

2006 Chevrolet Aveo

2006 TRANSMISSION Automatic Transaxle - Aisin (81-40LE) - Introduction (2 Of 2) - Aveo

2006 TRANSMISSION

Automatic Transaxle - Aisin (81-40LE) - Introduction (2 Of 2) - Aveo

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Check Valve Spring Bolts	6.5 N.m	57 lb in
Control Cable Adjusting Nut	8 N.m	71 lb in
Damping Block Connection Nut and Bolt	80 N.m	59 lb ft
Differential Case-to-Differential Ring Gear Bolt	102 N.m	75 lb ft
Drain Plug	17 N.m	13 lb ft
Fluid Cooler Inlet Pipe Bolt	9 N.m	80 lb in
Fluid Cooler Inlet Pipe Fitting Nut	35 N.m	26 lb ft
Fluid Cooler Rear Outlet Pipe Clip Bolt	9 N.m	80 lb in
Fluid Cooler Rear Outlet Pipe Fitting Nut	35 N.m	26 lb ft
Front Outlet Pipe Clip Bolt	9 N.m	80 lb in
Front Outlet Pipe Union Bolt	35 N.m	26 lb ft
Input Speed Sensor Retaining Bolt	5.4 N.m	48 lb in
Manual Detent Spring Bolt	9.8 N.m	87 lb in
Manual Valve Lever Shaft Nut	12 N.m	106 lb in
Lower Transaxle-to-Engine Retaining Bolts	73 N.m	54 lb ft
Lower Transaxle-to-Engine Retaining Bolts	31 N.m	23 lb ft
Lower Transaxle-to-Engine Retaining Bolts	21 N.m	15 lb ft
Oil Pan Bolts	7 N.m	62 lb in
Oil Pump Bolts	25 N.m	18 lb ft
Oil Reservoir Lock Plate Bolts	5.4 N.m	48 lb in
Oil Strainer Bolts	9.8 N.m	87 lb in
Output Speed Sensor Retaining Bolt	7.4 N.m	65 lb in
Park/Neutral Position Switch Bolts	5.4 N.m	48 lb in
Parking Lock Pawl Bracket Bolts	7.4 N.m	65 lb in
Planetary Ring Gear Nut-Maximum	29 N.m	22 lb ft
Planetary Ring Gear Nut-Standard	9.8 N.m	87 lb in
Rear Mounting Bracket Bolts	60 N.m	44 lb ft
Screw Plugs	7.4 N.m	65 lb in
Shift Control Lever Assembly Mounting Bolts	8 N.m	71 lb in
Shift Solenoid Valve Bolts	11 N.m	97 lb in

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Stator Shaft Bolts	25 N.m	18 lb ft
TCM Retaining Bolts	5 N.m	44 lb in
Torque Converter Bolts	45 N.m	43 lb ft
Transaxle Apply Clamp Bolt	5.4 N.m	48 lb in
Transaxle Case Plate Bolt	9.8 N.m	87 lb in
Transaxle Housing Bolts	29 N.m	22 lb ft
Transaxle Rear Cover Bolts	25 N.m	18 lb ft
Unions	25 N.m	18 lb ft
Upper Transaxle Mounting Bracket Bolts	60 N.m	44 lb ft
Upper Transaxle-to-Engine Mounting Bolts	73 N.m	54 lb ft
Valve Body Bolts	11 N.m	97 lb in

TRANSMISSION GENERAL SPECIFICATIONS

Transmission General Specifications

Application	Specification	
	Metric	English
Maker	AISIN	
Type or Model	81-40LE	
Gear Ratio - 1st	2.875:1	
Gear Ratio - 2nd	1.568:1	
Gear Ratio - 3rd	1.000:1	
Gear Ratio - 4th	0.697:1	
Reverse	2.300:1	
Final Drive Ratio	3.750:1	
Oil Capacity	5.6L	5.9 qt
Transmission Fluid Type	T-IV Automatic Transmission Fluid (GM Part No. U.S. 88900925, in Canada 22689186)	

Washer Thickness

Metric	English
0.95 mm	0.0374 in
1 mm	0.0394 in
1.05 mm	0.0413 in
1.1 mm	0.0433 in
1.15 mm	0.0453 in
1.2 mm	0.0472 in

Shim Thickness

	Specification	

Application	Metric	English
Mark A	1.8 mm	0.0709 in
Mark B	1.85 mm	0.0728 in
Mark C	1.9 mm	0.0748 in
Mark D	1.95 mm	0.0768 in
Mark E	2 mm	0.787 in
Mark F	2.05 mm	0.0807 in
Mark G	2.08 mm	0.0819 in
Mark H	2.11 mm	0.0831 in
Mark J	2.14 mm	0.0843 in
Mark K	2.17 mm	0.0854 in
Mark L	2.2 mm	0.0866 in
Mark M	2.23 mm	0.0878 in
Mark N	2.26 mm	0.089 in
Mark P	2.29 mm	0.0902 in
Mark Q	2.32 mm	0.0913 in
Mark R	2.35 mm	0.0925 in
Mark S	2.4 mm	0.0945 in
Mark T	2.45 mm	0.0965 in
Mark U	2.5 mm	0.0984 in
Mark V	2.55 mm	0.1004 in
Mark W	2.6 mm	0.1024 in
Mark X	2.65 mm	0.1043 in
Mark Y	2.7 mm	0.1063 in

Adjuster Shim Thickness

Application	Specification	
	Metric	English
Mark 1	1.70 mm	0.0669 in
Mark 2	1.75 mm	0.0689 in
Mark 3	1.80 mm	0.0709 in
Mark 4	1.85 mm	0.0728 in
Mark 5	1.90 mm	0.0748 in
Mark 6	1.93 mm	0.0760 in
Mark 7	1.96 mm	0.0772 in
Mark A	1.99 mm	0.0783 in
Mark B	2.02 mm	0.0795
Mark C	2.05 mm	0.0807 in
Mark D	2.08 mm	0.0819 in
Mark E	2.11 mm	0.0831 in
Mark F	2.14 mm	0.0843 in

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Mark G	2.17 mm	0.0854 in
Mark H	2.20 mm	0.0866 in
Mark K	2.25 mm	0.0886 in
Mark L	2.30 mm	0.0906 in
Mark M	2.35 mm	0.0925 in
Mark N	2.40 mm	0.0945 in
Mark P	2.45 mm	0.0965 in
Mark Q	2.50 mm	0.0984 in
Mark R	2.55 mm	0.1004 in
Mark S	2.60 mm	0.1024 in
Mark U	2.65 mm	0.1043 in
Mark W	2.70 mm	0.1063 in

Flange Thickness

Mark	Piston Stroke		Thickness	
	Metric	English	Metric	English
0	0.738-0.949 mm	0.02905-0.03736 in	3.0 mm	0.118 in
1	0.950-1.149 mm	0.03740-0.04524 in	3.2 mm	0.126 in
2	1.150-1.349 mm	0.04528-0.05311 in	3.4 mm	0.134 in
3	1.350-1.549 mm	0.05315-0.06098 in	3.6 mm	0.142 in
0	1.550-1.702 mm	0.06102-0.06701 in	3.8 mm	0.150 in

Accumulator Spring

Spring	Free length Outer Diameter		Color
	Metric	English	
O/D and 2nd brake	47.13 mm/16.0 mm	1.8555 in/0.630 in	Pink
Forward Clutch	57.90 mm/17.2 mm	2.2795 in/0.677 in	-
Direct Clutch	57.20 mm/17.5 mm	2.2520 in/0.689 in	Green

TRANSMISSION GEAR RATIO

Transmission Gear Ratio

Gear	Ratio
First	2.875
Second	1.568
Third	1.000
Fourth	0.697
Reverse	2.300
Counter	1.019
Differential 1.4L/1.5L/1.2L SOHC	3.750
Differential 1.4L DOHC	4.052

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FLUID CAPACITY SPECIFICATIONS

Fluid Capacity Specifications

Application	Specification	
	Metric	English
Transmission Fluid-Drain and Refill	2.1L	2.2 qt
Transmission Fluid-Dry Fill - 1.4L/1.5L/1.2L SOHC	5.6L	5.9 qt
Transmission Fluid-Dry Fill - 1.4L DOHC	5.8L	6.2 qt

SHIFT SPEED

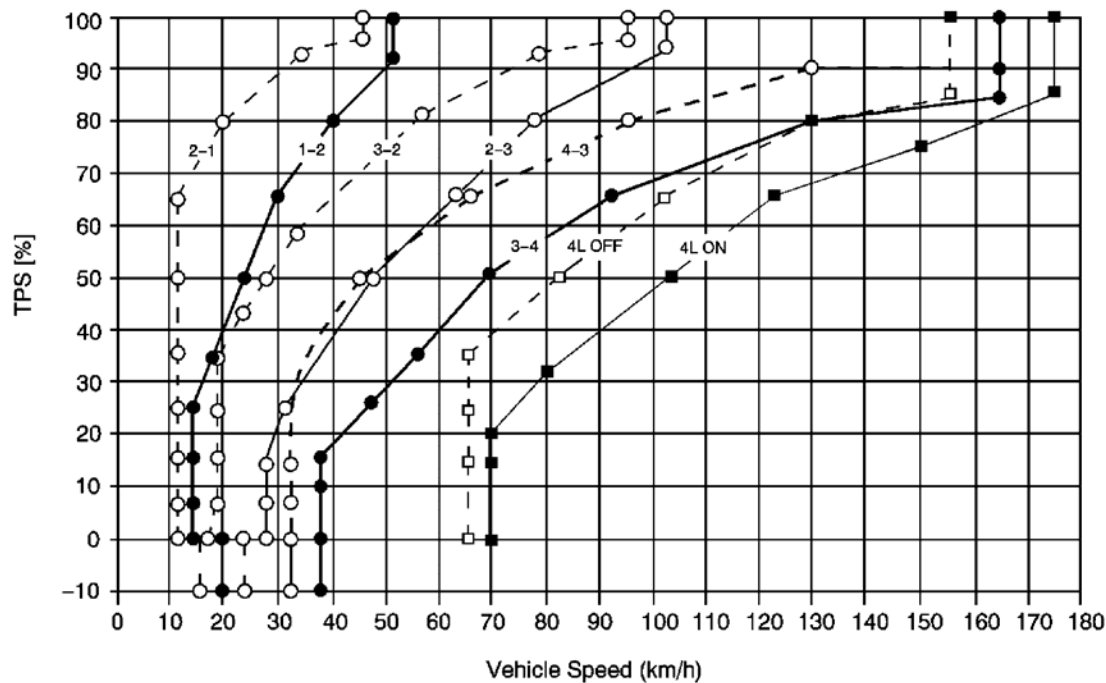


Fig. 1: Economic Mode (1.4/1.5L SOHC)
Courtesy of GENERAL MOTORS CORP.

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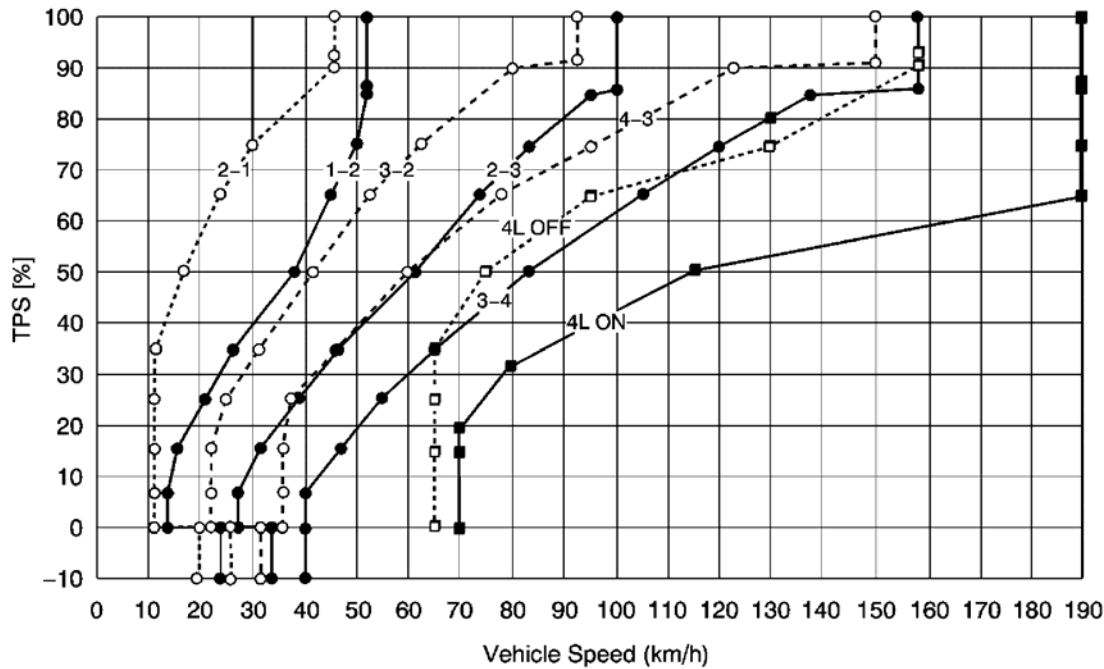


Fig. 2: Economic Mode (1.2L SOHC)
Courtesy of GENERAL MOTORS CORP.

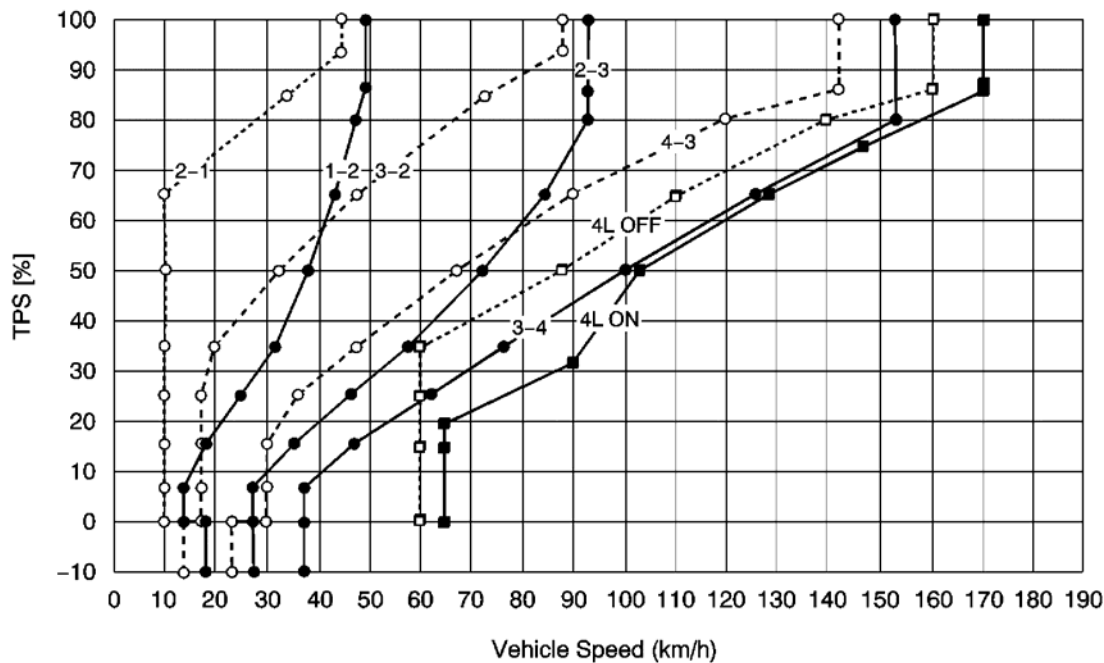


Fig. 3: Economic Mode (1.4L DOHC)
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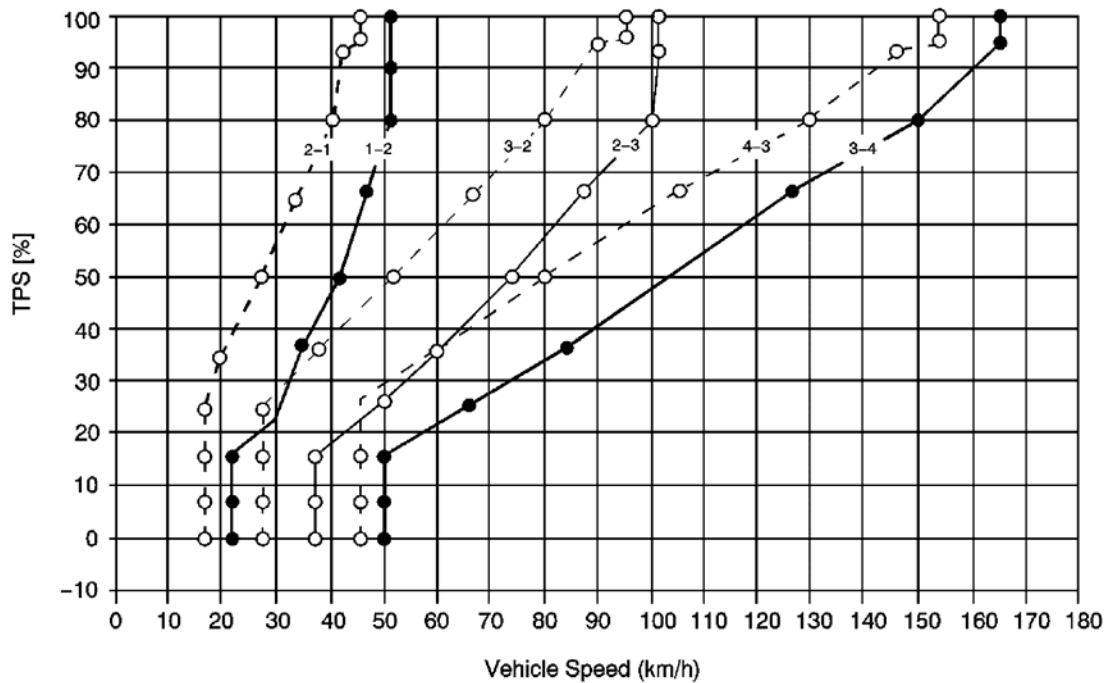


Fig. 4: Power Mode (1.4/1.5L SOHC)

Courtesy of GENERAL MOTORS CORP.

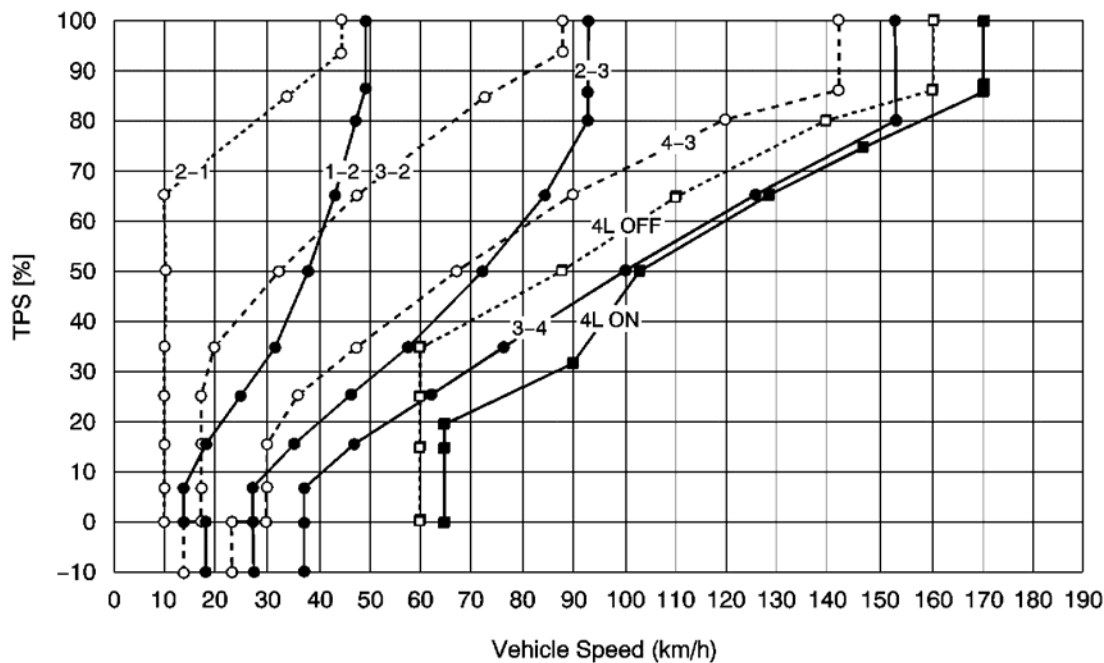


Fig. 5: Power Mode (1.2L SOHC)

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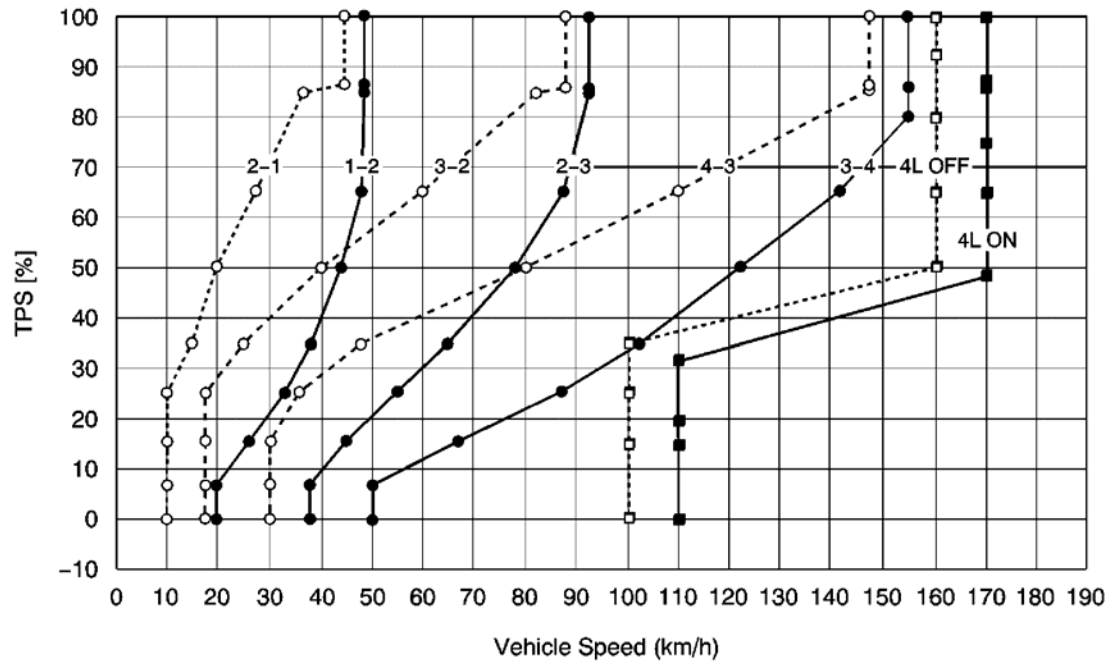


Fig. 6: Power Mode (1.4L DOHC)

Courtesy of GENERAL MOTORS CORP.

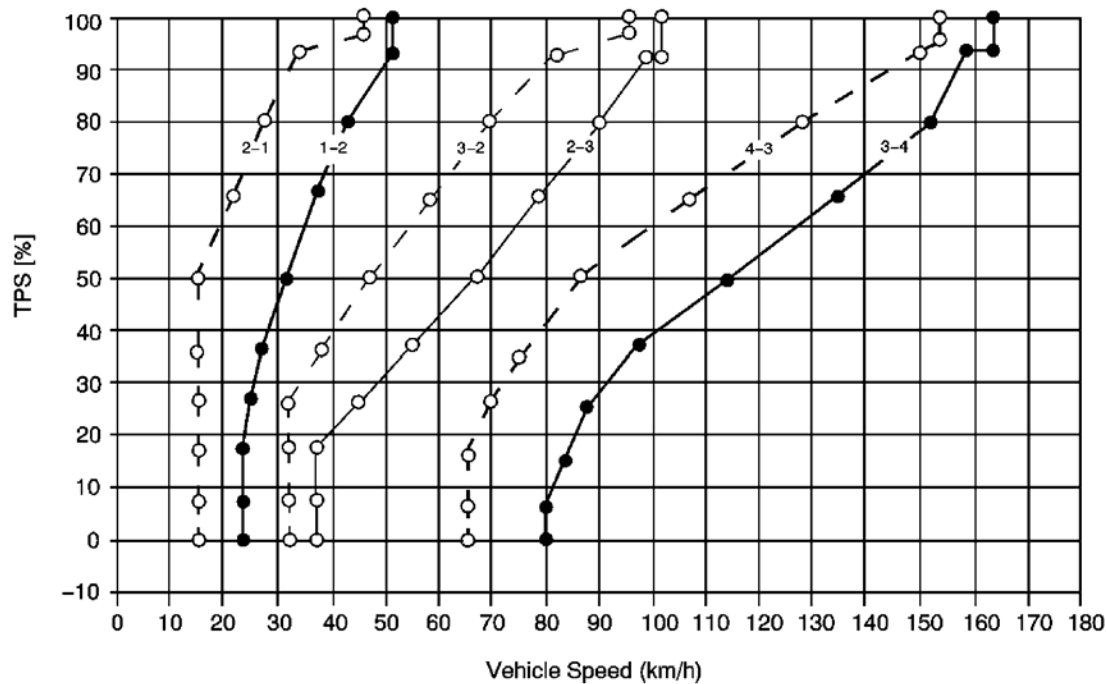


Fig. 7: Up-Slope 1 Mode (1.4/1.5L SOHC)

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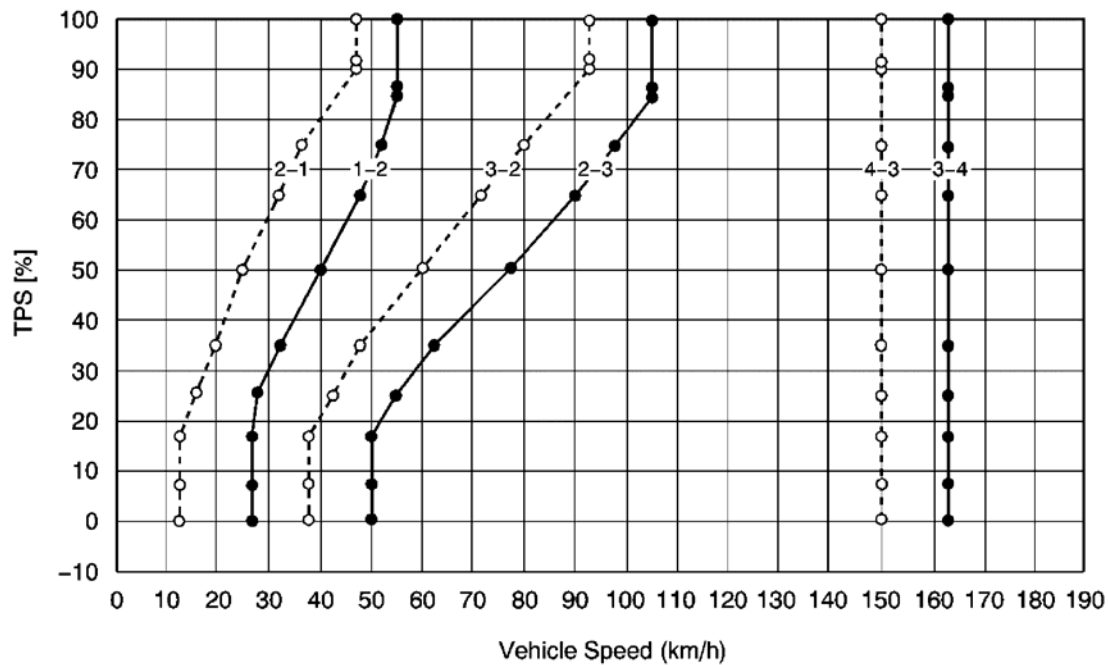


Fig. 8: Up-Slope 1 Mode (1.2L SOHC)
Courtesy of GENERAL MOTORS CORP.

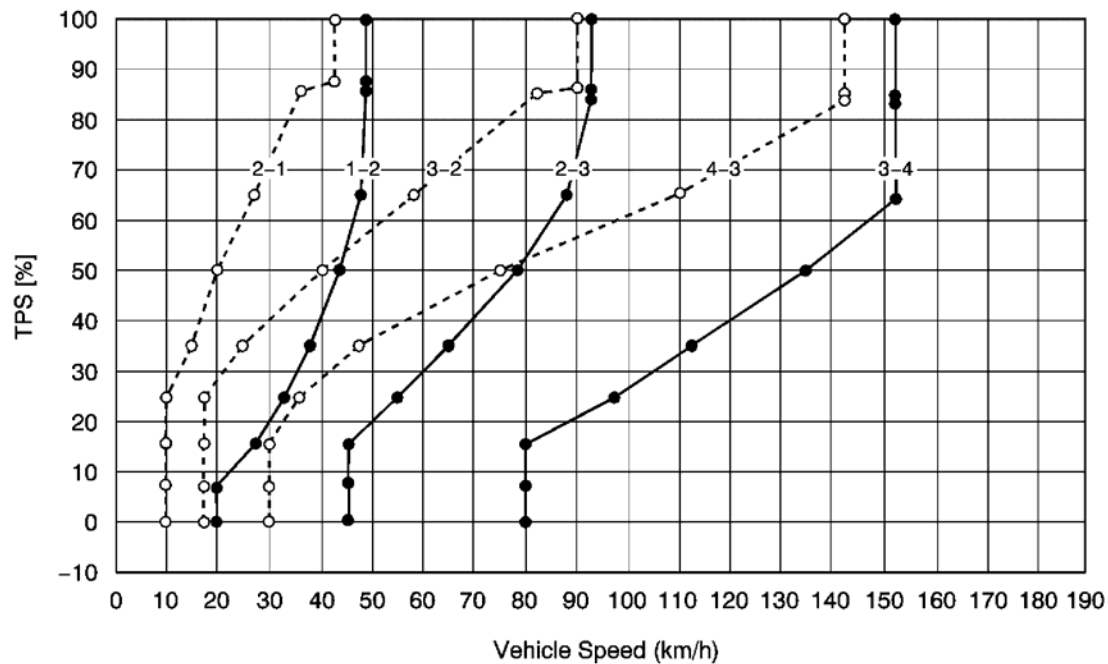


Fig. 9: Up-Slope 1 Mode (1.4L DOHC)
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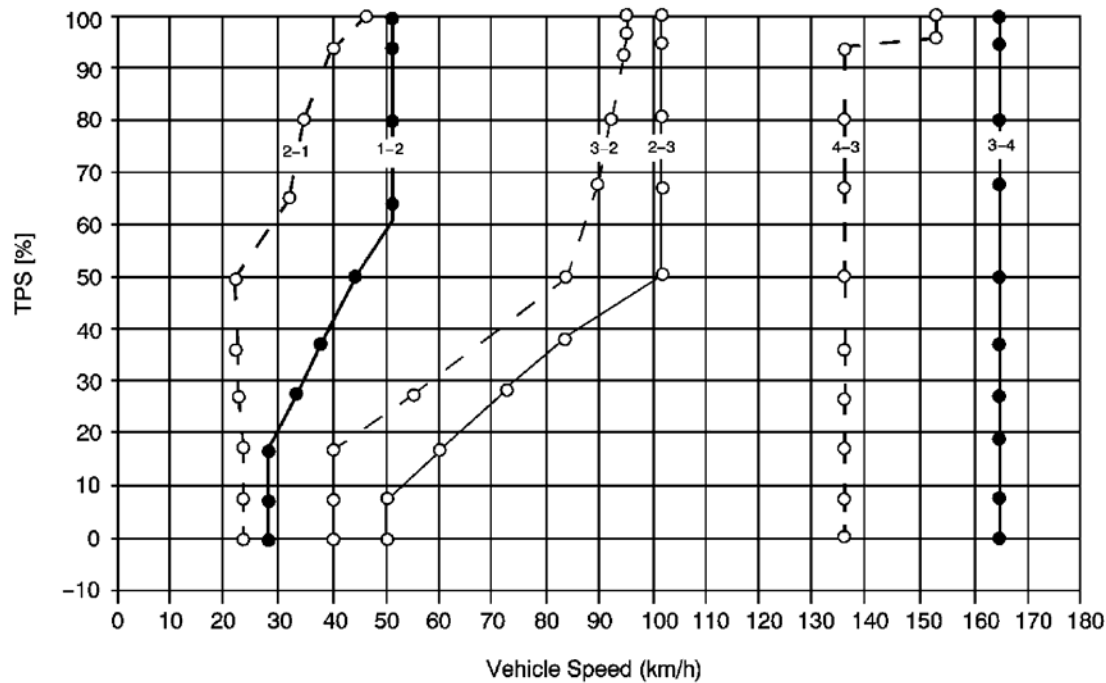


Fig. 10: Up-Slope 2 Mode (1.4/1.5L SOHC)
Courtesy of GENERAL MOTORS CORP.

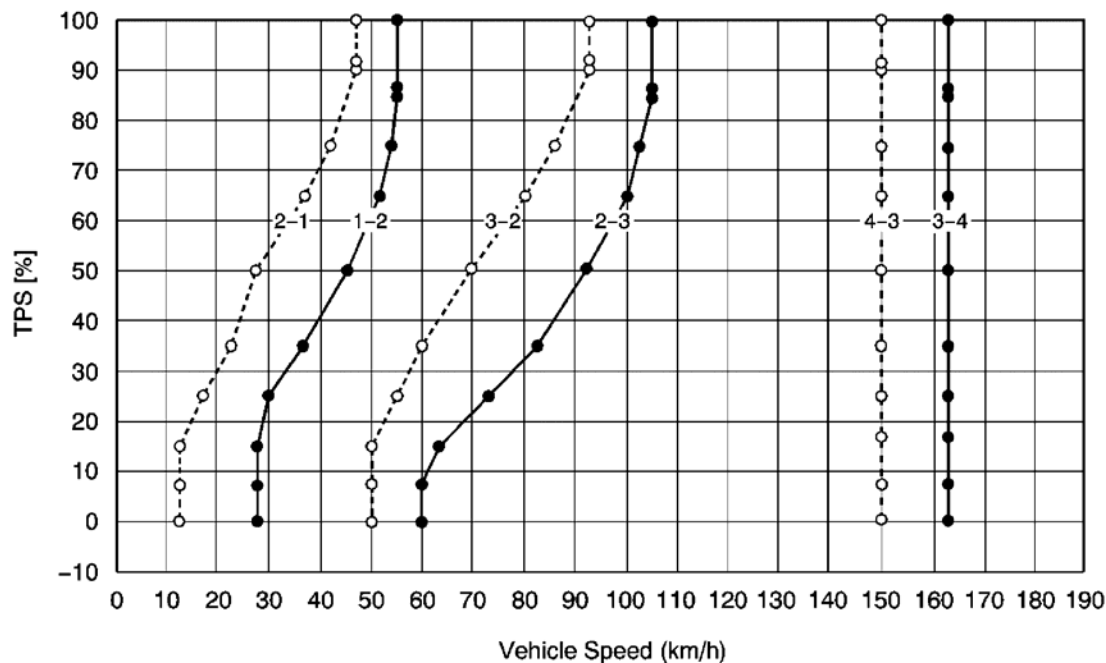


Fig. 11: Up-Slope 2 Mode (1.2L SOHC)
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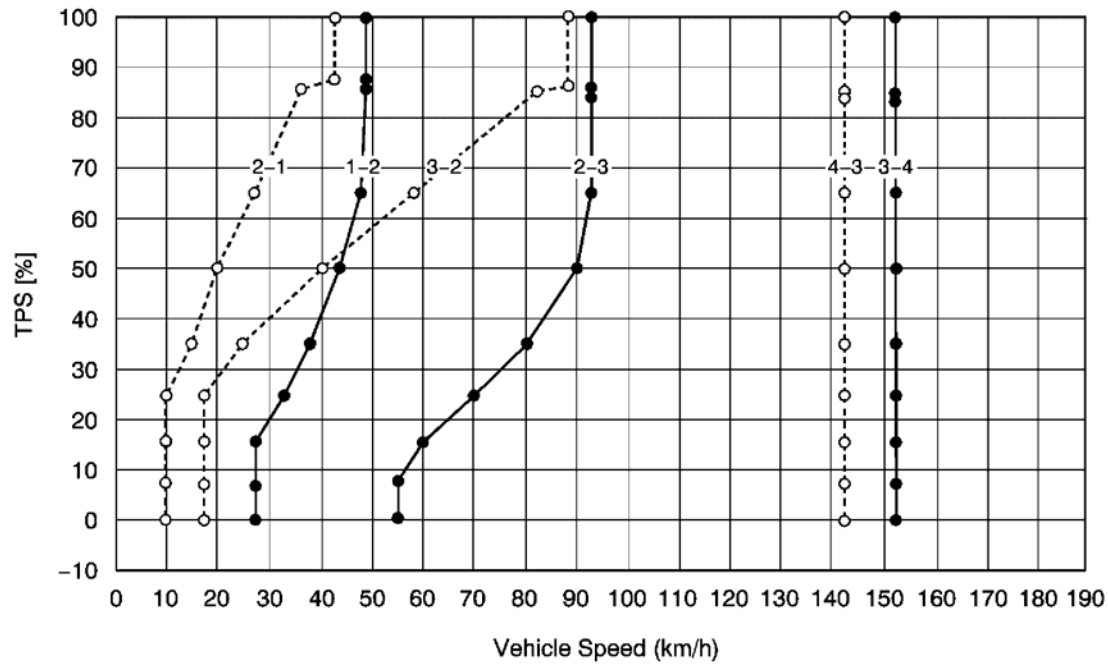


Fig. 12: Up-Slope 2 Mode (1.4L DOHC)
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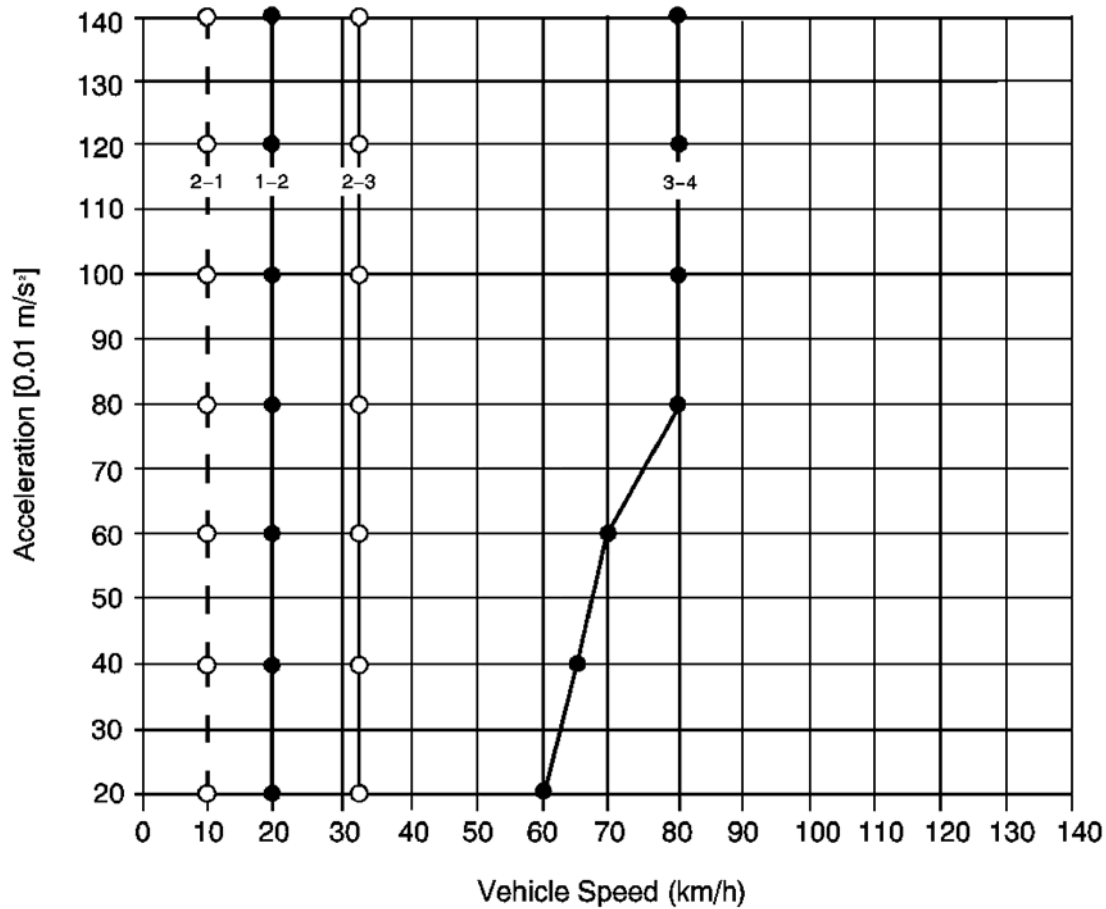


Fig. 13: Down-Slope Mode (1.4/1.5L SOHC)
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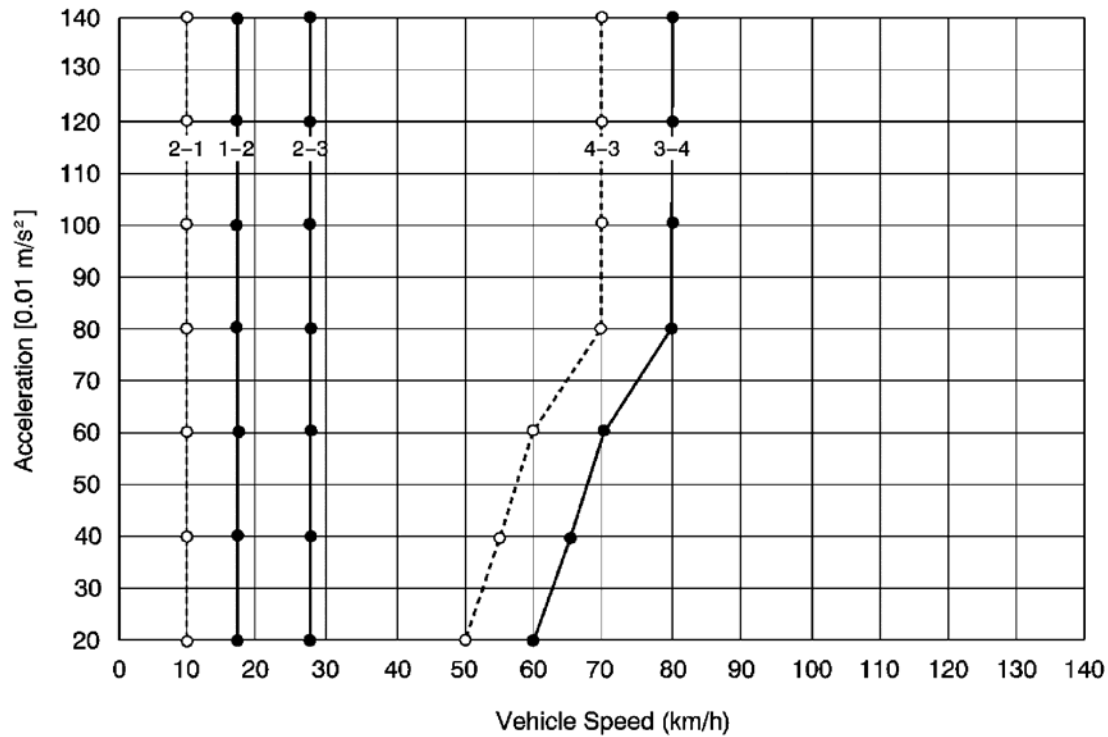


Fig. 14: Down-Slope 2 Mode (1.2L SOHC)
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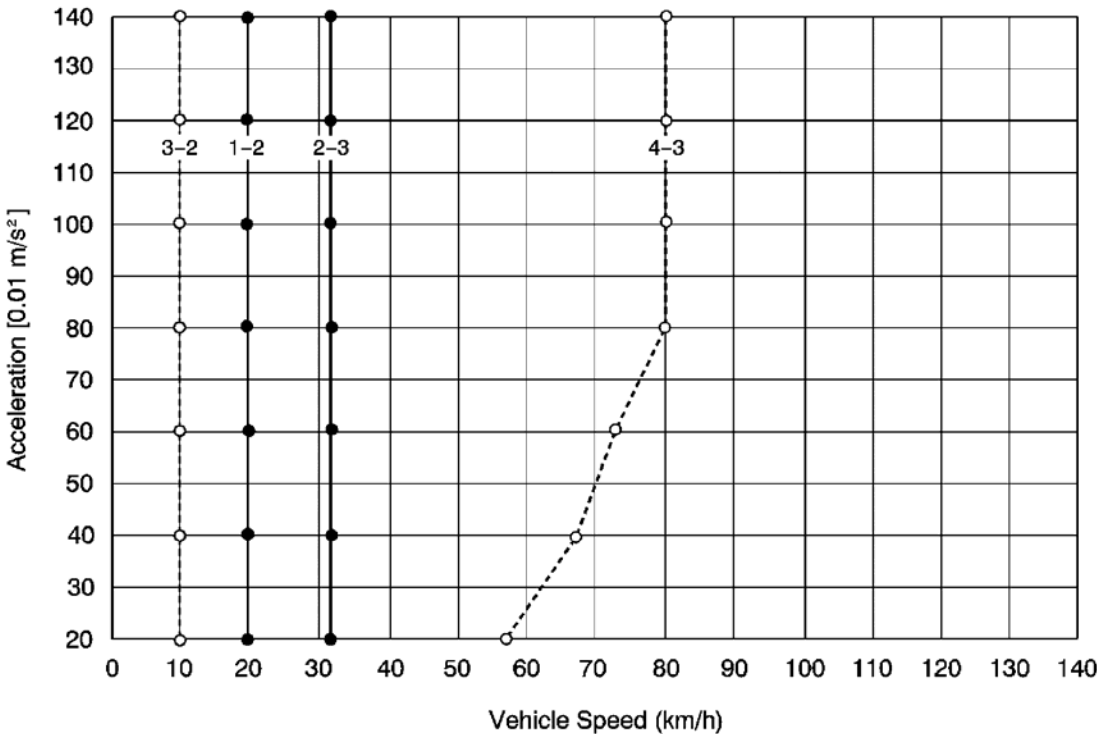


Fig. 15: Down-Slope 2 Mode (1.4L DOHC)
Courtesy of GENERAL MOTORS CORP.

LINE PRESSURE

Line Pressure

Application	Specification	
	Metric	English
At D Range		
• Idling	3.9-4.2 kg/cm ²	55-60 psi
• Stall	11.3-12.5 kg/cm ²	161-178 psi
At R Range		
• Idling	6.0-6.9 kg/cm ²	85-98 psi
• Stall	16.2-18.6 kg/cm ²	230-265 psi

SCHEMATIC AND ROUTING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS SCHEMATICS

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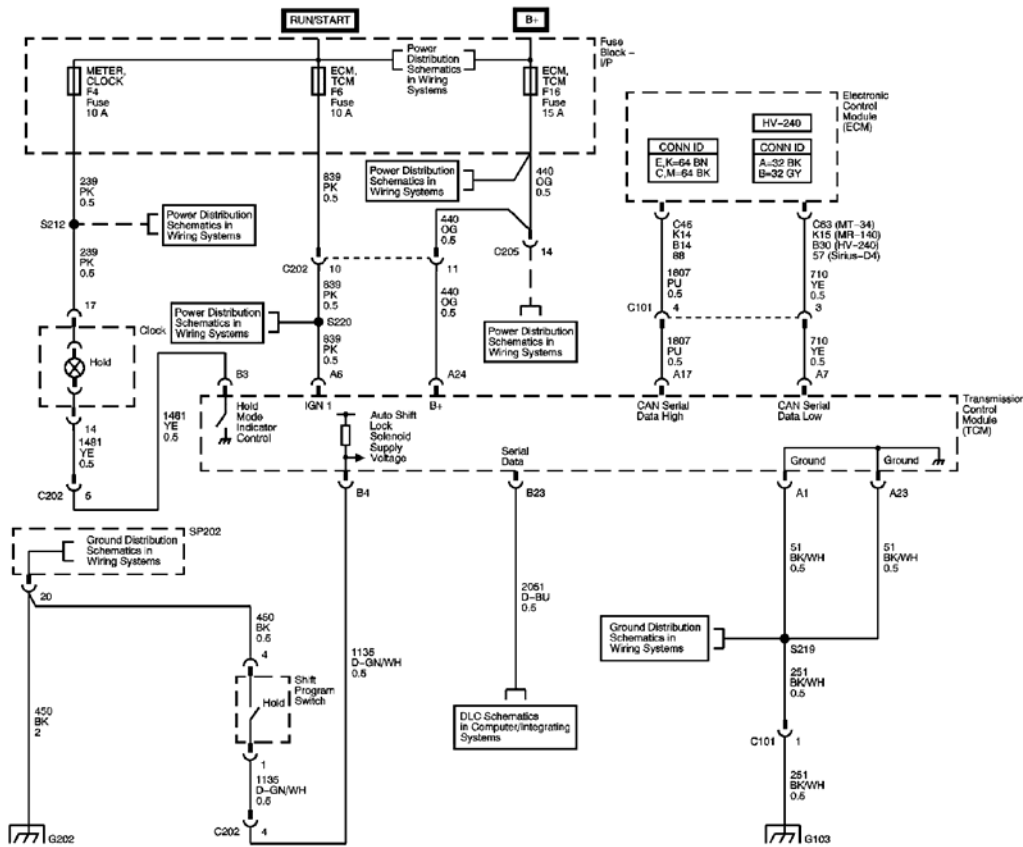


Fig. 16: Power and Ground
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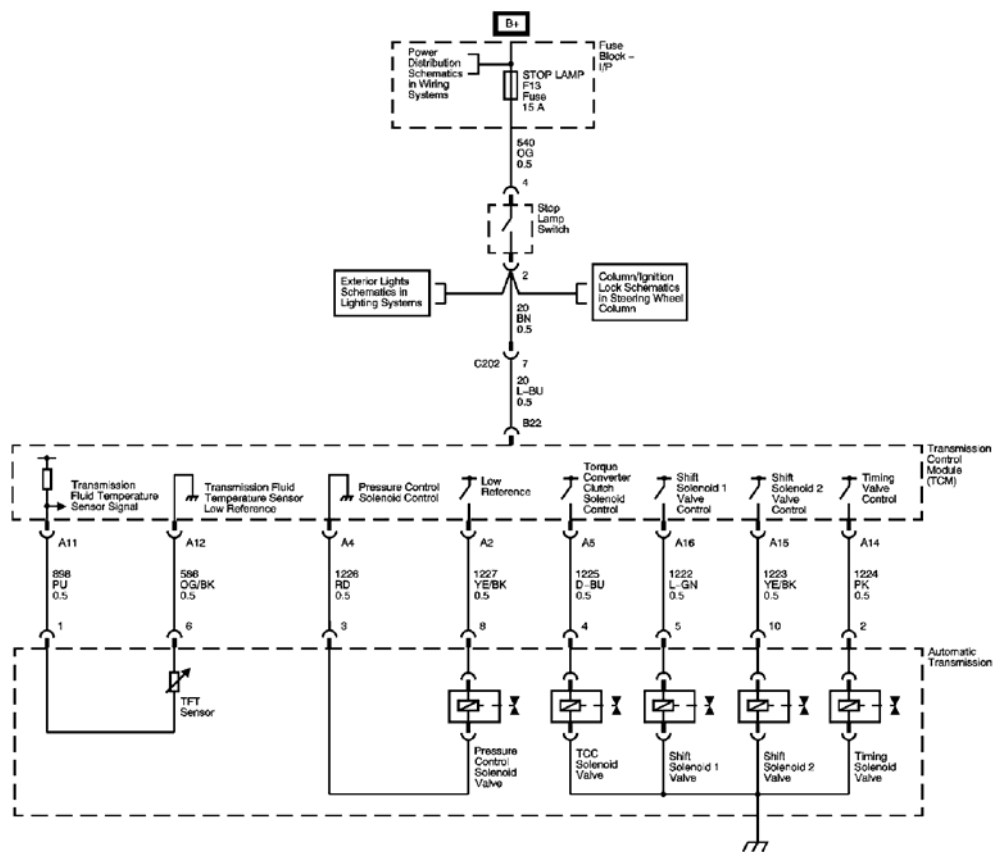


Fig. 17: Stop Lamp Switch And Transaxle Valves
Courtesy of GENERAL MOTORS CORP.

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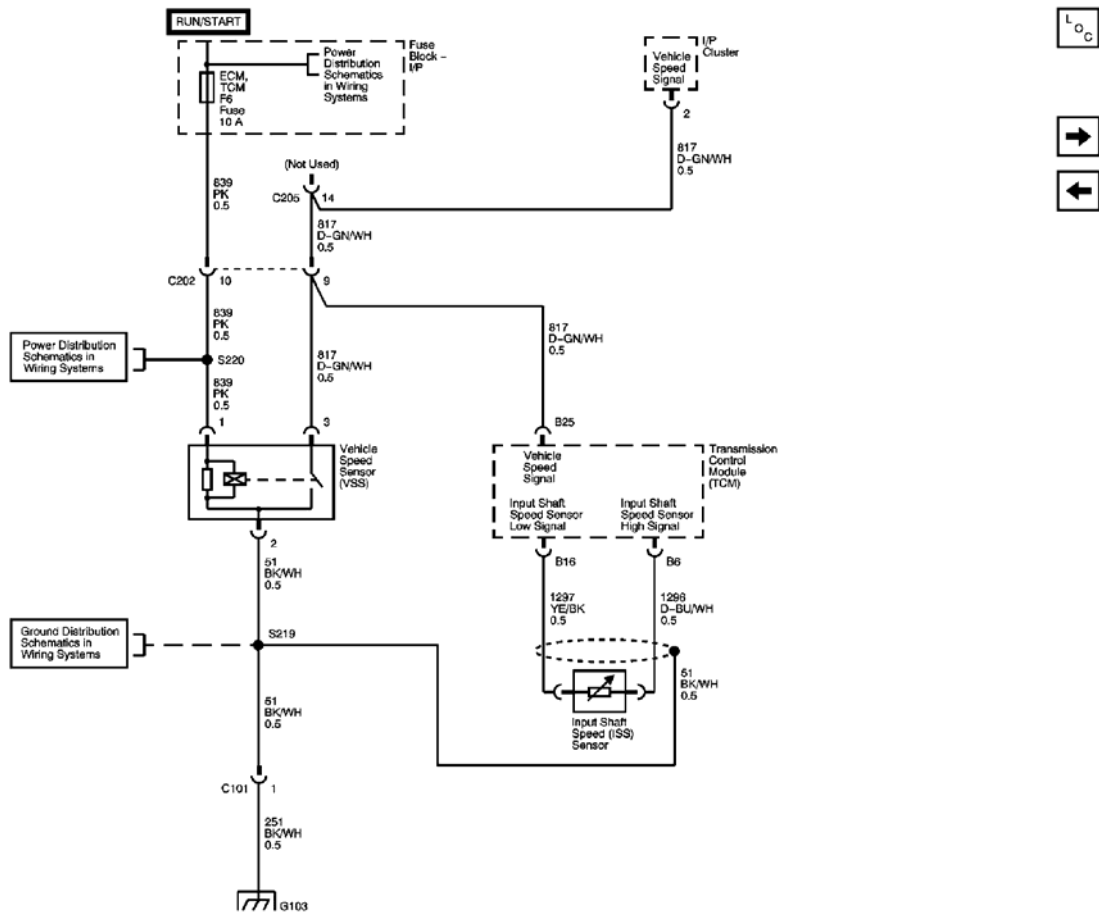


Fig. 18: Vehicle Speed And Input Speed Sensors
Courtesy of GENERAL MOTORS CORP.

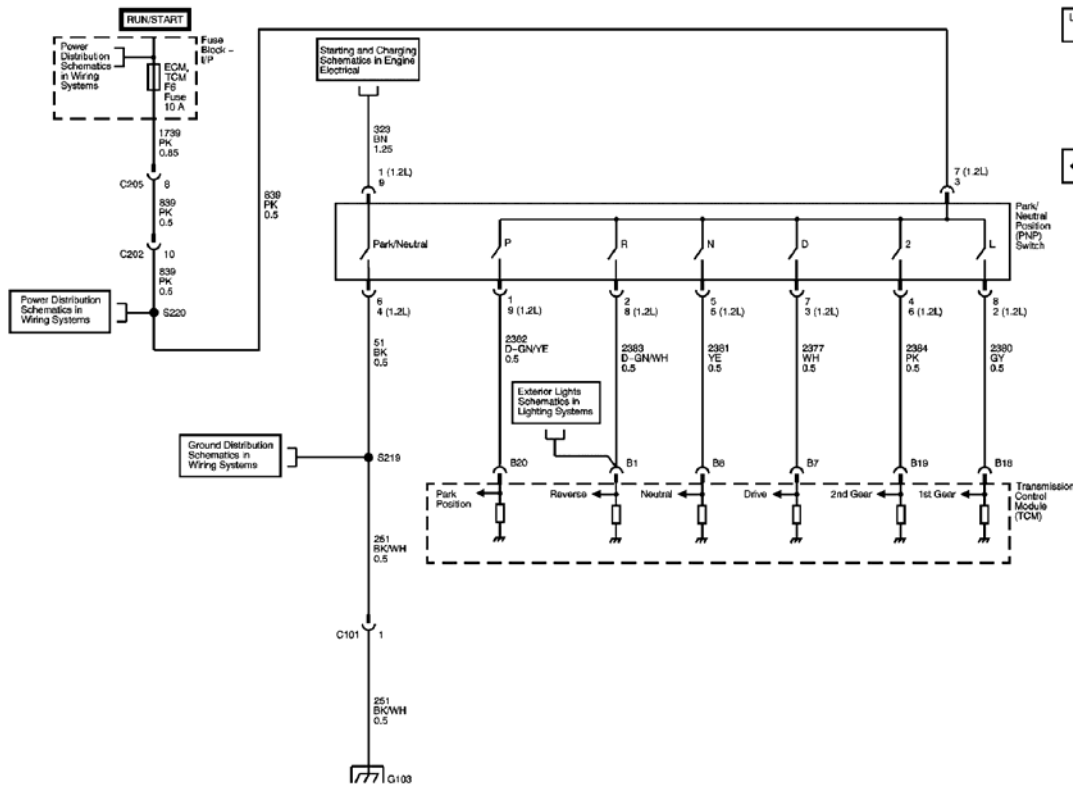


Fig. 19: PNP Switch

Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

AUTOMATIC TRANSMISSION ELECTRONIC COMPONENT VIEWS

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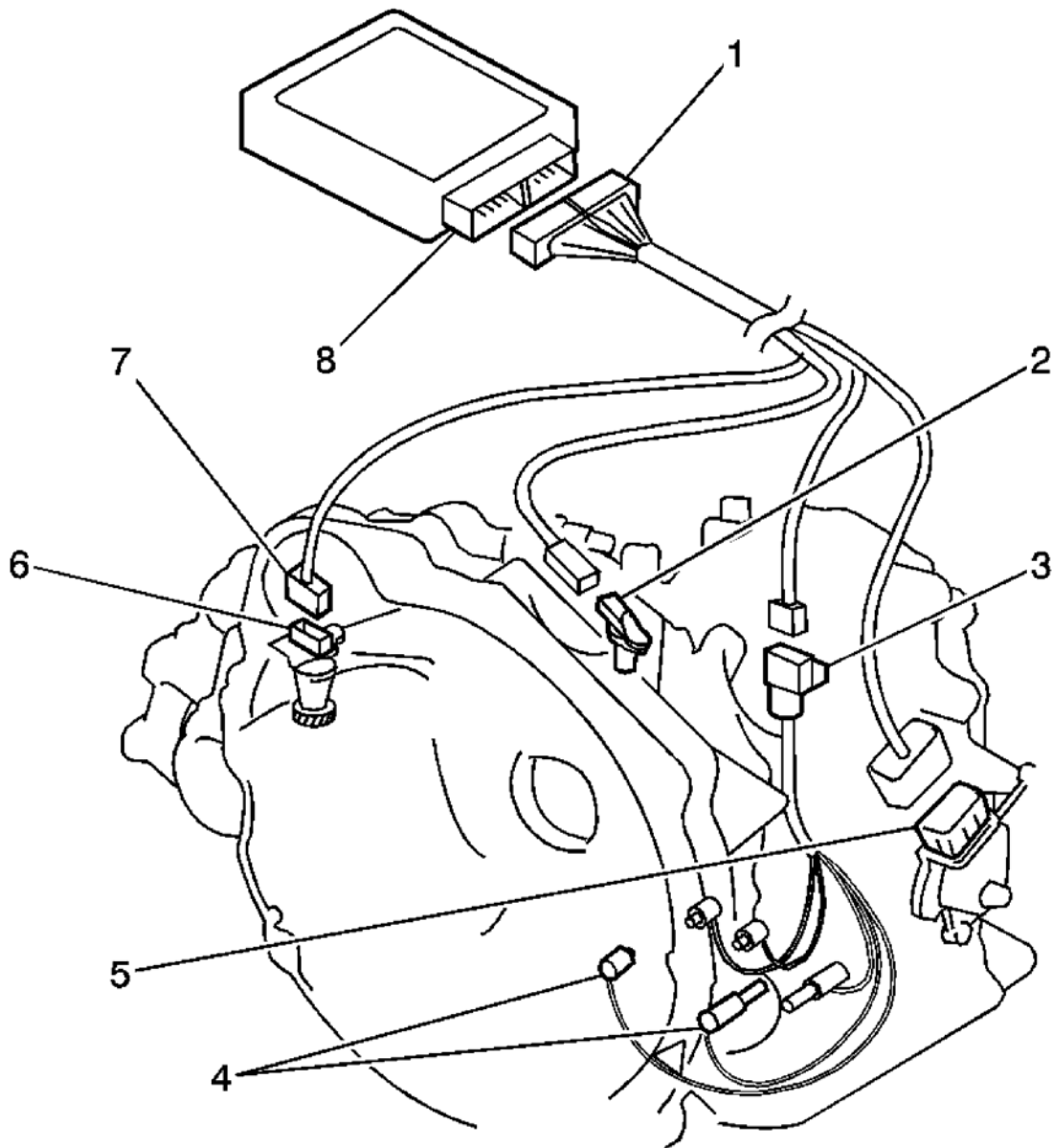


Fig. 20: Electronic Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 20

Callout	Component Name
1	Transmission Control Module (TCM) Harness Connector
2	Input Speed Sensor (ISS) Connector
3	Transaxle Harness
4	Solenoid Connectors
5	Park/Neutral Position (PNP) Switch

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6	Output Shaft Speed (OSS) Sensor (Vehicle Speed Sensor (VSS))
7	Output Shaft Speed (OSS) Connector
8	TCM

DISASSEMBLED VIEWS

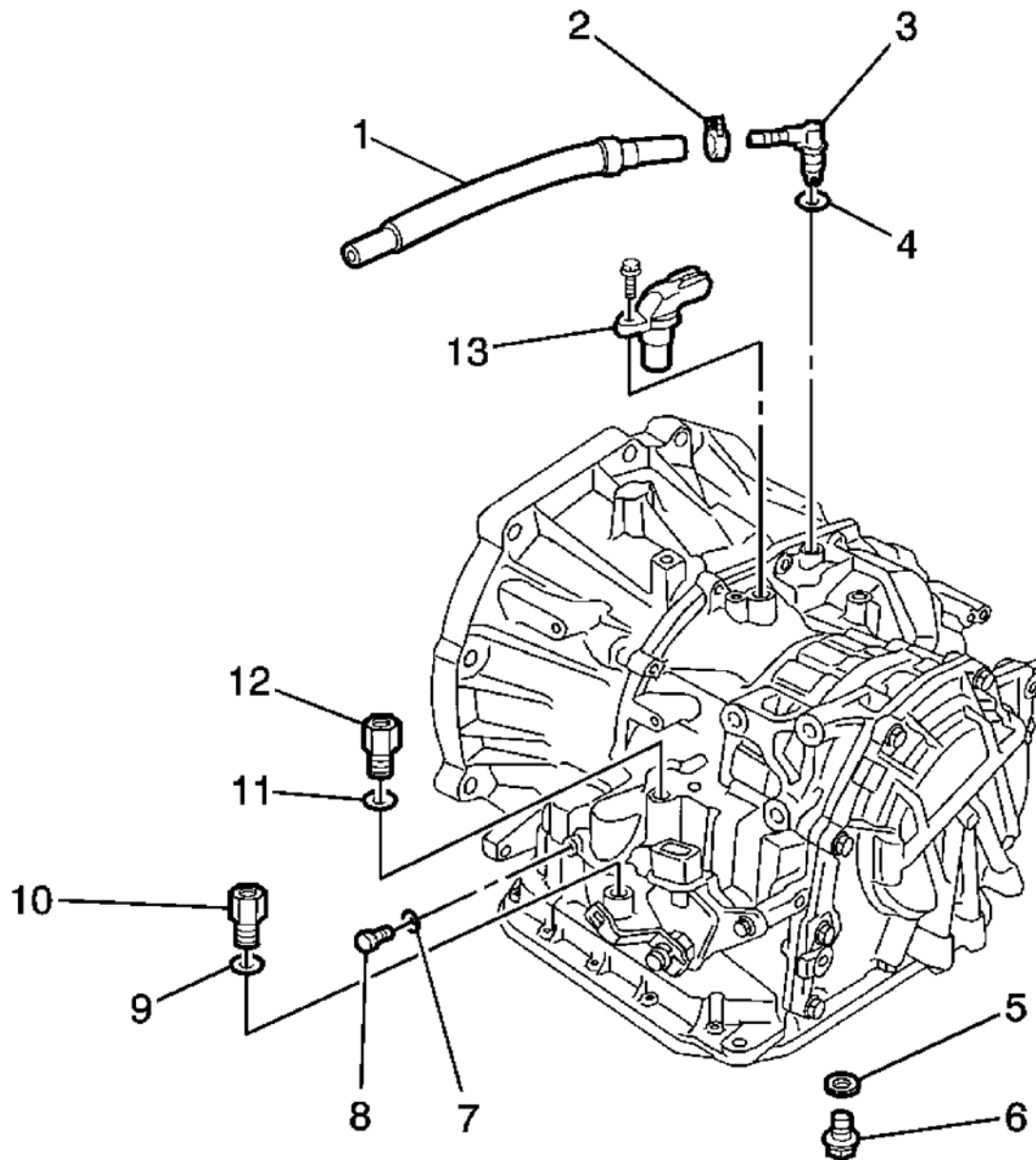


Fig. 21: Case And Associated Parts (1 of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 21

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Callout	Component Name
1	Breather Hose
2	Clip
3	Breather Plug
4	O-Ring
5	Washer
6	Drain Plug
7	O-Ring
8	Screw Plug
9	O-Ring
10	Oil Cooler Inlet Union
11	O-Ring
12	Oil Cooler Outlet Union
13	Input Shaft Speed (ISS) Sensor

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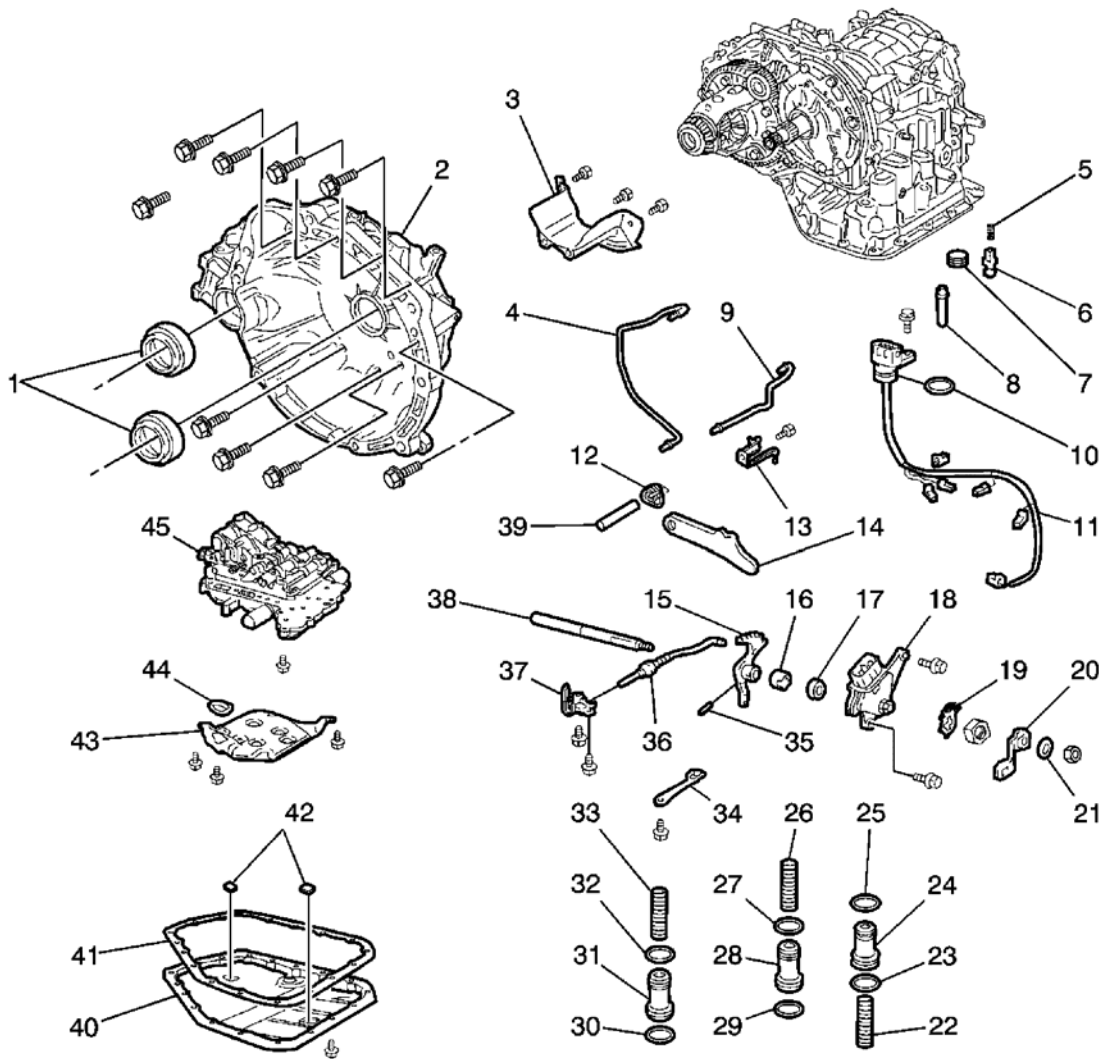


Fig. 22: Case And Associated Parts (2 of 2)
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 22

Callout	Component Name
1	Oil Seal
2	Transaxle Housing
3	Oil Reservoir Plate
4	Transaxle Oil Apply Pipe
5	Spring
6	Check Valve Pipe Clamp
7	Apply Gasket
8	Brake Drum Gasket
9	Differential Gear Oil Apply Pipe

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10	O-Ring
11	Transaxle Wire
12	Torsion Spring
13	Transaxle Oil Apply Pipe Clamp
14	Parking Lock Pawl
15	Manual Valve Lever
16	Spacer
17	Oil Seal
18	Park/Neutral Position Switch
19	Lock Washer
20	Control Lever
21	Washer
22	Spring
23	O-Ring
24	Overdrive Brake Accumulator Piston
25	O-Ring
26	Spring
27	O-Ring
28	Forward Clutch Accumulator Piston
29	O-Ring
30	O-Ring
31	Direct Clutch Accumulator Piston
32	O-Ring
33	Spring
34	Manual Detent Spring
35	Pin
36	Parking Lock Rod
37	Parking Lock Pawl Shaft
38	Manual Valve Lever Shaft
39	Parking Lock Pawl Bracket
40	Oil Pan
41	Gasket
42	Magnet
43	Oil Strainer
44	Gasket
45	Valve Body

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Callout	Component Name
1	Planetary Ring Gear
2	O-Ring
3	1st and Reverse Brake Piston
4	O-Ring
5	1st and Reverse Brake Piston Return Spring
6	Plate
7	Disc
8	Flange

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9	Snap Ring
10	Planetary Gear
11	Thrust Washer
12	No. 2 One-Way Clutch
13	Anti-Rattle Clip
14	Flange
15	Disc
16	Plate
17	2nd Brake Piston Return Spring
18	O-Ring
19	2nd Brake Piston
20	O-Ring
21	2nd Brake Clutch Cylinder
22	Snap Ring
23	Thrust Bearing Race
24	Front Planetary Sun Gear
25	Thrust Bearing Race
26	One-Way Clutch Assembly
27	Thrust Washer
28	Rear Planetary Sun Gear
29	Snap Ring
30	Flange
31	Disc
32	Plate
33	Thrust Bearing Race
34	Thrust Needle Roller Bearing
35	Forward Clutch Hub
36	Thrust Bearing Race
37	Thrust Needle Roller Bearing
38	Thrust Bearing Race
39	Forward and Reverse Clutch Assembly
40	Thrust Needle Roller Bearing
41	Snap Ring
42	O/D Brake Return Spring
43	O/D Brake Piston
44	O-Ring
45	Seal Ring
46	Transaxle Rear Cover
47	Apply Gasket
48	O-Ring
49	Screw Plug

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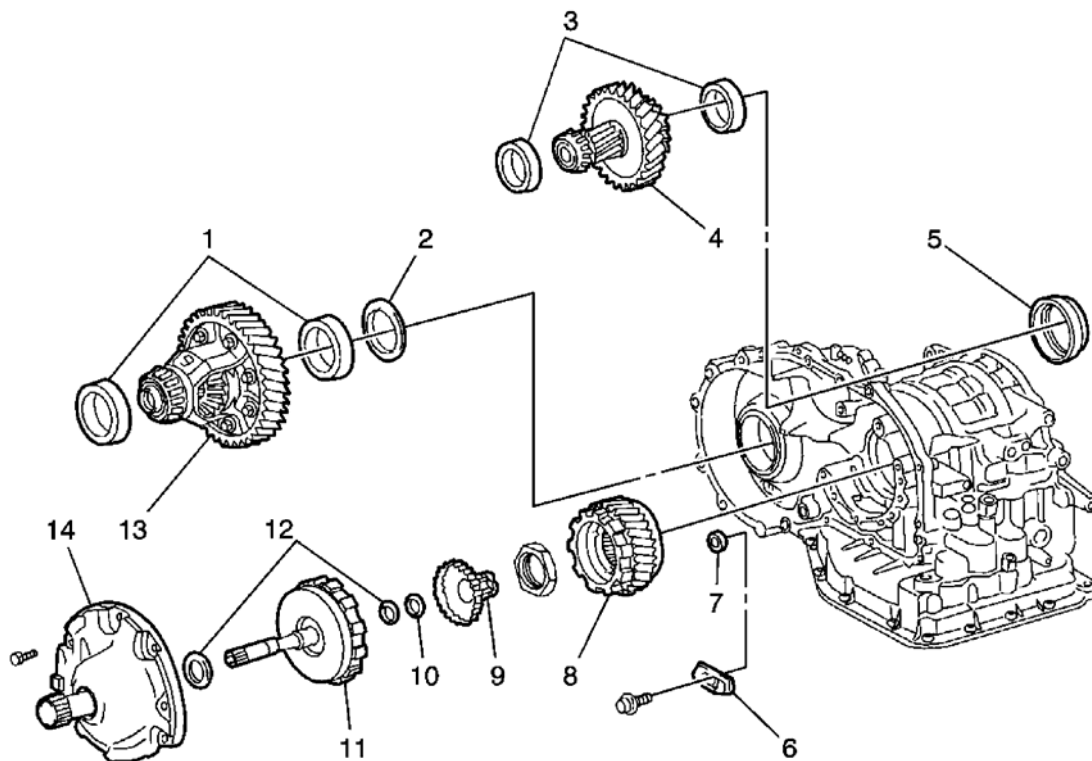


Fig. 24: Differential And Oil Pump Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 24

Callout	Component Name
1	Side Bearing Outer Race
2	Shim
3	Outer Tapered Roller Bearing Race
4	Counter Driven Gear
5	Oil Seal
6	Transaxle Case Plate
7	Apply Gasket
8	Counter Driven Gear
9	Direct Clutch Hub
10	Thrust Bearing Race
11	Direct Clutch Assembly
12	Thrust Needle Roller Bearing
13	Differential Case
14	Oil Pump

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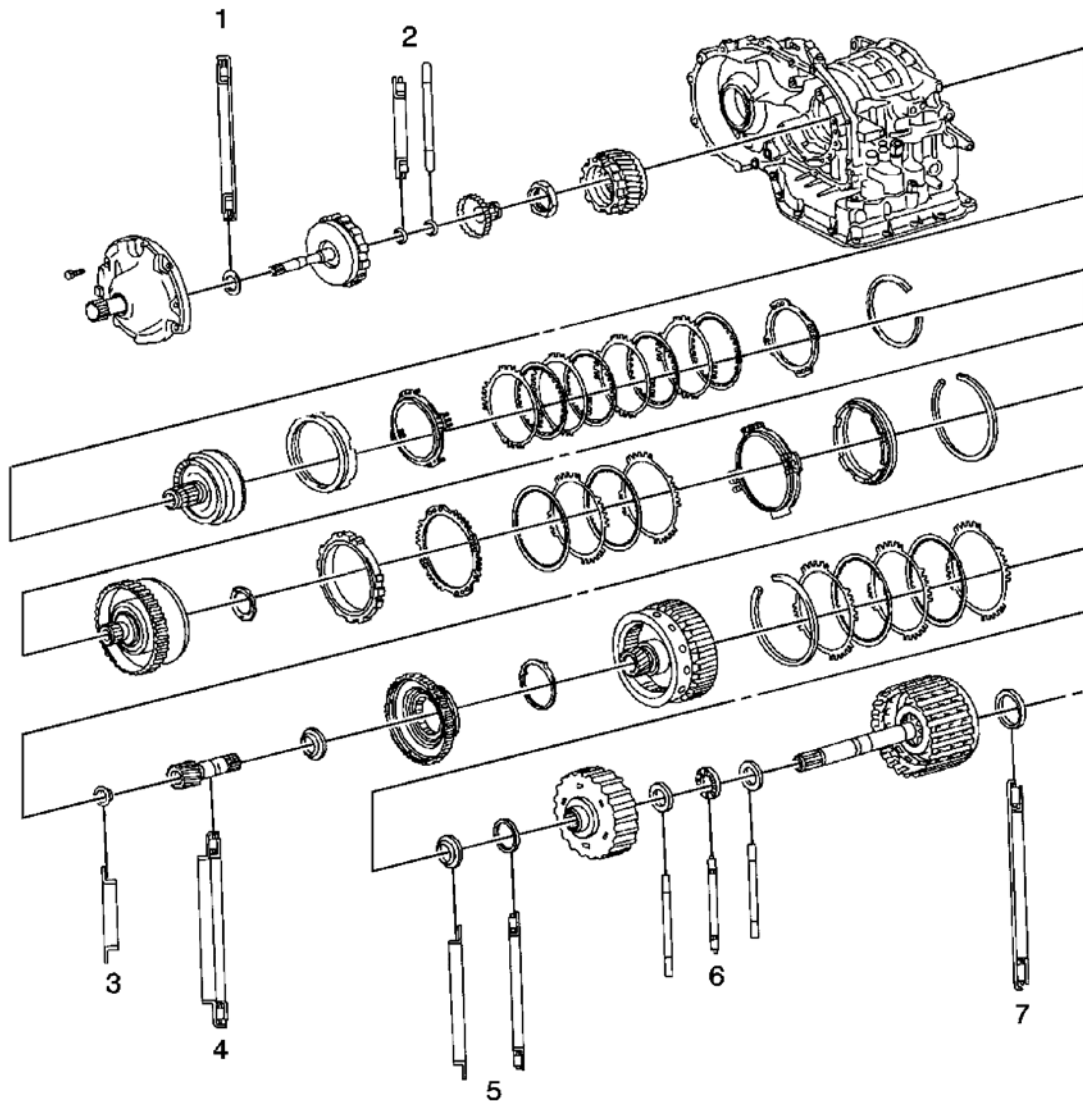


Fig. 25: Bearing And Race Installation And Direction Component View
 Courtesy of GENERAL MOTORS CORP.

Disassembled Views

Mark	Front Race Diameter		Thrust Bearing Diameter		Rear Race Diameter	
	Inside	Outside	Inside	Outside	Inside	Outside
1	-	-	32.5 mm (1.280 in)	48.5 mm (1.909 in)	-	-
2	-	-	17.8 mm (0.701 in)	30.2 mm (1.189 in)	20.5 mm (0.807 in)	32.6 mm (1.283 in)
3	19.3 mm (0.760 in)	29.0 mm (1.142 in)	-	-	-	-
4	-	-	42.5 mm	57.5 mm	-	-

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			(1.673 in)	(2.264 in)		
5	34.95 mm (1.3670 in)	45.50 mm (1.7913 in)	33.3 mm (1.311 in)	46.5 mm (1.831 in)	-	-
6	19.3 mm (0.760 in)	30.6 mm (1.205 in)	18.1 mm (0.713 in)	29.6 mm (1.165 in)	18.1 mm (0.713 in)	28.2 mm (1.110 in)
7	-	-	43.2 mm (1.701 in)	62.0 mm (2.441 in)	-	-

SHIFT SELECT CONTROL

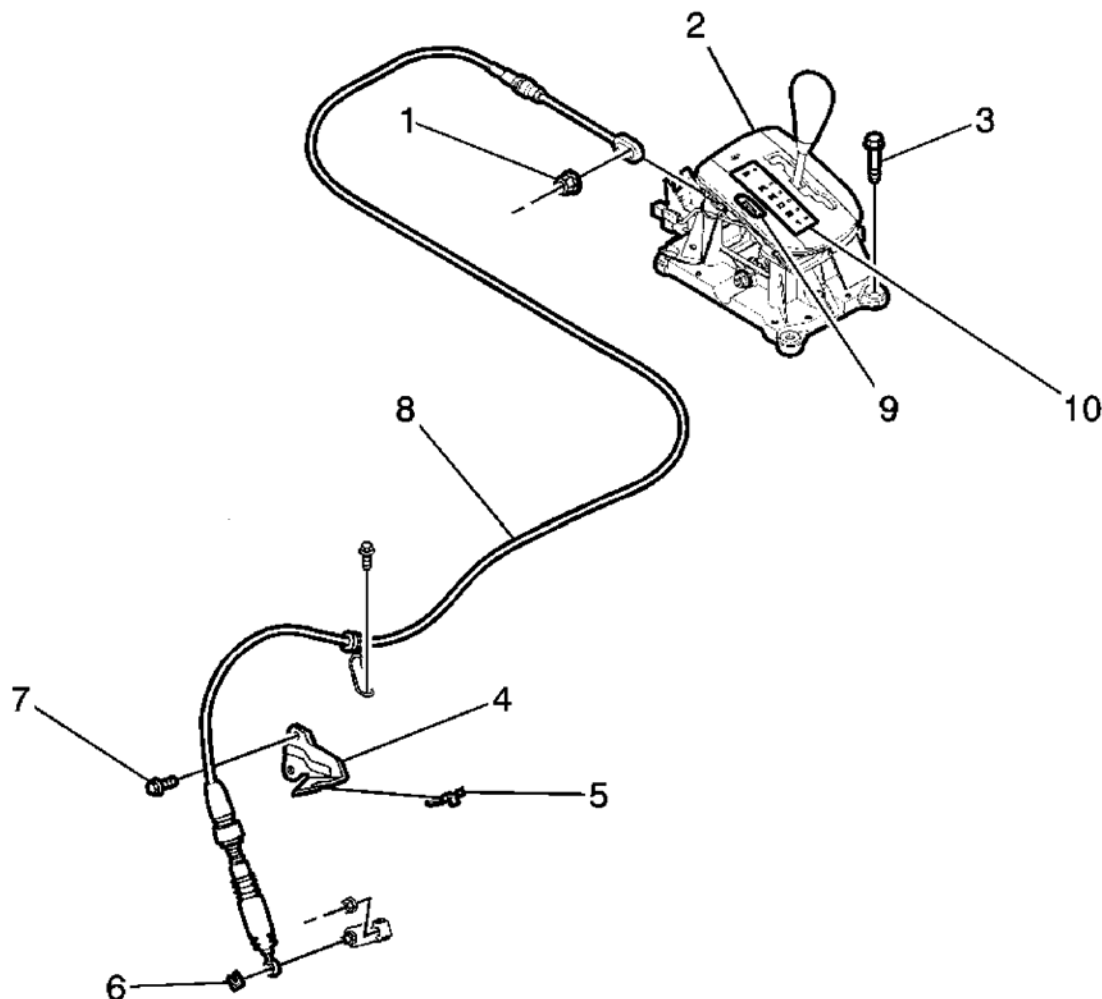


Fig. 26: Shift Select Control

Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 26

Callout	Component Name
1	Nut

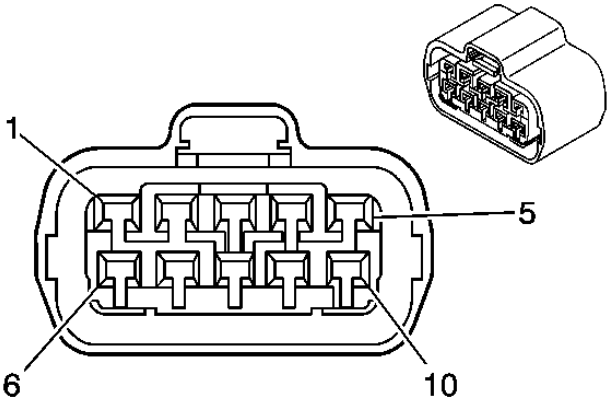
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2	Select Control Lever Assembly
3	Bolt
4	Cable Fastener
5	Clamp
6	E-Ring
7	Bolt
8	Select Control Cable
9	Shift Program Switch
10	Shift Indicator Lamp

CONNECTOR END VIEWS

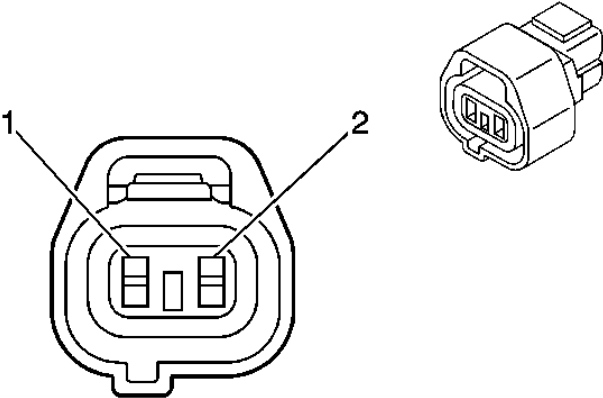
Automatic Transmission Connector



Connector Part Information		• Yazaki 7283-1407-40 • 10-Way (GY)	
Pin	Wire Color	Circuit No.	Function
1	PU	898	Transmission Fluid Temperature Sensor Signal
2	PK	1224	Timing Valve Control
3	RD	1226	Pressure Control Solenoid Control
4	D-BU	1225	Torque Converter Clutch Solenoid Control
5	L-GN	1222	Shift Solenoid 1 Valve Control
6	OG/BK	586	Transmission Fluid Temperature Sensor Low Reference
7	-	-	Not Used
8	YE/BK	1227	Low Reference
9	-	-	Not Used

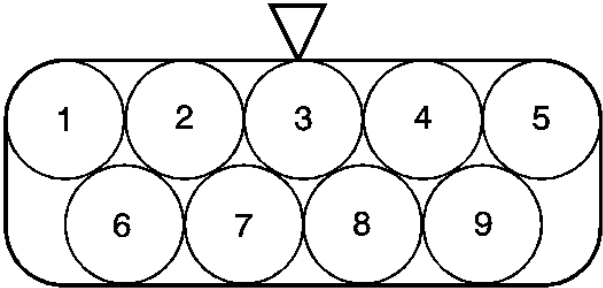
10	YE/BK	1223	Shift Solenoid 2 Valve Control
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Input Shaft Speed (ISS) Sensor



Connector Part Information		• Yazaki 7283-8125-90 • 2-Way F (BU)	
Pin	Wire Color	Circuit No.	Function
1	YE/BK	1297	Input Shaft Speed (ISS) Sensor Low Signal
2	D-BU/WH	1296	Input Shaft Speed (ISS) Sensor High Signal

Park/Neutral Position (PNP) Switch (1.2L)



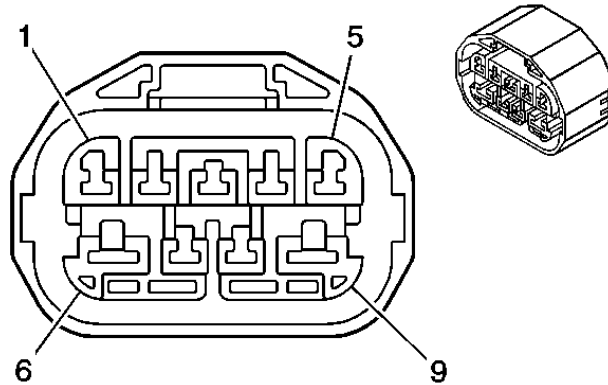
Connector Part Information		• Yazaki 7283-1909-40 • 9-Way F (GY)	
Pin	Wire Color	Circuit No.	Function
1	BN	323	Park/Neutral Position (PNP) Switch Signal
2	GY	2380	Park/Neutral Position (PNP) Switch Low

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			Gear Signal
3	WH	2377	Park/Neutral Position (PNP) Switch Drive Signal
4	BK	51	Ground
5	YE	2381	Park/Neutral Position (PNP) Switch Neutral Signal
6	PK	2384	Park/Neutral Position (PNP) Switch 2nd Gear Signal
7	PK	839	Ignition 1 Voltage
8	D-GN/WH	2383	Park/Neutral Position (PNP) Switch Reverse Signal
9	D-GN/YE	2382	Park/Neutral Position (PNP) Switch Park Signal

Park/Neutral Position (PNP) Switch (1.4L, 1.5L, 1.6L)



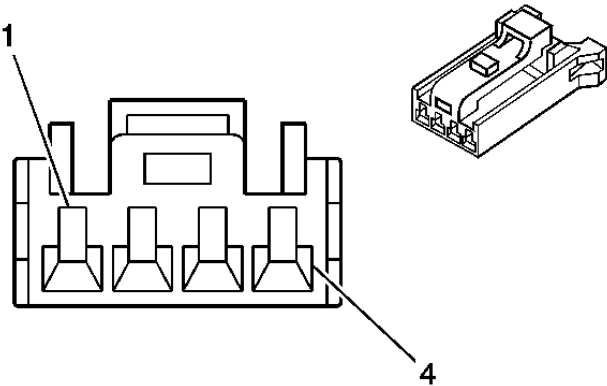
Connector Part Information		- Yazaki 7283-1909-40 9-Way F (GY)	
Pin	Wire Color	Circuit No.	Function
1	D-GN/YE	2382	Park/Neutral Position (PNP) Switch Park Signal
2	D-GN/WH	2383	Park/Neutral Position (PNP) Switch Reverse Signal
3	PK	839	Ignition 1 Voltage
4	PK	2384	Park/Neutral Position (PNP) Switch 2nd Gear Signal
5	YE	2381	Park/Neutral Position (PNP) Switch Neutral Signal
6	BK	51	Ground
			Park/Neutral Position (PNP) Switch Drive

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7	WH	2377	Signal
8	GY	2380	Park/Neutral Position (PNP) Switch Low Gear Signal
9	BN	323	Park/Neutral Position (PNP) Switch Signal

Shift Program Switch

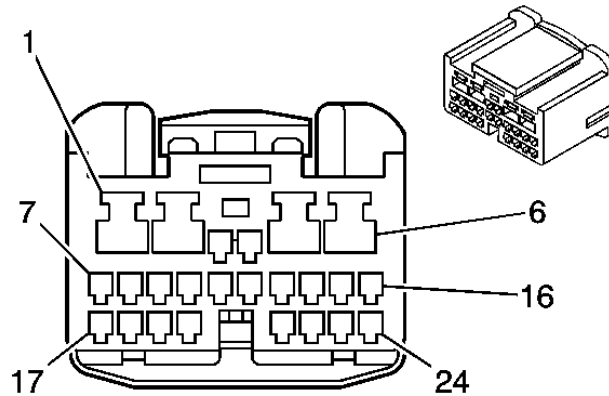


Connector Part Information		• KET MG 610366 • 4-Way F PCB 040 Series (WH)	
Pin	Wire Color	Circuit No.	Function
1	D-GN/WH	1135	Transmission Hold Signal
2	BN/WH	309	Right Park Lamp Supply Voltage
3	BK	450	Ground
4	BK	450	Ground

Transmission Control Module (TCM) - A

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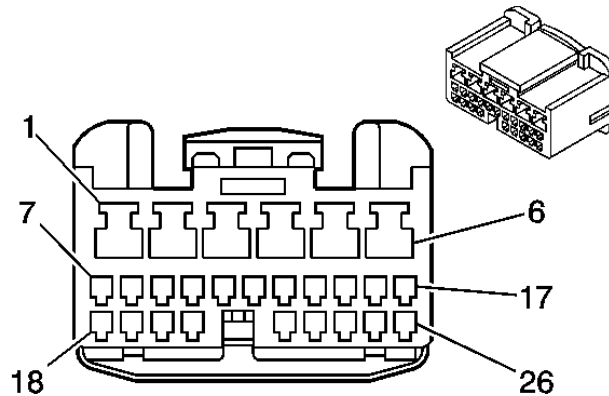


Connector Part Information		• AMP 1318756-1 • 24-Way F 025/090 SER 26POS PLUG ASSY (WH)	
Pin	Wire Color	Circuit No.	Function
1	BK/WH	51	Ground
2	YE/BK	1227	Low Reference
3	-	-	Not Used
4	RD	1226	Pressure Control Solenoid Control
5	D-BU	1225	Torque Converter Clutch Solenoid Control
6	PK	839	Ignition 1 Voltage
7	YE	710	CAN Serial Data Low
8-10	-	-	Not Used
11	PU	898	Transmission Fluid Temperature Sensor Signal
12	OG/BK	586	Transmission Fluid Temperature Sensor Low Reference
13	-	-	Not Used
14	PK	1224	Timing Valve Control
15	YE/BK	1223	Shift Solenoid 2 Valve Control
16	L-GN	1222	Shift Solenoid 1 Valve Control
17	PU	1807	CAN Serial Data High
18-22	-	-	Not Used
23	BK/WH	51	Ground
24	OG	440	Battery Positive Voltage

Transmission Control Module (TCM) B

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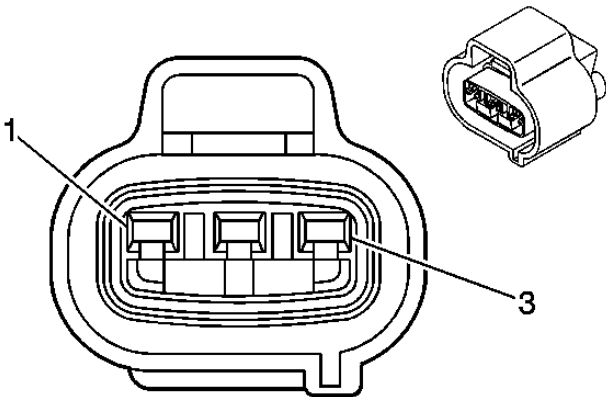
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Connector Part Information		- AMP 1318757-1 26-Way F 025/090 SER 24POS PLUG ASSY (WH)	
Pin	Wire Color	Circuit No.	Function
1	D-GN/WH	2383	Park/Neutral Position (PNP) Switch Reverse Signal
	L-GN	24	Back-Up Lamps Supply Voltage
2	-	-	Not Used
3	YE	1481	Hold Motor Indicator Control
4	D-GN/WH	1135	Transmission Hold Signal
5	-	-	Not Used
6	D-BU/WH	1296	Input Shaft Speed (ISS) Sensor High Signal
7	WH	2377	Park/Neutral Position (PNP) Switch Drive Signal
8	YE	2381	Park/Neutral Position (PNP) Switch Neutral Signal
9-15	-	-	Not Used
16	YE/BK	1297	Input Shaft Speed (ISS) Sensor Low Signal
17	-	-	Not Used
18	GY	2380	Park/Neutral Position (PNP) Switch Low Gear Signal
19	PK	2384	Park/Neutral Position (PNP) Switch 2nd Gear Signal
20	D-GN/YE	2382	Park/Neutral Position (PNP) Switch Park Signal
21	-	-	Not Used
22	L-BU	20	Stop Lamp Supply Voltage/Stop Lamp Switch Signal
23	D-BU	2051	Serial Data

24	-	-	Not Used
25	D-GN/WH	817	Vehicle Speed Signal
26	-	-	Not Used

Vehicle Speed Sensor (VSS)



Connector Part Information		• Yazaki 7283-1232 • 3-Way F (BK)	
Pin	Wire Color	Circuit No.	Function
1	PK	839	Ignition 1 Voltage
2	BK/WH	51	Ground
3	D-GN/WH	817	Vehicle Speed Signal

VISUAL IDENTIFICATION

AUTOMATIC TRANSMISSION COMPONENTS

During reassembly, please refer to the spring specifications below to help you to discriminate between the different springs.

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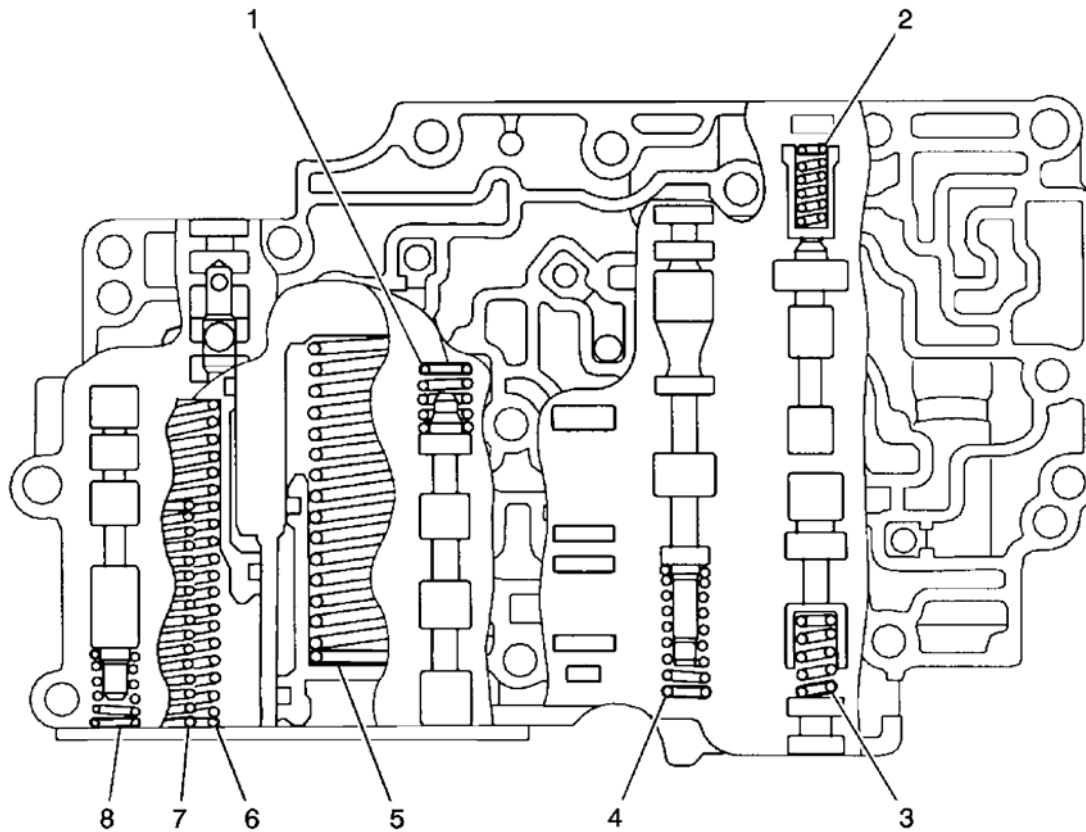


Fig. 27: Upper Valve Body Spring Component View
Courtesy of GENERAL MOTORS CORP.

Automatic Transmission Components

Mark	Name	Color	Free Length		Outer Diameter		Total Number of Coils
			Metric	English	Metric	English	
1	3-4 Shift Valve	Red	25.5 mm	1.0039 in	9.73 mm	0.3831 in	7.75
2	Lock Up Control Valve	Yellow	20.87 mm	0.8217 in	5.55 mm	0.2185 in	11.15
3	Reverse Control Valve	-	25.58 mm	1.0071 in	8.64 mm	0.3402 in	8.75
4	Secondary Regulator Valve	White	34.56 mm	1.3606 in	8.8 mm	0.346 in	12.27
5	Reverse Clutch Accumulator	-	65.4 mm	2.5748 in	17 mm	0.669 in	13.7

	Piston						
6	2nd Brake Accumulator Piston - Outer	White	69 mm	2.7165 in	16 mm	0.63 in	15.1
7	2nd Brake Accumulator Piston - Inner	-	45.9 mm	1.8071 in	10.5 mm	0.413 in	16.9
8	3-4 Shift Timing Valve	Pink	28.41 mm	1.1185 in	6.4 mm	0.252 in	10.49

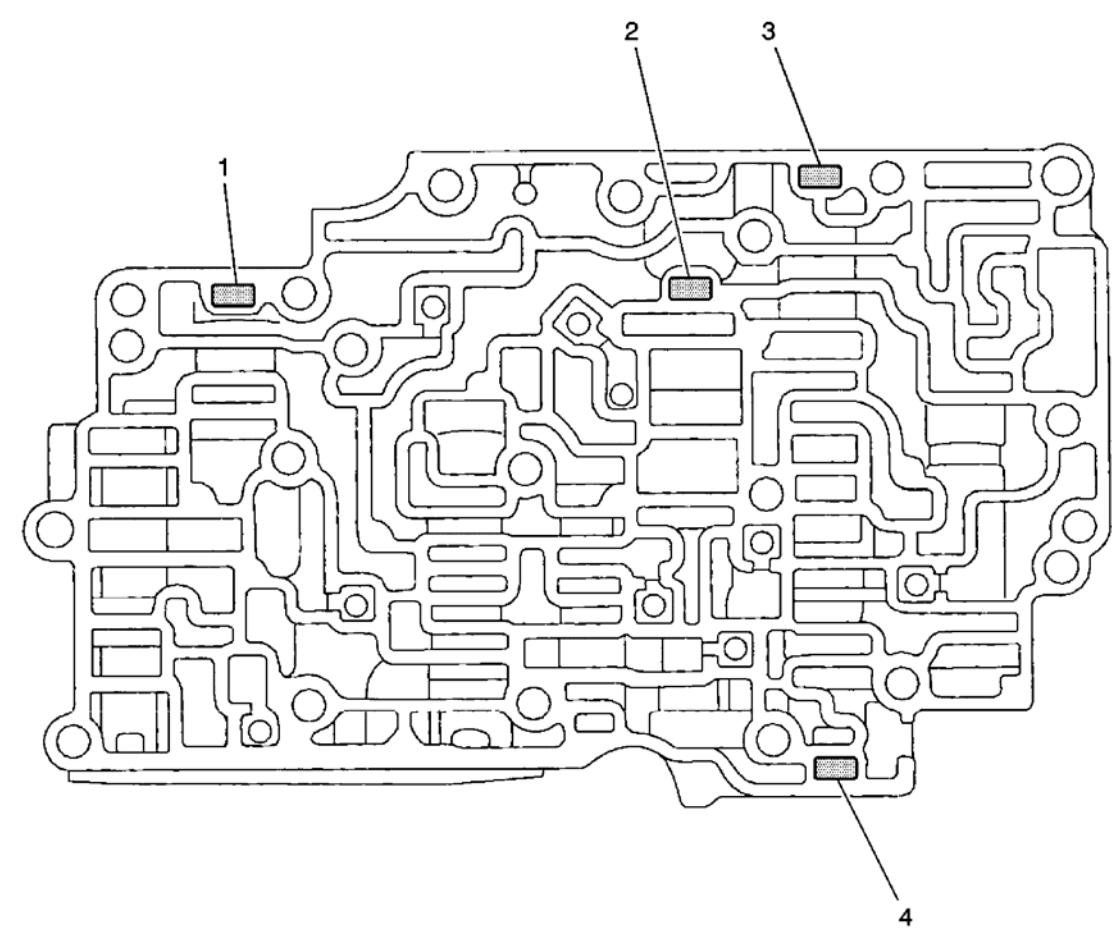


Fig. 28: Upper Valve Body Key Component View
 Courtesy of GENERAL MOTORS CORP.

Automatic Transmission Components

Mark	Retainer	Height		Width		Thickness	
		Metric	English	Metric	English	Metric	English

1	Check Valve	11.5 mm	0.453 in	5 mm	0.197 in	3.2 mm	0.126 in
2	Secondary Regulator Valve	16 mm	0.63 in	5 mm	0.197 in	3.2 mm	0.126 in
3	Lock Up Control Valve	16 mm	0.63 in	5 mm	0.197 in	3.2 mm	0.126 in
4	Reverse Control Valve	11.5 mm	0.453 in	5 mm	0.197 in	3.2 mm	0.126 in

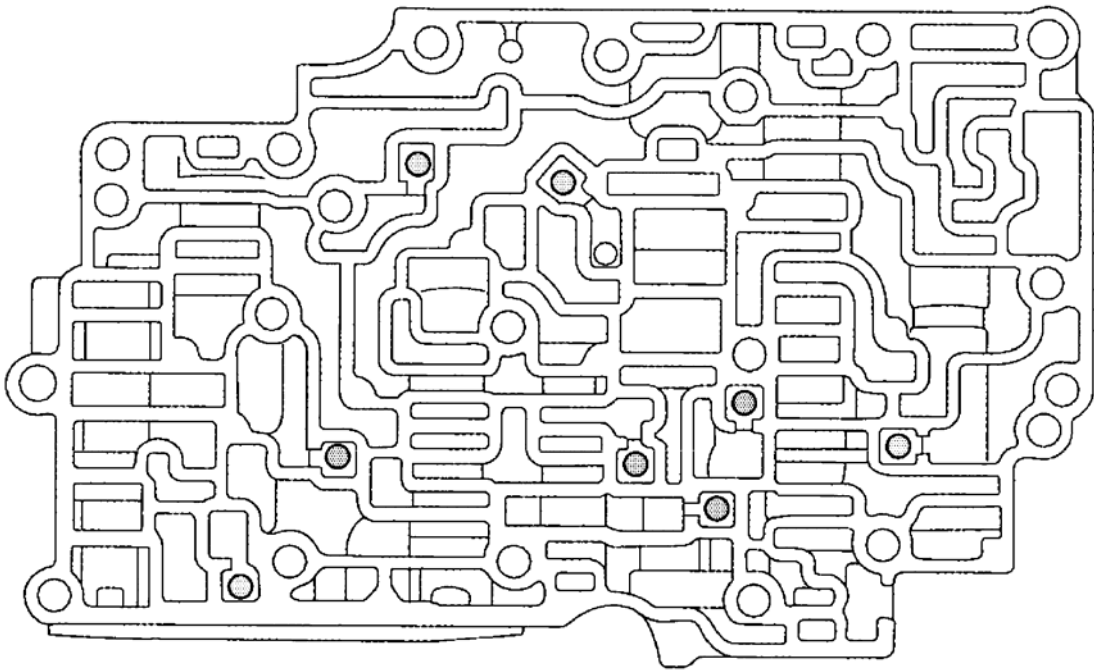


Fig. 29: Upper Valve Body Check Ball Component View
 Courtesy of GENERAL MOTORS CORP.

Automatic Transmission Components

Name	Metric	English
Check Ball	5.535 mm	0.21791 in

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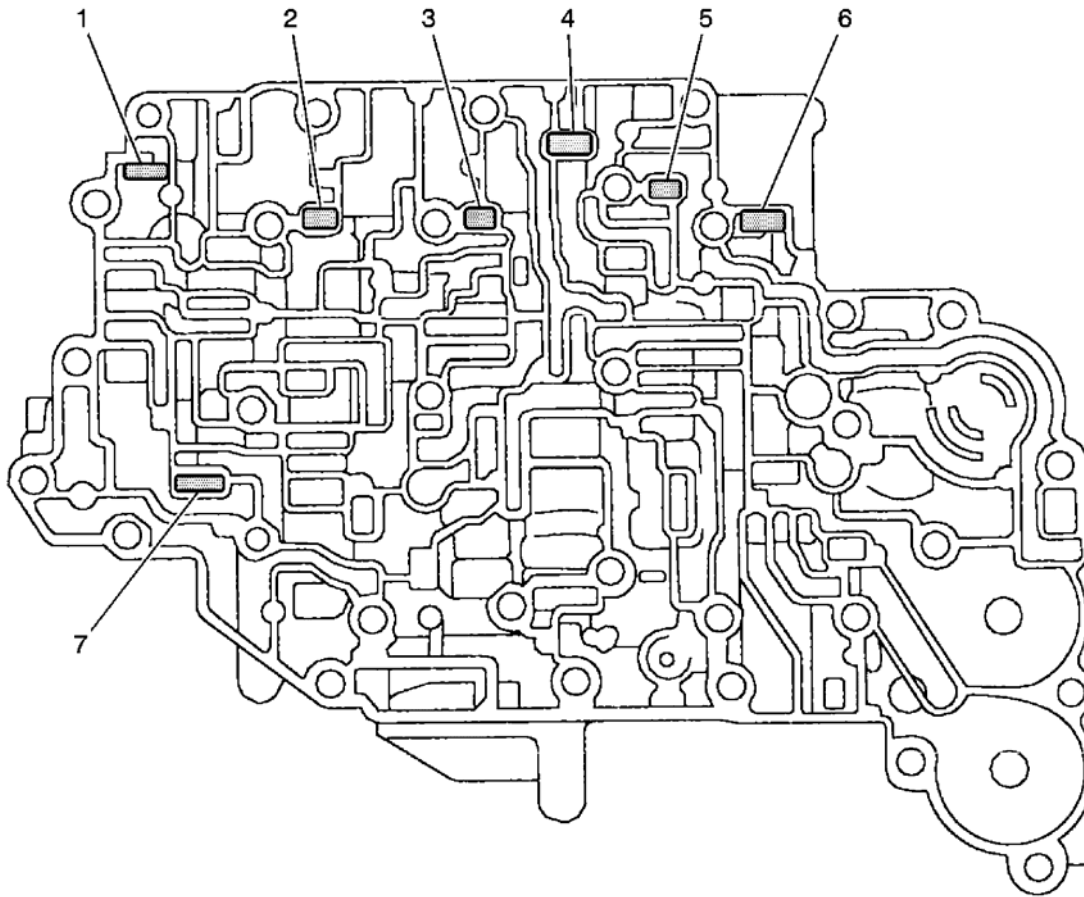


Fig. 30: Lower Valve Body Key Component View
Courtesy of GENERAL MOTORS CORP.

Automatic Transmission Components

Mark	Retainer	Height		Width		Thickness	
		Metric	English	Metric	English	Metric	English
1	4-3 Shift Timing Valve No. 1	36 mm	1.417 in	5 mm	0.197 in	3.2 mm	0.126 in
2	2-3 Shift Valve	10 mm	0.394 in	5 mm	0.197 in	3.2 mm	0.126 in
3	1-2 Shift Valve	10 mm	0.394 in	5 mm	0.197 in	3.2 mm	0.126 in
4	Primary Regulator Valve	9.8 mm	0.386 in	5.2 mm	0.205 in	3.2 mm	0.126 in
5	Lock Up Relay Valve	16 mm	0.63 in	5 mm	0.197 in	3.2 mm	0.126 in
	Solenoid						

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6	Modulator Valve	24 mm	0.945 in	5 mm	0.197 in	3.2 mm	0.126 in
7	Low Modulator Valve	24 mm	0.945 in	5 mm	0.197 in	3.2 mm	0.126 in

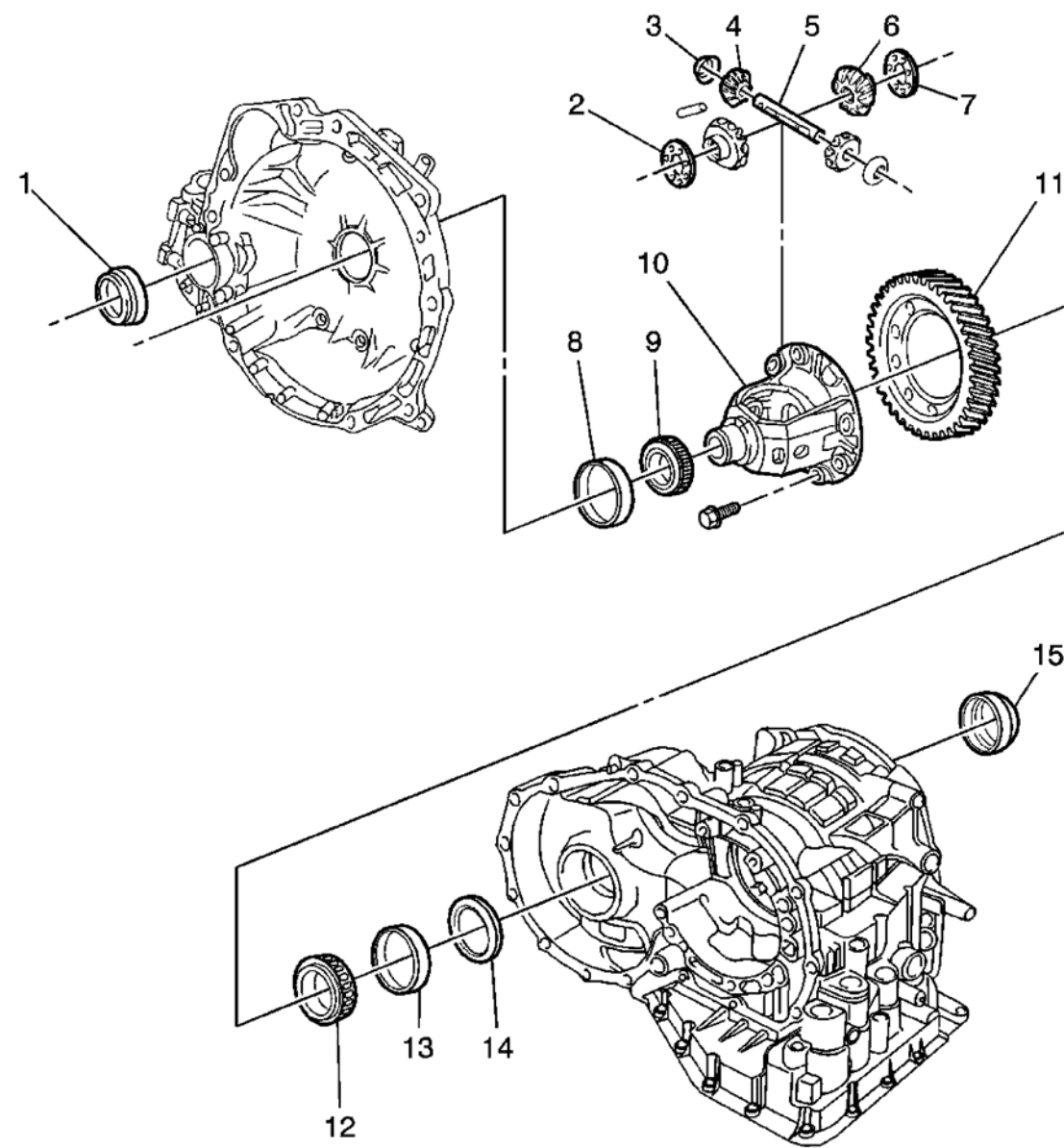


Fig. 31: Differential Case Component View
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 42

Callout	Component Name
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1	Differential Pinion Thrust Washer
2	Differential Pinion Gear
3	Differential Side Gear Thrust Washer
4	Differential Side Gear
5	Pin
6	Differential Pinion Shaft
7	Oil Seal
8	Side Bearing Outer Race
9	Tapered Roller Bearing
10	Differential Case
11	Differential Ring Gear
12	Tapered Roller Bearing
13	Side Bearing Outer Race
14	Shim
15	Oil Seal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC P0562 (Non-Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0562 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0563 (Non-Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0563 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0601 or P1790 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0601 or P1790 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0604 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0604 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0705 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0705 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0706 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0706 (Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0711</u>	DTC P0711Transmission Fluid Temperature (TFT) Sensor Circuit Performance
<u>DTC P0712 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0712 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0713 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0713 (European and N. American Emissions)</u>	** MULTIPLE VALUES **

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<u>DTC P0717 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0717 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0722 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0722 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0727 (Non European or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0727 (European or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0741 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0741 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0742 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0742 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0743 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0743 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0748 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0748 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0751 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0751 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0752</u>	Shift Solenoid (SS1) Valve Performance or Stuck On
<u>DTC P0753 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0753 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0756 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0756 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0757</u>	2-3 Shift Solenoid (SS) Valve Performance or Stuck On
<u>DTC P0758 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0758 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0785 or P1710 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0785 or P1710 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P0787</u>	Timing Solenoid (ST) Electrical (Ground Short)
<u>DTC P0788</u>	Timing Solenoid (ST) Electrical (Open or Short to Power)
<u>DTC P0962</u>	Pressure control solenoid (PCS) Voltage Low
<u>DTC P0963</u>	Pressure control solenoid (PCS) Voltage High
<u>DTC P0973</u>	Shift Solenoid 1 (SS1) Short to Ground
<u>DTC P0974</u>	Shift Solenoid 1 (SS1) Open or Short to Power
<u>DTC P0976</u>	Shift Solenoid 2 (SS2) Short to Ground

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<u>DTC P0977</u>	Shift Solenoid 2 (SS2) Open or Short to Power
<u>DTC P1701 or P1792 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P1701 or P1792 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P1702 (Non European or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P1702 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P1781</u>	Malfunction of Engine Speed Signal
<u>DTC P1791 (European and N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P1791 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC P2769</u>	Torque Converter Clutch (TCC) Electrical (Ground Short)
<u>DTC P2770</u>	Torque Converter Clutch (TCC) Electrical (Open or Short to Power)
<u>DTC U0401</u>	TCM Received Invalid Data from ECM
<u>DTC U2105 (Non Europe or N. American Emissions)</u>	** MULTIPLE VALUES **
<u>DTC U2105 (Europe and N. American Emissions)</u>	** MULTIPLE VALUES **

REPAIR INSTRUCTIONS

TRANSMISSION FLUID TEMPERATURE SENSOR REPLACEMENT

Removal Procedure

IMPORTANT: The Transmission Fluid Temperature (TFT) sensor is incorporated into the wiring harness assembly. The harness and sensor have to be replaced as an assembly

1. Drain the transaxle fluid from the transaxle. Refer to **Draining Transmission Fluid**.

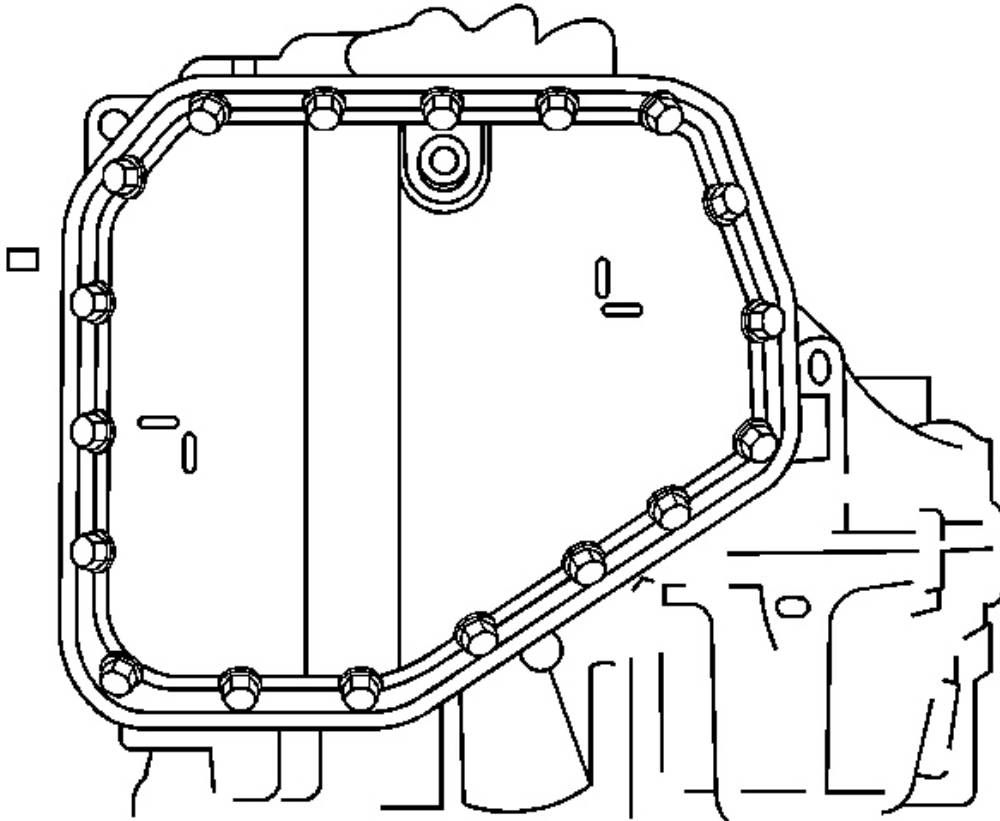


Fig. 32: Transmission Pan Bolts

Courtesy of GENERAL MOTORS CORP.

2. Remove the 18 oil pan retaining bolts, then remove the oil pan and gasket.

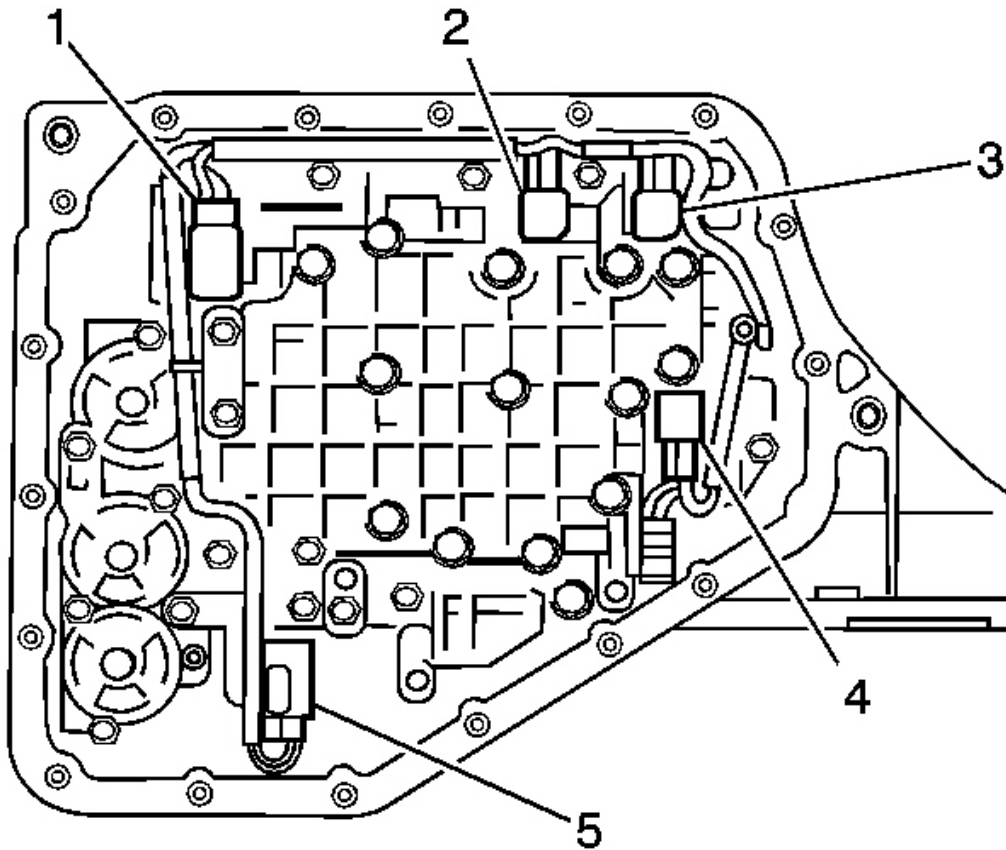


Fig. 33: Solenoids & Wiring Harness Assembly
Courtesy of GENERAL MOTORS CORP.

3. Disconnect the wiring harness assembly from the five solenoids.

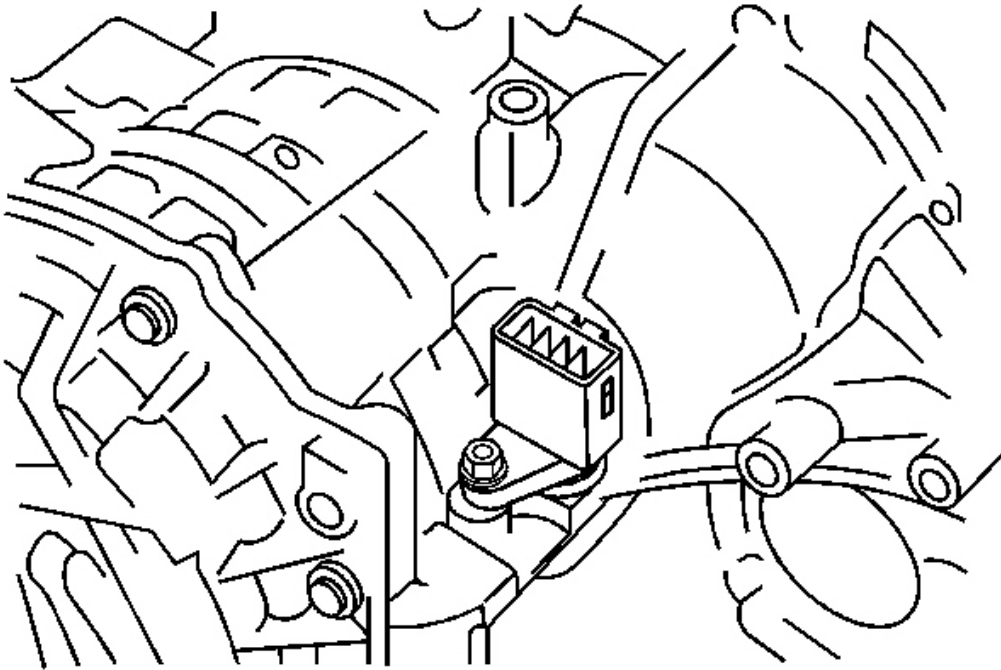


Fig. 34: Locating Transmission Fluid Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

4. Remove the wiring harness retaining bolt, then remove the wiring harness and TFT sensor from the transaxle.

Installation Procedure

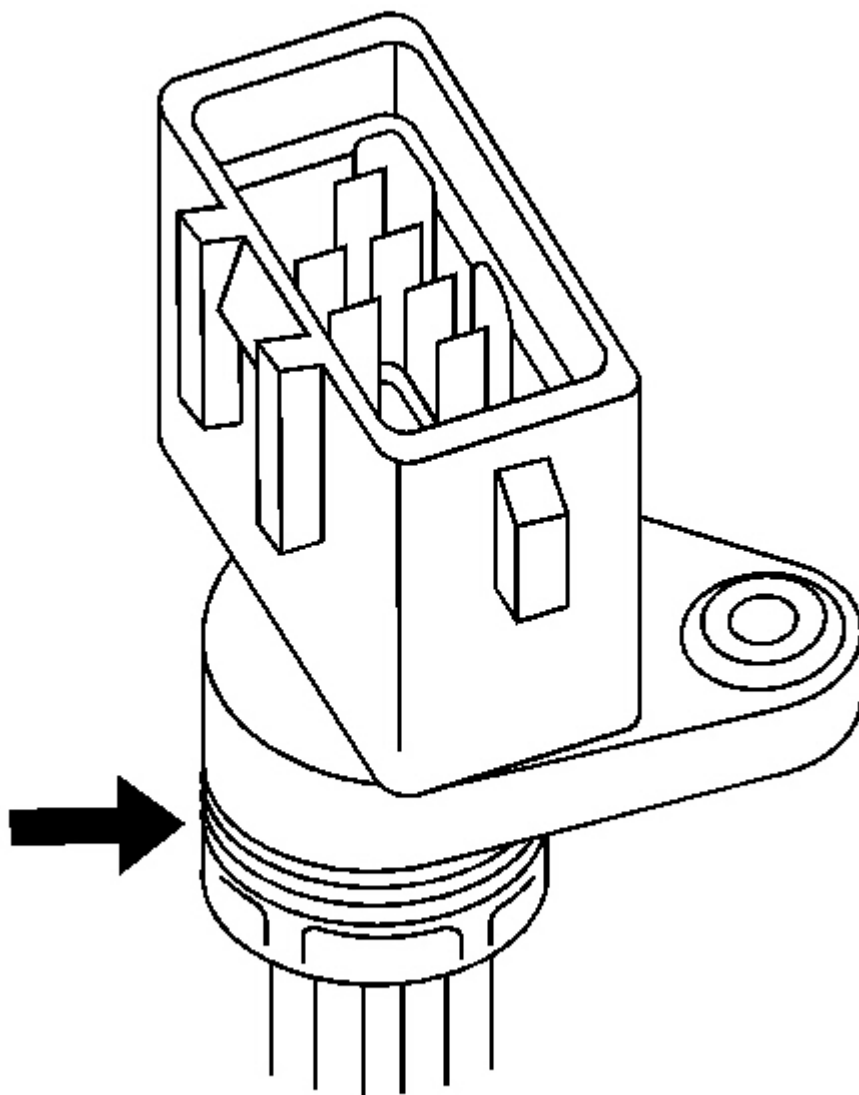


Fig. 35: Transmission Fluid Temperature Sensor
Courtesy of GENERAL MOTORS CORP.

1. Coat a new O-ring with ATF, then install it on the harness connector.
2. Install the TFT sensor and wiring harness into the transaxle case.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the wiring harness retaining bolt.

Tighten: Tighten the bolt to 5.5 Nm (48 lb-in).

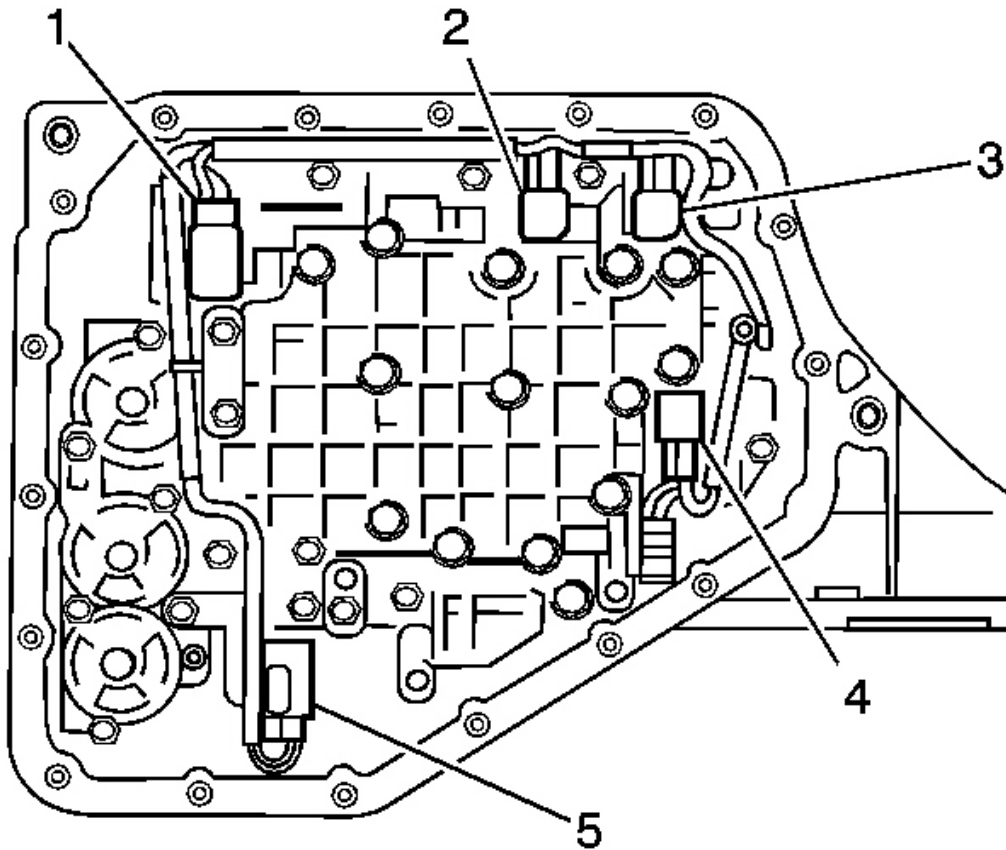


Fig. 36: Solenoid Wiring Harness Assembly
Courtesy of GENERAL MOTORS CORP.

4. Connect the wiring harness to the five solenoids.

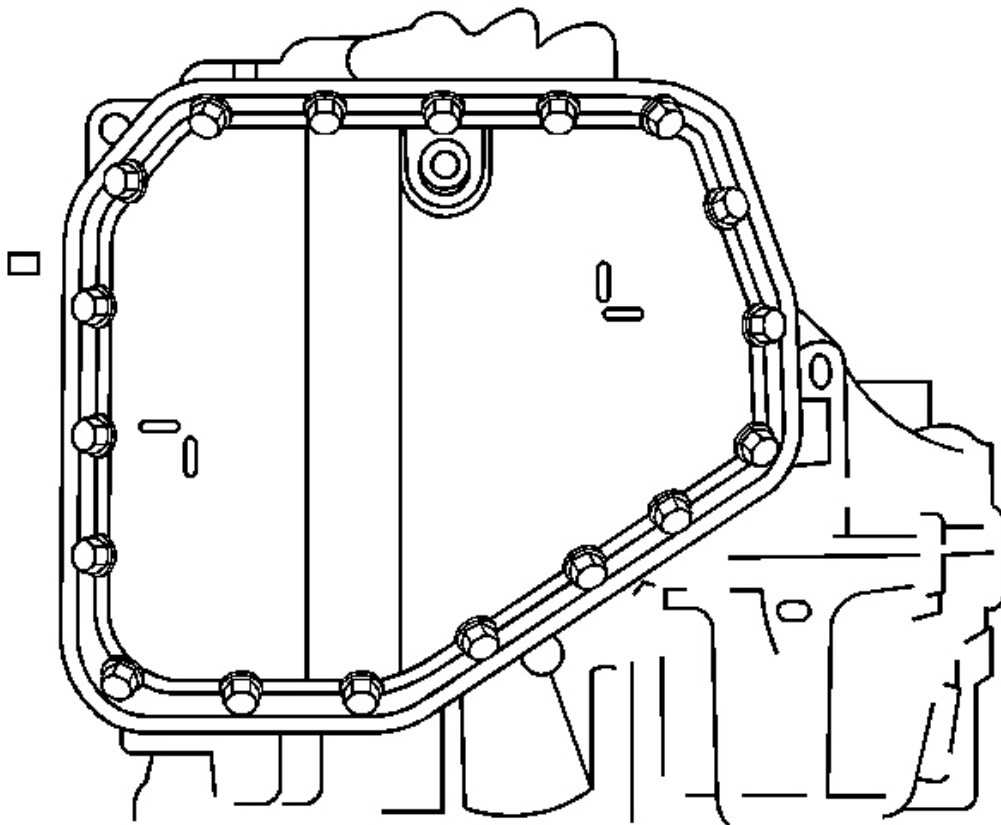


Fig. 37: Transmission Pan Bolts

Courtesy of GENERAL MOTORS CORP.

5. Install a new gasket on the oil pan, then install the oil pan to the transaxle with the 18 retaining bolts.

Tighten: Tighten the bolts to 7.5 Nm (65 lb-in).

6. Fill the transaxle with fluid. Refer to **Draining Transmission Fluid**.

GEARSHIFT CONTROL LEVER REPLACEMENT

Removal Procedure

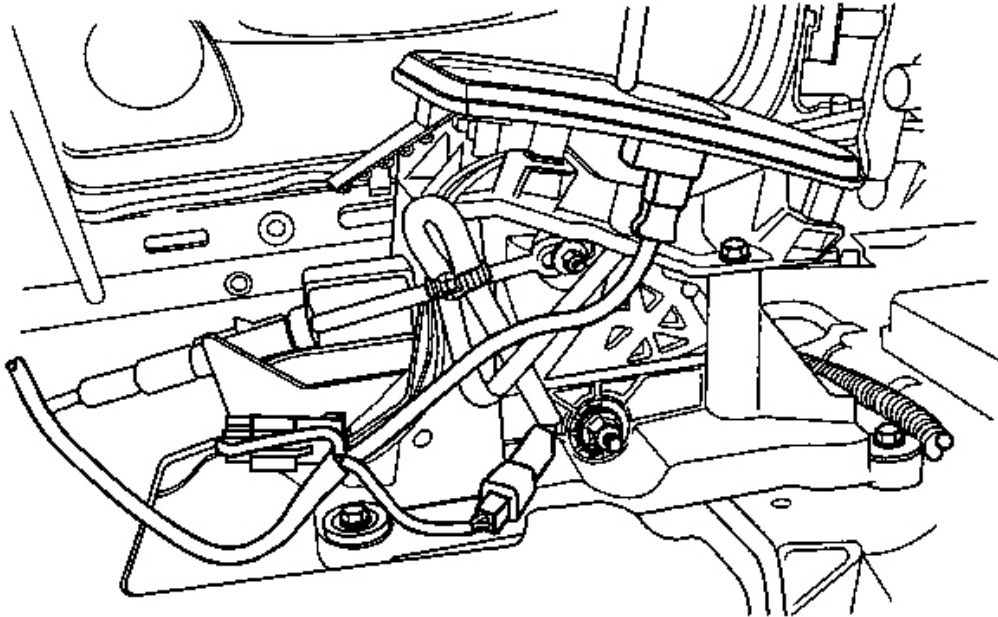


Fig. 38: Wiring Harness Connectors & Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution .

1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to Console Replacement - Front Floor .
3. Disconnect the wiring harness connectors from the shift control lever.

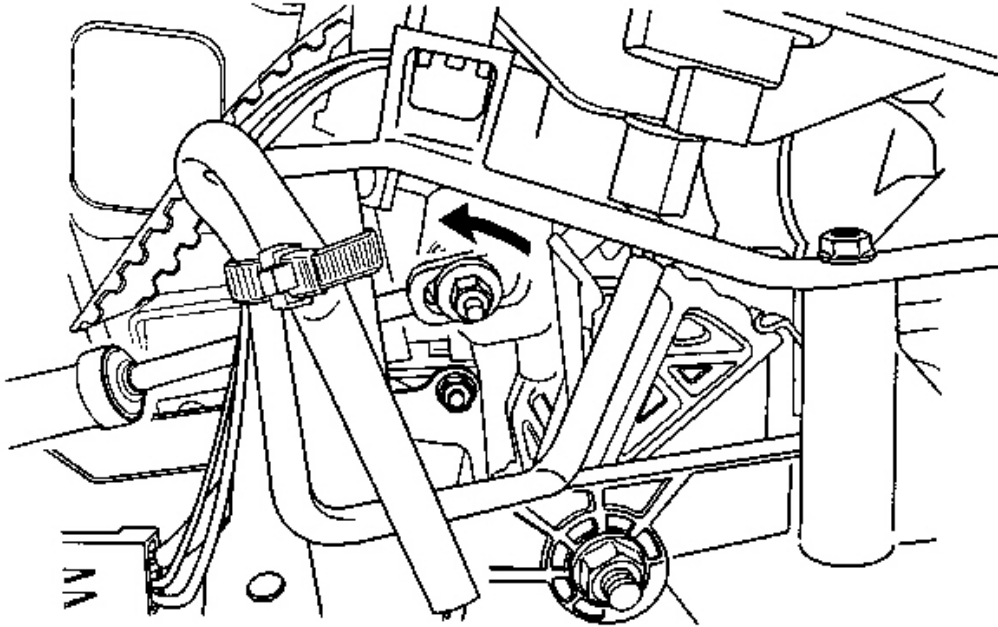


Fig. 39: Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

4. Loosen the control cable adjusting nut.
5. Disconnect the control cable from the shift control lever assembly.

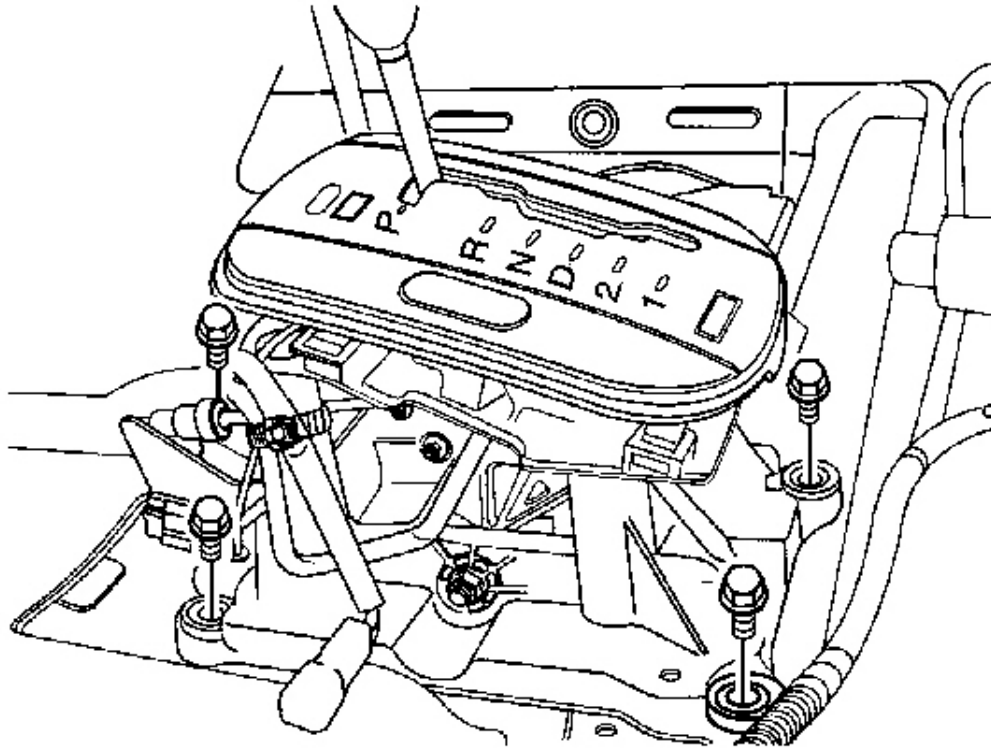


Fig. 40: Removing Shift Control Lever Assembly & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the shift control lever assembly mounting bolts.
7. Remove the shift control lever assembly.

Installation Procedure

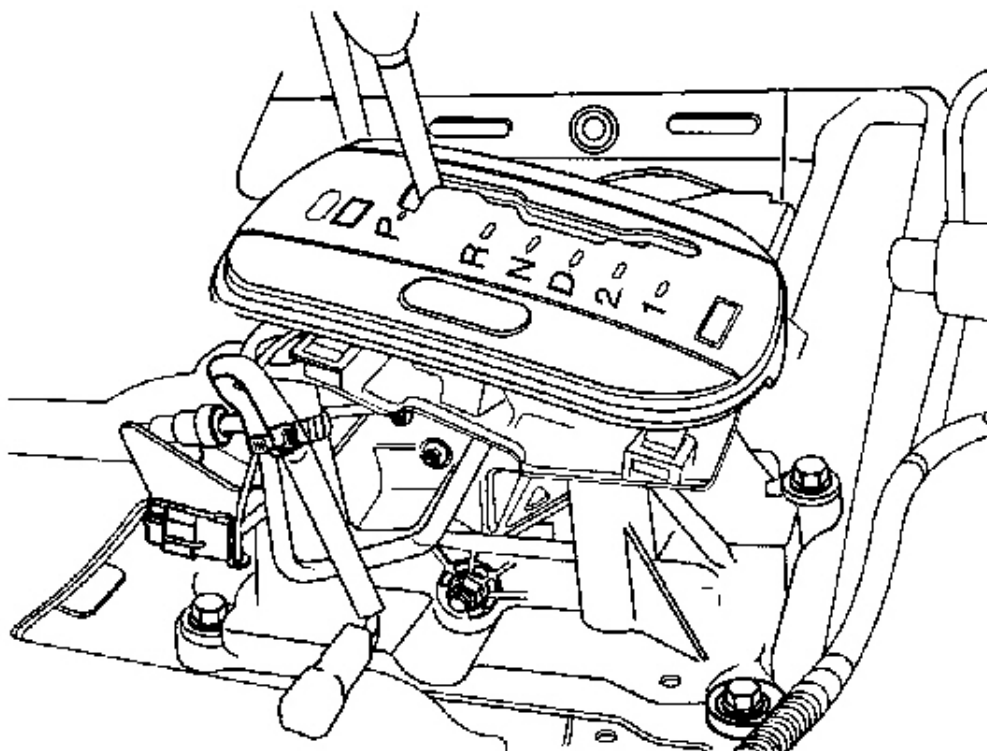


Fig. 41: Installing Shift Control Lever Assembly & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

1. Install the shift control lever assembly and mounting bolts.

Tighten: Tighten the shift control lever assembly mounting bolts to 8 N.m (71 lb in).

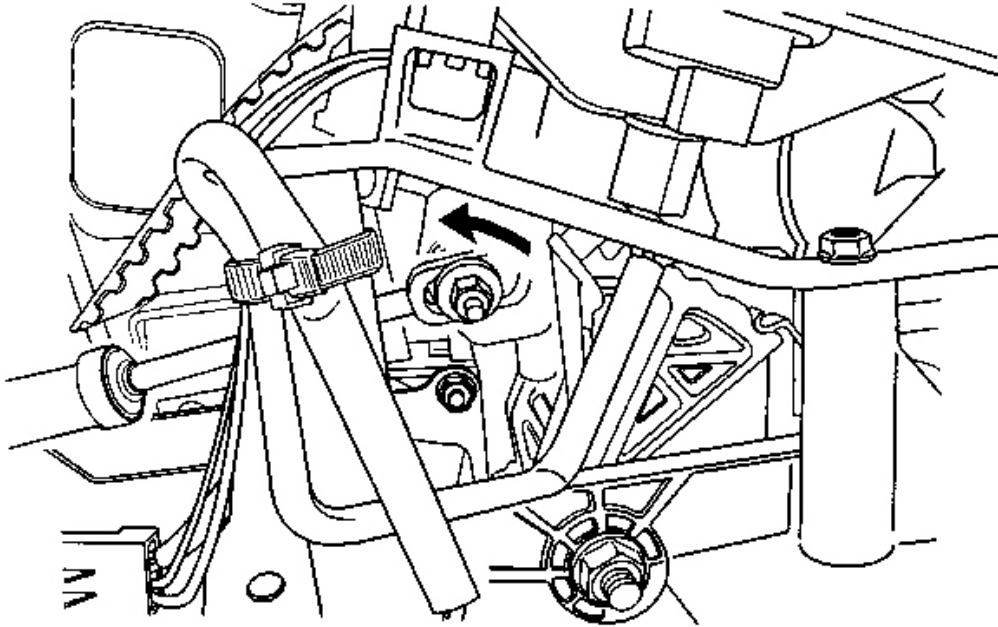


Fig. 42: Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

2. Connect the control cable to the shift control lever assembly.
3. Tighten the control cable adjusting nut.

Tighten: Tighten the control cable adjusting nut to 8 N.m (71 lb in).

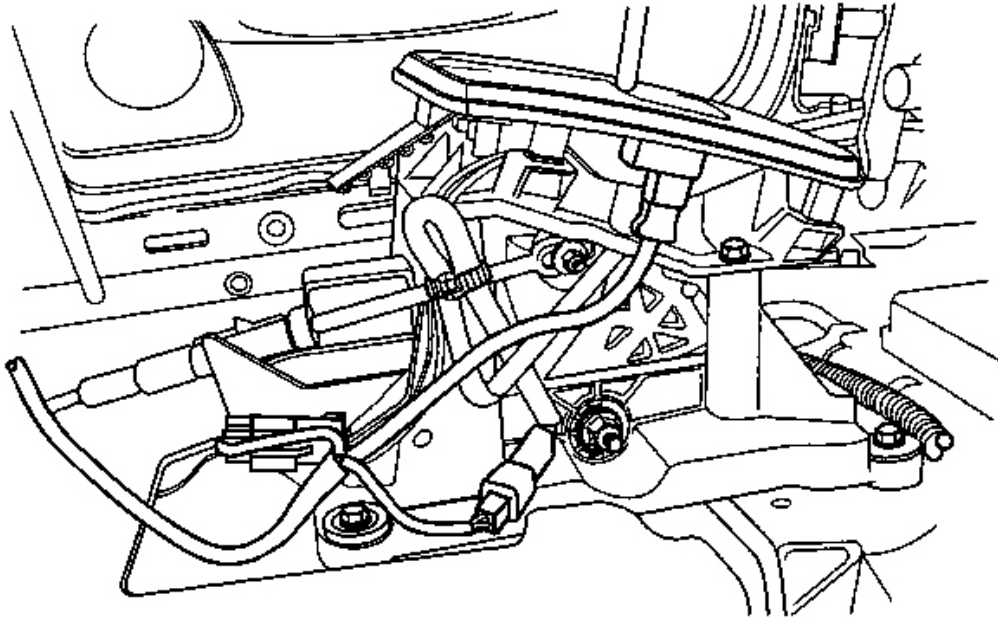


Fig. 43: Wiring Harness Connectors & Shift Control Lever
Courtesy of GENERAL MOTORS CORP.

4. Connect the harness connector.
5. Adjust the control cable. Refer to **Automatic Transmission Range Selector Cable Adjustment**.
6. Install the floor console. Refer to **Console Replacement - Front Floor**.
7. Connect the negative battery cable.

SHIFT CONTROL CABLE REPLACEMENT - FLOOR SHIFT

Removal Procedure

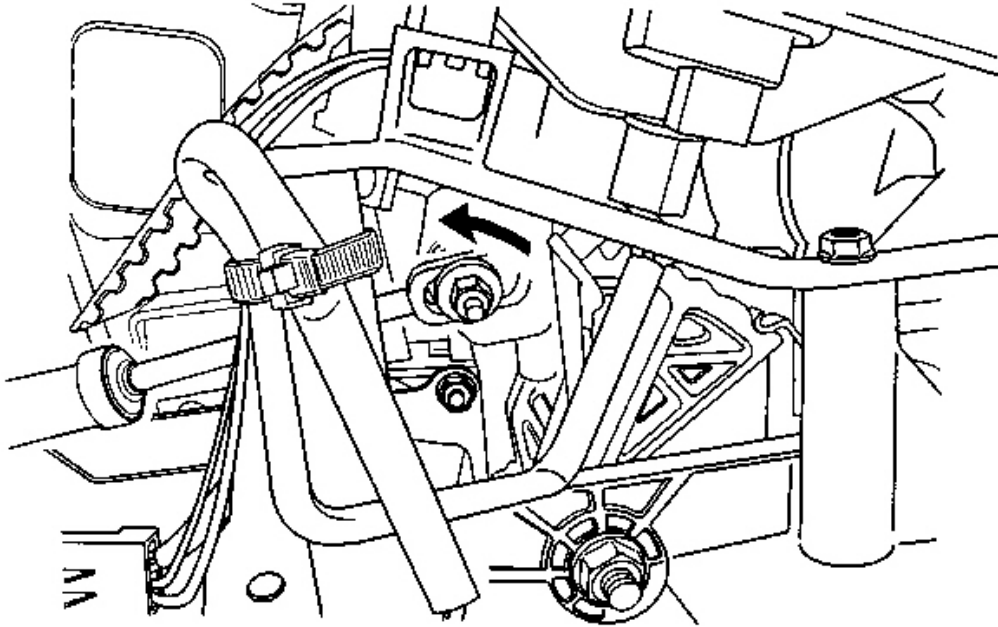


Fig. 44: Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to Console Replacement - Front Floor in Instrument Panel, Gages, and Console.
3. Remove the cable adjusting nut.
4. Disconnect the shift control cable from the shift control lever assembly.

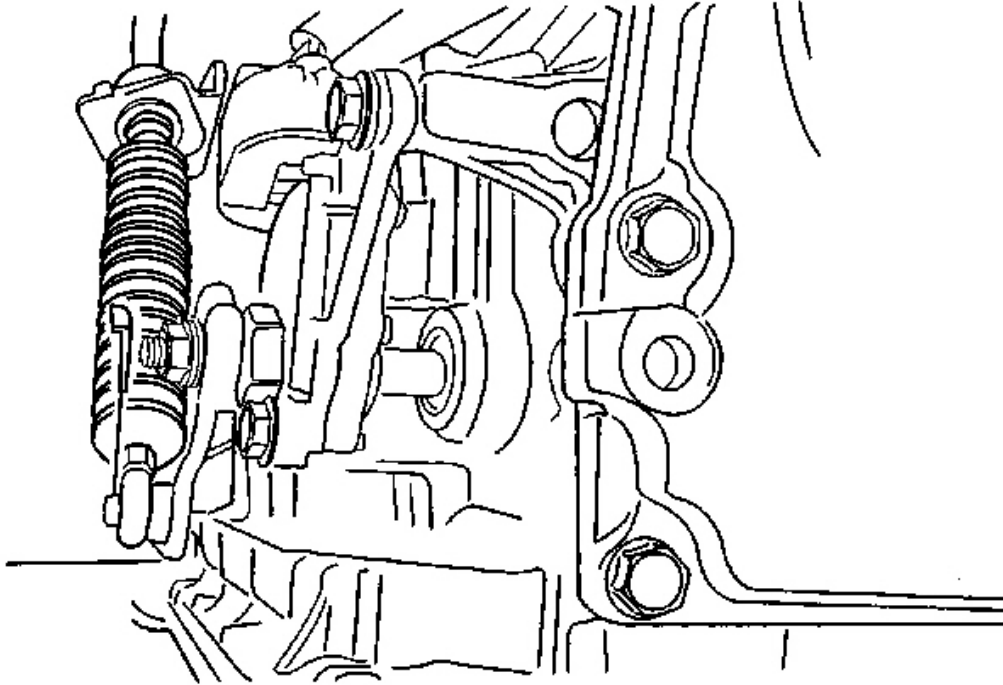


Fig. 45: Shift Control Cable & PNP Switch Lever
Courtesy of GENERAL MOTORS CORP.

5. Remove the shift control cable retaining E-ring.
6. Disconnect the shift control cable from the park/neutral position (PNP) switch.

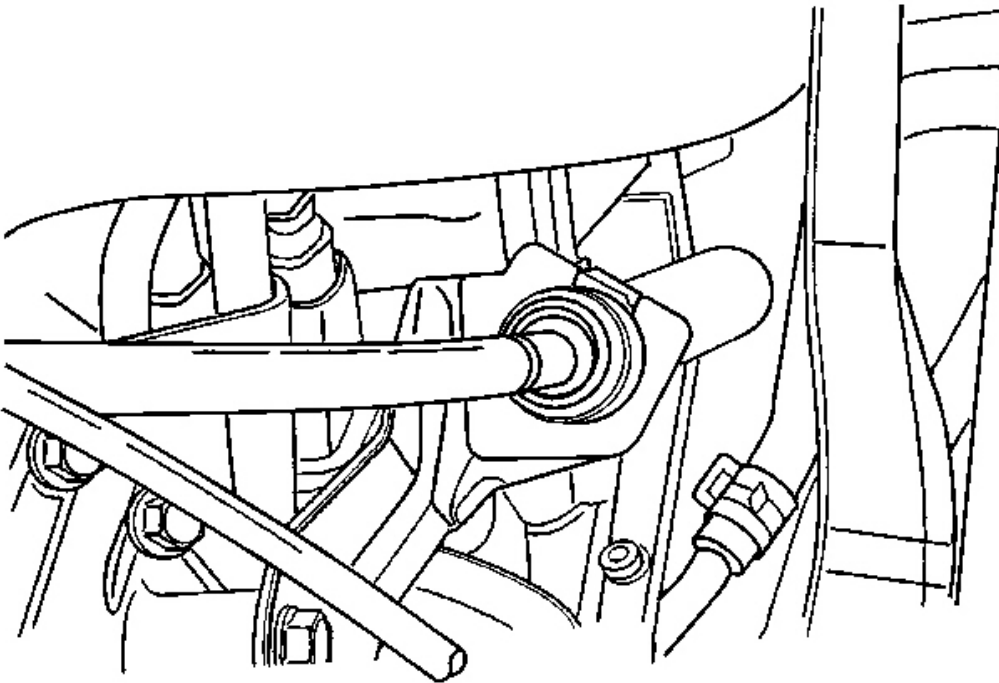


Fig. 46: Shift Control Cable, Bracket & Fastener
Courtesy of GENERAL MOTORS CORP.

7. Remove the E-ring from the shift control cable bracket and disconnect the shift control cable.
8. Disconnect the shift control cable from the shift control cable fastener.
9. Remove the shift control cable from the vehicle.

Installation Procedure

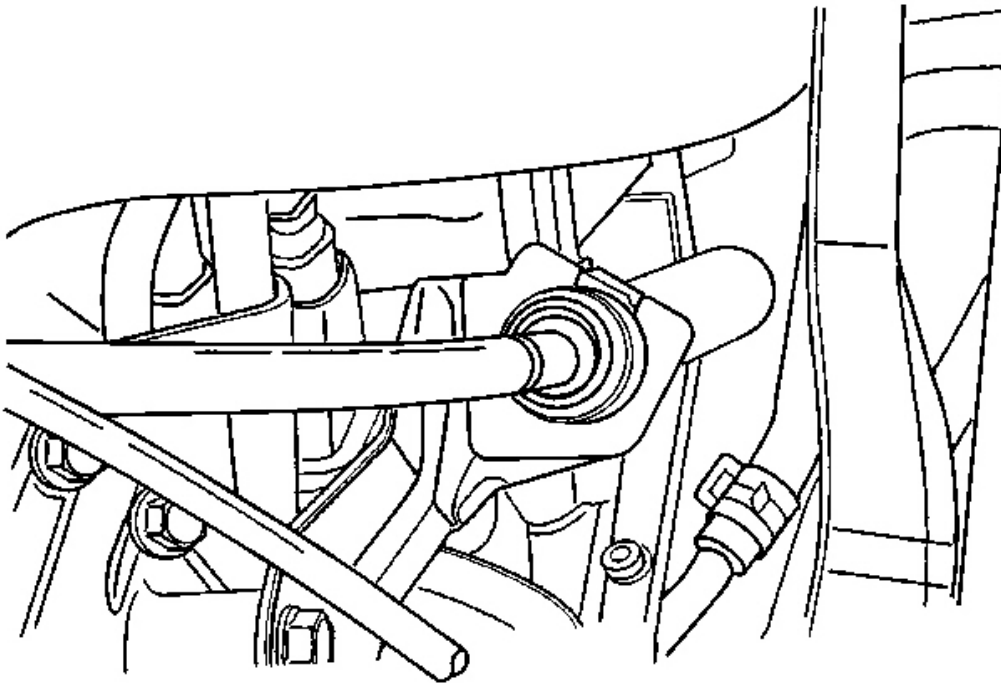


Fig. 47: Shift Control Cable, Bracket & Fastener
Courtesy of GENERAL MOTORS CORP.

1. Install the shift control cable to the vehicle.
2. Connect the shift control cable to the shift control cable fastener.
3. Install the E-ring to the shift control cable bracket and connect the shift control cable.

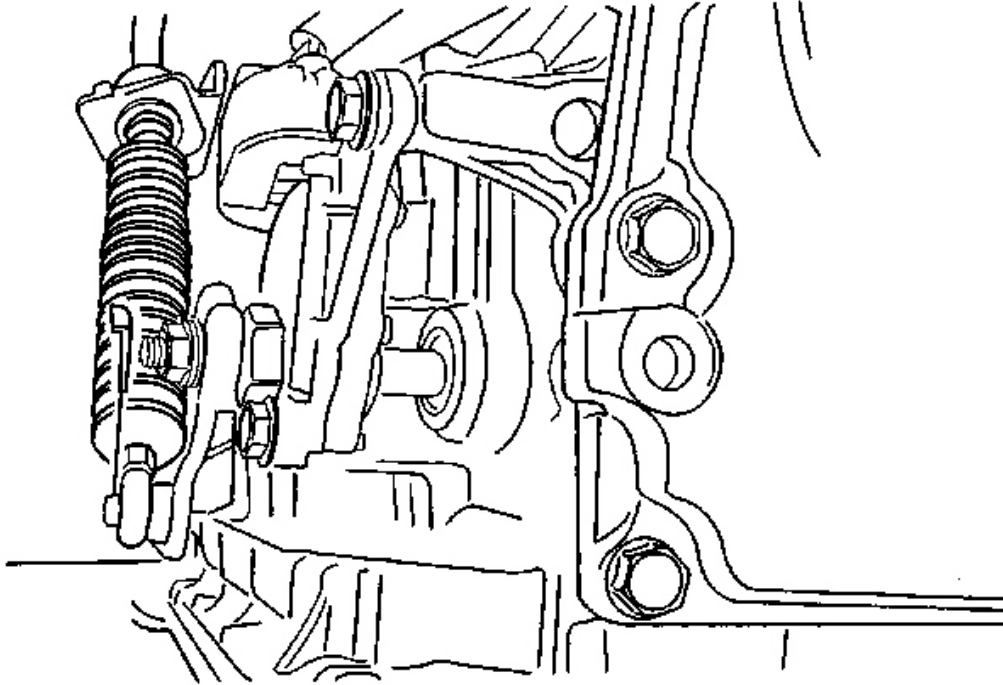


Fig. 48: Shift Control Cable & PNP Switch Lever
Courtesy of GENERAL MOTORS CORP.

4. Connect the shift control cable to the PNP switch.
5. Install the shift control cable retaining E-ring.

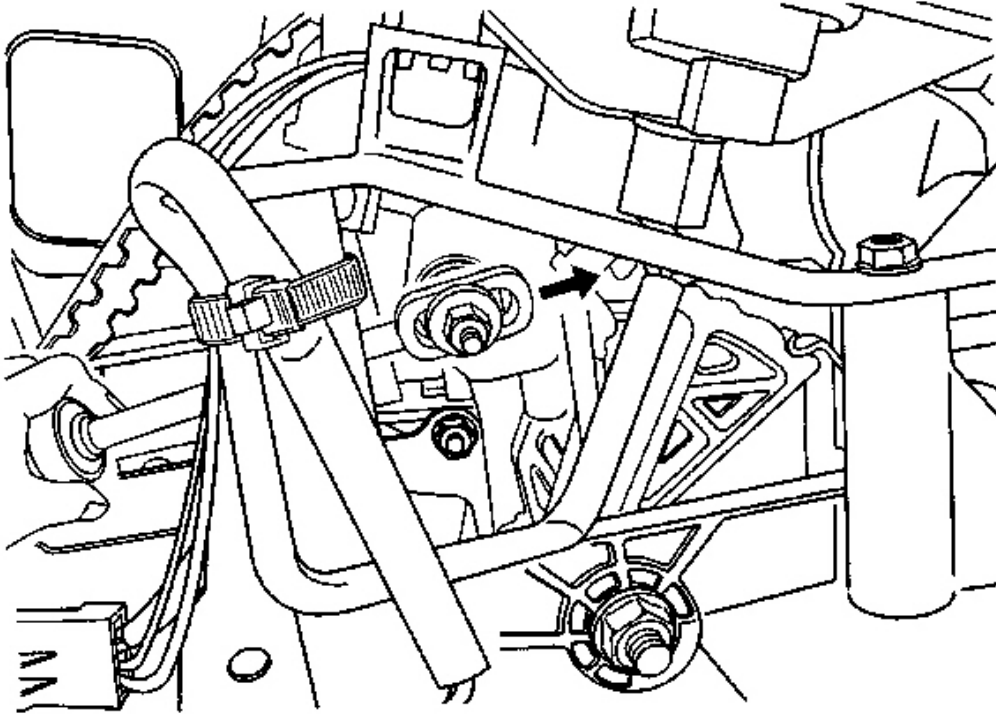


Fig. 49: Shift Control Cable & Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

6. Connect the shift control cable to the shift control lever assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

7. Install the cable adjusting nut.

Tighten: Tighten the cable adjusting nut to 8 N.m (71 lb in).

8. Install the trim panel to the floor console. Refer to Console Replacement - Front Floor in Instrument Panel, Gages, and Console.
9. Connect the negative battery cable.

CONSOLE SHIFT LEVER BEZEL REPLACEMENT

Removal Procedure

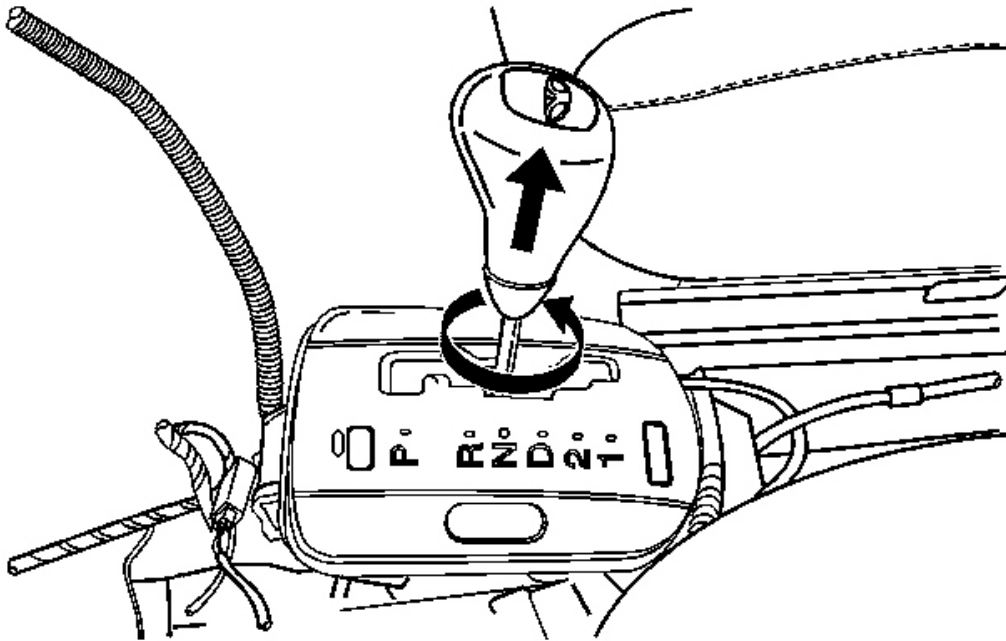


Fig. 50: Removing Shift Select Lever Knob
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Remove the floor console. Refer to Console Replacement - Front Floor in Instrument Panel, Gages, and Console.
3. Remove the shift select lever knob.

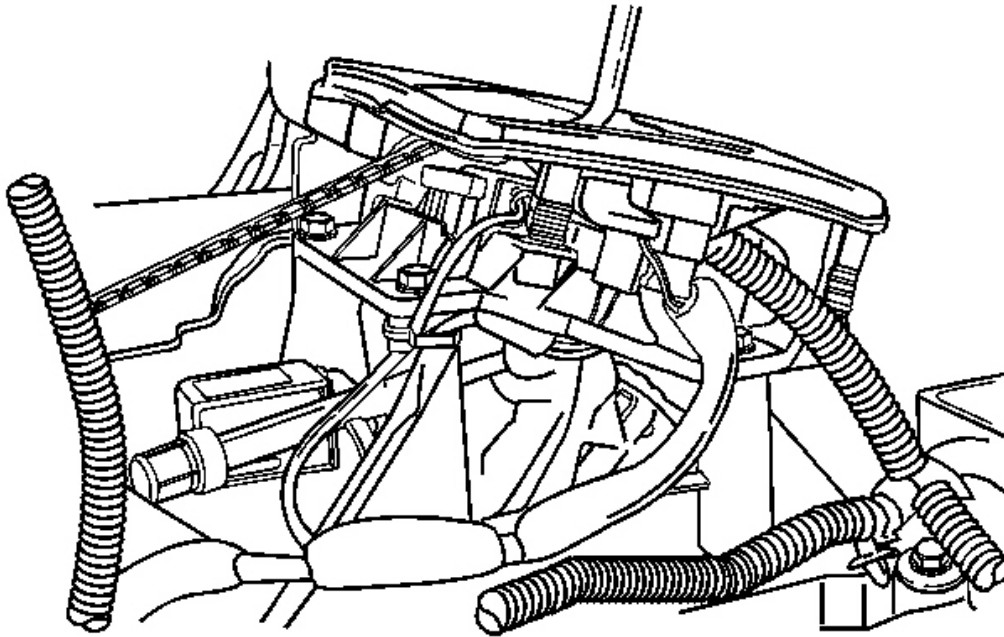


Fig. 51: Shift Select Cover, Shift Select Housing & Connectors
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the connectors.
5. Remove the shift select cover from the shift select housing.

Installation Procedure

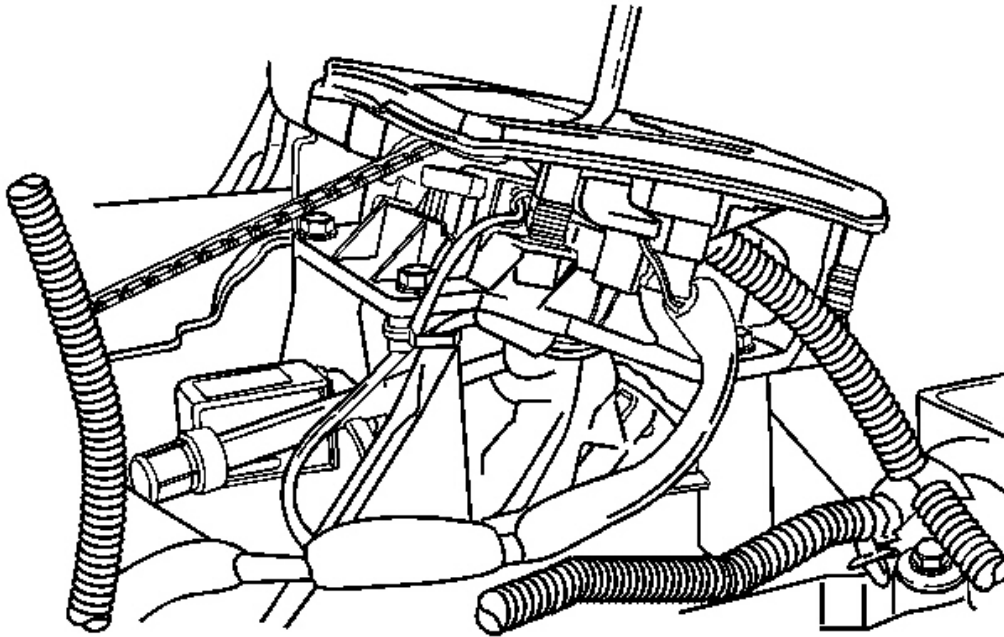


Fig. 52: Shift Select Cover, Shift Select Housing & Connectors
Courtesy of GENERAL MOTORS CORP.

1. Connect the connectors to the shift select cover.
2. Install the shift select cover to the hole.

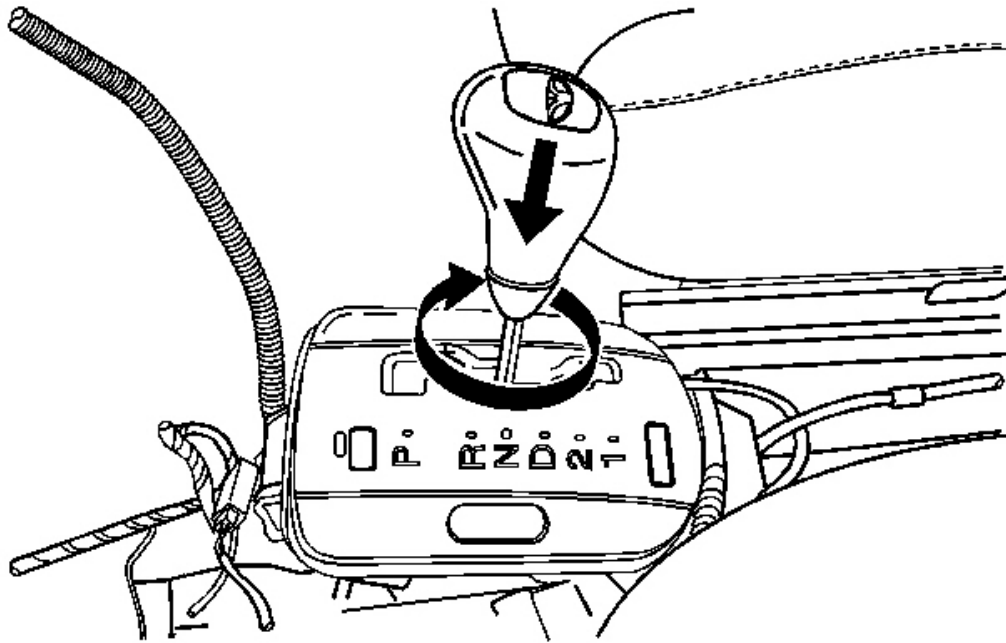


Fig. 53: Installing Shift Select Lever Knob
Courtesy of GENERAL MOTORS CORP.

3. Install the shift select lever knob.
4. Install the floor console. Refer to **Console Replacement - Front Floor** in Instrument Panel, Gages, and Console.
5. Connect the negative battery cable.

INPUT SHAFT SPEED SENSOR REPLACEMENT

Removal Procedure

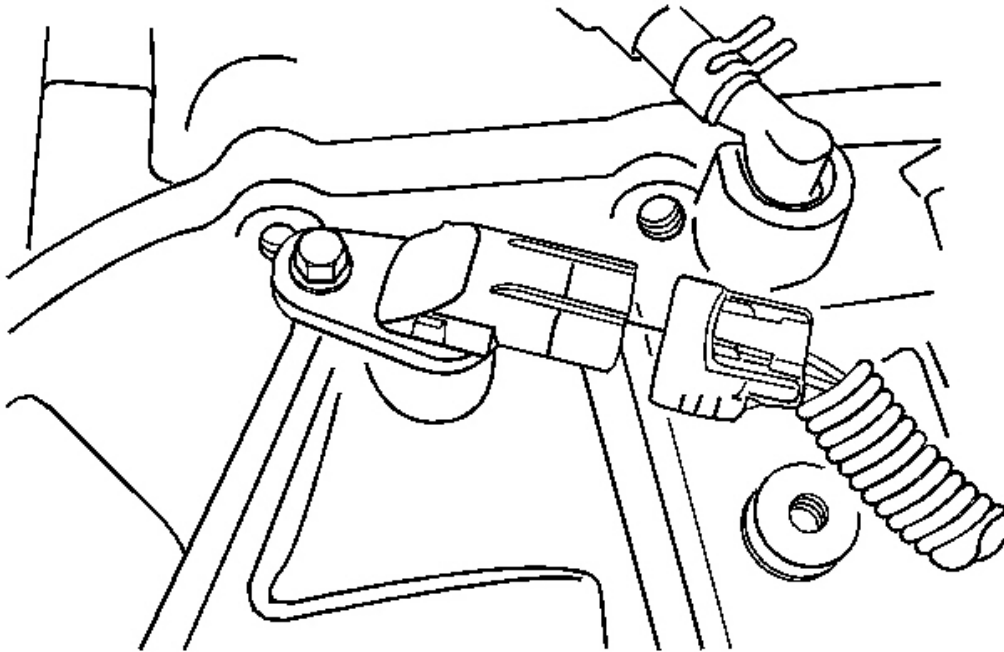


Fig. 54: ISS Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Disconnect the input shaft speed (ISS) sensor electrical connector.

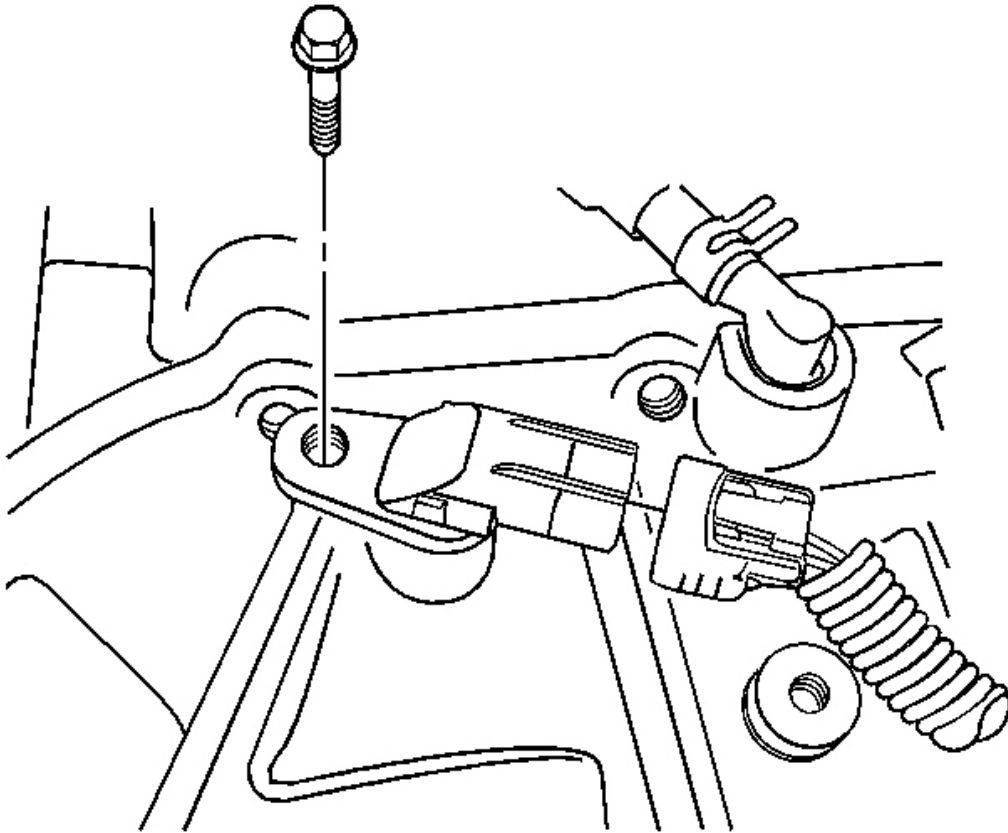


Fig. 55: ISS Sensor & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the ISS sensor retaining bolt.
4. Remove the ISS sensor from the transaxle.

Installation Procedure

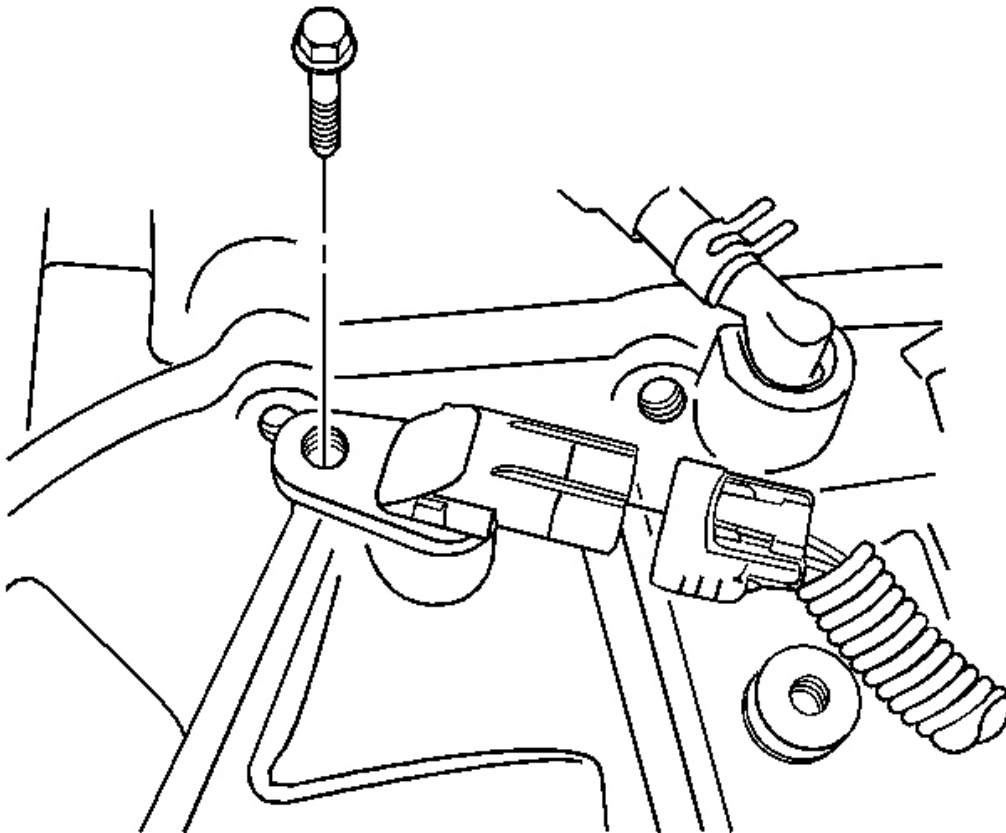


Fig. 56: ISS Sensor & Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Lubricate the O-ring with ISU DEXRON III.

1. Install a new O-ring on the ISS sensor.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the ISS sensor and retaining bolt into the transaxle case.

Tighten: Tighten the ISS sensor retaining bolt to 5.4 N.m (48 lb in).

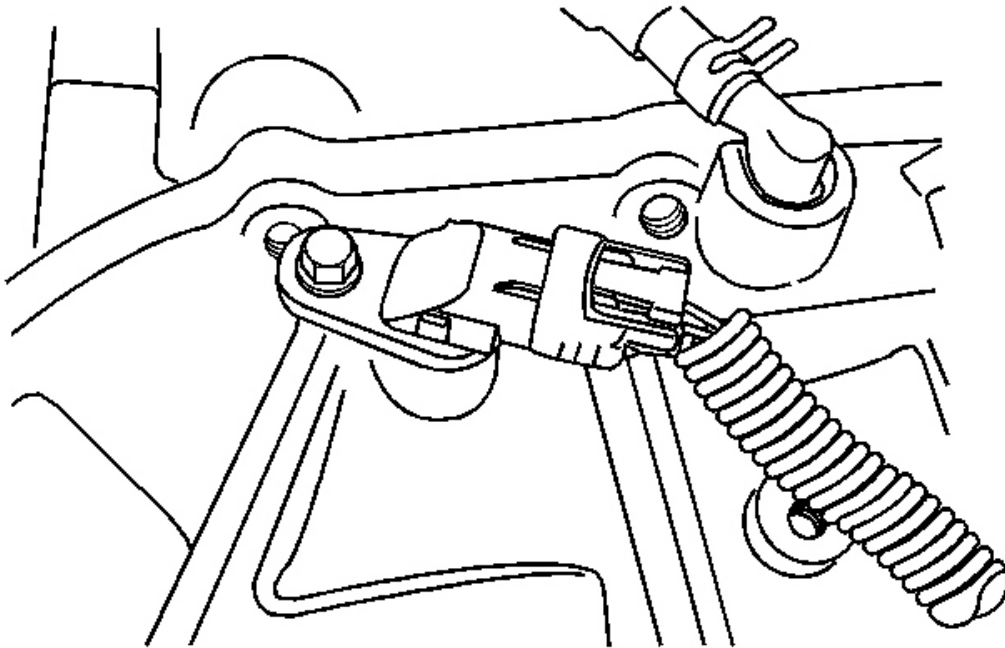


Fig. 57: ISS Sensor & Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the ISS sensor electrical connector.
4. Connect the negative battery cable.

OUTPUT SHAFT SPEED SENSOR REPLACEMENT

Removal Procedure

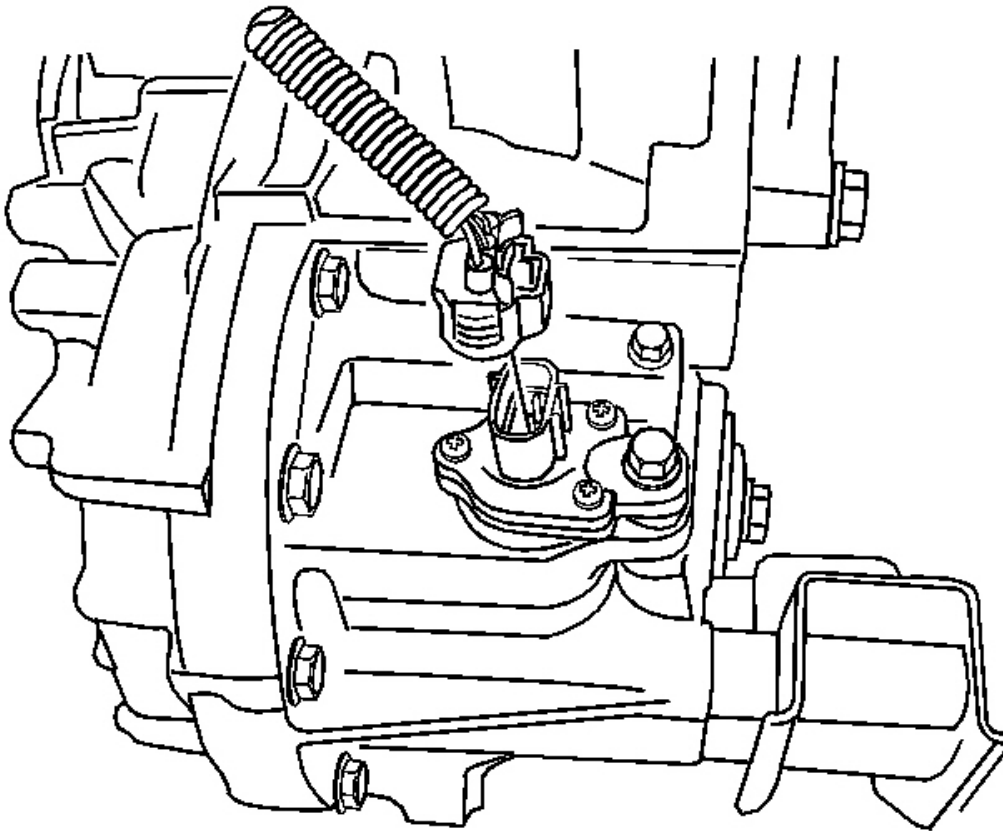


Fig. 58: OSS Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Disconnect the output shaft speed (OSS) sensor electrical connector.

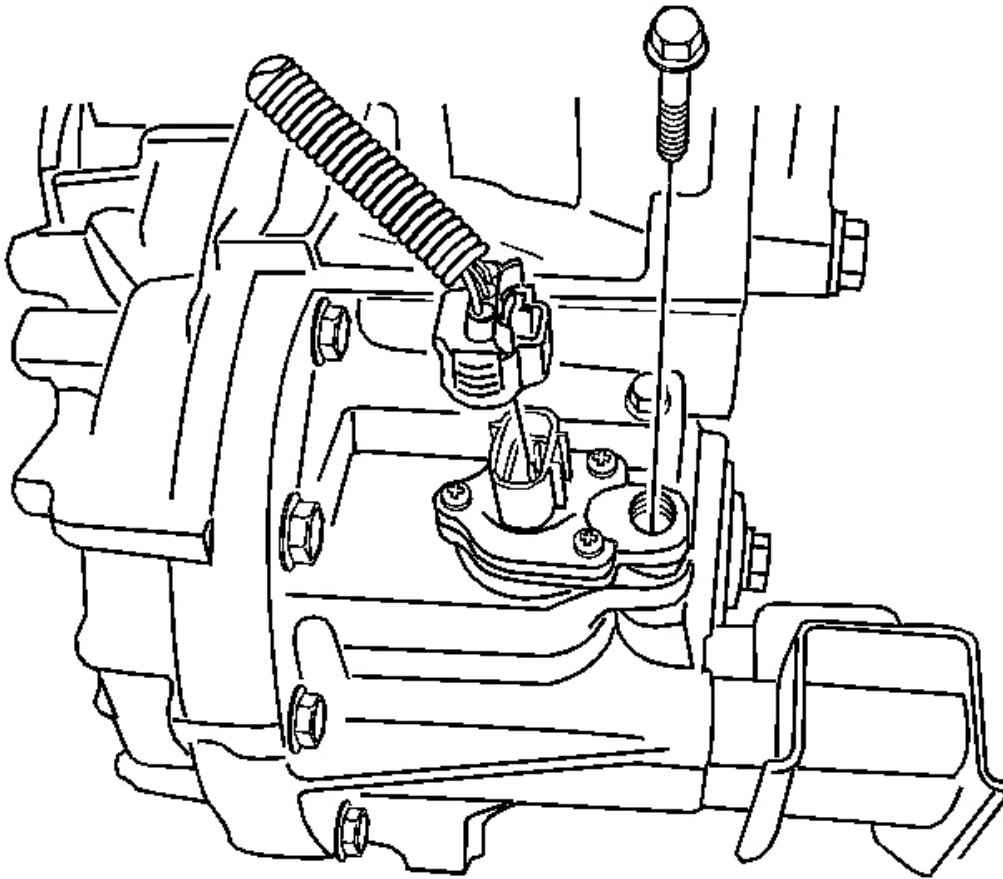


Fig. 59: OSS Sensor Retaining Bolt
Courtesy of GENERAL MOTORS CORP.

3. Remove the OSS sensor retaining bolt.
4. Remove the OSS sensor from the transaxle.

Installation Procedure

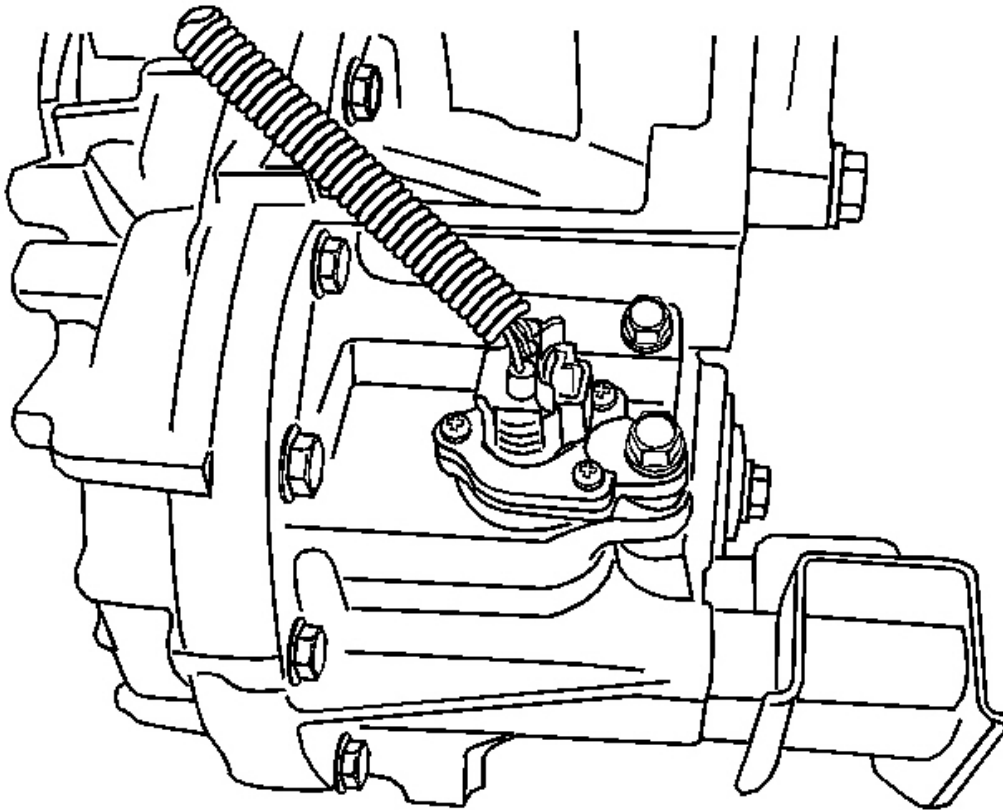


Fig. 60: OSS Sensor, Retaining Bolt & O-Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Lubricate the O-ring with T-IV Automatic Transmission Fluid GM P/N 88900925 (Canadian P/N 22689186).

1. Install a new O-ring on the OSS sensor.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the OSS sensor and retaining bolt into the transaxle.

Tighten: Tighten the OSS sensor retaining bolt to 7.4 N.m (65 lb in).

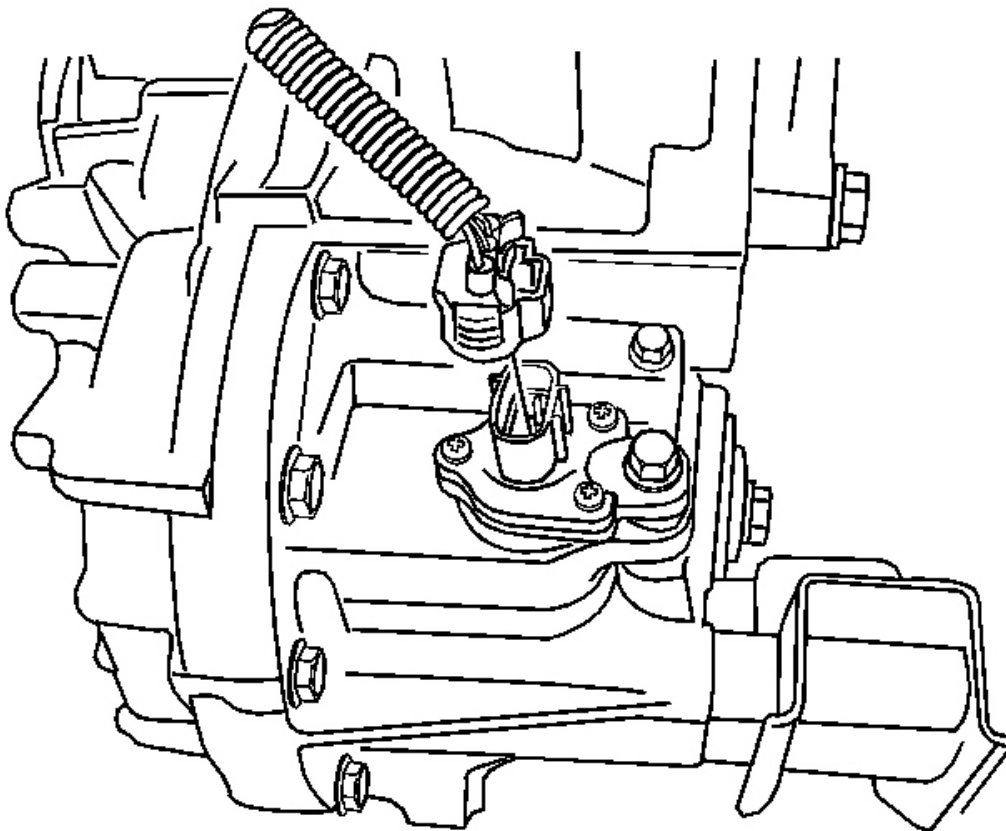


Fig. 61: OSS Sensor Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the OSS sensor electrical connector.
4. Connect the negative battery cable.

TRANSMISSION CONTROL MODULE (TCM) REPLACEMENT

Removal Procedure

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.

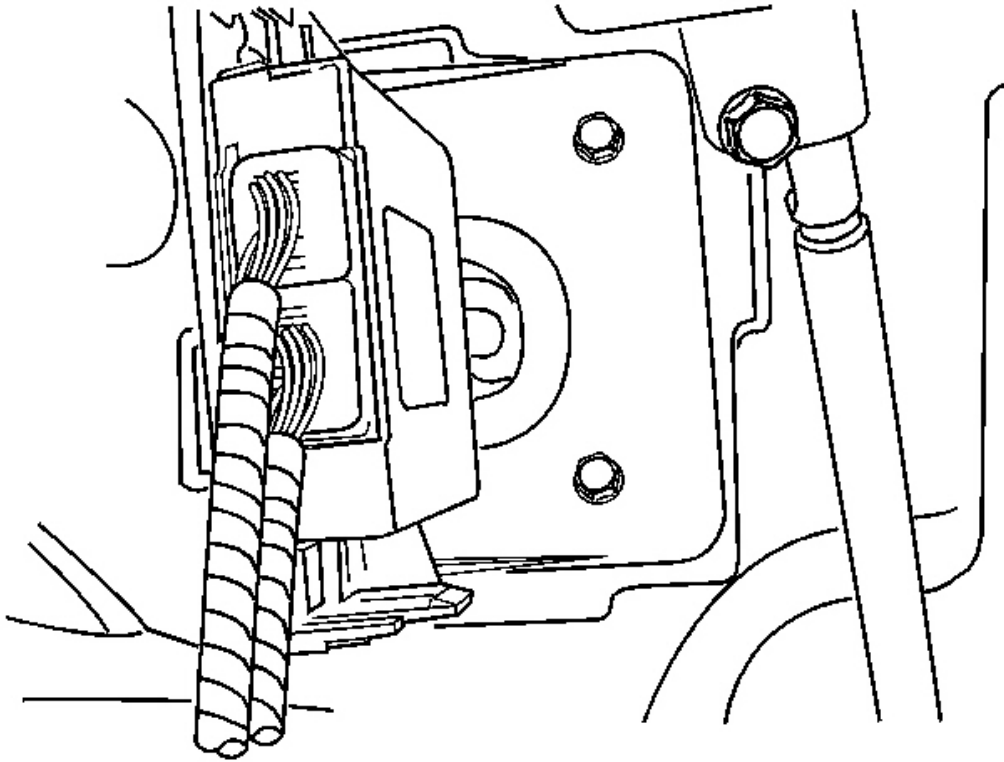


Fig. 62: TCM Electrical Connector

Courtesy of GENERAL MOTORS CORP.

2. Locate the transmission control module (TCM) electrical connector next to the brake pedal assembly.
3. Disconnect the transmission control module (TCM) electrical connector.

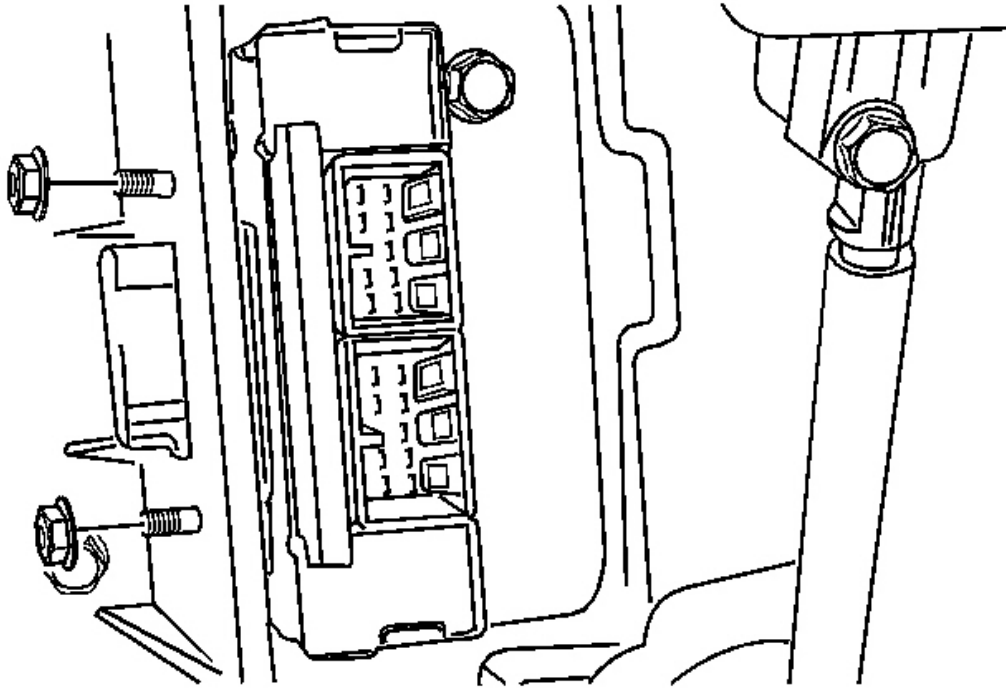


Fig. 63: TCM Retaining Bolts

Courtesy of GENERAL MOTORS CORP.

4. Remove the TCM retaining bolts.
5. Remove the TCM.

Installation Procedure

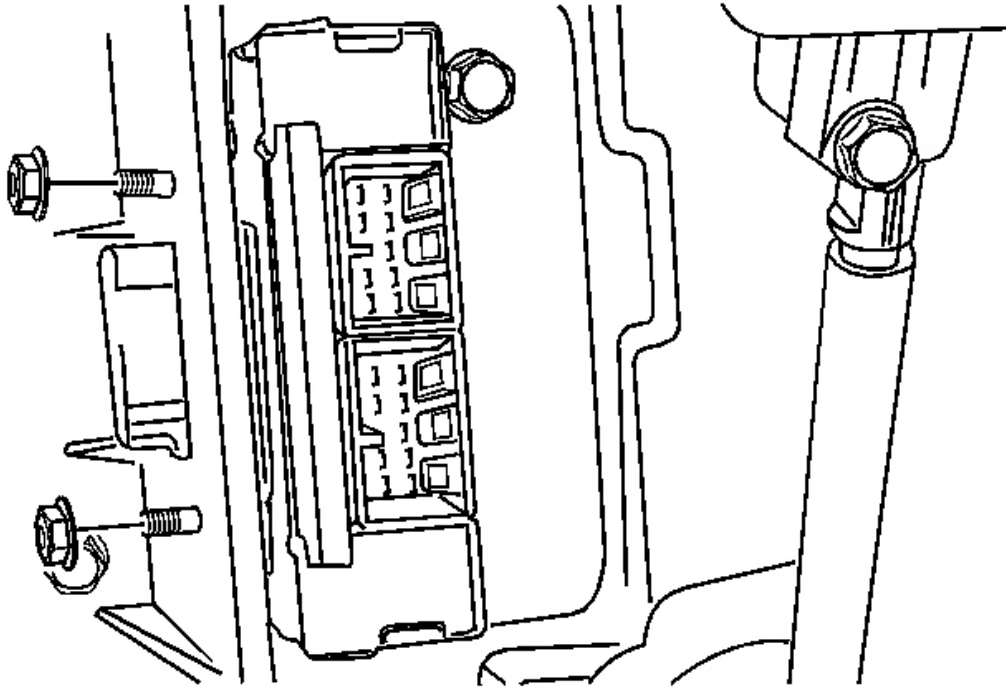


Fig. 64: TCM Retaining Bolts

Courtesy of GENERAL MOTORS CORP.

1. Connect the negative battery cable.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Install the TCM and retaining bolts.

Tighten: Tighten the TCM retaining bolts to 5 N.m (44 lb in).

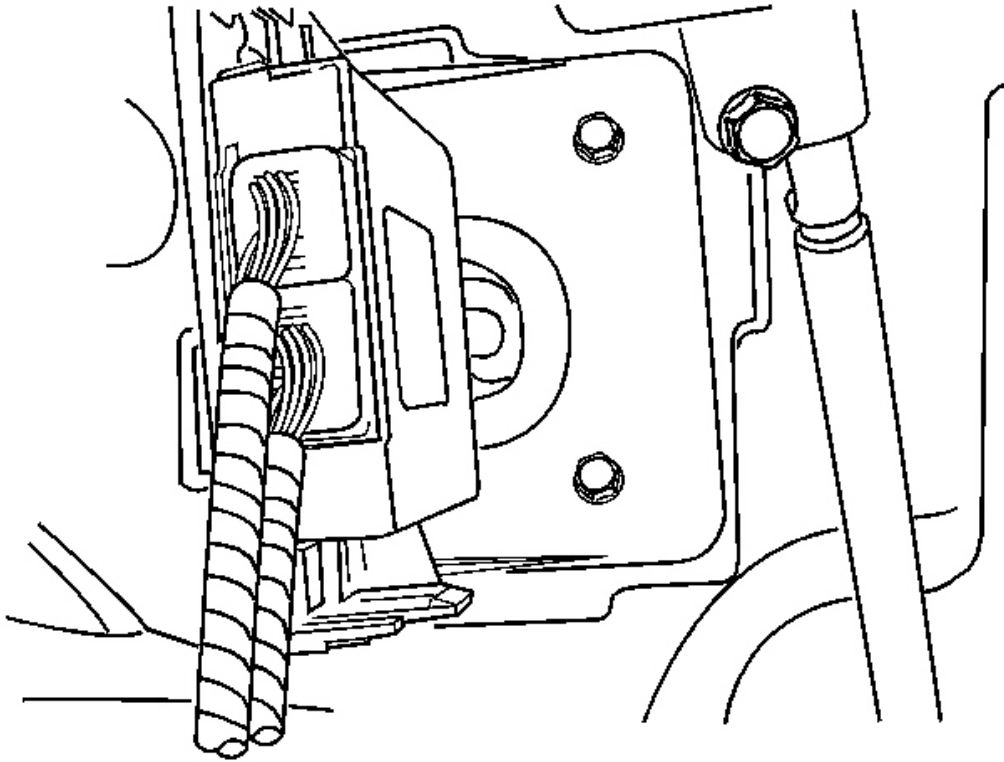


Fig. 65: TCM Electrical Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the TCM electrical connector.
4. Connect the negative battery cable.

TRANSMISSION COOLER PIPES AND HOSES REPLACEMENT (INLET)

Removal Procedure

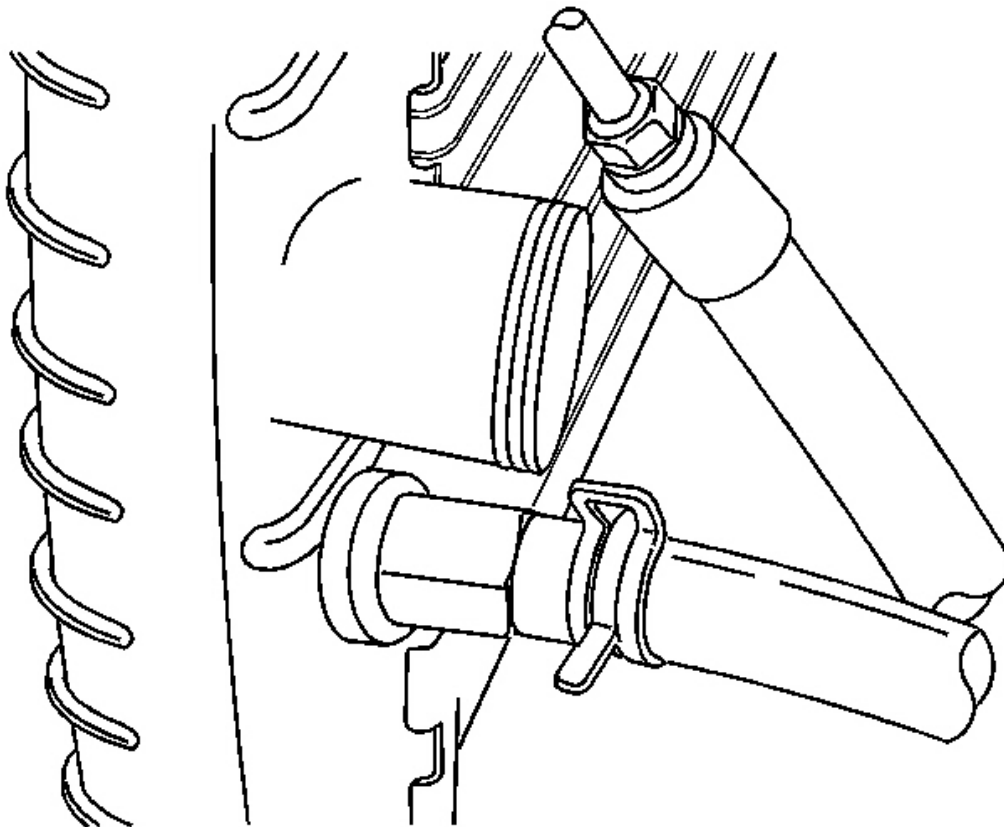


Fig. 66: Radiator Threaded Connector & Fluid Cooler Hoses

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Vehicle Lifting and Jacking Notice in Cautions and Notices.

1. Raise and support the vehicle.
2. Drain the transaxle fluid.
3. Remove the clip from the radiator threaded connector, then disconnect the fluid cooler hoses.

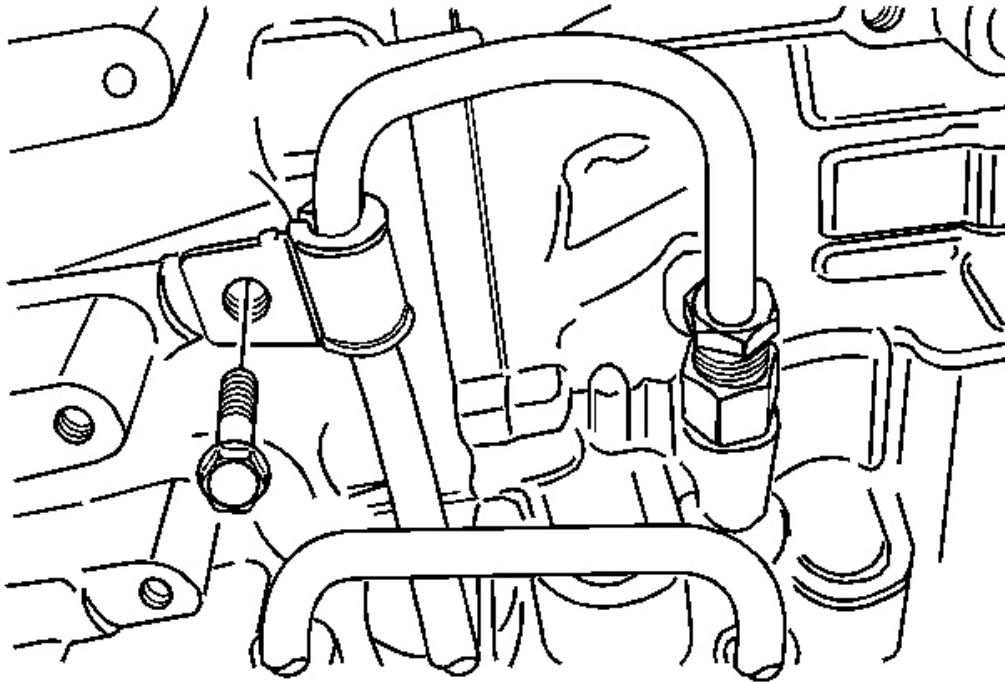


Fig. 67: Removing Fluid Cooler Inlet Pipe, Bolt & Transaxle
Courtesy of GENERAL MOTORS CORP.

4. Remove the fluid cooler inlet pipe bolt from the transaxle.
5. Remove the inlet pipe fitting nut from the transaxle.
6. Remove the fluid cooler inlet pipe and hoses.

Installation Procedure

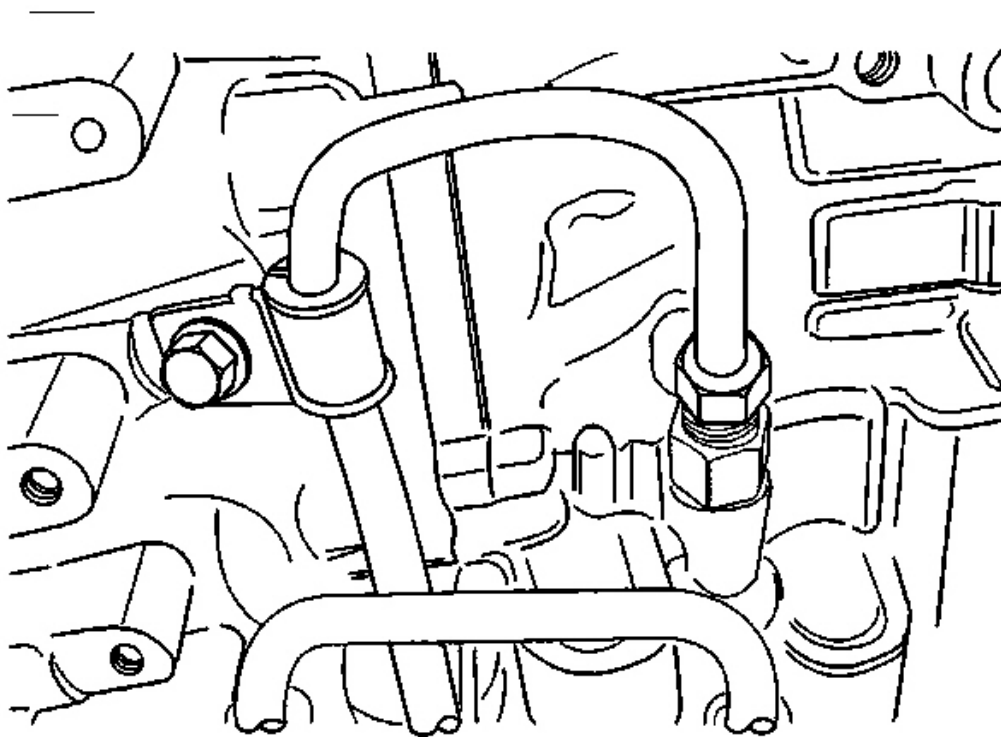


Fig. 68: Installing Fluid Cooler Inlet Pipe, Bolt & Transaxle
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the fluid cooler inlet pipe fitting nut into the transaxle.

Tighten: Tighten the fluid cooler inlet pipe fitting nut to 35 N.m (26 lb ft).

2. Install the fluid cooler inlet pipe bolt into the transaxle.

Tighten: Tighten the fluid cooler inlet pipe bolt to 9 N.m (80 lb in).

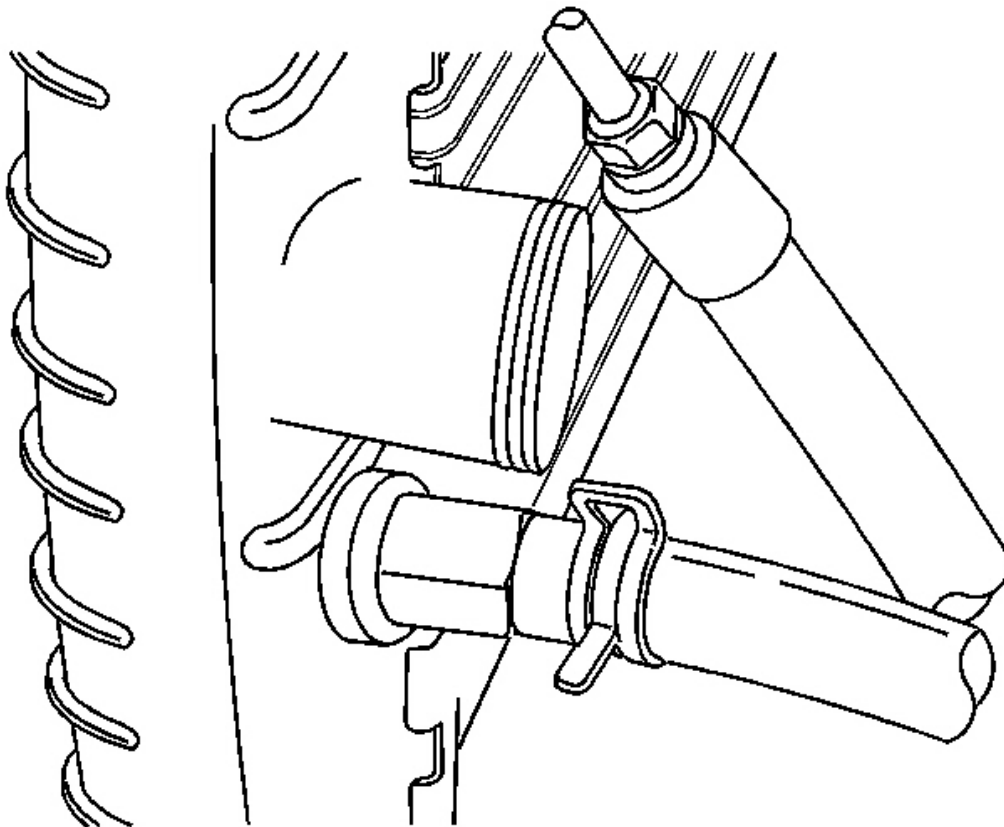


Fig. 69: Radiator Threaded Connector & Fluid Cooler Hoses
Courtesy of GENERAL MOTORS CORP.

3. Connect the fluid cooler hoses and install the clip into the radiator threaded connector.
4. Lower the vehicle.
5. Fill the transaxle with fluid. Refer to **Draining Transmission Fluid**.

TRANSMISSION COOLER PIPES AND HOSES REPLACEMENT (OUTLET)

Removal Procedure

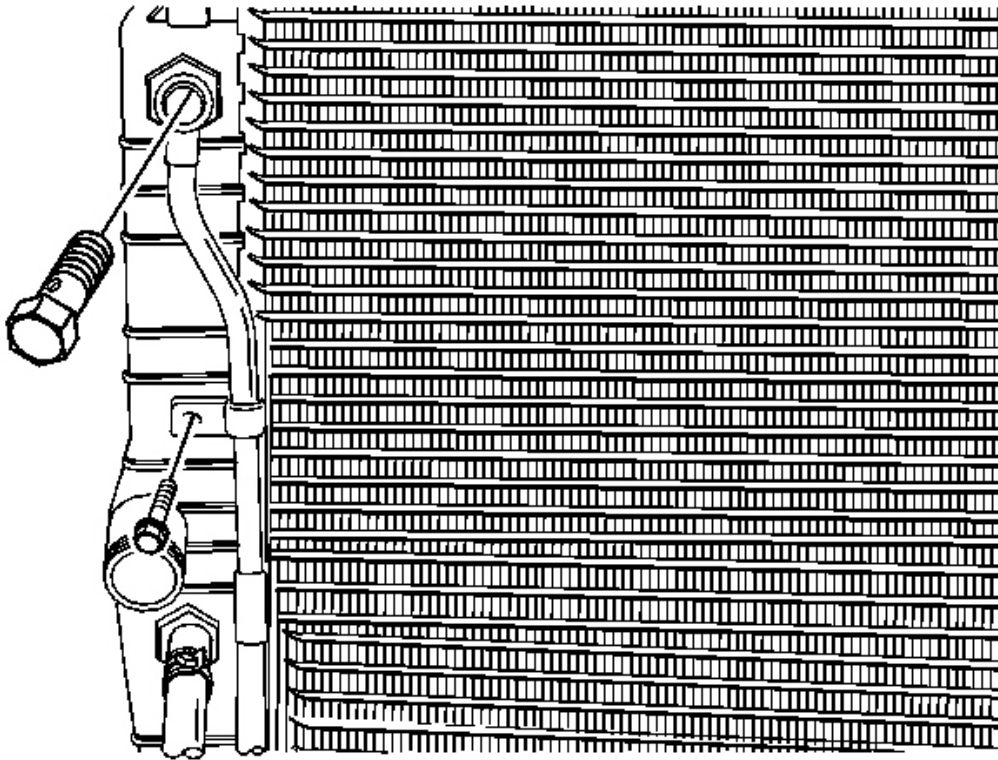


Fig. 70: Front Outlet Pipe, Clip, Bolt & Radiator
Courtesy of GENERAL MOTORS CORP.

1. Drain the transaxle fluid.
2. Remove the front outlet pipe union bolt from the radiator.
3. Remove the front outlet pipe clip bolt from the radiator.

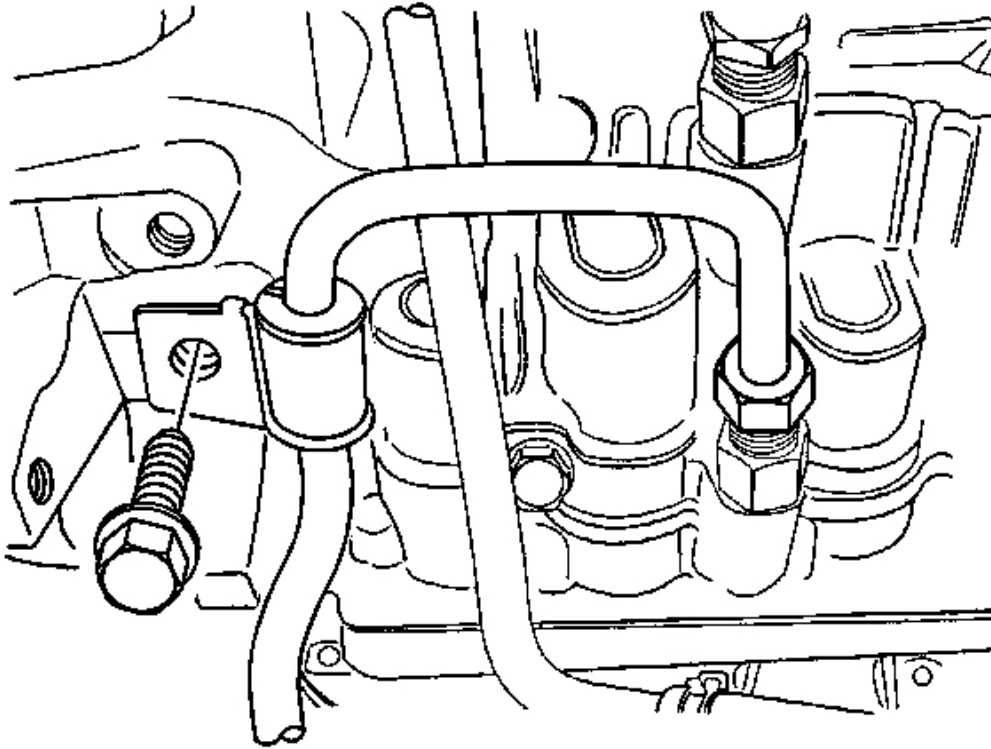


Fig. 71: Rear Outlet Pipe, Clip, Bolt & Transaxle
Courtesy of GENERAL MOTORS CORP.

4. Remove the rear outlet pipe clip bolt from the transaxle.
5. Remove the rear outlet pipe fitting nut from the transaxle.
6. Remove the fluid cooler outlet pipe and hoses.

Installation Procedure

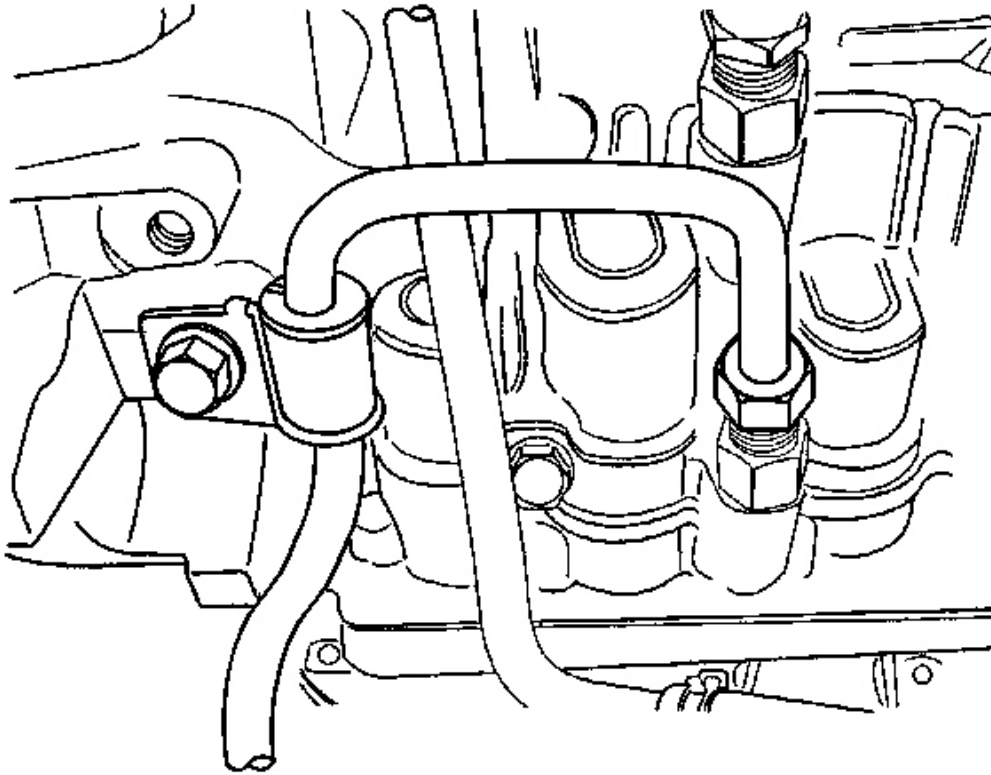


Fig. 72: Fluid Cooler Rear Outlet Pipe
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Install the fluid cooler rear outlet pipe fitting nut.

Tighten: Tighten the fluid cooler rear outlet pipe fitting nut to 35 N.m (26 lb ft).

2. Install the fluid cooler rear outlet pipe clip bolt.

Tighten: Tighten the fluid cooler rear outlet pipe clip bolt to 9 N.m (80 lb in).

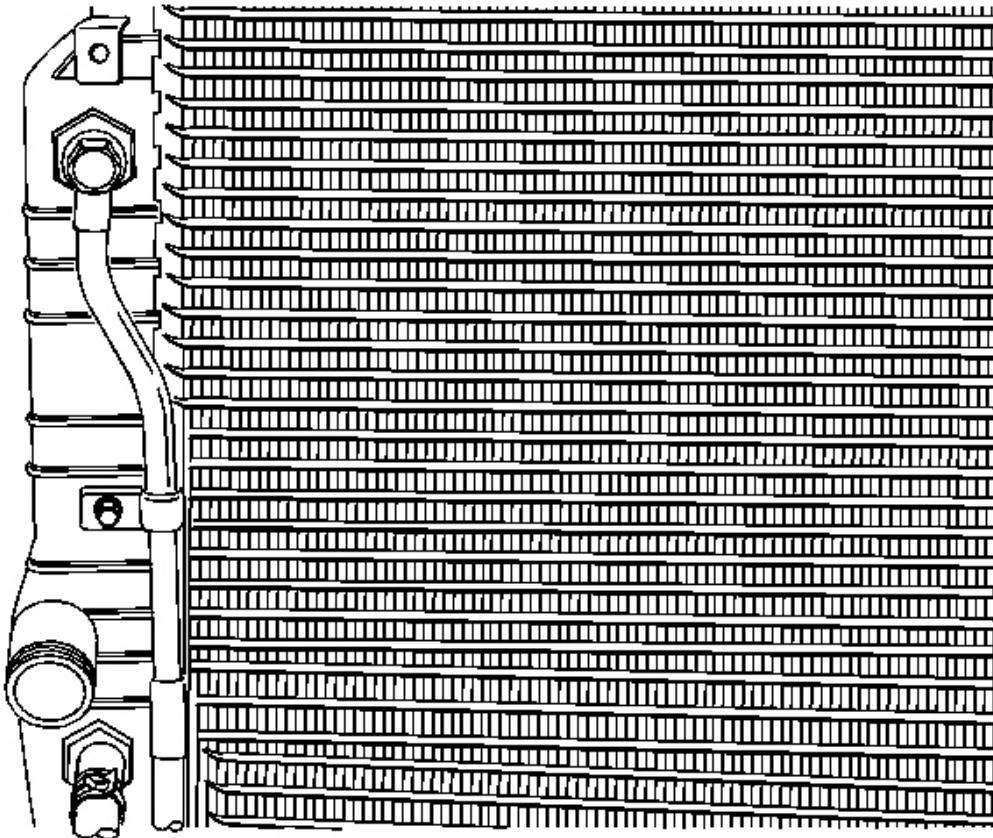


Fig. 73: Front Outlet Pipe, Union Bolt & Radiator
Courtesy of GENERAL MOTORS CORP.

3. Install the front outlet pipe union bolt into the radiator.

Tighten: Tighten the front outlet pipe union bolt to 35 N.m (26 lb ft).

4. Install the front outlet pipe clip bolt into the radiator.

Tighten: Tighten the front outlet pipe clip bolt to 9 N.m (80 lb in).

5. Fill the transaxle with fluid. Refer to **Draining Transmission Fluid**.

TRANSMISSION REPLACEMENT

Tools Required

- **J 28467-B** (DW 110-060) Engine Support Fixture
- **DW 260-120** (DW 260-012) Transaxle Support Fixture. See **Special Tools**.

Removal Procedure

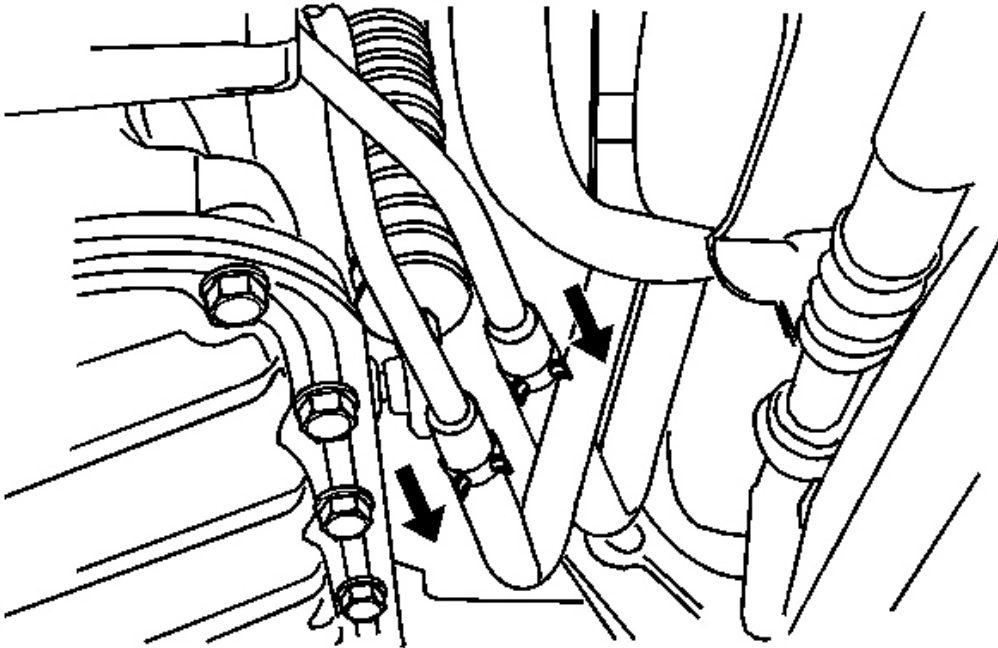


Fig. 74: Fluid Cooler Inlet/Outlet Hoses & Transaxle
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to **Battery Disconnect Caution** .

1. Remove the battery and battery tray.
2. Drain the transaxle fluid. Refer to **Draining Transmission Fluid**.
3. Remove the left and right drive axle assemblies. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle** .
4. Disconnect the fluid cooler inlet and outlet hoses from the transaxle.

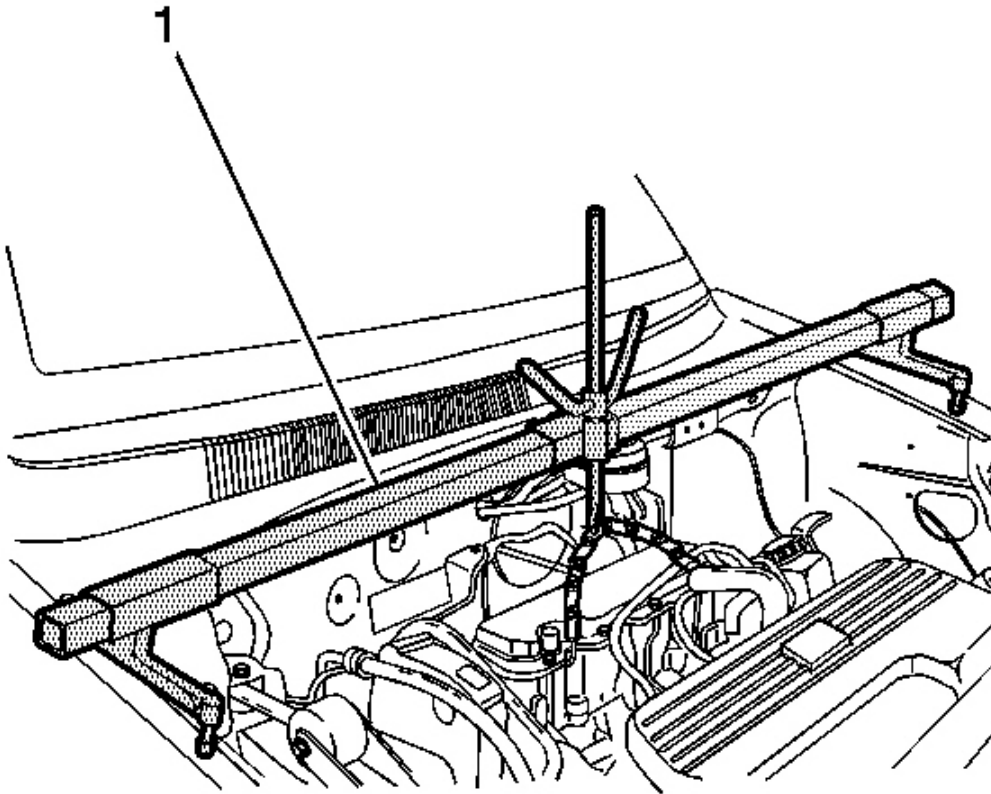


Fig. 75: J 28467-B & Engine

Courtesy of GENERAL MOTORS CORP.

5. Disconnect the shift control cable from the transaxle. Refer to **Shift Control Cable Replacement - Floor Shift.**
6. Install the J 28467-B (1) to support the engine.

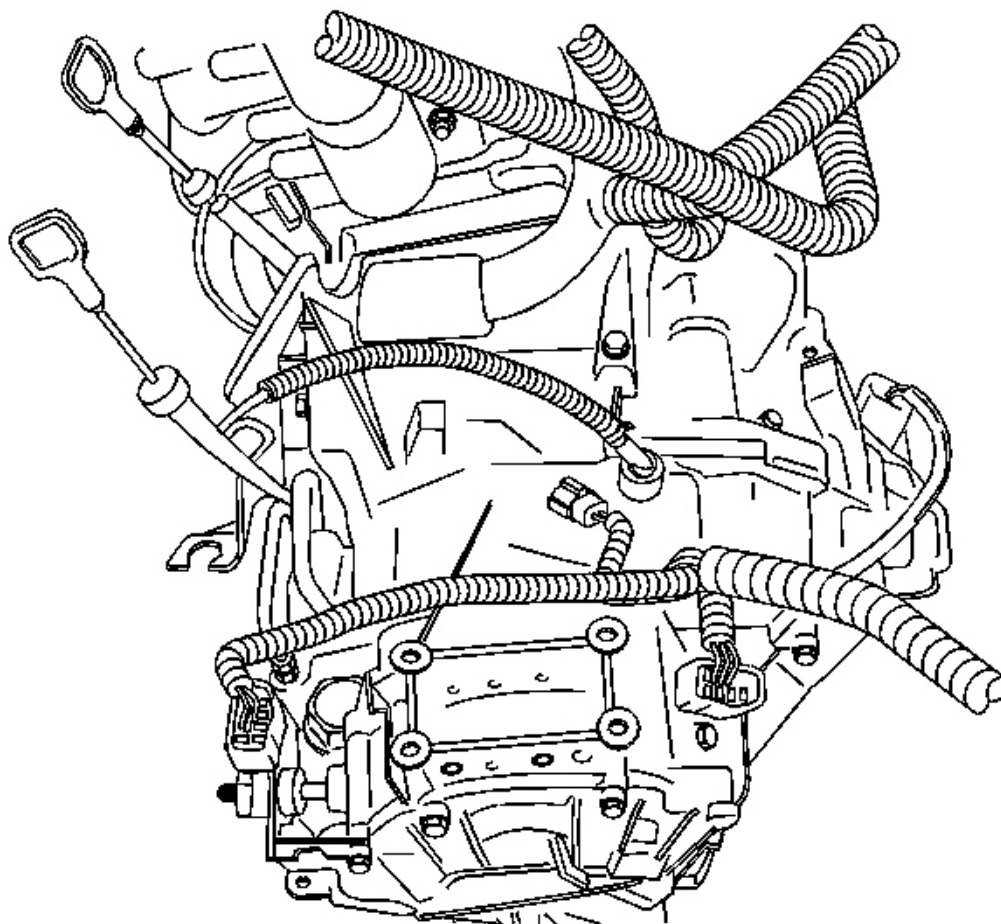


Fig. 76: Electrical Connectors

Courtesy of GENERAL MOTORS CORP.

7. Disconnect the input shaft speed (ISS) sensor electrical connector.
8. Disconnect the output shaft speed (OSS) sensor electrical connector.
9. Disconnect the park/neutral position (PNP) sensor electrical connector.
10. Disconnect the transaxle electrical connector.

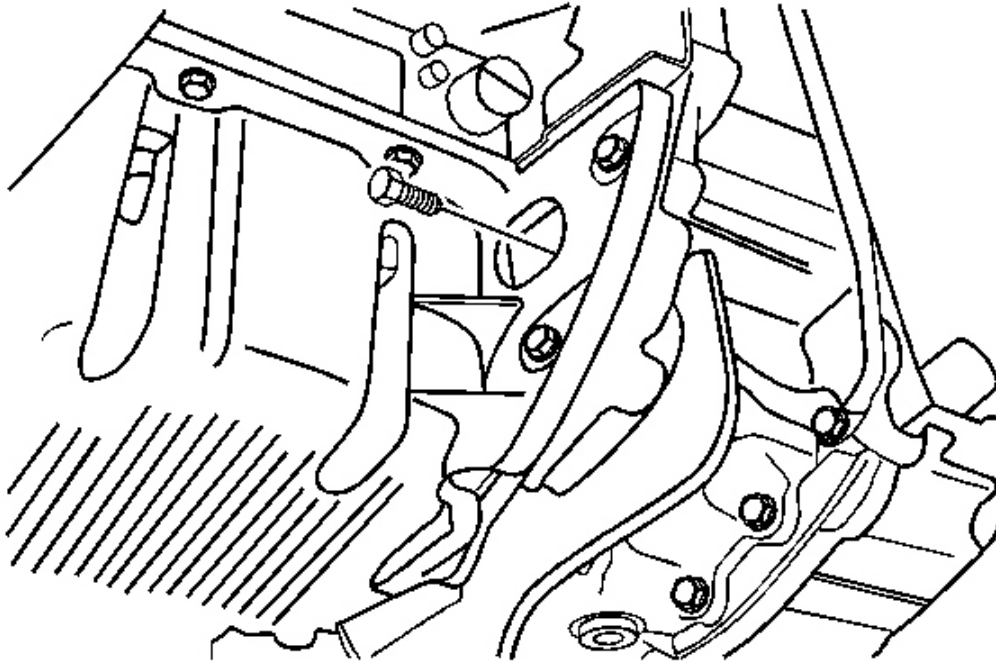


Fig. 77: View Of Torque Converter Bolts
Courtesy of GENERAL MOTORS CORP.

11. Remove the service hall cover.
12. Remove the torque converter bolts.

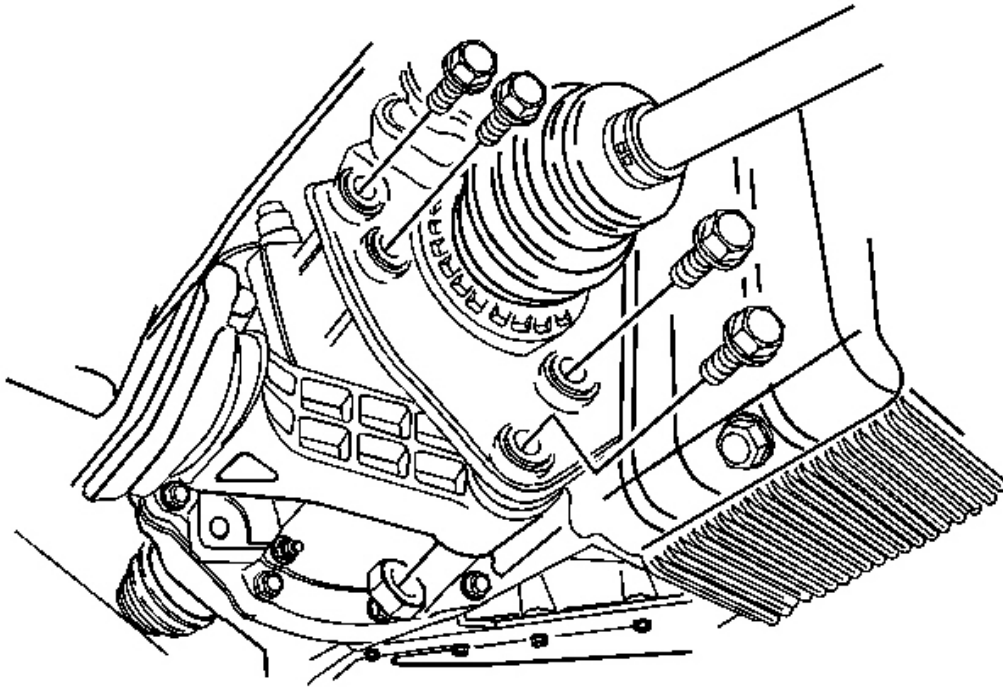


Fig. 78: Removal Of Rear Mounting Bracket Bolts And Bracket
Courtesy of GENERAL MOTORS CORP.

13. Remove the damping block connection nut and bolt.
14. Remove the rear mounting bracket bolts and rear mounting bracket.

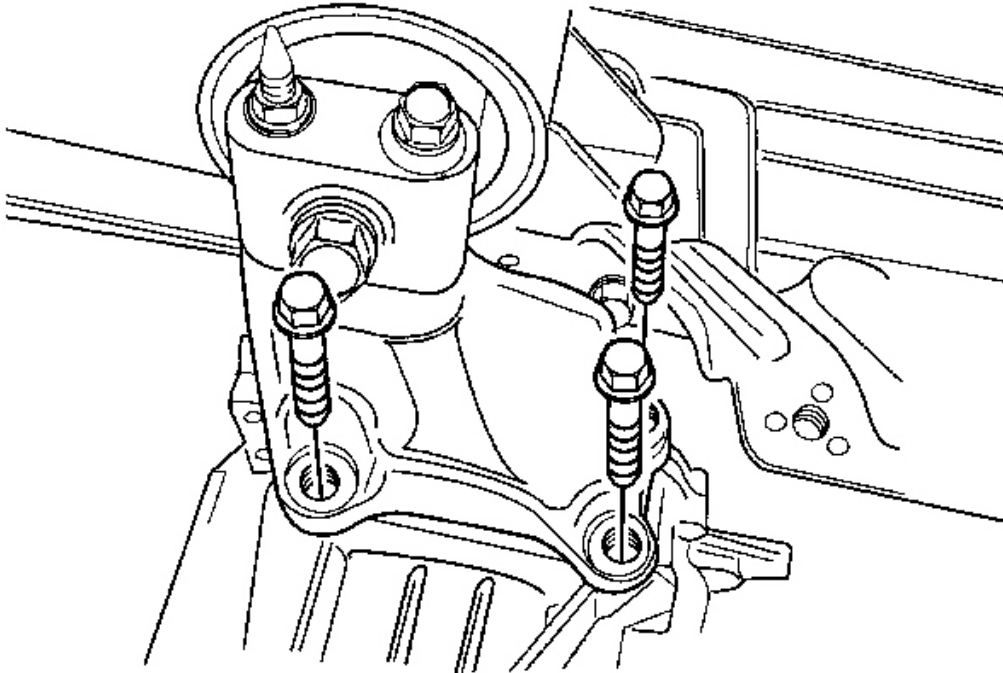


Fig. 79: View Of Upper Transaxle Mounting Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

15. Remove the 3 upper transaxle mounting bracket bolts.

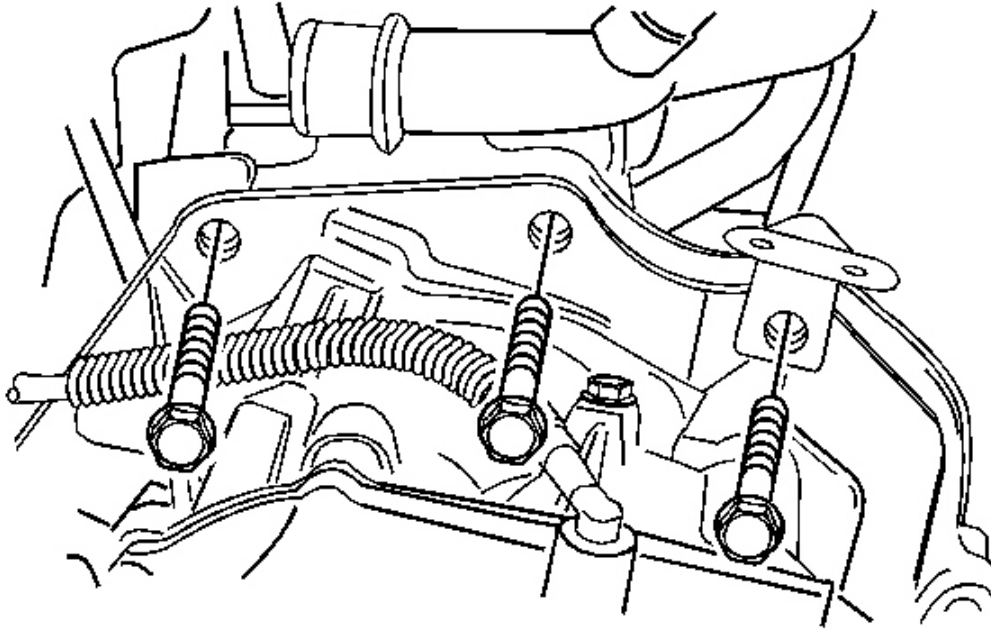


Fig. 80: Removing Upper Transaxle-To-Engine & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

16. Remove the 3 upper transaxle-to-engine mounting bolts.

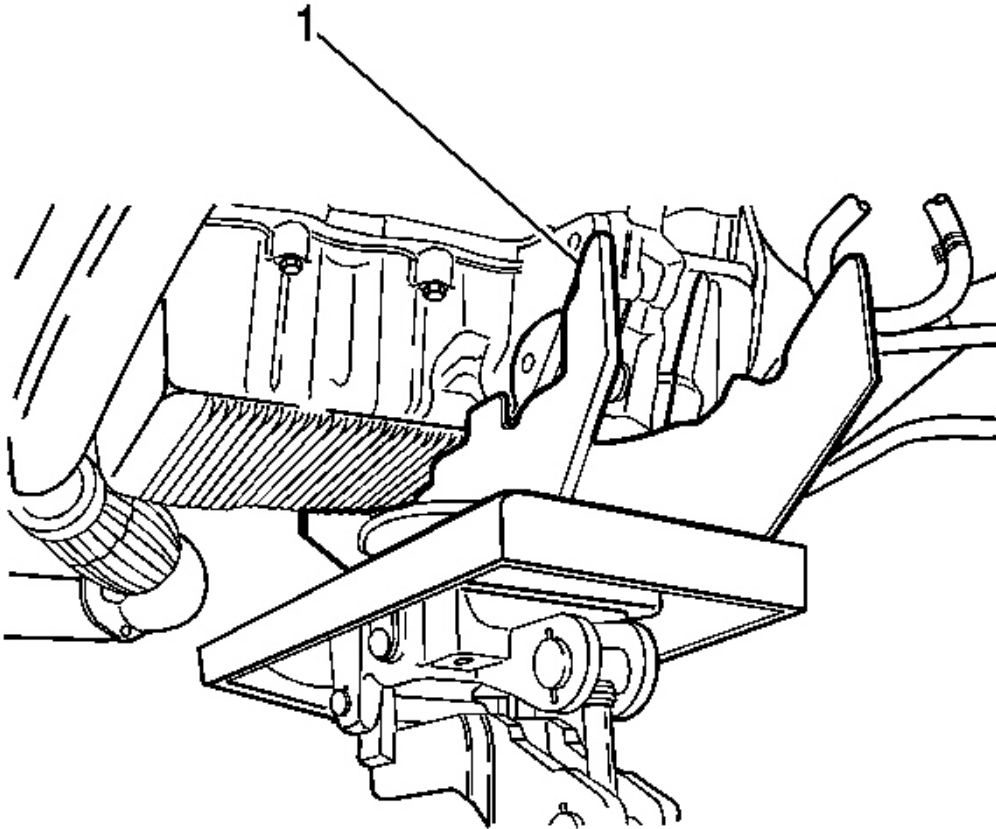


Fig. 81: Securing Transaxle Jack & DW 260-120
Courtesy of GENERAL MOTORS CORP.

17. Secure the transaxle to a transaxle jack and **DW 260-120 (1)**. See **Special Tools**.

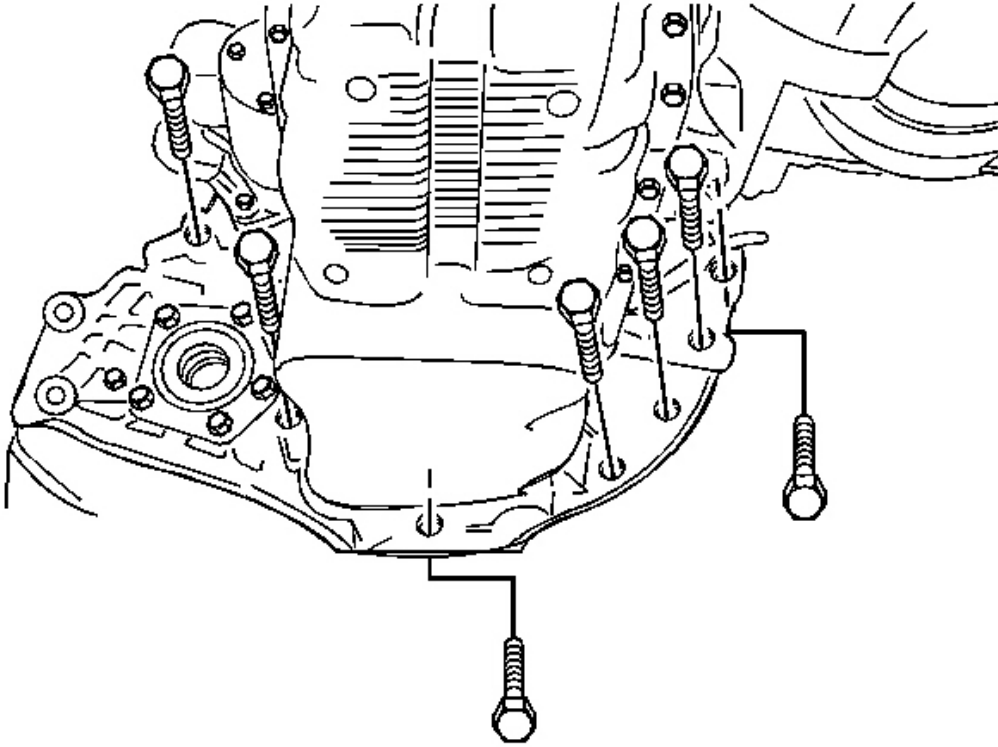


Fig. 82: Removing Lower Transaxle-To-Engine & Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

18. Remove the 7 lower transaxle-to-engine retaining bolts.

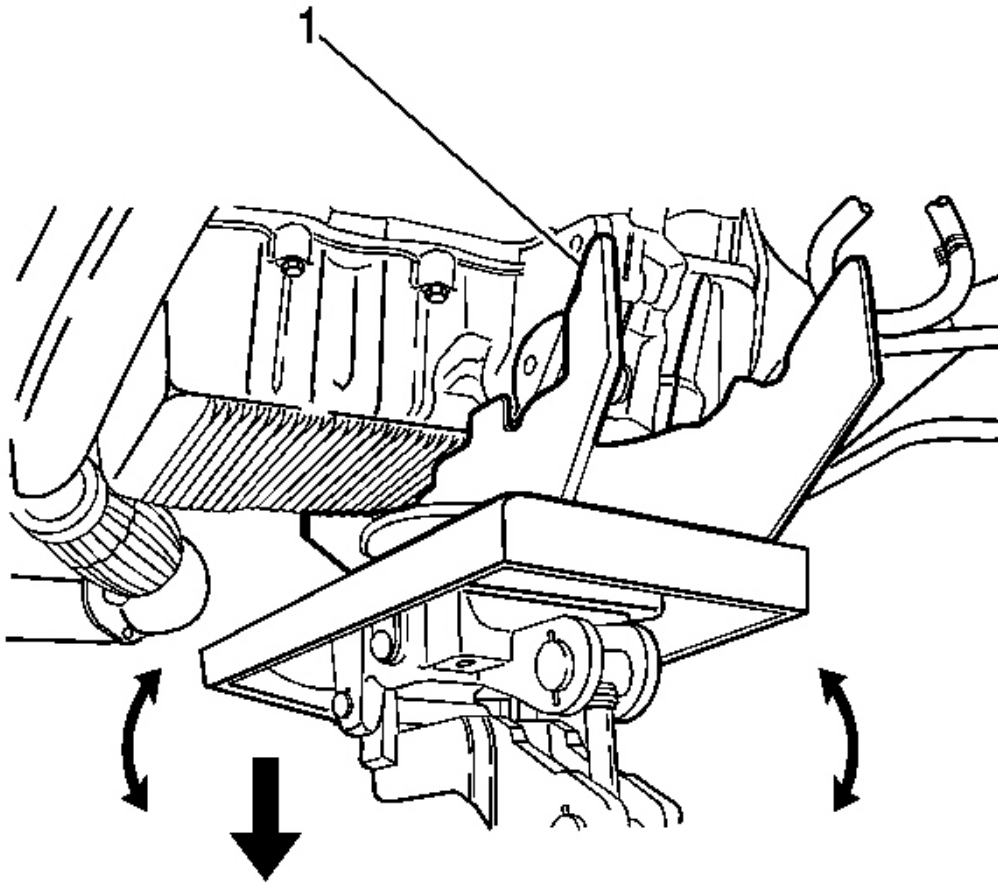


Fig. 83: Removing Transaxle Jack & DW 260-120
Courtesy of GENERAL MOTORS CORP.

19. Carefully remove the transaxle from the vehicle with the transaxle secured in the **DW 260-120** (1). See **Special Tools**.

Installation Procedure

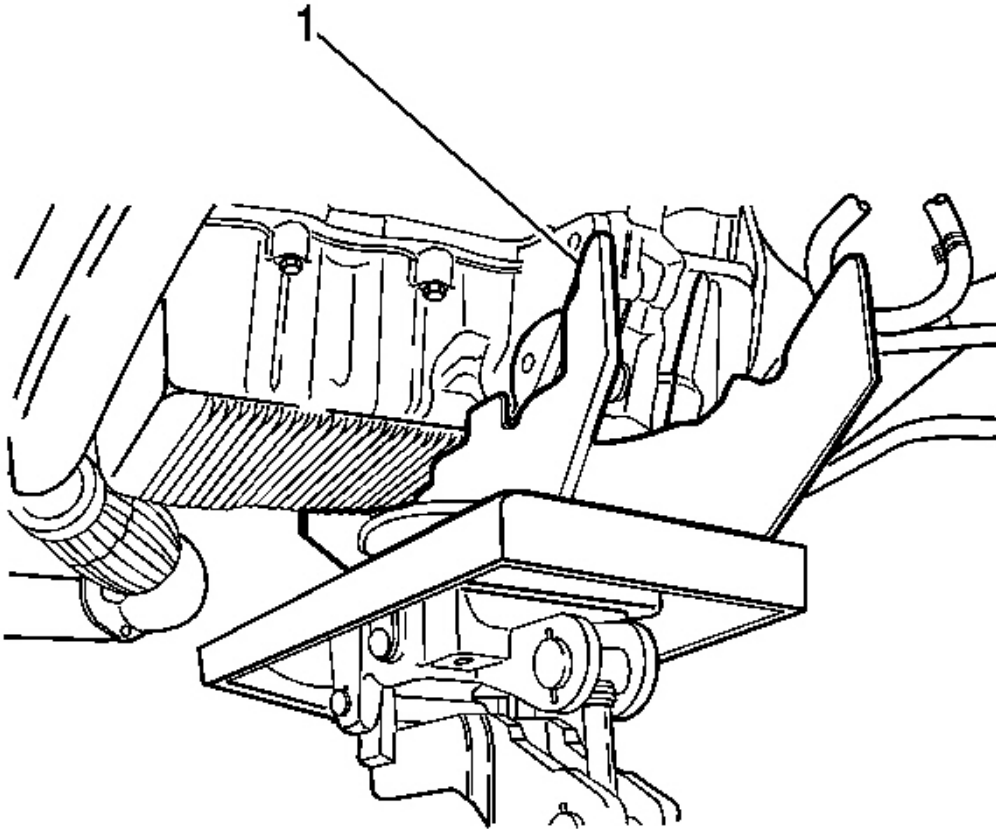


Fig. 84: Securing Transaxle Jack & DW 260-120
Courtesy of GENERAL MOTORS CORP.

1. Secure the transaxle to the transaxle jack, then carefully position in the vehicle with the transaxle secured in the **DW 260-120** (1). See **Special Tools**.

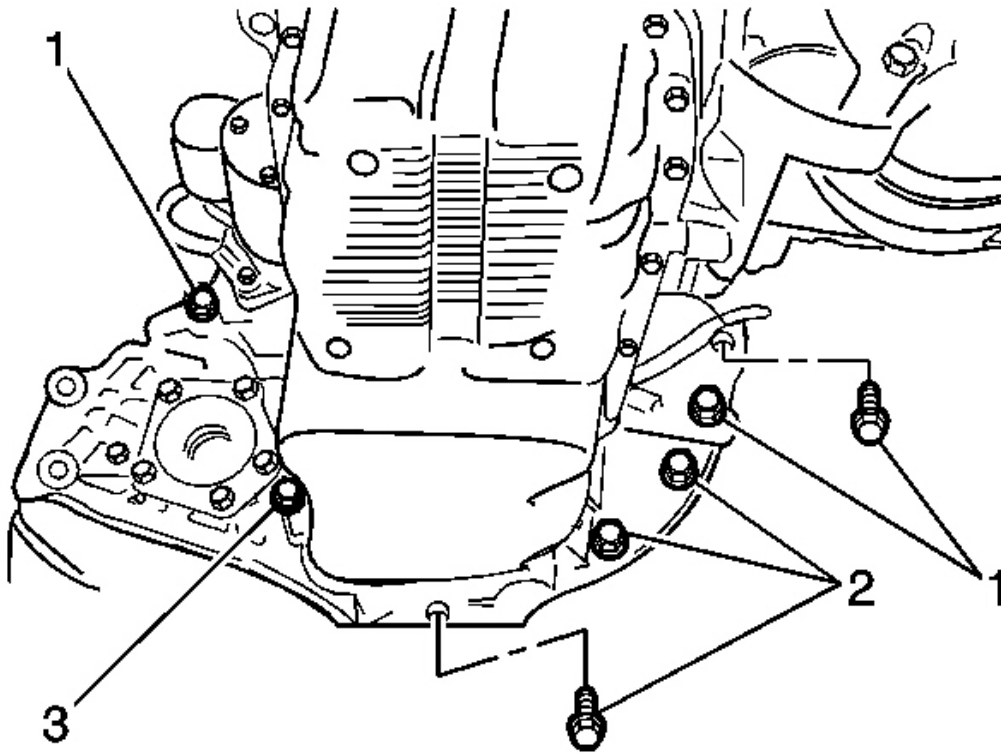


Fig. 85: Installing Transaxle Lower & Retaining Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

2. Install the 7 lower transaxle-to-engine retaining bolts.

Tighten:

- Tighten the bolts (1) to 73 N.m (54 lb ft).
- Tighten the bolts (3) to 31 N.m (23 lb ft).
- Tighten the bolts (2) to 21 N.m (15 lb ft).

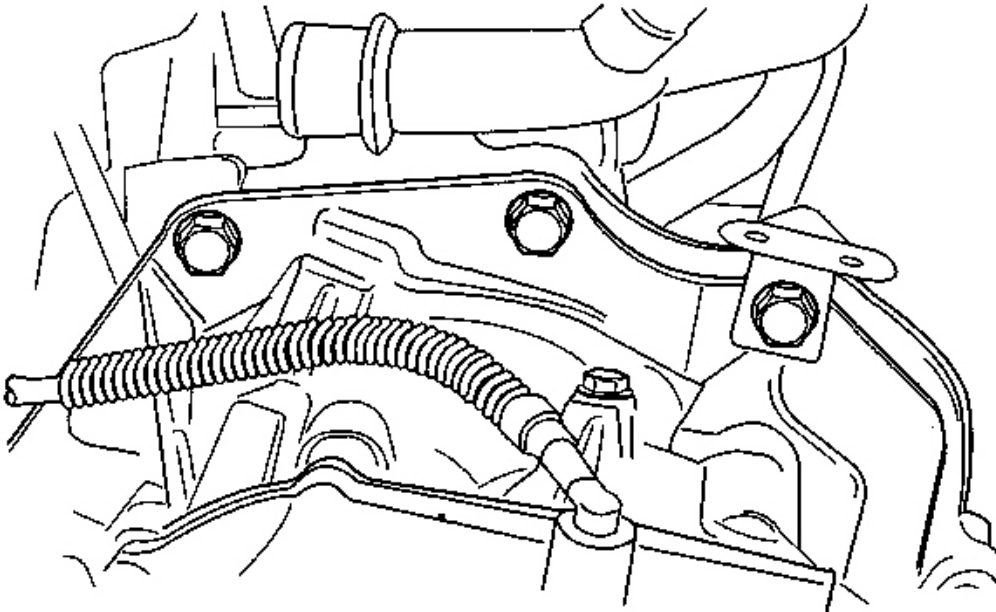


Fig. 86: Installing Upper Transaxle-To-Engine & Mounting Bolts
Courtesy of GENERAL MOTORS CORP.

3. Install the 3 upper transaxle-to-engine mounting bolts.

Tighten: Tighten the 3 upper transaxle-to-engine mounting bolts to 73 N.m (54 lb ft).

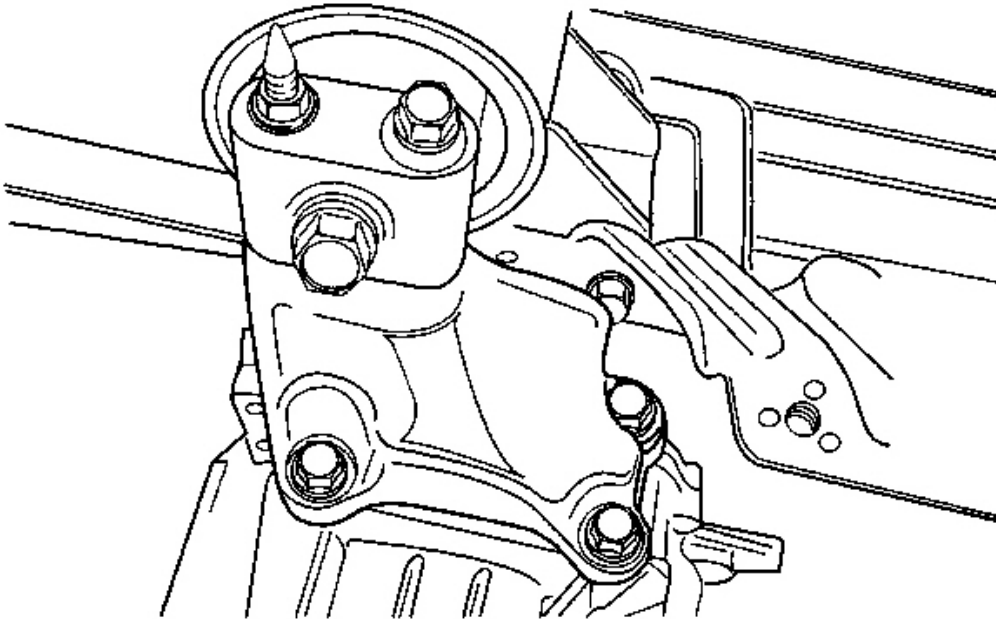


Fig. 87: Installing Upper Transaxle Mounting, Bracket & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the 3 upper transaxle mounting bracket bolts and the bracket.

Tighten: Tighten the 3 upper transaxle mounting bracket bolts to 60 N.m (44 lb ft).

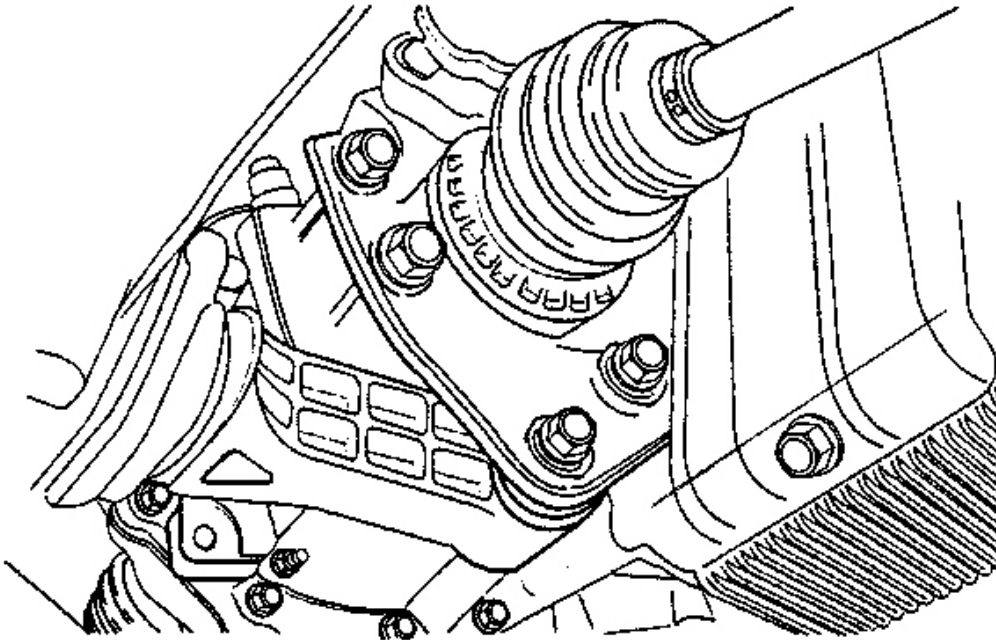


Fig. 88: Installing Damping Block Connection Nut And Bolt
Courtesy of GENERAL MOTORS CORP.

5. Install the rear mounting bracket bolts and the bracket.

Tighten: Tighten the rear mounting bracket bolts to 60 N.m (44 lb ft).

6. Install the damping block connection nut and bolt.

Tighten: Tighten the damping block connection nut and bolt to 80 N.m (59 lb ft).

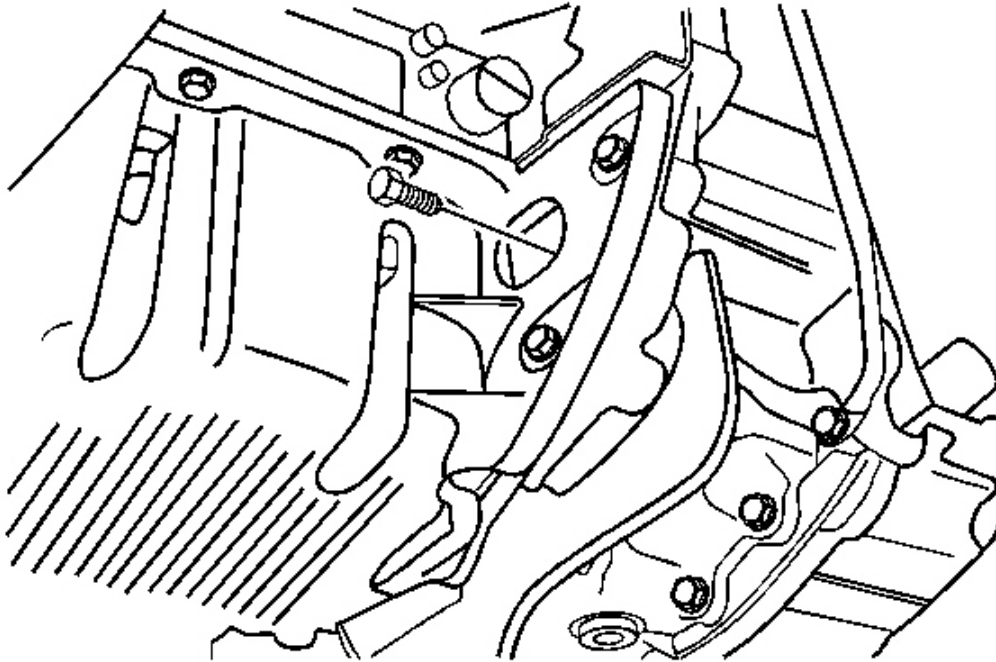


Fig. 89: View Of Torque Converter Bolts
Courtesy of GENERAL MOTORS CORP.

7. Install the torque converter bolts.

Tighten: Tighten the torque converter bolts to 45 N.m (33 lb ft).

8. Install the service hall cover.

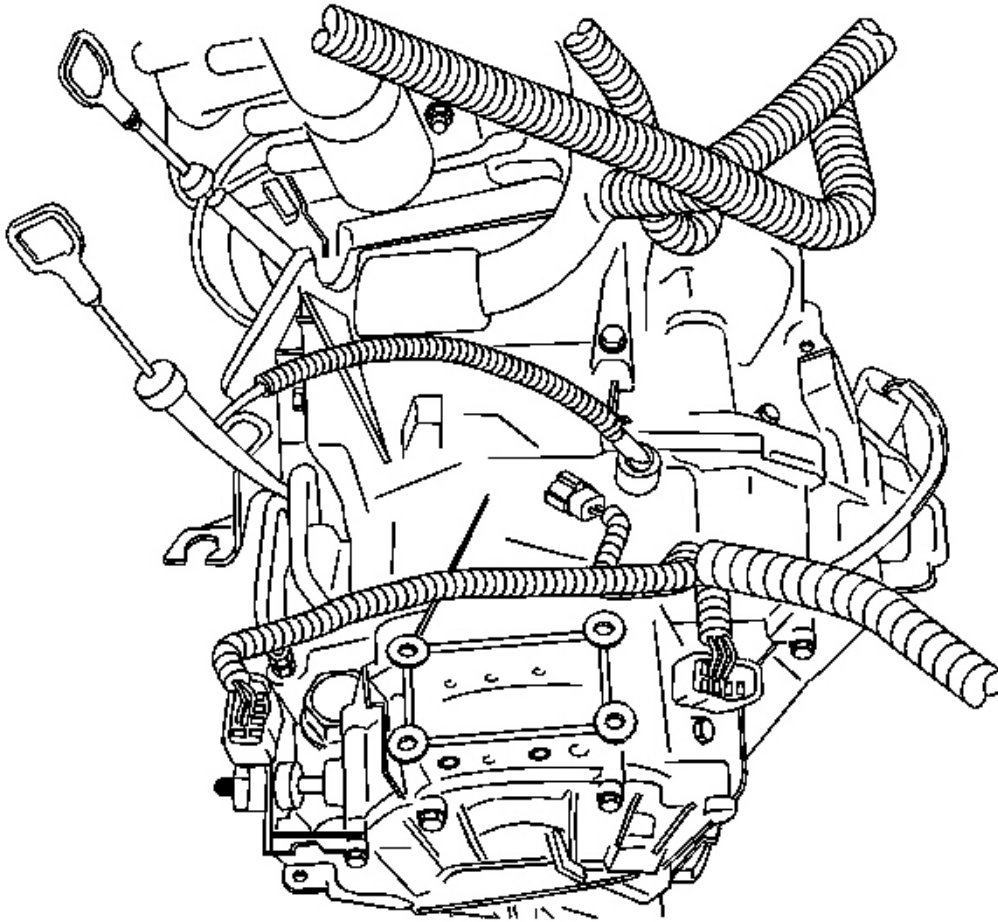


Fig. 90: Electrical Connectors

Courtesy of GENERAL MOTORS CORP.

9. Connect the transaxle electrical connector.
10. Connect the PNP sensor electrical connector.
11. Connect the OSS sensor electrical connector.
12. Connect the ISS sensor electrical connector.

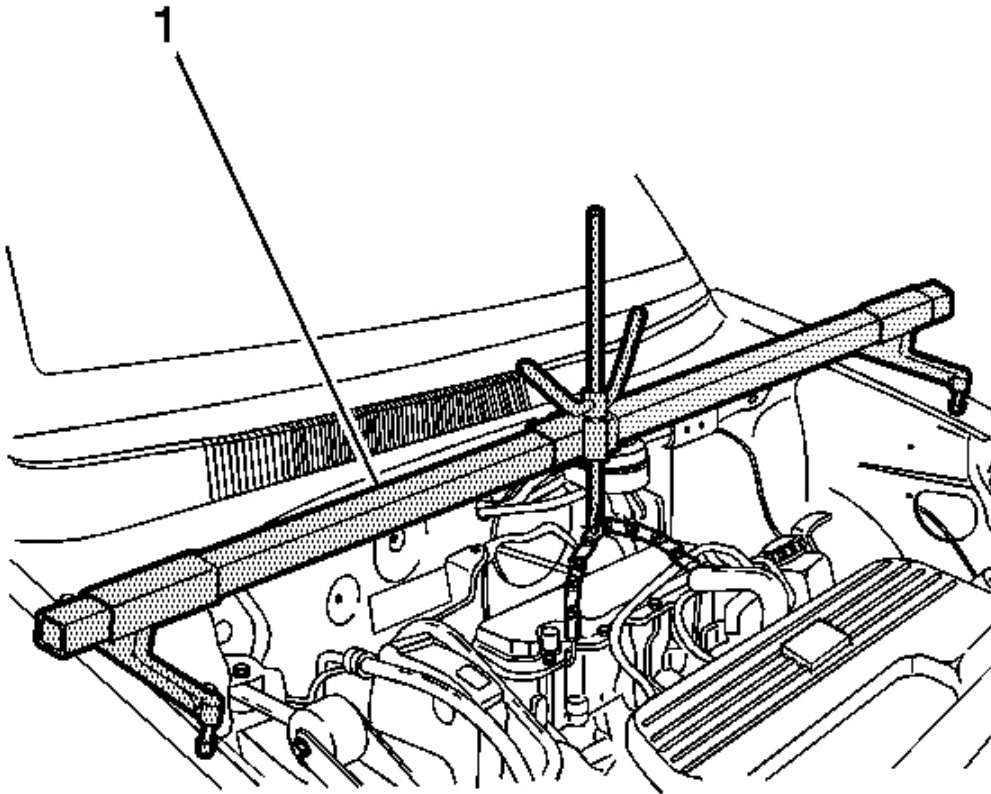


Fig. 91: J 28467-B & Engine

Courtesy of GENERAL MOTORS CORP.

13. Remove the **J 28467-B** (1).
14. Connect the shift control cable into the transaxle. Refer to **Shift Control Cable Replacement - Floor Shift.**

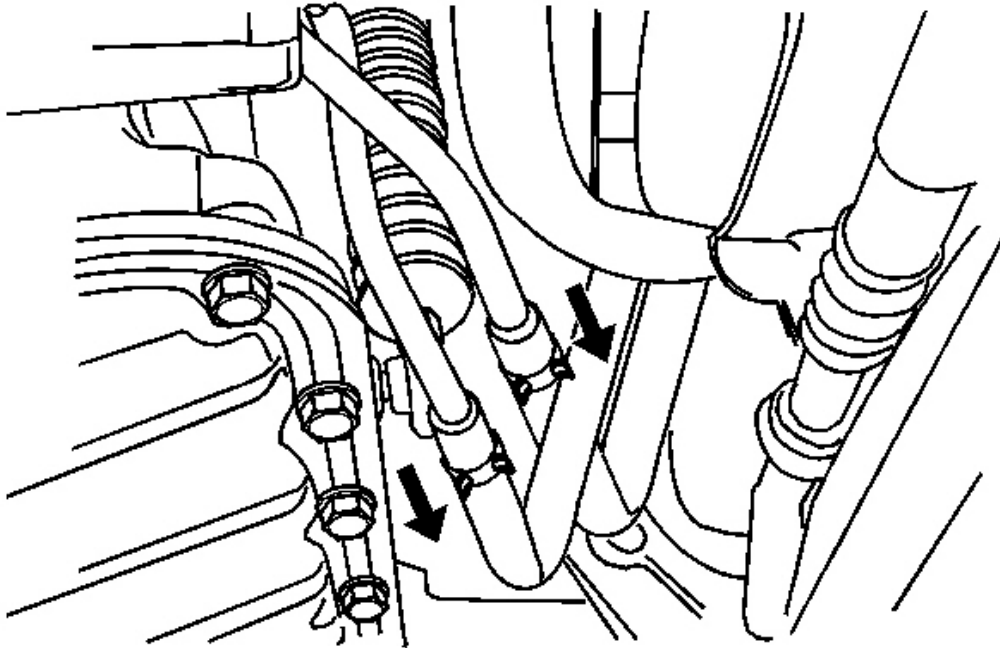


Fig. 92: Fluid Cooler Inlet/Outlet Hoses & Transaxle
Courtesy of GENERAL MOTORS CORP.

15. Connect the fluid cooler inlet and outlet hose into the transaxle.
16. Install the left and right drive axle assemblies. Refer to **Inner Shaft and/or Housing Replacement - Front Drive Axle**.
17. Install the battery and battery tray.
18. Fill the transaxle with fluid. Refer to **Draining Transmission Fluid**.
19. Measure the fluid level. Refer to **Transmission Fluid Level Inspection**.

DRIVE PLATE DEFLECTION INSPECTION

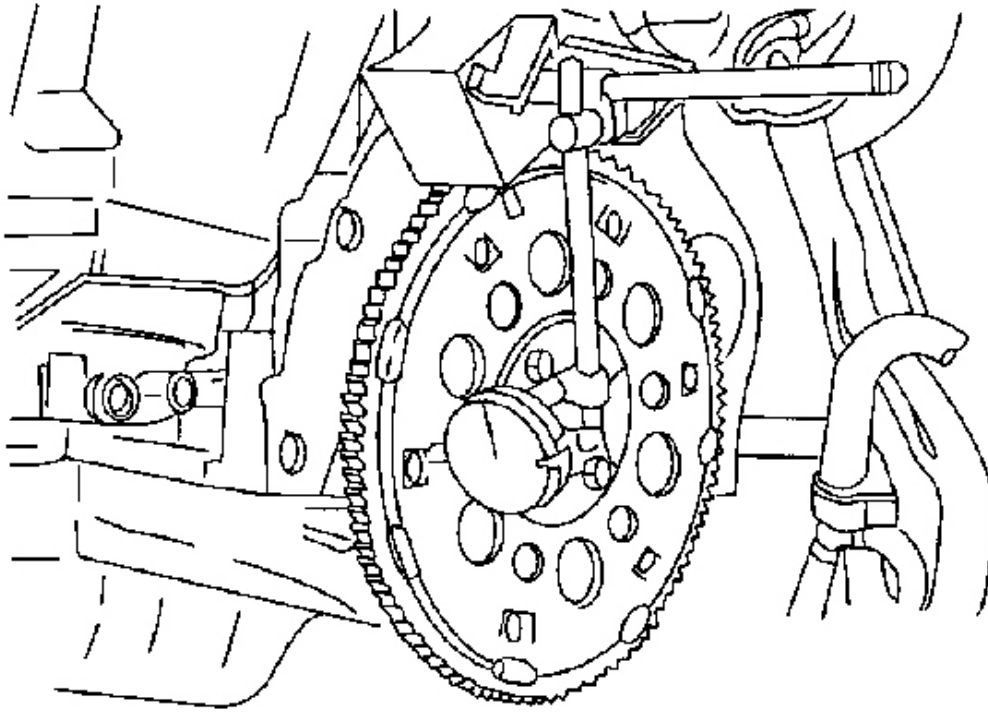


Fig. 93: Inspecting Drive Plate Deflection
Courtesy of GENERAL MOTORS CORP.

1. Inspect if the drive plate deflection is within standard value.

Specifications: The drive plate deflection standard value is 0.2 mm (0.008 in).

2. If the standard value is not within the specified value, replace the drive plate.

IMPORTANT: When assembling torque converter and drive plate. Be sure to use correct bolt with correct length. The bolt pushes up torque converter front cover, and it damages lock-up clutch lining. As a result, it causes major failure - No move.

IMPORTANT: Do not tighten the bolts by using an impact wrench.

3. When abnormal wear or stick on torque converter sleeve or oil pump is found, replace torque converter and automatic transmission.

COOLER PIPE BENDING AND CHOKES INSPECTION

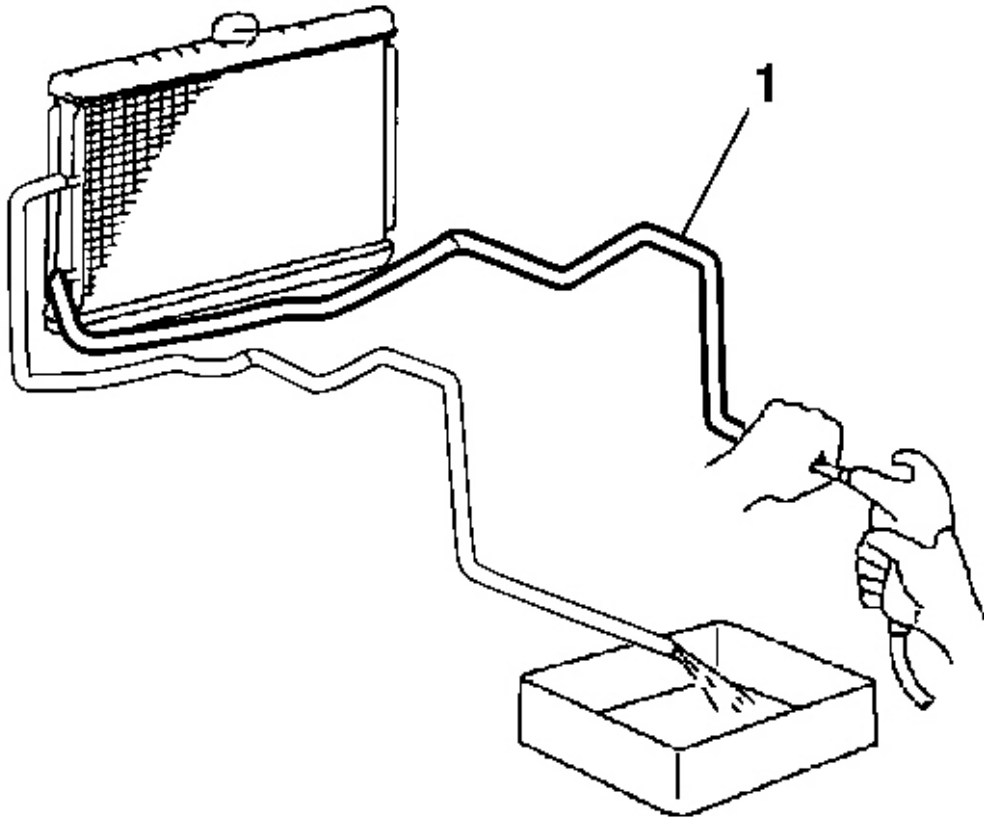


Fig. 94: Cooler Pipe Inlet Side

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Inspect if there is abnormal pipe bending in the cooler pipe, pipe deformation and small cross-section area of pipe line.

1. Replace failed parts.
2. Apply compressed air of 2 kg/cm^2 from cooler pipe inlet side (1), inspect whether there is not cooler pipe choke by confirming air flow smooth.
3. Remove foreign particles and clean inside of pipe line.

VEHICLE SPEED SENSOR INSPECTION

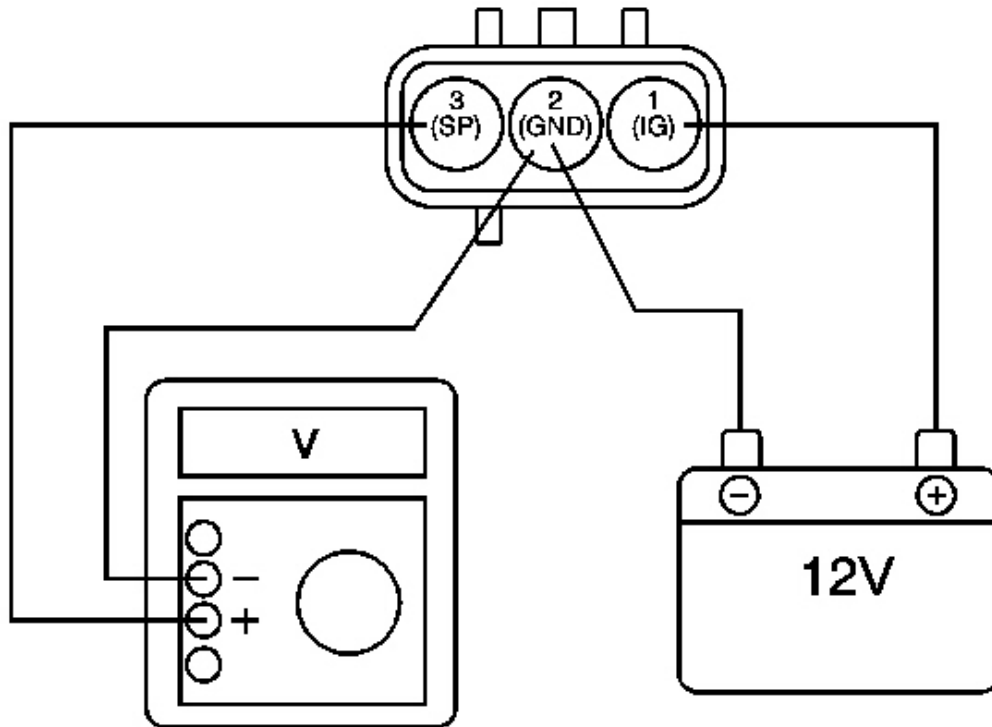


Fig. 95: Vehicle Speed Sensor, 12 Volt Power Supply & Voltmeter
Courtesy of GENERAL MOTORS CORP.

1. Remove the connector of vehicle speed sensor, connect 12 volt power supply and voltmeter to the terminal. Do not mistake polarity.

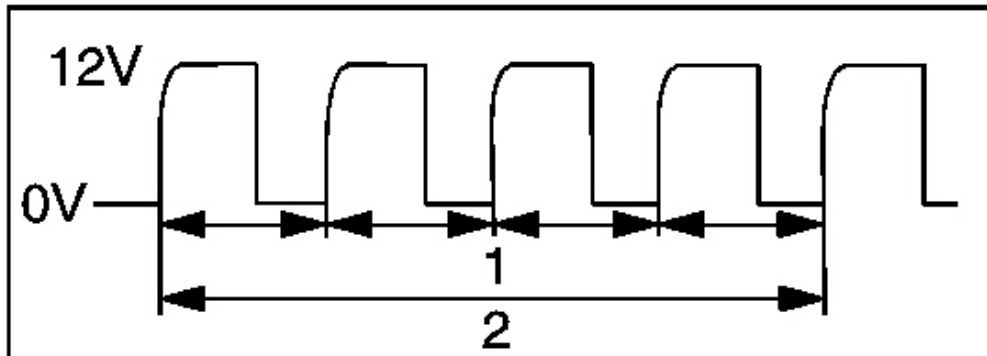


Fig. 96: Pulses Per Revolution

Courtesy of GENERAL MOTORS CORP.

2. Rotate the driven gear.
3. Observe the voltage.

IMPORTANT: The voltage value will change from approximately 0 to 12 to 0 volts per pulse (1). There will be 4 pulses per revolution (2).

4. If the result of the inspection is bad, replace the vehicle speed sensor.

INPUT SPEED SENSOR INSPECTION

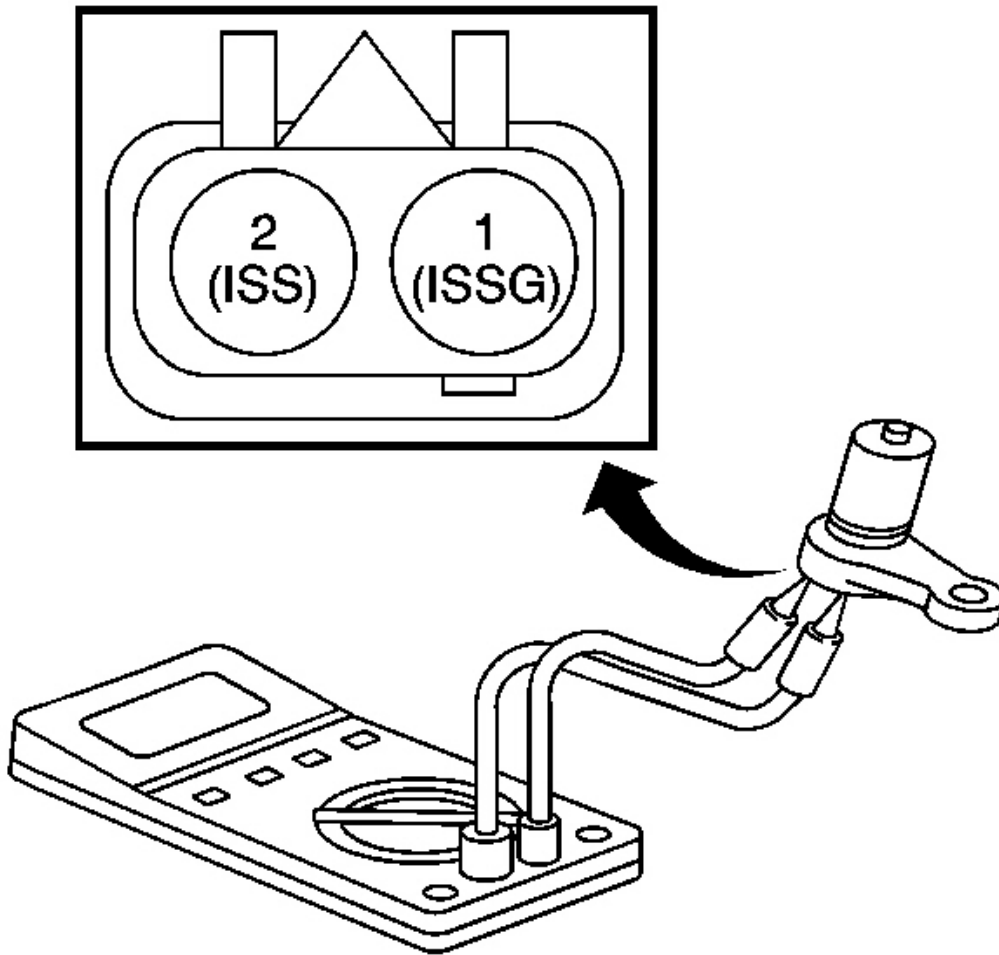


Fig. 97: Measuring The Resistance Of Each Input Speed Sensor Between Terminals
Courtesy of GENERAL MOTORS CORP.

1. Measure the resistance of each input speed sensor between terminals.

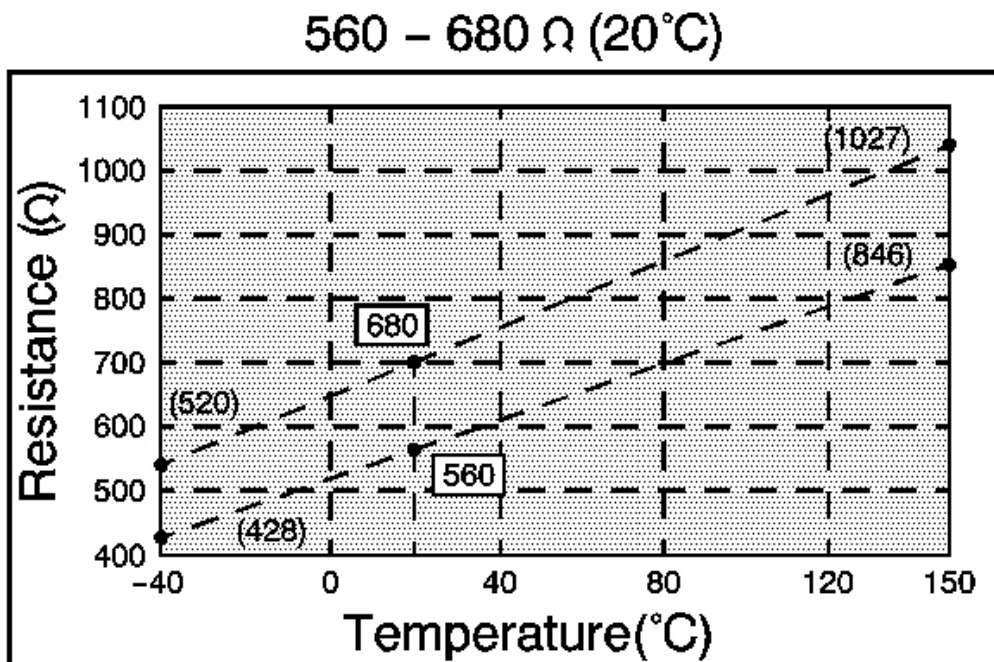


Fig. 98: Sensor Resistance

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The resistance of the sensor can become infinity ohm when the resistance measurement is made at high temperatures.

2. If the resistance value is not between the minimum and maximum resistance plot lines, then measure the sensor resistance at 20°C (68°F).
3. If both resistance measurements are not between the minimum and maximum resistance plot lines, then replace the input speed sensor.

PARK/NEUTRAL POSITION SWITCH INSPECTION

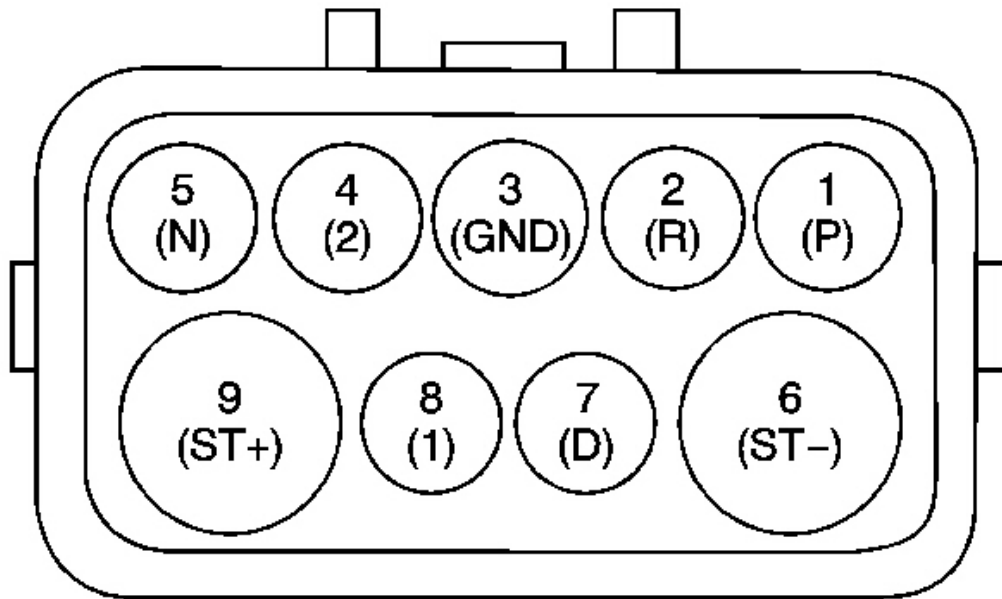


Fig. 99: PNP Switch

Courtesy of GENERAL MOTORS CORP.

1. Disconnect the park/neutral position (PNP) switch.

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Range	Starter Circuit		Indicator Circuit						
	ST+	ST-	IG	P	R	N	D	2	1
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
1			○						○
Polarity	+	-	+	-	-	-	-	-	-

Fig. 100: Polarity & Indicator Circuit Table
Courtesy of GENERAL MOTORS CORP.

2. Test the continuity of each range according to the polarity and indicator circuit table.
3. If an incorrect range is displayed during testing, then replace the PNP switch.

TRANSMISSION FLUID TEMPERATURE (TFT) SENSOR INSPECTION

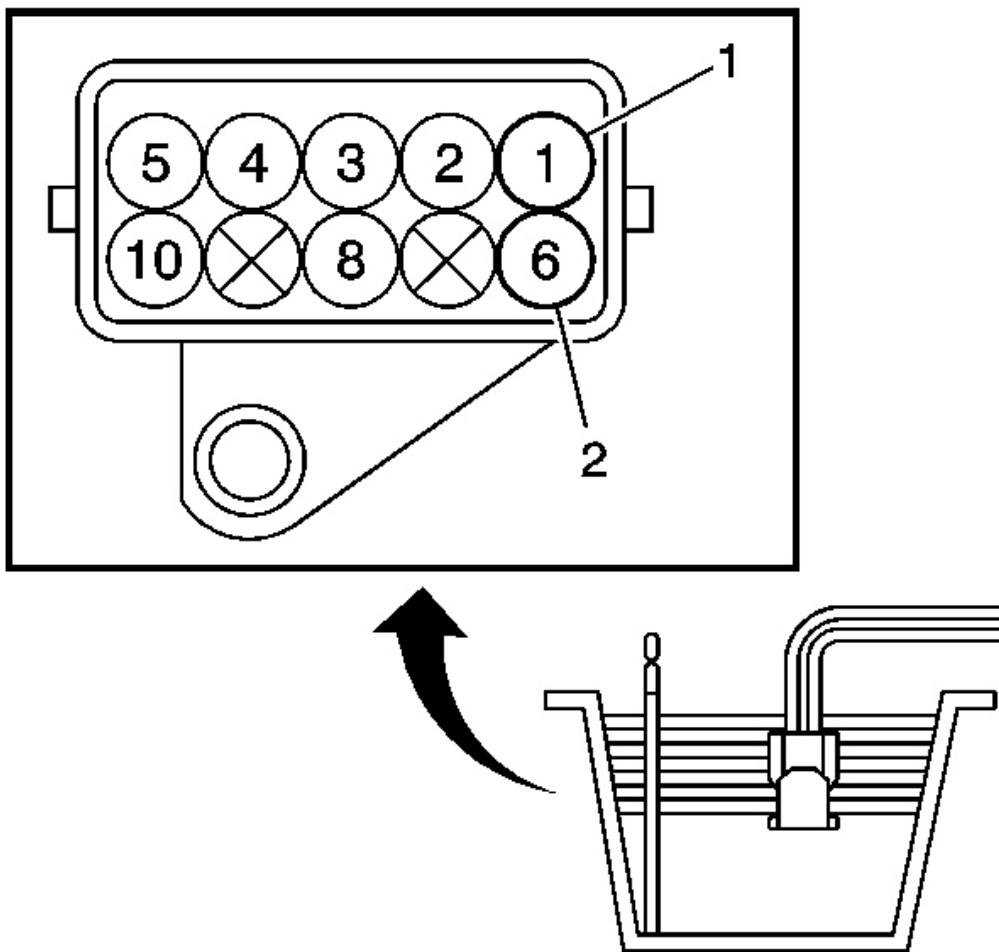


Fig. 101: TFT Sensor

Courtesy of GENERAL MOTORS CORP.

1. Measure the resistance of the transmission fluid temperature (TFT) sensor between terminals 1 and 6 (1, 2) of the TFT connector at 10°C (50°F) and 110°C (230°F).
2. If the resistance measurement of 10°C (50°F) is not between 5.8-7.09 k ohms, replace the TFT sensor.
3. If the resistance measurement of 110°C (230°F) is not between 0.23-0.263 k ohms, replace the TFT sensor.

SHIFT SOLENOID (1, 2), TIMING SOLENOID, LOCK-UP SOLENOID INSPECTION

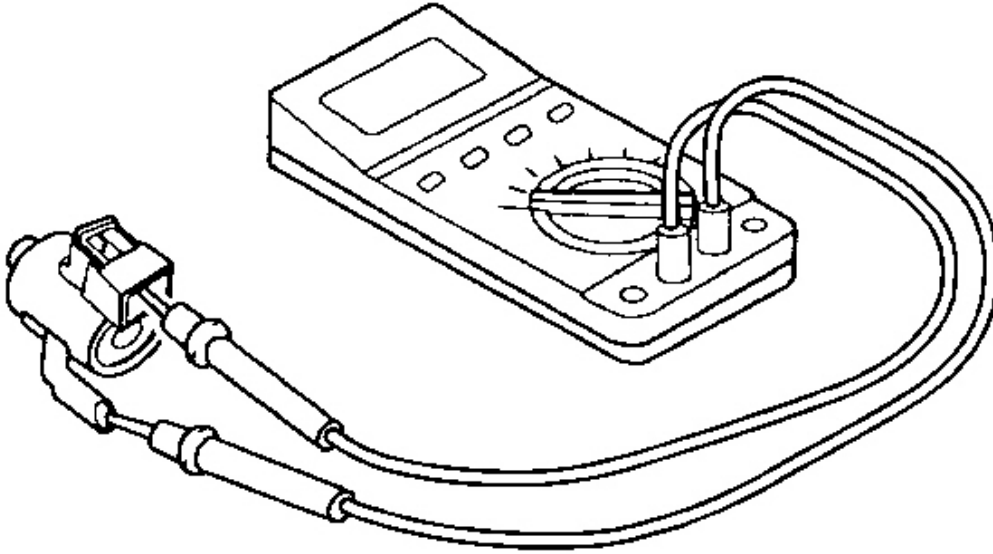


Fig. 102: Inspecting The Resistance Of Each Shift Solenoid Between The Terminal & Ground
Courtesy of GENERAL MOTORS CORP.

1. Inspect the resistance of each shift solenoid between the terminal and the ground.

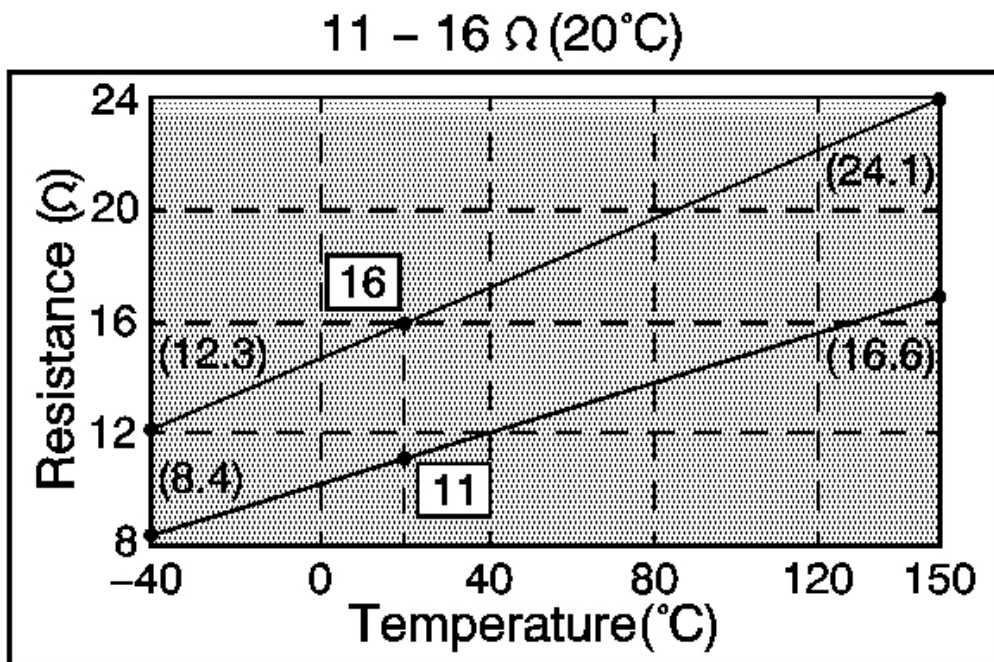


Fig. 103: Minimum & Maximum Resistance Plot Lines (Shift, Timing & Lock-Up Solenoid)
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The resistance of the solenoid can become infinity ohm when the resistance measurement is made at high temperatures.

2. If the resistance value is not between the minimum and maximum resistance plot lines, then measure the solenoid resistance at 20°C (68°F).

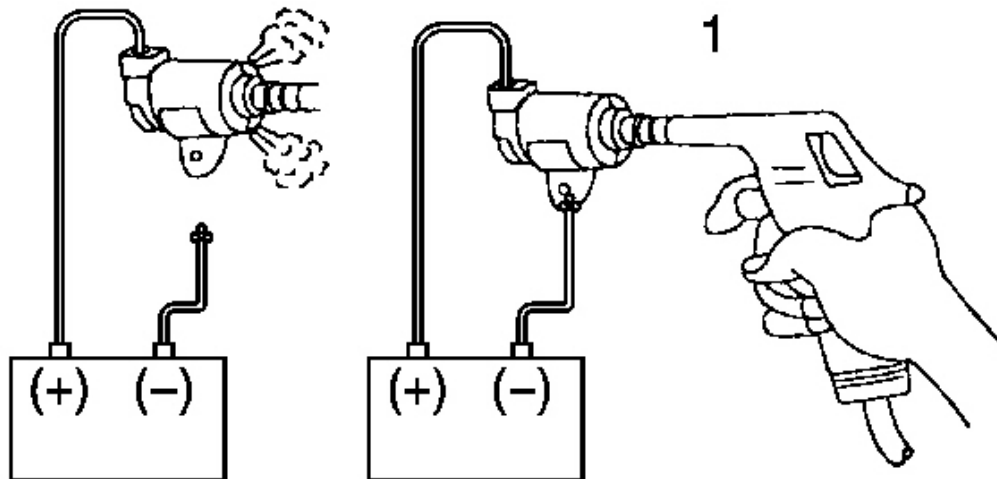


Fig. 104: Testing The Operation Of Shift Solenoid
Courtesy of GENERAL MOTORS CORP.

3. Test the operation of the shift solenoid. The shift solenoid is a normally open solenoid. Air will only pass through the solenoid when it is not energized.
4. Apply compressed air to the solenoid inlet.
5. If the solenoid does not allow air to pass through the solenoid, replace the solenoid.
6. Apply B+ and Ground to the solenoid.
7. If the solenoid allows air to pass through the solenoid, then replace the solenoid (1).

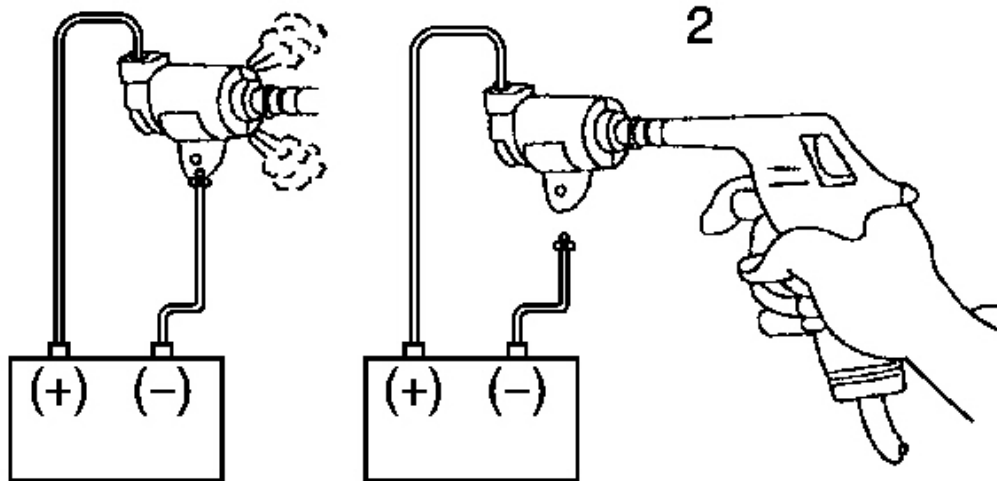


Fig. 105: Testing The Operation Of Timing Solenoid
Courtesy of GENERAL MOTORS CORP.

8. Test the operation of the timing solenoid. The timing solenoid is a normally closed solenoid (2). Air will only pass through the solenoid when the solenoid is energized.
9. Apply compressed air to the solenoid inlet.
10. If the solenoid allows air to pass through the solenoid, then replace the solenoid.
11. Apply B+ and Ground to the solenoid.
12. If the solenoid does not allow air to pass through the solenoid, replace the solenoid.

PRESSURE CONTROL SOLENOID INSPECTION

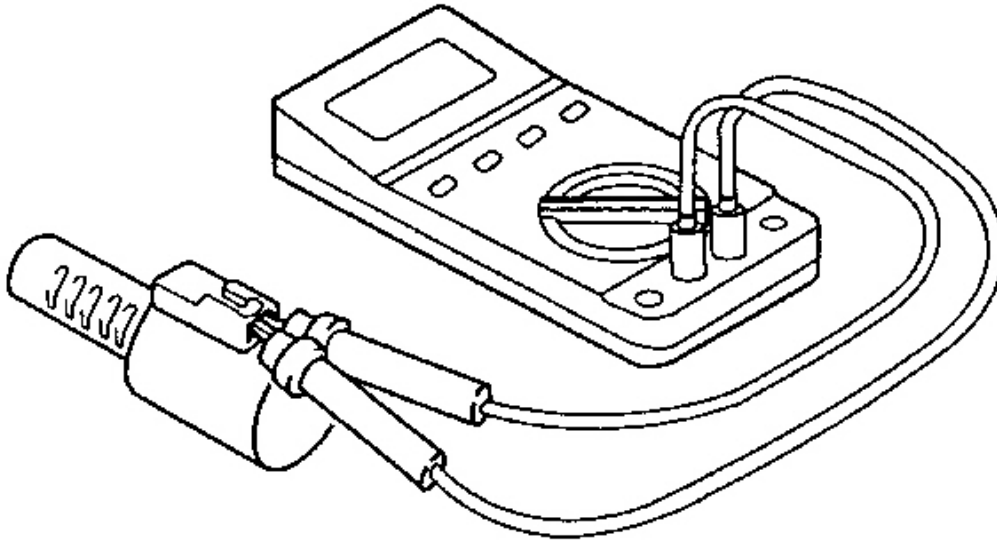


Fig. 106: Measuring The Resistance Of Each PCS Between Terminals
Courtesy of GENERAL MOTORS CORP.

1. Measure the resistance of each pressure control solenoid (PCS) between terminals.

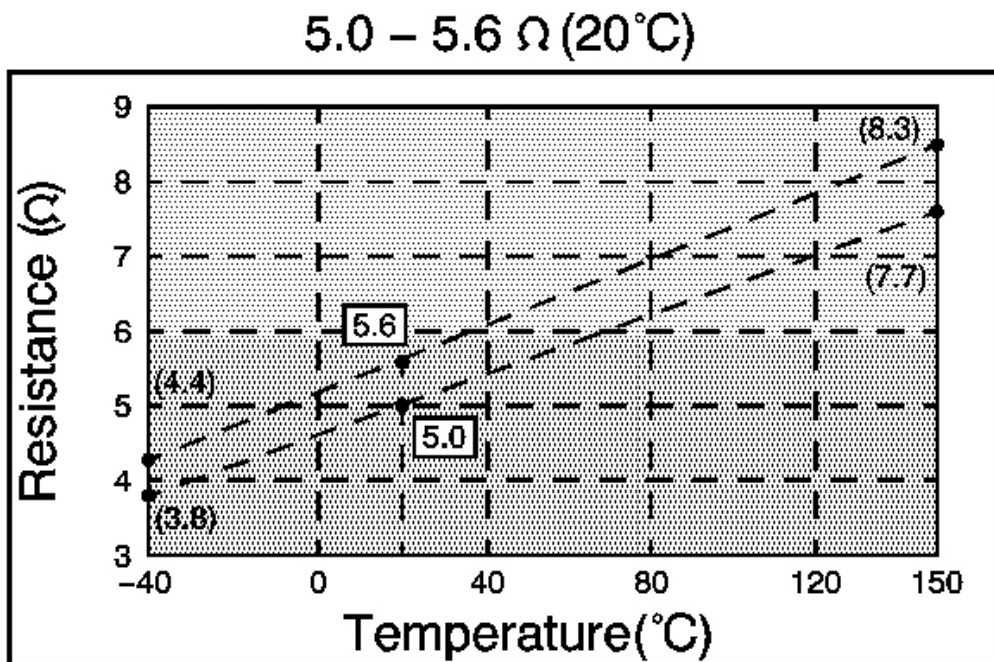


Fig. 107: Minimum & Maximum Resistance Plot Lines (Pressure Control Solenoid)
 Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The resistance of the solenoid can become infinity ohm when the resistance measurement is made at high temperatures.

- If the resistance value is not between the minimum and maximum resistance plot lines, then measure the solenoid resistance at 20°C (68°F).
- If both resistance measurements are not between the minimum and maximum resistance plot lines, then replace the PCS.

AUTOMATIC TRANSMISSION RANGE SELECTOR CABLE ADJUSTMENT

Adjustment Procedure

The various shift control cable positions must match at the shift control lever in the vehicle and at the selector lever on the transaxle to provide proper transaxle shifting.

Place the shift control lever in the park (P) position and check the selector lever connection to verify that it is in the forward most position. If it is not, the following adjustment must be performed:

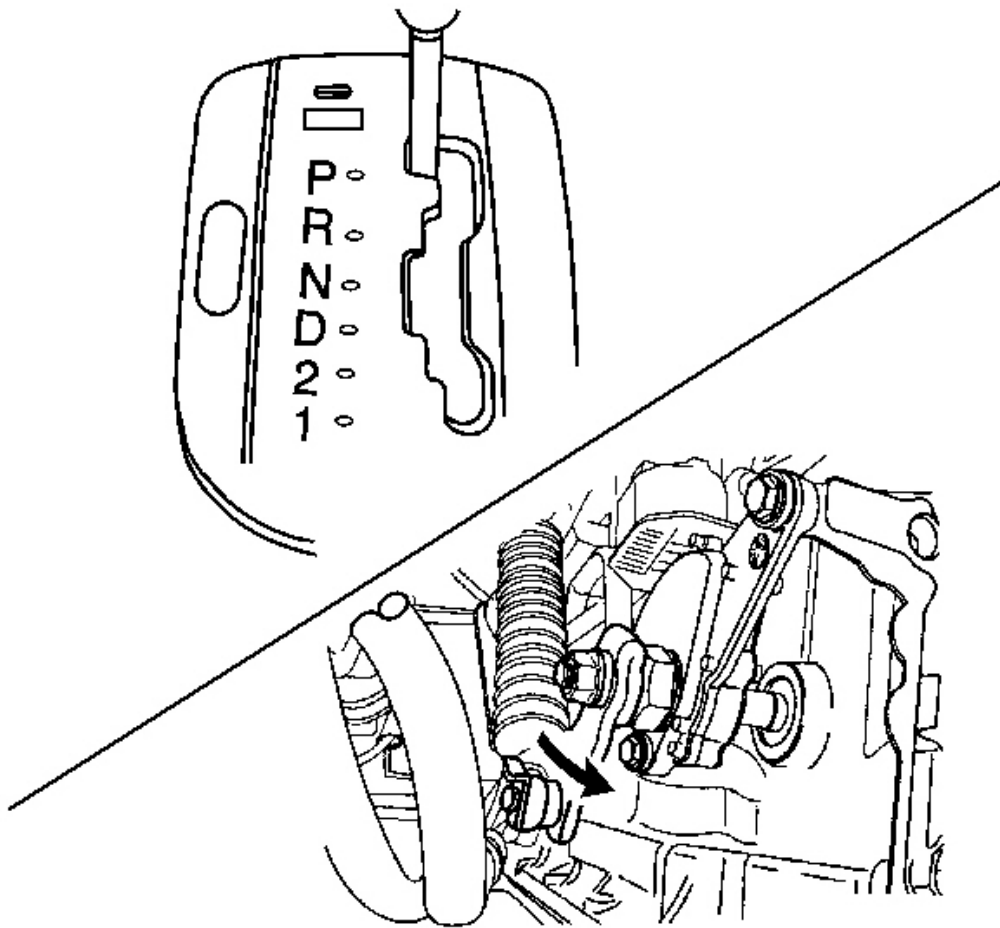


Fig. 108: Shift Control Lever In Park Position, Trim Panel & Floor Console
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution in Cautions and Notices.

1. Disconnect the negative battery cable.
2. Remove the trim panel from the floor console. Refer to Console Replacement - Front Floor in Instrument Panel, Gages, and Console.
3. Place the shift control lever in the park (P) position.

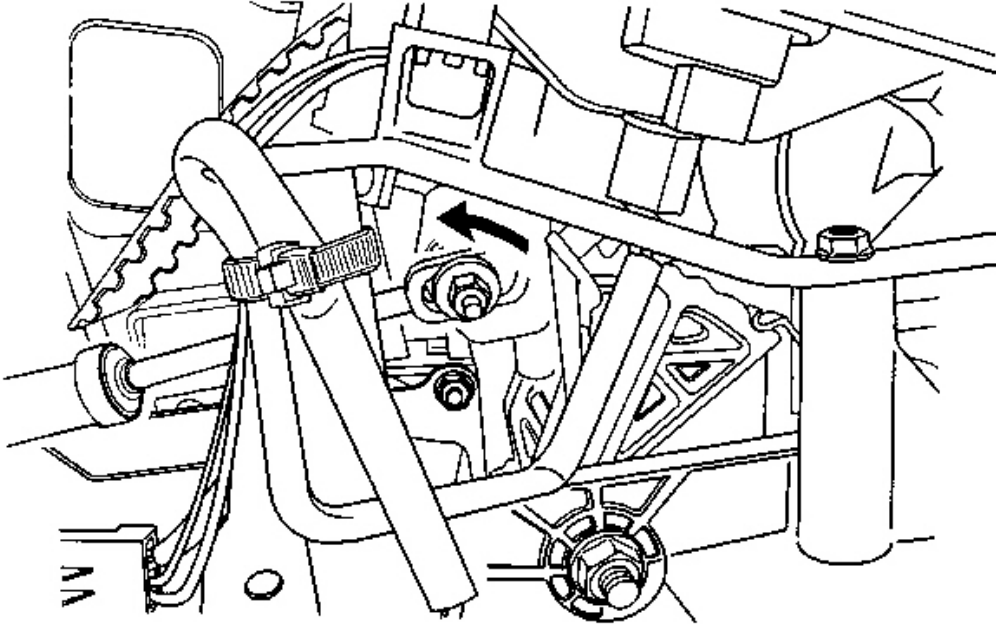


Fig. 109: Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

4. Loosen the control cable adjusting nut.

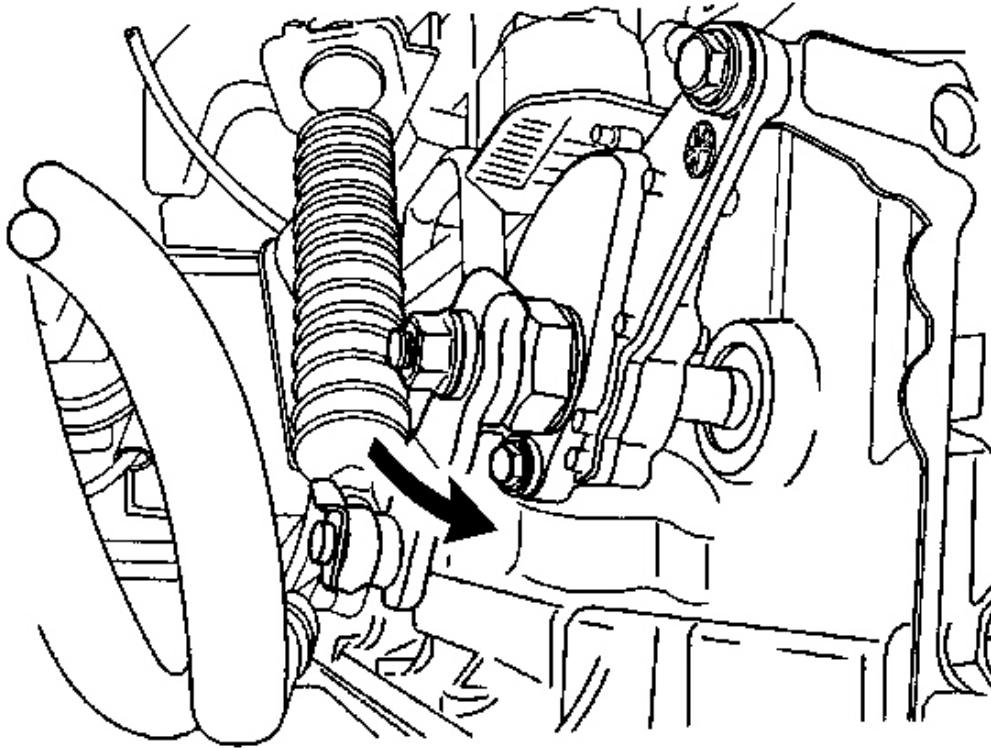


Fig. 110: PNP Switch Lever

Courtesy of GENERAL MOTORS CORP.

5. Move the park/neutral position (PNP) switch lever counterclockwise until stopping the lever.

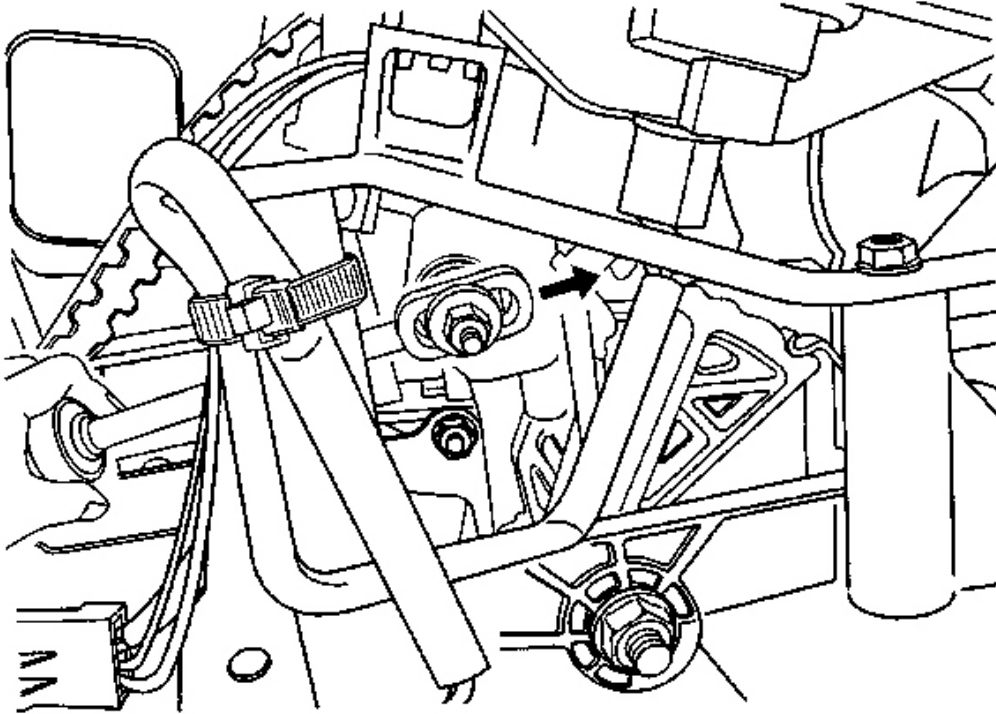


Fig. 111: Shift Control Cable & Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Pull the shift control cable until it is tight and tighten the control cable adjusting nut.

Tighten: Tighten the control cable adjusting nut to 8 N.m (71 lb in).

7. Install the floor console trim panel. Refer to Console Replacement - Front Floor in Instrument Panel, Gages, and Console.
8. Connect the negative battery cable.

PARK/NEUTRAL POSITION SWITCH ADJUSTMENT

Removal Procedure

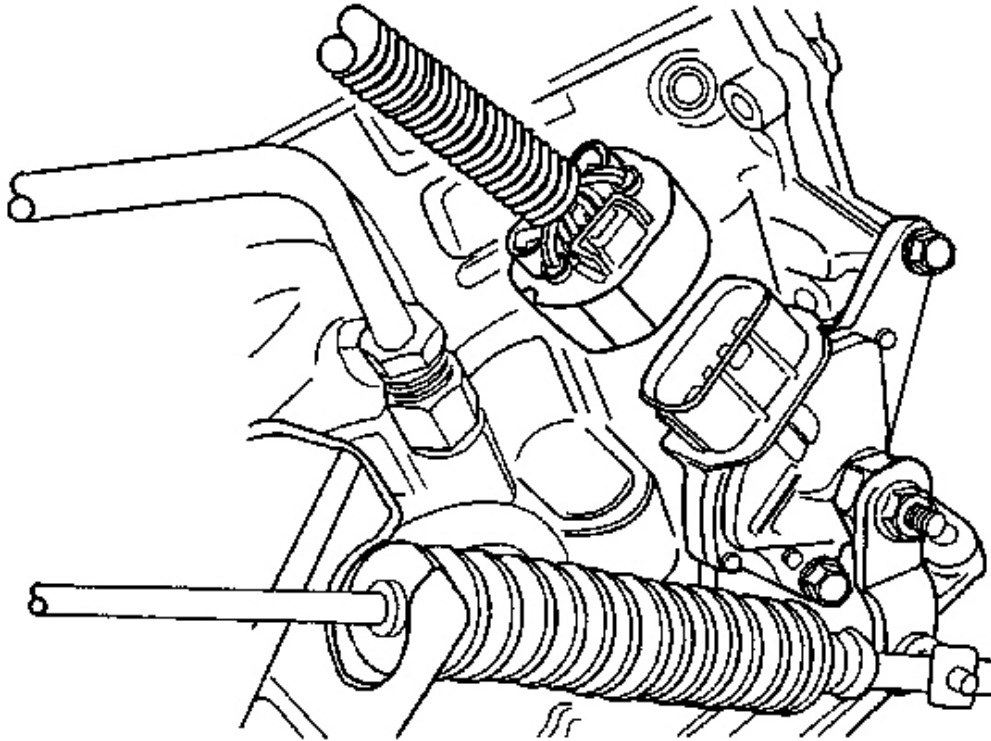


Fig. 112: PNP Switch Electrical Connector & Wiring Harness
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Battery Disconnect Caution .

1. Disconnect the negative battery cable.
2. Disconnect the park/neutral position (PNP) switch electrical connector from the wiring harness.

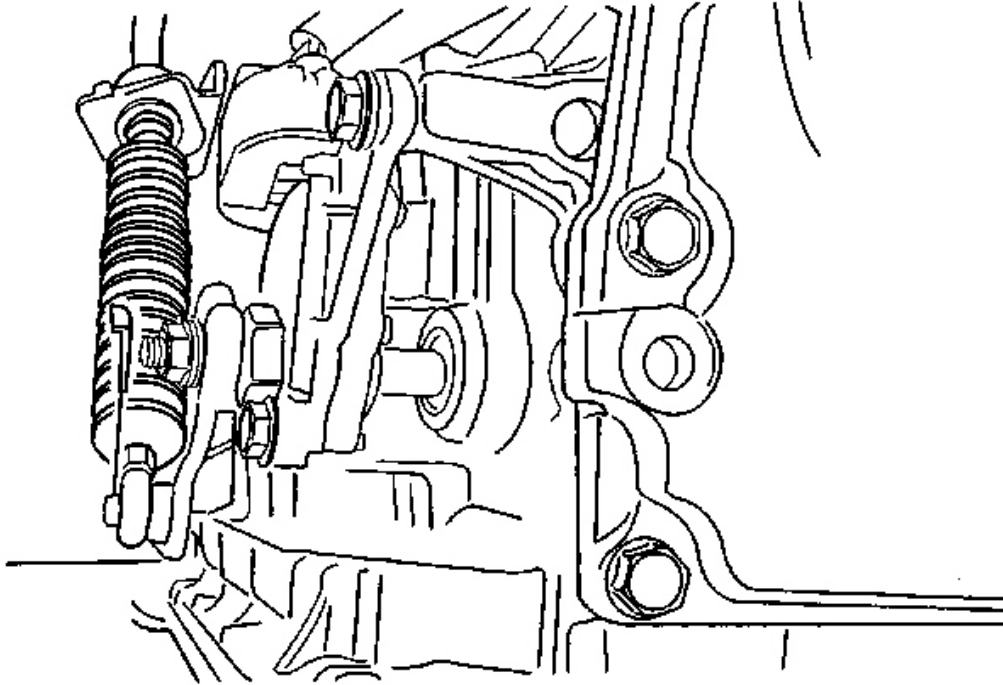


Fig. 113: Shift Control Cable & PNP Switch Lever
Courtesy of GENERAL MOTORS CORP.

3. Remove the E-ring.
4. Disconnect the shift control cable from the PNP switch lever.

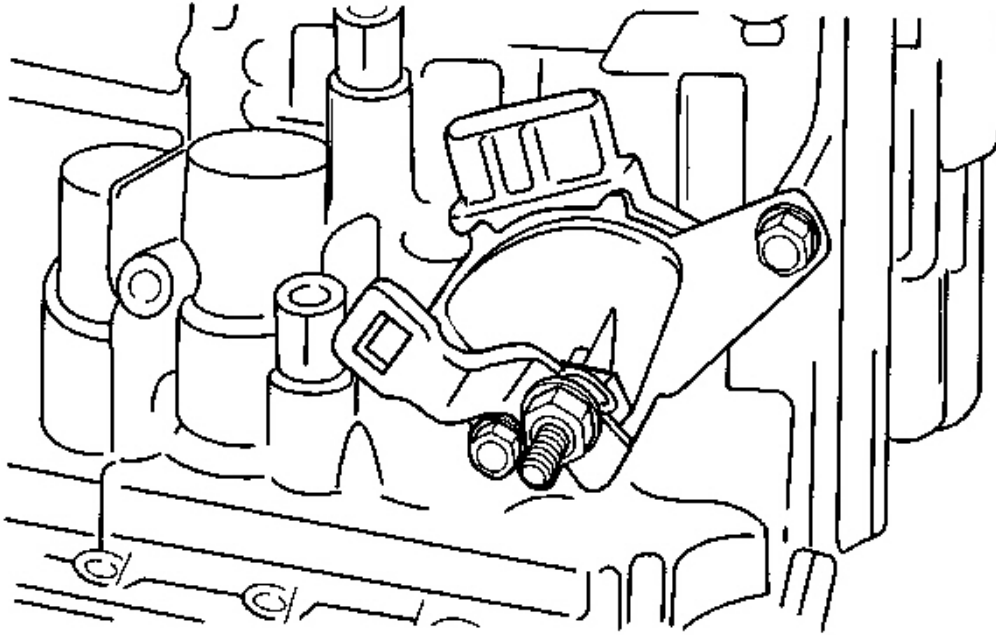


Fig. 114: Retaining Nut, Washer & Control Lever
Courtesy of GENERAL MOTORS CORP.

5. Remove the retaining nut and then remove the washer and the control lever.
6. Using a driver, unstake the lock washer and remove the nut.

Installation Procedure

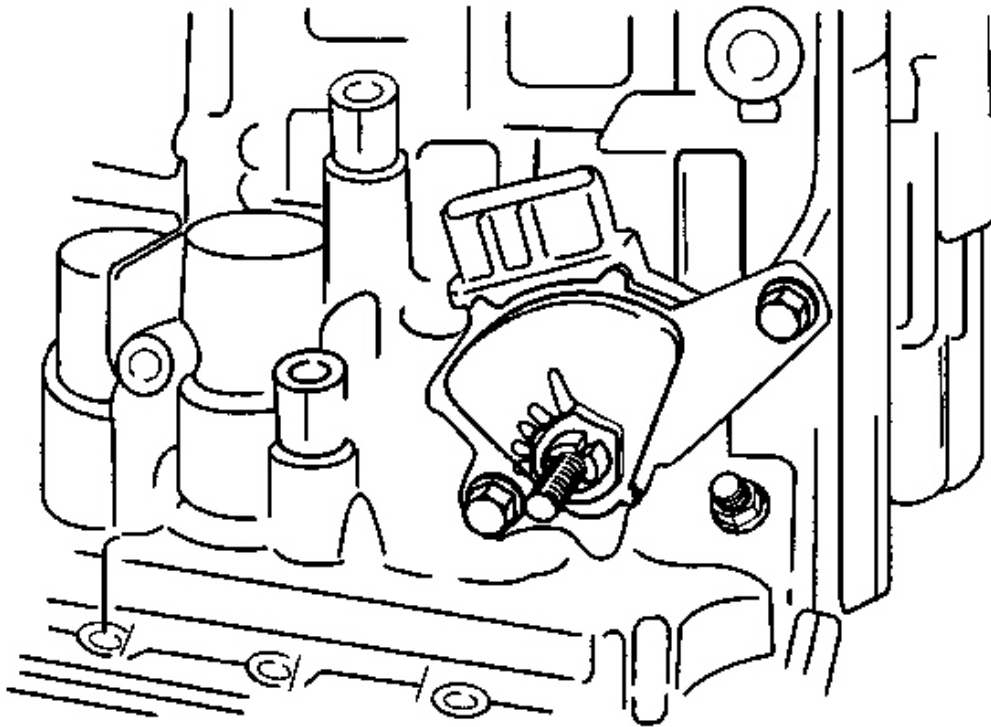


Fig. 115: PNP Switch & Manual Valve Lever Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the PNP switch onto the manual valve lever shaft and temporarily install the 2 adjusting bolts.

NOTE: Refer to Fastener Notice .

2. Install the new lock washer and nuts.

Tighten: Tighten the nuts to 12 N.m (106 lb in).

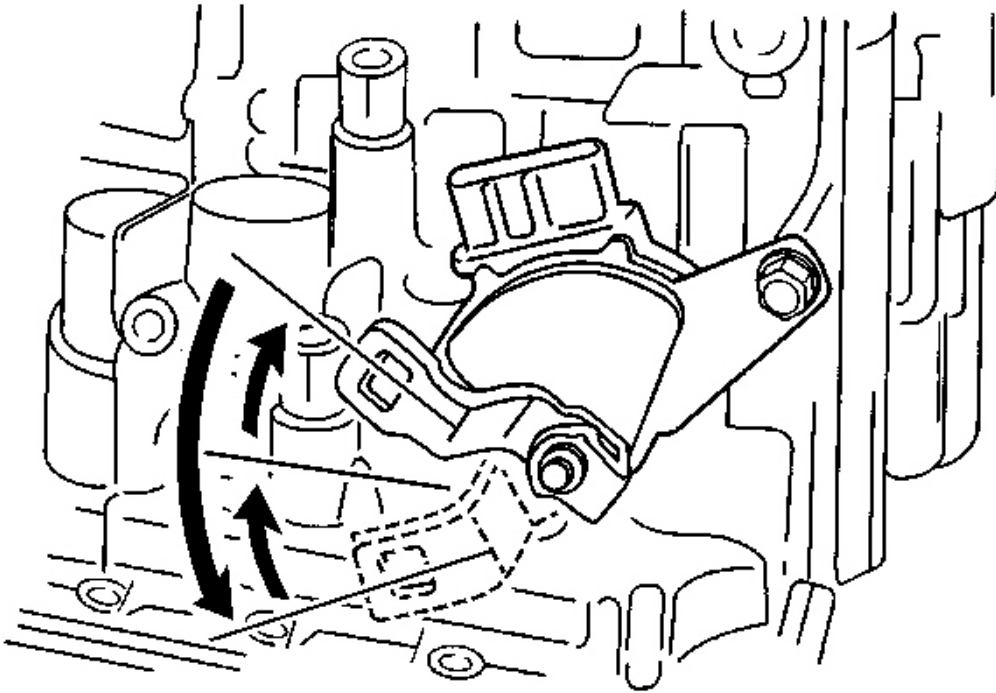


Fig. 116: Turning PNP Switch Lever
Courtesy of GENERAL MOTORS CORP.

3. Temporarily install the control lever
4. Turn the lever counterclockwise until it stops, then turn it clockwise 2 notches.
5. Remove the control lever.

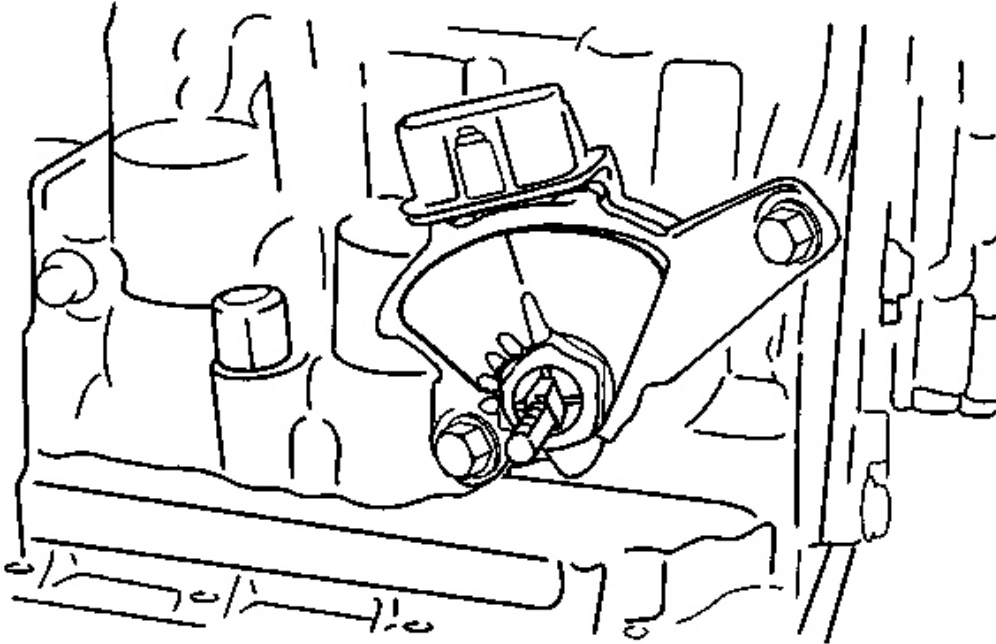


Fig. 117: Aligning Groove With Neutral Basic Line
Courtesy of GENERAL MOTORS CORP.

6. Align the groove with the neutral basic line, then install the 2 bolts.

Tighten: Tighten the 2 bolts to 5.4 N.m (48 lb in).

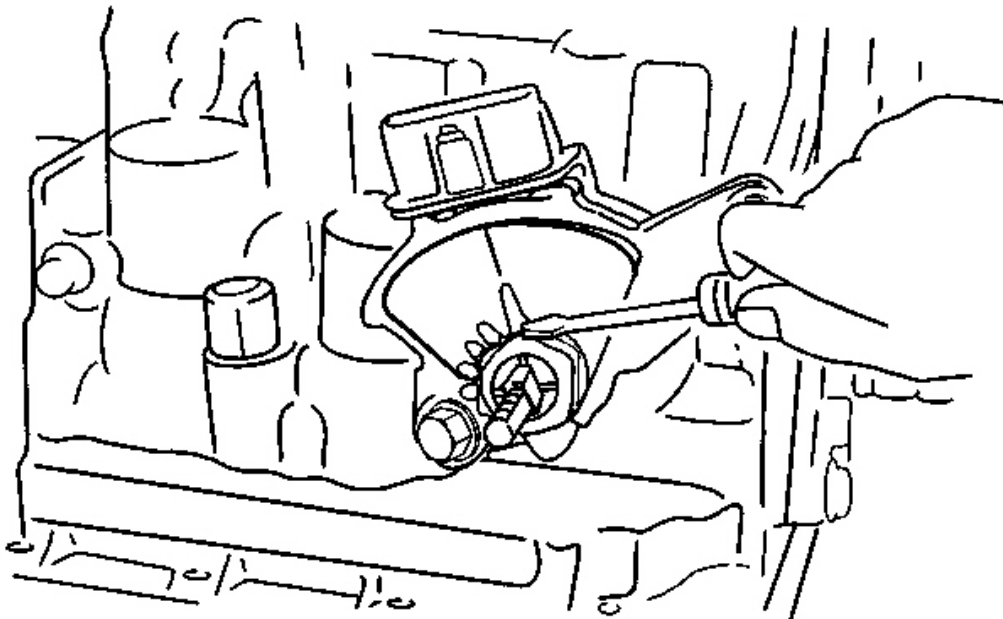


Fig. 118: Staking The Nut With Lock Washer Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

7. Using a screwdriver, stake the nut with the lock washer.

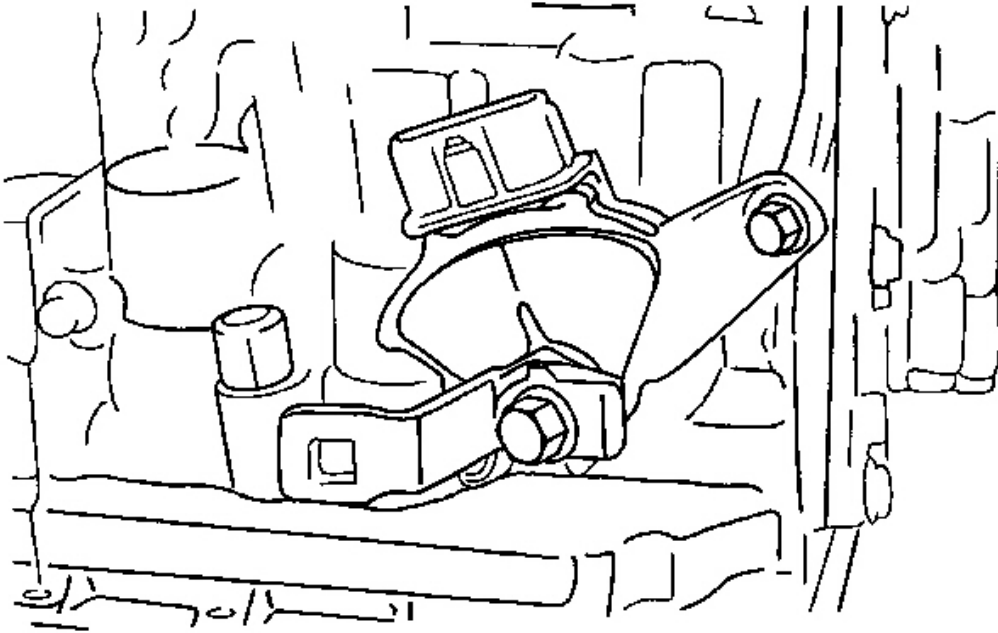


Fig. 119: PNP Switch Control Lever, Washer & Nut
Courtesy of GENERAL MOTORS CORP.

8. Install the control lever, washer and nut.

Tighten: Tighten the nut to 12 N.m (106 lb in).

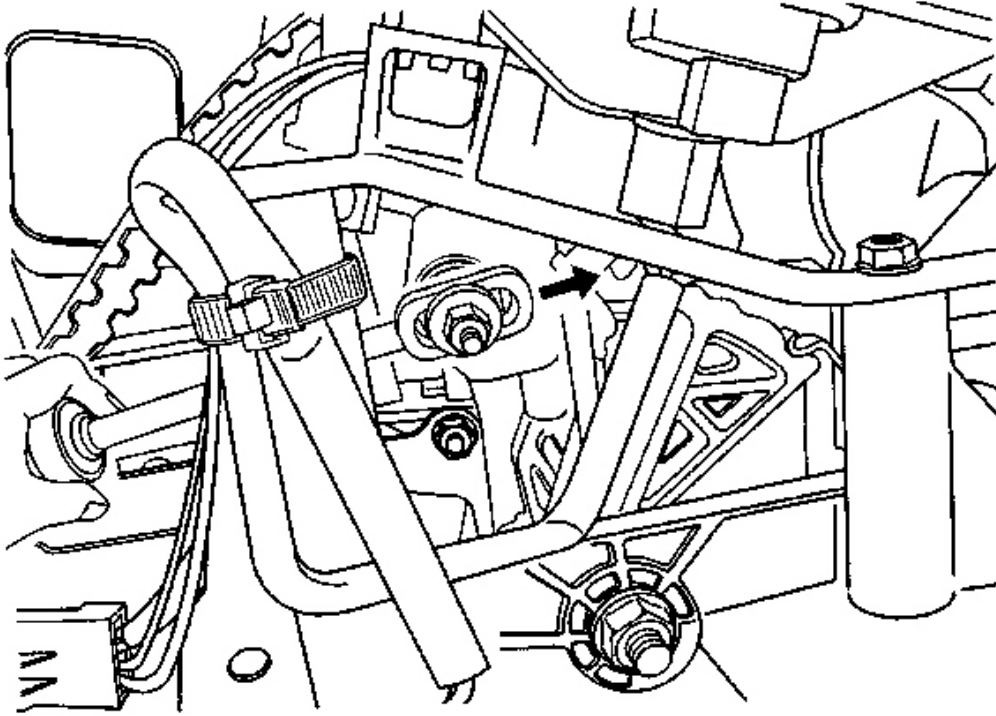


Fig. 120: Shift Control Cable & Control Cable Adjusting Nut
Courtesy of GENERAL MOTORS CORP.

9. Connect the control cable to PNP switch.
10. Connect the PNP switch electrical connector.
11. Adjust the control cable. Refer to **Automatic Transmission Range Selector Cable Adjustment**.
12. Install the control cable adjusting nut.

Tighten: Tighten the control cable adjusting nut to 8 N.m (71 lb in).

13. Connect the negative battery cable.

TRANSMISSION FLUID LEVEL INSPECTION

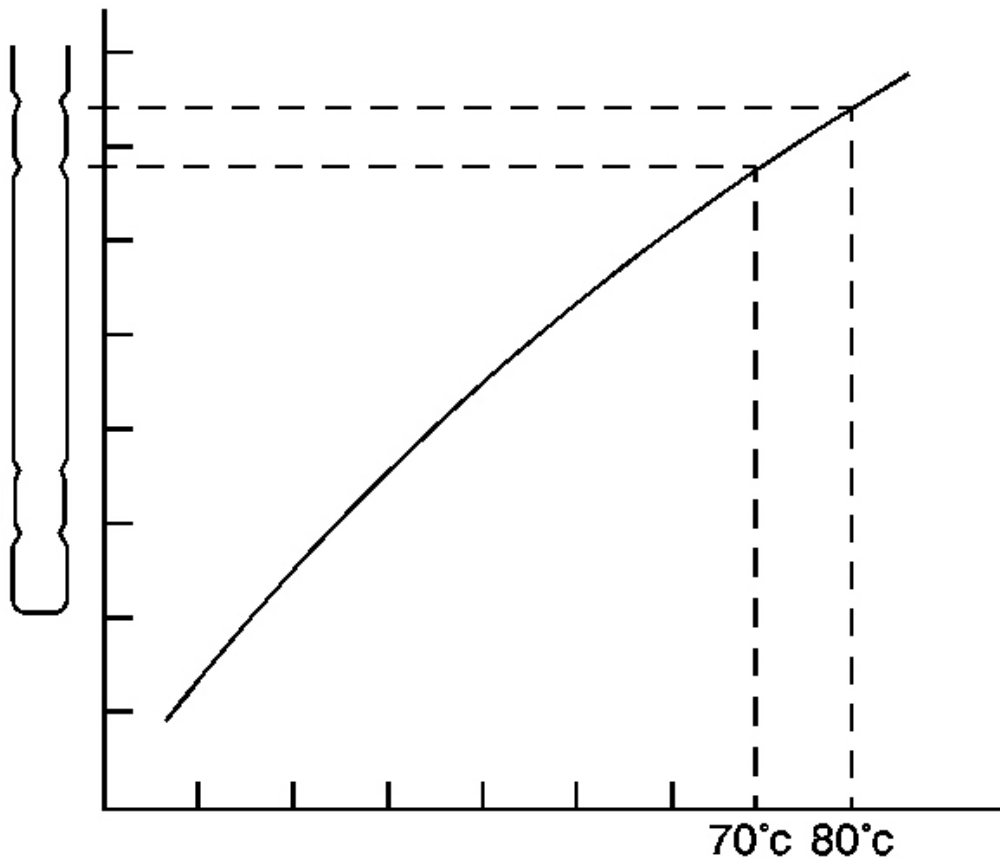


Fig. 121: Transmission Fluid Level Graph

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: When adding fluid or making a complete fluid change, always use T-IV Automatic Transmission Fluid.

IMPORTANT: Measure the fluid level when the transaxle temperature is 70°C-80°C (158°F-176°F).

IMPORTANT: During the fluid level check, the selector lever must be in position P.

1. Make sure the vehicle is level.
2. Shift into all range from P to 1 and return to P with engine idling.
3. Remove the transaxle fluid dipstick and check the transaxle fluid level.

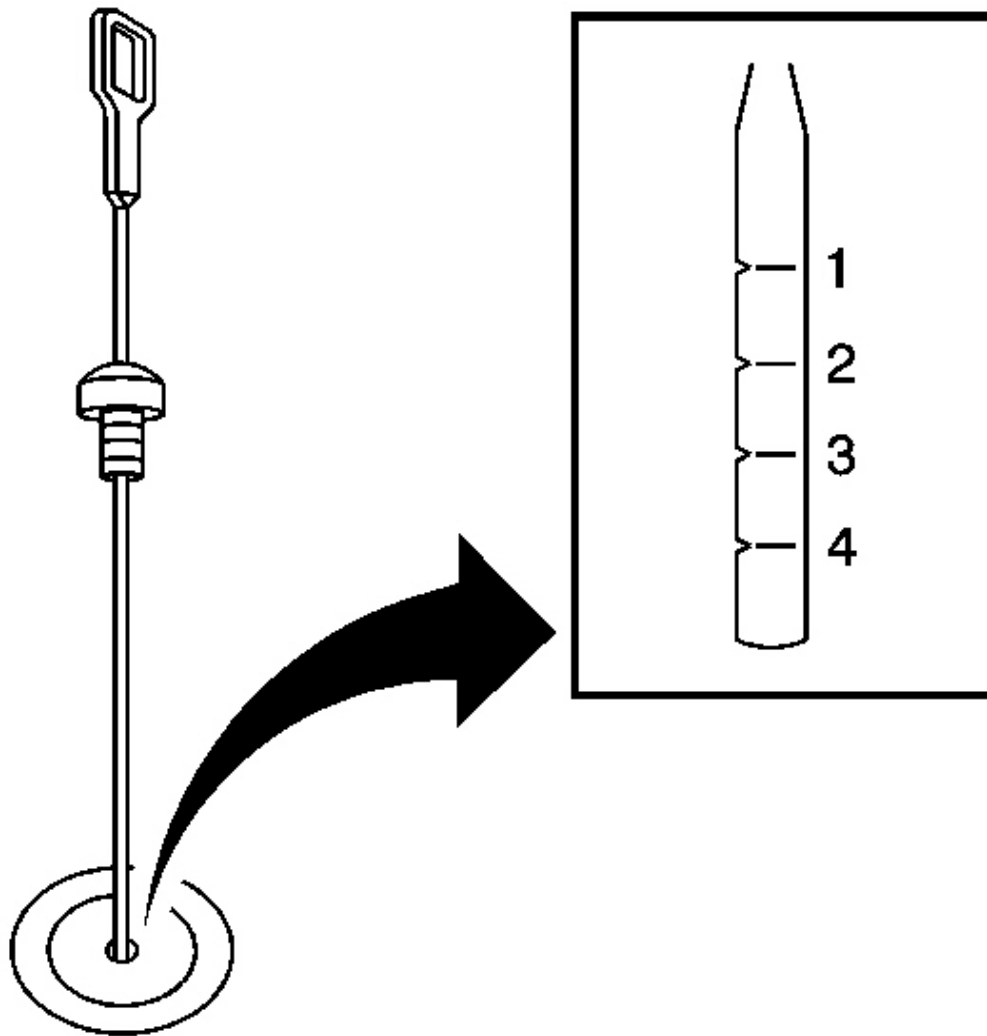


Fig. 122: Fluid Level & Dipstick
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The correct fluid level must be between the HOT MIN (2) and the HOT MAX (1) notches on the dipstick.

4. If the fluid level is below the MIN notch, add transaxle fluid through the fluid filler tube and check for leaks in the transaxle.
5. If the fluid above the MAX notch, the transaxle is overfilled. Drain some of the fluid through the fluid pan drain plug. Check the transaxle fluid level.

DRAINING TRANSMISSION FLUID

Draining Procedure

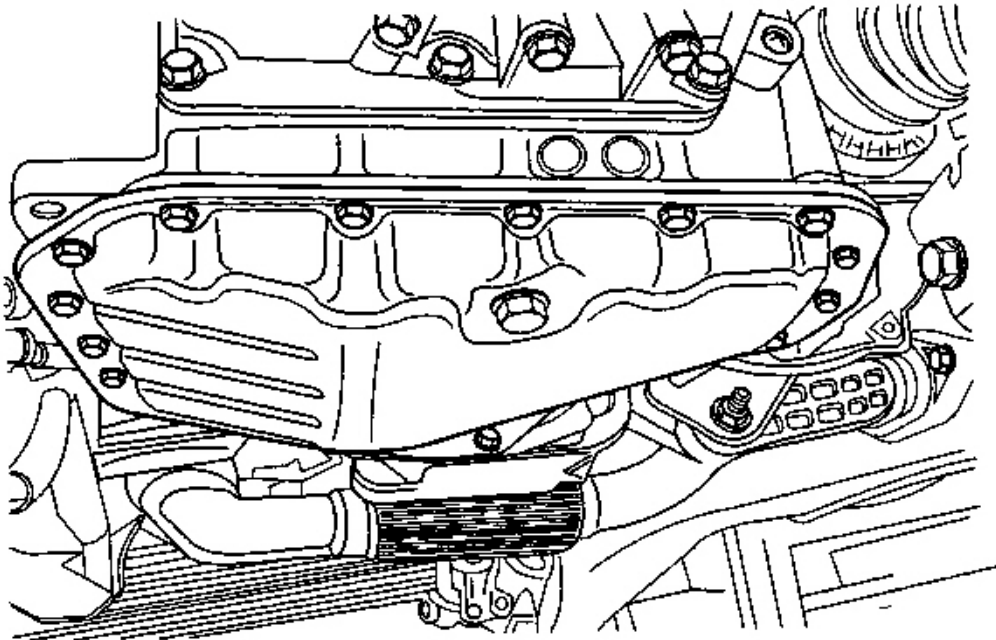


Fig. 123: Fluid Drain Plug & Transaxle
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Vehicle Lifting and Jacking Notice in Cautions and Notices.

1. Raise and support the vehicle
2. Place a suitable fluid drainage container under the transaxle.
3. Remove the fluid drain plug. Allow the fluid to drain completely.
4. Clean the drain plug threads.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. Install the fluid drain plug.

Tighten: Tighten the fluid drain plug to 17 N.m (13 lb ft).

Filling Procedure

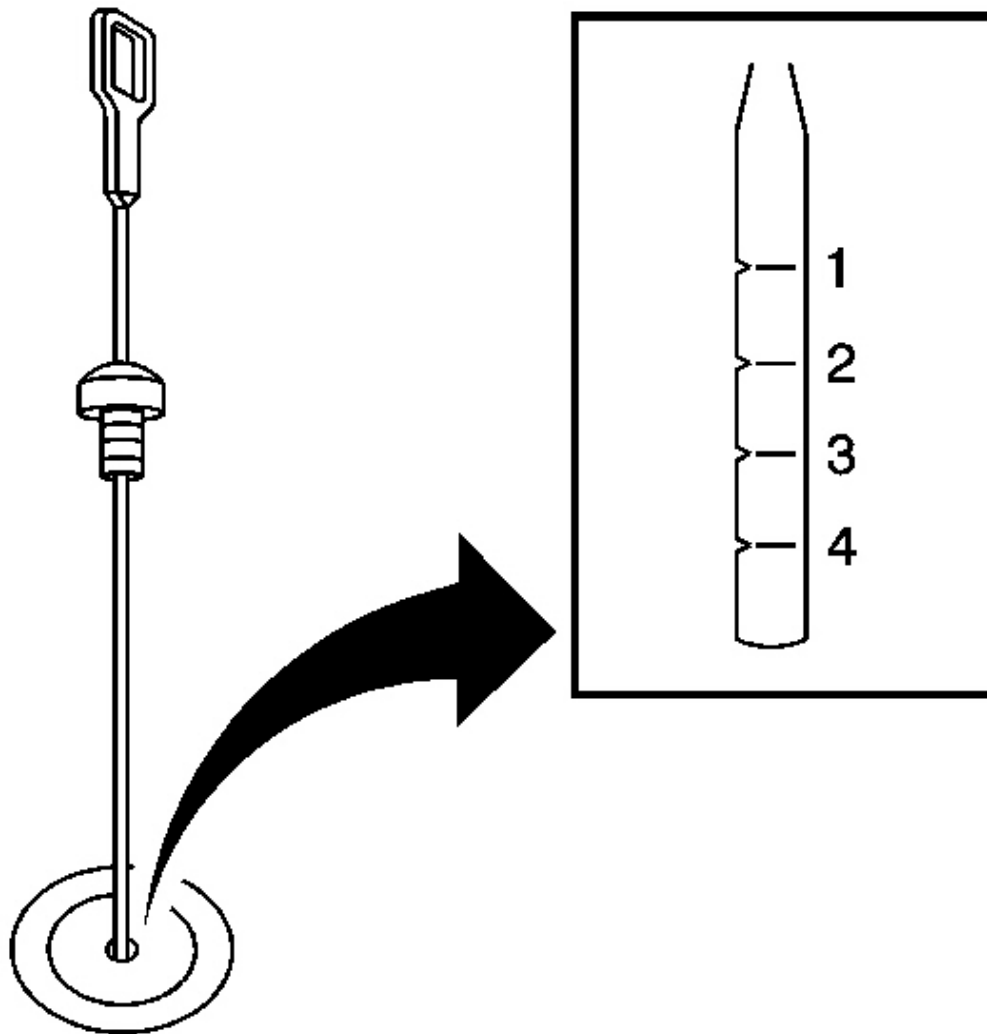


Fig. 124: Fluid Level & Dipstick
Courtesy of GENERAL MOTORS CORP.

1. Remove the drainage container and lower the vehicle.
2. Add 3/4 of the recommended amount of T-IV Automatic Transmission Fluid.
3. Start the engine and allow it to reach normal operating temperature.
4. Shift the gear selector through all positions.

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IMPORTANT: The correct fluid level must be between the HOT MIN (2) and the HOT MAX (1) notches on the dipstick.

5. Check the fluid level and add fluid until the dipstick indicates a safe level.

TRANSMISSION DISASSEMBLE

Tools Required

- **DT 46451** (DW240-020) Brake/Clutch Spring Compressor. See **Special Tools**.
- **DT 46454** (DW240-050) Overdrive Brake Adapter. See **Special Tools**.
- **DT 46455** (DW240-060-01) Brake Spring Compressor Bolt/Nut. See **Special Tools**.
- **DT 46457** (DW240-070) 1st and Reverse Brake Adapter. See **Special Tools**.
- **DT 46463** (DW240-150) Transaxle Case Side Bearing Outer Race Adapter. See **Special Tools**.
- **DT 46465** (DW240-170) Adapter Handle. See **Special Tools**.
- **DT 46453** (DW260-021) Automatic Transaxle Overhaul Fixture. See **Special Tools**.
- **DT 46472** (DW260-041) Planetary Ring Gear Nut Removal/Installation Socket. See **Special Tools**.

Disassembly Procedure

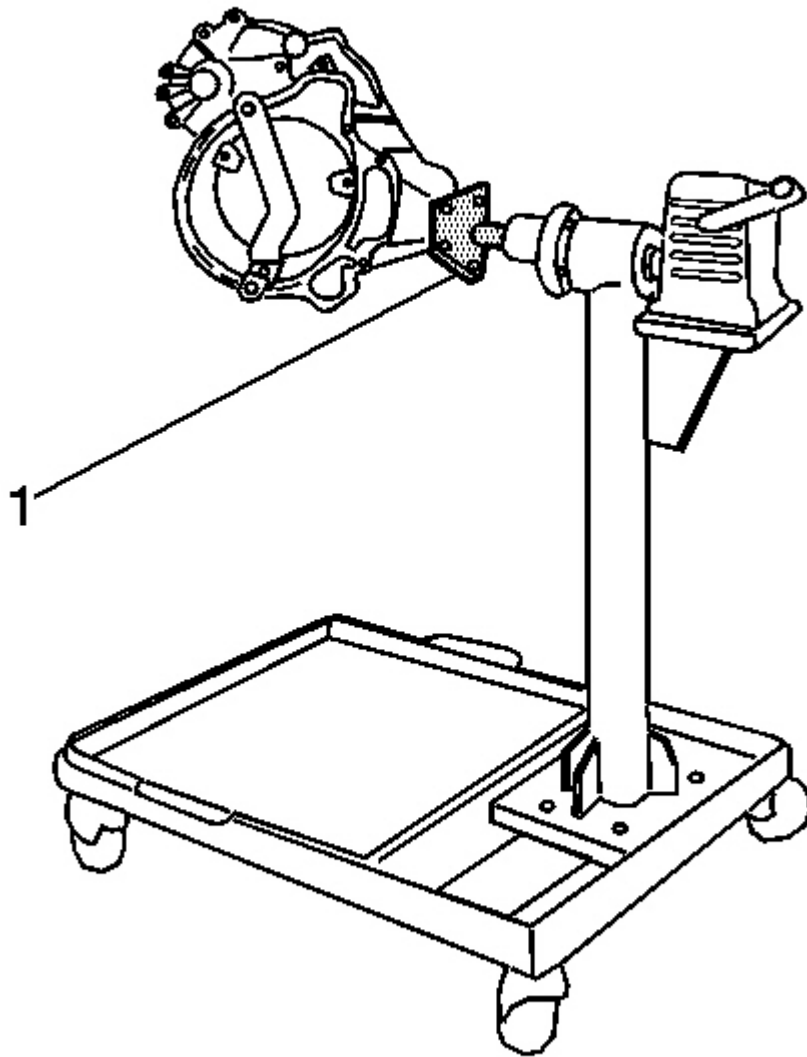


Fig. 125: Transaxle Assembly, Support & DT 46453
Courtesy of GENERAL MOTORS CORP.

1. Remove the transaxle assembly from the vehicle. Refer to **Transmission Replacement**.
2. Install the transaxle assembly to the transaxle support stand using the **DT 46453 (1)**. See **Special Tools**.

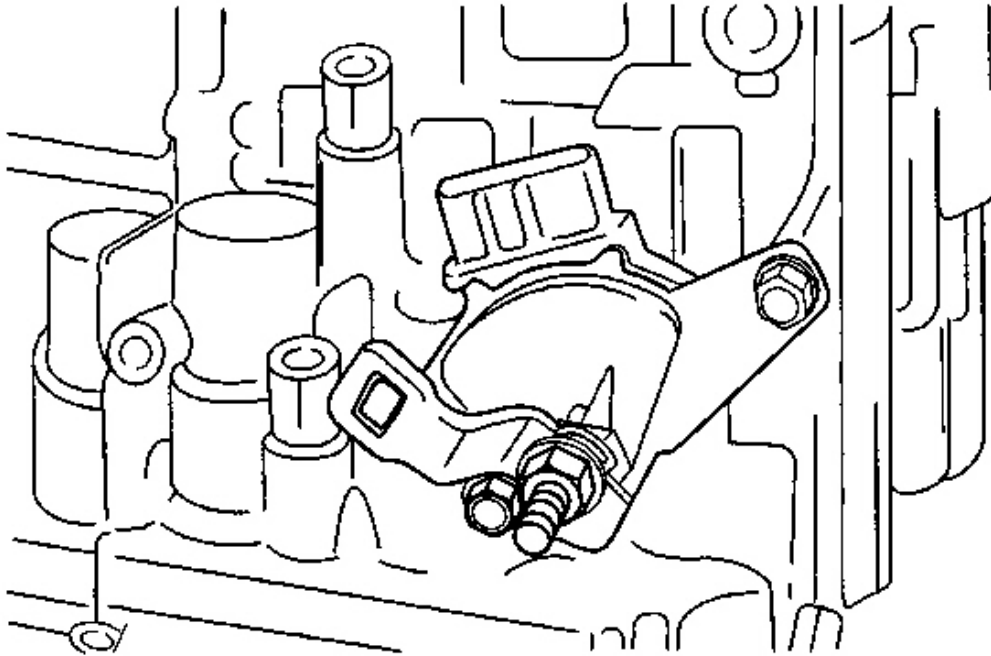


Fig. 126: PNP Switch, Nut, Washer & Control Lever
Courtesy of GENERAL MOTORS CORP.

3. Remove the nut, washer and control lever.
4. Using a screwdriver, unstake the lock washer.
5. Remove the 2 bolts and nut and pull out the park/neutral position (PNP) switch.

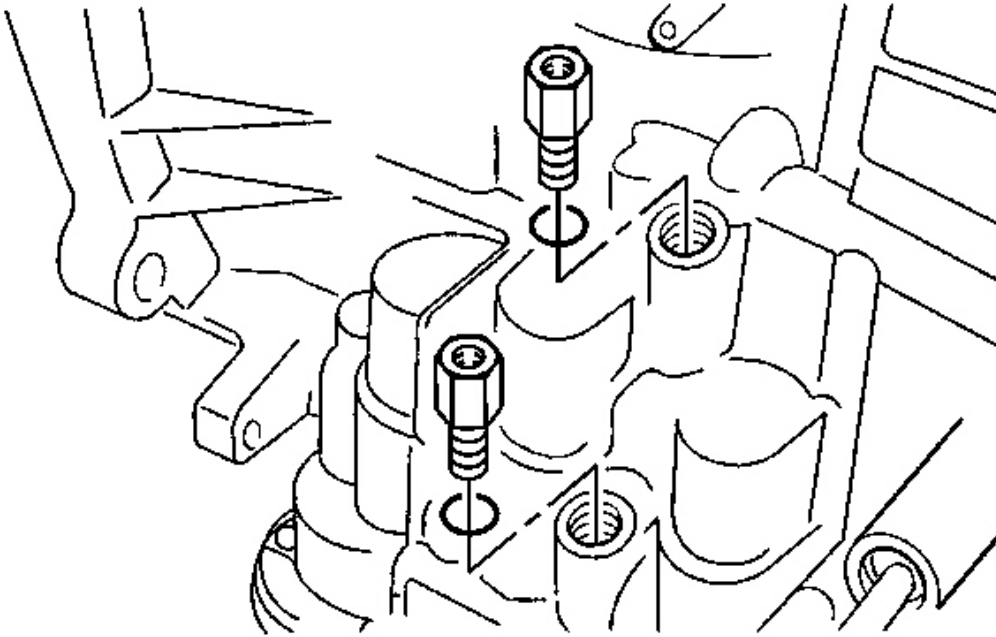


Fig. 127: Unions & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

6. Remove the 2 unions the transaxle case.
7. Remove the 2 O-rings from the unions.

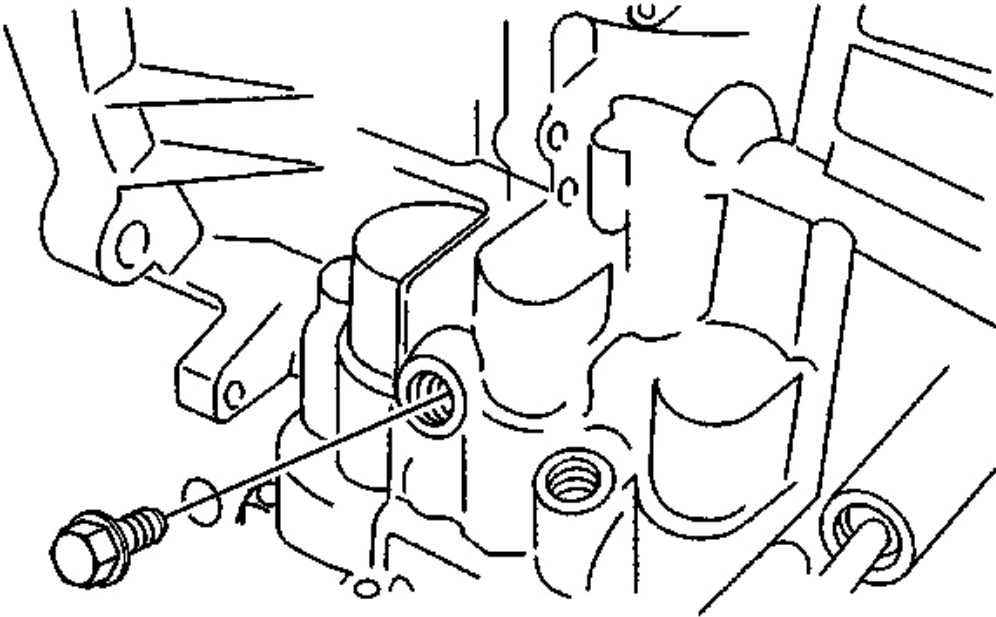


Fig. 128: Screw Plug & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

8. Remove the screw plug from the transaxle case.
9. Remove the O-ring from the screw plug.

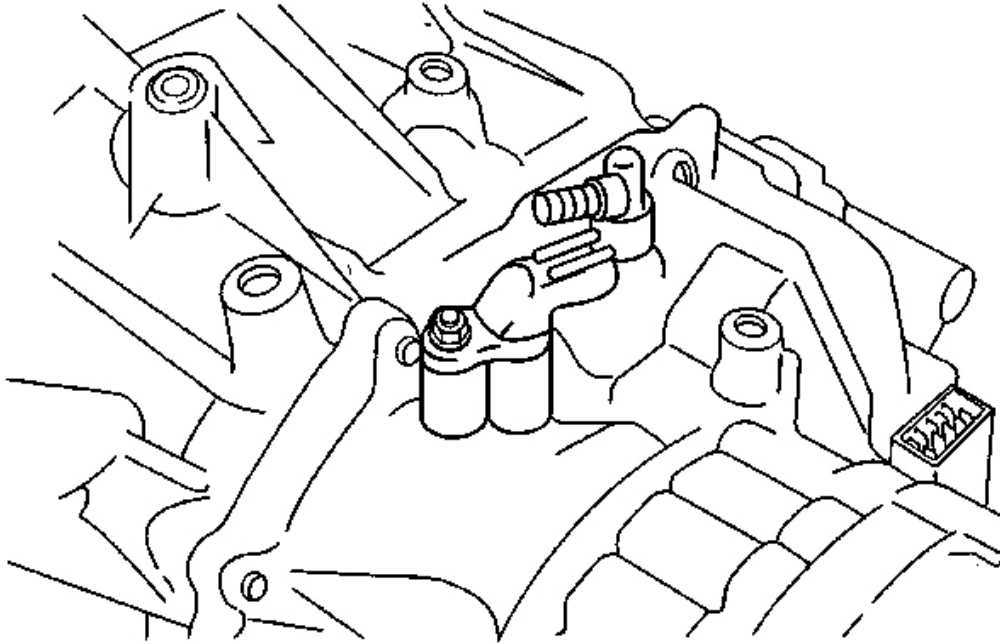


Fig. 129: ISS Sensor & Bolts

Courtesy of GENERAL MOTORS CORP.

10. Remove the bolt and the input shaft speed (ISS) sensor.
11. Remove the breather plug.
12. Remove the O-ring from the breather plug.

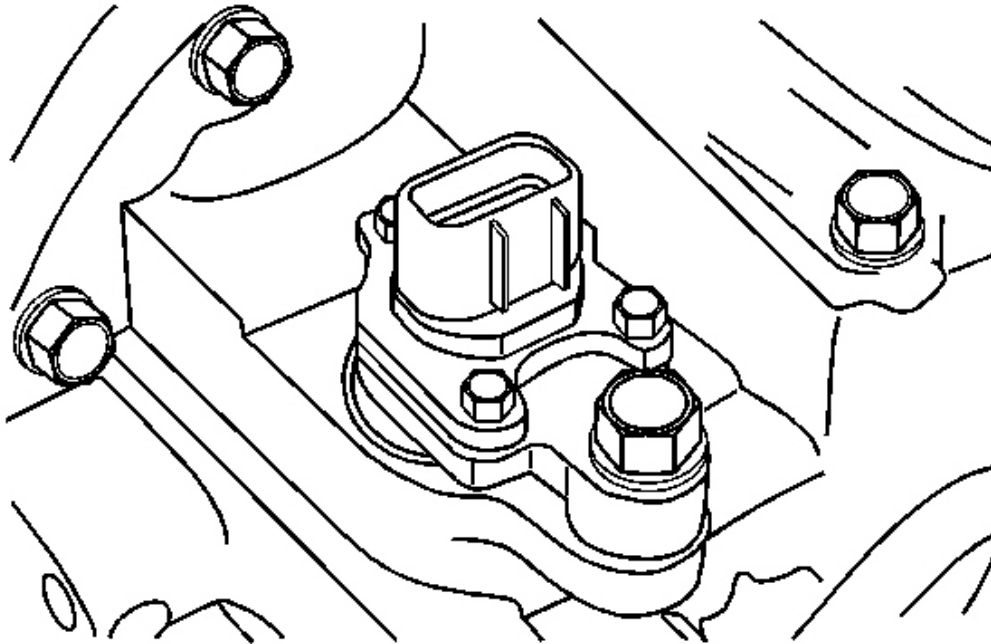


Fig. 130: OSS Sensor & Bolts
Courtesy of GENERAL MOTORS CORP.

13. Remove the bolt and the output shaft speed (OSS) sensor.

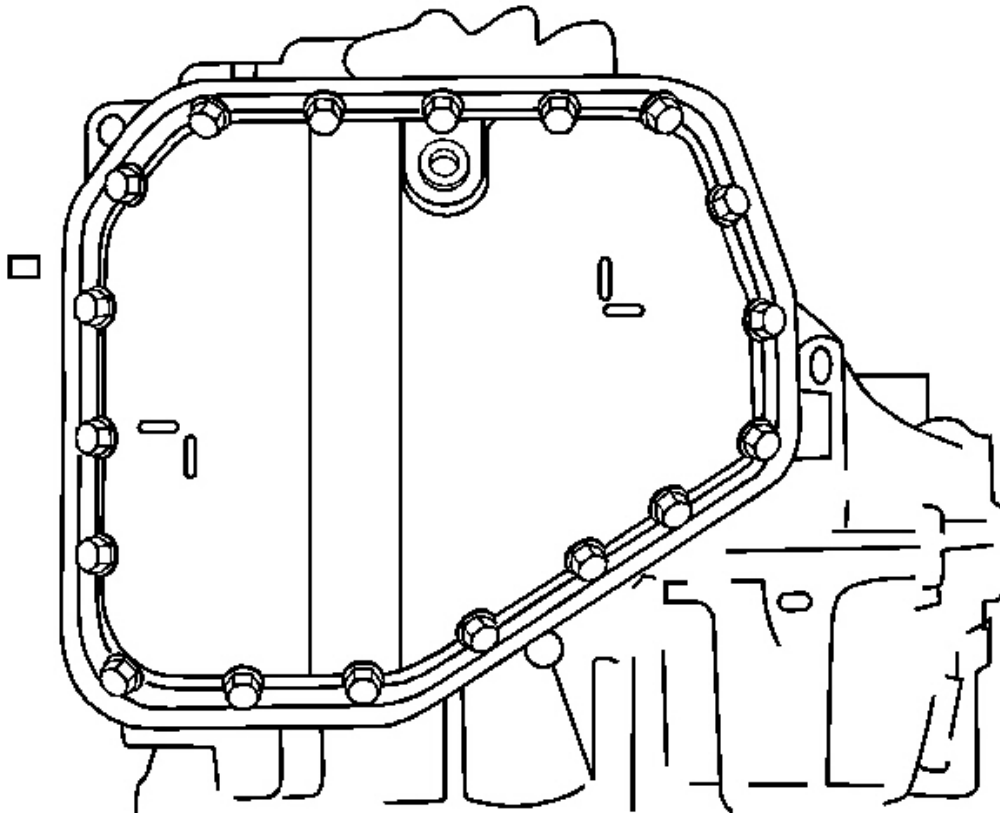


Fig. 131: Oil Pan & Gasket

Courtesy of GENERAL MOTORS CORP.

14. Remove the 18 bolts.
15. Remove the oil pan and gasket.
16. Remove the drain plug from the oil pan.

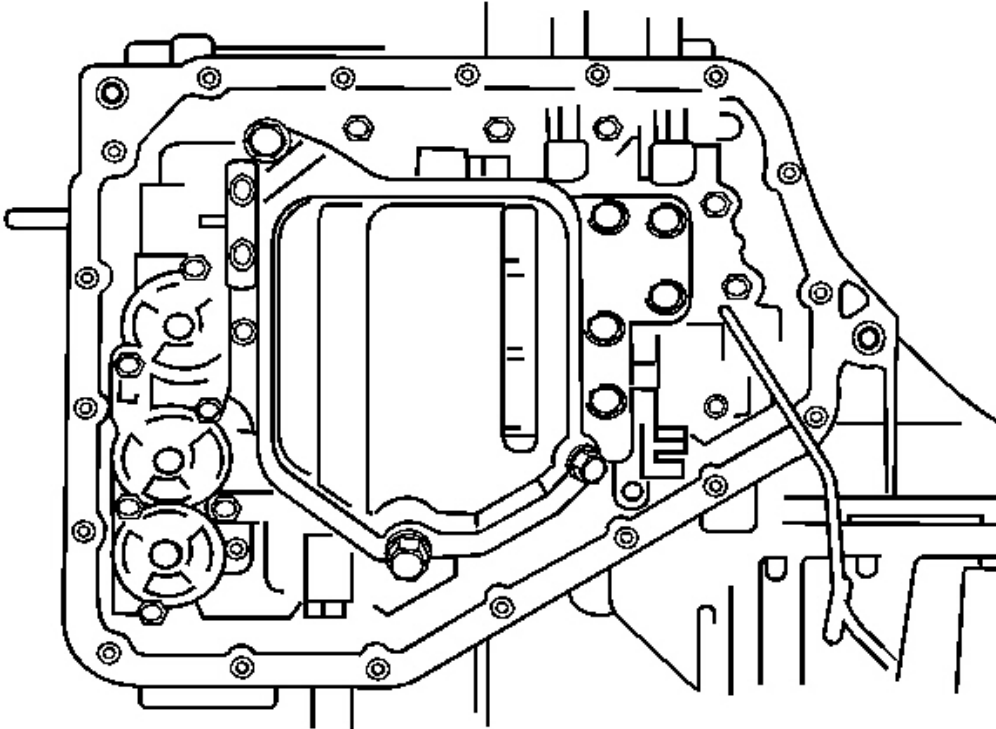


Fig. 132: Oil Strainer

Courtesy of GENERAL MOTORS CORP.

17. Remove the 3 bolts and oil strainer.

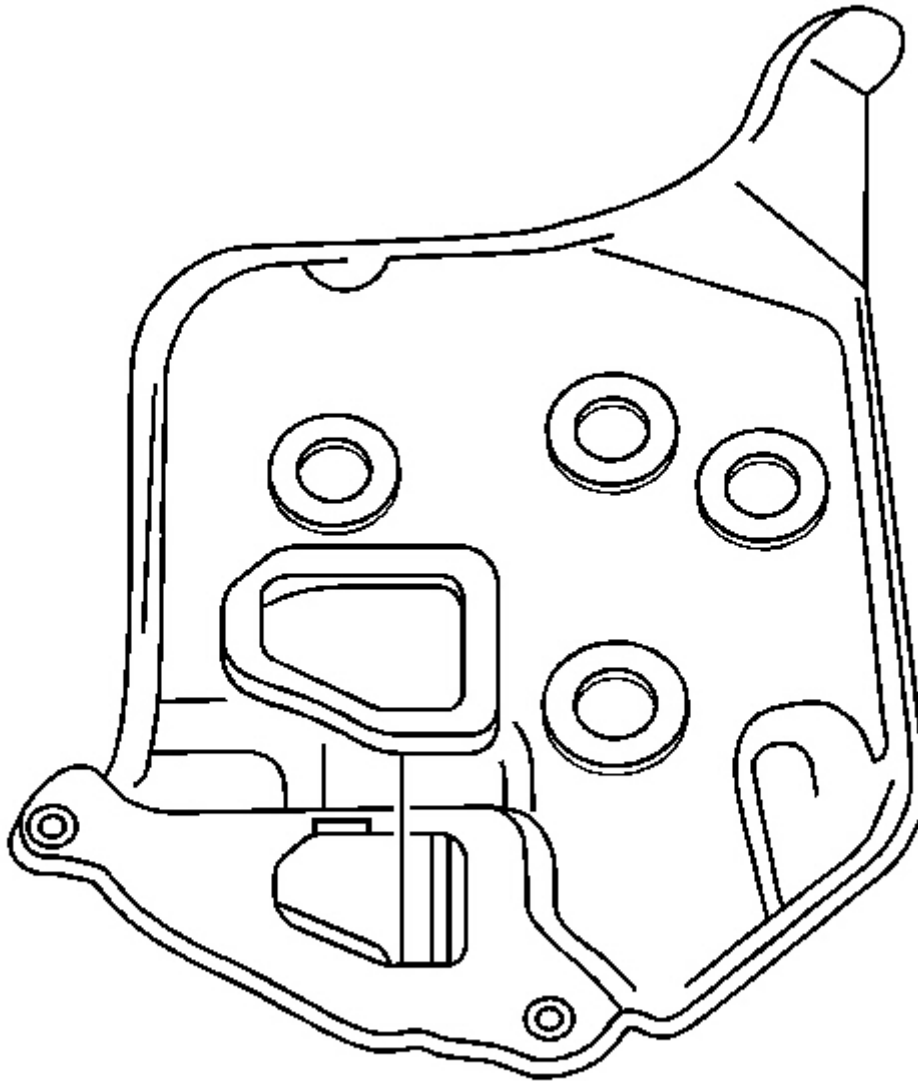


Fig. 133: Gasket

Courtesy of GENERAL MOTORS CORP.

18. Remove the gasket from the oil strainer.

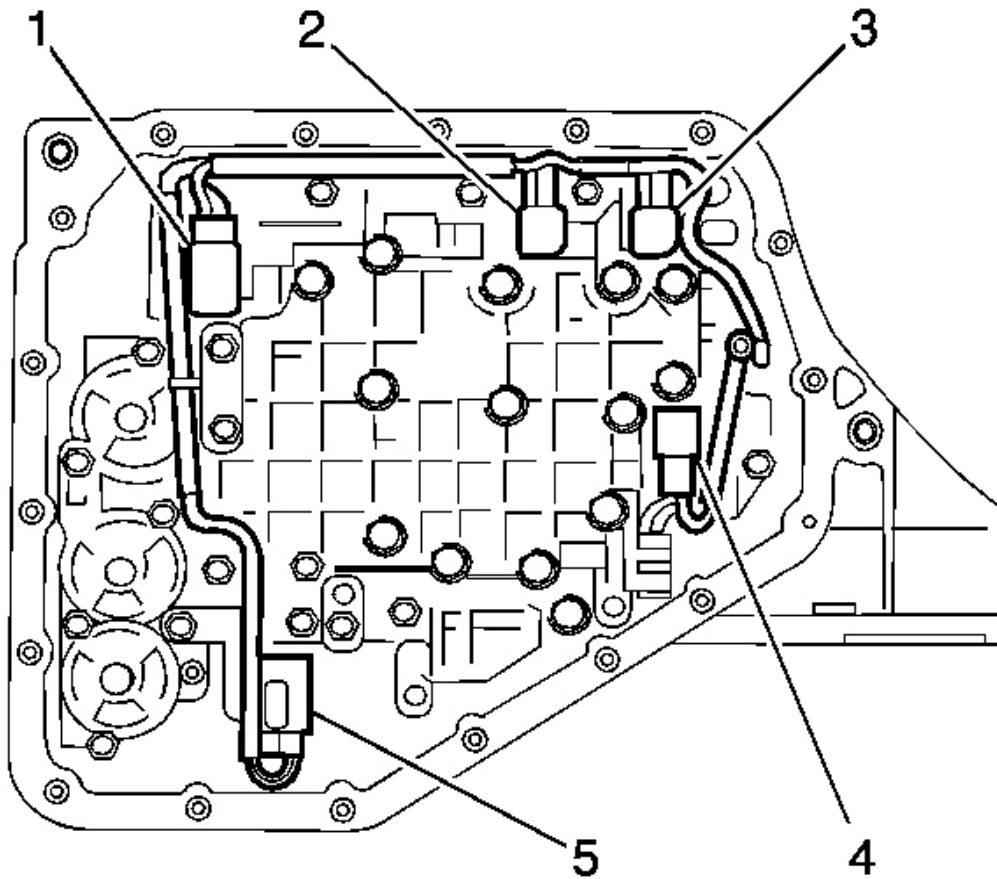


Fig. 134: Solenoid Connectors

Courtesy of GENERAL MOTORS CORP.

19. Remove the bolt and transmission fluid temperature sensor with the clamp.
20. Disconnect the 5 solenoid connectors.
 - Lock-up control solenoid (5)
 - Pressure control solenoid (1)
 - No. 2 shift solenoid (2)
 - No. 1 shift solenoid (3)
 - Timing solenoid (4)

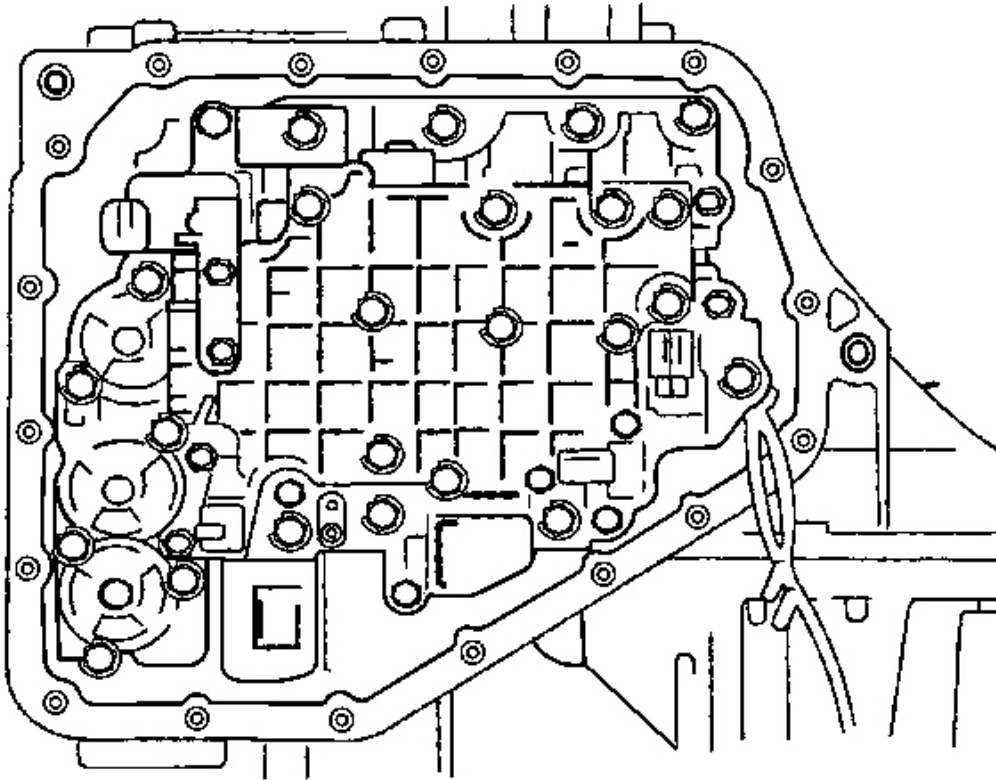


Fig. 135: Valve Body Assembly

Courtesy of GENERAL MOTORS CORP.

21. Support the valve body assembly and remove the 14 bolts.

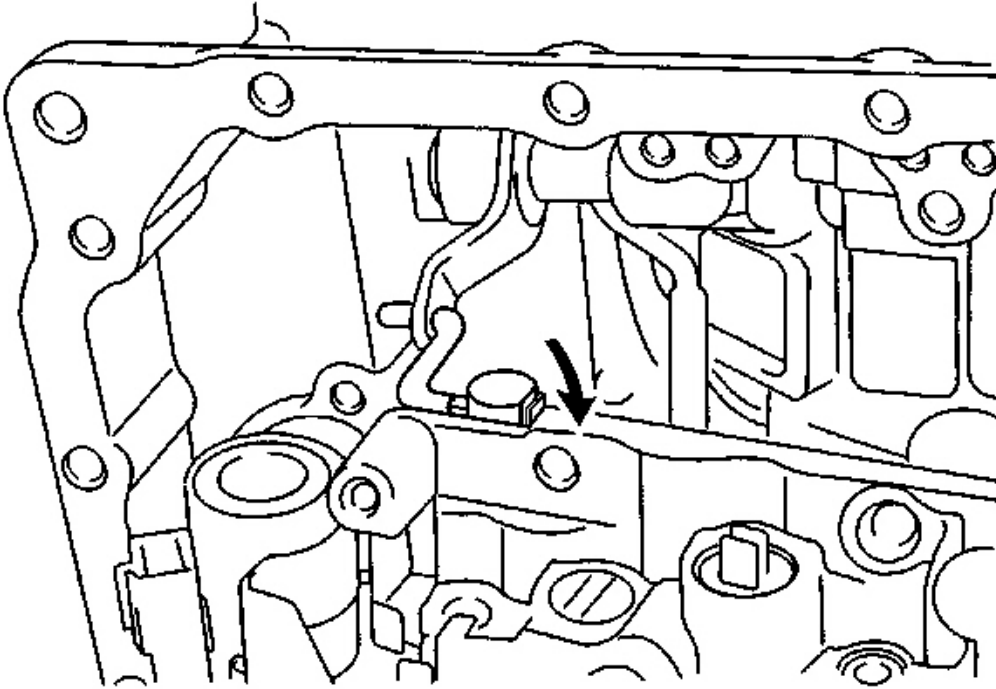


Fig. 136: Manual Valve Control Rod & Manual Valve Lever
Courtesy of GENERAL MOTORS CORP.

22. Disconnect the manual valve control rod from the manual valve lever, then remove the valve body assembly.

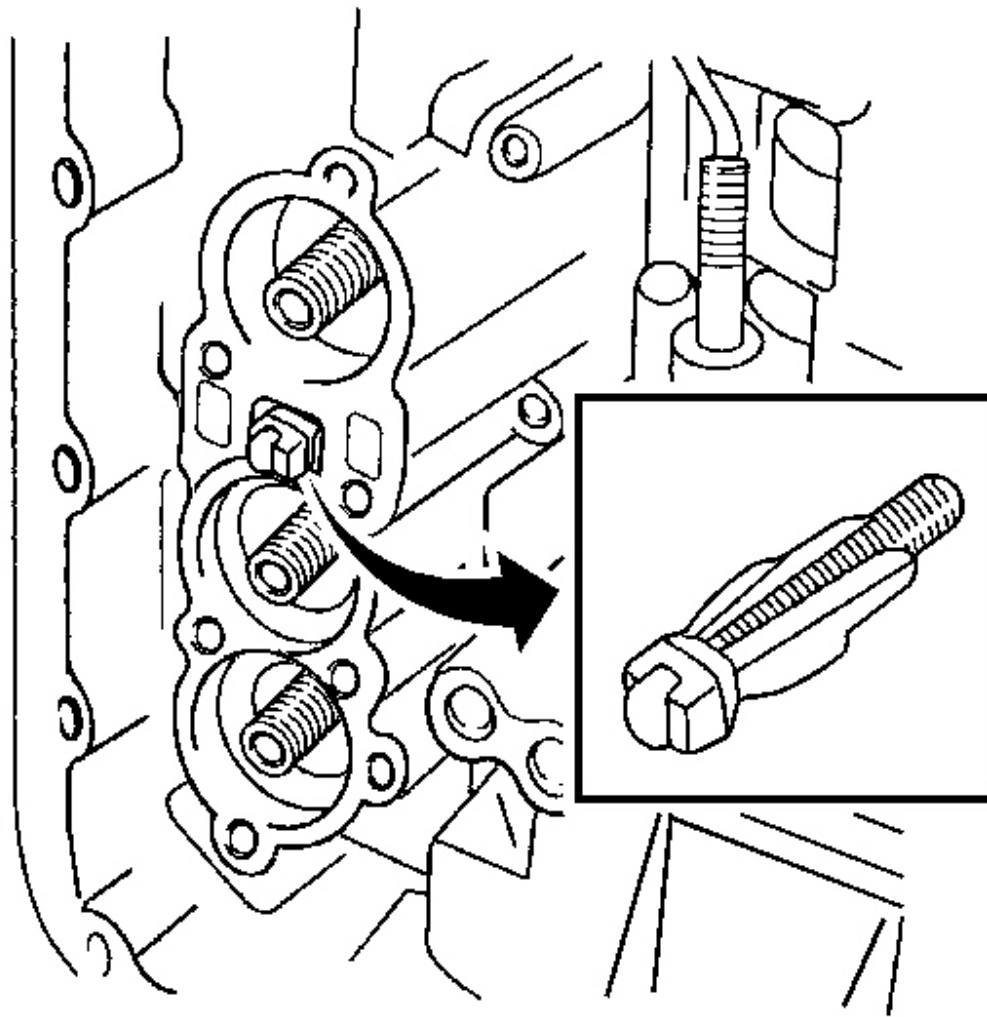


Fig. 137: Check Valve & Spring
Courtesy of GENERAL MOTORS CORP.

23. Remove the check valve and spring.

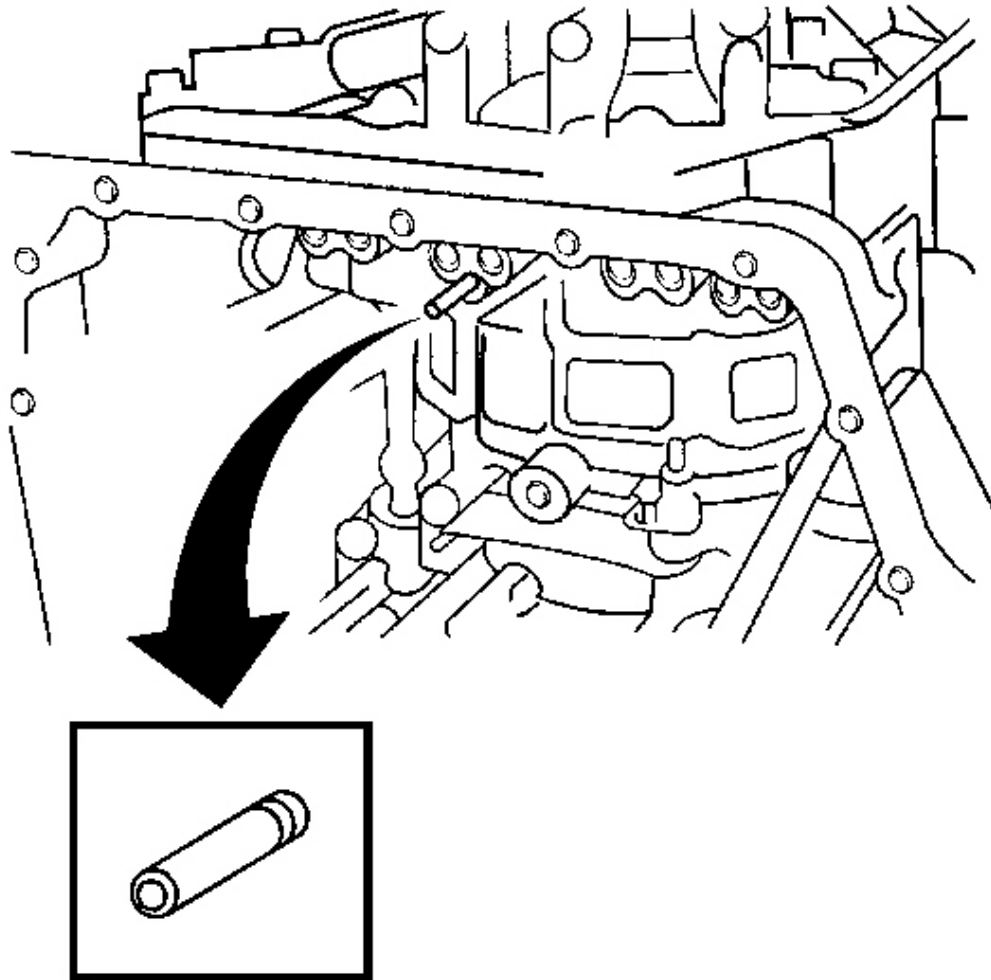


Fig. 138: Brake Drum Gasket
Courtesy of GENERAL MOTORS CORP.

24. Remove the brake drum gasket.

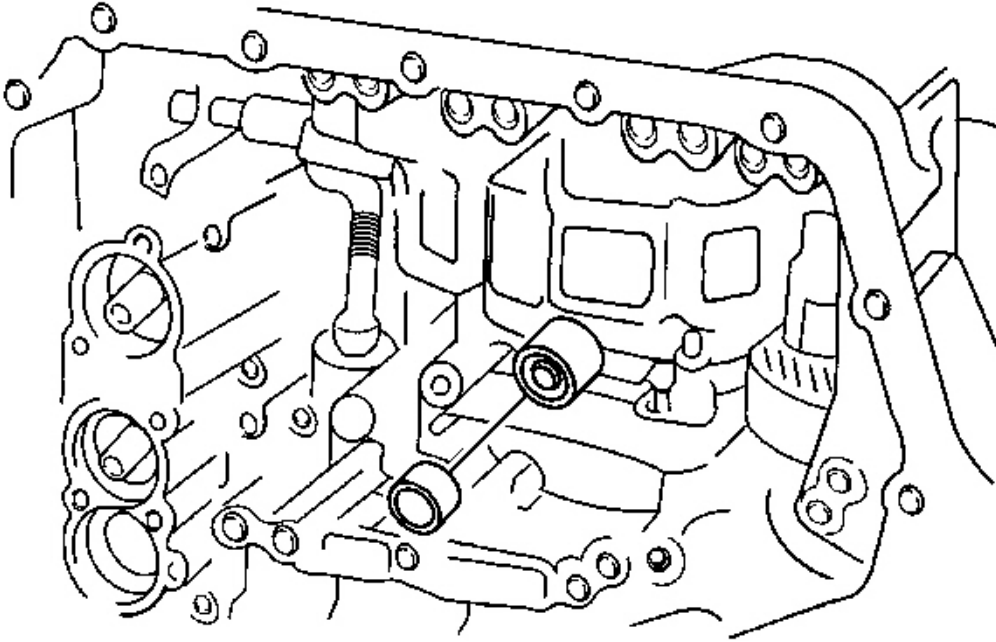


Fig. 139: Apply Gasket
Courtesy of GENERAL MOTORS CORP.

25. Remove the apply gasket.

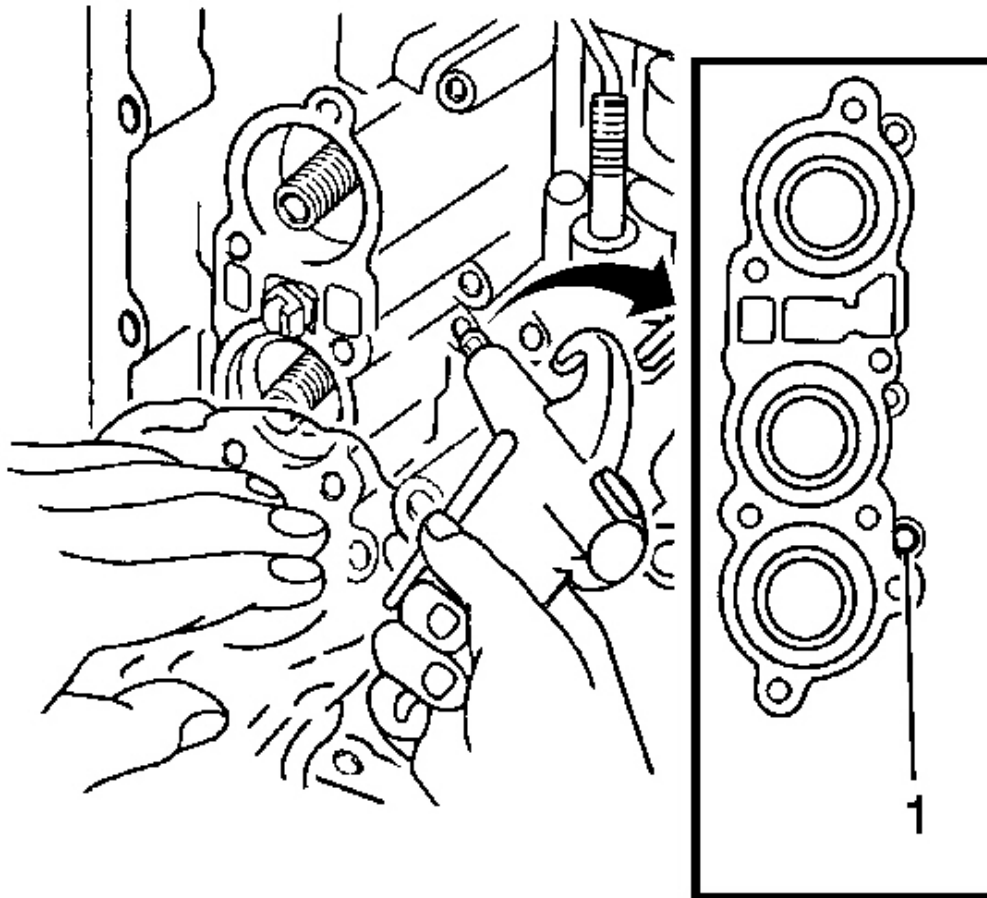


Fig. 140: Applying Compressed Air To Oil Hole & Removing Direct Clutch Accumulator Piston & Spring.

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash automatic transaxle fluid (ATF) when air-blowing.

26. Apply 392 kPa (57 psi) of compressed air to the oil hole (1) and remove the direct clutch accumulator piston and spring.

27. Remove the spring.

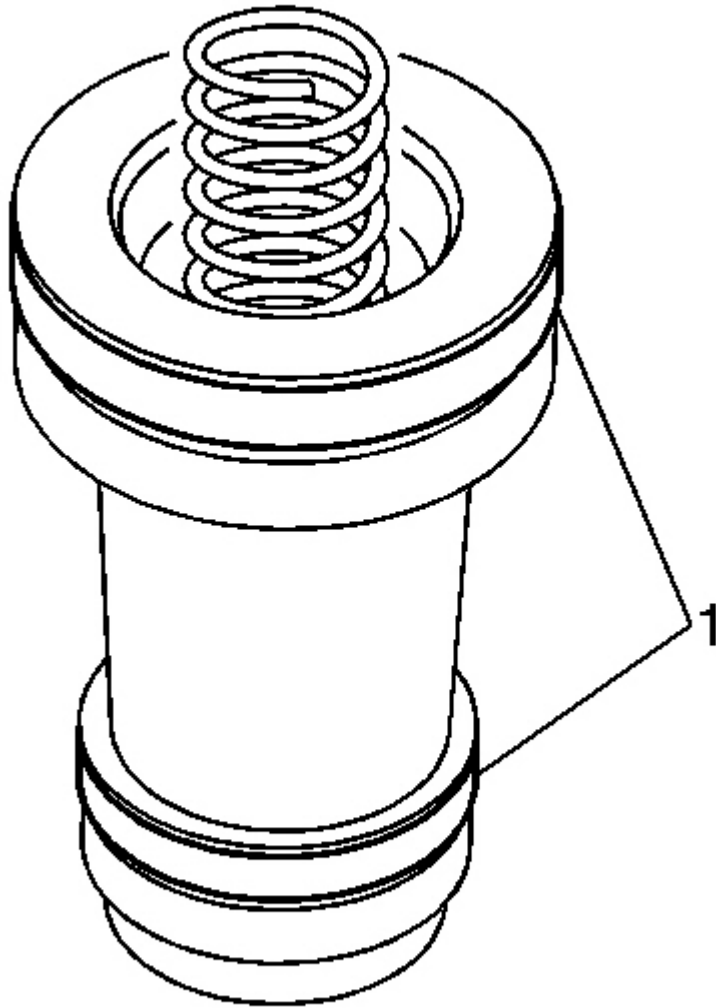


Fig. 141: O-Rings & Direct Clutch Accumulator Piston
Courtesy of GENERAL MOTORS CORP.

28. Remove the 2 O-rings (1) from the direct clutch accumulator piston.

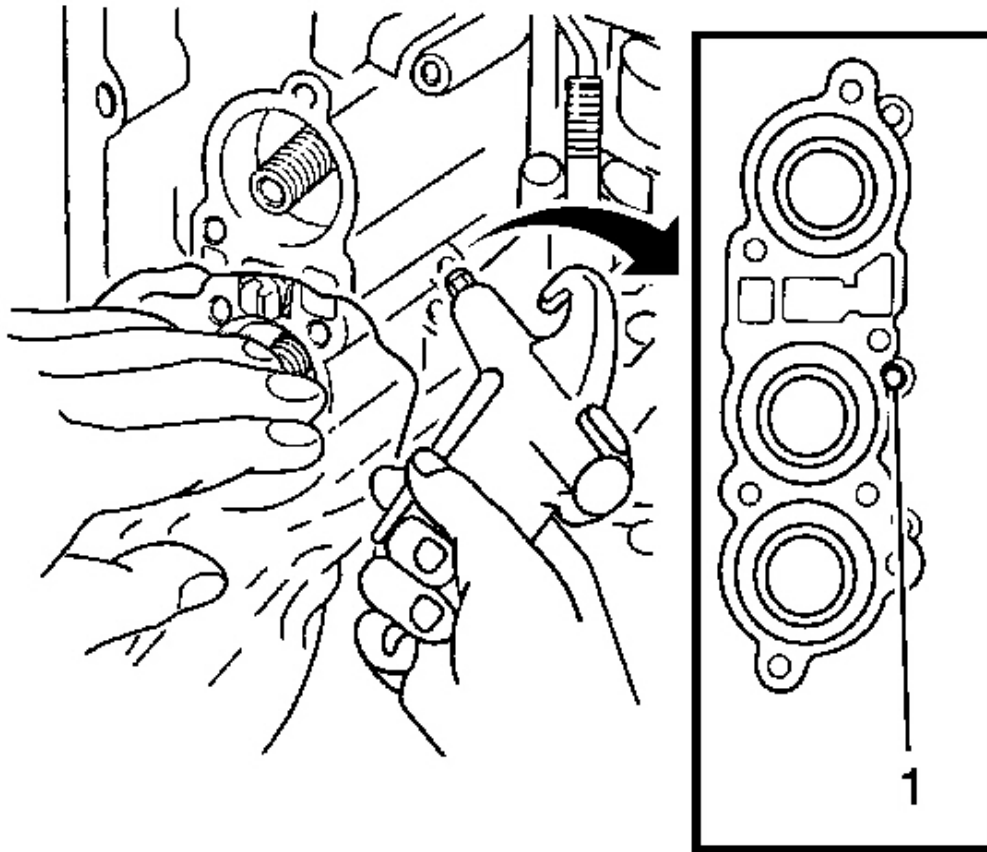


Fig. 142: Applying Compressed Air To Oil Hole & Removing Forward Clutch Accumulator Piston & Spring.

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

29. Apply 392 kPa (57 psi) of compressed air to the oil hole (1) and remove the forward clutch accumulator piston and spring.
30. Remove the spring.

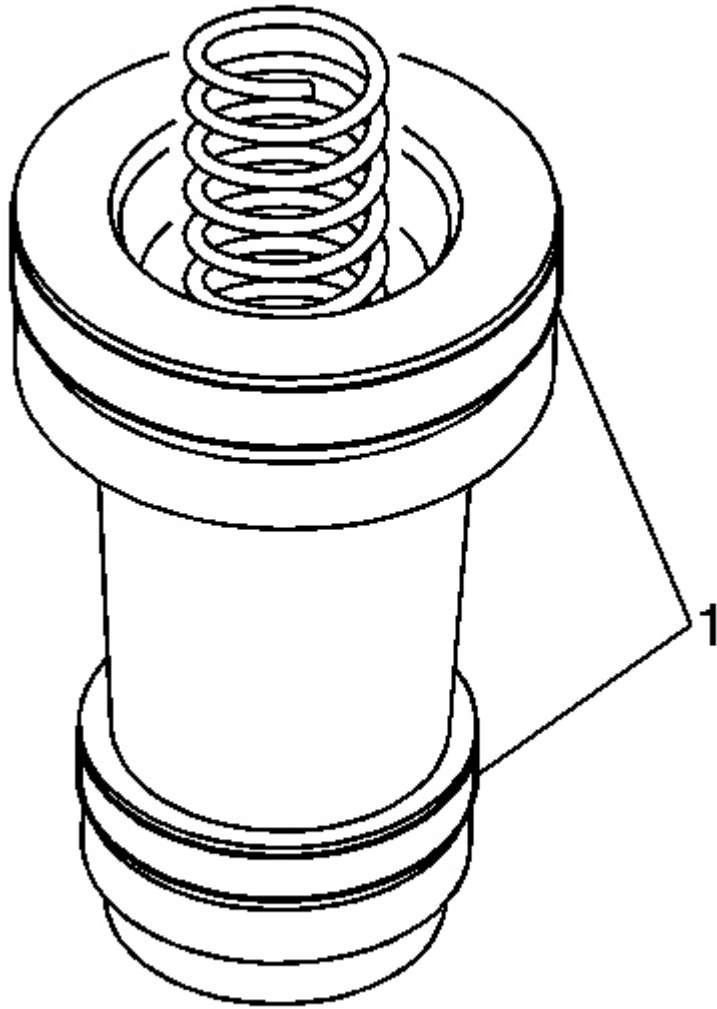


Fig. 143: O-Rings & Forward Clutch Accumulator Piston
Courtesy of GENERAL MOTORS CORP.

31. Remove the 2 O-rings (1) from the forward clutch accumulator piston.

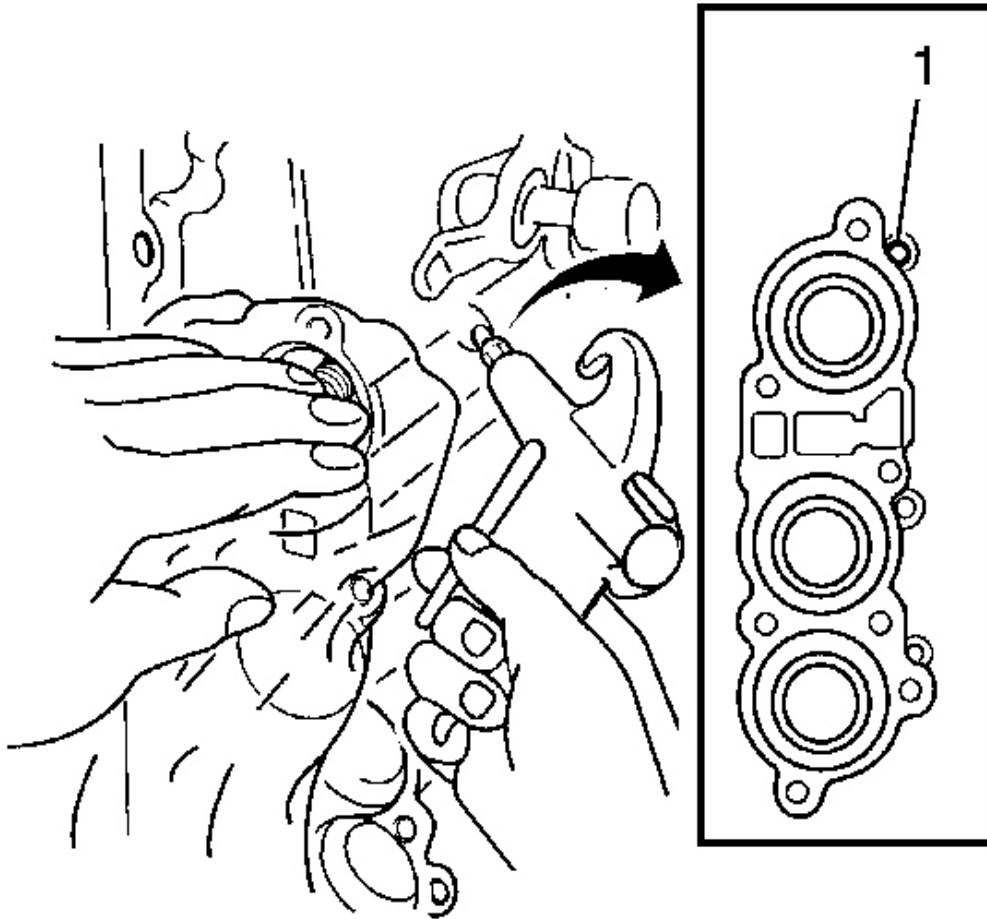


Fig. 144: Applying Compressed Air To Oil Hole & Removing O/D & 2nd Brake Clutch Accumulator Piston & Spring.

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

32. Apply 392 kPa (57 psi) of compressed air to the oil hole (1) and remove the over drive (O/D) and 2nd brake clutch accumulator piston and spring.

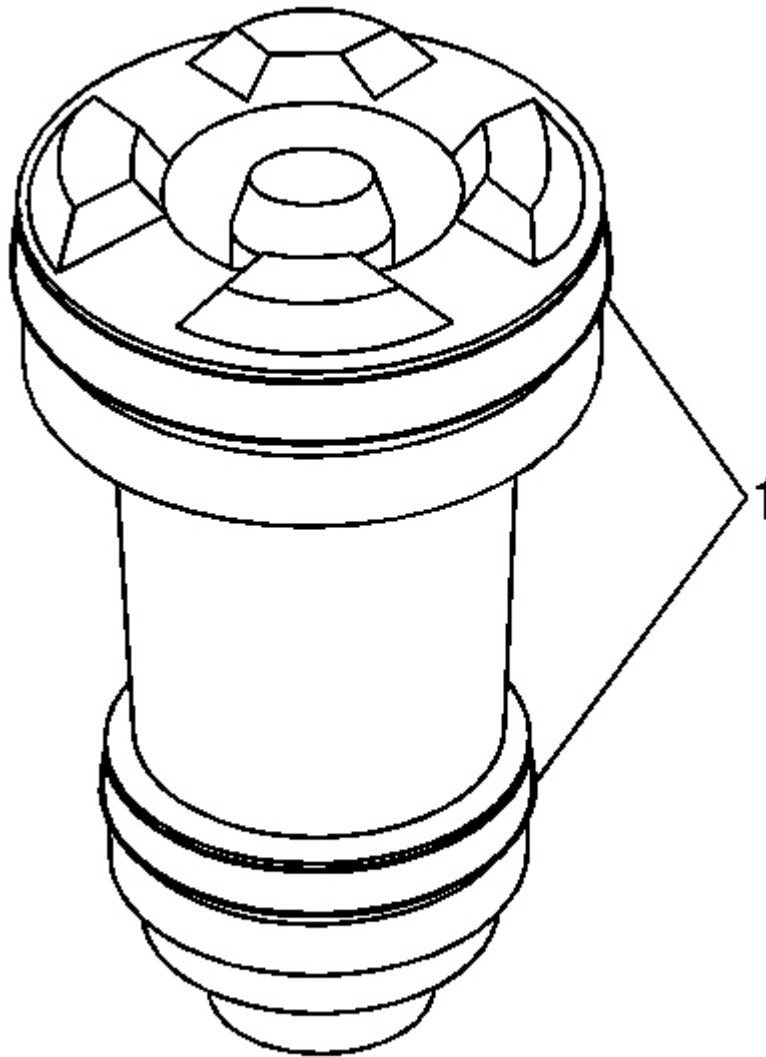


Fig. 145: O-Rings, O/D & 2nd Brake Accumulator Piston
Courtesy of GENERAL MOTORS CORP.

33. Remove the 2 O-rings (1) from the O/D and 2nd brake accumulator piston.

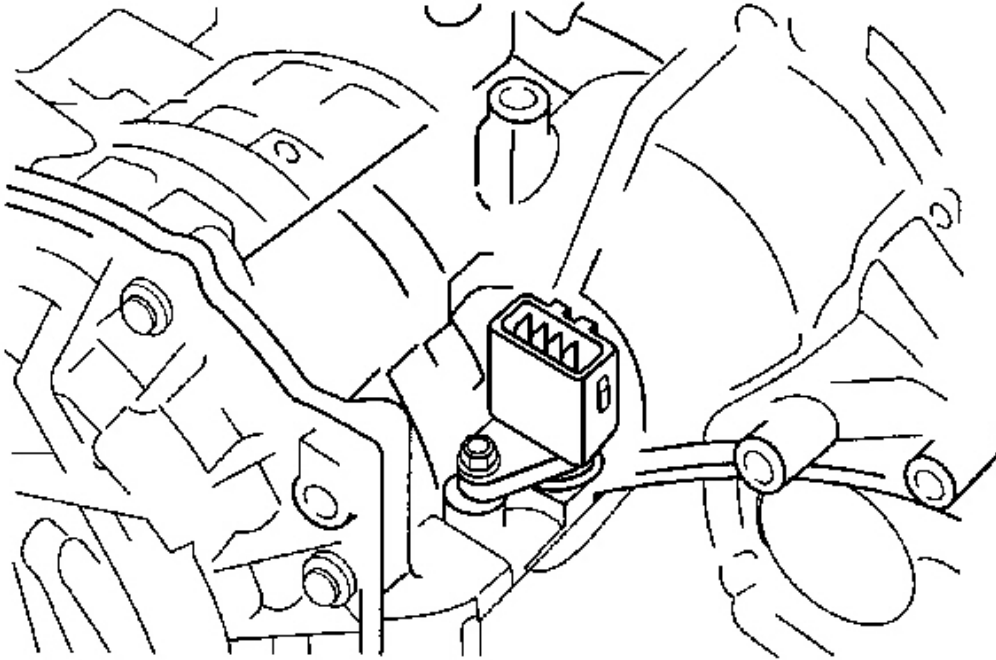


Fig. 146: Transaxle Wire & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

34. Remove the bolt and the transaxle wire from the transaxle case.

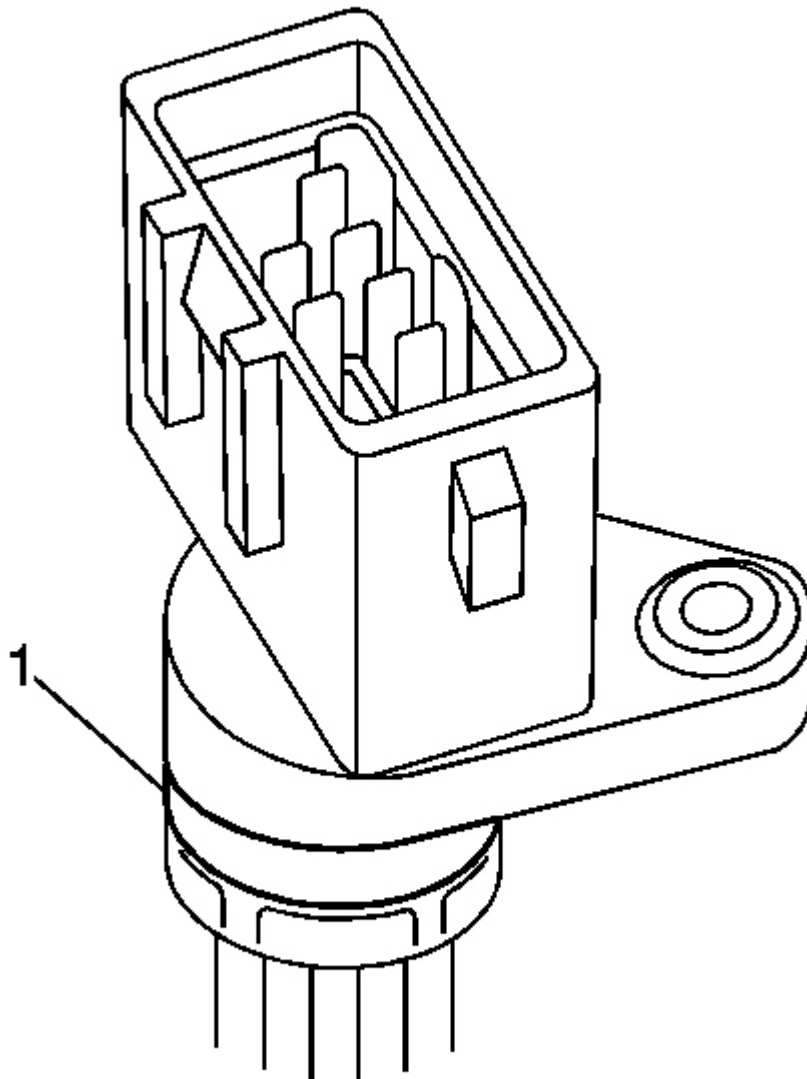


Fig. 147: O-Ring & Transaxle Wire
Courtesy of GENERAL MOTORS CORP.

35. Remove the O-ring (1) from the transaxle wire.

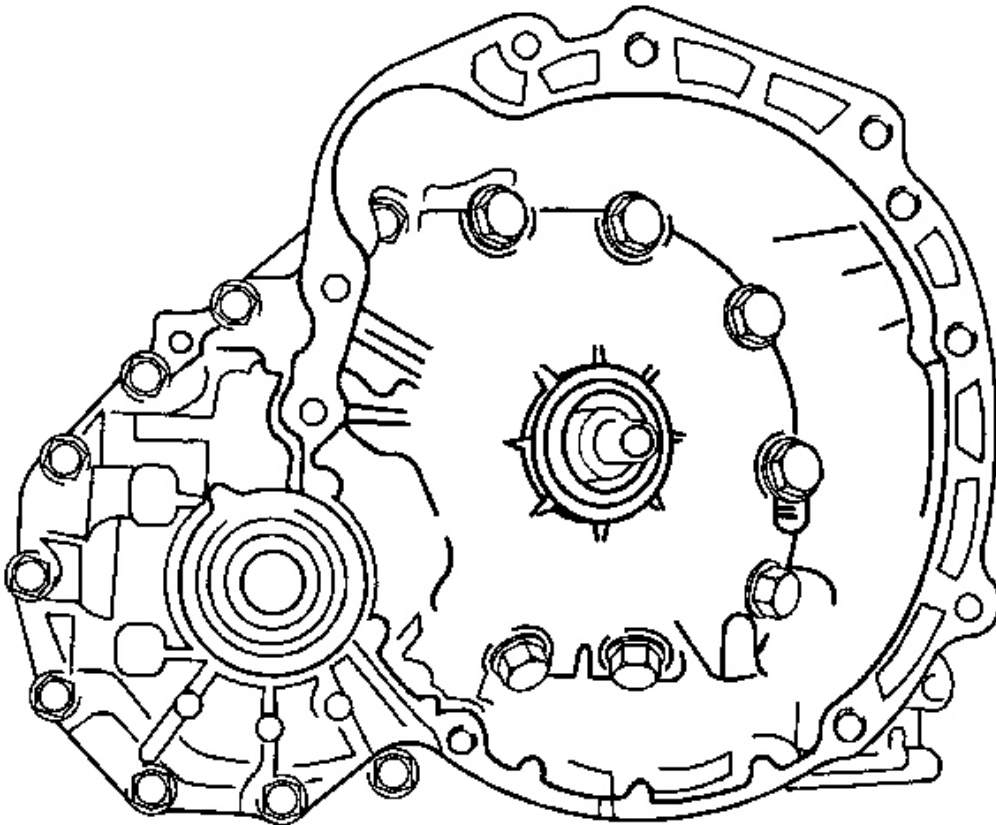


Fig. 148: Transaxle Housing

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Be careful not to drop the differential gear assembly when the transaxle housing is removed.

36. Remove the 16 bolts and tap on the circumference of the transaxle housing with a plastic hammer to remove the transaxle housing from the transaxle case.

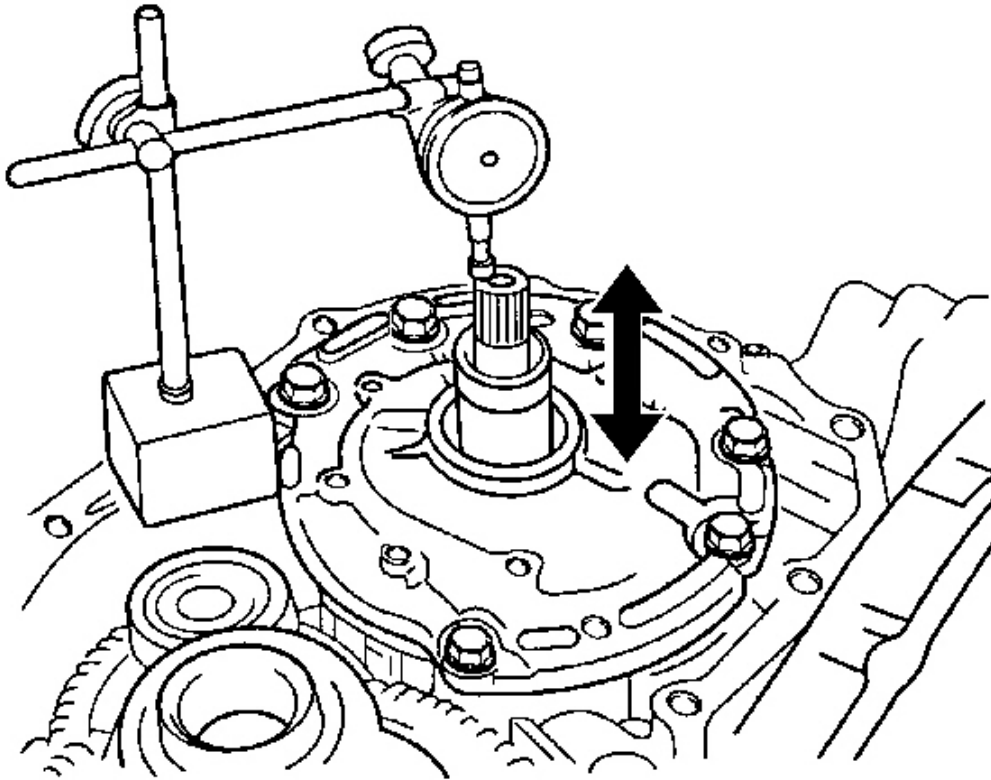


Fig. 149: Measuring The Input Shaft End Play Using A Dial Indicator
Courtesy of GENERAL MOTORS CORP.

37. Using a dial indicator, measure the input shaft end play.

Specification: The end play is 0.3-0.9 mm (0.012-0.035 in).

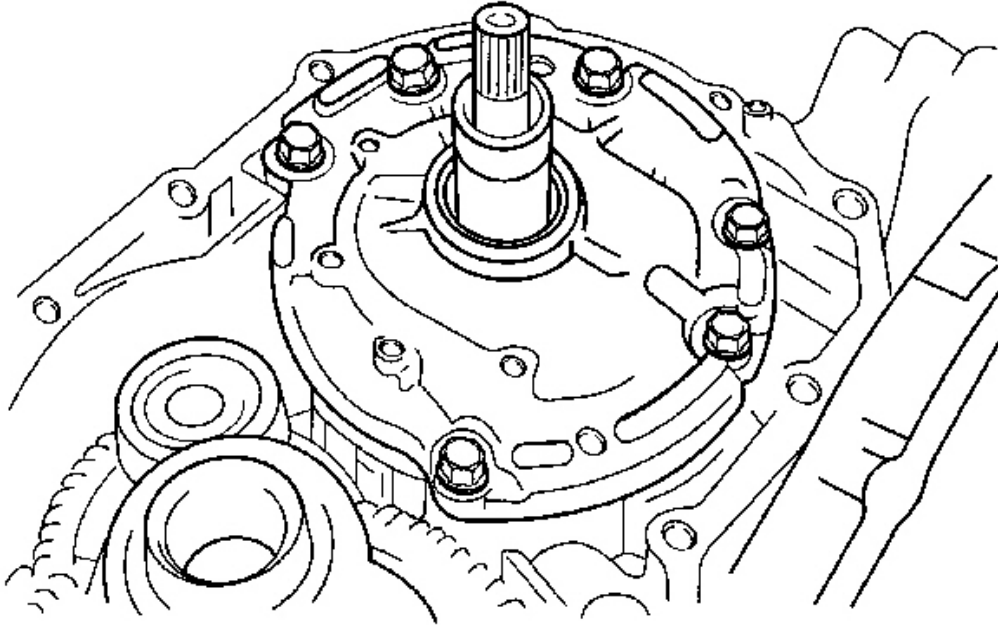


Fig. 150: Oil Pump & Bolts

Courtesy of GENERAL MOTORS CORP.

38. Remove the 6 bolts and oil pump.

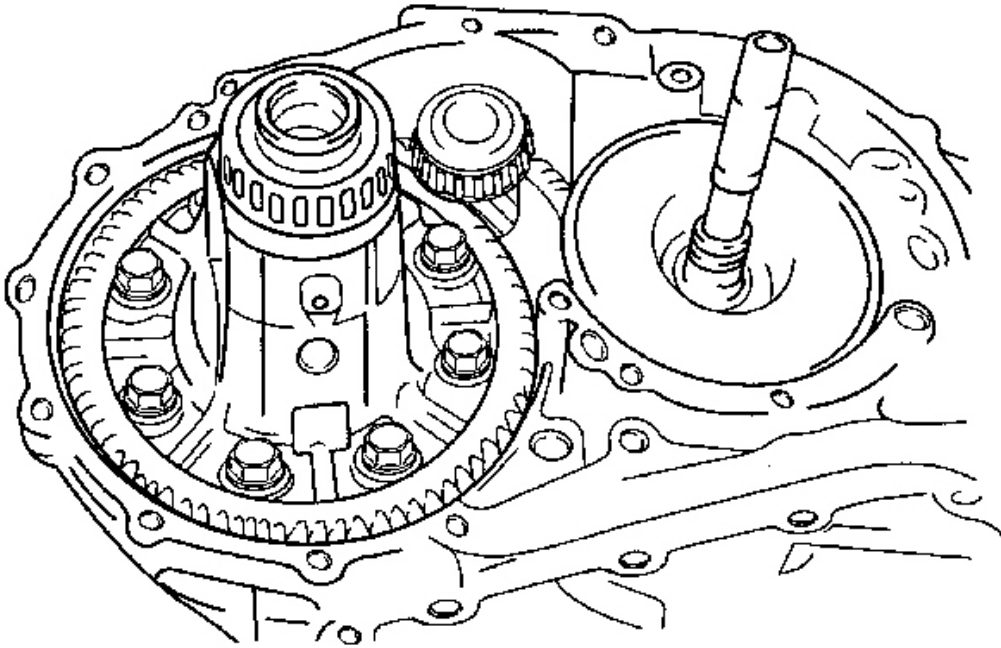


Fig. 151: Differential Gear Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

39. Remove the differential gear assembly from the transaxle case.

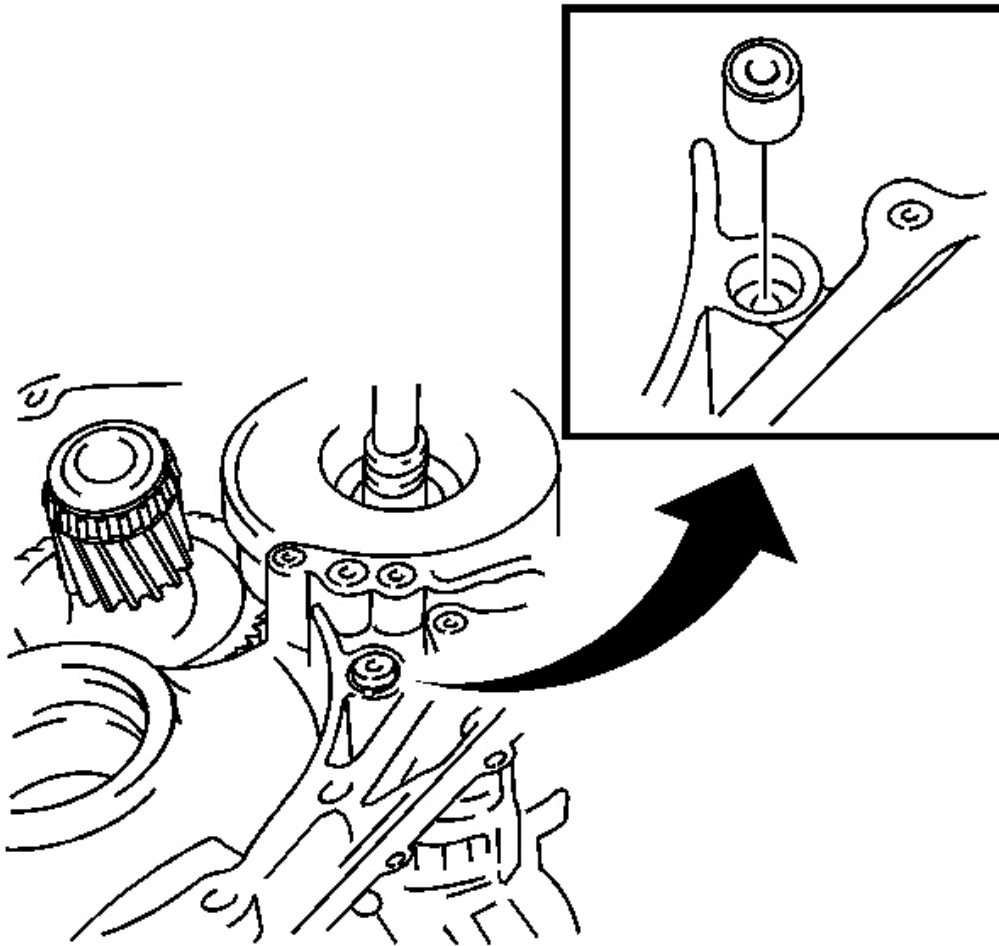


Fig. 152: Apply Gasket
Courtesy of GENERAL MOTORS CORP.

40. Remove the apply gasket.

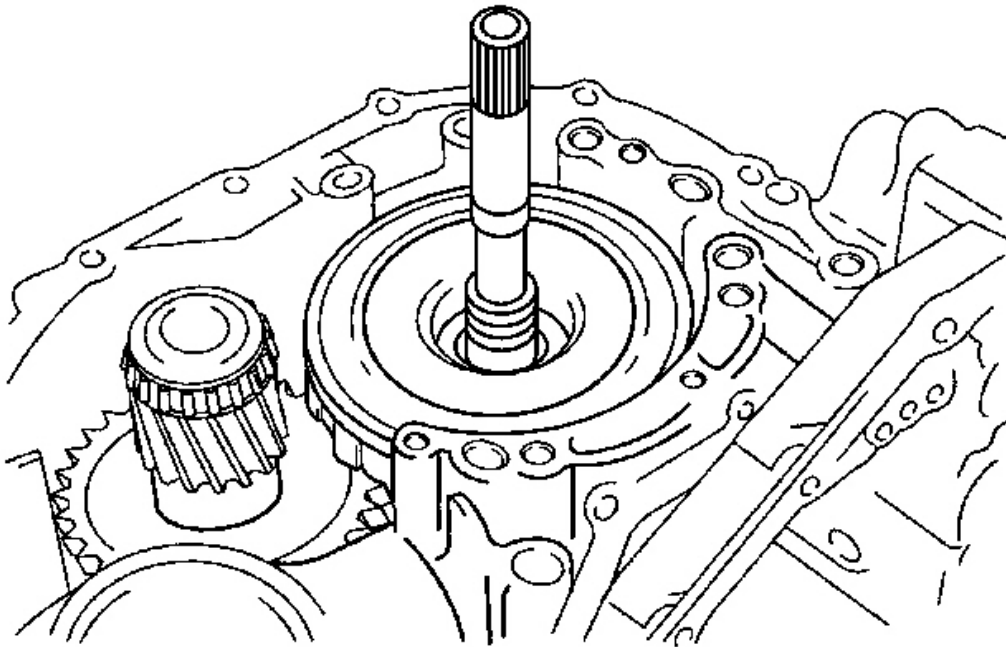


Fig. 153: Direct Clutch Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

41. Remove the direct clutch assembly from the transaxle case.

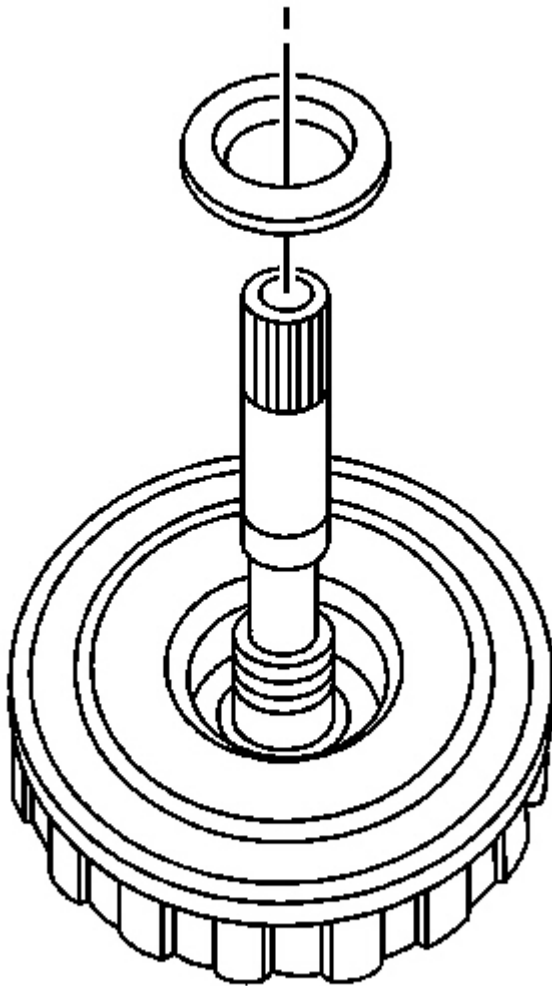


Fig. 154: Thrust Needle Roller Bearing & Direct Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

42. Remove the thrust needle roller bearing from the direct clutch assembly.

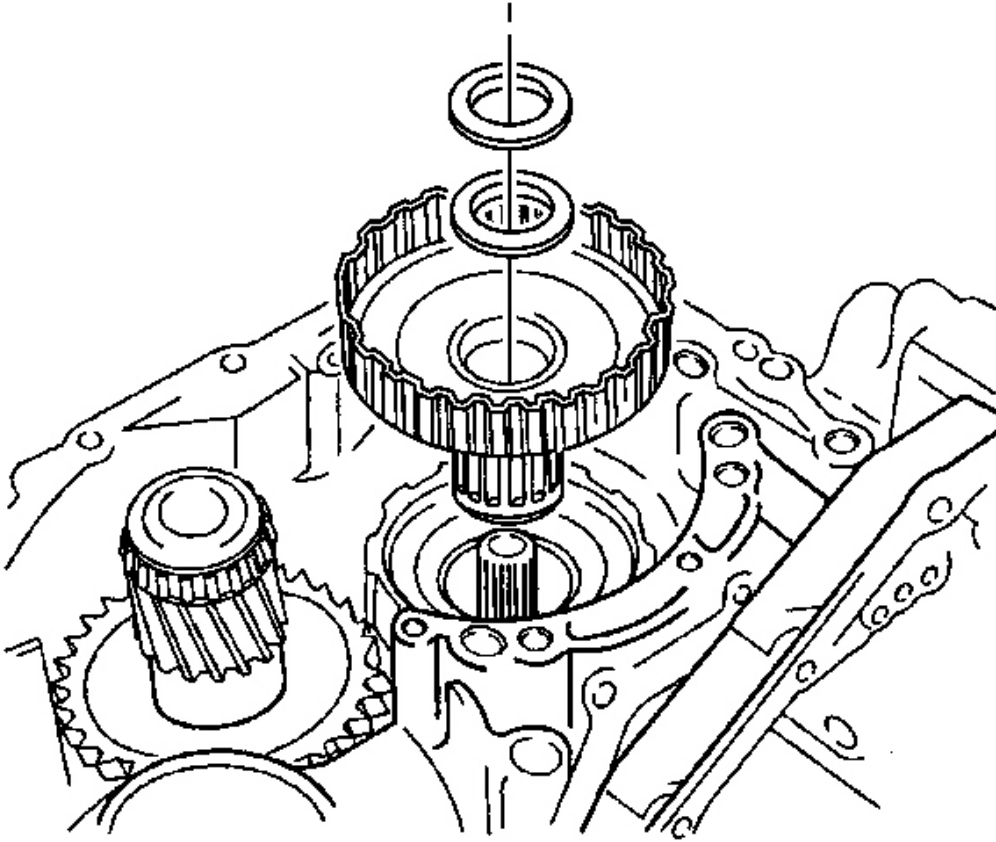


Fig. 155: Direct Clutch Hub, Thrust Needle Roller Bearing, Race & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

43. Remove the direct clutch hub, thrust needle roller bearing and thrust bearing race from the transaxle case.

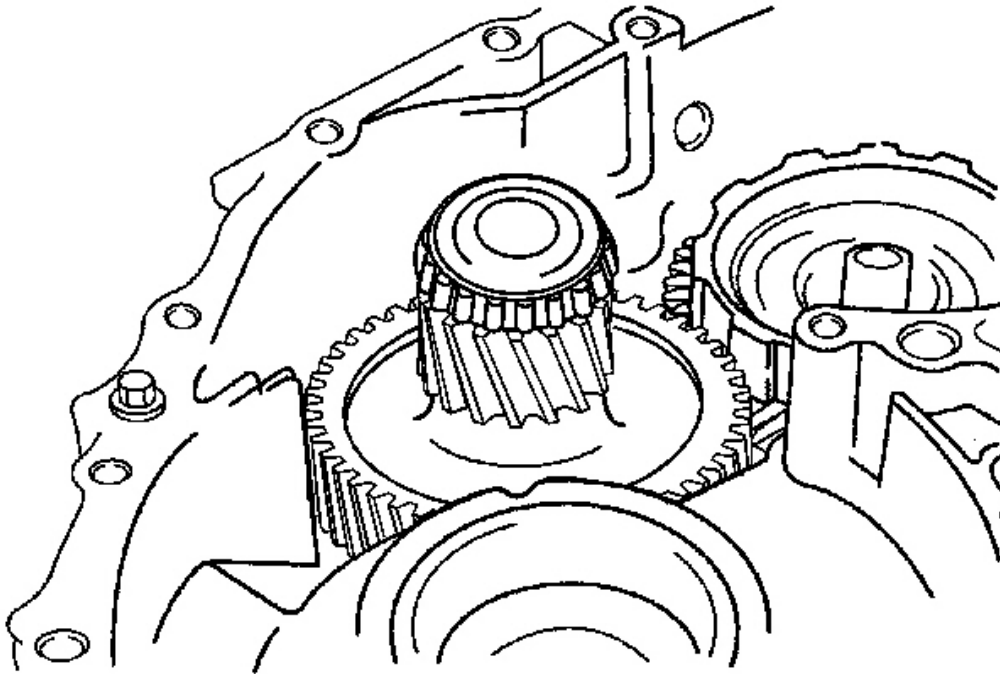


Fig. 156: Counter Driven Gear Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

44. Remove the counter driven gear assembly from the transaxle case.

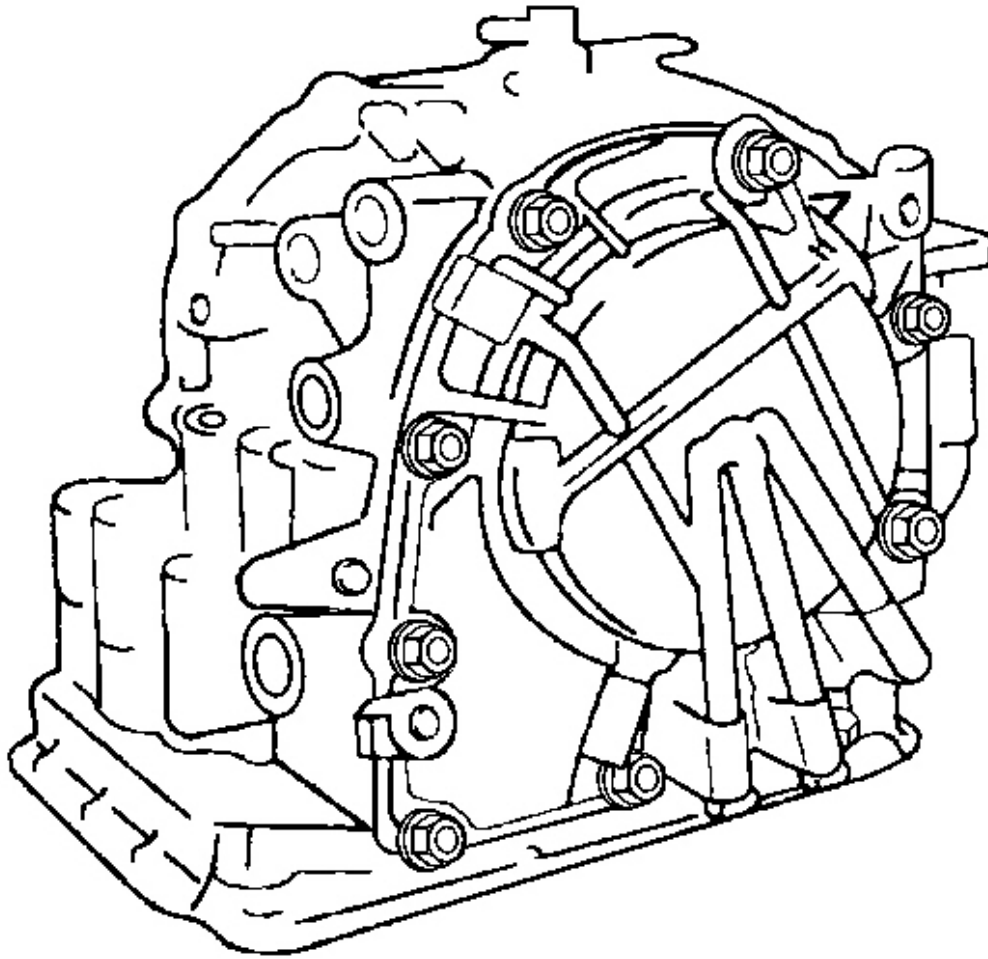


Fig. 157: Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

45. Remove the 9 bolts and tap on the circumference of the transaxle rear cover with a plastic hammer to remove the transaxle rear cover from the transaxle case.

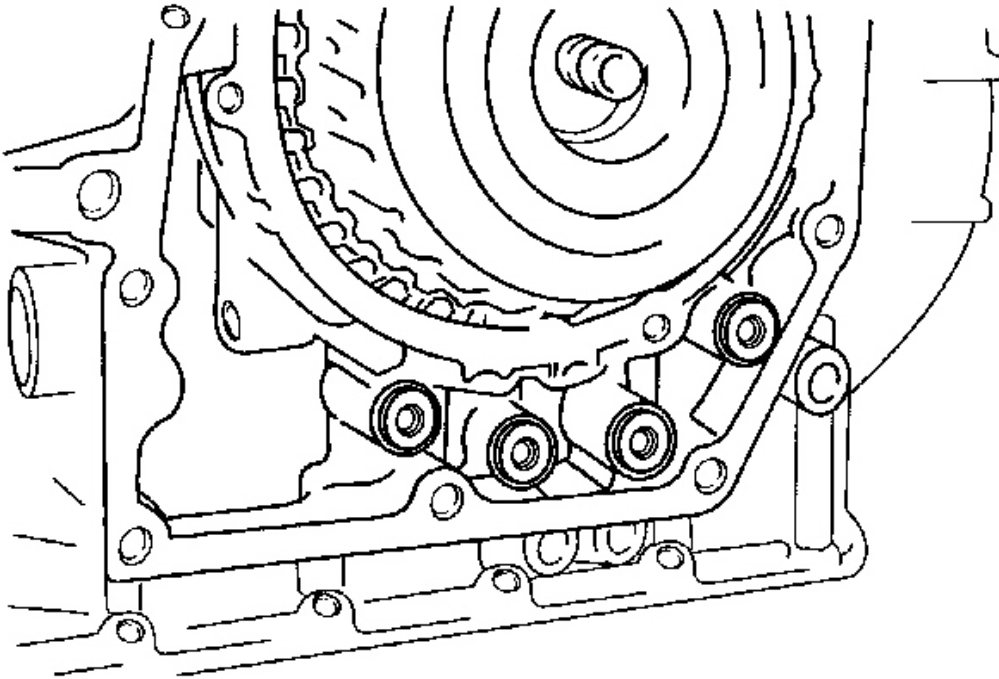


Fig. 158: Apply Gaskets & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

46. Remove the 4 apply gaskets.

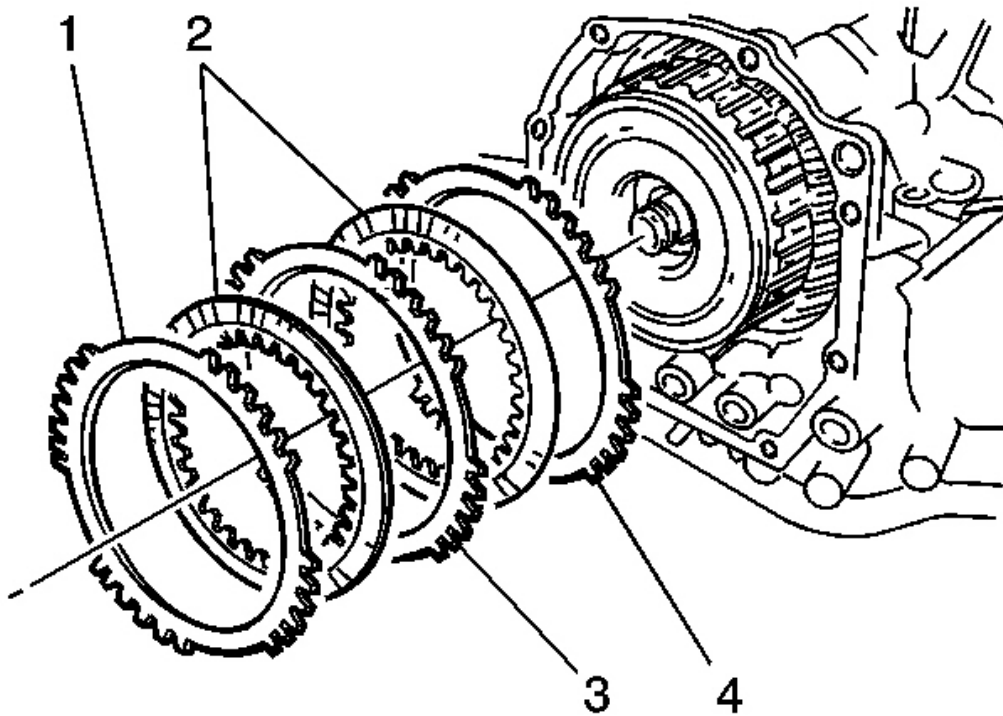


Fig. 159: O/D Brake Flange, Discs & Plates
Courtesy of GENERAL MOTORS CORP.

47. Remove 2nd coast and O/D brake flange (1), 2 discs (2), and 2 plates (3) from the transaxle case.

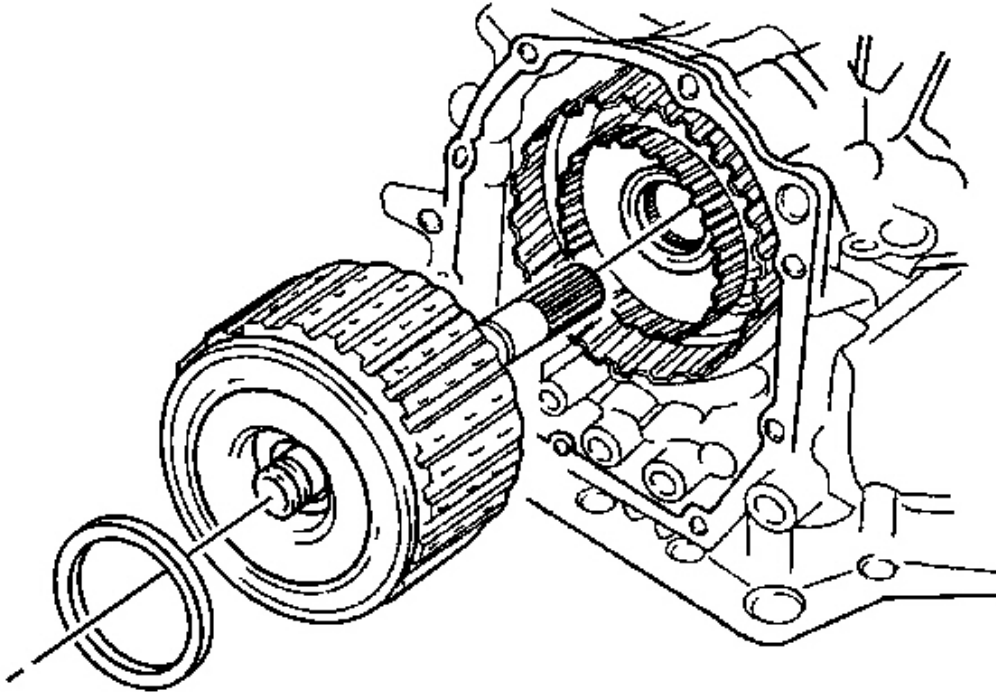


Fig. 160: Thrust Needle Roller Bearing & Forward/Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

48. Remove the thrust needle roller bearing and forward and reverse clutch assembly.

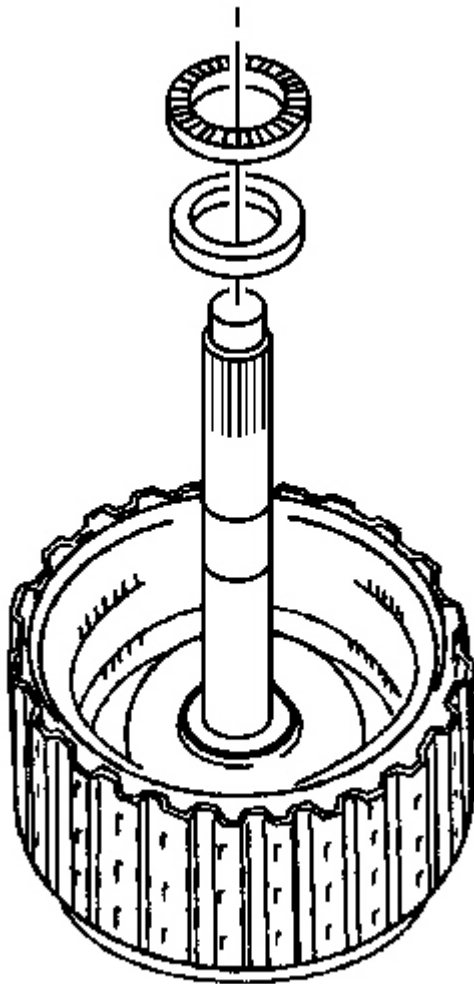


Fig. 161: Thrust Needle Roller Bearing, Race & Forward/Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

49. Remove the thrust needle roller bearing and thrust bearing race from the forward and reverse clutch assembly.

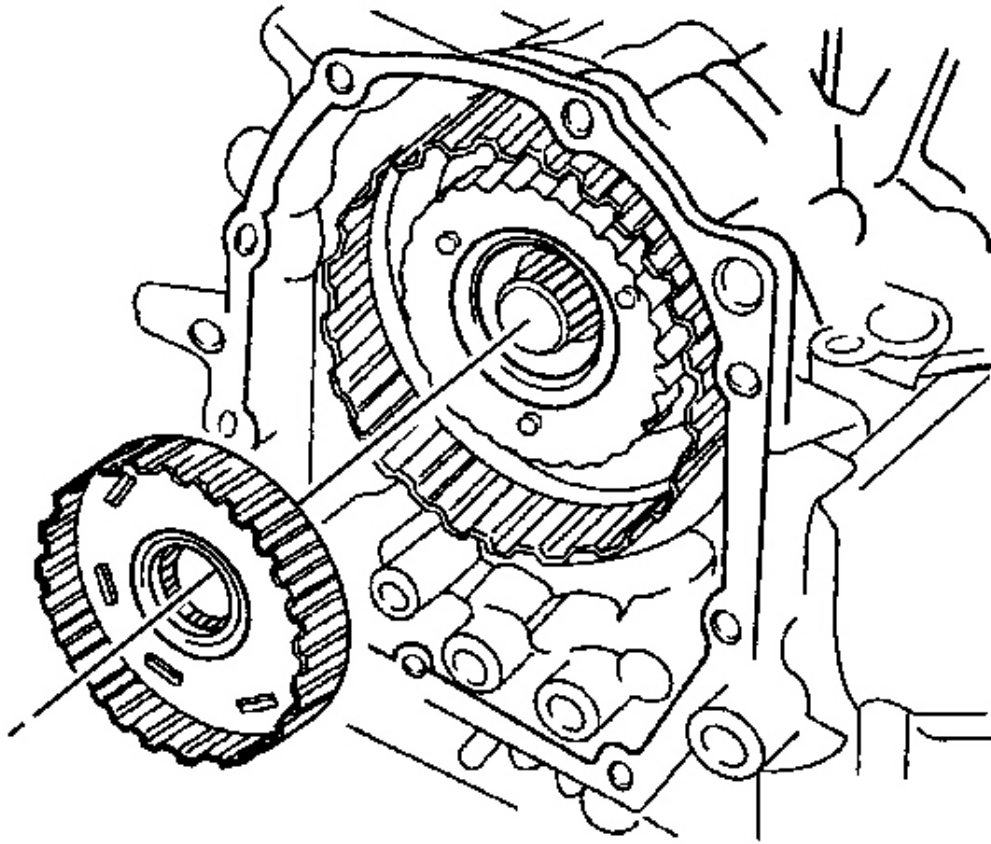


Fig. 162: Forward Clutch Hub & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

50. Remove the forward clutch hub from the transaxle case.

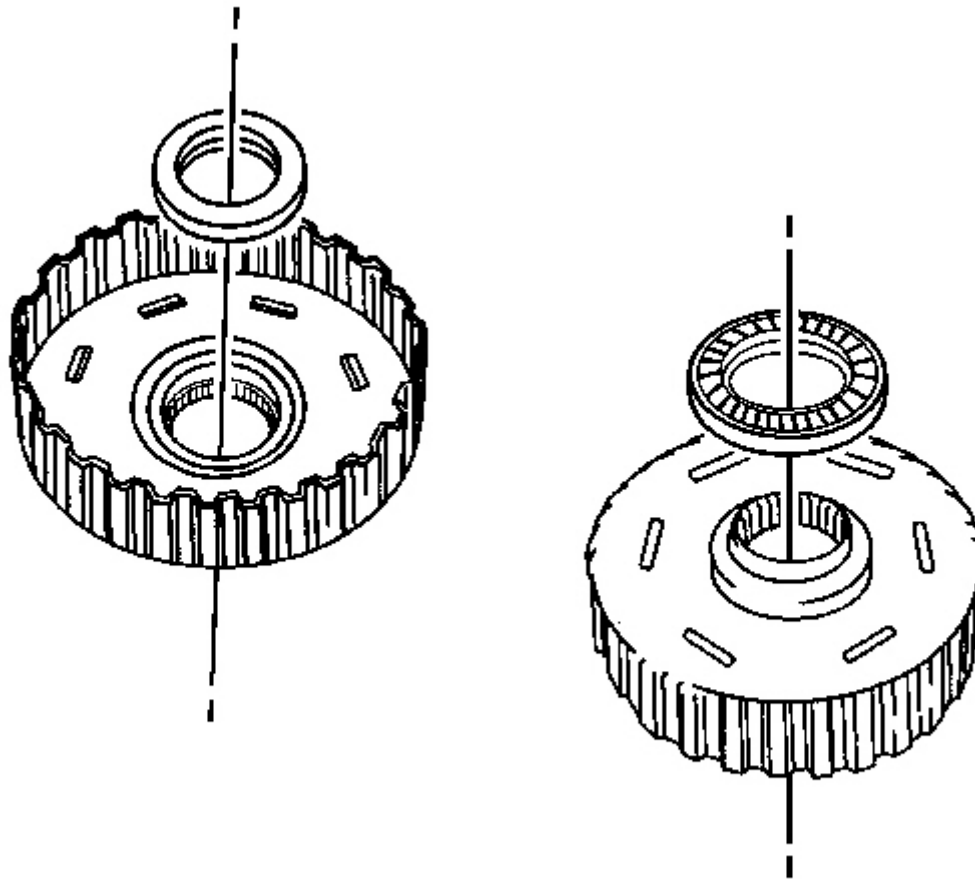


Fig. 163: Thrust Needle Roller Bearing & Forward Clutch Hub
Courtesy of GENERAL MOTORS CORP.

51. Remove the thrust bearing race and thrust needle roller bearing from the forward clutch hub.

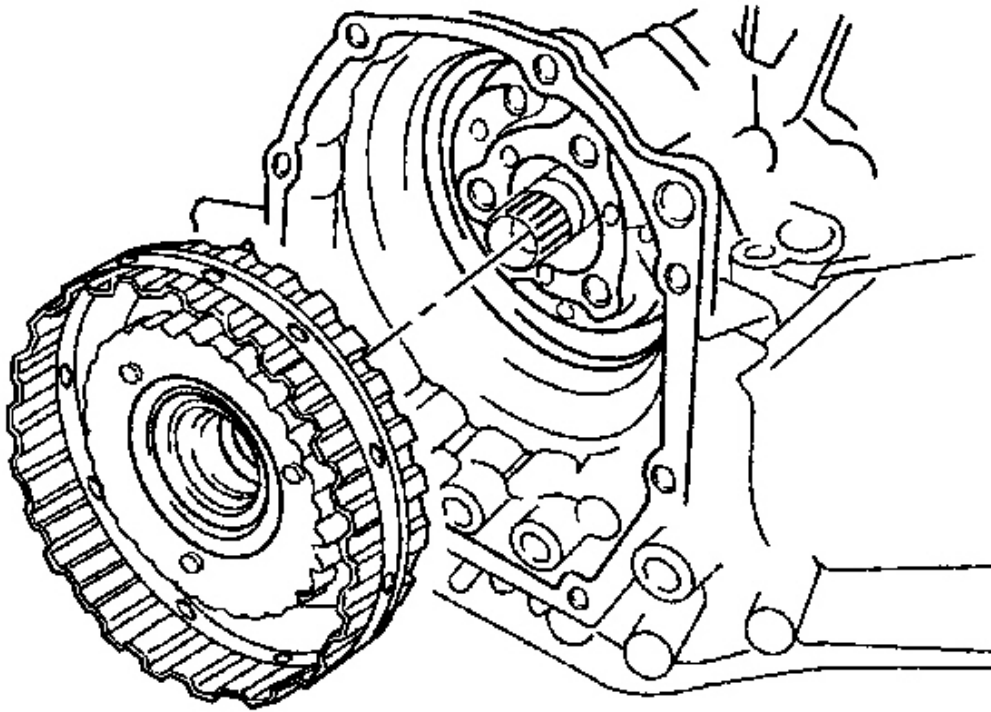


Fig. 164: Rear Planetary Sun Gear & 1-Way Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

52. Remove rear planetary sun gear and 1-way clutch assembly.

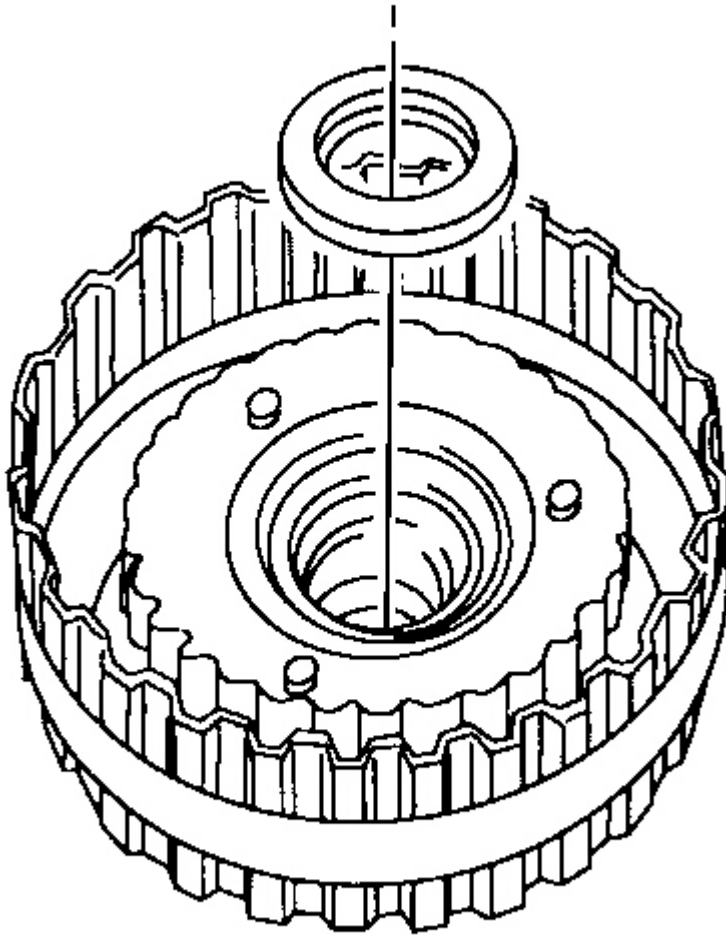


Fig. 165: Thrust Needle Bearing Race, Rear Planetary Sun Gear & 1-Way Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

53. Remove the thrust bearing race from the rear planetary sun gear and 1-way clutch assembly.

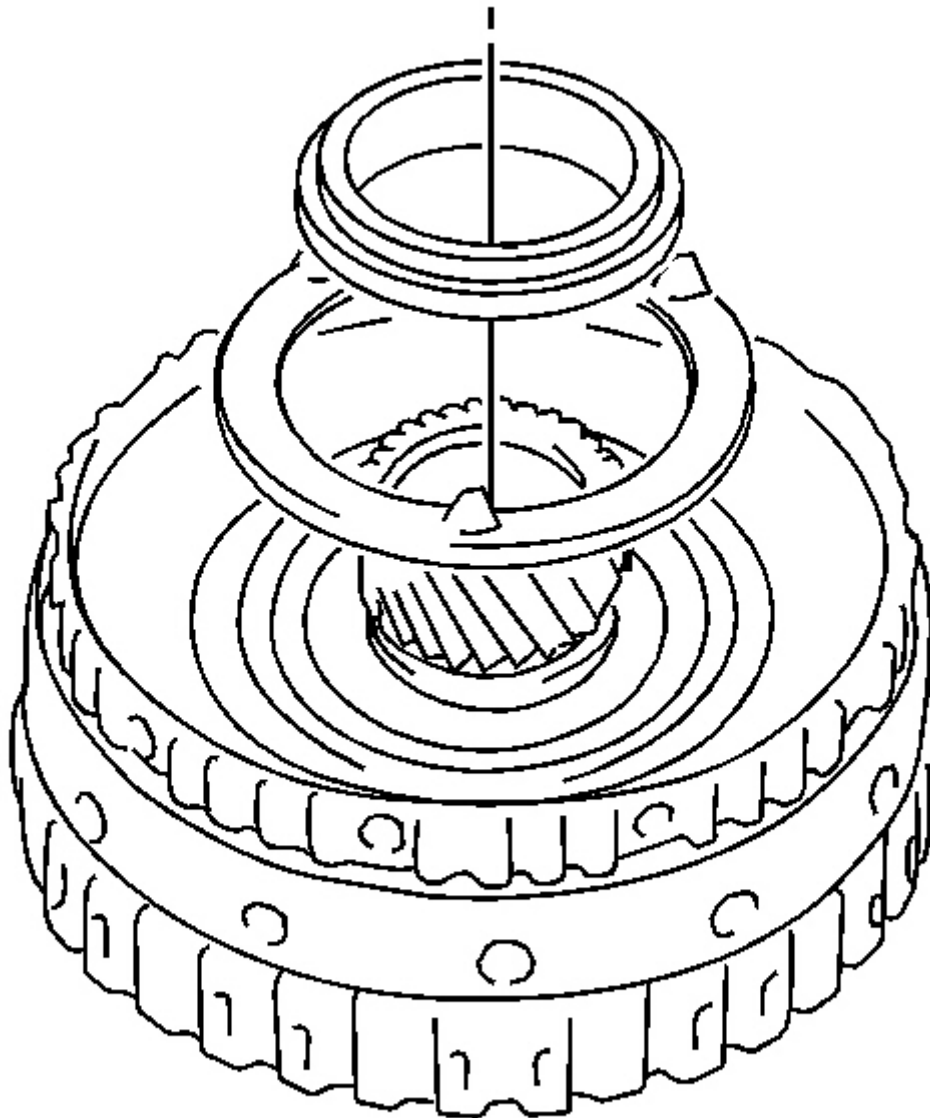


Fig. 166: Thrust Needle Bearing Race, Planetary Carrier Thrust Washer, Rear Planetary Sun Gear & 1-Way Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

54. Remove the thrust needle roller bearing and planetary carrier thrust washer from the rear planetary sun gear and 1-way clutch assembly.

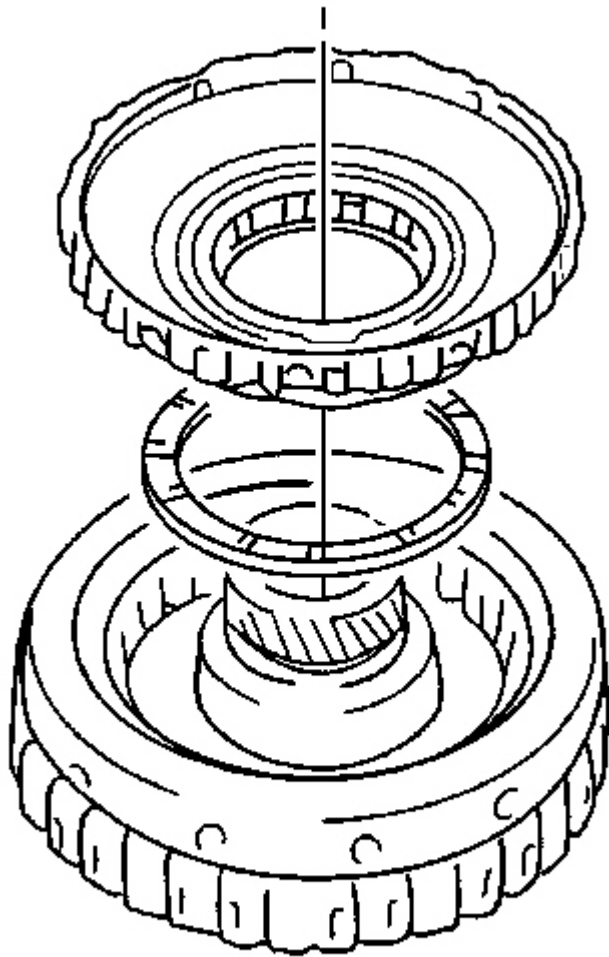


Fig. 167: 1-Way Clutch Assembly, Thrust Washer & Rear Planetary Sun Gear
Courtesy of GENERAL MOTORS CORP.

55. Remove the 1-way clutch assembly and thrust washer from the rear planetary sun gear.

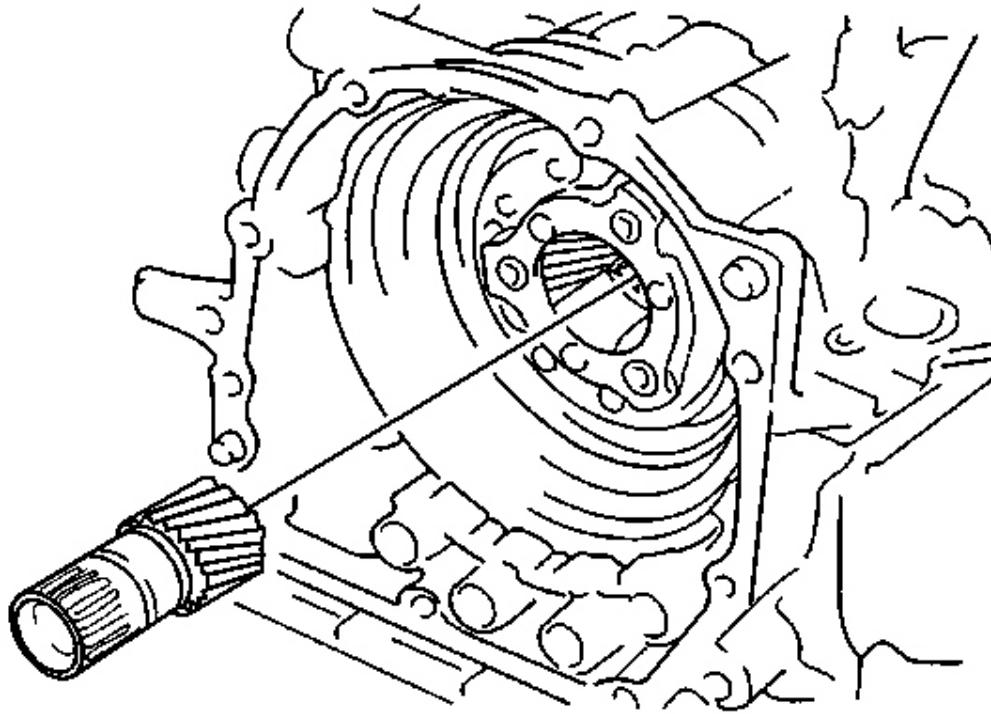


Fig. 168: Front Planetary Sun Gear & Thrust Bearing Race
Courtesy of GENERAL MOTORS CORP.

56. Remove the front planetary sun gear from the transaxle case.
57. Remove the thrust bearing race from the front planetary sun gear.

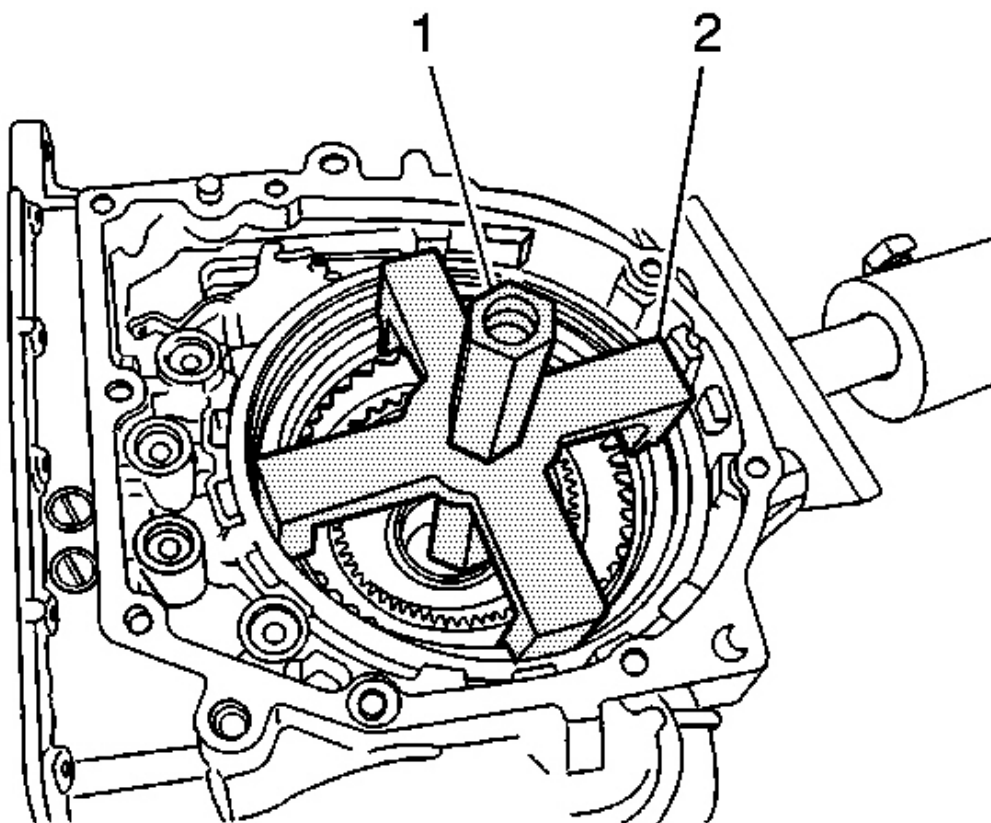


Fig. 169: DT 46455 & DT 46458
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

58. Using the **DT 46455** (1) and **DT 46458** (2), remove the 2 snap rings, 2nd brake piston, and 2nd brake piston return spring. See Special Tools.

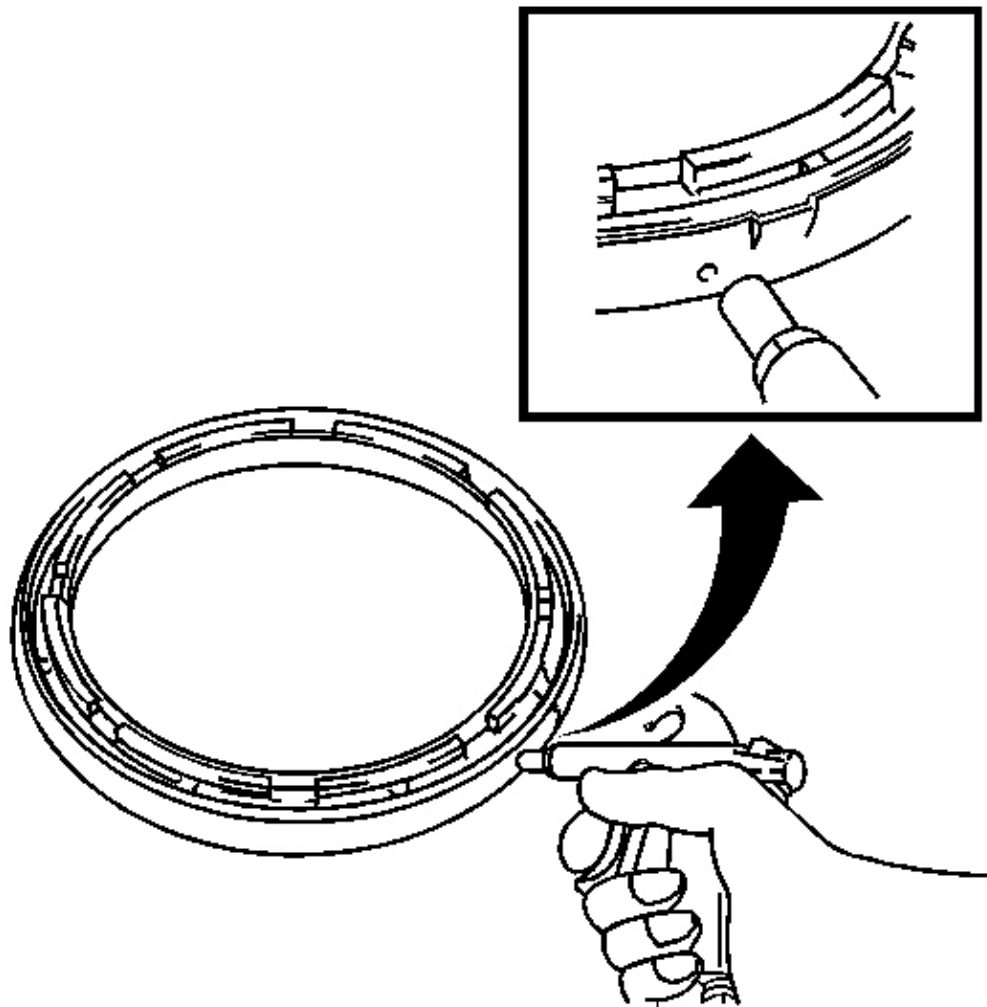


Fig. 170: Applying Compressed Air To 2nd Brake To Remove 2nd Brake Piston From The 2nd Brake Clutch Cylinder

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

59. Apply 392 kPa (57 psi) of compressed air to the 2nd brake to remove the 2nd brake piston from the 2nd brake clutch cylinder.

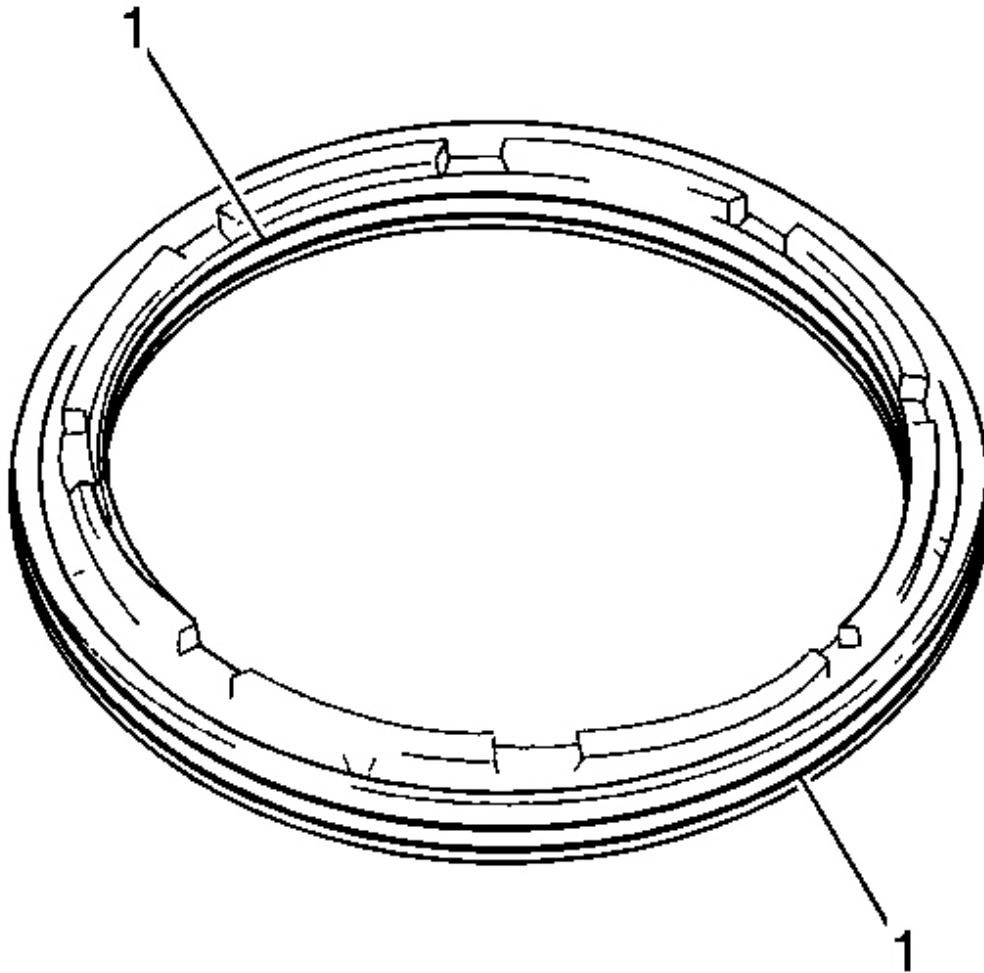


Fig. 171: O-Rings & 2nd Brake Piston
Courtesy of GENERAL MOTORS CORP.

60. Remove the 2 O-rings (1) from the 2nd brake piston.

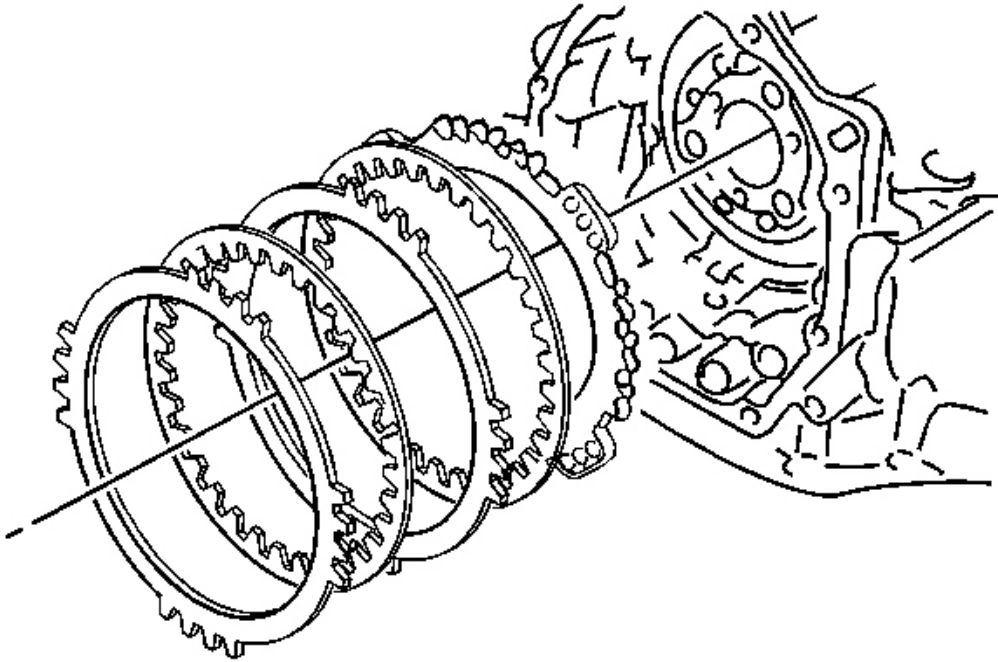


Fig. 172: Plates, Discs & Flange
Courtesy of GENERAL MOTORS CORP.

61. Remove the 2 plates, 2 discs, and flange.

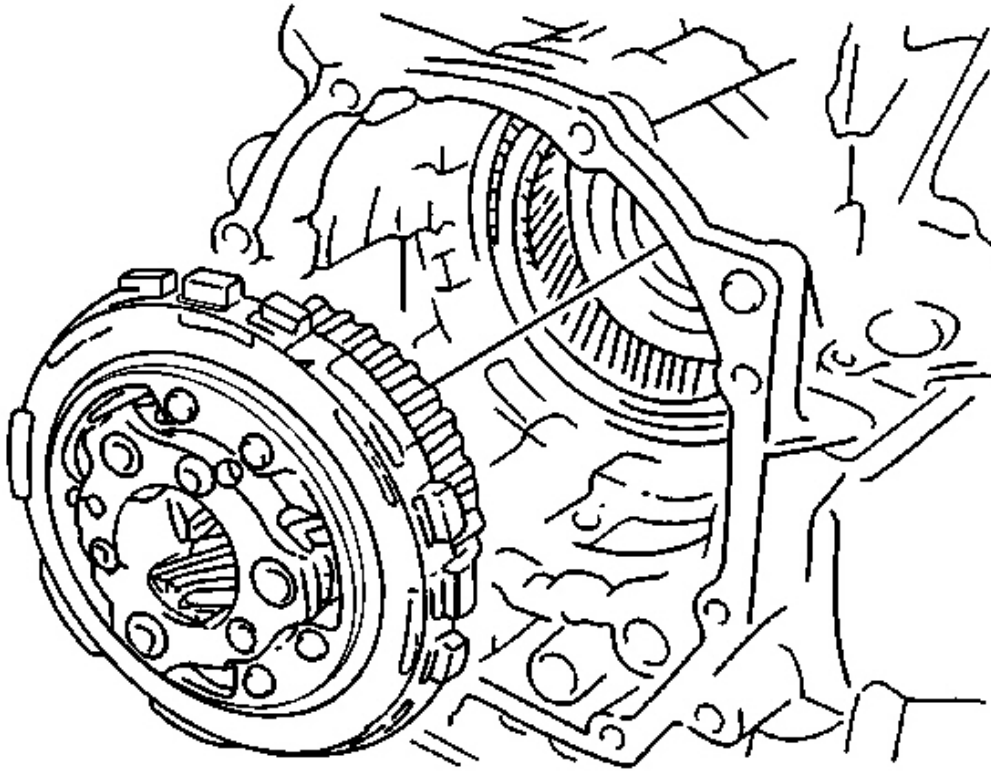


Fig. 173: No. 2 One Way Clutch & Planetary Gear
Courtesy of GENERAL MOTORS CORP.

62. Remove the No. 2 1-way clutch and planetary gear from the transaxle case.

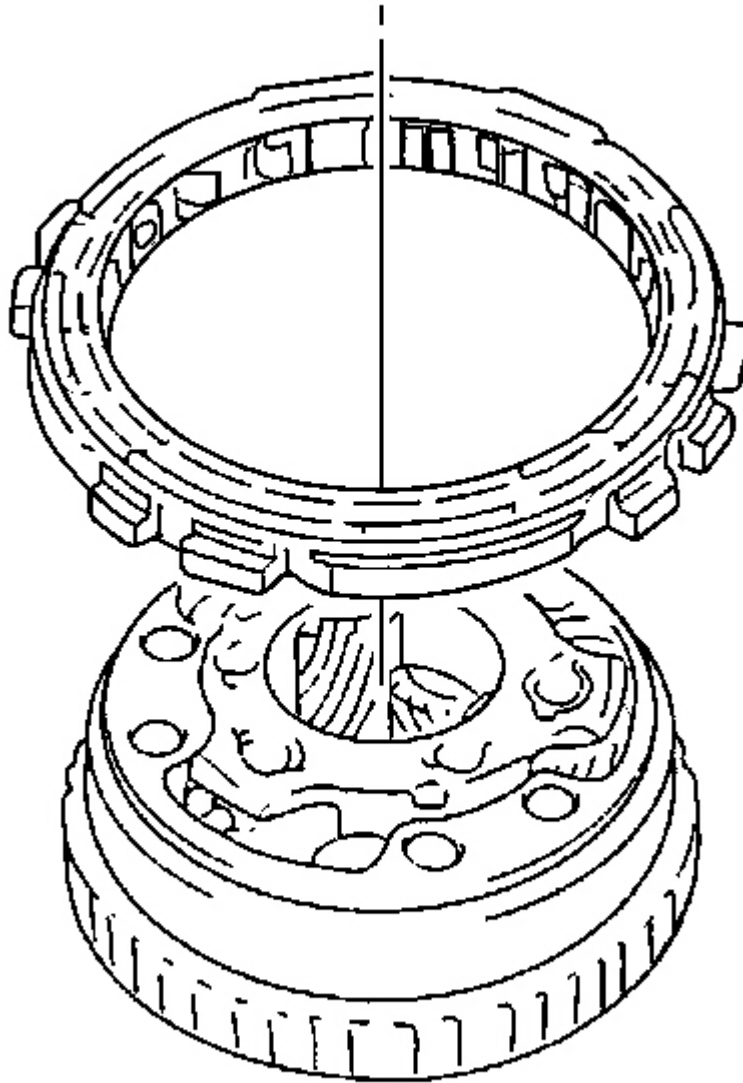


Fig. 174: No. 2 One Way Clutch, Planetary Gear & Remove Anti-Rattle Clip
Courtesy of GENERAL MOTORS CORP.

63. Remove the No. 2 1-way clutch from the planetary gear and remove the anti-rattle clip.

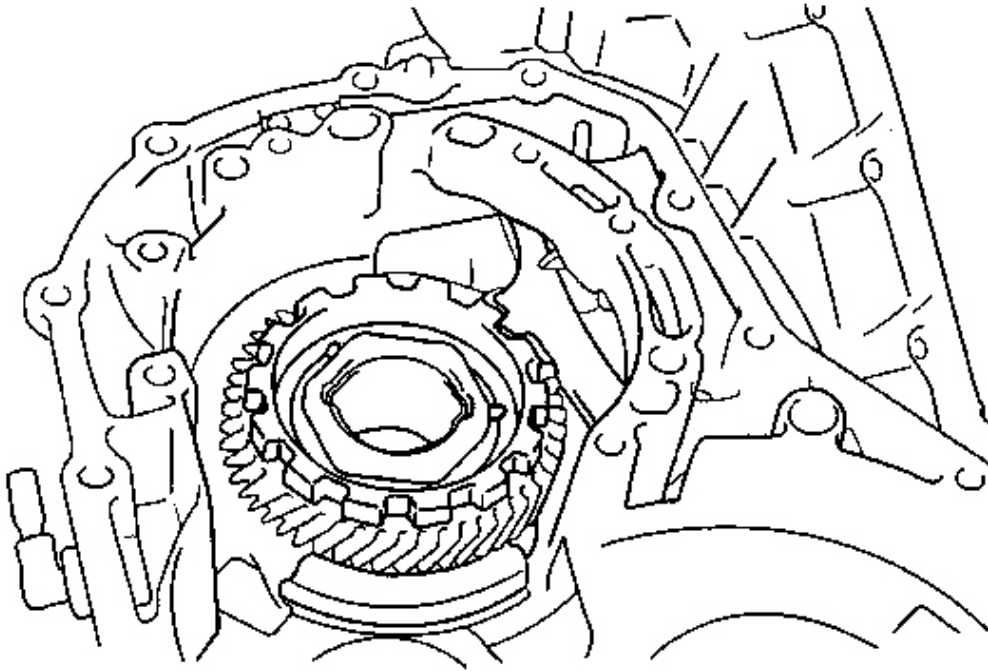


Fig. 175: Counter Drive Gear & Parking Lock Pawl
Courtesy of GENERAL MOTORS CORP.

64. Fix the counter drive gear with the parking lock pawl.

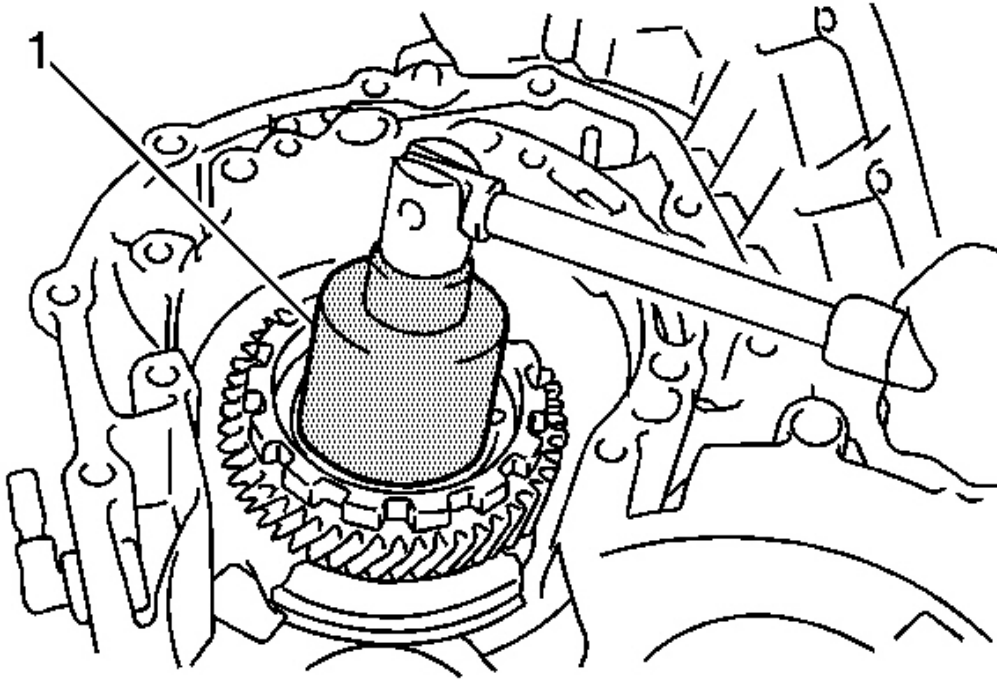


Fig. 176: Removing Planetary Ring Gear Nut Using DT 46472
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not chisel and remove the planetary ring gear nut staking before removing the nut. Damage to the planetary ring gear could result if force is applied. Remove the nut without unstaking the planetary ring gear. If force is used to unstack the planetary ring gear nut, damage the bearing could result.

65. Remove the planetary ring gear nut using planetary ring gear nut removal/installation socket **DT 46472** (1). See **Special Tools**.

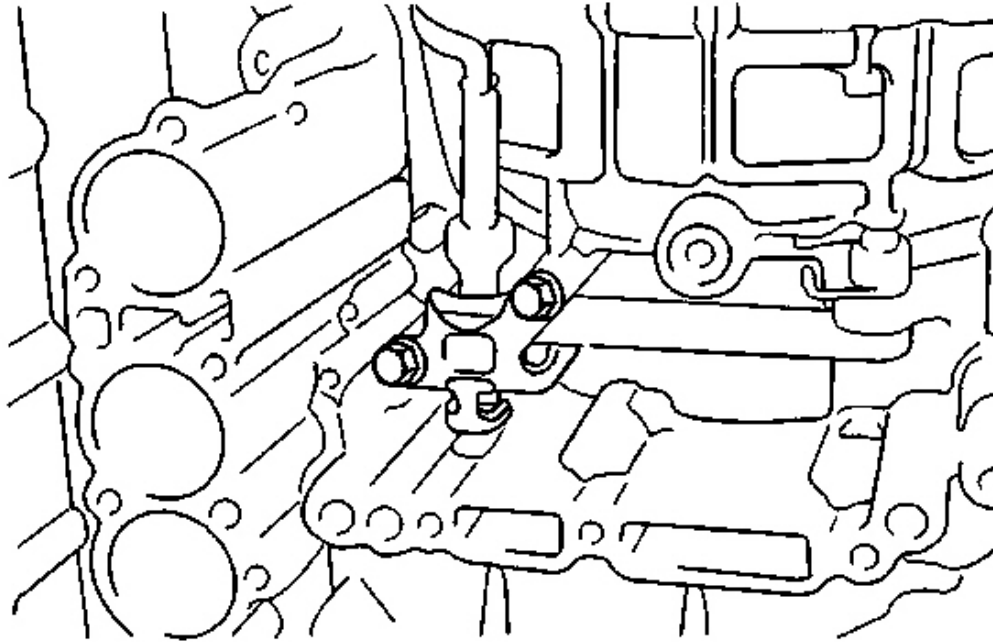


Fig. 177: Bolts & Parking Lock Pawl Bracket
Courtesy of GENERAL MOTORS CORP.

66. Remove the 2 bolts and parking lock pawl bracket.

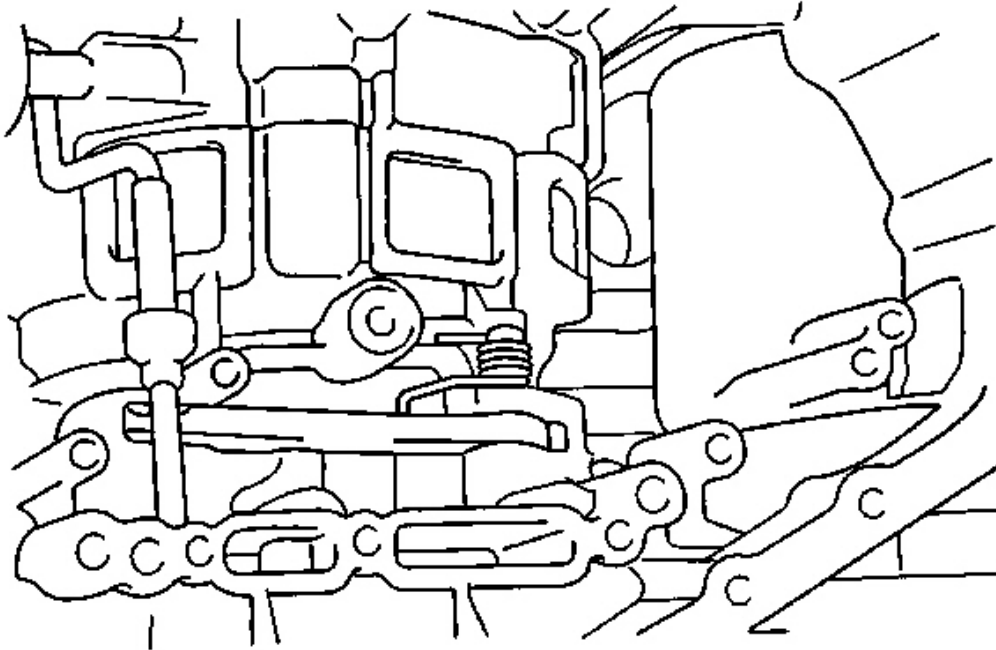


Fig. 178: Parking Lock Pawl, Shaft & Torsion Spring
Courtesy of GENERAL MOTORS CORP.

67. Remove the parking lock pawl shaft, torsion spring and parking lock pawl.

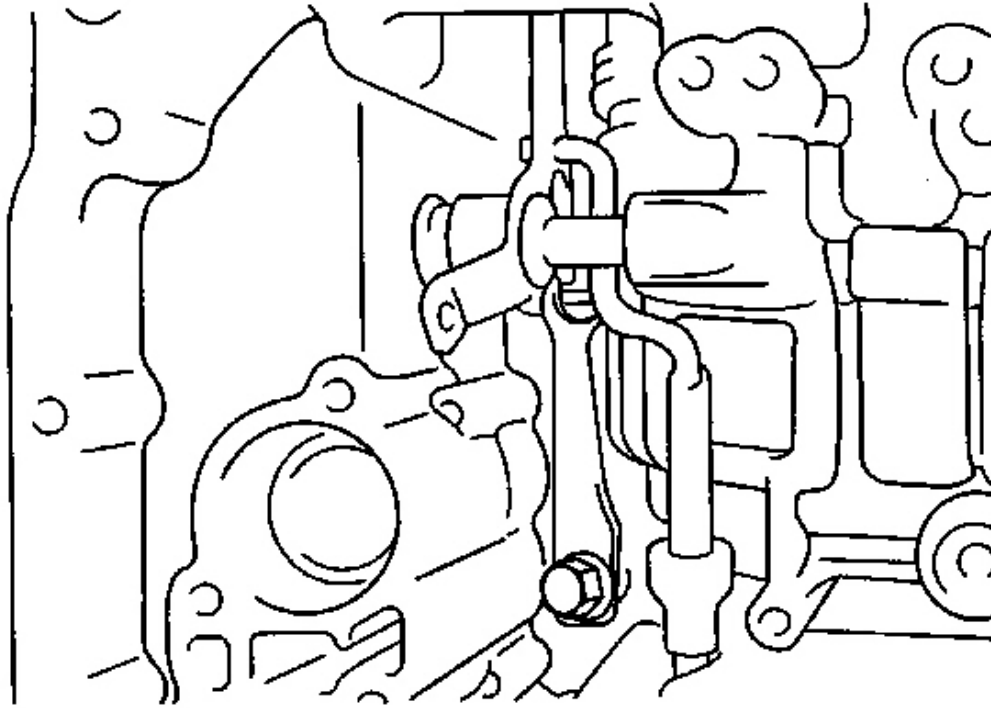


Fig. 179: Bolt & Manual Detent Spring
Courtesy of GENERAL MOTORS CORP.

68. Remove the bolt and manual detent spring.

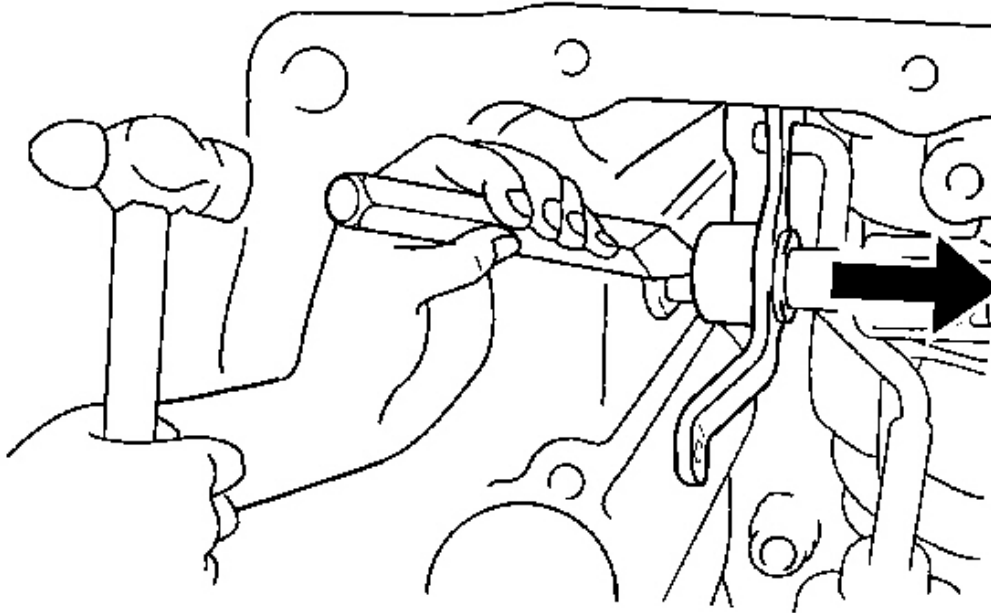


Fig. 180: Unstaking & Removing Spacer Using A Chisel & Hammer
Courtesy of GENERAL MOTORS CORP.

69. Using a chisel and hammer, unstake and remove the spacer.

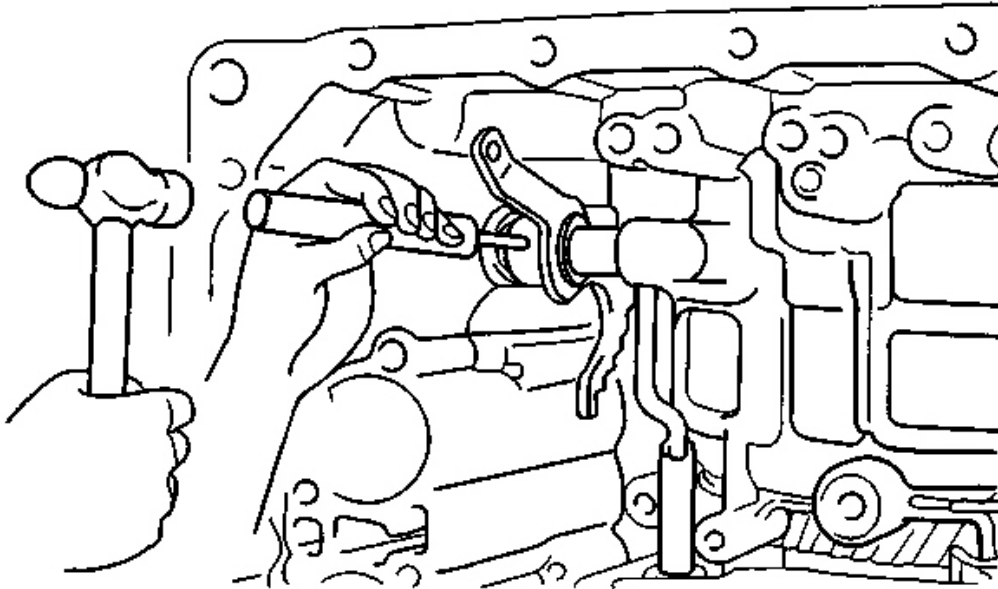


Fig. 181: Driving The Pin Using A Pin Punch & Hammer
Courtesy of GENERAL MOTORS CORP.

70. Using a pin punch and hammer, drive out the pin.

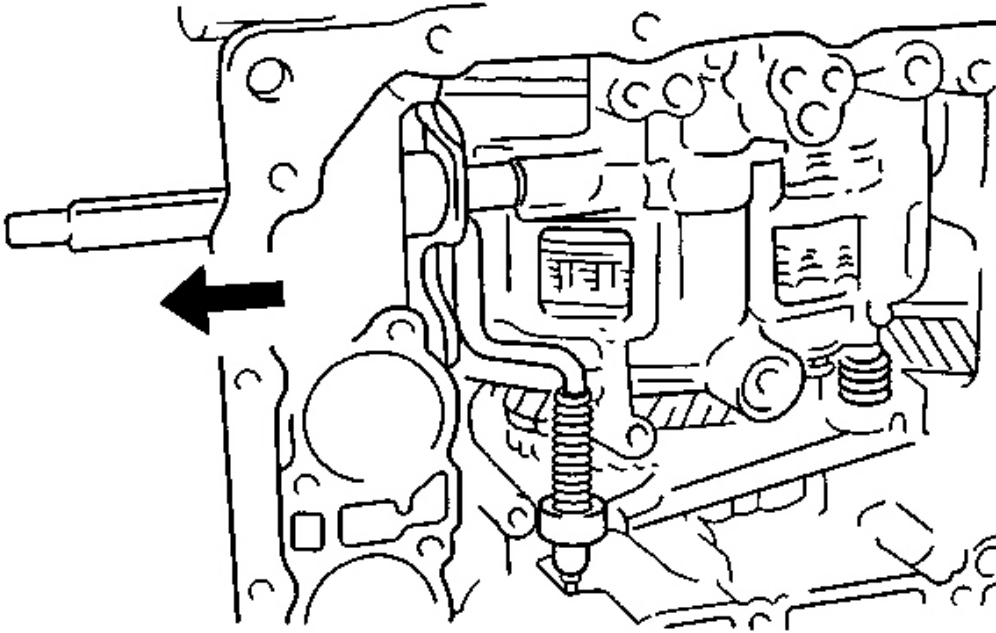


Fig. 182: Manual Valve Lever & Shaft
Courtesy of GENERAL MOTORS CORP.

71. Remove the manual valve lever shaft and manual valve lever.

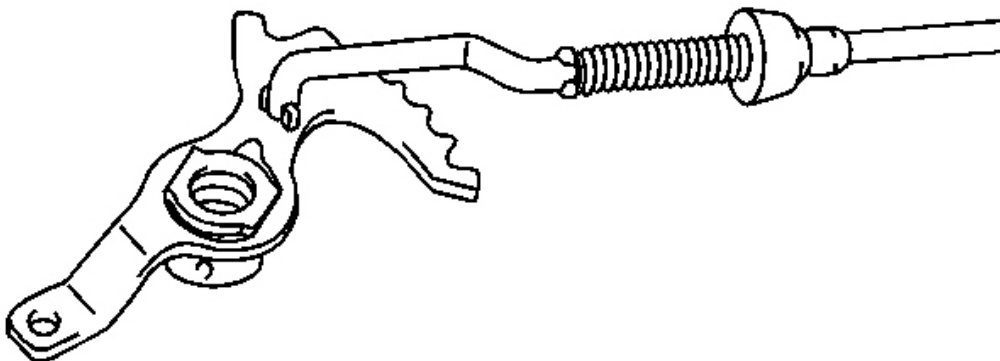


Fig. 183: Parking Lock Rod & Manual Valve Lever
Courtesy of GENERAL MOTORS CORP.

72. Remove the parking lock rod from the manual valve lever.

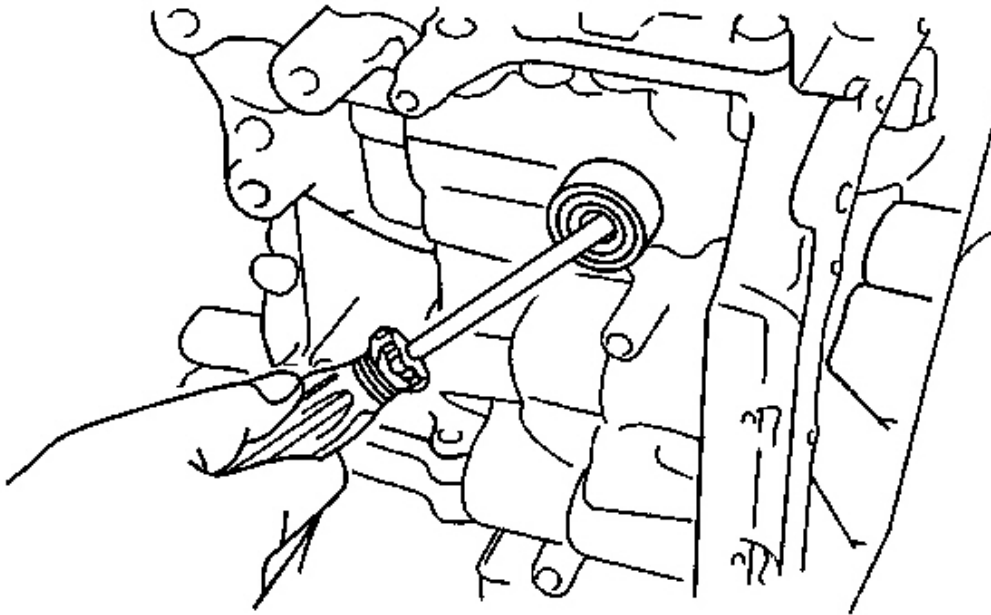


Fig. 184: Removing Oil Seal Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

73. Using a screwdriver, remove the oil seal.

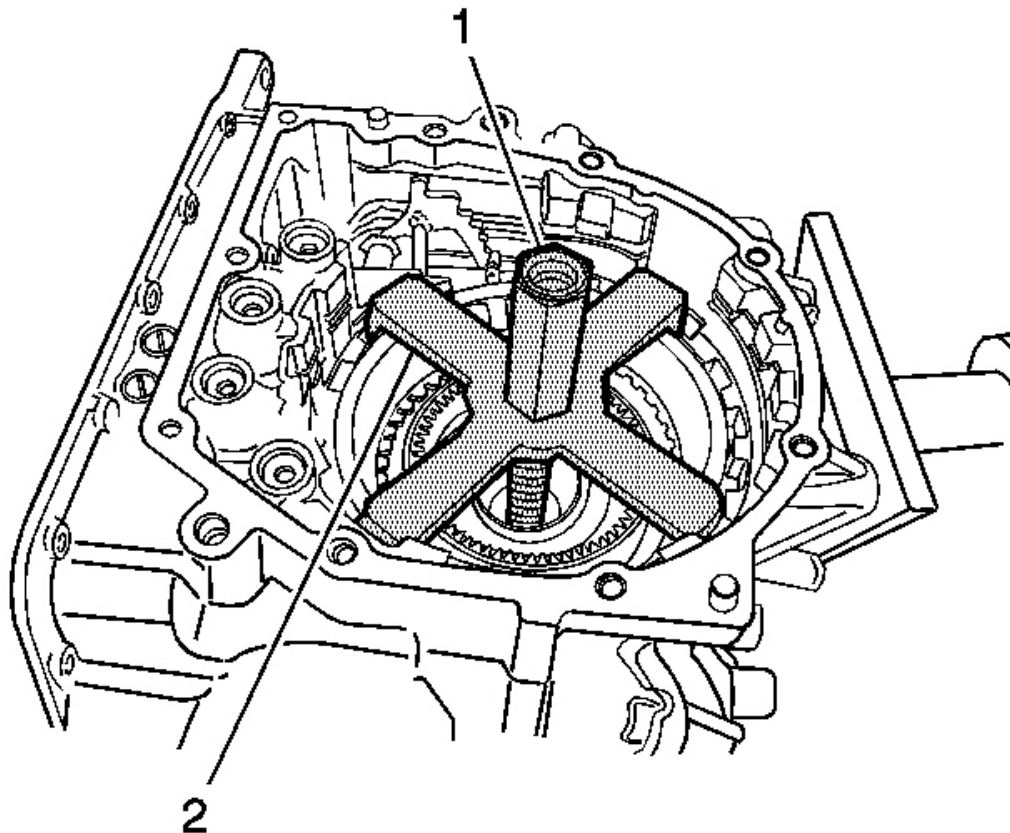


Fig. 185: DT 46455, DT 46457, Snap Ring Of 1st & Reverse Brake
Courtesy of GENERAL MOTORS CORP.

CAUTION: Use extreme care when removing snap rings. Always wear adequate eye protection in order to avoid personal injury.

74. Using the **DT 46455** (1) and **DT 46457** (2), remove the snap ring of 1st and reverse brake. See **Special Tools**.

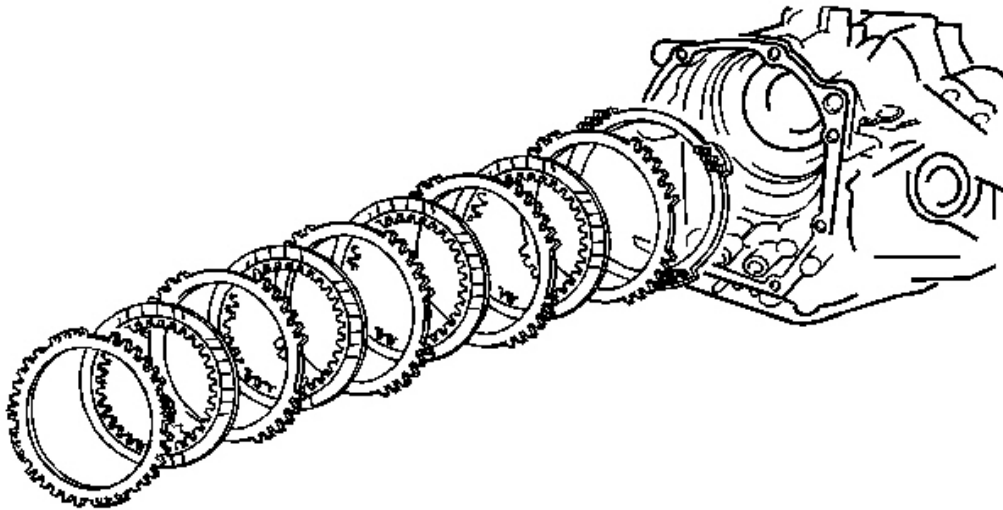


Fig. 186: Flange, Discs, Plates & Return Spring
Courtesy of GENERAL MOTORS CORP.

75. Remove the flange, 4 discs, 4 plates, and return spring.

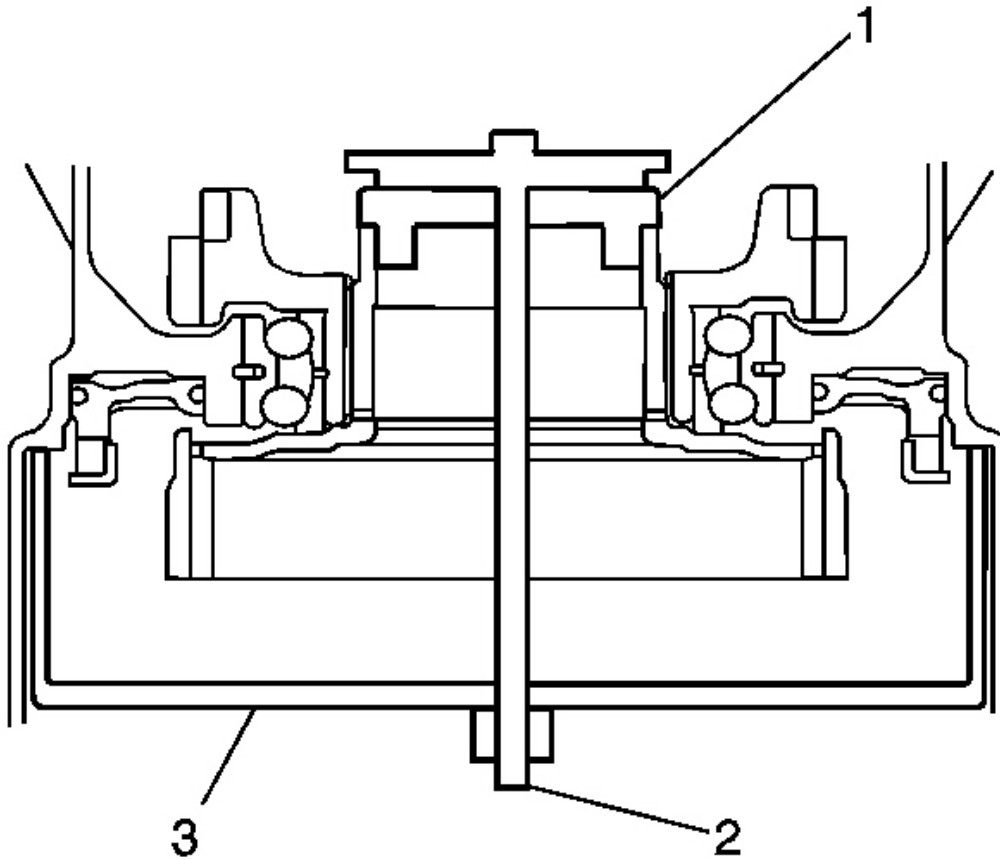


Fig. 187: Planetary Ring Gear, DT 46455, DT 46457 & DT 46459
Courtesy of GENERAL MOTORS CORP.

76. Using the DT 46455 (2), DT 46457 (3), and DT 46459 (1), remove the planetary ring gear. See **Special Tools**.

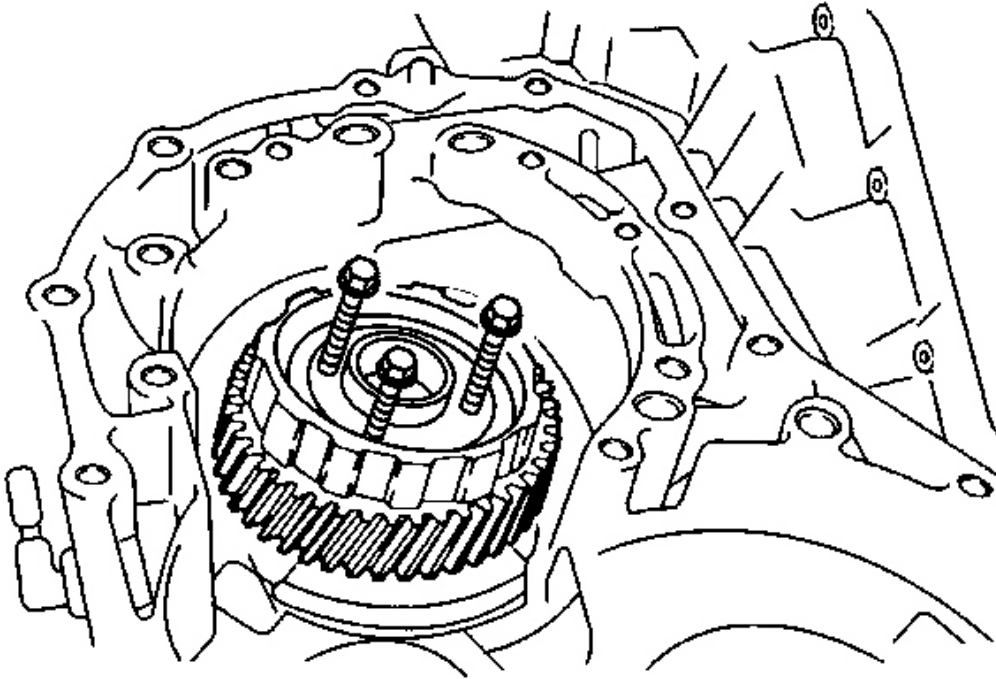


Fig. 188: Counter Drive Gear & Bolts
Courtesy of GENERAL MOTORS CORP.

77. Install the 3 bolts to the counter drive gear.

Specification:

- The bolt (M6) L is equal to 40-80 mm (1.57-3.15 in).
- The bolt (M6) pitch is equal to 1.0 mm (0.04 in).

78. Rotate 3 bolts in order and remove the counter drive gear and planetary ring gear.

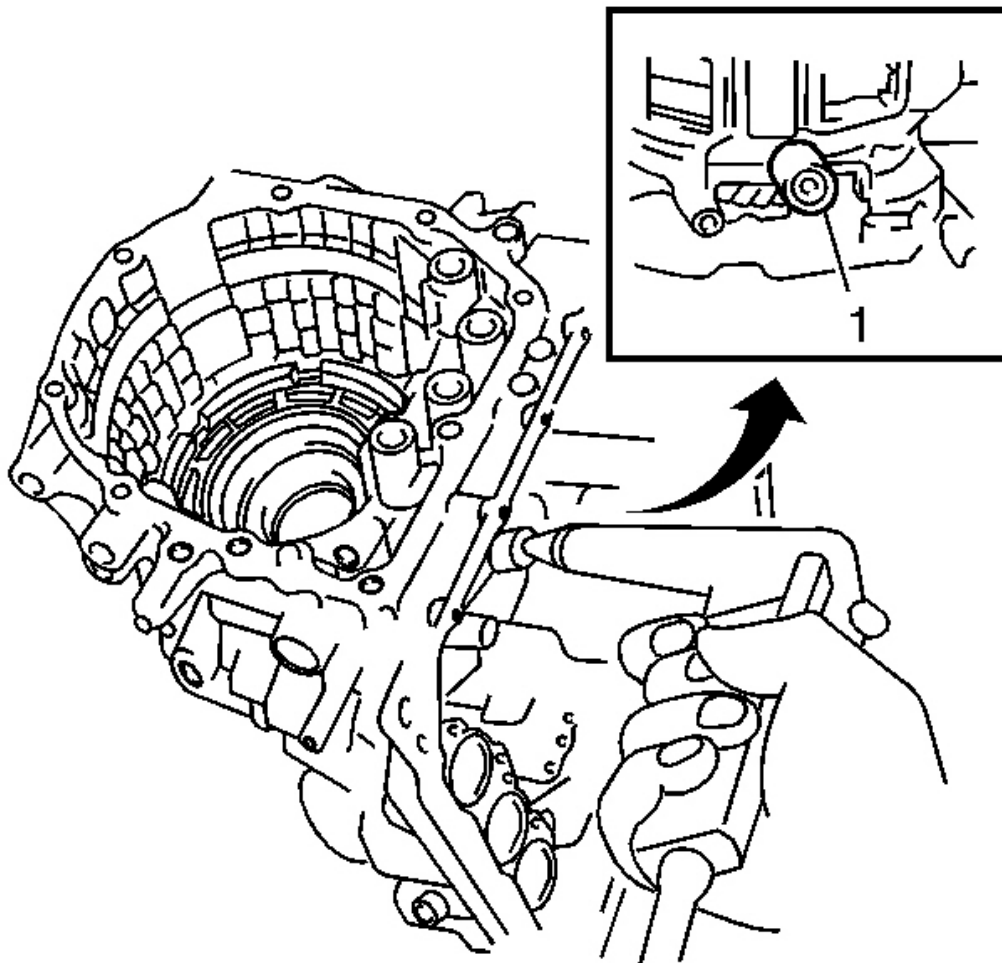


Fig. 189: Applying Compressed Air To Transaxle Case To Remove 1st & Reverse Brake Piston
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

79. Apply 392 kPa (57 psi) of compressed air to the transaxle case to remove the 1st and reverse brake piston.

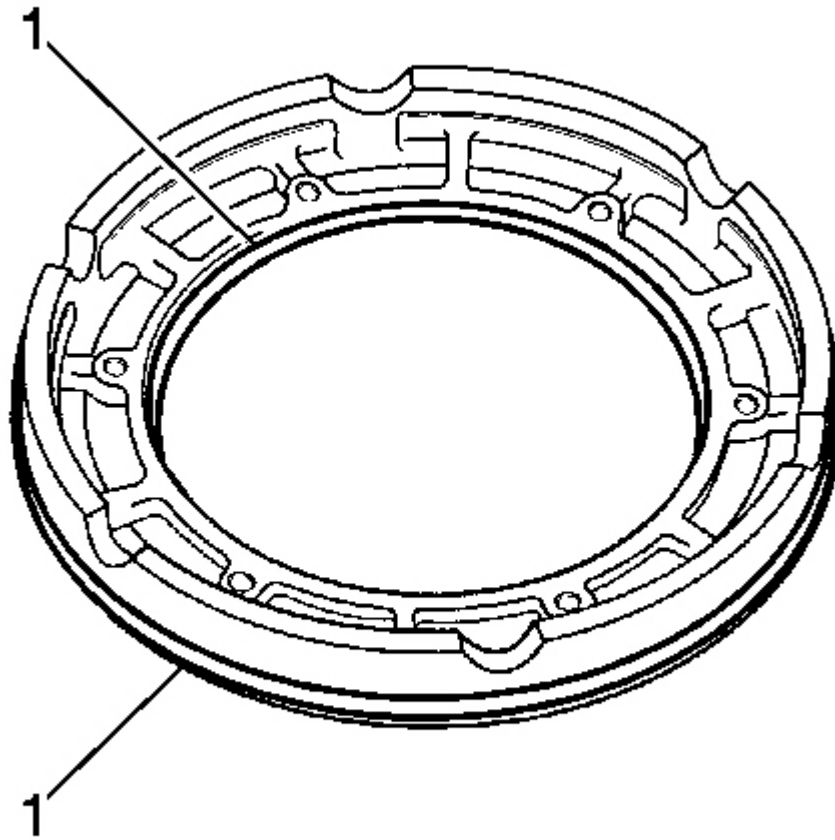


Fig. 190: O-Rings & 1st & Reverse Brake Piston
Courtesy of GENERAL MOTORS CORP.

80. Remove the 2 O-rings (1) from the 1st and reverse brake piston.

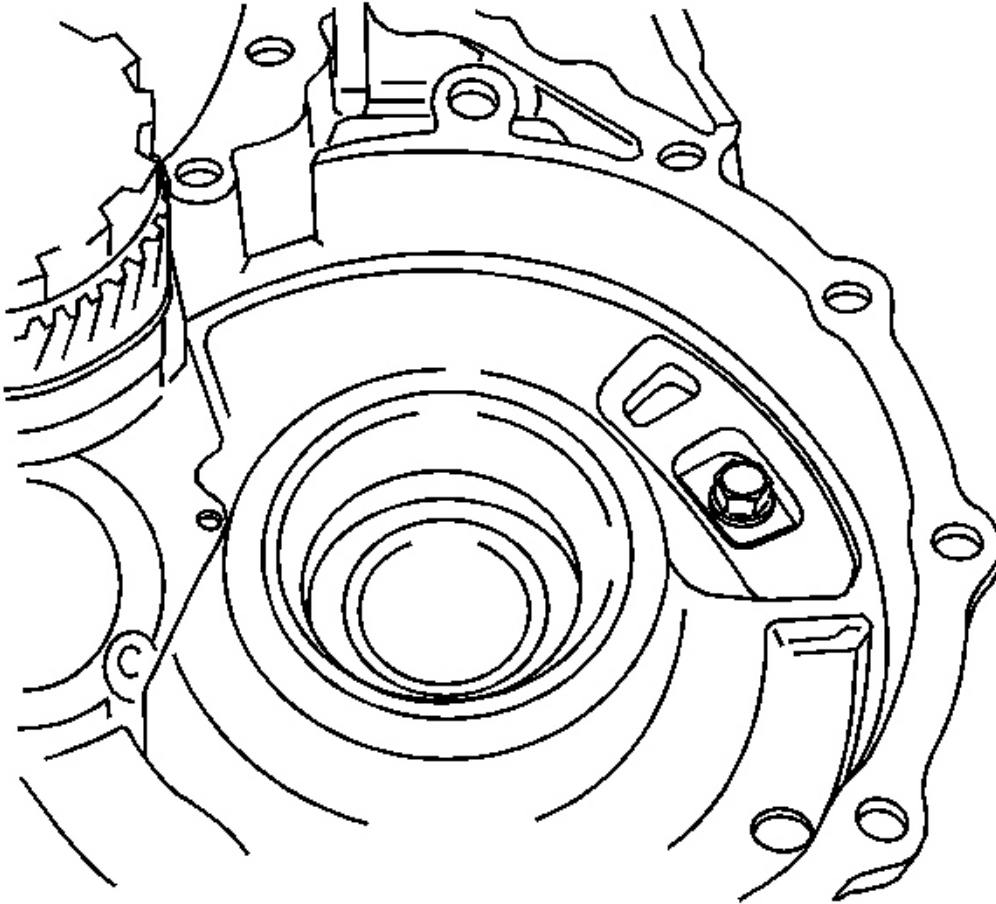


Fig. 191: No. 1 Transaxle Case Plate & Bolt
Courtesy of GENERAL MOTORS CORP.

81. Remove the bolt and No. 1 transaxle case plate from the transaxle case.

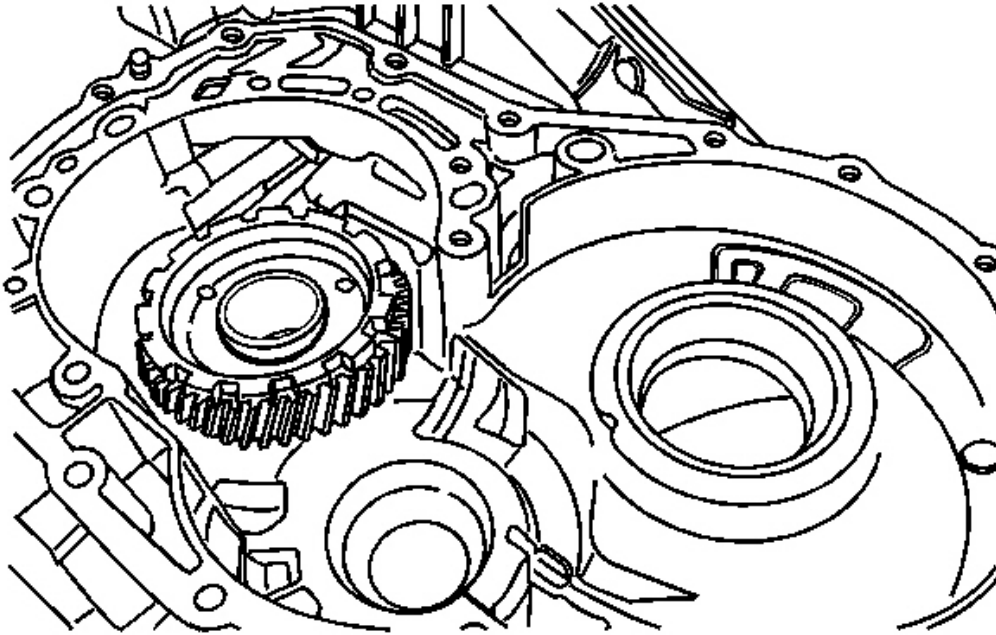


Fig. 192: Counter Driven Gear Outer Tapered Roller Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

82. Using a suitable puller, remove the counter driven gear outer tapered roller bearing race and shim from the transaxle case.
83. Using a driver, remove the oil seal from the transaxle case.

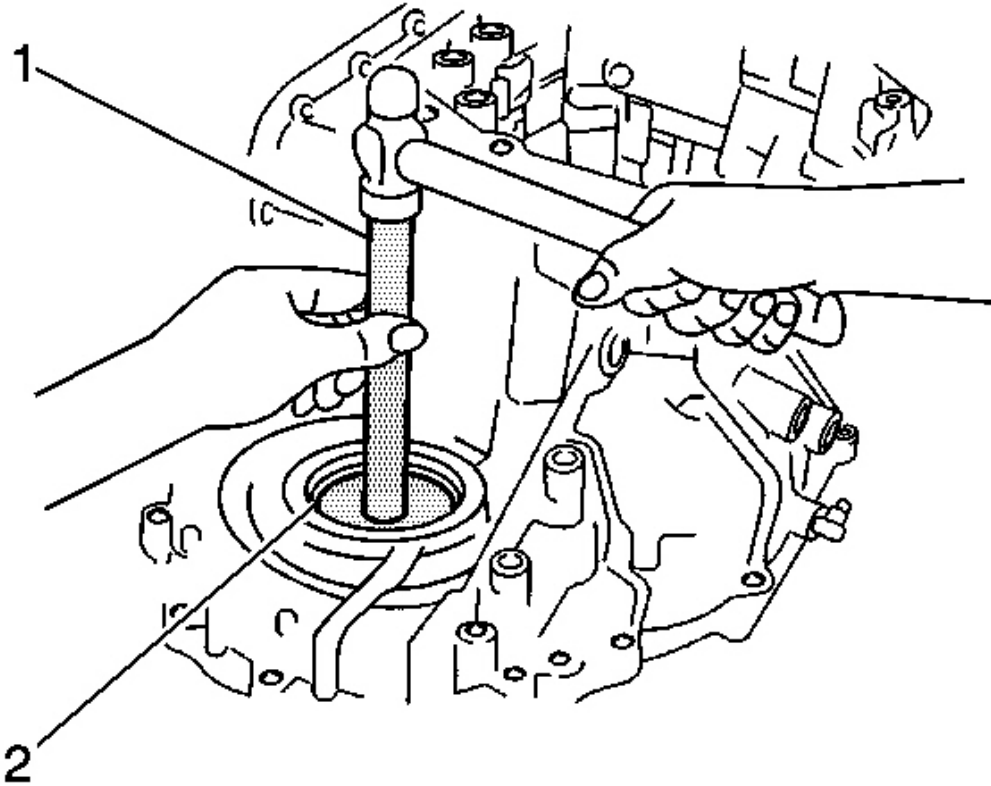


Fig. 193: Removing Transaxle Case Side Bearing Outer Race & Shim Using DT 46463 & DT 46465
Courtesy of GENERAL MOTORS CORP.

84. Using the DT 46463 (2) and DT 46465 (1), remove the transaxle case side bearing outer race and shim. See **Special Tools**.

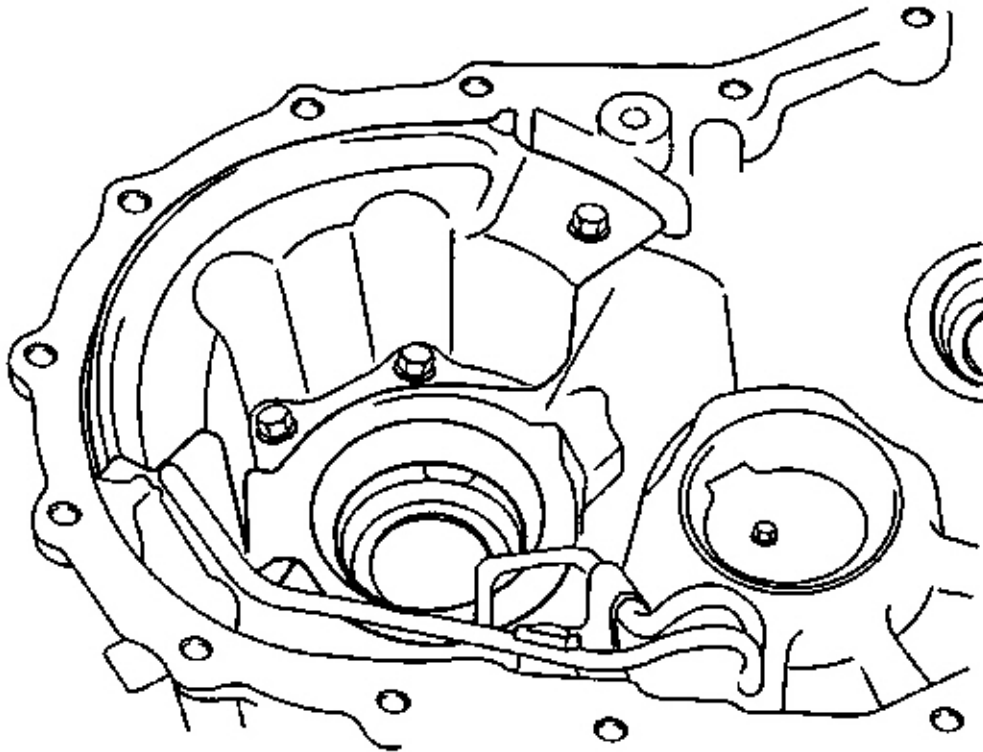


Fig. 194: Oil Reservoir Lock Plate
Courtesy of GENERAL MOTORS CORP.

85. Remove the 3 bolts and oil reservoir lock plate from the transaxle housing.

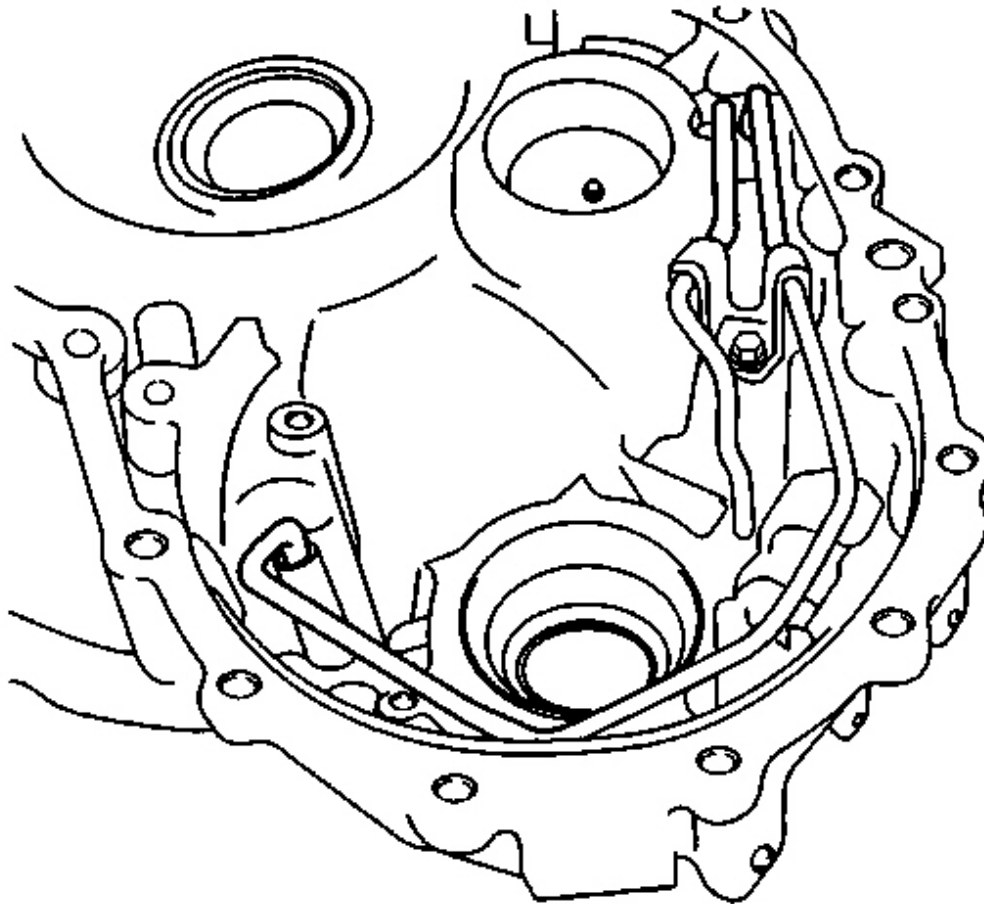


Fig. 195: No. 1 Transaxle Apply Pipe Clamp
Courtesy of GENERAL MOTORS CORP.

86. Remove the bolt and No. 1 transaxle apply pipe clamp from the transaxle housing.
87. Remove the transaxle lube apply pipe and differential gear lube apply pipe from the transaxle housing.

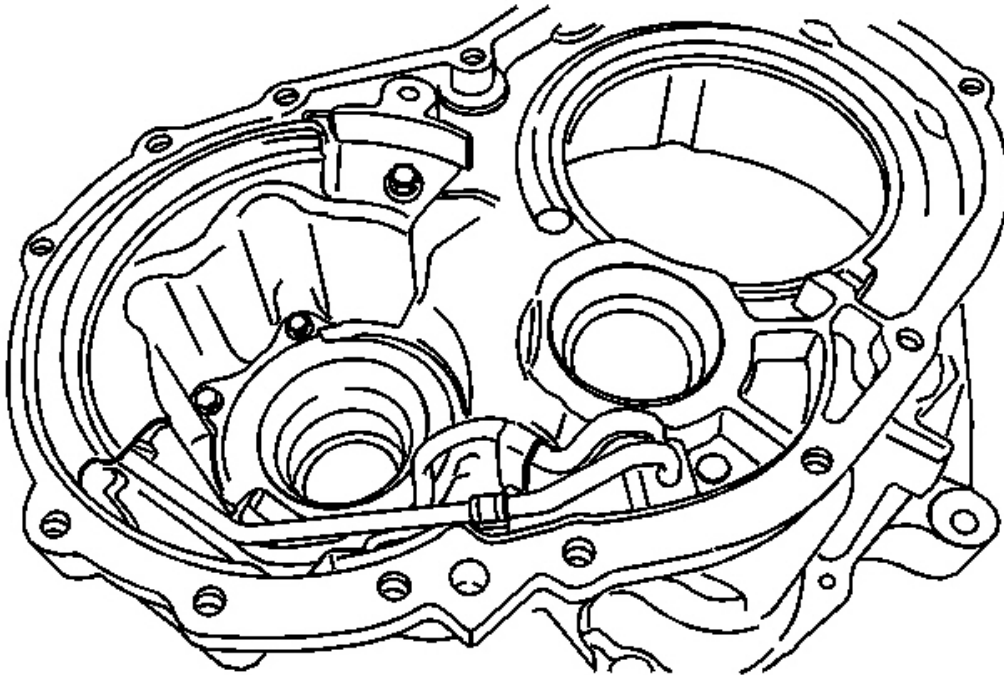


Fig. 196: Oil Seal & Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

88. Using a suitable puller, remove the counter driven gear outer tapered roller bearing race from the transaxle housing.
89. Using a driver, remove the oil seal from the transaxle housing.

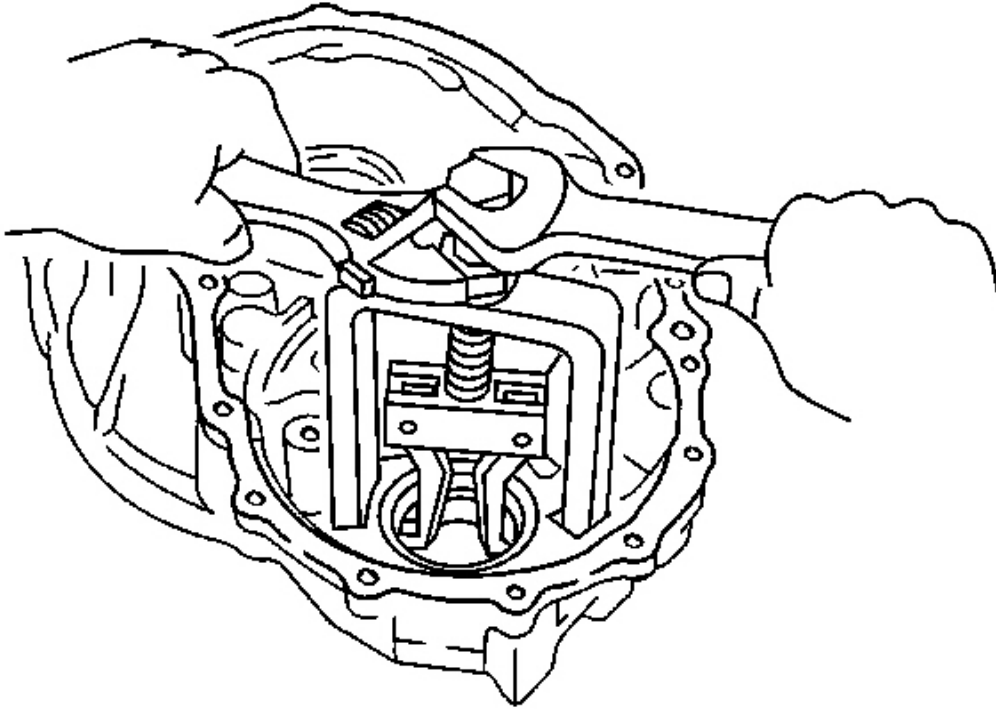


Fig. 197: Removing Side Bearing Outer Race & Transaxle Housing Using A Puller
Courtesy of GENERAL MOTORS CORP.

90. Using a suitable puller, remove the side bearing outer race from the transaxle housing.

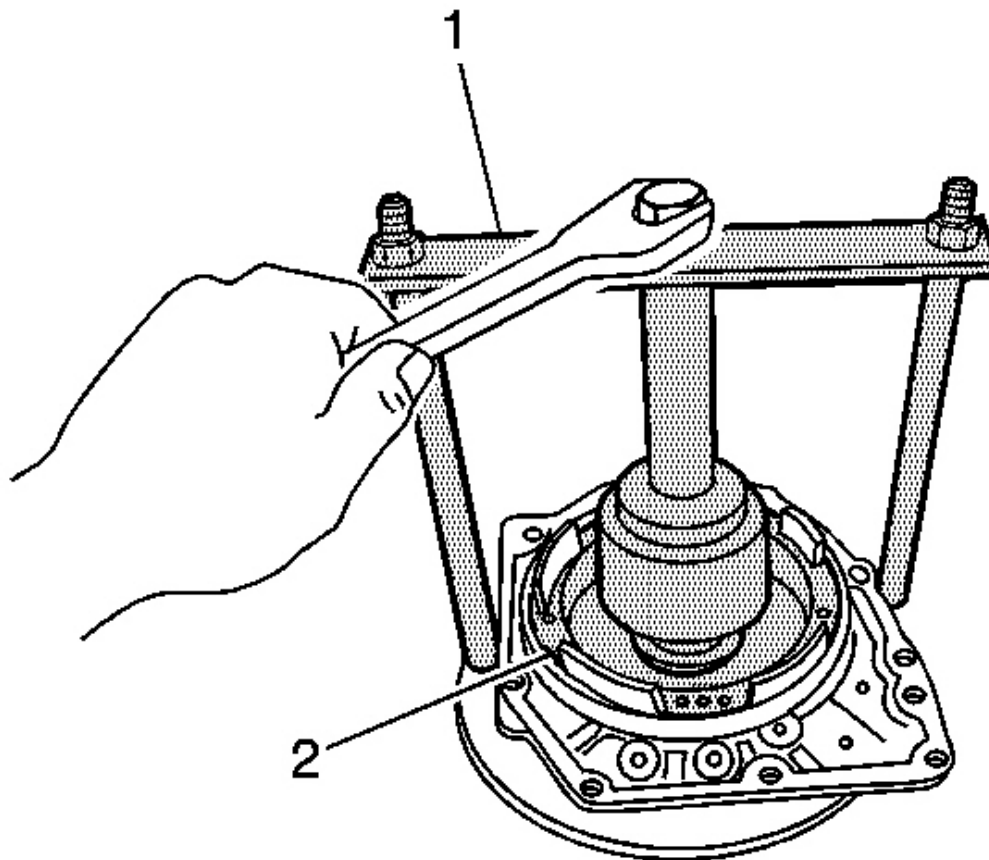


Fig. 198: Removing Snap Ring Using A Driver, DT 46451 & DT46454
Courtesy of GENERAL MOTORS CORP.

CAUTION: Use extreme care when removing snap rings. Always wear adequate eye protection in order to avoid personal injury.

91. Using the **DT 46451** (1), **DT 46454** (2) and a driver, remove the snap ring. See **Special Tools**.

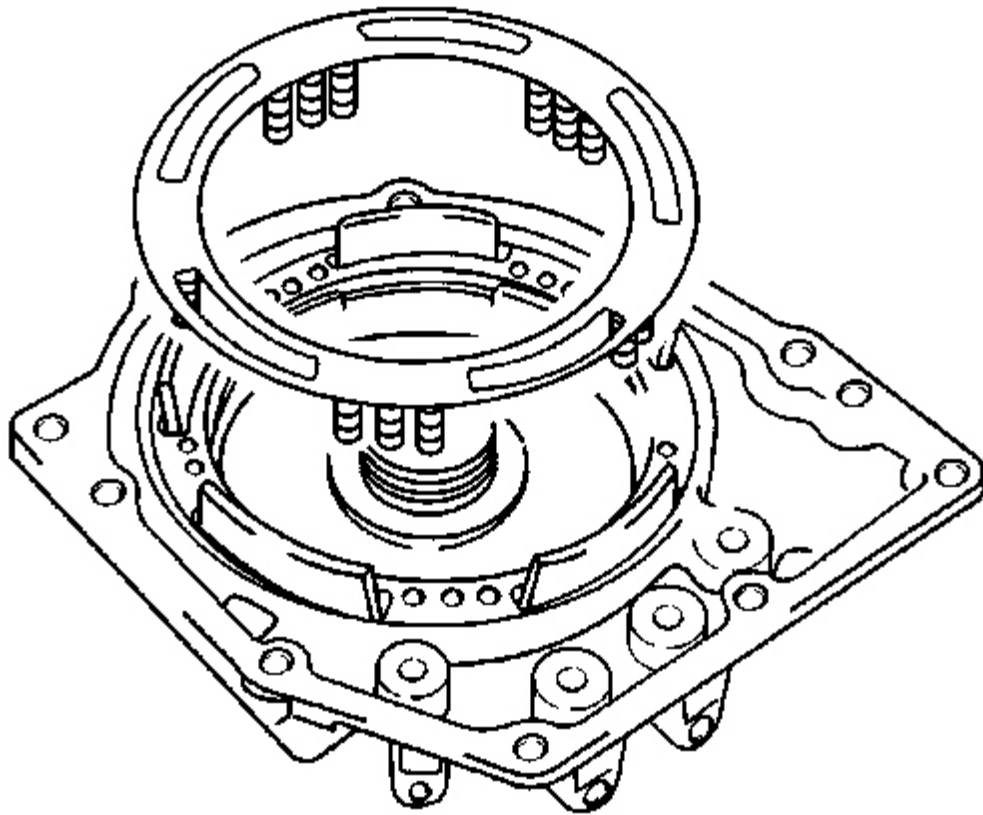


Fig. 199: O/D Brake Return Spring
Courtesy of GENERAL MOTORS CORP.

92. Remove the O/D brake return spring.

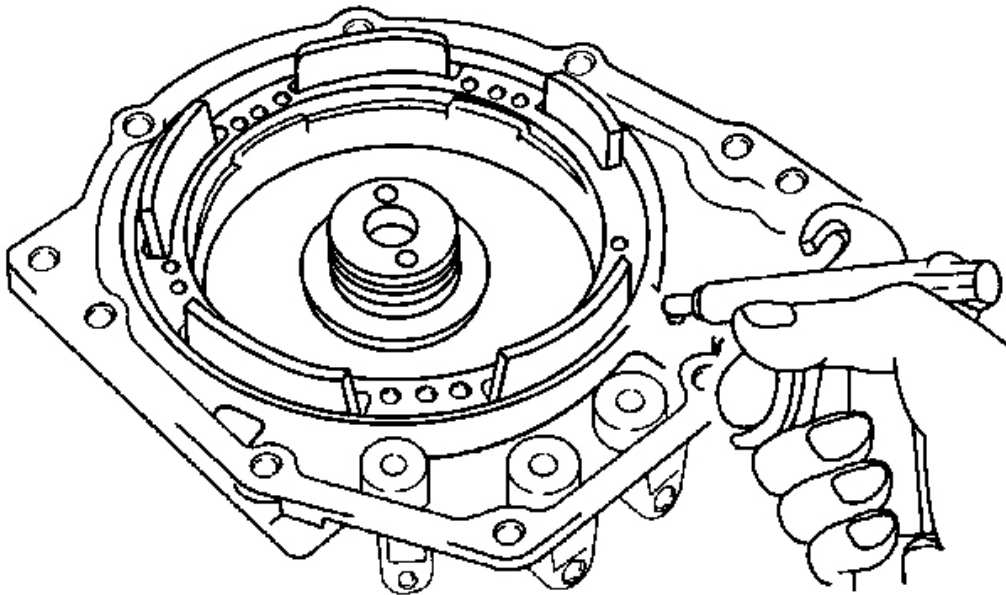


Fig. 200: Applying Compressed Air To Transaxle Rear Cover To Remove O/D Brake Piston
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

IMPORTANT:

- Air pressure may cause the pistons to jump out. When removing the piston, hold it in place with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

93. Apply 392 kPa (57 psi) of compressed air to the transaxle rear cover to remove the O/D brake piston.

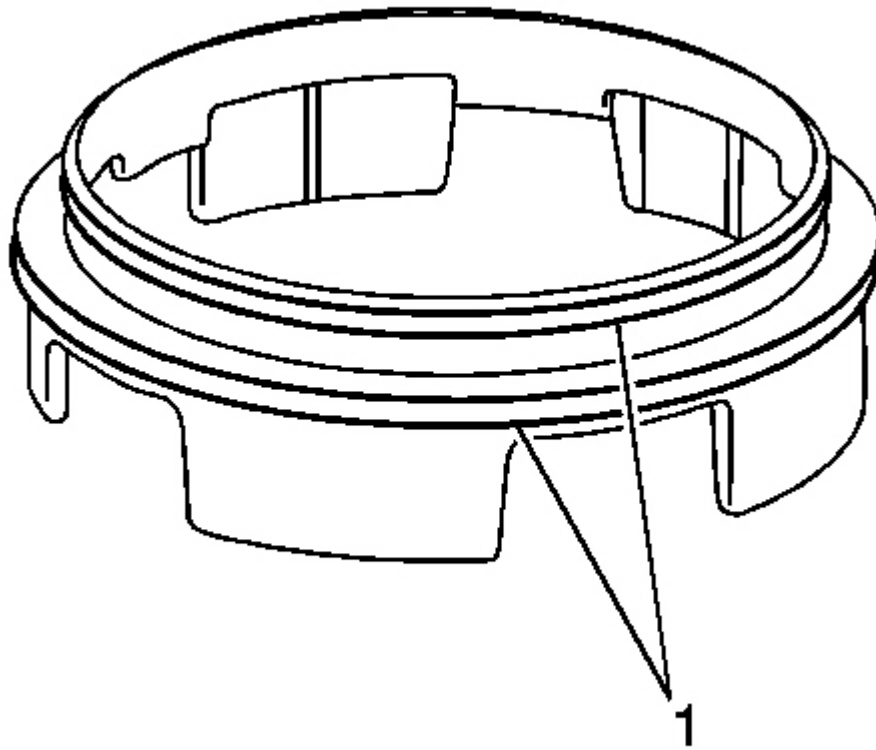


Fig. 201: O-Rings & O/D Brake Piston
Courtesy of GENERAL MOTORS CORP.

94. Remove the 2 O-rings (1) from the O/D brake piston.

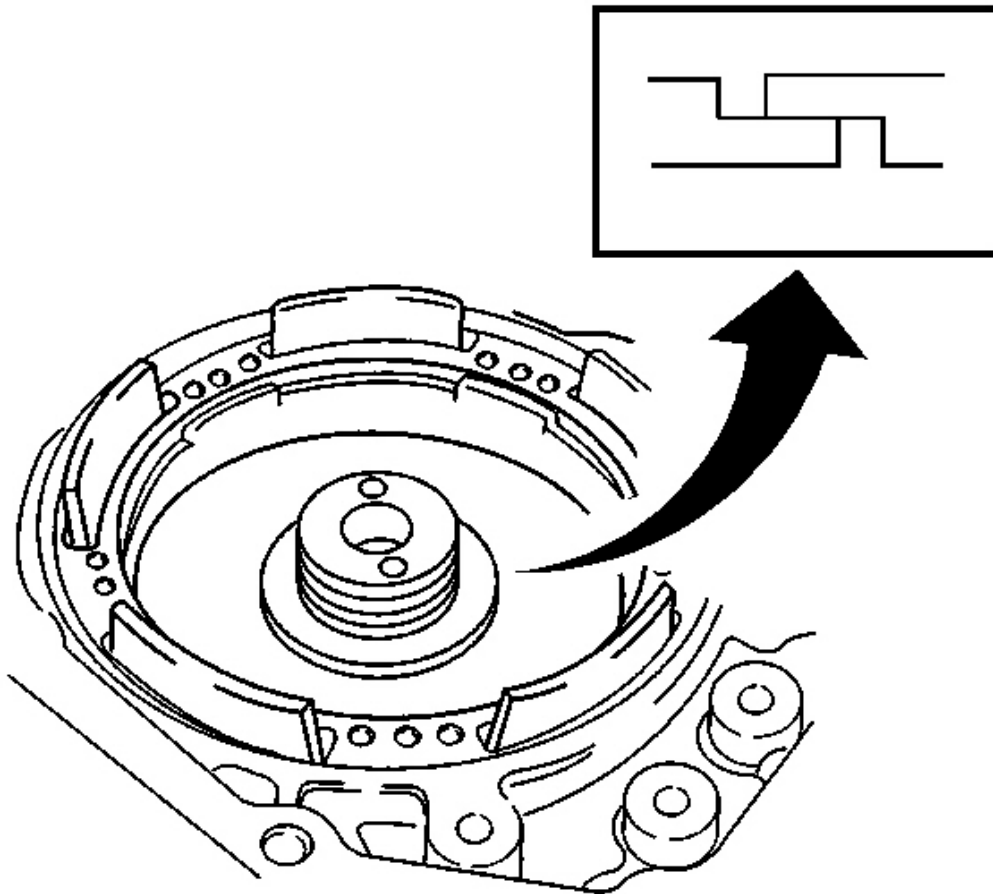


Fig. 202: Seal Rings & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not expand the seal ring excessively.

95. Remove the 2 seal rings from the transaxle rear cover.

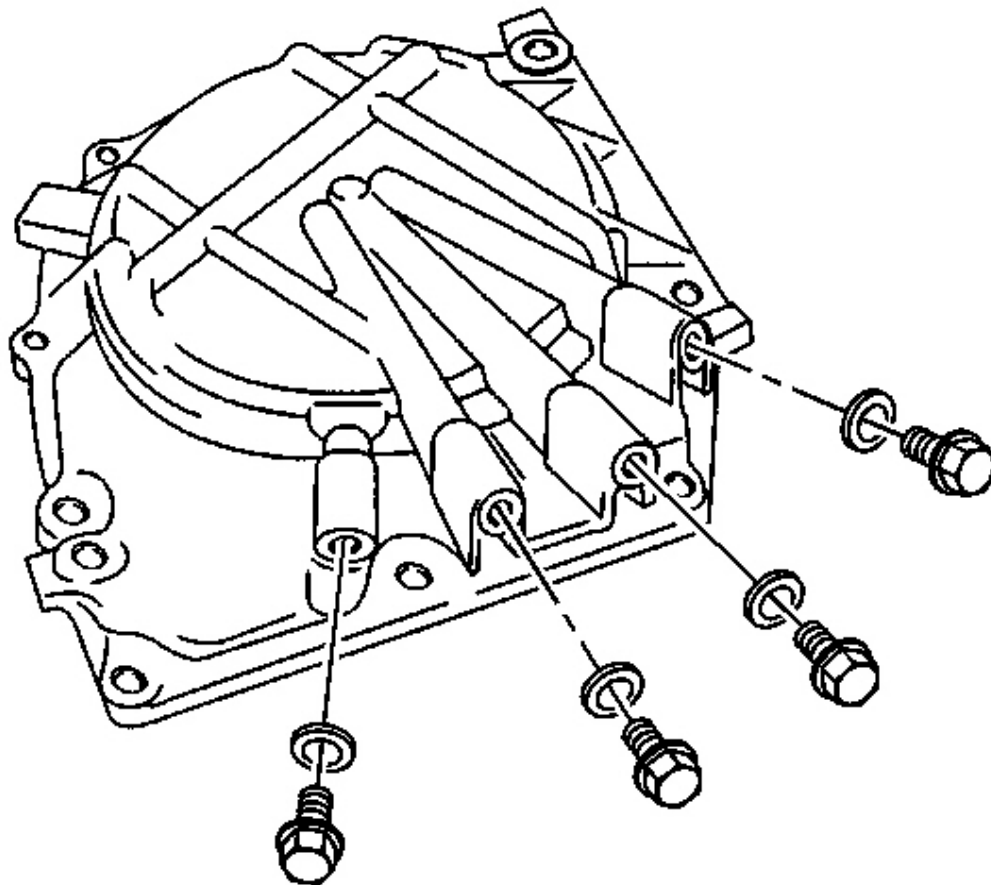


Fig. 203: Screw Plugs, 4 O-Rings & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

96. Remove the 4 screw plugs and 4 O-rings from the transaxle rear cover.

TRANSMISSION ASSEMBLE

Tools Required

- **DT 46451** (DW240-020) Brake Clutch Spring Compressor. See **Special Tools**.
- **DT 46454** (DW240-050) Overdrive Brake Adapter. See **Special Tools**.
- **DT 46455** (DW240-060-01) Brake Spring Compressor Bolt/Nut. See **Special Tools**.
- **DT 46456** (DW240-060-02) Brake Spring Compressor Plate. See **Special Tools**.

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- **DT 46457** (DW240-070) 1st/Reverse Brake Adapter. See **Special Tools**.
- **DT 46458** (DW240-080) 2nd Brake Adapter. See **Special Tools**.
- **DT 46460** (DW240-100) Counter Drive Gear Installation Adapter. See **Special Tools**.
- **DT 46461** (DW240-130) Differential Preload Adapter. See **Special Tools**.
- **DT 46462** (DW240-140) Transaxle Housing Side Bearing Outer Race Adapter. See **Special Tools**.
- **DT 46464** (DW240-160) Transaxle Case Outer Tapered Roller Bearing Race Adapter. See **Special Tools**.
- **DT 46465** (DW240-170) Adapter Handle. See **Special Tools**.
- **DT 46471** (DW260-031-01) Transaxle Housing Oil Seal Installer. See **Special Tools**.
- **DT 46472** (DW260-041) Planetary Ring Gear Nut Removal/Installation Socket. See **Special Tools**.
- **DT 47521** (DW260-031-02) Transaxle Case Oil Seal Installer. See **Special Tools**.

Assembly Procedure

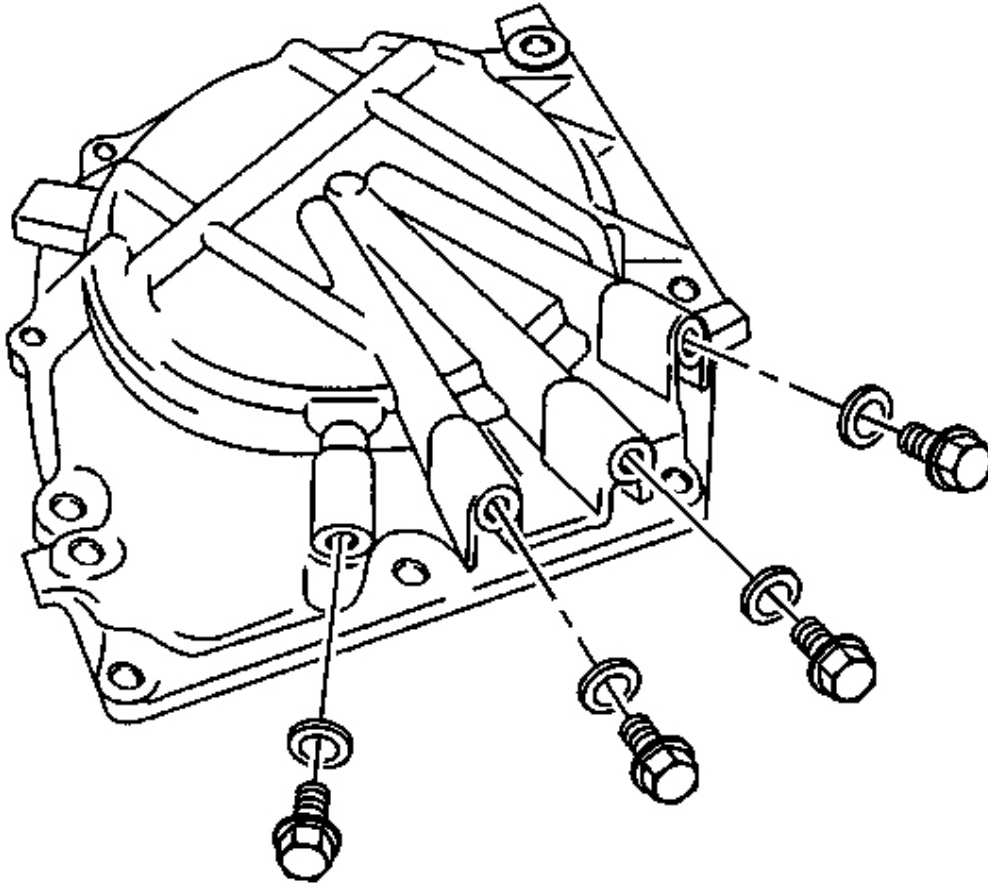


Fig. 204: Screw Plugs, 4 O-Rings & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

1. Install 4 new O-rings to the 4 screw plugs.

NOTE: Refer to Fastener Notice .

2. Install the 4 screw plugs with the O-rings to the transaxle rear cover.

Tighten: Tighten the screw plugs to 7.4 N.m (65 lb in).

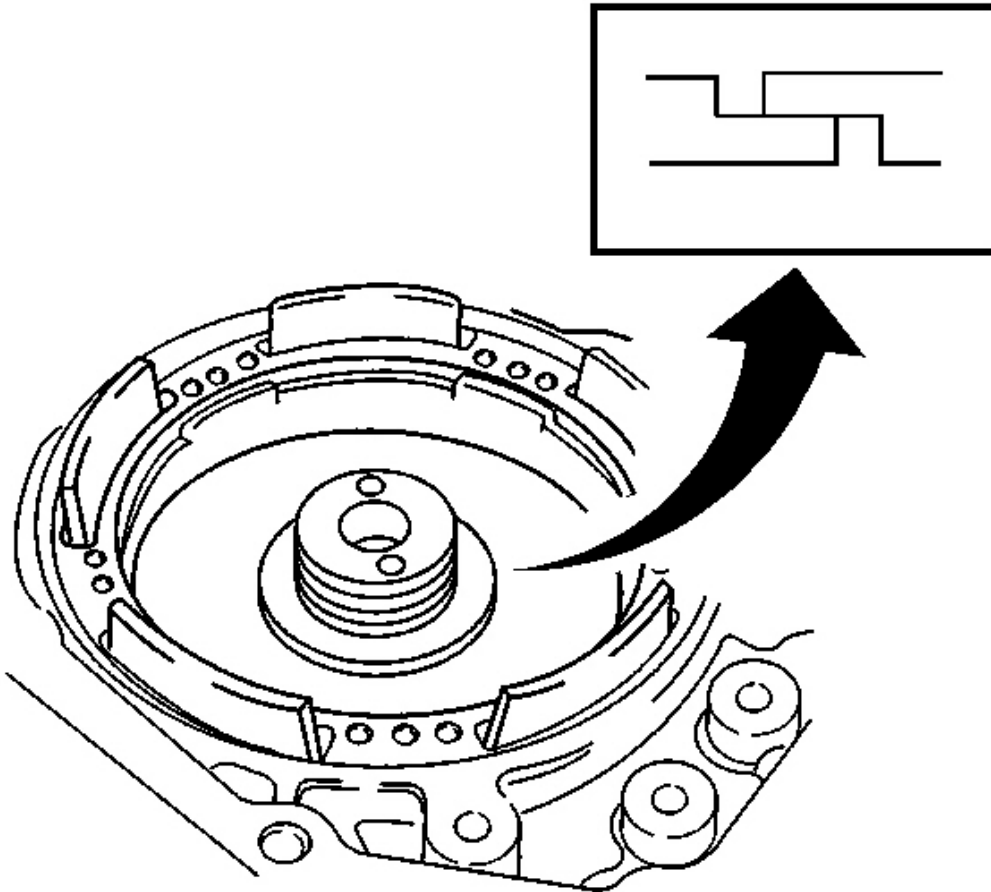


Fig. 205: Seal Rings & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

3. Install the 2 seal rings to the transaxle rear cover.

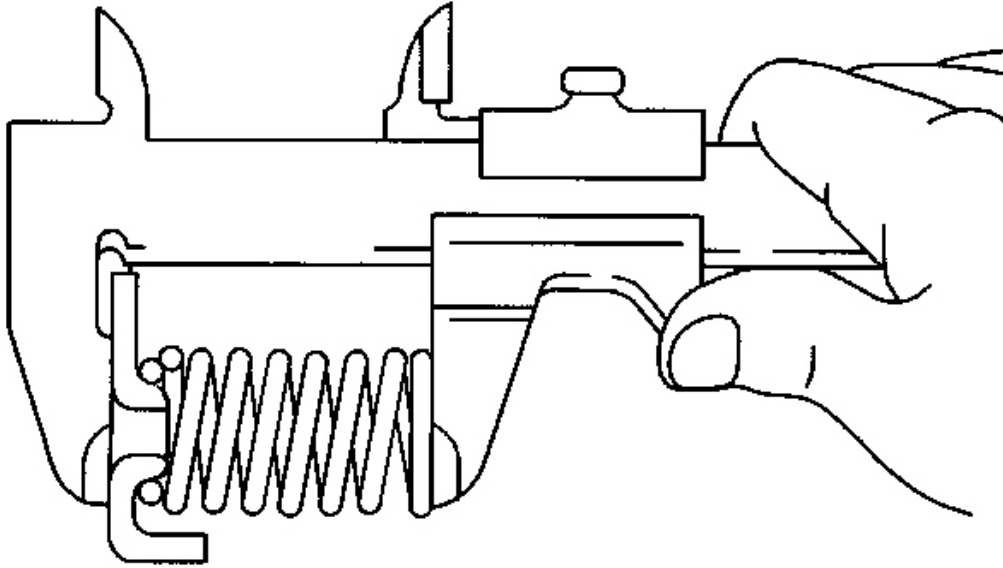


Fig. 206: Measuring Free Length Of O/D Brake Piston Return Spring Using The Vernier Calipers
Courtesy of GENERAL MOTORS CORP.

4. Using the vernier calipers, measure the free length of the overdrive (O/D) brake piston return spring together with the spring seat.

Specification: The standard free length is 18.99 mm (0.7476 in).

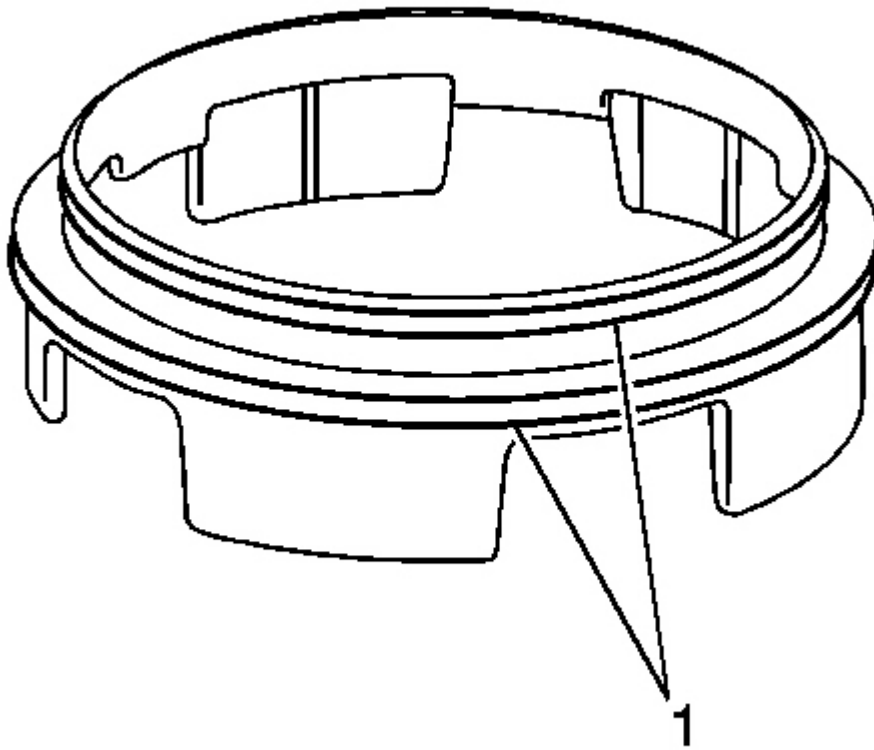


Fig. 207: O-Rings & O/D Brake Piston
Courtesy of GENERAL MOTORS CORP.

5. Coat 2 new O-rings (1) with automatic transaxle fluid (ATF). Install the O-rings to the O/D brake piston.

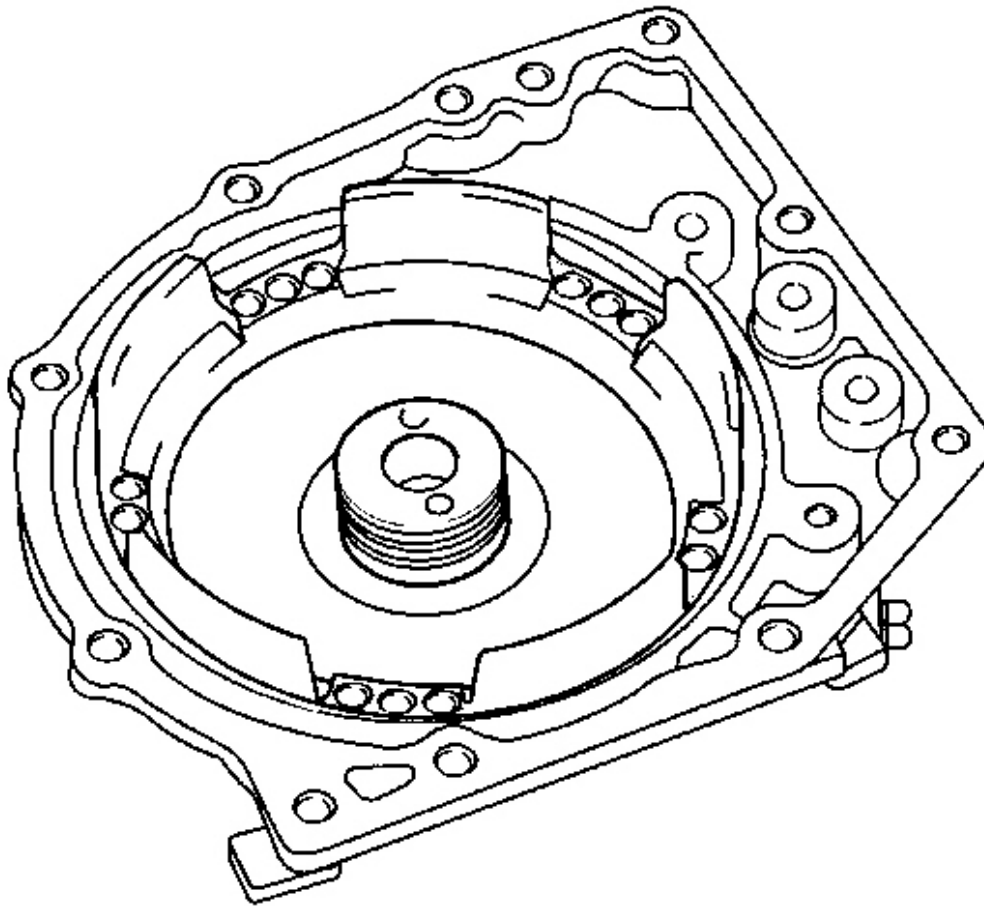


Fig. 208: O/D Brake Piston & ATF
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the O-rings of the O/D brake piston.

6. Coat the O/D brake piston with ATF. Install the piston to the transaxle rear cover.

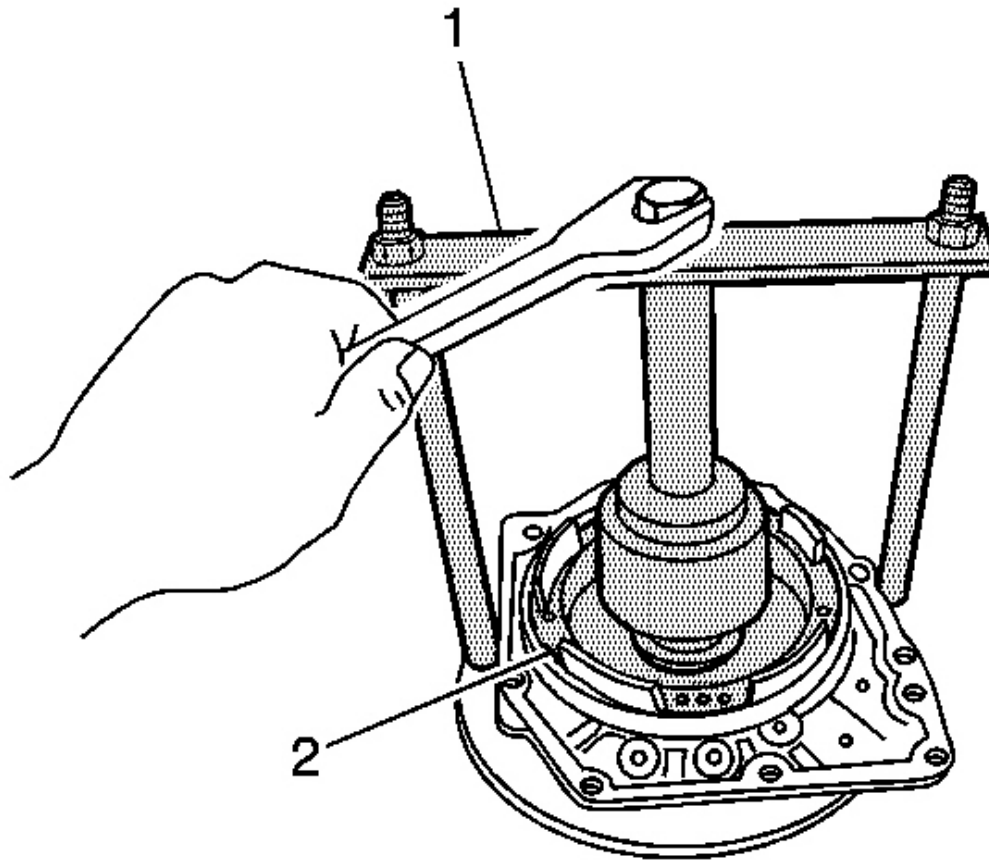


Fig. 209: Removing Snap Ring Using A Driver, DT 46451 & DT46454
Courtesy of GENERAL MOTORS CORP.

7. Using **DT 46451** (1), **DT 46454** (2) and a driver, install the O/D brake return spring and snap ring to the transaxle rear cover. See **Special Tools**.

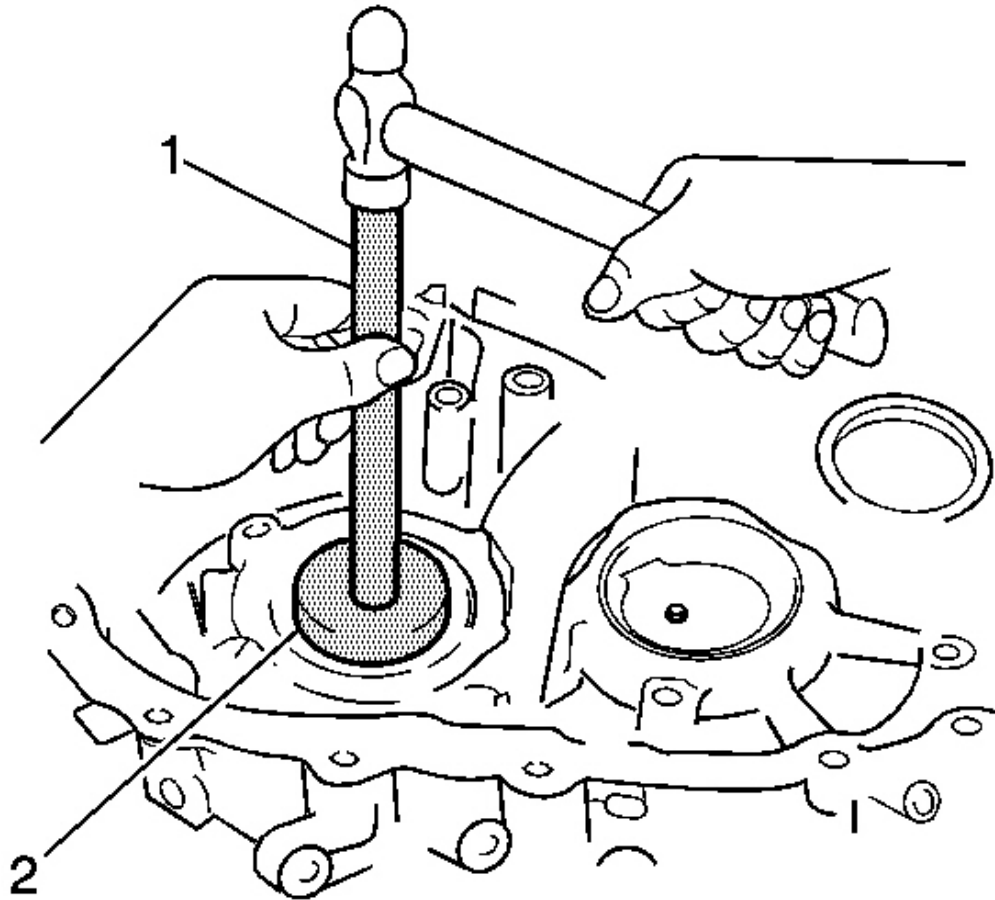


Fig. 210: Installing Side Bearing Outer Race & Transaxle Housing Using DT 46462 & DT 46465
Courtesy of GENERAL MOTORS CORP.

8. Using **DT 46462** (2) and **DT 46465** (1), install a new side bearing outer race into the transaxle housing. See **Special Tools**.

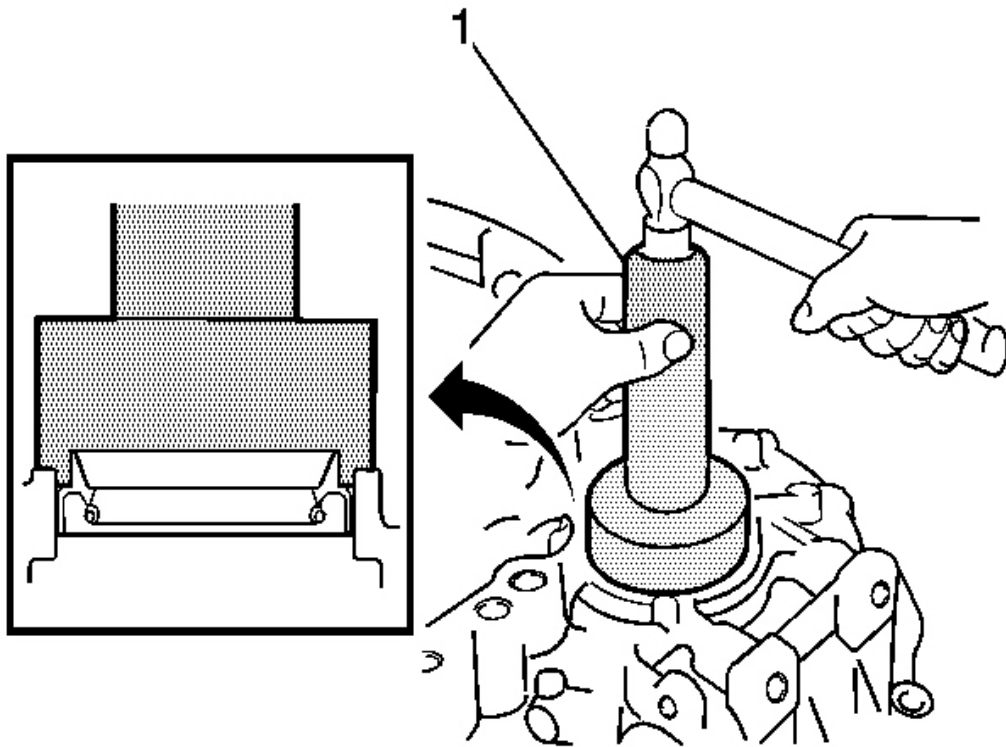


Fig. 211: Driving In A Transaxle Housing Oil Seal Using A Hammer & DT 46471
Courtesy of GENERAL MOTORS CORP.

9. Using **DT 46471** (1) and a hammer, drive in a new transaxle housing oil seal. See **Special Tools**.

Specification: The oil seal depth is 3.1 mm (0.122 in).

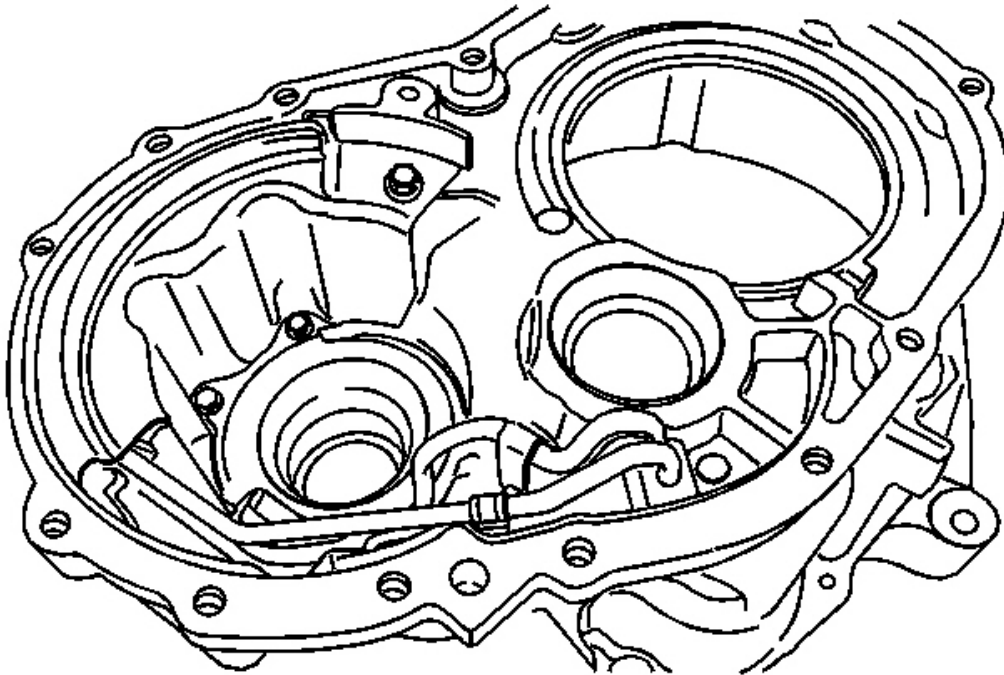


Fig. 212: Oil Seal & Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Press-fit the outer tapered roller bearing race until the race contacts the transaxle housing.

10. Install a new outer tapered roller bearing race into the transaxle housing.

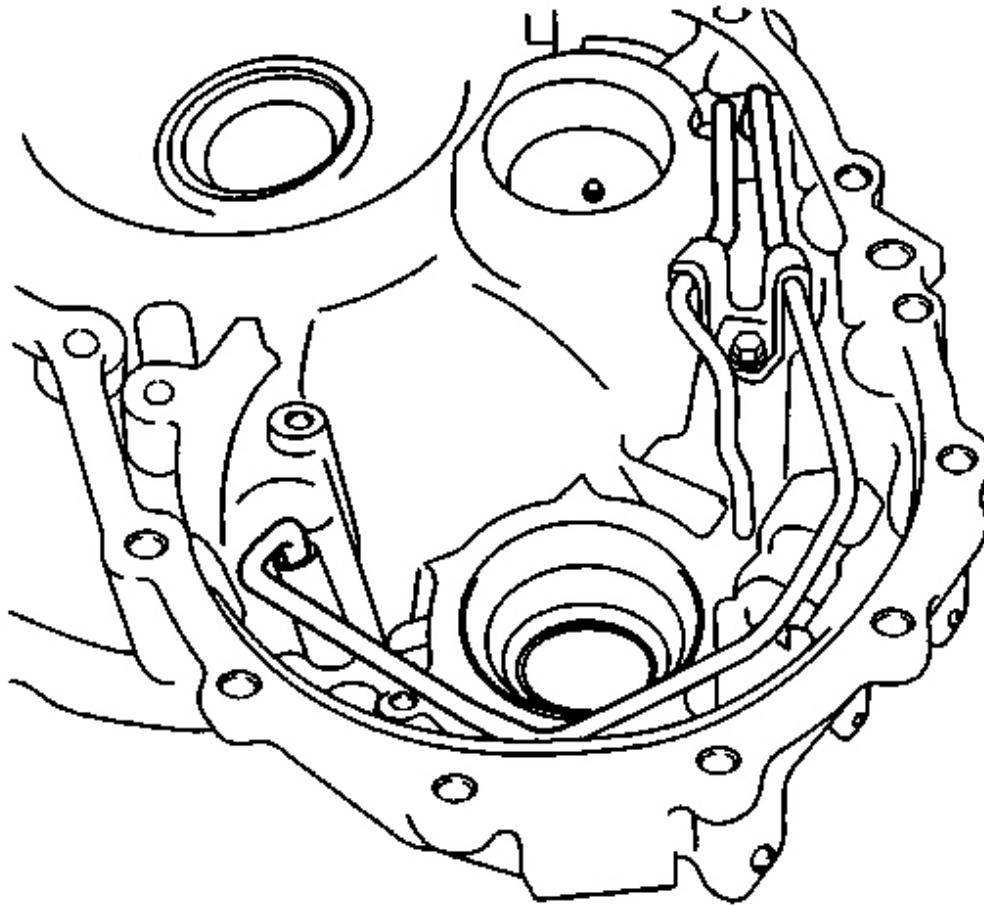


Fig. 213: No. 1 Transaxle Apply Pipe Clamp
Courtesy of GENERAL MOTORS CORP.

11. Install the transaxle lube apply pipe and differential gear lube apply pipe to the transaxle housing.
12. Install the No. 1 transaxle apply pipe clamp to the transaxle housing with the bolt.

Tighten: Tighten the bolts to 5.4 N.m (48 lb in).

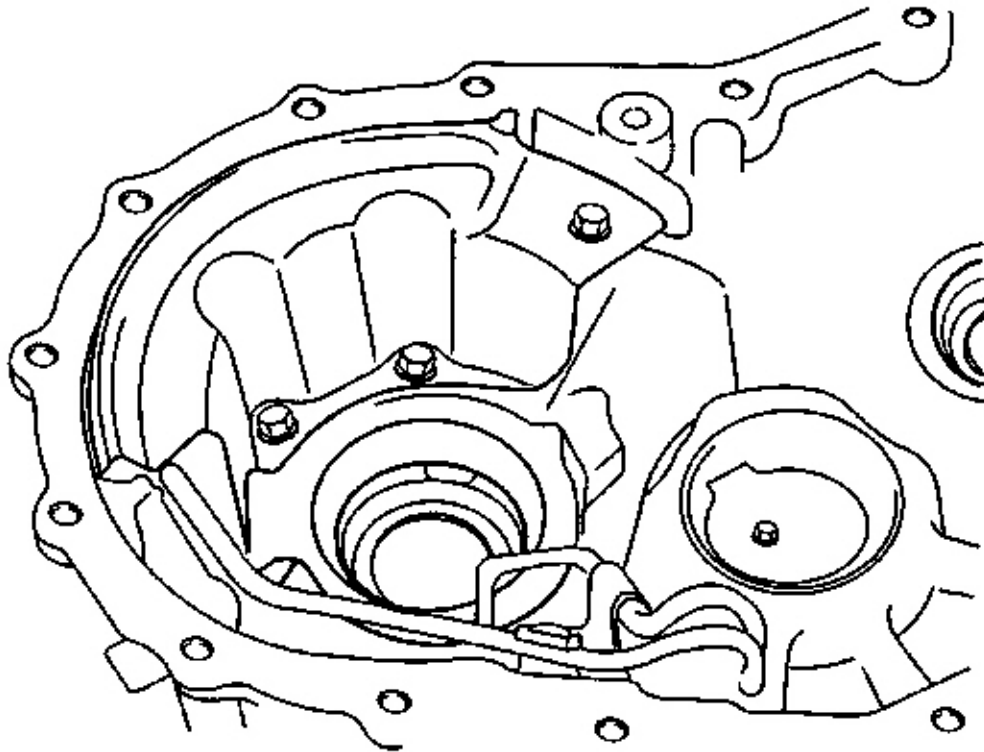


Fig. 214: Oil Reservoir Lock Plate
Courtesy of GENERAL MOTORS CORP.

13. Install the oil reservoir lock plate to the transaxle housing with the 3 bolts.

Tighten: Tighten the bolts to 5.4 N.m (48 lb in).

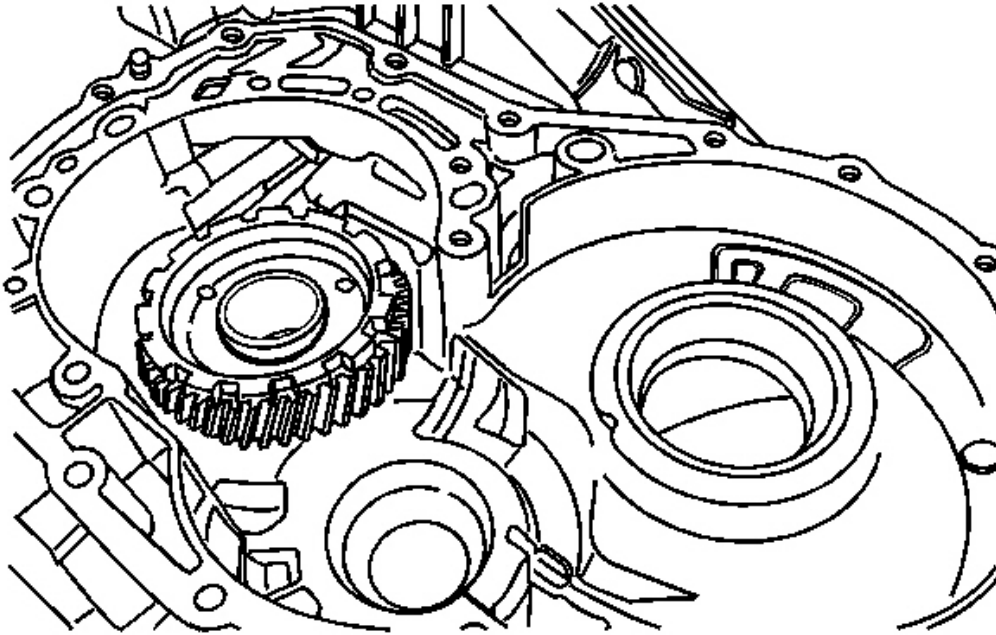


Fig. 215: Counter Driven Gear Outer Tapered Roller Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: First install a shim of the same thickness as the original shim.

14. Install the shim to the transaxle case.
15. Install a new bearing outer race into the transaxle case.

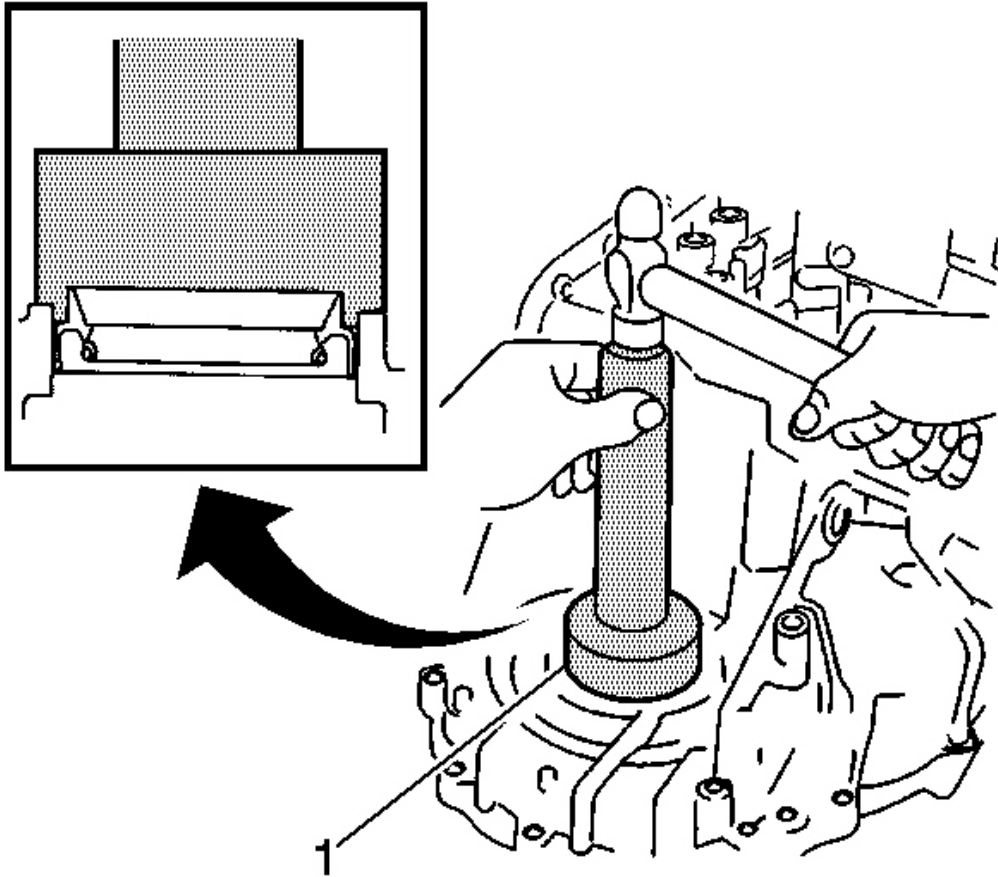


Fig. 216: Driving In A Transaxle Case Oil Seal Using A Hammer & DT 46471
Courtesy of GENERAL MOTORS CORP.

16. Using **DT 47521** (1) and a hammer, drive in a new transaxle case oil seal. See **Special Tools**.

Specifications: The oil seal depth is 4.3 mm (0.169 in).

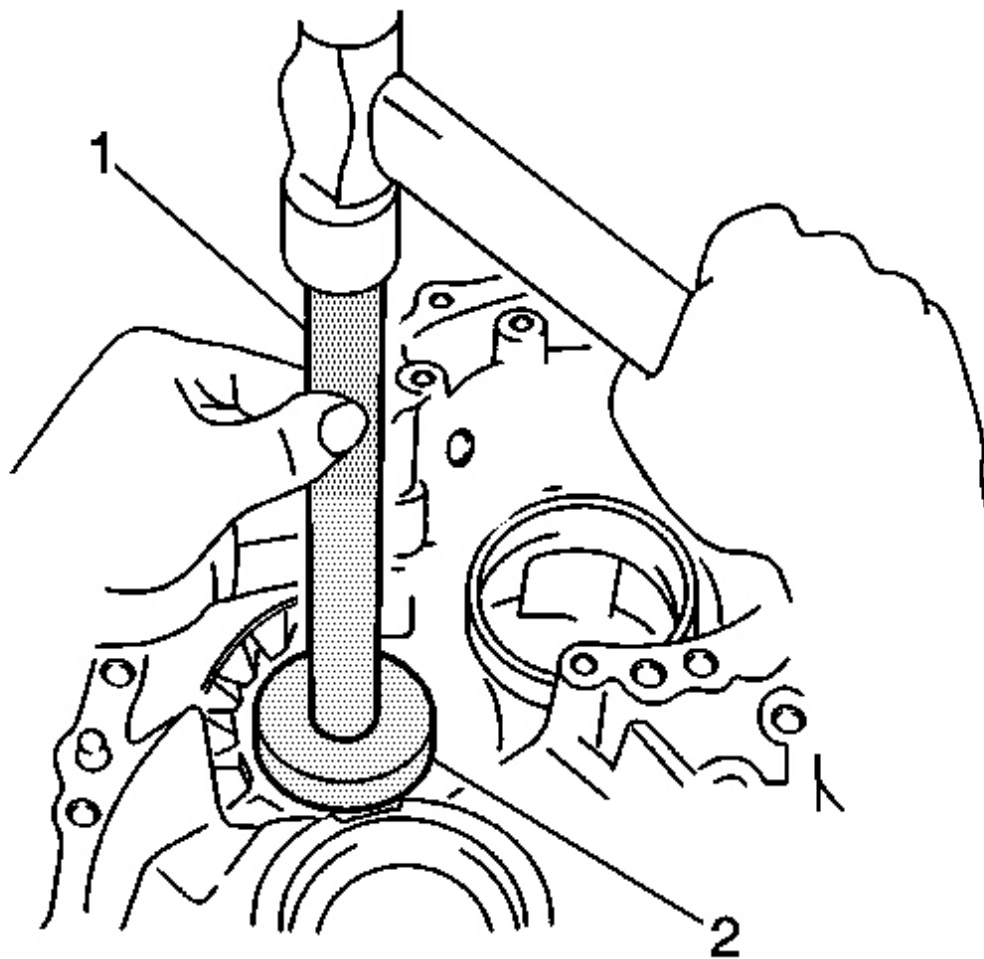


Fig. 217: Pressing In A New Outer Tapered Roller Bearing Race Using DT 46464 & DT 46465
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: First install a shim of the same thickness as the original shim.

17. Install the shim to the transaxle case.

IMPORTANT: Press-fit the shim until the shim contacts the transaxle case.

18. Using **DT 46464** (2) and **DT 46465** (1), press in a new outer tapered roller bearing race into the transaxle case. See **Special Tools**.

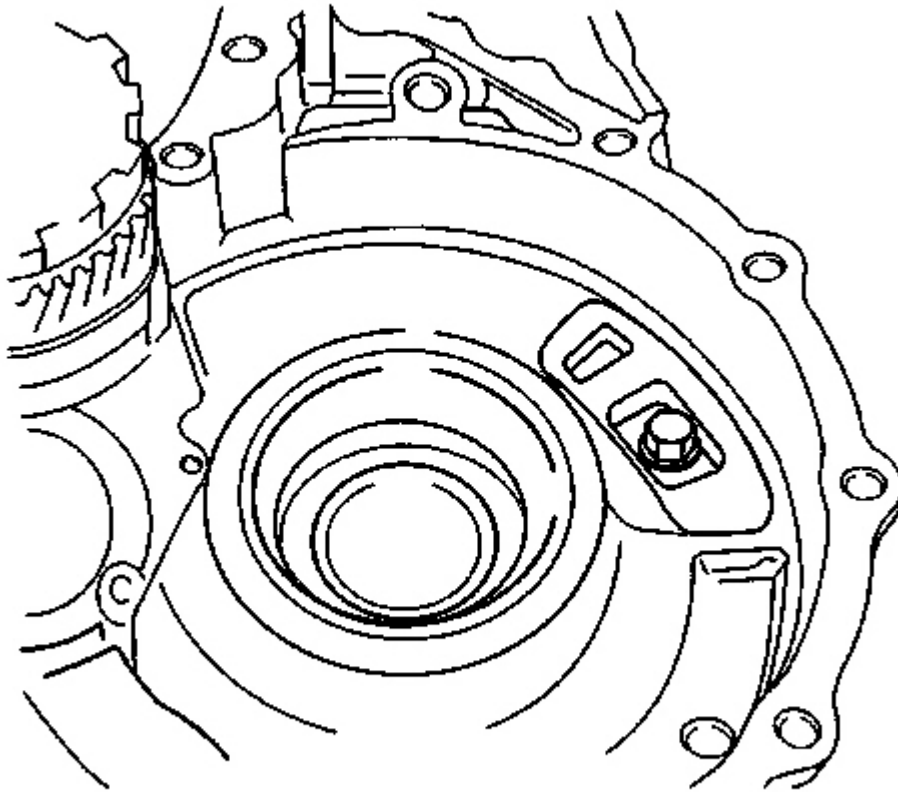


Fig. 218: No. 1 Transaxle Case Plate
Courtesy of GENERAL MOTORS CORP.

19. Install the No. 1 transaxle case plate to the transaxle case with the bolt.

Tighten: Tighten the bolt to 9.8 N.m (87 lb in).

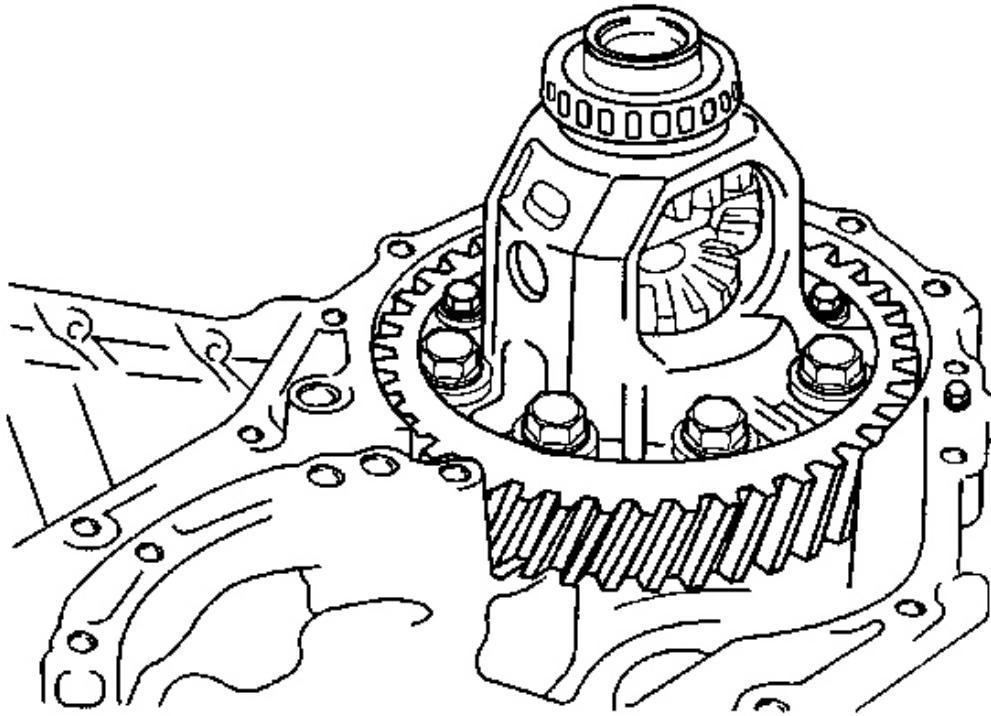


Fig. 219: Differential Gear & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

20. Install the differential gear to the transaxle case.

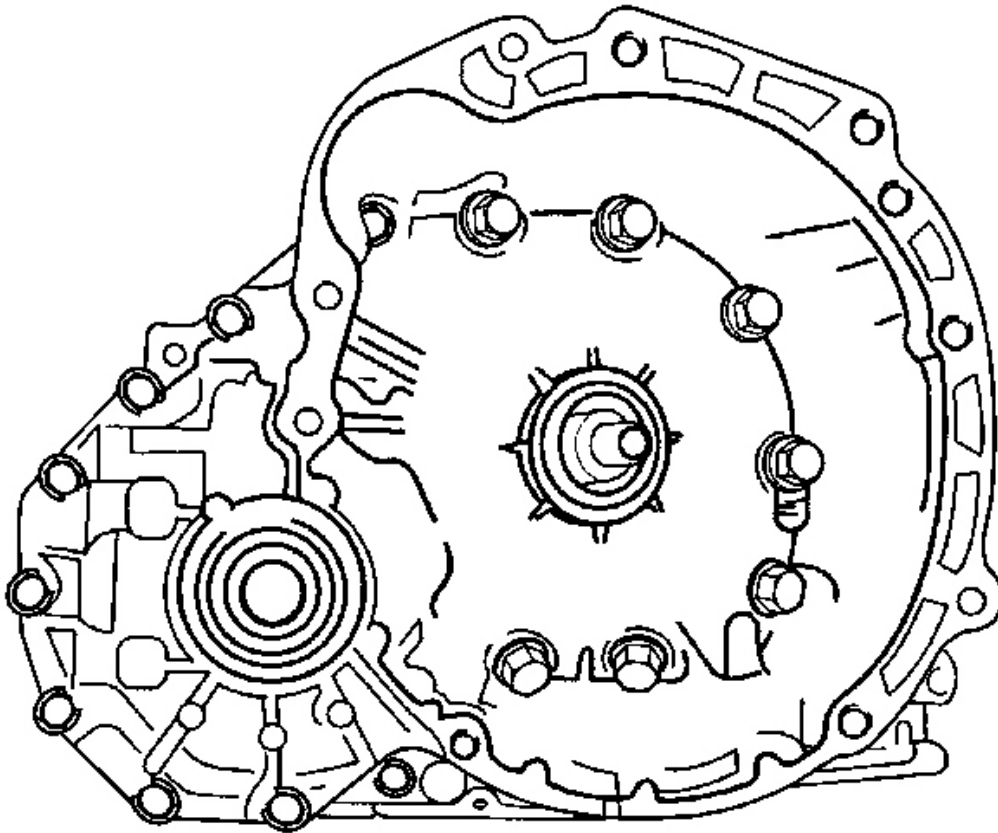


Fig. 220: Installing Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

21. Install the transaxle housing and hand tighten the 16 bolts of the transaxle housing.
22. Tighten 8 or 9 bolts of the transaxle housing completely.

Tighten: Tighten the bolts to 29 N.m (22 lb ft).

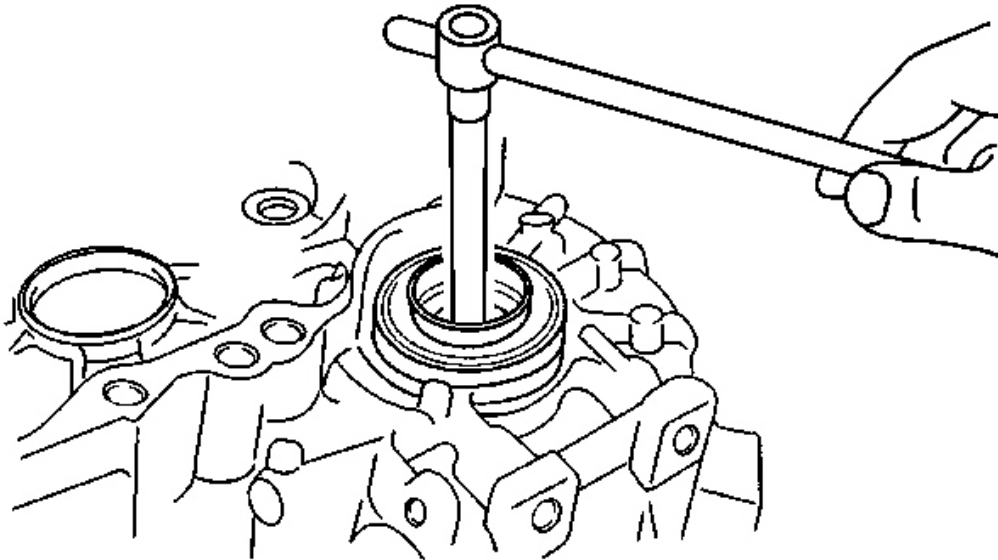


Fig. 221: Turning The Differential Gear Assembly
Courtesy of GENERAL MOTORS CORP.

23. Using **DT 46461** , turn the differential gear assembly right and left 2 or 3 times to allow the bearing to settle. See **Special Tools**.

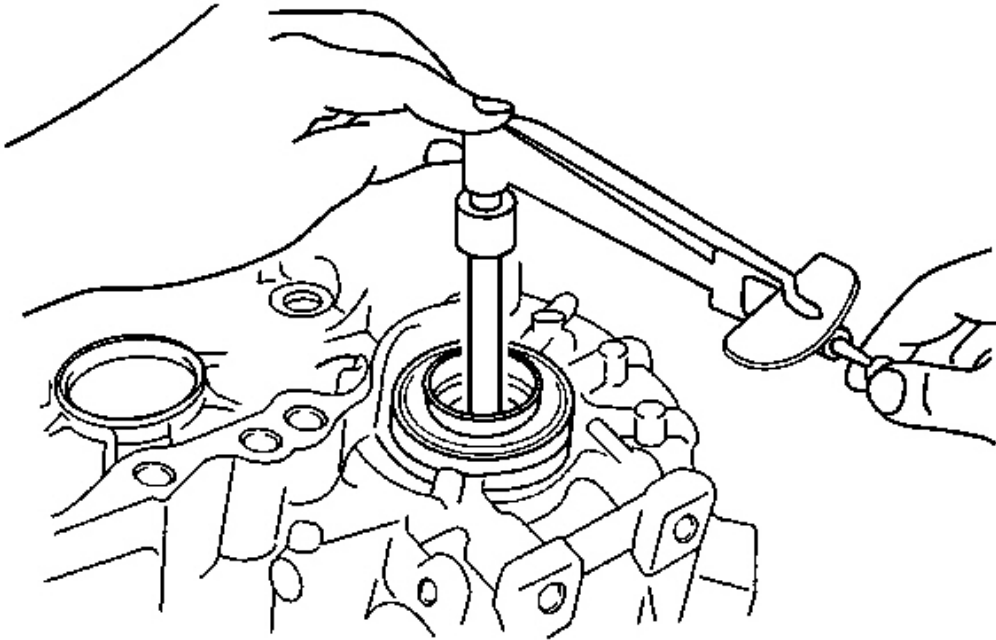


Fig. 222: Measuring Preload Of Differential Gear Using A Small Torque Wrench & DT 46461
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Note the measured value.

24. Using **DT 46461** and a small torque wrench, measure the preload of the differential gear. See **Special Tools**.

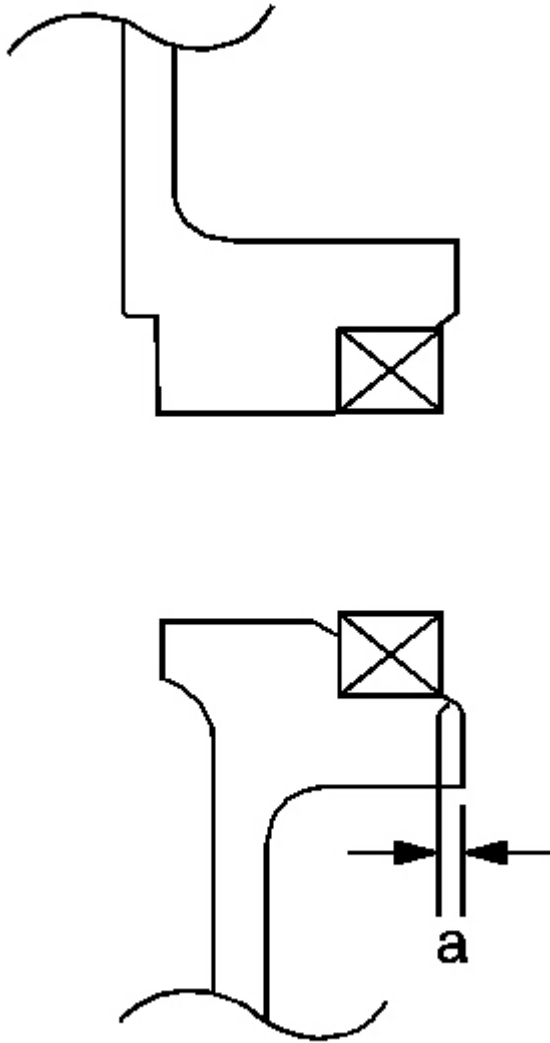


Fig. 223: Transaxle Housing & Counter Driven Gear
Courtesy of GENERAL MOTORS CORP.

25. Remove the transaxle housing and install the counter driven gear.

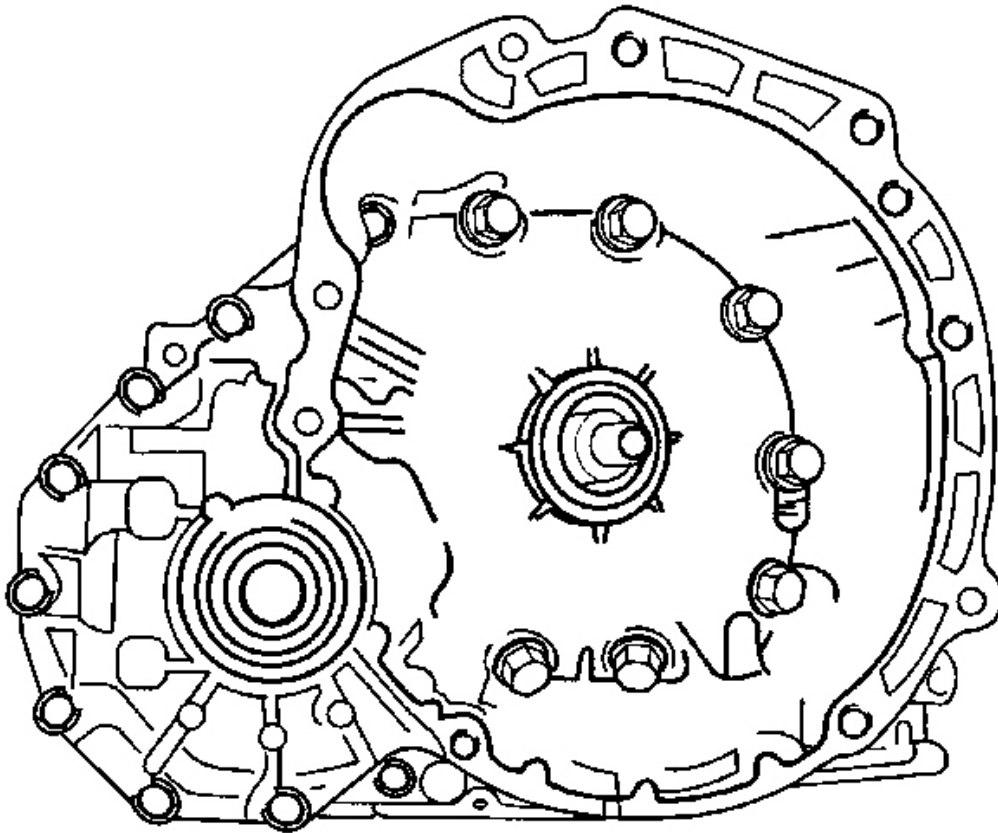


Fig. 224: Installing Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

26. Install the transaxle housing and hand tighten the 16 bolts of the transaxle housing.
27. Tighten 8 or 9 bolts of the transaxle housing completely.

Tighten: Tighten the bolts to 29 N.m (21 lb ft).

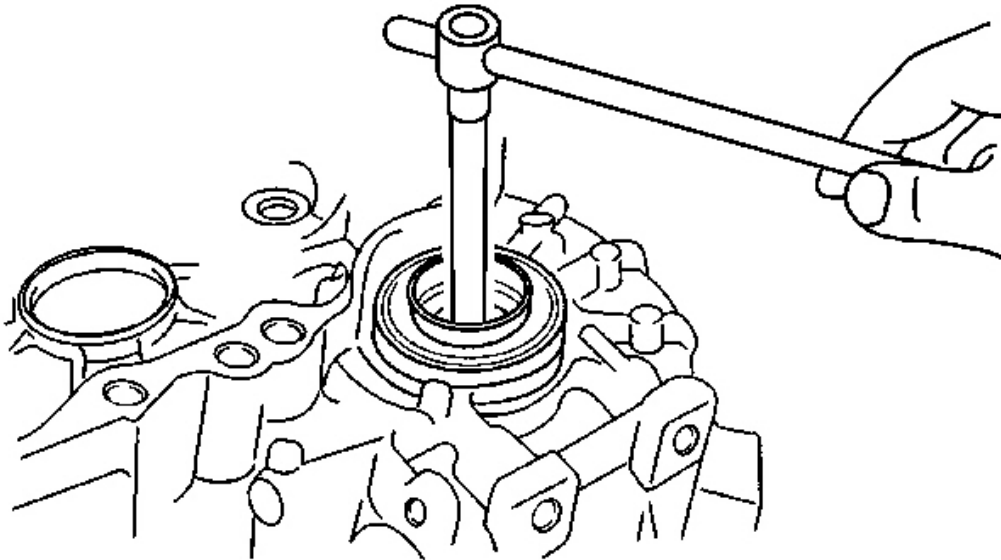


Fig. 225: Turning The Differential Gear Assembly
Courtesy of GENERAL MOTORS CORP.

28. Using **DT 46461** , turn the differential gear assembly right and left 2 or 3 times to allow the bearing to settle. See **Special Tools**.

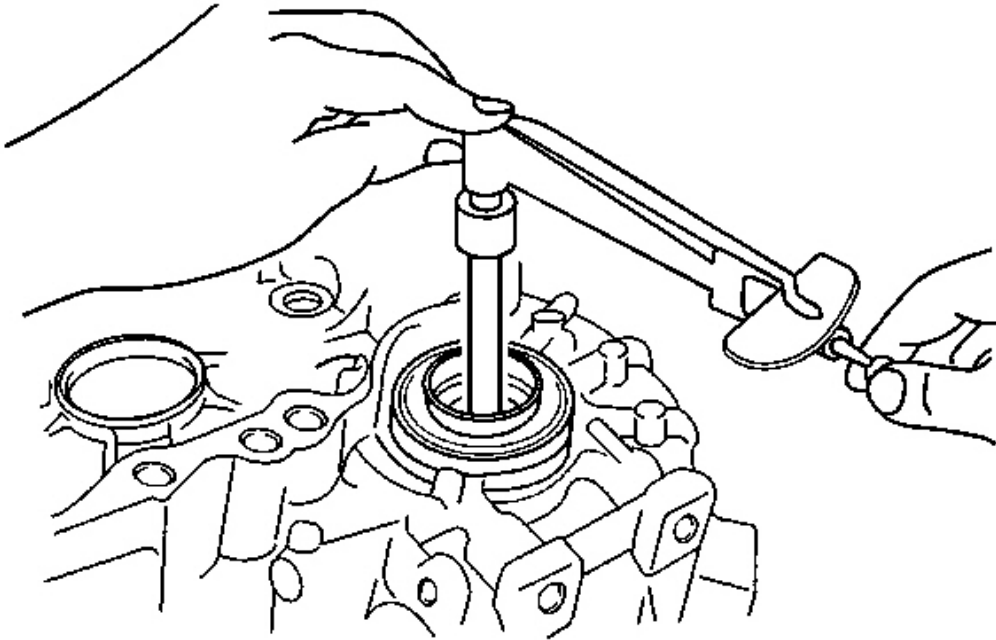


Fig. 226: Measuring Preload Of Differential Gear Using A Small Torque Wrench & DT 46461
 Courtesy of GENERAL MOTORS CORP.

29. Using **DT 46461** and a small torque wrench, measure the preload of the differential gear. See **Special Tools**. From this value deduct the value measured previously. This new value is the preload of the counter driven gear.

Specification:

- The preload for a new bearing is 0.33-0.76 N.m (3.21-6.77 lb in).
- The preload for a used bearing is 0.17-0.38 N.m (1.48-3.39 lb in).

IMPORTANT: When the preload is larger than the specification, select a thinner adjuster shim. When the preload is smaller than specification, select a thicker adjuster shim.

30. If the preload of the counter driven gear does not satisfy the specification, select the adjuster shim from the table below and re-measure the value. Until the value is within the specification, repeat the procedure.

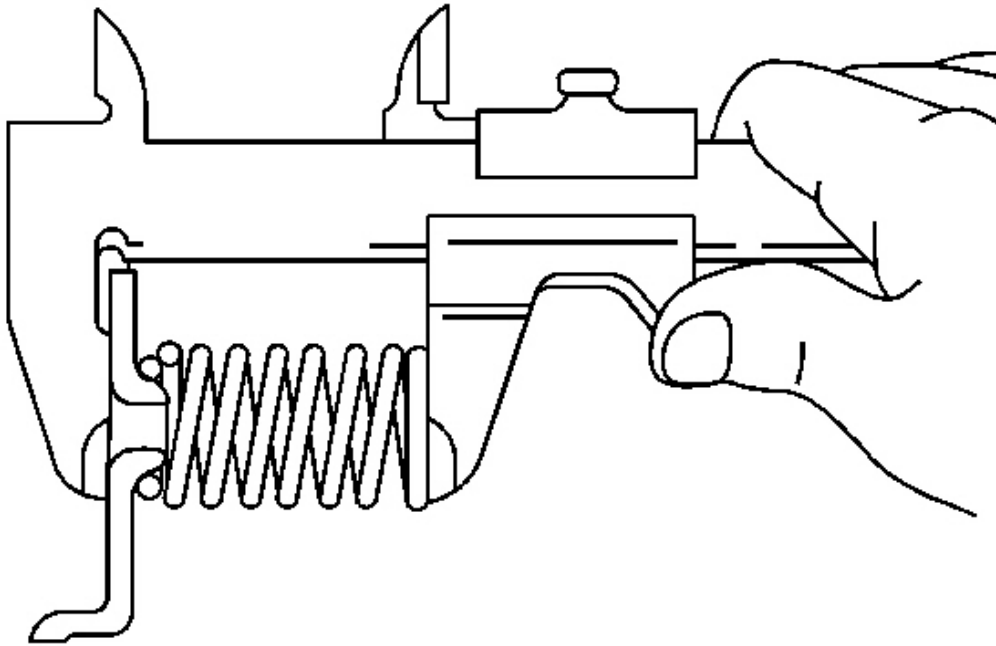


Fig. 227: Measuring The Free Length Of 1st & Reverse Brake Piston Return Spring Using The Vernier Calipers

Courtesy of GENERAL MOTORS CORP.

31. Using the vernier calipers, measure the free length of the 1st and reverse brake piston return spring together with the spring seat.

Specification: The standard free length is 18.053 mm (0.71075 in).

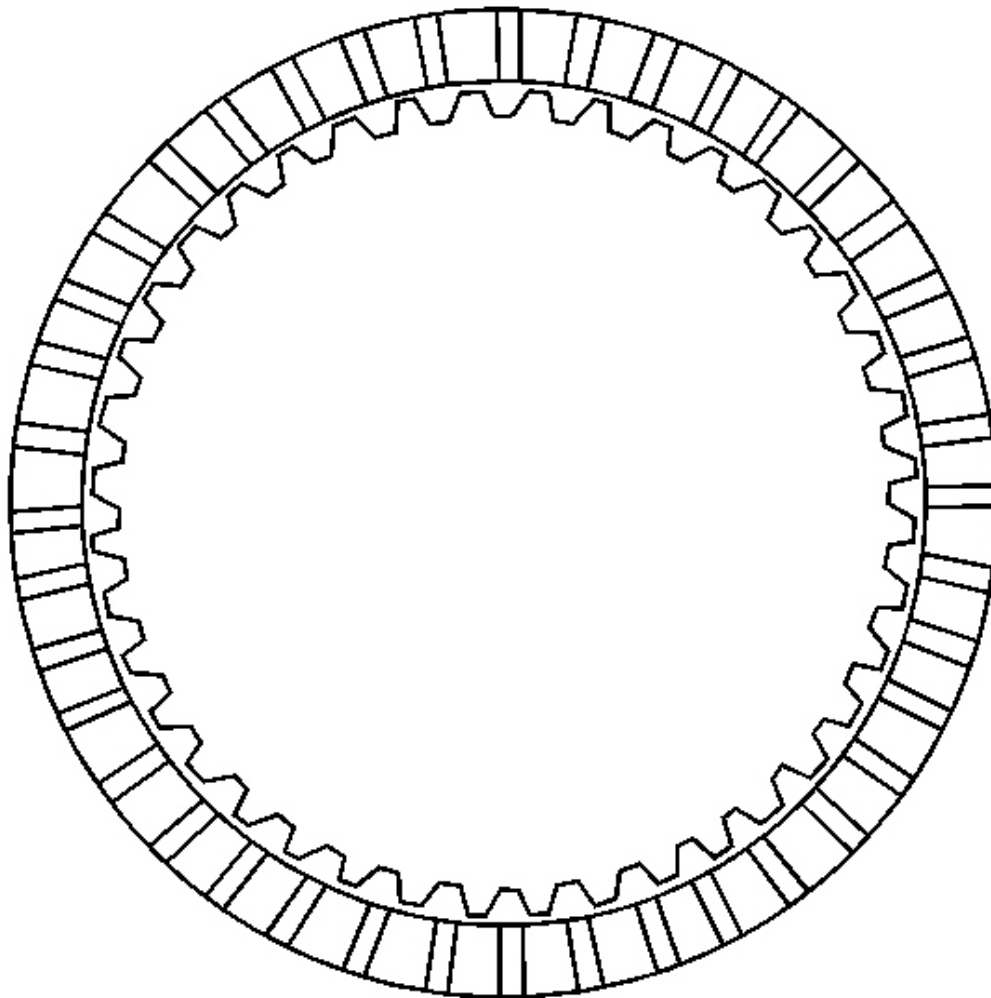


Fig. 228: Sliding Surface Of Disc
Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- If the lining of the disc is peeling off or discolored, or even if a part of the groove is defaced, replace all discs.
- Before assembling the new discs, soak the discs in ATF for at least 15 minutes.

32. Inspect the sliding surface of the disc, the plate and the flange of the 1st and reverse brake for wear or burn. Replace the parts, if necessary.

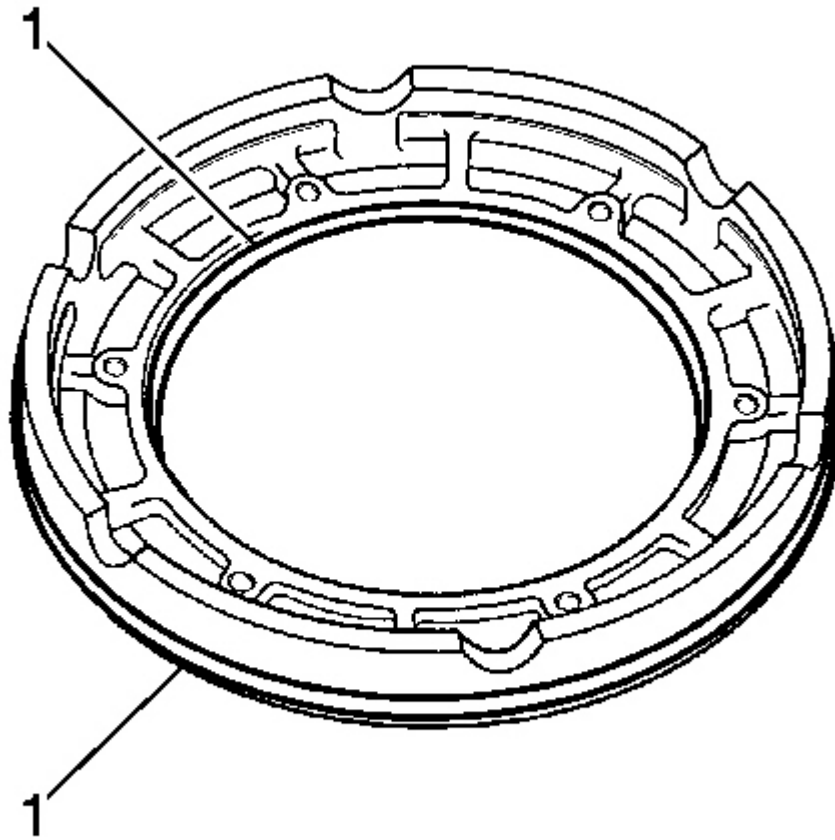


Fig. 229: O-Rings & 1st & Reverse Brake Piston
Courtesy of GENERAL MOTORS CORP.

33. Coat 2 new O-rings (1) with ATF, install the O-rings to the 1st and reverse piston.

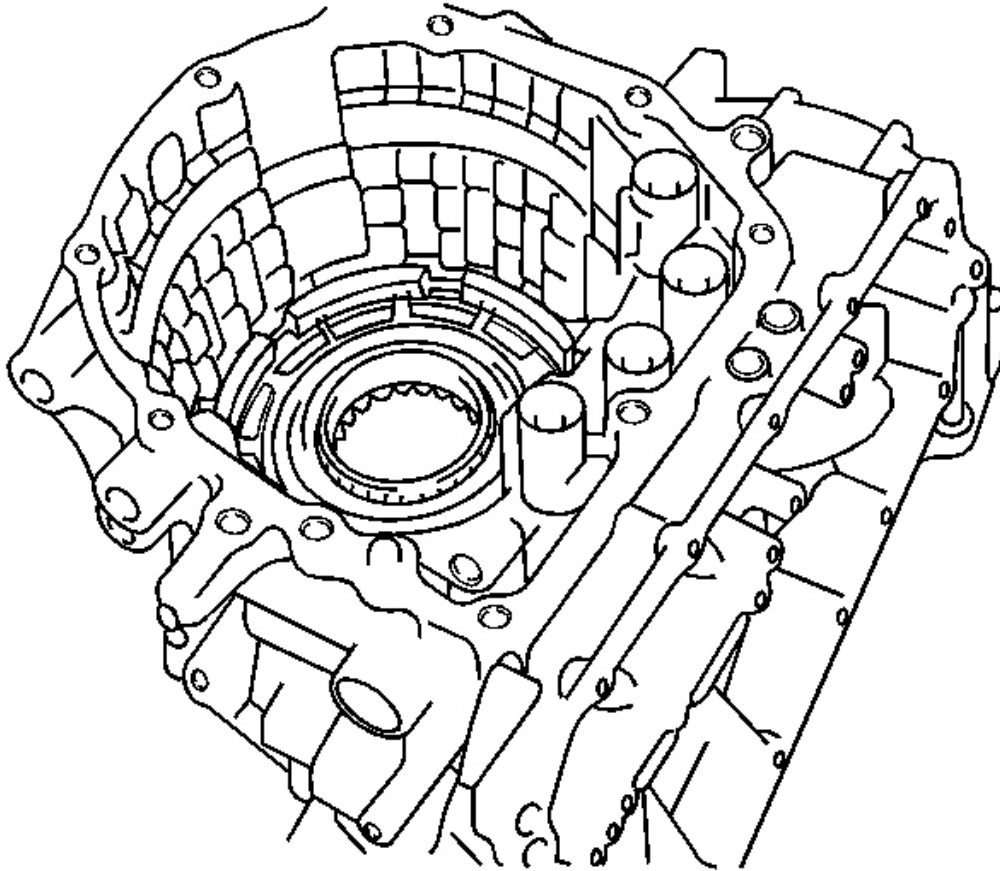


Fig. 230: 1st & Reverse Brake Piston
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the O-rings of the 1st and reverse brake piston.

34. Install the 1st and reverse brake piston to the transaxle case.

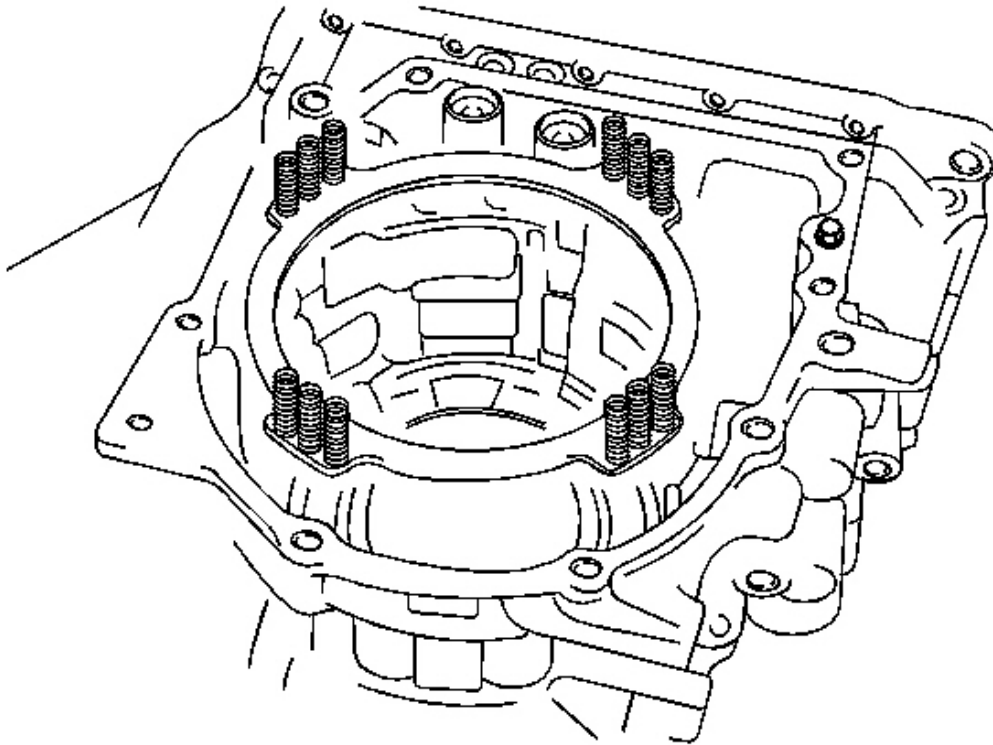


Fig. 231: Return Spring & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

35. Install the return spring to the transaxle case.

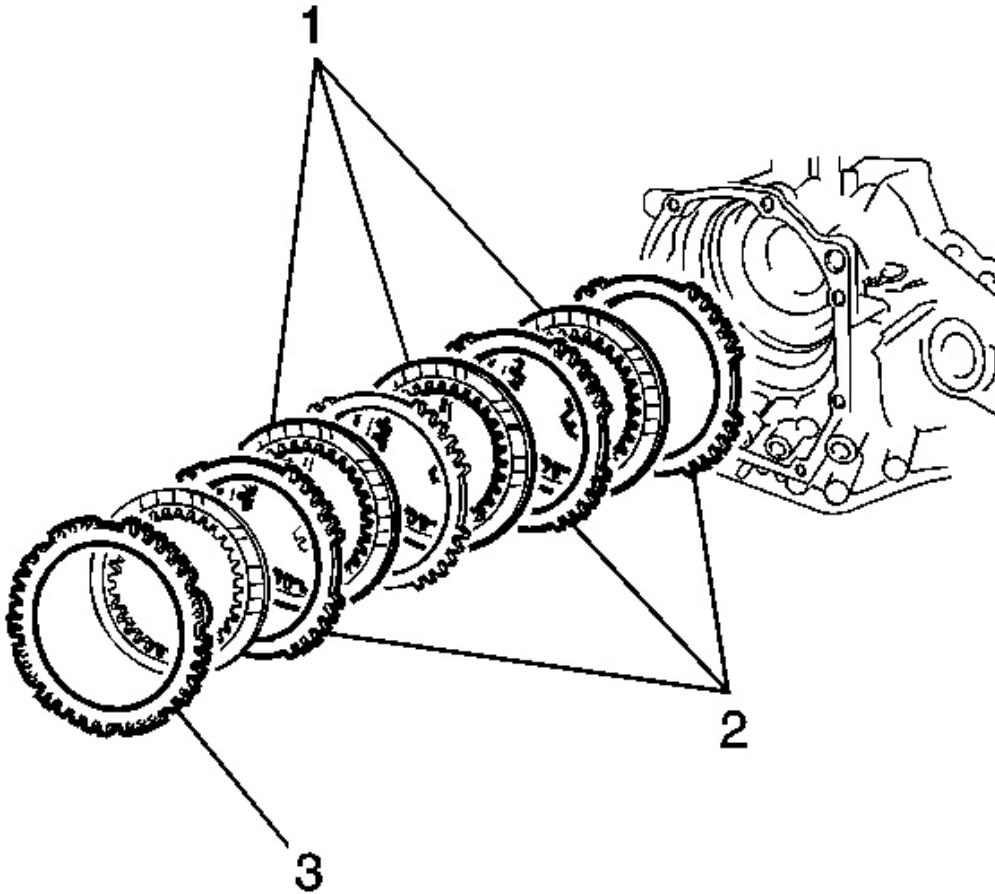


Fig. 232: Plates, Discs & Flange

Courtesy of GENERAL MOTORS CORP.

36. Install the 4 plates, the 4 discs and the flange in order: 2-1-2-1-2-1-2-1-3, where (2)=Plate, (1)=Disc, and (3)=Flange

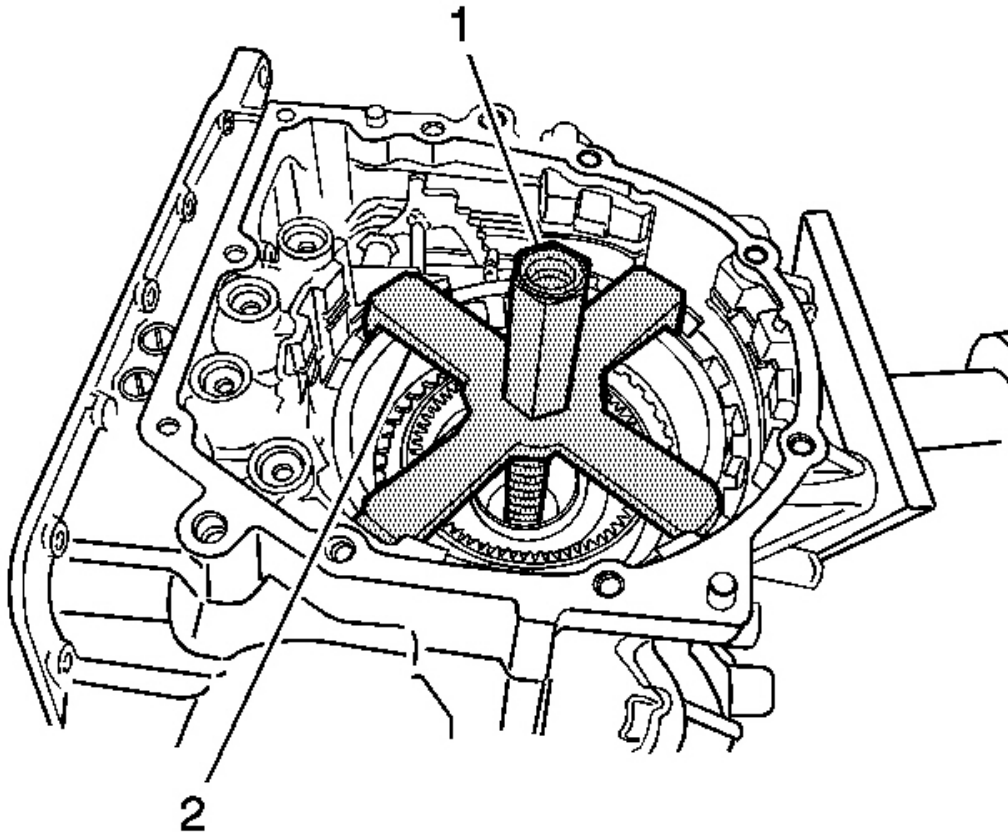


Fig. 233: DT 46455, DT 46457, Snap Ring Of 1st & Reverse Brake
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify that the snap ring is installed correctly in the groove of the transaxle case.

37. Using **DT 46457** (2) and **DT 46455** (1), install the snap ring. See **Special Tools**.

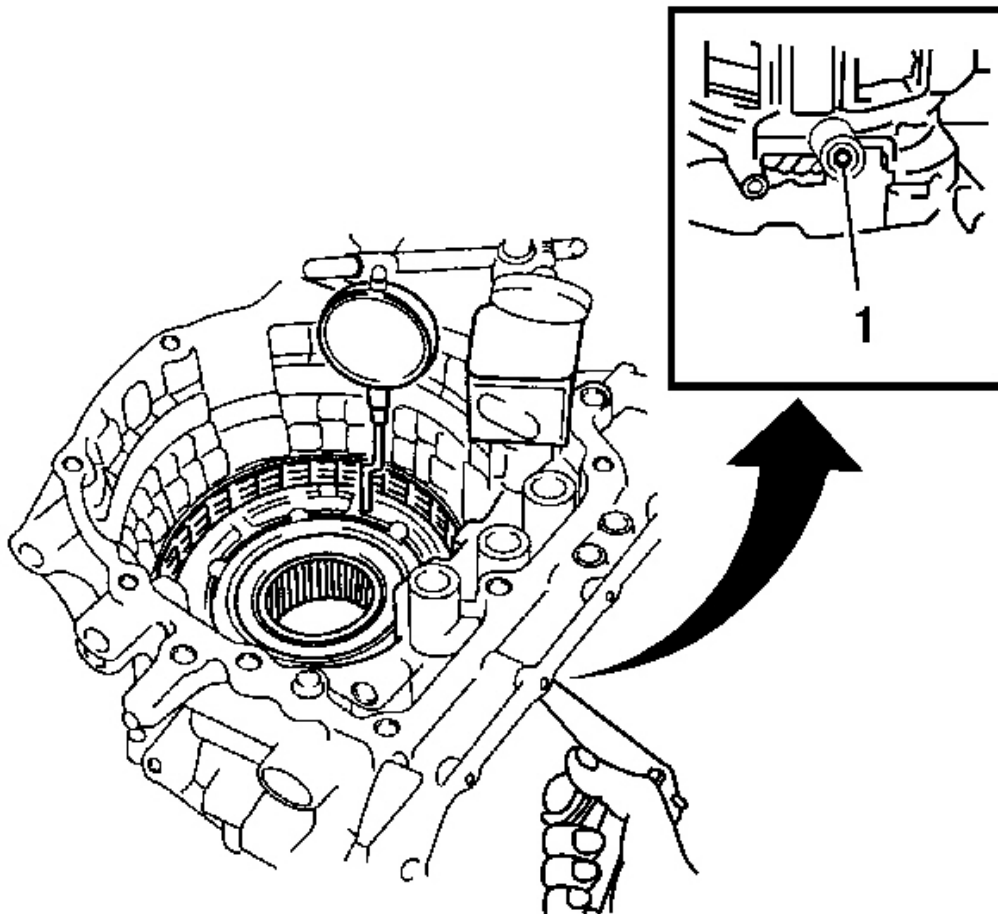


Fig. 234: Measuring The 1st & Reverse Brake Piston Stroke Using A Dial Indicator
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the piston stroke is non-standard, inspect the discs, the plates and the flange. The piston stroke is 0.6-1.3 mm (0.024-0.051 in).

38. Using a dial indicator, measure the 1st and reverse brake piston stroke while applying and releasing 392-785 kPa (57-114 psi) of compressed air.

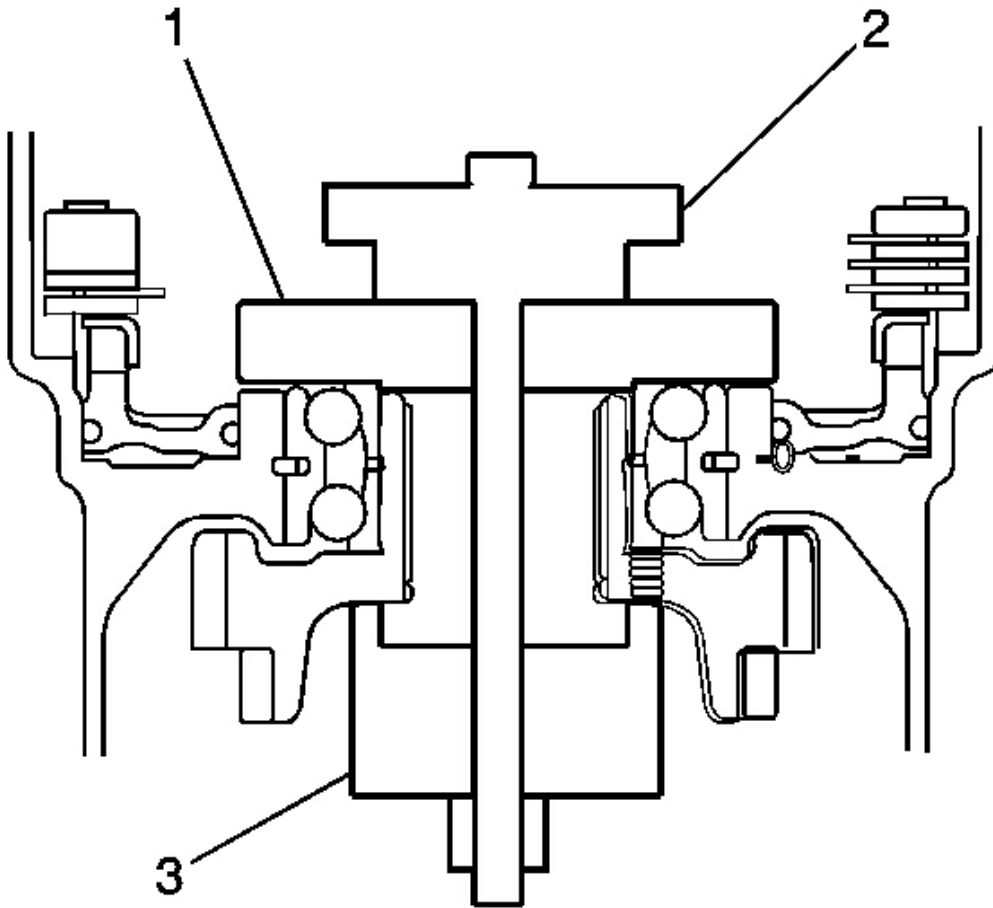


Fig. 235: DT 46460, DT 46455 & DT 46456
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not apply excessive force to the transaxle case.

39. Using **DT 46460** (3), **DT 46455** (2) and **DT 46456** (1), install the counter drive gear. See **Special Tools**.

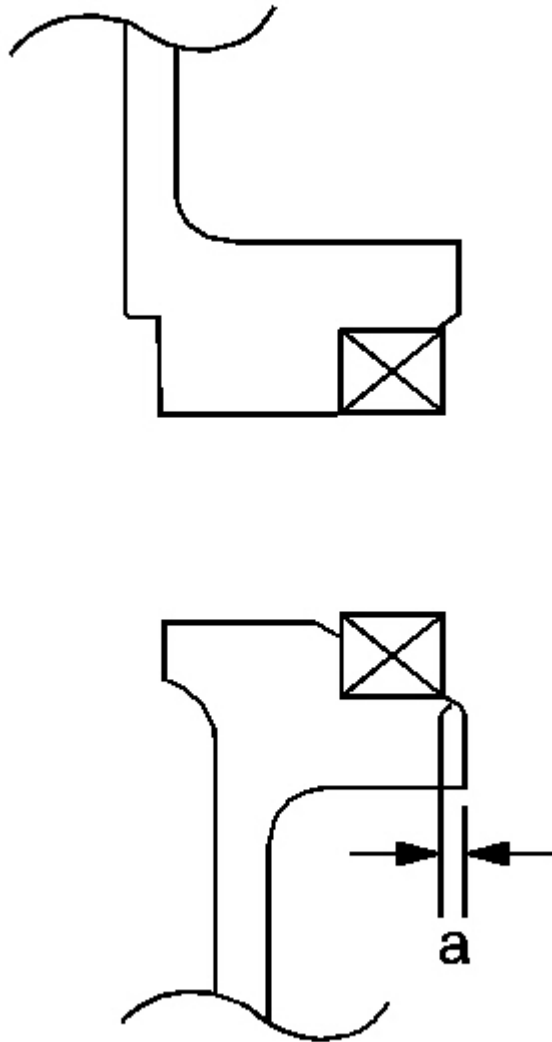


Fig. 236: Transaxle Housing & Counter Driven Gear
Courtesy of GENERAL MOTORS CORP.

40. Coat a new oil seal with ATF.
41. Install the oil seal to the transaxle case.

Specification: The oil seal depth is 0.75-1.25 mm (0.030-0.049 in).

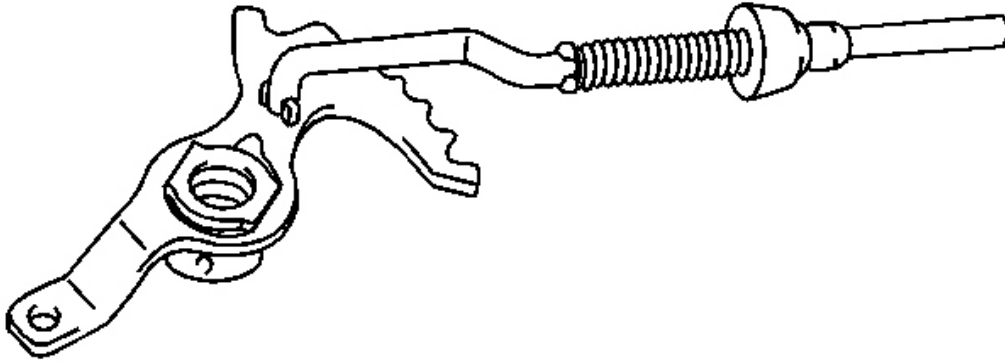


Fig. 237: Parking Lock Rod & Manual Valve Lever
Courtesy of GENERAL MOTORS CORP.

42. Install the parking lock rod to the manual valve lever.

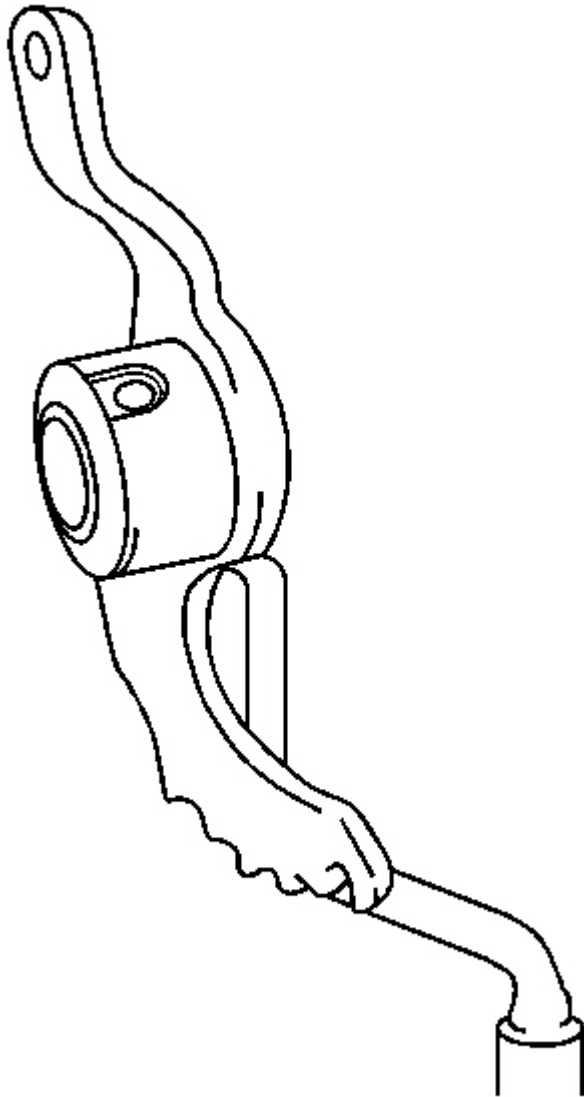


Fig. 238: Spacer & Manual Valve Lever
Courtesy of GENERAL MOTORS CORP.

43. Install a new spacer to the manual valve lever.

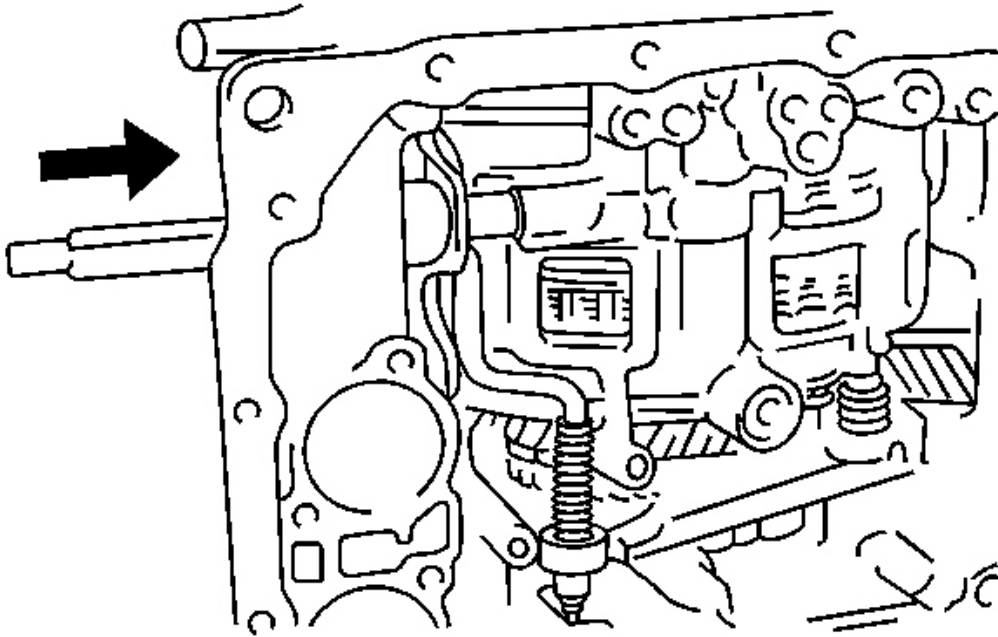


Fig. 239: Manual Valve Lever & Shaft
Courtesy of GENERAL MOTORS CORP.

44. Install the manual valve lever shaft and the manual valve lever.

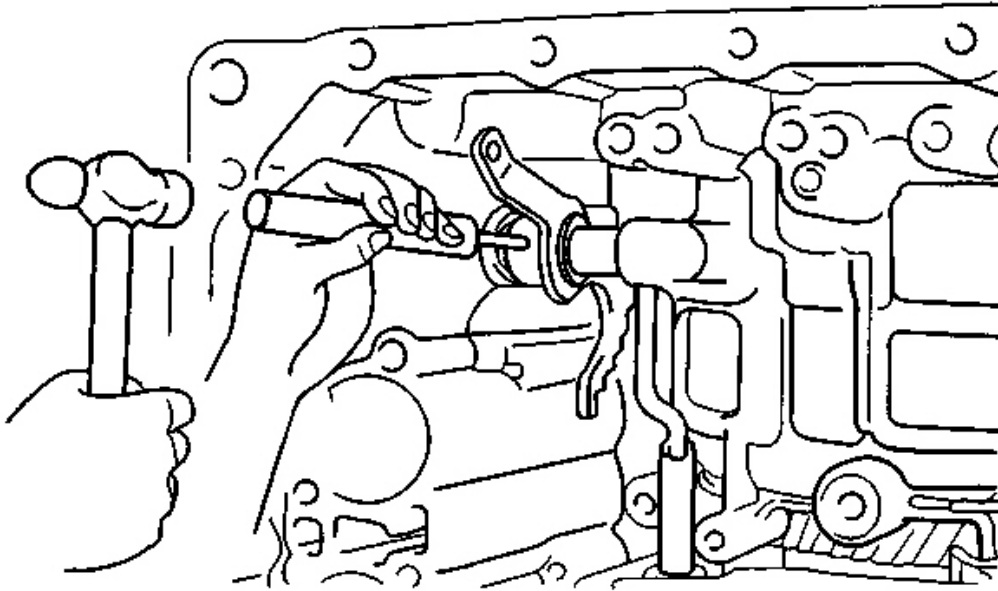


Fig. 240: Driving The Pin Using A Pin Punch & Hammer
Courtesy of GENERAL MOTORS CORP.

45. Using a pin punch and hammer, drive in a new pin.

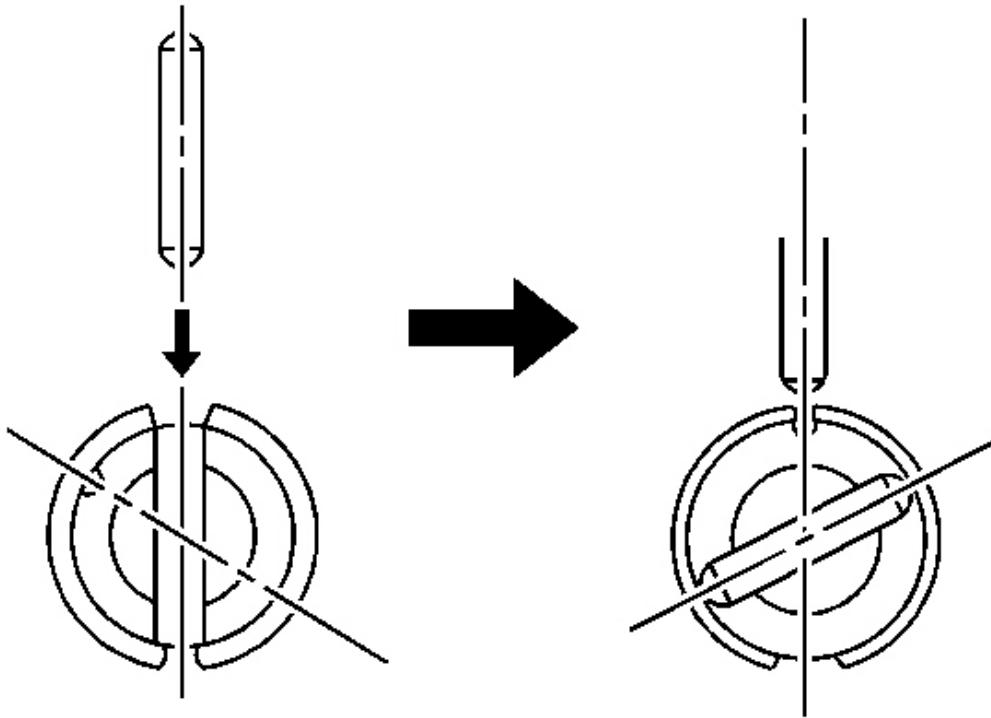


Fig. 241: Staking Spacer Through Small Hole
Courtesy of GENERAL MOTORS CORP.

46. Turn the spacer and the lever shaft to align the small hole for locating the staking position in the spacer with the staking position mark on the lever shaft.
47. Using a pin punch, stake the spacer through the small hole.
48. Verify that the spacer does not turn.

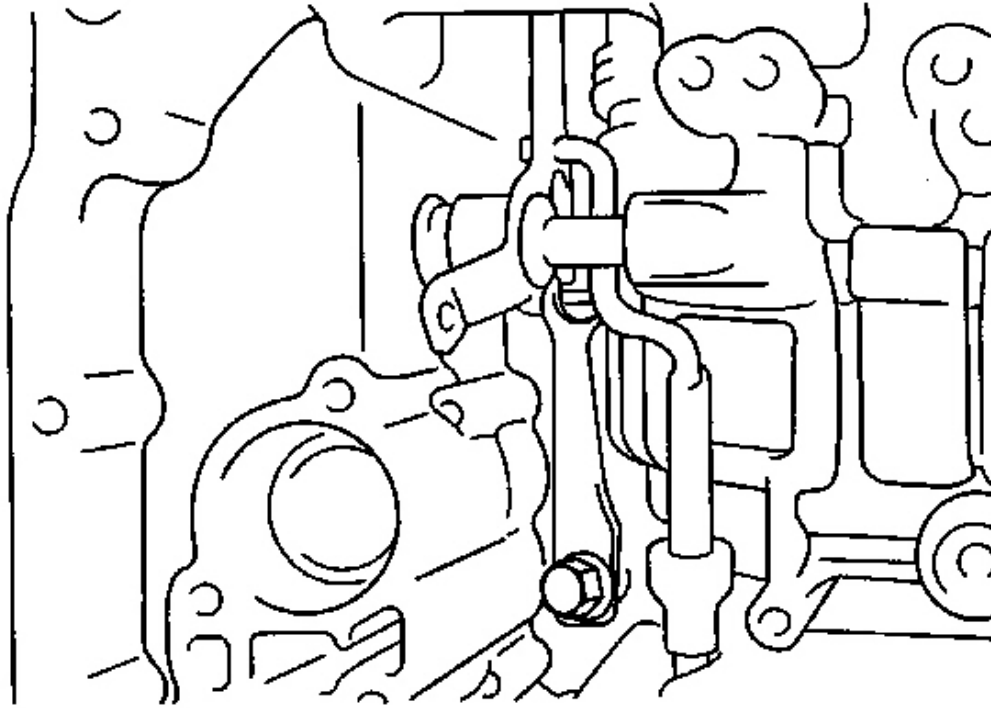


Fig. 242: Bolt & Manual Detent Spring
Courtesy of GENERAL MOTORS CORP.

49. Install the manual detent spring with the bolt.

Tighten: Tighten the bolt to 9.8 N.m (87 lb in).

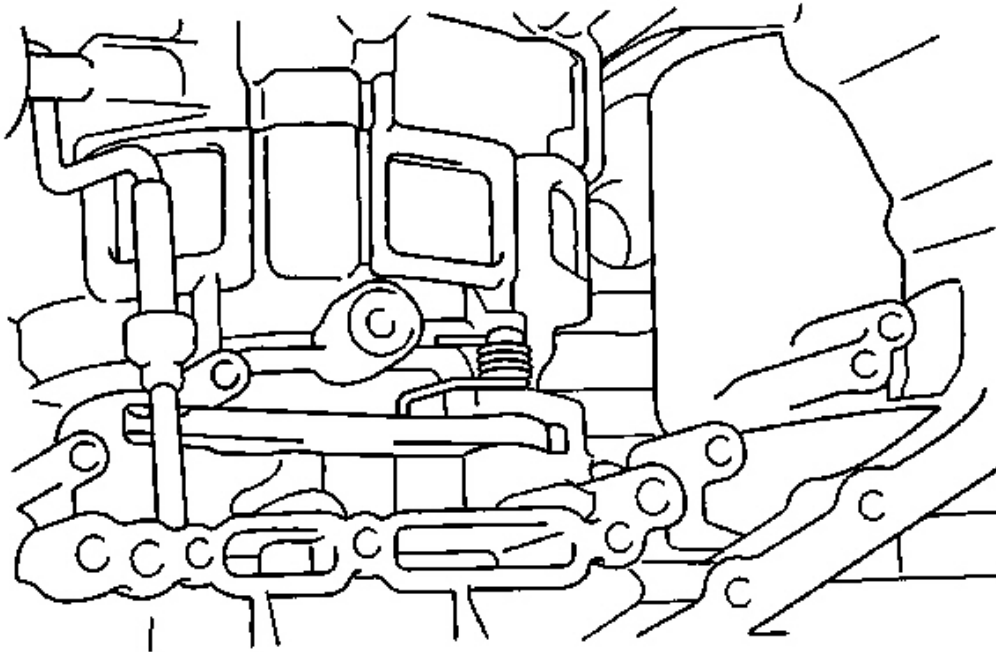


Fig. 243: Parking Lock Pawl, Shaft & Torsion Spring
Courtesy of GENERAL MOTORS CORP.

50. Install the parking lock shaft, the torsion spring and the parking lock pawl.

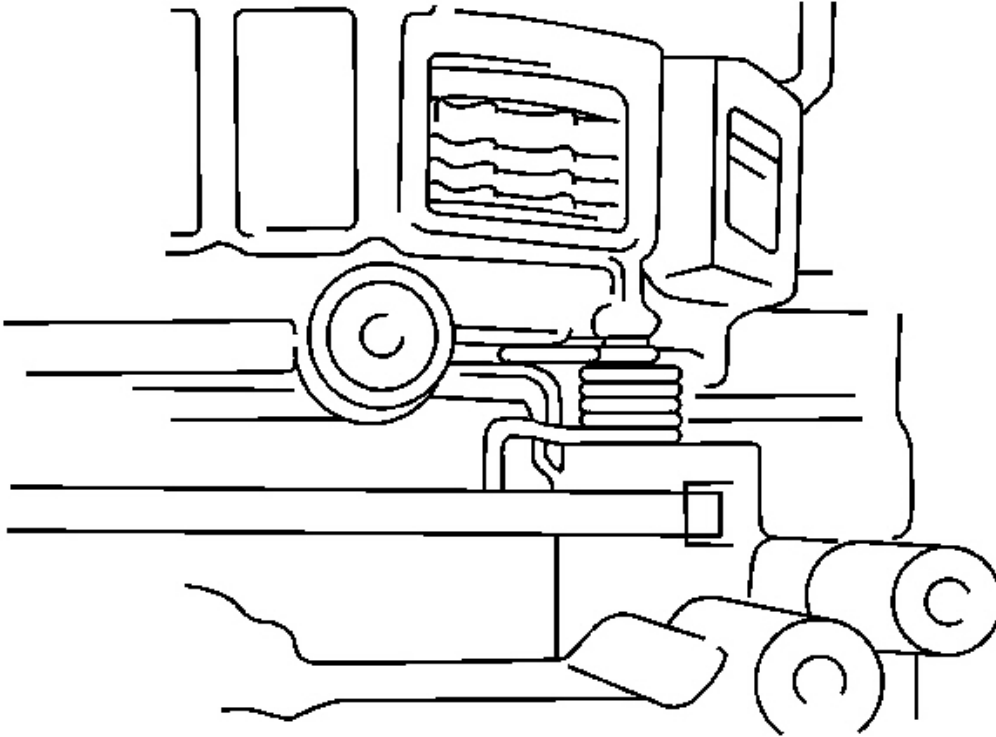


Fig. 244: Edge Of Torsion Spring
Courtesy of GENERAL MOTORS CORP.

51. Verify that the edge of the torsion spring fits into the groove securely.

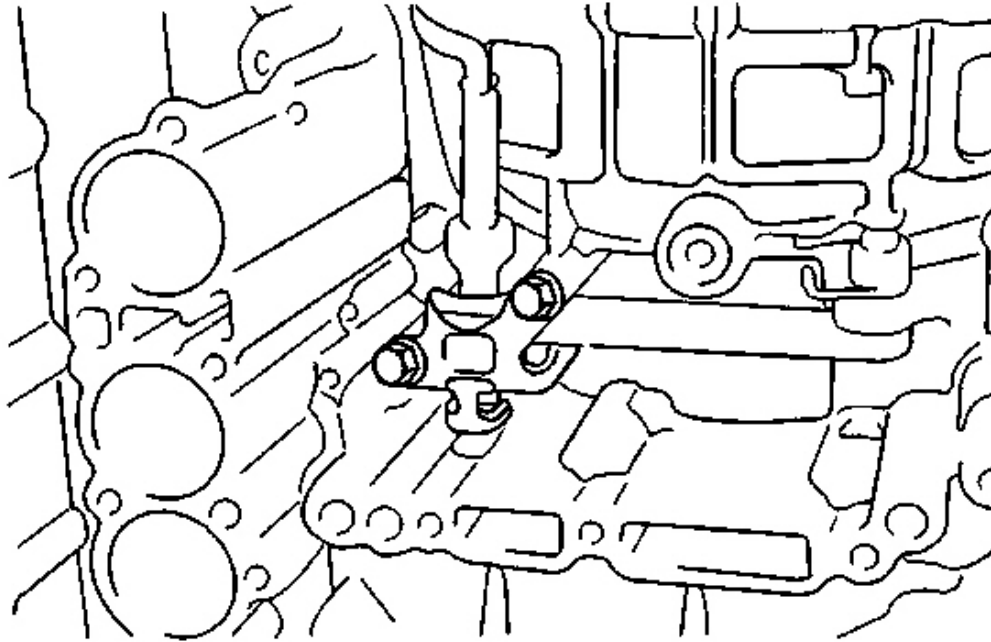


Fig. 245: Bolts & Parking Lock Pawl Bracket
Courtesy of GENERAL MOTORS CORP.

52. Install the parking lock pawl bracket with the 2 bolts.

Tighten: Tighten the bolts to 7.4 N.m (65 lb in).

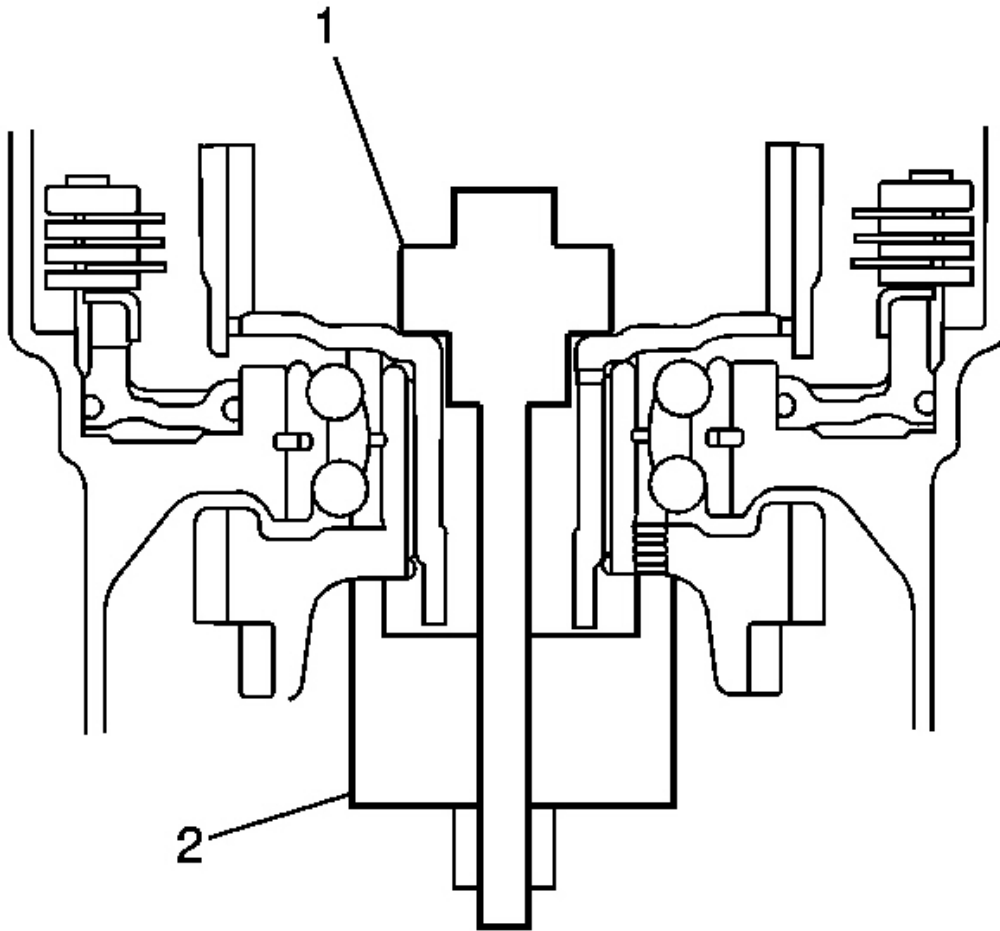


Fig. 246: DT 46460, DT 46455 & Planetary Ring Gear
Courtesy of GENERAL MOTORS CORP.

53. Replace the planetary ring flange of the planetary ring gear.
54. Using **DT 46460** (2) and **DT 46455** (1), install the planetary ring gear. See **Special Tools**.

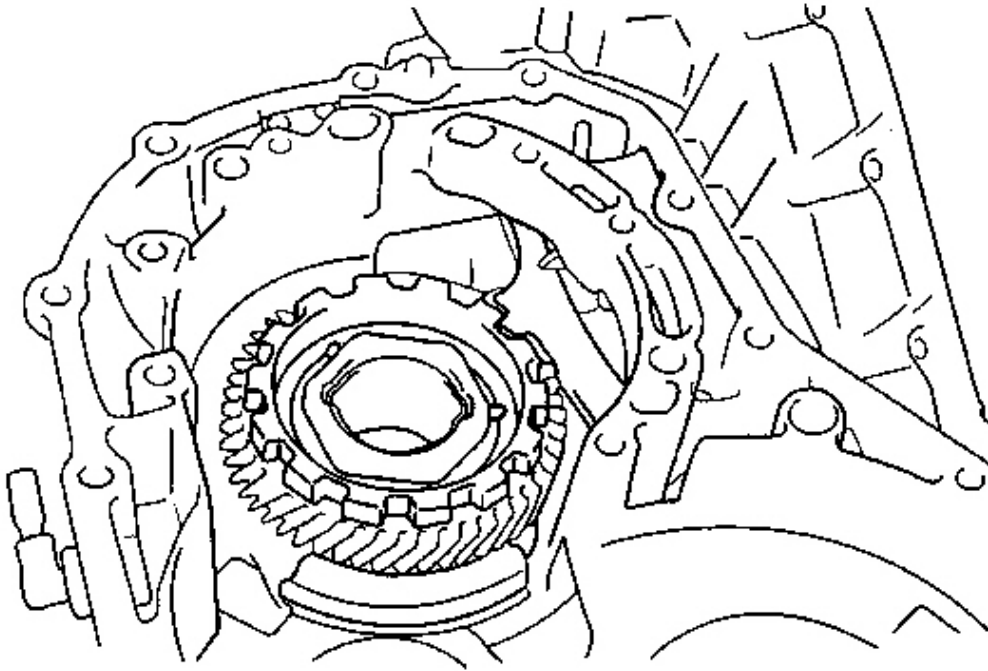


Fig. 247: Counter Drive Gear & Parking Lock Pawl
Courtesy of GENERAL MOTORS CORP.

55. Fix the counter drive gear with the parking lock pawl.

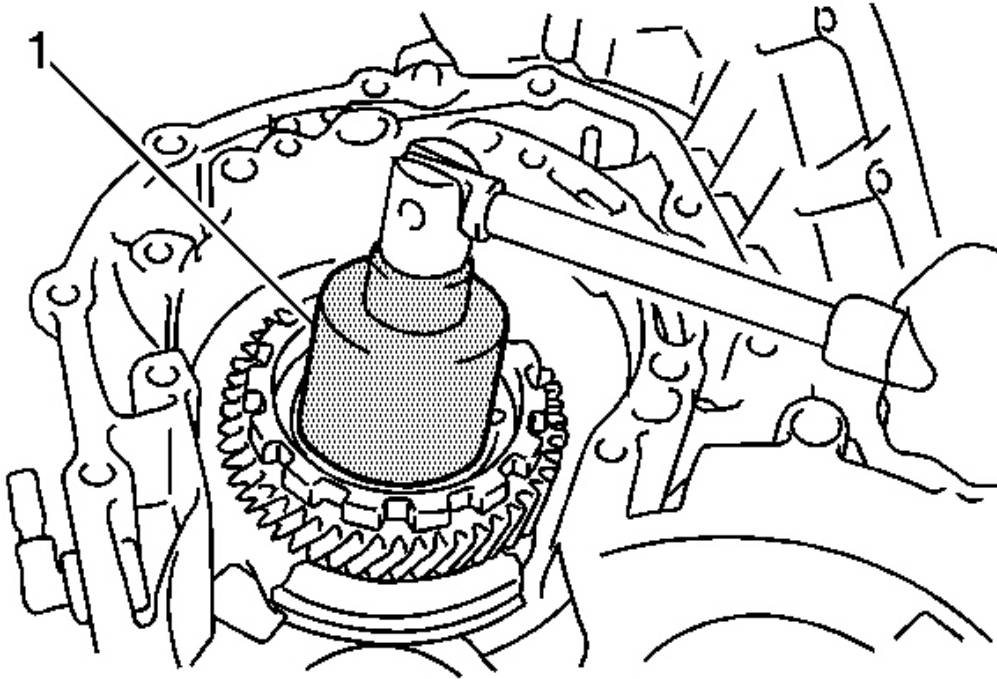


Fig. 248: Removing Planetary Ring Gear Nut Using DT 46472
Courtesy of GENERAL MOTORS CORP.

56. Using **DT 46472** (1), install a new nut. See **Special Tools**.

Tighten: Tighten the nut to 9.8 N.m (87 lb in).

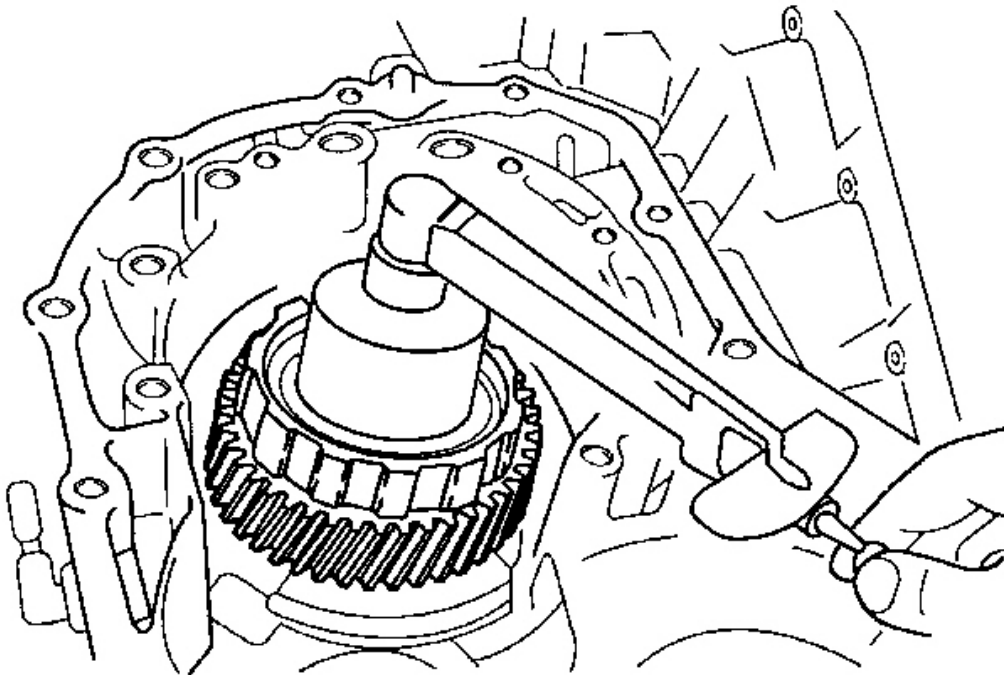


Fig. 249: Turning The Counter Drive Gear Using A Wrench
Courtesy of GENERAL MOTORS CORP.

57. Using a small torque wrench, turn the counter drive gear 100 turn per minute and measure the preload.

Tighten: Tighten the nut to 29 N.m (22 lb ft) or less.

Specification: When the preload is smaller than the specification, tighten the nut more and adjust the preload to 0.05-0.35 N.m (0.43-3.12 lb in).

58. Stake the nut.

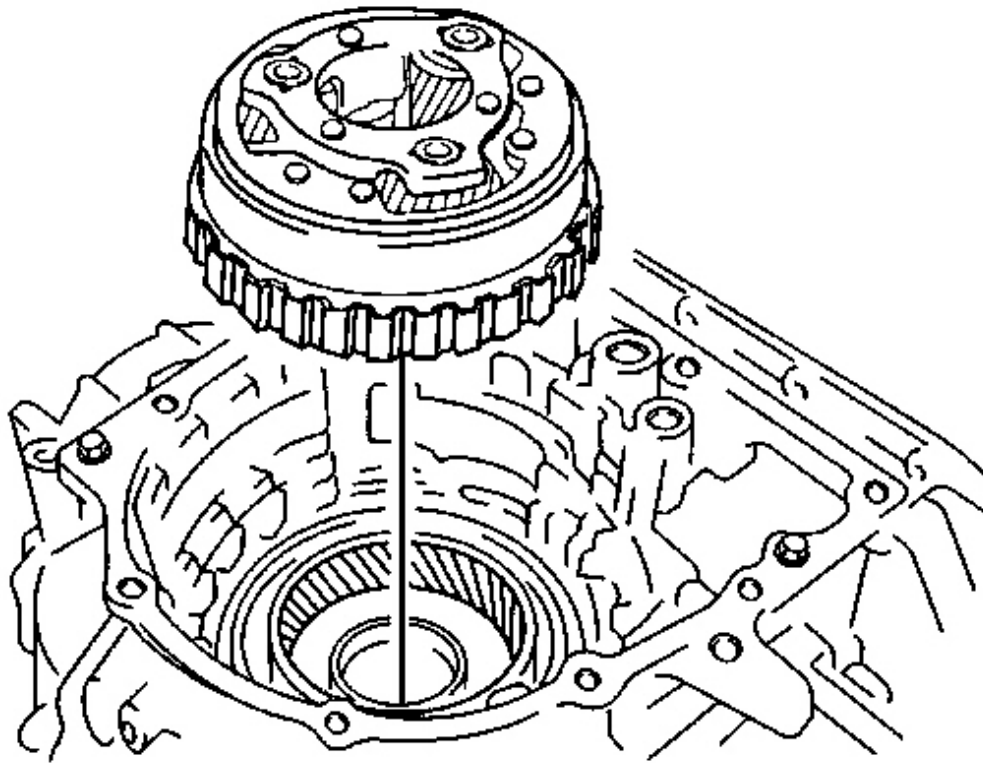


Fig. 250: Planetary Gear & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

59. Install the planetary gear to the transaxle case.

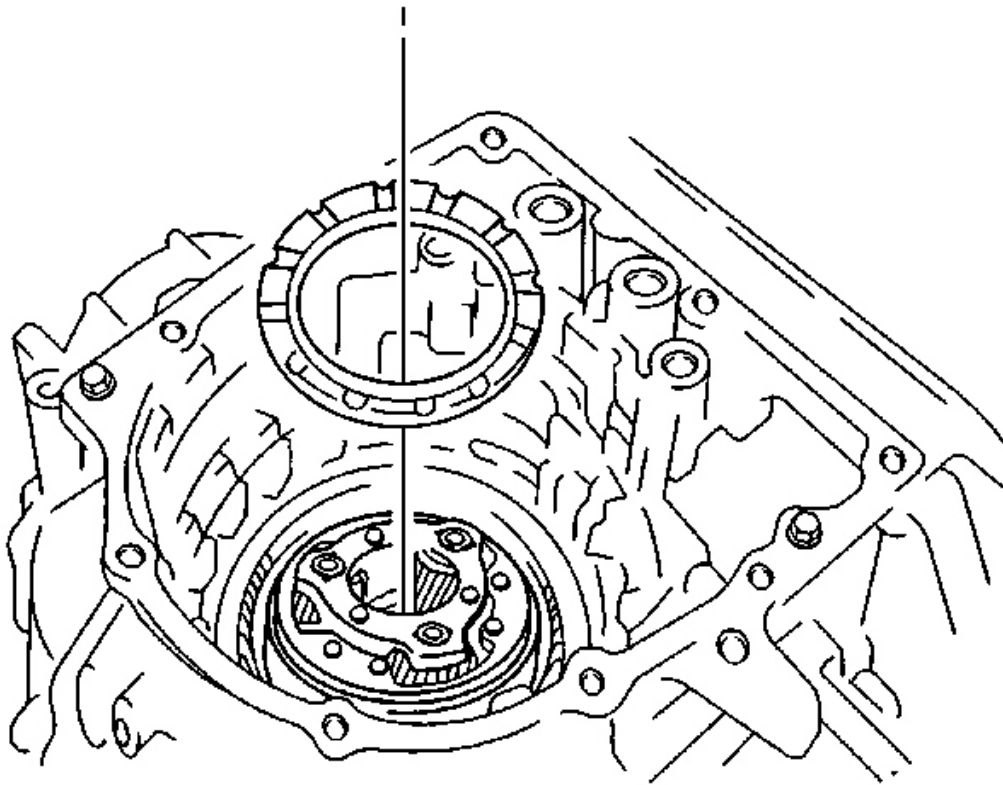


Fig. 251: Planetary Carrier Thrust Washer & Planetary Gear
Courtesy of GENERAL MOTORS CORP.

60. Coat the planetary carrier thrust washer with petroleum jelly and install the washer onto the planetary gear.

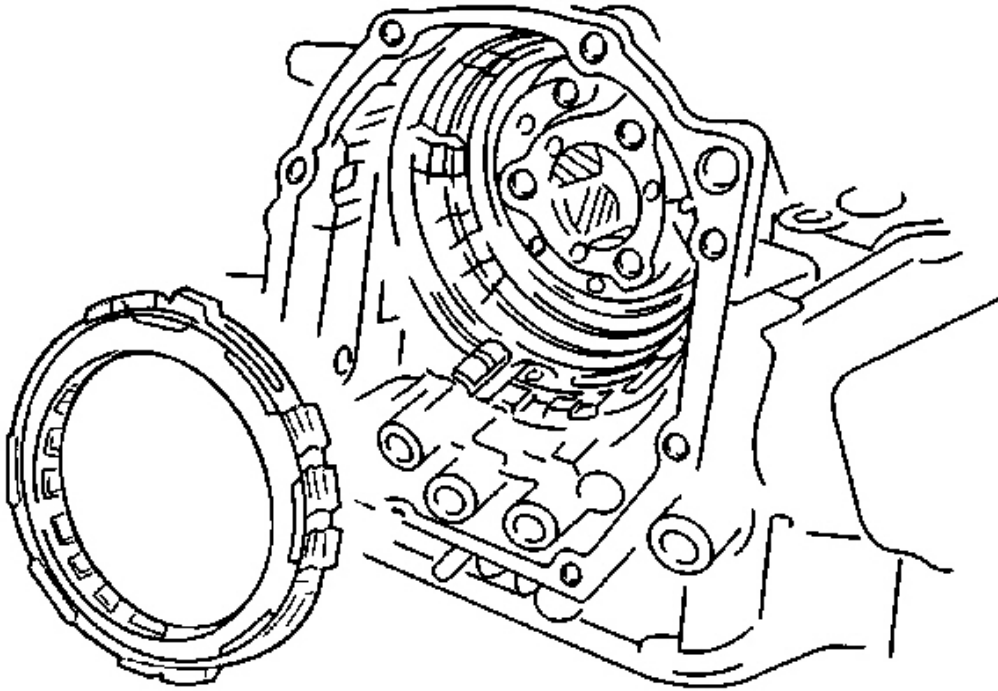


Fig. 252: No. 2 One-Way Clutch & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

61. Install the No. 2 one-way clutch to the transaxle case.

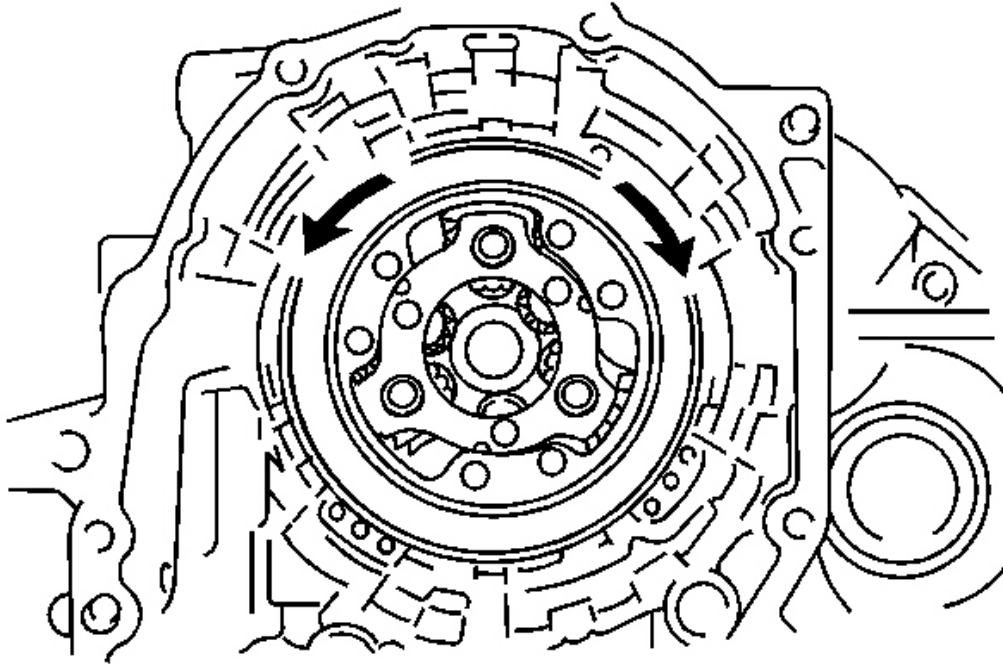


Fig. 253: Verifying Planetary Gear Turns Freely
Courtesy of GENERAL MOTORS CORP.

62. Verify that the planetary gear turns freely counterclockwise and locks clockwise.

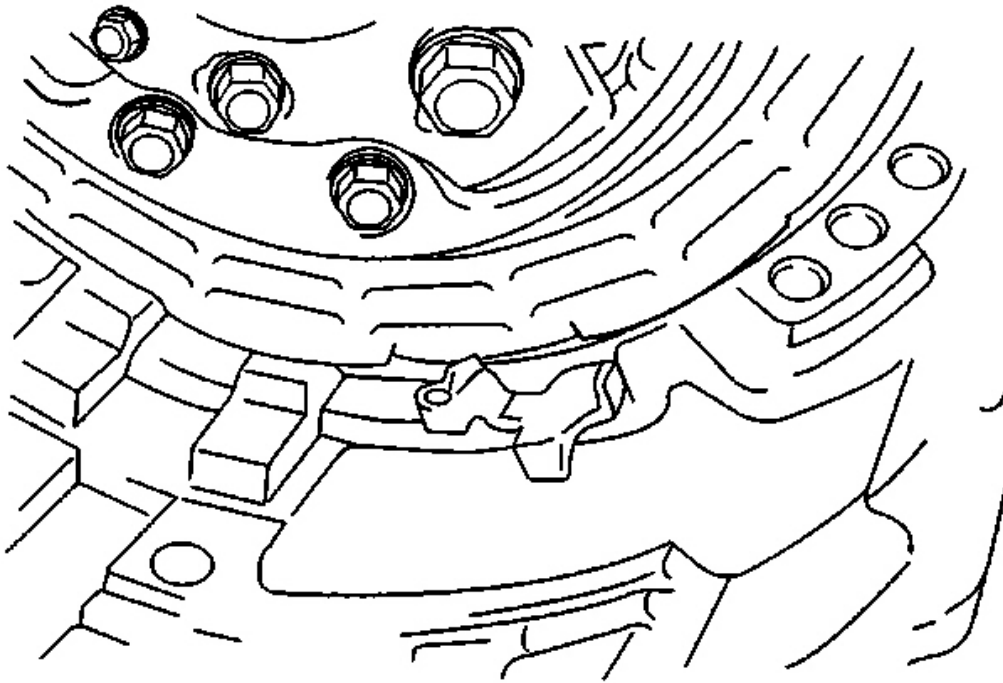


Fig. 254: Anti-Rattle Clip, No. 2 One-Way Clutch Outer Race & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

63. Install the anti-rattle clip in the space between the No. 2 one-way clutch outer race and transaxle case. Push the anti-rattle clip in place until you hear the click.

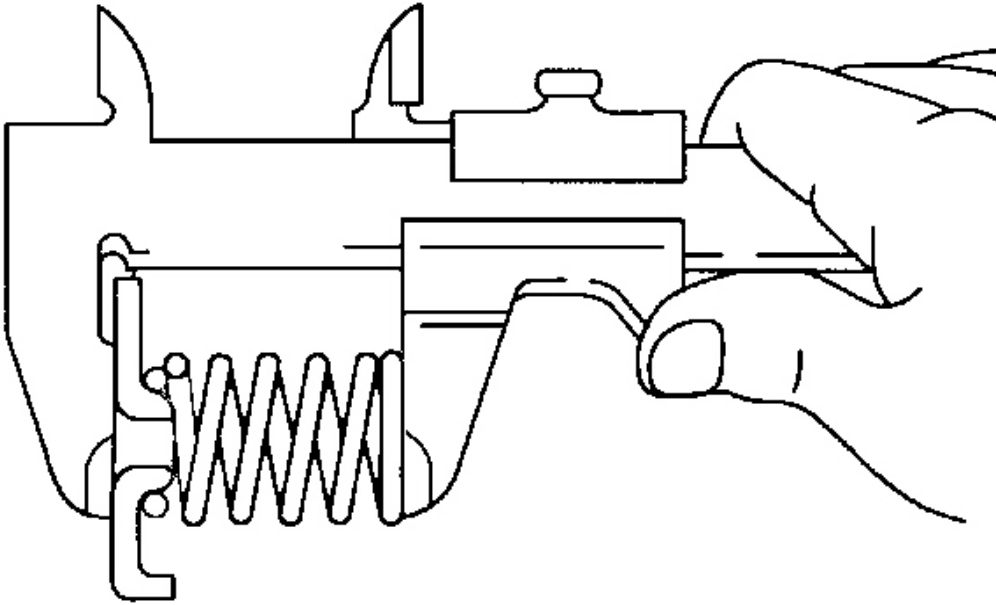


Fig. 255: Measuring The Free Length Of 2nd Brake Piston Return Spring Using Vernier Calipers
Courtesy of GENERAL MOTORS CORP.

64. Using vernier calipers, measure the free length of the 2nd brake piston return spring together with the spring seat.

Specification: The standard free length is 15.85 mm (0.6240 in).

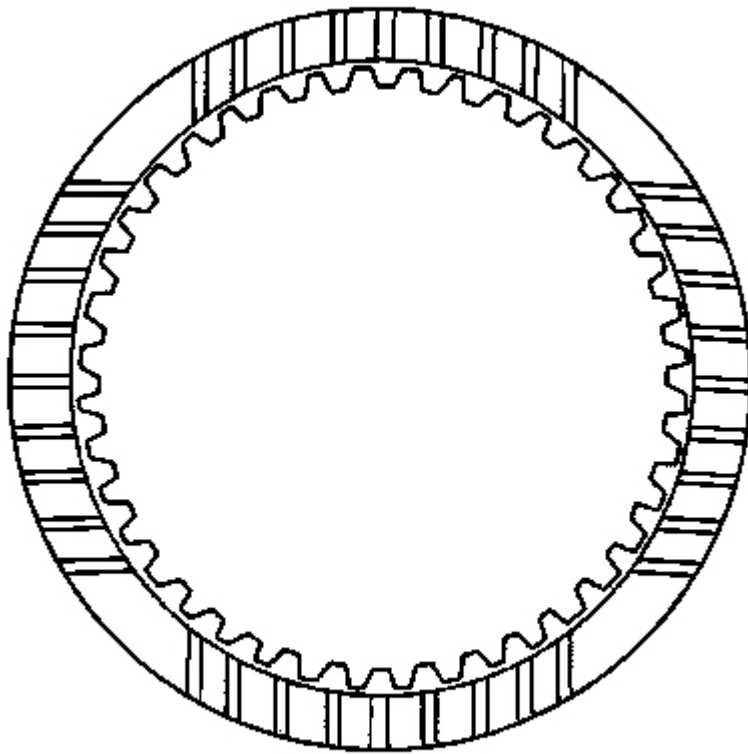


Fig. 256: Disc

Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- If the lining of the disc is peeling off or discolored, or even if a part of the groove is defaced, replace all discs.
- Before assembling the new discs, soak the discs in ATF for at least 15 minutes.

65. If the sliding surface of the disc, the plate and the flange of 2nd brake are worn or burnt, replace the parts.

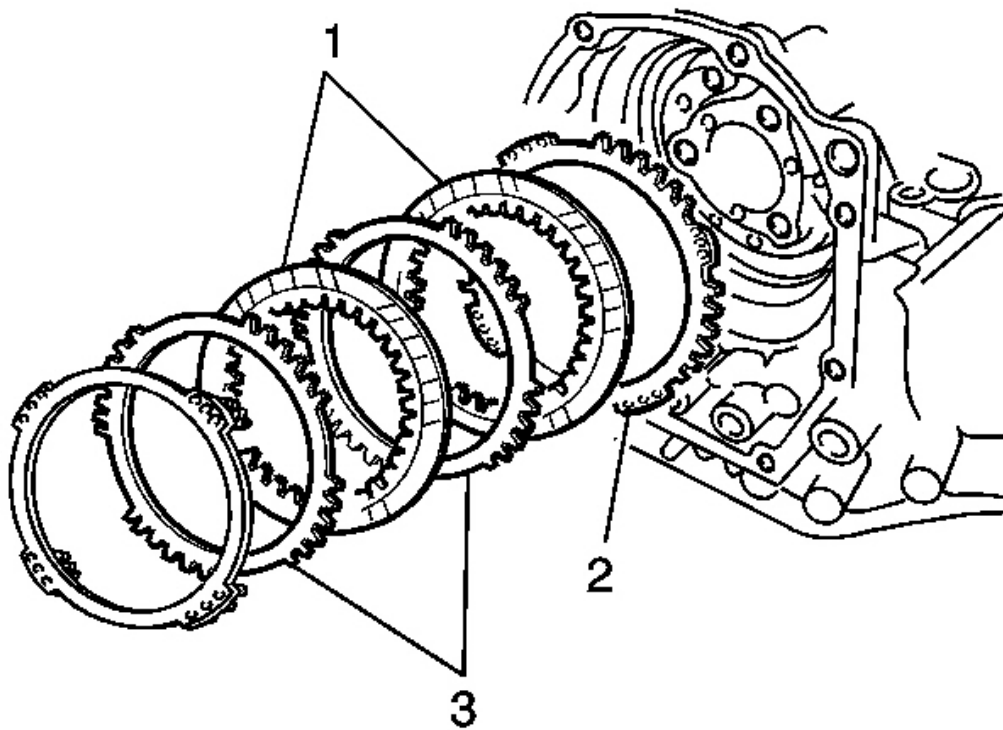


Fig. 257: Flange, Discs & Plates
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install the snap ring in the groove of the transaxle case correctly.

66. Install the flange, 2 discs and 2 plates in order: 2-1-3-1-3, where (1)=Disc, (2)=Flange, and (3)=Plate.
67. Install the 2nd brake return spring.

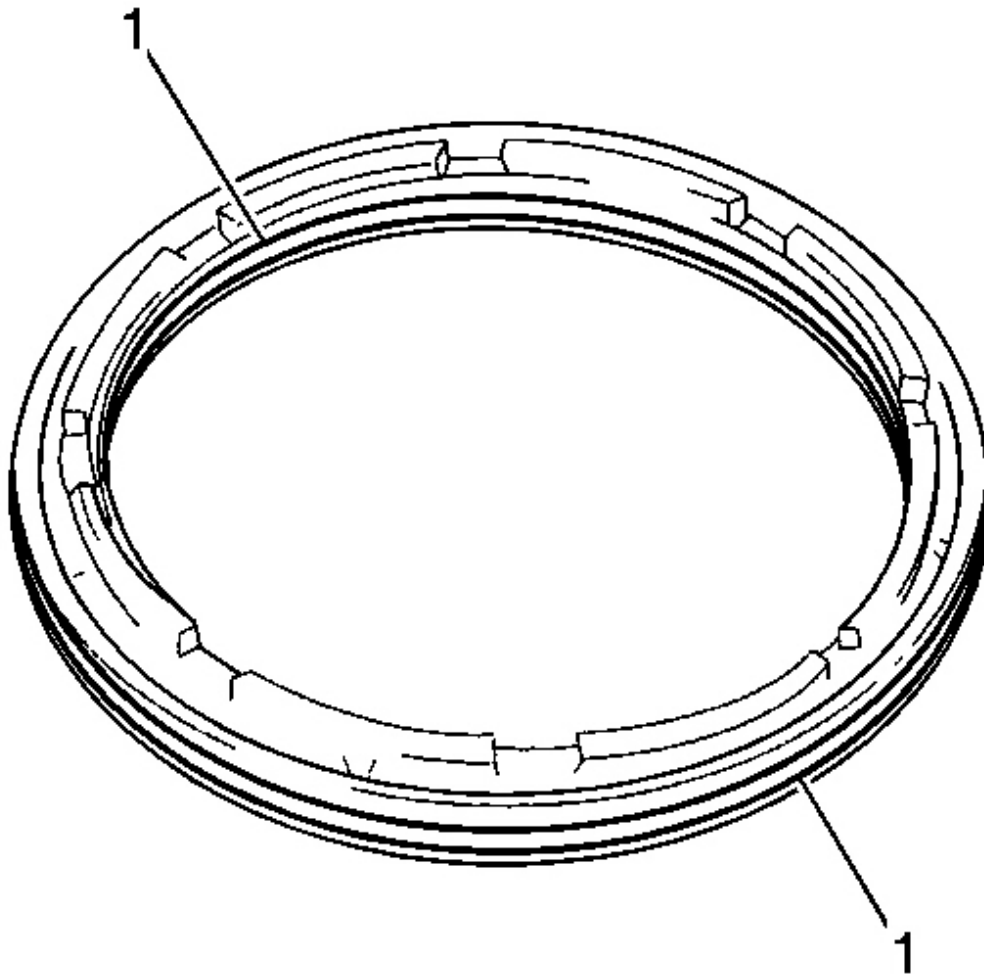


Fig. 258: O-Rings & 2nd Brake Piston
Courtesy of GENERAL MOTORS CORP.

68. Coat 2 new O-rings (1) with ATF and install the O-rings to the 2nd brake piston.

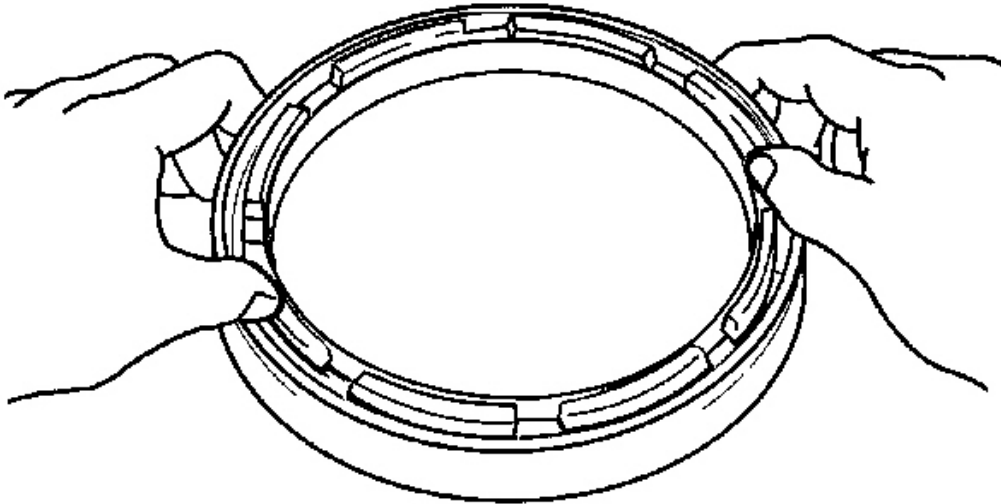


Fig. 259: 2nd Brake Piston & 2nd Brake Clutch Cylinder
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the O-rings.

69. Install the 2nd brake piston into the 2nd brake clutch cylinder.

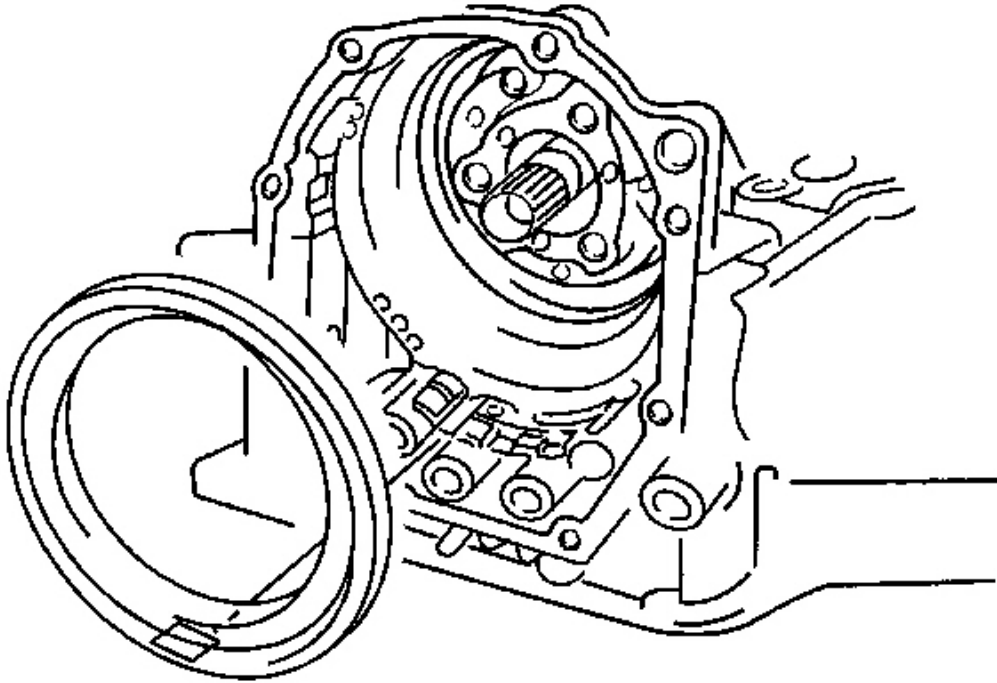


Fig. 260: 2nd Brake Clutch Cylinder & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

70. Install the 2nd brake clutch cylinder to the transaxle case.

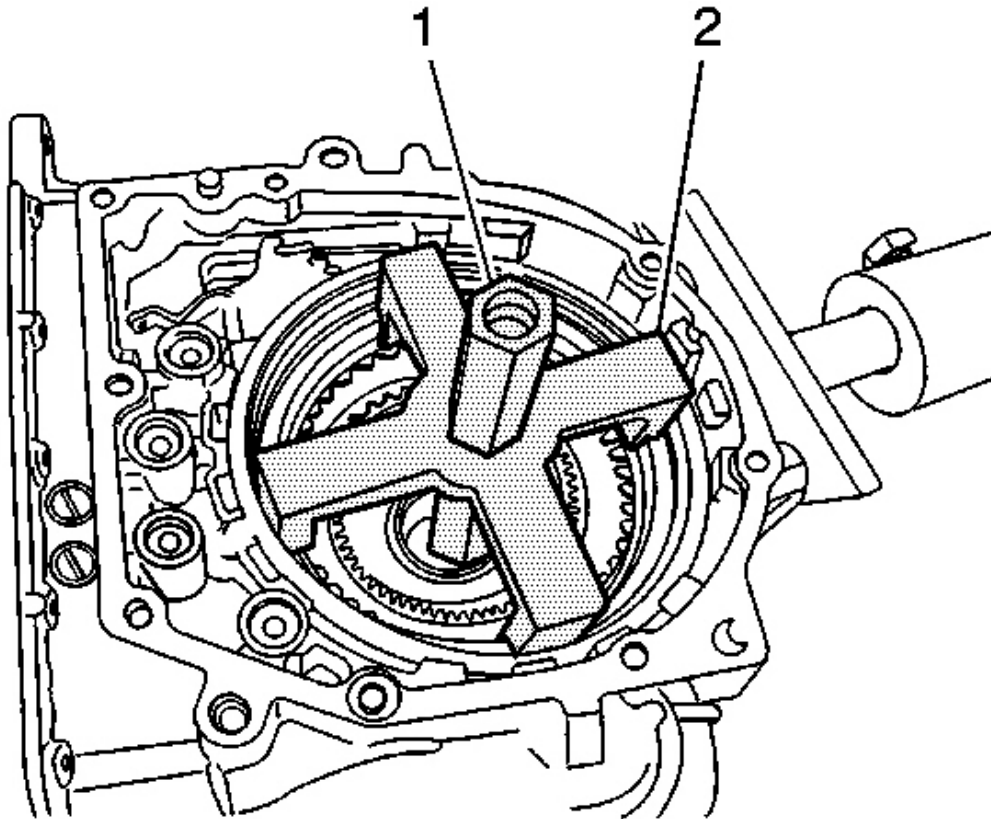


Fig. 261: DT 46455 & DT 46458
Courtesy of GENERAL MOTORS CORP.

71. Using **DT 46455** (1) and **DT 46458** (2), compress the 2nd brake piston return spring. See **Special Tools**.

IMPORTANT: Install the snap ring in the groove of the transaxle case correctly.

72. Using the screwdriver, install the snap ring.

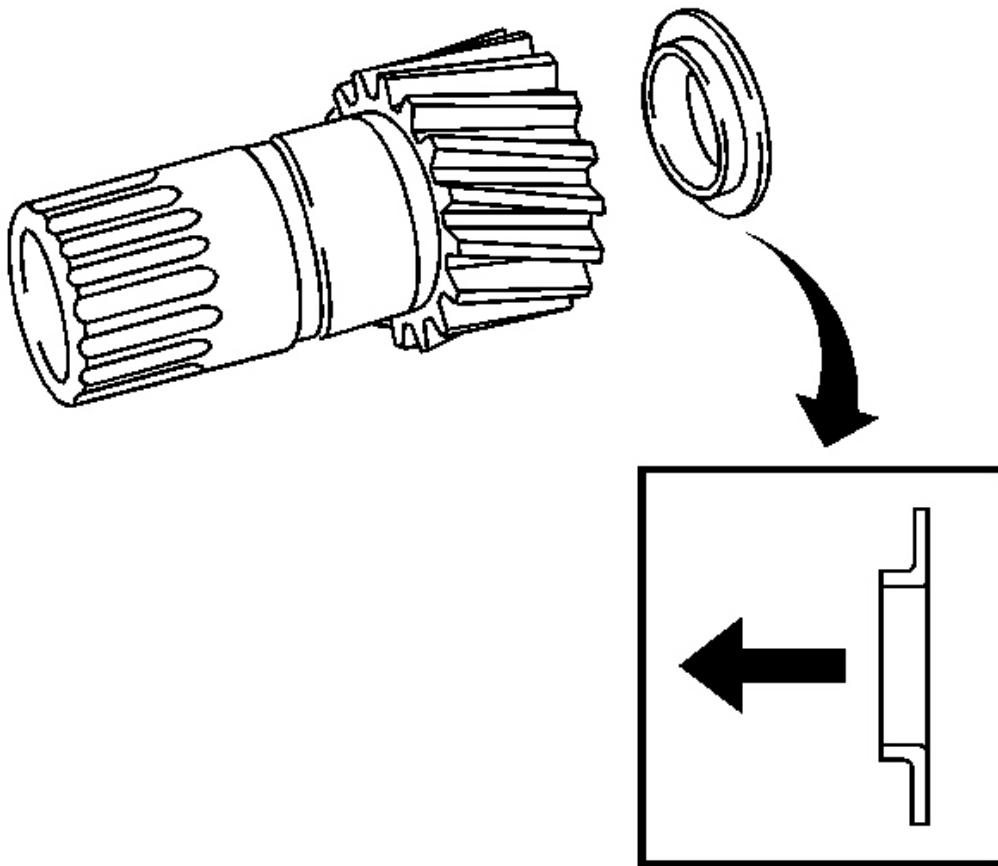


Fig. 262: Thrust Bearing Race & Front Planetary Sun Gear
Courtesy of GENERAL MOTORS CORP.

73. Coat the thrust bearing race with petroleum jelly and install the race onto the front planetary sun gear.

Specification:

- The race inner diameter is 19.3 mm (0.760 in).
- The race outer diameter is 29.0 mm (1.142 in).

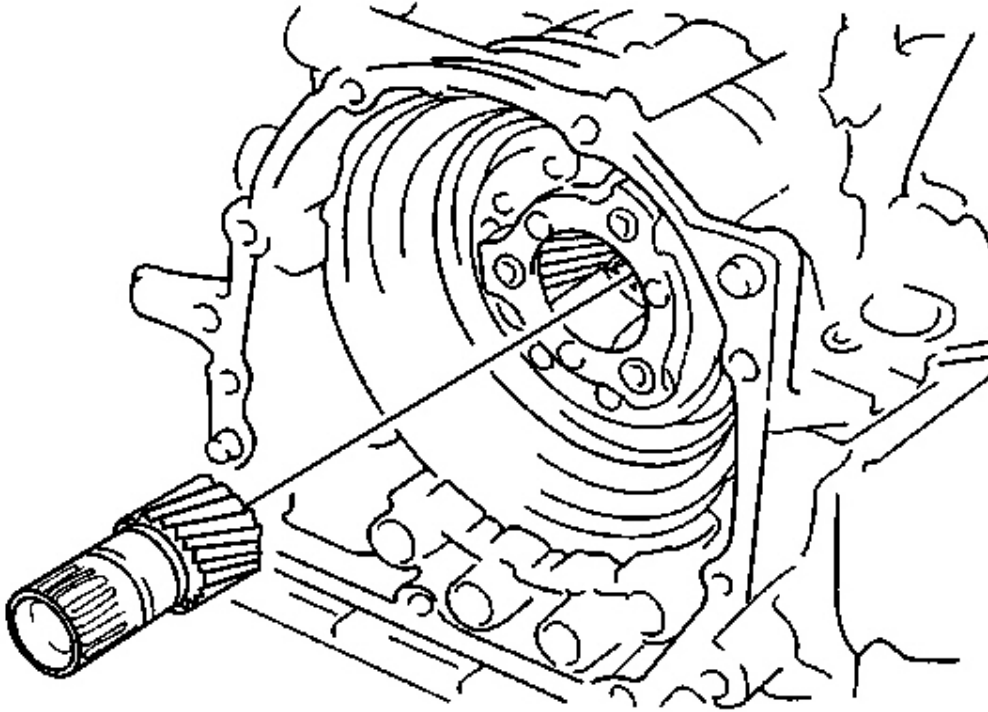


Fig. 263: Front Planetary Sun Gear & Thrust Bearing Race
Courtesy of GENERAL MOTORS CORP.

74. Install the front planetary sun gear to the transaxle case.

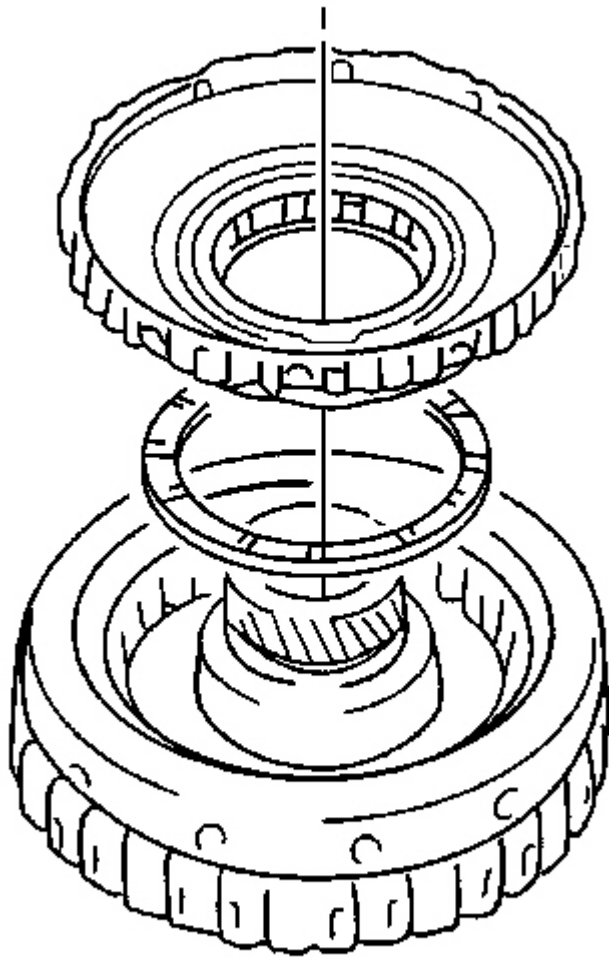


Fig. 264: 1-Way Clutch Assembly, Thrust Washer & Rear Planetary Sun Gear
Courtesy of GENERAL MOTORS CORP.

75. Install the thrust washer and the one-way clutch assembly to the rear planetary sun gear.

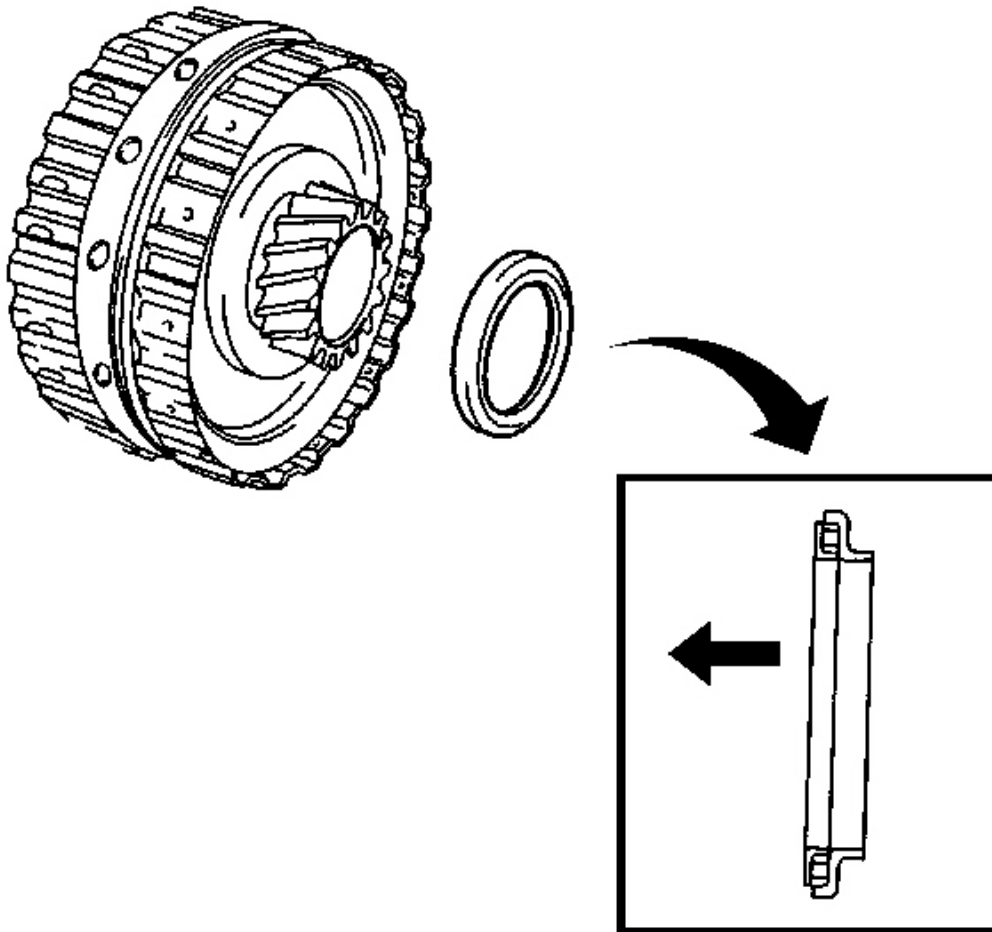


Fig. 265: Thrust Bearing Race & Rear Planetary Sun Gear
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify the direction of the bearing.

76. Coat the thrust bearing race with petroleum jelly and install the race onto the rear planetary sun gear and the one-way clutch assembly.

Specification:

- The bearing inner diameter is 42.5 mm (1.673 in).
- The bearing outer diameter is 57.5 mm (2.264 in).

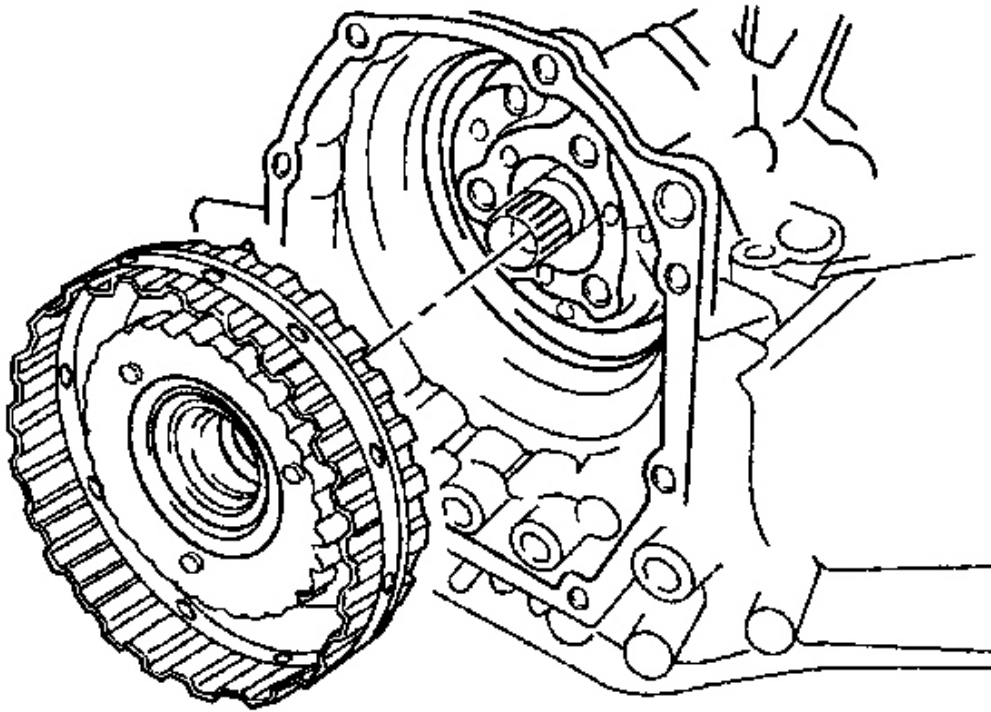


Fig. 266: Rear Planetary Sun Gear & 1-Way Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

77. Install the rear planetary sun gear and the one-way clutch assembly to the transaxle case.

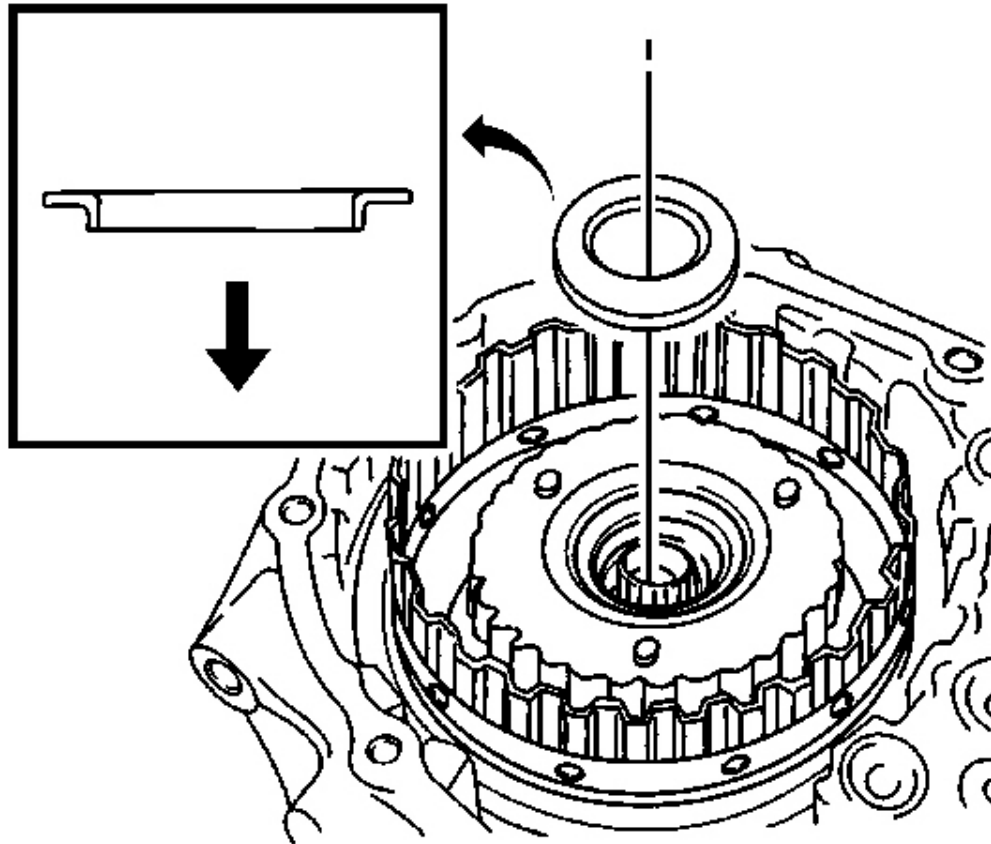


Fig. 267: Thrust Bearing Race & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify the direction of the race.

78. Coat the thrust bearing race with petroleum jelly and install the race onto the transaxle case.

Specification:

- The race inner diameter is 34.95 mm (1.3760 in).
- The race outer diameter is 45.50 mm (1.7913 in).

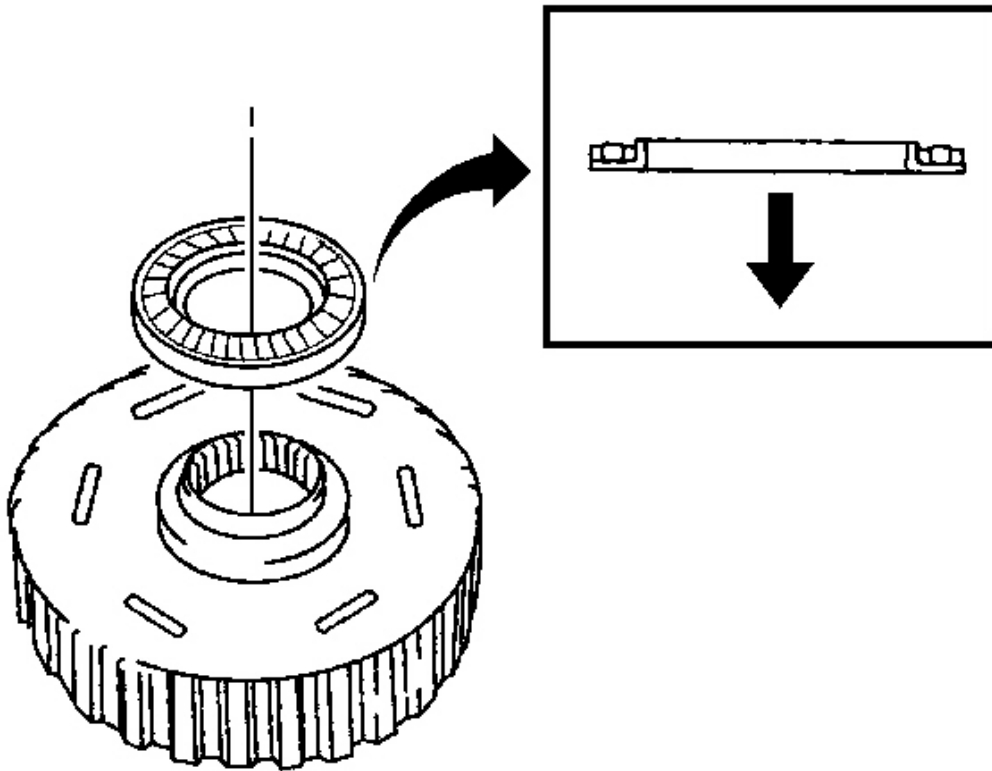


Fig. 268: Thrust Needle Roller Bearing & Forward Clutch Hub
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify the direction of the bearing.

79. Coat the thrust needle roller bearing with petroleum jelly and install the bearing onto the forward clutch hub.

Specification:

- The bearing inner diameter is 33.3 mm (1.311 in).
- The bearing outer diameter is 46.5 mm (1.831 in).

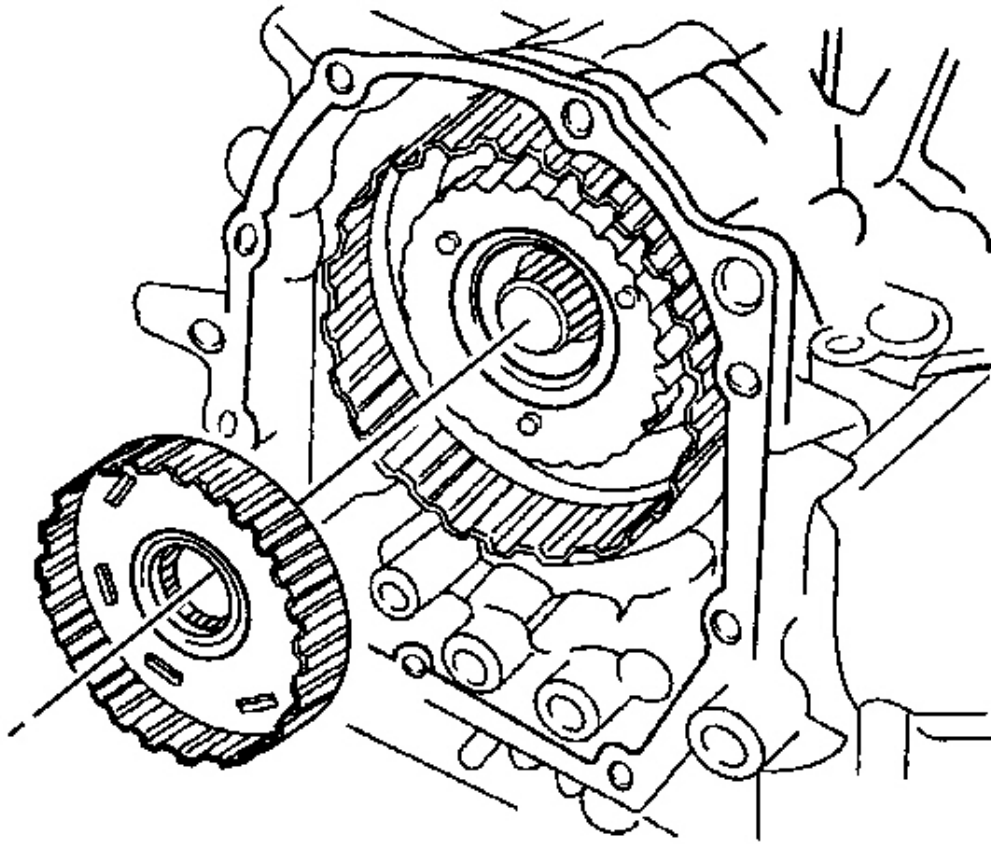


Fig. 269: Forward Clutch Hub & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

80. Install the forward clutch hub to the transaxle case.

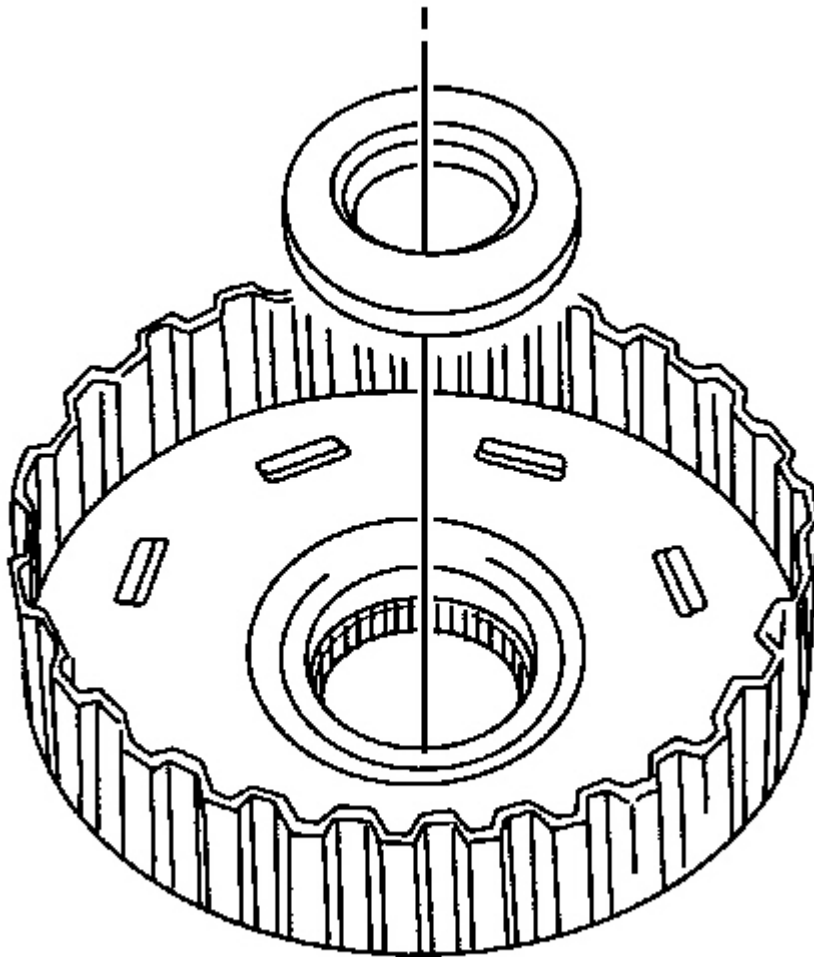


Fig. 270: Thrust Bearing Race & Forward Clutch Hub
Courtesy of GENERAL MOTORS CORP.

81. Coat the thrust bearing race with petroleum jelly and install the race onto the forward clutch hub.

Specification:

- The race inner diameter is 19.3 mm (0.760 in).
- The race outer diameter is 30.6 mm (1.205 in).

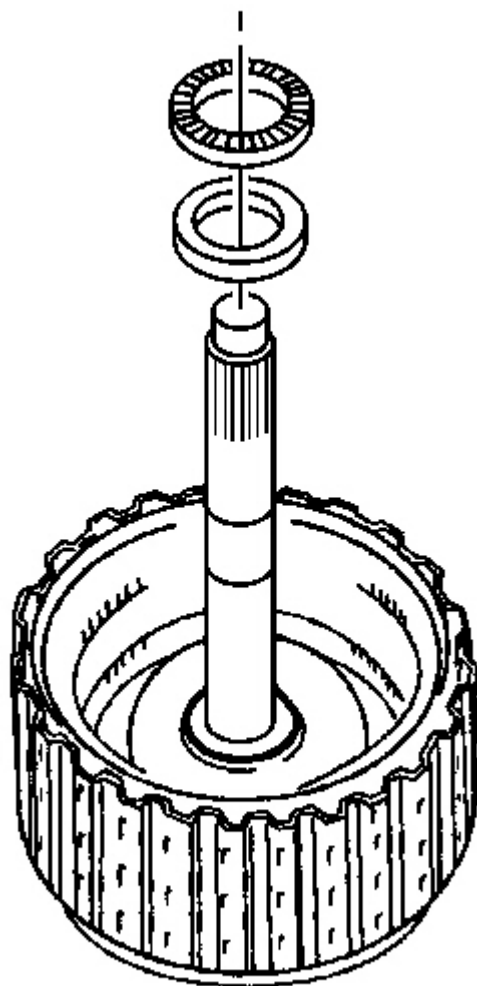


Fig. 271: Thrust Needle Roller Bearing, Race & Forward/Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

82. Install the thrust bearing race and thrust needle roller bearing to the forward and reverse clutch assembly.

Specification:

- The race inner diameter is 18.1 mm (0.713 in).
- The race outer diameter is 28.2 mm (1.110 in).
- The bearing inner diameter is 18.1 mm (0.713 in).
- The bearing outer diameter is 29.6 mm (1.165 in).

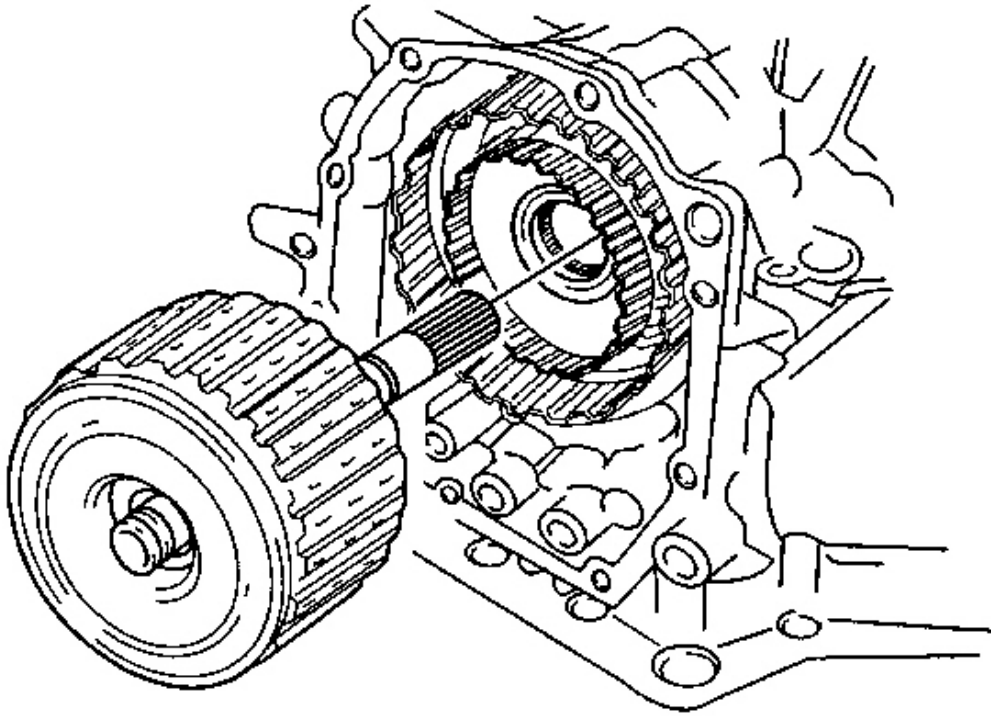


Fig. 272: Forward/Reverse Clutch Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

83. Install the forward and reverse clutch assembly to the transaxle case.

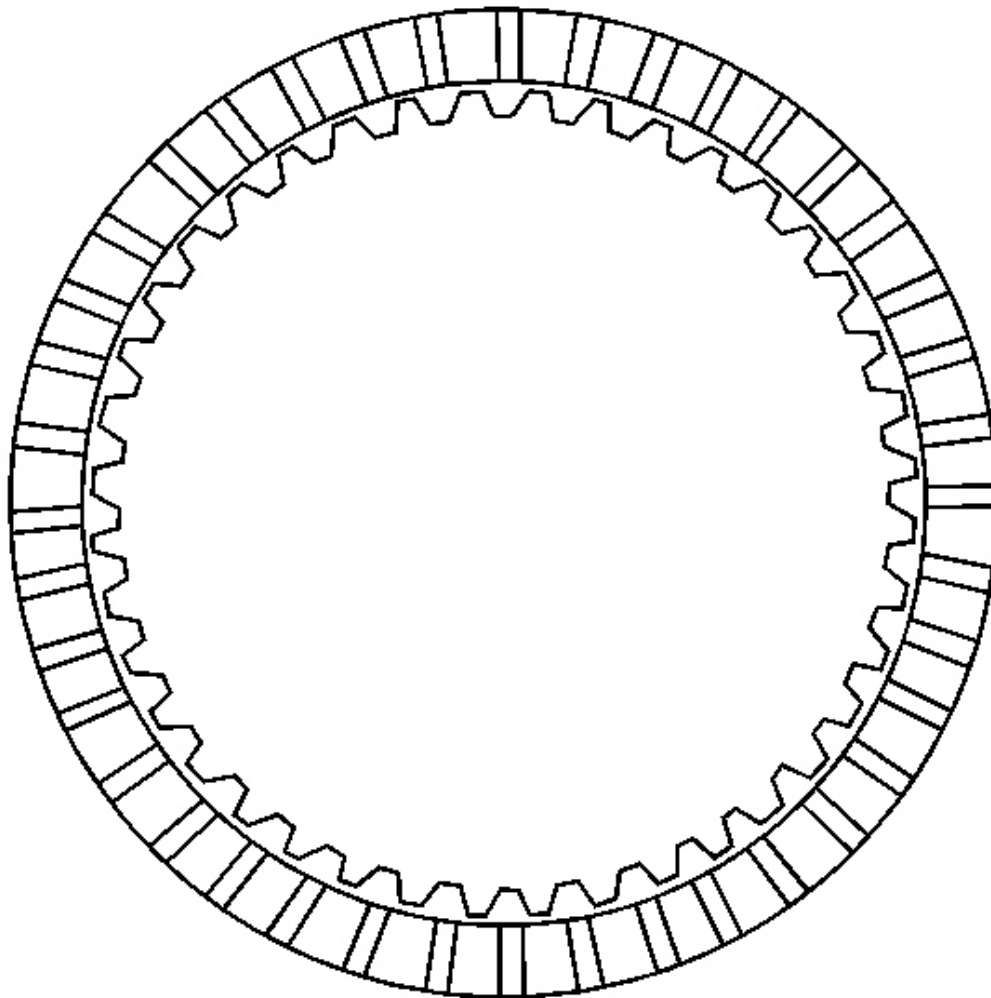


Fig. 273: Sliding Surface Of Disc

Courtesy of GENERAL MOTORS CORP.

IMPORTANT:

- If the lining of the disc is peeling off or discolored, or even if the part of the printed mark is defaced, replace all discs.
- Before assembling new discs, soak the discs in ATF for at least 15 minutes.

84. If the sliding surface of the disc, the plate and the flange of 2nd coast and O/D brake are worn or burnt, replace the components.

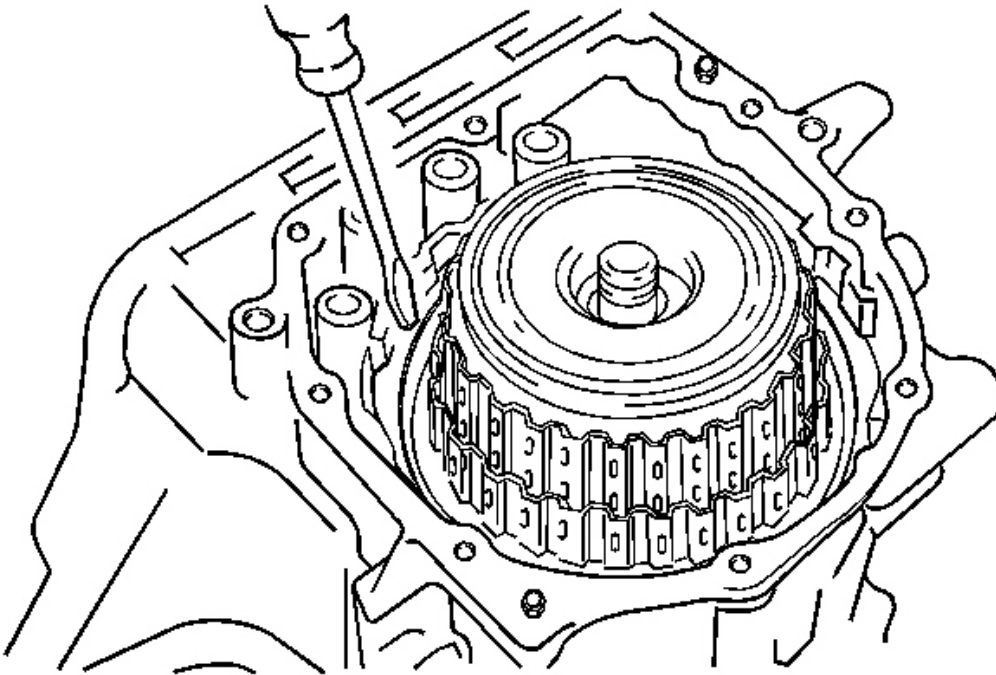


Fig. 274: Installing Snap Ring To Transaxle Case Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install the snap ring in the groove of the transaxle case correctly.

85. Using a screwdriver, install the snap ring to the transaxle case.

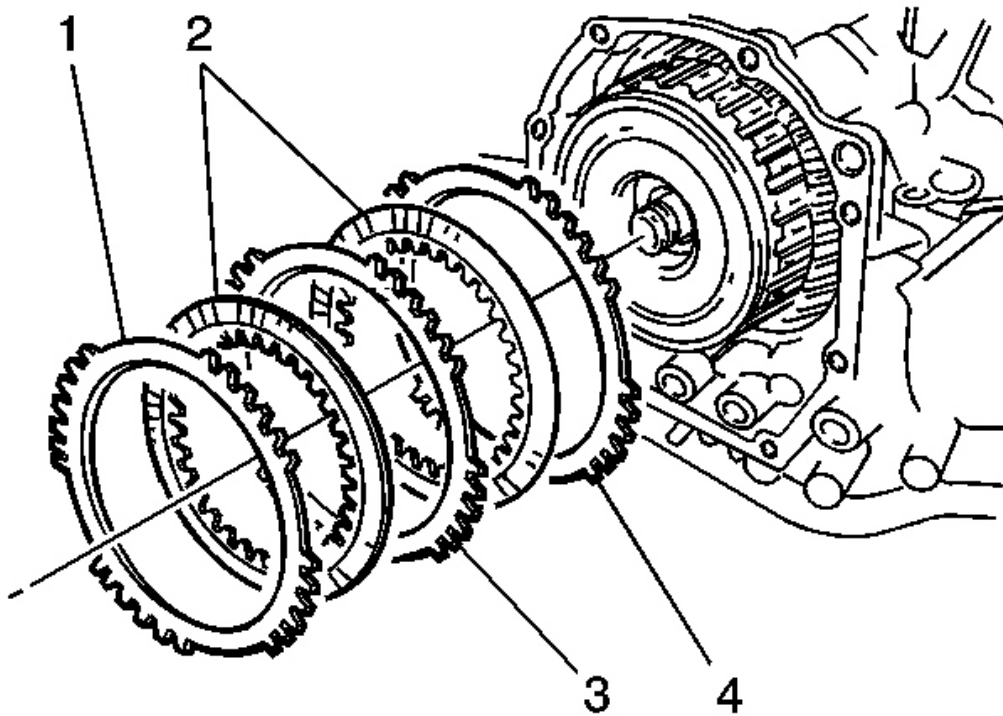


Fig. 275: O/D Brake Flange, Discs & Plates
Courtesy of GENERAL MOTORS CORP.

86. Install the flange, 2 discs and 2 plates to the transaxle case in the following order: 3-2-3-2-1, where (3) =Plate, (2)=Disc, and (1)=Flange.
87. Clean the connected part the transaxle case and the transaxle rear cover.

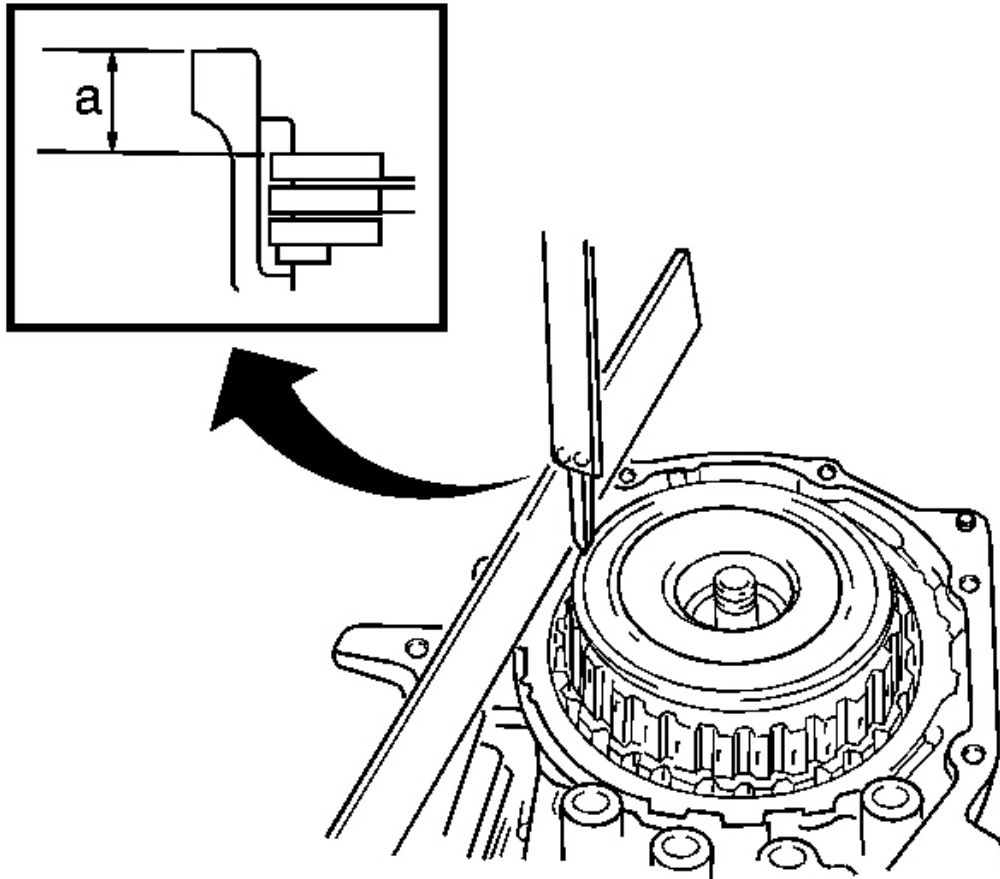


Fig. 276: Measuring The Distance Between 2nd Coast & O/D Brake Flange Using Vernier Calipers
Courtesy of GENERAL MOTORS CORP.

88. Place a straight edge on the transaxle case and measure the distance between the 2nd coast and the O/D brake flange and the straight edge using vernier calipers (a).

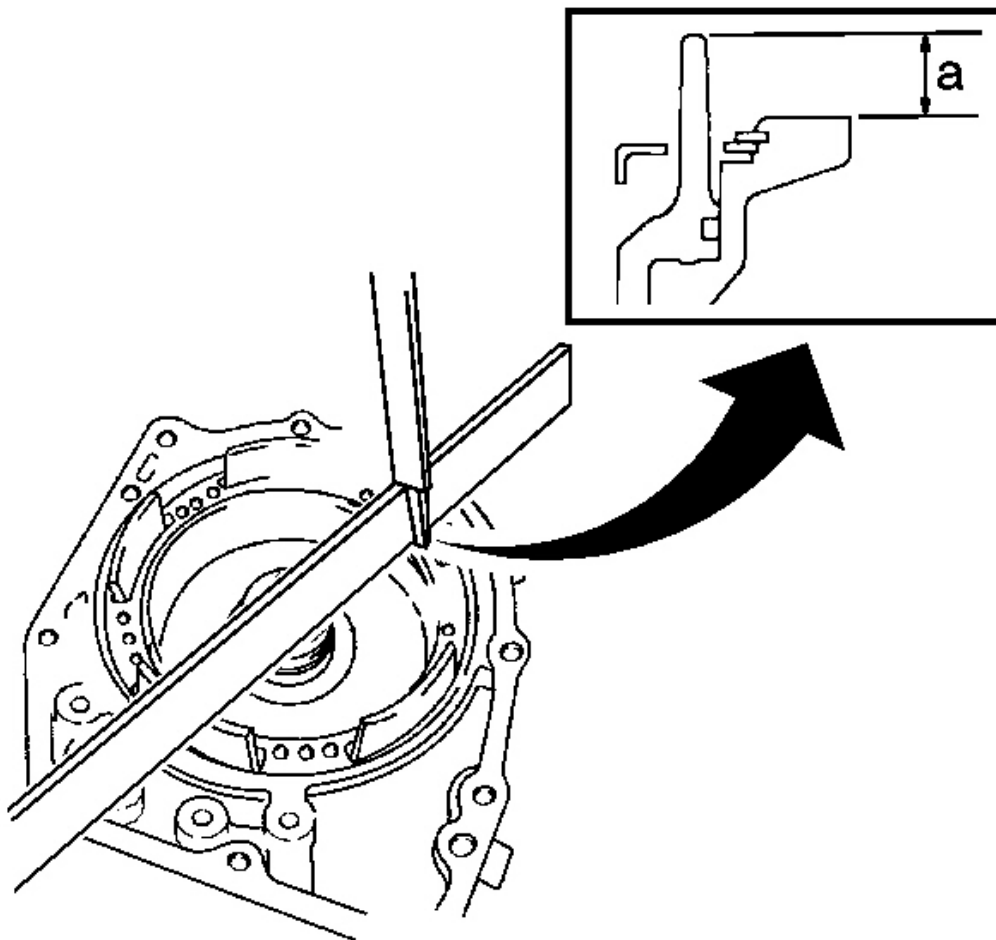


Fig. 277: Measuring The Distance Between Transaxle Rear Cover & Straight Edge Using Vernier Calipers

Courtesy of GENERAL MOTORS CORP.

89. Place a straight edge on the O/D brake piston and measure the distance between the transaxle rear cover and the straight edge using vernier calipers (a).
90. Calculate the piston stroke value using the following formula. Select and install a flange which satisfies the piston stroke value.

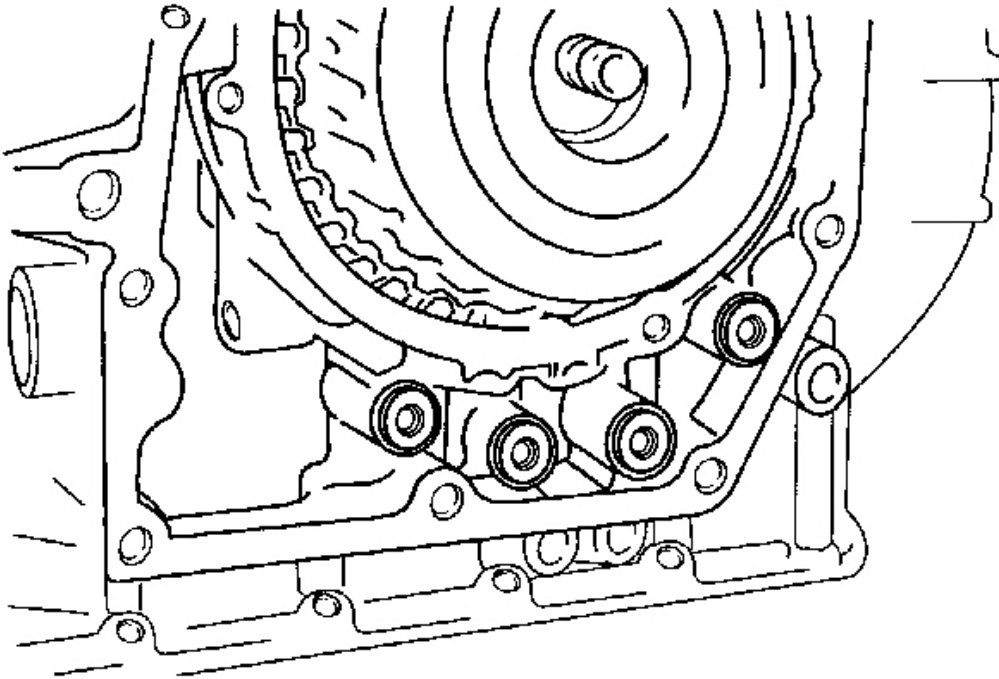


Fig. 278: Apply Gaskets & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

91. Install 4 new apply gaskets to the transaxle rear cover.

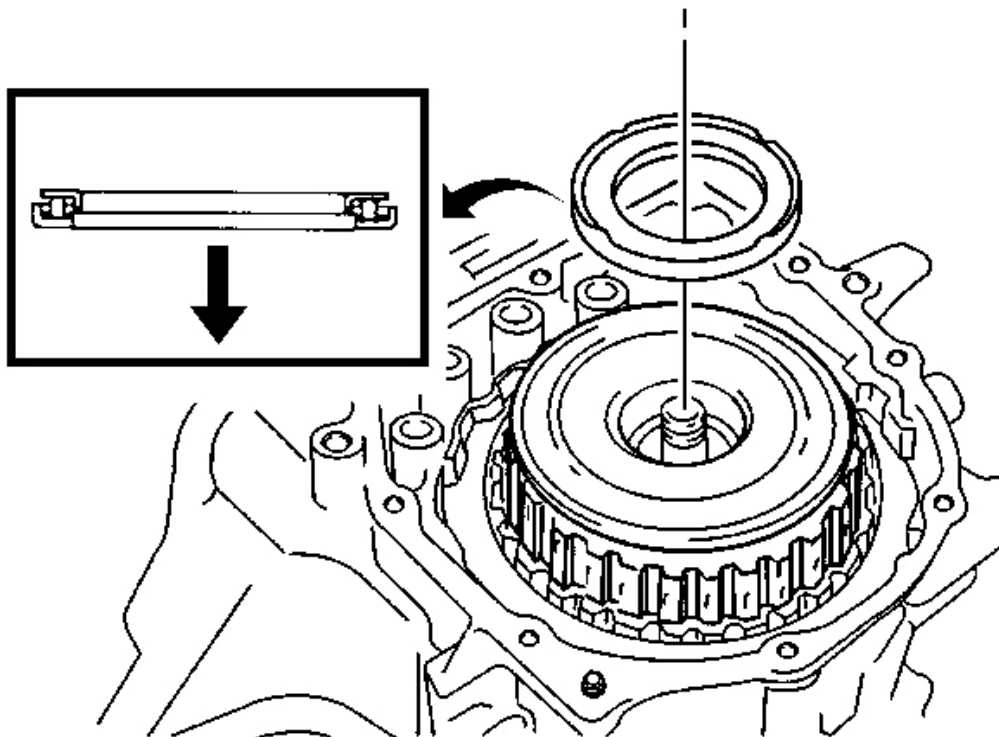


Fig. 279: Thrust Needle Roller Bearing & Forward/Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

92. Coat the thrust needle roller bearing with petroleum jelly and install the bearing onto the forward and reverse clutch assembly.

Specification:

- The bearing inner diameter is 43.2 mm (1.701 in).
 - The bearing outer diameter is 62.0 mm (2.441 in).
93. Remove any packing material. Do not get oil on the contacting surfaces of the transaxle rear cover or transaxle case.

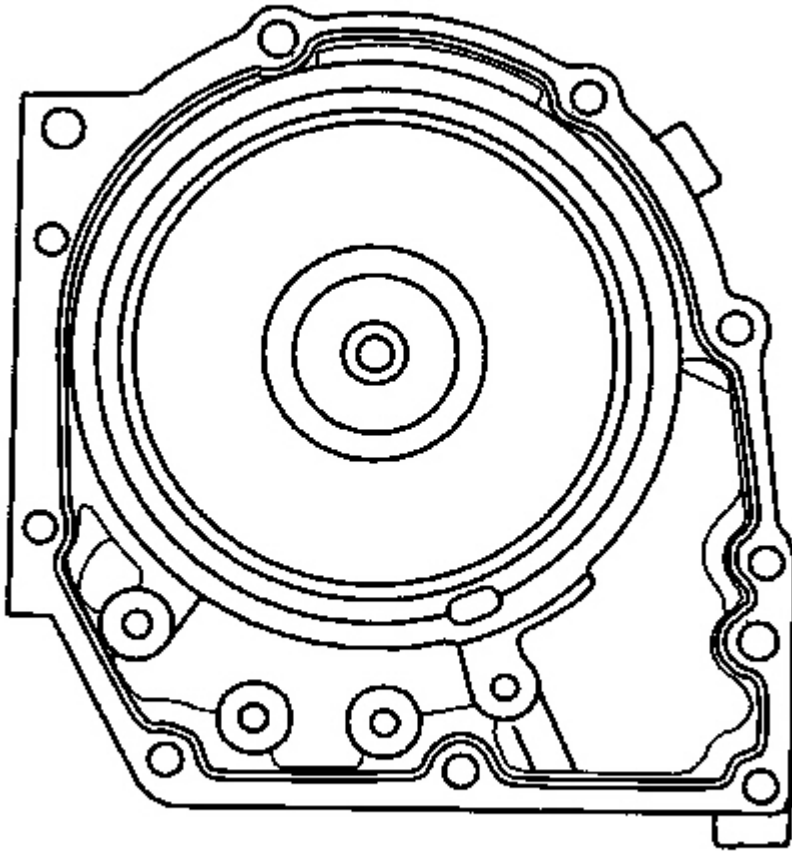


Fig. 280: Transaxle Rear Cover

Courtesy of GENERAL MOTORS CORP.

94. Apply a formed in place gasket (FIPG) to the transaxle rear cover.

Specification: The FIPG three bond 1281, or equivalent, seal bend width is 1.2 mm (0.047 in).

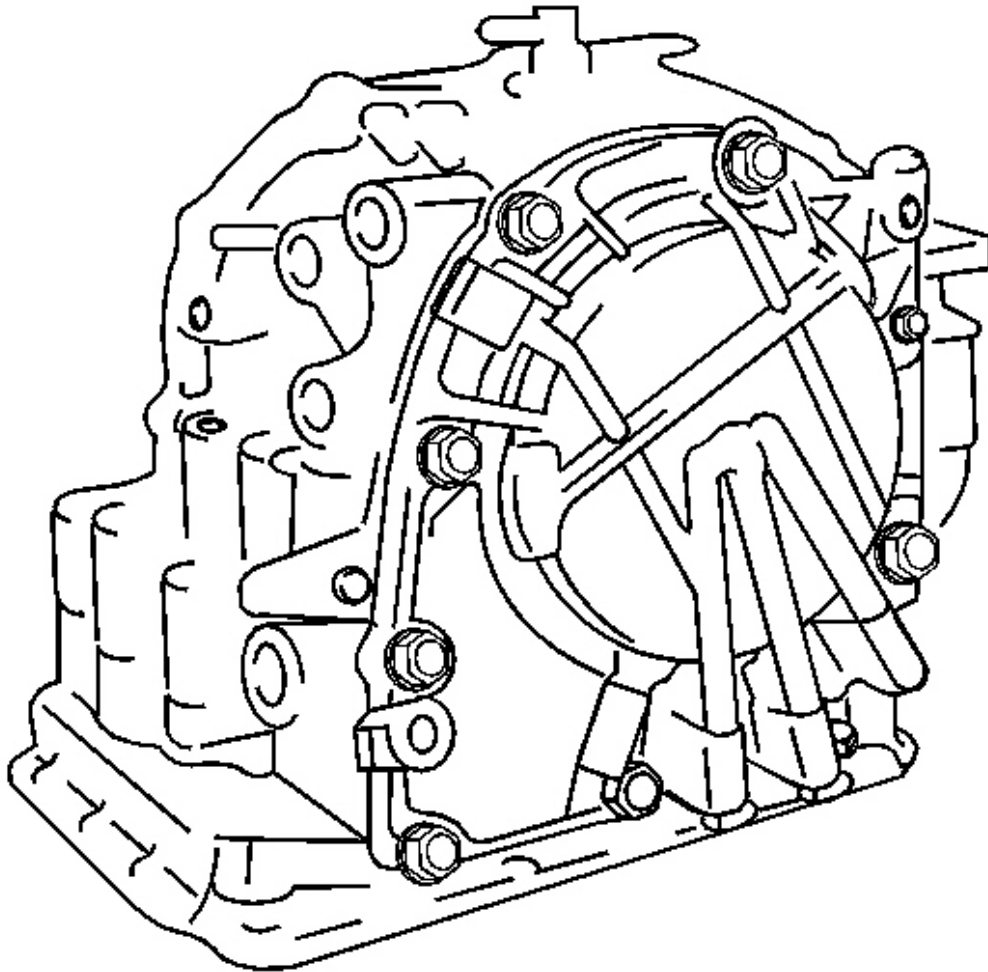


Fig. 281: Transaxle Rear Cover, Transaxle Case & Bolts
Courtesy of GENERAL MOTORS CORP.

95. Install the transaxle rear cover to the transaxle case with 9 bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

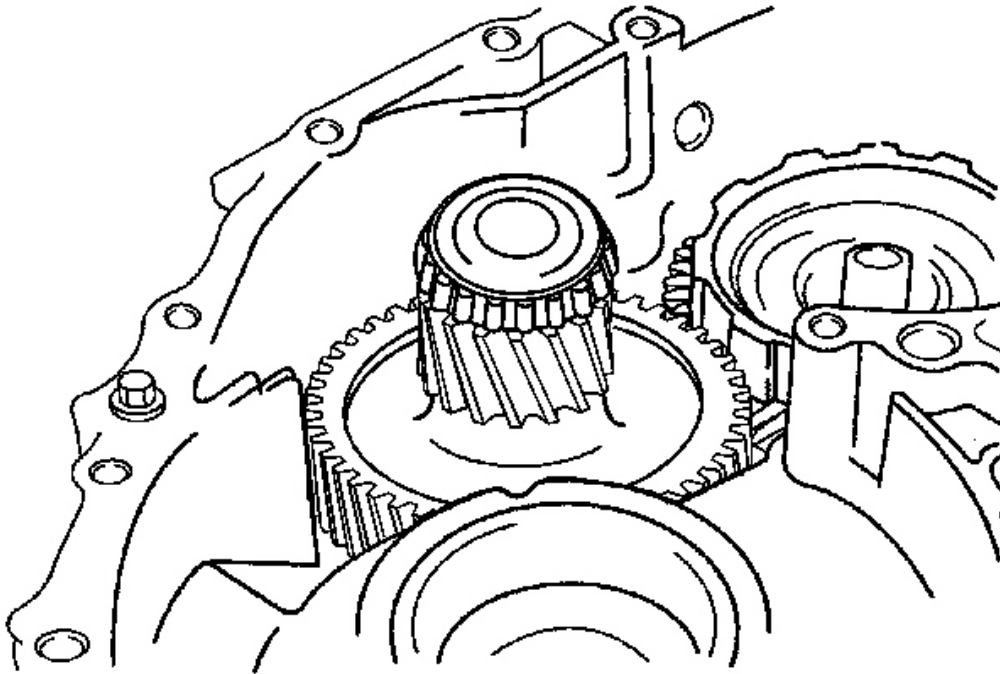


Fig. 282: Counter Driven Gear Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

96. Install the counter driven gear assembly to the transaxle case.

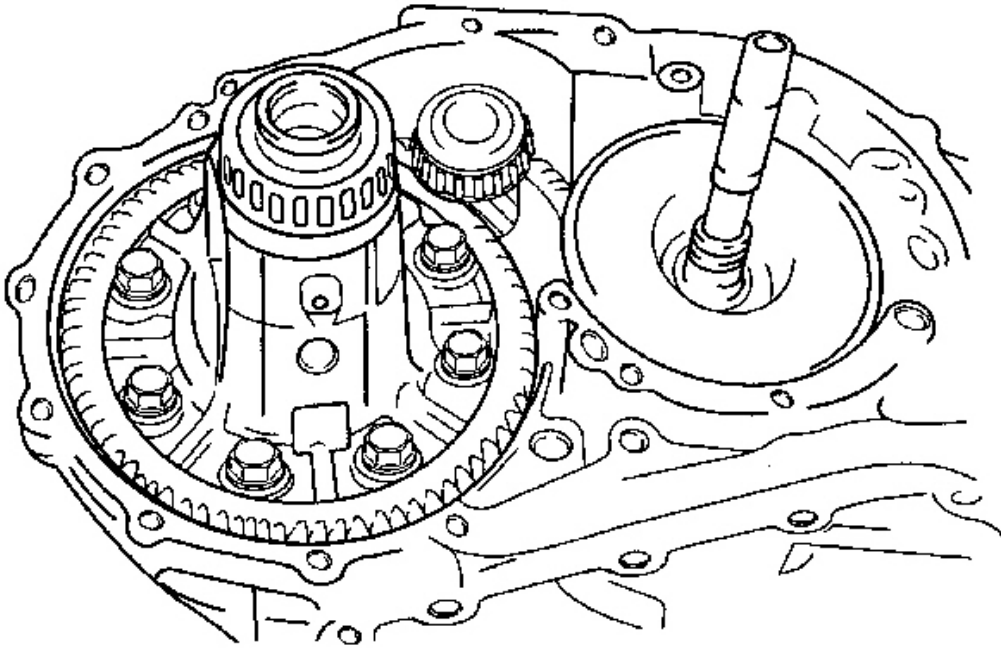


Fig. 283: Differential Gear Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

97. Install the differential gear assembly to the transaxle case.

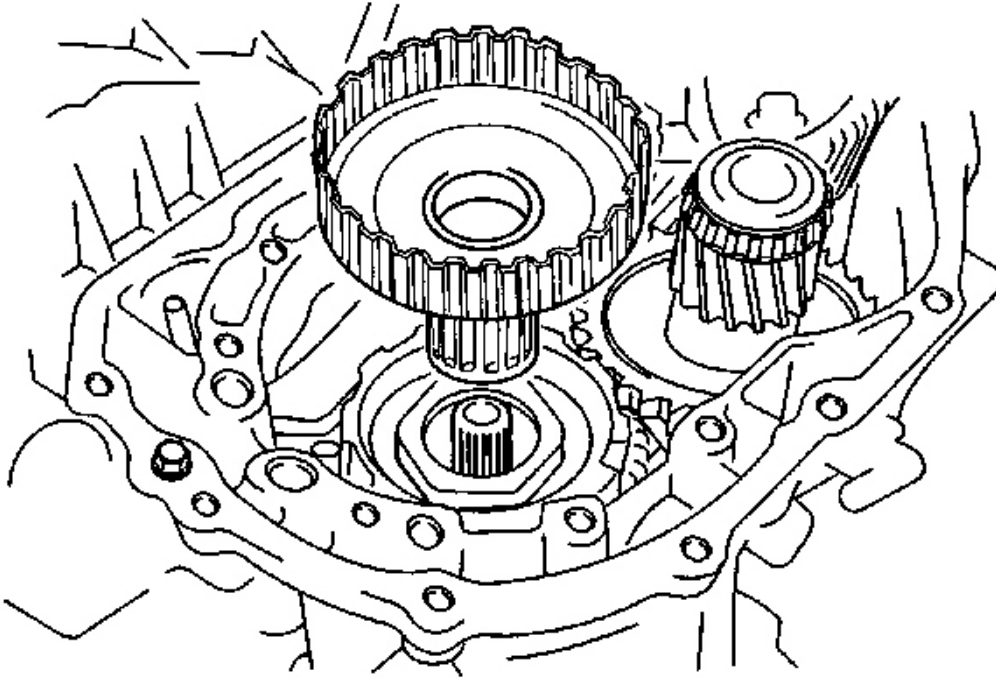


Fig. 284: Direct Clutch Hub & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

98. Install the direct clutch hub to the transaxle case.

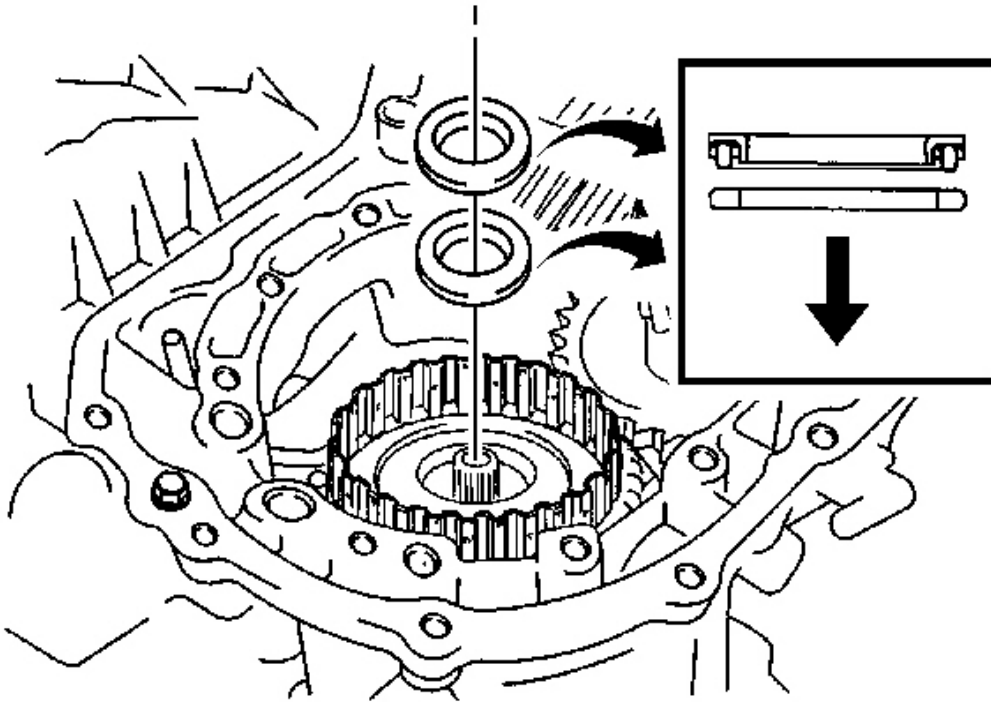


Fig. 285: Thrust Bearing Race, Thrust Needle Roller Bearing & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

99. Install the thrust bearing race and the thrust needle roller bearing to the transaxle case.

Specification:

- The race inner diameter is 20.5 mm (0.807 in).
- The race outer diameter is 32.6 mm (1.283 in).
- The bearing inner diameter is 17.8 mm (0.701 in).
- The bearing outer diameter is 30.2 mm (1.189 in).

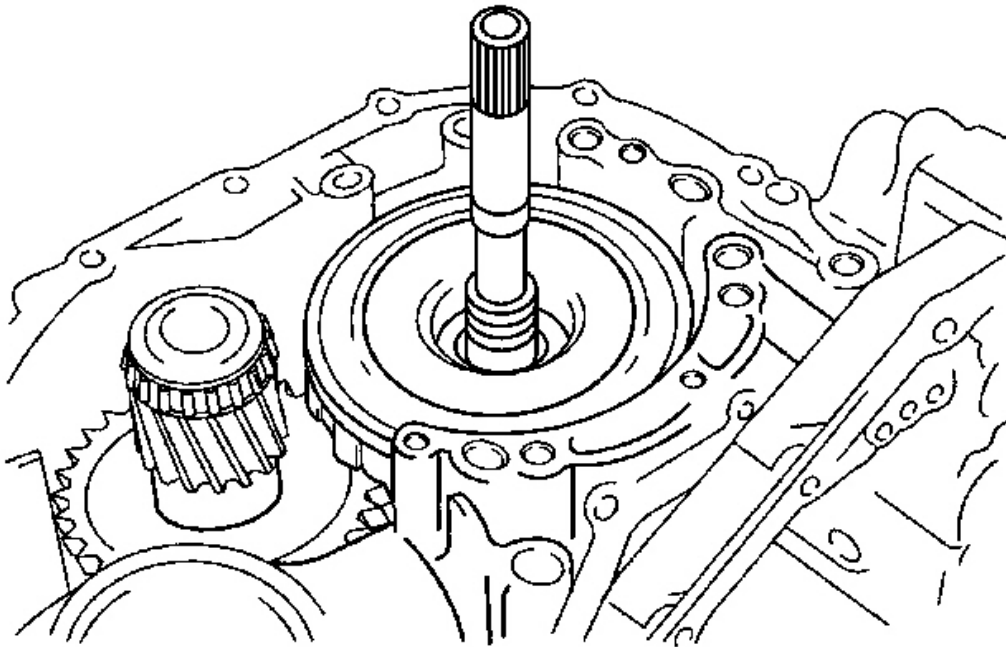


Fig. 286: Direct Clutch Assembly & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

100. Install the clutch assembly to the transaxle case.

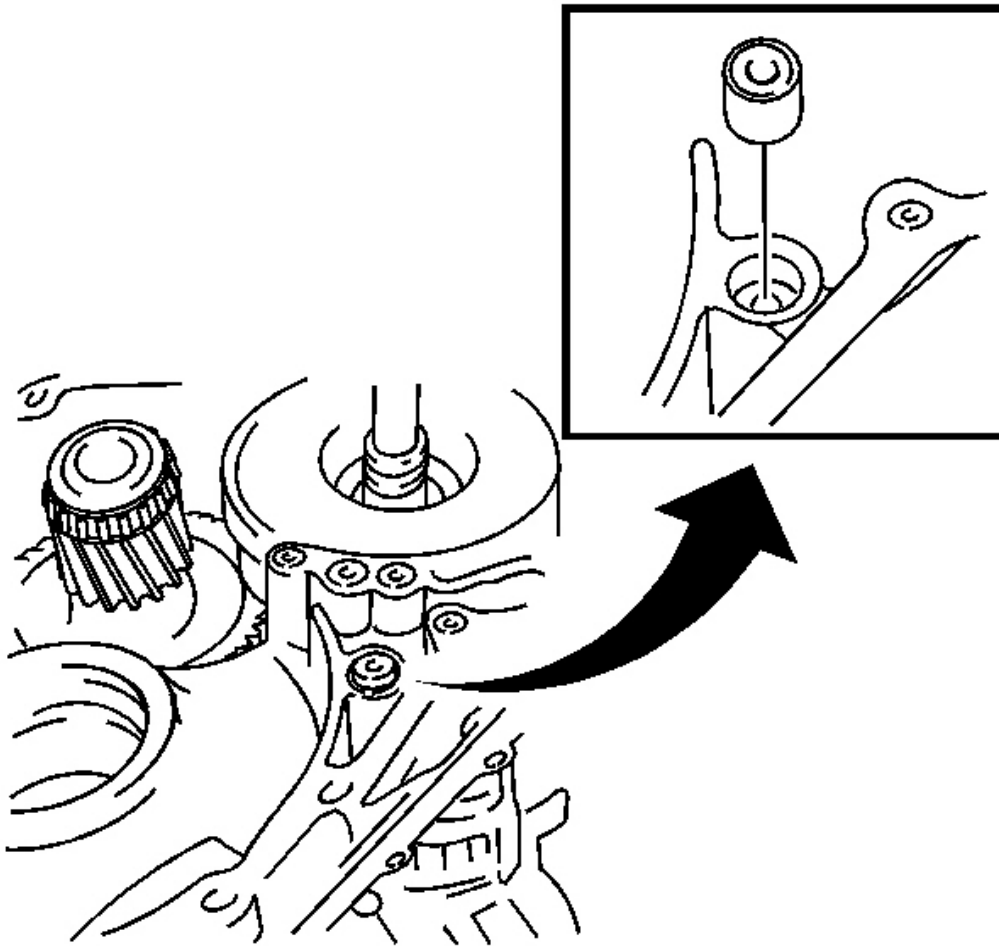


Fig. 287: Apply Gasket
Courtesy of GENERAL MOTORS CORP.

101. Install the new apply gasket.

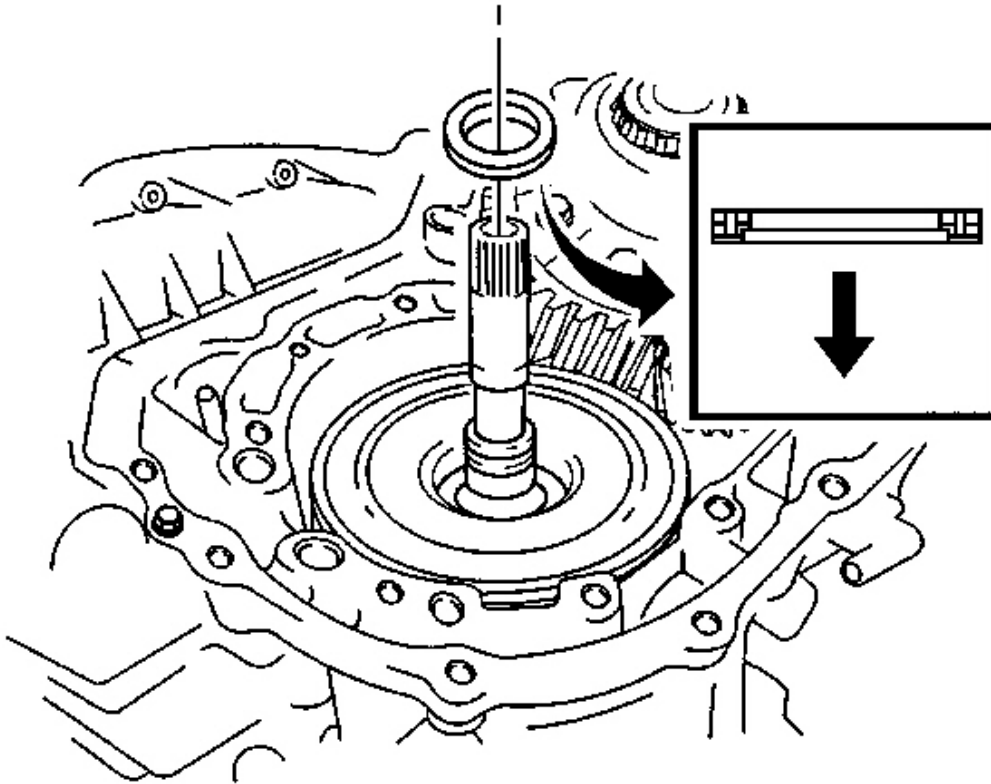


Fig. 288: Oil Pump & Input Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Verify the direction of the bearing.

102. Install the thrust needle roller bearing to the transaxle case.
103. Place the oil pump through the input shaft, and align the bolt holes of the oil pump with the transaxle case.

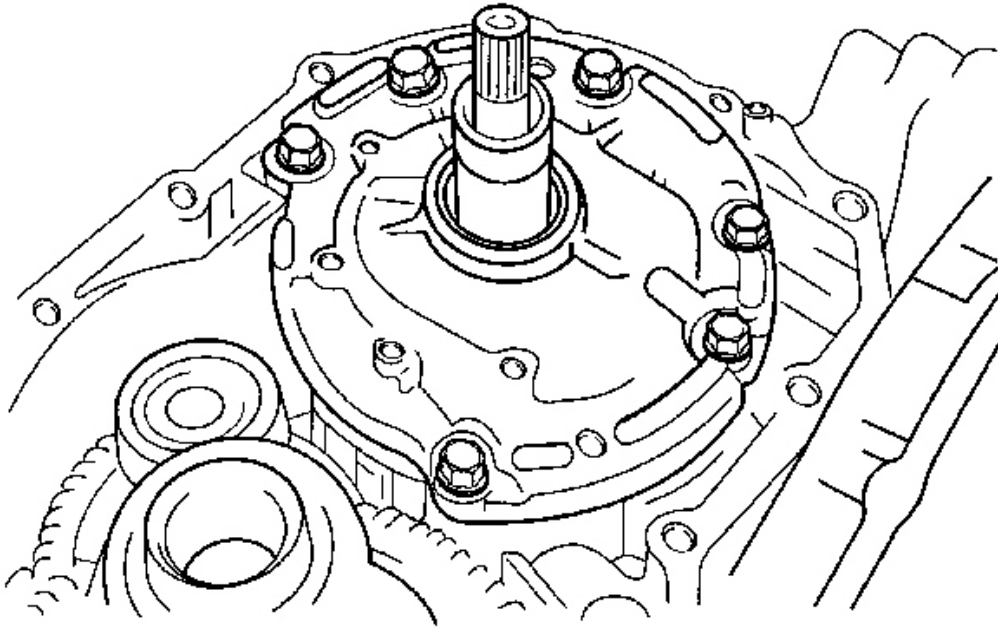


Fig. 289: Oil Pump & Bolts

Courtesy of GENERAL MOTORS CORP.

104. Install the 6 oil pump bolts.

Tighten: Tighten the bolts to 25 N.m (18 lb ft).

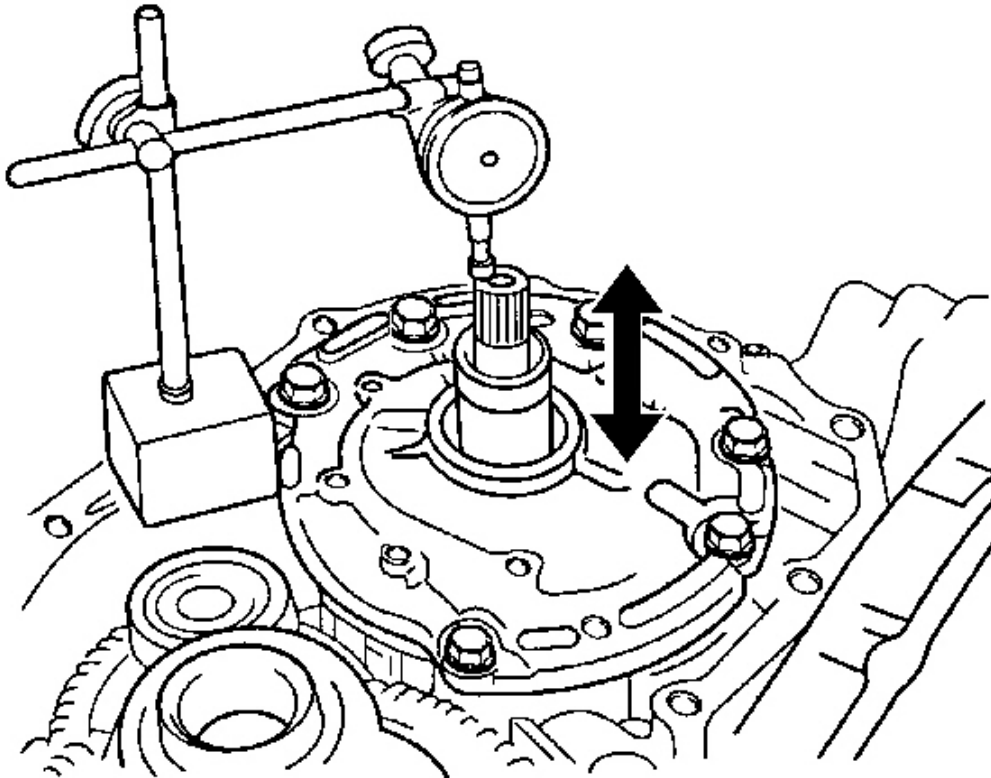


Fig. 290: Measuring The Input Shaft End Play Using A Dial Indicator

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the end play is not as specified, select and replace the thrust needle roller bearing.

105. Measure the end play in axial direction.

Specification:

- The end play is 0.3-0.9 mm (0.012-0.035 in).
- The bearing inner diameter is 32.5 mm (1.280 in).
- The bearing outer diameter is 48.5 mm (1.909 in).
- The bearing thickness is 4.21 mm (0.1657 in).
- The bearing inner diameter is 32.9 mm (1.295 in).
- The bearing outer diameter is 48.5 mm (1.909 in).
- The bearing thickness is 3.62 mm (0.1425 in).

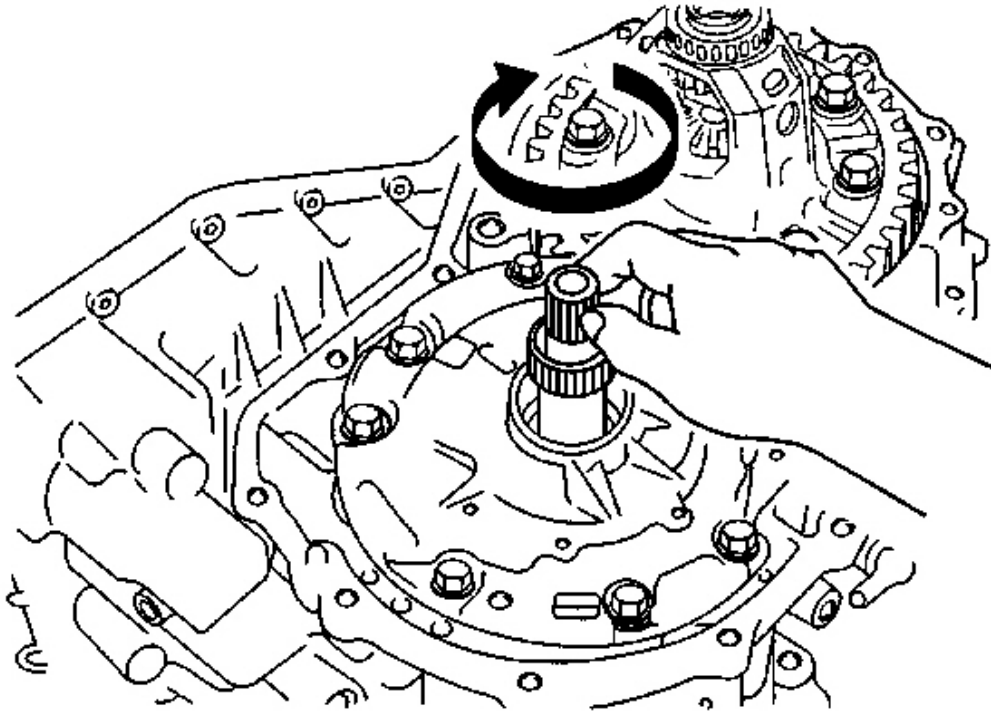


Fig. 291: Confirming Input Shaft Rotates Smoothly
Courtesy of GENERAL MOTORS CORP.

106. Confirm that the input shaft rotates smoothly.

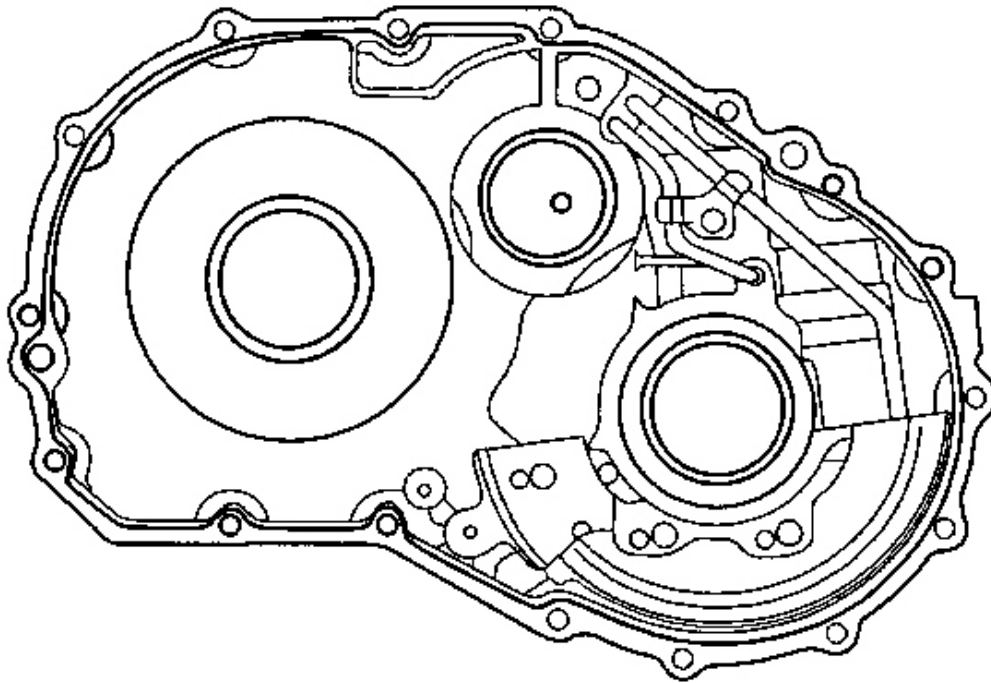


Fig. 292: FIPG & Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

107. Remove any packing material. Do not get oil on the contacting surfaces of the transaxle housing or the transaxle case.
108. Apply a formed in place gasket (FIPG) to the transaxle housing.

Specification: FIPG: Three bond 1281 or equivalent, seal bend width is 1.2 mm (0.047 in).

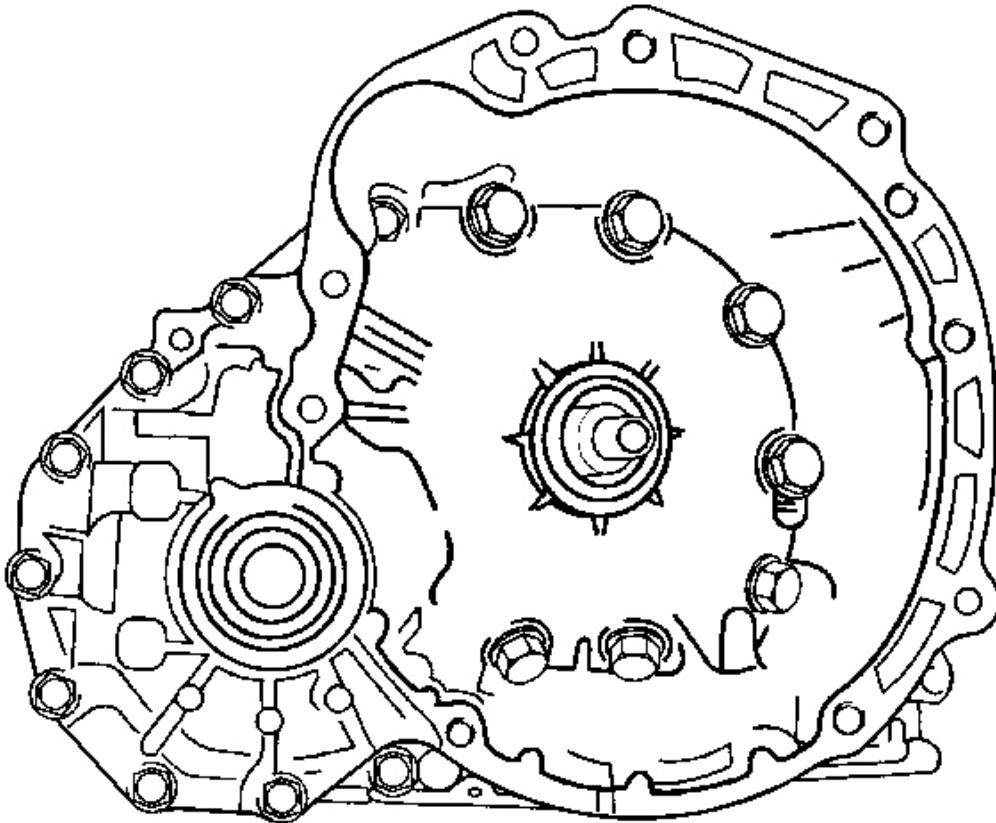


Fig. 293: Transaxle Housing, Transaxle Case & Bolts
Courtesy of GENERAL MOTORS CORP.

109. Install the transaxle housing to the transaxle case with 16 bolts.

Tighten: Tighten the bolts to 29 N.m (22 lb ft).

110. Apply seal packing or equivalent to the 3 bolts.

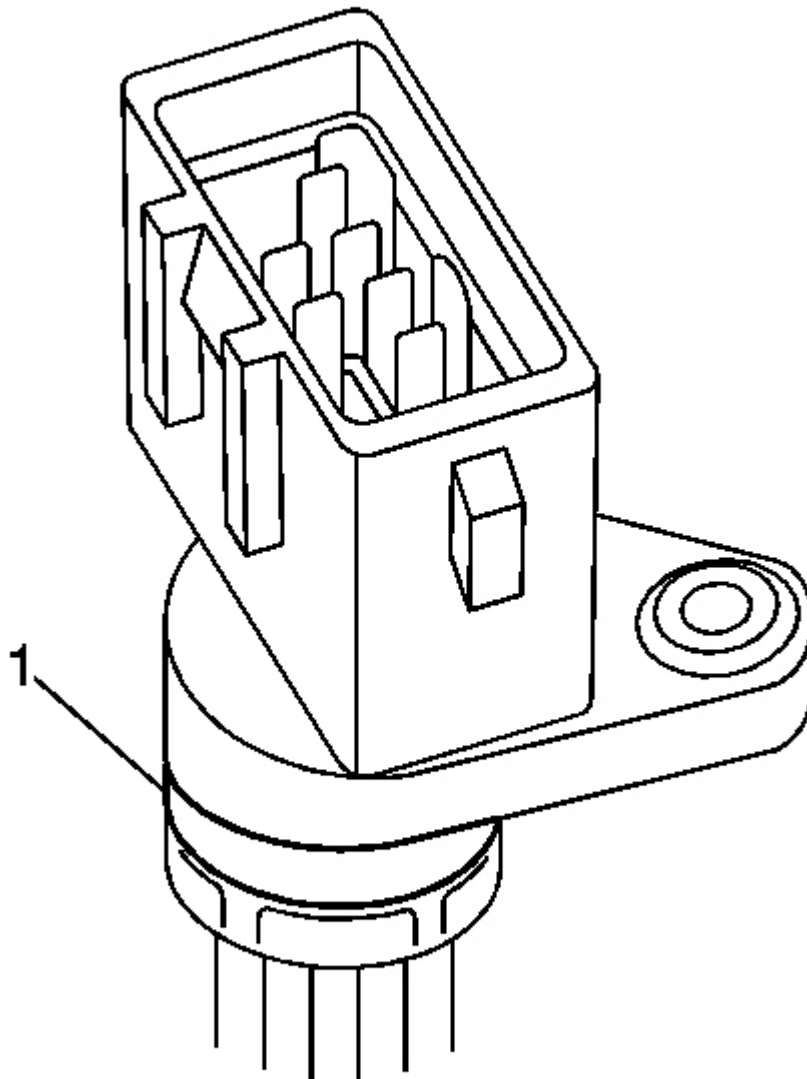


Fig. 294: O-Ring & Transaxle Wire
Courtesy of GENERAL MOTORS CORP.

111. Coat a new O-ring (1) with ATF, install the O-ring to the transaxle wire.

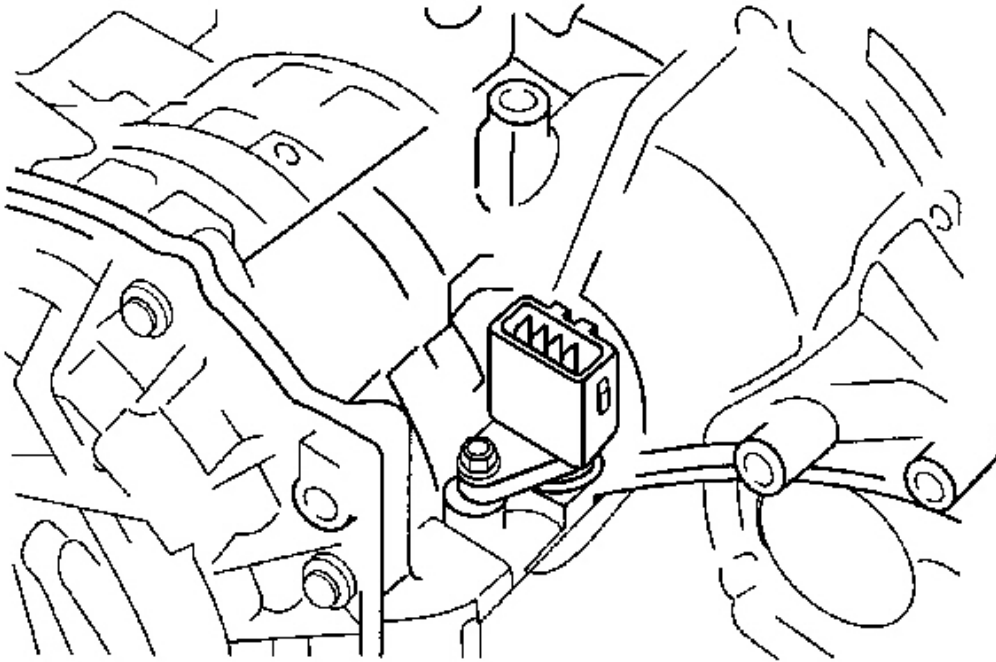


Fig. 295: Transaxle Wire & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

112. Install the transaxle wire to the transaxle case with the bolt.

Tighten: Tighten the bolt to 5.4 N.m (48 lb in).

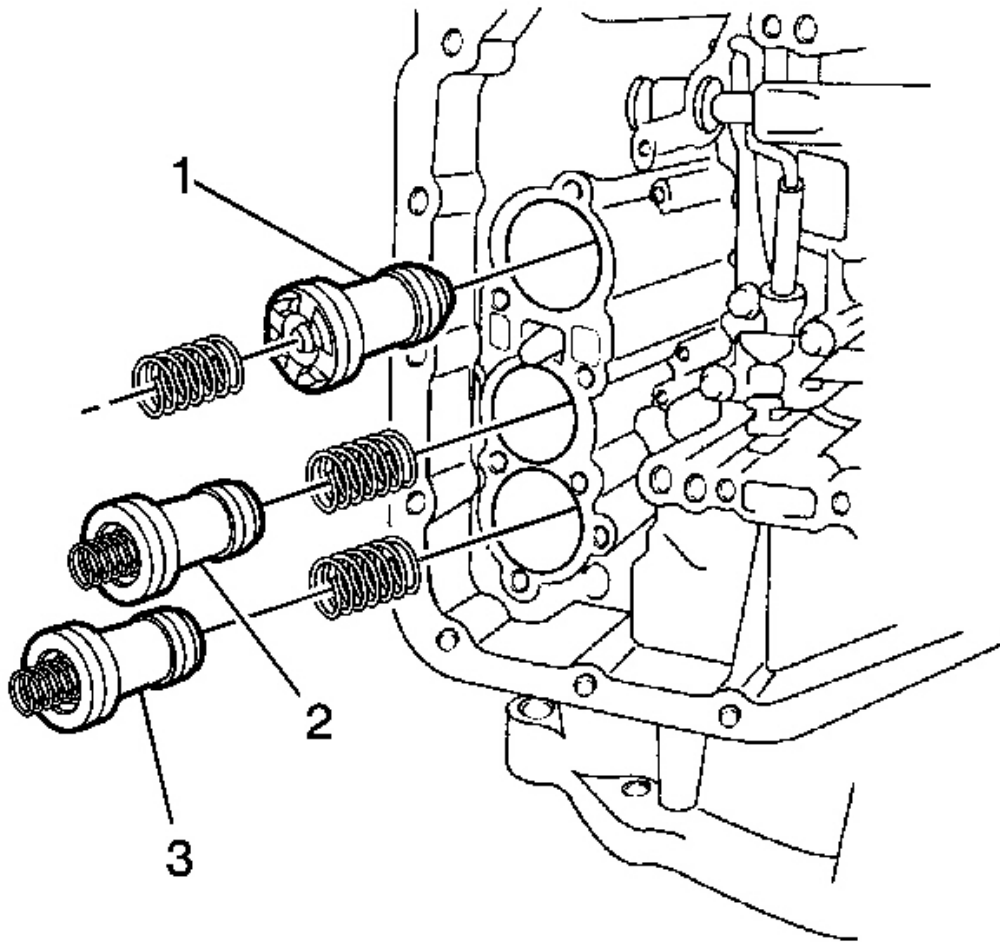


Fig. 296: O-Rings, ATF & Pistons
Courtesy of GENERAL MOTORS CORP.

113. Coat new 6 O-rings with ATF and install the O-rings to the pistons (1,2,3).
114. Coat the 3 springs and 3 accumulator pistons with ATF and install the components to the holes.

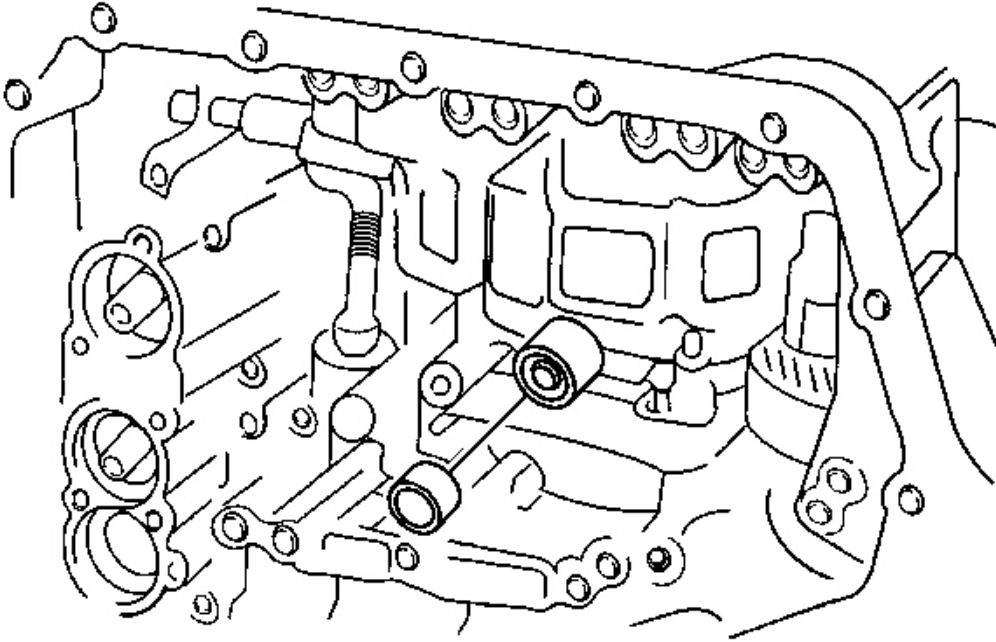


Fig. 297: Apply Gasket
Courtesy of GENERAL MOTORS CORP.

115. Coat a new apply gasket with ATF and install the gasket to the transaxle case.

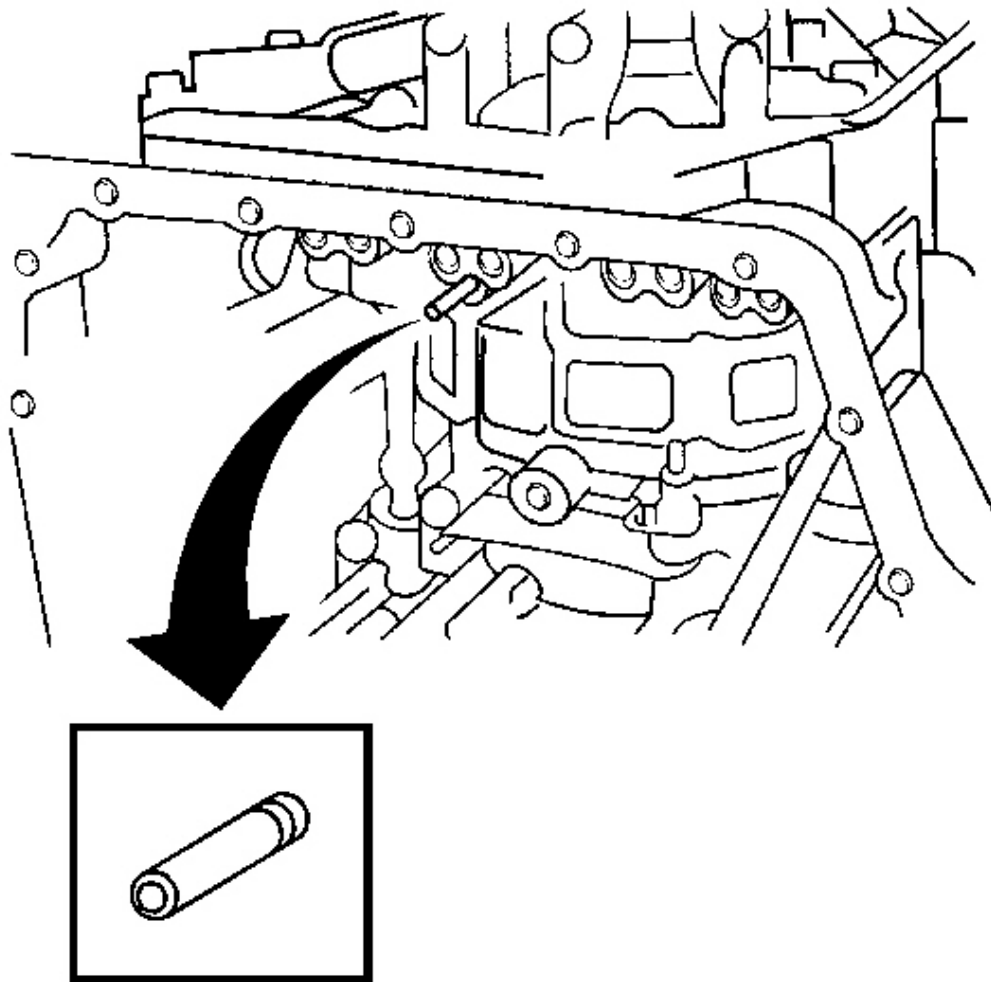


Fig. 298: Brake Drum Gasket

Courtesy of GENERAL MOTORS CORP.

116. Coat a new brake drum gasket with ATF and install the gasket to the transaxle case.

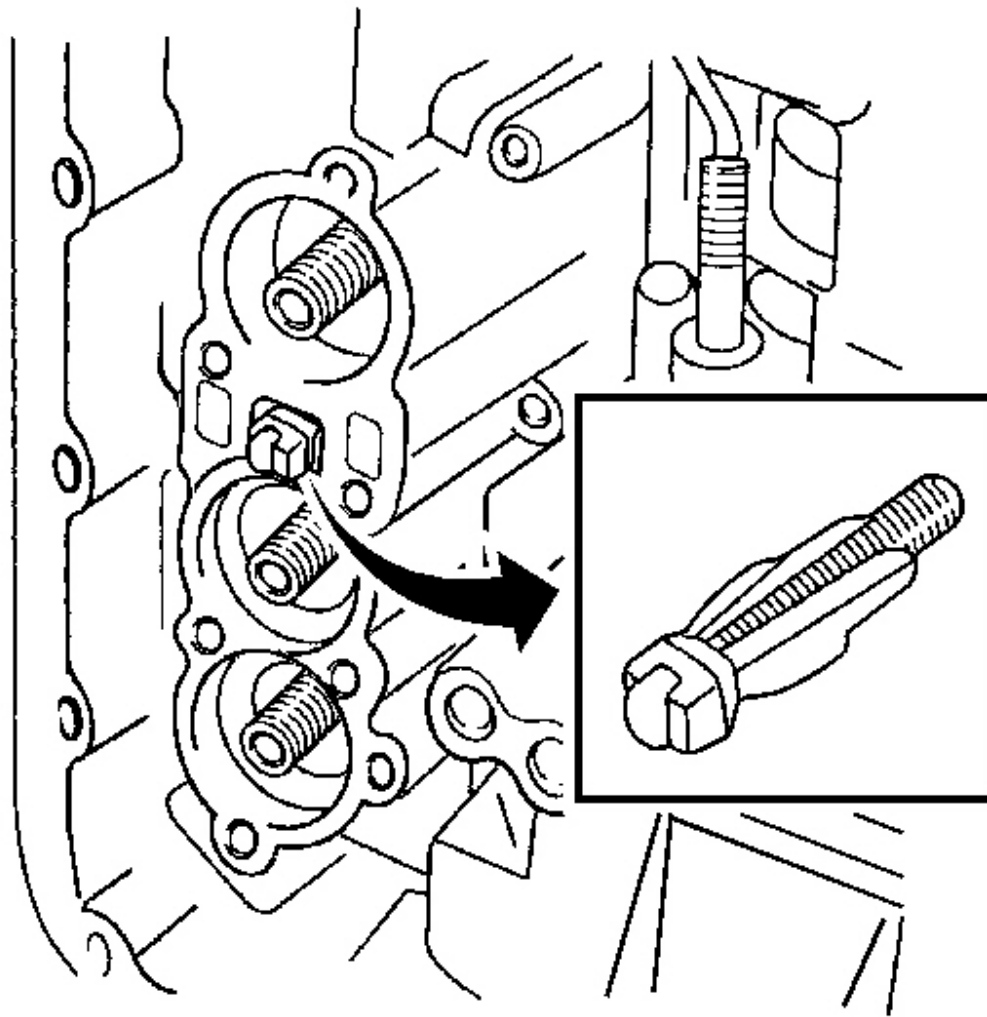


Fig. 299: Check Valve & Spring
Courtesy of GENERAL MOTORS CORP.

117. Install the spring and the check valve.

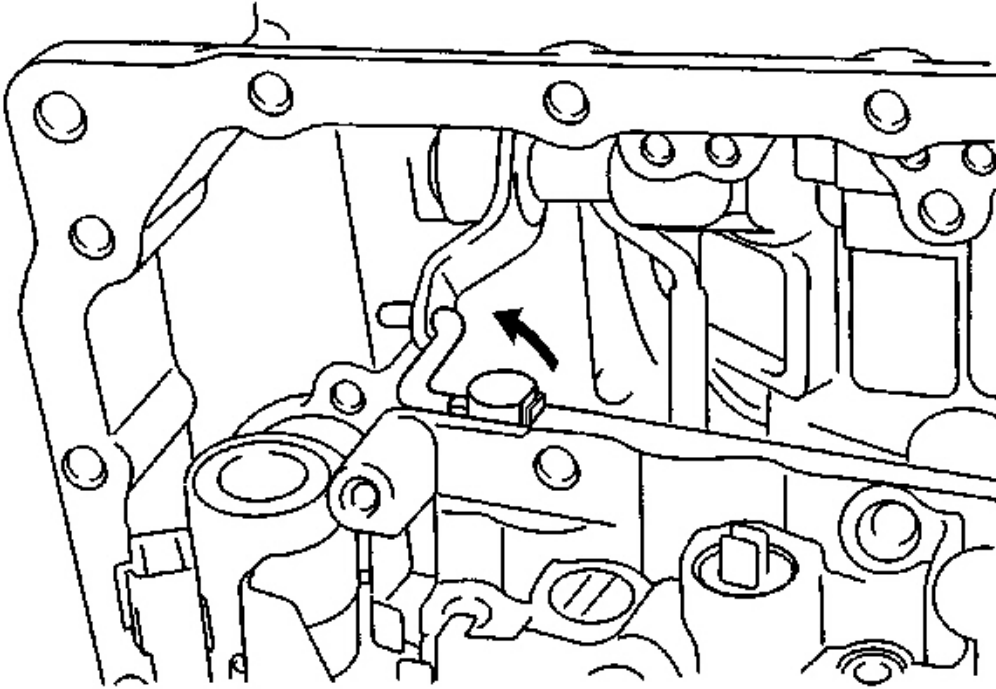


Fig. 300: Manual Valve Control Rod & Manual Valve Lever
Courtesy of GENERAL MOTORS CORP.

118. Connect the manual valve control rod to the manual valve lever as shown in the illustration.

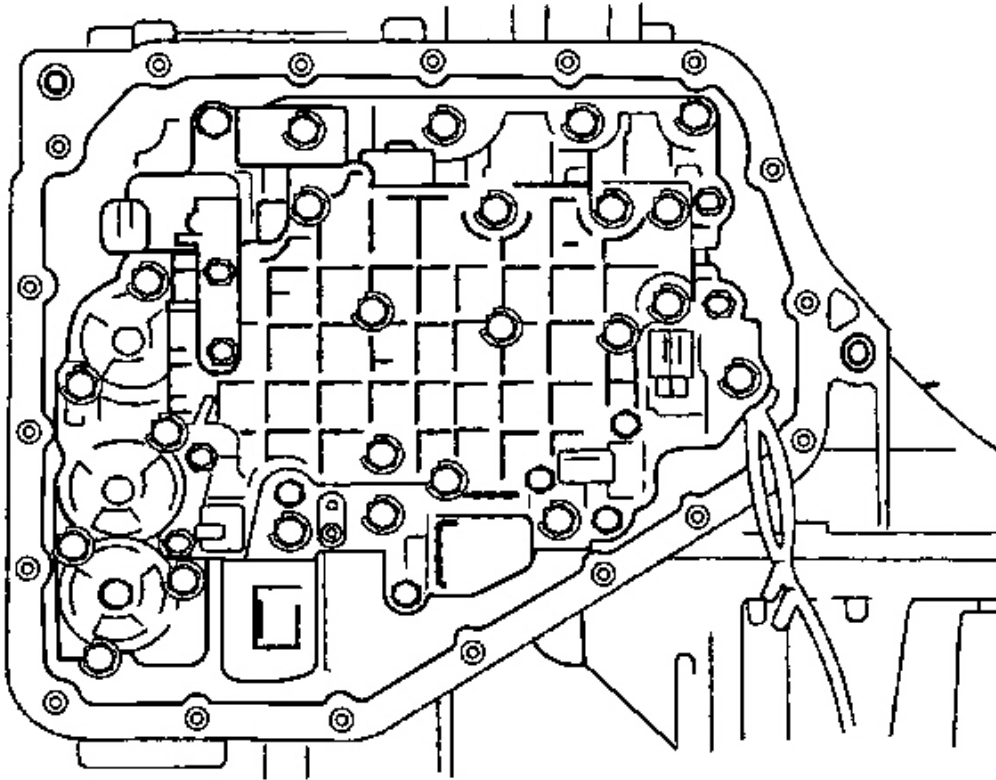


Fig. 301: Valve Body Assembly

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: When installing the valve body to the transaxle case, do not let each of the accumulator pistons incline. When installing the valve body to the transaxle case, do not hold the solenoids.

119. Install the valve body assembly to the transaxle case.

Tighten: Tighten the bolts to 11 N.m (97 lb in).

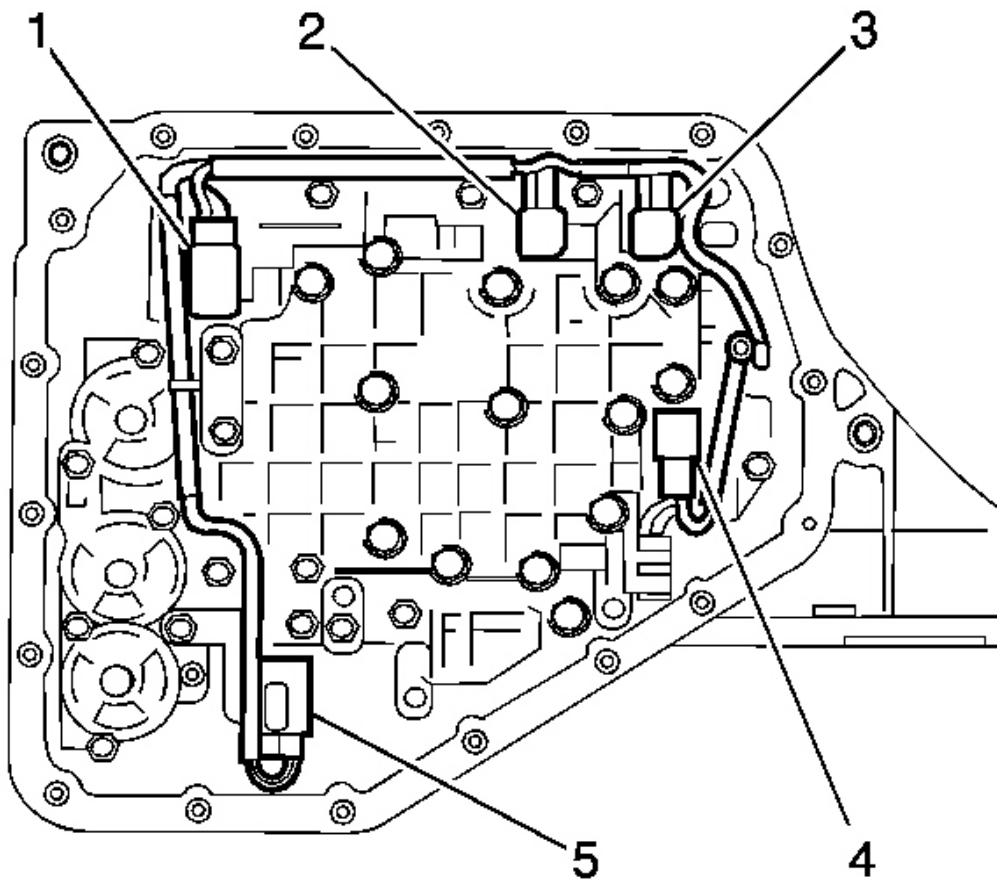


Fig. 302: Solenoid Connectors

Courtesy of GENERAL MOTORS CORP.

120. Connect the transaxle wire connector and harness to the valve body assembly.
121. Connect the 5 connectors.
 1. The lock-up control solenoid (5)
 2. The pressure control solenoid (1)
 3. The No. 2 shift solenoid (2)
 4. The No. 1 shift solenoid (3)
 5. The timing solenoid (4)

IMPORTANT: Verify that the transaxle wire does not come out from the oil pan installations surface.

122. Install the TFT sensor with a clamp.

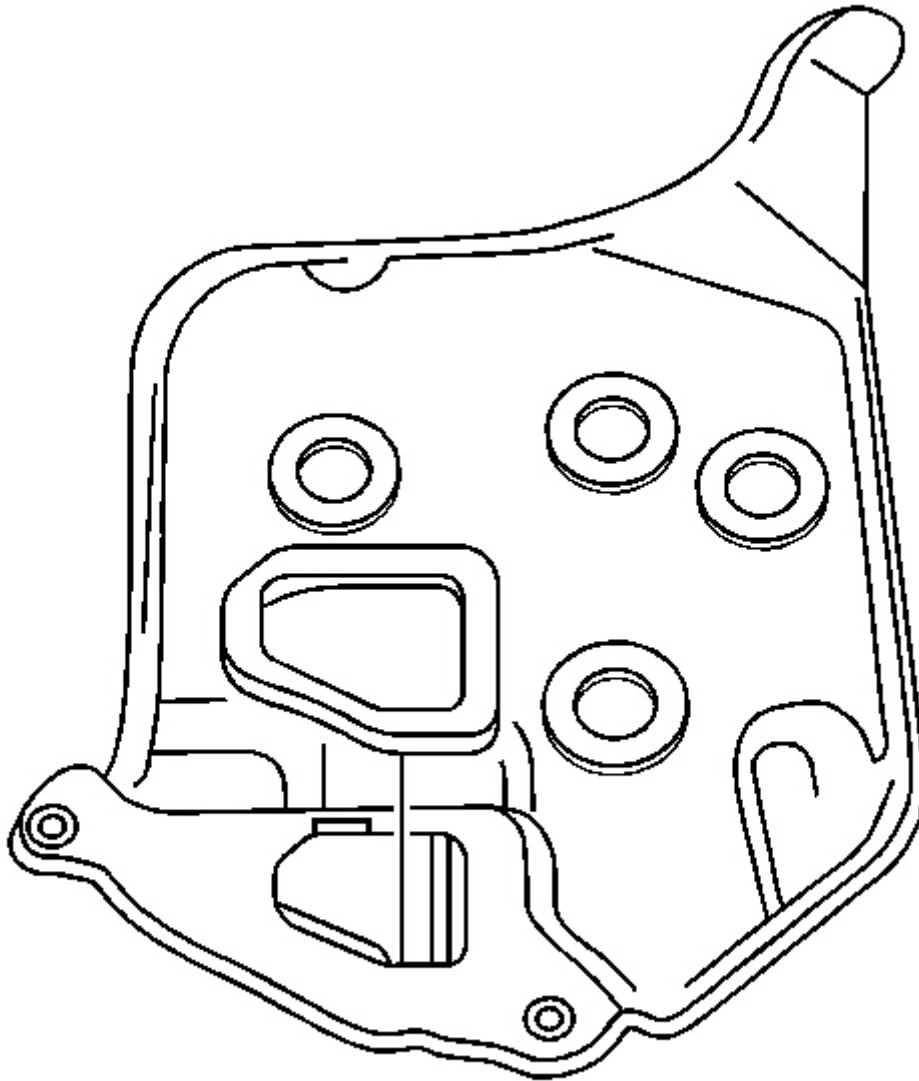


Fig. 303: Gasket

Courtesy of GENERAL MOTORS CORP.

123. Install a new gasket to the oil strainer.

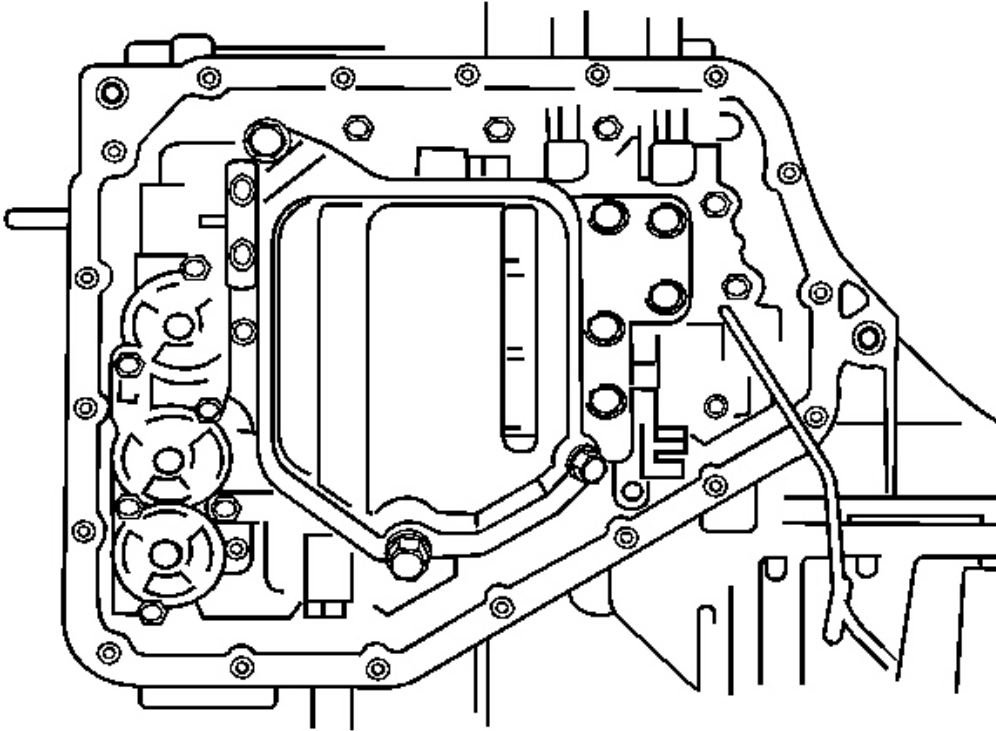


Fig. 304: Oil Strainer

Courtesy of GENERAL MOTORS CORP.

124. Install the oil strainer to the valve body with 3 bolts.

Tighten: Tighten the bolts to 9.8 N.m (87 lb in).

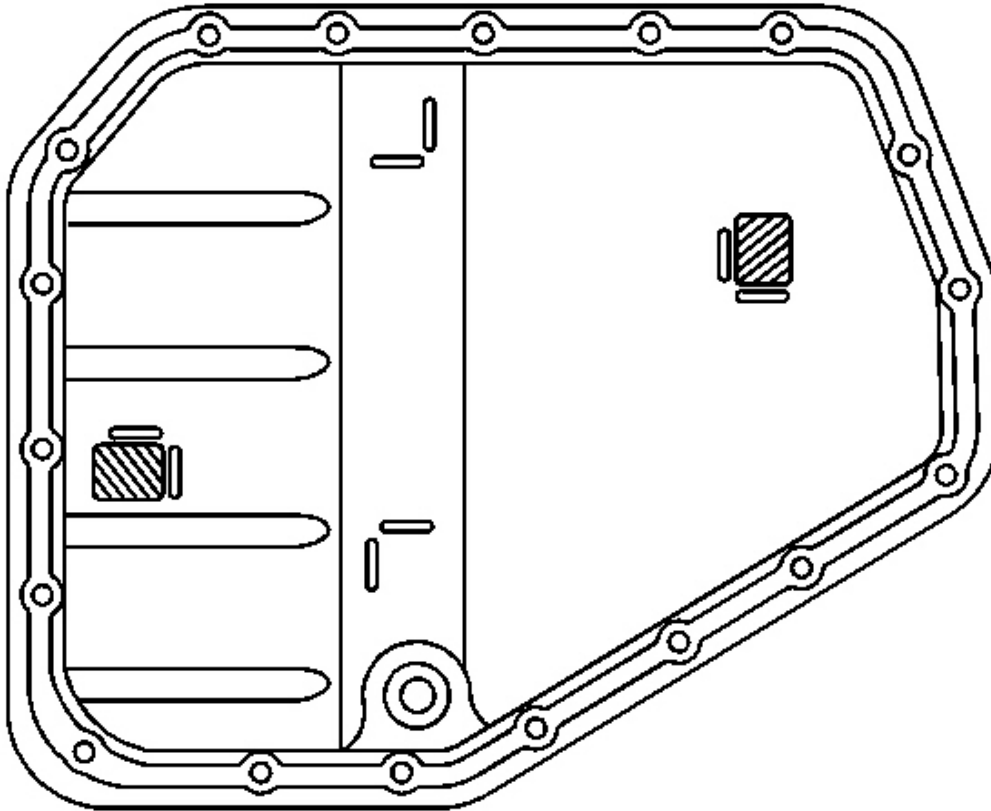


Fig. 305: Magnets & Oil Pan

Courtesy of GENERAL MOTORS CORP.

125. Install 2 magnets in the oil pan.

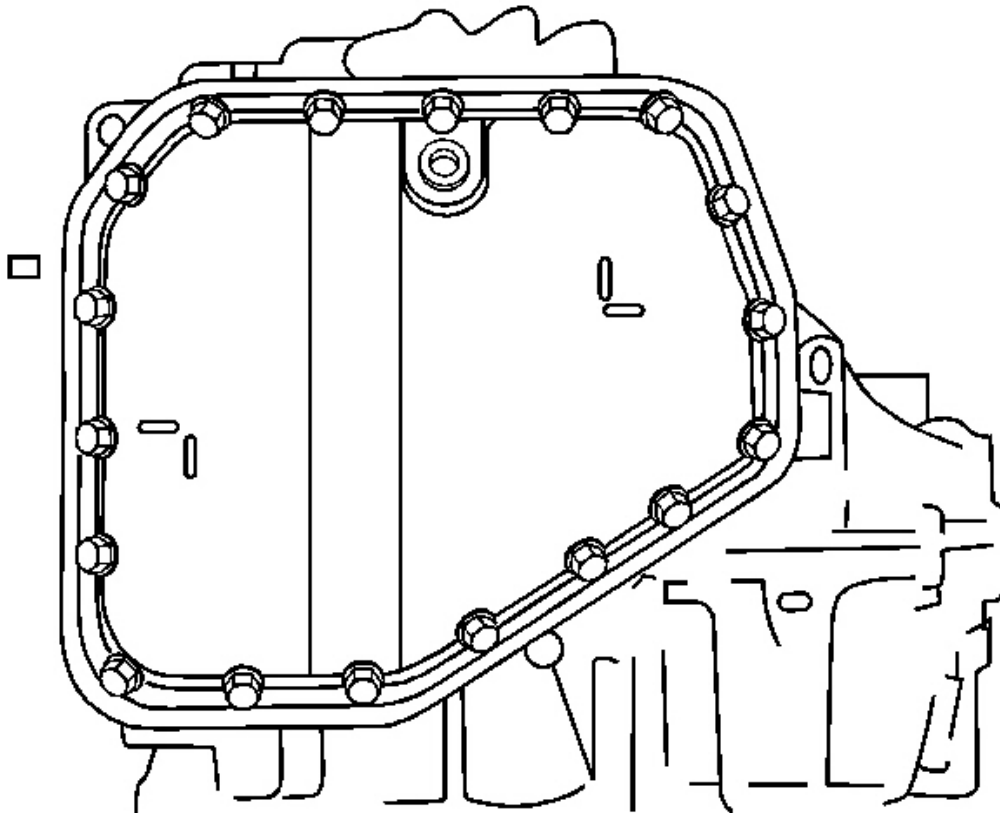


Fig. 306: Oil Pan & Gasket

Courtesy of GENERAL MOTORS CORP.

126. Install a new gasket to the oil pan and install the oil pan to the transaxle case with 18 bolts.

Tighten: Tighten the bolts to 7 N.m (62 lb in).

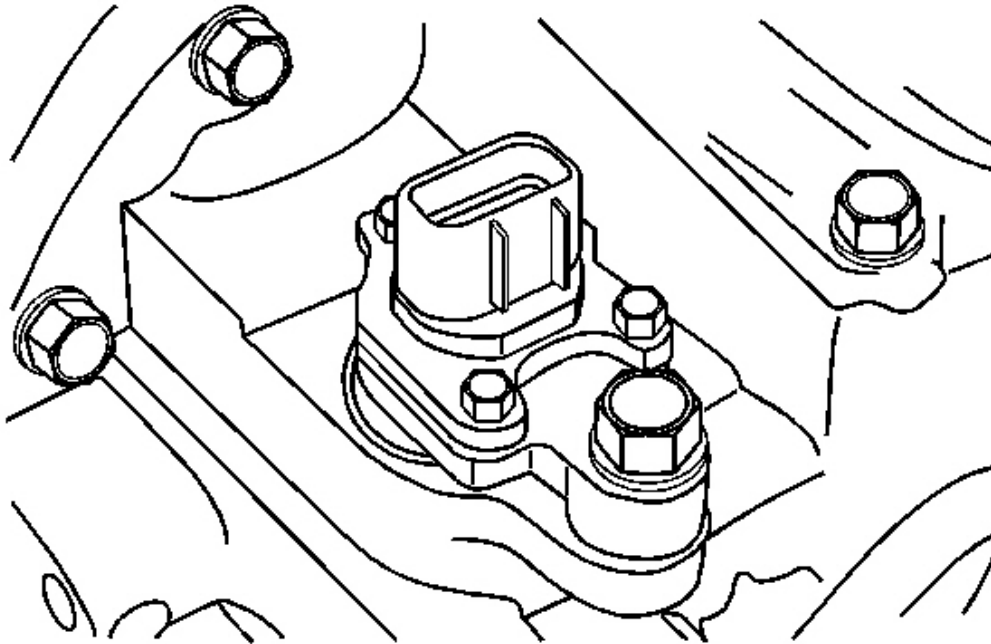


Fig. 307: OSS Sensor & Bolts
Courtesy of GENERAL MOTORS CORP.

127. Install the output shaft speed (OSS) sensor.

Tighten: Tighten the bolt to 7.4 N.m (65 lb in).

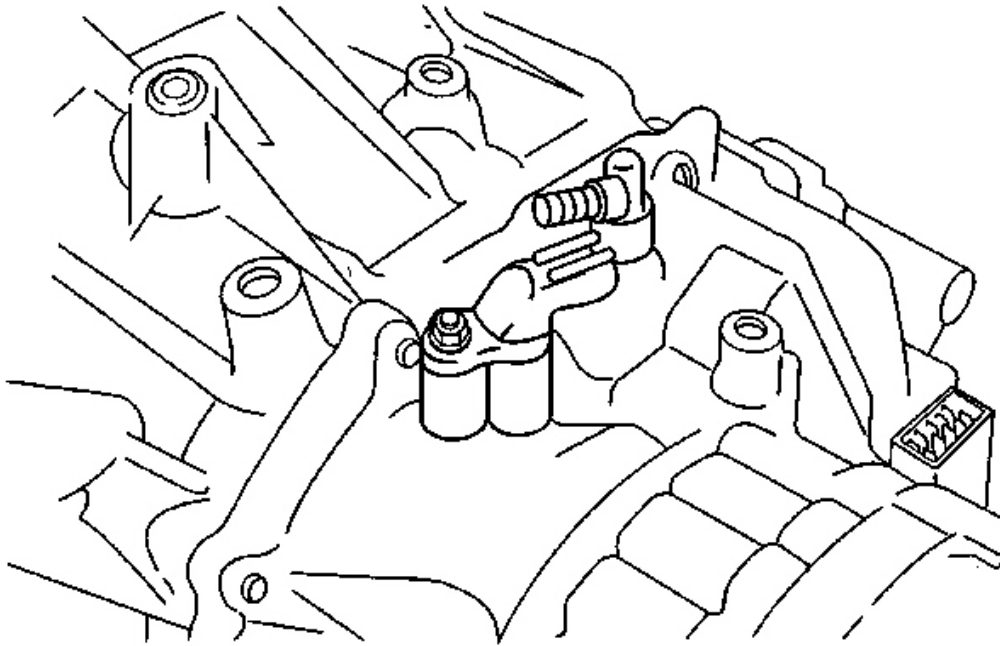


Fig. 308: ISS Sensor & Bolts

Courtesy of GENERAL MOTORS CORP.

128. Install the No. 1 breather plug.
129. Install the input shaft speed (ISS) sensor with the bolt.

Tighten: Tighten the bolt to the 5.4 N.m (48 lb in).

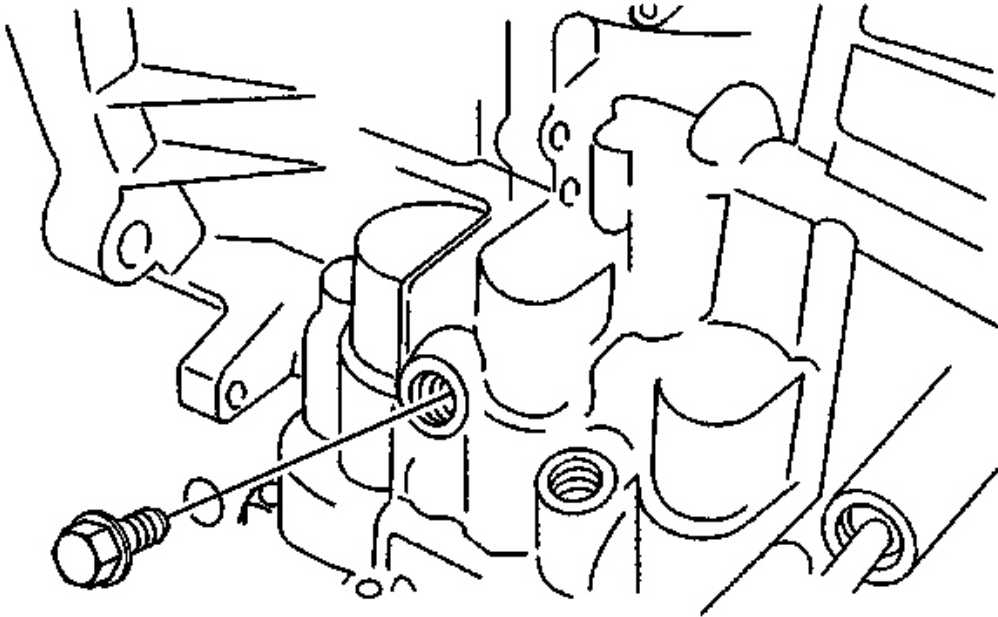


Fig. 309: Screw Plug & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

130. Coat the new O-ring with ATF and install the O-ring to the screw plug.
131. Install the screw plug to the transaxle case.

Tighten: Tighten the bolts to 7.4 N.m (65 lb in).

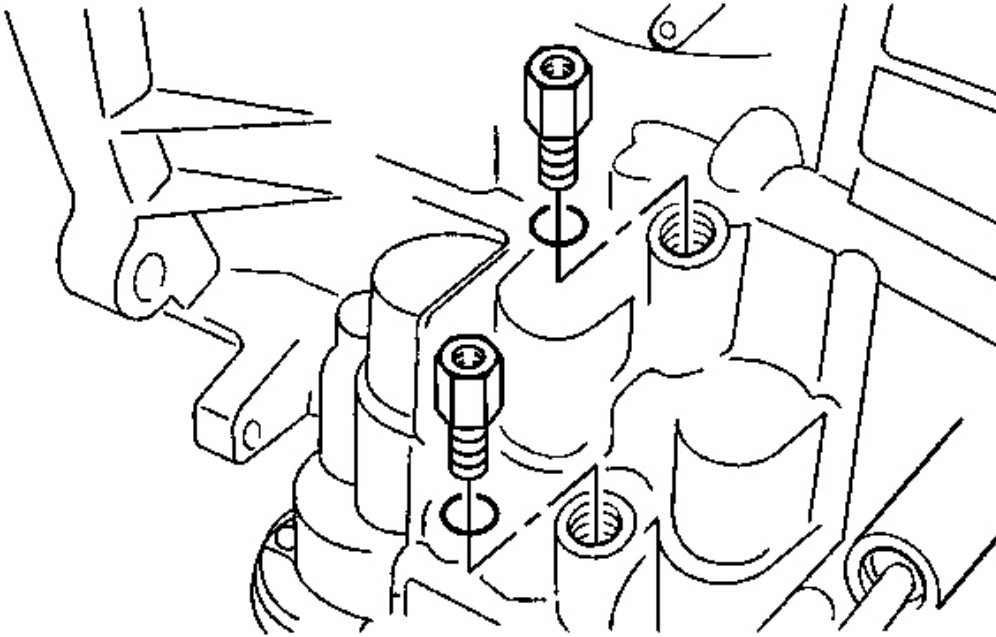


Fig. 310: Unions & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

132. Coat 2 new O-rings with ATF and install the O-rings to the unions.
133. Install the 2 unions to the transaxle case.

Tighten: Tighten the unions to 25 N.m (18 lb ft).

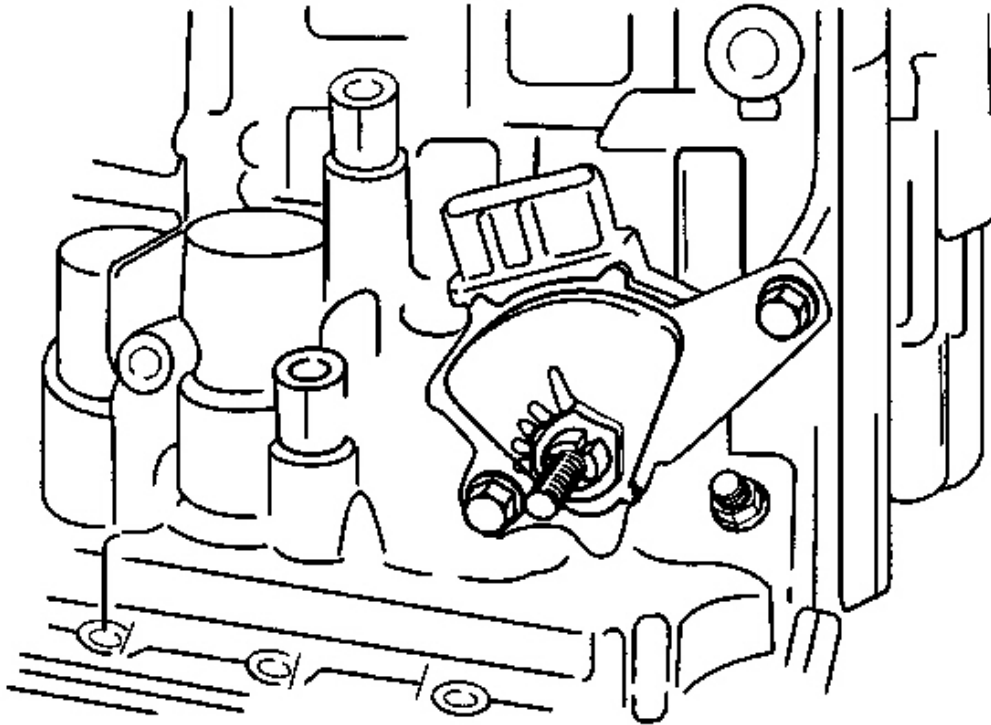


Fig. 311: PNP Switch & Manual Valve Lever Shaft
Courtesy of GENERAL MOTORS CORP.

134. Install the PNP switch to the manual valve lever shaft and temporarily install the 2 adjusting bolts.
135. Install a new lock washer and nuts.

Tighten: Tighten the nuts to 12 N.m (106 lb in).

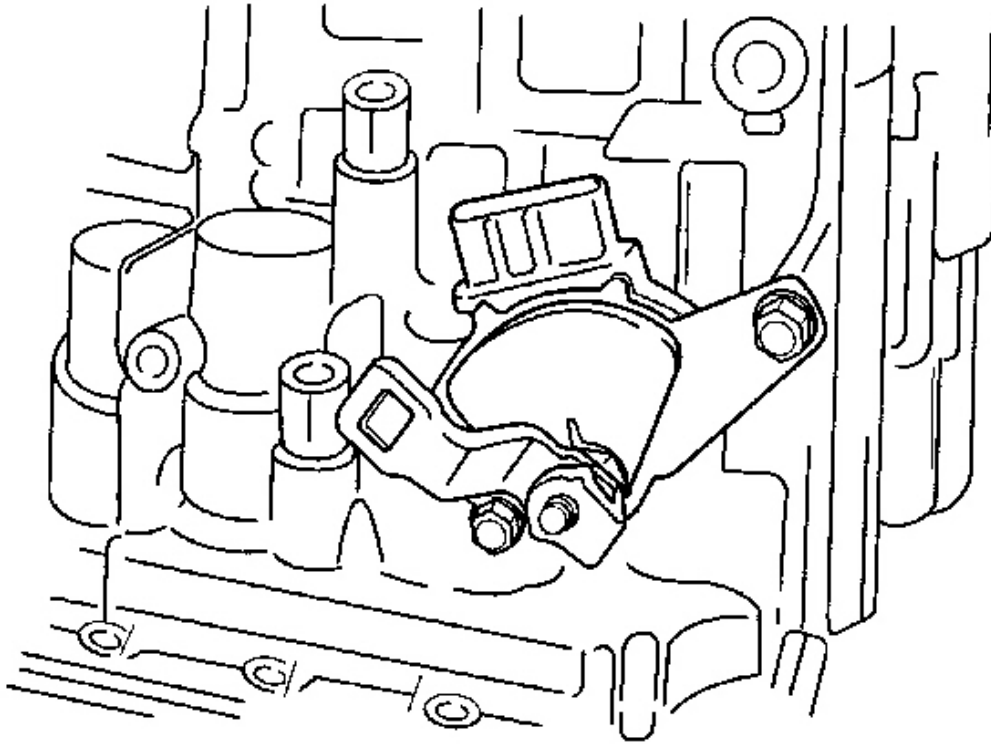


Fig. 312: Control Lever

Courtesy of GENERAL MOTORS CORP.

136. Temporarily install the control lever.

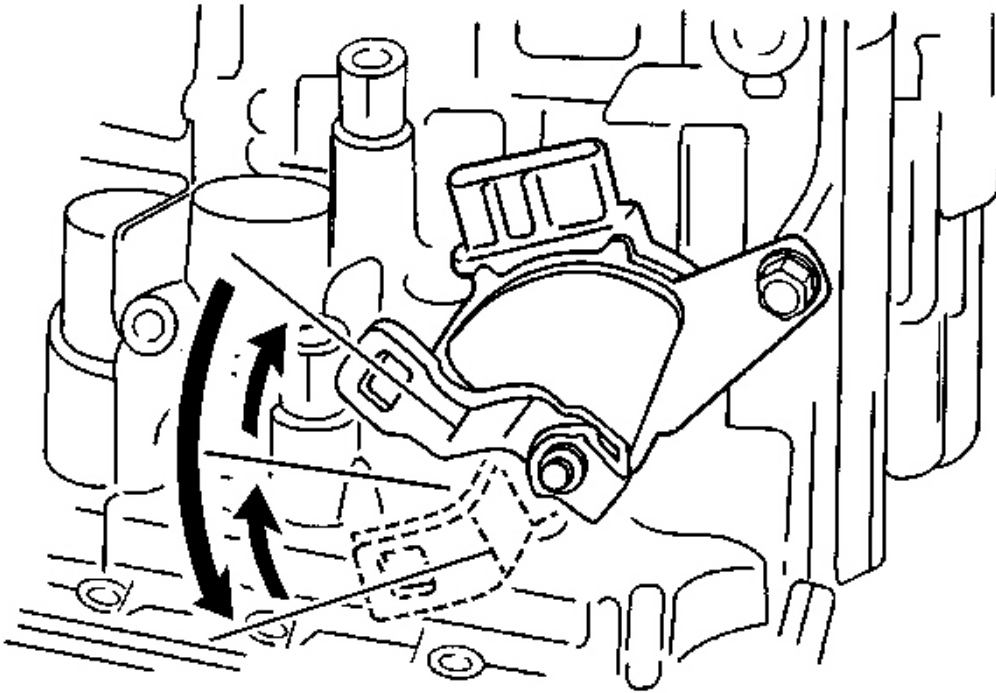


Fig. 313: Turning PNP Switch Lever
Courtesy of GENERAL MOTORS CORP.

137. Turn the lever counterclockwise until the lever stops, then turn clockwise 2 notches.
138. Remove the control lever.

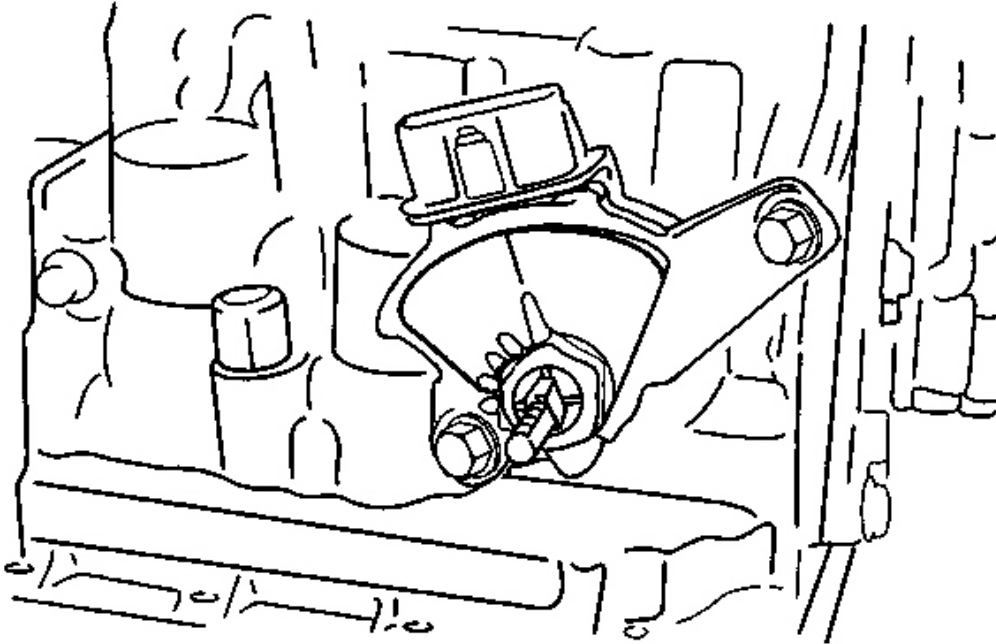


Fig. 314: Aligning Groove With Neutral Basic Line
Courtesy of GENERAL MOTORS CORP.

139. Align the groove with the neutral basic line. Tighten 2 bolts.

Tighten: Tighten the bolts to 5.4 N.m (48 lb in).

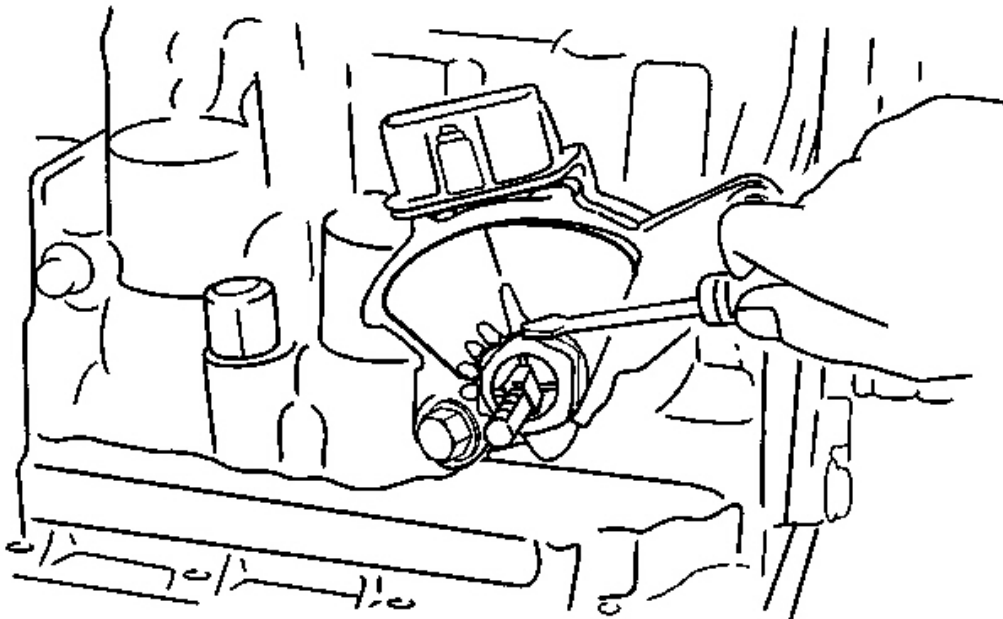


Fig. 315: Staking The Nut With Lock Washer Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

140. Using a screwdriver, stake the nut with the lock washer.

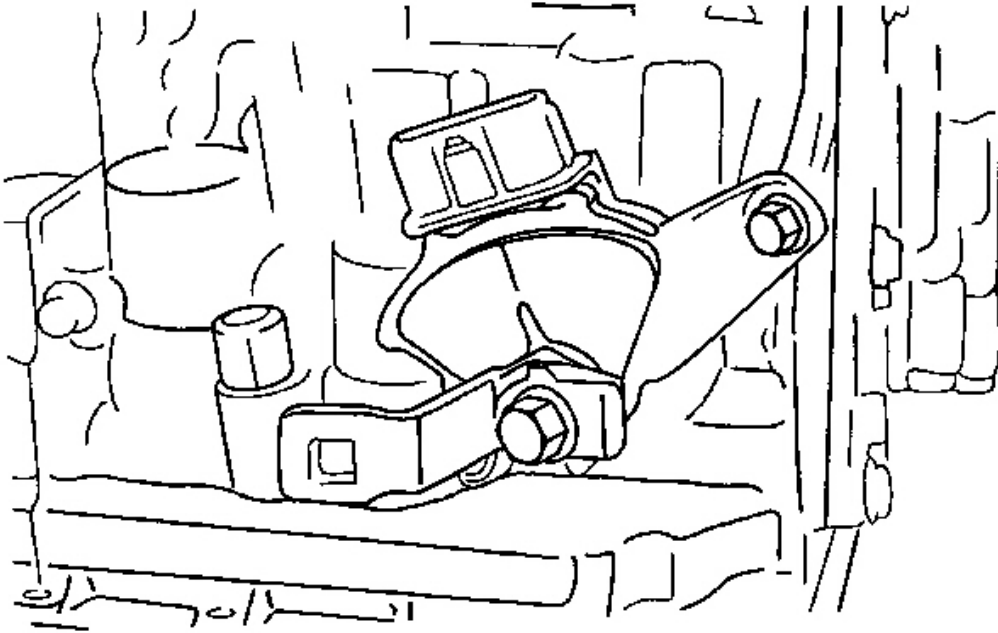


Fig. 316: PNP Switch Control Lever, Washer & Nut
Courtesy of GENERAL MOTORS CORP.

141. Install the control lever, the washer and the nut.

Tighten: Tighten the nut to 12 N.m (106 lb in).

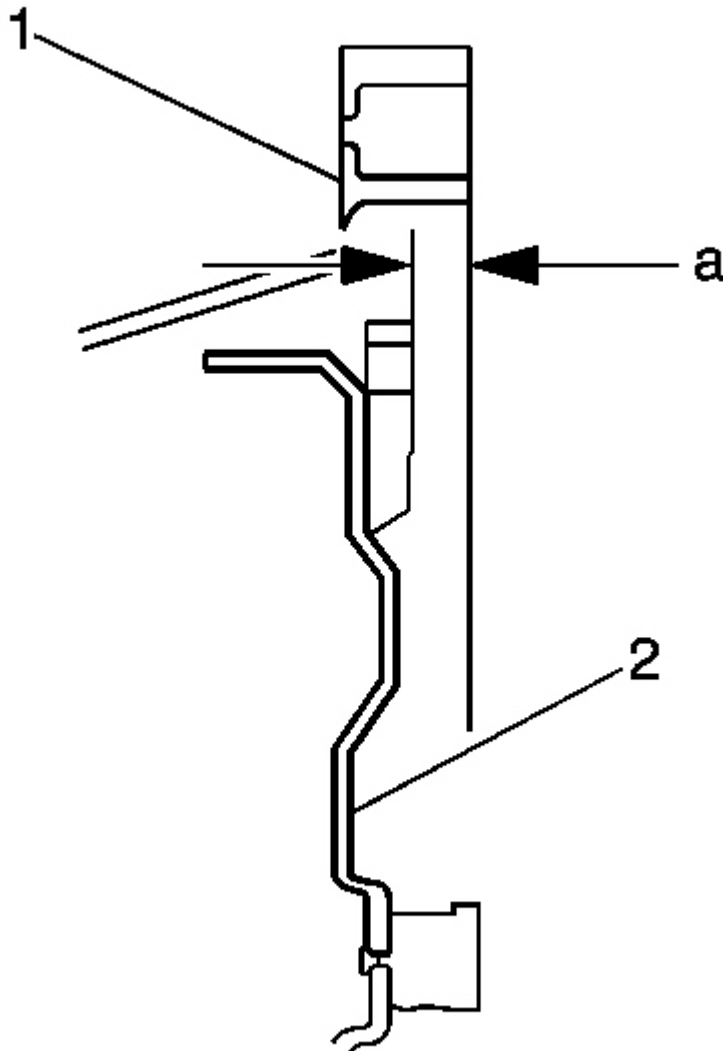


Fig. 317: Torque Converter & Transaxle
Courtesy of GENERAL MOTORS CORP.

142. Install the torque converter (2) to the transaxle.
143. Measure the installation depth of the torque converter.

Specification: The standard value is 11.1 mm (0.44 in).

144. If the measured value is beyond the standard value, readjust the torque converter within the specified

value.

OIL PUMP DISASSEMBLE

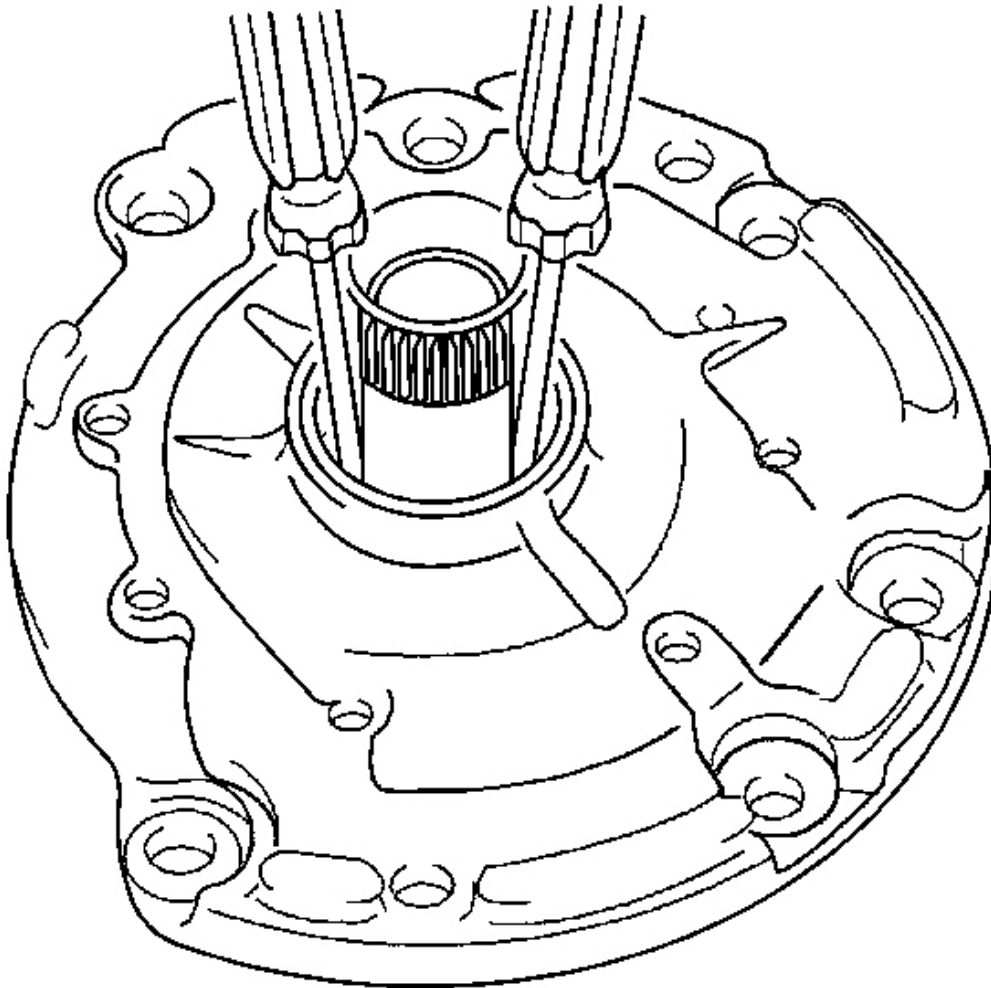


Fig. 318: Turning Drive Gear With 2 Screwdrivers
Courtesy of GENERAL MOTORS CORP.

NOTE: Use extreme care when working around oil seals. Damage to the lip of a seal will cause oil leaks.

1. Turn the drive gear with 2 screwdrivers and make sure it rotates smoothly.

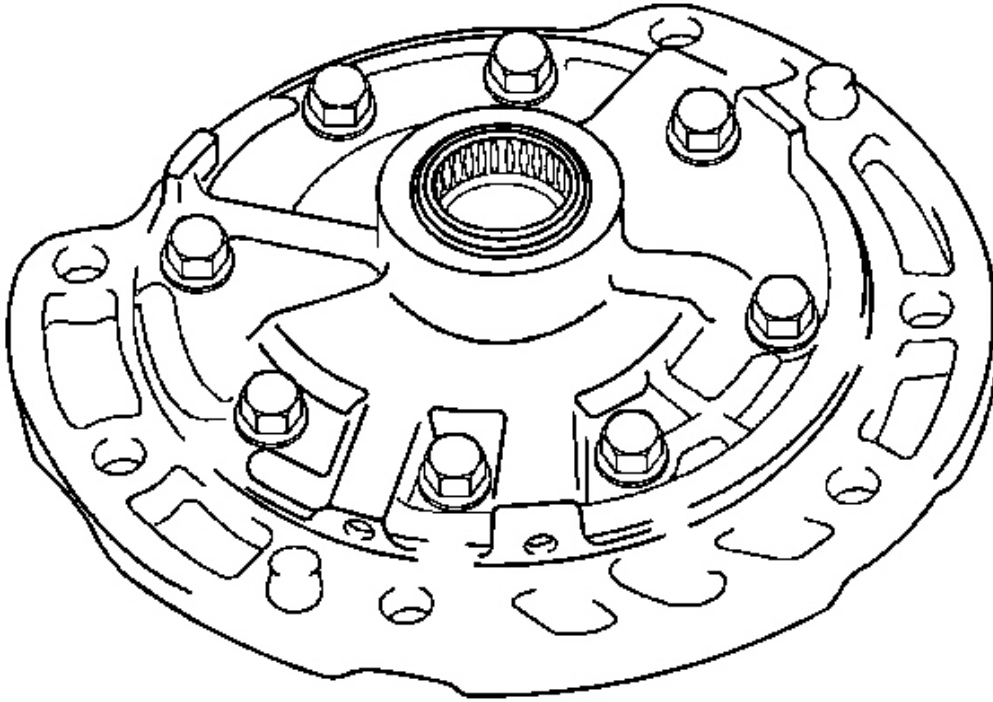


Fig. 319: Stator Shaft & Bolts

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not let the driver drop as it might come off attached to the stator shaft.

2. Remove the 8 bolts and the stator shaft.

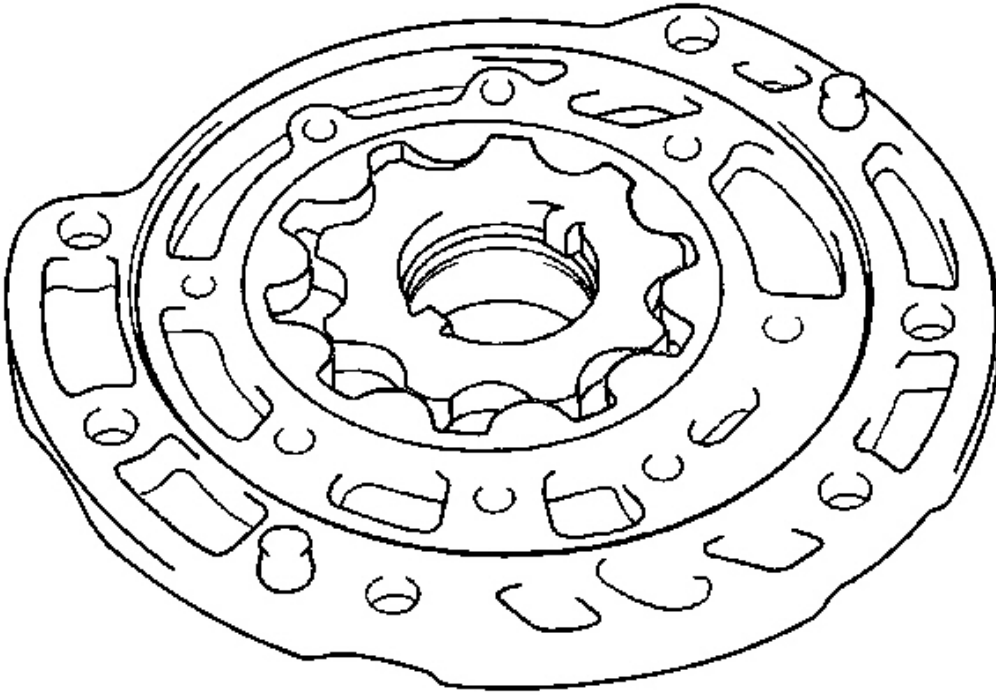


Fig. 320: Oil Pump Drive Gear
Courtesy of GENERAL MOTORS CORP.

3. Remove the oil pump drive gear and driven gear from the oil pump body.

OIL PUMP INSPECTION

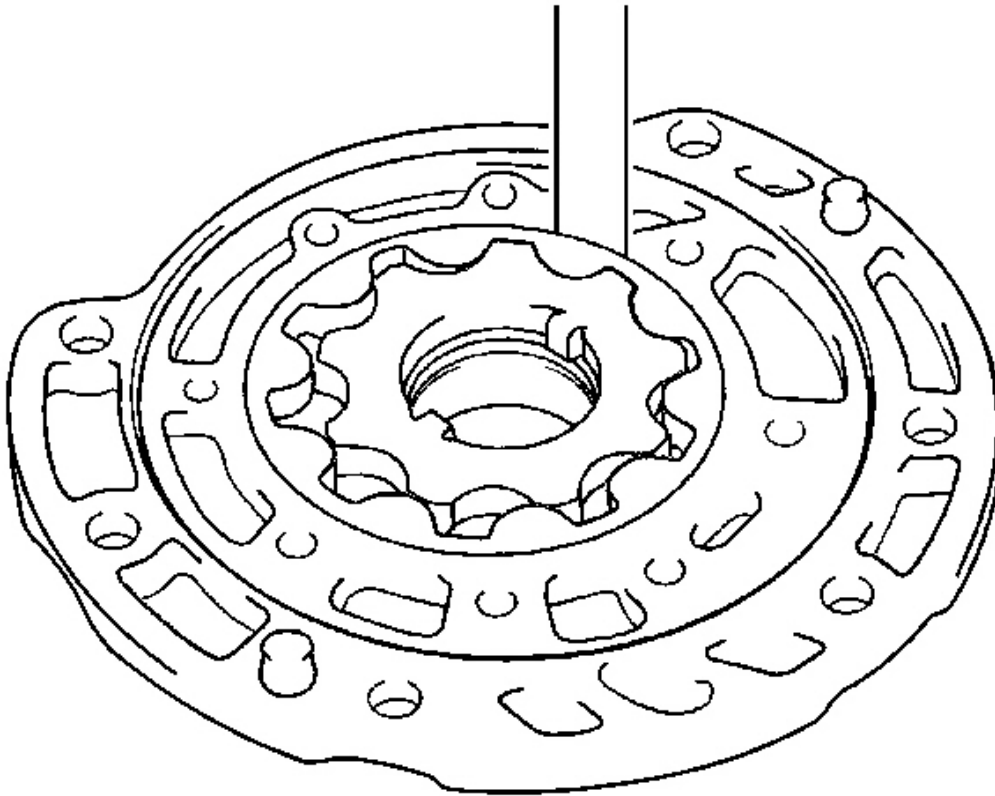


Fig. 321: Measuring The Clearance Of Driven Gear Using A Feeler Gage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the body clearance is greater than the maximum, replace the oil pump body sub-assembly.

1. Push the driven gear to one side of the body. Using a feeler gage, measure the clearance.

Specifications:

- The standard body clearance is 0.1-0.17 mm (0.0039-0.0067 in).
- The maximum body clearance is 0.17 mm (0.0067 in).

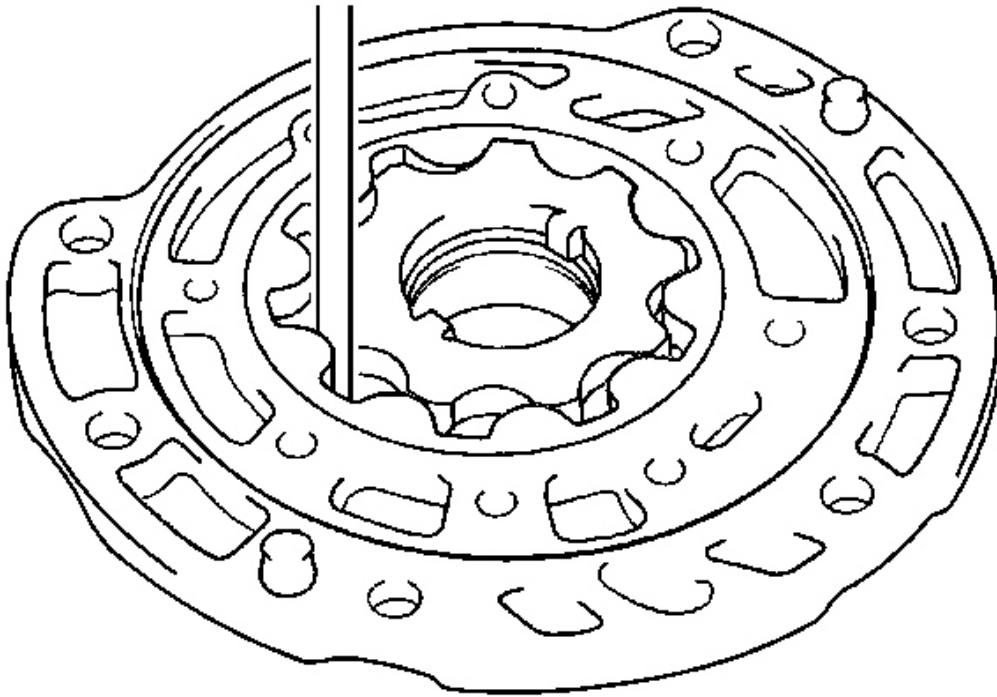


Fig. 322: Measuring The Tip Clearance Between Driven Gear Teeth
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the tip clearance is greater than the maximum, replace the oil pump body sub-assembly.

2. Measure the tip clearance between the driven gear teeth and drive gear teeth.

Specifications:

- The standard tip clearance is 0.07-0.15 mm (0.0028-0.0059 in).
- The maximum tip clearance is 0.15 mm (0.0059 in).

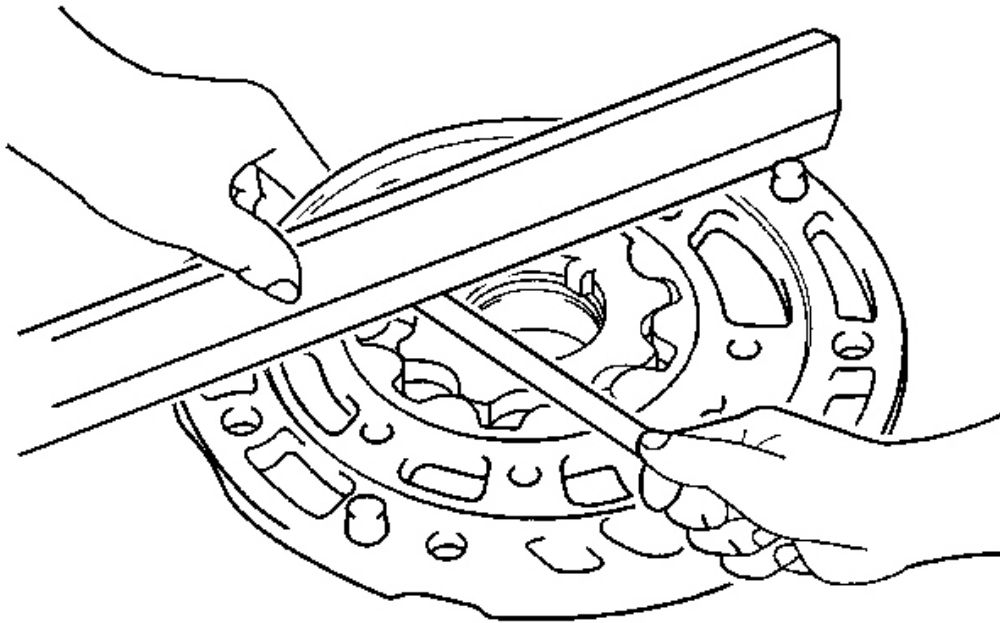


Fig. 323: Measuring The Side Clearance Of Both Gears Using A Steel Straight Edge & Feeler Gage
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the side clearance is greater than the maximum, replace the drive gear, driven gear, or pump body.

3. Using a steel straight edge and feeler gage, measure the side clearance of both gears.

Specifications:

- The standard side clearance is 0.02-0.05 mm (0.0008-0.002 in).
- The maximum side clearance is 0.05 mm (0.002 in).

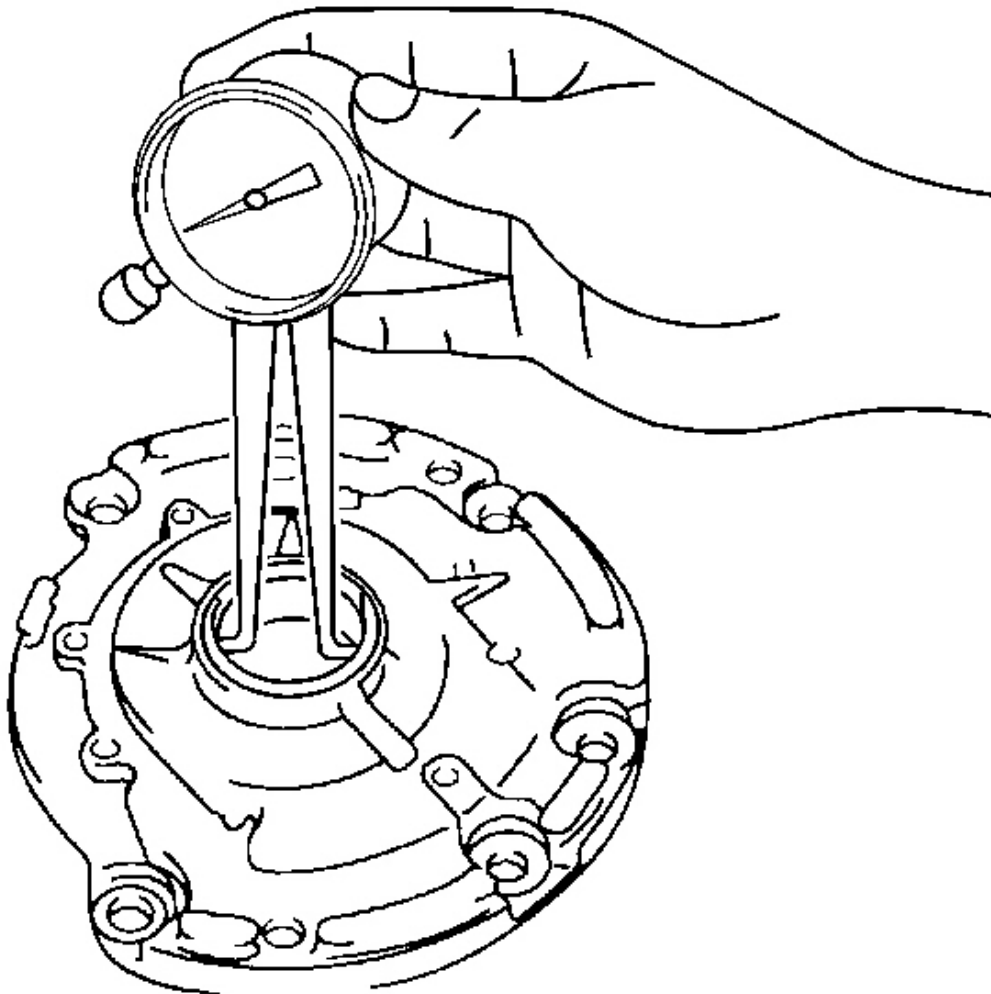


Fig. 324: Measuring The Inside Diameter Of Oil Pump Body Bushing Using A Dial Indicator
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the inside diameter is greater than the maximum, replace the oil pump body sub-assembly.

4. Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Specifications:

- The standard inside diameter is 38.126 mm (1.50102 in).
- The maximum inside diameter is 38.188 mm (1.50346 in).

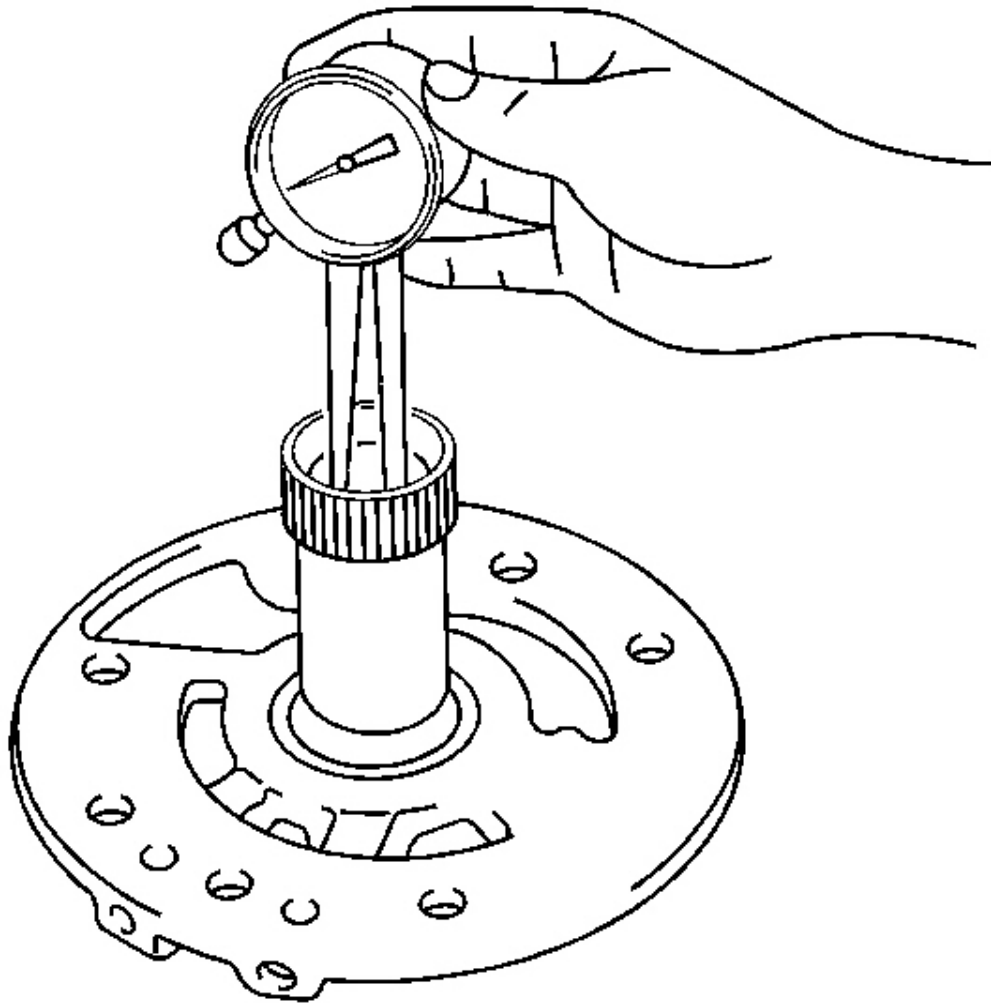


Fig. 325: Measuring The Inside Diameter Of Stator Shaft Bushings Using A Dial Indicator
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the inside diameter is greater than the maximum, replace the stator shaft.

5. Using a dial indicator, measure the inside diameter of the stator shaft bushings.

Specifications:

- The standard inside diameter is 18.437 mm (0.72586 in).

- The maximum inside diameter is 18.5 mm (0.728 in).

OIL PUMP ASSEMBLY

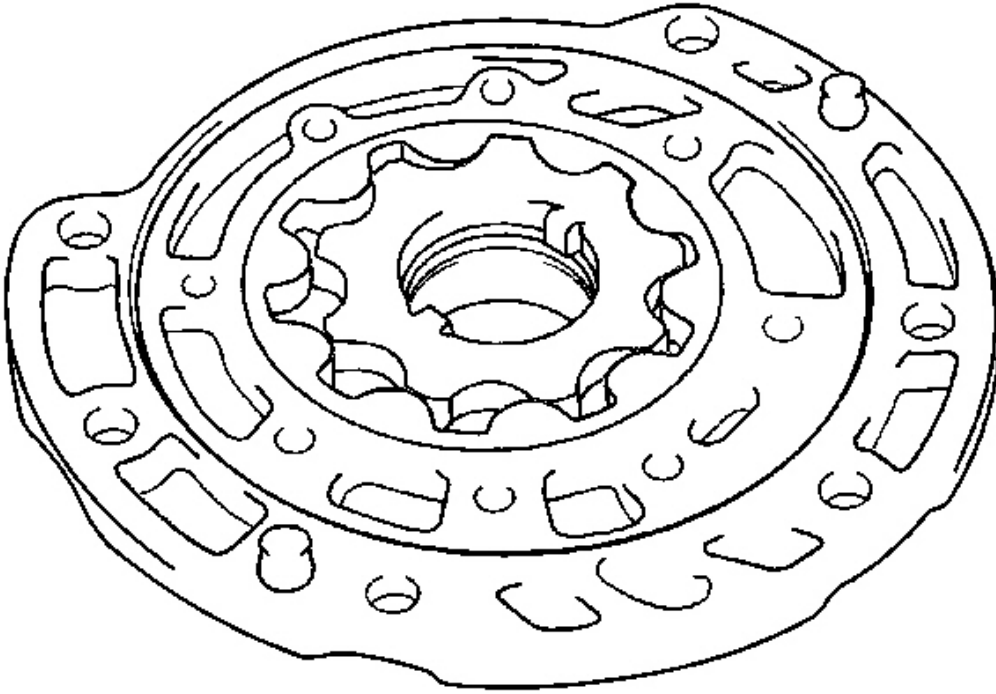


Fig. 326: Oil Pump Drive Gear
Courtesy of GENERAL MOTORS CORP.

1. Install the oil pump drive gear and driven gear.

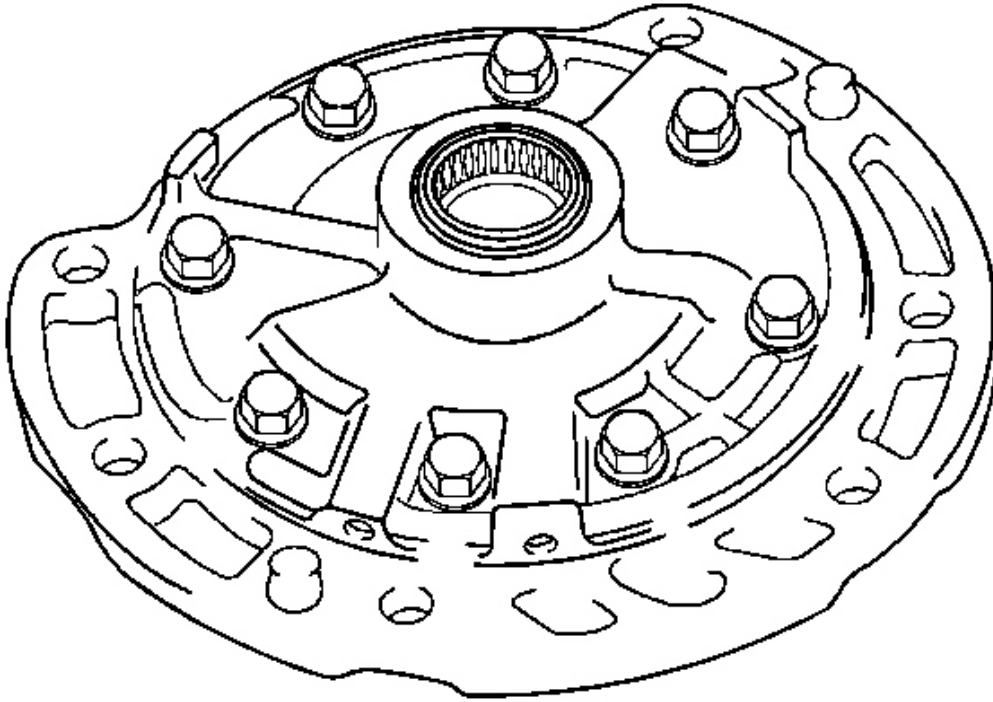


Fig. 327: Stator Shaft & Bolts

Courtesy of GENERAL MOTORS CORP.

2. Align the stator shaft with each bolt hole.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the 8 bolts.

Tighten: Tighten the bolts to 9.8 N.m (87 lb in).

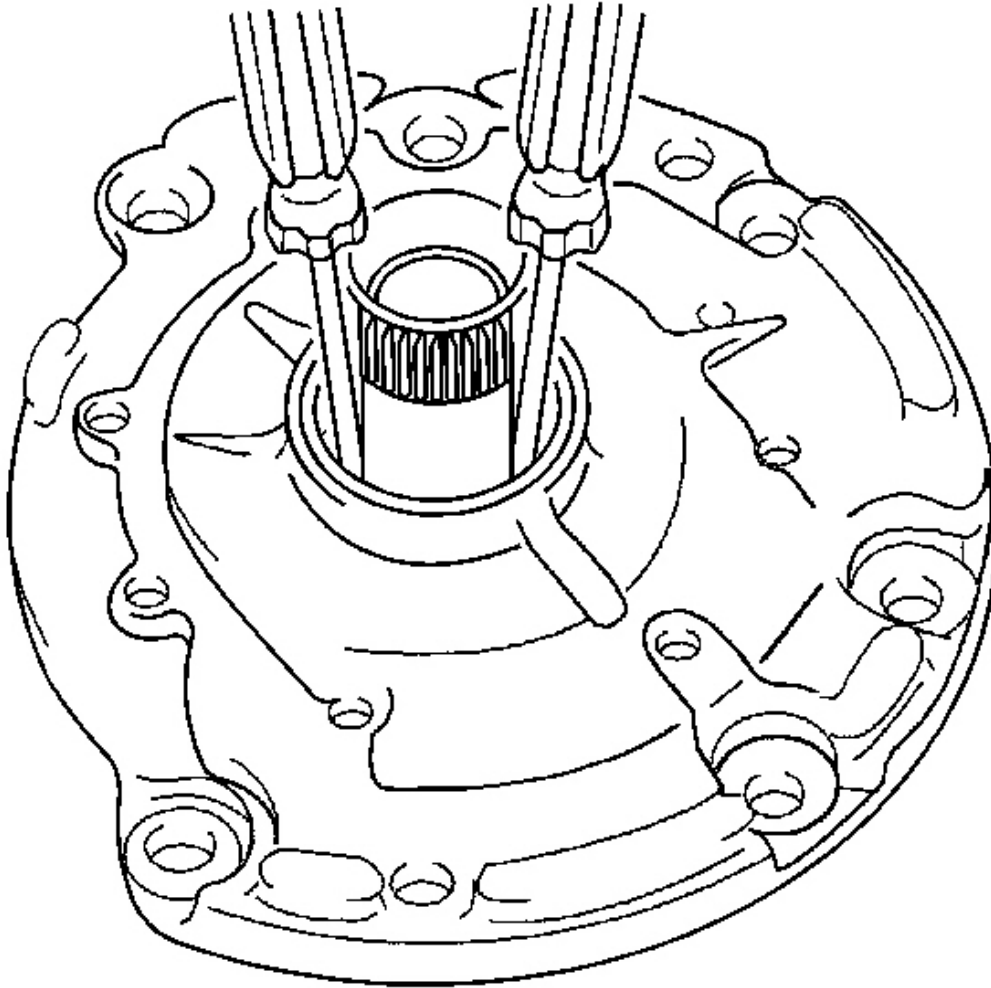


Fig. 328: Turning Drive Gear With 2 Screwdrivers
Courtesy of GENERAL MOTORS CORP.

NOTE: Use extreme care when working around oil seals. Damage to the lip of a seal will cause oil leaks.

4. Turn the drive gear with 2 screwdrivers and make sure it rotates smoothly.

DIRECT CLUTCH ASSEMBLY DISASSEMBLE

Tools Required

- **DT 46451** (DW240-020) Brake Clutch Spring Compressor. See Special Tools.
- **DT 46453** (DW240-040) Direct Clutch Adapter. See Special Tools.

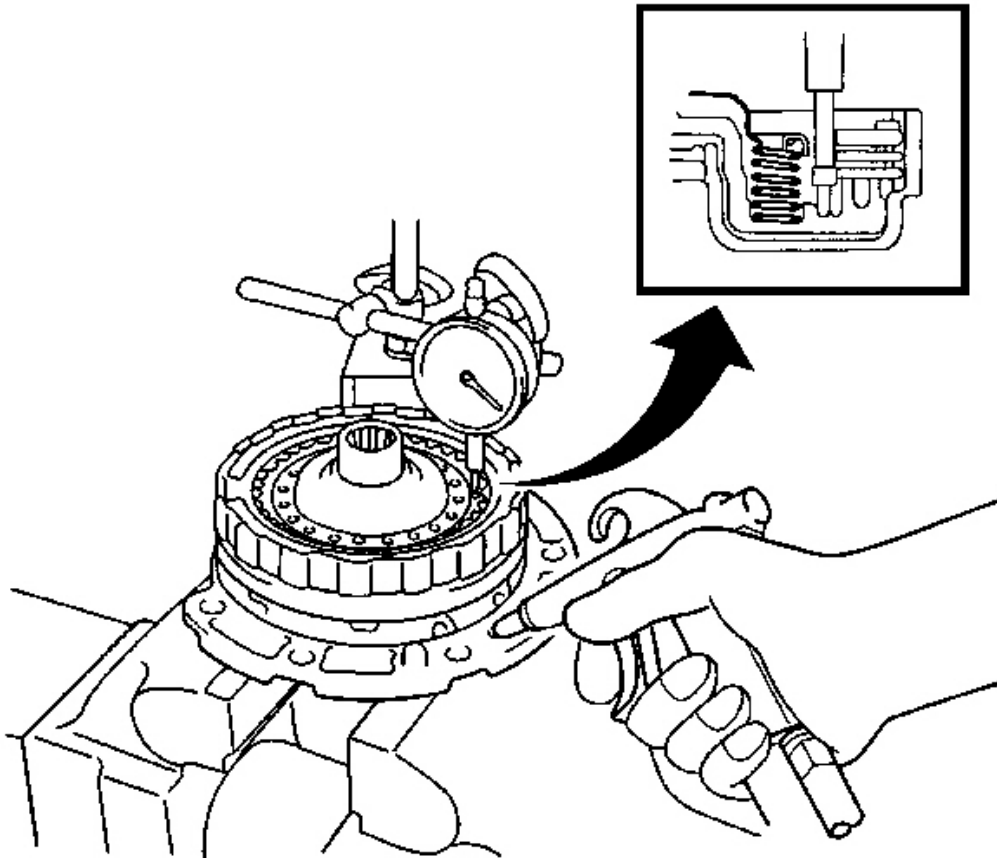


Fig. 329: Using A Dial Indicator Measure The Direct Clutch Piston Stroke While Applying Compressed Air

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice in Cautions and Notices.

1. Install the direct clutch and thrust needle roller bearing on the oil pump.
2. Using a dial indicator, measure the direct clutch piston stroke while applying and releasing 392 kPa (57 psi) of compressed air.

If the stroke is non-standard, inspect the discs, the plates, and the flange.

Specifications: The piston stroke is 0.4-0.8 mm (0.016-0.031 in).

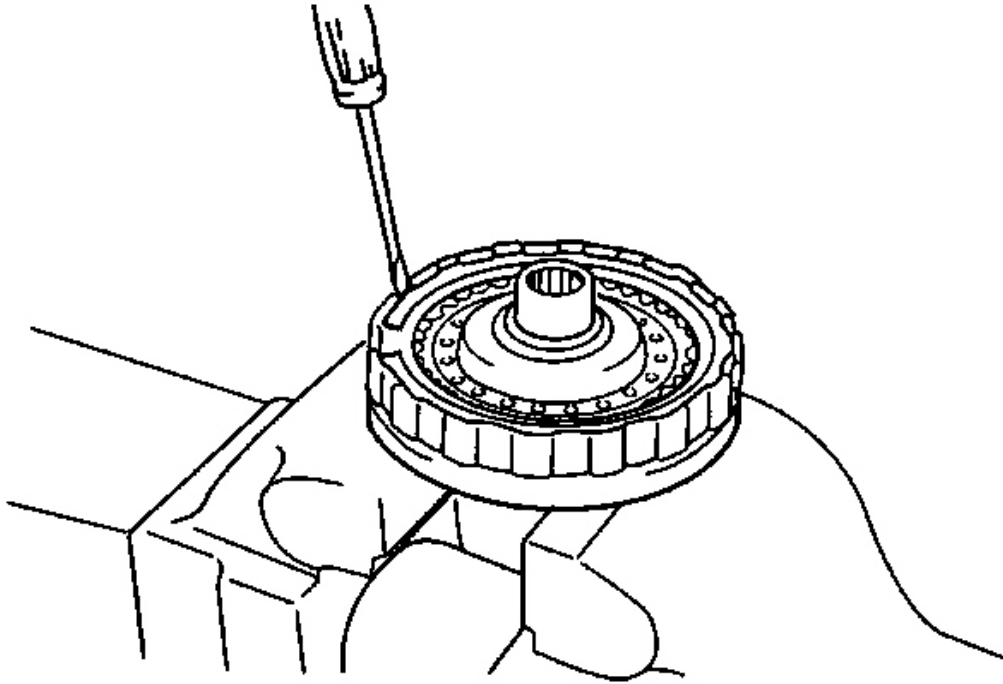


Fig. 330: Removing Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

3. Using the screwdriver, remove the snap ring.

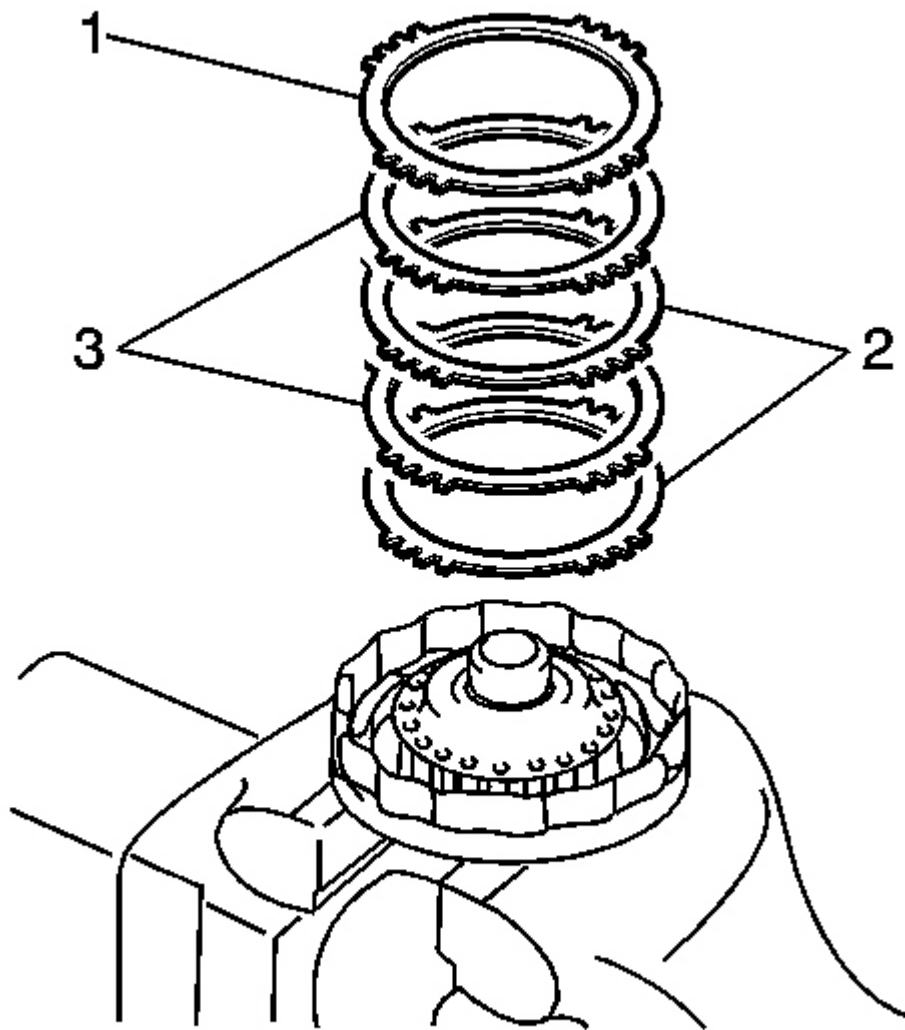


Fig. 331: Flange, Discs & Plates

Courtesy of GENERAL MOTORS CORP.

4. Remove the flange (1), 2 discs (2), and 2 plates (3).

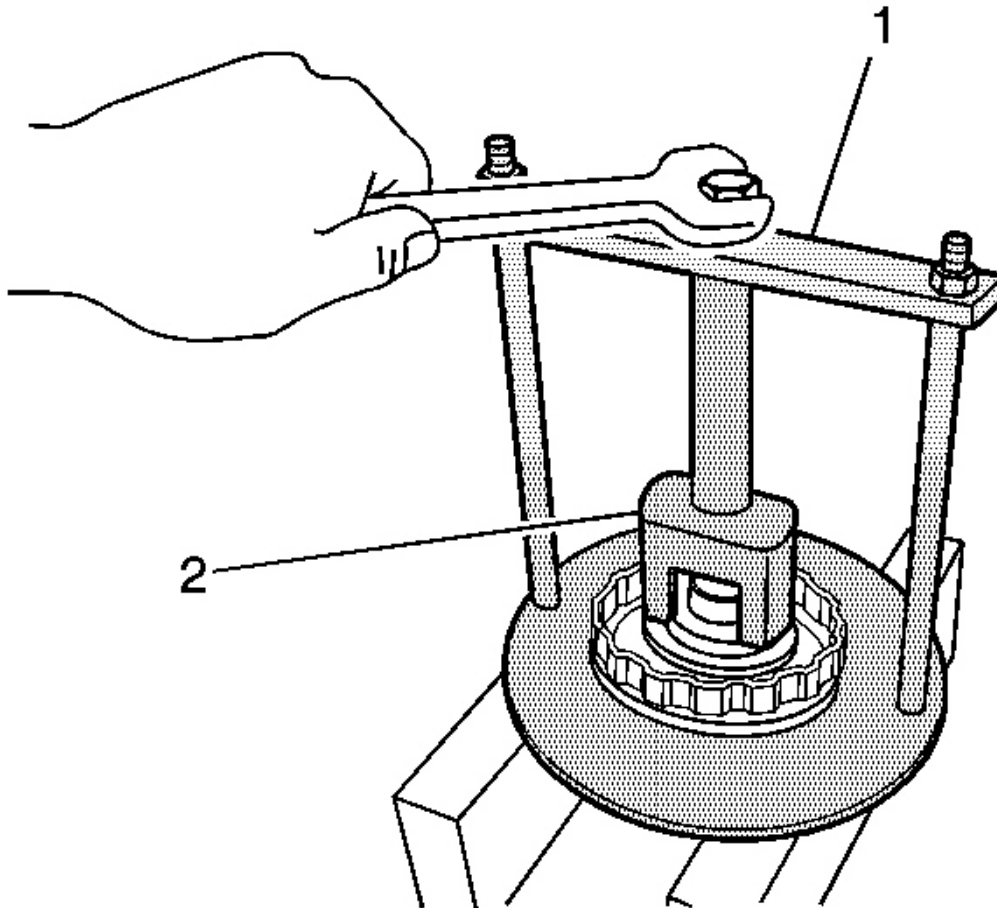


Fig. 332: Return Spring, Compress, DT 46451 & DT 46453
Courtesy of GENERAL MOTORS CORP.

5. Place the **DT 46451** (1) and **DT 46453** (2) on the direct clutch return spring and compress. See **Special Tools**.

NOTE: Do not depress the direct clutch piston return spring lower than 1-2 mm (0.039-0.078 in.) beyond the snap ring groove. This will prevent the direct clutch piston return spring from becoming distorted.

IMPORTANT: Do not expand the snap ring excessively.

6. Using a snap ring expander, remove the snap ring.

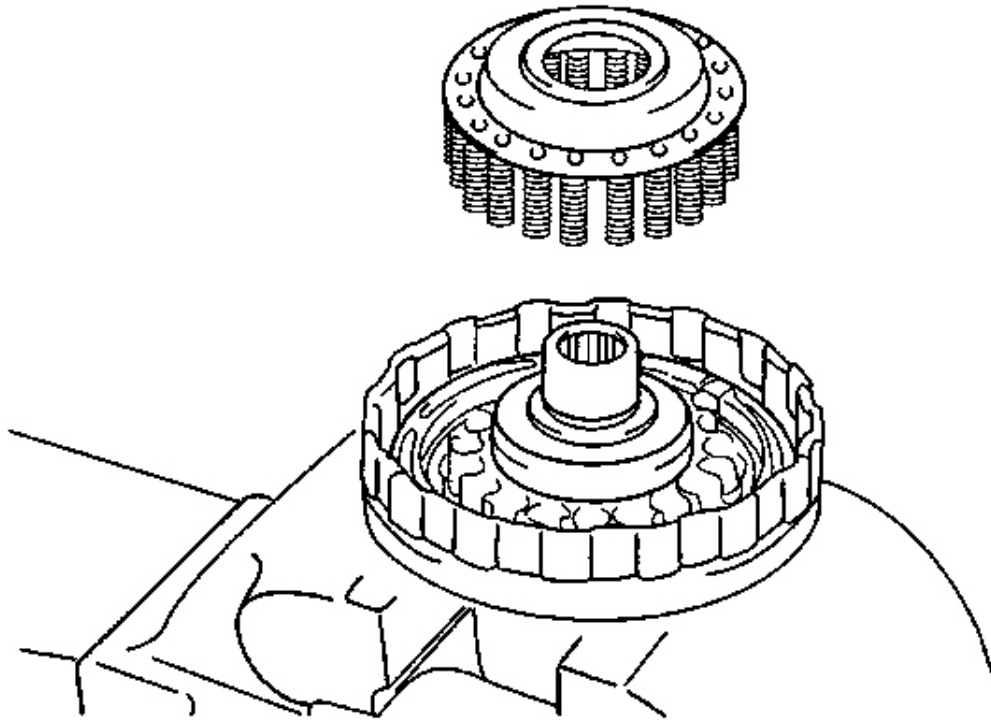


Fig. 333: Direct Clutch Return Spring
Courtesy of GENERAL MOTORS CORP.

7. Remove the direct clutch return spring.

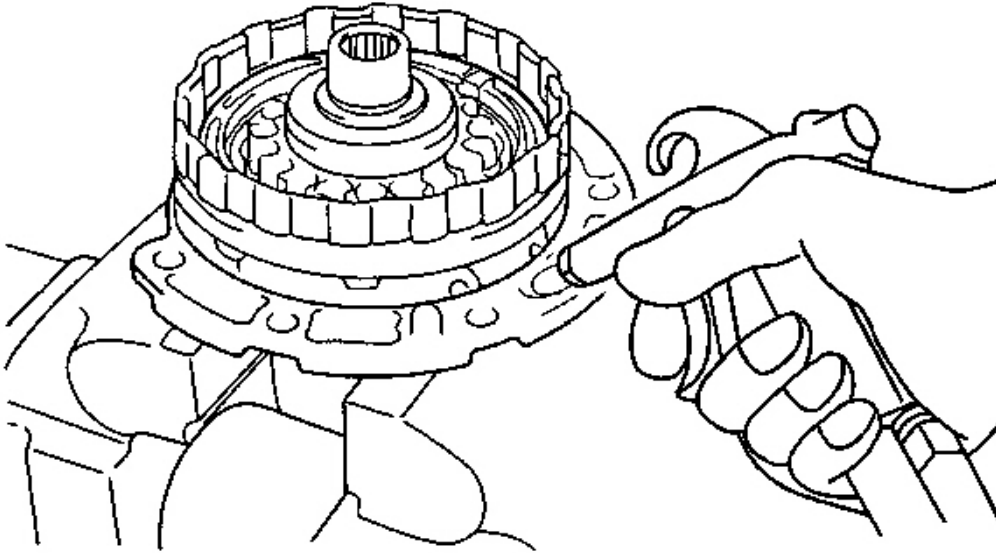


Fig. 334: Direct Clutch & Oil Pump
Courtesy of GENERAL MOTORS CORP.

8. Install the direct clutch on the oil pump.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice in Cautions and Notices.

IMPORTANT: Air pressure may cause the pistons to jump-out. When removing the piston, hold it with your hand using a waste cloth.

IMPORTANT: Do not splash ATF when air-blowing.

9. Apply 392 kPa (57 psi) of compressed air to the oil pump to remove the direct clutch piston.

When the piston can not be removed as it is slanted, either blow the air again with the protruding side pushed or remove the piston using needle nose pliers with vinyl tape on the tip.

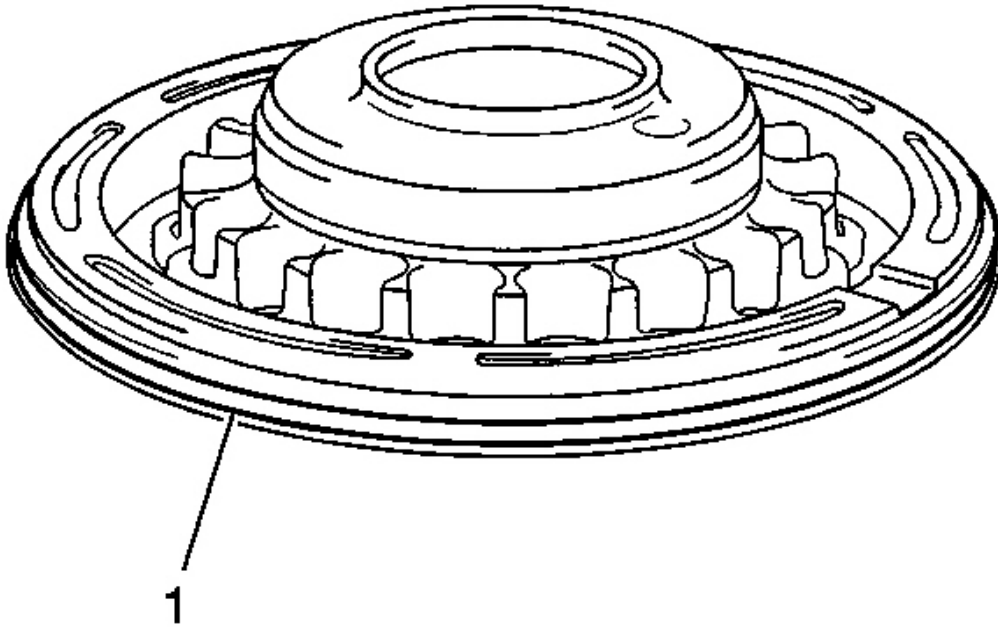


Fig. 335: O-Ring & Direct Clutch Piston
Courtesy of GENERAL MOTORS CORP.

10. Using a small screwdriver, remove the O-ring (1) from the direct clutch piston.

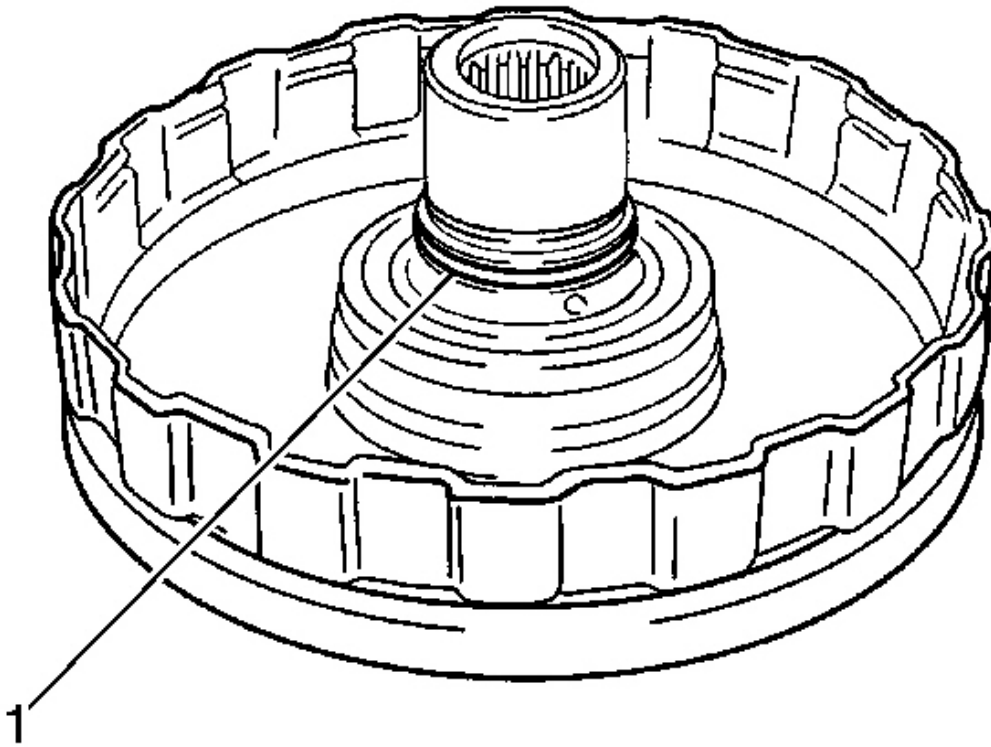


Fig. 336: O-Ring & Input Shaft
Courtesy of GENERAL MOTORS CORP.

11. Remove the O-ring (1) from the input shaft.

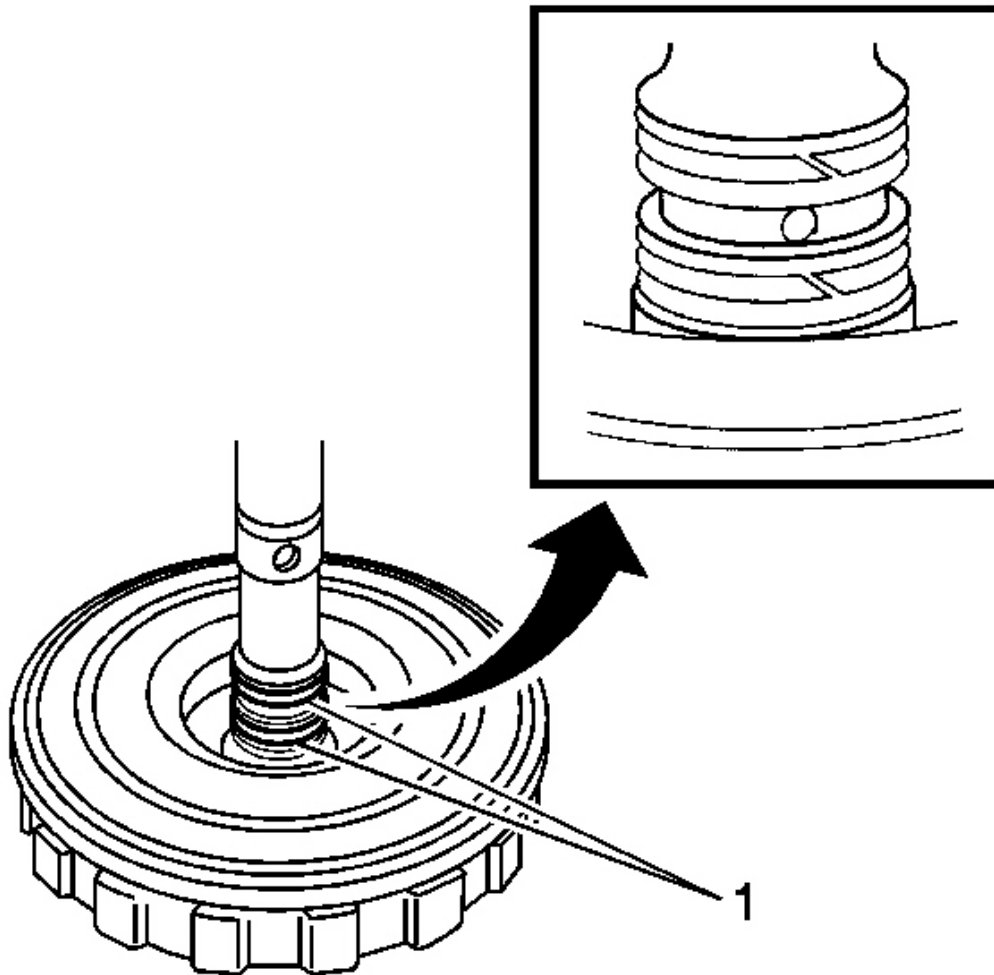


Fig. 337: Seal Rings & Input Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not expand the ring ends excessively.

12. Remove the 2 seal rings (1) from the input shaft.

DIRECT CLUTCH INSPECTION

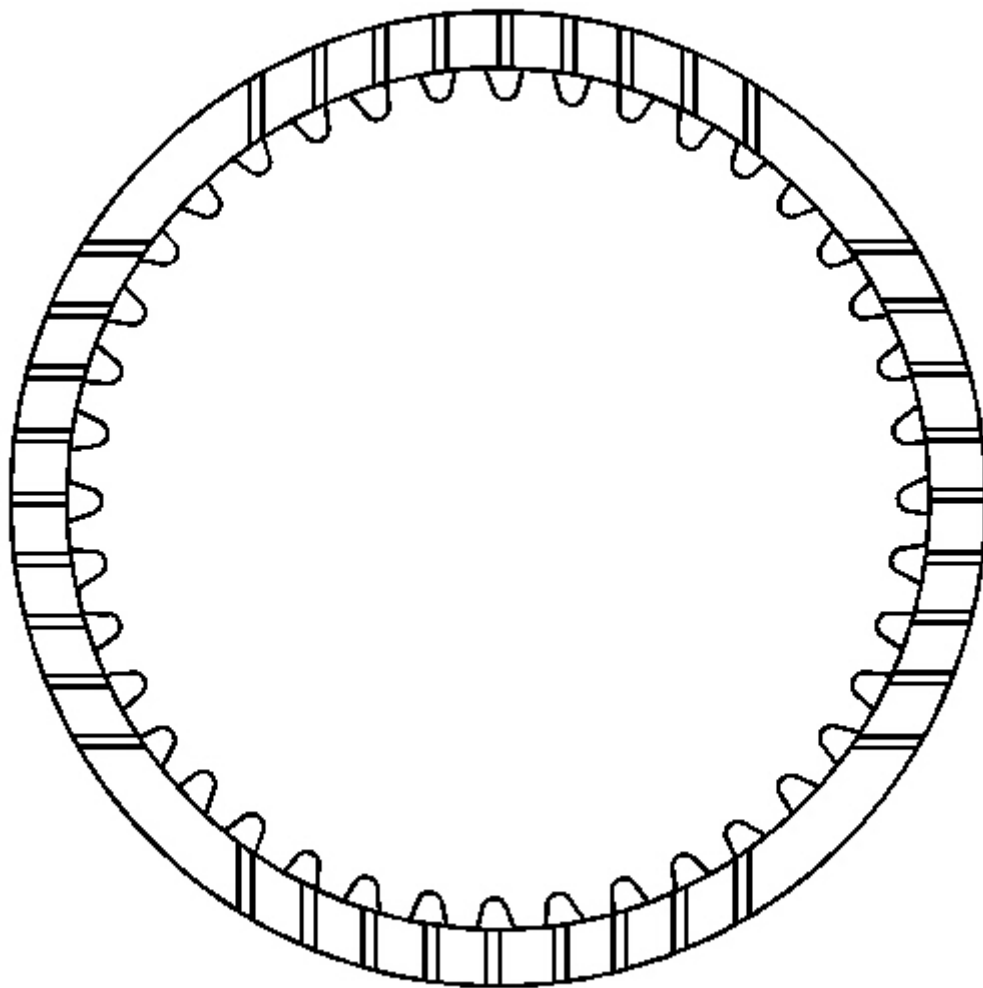


Fig. 338: Checking The Sliding Surface Of Disc, Plate & Flange For Damage
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to Safety Glasses Caution in Cautions and Notices.

1. Check to see if the sliding surface of the disc, plate, and flange are worn or burnt. If necessary, replace them.
 - If the lining of the disc is peeling off or discolored, or even if a part of the printed number is defaced, replace all discs.

- Before assembling new discs, soak them in ATF for at least 15 minutes.

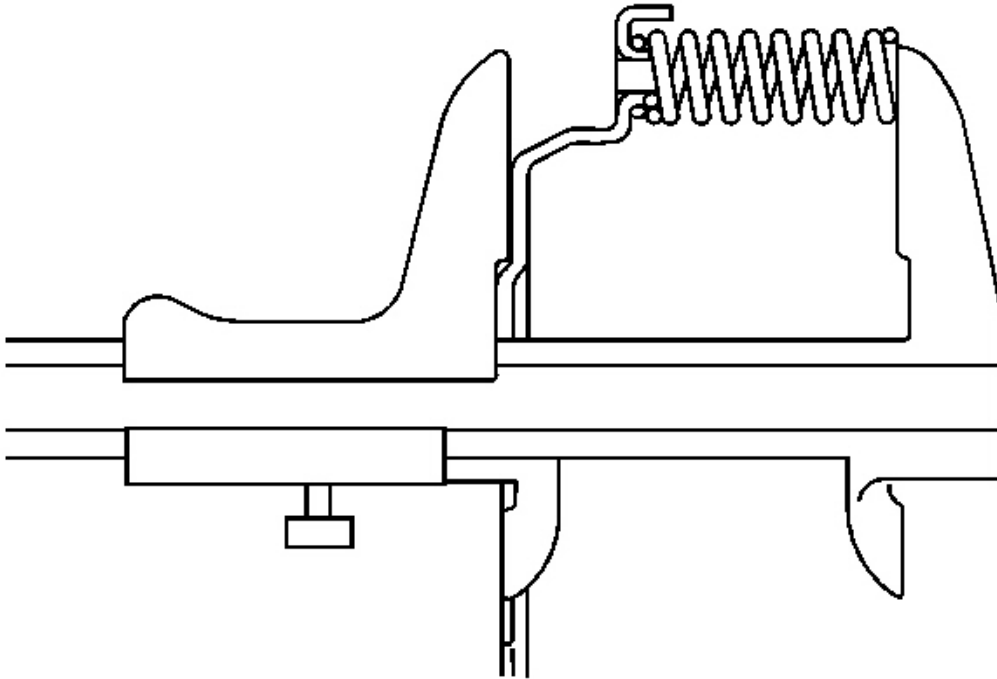


Fig. 339: Measuring The Free Length Of Direct Clutch Return Spring Using Vernier Calipers
Courtesy of GENERAL MOTORS CORP.

2. Using vernier calipers, measure the free length of the direct clutch return spring together with the spring sheet.

Specifications: Standard free length is 36.04 mm (1.4189 in).

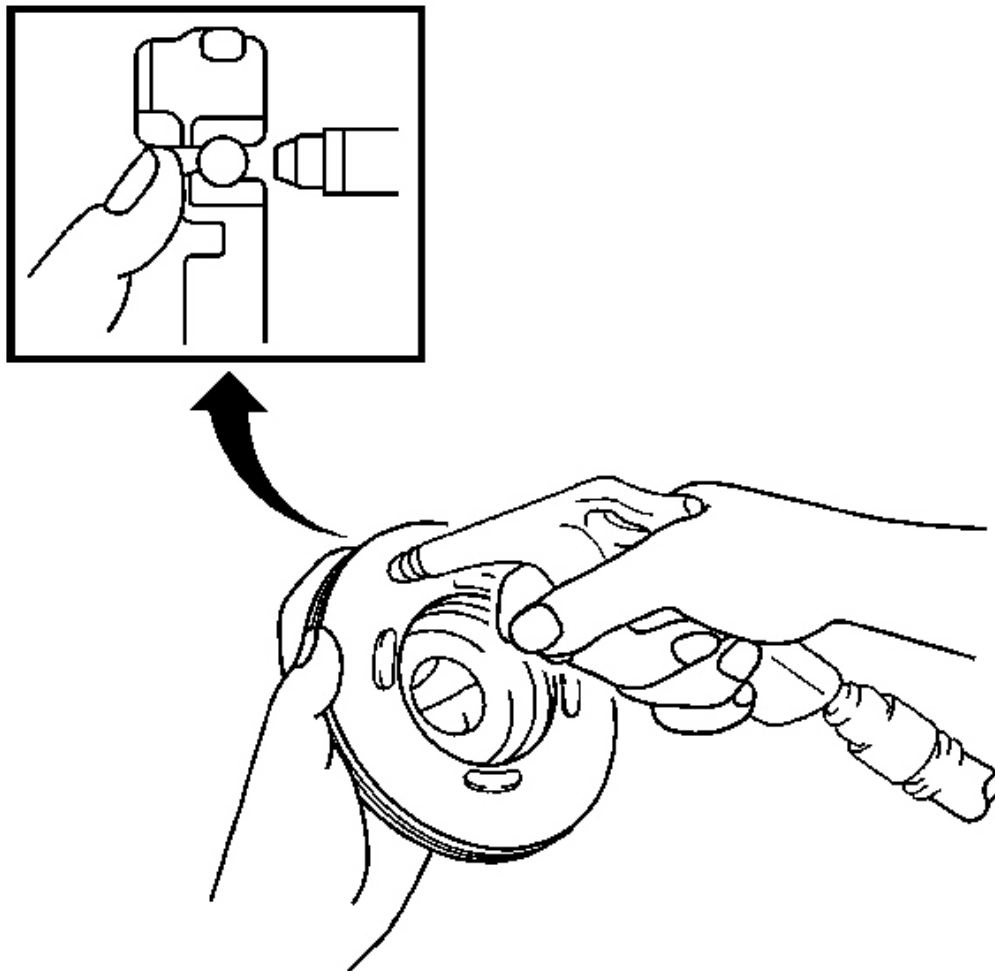


Fig. 340: Applying Low-Pressure Compressed Air To Direct Clutch Piston
Courtesy of GENERAL MOTORS CORP.

3. Check that the check ball is free by shaking the direct clutch piston.
4. Check that the valve does not leak by applying low-pressure compressed air.

DIRECT CLUTCH ASSEMBLY ASSEMBLE

Tools Required

- **DT 46451** (DW240-020) Brake/Clutch Spring Compressor. See **Special Tools**.
- **DT 46453** (DW240-040) Direct Clutch Adapter. See **Special Tools**.

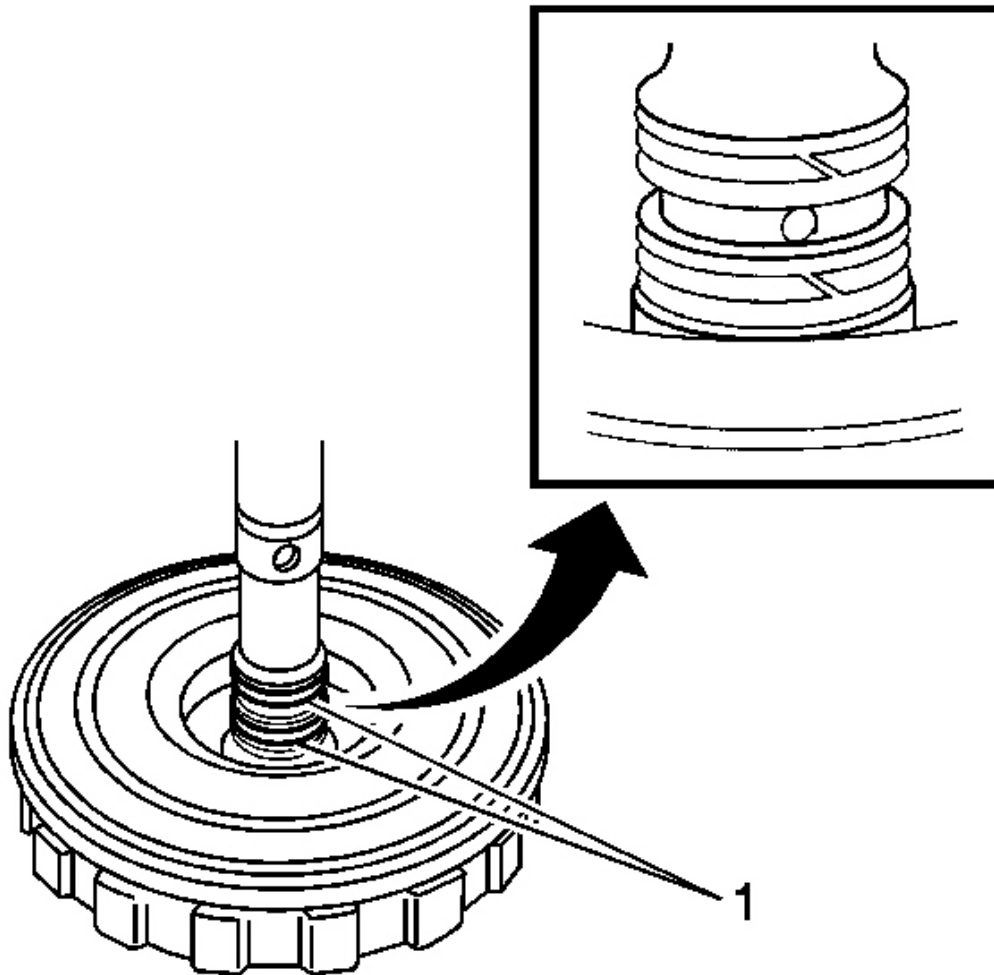


Fig. 341: Seal Rings & Input Shaft
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not expand the ring ends excessively.

1. Install the 2 seal rings (1) to the input shaft.

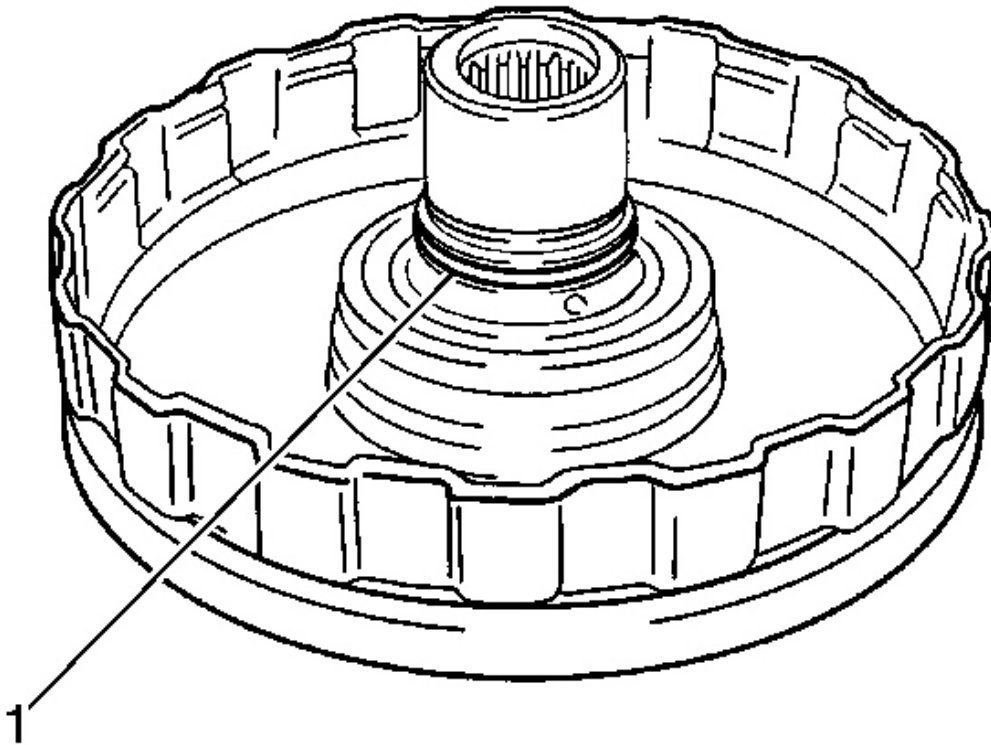


Fig. 342: O-Ring & Input Shaft

Courtesy of GENERAL MOTORS CORP.

2. Coat a new O-ring (1) with automatic transmission fluid (ATF) and install the O-ring to the input shaft.

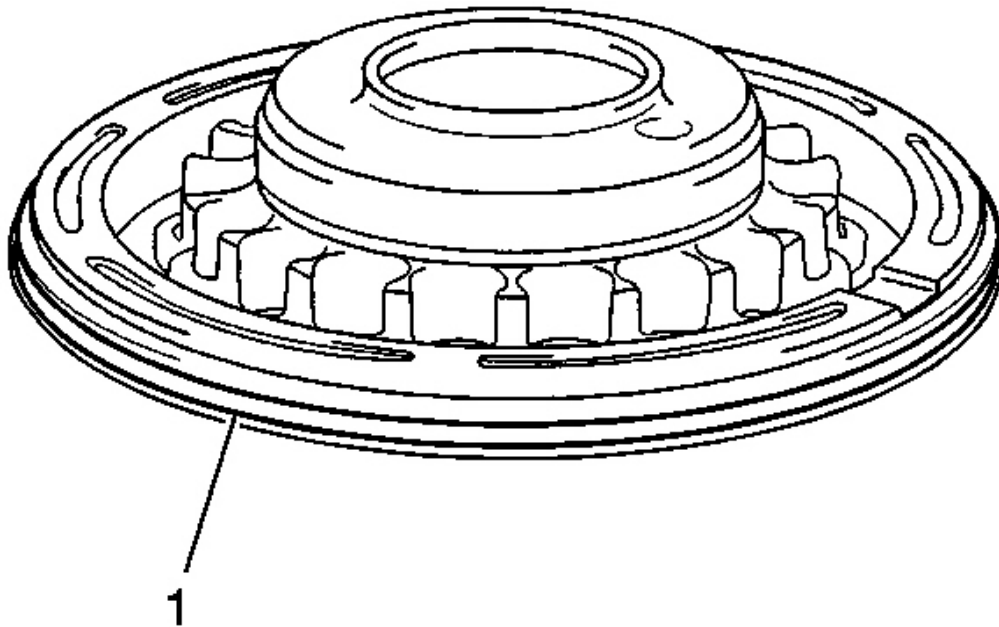


Fig. 343: O-Ring & Direct Clutch Piston
Courtesy of GENERAL MOTORS CORP.

3. Coat a new O-ring (1) with ATF and install the O-ring to the direct clutch piston.

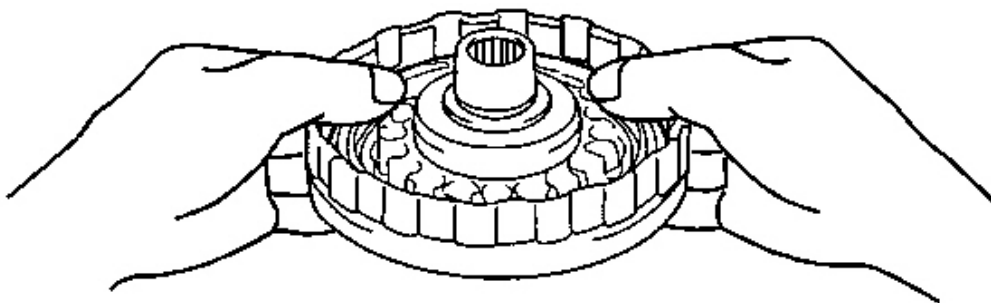


Fig. 344: Direct Clutch Drum & Direct Clutch Piston

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the lip seal of direct clutch piston.

4. Coat the direct clutch piston with ATF, and install it to the direct clutch drum.

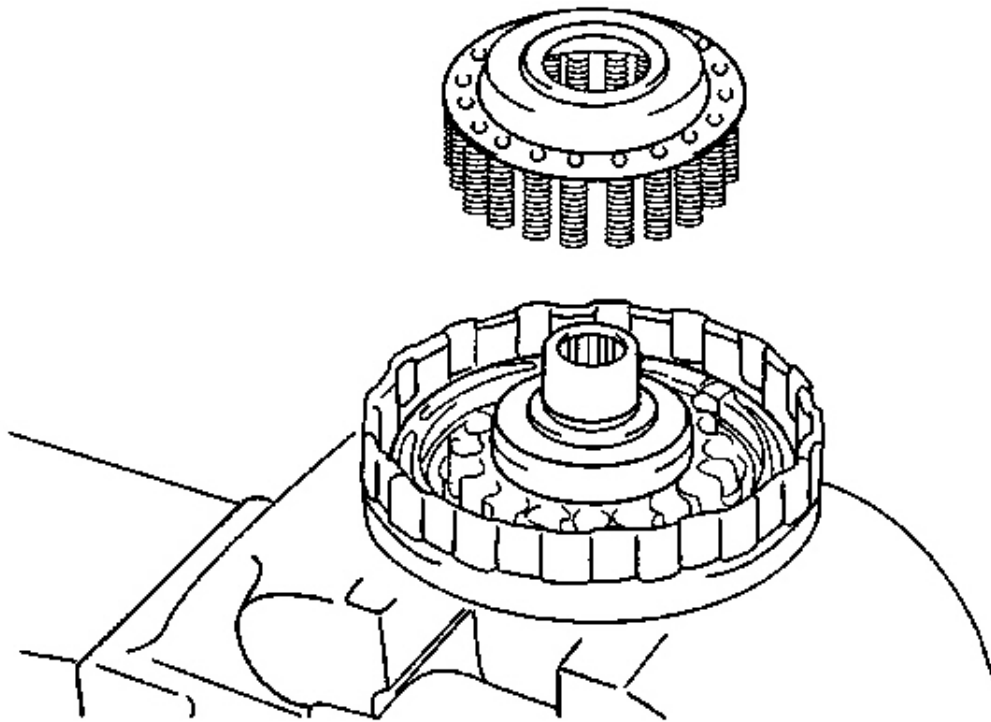


Fig. 345: Direct Clutch Return Spring
Courtesy of GENERAL MOTORS CORP.

5. Install the direct clutch return spring.

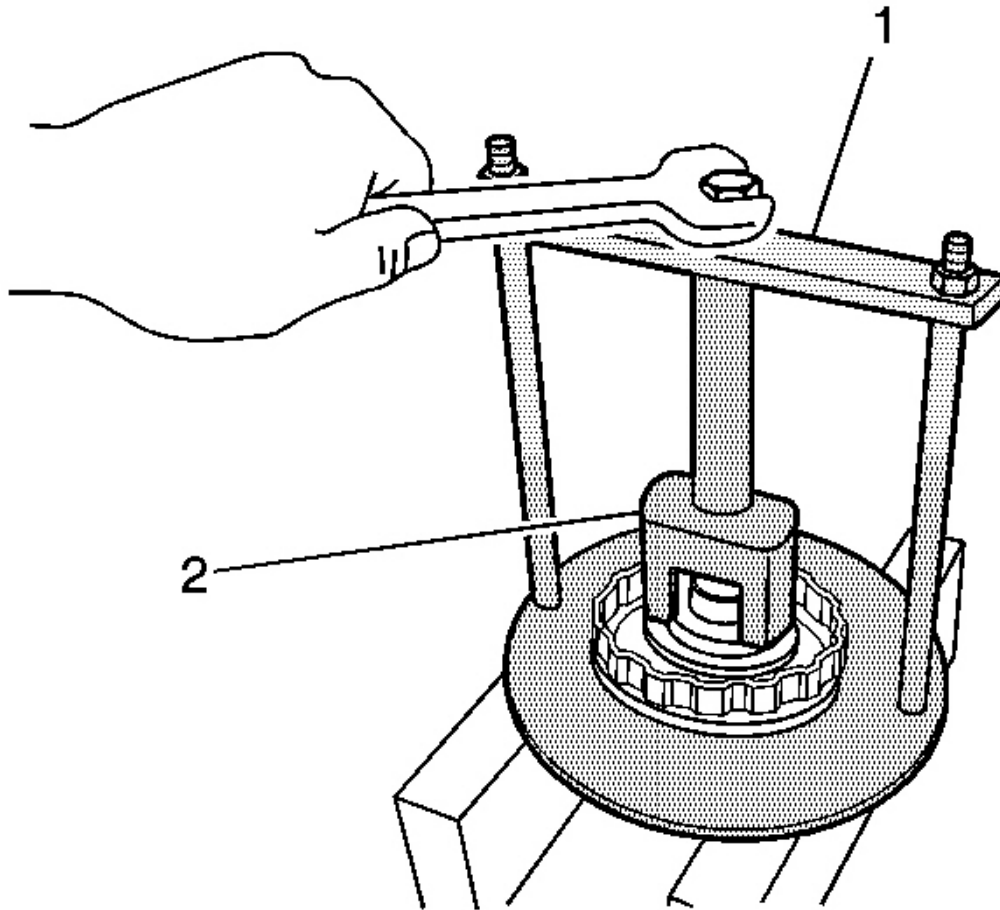


Fig. 346: Return Spring, Compress, DT 46451 & DT 46453
Courtesy of GENERAL MOTORS CORP.

6. Place the **DT 46451** (1) and the **DT 46453** (2) on the return spring and compress. See **Special Tools**.

IMPORTANT: Do not expand the snap ring excessively.

7. Using a snap ring expander, install the snap ring.

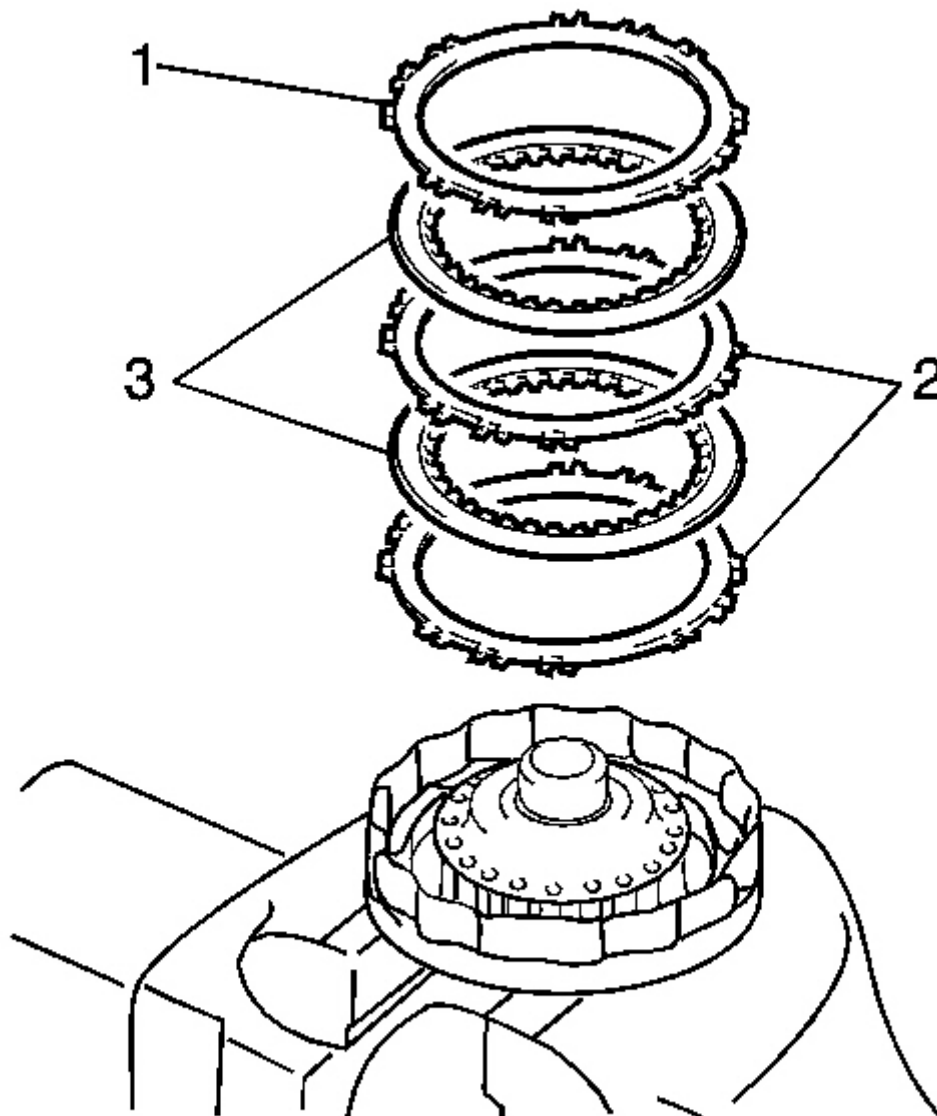


Fig. 347: Plates, Discs & Flange

Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Before installing the discs, coat them with ATF.

8. Install the 2 plates (2), 2 discs (3), and the flange (1) in order: 2-3-2-3-1.

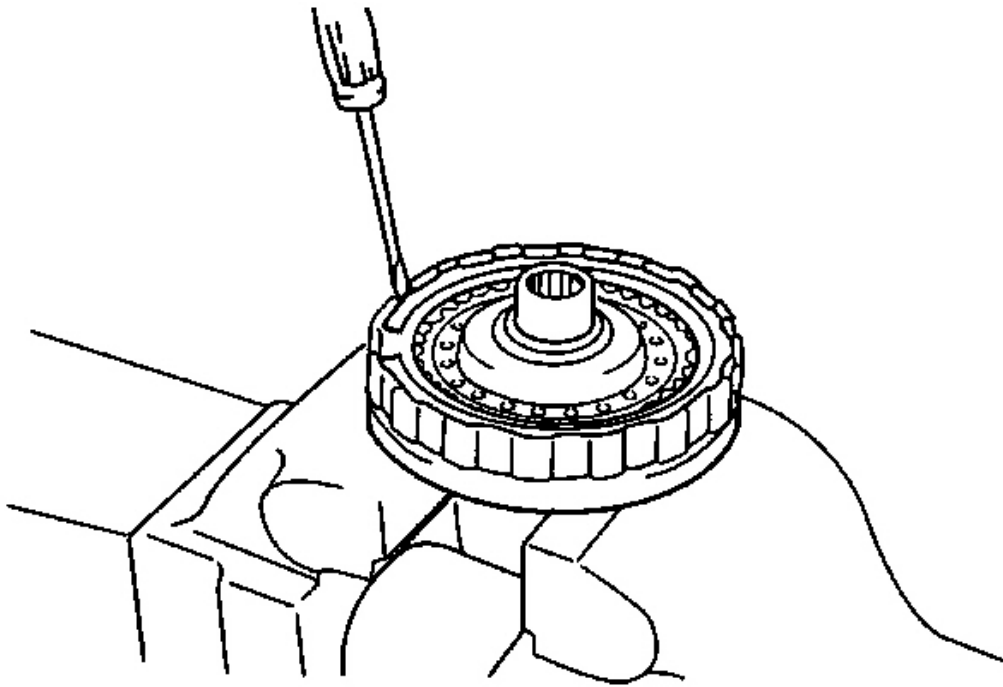


Fig. 348: Removing Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

9. Using a screwdriver, remove the snap ring.
10. Check that the end gap of the snap ring is not aligned with one of the cutouts.

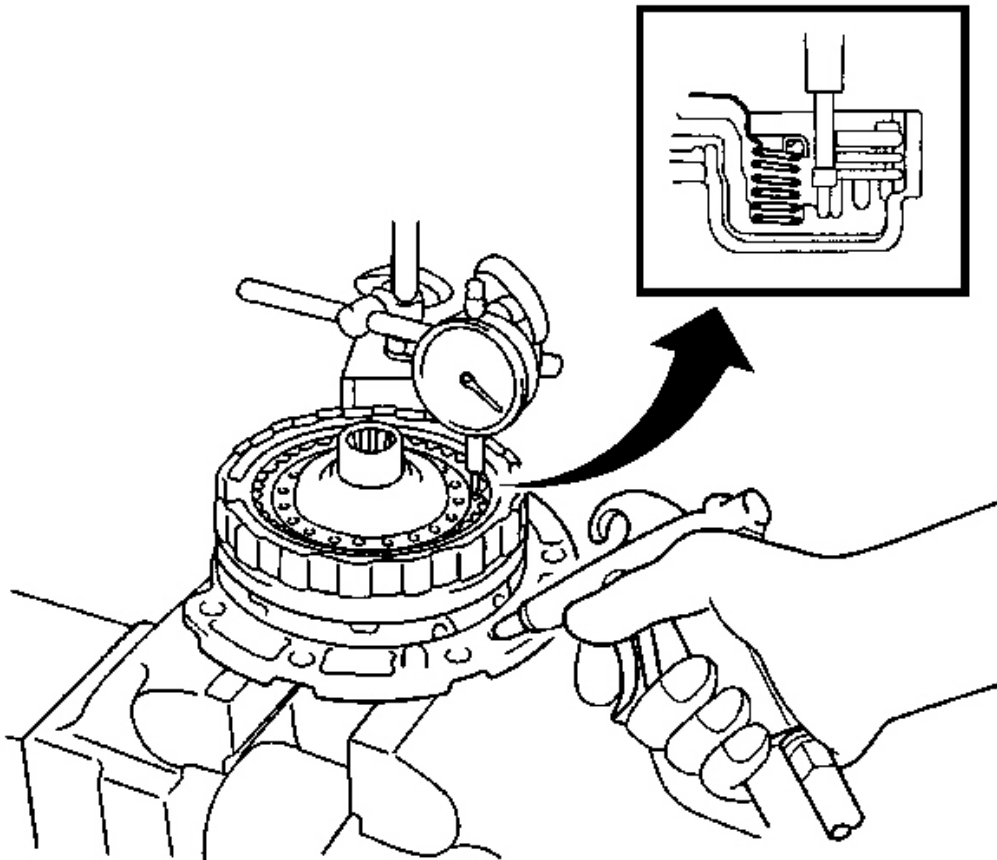


Fig. 349: Using A Dial Indicator Measure The Direct Clutch Piston Stroke While Applying Compressed Air
Courtesy of GENERAL MOTORS CORP.

11. Install the direct clutch on the oil pump.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

12. Using a dial indicator, measure the direct clutch piston stroke while applying and releasing 392 kPa (57 psi) of compressed air.

Specifications: The piston stroke is 0.4-0.8 mm (0.016-0.031 in).

- If the piston stroke is less than the limit of piston stroke, parts may have been assembled incorrectly, so check and reassemble again.

- If the stroke is non-standard, select another flange.
- There are 3 flanges in different thickness.

Specifications:

- The number 1 flange thickness is 3 mm (0.118 in).
- The number 2 flange thickness is 3.2 mm (0.126 in).
- The number 3 flange thickness is 3.4 mm (0.134 in).

PLANETARY RING GEAR DISASSEMBLE

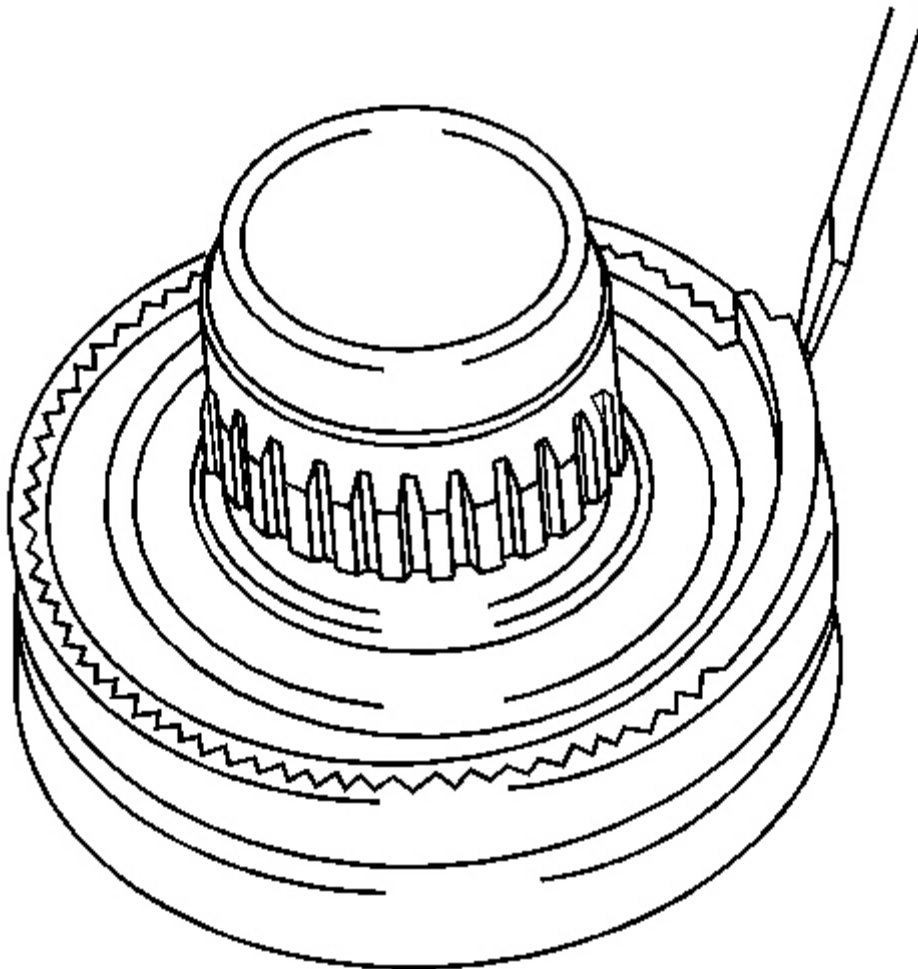


Fig. 350: Removing Snap Ring Planetary Ring Gear Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

1. Using a screwdriver, remove the snap ring.

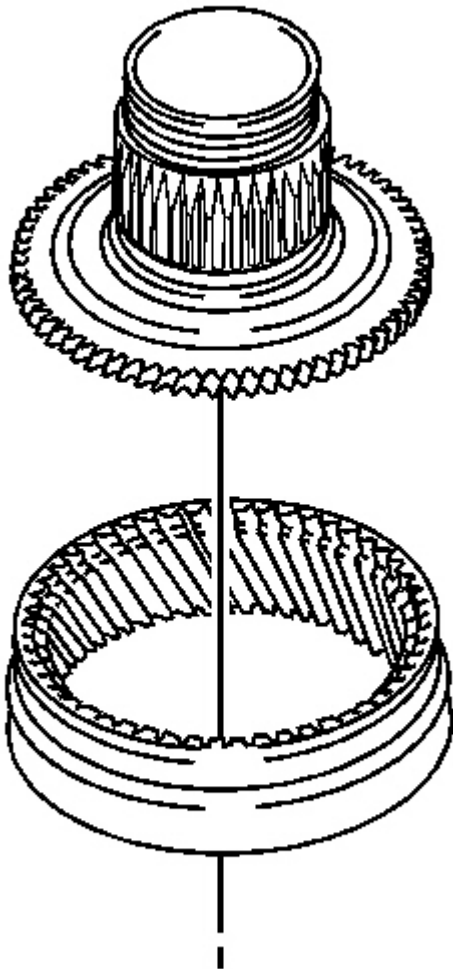


Fig. 351: Planetary Ring Gear & Flange
Courtesy of GENERAL MOTORS CORP.

2. Remove the planetary ring gear flange from the planetary ring gear.

PLANETARY RING GEAR ASSEMBLE

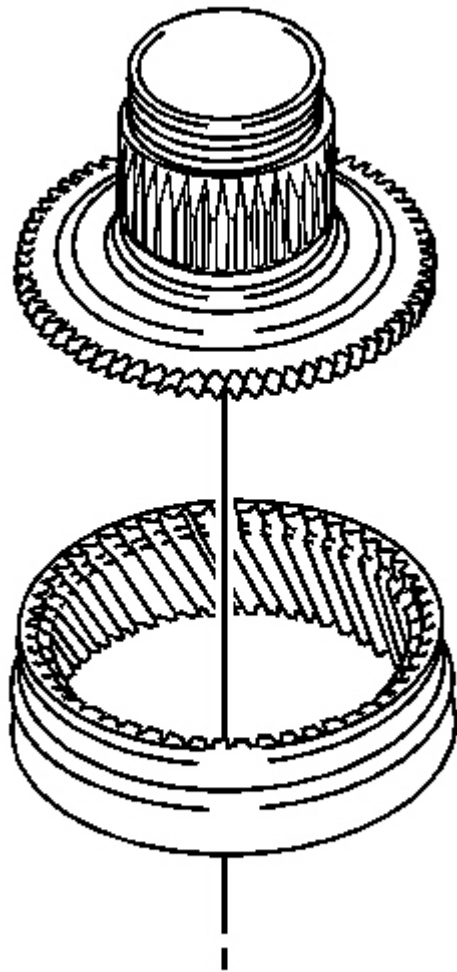


Fig. 352: Planetary Ring Gear & Flange
Courtesy of GENERAL MOTORS CORP.

1. Install a new planetary ring gear flange to the planetary ring gear.

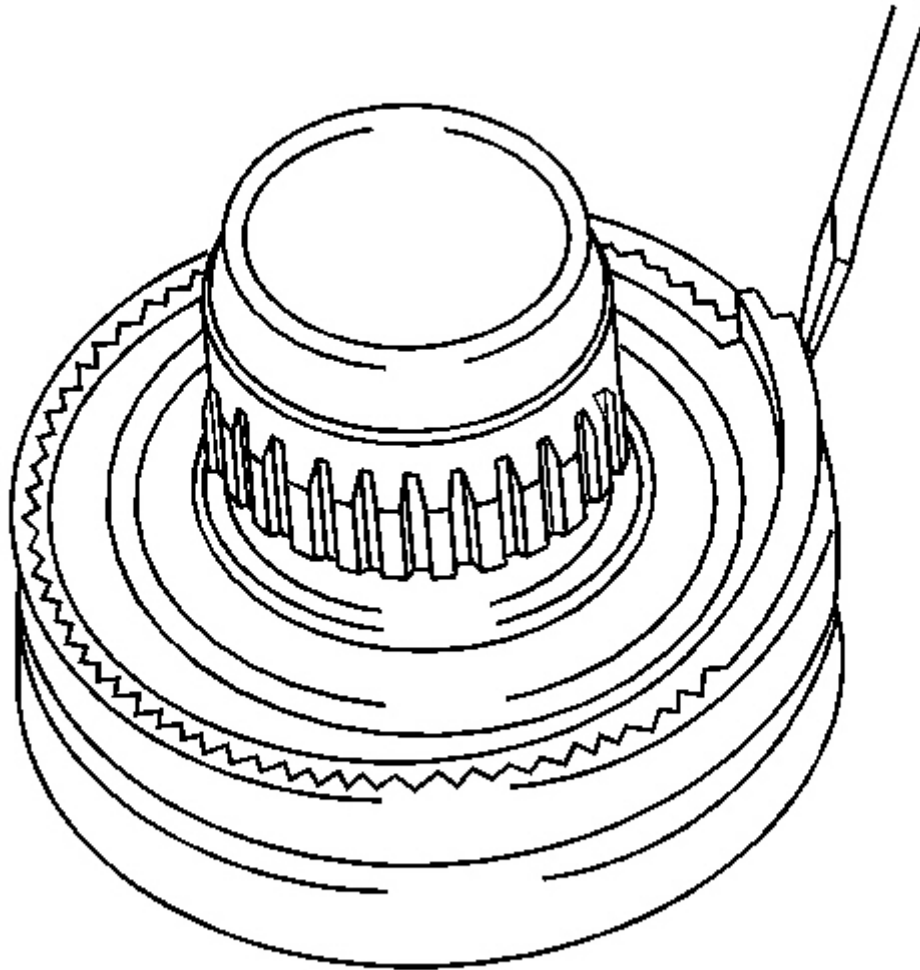


Fig. 353: Removing Snap Ring Planetary Ring Gear Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

2. Using a screwdriver, install the snap ring.

ONE WAY CLUTCH DISASSEMBLE

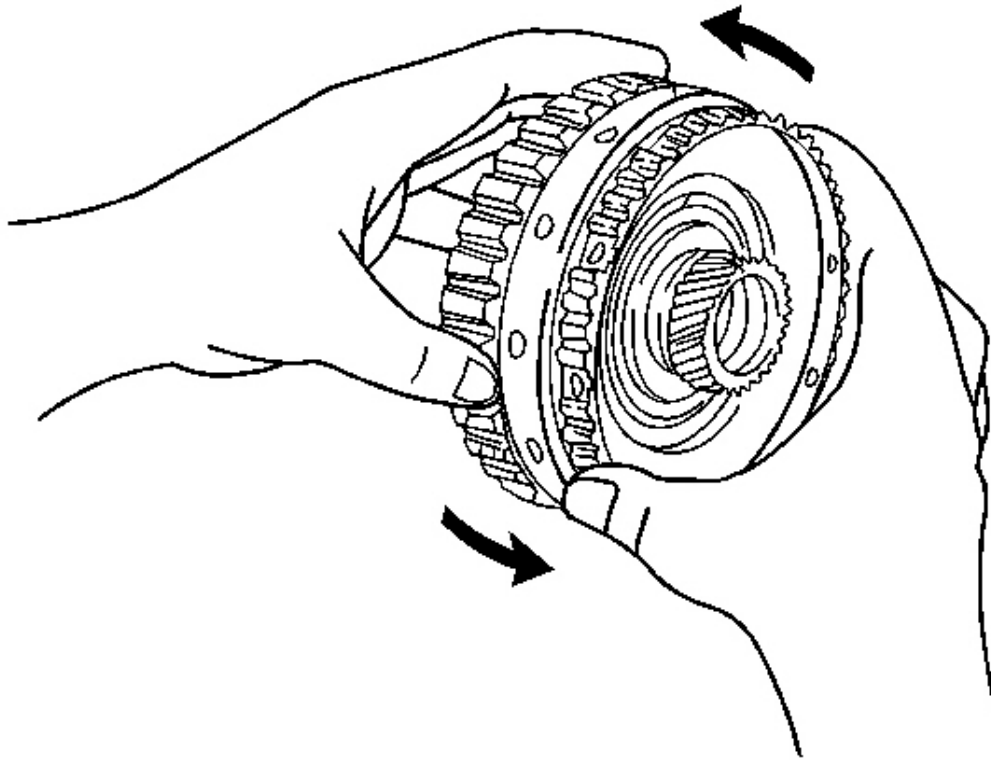


Fig. 354: Turning Rear Planetary Sun Gear & One-Way Clutch
Courtesy of GENERAL MOTORS CORP.

1. Install the one-way clutch and thrust washer to the rear planetary sun gear.
2. Hold the rear planetary sun gear and turn the one-way clutch. The one-way clutch should turn freely clockwise and should lock counterclockwise.

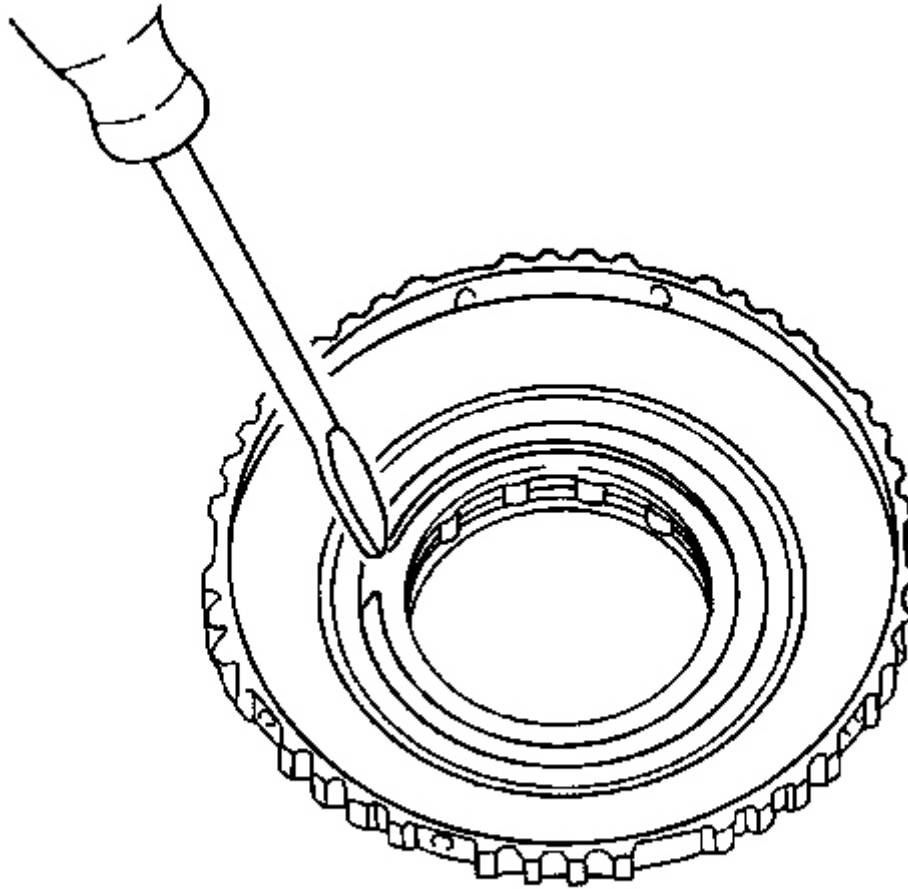


Fig. 355: Removing Snap Ring From 2nd Brake Hub Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

3. Using a screwdriver, remove the snap ring from the 2nd brake hub.

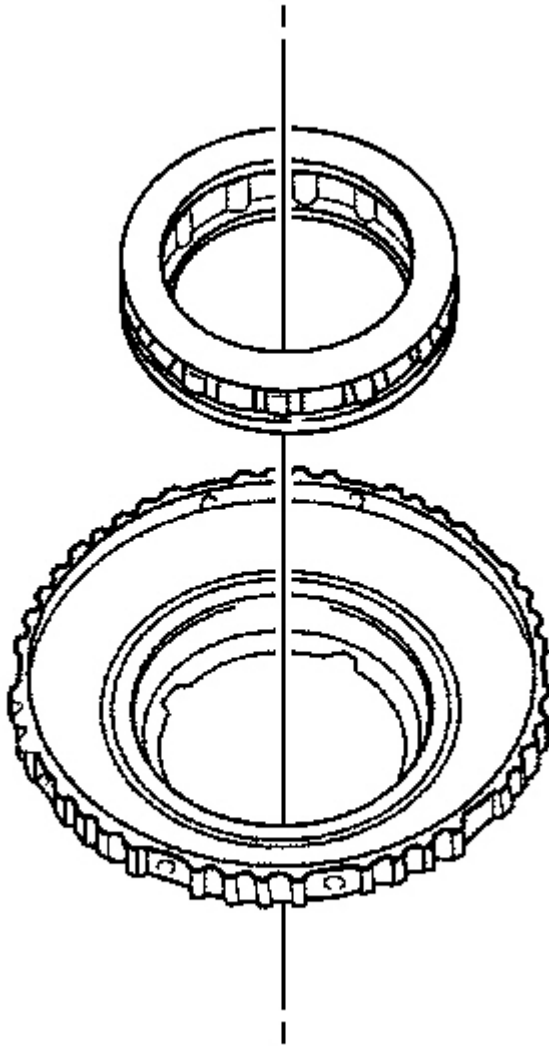


Fig. 356: One-Way Clutch & 2nd Brake Hub
Courtesy of GENERAL MOTORS CORP.

4. Remove the one-way clutch from the 2nd brake hub.

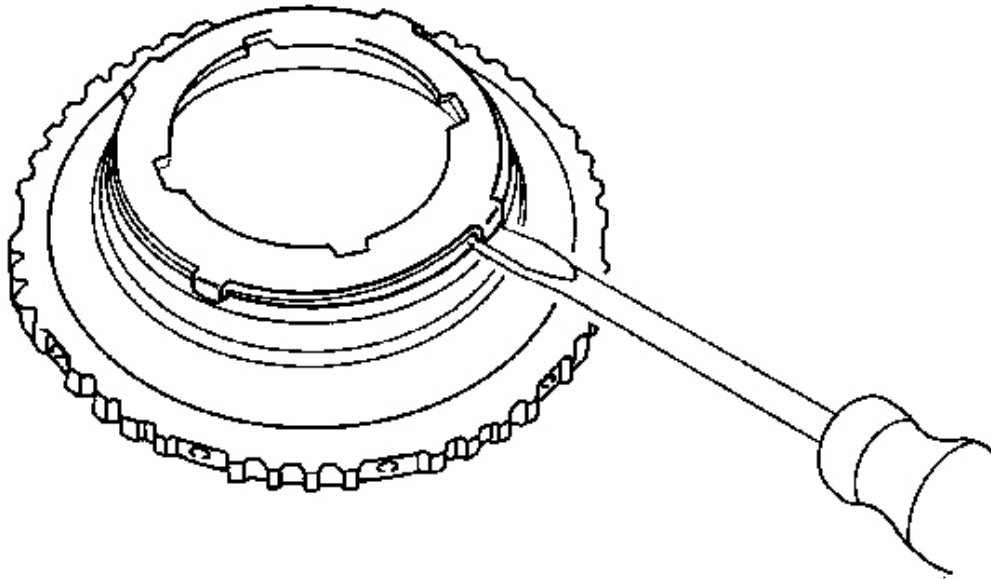


Fig. 357: Removing Retainer From 2nd Brake Hub Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

5. Using a small screwdriver, remove the retainer from the 2nd brake hub.

ONE WAY CLUTCH ASSEMBLY

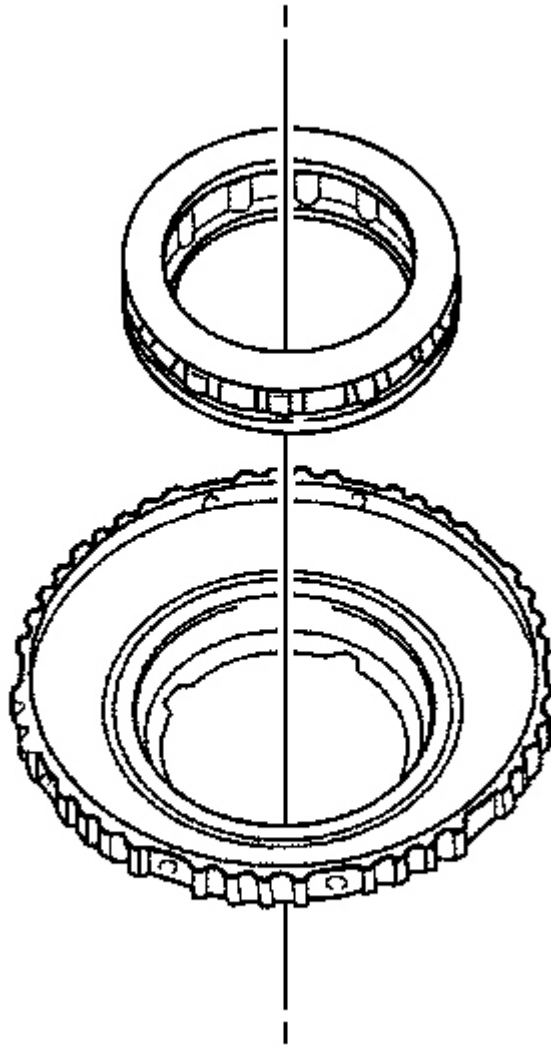


Fig. 358: One-Way Clutch & 2nd Brake Hub
Courtesy of GENERAL MOTORS CORP.

1. Install the retainer to the 2nd brake hub.
2. Install the one-way clutch.

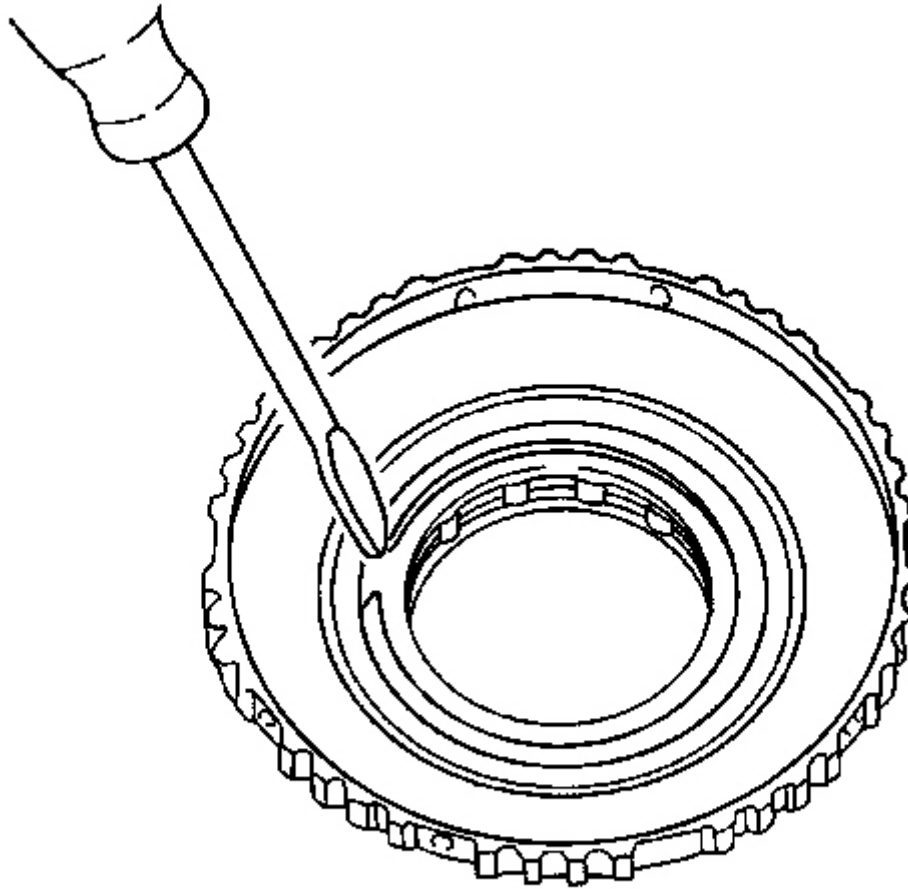


Fig. 359: Removing Snap Ring From 2nd Brake Hub Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

3. Using a screwdriver, install the snap ring.

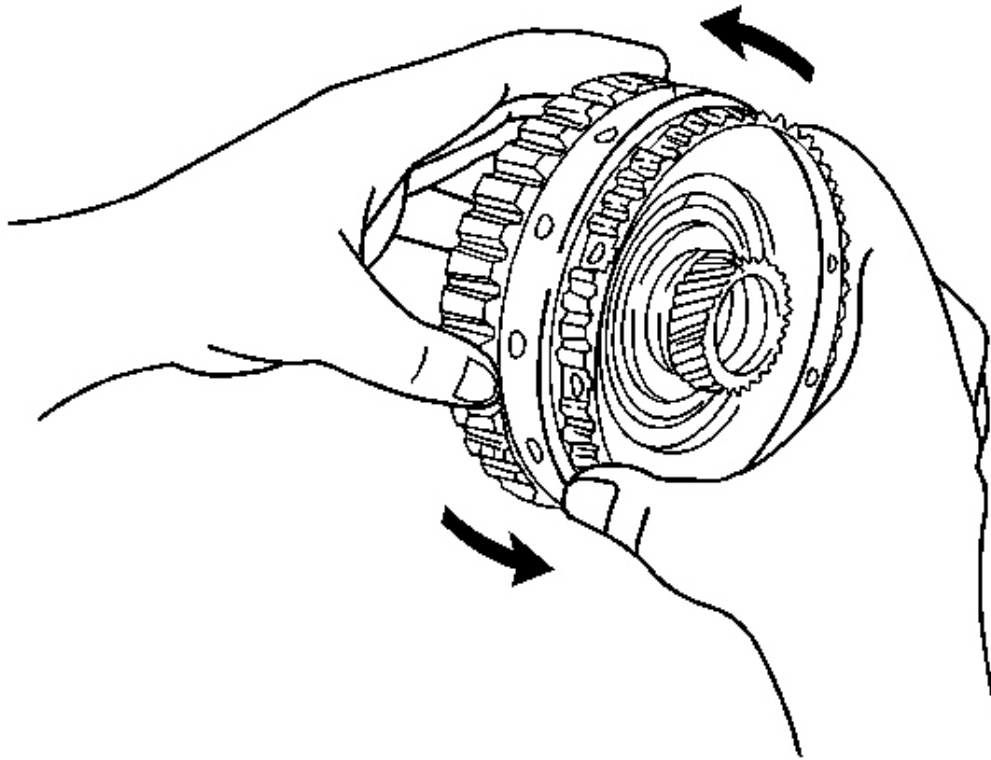


Fig. 360: Turning Rear Planetary Sun Gear & One-Way Clutch
Courtesy of GENERAL MOTORS CORP.

4. Install the one-way clutch and thrust washer to the rear planetary sun gear.
5. Hold the rear planetary sun gear and turn the one-way clutch. The one-way clutch should turn freely clockwise and should lock counterclockwise.

FORWARD AND REVERSE CLUTCH DISASSEMBLE

Tools Required

- DT 46451 (DW240-020) Brake/Clutch Spring Compressor. See Special Tools.
- DT 46452 (DW240-030) Forward Clutch Adapter. See Special Tools.
- DT 46520 (DW240-120) Measuring Terminal. See Special Tools.

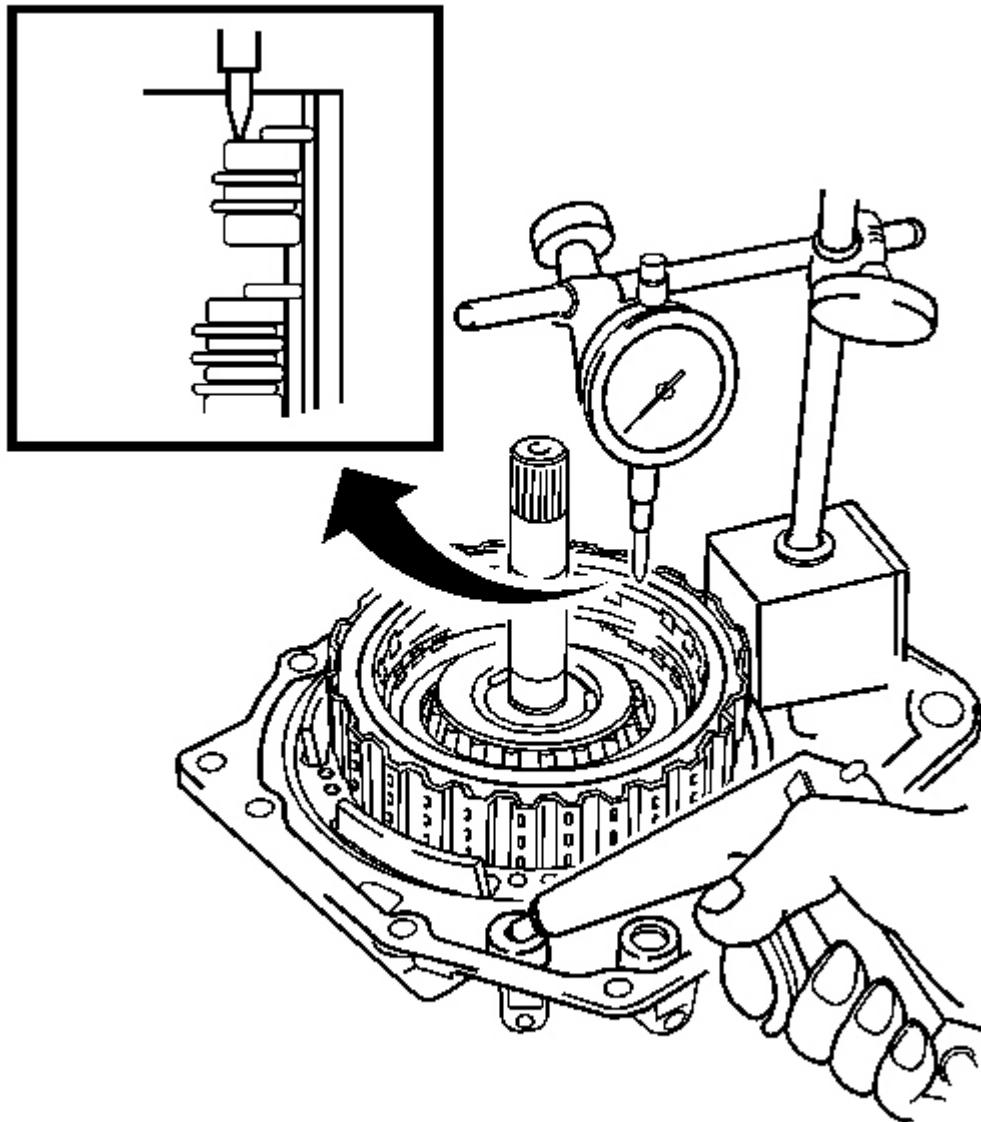


Fig. 361: Measuring Reverse Clutch Pack Clearance While Applying Compressed Air
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

1. Install the forward and reverse clutch and thrust needle roller bearing on the transaxle rear cover.
2. Using a dial indicator, measure the reverse clutch pack clearance while applying and releasing 392 kPa

(57 psi) of compressed air.

If the stroke is non-standard, inspect the discs, plates, and flange.

Specifications: The pack clearance is 0.4-1 mm (0.0157-0.0394 in).

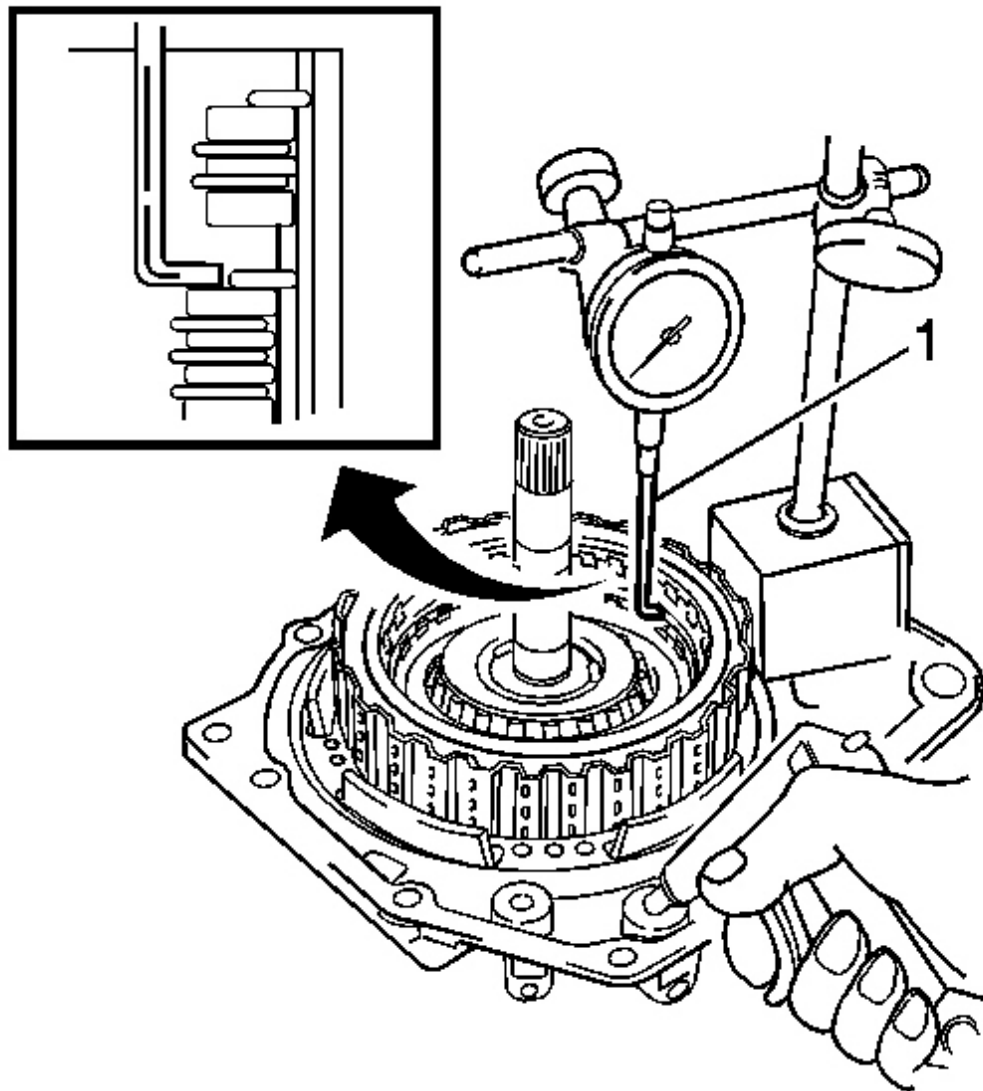


Fig. 362: Measuring Forward Clutch Pack Clearance While Applying Compressed Air
Courtesy of GENERAL MOTORS CORP.

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3. Install the forward and reverse clutch and thrust needle roller bearing on the transaxle rear cover.
4. Using a dial indicator and the **DT 46520** (1), measure the forward clutch pack clearance while applying and releasing 392 kPa (57 psi) of compressed air. See **Special Tools**.
 - The forward and reverse clutch will come out as you apply the compressed air. Therefore, while the checking is being done, press on the input shaft of the forward and reverse clutch using stamping machine or alike so that the pressure is not applied on the forward and reverse clutch.
 - If the stroke is non-standard, inspect the discs, plates and flange.

Specifications: The pack clearance is 1.1-1.5 mm (0.043-0.059 in).

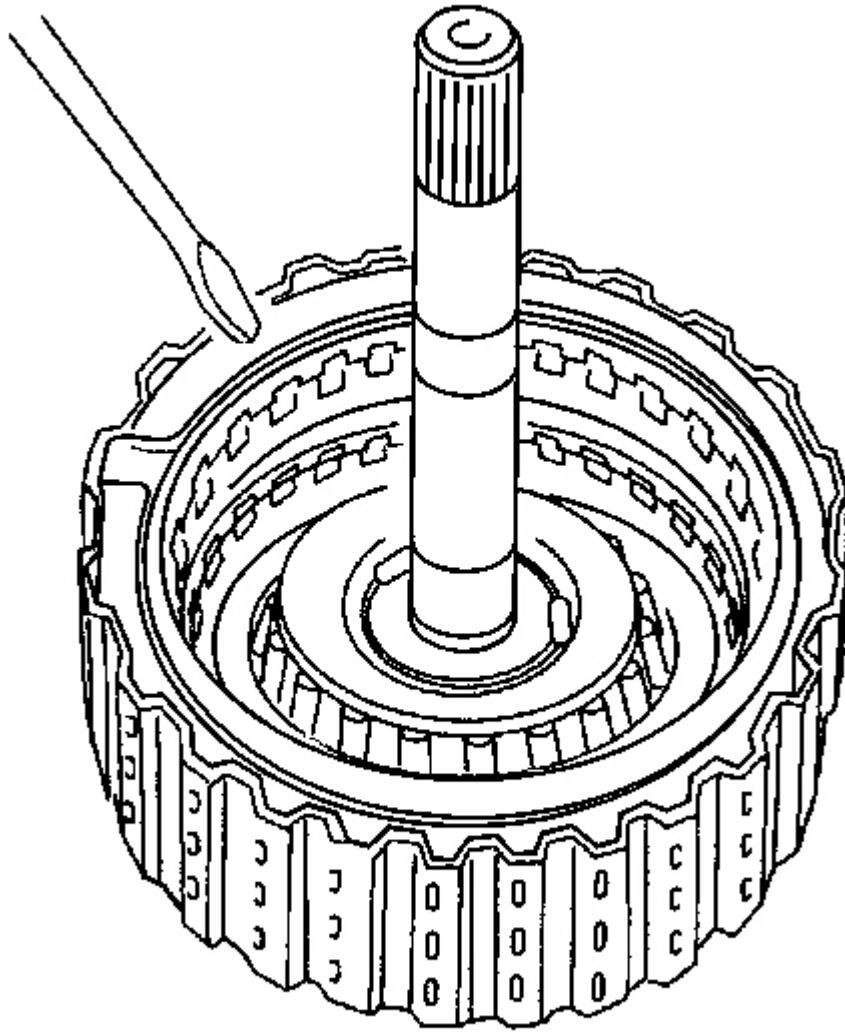


Fig. 363: Removing Reverse Clutch Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

5. Using a screwdriver, remove the reverse clutch snap ring.

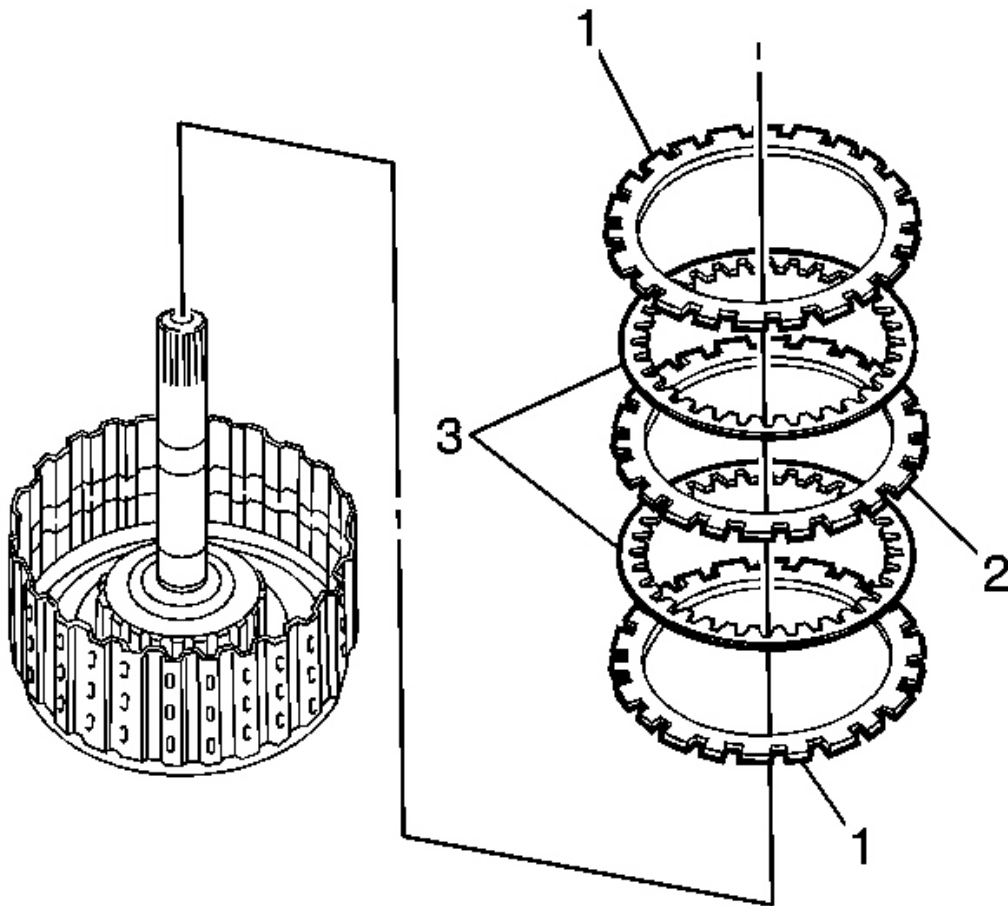


Fig. 364: Flanges, Discs, Plate & Reverse Clutch Drum
Courtesy of GENERAL MOTORS CORP.

6. Remove the 2 flanges (1), the 2 discs (3), and the plate (2) from the reverse clutch drum.

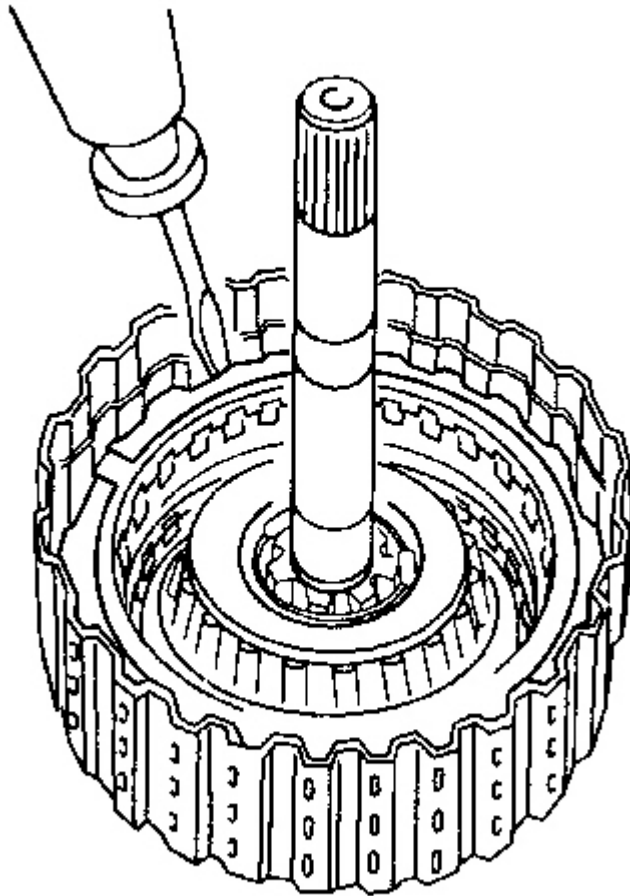


Fig. 365: Removing Forward/Reverse Clutch Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

7. Using a screwdriver, remove the snap ring.

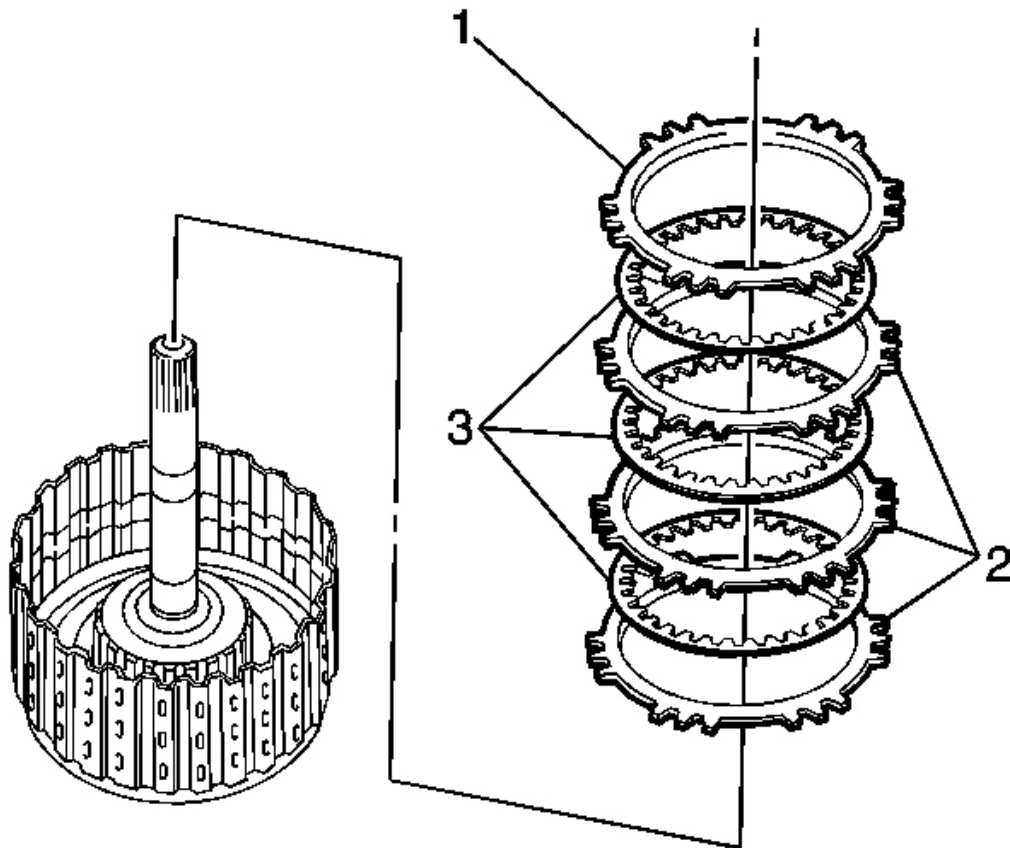


Fig. 366: Flanges, Discs, Plate & Forward Clutch Drum
Courtesy of GENERAL MOTORS CORP.

8. Remove the flange (1), 3 discs (3), and 3 plates (2) from the forward clutch drum.

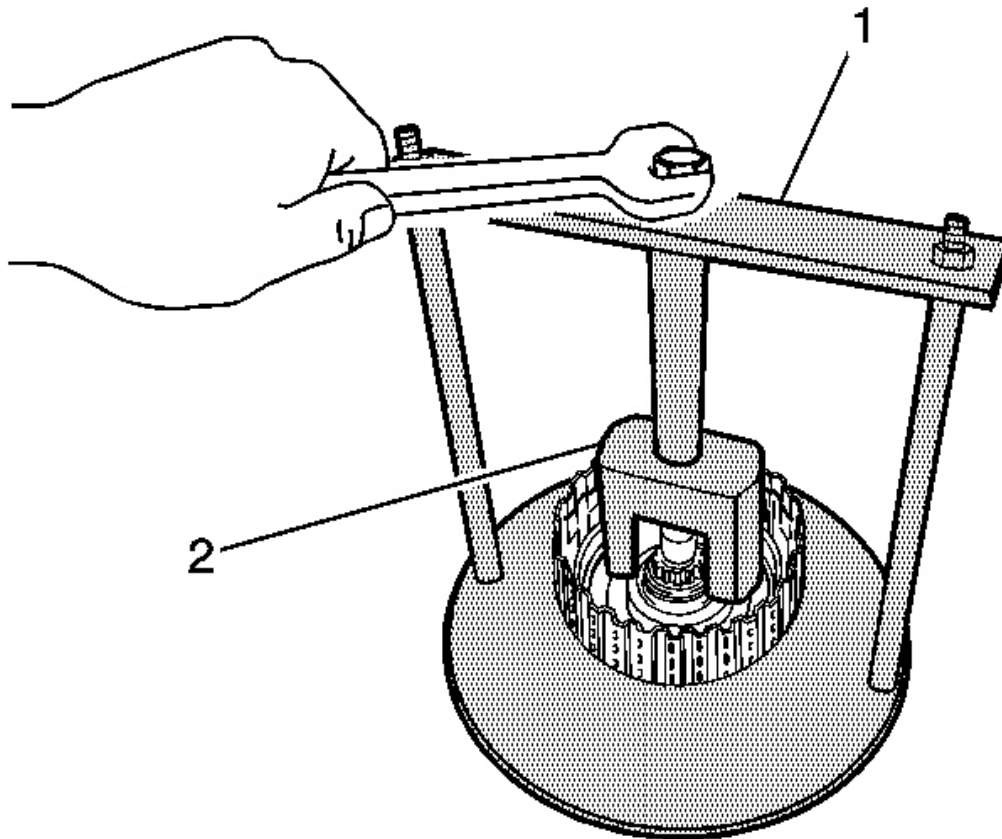


Fig. 367: Compressing Spring Using DT 46451 & DT 46452
Courtesy of GENERAL MOTORS CORP.

9. Using the **DT 46451** (1) and the **DT 46452** (2), compress the spring. See **Special Tools**.

IMPORTANT: Do not expand the snap ring excessively.

10. Using a snap ring expander, remove the snap ring.

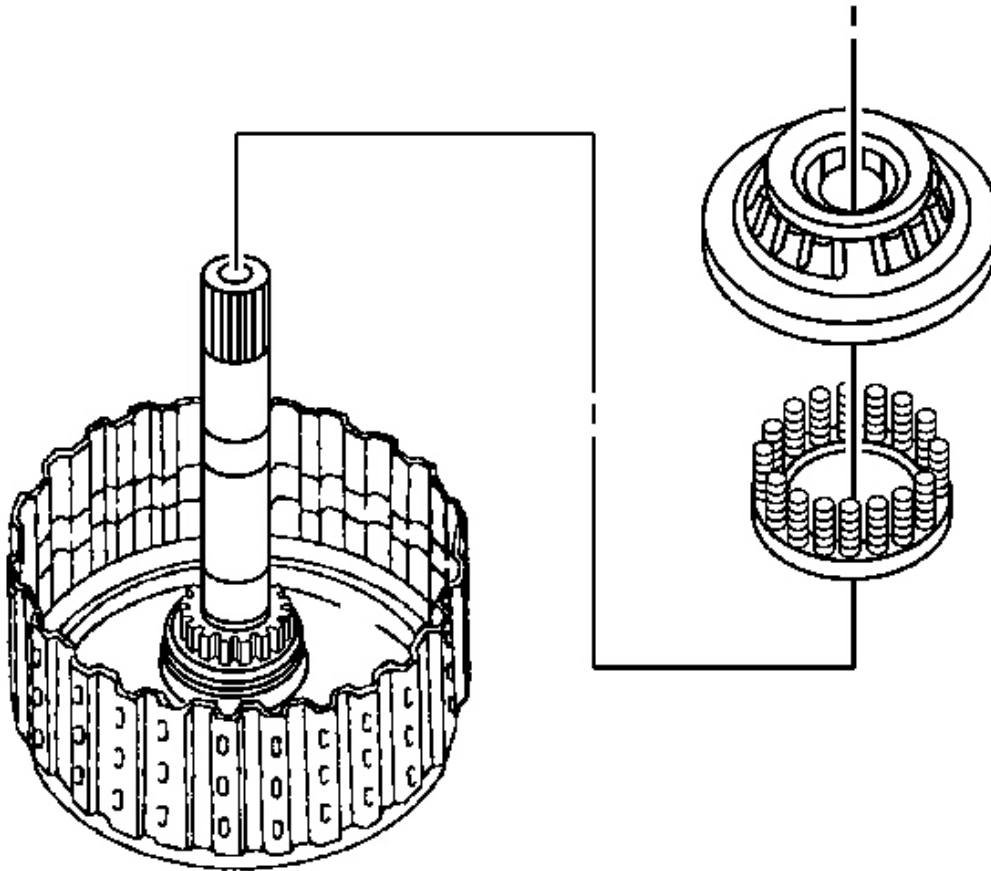


Fig. 368: Clutch Balancer & Forward Clutch Return Spring
Courtesy of GENERAL MOTORS CORP.

11. Remove the clutch balancer and forward clutch return spring.

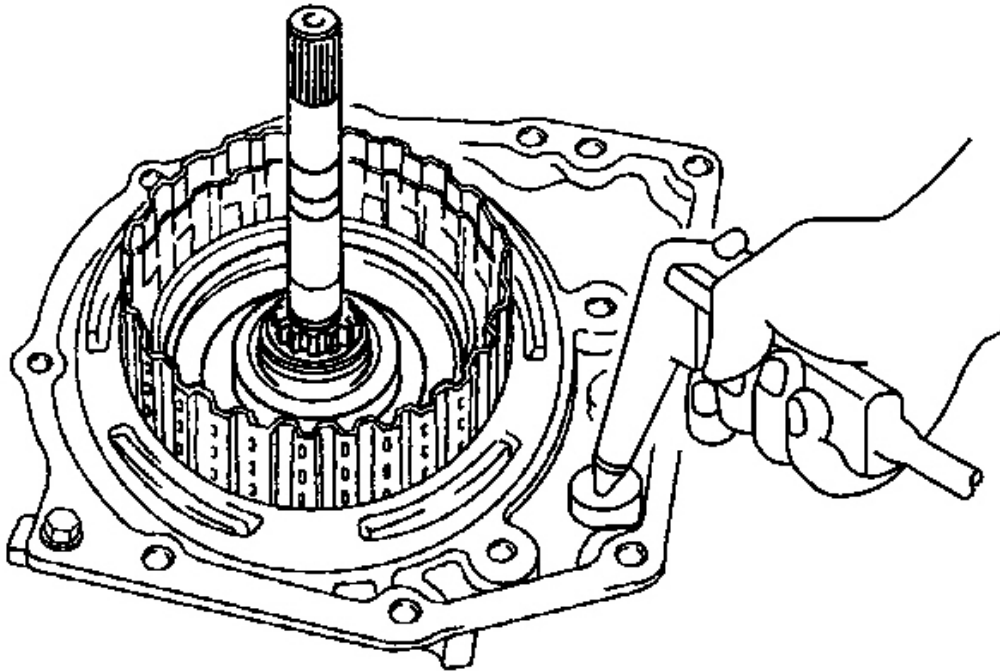


Fig. 369: Forward/Reverse Multiple Disc Clutch & Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

12. Install the forward and reverse multiple disc clutch on the transaxle rear cover.

IMPORTANT:

- Air pressure may cause the pistons to jump-out. When removing the piston, hold it with your hand using a waste cloth.
- Take care not to splash automatic transmission fluid (ATF) when air-blowing.

13. Apply 392 kPa (57 psi) of compressed air to the transaxle rear cover to remove the forward clutch piston.

When the piston cannot be removed as it is slanted, either blow the air again with the protruding side pushed or remove the piston using a needle-nose pliers with vinyl tape on the tip.

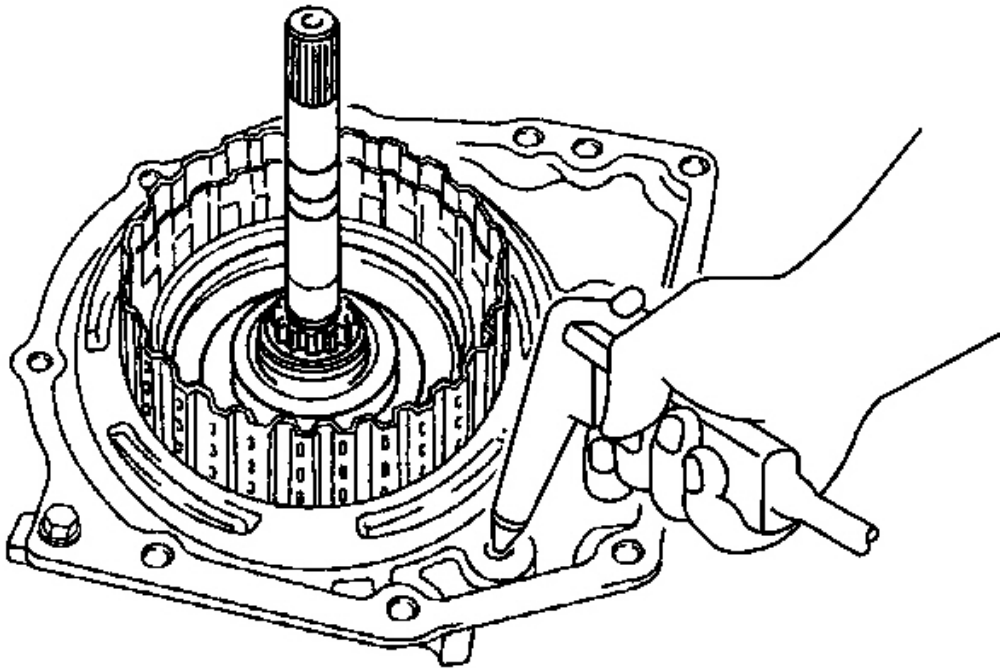


Fig. 370: Applying Compressed Air To Transaxle Rear Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Air pressure may cause the drums to jump-out. When removing the drum, hold it with your hand using a waste cloth.

14. Apply 392 kPa (57 psi) of compressed air to the transaxle rear cover to remove the forward clutch drum.

When the drum can not be removed as it is slanted, either blow the air again with the protruding side pushed or remove the drum using a needle nose pliers with vinyl tape on the tip.

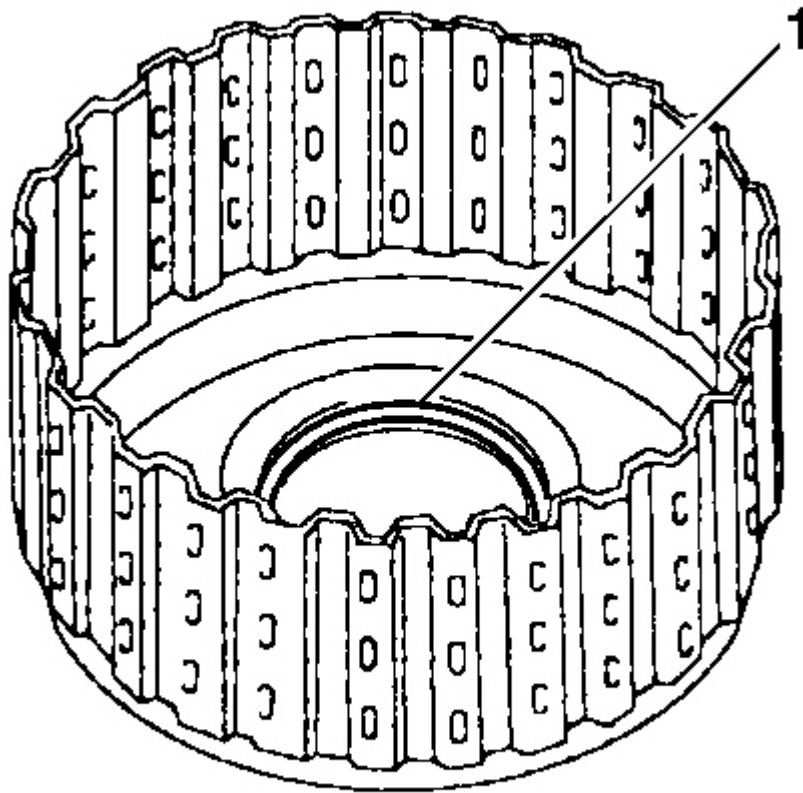


Fig. 371: O-Ring & Forward Clutch Drum
Courtesy of GENERAL MOTORS CORP.

15. Using a small screwdriver, remove the O-ring (1) from the forward clutch drum.

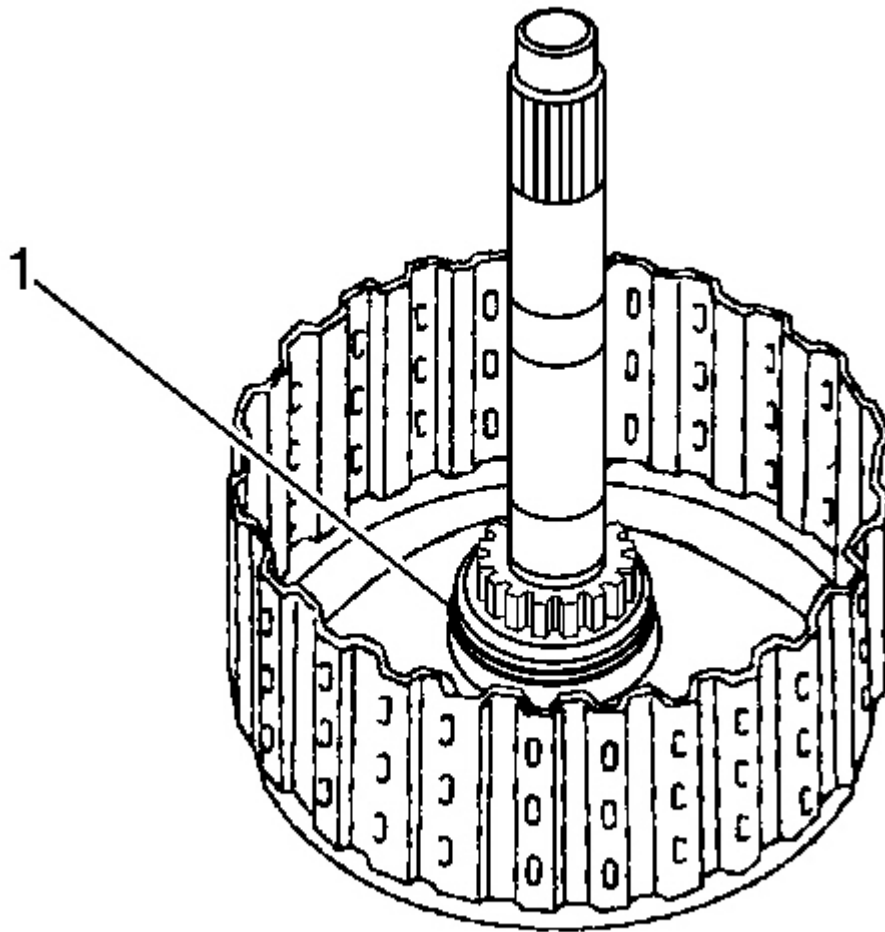


Fig. 372: O-Ring & Intermediate Shaft Sub-Assembly
Courtesy of GENERAL MOTORS CORP.

16. Using a small screwdriver, remove the O-ring (1) from the intermediate shaft sub-assembly.

FORWARD AND REVERSE CLUTCH INSPECTION

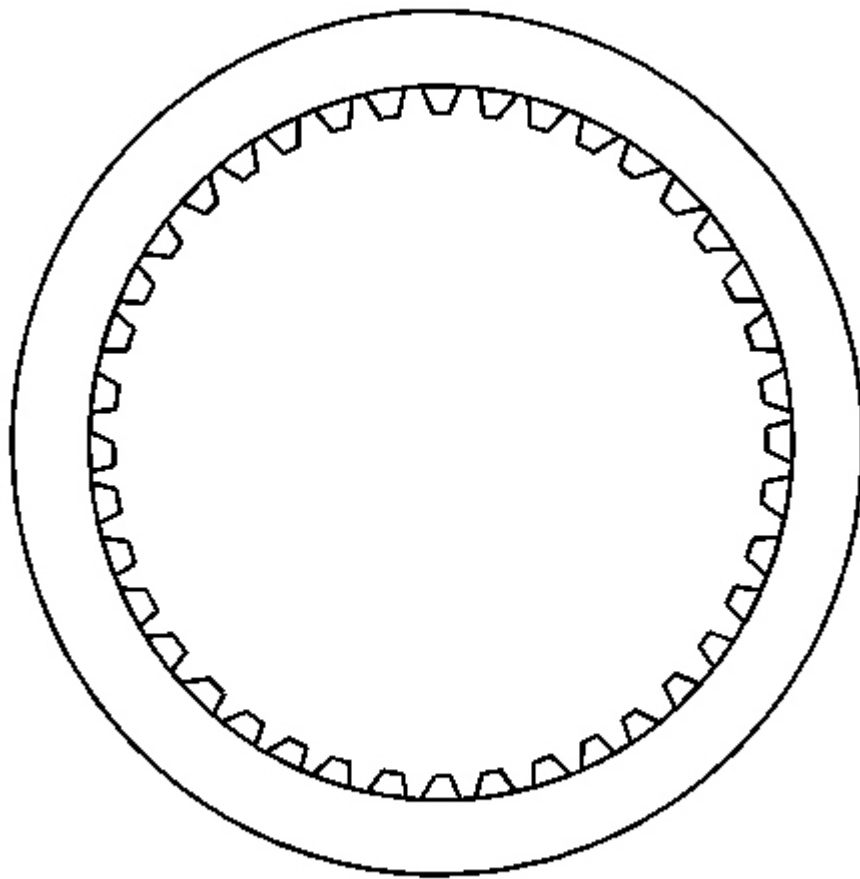


Fig. 373: Checking Forward/Reverse Clutch Disc, Plate & Flange For Damage
Courtesy of GENERAL MOTORS CORP.

1. Check to see if the sliding surface of the disc, plate, and flange are worn or burnt. If necessary, replace them.
 - If the lining of the disc is peeling off or discolored, or even if a part of the printed number is defaced, replace all discs.
 - Before assembling new discs, soak them in ATF for at least 15 minutes.

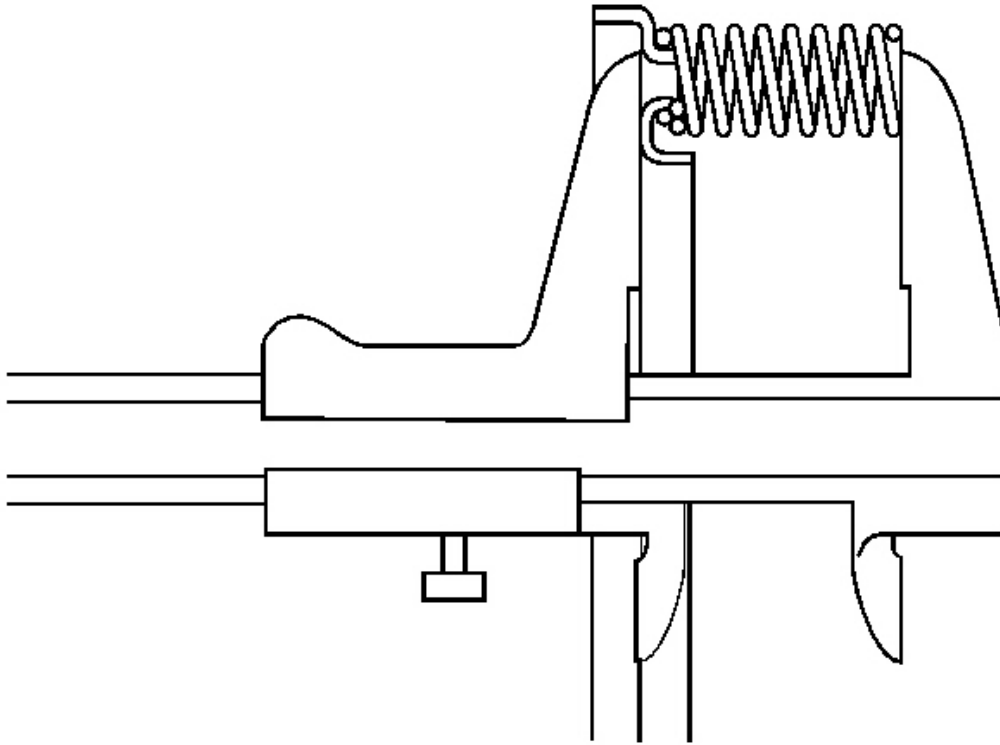


Fig. 374: Measuring Free Length Of Spring Using Vernier Calipers
Courtesy of GENERAL MOTORS CORP.

2. Using vernier calipers, measure the free length of the spring together with the spring seat.

Specifications: The standard free length is 24.04 mm (0.9465 in).

FORWARD AND REVERSE CLUTCH ASSEMBLE

Tools Required

- **DT 46451** (DW240-020) Brake/Clutch Spring Compressor. See **Special Tools**.
- **DT 46452** (DW240-030) Forward Clutch Adapter. See **Special Tools**.
- **DT 46520** (DW240-120) Measuring Terminal. See **Special Tools**.

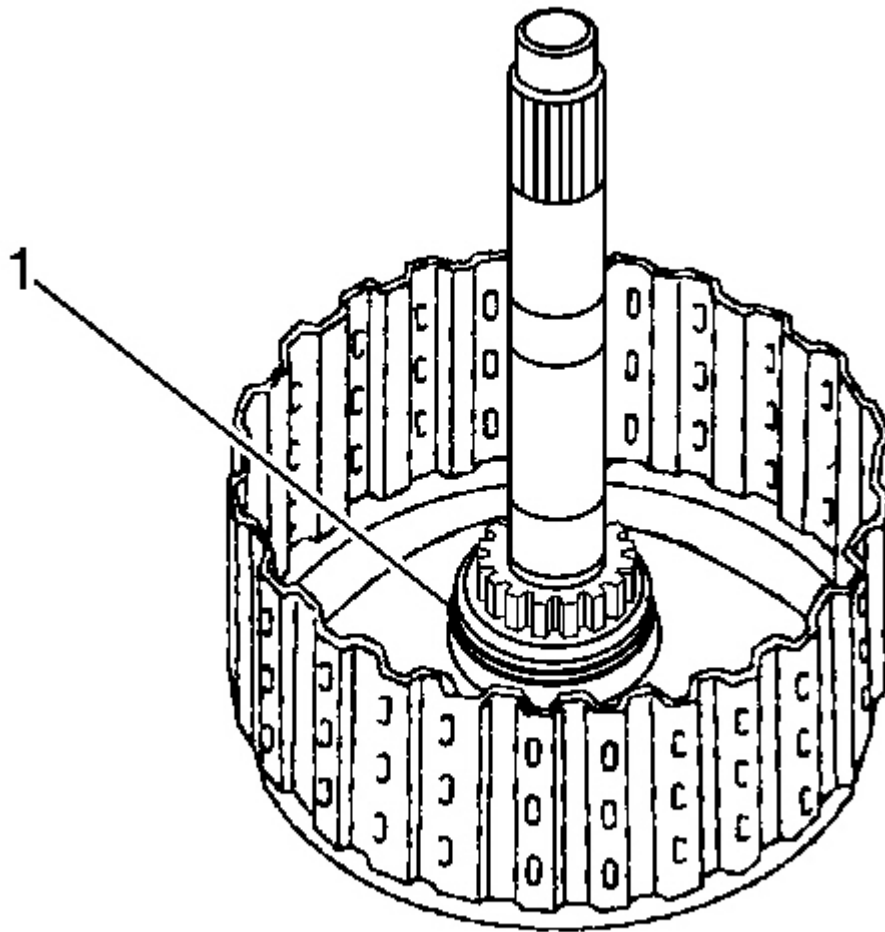


Fig. 375: O-Ring & Intermediate Shaft Sub-Assembly
Courtesy of GENERAL MOTORS CORP.

1. Coat a new O-ring (1) with automatic transmission fluid (ATF) and install it to the intermediate shaft sub-assembly.

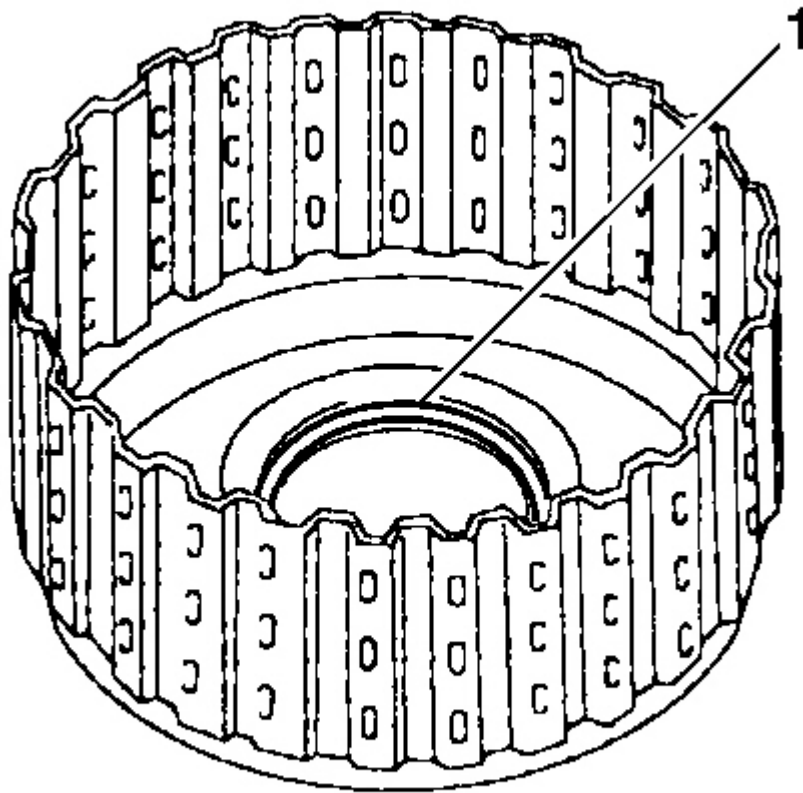


Fig. 376: O-Ring & Forward Clutch Drum
Courtesy of GENERAL MOTORS CORP.

2. Coat a new O-ring (1) with ATF, and install it to the forward clutch drum.

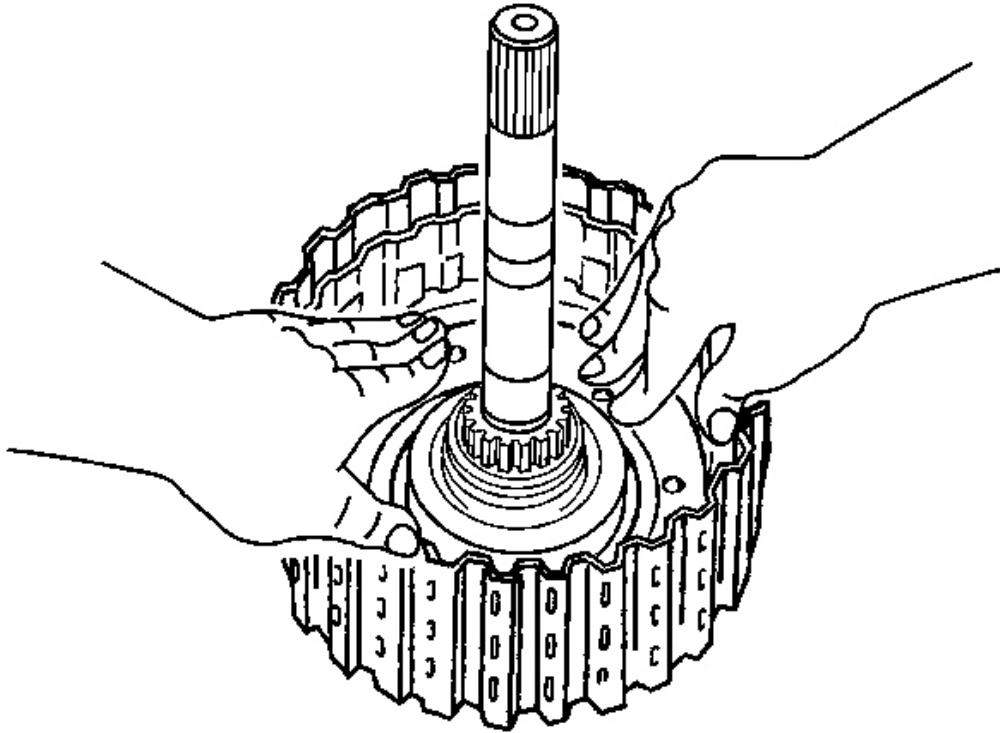


Fig. 377: Forward Clutch Drum, O-Ring, Lip Seal & ATF
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the O-ring and lip seal of forward clutch drum.

3. Coat the forward clutch drum with ATF, install the forward clutch drum.

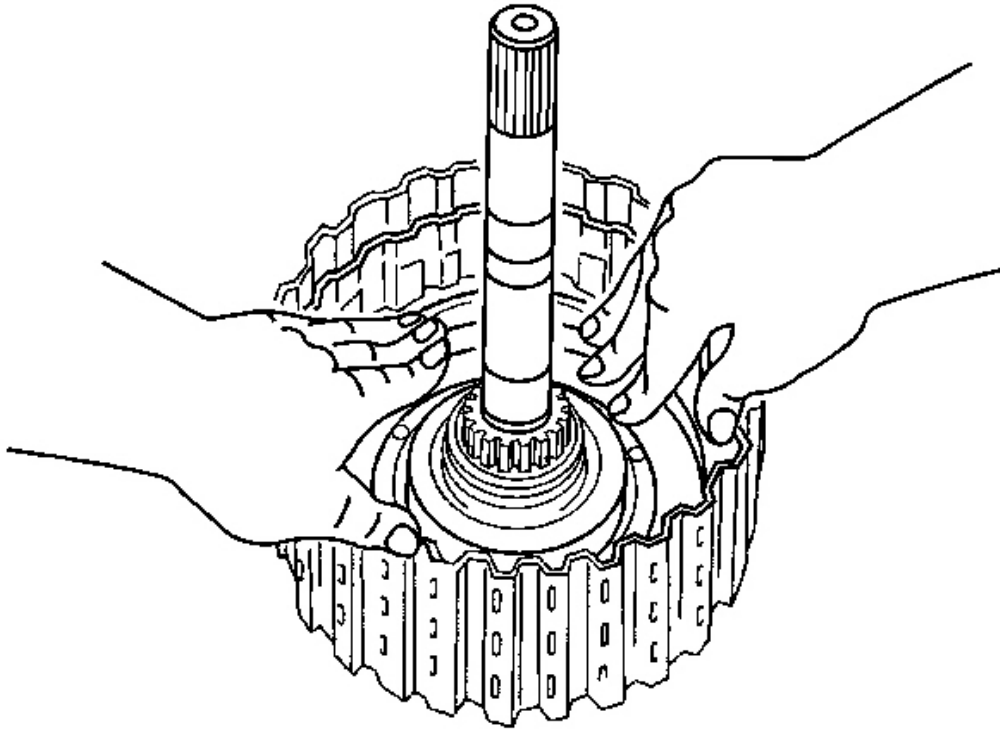


Fig. 378: Forward Clutch Drum, Lip Seal & ATF
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the lip seal of forward clutch return spring.

4. Coat the forward clutch piston with ATF, install the forward clutch piston.

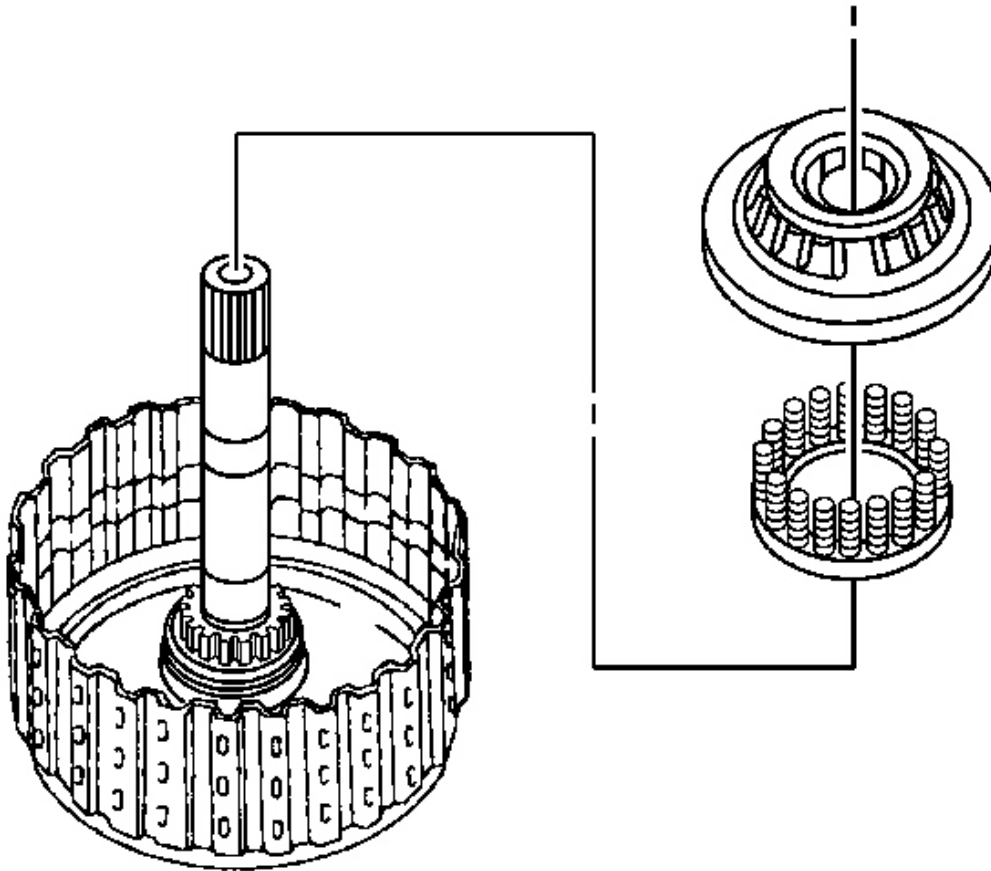


Fig. 379: Clutch Balancer & Forward Clutch Return Spring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not damage the lip seal of forward clutch return spring.

5. Install the forward clutch return spring and clutch balancer.

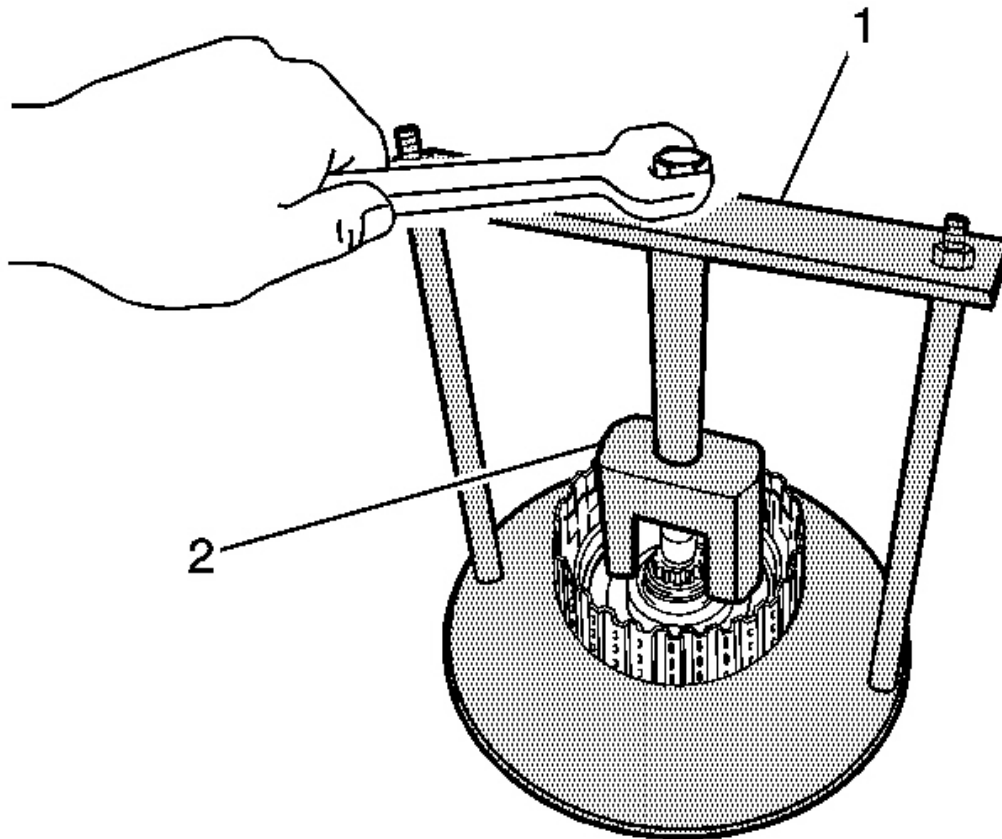


Fig. 380: Compressing Spring Using DT 46451 & DT 46452
Courtesy of GENERAL MOTORS CORP.

6. Place the **DT 46451** (1) and **DT 46452** (2) on the clutch balancer and compress the piston return spring. See **Special Tools**.

IMPORTANT: Do not expand the snap ring excessively.

7. Using a snap ring expander, install the snap ring.

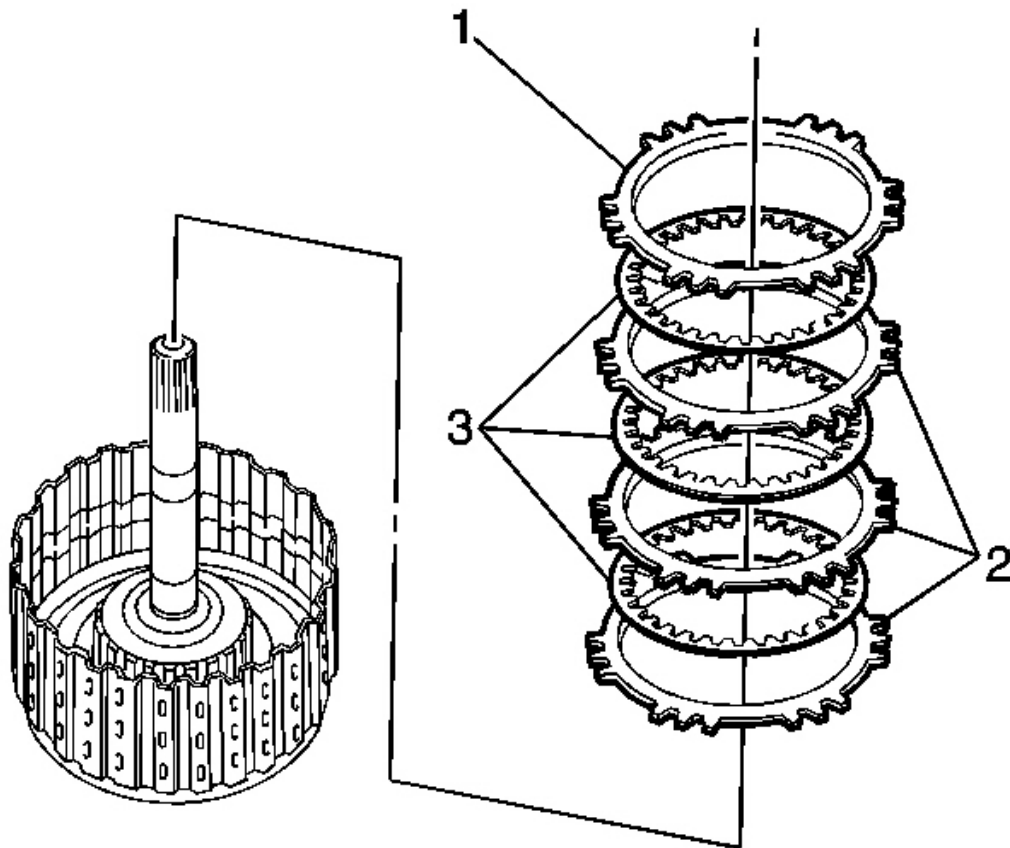


Fig. 381: Flanges, Discs, Plate & Forward Clutch Drum
Courtesy of GENERAL MOTORS CORP.

8. Install the 3 plates (2), 3 discs (3), and the flange (1) in order 2-3-2-3-2-3-1.

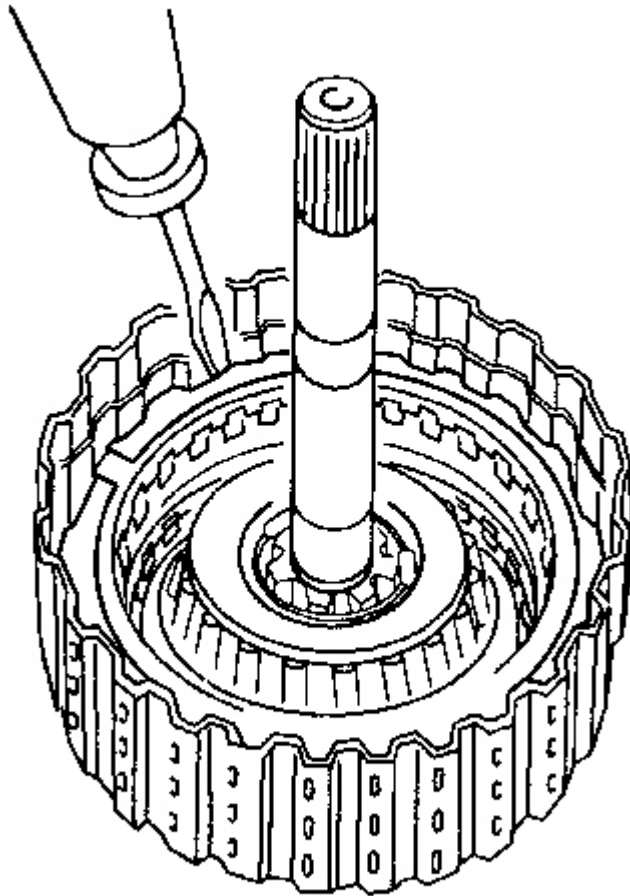


Fig. 382: Removing Forward/Reverse Clutch Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

9. Using a screwdriver, install the snap ring.
10. Check that the end gap of the snap ring is not aligned with one of the cutouts.

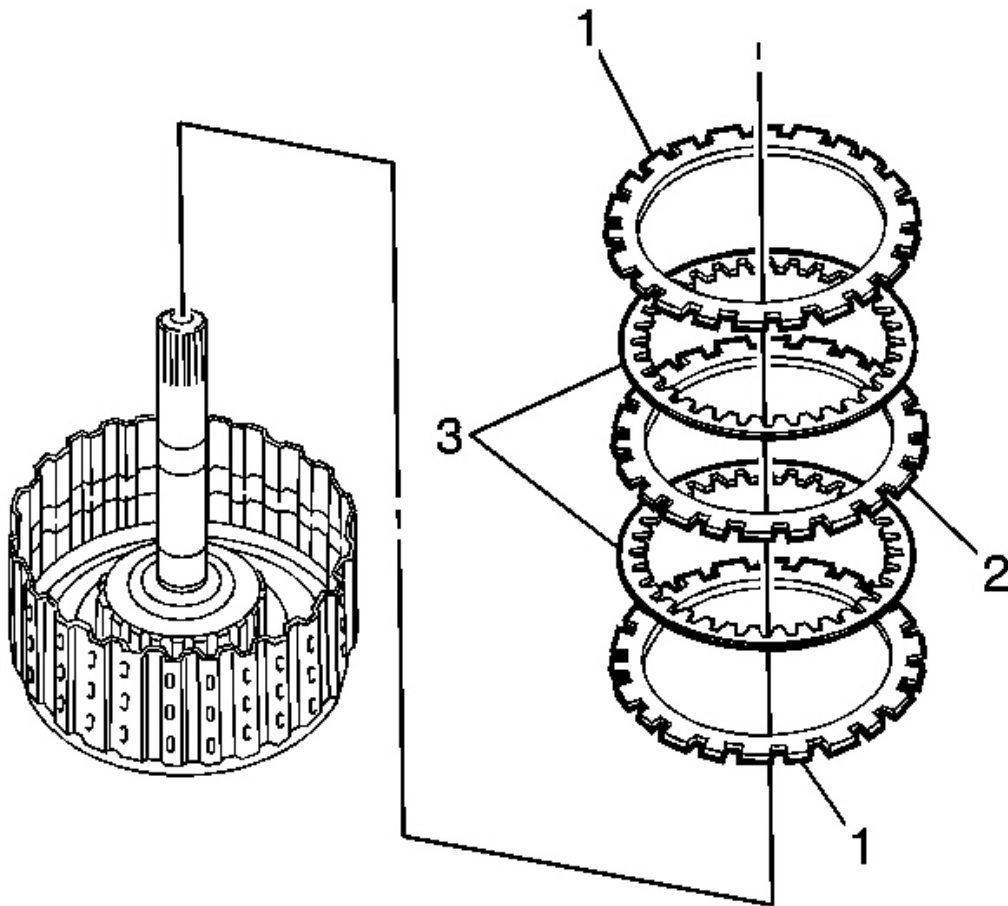


Fig. 383: Flanges, Discs, Plate & Reverse Clutch Drum
Courtesy of GENERAL MOTORS CORP.

11. Install the plate (2), 2 discs (3), and 2 flanges (1) in order 1-3-2-3-1.

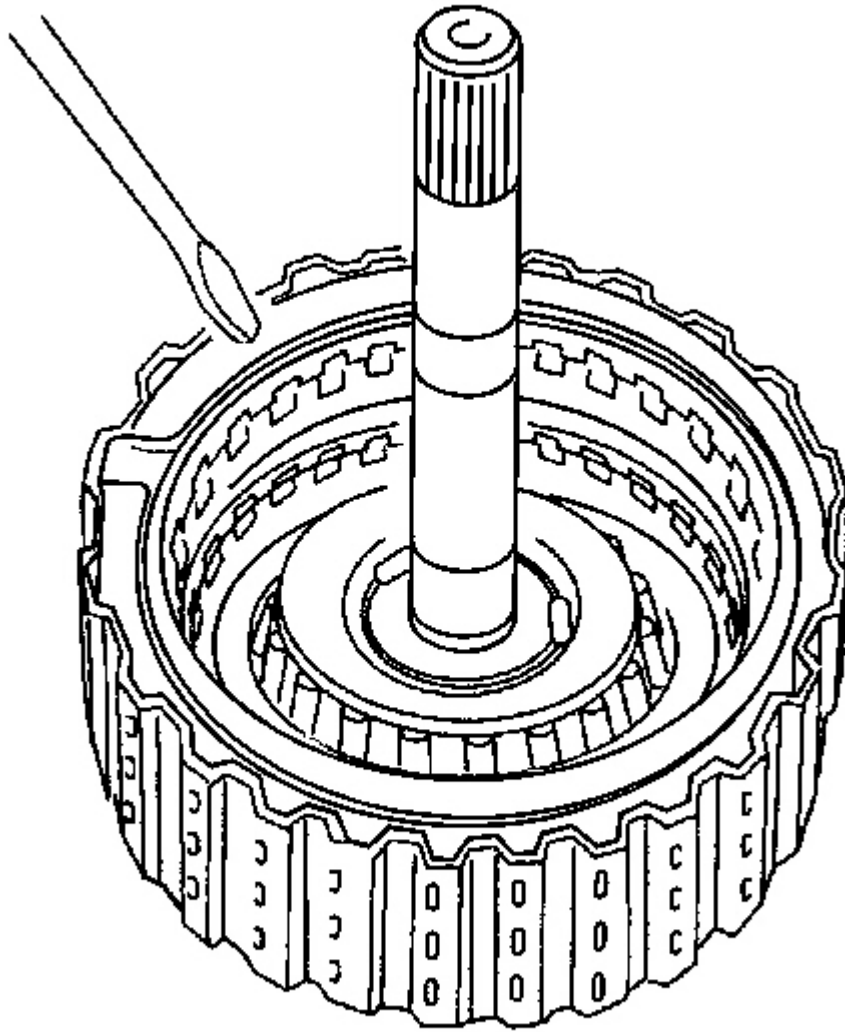


Fig. 384: Removing Reverse Clutch Snap Ring Using A Screwdriver
Courtesy of GENERAL MOTORS CORP.

12. Using a screwdriver, install the snap ring.
13. Check that the end gap of the snap ring is not aligned with one of the cutouts.

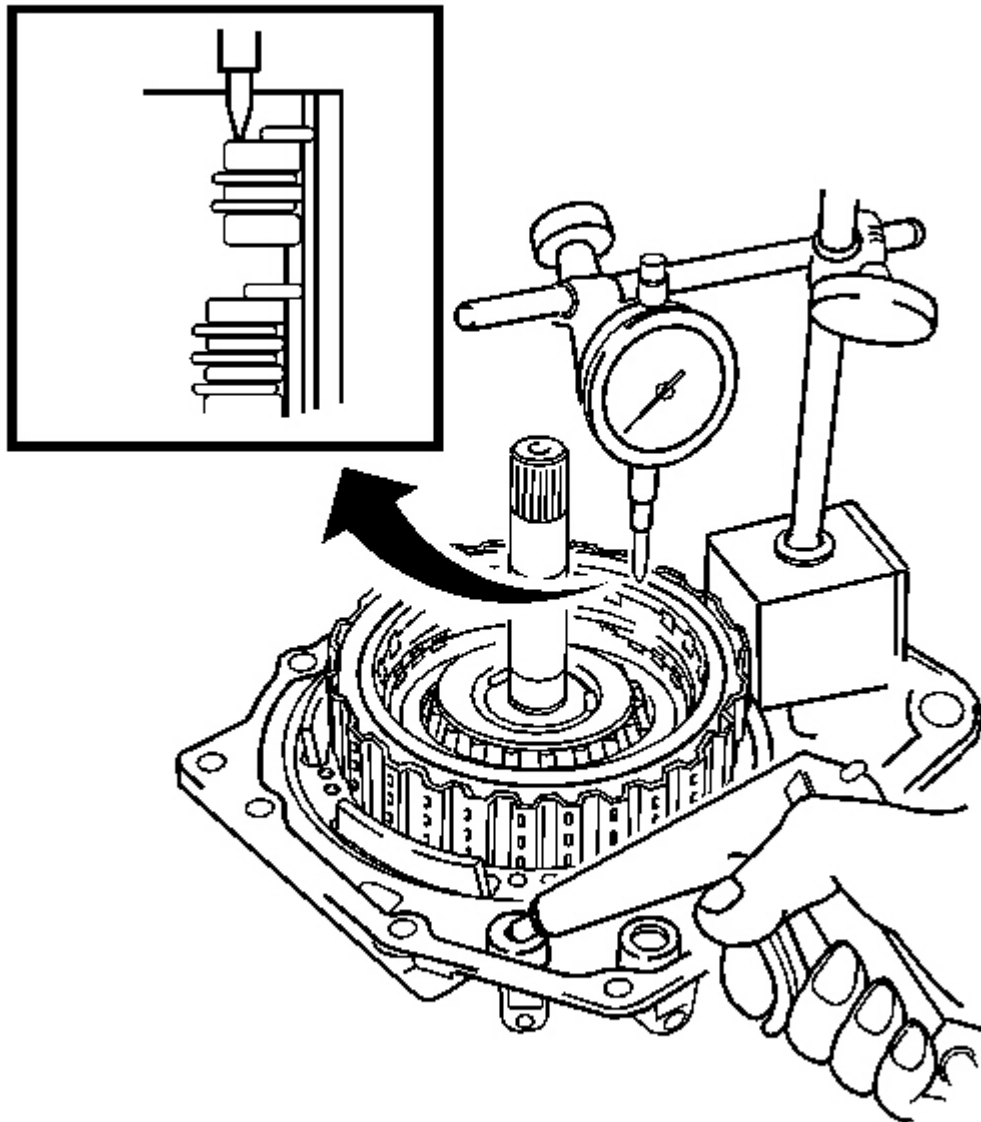


Fig. 385: Measuring Reverse Clutch Pack Clearance While Applying Compressed Air
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Compressed Air Should Not Exceed 98 kPa (14 psi) Notice .

14. Install the forward and reverse clutch and thrust needle roller bearing on the transaxle rear cover.
15. Using a dial indicator, measure the reverse clutch pack clearance while applying and releasing 392 kPa

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(57 psi) of compressed air.

- If the pack clearance is less than the limit of pack clearance, parts may have been assembled incorrectly, so check and reassemble again.

If the pack clearance is non-standard, select another flange.

Specifications: The pack clearance is 0.4-1 mm (0.0157-0.0394 in).

- There are 4 flanges in different thickness.

Specifications:

- The number 1 flange thickness is 3 mm (0.118 in).
- The number 2 flange thickness is 3.2 mm (0.126 in).
- The number 3 flange thickness is 3.4 mm (0.134 in).
- The number 4 flange thickness is 3.6 mm (0.142 in).

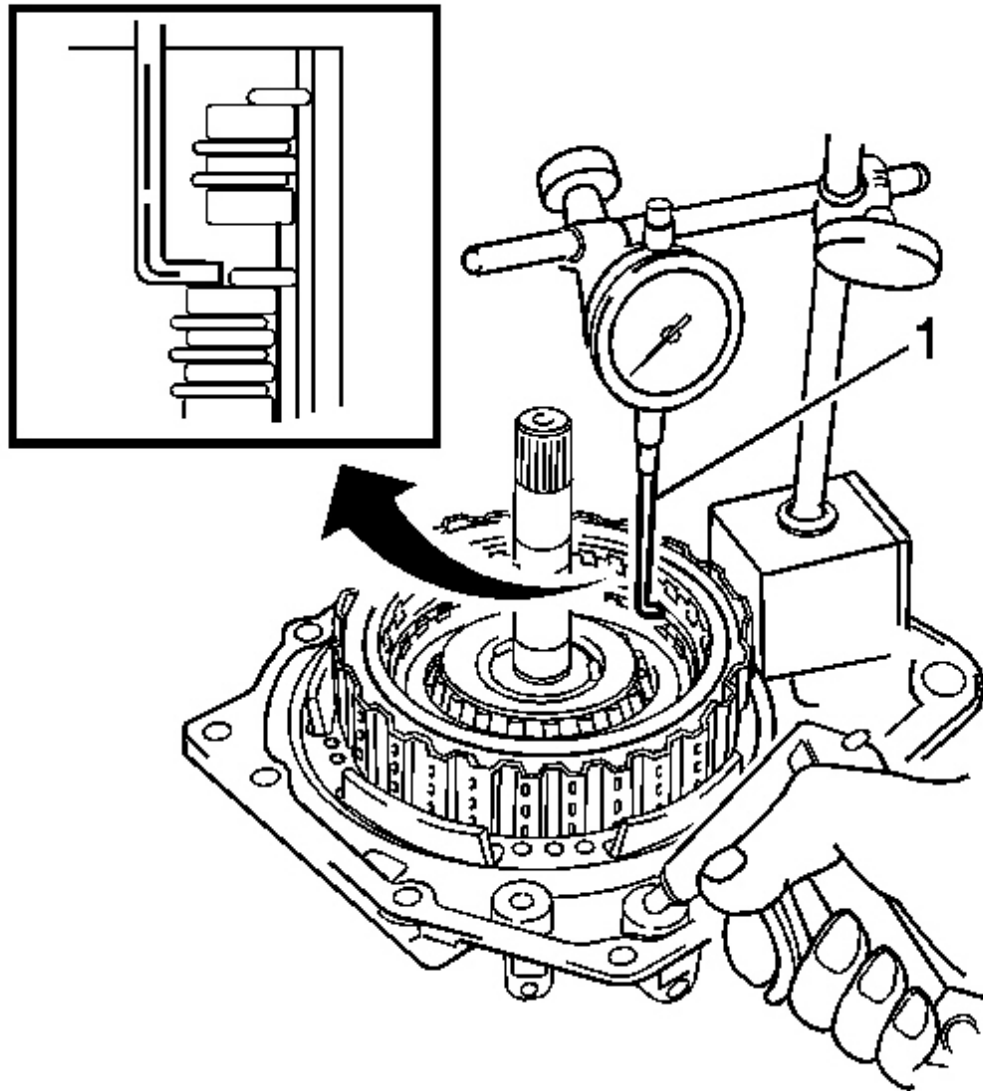


Fig. 386: Measuring Forward Clutch Pack Clearance While Applying Compressed Air
Courtesy of GENERAL MOTORS CORP.

16. Install the forward and reverse clutch and thrust needle roller bearing on the transaxle rear cover.
17. Using a dial indicator and the **DT 46464** (1), measure the forward clutch pack clearance while applying and releasing 392 kPa (57 psi) of compressed air. See **Special Tools**.
 - The forward and reverse clutch will come out as you apply the compressed air. Therefore, while the checking is being done, press on the input shaft of the forward and reverse clutch using stamping

machine or alike so that the pressure is not applied on the forward and reverse clutch.

- If the pack clearance is less than the limit of pack clearance, parts may have been assembled incorrectly, so check and reassemble again.

If the pack clearance is non-standard, select another flange.

Specifications: The pack clearance is 1.1-1.5 mm (0.043-0.059 in).

- There are 4 flanges in different thickness.

Specifications:

- The number 1 flange thickness is 3 mm (0.118 in).
- The number 2 flange thickness is 3.2 mm (0.126 in).
- The number 3 flange thickness is 3.4 mm (0.134 in).
- The number 4 flange thickness is 3.6 mm (0.142 in).

COUNTER DRIVE GEAR DISASSEMBLE

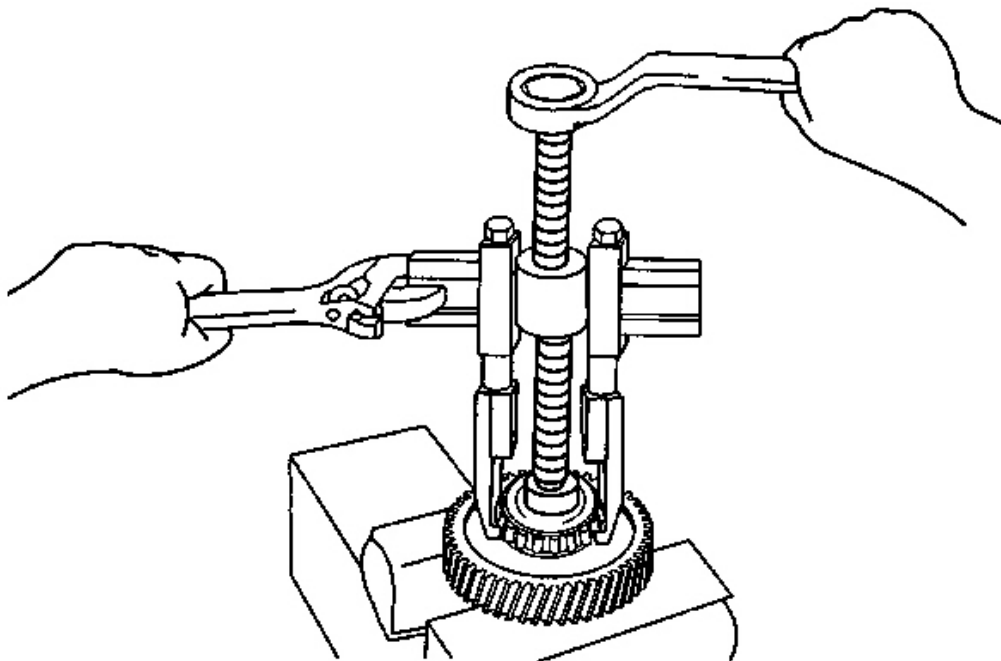


Fig. 387: Removing Tapered Roller Bearing From Transaxle Case Side Using A Puller
Courtesy of GENERAL MOTORS CORP.

1. Using a suitable puller, remove the tapered roller bearing from the transaxle case side.

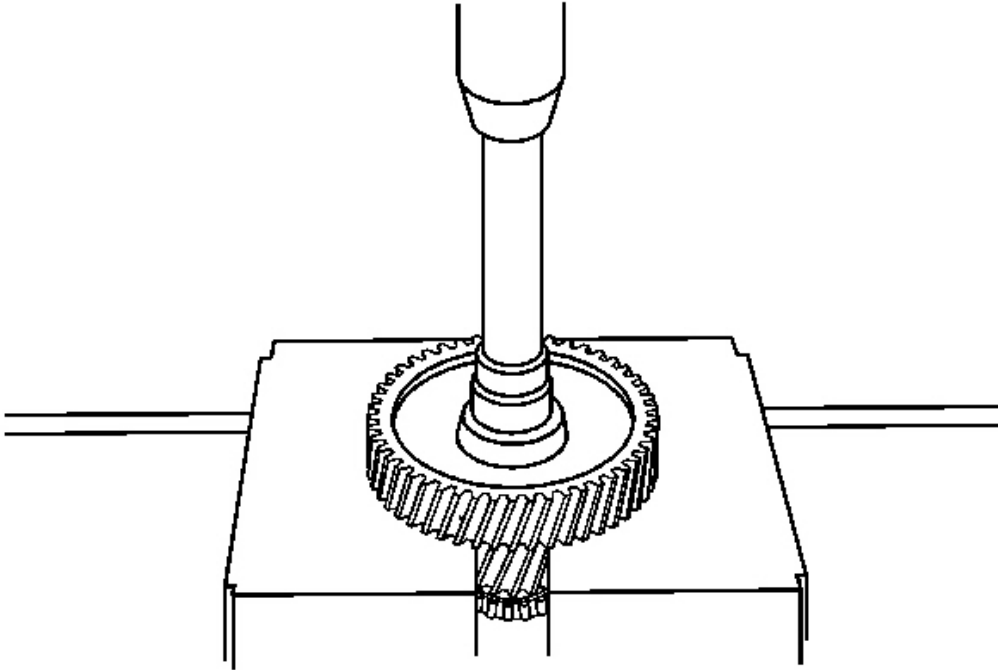


Fig. 388: Counter Driven Gear

Courtesy of GENERAL MOTORS CORP.

2. Using a press, remove the counter driven gear.

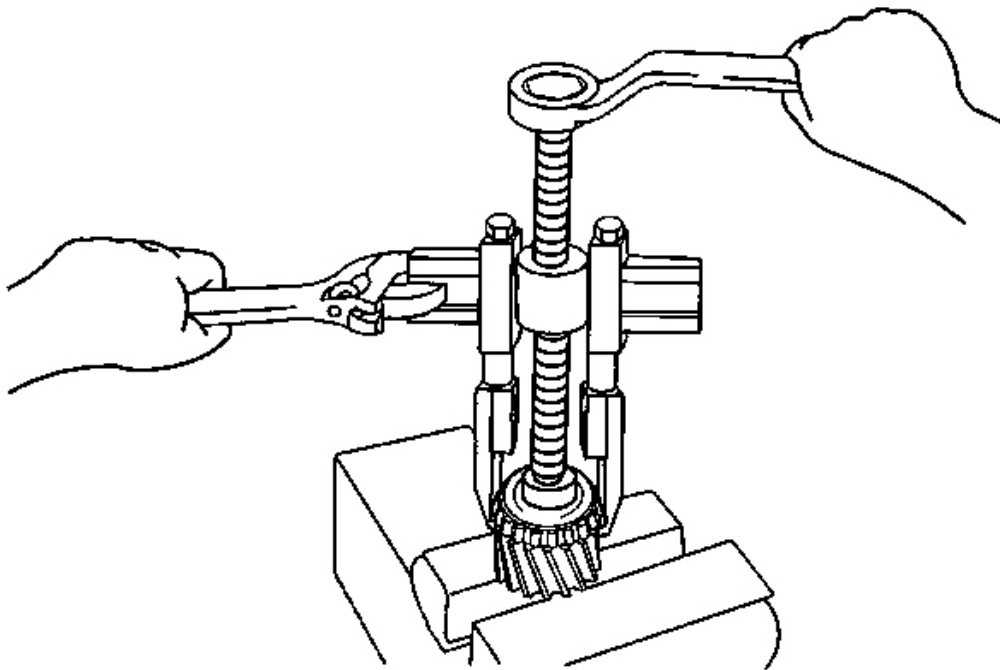


Fig. 389: Removing Outer & Tapered Roller Bearing Race Using A Puller
Courtesy of GENERAL MOTORS CORP.

3. Using a suitable puller, remove the tapered roller bearing.
4. Using a suitable puller, remove the outer tapered roller bearing race and shim from the transaxle case.
5. Using a suitable puller, remove the outer tapered roller bearing race from the transaxle housing.

COUNTER DRIVE GEAR ASSEMBLY

Tools Required

- **DT 46464** (DW240-160) Transaxle Case Outer Tapered Roller Bearing Race Adapter. See **Special Tools**.
- **DT 46465** (DW240-170) Adapter Handle. See **Special Tools**.

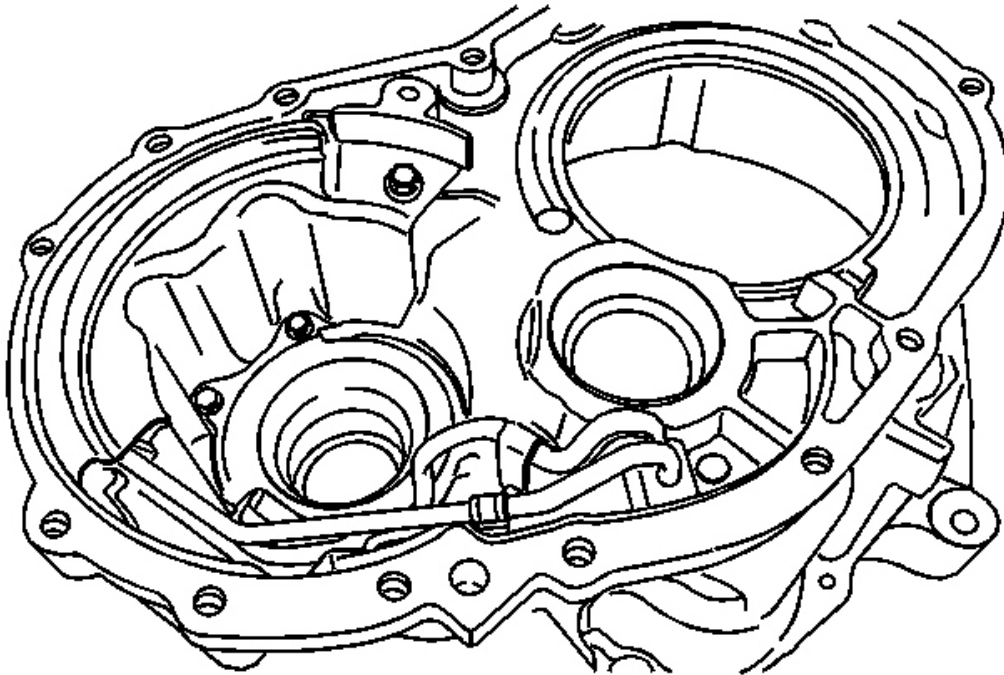


Fig. 390: Oil Seal & Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Press-fit the outer tapered roller bearing race until it contacts the transaxle housing.

1. Install a new outer tapered roller bearing race into the transaxle housing.

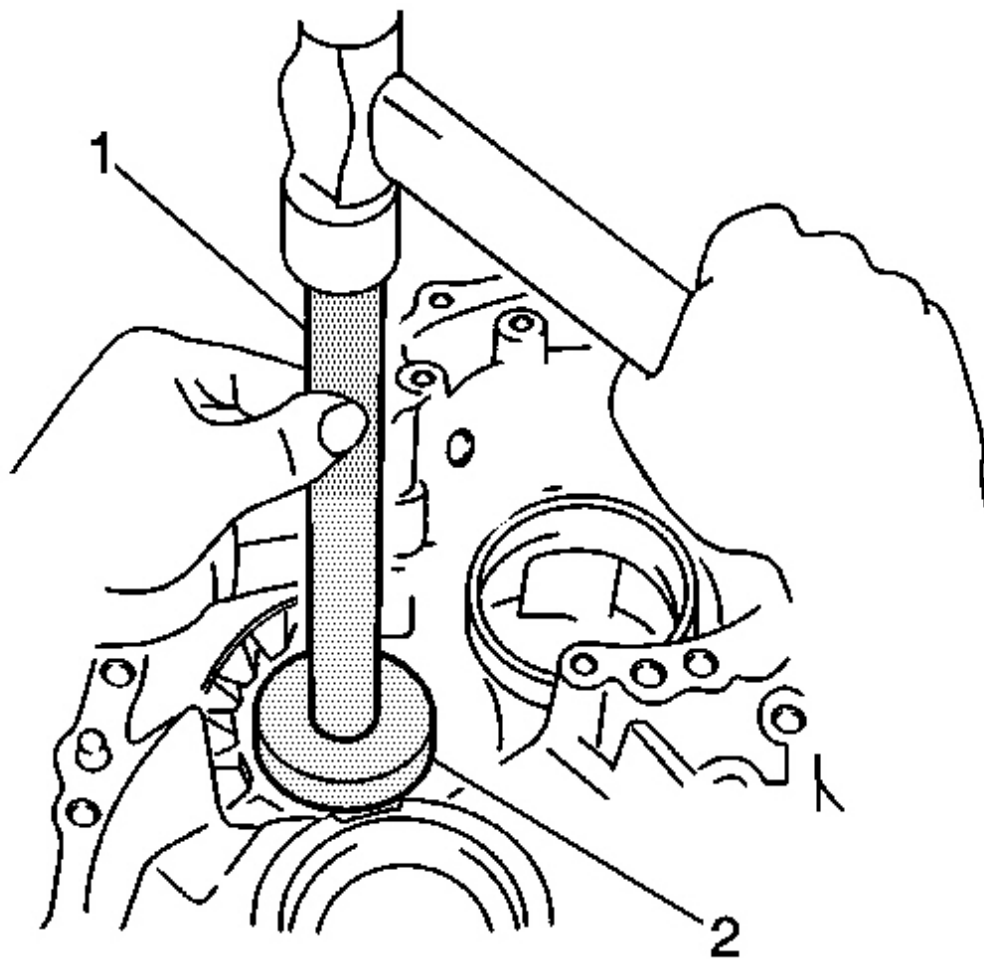


Fig. 391: Pressing In A New Outer Tapered Roller Bearing Race Using DT 46464 & DT 46465
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Press-fit the shim until it contacts the transaxle case.

IMPORTANT: Install a shim of the same thickness as the one removed.

2. Install the shim to the transaxle case.
3. Using the **DT 46464** (2) and the **DT 46465** (1), press in a new outer tapered roller bearing race into the transaxle case. See **Special Tools**.

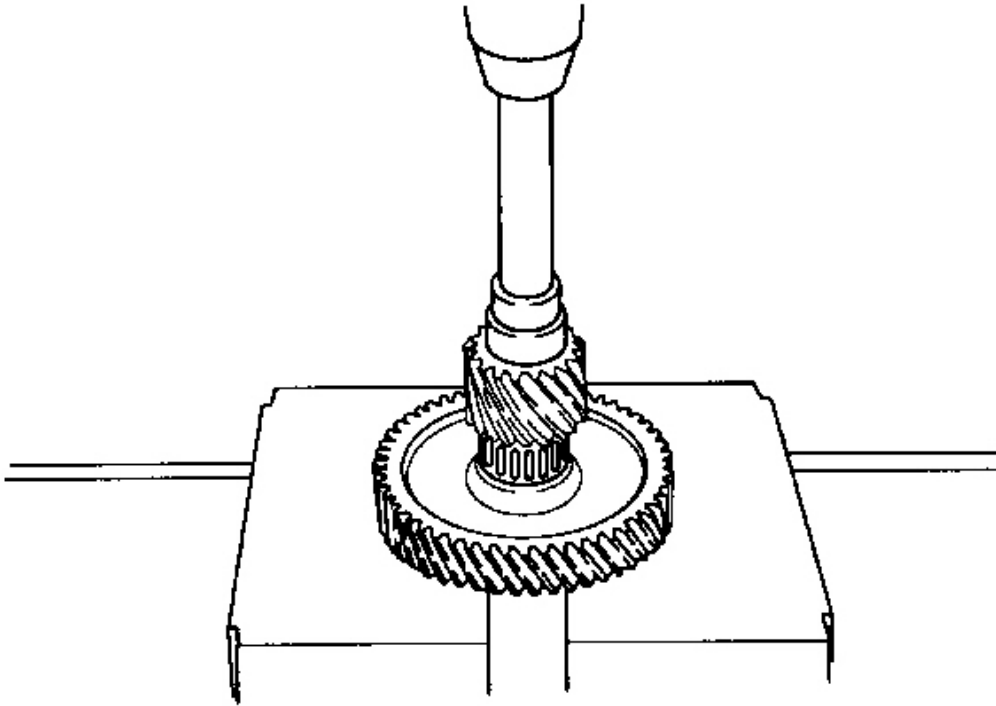


Fig. 392: Counter Driven Gear
Courtesy of GENERAL MOTORS CORP.

4. Using a press, install the counter driven gear.

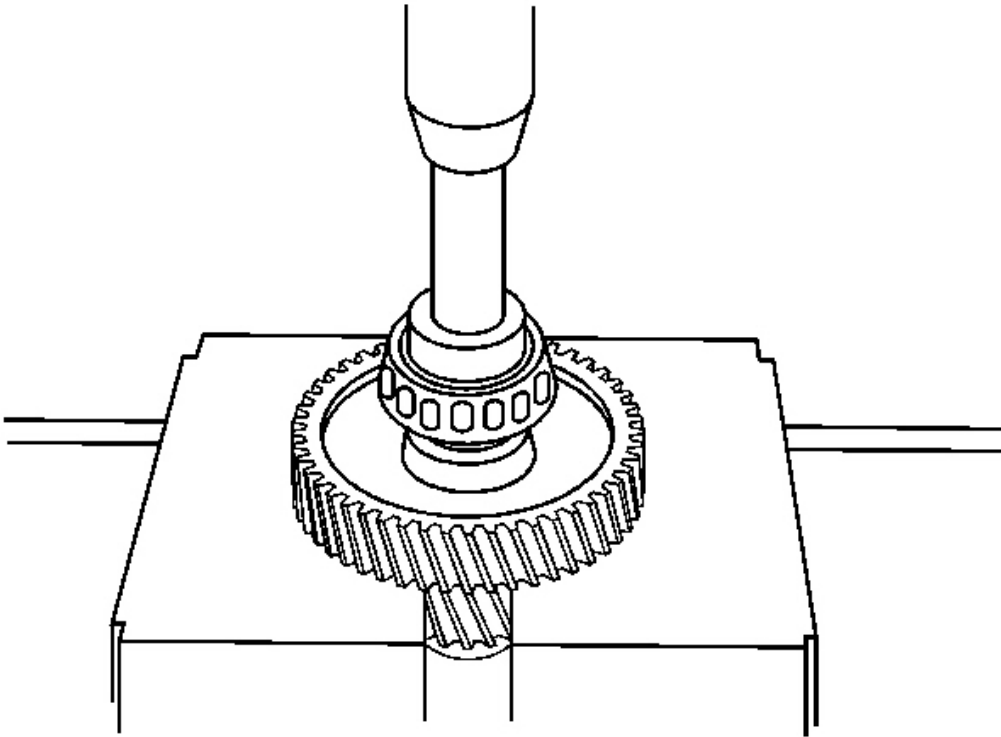


Fig. 393: Tapered Roller Bearing & Transaxle Case Side
Courtesy of GENERAL MOTORS CORP.

5. Using a press, install a new tapered roller bearing of the transaxle case side.

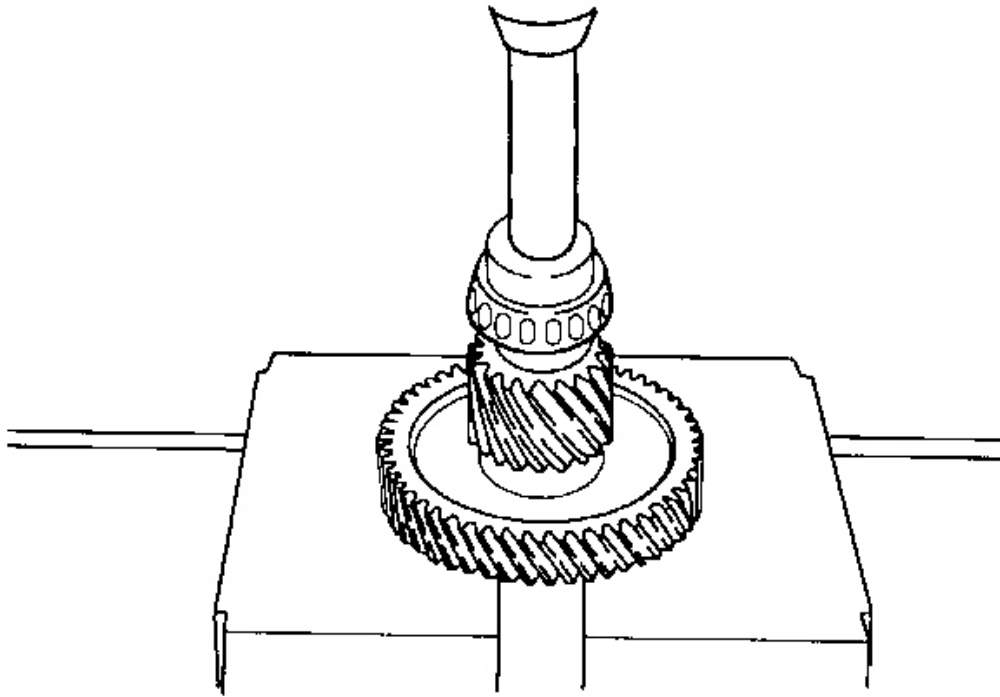


Fig. 394: Tapered Roller Bearing & Transaxle Housing Side
Courtesy of GENERAL MOTORS CORP.

6. Using a press, install a new tapered roller bearing of the transaxle housing side.

DIFFERENTIAL ASSEMBLY DISASSEMBLE

Tools Required

- **DT 46463** (DW240-150) Transaxle Case Side Bearing Outer Race Adapter. See **Special Tools**.
- **DT 46465** (DW240-170) Adapter Handle. See **Special Tools**.

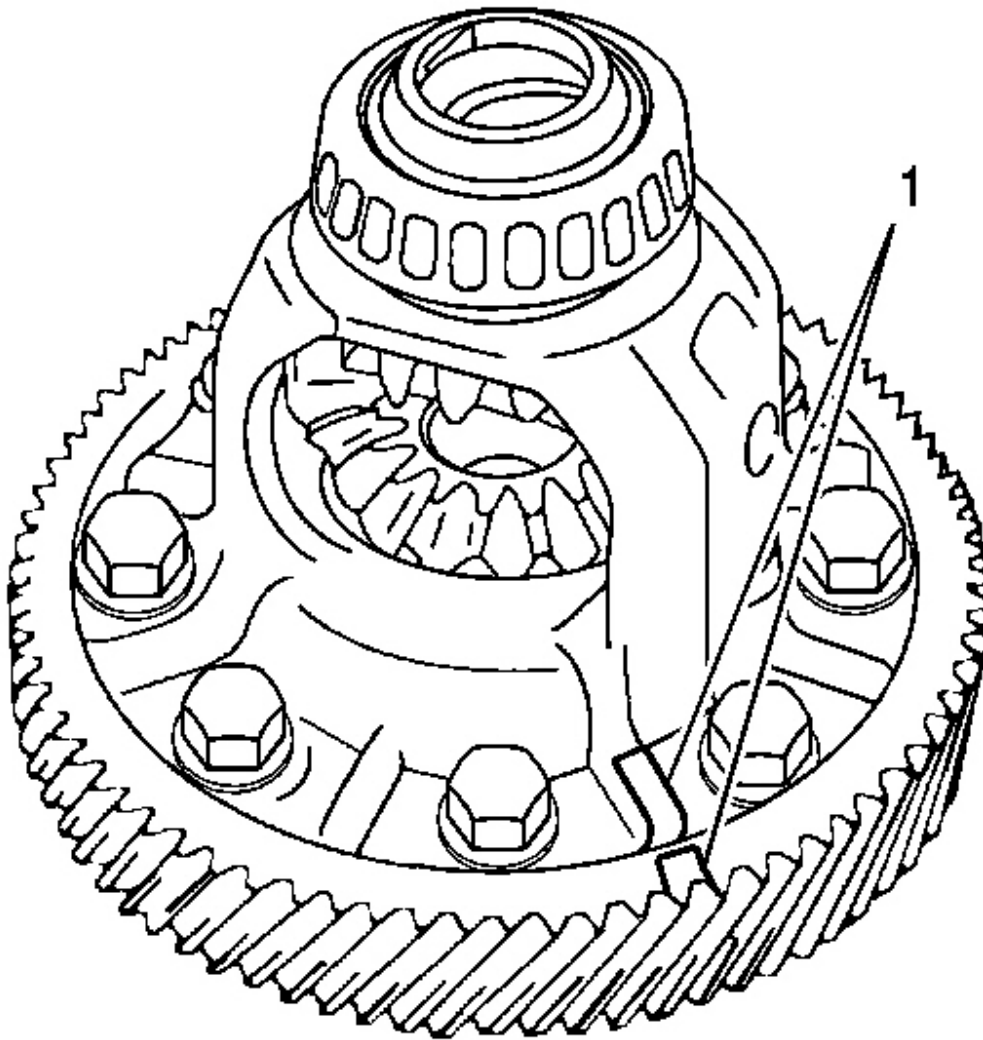


Fig. 395: Matchmarks, Ring Gear & Differential Case
Courtesy of GENERAL MOTORS CORP.

1. Place the matchmarks (1) on the ring gear and differential case.

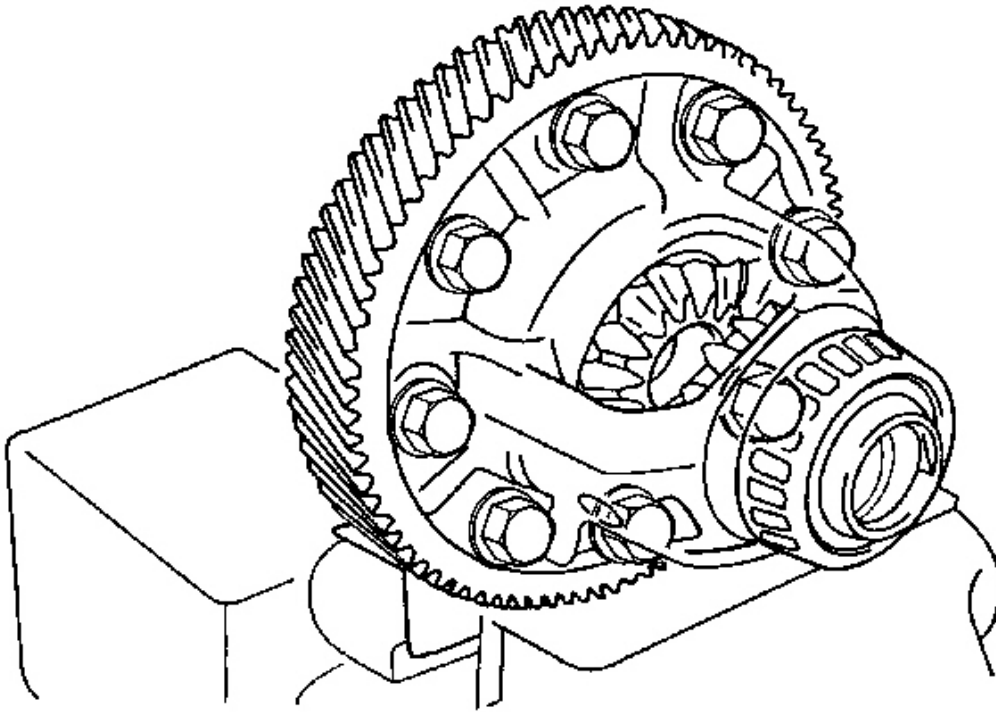


Fig. 396: Differential Assembly & Bolts
Courtesy of GENERAL MOTORS CORP.

2. Remove the 8 bolts.

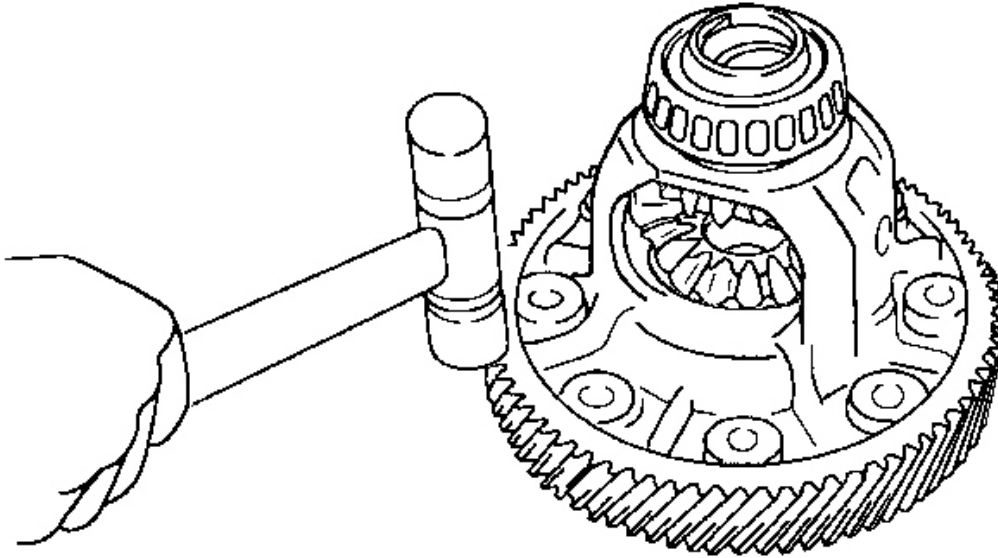


Fig. 397: Taping On Ring Gear To Remove From Case Using A Plastic Hammer
Courtesy of GENERAL MOTORS CORP.

3. Using a plastic hammer, tap on the ring gear to remove it from the case.

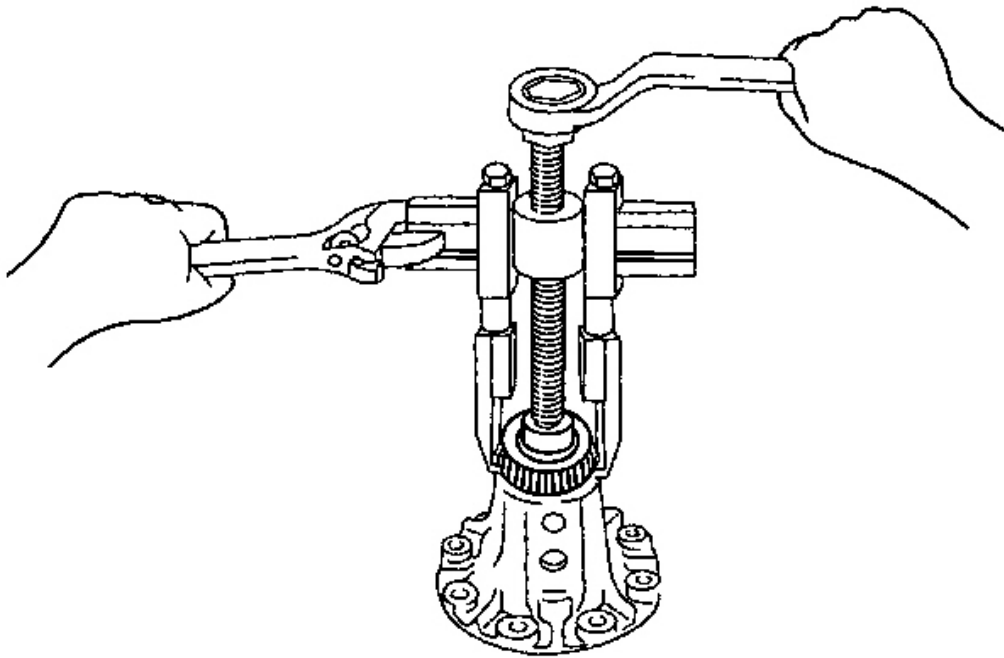


Fig. 398: Removing Tapered Roller Bearing & Transaxle Housing Side Using A Puller
Courtesy of GENERAL MOTORS CORP.

4. Using a suitable puller, remove the tapered roller bearing of transaxle housing side.

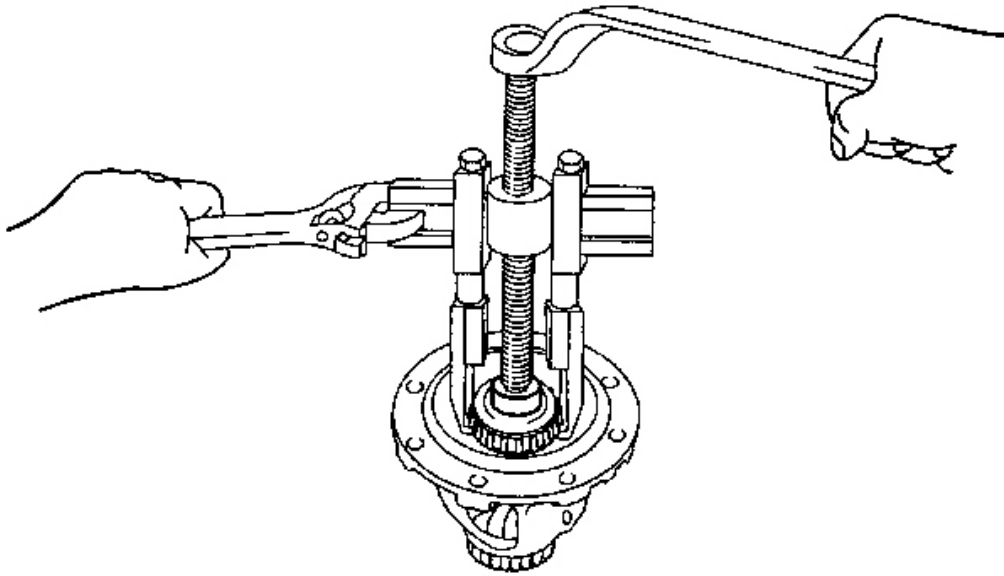


Fig. 399: Removing Tapered Roller Bearing & Transaxle Case Side Using A Puller
Courtesy of GENERAL MOTORS CORP.

5. Using a suitable puller, remove the tapered roller bearing of transaxle case side.

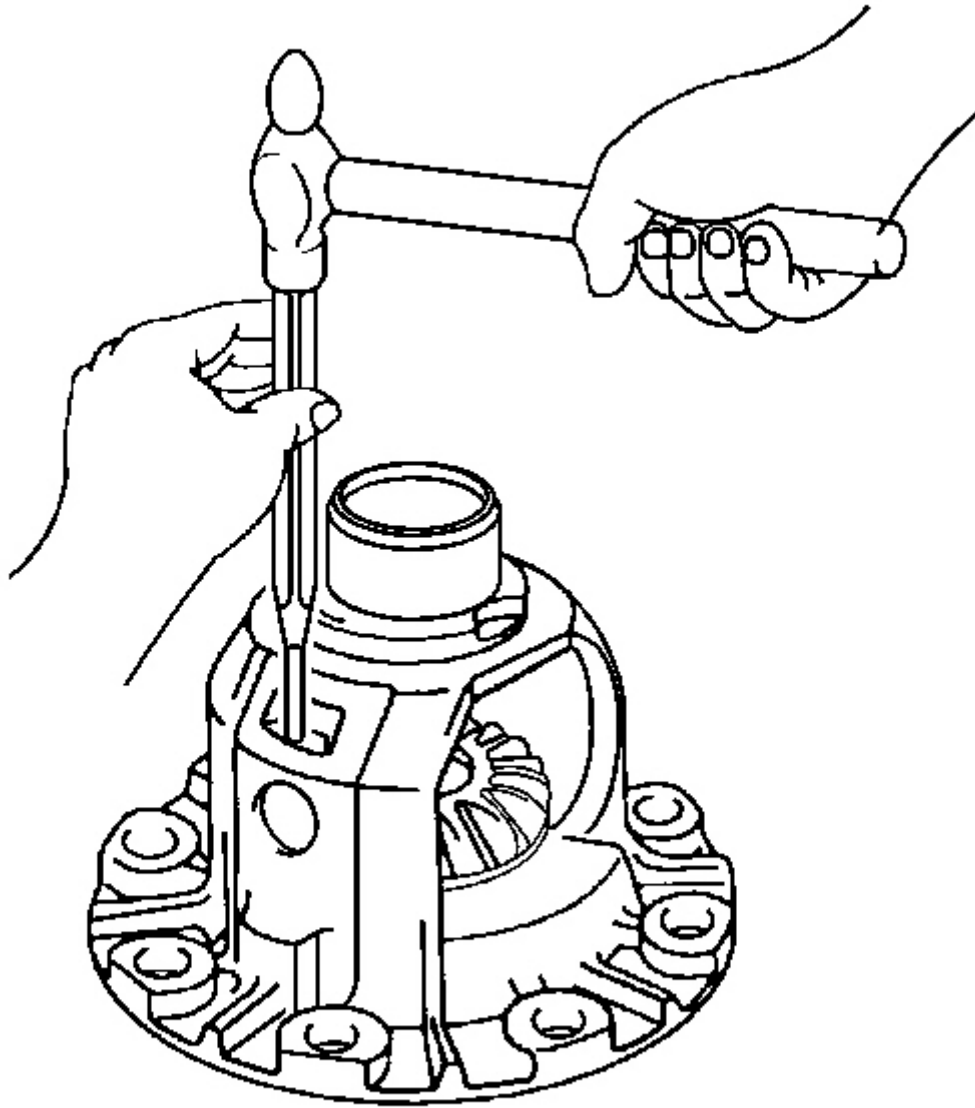


Fig. 400: Driving Pin From Ring Gear Side Using A Pin Punch & Hammer
Courtesy of GENERAL MOTORS CORP.

6. Using a pin punch and hammer, drive out the pin from the ring gear side.

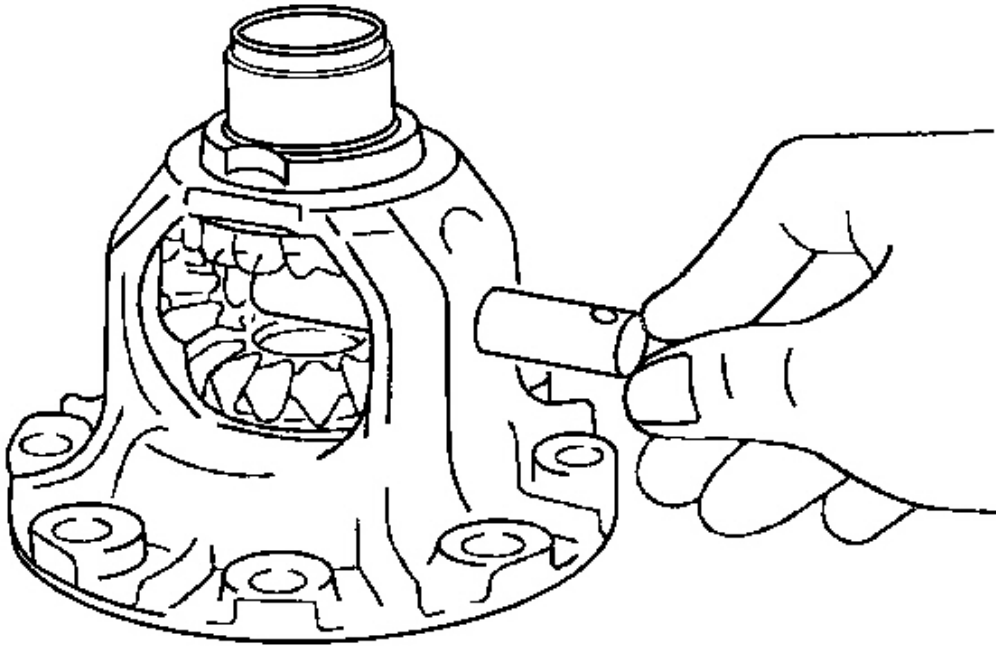


Fig. 401: Differential Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

7. Remove the differential pinion shaft from the case.

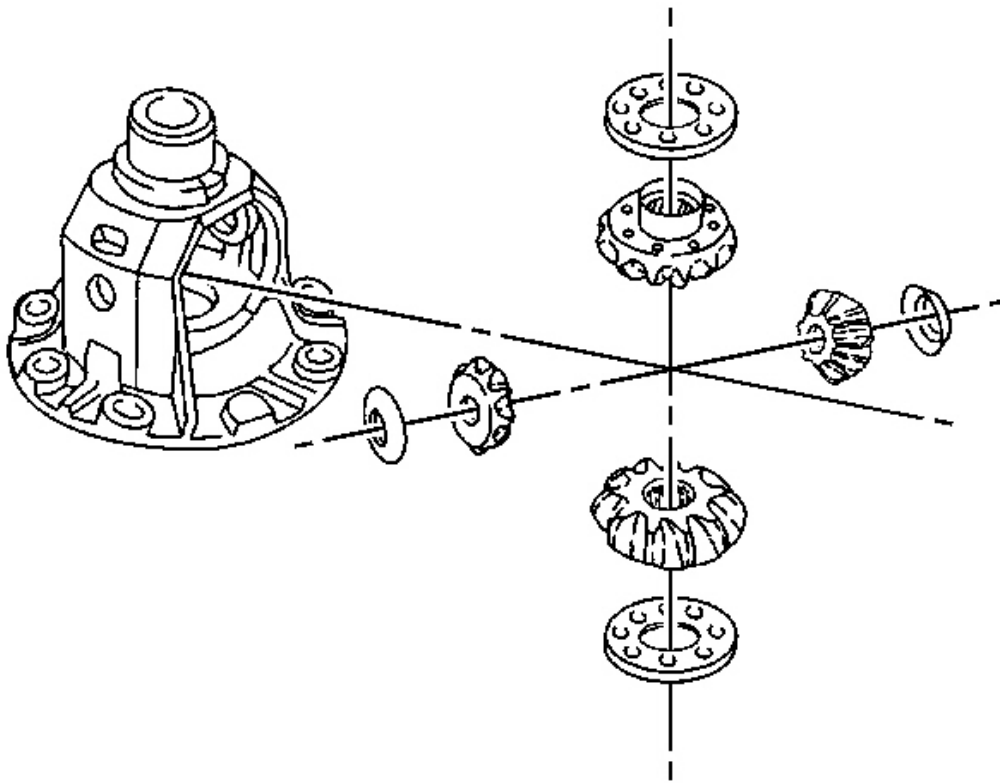


Fig. 402: Differential Side Gears, 2 Differential Pinion Thrust Washers, And 2 Differential Side Gear Thrust Washers

Courtesy of GENERAL MOTORS CORP.

8. Remove the 2 differential pinion gears, 2 differential side gears, 2 differential pinion thrust washers, and 2 differential side gear thrust washers.

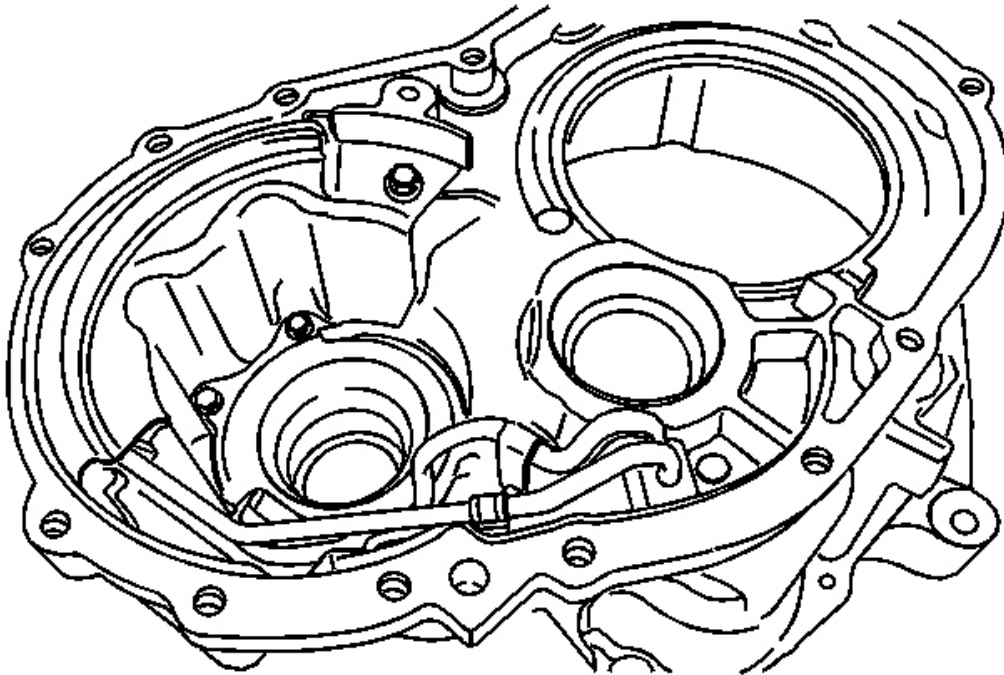


Fig. 403: Oil Seal & Transaxle Housing
Courtesy of GENERAL MOTORS CORP.

9. Using a driver, remove the oil seal from the transaxle housing.

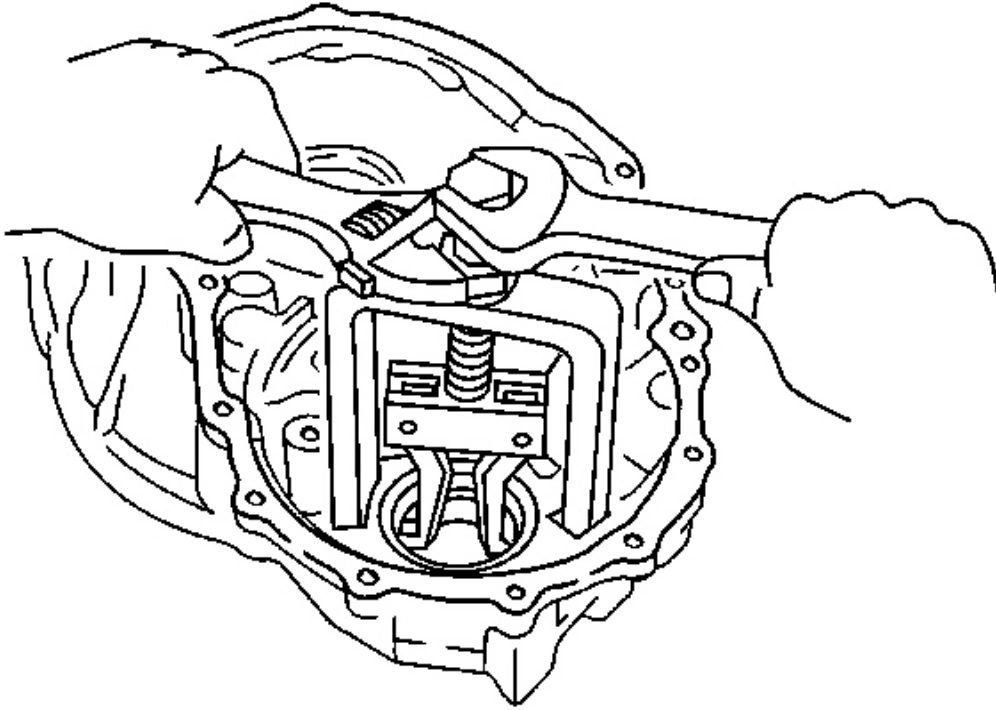


Fig. 404: Removing Side Bearing Outer Race & Transaxle Housing Using A Puller
Courtesy of GENERAL MOTORS CORP.

10. Using a suitable puller, remove the side bearing outer race of transaxle housing.

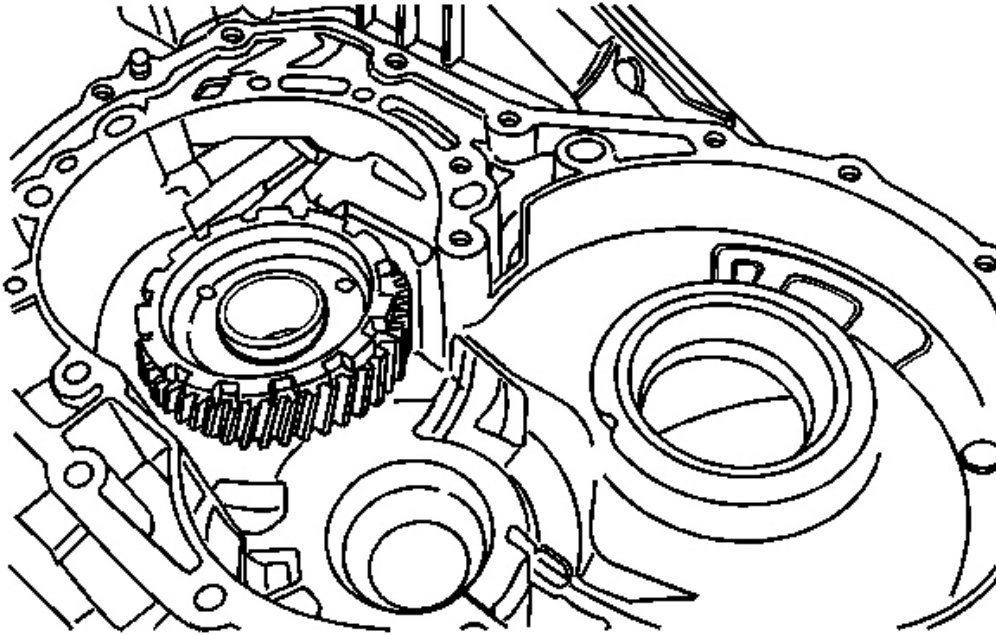


Fig. 405: Counter Driven Gear Outer Tapered Roller Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

11. Using a driver, remove the oil seal of transaxle case.

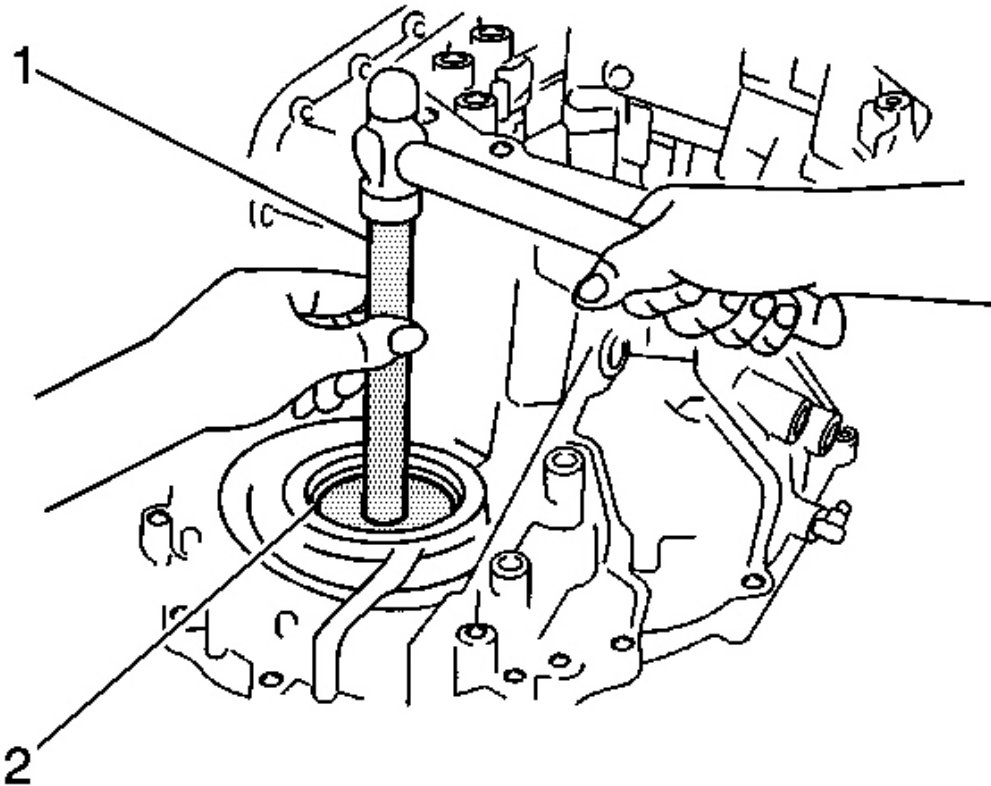


Fig. 406: Removing Transaxle Case Side Bearing Outer Race & Shim Using DT 46463 & DT 46465
Courtesy of GENERAL MOTORS CORP.

12. Using the **DT 46463** (2) and the **DT 46465** (1), remove the transaxle case side bearing outer race and shim. See **Special Tools**.

DIFFERENTIAL ASSEMBLY ASSEMBLE

Tools Required

- **DT 46462** (DW240-140) Transaxle Case Side Bearing Outer Race Adapter. See **Special Tools**.
- **DT 46465** (DW240-170) Adapter Handle. See **Special Tools**.
- **DT 46461** (DW240-130) Differential Preload Adapter. See **Special Tools**.
- **DT 46471** (DW260-031-01) Transaxle Housing Oil Seal Installer. See **Special Tools**.
- **DT 47521** (DW260-031-02) Transaxle Case Oil Seal Installer. See **Special Tools**.

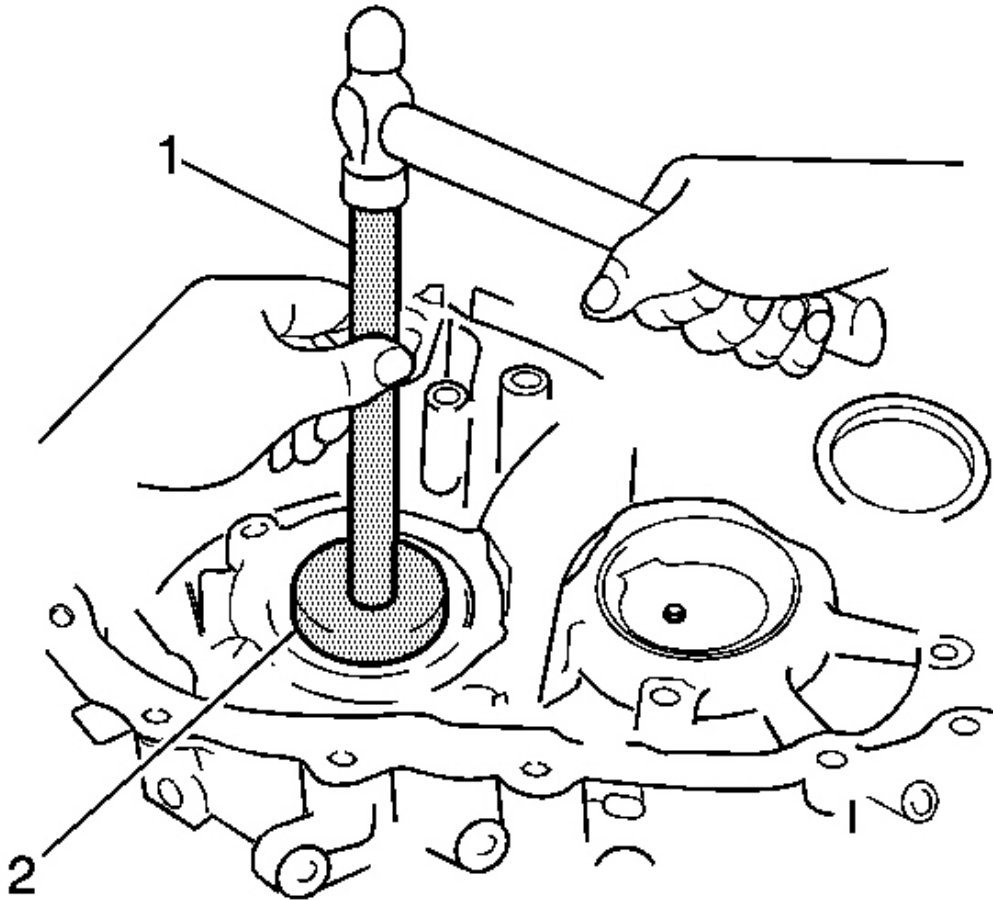


Fig. 407: Installing Side Bearing Outer Race & Transaxle Housing Using DT 46462 & DT 46465
Courtesy of GENERAL MOTORS CORP.

1. Using the **DT 46462** (2) and the **DT 46465** (1), install a new side bearing outer race into the transaxle housing. See **Special Tools**.

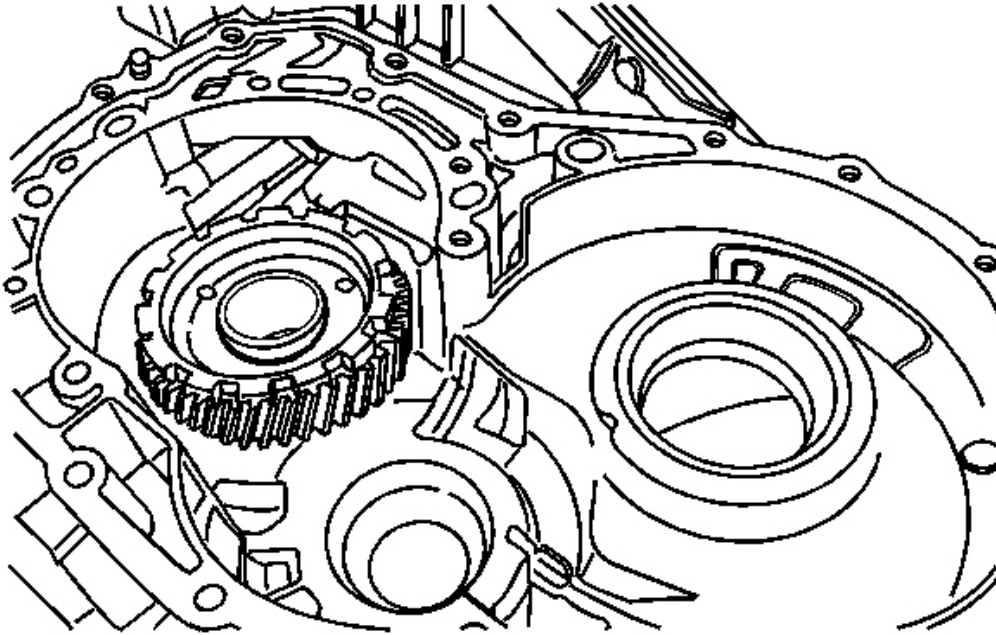


Fig. 408: Counter Driven Gear Outer Tapered Roller Bearing Race & Shim
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Install a shim of the same thickness as the one removed.

2. Install the shim to the transaxle case.
3. Install a new side bearing outer race into the transaxle case.

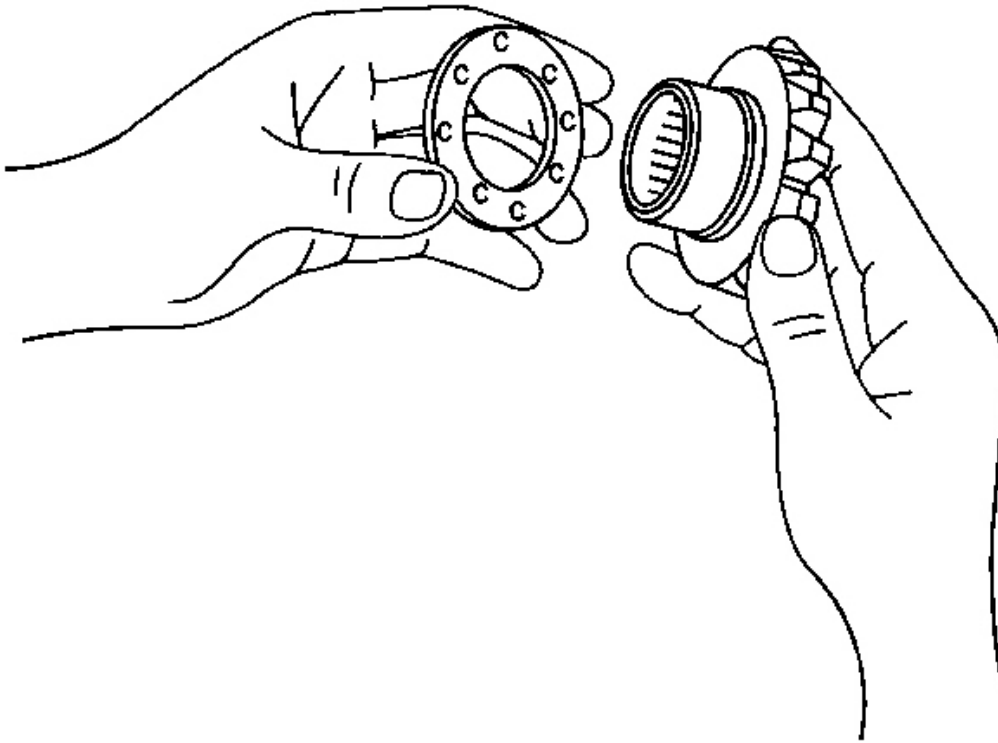


Fig. 409: Differential Side Gear Thrust Washers & Differential Side Gears
Courtesy of GENERAL MOTORS CORP.

4. Coat the thrust washers, side gears, pinion gears, and pinion thrust washers with automatic transmission fluid (ATF).
5. Install the 2 differential side gear thrust washers to 2 differential side gears.

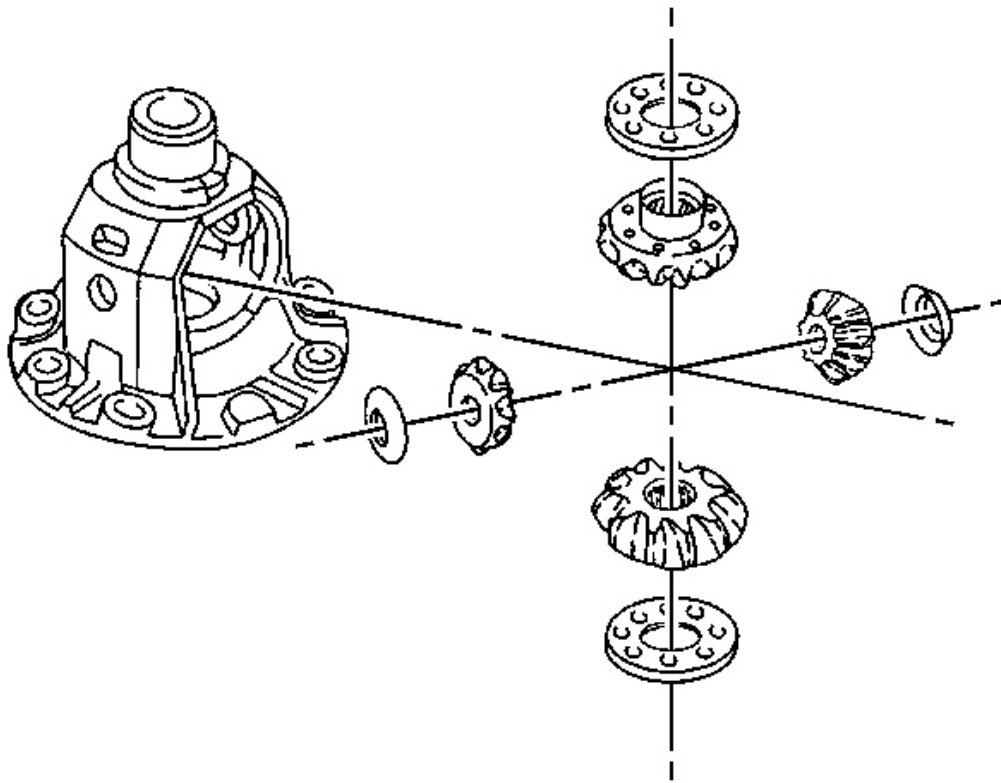


Fig. 410: Differential Side Gears, 2 Differential Pinion Thrust Washers, And 2 Differential Side Gear Thrust Washers

Courtesy of GENERAL MOTORS CORP.

6. Install the 2 side gears with 2 thrust washers, 2 pinion gears, and 2 pinion thrust washers into the differential case.
7. Coat the pinion shaft with ATF.

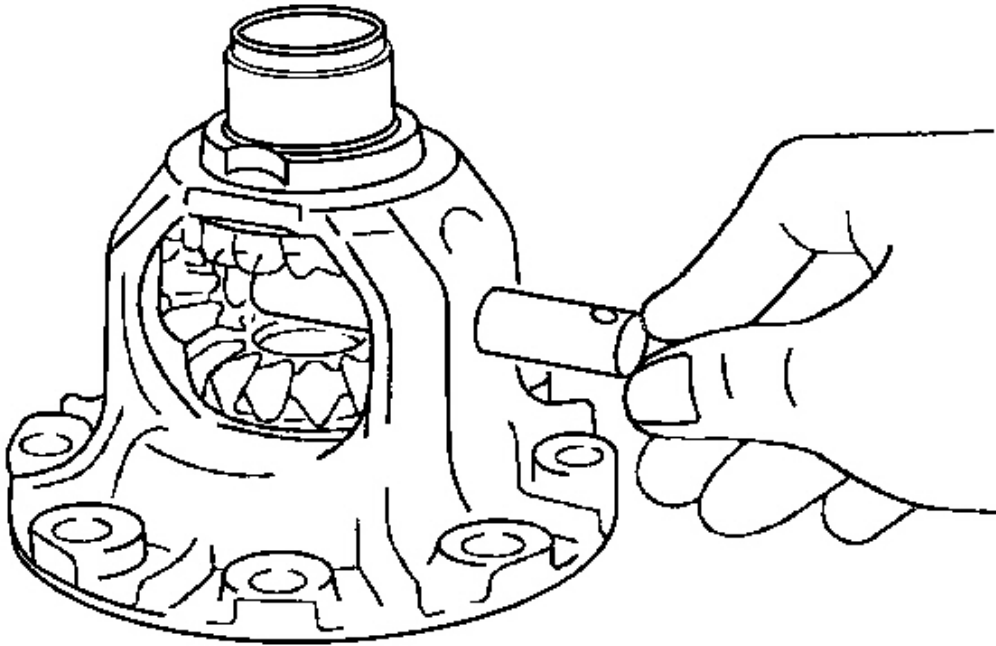


Fig. 411: Differential Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

8. Install the pinion shaft so as to align the lock pin holes on the pinion shaft and differential case.

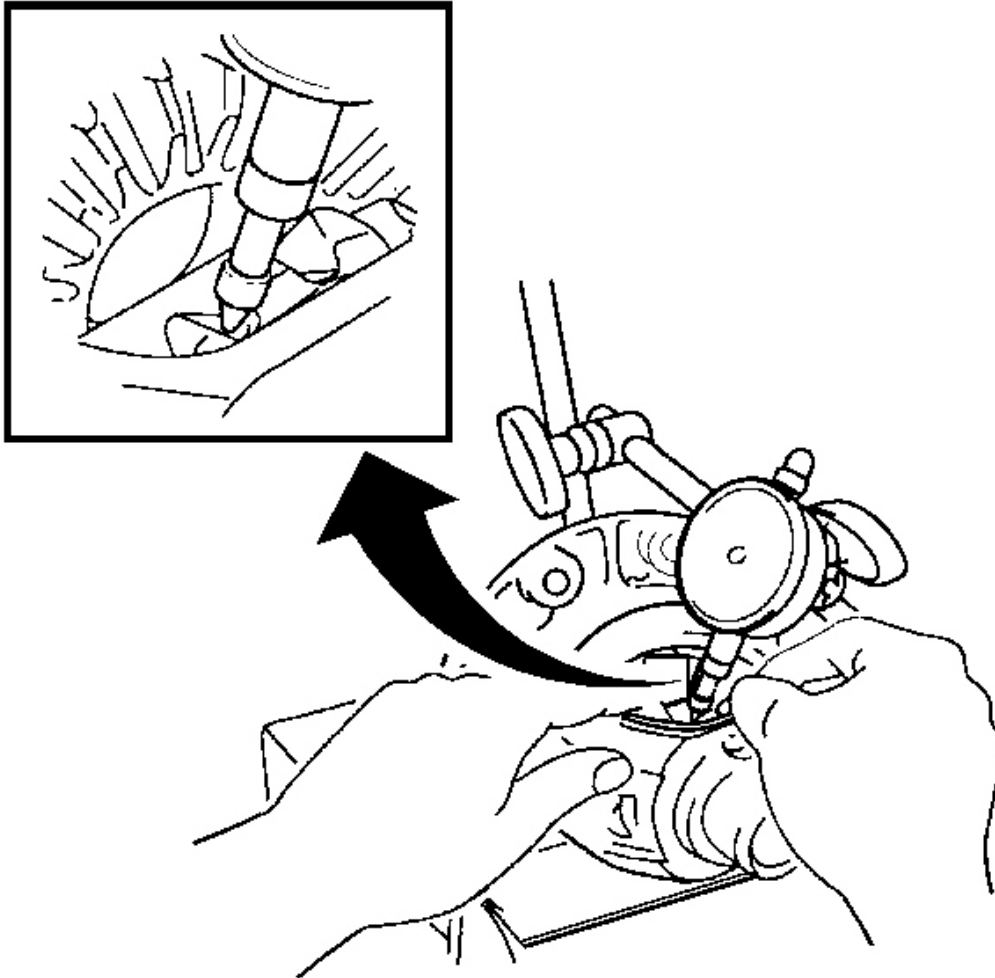


Fig. 412: Measuring Side Gear Backlash While Holding 1 Pinion Gear Toward The Case
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the backlash is out of specification, install the correct thrust washer to the side gear.

9. Measure the side gear backlash while holding 1 pinion gear toward the case.

Specifications: The standard backlash is 0.05-0.2 mm (0.002-0.0079 in).

IMPORTANT: • Try to select washers of the same size for both sides.

- If the backlash is not within the specification, install a thrust washer of a different thickness.

10. Select thrust washers which will ensure that the backlash is within the specification. Refer to Transmission General Specifications.

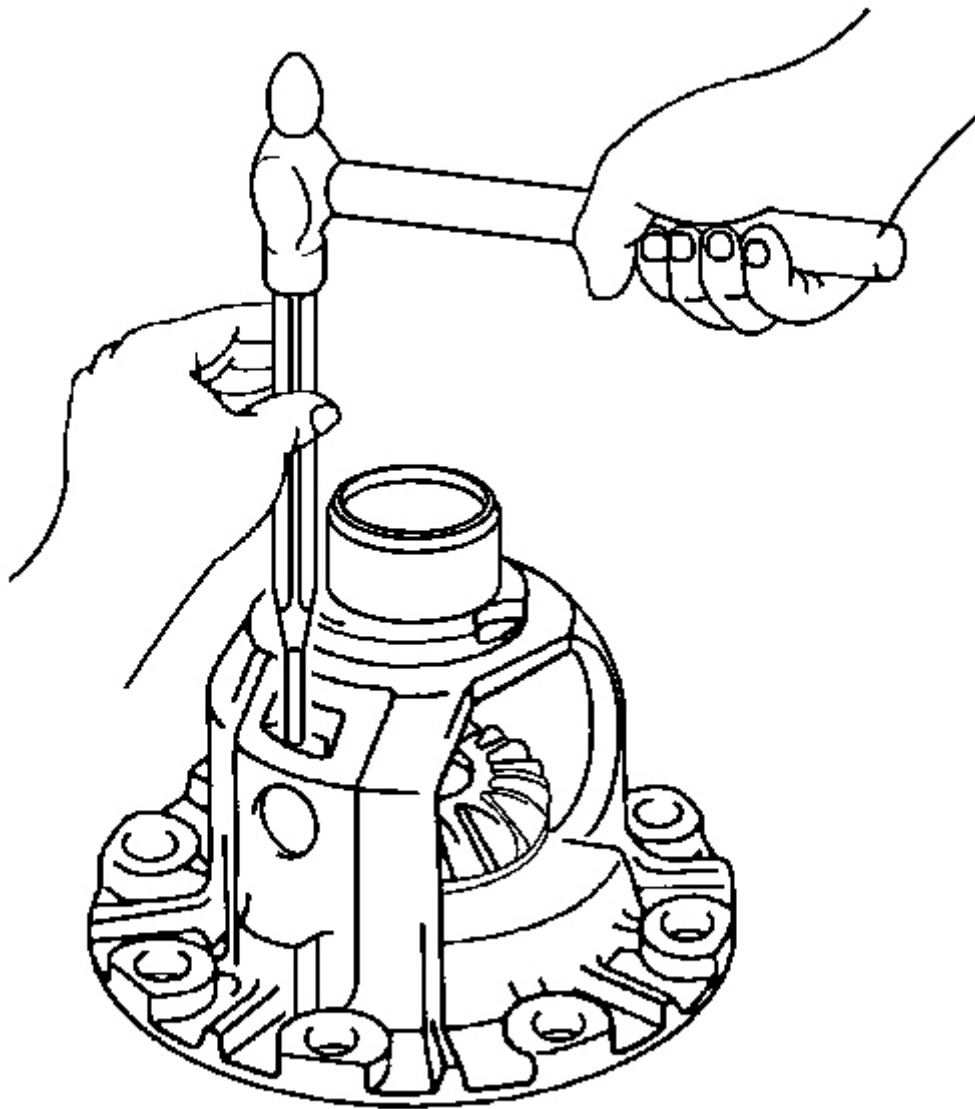


Fig. 413: Driving Pin From Ring Gear Side Using A Pin Punch & Hammer

Courtesy of GENERAL MOTORS CORP.

11. Using a hammer and punch, drive in the pin through the case and holes in the pinion shaft.

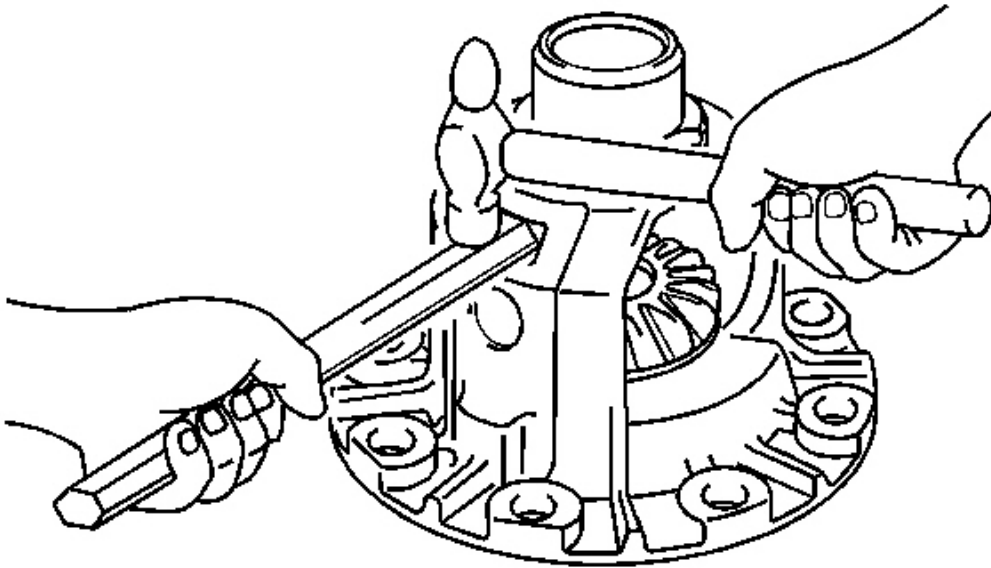


Fig. 414: Staking The Differential Case Using A Hammer & Chisel
Courtesy of GENERAL MOTORS CORP.

12. Using a hammer and chisel, stake the differential case.

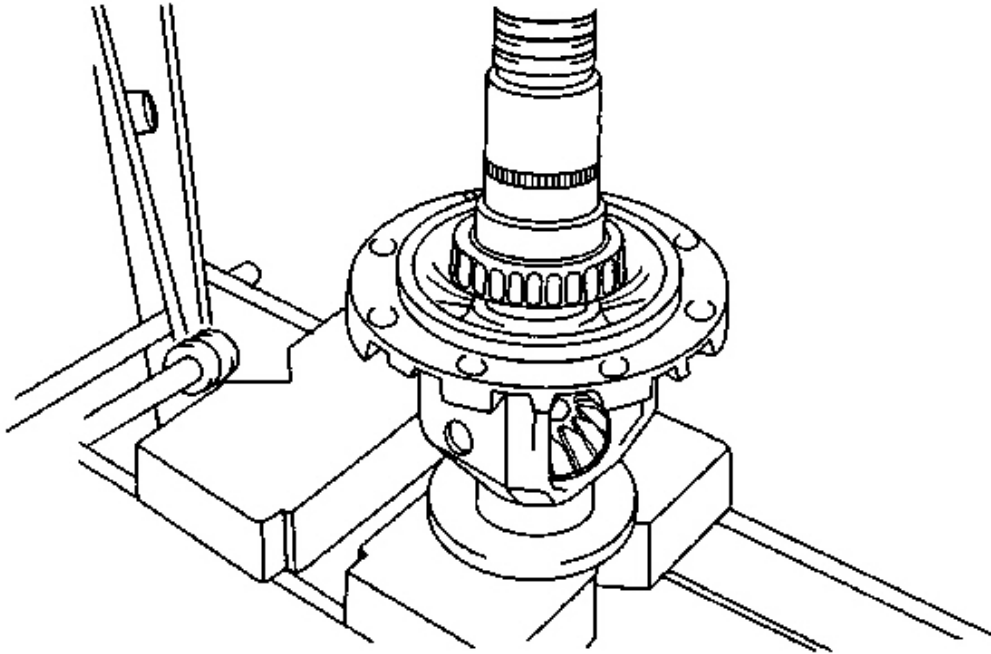


Fig. 415: Tapered Roller Bearing & Differential Case
Courtesy of GENERAL MOTORS CORP.

13. Using a press, install the tapered roller bearing into the differential case.

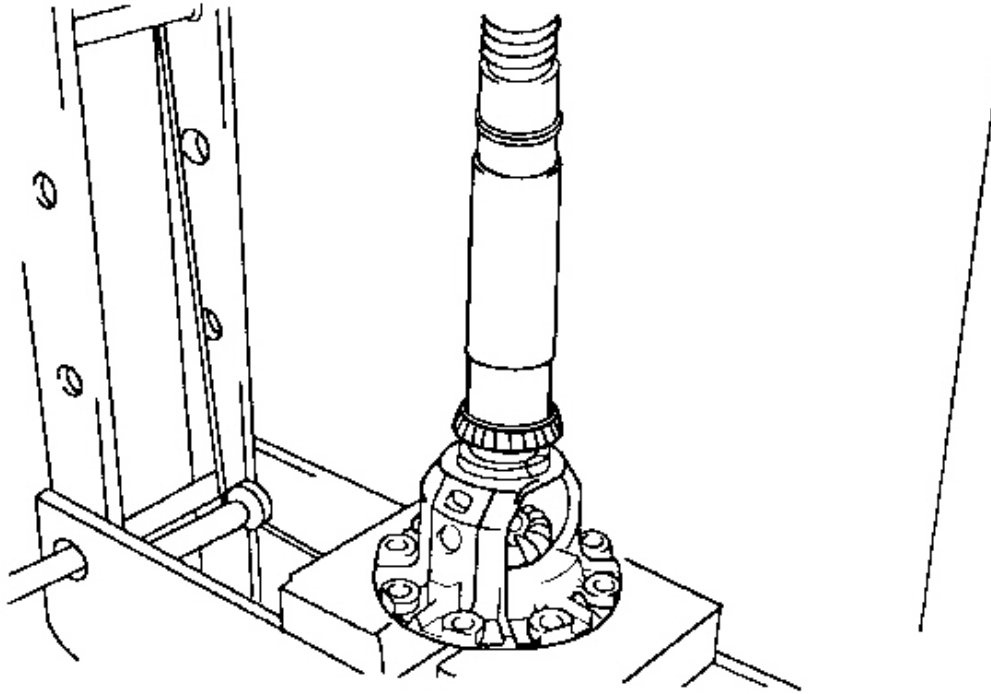


Fig. 416: FIPG, Tapered Roller Bearing & Differential Case
Courtesy of GENERAL MOTORS CORP.

14. Using a press, install the tapered roller bearing into the differential case.
15. Remove any formed in place gasket (FIPG) material. Do not get oil on the contacting surfaces of the transaxle housing or transaxle case.

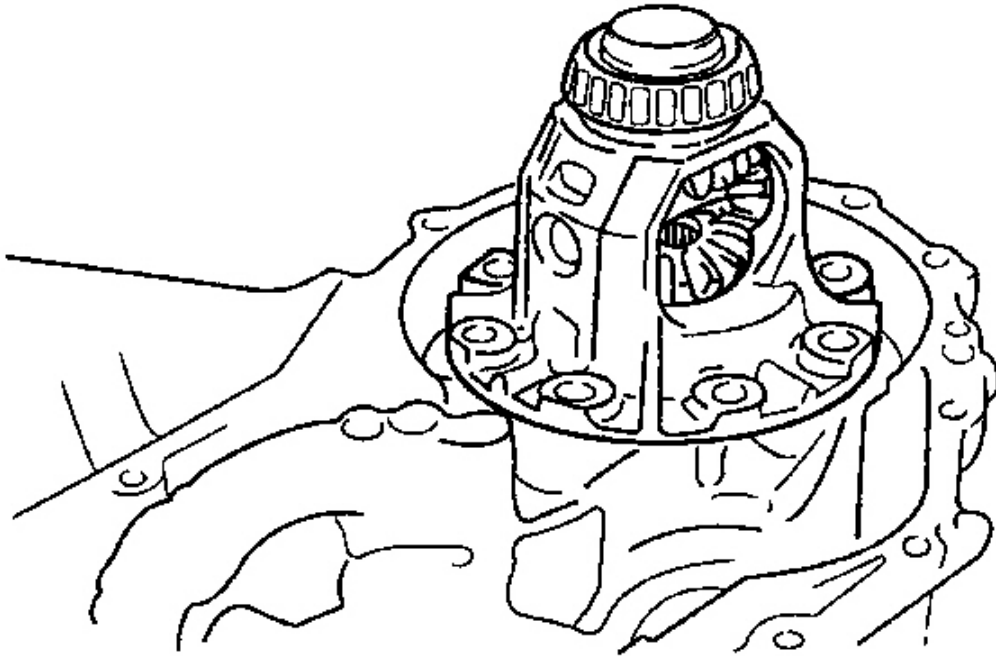


Fig. 417: Differential & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

16. Install the differential to the transaxle case.

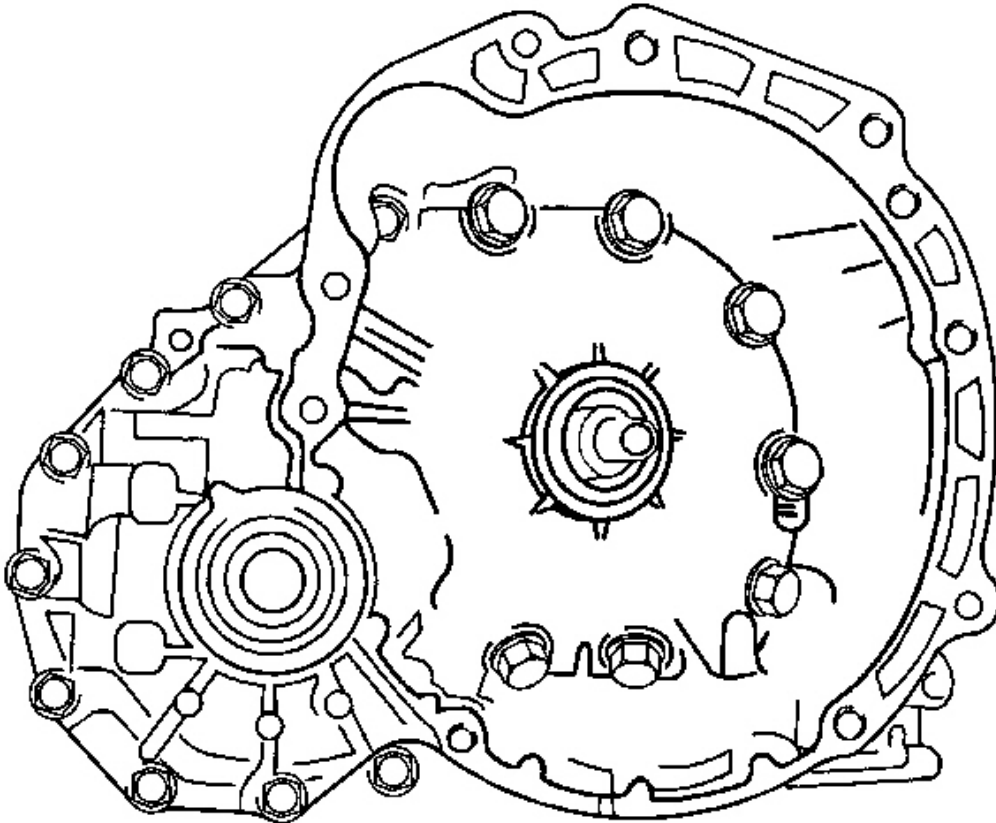


Fig. 418: Transaxle Housing

Courtesy of GENERAL MOTORS CORP.

17. Install the transaxle housing and 16 bolts of the transaxle housing temporarily.

NOTE: Refer to Fastener Notice in Cautions and Notices.

18. Tighten 8 or 9 bolts out of the 16 bolts of the transaxle housing completely.

Tighten: Tighten the bolts to 29 N.m (22 lb ft).

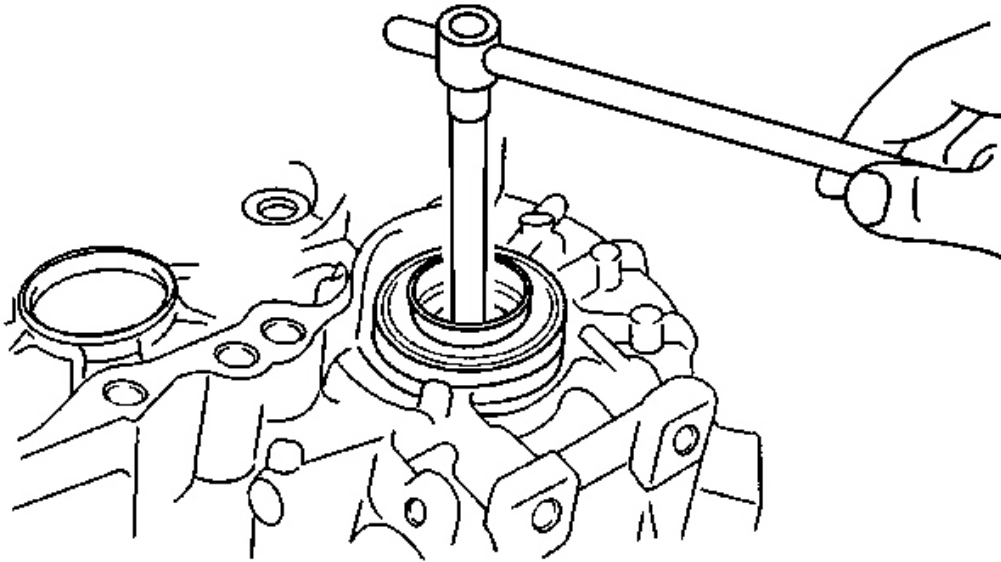


Fig. 419: Turning The Differential Gear Assembly
Courtesy of GENERAL MOTORS CORP.

19. Using the **DT 46461** , turn the differential gear assembly right and left 2-3 times to allow the bearing to settle. See **Special Tools**.

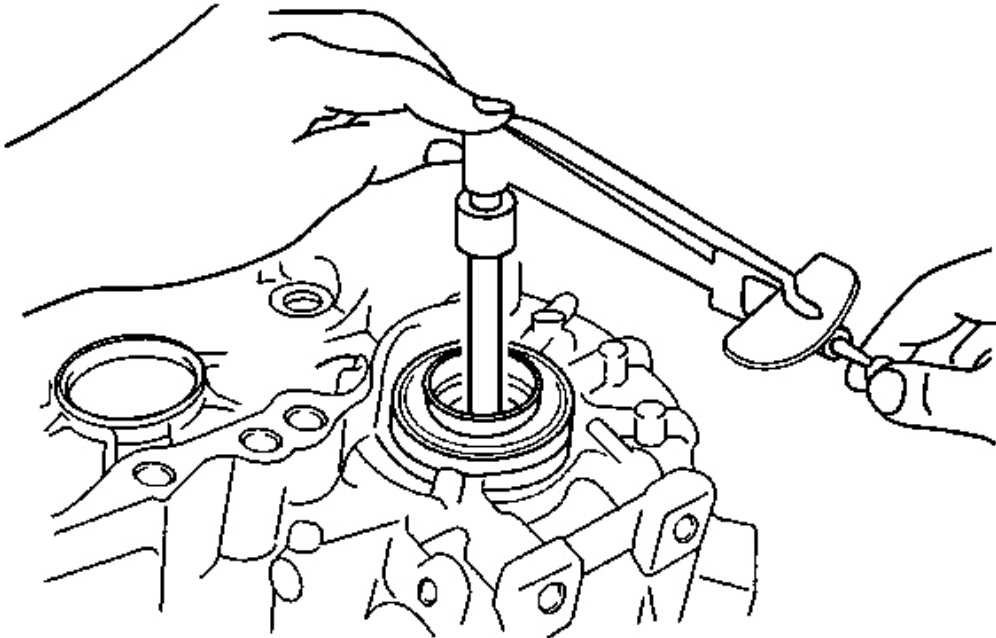


Fig. 420: Measuring Preload Of Differential Gear Using A Small Torque Wrench & DT 46461
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the preload is not within specifications, remove the differential from the transaxle case.

20. Using the **DT 46461** and a small torque wrench, measure the preload of the differential gear. See **Special Tools**.

Specifications:

- New bearing preload is 0.78-1.37 N.m (6.9-12.2 lb in).
 - Used bearing preload is 0.39-0.69 N.m (3.5-6.1 lb in).
21. Re-select the transaxle case side adjusting the shim according to the shim thickness table. Refer to **Transmission General Specifications**.

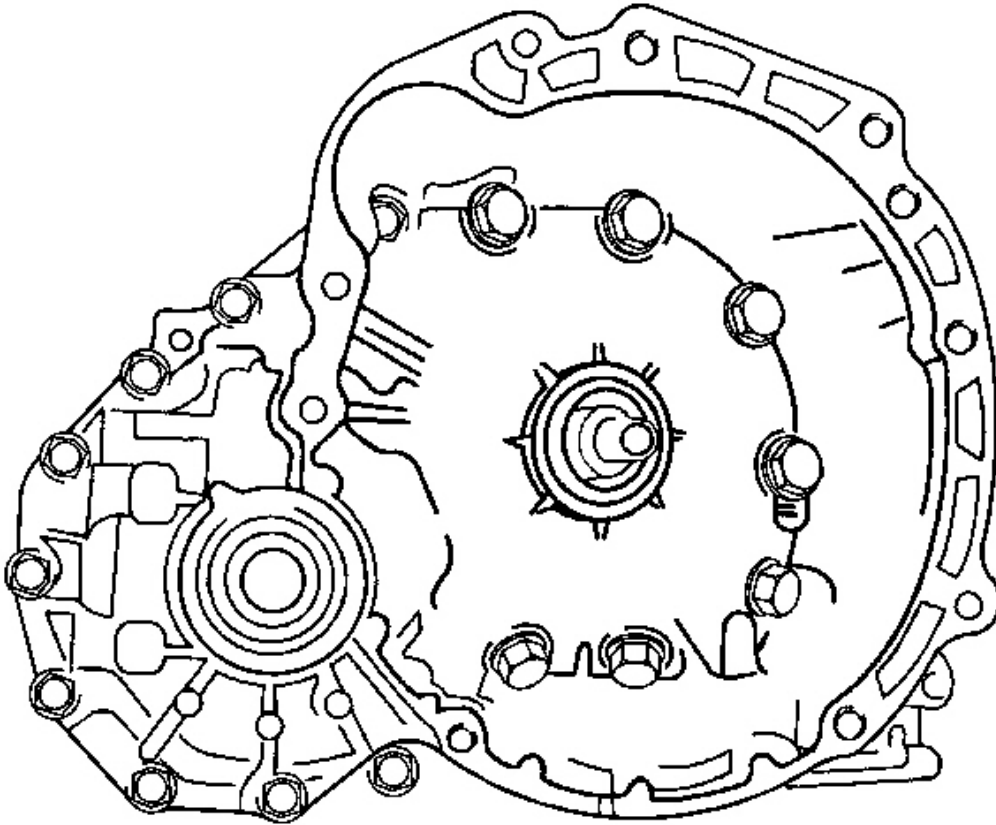


Fig. 421: Transaxle Housing

Courtesy of GENERAL MOTORS CORP.

22. Using a plastic hammer, remove the 16 bolts and transaxle housing.

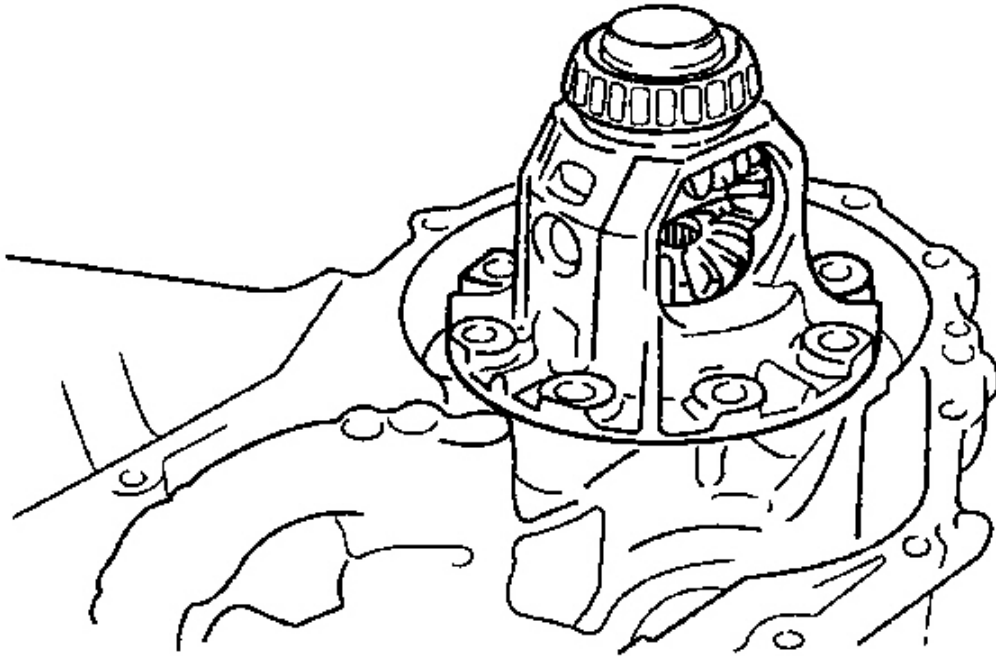


Fig. 422: Differential & Transaxle Case
Courtesy of GENERAL MOTORS CORP.

23. Remove the differential gear from the transaxle case.

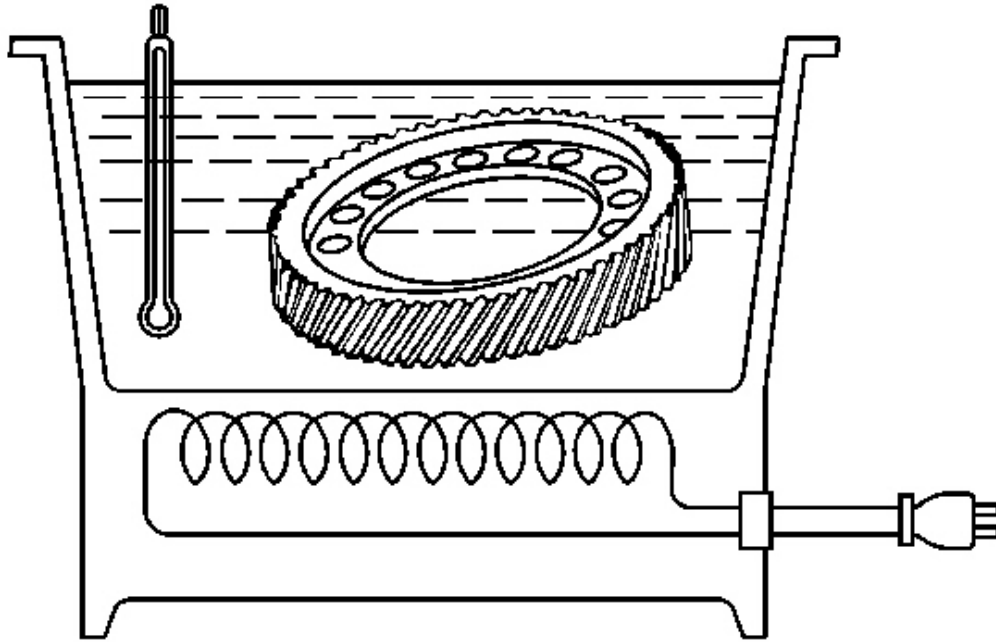


Fig. 423: Ring Gear & Differential Case
Courtesy of GENERAL MOTORS CORP.

24. Clean the contact surface of the differential case.
25. Heat the ring gear in water and boil for 10 minutes.
26. Carefully remove the ring gear from the water.
27. After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

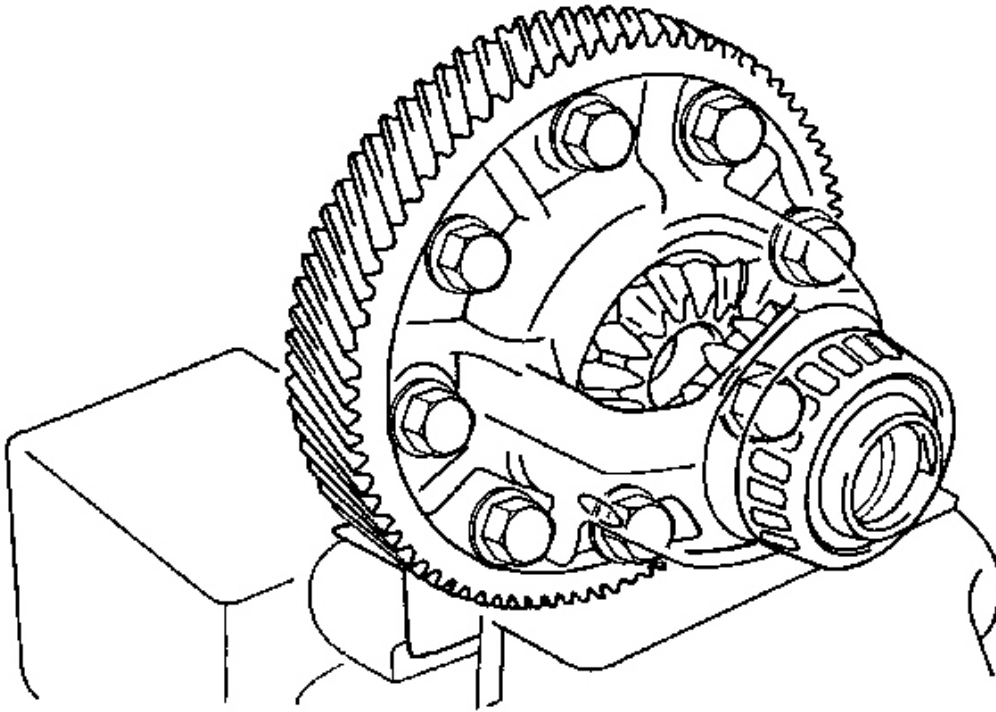


Fig. 424: Differential Assembly & Bolts
Courtesy of GENERAL MOTORS CORP.

28. Install the 8 bolts.

Tighten: Tighten the bolts to 102 N.m (75 lb ft).

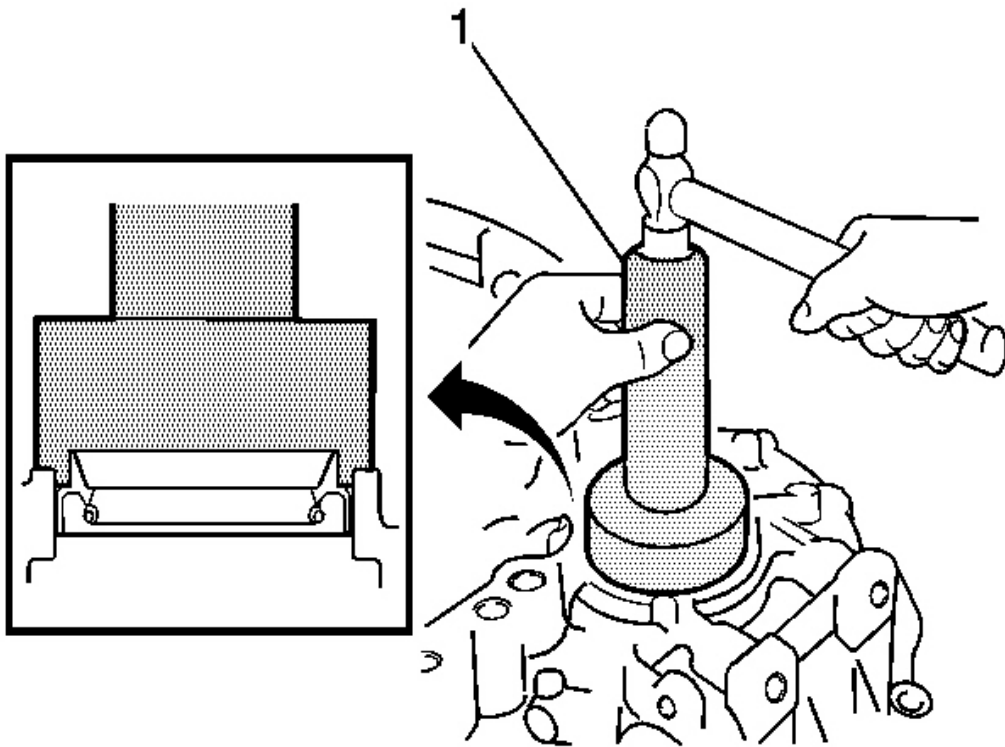


Fig. 425: Driving In A Transaxle Housing Oil Seal Using A Hammer & DT 46471
Courtesy of GENERAL MOTORS CORP.

29. Using the **DT 46471** (1) and a hammer, drive in a new transaxle housing oil seal. See **Special Tools**.

Specifications: The oil seal in depth is 3.1 mm (0.122 in).

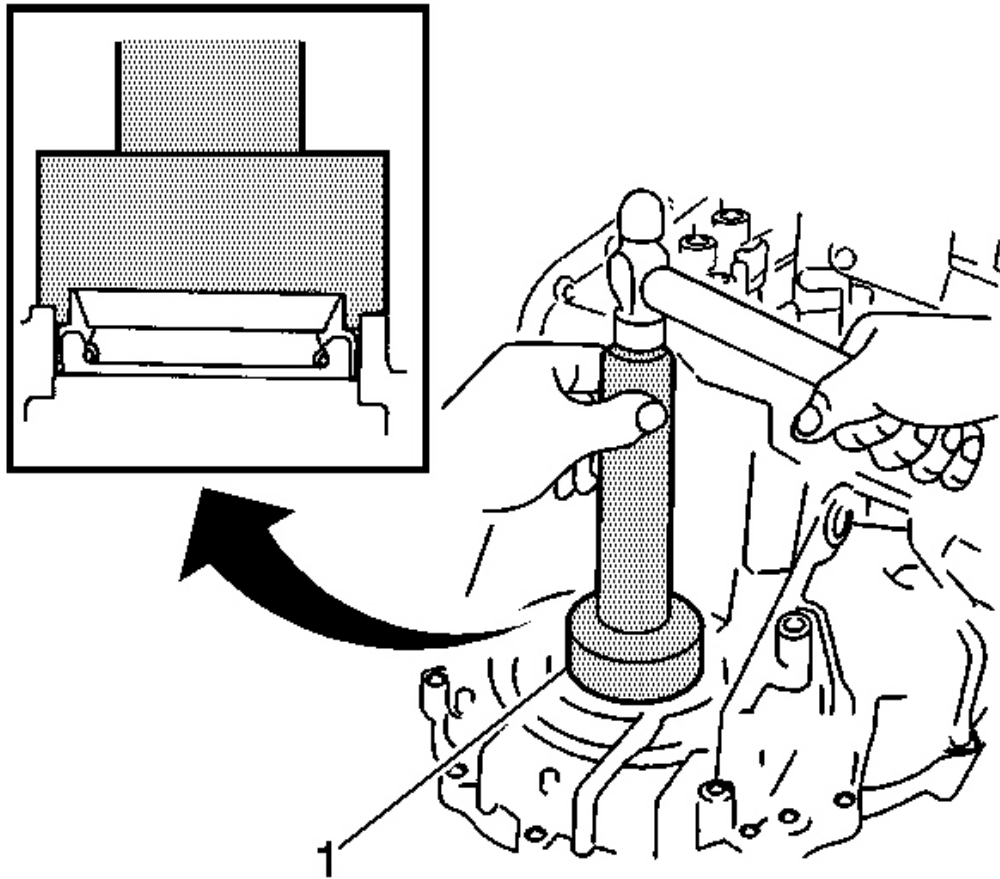


Fig. 426: Driving In A Transaxle Case Oil Seal Using A Hammer & DT 46471
Courtesy of GENERAL MOTORS CORP.

30. Using the **DT 47521 (1)**, drive in a new transaxle case oil seal. See **Special Tools**.

Specifications: The oil seal in depth is 4.3 mm (0.169 in).

CONTROL VALVE BODY DISASSEMBLE

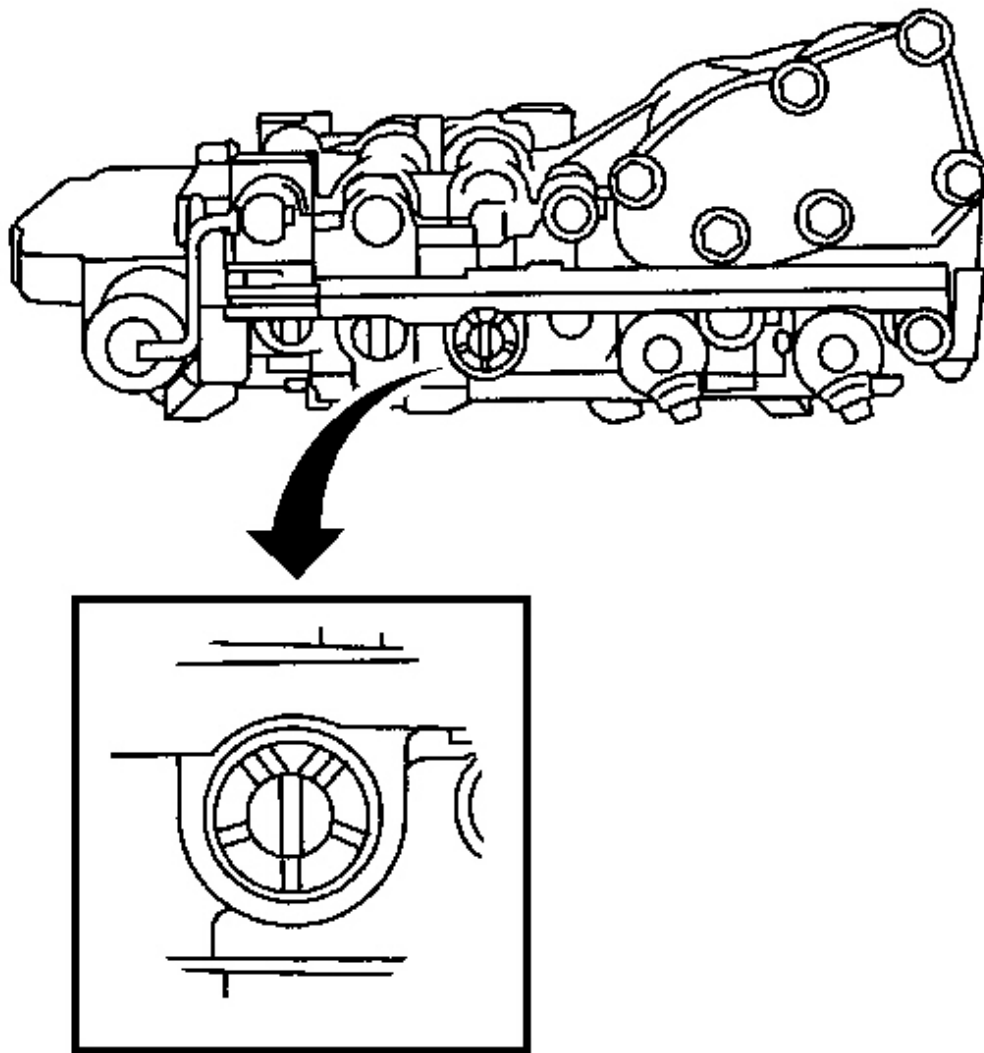


Fig. 427: Primary Regulator Valve Sleeve, Plug & Pin
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Because the line pressure is changed by the position of the pin and groove in the sleeve end, be sure to check the position.

1. Write down the relative position of the primary regulator valve sleeve, plug, and pin.
2. Remove the manual valve.

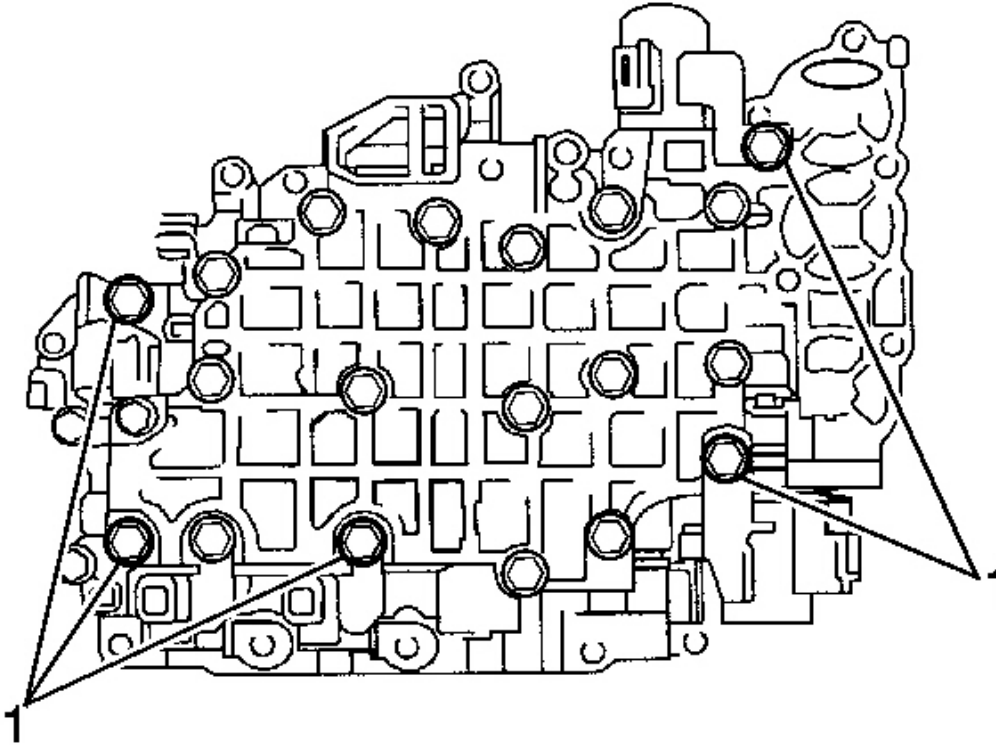


Fig. 428: Shift Solenoid Valves & Bolts
Courtesy of GENERAL MOTORS CORP.

3. Remove the 5 bolts (1) and 5 shift solenoid valves.

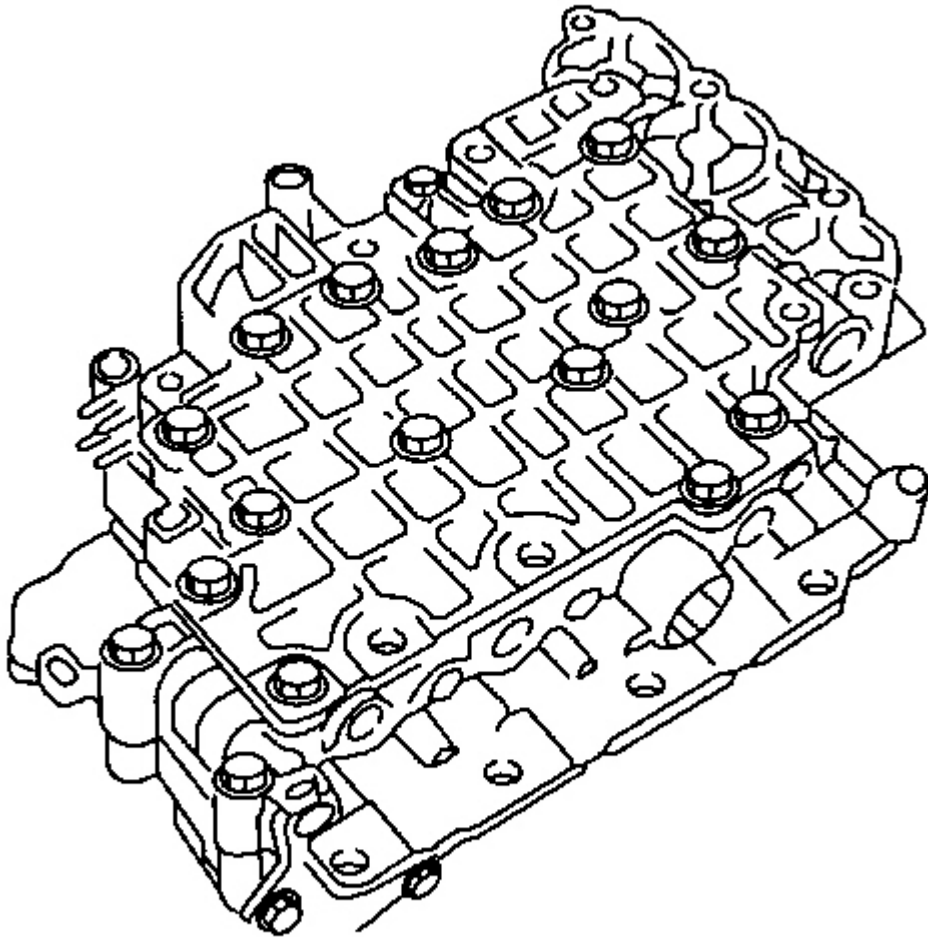


Fig. 429: Control Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the 15 bolts.

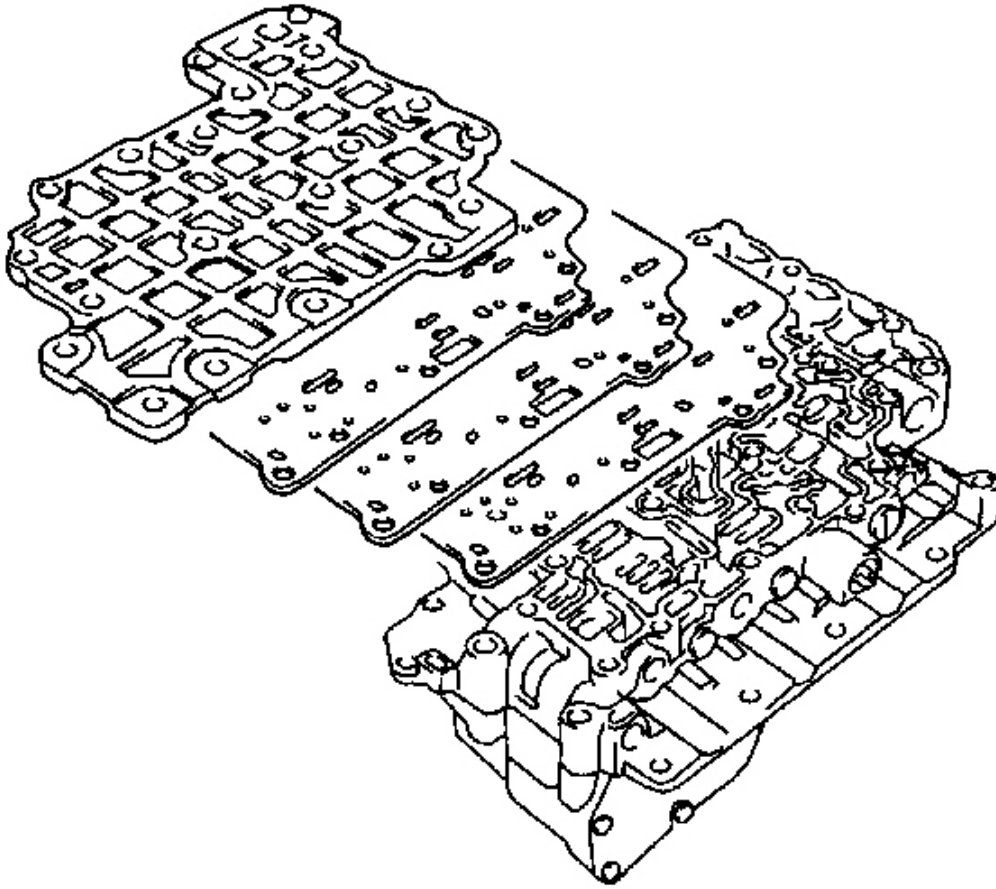


Fig. 430: Control Valve Body, Cover, Gaskets & Plate
Courtesy of GENERAL MOTORS CORP.

5. Remove the cover, the 2 gaskets, and the plate.

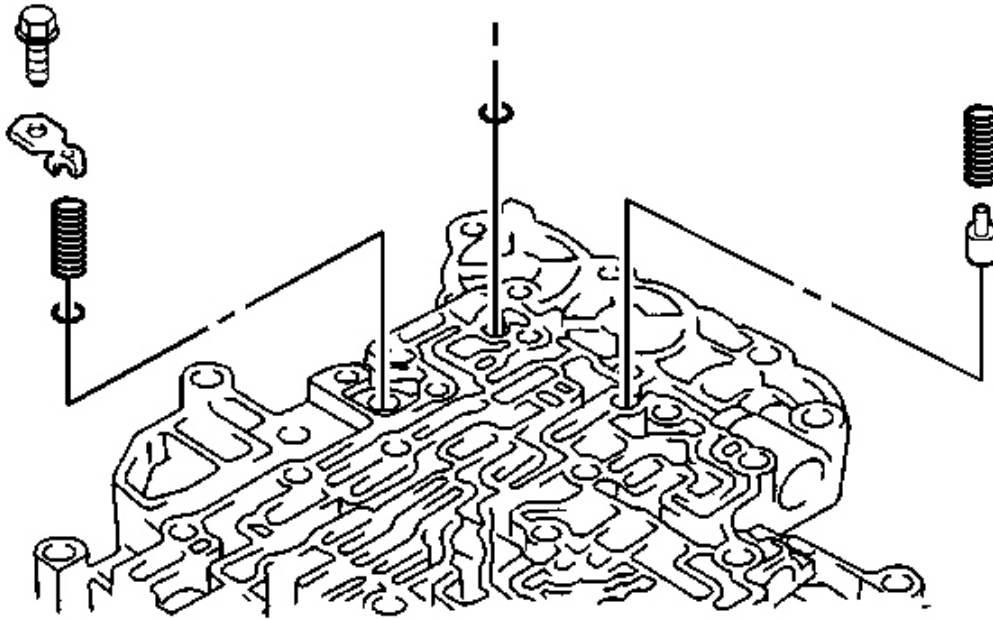


Fig. 431: Spring, Check Valve & Check Ball
Courtesy of GENERAL MOTORS CORP.

6. Remove the spring, check valve, and check ball.
7. Remove the bolt, spring seat, spring, and ball.
8. Turn over the valve body.

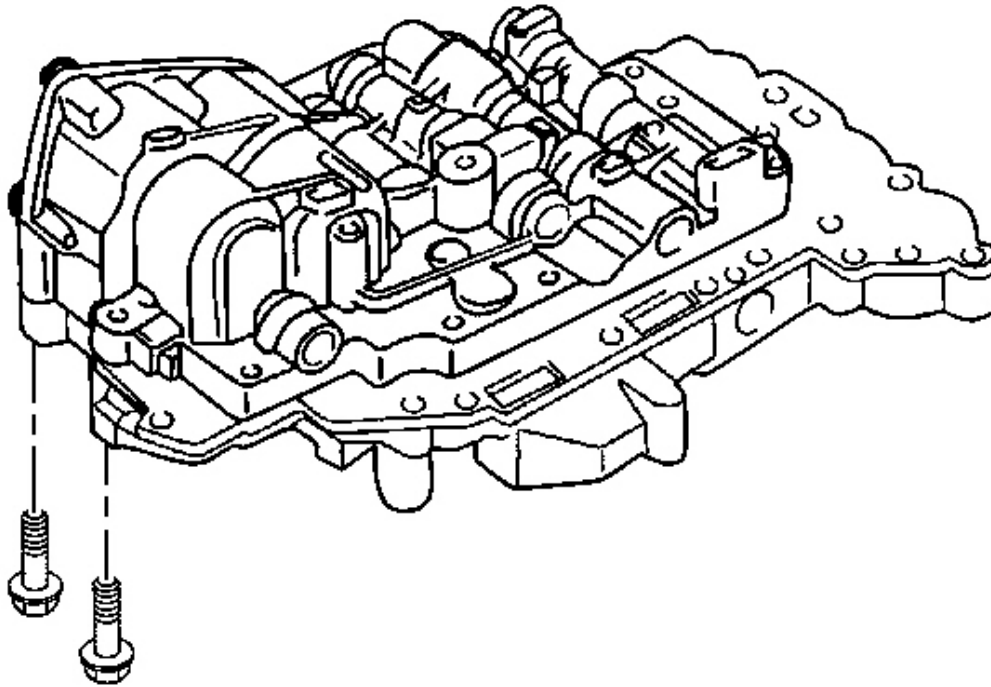


Fig. 432: Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the 2 bolts from the valve body.

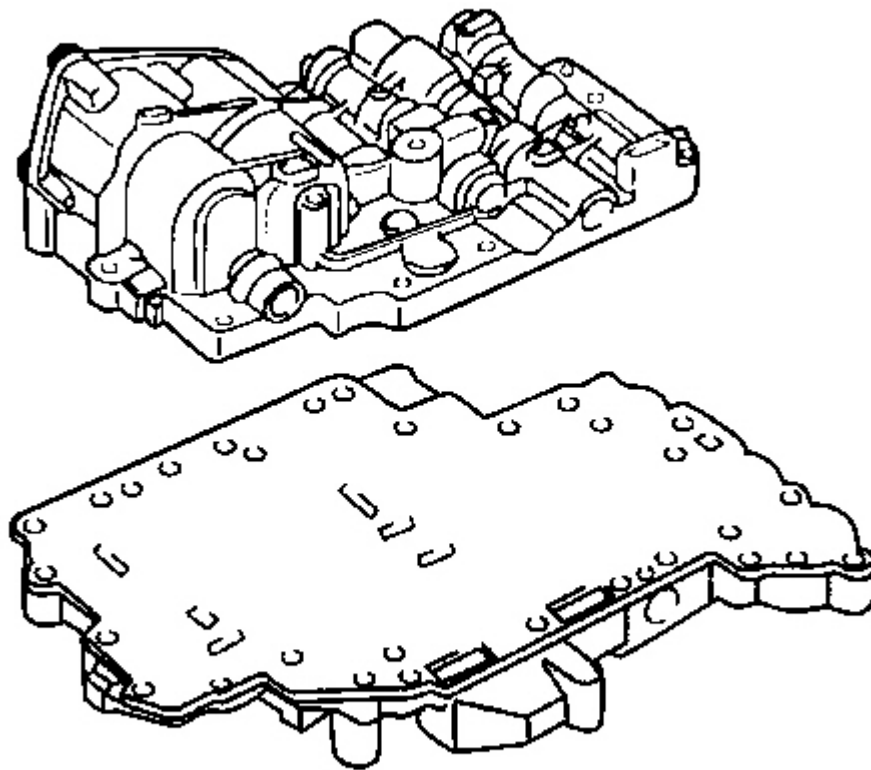


Fig. 433: Upper Valve Body & Lower Valve Body
Courtesy of GENERAL MOTORS CORP.

10. Remove the upper valve body from the lower valve body with the plate.

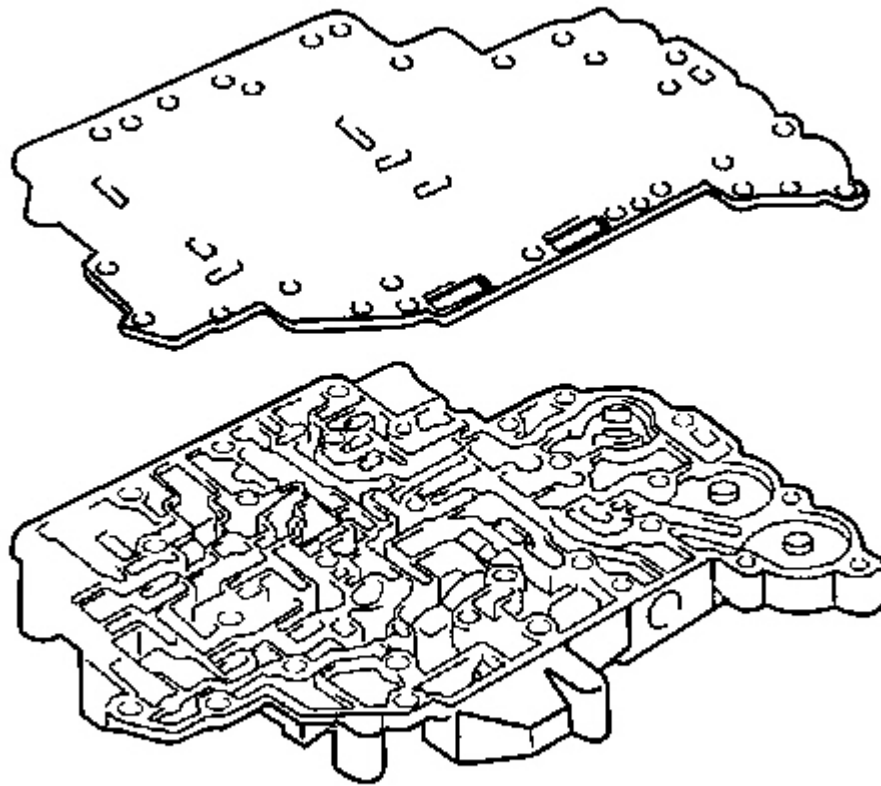


Fig. 434: Valve Body Plate & Lower Valve Body
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Be careful that the check balls do not fall out.

11. Remove the valve body plate from the lower valve body.

CONTROL VALVE BODY ASSEMBLE

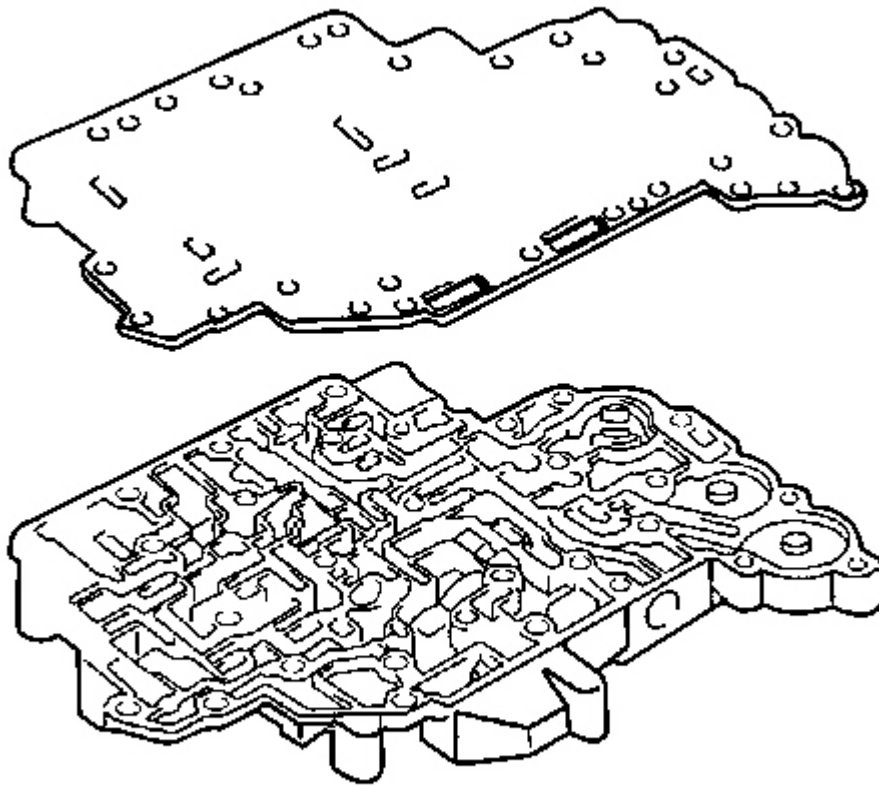


Fig. 435: Valve Body Plate & Lower Valve Body
Courtesy of GENERAL MOTORS CORP.

1. Install the valve body plate to the lower valve body.

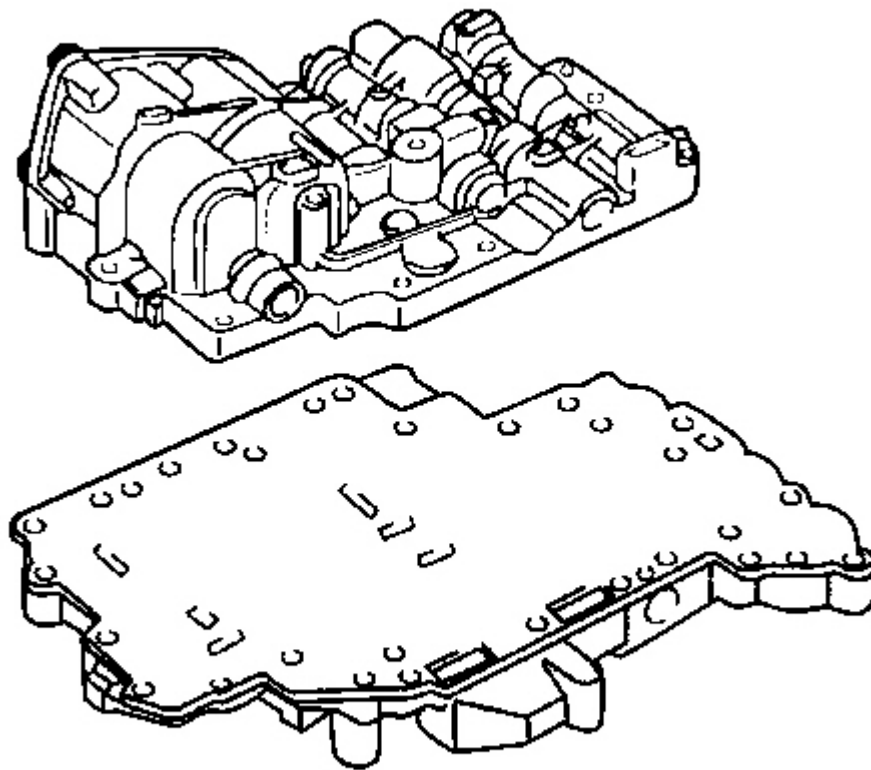


Fig. 436: Upper Valve Body & Lower Valve Body
Courtesy of GENERAL MOTORS CORP.

2. Install the upper valve body to the lower valve body with the plate.

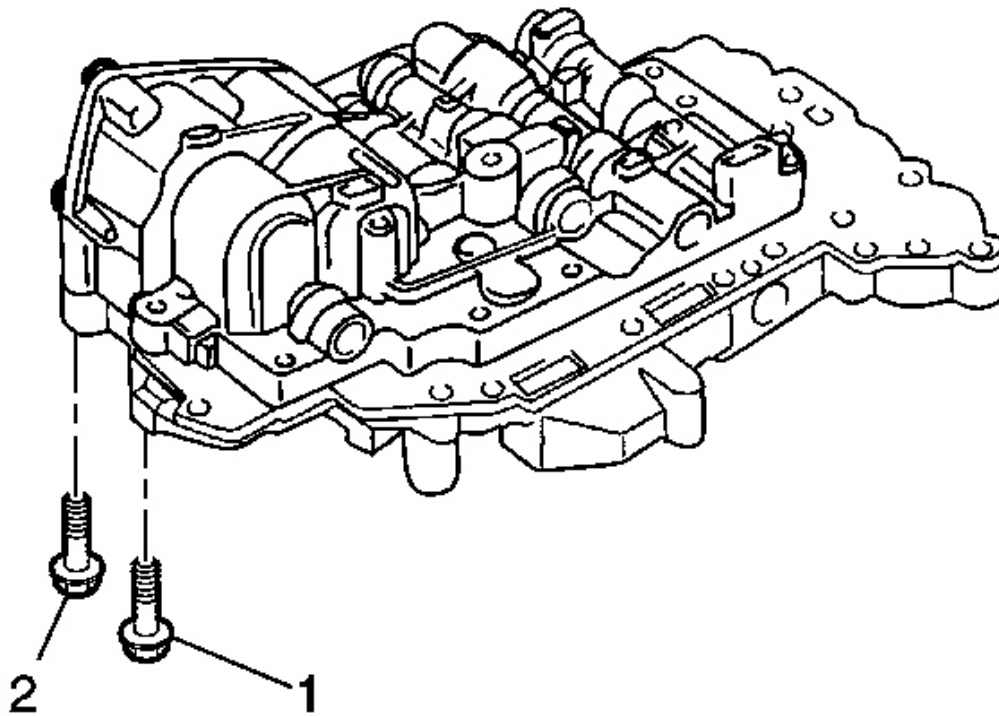


Fig. 437: Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the 2 bolts to the valve body. The bolt lengths are 49 mm (1.93 in) (1) and the 36 mm (1.42 in) (2).

Tighten: Tighten the bolts to 11 N.m (97 lb in).

4. Turn the valve body.

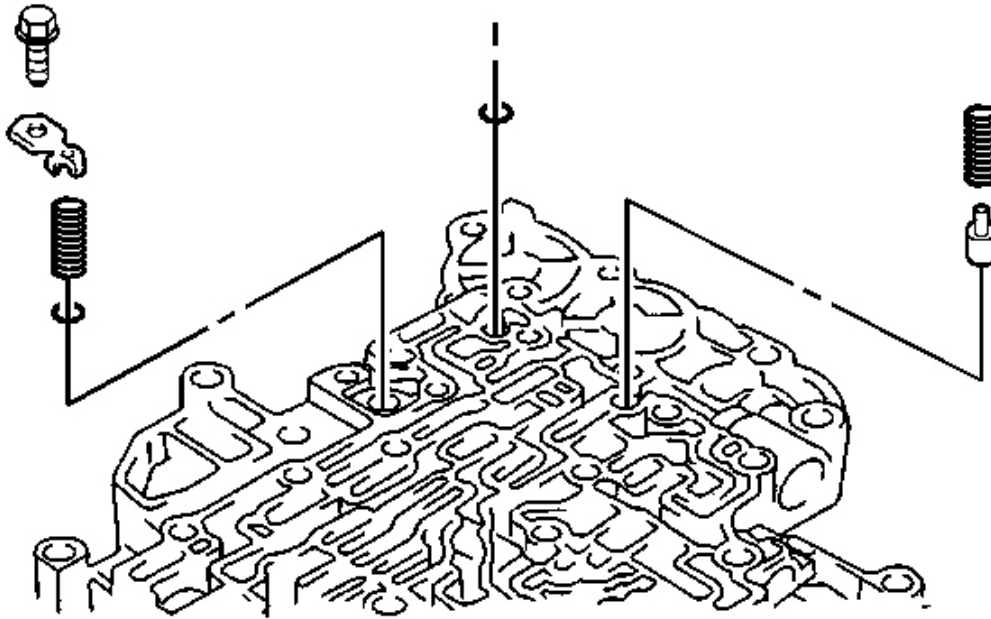


Fig. 438: Spring, Check Valve & Check Ball
Courtesy of GENERAL MOTORS CORP.

5. Install the check valve, spring, and check ball.
6. Install the ball, spring, spring seat, and bolt.

Tighten: Tighten the bolts to 6.5 N.m (57 lb in).

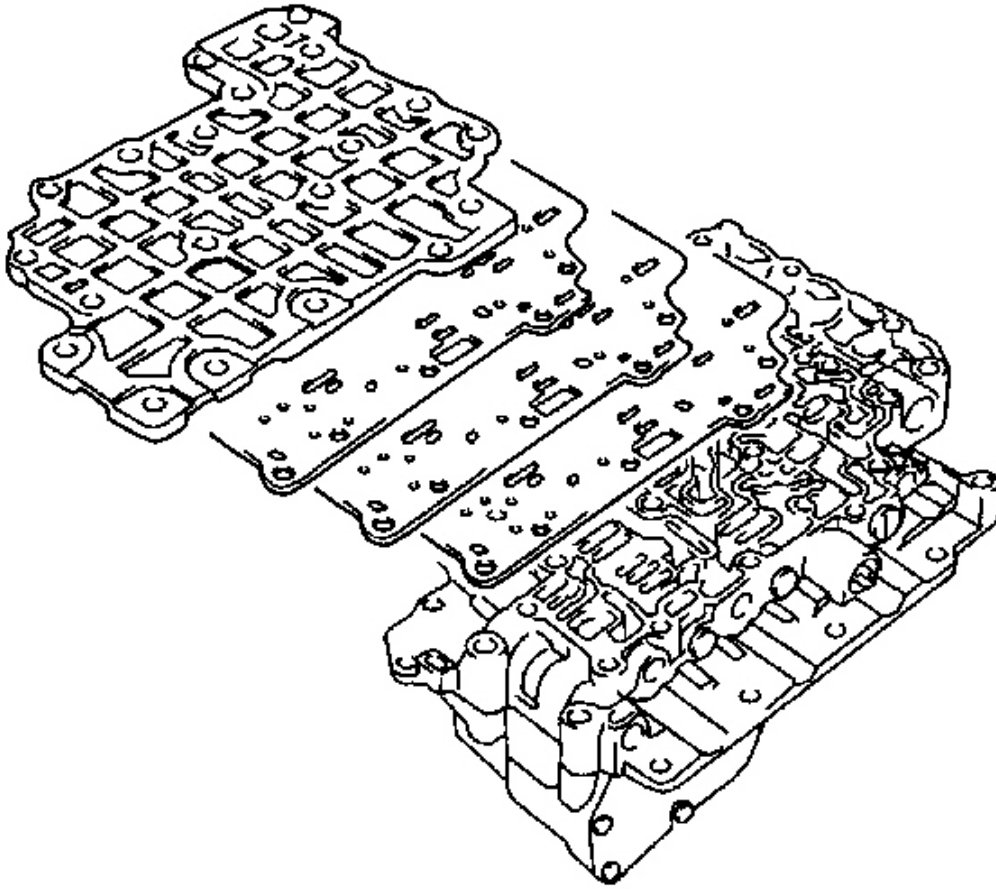


Fig. 439: Control Valve Body, Cover, Gaskets & Plate
Courtesy of GENERAL MOTORS CORP.

7. Install the 2 gaskets, the plate, and the lower valve body cover.

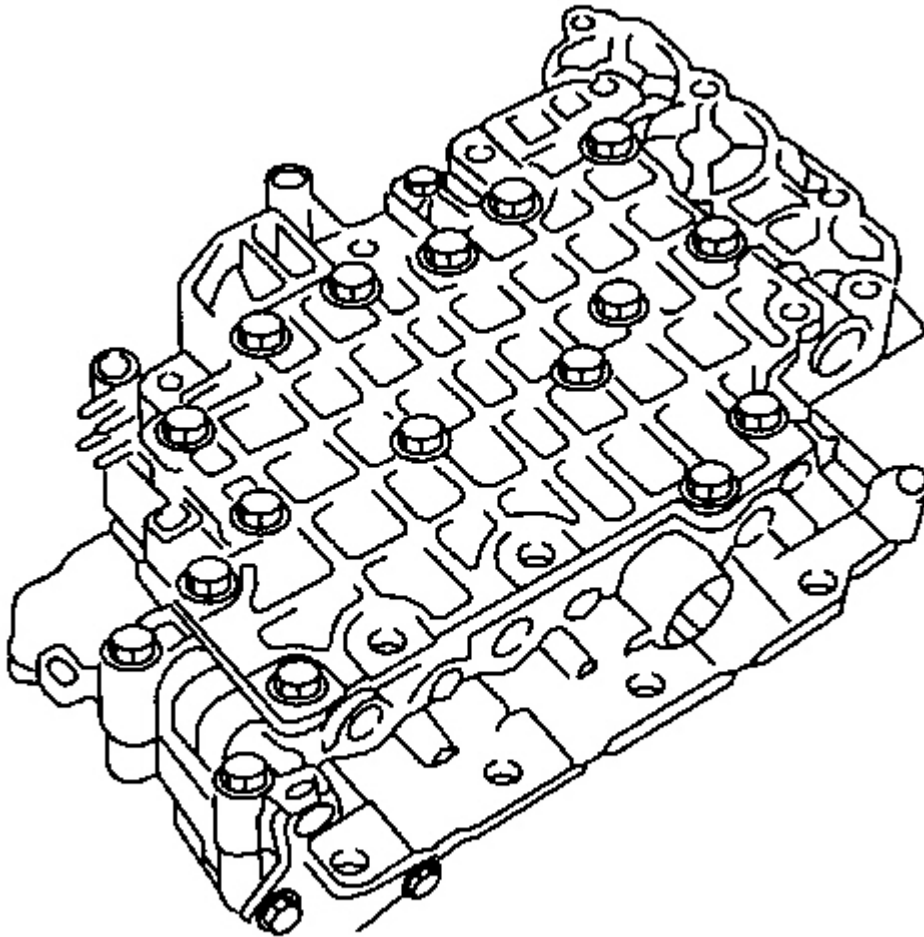


Fig. 440: Control Valve Body & Bolts
Courtesy of GENERAL MOTORS CORP.

8. Tighten the bolts temporarily.
9. Tighten the bolts completely. The bolt lengths are 49 mm (1.93 in), 20 mm (0.79 in), and 60 mm (2.36 in).

Tighten: Tighten the bolts to 11 N.m (97 lb in).

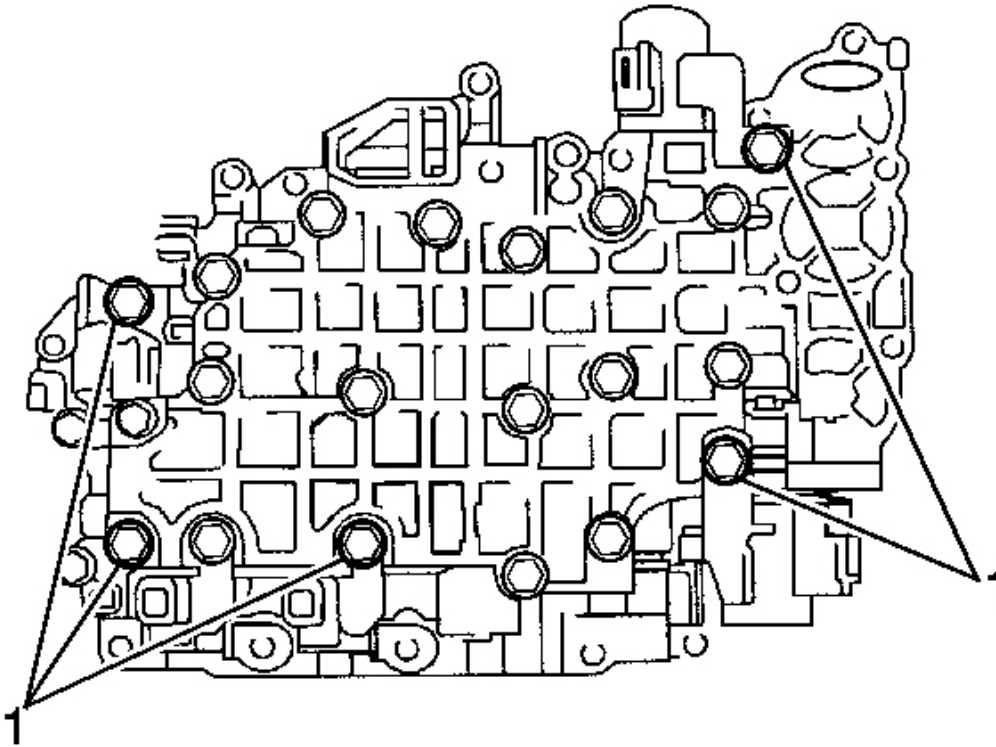


Fig. 441: Shift Solenoid Valves & Bolts
Courtesy of GENERAL MOTORS CORP.

10. Install the 5 shift solenoid valves with the 5 bolts (1). The bolt lengths are 49 mm (1.93 in) and 20 mm (0.79 in).

Tighten: Tighten the bolts to 11 N.m (97 lb in).

11. Install the manual valve.

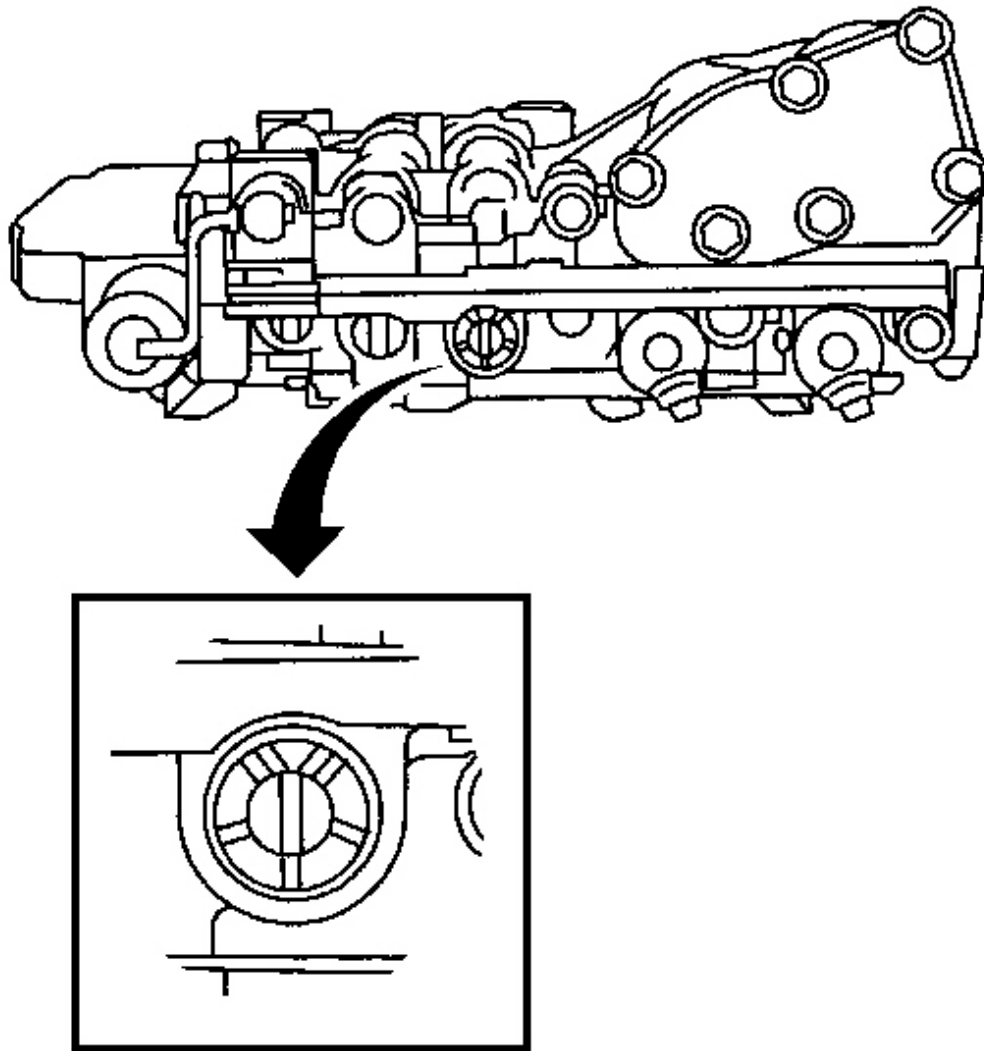


Fig. 442: Primary Regulator Valve Sleeve, Plug & Pin
Courtesy of GENERAL MOTORS CORP.

12. Make sure that the primary regulator valve is positioned in the same place where it was removed.

DESCRIPTION AND OPERATION

MANUAL FOURTH GEAR

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Manual Fourth Gear

Position		Solenoid		Clutch				Brake			1-Way Clutch	
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1	F2
D	4th	OFF	ON	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	OFF

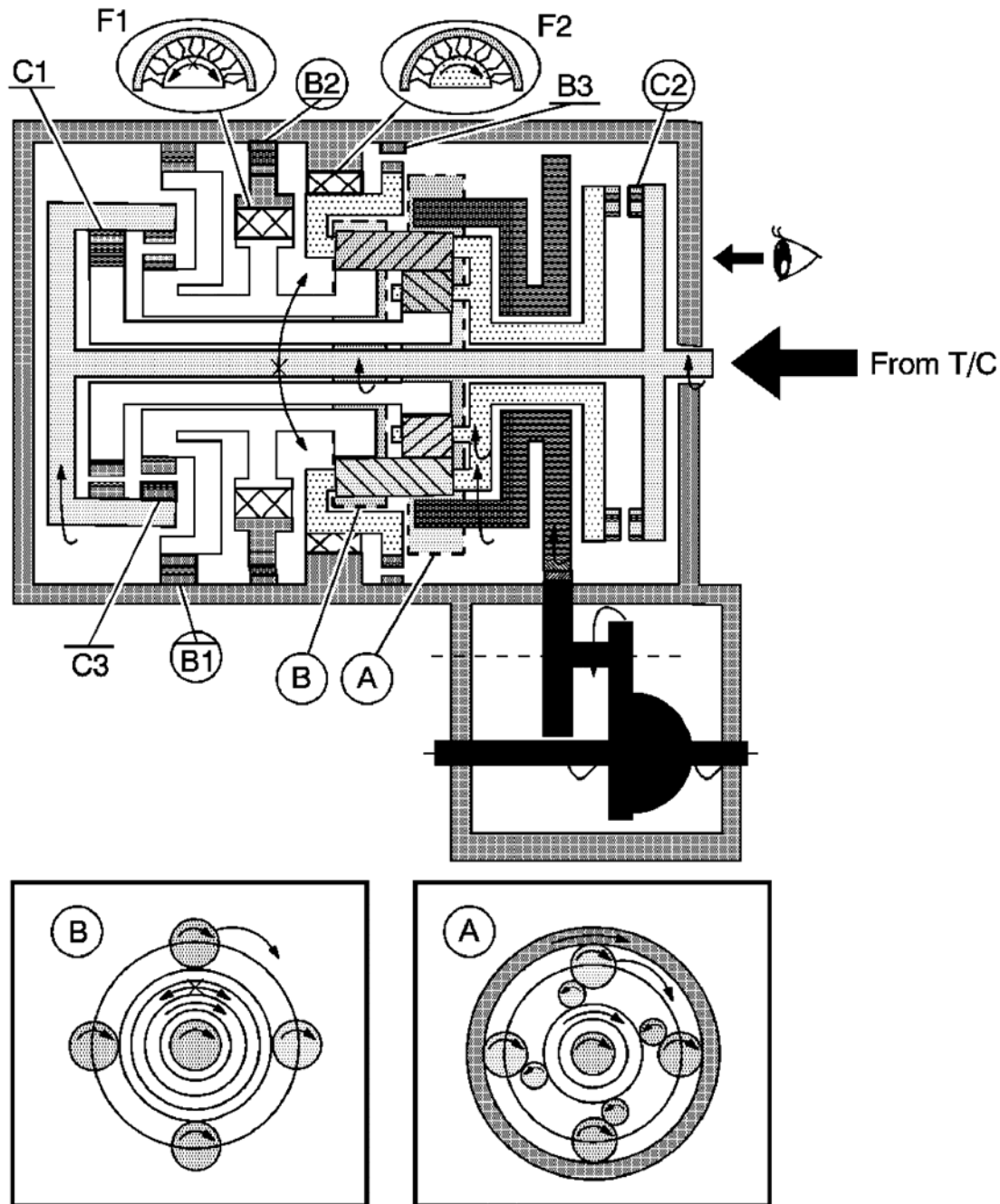


Fig. 443: Manual Fourth Gear Schematics
Courtesy of GENERAL MOTORS CORP.

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A. Front Planetary Gear

B. Rear Planetary Gear

D - 4th Gear

1. The input shaft rotates clockwise.

The direct clutch (C2) operates. Connect the input shaft to the planetary carrier.

2. The planetary carrier revolves clockwise.
3. The planetary long pinion rotates itself clockwise.
4. The rear planetary sun gear is going to rotate counterclockwise.

The O/D and 2nd brake (B1) operates. Lock rotates the planetary sun gear.

5. The planetary long pinion revolves clockwise while rotating itself clockwise.
6. The ring gear rotates clockwise.
7. The counter drive gear rotates clockwise for the ring gear and one.
8. The counter driven gear rotates counterclockwise.
9. The differential gear drive pinion rotates counterclockwise for the counter driven gear and one.
10. The differential gear rotates clockwise.

Engine Brake

The driving force is connected to the input shaft directly without the 1-way clutch. Therefore the engine brake operates.

MANUAL THIRD GEAR

Manual Third Gear

Position		Solenoid			Clutch			Brake			1-Way Clutch	
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1	F2
D	3rd	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF

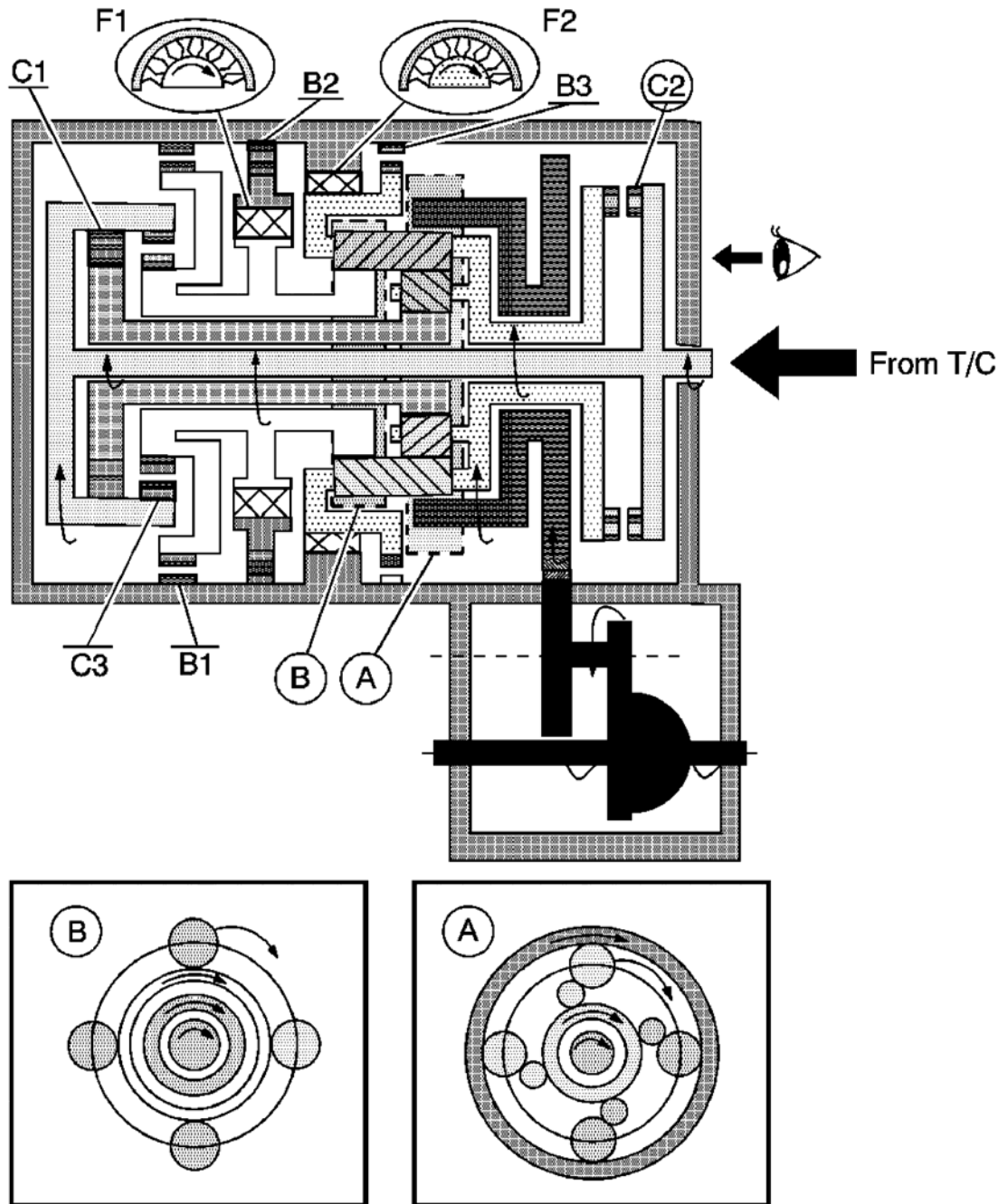


Fig. 444: Manual Third Gear Schematics
 Courtesy of GENERAL MOTORS CORP.

A. Front Planetary Gear

B. Rear Planetary Gear

D - 3rd Gear

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1. The input shaft rotates clockwise.
 - The forward clutch (C1) operates. Connect the input shaft to the front sun gear.
 - The direct clutch (C2) operates. Connect the input shaft to the planetary carrier.
2. The planetary short pinion and the planetary long pinion can not rotate itself, and the planetary gear unit rotates clockwise as one.
3. The counter drive gear rotates clockwise for the ring gear and one.
4. The counter drive gear rotates counterclockwise.
5. The differential drive pinion rotates counterclockwise for the counter driven gear and one.
6. The differential rotates clockwise.

Engine Brake

The driving force is connected to the input shaft directly without the 1-way clutch. Therefore the engine brake operates.

MANUAL SECOND GEAR

Manual Second Gear

Position		Solenoid			Clutch			Brake			1-Way Clutch	
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1	F2
D	2nd	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
2	2nd	ON	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	ON	OFF

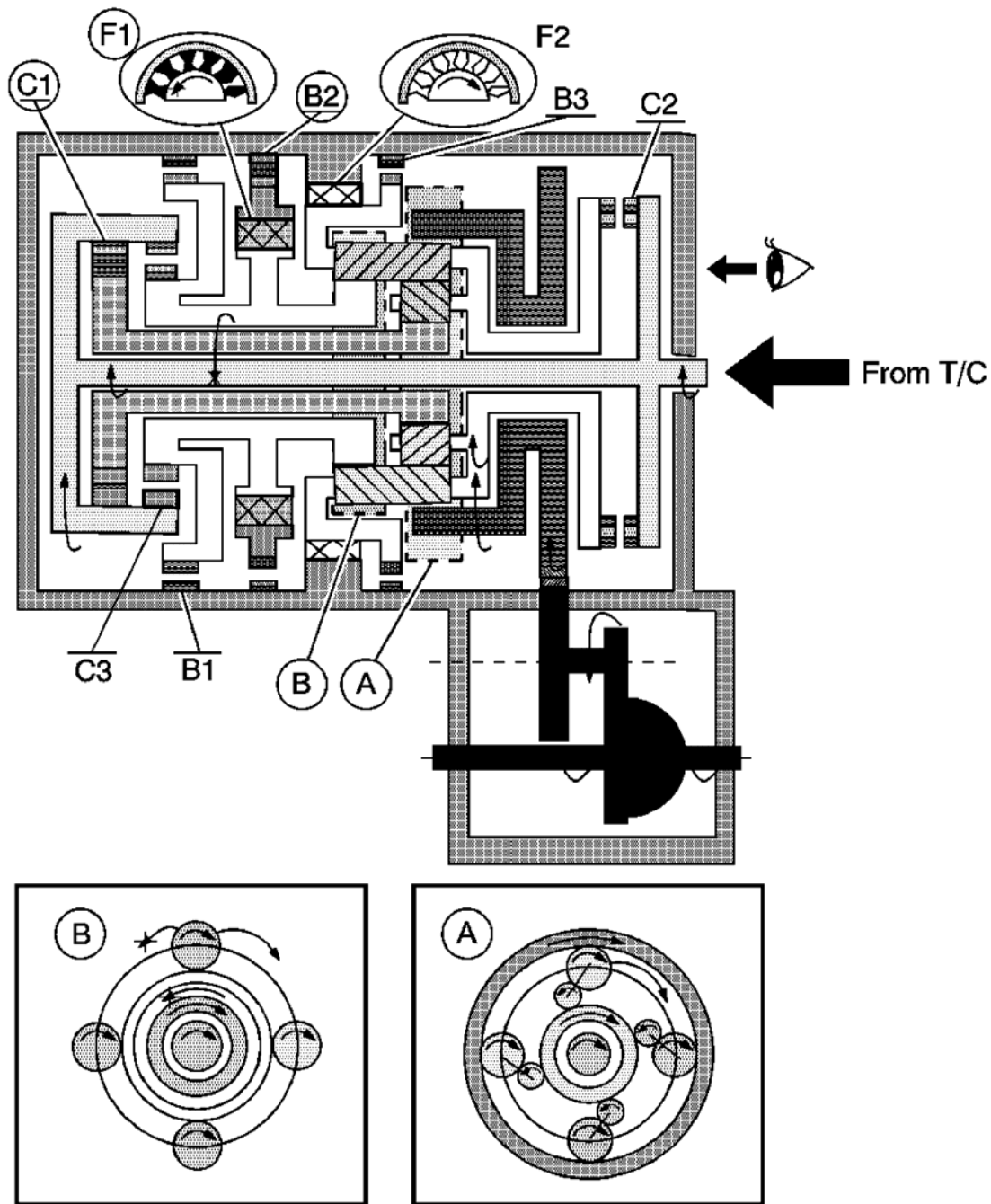


Fig. 445: Manual Second Gear Schematics
Courtesy of GENERAL MOTORS CORP.

A. Front Planetary Gear

B. Rear Planetary Gear

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D - 2nd Gear

1. The input shaft rotates clockwise.

The forward clutch (C1) operates. Connect the input shaft to the front sun gear.

2. The front sun gear rotates clockwise.
3. The planetary short pinion rotates itself counterclockwise.
4. The planetary long pinion rotates itself clockwise.
5. The rear planetary sun gear is going to rotate counterclockwise.

The 2nd brake (B2) and 1-way clutch No. 1 operates, lock counterclockwise rotation of the rear planetary sun gear.

6. The planetary carrier revolves clockwise due to reaction force of the planetary long pinion.
7. The ring gear rotates clockwise.
8. The counter drive gear rotates clockwise for the ring gear and one.
9. The counter driven gear rotates counterclockwise.
10. The differential gear drive pinion rotates counterclockwise for the counter driven gear and one.
11. The differential gear rotates clockwise.

Engine Brake

1. The counter drive gear and planetary ring gear rotates counterclockwise.
2. The planetary long pinion rotates itself counterclockwise.
3. The planetary short pinion rotates itself clockwise.
4. The rear sun gear rotates clockwise due to rotation itself counterclockwise of the planetary long pinion, but the driving force loses due to free to 1-way clutch No. 1 (F1). Therefore the engine brake does not operate.

MANUAL FIRST GEAR

Manual First Gear

Position		Solenoid			Clutch			Brake			1-Way Clutch	
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1	F2
D	1st	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
1	1st	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	ON

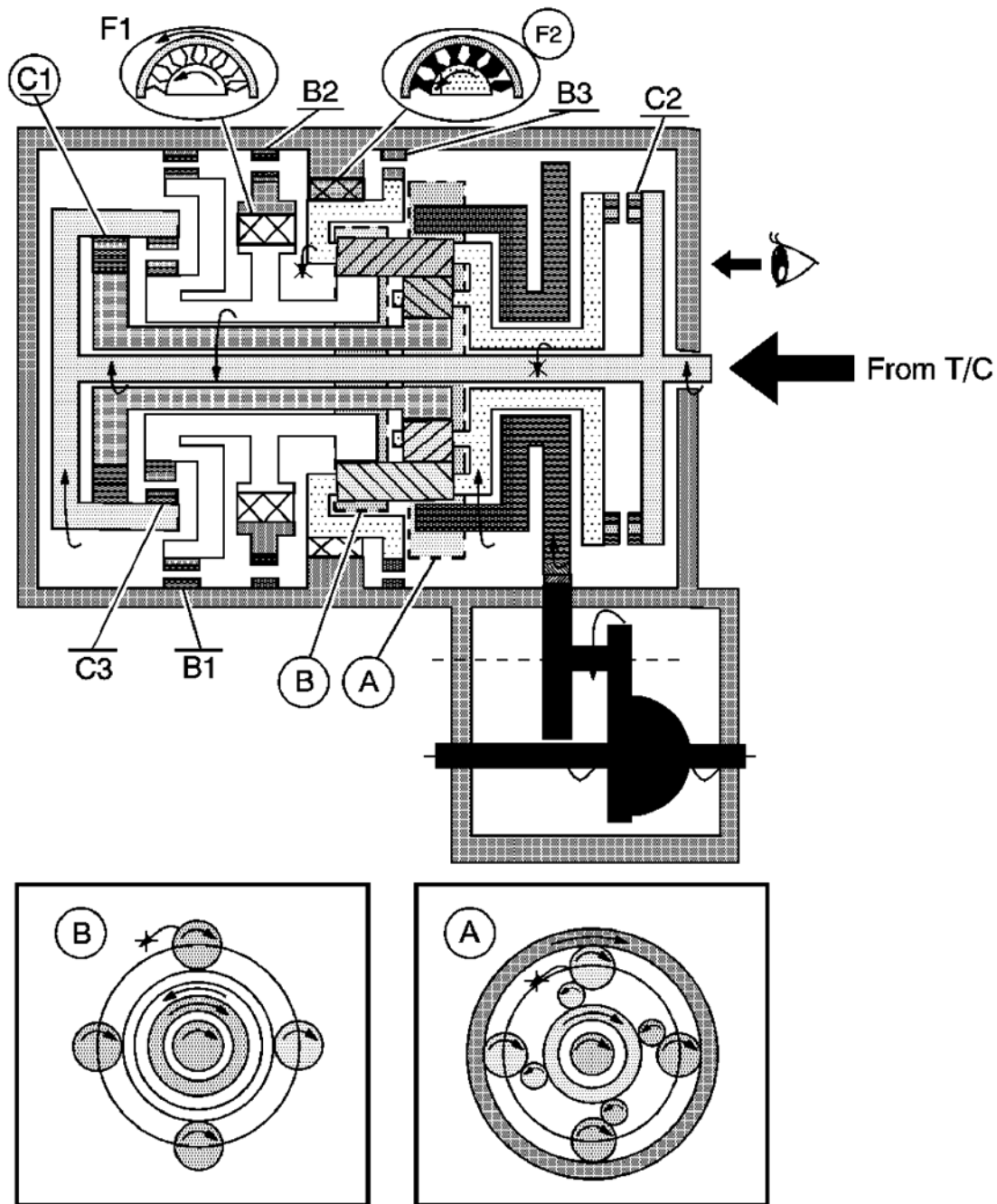


Fig. 446: Manual First Gear Schematics
Courtesy of GENERAL MOTORS CORP.

A. Front Planetary Gear

B. Rear Planetary Gear

D - 1st Gear

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1. The input shaft rotates clockwise.

The forward clutch (C1) operates. Connect the input shaft to the front sun gear.

2. The front sun gear rotates clockwise.
3. The planetary short pinion rotates itself counterclockwise.
4. The planetary long pinion rotates itself clockwise.
5. The planetary carrier is going to rotate counterclockwise.

The one-way clutch No. 2 (F2) operates. The lock revolves counterclockwise of the planetary carrier.

6. The ring gear rotates clockwise.
7. The counter drive gear rotates clockwise for ring gear and one.
8. The counter drive gear rotates counterclockwise.
9. The differential gear drive pinion rotates counterclockwise for the counter driven gear and one.
10. The differential gear rotates clockwise.

Engine Brake

1. The counter drive gear and planetary ring gear rotates counterclockwise.
2. The planetary long pinion rotates itself counterclockwise.
3. The planetary short pinion rotates itself clockwise.
4. The planetary carrier revolves clockwise due to rotation itself counterclockwise of the planetary long pinion, but driving force loses due to free of 1-way clutch No. 2 (F2). Therefore the engine brake does not operate.

REVERSE

Reverse

Position		Solenoid			Clutch			Brake			1-Way
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1
R	V is less than 9 km/h (5 mph)	ON	ON	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
	V is greater than or equal	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF

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to 9
km/h
(5
mph)

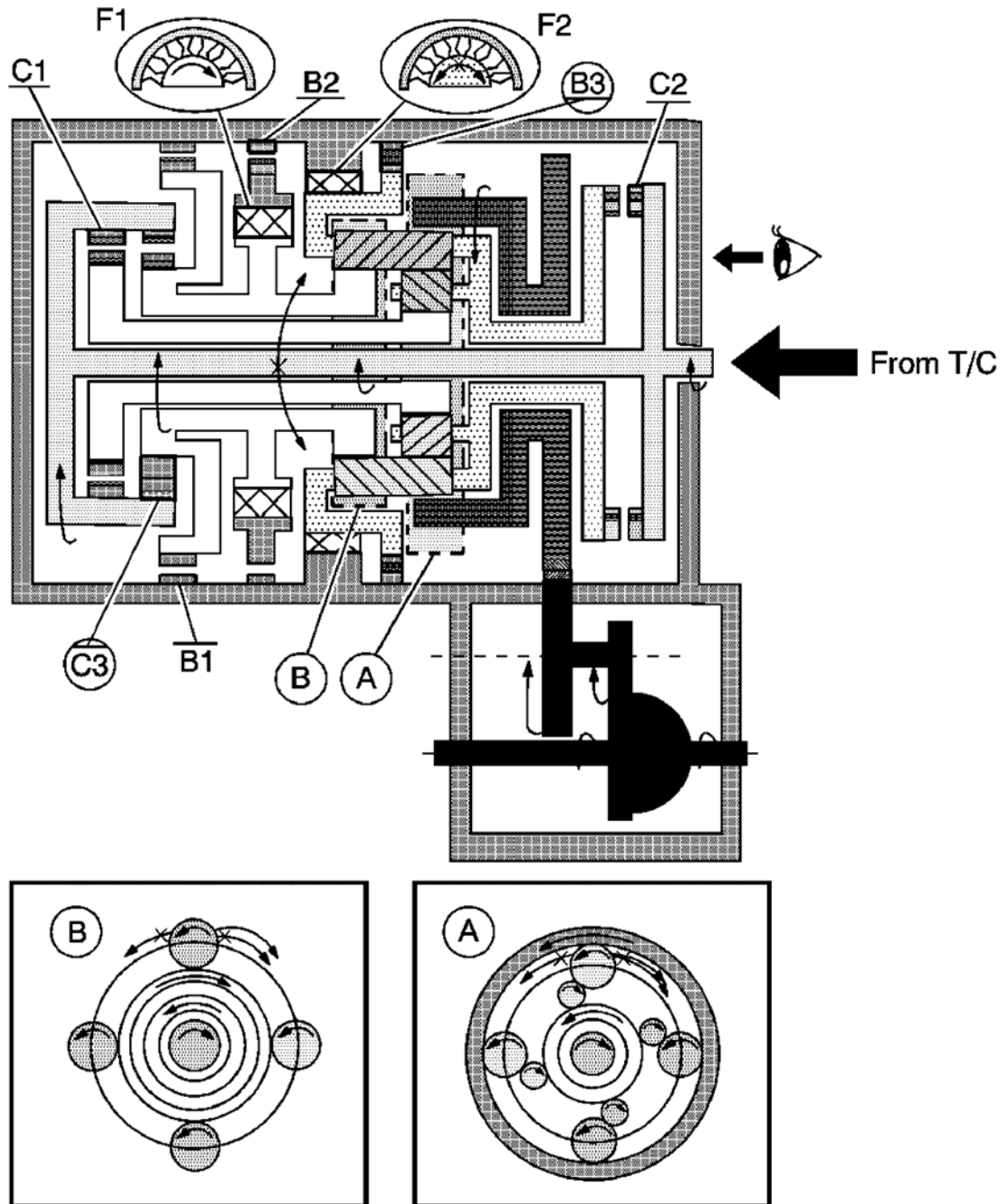


Fig. 447: Reverse Schematics
Courtesy of GENERAL MOTORS CORP.

A. Front Planetary Gear

B. Rear Planetary Gear

Reverse Gear

1. The input shaft rotates clockwise.

The reverse clutch (C3) operates. Connect the input shaft to the rear planetary sun gear.

2. The planetary long pinion rotates itself counterclockwise.
3. The 1st and reverse brake (3) operates. Lock rotates the planetary carrier.
4. The ring gear rotates counterclockwise.
5. The counter drive gear rotates counterclockwise for the ring gear and one.
6. The counter driven gear rotates clockwise.
7. The differential gear drive pinion rotates clockwise for the counter driven gear and one.
8. The differential gear rotates counterclockwise.

Engine Brake

The driving force is connected to the input shaft directly without the 1-way clutch. Therefore the engine brake operates.

TRANSMISSION GENERAL DESCRIPTION

NOTE: Lack of basic knowledge of this powertrain when performing diagnostic procedures could result in incorrect diagnostic performance or damage to powertrain components. Do not attempt to diagnose a powertrain problem without this basic knowledge.

The new automatic transmission AISIN (81-40LE) is an electronically controlled 4-speed automatic transmission with lock-up mechanism.

The transmission is mainly composed of the torque converter with lock up clutch, newly developed 4-speed planetary gear unit, the hydraulic control system and the electric control system.

Hydraulic Control System

Based on the hydraulic pressure created by the oil pump, the TCM sends signals to the solenoid and the hydraulic control system governs the hydraulic pressure acting on the torque converter, planetary gear, clutches, and brakes in accordance with the vehicle driving conditions.

Function of Components

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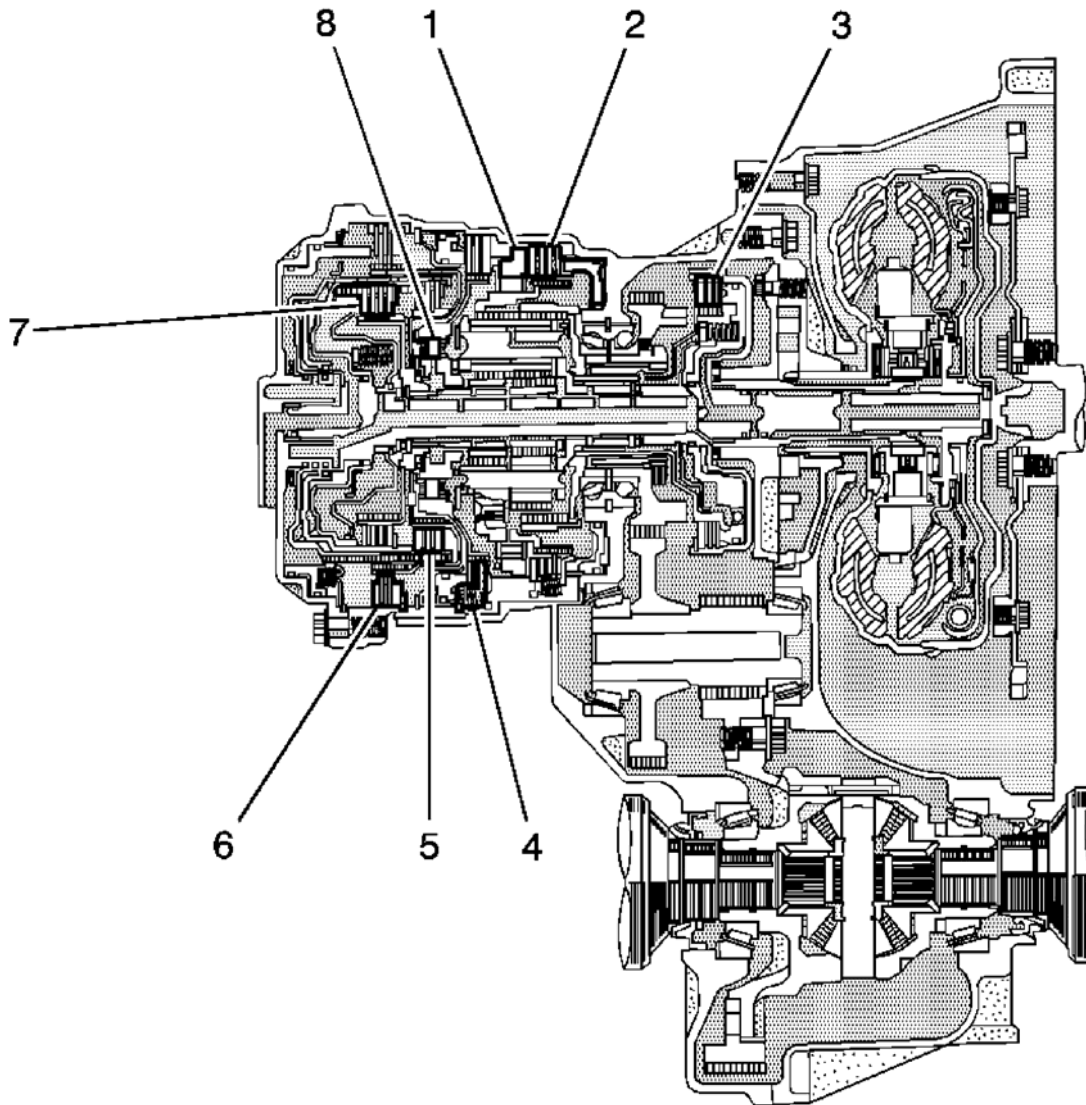


Fig. 448: Function Of Components
Courtesy of GENERAL MOTORS CORP.

Function of Components

Component		Function
7	Forward Clutch	Connects the input shaft and front sun gear.
3	Direct Clutch	Connects the input shaft and planetary carrier.
5	Reverse Clutch	Connects the input shaft and rear sun gear.
6	O/D and 2nd Brake	Prevents rear planetary sun gear from turning either clockwise or counterclockwise.
4	2nd Brake	Prevents outer race of 8 from turning either clockwise or counterclockwise, thus preventing the rear sun gear turning

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		counterclockwise.
2	1st and Reverse Brake	Prevents the planetary carrier from turning either clockwise or counterclockwise.
8	No. 1 One-Way Clutch	When 4 is operating, this clutch prevents rear sun gear from turning counterclockwise.
1	No. 2 One-Way Clutch	Prevents the planetary carrier from turning counterclockwise.
Planetary Gear		These gears change the route through which driving force is transmitted, in accordance with the operation of each clutch and brake, in order to increase or reduce the input and output speed.

Operations of Clutches and Brakes

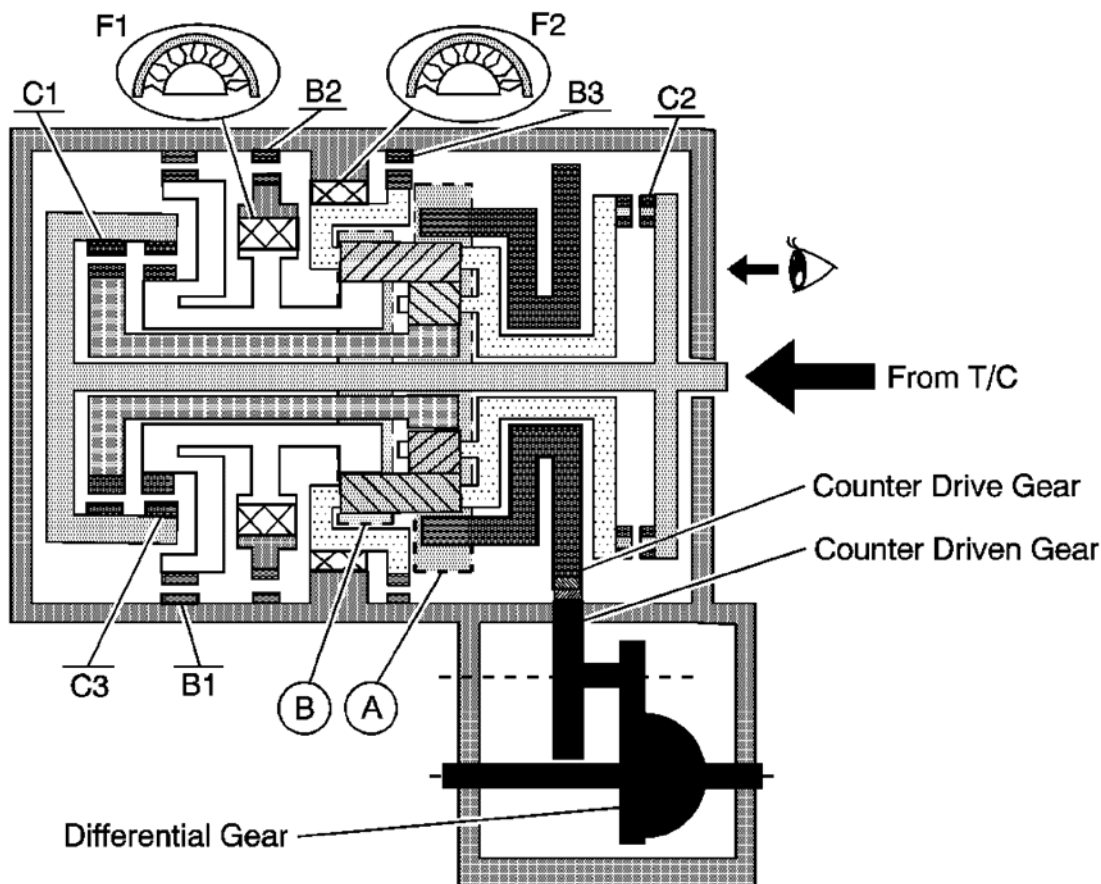


Fig. 449: Operations Of Clutches And Brakes
Courtesy of GENERAL MOTORS CORP.

Operations of Clutches and Brakes

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Clutch and Brake		Operation
C1	Forward Clutch	Connects the intermediate shaft and the front sun gear.
C2	Direct Clutch	Connects the input shaft and the planetary carrier.
C3	Reverse Clutch	Connects the intermediate shaft and the rear sun gear.
B1	O/D and 2nd Brake	Lock rear sun gear
B2	2nd Brake	Lock rear sun gear
B3	1st and Reverse Brake	Lock planetary carrier
F1	1-Way Clutch No. 1	Lock counterclockwise rotation of the rear sun gear, when B2 operations
F2	1-Way Clutch No. 2	Lock counterclockwise rotation of the planetary carrier

Transmission Range Reference

Position		Solenoid			Clutch			Brake			One-Way Clutch	
		Shift 1	Shift 2	Timing	C1	C2	C3	B1	B2	B3	F1	F2
P		ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
R	V less than 9 km/h (5 mph)	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
	V greater than or equal to 9 km/h (5 mph)	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
N		ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
D	1st	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	2nd	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
	3rd	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
	3-4	OFF	ON	ON-OFF	ON-OFF	ON	OFF	OFF-ON	ON	OFF	OFF	OFF
	4th	OFF	ON	OFF	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
2	1st	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	2nd	ON	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	ON	OFF
	3rd	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
1	1st	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF	ON
	2nd	ON	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	ON	OFF

ELECTRONIC COMPONENT DESCRIPTION

Transmission Control Module (TCM)

The transmission control module (TCM) primarily controls shift points and lockup engagement. It is located on the driver side under the instrument panel.

The transmission is controlled by an electronic shift system. The TCM processes input signals. From the information received, the TCM controls the transmission hydraulic system.

The electronic shift system consists of the following components.

- TCM
- Shift solenoids (SS1 and SS2)
- Pressure control solenoid (PCS)
- Lockup solenoid
- Input shaft speed (ISS) sensor
- Output shaft speed (OSS) sensor
- Transmission fluid temperature (TFT) sensor
- Park/neutral position (PNP) switch

Park/Neutral Position (PNP) Switch

The PNP switch transmits the information which range includes the shift lever of the automatic transmission (A/T) to the starter and TCM.

- It is possible for the PNP switch to start an engine in only park (P) and neutral (N) prevention of reckless driving
- The PNP switch makes the backup lamp turn on when reversing.
- It is used for PNP switch to shift control.

The PNP switch transmits the information by combination of starter and reverse circuit to the vehicle side directly without TCM.

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Range	Starter Circuit		Indicator Circuit						
	ST+	ST-	IG	P	R	N	D	2	1
P	○ — ○		○ — ○						
R			○ — ○						
N	○ — ○		○ — ○			○			
D			○ — ○				○		
2			○ — ○					○	
1			○ — ○						○
Polarity	+	-	+	-	-	-	-	-	-

Fig. 450: PNP Switch Chart

Courtesy of GENERAL MOTORS CORP.

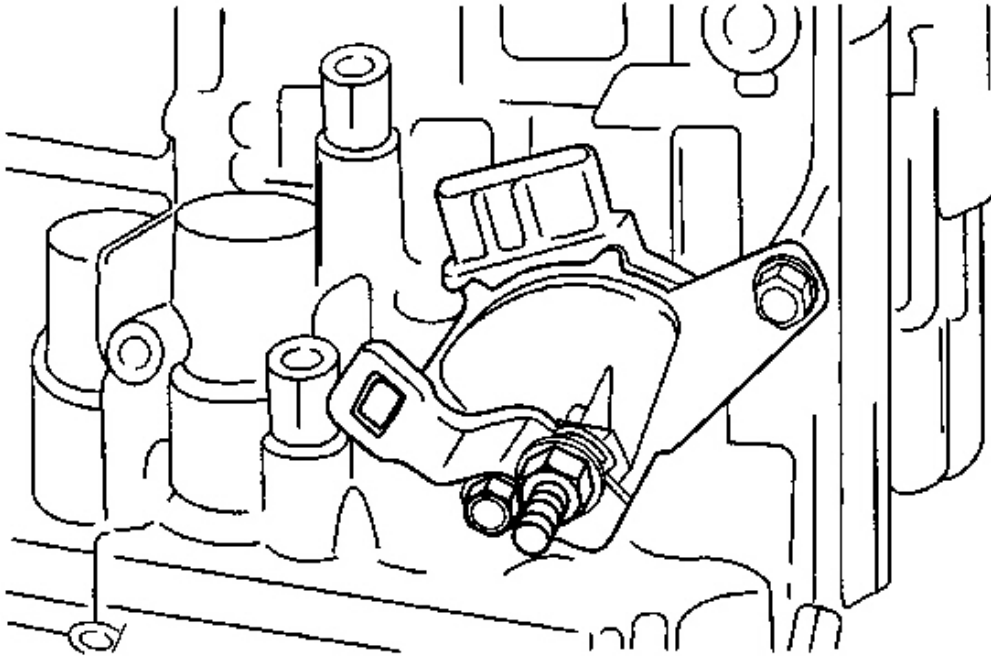


Fig. 451: PNP Switch, Nut, Washer & Control Lever
Courtesy of GENERAL MOTORS CORP.

Shift Solenoid No 1, 2 (SS1, SS2)

Two shift solenoids are installed directly in the valve body. The solenoids operate of ON and OFF by the control signal from TCM. Combinations of 2 solenoids, SS1 (2) and SS2 (1) changes gear ranges.

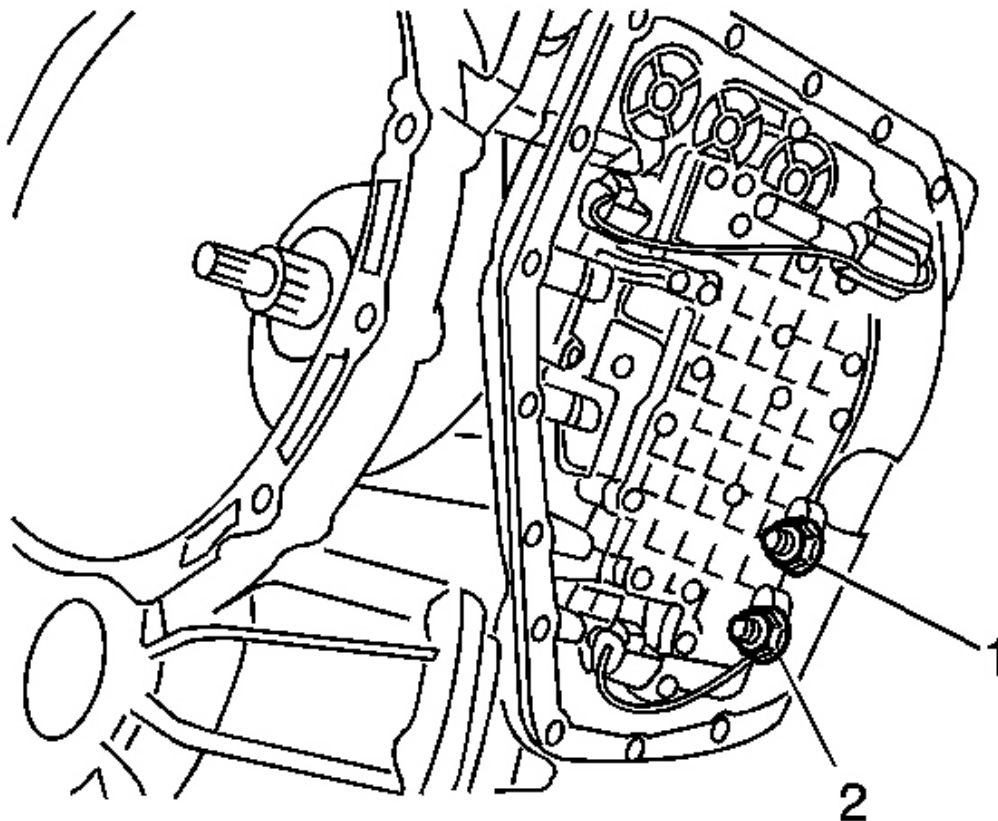


Fig. 452: Shift Solenoid No 1, 2 (SS1, SS2)
Courtesy of GENERAL MOTORS CORP.

Timing Solenoid

The timing solenoid (1) is installed directly in the valve body. The solenoid operates of ON/OFF by the control signal from TCM. The solenoid change timing valve of inside the valve body, operate hydraulic control with apply and drain of forward clutch.

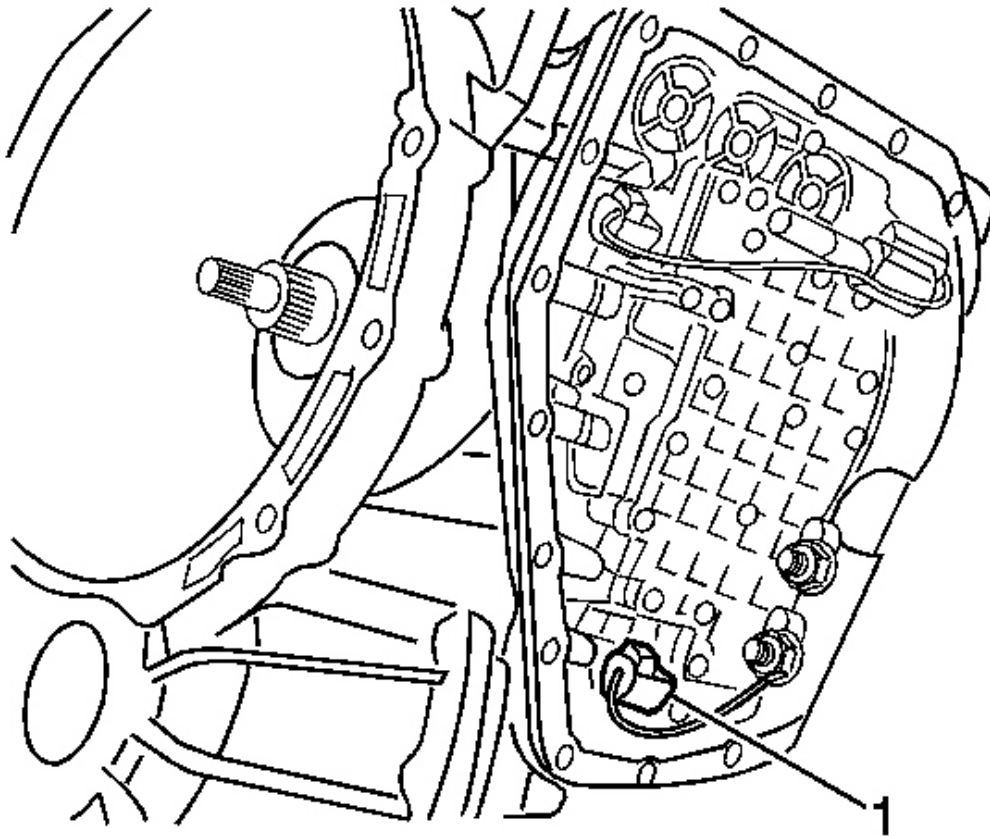


Fig. 453: Timing Solenoid

Courtesy of GENERAL MOTORS CORP.

Lock-Up Solenoid

The lock-up solenoid (1) is installed in the valve body. It receives control signal from TCM.

The lock-up solenoid operates the lock-up valve inside the valve body and controls the torque converter lockup function.

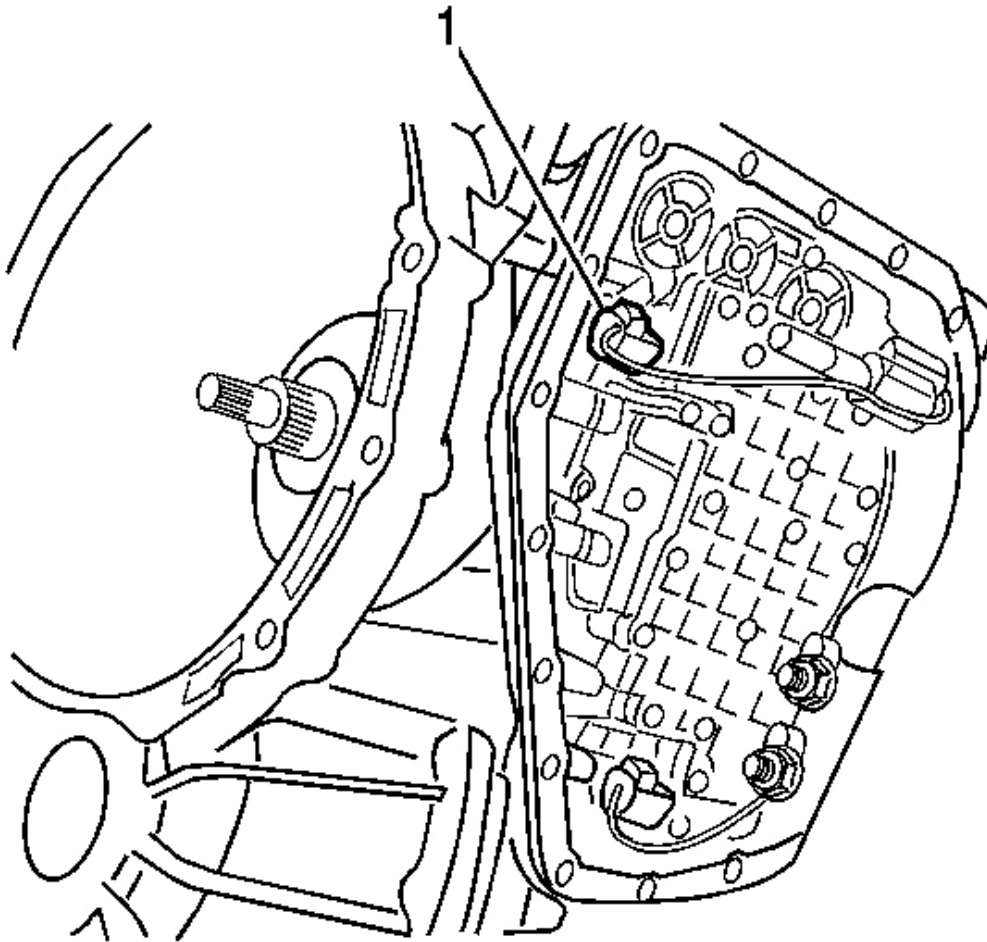


Fig. 454: Lock-Up Solenoid
Courtesy of GENERAL MOTORS CORP.

Pressure Control Solenoid (PCS)

The PCS (1) is located inside the valve body and regulates the transmission's fluid pressure system. It is internally grounded in the TCM and operates when it is supplied with battery voltage from the TCM, through the PCS and back to the TCM.

The battery voltage is controlled by a varying current from the TCM.

The strength of the current is a function of the throttle position.

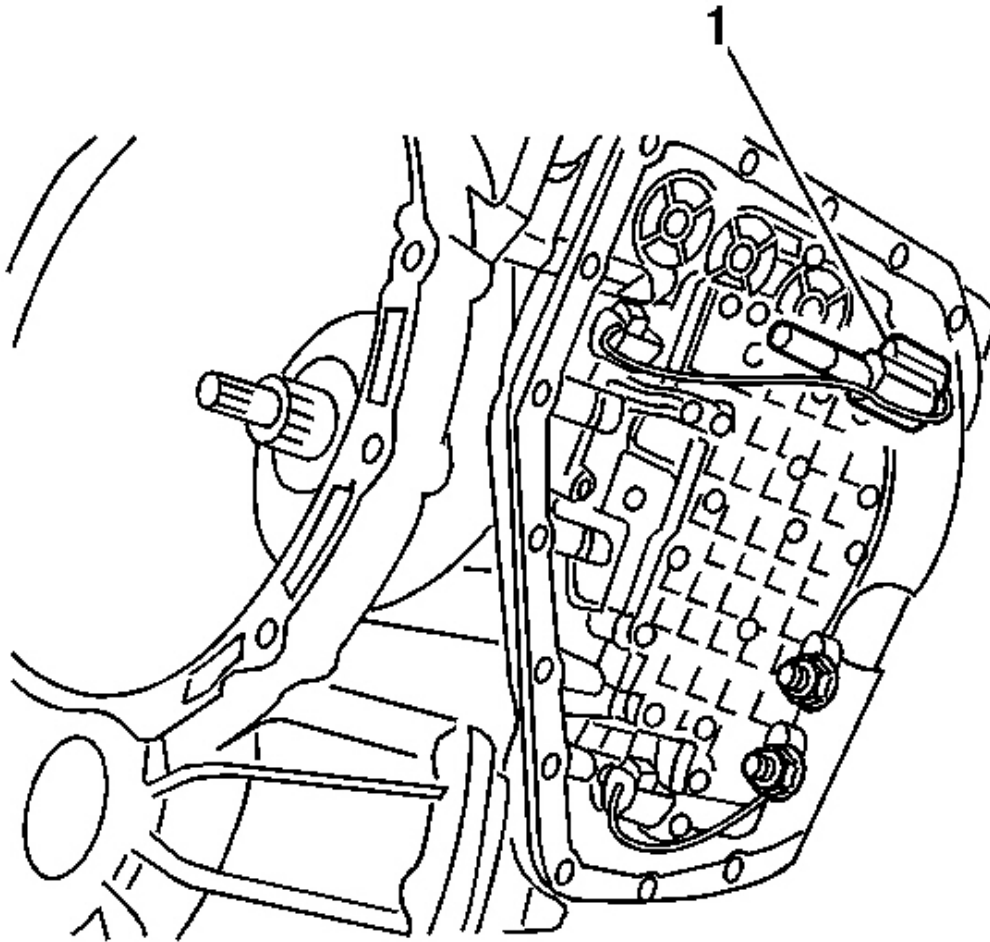


Fig. 455: Pressure Control Solenoid (PCS)
Courtesy of GENERAL MOTORS CORP.

Transmission Fluid Temperature (TFT) Sensor

The TFT sensor (1) provides the TCM with information on the transmission fluid temperature.

The TCM uses information from the TFT sensor to calculate the gear shift points and to engage the torque converter lock-up function.

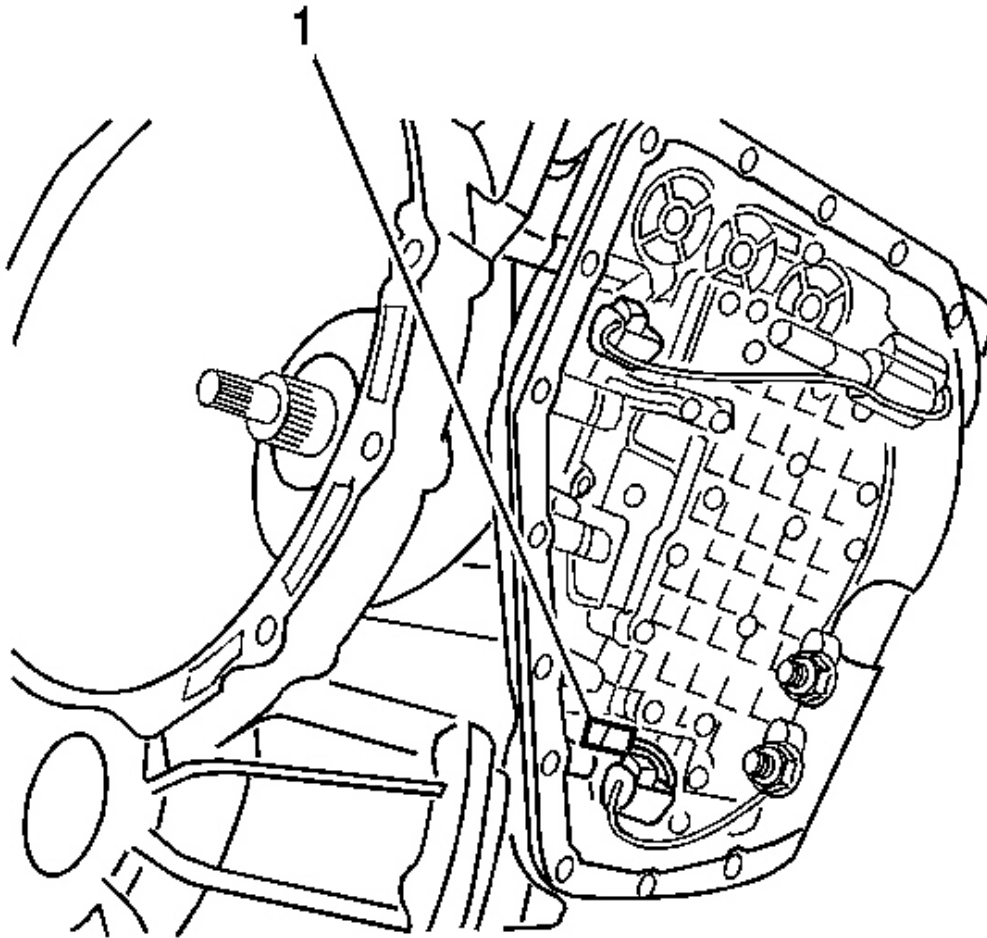


Fig. 456: Transmission Fluid Temperature (TFT) Sensor
Courtesy of GENERAL MOTORS CORP.

Input Shaft Speed (ISS) Sensor

The ISS sensor (1) is located on the upper position of the transaxle and detects A/T input speed from the rotation number of the direct clutch drum. They transmit to TCM as a signal.

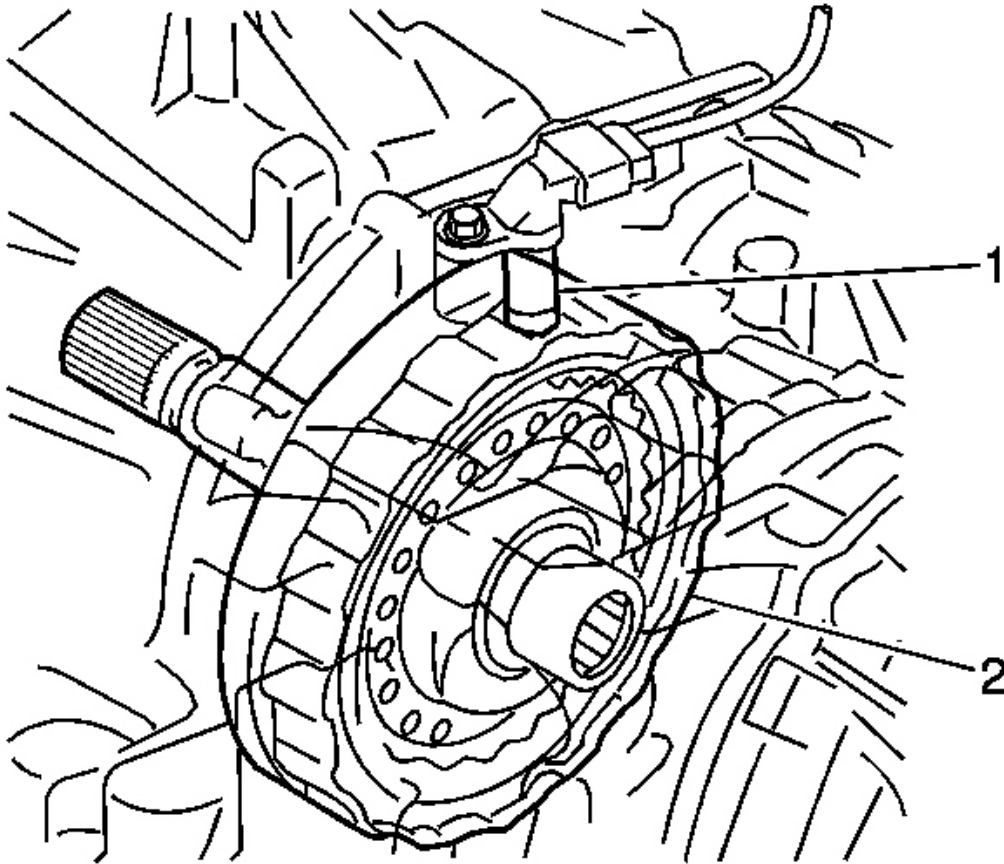


Fig. 457: Input Shaft Speed (ISS) Sensor
Courtesy of GENERAL MOTORS CORP.

Output Shaft Speed (ISS) Sensor

The OSS sensor (1) is located on the upper position of the transaxle and detects the vehicle speed from the rotation number of the differential gear.

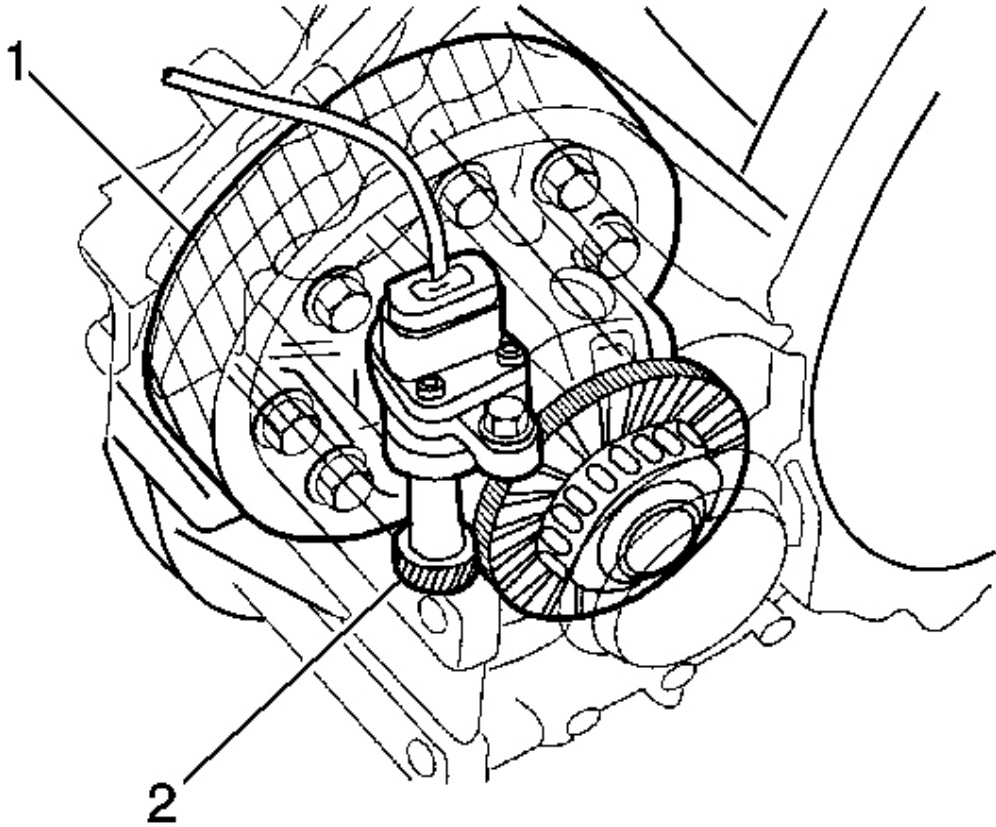


Fig. 458: Output Shaft Speed (ISS) Sensor
Courtesy of GENERAL MOTORS CORP.

Shift Control

When the AFT is below the specified 15°C (59°F), 4th up-shift is prevented.

SPECIAL TOOLS AND EQUIPMENT

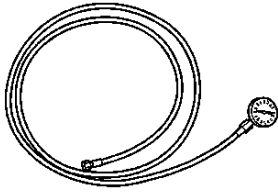
SPECIAL TOOLS

Special Tools

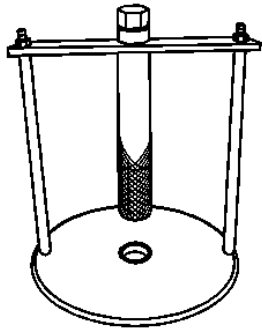
Illustration	Tool Number/ Description

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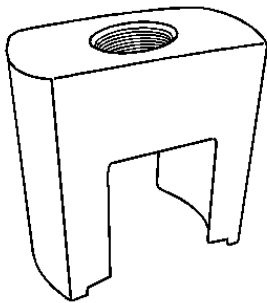
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DT 46450 (DW 240-010)
Auto Transaxle Pressure Gage Set



DT 46451 (DW 240-020)
Brake/Clutch Spring Compressor

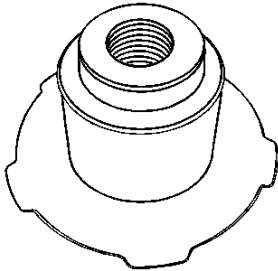
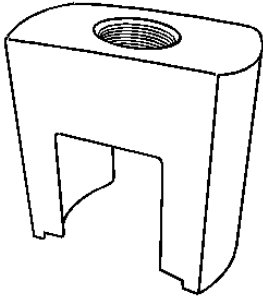


DT 46452 (DW 240-030)
Forward Clutch Adapter

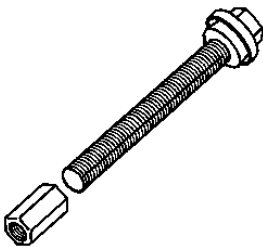
DT 46453 (DW 240-040)
Direct Clutch Adapter

2006 Chevrolet Aveo

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DT 46454 (DW 240-050)
Overdrive Brake Adapter

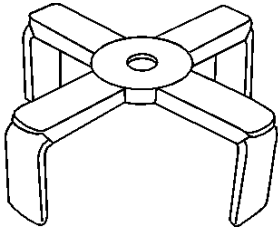
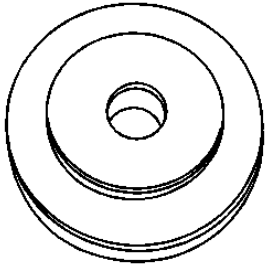


DT 46455 (DW 240-060-01)
Brake Spring Compressor Bolt/Nut

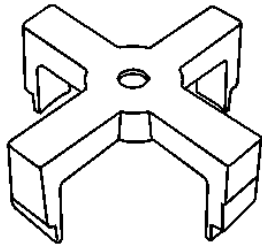
DT 46456 (DW 240-060-02)
Brake Spring Compressor Plate

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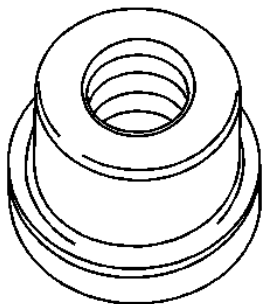
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DT 46457 (DW 240-070)
1st/Reverse Brake Adapter



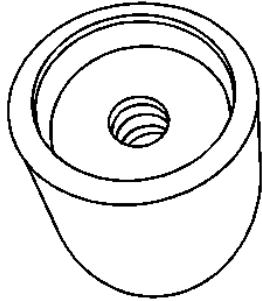
DT 46458 (DW 240-080)
2nd Brake Adapter



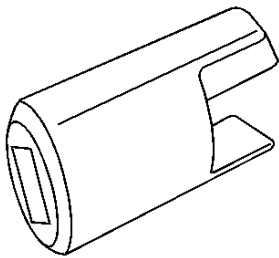
DT 46459 (DW 240-090)
Planetary Ring Gear Remover

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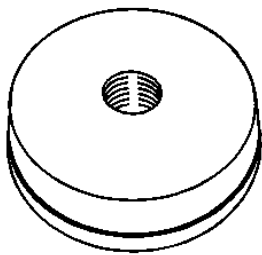
2006 TRANSMISSION Automatic Transaxle - Aisin (81-40LE) - Introduction (2 Of 2) - Aveo



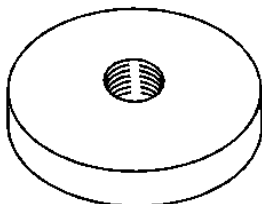
DT 46460 (DW 240-100)
Counter Drive Gear Installation Adapter



DT 46461 (DW 240-130)
Differential Preload Adapter



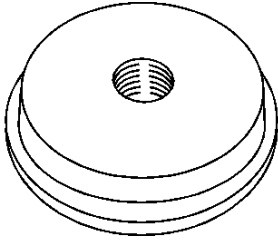
DT 46462 (DW 240-140)
Transaxle Housing Side Bearing Outer Race
Adapter



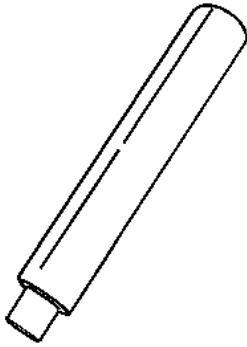
DT 46463 (DW 240-150)
Transaxle Case Side Bearing Outer Race Adapter

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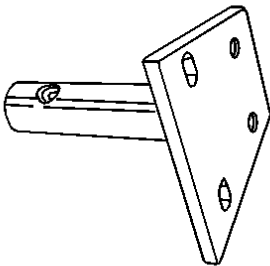
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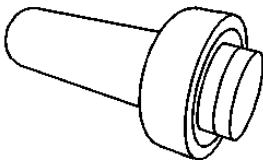
DT 46464 (DW 240-160)
Transaxle Case Outer Tapered Roller Bearing Race
Adapter



DT 46465 (DW 240-170)
Adapter Handle



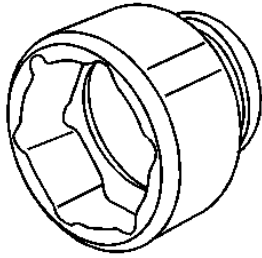
DT 46469-2 (DW 260-021)
Automatic Transaxle Overhaul Fixture



DT 46471 (DW 260-031-01)
Transaxle Housing Oil Seal Installer

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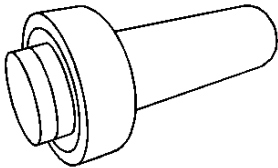
2006 TRANSMISSION Automatic Transaxle - Aisin (81-40LE) - Introduction (2 Of 2) - Aveo



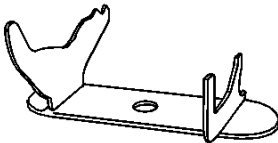
DT 46472 (DW 260-041)
Planetary Ring Gear Nut Removal/Installation
Socket (52 mm)



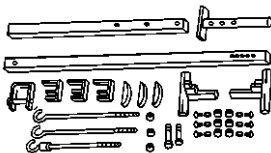
DT 46520 (DW 240-120)
Measuring Terminal



DT 47521 (DW 260-031-02)
Transaxle Case Oil Seal Installer



DW 260-102
Transaxle Support Fixture



J 28467-B (DW 117, DW 110-060) Universal
Engine Support Fixture