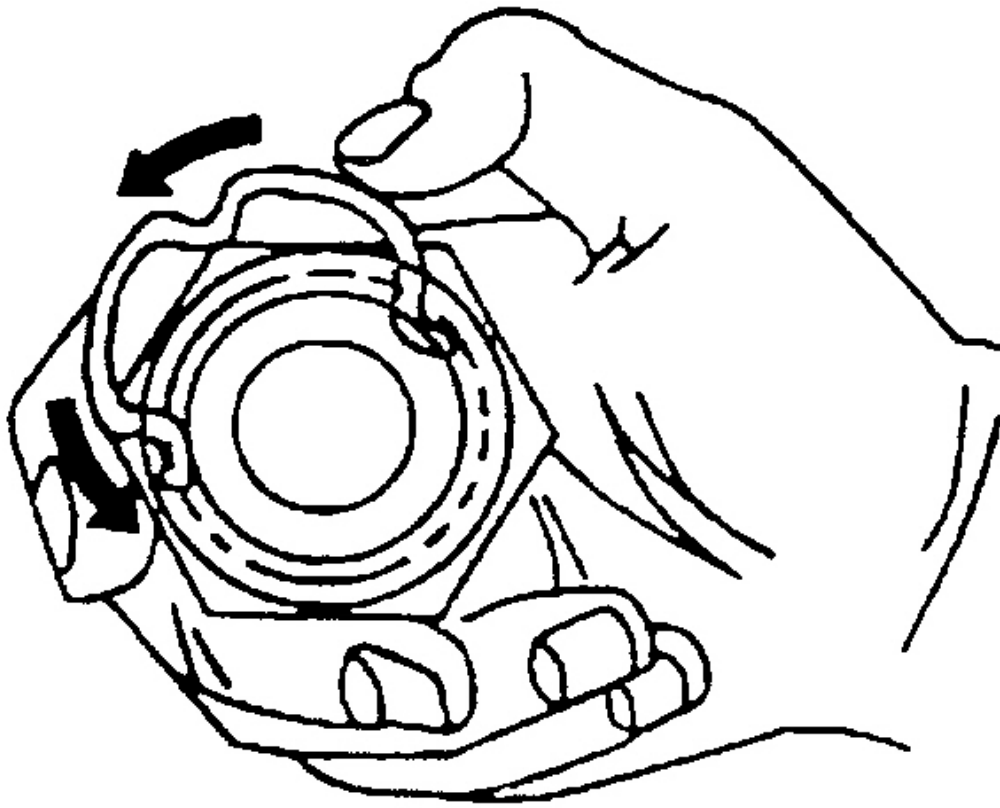


Fig. 21: Rotating Retaining Ring Around Fitting
Courtesy of GENERAL MOTORS CORP.

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.

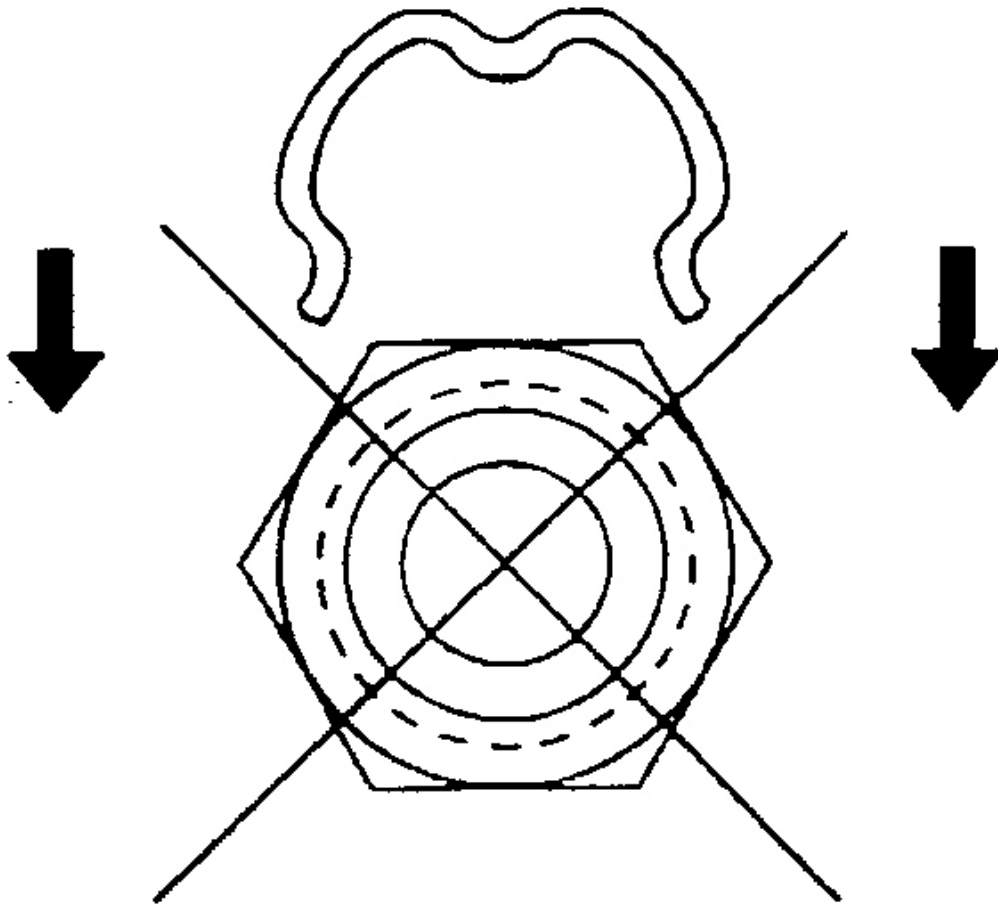


Fig. 22: Identifying Improper Engine Oil Cooler Hose/Pipe Retaining Ring Installation
Courtesy of GENERAL MOTORS CORP.

4. Do not install the new retaining ring onto the fitting by pushing the retaining ring.

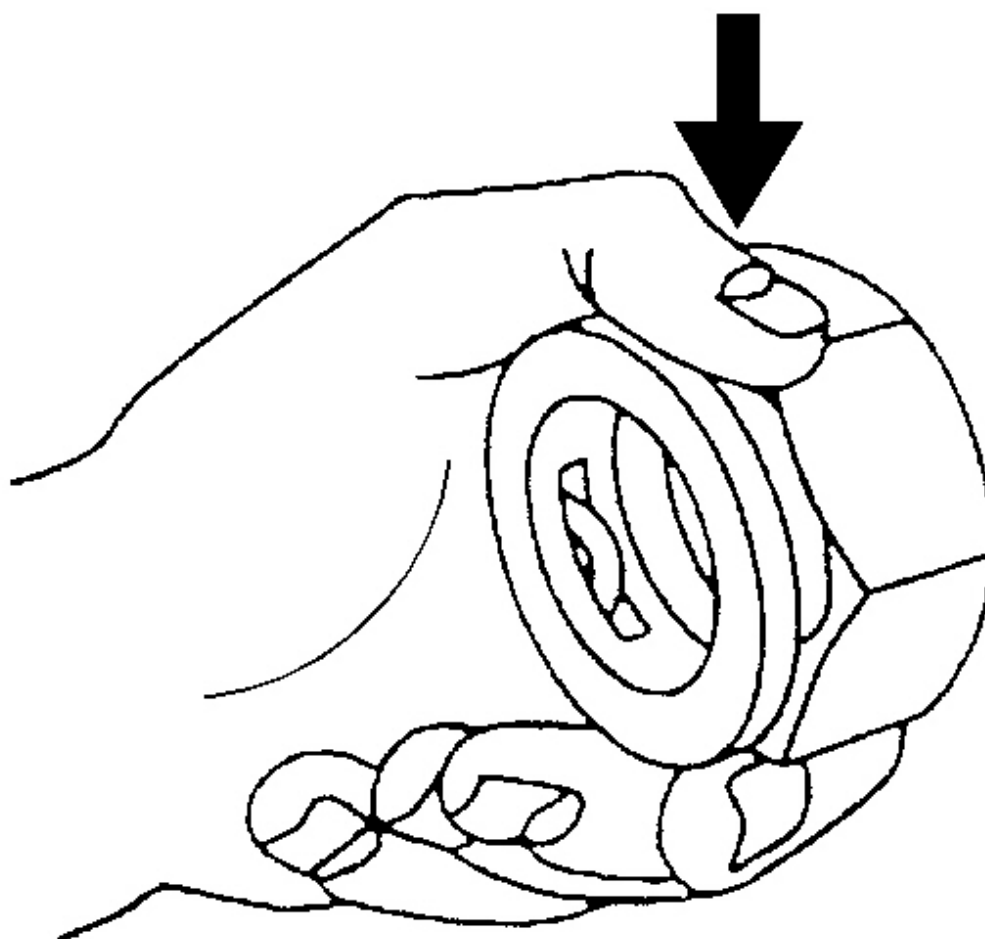


Fig. 23: Ensuring Retaining Ring Is Seated Correctly
Courtesy of GENERAL MOTORS CORP.

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.

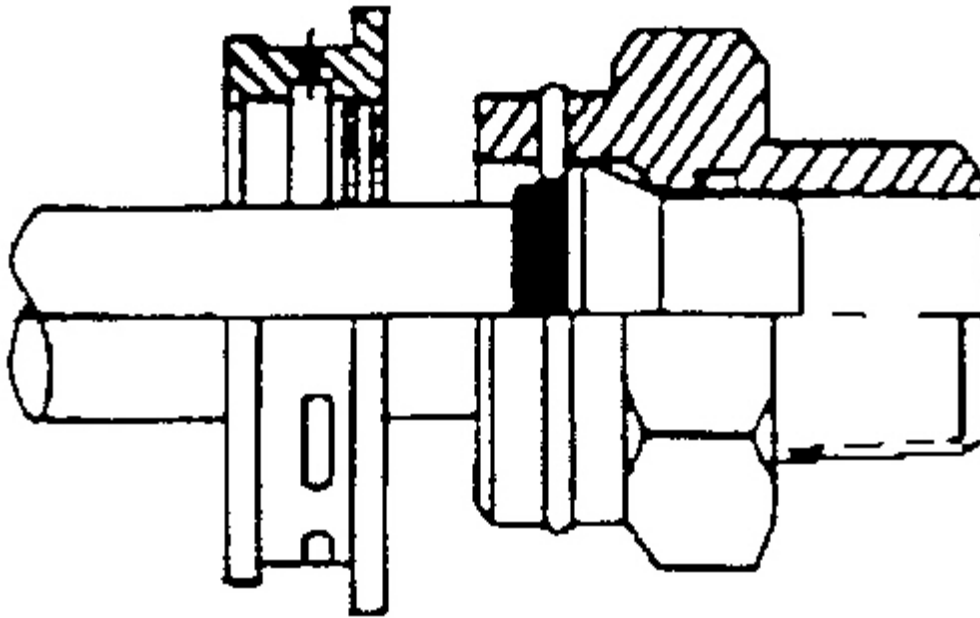


Fig. 24: View Of Cooler Line Quick Connect Fitting
Courtesy of GENERAL MOTORS CORP.

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.

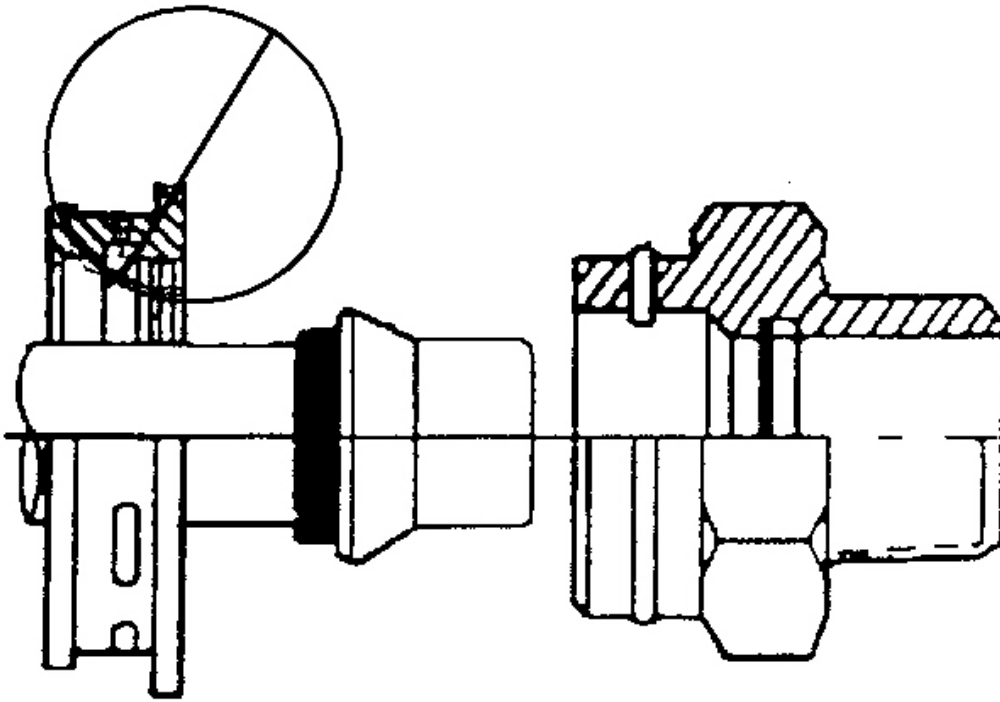


Fig. 25: Identifying Plastic Cap
Courtesy of GENERAL MOTORS CORP.

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.

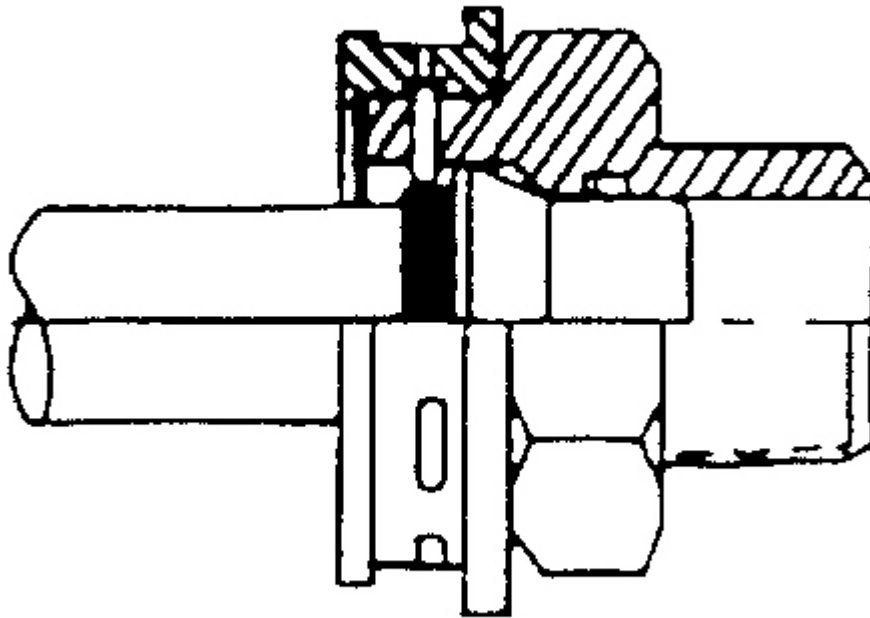


Fig. 26: View Of Cooler Line & Plastic Cap
Courtesy of GENERAL MOTORS CORP.

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.

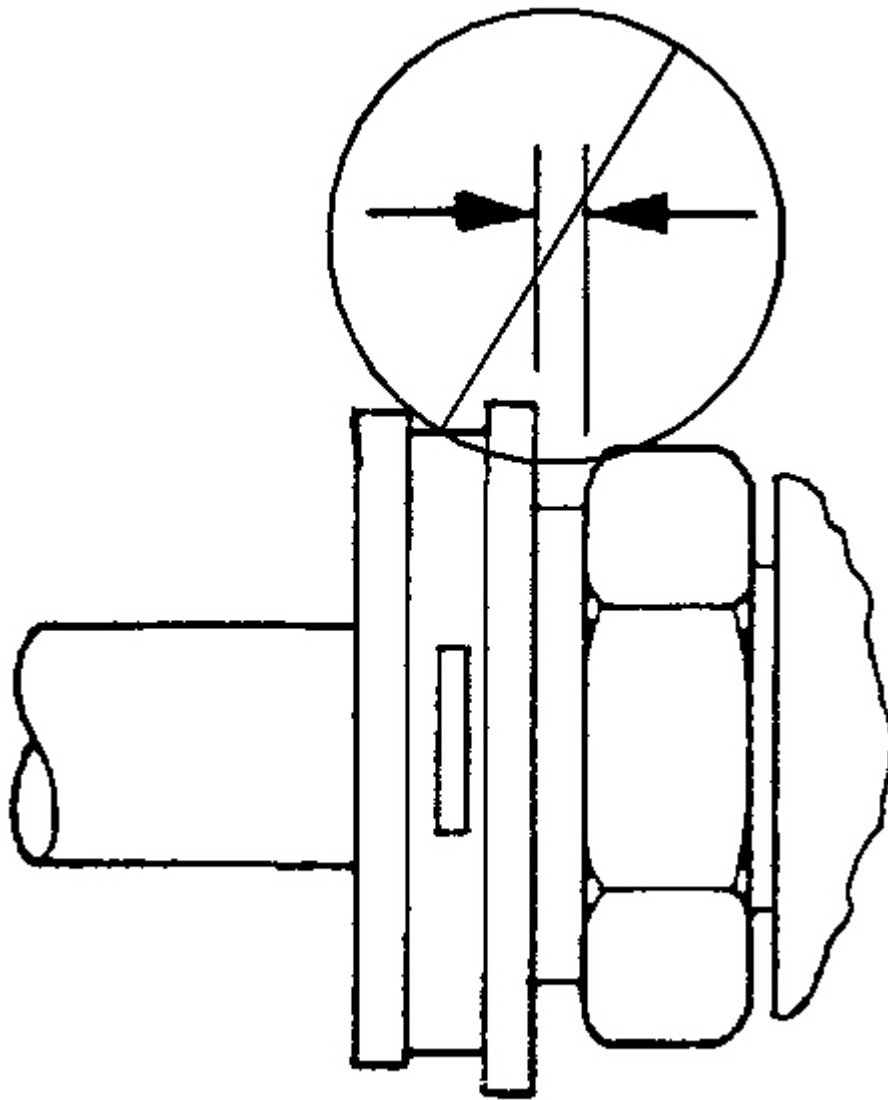


Fig. 27: Checking For Gap Between Cap & Fitting
Courtesy of GENERAL MOTORS CORP.

12. Ensure that no gap is present between the cap and the fitting.

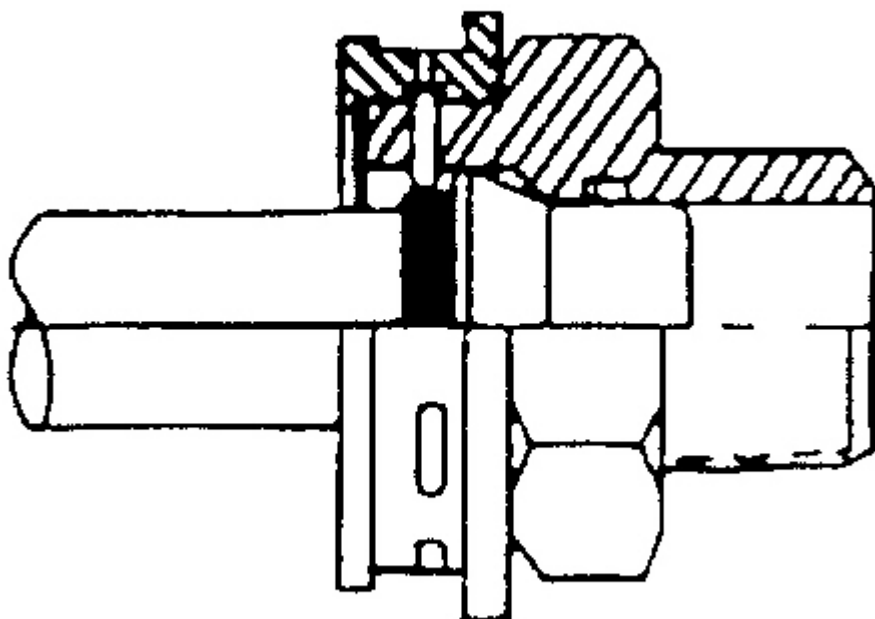


Fig. 28: View Of Cooler Line & Plastic Cap
Courtesy of GENERAL MOTORS CORP.

13. Ensure that the yellow identification band on the tube is hidden within the quick connect fitting.

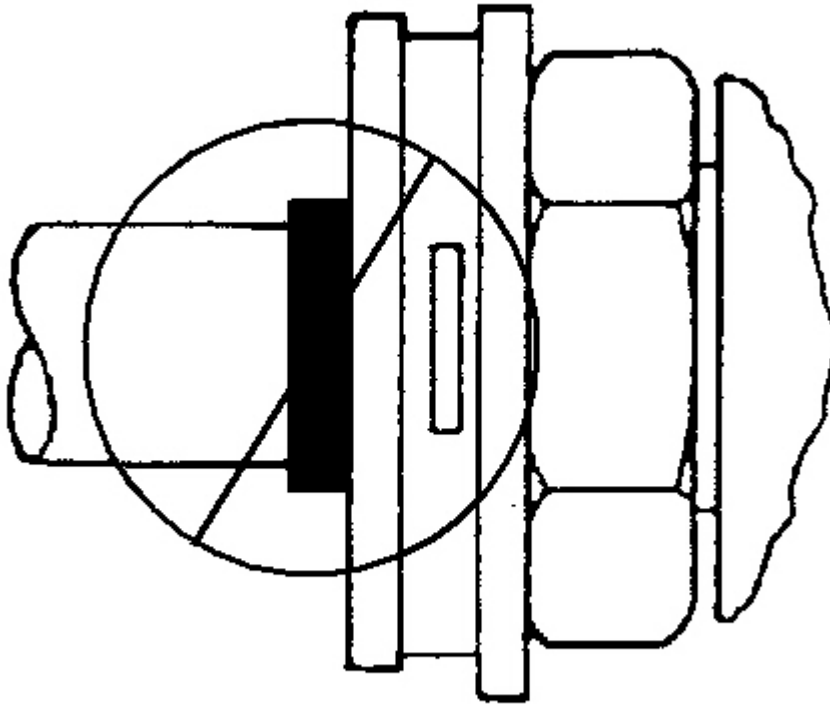


Fig. 29: Identifying Improper Joint Seating
Courtesy of GENERAL MOTORS CORP.

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 PIPE REPLACEMENT - FRONT

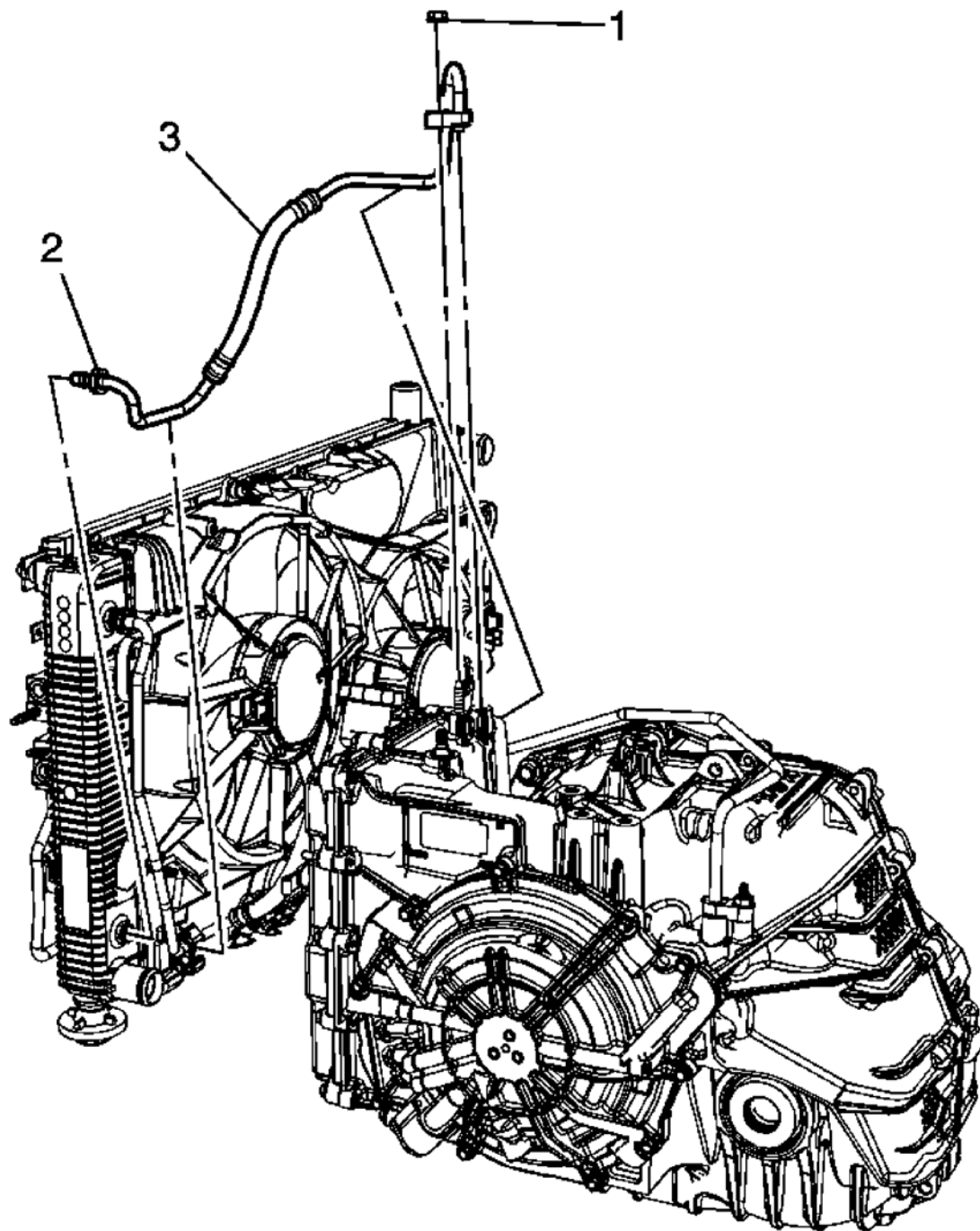


Fig. 30: Transmission Fluid Cooler Pipe - Front
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
	Transmission Fluid Cooler Inlet Pipe Nut

1	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> .

TRANSMISSION FLUID COOLER PIPE REPLACEMENT - REAR

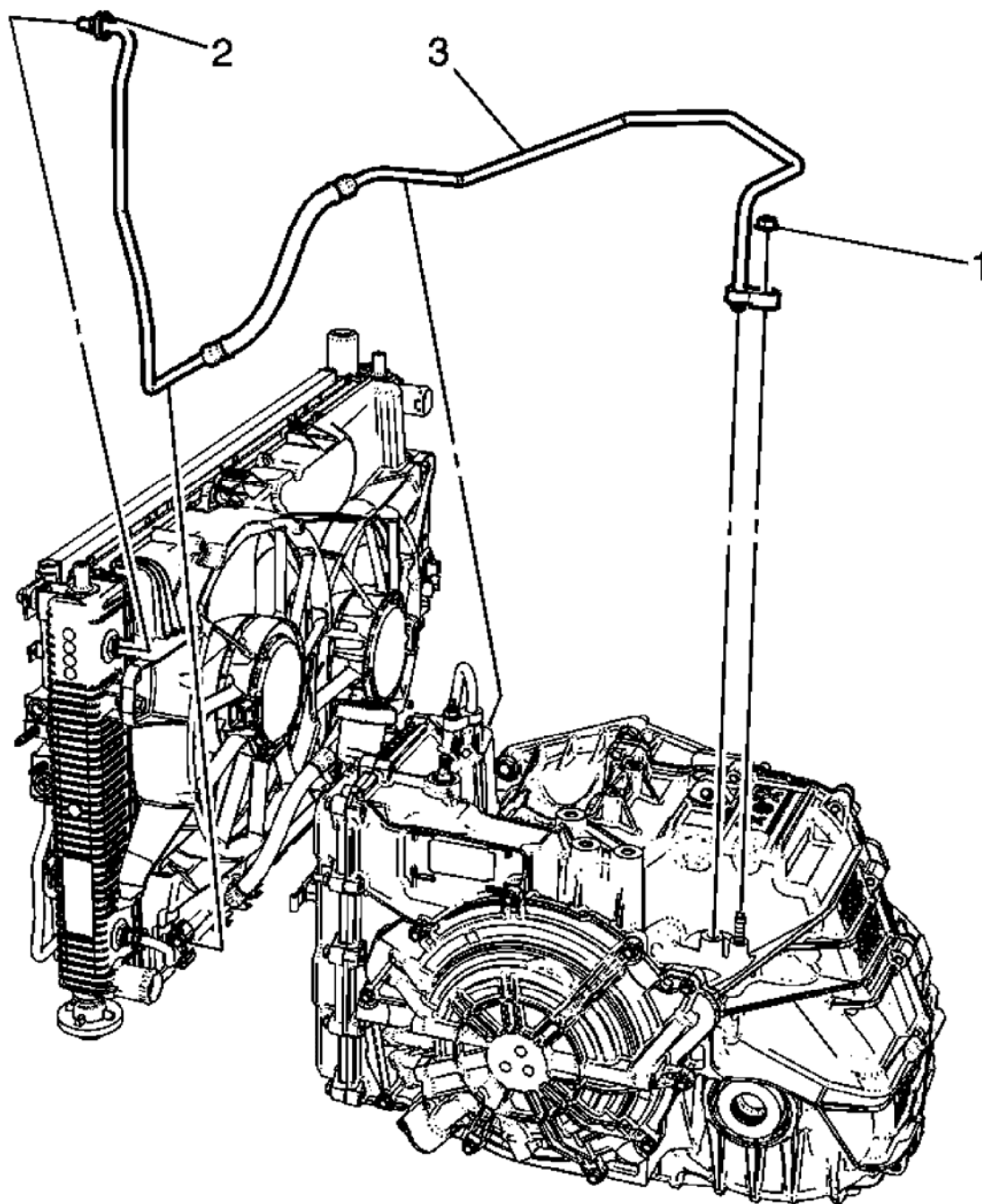


Fig. 31: Transmission Fluid Cooler Pipe - Rear
 Courtesy of GENERAL MOTORS CORP.

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> .

AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

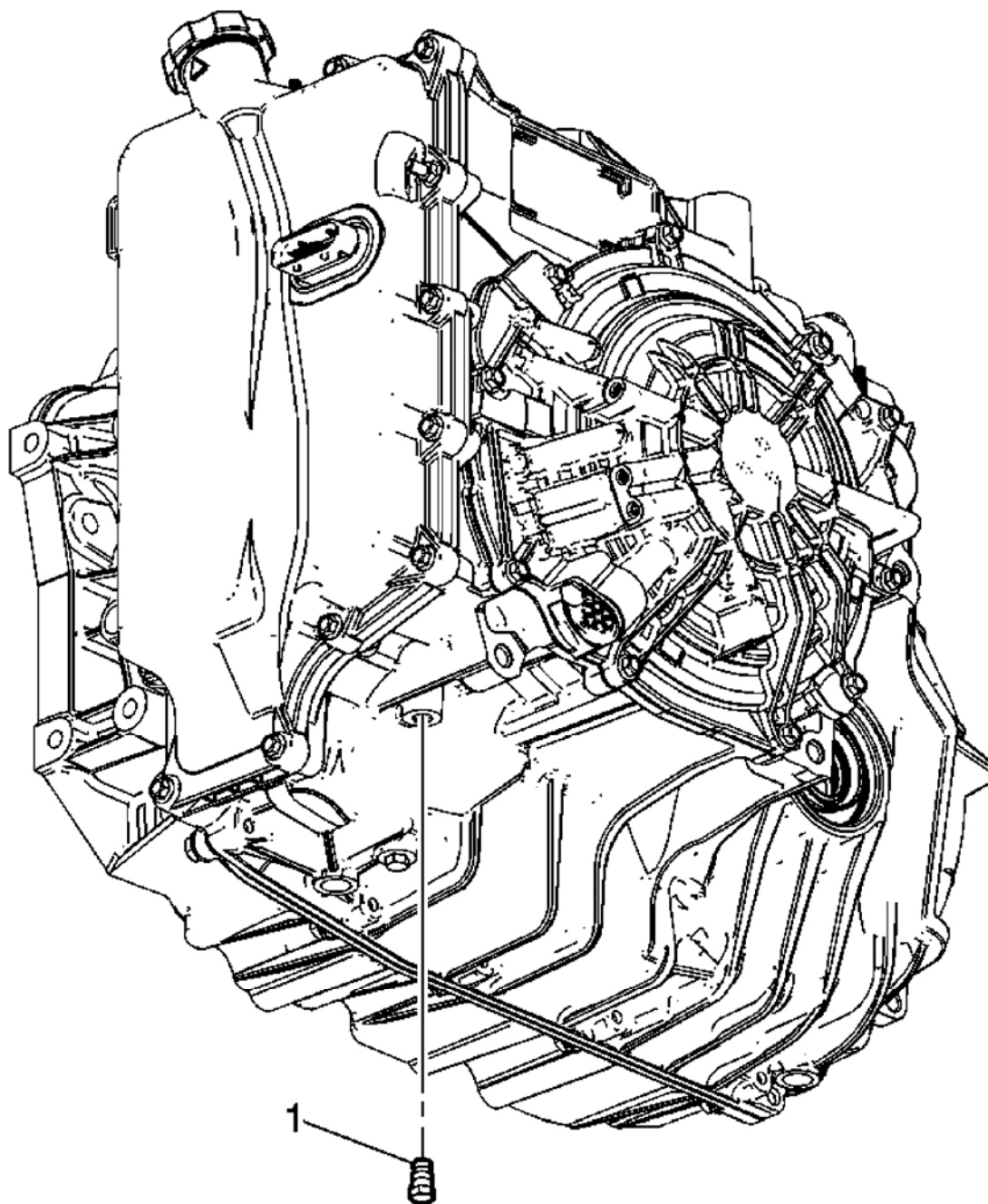


Fig. 32: Automatic Transmission Fluid Pressure Test Hole Plug
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedure: Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
	Fluid Pressure Test Plug

1

CAUTION:
Refer to Fastener Caution .

Tighten: 12 N.m (106 lb in)

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE

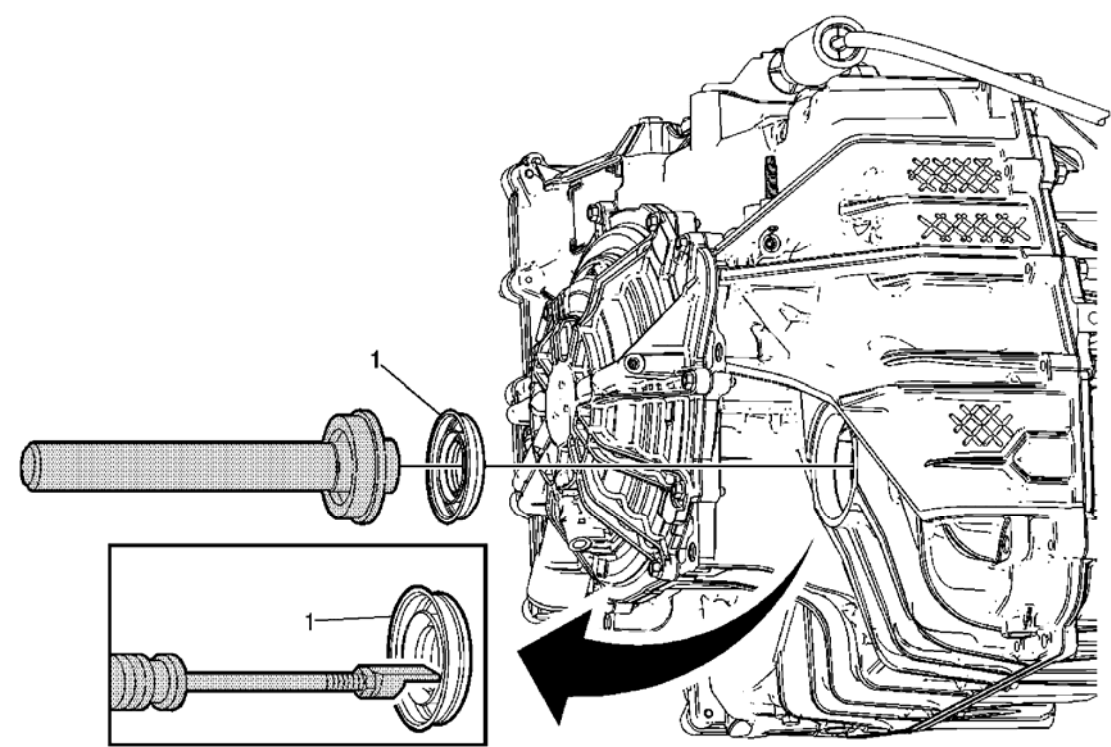


Fig. 33: Front Wheel Drive Shaft Seal - Left Side
Courtesy of GENERAL MOTORS CORP.

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 6125-1B Slide Hammer with J 23129 Universal Seal Remover. - For seal installation use J 8092 Driver Handle with J-46629-A Axle Seal Installer. See <u>Special Tools</u> .

Special Tools

- J 6125-1B: Slide Hammer
- J 8092: Driver Handle
- J 23129: Universal Seal Remover
- J 46629-A: Axle Seal Installer

FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE

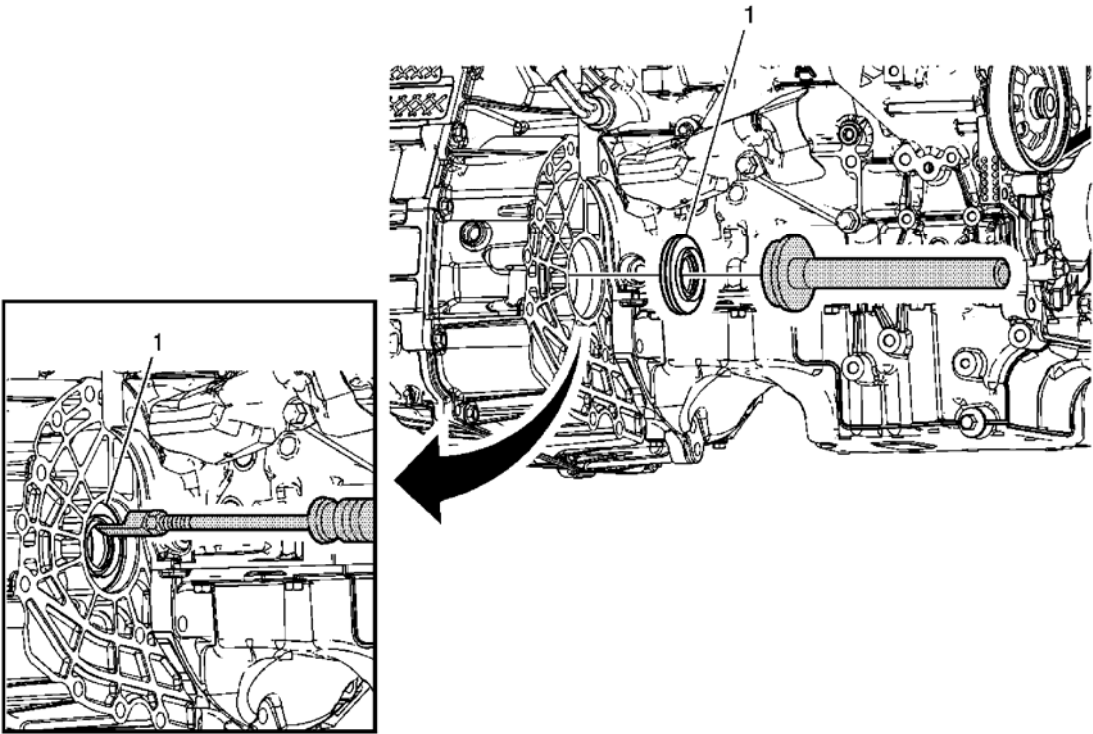


Fig. 34: Front Wheel Drive Shaft Seal - Right Side
Courtesy of GENERAL MOTORS CORP.

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: • For seal removal use J 6125-1B Slide Hammer with J 23129 Universal Seal Remover.

- For seal installation use **J 8092** Driver Handle with **J-46629-A** Axle Seal Installer. See **Special Tools** .

Special Tools

1

- **J 6125-1B**: Slide Hammer
- **J 8092**: Driver Handle
- **J 23129**: Universal Seal Remover
- **J 46629-A**: Axle Seal Installer

MANUAL SHIFT SHAFT AND SEAL REPLACEMENT

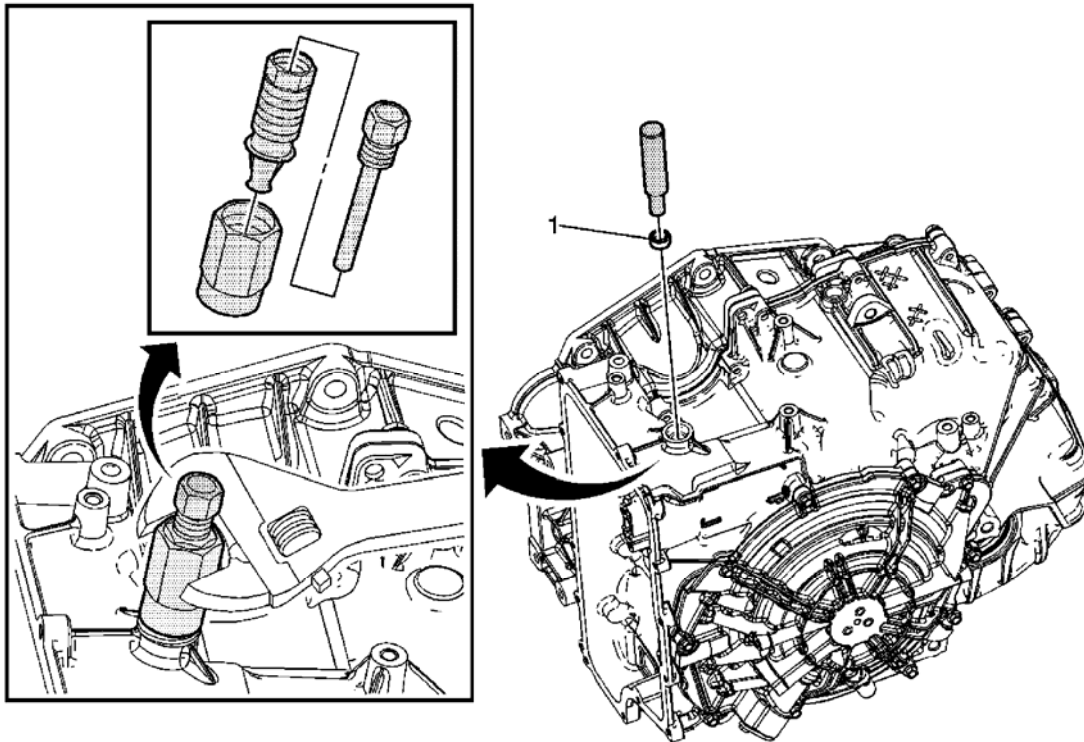


Fig. 35: Manual Shift Shaft & Seal
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
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 and Park Pawl Actuator Removal .	
	Manual Shift Shaft Seal

Tip:

1

- For seal removal use **J 45201** .
- For seal installation use **J-46626** . See **Special Tools** .
- Lubricate the manual shaft with automatic transmission fluid (ATF) to prevent damage to the manual shift shaft seal.

Special Tools

- **J 45201** Cooler Line Seal Remover
- **J-46626** Seal Installer. See **Special Tools** .

CONTROL VALVE BODY COVER REPLACEMENT

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement** .

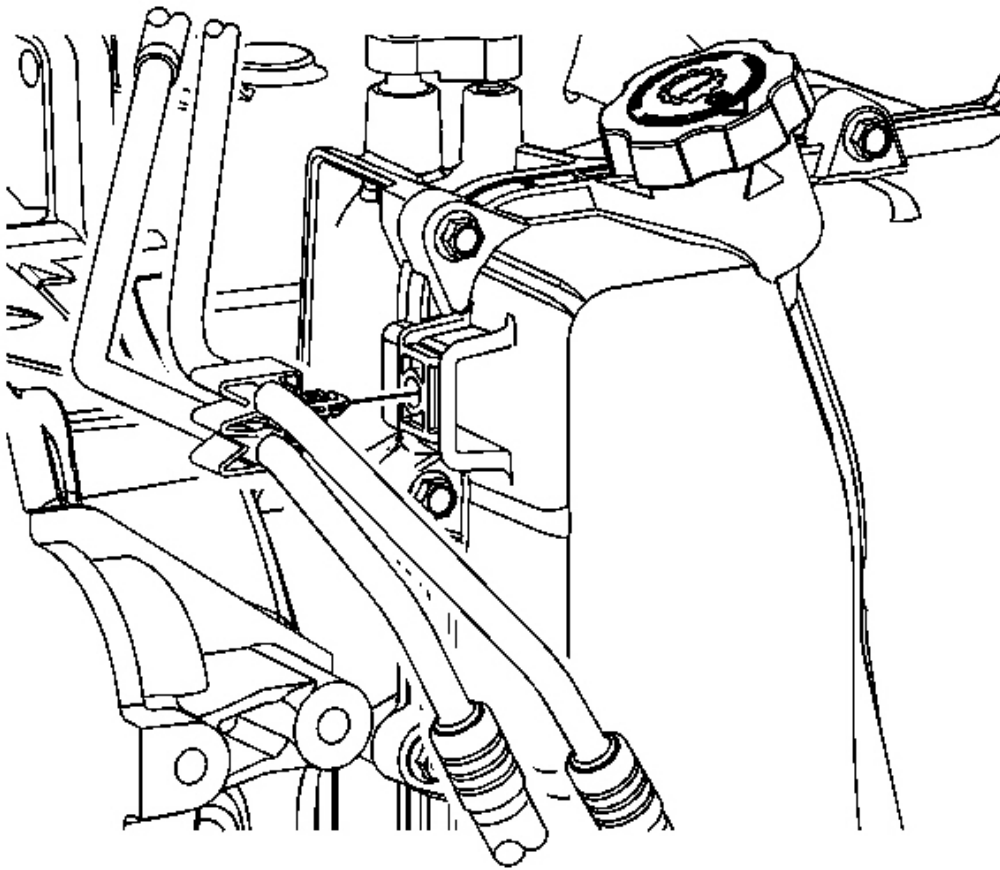


Fig. 36: View Of Oil Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

2. Remove the oil cooler inlet and outlet hoses from the retainer on the control valve body cover.
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the front transmission mount. Refer to **Transmission Front Mount Replacement**.
5. Remove the lower nuts from the left transmission mount. Refer to **Transmission Mount Replacement - Left Side** .
6. Drain the transmission. Refer to **Transmission Fluid Replacement**.

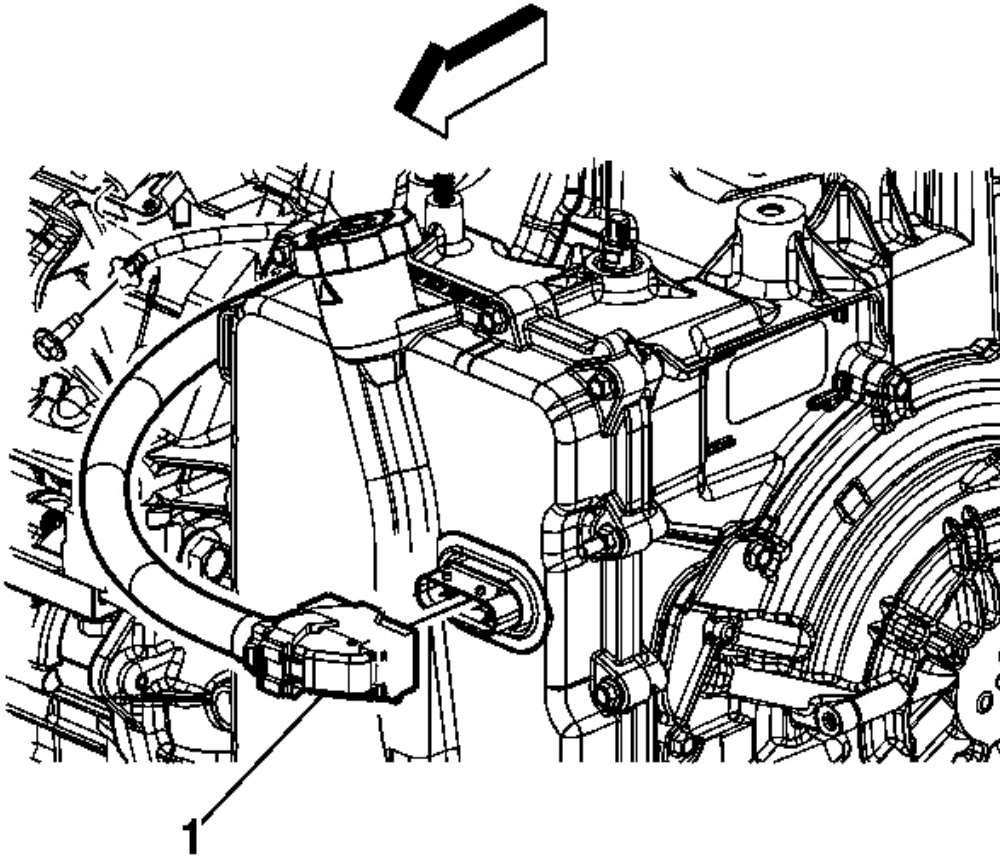


Fig. 37: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

7. Disconnect the control valve body transmission control module (TCM) electrical connector (1).

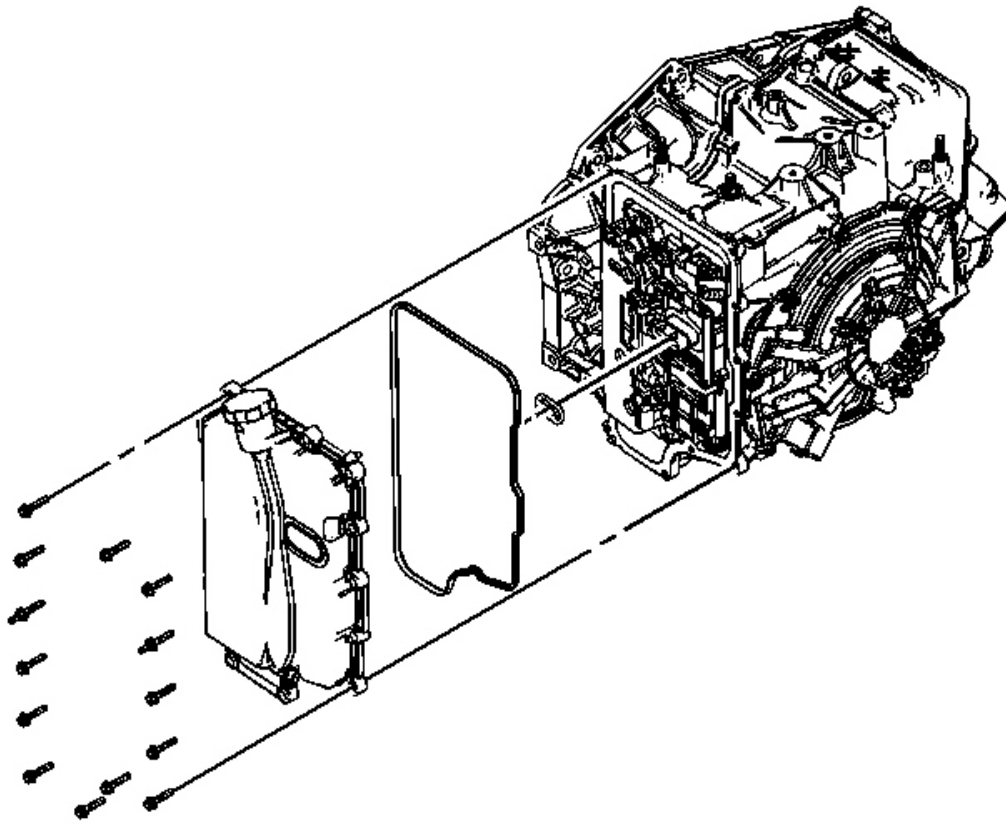


Fig. 38: Identifying Control Valve Body Cover Studs & Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the 2 control valve body cover studs M6 x 30.
9. Remove the 12 control valve body cover bolts M6 x 30.
10. Support the transmission with a transmission jack.
11. Using the transmission jack raise the transmission to gain clearance for removal of the control valve body cover.
12. Remove the control valve body cover.
13. 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.

14. Remove the control valve body cover wiring connector hole seal.

15. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

Installation Procedure

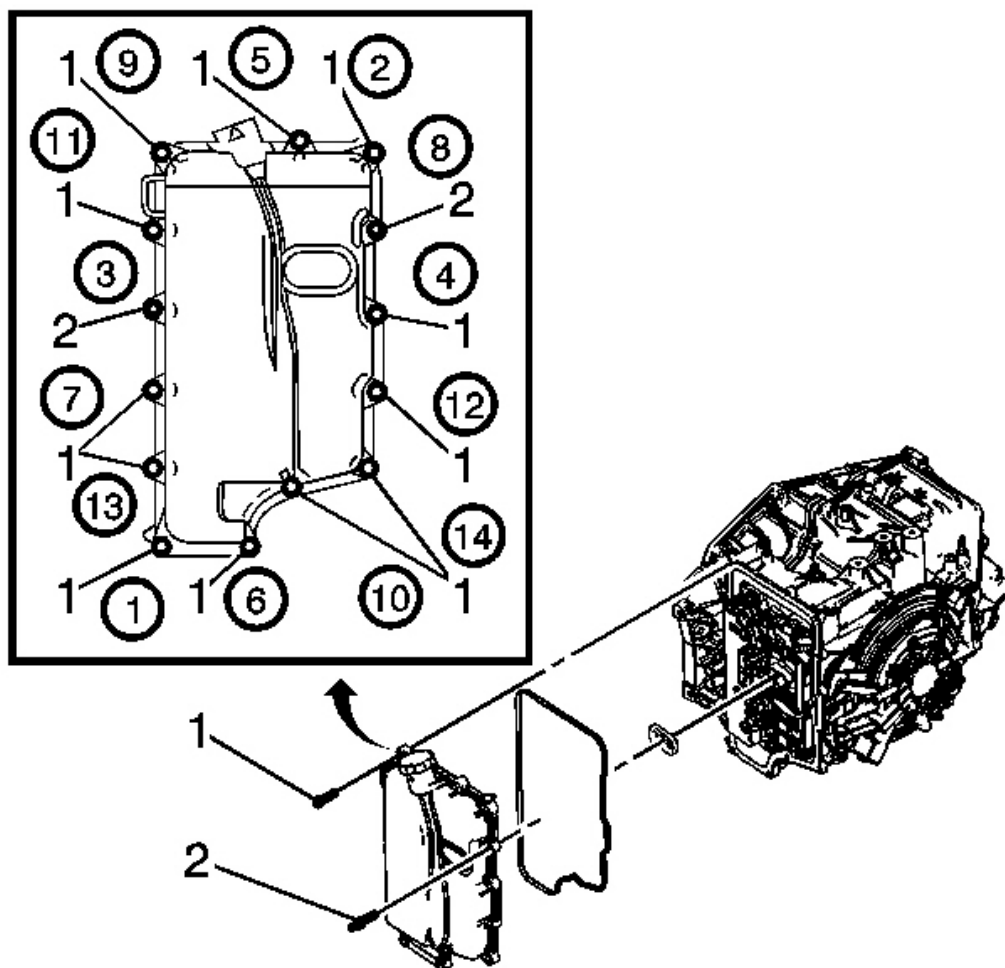


Fig. 39: Identifying Control Valve Body Cover Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: The holes in the control valve body cover wiring connector hole seal must face toward the control solenoid valve assembly. If the holes face toward the valve body cover, there is a potential for a leak around the seal.

1. Install the control valve body cover wiring connector hole seal.

2. Install the control valve body cover gasket to the control valve body cover.
3. Install the control valve body cover.
4. Lower the transmission and remove the transmission jack.

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.

5. Install the 12 control valve body cover bolts (1) M6 x 30 and tighten the bolts in sequence to 12 N.m (106 lb in).
6. Install the 2 control valve body cover studs (2) M6 x 30 and tighten the studs in sequence to 12 N.m (106 lb in).

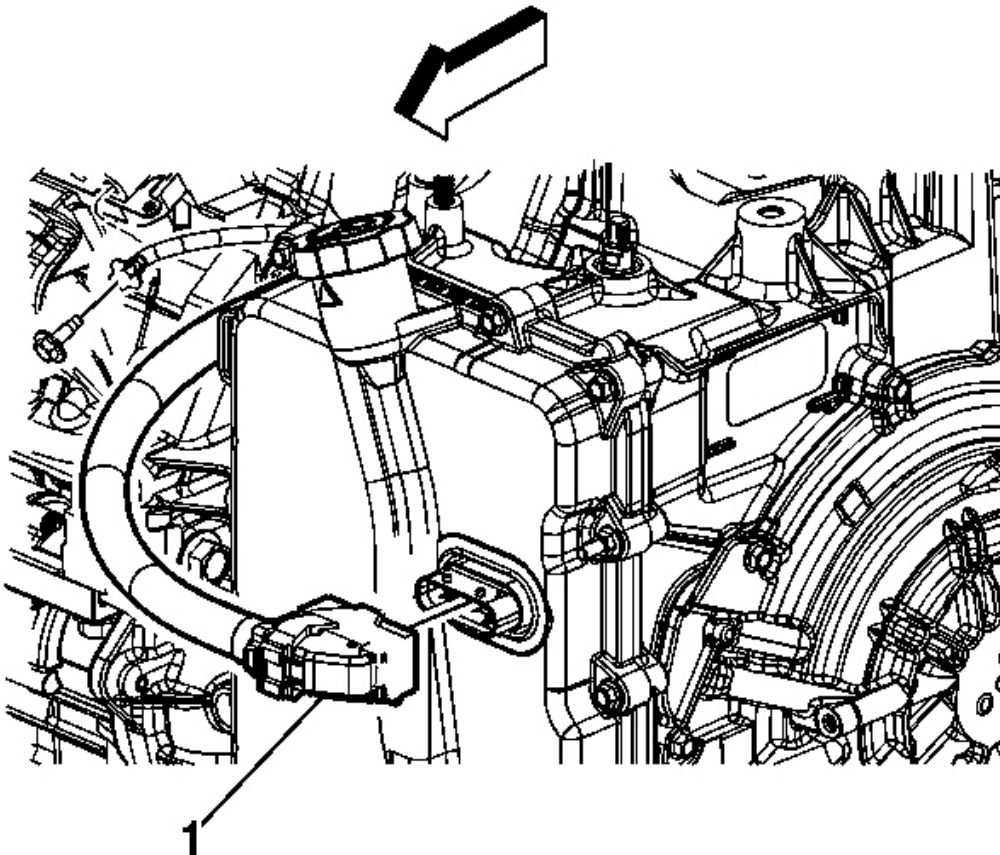


Fig. 40: Identifying Control Valve Body Transmission Control Module Electrical Connector
Courtesy of GENERAL MOTORS CORP.

7. Connect the control valve body TCM electrical connector (1).
8. Install the lower nuts to the left transmission mount. Refer to **Transmission Mount Replacement - Left Side**.
9. Install the front transmission mount. Refer to **Transmission Front Mount Replacement**.
10. Lower the vehicle.

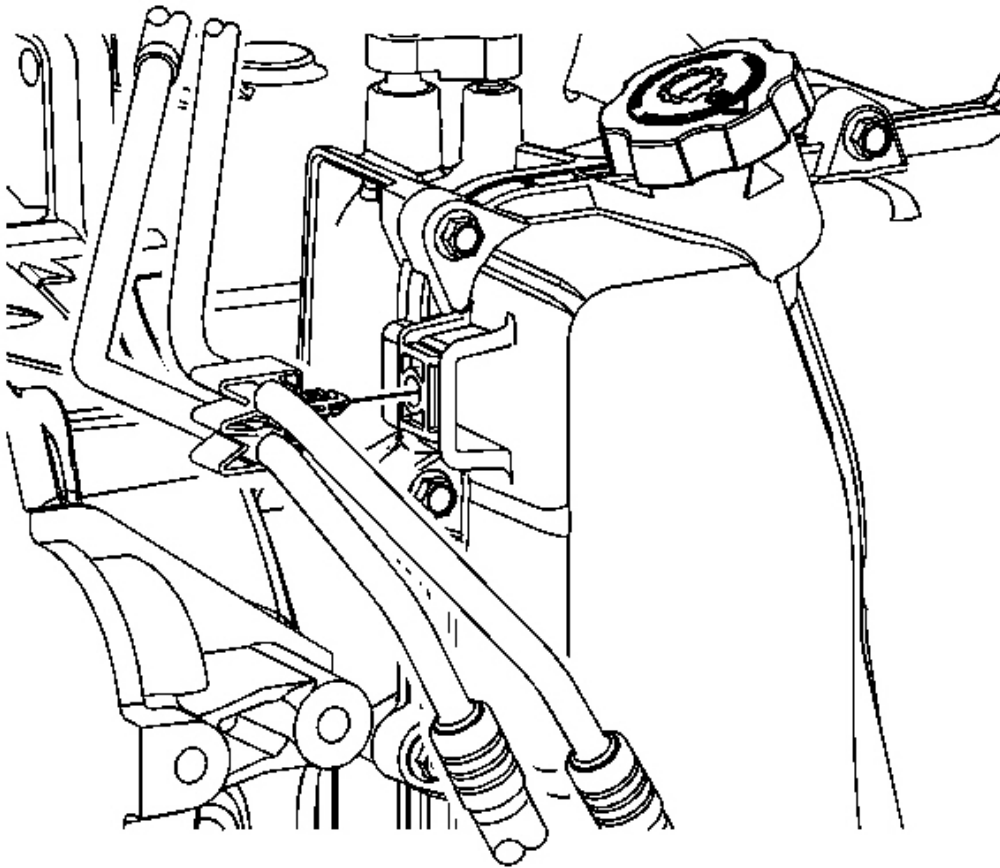


Fig. 41: View Of Oil Cooler Inlet & Outlet Hoses
Courtesy of GENERAL MOTORS CORP.

11. Install the oil cooler inlet and outlet hoses to the retainer on the control valve body cover.
12. Install the battery tray. Refer to **Battery Tray Replacement**.
13. Fill the transmission. Refer to **Transmission Fluid Replacement**.

14. Check for leaks.

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the control valve body cover. Refer to Control Valve Body Cover Replacement.

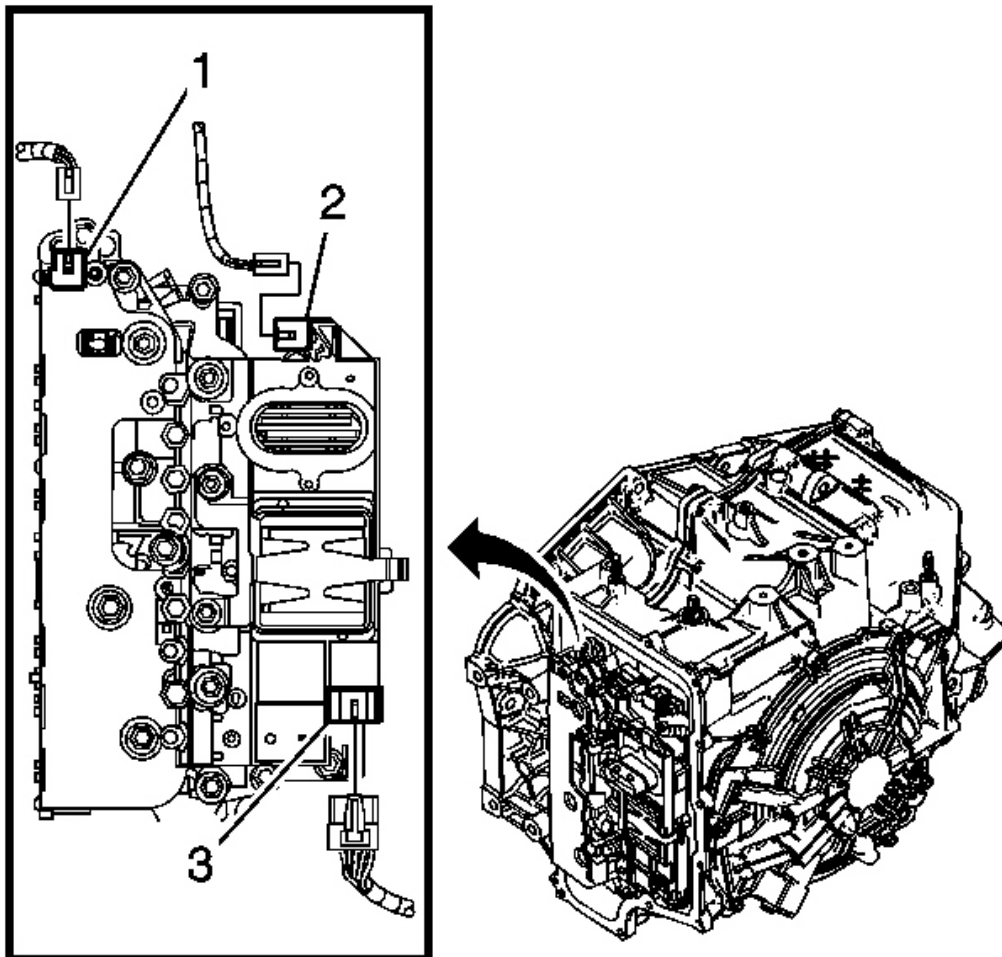


Fig. 42: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

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).

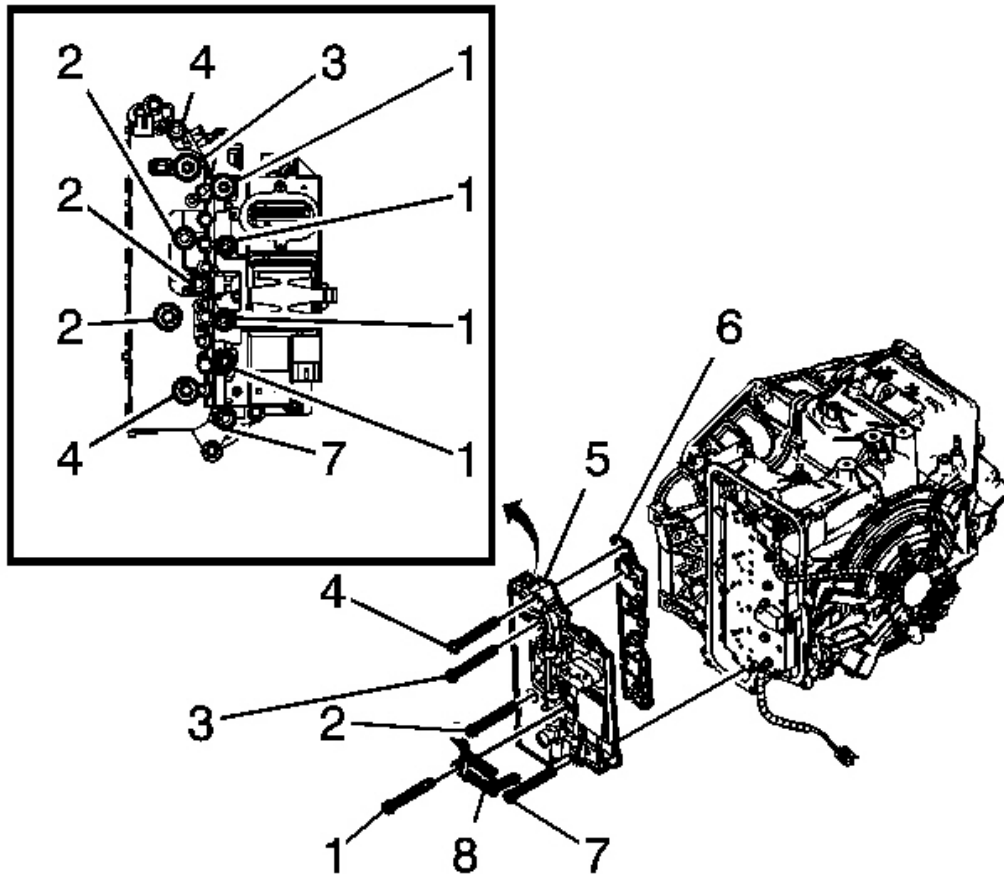


Fig. 43: Identifying Control Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the 4 control valve body bolts (1) M6 x 80.
6. Position the control solenoid valve spring (8) to the side. Spring will be released with the removal of the control valve body assembly.
7. Remove the 2 control valve body bolts (4) M6 x 65.
8. Remove the control valve body bolt (3) M6 x 42.
9. Remove the 3 control valve body bolts (2) M6 x 95.
10. Remove the control valve body bolt (7) M6 x 55.
11. Remove the control solenoid valve body and transmission control module (TCM) assembly (5).

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.

12. Remove the control solenoid valve assembly filter plate (6).

- Discard the filter plate. It is not reusable.
- Inspect the pressure switch manifold seals for damage or contamination. Replace the control solenoid valve assembly as necessary.
- Inspect the upper channel plate bolt holes for damage, peening or burnelling. Any damage around the bolt holes near the pressure control switch (PCS) feed holes could cause leakage around the PCS seals. Replace the upper channel plate as necessary.

Installation Procedure

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

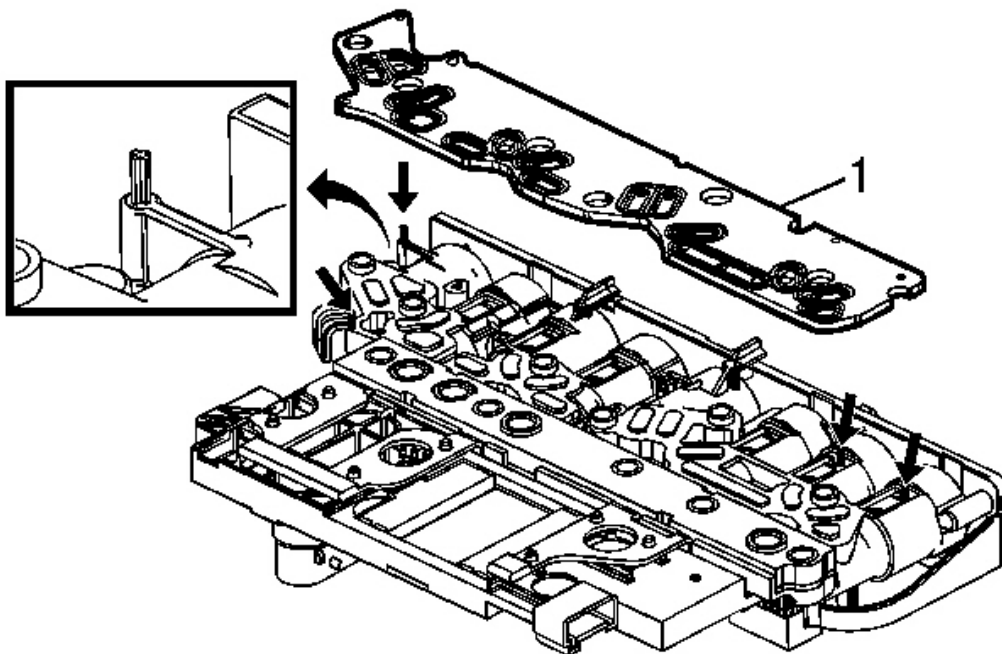


Fig. 44: Identifying Control Solenoid Valve Assembly Filter Plate

Courtesy of GENERAL MOTORS CORP.

1. Install a NEW control solenoid valve assembly filter plate (1).

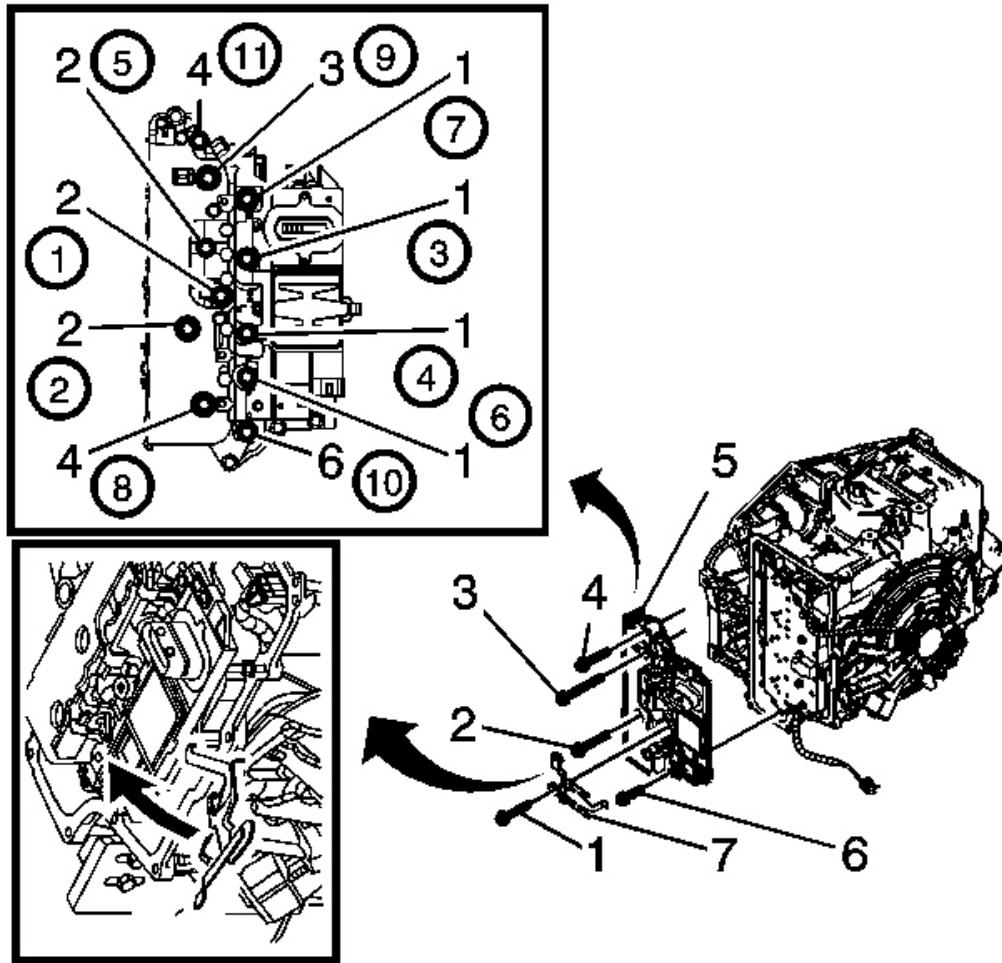


Fig. 45: Identifying Control Valve Body Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

2. Install the control solenoid valve body and TCM assembly (5).
3. Rotate the control solenoid valve spring (7) into position.

CAUTION: Refer to Fastener Caution .

NOTE: Install all bolts before tightening, then tighten in specified sequence.

4. Install the 4 control valve body bolts (1) M6 x 80.
5. Install the control valve body bolt (6) M6 x 55.
6. Install the 3 control valve body bolts (2) M6 x 95.
7. Install the control valve body bolt (3) M6 x 42.
8. Install the 2 control valve body bolts (4) M6 x 65 and tighten to 12 N.m (106 lb in).

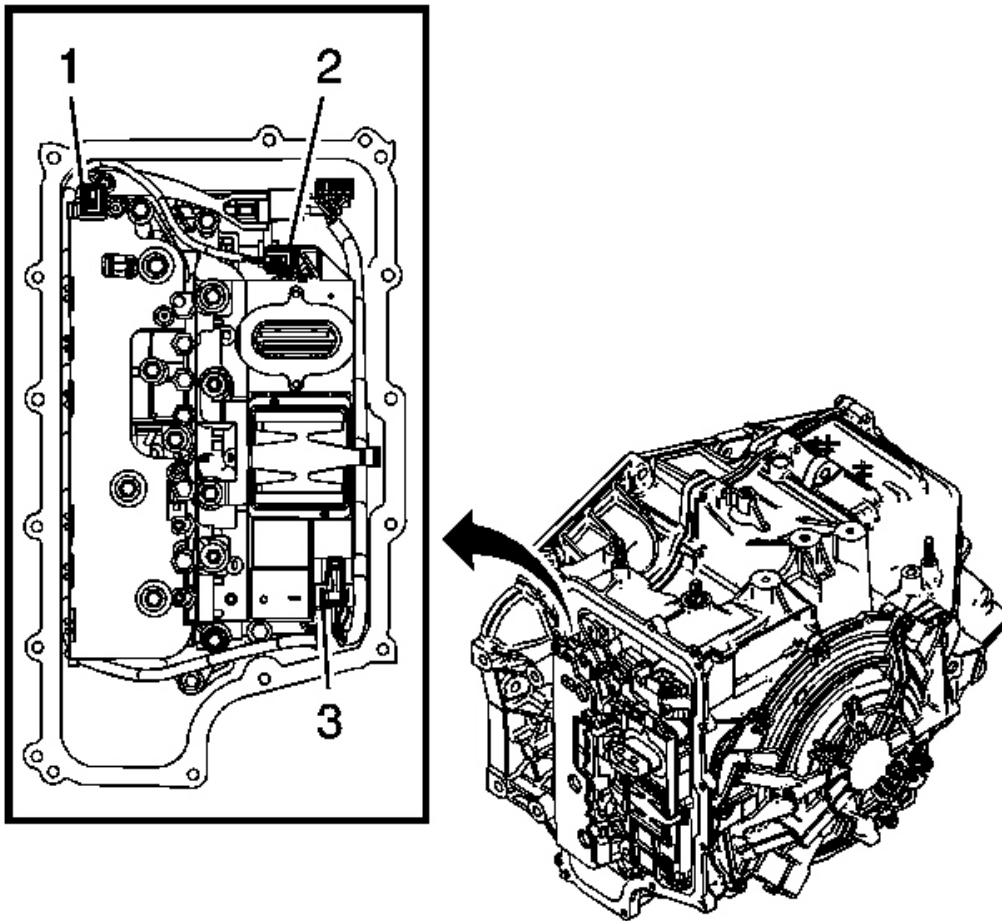


Fig. 46: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

9. Connect the input speed sensor electrical connector (1).
10. Connect the output speed sensor electrical connector (2).

11. Connect the shift position switch electrical connector (3).
12. Install the control valve body cover. Refer to **Control Valve Body Cover Replacement**.
13. 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.**

14. Perform the transmission adaptive values learn procedure. Refer to **Transmission Adaptive Values Learn** .

CONTROL VALVE LOWER BODY AND UPPER BODY REPLACEMENT

Removal Procedure

1. Remove the control valve body cover. Refer to **Control Valve Body Cover Replacement**.

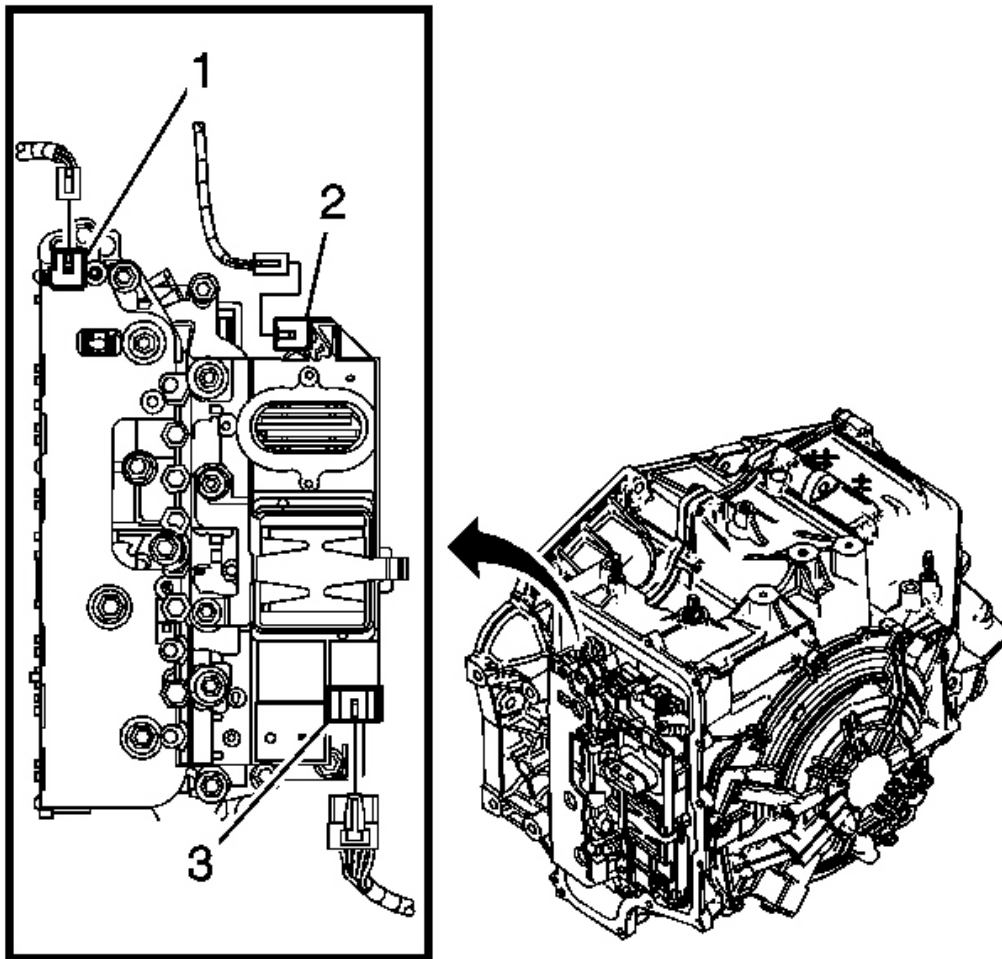


Fig. 47: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

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).

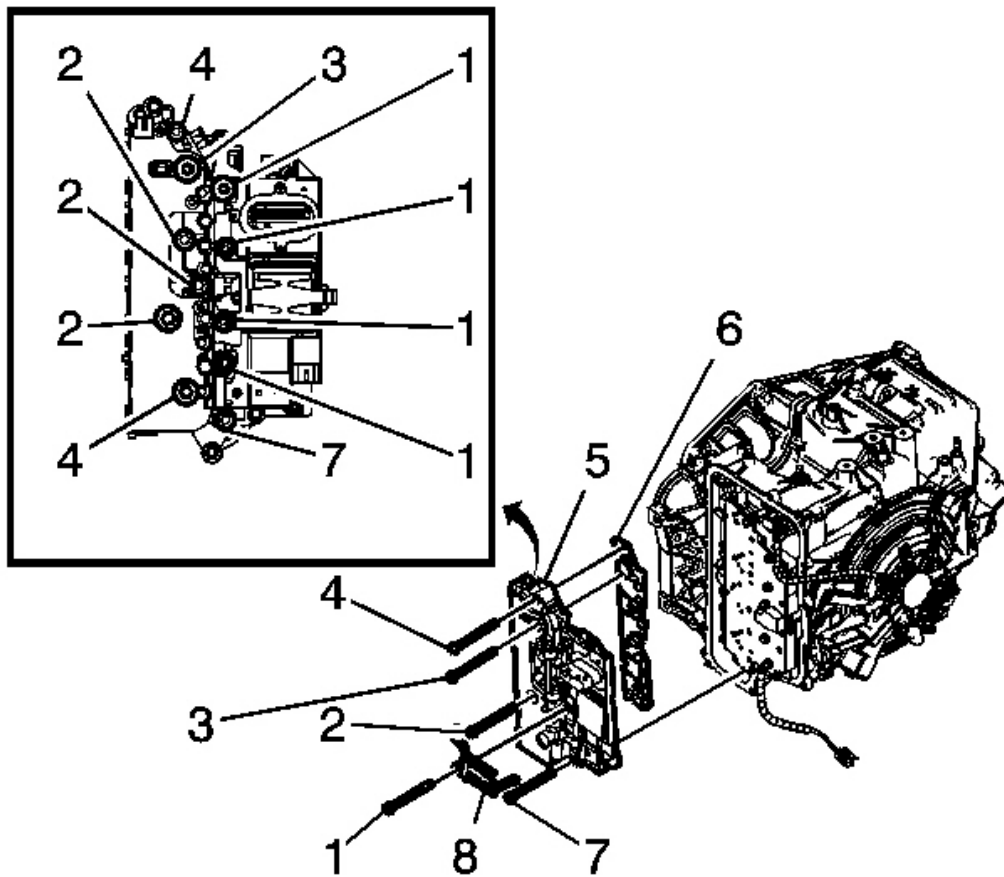


Fig. 48: Identifying Control Valve Body Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the 4 control valve body bolts (1) M6 x 80.
6. Position the control solenoid valve spring (8) to the side. Spring will be released with removal of lower control valve body.
7. Remove the 2 control valve body bolts (4) M6 x 65.
8. Remove the control valve body bolt (3) M6 x 42.
9. Remove the 3 control valve body bolts (2) M6 x 95.
10. Remove the control valve body bolt (7) M6 x 55.
11. Remove the control solenoid valve body and transmission control module (TCM) assembly (5).

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.

12. Remove the control solenoid valve body assembly filter plate (6).

- Discard the filler plate. It is not reusable.
- Inspect the pressure switch manifold seals for damage or contamination. Replace the control solenoid valve assembly as necessary.
- Inspect the upper channel plate bolt holes for damage, peening or burnelling. Any damage around the bolt holes near the PCS switch feed holes could cause leakage around the PCS switch seals. Replace the upper channel plate as necessary.

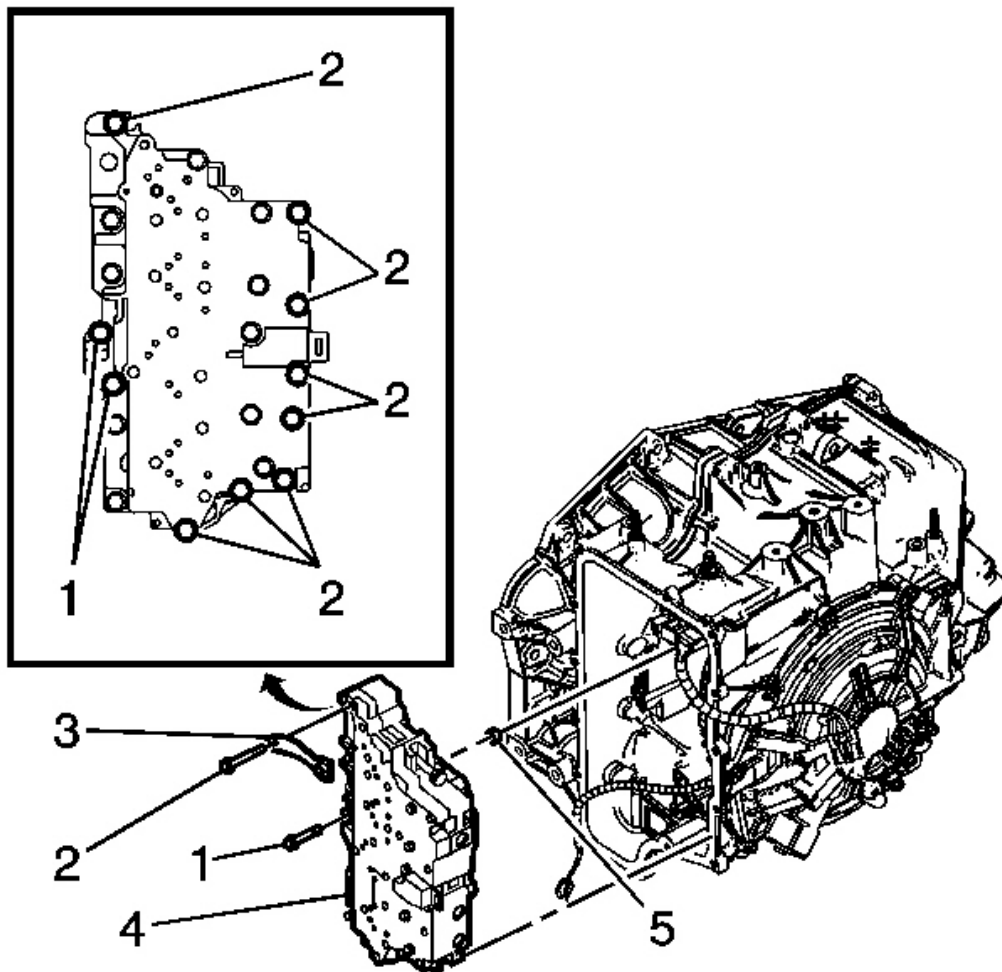


Fig. 49: Identifying Control Valve Body Bolts

Courtesy of GENERAL MOTORS CORP.

13. Remove the 8 control valve body bolts (2) M6 x 65.
14. Remove the 2 control valve body bolts (1) M6 x 55.
15. Remove the manual shaft detent assembly (3).
16. Remove the control valve body assembly (4).
17. The control solenoid valve spring can now be fully removed from the lower control valve body assembly.

NOTE: The clutch fluid passage seal is not reusable.

18. Remove the 1-2-3-4 clutch fluid passage seal (5).

Installation Procedure

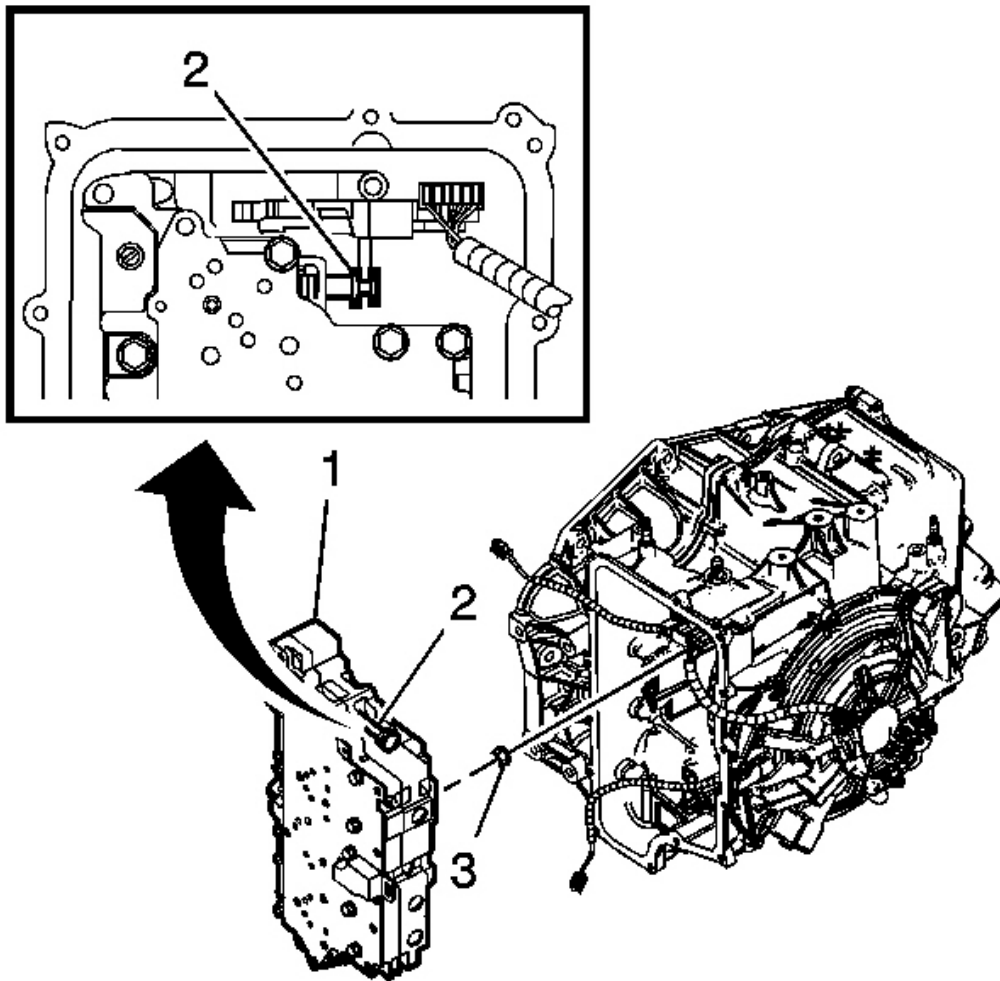


Fig. 50: Identifying Control Valve Body Components
Courtesy of GENERAL MOTORS CORP.

NOTE: The clutch fluid passage seal is not reusable.

1. Install a NEW 1-2-3-4 clutch fluid passage seal (3).

NOTE:

- Ensure the control solenoid valve spring is attached to the lower control valve body assembly.
- Align the manual valve (2) to the detent lever assembly while installing the lower control valve body assembly.

2. Install the control valve body assembly (1).

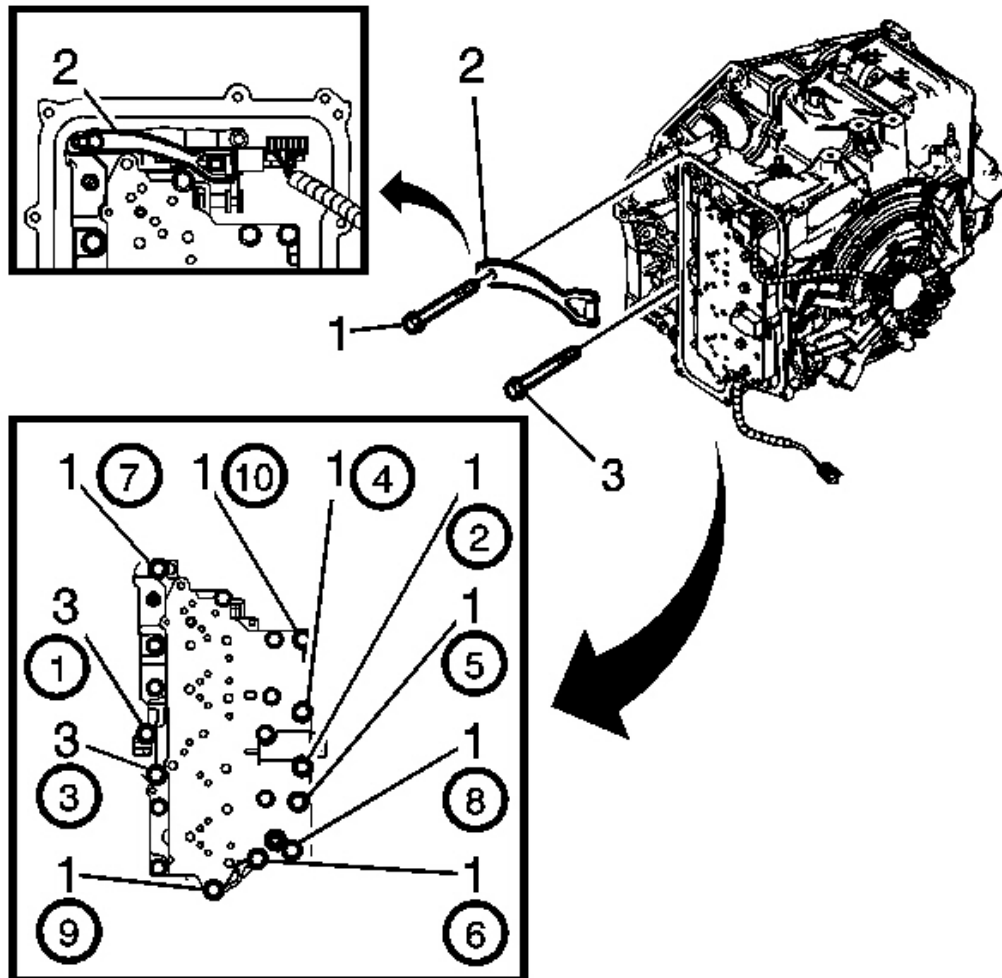


Fig. 51: Identifying Control Valve Body Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

NOTE: Ensure proper alignment of the detent assembly to the detent lever assembly with position switch while tightening the bolt. The detent assembly can move and hit the valve body assembly that could cause improper engagement with the detent lever assembly.

3. Install the manual shaft detent assembly (2).

CAUTION: Refer to Fastener Caution .

NOTE: Install all bolts before tightening, then tighten in specified sequence.

4. Install the 8 control valve body bolts (1) M6 x 65 and tighten to 12 N.m (106 lb in).
5. Install the 2 control valve body bolts (3) M6 x 55 and tighten to 12 N.m (106 lb in).

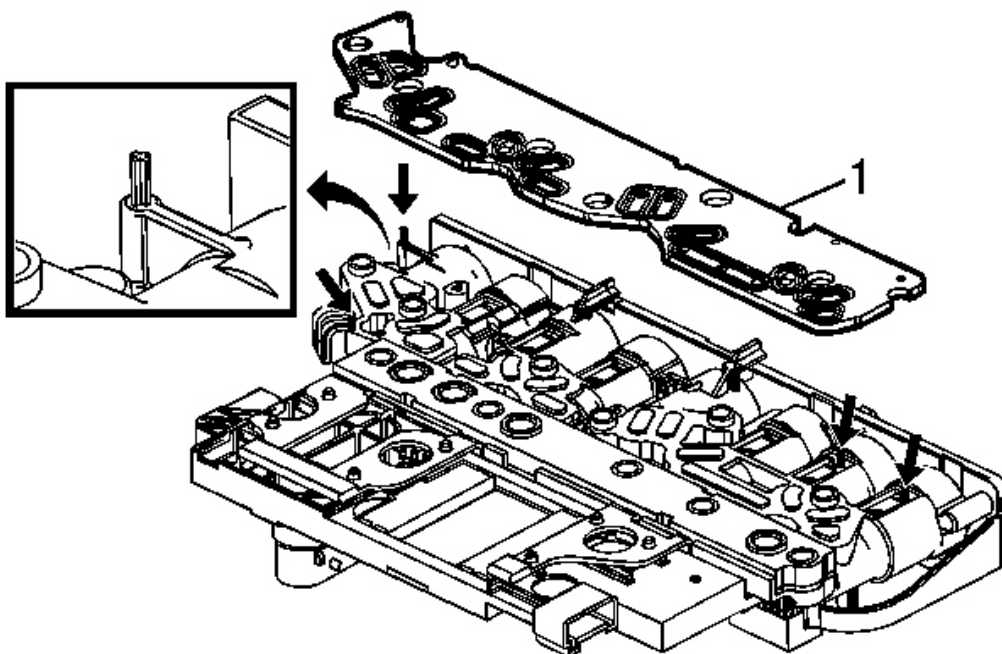


Fig. 52: Identifying Control Solenoid Valve Assembly Filter Plate
Courtesy of GENERAL MOTORS CORP.

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.

6. Install a NEW control solenoid valve assembly filter plate (1).

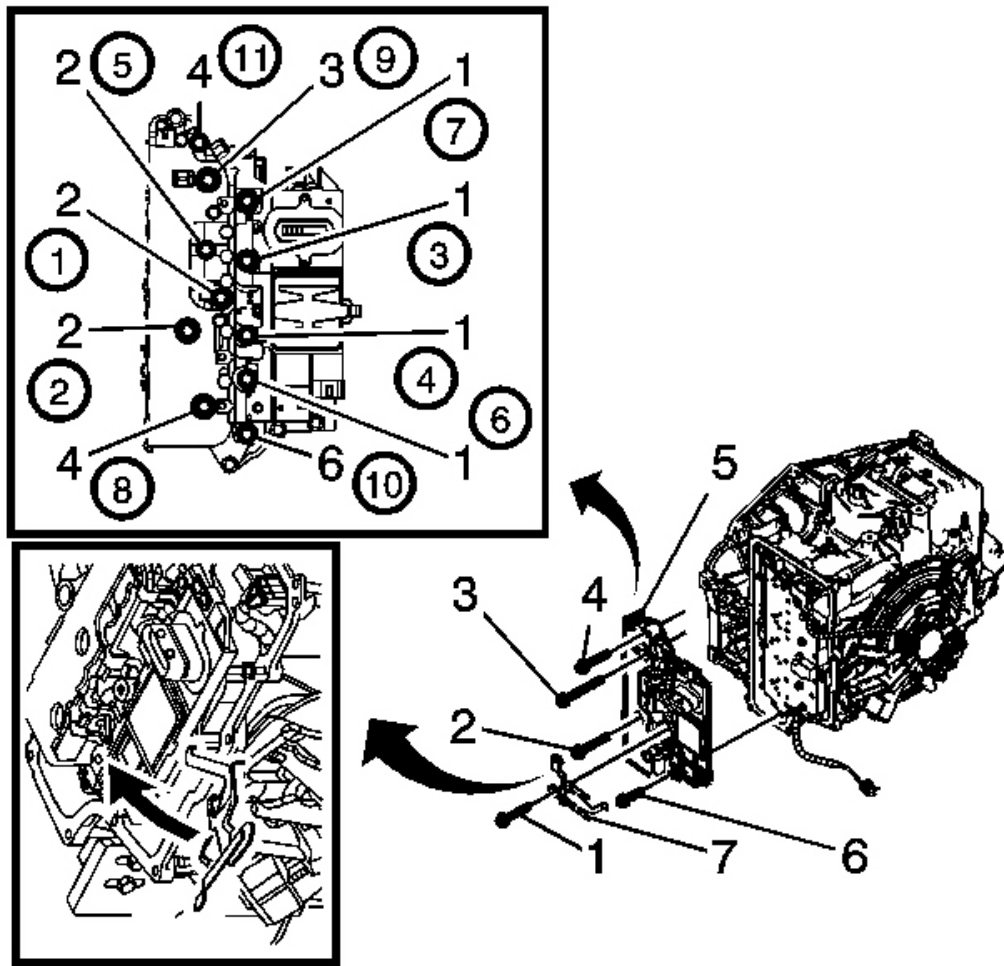


Fig. 53: Identifying Control Valve Body Bolt Tightening Sequence
Courtesy of GENERAL MOTORS CORP.

7. Install the control solenoid valve body and TCM assembly (5).
8. Rotate the control solenoid valve spring (7) into position.

NOTE: **Install all bolts before tightening, then tighten in specified sequence.**

9. Install the 4 control valve body bolts (1) M6 x 80.
10. Install the control valve body bolt (6) M6 x 55.
11. Install the 3 control valve body bolts (2) M6 x 95.
12. Install the control valve body bolt (3) M6 x 42.

13. Install the 2 control valve body bolts (4) M6 x 65.

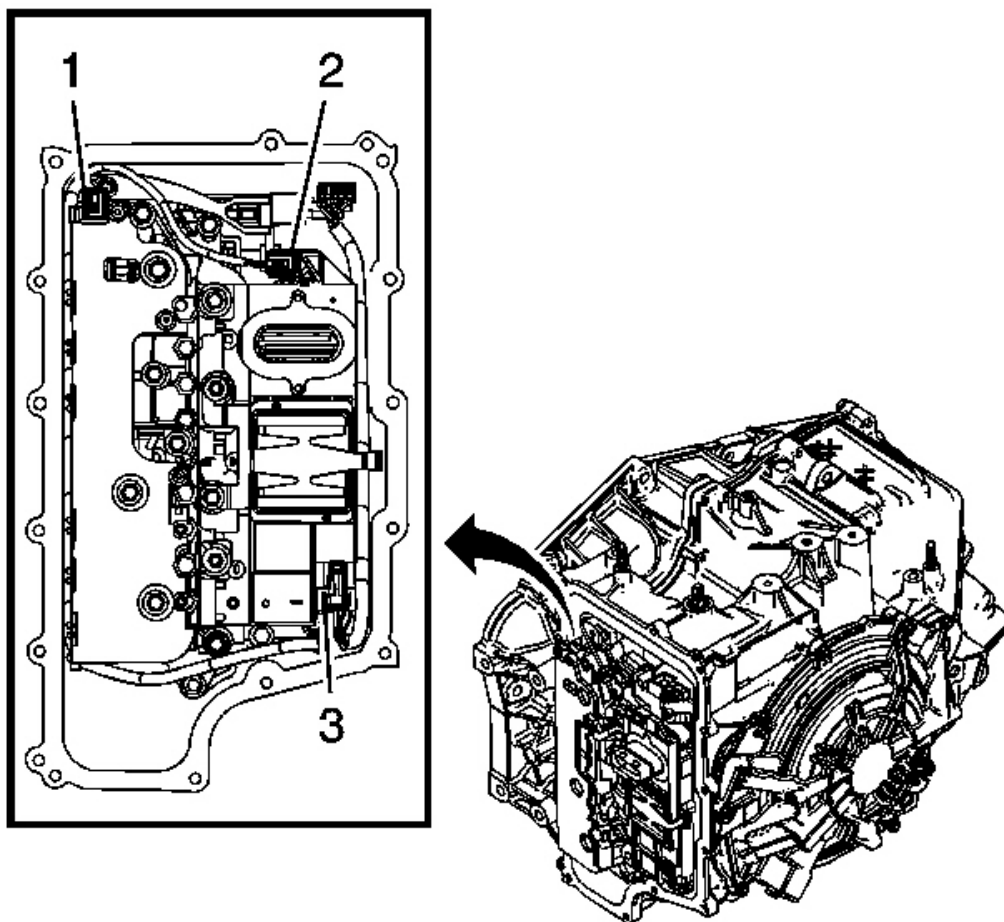


Fig. 54: Identifying Speed Sensor & Shift Position Switch Electrical Connectors
Courtesy of GENERAL MOTORS CORP.

14. Connect the input speed sensor electrical connector (1).
15. Connect the output speed sensor electrical connector (2).
16. Connect the shift position switch electrical connector (3).
17. Install the control valve body cover. Refer to **Control Valve Body Cover Replacement**.
18. 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.

19. Perform the transmission adaptive values learn procedure. Refer to **Transmission Adaptive Values Learn** .

OUTPUT SPEED SENSOR REPLACEMENT

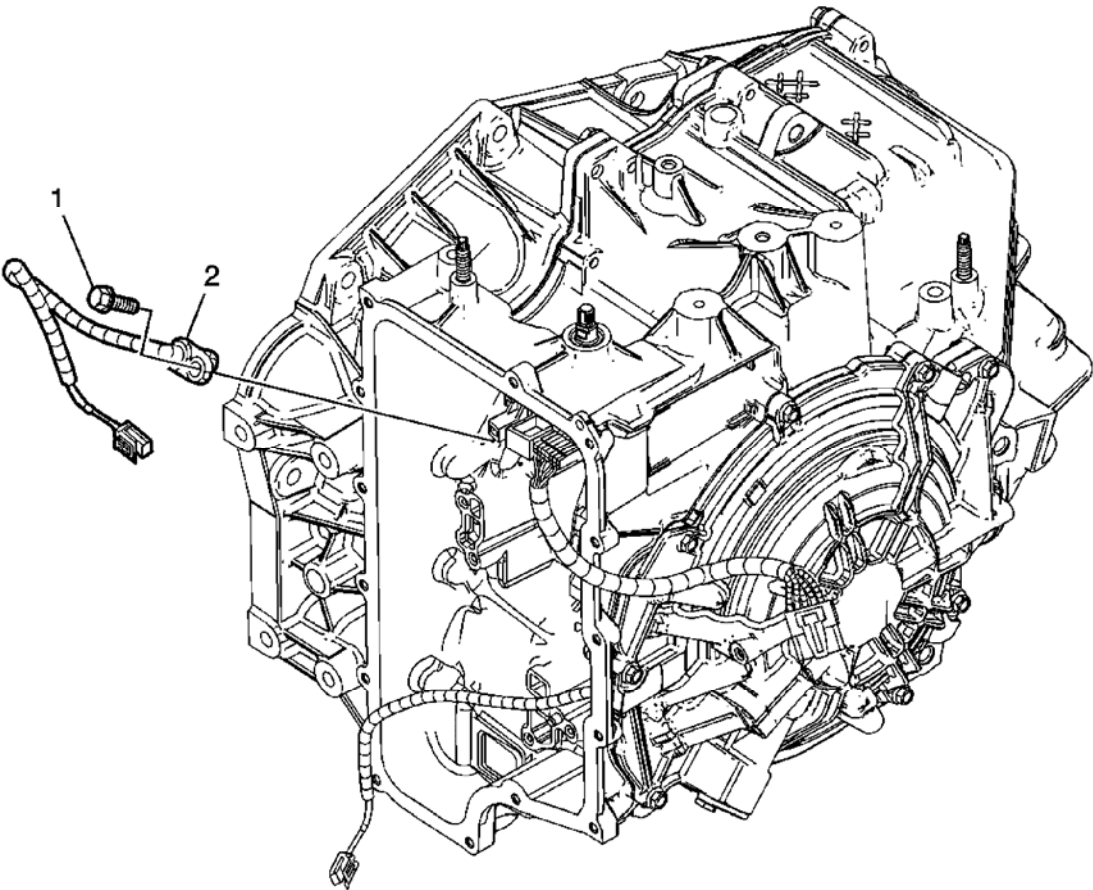


Fig. 55: Output Speed Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .	
2. Remove the control valve lower body and upper body. Refer to <u>Control Valve Lower Body and Upper Body Replacement</u> .	
1	Output Speed Sensor Bolt M6 x 25 CAUTION: Refer to <u>Fastener Caution</u> .

	Tighten: 12 N.m (106 lb in)
2	Output Speed Sensor Procedure: Perform the service programming system procedure. Refer to <u>Service Programming System (SPS)</u> . Tip: After an internal transmission repair or internal part replacement the service programming system procedure should be performed.

INPUT SPEED SENSOR REPLACEMENT

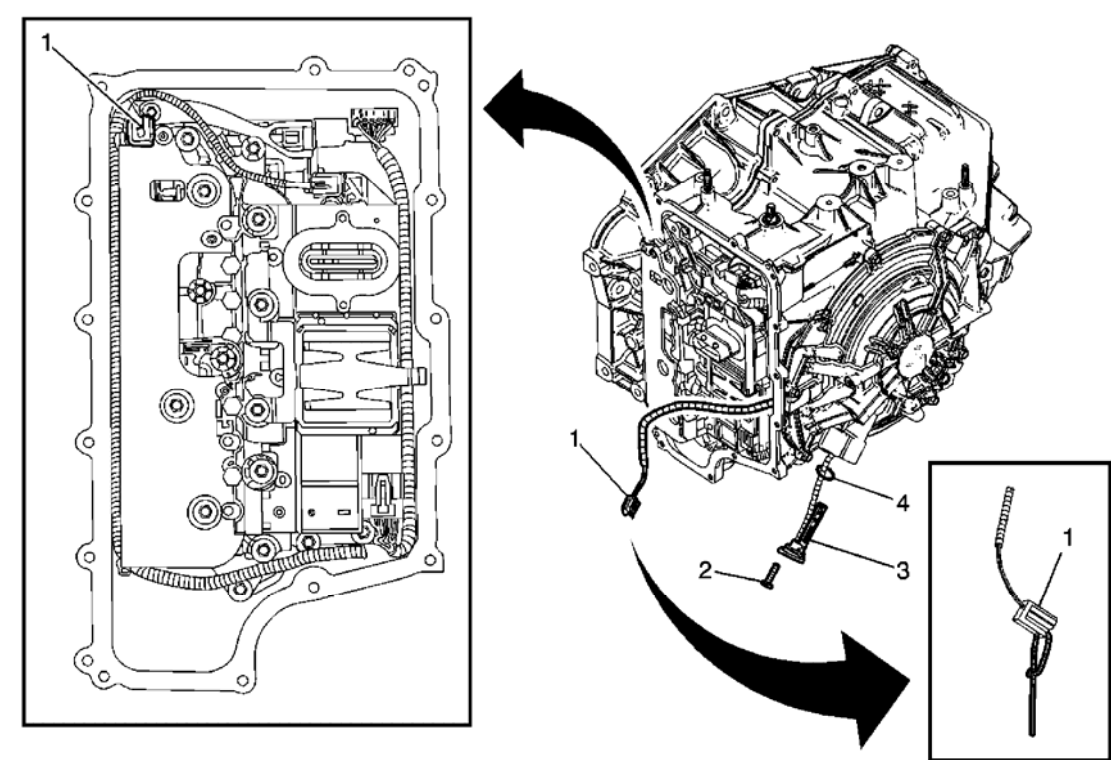


Fig. 56: Input Speed Sensor
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1.	Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> .
2.	Drain the transmission, refill when repair is completed. Refer to <u>Transmission Fluid Replacement</u> .
3.	Remove the radiator air lower baffle and deflector assembly. Refer to <u>Radiator Air Lower Baffle and Deflector Replacement</u> .
4.	Remove the front transmission mount and bracket. Refer to <u>Transmission Front Mount Replacement</u> .

5. Remove the control valve body cover. Refer to <u>Control Valve Body Cover Replacement</u> . 6. Perform the service programming system procedure. Refer to <u>Service Programming System (SPS)</u> .	
1	Input Speed Sensor (ISS) Wire Harness Procedure: Attach the DT-47734: tether to the ISS electrical connector locking tab before removal of old ISS to assist in installation of the new ISS. Special Tools: DT-47734: Speed Sensor Harness Tether
2	Input Speed Sensor Bolt M6 x 25 CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Apply threadlocker GM P/N 12345382 (Canadian P/N 10953489) or equivalent to the input speed sensor bolt. Tighten: 9 N.m (80 lb in)
3	Input Speed Sensor Tip: After an internal transmission repair or internal part replacement the service programming system procedure should be performed.
4	Input Speed Sensor Seal

INPUT SPEED SENSOR SEAL REPLACEMENT

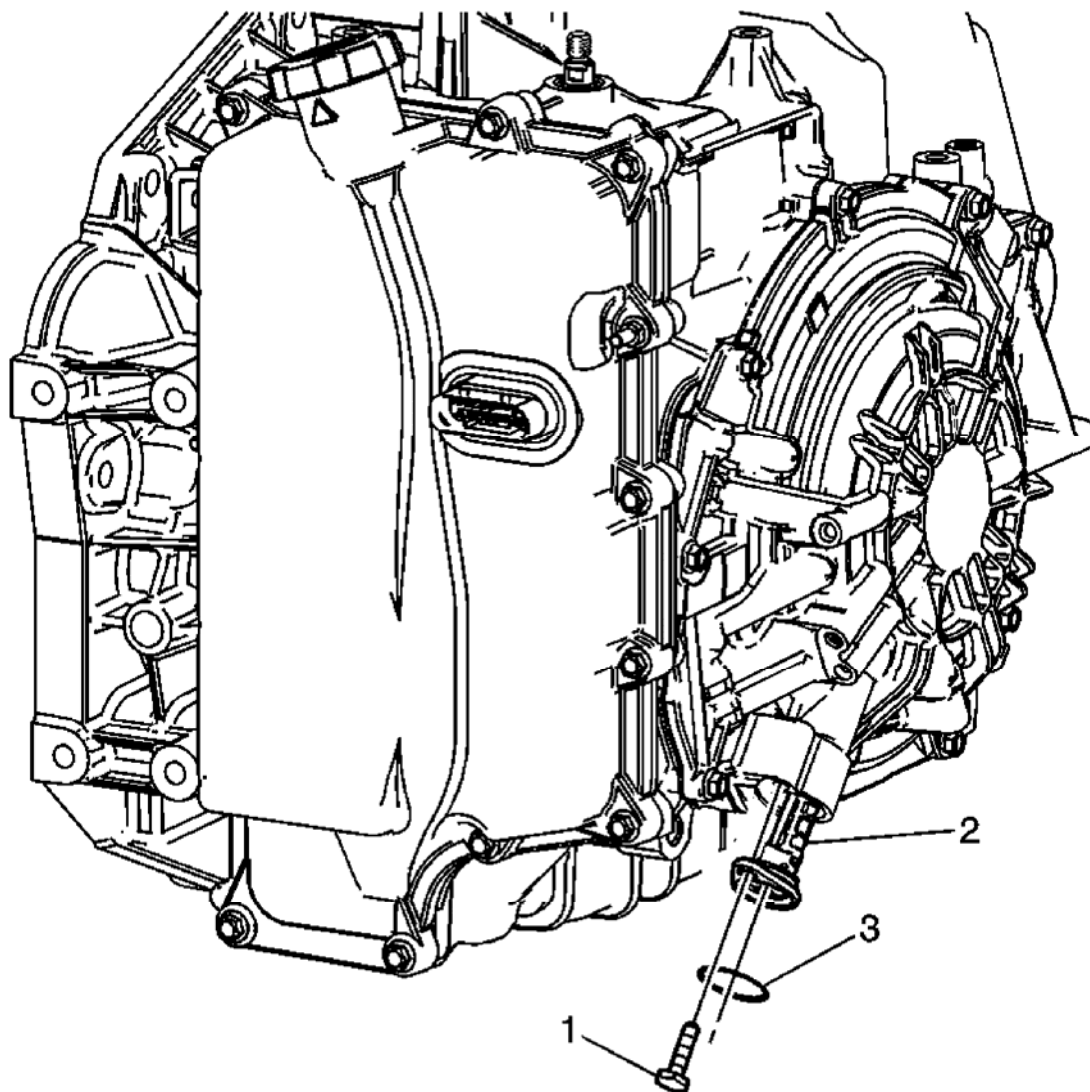


Fig. 57: Input Speed Sensor Seal
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
Preliminary Procedures	
1. Raise and support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Drain the transmission, refill when repair is completed. Refer to <u>Transmission Fluid Replacement</u> . 3. Remove the left wheel house. Refer to <u>Front Wheelhouse Liner Replacement (Equinox)</u> or <u>Front Wheelhouse Liner Replacement (Terrain)</u> .	
	Input Speed Sensor Bolt M6 x 25
	CAUTION:

	Refer to <u>Fastener Caution</u> .
1	Tip: Apply threadlocker to the input speed sensor bolt. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> for the recommended threadlock material. Tighten: 9 N.m (80 lb in)
2	Input Speed Sensor (ISS) Tip: Pull the ISS out of the case cover just far enough to gain access to the ISS seal.
3	Input Speed Sensor Seal Tip: • Remove the ISS seal by pulling it over the end of the ISS base. • Install the new ISS seal by gently stretching it over the ISS base. Overstretching the seal will cause it to not seal properly. The seal is coated with a dry lubricant. If the coating is missing, lubricate the seal with automatic transmission fluid prior to installation.

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** .

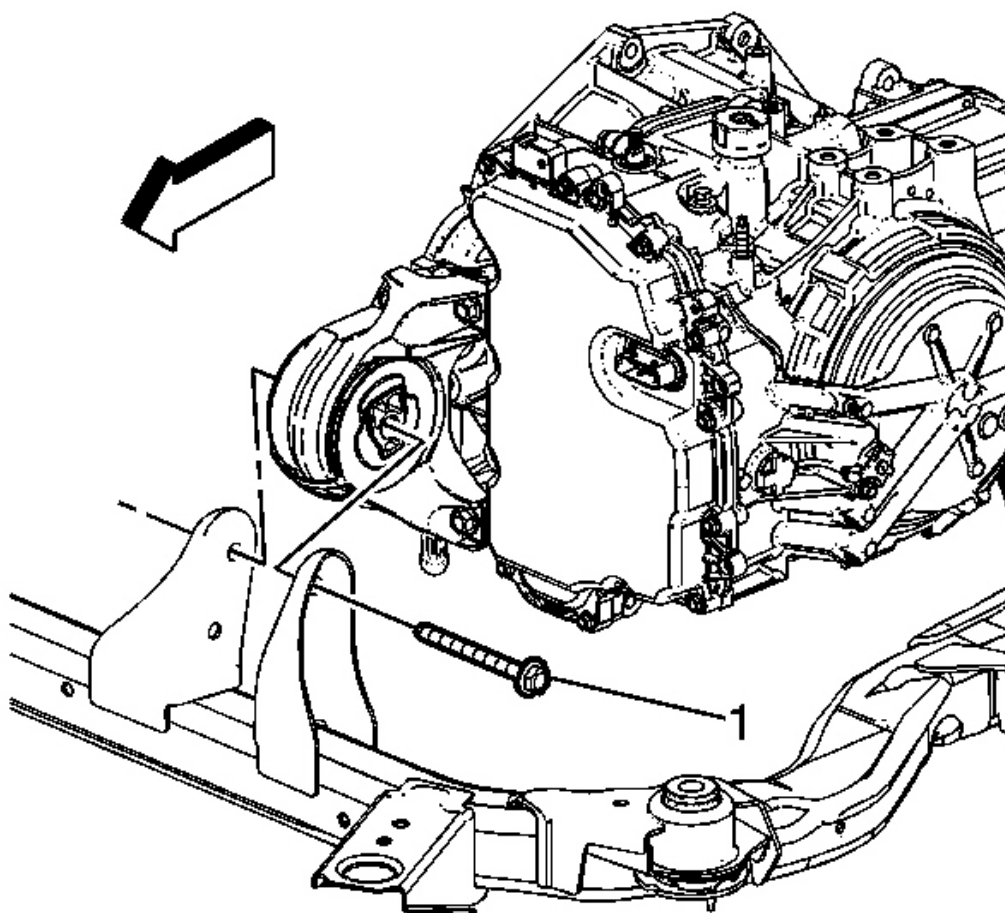


Fig. 58: Front Transmission Mount To Frame Bolt
Courtesy of GENERAL MOTORS CORP.

5. Remove the front transmission mount to frame bolt (1).

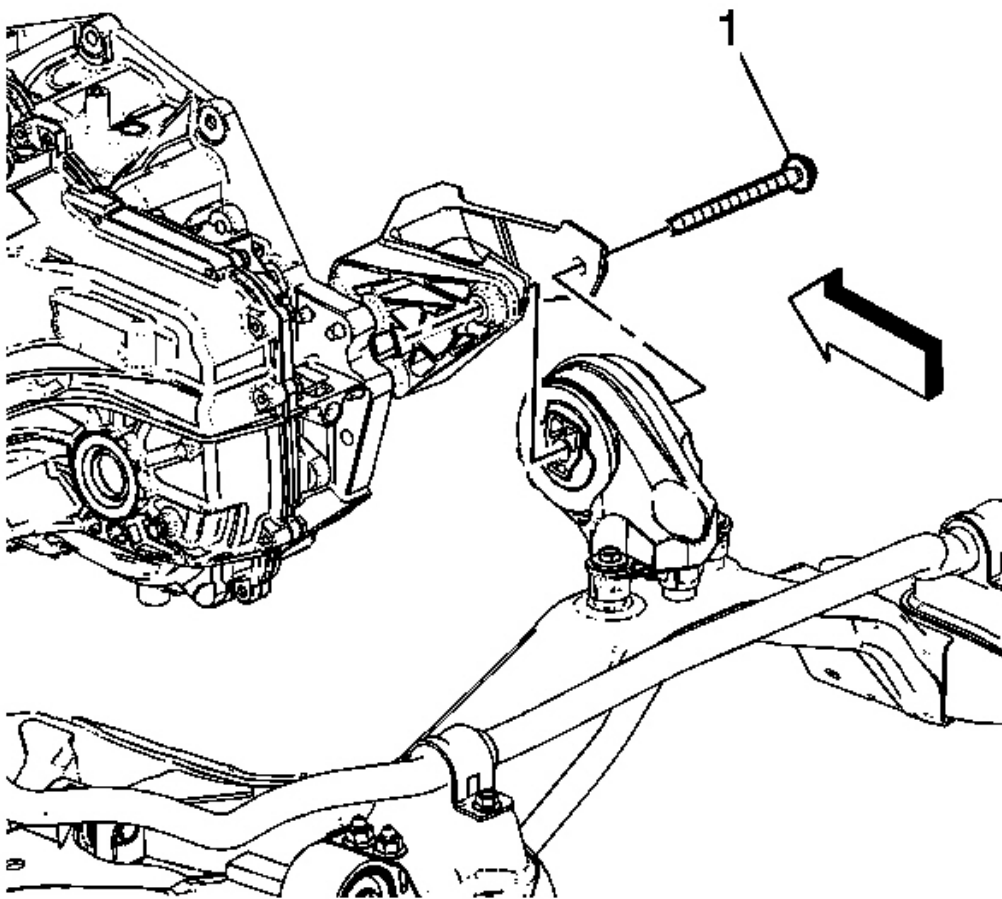


Fig. 59: Rear Transmission Mount To Rear Transmission Mount Bracket Bolt
Courtesy of GENERAL MOTORS CORP.

6. Remove the rear transmission mount to rear transmission mount bracket bolt (1).
7. Lower the vehicle.

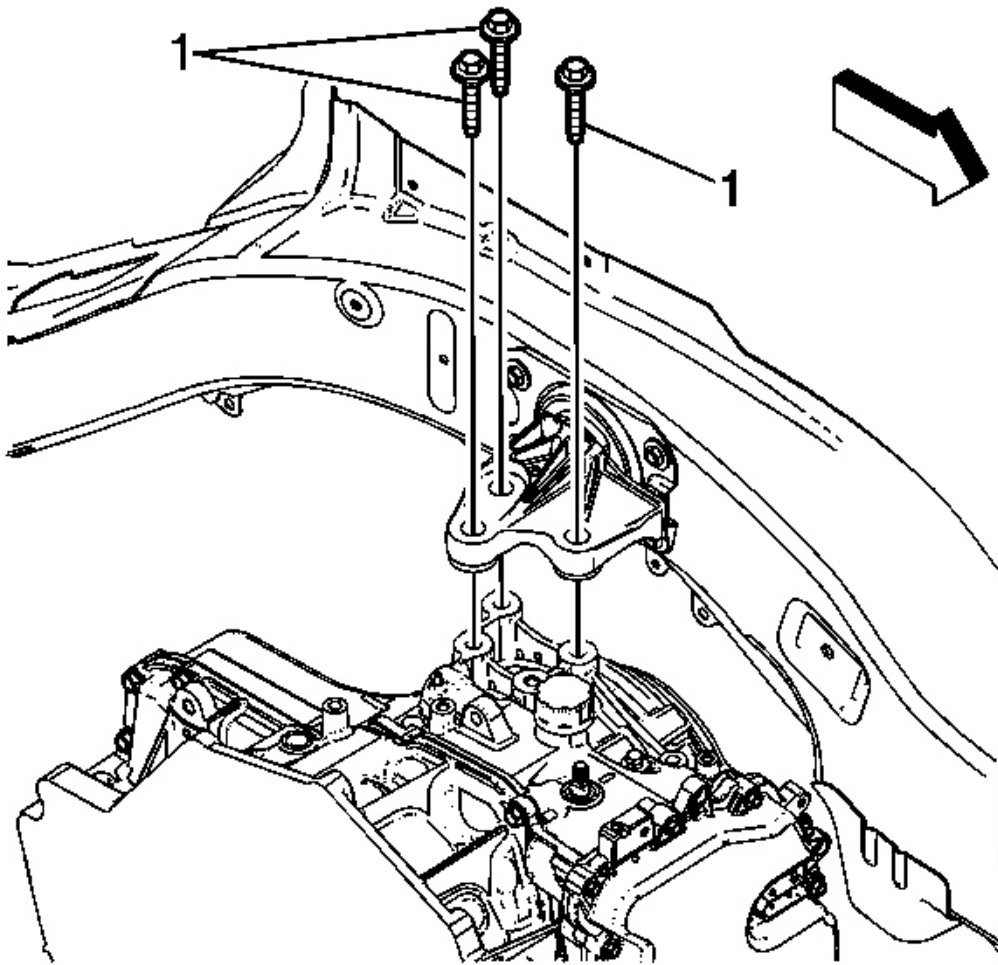


Fig. 60: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the left transmission mount to transmission bolts (1).

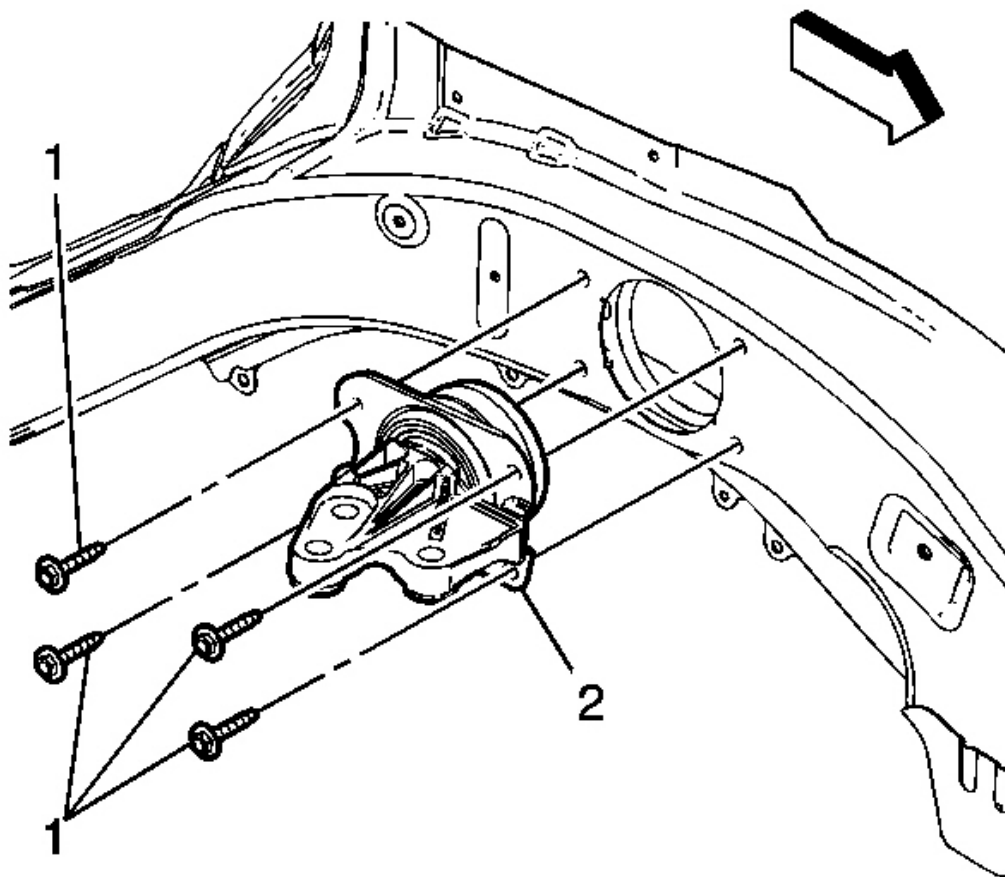


Fig. 61: Left Transmission Mount To Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

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

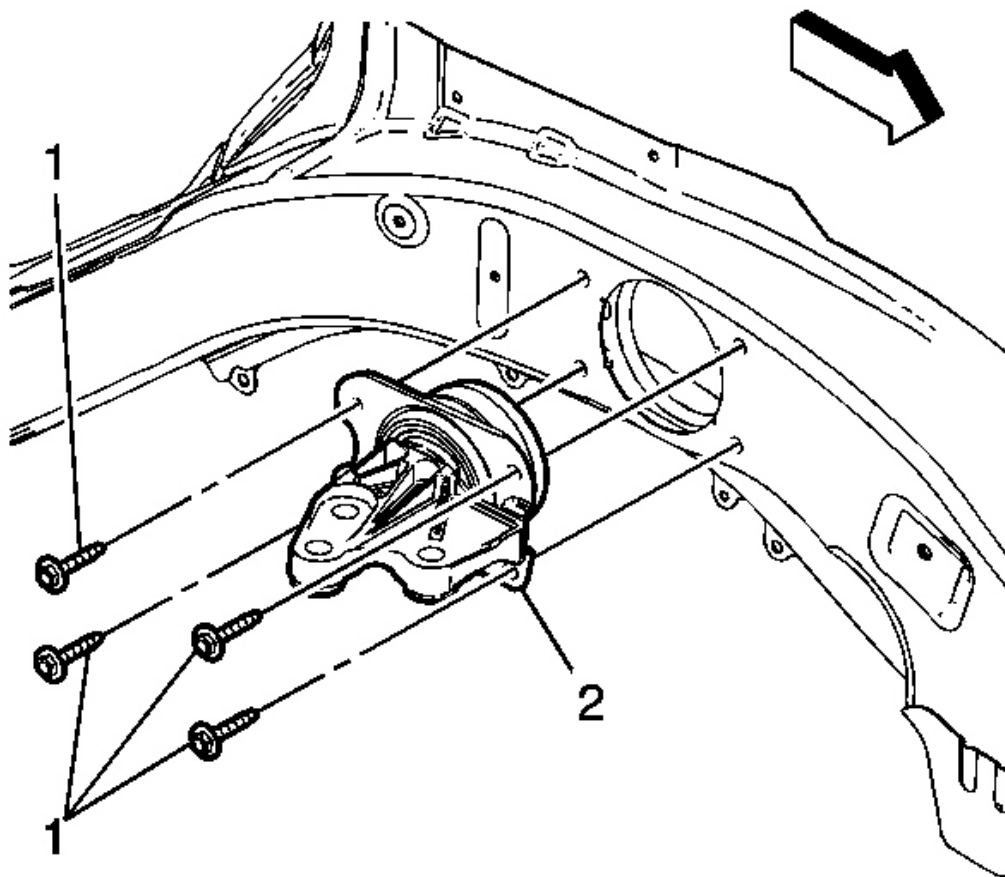


Fig. 62: Left Transmission Mount To Frame Rail Bolts
Courtesy of GENERAL MOTORS CORP.

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.

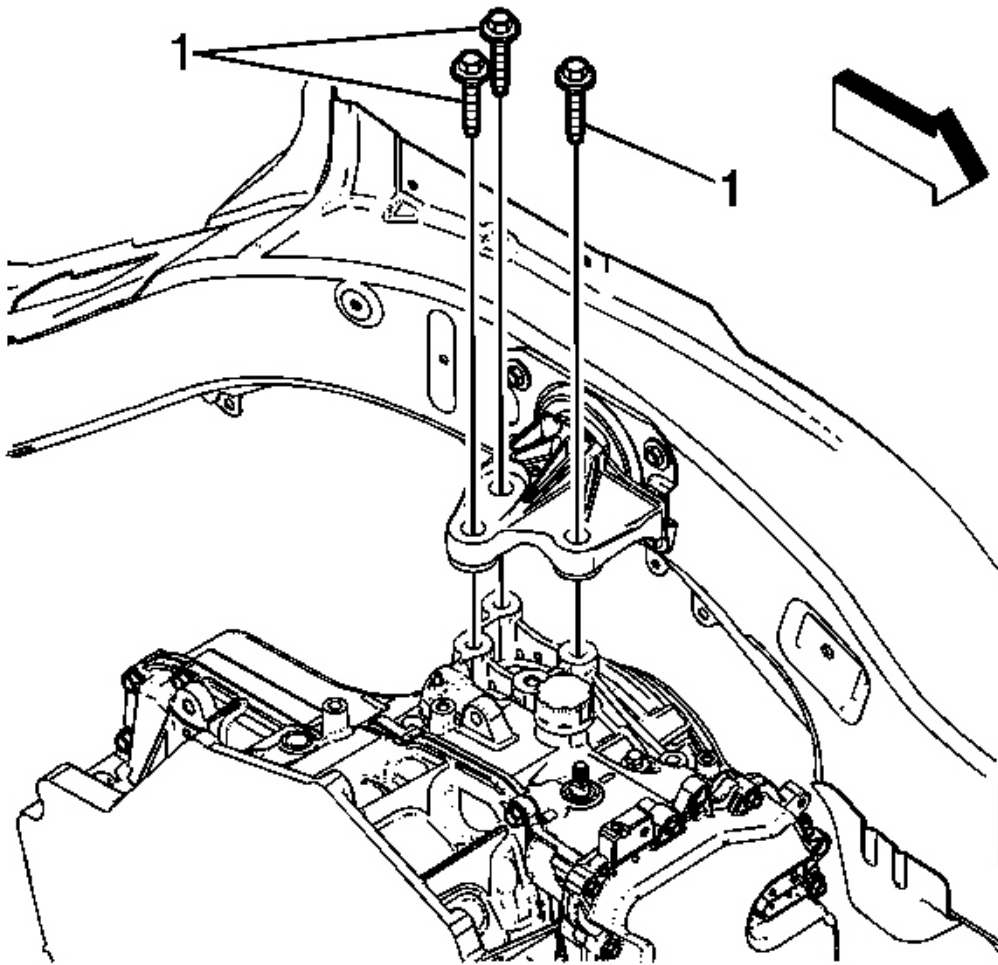


Fig. 63: Left Transmission Mount To Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the left transmission mount to transmission bolts (1) and tighten to 50 N.m (37 lb ft).
5. Raise the vehicle.

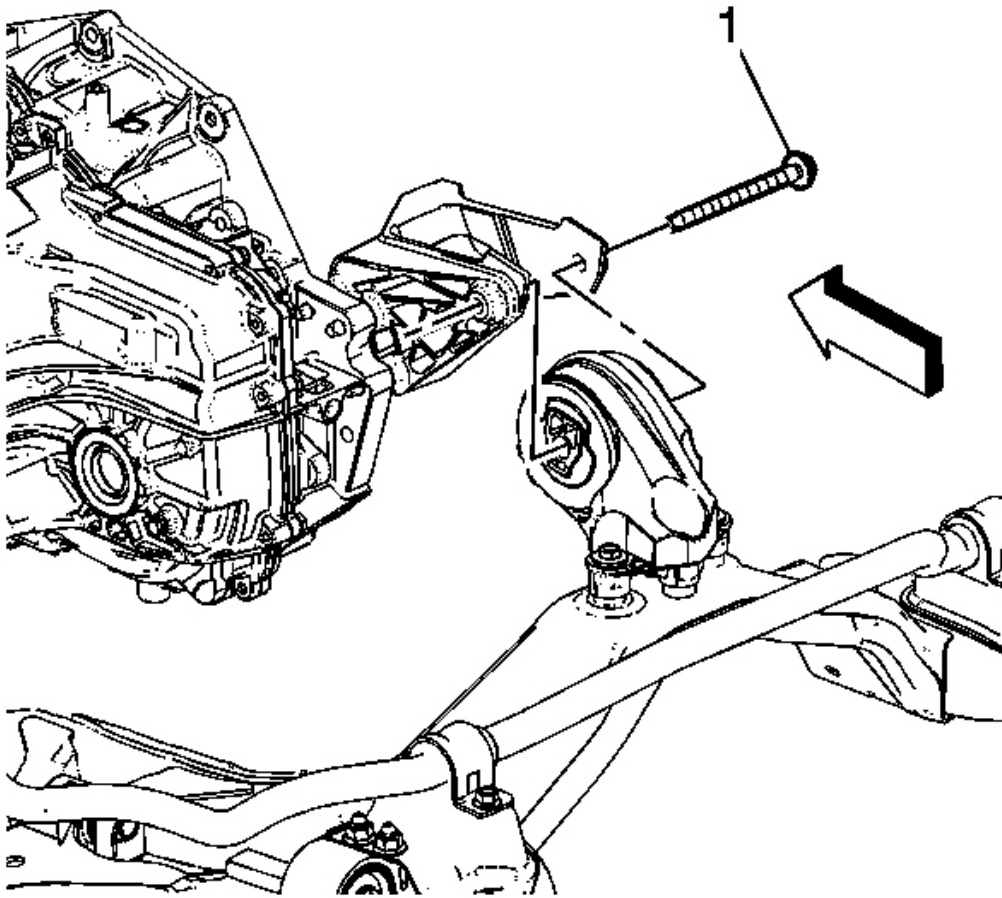


Fig. 64: Rear Transmission Mount To Rear Transmission Mount Bracket Bolt
Courtesy of GENERAL MOTORS CORP.

6. Install the rear transmission mount to rear transmission mount bracket bolt (1) and tighten to 110 N.m (81 lb ft).

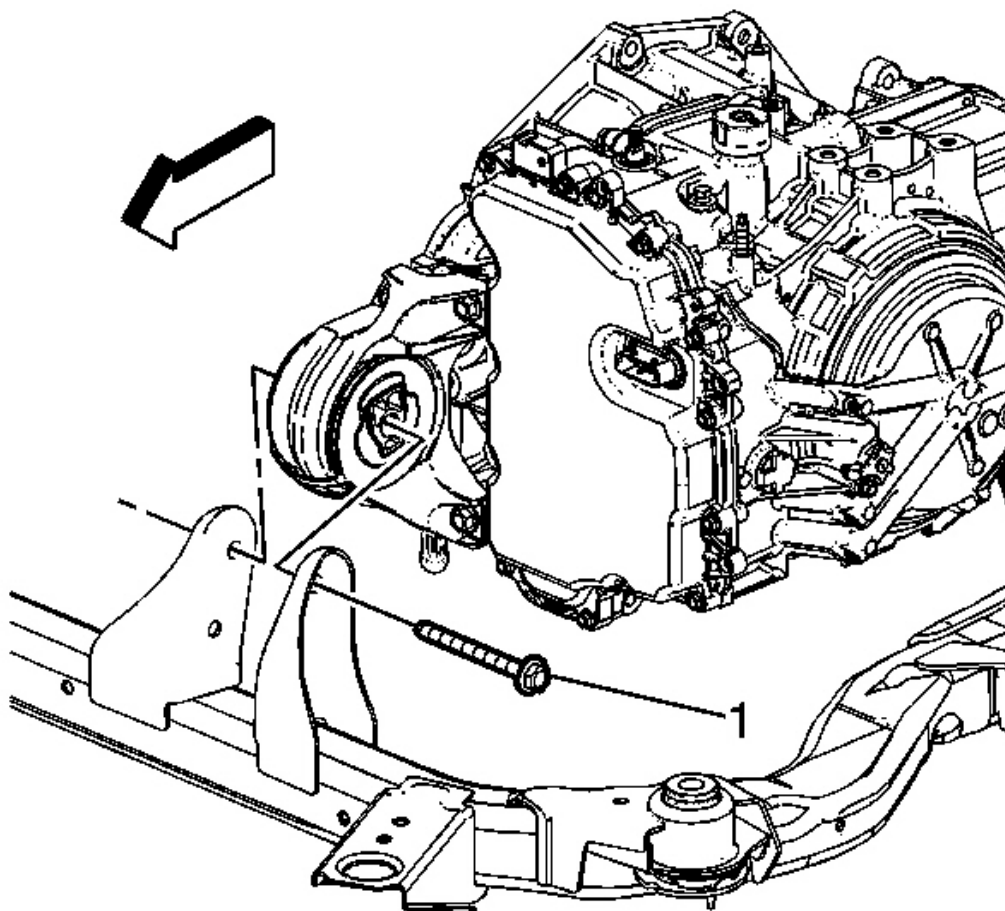


Fig. 65: Front Transmission Mount To Frame Bolt
Courtesy of GENERAL MOTORS CORP.

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

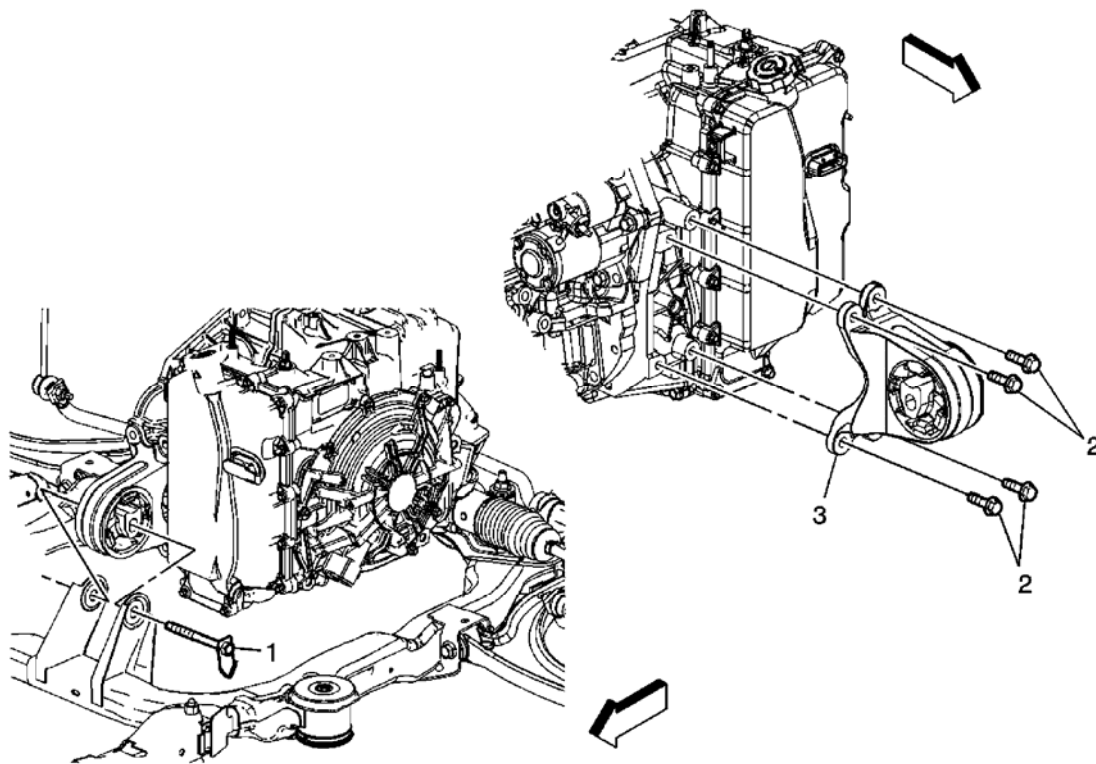


Fig. 66: Transmission Front Mount
 Courtesy of GENERAL MOTORS CORP.

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.	
1	Front Transmission Mount Thru Bolt
2	Front Transmission Mount Bolt (Qty: 4) Tighten: 50 N.m (37 lb ft)
3	Front Transmission Mount

TRANSMISSION REAR MOUNT REPLACEMENT

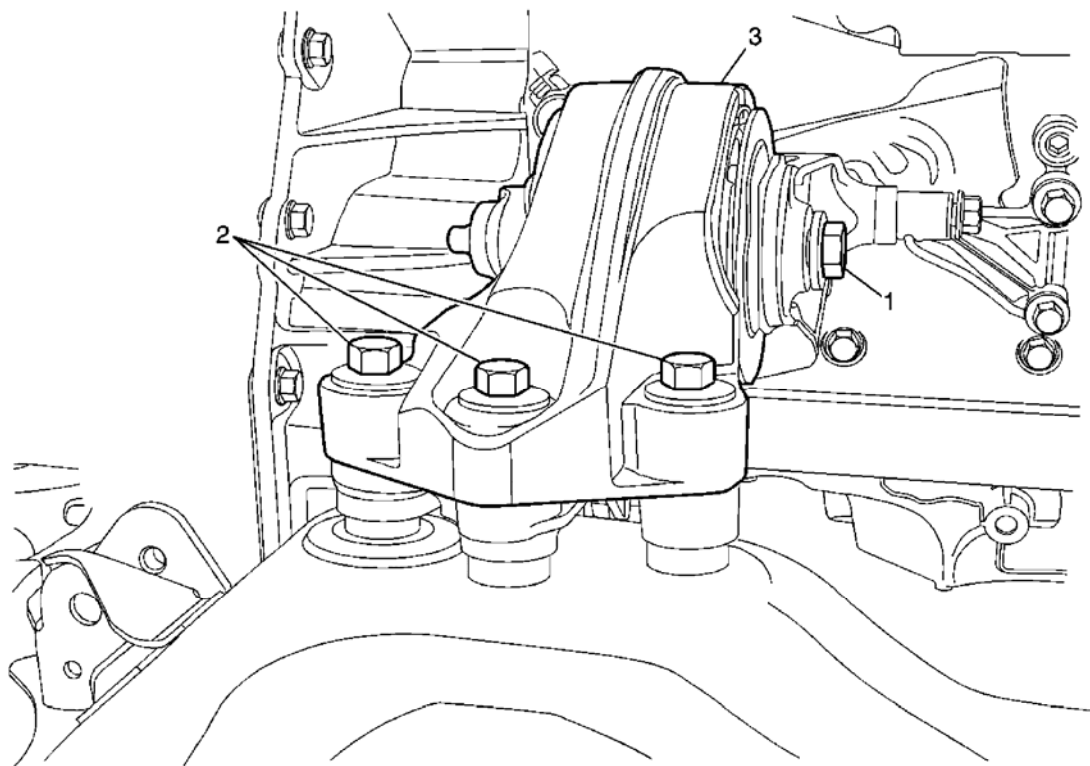


Fig. 67: Transmission Rear Mount
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist. WARNING: Refer to <u>Safety Glasses Warning</u> .	
Preliminary Procedures 1. Raise and suitably support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the left front tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> .	
1	Transmission Rear Thru Bolt (Qty: 1) CAUTION: Refer to <u>Fastener Caution</u> .

	Procedure: Support the transmission. Tighten: 100 N.m (74 lb ft)
2	Transmission Rear Mount Fastener (Qty: 3) CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 100 N.m (74 lb ft)
3	Transmission Rear Mount

TRANSMISSION REAR MOUNT BRACKET REPLACEMENT (FWD)

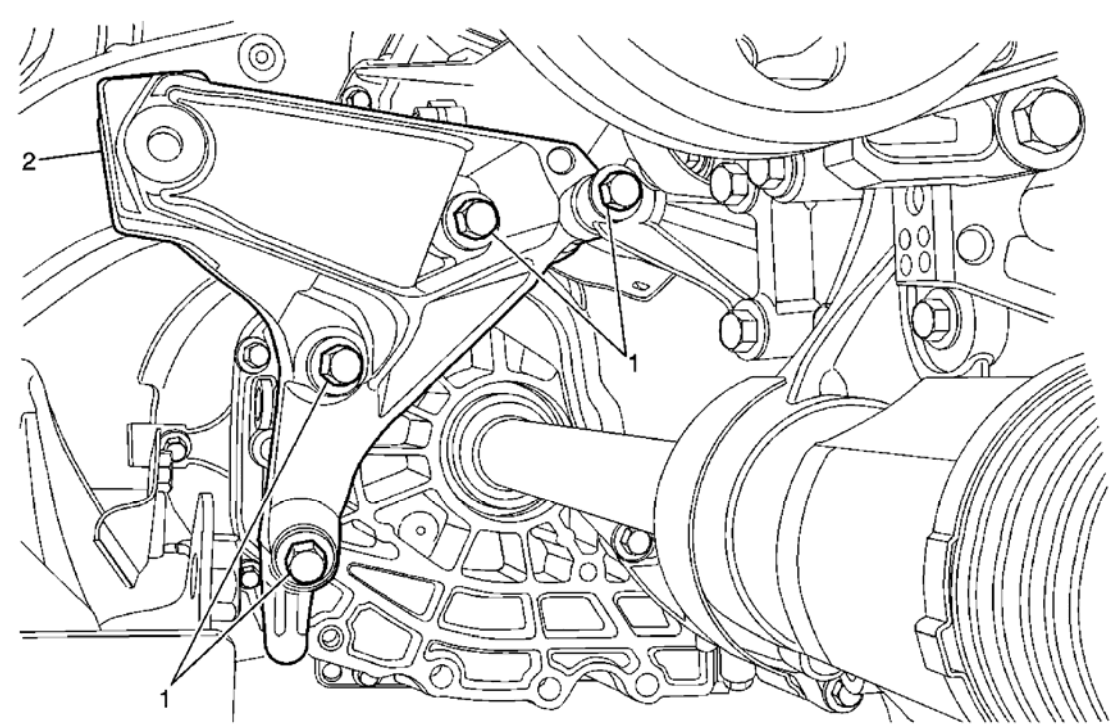


Fig. 68: Transmission Rear Mount Bracket (FWD)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.	

WARNING:
Refer to Safety Glasses Warning .

Preliminary Procedure

- 1. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle .
- 2. Remove the right front tire and wheel assembly. Refer to Tire and Wheel Removal and Installation
- 3. Remove the rear mount. Refer to Transmission Rear Mount Replacement

1	Transmission Rear Mount Bracket Fastener (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Procedure: Support the transmission. Tighten: 100 N.m (74 lb ft)
2	Transmission Rear Mount Bracket

TRANSMISSION REAR MOUNT BRACKET REPLACEMENT (AWD)

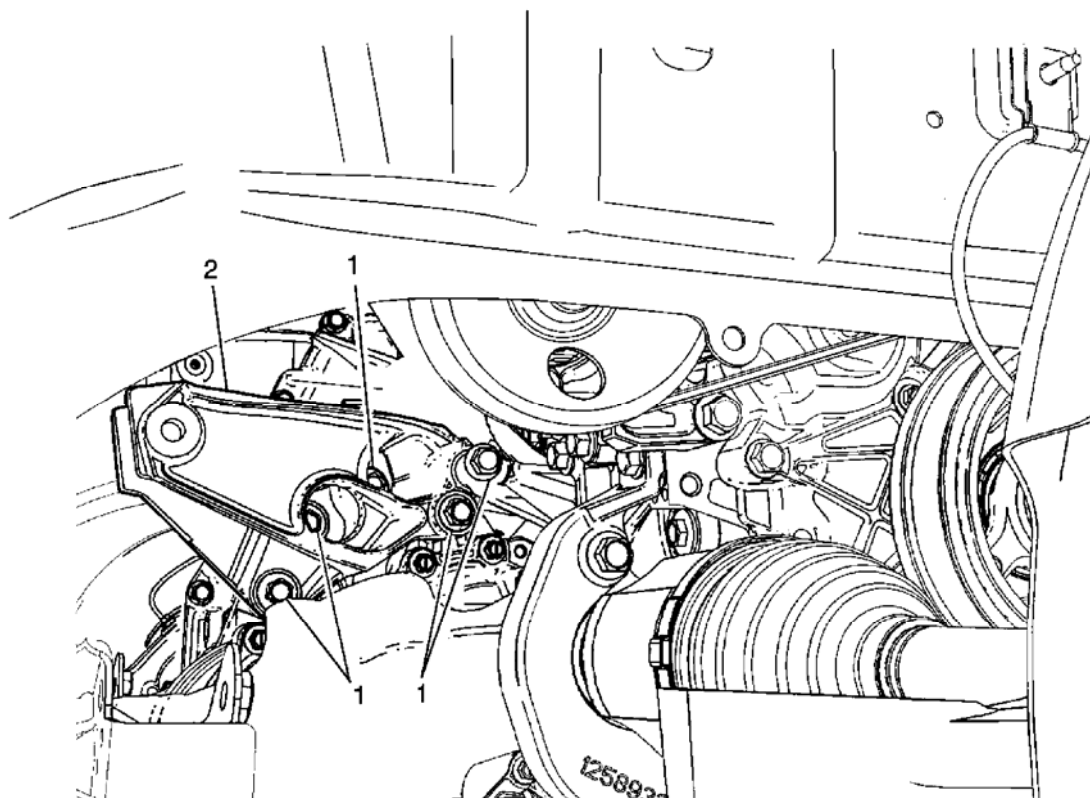


Fig. 69: Transmission Rear Mount Bracket (AWD)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
WARNING: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.	
WARNING: Refer to <u>Safety Glasses Warning</u> .	
Preliminary Procedure	
1. Raise and suitably support the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 2. Remove the right front tire and wheel assembly. Refer to <u>Tire and Wheel Removal and Installation</u> 3. Remove the right side catalytic converter. Refer to <u>Catalytic Converter Replacement - Right Side (LF1)</u> 4. Remove the rear mount. Refer to <u>Transmission Rear Mount Replacement</u>	
	Transmission Rear Mount Fastener (Qty: 5)

1	CAUTION: Refer to <u>Fastener Caution</u> . Tighten: 100 N.m (74 lb ft)
2	Transmission Rear Mount Bracket

TRANSMISSION REPLACEMENT (FWD)

Removal Procedure

- 1. Remove the battery tray. Refer to **Battery Tray Replacement** .
- 2. Remove the transmission range select lever cable and bracket.
- 3. Drain the transmission fluid. Refer to **Transmission Fluid Replacement**.

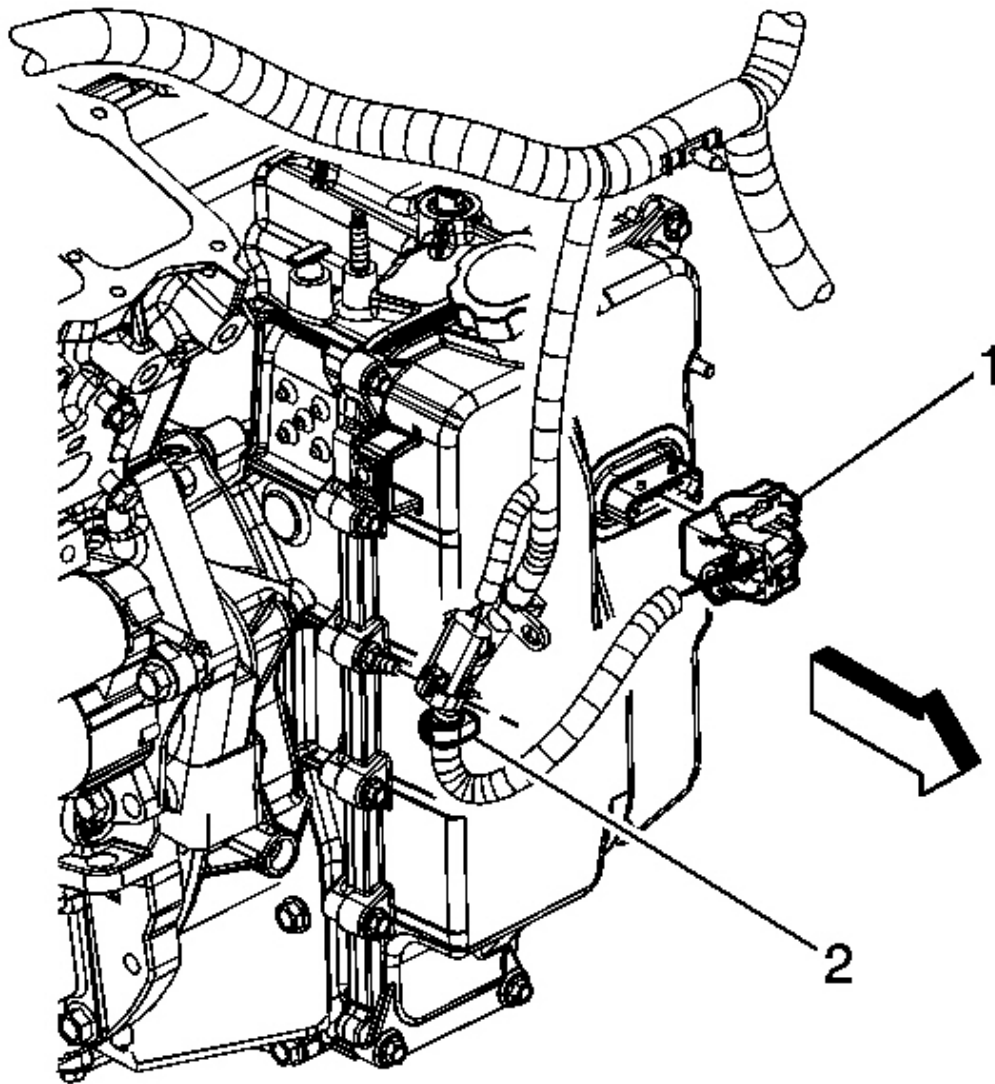


Fig. 70: Identifying Wire Harness Retainer & TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

4. Remove the wire harness retainer (2) from the control valve body cover stud.
5. Disconnect the control valve body transmission control module (TCM) electrical connector (1).

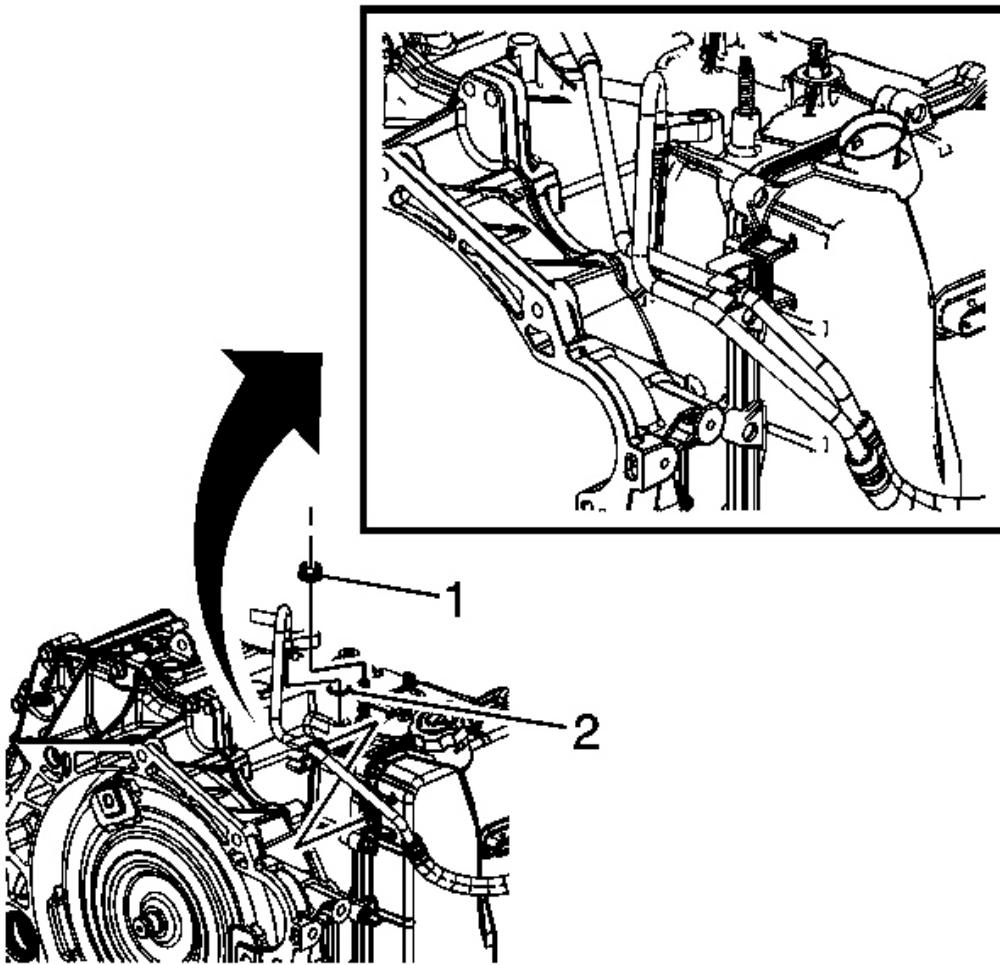


Fig. 71: Identifying Transmission Fluid Cooler Inlet Hose Components
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission fluid cooler pipe retainer nut (1).
7. Remove the transmission fluid cooler inlet hose and seal (2) from the transmission.
8. Plug and/or cap the hose and transmission to prevent contamination.

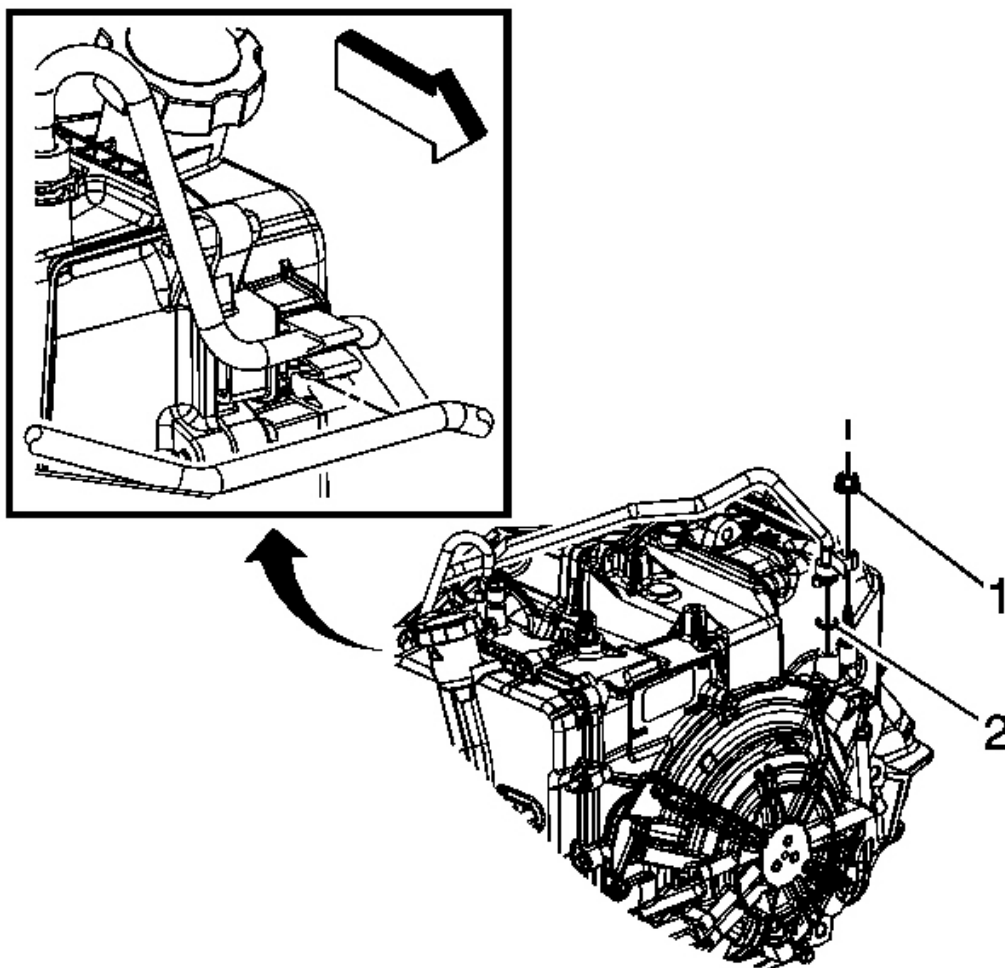


Fig. 72: Identifying Transmission Fluid Cooler Pipe Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the transmission fluid cooler pipe retainer nut (1).
10. Remove the transmission fluid cooler outlet hose and seal (2) from the transmission.
11. Plug and/or cap the hose and transmission to prevent contamination.
12. Disconnect both pipes from the retainer.
13. Install the engine support fixture. Refer to **Engine Support Fixture**.
14. Remove the rear transmission mount from the transmission. Refer to **Transmission Rear Mount Replacement**.
15. Remove the front transmission mount from the transmission. Refer to **Transmission Front Mount Replacement**.

16. Remove the left transmission mount from the transmission. Refer to **Transmission Mount Replacement - Left Side**.

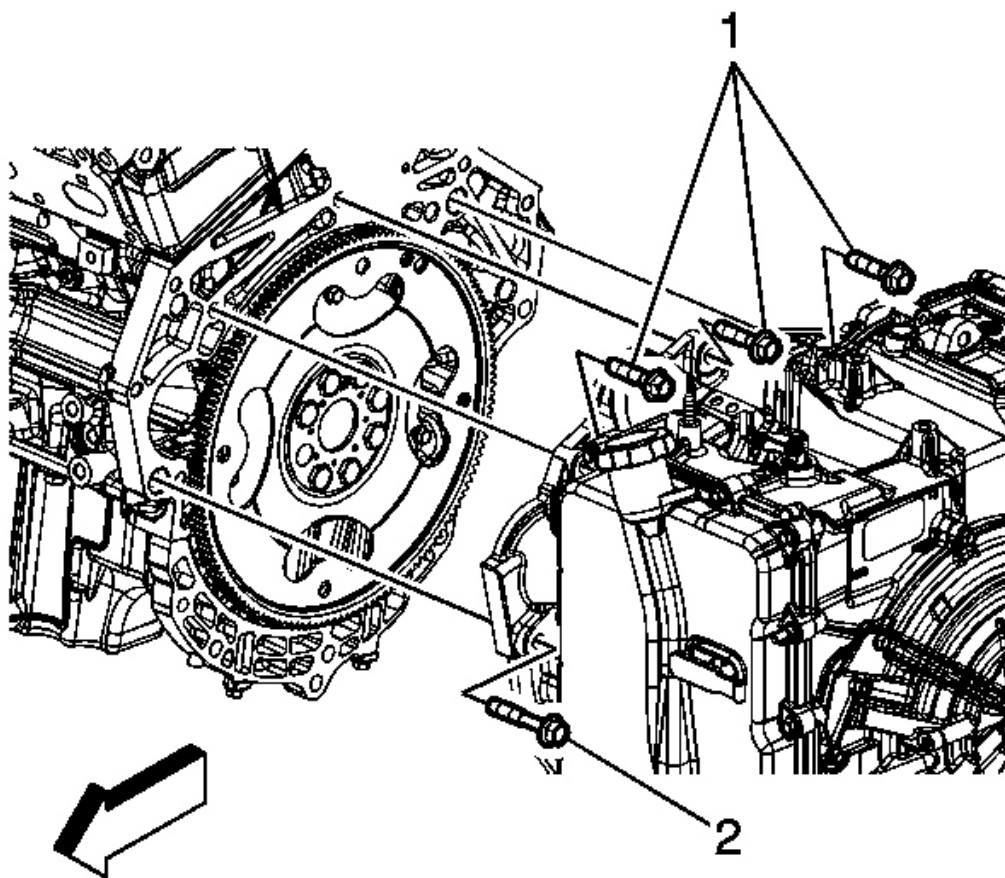


Fig. 73: Identifying Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS CORP.

17. Remove the upper transmission to engine bolts (1, 2).
18. Remove the frame. Refer to **Drivetrain and Front Suspension Frame Replacement**.
19. Disconnect the wheel drive shafts from the transmission. Refer to **Front Wheel Drive Shaft Replacement**.
20. Remove the intermediate drive shaft. Refer to **Front Wheel Drive Intermediate Shaft Replacement**.

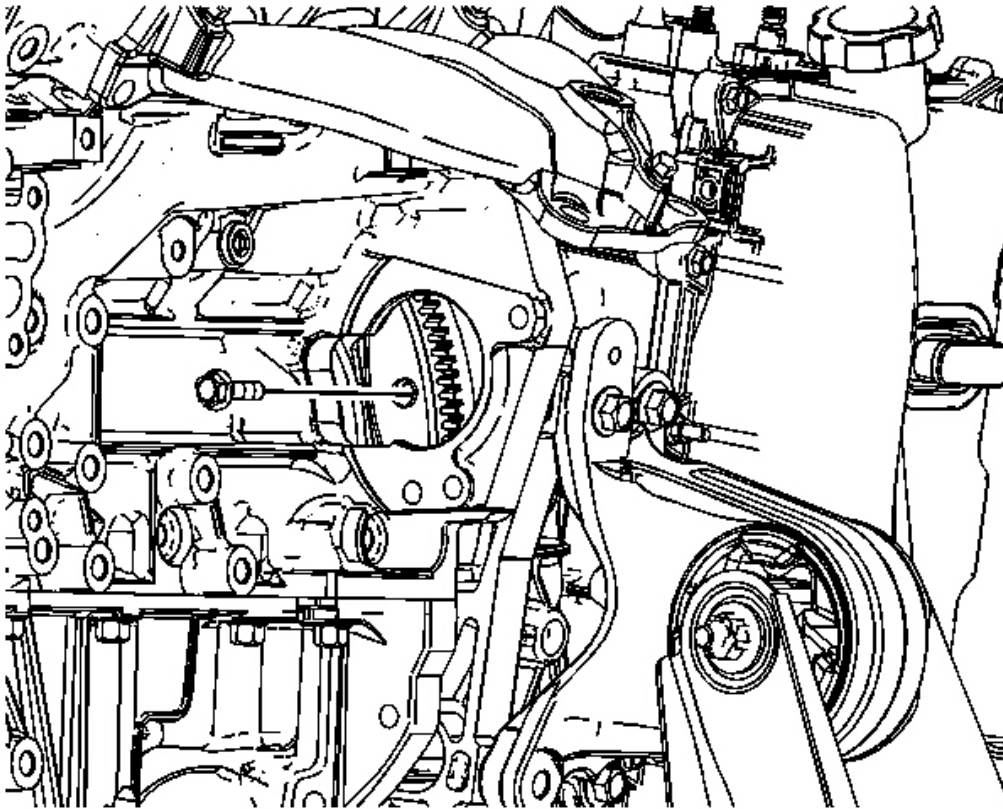


Fig. 74: View Of Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS CORP.

21. Remove the starter. Refer to **Starter Replacement (LAF)** or **Starter Replacement (LF1)** .
22. Mark the relationship of the flywheel to the torque converter for reassembly.
23. Remove the torque converter to flywheel bolts.
24. Use a transmission jack in order to support the transmission.

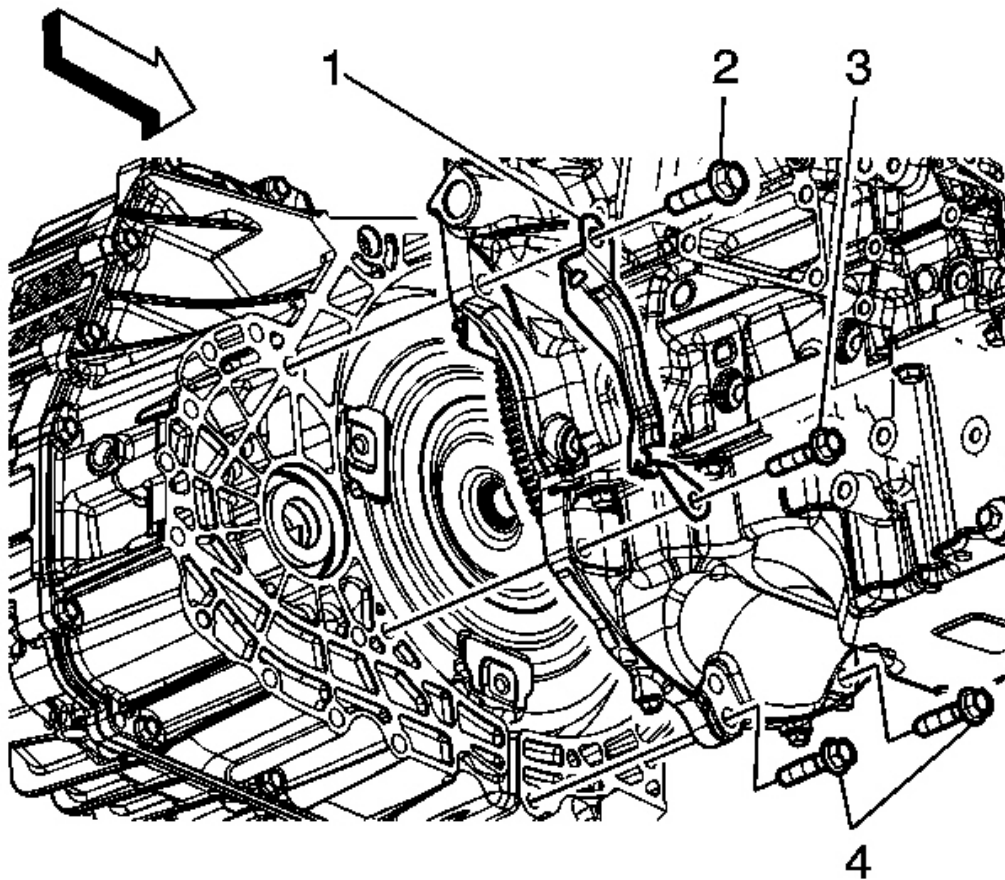


Fig. 75: Identifying Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

25. Remove the flywheel inspection cover bolts (2, 3).
26. Remove the flywheel inspection cover (1).
27. Remove the remaining transmission bolts (4).

NOTE: Insure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

28. Separate the transmission from the engine.
29. Lower the transmission with the transmission jack far enough to remove the transmission.

Installation Procedure

1. Raise the transmission with the transmission jack and position the transmission to the engine.

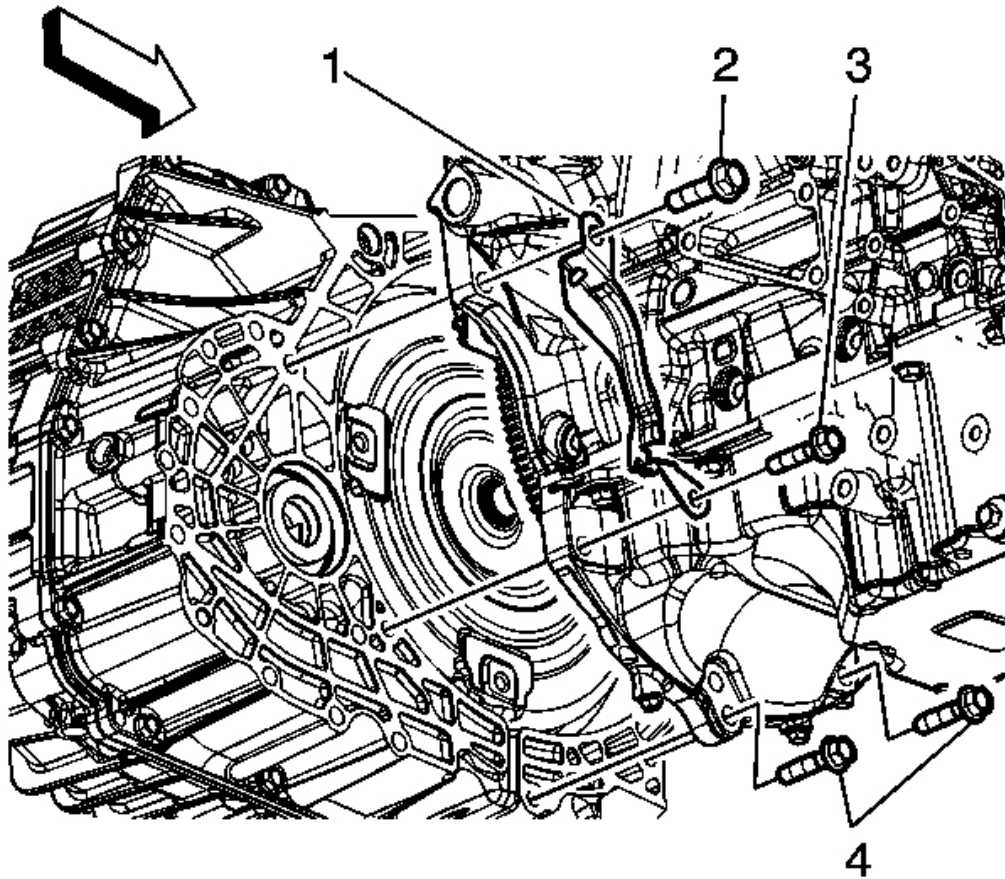


Fig. 76: Identifying Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the transmission bolts (4) and tighten to 75 N.m (55 lb ft).
3. Install the flywheel inspection cover (1).
4. Install the flywheel inspection cover bolts (2, 3) and tighten to 75 N.m (55 lb ft).
5. Remove the transmission jack.

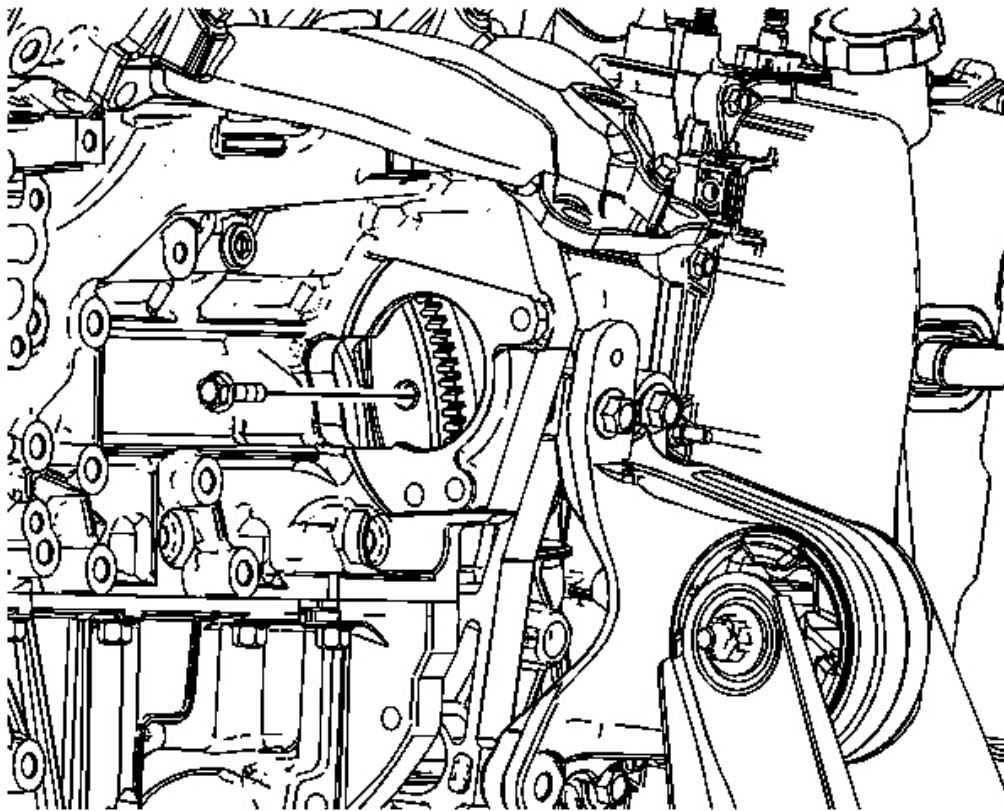


Fig. 77: View Of Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: If reusing the torque converter bolts, clean the threads and apply **LOCTITE™ 242**, GM P/N 12345382 (Canadian P/N 10953489) or equivalent to the threads prior to installation.

6. Install the torque converter to flywheel bolts and tighten to 62 N.m (46 lb ft).
7. Install the starter. Refer to **Starter Replacement (LAF)** or **Starter Replacement (LF1)**.
8. Install the front transmission mount to the transmission. Refer to **Transmission Front Mount Replacement**.
9. Install the rear transmission mount to the transmission. Refer to **Transmission Rear Mount Replacement**.
10. Install the left transmission mount to the transmission. Refer to **Transmission Mount Replacement - Left Side**.
11. Install the intermediate drive shaft. Refer to **Front Wheel Drive Intermediate Shaft Replacement**.

12. Install the wheel drive shafts to the transmission. Refer to **Front Wheel Drive Shaft Replacement** .
13. Install the frame. Refer to **Drivetrain and Front Suspension Frame Replacement** .

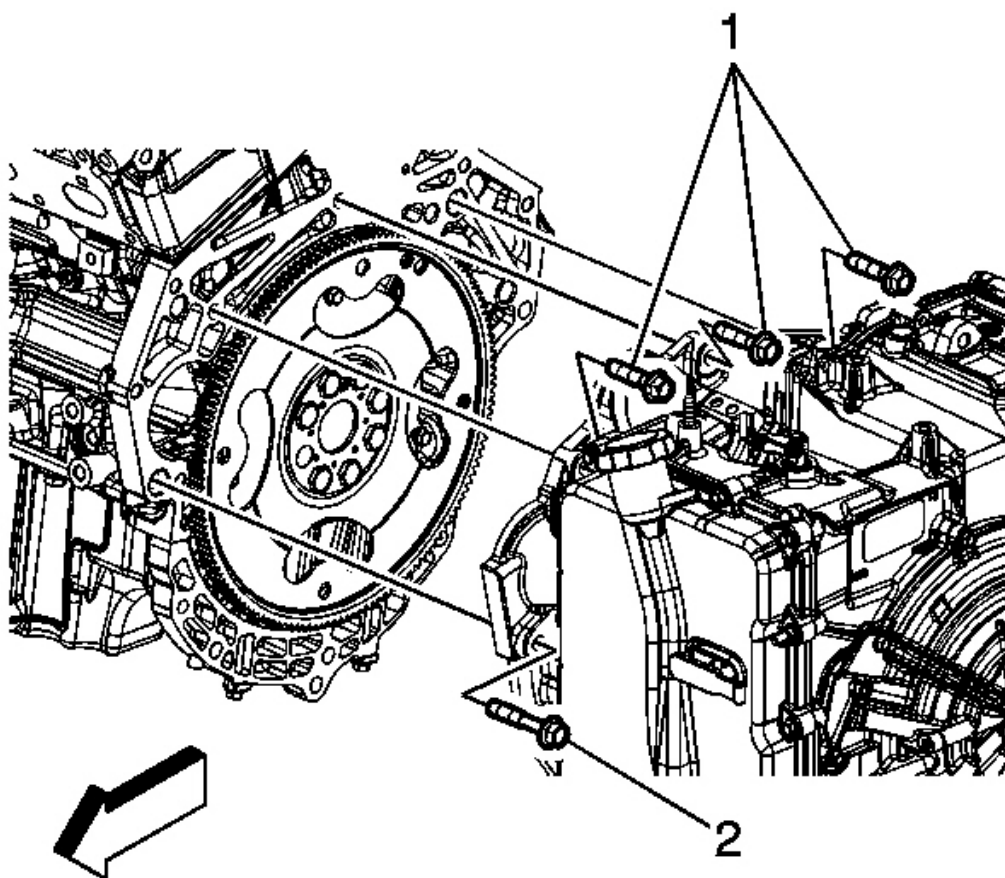


Fig. 78: Identifying Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS CORP.

14. Install the upper transmission to engine bolt (1, 2) and tighten to 75 N.m (55 lb ft).
15. Remove the engine support fixture.

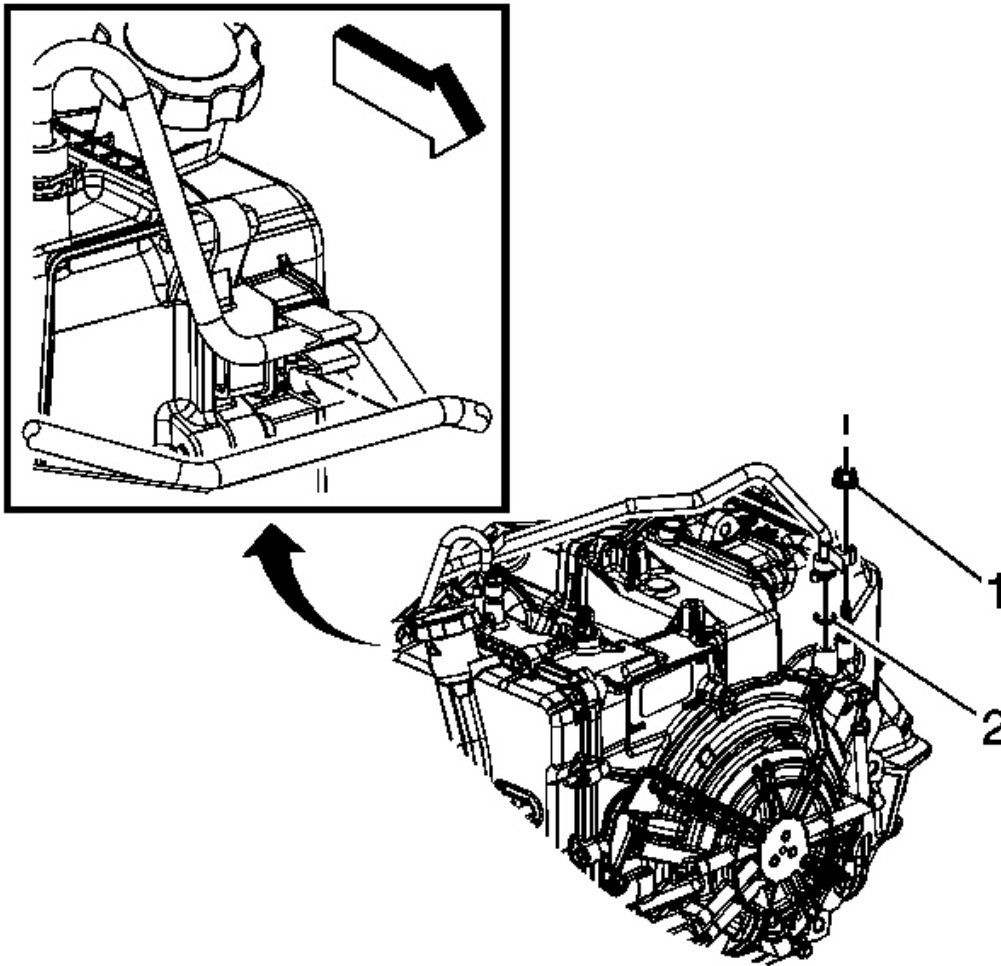


Fig. 79: Identifying Transmission Fluid Cooler Pipe Components
Courtesy of GENERAL MOTORS CORP.

16. Install the transmission fluid cooler outlet hose and seal (2) to the transmission.
17. Install the transmission fluid cooler pipe retainer nut (1) and tighten to 22 N.m (16 lb ft).

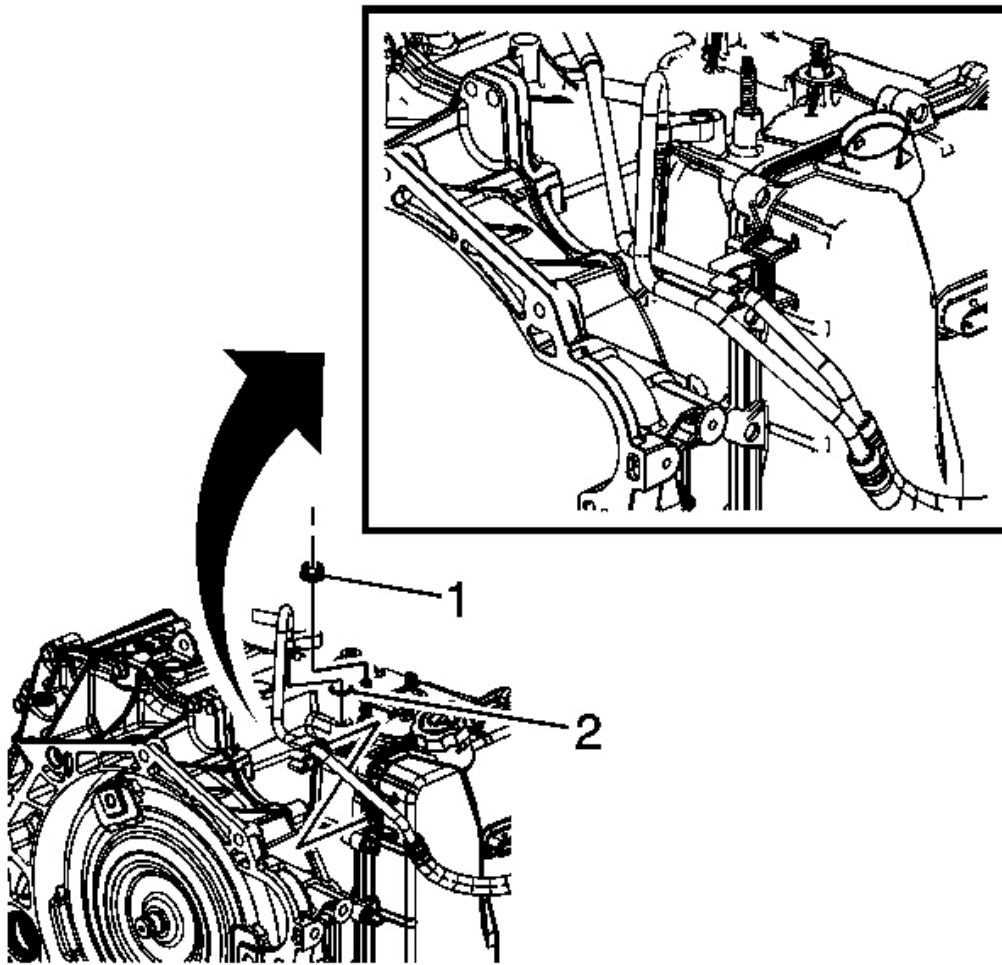


Fig. 80: Identifying Transmission Fluid Cooler Inlet Hose Components
Courtesy of GENERAL MOTORS CORP.

18. Install the transmission fluid cooler inlet hose and seal (2) to the transmission.
19. Install the transmission fluid cooler pipe retainer nut (1) and tighten to 22 N.m (16 lb ft).

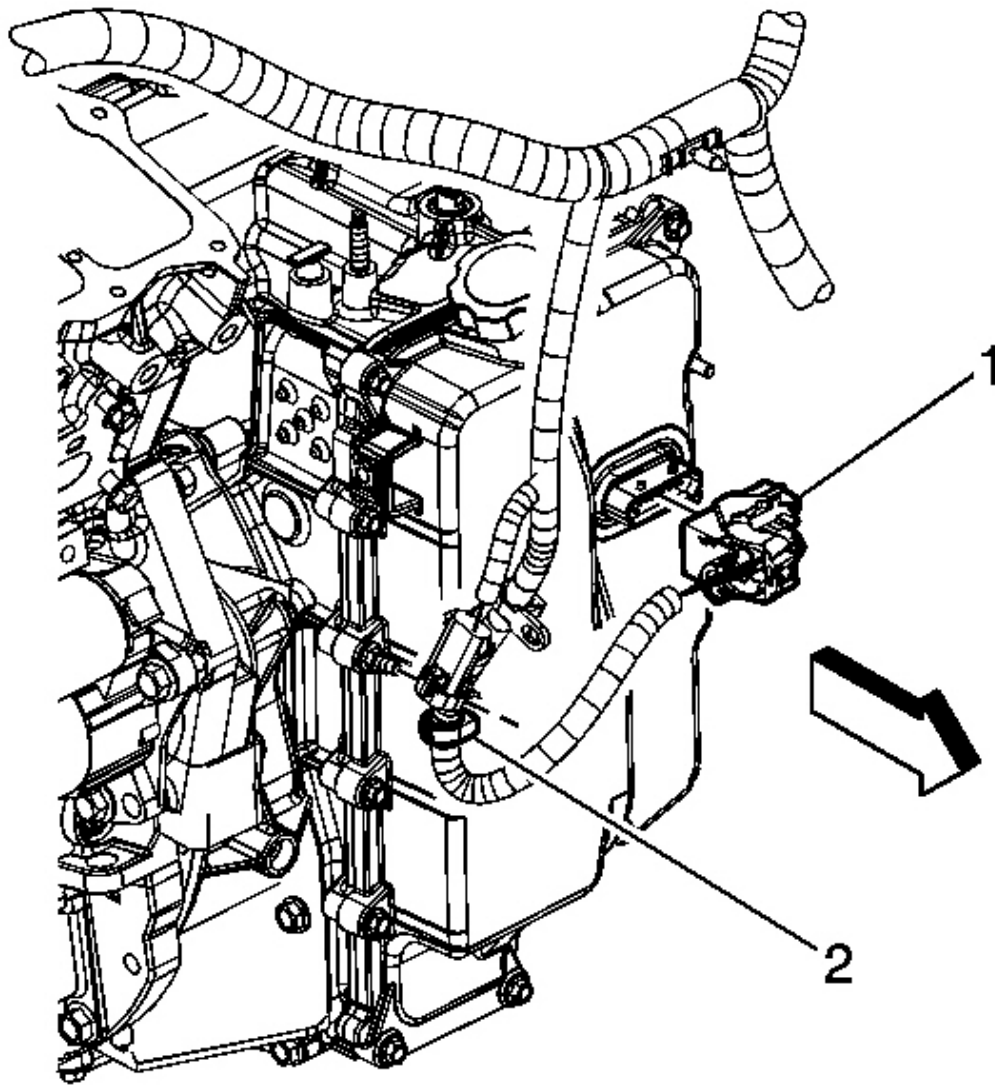


Fig. 81: Identifying Wire Harness Retainer & TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

20. Connect the control valve body TCM electrical connector (1).
21. Install the wire harness retainer (2) to the control valve body cover stud and tighten the nut to 12 N.m (106 lb in).
22. Install the transmission range select lever cable and bracket.
23. Install the battery tray. Refer to **Battery Tray Replacement**.

24. Adjust the automatic transmission range selector lever cable. Refer to **Range Selector Lever Cable Adjustment** .
25. Fill the transmission with fluid. Refer to **Transmission Fluid Replacement**.
26. For transmission control module programming and setup, refer to **Transmission Control Module Programming and Setup (6T30/6T40/6T45/6T50)** or **Transmission Control Module Programming and Setup (6T70)** .

NOTE: **After an internal transmission repair or internal part replacement the service fast learn adapt procedure should be performed.**

27. Perform the transmission adaptive values learn procedure. Refer to **Transmission Adaptive Values Learn** .
28. Road test the vehicle.

TRANSMISSION REPLACEMENT (AWD)

Removal Procedure

1. Remove the battery tray. Refer to **Battery Tray Replacement** .
2. Remove the transmission range select lever cable and bracket.
3. Drain the transmission fluid. Refer to **Transmission Fluid Replacement**.

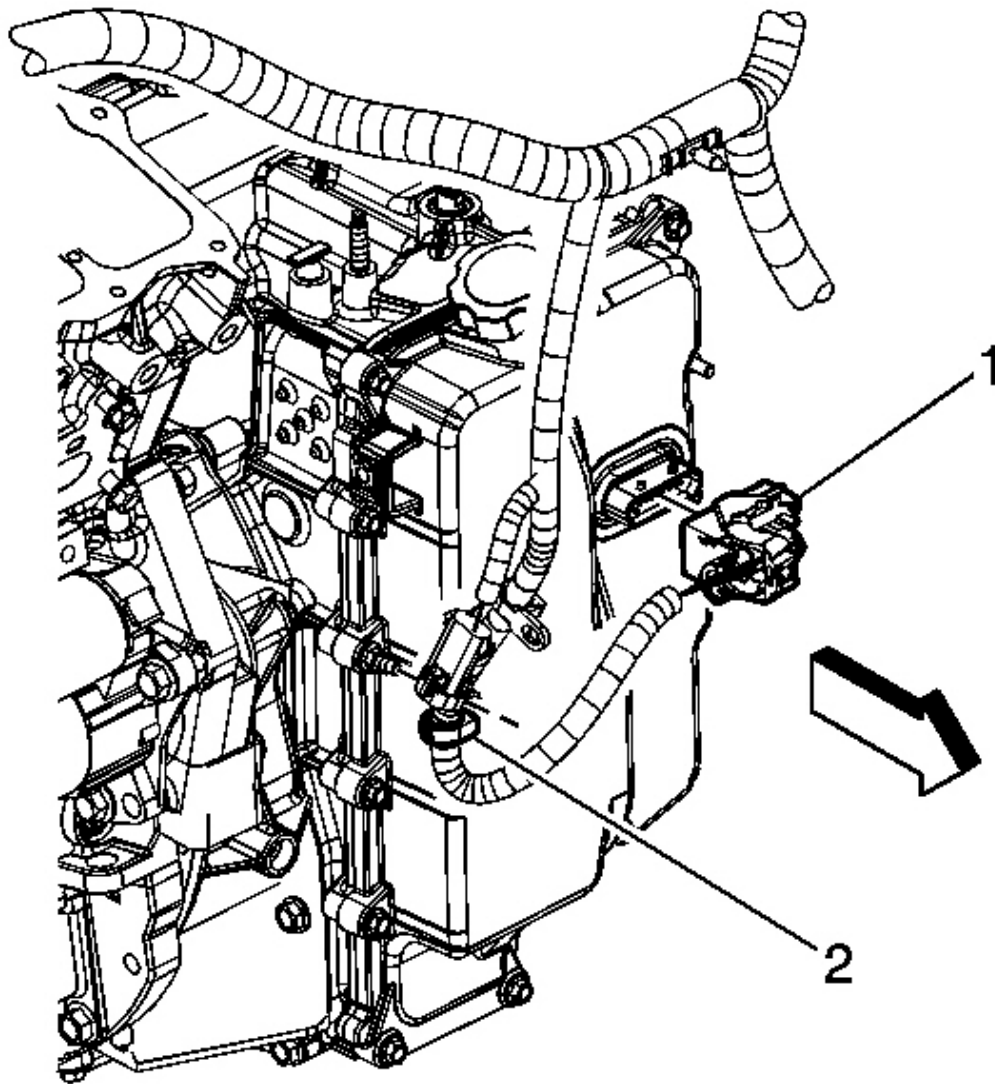


Fig. 82: Identifying Wire Harness Retainer & TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

4. Remove the wire harness retainer (2) from the control valve body cover stud.
5. Disconnect the control valve body transmission control module (TCM) electrical connector (1).

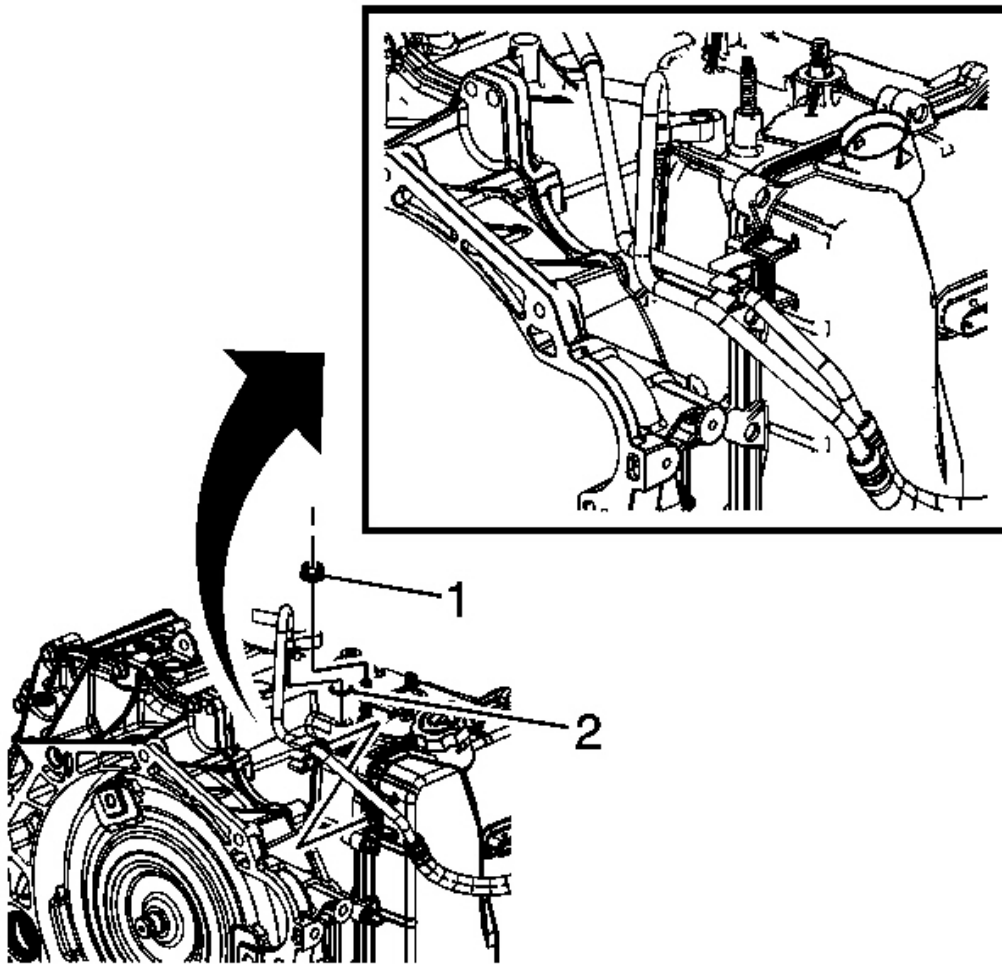


Fig. 83: Identifying Transmission Fluid Cooler Inlet Hose Components
Courtesy of GENERAL MOTORS CORP.

6. Remove the transmission fluid cooler pipe retainer nut (1).
7. Remove the transmission fluid cooler inlet hose and seal (2) from the transmission.
8. Plug and/or cap the hose and transmission to prevent contamination.

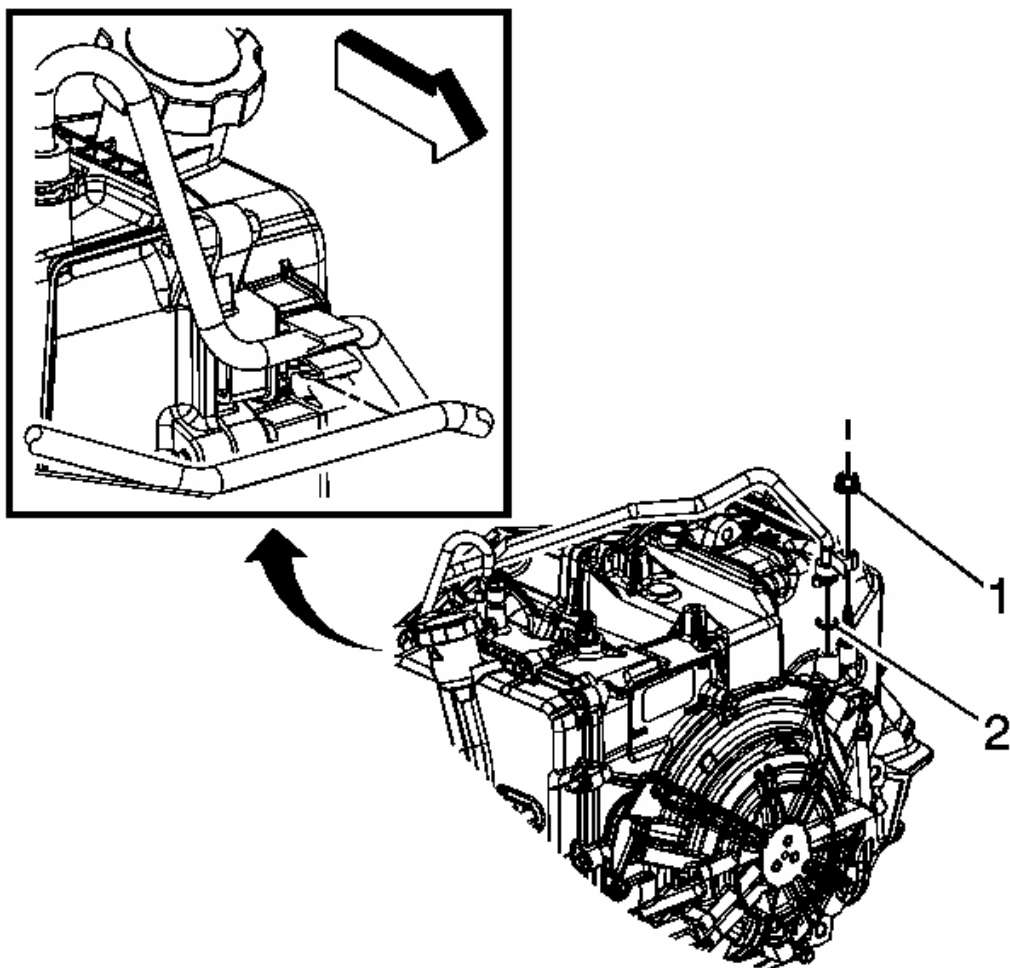


Fig. 84: Identifying Transmission Fluid Cooler Pipe Components
Courtesy of GENERAL MOTORS CORP.

9. Remove the transmission fluid cooler pipe retainer nut (1).
10. Remove the transmission fluid cooler outlet hose and seal (2) from the transmission.
11. Plug and/or cap the hose and transmission to prevent contamination.
12. Disconnect both pipes from the retainer.
13. Install the engine support fixture. Refer to **Engine Support Fixture**.
14. Remove the right catalytic converter and pipe assembly. Refer to **Catalytic Converter Replacement - Right Side (LF1)**.
15. Use a transmission jack in order to support the transmission.
16. Remove the rear transmission mount from the transmission. Refer to **Transmission Rear Mount**

Replacement.

17. Remove the front transmission mount from the transmission. Refer to **Transmission Front Mount Replacement.**
18. Remove the left transmission mount from the transmission. Refer to **Transmission Mount Replacement - Left Side .**

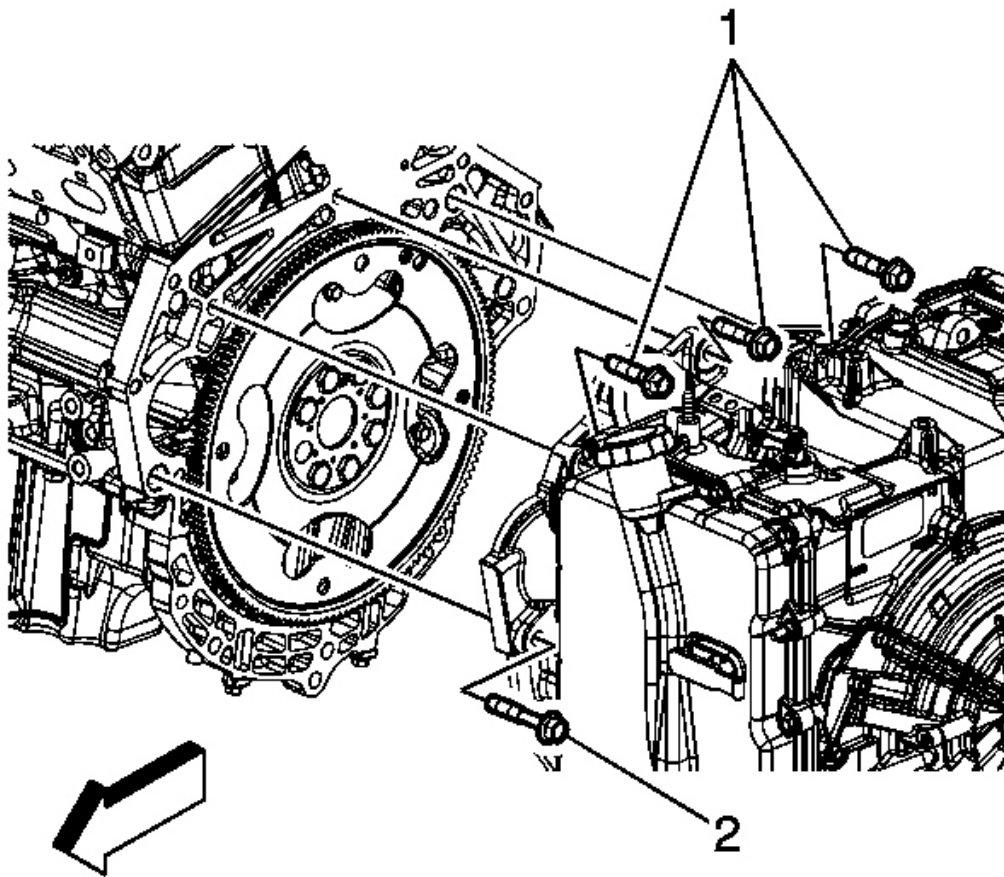


Fig. 85: Identifying Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS CORP.

19. Remove the upper transmission to engine bolts (1, 2).
20. Remove the frame. Refer to **Drivetrain and Front Suspension Frame Replacement .**
21. Disconnect the wheel drive shafts from the transmission and transfer case. Refer to **Front Wheel Drive Shaft Replacement .**
22. Remove the transfer case from the transmission. Refer to **Transfer Case Assembly Replacement .**

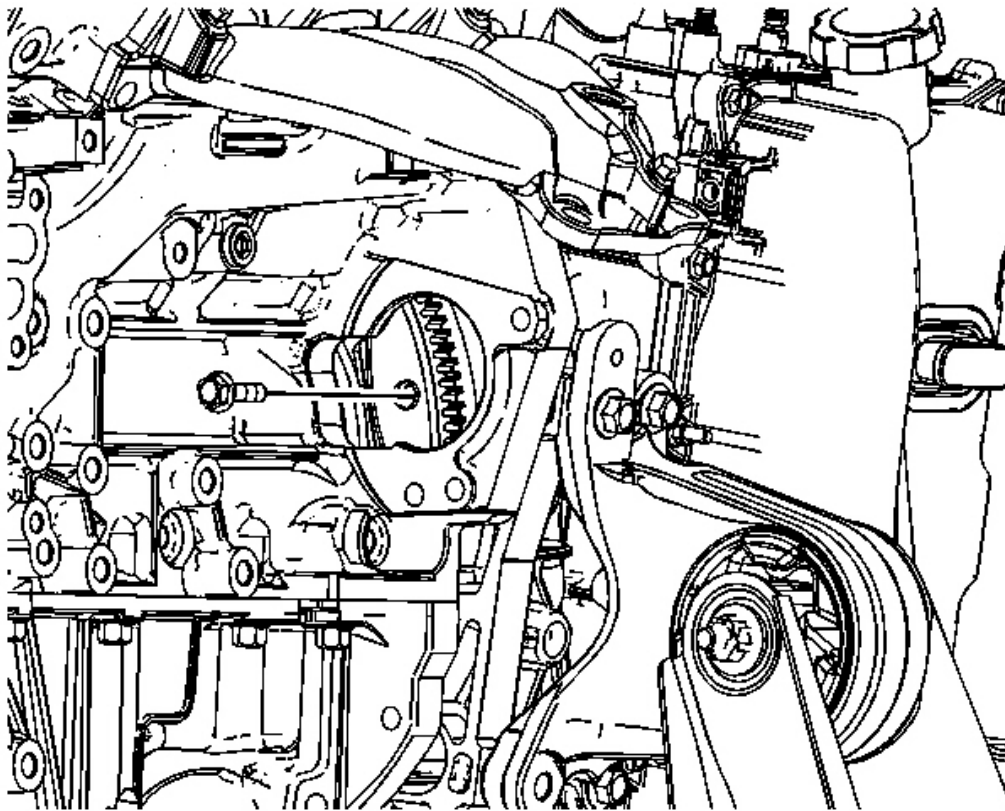


Fig. 86: View Of Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS CORP.

23. Remove the starter. Refer to **Starter Replacement (LAF)** or **Starter Replacement (LF1)** .
24. Mark the relationship of the flywheel to the torque converter for reassembly.
25. Remove the torque converter to flywheel bolts.

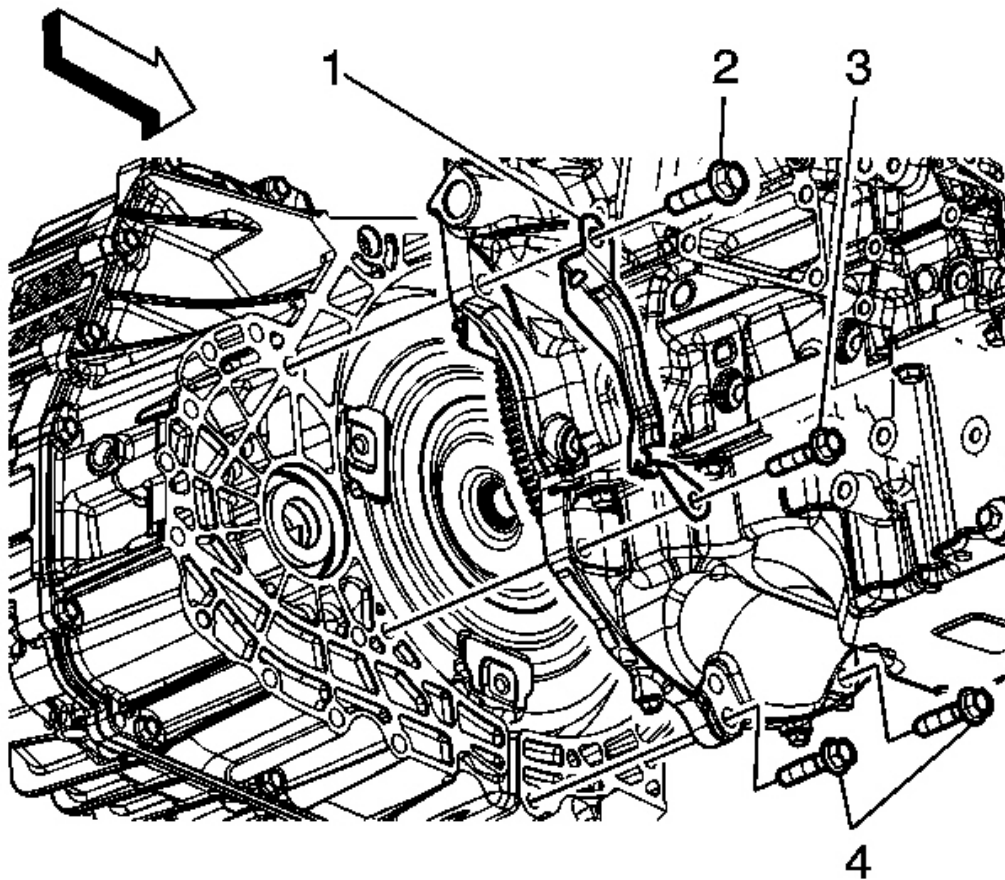


Fig. 87: Identifying Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

26. Remove the flywheel inspection cover bolts (2, 3).
27. Remove the flywheel inspection cover (1).
28. Remove the remaining transmission bolts (4).

NOTE: Insure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

29. Separate the transmission from the engine.
30. 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.

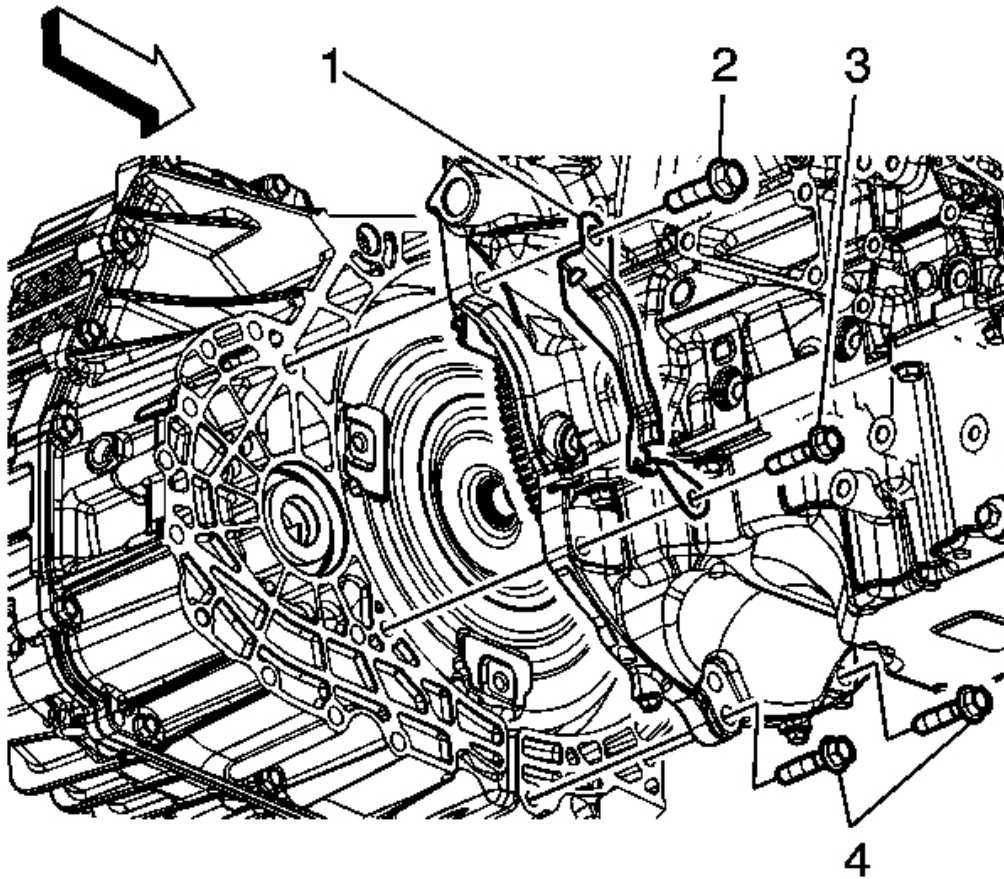


Fig. 88: Identifying Transmission Bolts
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Fastener Caution .

2. Install the transmission bolts (4) and tighten to 75 N.m (55 lb ft).
3. Install the flywheel inspection cover (1).
4. Install the flywheel inspection cover bolts (2, 3) and tighten to 75 N.m (55 lb ft).
5. Install the transfer case to the transmission. Refer to **Transfer Case Assembly Replacement** .
6. Remove the transmission jack.

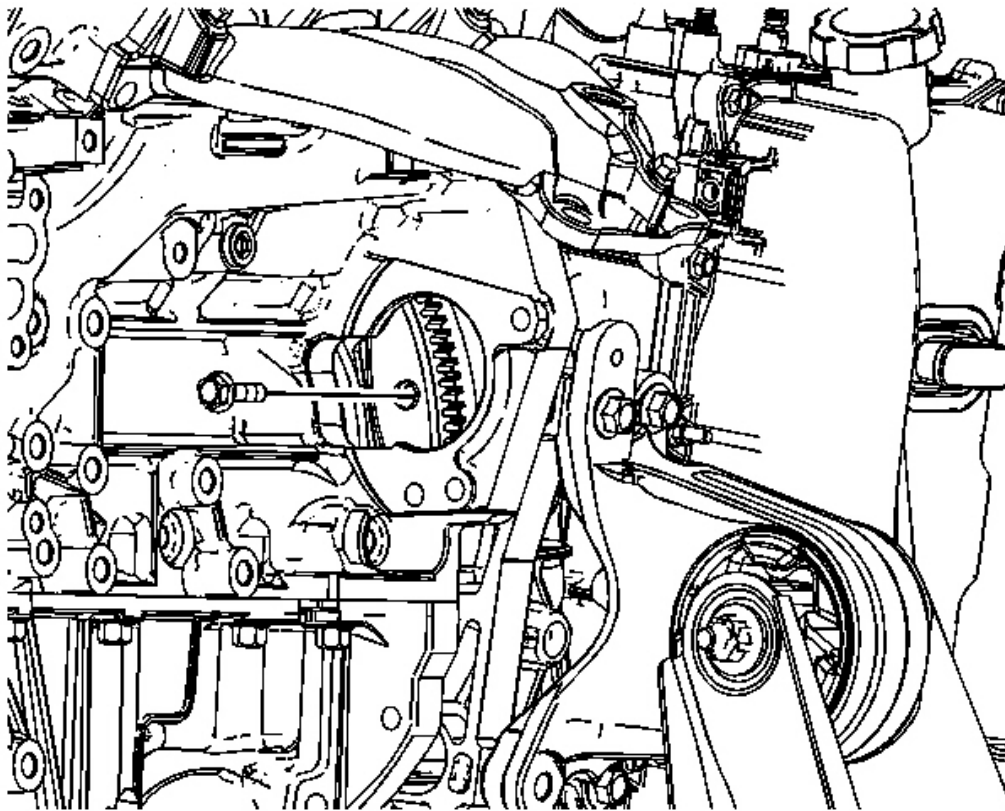


Fig. 89: View Of Torque Converter To Flywheel Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: If reusing the torque converter bolts, clean the threads and apply **LOCTITE™ 242**, GM P/N 12345382 (Canadian P/N 10953489) or equivalent to the threads prior to installation.

7. Install the torque converter to flywheel bolts and tighten to 62 N.m (46 lb ft).
8. Install the starter. Refer to **Starter Replacement (LAF)** or **Starter Replacement (LF1)** .
9. Install the front transmission mount to the transmission. Refer to **Transmission Front Mount Replacement**.
10. Install the rear transmission mount to the transmission. Refer to **Transmission Rear Mount Replacement**.
11. Install the left transmission mount to the transmission. Refer to **Transmission Mount Replacement - Left Side** .
12. Install the wheel drive shafts to the transmission. Refer to **Front Wheel Drive Shaft Replacement** .

13. Install the frame. Refer to **Drivetrain and Front Suspension Frame Replacement** .

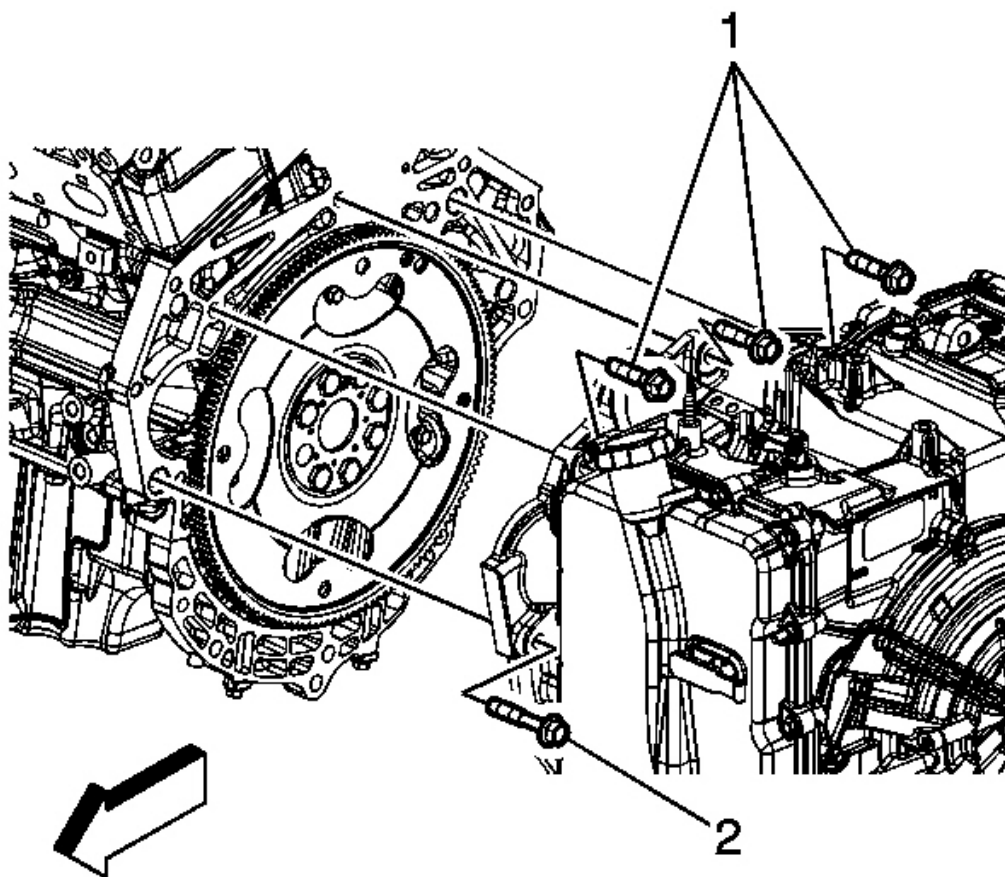


Fig. 90: Identifying Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS CORP.

14. Install the upper transmission to engine bolt (1, 2) and tighten to 75 N.m (55 lb ft).
15. Install the right catalytic converter and pipe assembly. Refer to **Catalytic Converter Replacement - Right Side (LF1)** .
16. Remove the engine support fixture.
17. Lower the vehicle.

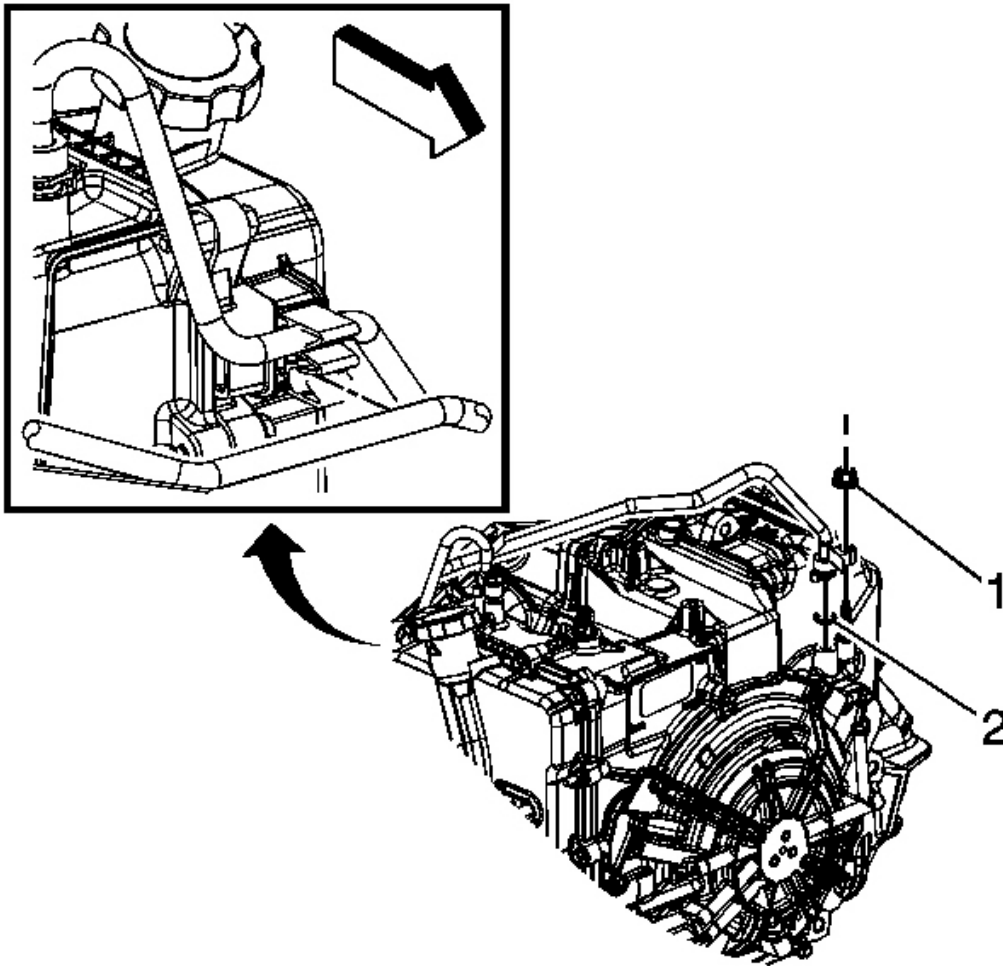


Fig. 91: Identifying Transmission Fluid Cooler Pipe Components
Courtesy of GENERAL MOTORS CORP.

18. Install the transmission fluid cooler outlet hose and seal (2) to the transmission.
19. Install the transmission fluid cooler pipe retainer nut (1) and tighten to 22 N.m (16 lb ft).

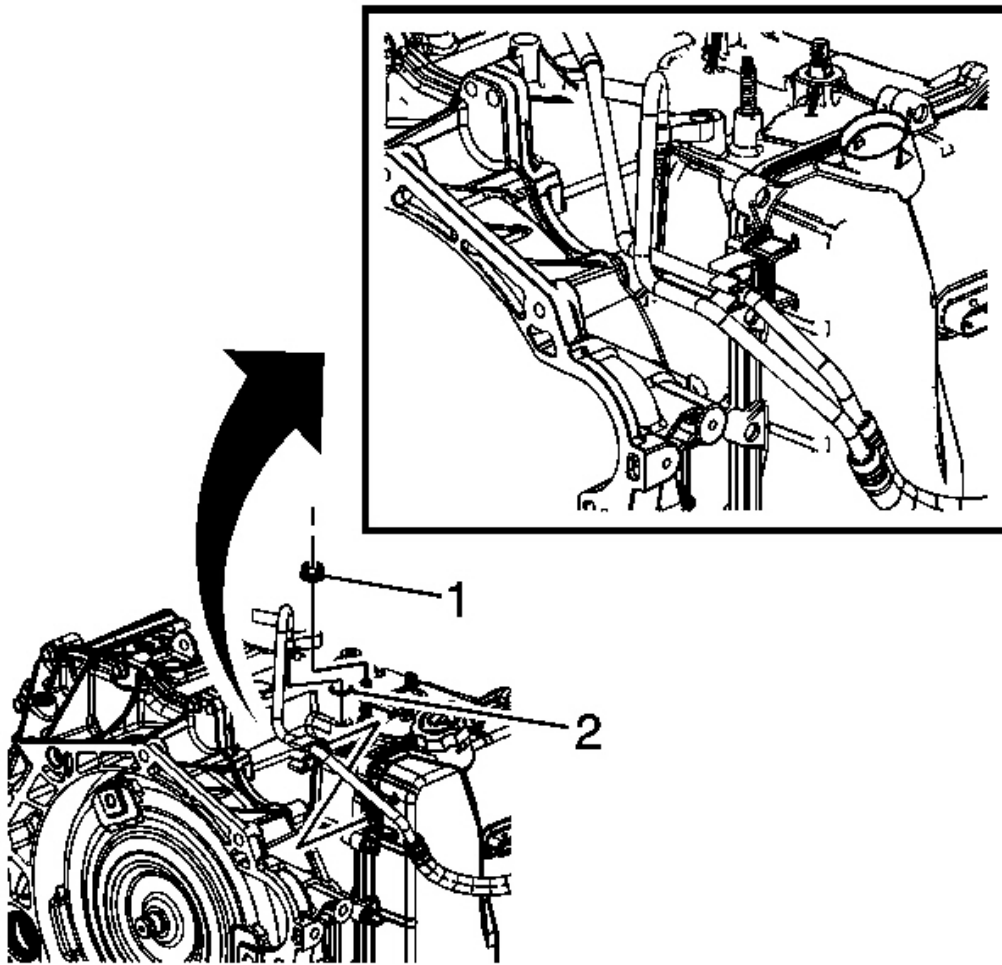


Fig. 92: Identifying Transmission Fluid Cooler Inlet Hose Components
Courtesy of GENERAL MOTORS CORP.

20. Install the transmission fluid cooler inlet hose and seal (2) to the transmission.
21. Install the transmission fluid cooler pipe retainer nut (1) and tighten to 22 N.m (16 lb ft).

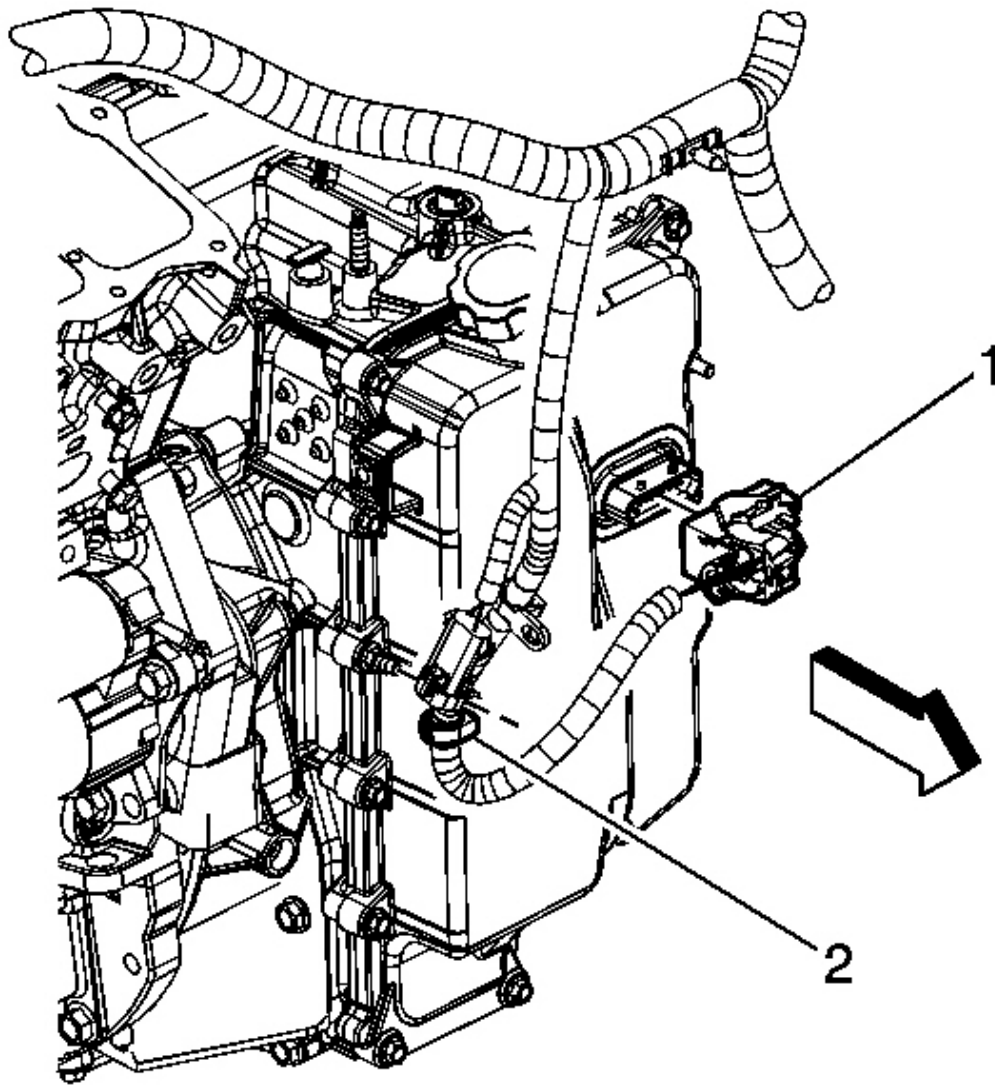


Fig. 93: Identifying Wire Harness Retainer & TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

22. Connect the control valve body TCM electrical connector (1).
23. Install the wire harness retainer (2) to the control valve body cover stud and tighten the nut to 12 N.m (106 lb in).
24. Install the transmission range select lever cable and bracket.
25. Install the battery tray. Refer to **Battery Tray Replacement**.

26. Adjust the automatic transmission range selector lever cable. Refer to **Range Selector Lever Cable Adjustment** .
27. Fill the transmission with fluid. Refer to **Transmission Fluid Replacement**.
28. For transmission control module programming and setup, refer to **Transmission Control Module Programming and Setup (6T30/6T40/6T45/6T50)** or **Transmission Control Module Programming and Setup (6T70)** .

NOTE: **After an internal transmission repair or internal part replacement the service fast learn adapt procedure should be performed.**

29. Perform the transmission adaptive values learn procedure. Refer to **Transmission Adaptive Values Learn** .
30. Road test the vehicle.

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

SCHEMATIC AND ROUTING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS

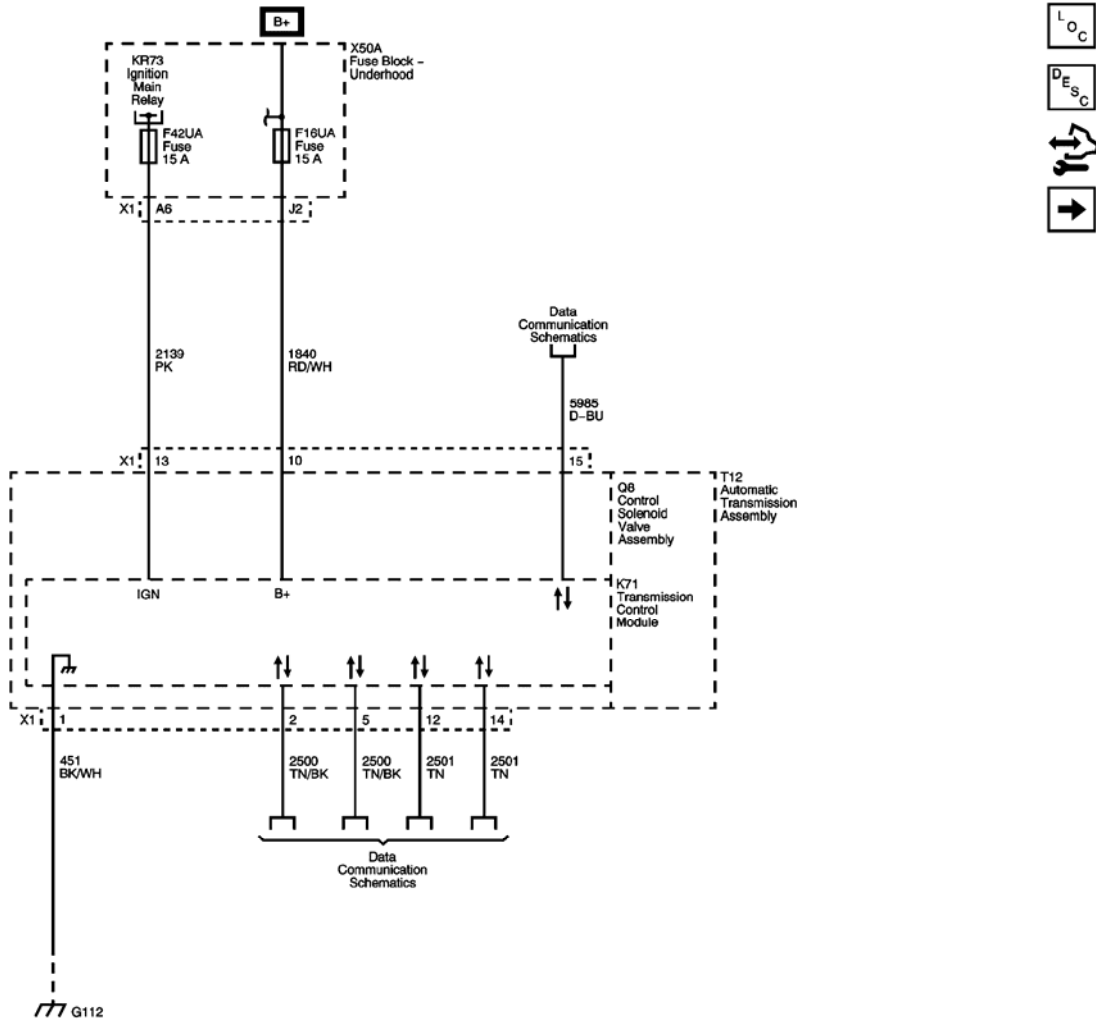


Fig. 1: Module Power, Ground, and Serial Data (MH2 or MH4)
Courtesy of GENERAL MOTORS CORP.

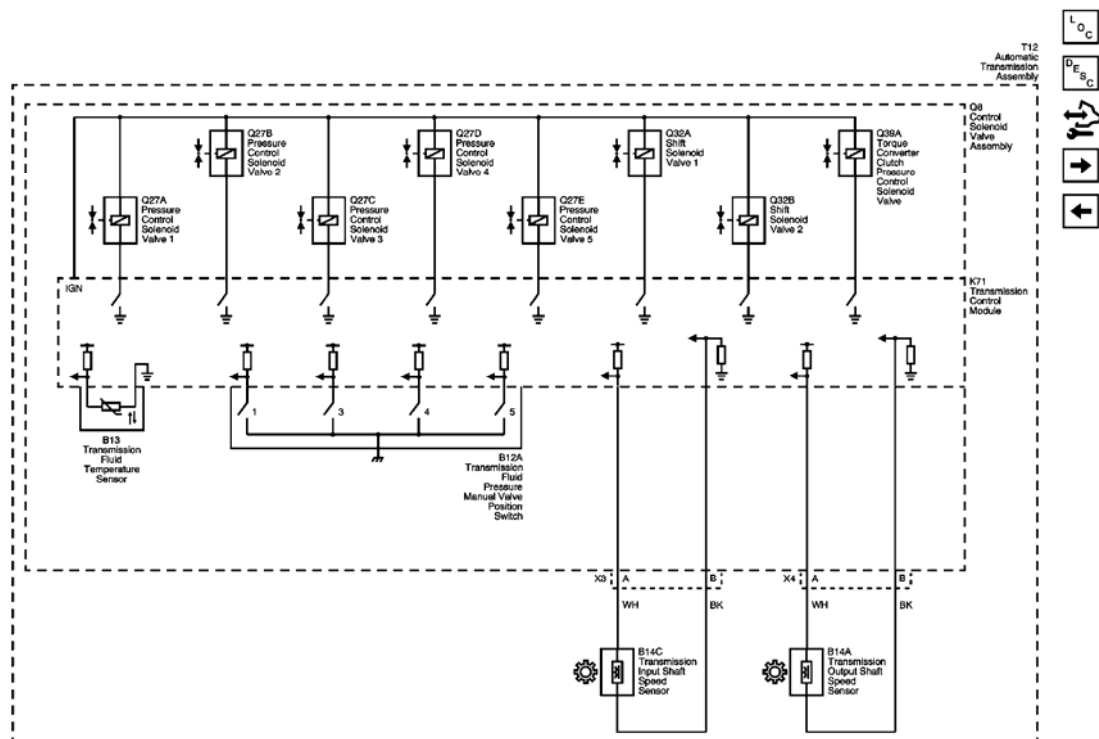


Fig. 2: ISS, OSS, TFP, TFT, Pressure Controls, and Shift Controls (MH2 or MH4)
 Courtesy of GENERAL MOTORS CORP.

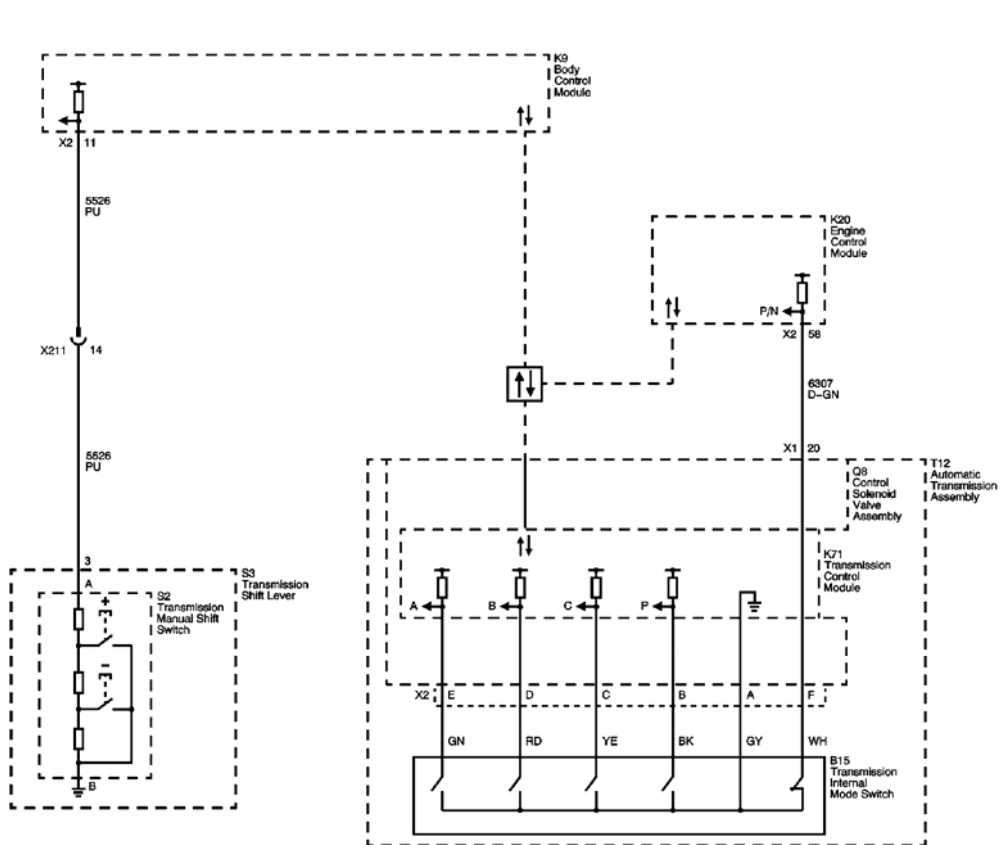


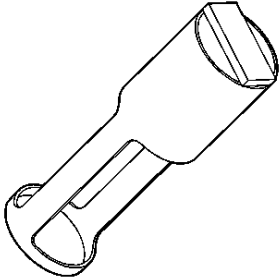
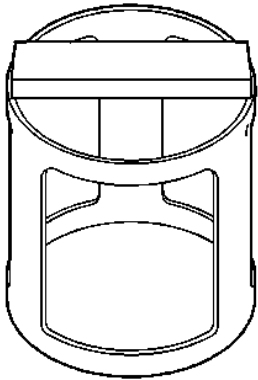
Fig. 3: IMS and Tap Up/Tap Down (MH2 or MH4)
 Courtesy of GENERAL MOTORS CORP.

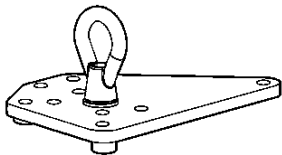
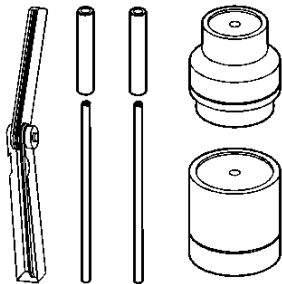
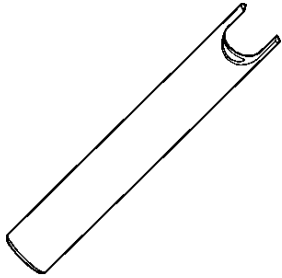
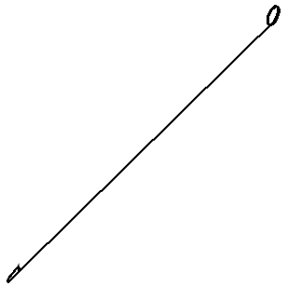
2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

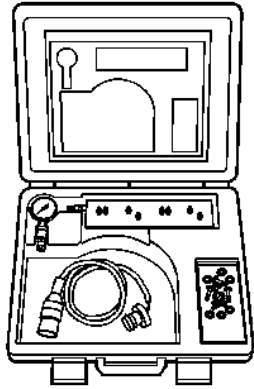
Illustration	Tool Number/Description
	DT 47693 Dam Protector
	DT 47694 Piston Spring Compressor
	DT 47734 Speed Sensor Harness Tether



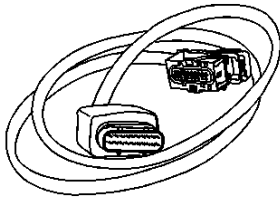
DT 47793
Differential Rotating Tool

DT 47800
Shim Selection Gauge

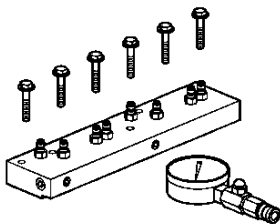
DT 47811-A
Lift Plate



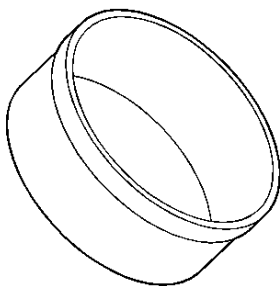
DT 47825
Control Solenoid Test Plate



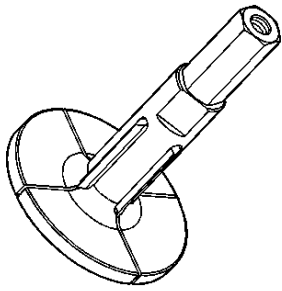
DT 47825-20
Adapter Harness



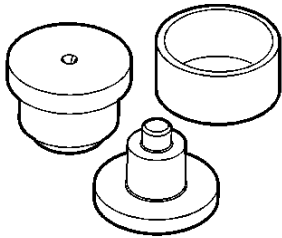
DT 47825-100
Solenoid Test Plate



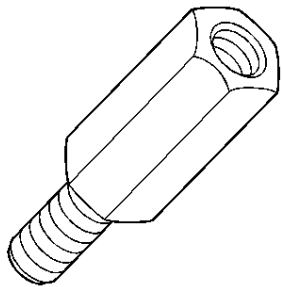
DT 47859
Piston Outer Seal Protector



DT 47927
Bearing Cup Remover

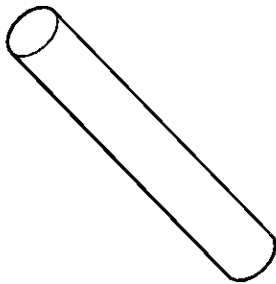
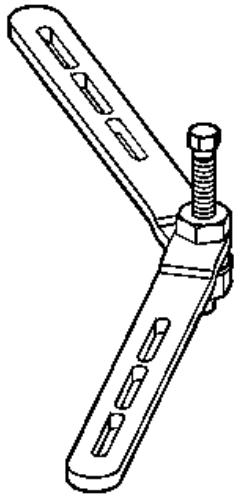


DT 47928
Bearing Installer

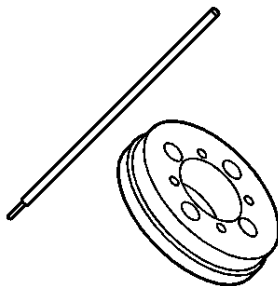


DT 48055
Lube Dam Remover

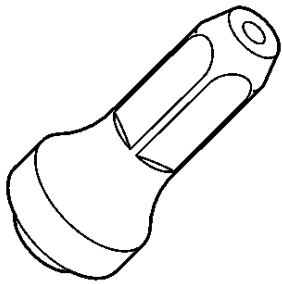
DT 48056
Spring Compressor Bridge



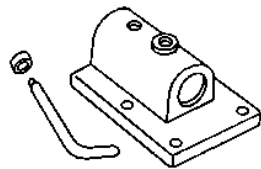
DT 48551
Reaction Hub Bushing Protector



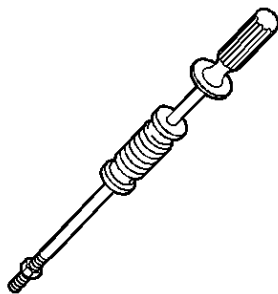
DT 49131
Seal Staking Tool



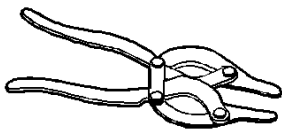
DT 49861
Seal Installer



J 3289-20
Holding Fixture

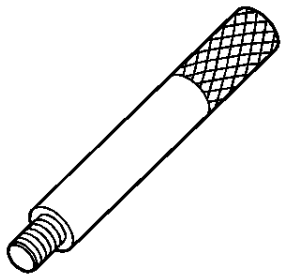


J 6125-1B
Slide Hammer with Adapter

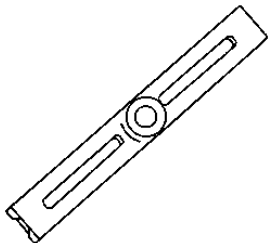


J 8059
Snap Ring Plier-Parallel Jaw

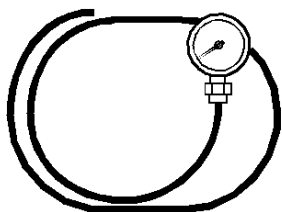
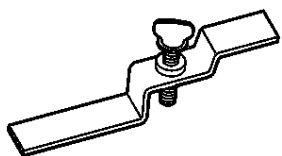
J 8092
Driver Handle



J 8433-1
Puller Bar

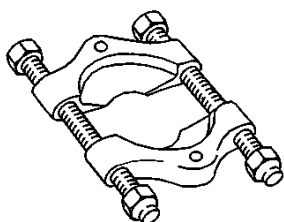


J 21366
Converter Holding Strap

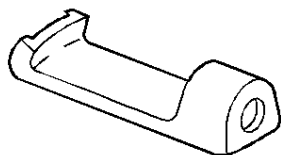


J 21867
Pressure Gauge

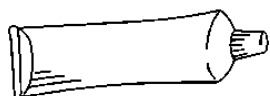
J 22912-01
Split Plate Bearing Remover



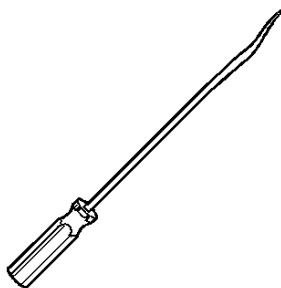
J 23129
Universal Seal Remover



J 23444-A
Extreme Press Lubricant-1/4 Ounce Tube

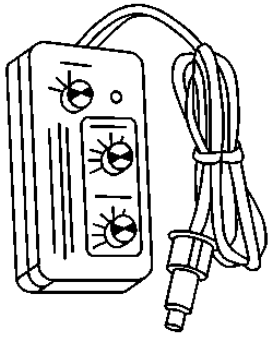


J 28585
Snap Ring Remover

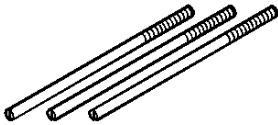


J 35616
GM-Approved Terminal Test Kit

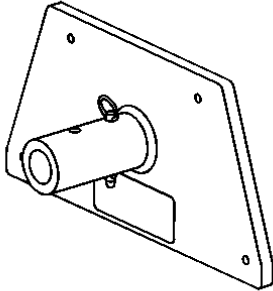




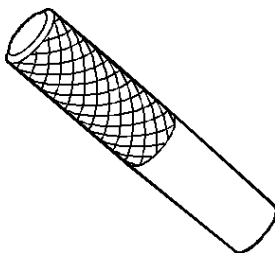
J 38522
Variable Signal Generator



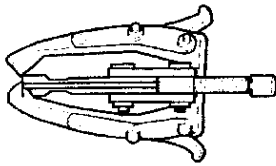
J 39068
Valve Body Guide Pins (3)



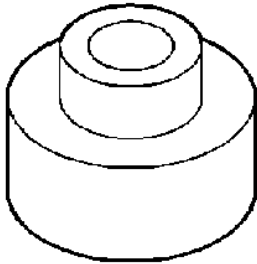
J 39890
Holding Fixture Adapter



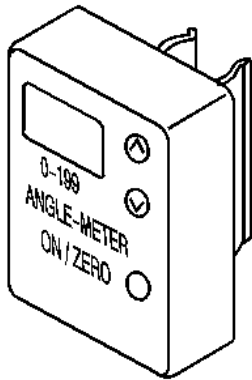
J 41229
Manual Shaft Pin Installer



J 41816
Three Legged Puller

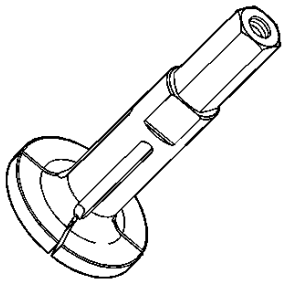
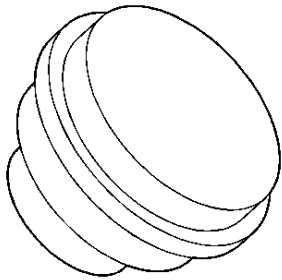


J 41816-2
Crankshaft End Protector

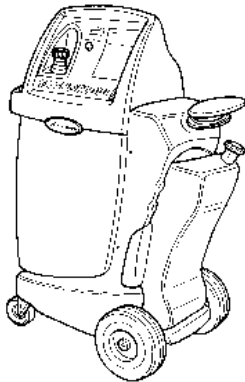


J 45059
Angle Meter

J 45087
Bearing Cup Installer

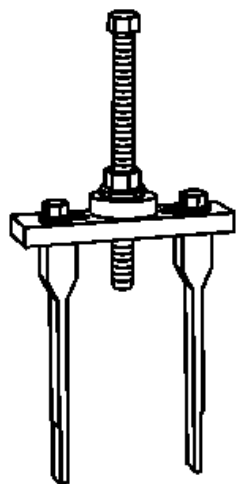
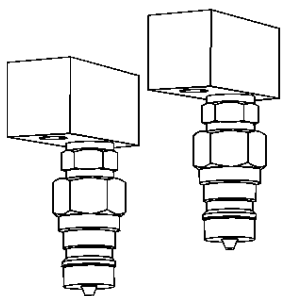


J 45094
Bearing Cup Remover

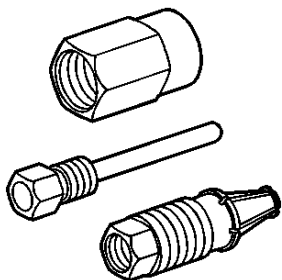


J 45096
Transmission Oil Cooling System Flush and Flow
Test Tool

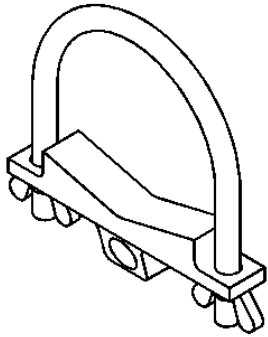
J 45096-50
Transmission Cooler Flush Adapter



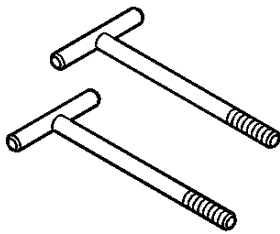
J 45124
Removal Bridge



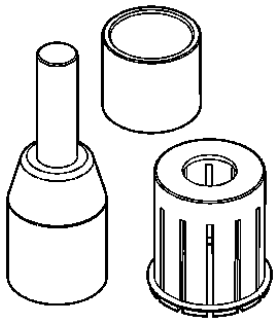
J 45201
Cooler Line Seal Remover



J 45341
Rear Wheel Drive Shaft Removal Tool

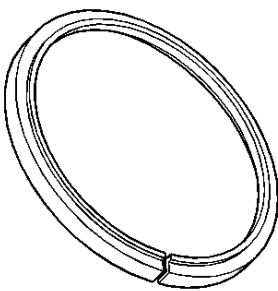
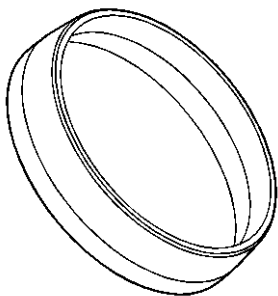


J 46409
Torque Converter Lifting Handles

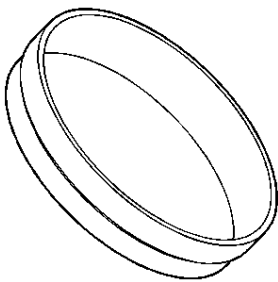


J 46620
Seal Installer

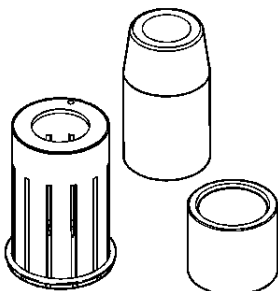
J 46621
Piston Seal Protector



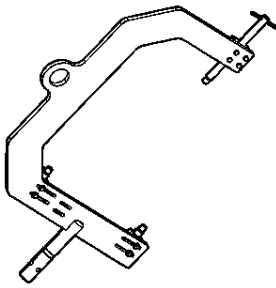
J 46622
Piston Seal Protector



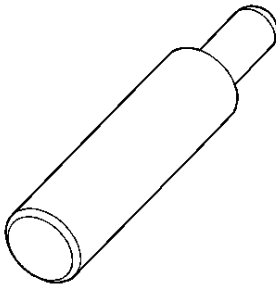
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Piston Seal Protector



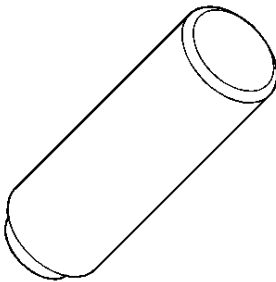
J 46624
Seal Installer



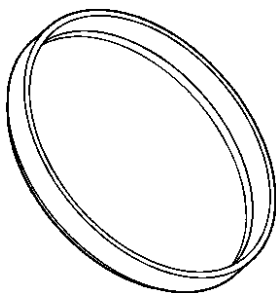
J 46625
Transmission Holding Fixture



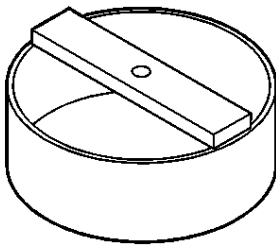
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Seal Installer



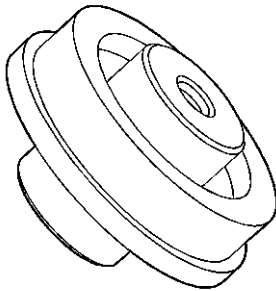
J 46627-A
Seal Installer



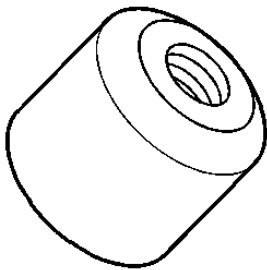
J 46628-1
Piston Seal Protector



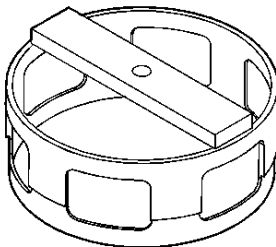
J 46628-2
Spring Compressor



J 46629-A
Seal Installer



J 46630
Lube Dam Installer



J 46632
Spring Compressor

2010 Transmission

Automatic Transmission - 6T70/6T75 - Equinox & Terrain

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Application	*Ref No.	Quantity	Size	Specification	
				Metric	English
A/Trans Case Cover Bolt	18	10	M6x1.0x30	12 N.m	106 lb in
A/Trans Fluid Pump Bolt	1	3	M6x1.0x25	12 N.m	106 lb in
A/Trans Fluid Trough Bolt	11	1	M6x1.0x25	12 N.m	106 lb in
Control Valve Body Assembly (Complete) Bolt	19, 21	3	M6x1.0x55	12 N.m	106 lb in
Control Valve Body Assembly (Complete) Bolt	20	3	M6x1.0x35	12 N.m	106 lb in
Control Valve Body Assembly (Complete) Bolt	22	5	M6x1.0x65	12 N.m	106 lb in
Control Valve Body to Case	23	2	M6x1.0x55	12 N.m	106 lb in
Control Valve Body to Case Bolt	24	8	M6x1.0x65	12 N.m	106 lb in
Control Valve Assembly (w/TCM and Body) to Case Bolt	25	1	M6x1.0x42	12 N.m	106 lb in
Control Valve Assembly (w/TCM and Body) to Case Bolt	26	1	M6x1.0x55	12 N.m	106 lb in
Control Valve Assembly (w/TCM and Body) to Case Bolt	27	2	M6x1.0x65	12 N.m	106 lb in
Control Valve Assembly (w/TCM and Body) to Case Bolt	28	4	M6x1.0x80	12 N.m	106 lb in
Control Valve Assembly (w/TCM and Body) to Case Bolt	29	3	M6x1.0x95	12 N.m	106 lb in
Control Valve Body Cover Bolt	30	12	M6x1.0x30	12 N.m	106 lb in
Control Valve Body Cover Stud	31	2	M6x1.0x30	12 N.m	106 lb in
Fluid Cooler Fitting at Radiator	-	-	-	38 N.m	28 lb ft
Fluid Cooler Outlet Pipe	-	-	-	22 N.m	16 lb ft

Retainer Nut					
Fluid Cooler Pipe Nut	-	-	-	228 N.m	16 lb ft
Fluid Pressure Test Hole Plug	12	1	1/8"-27 NPTF	12 N.m	106 lb in
Fluid Level Hole Plug	13	1	1/8"-27 NPTF	12 N.m	106 lb in
Front Differential Carrier Baffle Bolt	6	1	M6x1.0x25	12 N.m	106 lb in
Front Differential Transfer Drive Gear Support Bolt					
• First Pass	5	9	M8x1.25x25	10 N.m	89 lb in
• Final Pass	5	9	M8x1.25x25	50 degrees	
Input Shaft Support Bolt (Torx)	N/A	3	M6x1.0x50	12 N.m	106 lb in
Input Speed Sensor Bolt	17	1	M6x1.0x25	9 N.m	80 lb in
Output Speed Sensor Bolt	14	1	M6x1.0x25	12 N.m	106 lb in
Park Pawl Actuator Bracket Bolt	10	2	M6x1.0x25	12 N.m	106 lb in
Shift Control Knob Retaining Screw	-	-	-	1.5 N.m	13 lb in
Support Fluid Passage Tube (Torx) Bolt	2	2	M5x0.8x12	7 N.m	62 lb in
Support Fluid Passage Tube Bolt	3	2	M6x1.0x15	12 N.m	106 lb in
Torque Converter and Differential Housing Bolt	8	14	M8x1.25x35	36 N.m	27 lb ft
Torque Converter and Differential Housing Bolt	9	3	M8x1.25x35	30 N.m	22 lb ft
Torque Converter to Flywheel Bolt	-	-	-	62 N.m	46 lb ft
Transaxle Brace Bolts	-	-	-	50 N.m	37 lb ft
Transaxle Mount and Bracket Bolt					
• Rear	-	-	-	50 N.m	37 lb ft
• Front and Left Side Through Bolt	-	-	-	110 N.m	81 lb ft
Transaxle Mount Nuts					
• Front	-	-	-	50 N.m	37 lb ft
• Left Side	-	-	-	50 N.m	37 lb ft
Transaxle Range Selector Cable Bracket Bolt	-	-	-	25 N.m	18 lb ft
Transaxle Range Switch Lever Nut	-	-	-	20 N.m	15 lb ft
Transaxle Shift Control Nut	-	-	-	25 N.m	18 lb ft
Transaxle to Engine Bolt	-	-	-	75 N.m	55 lb ft

Transmission Cooler Pipe (External Torx) Stud	15	2	M8x1.25x30.5	12 N.m	106 lb in
Transmission Fluid Cooler Pipe Quick Connect Fitting	-	-	-	38 N.m	28 lb ft
Transmission Fluid Cooler Pipe Mounting Nuts	-	-	-	22 N.m	16 lb ft
*Reference number refers to the component callout number in Disassembled Views					

TRANSMISSION GENERAL SPECIFICATIONS

Name	6T70/6T75
RPO Codes	6T70-MH2 (2WD), MH4 (4WD) 6T75-MY9 (2WD), MH6 (4WD)
Production Location	Warren Michigan (USA), Ramos, Mexico
Transaxle Drive	Front Wheel Drive, All Wheel Drive
Reverse Gear Ratio	2.88
1st Gear Ratio	4.484
2nd Gear Ratio	2.872
3rd Gear Ratio	1.842
4th Gear Ratio	1.414
5th Gear Ratio	1.000
6th Gear Ratio	0.742
Effective Final Drive Gear Ratio	2.77/3.16
Torque Converter Size - Diameter of Torque Converter Turbine	246 mm
Pressure Taps	Line Pressure
Transaxle Fluid Type	DEXRON VI®
Transaxle Fluid Capacity	9.0 L/9.5 qts Quarts
Transaxle Type: 6	Six Forward Gears
Transaxle Type: T	Transverse Mount
Transaxle Type: 70/75	Product Series
Position Quadrant	P, R, N, D, * *(Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transaxle Net Weight	104 kg
Maximum Trailer Towing Capacity	N/A
Maximum Gross Vehicle Weight (GVW)	4,000 lbs

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada

Input Speed Sensor	Threadlock	12345382	10953489
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FLUID CAPACITY SPECIFICATIONS

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	7.0-9.0 liters	7.4-9.5 quarts

TAPER BEARING PRELOAD SELECTIVE SPECIFICATIONS

Front Differential Drive Pinion Gear and Differential Thrust Washer Selection Chart

Thrust Washer O.D. Color Code	Washer Thickness	
	Metric	English
Brown	0.494 mm	0.020 in
Purple	0.545 mm	0.022 in
Black	0.596 mm	0.024 in
Pink	0.647 mm	0.026 in
Dark Blue	0.698 mm	0.028 in
Light Green	0.749 mm	0.030 in
Plain	0.800 mm	0.032 in
White	0.851 mm	0.034 in
Light Blue	0.902 mm	0.036 in
Orange	0.953 mm	0.038 in
White/Black	1.004 mm	0.040 in
White/Orange	1.055 mm	0.042 in
White/Light Green	1.106 mm	0.044 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 (OWC)	-	-	-	Holding	Holding	-	-	-	-	-
* = Applied with NO load										

SHIFT SOLENOID VALVE STATE AND GEAR RATIO

Gear	Shift SOL 1	Shift SOL 2	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	ON	OFF	OFF	OFF	ON	-
Reverse	ON	OFF	OFF	OFF	ON	ON	2.88
Neutral	ON	ON	OFF	OFF	OFF	ON	-
1st Braking	ON	ON	ON	OFF	OFF	ON	4.484
1st	OFF	ON	ON	OFF	OFF	OFF	4.484
2nd	OFF	ON	ON	ON	OFF	OFF	2.872
3rd	OFF	ON	ON	OFF	ON	OFF	1.842
4th	OFF	ON	ON	OFF	OFF	ON	1.414
5th	OFF	ON	OFF	OFF	ON	ON	1.000
6th	OFF	ON	OFF	ON	OFF	ON	0.742
Effective Final Drive Ratio - 6T70/75 - 2.77/3.16							
For shift solenoids 1 and 2, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure).							
For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure							

SHIFT SPEED

Shift @ TP	km/h	mph	OSS (RPM)
1-2 @ 12.5	16	9.9	345
2-3 @ 12.5	26	16.2	561
3-4 @ 12.5	39.5	24.5	852
4-5 @ 12.5	54	33.6	1164
5-6 @ 12.5	71	44.1	1531
6-5 @ 12.5	68.5	42.6	1477
5-4 @ 12.5	51	31.7	1100
4-3 @ 12.5	36	22.4	776
3-2 @ 12.5	23	14.3	496
2-1 @ 12.5	11	6.8	237
1-2 @ 25	21.5	13.4	464
2-3 @ 25	36	22.4	776
3-4 @ 25	48	29.8	1035

4-5 @ 25	64	39.8	1380
5-6 @ 25	115	71.5	2479
6-5 @ 25	68.5	42.6	1477
5-4 @ 25	51	31.7	1100
4-3 @ 25	36	22.4	776
3-2 @ 25	23	14.3	496
2-1 @ 25	11	6.8	237

NOTE: Shift speed points are affected by many different vehicle and transmission operating conditions. The table above represents shift speed points calibrated at specific throttle angles during normal operating conditions and a temperature range between 0-130°C (32-266°F). These shift speed points are also based on an effective final drive ratio of 3.16, and assume a production-intent tire size. The table below illustrates a number of different variables that influence these shift speed points. Based on a given operating condition, these variables may override the normal shift speed points. To assist in monitoring the different variables, the respective scan tool data parameter is also listed.

Shift Speed Variables

Scan Tool Parameter	Shift Speed Variables
Calc. Throttle Position	Calc. Throttle Position (TP) is one of the most important inputs in the transmission shift pattern logic. A very low TP angle will impact the shift pattern by causing upshifts. A very high TP angle will impact the shift pattern by causing downshifts.
Commanded Gear	Based on numerous inputs, the transmission control module (TCM) selects the optimum gear. Once the TCM commands a gear, the pressure control solenoids are activated to hydraulically control engagement of the proper clutch.
Cruise	When cruise control is activated, the shift pattern is altered to reduce excessive shifting.
ECT	Shift speed points may be offset to enhance engine coolant temperature (ECT) warm-up. Also, operating the vehicle at higher engine speeds will reduce the time to warm the ECT and the TFT.
Engine Speed	To protect against an over speed condition, engine speed is monitored. If the engine speed becomes too high, an upshift will occur.
Engine Torque	Engine torque is used to predict vehicle operating conditions, in order to determine the optimum gear and provide for a smoother ride.
IMS	The internal mode switch (IMS) indicates the position of the transmission manual valve. The operator controls this valve by moving the gear range selector. Therefore, the possible gears may be limited by this valve position.
TCC PC Sol. Duty Cycle	The torque converter clutch (TCC) pressure control (PC) solenoid duty cycle indicates when the TCC has been engaged.
TCC Slip Speed	The TCC Slip Speed indicates the difference between engine speed and transmission input speed. The TCC is locked when slip speed is at or

	near zero, and may be controlling slip when at lower slip speeds.
TFP Switch 1, 3, 4 or 5	The transmission fluid pressure (TFP) switch is used to indicate if fluid pressure to a specific clutch has been applied or released.
Trans. Fluid Temp.	A lower TFT will extend shift speeds, a higher TFT, or hot mode condition, will invoke shorter shift speeds in order to establish a shift pattern required to cool the TFT.
Transmission Hot Mode	If the TFT becomes too hot, a hot mode shift pattern is used. The hot mode shift pattern will invoke lower shift speed points to establish a shift pattern necessary to cool the TFT.
Transmission OSS	The transmission output speed sensor (OSS) is one of the most important inputs into the transmission shift pattern logic. A very low transmission output speed will impact the shift pattern by causing downshifts. A very high transmission output speed will impact the shift pattern by causing upshifts.

TRANSMISSION FLUID PRESSURE SWITCH LOGIC

Gear	TFP Switch States			
	TFP SW1	*TFP SW3	TFP SW4	TFP SW5
Park	High	Low	Low	Low
Reverse	Low	Low	Low	Low
Neutral	High	Low	Low	Low
Drive 1st - Engine Braking	High	High	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 = 12 V (Switch Open or Pressurized) Low = 0 V (Switch Closed or No Pressure) Note: All TFP switches are normally closed (NC) *TFP switch 2 does not exist				

TRANSMISSION INTERNAL MODE SWITCH LOGIC

Gear Selector Position	Signal A	Signal B	Signal C	Signal P
Park	LOW	HI	HI	LOW
Park/Reverse	LOW	LOW	HI	LOW
Reverse	LOW	LOW	HI	HI
Reverse/Neutral	HI	LOW	HI	HI
Neutral	HI	LOW	HI	LOW
Neutral/Drive 6	HI	LOW	LOW	LOW

Drive 6	HI	LOW	LOW	HI
Drive 6/Drive 4	LOW	LOW	LOW	HI
Drive 4	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
0	345-900 kPa	50-130 psi
200	690-900 kPa	100-130 psi
400	1100-1310 kPa	160-190 psi
600	1520-1725 kPa	220-250 psi
800	1860-2070 kPa	270-300 psi
1000	1860-2070 kPa	270-300 psi

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

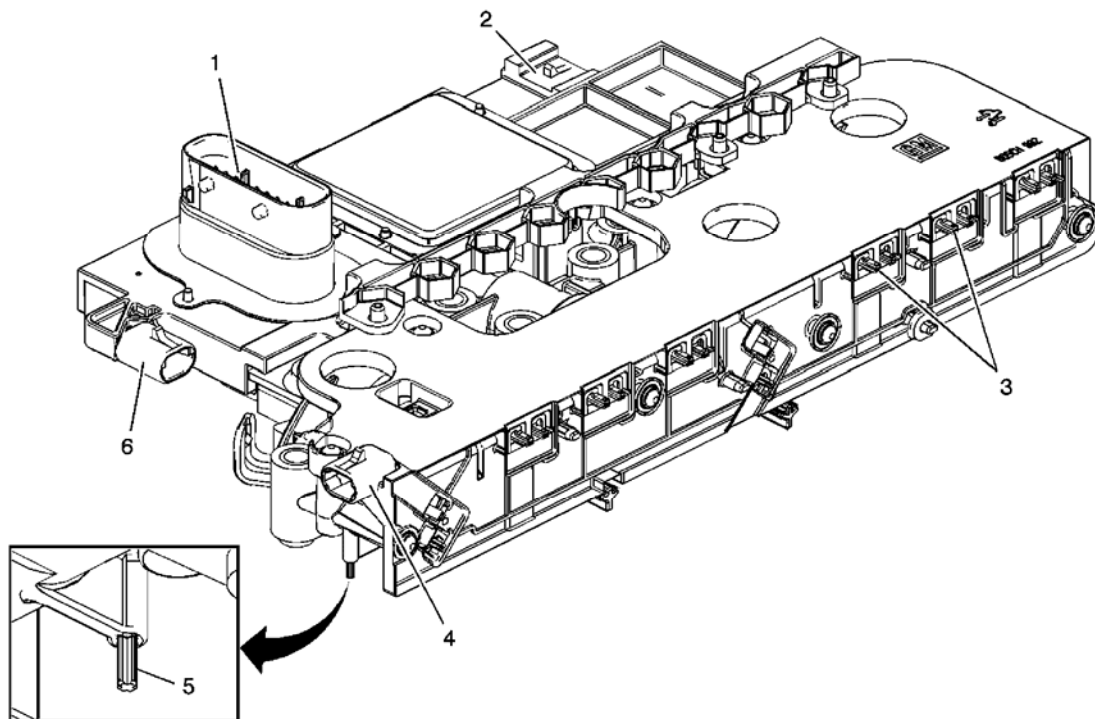


Fig. 1: Identifying Control Solenoid Valve & Transmission Control Module Assembly
Courtesy of GENERAL MOTORS CORP.

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 4 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

- **J 35616:** GM-Approved Terminal Test Kit
- **J 38522:** Variable Signal Generator

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

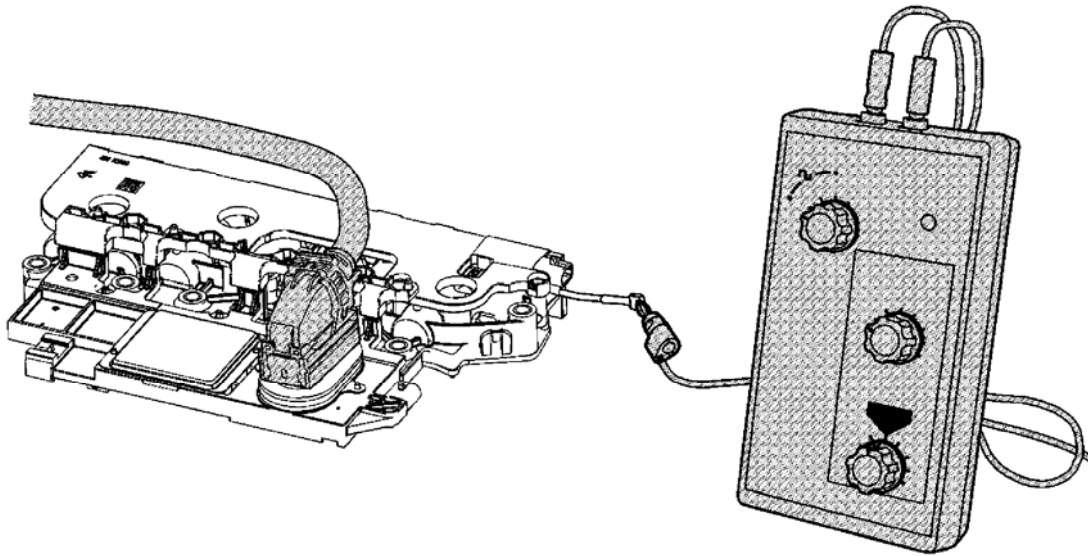


Fig. 2: Connecting Special Tool To Affected Signal Circuit
Courtesy of GENERAL MOTORS CORP.

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 8.3-9.3 volts at terminal A.
 - 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 **J 35616**: terminal test kit, connect the **J 38522**: variable signal generator red lead to the ISS signal circuit terminal B on the TCM.
4. Connect the black lead from the **J 38522**: variable signal generator to ground.
5. Set the **J 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 8.3-9.3 volts at terminal A.
 - 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 **J 35616**: terminal test kit, connect the **J 38522**: variable signal generator red lead to the OSS signal circuit terminal B on the TCM.
4. Connect the black lead from the **J 38522**: variable signal generator to ground.
5. Set the **J 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 256-266 RPM.
 - If not within the specified range, replace the control solenoid valve assembly. Refer to **Control Solenoid Valve and Transmission Control Module Assembly Replacement** .

CONTROL SOLENOID VALVE AND TRANSMISSION CONTROL MODULE ASSEMBLY SOLENOID PERFORMANCE TEST

Special Tools

- **DT-47825-100**: Solenoid Test Plate
- **DT-47825-20**: Adapter Harness

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

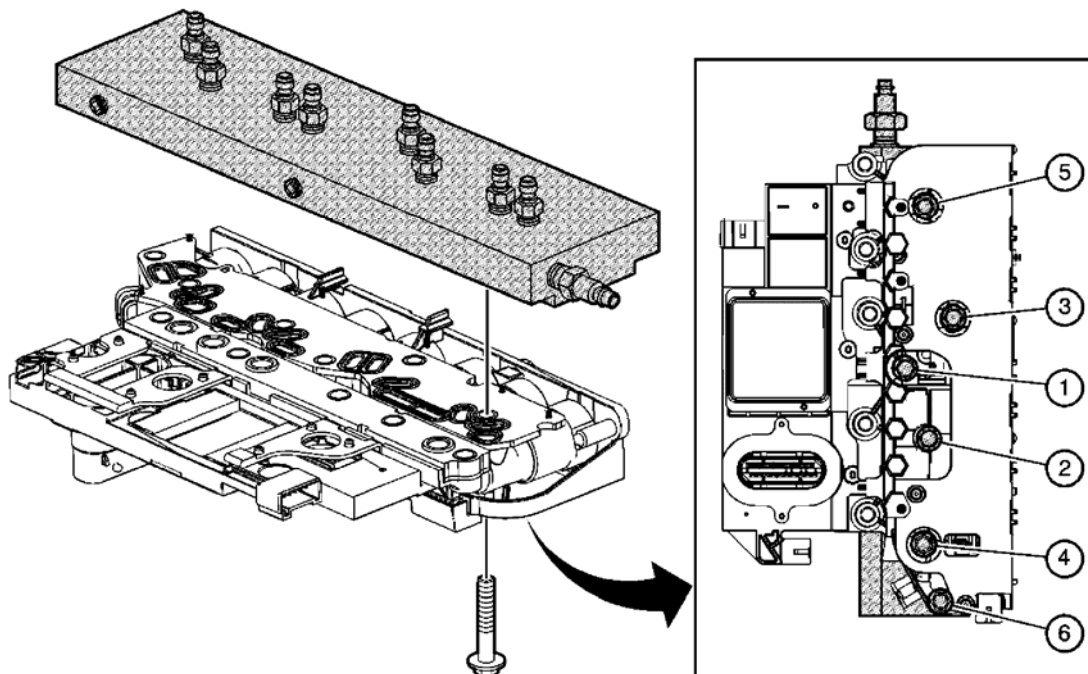


Fig. 3: Identifying Special Tool Bolt Tightening Sequence

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. The **DT-47825-100**: test plate is bolted to the control solenoid valve assembly on the valve body mounting surface. Pressurized air is passed into the aluminum test plate, through the control solenoid valve assembly solenoid passage and back to a pressure gauge on the test plate. 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.
- 2. Bolt the **DT-47825-100**: 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 plate. 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-47825-100** test plate air psi inlet port. See Special Tools .
- 5. Connect the **DT-47825-20**: harness to the vehicle and control solenoid valve assembly.

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	C	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	F	Full pressure to gauge	No pressure to gauge
Shift Solenoid 1	H	Full pressure to gauge	No pressure to gauge
Shift Solenoid 2	D	Full pressure to gauge	No 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 transmission control module (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.

Drain the TCM of excess transmission fluid before attaching to test plate and use caution when attaching air to test plate air inlet.

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 there must be at least enough fluid to wet the end of the dipstick bullet. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Level Checking Procedure

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P).

2. Start the engine.
3. 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).
4. Allow the engine to idle 500-800 rpm for at least 1 minute. Release the brake pedal.
5. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

NOTE: If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specified range.

6. If the TFT reading is not within the required temperature ranges, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached.

Drive the vehicle in second gear until the fluid temperature is within the specified range.

NOTE: Check the transmission fluid level when the TFT is between 180°F and 200°F (82°C and 93°C). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is within range.

7. Remove the dipstick and wipe it with a clean rag or paper towel.
8. 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.
9. Install the dipstick and tighten. 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 assembly 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.

10. Check both sides of the dipstick and read the lower level.
11. Install and remove the dipstick again to verify the reading.
12. If the fluid level is not within the crosshatch band, and the transmission temperature is between 180°F and 200°F (82°C and 93°C), 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.

NOTE: Do not add more than one pint (0.5L) 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.

13. If the fluid level is in the acceptable range, install the dipstick.
14. 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

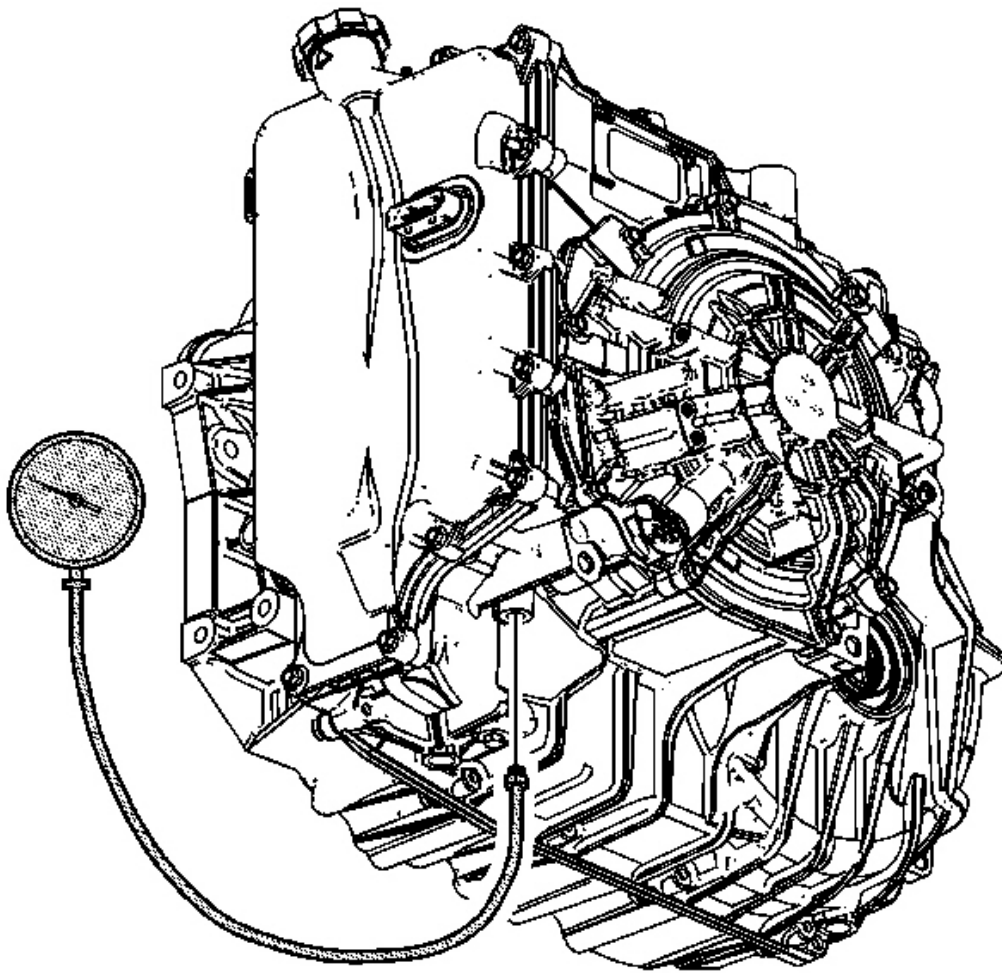


Fig. 4: View Of Pressure Gage
Courtesy of GENERAL MOTORS CORP.

SPECIAL TOOLS

J 21867: Pressure Gauge

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

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 200 KPa (29 psi). The scan tool commands the increment values automatically.
12. Allow the pressure to stabilize between increments.
13. Compare the pressure readings on the **J 21867**: pressure gauge to the actual pressure values in the solenoid valve pressure chart. Refer to **Solenoid Valve Pressure**.
14. If the pressure readings vary greatly, refer to **Fluid Pressure High or Low**.
15. Turn the engine OFF.
16. Remove the **J 21867**: pressure 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 and for Harsh First and Reverse 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.

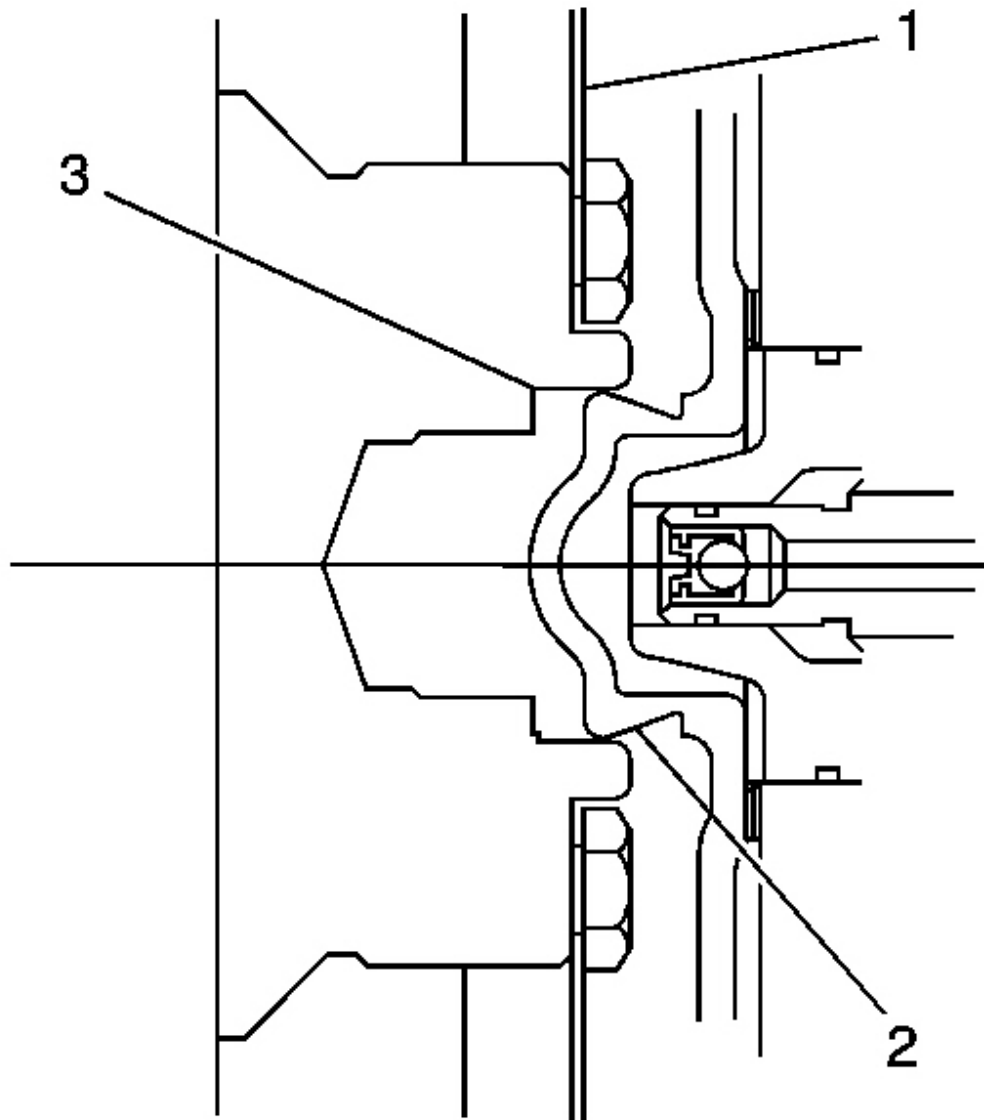


Fig. 5: View Of Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS CORP.

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.
- 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 Case Cover and/or 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

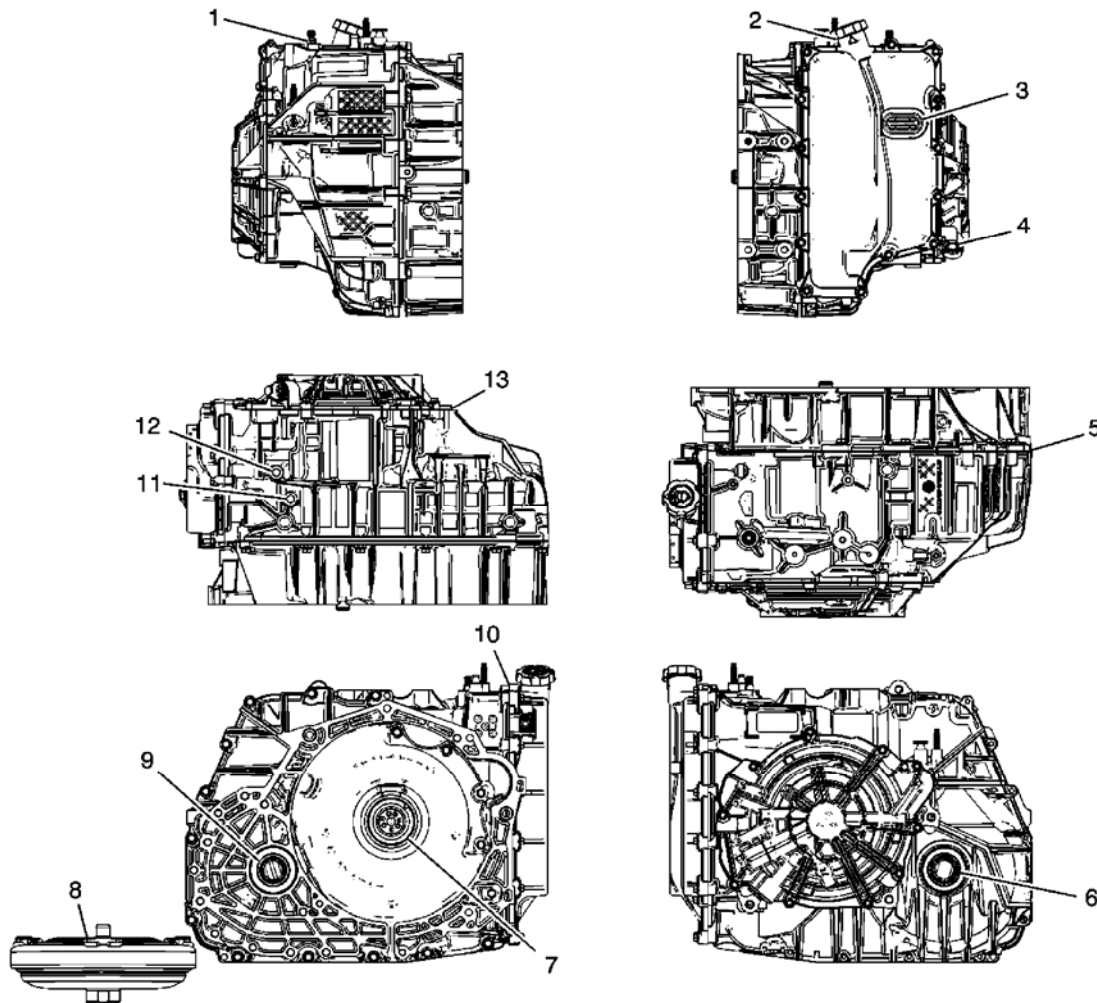


Fig. 6: Identifying Leak Inspection Points
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
1	Manual Shift Shaft Seal
2	Automatic Transmission Vent
3	Control Valve Body Cover Wiring Connector Hole Seal
4	Input Speed Sensor Seal
5	Converter Housing to Case Joint
6	Front Wheel Drive Shaft Oil Seal Assembly - Case
7	Torque Converter Fluid Seal Assembly
8	Torque Converter Assembly
9	Front Wheel Drive Shaft Oil Seal Assembly - Torque Converter Housing

10	Control Valve Body Cover Assembly Gasket
11	Fluid Level Hole Plug
12	Fluid Pressure Hole Plug
13	Case Cover Gasket

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 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

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

MACHINE SET-UP

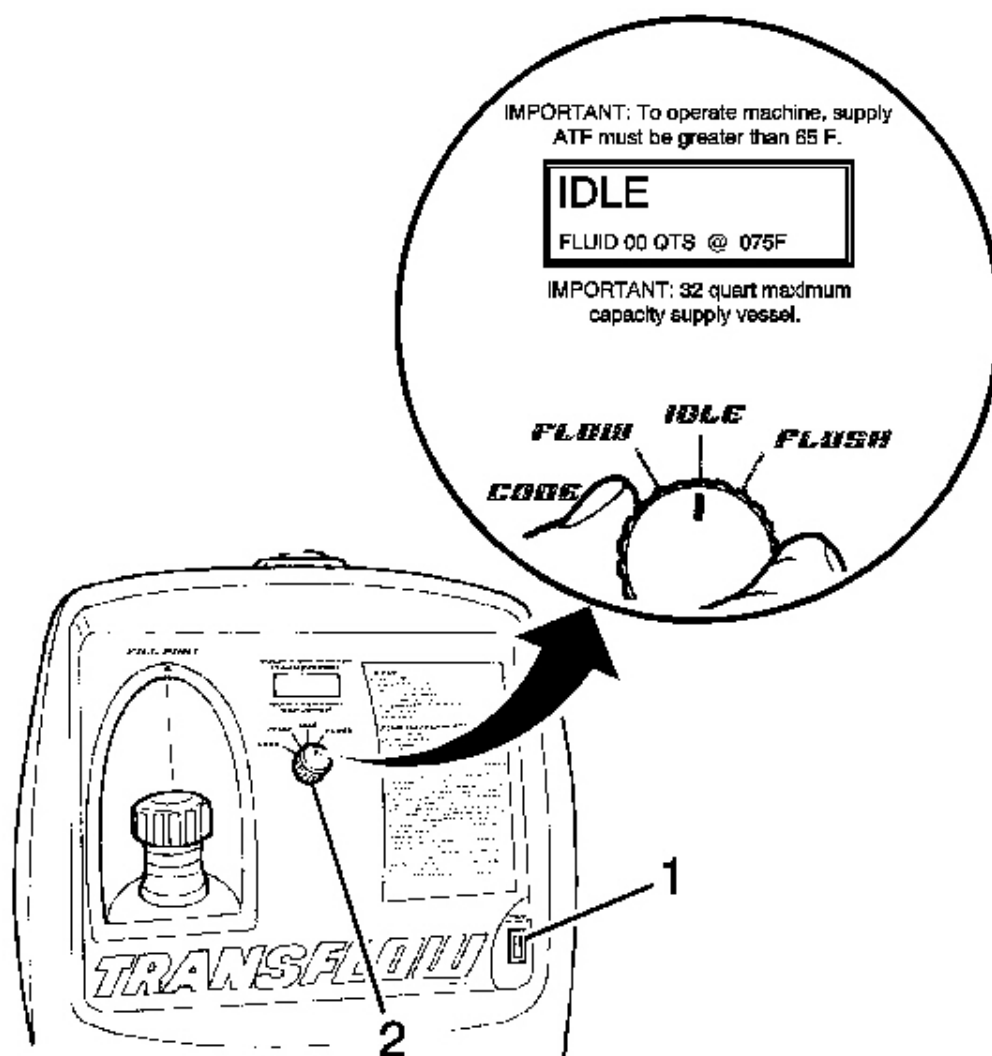


Fig. 7: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.

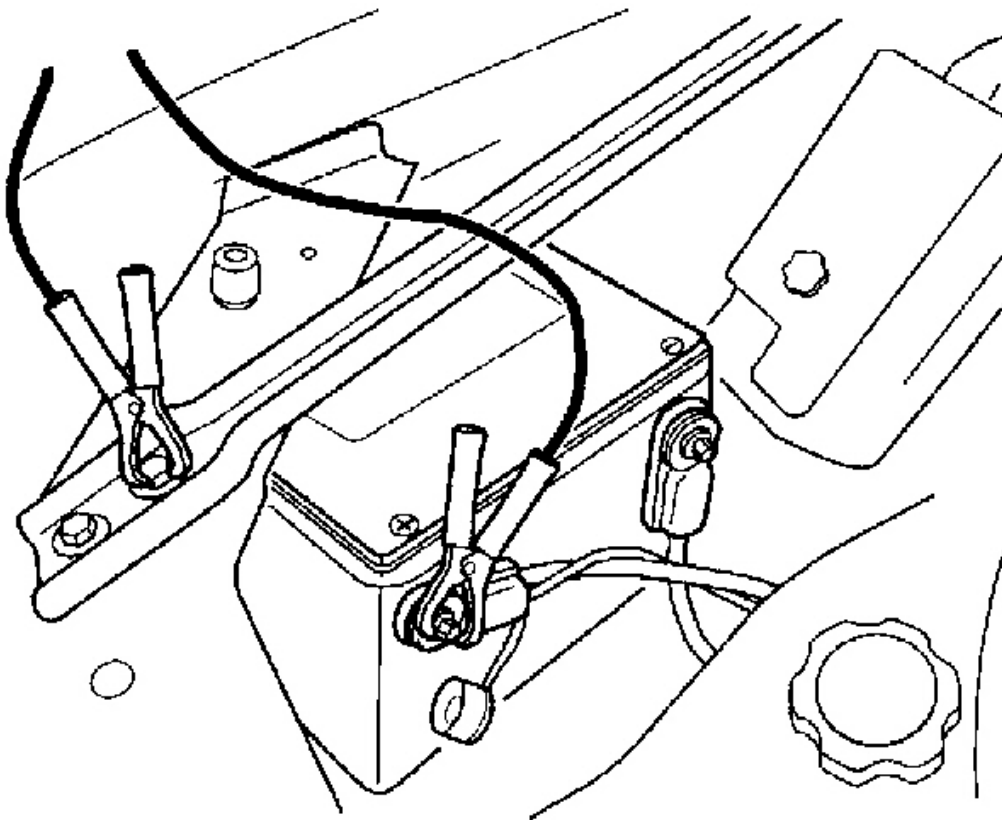


Fig. 8: Connecting To 12V DC Power Source
Courtesy of GENERAL MOTORS CORP.

3. Connect **J 45096**: flush and flow test 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.

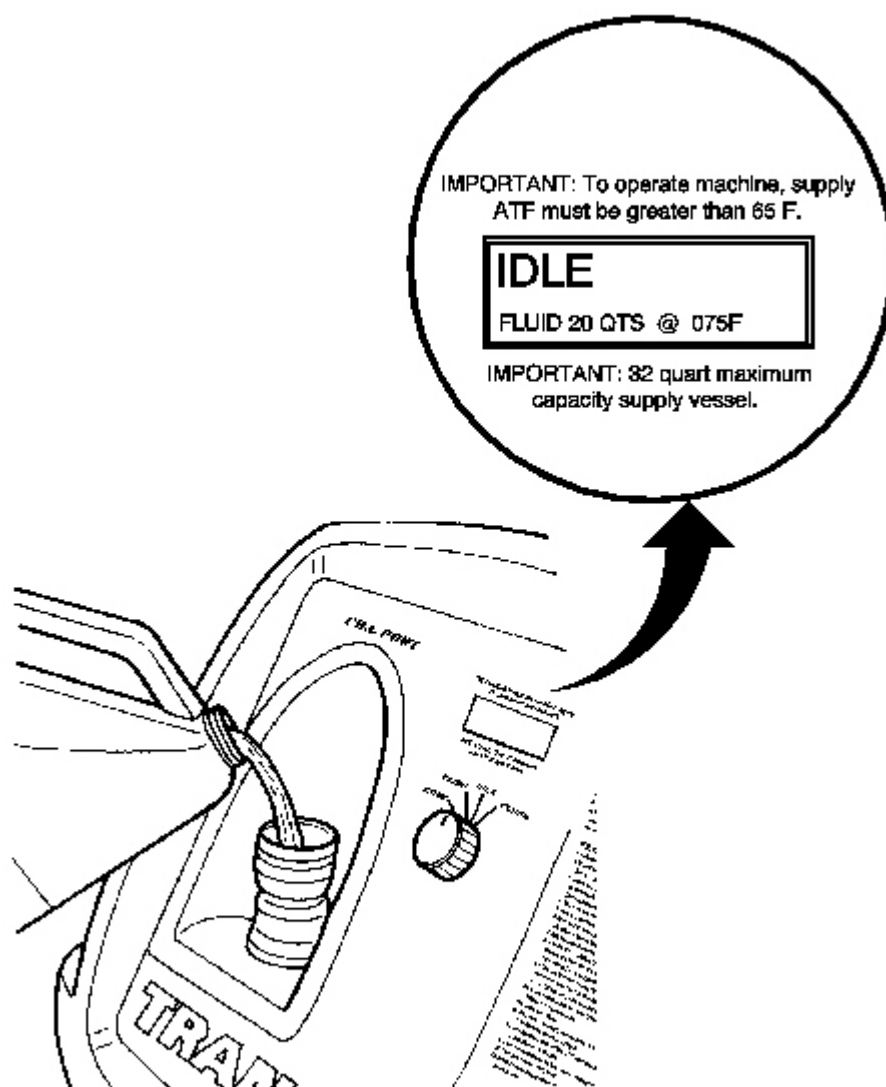


Fig. 9: Filling Supply Tank With Transmission Fluid
Courtesy of GENERAL MOTORS CORP.

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.

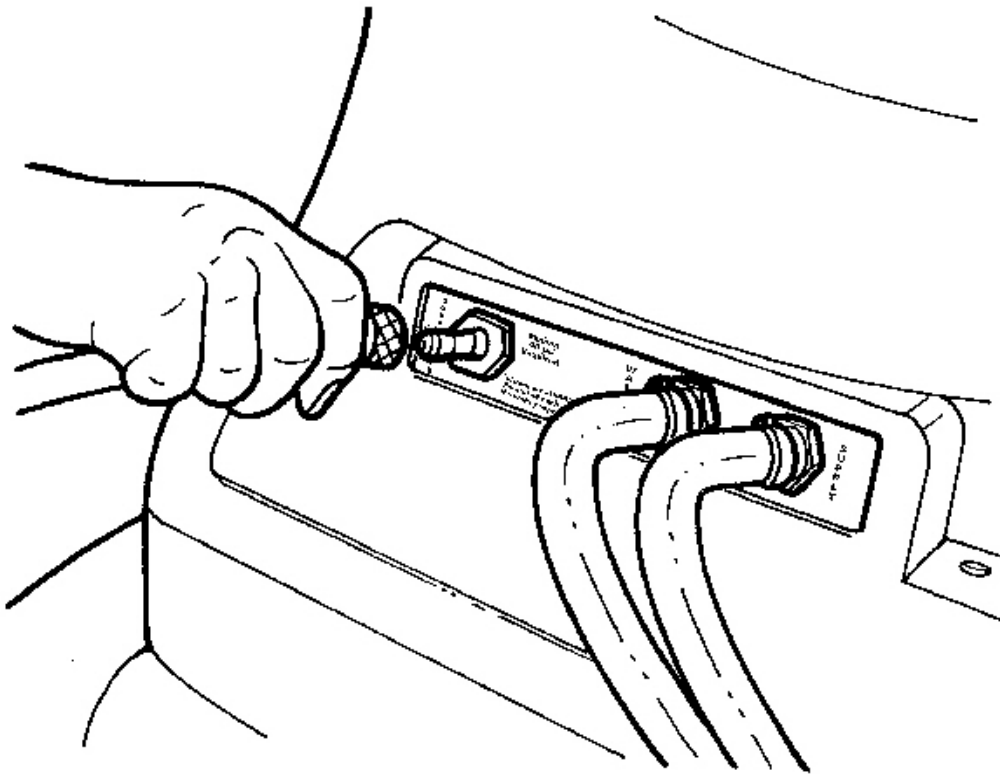


Fig. 10: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

DETERMINE MINIMUM FLOW RATE

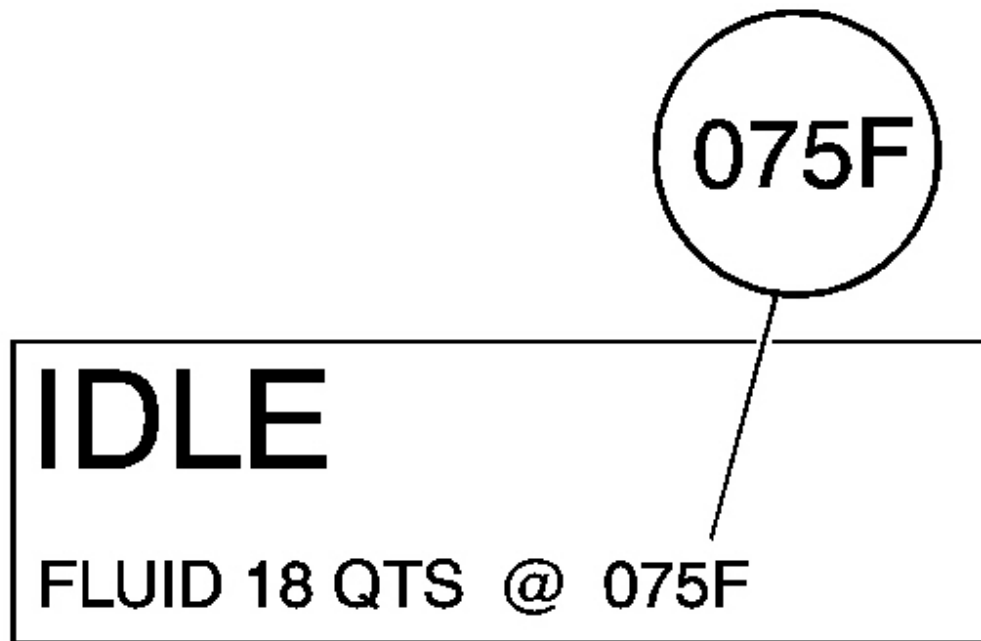


Fig. 11: Identifying Machine Display Of Automatic Transmission Fluid Temperature
Courtesy of GENERAL MOTORS CORP.

1. From the machine display, identify the temperature of the automatic transmission fluid that is stored in the supply vessel of **J 45096**: flush and flow test tool.

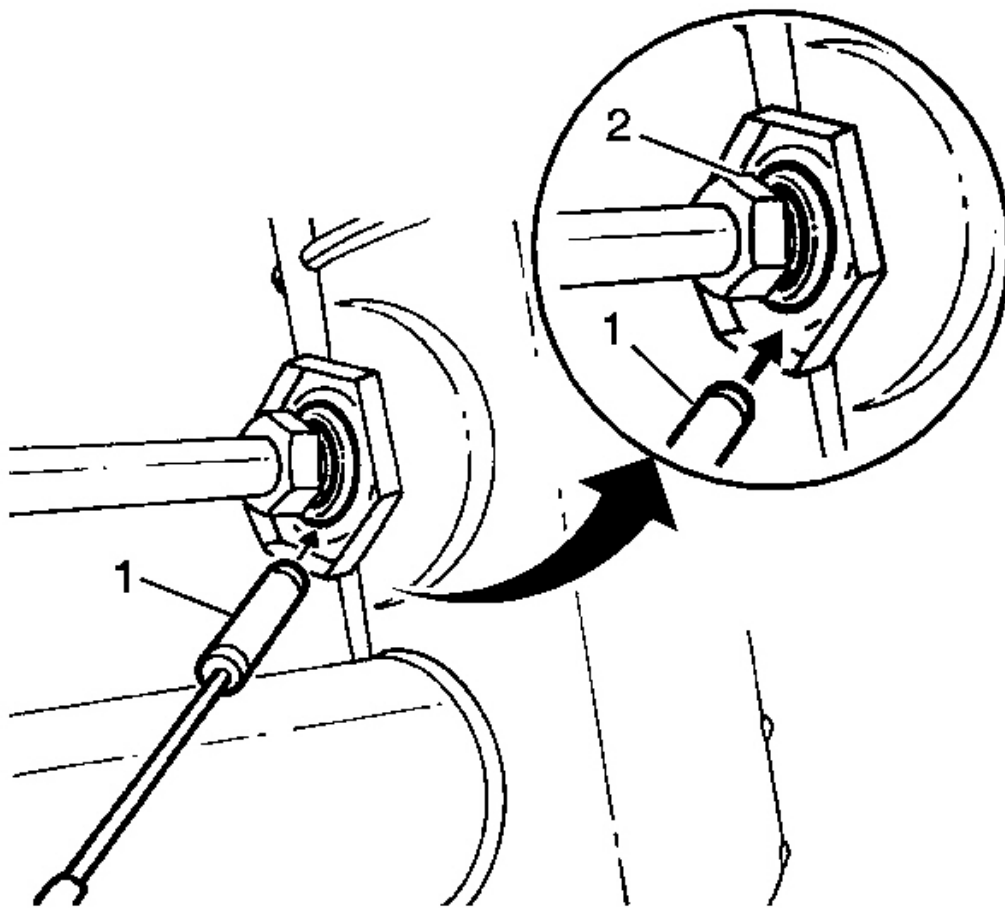


Fig. 12: Identifying Transmission Oil Cooler Metal Composition
Courtesy of GENERAL MOTORS CORP.

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

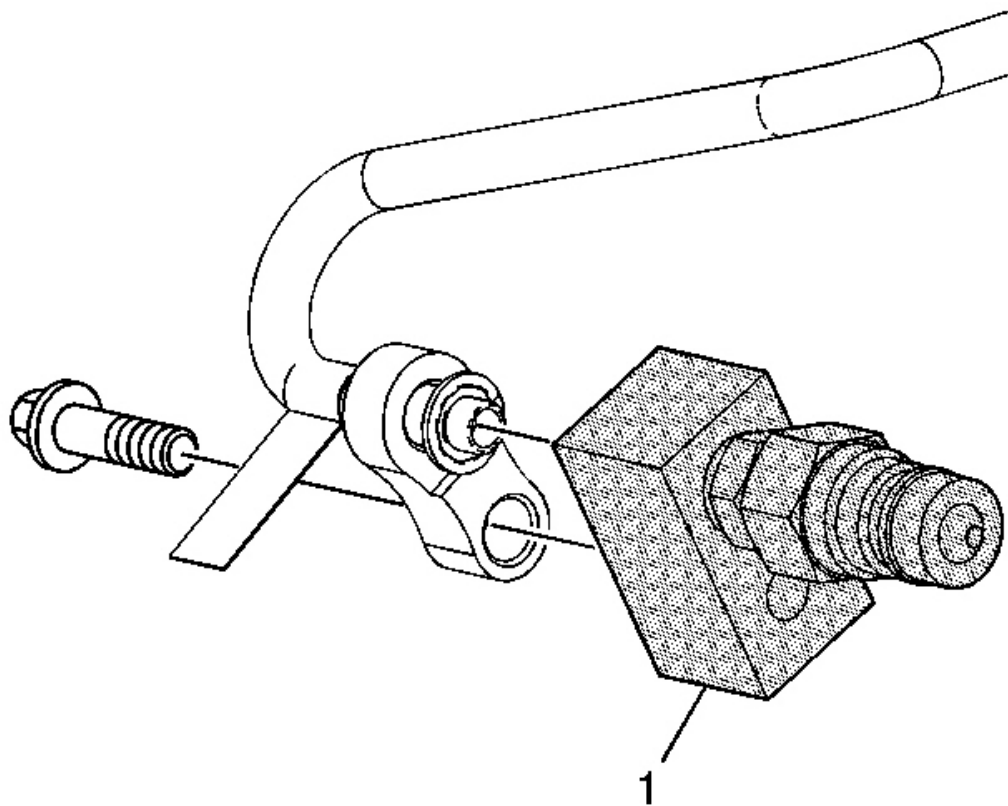


Fig. 13: Identifying Cooler Flush Adapter
Courtesy of GENERAL MOTORS CORP.

1. Connect the **J 45096-50**: cooler flush adapter (1) to the vehicle transmission oil cooler supply and return lines at the transmission.

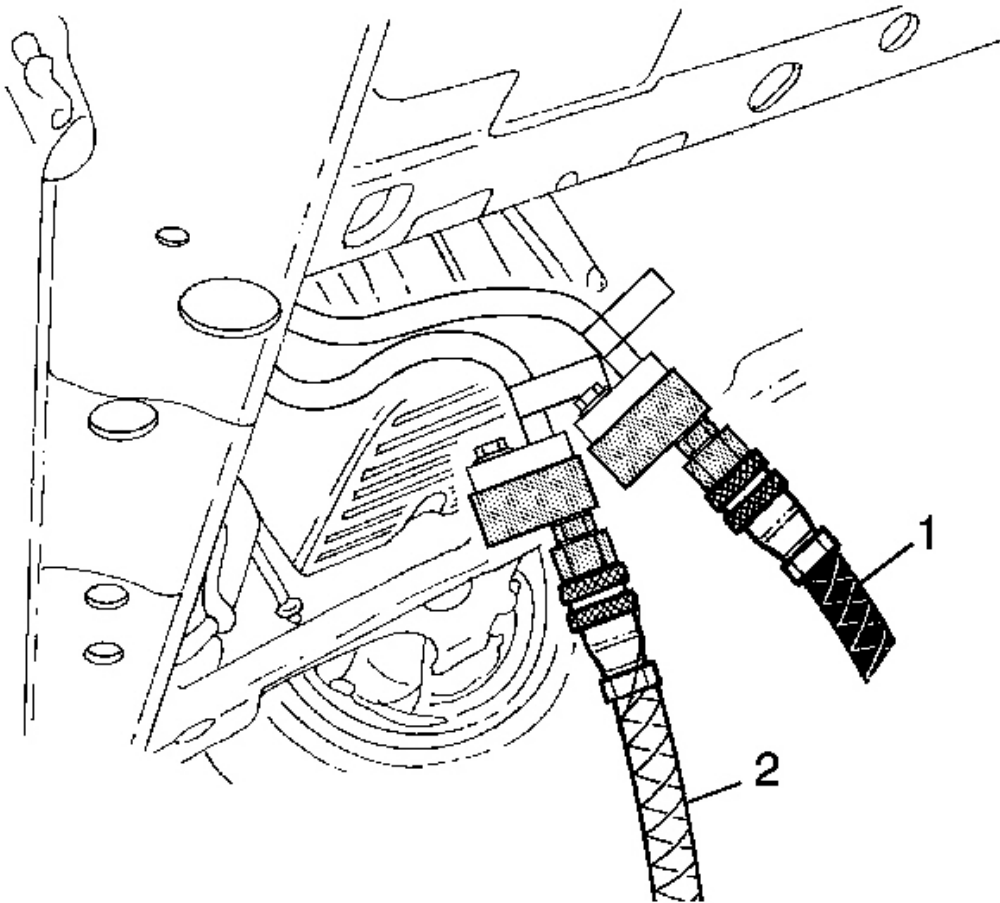


Fig. 14: View Of Black Supply Hose And Clear Waste Hose
Courtesy of GENERAL MOTORS CORP.

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.

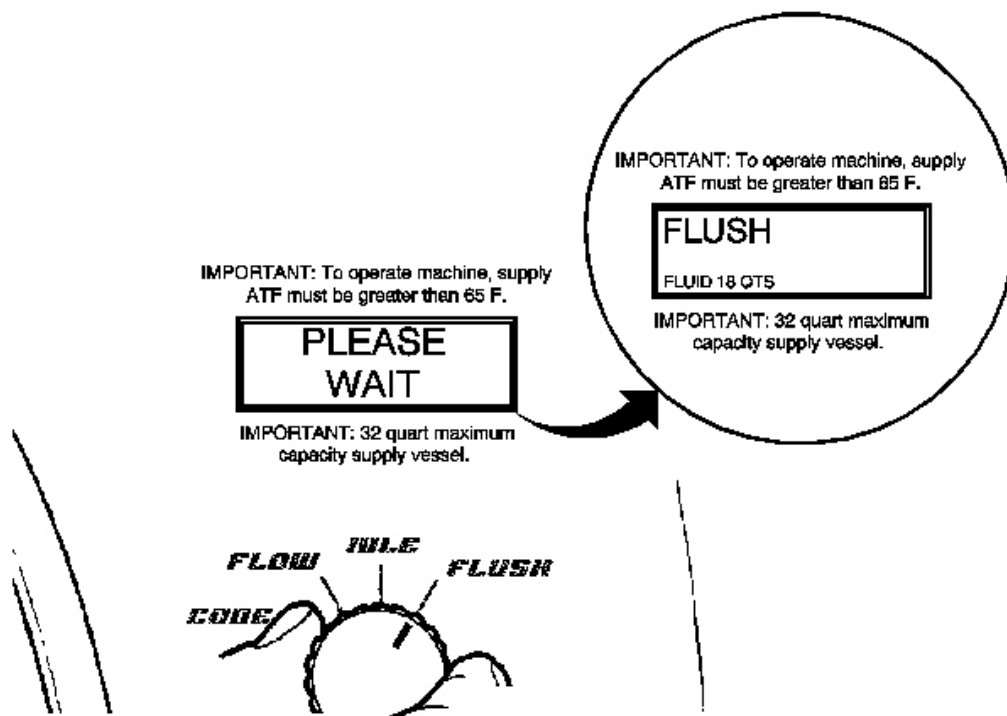


Fig. 15: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

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.

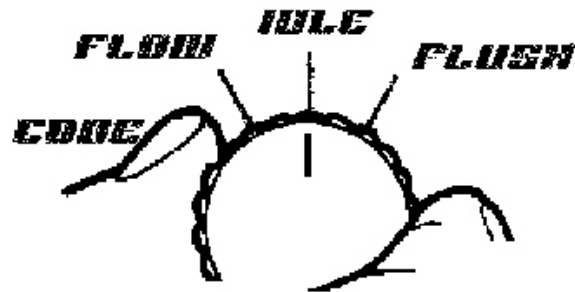


Fig. 16: Setting Main Function Switch To IDLE Position
Courtesy of GENERAL MOTORS CORP.

4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

FORWARD FLUSH

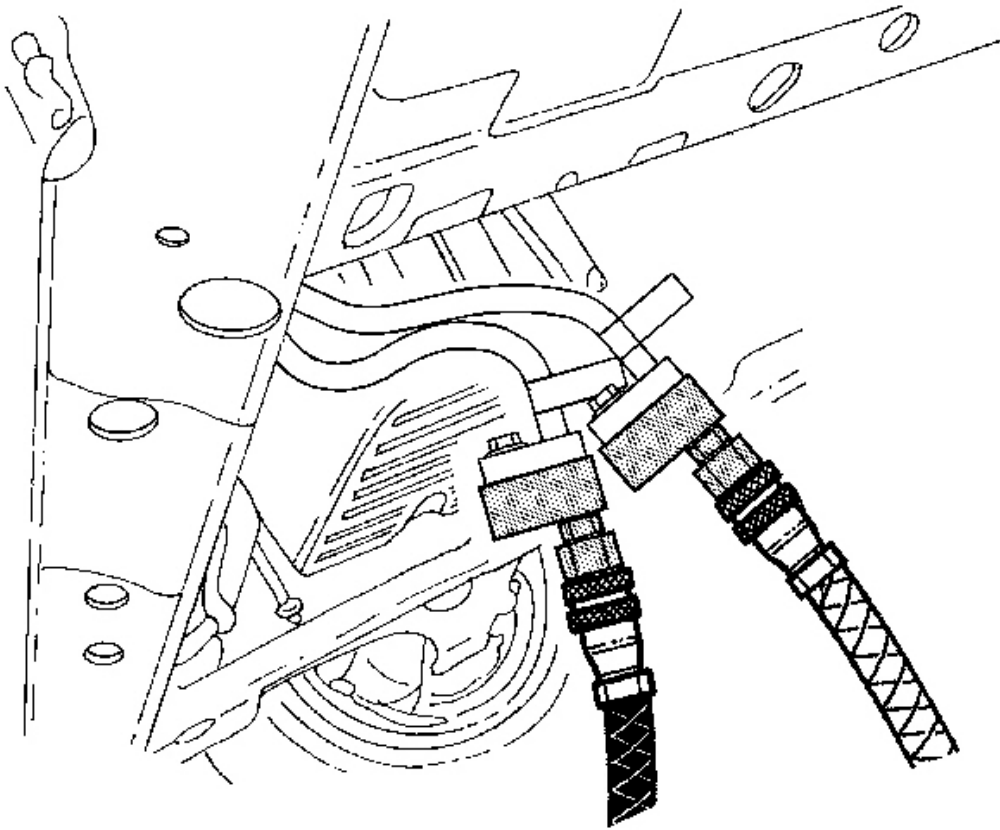


Fig. 17: Identifying Supply And Waste Hoses
Courtesy of GENERAL MOTORS CORP.

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.

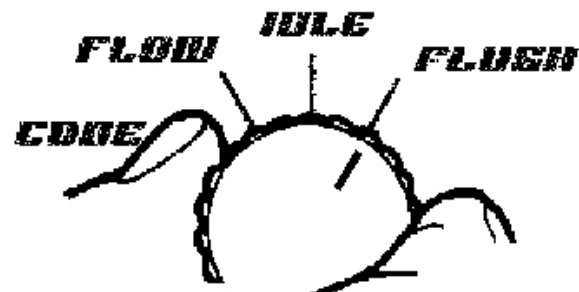


Fig. 18: Setting Main Function Switch To FLUSH Position
Courtesy of GENERAL MOTORS CORP.

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

FLOW TEST

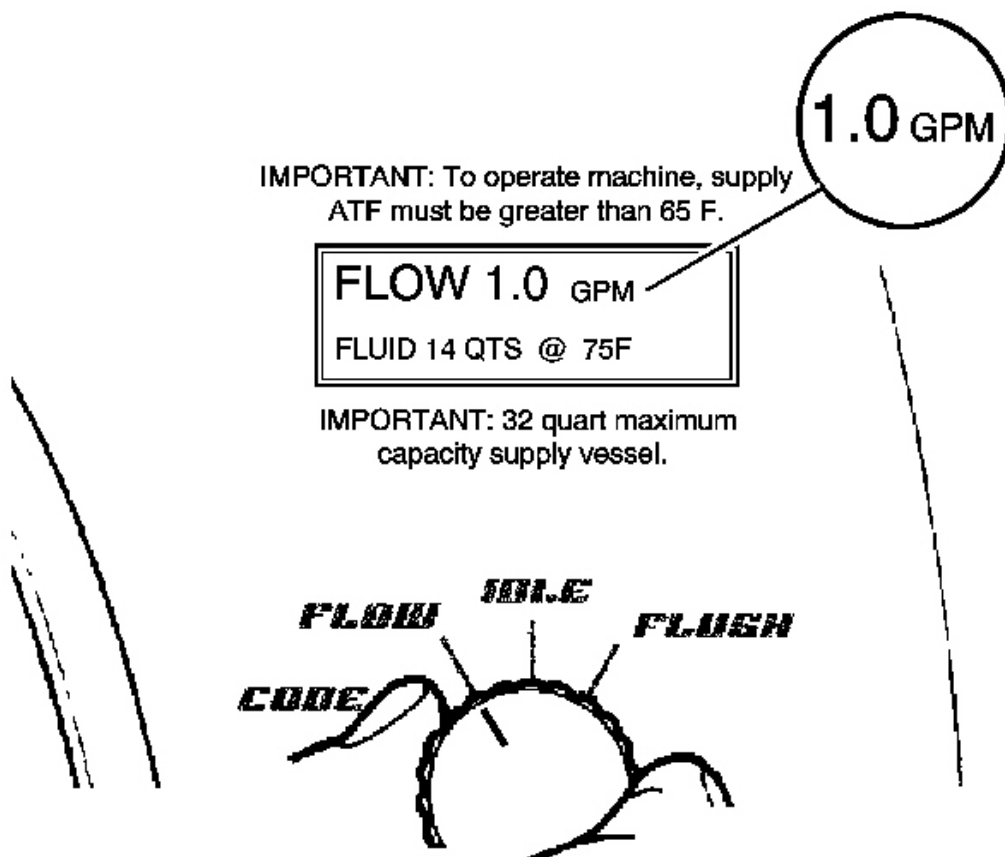


Fig. 19: Setting Main Function Switch To FLOW Position
Courtesy of GENERAL MOTORS CORP.

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. 20: 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

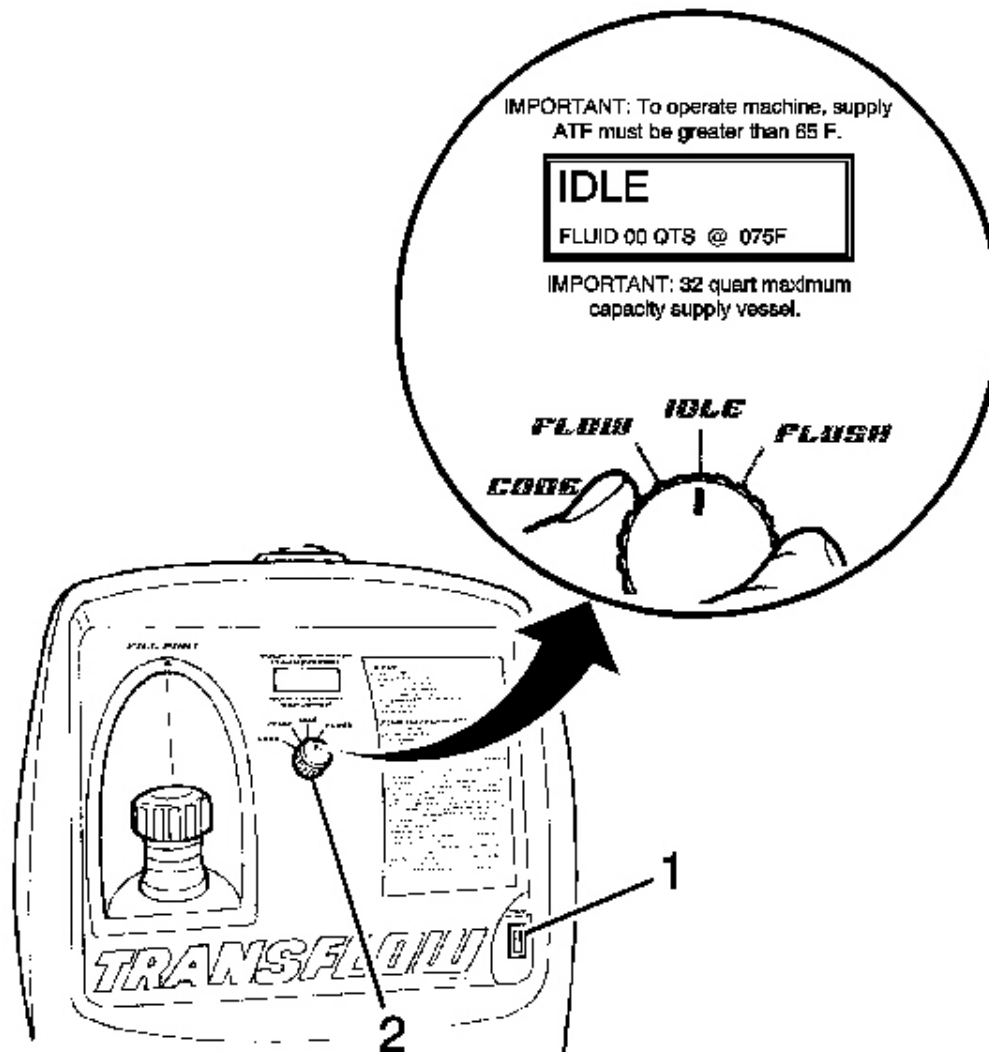


Fig. 21: View Of Main Power Switch & Main Function Switch
Courtesy of GENERAL MOTORS CORP.

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.

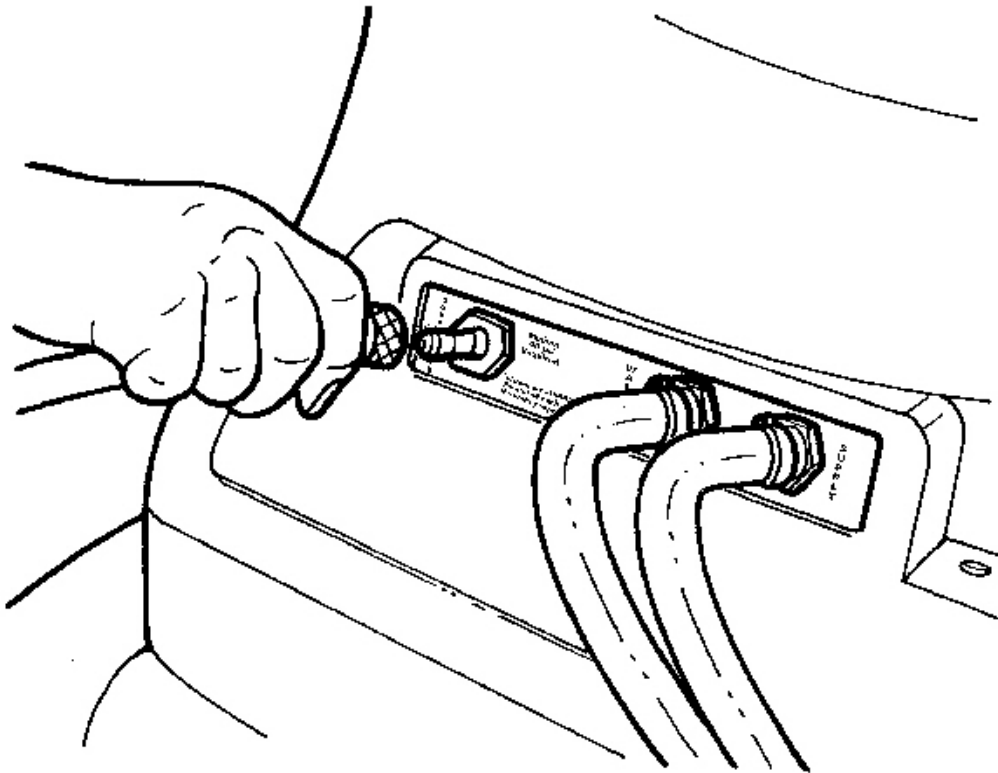


Fig. 22: Applying Shop Air Supply Hose To Quick-Disconnect
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the air supply hose from **J 45096**: flush and flow test 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
Front Differential Drive Pinion Gear Assembly (23)	• Inspect for proper Taper Roller Bearing Pre-load • Inspect for loose or worn transfer Driven Gear
Differential Assembly (486)	• Inspect for proper Taper Roller Bearing Pre-load • Inspect for worn or damaged Side Gear Thrust Washer (492) or Pinion Gear Thrust Washer (488) • Inspect for loose or worn Side Gear Axle Splines
Input Carrier Assembly (470)	• 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 Carrier Assembly (474)	• 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
Reaction Carrier Assembly (467)	• 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
Fluid Pump Assembly (203)	• Inspect for proper fluid level • Inspect for loose or worn Drive Link Assembly (218) • Inspect for worn Driven Sprocket Thrust Washer (214) or Drive Sprocket Thrust Washers (219, 220) • Inspect for leaking Transfer Drive Gear Support Seal (213), Pump Fluid Outlet Seal Assembly (57) or Filter Seal (202) • Inspect for worn or damaged Fluid Pump Shaft Splines
3-5-Reverse Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for loose or worn Clutch Plate Splines (423-425) • Inspect for loose or worn Clutch Spring Retainer (427) • Inspect for loose Speed Sensor Reluctor Wheel (416) or Retainer (415)
	• Inspect for inadequate Clutch Plate Clearance

4-5-6 Clutch Assembly	• Inspect for loose or worn Clutch Plate Splines (449, 440) • Inspect for loose or worn Clutch Spring Retainer (442) • 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 loose or worn Clutch Plate Splines (456-458) • Inspect for loose or worn Clutch Spring Retainer (459)
Low and Reverse Clutch Assembly (OWC) (455)	• Inspect for loose or worn Splines (455) • Inspect for loose or worn Retainer (454)
Low and Reverse Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for loose or worn Clutch Plate Splines (449-452) • Inspect for loose or worn Clutch Spring Retainer (410)
2-6 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for loose or worn Clutch Plate Splines (445-447) • Inspect for loose or worn Clutch Spring Retainer (407)
Case Assembly (51)	• Inspect for loose or broken Transmission Mount Bolts • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for loose or broken Fluid Trough Bolts (56)

AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (27)	Inspect for damage.
Case Assembly (21)	• 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 (58) • Inspect for damaged or worn Axle Seal (61) or Axle Seal Slinger on the axle shafts • Inspect for loose Pressure Test Plug (62) and Fluid Level Plug (63)
Torque Converter Housing Assembly (221)	• Inspect for damaged Torque Converter Housing Assembly (25) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Seal (22) • Inspect for damaged or worn Torque Converter Fluid Seal (225)

	• Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for damaged or worn Axle Seal (226) or Axle Seal Slingers on the axle shafts
Case Cover assembly (34)	• Inspect for porosity or damage on the sealing surface • Inspect for damaged Case Cover Gasket (33) • Inspect for loose Case Cover Assembly Bolts (35) • Inspect for loose Input Speed Sensor (ISS) Bolt (401) • Inspect for damaged Input Speed Sensor (ISS) Seal (402) • Inspect for loose, damaged or leaking Case Cover Assembly bore plugs
Valve Body Cover Assembly (1)	• Inspect for damaged or warped Valve Body Cover Assembly (1) • Inspect for damaged Valve Body Cover Gasket (5) • Inspect for loose Valve Body Cover Bolts (7) and Valve Body Cover Studs (6) • Inspect for damaged or improperly installed Wire Connector Hole Seal (10) • Inspect for damaged or worn Fluid Level Indicator Seal • Inspect for plugged vent holes in the Fluid Level Indicator (2)

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
Front Differential Drive Pinion (w/Transfer Gear) Gear Assembly	• Inspect for broken or stripped Park Gear splines

(481)	Inspect for broken or worn Park Gear
Front Differential Carrier Assembly (486)	Inspect for damaged, broken or loose Front Differential Ring Gear
Output Carrier Transfer Drive Gear Hub Assembly (477)	- Inspect for worn, stripped or broken splines - Inspect for disengaged hub to Transfer Drive Gear
Reaction Carrier Assembly (467)	- Inspect for worn, stripped or broken splines - Inspect for disengaged to the Output Sun Gear (475)
Case Assembly (507)	- Inspect for broken or damaged Case - Inspect for loose or stripped Park Pawl Actuator Bracket Bolts (500) - Inspect for broken or bent Park Pawl Actuator Bracket (501) - Inspect for broken or missing Park Pawl Actuator Guide Pin (505) or Manual Shaft Pin (510) - Inspect for broken, loose or misaligned Park Pawl Guide (506) - Inspect for binding or broken Park Pawl (503) or Actuator Assembly (509)
Manual Shift Detent Lever Assembly (511)	Inspect for broken or disengaged Manual Valve Link Pin

HARSH GARAGE SHIFT

Checks	Causes
Input Carrier Assembly (470)	Inspect for worn or stripped ring gear splines
Case Assembly (51)	- Check the engine for diagnostic codes. If the engine controller signals the transmission that engine torque is inaccurate, the transmission will command high line pressure. - Check line pressure at idle is below 800 kPa. - Inspect for stuck valves in the lower valve body, particularly the boost valves. - Inspect for damaged or fatigued 1-2-3-4 clutch wave plate (458) and low and reverse clutch wave plate (450). - Inspect for stripped or worn splines on 1-2-3-4 clutch plate (456). - Inspect for improperly positioned or plugged low reverse piston (408) air bleed. - Inspect for correct fluid level.
Low and Reverse Clutch Assembly (OWC) (455)	Inspect for stripped or sheared internal and external splines on the low and reverse clutch assembly (455).

NO DRIVE IN ALL RANGES

Checks	Causes
Case Assembly (51)	• Inspect for cracked or broken Case (51) • Inspect for stripped or sheared splines • Inspect for missing Lube Orifice Plug • Inspect for binding Manual Shift Detent Lever Assembly (511) • Inspect for missing Manual Shift Shaft Pin (510) • Inspect for interference or binding Park Pawl Actuator Assembly (509) • Inspect for disengaged or broken 1-2-3-4 Clutch Piston Spring Retainer (459)
Torque Converter	• Inspect for stripped or sheared splines on Turbine Shaft • Inspect for missing bolts from Torque Converter to Flywheel
35R/456 Housing Assembly	• Inspect for damaged or broken Input Shaft Thrust Bearing Assembly (32) • Inspect for stripped, sheared or loose splines on the Input Shaft to the 3-5 Reverse/4-5-6 Clutch Housing (422)
Oil Pump Assembly	• Inspect for fluid leaks / improper fluid level • Inspect for disengaged, worn, binding or failed Drive Sprocket (216), Driven Sprocket (215) or Drive Link (217) • Inspect for leaking Fluid Outlet Seal Assembly (57) • Inspect for damaged or worn Drive (219, 220) and Driven Sprocket Thrust Washers (214) • Inspect for loose or missing Oil Pump Bolts (204) • Inspect for stripped or sheared splines on the Oil Pump Shaft or Driven Sprocket (215) • Inspect for damaged, clogged or improperly installed Oil Filter Assembly (201) • Inspect for damaged or leaking Oil Filter Neck Seal (202)
Low & Reverse Clutch Assembly (455)	Inspect for stripped or sheared splines to the Reaction Carrier (467)
Input Carrier Assembly (470)	• Inspect for stripped or sheared splines to ring gear • Inspect for improperly installed carrier pinion gear pins

NO FIRST AND REVERSE GEARS

Checks	Causes
Low and Reverse Clutch Assembly	• Inspect for disengaged or broken low and reverse clutch

(455)	retainer (454). Inspect for stripped or sheared splines on low and reverse clutch (455).
Low and Reverse Clutch	- Inspect for stripped or sheared splines on low and reverse clutch plates (449-453). - Inspect for damaged, deformed or improper surface finish on the low and reverse clutch plates (449-453).
Case Cover Assembly (403)	- Inspect for disengaged or broken low and reverse clutch piston spring retainer (410). - Inspect for worn, damaged or debonding low and reverse clutch piston seals (408). - Inspect for broken or deformed low and reverse clutch piston (408). - Inspect for improperly position or too large bleed hole in low and reverse piston (408). - Inspect for porosity or improper finish on the case cover. - Inspect for broken or fatigued low and reverse clutch piston return spring (409).

NO FIRST, SECOND, THIRD, AND FOURTH GEAR

Checks	Causes
1-2-3-4 Clutch Assembly	- Inspect for damaged or worn 1-2-3-4 clutch plates (456-458). - Inspect for damaged or broken 1-2-3-4 clutch piston (461) and piston seals damaged, worn or delaminating. - Inspect for broken or binding 1-2-3-4 clutch piston return spring (460). - Inspect for broken or disengaged 1-2-3-4 clutch piston return spring retainer (459). - Inspect for broken or fatigued 1-2-3-4 clutch wave plate (458).
Output Sun Gear Assembly (457)	Inspect for stripped or sheared splines on the output sun gear shell.
Reaction Carrier Assembly (467)	- Inspect for stripped or sheared splines on the input ring gear. - Inspect for disengaged or broken input ring gear retainer.
Output Carrier Assembly (474)	- Low/reverse clutch assembly (OWC) (455) splines sheared or broken. - Inspect for disengaged or broken reaction ring gear retainer.
Case Assembly (51)	Inspect for worn or damaged case splines or retainer ring grooves.

NO SECOND AND SIXTH GEAR

Checks	Causes
2-6 Clutch Assembly	- Inspect for damaged or worn 2-6 clutch plates (445-447). - Inspect for damaged, worn, broken, improper surface finish or sheared splines on the 2-6 clutch backing plate (448).
Reaction Carrier Assembly (467)	- Inspect for stripped or sheared splines on the input ring gear. - Inspect for disengaged or broken input ring gear retainer.
Case Cover Assembly (403)	- Inspect for damaged or broken 2-6 clutch piston (405) and piston seals damaged, worn or delaminating. - Inspect for broken or binding 2-6 clutch piston return spring (406). - Inspect for broken or disengaged 2-6 clutch piston return spring retainer (407). - Inspect for damaged, worn or improper surface finish in the piston bore (403).
Case Assembly (51)	Inspect for stripped or sheared splines (51).

HARSH OR LATE FIRST, SECOND, THIRD, AND FOURTH SHIFT

Checks	Causes
1-2-3-4 Clutch Assembly	- Inspect for damaged or broken 1-2-3-4 clutch piston (461) and piston seals damaged, worn or leaking. - Inspect for fatigued or binding 1-2-3-4 clutch piston return spring (460). - Inspect for improper surface finish on 1-2-3-4 clutch plates (456-458). - Inspect for broken or fatigued 1-2-3-4 clutch waved plate (458).
Case	Inspect for leaking or damaged 1-2-3-4 clutch fluid passage seal (65).

HARSH FIRST AND REVERSE SHIFT

Checks	Causes
Case Cover Assembly (403)	Inspect for plugged or improperly positioned low and reverse piston (408) air bleed.
Low and Reverse Clutch	- Inspect for improper surface finish on low and reverse clutch plates (449-453). - Inspect for damaged or worn low and reverse clutch plates (452). - Inspect for damaged low and reverse clutch backing plate (453).

	• Inspect for worn splines on backing plate (453). • Inspect for damaged low and reverse clutch piston assembly (408), spring (409), and spring retaining ring (410). • Inspect for fatigued or binding low and reverse clutch piston return spring (409). • Inspect for broken low and reverse clutch wave plate (449).
Lower Valve Body	Inspect for stuck 4-5-6 clutch boost valve.

NO THIRD, FIFTH, AND REVERSE GEAR

Checks	Causes
3-5-Reverse Clutch Assembly	• Inspect for damaged, worn or stripped splines on 3-5-reverse clutch plates (423-426), backing plate (426). • Inspect for sheared or stripped splines on 3-5-rev/4-5-6 housing to turbine shaft (422). • Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5-rev/4-5-6 housing (422). • 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 (422). • Inspect for failure of the Input shaft thrust bearing (32). • Inspect for disengaged or broken 3-5-reverse clutch backing plate retainer (427). • Inspect for disengaged or broken 3-5-reverse backing plate (426). • Inspect for damaged, worn or leaking 3-5-reverse clutch piston seals (419-421). • Inspect for damaged or broken 3-5-rev/4-5-6 clutch housing (422). • Inspect for warped, damaged, improper surface finish or debonding 3-5-reverse clutch piston (417). • Inspect for broken or fatigued 3-5-reverse clutch spring (418). • Inspect for disengaged or broken speed sensor reluctor retainer (415). • Inspect for broken speed sensor reluctor wheel (416). • Inspect for seized input shaft thrust bearing (32).
Reaction Carrier (467)	• Inspect for broken or disengaged input internal gear retainer. • Inspect for stripped or sheared splines on the input internal gear.

Output Carrier (474)	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 (446, 447) and Backing Plate (448) • Inspect for fatigued 2-6 Clutch Piston Cushion Spring (445)
Case Cover Assembly (403)	• Inspect for damaged or broken 2-6 Clutch Piston (405) and piston seals damaged, worn or delaminating • Inspect for fatigued 2-6 Clutch Piston Return Spring (406)

NO FOURTH, FIFTH, AND SIXTH GEAR

Checks	Causes
4-5-6 Clutch Assembly	• Inspect for damaged or broken 4-5-6 clutch piston (433) and piston seals (430-432). • Inspect for broken or disengaged 4-5-6 backing plate retainer (442). • Inspect for damaged or broken 4-5-6 clutch dam piston (435) and piston seals damaged, worn or delaminating. • Inspect for broken or disengaged 4-5-6 clutch dam retainer (436). • Inspect for sheared or stripped splines on the reaction carrier hub (438). • Inspect for sheared or stripped splines on 3-5-rev/4-5-6 housing to turbine shaft (422). • 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 (422). • Inspect for failure of the input shaft thrust bearing (32). • Inspect for damaged, stripped or sheared splines on 4-5-6 clutch plates (439-441). • Inspect for broken or fatigued 4-5-6 clutch piston return spring (434).

HARSH OR LATE THIRD, FIFTH, AND REVERSE SHIFT

Checks	Causes
3-5-Reverse Clutch Assembly	- Inspect for improper surface finish on 3-5-Reverse Clutch Plates (423-426), Backing Plate (426) - Inspect for plugged or restricted oil passages and air bleed of the 3-5-Rev/4-5-6 Housing (422) - Inspect for damaged, worn or leaking 3-5-Reverse Clutch Piston Seals (419-421) - Inspect for warped 3-5-Rev/4-5-6 Clutch Housing (422) - Inspect for fatigued 3-5-Reverse Clutch Waved Plate (423)

HARSH FOURTH, FIFTH, AND SIXTH SHIFT

Checks	Causes
4-5-6 Clutch Assembly	- Inspect for leaking 4-5-6 clutch piston (433) and piston seals (430-432). - Inspect for plugged or restricted 4-5-6 piston dam air bleed. - Inspect for fatigued 4-5-6 clutch piston spring (434). - Inspect for leaking 4-5-6 clutch dam seals (435). - Inspect for improper surface finish on 4-5-6 clutch plates (439-441). - Inspect for porous, improper surface finish, seal groove damage or plugged or restricted oil passages of the 3-5-rev/4-5-6 housing (422). - Inspect for leaking or damaged 4-5-6 piston dam (435).

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter Assembly (27)	- 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>.
Upper Valve Body Assembly (349)	Inspect for worn, damaged or sticking TCC Regulator Apply (330) and TCC Regulator Apply Shuttle (331) Valves.
Transfer Drive Gear Support Assembly (208)	Inspect for worn or damaged Transfer Drive Gear Support Seal (213).
Torque Converter Housing Assembly (221)	Inspect for leaking or damaged Torque Converter Fluid Seal Assembly (225).

NO TORQUE CONVERTER CLUTCH RELEASE

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Checks	Causes
Torque Converter Assembly (27)	Diagnose Torque Converter Assembly for possible internal damage. Refer to <u>Torque Converter Diagnosis</u> .
Upper Valve Body Assembly (349)	Inspect for worn, damaged or sticking TCC Regulator Apply (330) and TCC Regulator Apply Shuttle (331) Valves.

HARSH TORQUE CONVERTER CLUTCH APPLY, OR INOPERATIVE OR NO ELECTRONICALLY CONTROLLED CAPACITY CLUTCH CONTROL

Checks	Causes
Torque Converter Assembly (27)	- 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>.
Drive Gear Support Assembly (208)	Inspect for leaking Drive Gear Support Seal (213).

NO REVERSE GEAR

Checks	Causes
3-5-Reverse Clutch Assembly	- Inspect for damaged, worn or stripped splines on 3-5-Reverse Clutch Plates (423-426), Backing Plate (426) - Inspect for sheared or stripped splines on 3-5-Rev/4-5-6 Housing to Turbine Shaft (422) - Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5-Rev/4-5-6 Housing (422) - 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 (422) - Inspect for failure of the Input Shaft Thrust Bearing (32) - Inspect for disengaged or broken 3-5-Reverse Clutch Backing Plate Retainer (427) - Inspect for damaged, worn or leaking 3-5-Reverse Clutch Piston Seals (419-421) - Inspect for damaged or broken 3-5-Rev/4-5-6 Clutch Housing (422) - Inspect for warped, damaged, improper surface finish or debonding 3-5-Reverse Clutch Piston (417) - Inspect for broken or fatigued 3-5-Reverse Clutch Spring (418) - Inspect for disengaged or broken Speed Sensor Reluctor

	Retainer (415) - Inspect for broken Speed Sensor Reluctor Wheel (416) - Inspect for seized Input Shaft Thrust Bearing (32)
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FLUID PRESSURE HIGH OR LOW

Checks	Causes
Fluid Pump Assembly (203)	- Inspect for loose fluid pump bolts (204). - Inspect for leaking or damaged fluid pump outlet seals (57) and oil filter seal (202). - Inspect for improperly installed or damaged oil filter (201). - Inspect for sticking line pressure blow off valve.
Front Differential Drive Gear Support Assembly (208)	- Inspect for leaking or damaged drive gear support torque converter seal assembly (206) or fluid passage tube gasket (212). - Inspect for leaking or damaged drive gear support fluid passage tube assembly (209).
Upper Valve Body Assembly (312)	- Inspect for leaking or damaged upper valve body assembly (309) gasket. - Inspect for worn, sticking or damaged pressure regulator valve (337) or pressure regulator valve spring (338).
Lower Valve Body Assembly (313)	Inspect for leaking or damaged lower valve body assembly (313) gasket.
Control Valve (w/Body and TCM) Valve Assembly (15)	- Inspect for leaking or damaged filter plate assembly seals (16). - Verify VBS operation in not stuck high or low.
Filter Assembly	Inspect for damaged, restricted, or mis-installed fluid filter assembly.
Case Assembly (51)	Inspect for missing lube oil circuit orifice or baffle (229).