Automatic Transmission - 6T30/6T40/6T45/6T50 (MH8, MH9)

Specifications

Fastener Tightening Specifications (On Vehicle)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
A/Trans Fluid Pump Bolt to Converter Housing					
First Pass	200	7	M8x33	10 N•m	89 lb in
Final Pass	200	7	M8x33	45°	
A/Trans Fluid Pump Cover Bolt	302	3	M6x18.5	12 N•m	106 lb in
A/Trans Fluid Pump Cover Bolt	320	20	M6x21.5	12 N•m	106 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	4	12	M6x97	12 N•m	106 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	6	3	M5x40.5	7 N•m	62 lb in
Control Valve Body Assembly (Complete) Bolt	400	1	M5x40.5	7 N•m	62 lb in
Control Valve Body to Case Bolt	9	2	M6x53	11 N•m	97 lb in
Control Valve Body to Case Bolt	10	9	M6x60	11 N•m	97 lb in
Control Valve Body Cover Bolt	1	13	M6x30	12 N•m	106 lb in
Drain Plug	64	1	1/8"–27 NPTF	12 N•m	106 lb in
Fluid Level Hole Plug	63	1	1/8"–27 NPTF	12 N•m	106 lb in
Fluid Pressure Test Hole Plug	51	1	1/8"–27 NPTF	12 N•m	106 lb in
Front Differential Carrier Baffle Bolt – Converter Housing	204	2	M6x25	12 N•m	106 lb in
Front Differential Carrier Baffle Bolt – Case	61	2	M6x18.5	12 N•m	106 lb in
Grommet Fasteners	—	2	—	9 N•m	80 lb in
Input Shaft Support Bolt	57	3	M6x50	12 N•m	106 lb in
Input Speed Sensor Bolt	21	1	M6x23	9 N•m	80 lb in
Manual Shift Detent Spring	17	1	M6x16	12 N•m	106 lb in
Oil Cooler Fitting	—	2	—	20 N•m	15 lb ft
Oil Cooler Fitting to Radiator	—	—	—	20 N•m	15 lb ft
Output Speed Sensor Bolt	15	1	M6x18	9 N•m	80 lb in
Torque Converter and Differential Housing Bolt					
First Pass	27	14	M8x30	10 N•m	89 lb in
Final Pass	27	14	M8x30	50°	
Torque Converter to Flywheel Bolt	—	—	—	60 N•m	44 lb ft
Transmission Bolt (1, 2, 4) – 6T30 (1.4L LDD, L2N, L2I)	—	—	—	60 N•m	44 lb ft
Transmission Bolt (2, 3, 4) – 6T30 (1.6L LDE, LFJ and 1.8L LUW, LWE)	—	—	—	60 N•m	44 lb ft
Transmission Bolt (5) – 6T30 (1.6L LDE, LFJ and 1.8L LUW, LWE)	—	—	—	40 N•m	30 lb ft
Transmission Bracket Mount to Mount Through Bolt	—	—	—	80 N•m plus 45–60 degrees	59 lb ft plus 45–60 degrees
Transmission Control Fasteners	—	4	—	9 N•m	80 lb in
Transmission Fluid Cooler Outlet Pipe Nut	—	—	—	22 N•m	17 lb ft

Fastener Tightening Specifications (On Vehicle) (cont'd)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
Transmission Fluid Cooler Pipe Inlet Nut	—	—	—	22 N•m	17 lb ft
Transmission Mount Bolt – Left Side to Body	—	—	—	58 N•m	43 lb ft
Transmission Mount Bolt – Left Side to Transmission	—	—	—	50 N•m plus 60–75 degrees	37 lb ft plus 60–75 degrees
Transmission Mount Bracket to Transmission Bolt – Rear	—	—	—	100 N•m plus 30–45 degrees	74 lb ft plus 30–45 degrees
Transmission Mount to Frame Bolt	—	—	—	100 N•m	74 lb ft
Transmission Mount Nut – Left Side to Body	—	—	—	58 N•m	43 lb ft
Transmission Nut (1) – 6T30 (1.6L LDE, LFJ and 1.8L LUW, LWE)	—	—	—	40 N•m	30 lb ft
Transmission Nut (1) and Bolt (3) – 6T30 (1.4L LDD, L2N, L2I)	—	—	—	40 N•m	30 lb ft
Transmission Range Selector Cable Bracket Bolt	—	—	—	18 N•m	14 lb ft
Transmission Range Selector Lever Nut	—	—	—	30 N•m	22 lb ft
*Reference number refers to the component callout number in Disassembled Views					

Fastener Tightening Specifications (Off Vehicle)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
A/Trans Auxiliary Fluid Pump Outlet Bolt (Hybrid Models)	350	4	—	22 N•m	16 lb ft
A/Trans Auxiliary Fluid Pump Bolt (Hybrid Models)	355	1	—	22 N•m	16 lb ft
A/Trans Auxiliary Fluid Pump (Pump to Motor) Bolt (Hybrid Models)	370	4	—	10–12 N•m	89–106 lb in
A/Trans Fluid Pump Bolt to Converter Housing					
First Pass	200	7 – 6T30, 8 – 6T40/45/50	M8x33	10 N•m	89 lb in
Final Pass	200		M8x33	45°	
A/Trans Fluid Pump Cover Bolt	302	3 – 6T30, 23 – 6T40/45/50	M6x25	12 N•m	106 lb in
A/Trans Fluid Pump Cover Bolt	320	20 – 6T30,	M6x21.5	12 N•m	106 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	4	12	M6x97	10 N•m	89 lb in
Control Solenoid Valve Assembly (w/TCM and Body) to Case Bolt	6	3	M5x40.5	7 N•m	62 lb in
Control Valve Body Assembly (Complete) Bolt	400	1	M5x40.5	7 N•m	62 lb in
Control Valve Body to Case Bolt	9	2	M6x53	11 N•m	97 lb in
Control Valve Body to Case Bolt	10	9	M6x60	11 N•m	97 lb in
Control Valve Body Cover Bolt	1	13	M6x30	12 N•m	106 lb in
Drain Plug	64	1	1/8"–27 NPTF	12 N•m	106 lb in
Fluid Level Hole Plug	63	1	1/8"–27 NPTF	12 N•m	106 lb in
Fluid Pressure Test Hole Plug	51	1	1/8"–27 NPTF	12 N•m	106 lb in

Fastener Tightening Specifications (Off Vehicle) (cont'd)

Application	Ref No.*	Quantity	Size	Specification	
				Metric	English
Front Differential Carrier Baffle Bolt – Converter Housing	204	2	M6x25	12 N•m	106 lb in
Front Differential Carrier Baffle Bolt – Case	61	2	M6x18.5 – 6T30, M6x16 – 6T40/45/50	12 N•m	106 lb in
Input Shaft Support Bolt	57	3	M6x50	12 N•m	106 lb in
Input Speed Sensor Bolt	21	1	M6x23	9 N•m	80 lb in
Manual Shift Detent Spring	17	1	M6x16	12 N•m	106 lb in
Output Speed Sensor Bolt	15	1	M6x18	9 N•m	80 lb in
Torque Converter and Differential Housing Bolt					
First Pass	27	14 – 6T30, 15 – 6T40/45/50	M8x30	10 N•m	89 lb in
Final Pass	27		M8x30	50°	
*Reference number refers to the component callout number in Disassembled Views					

Transmission General Specifications (6T30)

Name	6T30
RPO Codes	MH9
Production Location	Korea/China
Transmission Drive	Front Wheel Drive
Reverse Gear Ratio	2.87
1st Gear Ratio	4.449
2nd Gear Ratio	2.908
3rd Gear Ratio	1.893
4th Gear Ratio	1.446
5th Gear Ratio	1.000
6th Gear Ratio	0.742
Effective Final Drive Gear Ratio	2.84/3.14/3.37/3.72/4.11
Torque Converter Size– Diameter of Torque Converter Turbine	220 mm
Pressure Taps	Line Pressure
Transmission Fluid Type	DEXRON VI®
Transmission Fluid Capacity	7.5 L/8.0 qts Quarts
Transmission Type: 6	Six Forward Gears
Transmission Type: T	Transverse Mount
Transmission Type: 30	Product Series
Position Quadrant	P, R, N, D, * *(Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transmission Net Weight	72 kg (159 lbs)
Maximum Trailer Towing Capacity	N/A
Maximum Gross Vehicle Weight (GVW)	2268 kg (5,000 lbs)

Transmission General Specifications (6T40/45/50)

Name	6T40/6T45/6T50
RPO Codes	MH8, MH7, MHK, MHH, MHC, MHJ, MNH, MHB
Production Location	Korea/China/Mexico/Toledo
Transmission Drive	Front Wheel Drive
Reverse Gear Ratio	2.94
1st Gear Ratio	4.584
2nd Gear Ratio	2.964
3rd Gear Ratio	1.912
4th Gear Ratio	1.446
5th Gear Ratio	1.000
6th Gear Ratio	0.746
Effective Final Drive Gear Ratio	2.64/2.89/3.23/3.53/3.87
Torque Converter Size– Diameter of Torque Converter Turbine	236 mm
Pressure Taps Line	Pressure
Transmission Fluid Type	DEXRON VI®
Transmission Fluid Capacity	8.0 L/8.5 Quarts
Transmission Type: 6	Six Forward Gears
Transmission Type: T	Transverse Mount
Transmission Type: 40/ 45/50	Product Series
Position Quadrant	P, R, N, D, * *(Refer to the applicable owner's manual)
Case Material	Die Cast Aluminum
Transmission Net Weight	81/86 kg (178/190 lbs)
Maximum Trailer Towing Capacity	N/A

Transmission General Specifications (6T40/45/50) (cont'd)

Name	6T40/6T45/6T50
Maximum Gross Vehicle Weight (GVW)	6T40 – 2000 kg (4,409 lbs) 6T45 – 2200 kg (4,850 lbs) 6T50 – 2500 kg (5,511 lbs)

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Automatic Transmission Fluid	DEXRON®VI	88861037	19264717

Fluid Capacity Specifications (6T30)

Application	Specification	
	Metric	English
Valve Body Cover Removal – Approximate Capacity	4.0–5.0 liters	4.2–5.3 quarts
Fluid Change – Drain Plug – Approximate Capacity	4.5–5.5 liters	4.75– 5.8 quarts
Overhaul – Approximate Capacity	7.62 liters	8.05 quarts

Fluid Capacity Specifications (6T40/45/50)

Application	Specification	
	Metric	English
Valve Body Cover Removal – Approximate Capacity	5.0–7.0 liters	5.3–7.4 quarts
Fluid Change – Drain Plug – Approximate Capacity	4.0–6.0 liters	4.2– 6.3 quarts
Overhaul – Approximate Capacity	8.0–8.5 liters	8.5–9.0 quarts

Fluid Pump Selective Specifications

Fluid Pump Body Pocket Depth		Fluid Pump Gear Thickness	
Metric	English	Metric	English
12.617–12.625 mm	0.4967–0.4970 in	12.580–12.588 mm	0.4952–0.4955 in
12.626–12.636 mm	0.4970–0.4974 in	12.589–12.599 mm	0.4956–0.4960 in
12.637–12.645 mm	0.4975–0.4978 in	12.600–12.608 mm	0.4960–0.4963 in

Range Reference

Range	Park	Reverse	Neutral	Drive						
				1st Braking	1st	2nd	3rd	4th	5th	6th
1–2–3–4 Clutch	—	—	—	Applied	Applied	Applied	Applied	Applied	—	—
3–5 Reverse Clutch	—	Applied	—	—	—	—	Applied	—	Applied	—
4–5–6 Clutch	—	—	—	—	—	—	—	Applied	Applied	Applied
2–6 Clutch	—	—	—	—	—	Applied	—	—	—	Applied
Low and Reverse Clutch	Applied*	Applied	Applied*	Applied	—	—	—	—	—	—

Range Reference (cont'd)

Range	Park	Reverse	Neutral	Drive						
				1st Braking	1st	2nd	3rd	4th	5th	6th
Low Clutch Assembly (OWL)	—	—	—	Holding	Holding	—	—	—	—	—
* = Applied with NO load										

Shift Solenoid Valve State and Gear Ratio

Gear	Shift SOL 1	1-2-3-4 CL PC SOL 5 N.L.	2-6 CL PC SOL 4 N.L.	3-5 REV CL PC SOL 2 N.H.	LOW REV 4-5-6 CL PC SOL 3 N.H.	Gear Ratio 6T30	Gear Ratio 6T40/45/50
Park	ON	OFF	OFF	OFF	ON	—	—
Reverse	ON	OFF	OFF	ON	ON	2.87	2.940
Neutral	ON	OFF	OFF	OFF	ON	—	—
1st Braking	ON	ON	OFF	OFF	ON	4.449	4.584
1st	OFF	ON	OFF	OFF	OFF	4.449	4.584
2nd	OFF	ON	ON	OFF	OFF	2.908	2.964
3rd	OFF	ON	OFF	ON	OFF	1.893	1.912
4th	OFF	ON	OFF	OFF	ON	1.446	1.446
5th	OFF	OFF	OFF	ON	ON	1.000	1.000
6th	OFF	OFF	ON	OFF	ON	0.742	0.746
For shift solenoid 1, "ON" = Solenoid Energized (Pressurized) "OFF" = Solenoid De-energized (No Pressure). For pressure control solenoids, "ON" = Pressurized, "OFF" = No Pressure							

Transmission Fluid Pressure Switch Logic

Gear	Transmission Fluid Pressure Switch States			
	Switch 1	*Switch 3	Switch 4	Switch 5
Park	Low	Low	Low	Low
Reverse	Low	Low	Low	Low
Neutral	Low	Low	Low	Low
Drive 1st – Engine Braking	Low	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 = 12V (Switch Open or Pressurized) Low = 0V (Switch Closed or No Pressure) Note: All transmission fluid pressure switches are normally closed (NC) *Transmission fluid pressure 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 (Gen 1)

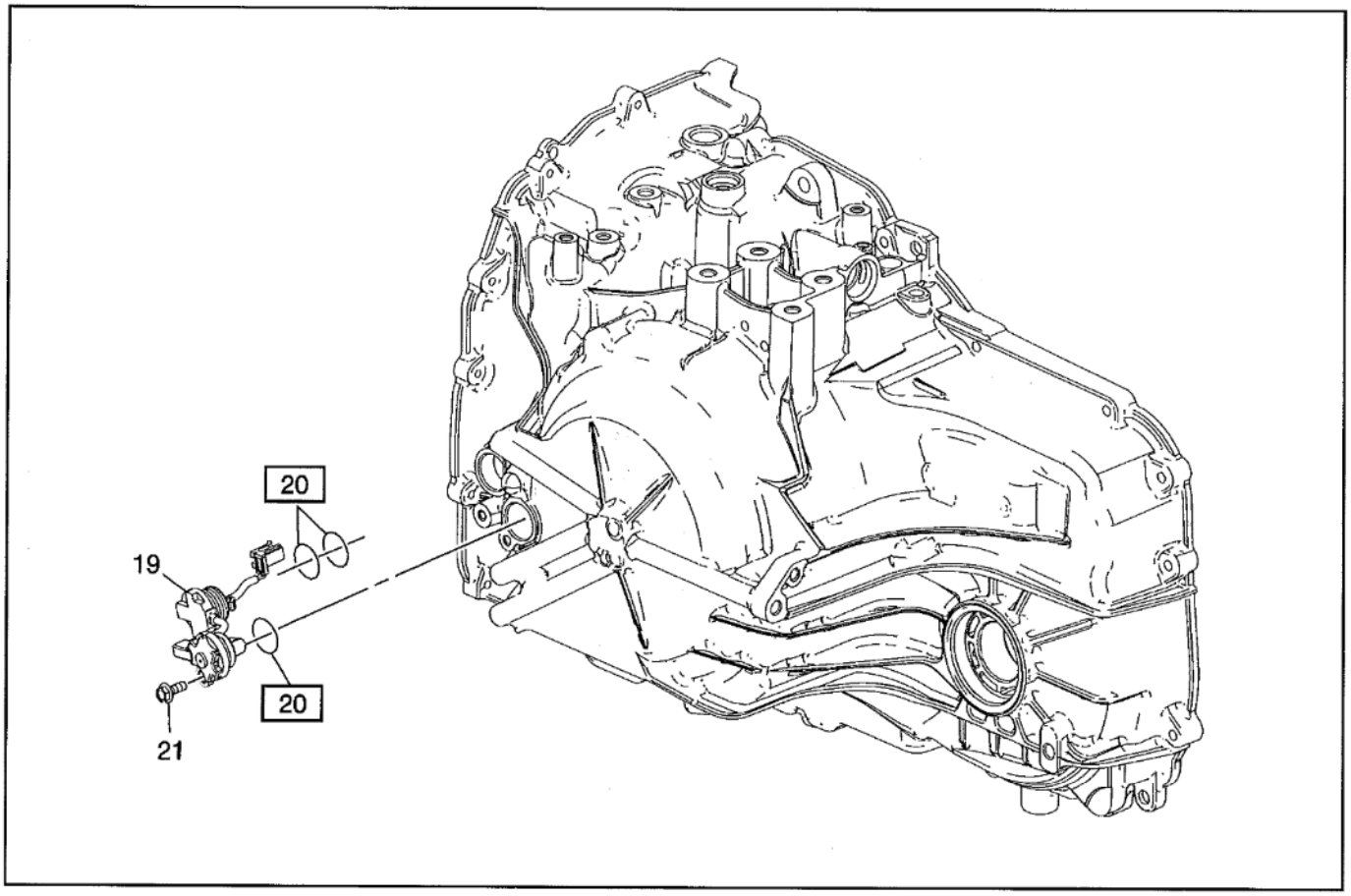
Line PC Solenoid Valve Pressure

Requested Pressure (kPa)	Actual Pressure	
	Metric	English
None	345–550 kPa	50–80 psi
200	690–900 kPa	100–130 psi
400	1100–1310 kPa	160–190 psi
600	1520–1725 kPa	220–250 psi
800	1860–2275 kPa	270–330 psi

Line PC Solenoid Valve Pressure (cont'd)

Requested Pressure (kPa)	Actual Pressure	
	Metric	English
1000	1860–2275 kPa	270–330 psi
1200	1860–2275 kPa	270–330 psi
1400	1860–2275 kPa	270–330 psi
1600	1860–2275 kPa	270–330 psi
1800	1860–2275 kPa	270–330 psi
2000	1860–2275 kPa	270–330 psi

Transmission Parts Kit Specifications
A/Trans Seal Kit (Gen 1& 2) 24251028



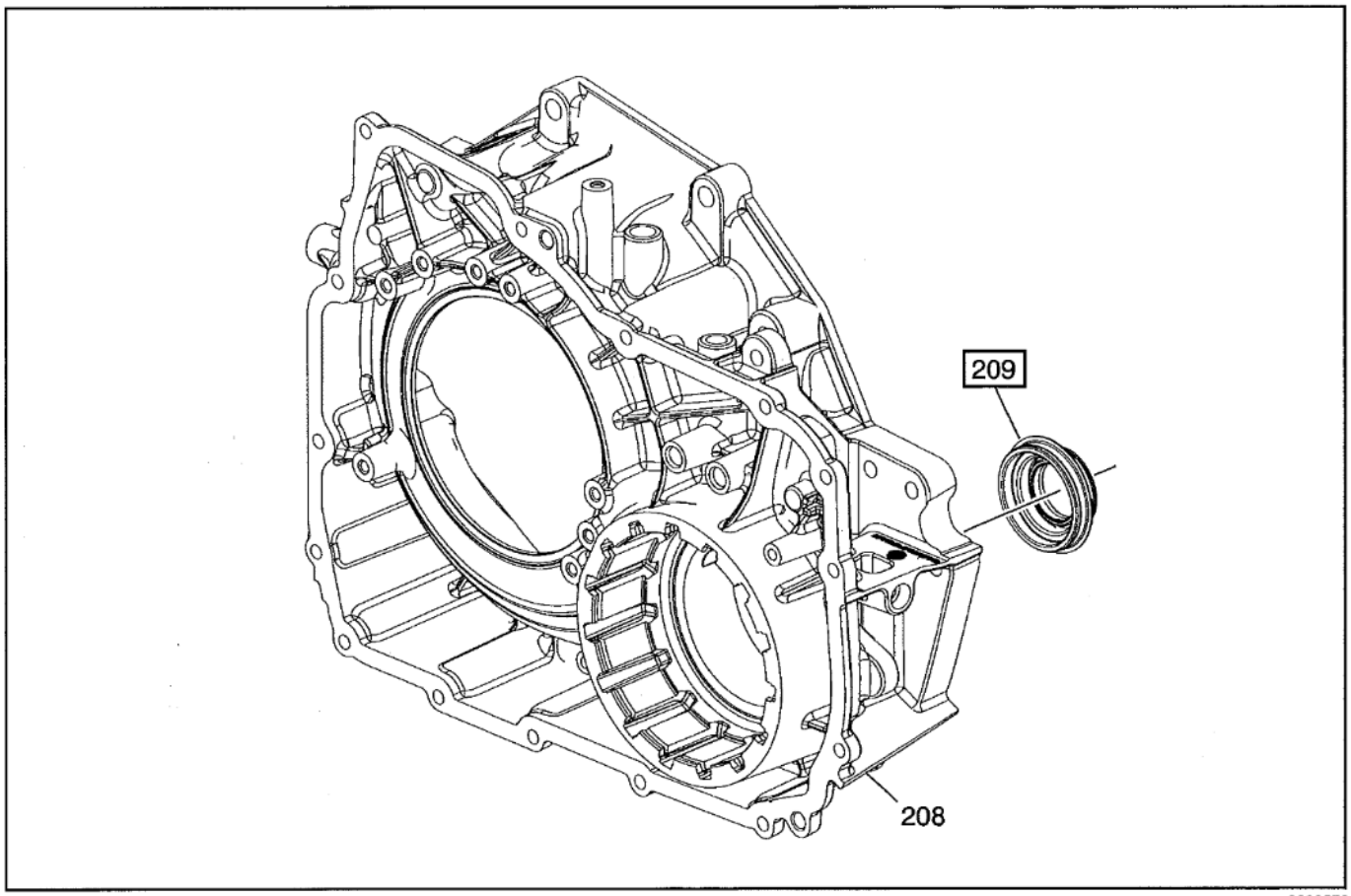
2660570

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

A/Trans Seal Kit (Gen 1& 2) 24251028

Callout	Quantity	Component Name
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal

Front Wheel Seal Kit (Gen 1& 2) 19258415



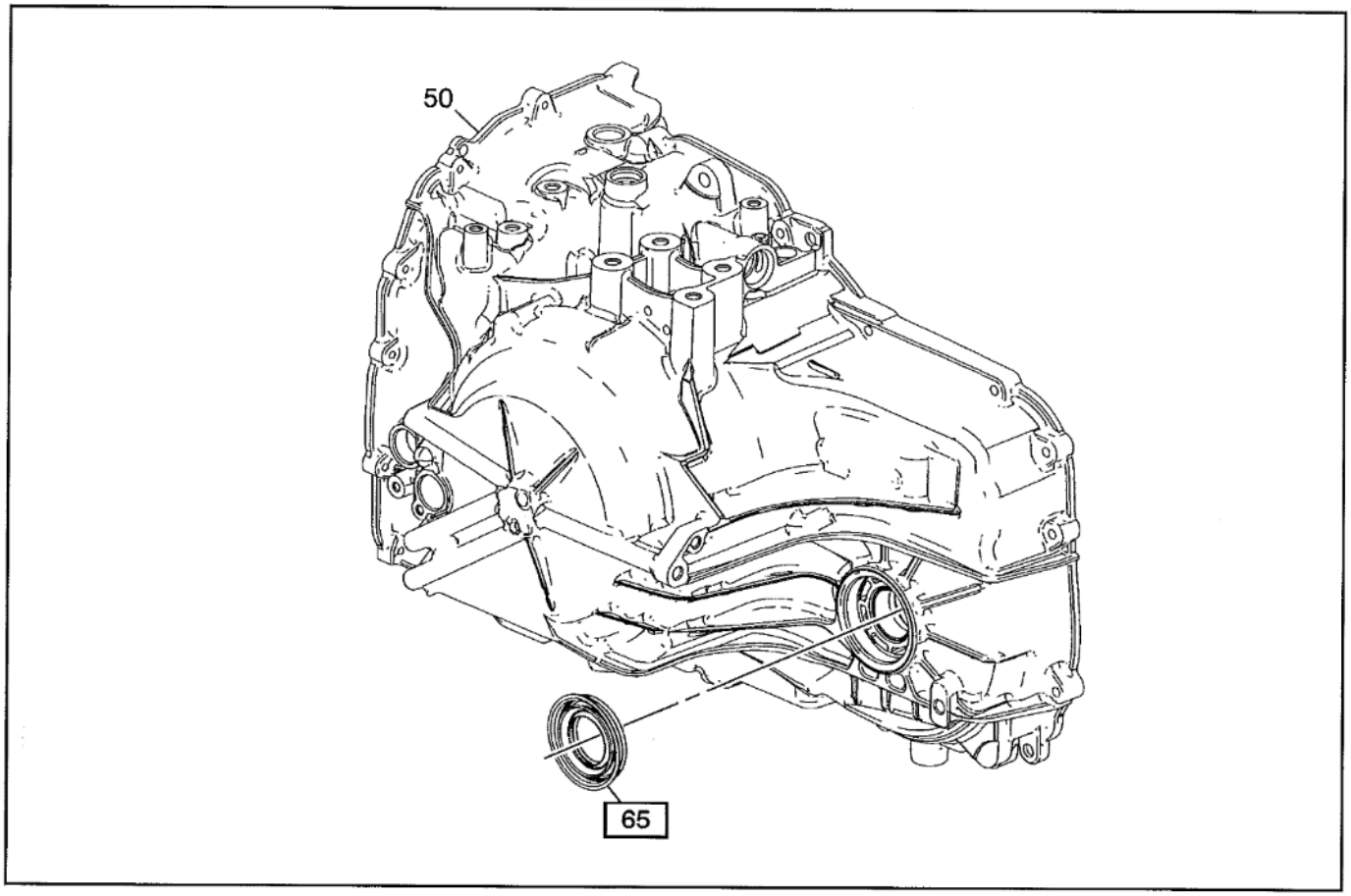
2660572

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Front Wheel Seal Kit (Gen 1& 2) 19258415

Callout	Quantity	Component Name
209	1	Front Wheel Drive Shaft Oil Seal Assembly

Front Wheel Seal Kit (Gen 1& 2) 19258416



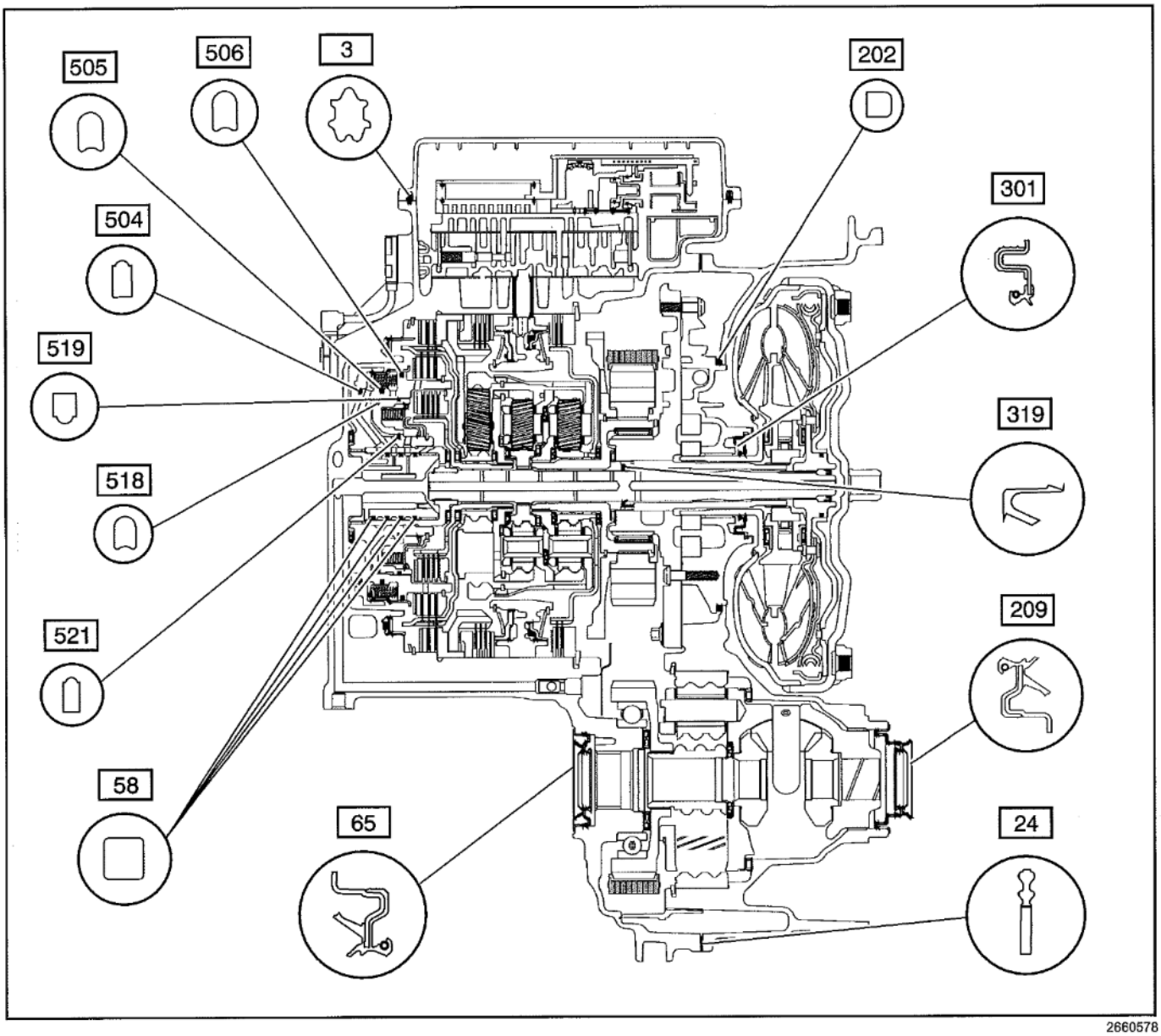
2660582

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Front Wheel Seal Kit (Gen 1& 2) 19258416

Callout	Quantity	Component Name
65	1	Drive Shaft Oil Seal Assembly

A/Trans Seal Kit (Gen 1) 24251353 (1 of 2)



2660578

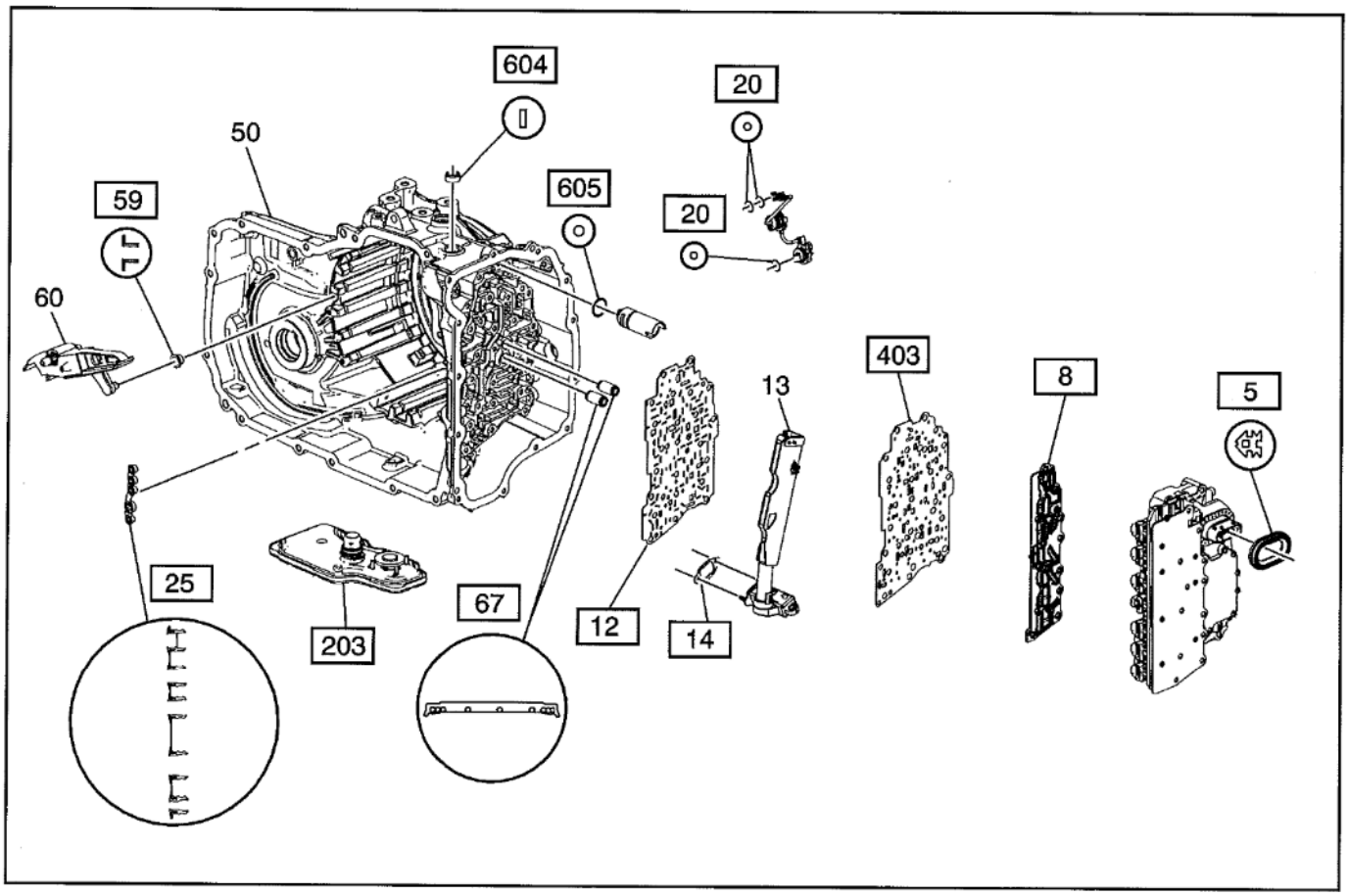
A/Trans Seal Kit (Gen 1) 24251353 (1 of 2)

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

A/Trans Seal Kit (Gen 1) 24251353 (1 of 2) (cont'd)

Callout	Quantity	Component Name
521	1	4-5-6 Clutch Piston Inner Seal

A/Trans Seal Kit (Gen 1) 24251353 (2 of 2)



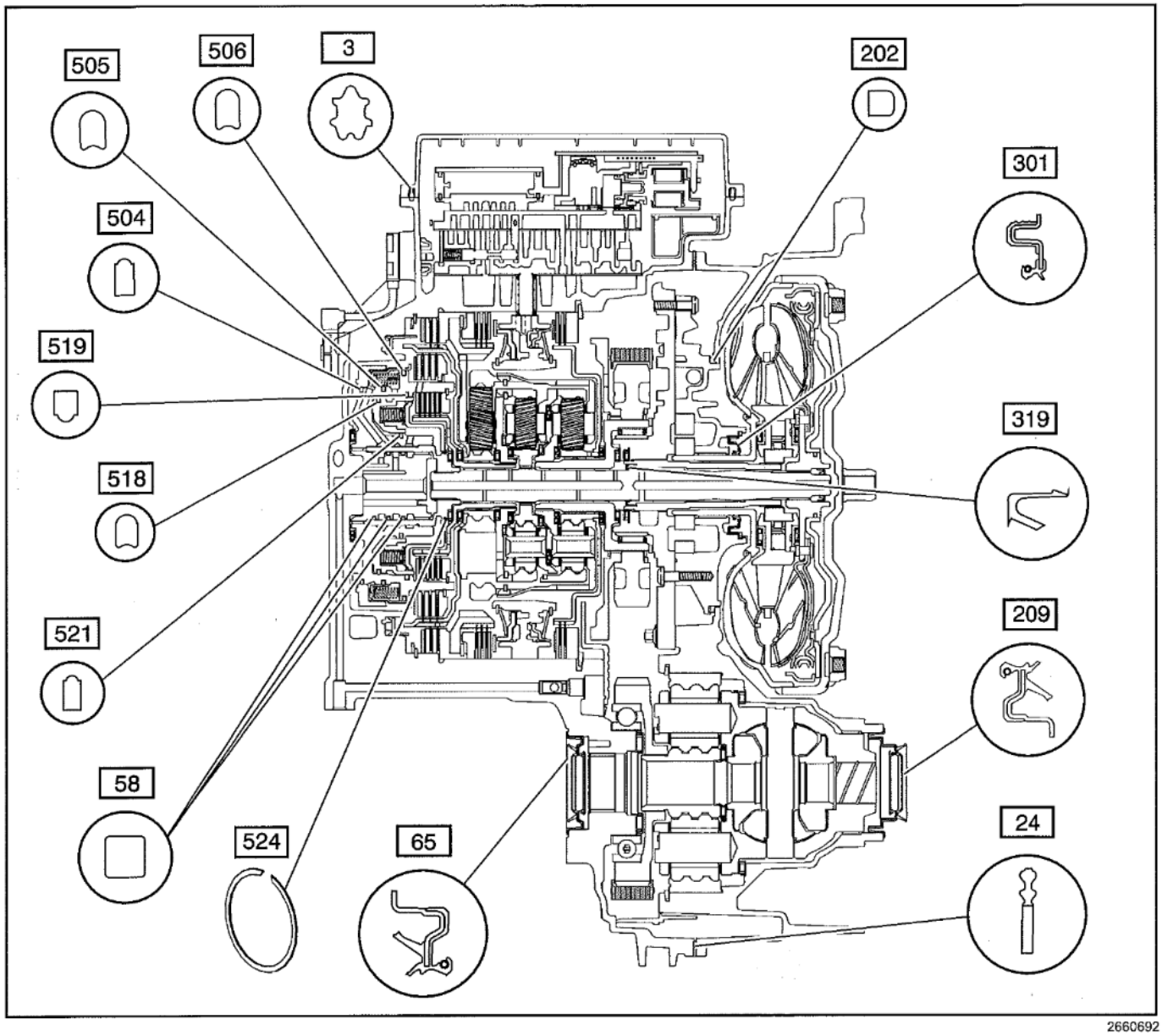
2660688

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

A/Trans Seal Kit (Gen 1) 24251353 (2 of 2)

Callout	Quantity	Component Name
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal
25	1	A/Trans Fluid Pump Seal Assembly
59	1	Drive Link Lube Fluid Seal
67	1	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
203	1	A/Trans Fluid Filter Assembly
403	1	Channel Plate to Valve Body Spacer Plate Assembly
604	1	Manual Shift Shaft Seal
605	1	Park Pawl Actuator Guide Seal

A/Trans Seal Kit (Gen 2) 24260603 (1 of 2)



2660692

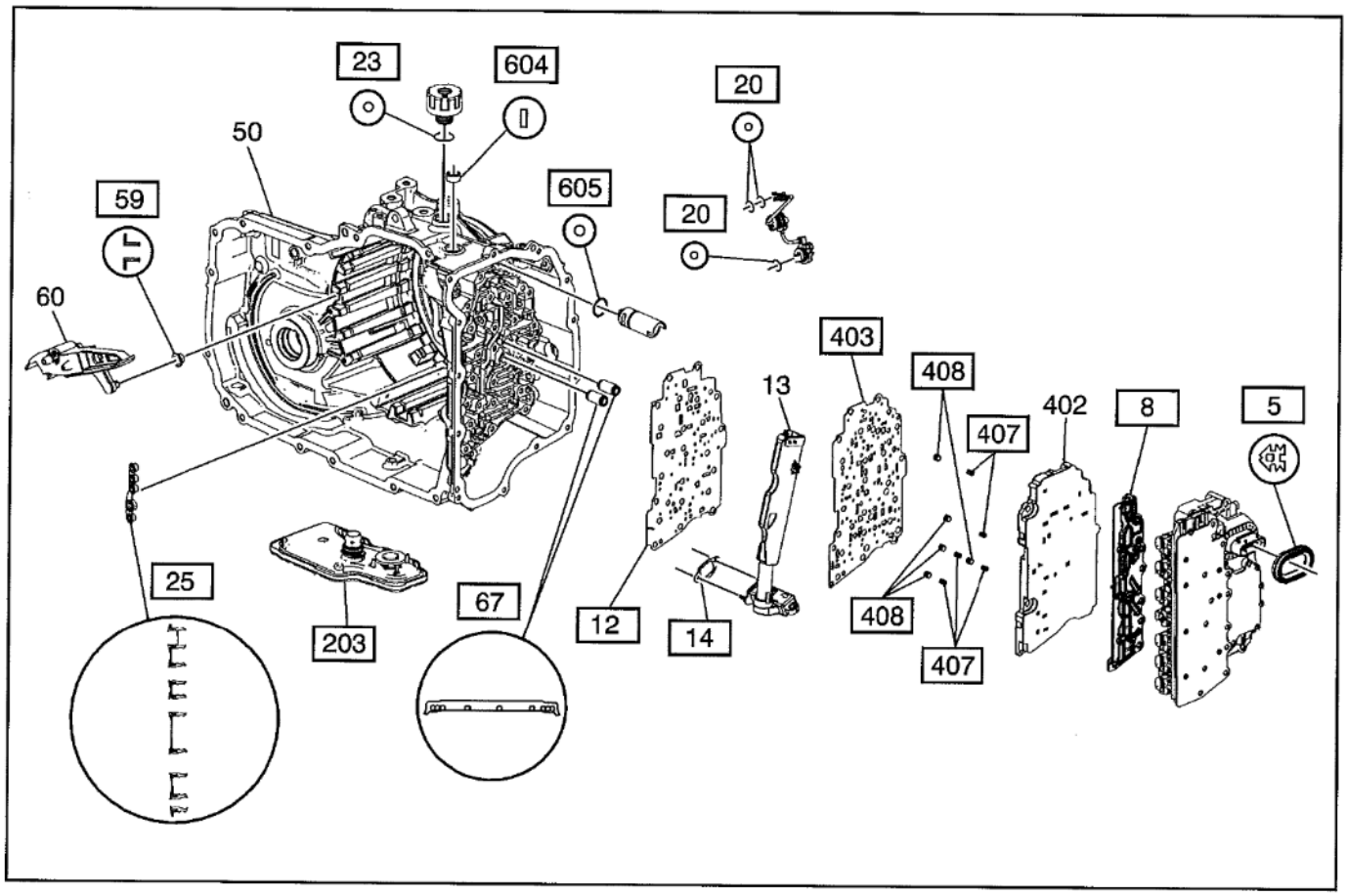
A/Trans Seal Kit (Gen 2) 24260603 (1 of 2)

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

A/Trans Seal Kit (Gen 2) 24260603 (1 of 2) (cont'd)

Callout	Quantity	Component Name
521	1	4-5-6 Clutch Piston Inner Seal
524	1	4-5-6 Clutch Piston Fluid Dam Retainer Ring

A/Trans Seal Kit (Gen 2) 24260603 (2 of 2)



2660699

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

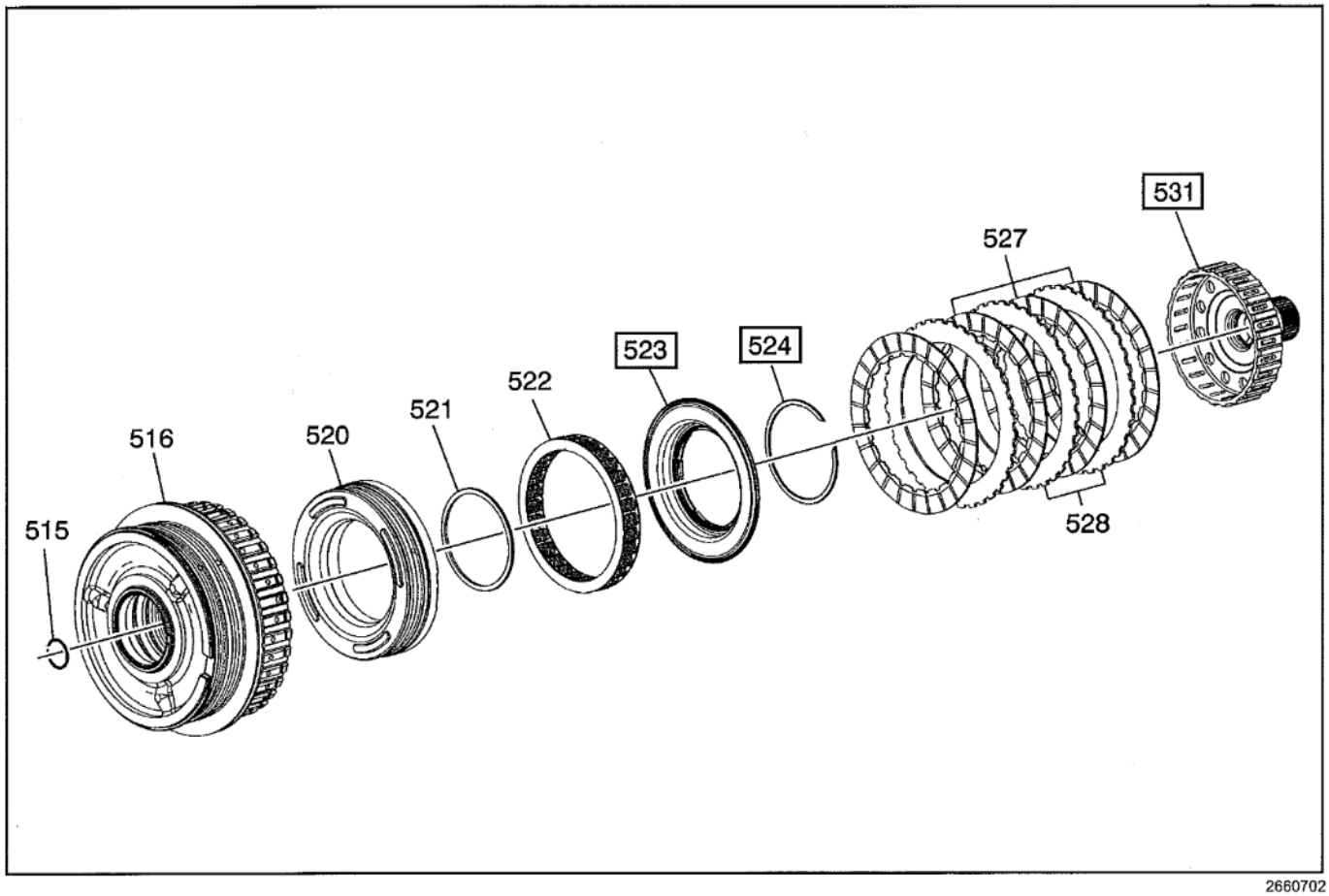
A/Trans Seal Kit (Gen 2) 24260603 (2 of 2)

Callout	Quantity	Component Name
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
20	3	A/Trans Input Speed Sensor Assembly O-Ring Seal
23	1	Fill Cap Seal
25	1	A/Trans Fluid Pump Seal Assembly
59	1	Drive Link Lube Fluid Seal
67	1	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
203	1	A/Trans Fluid Filter Assembly
403	1	Channel Plate to Valve Body Spacer Plate Assembly
407	5	Actuator Feed Accumulator Spring

A/Trans Seal Kit (Gen 2) 24260603 (2 of 2) (cont'd)

Callout	Quantity	Component Name
408	5	Actuator Feed Accumulator Piston
604	1	Manual Shift Shaft Seal
605	1	Park Pawl Actuator Guide Seal

Transmission Kit (Gen 1) 24260701



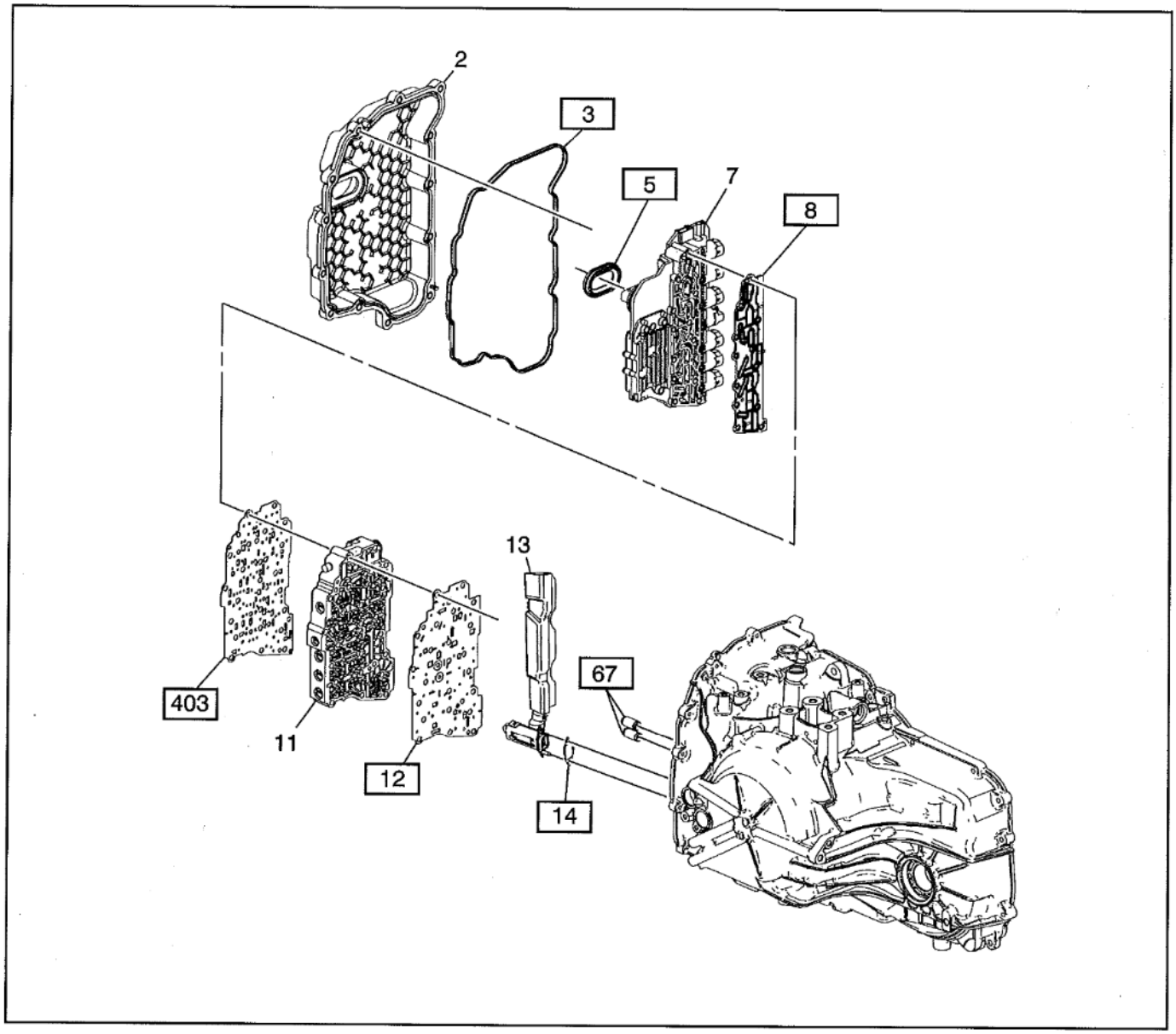
2660702

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Transmission Kit (Gen 1) 24260701

Callout	Quantity	Component Name
523	1	4-5-6 Clutch Piston Fluid Dam Assembly
524	1	4-5-6 Clutch Piston Fluid Dam Retainer Ring
531	1	Reaction Carrier Hub Assembly

Control Valve Body Kit (Gen 1) 24248473



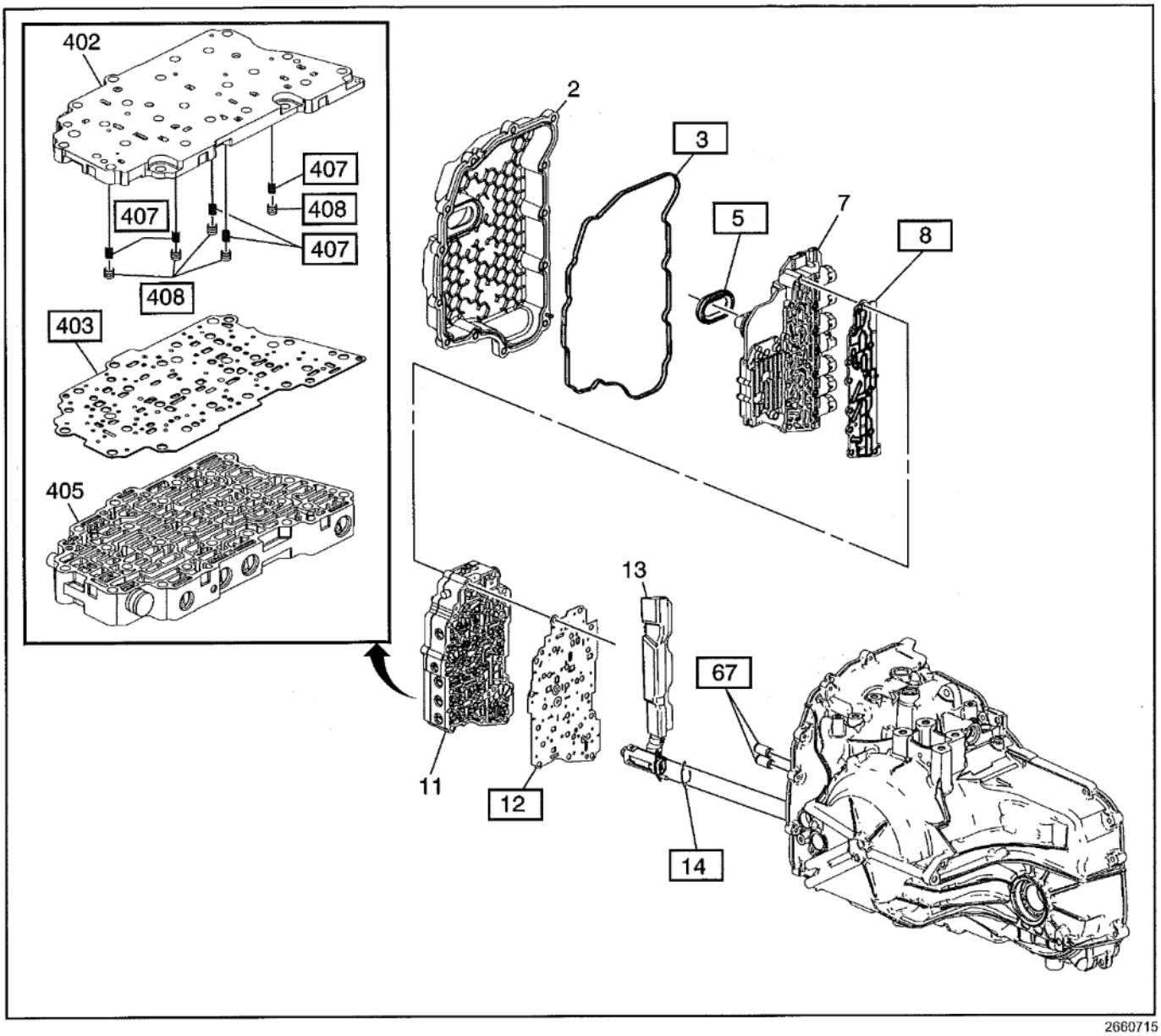
2660711

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Control Valve Body Kit (Gen 1) 24248473

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
67	2	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
403	1	Channel Plate to Valve Body Spacer Plate Assembly

Control Valve Body Kit (Gen 2) 24260702



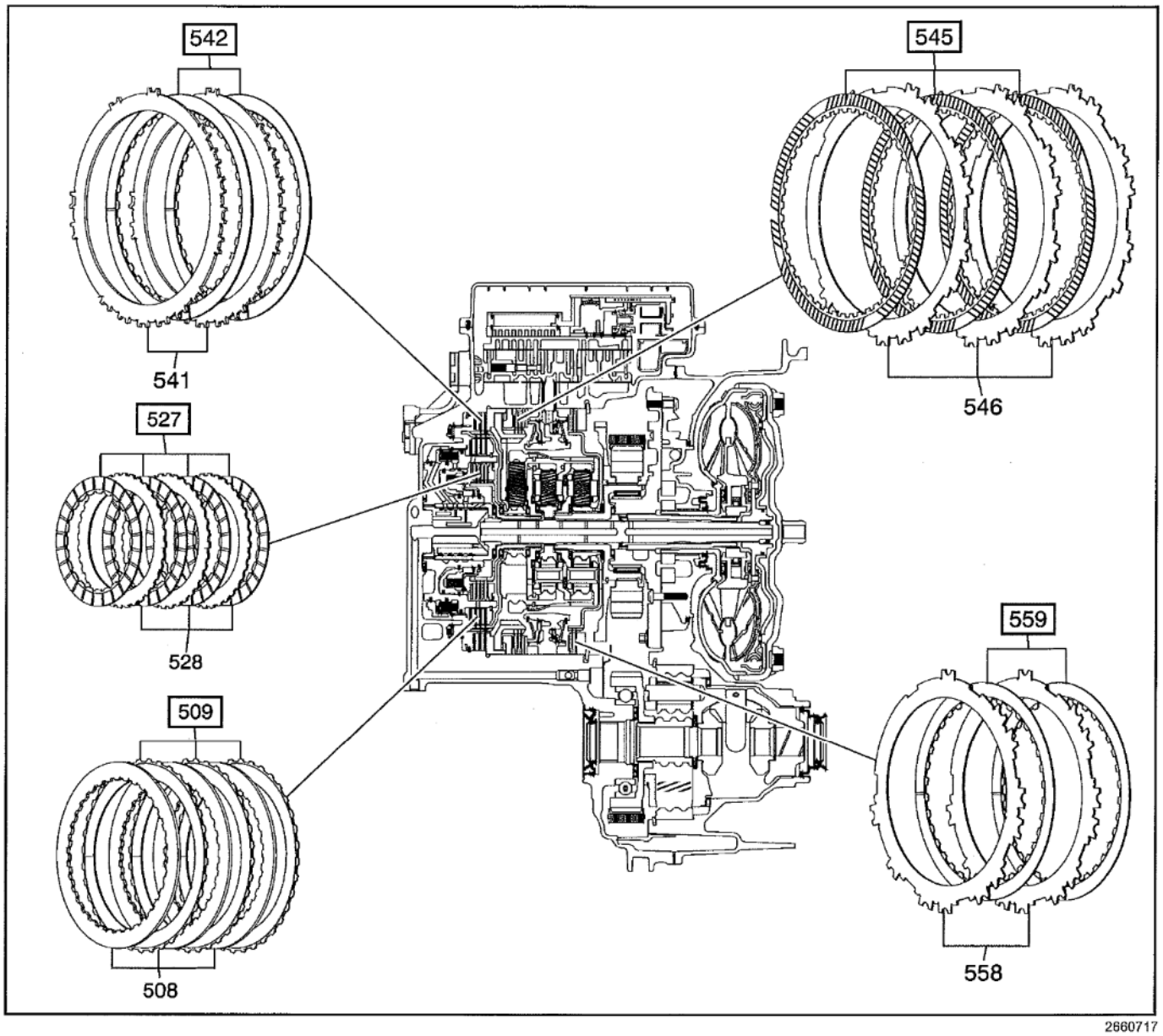
2660715

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Control Valve Body Kit (Gen 2) 24260702

Callout	Quantity	Component Name
3	1	Control Valve Body Cover Gasket
5	1	Control Valve Body Cover Hole Seal
8	1	Control Valve Body Filter Plate Assembly
12	1	Control Valve Body Spacer Plate Assembly
14	1	A/Trans Fluid Level Control Valve Gasket
67	2	1-2-3-4 and Low Reverse Clutch Fluid Passage Seal
403	1	Channel Plate to Valve Body Spacer Plate Assembly
407	5	Actuator Feed Accumulator Spring
408	5	Actuator Feed Accumulator Piston

Clutch Plate Package (Gen 1) 24249460

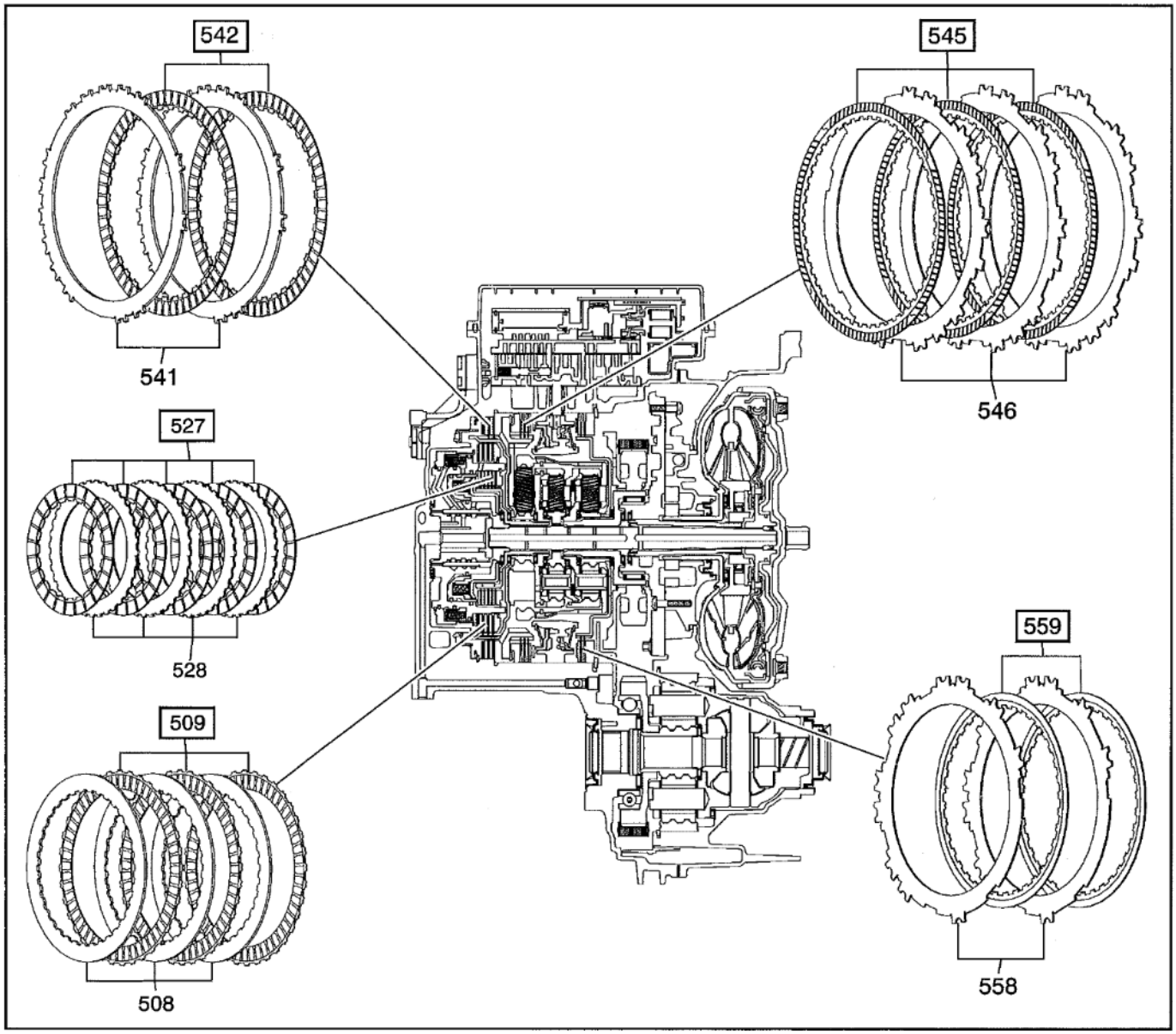


Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Clutch Plate Package (Gen 1) 24249460

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly
527	4	4-5-6 Clutch (w/Friction Material) Plate Assembly
542	2	2-6 Clutch (w/Friction Material) Plate Assembly
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

Clutch Plate Package (Gen 2) 24260695



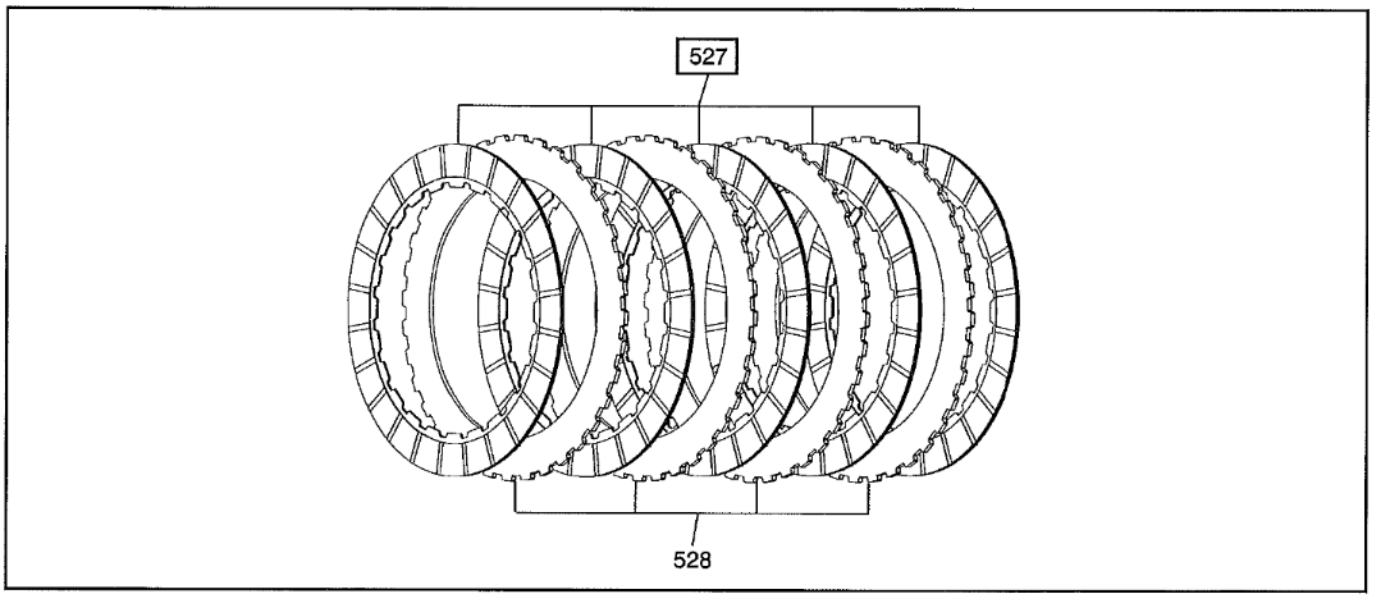
2660718

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Clutch Plate Package (Gen 2) 24260695

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly
527	5	4-5-6 Clutch (w/Friction Material) Plate Assembly
542	2	2-6 Clutch (w/Friction Material) Plate Assembly
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

4-5-6 Plate Assembly (Gen 2) 24260700



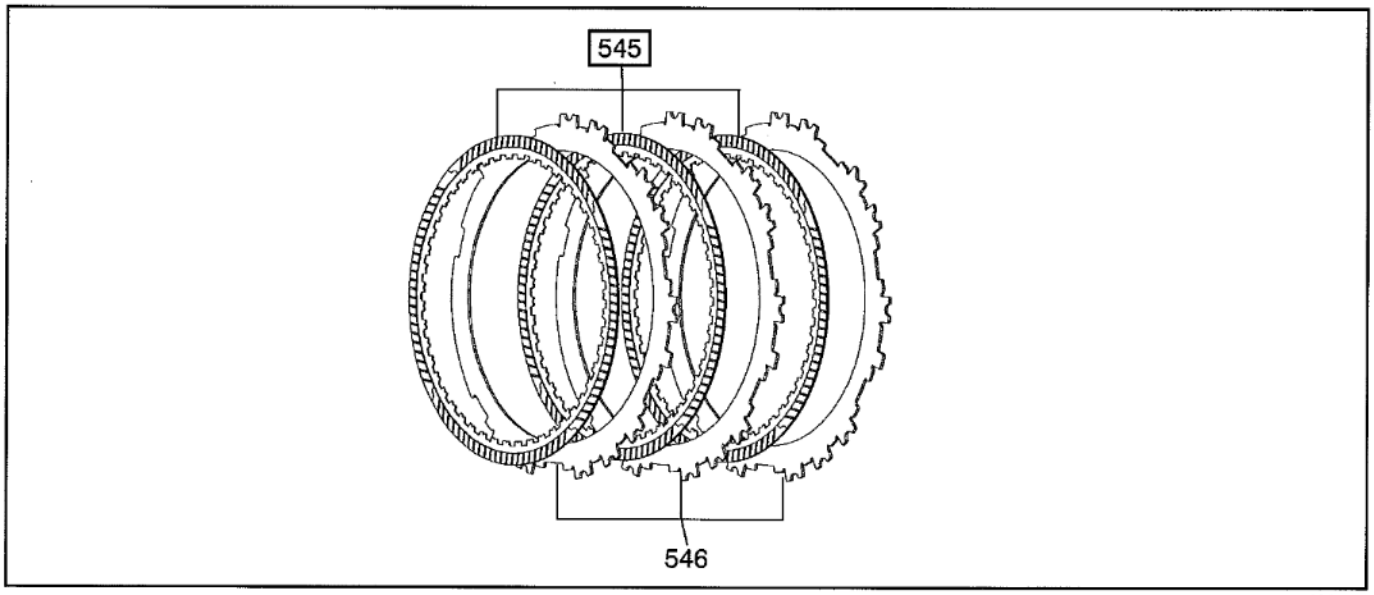
2660719

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

4-5-6 Plate Assembly (Gen 2) 24260700

Callout	Quantity	Component Name
527	5	4-5-6 Clutch (w/Friction Material) Plate Assembly

Low and Reverse Plate Assembly (Gen 2) 24260696



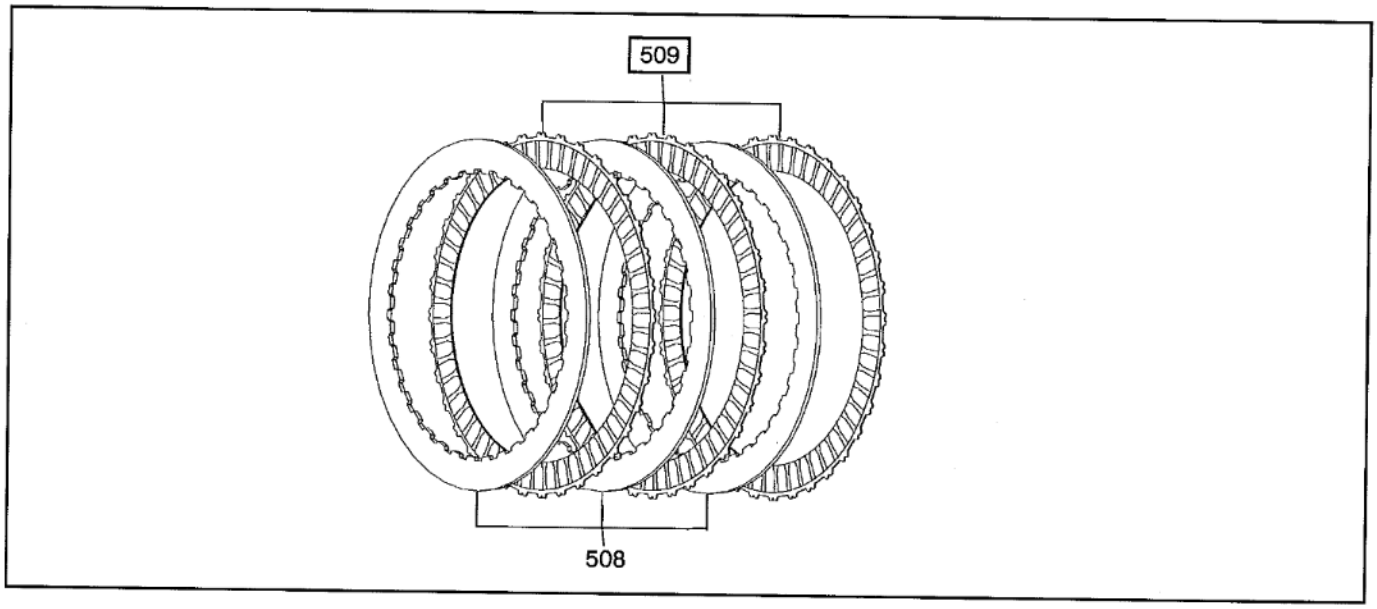
2660722

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

Low and Reverse Plate Assembly (Gen 2) 24260696

Callout	Quantity	Component Name
545	3	Low and Reverse Clutch (w/Friction Material) Plate Assembly

3-5 Reverse Plate Assembly (Gen 2) 24260697



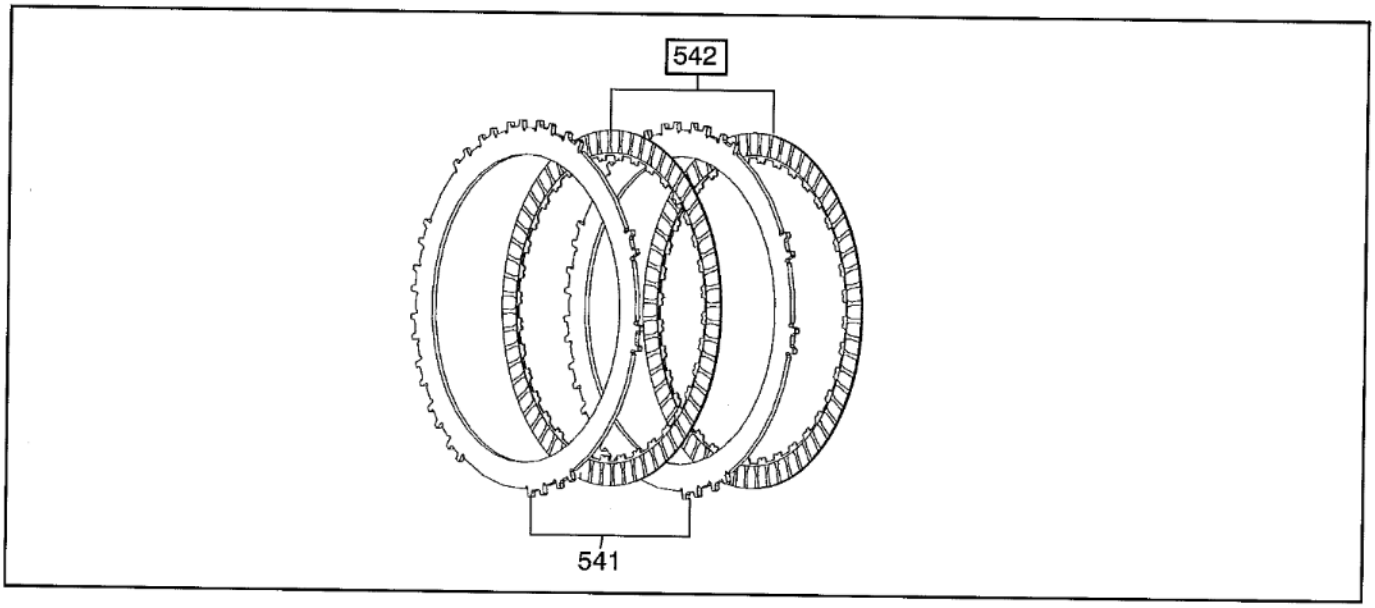
2660723

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

3-5 Reverse Plate Assembly (Gen 2) 24260697

Callout	Quantity	Component Name
509	3	3-5 Reverse Clutch (w/Friction Material) Plate Assembly

2-6 Plate Assembly (Gen 2) 24260698



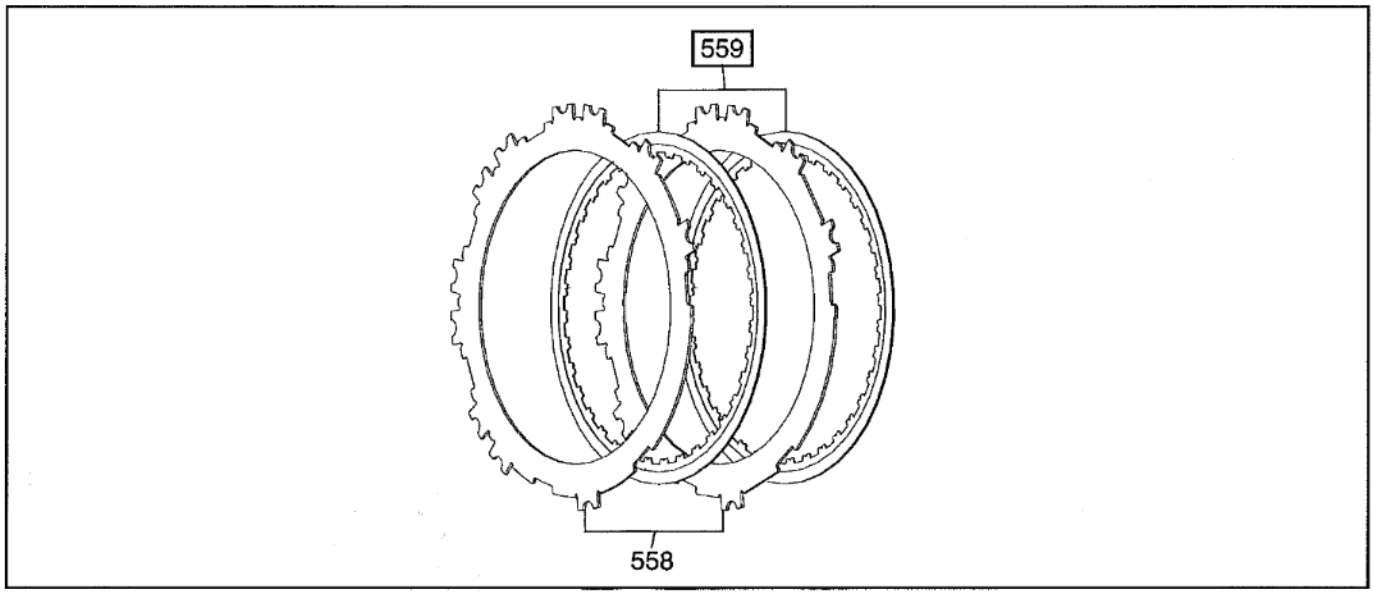
2660728

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

2-6 Plate Assembly (Gen 2) 24260698

Callout	Quantity	Component Name
542	2	2-6 Clutch (w/Friction Material) Plate Assembly

1-2-3-4 Plate Assembly (Gen 2) 24260699



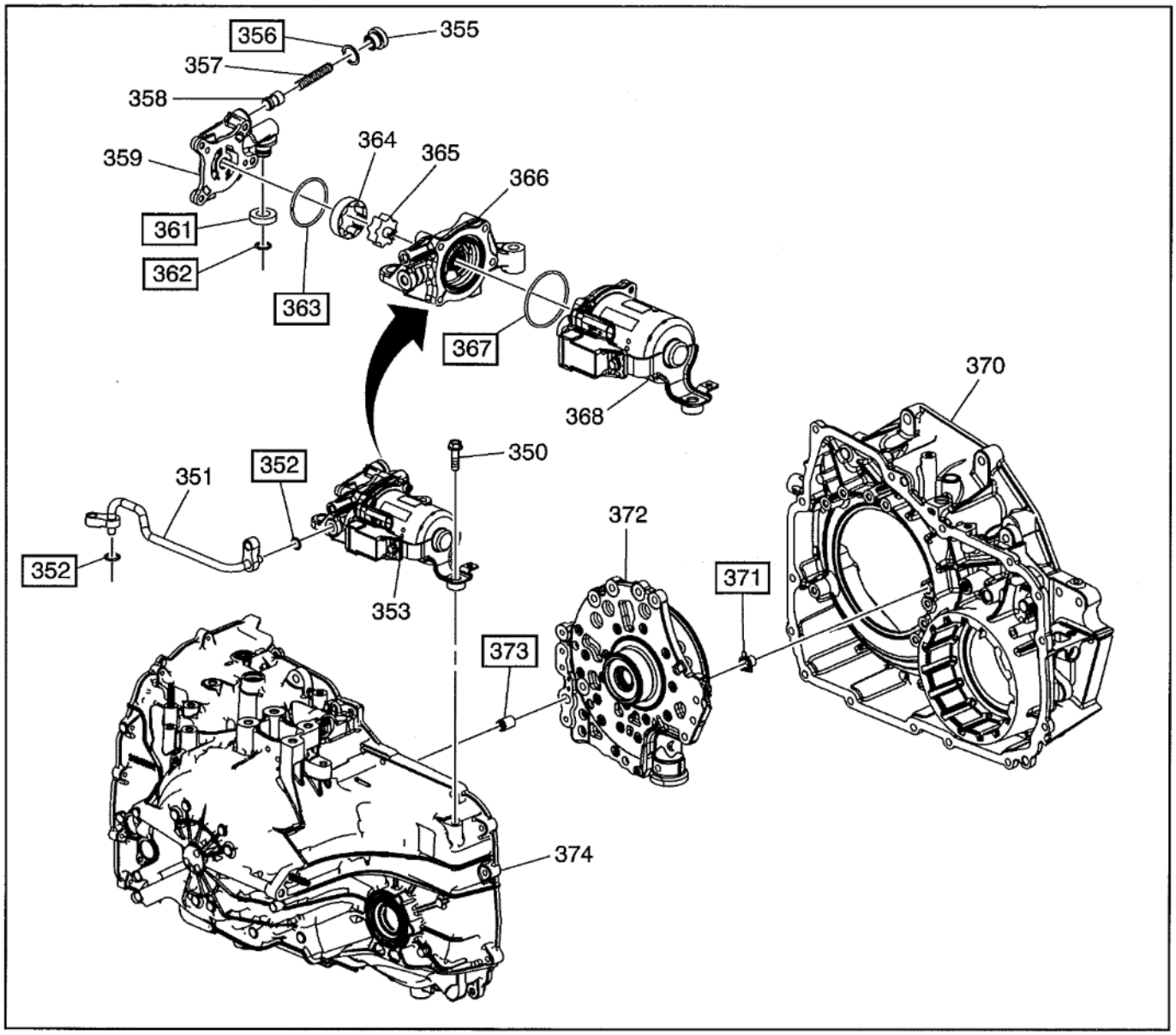
2660729

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

1-2-3-4 Plate Assembly (Gen 2) 24260699

Callout	Quantity	Component Name
559	2	1-2-3-4 Clutch (w/Friction Material) Plate Assembly

A/Trans Seal Kit (Gen 2) 24260704



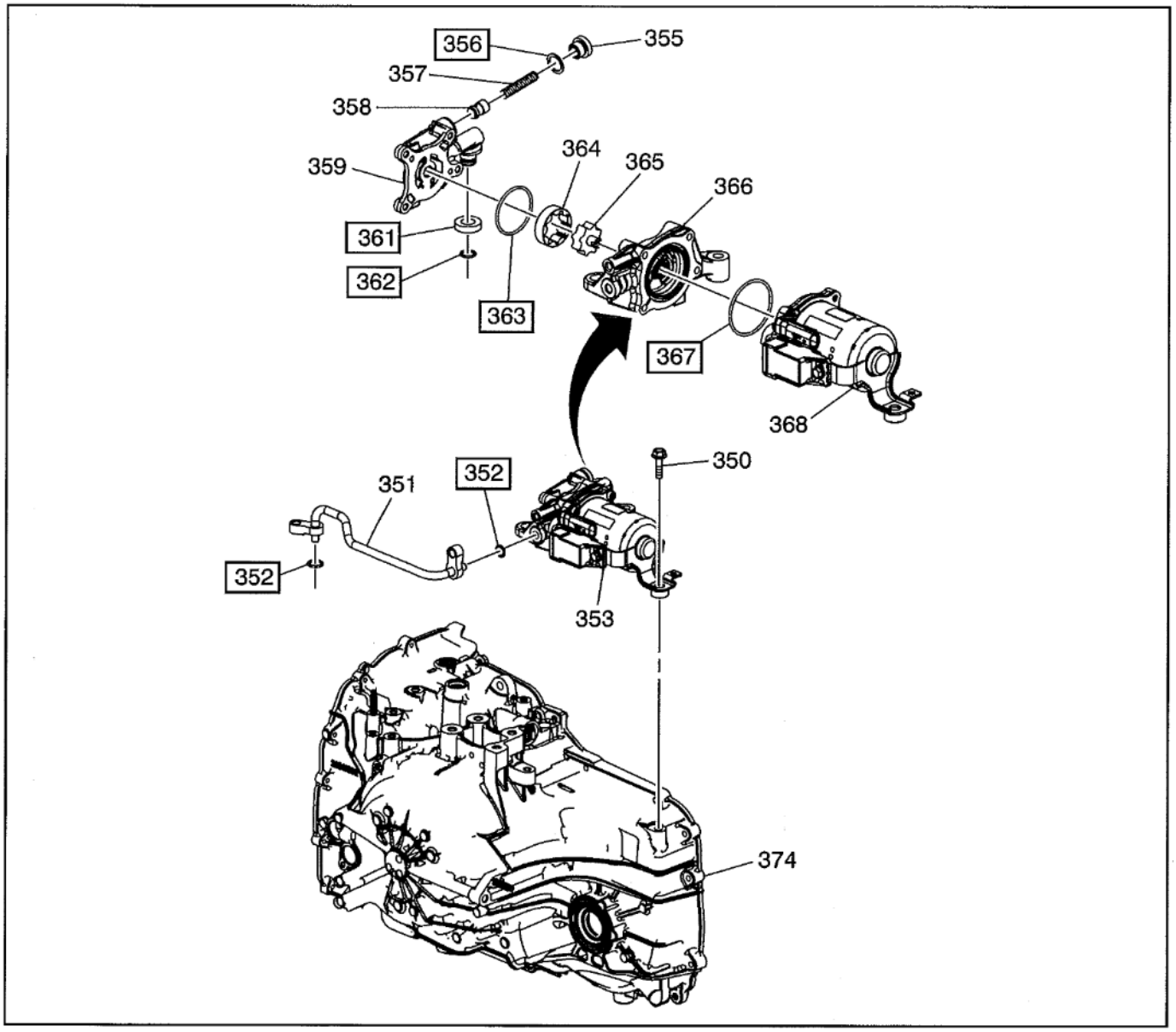
2660731

Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

A/Trans Seal Kit (Gen 2) 24260704

Callout	Quantity	Component Name
352	2	A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
356	1	Pressure Regulator Valve Spring Spacer
361	1	A/Trans Auxiliary Fluid Pump Gasket
362	1	A/Trans Auxiliary Fluid Pump Seal
363	1	A/Trans Auxiliary Fluid Pump Cover Seal
367	1	A/Trans Auxiliary Fluid Pump Motor Cover Seal– O-Ring
371	1	A/Trans Auxiliary Fluid Inlet Pump Seal
373	1	A/Trans Fluid Trough Check Ball

A/Trans Auxiliary Seal Kit (Gen 2) 24260705



2660733

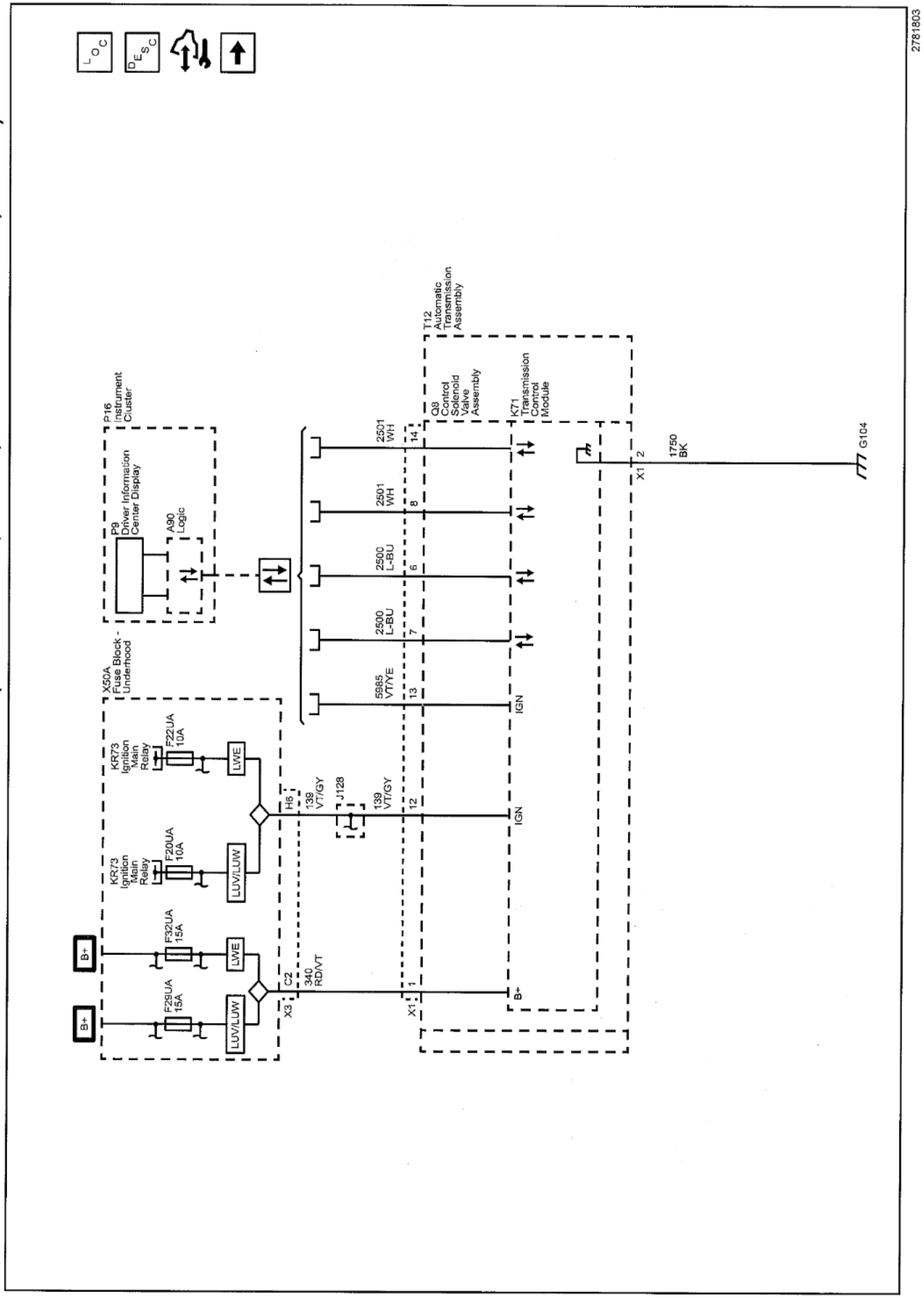
Note: Callouts with boxes around them indicate part is included in the service kit. Callouts without boxes are shown for relationship purposes only.

A/Trans Auxiliary Seal Kit (Gen 2) 24260705

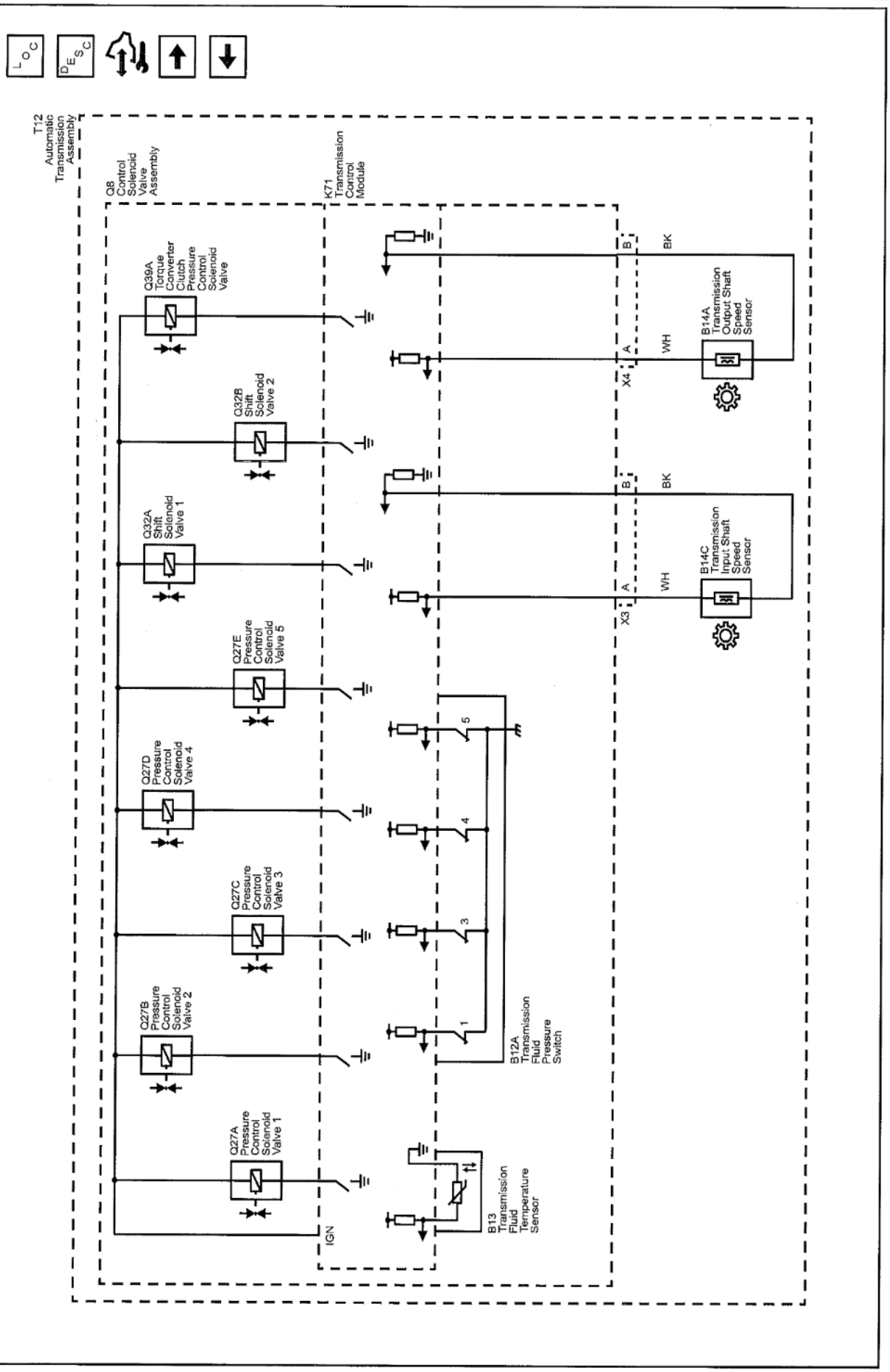
Callout	Quantity	Component Name
352	2	A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
356	1	Pressure Regulator Valve Spring Spacer
361	1	A/Trans Auxiliary Fluid Pump Gasket
362	1	A/Trans Auxiliary Fluid Pump Seal
363	1	A/Trans Auxiliary Fluid Pump Cover Seal
367	1	A/Trans Auxiliary Fluid Pump Motor Cover Seal– O-Ring

Schematic and Routing Diagrams

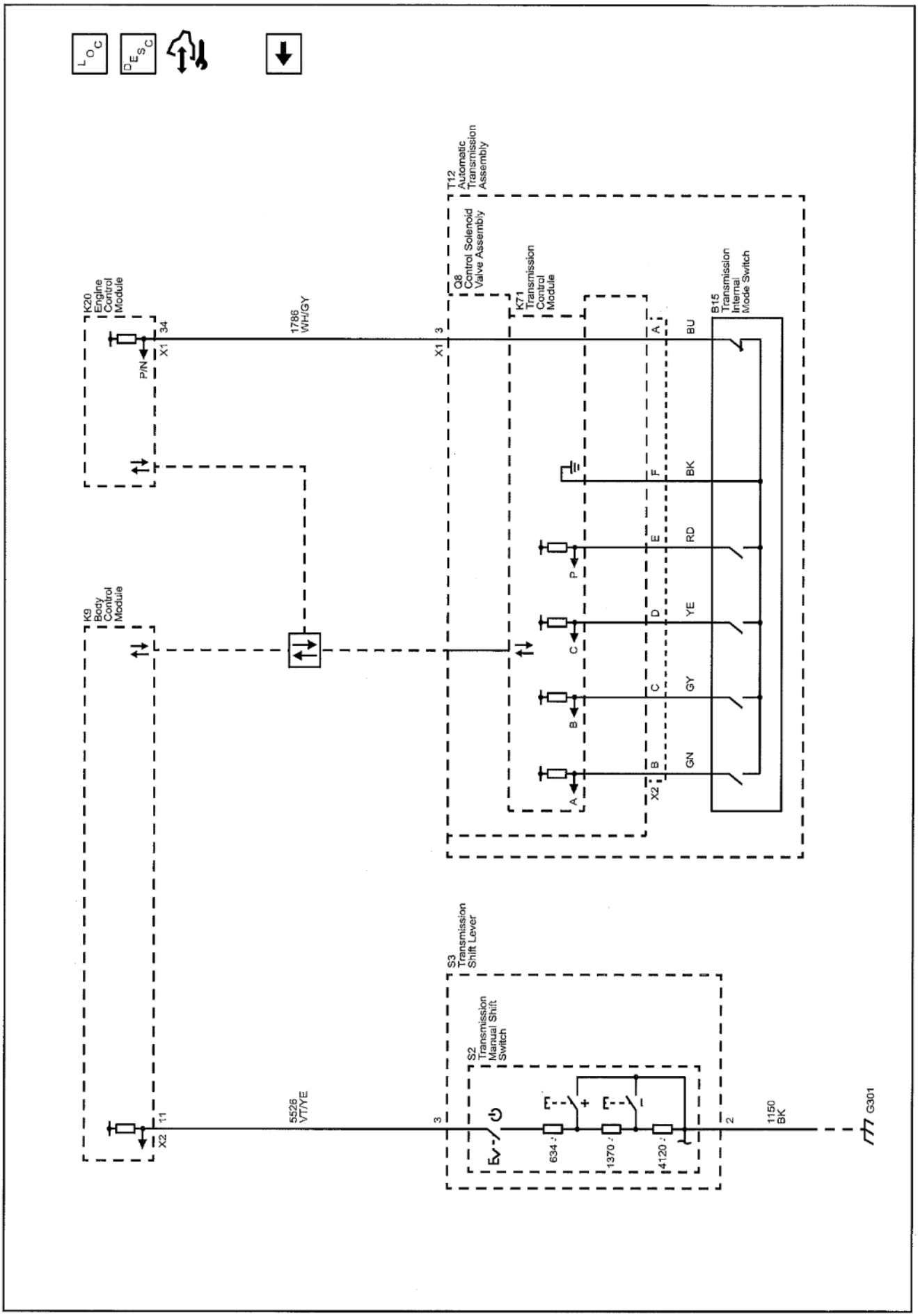
Automatic Transmission Controls Schematics (Module Power, Ground, Data Communication, and MIL)



Automatic Transmission Controls Schematics (Speed and Temperature Sensors, Pressure and Shift Controls)



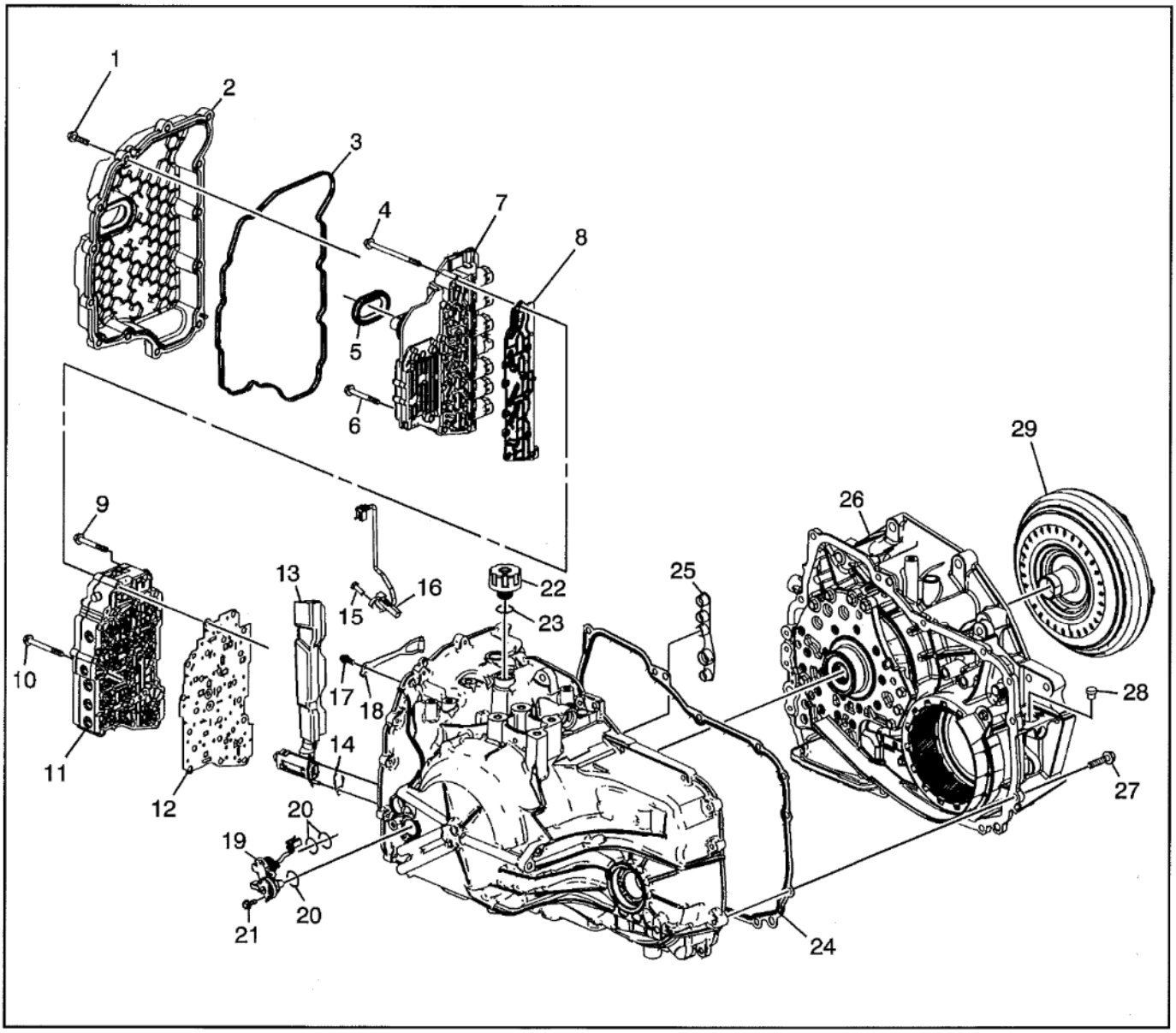
Automatic Transmission Controls Schematics (Internal Mode Switch and Tap Up/Tap Down Switches)



Component Locator

Disassembled Views

Case and Associated Parts



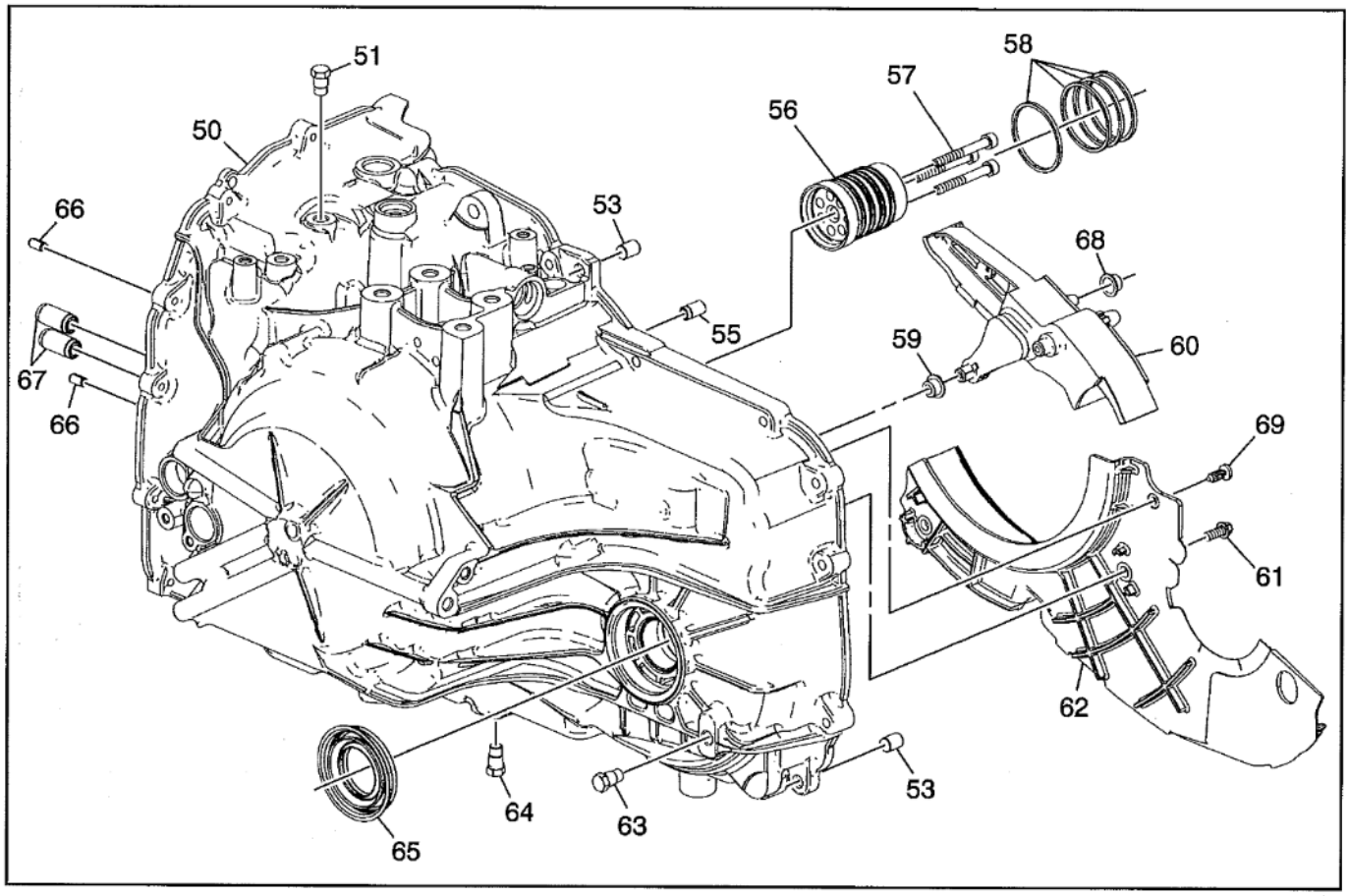
1891276

Legend

(1) Control Valve Body Cover Bolt
(2) Control Valve Body Cover Assembly
(3) Control Valve Body Cover Gasket
(4) Control Valve Body Bolt
(5) Control Valve Body Cover Hole Seal
(6) Control Solenoid Valve Heat Sink Bolt
(7) Control Solenoid (w/Body and TCM) Valve Assembly
(8) Control Valve Body Filter Plate Assembly
(9) Control Valve Body Bolt
(10) Control Valve Body Bolt
(11) Control Valve Body Assembly
(12) Control Valve Body Spacer Plate Assembly
(13) A/Trans Fluid Level Control Valve
(14) A/Trans Fluid Level Control Valve Gasket
(15) A/Trans Output Speed Sensor Bolt
(16) A/Trans Output Speed Sensor Assembly
(17) Manual Shaft Detent Spring Bolt
(18) Manual Shaft Detent Lever Spring Assembly
(19) A/Trans Input Speed Sensor Assembly
(20) A/Trans Input Speed Sensor Assembly O-Ring Seal
(21) A/Trans Input Speed Sensor Bolt
(22) Fill Cap
(23) Fill Cap Seal
(24) Torque Converter Housing Gasket
(25) A/Trans Fluid Pump Seal Assembly

(26) Torque Converter with Fluid Pump Housing Assembly
(27) Torque Converter and Differential Housing Bolt
(28) A/Trans Fluid Fill Tube Plug Assembly
(29) Torque Converter Assembly

Transmission Case Assembly – 6T30 – Gen 1

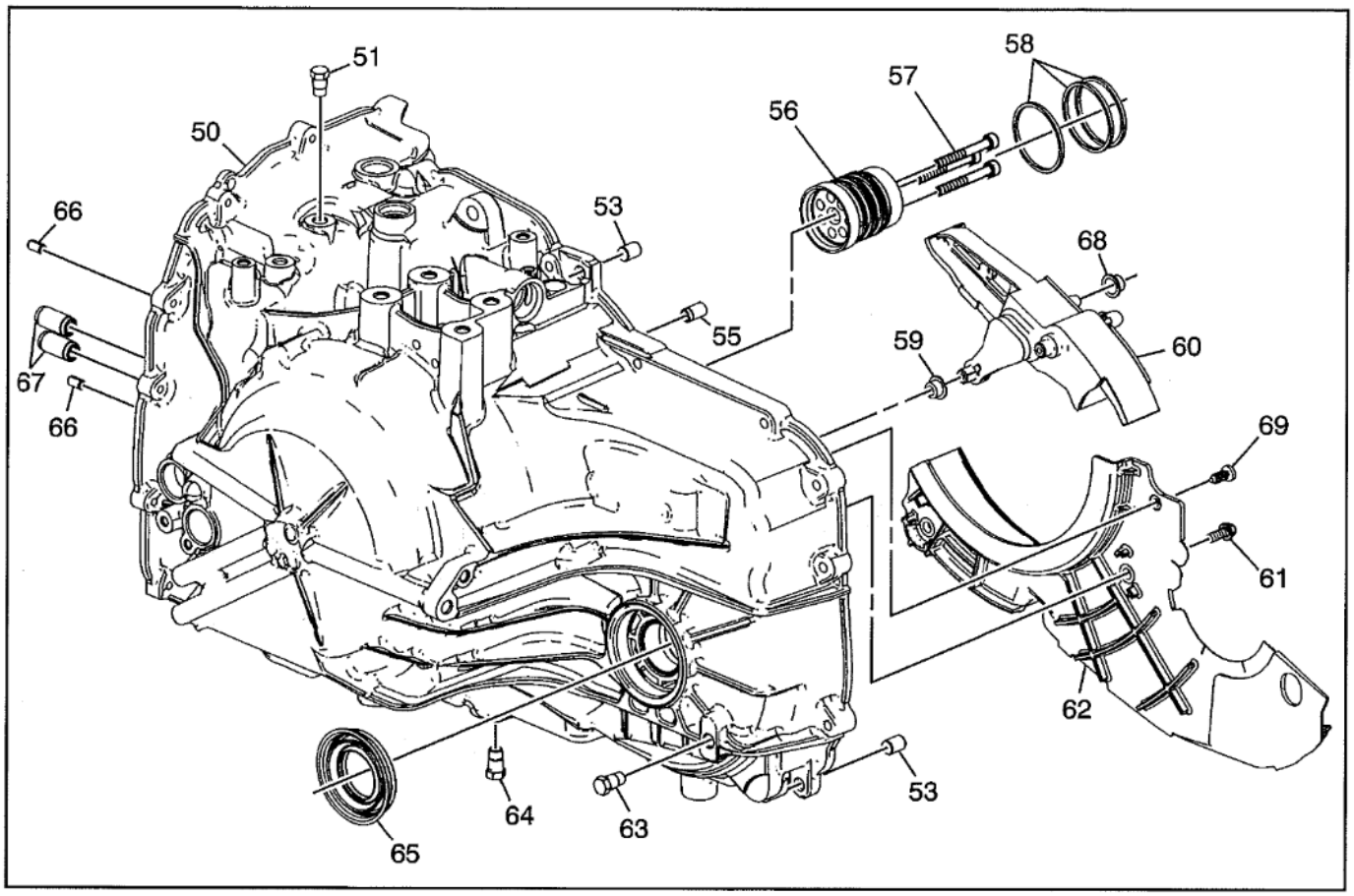


2202182

Legend

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

Transmission Case Assembly – 6T30 – Gen 2

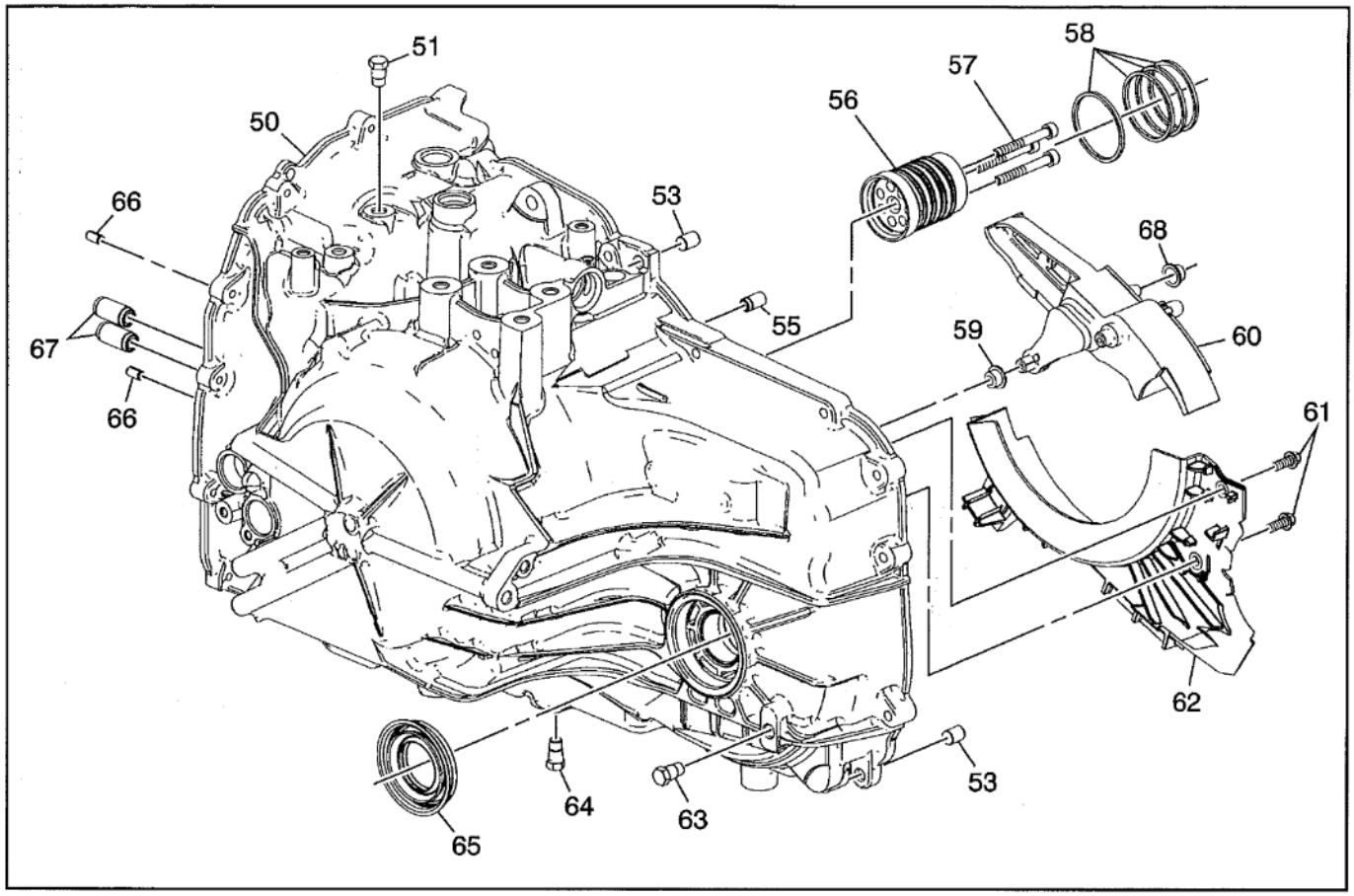


2772775

Legend

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

Transmission Case Assembly – 6T40/6T45/6T50 – Gen 1

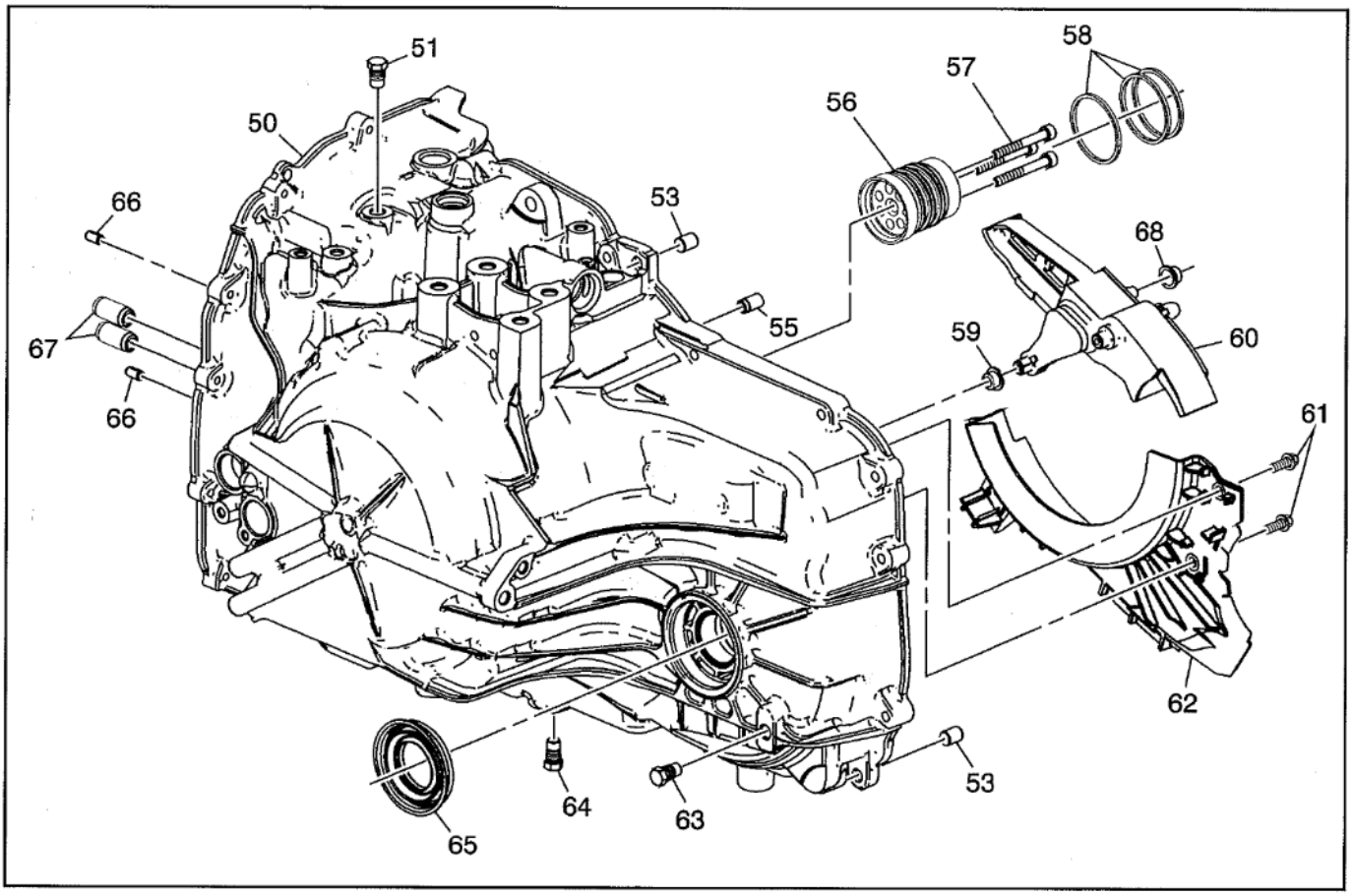


1891279

Legend

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

Transmission Case Assembly – 6T40/6T45/6T50 – Gen 2

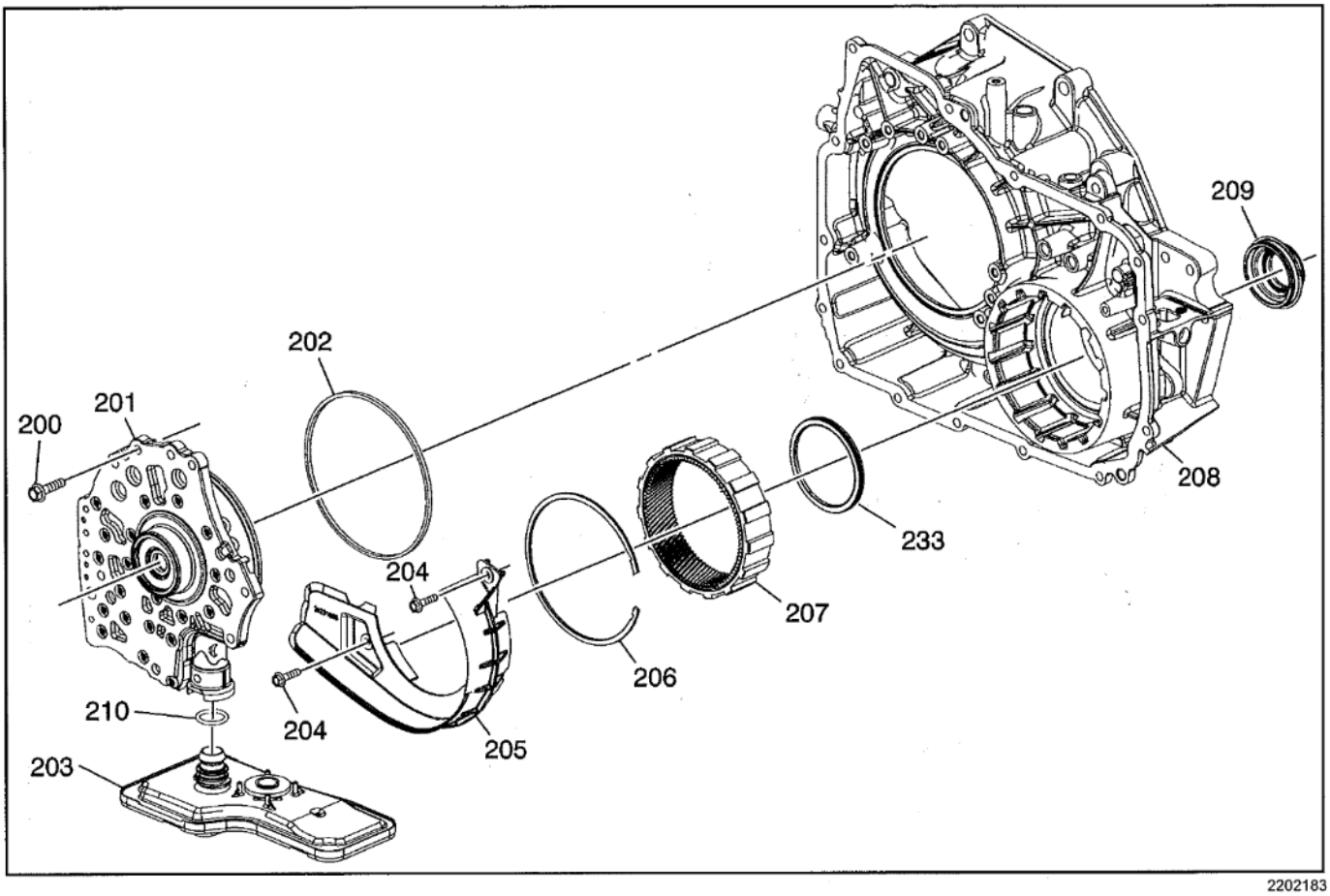


2552202

Legend

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

Torque Converter and Fluid Pump Housing Assembly– 6T30

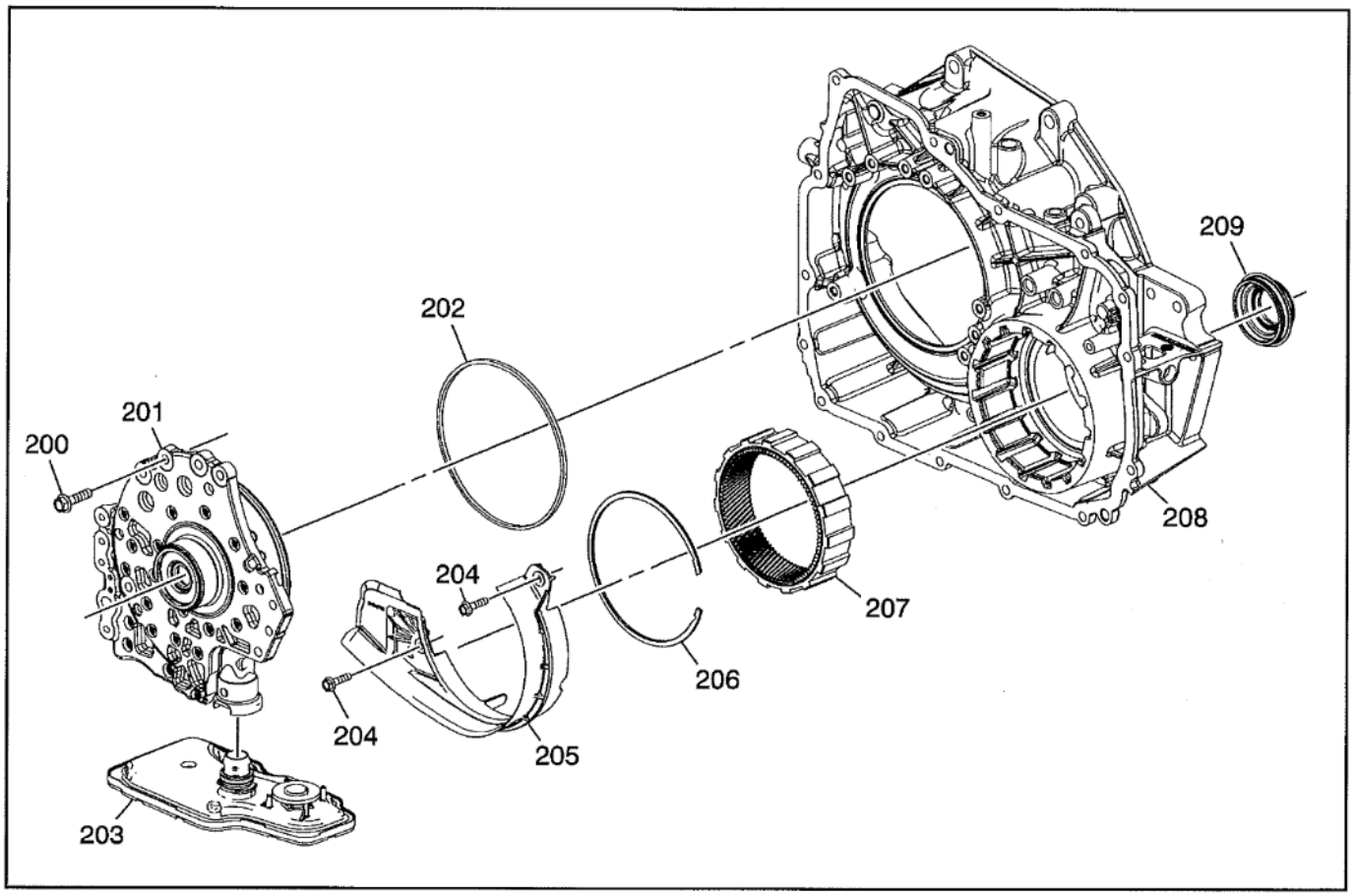


2202183

Legend

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

Torque Converter and Fluid Pump Housing Assembly– 6T40/6T45/6T50

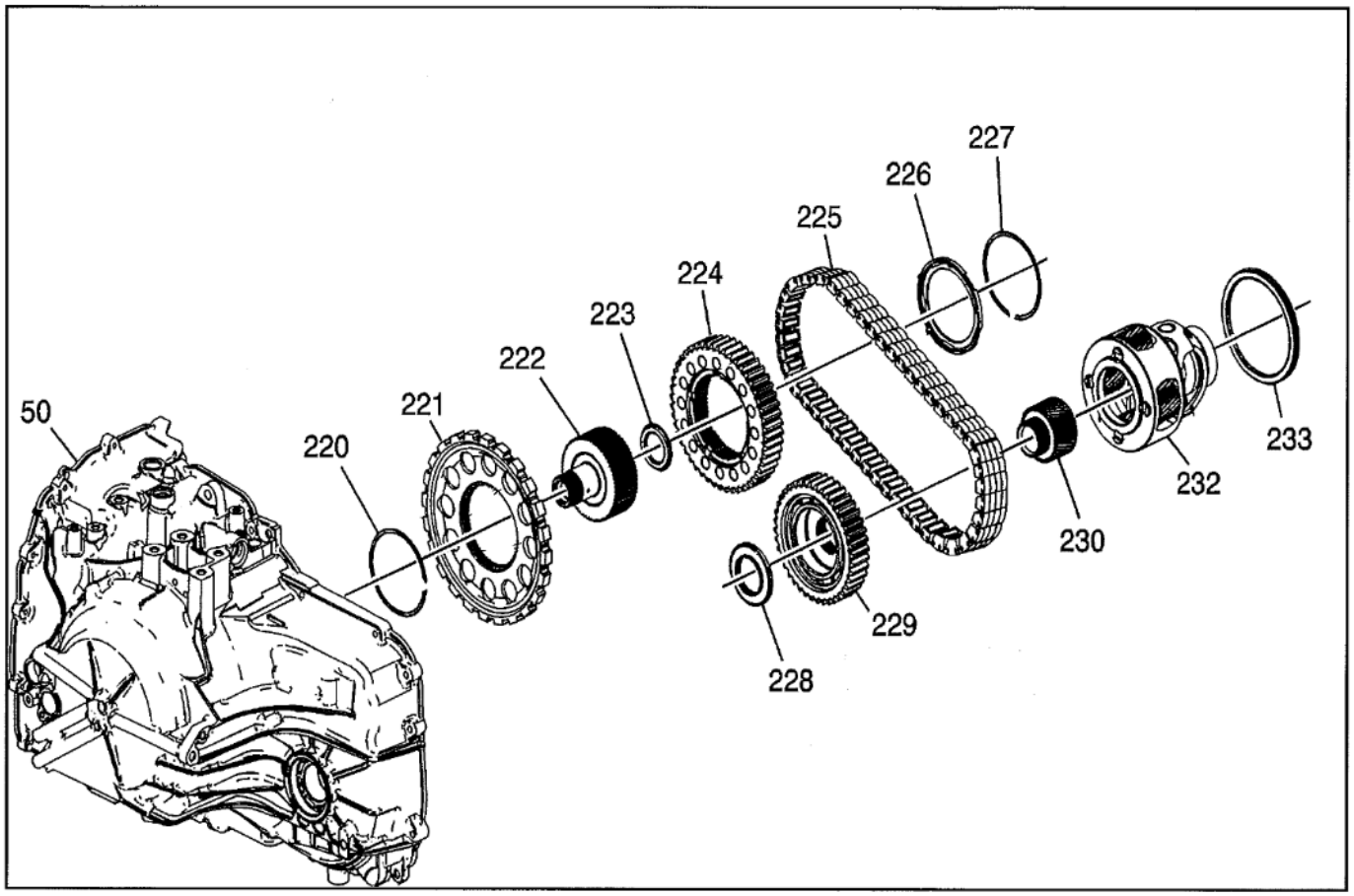


2395537

Legend

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

Drive Link Assembly

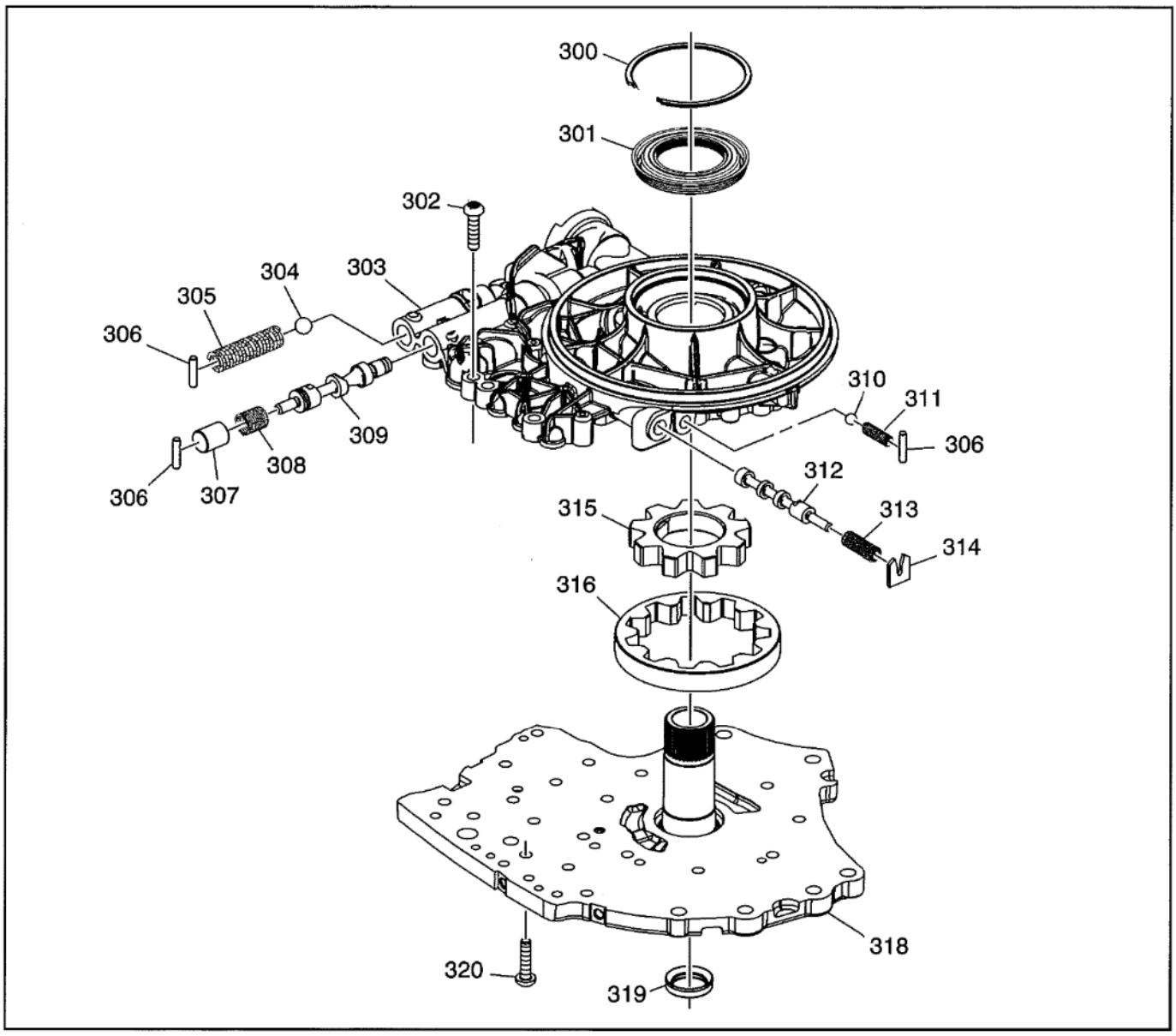


1891282

Legend

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

Oil Pump Assembly– 6T30

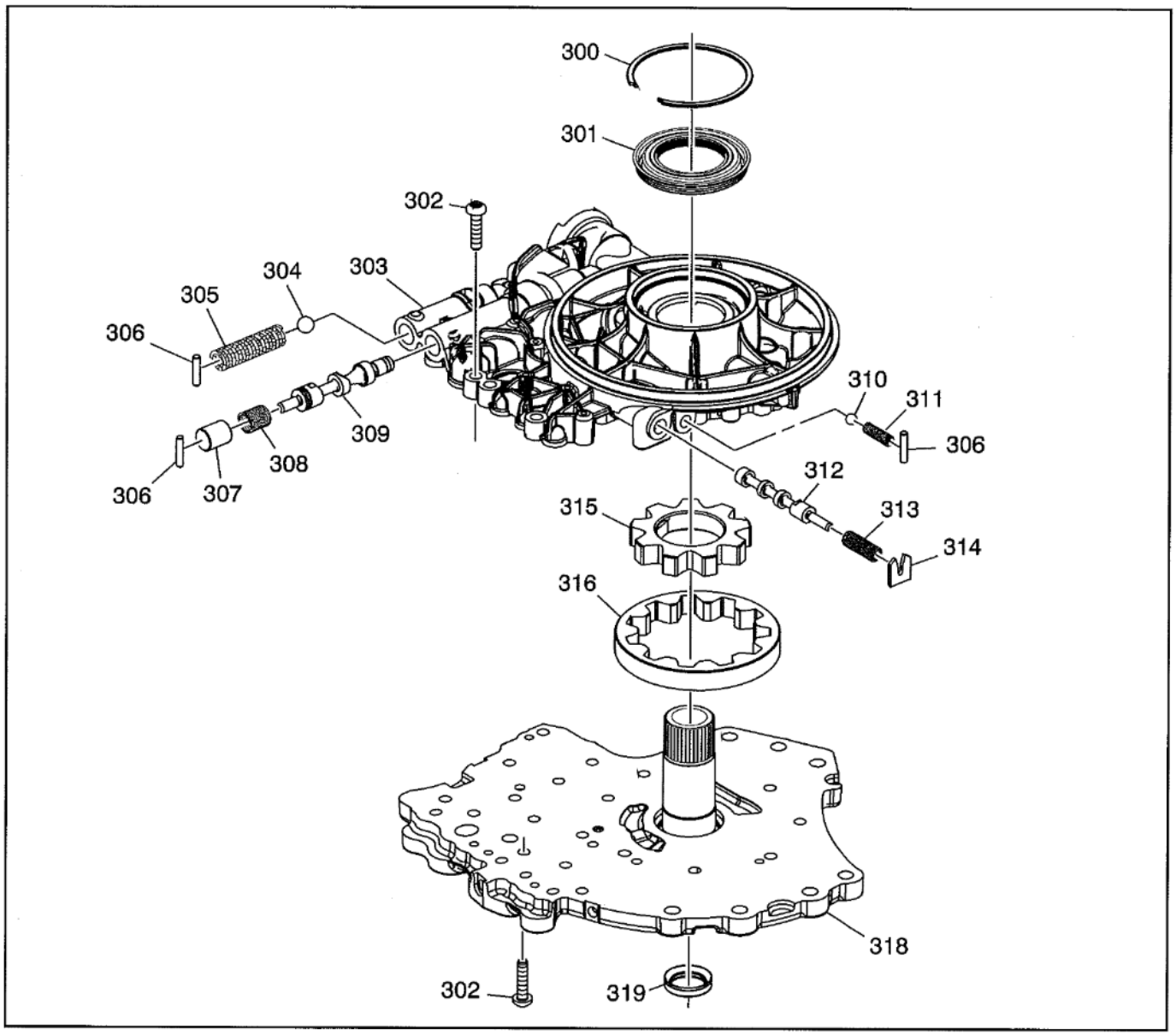


2202190

Legend

(300) Torque Converter Fluid Seal Retainer
(301) Torque Converter Fluid Seal Assembly
(302) A/Trans Fluid Pump Cover Bolt
(303) A/Trans Fluid Pump Body
(304) Pump Blowoff Ball Valve
(305) Pump Blowoff Valve Spring
(306) Pressure Regulator Valve Bore Plug Retainer
(307) Pressure Regulator Valve Bore Plug
(308) Pressure Regulator Valve Spring
(309) Pressure Regulator Valve
(310) Torque Converter Clutch Blowoff Ball Valve
(311) Torque Converter Clutch Blowoff Ball Valve Spring
(312) Torque Converter Clutch Control Valve
(313) Torque Converter Clutch Control Valve Spring
(314) Torque Converter Clutch Control Valve Spring Retainer
(315) A/Trans Fluid Pump Drive Gear
(316) A/Trans Fluid Pump Driven Gear
(318) A/Trans Fluid Pump Cover Assembly
(319) Torque Converter Fluid Seal Assembly
(320) A/Trans Fluid Pump Cover Bolt

Oil Pump Assembly– 6T40/6T45/6T50– Gen 1

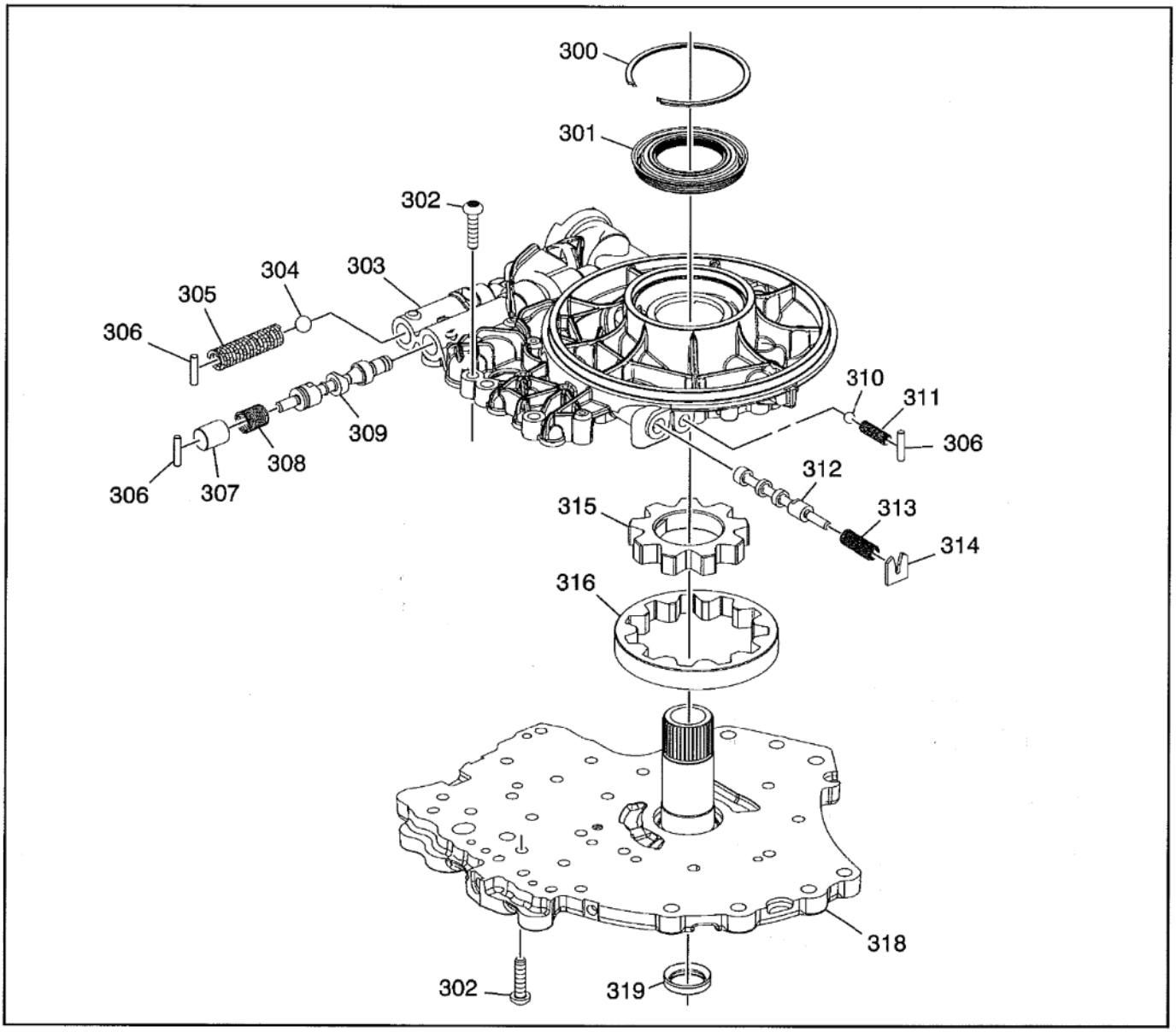


1891283

Legend

(300) Torque Converter Fluid Seal Retainer
(301) Torque Converter Fluid Seal Assembly
(302) A/Trans Fluid Pump Cover Bolt
(303) A/Trans Fluid Pump Body
(304) Pump Blowoff Ball Valve
(305) Pump Blowoff Valve Spring
(306) Pressure Regulator Valve Bore Plug Retainer
(307) Pressure Regulator Valve Bore Plug
(308) Pressure Regulator Valve Spring
(309) Pressure Regulator Valve
(310) Torque Converter Clutch Blowoff Ball Valve
(311) Torque Converter Clutch Blowoff Ball Valve Spring
(312) Torque Converter Clutch Control Valve
(313) Torque Converter Clutch Control Valve Spring
(314) Torque Converter Clutch Control Valve Spring Retainer
(315) A/Trans Fluid Pump Drive Gear
(316) A/Trans Fluid Pump Driven Gear
(318) A/Trans Fluid Pump Cover Assembly
(319) Torque Converter Fluid Seal Assembly

Oil Pump Assembly– 6T40/6T45/6T50– Gen 2

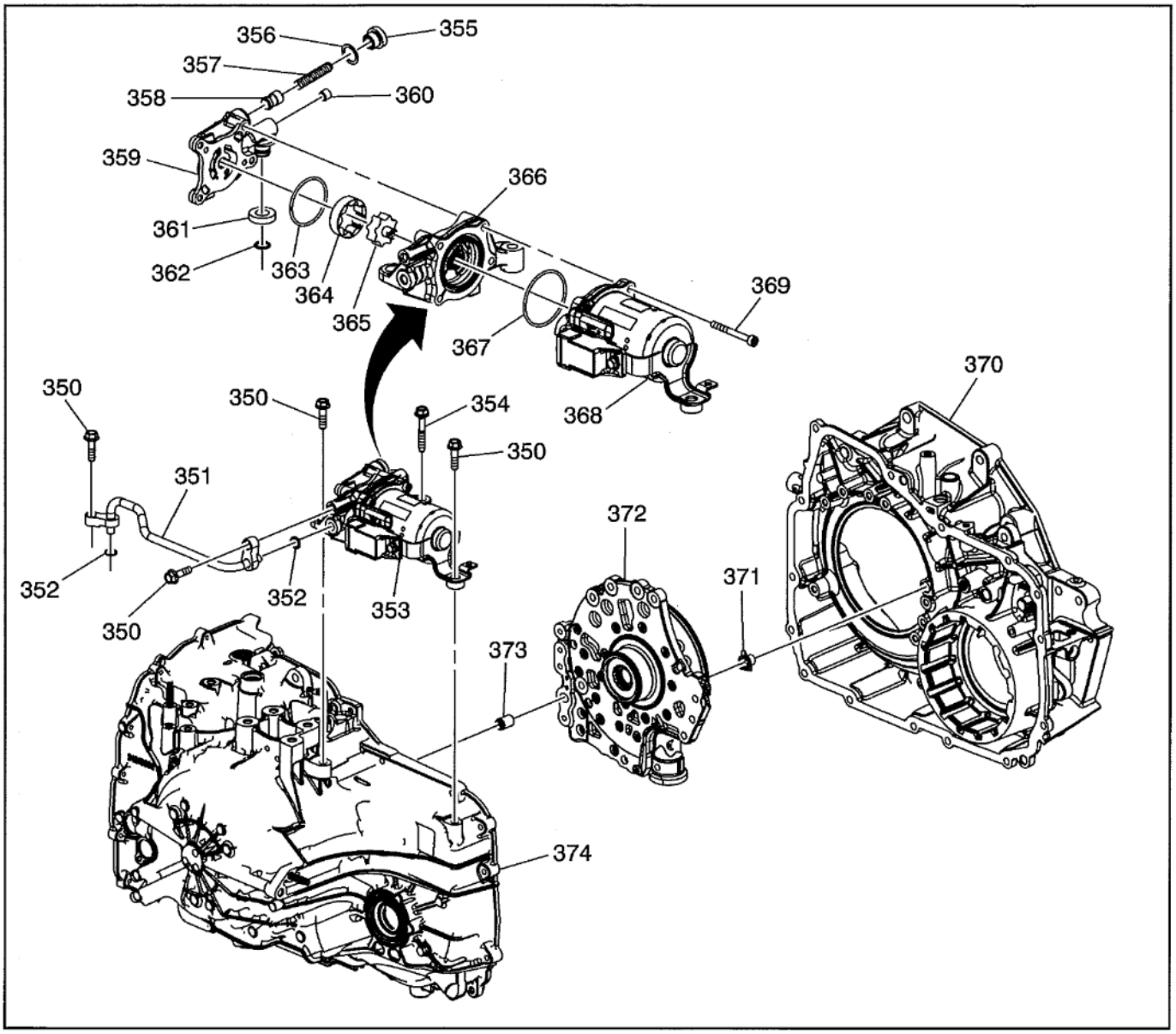


2552614

Legend

(300) Torque Converter Fluid Seal Retainer
(301) Torque Converter Fluid Seal Assembly
(302) A/Trans Fluid Pump Cover Bolt
(303) A/Trans Fluid Pump Body
(304) Pump Blowoff Ball Valve
(305) Pump Blowoff Valve Spring
(306) Pressure Regulator Valve Bore Plug Retainer
(307) Pressure Regulator Valve Bore Plug
(308) Pressure Regulator Valve Spring
(309) Pressure Regulator Valve
(310) Torque Converter Clutch Blowoff Ball Valve
(311) Torque Converter Clutch Blowoff Ball Valve Spring
(312) Torque Converter Clutch Control Valve
(313) Torque Converter Clutch Control Valve Spring
(314) Torque Converter Clutch Control Valve Spring Retainer
(315) A/Trans Fluid Pump Drive Gear
(316) A/Trans Fluid Pump Driven Gear
(318) A/Trans Fluid Pump Cover Assembly
(319) Torque Converter Fluid Seal Assembly

Auxiliary Fluid Pump and Hybrid Components – Hybrid Models

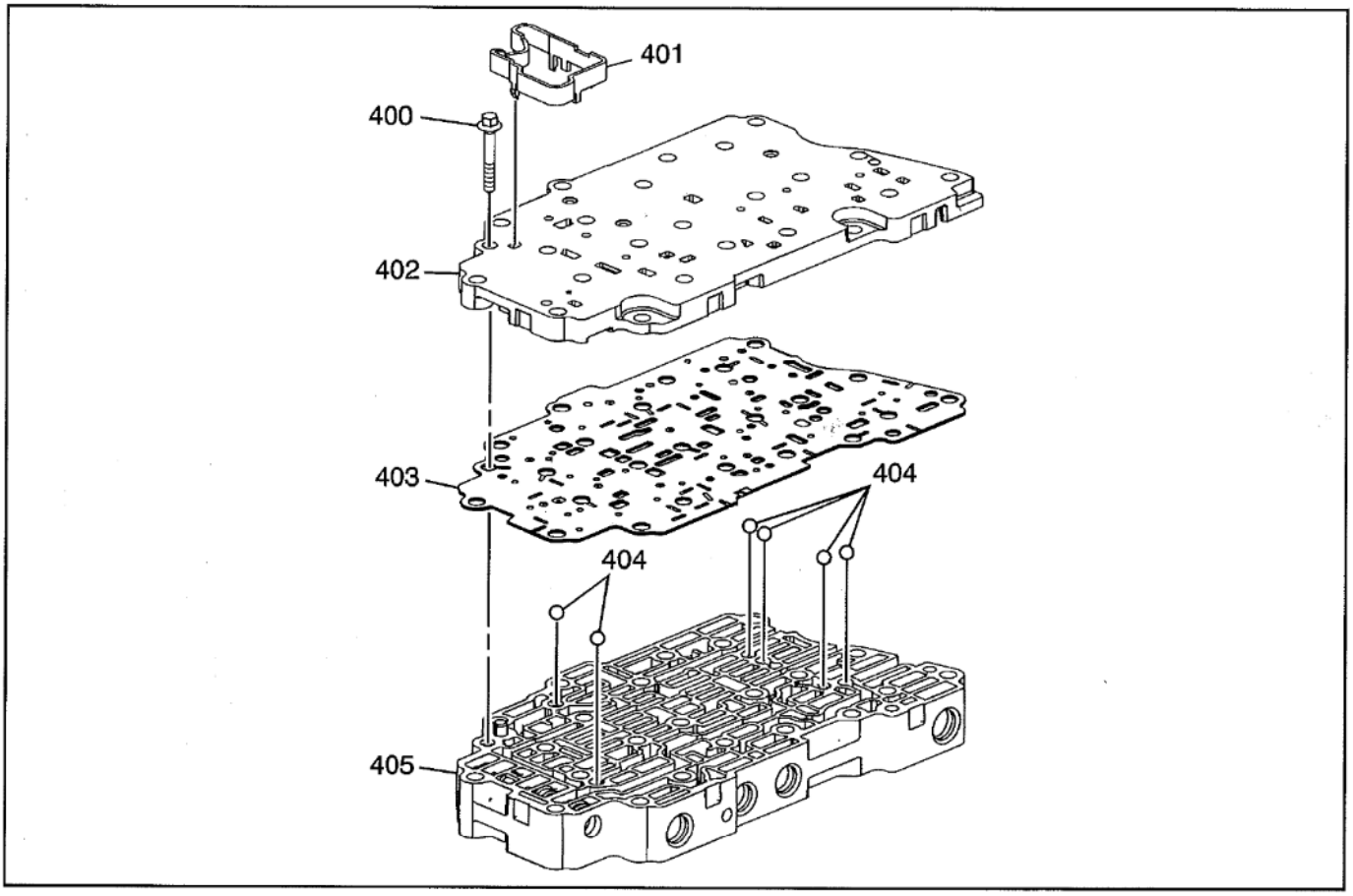


2552230

Legend

(350) A/Trans Auxiliary Fluid Pump Outlet Bolt (Qty: 4)
(351) A/Trans Auxiliary Fluid Pump Outlet Pipe Assembly
(352) A/Trans Auxiliary Fluid Pump Outlet Pipe Seal Assembly
(353) A/Trans Auxiliary Fluid Pump Assembly
(354) A/Trans Auxiliary Fluid Pump Bolt
(355) Pressure Regulator Valve Spring Retainer
(356) Pressure Regulator Valve Spring Spacer
(357) Pressure Regulator Valve Spring
(358) Pressure Regulator Valve
(359) A/Trans Auxiliary Fluid Pump Cover
(360) A/Trans Auxiliary Fluid Pump Cover Hole Plug
(361) A/Trans Auxiliary Fluid Pump Gasket
(362) A/Trans Auxiliary Fluid Pump Seal
(363) A/Trans Auxiliary Fluid Pump Cover Seal
(364) A/Trans Auxiliary Fluid Pump Outer Rotor
(365) A/Trans Auxiliary Fluid Pump Inner Rotor
(366) A/Trans Auxiliary Fluid Pump Body
(367) A/Trans Auxiliary Fluid Pump Motor Cover Seal – O-ring
(368) A/Trans Auxiliary Fluid Pump Motor Assembly
(369) A/Trans Auxiliary Fluid Pump (Pump to Motor) Bolt (Qty: 4)
(370) Torque Converter and Differential Housing
(371) A/Trans Auxiliary Fluid Inlet Pump Seal
(372) A/Trans Fluid Pump Assembly
(373) A/Trans Fluid Trough Check Ball
(374) A/Trans Case

Control Valve Body Assembly (1 of 2 – Gen 1)

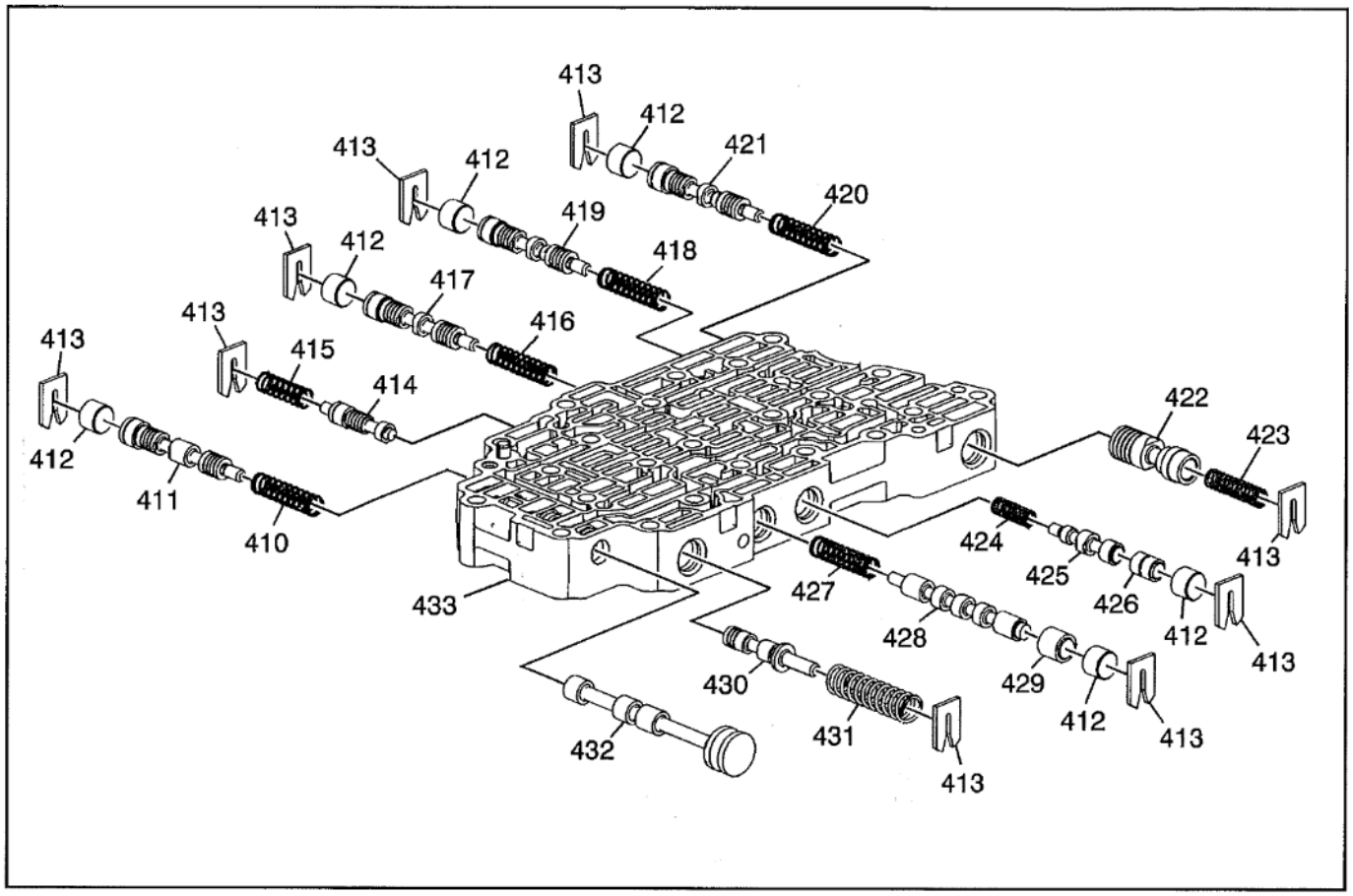


1891285

Legend

(400) Control Valve Body Bolt
(401) Control Solenoid Valve Support
(402) Valve Channel Plate
(403) Channel Plate to Valve Body Spacer Plate Assembly
(404) Control Valve Body Ball Check Valve
(405) Control Valve Body Assembly

Control Valve Body Assembly (2 of 2 – Gen 1)

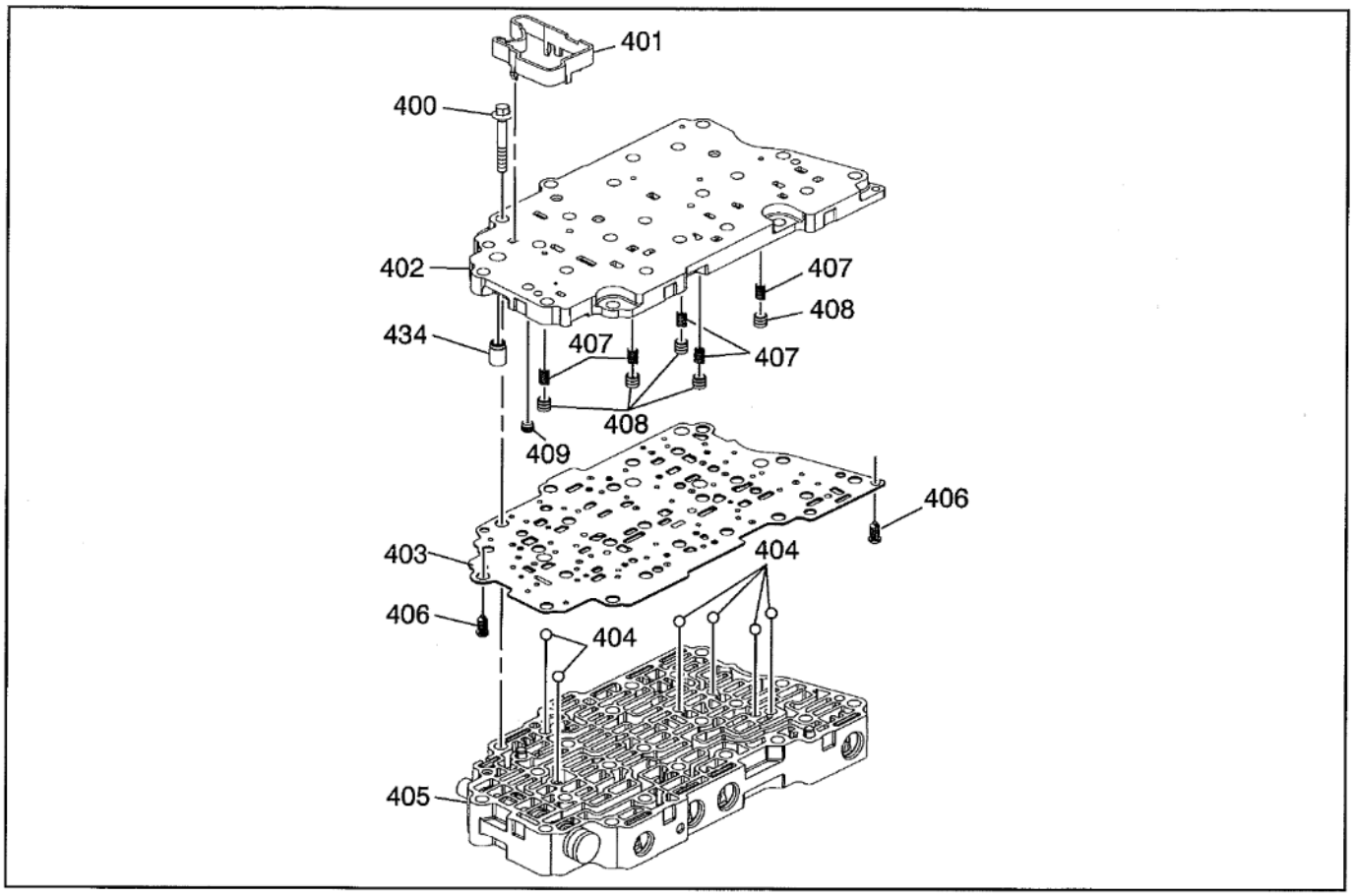


1891286

Legend

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

Control Valve Body Assembly (1 of 2 – Gen 2)

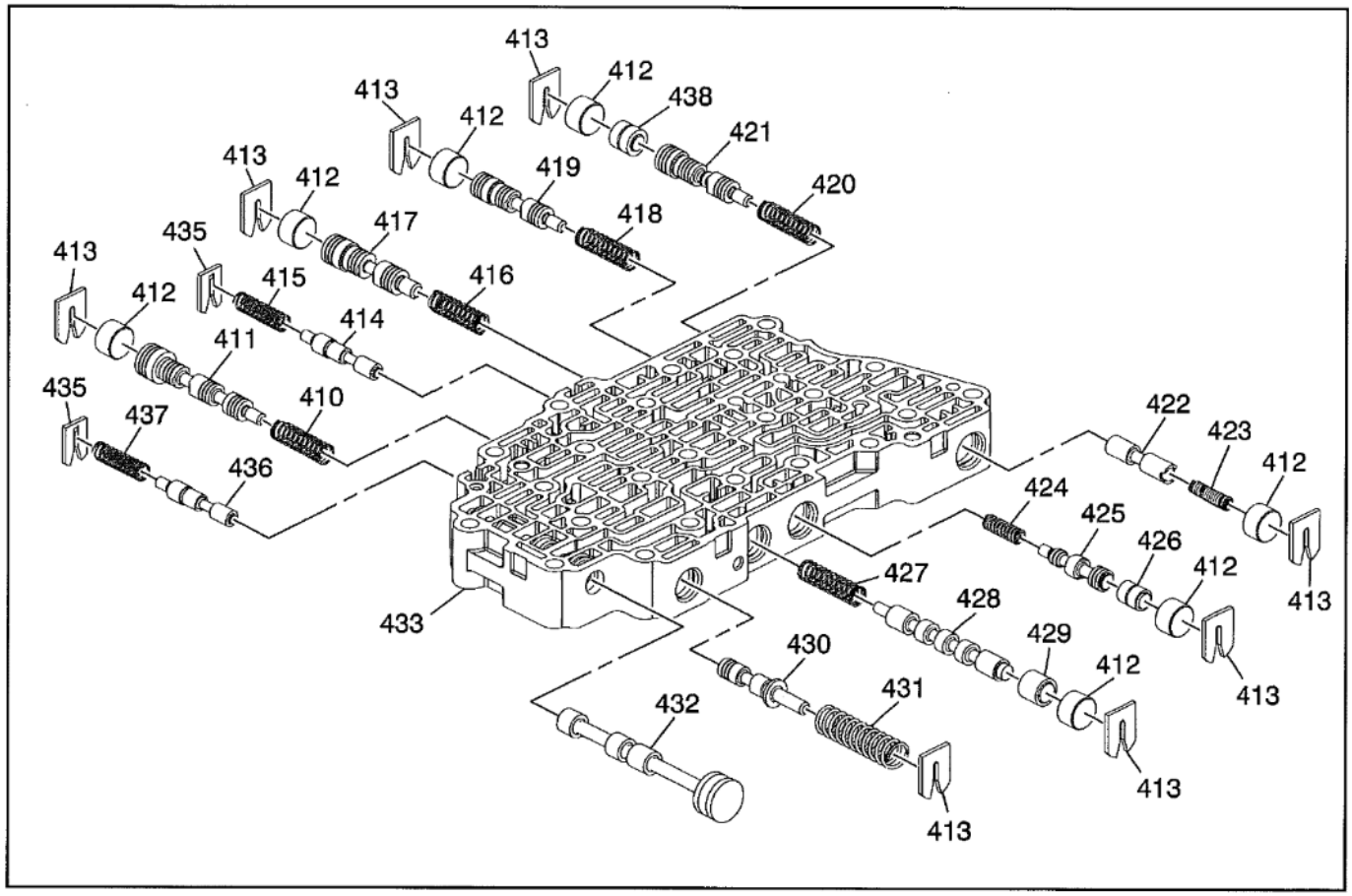


2552205

Legend

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

Control Valve Body Assembly (2 of 2 – Gen 2)

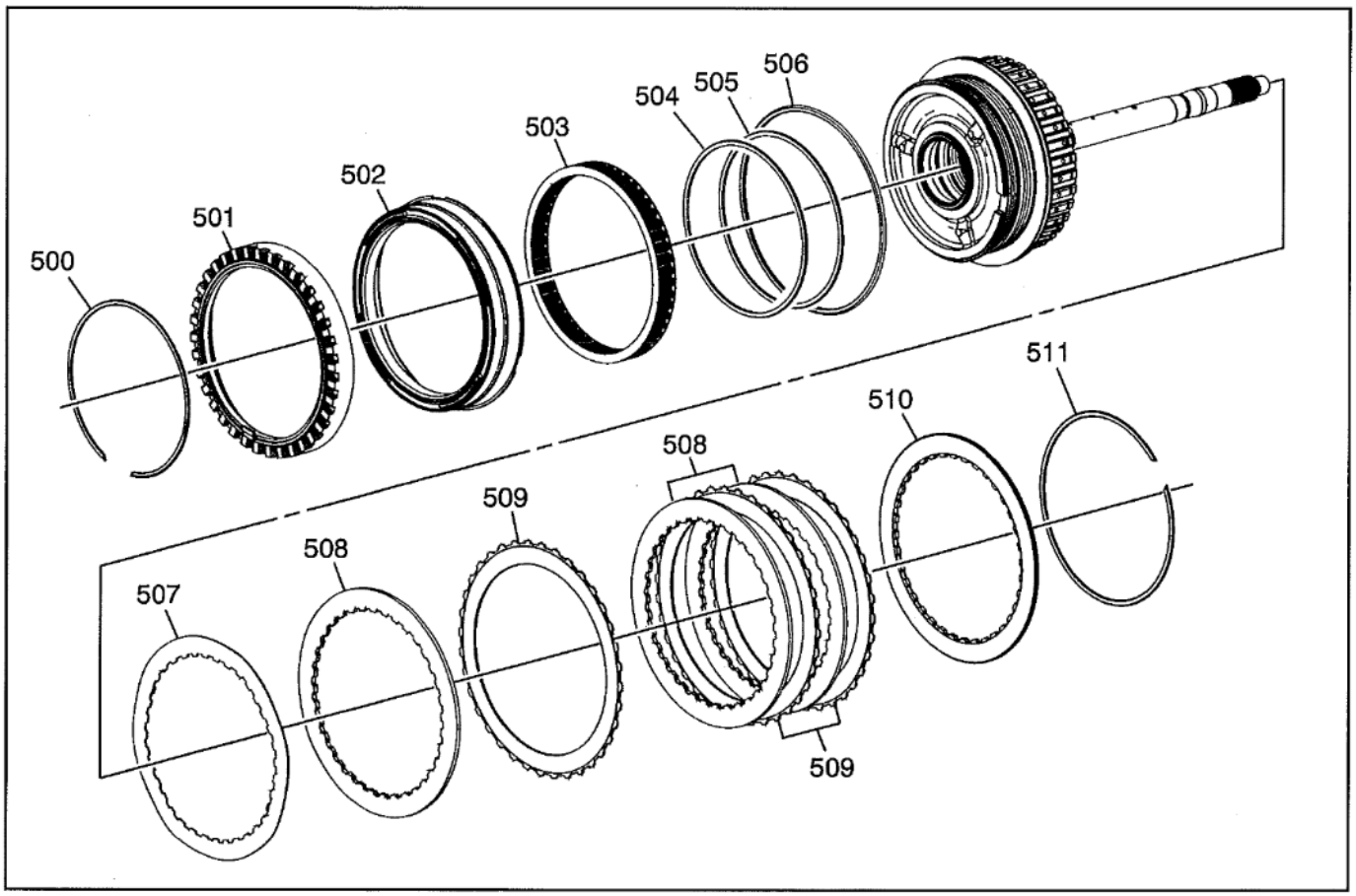


2552207

Legend

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

3–5 Reverse Clutch Assembly – Gen 1

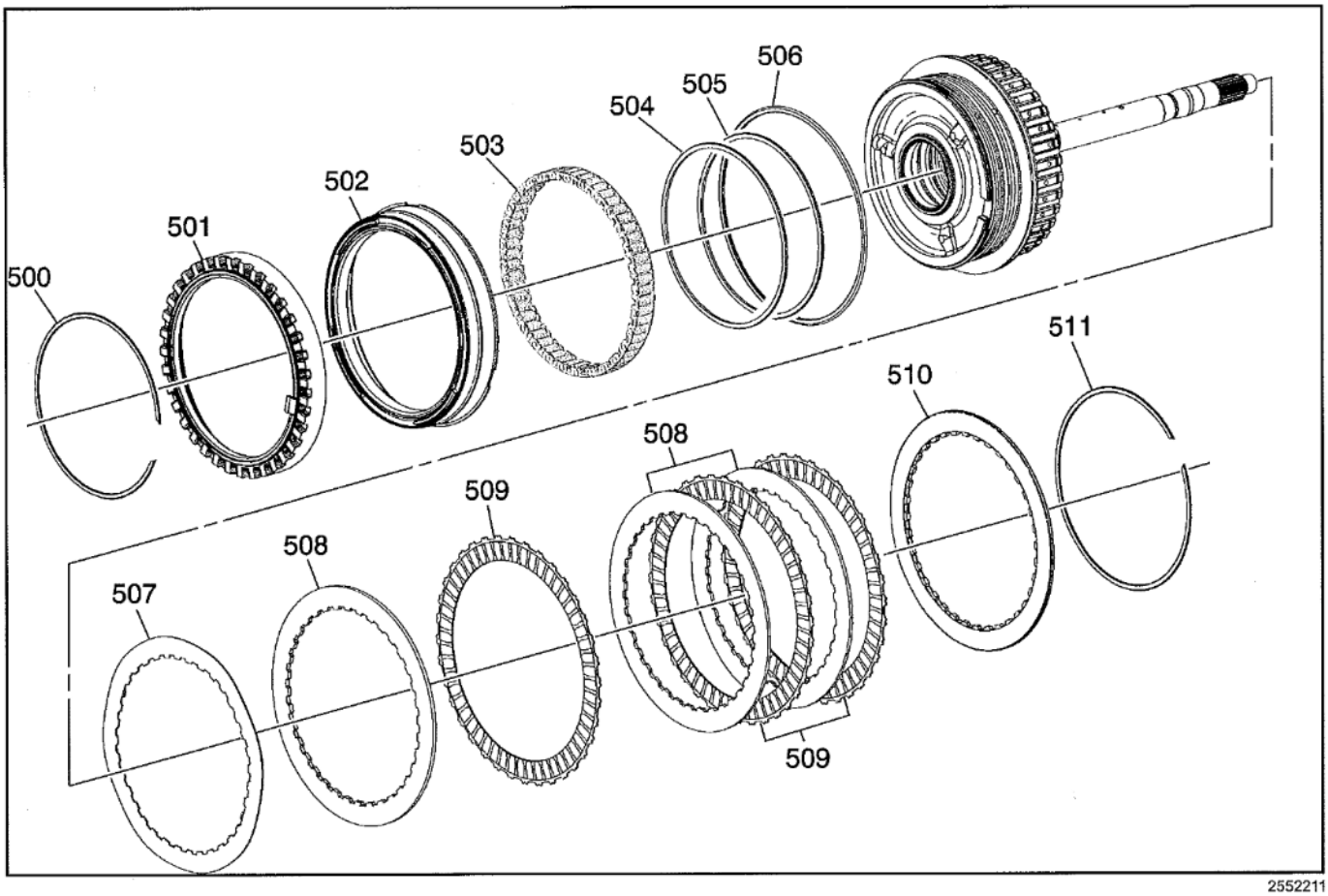


1891289

Legend

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

3–5 Reverse Clutch Assembly – Gen 2

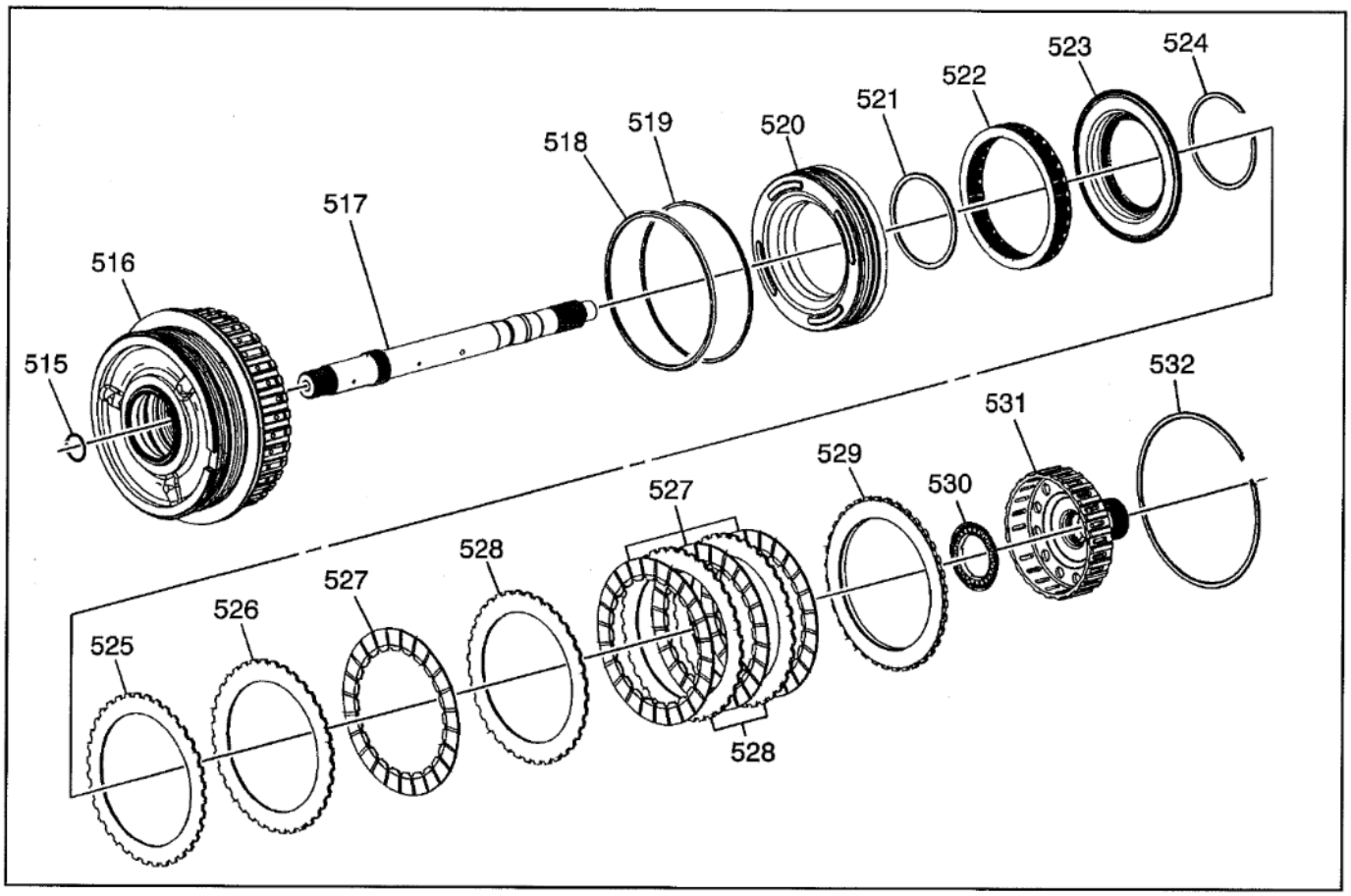


2552211

Legend

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

4–5–6 Clutch Assembly – Gen 1

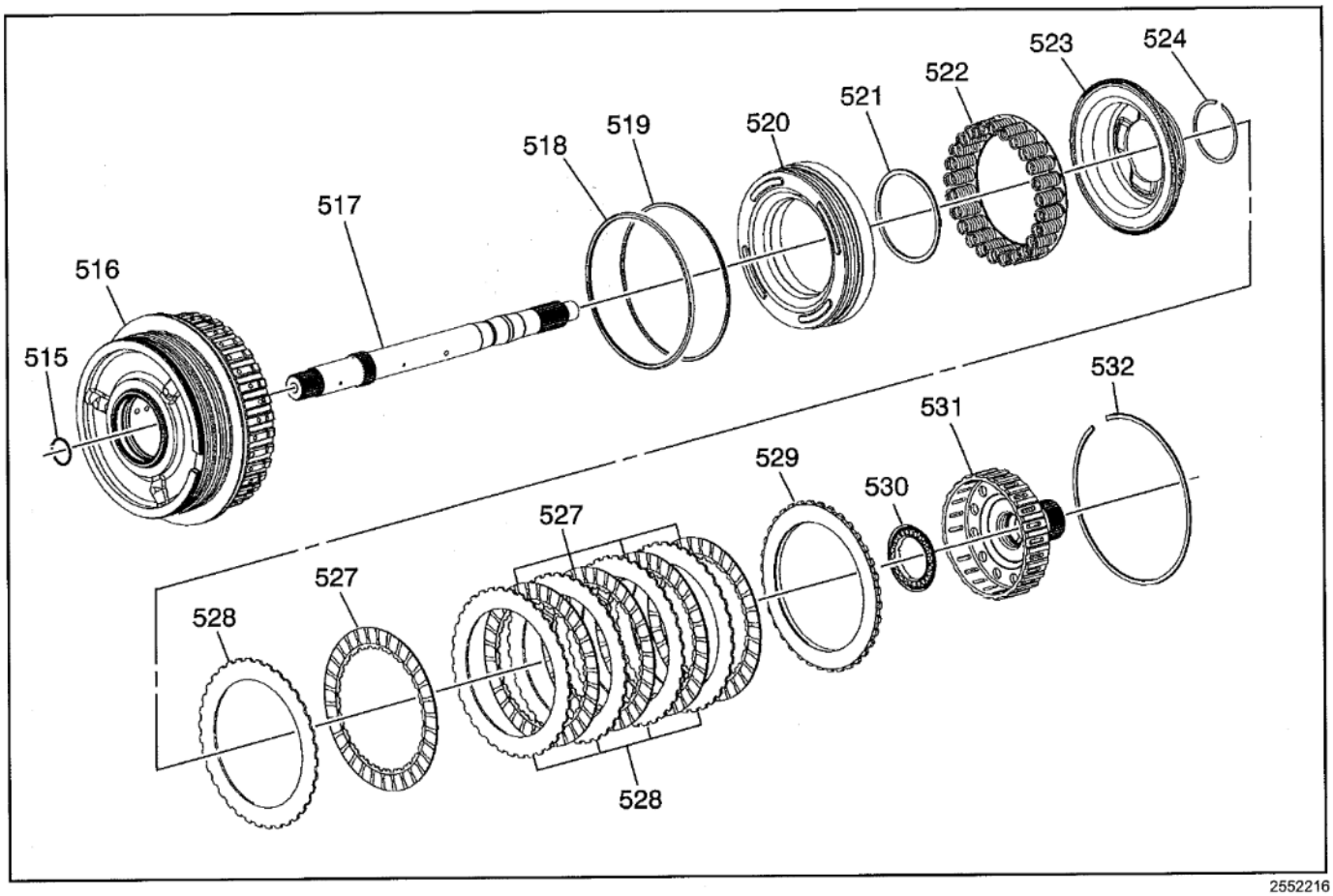


1891290

Legend

(515) Turbine Shaft Retainer Ring
(516) 3-5-Reverse and 4-5-6 Clutch Housing Assembly
(517) Turbine Shaft
(518) 4-5-6 Clutch Piston Outer Seal
(519) 4-5-6 Clutch Piston Outer Seal
(520) 4-5-6 Clutch Piston
(521) 4-5-6 Clutch Piston Inner Seal
(522) 4-5-6 Clutch Piston Return Spring Assembly
(523) 4-5-6 Clutch Piston Fluid Dam Assembly
(524) 4-5-6 Clutch Piston Fluid Dam Retainer Ring
(525) 4-5-6 Clutch (Waved) Plate
(526) 4-5-6 Clutch Apply Plate
(527) 4-5-6 Clutch (w/Friction Material) Plate Assembly
(528) 4-5-6 Clutch Plate
(529) 4-5-6 Clutch Backing Plate
(530) Reaction Carrier Hub Thrust Bearing Assembly
(531) Reaction Carrier Hub Assembly
(532) 4-5-6 Clutch Backing Plate Retainer Ring

4–5–6 Clutch Assembly – Gen 2

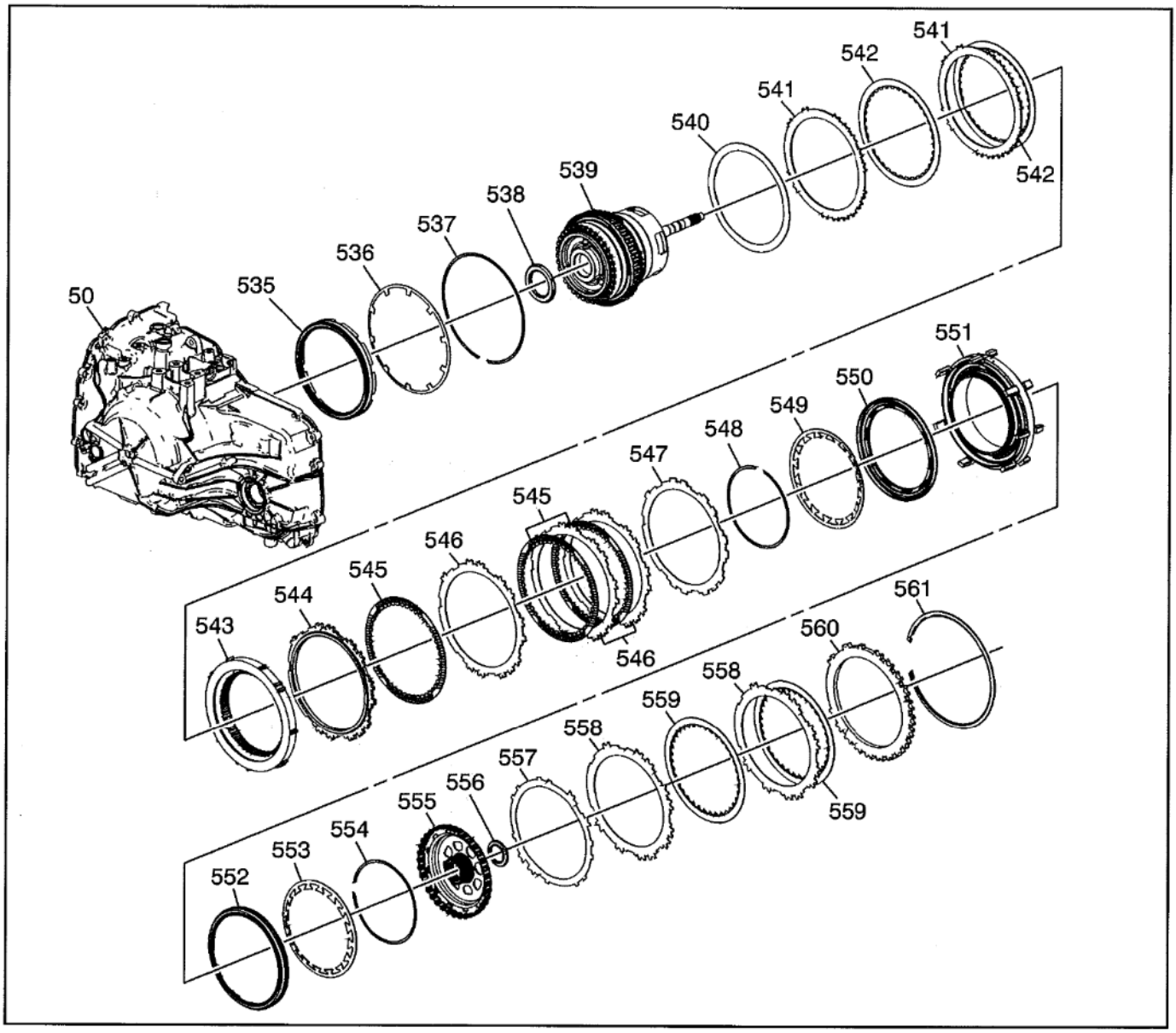


2552216

Legend

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

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



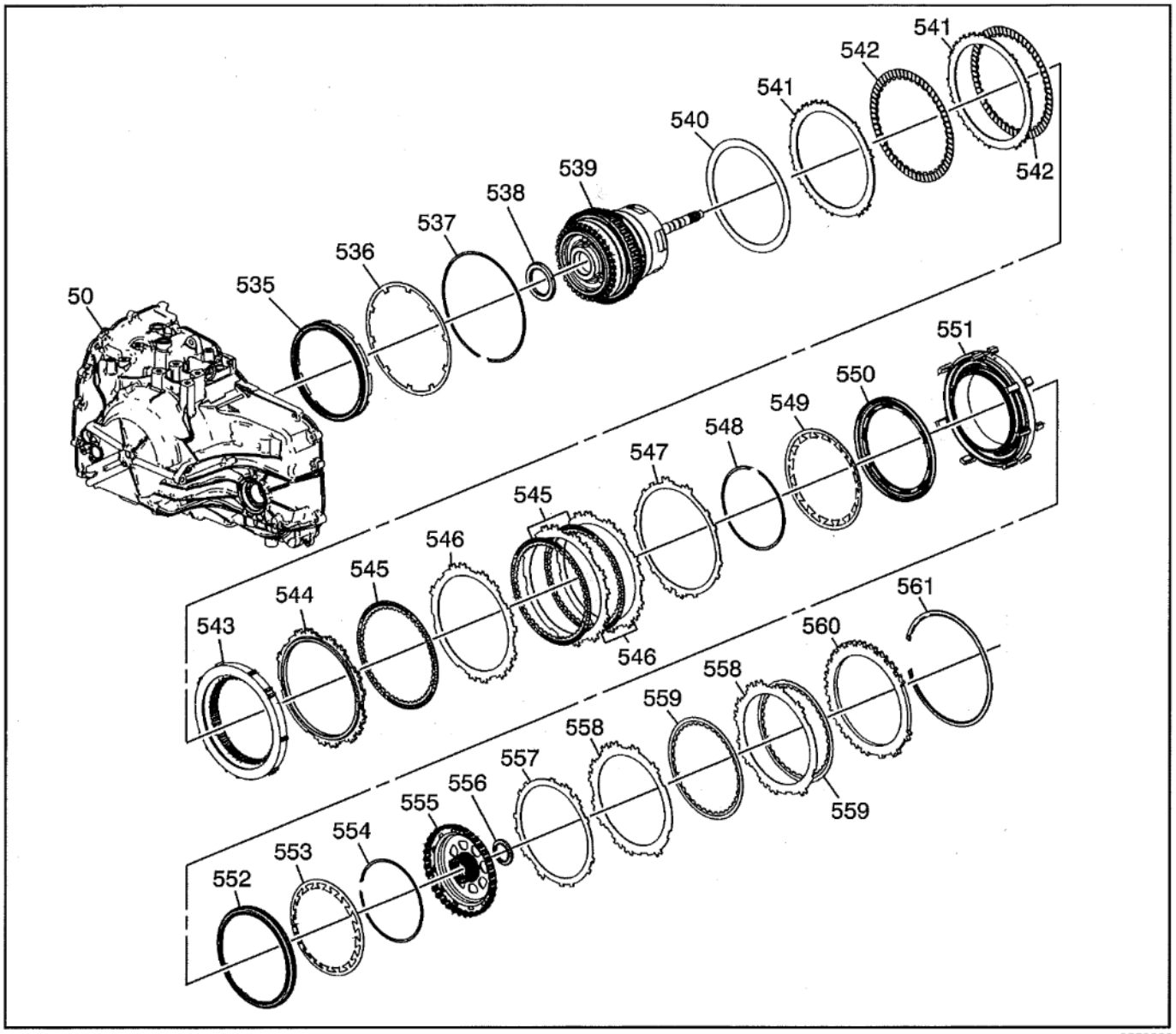
1891291

Legend

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

(561) 1-2-3-4 Clutch Backing Plate Retainer Ring

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



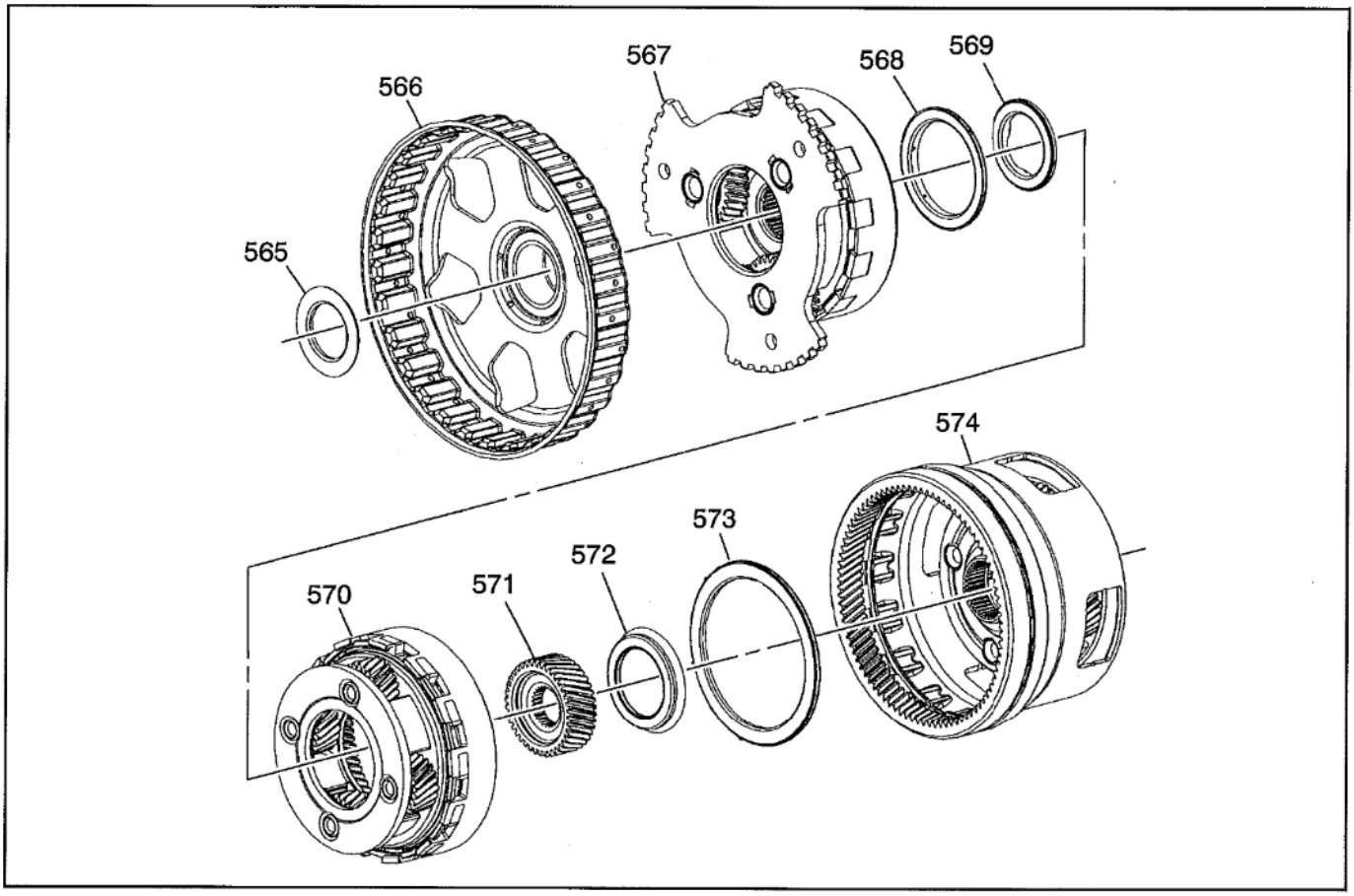
2552222

Legend

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

(559) 1-2-3-4 Clutch (w/Friction Material) Plate Assembly (Qty: 2)
(560) 1-2-3-4 Clutch Backing Plate
(561) 1-2-3-4 Clutch Backing Plate Retainer Ring

Input, Output and Reaction Gearsets– 6T30/6T40

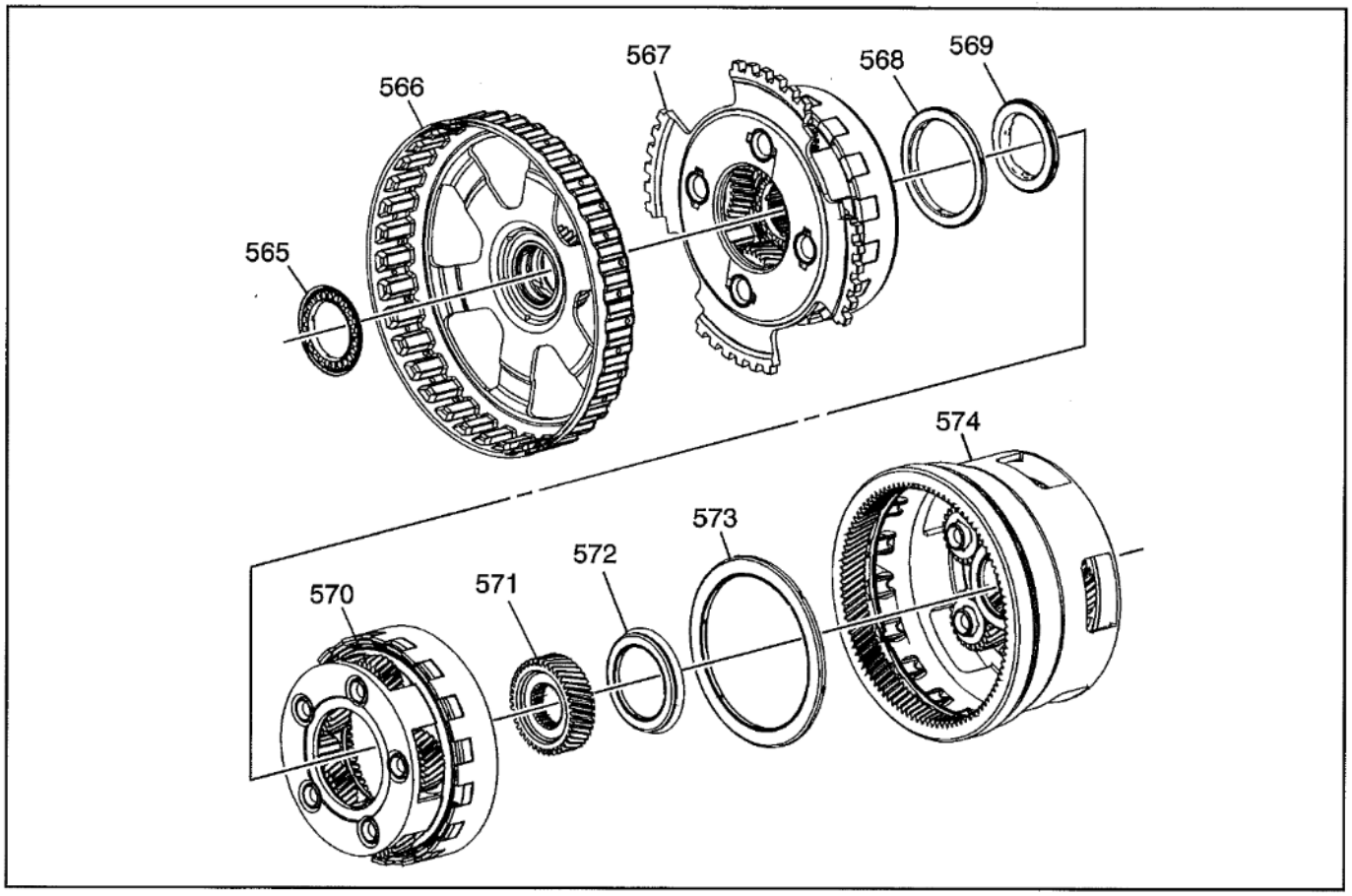


2395536

Legend

(565) Reaction Sun Gear Thrust Bearing Assembly
(566) Reaction Sun Gear Assembly
(567) Reaction Carrier Assembly
(568) Input Carrier Thrust Bearing Assembly
(569) Input Sun Gear Thrust Bearing Assembly
(570) Input Carrier Assembly
(571) Input Sun Gear
(572) Input Sun Gear Thrust Bearing Assembly
(573) Output Carrier Thrust Bearing Assembly
(574) Output Carrier Assembly

Input, Output and Reaction Gearsets– 6T45/6T50

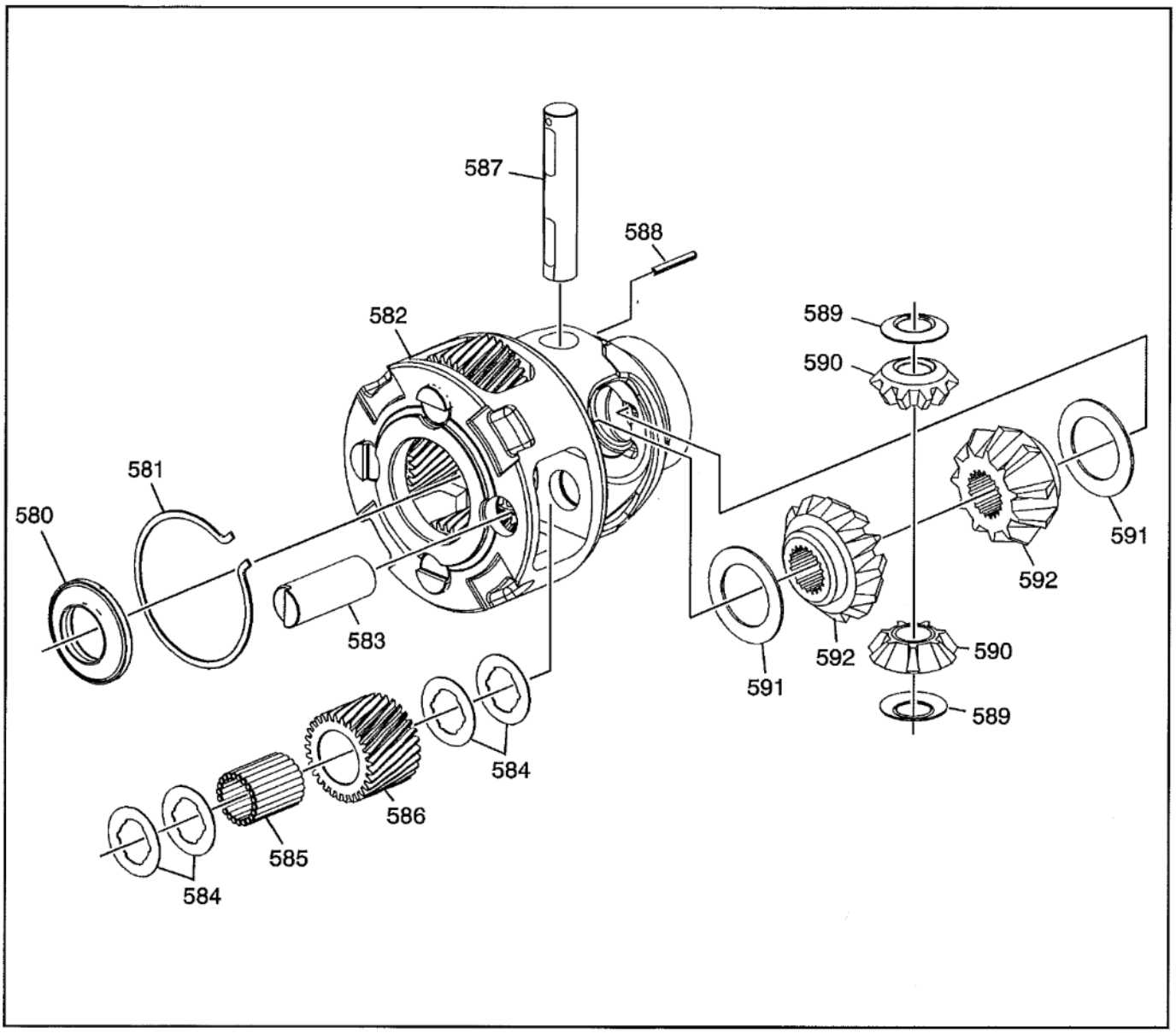


1891293

Legend

(565) Reaction Sun Gear Thrust Bearing Assembly
(566) Reaction Sun Gear Assembly
(567) Reaction Carrier Assembly
(568) Input Carrier Thrust Bearing Assembly
(569) Input Sun Gear Thrust Bearing Assembly
(570) Input Carrier Assembly
(571) Input Sun Gear
(572) Input Sun Gear Thrust Bearing Assembly
(573) Output Carrier Thrust Bearing Assembly
(574) Output Carrier Assembly

Front Differential Carrier Assembly (2 Pinion)

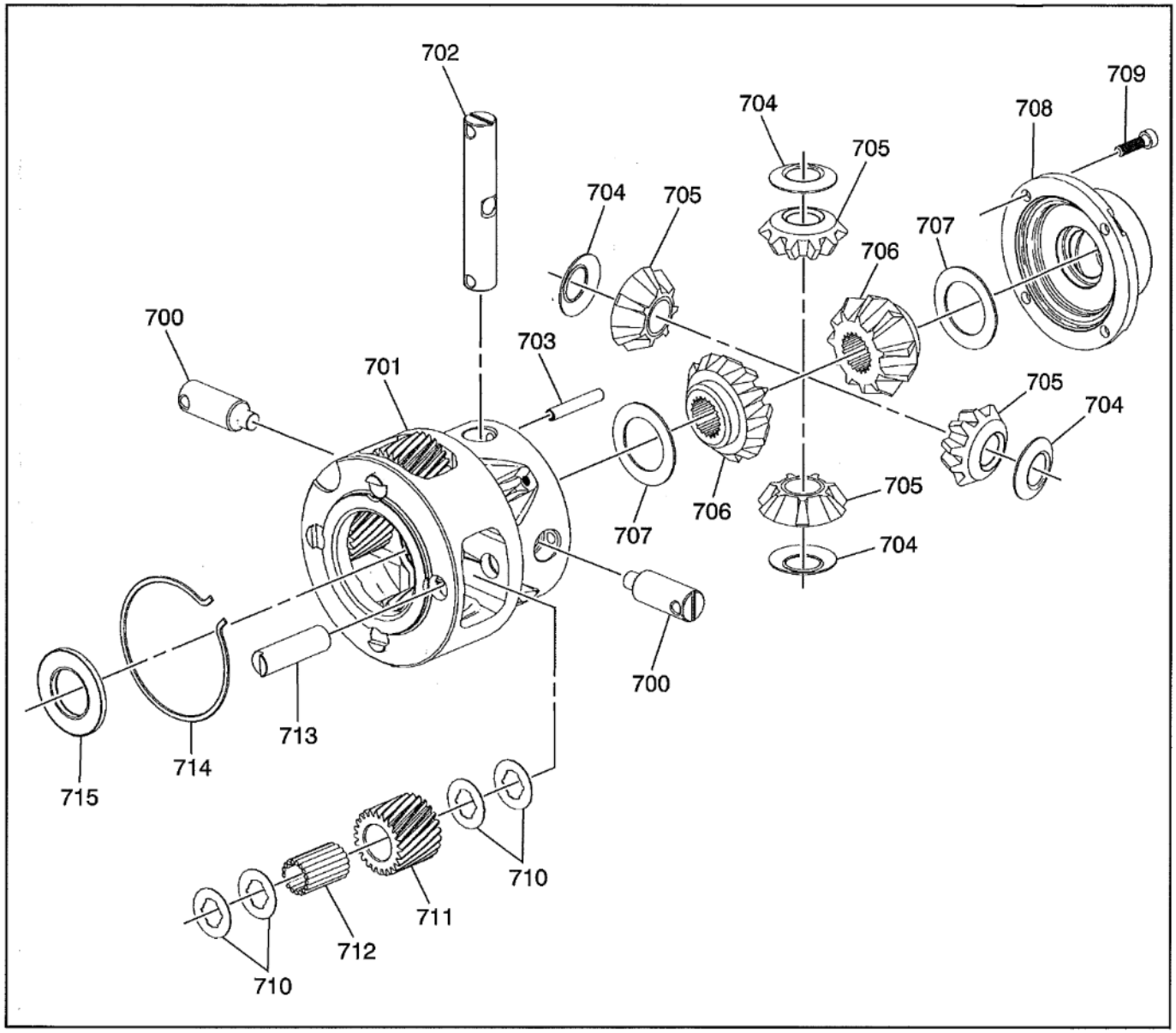


1891295

Legend

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

Front Differential Carrier Assembly (4 Pinion)

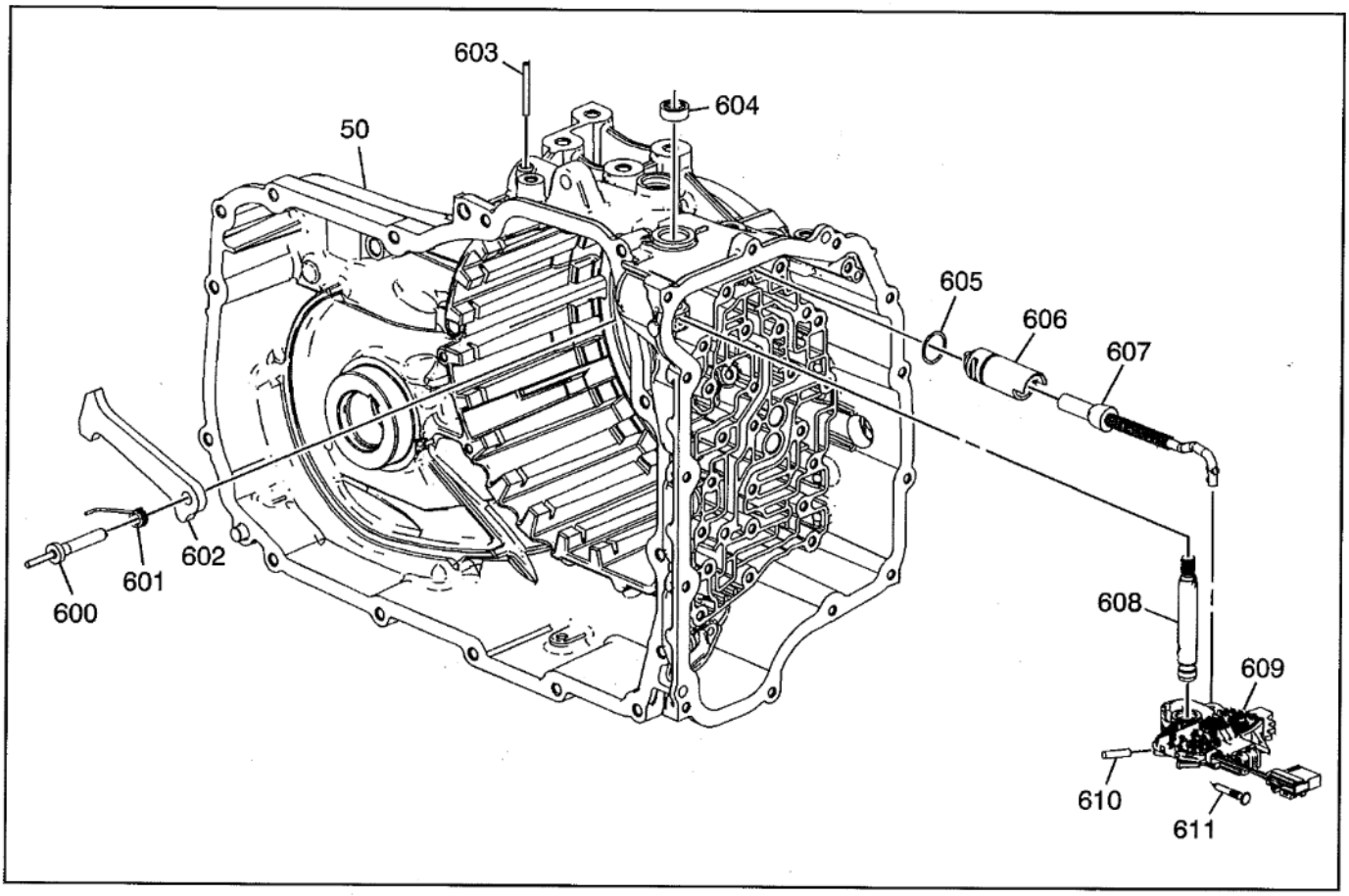


2369197

Legend

(700) Front Differential Pinion Gear Shaft
(701) Differential Carrier Assembly
(702) Front Differential Pinion Gear Shaft
(703) Front Differential Pinion Gear Shaft
(704) Front Differential Pinion Thrust Washer
(705) Front Differential Pinion Gear
(706) Front Differential Side Gear
(707) Front Differential Side Gear Thrust Washer
(708) Front Differential Carrier Cover
(709) Front Differential Carrier Cover Bolts
(710) Front Differential Pinion Gear Shaft Washer
(711) Front Differential Drive Pinion Gear
(712) Front Differential Carrier Pinion Gear Bearing Rollers
(713) Front Differential Pinion Gear Shaft Pin
(714) Front Differential Pinion Gear Shaft Retainer
(715) Front Differential Bearing

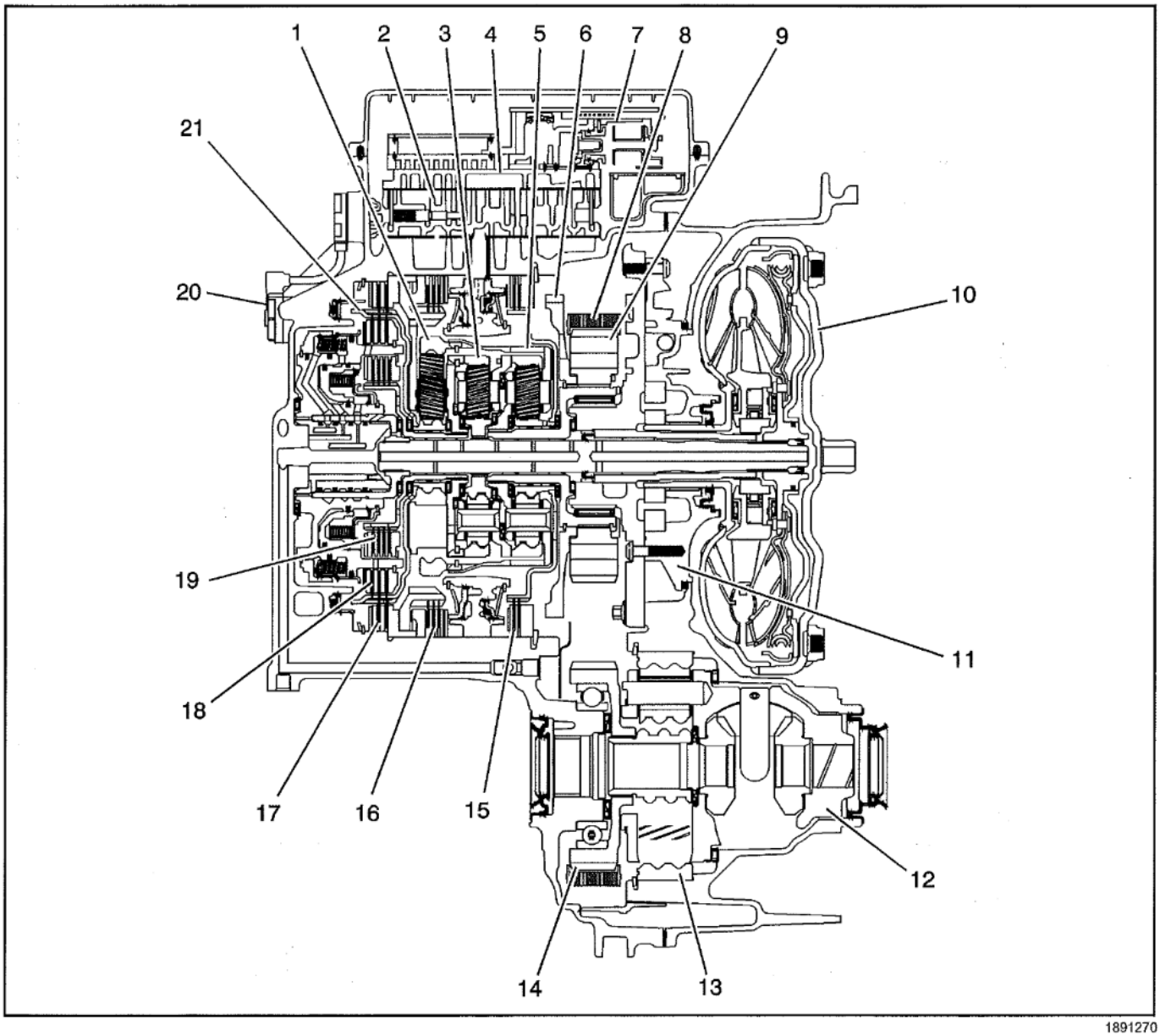
Park System Components



Legend

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

Component Location

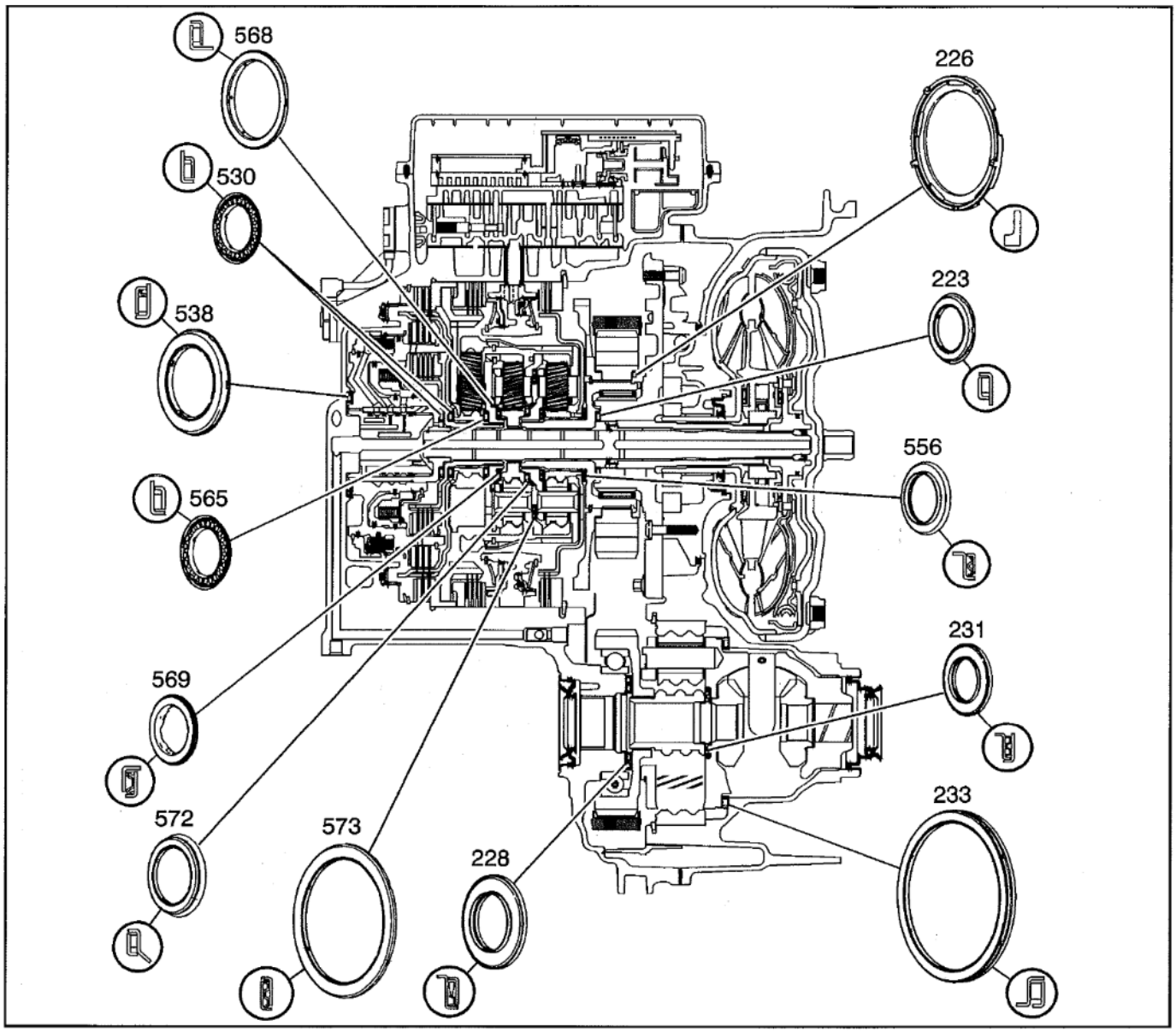


1891270

Legend

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

Bushing, Bearing, and Washer Locations (Gen 1)

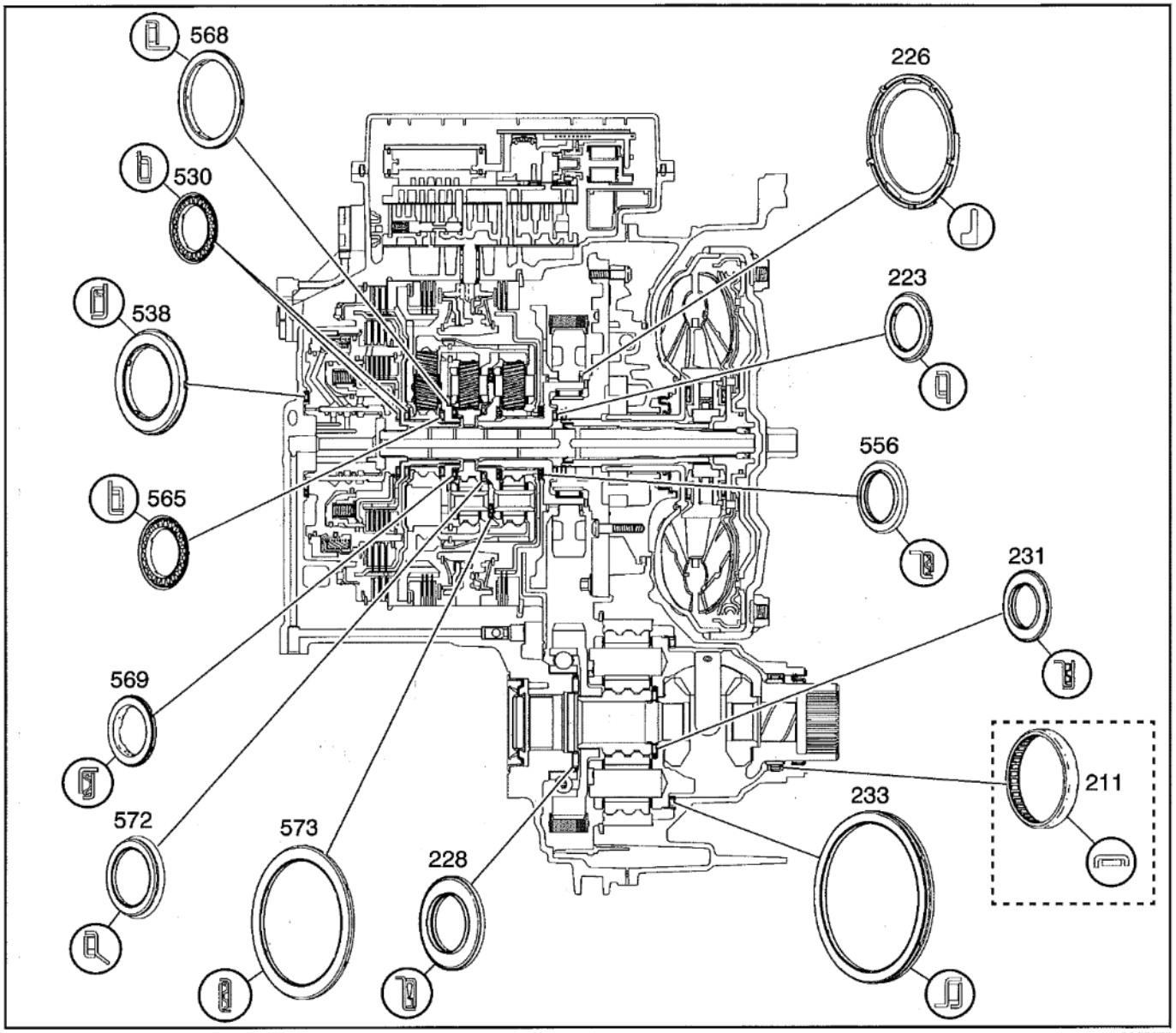


1891271

Legend

(223) Drive Spocket Bearing Assembly
(226) Drive Sprocket Thrust Washer
(228) Drive Sprocket Bearing Assembly
(231) Differential Sun Gear to Differential Housing Bearing Assembly
(233) Front Differential Carrier Bearing Assembly
(530) Reaction Carrier Hub Thrust Bearing Assembly
(538) 3–5–Reverse and 4–5–6 Clutch Housing Thrust Bearing
(556) Output Sun Thrust Bearing Assembly
(565) Reaction Sun Gear Thrust Bearing Assembly
(568) Input Carrier Thrust Bearing Assembly
(569) Input Sun Gear Thrust Bearing Assembly
(572) Input Sun Gear Thrust Bearing Assembly
(573) Output Carrier Thrust Bearing Assembly

Bushing, Bearing, and Washer Locations (Gen 2)



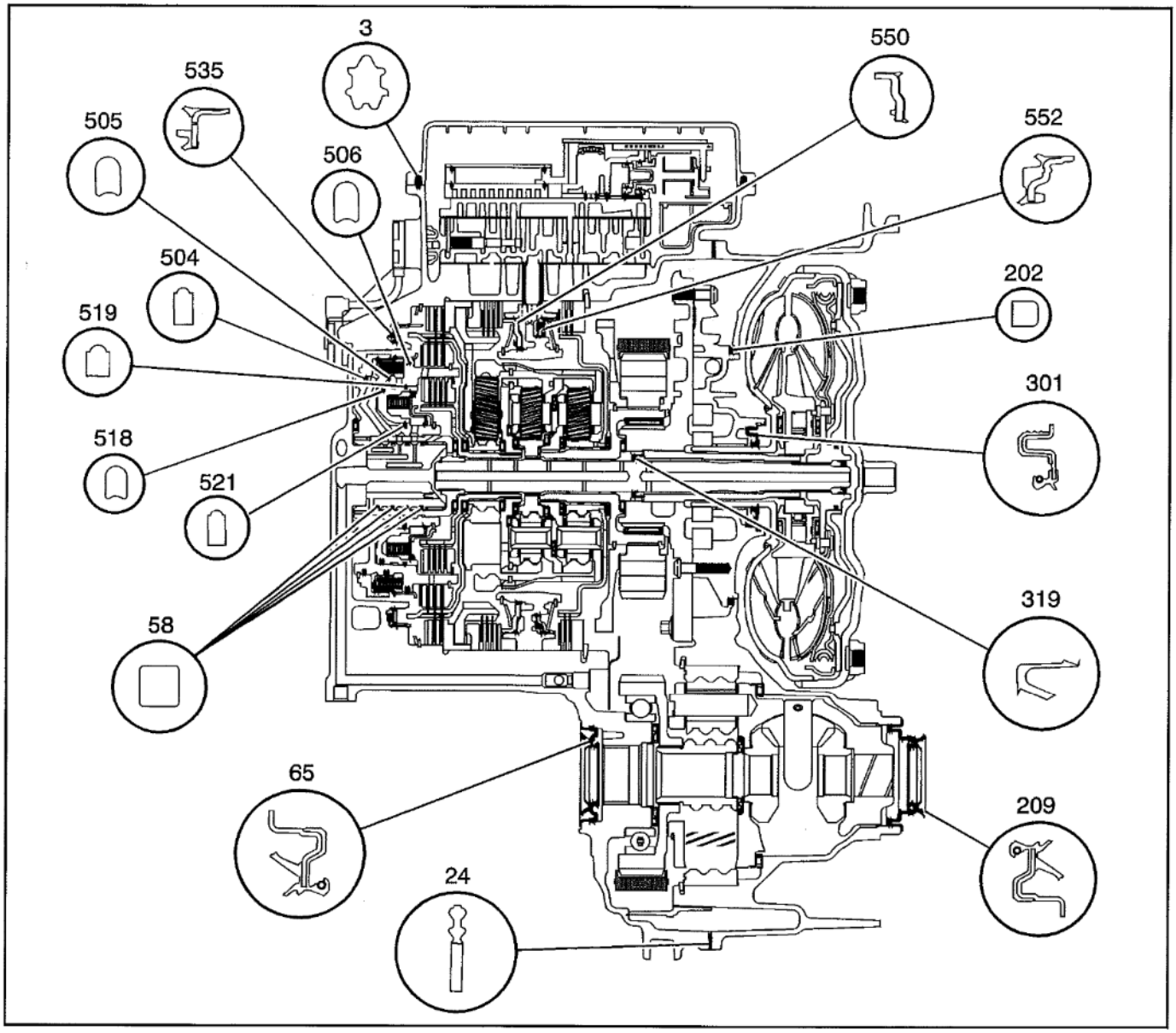
2608978

Legend

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

Seal Locations (Gen 1)

Seal Locations (1 of 2)

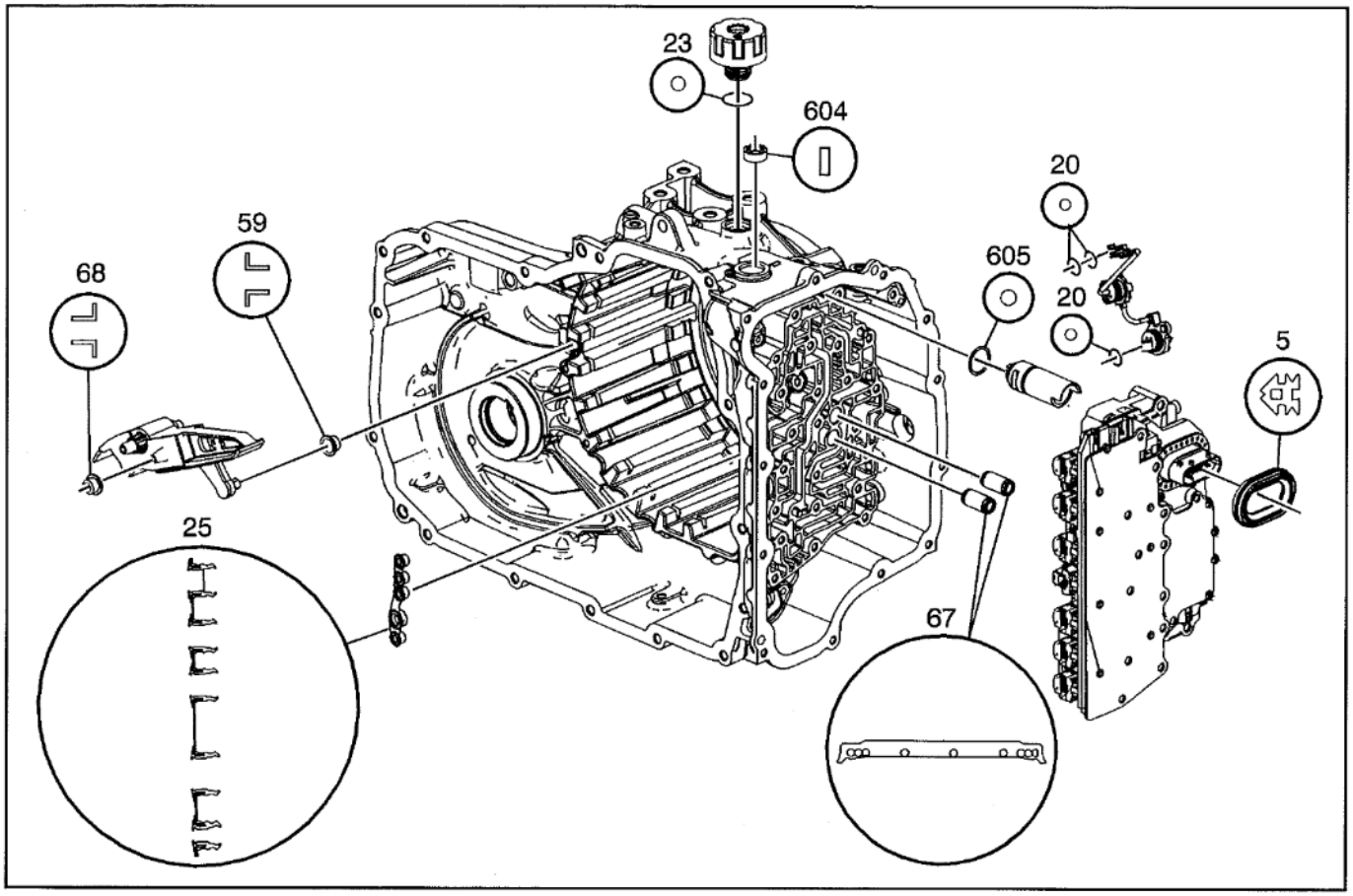


1891273

Legend

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

Seal Locations (2 of 2)

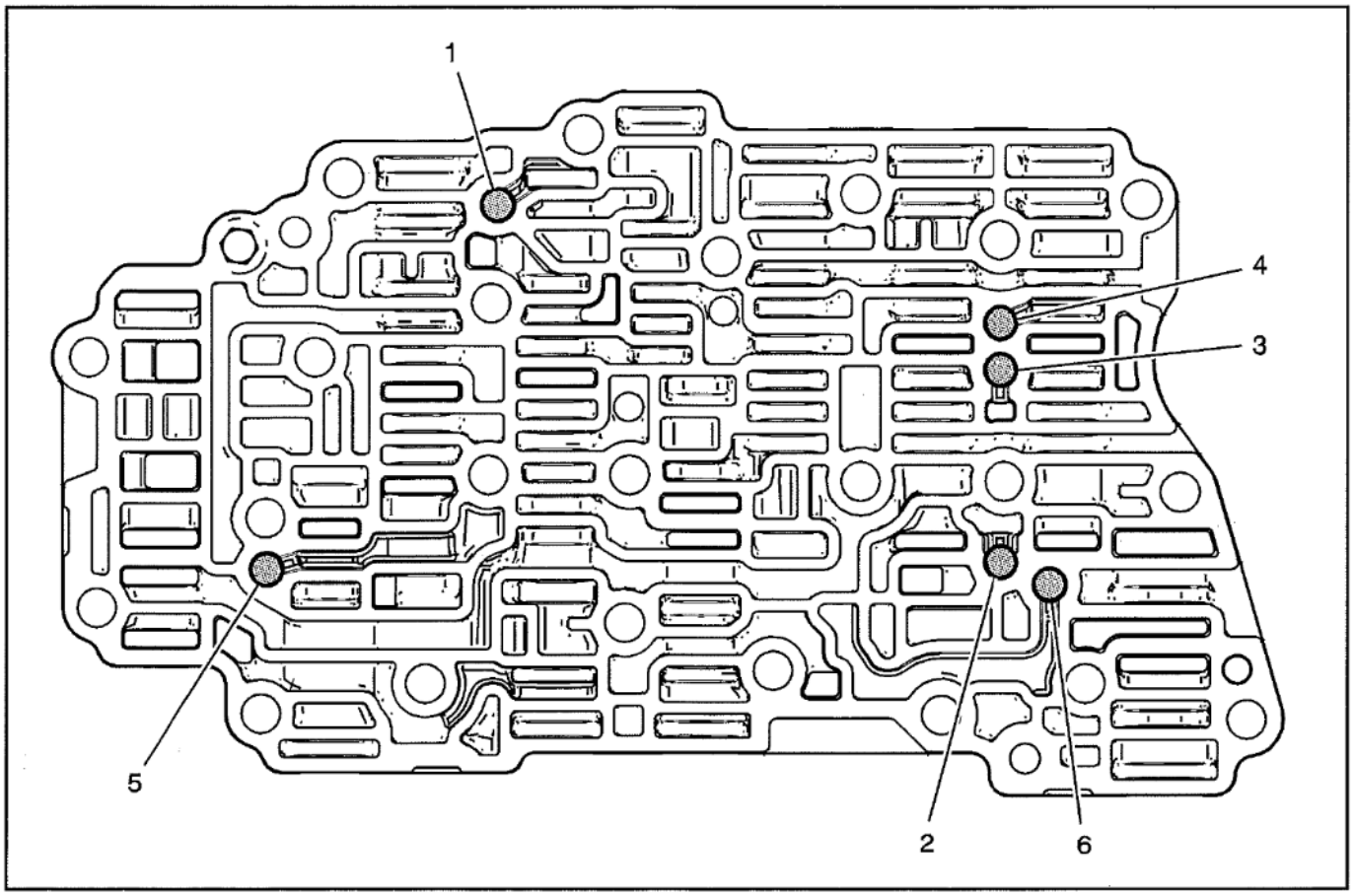


1891274

Legend

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

Ball Check Valve Locations (Gen 1)

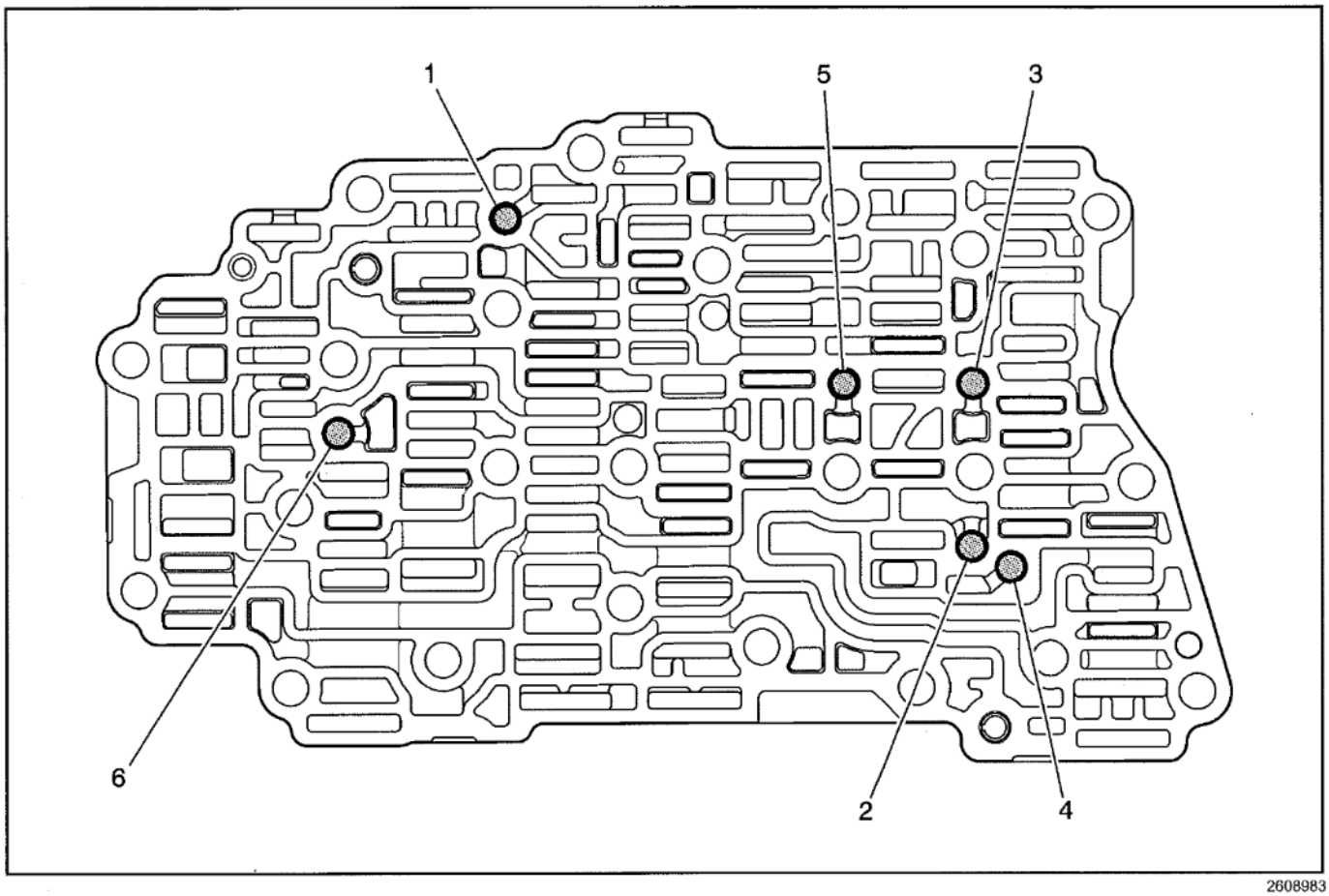


1891275

Ball Check Valve Locations (Gen 1)

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

Ball Check Valve Locations (Gen 2)



2608983

Ball Check Valve Locations (Gen 2)

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

Diagnostic Information and Procedures

DTC P057B-P057D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P057B: Brake Pedal Position Sensor Performance
DTC P057C: Brake Pedal Position Sensor Circuit Low Voltage
DTC P057D: Brake Pedal Position Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P057C	P057C	P057D	P057B
5 V Reference	P057C P0651	P057C	P0651	—
Low Reference	—	P057D	P057D	—

Typical Scan Tool Data

Brake Pedal Position Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON. **Brake Pedal Position Sensor Parameter Normal Range:** 0.25–4.75 V			
5 V Reference	0 V	0 V	—
Signal	0 V	0 V	5 V
Low Reference	—	5 V	—

Circuit/System Description

The brake pedal position (BPP) sensor is part of the engine brake pedal override feature. The engine control module (ECM) continuously monitors the vehicle speed and the position of the brake pedal. These two main inputs, along with other ECM inputs are used to determine if the vehicle is decelerating at the proper speed and rate with the brake pedal applied. When the engine brake pedal override system is active, the ECM reduces engine torque to assist in reducing vehicle speed.

The BPP sensor is a six wire sensor, and is part of a dual brake position sensor. One BPP Sensor is used for the stop lamps and the other BPP Sensor is used for the engine brake pedal override feature. The BPP Sensor for engine brake pedal override communicates with the ECM. The ECM supplies a 5 V reference circuit, low reference circuit, and signal circuit to the BPP sensor. The BPP sensor sends a voltage signal to the ECM on the signal circuit. The voltage on the signal circuit will vary from a voltage greater than 0.25 V when the brake pedal is released to a voltage less than 4.75 V when the brake pedal is fully applied.

For information on the Stop Lamps side of the BPP Sensor, refer to *Exterior Lighting Systems Description and Operation on page 4-217*.

Conditions for Running the DTC

- Ignition voltage is greater than 10 V.
- DTC runs continuously when above condition is met.

Conditions for Setting the DTC

P057B

ECM detects the BPP sensor signal is stuck in a range.

P057C

ECM detects the BPP sensor voltage is less than 0.25 V for 1 s.

P057D

ECM detects the BPP sensor voltage is greater than 4.75 V for 1 s.

Action Taken When the DTC Sets

- P057B, P057C, and P057D are Type A DTCs.
- Engine torque is reduced to 50% of available engine torque during brake torque management.
- Brake torque management is active at 25 kPa (3.7 PSI) of brake apply pressure.

Conditions for Clearing the DTC

P057B, P057C, and P057D are Type A DTCs

Reference Information

Schematic Reference

- *Exterior Lights Schematics on page 4-85*

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Verify DTC P0641, P0651, P0697, or P06A3 is not set.

⇒ **If any of the DTCs are set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If none of the DTCs are set**

2. Ignition ON, transmission in Park, and service brake pedal released.
3. Verify the scan tool Brake Pedal Position Sensor parameter in the ECM displays greater than 0.25 V.

⇒ **If 0.25 V or less**

Refer to Circuit/System Testing.

⇓ **If greater than 0.25 V**

4. Verify the scan tool Brake Pedal Position Sensor parameter voltage changes as the brake pedal is applied and displays less than 4.75 V when the brake pedal is fully applied.

⇒ **If the voltage does not change, or is greater than 4.74 V**

Refer to Circuit/System Testing.

⇓ **If the voltage changes and less than 4.75 V**

5. Verify the scan tool Brake Pedal Position Sensor Learned Release Position parameter is within 0.1 V of the Brake Pedal Position Sensor parameter when the brake pedal is fully released.

⇒ **If difference is greater than 0.1 V**

Perform the *Brake Pedal Position Sensor Learn on page 17-164*.

⇓ **If difference is 0.1 V or less**

6. Verify the Brake Pedal Position Sensor parameter transitions smoothly without any spikes or dropouts when slowly applying and releasing the brake pedal.

⇒ **If parameter does not transition smoothly or has spikes or dropouts**

Refer to Circuit/System Testing.

⇓ **If parameter transitions smoothly and there are no spikes or dropouts**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B22 Brake Pedal Position Sensor. It may take up to 2 minutes for all vehicle systems to power down.

Note: All terminal references are for the vehicle harness brake pedal position sensor connector.

2. Test for less than 10 Ω between the low reference circuit terminal 6 and ground.

⇒ **If 10 Ω or greater**

2.1. Disconnect the harness connector at the K20 Engine Control Module.

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

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

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇓ **If less than 10 Ω**

3. Ignition ON.

4. Test for 4.8–5.2 V between the 5 V reference circuit terminal 5 and ground.

⇒ **If less than 4.8 V**

4.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

4.2. Test for infinite resistance between the 5 V reference circuit and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance.

4.3. Test for less than 2 Ω in the 5 V reference circuit end to end.

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

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇒ **If greater than 5.2 V**

4.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

4.2. Test for less than 1 V between the 5 V reference circuit and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K20 Engine Control Module.

⇓ **If between 4.8–5.2 V**

5. Verify the scan tool Brake Pedal Position Sensor parameter is less than 0.25 V.

⇒ **If 0.25 V or greater**

5.1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module, ignition ON.

5.2. Test for less than 0.25 V between the signal circuit terminal 4 and ground.

⇒ If 0.25 V or greater, repair the short to voltage on the circuit.

⇒ If less than 0.25 V, replace the K20 Engine Control Module.

⇓ **If less than 0.25 V**

6. Install a 3 A fused jumper wire between the signal circuit terminal 4 and the 5 V reference circuit terminal 5.

7. Verify the scan tool Brake Pedal Position Sensor parameter is greater than 4.8 V.

⇒ **If 4.8 V or less**

7.1. Ignition OFF, remove the jumper wire, and disconnect the harness connector at the K20 Engine Control Module.

7.2. Test for infinite resistance between the signal circuit terminal 4 and ground.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇓ If infinite resistance.

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

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

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇓ **If greater than 4.8 V**

8. Replace the B22 Brake Pedal Position Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Brake Pedal Position Sensor Replacement on page 4-186*
- Perform the *Brake Pedal Position Sensor Learn on page 17-164* following the replacement of the ECM or BPP sensor, or any repair that effects the BPP sensor alignment.
- *Control Module References on page 6-3* for Engine Control Module replacement, programming and setup.

DTC P0601, P0603, P0604, or P062F

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

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

DTC P0601: Control Module Read Only Memory Performance
DTC P0603: Control Module Long Term Memory Reset
DTC P0604: Control Module Random Access Memory Performance
DTC P062F: Control Module Long Term Memory Performance

Circuit/System Description

This is an internal fault detection of the 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

P0601 or P0604

Runs continuously when TCM is powered up.

P0603

One time at TCM power up.

P062F

One time at TCM power down.

Conditions for Setting the DTC

P0601

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

P0603

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

P0604

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

P062F

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 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 and all vehicle systems OFF. It may take up to 2 minutes for all vehicle systems to power down.
2. Ignition ON.
3. Verify that DTC P0601, P0603, P0604, or P062F is not set.

⇒ **If any of the DTCs are set**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If none of the DTCs are set**

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

⇒ **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the DTC does not set**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0634

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

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

Conditions for Setting the DTC

Condition 1

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

Condition 2

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

DTC P0634 is a Type A DTC.

Diagnostic Aids

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

Reference Information

Description and Operation

Electronic Component Description on page 17-319 for control solenoid valve assembly information.

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool Engine Coolant Temperature parameter was less than 125°C (257°F) when DTC set by reviewing the scan tool Freeze Frame/ Failure Records.

⇒ **If 125°C (257°F) or greater**

Refer to *Engine Overheating on page 9-625*.

⇓ **If less than 125°C (257°F)**

3. Verify the scan tool TCM Temperature parameter is less than 146°C (295°F).

⇒ **If 146°C (295°F) or greater**

Replace the Q8 control solenoid valve assembly.

⇓ **If less than 146°C (295°F)**

4. Verify correct fluid level and condition. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
5. Clear the DTCs from the TCM using a scan tool.
6. Operate the vehicle within the conditions for running and setting the DTC until normal engine temperature is reached.
7. Verify the scan tool Transmission Fluid Temperature parameter is less than 140°C (284°F) and DTC P0634 did not set.

⇒ **If 140°C (284°F) or greater**

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 problems with cooling system are found, repair or replace as necessary.

⇒ If no problems are found, refer to Refer to *Transmission Fluid Cooler Flushing and Flow Test on page 17-175*.

⇒ **If less than 140°C (284°F) and DTC P0634 set**

Replace the Q8 control solenoid valve assembly.

⇓ **If less than 140°C (284°F) and DTC P0634 did not set**

8. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Refer to *Control Module References on page 6-3* for control solenoid valve assembly replacement, programming and setup.
- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

DTC P0658 or P0659

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 the control solenoid valve assembly which has no serviceable components. The high side driver 1 provides power to the TCM pressure control solenoids and shift solenoids.

Conditions for Running the DTC

P0658

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

P0659

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

Conditions for Setting the DTC

P0658

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

P0659

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

Action Taken When the DTC Sets

P0658

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

P0659

P0659 is a Type C DTC.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

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

⇒ **If On is not displayed**

Refer to Circuit/System Testing.

⇓ **If On is displayed**

3. Engine Running and gear selector lever in the Park position.
4. Verify the scan tool parameters listed below do not display malfunction.
   - High Side Drvr 1 Ckt Short Gnd Test Status
   - High Side Drvr 1 Ckt Open Test Status
   - High Side Drvr 1 Ckt Short Volts Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* harness between the vehicle harness connector, and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction.
   - High Side Drvr 1 Ckt Short Gnd Test Status
   - High Side Drvr 1 Ckt Open Test Status
   - High Side Drvr 1 Ckt Short Volts Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- Refer to *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0667, P0668, or P0669

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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.
- Engine torque signal is valid.
- Ignition voltage is 9–32 V.
- Engine speed is 400–7,500 RPM for 5 s.
- Throttle position signal is valid.
- Runs continuously when above conditions are met.

P0668

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

P0669

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

Conditions for Setting the DTC

P0667

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

P0668

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

P0669

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P0667, P0668, and P0669 are Type B DTCs.

Diagnostic Aids

The TCM temperature sensor is located inside of the Control Solenoid Valve Assembly and its output should resemble that of the transmission fluid temperature sensor output. During a road test, the TCM temperature should steadily increase to a normal operating temperature, and then stabilize.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool TCM Temperature parameter is between −254 and +254°C (−425 and +489°F).

⇒ **If not between −254 and +254°C (−425 and +489°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between −254 and +254°C (−425 and +489°F)**

3. Verify the scan tool TCM Temperature parameter increases greater than 2°C (3.6°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.

⇒ **If the temperature does not increase greater than 2°C (3.6°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the temperature increases greater than 2°C (3.6°F)**

4. Verify the scan tool Transmission Fluid Temperature and TCM Temperature parameters are within 20°C (36°F) of each other.

⇒ **If the temperatures are not within 20°C (36°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the temperatures are within 20°C (36°F)**

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

⇒ **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the DTC does not set**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P06AC, P06AD, or P06AE

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 in the TCM software. This fault is handled inside the TCM and no external circuits are involved.

Conditions for Running the DTC

P06AC

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

P06AD

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

P06AE

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

Conditions for Setting the DTC

P06AC

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

P06AD

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

P06AE

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P06AC, P06AD, and P06AE are Type B DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

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

⇒ **If any of the DTCs are set**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If none of the DTCs are set**

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

⇒ **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the DTC does not set**

6. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0711-P0713

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 sensor is located inside of the transmission Control Solenoid Valve Assembly which has no serviceable components. The transmission fluid temperature sensor provides transmission fluid temperature to the transmission control module (TCM). This fault is handled inside the TCM and no external circuits are involved.

Conditions for Running the DTC

P0711

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

P0712

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

P0713

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

Conditions for Setting the DTC

P0711

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

P0712

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

P0713

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P0711, P0712, and P0713 are Type B DTCs.

Diagnostics Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319*
- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Engine idling at the normal operating temperature.
2. Verify the scan tool Transmission Fluid Temperature parameter is between −254 and +254°C (−425 and +489°F).

⇒ **If not between −254 and +254°C (−425 and +489°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between −254 and +254°C (−425 and +489°F)**

3. Verify the scan tool Transmission Fluid Temperature parameter increases greater than 2°C (3.6°F) after operating the vehicle at 64 km/h (40 mph) for 10 minutes.

⇒ **If the temperature does not increase greater than 2°C (3.6°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the temperature increases greater than 2°C (3.6°F)**

4. Verify the scan tool Transmission Fluid Temperature and the TCM Temperature parameters are within 20°C (36°F).

⇒ **If the temperatures are not within 20°C (36°F)**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the temperatures are within 20°C (36°F)**

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

⇒ **If the DTC sets**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the DTC does not set**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0716, P0717, P07BF, or P07C0

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0716: Input Speed Sensor Performance
DTC P0717: Input Speed Sensor Circuit No Signal
DTC P07BF: Input Speed Sensor Circuit Low Voltage
DTC P07C0: Input Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Input Speed Sensor Supply Voltage	P0716, P0717, P07BF	P0716, P0717, P07BF	—	P0716
Input Speed Sensor Signal	P0716, P0717	P0716, P0717, P07BF	P0716, P0717, P07C0	P0716

Typical Scan Tool Data

Transmission ISS

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

ISS/OSS Supply Voltage

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

Circuit/System Description

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

Conditions for Running the DTC

P0716

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

- Throttle position signal is valid.
- DTC runs continuously when above conditions are met.

P0717

- DTC P0101, P0102, P0103, P0717, P0722, or P0723 is not set.
- Engine speed is 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- Vehicle speed is 16 km/h (10 mph) or greater.
- Engine torque is 50 N•m (37 lb ft) or greater.
- DTC runs continuously when above conditions are met.

P07BF or P07C0

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

Conditions for Setting the DTC

P0716

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

P0717

Transmission input shaft speed is less than 67 RPM for 5 s.

P07BF

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

P07C0

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

Action Taken When the DTC Sets

P0716

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

P0717

- P0717 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM forces TCC OFF.
- TCM commands maximum line pressure.
- TCM inhibits neutral idle.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM limits the transmission to reverse and 4th gear.

P07BF or P07C0

- P07BF and P07C0 are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits neutral idle.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM limits the transmission to reverse and 4th gear.

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

1. Ignition ON.
2. Verify with a scan tool ISS/OSS Supply Voltage test status parameter displays OK.

⇒ **If OK is not displayed**

Refer to Circuit/System Testing.

⇓ **If OK is displayed**

3. Engine idling, transmission in Park.
4. Verify the scan tool Transmission ISS parameter changes without spikes or dropouts, while varying the engine speed.

⇒ **If the Transmission ISS does not change with engine speed or has spikes or dropouts**

Refer to Circuit/System Testing.

⇓ **If the Transmission ISS changes with engine speed and there are no spikes or dropouts**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
3. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve assembly. Ignition ON.
4. Test for 11–13 V between the ISS 12 V circuit terminal B on the Q8 Control Solenoid Valve Assembly X3 connector and ground.

⇒ **If not between 11–13 V**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between 11–13 V**

5. Verify the scan tool Transmission ISS parameter is between 495–505 RPM when performing the input shaft speed test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test on page 17-159*.

⇒ **If not between 495–505 RPM**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between 495–505 RPM**

6. Verify there is no damage to the reluctor, which is attached to the 4-5-6 clutch and 3-5-R clutch housing assembly, or misalignment between the B14C Transmission Input Shaft Speed Sensor and reluctor.

⇒ **If the reluctor is damaged or misaligned**

Repair or replace as necessary.

⇓ **If the reluctor is not damaged or misaligned**

7. Replace the B14C Transmission Input Shaft Speed Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Input and Output Speed Sensor Installation on page 17-303*
- *Input and Output Speed Sensor Removal on page 17-230*
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P071D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptor

DTC P071D: Transmission Sport Mode Switch Circuit

Diagnostic Fault Information

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

Circuit/System Description

The engine control module (ECM) supplies 5 V reference voltage, through the 5 V reference voltage circuit, to the fuel economy mode switch. The 5 V reference voltage causes current to flow through a series of resistors in the switch to the switch ground circuit. The ECM also supplies a signal circuit to detect voltage within the resistor network. When the fuel economy mode switch button is momentarily pressed, the switch contacts allow the current to by-pass one of the resistors. The ECM detects the resulting change in voltage drop as a fuel economy mode request and sends a GMLAN message to the transmission control module (TCM) indicating the request. When the TCM receives the request, and if operating conditions are correct, the transmission shift points are modified to optimize fuel efficiency. The TCM sends a confirmation message to the ECM and the instrument panel cluster (IPC) also receives the fuel economy mode request message from the TCM and illuminates the fuel economy mode indicator lamp.

Conditions for Running the DTC

- Engine speed is 500–7,500 RPM for 5 s.
- Ignition voltage is between 9–18 V.

Conditions for Setting the DTC

TCM detects that the Economy Mode Switch has been continuously activated for 10 min.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

DTC P071D is a Type C DTC.

Diagnostic Aids

Diagnose all communication and body DTCs first.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the Fuel Economy Mode parameter changes between Active and Inactive each time the S112 fuel economy mode switch is depressed.

⇒ **If Inactive or Active is not displayed**

Refer to Circuit/System Testing.

⇓ **If Inactive or Active is displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

5. All OK.

Circuit/System Testing

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

1. Ignition OFF, disconnect the harness connector at the S112 fuel economy mode switch.
2. Test for less than 10 Ω between the ground circuit terminal 1 of the harness connector and ground.

⇒ **If 10 Ω or greater**

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

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

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 4.8–5.2 V between the 5 V reference circuit terminal 3 of the harness connector and ground.

⇒ **If less than 4.8 volts**

4.1. Ignition OFF, remove the harness connector at the ECM.

4.2. Test for infinite resistance between the 5 V reference circuit terminal 3 of the harness connector and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance.

4.3. Test for less than 2 Ω in the 5 V reference circuit, end to end.

⇒ If 2 Ω or greater, repair the open/high resistance in the 5 V reference circuit.

⇒ If less than 2 Ω, replace the K20 engine control module.

⇒ **If greater than 5.2 V**

4.1. Ignition OFF, disconnect the harness connector at the ECM, ignition ON.

4.2. Test for less than 1 V between 5 V reference circuit terminal 3 and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K20 engine control module.

⇓ **If between 4.8–5.2 volts**

5. Verify the scan tool Fuel Economy Mode Switch parameter displays Circuit Low Voltage.

⇒ **If the Fuel Economy Mode Switch parameter does not display Circuit Low Voltage**

5.1. Ignition OFF, disconnect the harness connector at the K20 engine control module, ignition ON.

5.2. Test for less than 1 V between the fuel economy signal circuit terminal 4 and ground.

⇒ If 1 V or greater, repair the short to voltage on the circuit.

⇒ If less than 1 V, replace the K20 engine control module.

⇓ **If the Fuel Economy Mode Switch parameter displays Circuit Low Voltage**

6. Connect a 3 A fused jumper wire between 5 V reference circuit terminal 3 of the harness connector and signal circuit terminal 4 of the harness connector.
7. Verify the scan tool Fuel Economy Mode Switch parameter displays Circuit High Voltage.

⇒ **If the Fuel Economy Mode Switch parameter does not display Circuit High Voltage**

7.1. Ignition OFF, remove the connector at the K20 engine control module.

7.2. Test for infinite resistance between signal circuit terminal 4 and ground.

⇒ If less than infinite resistance, repair the short to ground in the signal circuit.

⇓ If infinite resistance.

7.3. Test for less than 2 Ω in the fuel economy mode signal circuit, end to end.

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

⇒ If less than 2 Ω, replace the K20 engine control module.

⇓ **If the Fuel Economy Mode Switch parameter displays Circuit High Voltage**

8. Ignition OFF.
9. Test for 266–294 Ω between the 5 V reference voltage circuit terminal 3 and the signal circuit terminal 4 on the S112 fuel economy mode switch.

⇒ **If not between 266–294 Ω**

Replace the S112 fuel economy mode switch.

⇓ **If between 266–294 Ω**

10. Test for 927–1024 Ω between signal circuit terminal 4 and low reference circuit terminal 1 on the S112 fuel economy mode switch.

⇒ **If not between 927–1024 Ω**

Replace the S112 fuel economy mode switch.

⇓ **If between 927–1024 Ω**

11. Test for 220–244 Ω between terminal 4 and terminal 1 on the S112 fuel economy mode switch, with the switch pressed.

⇒ **If not between 220–244 Ω**

Replace the S112 fuel economy mode switch.

⇓ **If between 220–244 Ω**

12. Replace the K20 Engine Control Module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Control Module References on page 6-3 for Control Solenoid Valve Assembly or Engine Control Module replacement, programming and setup.

DTC P0722, P0723, P077C, or P077D

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0722: Output Speed Sensor Circuit No Signal
DTC P0723: Output Speed Sensor Circuit Intermittent
DTC P077C: Output Speed Sensor Circuit Low Voltage
DTC P077D: Output Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Output Speed Sensor Signal	P0722, P0723, P077C	P0722, P0723, P077C	P0722, P0723, P077D	—
Output Speed Sensor Supply Voltage	P0722, P0723, P077C	P0722, P0723, P077C	—	—

Typical Scan Tool Data

Transmission OSS

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Drive vehicle, normal operating temperature **Parameter Normal Range:** 0–7,000 RPM			
Output Speed Sensor Supply Voltage	0 RPM	0 RPM	0 RPM
Output Speed Sensor Signal	0 RPM	0 RPM	0 RPM

ISS/OSS Supply Voltage

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

Circuit/System Description

The output shaft speed (OSS) sensor is a hall-effect type sensor. The OSS sensor mounts to the automatic transmission case assembly and connects to the control solenoid valve assembly through a 2-wire harness and connector. The sensor faces the park gear teeth. The sensor receives battery voltage on the OSS supply voltage circuit from the transmission control module (TCM). As the output shaft rotates, the sensor produces a signal frequency based on the park gear teeth. This signal is transmitted through the OSS sensor signal circuit to the TCM. The TCM uses the OSS signal to calculate output shaft speed to determine commanded line pressure, transmission shift patterns, vehicle speed and gear ratio.

Conditions for Running the DTC

P0722

- DTC P0101, P0102, P0103, P0121, P0122, P0123, P0716, P0717, P0722, or P0723 is not set.
- Ignition voltage is 9–32 V.
- Engine speed is 400–7,500 RPM for 5 s.
- Engine torque signal is valid.
- Throttle position signal is valid.
- Transmission input speed is between 1,000–8,191 RPM.
- Calculated throttle position is 8% or greater.
- Engine torque is 30 N•m (22 lb ft) or greater.

- Transmission fluid temperature is greater than −40°C (−40°F).
- DTC runs continuously when the above conditions are met.

P0723

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

P077C

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

P077D

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

Conditions for Setting the DTC

P0722

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

P0723

- Transmission output speed is 105 RPM or greater.
- Transmission output speed drops 1,000 RPM for greater than 3 s.

P077C

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

P077D

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

Action Taken When the DTC Sets

P0722

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

P0723, P077C or P077D

- P0723, P077C, and P077D are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM forces TCC OFF.
- TCM commands the high side driver OFF.
- TCM commands maximum line pressure.
- TCM enables torque management.
- TCM limits the transmission to reverse and 5th gear.
- TCM inhibits neutral idle.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.

Conditions for Clearing the DIC/DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319* for output speed sensor (OSS)
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

- *DT-48616-10* Adapter Harness
- *EL 38522* Variable Signal Generator

For equivalent regional tools, refer to *Special Tools on page 17-394.*

Circuit/System Verification

1. Ignition ON.
2. Verify with a scan tool the transmission ISS/OSS Supply Voltage test status parameter displays OK.

⇒ **If OK is not displayed**

Refer to Circuit/System Testing.

⇓ **If OK is displayed**

3. Verify the scan tool Transmission OSS parameter changes with vehicle speed or does not drop out, while operating the vehicle at 16–32 km/h (10–20 mph).

⇒ **If the Transmission OSS does not vary with vehicle speed or drops out**

Refer to Circuit/System Testing.

⇓ **If the Transmission OSS varies with vehicle speed and does not drop out**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Connect the *DT-48616-10* harness between the vehicle wire harness connector, and the Q8 Control Solenoid Valve Assembly connector.
3. Ignition ON.
4. Test for 11–13 volts between the OSS voltage circuit terminal B at the Q8 Control Solenoid Valve Assembly X4 connector and ground.

⇒ **If not between 11–13 V**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between 11–13 V**

5. Verify the scan tool Transmission OSS parameter is between 745–825 RPM when performing the output shaft speed test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test on page 17-159.*

⇒ **If not between 745–825 RPM**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If between 745–825 RPM**

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

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

Repair or replace as necessary.

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

7. Replace the B14A Transmission Output Speed Sensor.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- *Input and Output Speed Sensor Installation on page 17-303*
- *Input and Output Speed Sensor Removal on page 17-230*
- Refer to *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0741 or P0742

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 solenoid is part of the control solenoid valve assembly which has no serviceable components. The TCC pressure control solenoid is a normally low pressure control solenoid. The TCC pressure control solenoid regulates transmission fluid pressure to the TCC regulator valve in the lower valve body and the TCC control valve in the fluid pump assembly. When vehicle operating conditions are appropriate to apply the torque converter clutch, the transmission control module (TCM) will increase TCC pressure control solenoid current flow thereby increasing pressure to move the TCC control valve into the apply position. When the TCC is fully applied, the engine is coupled directly to the transmission. TCC release is accomplished by the TCM decreasing current flow, dropping the apply pressure thereby allowing the TCC control valve to move to the release position. The TCM calculates torque converter slip speed based on the speed signal from the input shaft speed (ISS) sensor and engine RPM provided by the engine control module (ECM).

Conditions for Running the DTC

P0741

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P0741, P0742, P2763, or P2764 is not set.
- Engine speed is 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- Transmission fluid temperature is between −7 to +137°C (19–279°F).
- Throttle position is 8% or greater.
- Engine torque is 50 N•m (36 lb ft) or greater.
- Engine torque signal is valid.
- Throttle position signal is valid.
- TCM detects the transmission gear ratios listed below for the commanded gear when TCC is commanded ON:
  - 2nd gear ratio is between 2.75–3.17.
  - 3rd gear ratio is between 1.78–2.04.
  - 4th gear ratio is between 1.35–1.55.
  - 5th gear ratio is between 0.93–1.07.
  - 6th gear ratio is between 0.70–0.80.
- DTC runs continuously when the above conditions are met.

P0742

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P0741, P0742, P2763, or P2764 is not set.
- Engine speed is greater than 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- Transmission fluid temperature is between 15–137°C (59–279°F).
- Calculated throttle position was 10% or greater and has not dropped below 2%.
- Engine torque is greater than 60 N•m (44 lb ft).
- Vehicle speed is greater than 1 km/h (0.6 mph).
- TCC is commanded OFF.
- Engine torque signal is valid.
- Throttle position signal is valid.
- DTC runs continuously when the above conditions are met.

Conditions for Setting the DTC

P0741

- TCC pressure command is 500 kPa (73 PSI) or greater for 2 s.
- TCM detects TCC slip is 130 RPM or greater for 5 s.
- The above conditions must occur 2 times.

P0742

- TCM detects the TCC slip is between −50 and +30 RPM for 1 s or greater when the TCC is commanded OFF.
- The above condition must occur 8 times.

Action Taken When the DTC Sets

P0741

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

P0742

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON, engine OFF.
2. Verify DTC P0716, P0717, P07BF, or P07C0 was not set by reviewing the scan tool TCM Failure Records.

⇒ **If any of the DTCs were set**

Refer to *DTC P0716, P0717, P07BF, or P07C0 on page 17-82*.

⇓ **If none of the DTCs were set**

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

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

Repair as necessary.

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

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0741 or P0742 does not set while performing a road test. Refer to *Road Test on page 17-167*.

⇒ **If DTC P0742 or P0743 sets**

Refer to Circuit/System Testing.

⇓ **If DTC P0741 or P0742 does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

9. All OK.

Circuit/System Testing

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

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

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the pressures are within range**

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

4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*

⇒ **If the pressure change does change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

P0741 Upper Valve Body

Release exhaust port/orifice plugged or blocked.

P0741 or P0742 – Upper Valve Body

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

P0741 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P0741 or P0742 – Fluid Pump Assembly

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

P0741 – Torque Converter

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

P0741 – Support

Damaged seal.

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

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

P0741 – Turbine Shaft

O-ring seal cut or damaged.

P0741 or P0742 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- *Control Valve Body Assembly Removal on page 17-227*
- *Torque Converter Installation on page 17-314.*
- *Torque Converter Removal on page 17-226*
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0751 or P0752

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0751: Shift Solenoid Valve 1 Performance - Stuck Off
DTC P0752: Shift Solenoid Valve 1 Performance - Stuck On

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

P0751

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

P0752

- Commanded gear is 3rd.
- Transmission has achieved 1st or 2nd.
- Gear slip is 400 RPM or greater for 1.5 s.
- TCM commands 4th gear if above conditions exist and detects a gear ratio of 4.35–4.81 for 1.5 s.
- Conditions listed above have to occur 5 times.

Action Taken When the DTC Sets

P0751

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

P0752

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

Conditions for Clearing the DTC

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

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Drive Range, First Gear Engine Braking (Gen 1) on page 17-333* or *Drive Range, First Gear Engine Braking (Gen 2) on page 17-335*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

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

1. Ignition ON, engine OFF.
2. Verify no other TCM DTCs are set using a scan tool.

⇒ **If another DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If no other DTCs are set**

3. Engine idling at the normal operating temperature, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

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

Repair as necessary.

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

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. From a stop, accelerate to 72 km/h (45 mph) with the throttle position greater than 15%. Perform this test 8 times.
7. Verify DTC P0751 or P0752 did not set.

⇒ **If DTC P0751 or P0752 sets**

Refer to Circuit/System Testing.

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

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

10. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

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

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

⇒ **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

P0751 – Control Valve Body

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

P0751 or P0752 – Control Valve Body

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

P0751 or P0752 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P0752 Output Carrier Assembly

Output carrier pinion pins too high or too low.

P0751 or P0752 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0776 or P0777 (Gen 1)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0776: Pressure Control Solenoid Valve 2 Stuck Off

DTC P0777: Pressure Control Solenoid Valve 2 Stuck On

Circuit/System Description

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

Conditions for Running the DTC

P0776

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is between 400–7500 RPM for 5 seconds.
- Ignition voltage is between 9–32 V.
- Transmission fluid temperature is −7°C (19°F) or greater.
- Transmission output speed is 650 RPM or greater, or the throttle position is 0.5 percent or greater.
- Throttle position signal is valid.
- High side driver is enabled.

P0777

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is between 400–7500 RPM for 5 seconds.
- Ignition voltage is between 9–32 V.
- Transmission fluid temperature is −7°C (19°F) or greater.
- Transmission output shaft speed is 200 RPM or greater.
- Throttle position signal is valid.
- High side driver 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 4 seconds and the transmission input shaft speed is 400 RPM or greater from the anticipated input shaft speed. This must occur 3 times.

P0777

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

Action Taken When the DTC Sets

P0776

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

P0777

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

Conditions for Clearing the DIC/DTC

DTCs P0776 and P0777 are Type A DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Reverse (Gen 1) on page 17-325* or *Reverse (Gen 2) on page 17-327*
- *Drive Range, Third Gear (Gen 1) on page 17-345* or *Drive Range, Third Gear (Gen 2) on page 17-347*
- *Drive Range, Fifth Gear (Gen 1) on page 17-356* or *Drive Range, Fifth Gear (Gen 2) on page 17-358*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
3. Verify the scan tool TFP Switch 1 parameter displays the correct state for each gear range while placing the gear select lever in Park, Reverse, and Neutral range. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

4. Gear select lever in Drive range.

Note: Use Drive 1st – Engine Braking to determine expected 1st gear Transmission Fluid Pressure Switch parameter states.

5. Verify the scan tool TFP Switch 1 parameter displays the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

6. Ignition ON, engine OFF. Clear the TCM DTC information with a scan tool.
7. Perform the *Road Test on page 17-167*.
8. Verify DTC P0776 or P0777 did not set.

⇒ **If a DTC sets**

Refer to Circuit/System Testing.

⇓ **If a DTC does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

11. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

⇒ **If the line pressures are not within the specified ranges**

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If line pressures are within the specified ranges**

3. Engine Idling, shift selector in the Drive position.
4. Verify the scan tool parameters listed below display the correct state for each gear range while each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11* for the correct gear range states.
   - TFP Switch 1
   - TFP Switch 3
   - TFP Switch 4
   - TFP Switch 5

⇒ **If the correct state for each gear range is not displayed**

4.1. Ignition OFF.

4.2. Remove the Control Valve Body. Refer to *Control Valve Body Replacement on page 17-213*.

4.3. Verify the Control Valve Body is not contaminated with any debris and there is no damage or sticking valves, refer to *Control Valve Body Cleaning and Inspection (Gen 2) on page 17-306*.

⇒ If there is contamination, damage, or sticking valves, repair or replace the control valve body as necessary.

⇒ If there is no contamination, damage, or sticking valves, replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the correct state for each gear range is displayed**

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

DTC P0776 or P0777 – 3-5-R and 4-5-6 Clutch Housing Assembly

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

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

Fluid pump housing/gear damaged/scored.

DTC P0776 or P0777 – Control Valve Body Assembly

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

DTC P0776 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

DTC P0776 or P0777 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.

- *Internal Components Removal on page 17-236*
- *3-5-Reverse and 4-5-6 Clutch Housing Disassemble (6T30/40/45/50 - Gen 2) on page 17-256*
- *3-5-Reverse and 4-5-6 Clutch Housing Assemble (6T30/40/45/50 - Gen 2) on page 17-261*
- *3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation on page 17-269*
- Refer to *Control Module References on page 6-3* for control solenoid valve assembly replacement, programming and setup.

DTC P0776 or P0777 (Gen 2)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0776: Pressure Control Solenoid Valve 2 Stuck Off
DTC P0777: Pressure Control Solenoid Valve 2 Stuck On

Circuit/System Description

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

Conditions for Running the DTC

P0776

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

P0777

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

Conditions for Setting the DTC

P0776 – Condition 1

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

P0776 – Condition 2

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

P0777

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

Action Taken When the DTC Sets

P0776

- P0776 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down function.
- TCM inhibits manual shifting of forward gears.

- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.
- TCM inhibits neutral idle.
- TCM commands 2nd gear if the transmission is in a forward gear and the output speed is less than 700 RPM.
- TCM commands neutral if the output speed is 700 RPM or greater.

P0777

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

Conditions for Clearing the DTC

P0776 and P0777 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Drive Range, Fifth Gear (Gen 1) on page 17-356* or *Drive Range, Fifth Gear (Gen 2) on page 17-358*
- *Drive Range - Fourth Gear (Gen 1) on page 17-349* or *Drive Range - Fourth Gear (Gen 2) on page 17-351*
- *Drive Range, Third Gear (Gen 1) on page 17-345* or *Drive Range, Third Gear (Gen 2) on page 17-347*
- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

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

⇒ **If any of the DTCs were set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If none of the DTCs were set**

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

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

Repair as necessary.

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

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0776 or P0777 does not set while performing a road test. Refer to *Road Test on page 17-167*.

⇒ **If DTC P0776 or P0777 sets**

Refer to Circuit/System Testing.

⇓ **If DTC P0776 or P0777 does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

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

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

⇒ **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

DTC P0776 or P0777 – Control Valve Body Assembly

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

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

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

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

Fluid pump housing/gear damaged/scored.

DTC P0776 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

DTC P0776 or P0777 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0796 or P0797 (Gen 1)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 solenoid 3 is part of the control solenoid valve assembly which has no serviceable components. Pressure control solenoid 3 regulates transmission fluid pressure to the R1/4-5-6 regulator valve which controls pressure to the reverse and low clutch and the 4-5-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the automatic transmission input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

P0796

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is between 400–7500 RPM for 5 seconds.
- Transmission output speed is 650 RPM or greater or the throttle position is 0.5 percent or greater.
- Ignition voltage is between 9–32 V.
- Transmission fluid temperature is −7°C (19°F) or greater.
- High side driver is enabled.
- Throttle position signal is valid.

P0797

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is between 400–7500 RPM for 5 seconds.
- Transmission output speed is 650 RPM or greater, or the throttle position is 0.5 percent or greater.
- Throttle position signal is valid.
- Ignition voltage is between 9–32 V.
- Transmission fluid temperature is −7°C (19°F) or greater.
- High side driver is enabled.
- Transmission output shaft speed is 200 RPM or greater.

Conditions for Setting the DTC

P0796

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

P0797

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

Action Taken When the DTC Sets

P0796

- DTC P0796 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM limits the transmission to reverse and 3rd gear.

P0797

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

Conditions for Clearing the DIC/DTC

DTCs P0796 and P0797 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Reverse (Gen 1) on page 17-325* or *Reverse (Gen 2) on page 17-327*
- *Drive Range, First Gear Engine Braking (Gen 1) on page 17-333* or *Drive Range, First Gear Engine Braking (Gen 2) on page 17-335*
- *Drive Range - Fourth Gear (Gen 1) on page 17-349* or *Drive Range - Fourth Gear (Gen 2) on page 17-351*
- *Drive Range, Fifth Gear (Gen 1) on page 17-356* or *Drive Range, Fifth Gear (Gen 2) on page 17-358*
- *Drive Range, Sixth Gear (Gen 1) on page 17-366* or *Drive Range, Sixth Gear (Gen 2) on page 17-368*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
3. Verify the scan tool TFP Switch 5 parameter displays the correct state for each gear range while placing the gear select lever in Park, Reverse, and Neutral range. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

4. Gear select lever in Drive range.

Note: Use Drive 1st – Engine Braking to determine expected 1st gear Transmission Fluid Pressure Switch parameter states.

5. Verify the scan tool TFP Switch 5 parameter displays the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

6. Ignition ON, engine OFF. Clear the TCM DTC information with a scan tool.
7. Perform the *Road Test on page 17-167*.
8. Verify DTC P0796 or P0797 did not set.

⇒ **If a DTC set**

Refer to Circuit/System Testing.

⇓ **If a DTC does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

11. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

⇒ **If the line pressures are not within the specified ranges**

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If line pressures are within the specified ranges**

3. Engine Idling, shift selector in the Drive position.
4. Verify the scan tool parameters listed below display the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11* for the correct gear range states.
   - TFP Switch 1
   - TFP Switch 3

- TFP Switch 4
- TFP Switch 5

⇒ **If the correct state for each gear range is not displayed**

4.1. Ignition OFF.

4.2. Remove the Control Valve Body. Refer to *Control Valve Body Replacement on page 17-213*.

4.3. Verify the Control Valve Body is not contaminated with any debris and there is no damage or sticking valves, refer to *Control Valve Body Cleaning and Inspection (Gen 2) on page 17-306*.

⇒ If there is contamination, damage, or sticking valves, repair or replace the control valve body as necessary.

⇒ If there is no contamination, damage, or sticking valves, replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the correct state for each gear range is displayed**

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

P0796 – Transmission Cooling/Lubrication

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

P0796 – Input Shaft Support

Input shaft tower seals damaged or leaking.

P0796 – 4-5-6 Clutch Housing Assembly

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

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

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

P0796 – 4-5-6 Reaction Carrier Hub Assembly

4-5-6 reaction carrier Hub/Shaft – broken hub weld.

P0796 or P0797 – Control Valve Body Assembly

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

P0796 Output Carrier Assembly

Output carrier pinion pins too high or too low.

P0796 or P0797 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Internal Components Removal on page 17-236*
- *3-5-Reverse and 4-5-6 Clutch Housing Disassemble (6T30/40/45/50 - Gen 2) on page 17-256*
- *3-5-Reverse and 4-5-6 Clutch Housing Assemble (6T30/40/45/50 - Gen 2) on page 17-261*
- *3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation on page 17-269*
- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Refer to *Control Module References on page 6-3* for Q8 Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0796 or P0797 (Gen 2)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

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

Conditions for Running the DTC

P0796

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

P0797

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

Conditions for Setting the DTC

P0796

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

P0797

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

Action Taken When the DTC Sets

- P0796 and P0797 are Type A DTCs.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits TAP Up/TAP Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 3rd gear – DTC P0796 only.
- TCM limits the transmission to reverse and 4th gear – DTC P0797 only.

Conditions for Clearing the DIC/DTC

P0796 and P0797 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Drive Range - Fourth Gear (Gen 1) on page 17-349* or *Drive Range - Fourth Gear (Gen 2) on page 17-351*
- *Drive Range, Fifth Gear (Gen 1) on page 17-356* or *Drive Range, Fifth Gear (Gen 2) on page 17-358*
- *Drive Range, Sixth Gear (Gen 1) on page 17-366* or *Drive Range, Sixth Gear (Gen 2) on page 17-368*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

⇒ **If any of the DTCs were set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69.*

⇓ **If none of the DTCs were set**

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164.*

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

Repair as necessary.

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

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P0796 or P0797 does not set while performing a road test. Refer to *Road Test on page 17-167.*

⇒ **If DTC P0796 or P0797 sets**

Refer to Circuit/System Testing.

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

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12.*

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

Refer to *Fluid Pressure High or Low on page 17-191.*

⇓ **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160.*

⇒ **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

P0796 or P0797 – Control Valve Body Assembly

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

P0796 – Transmission Cooling/Lubrication

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

P0796 - Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P0796 – Input Shaft Support

Input shaft tower seals damaged or leaking.

P0796 – 4-5-6 Clutch Housing Assembly

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

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

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

P0796 – 4-5-6 Reaction Carrier Hub Assembly

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

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

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

P0796 Output Carrier Assembly

Output carrier pinion pins too high or too low.

P0796 or P0797 – Q8 Control Solenoid Valve Assembly

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

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0815, P0816, or P0826

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Typical Scan Tool Data

Driver Shift Request

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

Circuit/System Description

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

Conditions for Running the DTC

P0815 or P0816

- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 V or greater.
- DTC P0815, P0816, P0826, P1761, P182E, P1876, P1877, or P1915 is not set.
- Time since the last gear range change is greater than 1 second.

P0826

- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 V or greater.
- DTC P0826 or P1761 is not set.

Conditions for Setting the DTC

P0815 – Condition 1

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

P0815 – Condition 2

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

P0816 – Condition 1

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

P0816 – Condition 2

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

P0826

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

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Ignition ON.
2. Verify with a scan tool there were no internal mode switch (IMS) DTCs set.

⇒ **If IMS DTCs were set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If IMS DTCs were not set**

3. 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.

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

Refer to Circuit/System Testing below.

⇓ **If the parameter displays the correct value**

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector from the S3 transmission shift lever.
2. Test for less than 10 Ω between the S3 transmission shift lever harness connector terminal 2 and ground.

⇒ **If 10 Ω or greater**

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

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

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 11 V or greater at the S3 transmission shift lever harness connector between signal circuit terminal 3 and ground.

⇒ **If less than 11 V**

4.1. Ignition OFF, remove the connector at the K9 body control module.

4.2. Test for infinite resistance between the S3 transmission shift lever harness connector signal circuit terminal 3 and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance.

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

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

⇒ If less than 2 Ω, replace the K9 body control module.

⇓ **If 11 V or greater**

5. Ignition OFF.
6. Test for 5.8–6.4 kΩ between the S3 transmission shift lever connector terminal 3 and terminal 2.

⇒ **If not between 5.8–6.4 kΩ**

Replace the S3 transmission shift lever.

⇓ **If between 5.8–6.4 kΩ**

7. Test for 1.8–2.2 kΩ between the S3 shift lever connector terminal 3 and terminal 2 with the tap down button depressed.

⇒ **If not between 1.8–2.2 kΩ**

Replace the S3 transmission shift lever.

⇓ **If between 1.8–2.2 kΩ**

8. Test for 580–680 Ω between the S3 shift lever connector terminal 3 and terminal 2 with the tap up button depressed.

⇒ **If not between 580–680 Ω**

Replace the S3 transmission shift lever.

⇓ **If between 580–680 Ω**

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

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

10. Replace the K9 body control module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic repair.

- Refer to *Control Module References on page 6-3* for BCM replacement, programming and setup.
- Refer to *Transmission Control Replacement on page 17-193* for AT TAP shift switch replacement.

DTC P0842 or P0843

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0842: Transmission Fluid Pressure Switch 1 Circuit Low Voltage

DTC P0843: Transmission Fluid Pressure Switch 1 Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

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:** High or Low			
Transmission Fluid Pressure Switch 1 Signal	Low	High	High

Circuit/System Description

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

Conditions for Running the DTC

P0842 or P0843

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P182E, or P1915 is not set.
- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- Transmission fluid temperature (TFT) is −7 to +110°C (19–230°F).
- High Side Driver is ON.
- Engine speed is 550 RPM or greater.

Conditions for Setting the DTC

P0842

The TCM detects that the TFP switch 1 signal voltage remains LOW after the 3-5-R clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 42 counts are accumulated.

P0843

The TCM detects that the TFP switch 1 signal voltage remains HIGH after the 3-5-R clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 57 counts are accumulated.

Action Taken When the DTC Sets

- DTCs P0842 and P0843 are Type C DTCs.
- TCM freezes transmission adaptive functions on the 3-5-R 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 condition should not be immediately noticeable to a customer, as the switch outputs are used for shift adaptive pressure and do not cause transmission symptoms unless the switch malfunctions continuously for an extended period of time.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319* for control solenoid valve assembly
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Verify with a scan tool the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for the Park, Reverse, and Neutral gear select lever positions. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

3. Verify the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for each forward range with the gear select lever in Drive, using the scan tool to command all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

1. Ignition OFF, remove the Q8 control solenoid valve assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.
2. Inspect the Q8 control solenoid valve assembly, channel plate, and spacer plate for debris and blocked orifices.

⇒ **If debris or blocked orifices are observed**

Clean or replace as necessary.

⇒ **If no debris or blocked orifices are observed**

Replace the Q8 control solenoid valve assembly.

Repair Instructions

Note:

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158.*

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic procedure.

Control Module References on page 6-3 for control solenoid valve assembly replacement, setup, or programming

DTC P0850-P0852

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0850: Park/Neutral Position Switch Circuit
DTC P0851: Park/Neutral Position Switch Circuit Low Voltage
DTC P0852: Park/Neutral Position Switch Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Park/Neutral Position Switch

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

Circuit/System Description

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

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

Conditions for Running the DTC

- Ignition voltage is between 8–18 V.
- Engine speed is 1000 RPM or greater.

Conditions for Setting the DTC

P0850 and P0851

- ECM detects the Park/Neutral switch signal equals 0 volts (Park/Neutral) when the IMS reports a Drive range.
- Throttle position is 10 percent or greater.
- Engine torque is 75 N•m (55 lb ft) or greater.
- Vehicle speed is 10 km/h (6 mph) or greater.
- Above conditions must be met for .2 seconds.

P0852

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.
- ECM uses IMS position, which is determined by the transmission control module and broadcast over GMLAN, for engine start-up.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394.*

Circuit/System Verification

1. Ignition ON.
2. Verify that DTC P182E or P1915 is not set.

⇒ **If any of the DTCs are set**

Refer to *DTC P182E or P1915 on page 17-134.*

⇓ **If none of the DTCs are set**

3. Verify the range selector lever cable is adjusted properly. Refer to *Range Selector Lever Cable Adjustment on page 17-196.*

⇒ **If the cable adjustment is not OK**

Adjust, repair or replace as necessary.

⇓ **If the cable adjustment is OK**

4. Ignition ON.
5. Verify the scan tool transmission control module Internal Mode Switch parameter matches the gear shift lever position while slowly moving the gear shift lever from Park through all gear ranges.

⇒ **If any gear shift lever position does not match**

Refer to *DTC P182E or P1915 on page 17-134.*

⇓ **If all gear positions match**

6. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral when in Park or Neutral and In-Gear when in Reverse or Drive.

⇒ **If Park/Neutral or In Gear is not displayed**

Refer to Circuit/System Testing.

⇓ **If Park/Neutral and In Gear is displayed**

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

⇒ **If a DTC sets**

Refer to Circuit/System Testing.

⇓ **If a DTC does not set**

9. All OK

Circuit/System Testing

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

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

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

3. Test for less than 5 Ω between the ground circuit terminal 2 and ground.

⇒ **If 5 Ω or greater**

3.1. Ignition OFF.

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

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

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 5 Ω**

4. Ignition ON.
5. Test for 11–13 V between signal circuit terminal 3 and ground.

⇒ **If not between 11–13 V**

5.1. Ignition OFF, remove the harness connector at the K20 Engine Control Module.

5.2. Test for infinite resistance between signal circuit terminal 3 and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance.

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

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

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇓ **If between 11–13 V**

6. Ignition OFF, disconnect the *DT-48616-10* adapter harness from the vehicle wire harness.
7. Remove the transmission control valve body cover.
8. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
9. Disconnect the B15 Transmission Internal Mode Switch electrical connector from the Q8 Control Solenoid Valve Assembly.
10. Ignition ON.

11. Verify the scan tool ECM Park/Neutral Position Switch parameter displays In Gear.

⇒ **If In Gear is not displayed**

11.1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.

11.2. Install the *DT-48616-10* adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.

11.3. Test for infinite resistance between the *DT-48616-10* adapter harness connector terminals 2 and 3.

⇒ If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If In Gear is displayed**

12. Connect a 3A fused jumper between the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A and ground.
13. Verify the scan tool engine control module Park/ Neutral Position Switch parameter displays Park/ Neutral.

⇒ **If Park/Neutral is not displayed**

13.1. Ignition OFF, disconnect the X1 harness connector at the Q8 Control Solenoid Valve Assembly.

13.2. Install the *DT-48616-10* adapter harness to the Q8 Control Solenoid Valve Assembly X1 connector.

13.3. Test for less than 2 Ω between adapter harness connector terminal 3 and the Q8 Control Solenoid Valve Assembly connector signal circuit terminal A.

⇒ If 2 Ω or greater, replace the Q8 Control Solenoid Valve Assembly.

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇓ **If Park/Neutral is displayed**

14. Replace the B15 Transmission Internal Mode Switch.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Range Selector Lever Cable Adjustment on page 17-196*
- *Control Valve Body Cover Replacement on page 17-210*
- *Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement on page 17-191*
- *Control Valve Body Cover Replacement on page 17-210*
- *Control Module References on page 6-3* for ECM or control solenoid valve assembly replacement, programming and setup

DTC P0872 or P0873

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 3

Circuit	Short to Ground	Open/High Resistance	Short to Voltage
Operating Conditions: Engine running, normal operating temperature **Parameter Normal Range:** High, Low			
Transmission Fluid Pressure Switch 3 Signal	Low	High	High

Circuit/System Description

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

Conditions for Running the DTC

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P182E, or P1915 is not set.
- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- Transmission fluid temperature (TFT) is −7 to +110°C (19–230°F).
- High Side Driver is ON.
- Engine speed is 550 RPM or greater.

Conditions for Setting the DTC

P0872

The TCM detects that the TFP switch 3 signal voltage remains LOW after the 2–6 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 8 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 11 counts are accumulated.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

DTCs P0872 and P0873 are type C DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319* for control solenoid valve assembly
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Verify with a scan tool, the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for the Park, Reverse and Neutral gear select lever positions. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

3. Verify the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for each forward range with the gear select lever in Drive, using the scan tool to command all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 control solenoid valve assembly, filter plate, channel plate and spacer plate. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209* and *Control Valve Body Replacement on page 17-213*.
2. Inspect the Q8 control solenoid valve assembly,filter plate, channel plate, and spacer plate for debris and blocked orifices.

⇒ **If debris or blocked orifices are observed**

Clean or replace as necessary.

⇒ **If no debris or blocked orifices are observed**

Replace the Q8 control solenoid valve assembly.

Repair Instructions

Note:

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic procedure.

Control Module References on page 6-3 for control solenoid valve assembly replacement, setup, or programming.

DTC P0877 or P0878

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 4

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

Circuit/System Description

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

Conditions for Running the DTC

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P182E or P1915 is not set.
- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- Transmission fluid temperature (TFT) is −7 to +110°C (19–230°F).
- High Side Driver is ON.
- Engine speed is 550 RPM or greater.

Conditions for Setting the DTC

P0877

The TCM detects that the TFP switch 4 signal voltage remains LOW after the 1-2-3-4 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 12 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 12 counts are accumulated.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

DTCs P0877 and P0878 are Type C DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319* for control solenoid valve assembly
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Verify the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameters parameter states are correct for the Park, Reverse, and Neutral gear select lever positions. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

3. Verify the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for each forward range with the gear select lever in Drive, using the scan tool to command all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

1. Ignition OFF, remove the Q8 control solenoid valve assembly, filter plate, channel plate and spacer plate. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.
2. Inspect the Q8 control solenoid valve assembly, filter plate, channel plate, and spacer plate for debris and blocked orifices.

⇒ **If debris or blocked orifices are observed**

Clean or replace as necessary.

⇒ **If no debris or blocked orifices are observed**

Replace the Q8 control solenoid valve assembly.

Repair Instructions

Note:

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic procedure.

Control Module References on page 6-3 for control solenoid valve assembly replacement, setup, or programming.

DTC P0961-P0963

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0961: Line Pressure Control Solenoid Valve Performance
DTC P0962: Line Pressure Control Solenoid Valve Control Circuit Low Voltage
DTC P0963: Line Pressure Control Solenoid Valve Control Circuit High Voltage

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

P0961

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

P0962

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

P0963

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

Action Taken When the DTC Sets

P0961 or P0963

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

P0962

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394.*

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

5. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158.*

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158.*

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Line Pressure Control Solenoid Valve Performance Test Status
   - Line Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
   - Line Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0965-P0967

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

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

Conditions for Running the DTC

P0965, P0966, or P0967

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

Conditions for Setting the DTC

P0965

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

P0966

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

P0967

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

Action Taken When the DTC Sets

P0965

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

P0966 or P0967

- P0966 and P0967 are Type A DTCs.
- TCM limits the transmission to 5th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM forces the torque converter clutch (TCC) OFF.
- TCM forces the high side driver OFF.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM enables torque management.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

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 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 2 Performance Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect *DT-48616-10* adapter harness between the vehicle harness connector, and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 2 Performance Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0969-P0971

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

P0969

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

P0970

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

P0971

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

Action Taken When the DTC Sets

P0969

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

P0970 or P0971

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

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 with the transmission in Park for 5 s.
2. Operate the vehicle in drive range. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 3 Performance Test Status
   - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 2 Performance Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P0973 or P0974

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

P0973

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

P0974

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

Action Taken When the DTC Sets

P0973

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

P0974

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

Conditions for Clearing the DIC/DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

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

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158.*

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158.*

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Shift Solenoid Valve 1 Control Circuit Low Voltage Test
   - Shift Solenoid Valve 1 Control Circuit Open Test
   - Shift Solenoid Valve 1 Control Circuit High Voltage Test

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*
- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P0989 or P0990

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P0989: Transmission Fluid Pressure Switch 5 Circuit Low Voltage
DTC P0990: Transmission Fluid Pressure Switch 5 Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Transmission Fluid Pressure Switch 5

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

Circuit/System Description

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

Conditions for Running the DTC

- DTC P0711, P0712, P0713, P0716, P0717, P0722, P0723, P0742, P0751, P0756, P0757, P0973, P0974, P0976, P0977, P1915, or P182E is not set.
- Engine speed is 400 RPM or greater for 5 seconds.
- Ignition voltage is 9.0 volts or greater.
- Transmission fluid temperature (TFT) is −7 to +110°C (19–230°F).
- High side driver is ON.
- Engine speed is 550 RPM or greater.

Conditions for Setting the DTC

P0989

The TCM detects that the TFP switch 5 signal voltage remains LOW after the low and reverse clutch or 4-5-6 clutch transitions from a HIGH pressure state to a LOW pressure state. The TCM counts each incident. The DTC sets when 17 counts are accumulated.

P0990

The TCM detects that the TFP switch 5 signal voltage remains HIGH after the low and reverse clutch or 4-5-6 clutch transitions from a LOW pressure state to a HIGH pressure state. The TCM counts each incident. The DTC sets when 30 counts are accumulated.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

DTCs P0989 and P0990 are Type C DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Engine idling in PARK with parking brake applied, and drive wheels chocked.
2. Verify with a scan tool, the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for the Park, Reverse, and Neutral gear select lever positions. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

3. Verify the Transmission Fluid Pressure Switch 1, Transmission Fluid Pressure Switch 3, Transmission Fluid Pressure Switch 4, and Transmission Fluid Pressure Switch 5 parameter states are correct for each forward range with the gear select lever in Drive, using the scan tool to command all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If any parameter value is not correct for a given gear range**

Refer to Circuit/System Testing below.

⇓ **If the parameter values are correct for all gear ranges**

4. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 control solenoid valve assembly, filter plate, channel plate and spacer plate. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209* and *Control Valve Body Replacement on page 17-213*.
2. Inspect the Q8 control solenoid valve assembly, filter plate, channel plate, and spacer plate for debris and blocked orifices.

⇒ **If debris or blocked orifices are observed**

Clean or replace as necessary.

⇒ **If no debris or blocked orifices are observed**

Replace the Q8 control solenoid valve assembly.

Repair Instructions

Note:

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic procedure.

Control Module References on page 6-3 for control solenoid valve assembly replacement, setup, or programming.

DTC P1761

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1761: Up and Down Shift Switch Signal Message Counter Incorrect

Circuit/System Description

When the shift lever is placed in the M position, electronic range select or manual mode, which allows for the selection of the range of gears available, is activated. This is also known as the tap shift function. The manual mode allows the vehicle operator to increase the highest range attainable by pressing the plus (+) button or decrease the highest attainable range by pressing the minus (−) button. The body control module (BCM) supplies a signal circuit to the shift controller. The shift controller has switches connected to a resistor array. A voltage drop occurs across the resistor network. When the plus or minus button is pushed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the transmission control module (TCM) to increase or decrease the available gear ranges. The BCM internal counter increments each time the tap shift signal status is sent and the BCM sends the rolling count with the tap shift signal status. The TCM counter increments each time the tap shift signal status is received. The DTC will set if the rolling count value of the TCM does not match the rolling count sent from the BCM.

Conditions for Running the DTC

- Engine speed is 400–7,500 RPM for 5 s.
- Runs continuously when above condition is met.

Conditions for Setting the DTC

TCM detects the internal rolling count value does not match the expected BCM count value, 3 times within 10 s.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P1761 is a Type C DTC.

Reference Information

Schematic Reference

- *Automatic Transmission Controls Schematics on page 17-30*
- *Data Communication Schematics on page 11-4*
- *Body Control System Schematics on page 11-8*

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Note:

- DTC P1761 is an informational DTC.
- Diagnose all other body control module DTCs prior to DTC P1761.

1. Verify there are no other body control module or communication DTCs set.

⇒ **If a DTC is set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If a DTC is not set**

2. Complete the diagnosis by looking for a GMLAN circuit fault. Refer to *Scan Tool Does Not Communicate with High Speed GMLAN Device on page 11-58*.

⇒ **If a GMLAN circuit fault is found**

Repair as necessary.

⇓ **If a GMLAN circuit fault is not found**

3. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Body Control Module and Control Solenoid Valve Assembly replacement, programming and setup.

DTC P182E or P1915

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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
Signal A	P182E	P1915	P1915	P182E, P1915
Signal B	P1915	P182E	P182E	P182E, P1915
Signal C	P1915	P182E	P182E	P182E, P1915
Signal P	P182E	P1915	P1915	P182E, P1915
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:** Low High High Low			
Switch Signal A	Low	High	High
Switch Signal B	Low	High	High
Switch Signal C	Low	High	High
Switch Signal P	Low	High	High
High = 12 volts Low = 0 volts			

Circuit/System Description

The manual shift detent lever with shaft position switch assembly, also known as the transmission internal mode switch assembly, is a sliding contact switch attached to the manual shift detent lever shaft inside the transmission. The 4 inputs to the transmission control module (TCM) from the switch indicate which position is selected by the transmission manual shaft. The input voltage at the TCM is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as Internal Mode Switch A/B/C/P parameter. The internal mode switch input parameters represented are transmission range Signal A, Signal B, Signal C, and Signal P. The park/neutral position switch is integrated into the transmission internal mode switch. The circuit uses the TCM as a pass-through connector only.

The park/neutral signal is sent from the park/neutral switch directly to the engine control module (ECM) and is used for engine start enable.

Conditions for Running the DTC

P182E

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, P07C0, P07BF, P077C, OR P077D is not set.
- Engine speed is 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- Engine torque signal is valid.
- DTC runs continuously when the above conditions are met.

P1915

- DTC P0722, P0723, or P1915 is not set.
- Transmission output shaft speed is 90 RPM or less.
- Ignition voltage is 6–32 V.
- DTC runs when conditions above are met during engine start sequence.

Conditions for Setting the DTC

P182E

Internal mode switch does not indicate a valid Park, Reverse, Neutral, or Drive Range position for 7 s.

P1915

Internal mode switch does not indicate Park or Neutral during the following sequence:

- Engine speed is less than 50 RPM for greater than 0.10 s.
- Engine speed is 50–480 RPM for greater than 0.07 s.
- Engine speed is greater than 500 RPM and the transmission input speed is greater than 100 RPM for greater than 1.25 s.

Action Taken When the DTC Sets

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

Conditions for Clearing the DTC

P182E and P1915 are Type A DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

1. Verify the range selector lever cable is adjusted properly. Refer to *Range Selector Lever Cable Adjustment on page 17-196.*

⇒ **If cable adjustment is not OK**

Repair as necessary.

⇓ **If cable adjustment is OK**

2. Ignition ON.
3. Verify the scan tool TCM Internal Mode Switch A/B/C/P parameter matches the *Transmission Internal Mode Switch Logic on page 17-12* table for each transmission shift lever position.

⇒ **If the parameter does not match**

Refer to Circuit/System Testing.

⇓ **If the parameter matches**

4. Verify the scan tool engine control module Park/Neutral Position Switch parameter displays Park/Neutral with the gear shift lever in Park or Neutral and In Gear in Reverse or Drive.

⇒ **If Park/Neutral or In Gear is not displayed**

Refer to Circuit/System Testing.

⇓ **If Park/Neutral and In Gear is displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

7. All OK.

Circuit/System Testing

Note: You must perform Circuit/System Verification first.

1. Ignition OFF, remove the control valve body cover.
2. Connect the vehicle harness connector to the Q8 Control Solenoid Valve Assembly.
3. Disconnect the B15 Transmission Internal Mode Switch connector at the Q8 Control Solenoid Valve Assembly.
4. Ignition ON.
5. Verify the scan tool engine control module Park/ Neutral Position Switch parameter displays In Gear.

⇒ **If In Gear is not displayed**

5.1. Ignition OFF, disconnect the vehicle harness X1 connector at the Q8 Control Solenoid Valve Assembly.

5.2. Install the *DT-48616-10* adapter harness to the X1 connector at Q8 Control Solenoid Valve Assembly.

5.3. Test for infinite resistance between the *DT-48616-10* adapter harness connector terminals 2 and 3.

⇒ If less than infinite resistance, replace the Q8 Control Solenoid Valve Assembly.

⇓ If infinite resistance.

5.4. Disconnect the harness connector at the K20 Engine Control Module.

5.5. Test for infinite resistance between the signal circuit and ground at the vehicle harness K20 Engine Control Module connector.

⇒ If less than infinite resistance, repair the short to ground on the circuit.

⇒ If infinite resistance, replace the K20 Engine Control Module.

⇓ **If In Gear is displayed**

6. Verify the scan tool transmission control module Internal Mode Switch A/B/C/P parameter displays High High High High.

⇒ **If High High High High is not displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If High High High High is displayed**

7. Install a 3 A fused jumper wire between the low reference circuit terminal F and each signal circuit listed below one at a time at the Q8 Control Solenoid Valve Assembly.
   - Signal A – terminal B
   - Signal B – terminal C
   - Signal C – terminal D
   - Signal P – terminal E
8. Verify the scan tool transmission control module A/B/C/P displays 1 Low and 3 High when a signal circuit is grounded.

⇒ **If 1 Low and 3 High is not displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If 1 Low and 3 High is displayed**

9. Connect a 3-amp fused jumper wire between terminal A and terminal F.
10. Verify the engine control module Park/Neutral Position Switch parameter displays Park/Neutral.

⇒ **If Park/Neutral is not displayed**

10.1. Ignition OFF, remove the jumper wire and disconnect the X1 connector at the Q8 Control Solenoid Valve Assembly.

10.2. Install the *DT-48616-10* adapter harness to the X1 connector at the Q8 Control Solenoid Valve Assembly.

10.3. Test for less than 2 Ω between the adapter harness terminal 2 and the X2 connector terminal F at the Q8 Control Solenoid Valve Assembly.

⇒ If greater than 2 Ω, replace the Q8 Control Solenoid Valve Assembly.

⇓ If less than 2 Ω .

10.4. Disconnect the connector at the K20 Engine Control Module.

10.5. Test for less than 2 Ω in the vehicle harness park/neutral signal circuit, end to end.

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

⇒ If less than 2 Ω, replace the K20 Engine Control Module.

⇓ **If Park/Neutral is displayed**

11. Replace the B15 Transmission Internal Mode Switch.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- *Control Valve Body Cover Replacement on page 17-210*
- *Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement on page 17-191*
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup

DTC P1876

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptor

DTC P1876: Up and Down Shift Enable Switch Circuit Low Voltage

Circuit/System Description

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

Conditions for Running the DTC

- Engine speed is greater than 400 RPM for 5 seconds.
- Ignition voltage is 9.0 V or greater.
- DTC P0815, P0816, P0826, P1761, P1825, P1876, P1877, P1915, or U0100 is not set.

Conditions for Setting the DTC

Transmission control module (TCM) detects a TAP Enable Switch request for 3 seconds when the shift lever is in Park, Reverse, or Neutral, a total of 5 times.

Action Taken When the DTC Sets

- DTC P1876 is a Type C DTC.
- TCM inhibits Tap-Up/Tap-Down functions.
- TCM inhibits manual up, manual down shifts with the shift selector.

Conditions for Clearing the DIC/DTC

DTC P1876 is a Type C DTC.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

- *Transmission General Description on page 17-317*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

1. Verify there were no internal mode switch (IMS) DTCs set.

⇒ **If IMS DTCs were set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If IMS DTCs are not set**

2. Ignition ON.
3. Verify the gear shift lever position matches the scan tool TCM Internal Mode Switch parameter while slowly moving the gear shift lever from Park through all ranges.

⇒ **If the specified values are not correct**

Refer to *Range Selector Lever Cable Adjustment on page 17-196*.

⇓ **If the specified values are correct**

4. 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.

⇒ **If the Driver Shift Request parameter does not display the correct values**

Refer to Circuit/System Testing below.

⇓ **If the Driver Shift Request parameter displays the correct values**

5. After performing the above steps, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions you observe from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

Circuit/System Testing

Note: You must perform Circuit/System Verification first.

1. Ignition OFF, disconnect the S3 transmission shift lever electrical connector.
2. Test for less than 10 ohms between the S3 transmission shift lever harness connector terminal 2 and ground.

⇒ **If 10 Ω or greater**

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

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

⇒ If less than 2 Ω, repair the open/high resistance in the ground connection.

⇓ **If less than 10 Ω**

3. Ignition ON.
4. Test for 11 V or greater at the S3 transmission shift lever harness connector between signal circuit terminal 3 and ground.

⇒ **If less than 11 V**

4.1. Ignition OFF, remove the connector at the K9 body control module.

4.2. Test for infinite resistance between the S3 transmission shift lever harness connector signal circuit terminal 3 and ground.

⇒ If less than infinite resistance, repair the short to ground in the circuit.

⇓ If infinite resistance.

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

⇒ If 2 Ω or greater, repair the open/high resistance in the signal circuit wire.

⇒ If less than 2 Ω, replace the K9 body control module.

⇓ **If 11 V or greater**

5. Ignition OFF.
6. Test for 5.8–6.4 kΩ between the S3 transmission shift lever connector terminal 3 and terminal 2.

⇒ **If not between 5.8–6.4 kΩ**

Replace the S3 transmission shift lever.

⇓ **If between 5.8–6.4 kΩ**

7. Test for 1.8–2.2 kΩ between the S3 shift lever connector terminal 3 and terminal 2 with the tap down button depressed.

⇒ **If not between 1.8–2.2 kΩ**

Replace the S3 transmission shift lever.

⇓ **If between 1.8–2.2 kΩ**

8. Test for 580–680 Ω between the S3 shift lever connector terminal 3 and terminal 2 with the tap down button depressed.

⇒ **If not between 580–680 Ω**

Replace the S3 transmission shift lever.

⇓ **If between 580–680 Ω**

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

⇒ **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

⇓ **If less than 2 Ω**

10. Replace the K9 body control module.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the diagnostic repair.

Note:

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- Before replacing the TCM, perform the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.
- *Transmission Control Replacement on page 17-193* for AT TAP shift switch replacement.
- *Control Module References on page 6-3* for BCM or control solenoid valve assembly replacement, programming and setup.

DTC P2714 or P2715 (Gen 1)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P2714: Pressure Control Solenoid Valve 4 Stuck Off
DTC P2715: Pressure Control Solenoid Valve 4 Stuck On

Circuit/System Description

The clutch pressure control solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. The pressure control solenoid 4 regulates transmission fluid pressure to the 2-6 regulator valve which controls pressure to the 2-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

P2714

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- High side driver is enabled.
- Throttle position signal is valid.
- Ignition voltage is between 9–32 V.
- Transmission fluid temperature is −7°C (19°F) or greater.
- Engine speed is between 400–7500 RPM for 5 seconds.
- 2-6 clutch is commanded ON.
- Output speed is 650 RPM or greater, or the throttle position is greater than 0.5 percent.

P2715

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Ignition voltage is between 9–32 V.
- Transmission output shaft speed is 200 RPM or greater.
- Engine speed is between 400–7500 RPM for 5 seconds.
- 2-6 clutch is commanded OFF.
- Transmission fluid temperature is 0°C (32°F) or greater.
- Attained range is not 1st gear.
- High side driver is enabled.
- Transmission input speed is 200 RPM or greater.

Conditions for Setting the DTC

P2714

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

P2715

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

Action Taken When the DTC Sets

P2714

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

P2715

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

Conditions for Clearing the DIC/DTC

DTCs P2714 and P2715 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Drive Range, Second Gear (Gen 1) on page 17-341* or *Drive Range, Second Gear (Gen 2) on page 17-343*
- *Drive Range, Sixth Gear (Gen 1) on page 17-366* or *Drive Range, Sixth Gear (Gen 2) on page 17-368*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
3. Verify the scan tool TFP Switch 3 parameter displays the correct state for each gear range while placing the gear select lever in Park, Reverse, and Neutral range. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

4. Gear select lever in Drive range.

Note: Use Drive 1st – Engine Braking to determine expected 1st gear Transmission Fluid Pressure Switch parameter states.

5. Verify the scan tool TFP Switch 3 parameter displays the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

6. Ignition ON, engine OFF. Clear the TCM DTC information with a scan tool.
7. Perform the *Road Test on page 17-167*.
8. Verify DTC P2714 or P2715 did not set.

⇒ **If a DTC set**

Refer to Circuit/System Testing.

⇓ **If a DTC does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

11. All OK.

Circuit/System Testing

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

1. Verify the transmission line pressures are within range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

⇒ **If the line pressures are not within the specified ranges**

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the line pressures are within the specified ranges**

2. Engine Idling, shift selector in the Drive position.
3. Verify the scan tool parameters listed below display the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11* for the correct gear range states.
   - TFP Switch 1
   - TFP Switch 3

- TFP Switch 4
- TFP Switch 5

⇒ **If the correct state for each gear range is not displayed**

3.1. Ignition OFF.

3.2. Remove the Control Valve Body. Refer to *Control Valve Body Replacement on page 17-213*.

3.3. Verify the Control Valve Body is not contaminated with any debris and there is no damage or sticking valves, refer to *Control Valve Body Cleaning and Inspection (Gen 2) on page 17-306*.

⇒ If there is contamination, damage, or sticking valves, repair or replace the control valve body as necessary.

⇒ If there is no contamination, damage, or sticking valves, replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the correct state for each gear range is displayed**

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

P2714 A/Trans Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2714 Torque Converter (w/fluid pump) Housing Assembly

Fluid pump housing/gear damaged/scored.

P2714 Trans case and 1-2-3-4 clutch backing plate retainer ring

1-2-3-4 clutch backing plate retaining ring not seated/ oriented correctly at trans case groove.

P2714 or P2715 Trans case, 2-6 clutch piston, spring retaining ring, reaction sun gear

- 2-6 clutch return spring retaining ring not seated in groove
- 2-6 clutch piston assembly – seal damaged or leaking
- 2-6 clutch plates worn or damaged
- 2-6 clutch plates will not slide over the reaction sun gear shell freely

P2714 Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2714 or P2715 Control Valve Body Assembly

2-6 clutch regulator valve stuck/sticking, debris, binding, damaged valve, or scored bore.

P2714 or P2715 Q8 Control Solenoid Valve Assembly

- Pressure Control Solenoid Valve 4 Stuck ON/OFF.
- Control signal fluid supply leak – valve body filter plate assembly cracked or damaged gasket seal.
- O-ring seals leaking.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.

- *Internal Components Removal on page 17-236*
- *2-6 Clutch Piston Removal on page 17-237*
- *Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 1) on page 17-253* or *Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 2) on page 17-254*
- *2-6 Clutch Piston Installation (6T30) on page 17-251* or *2-6 Clutch Piston Installation (6T40/45/50) on page 17-252*
- *3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation on page 17-269*
- Refer to *Control Module References on page 6-3* for control solenoid valve assembly replacement, programming and setup.

DTC P2714 or P2715 (Gen 2)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* provides an overview of each diagnostic category.

DTC Descriptors

DTC P2714: Pressure Control Solenoid Valve 4 Stuck Off
DTC P2715: Pressure Control Solenoid Valve 4 Stuck On

Circuit/System Description

Pressure control solenoid 4 is part of the control solenoid valve assembly which has no serviceable components. Pressure control solenoid 4 regulates transmission fluid pressure to the 2-6 regulator valve which controls pressure to the 2-6 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

P2714

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- High side driver is enabled.
- Throttle position signal is valid.
- Ignition voltage is 9–32 V.
- Transmission fluid temperature is −6.6°C (20°F) or greater.
- Engine speed is 400–7,500 RPM for 5 s.
- Pressure control solenoid 4 is commanded ON, applying the 2-6 clutch.
- Output speed is 100 RPM or greater, or the throttle position is greater than 0.5%.
- Runs continuously when above conditions are met.

P2715

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Ignition voltage is 9–32 V.
- Transmission output shaft speed is 100 RPM or greater, or throttle position is 0.5% or greater.
- Pressure control solenoid 4 is commanded OFF, releasing the 2–6 clutch.
- Transmission fluid temperature is −6.6°C (20°F) or greater.
- Engine speed is 400–7,500 RPM for 5 s.
- Engine torque is 45 N•m (33 lb ft) or greater.
- The attained range is not 1st gear.
- High side driver is enabled.
- Runs continuously when above conditions are met.

Conditions for Setting the DTC

P2714

TCM detects an incorrect on-coming clutch gear ratio, or shift flare. This condition must occur 3 times.

P2715

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up. This condition must occur 3 times.

Action Taken When the DTC Sets

P2714

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

P2715

- P2715 is a Type A DTC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits the Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM inhibits powertrain braking.
- TCM inhibits auto grade braking.
- TCM inhibits neutral idle.

- TCM commands 2nd gear if the output speed is less than 700 RPM.
- TCM commands neutral if the output speed is 700 RPM or greater.

Conditions for Clearing the DTC

P2714 and P2715 are Type A DTCs.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Drive Range, Second Gear (Gen 1) on page 17-341* or *Drive Range, Second Gear (Gen 2) on page 17-343*
- *Drive Range, Sixth Gear (Gen 1) on page 17-366* or *Drive Range, Sixth Gear (Gen 2) on page 17-368*
- *Electronic Component Description on page 17-319*
- *Transmission Component and System Description on page 17-318*
- *Transmission General Description on page 17-317*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

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

⇒ **If any of the DTCs were set**

Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.

⇓ **If none of the DTCs were set**

3. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
4. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

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

Repair as necessary.

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

5. Ignition ON, clear the TCM DTCs with a scan tool.
6. Verify DTC P2714 or P2715 does not set while performing a road test. Refer to *Road Test on page 17-167*.

⇒ **If DTC P2714 or P2715 sets**

Refer to Circuit/System Testing.

⇓ **If DTC P2714 or P2715 does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

9. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

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

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the pressures are within range**

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

4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

⇒ **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

P2714 Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2714 or P2715 Control Valve Body Assembly

2-6 clutch regulator valve stuck/sticking, debris, binding, damaged valve, or scored bore.

P2714 Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2714 Torque Converter (w/fluid pump) Housing Assembly

Fluid pump housing/gear damaged/scored.

P2714 Trans case and 1-2-3-4 clutch backing plate retainer ring

1-2-3-4 clutch backing plate retaining ring not seated/ oriented correctly at trans case groove.

P2714 or P2715 Transmission case, 2-6 clutch piston, spring retaining ring, reaction sun gear

- 2-6 clutch return spring retaining ring not seated in groove
- 2-6 clutch piston assembly – seal damaged or leaking
- 2-6 clutch plates worn or damaged
- 2-6 clutch plates will not slide over the reaction sun gear shell freely

P2714 or P2715 Q8 Control Solenoid Valve Assembly

- Pressure Control Solenoid Valve 4 Stuck ON/OFF.
- Control signal fluid supply leak – valve body filter plate assembly cracked or damaged gasket seal.
- O-ring seals leaking.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P2719-P2721

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

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

Conditions for Running the DTC

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

Conditions for Setting the DTC

P2719

TCM detects an internal electrical performance malfunction on the clutch pressure solenoid 4 control circuit where the measured clutch pressure control solenoid 4 current does not equal the commanded clutch pressure control solenoid 4 current for 5 s.

P2720

TCM detects a short to ground on the clutch pressure control solenoid 4 control circuit for 1 s.

P2721

TCM detects an open or short to voltage on the clutch pressure control solenoid 4 control circuit for 1 s.

Action Taken When the DTC Sets

P2719

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

P2720

- P2720 is a Type A DTC.
- TCM limits the transmission to 2nd gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual up, manual down shifts with the shift selector.
- TCM commands 2nd gear if the transmission is in a forward gear and the output speed is less than 700 RPM, or neutral if the output speed is 700 RPM or greater.

P2721

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

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

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. Allow the transmission to shift through all forward gear ranges.
3. Ignition ON.
4. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 4 Performance Test Status
   - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 2 Performance Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P2723 or P2724 (Gen 1)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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 solenoid 5 is part of the control solenoid valve assembly, which has no serviceable components. The pressure control solenoid 5 regulates transmission fluid pressure to the 1-2-3-4 regulator valve which controls pressure to the 1-2-3-4 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft (OSS) speed sensor. 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.
- Ignition voltage is between 9–32 V.
- Throttle position signal is valid.
- Engine speed is between 400–7500 RPM for 5 seconds.
- High side driver is enabled.
- Transmission fluid temperature is −7°C (19°F) or greater.
- Transmission output speed is 100 RPM or greater or the throttle position is 0.5 percent or greater.

P2724

- DTC P0101, P0102, P0103, P0106, P0107, P0108, P0171, P0172, P0174, P0175, P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208, P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308, P0401, P042E, P0716, P0717, P0722, P0723, or P182E is not set.
- Engine speed is between 400–7500 RPM for 5 seconds.
- Ignition voltage is between 9–32 V.
- Throttle position signal is valid.
- Transmission Fluid Temperature is −7°C (19°F) or greater.
- High side driver is enabled.
- Transmission output shaft speed is 100 RPM or greater, or the throttle position is 0.5 percent or greater.
- If commanded range is 1st gear, throttle position is 10 percent or greater and engine torque is 45 N•m (33 lb ft) or greater.

Conditions for Setting the DTC

P2723

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

P2724

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

Action Taken When the DTC Sets

P2723

- DTC P2723 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits Manual Up/Manual Down with the gear selector.
- Torque management is enabled.
- TCM inhibits neutral idle.
- TCM inhibits powertrain braking.
- TCM inhibits autograde braking.
- TCM limits the transmission to reverse and 5th range.

P2724

- DTC P2724 is a Type A DTC.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits Manual Up/Manual Down with the gear selector.
- TCM limits the transmission to reverse and 3rd range.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.

Conditions for Clearing the DIC/DTC

DTCs P2723 and P2724 are Type A DTCs.

Reference Information

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Drive Range, First Gear (Gen 1) on page 17-337* or *Drive Range, First Gear (Gen 2) on page 17-339*
- *Drive Range, Second Gear (Gen 1) on page 17-341* or *Drive Range, Second Gear (Gen 2) on page 17-343*
- *Drive Range, Third Gear (Gen 1) on page 17-345* or *Drive Range, Third Gear (Gen 2) on page 17-347*
- *Drive Range - Fourth Gear (Gen 1) on page 17-349* or *Drive Range - Fourth Gear (Gen 2) on page 17-351*
- *Drive Range, Fifth Gear (Gen 1) on page 17-356* or *Drive Range, Fifth Gear (Gen 2) on page 17-358*
- *Drive Range - Fourth Gear Default (Gen 2/Hybrid) on page 17-353*
- *Drive Range, Sixth Gear (Gen 1) on page 17-366* or *Drive Range, Sixth Gear (Gen 2) on page 17-368*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

1. Engine idling in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
3. Verify the scan tool TFP Switch 4 parameter displays the correct state for each gear range while placing the gear select lever in Park, Reverse, and Neutral range. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

4. Gear select lever in Drive range.
5. Verify the scan tool TFP Switch 4 parameter state displays the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11*.

⇒ **If the correct state for each gear range is not displayed**

Refer to Circuit/System Testing.

⇓ **If the correct state for each gear range is displayed**

6. Ignition ON, engine OFF. Clear the TCM DTC information with a scan tool.
7. Perform the *Road Test on page 17-167*.
8. Verify DTC P2723 or P2724 did not set.

⇒ **If a DTC set**

Refer to Circuit/System Testing.

⇓ **If a DTC does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

11. All OK.

Circuit/System Testing

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

1. Verify the transmission line pressures are within range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

⇒ **If line pressures are not within the specified ranges**

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If line pressures are within the specified ranges**

2. Engine Idling, shift selector in the Drive position.
3. Verify the scan tool parameters listed below display the correct state for each gear range while commanding the scan tool Shift Transmission Gear through all forward ranges. Refer to *Transmission Fluid Pressure Switch Logic on page 17-11* for the correct gear range states.
   - TFP Switch 1
   - TFP Switch 3

- TFP Switch 4
- TFP Switch 5

⇒ **If the correct state for each gear range is not displayed**

Replace the Q8 control solenoid valve assembly.

3.1. Ignition OFF.

3.2. Remove the Control Valve Body. Refer to *Control Valve Body Replacement on page 17-213*.

3.3. Verify the Control Valve Body is not contaminated with any debris and there is no damage or sticking valves, refer to *Control Valve Body Cleaning and Inspection (Gen 2) on page 17-306*.

⇒ If there is contamination, damage, or sticking valves, repair or replace the control valve body as necessary.

⇒ If there is no contamination, damage, or sticking valves, replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the correct state for each gear range is displayed**

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

P2723 – Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2723 – Torque Converter (w/Fluid Pump) Housing Assembly

- Fluid pump housing/gear damaged/scored.
- Fluid pump or torque converter overstressed due to high temperatures.

P2723 – Trans Case and 1-2-3-4 Clutch Backing Plate Retaining Ring

1-2-3-4 clutch backing plate retaining ring not seated/ oriented, causing clutch pack/piston over travel.

P2723 – Output Sun Gear Assembly

Housing/hub weld cracked/leaking.

P2723 – Lo and Reverse and 1-2-3-4 Clutch Housing Assembly (51)

1-2-3-4 clutch piston (414) cracked/damaged/leaking.

P2723 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2723 or P2724 – Control Valve Body Assembly

1-2-3-4 clutch regulator valve stuck/sticking – debris, binding, damaged valve, or scored bore.

P2723 or P2724 – Q8 Control Solenoid Valve Assembly (314)

- Pressure Control Solenoid Valve 5 Stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damage gasket seal.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission related repairs.
- *Internal Components Removal on page 17-236*
- *Low and Reverse and 1-2-3-4 Clutch Housing Disassemble on page 17-271*
- *Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection on page 17-273*
- *Low and Reverse and 1-2-3-4 Clutch Housing Assemble (6T30) on page 17-274* or *Low and Reverse and 1-2-3-4 Clutch Housing Assemble (6T40/45/50) on page 17-276*
- *Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T30) on page 17-278* or *Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T40/45/50) on page 17-279*
- Refer to *Control Module References on page 6-3* for control solenoid valve assembly replacement, programming and setup

DTC P2723 or P2724 (Gen 2)

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Pressure control solenoid 5 is part of the control solenoid valve assembly, which has no serviceable components. The pressure control solenoid 5 regulates transmission fluid pressure to the 1-2-3-4 regulator valve which controls pressure to the 1-2-3-4 clutch. The transmission control module (TCM) calculates gear ratio based on the speed signals from the input shaft speed (ISS) sensor and the output shaft speed (OSS) sensor. The TCM compares the expected transmission gear ratio to the calculated gear ratio for each commanded gear.

Conditions for Running the DTC

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

Conditions for Setting the DTC

P2723

TCM detects an incorrect on-coming clutch gear ratio, or shift flare when the 1-2-3-4 clutch is commanded ON. This condition must occur 3 times.

P2724

TCM detects an incorrect off-going clutch gear ratio, or shift tie-up when the 1-2-3-4 clutch is commanded OFF. This condition must occur 3 times.

Action Taken When the DTC Sets

- P2723 and P2724 are Type A DTCs.
- TCM freezes transmission adaptive functions.
- TCM commands maximum line pressure.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits Manual Up/Manual Down with the gear selector.
- Torque management is enabled.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits auto grade braking.
- TCM limits the transmission to reverse and 5th range – P2723 only.
- TCM limits the transmission to reverse and 3rd range – P2724 only.

Conditions for Clearing the DIC/DTC

P2723 and P2724 are Type A DTCs.

Diagnostic Aids

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*
- *Drive Range, First Gear (Gen 1) on page 17-337* or *Drive Range, First Gear (Gen 2) on page 17-339*
- *Drive Range, Second Gear (Gen 1) on page 17-341* or *Drive Range, Second Gear (Gen 2) on page 17-343*

- *Drive Range, Third Gear (Gen 1) on page 17-345* or *Drive Range; Third Gear (Gen 2) on page 17-347*
- *Drive Range - Fourth Gear (Gen 1) on page 17-349* or *Drive Range - Fourth Gear (Gen 2) on page 17-351*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

Warning: Refer to Parking Brake and Drive Wheels Warning on page 0-5.

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

1. Engine idling, transmission in Park, with parking brake applied and drive wheels chocked.
2. Verify the transmission fluid level and condition is correct. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

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

Repair as necessary.

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

3. Ignition ON, clear the TCM DTCs with a scan tool.
4. Verify DTC P2723 or P2724 does not set while performing a road test. Refer to *Road Test on page 17-167*.

⇒ **If DTC P2723 or P2724 sets**

Refer to Circuit/System Testing.

⇓ **If DTC P2723 or P2724 does not set**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

7. All OK.

Circuit/System Testing

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

1. Engine idling at the normal operating temperature.
2. Verify the transmission line pressures are within the specified range. Refer to *Line Pressure Check on page 17-166* and *Solenoid Valve Pressure (Gen 1) on page 17-12*.

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

Refer to *Fluid Pressure High or Low on page 17-191*.

⇓ **If the pressures are within range**

3. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
4. Verify the pressure changes for all solenoids when performing the solenoid test. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

⇒ **If the pressure does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure changes**

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

P2723 or P2724 – Control Valve Body Assembly

1-2-3-4 clutch regulator valve stuck/sticking – debris, binding, damaged valve, or scored bore.

P2723 – Automatic Transmission Fluid Filter Assembly

Oil filter or filter seal loose or damaged.

P2723 – Torque Converter (w/Fluid Pump) Housing Assembly

- Fluid pump housing/gear damaged/scored.
- Fluid pump or torque converter overstressed due to high temperatures.

P2723 – Trans Case and 1-2-3-4 Clutch Backing Plate Retaining Ring

1-2-3-4 clutch backing plate retaining ring not seated/ oriented, causing clutch pack/piston over travel.

P2723 – Output Sun Gear Assembly

Housing/hub weld cracked/leaking.

P2723 – Lo and Reverse and 1-2-3-4 Clutch Housing Assembly

1-2-3-4 clutch piston cracked/damaged/leaking.

P2723 – Channel Plate and Spacer Plate

Oil channels or orifices blocked by debris.

P2723 or P2724 – Q8 Control Solenoid Valve Assembly

- Pressure Control Solenoid Valve 5 Stuck ON/OFF.
- O-ring seals leaking.
- Valve body filter plate assembly cracked, blocked, or damage gasket seal.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P2728-P2730

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

Pressure control solenoid 5 is part of the control solenoid valve assembly which has no serviceable components. The normally high pressure control solenoid 5 regulates and directs oil pressure to the 1-2-3-4 clutch regulator valve. Increasing pressure control solenoid 5 pressure increases pressure to the 1-2-3-4 clutch. The transmission control module (TCM) varies the current to the pressure control solenoid 5 by controlling the amount of time the low side driver is ON and OFF. Increasing the current to pressure control solenoid 5 decreases pressure control solenoid 5 oil pressure by opening the solenoid exhaust port. Decreasing the current to pressure control solenoid 5 increases pressure control solenoid 5 oil pressure by closing OFF the solenoid exhaust port. Pressure control solenoid 5 power is supplied by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset.

Conditions for Running the DTC

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

Conditions for Setting the DTC

P2728

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

P2729

TCM detects a short to ground on the clutch pressure control solenoid 5 control circuit for 1 s.

P2730

TCM detects an open or short to voltage on the clutch pressure control solenoid 5 control circuit for 1 s.

Action Taken When the DTC Sets

P2728

- P2728 is a Type C DTC.
- TCM freezes transmission adaptive functions on the 1-2-3-4 clutch.

P2729

- P2729 is a Type A DTC.
- TCM commands the high side driver OFF.
- TCM forces the torque converter clutch OFF.
- TCM limits the transmission to 4th gear and reverse.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM inhibits Tap Up/Tap Down.
- TCM inhibits manual up, manual down with the shift selector.
- TCM inhibits neutral idle.
- TCM inhibits powertrain braking.

P2730

- P2730 is a Type A DTC.
- TCM limits the transmission to reverse and 4th gear.
- TCM inhibits powertrain braking.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Tap Down function.
- TCM inhibits manual shifting of forward gears.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.

Conditions for Clearing the DTC

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

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

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. Allow the transmission to shift through all forward gear ranges.
3. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 5 Performance Test Status
   - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - Pressure Control Solenoid Valve 5 Performance Test Status
   - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
   - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

DTC P2762, P2763, or P2764

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle on page 6-66* prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis on page 6-58* for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions on page 6-59* 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

Circuit/System Description

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

Conditions for Running the DTC

P2762

- P2762 is not set.
- Engine speed is 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- DTC runs continuously when above conditions are met.

P2763 or P2764

- P0658 or P0659 is not set.
- Engine speed is 400–7,500 RPM for 5 s.
- Ignition voltage is 9–32 V.
- High side driver is enabled.
- DTC runs continuously when above conditions are met.

Conditions for Setting the DTC

P2762

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

P2763

TCM detects an open/high resistance or short to voltage on the TCC pressure control solenoid control circuit for 5 s.

P2764

TCM detects a short to ground on the TCC pressure control solenoid control circuit for 5 s.

Action Taken When the DTC Sets

P2762

P2762 is a Type C DTC.

P2763

- P2763 is a Type B DTC.
- TCM inhibits 6th gear.
- TCM forces TCC OFF.
- TCM changes to a Hot Mode shift pattern.

P2764

- P2764 is a Type A DTC.
- TCM inhibits TCC.
- TCM commands maximum line pressure.
- TCM freezes transmission adaptive functions.
- TCM defaults the transmission to 4th gear and reverse.
- TCM inhibits neutral idle.
- TCM inhibits Tap Up/Down function.
- TCM inhibits manual shifting of forward gears.
- TCM forces the high side driver OFF.
- TCM enables torque management.
- TCM inhibits auto grade braking.
- TCM inhibits powertrain braking.

Conditions for Clearing the DIC/DTC

- P2762 is a Type C DTC.
- P2763 is a Type B DTC.
- P2764 is a Type A DTC.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics on page 17-30

Connector End View Reference

- *Component Connector End Views on page 11-269*
- *Inline Harness Connector End Views on page 11-465*

Description and Operation

- *Transmission General Description on page 17-317*
- *Transmission Component and System Description on page 17-318*
- *Electronic Component Description on page 17-319*

Electrical Information Reference

- *Circuit Testing on page 11-526*
- *Connector Repairs on page 11-548*
- *Testing for Intermittent Conditions and Poor Connections on page 11-531*
- *Wiring Repairs on page 11-537*

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions on page 6-68

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Special Tools

DT-48616-10 Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Circuit/System Verification

1. Operate the vehicle in 2nd gear long enough to ensure at least a 3°C (5°F) rise in TCM temperature.
2. Operate the vehicle in drive range and ensure TCC is commanded ON for 1 min.
3. Verify the scan tool parameters listed below do not display Malfunction:
   - TCC Pressure Control Solenoid Valve Performance Test Status
   - TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
   - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Refer to Circuit/System Testing.

⇓ **If Malfunction is not displayed**

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

⇒ **If the DTC sets**

Refer to Circuit/System Testing.

⇓ **If the DTC does not set**

6. All OK.

Circuit/System Testing

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

1. Ignition OFF, remove the Q8 Control Solenoid Valve Assembly.
2. Verify the Q8 Control Solenoid Valve Assembly is not contaminated with any debris and clean as necessary. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

⇒ **If contaminated**

Repair as necessary.

⇓ **If not contaminated**

3. Verify the resistance is within the specified range for each solenoid listed in the *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.

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

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the resistance is within range**

4. Place the Q8 Control Solenoid Valve Assembly on a clean work surface near the transmission assembly.
5. Connect the *DT-48616-10* adapter harness between the vehicle harness connector and the Q8 Control Solenoid Valve Assembly connector. Ignition ON.
6. Verify the scan tool parameters listed below do not display Malfunction:
   - TCC Pressure Control Solenoid Valve Performance Test Status
   - TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
   - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

⇒ **If Malfunction is displayed**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If Malfunction is not displayed**

7. All OK.

Repair Instructions

Perform the *Diagnostic Repair Verification on page 6-92* after completing the repair.

- Perform the *Transmission Adaptive Values Learn on page 17-163* following all transmission repairs.
- *Control Module References on page 6-3* for Control Solenoid Valve Assembly replacement, programming and setup.

Symptoms - Automatic Transmission

Note: Use the symptom tables only if the following conditions are met:

- Refer to *Diagnostic Starting Point - Vehicle on page 6-66*.
- 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 on page 17-317* and *Transmission Component and System Description on page 17-318*.

Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

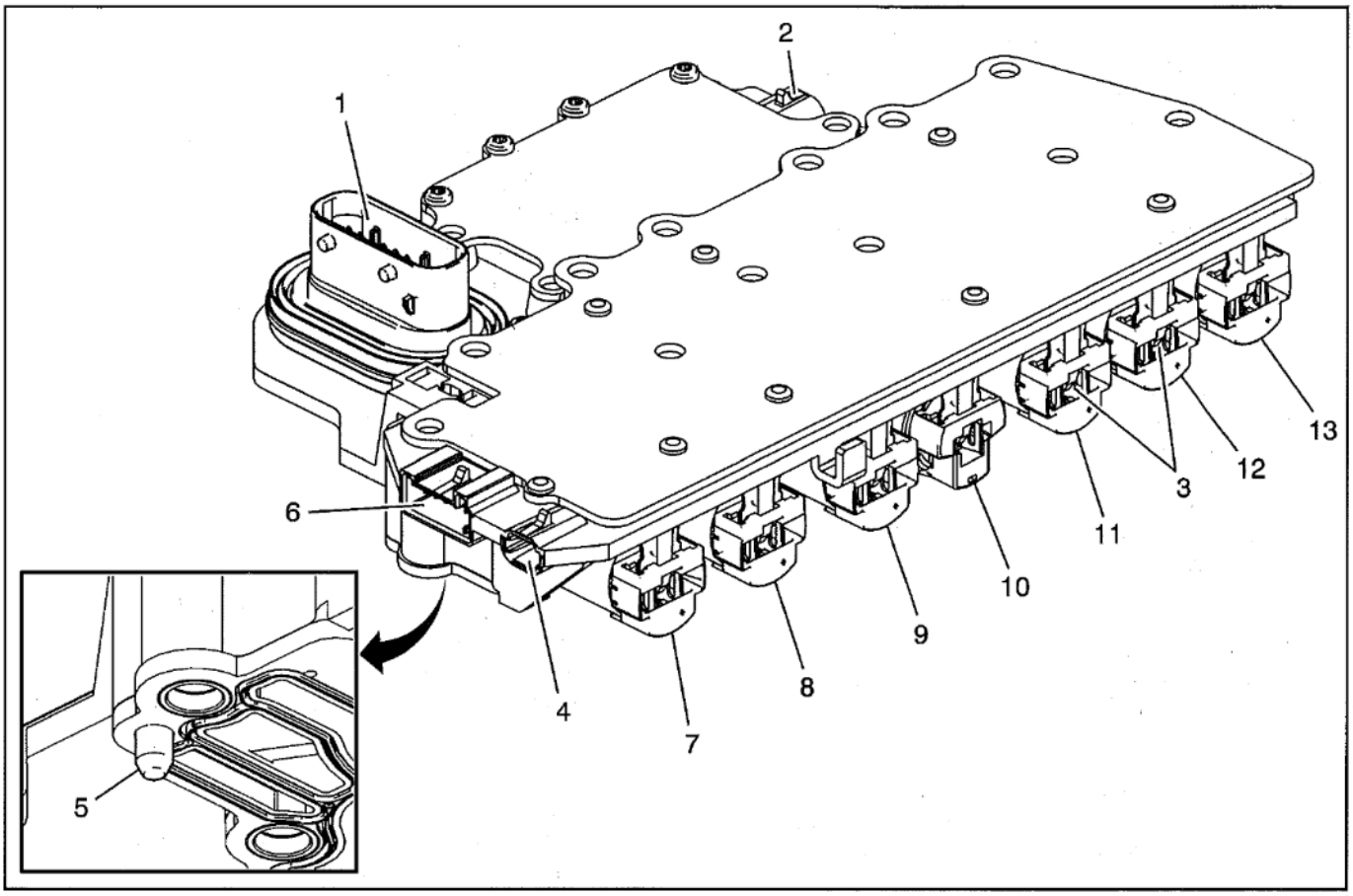
Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections on page 11-531*.

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 on page 17-164*
  - *Fluid Pressure High or Low on page 17-191*
  - *Automatic Transmission Fluid Leaks on page 17-183*
  - *Fluid Leak Diagnosis (Non Hybrid) on page 17-172*
- Noise and Vibration Diagnosis
  - *Whine/Growl Noise on page 17-181*
  - *Noise and Vibration Analysis on page 17-180*
  - *Torque Converter Diagnosis on page 17-169*
- Range Performance Diagnosis
  - *No Park on page 17-183*
  - *No Drive in All Ranges on page 17-184*
  - *No Reverse Gear on page 17-190*
- Shift Quality Feel Diagnosis
  - *Harsh Garage Shift on page 17-184*
  - *Harsh or Late First, Second, Third, and Fourth Shift on page 17-187*
  - *Harsh First and Reverse Shift on page 17-188*
  - *Harsh or Late Second and Sixth Shift on page 17-188*
  - *Harsh or Late Third, Fifth, and Reverse Shift on page 17-189*
  - *Harsh Fourth, Fifth, and Sixth Shift on page 17-189*
- Shift Pattern
  - *No First and Reverse Gears on page 17-186*
  - *No First, Second, Third, and Fourth Gear on page 17-186*
  - *No Second and Sixth Gear on page 17-187*
  - *No Fourth, Fifth, and Sixth Gear on page 17-189*
  - *No Third, Fifth, and Reverse Gear on page 17-188*
- Torque Converter Diagnosis
  - *Torque Converter Diagnosis on page 17-169*
  - *No Torque Converter Clutch Apply on page 17-189*
  - *No Torque Converter Clutch Release on page 17-190*
- Symptom Not Found or No Symptom Detected
  - *Transmission Fluid Level and Condition Check on page 17-164*
  - *Road Test on page 17-167*
  - *Line Pressure Check on page 17-166*

Control Solenoid Valve and Transmission Control Module Assembly Inspection



1. Verify the conditions listed below do not exist. Carefully inspect the control solenoid valve assembly connectors and pins (1, 2, 4, 6) for the condition. Repair or replace as necessary.
   - Damage
   - Bent pins
   - Debris
   - Broken retaining tab
   - Contamination
2. Verify there is no metallic debris inside the connectors near the terminal pins. Clean as necessary.
3. Verify the control solenoid valve assembly solenoid leads (3) do not have contamination or metallic debris. Clean as necessary.
4. Verify the resistance between the leads of each solenoid is within the range in the table below, with the solenoids at room temperature. If the resistance of any solenoid is not within range, replace the Control Valve Body Assembly.
5. Inspect the 2 control solenoid valve assembly filter plate retaining tabs (5) for cracks and ensure proper tension when filter plate is attached.

Solenoid Resistance

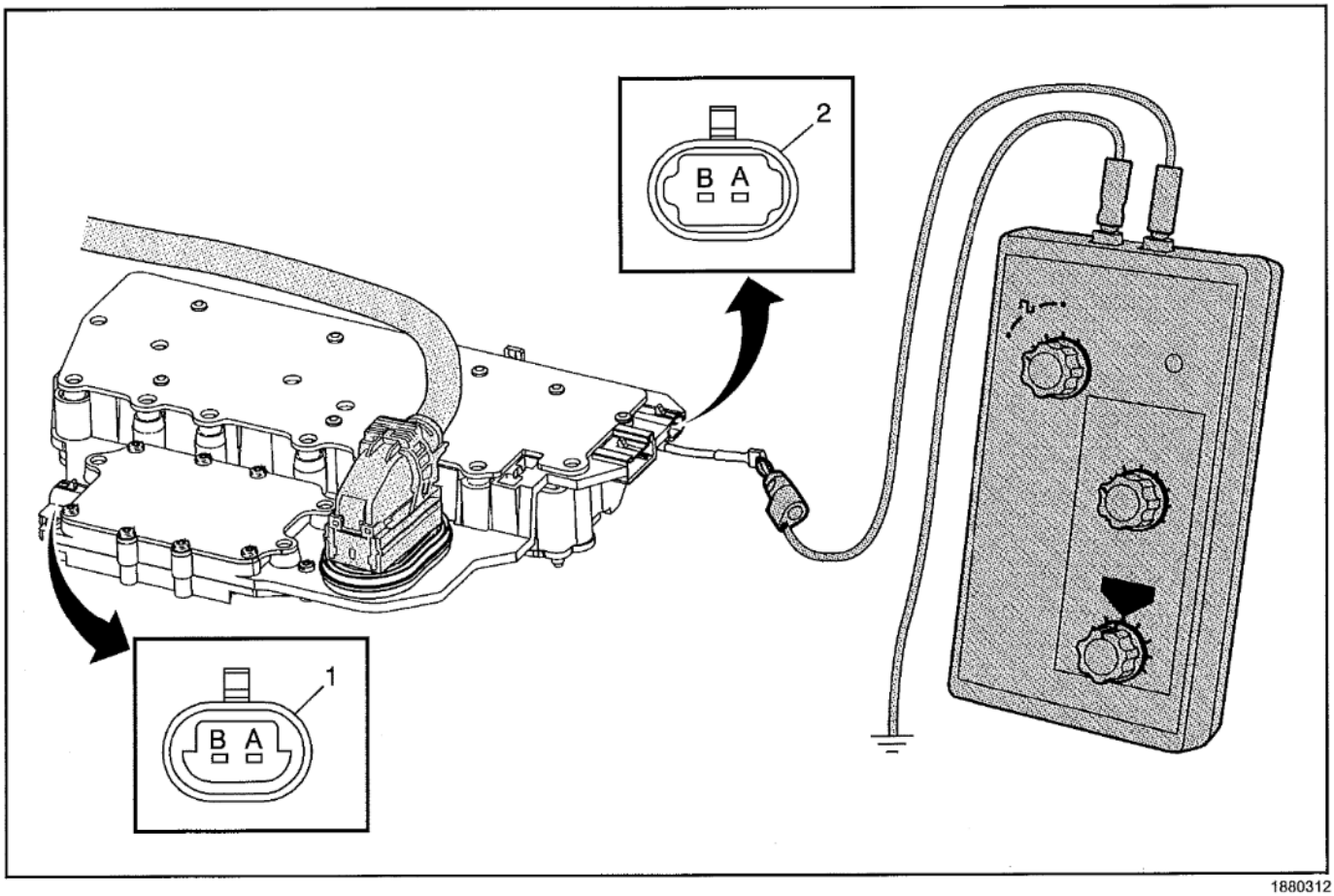
Solenoid Name	Illustration Number	Expected Resistance Ω
Pressure Control Solenoid 3	7	3.42–4.18
Pressure Control Solenoid 2	8	3.42–4.18
TCC Pressure Control Solenoid Valve	9	3.42–4.18
Shift Solenoid Valve 1	10	16.2–19.8
Pressure Control Solenoid 5	11	3.42–4.18
Pressure Control Solenoid 4	12	3.42–4.18
Line Pressure Control Solenoid Valve	13	3.42–4.18

Control Solenoid Valve and Transmission Control Module Assembly Input Shaft Speed/Output Shaft Speed Input Test

Special Tools

- *EL 35616* GM-Approved Terminal Test Kit
- *EL 38522* Variable Signal Generator

For equivalent regional tools, refer to *Special Tools on page 17-394*.



1880312

The purpose of this test is to provide a simulated input/output speed sensor (ISS/OSS) signal to the control solenoid valve assembly ISS/OSS input circuits.

Transmission Input Speed Sensor

1. Ignition OFF, disconnect the ISS wiring harness connector X3 (1) from the control solenoid valve assembly.
2. Ignition ON, test for 11–14 volts at terminal B.
   ⇒ If not within the specified range, replace the control solenoid valve assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.
3. Ignition OFF, using the *EL 35616* terminal test kit, connect the *EL 38522* variable signal generator red lead to the ISS signal circuit terminal A on the TCM.
4. Connect the black lead from the *EL 38522* variable signal generator to ground.
5. Set the *EL 38522* variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission ISS parameter is between 495–505 RPM.
   ⇒ If not within the specified range, replace the control solenoid valve assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.

Transmission Output Speed Sensor

1. Ignition OFF, disconnect the OSS wiring harness connector X4 (2) from the control solenoid valve assembly.
2. Ignition ON, test for 11–14 volts at terminal B.
   ⇒ If not within the specified range, replace the control solenoid valve assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.

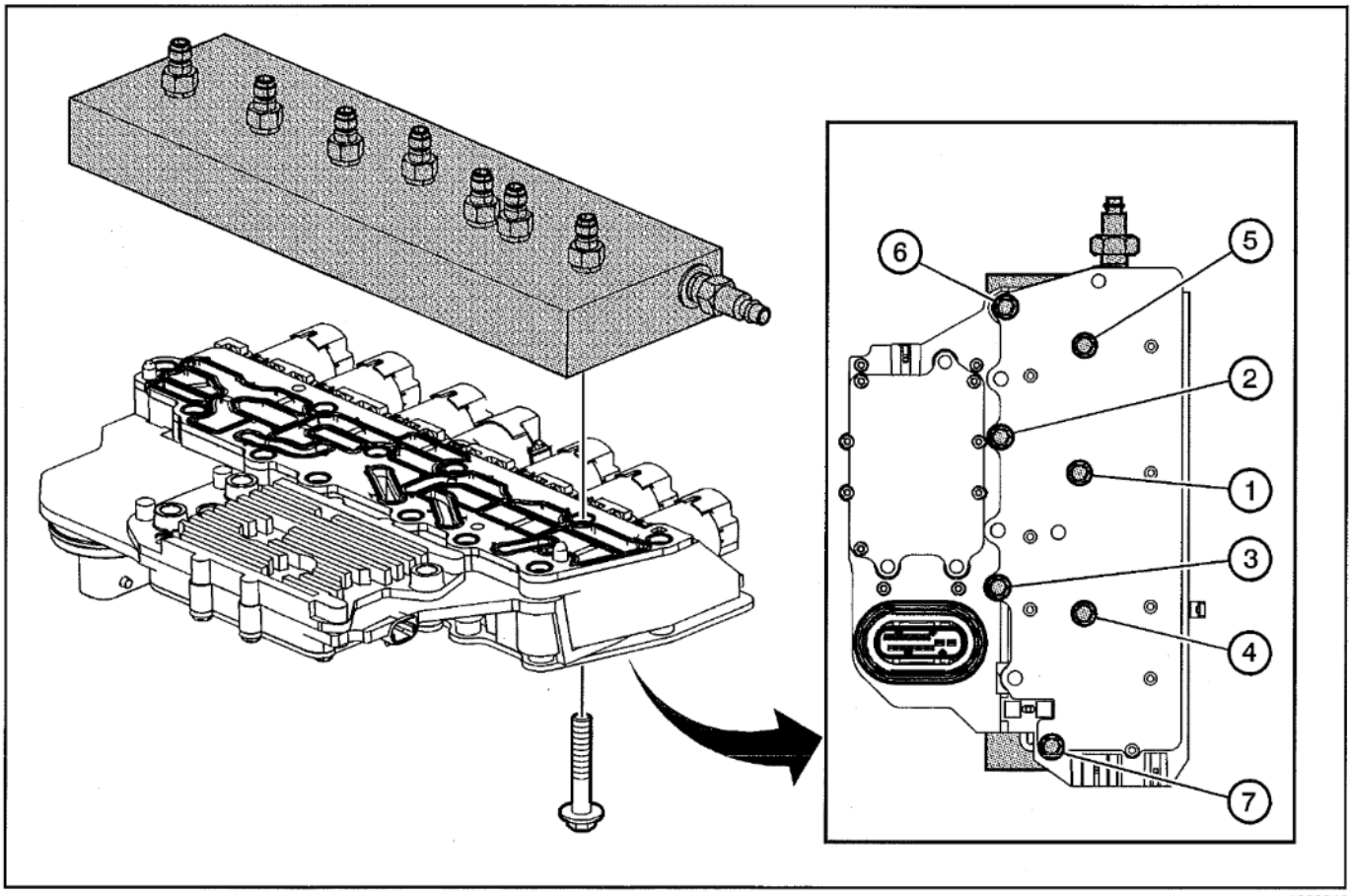
3. Ignition OFF, using the *EL 35616* terminal test kit, connect the *EL 38522* variable signal generator red lead to the OSS signal circuit terminal A on the TCM.
4. Connect the black lead from the *EL 38522* variable signal generator to ground.
5. Set the *EL 38522* variable signal generator to 5 volts, the frequency to 300 Hz, and the percent duty cycle to 50 or the normal position.
6. Ignition ON, verify with a scan tool the Transmission OSS parameter is between 745–825 RPM.
   ⇒ If not within the specified range, replace the control solenoid valve assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.

Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test

Special Tools

DT-48616 Solenoid Assembly Test Kit & Adapter Harness

For equivalent regional tools, refer to *Special Tools on page 17-394*.



1880313

Note: Air inlet may be installed at either end of the *DT-48616-1* test plate.

The purpose of this procedure is to test the functionality of the control solenoid valve assembly solenoids for a gross stuck open or stuck closed condition. *DT-48616* test plate is bolted to the control solenoid valve assembly on the valve body mounting surface. Pressurized air is passed into the aluminum test block, through the control solenoid valve assembly solenoid passage and back to a pressure gauge on the test block. The pressure gauge indicates open if air pressure is passed through the solenoid, or closed if the solenoid is unable to pass air through. A scan tool is used to command the solenoids ON and OFF. While watching the pressure gauge, one can determine the valve functionality.

Note: The scan tool output control will not work on Gen 1 transmissions, thus the Q8 Control Solenoid Valve Assembly performance test cannot be performed on these models. Gen 2 and later transmissions do not contain transmission fluid pressure switches. As a result, Gen 2 and later transmissions cannot have a valid Transmission Fluid Pressure Switch DTC. Steps 1 and 2 in the test procedure will determine if you are working with a Gen 1 or Gen 2 and later transmission.

1. Ignition ON, use a scan tool to check for Specific DTC P0842.
2. Verify that DTC P0842 shows invalid.

⇒ **If parameter does not indicate Invalid**

2.1. Do not attempt to complete the performance test as it will not work on a Gen 1 Q8 Control Solenoid Valve Assembly.

2.2. Verify the vehicle model year, engine, and options to make certain the correct diagnostic is selected.

⇓ **If parameter indicates Invalid**

3. Remove the control solenoid valve assembly and filter plate from the transmission. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.

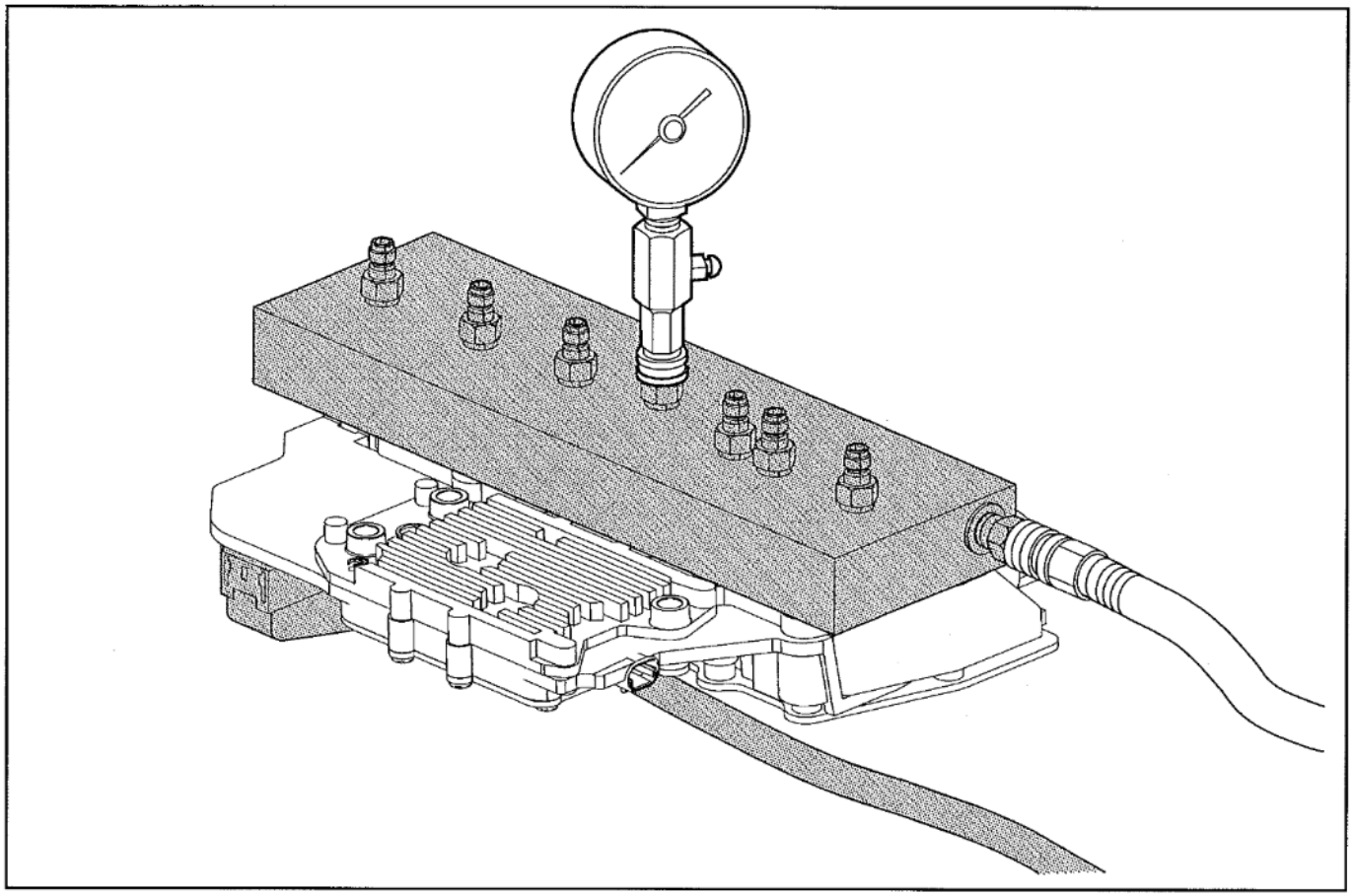
Caution: Refer to *Fastener Caution on page 0-8*.

Note: Drain the TCM of excess transmission fluid before attaching to test block and use caution when attaching air to test block air inlet.

4. Bolt the *DT-48616-1* test plate to the filter plate, and control solenoid valve assembly. Use the bolts and washers supplied with the tool to attach the test block. Tighten the bolts to **5 N•m (44 lb in)** using a center out alternating torque sequence.
5. Install the pressure gauge to the affected solenoid air port. Reference the Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification for test plate port identification.

Note: If air pressure greater than 345 kpa (50 psi) is applied, an accurate test of the shift solenoid cannot be performed.

6. Regulate the shop air pressure to 310–345 kpa (45–50 psi) and connect the line to the *DT-48616-1* test plate air inlet port.
7. Connect the *DT-48616-10* harness to the vehicle harness and the control solenoid valve assembly.



2400940

Note: The TCM limits the time the solenoids are commanded on to prevent overheating of the solenoids. Once the time limit is reached, the TCM prevents the test from being continued for 5 minutes. The ignition must remain ON during the 5 minute countdown period.

8. Ignition ON.

Note:

- Release the air pressure in the gauge between pressurization tests.
- If the solenoid valve is stuck, no pressure change will occur.

9. Verify the pressure gauge changes when commanding the appropriate solenoid ON and OFF with a scan tool. Repeat test as necessary.

⇒ **If the pressure gauge does not change**

Replace the Q8 Control Solenoid Valve Assembly.

⇓ **If the pressure gauge changes**

10. Solenoids are not grossly stuck.

Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification

Component	Port On Test Plate	Commanded State	
		ON	OFF
PC Solenoid 2, 35R	GEN 2 - 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	GEN 2 - F	Full pressure to gauge	No pressure to gauge
Shift Solenoid	D	Full pressure to gauge	Below full pressure to gauge

Control Solenoid Valve Assembly Solenoid Performance Test Plate to Component Identification (cont'd)

Component	Port On Test Plate	Commanded State	
		ON	OFF
Line Pressure Control Solenoid	A	Command to highest setting, full pressure to gauge	Command to lowest setting, below full pressure to gauge
TCC PC Solenoid	E	Full pressure to gauge	No pressure to gauge

Note: With the key on engine off (KOEO), the TCM will normally cycle some of the transmission solenoids On and Off to facilitate keeping the ports and solenoids clean and free of debris. This dither function is a normal activity and will cause the valves to cycle open and closed quickly when the TCM is powered up. This can cause the psi gauge to flicker high and low as the valves open and close. This may cause some air to exit the ports where the psi gauge is not connected as those solenoids cycle on and off.

Transmission Adaptive Values Learn

Transmission Adaptive Values Learn is a procedure for 6 speed automatic transmissions in which a series of tests are run to allow the transmission control module (TCM) to learn individual clutch characteristics. Once the clutch data is learned, Transmission Adaptive Values Learn translates it into the adaptive data cells, which the TCM uses for clutch control during shifts. The scan tool provides initiation of the Transmission Adaptive Values Learn procedure. This procedure is to be used following transmission repair.

The Transmission Adaptive Values Learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

Note: Ensure the following conditions are met before performing the Transmission Adaptive Values Learn procedure:

- Drive wheels are blocked
- Parking brake is applied
- Service brake is applied
- Zero percent throttle and no external engine RPM control
- Transmission fluid temperature is between values listed below:
  - MY 2011 and prior 70–95°C (158–203°F)
  - MY 2012 Gen 1 70–95°C (158–203°F)
  - MY 2012 Gen 2 60–90°C (140–194°F)
  - MY 2013 Gen 1 70–95°C (158–203°F)
  - MY 2013 Gen 2 58–70°C (136–158°F)
- Transmission gear selector has been cycled from Park to Reverse 3 times in order to purge air from the reverse clutches.

Note: If at any time during the procedure, required conditions are not met, Service Fast Learn Adapts may abort and the process may need to be started again from the beginning. If this occurs, the transmission will be left in a neutral state until the controller is shut down, key OFF and remove the scan tool and wait for more than 30 seconds prior to re-try procedure. If the procedure repeatedly fails, a limit that engineering set is being exceeded and there is possibly a transmission hardware issue.

1. Use the scan tool to navigate to Transmission Adaptive Values Learn by selecting the following:
   1.1. Module Diagnostics
   1.2. Transmission Control Module
   1.3. Configurations/Reset Functions
   1.4. Transmission Adaptive Values Learn

Note: If at any time during the procedure, required conditions are not met, Transmission Adaptive Values Learn may abort and the process may need to be started again from the beginning.

2. Use the scan tool to perform the Transmission Adaptive Values Learn procedure. As the procedure is being performed, the scan tool data display will provide operator instructions. Follow the scan tool instructions, as required.
3. Once the procedure is complete, shut OFF the engine and power down the TCM. You will lose communication to the scan tool.

Note: When the Service Fast Learn Adapts procedure is completed, the transmission will remain in a neutral state until the controller shuts down. If after 1–2 minutes of sitting, with the key OFF and scan tool removed, the vehicle remains in a neutral state, disconnect the battery and wait 5–10 minutes and then hook the battery back up. Reverse and drive should return.

4. Restart the engine. This will complete the Transmission Adaptive Values Learn procedure.

Troubleshooting

If the Transmission Adaptive Values Learn will not run and the above stated conditions have been met, ensure the following:

Note: The generation of transmission can be determined by using a scan tool to check for Specific DTC P0842. If DTC does not show Invalid, the transmission is Gen 1. If DTC shows Invalid, transmission is Gen 2.

- Determine if transmission is Gen 1 or Gen 2.
- Verify vehicle model year.

- Verify transmission fluid temperature is between the temperatures listed above for the vehicle model year and generation of transmission.
- Brakes and brake switch are functioning properly
- No active DTCs
- Closed throttle and engine RPM increases above 1,500 RPM while at entrance of the test
- Park/Neutral position switch is properly adjusted and functioning
- Line pressure control is able to provide 1,000 kPa and is within specifications
- Vehicle is not moving or vibrating excessively
- Clutches are properly assembled

Brake Pedal Position Sensor Learn

Brake Pedal Position Sensor Learn is a procedure for the ECM to determine the position of the brake pedal position sensor when the brake pedal is in the released position.

Note: The Brake Pedal Position Sensor Learn procedure is required when the following service procedures have been performed:

- An Engine Control Module Replacement
- A BPP Sensor Replacement
- Any repair procedure that effects the brake pedal position sensor alignment

1. Install a scan tool.
2. Monitor the ECM for DTCs with a scan tool. If other DTCs are set, refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69* for the applicable DTC that set.
3. Navigate to the scan tool Brake Pedal Position Sensor Learn command by selecting the following:
   3.1. Module Diagnosis
   3.2. Engine Control Module
   3.3. Configuration/Reset Functions
   3.4. Learn Functions
   3.5. Brake Pedal Position Sensor Learn
4. Ignition ON, Engine OFF, transmission in Park, brake pedal in the fully released position, select Learn.
5. Verify Brake Pedal Position Sensor and Brake Pedal Position Sensor Learned Home Position are within .1 Volts.
6. Select Exit.
7. Perform the body control module (BCM) brake pedal position sensor calibration. Refer to *Brake Pedal Position Sensor Calibration on page 4-185*.

Manual Mode or Tap Up/Down Diagnosis

1. If any DTCs are set, diagnose those DTCs first. Refer to *Diagnostic Trouble Code (DTC) List - Vehicle on page 6-69*.
2. If the Manual Mode or Tap Up/Down does not function, refer to the Circuit/System Verification for *DTC P0815, P0816, or P0826 on page 17-109*.

Transmission Fluid Level and Condition Check

This procedure checks both the transmission fluid level, as well as the condition of the fluid itself.

Caution: Use Dexron VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.

Note: Ensure the transmission has enough fluid in it to safely start the vehicle without damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20–25°C (68–77°F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500–800 rpm for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

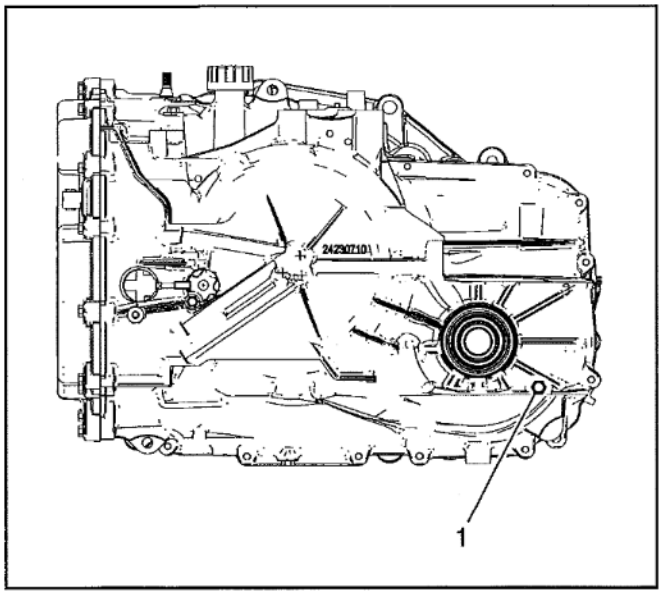
Note: If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

Caution: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85–95°C (185–203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.



2201841

6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.

   Oil Level Plug (1)

   - If the fluid is flowing as a steady stream, wait until the fluid begins to drip.
   - If no fluid comes out, add fluid until fluid drips out.
7. Inspect the fluid color. The fluid should be red or dark brown.
   - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
   - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to *Engine Coolant/Water in Transmission on page 17-172*.
8. Inspect for external leaks. Refer to *Fluid Leak Diagnosis (Non Hybrid) on page 17-172*.
9. If the fluid was changed, reset the transmission oil life monitor if applicable.

Dipstick Level Checking Procedure (If equipped)

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P). Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500–800 rpm for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.
4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

Caution: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85–95°C (185–203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°C over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.

Note:

- If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
- Check the transmission fluid level when the TFT is at between 85–95°C (185–203°F). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is at the specified temperature.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

5. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. Remove the dipstick and wipe it with a clean rag or paper towel.
7. Inspect the fluid color. The fluid should be red or dark brown.
   - If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, repair the oil cooler, and flush the cooler lines.
   - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to *Engine Coolant/Water in Transmission on page 17-172*.
8. Install the dipstick. Wait three seconds and then remove it again.

Note: Always check the fluid level at least twice. Consistent readings are important to maintaining proper fluid level. If inconsistent readings are noted, inspect the transmission vent cap to ensure it is clean and unclogged.

Note: It is not necessary to get the fluid level all the way up to the MAX mark. Anywhere within the crosshatch band is acceptable.

9. Check both sides of the dipstick and read the lower level.
10. Install and remove the dipstick again to verify the reading.

Note: Do not add more than one half pint (0.25L) at a time without rechecking the level. Once the oil is on the dipstick bullet, it will not take much more fluid to raise the fluid level into the crosshatch band. Do not overfill. Also, if the fluid level is low, inspect the transmission for leaks. Refer to *Fluid Leak Diagnosis (Non Hybrid) on page 17-172*.

11. If the fluid level is not within the crosshatch band, and the transmission temperature is at 90°C (194° F), add or drain fluid as necessary to bring the level into the crosshatch band. If the fluid level is low, add only enough fluid to bring the level into the crosshatch band.
12. If the fluid level is in the acceptable range, install the dipstick.
13. If the fluid was changed, reset the transmission oil life monitor if applicable.

Fluid Condition Inspection

- Inspect the fluid color. The fluid should be red in color. The fluid may also turn brown form 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.

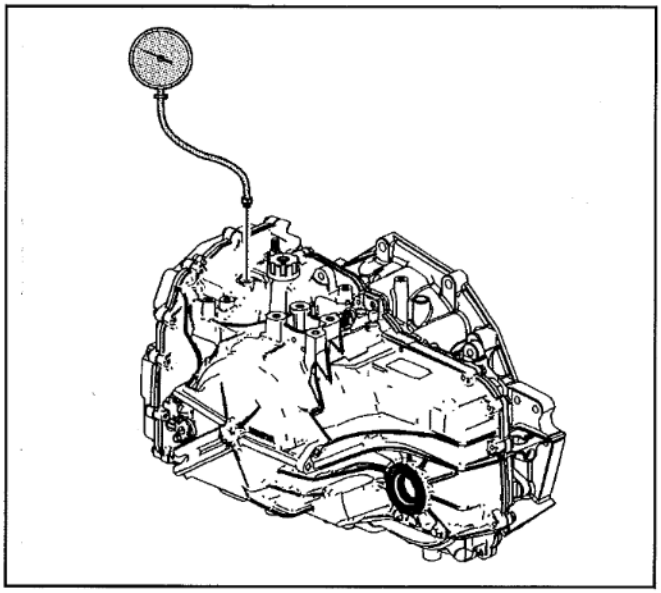
- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission damage. Refer to *Road Test on page 17-167* to verify transmission operation. Change the transmission fluid if no other conditions are found.
- 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 on page 17-172*.

Line Pressure Check

Special Tools

GE-21867-A Oil Pressure Gauge Kit

For equivalent regional tools, refer to *Special Tools on page 17-394*.



1897993

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 on page 17-164*.
4. Use the scan tool to inspect for any active or stored diagnostic trouble codes.
5. Inspect the manual linkage at the transmission for proper function.
6. Turn the engine OFF.
7. Remove the line pressure test hole plug.
8. Install the *GE-21867-A* pressure gauge.
9. Access the Scan Tool Transmission Output Controls for the Line PC Solenoid.
10. Start the engine.

Note:

- In order to achieve accurate line pressure readings, the following procedure must be performed at least 3 times in order to gather uniform pressure readings.
- The scan tool is only able to control the line PC solenoid in PARK and NEUTRAL with engine speeds below 1500 RPM. This protects the clutches from extreme high or low line pressures.

11. Use the scan tool to increase and decrease the Line PC Solenoid in increments of approximately 100 KPa (15 psi). The scan tool commands the increment values automatically.
12. Allow the pressure to stabilize between increments.
13. Compare the pressure readings on the scan tool to those indicated on the *GE-21867-A* pressure gauge. Refer to *Solenoid Valve Pressure (Gen 1) on page 17-12*.

14. If the pressure readings vary greatly, refer to *Fluid Pressure High or Low on page 17-191*.
15. Turn the engine OFF.
16. Remove the *GE-21867-A* pressure gauge.

Caution: Refer to *Fastener Caution on page 0-8*.

17. Install the line pressure test hole plug. Tighten the pressure test hole plug to **12 N•m (106 lb in)**.

Road Test

Note: The Road Test Procedure should be performed only as part of the Symptom Diagnosis.

Perform the road test in conjunction with the symptom diagnosis. Refer to *Symptoms - Automatic Transmission on page 17-157*.

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 on page 17-164*.
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

  Take along qualified help in order to operate the vehicle safely.
- Observe any unusual sounds or smells.
- Ensure the transmission fluid temperature is at least 90°C (194°F).

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
- 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 (Non Hybrid) on page 17-172*.

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 on page 6-3* 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.
   5.1. Apply the brake pedal and ensure the parking brake is set.
   5.2. Move the gear selector through the following ranges:
      5.2.1. PARK to REVERSE
      5.2.2. REVERSE to NEUTRAL
      5.2.3. NEUTRAL to DRIVE
      5.2.4. DRIVE to REVERSE
      5.2.5. REVERSE to DRIVE

5.3. Pause 2 to 3 seconds in each gear position.

5.4. Verify the gear engagements are immediate (less than 2 seconds to complete if transmission fluid temperature is above 20°C (68°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 on page 17-166*.
- 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 on page 17-184*.

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 on page 17-166*.
- 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 on page 17-188*.

6. Monitor transmission range on the scan tool, transmission data list.
   6.1. Apply the brake pedal and ensure the parking brake is set.
   6.2. Move the gear selector through all ranges.
   6.3. Pause 2 to 3 seconds in each range.
   6.4. Return gear selector to PARK.
   6.5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
   7.1. Apply the brake pedal and ensure the parking brake is set.
   7.2. Ensure the gear selector is in PARK.
   7.3. 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 chang 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 on page 17-169*.

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 on page 9-511* (1.6L LDE or 1.8L) in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

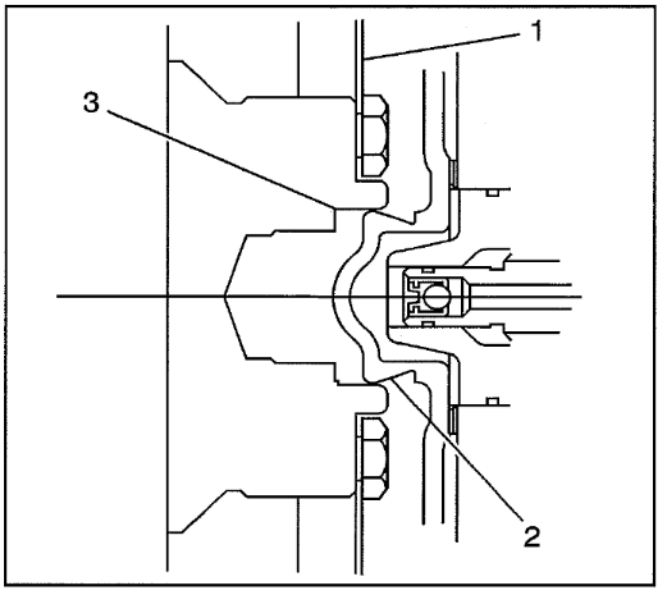
Torque Converter Vibration Test

Note: The *Noise and Vibration Analysis on page 17-180* 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.



572368

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 on page 0-8*.

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 (On Vehicle) on page 17-7* or *Fastener Tightening Specifications (Off Vehicle) on page 17-8*.
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 (On Vehicle) on page 17-7* or *Fastener Tightening Specifications (Off Vehicle) on page 17-8*.

Torque Converter Replacement Guide

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
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 *Symptoms - Automatic Transmission on page 17-157*.
Noise–Whine	• Refer to *Symptoms - Automatic Transmission on page 17-157*. • Do not replace the torque converter if noise is present in Neutral/Park. Refer to *Symptoms - Engine Mechanical on page 9-944* (1.6L LDE or 1.8L).
Vibration–Out of Balance	Refer to Torque Converter Vibration Test in this procedure.
No Drive/Slips in Drive	Do not replace the torque converter until completing all engine and transmission diagnostics.
Idle Surge/Rough Idle	Do not replace the torque converter. Refer to *Symptoms - Engine Controls on page 9-511* (1.6L LDE or 1.8L).
TCC Apply/Release Shudder	Do not replace the torque converter. Refer to Torque Converter Clutch Shudder in this procedure.
TCC Chuggle	Do not replace the torque converter. Refer to *Symptoms - Engine Controls on page 9-511* (1.6L LDE or 1.8L).
DTC P0741–TCC Stuck OFF/High Slip–Intermittent Only	Do not replace the torque converter. Refer to *DTC P0741 or P0742 on page 17-91* diagnostic table.
DTC P0741–TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to *DTC P0741 or P0742 on page 17-91* diagnostic table.
DTC P0742–TCC Stuck ON	Do not replace the torque converter. Refer to *DTC P0741 or P0742 on page 17-91* diagnostic table.
Transmission Fluid Contaminated with Sludge/Metal Particles as a result of: • Engine Coolant/Oil • Pump damage • Drive sprocket support damage • Turbine/stator shaft damage • Internal converter damage with no damage found in the transmission	Replace the torque converter.
Poor Acceleration above 48 km/h (30 mph) – Good Launch	Do not replace the torque converter until completing all engine and transmission diagnostics. • Refer to Torque Converter Stator in this procedure. • Refer to *Symptoms - Engine Controls on page 9-511* (1.6L LDE or 1.8L).
Poor Launch – Good Acceleration above 48 km/h (30 mph)	Do not replace the torque converter until completing all engine and transmission diagnostics. • Refer to Torque Converter Stator in this procedure. • Refer to *Symptoms - Engine Controls on page 9-511* (1.6L LDE or 1.8L).
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to *Lower Engine Noise, Regardless of Engine Speed on page 9-952* (1.6L or 1.8L).
Torque Converter Pilot Damaged	Replace the torque converter.

Torque Converter Replacement Guide (cont'd)

Condition	Action
Torque Converter Hub surface is damaged – scored, raised/ transferred metal.	Replace the torque converter.
External Leaks in the weld areas – hub, lug or closure weld.	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

Clutch Plate Diagnosis

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Delamination—splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking
- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
  - The valve body face is not flat.
  - Porosity in between channels.
  - The valve train retainers are improperly installed.
  - The checkballs are misplaced.
  - Malfunctioning valves.
- The Teflon® seal rings are worn or damaged.

Engine Coolant/Water in Transmission

Caution: The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts – washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to *Transmission Fluid Cooler Flushing and Flow Test on page 17-175*.

Fluid Leak Diagnosis (Non Hybrid)

General Method

1. Verify that the leak is transmission fluid.

Caution: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

2. Thoroughly clean the suspected leak area using a rag.

Note: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15–20 minutes under city driving conditions until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

Powder Method

Caution: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type leak tracing powder to the suspected leak area.

Note: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15–20 minutes under city driving conditions until normal operating temperatures are reached.
4. Shut OFF the engine.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Valve Body Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

Case Leak

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

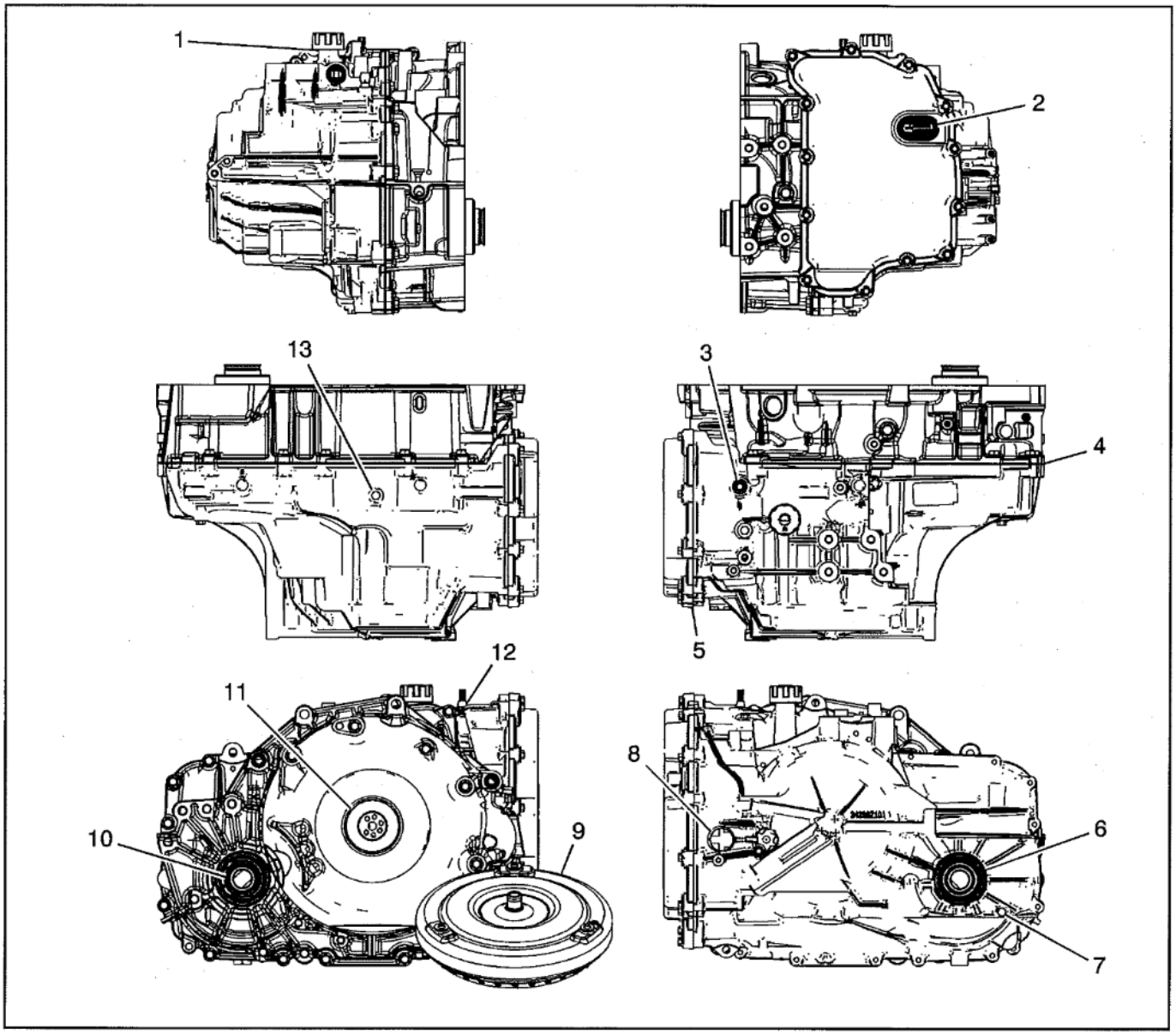
Leak at the Torque Converter End

- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the torque converter housing

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

Leak Inspection Points



1891269

Legend

(1) Fill Cap Seal
(2) Control Valve Body Cover Hole Seal
(3) Line Pressure Tap Plug
(4) Converter Housing to Case Joint
(5) Control Valve Body Cover Gasket
(6) Drive Shaft Oil Seal Assembly
(7) Oil Level Plug
(8) A/Trans Input Speed Sensor Assembly O-Ring Seal
(9) Torque Converter Assembly
(10) Front Wheel Drive Shaft Oil Seal Assembly
(11) Torque Converter Fluid Seal Assembly
(12) Manual Shift Shaft Seal
(13) Drain Plug

Case Porosity Repair

Some external leaks are caused by case porosity in non-pressurized areas.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

Warning: Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. Apply the epoxy. A clean, dry soldering acid brush can be used to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before assembling the components.
5. Repeat the fluid leak diagnosis procedures.

Transmission Fluid Cooler Flushing and Flow Test

GM studies indicate that plugged or restricted transmission oil coolers and pipes cause insufficient transmission lubrication and elevated operating temperatures which can lead to premature transmission failure. Many repeat repair cases could have been prevented by following published procedures for transmission oil cooler flushing and flow checking. This procedure includes flow checking and flushing the auxiliary transmission oil cooler, if equipped.

Note: Use the *DT-45096* flush and flow test tool or equivalent to flush and flow test the transmission oil cooler and the oil cooler pipes after the transaxle is removed for repairs.

Only GM Goodwrench DEXRON®VI automatic transmission fluid should be used when doing a repair on a GM transmission.

Time allowance for performing the cooler flow checking and flushing procedure has been included in the appropriate labor time guide operations since the 1987 model year. The service procedure steps for oil cooler flushing and flow testing are as follows:

Cooler Flow Check and Flushing Steps

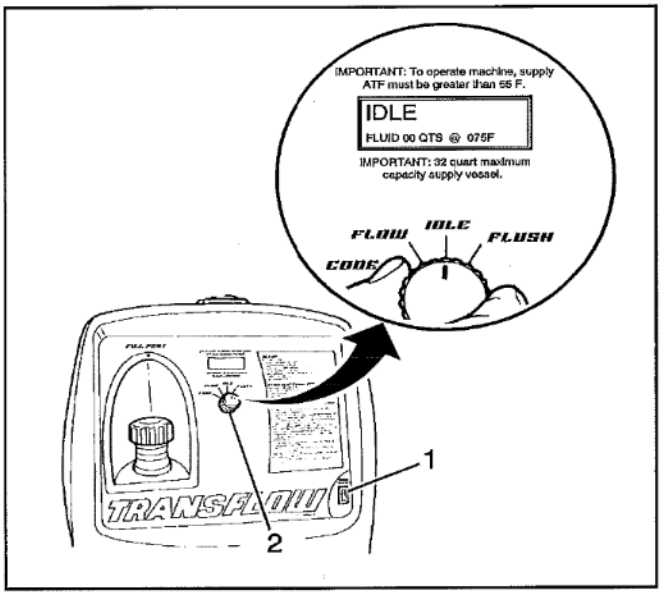
1. Machine Set-up
2. Determine Minimum Flow Rate
3. Back Flush
4. Forward Flush
5. Flow Test
6. Code Recording Procedure
7. Clean-up

Special Tools

- *DT-45096* Transmission Oil Cooling System Flush and Flow Test Tool
- *DT-45096-50* Transmission Cooler Flush Adapter
- Shop air supply with water/oil filters, regulator and pressure gauge — minimum 90 psi
- Eye protection
- Rubber gloves

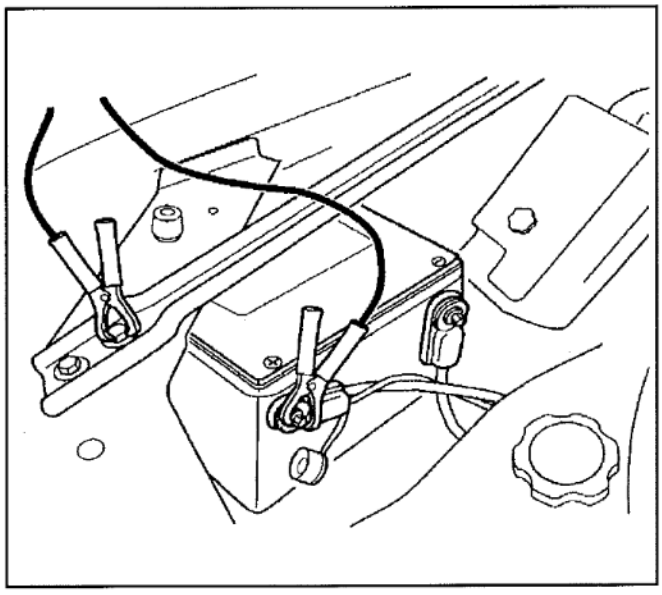
For equivalent regional tools, refer to *Special Tools on page 17-394*.

Machine Set-up



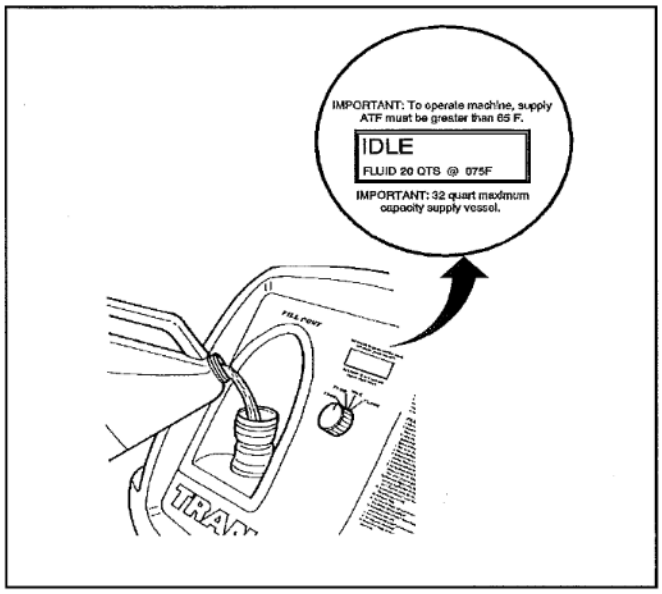
1212328

1. Verify that the main power switch (1) is in the OFF position.
2. Place the main function switch (2) in the IDLE position.



1212329

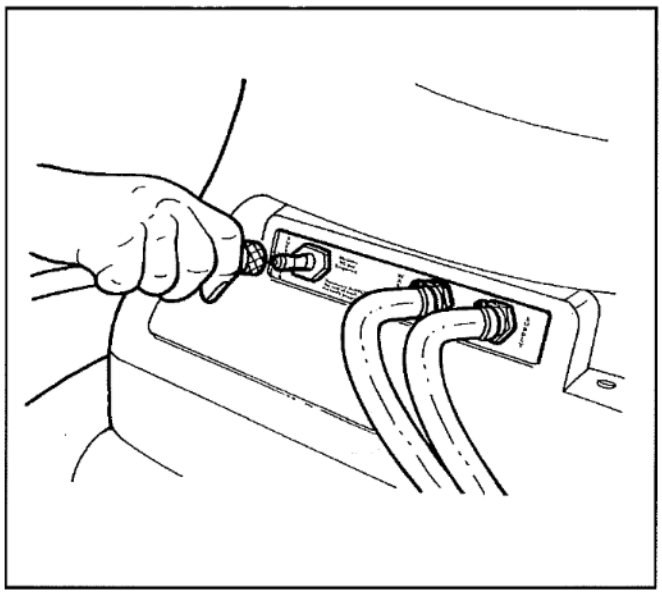
3. Connect *DT-45096* flush and flow test tool to the vehicle 12V DC power source by connecting the red battery clip to the positive, +, battery post on the vehicle and connect the negative lead to a known good chassis ground.
4. Turn the main power switch to the ON position.



1212332

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).

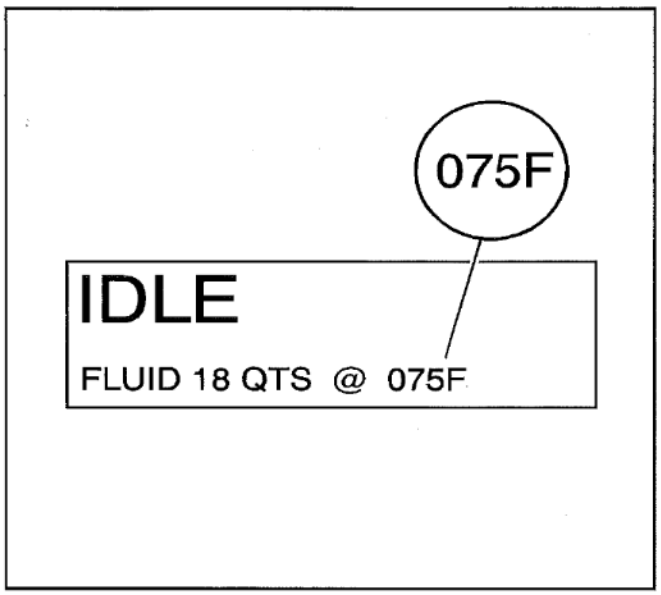
5. Fill the supply tank with Dexron®VI through the fill port.
6. Reinstall and tighten the fill cap.



1212333

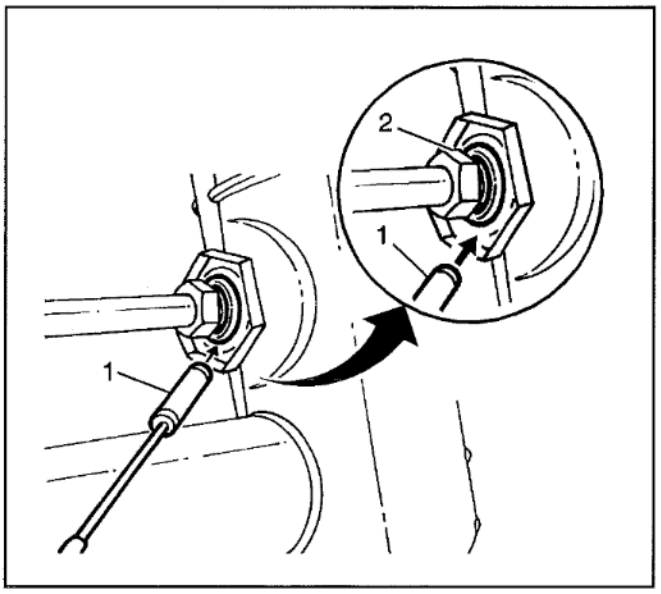
7. Connect a shop air supply hose to the quick-disconnect on the rear panel marked SUPPLY AIR.

Determine Minimum Flow Rate



1212334

1. From the machine display, identify the temperature of the automatic transmission fluid that is stored in the supply vessel of *DT-45096* flush and flow test tool.



1212335

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

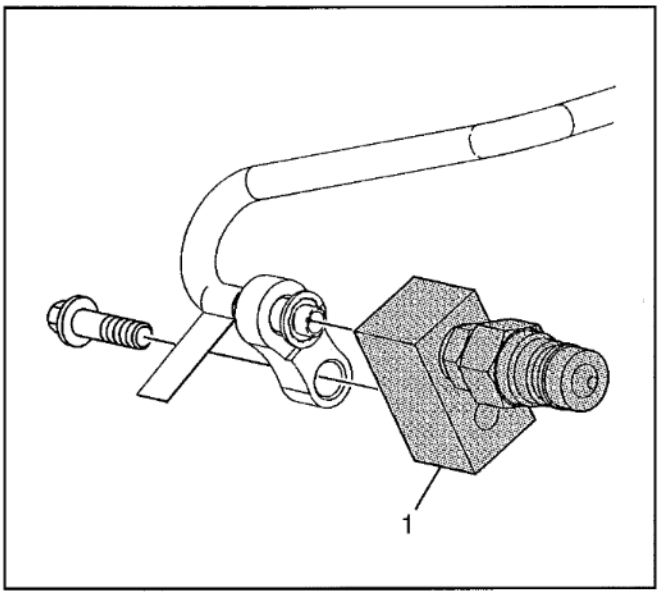
  The MINIMUM flow rate for this example would be 0.8 GPM.

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)

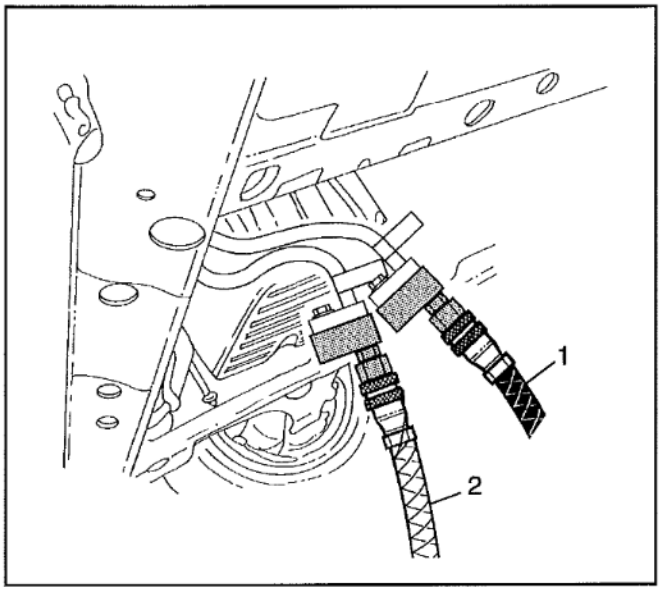
Temperature Range	Steel	Aluminum
65 – 66°F	0.6 gpm	0.5 gpm
67 – 70°F	0.7 gpm	0.6 gpm
71 – 75°F	0.8 gpm	0.7 gpm
76 – 80°F	0.9 gpm	0.8 gpm
81 – 84°F	1.0 gpm	0.9 gpm
85 – 89°F	1.1 gpm	1.0 gpm
90 – 94°F	1.2 gpm	1.1 gpm
95 – 98°F	1.3 gpm	1.2 gpm
99 – 103°F	1.4 gpm	1.3 gpm
104 – 108°F	1.5 gpm	1.4 gpm
109 – 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



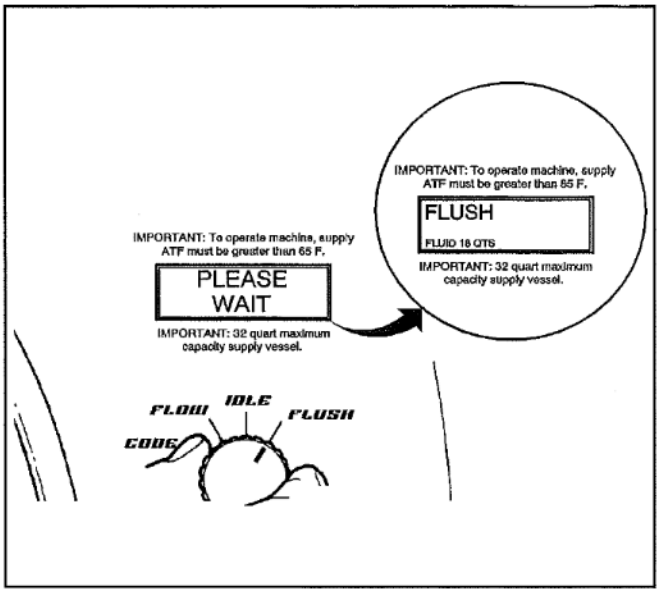
1765256

1. Connect the *DT-45096-50* cooler flush adapter (1) to the vehicle transmission oil cooler supply and return lines at the transmission.



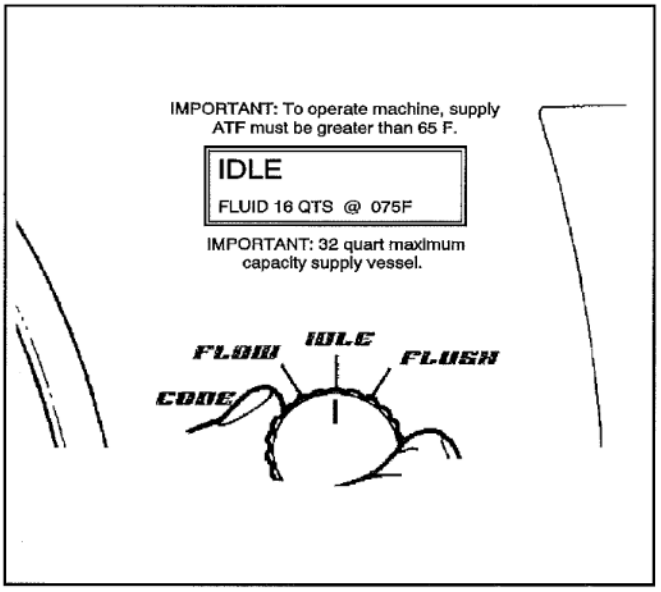
1765259

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.



1212339

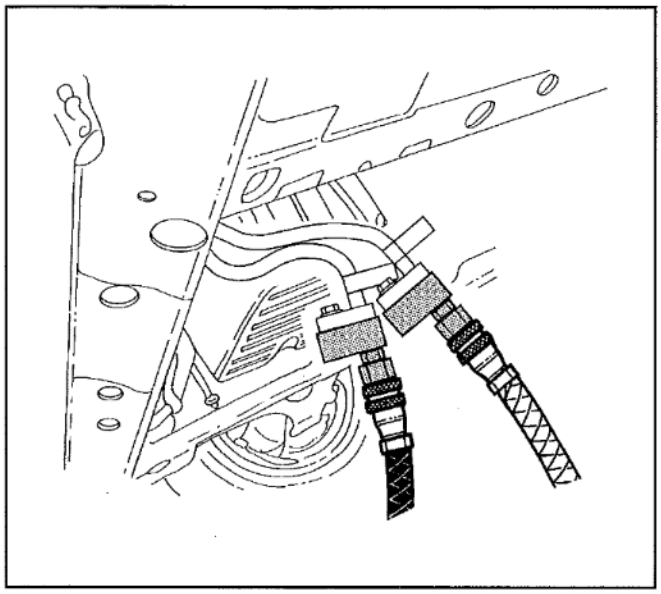
3. Turn the main function switch to the FLUSH position. Allow the machine to operate for 30 seconds.



1212341

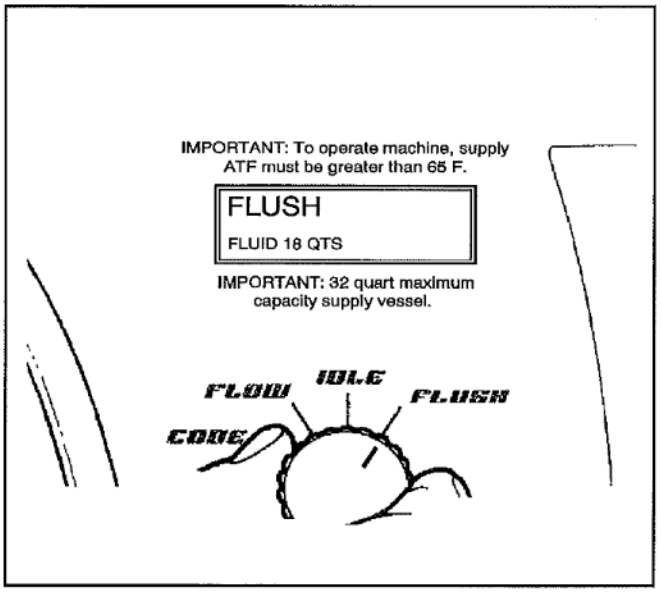
4. Turn the main function switch to the IDLE position and allow the supply vessel pressure to dissipate.

Forward Flush



1765261

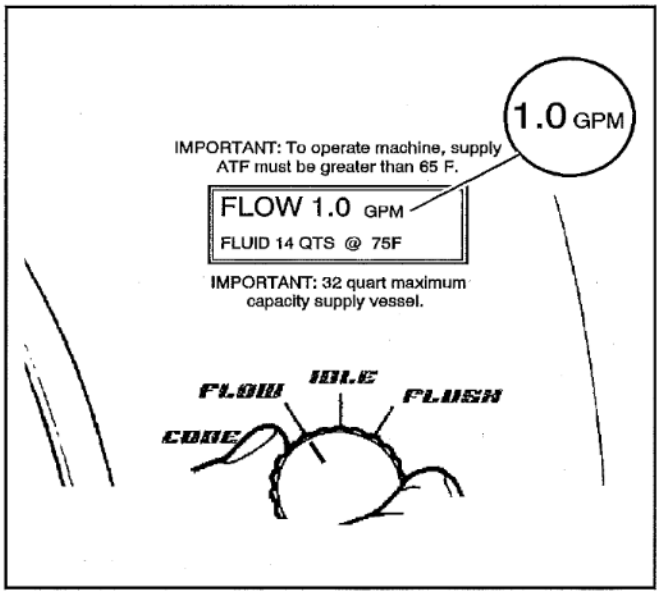
1. Disconnect the supply and waste hoses from the vehicle cooler lines. Reverse the supply and waste hoses to provide a normal flow direction.



1212343

2. Turn the main function switch to the FLUSH position and allow machine to operate for 30 seconds.

Flow Test

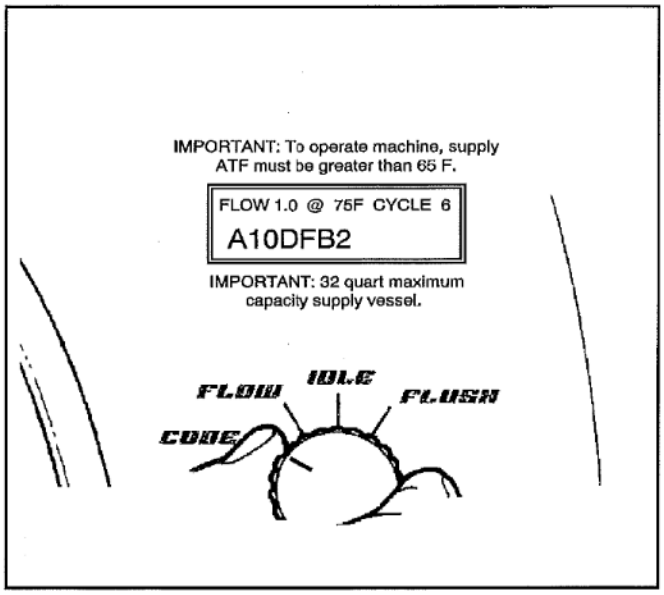


1212345

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.
   3.1. Replace the transmission oil cooler.
   3.2. Reconnect supply and waste hoses to the cooler lines in the normal flow direction. Perform Flow Test.
   3.3. Perform Code Recording Procedure.

Code Recording Procedure



1212346

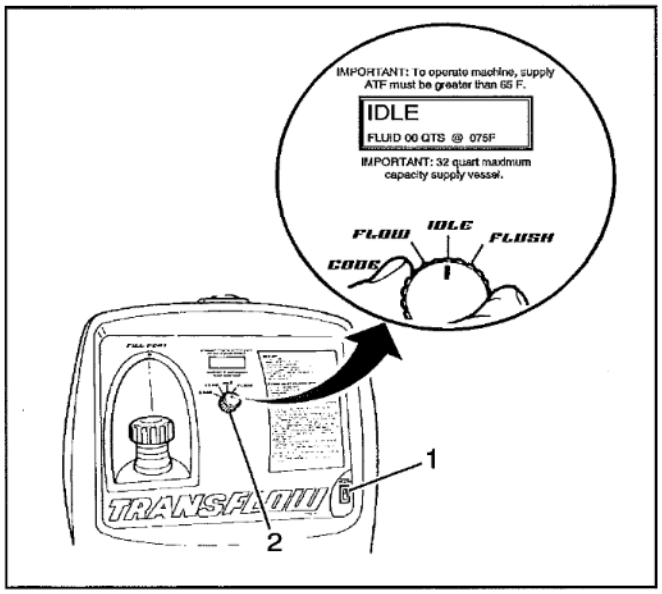
1. Turn the main function switch to the CODE position.

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

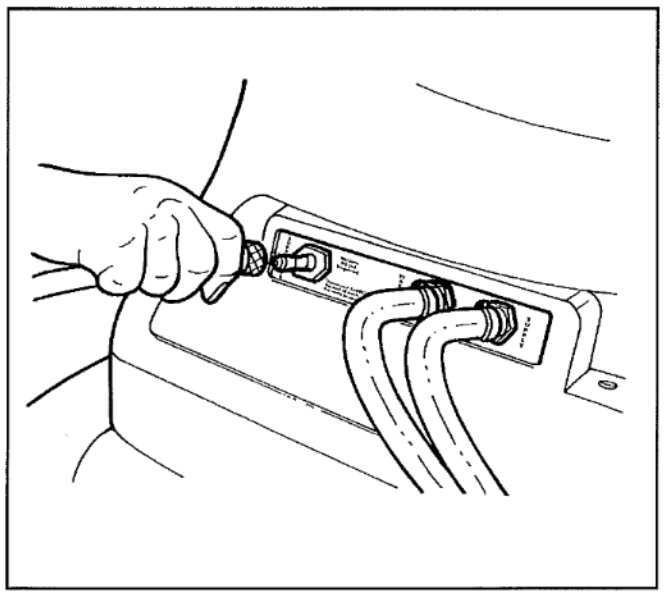


1212328

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.



1212333

4. Disconnect the air supply hose from *DT-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 on page 17-169*.

Whine/Growl Noise

Checks	Causes
Differential Assembly (232)	• Inspect for worn wheel bearings or axles. • Inspect for worn or damaged Side Gear Thrust Washer) or Pinion Gear Thrust Washer • Inspect for loose or worn Side Gear Axle Splines • Inspect for damaged or worn Side Gear • Inspect for worn or damaged Final Drive Inner and Outer Washers (584) • Inspect for loose, damaged or worn Front Differential Carrier Thrust Bearings, (228, 231, 233) • Inspect for broken, worn or disengaged Final Drive Pinion Pin Retainer (581) • Inspect for damaged or worn Pinion Gears
Drive Link Assembly (225)	• Inspect for worn, loose or damaged links • Inspect for broken, worn or loose Drive Link Lube Scoop (60)
Drive Sprocket Assembly (224)	• Inspect for improper Drive Sprocket (224) tooth surface finish • Inspect for broken or damaged Drive Sprocket (224) teeth • Inspect for worn or damaged Drive Sprocket Thrust Bearings (223, 556) • Inspect for worn or damaged Output Carrier Transfer Drive Gear Hub Assembly splines (222) • Inspect for loose, worn or damaged Output Carrier Transfer Drive Gear Hub Assembly bushing
Driven Sprocket Assembly (229)	• Inspect for worn, binding or damaged Driven Sprocket Bearing Assembly (228) • Inspect for worn or damaged Driven Sprocket Ball Bearing Assembly • Inspect for improper Driven Sprocket (229) tooth surface finish • Inspect for broken or damaged Driven Sprocket (229) teeth
Input Carrier Assembly (570)	• Inspect for pitted/spalled Pinion Gear teeth • Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose or broken Hub and Ring Gear • Inspect for loose or broken Output Internal Gear Retainer • Inspect for loose or worn Sun Gear Thrust Bearings (569, 572)
Output Carrier Assembly (574)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose Hub and Ring Gear
Output Sun Gear Assembly (555)	• Inspect for worn or damaged Output Sun Gear Thrust Bearing (556) • Inspect for loose, worn or damaged Output Sun Gear bushing • Inspect for worn or damaged Output Sun Gear teeth
Reaction Carrier Assembly (567)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose hub and Ring Gear • Inspect for worn or damaged Reaction Carrier Thrust Bearings (565)
Reaction Sun Gear Assembly (566)	Inspect for loose, worn or damaged Reaction Sun Gear Assembly bushing
Fluid Pump Assembly (201)	1. Inspect for proper fluid level 2. Inspect for leaking Pump Fluid Outlet Seal Assembly (24) or Filter Seal
3–5–Reverse Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (508–510) • Inspect for loose or worn Backing Plate Retainer (511) • Inspect for loose Speed Sensor Reluctor Wheel (501) or Retainer (500)

Whine/Growl Noise (cont'd)

Checks	Causes
4–5–6 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (425–428) • Inspect for loose or worn Clutch Dam Retainer (524) • Inspect for loose or worn 3–5–Reverse/4–5–6 Clutch Housing Bushing
1–2–3–4 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (557–559) • Inspect for loose or worn Clutch Spring Retainer (561)
Low and Reverse Clutch Assembly (OWC) (543)	• Inspect for stripped or sheared Low and Reverse Clutch Assembly (543) splines • Inspect for non-rotating Low and Reverse Clutch Assembly (543)
Low and Reverse Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (545–547) • Inspect for loose or worn Clutch Spring Retainer (548)
2–6 Clutch Assembly	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (540–542) • Inspect for loose or worn Clutch Spring Retainer (537)
Case Assembly (50)	• Inspect for loose or broken Transmission Mount Bolts • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for loose, worn or damaged differential bushing • Inspect for loose or broken Input Shaft Support Bolts (57) • Inspect for loose or broken Front Differential Carrier Baffle Bolts (61) • Inspect for stripped or sheared splines • Inspect for loose, worn or damaged bushing
Torque Converter Housing Assembly (208)	• Inspect for loose or broken Front Differential Ring Gear Retainer (206) • Inspect for loose, worn or damaged differential bushing • Inspect for loose or broken Pinion Gear Shaft Retainer Pin • Inspect for loose or broken Front Differential Carrier Baffle Bolts (204) • Inspect for loose or broken Fluid Pump Bolts (200) • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for loose, worn or damaged bushing
Control Valve Body Cover Assembly (2)	Inspect for loose, missing or broken Valve Body Cover Bolts (1)
Torque Converter (28)	• Inspect for improper alignment of Torque Converter to the Crankshaft • Inspect for ballooning of the Torque Converter
Differential Carrier Assembly (232)	• Inspect for worn or damaged Differential Carrier (582) • Inspect for worn or damaged Pinion Pins (583) • Inspect for broken, worn or damaged Differential Sun Gear Bearing (231) or Driven Sprocket Bearing (228) • Inspect for worn or damaged Differential Side Gear teeth, Final Drive Pinion Gear (586) teeth or Final Drive Sun Gear (230) teeth • Inspect for worn or damaged Differential Side Gear Thrust Washers or Final Drive Inner and Outer Washers (584) • Inspect for worn or damaged Final Drive Rollers (585) • Inspect for broken or damaged Differential Pinion Gear Shaft Retainer

Automatic Transmission Fluid Leaks

Checks	Causes
Torque Converter (28)	Inspect for damage
Case Assembly (50)	• Inspect for cracked or broken Case (50) • Inspect for porosity or damage on the sealing surfaces • Inspect for loose Oil Cooler Line Bolts or damaged Oil Cooler Line Seals • Inspect for damaged Manual Shift Shaft Seal (604) • Inspect for damaged or worn Axle Seal (65) or Axle Seal Slinger on the axle shafts • Inspect for plugged Vent Cap (52) • Inspect for loose Pressure Test Plug (51), Drain Plug (64) and Fluid Level Plug (63) • Inspect for damaged Park Pawl Actuator Guide Seal (605) • Inspect for damaged or worn Input Speed Sensor Seals (19)
Torque Converter Housing Assembly (208)	• Inspect for damaged Torque Converter Housing Assembly (208) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Seal (23) • Inspect for damaged or worn Torque Converter Fluid Seal (301) • Inspect for loose Torque Converter and Differential Housing Bolts (26) • Inspect for damaged or worn Axle Seal (209) or Axle Seal Slingers on the axle shafts • Inspect for loose, missing or damaged Fluid Fill Tube Plug Assembly (27) • Inspect for damaged Torque Converter and Differential Housing Seal (202)
Valve Body Cover Assembly (2)	• Inpsect for damaged or warped Valve Body Cover Assembly (2) • Inspect for damaged or improperly installed Valve Body Cover Gasket (3) • Inspect for loose Valve Body Cover Bolts (1) • Inspect for damaged or improperly installed Wire Connector Hole Seal (5)

Shift Indicator Indicates Wrong Gear Selection

Checks	Causes
Shift Cable	• Inspect for damage. • Verify proper attachment to shifter. • Verify cable is locked into shifter bracket. • Verify cable is properly attached to the transmission. • Verify that the cable is locked into the transmission bracket. • Verify proper cable adjustment. Refer to *Range Selector Lever Cable Adjustment on page 17-196*.
Manual Shaft	• Verify shift lever is properly attached to the manual shaft. • Verify manual shaft is not twisted or damaged.
Manual Shift Detent Lever with Shaft Position Switch Assembly, IMS	Verify proper operation. Refer to *Transmission Internal Mode Switch Logic on page 17-12*.

No Park

Checks	Causes
Differential Carrier Assembly (232)	• Inspect for damaged or broken Front Differential Assembly (232). • Inspect for damaged or broken Front Differential Side Gear or Pinion Gear. • Inspect for damaged or broken Front Differential Pinion Gear Shaft. • Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin. • Inspect for worn, stripped or sheared Front Differential Side Gear splines. • Inspect for damaged or broken Final Drive Sun, Pinion or Ring Gear. • Inpsect for worn, stripped or sheared Final Drive Sun Gear splines.

No Park (cont'd)

Checks	Causes
Output Carrier Transfer Drive Gear Hub Assembly (222)	• Inspect for broken Drive Gear Hub (222). • Inspect for worn, stripped or sheared Drive Gear hub (222) splines. • Inspect for disengaged or broken Park Gear Retainer Ring (220). • Inspect for damaged or broken park Gear (221). • Inspect for disengaged or broken Drive Sprocket Retainer Ring (227).
Drive Link Assembly (225)	• Inspect for broken, worn or damaged Drive Link Assembly (225). • Inspect for broken, worn or damaged Drive Sprocket (224). • Inspect for broken, worn or damaged Driven Sprocket Assembly (229). • Inspect for worn, stripped or sheared Driven Sprocket splines. • Inspect for broken Drive Gear Hub (222).
Case Assembly (50)	• Inspect for broken or damaged Case. • Inspect for broken or bent Park Pawl Shaft (600). • Inspect for broken or missing Park Pawl Actuator Guide Pin (603) or Manual Shaft Pin (611). • Inspect for broken or missing Manual Shaft Detent Lever Pin (610). • Inspect for broken or missing Manual Shift Shaft Pin (611). • Inspect for damaged or broken Manual Shift Detent Lever Shaft (608). • Inspect for loose, damaged or broken Detent Lever Spring Assembly (17). • Inspect for broken, loose or misaligned Park Pawl Actuator Guide (606). • Inspect for binding, bent or broken Park Pawl (602) or Actuator Assembly (607).

Harsh Garage Shift

Checks	Causes
Input Carrier Assembly (570)	Inspect for worn or stripped Output Internal Gear Splines.
Low-Reverse and 1–2–3–4 Clutch Housing (551)	• Inspect for damaged or fatigued 1–2–3–4 Clutch Wave Plate (557) and Low and Reverse Clutch Wave Plate (547). Refer to *Clutch Plate Diagnosis on page 17-172*. • Inspect for stripped or sheared splines on 1–2–3–4 Clutch Plate (546). Refer to *Clutch Plate Diagnosis on page 17-172*. • Inspect for improperly positioned or plugged Low Reverse Piston (550) air bleed. • Inspect for correct fluid level.
Low and Reverse Clutch Assembly (OWC) (543)	Inspect for stripped or sheared internal and external splines on Low and Reverse Clutch Assembly (543).

No Drive in All Ranges

Checks	Causes
Case Assembly (50)	• Inspect for cracked or broken Case (50). • Inspect for stripped or sheared splines. • Inspect for binding Manual Shift Detent Lever Assembly (609). • Inspect for missing Manual Shift Shaft Pin (611). • Inspect for missing Manual Shaft Lever Pin (610). • Inspect for interference or binding Park Pawl Actuator Assembly (607). • Inspect for broken or disengaged 1–2–3–4 Clutch Backing Plate Retainer Ring (561). • Inspect for loose or damaged case bushing. • Inspect A/Trans Fluid Pump Seal Assembly (25) for damage.
Torque Converter (28)	• Inspect for stripped or sheared splines on Turbine Shaft. • Inspect for missing Torque Converter to Flywheel bolts. • Inspect for damaged or disengaged Torque Converter Hub to Oil Pump Drive Gear.

No Drive in All Ranges (cont'd)

Checks	Causes
Torque Converter Housing (208)	• Inspect for stripped or sheared Differential Ring Gear splines. • Inspect for broken or disengaged Differential Ring Gear Retainer (206). • Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (26). • Inspect for loose, missing or broken Fluid Pump bolts (200).
35R/456 Housing Assembly (516)	• Inspect for damaged or broken Input Shaft Thrust Bearing Assembly (538). • Inspect for stripped or sheared splines on the Input Shaft to the 3–5 Reverse/ 4–5–6 Clutch Housing (516).
Oil Pump Assembly (201)	• Inspect for fluid leaks / improper fluid level. • Inspect for leaking Fluid Outlet Seal Assembly (24). • Inspect for loose or missing Oil Pump Bolts (200). • Inspect for damaged, restricted or improperly installed Oil Filter Assembly (203). • Inspect for damaged or leaking Oil Filter Neck Seal. • Inspect for broken or seized Fluid Pump Drive Gear (315) and Fluid Pump Driven Gear (316).
Low & Reverse Clutch Assembly (543)	Inspect for stripped or sheared splines to the Reaction Carrier (567).
Input Carrier Assembly (570)	• Inspect for stripped or sheared castle splines to ring gear. • Inspect for improperly installed carrier pinion gear pins. • Inspect for damaged or broken Pinion Gears. • Inspect for stripped or sheared splines on the Input Sun Gear (571). • Inspect for damaged or broken Output Internal Gear. • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing Assembly (568) and Output Carrier Thrust Bearing Assembly (573). • Inspect for damaged or broken Input Carrier Thrust Bearings (569, 572).
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared Reaction Carrier Assembly (567) splines. • Inspect for damaged or broken Input Carrier Thrust Bearings (568). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Reaction Internal Gear teeth. • Inpsect for disengaged or broken Reaction Internal Gear retainer ring.
Reaction Sun Gear Assembly (566)	• Inspect for damaged or broken weld at Sun Gear. • Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Output Carrier Assembly (574)	• Inspect for stripped or sheared splines to reaction internal ring gear. • Inspect for damaged or broken Input Sun Gear Thrust Bearings (572). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Input Carrier Thrust Bearings (573). • Inspect for broken or damaged Output Internal Gear.
Output Sun Gear Assembly (555)	• Inspect for stripped or sheared Output Sun Gear Assembly (555) splines. • Inspect for broken Output Sun Gear Assembly (555) hub or weld.
Low-Reverse and 1–2–3–4 Clutch Housing (551)	Inspect for disengaged or broken 1–2–3–4 Clutch Piston Spring Retainer (554).
Drive Link Assembly (225)	• Inspect for broken, worn or damaged Drive Link Assembly (225). • Inspect for broken, worn or damaged Drive Sprocket (224). • Inspect for broken, worn or damaged Driven Sprocket Assembly (229). • Inspect for broken Drive Gear Hub (222).
Differential Carrier Assembly (232)	• Inspect for stripped or sheared splines on Differential Side Gear. • Inspect for stripped or sheared splines Final Drive Sun Gear (230). • Inspect for stripped or sheared splines Differential Carrier to PTU (AWD only). • Inspect for stripped broken or disengaged Final Drive Retainer (581). • Inspect for damaged or broken Pinion Gear teeth.

No Drive in All Ranges (cont'd)

Checks	Causes
	• Inpsect for damaged or broken Final Drive Rollers (585). • Inspect for broken, worn or damaged Final Drive Inner and Outer Thrust Washers (584).
Control Solenoid (w/Body and TCM) Valve Assembly	• Check that the Manual Valve (432) is engaged with Manual Shift Detent Lever Assembly (609). • Inspect the Control Solenoid (w/Body and TCM) Valve Assembly (7) and verify that it is functioning properly.

No First and Reverse Gears

Checks	Causes
Low and Reverse Clutch Assembly (543)	• Inspect for stripped or sheared internal or external splines on Low and Reverse Clutch Assembly (543) • Inspect for broken or disengaged retainer ring
Low and Reverse Clutch	• Inspect for stripped or sheared splines on Low and Reverse Clutch Plates (545–547) • Inspect for damaged, deformed or improper surface finish on the Low and Reverse Clutch Plates (545–547) • Inspect for stripped or sheared splines on Low and Reverse Clutch Backing Plate (544) • Inspect for worn, damaged or debonding Low and Reverse Clutch Piston Seals (550) • Inspect for broken or fatigued Low and Reverse Clutch Piston Return Spring (549)
Low-Reverse and 1–2–3–4 Clutch Housing (551)	• Inspect for disengaged or broken Low and Reverse Clutch Piston Spring Retainer (548) • Inspect for broken or deformed Low and Reverse Clutch Piston (550) • Inspect for damaged or improper surface finish in the piston bore

No First, Second, Third, and Fourth Gear

Checks	Causes
Control Solenoid (w/Body and TCM) Valve Assembly	Check 1234 PC Solenoid 5 for proper operation. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.
Control Valve Body Assembly	Inspect 1-2-3-4 Clutch Regulator Valve (417) and 1-2-3-4 Clutch Boost Valve (414) for debris and stickyness.
1-2-3-4 Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 1-2-3-4 Clutch Plates (557–559), Backing Plate (560). • Inspect for damaged or broken 1-2-3-4 Clutch Piston (552) and Piston Seals damaged, worn or delaminating. • Inspect for broken or fatigued 1-2-3-4 Clutch Piston Return Spring (553). • Inspect for broken or disengaged 1-2-3-4 Clutch Piston Return Spring Retainer (554). • Inspect for broken or fatigued 1-2-3-4 Clutch Waved Plate (557). • Inspect for disengaged or broken 1-2-3-4 Clutch Backing Plate Retainer (561). • Inspect for broken, porous or improper surface finish or plugged oil passages of the Low-Reverse/1-2-3-4 Clutch Housing (551). • Inspect for worn or damaged Low-Reverse/ 1-2-3-4 Clutch Housing (551) splines.
Output Sun Gear Assembly (555)	Inspect for stripped or sheared splines on the Output Sun Gear shell.
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared splines on the Input Ring Gear • Inspect for disengaged or broken Input Ring Gear Retainer.
Output Carrier Assembly (574)	• Low/Reverse Clutch Assembly (OWC) (543) splines stripped or sheared. • Inspect for disengaged or broken Reaction Ring Gear Retainer.

No First, Second, Third, and Fourth Gear (cont'd)

Checks	Causes
Case Assembly (50)	1. Inspect for leaking or damaged 1-2-3-4 and Low-Reverse Clutch Fluid Passage Seals (67). 2. Inspect for worn or damaged case splines or retainer ring grooves.
Input Sun Gear (571)	Inspect for damaged gear teeth and damaged splines.
Turbine Shaft (517)	Inspect for damaged splines to the Input Shaft Sun Gear.

No Second and Sixth Gear

Checks	Causes
2–6 Clutch Assembly	• Inspect for damaged or worn 2–6 Clutch Plates (540–542). • Inspect for damaged, worn, broken, improper surface finish or sheared splines on the Low-Reverse Clutch Assembly (543). • Inspect for damaged or broken 2–6 Clutch Piston (535) and piston seals damaged, worn or delaminating. • Inspect for broken or binding 2–6 clutch Piston Return Spring (536).
Reaction Carrier Assembly (567)	• Inspect for stripped or sheared splines on the Input Ring Gear. • Inspect for disengaged or broken Input Ring Gear Retainer.
Reaction Sun Gear Assembly (566)	• Inspect for damaged or broken Reaction Sun Gear Assembly hub. • Inspect for damaged or broken sun gear weld. • Inspect for loose or worn Reaction Sun Gear Assembly bushing.
Case Assembly (50)	• Inspect for stripped or sheared splines. • Inspect for broken or disengaged 2–6 Clutch Piston Return Spring Retainer (537). • Inspect for damaged, worn, or improper surface finish in the piston bore.
Output Carrier Assembly (574)	Inspect for reaction ring gear damage or missing ring gear snap ring.
Control Valve Body Assembly	Inspect 2-6 Clutch Regulator Valve (419) for debris and stickyness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check 2-6 PC Solenoid 4 for proper operation. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

Harsh or Late First, Second, Third, and Fourth Shift

Checks	Causes
Low-Reverse and 1–2–3–4 Clutch Housing (551)	• Inspect for damaged or broken 1–2–3–4 Clutch Piston (552) and piston seals damaged, worn or leaking. • Inspect for fatigued or binding 1–2–3–4 Clutch Piston Return Spring (553). • Inspect for improper surface finish on 1–2–3–4 Clutch Plates (557–559). Refer to *Clutch Plate Diagnosis on page 17-172*. • Inspect for broken or fatigued 1–2–3–4 Clutch Waved Plate (557). • Inspect for plugged or restricted Low-Reverse and 1–2–3–4 Clutch Piston Housing (551) air bleed.
Case Assembly (50)	• Inspect for leaking or loose fitting Fluid Check Valve (55). • Inspect for leaking or damaged 1–2–3–4 and Low-Reverse Clutch Fluid Passage Seals (67).

Harsh First and Reverse Shift

Checks	Causes
Low-Reverse and 1–2–3–4 Clutch Housing (551)	Inspect for plugged or restricted Low-Reverse/1–2–3–4 Clutch Piston Housing (551) air bleed
Low and Reverse Clutch	• Inspect for improper surface finish on Low and Reverse Clutch Plates (545–547) • Inspect for broken or fatigued Low and Reverse Clutch Apply Plate (547) • Inspect for damaged or broken Low and Reverse Clutch Piston (550) and piston seals damaged, worn or leaking • Inspect for fatigued or binding Low and Reverse Clutch Piston Return Spring (549)

No Third, Fifth, and Reverse Gear

Checks	Causes
3–5 Reverse Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 3–5 Reverse Clutch Plates (507–509), Backing Plate (510) • Inspect for sheared or stripped splines on 3–5 Rev/4–5–6 Housing (516) to Turbine Shaft (517) • Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3–5 Rev/4–5–6 Housing (516) • Inspect for damaged, worn, loose or seized hub bushing in the 3–5 Rev/4–5–6 Housing • Inspect for broken, porous or improper surface finish or plugged oil passages of the 3–5 Rev/4–5–6 Housing (516) • Inspect for failure of the Input Shaft Thrust Bearing (538) • Inspect for disengaged or broken 3–5 Reverse Clutch Backing Plate (511) • Inspect for damaged, worn or leaking 3–5 Reverse Clutch Piston Seals (504–506) • Inspect for damaged or broken 3–5 Rev/4–5–6 Clutch Housing (516) • Inspect for warped, damaged, improper surface finish or debonding 3–5 Reverse Clutch Piston (502) • Inspect for broken or fatigued 3–5 Reverse Clutch Spring (503) • Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500) • Inspect for worn, broken or damaged Speed Sensor Reluctor Wheel (501)
Reaction Sun Gear Assembly (566)	Inspect for stripped or sheared splines
Reaction Carrier (567)	• Inspect for broken or disengaged Input Internal Gear Retainer • Inspect for stripped or sheared splines on the Input Internal Gear
Output Carrier (574)	Inspect for stripped or sheared splines for the Reaction Internal Ring Gear
4–5–6 Clutch Assembly	• Inspect for plugged or missing 4–5–6 Piston Dam Oil Feed hole • Inspect for leaking 4–5–6 Piston Dam

Harsh or Late Second and Sixth Shift

Checks	Causes
2–6 Clutch Assembly	• Inspect for worn or improper surface finish on the 2–6 Clutch Plates (540–542) • Inspect for fatigued 2–6 Clutch Piston Apply Plate (540) • Inspect for plugged, restricted or incorrect orientation of the 2–6 Clutch Piston (535) air bleed
Case Assembly (50)	• Inspect for damaged or broken 2–6 Clutch Piston (535) and piston seals damaged, worn or delaminating • Inspect for fatigued 2–6 Clutch Piston Return Spring (536)

No Fourth, Fifth, and Sixth Gear

Checks	Causes
4–5–6 Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 4–5–6 Clutch Plates (526–528), Backing Plate (529) • Inspect for broken or fatiqued 4–5–6 Clutch Waved Plate (525) • Inspect for damaged or broken 4–5–6 Clutch Piston (520) and Piston Seals (518, 519, 521) • Inspect for broken or fatigued 4–5–6 Piston Return Spring (522) • Inspect for broken or disengaged 4–5–6 Backing Plate Retainer (532) • Inspect for damaged or broken 4–5–6 Clutch Dam Piston (523) and piston seals damaged, worn or delaminating • Inspect for broken or disengaged 4–5–6 Clutch Dam Retainer (524) • Inspect for stripped or sheared splines on the Reaction Carrier Hub (531) • Inspect for stripped or sheared splines on 3–5 Rev/4–5–6 Housing to Turbine Shaft (516) • Inspect for loose, worn or damaged 3–5 Rev/4–5–6 Housing Bushing • Inspect for broken, porous or improper surface finish or plugged oil passages of the 3–5 Rev/4–5–6 Housing (516)
Transmission Case Assembly	Inspect the input shaft support (56) for missing or damaged fluid ring seals (58).
Control Valve Body Assembly	Inspect the reverse and 4-5-6 regulator valve (411) and ball check valve (404) for debris and stickyness.
Control Solenoid (w/Body and TCM) Valve Assembly	Check the pressure control solenoid 3 (R1/456) for proper operation. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.

Harsh or Late Third, Fifth, and Reverse Shift

Checks	Causes
3–5 Reverse Clutch Assembly	• Inspect for damaged splines or improper surface finish on 3–5 Reverse Clutch Plates (507–509), Backing Plate (510) • Inspect for damaged, worn or leaking 3–5 Reverse Clutch Piston Seals (504–506) • Inspect for warped 3–5 Rev/4–5–6 Clutch Housing (516) • Inspect for broken or fatigued 3–5 Reverse Clutch Waved Plate (507)

Harsh Fourth, Fifth, and Sixth Shift

Checks	Causes
4–5–6 Clutch Assembly	• Inspect for leaking or damaged 4–5–6 Clutch Piston (520) and Piston Seals (518, 519, 521) • Inspect for plugged or restricted 4–5–6 Piston Dam air bleed • Inspect for leaking or damaged 4–5–6 Clutch Dam (523) • Inspect for plugged or restricted Dam oil feed hole in the 4–5–6 Piston (520) • Inspect for fatiqued 4–5–6 Clutch Piston Spring (522) • Inspect for leaking 4–5–6 Clutch Dam Seals (523) • Inspect for improper surface finish on 4–5–6 Clutch Plates (525–528) • Inspect for fatigued 4–5–6 Clutch Waved Plate (525) • Inspect for porous, improper surface finish, seal groove damage or plugged or restricted oil passages of the 3–5 Rev/4–5–6 Housing (516)

No Torque Converter Clutch Apply

Checks	Causes
Torque Converter Assembly (28)	• Inspect for damaged Torque Converter Clutch Seal (inside converter assembly). • Diagnose Torque Converter Assembly for possible internal damage. Refer to *Torque Converter Diagnosis on page 17-169*.

No Torque Converter Clutch Apply (cont'd)

Checks	Causes
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Inspection on page 17-158*.
Oil Pump Assembly (201)	Inspect for worn or damaged Torque Converter Fluid Seal Assembly (301).
Torque Converter Housing Assembly (29)	Inspect for leaking or damaged Torque Converter Fluid Seal Assembly (301), Torque Converter Fluid Seal Assembly (319) and A/Trans Fluid Pump Assembly (201).

No Torque Converter Clutch Release

Checks	Causes
Torque Converter Assembly (28)	Diagnose Torque Converter Assembly for possible internal damage. Refer to *Torque Converter Diagnosis on page 17-169*.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

Harsh Torque Converter Clutch Apply, or Inoperative or No Electronically Controlled Capacity Clutch Control

Checks	Causes
Torque Converter Assembly (28)	• Inspect for leaking or damaged Torque Converter Clutch Hub Seal. • Diagnose Torque Converter Assembly for possible internal damage. Refer to *Torque Converter Diagnosis on page 17-169*.
Valve Body Assembly (433)	Inspect for worn, damaged or sticking TCC Regulator Apply (425) and TCC Regulator Apply Shuttle (426) Valves.

No Reverse Gear

Checks	Causes
Control Solenoid (w/Body and TCM) Valve Assembly	Check the 35R PC Solenoid 2 for proper operation. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test on page 17-160*.
Control Valve Body Assembly	• Inspect the 3-5-Reverse Clutch Regulator Valve (421) and Control Valve Body Ball Check Valve (404) for debris and stickyness. • Inspect the Clutch Select Valve (428) and the Actuator Feed Limit Valve (430) for debris and stickyness.
Transmission Case Assembly	Inspect the Input Shaft Support (56) for missing or damaged Fluid Seal Rings (58).
3-5 Reverse Clutch Assembly	• Inspect for damaged, stripped or sheared splines on 3-5 Reverse Clutch Plates (507–509), Backing Plate (510). • Inspect for stripped or sheared splines on 3-5 Rev/4-5-6 Housing to Turbine Shaft (516). • Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516). • Inspect for damaged, worn, loose or seized hub bushing in the 3-5 Rev/4-5-6 Housing. • Inspect for broken, porous or improper surface finish or plugged oil passages of the 3-5 Rev/4-5-6 Housing (516). • Inspect for failure of the Input Shaft Thrust Bearing (538). • Inspect for disengaged or broken 3-5 Reverse Clutch Backing Plate Retainer (511). • Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (504–506). • Inspect for damaged or broken 3-5 Rev/4-5-6 Clutch Housing (516). • Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (502). • Inspect for broken or fatiqued 3-5 Reverse Clutch Spring (503).

No Reverse Gear (cont'd)

Checks	Causes
	• Inspect for disengaged or broken Speed Sensor Reluctor Retainer (500). • Inspect for broken Speed Sensor Reluctor Wheel (501).

Fluid Pressure High or Low

Checks	Causes
Fluid Pump Assembly (201)	• Inspect for loose fluid pump bolts (204). • Inspect for leaking or damaged fluid pump outlet seals (24) and oil filter seal. • Inspect for improperly installed, restricted or damaged oil filter (203). • Inspect for sticking line pressure blow off valve (304). • Inspect for worn, sticking or damaged pressure regulator valve (309) or pressure regulator valve spring (308). • Inspect for damaged or restricted oil ports in the oil pump body (303). • Inspect for missing, leaking, or damaged auxiliary fluid inlet pump seal (371) – Hybrid Models.
Torque Converter Housing (208)	• Inspect for missing or restricted differential lube oil circuit orifice. • Inspect for missing front differential carrier baffle (205).
Control Solenoid Valve Assembly (w/Body and TCM) (7)	• Inspect for leaking or damaged filter plate assembly seals (8). • Verify VBS operation is not stuck high or low.
Case Assembly (50)	• Inspect for proper fluid level. • Inspect for missing lube oil circuit orifice or front differential carrier baffle (62). • Inspect for leaking or damaged valve body spacer plate assembly (12). • Inspect for damaged or leaking fluid check valve (55). • Inspect for leaking, damaged or broken fluid level control valve (13).
Torque Converter Assembly (28)	• Inspect for damaged torque converter clutch seal (inside converter assembly). • Inspect for damaged or disengaged torque converter hub to oil pump drive gear.

Repair Instructions - On Vehicle

Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement

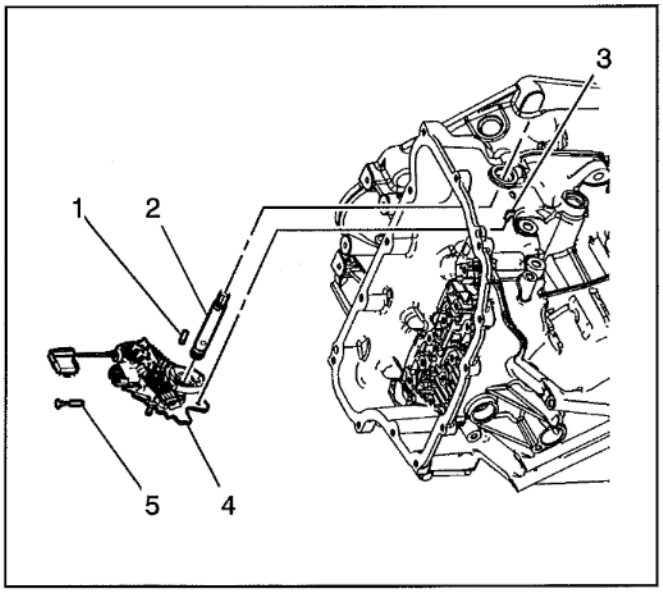
Special Tools

- *DT-41229* Manual Shaft Pin Installer
- *DT-48550* Detent Lever Pin Remover

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Removal Procedure

1. Remove the control valve body cover. Refer to *Control Valve Body Cover Replacement on page 17-210*.
2. Remove the control valve body. Refer to *Control Valve Body Replacement on page 17-213*.



1998834

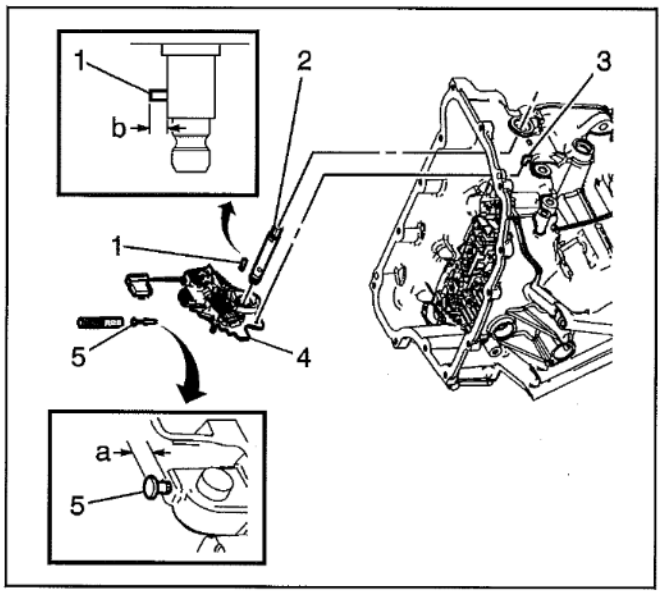
3. Remove the manual shaft detent lever hub pin (1) using *DT-48550* remover.
4. Remove the manual shift shaft pin (5) using diagonal pliers or equivalent tool. Discard the pin.
5. Remove the manual shaft (2).

Note:

- Disconnect the actuator rod (3) from the detent lever assembly. Do not remove the actuator rod from the transmission case.
- Do not pull the park actuator rod end out beyond the machined oil passage surface in the case. A no park condition will exist if the park pawl actuator assembly is pulled out of the transmission too far and the actuator rod disengages from the park pawl. The transmission assembly will require disassembly to reinstall the actuator rod over the park pawl.

6. Remove the manual shaft detent (w/shift position switch) lever assembly (4).

Installation Procedure



1998832

Note: Connect the actuator rod (3) to the detent lever assembly.

1. Install the manual shaft detent (w/shift position switch) lever assembly (4).

Note: Lubricate the shaft with automatic transmission fluid to prevent damage to the manual shift shaft seal during installation.

2. Install the manual shaft (2).
3. Install the manual shaft detent lever hub pin (1) using *DT-48550* remover.

Specification

Install the Manual Shaft Detent Lever Hub Pin to height of (b) 7.9 mm (0.38 in).

Caution: Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack.

4. Install the NEW manual shift shaft pin (5) using *DT-41229* installer. Use a NEW pin to ensure proper engagement with the case.

Specification

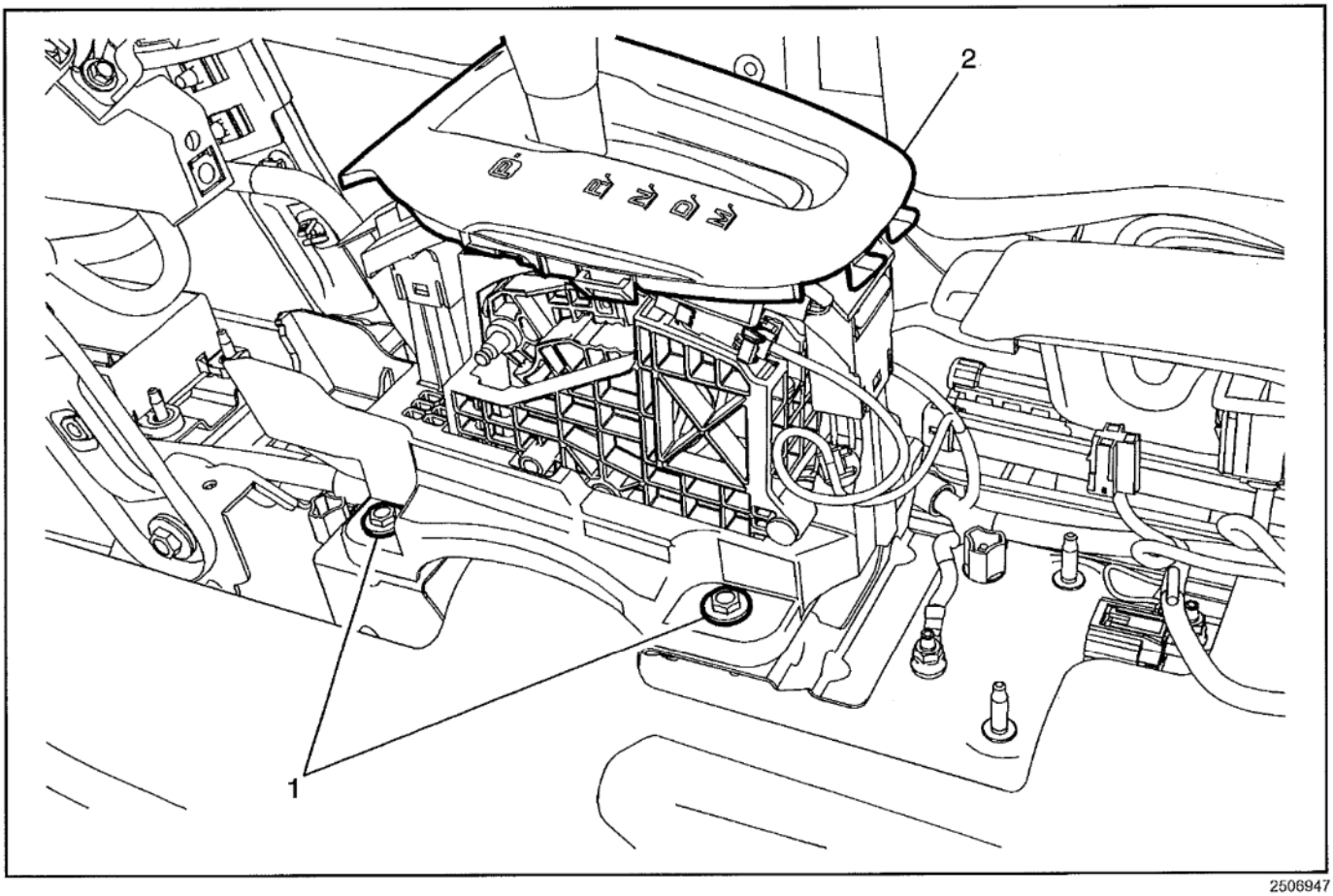
Inspect pin installed height is within (a) 7.2–8.2 mm (0.28–0.32 in).

5. Install the control valve body. Refer to *Control Valve Body Replacement on page 17-213*.
6. Install the control valve body cover. Refer to *Control Valve Body Cover Replacement on page 17-210*.
7. Perform the service fast learn adapt procedure.

Transmission Control Lever Knob Replacement

The transmission control lever knob is not serviceable separately. Refer to *Transmission Control Replacement on page 17-193*.

Transmission Control Replacement



2506947

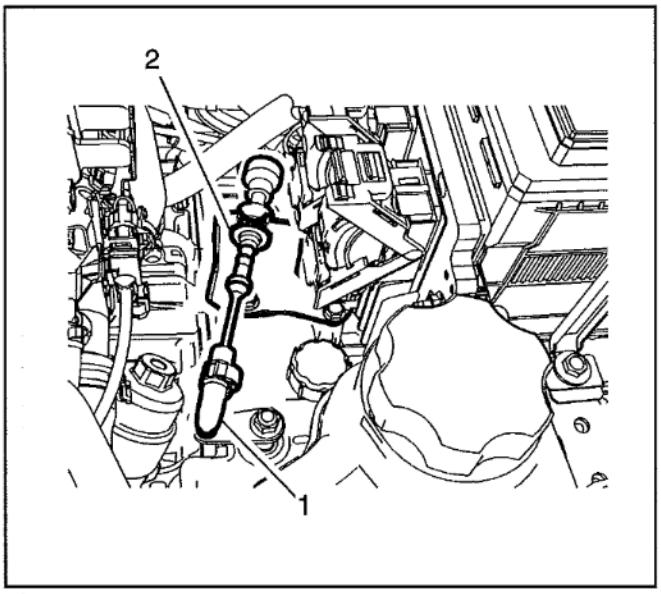
Transmission Control Replacement

Callout	Component Name
Preliminary Procedures 1. Remove the front floor console. Refer to *Front Floor Console Replacement on page 2-61*. 2. Disconnect the range selector lever cable. Refer to *Range Selector Lever Cable Replacement on page 17-195*. 3. Disconnect the transmission control electrical connectors.	
1	Transmission Control Fastener (Qty: 4) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)
2	Transmission Control

Automatic Transmission Range Selector Lever Replacement

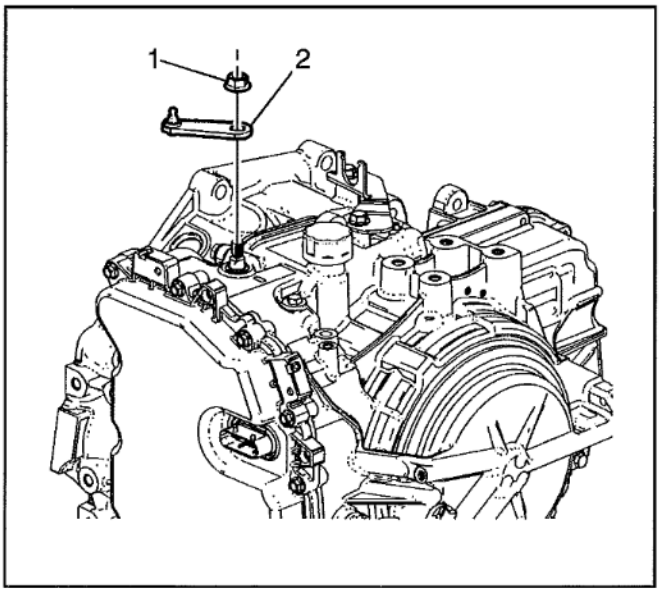
Removal Procedure

1. Set the park brake and chock the wheels.



2492632

2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.
3. Press the locking tabs inward in order to release the transmission range selector lever cable (2) from the cable bracket.

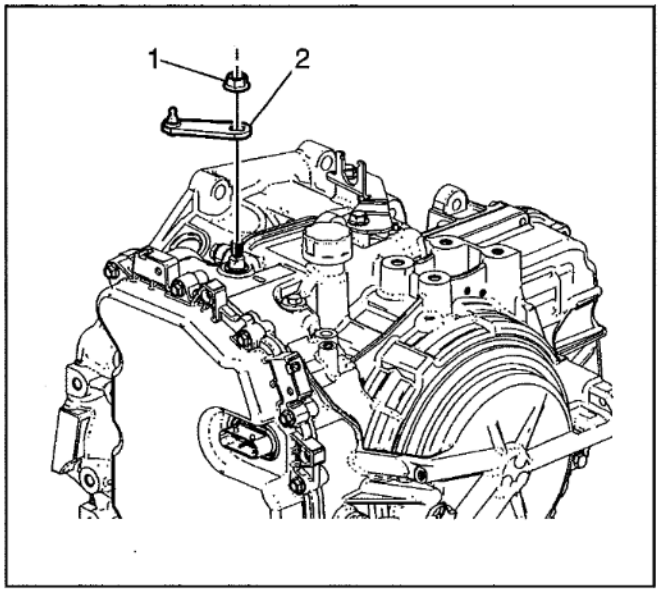


2001183

Warning: Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

4. Remove the transmission range selector lever nut (1).
5. Remove the transmission range selector lever (2).

Installation Procedure



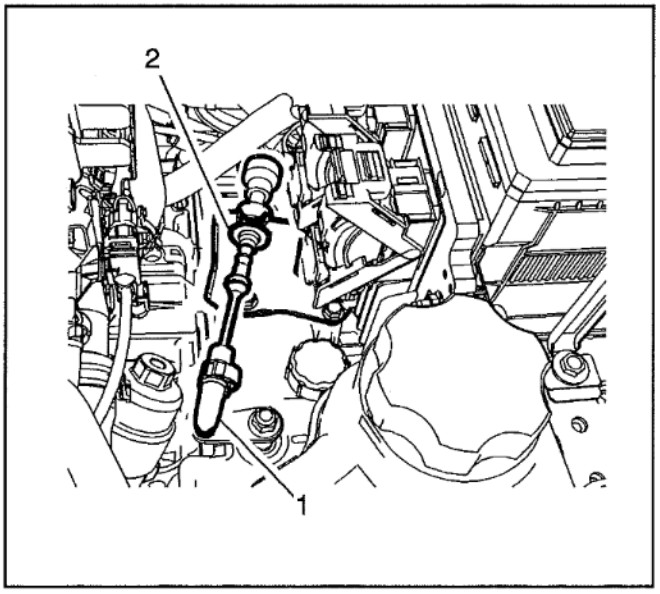
2001183

Warning: Hold the transmission range selector lever while removing or installing the lever retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position.

1. Install the transmission range selector lever (2).

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the transmission range selector lever nut (1) and tighten to **30** N•m **(22 lb ft)**.



2492632

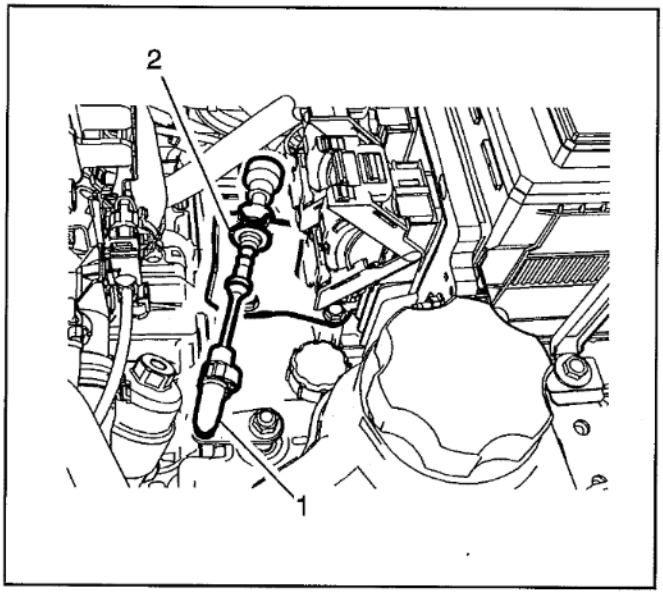
3. Install the transmission range selector lever cable (2) to the cable bracket.

4. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin.
5. Check the range selector cable adjustment. Refer to *Range Selector Lever Cable Adjustment on page 17-196*.

Range Selector Lever Cable Replacement

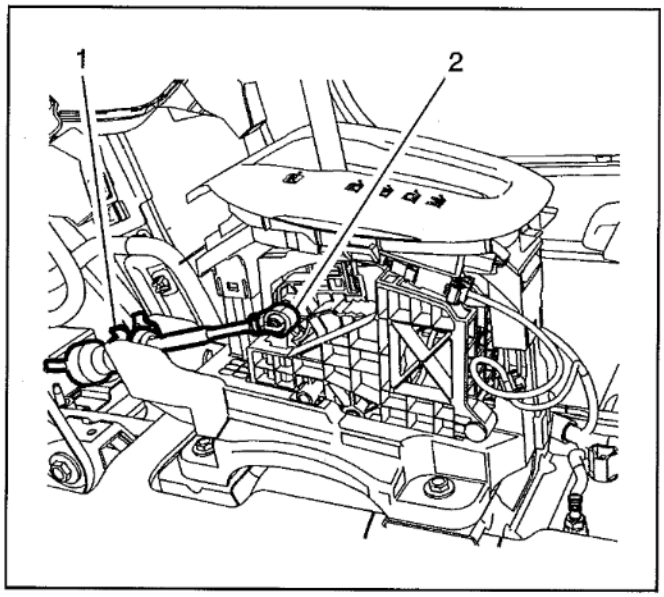
Removal Procedure

1. Set the park brake and chock the wheels.



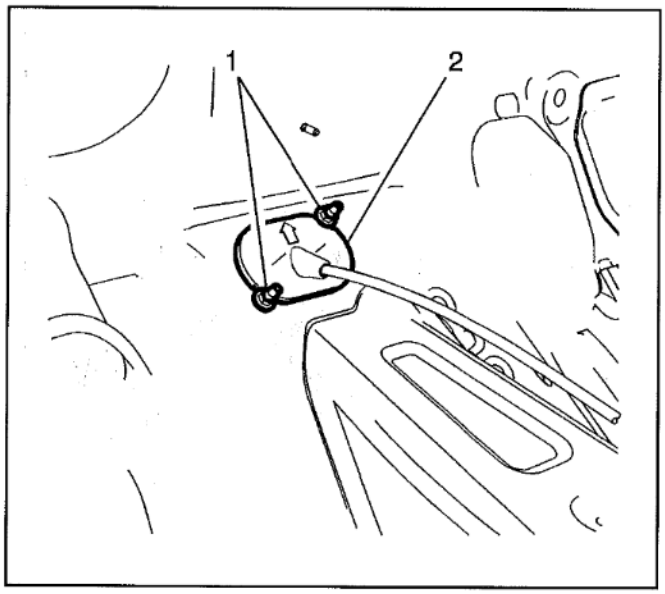
2492632

2. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin.
3. Press the locking tabs inward in order to release the transmission range selector lever cable (2) from the cable bracket.
4. Remove the console. Refer to *Front Floor Console Replacement on page 2-61*.



2492809

5. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin.
6. Release the transmission range selector lever cable retainer (1) and remove the transmission range selector cable from the transmission control lever base.

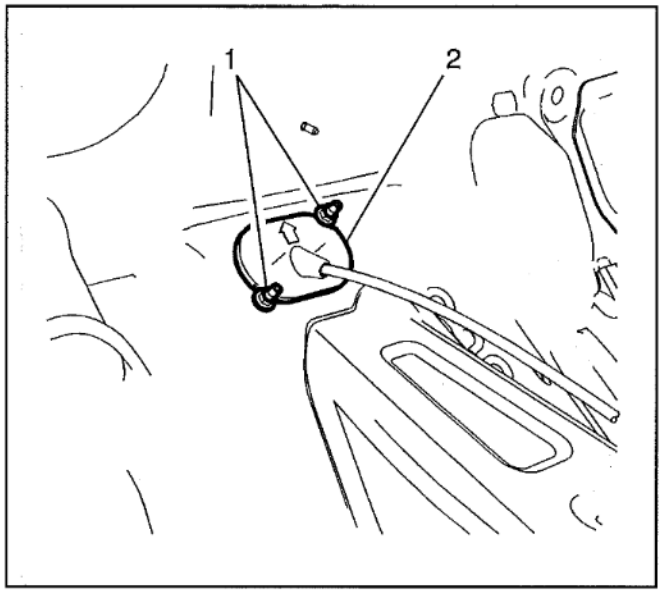


2526950

7. Move the floor carpet in order to gain access to the gear shift cable grommet (2).
8. Remove the grommet fasteners (1) and the transmission range selector lever cable grommet from the cowl panel.
9. Remove the transmission range selector lever cable from the vehicle.

Installation Procedure

1. Install the transmission range selector lever cable to the vehicle.

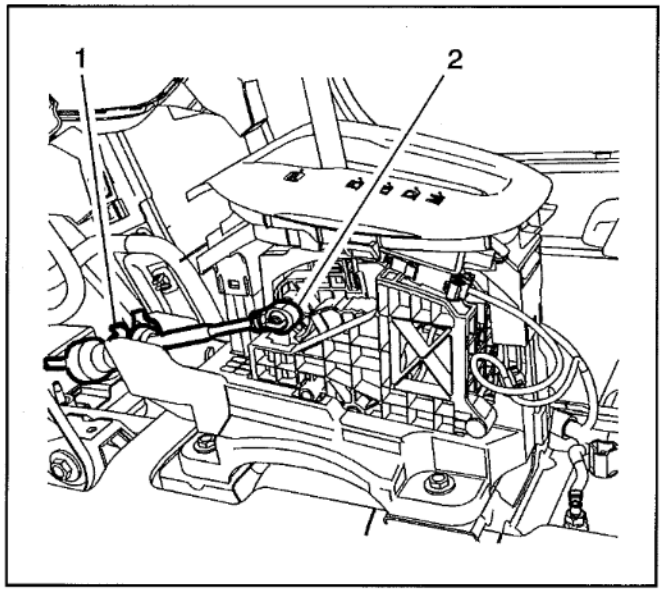


2526950

2. Install the transmission range selector lever cable grommet to the cowl panel.

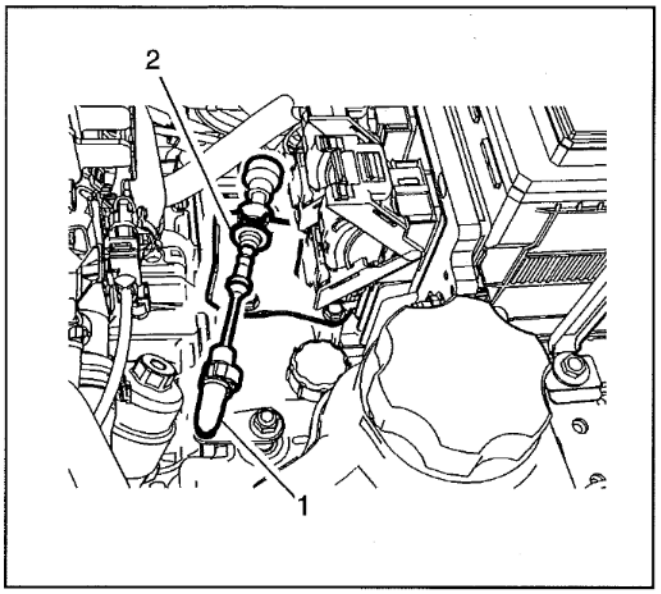
Caution: Refer to *Fastener Caution on page 0-8*.

3. Install the grommet fasteners (2) and tighten to **9 N•m (80 lb in)**.



2492809

4. Install the transmission range selector lever cable to the transmission control lever base. Insure the cable retainer (1) is fully secured to the transmission control lever base.
5. Connect the transmission range selector lever cable terminal (2) to the shift lever pin.
6. Install the console. Refer to *Front Floor Console Replacement on page 2-61*.



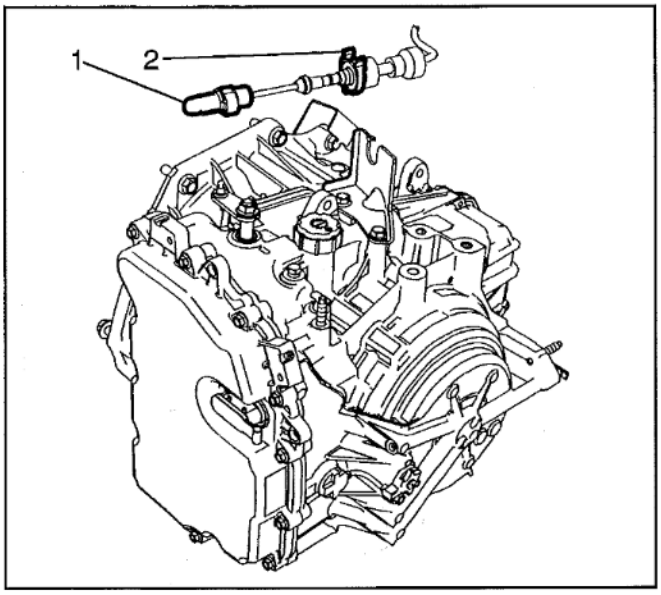
2492632

7. Install the transmission range selector lever cable (2) to the cable bracket.
8. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin.
9. Adjust the automatic transmission range selector lever cable. Refer to *Range Selector Lever Cable Adjustment on page 17-196*.

Range Selector Lever Cable Adjustment

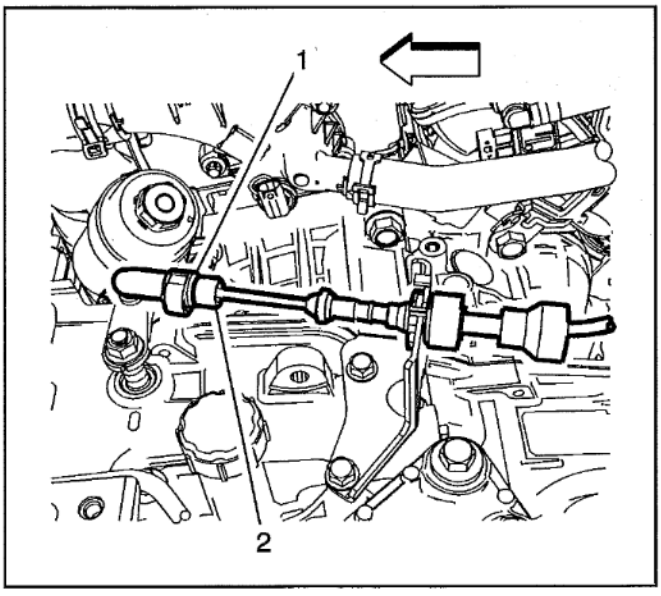
Note: Adjust the automatic transmission range selector cable while the transmission and the gear selector are in the Park position only. Failure to do so may cause mis-adjustment.

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.



2527095

4. Disconnect the range selector cable (2) from the range selector cable bracket.
5. Disconnect the range selector cable end (1) from the range selector lever.
6. Release the range select cable adjuster clip from the cable end (1).
7. Connect the range selector cable (2) to the range selector cable bracket.
8. Connect the range selector cable end (1) to the range selector lever.



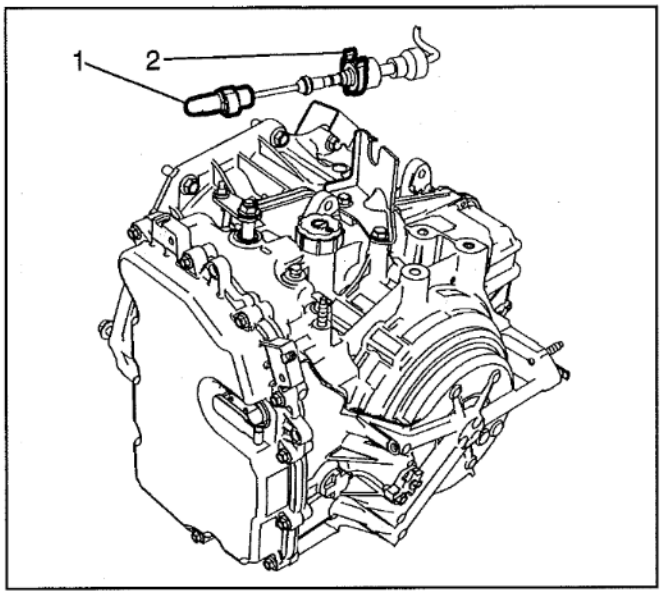
2492897

9. Depress the adjuster clip (1) locking the adjuster clip completely.
10. Ensure the cable tube (2) is secure.
11. Check the transmission range select lever in all gear selections for proper operation.

Range Selector Lever Cable Bracket Replacement

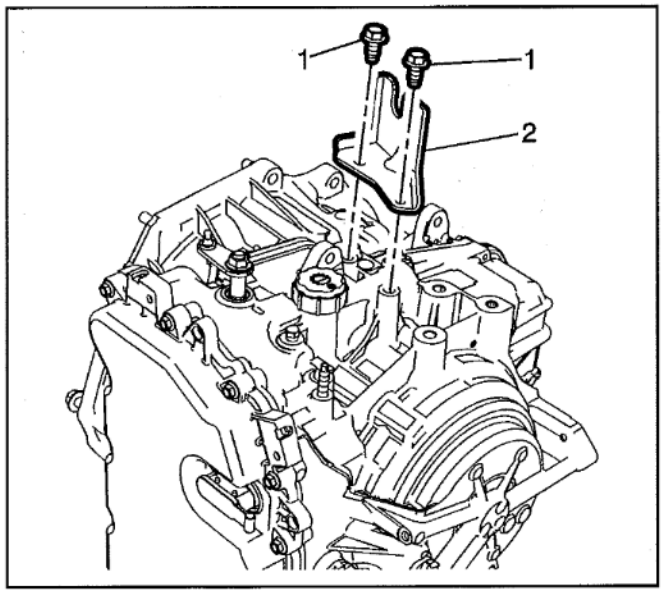
Removal Procedure

1. Set the park brake and chock the wheels.



2527095

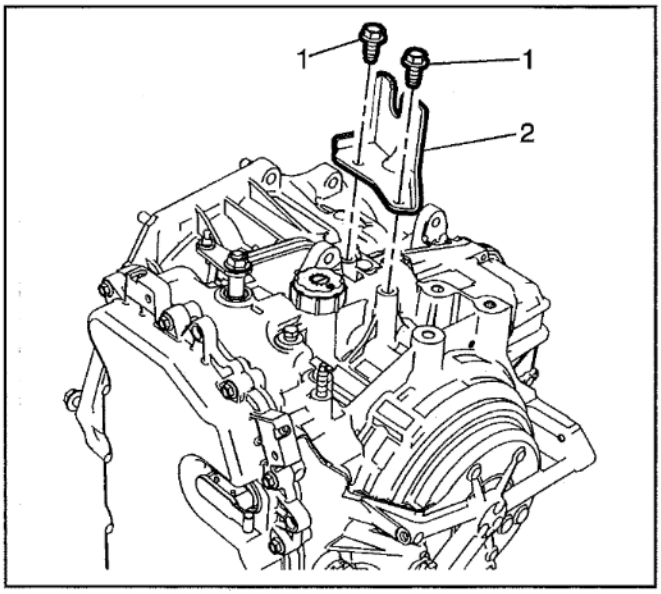
2. Disconnect the range selector cable end (1) from the range selector lever.
3. Disconnect the range selector cable (2) from the range selector cable bracket.



2527104

4. Remove the transmission range selector cable bracket bolts (1).
5. Remove the transmission range selector cable bracket (2).

Installation Procedure

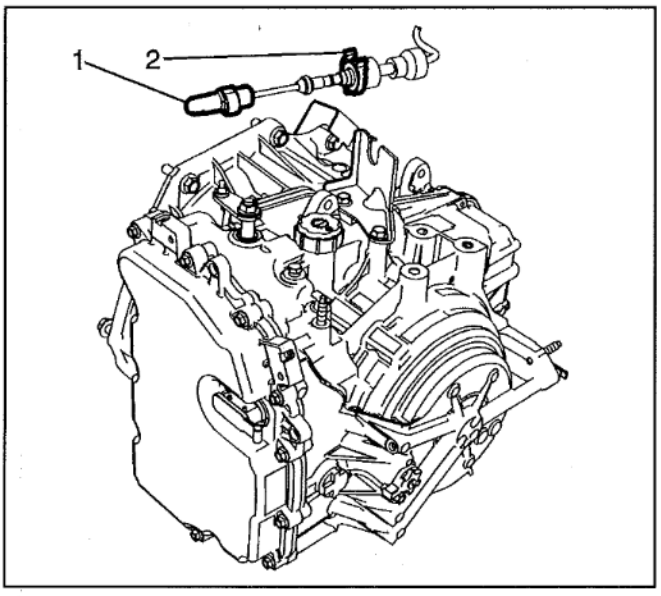


2527104

1. Install the transmission range selector cable bracket (2).

Caution: Refer to *Fastener Caution on page 0-8.*

2. Install the transmission range selector cable bracket bolts (1) and tighten to **18 N•m (14 lb ft)**.

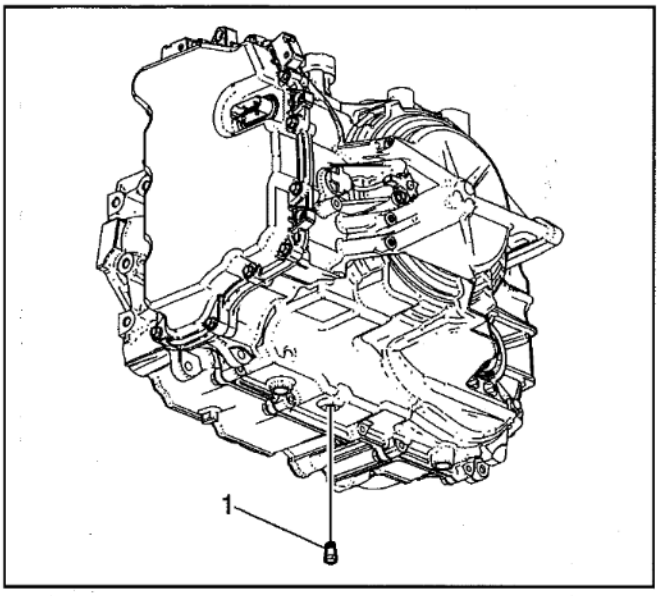


2527095

3. Connect the range selector cable (2) to the range selector cable bracket.
4. Connect the range selector cable end (1) to the range selector lever.
5. Check the range selector cable adjustment. Refer to *Range Selector Lever Cable Adjustment on page 17-196.*

Transmission Fluid Drain and Fill

Removal Procedure



1998836

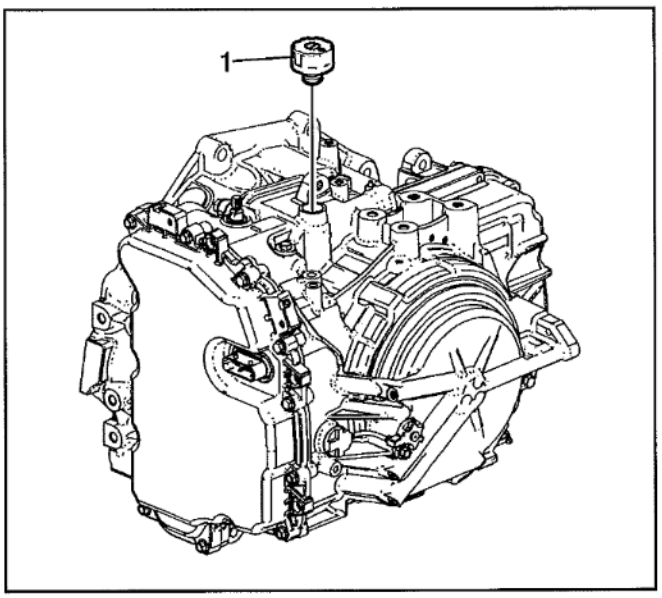
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31.*
2. Remove the drivetrain and front suspension frame skid plate. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143.*
3. Remove the fluid drain plug (1).
4. Drain transmission fluid into a suitable container.

Caution: Refer to *Component Fastener Tightening Caution on page 0-8.*

5. Install the fluid drain plug (1) and tighten to **12 N•m (106 lb in)**.

Installation Procedure

1. Install the drivetrain and front suspension frame skid plate. Refer to *Drivetrain and Front Suspension Frame Skid Plate Replacement on page 3-143.*



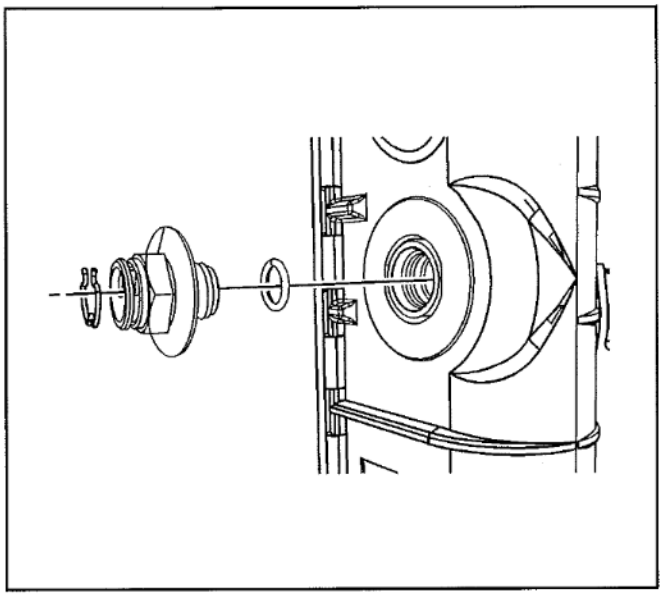
1998835

2. Lower the vehicle.
3. Remove the fluid fill cap (1).
4. Fill the transmission to the proper level with the correct fluid. Refer to *Transmission Fluid Level and Condition Check on page 17-164* and *Fluid Capacity Specifications (6T30) on page 17-10* or *Fluid Capacity Specifications (6T40/45/50) on page 17-10.*
5. Install the fluid fill cap (1).

Transmission Fluid Cooler Pipe Connector Replacement - Radiator

Removal Procedure

1. Drain the cooling system. Refer to *Cooling System Draining and Filling on page 9-628*
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 on page 17-200*



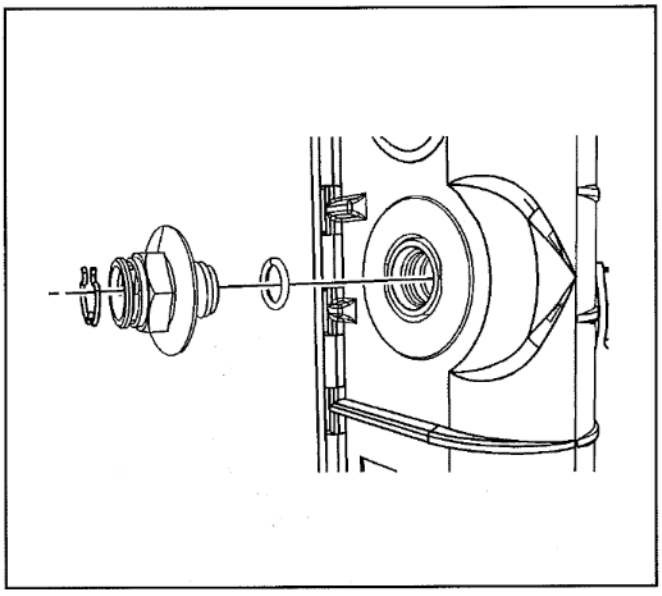
1443001

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.



1443001

Caution: Refer to *Fastener Caution on page 0-8*

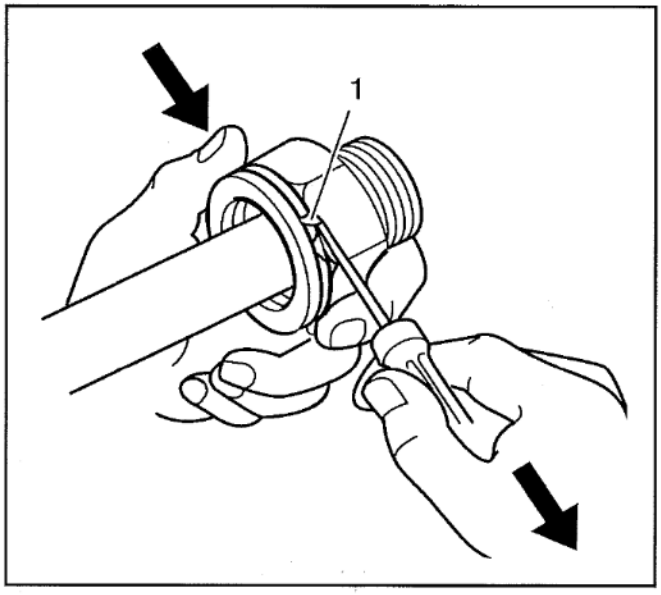
Note: The correct thread engagement is critical. Cross-threaded fittings can achieve proper tightness and still leak.

2. Install the oil cooler fitting to the radiator and tighten to **20** N•m **(15 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 on page 17-200*
4. Fill the cooling system. Refer to *Cooling System Draining and Filling on page 9-628*
5. Adjust the transmission fluid level.
6. Inspect for fluid leaks.

Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection

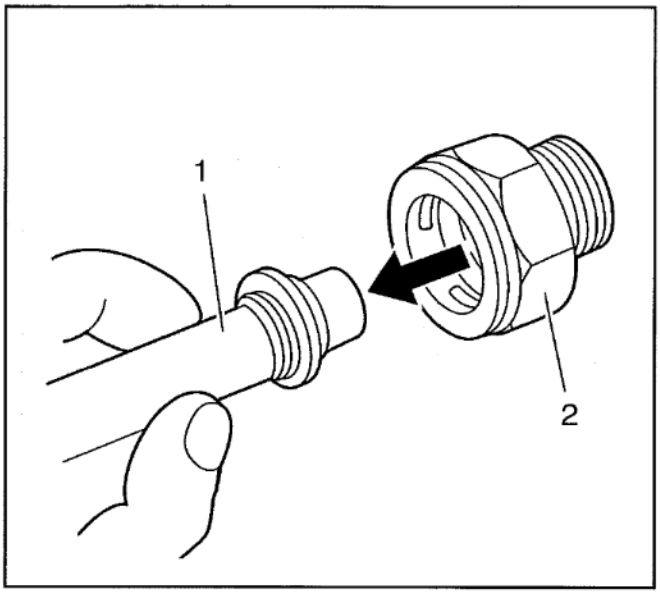
Removal Procedure



2027466

Note: Perform the following procedure when removing the retaining rings and cooler lines from the quick connect fittings located on the radiator and/or the transmission.

1. Pull the plastic cap back from the quick connect fitting and down along the cooler line about 5 cm (2 in).
2. Using a bent-tip screwdriver, pull on one of the open ends of the retaining ring (1) in order to rotate the retaining ring around the quick connect fitting until the retaining ring is out of position and can be completely removed.
3. Remove the retaining ring from the quick connect fitting.
4. Discard the retaining ring.



2027467

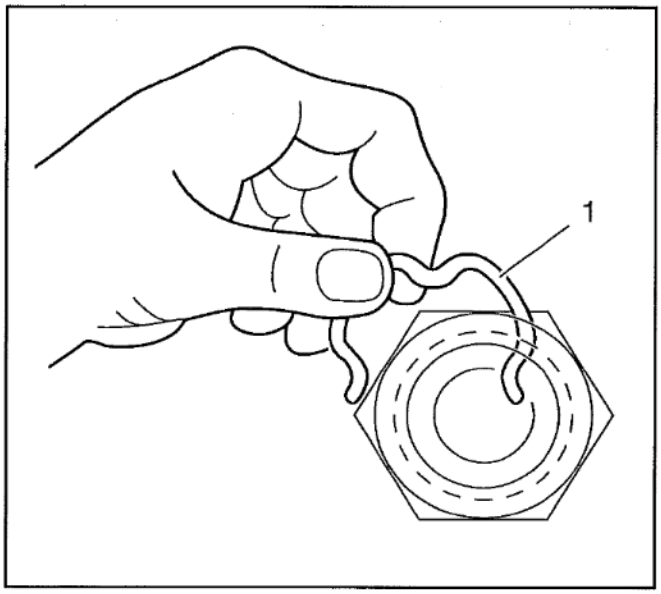
5. Pull the cooler line (1) straight out from the quick connect fitting (2).

Installation Procedure

Note:

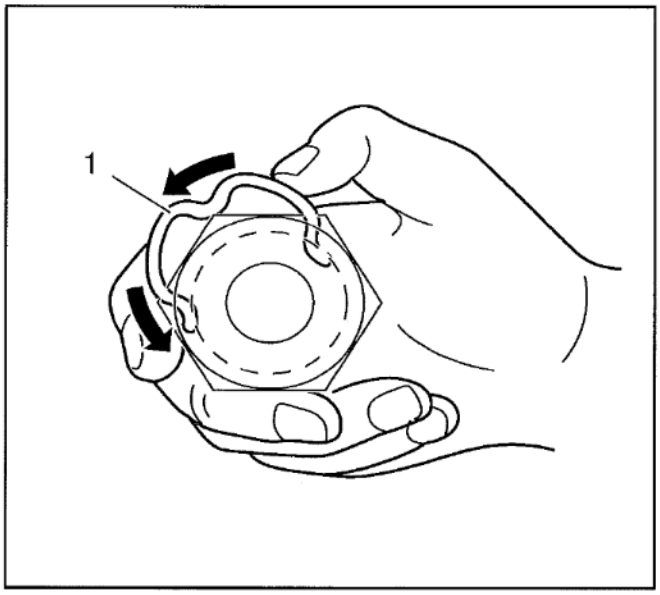
- Do not reuse any of the existing oil lines or oil line fittings if there is excessive corrosion.
- Do not reuse any of the existing retaining rings that were removed from the existing quick connect fittings. Install new retaining rings.
- Ensure the following procedures are performed when installing the new retaining rings onto the fittings.

1. Install a new retaining ring into the quick connect fitting using the following procedure:



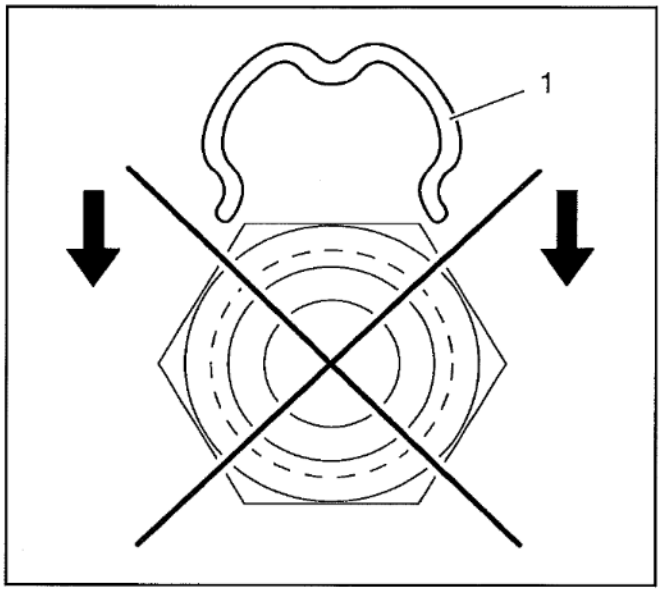
2027468

2. Hook one of the open ends of the retaining ring (1) in one of the slots in the quick connect fitting.



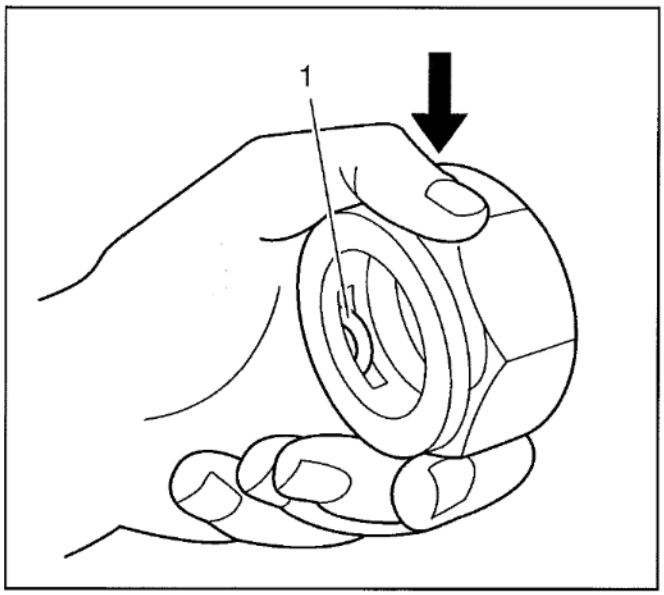
2027469

3. Rotate the retaining ring (1) around the fitting until the retaining ring is positioned with all three ears through the three slots on the fitting.



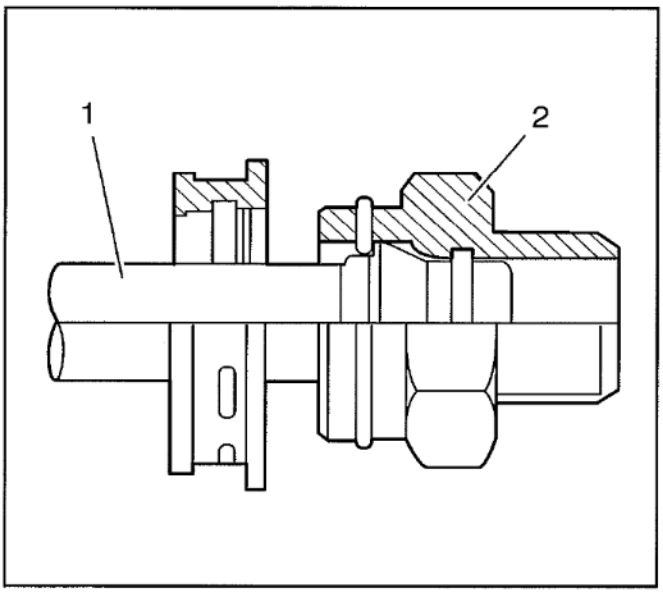
2027470

4. Do not install the new retaining ring (1) onto the fitting by pushing the retaining ring.



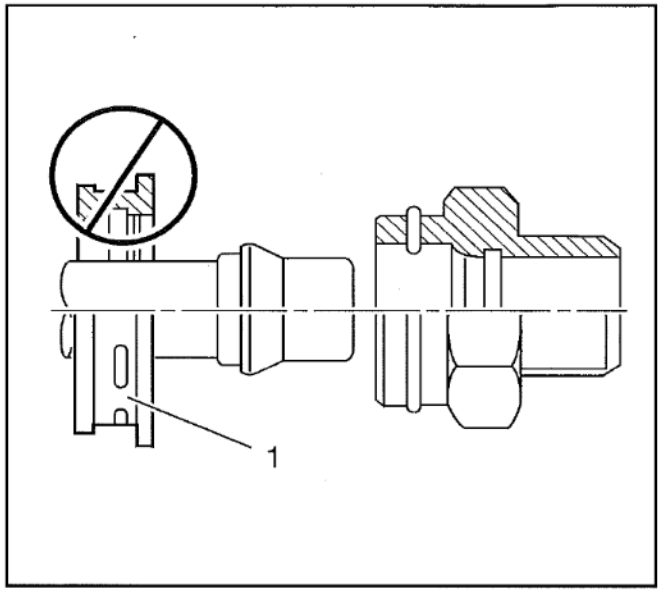
2027473

5. Ensure that the three retaining ring ears are seen from inside the fitting (1) and that the retaining ring moves freely in the fitting slots.



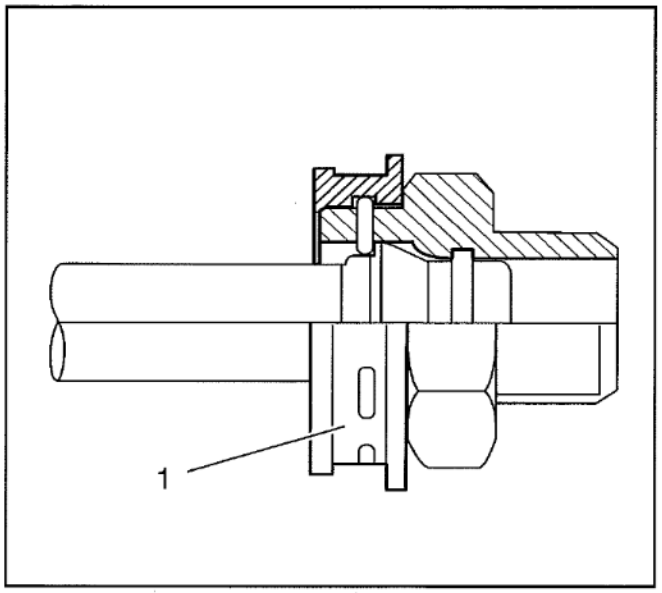
2027475

6. Install the cooler line (1) into the quick connect fitting (2).
7. Insert the cooler line end into the quick connect fitting until a click is either heard or felt.



2027476

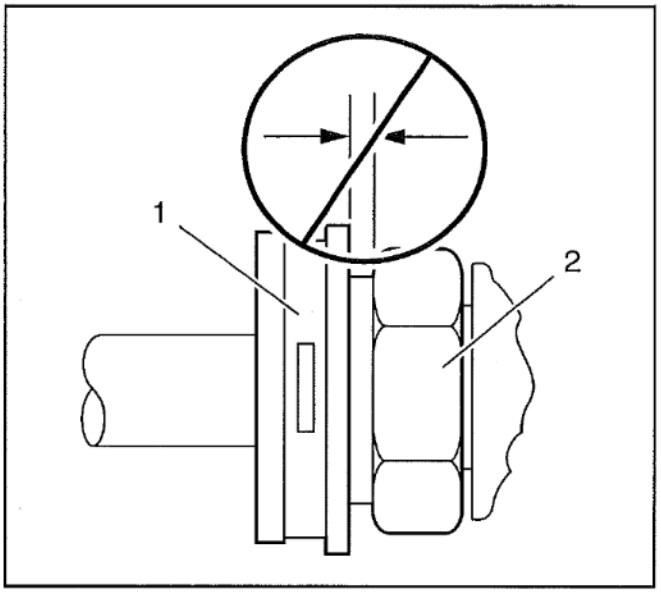
8. Do not use the plastic cap (1) on the cooler line in order to install the cooler line into the fitting.
9. Pull back sharply on the cooler line in order to ensure that the cooler line is fastened into the quick connect fitting.



2027482

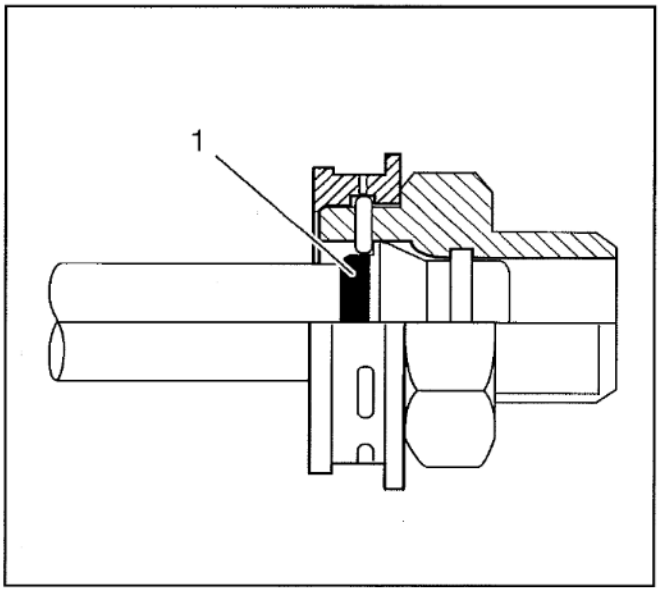
Note: Do not manually depress the retaining clip when installing the plastic cap.

10. Position (snap) the plastic cap (1) 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.



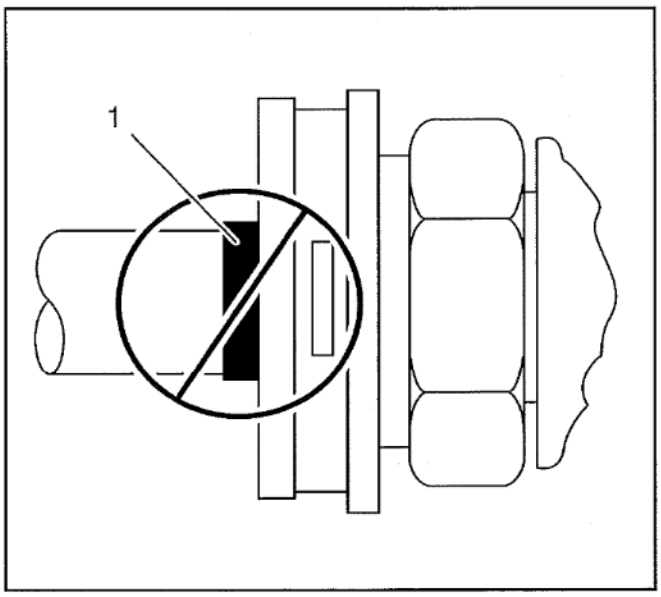
2027484

12. Ensure that no gap is present between the plastic cap (1) and the fitting (2).



2027485

13. Ensure that the yellow identification band (1) on the tube is hidden within the quick connect fitting.



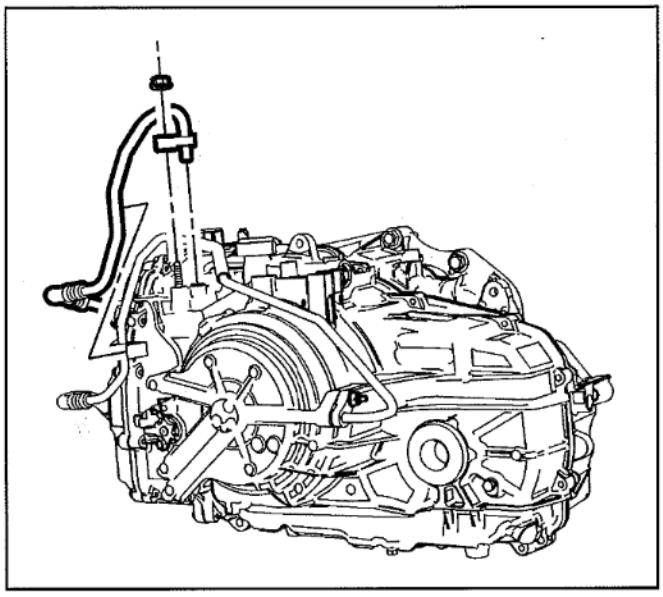
2027486

14. A hidden yellow identification band (1) indicates proper joint seating.
15. Fill the transmission to the proper level. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.

Fluid Cooler Inlet Hose Replacement

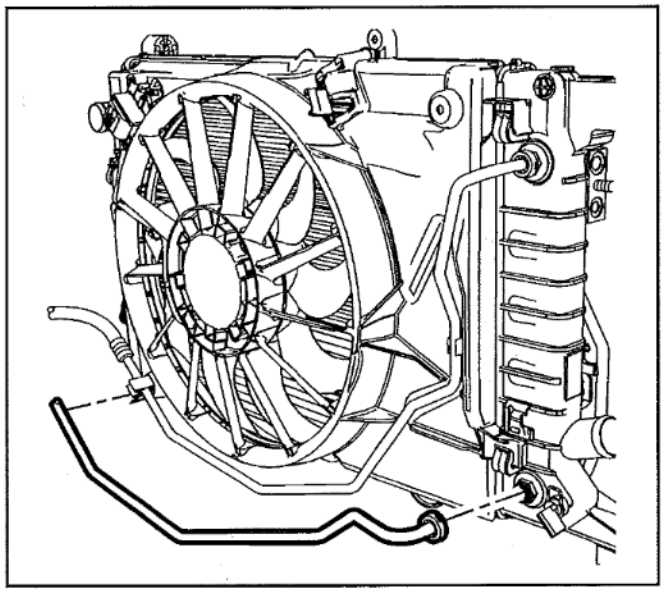
Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*
2. Remove the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*
3. Remove the front wheelhouse liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*



2508163

4. Remove the trans fluid cooler nut.
5. Remove and unclip the trans fluid cooler hose from the transmission.

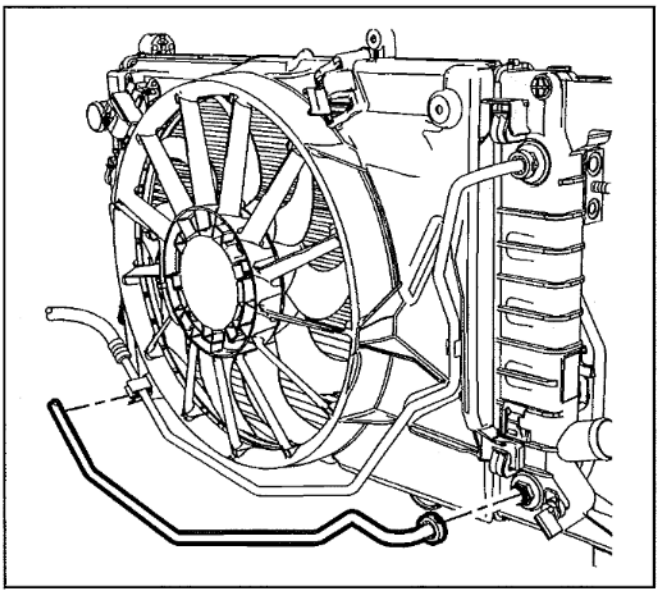


2508153

6. Remove the transmission fluid cooler hose from the radiator. Refer to *Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection on page 17-200*
7. Unclip the transmission fluid cooler hose from fan shroud and remove from vehicle.

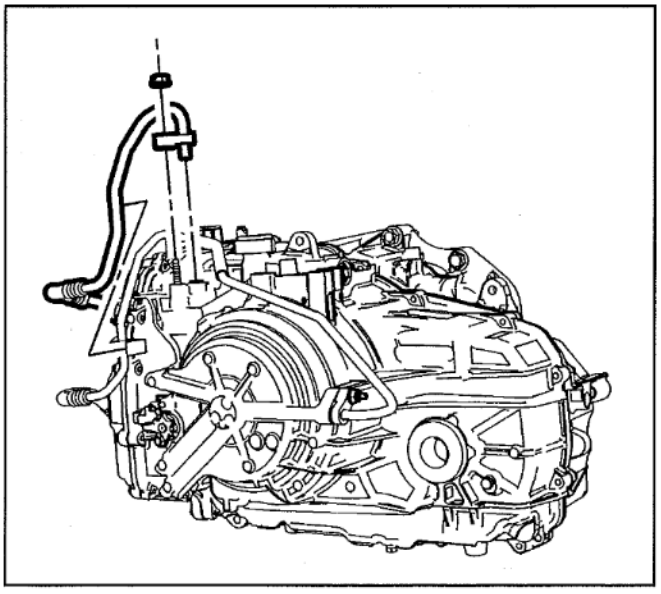
Installation Procedure

1. Inspect the seals for cracks, cuts or damage. Replace if necessary.



2508153

2. Install the transmission fluid cooler hose to the radiator. Refer to *Transmission Fluid Cooler Hose/ Pipe Quick-Connect Fitting Disconnection and Connection on page 17-200*
3. Clip the transmission fluid cooler hose to the fan shroud.



2508163

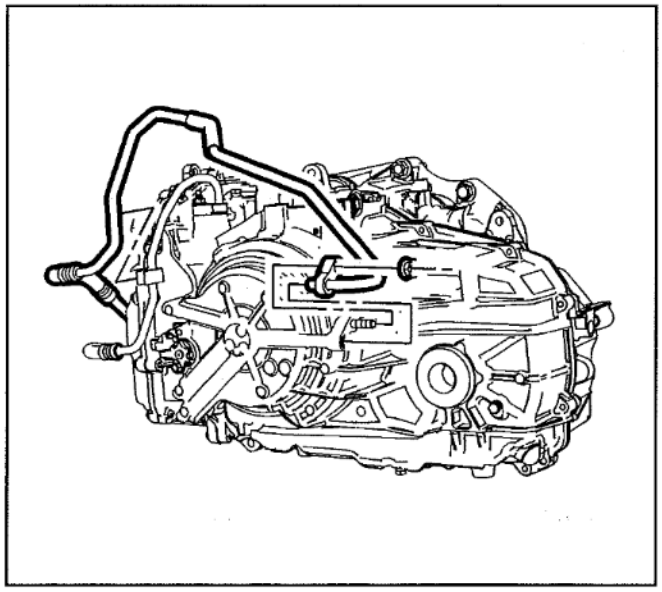
Caution: Refer to *Fastener Caution on page 0-8*

4. Install and clip the trans fluid cooler hose to the transmission.
5. Install the trans fluid cooler nut and tighten to **22 N•m (17 lb ft)**.
6. Install the front wheelhouse liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*
7. Install the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*
8. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*
9. Adjust the transmission fluid level.
10. Inspect for fluid leaks.

Fluid Cooler Outlet Hose Replacement

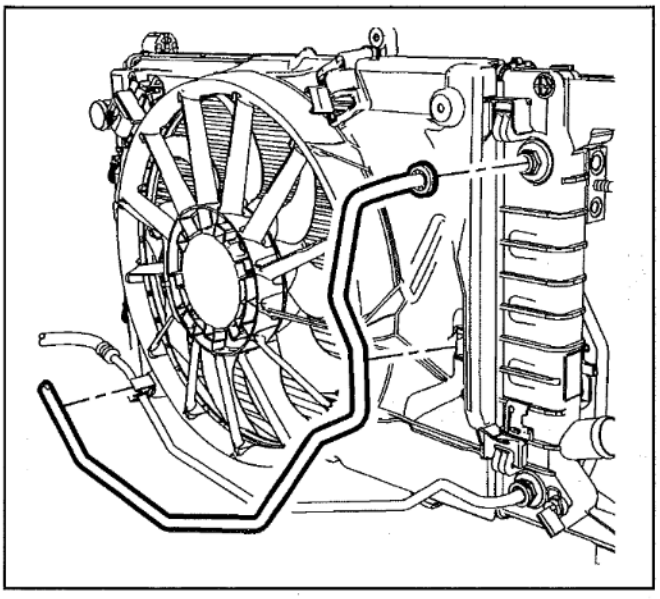
Removal Procedure

1. Remove the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*
2. Remove the front wheelhouse liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*



2508165

3. Remove the trans fluid cooler nut.
4. Remove and unclip the trans fluid cooler hose from the transmission.

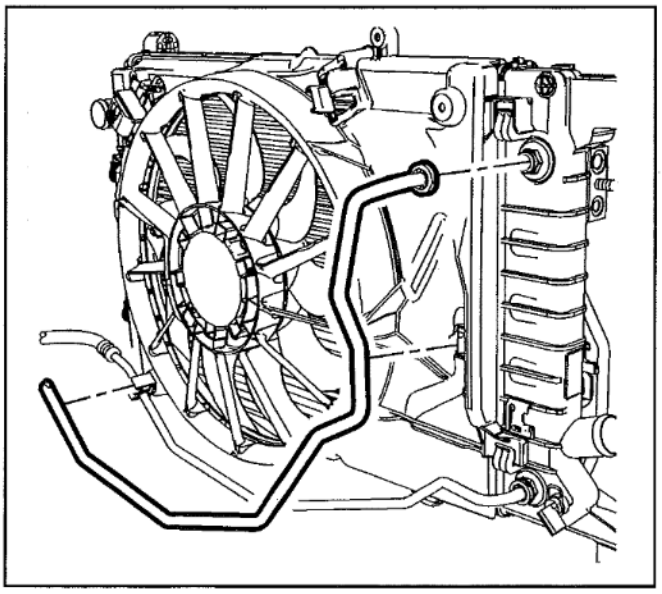


2508158

5. Remove the transmission fluid cooler hose from the radiator. Refer to *Transmission Fluid Cooler Hose/Pipe Quick-Connect Fitting Disconnection and Connection on page 17-200*
6. Unclip the transmission fluid cooler hose from fan shroud and remove from vehicle.

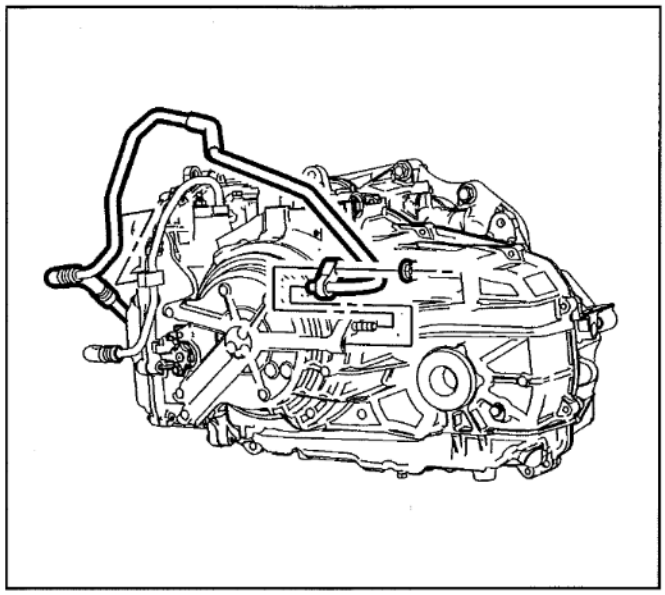
Installation Procedure

1. Inspect the seals for cracks, cuts or damage. Replace if necessary.



2508158

2. Install the transmission fluid cooler hose to the radiator. Refer to *Transmission Fluid Cooler Hose/ Pipe Quick-Connect Fitting Disconnection and Connection on page 17-200*
3. Clip the transmission fluid cooler hose to the fan shroud.

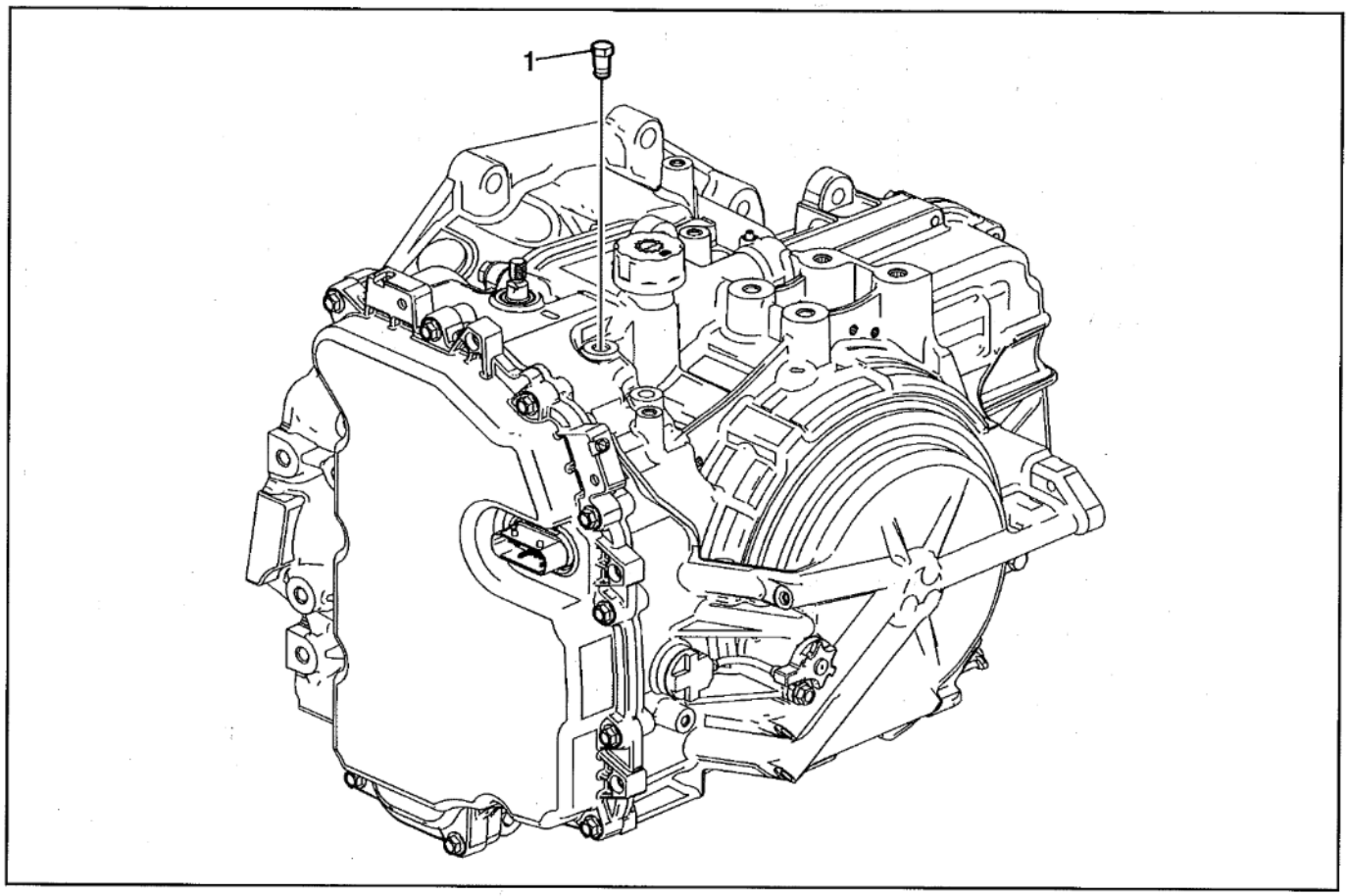


2508165

Caution: Refer to *Fastener Caution on page 0-8*

4. Install and clip the trans fluid cooler hose to the transmission.
5. Install the trans fluid cooler nut and tighten to **22** N•m **(17 lb ft)**.
6. Install the front wheelhouse liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left SIde) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right SIde, LWE, LUW) on page 3-149*
7. Install the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*
8. Adjust the transmission fluid level.
9. Inspect for fluid leaks.

Automatic Transmission Fluid Pressure Test Hole Plug Replacement

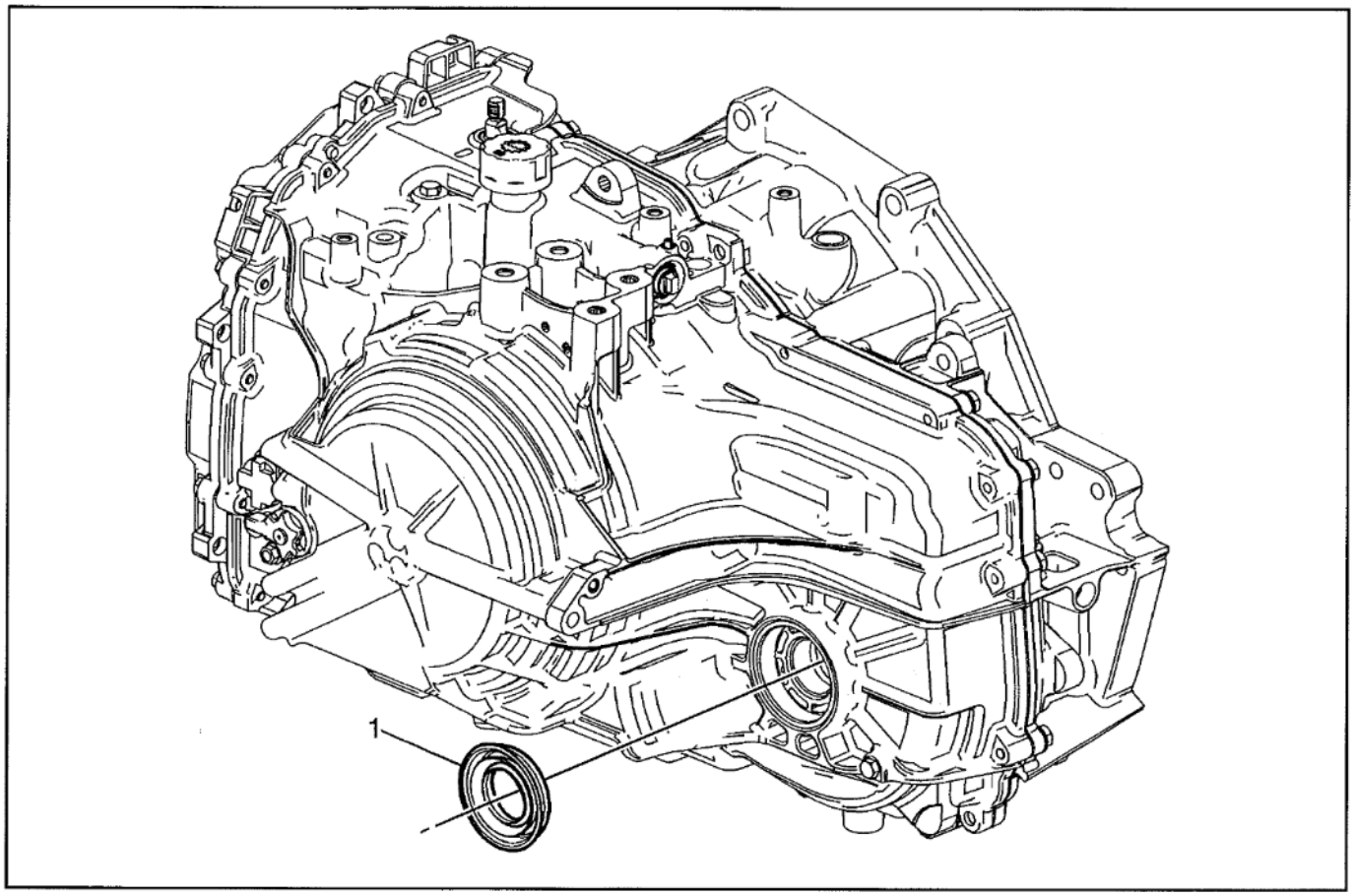


1998837

Automatic Transmission Fluid Pressure Test Hole Plug Replacement

Callout	Component Name
1	Fluid Pressure Test Plug **Caution:** Refer to *Component Fastener Tightening Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)

Front Wheel Drive Shaft Seal Replacement - Left Side

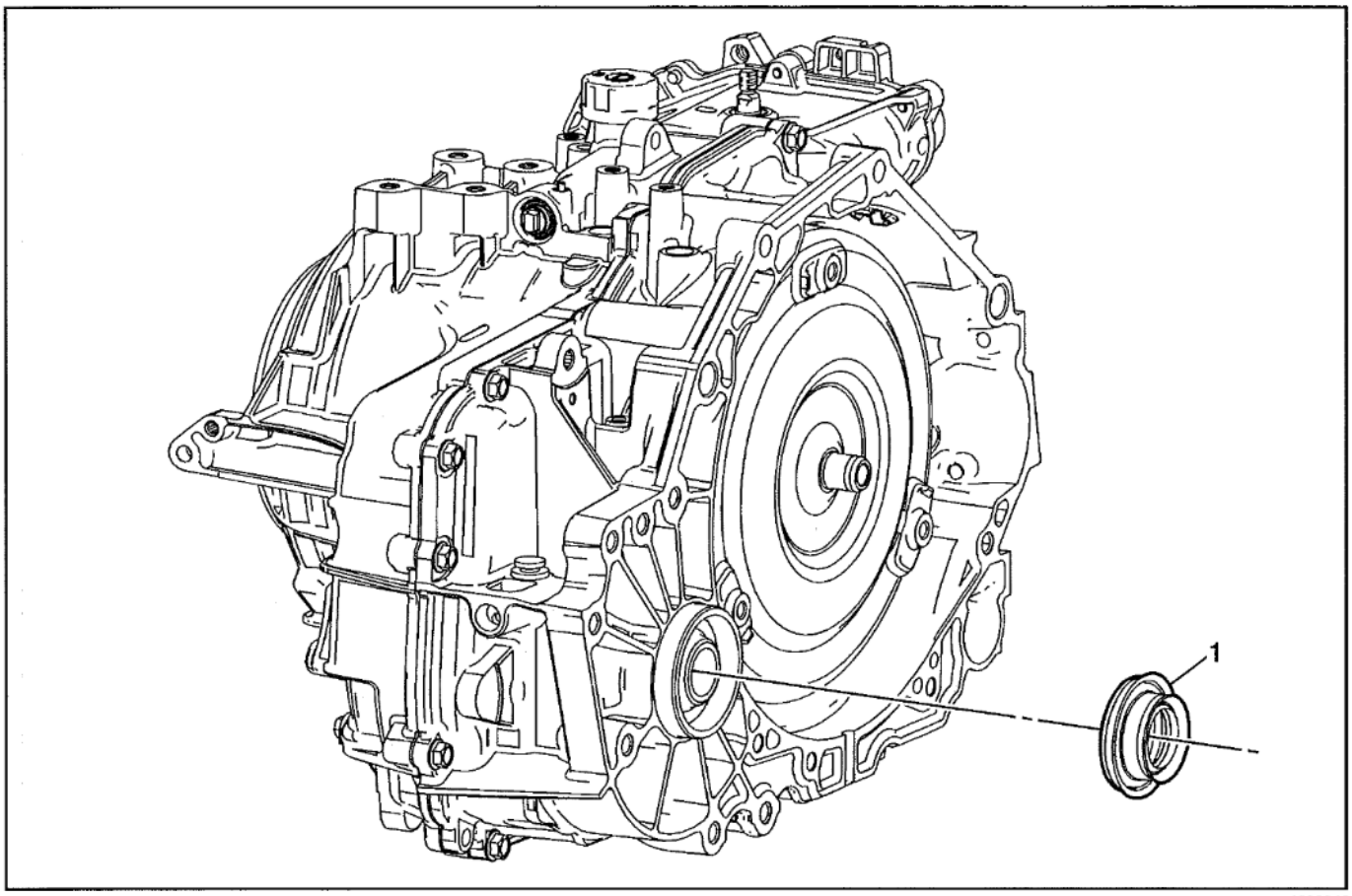


1998842

Front Wheel Drive Shaft Seal Replacement - Left Side

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*. 2. Remove the left wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.	
1	Left Front Wheel Drive Shaft Oil Seal **Procedure** 1. For seal removal use *GE-6125-1B* slide hammer with *DT-23129* universal seal remover. 2. For seal installation use *GE-8092* driver handle with *DT-47790* seal installer. **Special Tools** • *DT-23129* Universal Seal Remover • *DT-47790* Seal Installer • *GE-6125–1B* Slide Hammer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 17-394*.

Front Wheel Drive Shaft Seal Replacement - Right Side



1998843

Front Wheel Drive Shaft Seal Replacement - Right Side

Callout	Component Name
Preliminary Procedures 1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*. 2. Remove the right wheel drive shaft. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.	
1	Right Front Wheel Drive Shaft Oil Seal **Procedure** 1. For seal removal use *GE-6125-1B* slide hammer with *DT-23129* universal seal remover. 2. For seal installation use *GE-8092* driver handle with *DT-47790* seal installer. **Special Tools** • *DT-23129* Universal Seal Remover • *DT-47790* Seal Installer • *GE-6125-1B* Slide Hammer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 17-394*.

Manual Shift Shaft and Seal Replacement

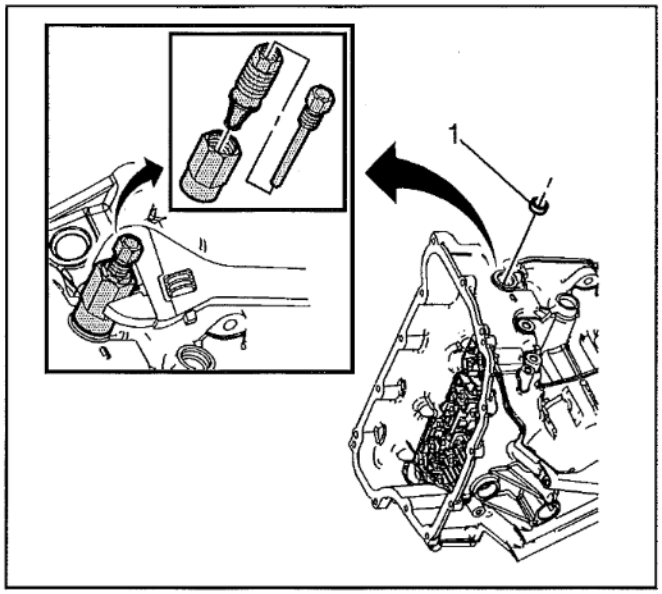
Special Tools

- *DT-45201* Cooler Line Seal Remover
- *DT-49101* Seal Installer

For equivalent regional tools, refer to *Special Tools on page 17-394*.

Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Remove the manual shaft and position switch assembly. Refer to *Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement on page 17-191*.

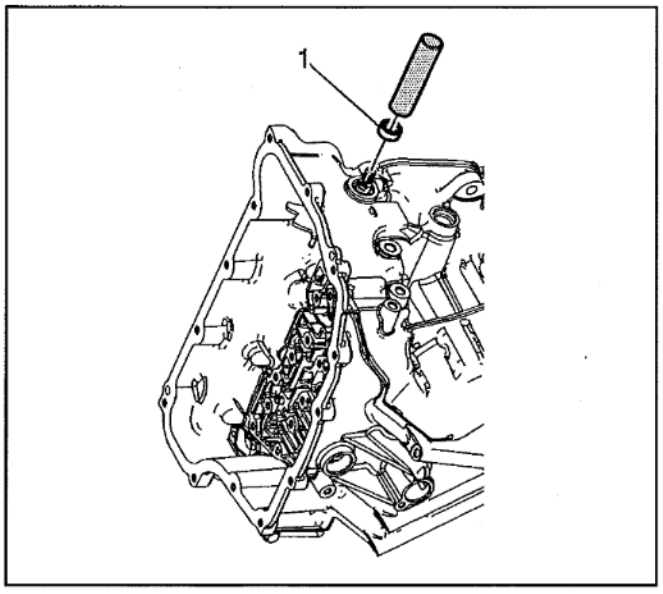


2079285

3. Remove the manual shaft seal (1) using *DT-45201* remover.

Installation Procedure

1. Install the manual shaft and position switch assembly. Refer to *Manual Shift Detent Lever with Shaft Position Switch Assembly Replacement on page 17-191*.



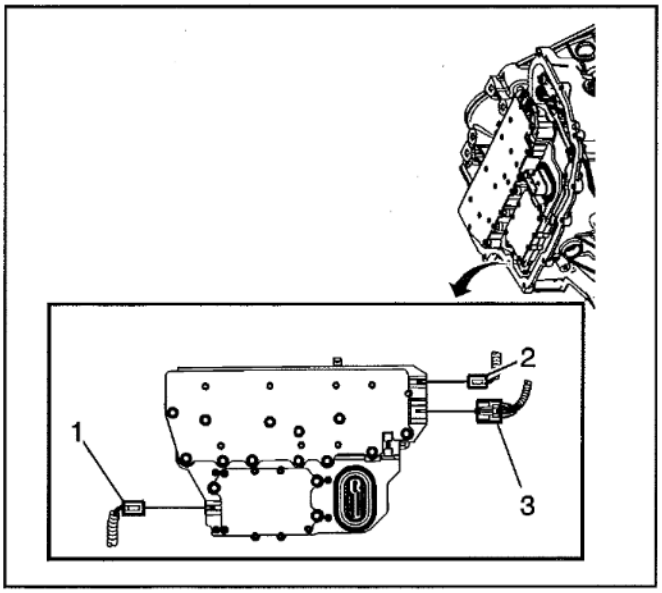
2079287

2. Install the manual shaft seal (1) using *DT-49101* seal installer.
3. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.

Control Solenoid Valve and Transmission Control Module Assembly Replacement

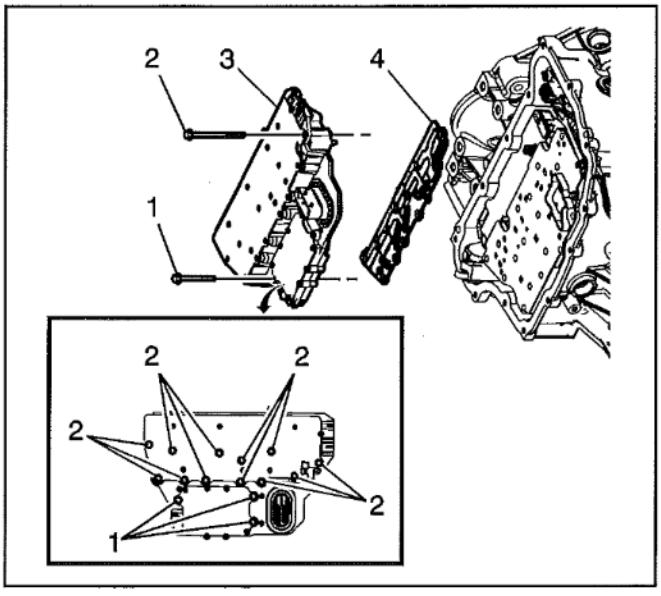
Removal Procedure

1. Remove the transmission control valve body cover. Refer to *Control Valve Body Cover Replacement on page 17-210*.



1998829

2. Disconnect the output speed sensor electrical connector (2).
3. Disconnect the shift position switch electrical connector (3).
4. Disconnect the input speed sensor electrical connector (1).



1998830

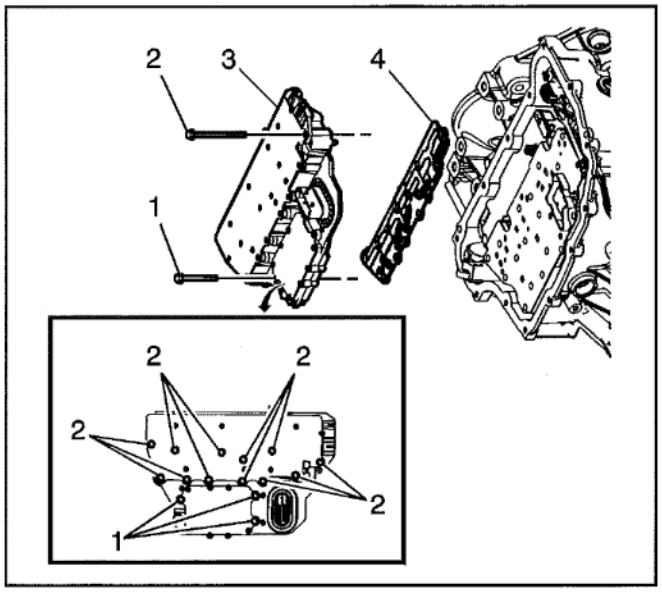
5. Remove the 3 control solenoid valve assembly bolts (1) M5 x 40.5.

6. Remove the 12 control solenoid valve assembly bolts (2) M6 x 97.
7. Remove the control solenoid valve assembly with transmission control module (3).

Caution: Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.

8. Remove the control solenoid valve assembly filter plate (4). Discard the filter plate. It is not reusable.
9. Inspect the pressure switch seals for damage or contamination. Replace the control solenoid valve assembly as necessary.
10. Inspect the channel plate bolt pass through holes for damage or burnelling. Any damage could cause leaking. Replace as necessary.

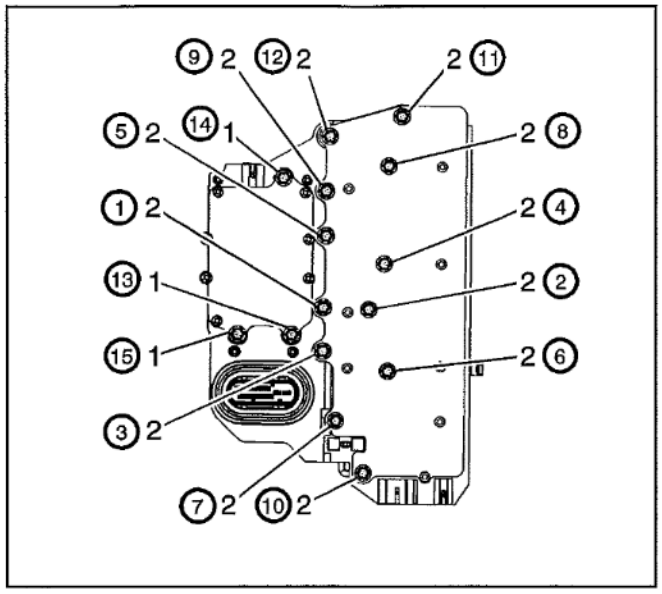
Installation Procedure



1998830

Caution: Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination.

1. Install a NEW control solenoid valve assembly filter plate (4) to prevent fluid leaks past the fluid seals.
2. Install the control solenoid valve assembly with transmission control module (3).
3. Hand start the control valve body bolts (1, 2).



2000158

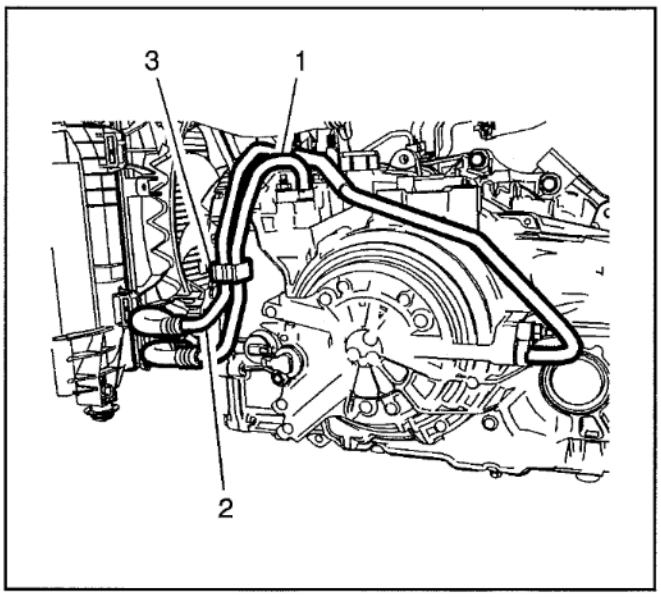
Caution: Refer to *Fastener Caution on page 0-8*.

4. Secure the 12 control solenoid valve assembly bolts (2) M6 x 97 and tighten in sequence to **12** N•m **(106 lb in)**.
5. Secure the 3 control valve body bolts (1) M5 x 40.5 and tighten in sequence to **7** N•m **(62 lb in)**.
6. Connect the input speed sensor electrical connector (1).
7. Connect the output speed sensor electrical connector (2).
8. Install the transmission control valve body cover. Refer to *Control Valve Body Cover Replacement on page 17-210*.
9. After repairs, refer to *Control Module References on page 6-3* for programming and set up procedures.
10. Perform the transmission adaptive values learn. Refer to *Transmission Adaptive Values Learn on page 17-163*.

Control Valve Body Cover Replacement

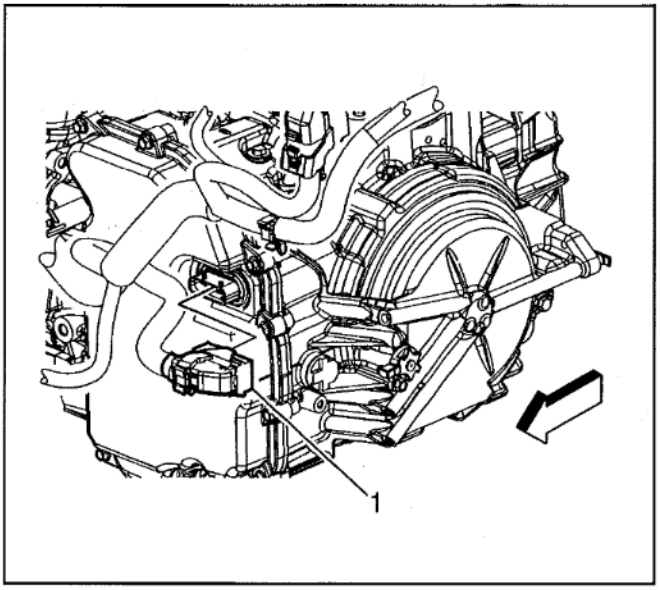
Removal Procedure

1. Disconnect the battery negative cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-713*.
2. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
3. Remove the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*.
4. Remove the front wheel house liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*.
5. Drain the transmission fluid.



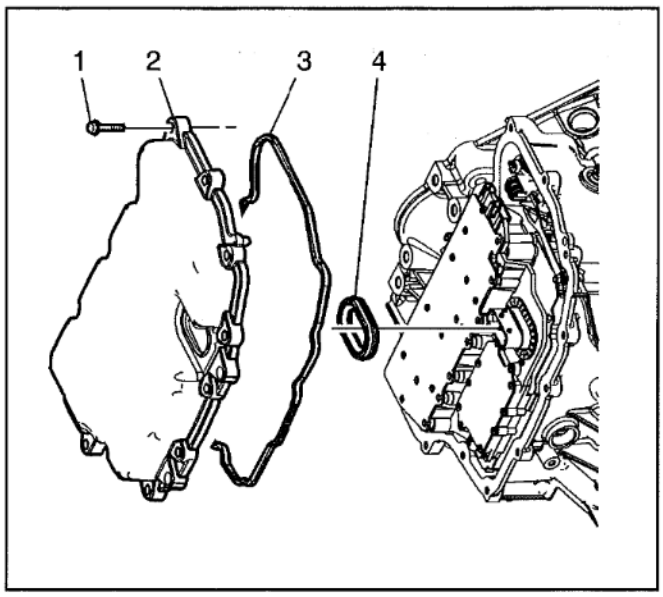
2536225

6. Remove oil cooler inlet (1) and outlet (2) hoses from the retainer (3) on the control valve body cover.



1999448

7. Disconnect the control valve body transmission control module electrical connector (1), then unclip the wiring harness from the cover.



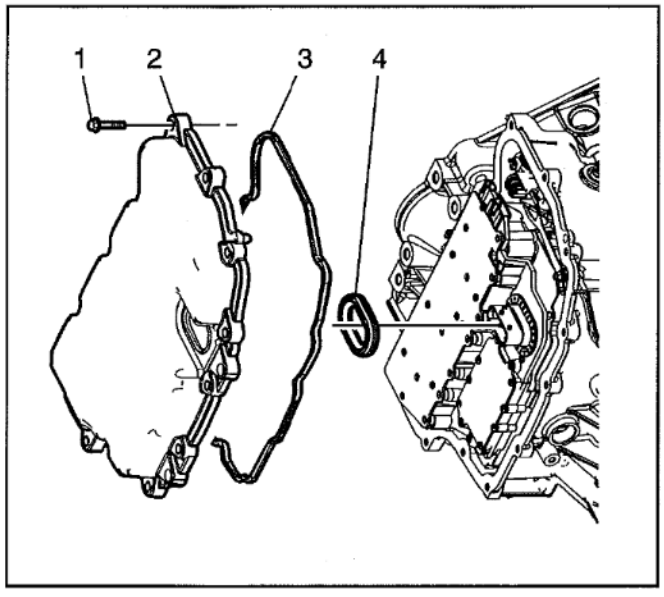
1999445

8. Remove the control valve body cover bolts (1).
9. Remove the control valve body cover (2).
10. Remove the control valve body cover gasket (3).

Caution: Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections.

11. Remove the control valve body cover wiring connector hole seal (4).
12. Remove all traces of the old gasket material. Clean the transmission case and control valve body cover gasket surfaces.

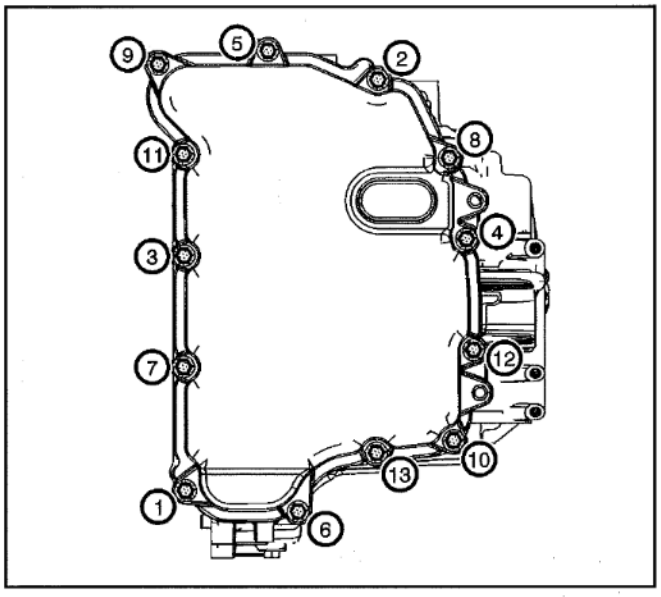
Installation Procedure



1999445

1. Install the control valve body cover wiring connector hole seal (4).
2. Install the control valve body cover gasket (3) to the control valve body cover.

3. Install the control valve body cover (2).
4. Hand start the control valve body cover bolts (1).

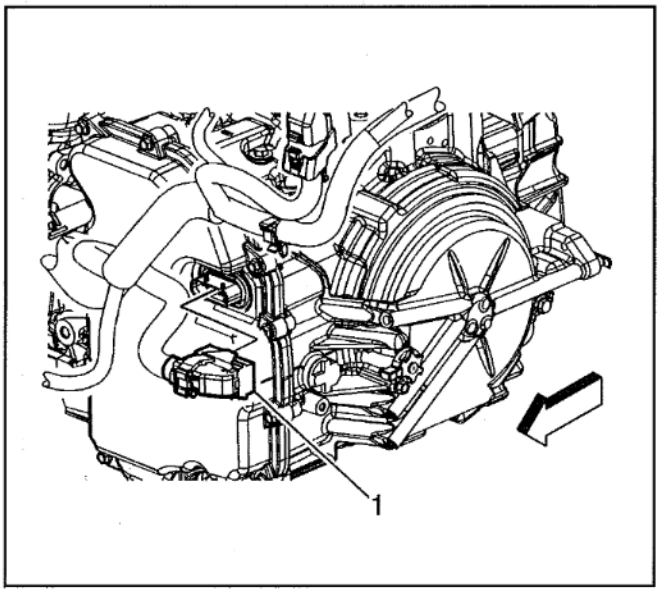


1999447

Caution: Refer to *Fastener Caution on page 0-8*.

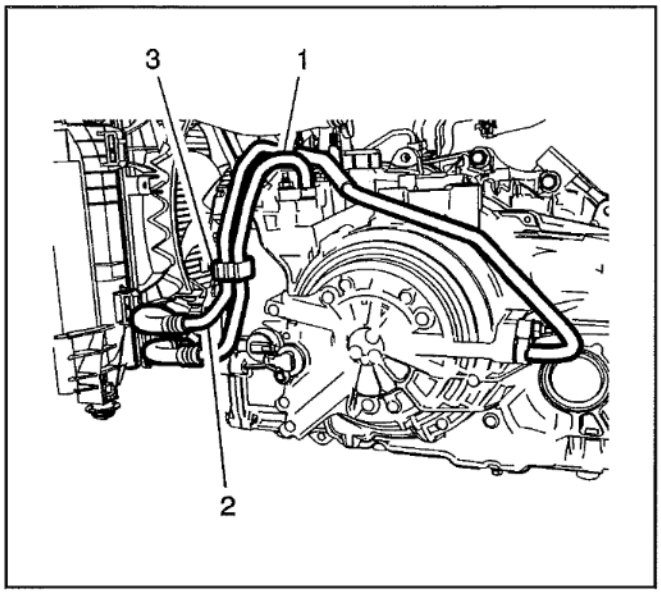
Note: Install all control valve body cover bolts and studs by hand then torque all bolts and studs in sequence.

5. Install the control valve body cover bolts. Tighten the bolts in sequence to **12 N•m (106 lb in)**.



1999448

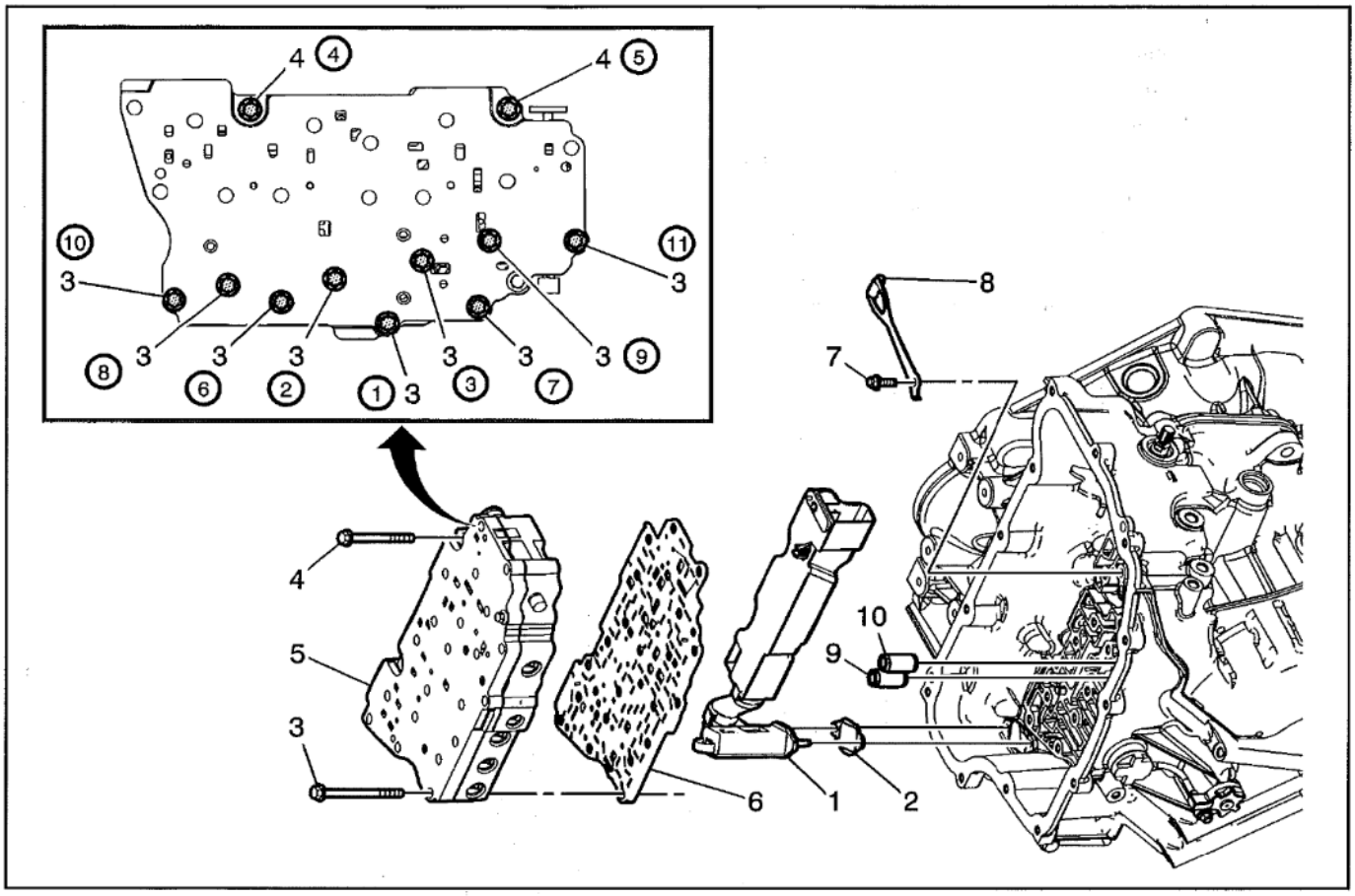
6. Connect the control valve body transmission control module electrical connector (1), then clip the wiring harness to the cover.
7. Raise the vehicle.



2536225

8. Install the oil cooler inlet (1) and outlet (2) hoses to the retainer (3) on the control valve body cover.
9. Install the front wheel house liner inner front extension. Refer to *Front Wheelhouse Liner Inner Front Extension Replacement (Left Side) on page 3-147* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LUV) on page 3-148* or *Front Wheelhouse Liner Inner Front Extension Replacement (Right Side, LWE, LUW) on page 3-149*.
10. Install the front bumper fascia opening lower cover. Refer to *Front Bumper Fascia Opening Lower Cover Replacement on page 3-58*.
11. Fill the transmission with correct fluid.
12. Check transmission fluid level. Refer to *Transmission Fluid Level and Condition Check on page 17-164*.
13. Lower the vehicle.
14. Connect the battery negative cable. Refer to *Battery Negative Cable Disconnection and Connection on page 9-713*.
15. Check for leaks.

Control Valve Body Replacement



1998831

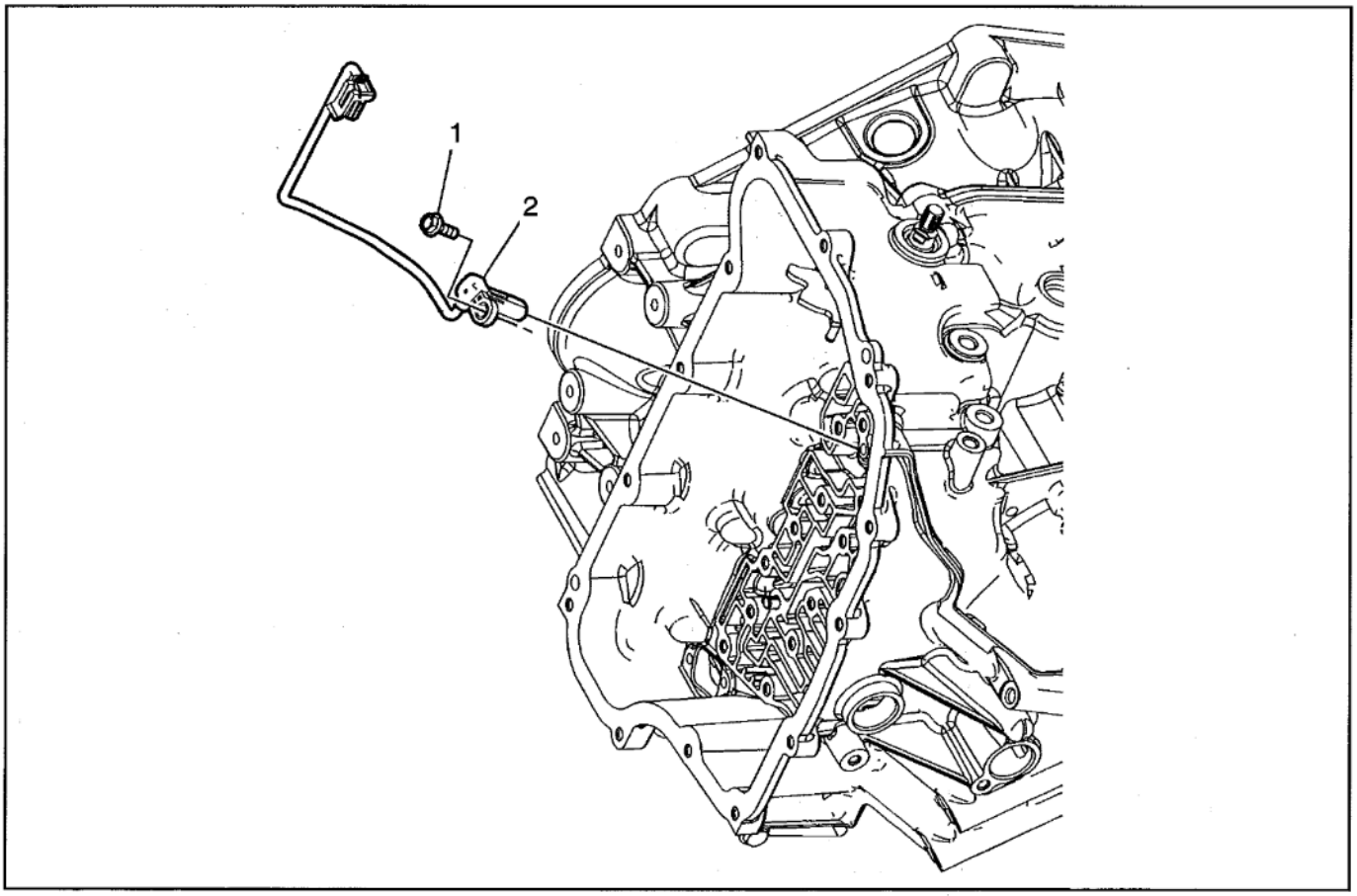
Control Valve Body Replacement

Callout	Component Name
Preliminary Procedure Remove the control solenoid valve and transmission control module assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.	
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket **Procedure** DISCARD the Gasket. Use a NEW gasket ONLY.
3	Control Valve Body Bolt M6 x 60 (Qty: 9) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tip:** Tighten in specified sequence. **Tighten** 11 N•m (97 lb in)
4	Control Valve Body Bolt M6 x 53 (Qty: 2) **Tip:** Tighten in specified sequence. **Tighten** 11 N•m (97 lb in)
5	Control Valve Body Assembly **Procedure** 1. After repairs, refer to *Control Module References on page 6-3* for programming and set up procedures. 2. Perform the transmission adaptive values learn. Refer to *Transmission Adaptive Values Learn on page 17-163*.
6	Control Valve Body Spacer Plate Assembly

Control Valve Body Replacement (cont'd)

Callout	Component Name
7	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) **Tighten** 12 N•m (106 lb in)
8	Manual Shaft Detent Lever Spring Assembly
9	1-2-3-4 Clutch Fluid Passage Seal **Tip:** Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal **Tip:** Discard the seal. It is not reusable.

Output Speed Sensor Replacement



1998840

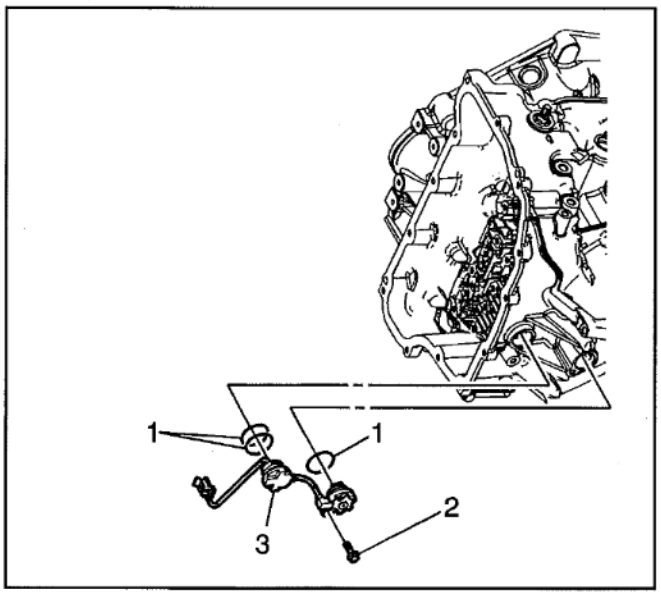
Output Speed Sensor Replacement

Callout	Component Name
Preliminary Procedure Remove the control valve body. Refer to *Control Valve Body Replacement on page 17-213*.	
1	Output Speed Sensor Bolt M6 x 18 **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)
2	Output Speed Sensor **Procedure** Perform the transmission adaptive values learn procedure. Refer to *Transmission Adaptive Values Learn on page 17-163*.

Input Speed Sensor Replacement

Removal Procedure

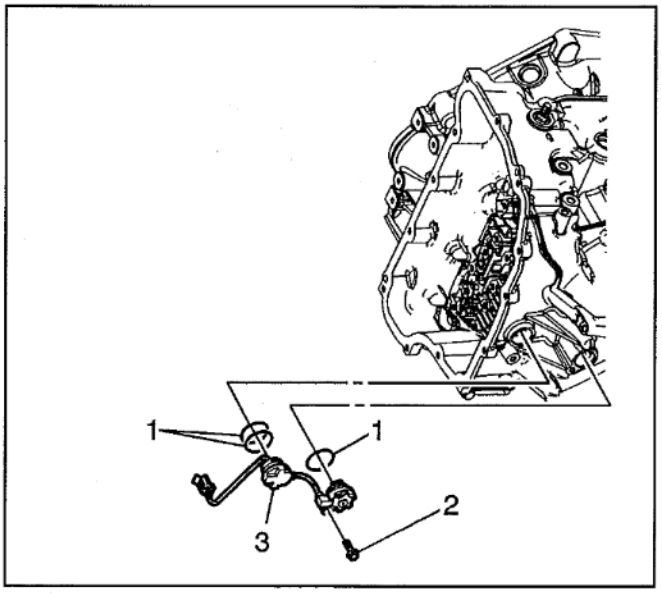
1. Remove the control solenoid valve and transmission control module assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.



1998841

2. Remove the input speed sensor bolt (2) M6 x 23.
3. Unlock the 2 retaining tabs inside the transmission housing.
4. Remove the input speed sensor (3).
5. Remove the 3 input speed sensor seals (1).

Installation Procedure



1998841

1. Install the 3 input speed sensor seals (1).
2. Install the input speed sensor (3).
3. Verify that the retaining tabs are locked completely.

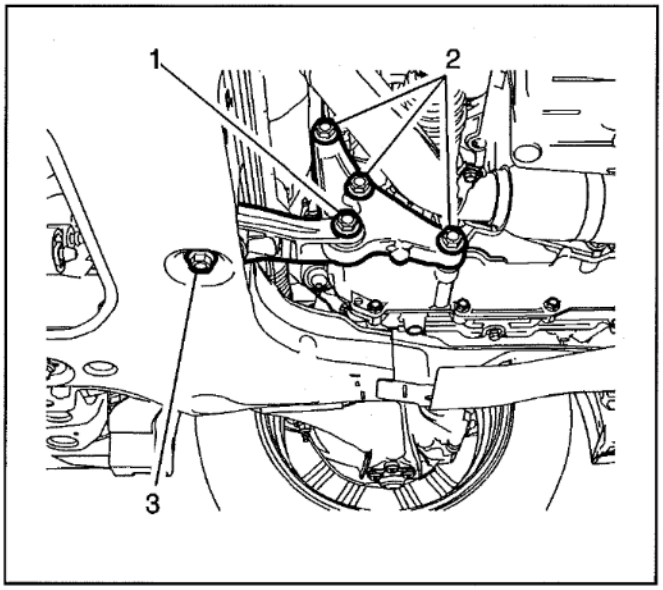
Caution: Refer to *Fastener Caution on page 0-8*.

4. Install the input speed sensor bolt (2) M6 x 23 and tighten to **9 N•m (80 lb in)**.
5. Install the control solenoid valve and transmission control module assembly. Refer to *Control Solenoid Valve and Transmission Control Module Assembly Replacement on page 17-209*.
6. Perform the transmission adaptive values learn procedure. Refer to *Transmission Adaptive Values Learn on page 17-163*.

Transmission Mount Bracket Replacement - Rear

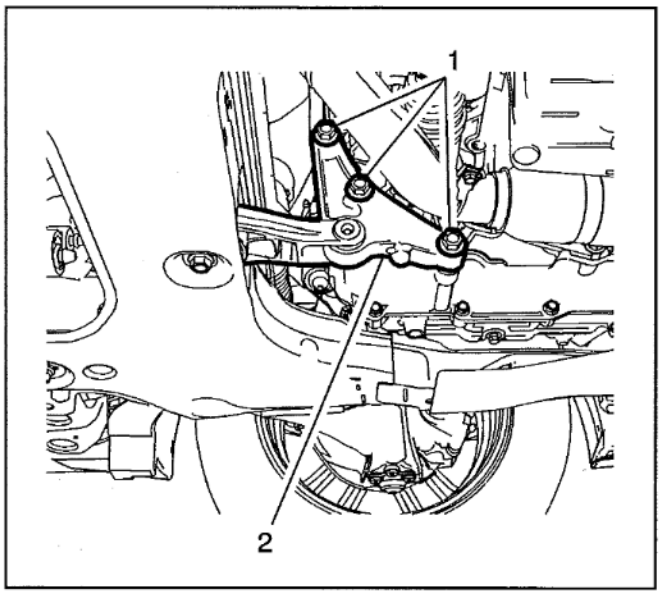
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.
2. Using a suitable jack stand, support the rear of the transmission.



2492702

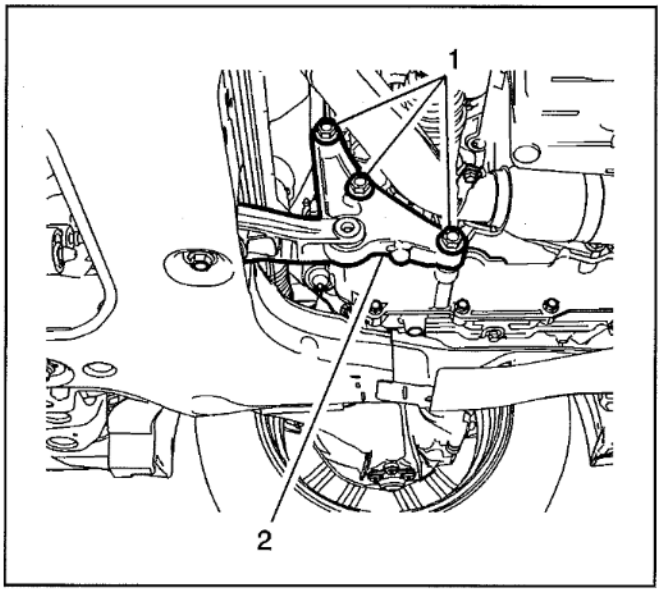
3. Remove and DISCARD the rear transmission mount bracket to rear mount through bolt (1).



2507626

4. Remove and DISCARD the 3 rear transmission mount bracket to transmission bolts (1).
5. Remove the rear transmission mount bracket (2).

Installation Procedure

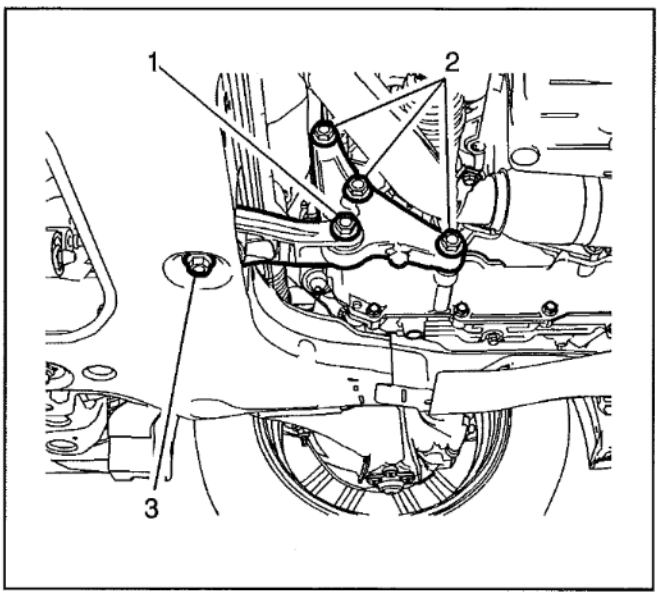


2507626

1. Install the rear transmission mount bracket (2).

Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the 3 NEW rear transmission mount bracket to transmission bolts (1) and tighten to **100 N•m (74 lb ft) plus 30–45 degrees**.



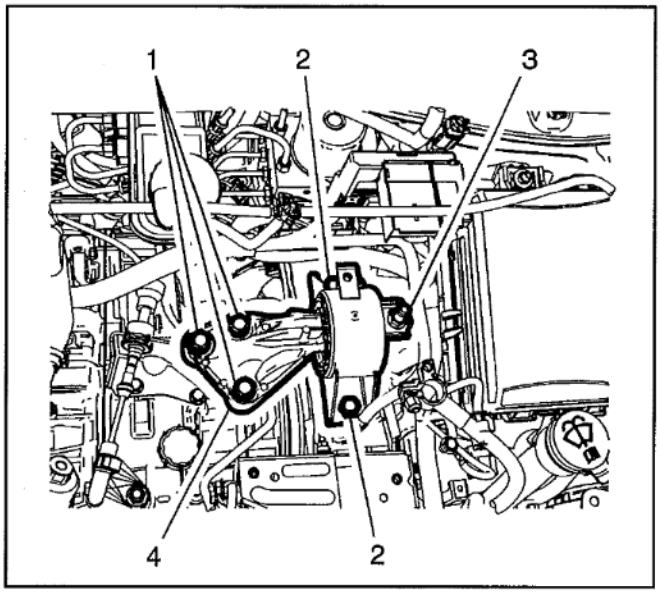
2492702

3. Install the NEW rear transmission mount bracket to rear mount through bolt (1) and tighten to **80 N•m (59 lb ft) plus 45–60 degrees**.
4. Remove the jack stand.
5. Lower the vehicle.

Transmission Mount Replacement - Left Side

Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Install the engine support fixture. Refer to *Engine Support Fixture on page 9-1060*.

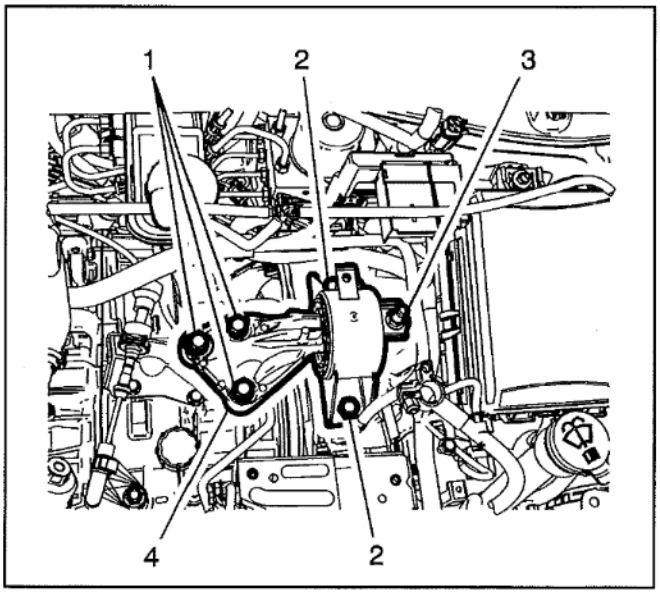


2492638

3. Remove and DISCARD the left transmission mount to bracket bolts (1).
4. Remove the left transmission mount to body bolts (2).

5. Remove the left transmission mount to body nut (3).
6. Remove the transmission mount (4) from the vehicle.

Installation Procedure



2492638

1. Install the left transmission mount (4) to the vehicle.

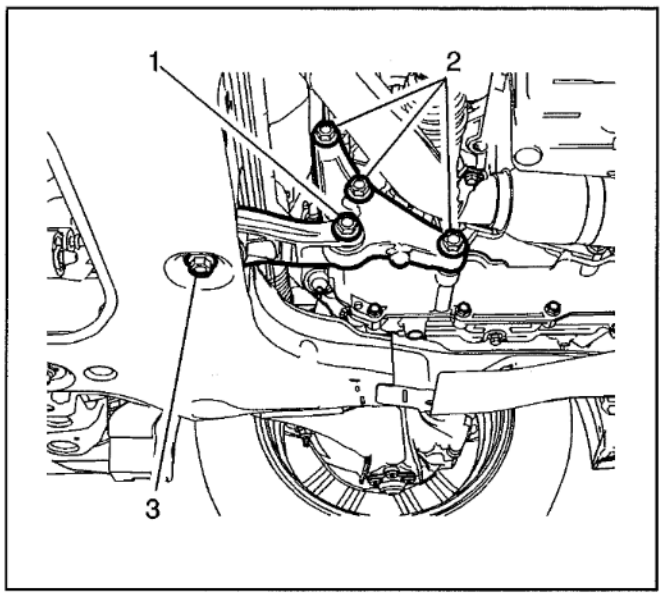
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the transmission mount to body bolts (2) and tighten to **58 N•m (43 lb ft)**.
3. Install the transmission mount to body nut (3) and tighten to **58 N•m (43 lb ft)**.
4. Install the NEW left transmission mount to transmission bolts (1) and tighten to **50 N•m (37 lb ft) plus 60–75 degrees**.
5. Remove the engine support fixture. Refer to *Engine Support Fixture on page 9-1060*.
6. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.

Transmission Rear Mount Replacement

Removal Procedure

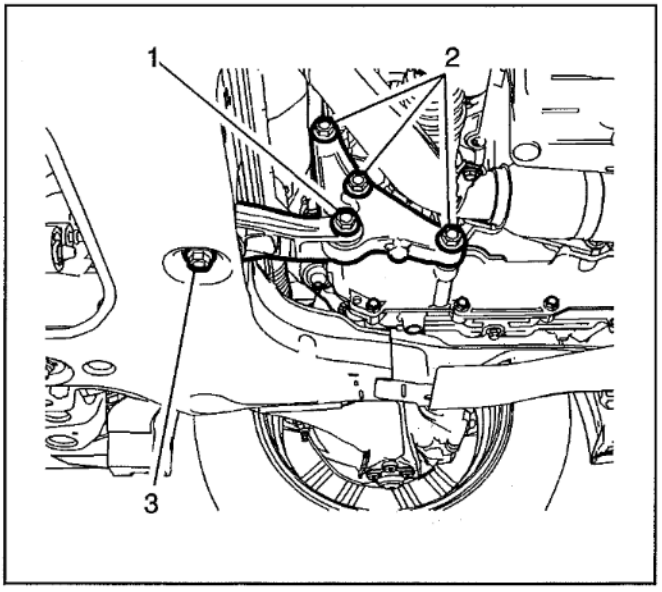
1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle on page 1-31*.



2492702

2. Remove and DISCARD the rear transmission mount bracket to rear mount through bolt (1).
3. Remove rear transmission mount to frame bolt (3).
4. Push and hold the powertrain assembly forward and then remove rear transmission mount.

Installation Procedure



2492702

1. Push and hold the powertrain assembly forward and then install rear transmission mount.

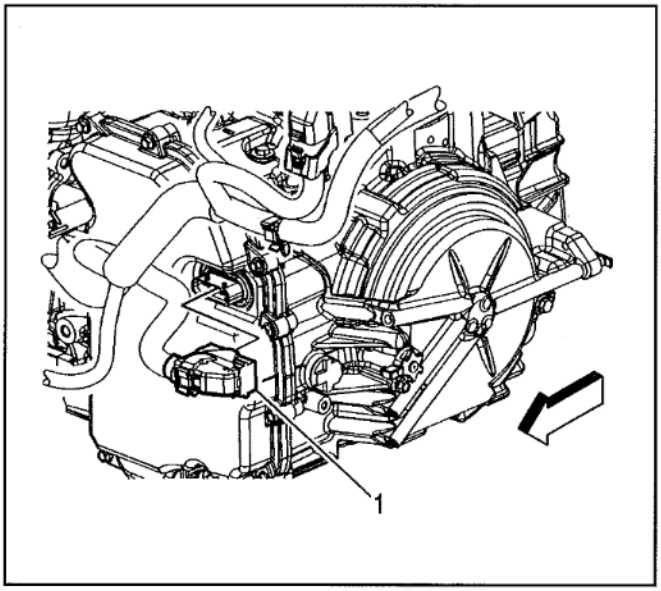
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install rear transmission mount to frame bolt (3) and tighten to **100 N•m (74 lb ft)**.
3. Install the NEW rear transmission mount bracket to rear mount through bolt (1) and tighten to **80 N•m (59 lb ft) plus 45–60 degrees**.
4. Lower the vehicle.

Transmission Replacement (With 1.2L or 1.4L Engine)

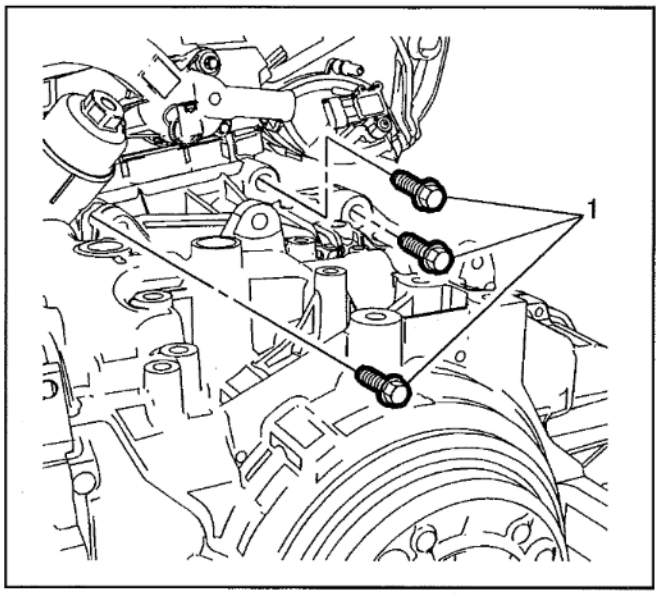
Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Without draining the coolant or removing the hoses, remove and position aside the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630*.
3. Remove the transmission range selector lever cable. Refer to *Range Selector Lever Cable Replacement on page 17-195*.



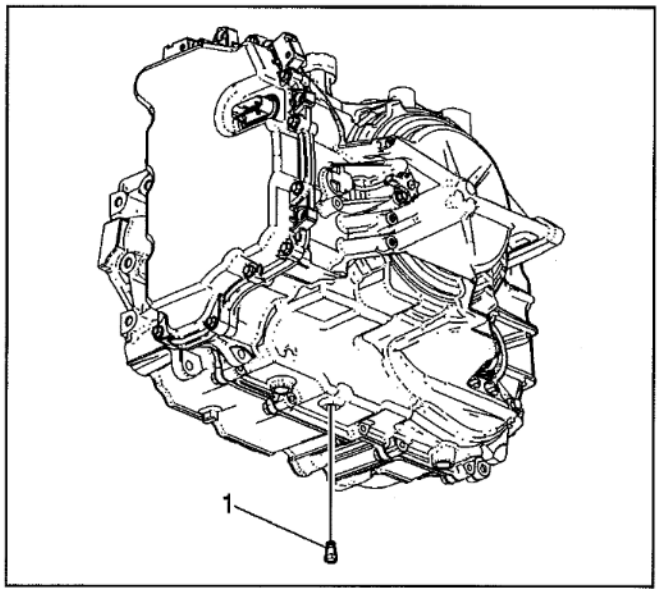
1999448

4. Disconnect the control valve body transmission control module electrical connector (1) then unclip the connector from the transmission.
5. Remove the transmission fluid cooler inlet hose from the transmission. Refer to *Fluid Cooler Inlet Hose Replacement on page 17-203*.
6. Remove the transmission fluid cooler outlet hose from the transmission. Refer to *Fluid Cooler Outlet Hose Replacement on page 17-204*.
7. Plug and/or cap the pipes and transmission to prevent contamination.



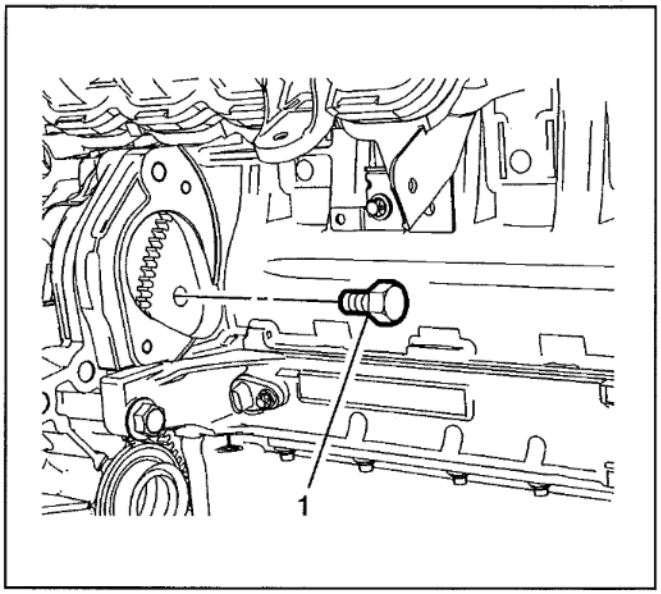
2571900

8. Remove the upper transmission to engine bolts (1).
9. Install the support fixture. Refer to *Engine Support Fixture on page 9-854*.



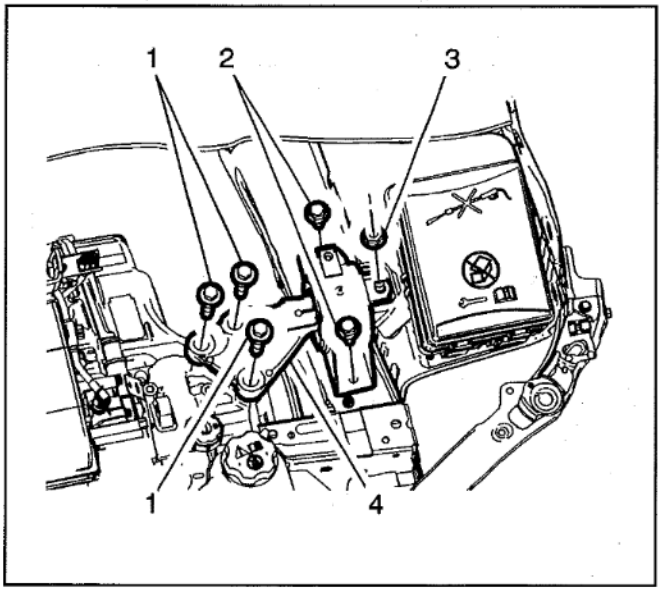
1998836

10. Drain the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 17-198*.
11. Remove the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.
12. Remove the front wheel drive shafts from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
13. Remove the starter motor. Refer to *Starter Replacement (LUW) on page 9-722* or *Starter Replacement (LUV) on page 9-724*.



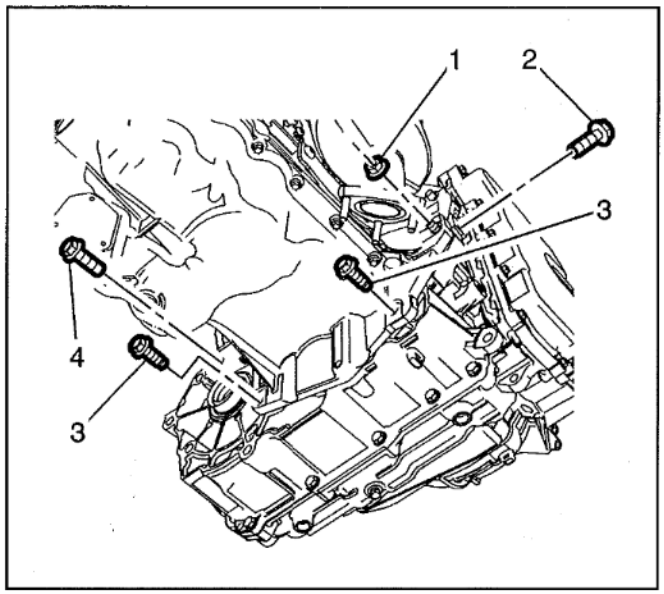
2571901

14. Mark the relationship of the flywheel to the torque converter for reassembly.
15. Remove the torque converter to flywheel bolts (1).
16. Remove the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.
17. Remove the rear transmission mount bracket from the transmission. Refer to *Transmission Mount Bracket Replacement - Rear on page 17-215*.



2534715

18. Remove the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-216*.
19. Use a transmission jack in order to support the transmission.



2571892

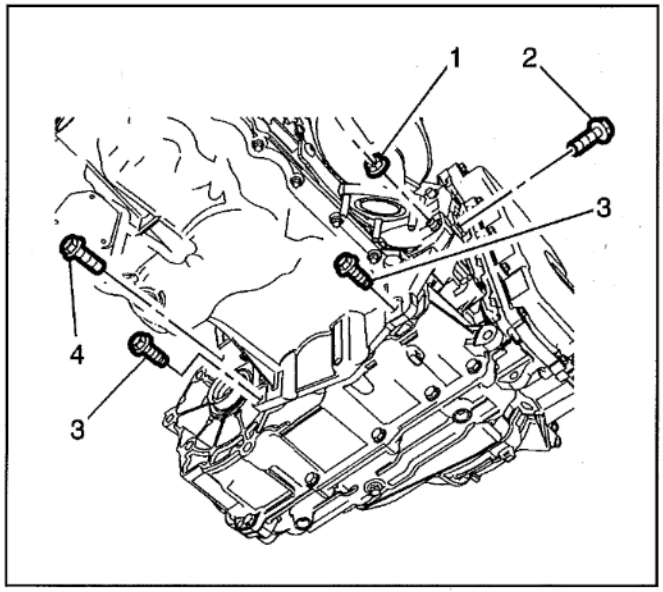
20. Remove the lower transmission nut (1) and the lower transmission bolts (2–4).

Note: Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

21. Separate the transmission from the engine.
22. Lower the transmission with the transmission jack far enough to remove the transmission.
23. Flush and flow test the transmission oil cooler and lines. Refer to *Transmission Fluid Cooler Flushing and Flow Test on page 17-175*.

Installation Procedure

1. Raise the transmission with the transmission jack and position the transmission to the engine.

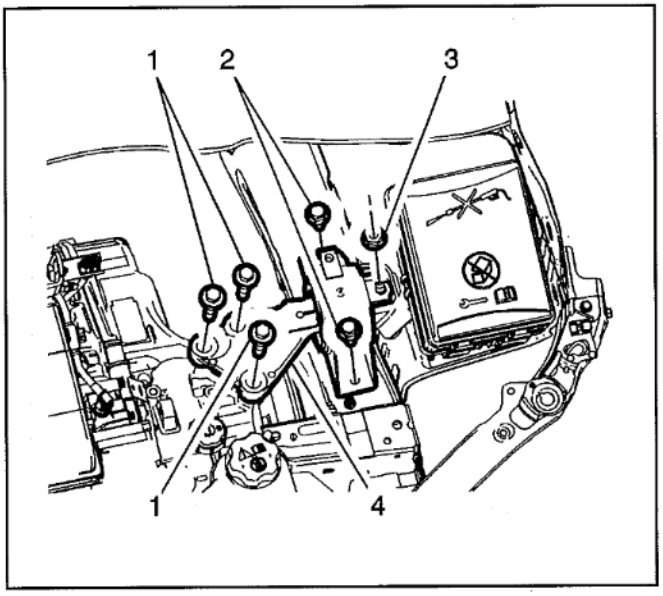


2571892

Caution: Refer to *Fastener Caution on page 0-8*.

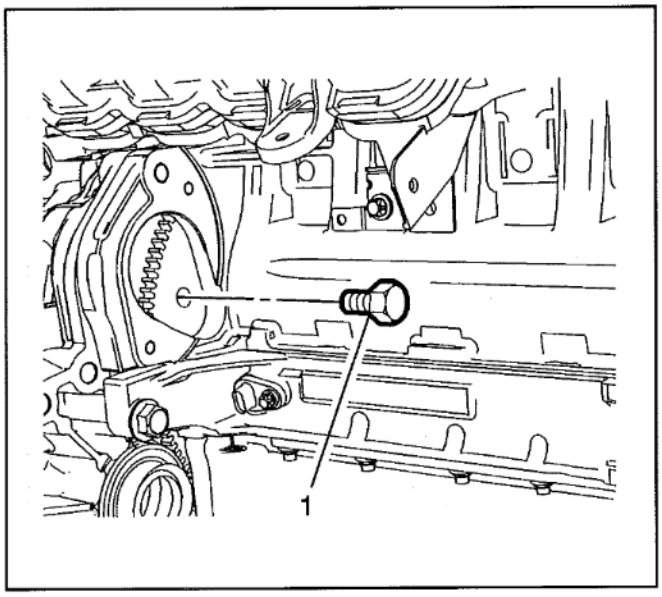
2. Install the lower transmission bolts (2, 4) and tighten to **60** N•m **(44 lb ft)**.

3. Install the lower transmission bolts (3) and the lower transmission nut (1) and tighten to **40** N•m **(30 lb ft)**.
4. Remove the transmission jack.



2534715

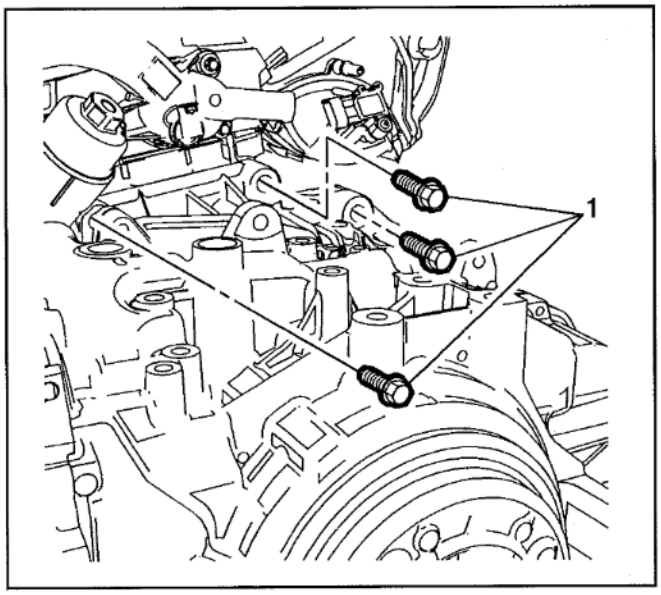
5. Install the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-216*.
6. Install the rear transmission mount bracket to the transmission. Refer to *Transmission Mount Bracket Replacement - Rear on page 17-215*.
7. Install the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.



2571901

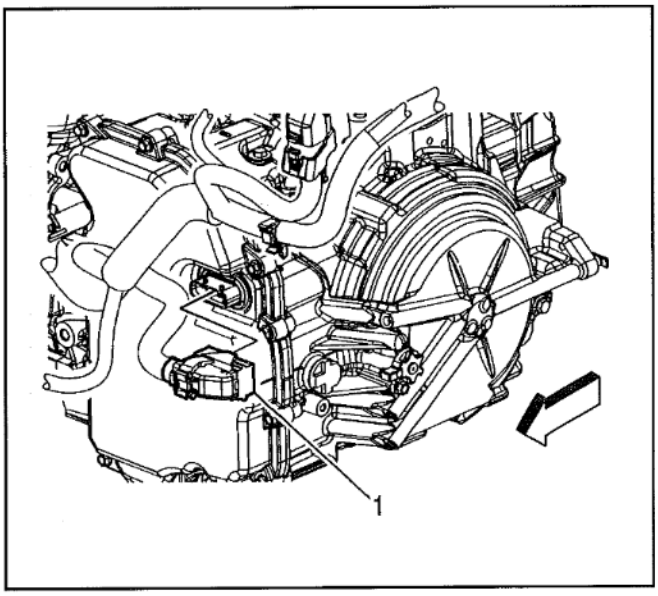
Note: If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation.

8. Install the torque converter to flywheel bolts (1) and tighten to **60** N•m **(44 lb ft)**.
9. Install the starter motor. Refer to *Starter Replacement (LUW) on page 9-722* or *Starter Replacement (LUV) on page 9-724*.
10. Install the front wheel drive shafts to the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
11. Install the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.



2571900

12. Remove the support fixture. Refer to *Engine Support Fixture on page 9-854*.
13. Install the upper transmission to engine bolts (1) and tighten to **60** N•m **(44 lb ft)**.



1999448

14. Connect the control valve body transmission control module electrical connector (1) then clip the connector to the transmission.

15. Install the transmission fluid cooler outlet hose to the transmission. Refer to *Fluid Cooler Outlet Hose Replacement on page 17-204*.
16. Install the transmission fluid cooler inlet hose to the transmission. Refer to *Fluid Cooler Inlet Hose Replacement on page 17-203*.
17. Install the transmission range selector lever cable. Refer to *Range Selector Lever Cable Replacement on page 17-195*.
18. Adjust the automatic transmission range selector lever cable. Refer to *Range Selector Lever Cable Adjustment on page 17-196*.
19. Install the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630*.
20. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
21. Fill the transmission with fluid. Refer to *Transmission Fluid Drain and Fill on page 17-198*.
22. If a NEW transmission control module (TCM) has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to *Service Programming System (SPS) on page 6-13*.

Note: The transmission adaptive values learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

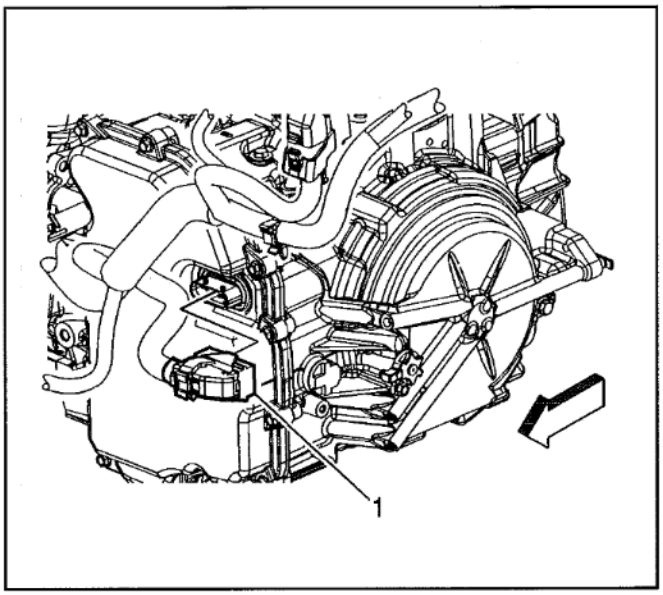
- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

23. Perform the transmission adaptive values learn. Refer to *Transmission Adaptive Values Learn on page 17-163*.
24. Road test the vehicle.

Transmission Replacement (With 1.6L or 1.8L Engine)

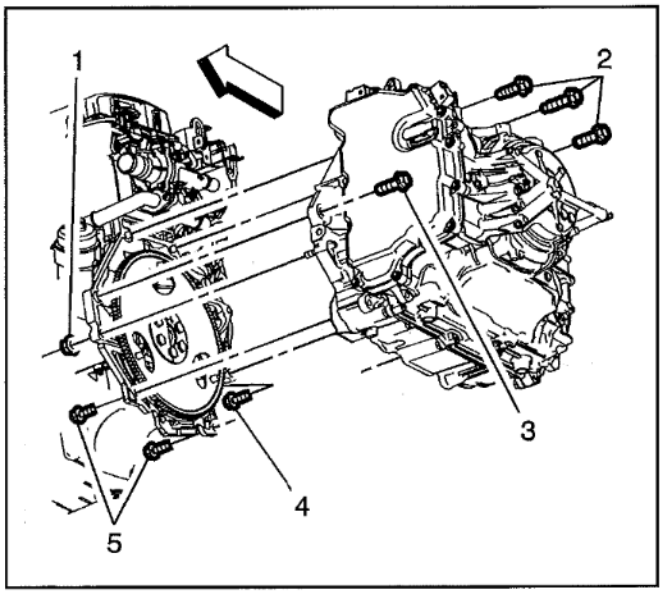
Removal Procedure

1. Remove the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
2. Without draining the coolant or removing the hoses, remove and position aside the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630*.
3. Remove the transmission range selector lever cable. Refer to *Range Selector Lever Cable Replacement on page 17-195*.



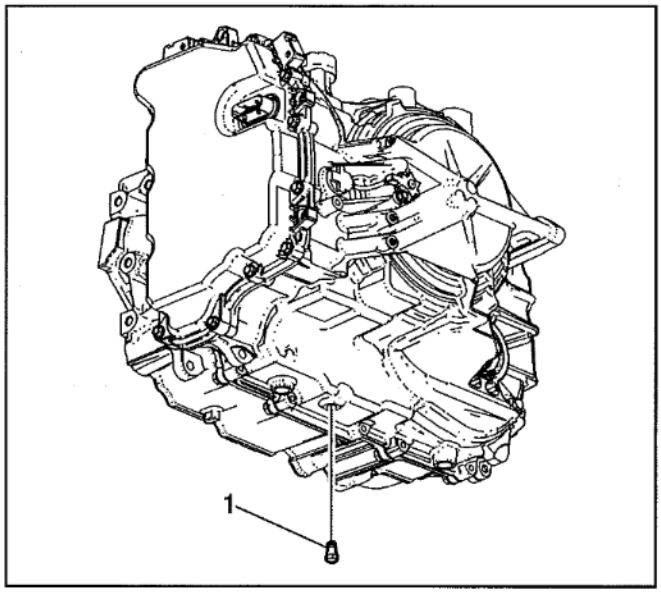
1999448

4. Disconnect the control valve body transmission control module electrical connector (1) then unclip the connector from the transmission.
5. Remove the transmission fluid cooler inlet hose from the transmission. Refer to *Fluid Cooler Inlet Hose Replacement on page 17-203*.
6. Remove the transmission fluid cooler outlet hose from the transmission. Refer to *Fluid Cooler Outlet Hose Replacement on page 17-204*.
7. Plug and/or cap the pipes and transmission to prevent contamination.



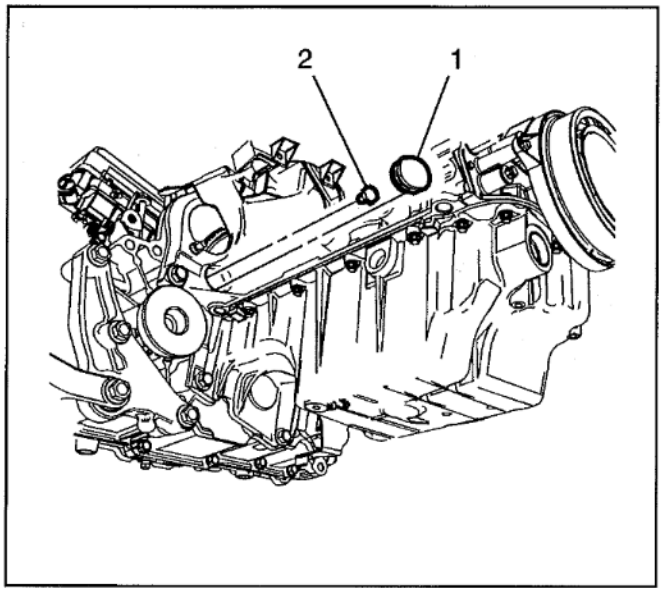
2534716

8. Remove the upper transmission to engine bolts (2).
9. Install the support fixture. Refer to *Engine Support Fixture on page 9-1060*.



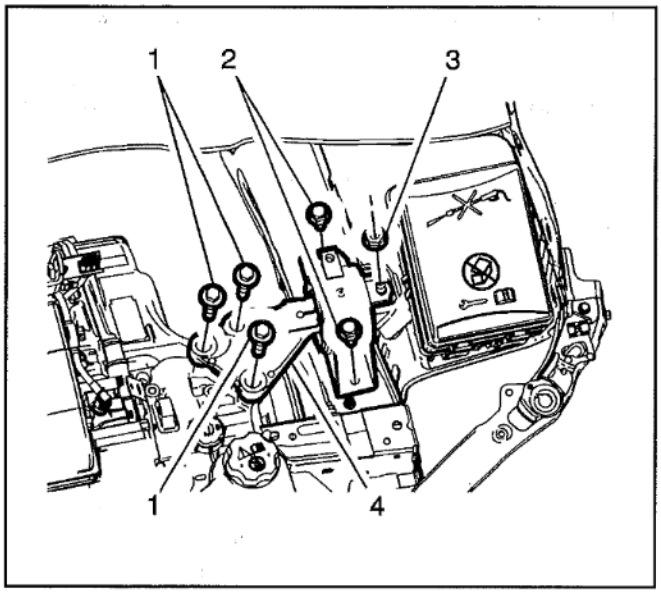
1998836

10. Drain the transmission fluid. Refer to *Transmission Fluid Drain and Fill on page 17-198*.
11. Remove the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.
12. Remove the front wheel drive shafts from the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
13. Remove the starter motor. Refer to *Starter Replacement (LUW) on page 9-722* or *Starter Replacement (LUV) on page 9-724*.



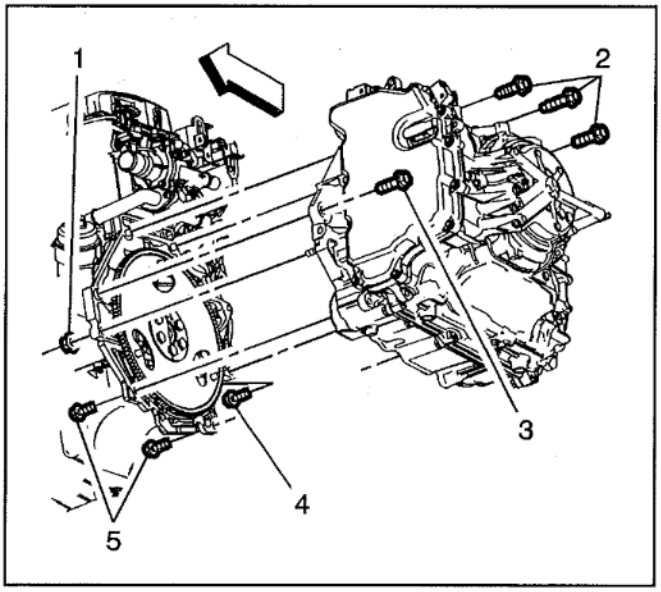
2534714

14. Mark the relationship of the flywheel to the torque converter for reassembly.
15. Remove the hole cover (1) and the torque converter to flywheel bolts (2).
16. Remove the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.
17. Remove the rear transmission mount bracket from the transmission. Refer to *Transmission Mount Bracket Replacement - Rear on page 17-215*.



2534715

18. Remove the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-216*.
19. Use a transmission jack in order to support the transmission.



2534716

20. Remove the lower transmission fasteners (1, 3, 4, 5).

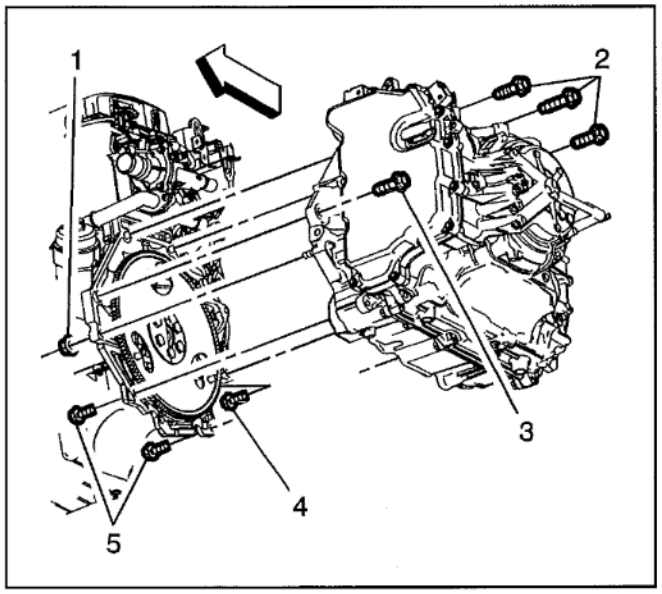
Note: Ensure the torque converter remains securely in place on the transmission input shaft while separating and removing the transmission.

21. Separate the transmission from the engine.
22. Lower the transmission with the transmission jack far enough to remove the transmission.

23. Flush and flow test the transmission oil cooler and lines. Refer to *Transmission Fluid Cooler Flushing and Flow Test on page 17-175*.

Installation Procedure

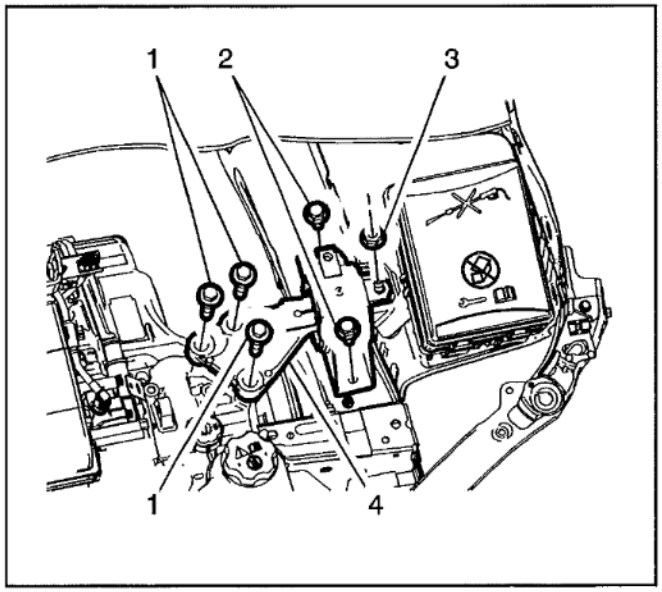
1. Raise the transmission with the transmission jack and position the transmission to the engine.



2534716

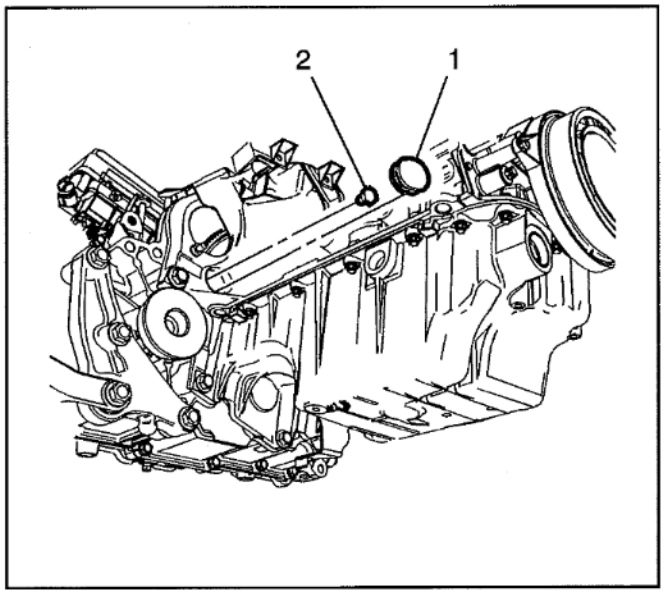
Caution: Refer to *Fastener Caution on page 0-8*.

2. Install the transmission bolts (3, 4) and tighten to **60** N•m **(44 lb ft)**.
3. Install the transmission bolts (5) and the transmission nut (1) and tighten to **40** N•m **(30 lb ft)**.
4. Remove the transmission jack.



2534715

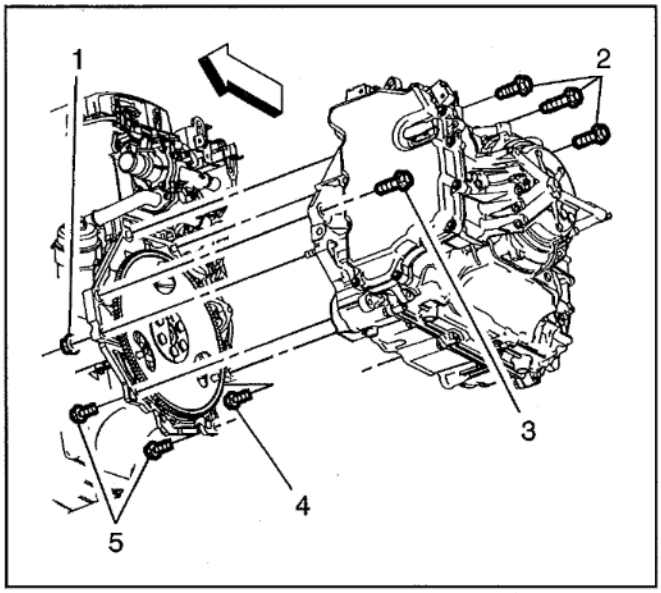
5. Install the left transmission mount (4). Refer to *Transmission Mount Replacement - Left Side on page 17-216*.
6. Install the rear transmission mount bracket to the transmission. Refer to *Transmission Mount Bracket Replacement - Rear on page 17-215*.
7. Install the drivetrain and front suspension frame. Refer to *Drivetrain and Front Suspension Frame Replacement on page 3-144*.



2534714

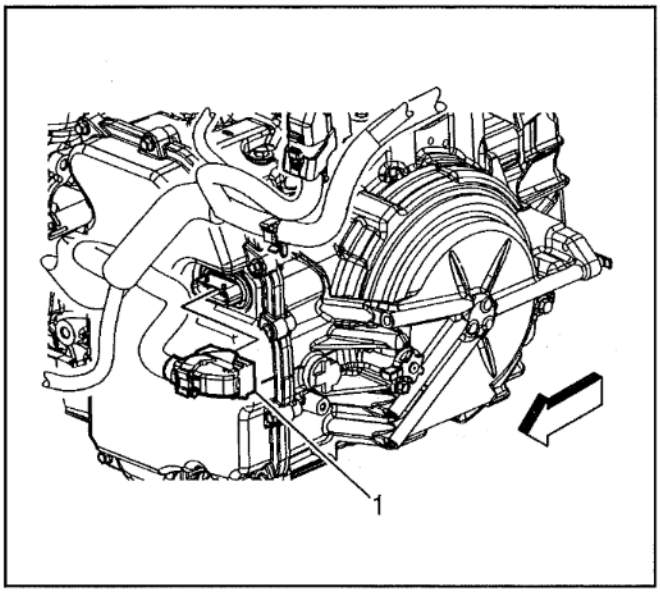
Note: If reusing the torque converter bolts, clean the threads and apply threadlocker to the threads prior to installation.

8. Install the torque converter to flywheel bolts (2) and tighten to **60** N•m **(44 lb ft)**and install the hole cover (1).
9. Install the starter motor. Refer to *Starter Replacement (LUW) on page 9-722* or *Starter Replacement (LUV) on page 9-724*.
10. Install the front wheel drive shafts to the transmission. Refer to *Front Wheel Drive Shaft Replacement on page 7-5*.
11. Install the front exhaust pipe. Refer to *Exhaust Front Pipe Replacement (LUV,LUW) on page 9-738*.



2534716

12. Remove the support fixture. Refer to *Engine Support Fixture on page 9-1060*.
13. Install the upper transmission to engine bolts (2) and tighten to **60** N•m **(44 lb ft)**.



1999448

14. Connect the control valve body transmission control module electrical connector (1) then clip the connector to the transmission.
15. Install the transmission fluid cooler outlet hose to the transmission. Refer to *Fluid Cooler Outlet Hose Replacement on page 17-204*.
16. Install the transmission fluid cooler inlet hose to the transmission. Refer to *Fluid Cooler Inlet Hose Replacement on page 17-203*.
17. Install the transmission range selector lever cable. Refer to *Range Selector Lever Cable Replacement on page 17-195*.
18. Adjust the automatic transmission range selector lever cable. Refer to *Range Selector Lever Cable Adjustment on page 17-196*.
19. Install the radiator surge tank. Refer to *Radiator Surge Tank Replacement on page 9-630*.
20. Install the battery tray. Refer to *Battery Tray Replacement on page 9-721*.
21. Fill the transmission with fluid. Refer to *Transmission Fluid Drain and Fill on page 17-198*.
22. If a NEW transmission control module (TCM) has been installed into the vehicle, the NEW module needs to be reprogrammed. Refer to *Service Programming System (SPS) on page 6-13*.

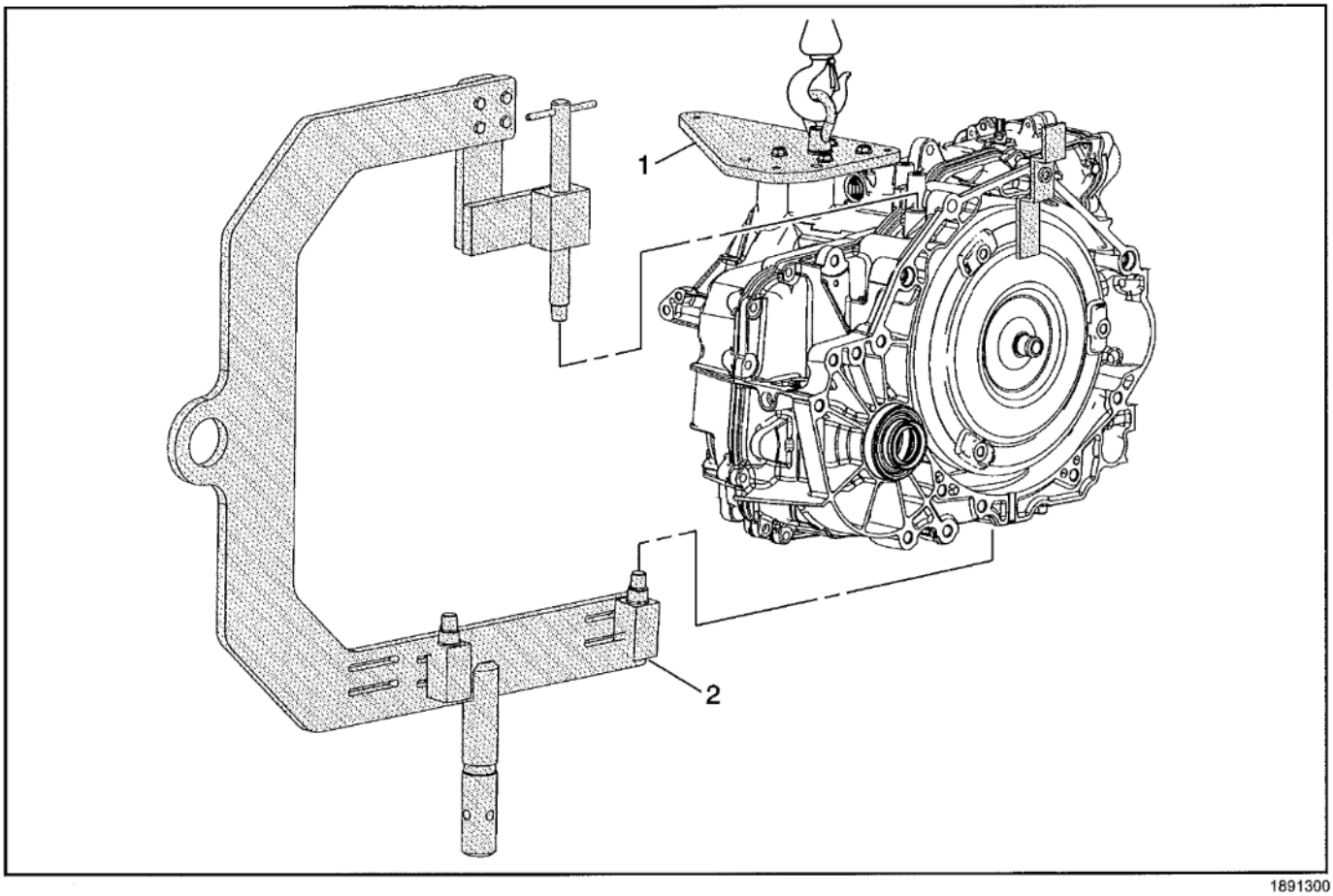
Note: The transmission adaptive values learn procedure must be performed when one of the following repairs have been made to the vehicle. Failure to perform the procedure after one of the following repairs may result in poor transmission performance, as well as transmission DTCs being set:

- Transmission internal service/overhaul
- Valve body repair or replacement
- Control solenoid valve assembly replacement
- TCM software/calibration update
- Any service in response to a shift quality concern

23. Perform the transmission adaptive values learn. Refer to *Transmission Adaptive Values Learn on page 17-163*.
24. Road test the vehicle.

Repair Instructions - Off Vehicle

Lift Plate and Holding Fixture Installation

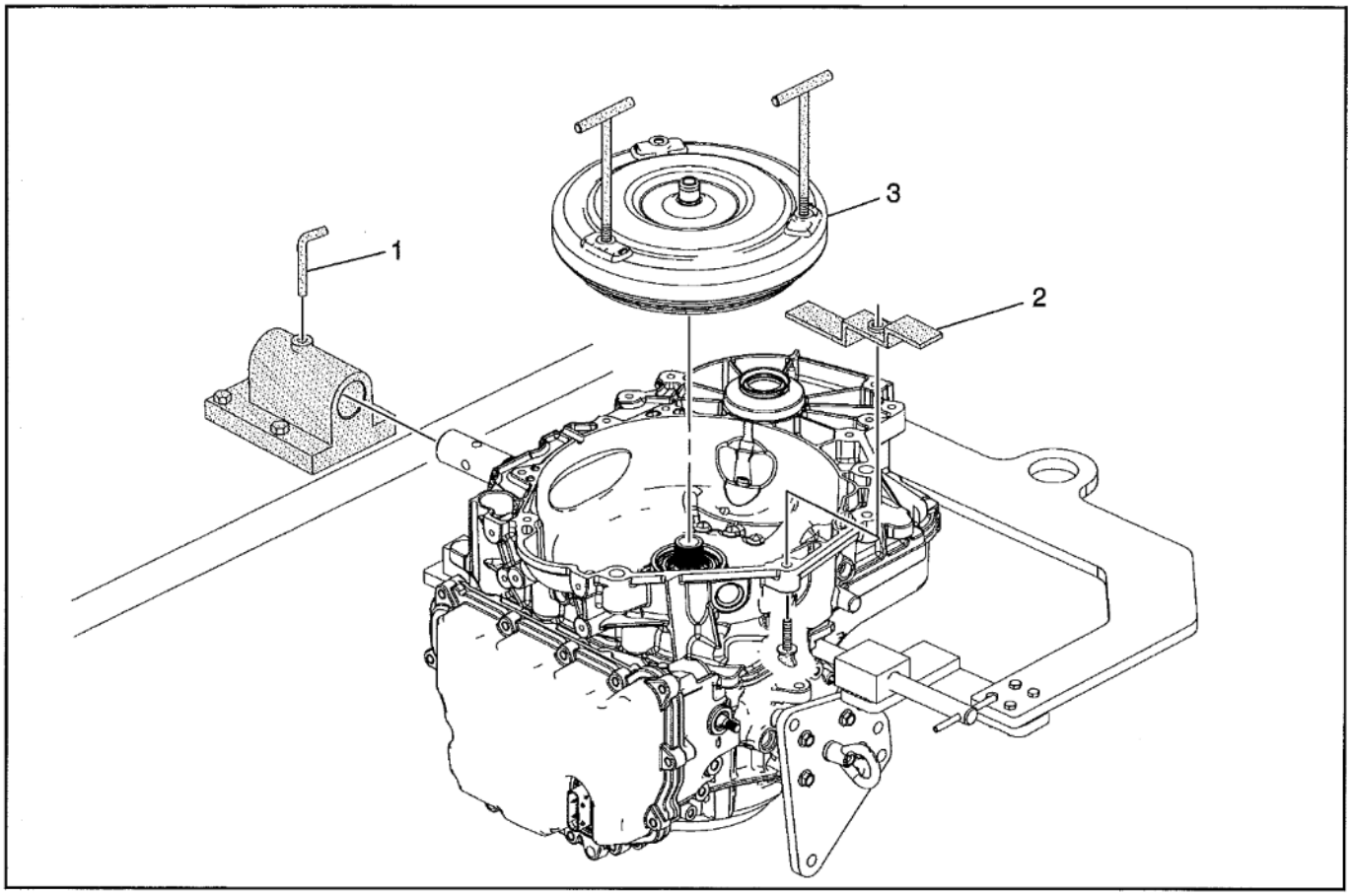


1891300

Lift Plate and Holding Fixture Installation

Callout	Component Name
1	*DT-47811-A* Transmission Lift Plate ***Warning: Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly.*** **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** Tighten bolts and nut. **Tighten** 12 N•m (106 lb in) **Special Tools** *DT-47811-A* Transmission Lift Plate For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	*DT-46625* Transmission Holding Fixture **Procedure** 1. Raise the transmission with an overhead hoist. 2. Adjust mounting block on fixture to match bosses on case, then tighten bolts. **Tighten** 13 N•m (10 lb ft) **Special Tools** *DT-46625-10* Holding Fixture Adapter For equivalent regional tools, refer to *Special Tools on page 17-394*.

Torque Converter Removal

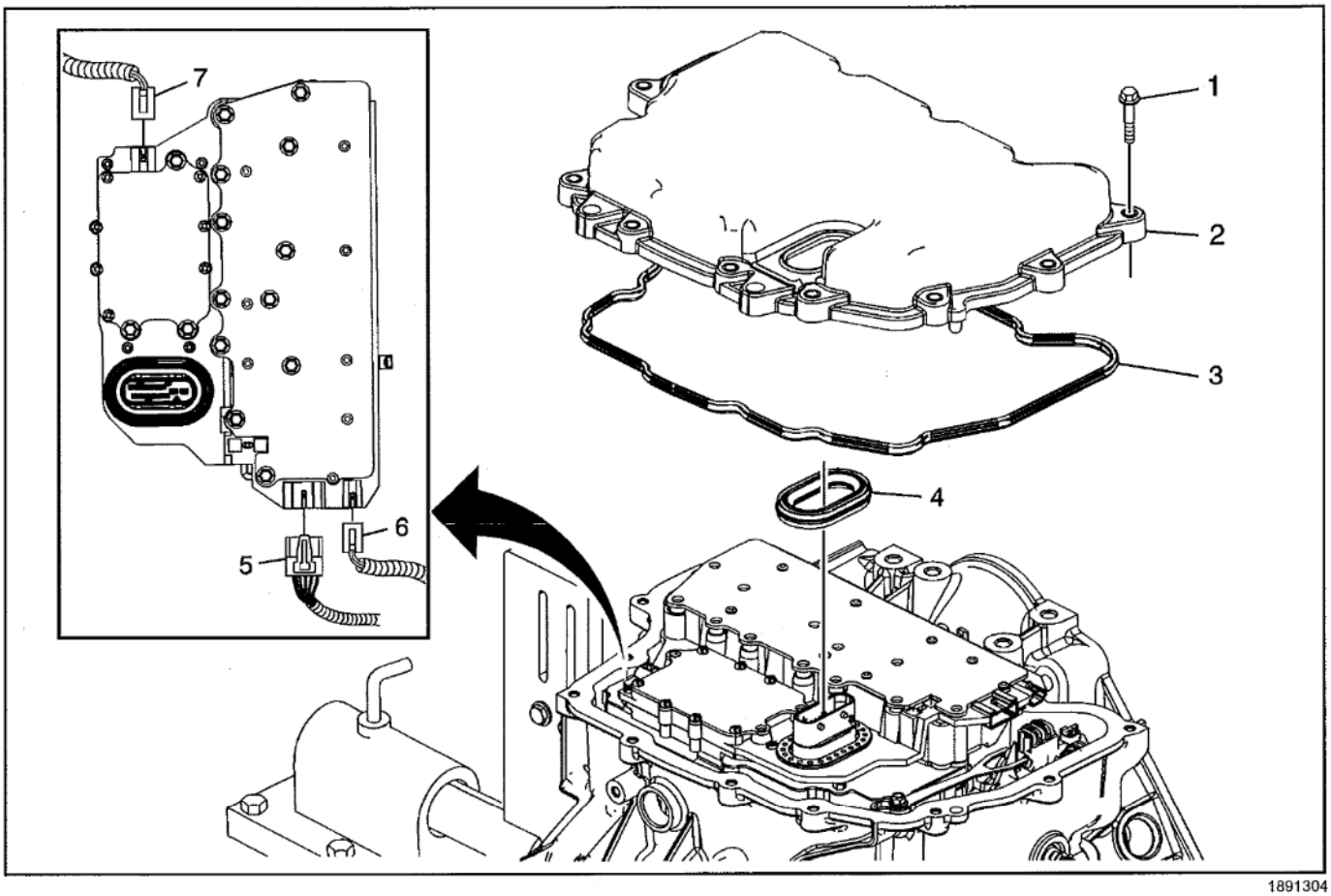


1891302

Torque Converter Removal

Callout	Component Name
1	Lock Pin ***Warning: Lock pin must be secured into the bench fixture to hold the transmission and prevent bodily injury.*** **Tip:** Ensure the *DT 3289-20* holding fixture is mounted to a bench that is properly supported and will support the weight of the transmission assembly without tipping. *DT-39890* holding fixture adapter and an engine stand can be used as an alternative method for supporting the transmission assembly during repairs. **Special Tools** • *DT 3289-20* Holding Fixture • *DT-39890* Transmission Holding Fixture Adapter For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	*DT 21366* Torque Converter Holding Strap
3	Torque Converter Assembly **Caution:** Only install the lift assist handles until it stops. Do not tighten. Over tightening the lift assist handles can cause damage to the torque converter. **Tip:** Failure to raise the torque converter straight up could damage the torque converter clutch lip seal inside the torque converter clutch assembly. **Special Tool** *DT 46409* Torque Converter Lifting Handles For equivalent regional tools, refer to *Special Tools on page 17-394*.

Control Valve Body Assembly Removal
Control Valve Body Cover Removal

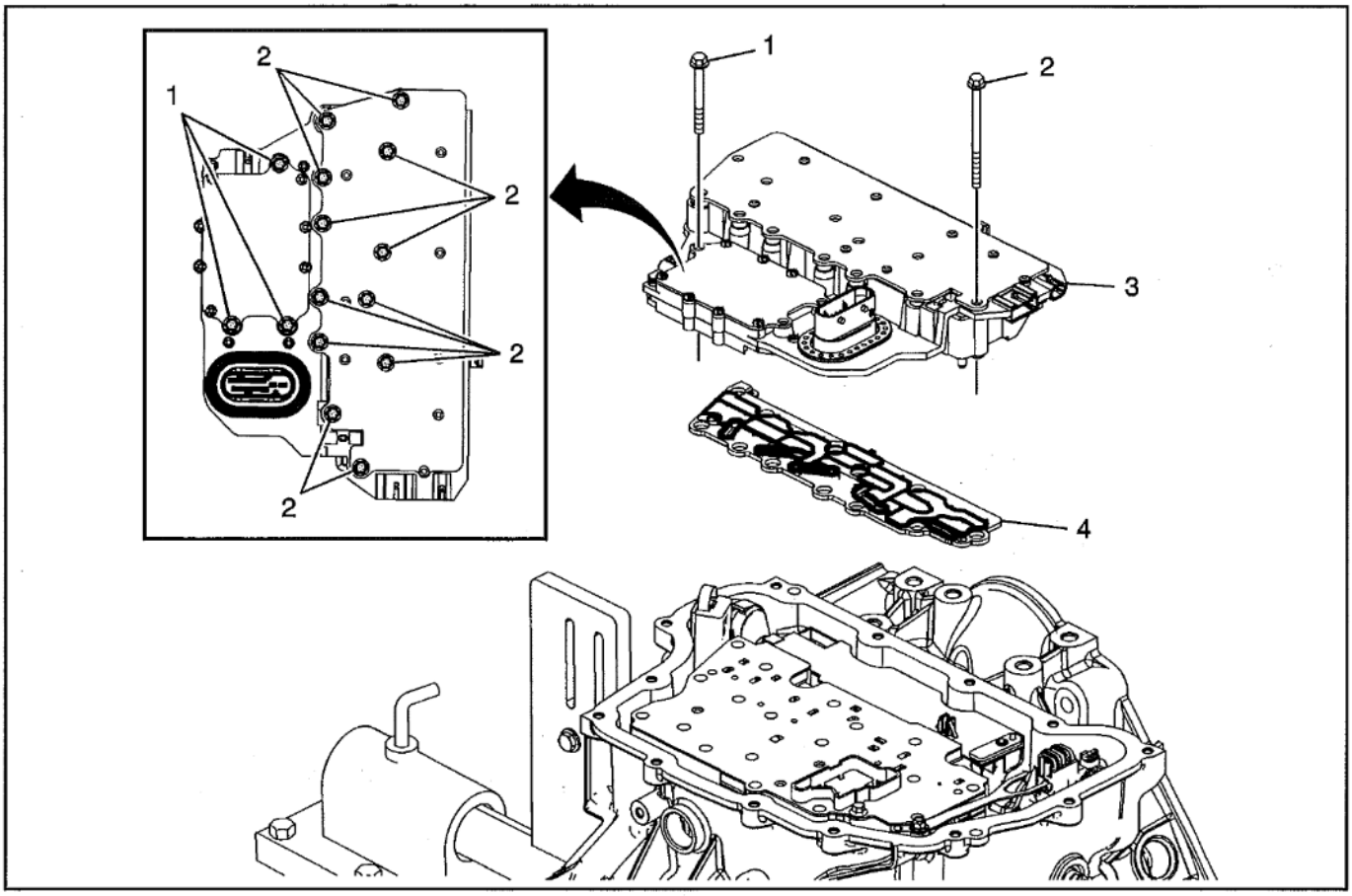


1891304

Control Valve Body Cover Removal

Callout	Component Name
1	Control Valve Body Cover Bolts M6 x 30 (Qty: 13)
2	Control Valve Body Cover
3	Control Valve Body Gasket **Tip:** Discard the seal. It is not reusable.
4	Control Valve Body Cover Wiring Connector Hole Seal **Caution:** Support the control solenoid valve assembly around the connector when removing the seal. Excessive pulling force can damage the internal electrical connections. **Tip:** Discard the seal. It is not reusable.
5	Shift Position Switch Connector
6	Output Speed Sensor Connector
7	Input Speed Sensor Connector

Control Solenoid (With Body and TCM) Valve Assembly Removal

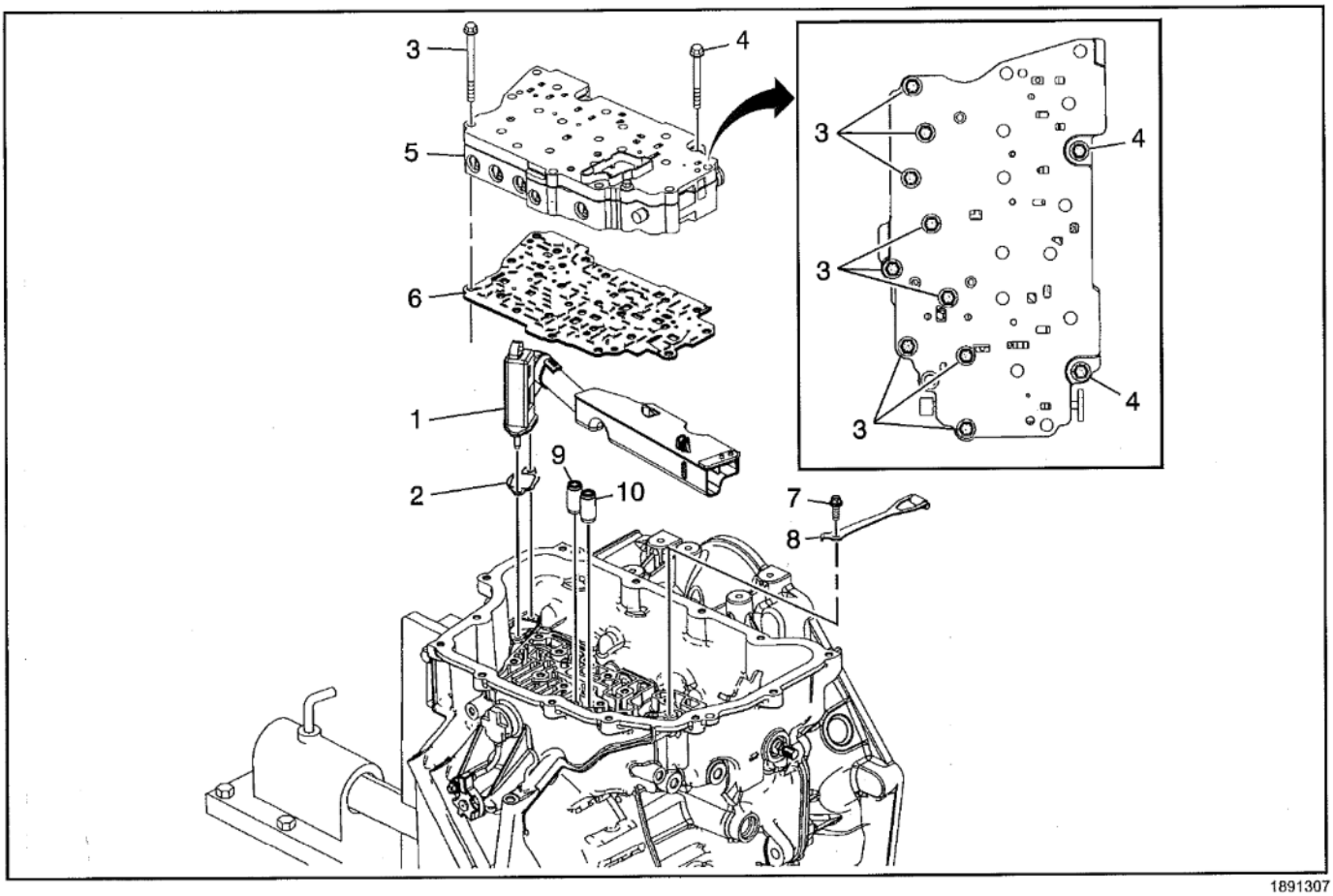


1891305

Control Solenoid (With Body and TCM) Valve Assembly Removal

Callout	Component Name
1	Control Valve Body M5 x 40.5 (Qty: 3)
2	Control Valve Body Bolt M6 x 30 (Qty: 12)
3	Control Solenoid (with Body and TCM) Valve Assembly
4	Control Solenoid Valve Assembly Filter Plate **Caution:** Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination. **Tip:** Discard the filter plate. It is not reusable.

Control Valve Body Assembly Removal

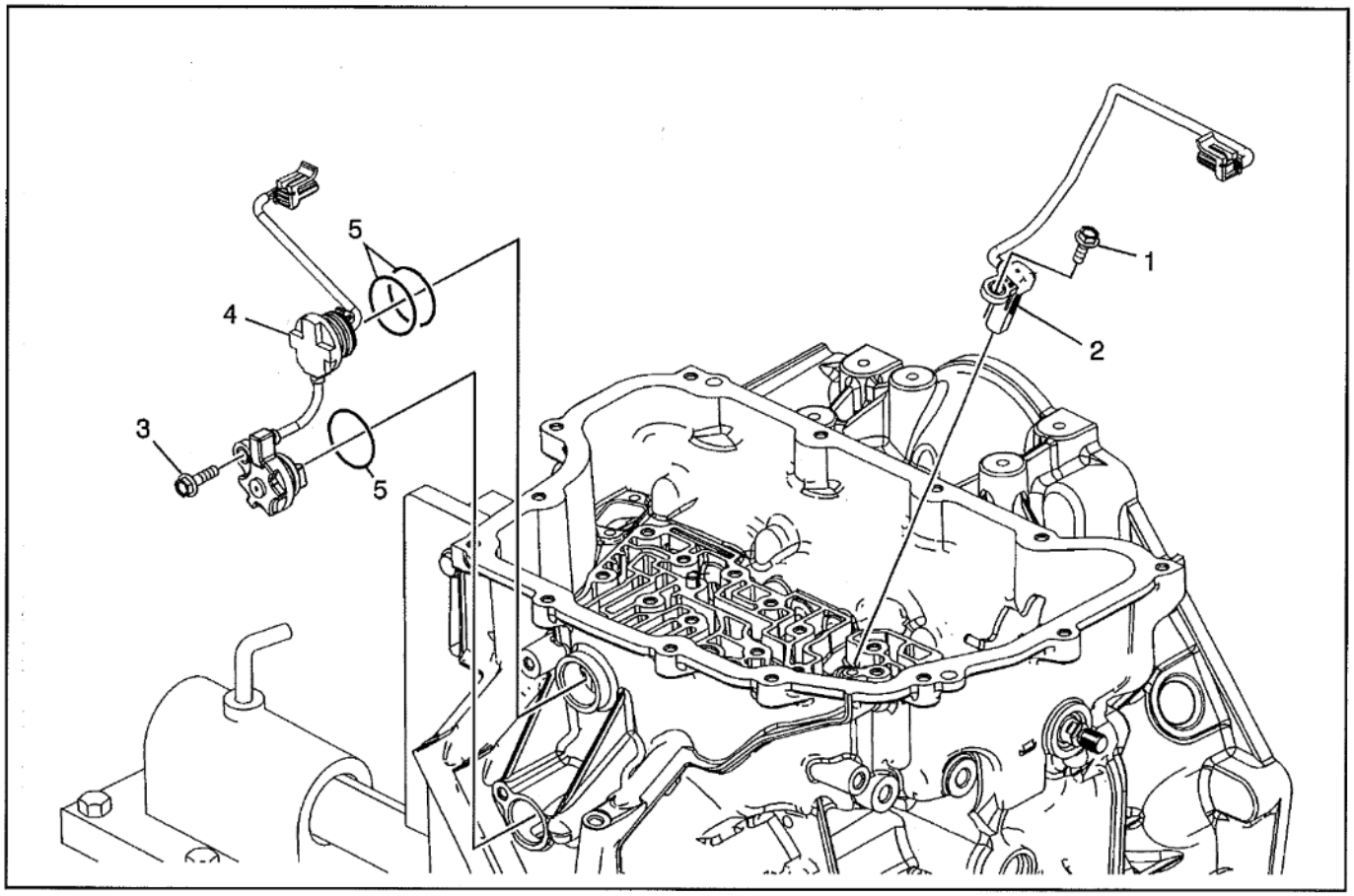


1891307

Control Valve Body Assembly Removal

Callout	Component Name
1	Fluid Level Control Valve
2	Fluid Level Control Valve Gasket
3	Control Valve Body Bolt M6 x 60 (Qty: 9)
4	Control Valve Body Bolt M6 x 53 (Qty: 2)
5	Control Valve Body Assembly
6	Control Valve Body Spacer Plate Assembly
7	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1)
8	Manual Shaft Detent Lever Spring Assembly
9	1-2-3-4 Clutch Fluid Passage Seal **Tip:** Discard the seal. It is not reusable.
10	Low/Reverse Clutch Fluid Passage Seal **Tip:** Discard the seal. It is not reusable.

Input and Output Speed Sensor Removal

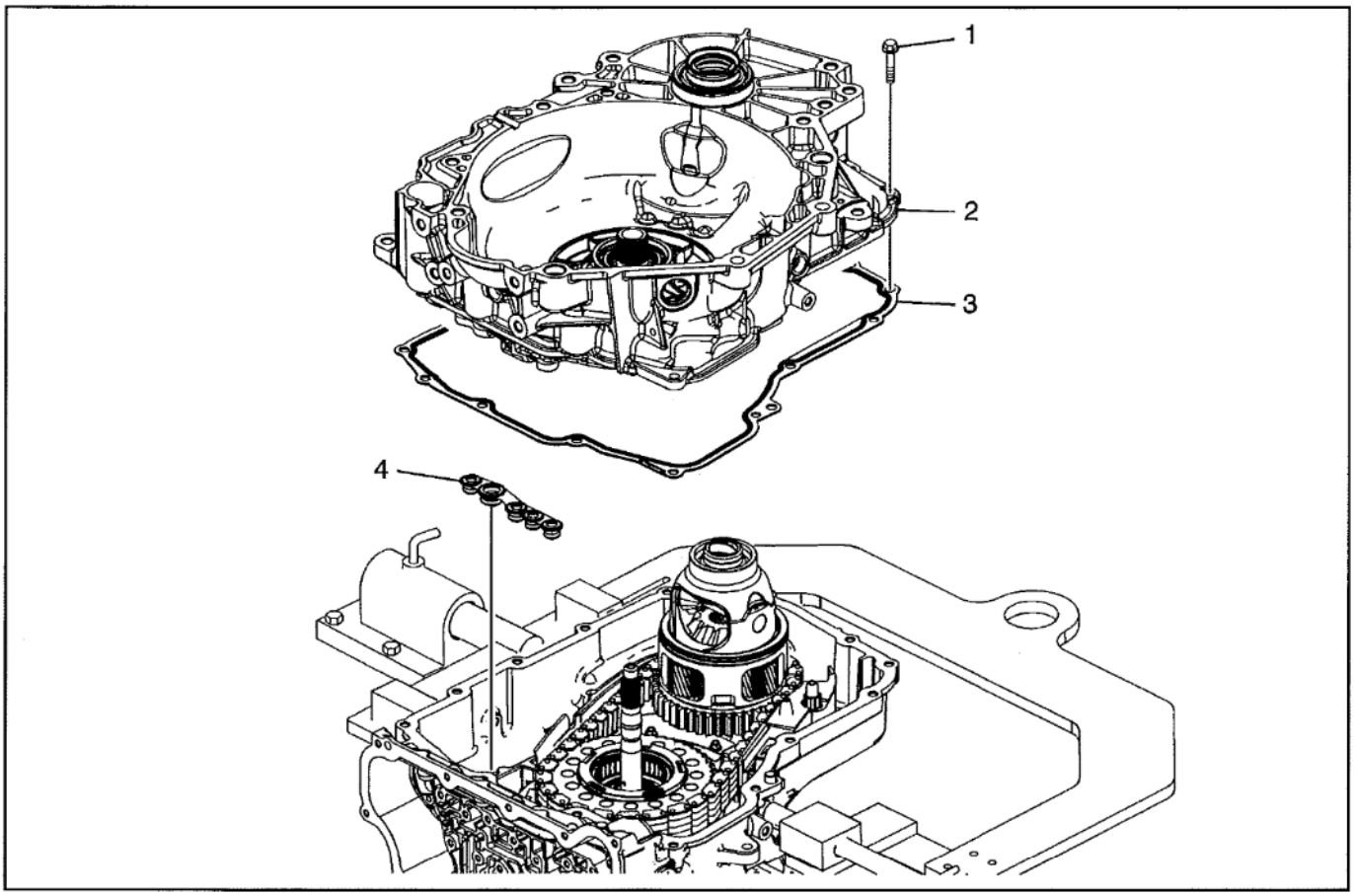


1891309

Input and Output Speed Sensor Removal

Callout	Component Name
1	A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1)
2	A/Trans Output Speed Sensor Assembly
3	Input Speed Sensor Bolt M6 x 23 (Qty: 1)
4	Input Speed Sensor Assembly **Tip:** Compress the locking tabs on the plug to release it from the case and to avoid damaging the retainers.
5	Input Speed Sensor Assembly Seals (Qty: 3) **Tip:** Discard the seals. They are not reusable.

Torque Converter Housing with Fluid Pump Assembly Removal (Non Hybrid)

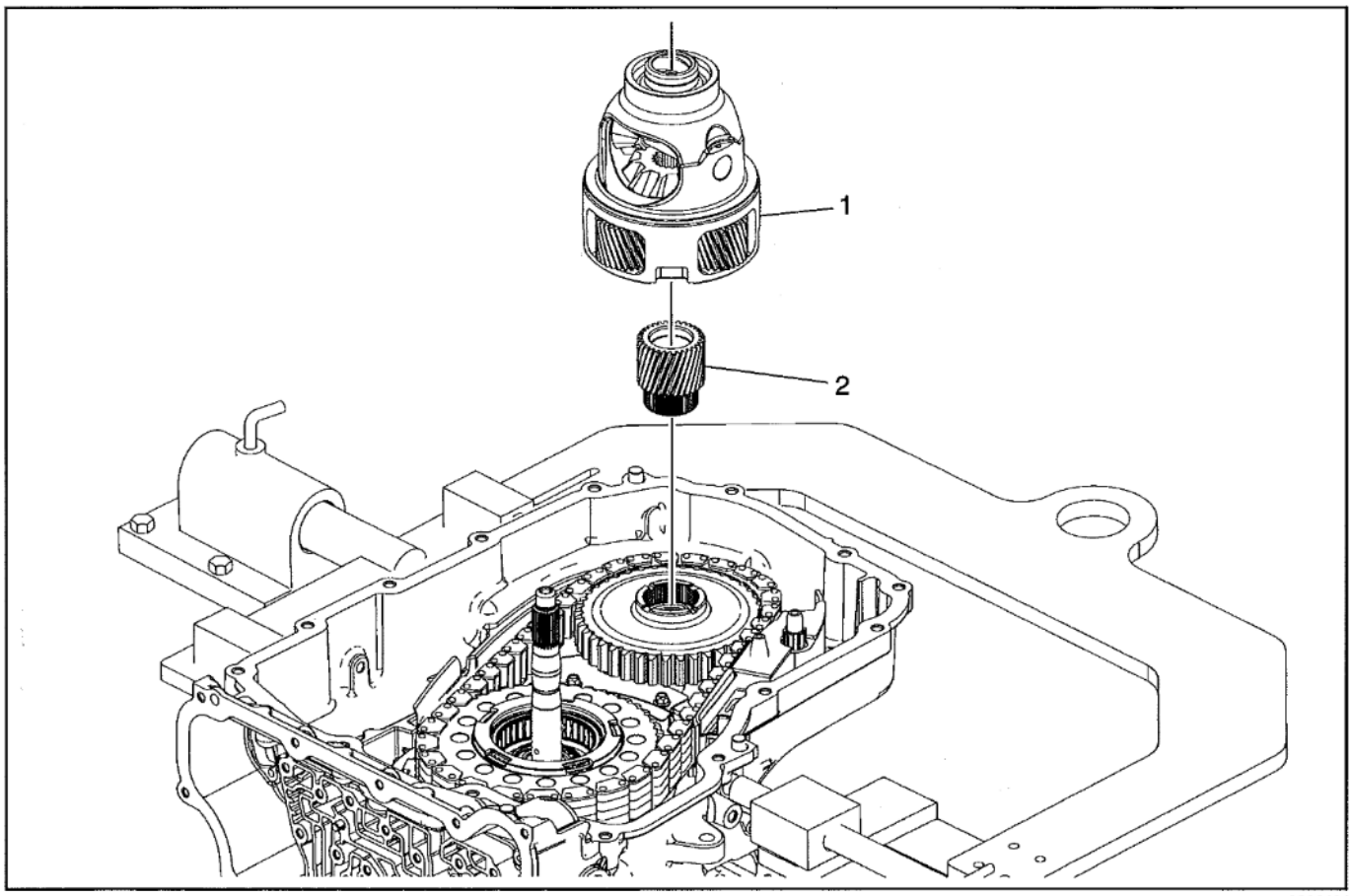


1891311

Torque Converter Housing with Fluid Pump Assembly Removal (Non Hybrid)

Callout	Component Name
1	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15)
2	Torque Converter with Fluid Pump Housing Assembly
3	Torque Converter Housing Gasket **Tip:** Discard the seal. It is not reusable.
4	Fluid Pump Seal Assembly **Tip:** Discard the seal. It is not reusable.

Differential Carrier Removal (6T30)

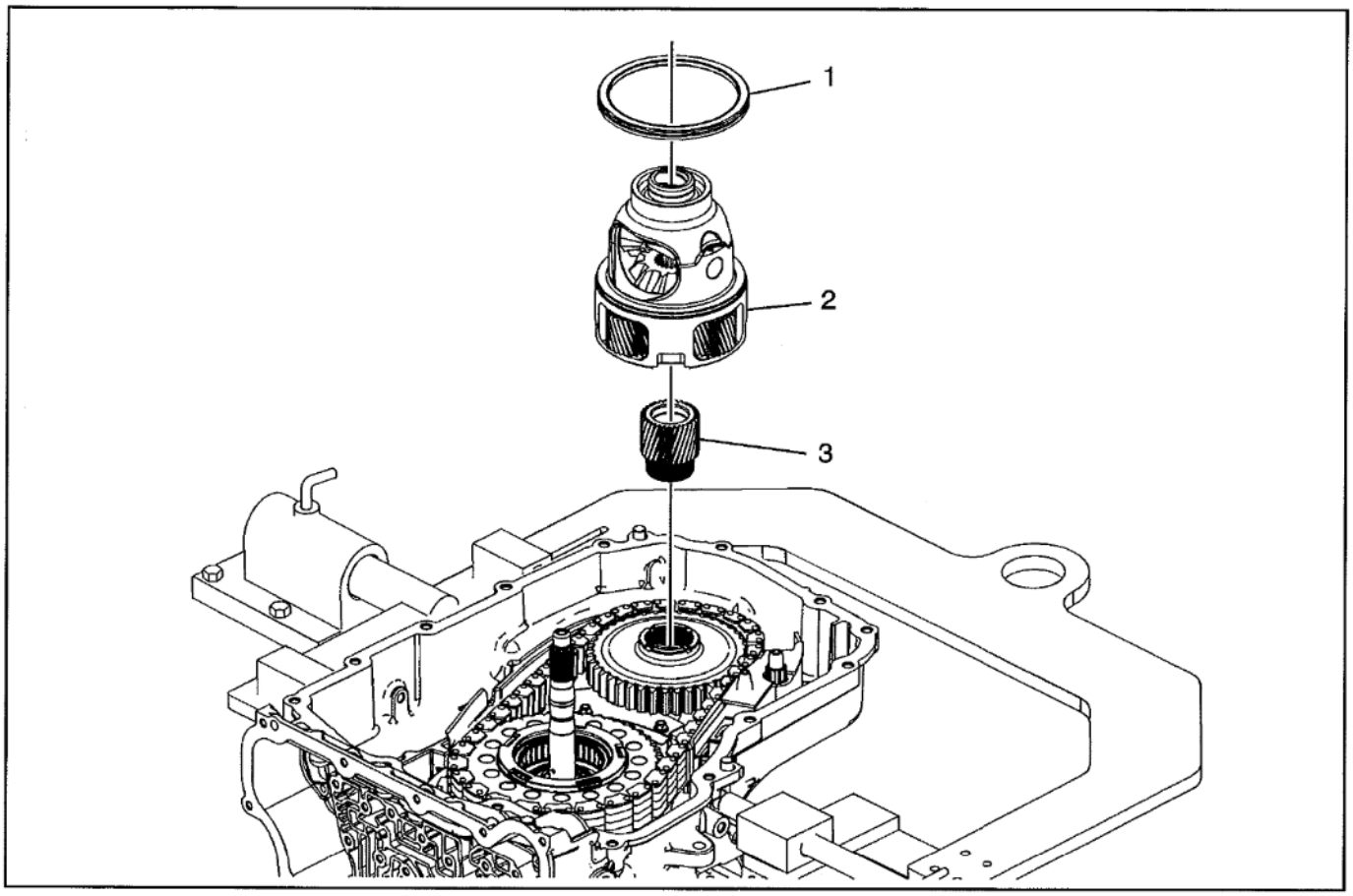


2202194

Differential Carrier Removal (6T30)

Callout	Component Name
1	Differential Carrier Assembly
2	Final Drive Sun Gear

Differential Carrier Removal (6T40/45/50)

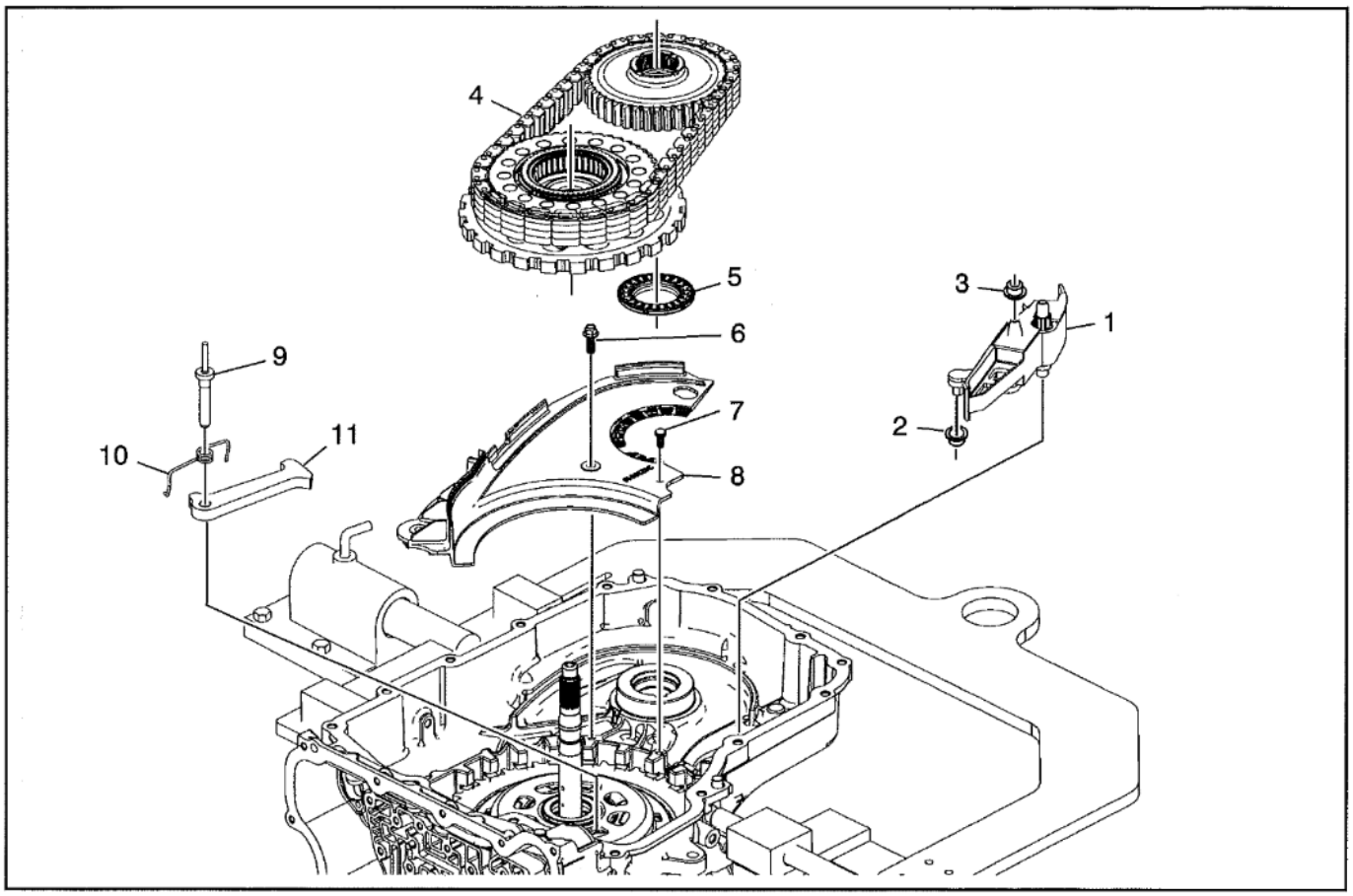


1891312

Differential Carrier Removal (6T40/45/50)

Callout	Component Name
1	Front Differential Carrier Bearing Assembly
2	Differential Carrier Assembly
3	Final Drive Sun Gear

Drive and Driven Sprocket, Drive Link, and Park Pawl Removal (6T30)

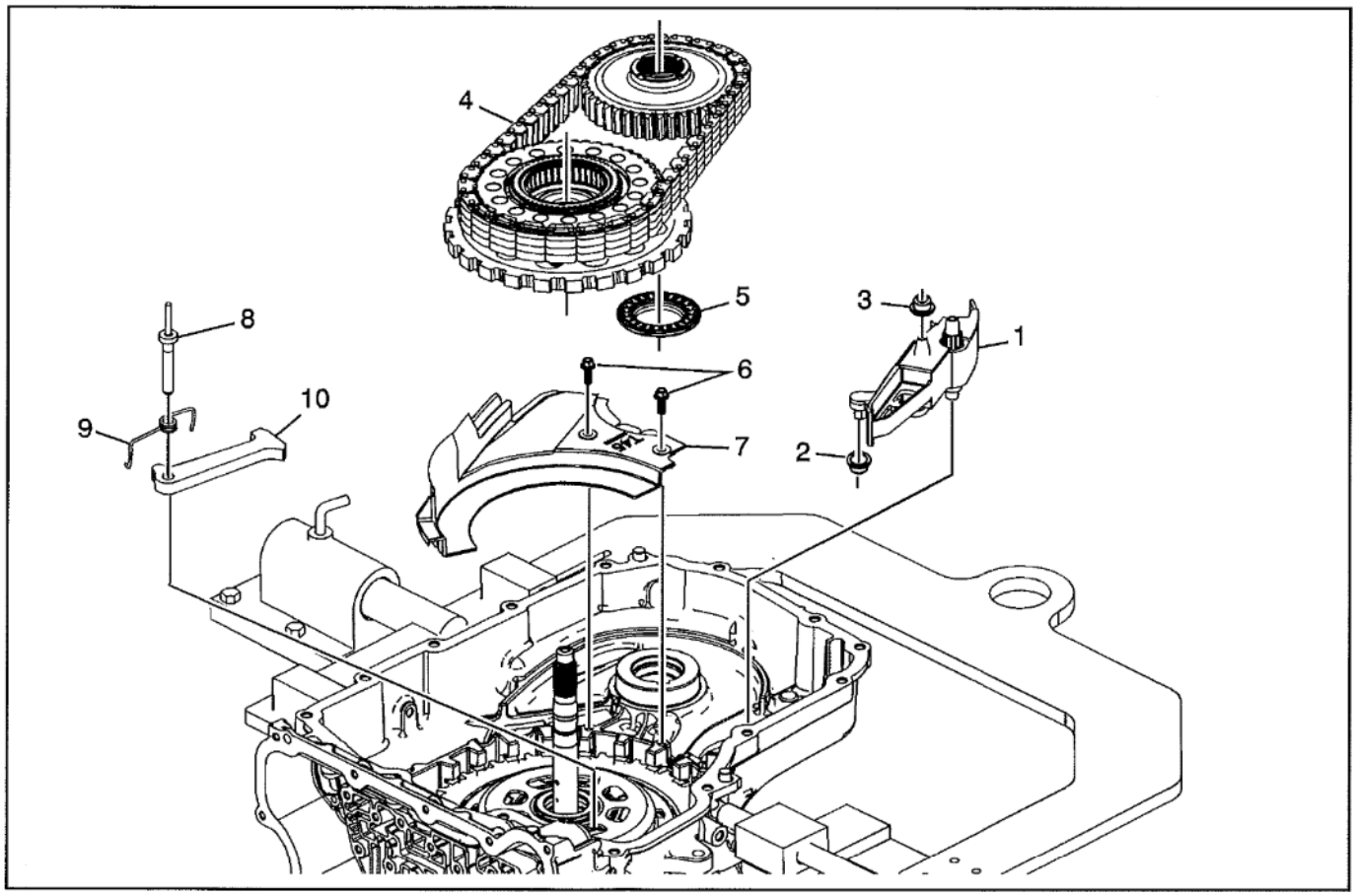


2202195

Drive and Driven Sprocket, Drive Link, and Park Pawl Removal (6T30)

Callout	Component Name
1	Drive Link Lube Scoop
2	Drive Link Lube Scoop Seals
3	Drive Link Lube Fluid Seal
4	Driven Sprocket Assembly, Drive Sprocket and Park Gear Assembly and Drive Link **Tip:** 1. The drive link, drive and driven sprocket assemblies must be removed at the same time. 2. The driven sprocket ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.
5	Driven Sprocket Bearing Assembly **Tip:** The driven sprocket bearing may be stuck to the driven sprocket.
6	Baffle Retainer
7	Front Differential Carrier Baffle Bolts M6 x 16 (Qty: 2)
8	Front Differential Carrier Baffle
9	Park Pawl Shaft
10	Park Pawl Spring
11	Park Pawl

Drive and Driven Sprocket, Drive Link, and Park Pawl Removal (6T40/45/50)

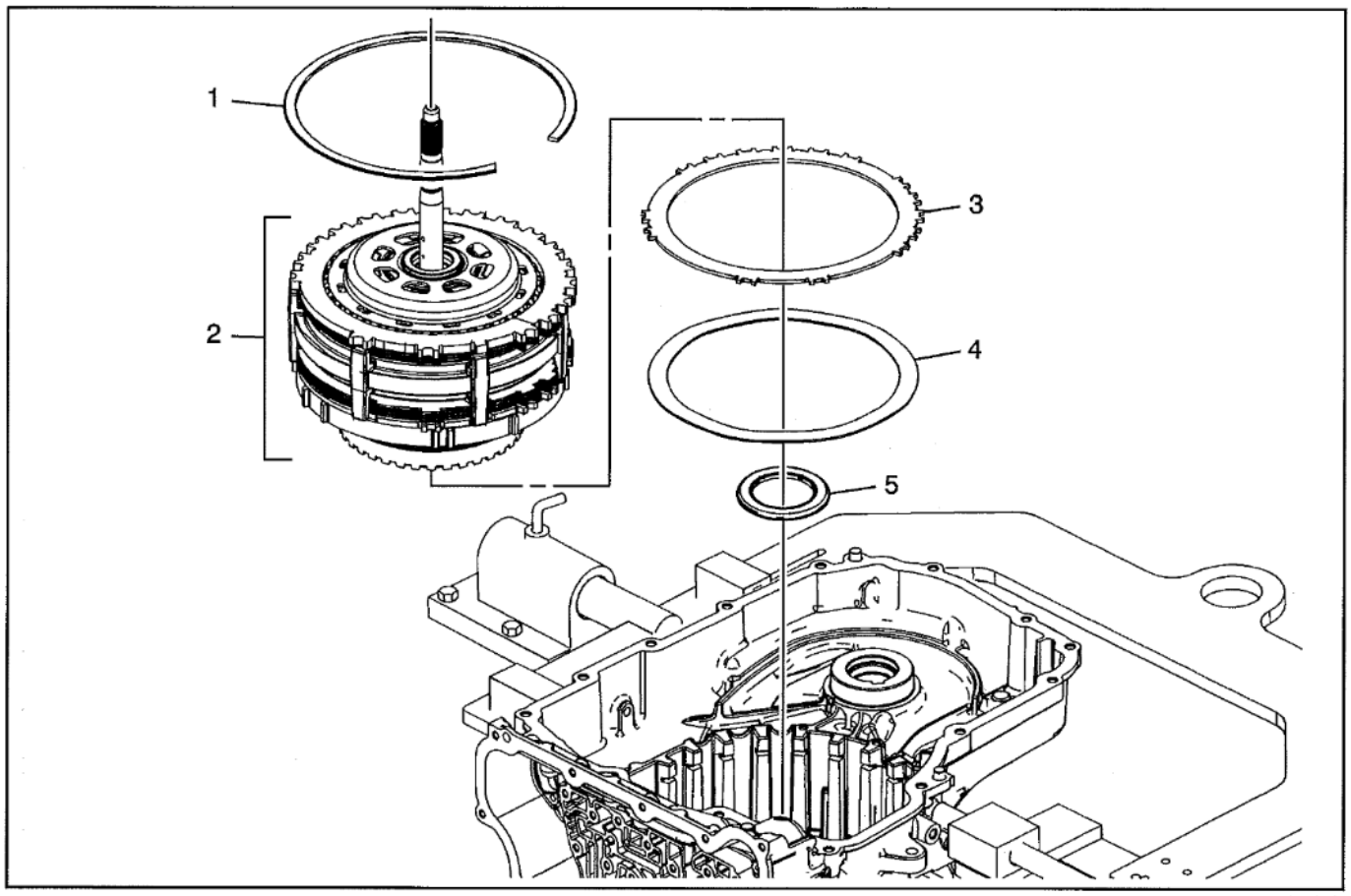


1891313

Drive and Driven Sprocket, Drive Link, and Park Pawl Removal (6T40/45/50)

Callout	Component Name
1	Drive Link Lube Scoop
2	Drive Link Lube Scoop Seals
3	Drive Link Lube Fluid Seal
4	Driven Sprocket Assembly, Drive Sprocket and Park Gear Assembly and Drive Link **Procedure** 1. The drive link, drive and driven sprocket assemblies must be removed at the same time. 2. The driven sprocket ball bearing inner race has a slight interference fit with the case. Pull straight up to ease removal.
5	Driven Sprocket Bearing Assembly **Tip:** The driven sprocket bearing may be stuck to the driven sprocket.
6	Front Differential Carrier Baffle Bolts M6 x 16 (Qty: 2)
7	Front Differential Carrier Baffle
8	Park Pawl Shaft
9	Park Pawl Spring
10	Park Pawl

Internal Components Removal

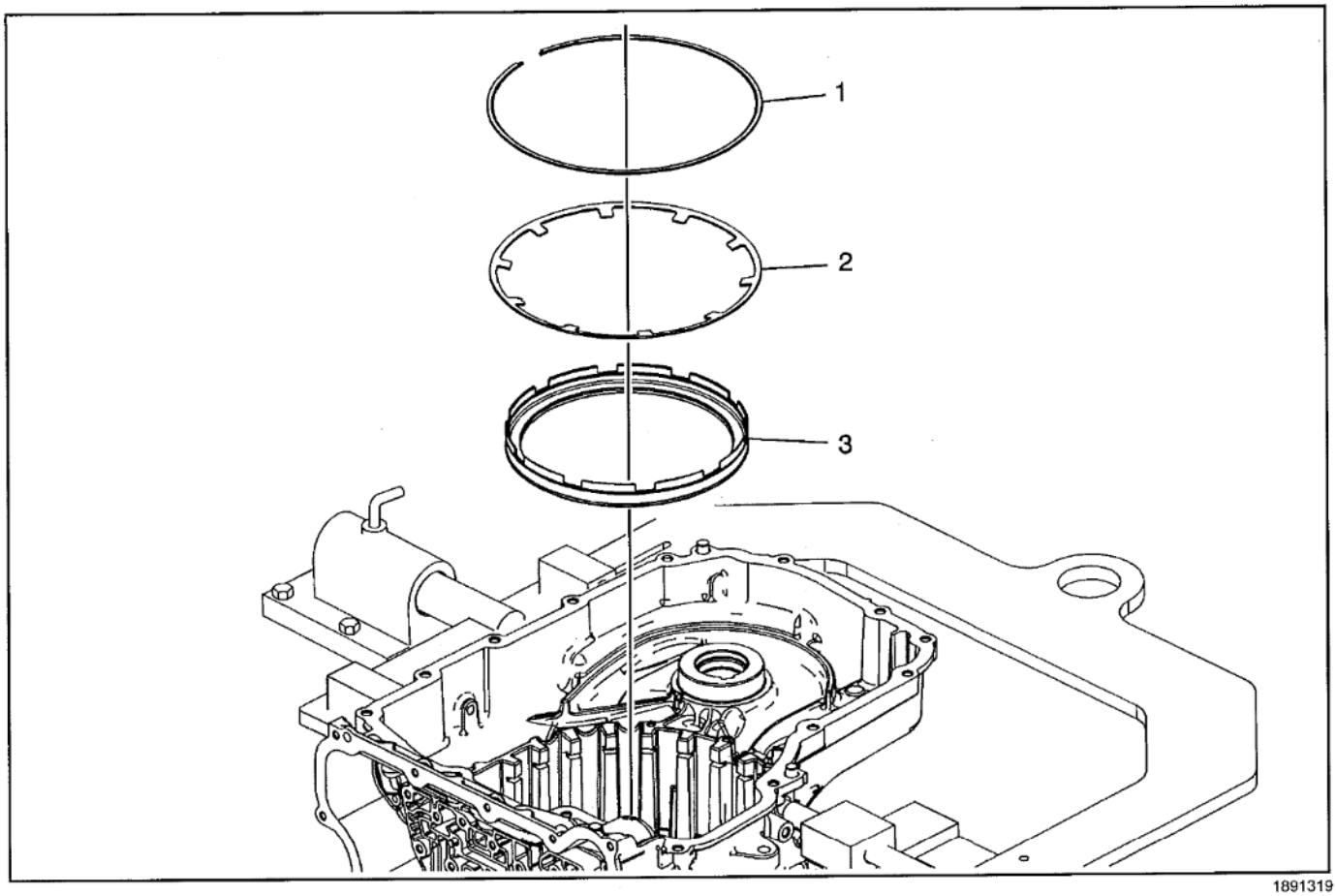


1891318

Internal Components Removal

Callout	Component Name
1	1–2–3–4 Clutch Backing Plate Retainer Ring ***Warning: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result.*** **Caution:** Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear. **Tip:** Remove one end of the retainer using *DT-28585* snap ring remover or equivalent and work the retainer out of the case groove. **Special Tool** *DT-28585* Snap Ring Remover or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	3–5 Reverse and 4–5–6 Clutch Housing Assembly, Gearset, Low-Reverse Clutch Assembly and Low-Reverse and 1–2–3–4 Clutch Housing **Tip:** This unit is heavy – weighs 40 lbs. (18 Kg).
3	2–6 Clutch Plate (Qty: 1)
4	2–6 Clutch Apply Plate (Waved)
5	35R and 456 Clutch Housing Thrust Bearing Assembly

2-6 Clutch Piston Removal



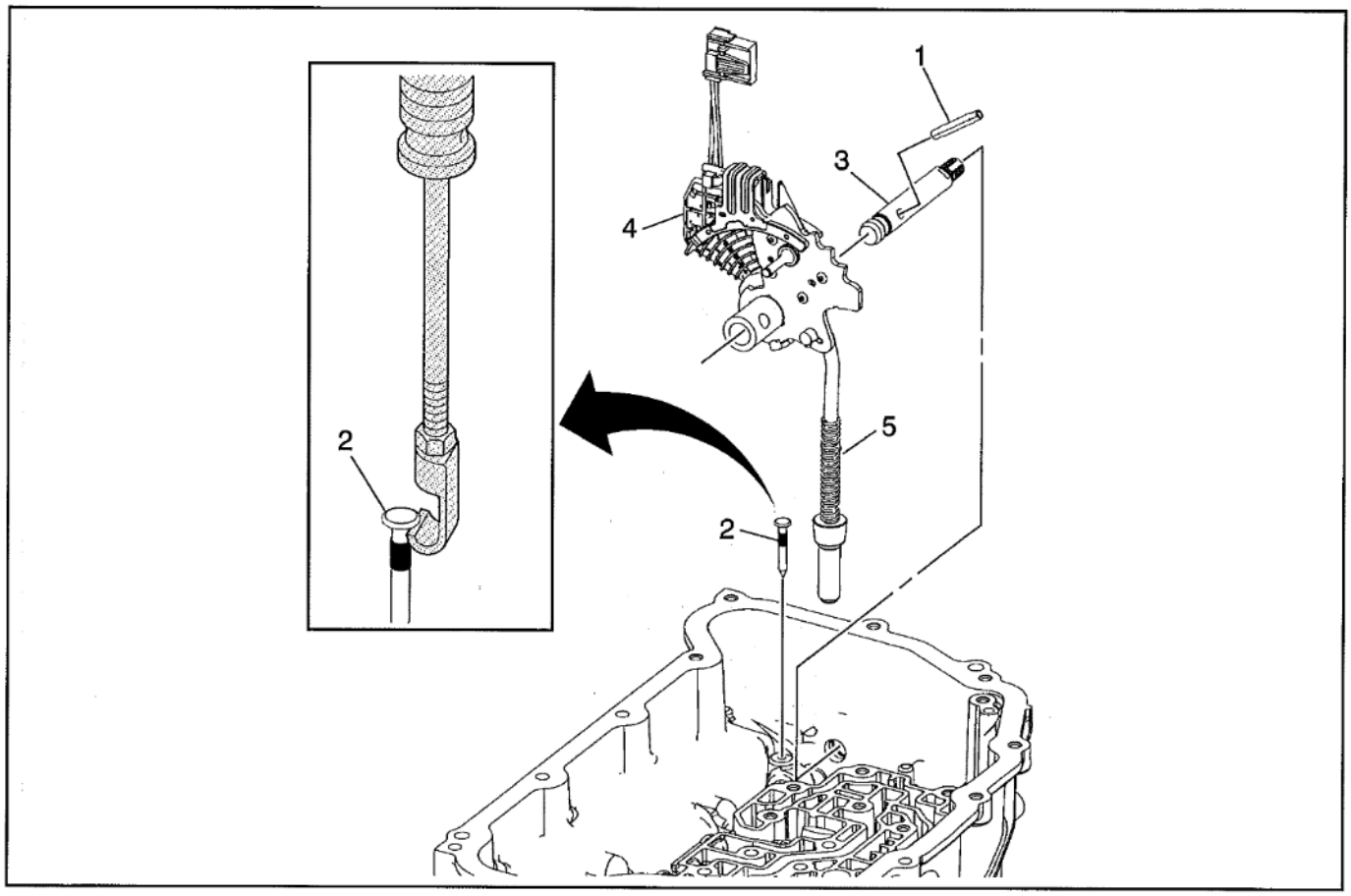
1891319

2-6 Clutch Piston Removal

Callout	Component Name
1	2–6 Clutch Spring Retainer **Special Tool** *DT-28585* Snap Ring Remover or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	2–6 Clutch Spring
3	2–6 Clutch Piston Assembly **Tip:** • Use pliers to remove the piston. • Inspect the piston seals for damage and/or wear. The piston is reusable.

Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Removal

Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal

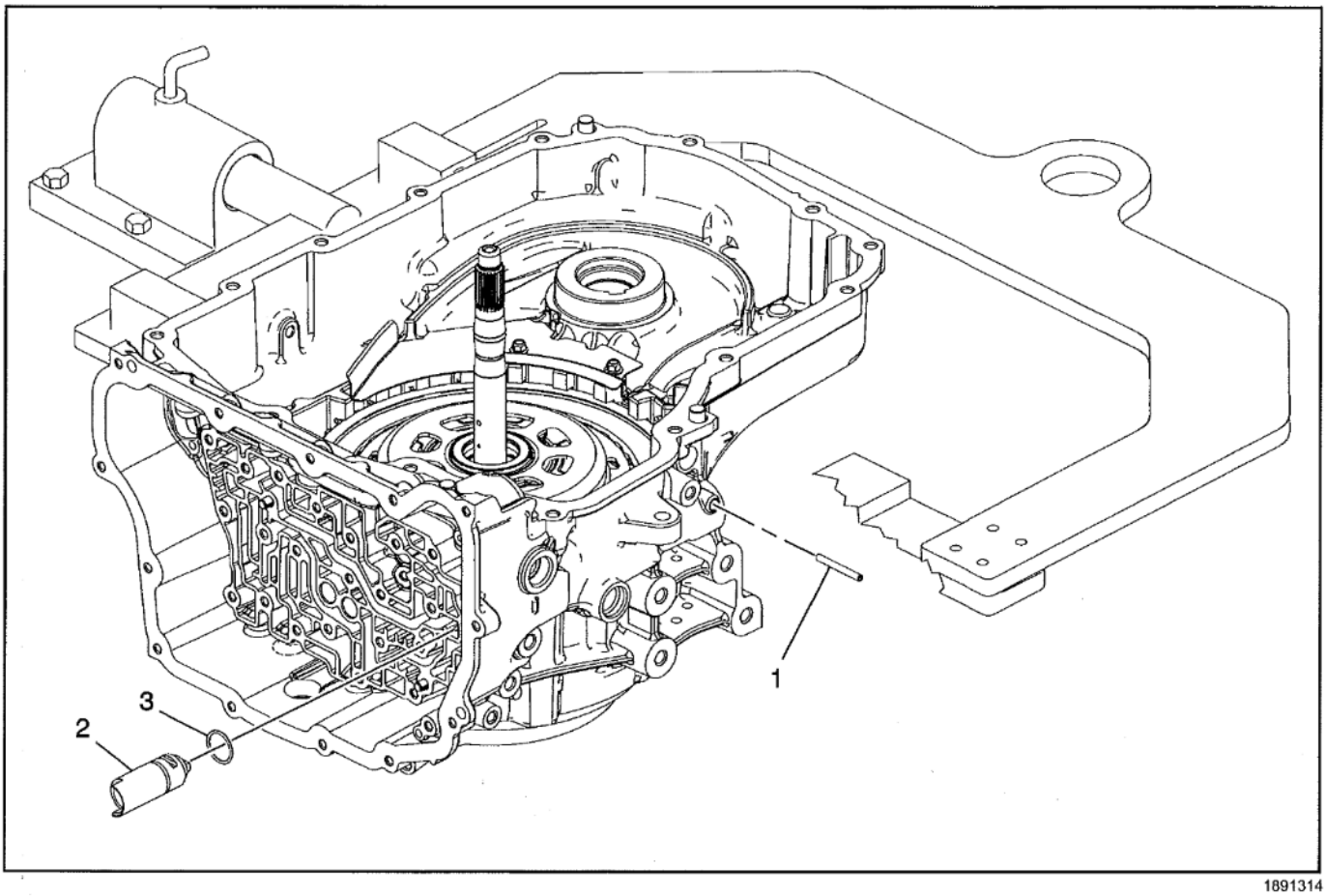


1891310

Manual Shaft Detent (w/Shift Position Switch) Lever Assembly Removal

Callout	Component Name
1	Manual Shaft Detent Lever Hub Pin **Tip:** Use side cutter to remove the pin (1) and discard.
2	Manual Shift Shaft Pin **Tip:** Discard the pin. It is not reusable. **Special Tools** • *DT-23129* Universal Seal Remover • *GE-6125-1B* Slide Hammer For equivalent regional tools, refer to *Special Tools on page 17-394*.
3	Manual Shaft
4	Manual Shaft Detent (w/Shift Position Switch) Lever Assembly
5	Park Pawl Actuator Assembly

Park Pawl Actuator Guide Removal

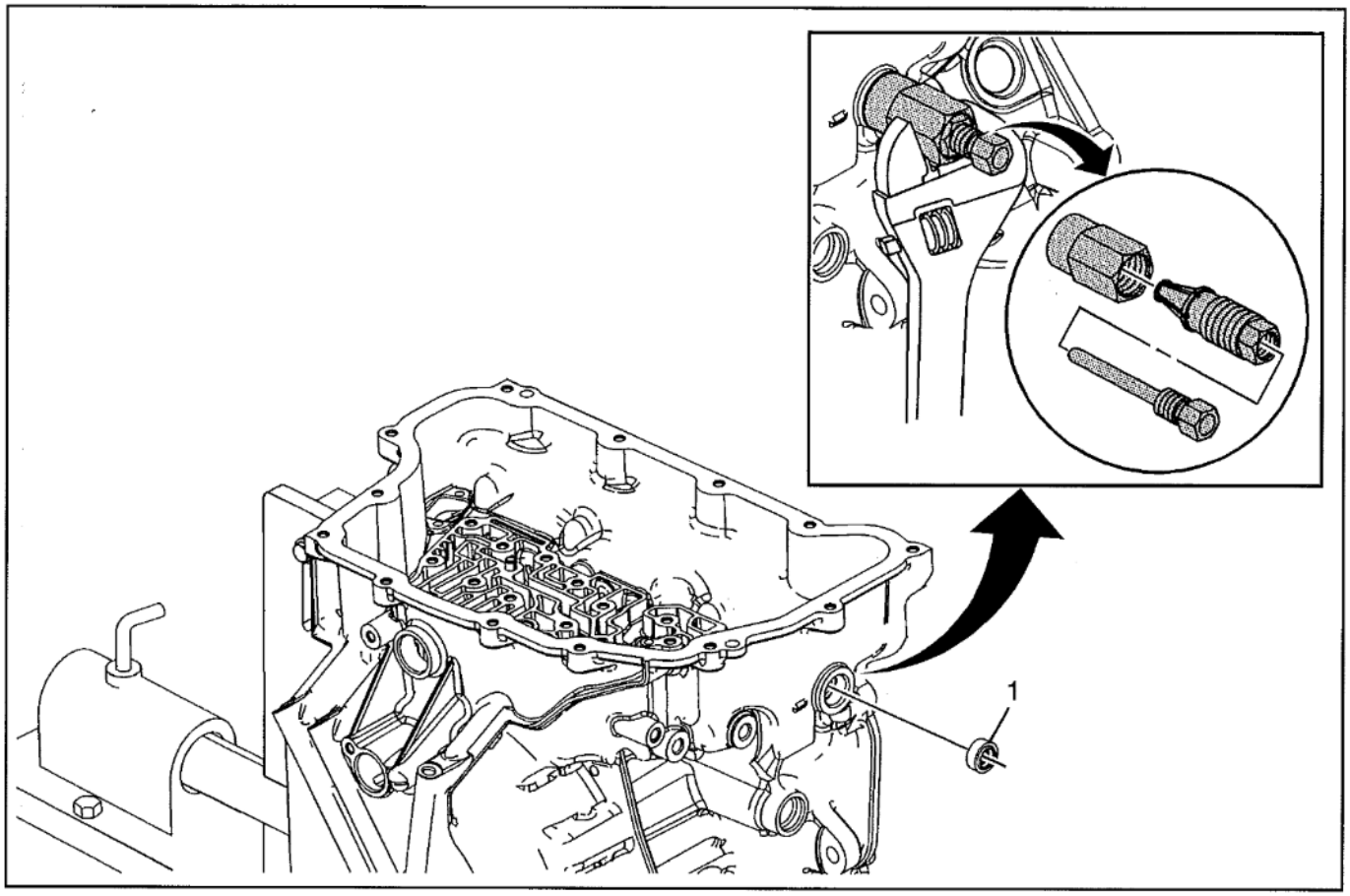


1891314

Park Pawl Actuator Guide Removal

Callout	Component Name
1	Park Pawl Actuator Guide Pin **Tip:** Use side cutter to remove the pin (1) and discard.
2	Park Pawl Actuator Guide Assembly
3	Park Pawl Actuator Guide Assembly Seal **Tip:** Discard the seal. It is not reusable.

Manual Shift Shaft Seal Removal

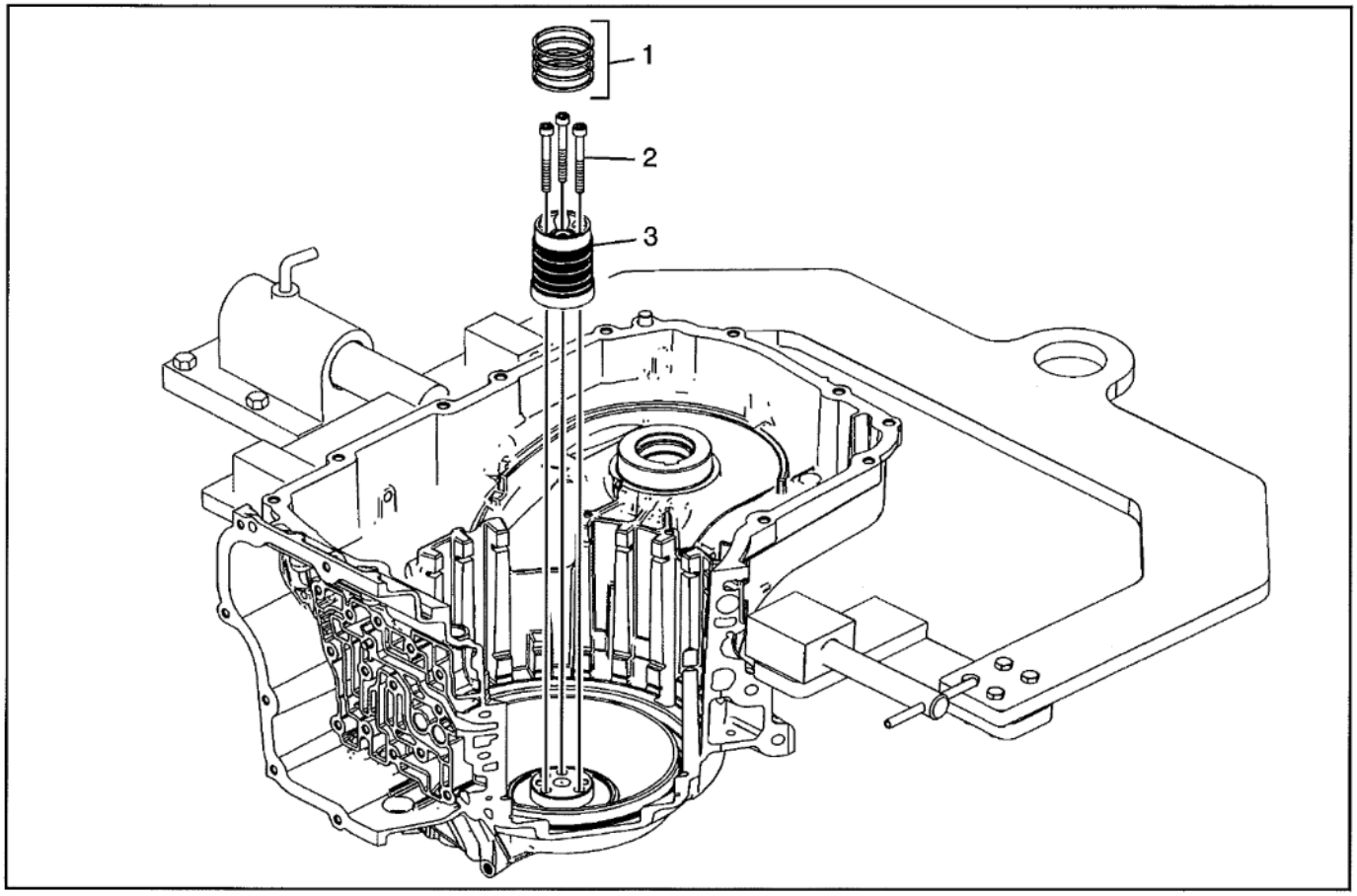


1891412

Manual Shift Shaft Seal Removal

Callout	Component Name
1	Manual Shift Shaft Seal **Tip:** Use the *DT-45201* seal remover to remove the seal to prevent damage to the case surface. **Special Tools** *DT-45201* Seal Remover For equivalent regional tools, refer to *Special Tools on page 17-394*.

Input Shaft Support Replacement (Gen 1)

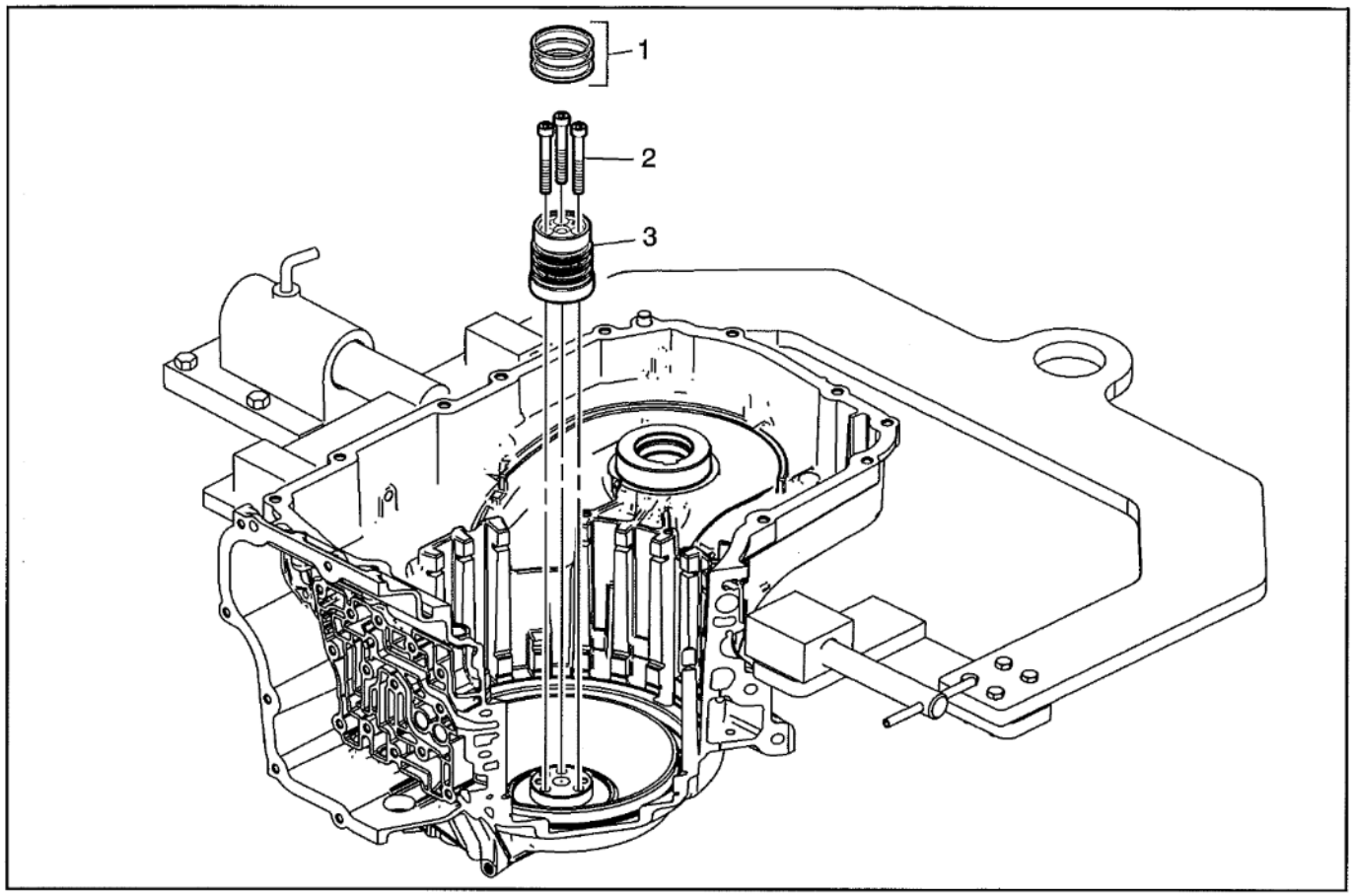


1891321

Input Shaft Support Replacement (Gen 1)

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 4) **Tip:** • Discard the fluid seals. They are not reusable. • Refer to *3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 1) on page 17-243* or *3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2) on page 17-244*.
2	Input Shaft Support Bolts M6 x 50 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 12 N•m (106 lb in)
3	Input Shaft Support **Tip:** Inspect the support for wear, damage or porosity.

Input Shaft Support Replacement (Gen 2)

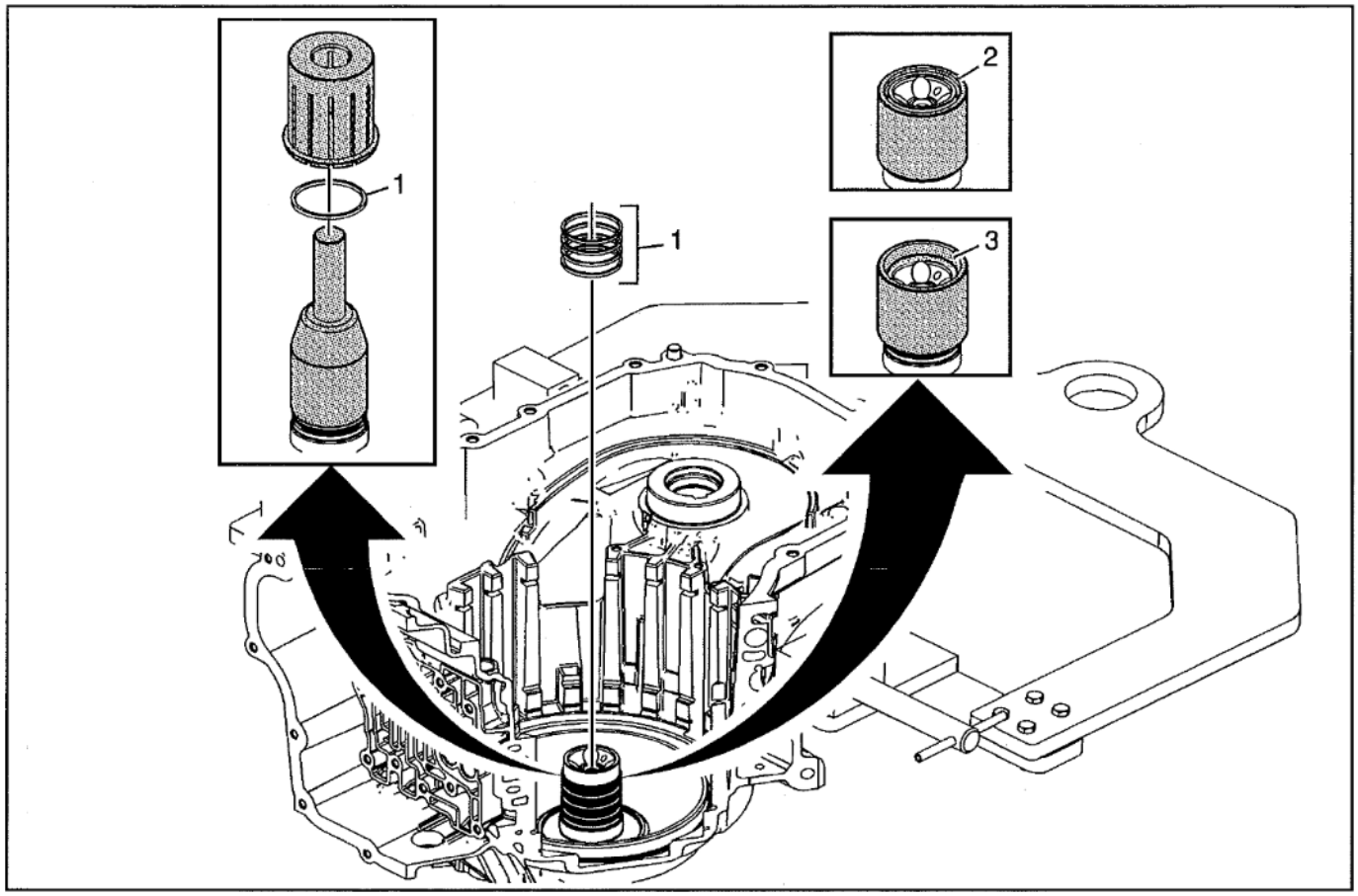


2552948

Input Shaft Support Replacement (Gen 2)

Callout	Component Name
1	3-5 Reverse and 4-5-6 Clutch Fluid Seals (Qty: 3) **Tip:** • Discard the fluid seals. They are not reusable. • Refer to *3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 1) on page 17-243* or *3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2) on page 17-244*.
2	Input Shaft Support Bolts M6 x 50 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 12 N•m (106 lb in)
3	Input Shaft Support **Tip:** Inspect the support for wear, damage or porosity.

3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 1)



1891328

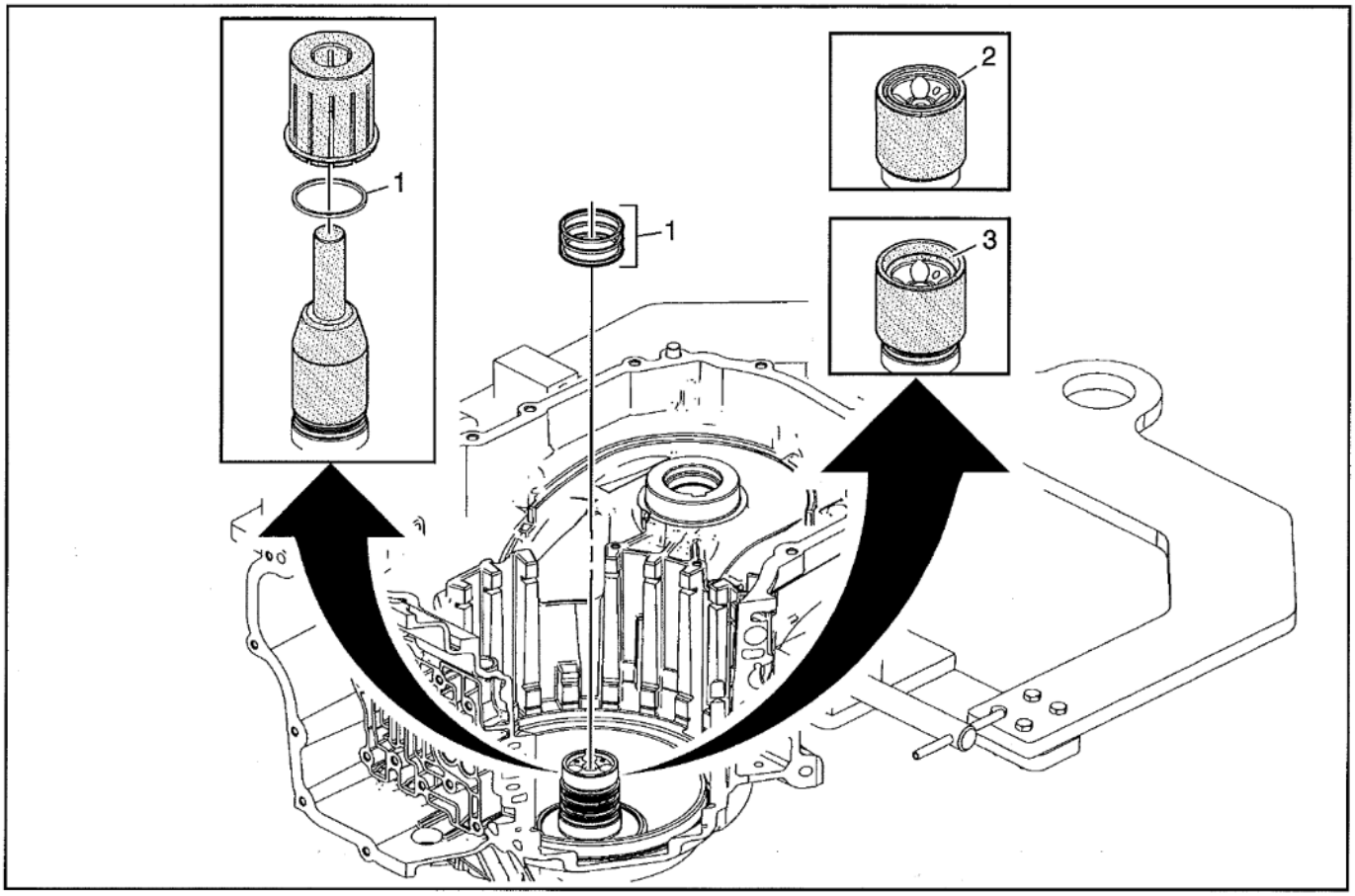
3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 1)

Callout	Component Name
Special Tools *DT-46620* Seal Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.	
1	3–5 Reverse and 4–5–6 Clutch Fluid Seals (Qty: 4) **Procedure** 1. Place DT-46620-3 which is part of *DT-46620* seal installer over the case hub and adjust it so that only the bottom seal ring is exposed. 2. Place a NEW fluid seal ring onto DT-46620-3 which is part of *DT-46620* seal installer. 3. Use DT-46620-2 which is part of *DT-46620* seal installer to push the fluid seal ring down over DT-46620-3 which is part of *DT-46620* seal installer into the hub ring groove. 4. Repeat the above steps to install all 4 seal rings, adjusting DT-46620-3 which is part of *DT-46620* seal installer to the appropriate ring groove.
2	Small Chamfer Up **Caution:** Do not force the seal installer down over the seals as this will roll and damage the seals. The large chamfer is designed to fit over the over stretched seal. Use a hand to help shrink the seal if the seal installer is difficult to install over the seal rings. **Procedure** Install DT-46620-1 which is part of *DT-46620* seal installer with the large chamfer end down over the fluid seal rings and leave DT-46620-1 which is part of *DT-46620* seal installer on the seals for at least 60 seconds.

3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 1) (cont'd)

Callout	Component Name
3	Large Chamfer Up **Procedure** 1. Install DT-46620-1 which is part of *DT-46620* seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. 2. Leaving DT-46620-1 which is part of *DT-46620* seal installer on the fluid seal rings for an extended period of time could cause a fluid leak on the initial clutch piston circuit until the seal rings warm up and expand to the proper dimension.

3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2)



2552950

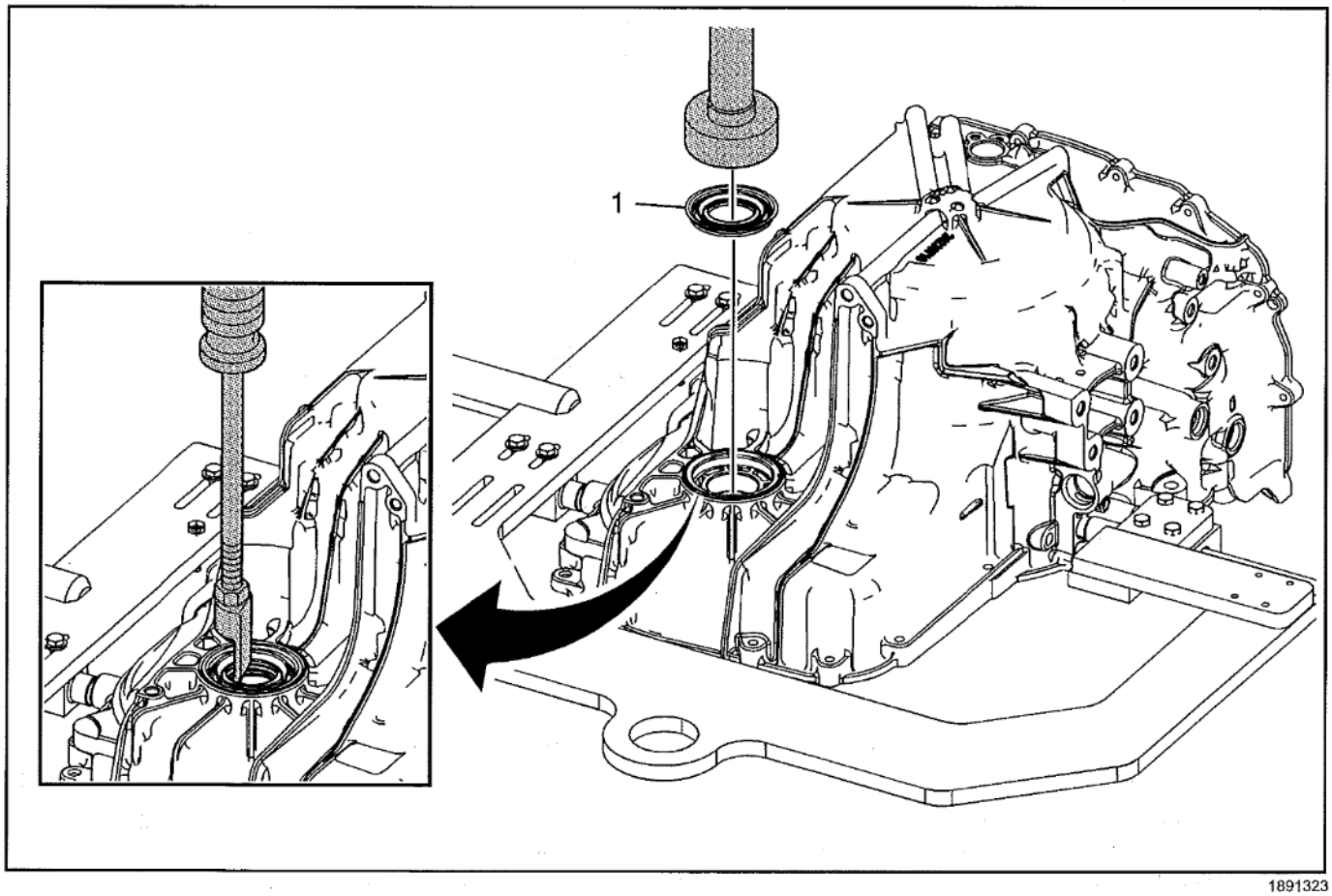
3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2)

Callout	Component Name
Special Tools *DT-46620* Seal Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.	
1	3–5 Reverse and 4–5–6 Clutch Fluid Seals (Qty: 3) **Procedure** 1. Place DT-46620-3 which is part of *DT-46620* seal installer over the case hub and adjust it so that only the bottom seal ring is exposed. 2. Place a NEW fluid seal ring onto DT-46620-3 which is part of *DT-46620* seal installer. 3. Use DT-46620-2 which is part of *DT-46620* seal installer to push the fluid seal ring down over DT-46620-3 which is part of *DT-46620* seal installer into the hub ring groove. 4. Repeat the above steps to install all 3 seal rings, adjusting DT-46620-3 which is part of *DT-46620* seal installer to the appropriate ring groove.

3-5-Reverse and 4-5-6 Clutch Fluid Seal Ring Replacement (Gen 2) (cont'd)

Callout	Component Name
2	Small Chamfer Up **Caution:** Do not force the seal installer down over the seals as this will roll and damage the seals. The large chamfer is designed to fit over the over stretched seal. Use a hand to help shrink the seal if the seal installer is difficult to install over the seal rings. **Procedure** Install DT-46620-1 which is part of *DT-46620* seal installer with the large chamfer end down over the fluid seal rings and leave DT-46620-1 which is part of *DT-46620* seal installer on the seals for at least 60 seconds.
3	Large Chamfer Up **Procedure** 1. Install DT-46620-1 which is part of *DT-46620* seal installer with the small chamfer end facing down for at least 60 seconds. This will properly size the bottom seal ring. 2. Leaving DT-46620-1 which is part of *DT-46620* seal installer on the fluid seal rings for an extended period of time could cause a fluid leak on the initial clutch piston circuit until the seal rings warm up and expand to the proper dimension.

Front Wheel Drive Shaft Seal Replacement - Case Side

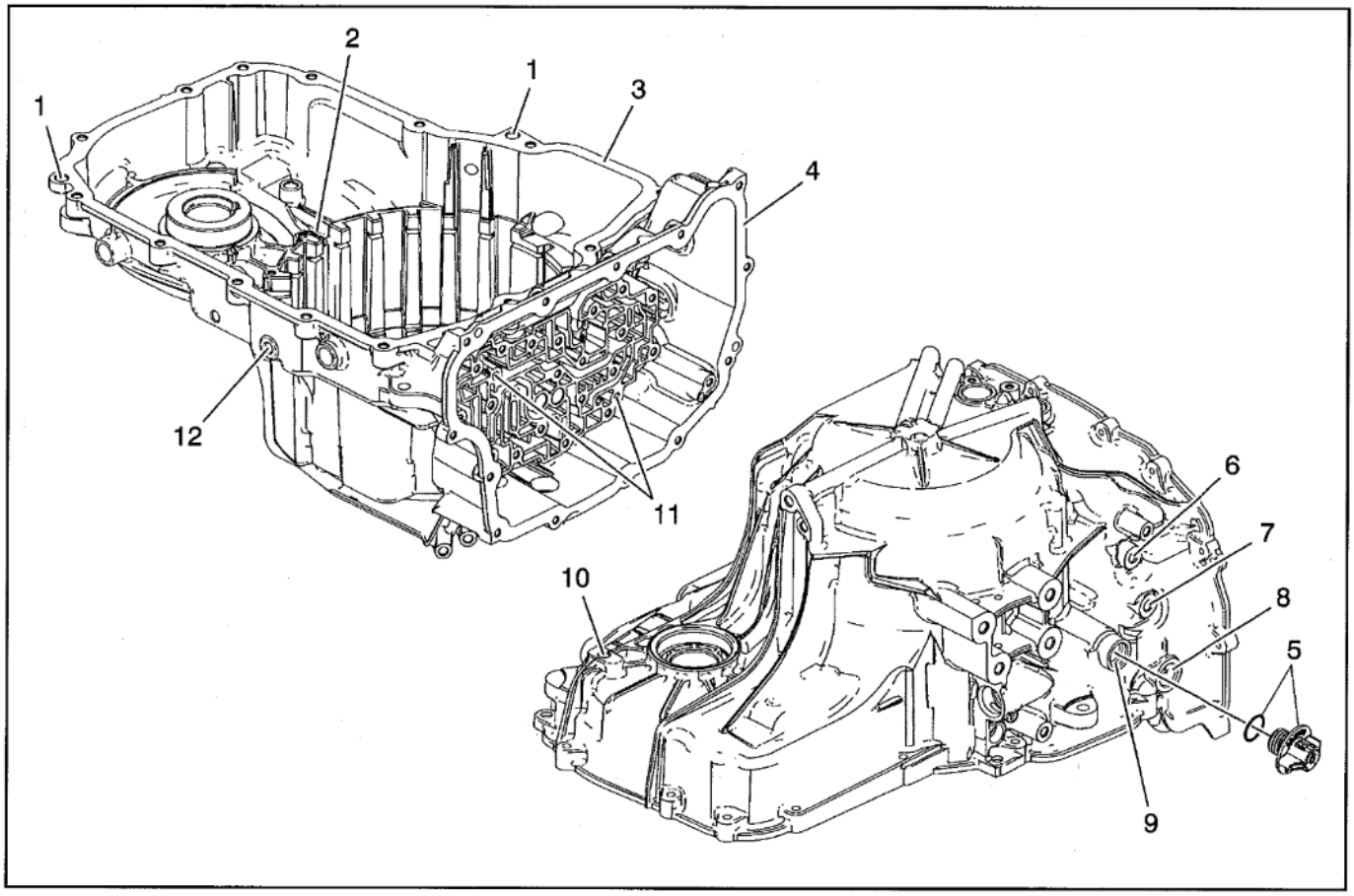


1891323

Front Wheel Drive Shaft Seal Replacement - Case Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal **Special Tools** • *DT-23129* Universal Seal Remover • *DT-47790* Seal Installer • *GE-6125-1B* Slide Hammer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 17-394*.

Transmission Case Cleaning and Inspection



2366241

Transmission Case Cleaning and Inspection

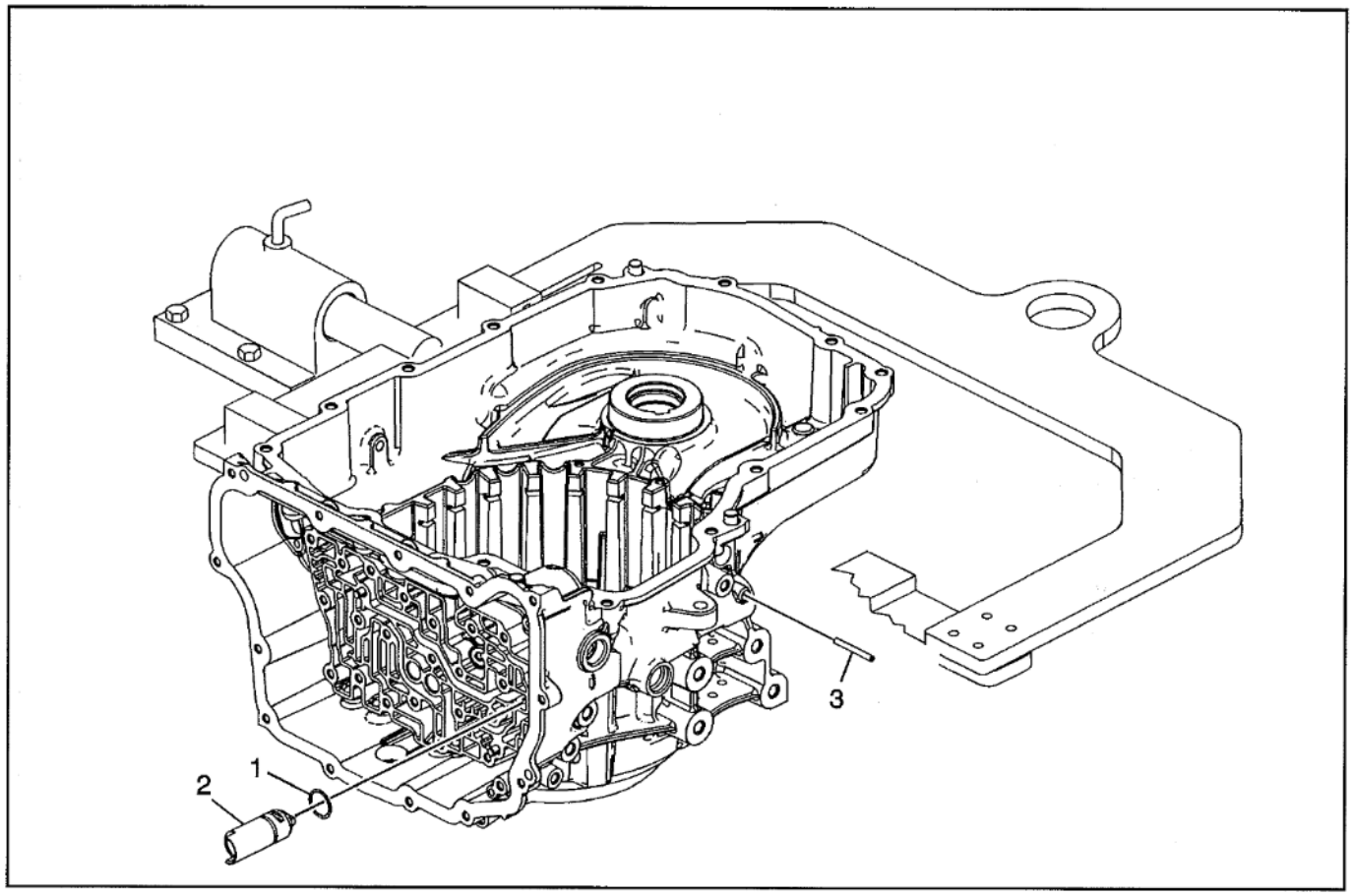
Callout	Component Name
	Caution: Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks. **Caution:** After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Preliminary Procedures** 1. Thoroughly clean the transmission case assembly, including case threads, with clean solvent. 2. Clean gasket sealing surfaces. Remove all residual gasket material. 3. Inspect all threaded holes. If necessary, repair any thread damage.
1	Torque Converter Housing Locating Pin **Procedure** Inspect the torque converter housing locating pins.

Transmission Case Cleaning and Inspection (cont'd)

Callout	Component Name
	Specification The locating pins installed height is 7.4 mm (0.29 in).
2	Fluid Trough Check Ball **Specification** The check ball installed depth is 11 mm (0.43 in).
3	Converter Housing Sealing Surface
4	Control Valve Body Cover Sealing Surface
5	Fill Cap Seal
6	Transmission Fluid Cooler Pipe Sealing Surface
7	Fluid Pressure Test Plug **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)
8	Manual Shift Shaft Seal Surface
9	Fluid Fill Cap Sealing Surface
10	Fluid Level Plug **Tighten** 12 N•m (106 lb in)
11	Valve Body Locating Pin **Procedure** Inspect the valve body locating pins. **Specification** The locating pins installed height is 5.8 mm (0.22 in).
12	Drain Plug **Tighten** 12 N•m (106 lb in)

Manual Shift Detent Lever with Shaft Position Switch Assembly and Park Pawl Actuator Installation

Park Pawl Actuator Guide Installation

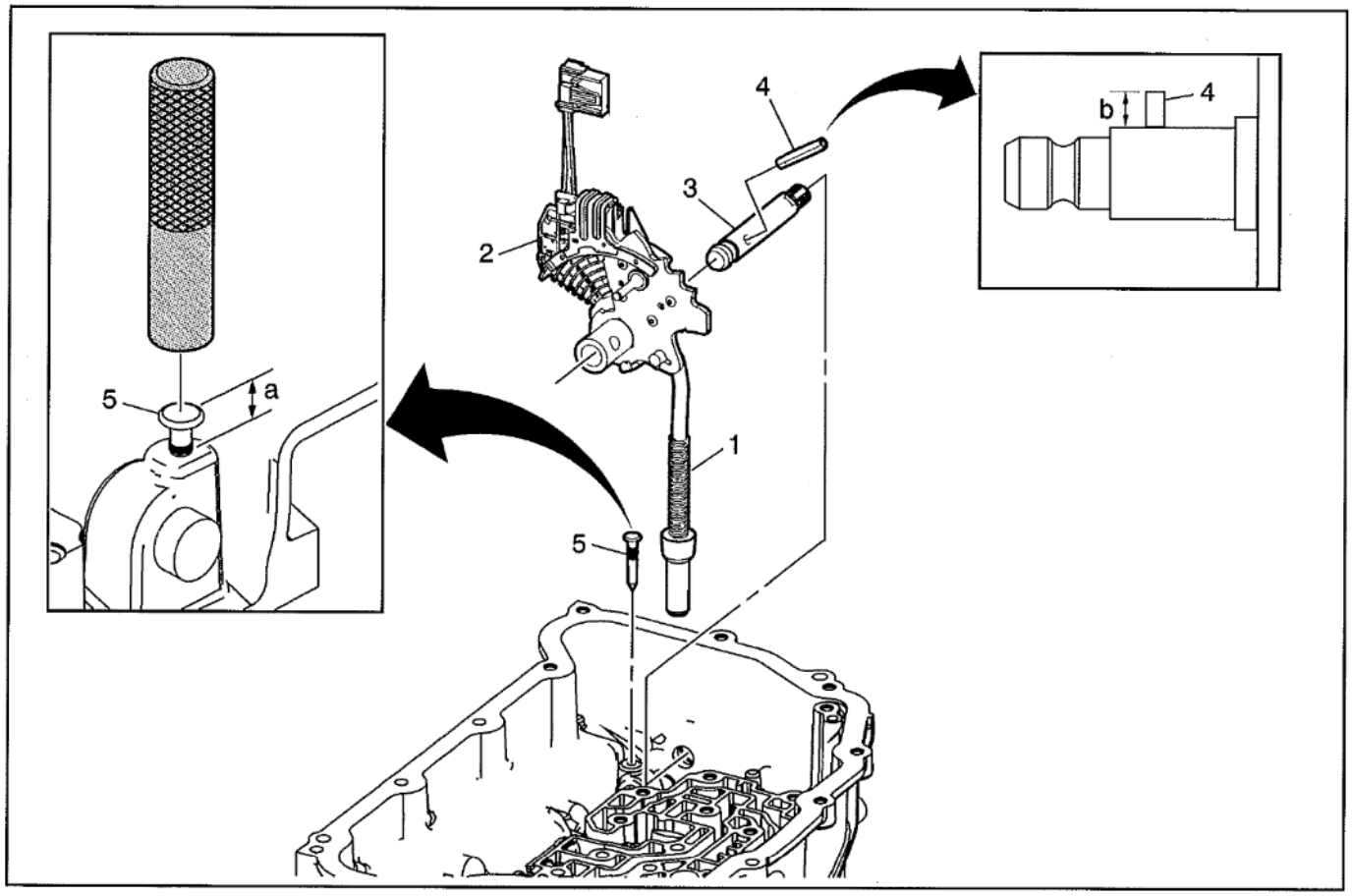


1891435

Park Pawl Actuator Guide Installation

Callout	Component Name
1	Park Pawl Actuator Guide Assembly Seal
2	Park Pawl Actuator Guide Assembly
3	Park Pawl Actuator Guide Pin **Caution:** Refer to *Fastener Caution on page 0-8.* **Procedure** Install the park pawl actuator guide pin to correct height. **Tighten** 7.2 mm (0.28 in)

Park Pawl Actuator Installation



1891436

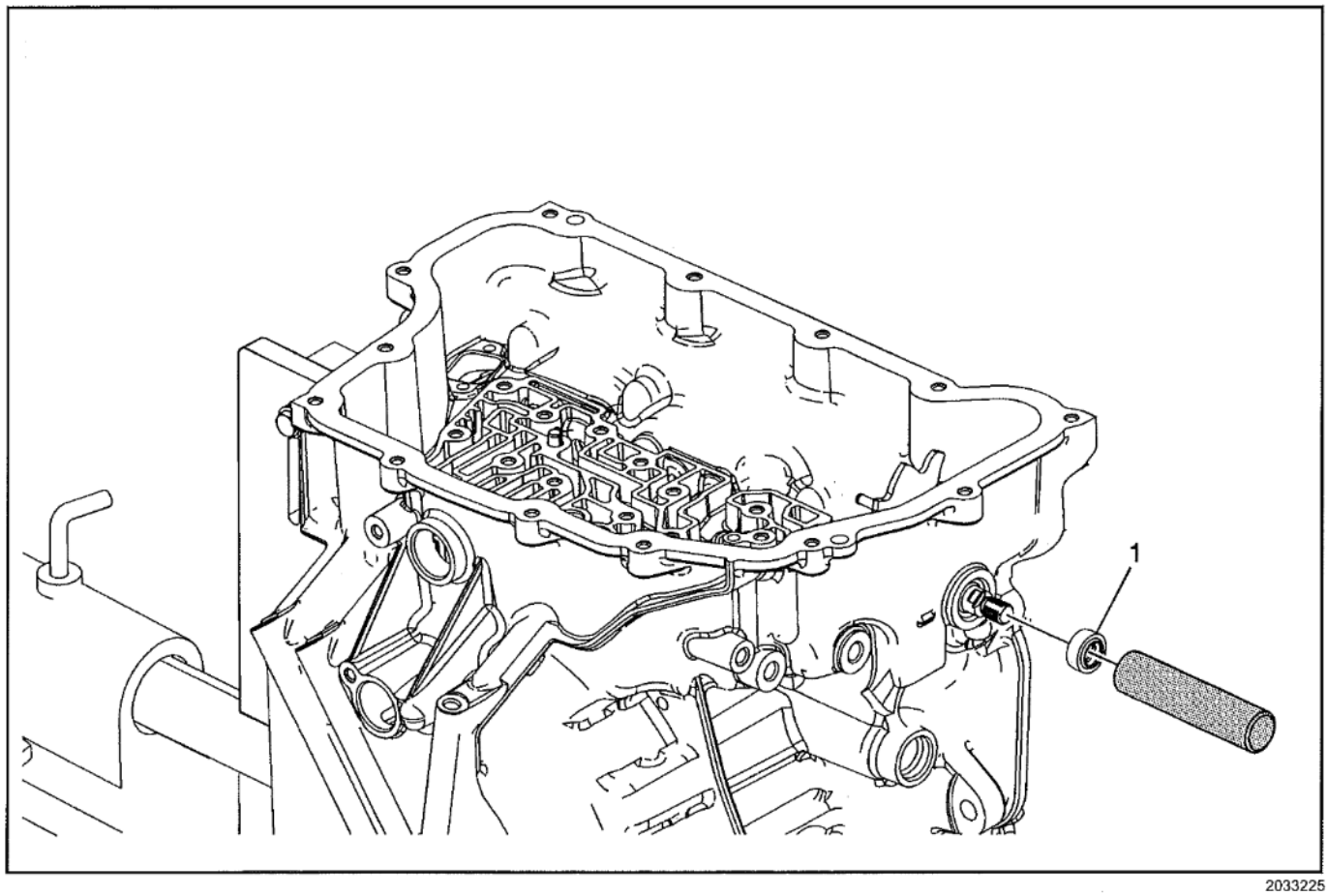
Park Pawl Actuator Installation

Callout	Component Name
1	Park Pawl Actuator Assembly
2	Manual Shift Detent (w/Shaft Position Switch) Lever Assembly
3	Manual Shaft **Tip:** Lubricate the shaft with ATF to prevent damage to the manual shift shaft seal during installation.
4	Manual Shaft Detent Lever Hub Pin **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** Install the manual shaft detent lever hub pin to correct height. **Tip:** Use a NEW pin to ensure proper engagement with the shaft. **Specification** 7.9 mm (0.38 in) (b) **Special Tools** *DT-48550* Detent Lever Pin Remover For equivalent regional tools, refer to *Special Tools on page 17-394*.

Park Pawl Actuator Installation (cont'd)

Callout	Component Name
5	Manual Shift Shaft Pin **Caution:** Use the manual shaft pin installer to install the pin at the correct height in order to properly secure the manual shaft. If you install the pin too deep, the case bore may crack. **Procedure** Inspect pin installed height is within specifications. **Tip:** Use a NEW pin to ensure proper engagement with the case. **Specification** 7.2–8.2 mm (0.28–0.32 in) (a) **Special Tools** *DT-41229* Manual Shaft Pin Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.

Manual Shift Shaft Seal Installation

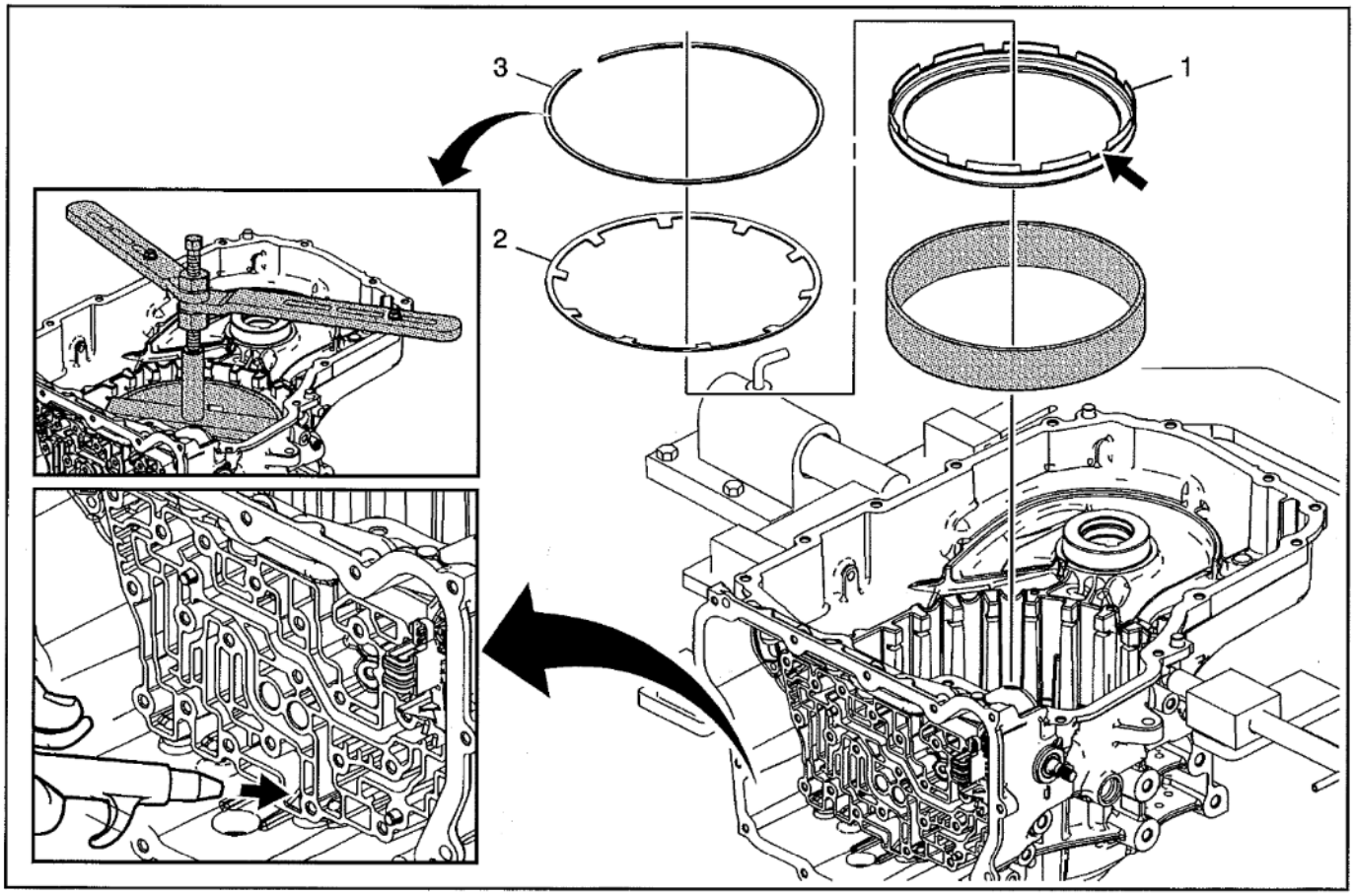


2033225

Manual Shift Shaft Seal Installation

Callout	Component Name
1	Manual Shift Shaft Seal **Special Tool** *DT-49101* Seal Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.

2-6 Clutch Piston Installation (6T30)

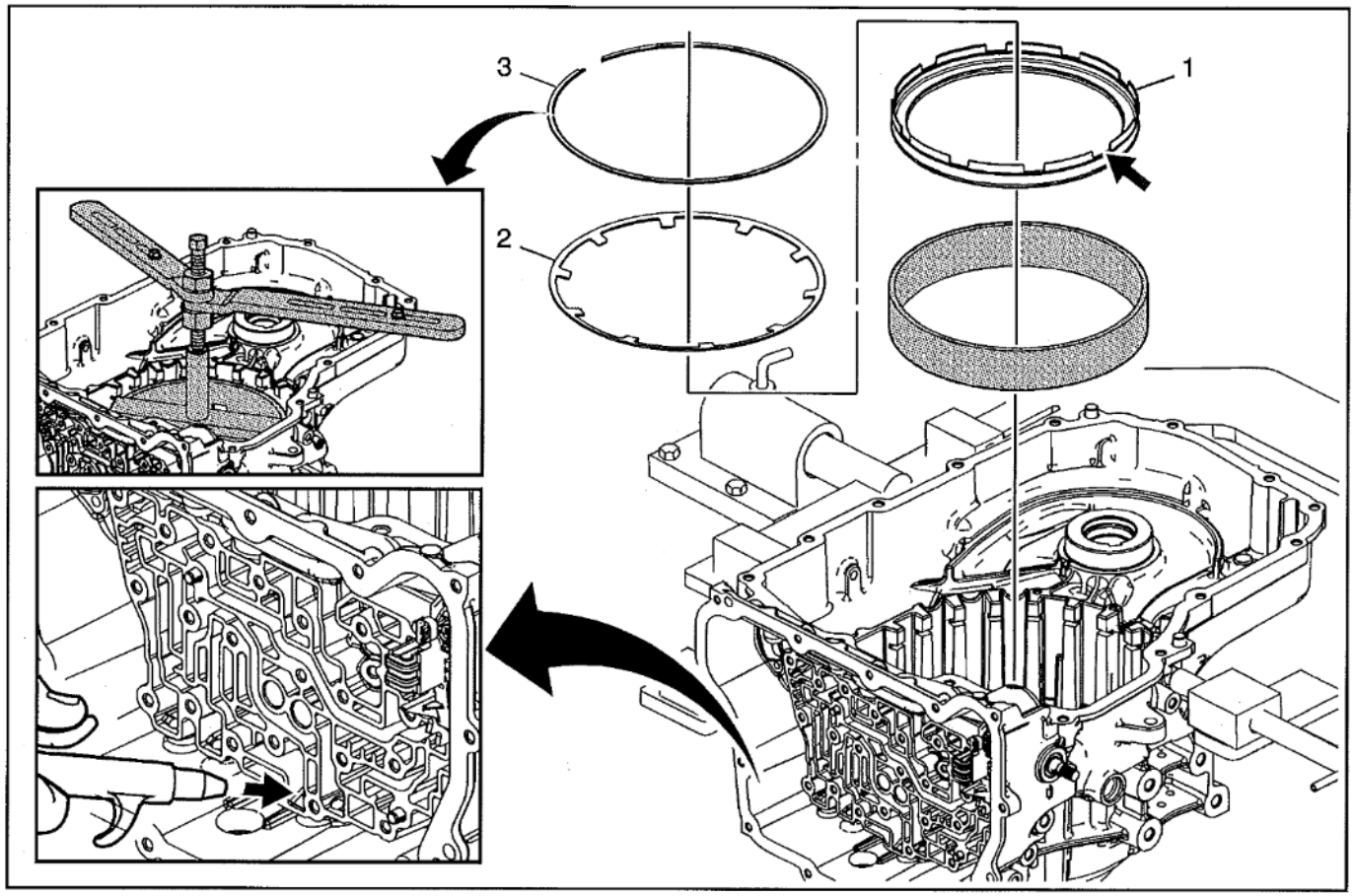


1891330

2-6 Clutch Piston Installation (6T30)

Callout	Component Name
1	2–6 Clutch Piston Assembly **Tip:** • Position the 2–6 piston air bleed and large slot toward the top of the case. • *DT-48271* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the *DT-48271* seal protector to ease installation of the piston. **Special Tool** *DT-48271* Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	2–6 Clutch Spring
3	2–6 Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** • Place the retainer on the 2-6 clutch spring and align the retainer opening with the largest gap in the case splines toward the bottom of the case. The retainer opening should be supported by a spline tooth of the case. • Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. **Special Tools** • *DT-48272* Spring Installer • *DT-48056* Spring Compressor Bridge For equivalent regional tools, refer to *Special Tools on page 17-394*.

2-6 Clutch Piston Installation (6T40/45/50)

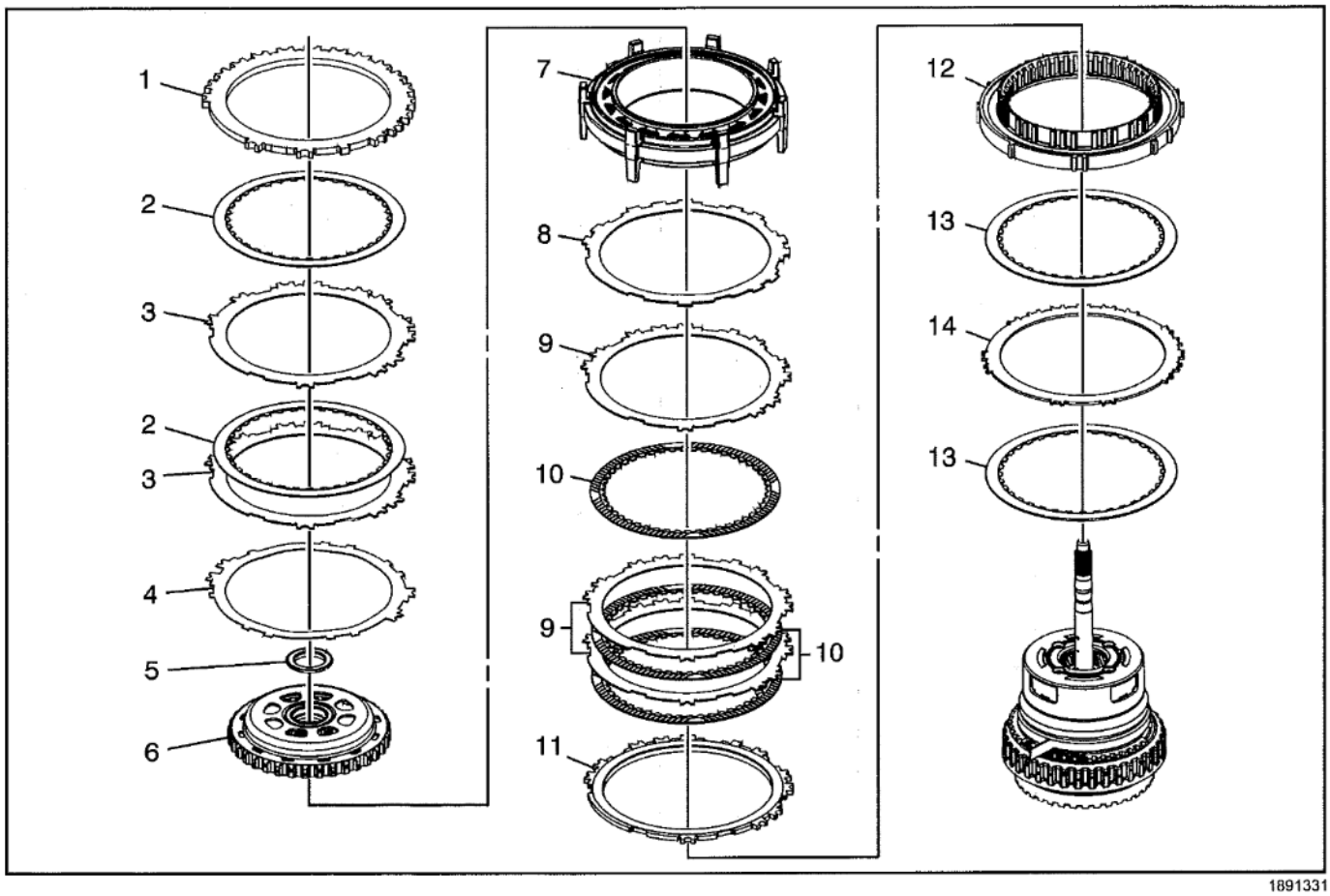


1891330

2-6 Clutch Piston Installation (6T40/45/50)

Callout	Component Name
1	2–6 Clutch Piston Assembly **Tip:** • Position the 2–6 piston air bleed and large slot toward the top of the case. • *DT-47796* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the *DT-47796* seal protector to ease installation of the piston. **Special Tool** *DT-47796* Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	2–6 Clutch Spring
3	2–6 Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** • Place the retainer on the 2-6 clutch spring and align the retainer opening with the largest gap in the case splines toward the bottom of the case. The retainer opening should be supported by a spline tooth of the case. • Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. **Special Tools** • *DT-47797* Spring Installer • *DT-48056* Spring Compressor Bridge For equivalent regional tools, refer to *Special Tools on page 17-394*.

Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 1)

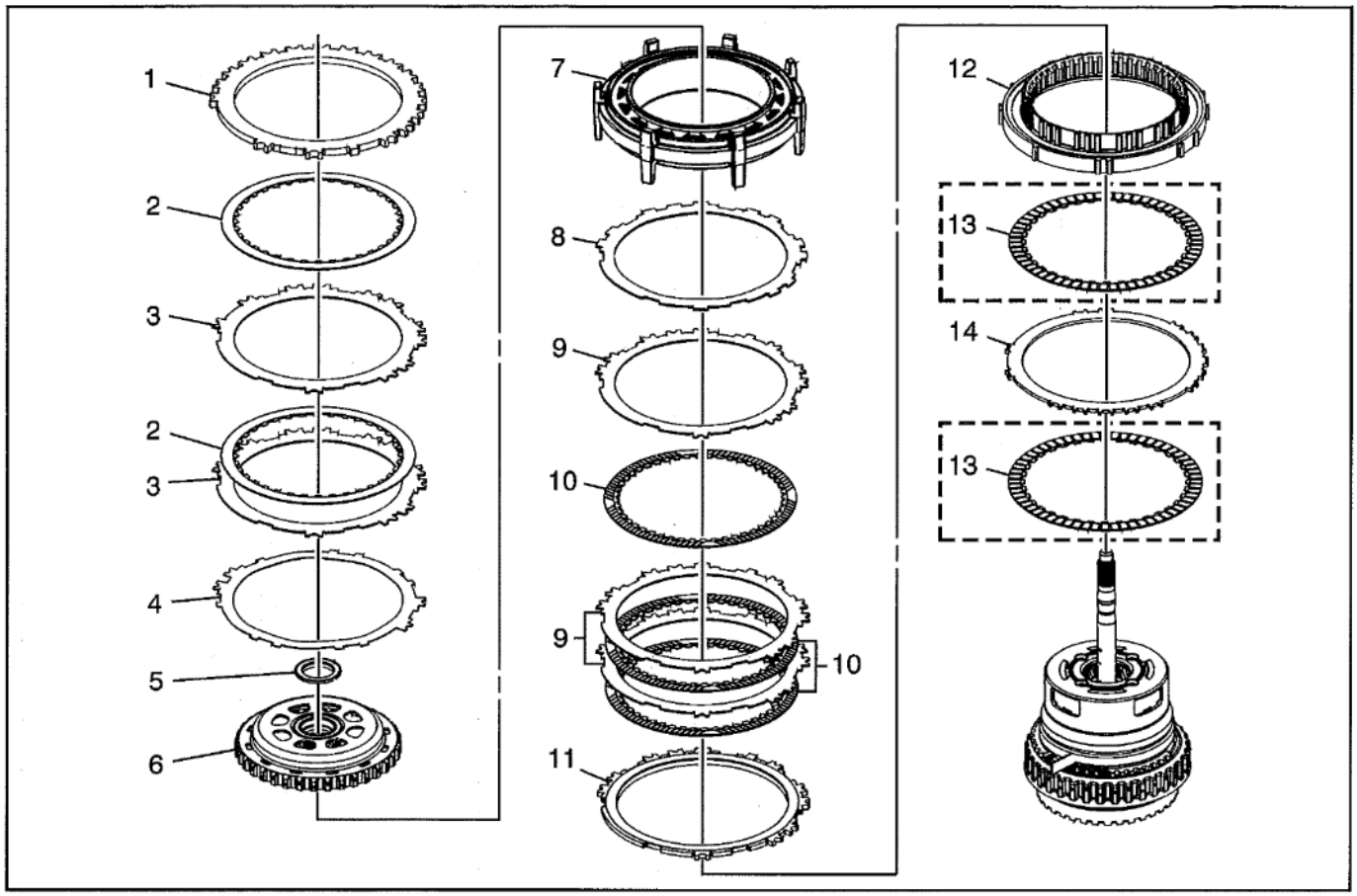


1891331

Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 1)

Callout	Component Name
1	1–2–3–4 Clutch Backing Plate
2	1–2–3–4 Clutch Plate Assembly (Qty: 2)
3	1–2–3–4 Clutch Plate (Qty: 2)
4	1–2–3–4 Clutch Waved Plate
5	Output Sun Gear Thrust Bearing Assembly **Tip:** The sun gear thrust bearing may be stuck to the driven sprocket hub.
6	Output Sun Gear Assembly
7	Low-Reverse and 1–2–3–4 Clutch Housing Assembly
8	Low and Reverse Clutch Apply Plate
9	Low and Reverse Clutch Plate (Qty: 3)
10	Low and Reverse Clutch Plate Assembly (Qty: 3)
11	Low and Reverse Clutch Backing Plate
12	Low and Reverse Clutch Assembly (OWC)
13	2–6 Clutch Plate Assembly (Qty: 2)
14	2–6 Clutch Plate (Qty: 1)

Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 2)

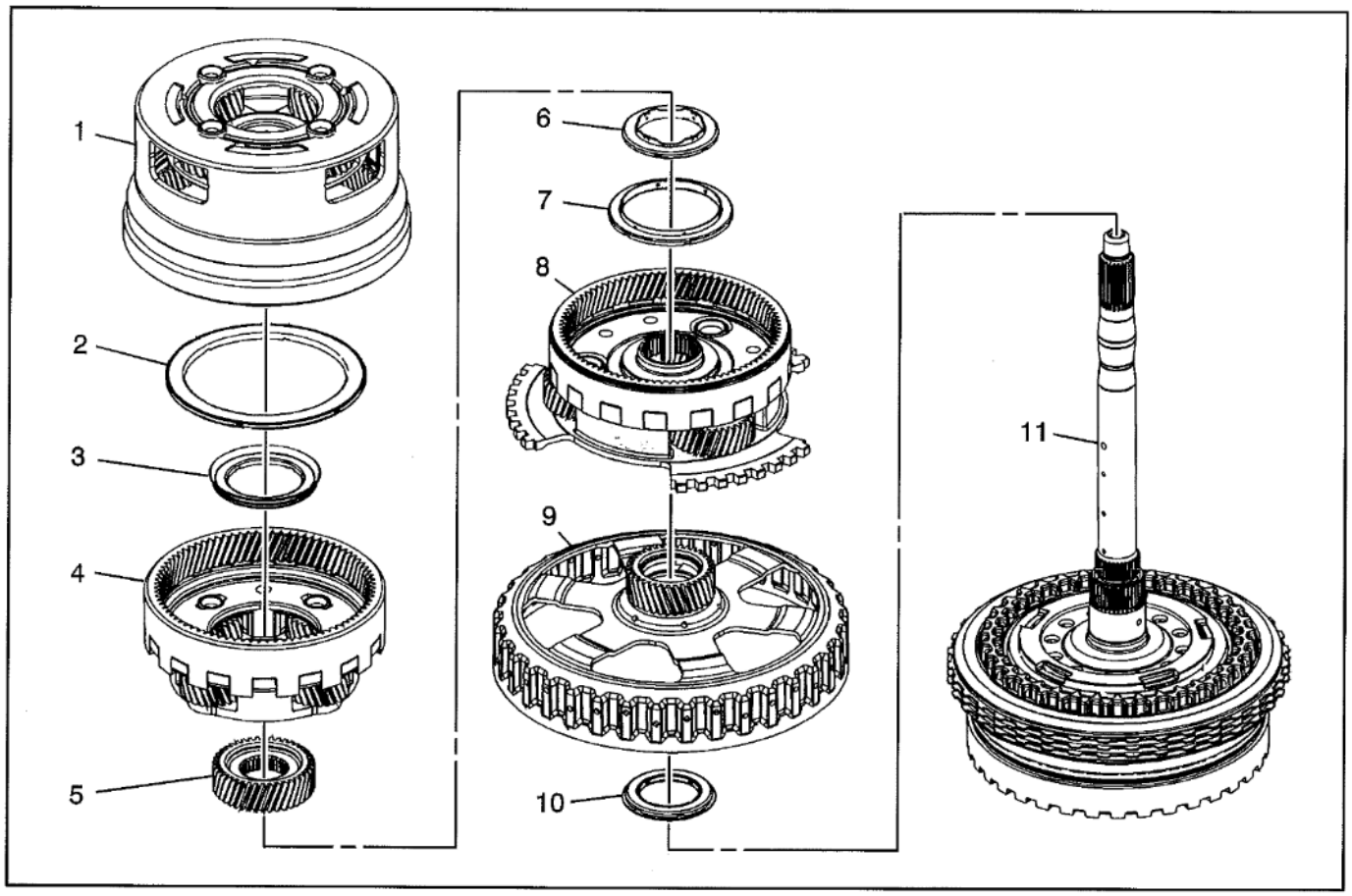


2552951

Low and Reverse and 1-2-3-4 Clutch Housing, Low and Reverse Clutch Assembly, Output Sun Gear, and 2-6 Clutch Plate Disassemble (Gen 2)

Callout	Component Name
1	1–2–3–4 Clutch Backing Plate
2	1–2–3–4 Clutch Plate Assembly (Qty: 2)
3	1–2–3–4 Clutch Plate (Qty: 2)
4	1–2–3–4 Clutch Waved Plate
5	Output Sun Gear Thrust Bearing Assembly **Note:** The sun gear thrust bearing may be stuck to the driven sprocket hub.
6	Output Sun Gear Assembly
7	Low-Reverse and 1–2–3–4 Clutch Housing Assembly
8	Low and Reverse Clutch Apply Plate
9	Low and Reverse Clutch Plate (Qty: 3)
10	Low and Reverse Clutch Plate Assembly (Qty: 3)
11	Low and Reverse Clutch Backing Plate
12	Low and Reverse Clutch Assembly (OWC)
13	2–6 Clutch Plate Assembly (Qty: 2) - Model Dependent **Note:** The number of grooves in the clutch plate friction material varies depending on model.
14	2–6 Clutch Plate (Qty: 1)

Input, Reaction, and Output Carrier Disassemble



1891335

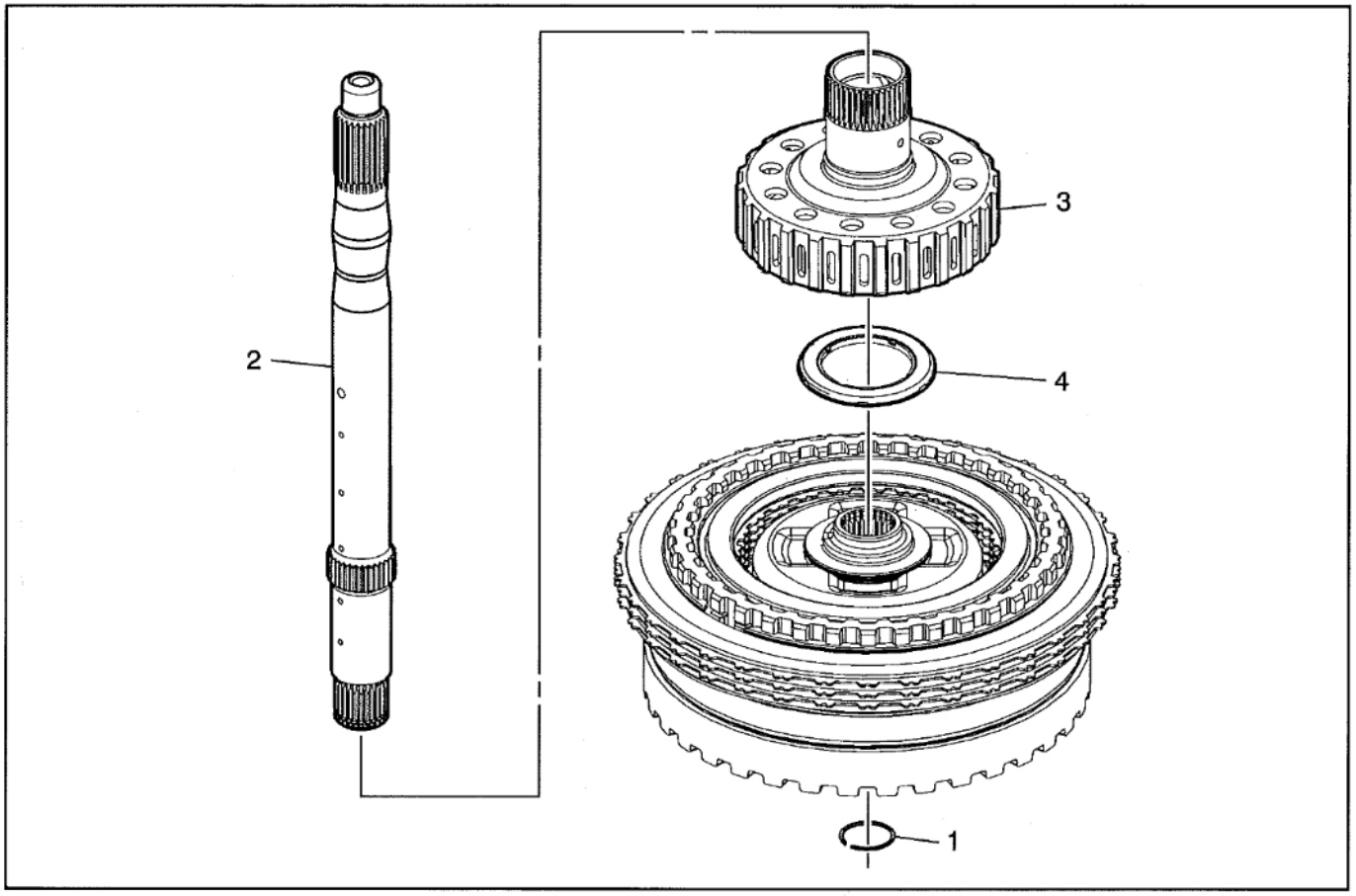
Input, Reaction, and Output Carrier Disassemble

Callout	Component Name
1	Output Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
2	Output Carrier Thrust Bearing Assembly
3	Input Sun Gear Thrust Bearing Assembly
4	Input Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
5	Input Sun Gear
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Thrust Bearing Assembly
8	Reaction Carrier Assembly **Note:** Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models. **Original Configuration:** • The 6T30 and 6T40 had 3 pinions. • The 6T45 and 6T50 had 4 pinions.
9	Reaction Carrier Sun Gear Assembly
10	Reaction Carrier Sun Gear Thrust Bearing **Note:** The sun gear thrust bearing may be stuck to the sun gear.

Input, Reaction, and Output Carrier Disassemble (cont'd)

Callout	Component Name
11	3–5 Reverse and 4–5–6 Clutch Housing Assembly

3-5-Reverse and 4-5-6 Clutch Housing Disassemble (6T30/40/45/50 - Gen 2)
Turbine Shaft, Reluctor Wheel and Piston Removal

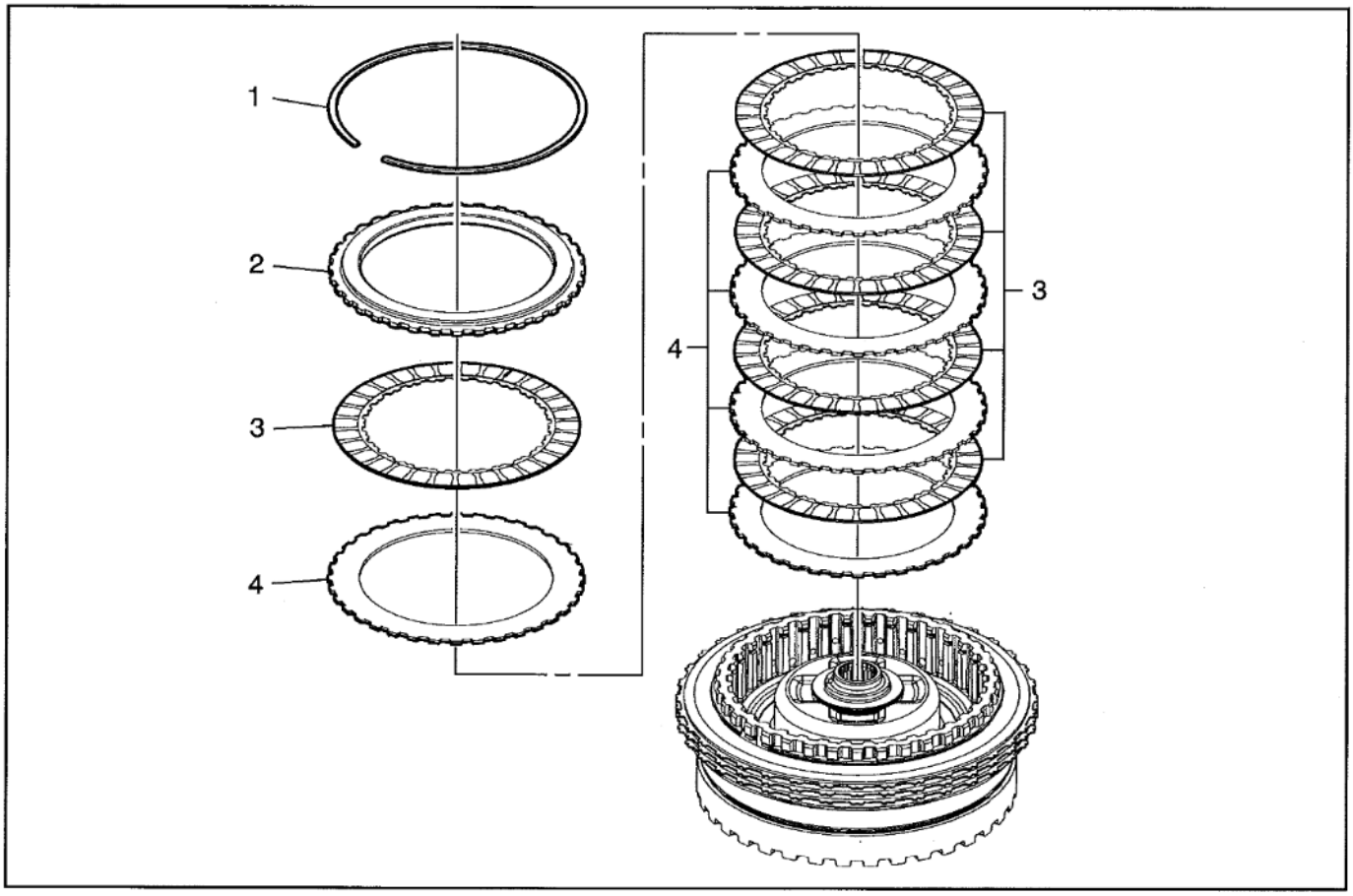


2552953

Turbine Shaft, Reluctor Wheel and Piston Removal

Callout	Component Name
1	Turbine Shaft Retainer Ring **Tip:** Discard the retainer ring. It is not re-usable. **Special Tools** *GE 5586-A* Snap Ring Pliers or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Turbine Shaft
3	Reaction Carrier Hub Assembly
4	Reaction Carrier Hub Thrust Bearing Assembly

4–5–6 Clutch Plate Removal

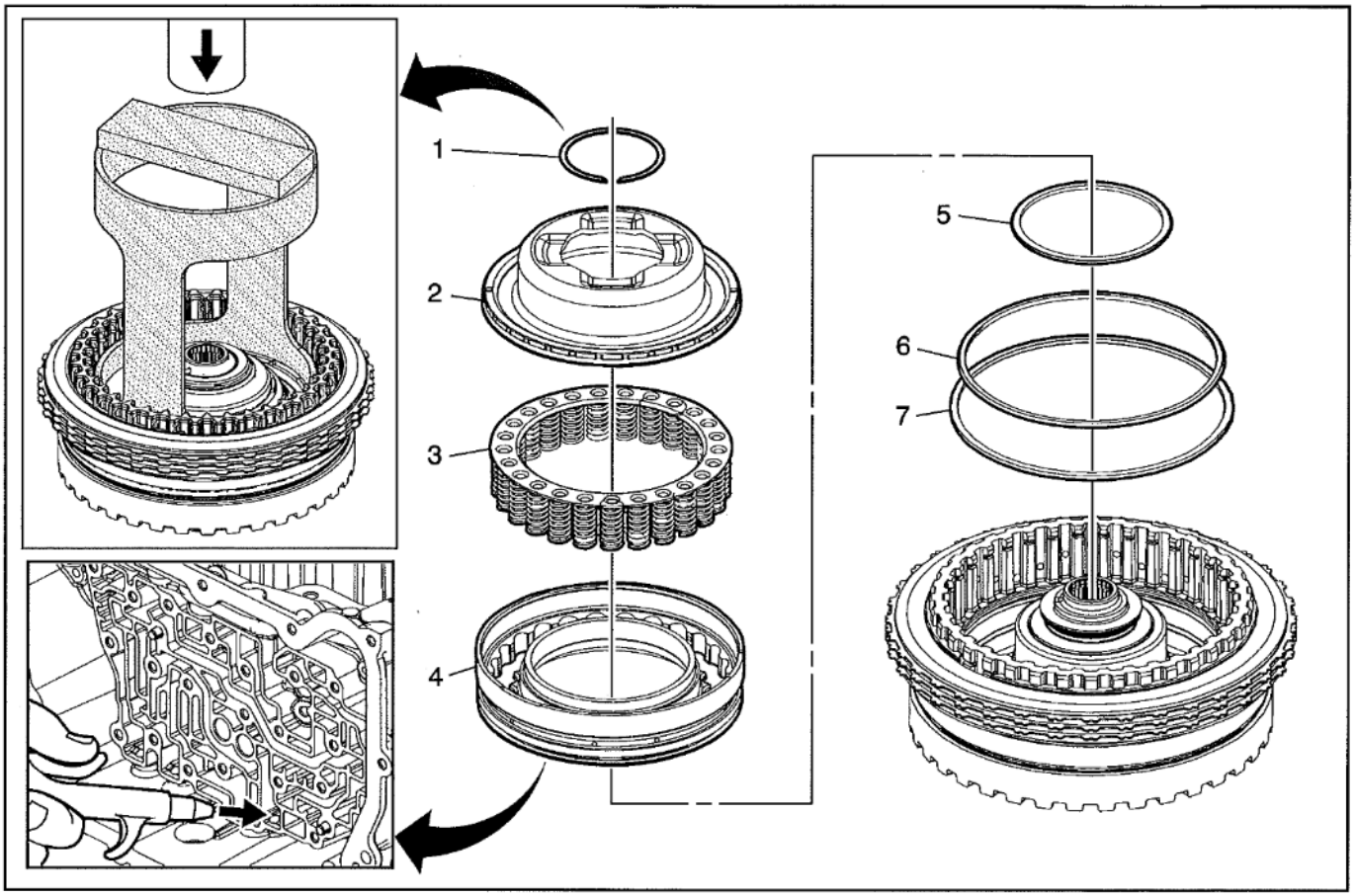


2552955

4–5–6 Clutch Plate Removal

Callout	Component Name
1	4–5–6 Clutch Backing Plate Retaining Ring
2	4–5–6 Clutch Backing Plate
3	4–5–6 Clutch Plate Assembly (Qty: 5)
4	4–5–6 Clutch Plate (Gen 2 – Qty: 5)

4–5–6 Clutch Piston Removal

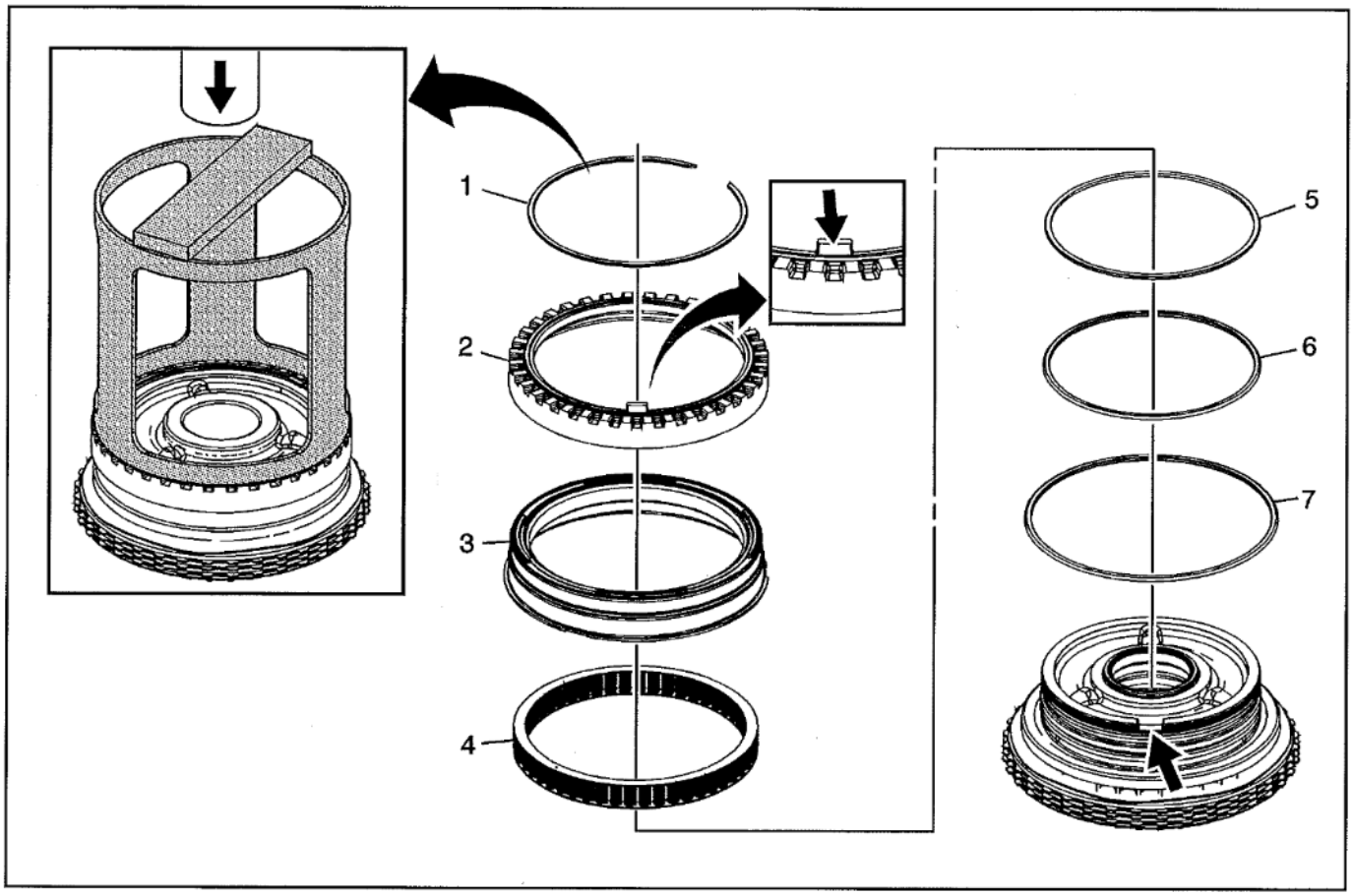


2552957

4–5–6 Clutch Piston Removal

Callout	Component Name
1	4–5–6 Clutch Dam Retaining Ring **Tip:** The 4-5-6 clutch dam retaining ring is not reusable. **Special Tools** • *DT-47951-2* Spring Compressor • *GE 5586-A* Snap Ring Pliers or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	4–5–6 Clutch Piston Fluid Dam Assembly **Procedure** 1. Place the 3–5 reverse and 4–5–6 clutch housing onto the support hub in the case. 2. Apply shop air to the 4–5–6 clutch feed hole using a rubber tipped air gun to dislodge the dam piston and the 4–5–6 clutch piston from the clutch housing.
3	4–5–6 Clutch Piston Return Spring Assembly
4	4–5–6 Clutch Piston **Tip:** Apply shop air to the 4–5–6 clutch feed hole using a rubber tipped air gun to dislodge the clutch piston.
5	4–5–6 Clutch Piston Inner Seal
6	4–5–6 Clutch Piston Outer Seal (Dark Blue) (Stepped)
7	4–5–6 Clutch Piston Outer Seal (Large) (Rounded)

Reluctor Wheel and Piston Removal

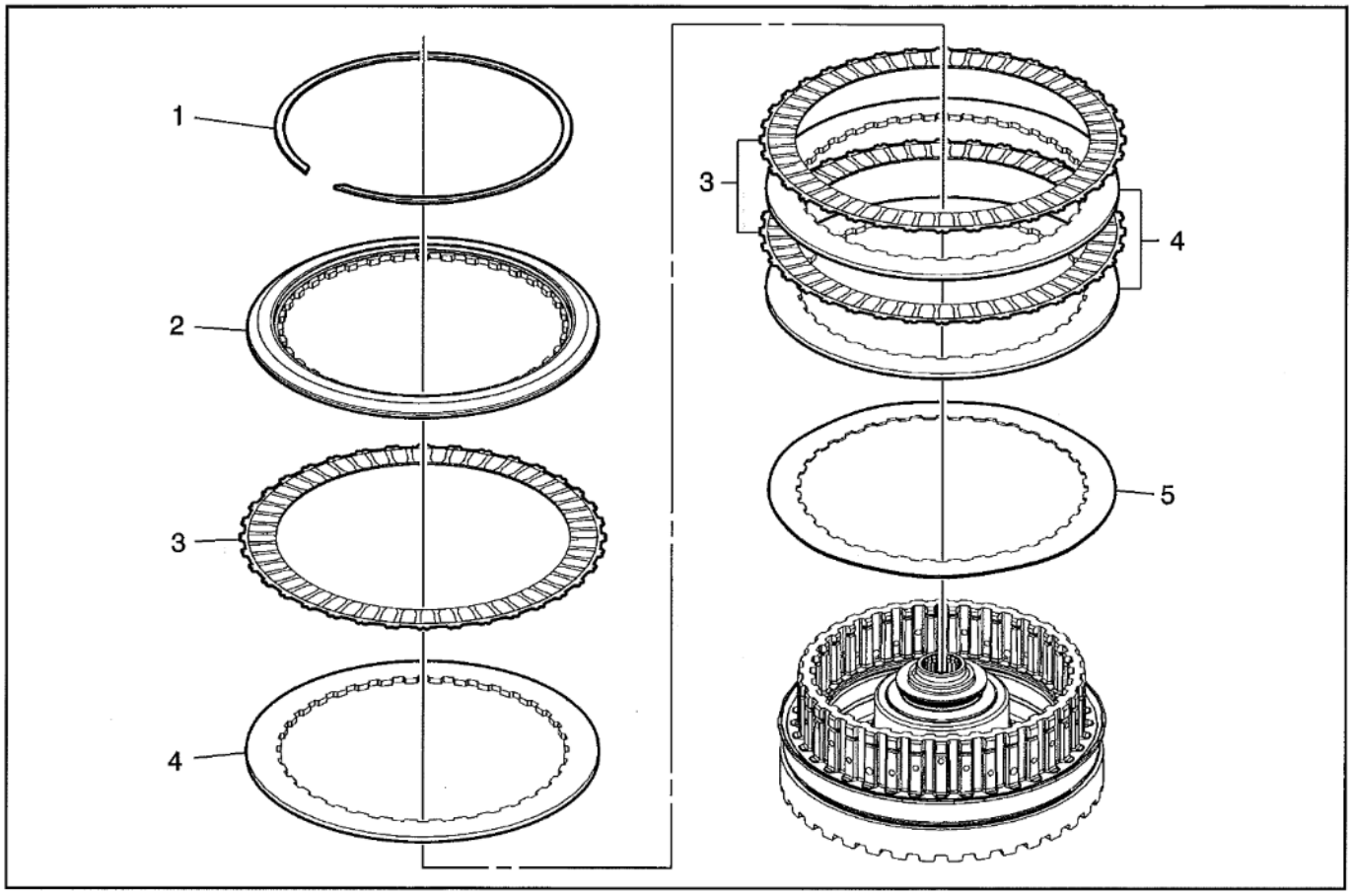


1891344

Reluctor Wheel and Piston Removal

Callout	Component Name
1	Input Shaft Speed Sensor Reluctor Ring Retainer Ring **Caution:** Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. **Special Tool** *DT-47694* Piston Spring Compressor For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Input Shaft Speed Sensor Reluctor Wheel
3	3–5 Reverse Clutch Piston
4	3–5 Reverse Clutch Piston Return Spring Assembly
5	3–5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
6	3–5 Reverse Clutch Piston Inner Seal
7	3–5 Reverse Clutch Piston Dam Seal (Black)

3–5 Reverse Clutch Plate Removal



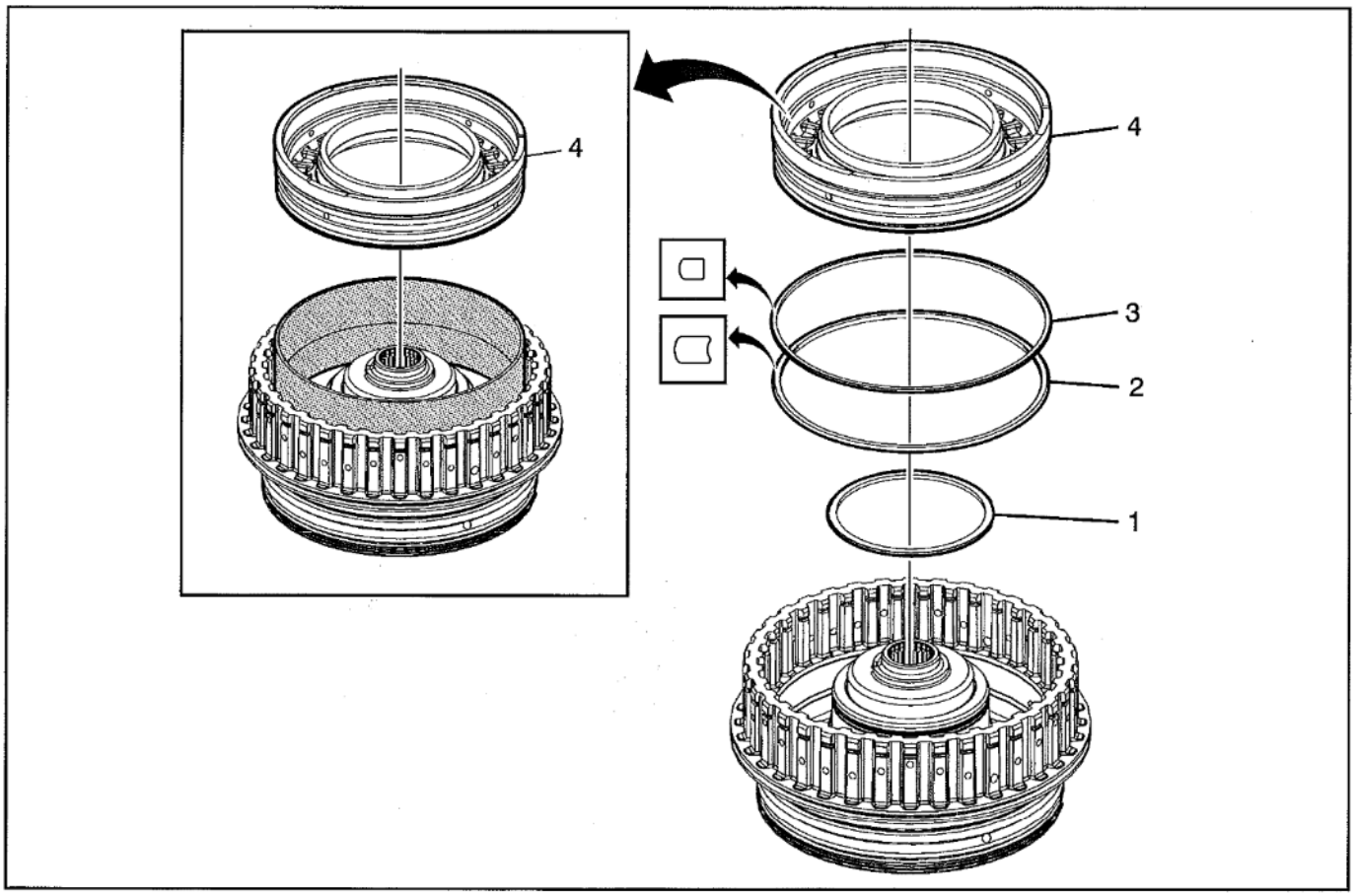
2552958

3–5 Reverse Clutch Plate Removal

Callout	Component Name
1	3–5 Reverse Clutch Backing Plate Ring Retainer Ring **Tip:** Gently push down on the backing plate to get enough clearance between the backing plate and retainer.
2	3–5 Reverse Clutch Backing Plate
3	3–5 Reverse Clutch Plate Assembly (Qty: 3)
4	3–5 Reverse Clutch Plate (Qty: 3)
5	3–5 Reverse Clutch Apply Plate (Waved)

3-5-Reverse and 4-5-6 Clutch Housing Assemble (6T30/40/45/50 - Gen 2)

4–5–6 Clutch Piston Installation

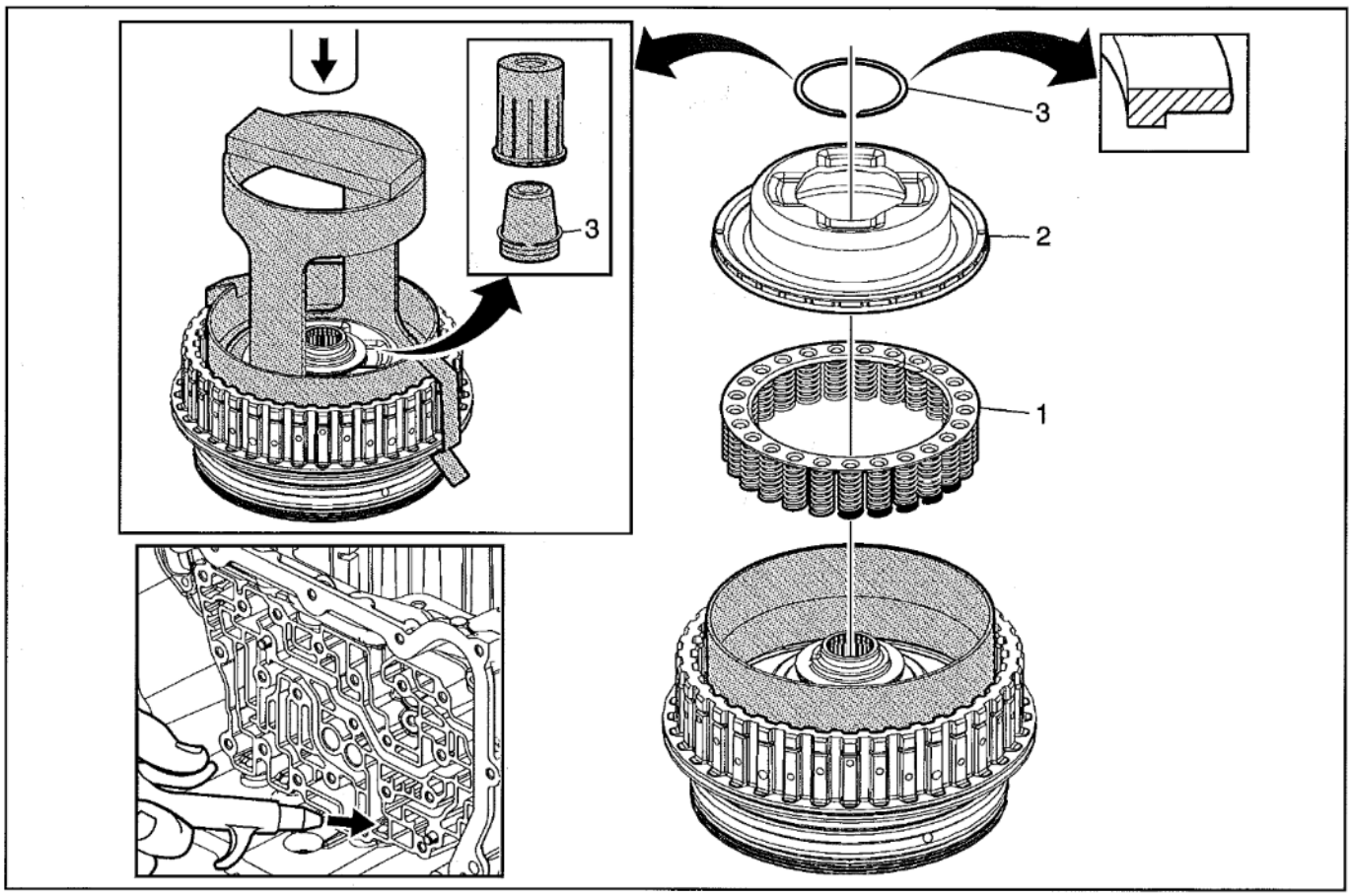


2552959

4–5–6 Clutch Piston Installation

Callout	Component Name
1	4–5–6 Clutch Piston Inner Seal
2	4–5–6 Clutch Piston Outer Seal (Large) (Rounded)
3	4–5–6 Clutch Piston Outer Seal (Dark Blue) (Stepped)
4	4–5–6 Clutch Piston **Tip:** • *DT-47805* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of *DT-47805* seal protector to ease the installation of the piston. • *DT-47951-2* spring compressor can be used as a pusher if necessary. **Special Tools** • *DT-47805* Seal Protector • *DT-47951-2* Spring Compressor For equivalent regional tools, refer to *Special Tools on page 17-394*.

4–5–6 Clutch Fluid Dam Installation



2552961

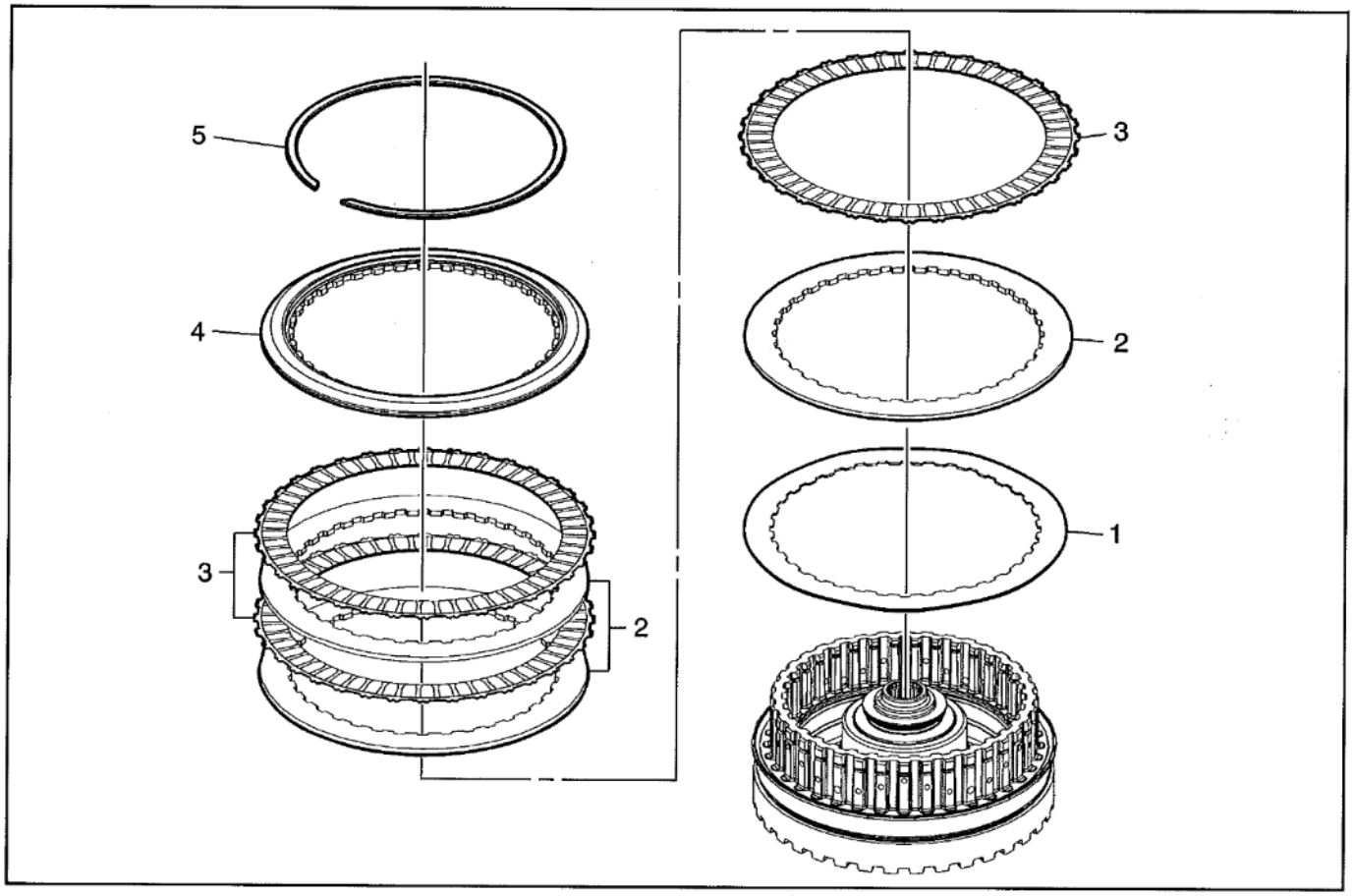
4–5–6 Clutch Fluid Dam Installation

Callout	Component Name
1	4–5–6 Clutch Piston Return Spring Assembly
2	4–5–6 Clutch Piston Fluid Dam Assembly **Tip:** The seal protector prevents the dam seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of the seal protector to ease the installation of the dam. **Special Tools** • *DT-47951-1* Seal Protector for 6T40/45 applications • *DT-50117* Seal Protector for 6T50 applications For equivalent regional tools, refer to *Special Tools on page 17-394*.
3	4–5–6 Clutch Dam Retaining Ring **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Procedure** 1. Leave the seal protector on the clutch housing while installing the retaining ring. Install the damn retainer clips *DT 50117-1* seal protector to hold the seal protector in place. 2. Use *DT 46620-2* retaining clips and *DT 50573* ring guide to install a NEW 4-5-6 clutch dam retaining ring. Assemble the ring "L" leg facing down, DT 50573 and DT 46620 and insert as an assembly onto the clutch hub to install the ring. 3. Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. **Special Tools** • *DT-47951-2* Spring Compressor • *DT 46620* Seal Installer • *DT 50117-1* Seal Protector

4–5–6 Clutch Fluid Dam Installation (cont'd)

Callout	Component Name
	• *DT 50117-2* Seal Protector Retaining Clips • *DT 50573* Retaining Ring Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.

3–5 Reverse Clutch Plates Installation

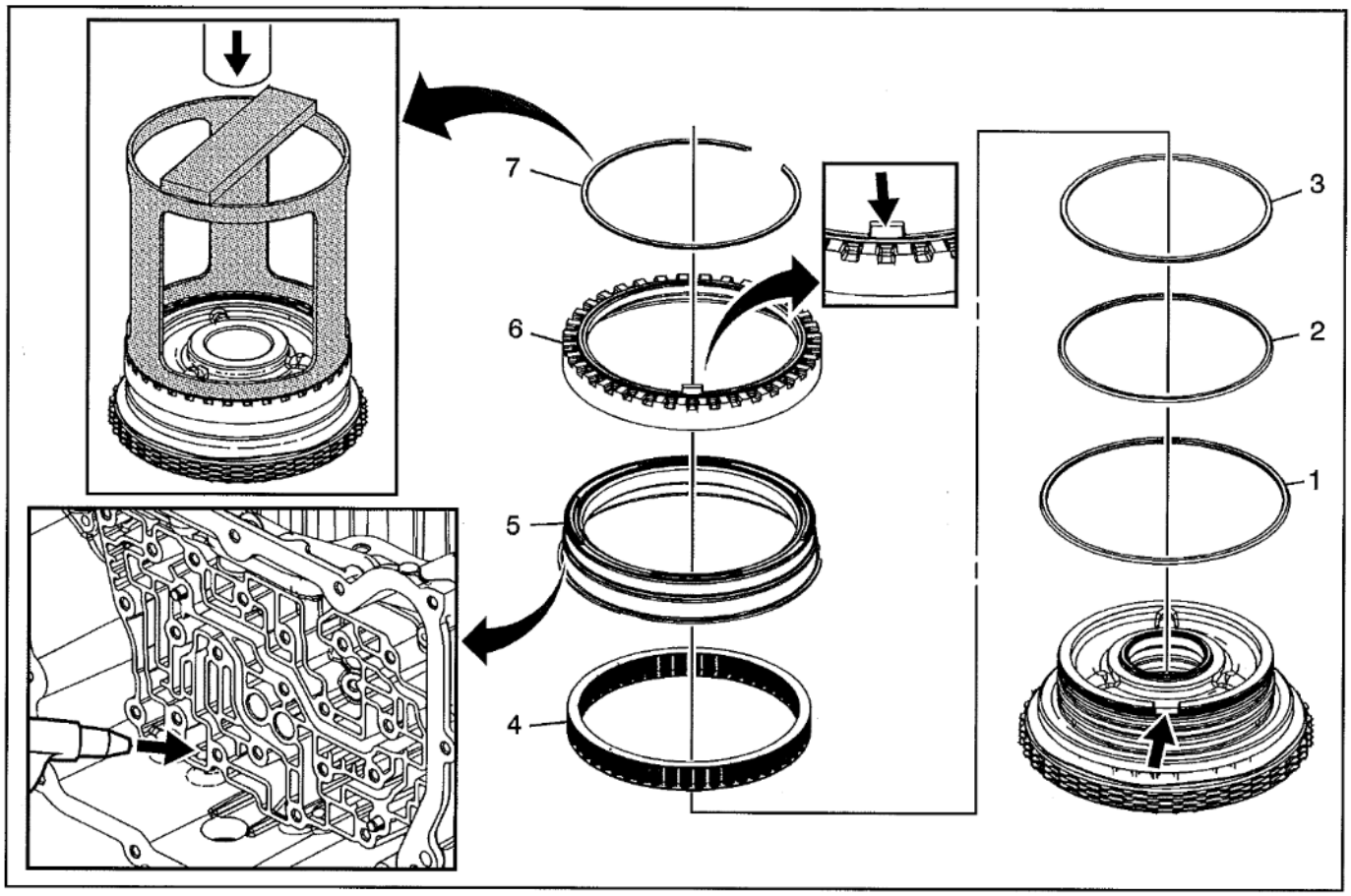


2552963

3–5 Reverse Clutch Plates Installation

Callout	Component Name
1	3–5 Reverse Clutch Apply Plate (Waved)
2	3–5 Reverse Clutch Plate (Qty: 3)
3	3–5 Reverse Clutch Plate Assembly (Qty: 3)
4	3–5 Reverse Clutch Backing Plate
5	3–5 Reverse Clutch Backing Plate Ring Retainer Ring

Reluctor Wheel and Piston Installation

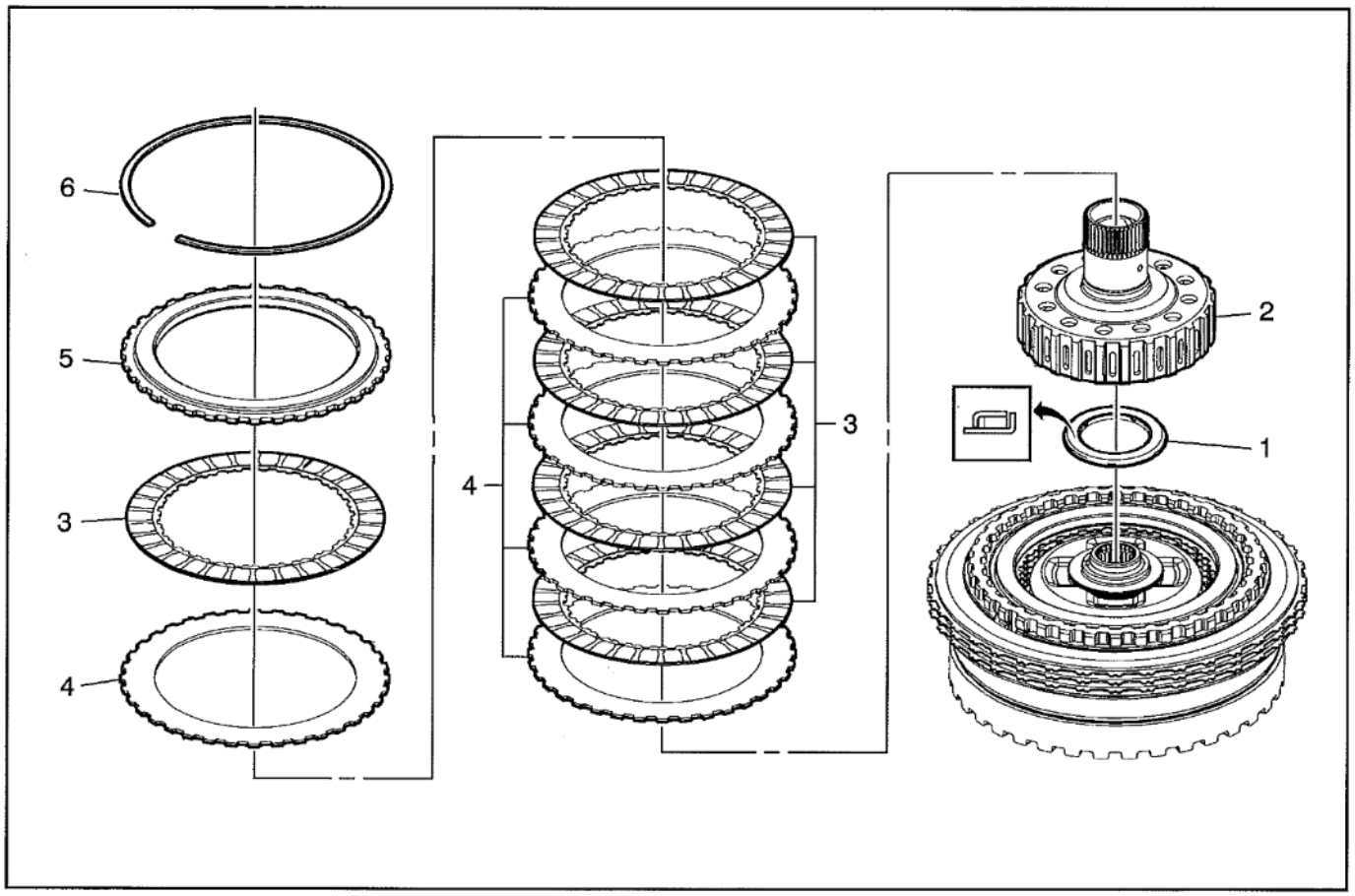


1891348

Reluctor Wheel and Piston Installation

Callout	Component Name
1	3–5 Reverse Clutch Piston Dam Seal (Black)
2	3–5 Reverse Clutch Piston Inner Seal
3	3–5 Reverse Clutch Piston Inner (Reluctor) Seal (Orange)
4	3–5 Reverse Clutch Piston Return Spring Assembly
5	3–5 Reverse Clutch Piston
6	Input Shaft Speed Sensor Reluctor Wheel
7	Input Shaft Speed Sensor Reluctor Ring Retainer Ring **Caution:** Compress the reluctor wheel just enough to clear the retainer. Over compressing the reluctor wheel will break the alignment tab and the clutch housing. **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Procedure** Place the housing assembly onto the input shaft support inside the case. Apply shop air to the clutch fluid feed hole in the case to verify proper piston operation. **Special Tools** *DT-47694* Piston Spring Compressor For equivalent regional tools, refer to *Special Tools on page 17-394*.

4–5–6 Clutch Plates Installation

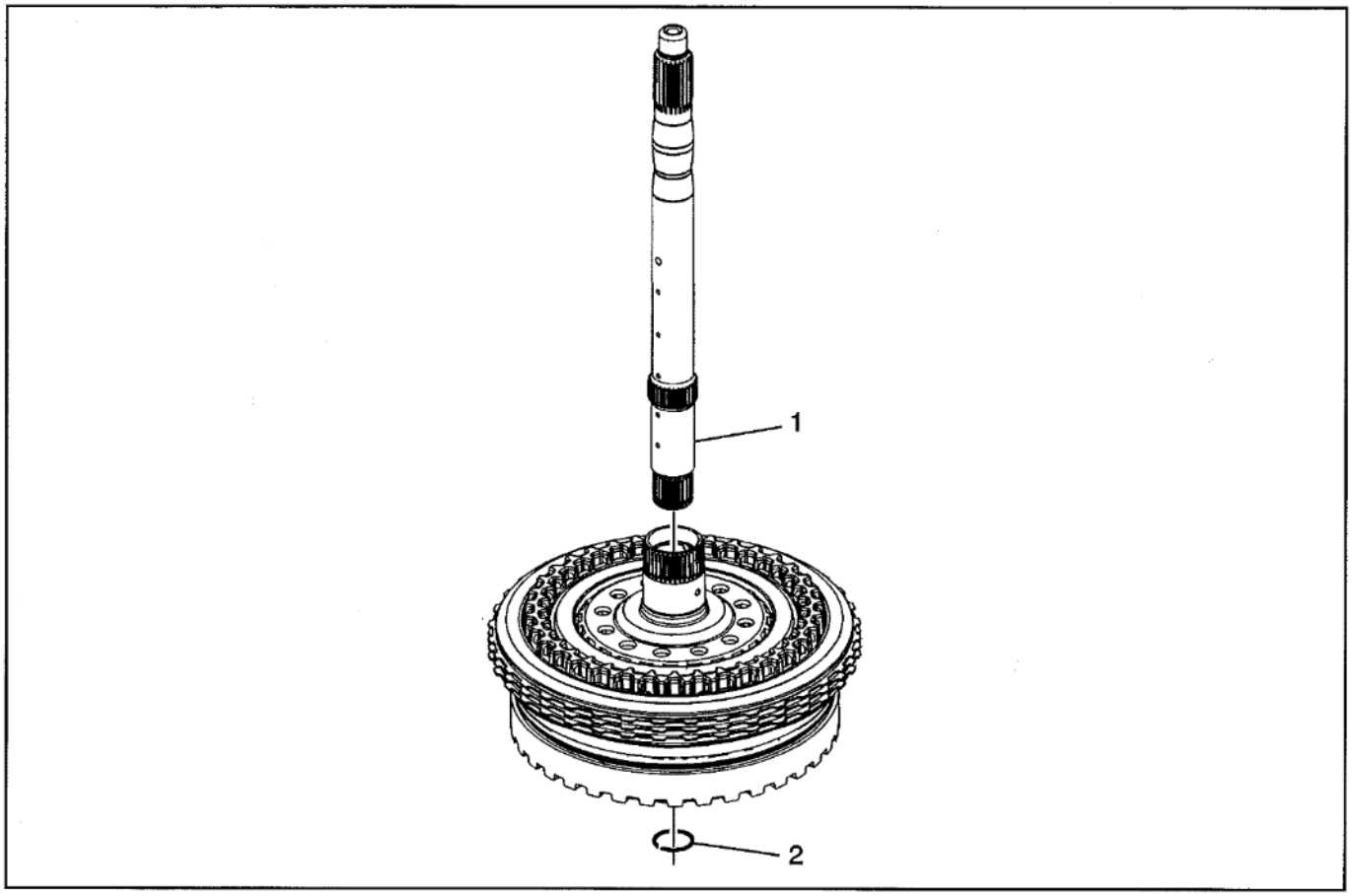


2552966

4–5–6 Clutch Plates Installation

Callout	Component Name
1	Reaction Carrier Hub Thrust Bearing Assembly
2	Reaction Carrier Hub Assembly
3	4–5–6 Clutch Plate Assembly (Qty: 5)
4	4–5–6 Clutch Plate (Qty: 5)
5	4–5–6 Clutch Backing Plate
6	4–5–6 Clutch Backing Plate Retaining Ring

Turbine Shaft Installation

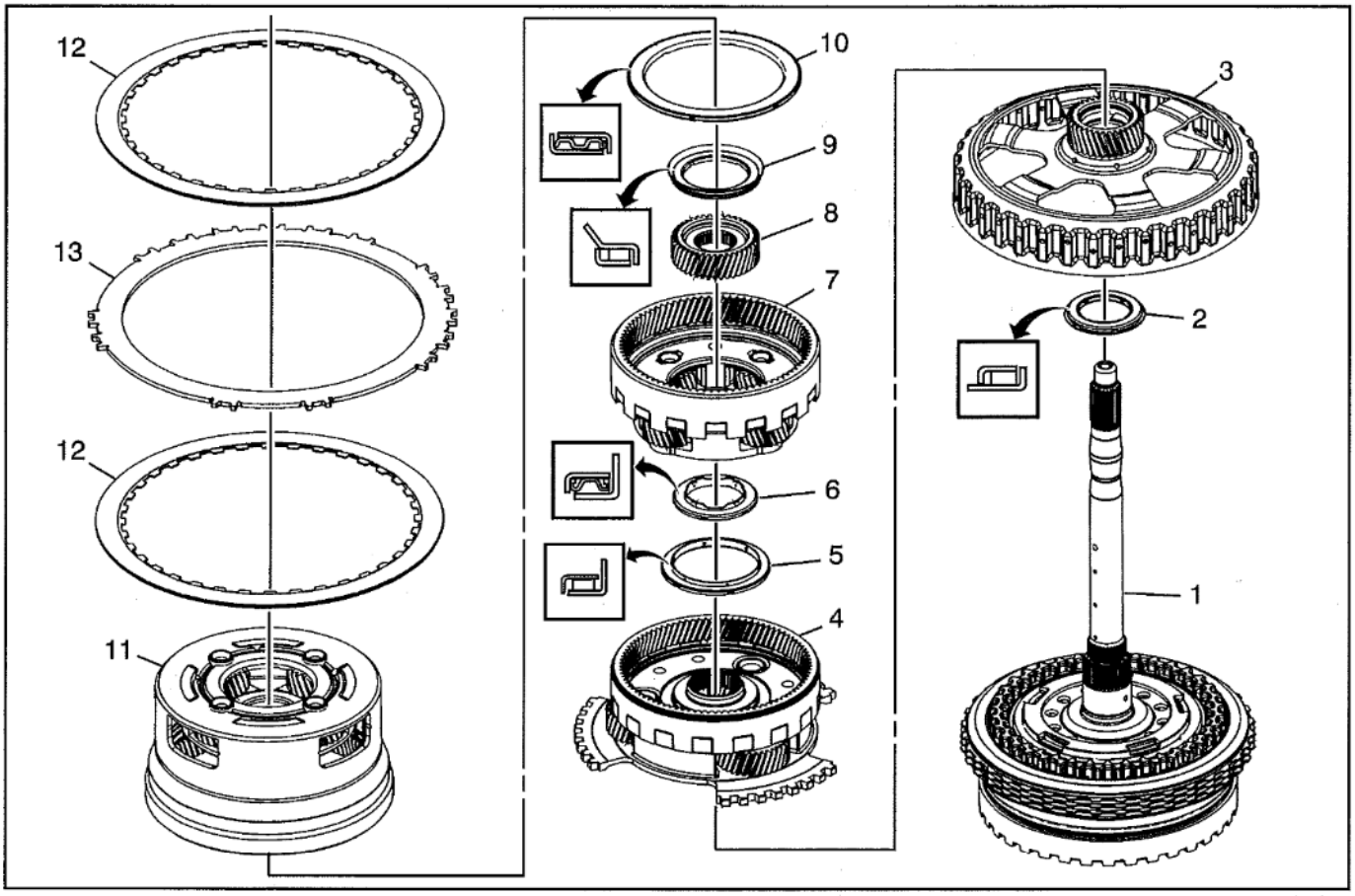


1891372

Turbine Shaft Installation

Callout	Component Name
1	Turbine Shaft
2	Turbine Shaft Retainer Ring **Tip:** Do not re-use the turbine shaft retainer ring. **Special Tools** *GE 5586-A* Snap Ring Pliers or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.

Input, Reaction, and Output Carrier Assemble (Gen 1)



1891373

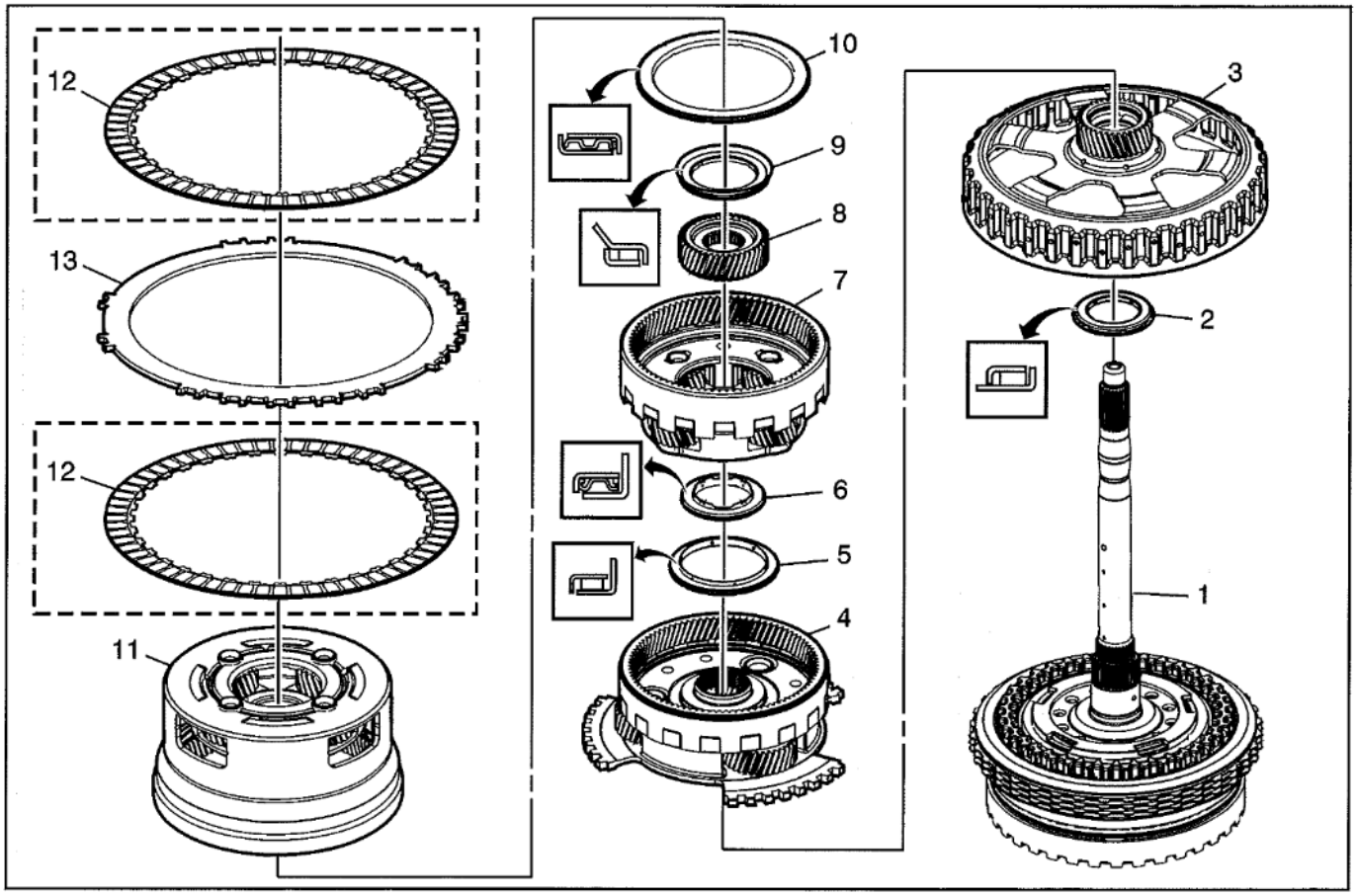
Input, Reaction, and Output Carrier Assemble (Gen 1)

Callout	Component Name
1	3–5 Reverse and 4–5–6 Clutch Housing Assembly
2	Reaction Carrier Sun Gear Thrust Bearing
3	Reaction Carrier Sun Gear Assembly
4	Reaction Carrier Assembly **Note:** Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models. **Original Configuration:** • The 6T30 and 6T40 had 3 pinions. • The 6T45 and 6T50 had 4 pinions.
5	Input Carrier Thrust Bearing Assembly
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
8	Input Sun Gear
9	Input Sun Gear Thrust Bearing Assembly
10	Output Carrier Thrust Bearing Assembly

Input, Reaction, and Output Carrier Assemble (Gen 1) (cont'd)

Callout	Component Name
11	Output Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
12	2–6 Clutch Plate Assembly (Qty: 2) **Note:** Begin with the clutch plate assembly and alternate with the clutch plate.
13	2–6 Clutch Plate (Qty: 1) **Note:** Only install one 2–6 Clutch Plate at this time. The remaining clutch plate is installed into the case.

Input, Reaction, and Output Carrier Assemble (Gen 2)



2552968

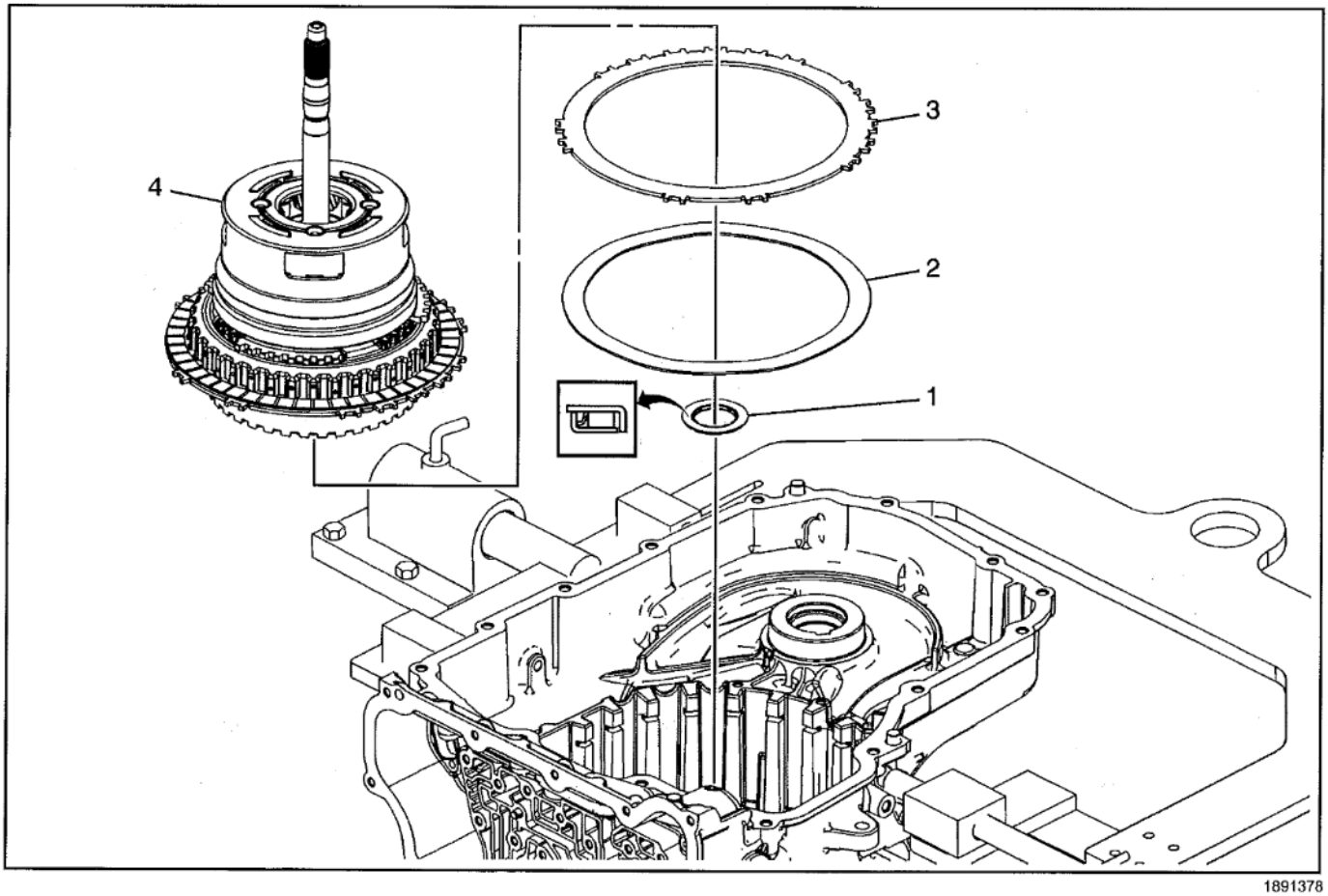
Input, Reaction, and Output Carrier Assemble (Gen 2)

Callout	Component Name
1	3–5 Reverse and 4–5–6 Clutch Housing Assembly
2	Reaction Carrier Sun Gear Thrust Bearing
3	Reaction Carrier Sun Gear Assembly
4	Reaction Carrier Assembly **Note:** Starting in 2012, all 6T30/40/45/50 models have 3 pinion reaction carriers. The 3 pinion reaction carriers are back serviceable for all models. **Original Configuration:** • The 6T30 and 6T40 had 3 pinions. • The 6T45 and 6T50 had 4 pinions.

Input, Reaction, and Output Carrier Assemble (Gen 2) (cont'd)

Callout	Component Name
5	Input Carrier Thrust Bearing Assembly
6	Input Sun Gear Thrust Bearing Assembly
7	Input Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
8	Input Sun Gear
9	Input Sun Gear Thrust Bearing Assembly
10	Output Carrier Thrust Bearing Assembly
11	Output Carrier Assembly **Note:** • The 6T30 and 6T40 have 4 pinions. • The 6T45 and 6T50 have 5 pinions.
12	2–6 Clutch Plate Assembly (Qty: 2) - Model Dependent **Note:** • Begin with the clutch plate assembly and alternate with the clutch plate. • The number of grooves in the clutch plate friction material varies depending on model.
13	2–6 Clutch Plate (Qty: 1) **Note:** Only install one 2–6 Clutch Plate at this time. The remaining clutch plate is installed into the case.

3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation

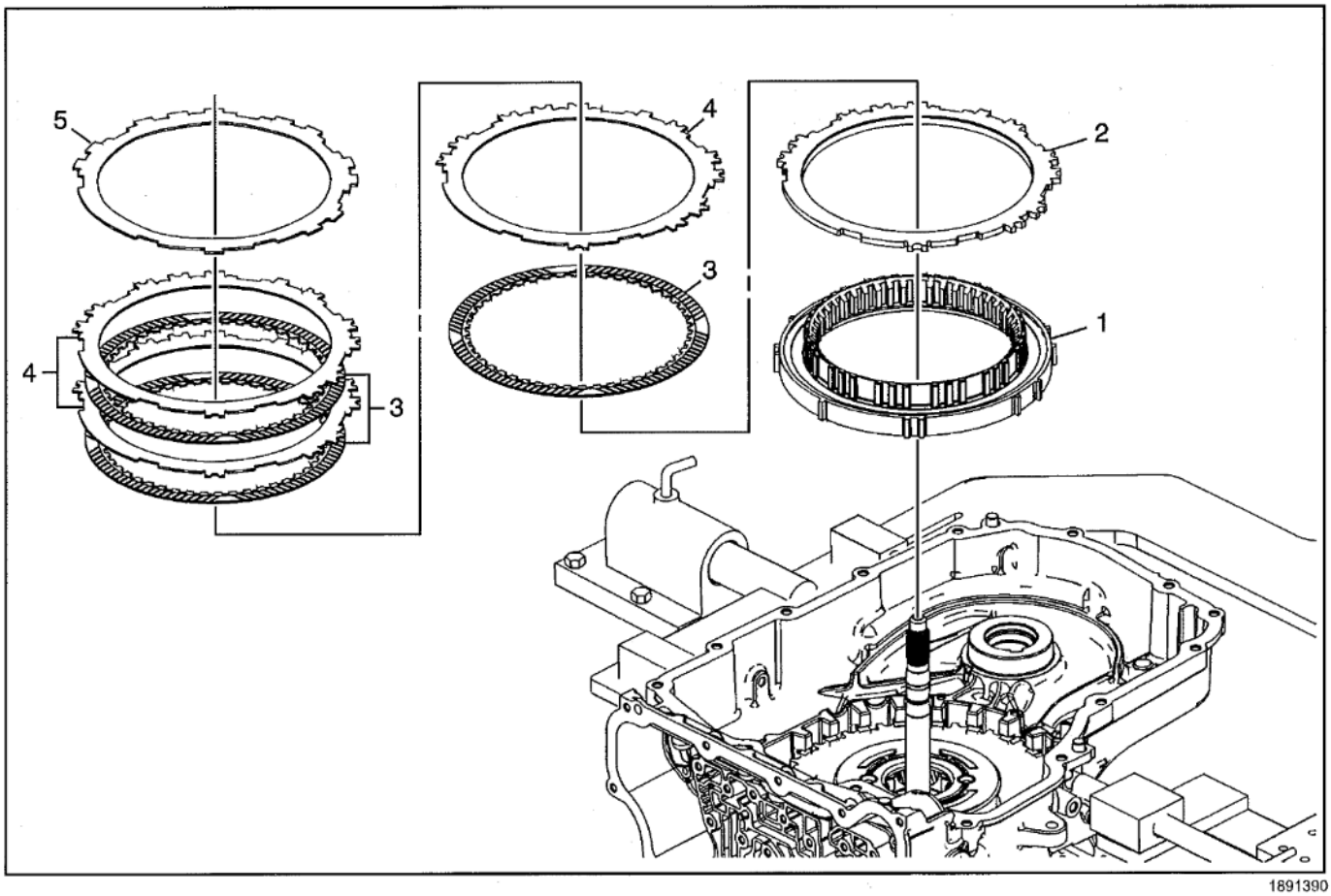


1891378

3-5-Reverse and 4-5-6 Clutch Housing, and Input, Reaction, and Output Carrier Installation

Callout	Component Name
1	3–5 Reverse and 4–5–6 Clutch Housing Thrust Bearing
2	2–6 Clutch Apply Plate (Waved)
3	2–6 Clutch Plate (Qty: 1) **Tip:** • Only install one 2–6 Clutch Plate. The remaining clutch plate is installed with the gearset assembly. • Align the large flat areas with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.
4	3–5 Reverse and 4–5–6 Clutch Housing Assembly and Gearset **Tip:** Align the large flat areas of the 2–6 Clutch Plate with the valve body end of the case and the 2 tabs on the clutch plate that are close to each other with the slots at the bottom right corner of the case.

Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation



1891390

Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation

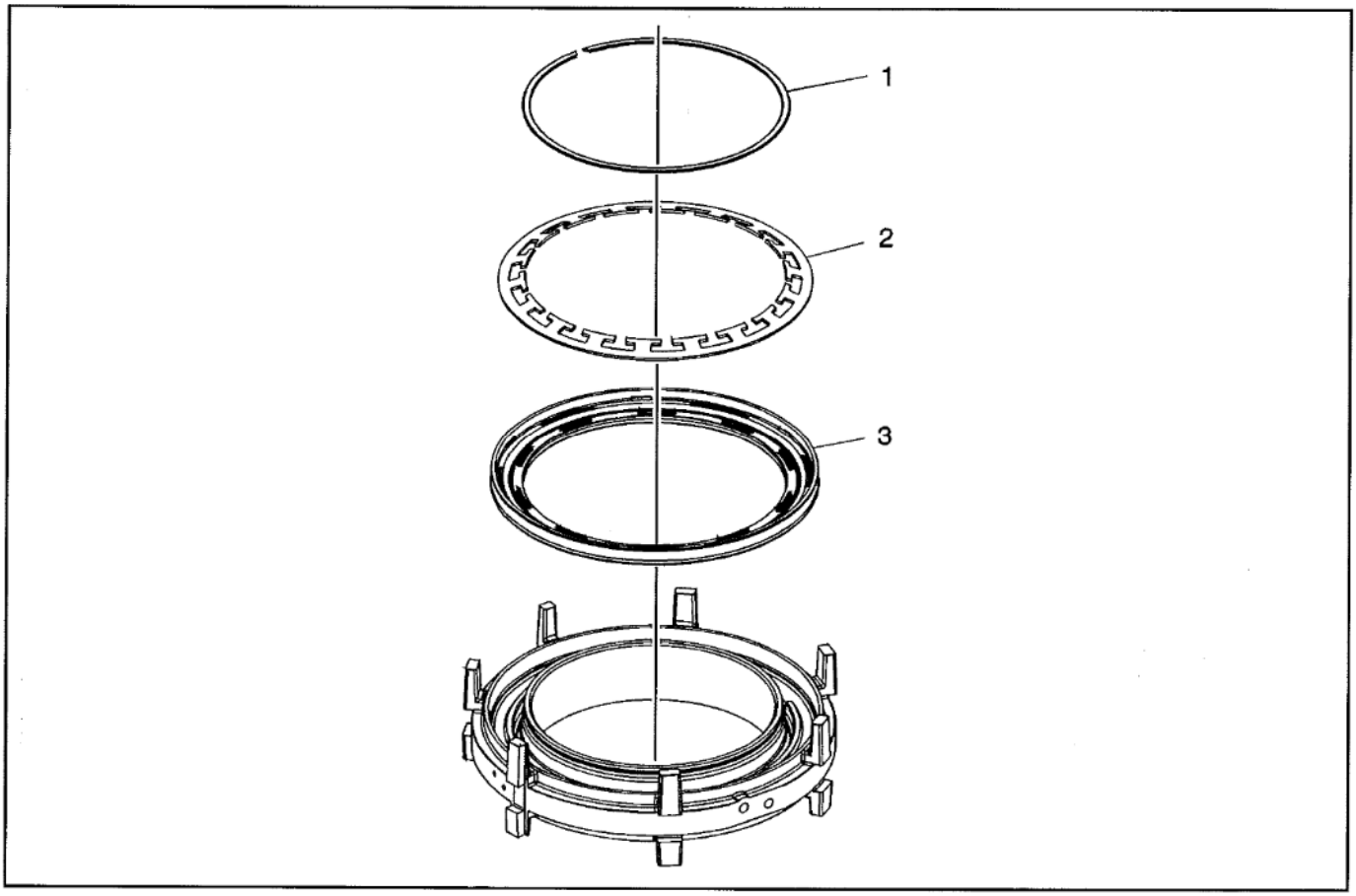
Callout	Component Name
1	Low and Reverse Clutch Assembly (OWC) **Note:** • The Low and Reverse Clutch Assembly should rotate freely in one direction and lock in the opposite direction. • Align the large flat areas of the Low and Reverse Clutch Assembly with the valve body end of the case.
2	Low and Reverse Clutch Backing Plate
3	Low and Reverse Clutch Plate Assembly (Qty: 3)

Low and Reverse Clutch Assembly and Low and Reverse Clutch Plate Installation (cont'd)

Callout	Component Name
4	Low and Reverse Clutch Plate (Qty: 3) **Note:** Align the large flat areas of the Low and Reverse Clutch Plate with the valve body end of the case.
5	Low and Reverse Clutch Apply (Waved) Plate **Note:** • Align the large flat areas of the Low and Reverse Clutch Apply Plate with the valve body end of the case. • Ensure the correct waved plate is being installed. The 1–2–3–4 clutch and low and reverse clutch waved plates are visually similar, however the low and reverse clutch waved plate is thicker.

Low and Reverse and 1-2-3-4 Clutch Housing Disassemble

Low and Reverse Clutch Piston Removal

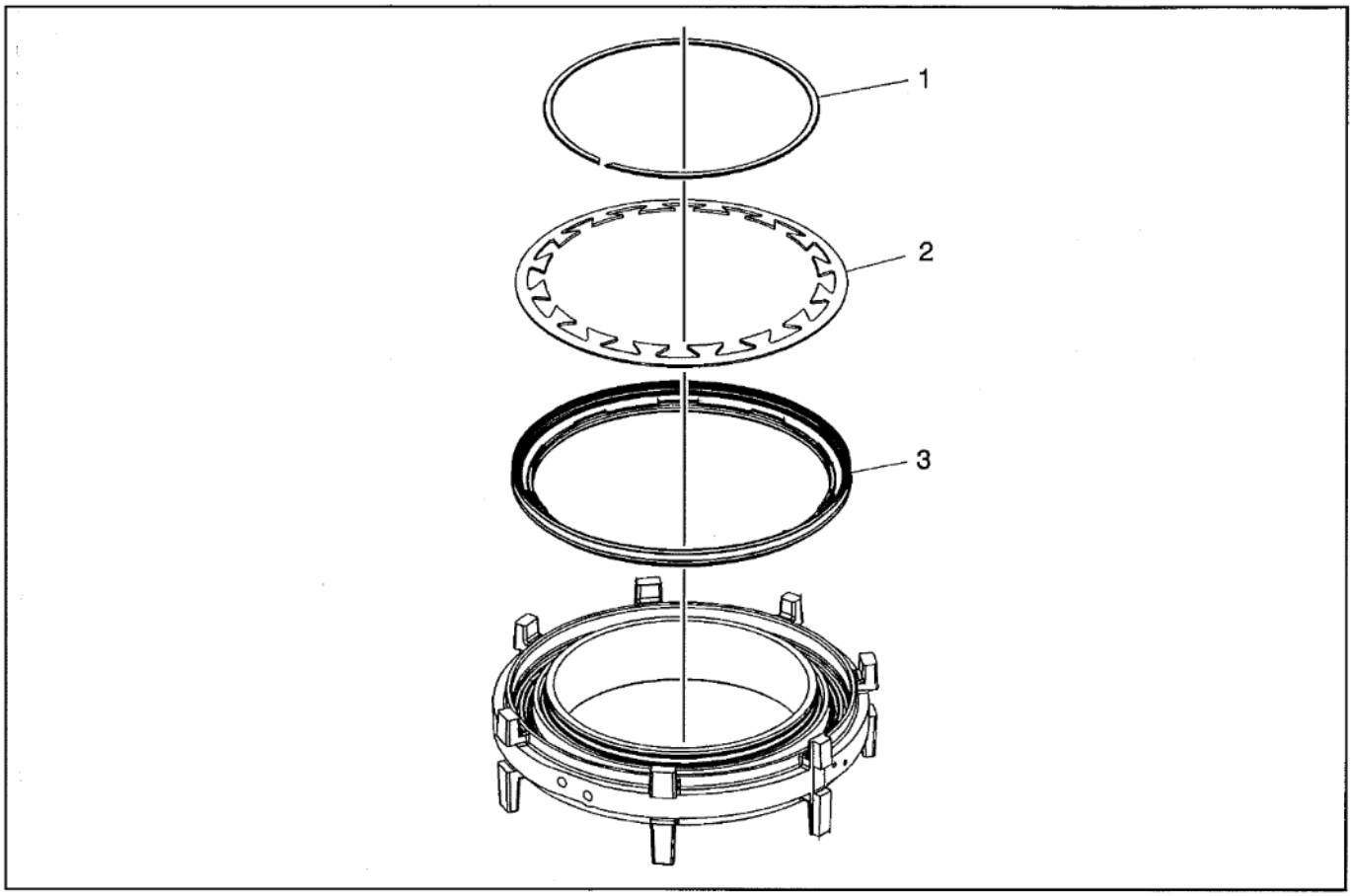


1891392

Low and Reverse Clutch Piston Removal

Callout	Component Name
1	Low and Reverse Clutch Spring Retainer **Special Tool** *GE-8059* Snap Ring Pliers – Parallel Jaw For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Piston

1–2–3–4 Clutch Piston Removal

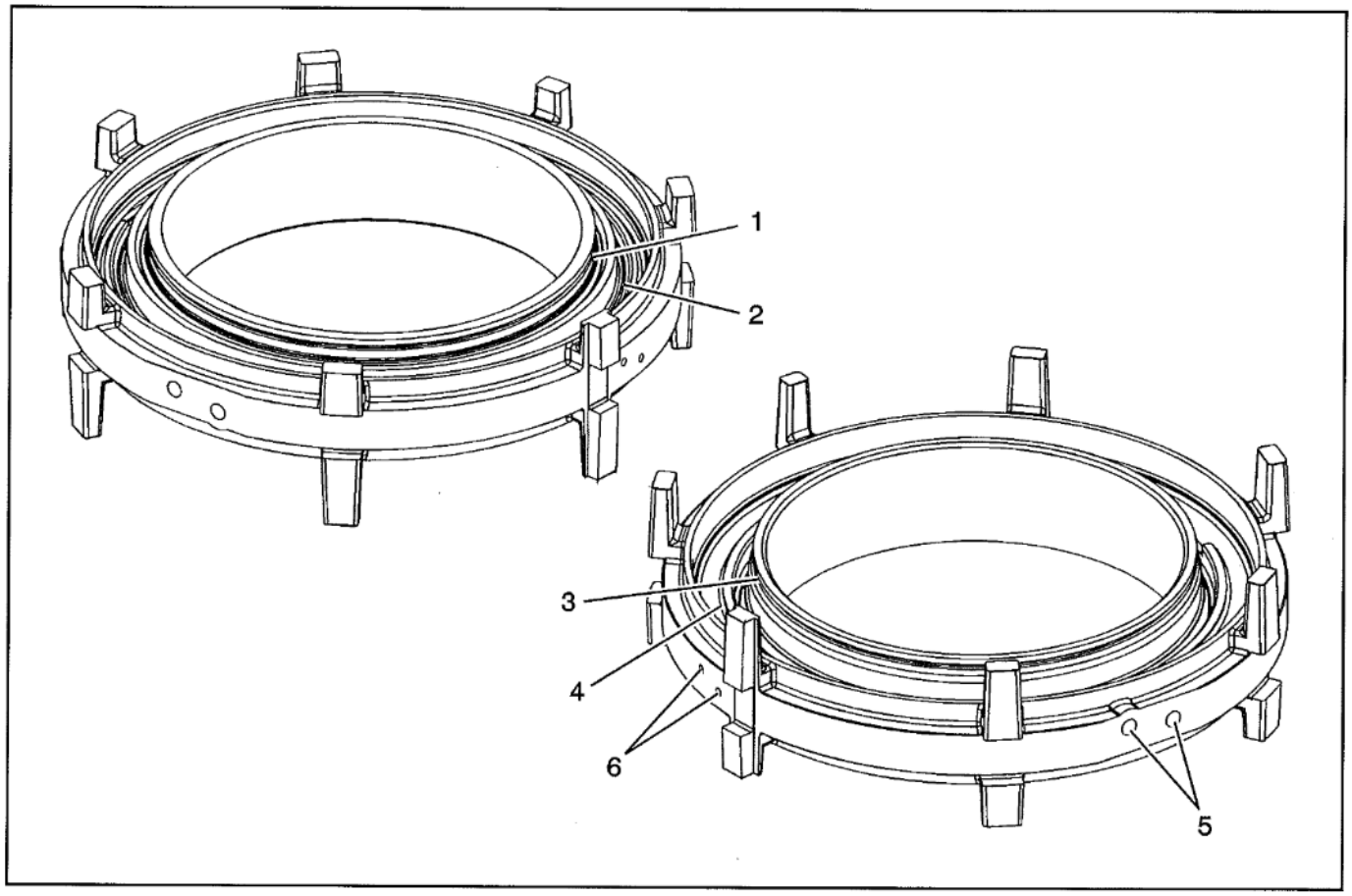


1891395

1–2–3–4 Clutch Piston Removal

Callout	Component Name
1	1–2–3–4 Clutch Spring Retainer **Special Tool** *GE-8059* Snap Ring Pliers – Parallel Jaw For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	1–2–3–4 Clutch Spring
3	1–2–3–4 Clutch Piston

Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection



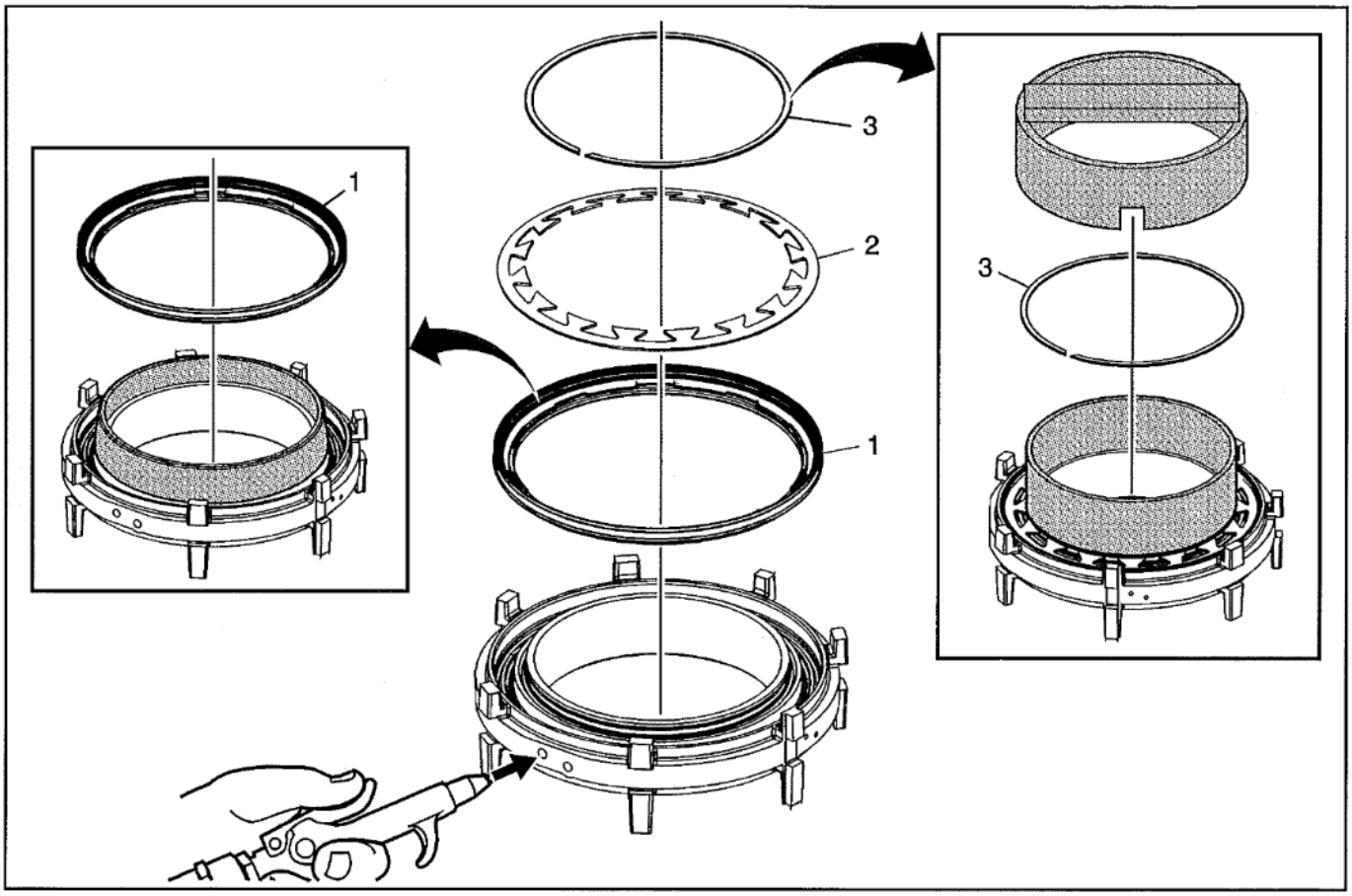
1891399

Low and Reverse and 1-2-3-4 Clutch Housing Cleaning and Inspection

Callout	Component Name
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Preliminary Procedures** 1. Thoroughly clean the housing with clean solvent. 2. Inspect the piston bores and retainer ring grooves for wear, damage or porosity.	
1	1–2–3–4 Clutch Spring Retainer Groove
2	1–2–3–4 Clutch Piston Bore
3	Low and Reverse Clutch Spring Retainer Groove
4	Low and Reverse Clutch Piston Bore
5	Clutch Oil Passages
6	Air Bleed Passages

Low and Reverse and 1-2-3-4 Clutch Housing Assemble (6T30)

1–2–3–4 Clutch Piston Installation

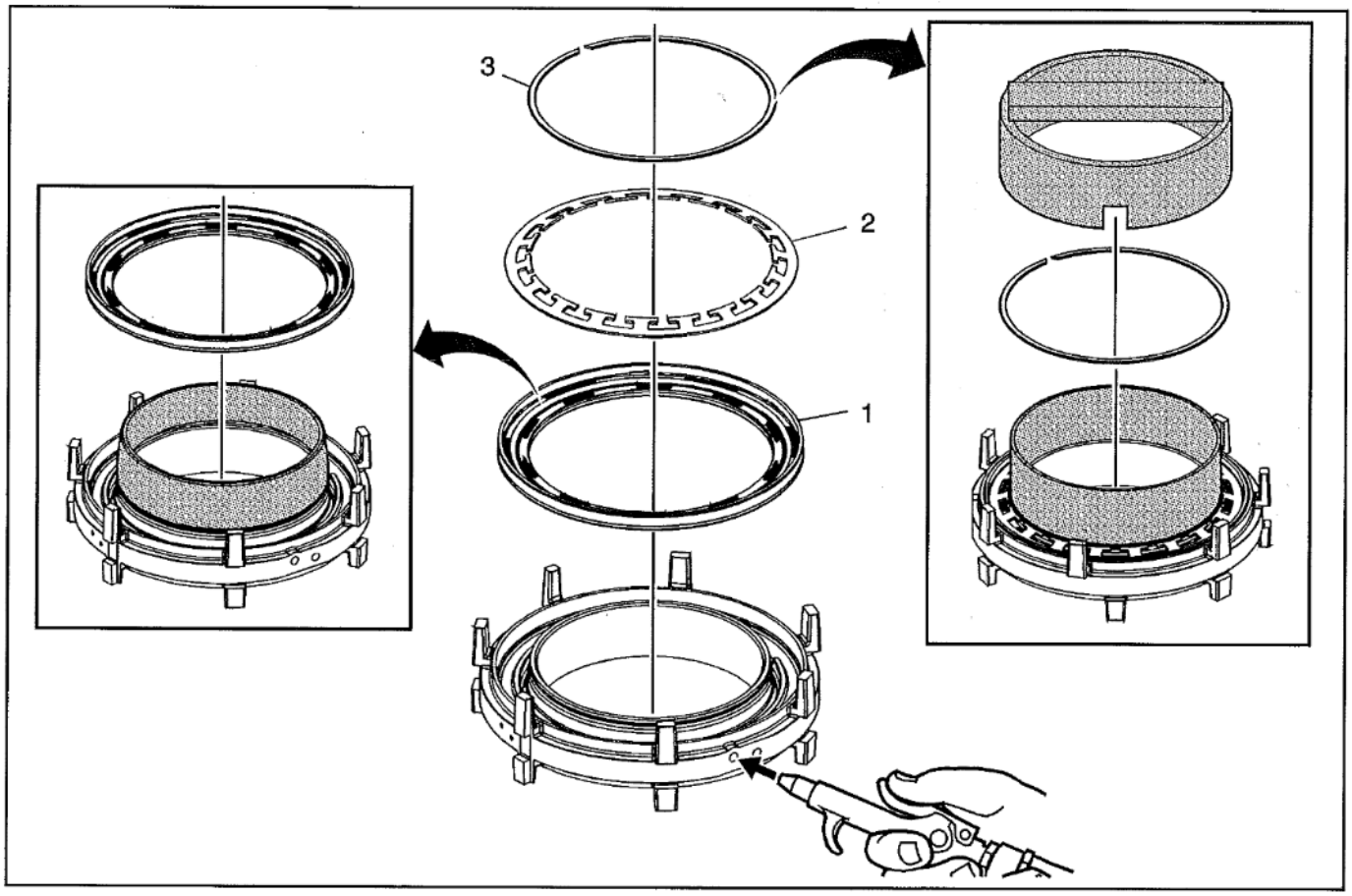


1891402

1–2–3–4 Clutch Piston Installation

Callout	Component Name
1	1–2–3–4 Clutch Piston **Tip:** *DT-48273* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of *DT-48273* seal protector to ease the installation of the piston. **Special Tool** *DT-48273* Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394.*
2	1–2–3–4 Clutch Spring
3	1–2–3–4 Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** 1. Place the retainer onto DT-48274-1 which is part of *DT-48274* spring installer. Compressing the spring using DT-48274-2 which is part of *DT-48274* spring installer, will install the retainer into the retainer groove. 2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. **Special Tool** *DT-48274* Clutch Piston Spring Installer For equivalent regional tools, refer to *Special Tools on page 17-394.*

Low and Reverse Clutch Piston Installation



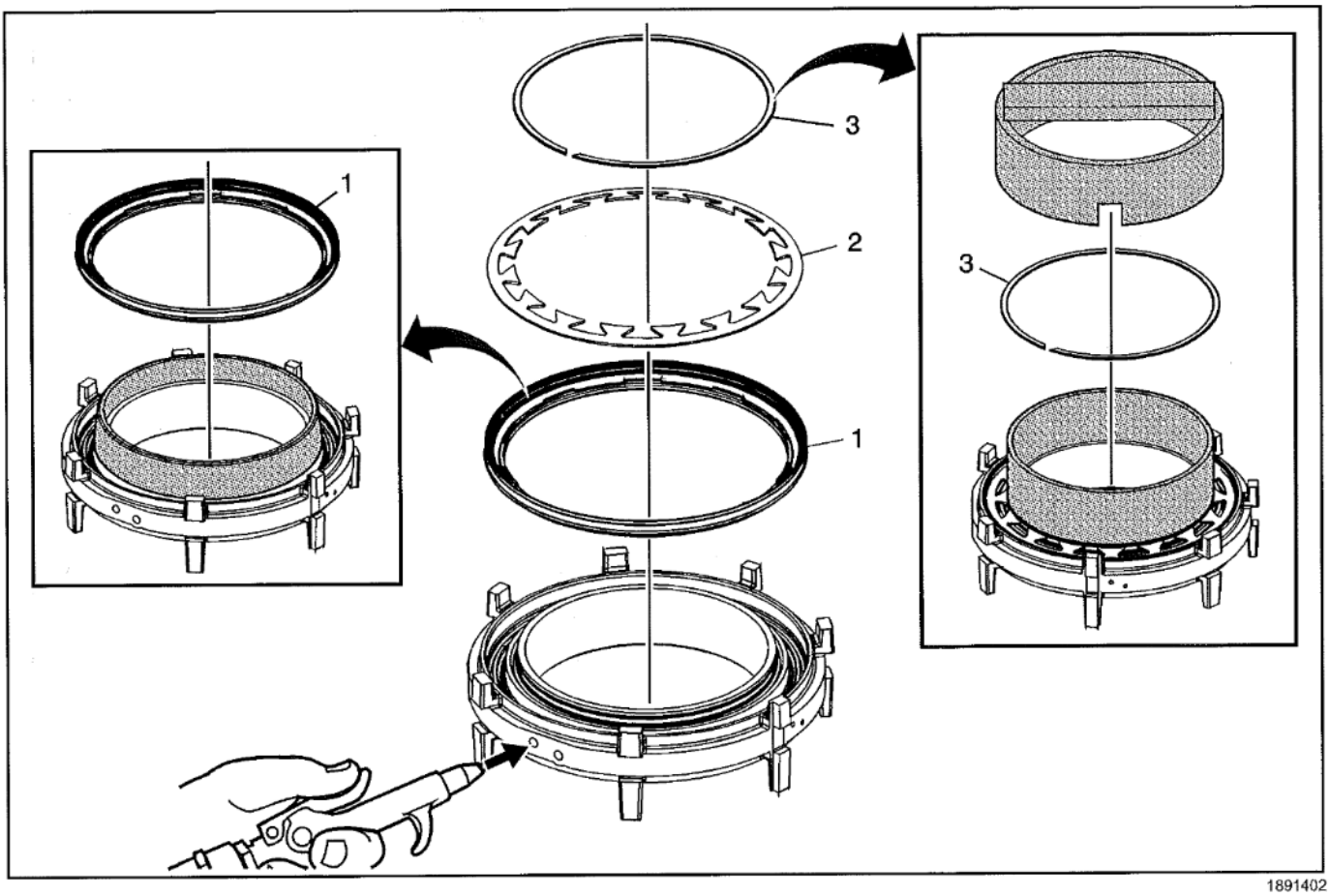
1891404

Low and Reverse Clutch Piston Installation

Callout	Component Name
1	Low and Reverse Clutch Piston **Tip:** *DT-48273* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of *DT-48273* seal protector to ease the installation of the piston. **Special Tool** *DT-48273* Clutch Piston Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** 1. Place the retainer onto DT-48274-1 which is part of *DT-48274* spring installer. Compressing the spring using DT-48274-2 which is part of *DT-48274* spring installer, will install the retainer into the retainer groove. 2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. **Special Tool** *DT-48274* Spring Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.

Low and Reverse and 1-2-3-4 Clutch Housing Assemble (6T40/45/50)

1–2–3–4 Clutch Piston Installation

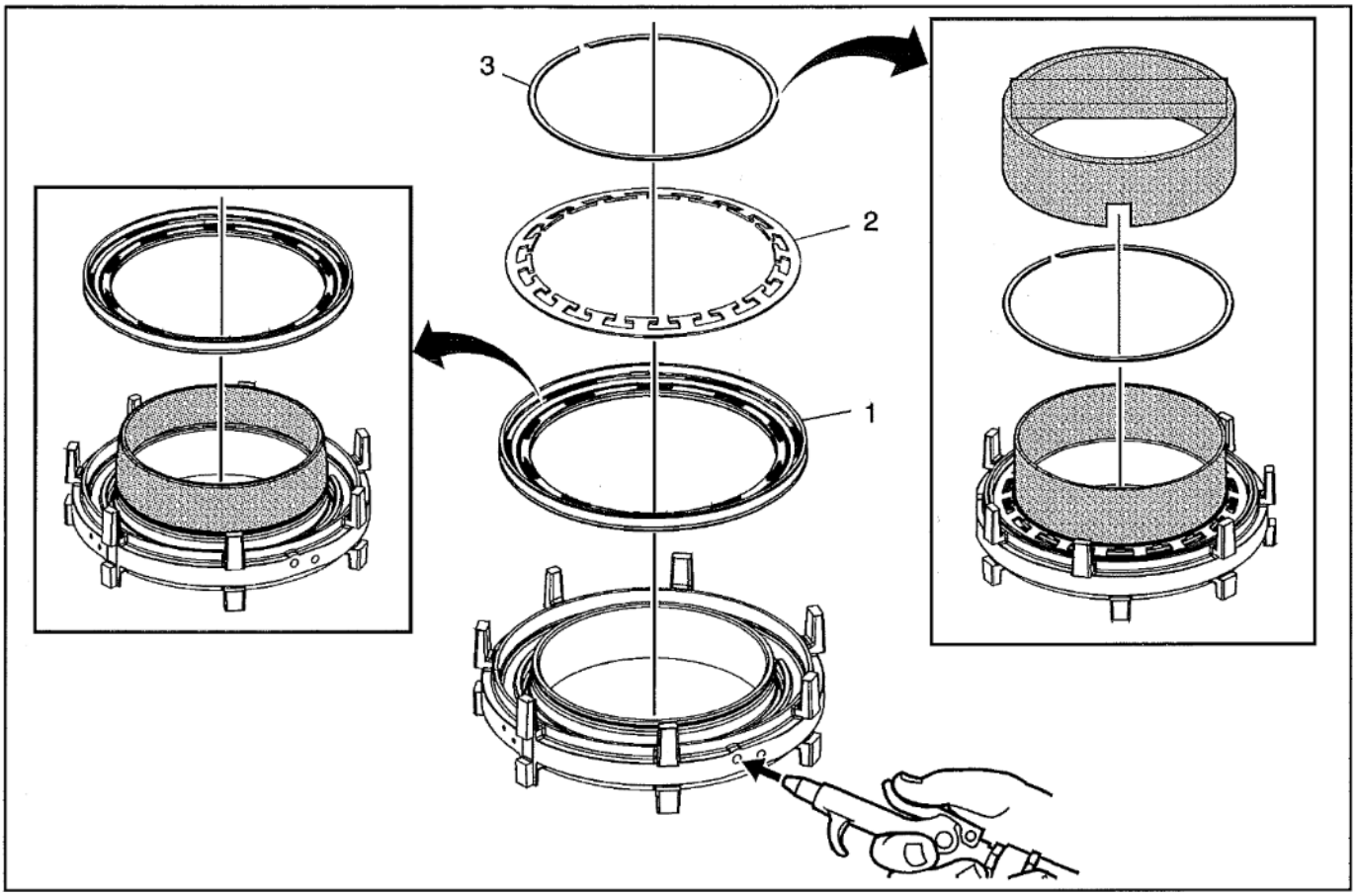


1891402

1–2–3–4 Clutch Piston Installation

Callout	Component Name
1	1–2–3–4 Clutch Piston **Tip:** *DT-47798* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of *DT-47798* seal protector to ease the installation of the piston. **Special Tool** *DT-47798* Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	1–2–3–4 Clutch Spring
3	1–2–3–4 Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** 1. Place the retainer onto DT-47799-1 which is part of *DT-47799* spring compressor. Compressing the spring using DT-47799-2 which is part of *DT-47799* spring compressor, will install the retainer into the retainer groove. 2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. **Special Tool** *DT-47799* Clutch Piston Spring Compressor For equivalent regional tools, refer to *Special Tools on page 17-394*.

Low and Reverse Clutch Piston Installation

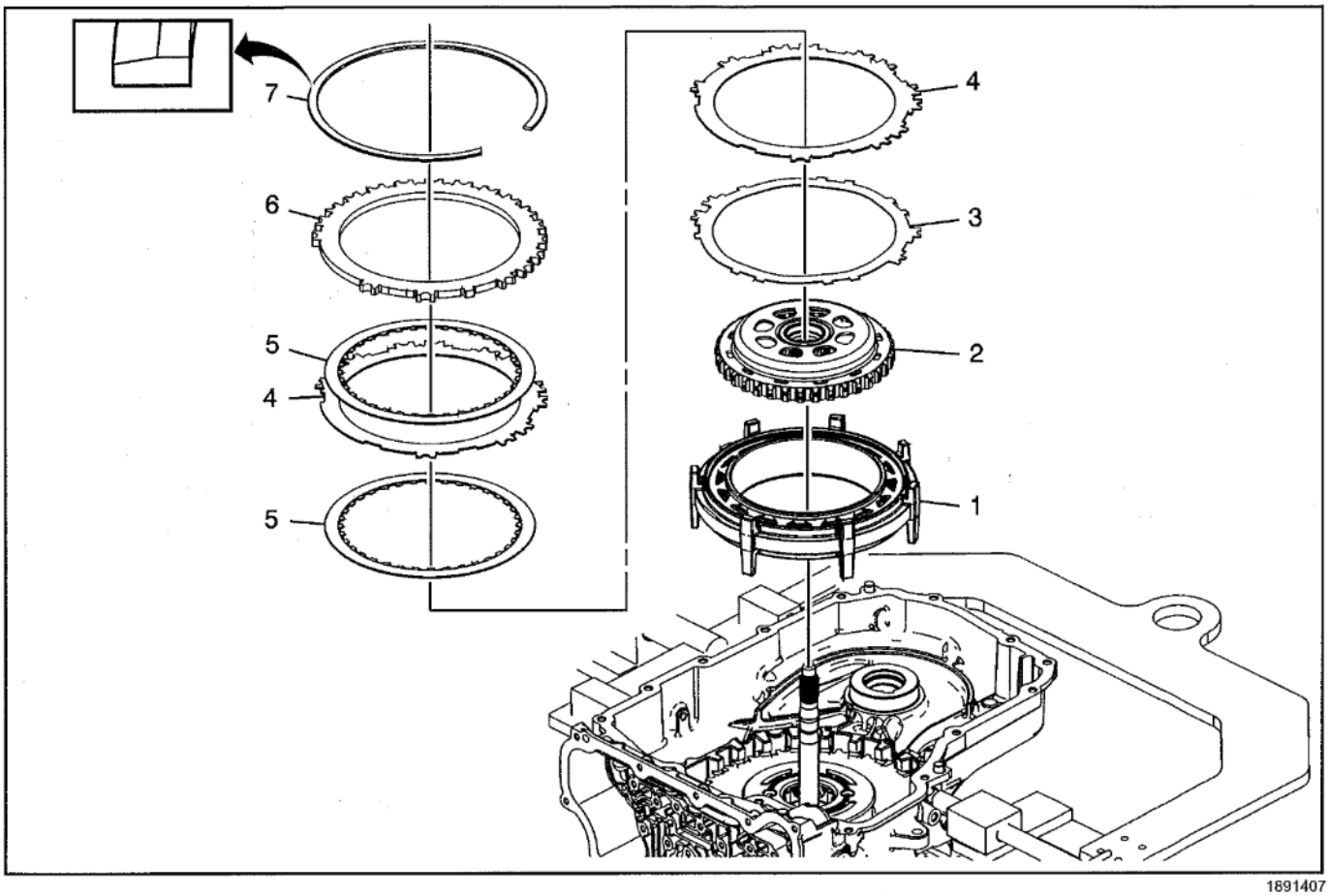


1891404

Low and Reverse Clutch Piston Installation

Callout	Component Name
1	Low and Reverse Clutch Piston **Tip:** *DT-47807* seal protector prevents the piston seal lip from damage during installation. Apply a thin coat of ATF to the I.D. of *DT-47807* seal protector to ease the installation of the piston. **Special Tool** *DT-47807* Clutch Piston Seal Protector For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Low and Reverse Clutch Spring
3	Low and Reverse Clutch Spring Retainer **Caution:** Regulate the air pressure to 276 kPa (40 psi) maximum. High pressure could cause the piston to over travel and damage the piston seals. **Tip:** 1. Place the retainer onto DT-47794-1 which is part of *DT-47794* spring compressor. Compressing the spring using DT-47794-2 which is part of *DT-47794* spring compressor, will install the retainer into the retainer groove. 2. Apply shop air to the clutch fluid feed hole in the clutch housing to verify proper piston operation. **Special Tool** *DT-47794* Spring Compressor For equivalent regional tools, refer to *Special Tools on page 17-394*.

Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T30)



1891407

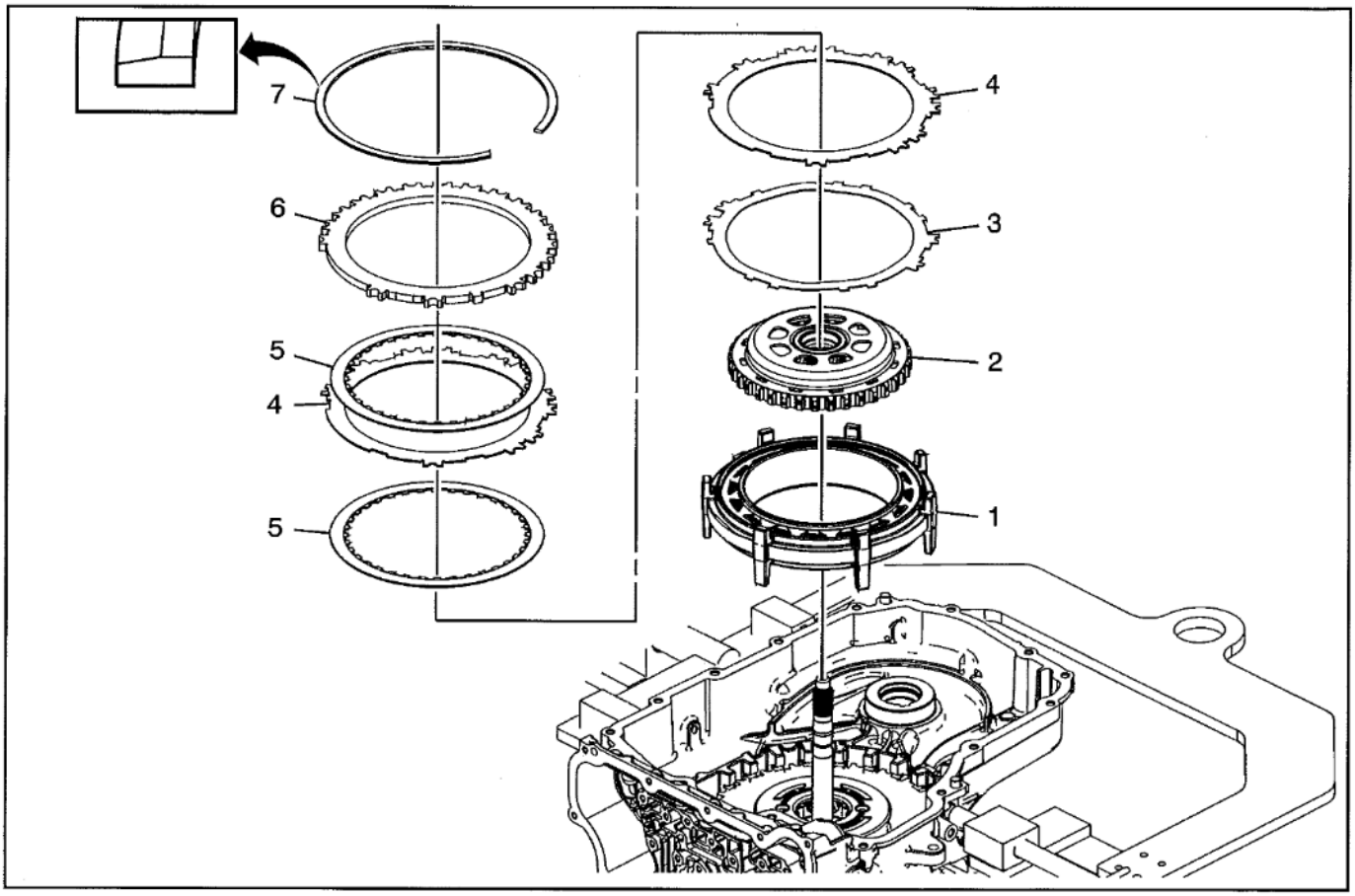
Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T30)

Callout	Component Name
1	Low and Reverse and 1–2–3–4 Clutch Housing **Tip:** The longer legs face the bottom of the case and the oil passages face the valve body end of the case.
2	Output Sun Gear Assembly
3	1–2–3–4 Clutch Waved Plate **Tip:** Align the single pair of tabs with the bottom valve body end of the case.
4	1–2–3–4 Clutch Plate (Qty: 2)
5	1–2–3–4 Clutch Plate Assembly (Qty: 2)
6	1–2–3–4 Clutch Backing Plate **Tip:** Align the single tab with the case spline facing the bottom of the case.
7	1–2–3–4 Clutch Backing Plate Retainer Ring ***Warning: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result.*** **Caution:** Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear. **Tip:** • Install the retainer with the taper facing away from the backing plate. • Align the retainer opening with the largest gap in the case splines toward the bottom of the case. • Install one end of the retainer into the retainer ring groove. Use *DT-28585* snap ring remover and work the retainer into the case groove. Use a screwdriver to hold the retainer away from the case while pushing down on the retainer with *DT-28585* snap ring remover.

Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T30) (cont'd)

Callout	Component Name
	Special Tool *DT-28585* Snap Ring Remover or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.

Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T40/45/50)



1891407

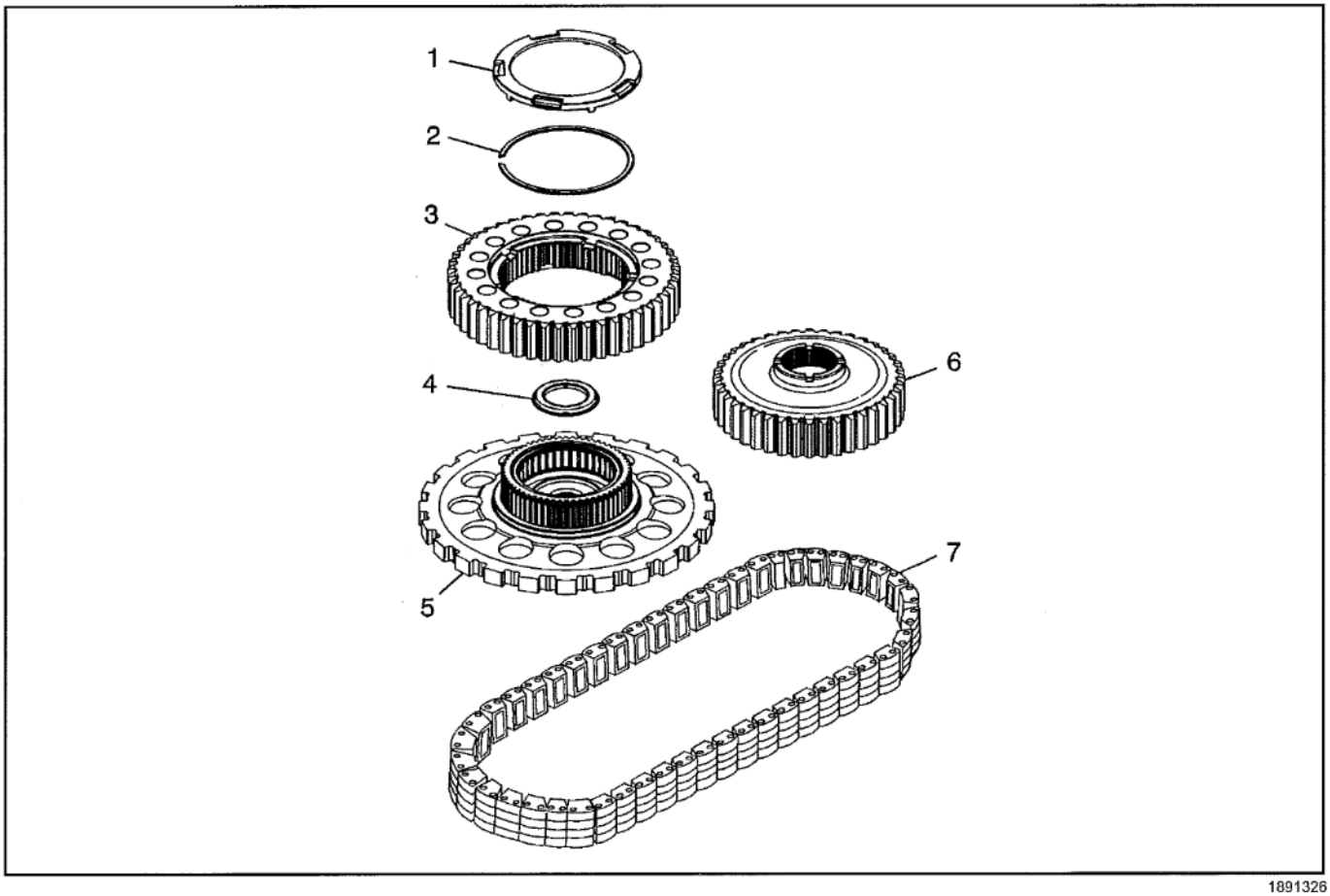
Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T40/45/50)

Callout	Component Name
1	Low and Reverse and 1–2–3–4 Clutch Housing **Note:** The longer legs face the bottom of the case and the oil passages face the valve body end of the case.
2	Output Sun Gear Assembly
3	1–2–3–4 Clutch Waved Plate **Note:** • Align the single pair of tabs with the bottom valve body end of the case. • Ensure the correct waved plate is being installed. The 1–2–3–4 clutch and low and reverse clutch waved plates are visually similar, however the low and reverse clutch waved plate is thicker.
4	1–2–3–4 Clutch Plate (Qty: 2)
5	1–2–3–4 Clutch Plate Assembly (Qty: 2)
6	1–2–3–4 Clutch Backing Plate **Note:** Align the single skinny tab with the case spline facing the top of the case.

Low and Reverse and 1-2-3-4 Clutch Housing, and 1-2-3-4 Clutch Plate Installation (6T40/45/50) (cont'd)

Callout	Component Name
7	1–2–3–4 Clutch Backing Plate Retainer Ring ***Warning: The retainer is under tension. Use care when removing or installing the retainer. Personal injury could result.*** **Caution:** Use caution during removal or installation of the retainer ring to avoid damage to the case machined surface in the park pawl area. Burrs or raised edges on the case machined surface can cause the park pawl to bind and prohibit it from engaging the park gear. **Note:** • Install the retainer with the taper facing away from the backing plate. • Align the retainer opening with the largest gap in the case splines toward the bottom of the case. • Install one end of the retainer into the retainer ring groove. Use *DT-28585* snap ring remover and work the retainer into the case groove. Use a screwdriver to hold the retainer away from the case while pushing down on the retainer with *DT-28585* snap ring remover. **Special Tool** *DT-28585* Snap Ring Remover or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.

Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection



1891326

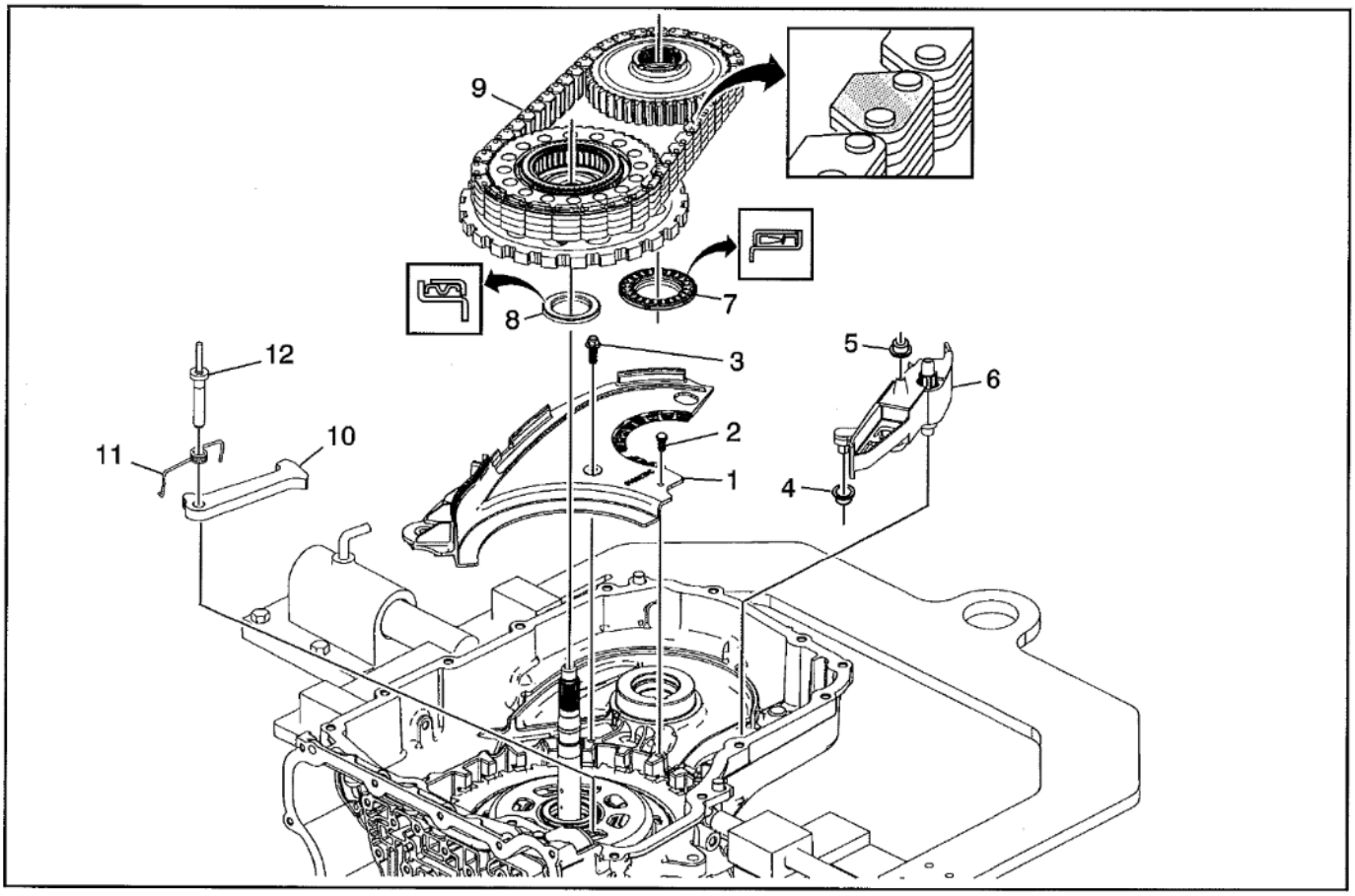
Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection

Callout	Component Name
1	Drive Sprocket Thrust Washer
2	Drive Sprocket Retainer Ring
3	Drive Sprocket

Drive Sprocket, Driven Sprocket, and Drive Link Cleaning and Inspection (cont'd)

Callout	Component Name
4	Drive Sprocket Bearing Assembly
5	Park Gear
6	Driven Sprocket
7	Drive Link Assembly

Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T30)



2202232

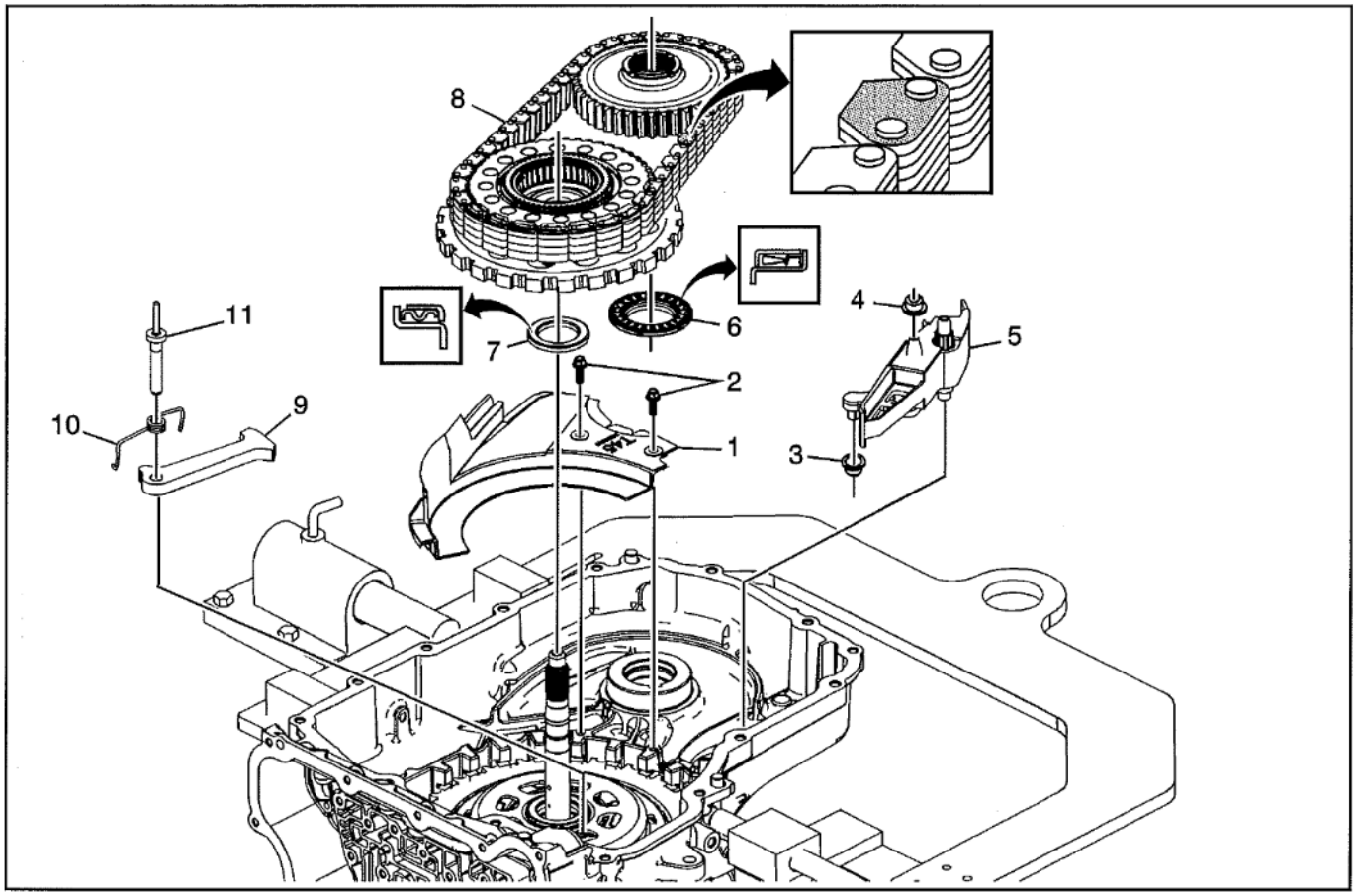
Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T30)

Callout	Component Name
1	Front Differential Carrier Baffle
2	Baffle Retainer
3	Front Differential Carrier Baffle Bolt M6 x 16 (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)
4	Drive Link Lube Scoop Seal
5	Drive Link Lube Fluid Seal
6	Drive Link Lube Scoop
7	Driven Sprocket Bearing Assembly
8	Drive Sprocket Bearing Assembly

Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T30) (cont'd)

Callout	Component Name
9	Driven Sprocket Assembly, Drive Sprocket Assembly and Drive Link **Tip:** • Install the drive link with the colored links and/or part number facing up. • The drive link, drive, and driven sprocket assemblies must be installed at the same time. • The ball bearing should spin freely and smoothly. • The driven sprocket ball bearing inner race has a slight interference fit with the case. Tap gently with the palm of a hand or a soft tip hammer to install.
10	Park Pawl
11	Park Pawl Spring
12	Park Pawl Shaft **Tip:** Check to ensure that the park pawl operates freely and is not binding.

Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T40/45/50)



1891417

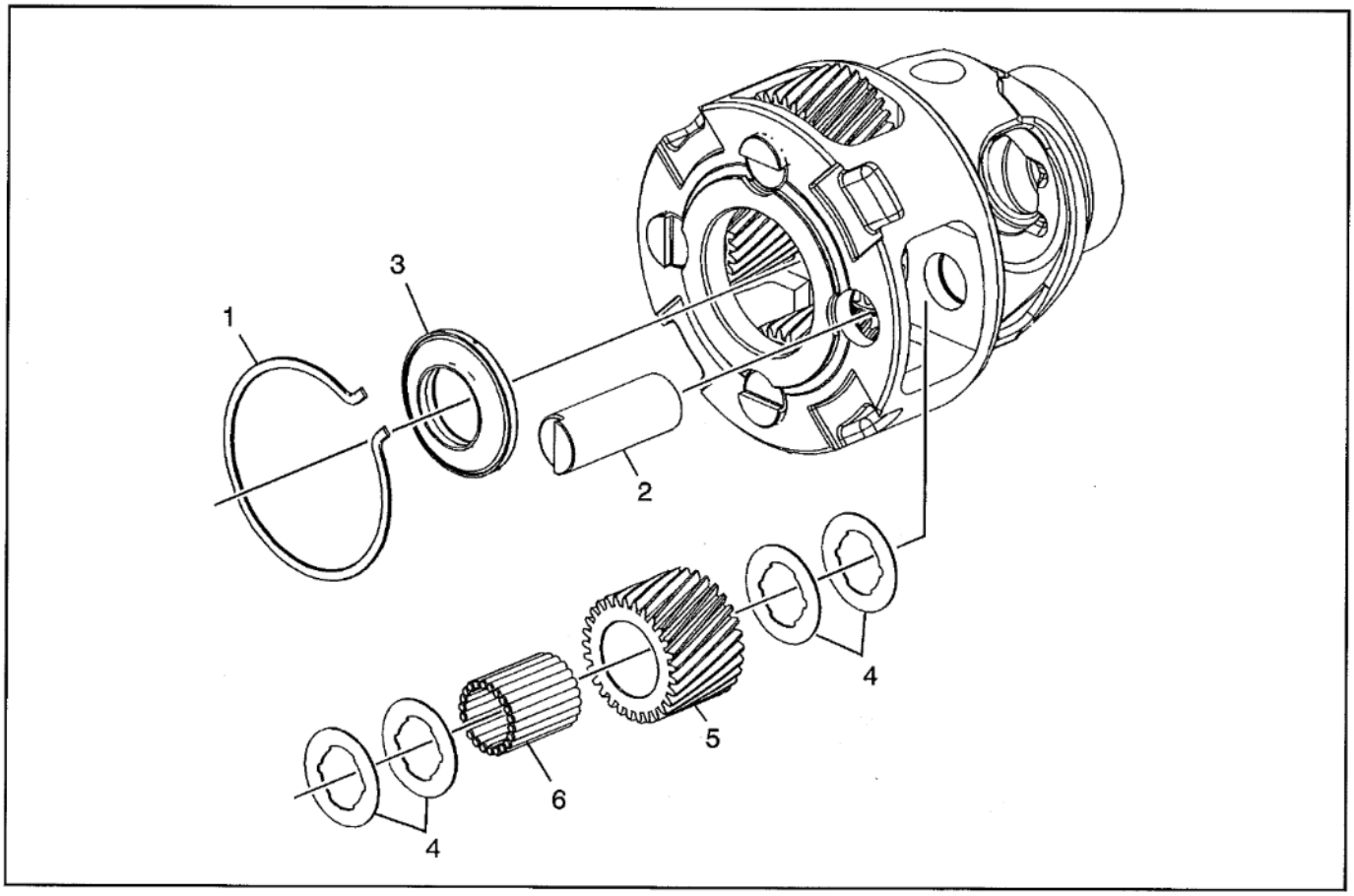
Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T40/45/50)

Callout	Component Name
1	Front Differential Carrier Baffle
2	Front Differential Carrier Baffle Bolt M6 x 16 (Qty: 2) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)
3	Drive Link Lube Scoop Seal
4	Drive Link Lube Fluid Seal

Drive and Driven Sprocket, Drive Link, and Park Pawl Installation (6T40/45/50) (cont'd)

Callout	Component Name
5	Drive Link Lube Scoop
6	Driven Sprocket Bearing Assembly
7	Drive Sprocket Bearing Assembly
8	Driven Sprocket Assembly, Drive Sprocket Assembly and Drive Link **Tip:** • Install the drive link with the colored links and/or part number facing up. • The drive link, drive, and driven sprocket assemblies must be installed at the same time. • The ball bearing should spin freely and smoothly. • The driven sprocket ball bearing inner race has a slight interference fit with the case. Tap gently with the palm of a hand or a soft tip hammer to install.
9	Park Pawl
10	Park Pawl Spring
11	Park Pawl Shaft **Tip:** Check to ensure that the park pawl operates freely and is not binding.

Front Differential Carrier Cleaning and Inspection

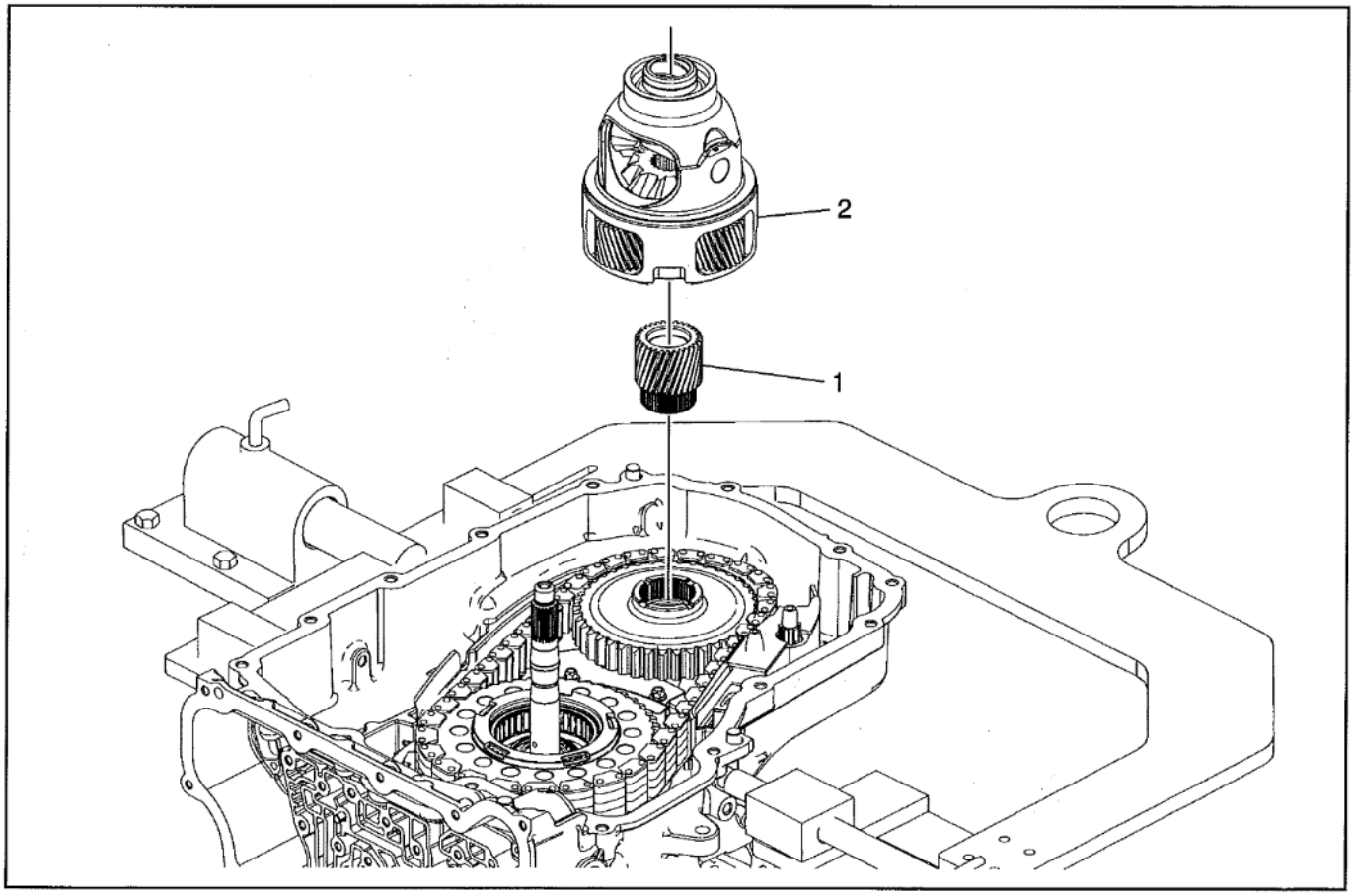


1891418

Front Differential Carrier Cleaning and Inspection

Callout	Component Name
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Caution:** Keep thrust washers with the gear it was matched to. The thrust washers are selective sizes and it is difficult to identify the proper washer thickness. Improper assembly can cause premature failure of the differential assembly. **Preliminary Procedures** • Clean and inspect the differential assembly, pinion gears and thrust washers for scoring, wear or damage. • The differential assembly is only serviced as an assembly.	
1	Front Differential Pinion Gear Shaft Retainer
2	Front Differential Pinion Gear Pin
3	Sun Gear to Differential Housing Bearing Assembly
4	Front Differential Pinion Gear Washer
5	Front Differential Pinion Gear
6	Front Differential Planetary Pinion Gear Bearing Roller

Front Differential Carrier Installation (6T30)

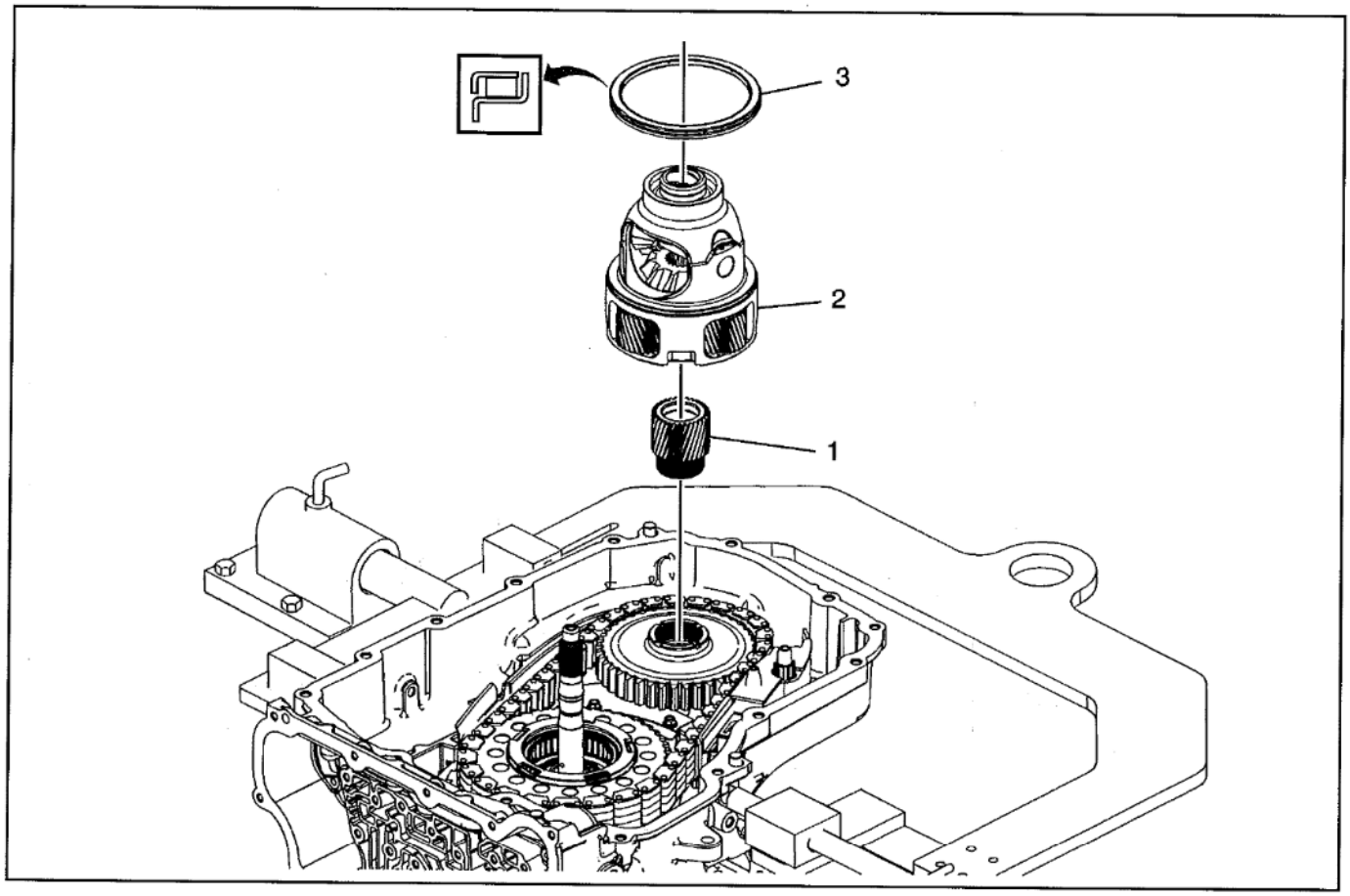


2202201

Front Differential Carrier Installation (6T30)

Callout	Component Name
1	Final Drive Sun Gear
2	Differential Carrier Assembly

Front Differential Carrier Installation (6T40/45/50)

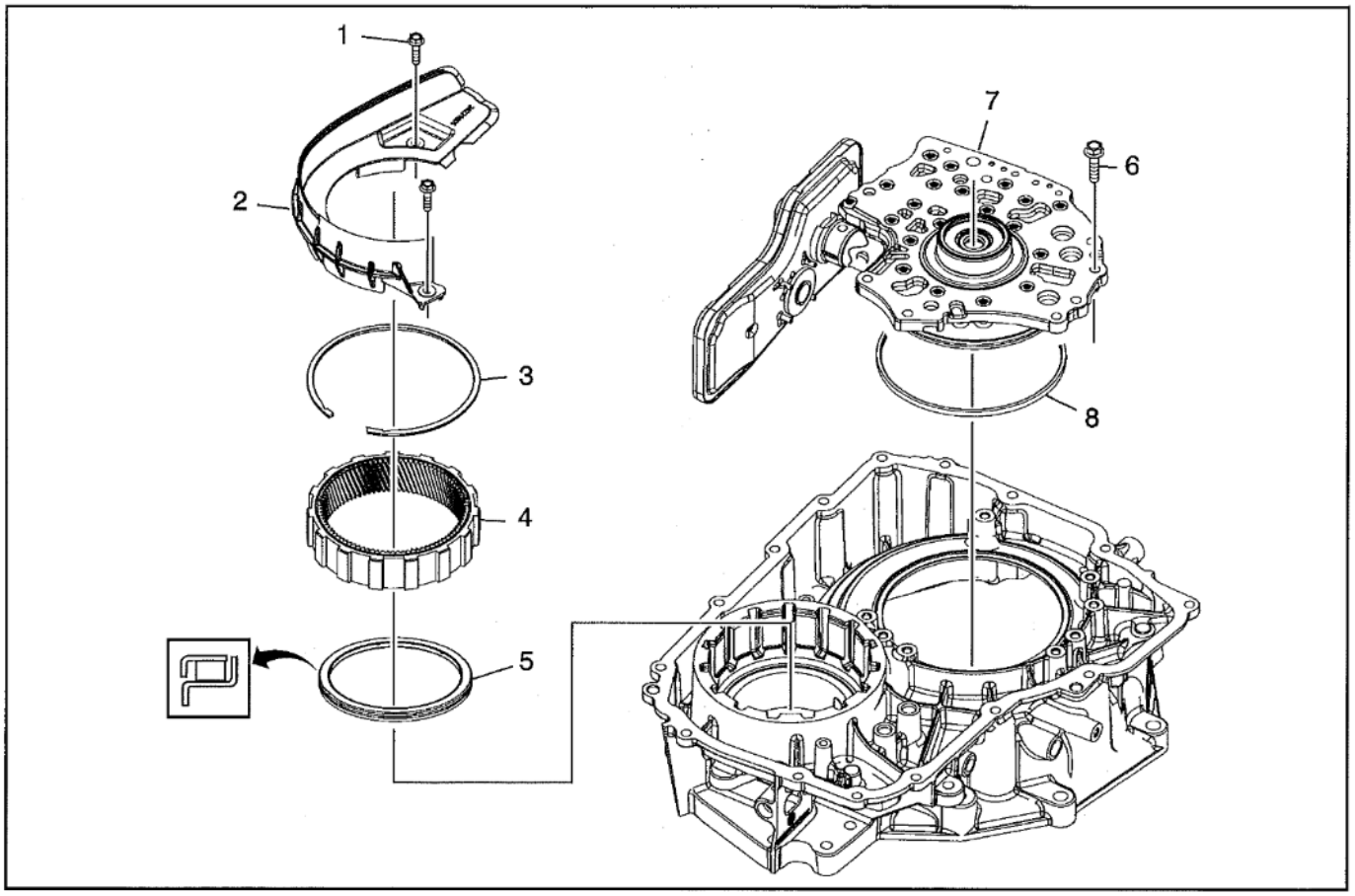


1891420

Front Differential Carrier Installation (6T40/45/50)

Callout	Component Name
1	Final Drive Sun Gear
2	Differential Carrier Assembly
3	Front Differential Carrier Bearing Asembly

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal (6T30)

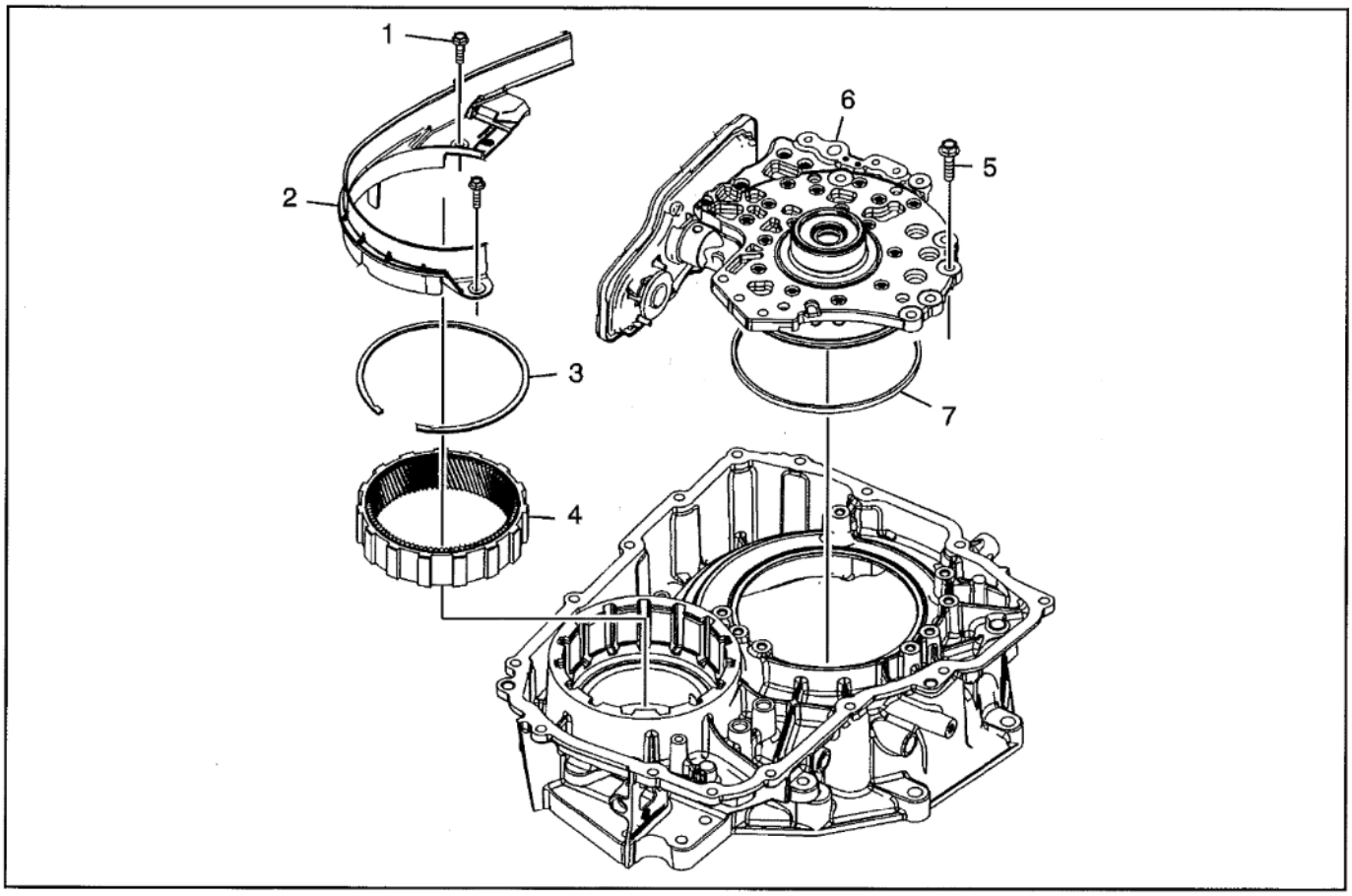


2202202

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal (6T30)

Callout	Component Name
1	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)
2	Front Differential Carrier Baffle
3	Front Differential Ring Gear Retainer **Tip:** Note the direction of the taper to ensure proper installation.
4	Front Differential Ring Gear
5	Front Differential Carrier Bearing Assembly
6	Fluid Pump Bolts M8 x 33 (Qty: 7)
7	Fluid Pump Assembly
8	Torque Converter and Differential Housing Seal

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal (6T40/45)

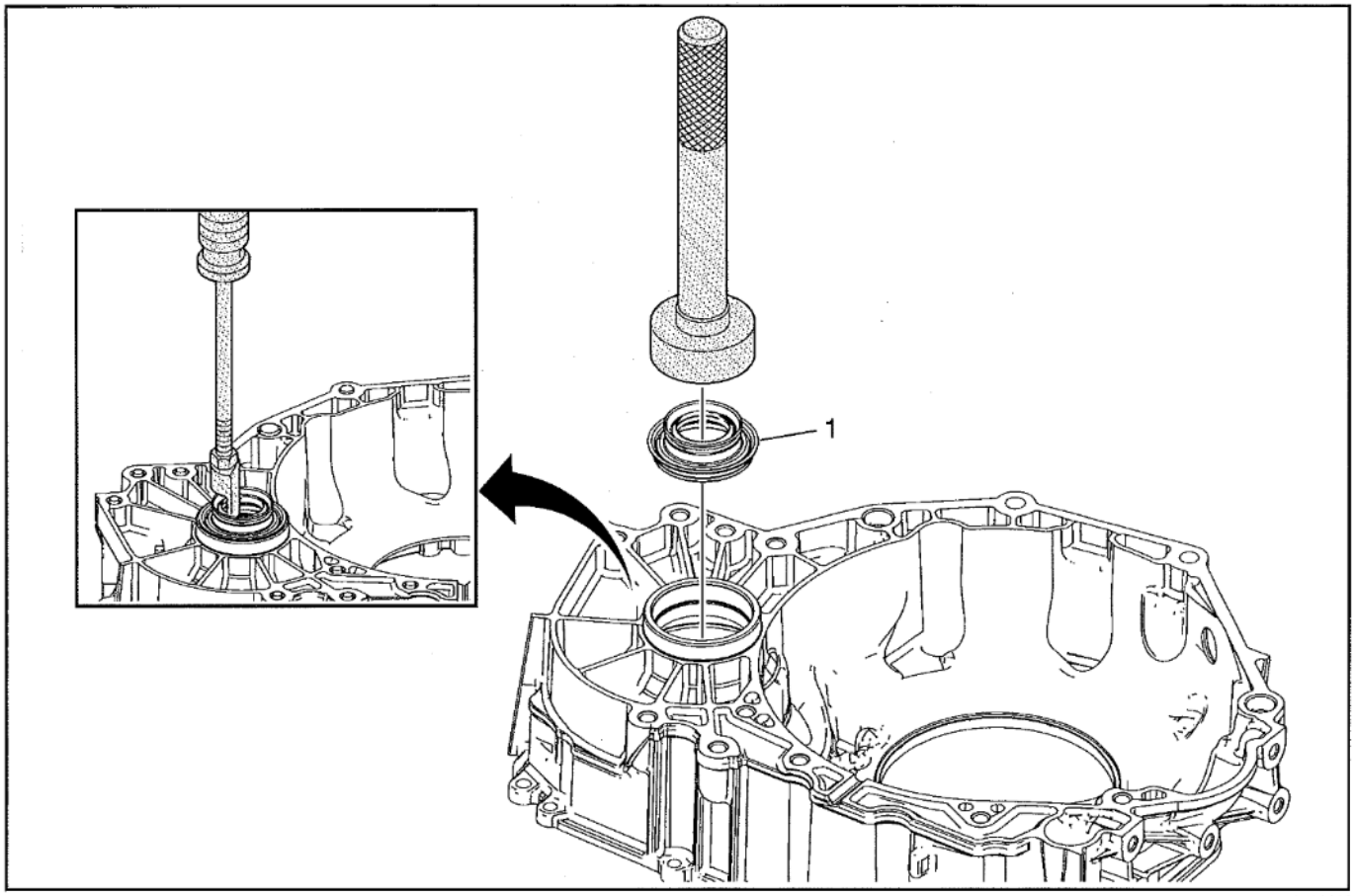


1891422

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Removal (6T40/45)

Callout	Component Name
1	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2)
2	Front Differential Carrier Baffle
3	Front Differential Ring Gear Retainer **Tip:** Note the direction of the taper to ensure proper installation.
4	Front Differential Ring Gear
5	Fluid Pump Bolts M8 x 33 (Qty: 8)
6	Fluid Pump Assembly
7	Torque Converter and Differential Housing Seal

Front Wheel Drive Shaft Seal Replacement - Torque Converter Housing Side

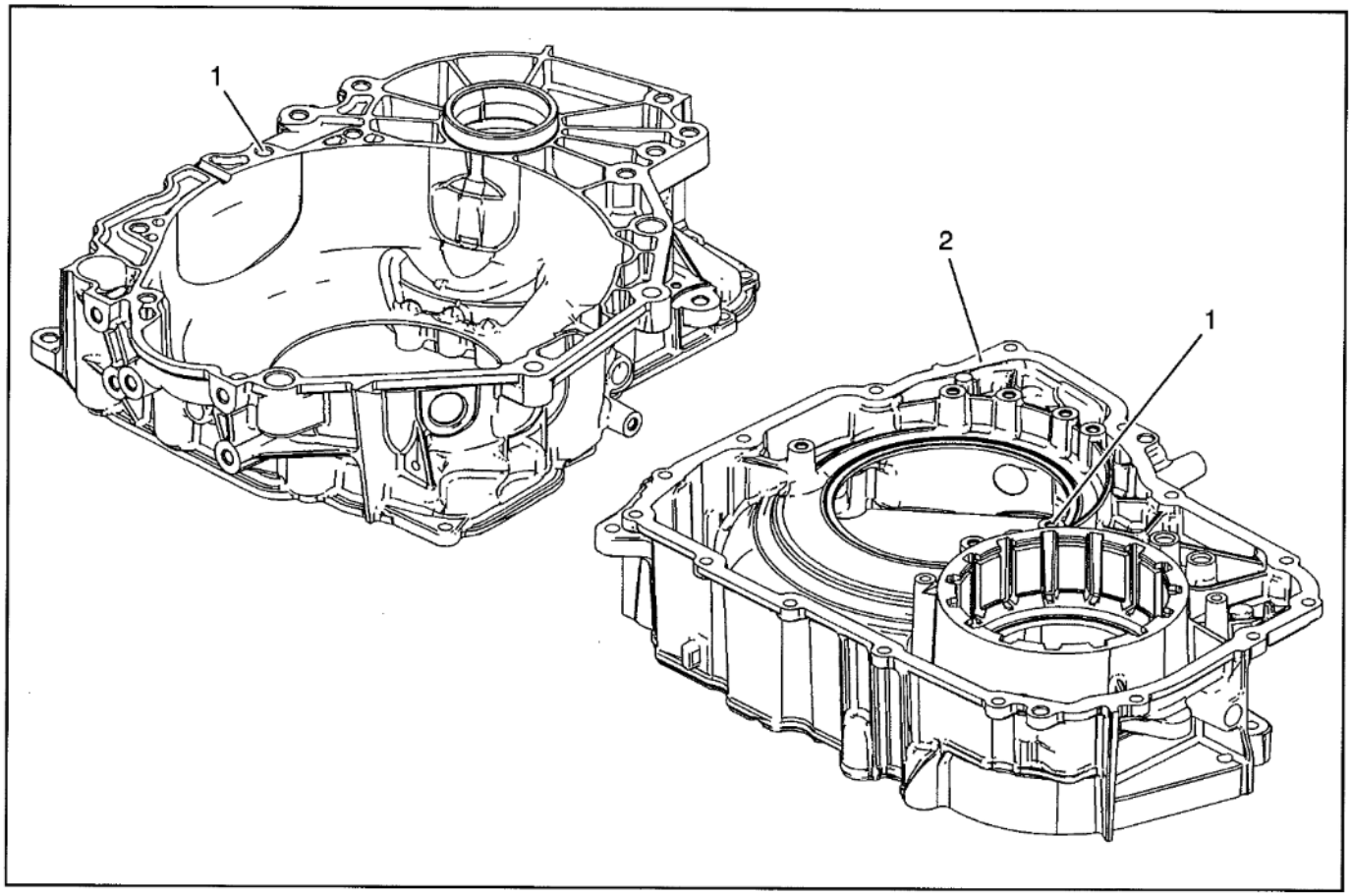


1891410

Front Wheel Drive Shaft Seal Replacement - Torque Converter Housing Side

Callout	Component Name
1	Front Wheel Drive Shaft Oil Seal Assembly **Special Tools** • *DT-23129* Universal Seal Remover • *DT-47790* Seal Installer • *GE-6125-1B* Slide Hammer • *GE-8092* Driver Handle For equivalent regional tools, refer to *Special Tools on page 17-394*.

Torque Converter Housing Cleaning and Inspection



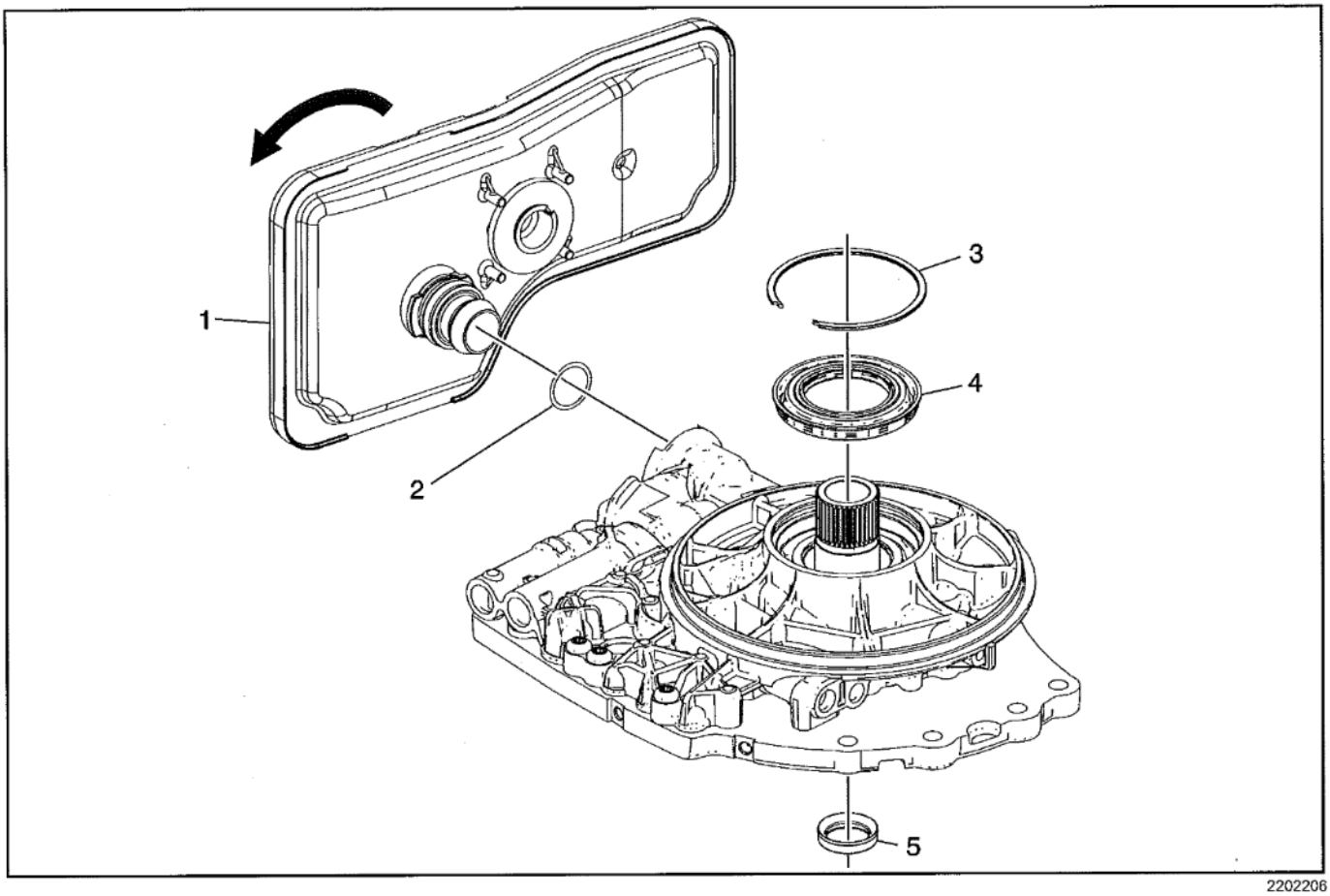
1902422

Torque Converter Housing Cleaning and Inspection

Callout	Component Name
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure. **Caution:** Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component. **Caution:** Do not use abrasive pads or bristle devices to clean the sealing surfaces. Abrasive pads produce a fine grit that can effect transmission function. Abrasive pads can also remove enough metal to create oil leaks. **Preliminary Procedure** Thoroughly clean the torque converter housing, including case threads with clean solvent.	
1	Threaded Hole
2	Gasket Sealing Surface

Transmission Fluid Pump Disassemble (6T30)

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

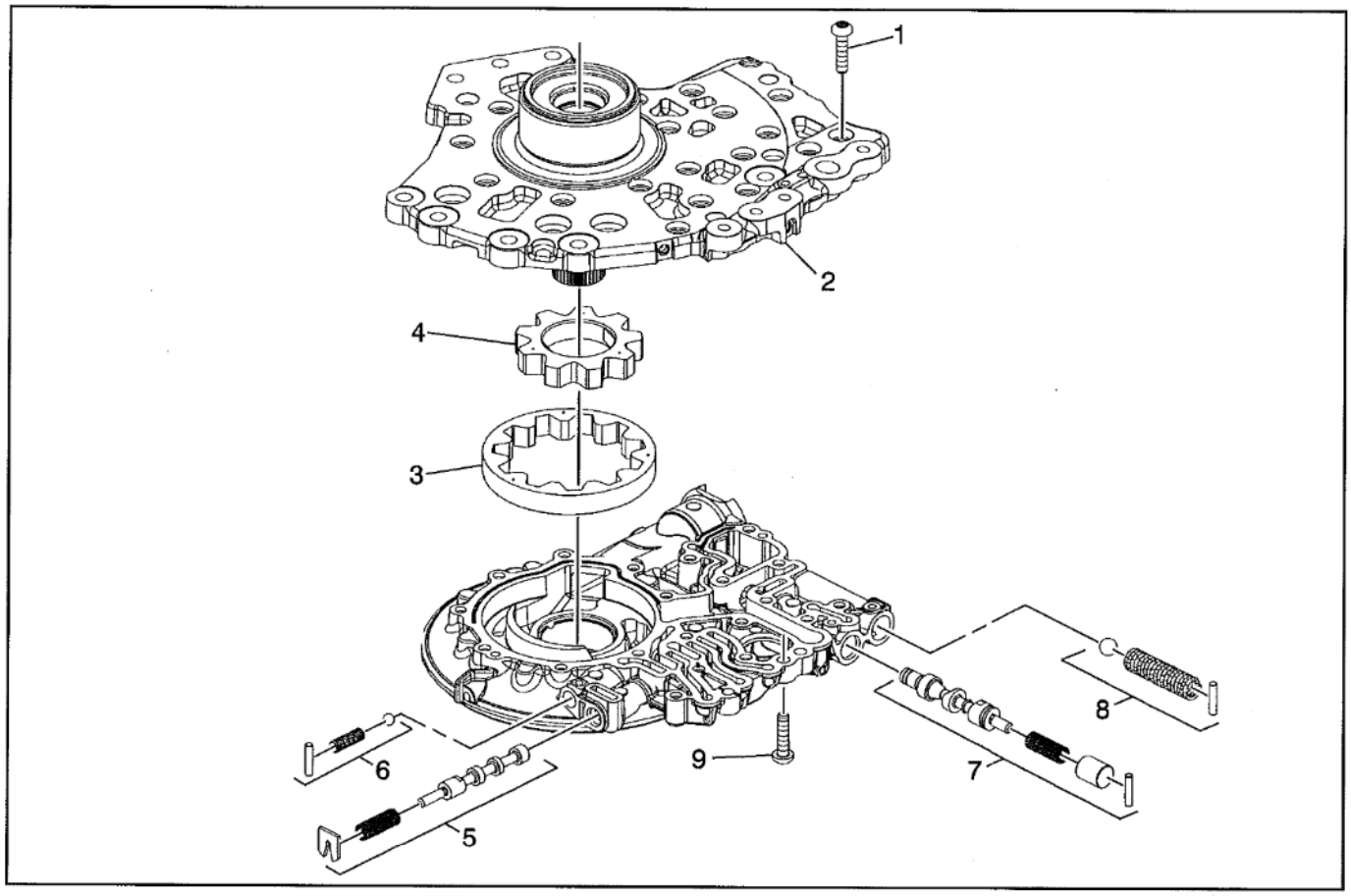


2202206

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Callout	Component Name
1	Fluid Filter Assembly **Tip:** Rotate filter 90 degrees to disengage locking tangs.
2	A/Trans Fluid Filter Seal
3	Torque Converter Fluid Seal Retainer
4	Torque Converter Fluid Seal
5	Torque Converter Fluid Seal Assembly

Fluid Pump Disassemble

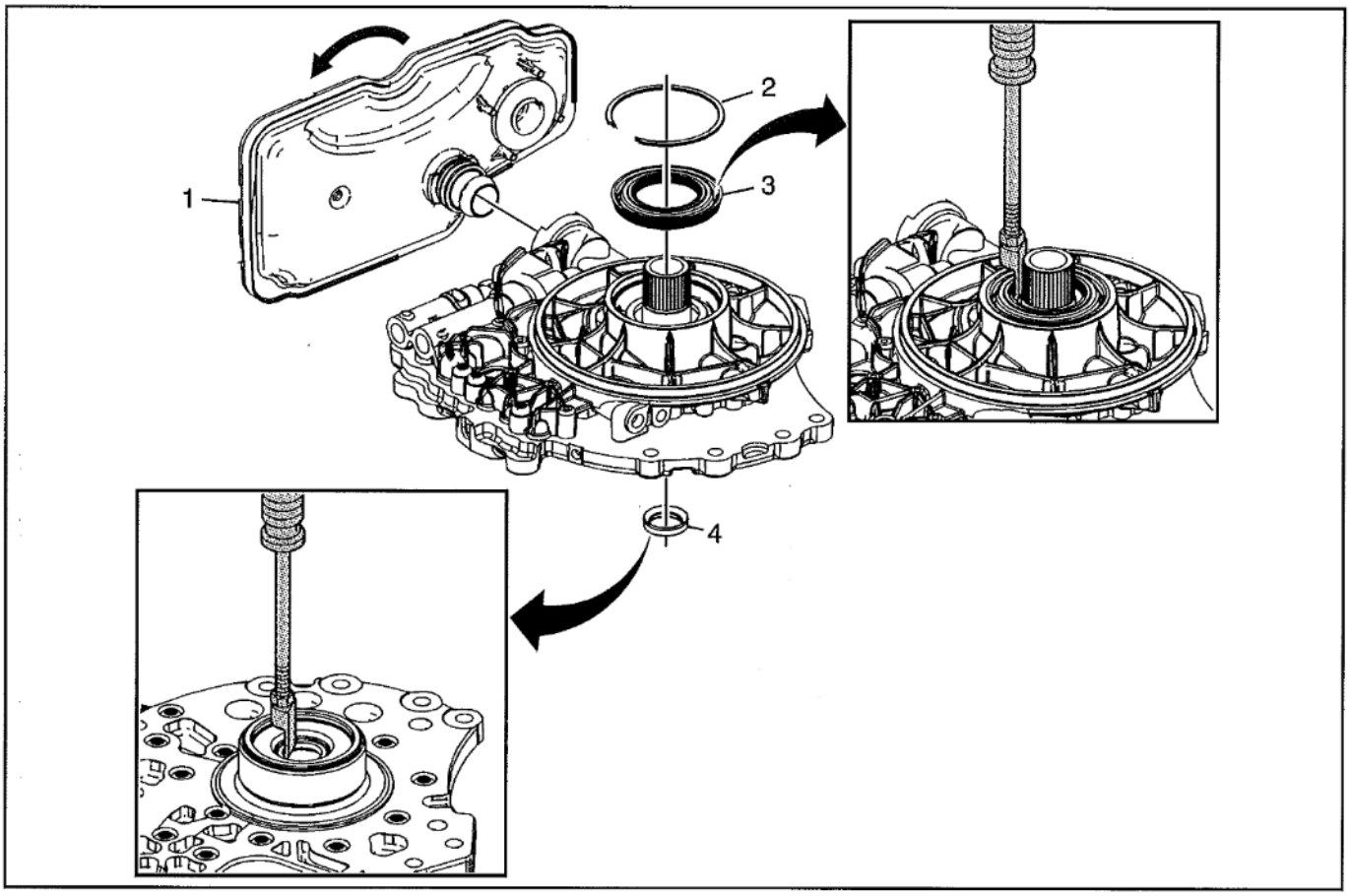


2215840

Fluid Pump Disassemble

Callout	Component Name
Warning: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
Caution: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components and the pump body for wear and/or damage.	
1	Fluid Pump Cover Bolts M6 x 21.5 (Qty: 20) **Tip:** There are 3 bolts on the pump cover side and 20 bolts on the pump body side.
2	Fluid Pump Cover
3	Fluid Pump Driven Gear
4	Fluid Pump Drive Gear
5	TCC Control Valve Train
6	Fluid Pump Blow Off Ball Valve Train
7	Pressure Regulator Valve Train
8	TCC Blow Off Ball Valve Train
9	Fluid Pump Cover Bolts M6 x 18.5 (Qty: 3)

Transmission Fluid Pump Disassemble (6T40/45/50)
Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

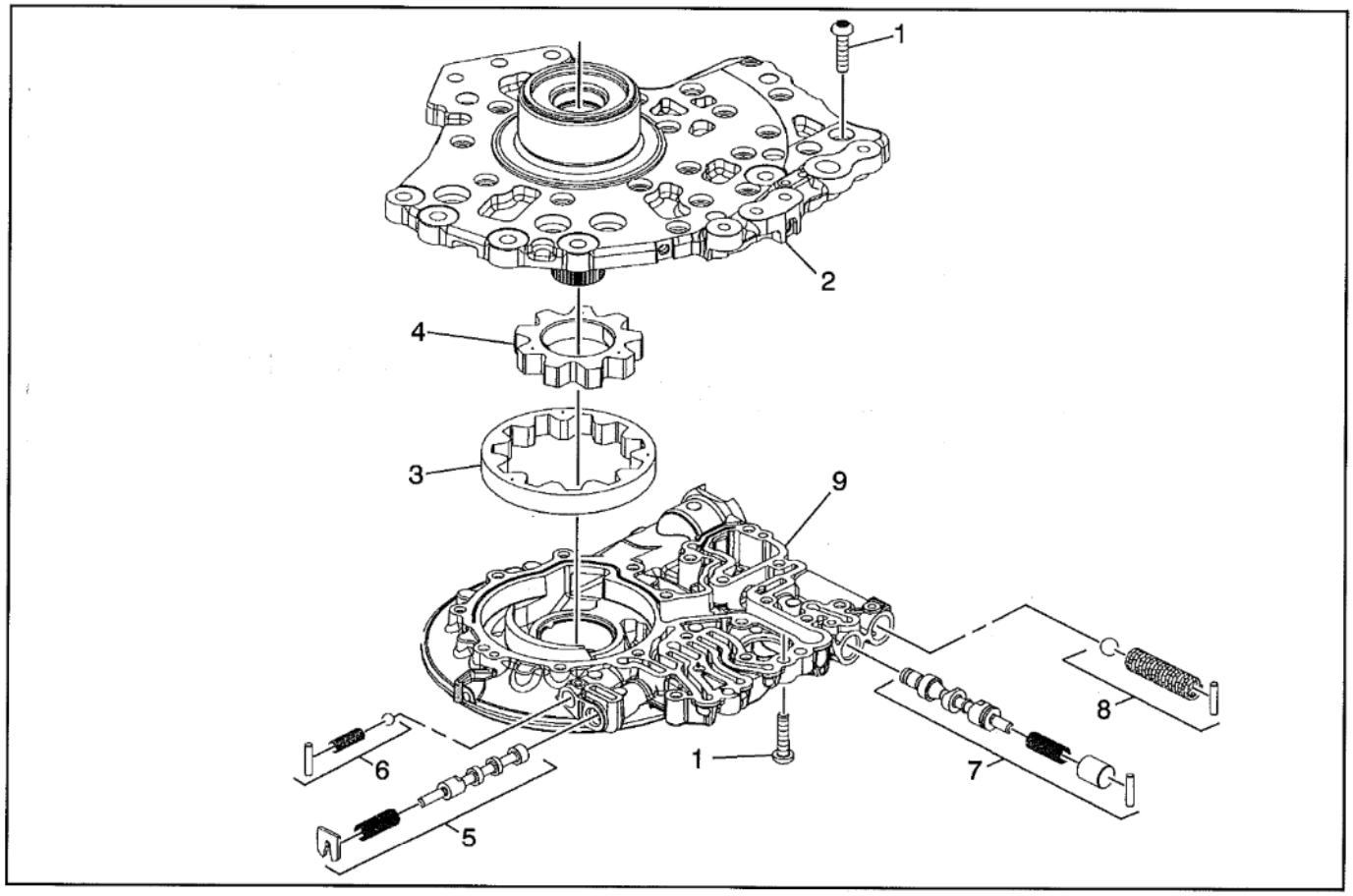


1891423

Fluid Filter Assembly and Torque Converter Fluid Seal Disassemble

Callout	Component Name
1	Fluid Filter Assembly **Tip:** Rotate filter 90 degrees to disengage locking tangs.
2	Torque Converter Fluid Seal Retainer
3	Torque Converter Fluid Seal **Special Tools** • *DT-23129* Universal Seal Remover • *GE-6125-1B* Slide Hammer For equivalent regional tools, refer to *Special Tools on page 17-394*.
4	Torque Converter Fluid Seal Assembly **Special Tools** • *DT-23129* Universal Seal Remover • *GE-6125-1B* Slide Hammer For equivalent regional tools, refer to *Special Tools on page 17-394*.

Fluid Pump Disassemble

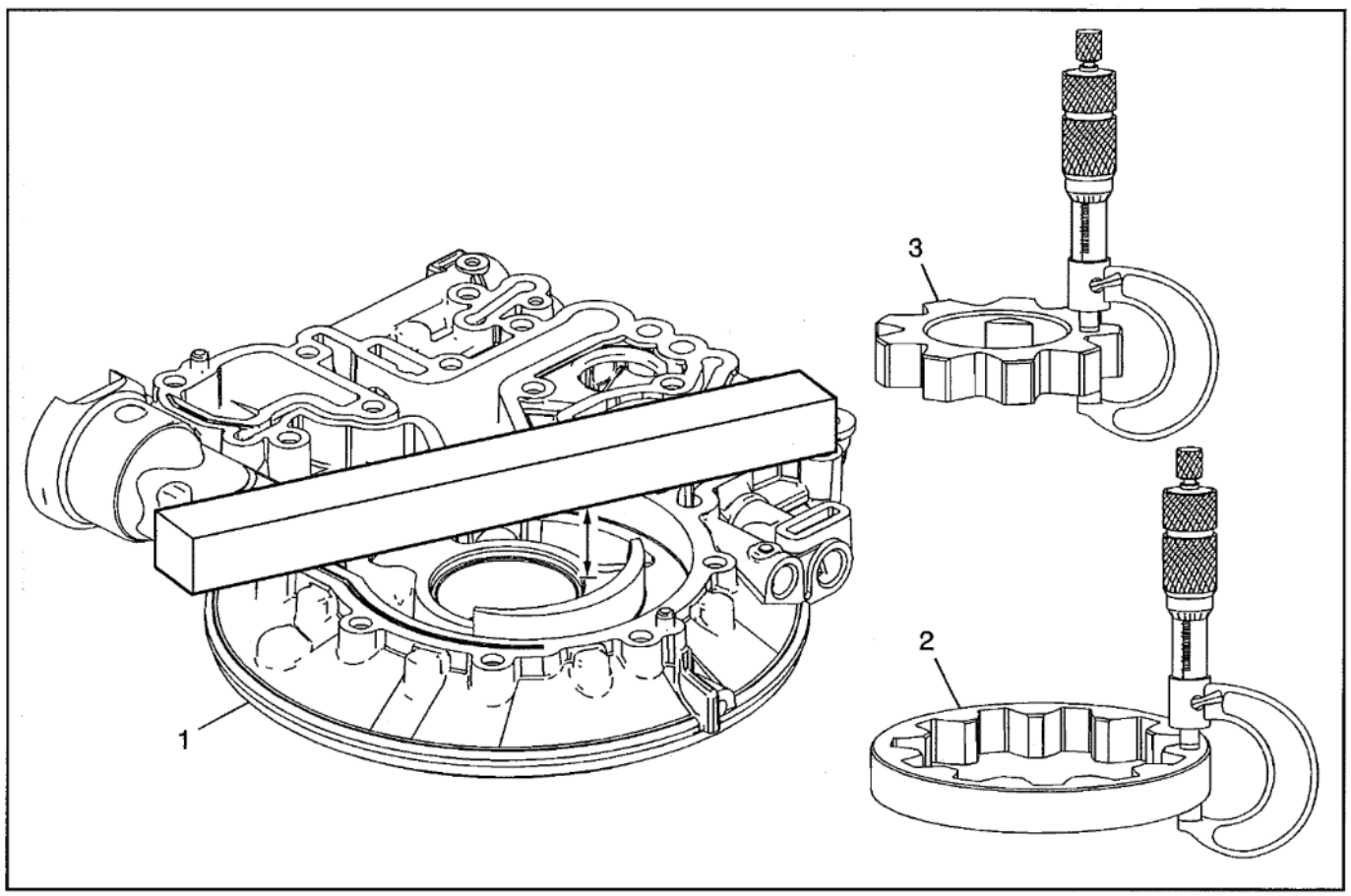


2552969

Fluid Pump Disassemble

Callout	Component Name
Warning: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
Caution: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components and the pump body for wear and/or damage.	
1	Fluid Pump Cover Bolts M6 x 25 (Qty: 23) **Tip:** There are 3 bolts on the pump cover side and 20 bolts on the pump body side.
2	Fluid Pump Cover
3	Fluid Pump Driven Gear
4	Fluid Pump Drive Gear
5	TCC Control Valve Train
6	TCC Blow Off Ball Valve Train
7	Pressure Regulator Valve Train
8	Fluid Pump Blow Off Ball Valve Train
9	A/Trans Fluid Pump Body

Fluid Pump Selective Measurement

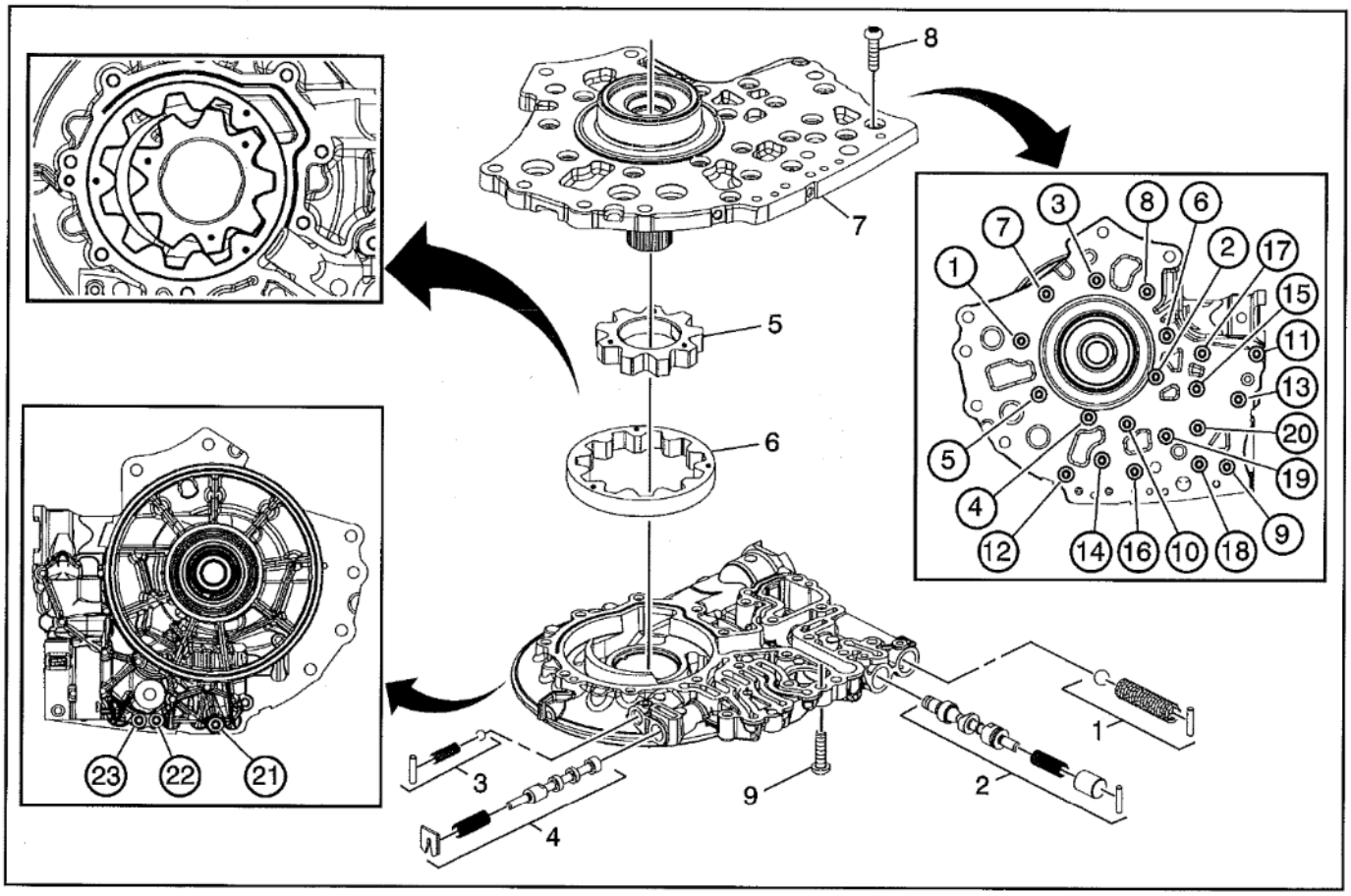


1898044

Fluid Pump Selective Measurement

Callout	Component Name
1	A/Trans Fluid Pump Body **Tip:** Measure the distance from the bottom of a gauge bar to the bottom of the pump rotor cavity. Refer to *Fluid Pump Selective Specifications on page 17-10*. **Special Tools** *GE 34673* Flat Gauge Bar or equivalent
2	A/Trans Fluid Pump Driven Gear **Tip:** Refer to *Fluid Pump Selective Specifications on page 17-10* to select the correct gear.
3	A/Trans Fluid Pump Drive Gear **Tip:** Refer to *Fluid Pump Selective Specifications on page 17-10* to select the correct gear.

Transmission Fluid Pump Assemble (6T30)
Fluid Pump w/Valve Trains Assemble

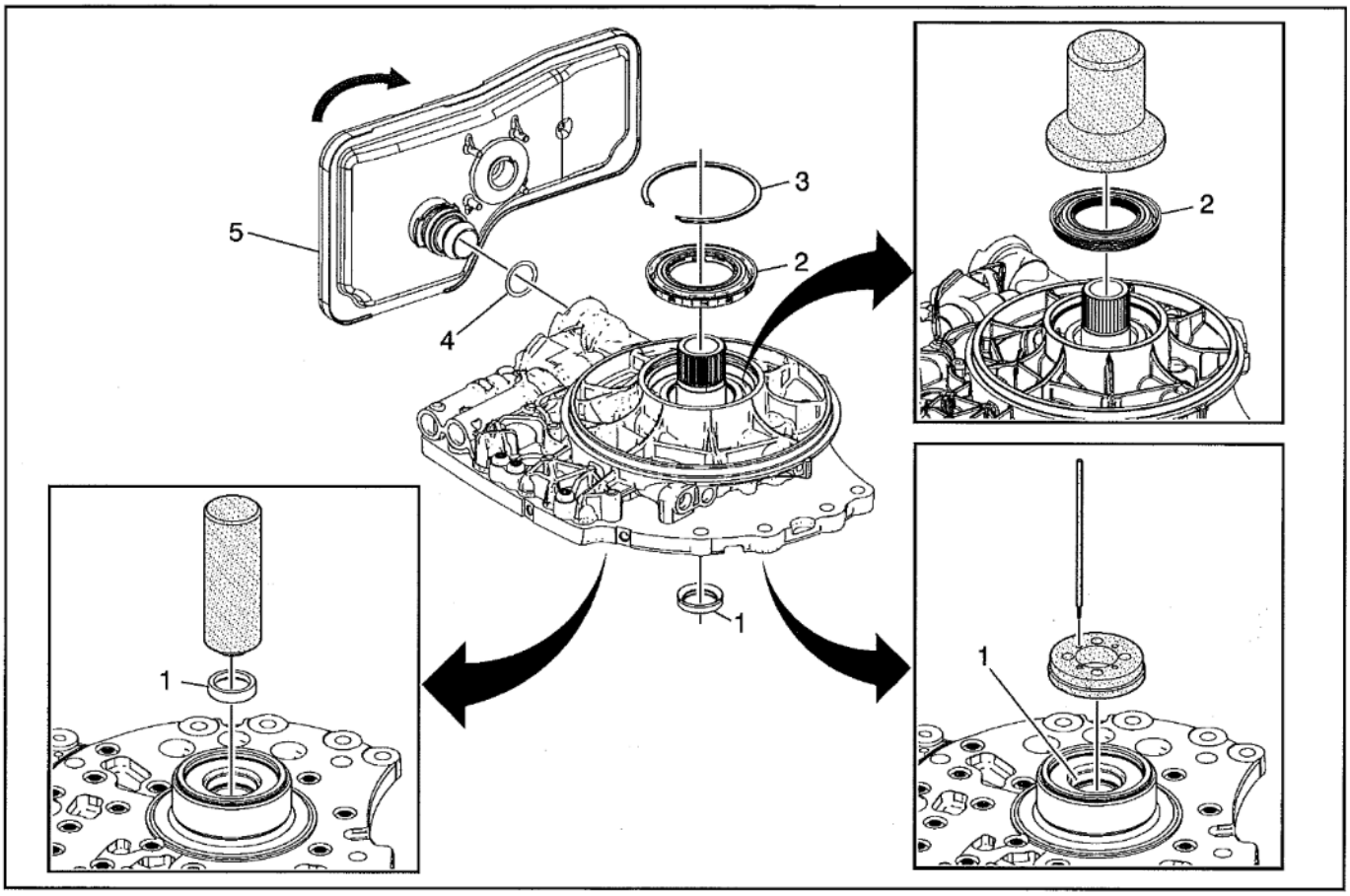


2202547

Fluid Pump w/Valve Trains Assemble

Callout	Component Name
1	TCC Blow Off Ball Valve Train
2	Pressure Regulator Valve Train
3	Fluid Pump Blow Off Ball Valve Train
4	TCC Control Valve Train
5	Fluid Pump Drive Gear **Tip:** The chamfer on the drive gear teeth face towards the pump body.
6	Fluid Pump Driven Gear **Tip:** The chamfer on the driven gear O.D. faces the pump body.
7	Fluid Pump Cover
8	Fluid Pump Cover Bolts M6 x 21.5 (Qty: 20) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)
9	Fluid Pump Cover Bolts M6 x 18.5 (Qty: 3) **Tighten** 12 N•m (106 lb in)

Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

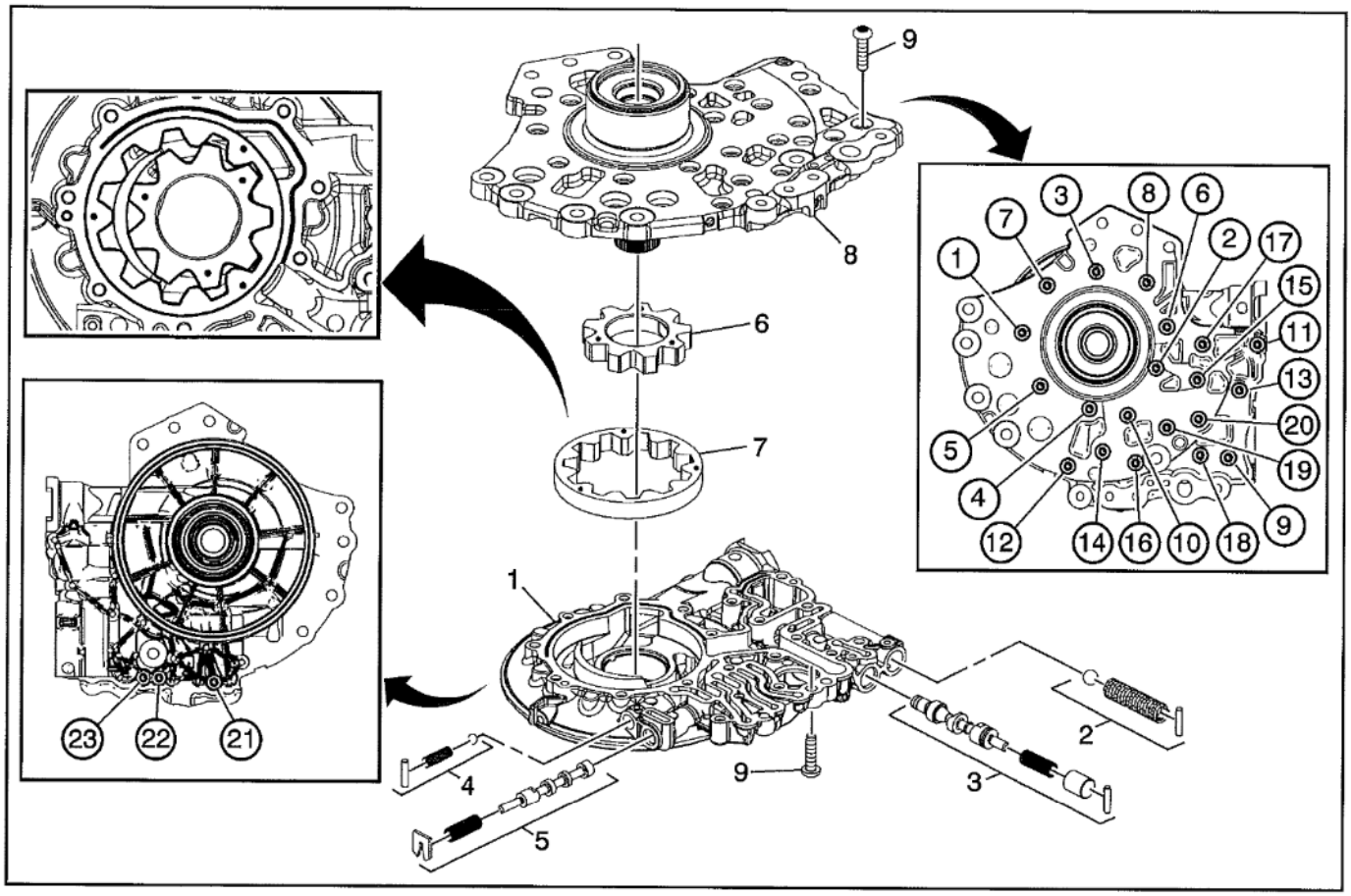


2202549

Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

Callout	Component Name
1	Torque Converter Fluid Seal Assembly **Tip:** The fluid seal assembly must be staked in place using *DT-49131* seal staking tool to ensure proper seal retention. **Special Tool** • *DT-48270* Seal Installer • *DT-49131* Seal Staking Tool For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Torque Converter Fluid Seal **Special Tool** *DT-47791* Seal Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.
3	Torque Converter Fluid Seal Retainer
4	A/Trans Fluid Filter Seal
5	Fluid Filter Assembly **Tip:** Rotate filter 90 degrees to engage locking tangs.

Transmission Fluid Pump Assemble (6T40/45/50)
Fluid Pump w/Valve Trains Assemble

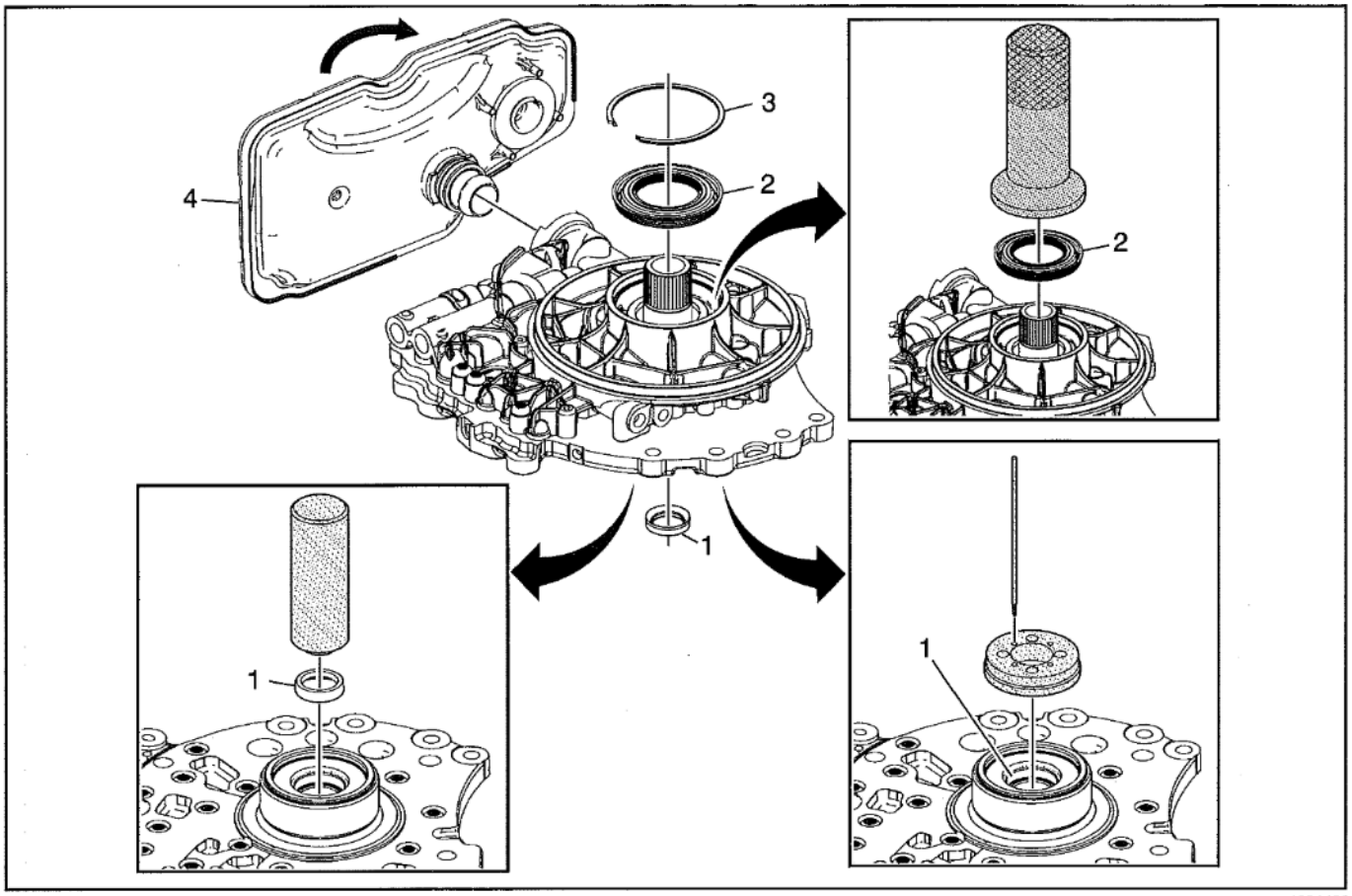


2552971

Fluid Pump w/Valve Trains Assemble

Callout	Component Name
1	A/Trans Fluid Pump Body
2	Fluid Pump Blow Off Ball Valve Train
3	Pressure Regulator Valve Train
4	TCC Blow Off Ball Valve Train
5	TCC Control Valve Train
6	Fluid Pump Drive Gear **Tip:** • Align ID feature dots with the driven gear as shown above. • The chamfer on the drive gear teeth faces the pump body.
7	Fluid Pump Driven Gear **Tip:** • Align ID feature dots with the drive gear as shown above, some models. • The chamfer on the driven gear O.D. faces the pump body.
8	Fluid Pump Cover
9	Fluid Pump Cover Bolts M6 x 25 (Qty: 23) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)

Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

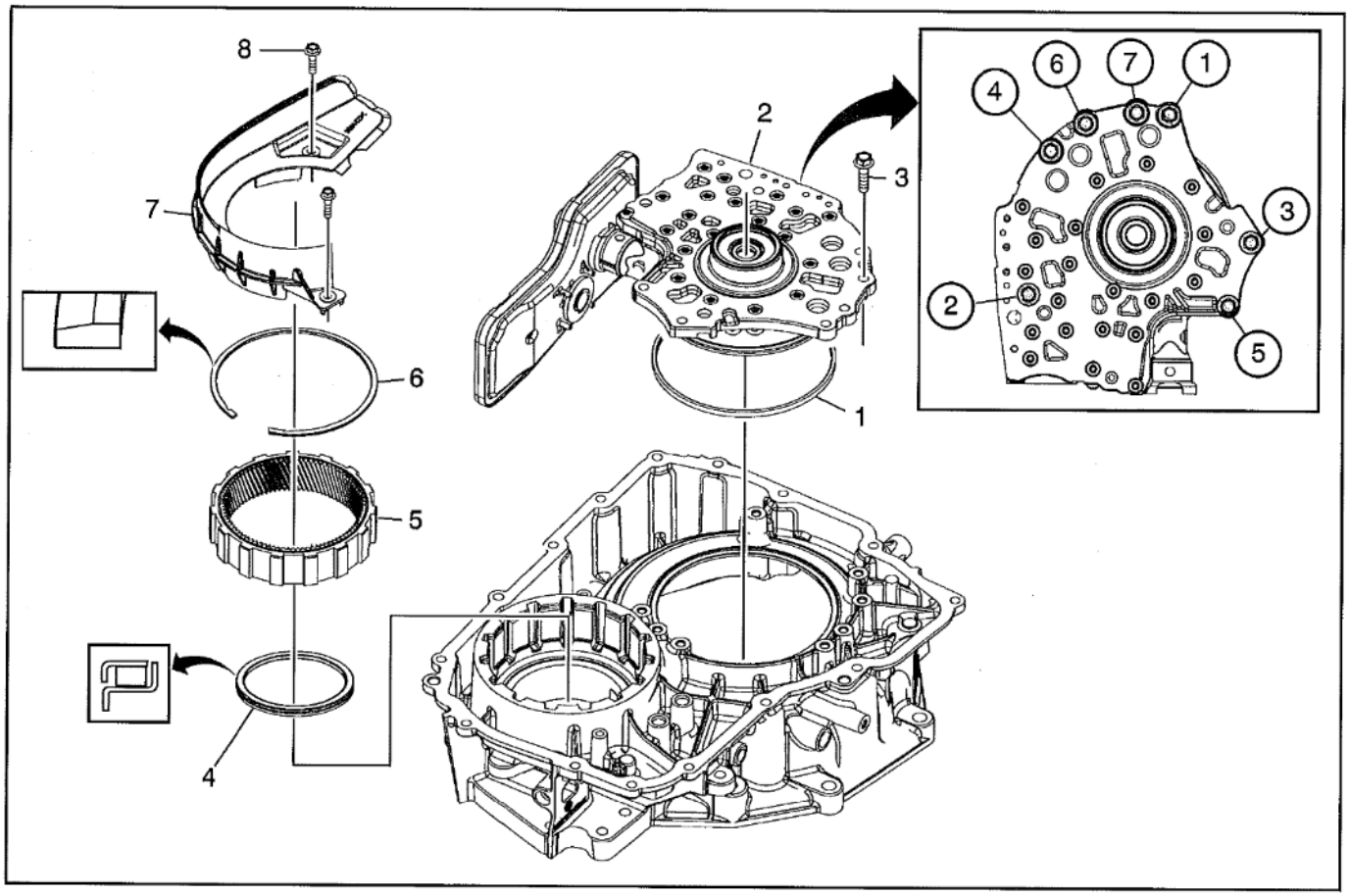


1891430

Torque Converter Fluid Seal and Fluid Filter Assembly Assemble

Callout	Component Name
1	Torque Converter Fluid Seal Assembly **Tip:** The fluid seal assembly must be staked in place using *DT-49131* seal staking tool to ensure proper seal retention. **Special Tool** • *DT-47792* Seal Installer • *DT-49131* Seal Staking Tool For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	Torque Converter Fluid Seal **Special Tool** *DT-47791-A* Seal Installer For equivalent regional tools, refer to *Special Tools on page 17-394*.
3	Torque Converter Fluid Seal Retainer
4	Fluid Filter Assembly **Tip:** Rotate filter 90 degrees to engage locking tangs.

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation (6T30)

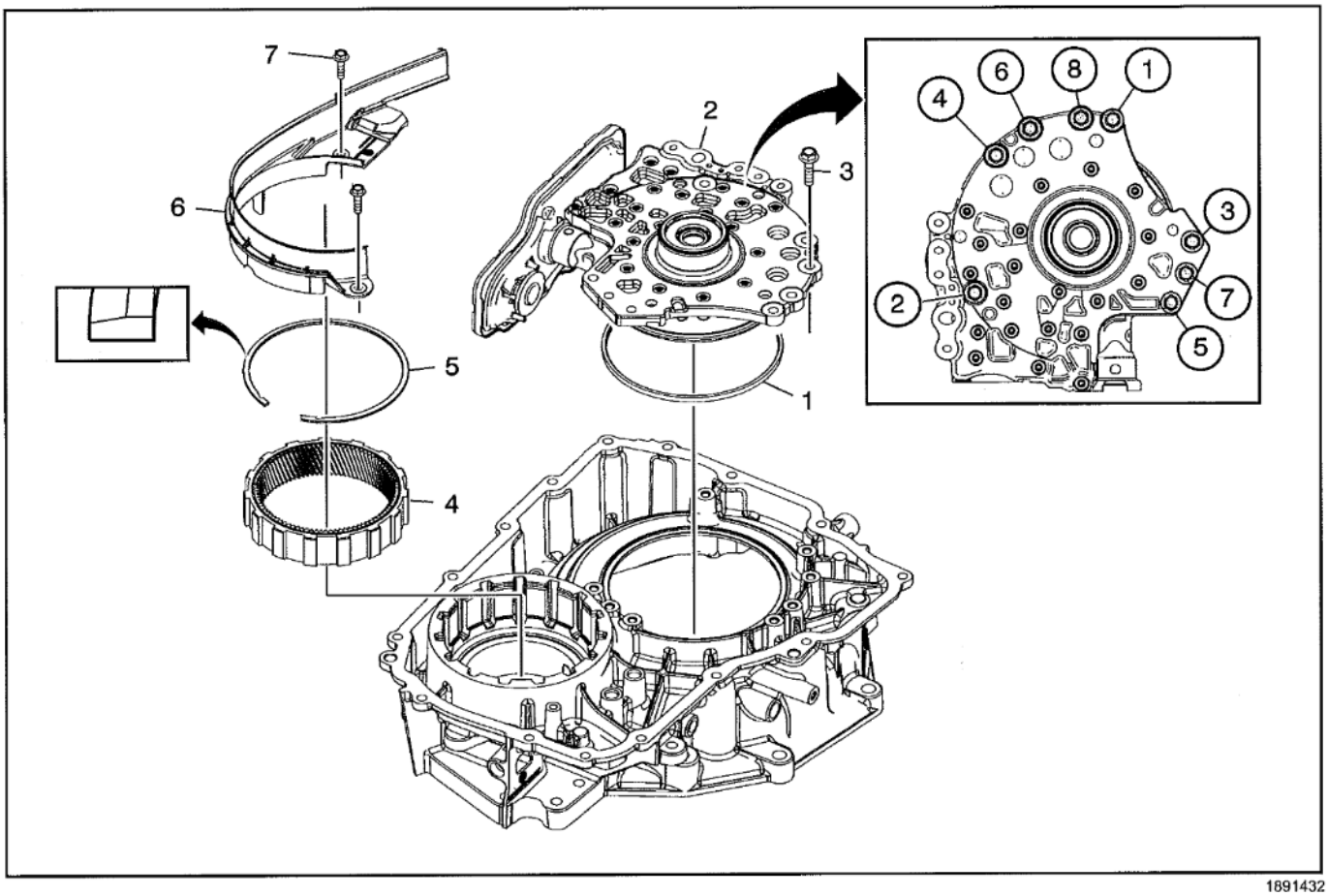


2202209

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation (6T30)

Callout	Component Name
1	Torque Converter and Differential Housing Seal
2	Fluid Pump Assembly
3	Fluid Pump Bolts M8 x 33 (Qty: 7) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in) then rotate the bolt an additional 45 degrees **Special Tool** *EN-45059* Angle Meter or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
4	Front Differential Carrier Bearing Assembly
5	Front Differential Ring Gear
6	Front Differential Ring Gear Retainer **Tip:** Install the retainer with the taper facing away from the ring gear.
7	Front Differential Carrier Baffle
8	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2) **Tighten** 12 N•m (106.21 lb in)

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation (6T40/45)

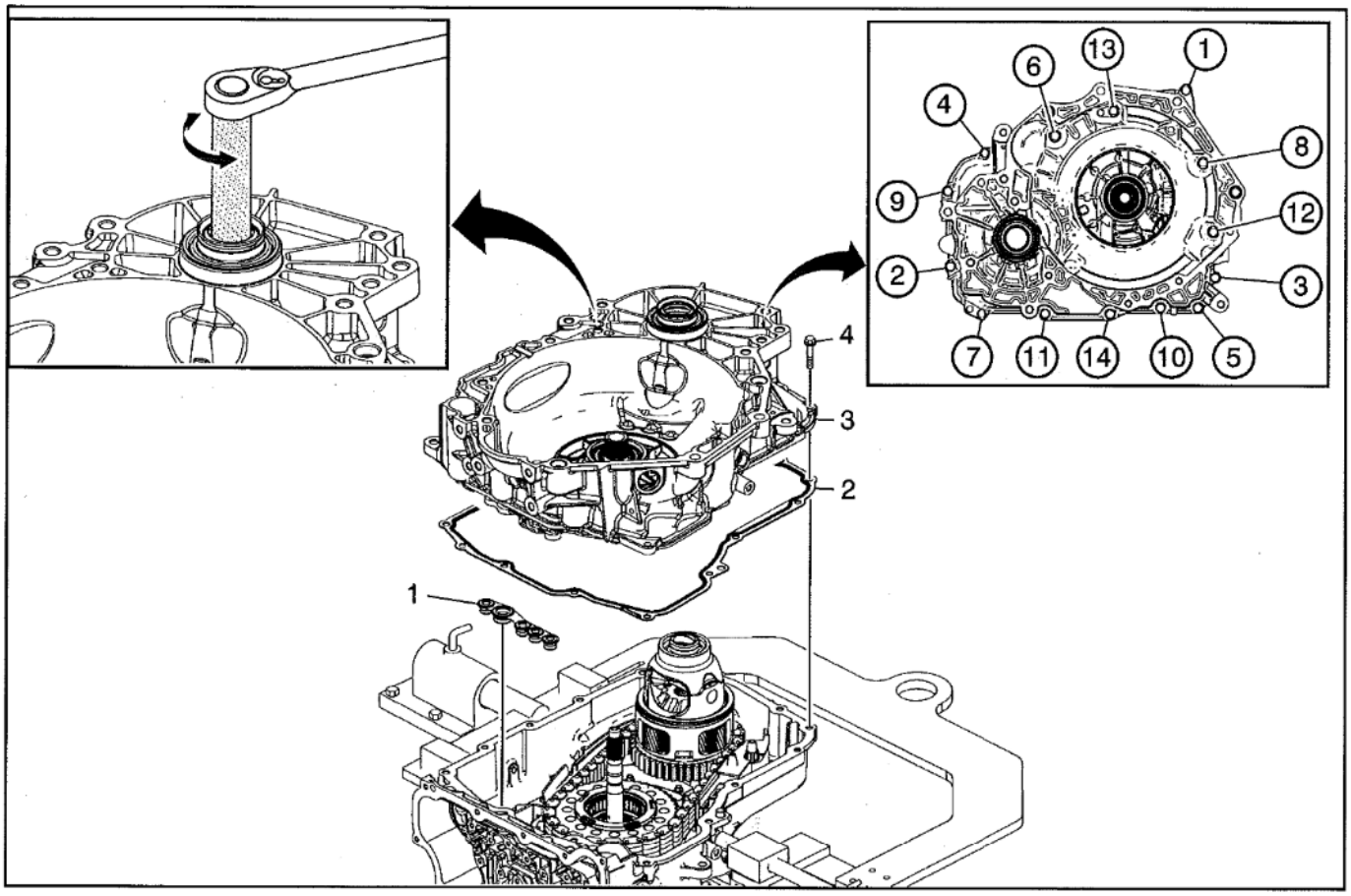


1891432

Transmission Fluid Pump, Front Differential Carrier Baffle, and Front Differential Ring Gear Installation (6T40/45)

Callout	Component Name
1	Torque Converter and Differential Housing Seal
2	Fluid Pump Assembly
3	Fluid Pump Bolts M8 x 33 (Qty: 8) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 10 N•m (89 lb in) then rotate the bolt an additional 45 degrees **Special Tool** *EN-45059* Angle Meter or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.
4	Front Differential Ring Gear
5	Front Differential Ring Gear Retainer **Tip:** Install the retainer with the taper facing away from the ring gear.
6	Front Differential Carrier Baffle
7	Front Differential Carrier Baffle Bolts M6 x 25 (Qty: 2) **Tighten** 12 N•m (106.21 lb in)

Torque Converter Housing with Fluid Pump Assembly Installation (6T30)

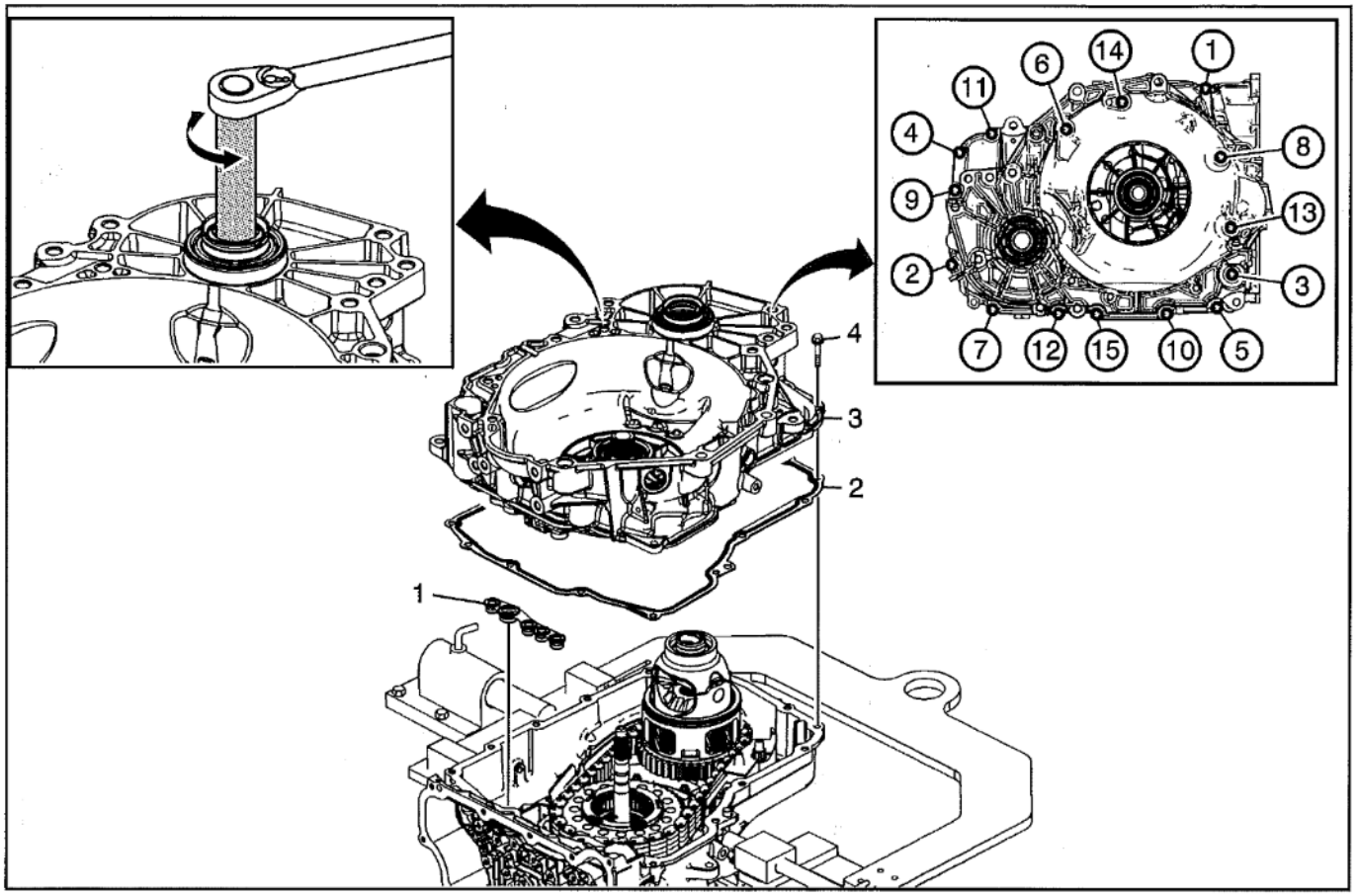


2372258

Torque Converter Housing with Fluid Pump Assembly Installation (6T30)

Callout	Component Name
1	Fluid Pump Seal Assembly
2	Torque Converter Housing Gasket
3	Torque Converter (w/Fluid Pump) Housing Assembly **Tip:** Rotate the differential slightly in each direction using *DT-48277* rotating tool to align the Differential Pinion Gears with the Differential Ring Gear in the Torque Converter Housing. **Special Tool** *DT-48277* Differential Rotating Tool For equivalent regional tools, refer to *Special Tools on page 17-394*.
4	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 14) **Caution:** Refer to *Fastener Caution on page 0-8*. **Procedure** Tighten the bolts in sequence shown. **Tighten** 10 N•m (89 lb in) then rotate the bolt an additional 50 degrees **Special Tool** *EN-45059* Angle Meter or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394*.

Torque Converter Housing with Fluid Pump Assembly Installation (6T40/45/50 Non Hybrid)

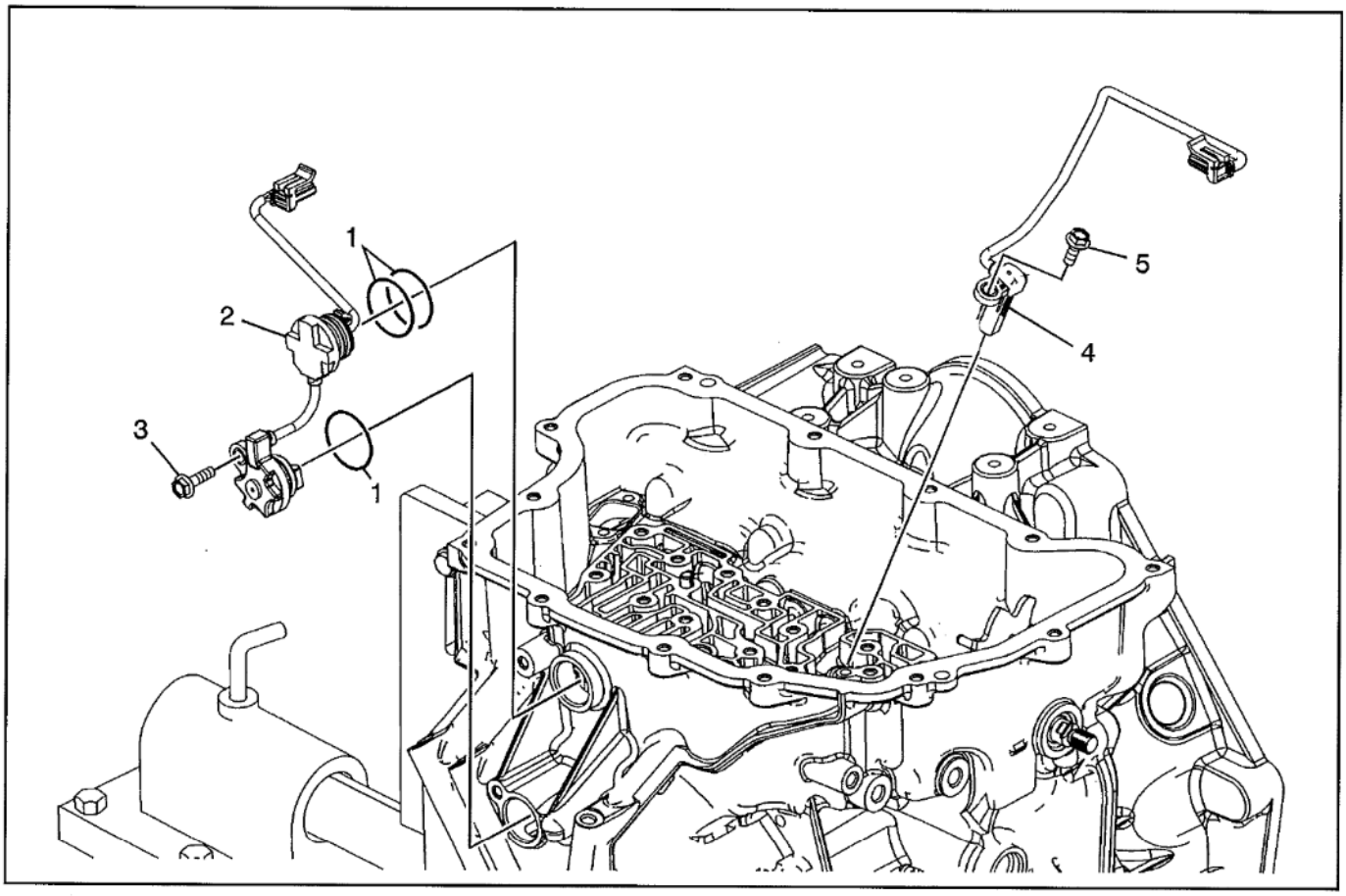


1891439

Torque Converter Housing with Fluid Pump Assembly Installation (6T40/45/50 Non Hybrid)

Callout	Component Name
1	Fluid Pump Seal Assembly
2	Torque Converter Housing Gasket
3	Torque Converter (w/Fluid Pump) Housing Assembly **Tip:** Rotate the differential slightly in each direction using the rotating tool to align the Differential Pinion Gears with the Differential Ring Gear in the Torque Converter Housing. • *DT-47793* Differential Rotating Tool for 6T40/45 applications • *DT-49938* Differential Rotating Tool for 6T50 applications **Special Tools** • *DT-47793* Differential Rotating Tool • *DT-49938* Differential Rotating Tool For equivalent regional tools, refer to *Special Tools on page 17-394.*
4	Torque Converter and Differential Housing Bolts M8 x 30 (Qty: 15) **Caution:** Refer to *Fastener Caution on page 0-8.* **Procedure** Tighten the bolts in sequence shown. **Tighten** 10 N•m (89 lb in) then rotate the bolt an additional 50 degrees **Special Tool** *EN-45059* Angle Meter or equivalent For equivalent regional tools, refer to *Special Tools on page 17-394.*

Input and Output Speed Sensor Installation

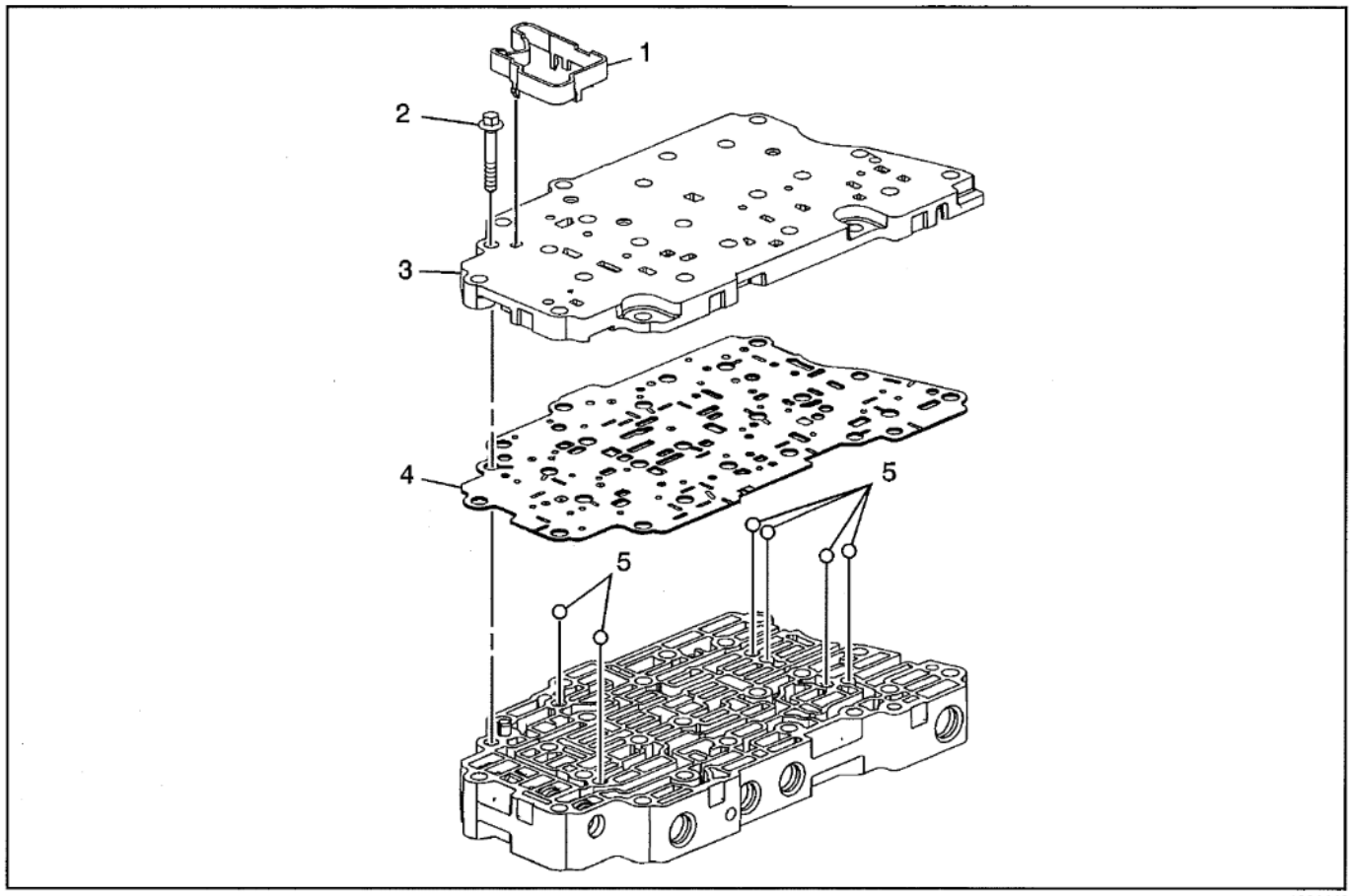


1891444

Input and Output Speed Sensor Installation

Callout	Component Name
1	Input Speed Sensor Assembly Seals
2	Input Speed Sensor Assembly
3	Input Speed Sensor Bolt M6 x 23 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 9 N•m (80 lb in)
4	A/Trans Output Speed Sensor Assembly
5	A/Trans Output Speed Sensor Bolt M6 x 18 (Qty: 1) **Tighten** 9 N•m (80 lb in)

Control Valve Body Assembly Disassemble (Gen 1)

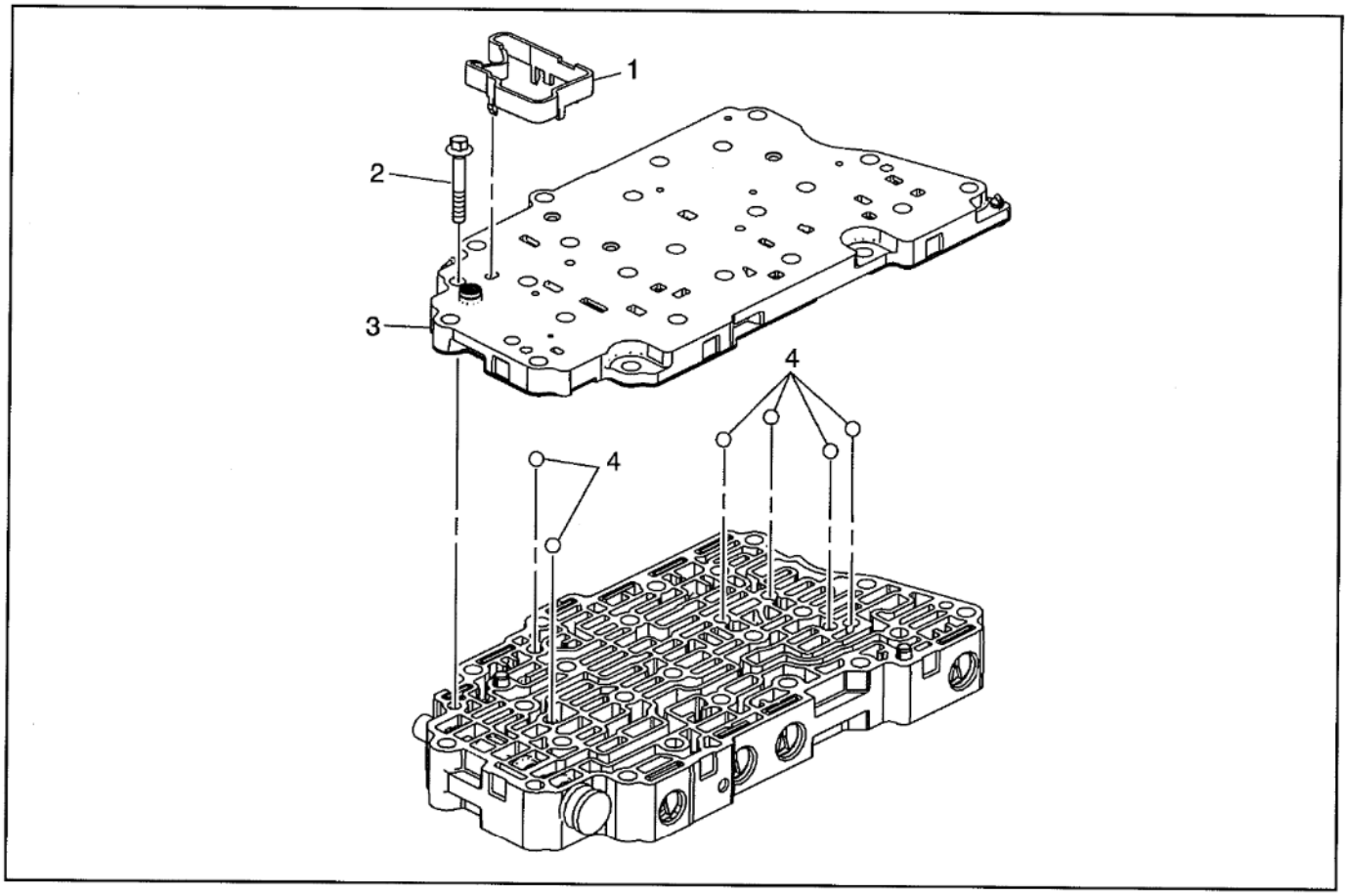


1891440

Control Valve Body Assembly Disassemble (Gen 1)

Callout	Component Name
1	Control Solenoid Valve Support
2	Control Valve Body Bolt M5 x 40.5 (Qty: 1)
3	Valve Channel Plate **Tip:** Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
4	Control Valve Channel Plate Spacer Plate Assembly
5	Valve Body Ball Check Valves (Qty: 6)

Control Valve Body Assembly Disassemble (Gen 2)

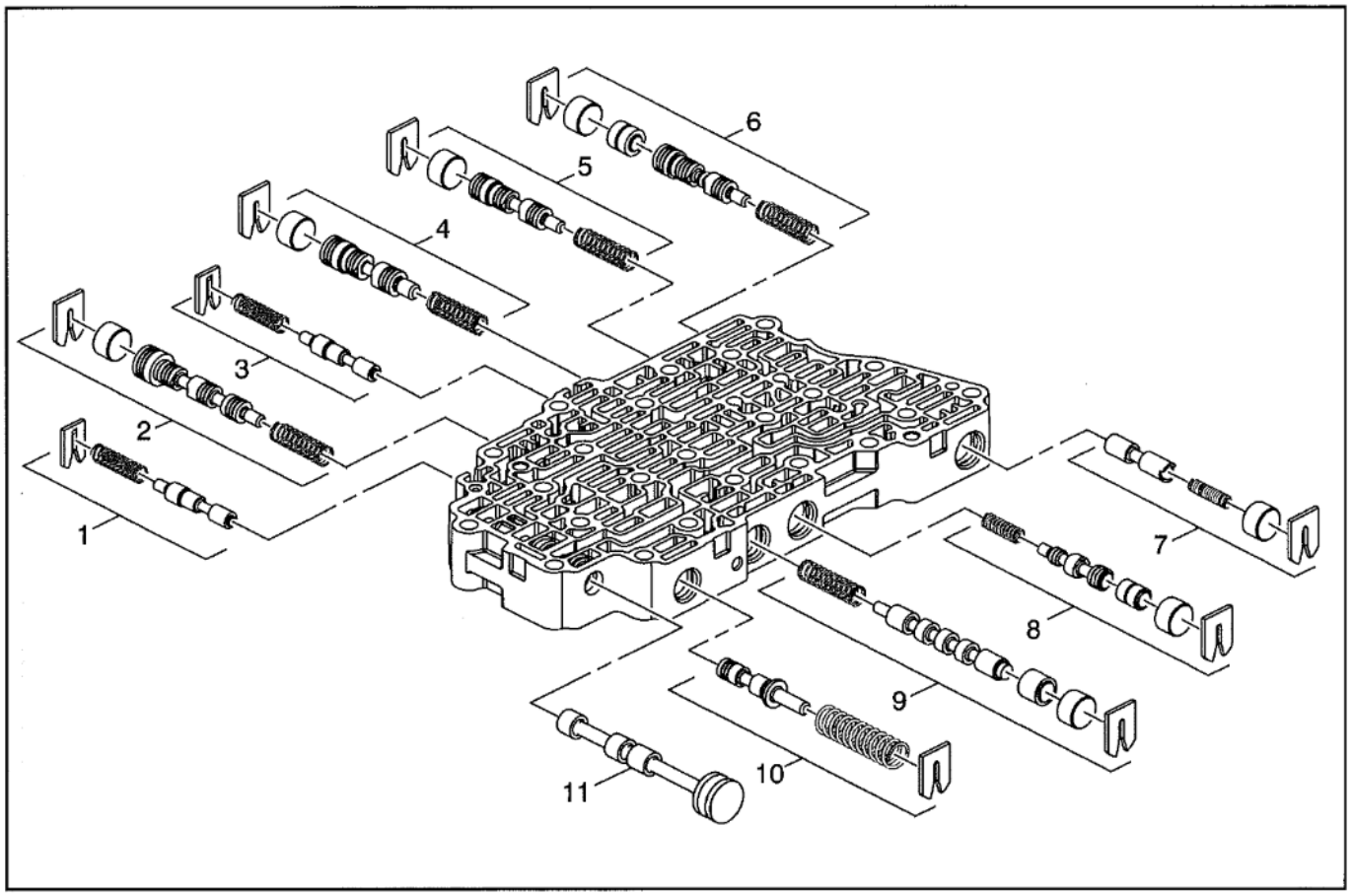


2552972

Control Valve Body Assembly Disassemble (Gen 2)

Callout	Component Name
1	Control Solenoid Valve Support
2	Control Valve Body Bolt M5 x 40.5 (Qty: 1)
3	Valve Channel Plate **Tip:** Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
4	Valve Body Ball Check Valves (Qty: 6)

Control Valve Body Cleaning and Inspection (Gen 2)

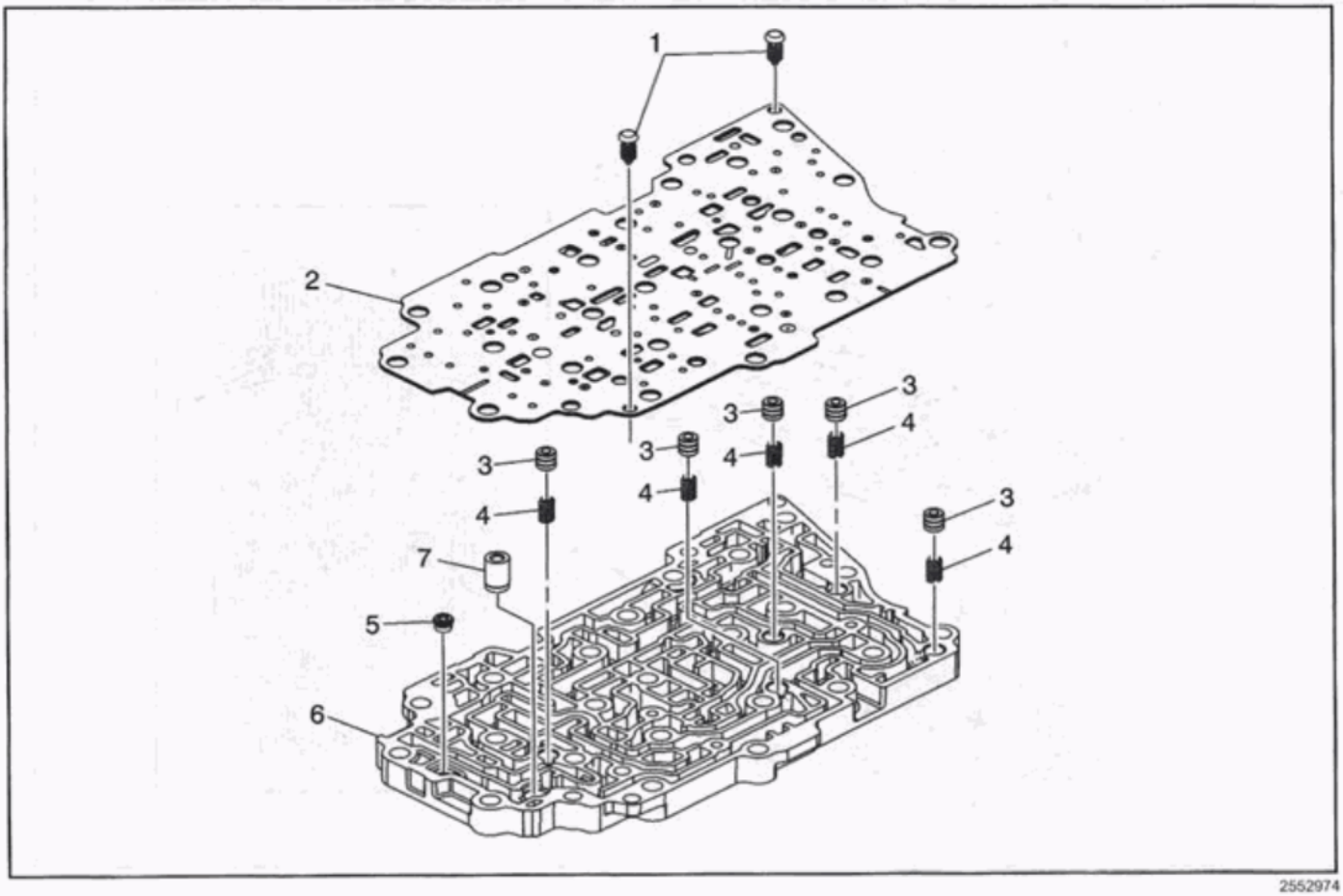


2552973

Control Valve Body Cleaning and Inspection (Gen 2)

Callout	Component Name
Warning: Valve springs can be tightly compressed. Use care when removing retainers and plugs. Personal injury could result.	
Caution: After cleaning the transmission components, allow to air dry. Do not use cloth or paper towels in order to dry any transmission components. Lint from the towels can cause component failure.	
Caution: Do not reuse cleaning solvents. Previously used solvents may deposit sediment which may damage the component.	
Preliminary Procedure Clean and inspect all valve components and the valve body. The control valve body assembly is only replaceable as an assembly.	
1	Low-Reverse and 4–5–6 Clutch Boost Valve Train
2	Low-Reverse and 4–5–6 Clutch Regulator Valve Train
3	1–2–3–4 Clutch Boost Valve Train
4	1–2–3–4 Clutch Regulator Valve Train
5	2–6 Clutch Regulator ValveTrain
6	3–5 Reverse Clutch Regulator Valve Train
7	Defualt Override Valve Train
8	TCC Regulator Apply Valve Train
9	Clutch Select Valve Train
10	Actuator Feed Limit Valve Train
11	Manual Valve

Control Valve Channel Plate Cleaning and Inspection (6T30/40/45/50 - Gen 2)

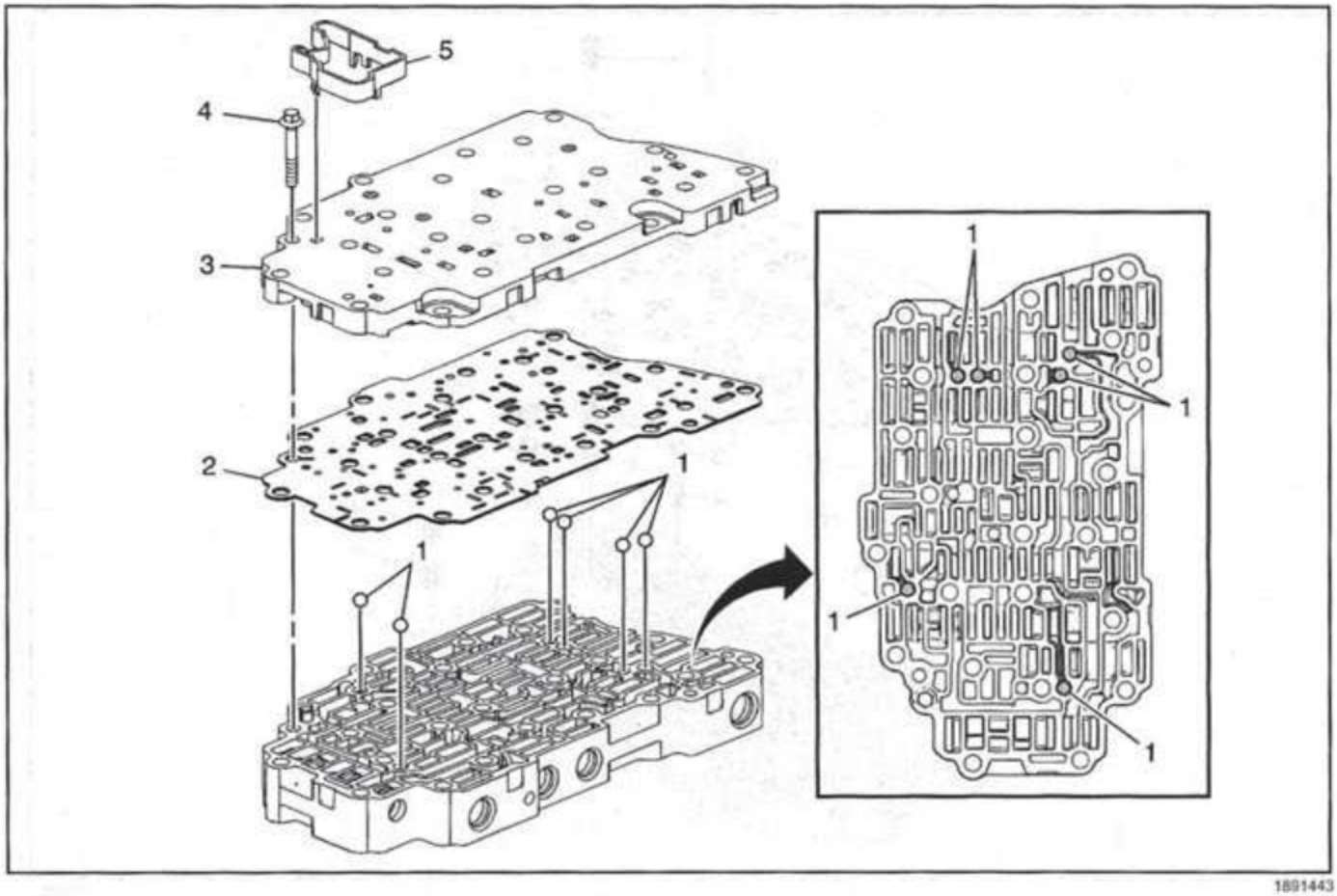


2552974

Control Valve Channel Plate Cleaning and Inspection (6T30/40/45/50 - Gen 2)

Callout	Component Name
1	Control Valve Body Spacer Plate Retainer
2	Channel Plate to Valve Body Spacer Plate Assembly
3	Actuator Feed Accumulator Piston (Qty: 5)
4	Actuator Feed Accumulator Spring (Qty: 5)
5	Variable Hi and 2-3-4 Clutch Housing Valve Ball
6	Valve Channel Plate **Tip:** Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage will cause incorrect pressure switch operation. Replace as necessary.
7	Control Valve Channel Plate Ball Spring Assembly

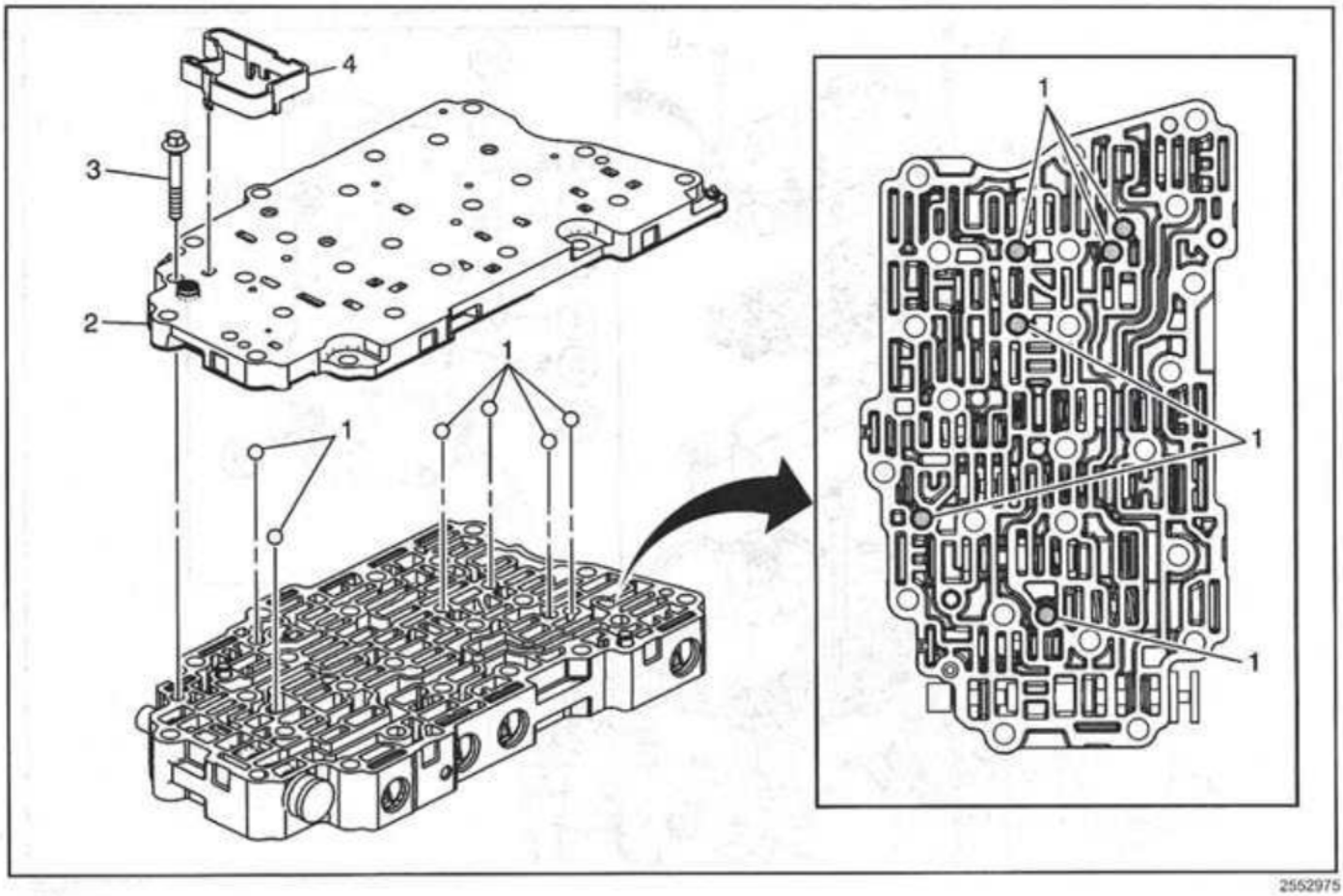
Control Valve Body Assembly Assemble (Gen 1)



Control Valve Body Assembly Assemble (Gen 1)

Callout	Component Name
1	Valve Body Ball Check Valve (Qty: 6)
2	Control Valve Channel Plate Spacer Plate Assembly
3	Valve Channel Plate **Tip:** Inspect the channel plate bolt pass through holes for damage or brinelling. Any damage could cause leaking. Replace as necessary.
4	Control Valve Body Bolt M5 x 40.5 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 7 N•m (62 lb in)
5	Control Solenoid Valve Support

Control Valve Body Assembly Assemble (Gen 2)

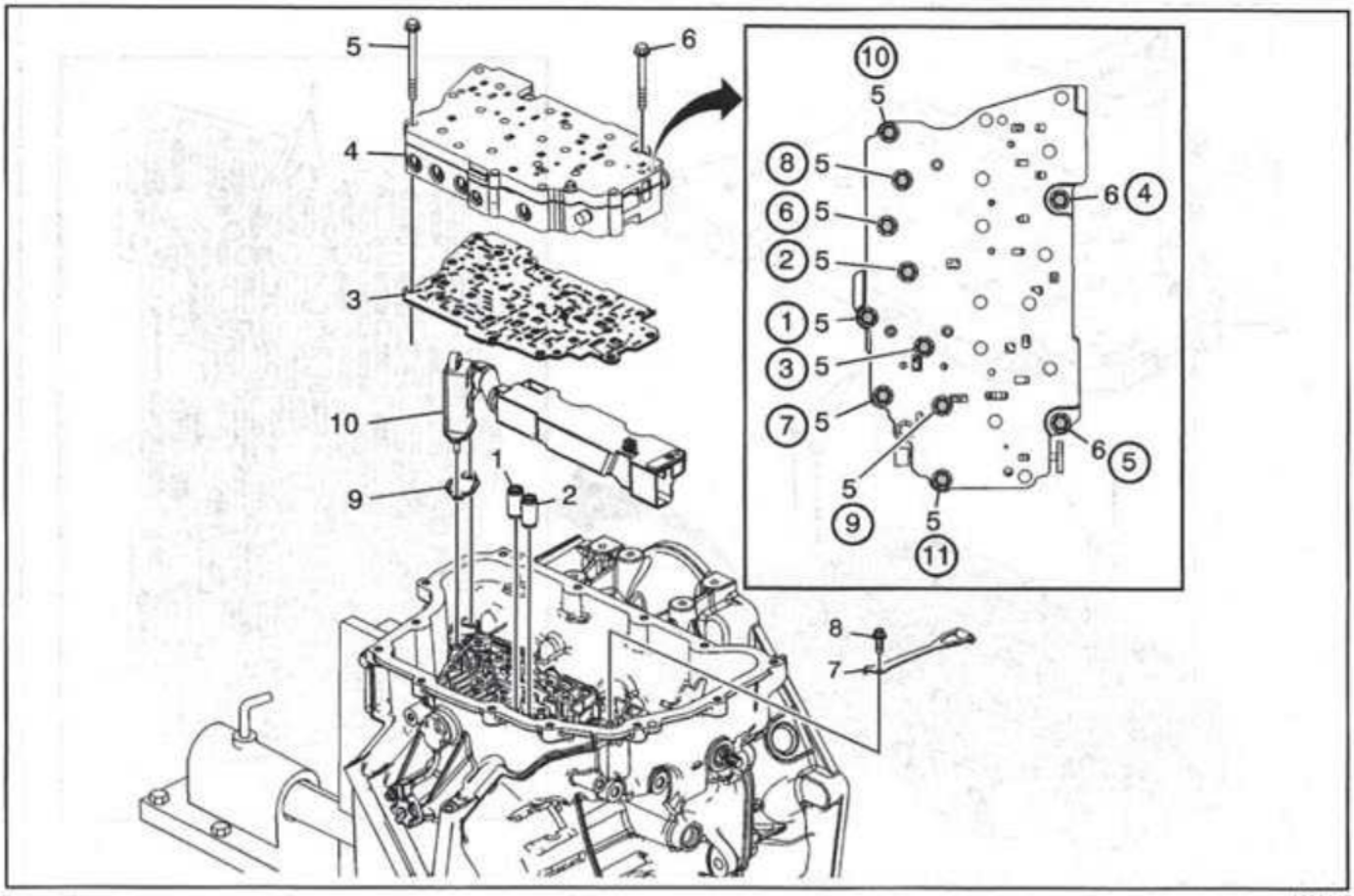


2552975

Control Valve Body Assembly Assemble (Gen 2)

Callout	Component Name
1	Valve Body Ball Check Valve (Qty: 6)
2	Valve Channel Plate
3	Control Valve Body Bolt M5 x 40.5 (Qty: 1) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 7 N•m (62 lb in)
4	Control Solenoid Valve Support

Control Valve Body Assembly Installation

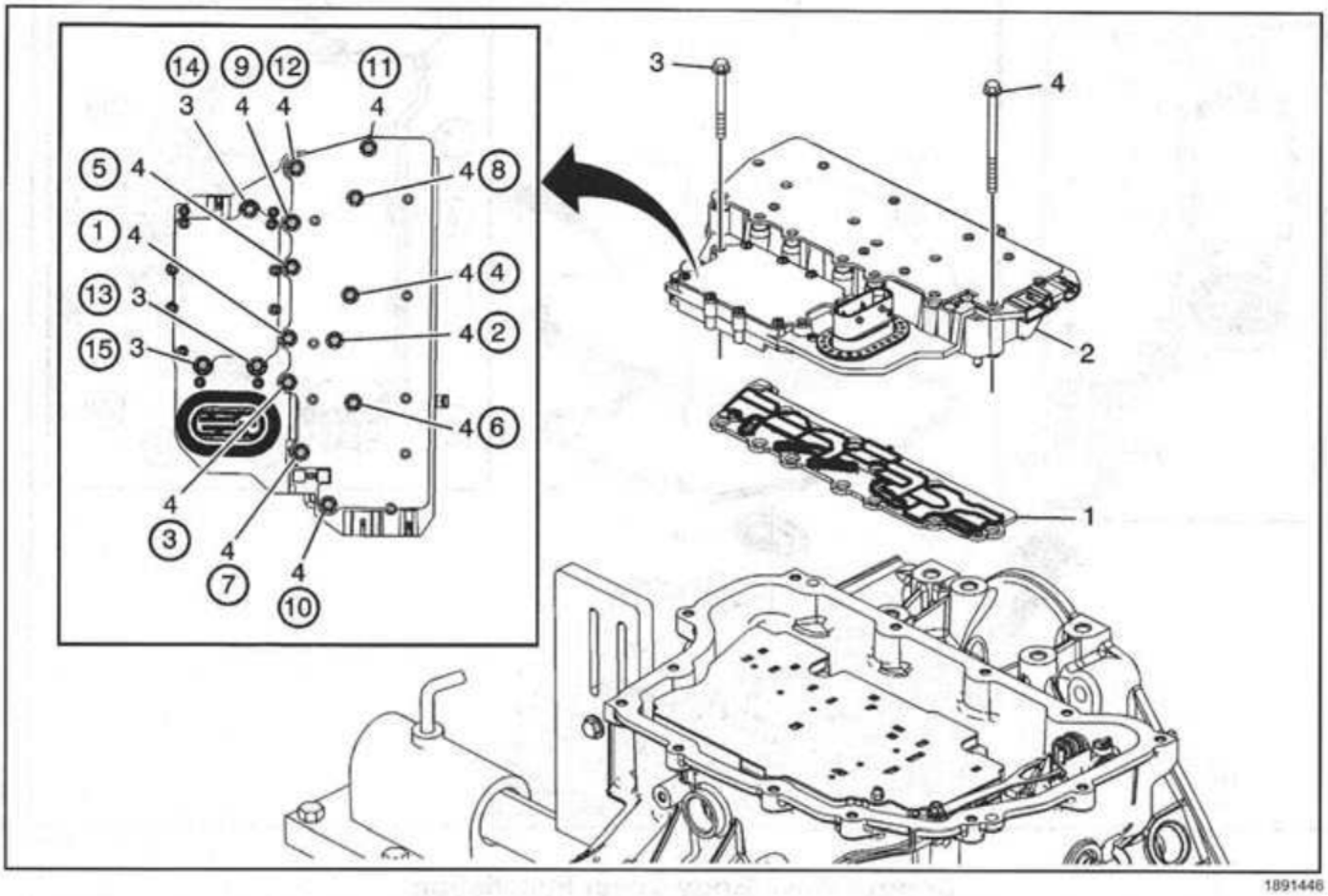


1891445

Control Valve Body Assembly Installation

Callout	Component Name
1	Low and Reverse Clutch Fluid Passage Seal
2	1-2-3-4 Clutch Fluid Passage Seal
3	Control Valve Body Spacer Plate Assembly
4	Control Valve Body Assembly **Tip:** Align the manual valve to the rod on the manual shaft.
5	Control Valve Body Bolt M6 x 60 (Qty: 9) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 11 N•m (97 lb in)
6	Control Valve Body Bolt M6 x 53 (Qty: 2) **Tighten** 11 N•m (97 lb in)
7	Manual Shaft Detent Lever Spring Assembly
8	Manual Shaft Detent Spring Bolt M6 x 16 (Qty: 1) **Tighten** 12 N•m (106 lb in)
9	Fluid Level Control Valve Gasket
10	Fluid Level Control Valve

Control Solenoid Valve and Transmission Control Module Assembly Installation

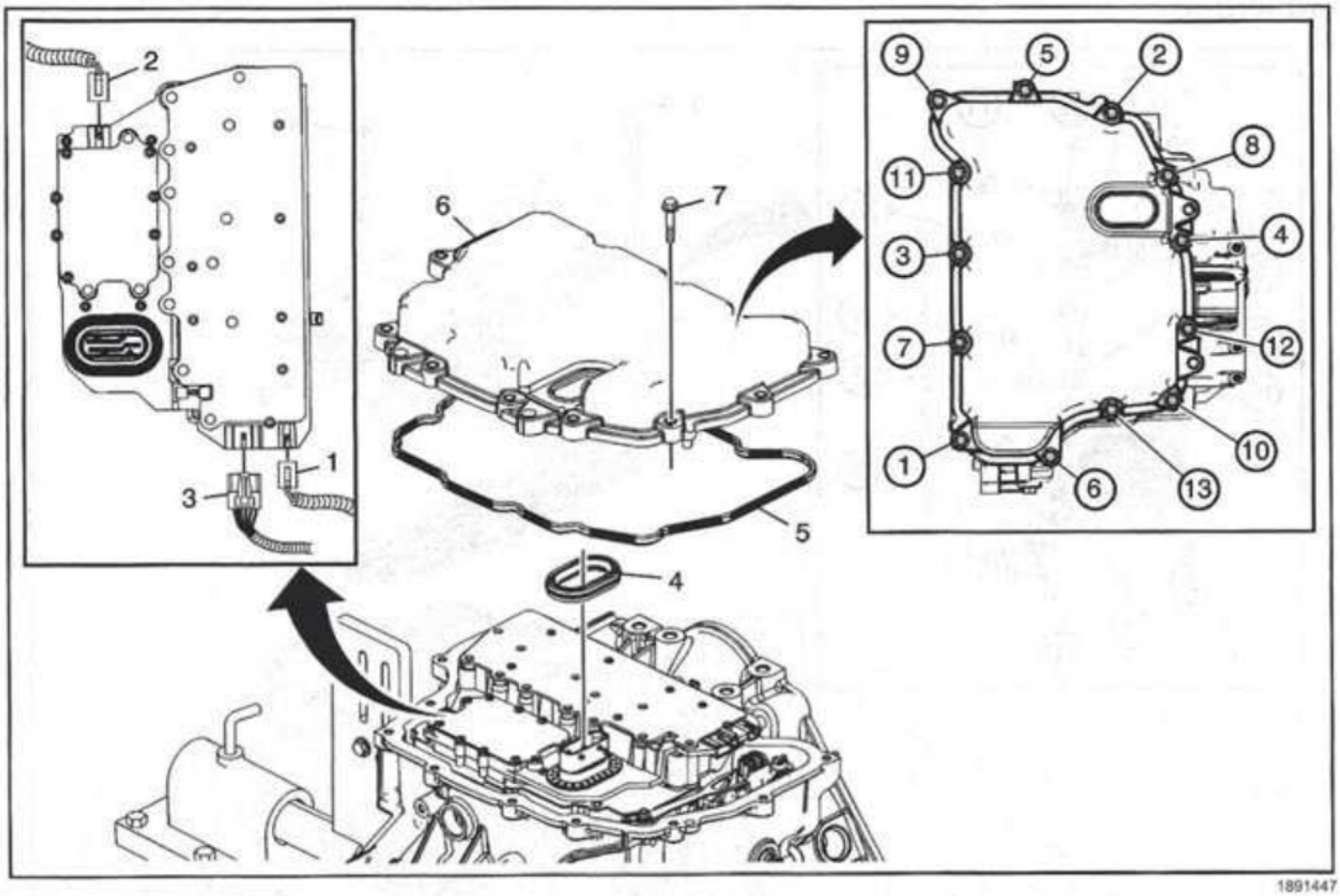


1891446

Control Solenoid Valve and Transmission Control Module Assembly Installation

Callout	Component Name
1	Control Solenoid Valve Assembly Filter Plate **Caution:** Use care when removing or installing the filter plate assembly. A broken or missing retaining tab may not adequately secure the filter plate to the control solenoid valve assembly, resulting in possible damage or contamination. **Tip:** Install a NEW filter plate to prevent fluid leaks past the fluid seals.
2	Control Solenoid (w/Body and TCM) Valve Assembly
3	Control Valve Body Bolt M5 x 40.5 (Qty: 3) **Caution:** Refer to *Fastener Caution on page 0-8*. **Tighten** 7 N•m (62 lb in)
4	Control Valve Body Bolt M6 x 97 (Qty: 12) **Tighten** 10 N•m (89 lb in)

Control Valve Body Cover Installation

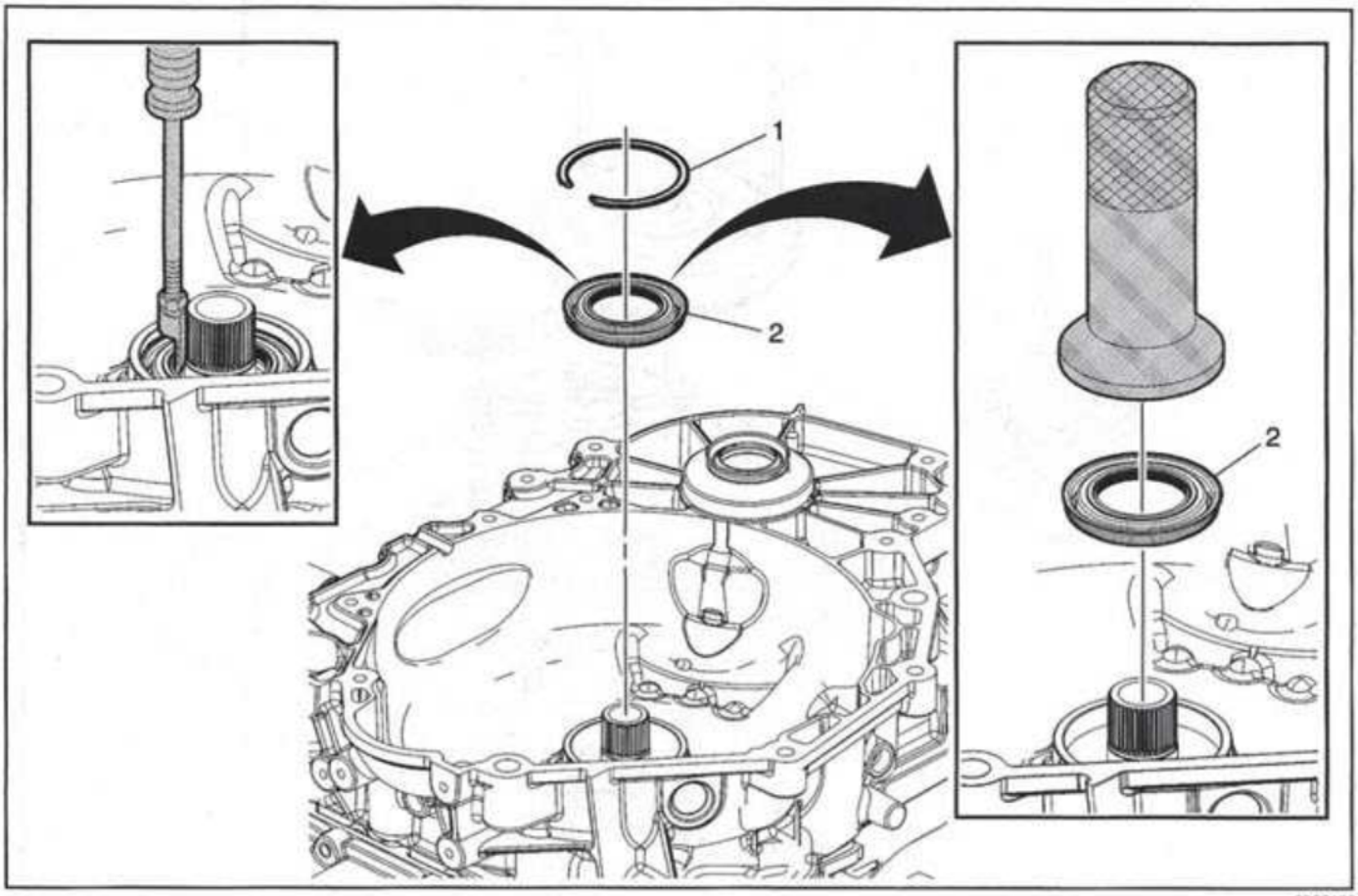


1891447

Control Valve Body Cover Installation

Callout	Component Name
1	Input Speed Sensor Connector
2	Output Speed Sensor Connector
3	Shift Position Switch Connector
4	Control Valve Body Cover Wiring Connector Hole Seal **Tip:** Do not re-use the valve body cover wiring connector hole seal.
5	Control Valve Body Cover Gasket **Tip:** Do not re-use the valve body cover gasket.
6	Control Valve Body Cover
7	Control Valve Body Cover Bolts M6 x 30 (Qty: 13) **Caution:** Refer to *Fastener Caution on page 0-8.* **Tighten** 12 N•m (106 lb in)

Torque Converter Fluid Seal Replacement

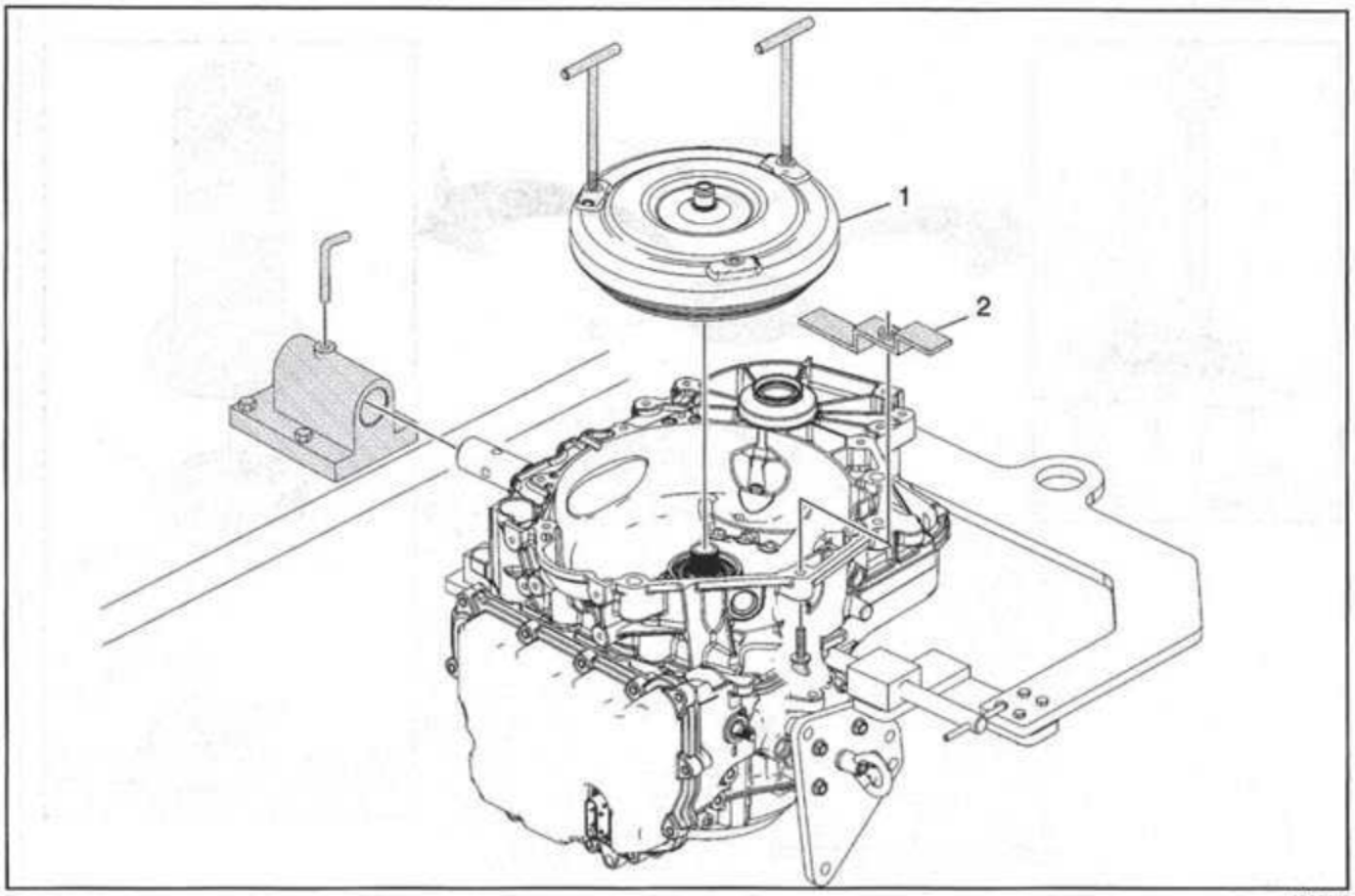


2362106

Torque Converter Fluid Seal Replacement

Callout	Component Name
1	Torque Converter Fluid Seal Retainer
2	Torque Converter Fluid Seal **Special Tools** • *DT-47791-A* Seal Installer • *DT-6125-B* Slide Hammer • *EN-23129* Universal Seal Remover For equivalent regional tools, refer to *Special Tools on page 17-394*.

Torque Converter Installation

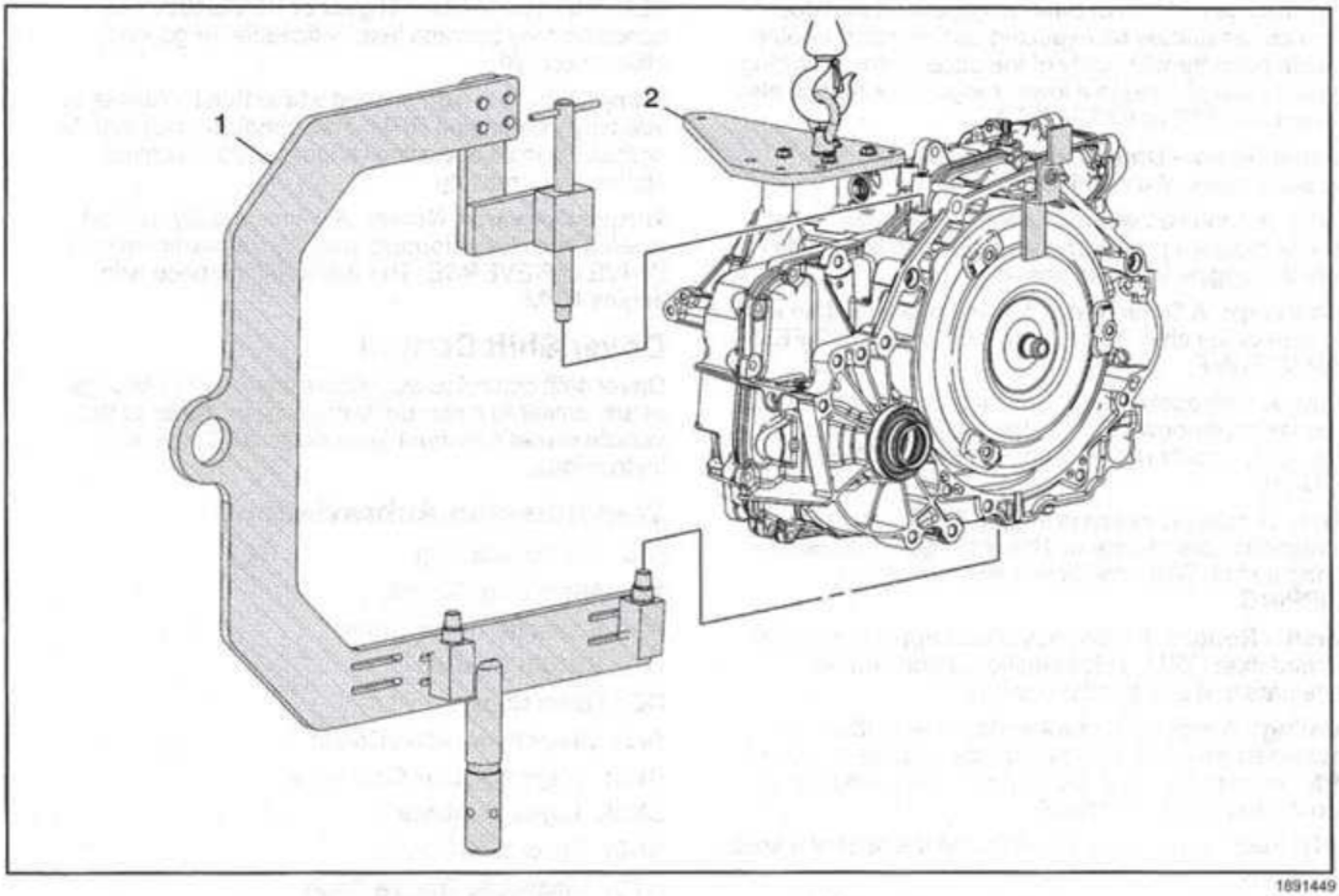


1891448

Torque Converter Installation

Callout	Component Name
1	Torque Converter Assembly **Tip:** Failure to lower the torque converter straight down could damage the torque converter clutch lip seal inside the torque converter clutch assembly. **Special Tool** *DT-46409* Torque Converter Lifting Handles For equivalent regional tools, refer to *Special Tools on page 17-394*.
2	*DT-21366* Converter Holding Strap ***Warning: The torque converter must be held to the torque converter housing by a retaining device such as shipping brackets. Without the retaining device, the torque converter may slide forward, disengaging the oil pump, or may fall completely out of the transmission causing personal injury and/or property damage.***

Lift Plate and Holding Fixture Removal



1691449

Lift Plate and Holding Fixture Removal

Callout	Component Name
1	*DT-46625* Transmission Holding Fixture For equivalent regional tools, refer to *Special Tools on page 17-394*. **Tip:** Raise the transmission in order to remove the holding fixture.
2	*DT-47811-S1* Transmission Lift Plate For equivalent regional tools, refer to *Special Tools on page 17-394*. **Tip:** Lower the transmission assembly onto the transmission jack in order to remove the lift plate.

Description and Operation

Definitions and Abbreviations

Throttle Positions

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

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

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

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

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

Minimum Throttle: The least amount of throttle opening required for an upshift.

Wide Open Throttle (WOT): Full travel of the accelerator pedal, 100 percent throttle position.

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

Shift Condition Definitions

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

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

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

Double Bump – Double Feel: Two sudden and forceful applies of a clutch or a band.

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

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

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

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

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

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

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

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

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

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

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

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

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

Noise Conditions

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

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

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

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

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

Driver Shift Control

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

Transmission Abbreviations

A/C: Air Conditioning

AC: Alternating Current

AT: Automatic Transmission

CC: Climate Control

DC: Direct Current

DIC: Driver Information Center

DLC: Diagnostic Link Connector

DMM: Digital Multimeter

DSC: Driver Shift Control

DTC: Diagnostic Trouble Code

EBTCM: Electronic Brake/Traction Control Module

ECCC: Electronically-Controlled Capacity Clutch

ECT: Engine Coolant Temperature

EMI: Electromagnetic Interference

IAT: Intake Air Temperature

IGN: Ignition

IMS: Internal Mode Switch

ISS: Input Speed Sensor

MAP: Manifold Absolute Pressure

MIL: Malfunction Indicator Lamp

NC: Normally Closed

NO: Normally Open

OBD: On Board Diagnostic

OSS: Output Speed Sensor

PC: Pressure Control

PCM: Powertrain Control Module

PCS: Pressure Control Solenoid

PS: Pressure Switch

PWM: Pulse Width Modulation

RPM: Revolutions Per Minute

SS: Shift Solenoid

STL: Service Transmission Lamp

TAP: Transmission Adaptive Pressure

TCC: Torque Converter Clutch

TFP: Transmission Fluid Pressure

TFT: Transmission Fluid Temperature

TP: Throttle Position

VSS: Vehicle Speed Sensor

WOT: Wide Open Throttle

Transmission Identification Information



1698124

Legend

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

Transmission General Description

The Hydra-matic 6T30/40/45/50 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 3 variants of the transmission, based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

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

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

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

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

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

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

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

REVERSE (R): This position allows the vehicle to be operated in a rearward direction.

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

DRIVE (D): Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the 6 forward gear ratios. Downshifts to a lower gear, or higher gear ratio, are available for

safe passing by depressing the accelerator or by manually selecting a lower gear in the manual mode range.

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

Transmission Component and System Description

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

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

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

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

For more information, refer to *Electronic Component Description on page 17-319*.

Transmission Adaptive Functions

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

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

Transmission Indicators and Messages

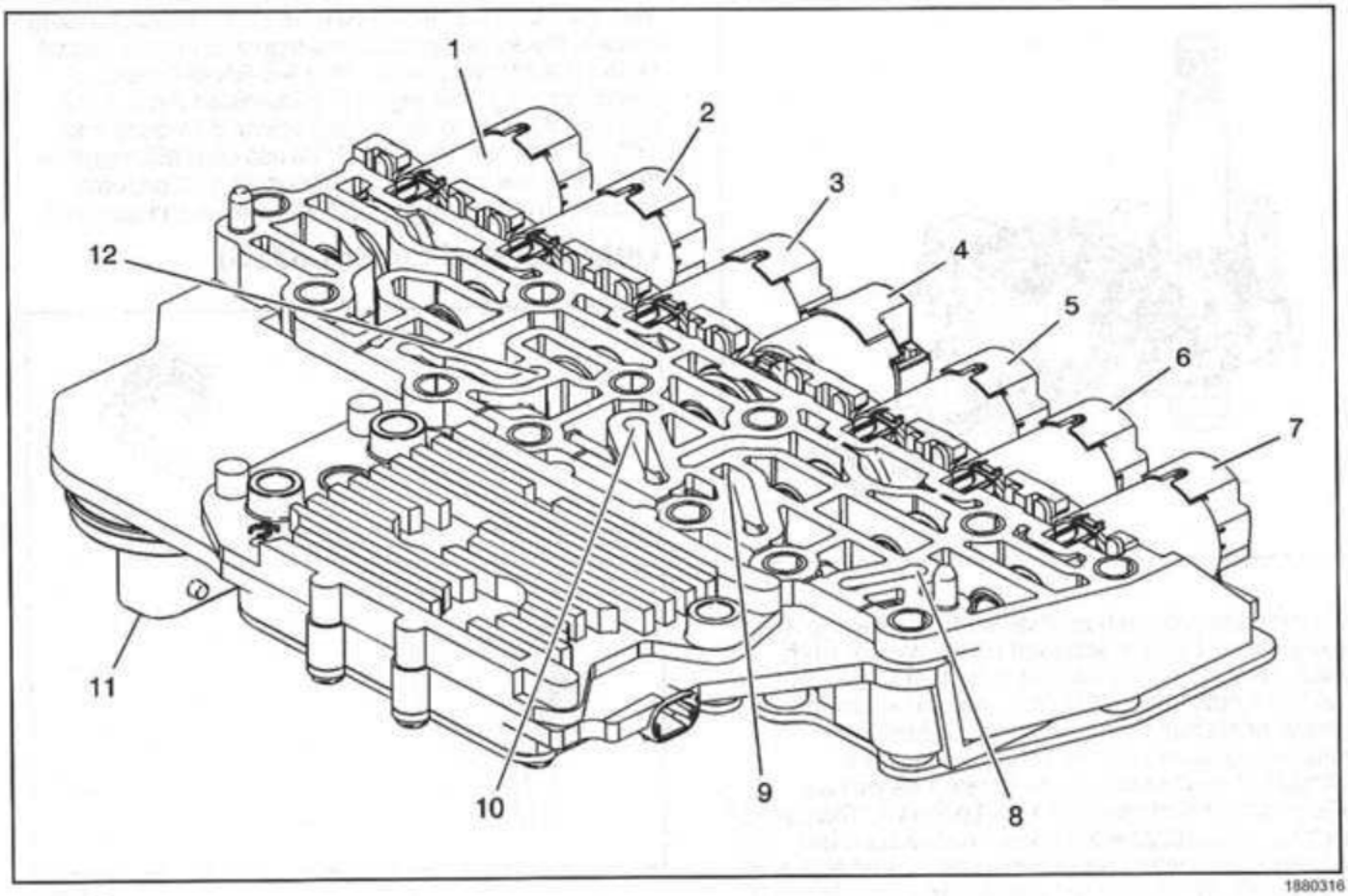
The following transmission-related indicators and messages may be displayed on the Instrument Panel Cluster (IPC). For a complete listing and description of all vehicle indicators and messages, refer to *Indicator/ Warning Message Description and Operation on page 8-108*.

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

"SERVICE TRANSMISSION": This message displays when there is a problem with the transmission.

Electronic Component Description

Control Solenoid Valve Assembly

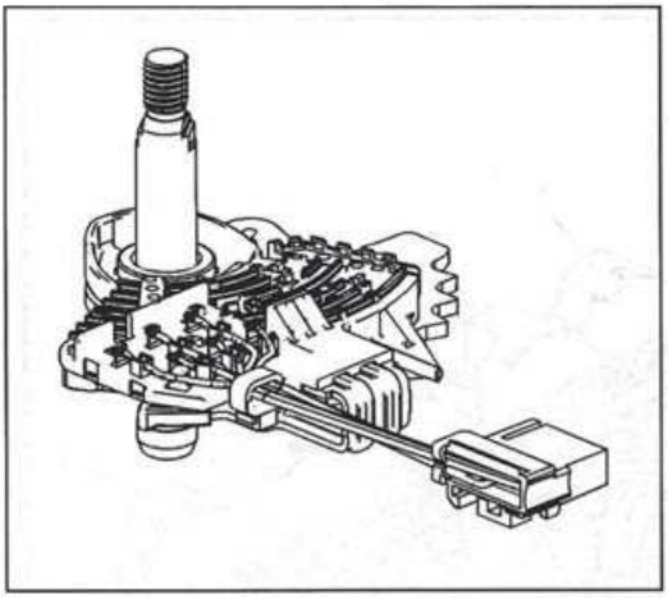


1880316

Legend

(1) Pressure Control Solenoid 3 (R-1/4-5-6)
(2) (GEN 1) Pressure Control Solenoid 2 (3-5-R)
(2) (GEN 2) Pressure Control Solenoid 5 (1-2-3-4)
(3) Torque Converter Clutch (TCC) Pressure Control Solenoid
(4) Shift Solenoid 1 (On/Off)
(5) (GEN 1) Pressure Control Solenoid 5 (1-2-3-4)
(5) (GEN 2) Pressure Control Solenoid 2 (3-5-R)
(6) Pressure Control Solenoid 4 (2-6)
(7) Line Pressure Control Solenoid
(8) (GEN 1) Transmission Fluid Pressure (TFP) Switch 1 (3-5-R)
(9) (GEN 1) Transmission Fluid Pressure (TFP) Switch 3 (2-6)
(10) (GEN 1) Transmission Fluid Pressure (TFP) Switch 4 (1-2-3-4)
(11) Pass Through Connector
(12) (GEN 1) Transmission Fluid Pressure (TFP) Switch 5 (4-5-6/R-1)

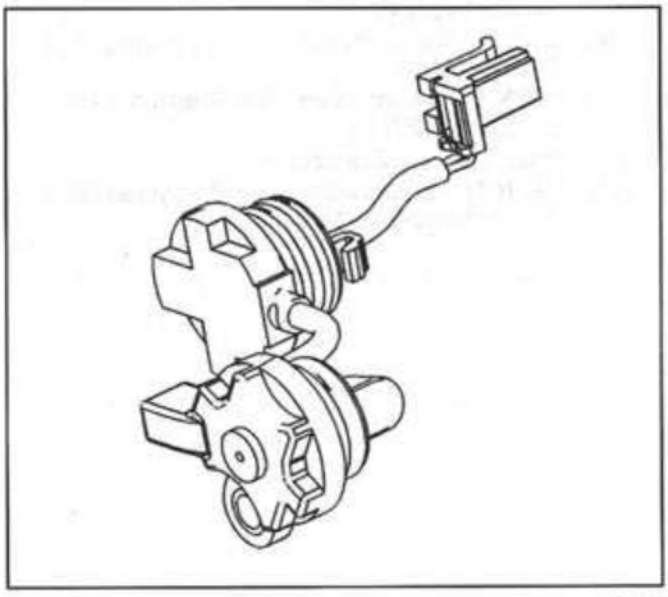
Manual Shift Detent Lever with Shaft Position Switch Assembly



1880317

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

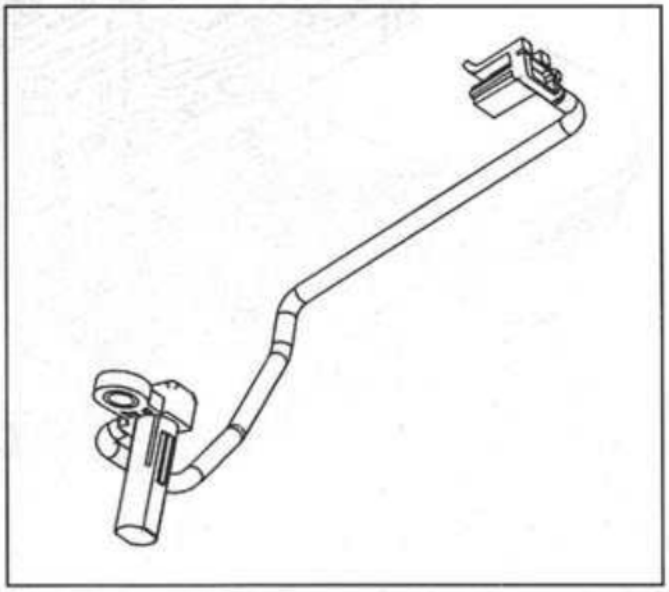
Input Speed Sensor (ISS)



1880318

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

Output Speed Sensor (OSS)



1880319

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

Park - Engine Running (Gen 1)

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

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

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

Actuator Feed Limit Valve

Line pressure is regulated through the valve into the actuator feed limit circuit. Actuator feed limit fluid passes through orifice #10 to a differential area to move the valve against actuator feed limit valve spring pressure. Actuator feed limit fluid is routed to the pressure control solenoids, the shift solenoid, and to the #5 and #6 ball check valves.

Compensator Feed Regulator Valve

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch Assembly

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

TCC Regulated Apply Valve

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

Low and Reverse Clutch Applies

R1/456 Pressure Control (PC) Solenoid 3

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

R1/4-5-6 Clutch Regulator Valve

PCS R1/456 clutch fluid at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator spring force and R1/456 clutch feed fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is routed to the clutch select valve and through orifice #34 to the #5 ball check valve.

Shift Solenoid

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

Clutch Select Valve

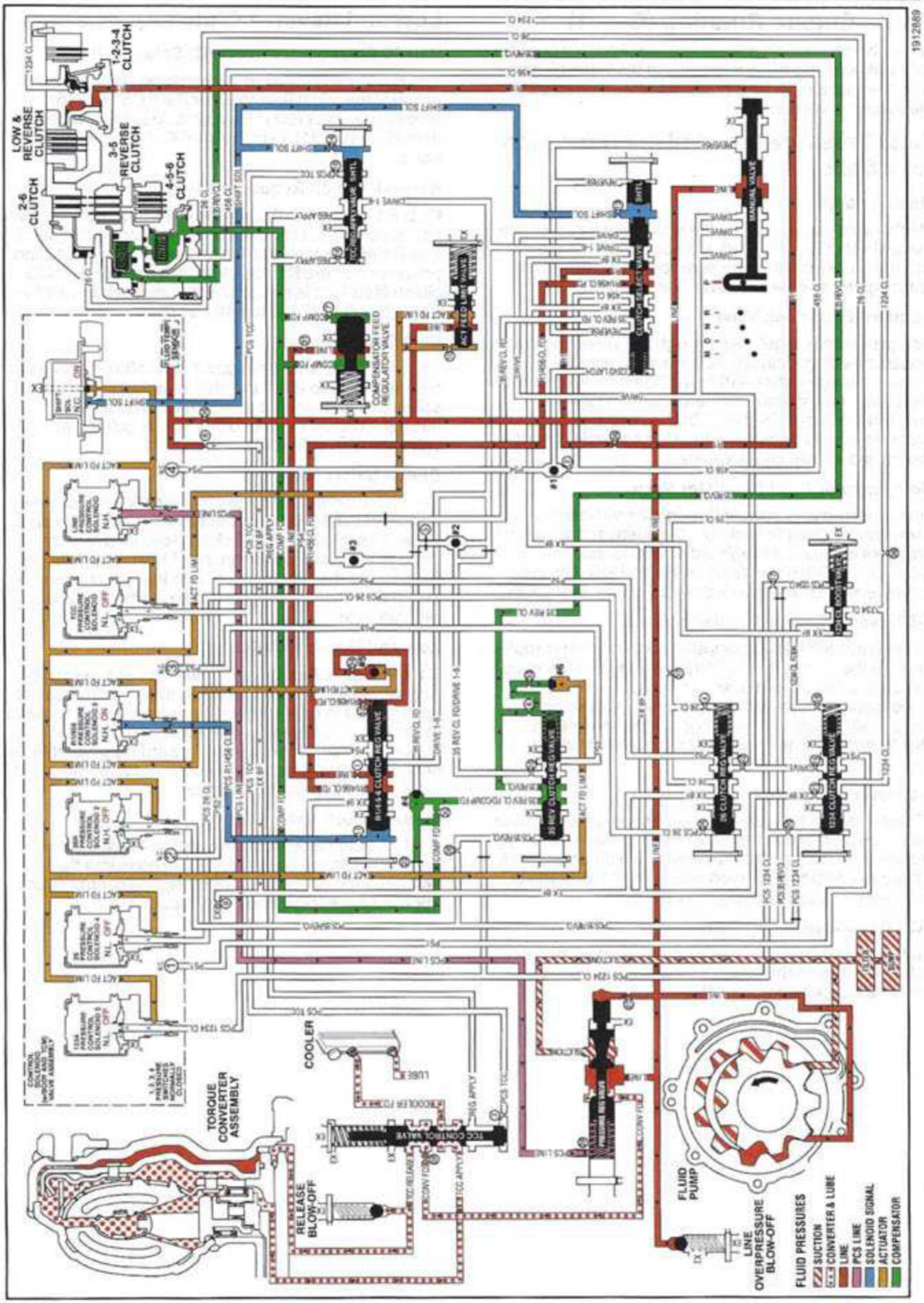
Shift solenoid fluid is routed to the clutch select valve and moves the valve against clutch select valve spring force. This allows R1/456 clutch feed fluid to pass through the valve and enter the R1 circuit. R1 fluid is then routed through orifice #38 to the low and reverse clutch assembly in preparation for a shift into low or reverse gear.

Low and Reverse Clutch

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

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.


Park– Engine Running
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
ACT FEED LIMIT VALVE
MANUAL VALVE
CLUTCH SELECT VALVE
LINE PRESSURE CONTROL SOLENOID N.H.
TCC PRESSURE CONTROL SOLENOID N.H. OFF
3-5 REV PRESSURE CONTROL SOLENOID N.H. ON
2-6 PRESSURE CONTROL SOLENOID N.H. OFF
4-5-6 PRESSURE CONTROL SOLENOID N.H. OFF
1-2-3-4 PRESSURE CONTROL SOLENOID N.H. OFF
1-2-3-4 CLUTCH REG VALVE
3-5 REV CLUTCH REG VALVE
2-6 CLUTCH REG VALVE
4-5-6 CLUTCH REG VALVE
TCC CONTROL VALVE
COOLER
TORQUE CONVERTER ASSEMBLY
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR
1912869

Park - Engine Running (Gen 2)

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

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

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

Actuator Feed Limit Valve

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

TCC Regulated Apply Valve

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

Default Override Valve

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

Low and Reverse Clutch Applies

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

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

R1/4-5-6 Clutch Boost Valve

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

Shift Solenoid

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

Clutch Select Valve

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

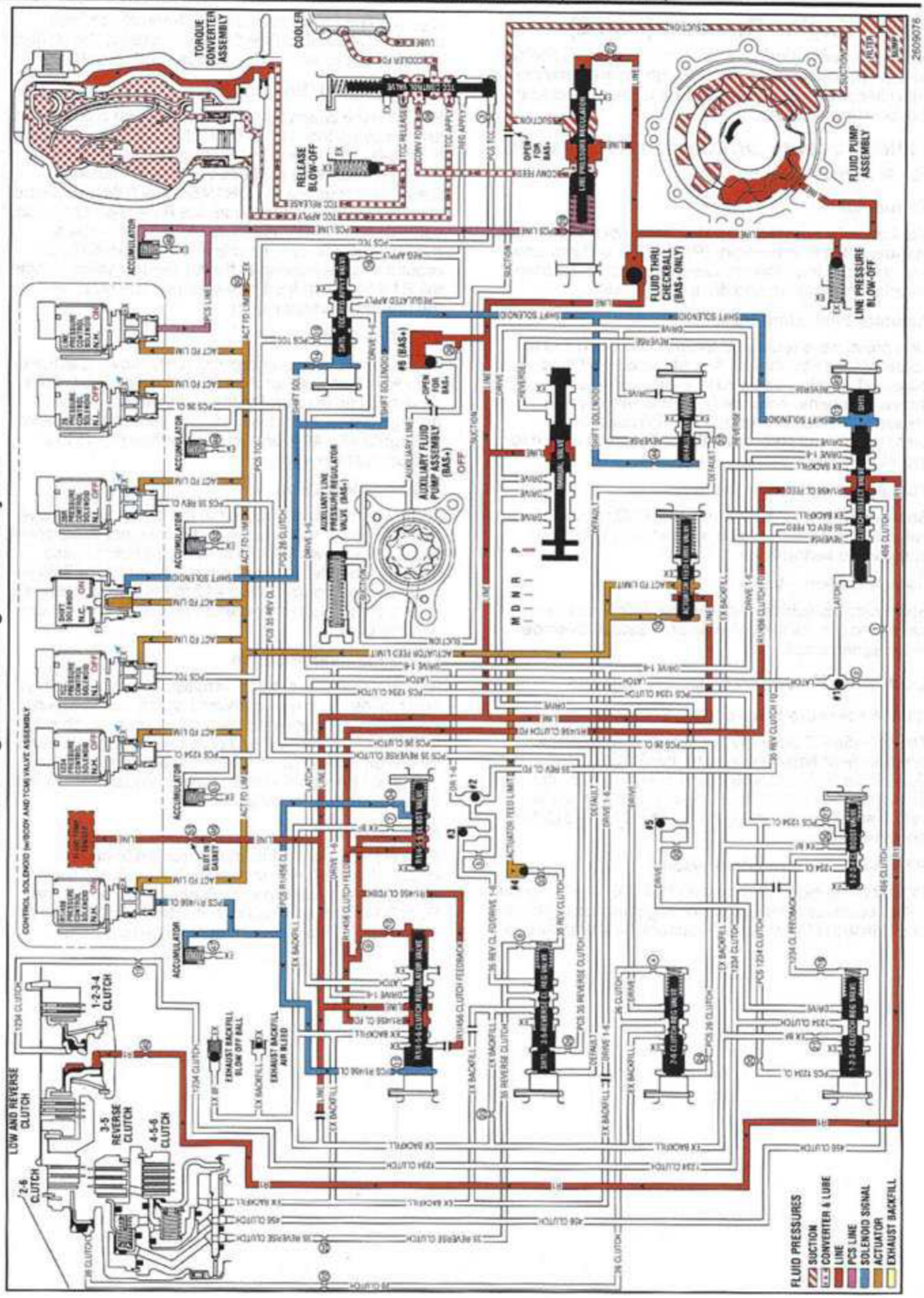
Low and Reverse Clutch

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

Accumulator

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

Park – Engine Running – Gen 2/Hybrid



Reverse (Gen 1)

When the gear selector lever is moved to the Reverse (R) position (from the Park position) the normally-high 35R pressure control solenoid 2 is commanded ON and the following changes occur in the transmission's hydraulic and electrical systems:

3-5-Reverse Clutch Applies

Manual Valve

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

Clutch Select Valve

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

#2 Ball Check Valve

3-5 reverse fluid passes through orifice #5, seats the #2 ball check valve against the drive 1-6 fluid passage, and enters the 35 reverse/drive 1-6 circuit. 35 reverse/drive 1-6 fluid is routed through orifice #25 to the 3-5-reverse clutch regulator valve.

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 is energized (ON), allowing actuator feed limit fluid to enter the PCS 35 reverse clutch circuit. PCS 35 reverse clutch fluid is then routed through orifice #26 to the 3-5-reverse clutch regulator valve.

3-5-Reverse Clutch Regulator Valve

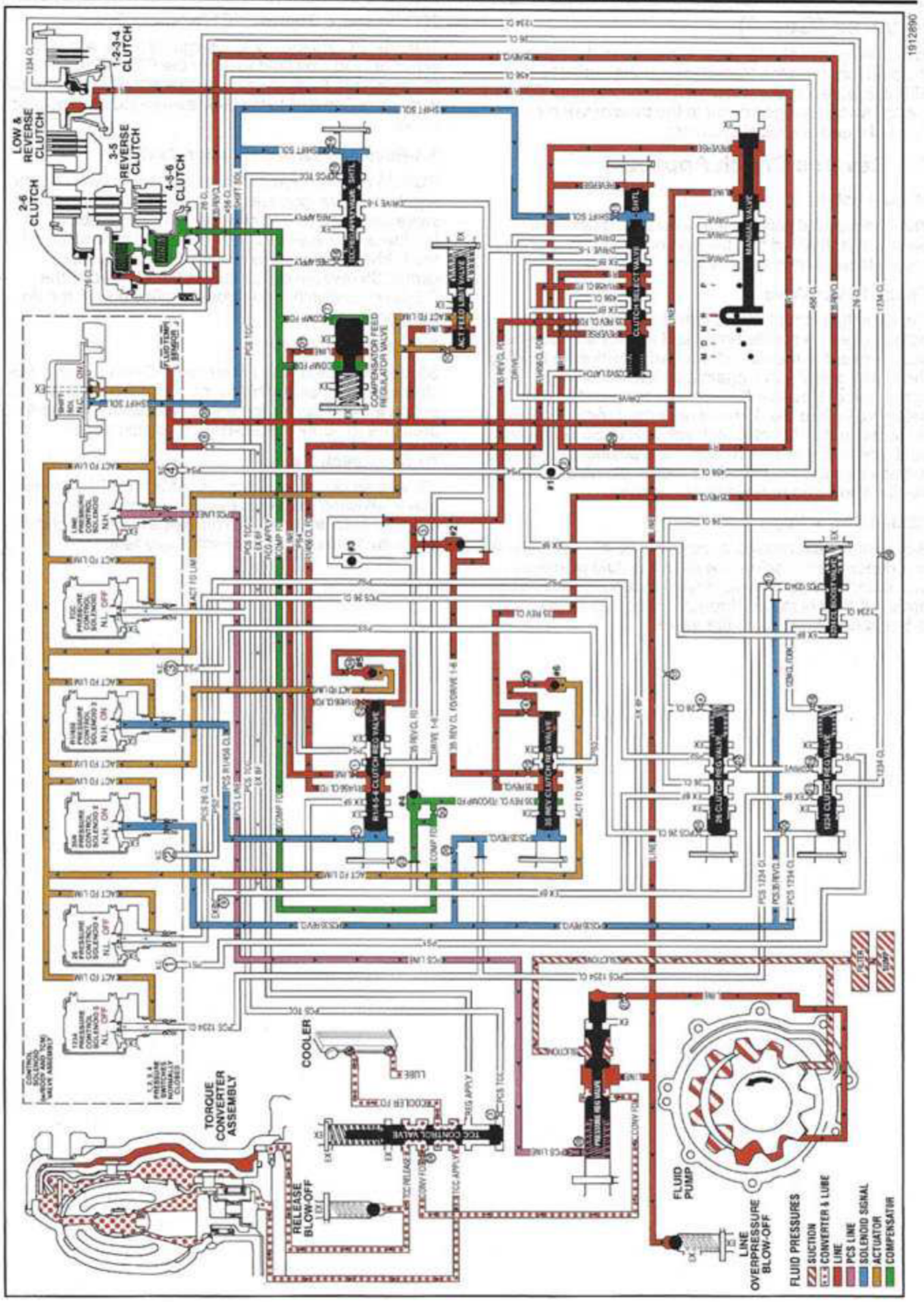
PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and orificed 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. 35 reverse clutch fluid is then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

3-5-Reverse Clutch

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

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.


Reverse
1912890
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
MANUAL VALVE
TORQUE CONVERTER ASSEMBLY
COOLER
TCC CONTROL VALVE
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Reverse (Gen 2)

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

3-5-Reverse Clutch Applies

Manual Valve

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

Clutch Select Valve

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

#2 Ball Check Valve

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

#3 Ball Check Valve

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

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

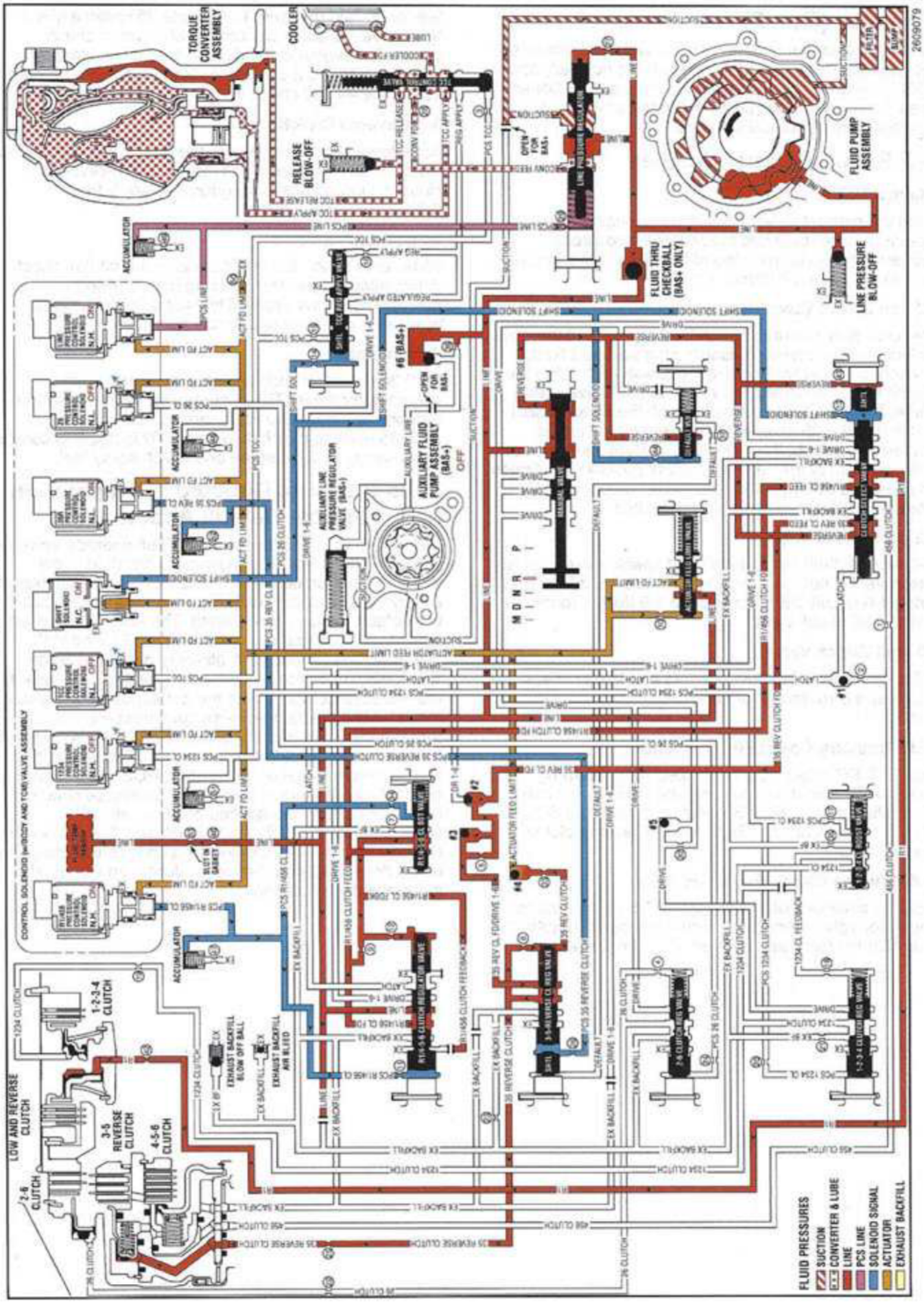
Accumulator

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

Fluid Pressure Directed in Preparation for a Possible Default Action

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

Reverse – Gen 2/Hybrid



Neutral - Engine Running (Gen 1)

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the normally-high 35R pressure control solenoid 2 is commanded OFF and the following changes would occur in the hydraulic system.

3-5 Reverse Clutch Releases

Manual Valve

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

35R Pressure Control Solenoid 2

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

3-5-Reverse Clutch Regulator Valve

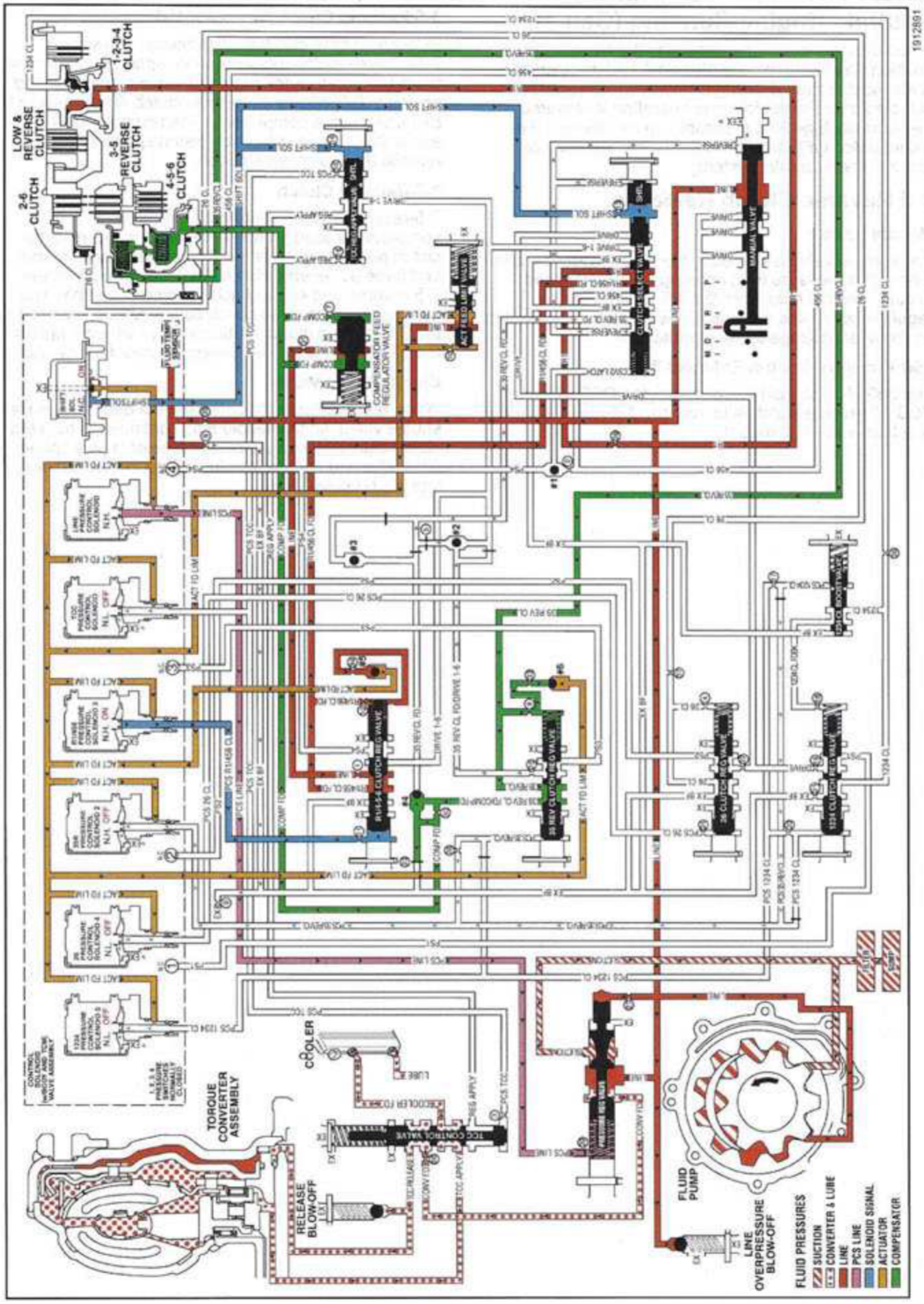
PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows 35 reverse clutch fluid pressure to exhaust into the compensator feed circuit in order to assist the 3-5-reverse clutch piston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

3-5-Reverse Clutch

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

Clutch Select Valve

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


Neutral– Engine Running
1912891
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
MANUAL VALVE
COMPENSATOR FEED REGULATOR VALVE
CLUTCH SELECT VALVE
TCC CONTROL VALVE
TORQUE CONVERTER ASSEMBLY
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
COOLER
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Neutral - Engine Running (Gen 2)

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the normally-low 35R pressure control solenoid is commanded OFF and the following changes would occur in the hydraulic system.

3-5 Reverse Clutch Releases

Manual Valve

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

35R Pressure Control Solenoid

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

3-5-Reverse Clutch Regulator Valve

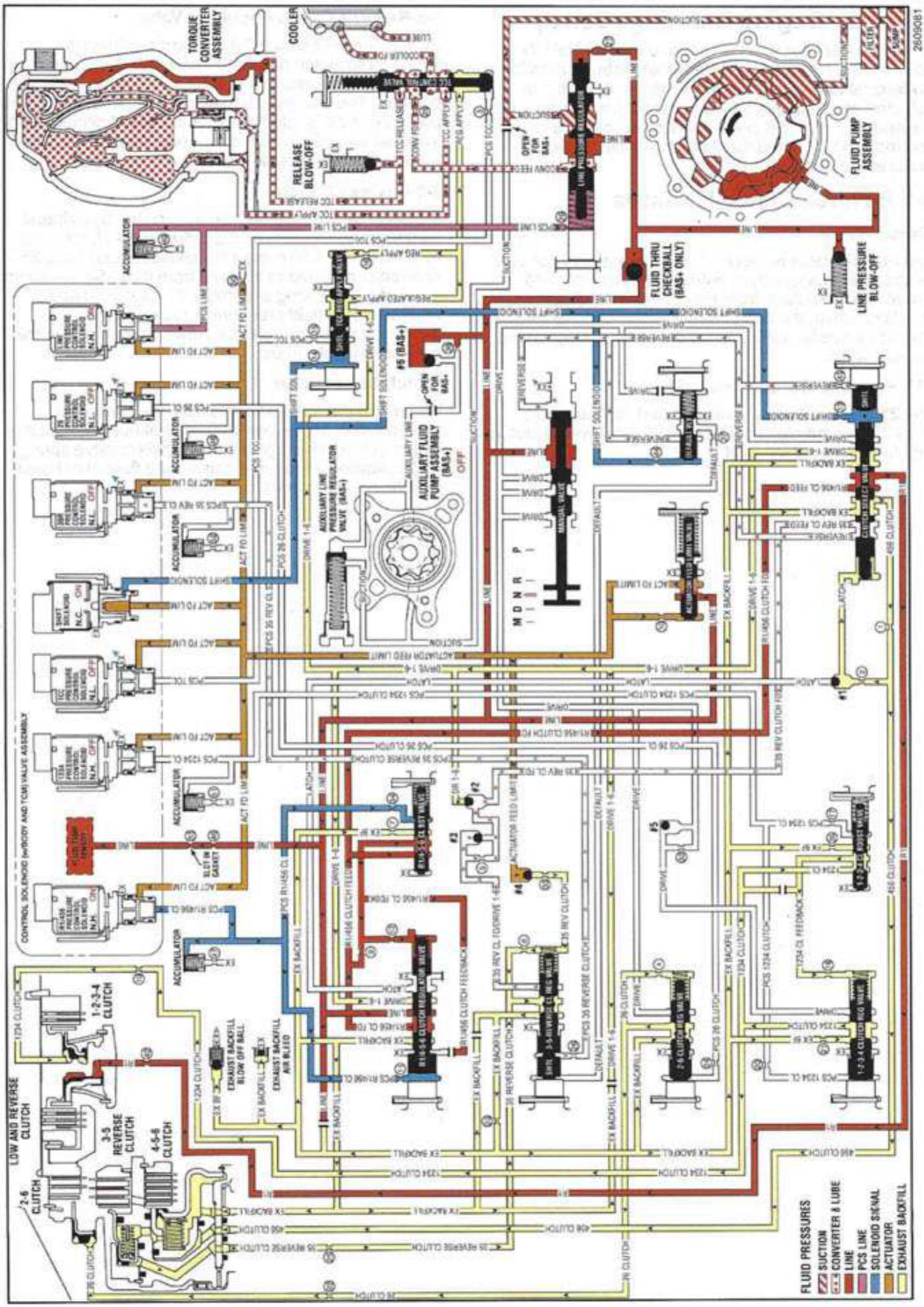
PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows exhausting 35 reverse clutch fluid pressure to pass into the exhaust backfill circuit in order to assist the 3-5-reverse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

3-5-Reverse Clutch

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

Clutch Select Valve

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


Neutral – Engine Running – Gen 2/Hybrid
TORQUE CONVERTER ASSEMBLY
COOLER
RELEASE BLOW-OFF
FLUID PUMP ASSEMBLY
FLUID THRU CHECKBALL (BAS+ ONLY)
LINE PRESSURE BLOW-OFF
ACCUMULATOR
AUXILIARY FLUID PUMP ASSEMBLY (BAS+)
AUXILIARY LINE PRESSURE REGULATOR VALVE (BAS+)
MANUAL VALVE
1-2-3-4 CLUTCH
LOW AND REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
EXHAUST BACKFILL BLOW OFF BALL
EXHAUST BACKFILL AIR BLEED
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
EXHAUST BACKFILL
2809081

Drive Range, First Gear Engine Braking (Gen 1)

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.

1-2-3-4 Clutch Applies

Manual Valve

The manual valve is moved to the Drive (D) position and allows line fluid pressure to enter the drive fluid circuit. Drive fluid is then routed to the clutch select valve, the 1-2- 3-4 clutch regulator valve through orifice #19 and to the 2-6 clutch regulator valve through orifice #22.

1234 Pressure Control (PC) Solenoid 5

The 1234 PC 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 #20 to the 1-2-3-4 clutch regulator valve, and through orifice #17 to the 1-2-3-4 clutch boost valve.

1-2-3-4 Clutch Regulator Valve

PCS 1234 clutch fluid, at the 1-2-3-4 clutch regulator valve, opposes 1-2-3-4 clutch regulator valve spring force and 1234 clutch feedback fluid pressure to regulate drive fluid pressure into the 1234 clutch fluid circuit. The 1234 clutch fluid is then routed to the 1234 clutch boost valve and through orifice #36 to the 1-2-3-4 clutch.

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

2-6 Clutch Regulator Valve

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

#2 Pressure Switch

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

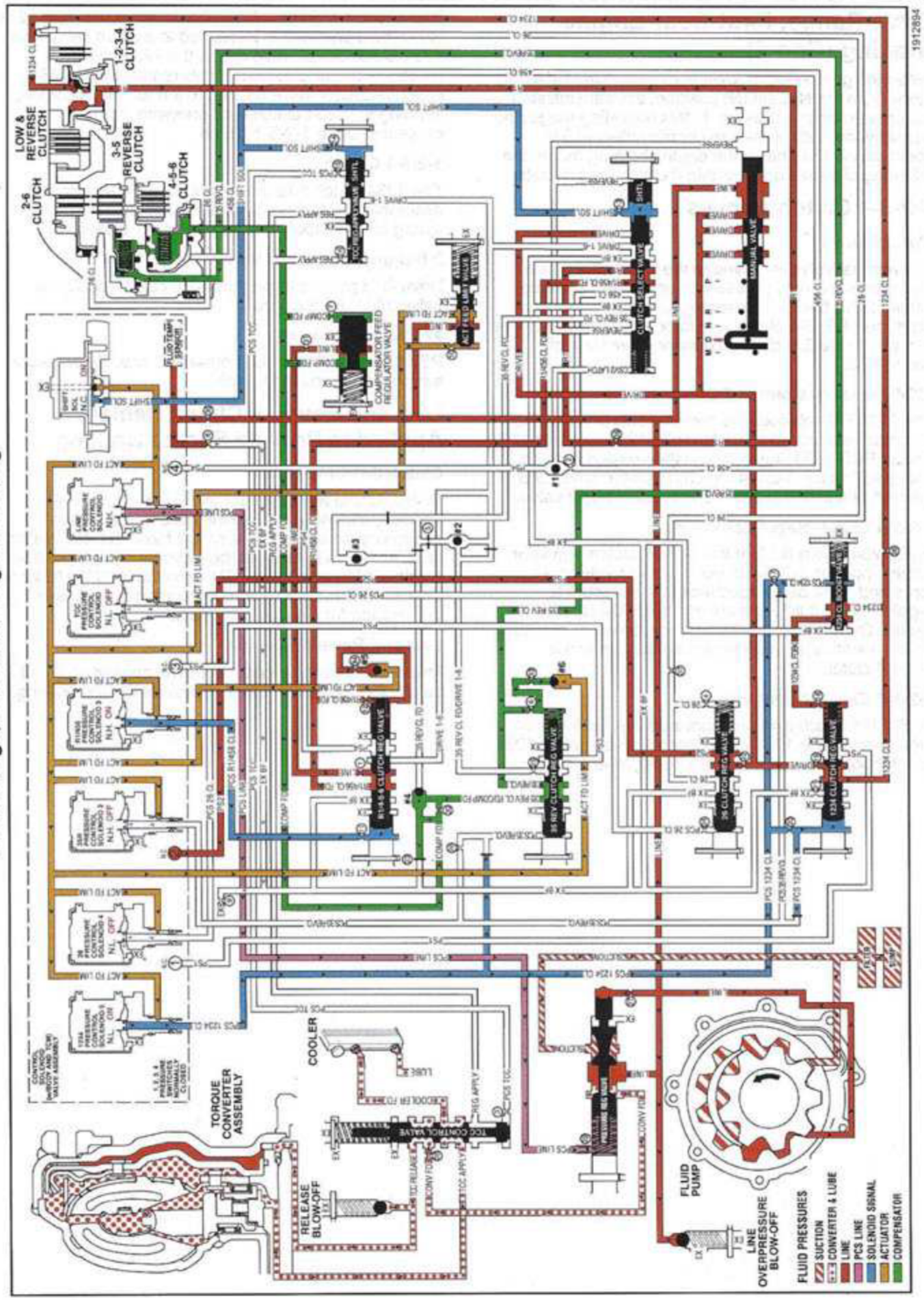
Low and Reverse Clutch Remains Applied to Provide Engine Braking

Clutch Select Valve

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

Low and Reverse Clutch

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


Drive Range, First Gear Engine Braking
1912894
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
MANUAL VALVE
TORQUE CONVERTER ASSEMBLY
COOLER
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Drive Range, First Gear Engine Braking (Gen 2)

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

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

1-2-3-4 Clutch Applies

Manual Valve

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

#5 Ball Check Valve

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

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

Accumulator

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

Low and Reverse Clutch Remains Applied to Provide Engine Braking

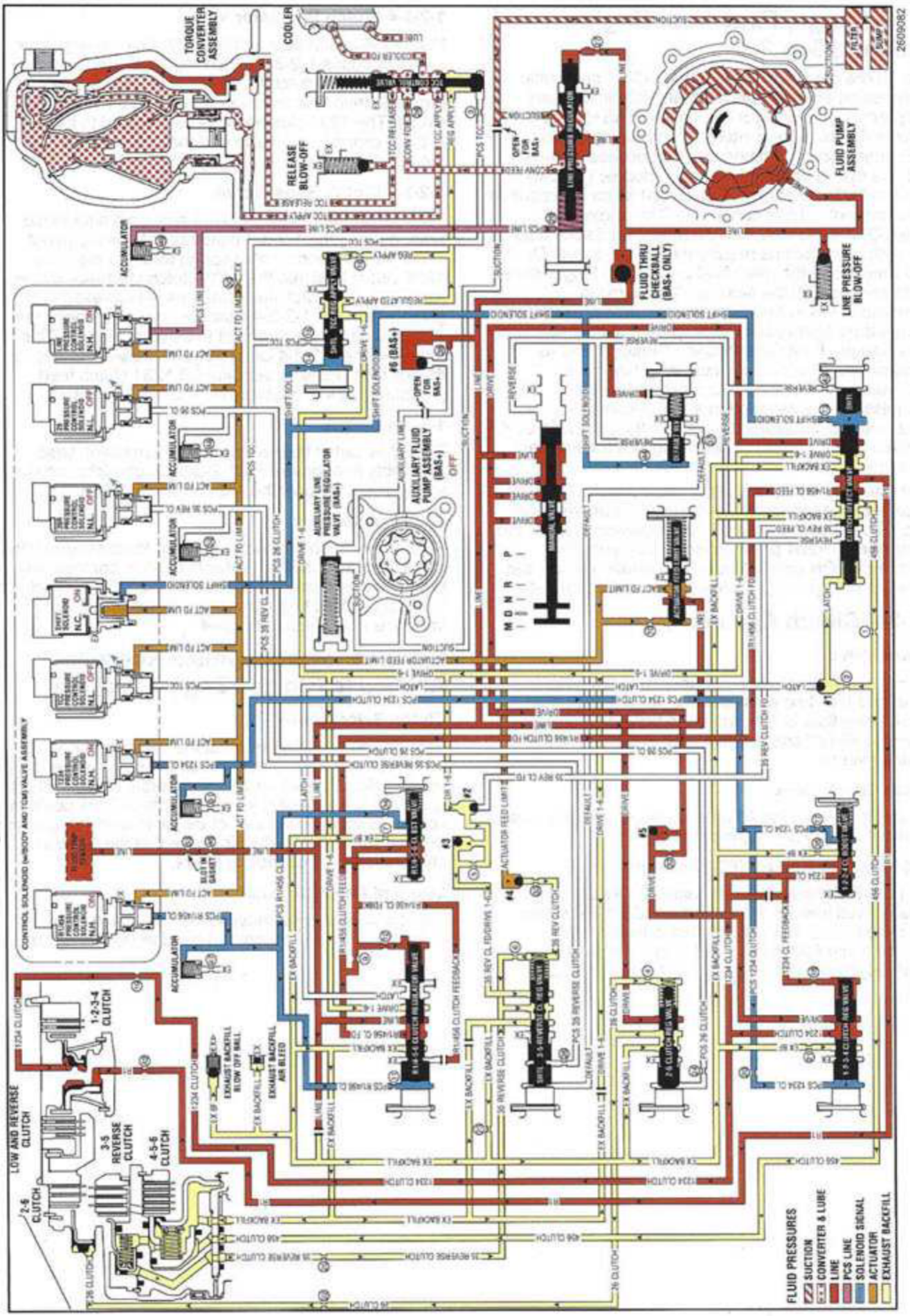
Clutch Select Valve

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

Low and Reverse Clutch

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

Drive Range, First Gear Engine Braking – Gen 2/Hybrid



Drive Range, First Gear (Gen 1)

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

Low & Reverse Clutch Releases

Shift Solenoid

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

Clutch Select Valve

Shift solenoid fluid is exhausted from the clutch select valve and clutch select valve spring force moves the valve to the released position. This allows R1 fluid pressure to pass through the valve into the exhaust backfill circuit where it exhausts. Drive fluid from the manual valve passes through the clutch select valve and enters the drive 1-6 fluid circuit. Drive 1-6 fluid is routed to the R1/456 clutch regulator valve, the 35 reverse clutch regulator valve, and the TCC regulator valve.

Low and Reverse Clutch

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

Fluid Pressure Directed in Preparation for a Shift

R1/456 Pressure Control (PC) Solenoid 3

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

R1/456 Clutch Regulator Valve

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

#1 Ball Check Valve

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

#2 Ball Check Valve

Drive 1-6 fluid pressure seats the #2 ball check valve against the 35 reverse clutch feed fluid passage, and is directed into the 35 reverse clutch feed/drive 1-6 circuit. 35 reverse clutch feed/drive 1-6 fluid is routed through orifice #25 to the 35 Reverse clutch regulator valve.

3-5-Reverse Clutch Regulator Valve

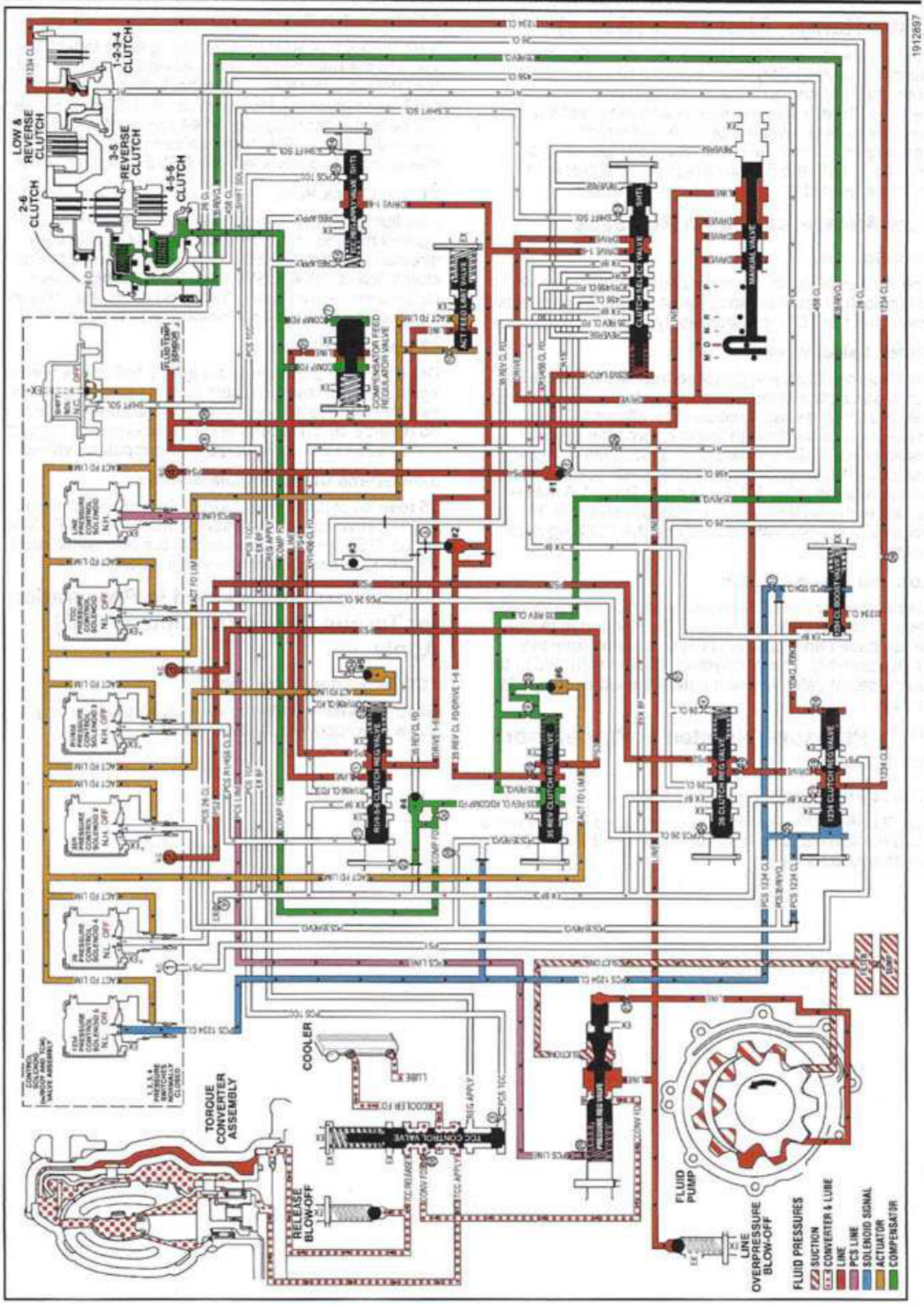
35 reverse clutch feed/drive 1-6 fluid passes through the 3- 5-reverse clutch regulator valve into the PS3 fluid circuit. PS3 fluid is then routed to the normally-closed #3 pressure switch and opens the switch.

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

TCC Regulator Apply Valve

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

Drive Range, First Gear



Drive Range, First Gear (Gen 2)

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

Low & Reverse Clutch Releases

Shift Solenoid

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

Clutch Select Valve

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

Low and Reverse Clutch

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

Fluid Pressure Directed in Preparation for a Shift

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

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

#1 Ball Check Valve

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

#2 Ball Check Valve

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

#3 Ball Check Valve

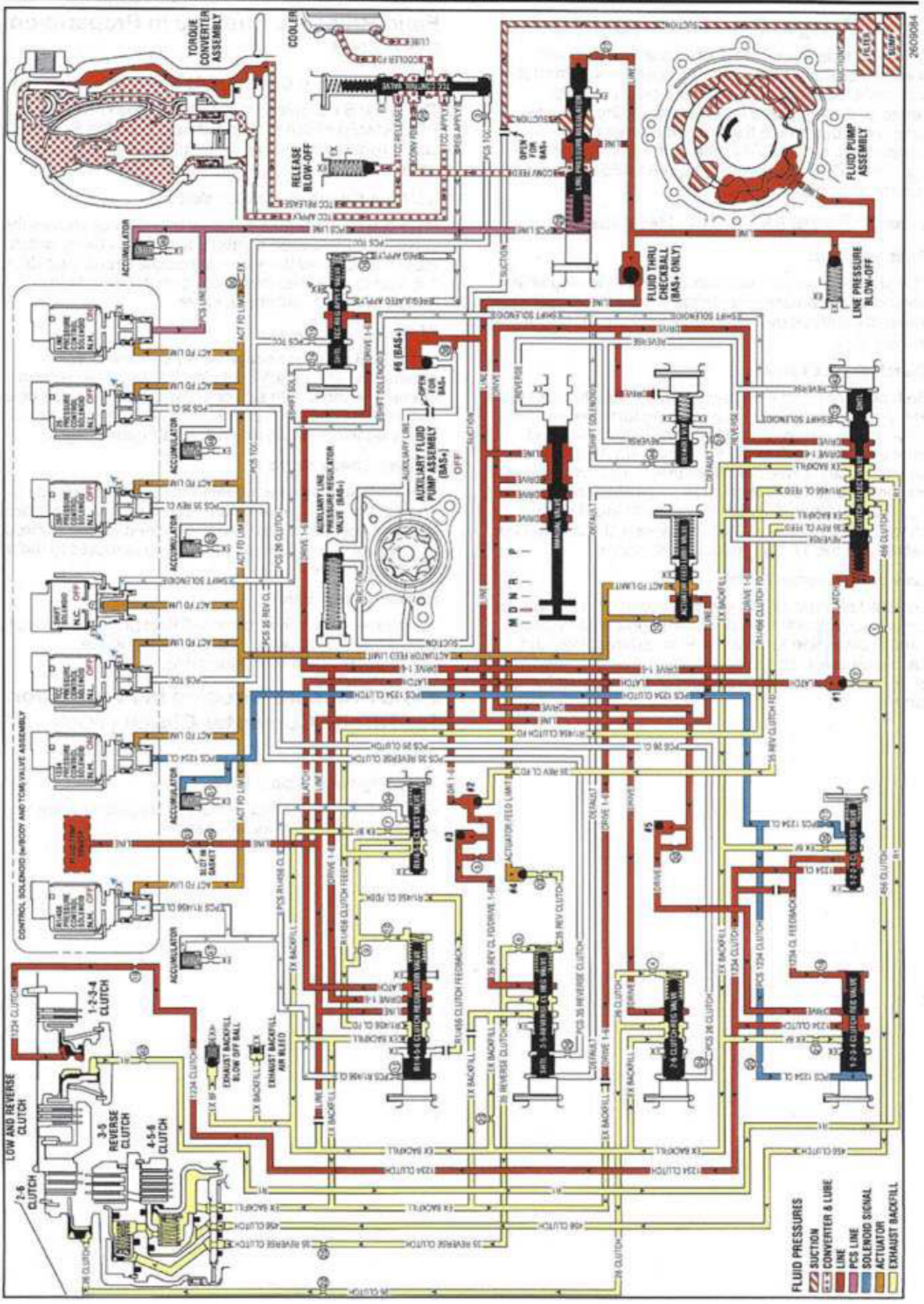
35 reverse clutch feed/drive 1-6 fluid pressure unseats the #3 ball check valve and is directed to the 3-5-reverse clutch regulator valve.

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

TCC Regulator Apply Valve

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

Drive Range, First Gear – Gen 2/Hybrid



Drive Range, Second Gear (Gen 1)

As vehicle speed increases and operating conditions become appropriate, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low 2-6 pressure control solenoid 4 and shift the transmission into Second gear. The manual valve remains in the Drive (D) position and line pressure continues to feed the drive fluid circuit.

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid 4

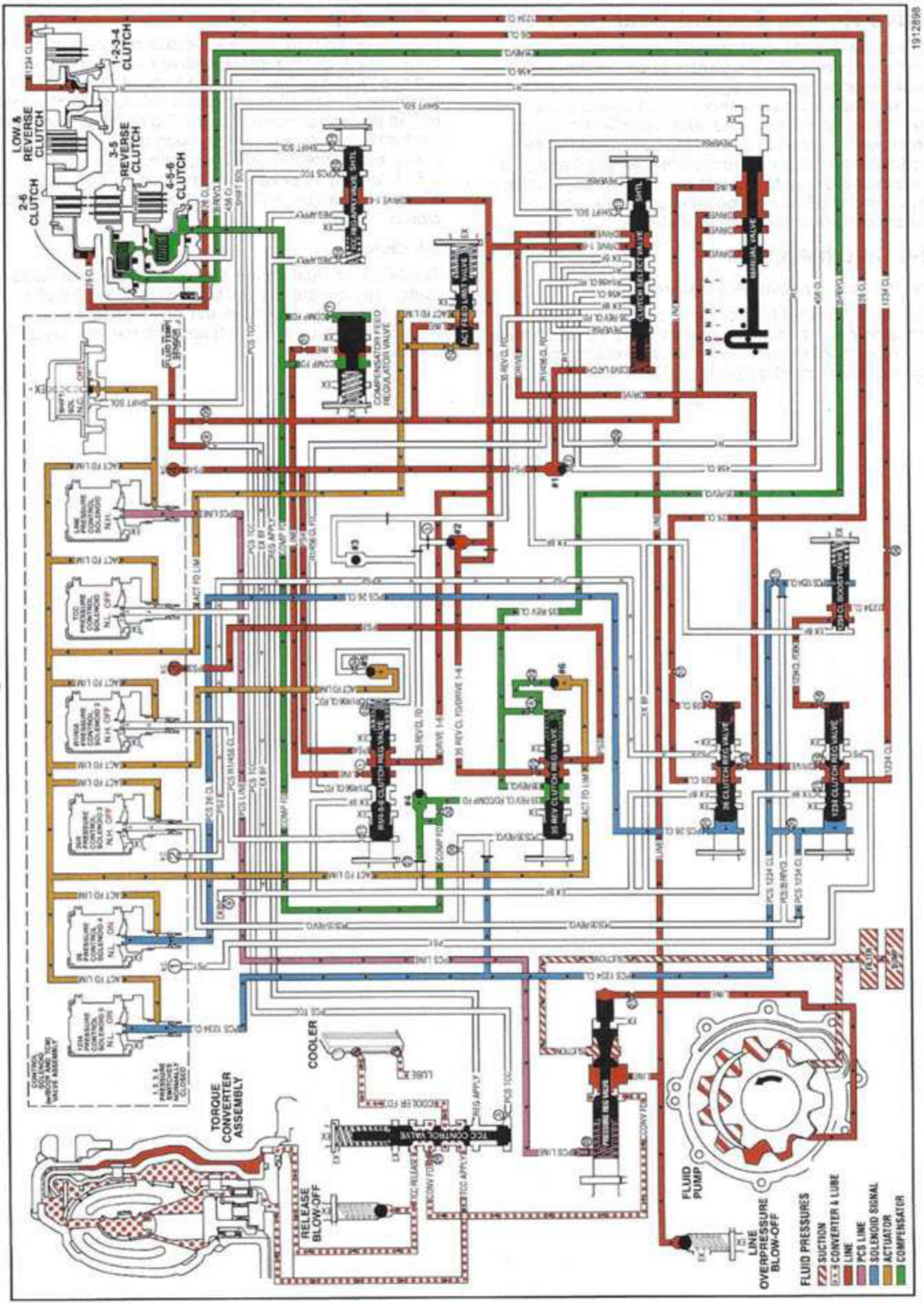
The 26 PC solenoid 4 is commanded ON, allowing actuator feed limit fluid to enter the PCS 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #24 to the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid, at the 2-6 clutch regulator valve, opposes 2-6 clutch regulator valve spring force and orificed 26 clutch fluid pressure to regulate drive fluid pressure into the 26 clutch circuit. 26 clutch fluid is then routed through orifice #37 to the 2-6 clutch assembly in the transmission case, and through orifice #4 to the spring end of the 2-6 clutch regulator valve. With the 2-6 clutch regulator valve in this position, PS2 fluid is allowed to exhaust and the normally-closed PS2 switch closes.

2-6 Clutch

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


Drive Range, Second Gear
1912898
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
COOLER
TORQUE CONVERTER ASSEMBLY
RELEASE
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Drive Range, Second Gear (Gen 2)

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

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid

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

2-6 Clutch Regulator Valve

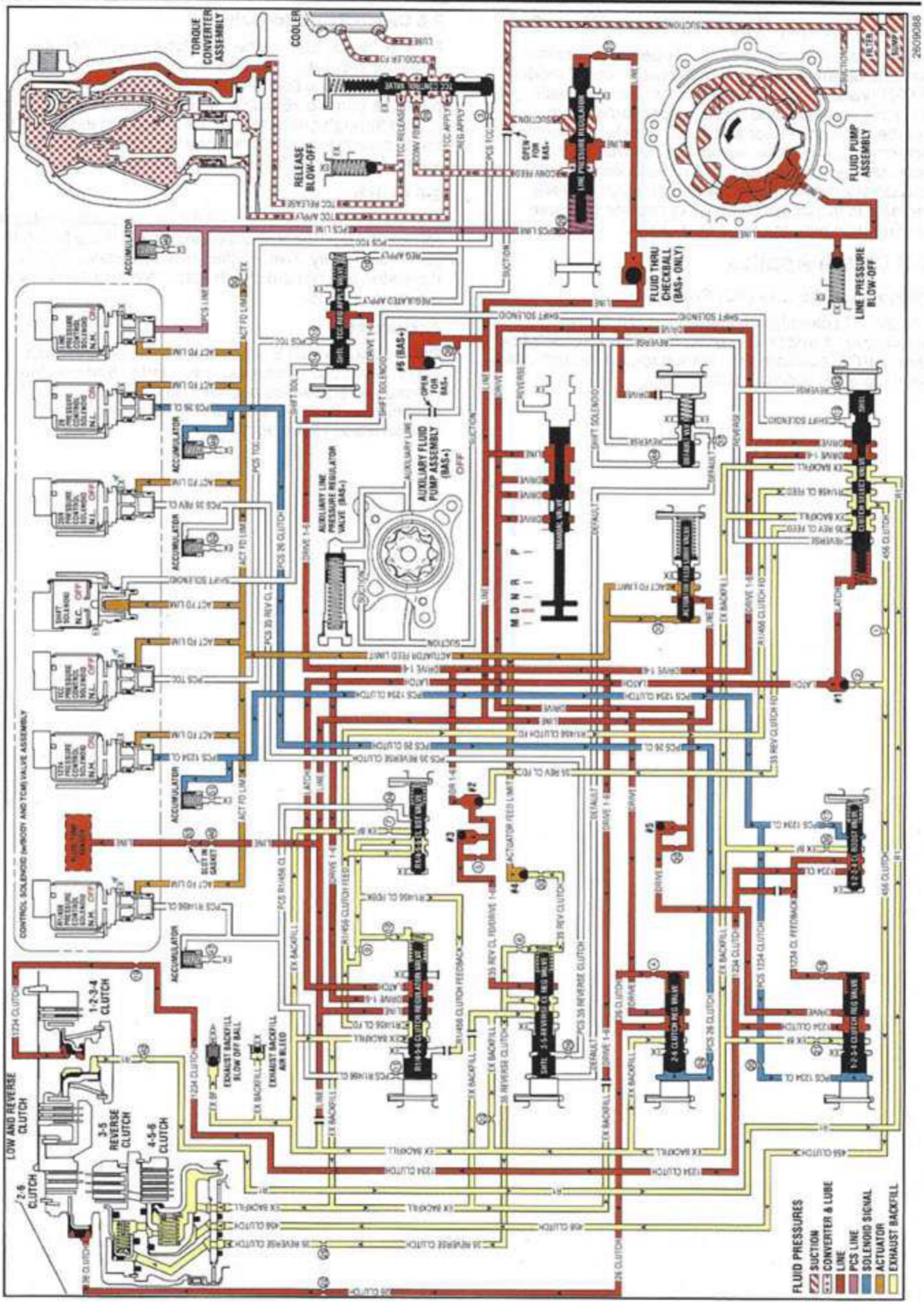
PCS 26 clutch fluid, at the 2-6 clutch regulator valve, opposes 2-6 clutch regulator valve spring force and orificed 26 clutch fluid pressure to regulate drive fluid pressure into the 26 clutch circuit. 26 clutch fluid is then routed through orifice #22 to the 2-6 clutch assembly in the transmission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

2-6 Clutch

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

Accumulator

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


Drive Range, Second Gear – Gen 2/Hybrid
TORQUE CONVERTER ASSEMBLY
COOLER
RELEASE BLOW-OFF
FLUID PUMP ASSEMBLY
FLUID THRU CHECKBALL (BAS+ ONLY)
LINE PRESSURE BLOW-OFF
AUXILIARY FLUID PUMP ASSEMBLY (BAS+)
AUXILIARY LINE PRESSURE REGULATOR VALVE (BAS+)
CONTROL SOLENOID (w/BODY AND TCM) VALVE ASSEMBLY
LOW AND REVERSE CLUTCH
1-2-3-4 CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
EXHAUST BACKFILL

Drive Range, Third Gear (Gen 1)

As vehicle speed increases and operating conditions become appropriate, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-low 26 pressure control solenoid 4. At the same time the 35R pressure control solenoid 2 is also commanded ON to regulate 3-5 clutch apply, and the transmission shifts into Third gear. The manual valve remains in the Drive (D) position and line pressure continues to feed the drive fluid circuit.

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 is commanded ON, allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #26 to the 3-5-reverse clutch regulator valve.

3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5-reverse clutch assembly, through orifice #6 to the spring end of the 3-5-reverse clutch regulator valve and through orifice #33 to the #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

3-5-Reverse Clutch

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

#6 Ball Check Valve

#6 Ball Check Valve 35 reverse clutch feed fluid unseats the #6 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid 4

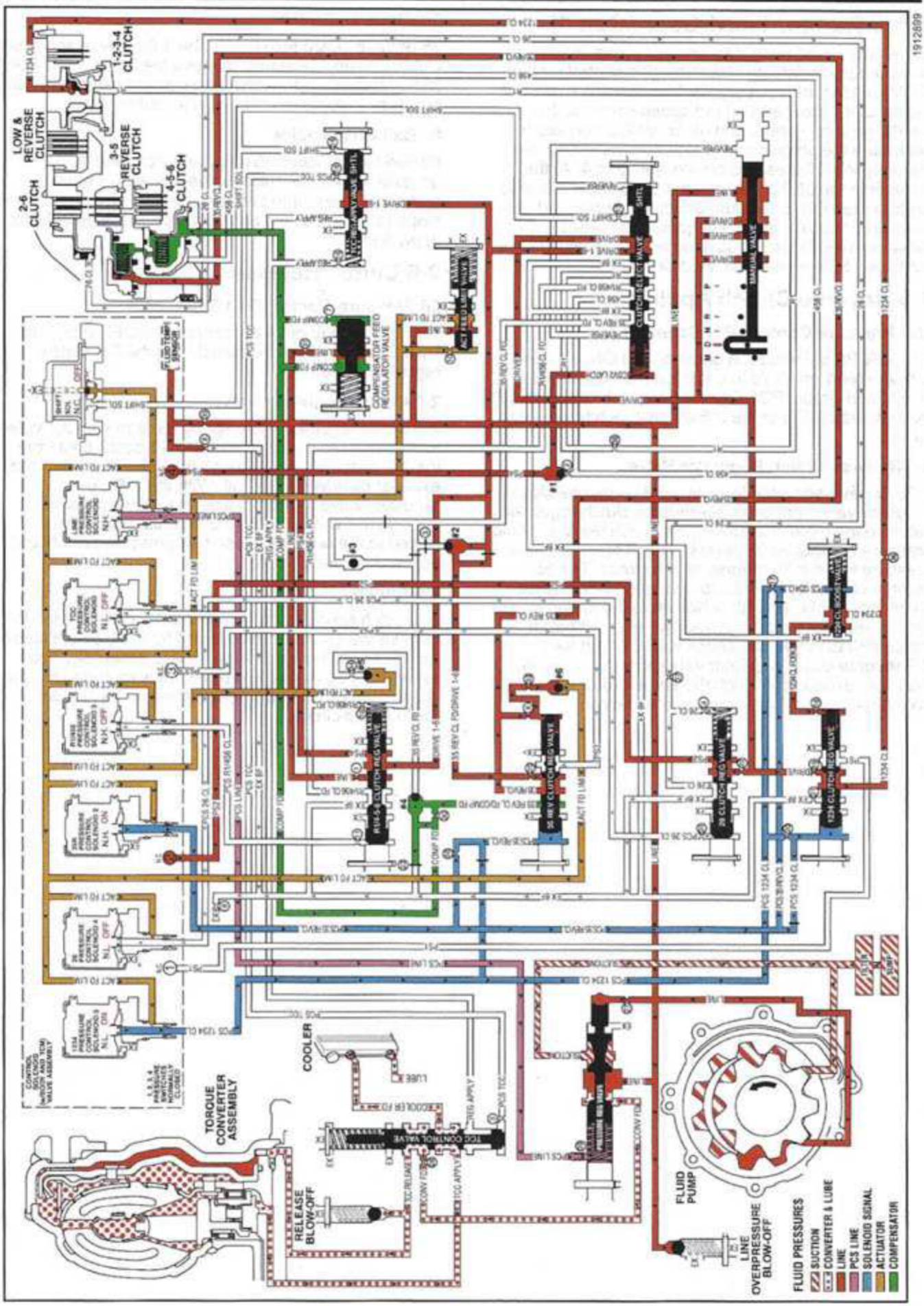
The 26 PC solenoid 4 is commanded OFF, allowing PCS 26 clutch fluid to exhaust from the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

2-6 clutch regulator valve spring force moves the valve to the released position, allowing 26 clutch fluid from the 2-6 clutch to pass through the valve and enter the exhaust backfill fluid circuit. With the 2-6 clutch regulator valve in this position, drive fluid passes through the valve into the PS2 circuit. PS2 fluid is routed to the normally-closed #2 pressure switch and opens the switch.

2-6 Clutch

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


Drive Range, Third Gear
1912699
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
MANUAL VALVE
COOLER
TORQUE CONVERTER ASSEMBLY
TCC CONTROL VALVE
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Drive Range, Third Gear (Gen 2)

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

Accumulator

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid

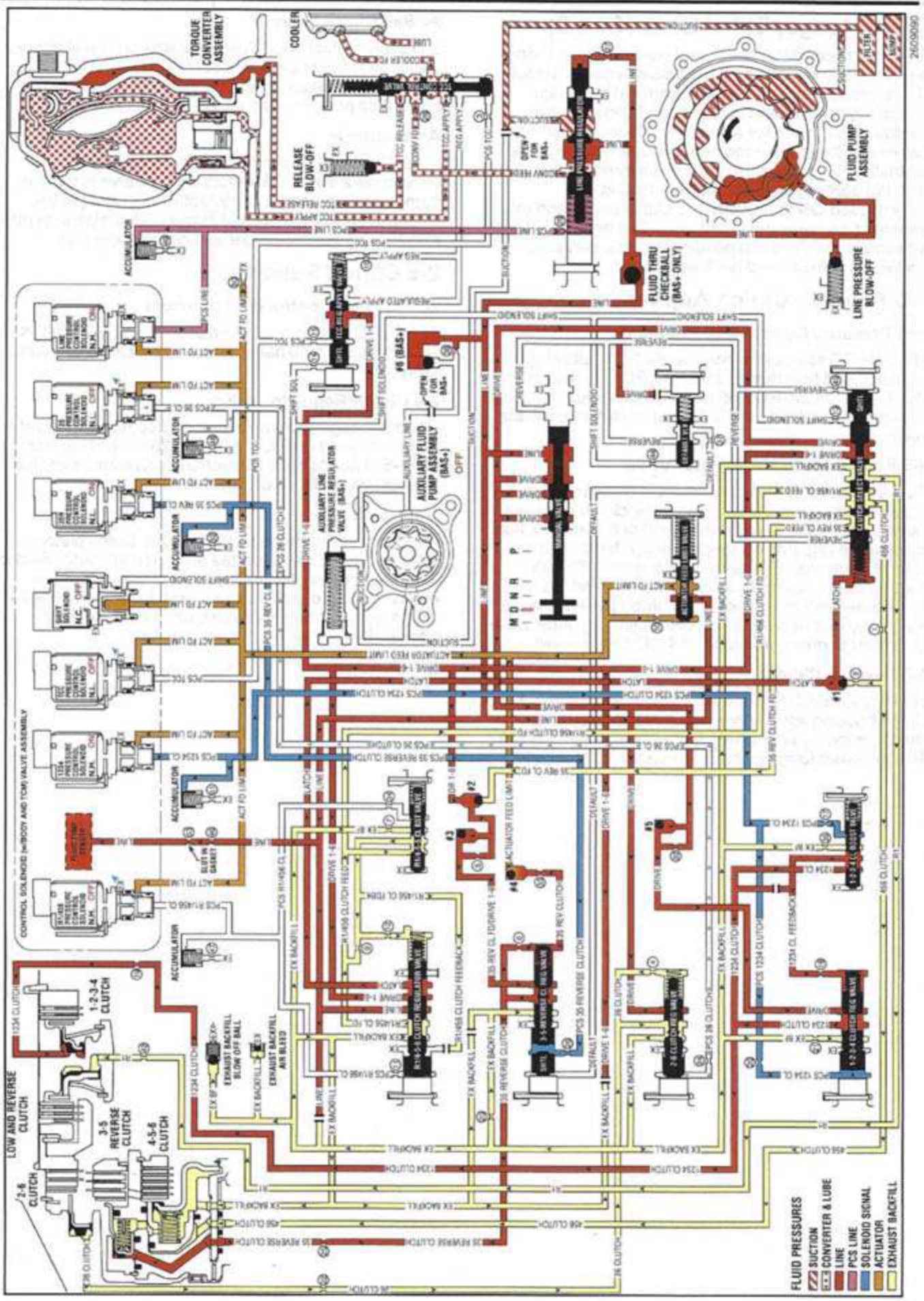
The 26 PC solenoid is commanded OFF, allowing PCS 26 clutch fluid to exhaust from the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

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

2-6 Clutch

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


Drive Range, Third Gear – Gen 2/Hybrid
TORQUE CONVERTER ASSEMBLY
COOLER
RELEASE BLOW-OFF
FLUID PUMP ASSEMBLY
FLUID THRU CHECKBALL (BAS+ ONLY)
LINE PRESSURE BLOW-OFF
AUXILIARY FLUID PUMP ASSEMBLY (BAS+)
AUXILIARY LINE PRESSURE REGULATOR VALVE (BAS+)
#6 (BAS+)
OPEN FOR BAS+
CONTROL SOLENOID (w/BODY AND TCM) VALVE ASSEMBLY
ACCUMULATOR
SHIFT SOLENOID
LOW AND REVERSE CLUTCH
1-2-3-4 CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
EXHAUST BACKFILL BLOW OFF BALL
EXHAUST BACKFILL AIR BLEED
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
EXHAUST BACKFILL

Drive Range - Fourth Gear (Gen 1)

As vehicle speed increases, the transmission control module (TCM) processes input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-high 35R pressure control solenoid 2. At the same time, the normally-low R1/456 pressure control solenoid 3 is commanded ON to regulate 4-5-6 clutch apply and the transmission shifts into Fourth gear.

4-5-6 Clutch Applies

R1/456 Pressure Control (PC) Solenoid 3

The R1/456 PC solenoid 3 is commanded ON allowing actuator feed limit fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is routed through orifice #11 to the R1/456 clutch regulator valve.

R1/4-5-6 Clutch Regulator Valve

PCS R1/456 clutch fluid, at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator valve spring force and orificed R1/456 clutch feed fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is then routed to the clutch select valve, through orifice #12 to the spring end of the R1/4-5-6 clutch regulator valve, and through orifice #34 to ball check valve #5. When the R1/4-5-6 clutch regulator valve is in this position, PS4 fluid exhausts through the valve allowing the normally-closed #4 pressure switch to close.

Clutch Select Valve

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

#1 Ball Check Valve

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

4-5-6 Clutch

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

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid 2

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

3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows 35 reverse clutch fluid pressure to exhaust into the compensator feed circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch. With the 3-5-reverse clutch regulator valve in this position, orificed (#25) 35 reverse clutch feed/drive 1-6 fluid passes through the valve into the PS3 circuit. PS3 fluid is routed to the normally-closed #3 pressure switch and opens the switch.

3-5-Reverse Clutch

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

Torque Converter Clutch (TCC) Applies

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

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

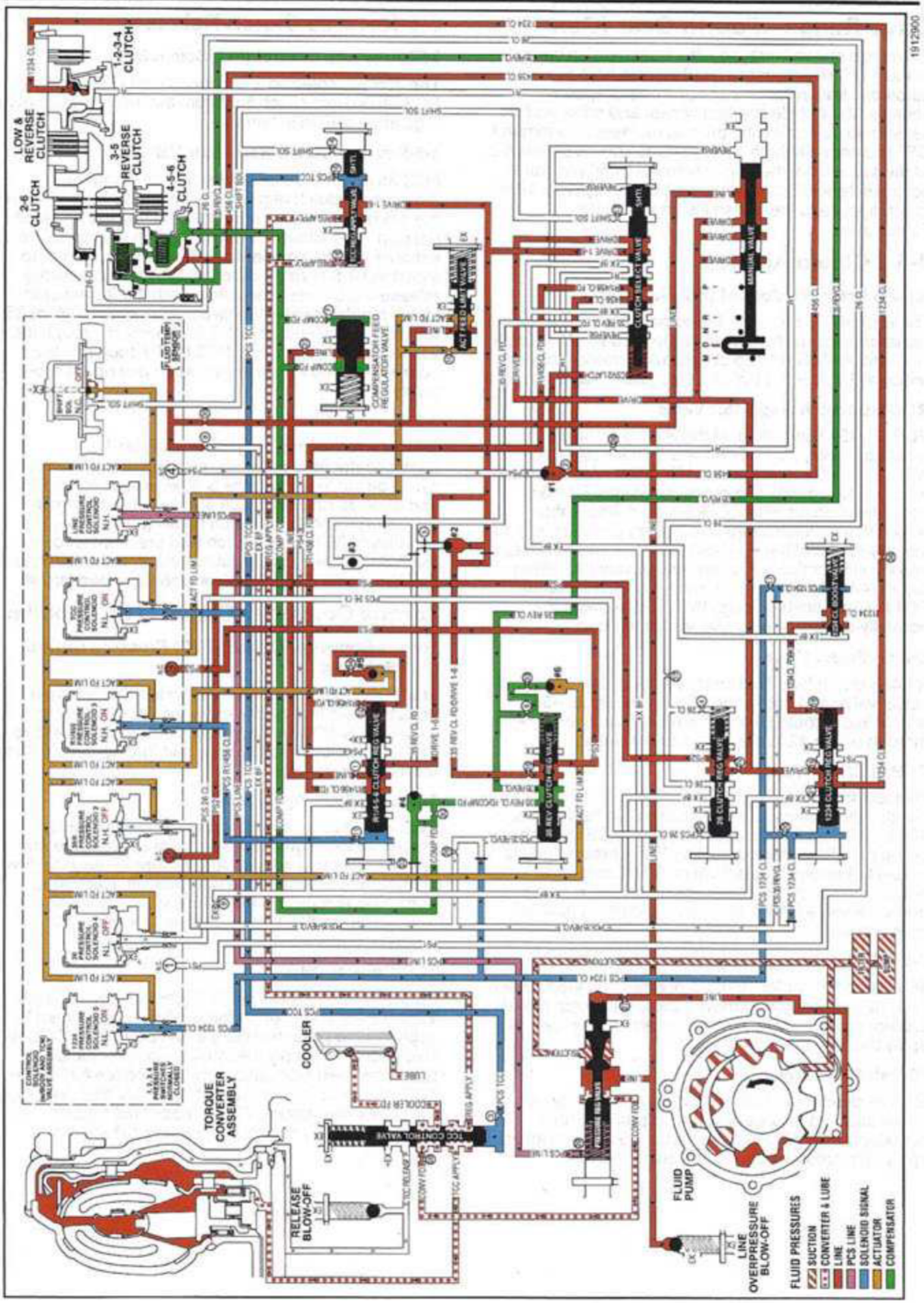
TCC Regulator Apply Valve

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

TCC Control Valve

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

Drive Range, Fourth Gear



Drive Range - Fourth Gear (Gen 2)

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

4-5-6 Clutch Applies

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Regulator Valve

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

R1/4-5-6 Clutch Boost Valve

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

#1 Ball Check Valve

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

Clutch Select Valve

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

4-5-6 Clutch

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

Accumulator

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

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

Torque Converter Clutch (TCC) Applies

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

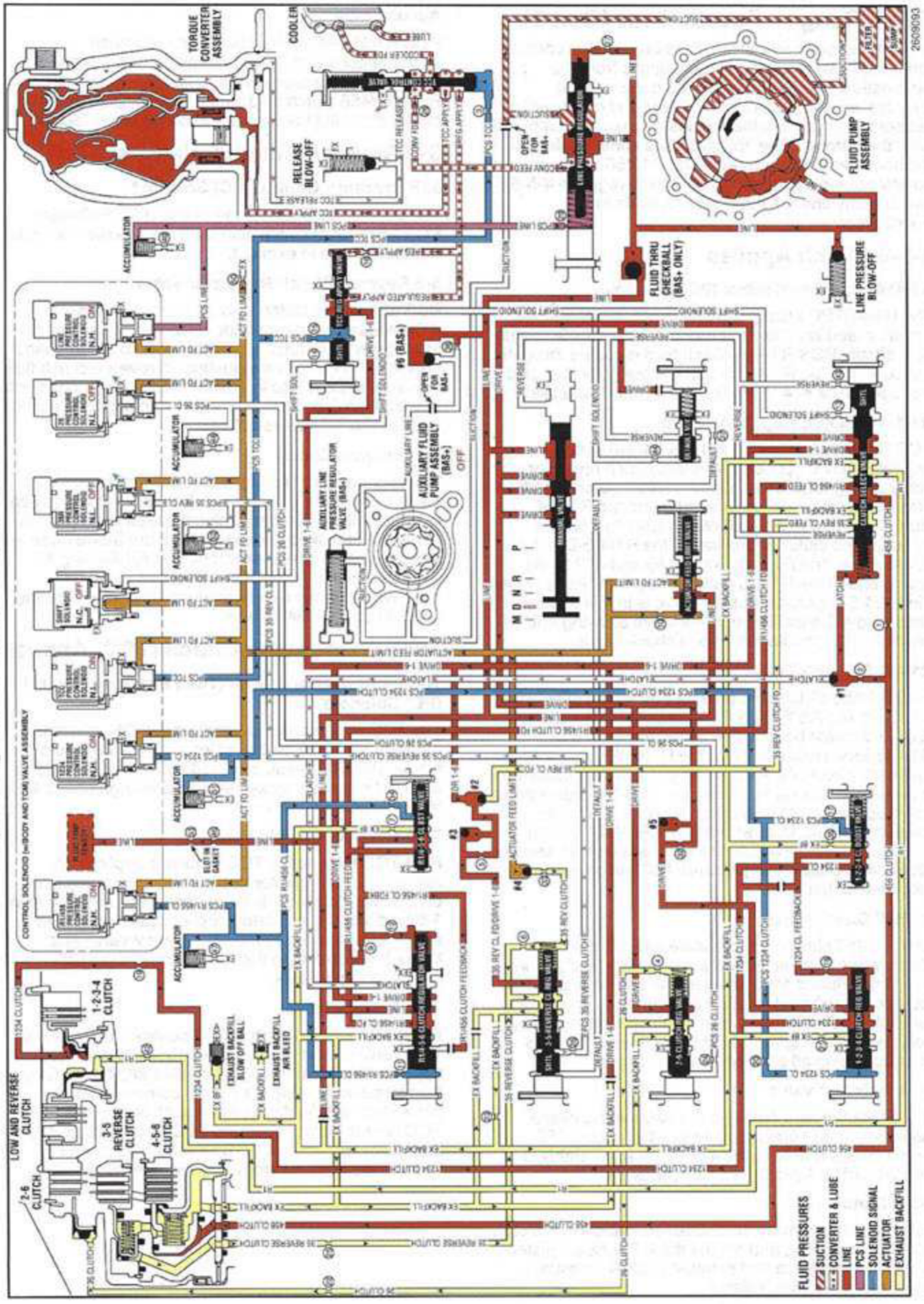
The TCC PC solenoid is commanded ON, allowing actuator feed limit fluid to enter the PCS TCC fluid circuit. PCS TCC fluid is routed through orifice #15 to the TCC regulator apply valve and through orifice #3 to the TCC control valve.

TCC Regulator Apply Valve

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

TCC Control Valve

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


Drive Range, Fourth Gear – Gen 2/Hybrid
TORQUE CONVERTER ASSEMBLY
COOLER
RELEASE BLOW-OFF
FLUID PUMP ASSEMBLY
FLUID THRU CHECKBALL (BAS+ ONLY)
LINE PRESSURE BLOW-OFF
ACCUMULATOR
CONTROL SOLENOID (w/BODY AND TCM) VALVE ASSEMBLY
AUXILIARY FLUID PUMP ASSEMBLY (BAS+)
AUXILIARY LINE PRESSURE REGULATOR VALVE (BAS+)
LOW AND REVERSE CLUTCH
2-6 CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
1-2-3-4 CLUTCH
EXHAUST BACKFILL BLOW OFF BALL
EXHAUST BACKFILL AIR BLEED
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
EXHAUST BACKFILL

Drive Range - Fourth Gear Default (Gen 2/Hybrid)

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

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

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch

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

Accumulator

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

4-5-6 Clutch Applies or Remains Applied

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Boost Valve

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

R1/4-5-6 Clutch Regulator Valve

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

#1 Ball Check Valve

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

Clutch Select Valve

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

4-5-6 Clutch

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

Accumulator

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

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid

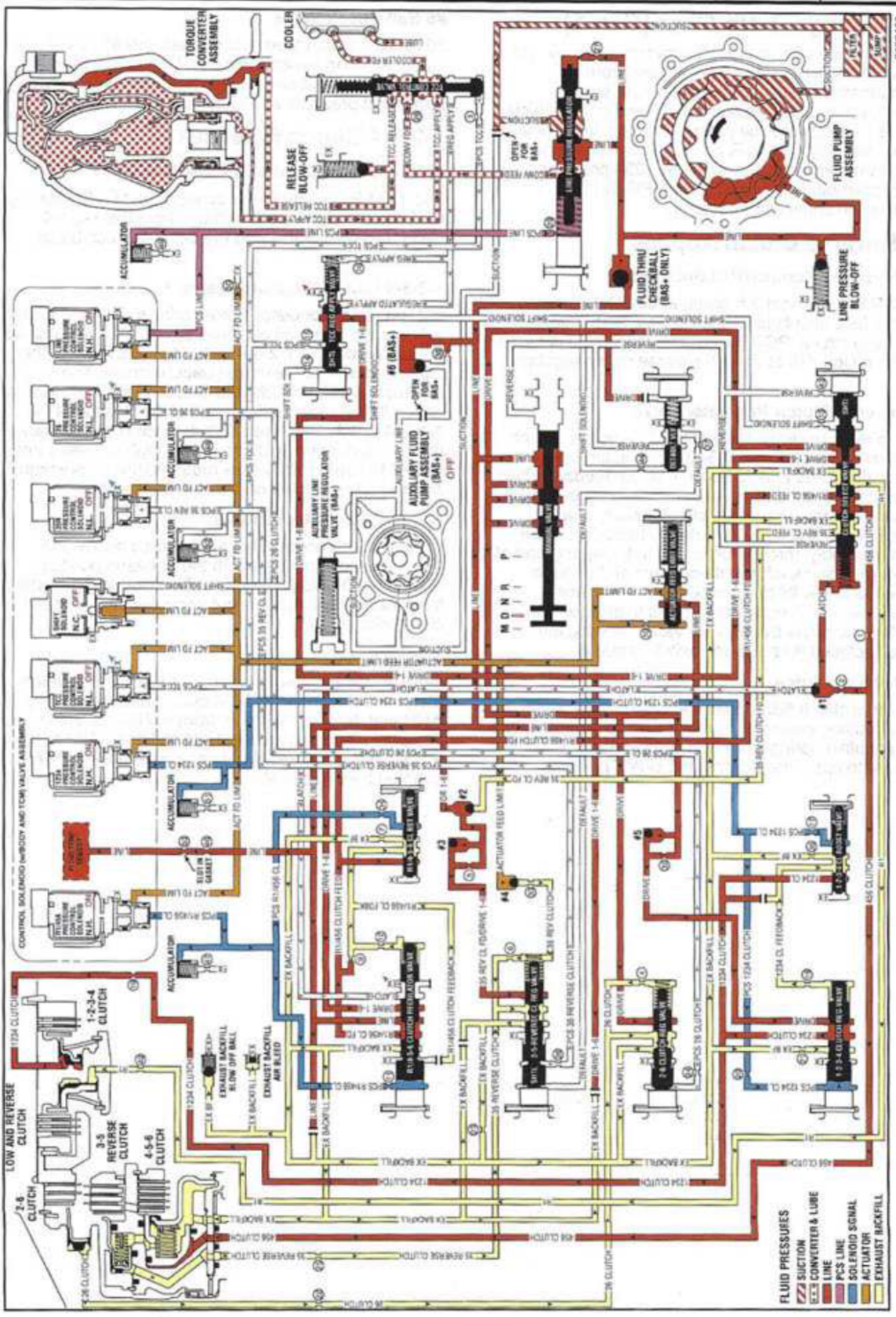
If the transmission is in Second or Sixth gear when an electrical condition commands a protection mode, the 26 PC solenoid defaults to its normally-low state (OFF), allowing PCS 26 clutch fluid pressure to exhaust and the 2-6 clutch to release. See Drive Range– Third Gear for a complete description of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

Torque Converter Clutch (TCC) Releases

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

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

Drive Range, Fourth Gear Default – Gen 2/Hybrid



Drive Range, Fifth Gear (Gen 1)

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 is commanded ON, allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #26 to the 3-5-reverse clutch regulator valve.

3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5-reverse clutch assembly, through orifice #6 to the spring end of the 3-5-reverse clutch regulator valve and through orifice #33 to the #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

3-5-Reverse Clutch

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

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid 5

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

1-2-3-4 Clutch Regulator Valve

1-2-3-4 clutch regulator valve spring force moves the valve to the released position, allowing 1234 clutch fluid pressure from the 1-2-3-4 clutch to pass through the valve and enter the exhaust backfill circuit. The exhausting 1234 clutch fluid pressure is routed through orifice #21 in order to help control the release of the 1-2-3-4 clutch. With the 1-2-3-4 clutch regulator valve in this position, drive fluid passes through the valve into the PS1 circuit. PS1 fluid is routed to the #1 pressure switch and opens the normally-closed switch.

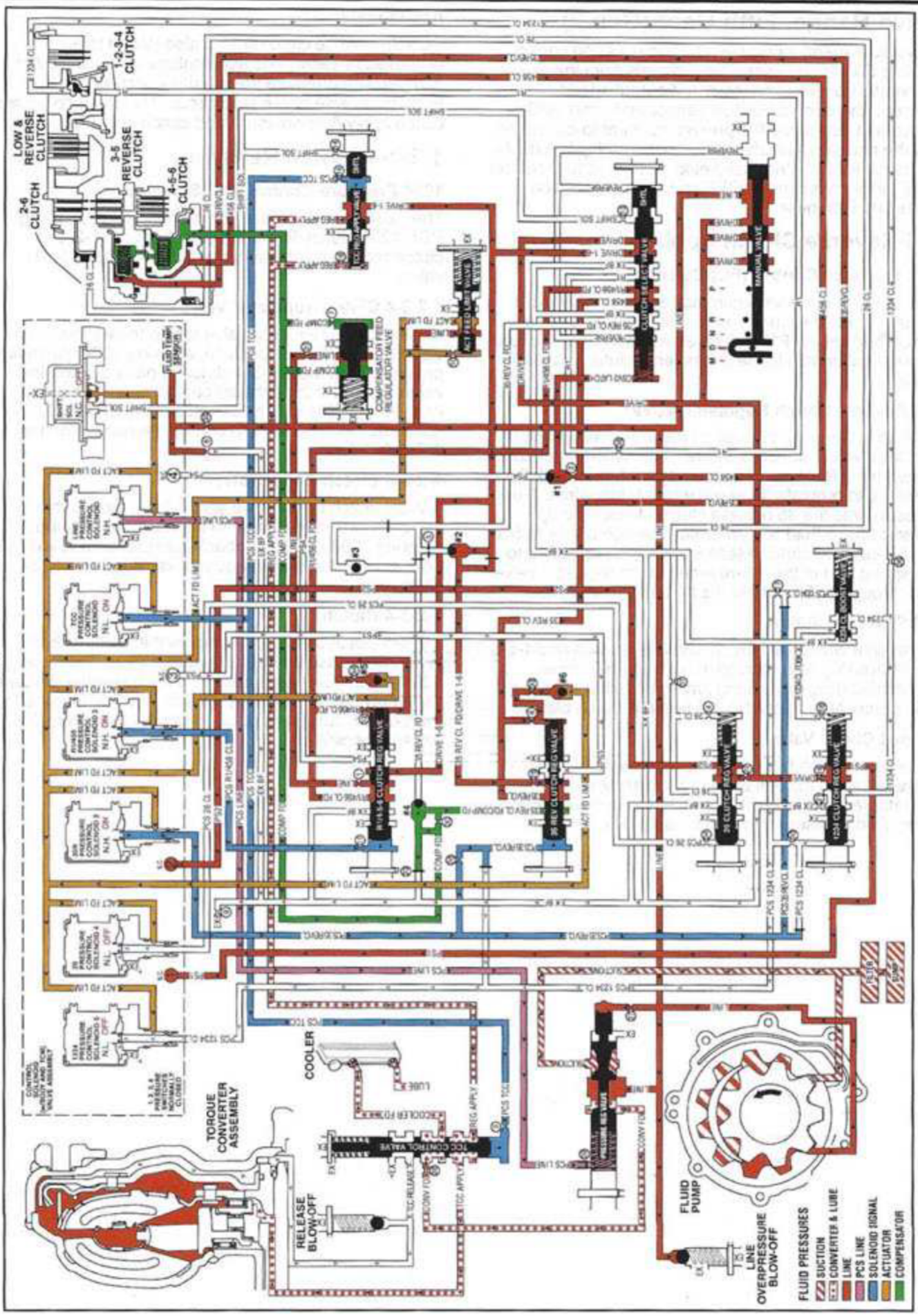
1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

Drive Range, Fifth Gear



Drive Range, Fifth Gear (Gen 2)

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

3-5-Reverse Clutch Applies

35R Pressure Control (PC) Solenoid

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

3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

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

#4 Ball Check Valve

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

Accumulator

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

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Regulator Valve

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

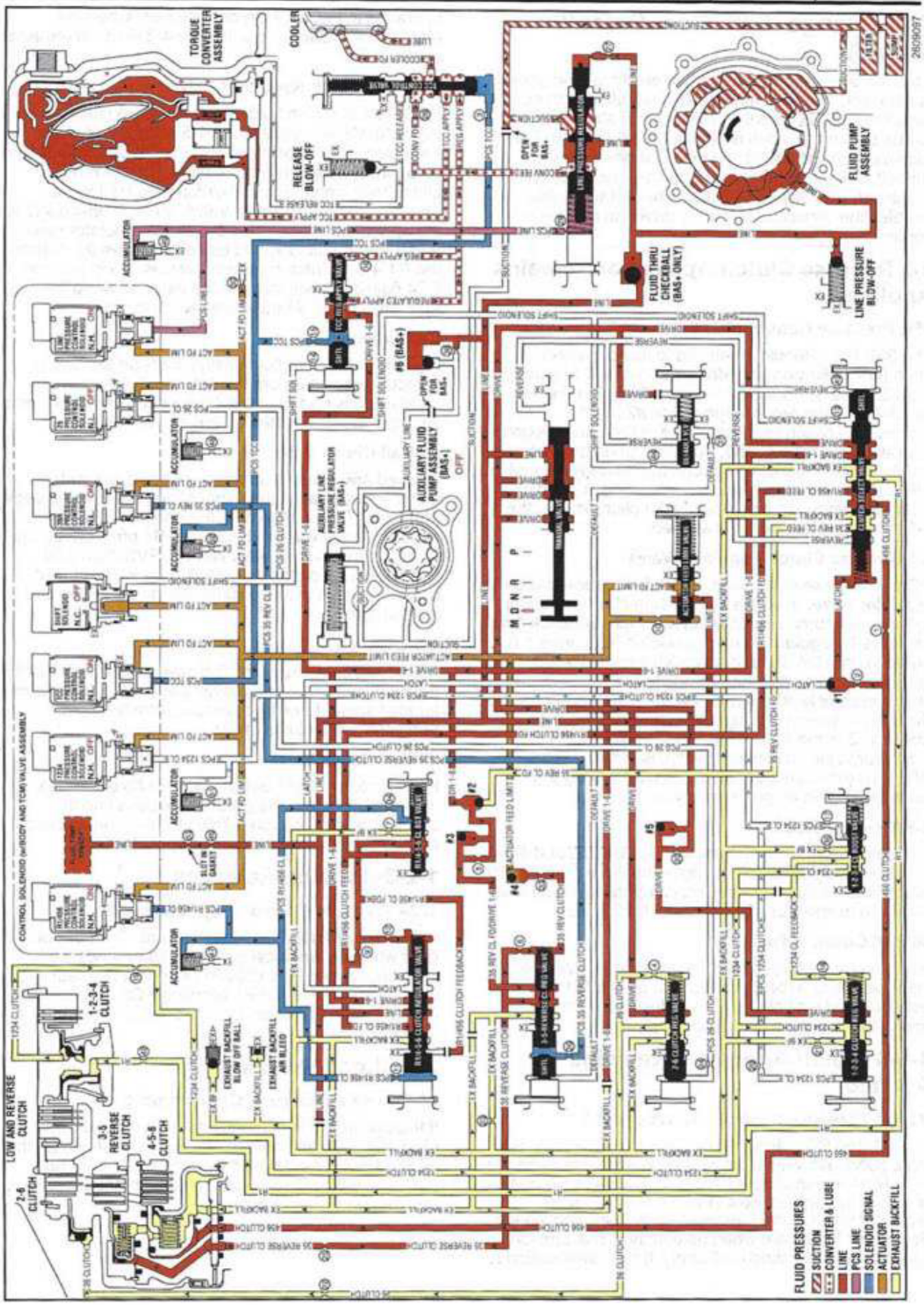
1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch

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

Drive Range, Fifth Gear – Gen 2/Hybrid



Drive Range, Fifth Gear Default (Gen 1)

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

3-5 Reverse Clutch Applies or Remains Applied

35R Pressure Control (PC) Solenoid 2

The 35R PC solenoid 2 defaults to its normally-high state (ON), allowing actuator feed limit fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #26 to the 3-5-reverse clutch regulator valve. If the transmission is operating in First, Second, Fourth or Sixth gear when an electrical malfunction occurs, the 3-5-reverse clutch will apply. If the transmission is operating in Third or Fifth gear when the electrical malfunction occurs, the 3-5-reverse clutch remains applied.

3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid, at the 3-5-reverse clutch regulator valve, opposes 3-5-reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid pressure to regulate 35 reverse clutch feed/drive 1-6 pressure into the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5-reverse clutch assembly, through orifice #6 to the spring end of the 3-5-reverse clutch regulator valve and through orifice #33 to the #6 ball check valve. When the 3-5-reverse clutch regulator valve is in this position, PS3 fluid exhausts through the valve allowing the normally-closed #3 pressure switch to close.

3-5-Reverse Clutch

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

#6 Ball Check Valve

35 reverse clutch feed fluid unseats the #6 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

4-5-6 Clutch Applies or Remains Applied

R1/456 Pressure Control (PC) Solenoid 3

The R1/456 PC solenoid 3 defaults to its normally-high state (ON), allowing actuator feed limit fluid to enter the PCS R1/456 clutch fluid circuit. PCS R1/456 clutch fluid is routed through orifice #11 to the R1/456 clutch regulator valve. If the transmission is operating in First, Second or Third gear when an electrical malfunction occurs, the 4-5-6 clutch will apply. If the transmission is operating in Fourth, Fifth or Sixth gear when the electrical malfunction occurs, the 4-5-6 clutch remains applied.

R1/4-5-6 Clutch Regulator Valve

PCS R1/456 clutch fluid, at the R1/4-5-6 clutch regulator valve, opposes R1/4-5-6 clutch regulator valve spring force and orificed R1/456 clutch feed fluid pressure to regulate line pressure into the R1/456 clutch feed circuit. R1/456 clutch feed fluid is then routed to the clutch select valve, through orifice #12 to the spring end of the R1/4-5-6 clutch regulator valve, and through orifice #34 to ball check valve #5. When the R1/4-5-6 clutch regulator valve is in this position, PS4 fluid exhausts through the valve allowing the normally-closed #4 pressure switch to close.

Clutch Select Valve

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

#1 Ball Check Valve

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

4-5-6 Clutch

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

#5 Ball Check Valve

R1/456 clutch feed fluid unseats the #5 ball check valve, allowing excess pressure to pass into the actuator feed limit circuit. This helps to control clutch apply fluid pressure and clutch apply feel.

1-2-3-4 Clutch Releases

1234 Pressure Control (PC) Solenoid 5

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid 4

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

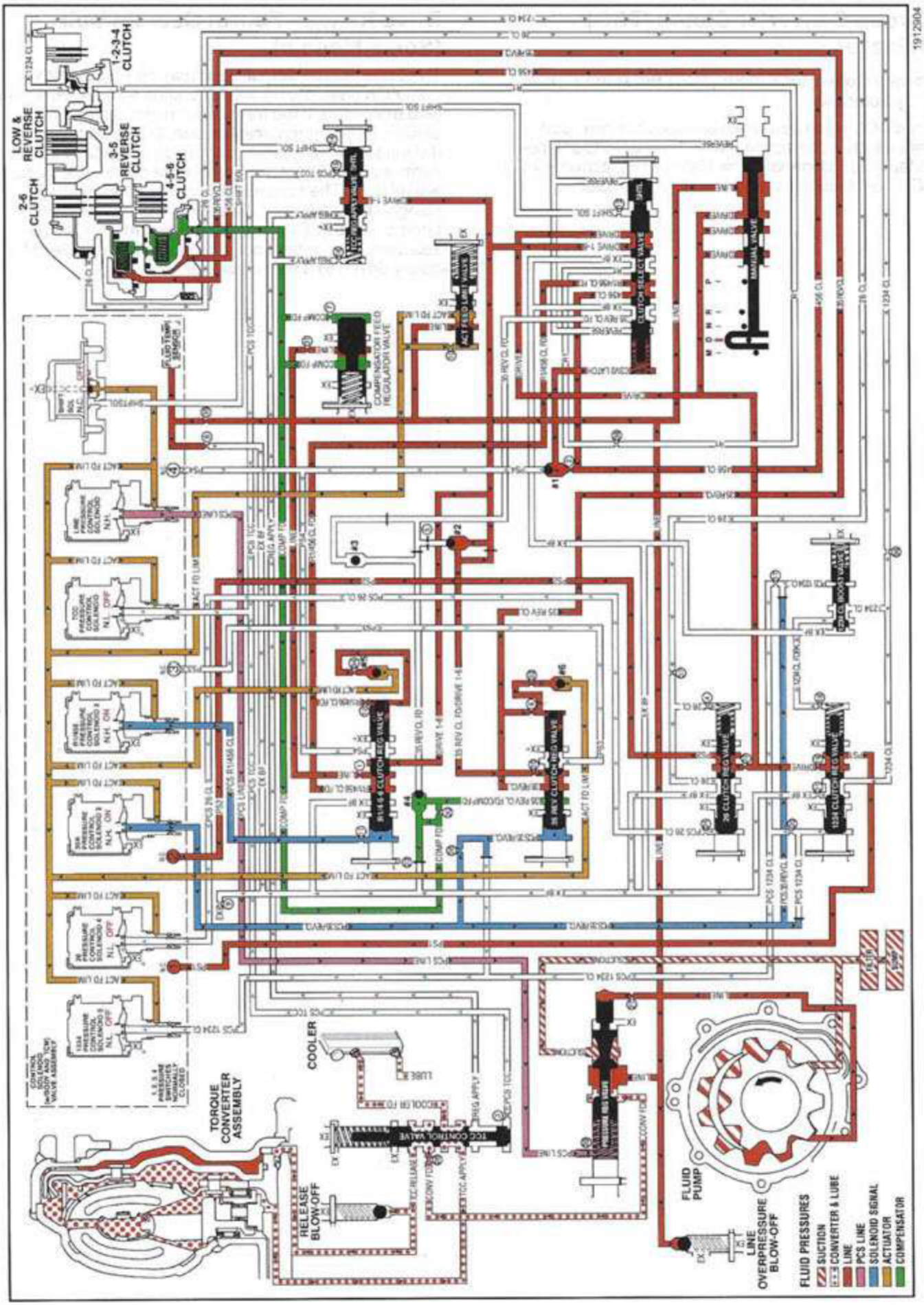
Torque Converter Clutch (TCC) Releases

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

If the TCC is applied when an electrical condition commands a protection mode, the TCC PC solenoid defaults to its normally-low state (OFF), allowing PCS TCC fluid to exhaust and the TCC to release.

Drive Range– Fourth Gear Default (Some Models)

The transmission default gear may be Fourth, rather than Fifth gear, depending on engine size and effective final drive ratio. If the transmission encounters an electrical component malfunction, the transmission will default to Fourth gear. All solenoids will default to their normal state. If the torque converter clutch is applied, it will release. The transmission will remain in Drive Range– Fourth Gear Default until the condition has been corrected. Reverse (R) range can also still be selected. This default action enables the vehicle to be safely driven to a service center.


Drive Range, Fifth Gear Default
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
MANUAL VALVE
CLUTCH FEED LIMIT VALVE
ACT FEED LIMIT VALVE
CLUTCH SELECT VALVE
#1
#2
#3
#4
#5
#6
COOLER
TORQUE CONVERTER ASSEMBLY
TCC CONTROL VALVE
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR
19129904

Drive Range, Fifth Gear Default (Gen 2)

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

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

1234 Pressure Control (PC) Solenoid

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

1-2-3-4 Clutch Boost Valve

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

1-2-3-4 Clutch Regulator Valve

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

1-2-3-4 Clutch

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

Accumulator

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

4-5-6 Clutch Applies or Remains Applied

R1/456 Pressure Control (PC) Solenoid

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

R1/4-5-6 Clutch Boost Valve

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

R1/4-5-6 Clutch Regulator Valve

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

#1 Ball Check Valve

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

Clutch Select Valve

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

4-5-6 Clutch

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

Accumulator

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

3-5-Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

2-6 Clutch Releases

26 Pressure Control (PC) Solenoid

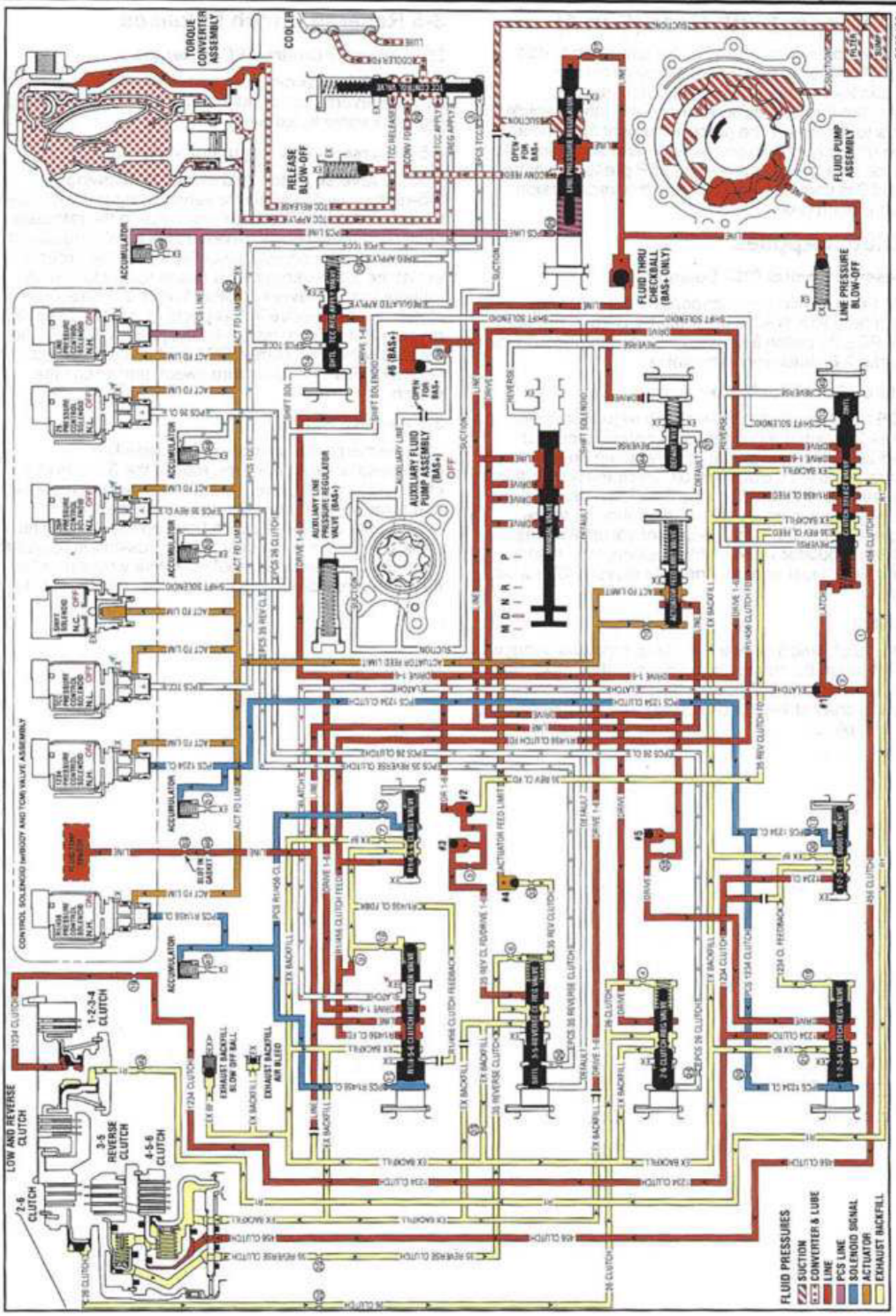
If the transmission is in Second or Sixth gear when an electrical condition commands a protection mode, the 26 PC solenoid defaults to its normally-low state (OFF), allowing PCS 26 clutch fluid pressure to exhaust and the 2-6 clutch to release. See Drive Range– Third Gear for a complete description of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

Torque Converter Clutch (TCC) Releases

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

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

Drive Range, Fourth Gear Default – Gen 2/Hybrid



Drive Range, Sixth Gear (Gen 1)

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

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid 4

The 26 PC solenoid 4 is commanded ON, allowing actuator feed limit fluid to enter the PCS 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #24 to the 2-6 clutch regulator valve.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid, at the 2-6 clutch regulator valve, opposes 2-6 clutch regulator valve spring force and orificed 26 clutch fluid pressure to regulate drive fluid pressure into the 26 clutch circuit. 26 clutch fluid is then routed through orifice #37 to the 2-6 clutch assembly in the transmission case, and through orifice #4 to the spring end of the 2-6 clutch regulator valve. With the 2-6 clutch regulator valve in this position, PS2 fluid is allowed to exhaust and the normally-closed PS2 switch closes.

2-6 Clutch

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

3-5 Reverse Clutch Releases

35R Pressure Control (PC) Solenoid 2

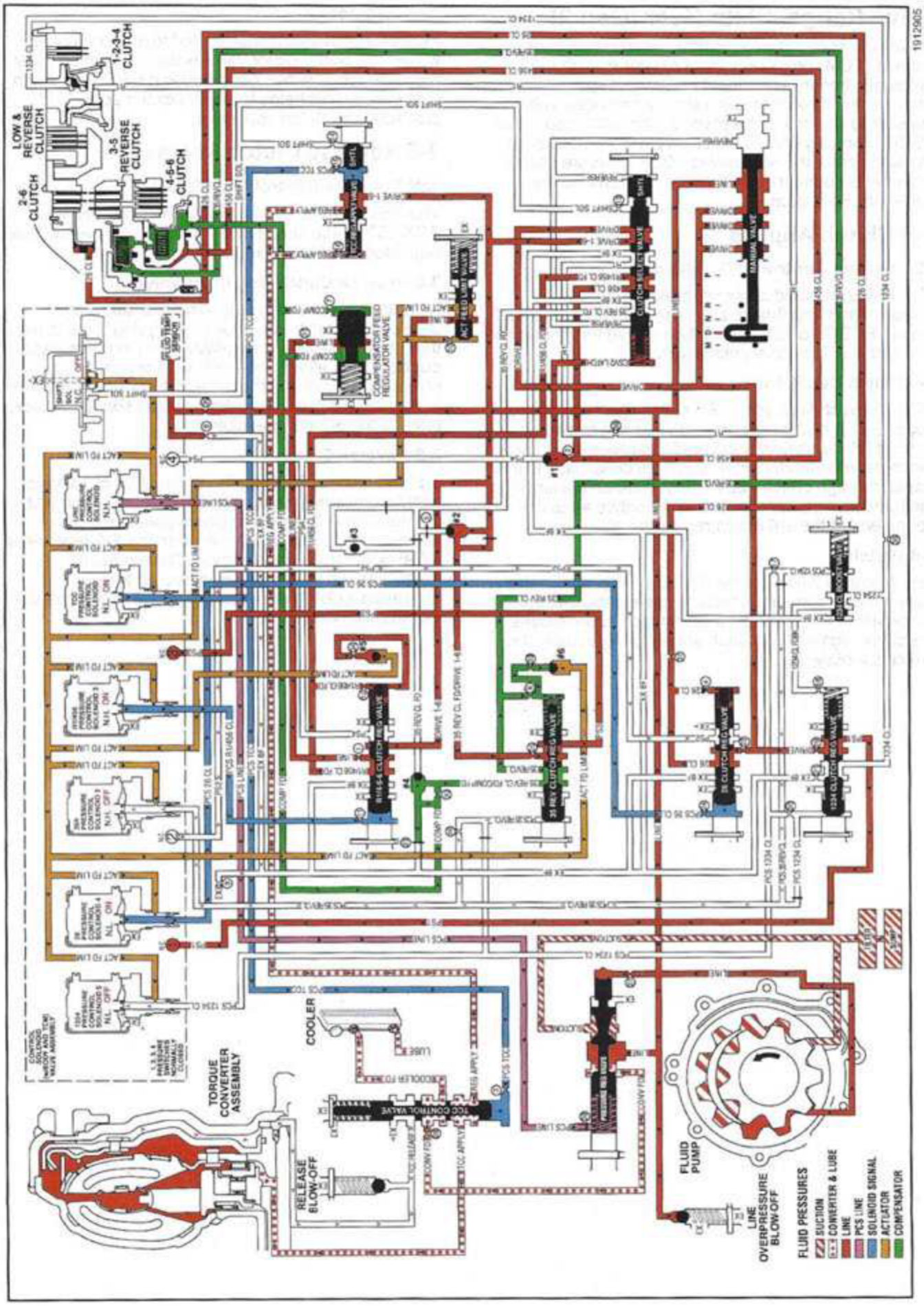
The 35R PC solenoid 2 is commanded OFF allowing PCS 35 reverse clutch fluid from the 3-5-reverse clutch regulator valve to exhaust.

3-5-Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid exhausts, allowing 3-5-reverse clutch regulator valve spring force to move the 3-5-reverse clutch regulator valve to the released position. This allows 35 reverse clutch fluid pressure to exhaust into the compensator feed circuit in order to assist the 3-5-reverse clutch piston spring to quickly release the 3-5-reverse clutch. With the 3-5-reverse clutch regulator valve in this position, orificed (#25) 35 reverse clutch feed/drive 1-6 fluid passes through the valve into the PS3 circuit. PS3 fluid is routed to the normally-closed #3 pressure switch and opens the switch.

3-5-Reverse Clutch

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


Drive Range, Sixth Gear
1912905
1-2-3-4 CLUTCH
LOW & REVERSE CLUTCH
3-5 REVERSE CLUTCH
4-5-6 CLUTCH
2-6 CLUTCH
COMPENSATOR FEED REGULATOR VALVE
ACT FEED LIMIT VALVE
CLUTCH RELEASE VALVE
MANUAL VALVE
LINE PRESSURE CONTROL SOLENOID
TCC PRESSURE CONTROL SOLENOID
3-2 PRESSURE CONTROL SOLENOID
1-2 PRESSURE CONTROL SOLENOID
35 REV CLUTCH REG VALVE
26 CLUTCH REG VALVE
1234 CLUTCH REG VALVE
COOLER
TCC CONTROL VALVE
TORQUE CONVERTER ASSEMBLY
RELEASE BLOW-OFF
FLUID PUMP
LINE OVERPRESSURE BLOW-OFF
FLUID PRESSURES
SUCTION
CONVERTER & LUBE
LINE
PCS LINE
SOLENOID SIGNAL
ACTUATOR
COMPENSATOR

Drive Range, Sixth Gear (Gen 2)

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

2-6 Clutch Applies

26 Pressure Control (PC) Solenoid

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

2-6 Clutch Regulator Valve

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

2-6 Clutch

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

Accumulator

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

3-5 Reverse Clutch Releases

35R Pressure Control (PC) Solenoid

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

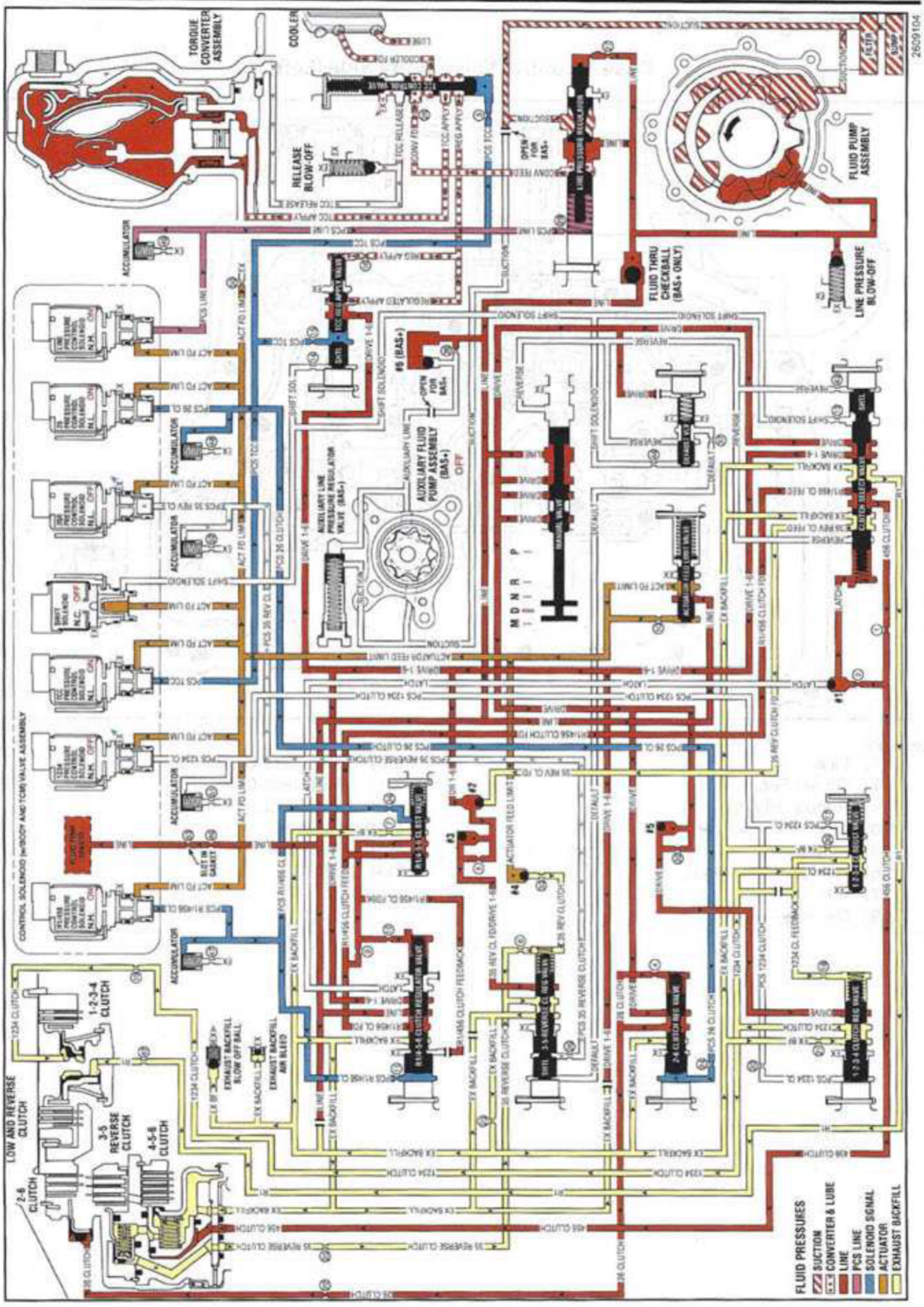
3-5-Reverse Clutch Regulator Valve

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

3-5-Reverse Clutch

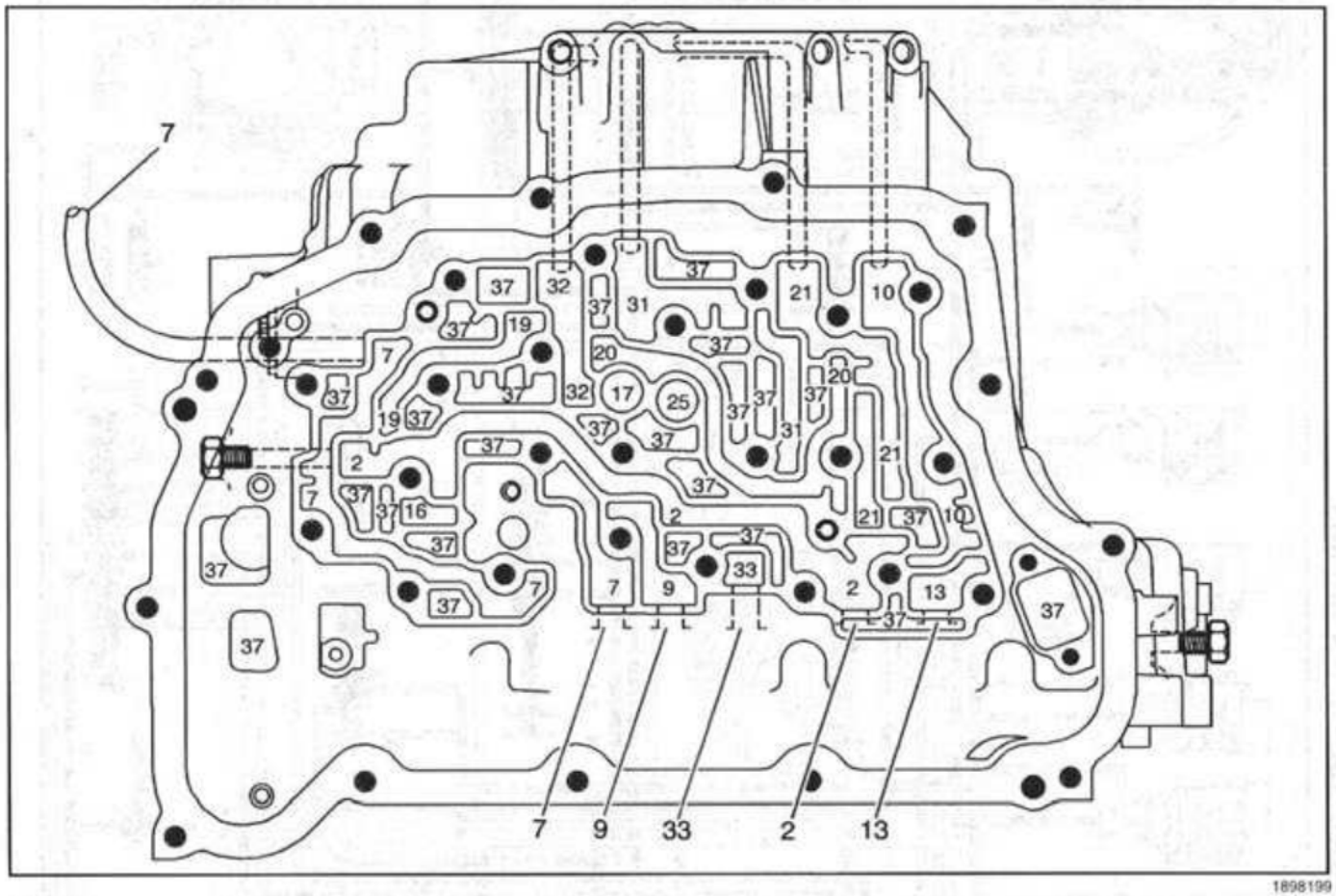
3-5-reverse clutch spring force, assisted by exhaust backfill pressure, moves the 3-5-reverse clutch piston to release the 3-5-reverse clutch plates and force 35 reverse clutch fluid to exhaust from the 3-5-reverse and 4-5-6 clutch housing assembly. The exhausting 35 reverse clutch fluid pressure is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

Drive Range, Sixth Gear – Gen 2/Hybrid



Fluid Passages (Gen 1)

Case – Control Valve Body Side (Left)

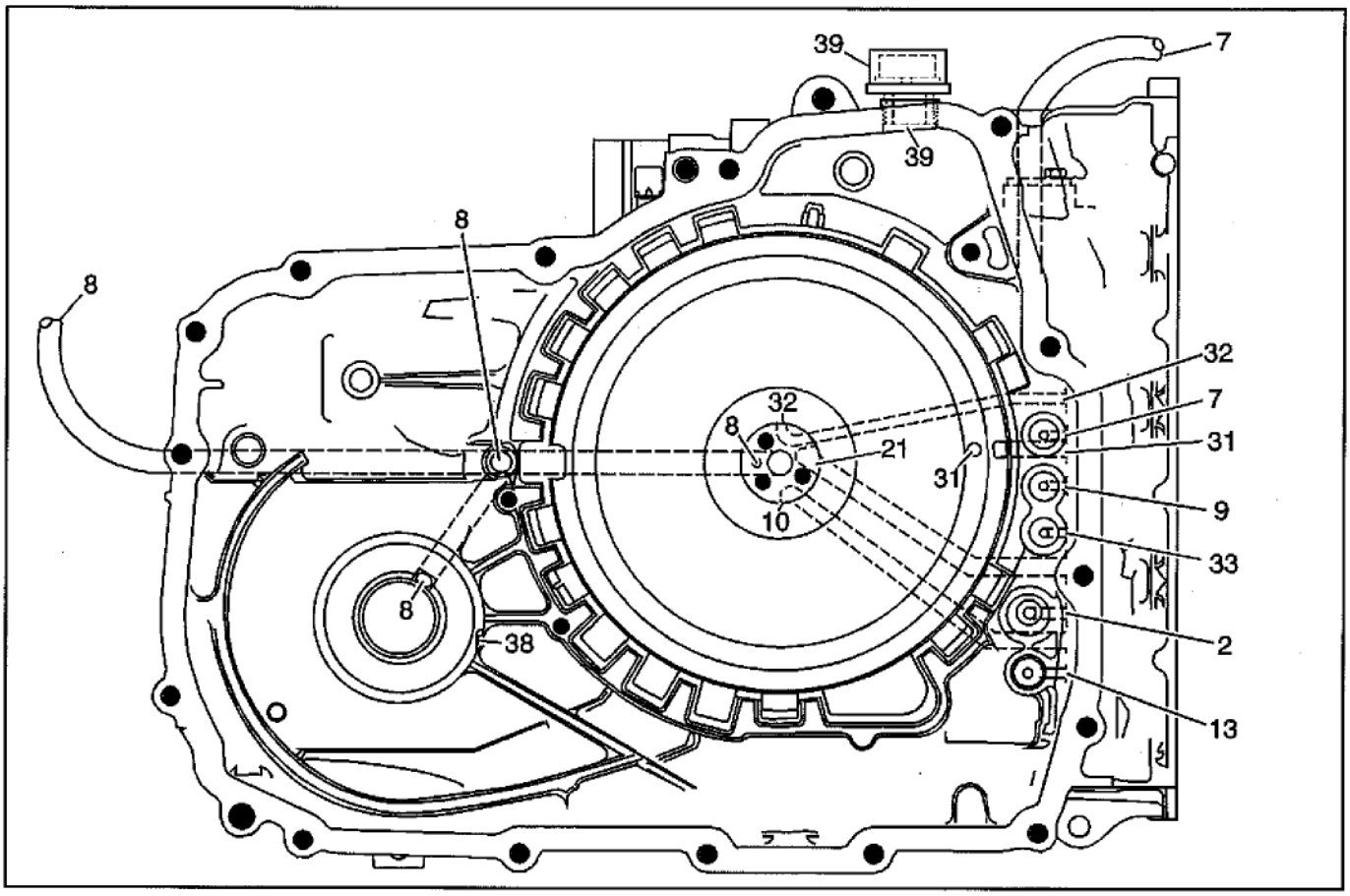


1898199

Legend

(2) Line
(7) Cooler Feed
(9) Regulated Apply
(10) Compensator Feed
(13) PCS Line
(16) R1/456 Clutch Feed
(17) R1
(19) Reverse
(20) 35 Reverse Clutch Feed
(21) 35 Reverse Clutch
(25) 1234 Clutch
(31) 26 Clutch
(32) 456 Clutch
(33) PCS TCC
(37) Void

Case – Pump Side (Back)

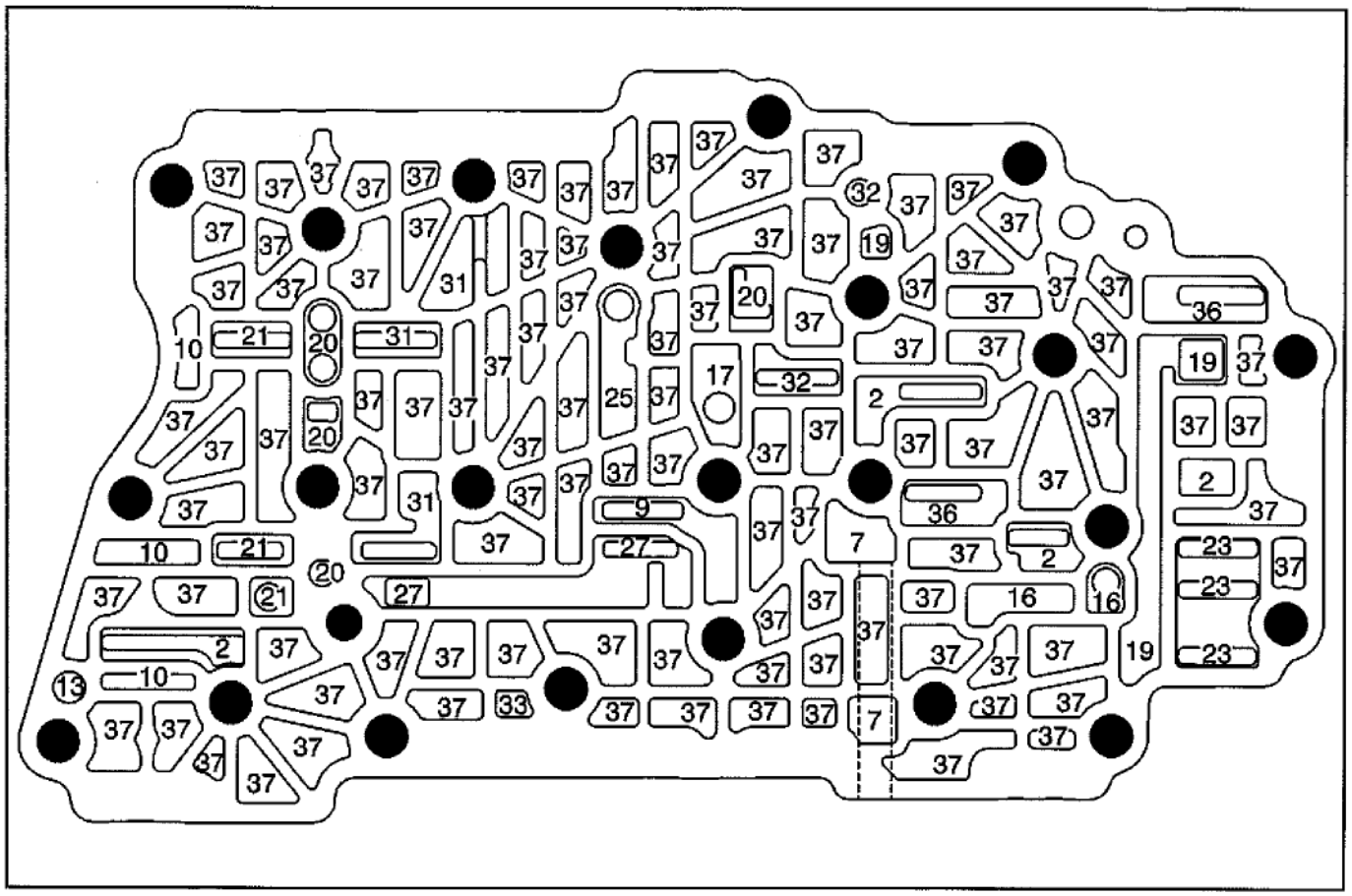


1898202

Legend

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

Control Valve Body – Case Side (Left)

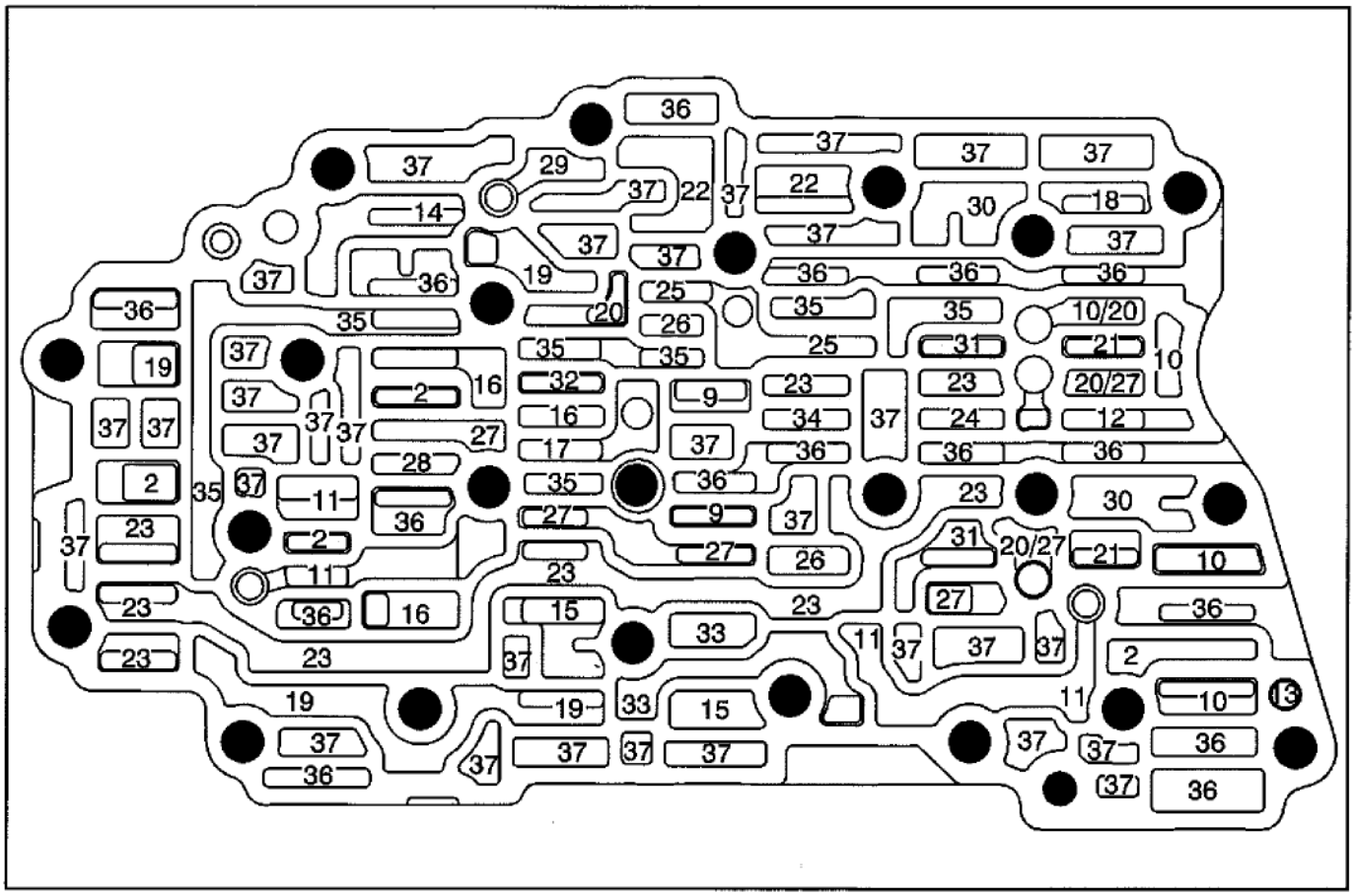


1898205

Legend

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

Control Valve Body – Channel Plate Side (Right – No Valves)

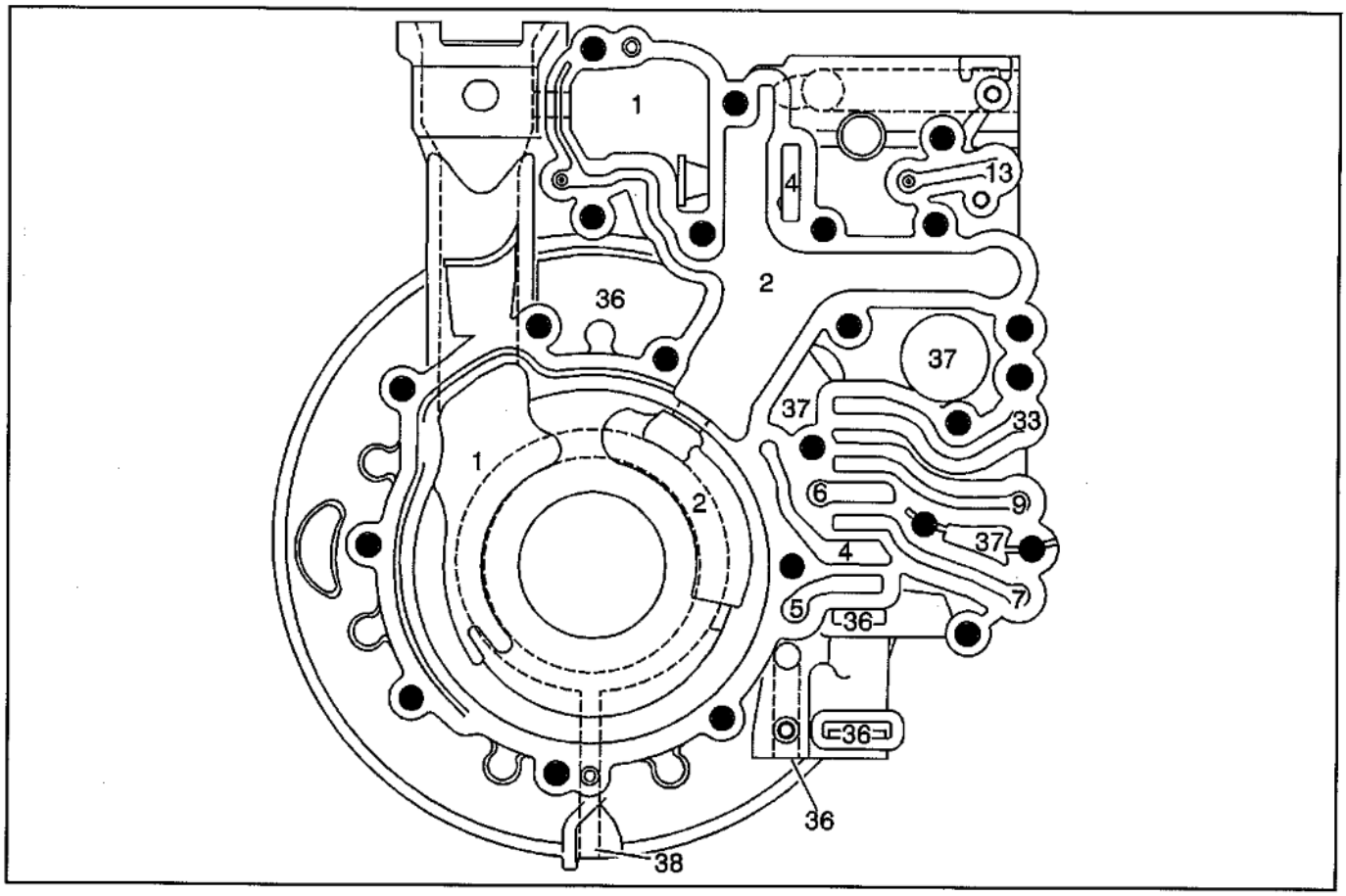


1898210

Legend

(2) Line
(9) Regulated Apply
(10) Compensator Feed
(11) Actuator Feed Limit
(12) PS3
(13) PCS Line
(14) PCS R1/456 Clutch
(15) Shift Solenoid
(16) R1/456 Clutch Feed
(17) R1
(18) PCS 35 Reverse Clutch
(19) Reverse
(20) 35 Reverse Clutch Feed
(21) 35 Reverse Clutch
(22) PCS 1234 Clutch
(23) Drive
(24) PS2
(25) 1234 Clutch
(26) 1234 Clutch Feedback
(27) Drive 1–6
(28) PS4
(29) CSV2 Latch
(30) PCS 26 Clutch
(31) 26 Clutch
(32) 456 Clutch
(33) PCS TCC
(34) PS1
(35) Exhaust Backfill
(36) Exhaust
(37) Void

Pump Body – Pump Cover Side (Front)

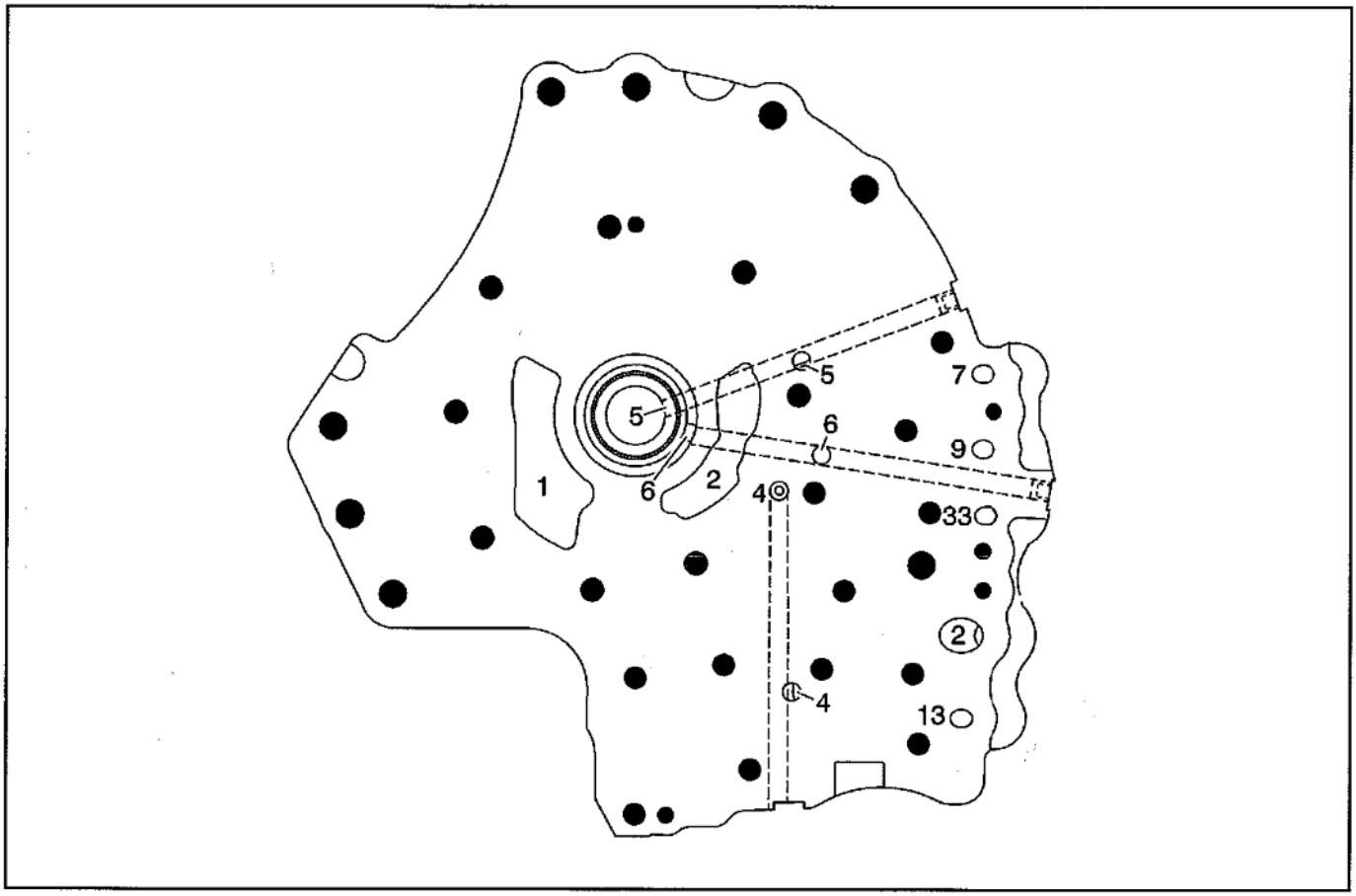


1898215

Legend

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

Pump Cover – Pump Body Side (Back)

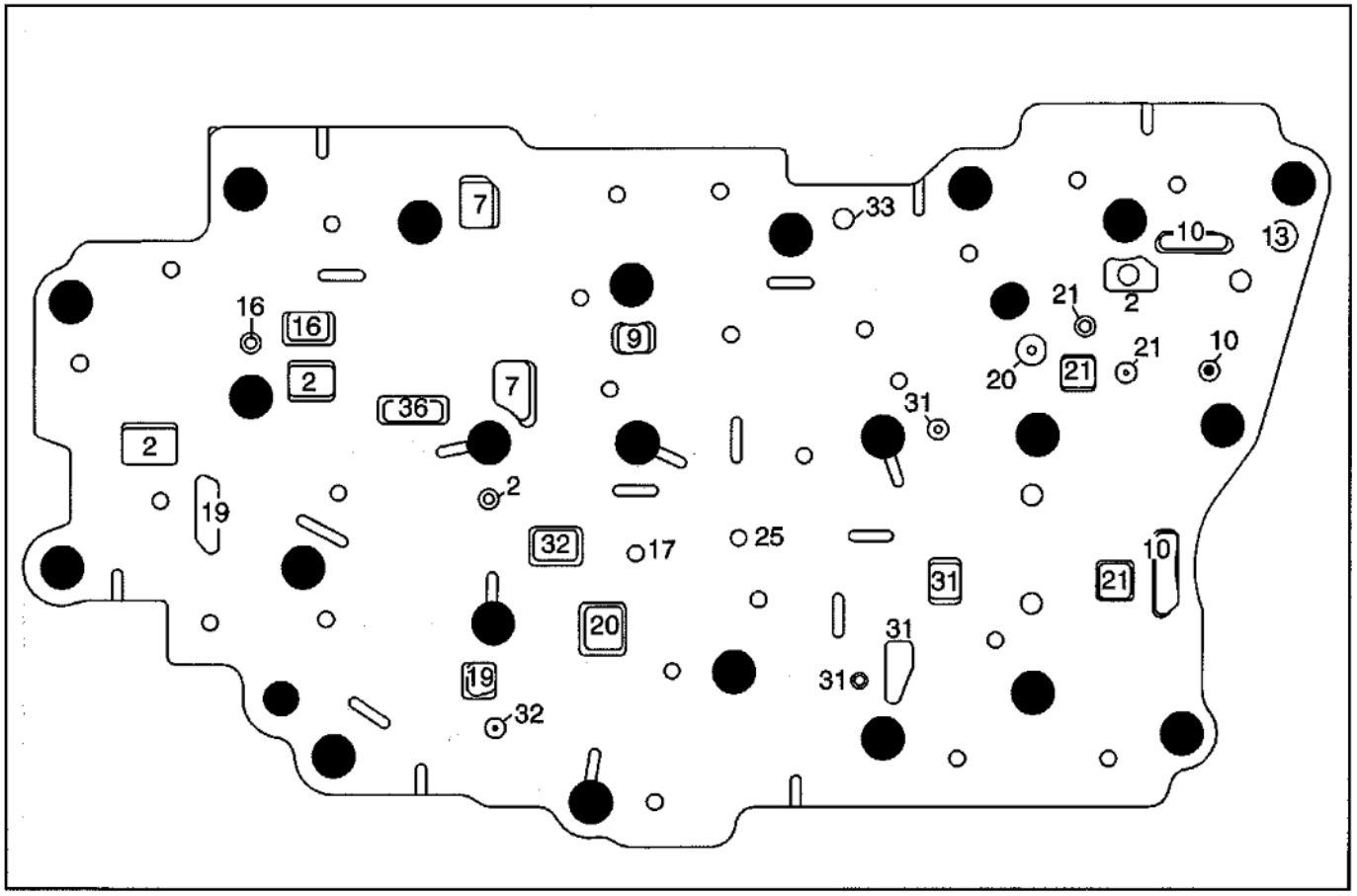


1898220

Legend

(1) Suction
(2) Line
(4) Converter Feed
(5) TCC Released
(6) TCC Apply
(7) Cooler Feed
(9) Regulated Apply
(13) PCS Line
(33) PCS TCC

Spacer Plate (12) – Case Side (Left)

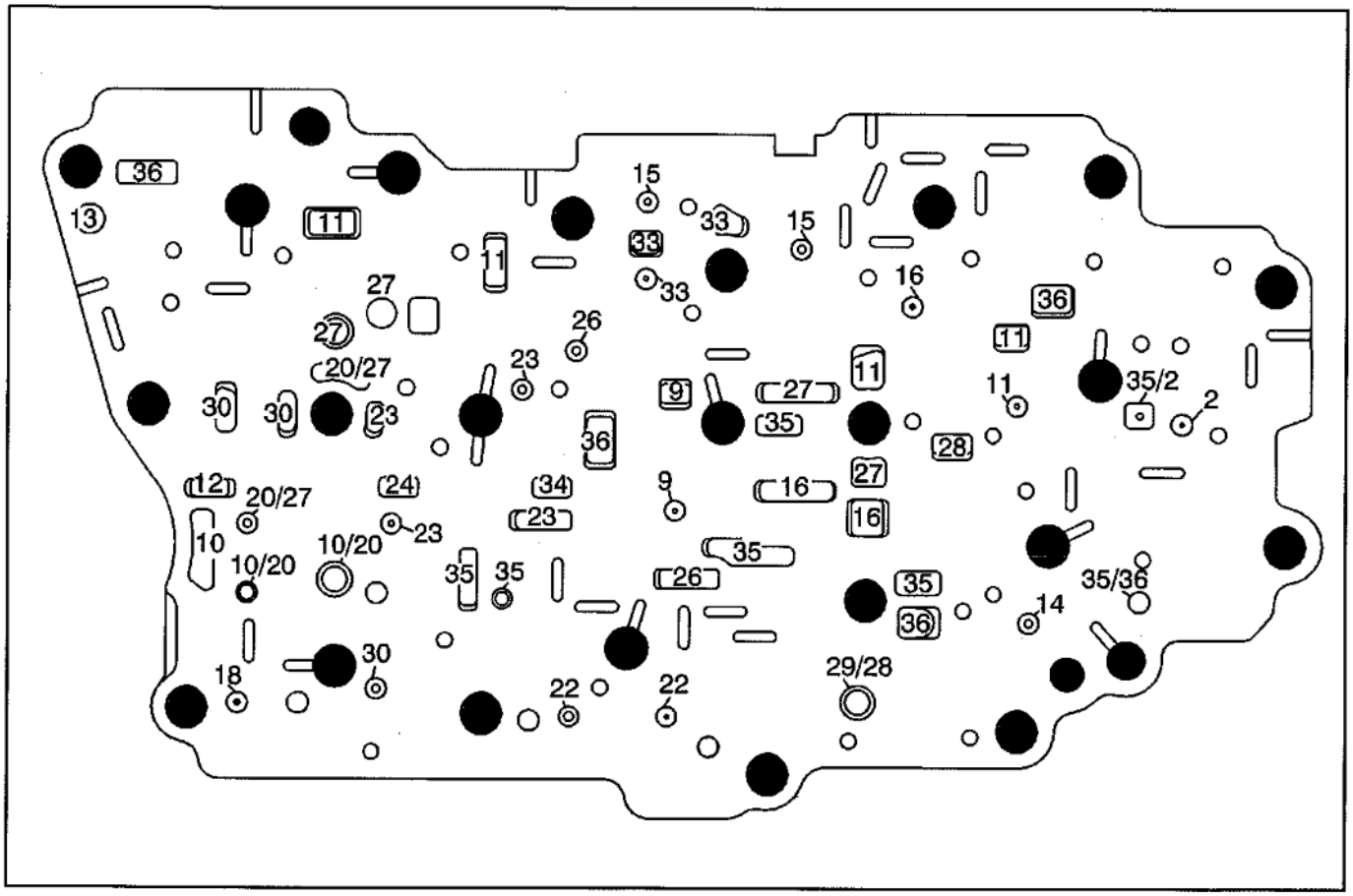


1898233

Legend

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

Spacer Plate (402) – Channel Plate Side (Right)

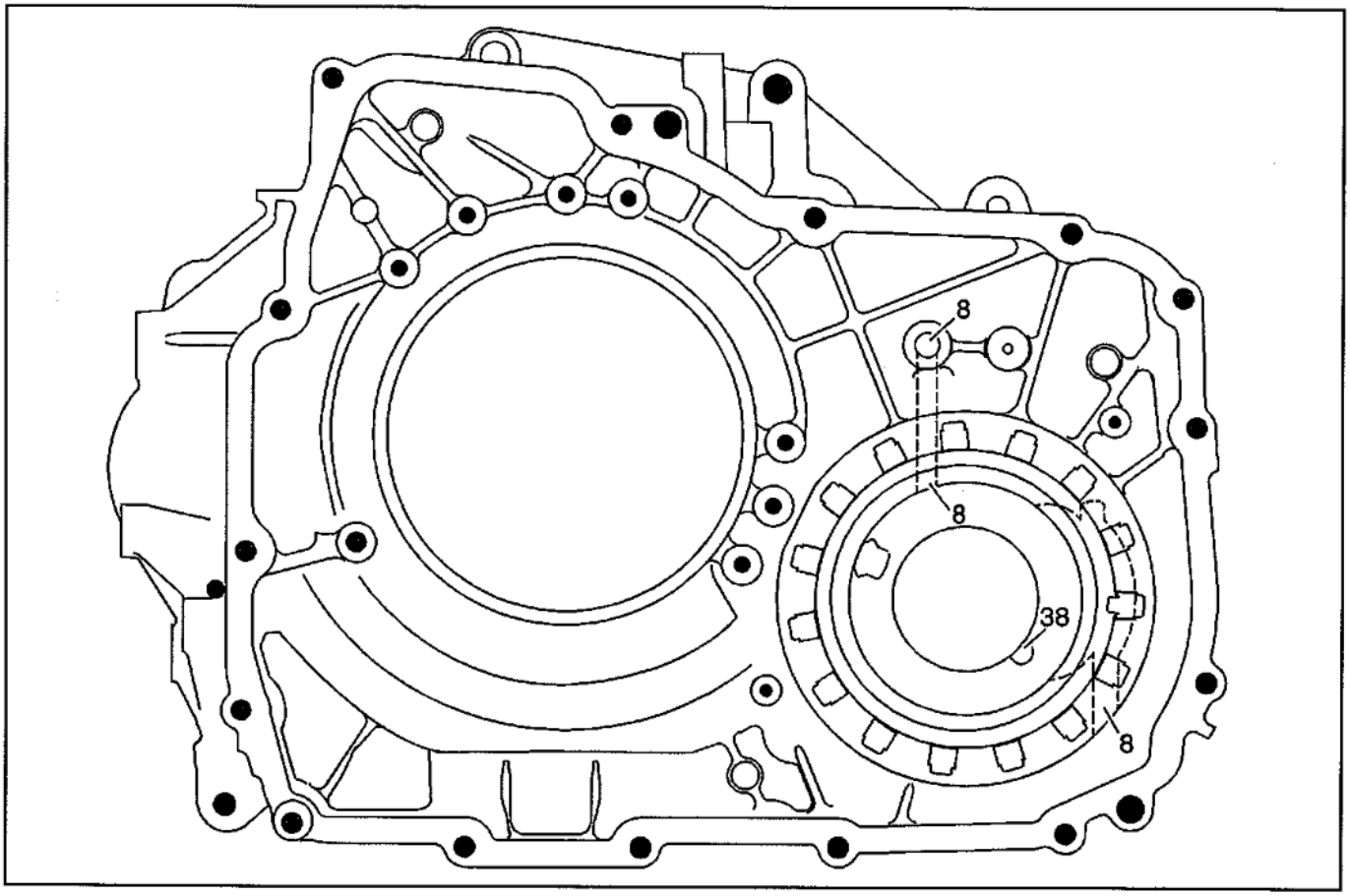


1898238

Legend

(2) Line
(9) Regulated Apply
(10) Compensator Feed
(11) Actuator Feed Limit
(12) PS3
(13) PCS Line
(14) PCS R1/456 Clutch
(15) Shift Solenoid
(16) R1/456 Clutch Feed
(18) PCS 35 Reverse Clutch
(20) 35 Reverse Clutch Feed
(22) PCS 1234 Clutch
(23) Drive
(24) PS2
(26) 1234 Clutch Feedback
(27) Drive 1–6
(28) PS4
(29) CSV2 Latch
(30) PCS 26 Clutch
(33) PCS TCC
(34) PS1
(35) Exhaust Backfill
(36) Exhaust

Torque Converter Clutch Housing – Pump Side (Front)



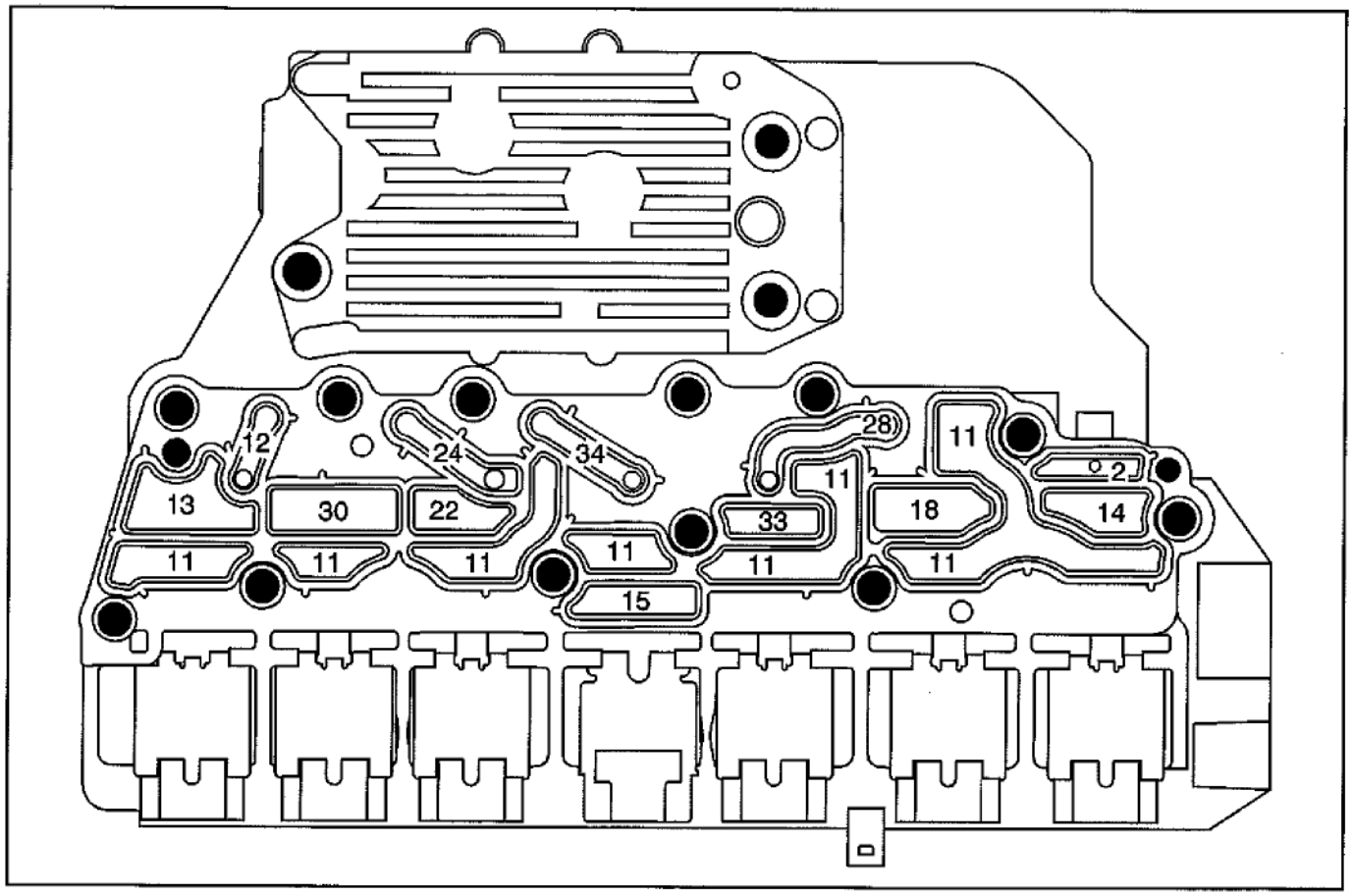
1898245

Legend

(8) Lube

(38) Seal Drainback

Control Solenoid Valve Assembly with Filter Plate – Channel Plate Side (Front)

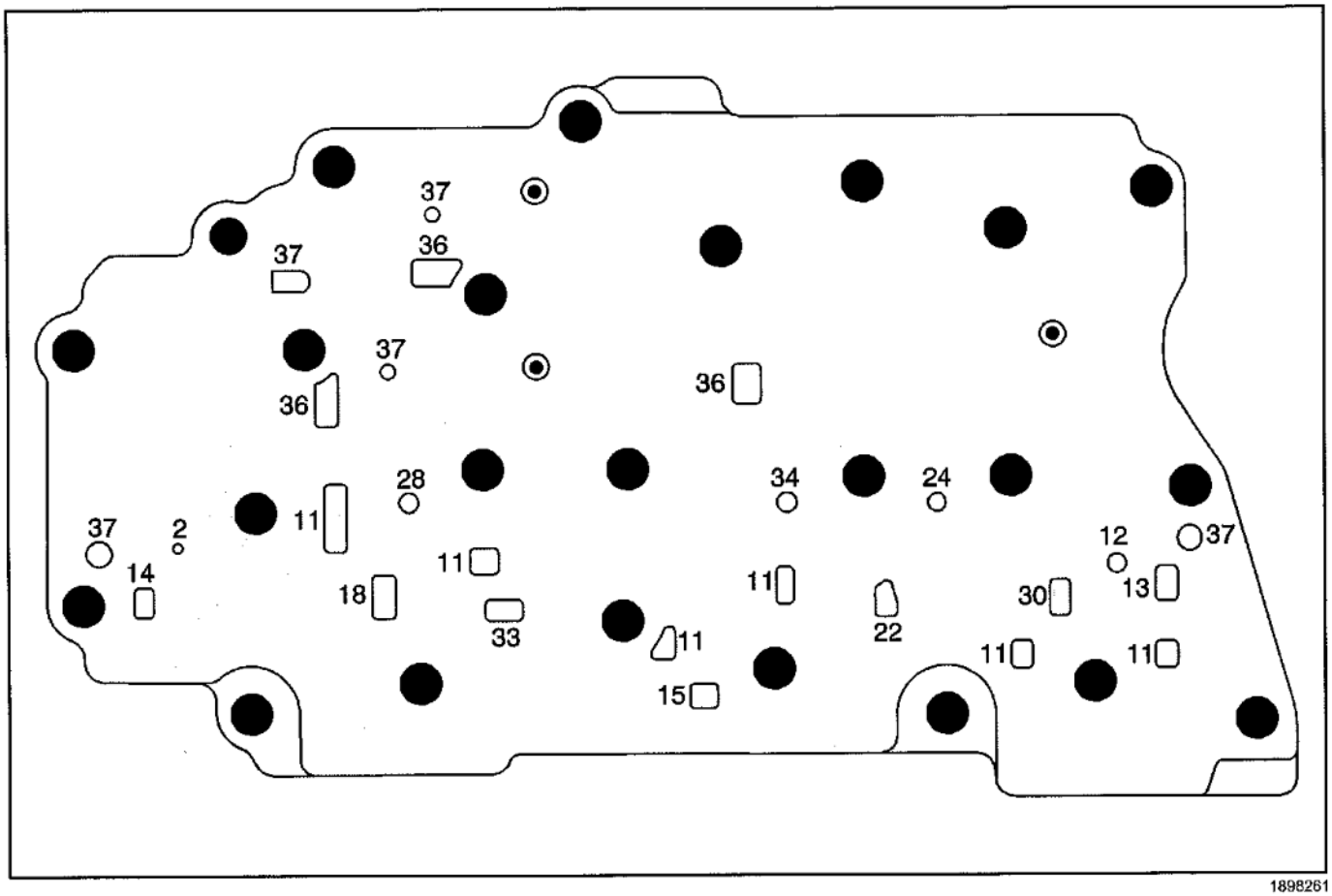


1898250

Legend

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

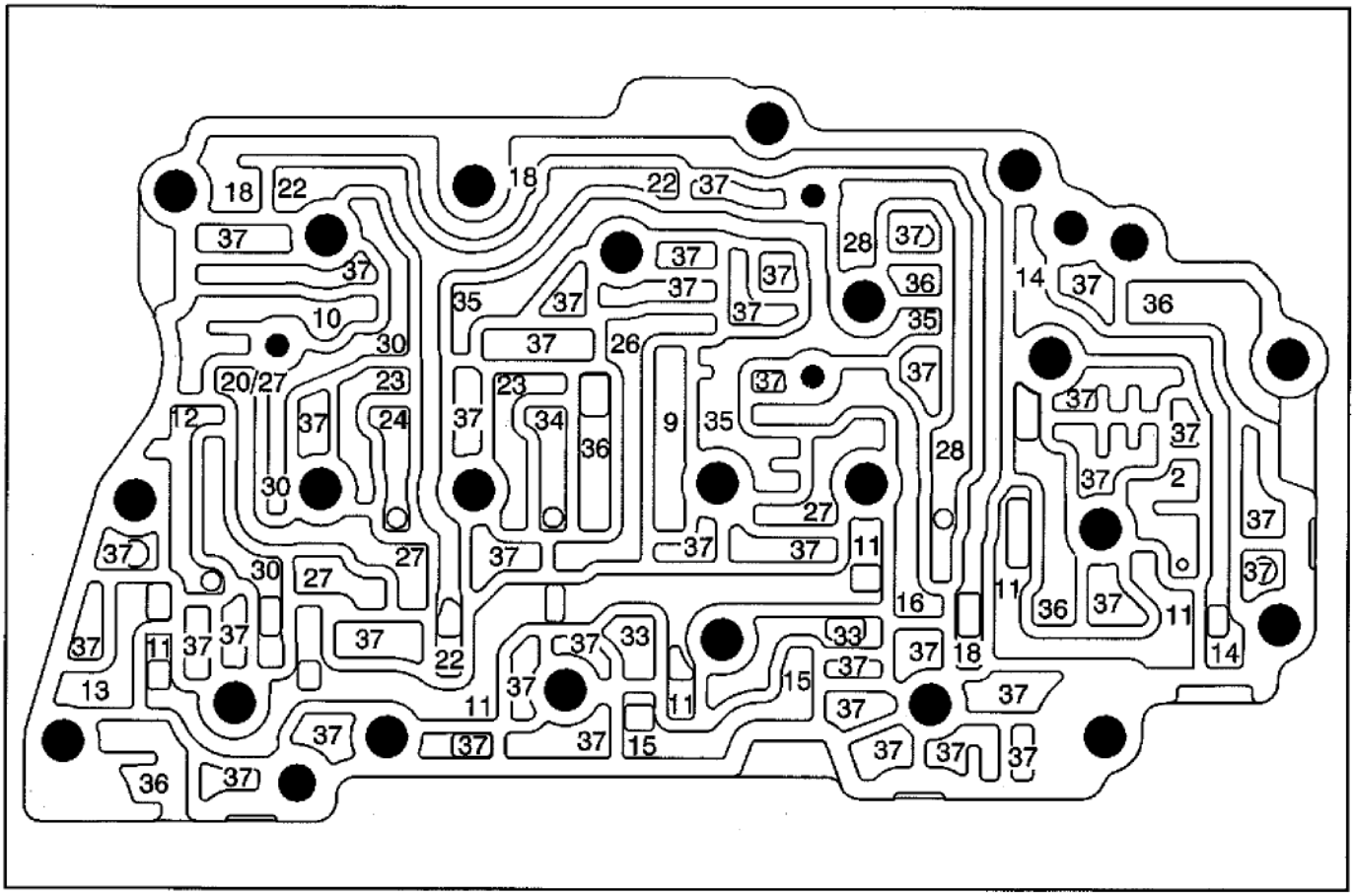
Channel Plate – Control Solenoid Valve Assembly Side (Right)



Legend

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

Channel Plate – Control Valve Body Side (Left)

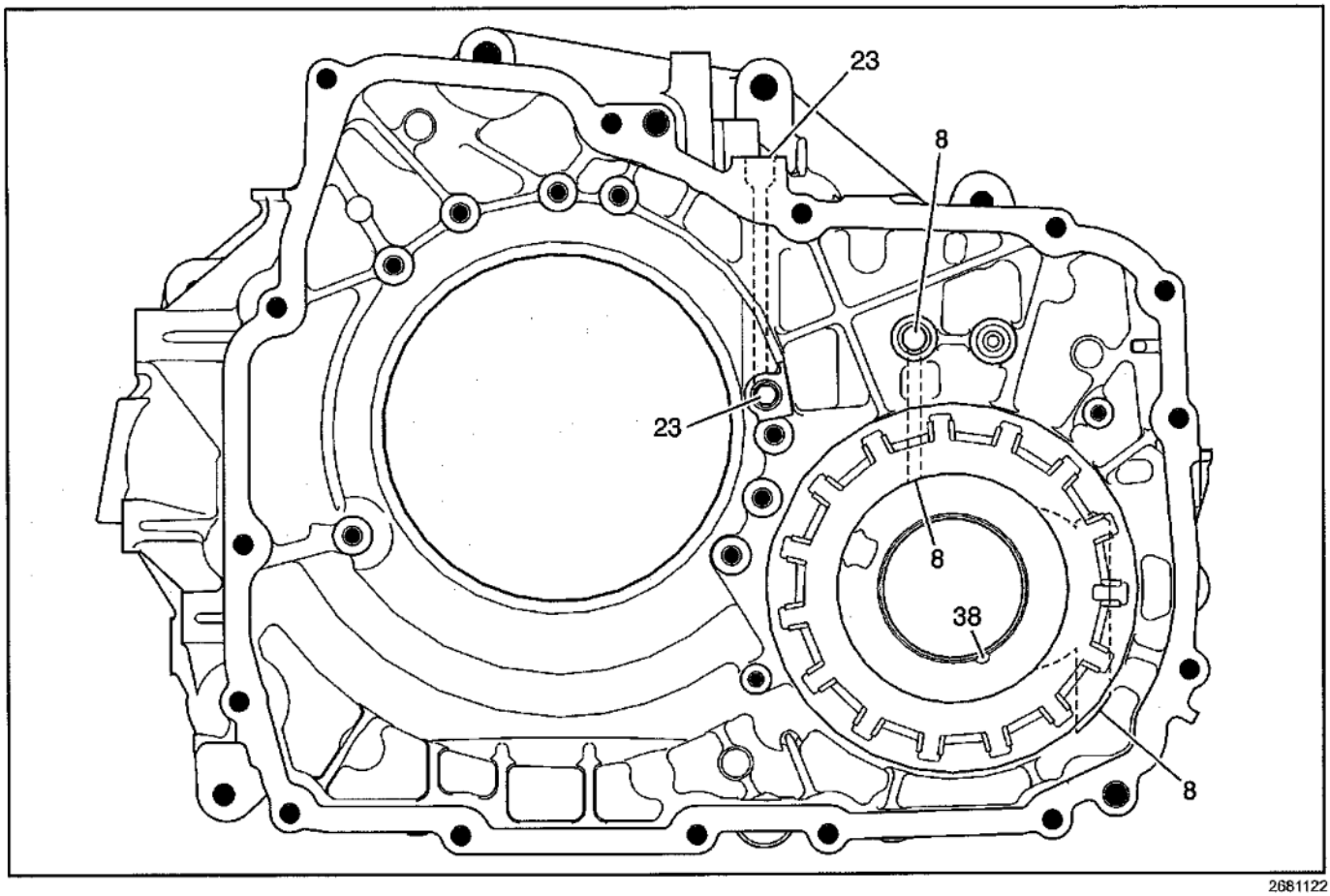


Legend

(2) Line
(9) Regulated Apply
(10) Compensator Feed
(11) Actuator Feed Limit
(12) PS3
(13) PCS Line
(14) PCS R1/456 Clutch
(15) Solenoid
(16) R1/456 Clutch Feed
(18) PCS 35 Reverse Clutch
(20) 35 Reverse Clutch Feed
(22) PCS 1234 Clutch
(23) Drive
(24) PS2
(26) 1234 Clutch Feedback
(27) Drive 1–6
(28) PS4
(30) PCS 26 Clutch
(33) PCS TCC
(34) PS1
(35) Exhaust Backfill
(36) Exhaust
(37) Void

Fluid Passages (Gen 2)

Torque Converter and Differential Housing – Case Side

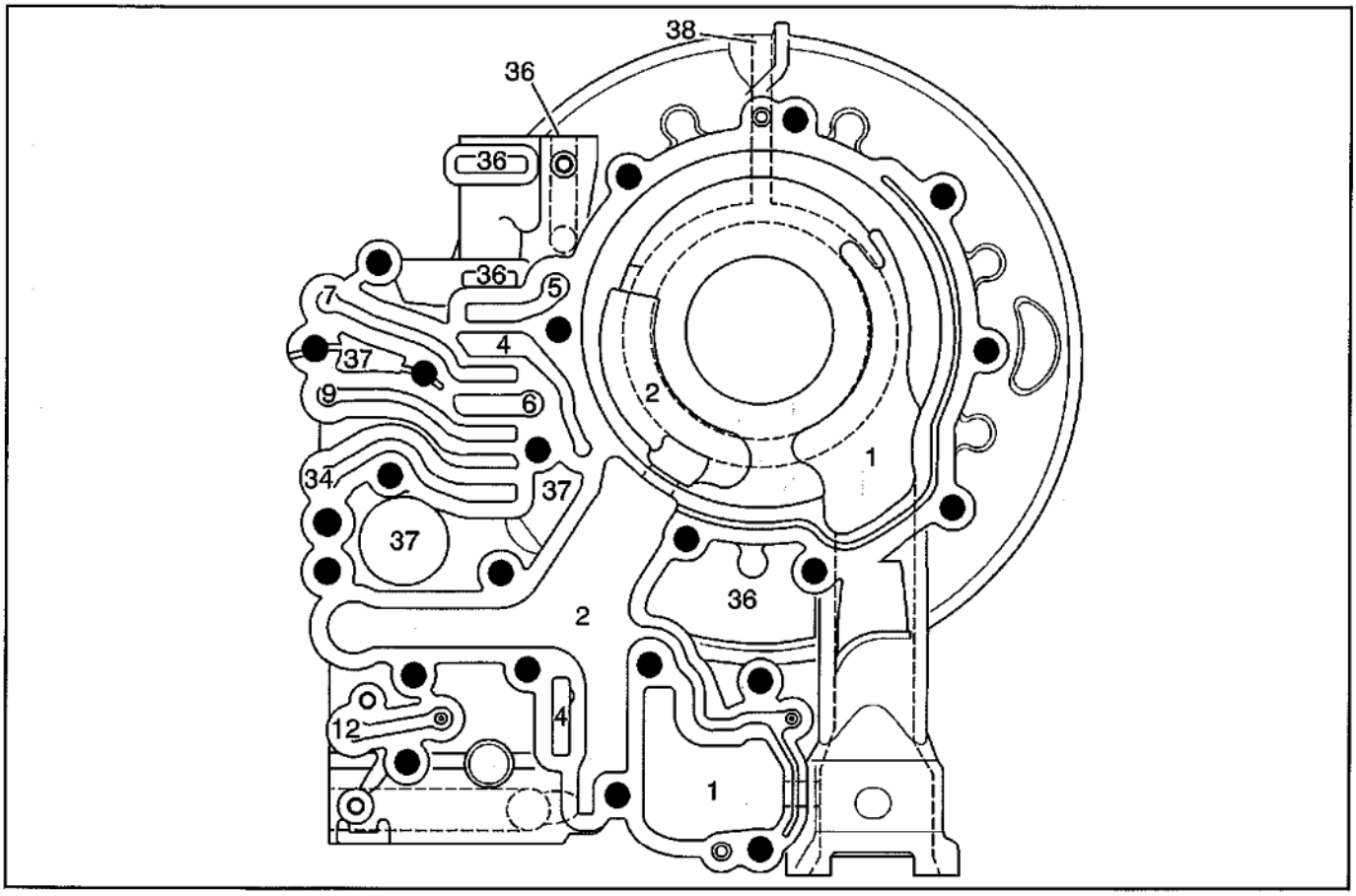


2681122

Legend

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

Fluid Pump Body – Fluid Pump Cover Side

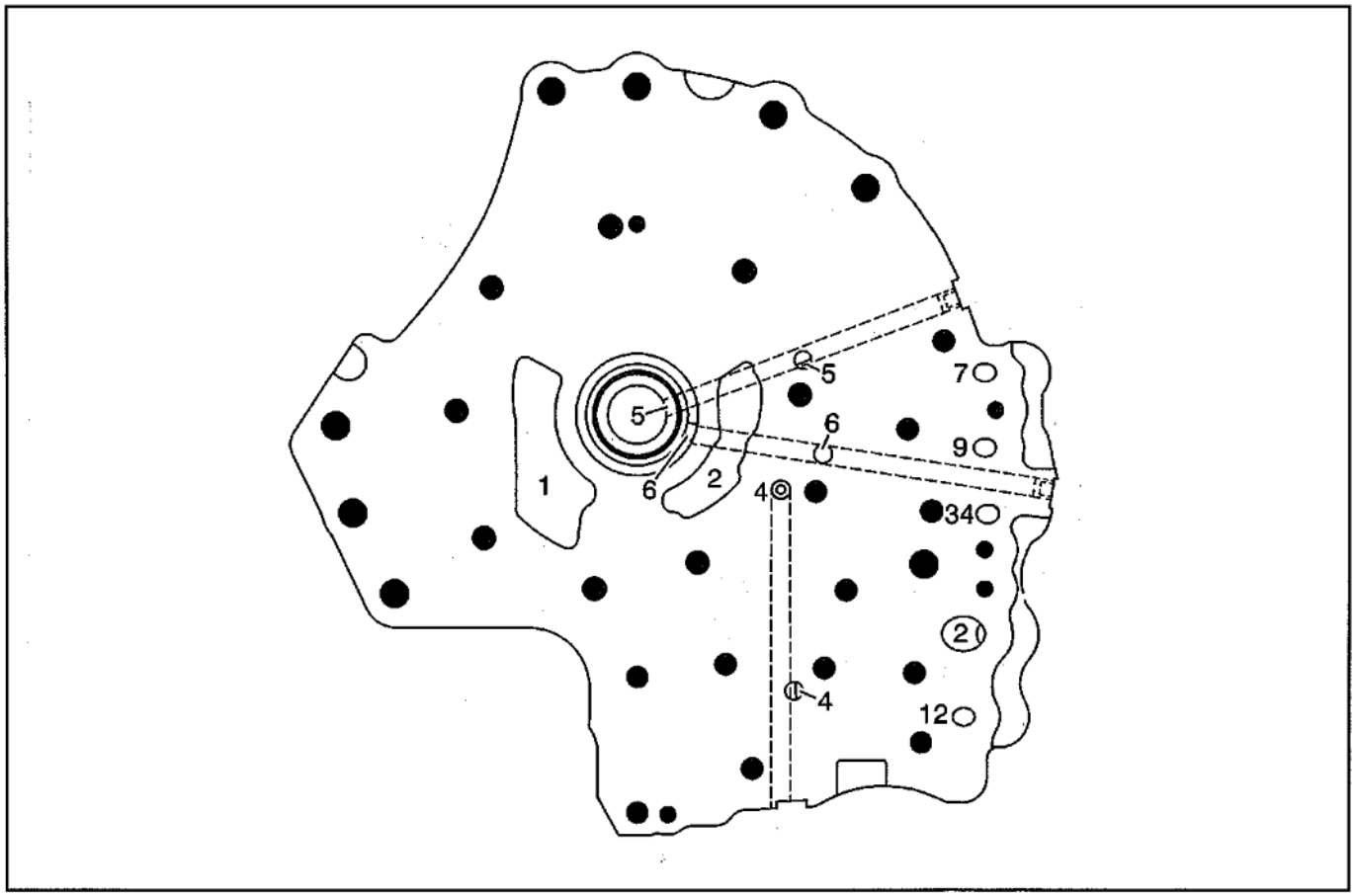


2681124

Legend

(1) Suction
(2) Line
(4) Converter Feed
(5) TCC Release
(6) TCC Apply
(7) Cooler Feed
(9) Regulated Apply
(12) PCS Line
(34) PCS TCC
(36) Exhaust
(37) Void
(38) Seal Drainback

Fluid Pump Cover – Fluid Pump Body Side

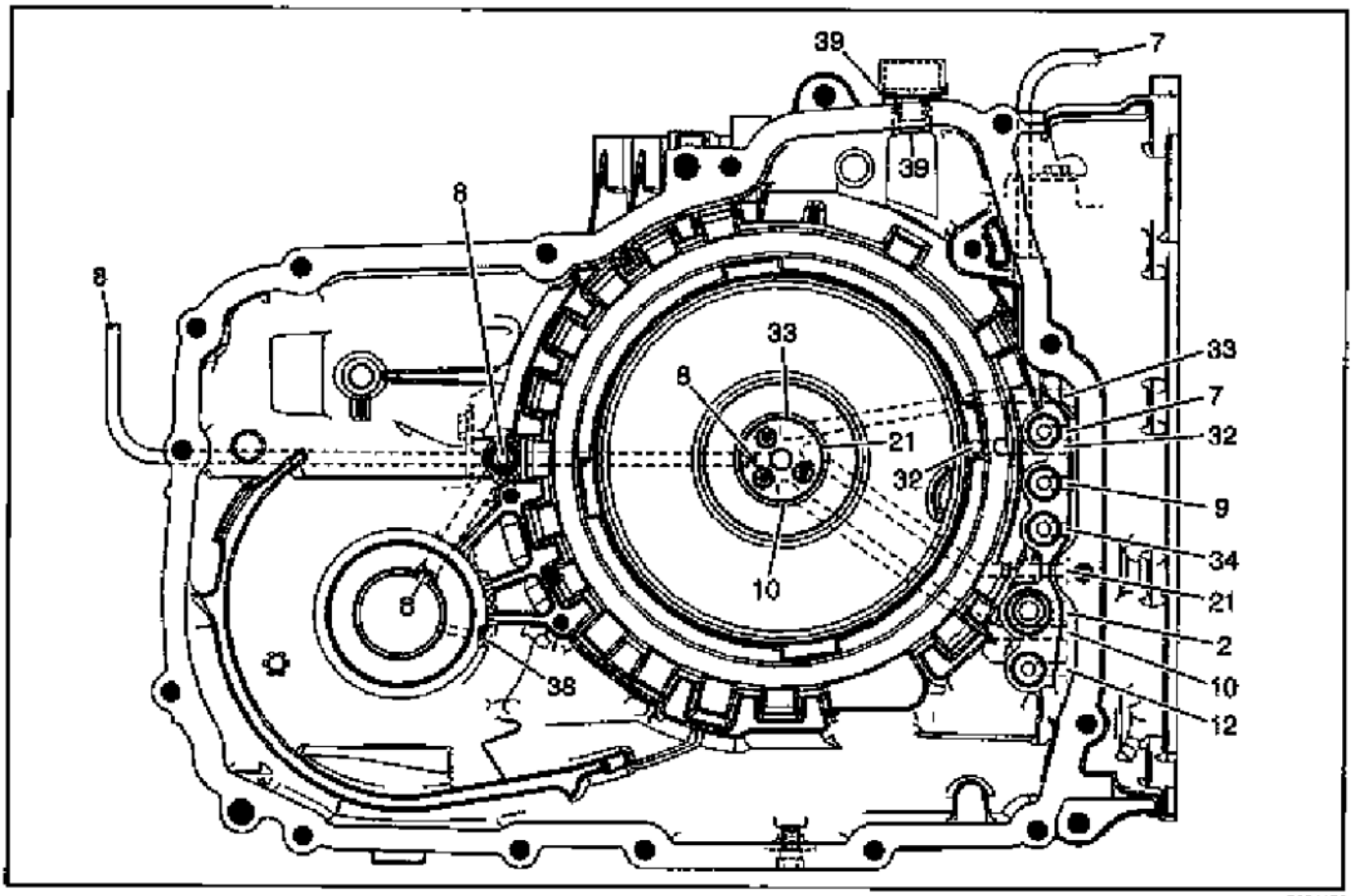


2681126

Legend

(1) Suction
(2) Line
(4) Converter Feed
(5) TCC Release
(6) TCC Apply
(7) Cooler Feed
(9) Regulated Apply
(12) PCS Line
(34) PCS TCC

Case – Torque Converter and Differential Housing Side

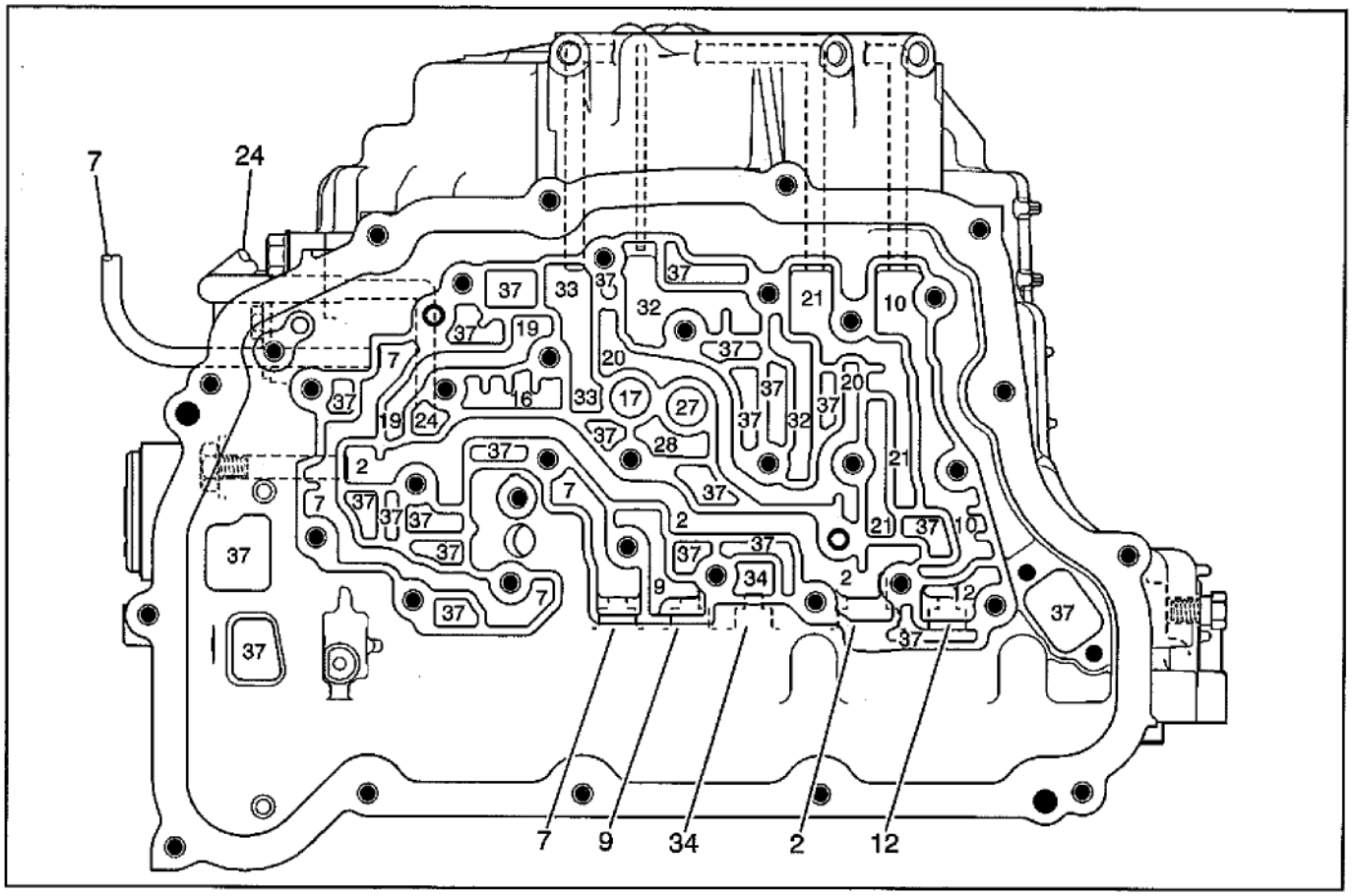


2681128

Legend

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

Case – Control Valve Body Side

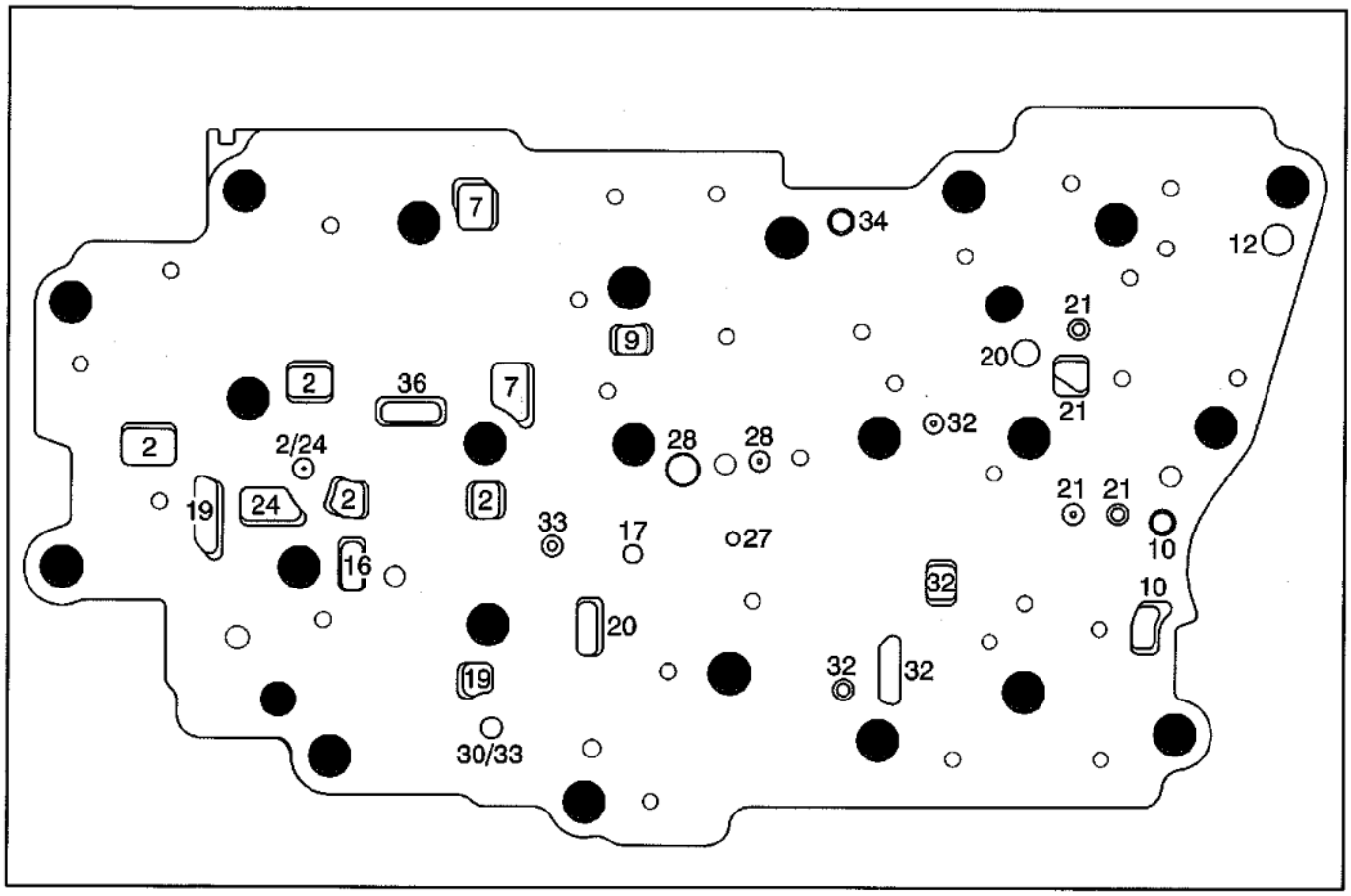


2681129

Legend

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

Control Valve Body Spacer Plate Assembly – Case Side

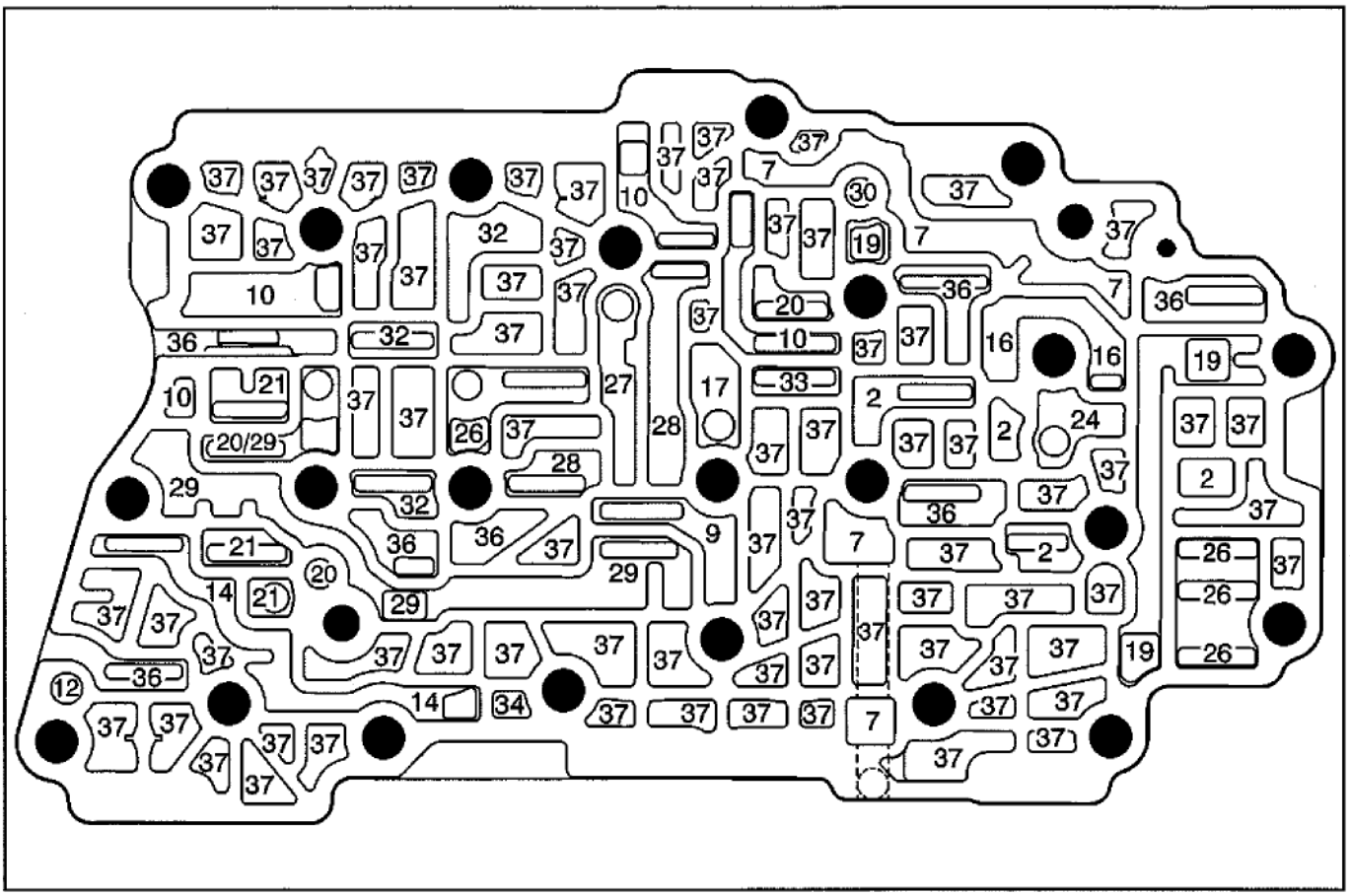


2681130

Legend

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

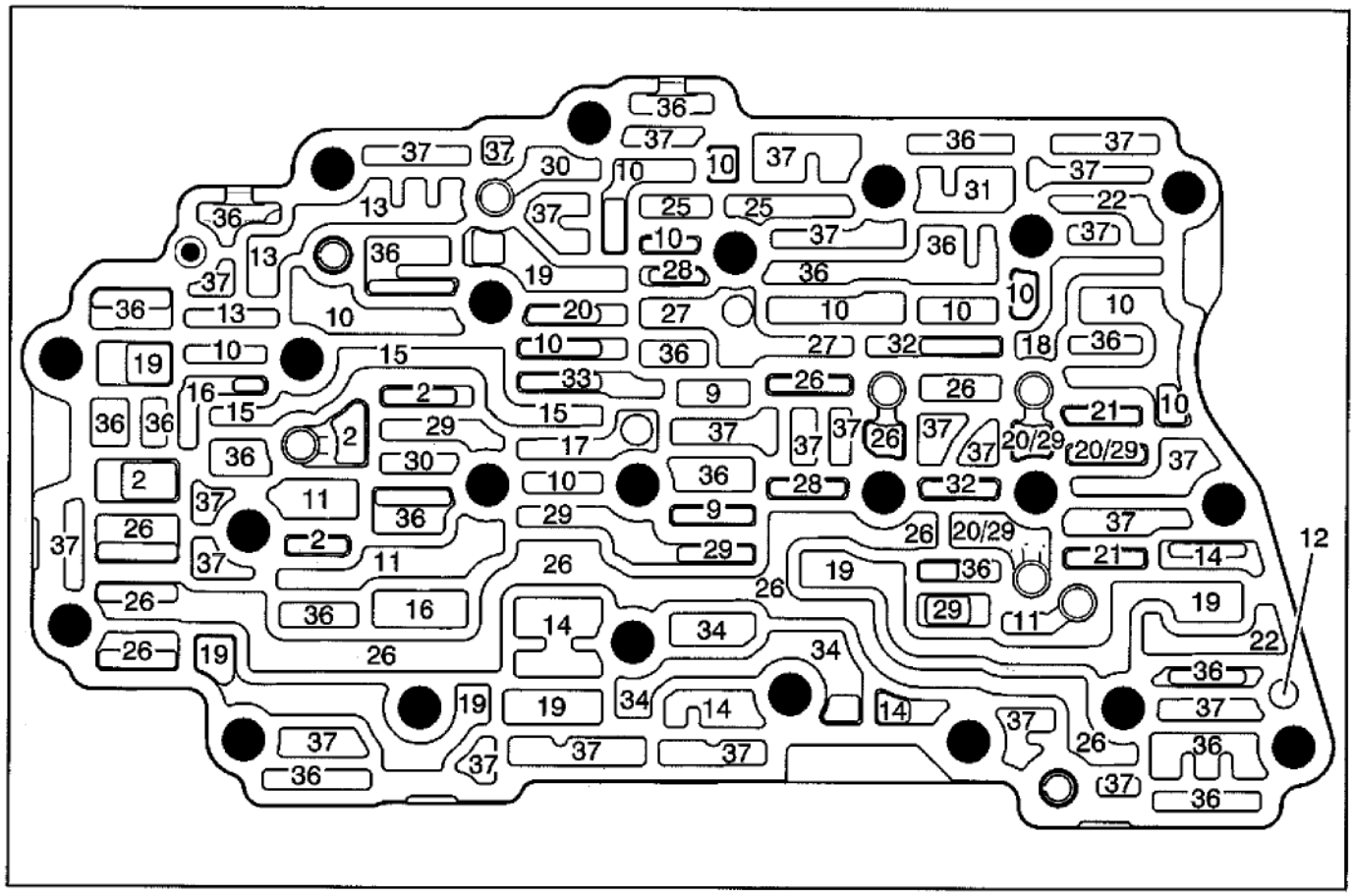
Control Valve Body – Case Side



Legend

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

Control Valve Body – Channel Plate Side

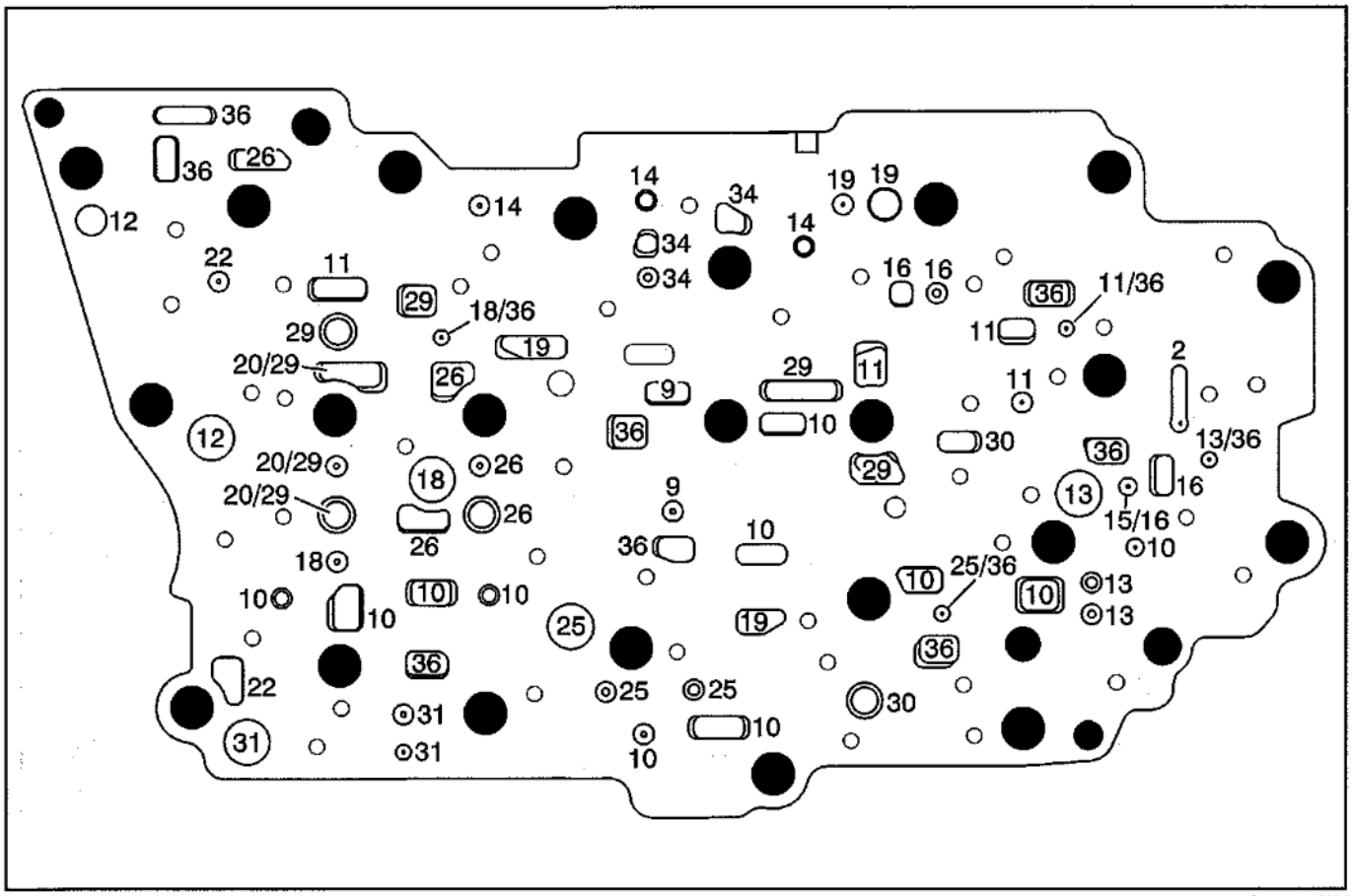


2681134

Legend

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

Channel Plate to Valve Body Spacer Plate Assembly – Channel Plate Side

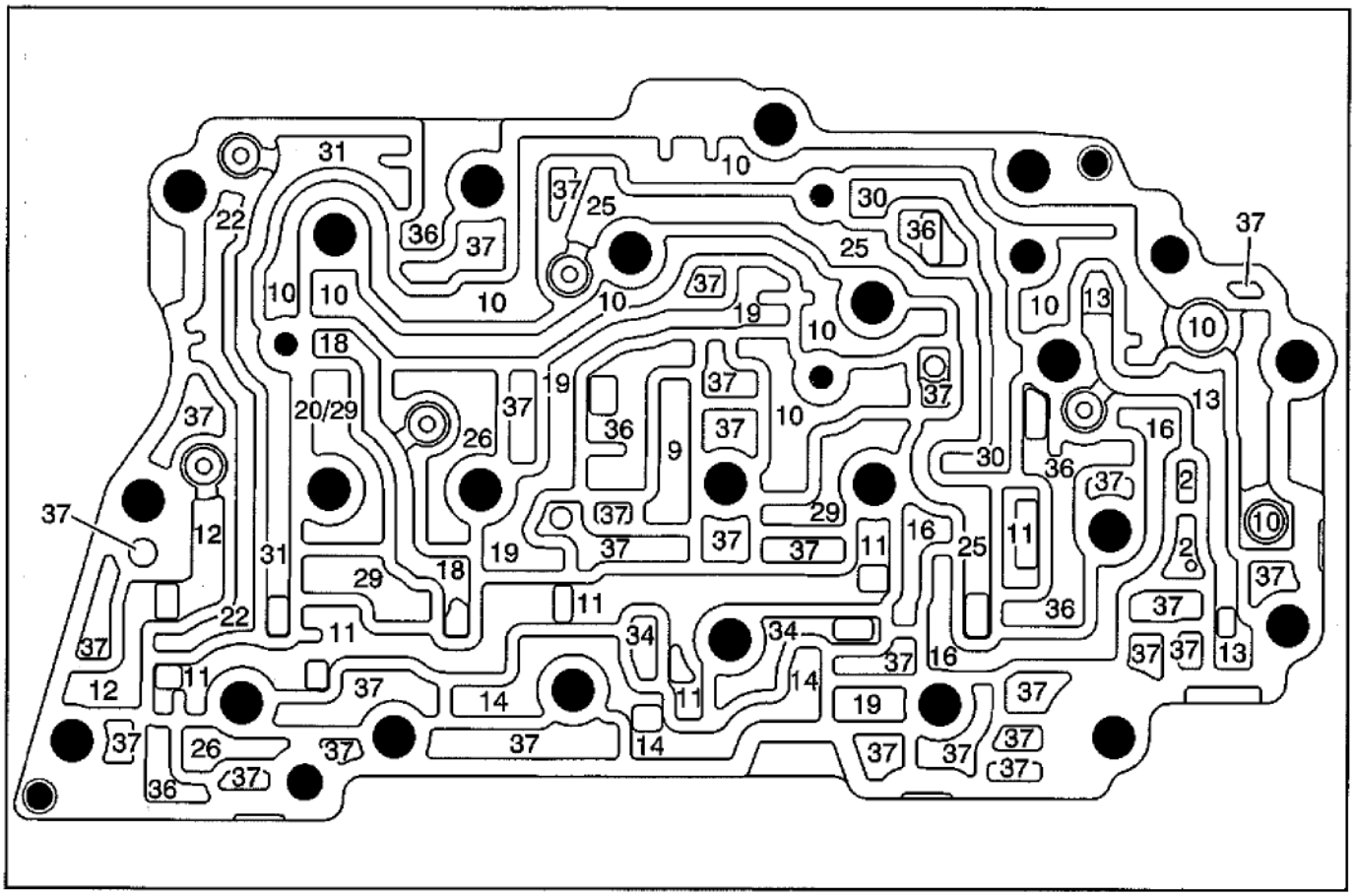


2681135

Legend

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

Channel Plate – Control Valve Body Side

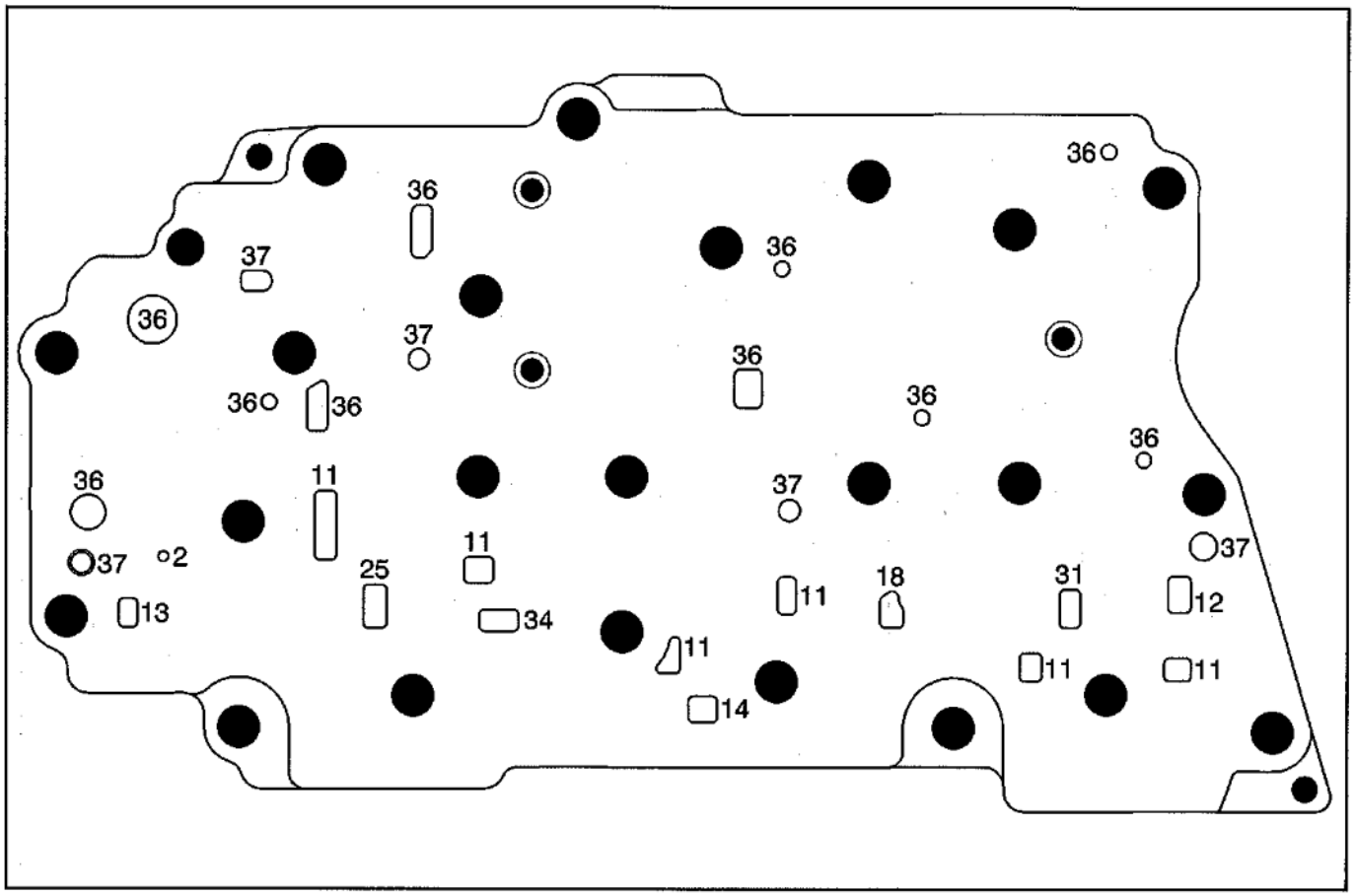


2681136

Legend

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

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

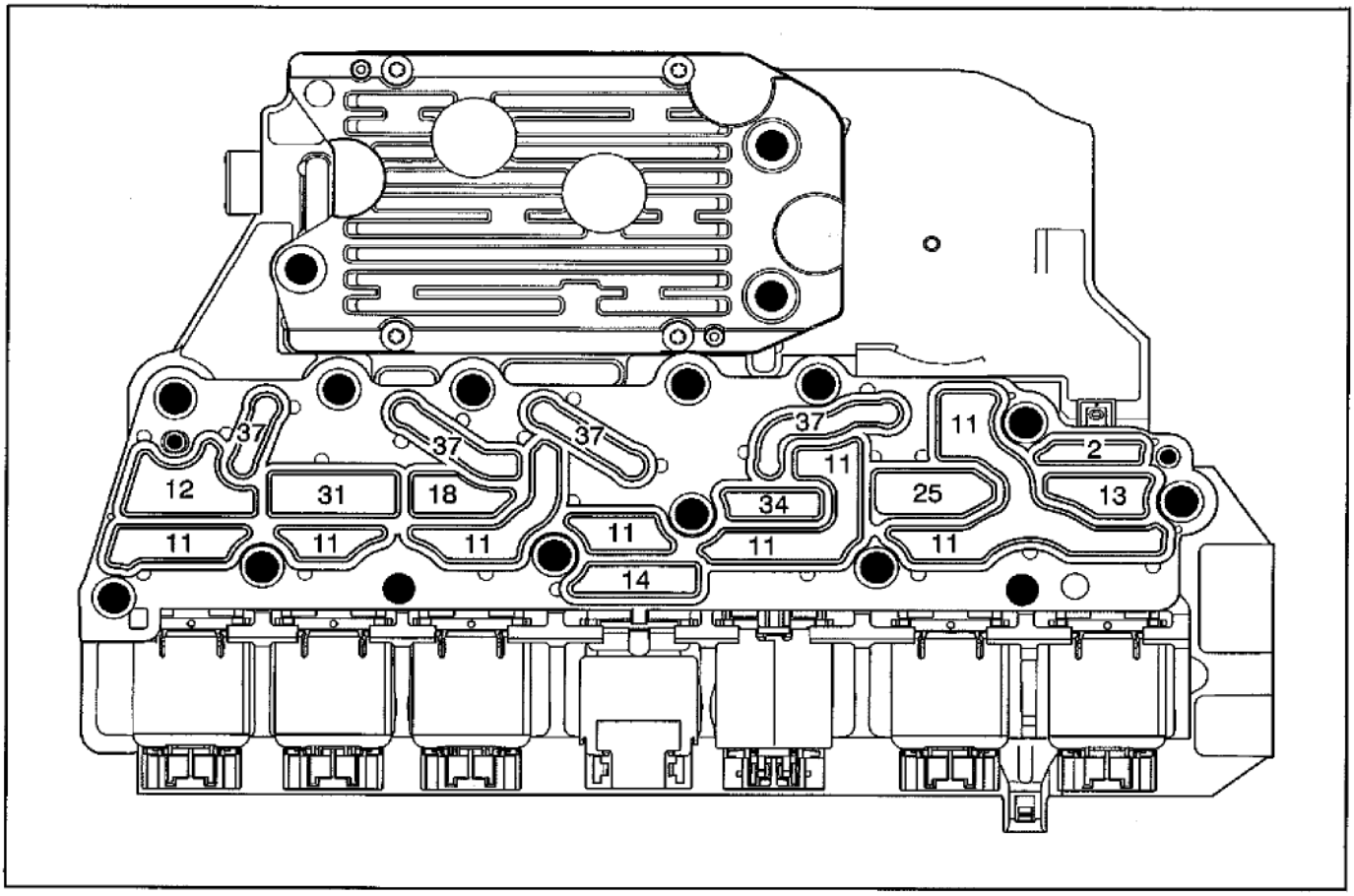


2681137

Legend

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

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



2681136

Legend

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

Special Tools and Equipment

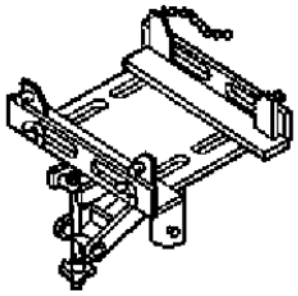
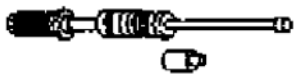
Illustration	Tool Number/Description
 2753054	3-9607433 Transmission Support
 36152	DT-586 J-23129 KM-586 Universal Seal Remover
 144087	DT-3289-20 J-3289-20 Holding Fixture
 168378	DT-7004 J-6125-1B KM-J-7004 Slide Hammer with Adapter
 5618	DT-8059 J-8059 KM-396 Snap Ring Pliers-Parallel Jaw

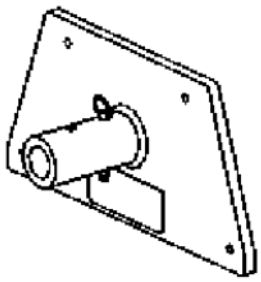
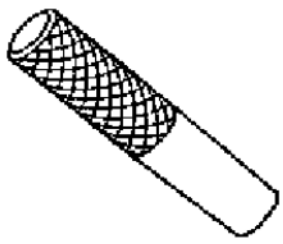
Illustration	Tool Number/Description
 2015	DT-6092 J-8092 KM-J-8092 DW340-010 Driver Handle
 47935	DT-21366 J-21366 Converter Holding Strap
 13077	DT-28585 J-28585 KM-J-28585 Snap Ring Remover
 1936120	DT-39890 J-39890 Transmission Holding Fixture Adapter
 20884	DT-41229 J-41229 Manual Shaft Pin Installer

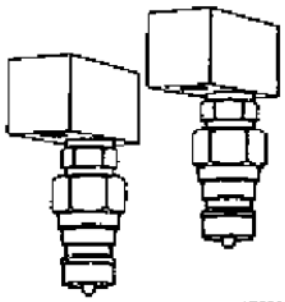
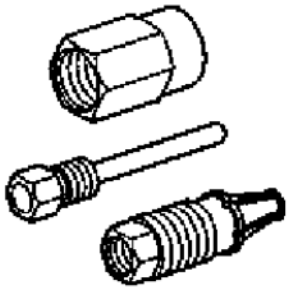
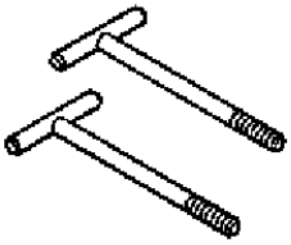
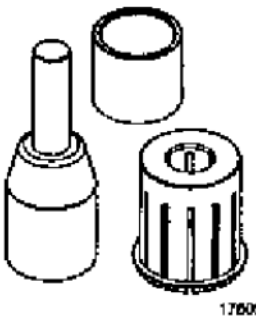
Illustration	Tool Number/Description
 1215917	DT-45096 J-45096 Transmission Oil Cooling System Flush and Flow Test Tool
 1768144	DT-45096-50 J-45096-50 Transmission Oil Cooler Flush Adapter
 792092	DT-45201 J-45201 DT-46203 Cooler Line Seal Remover
 1208548	DT-46409 J-46409 KM-922 Torque Converter Lifting Handles
 1760574	DT-46620 J-46620 Seal Installer

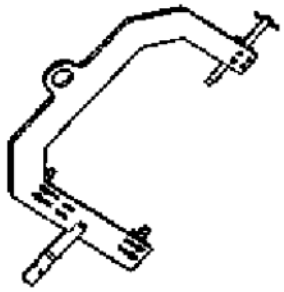
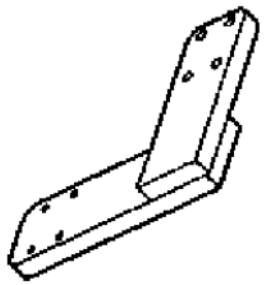
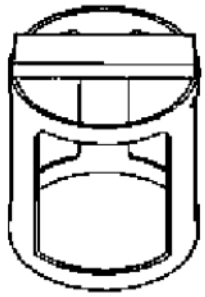
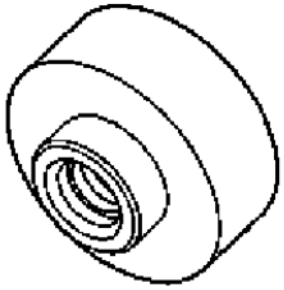
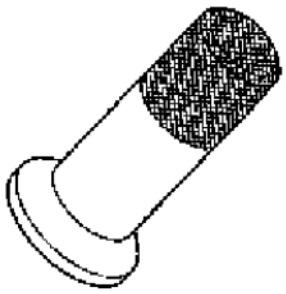
Illustration	Tool Number/Description
 1760589	DT-46625 J-46625 Holding Fixture
 1913013	DT-46625-10 J-46625-10 Holding Fixture Adapter
 1760496	DT-47694 Spring Compressor
 1909710	DT-47790 Seal Installer
 1909711	DT-47791-A Seal Installer

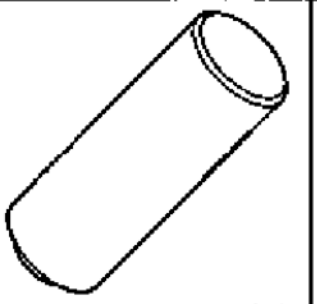
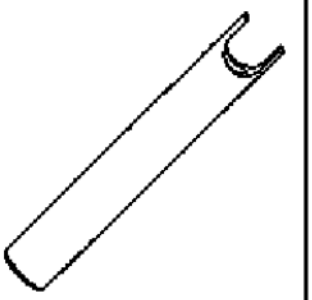
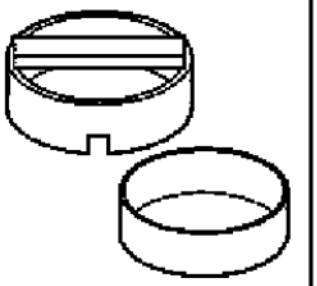
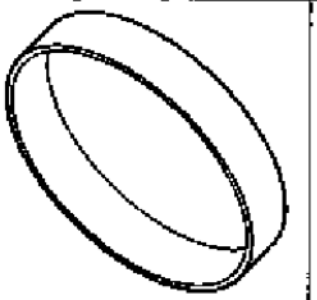
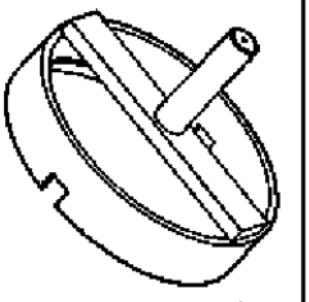
Illustration	Tool Number/Description
 1909715	DT-47792 Seal Installer
 1760502	DT-47793 Differential Rotating Tool
 1913012	DT-47794 Spring Compressor
 1909719	DT-47796 Seal Protector
 1909722	DT-47797 Spring Installer

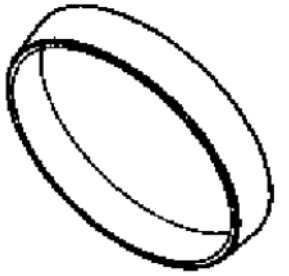
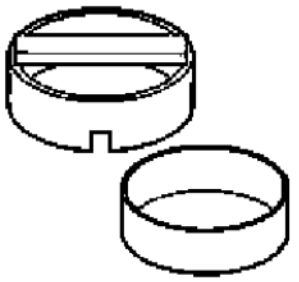
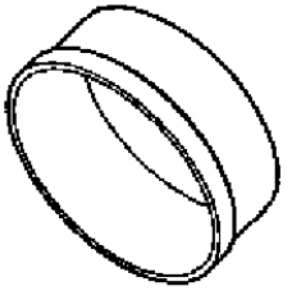
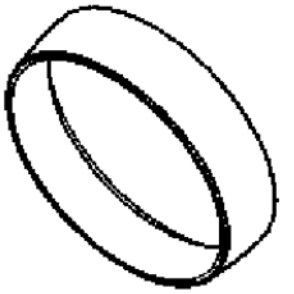
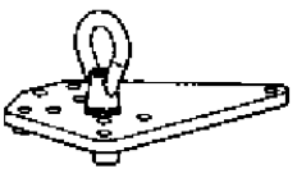
Illustration	Tool Number/Description
 1909726	DT-47798 Seal Protector
 1909728	DT-47799 Clutch Piston Spring Compressor
 1909733	DT-47805 Seal Protector
 1909732	DT-47807 Clutch Piston Seal Installer
 1760510	DT-47811-S1 Lift Plate

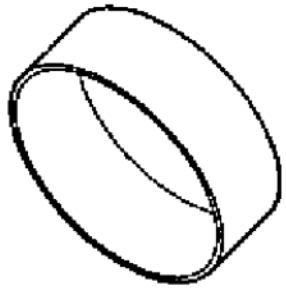
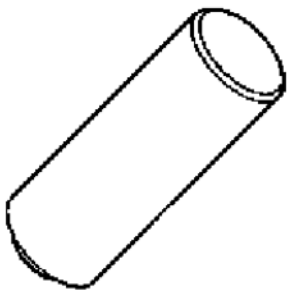
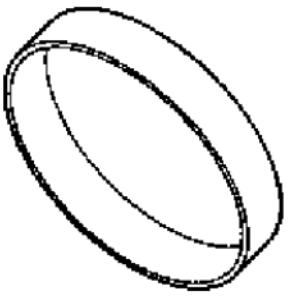
Illustration	Tool Number/Description
 1909736	DT-47951-1 Seal Protector
 1909744	DT-47951-2 Spring Compressor
 1760588	DT-48056 Spring Compressor Bridge
 2202656	DT-48270 Spring Installer
 2202657	DT-48271 Seal Protector

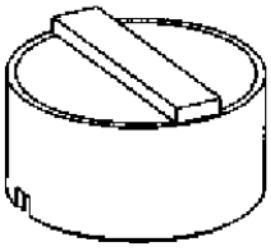
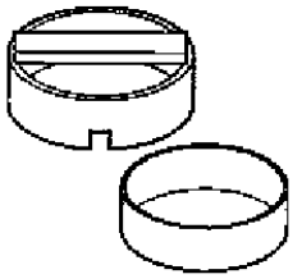
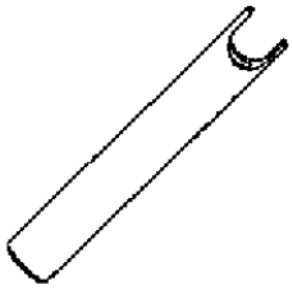
Illustration	Tool Number/Description
 2202658	DT-48272 Spring Installer
 2202676	DT-48273 Seal Protector
 2202672	DT-48274 Spring Compressor
 2202673	DT-48277 Differential Rotating Tool
 1909749	DT-48550 Detent Lever Pin Remover

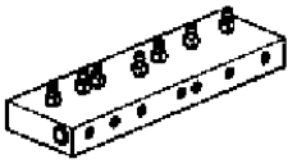
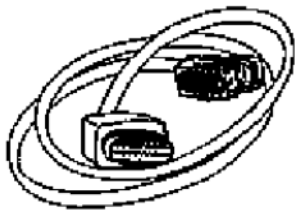
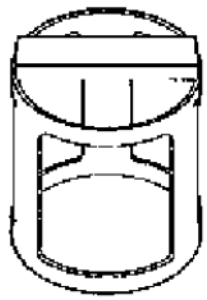
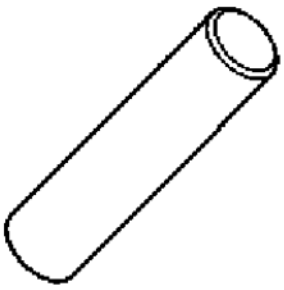
Illustration	Tool Number/Description
	DT-48616 Control Solenoid Test Plate
	DT-48616-10 Adapter Harness
	DT-48886 Spring Compressor
	DT-48903 Spring Compressor
	DT-49101 Seal Installer

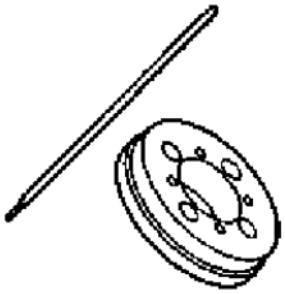
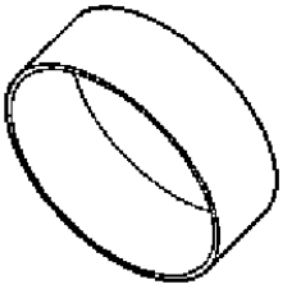
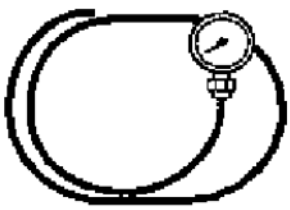
Illustration	Tool Number/Description
	DT-49131 Seal Staking Tool
	DT-50369 Seal Protector
	EL-35616 J 35616 Terminal Test Probe Kit
	EL-38522 J-38522 Variable Signal Generator
	EN-21867 GE 21867 J-21867 Pressure Gauge

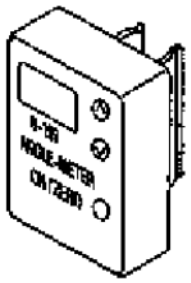
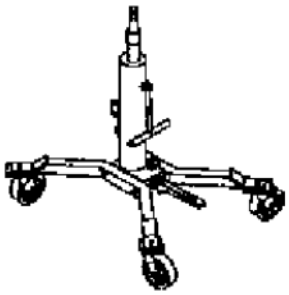
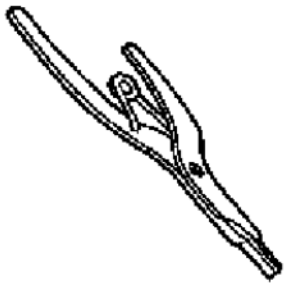
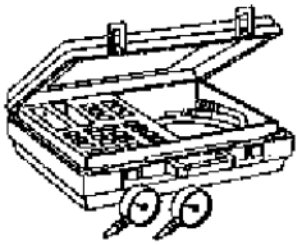
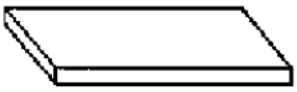
Illustration	Tool Number/Description
 1197696	EN-45059 J-45059 Angle Meter
 2269215	EN-680770 M-680770 Universal Sliding Malet
 2269210	EN-9703392 J-9703392 Hydraulic Jack

Illustration	Tool Number/Description
 1909734	GE-5586-A J-5586-A Snap Ring Pliers
 3021185	GE-21867-A J-21867-A Oil Pressure Gauge Kit
 38548	GE-34673 J-34673 Flat Gauge Bar