

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

2001-03 AUTOMATIC TRANSMISSIONS

Hydra-Matic 4T65-E Overhaul

APPLICATION

CAUTION: Flush oil cooler and oil cooler lines prior to transaxle installation. Oil cooling system contamination may cause premature transaxle failure. For additional information, see LUBRICATION in appropriate **SERVICING** article.

TRANSAXLE APPLICATION

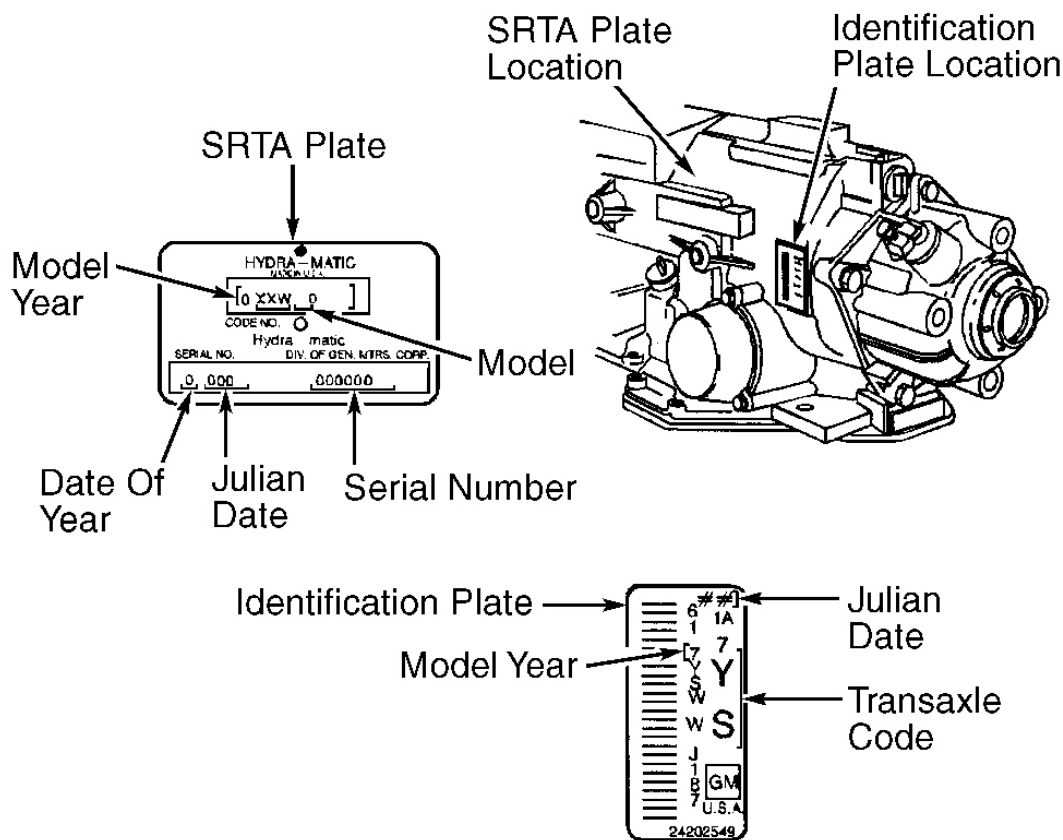
Application	Transaxle Model (RPO Code)
Buick	
Century (3.1L)	4T65-E (M15)
LeSabre (3.8L)	4T65-E (MN3 Or M15)
Park Avenue (3.8L)	4T65-E (MN3 Or MN7)
Regal (3.8L)	4T65-E (M15 Or MN7)
Rendezvous (3.4L)	4T65-E (M15 Or M76)
Chevrolet	
Impala (3.4L & 3.8L)	4T65-E (M15)
Lumina (3.1L)	4T65-E (M15)
Monte Carlo (3.4L & 3.8L)	4T65-E (M15)
Venture (3.4L)	4T65-E (M15 Or M76)
Oldsmobile	
Aurora (3.5L)	4T65E (MN3)
Intrigue (3.5L)	4T65-E (MN3)
Silhouette (3.4L)	4T65-E (M15 Or M76)
Pontiac	
Aztek (3.4L)	4T65-E (M15 Or M76)
Bonneville (3.8L)	4T65-E (MN3, M15 Or MN7)
Grand Prix	
3.1L	4T65E (M15)
3.8L	4T65-E (M15 Or MN7)
Montana (3.4L)	4T65-E (M15 Or M76)

IDENTIFICATION

TRANSAXLE

Transaxle has a metal identification plate or Service Replacement Transmission Assembly (SRTA) plate attached to rear face of transaxle. See **Fig. 1**. Transaxle RPO codes are MN3, MN7, M15 or M76. The MN3 and MN7 are heavy duty models and have 10.2" (258 mm) torque converters. The M15 model has a 9.6" (245 mm)

torque converter. The M76 model is used in All Wheel Drive (AWD) applications. For model build information on each RPO code, see **Fig. 2-Fig. 9**.



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Fig. 1: Locating Transaxle ID Plate & SRTA Plate Information
Courtesy of GENERAL MOTORS CORP.

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Transmission Model	1DGB	1FFB	1DCB	1PAB	1PBB	1APB	1YCB	1YMB
Platform	G	C	L,G	H	H	W	W	W
Carline	0-3	B	O	B,P	B,P	B	O	O
Engine Displacement	3.5	3.8L	3.5L	3.8L	3.8L	3.8L	3.5L	3.5L
Engine RPO	LX5	L36	LX5	L36	L36	L36	LX5	LX5
Eng Vin ID	H	K	H	K	K	K	H	H
Overall	3.29	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.24	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Final Drive	STD	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD	STD
Converter Code	JXFM	JSFM	JXFM	JSFM	JZFM	JZFM	JXFM	JXFM
Converter K-Factor	164K	133K	164K	133K	RI15	RI15	164K	164K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	YES	YES	YES	YES	YES	NO	NO	NO

• HD = Heavy Duty
 • IMS = Internal Mode Switch
 • SSC = Case Aluminum Structural Side Cover Pan
 • STD = Standard
 • VSS = Vehicle Speed Sensor
 • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)
 This table does not identify all unique build items and this table may be subject to change.

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Fig. 2: Identifying Model Build Information (2001 - MN3)
 Courtesy of GENERAL MOTORS CORP.

Transmission Model	1CHB	1FCB	1XAB
Platform	H	C	W
Carline	P	B	B,P
Engine Displacement	3.8L	3.8L	3.8L
Engine RPO	L67	L67	L67
Eng Vin ID	1	1	1
Overall	2.93	2.93	2.93
Sprocket, Drive/Driven	37/33	37/33	37/33
Final Drive Ratio	3.29	3.29	3.29
Final Drive	HD	HD	HD
Output Shaft	LONG	LONG	LONG
Converter Code	JZFM	JSFM	JTFM
Converter K-Factor	R115	133K	155K
Converter Type	ECCC	ECCC	ECCC
IMS	NO	YES	NO

• HD = Heavy Duty
 • IMS = Internal Mode Switch
 • SSC = Case Aluminum Structural Side Cover Pan
 • STD = Standard
 • VSS = Vehicle Speed Sensor
 • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)
 This table does not identify all unique build items and this table may be subject to change.

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Fig. 3: Identifying Model Build Information (2001 - MN7)
 Courtesy of GENERAL MOTORS CORP.

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2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	1BCB	1LBB	1LCB	1LDB	1RDB	1RNB	1BCB
Platform	W	W	W	W	W	W	U
Carline	P	C	C	C	C	B,C,P	C,O,P
Engine Displacement	3.8L	3.8L	3.8L	3.8L	3.4L	3.1L	3.4L
Engine RPO	L36	L36	L36	L36	LA1	LG8	LA1
Eng Vin ID	K	K	K	K	E	J	E
Overall	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Final Drive	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD
Converter Code	FLQB	FLQB	FLQB	FLQB	FDQB	FDKB	FLQB
Converter K-Factor	163K	163K	163K	163K	180K	180K	163K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	NO	YES	YES	YES	YES	NO	NO

• HD = Heavy Duty
 • IMS = Internal Mode Switch
 • SSC = Case Aluminum Structural Side Cover Pan
 • STD = Standard
 • VSS = Vehicle Speed Sensor
 • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)
 This table does not identify all unique build items and this table may be subject to change.

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Fig. 4: Identifying Model Build Information (2001 - M15)

Courtesy of GENERAL MOTORS CORP.

Transmission Model	1CXB
Platform	B
Carline	P
Engine Displacement	3.4L
Engine RPO	LA1
Eng Vin ID	E
Overall	3.29
Sprocket, Drive/Driven	35/35
Final Drive Ratio	3.29
Final Drive	AWD
Output Shaft	STD
Converter Code	FLQB
Converter K-Factor	163K
Converter Type	ECCC
IMS	NO

• HD = Heavy Duty
 • IMS = Internal Mode Switch
 • SSC = Case Aluminum Structural Side Cover Pan
 • STD = Standard
 • VSS = Vehicle Speed Sensor
 • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings)
 This table does not identify all unique build items and this table may be subject to change.

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Fig. 5: Identifying Model Build Information (2001 - M76)

Courtesy of GENERAL MOTORS CORP.

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2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	2FFB	2DCB	2PAB	2PBB	2APB	2YCB	2YMB
Platform	C	L,G	H	H	W	W	W
Carline	B	O	B,P	B,P	B	O	O
Engine Displacement	3.8L	3.5L	3.8L	3.8L	3.8L	3.5L	3.5L
Engine RPO	L36	LX5	L36	L36	L36	LX5	LX5
Eng Vin ID	K	H	K	K	K	H	H
Overall	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Final Drive	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD
Converter Code	JSFM	JXFM	JSFM	JZFM	JZFM	JXFM	JXFM
Converter K-Factor	133K	164K	133K	RI15	RI15	164K	164K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	YES	YES	YES	YES	NO	NO	NO
• HD = Heavy Duty • IMS = Internal Mode Switch • SSC = Case Aluminum Structural Side Cover Pan • STD = Standard • VSS = Vehicle Speed Sensor • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings) This table does not identify all unique build items and this table may be subject to change.							

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Fig. 6: Identifying Model Build Information (2002 - MN3)

Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	2CHB	2FCB	2XAB
Platform	H	C	W
Carline	P	B	B,P
Engine Displacement	3.8L	3.8L	3.8L
Engine RPO	L67	L67	L67
Eng Vin ID	1	1	1
Overall	2.93	2.93	2.93
Sprocket, Drive/Driven	37/33	37/33	37/33
Final Drive Ratio	3.29	3.29	3.29
Final Drive	HD	HD	HD
Output Shaft	LONG	LONG	LONG
Converter Code	JZFM	JSFM	JTFM
Converter K-Factor	RI15	133K	155K
Converter Type	ECCC	ECCC	ECCC
IMS	YES	YES	NO
• HD = Heavy Duty • IMS = Internal Mode Switch • SSC = Case Aluminum Structural Side Cover Pan • STD = Standard • VSS = Vehicle Speed Sensor • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings) This table does not identify all unique build items and this table may be subject to change.			

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Fig. 7: Identifying Model Build Information (2002 - MN7)

Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	2BCB	2LBB	2LCB	2LDB	2RDB	2RNB	2BCB
Platform	W	W	W	W	W	W	U
Carline	P	C	C	C	C	B,C,P	C,O,P
Engine Displacement	3.8L	3.8L	3.8L	3.8L	3.4L	3.1L	3.4L
Engine RPO	L36	L36	L36	L36	LA1	LG8	LA1
Eng Vin ID	K	K	K	K	E	J	E
Overall	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Final Drive	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD
Converter Code	FLQB	FLQB	FLQB	FLQB	FDQB	FDKB	FLQB
Converter K-Factor	163K	163K	163K	163K	180K	180K	163K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	NO	YES	YES	YES	YES	NO	NO
• HD = Heavy Duty • IMS = Internal Mode Switch • SSC = Case Aluminum Structural Side Cover Pan • STD = Standard • VSS = Vehicle Speed Sensor • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings) This table does not identify all unique build items and this table may be subject to change.							

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Fig. 8: Identifying Model Build Information (2002 - M15)

Courtesy of GENERAL MOTORS CORP.

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2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	2CXB
Platform	B, U
Carline	C, B, P, O
Engine Displacement	3.4L
Engine RPO	LA1
Eng Vin ID	E
Overall	3.29
Sprocket, Drive/Driven	35/35
Final Drive Ratio	3.29
Final Drive	AWD
Output Shaft	STD
Converter Code	FLQB
Converter K-Factor	163K
Converter Type	ECCC
IMS	NO
• HD = Heavy Duty • IMS = Internal Mode Switch • SSC = Case Aluminum Structural Side Cover Pan • STD = Standard • VSS = Vehicle Speed Sensor • K-factor = Torque converter numeric rating (combines stall speed and torque multiplication ratings) This table does not identify all unique build items and this table may be subject to change.	

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Fig. 9: Identifying Model Build Information (2002 - M76)

Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transmission Model	3FFB	3DCB	3PAB	3PBB	3APB	3YCB	3YMB
Platform	C	L,G	H	H	W	W	W
Carline	B	O	B,P	B,P	B	O	O
Engine Displacement	3.8L	3.5L	3.8L	3.8L	3.8L	3.5L	3.5L
Engine RPO	L36	LX5	L36	L36	L36	LX5	LX5
Eng Vin ID	K	H	K	K	K	H	H
Overall	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.05	3.29	2.86	3.05	3.05	3.29	3.05
Final Drive	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD
Converter Code	JSFM	JXFM	JSFM	JZFM	JZFM	JXFM	JXFM
Converter K-Factor	133K	164K	133K	RI15	RI15	164K	164K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	YES	YES	YES	YES	NO	NO	NO

- HD = Heavy Duty
- IMS = Internal Mode Switch
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating - combines stall speed and torque multiplication ratings

Note: This table does not identify all unique build items and this table may be subject to change.

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Fig. 10: Identifying Model Build Information (2003 - MN3)

Courtesy of GENERAL MOTORS CORP.

Transmission Model	3CHB	3FCB	3XAB
Platform	H	C	W
Carline	P	B	B,P
Engine Displacement	3.8L	3.8L	3.8L
Engine RPO	L67	L67	L67
Eng Vin ID	1	1	1
Overall	2.93	2.93	2.93
Sprocket, Drive/Driven	37/33	37/33	37/33
Final Drive Ratio	3.29	3.29	3.29
Final Drive	HD	HD	HD
Output Shaft	LONG	LONG	LONG
Converter Code	JZFM	JSFM	JTFM
Converter K-Factor	RI15	133K	155K
Converter Type	ECCC	ECCC	ECCC
IMS	YES	YES	NO

- HD = Heavy Duty
- IMS = Internal Mode Switch
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating - combines stall speed and torque multiplication ratings

Note: This table does not identify all unique build items and this table may be subject to change.

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Fig. 11: Identifying Model Build Information (2003 - MN7)

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Courtesy of GENERAL MOTORS CORP.

Transmission Model	3BCB	3LBB	3LCB	3LDB	3RDB	3RNB	3BCB
Platform	W	W	W	W	W	W	U
Carline	P	C	C	C	C	B,C,P	C,O,P
Engine Displacement	3.8L	3.8L	3.8L	3.8L	3.4L	3.1L	3.4L
Engine RPO	L36	L36	L36	L36	LA1	LG8	LA1
Eng Vin ID	K	K	K	K	E	J	E
Overall	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Sprocket, Drive/Driven	35/35	35/35	35/35	35/35	35/35	35/35	35/35
Final Drive Ratio	3.29	3.05	3.29	3.29	2.86	3.05	3.29
Final Drive	STD	STD	STD	STD	STD	STD	STD
Output Shaft	STD	STD	STD	STD	STD	STD	STD
Converter Code	FLQB	FLQB	FLQB	FLQB	FDQB	FDKB	FLQB
Converter K-Factor	163K	163K	163K	163K	180K	180K	163K
Converter Type	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC	ECCC
IMS	NO	YES	YES	YES	YES	NO	NO

- HD = Heavy Duty
- IMS = Internal Mode Switch
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating - combines stall speed and torque multiplication ratings

Note: This table does not identify all unique build items and this table may be subject to change.

G00107692

Fig. 12: Identifying Model Build Information (2003 - M15)
Courtesy of GENERAL MOTORS CORP.

Transmission Model	3CXB
Platform	B, U
Carline	C, B, P, O
Engine Displacement	3.4L
Engine RPO	LA1
Eng Vin ID	E
Overall	3.29
Sprocket, Drive/Driven	35/35
Final Drive Ratio	3.29
Final Drive	AWD
Output Shaft	STD
Converter Code	FLQB
Converter K-Factor	163K
Converter Type	ECCC
IMS	NO

- HD = Heavy Duty
- IMS = Internal Mode Switch
- SSC = Case Aluminum Structural Side Cover Pan
- STD = Standard
- VSS = Vehicle Speed Sensor
- K-factor = Torque converter numeric rating - combines stall speed and torque multiplication ratings

Note: This table does not identify all unique build items and this table may be subject to change.

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Fig. 13: Identifying Model Build Information (2003 - M76)

Courtesy of GENERAL MOTORS CORP.

GEAR RATIOS

TRANSAXLE GEAR RATIOS

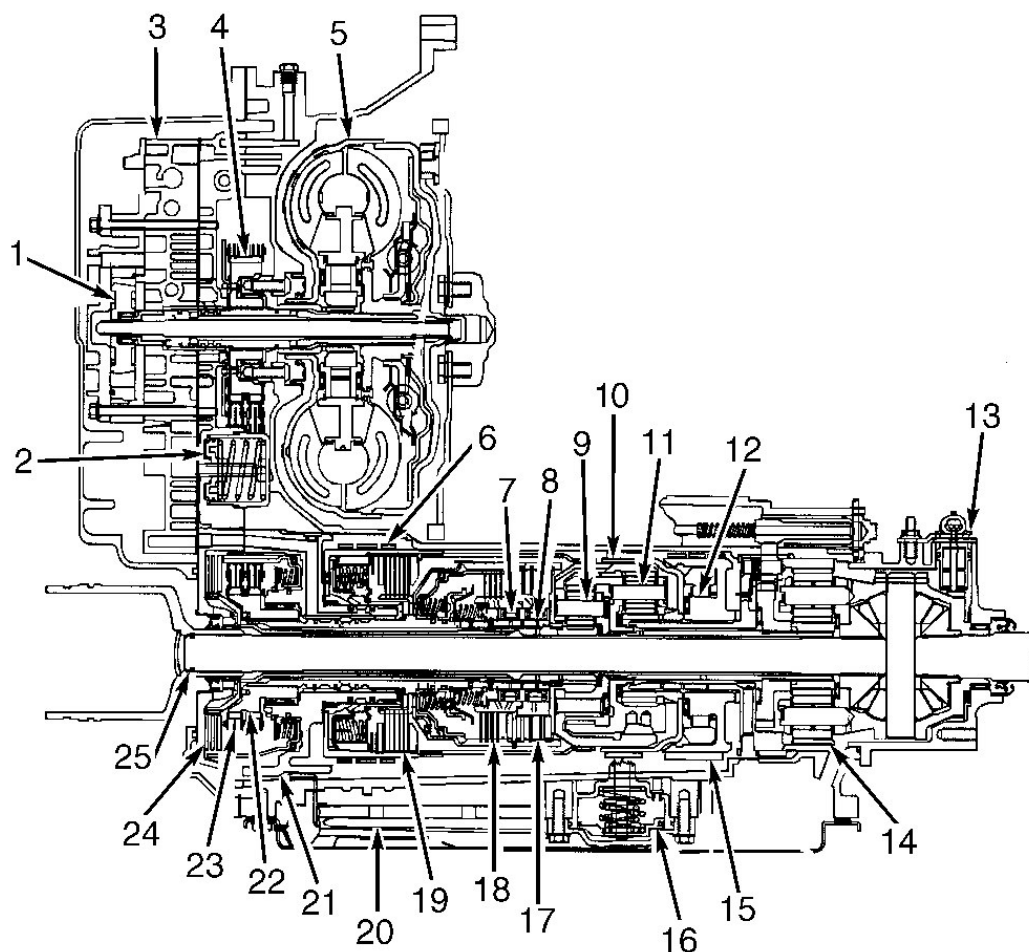
Gear Range	Gear Ratio
1st	2.921:1
2nd	1.568:1
3rd	1.000:1
4th	0.705:1
Reverse	2.385:1

DESCRIPTION & OPERATION

Hydra-Matic 4T65-E is a fully automatic front wheel drive electronically controlled transaxle. Four forward ranges including overdrive are provided. Powertrain Control Module (PCM) controls shift points using two shift solenoids. A vane-type oil pump supplies oil pressure. PCM regulates oil pressure using pressure control solenoid valve. All vehicles equipped with 4T65-E transaxle have an Electronically Controlled Capacity Clutch (ECCC) system. In ECCC system, pressure plate does not fully lock to torque converter cover. It is precisely controlled to maintain a small amount of slippage between engine and turbine, reducing driveline torsional disturbances.

Multiplied torque from torque converter is transferred to transaxle by a sprocket and drive chain (drive link) assembly. Other internal components consist of 4 multiple-disc clutches, roller clutch, sprag clutch, 3 bands and compound planetary gear set. Final drive gear and differential assemblies are an integral part of transaxle. See **Fig. 14-Fig. 20** .

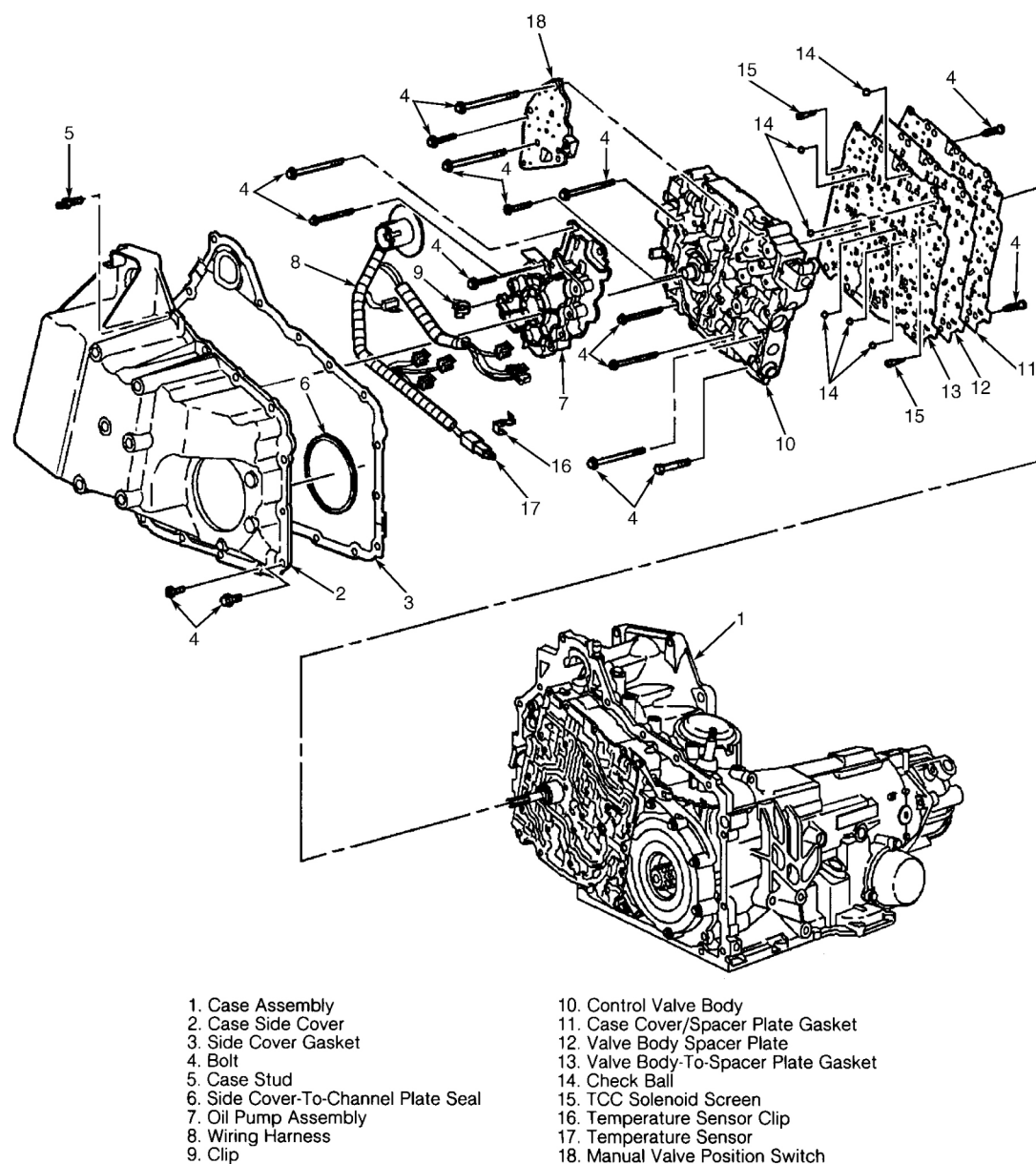
NOTE: Drive chain may also be referred to as "drive link".



- | | |
|--------------------------------|--------------------------------------|
| 1. Oil Pump Assembly | 14. Final Drive/Differential Carrier |
| 2. Case Cover Assembly | 15. Forward Band |
| 3. Control Valve Body | 16. 2-1 Manual Band Servo |
| 4. Drive Sprocket | 17. Input Clutch Assembly |
| 5. Torque Converter | 18. 3rd Clutch Assembly |
| 6. Reverse Band | 19. 2nd Clutch Assembly |
| 7. 3rd Clutch Sprag Assembly | 20. Oil Filter |
| 8. Input Clutch Sprag Assembly | 21. Driven Sprocket Support Assembly |
| 9. Input Carrier Assembly | 22. Driven Sprocket |
| 10. 2-1 Manual Band | 23. Drive Link Assembly |
| 11. Reaction Carrier Assembly | 24. 4th Clutch Assembly |
| 12. 1-2 Roller Clutch Assembly | 25. Output Shaft |
| 13. Vehicle Speed Sensor (VSS) | |

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Fig. 14: Identifying Hydra-Matic 4T65-E Transaxle Component Locations
 Courtesy of GENERAL MOTORS CORP.

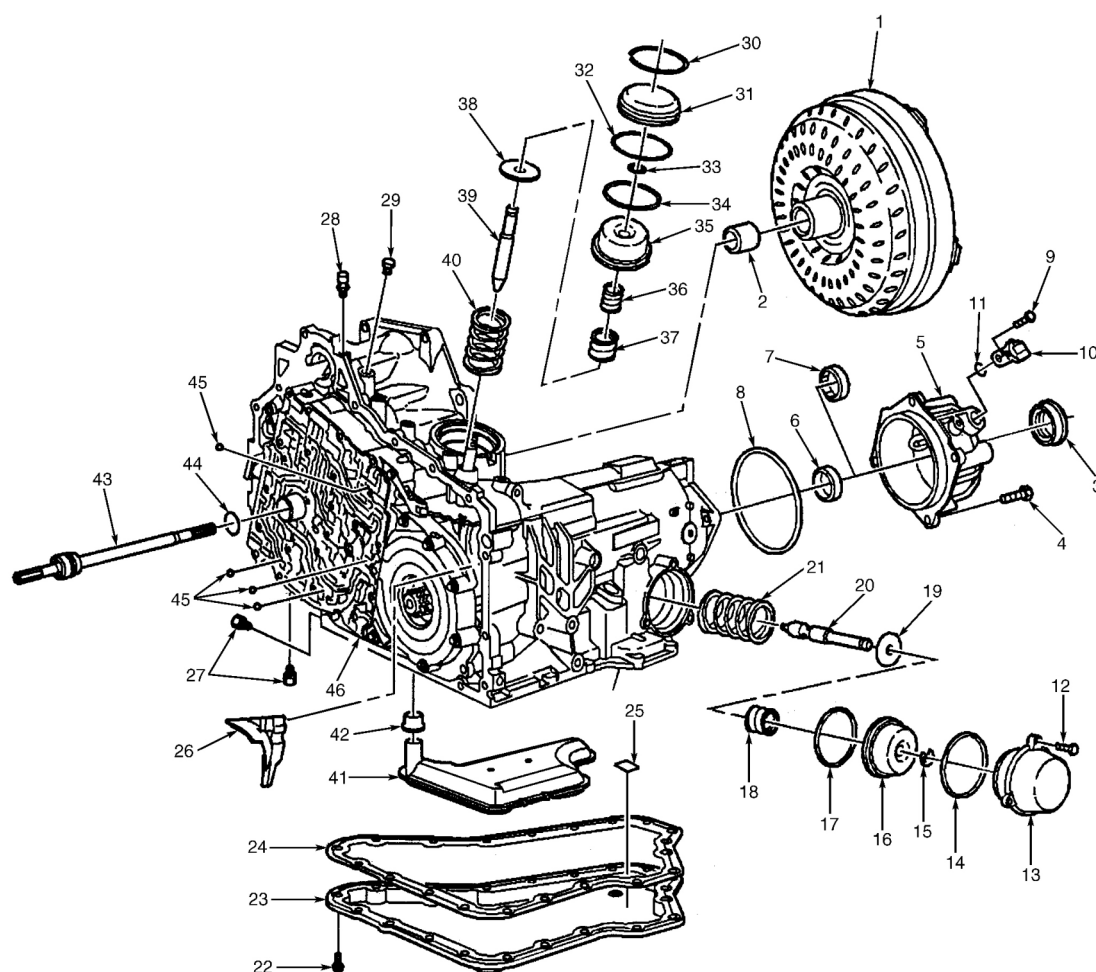


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Fig. 15: Exploded View Of Case Side Cover Components
 Courtesy of GENERAL MOTORS CORP.

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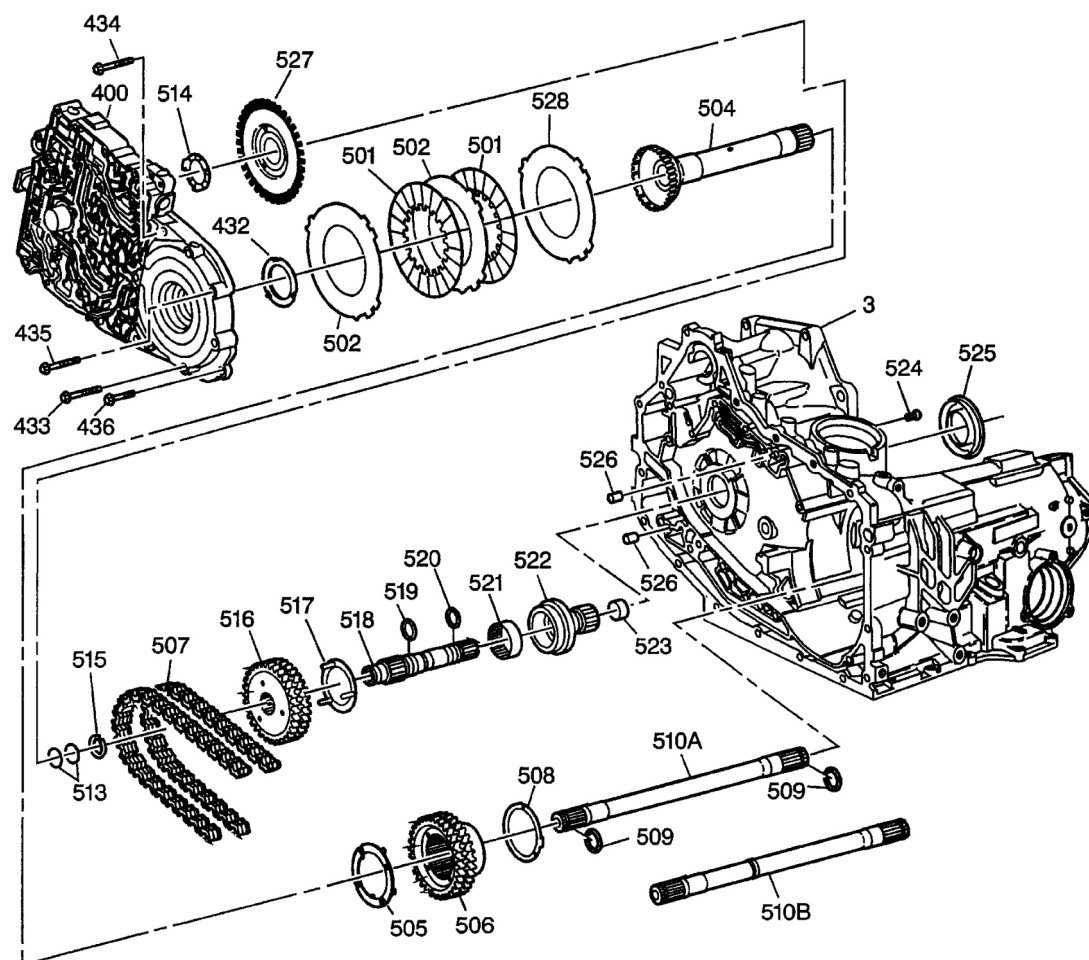
1. Torque Converter
2. Torque Converter Bushing
3. Right Axle Oil Seal
4. Bolt
5. Case Extension
6. Front Differential Carrier Bushing (RPO Code M15 & MN3)
7. Output Shaft Bearing (RPO Code MN7)
8. Case Extension Seal
9. Bolt
10. Vehicle Speed Sensor (VSS)
11. "O" Ring
12. Servo Cover Bolt
13. Forward Band Servo Cover
14. Cover Seal

15. Retaining Ring
16. Servo Piston
17. Oil Seal Ring
18. Cushion Spring
19. Cushion Spring Retainer
20. Piston Apply Pin
21. Piston Return Spring
22. Transaxle Oil Pan Bolt
23. Transaxle Oil Pan
24. Oil Pan Gasket
25. Oil Pan Magnet
26. Oil Dam
27. Cooler Pipe Fittings
28. Transaxle Vent Assembly
29. Oil Pressure Test Hole Plug
30. Servo Cover Retaining Ring

31. Reverse Band Servo Cover
32. "O" Ring Seal
33. Servo Pin Retaining Ring
34. Piston Oil Seal Ring
35. Reverse Band Servo Piston
36. Inner Cushion Spring
37. Outer Cushion Spring
38. Piston Cushion Spring Retainer
39. Servo Piston Apply Pin
40. Piston Return Spring
41. Oil Filter
42. Oil Filter Seal
43. Oil Pump Drive Shaft
44. Drive Shaft Seal
45. Check Balls
46. Case Cover Assembly

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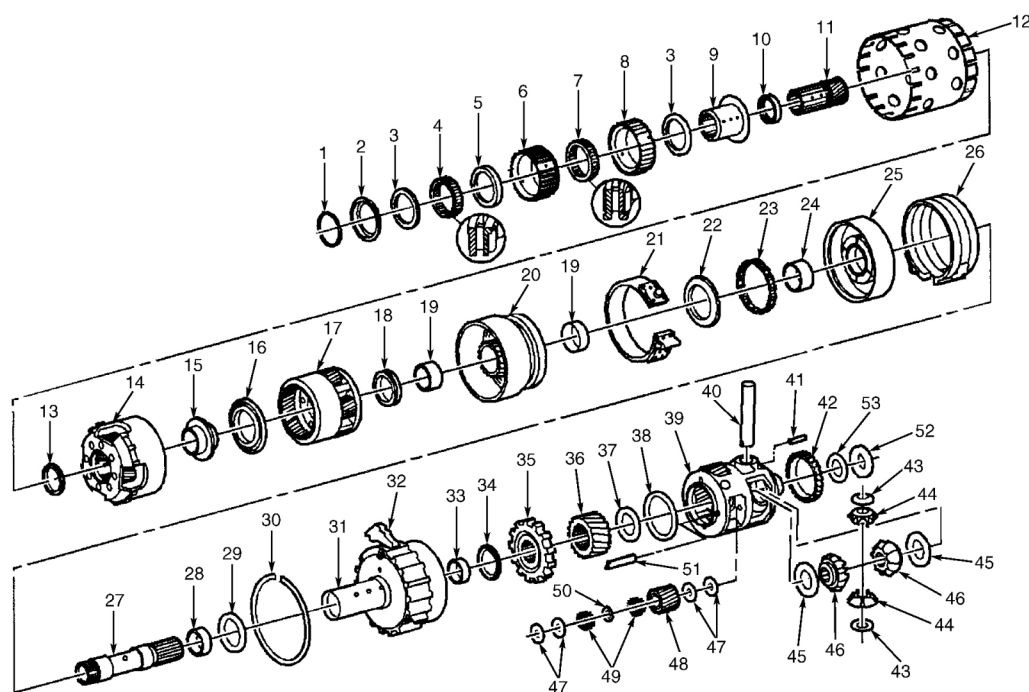
Fig. 16: Exploded View Of Transaxle Case Components
Courtesy of GENERAL MOTORS CORP.



- | | |
|--|---|
| (3) Transmission Case | (510a) Output shaft (Standard) |
| (400) Complete Case Cover Assembly | (510b) Output Shaft (Heavy Duty) |
| (432) 4th Clutch Shaft Thrust Washer | (513) Turbine Shaft Oil Seal Ring |
| (433) Case Cover Bolt/Screw (TORX® Special)
M6 X 1.0 X 32.0 | (514) Drive Sprocket Thrust Washer |
| (434) Case Cover Bolt/Screw M6 X 1.0 X 40.0 | (515) Drive Sprocket Retaining Ring |
| (435) Case Cover Bolt/Screw M8 X 1.25 X 50.0 | (516) Drive Sprocket |
| (436) Case Cover Bolt/Screw M6 X 1.0 X 30.0 | (517) Drive Sprocket Thrust Washer |
| (501) 4th Clutch Fiber Plate Assembly | (518) Turbine Shaft |
| (502) 4th Clutch Steel Plate | (519) Turbine Shaft Oil Seal Ring |
| (504) 4th Clutch Shaft Assembly | (520) Turbine Shaft O-Ring Seal |
| (505) 4th Clutch Shaft Thrust Washer | (521) Drive Sprocket Bearing Assembly |
| (506) Driven Sprocket | (522) Drive Sprocket Support |
| (507) Drive Link Assembly | (523) Drive Sprocket Support Bushing |
| (508) Driven Sprocket Thrust Washer | (524) Drive Sprocket Support Bolt/Screw
M8 X 1.25 X 24.0 |
| (509) Drive Shaft Retaining Ring | |

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Fig. 17: Exploded View Of 4th Clutch, Turbine Shaft, Output Shaft, & Drive & Driven Sprocket Assembly Components
Courtesy of GENERAL MOTORS CORP.



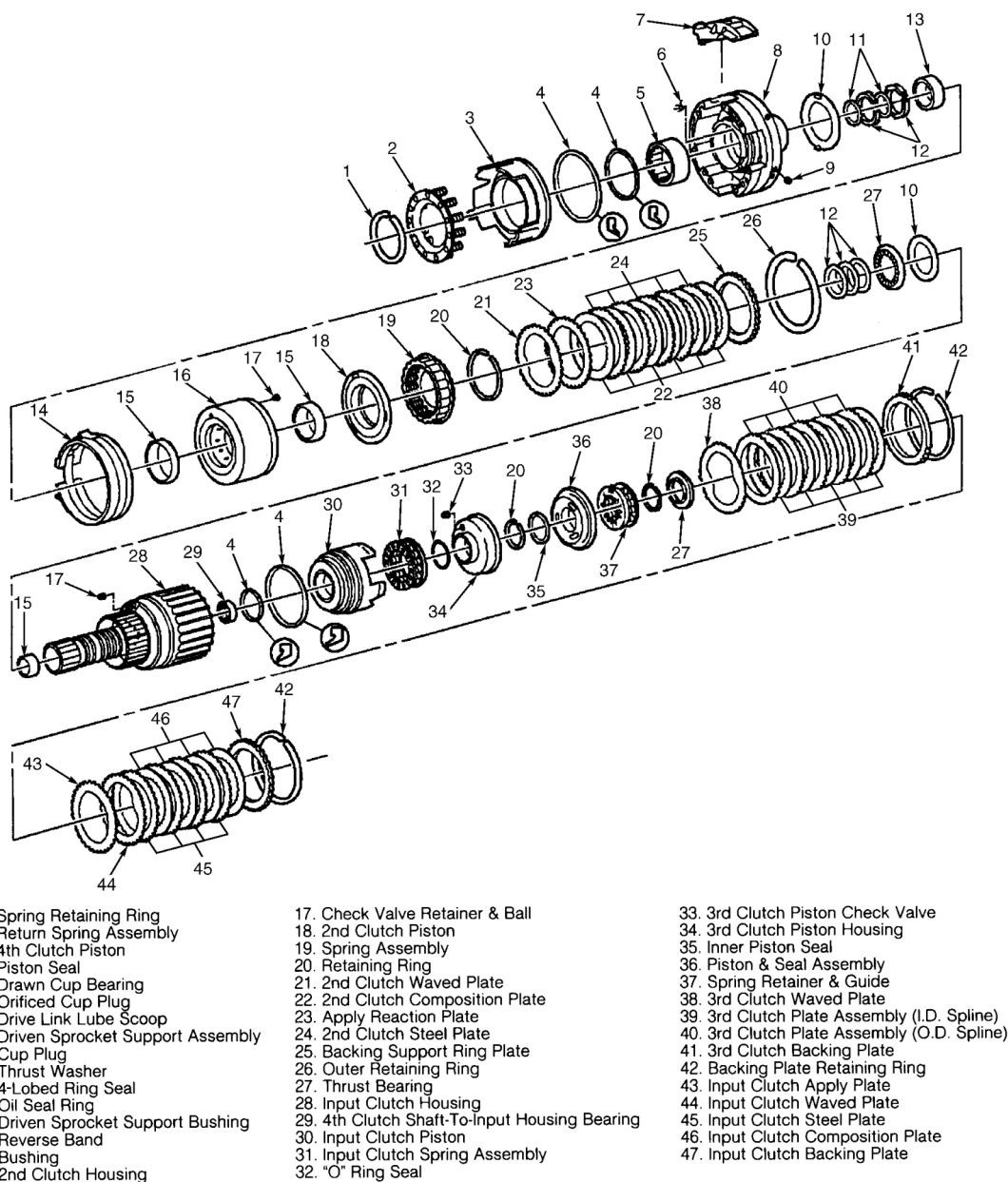
- | | | |
|--|---|---|
| 1. Spiral Lock Retaining Ring | 19. Reaction Sun Gear Bushing (Left Side) | 37. Carrier/Sun Gear Thrust Bearing |
| 2. 3rd Clutch Sprag Outer Race Retainer | 20. Reaction Sun Gear | 38. Spiral Pinion Gear Pin Retaining Ring |
| 3. Input & 3rd Clutch Sprag End Bearing | 21. 2-1 Manual Band | 39. Differential/Final Drive Carrier |
| 4. 3rd Clutch Sprag | 22. Thrust Bearing | 40. Pinion Shaft |
| 5. Input & 3rd Clutch Sprag Center Bearing | 23. 1-2 Support Roller Clutch | 41. Pinion Shaft Retaining Pin |
| 6. 3rd Clutch Sprag Outer Race | 24. 1-2 Support Bearing | 42. VSS Reluctor Wheel |
| 7. Input Clutch Sprag | 25. 1-2 Support Drum | 43. Pinion Gear Thrust Washer |
| 8. Input Clutch Sprag Outer Race | 26. Forward Band | 44. Pinion Gear |
| 9. Input & 3rd Clutch Sprag Inner Race | 27. Final Drive Sun Gear Shaft | 45. Bronze Thrust Washer |
| 10. Input Sun Gear Spacer | 28. Final Drive Internal Gear Bushing | 46. Differential Side Gear |
| 11. Input Sun Gear | 29. Thrust Washer | 47. Pinion Thrust Washer |
| 12. Reverse Reaction Drum | 30. Internal Gear Retaining Ring | 48. Final Drive Planetary Pinion Gear |
| 13. Input Sun Gear Thrust Bearing | 31. Final Drive Internal Gear | 49. Roller Needle Bearing |
| 14. Input Carrier Assembly | 32. Parking Pawl | 50. Pinion Needle Bearing Spacer |
| 15. Input Carrier/Reaction Carrier Lube Dam | 33. Internal Gear Bushing | 51. Planetary Pinion Gear Pin |
| 16. Input/Reaction Carrier Thrust Bearing | 34. Internal Gear Thrust Bearing | 52. Differential Carrier/Case Bearing |
| 17. Reaction Carrier Assembly | 35. Parking Gear | 53. Carrier Thrust Washer |
| 18. Reaction Carrier/Sun Gear Thrust Bearing | 36. Final Drive Sun Gear | |

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Fig. 18: Exploded View Of Transaxle Internal Components (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

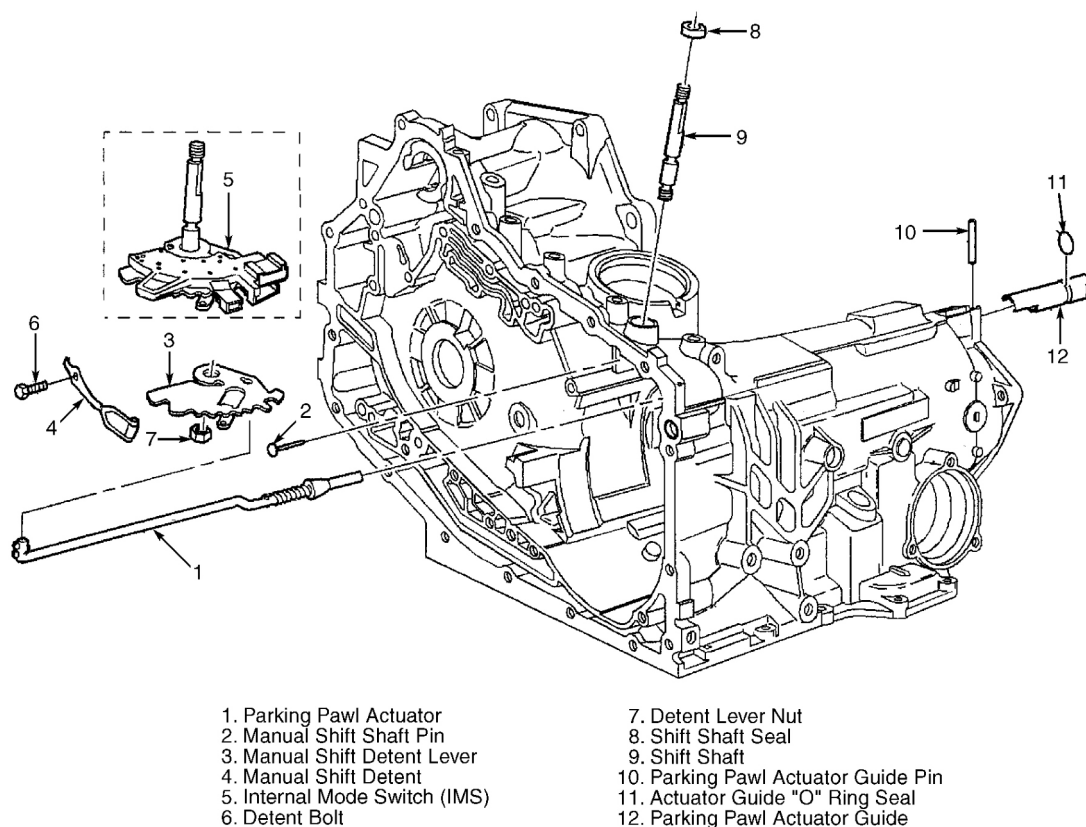
2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul



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Fig. 19: Exploded View Of Transaxle Internal Components (2 Of 2)
 Courtesy of GENERAL MOTORS CORP.



G99B54982

Fig. 20: Exploded View Of Parking System Components
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

NOTE: See appropriate **SERVICING - A/T** article.

TROUBLE SHOOTING

NOTE: Transaxle malfunctions may be caused by poor engine performance, improper adjustments, fluid condition or failure of hydraulic, mechanical or electronic components. Ensure all concerns have been properly checked prior to transaxle overhaul. See appropriate **DIAGNOSIS** article.

COMPONENT TESTS

TORQUE CONVERTER

Visual Inspection

Inspect and replace torque converter for the following conditions:

- Overheated (torque converter will be blue in color).
- ATF leaking at weld areas.
- Damaged torque converter pilot.
- Evidence of metal particles in torque converter, oil cooler, or cooler pipes.
- Damaged torque converter stator, damaged pump, or damaged turbine.
- Damaged or worn torque converter bushing.
- Contaminated ATF due to engine coolant.

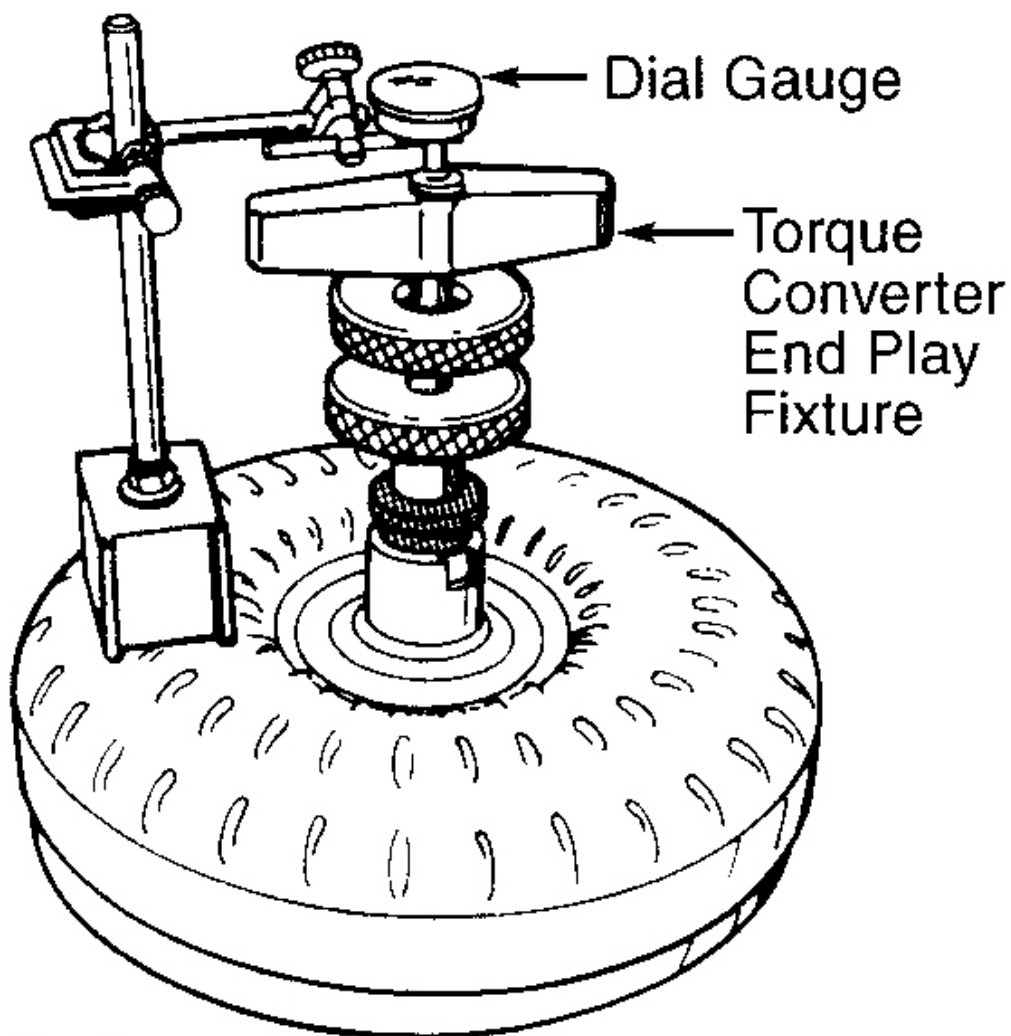
Inspect torque converter for stripped bolt hole threads. Repair as necessary.

Stator Check

With torque converter removed from vehicle, stator roller clutch can be checked by inserting 2 fingers into splined inner race of roller clutch and attempting to rotate race in both directions. Inner race should rotate freely clockwise, but should not rotate or should be difficult to rotate counterclockwise.

End Play Check

Mount Torque Converter End Play Fixture (J-35138) and Dial Indicator (J-8001) on torque converter to check end play. End play should be 0-.020" (0-.50 mm). See **Fig. 21**.



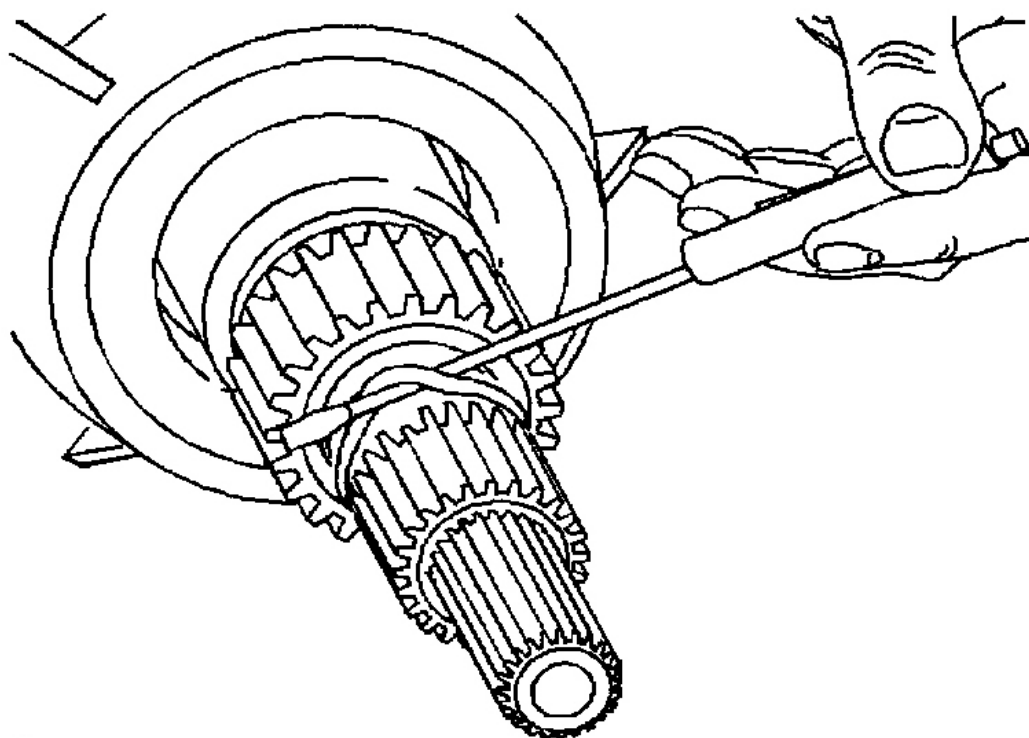
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Fig. 21: Measuring Torque Converter End Play
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE DISASSEMBLY

TORQUE CONVERTER

Remove torque converter and turbine shaft "O" ring seal. See **Fig. 22**. Install Holding Fixture (J-28664-B) onto transaxle. See **Fig. 23**. Install transaxle and holding fixture into Base (J-3289-20). Insert pin into base to hold transaxle in desired position.



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Fig. 22: Removing Turbine Shaft "O" Ring Seal
Courtesy of GENERAL MOTORS CORP.

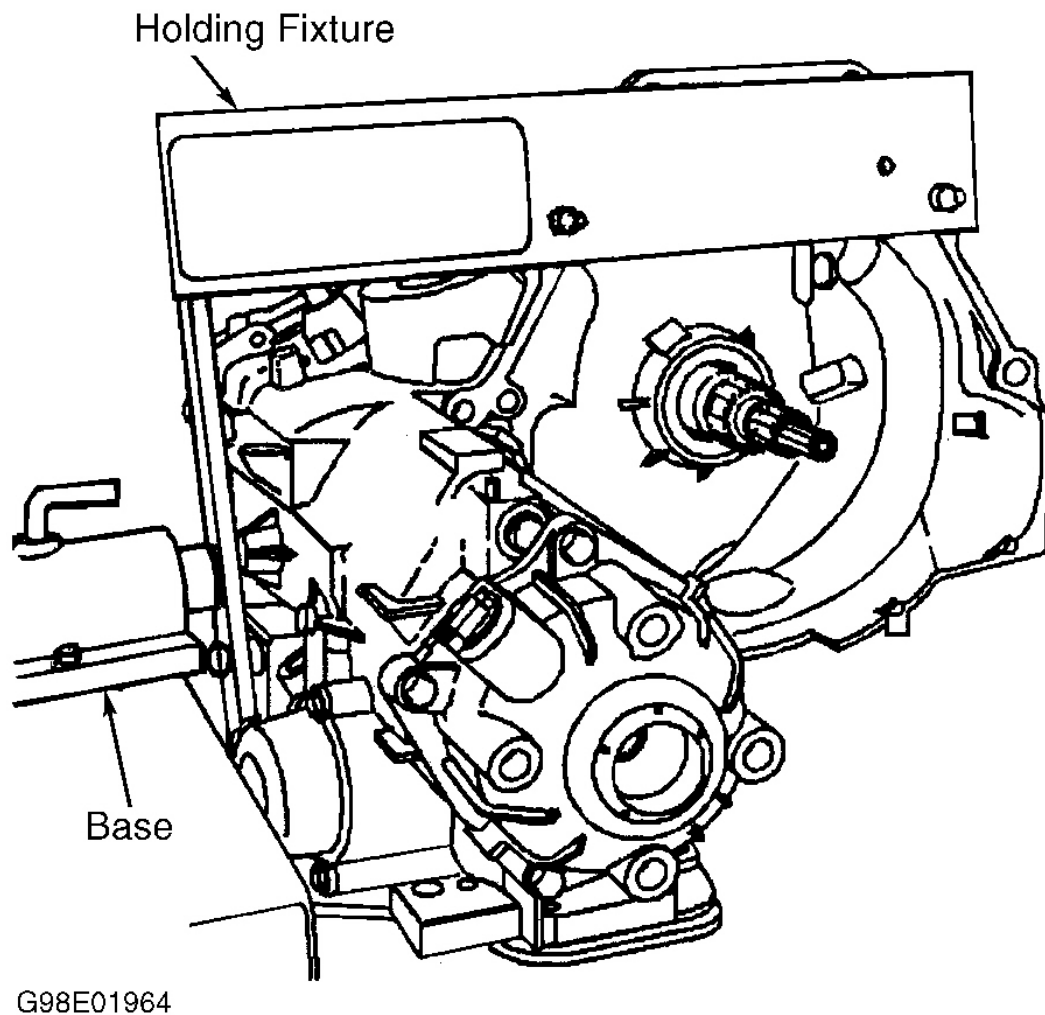


Fig. 23: Installing Transaxle Holding Fixture & Base
Courtesy of GENERAL MOTORS CORP.

TRANSFER CASE REMOVAL

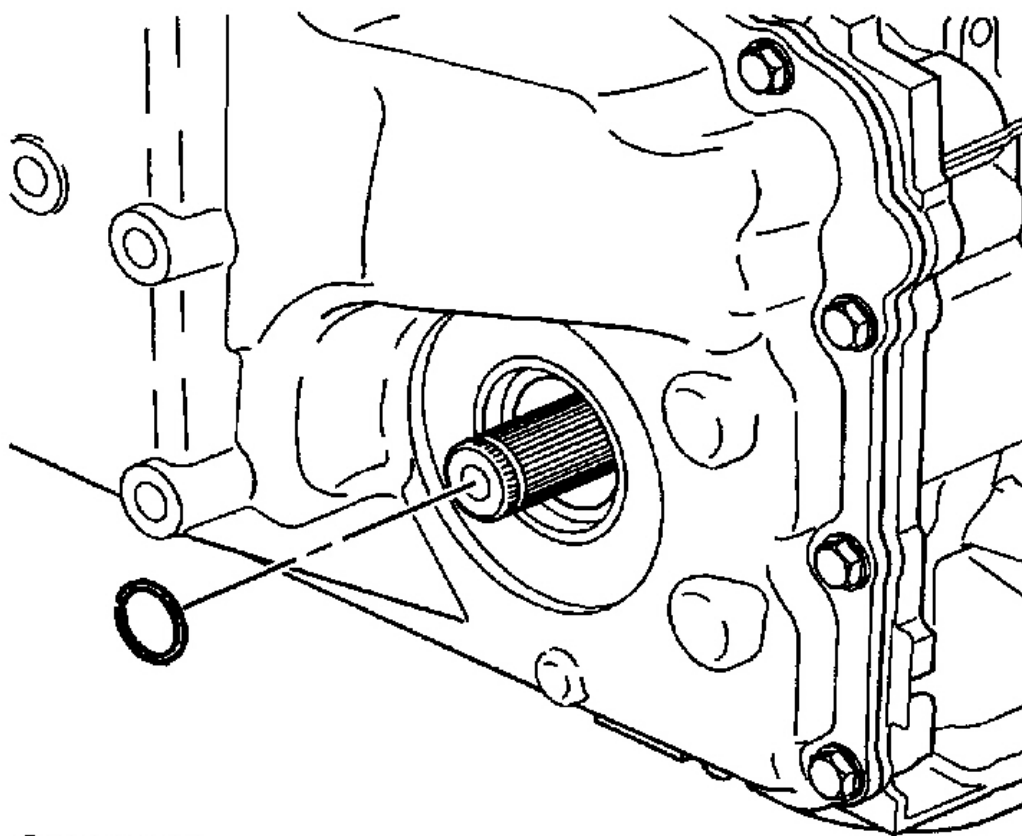
CAUTION: ATF circulates between transaxle and transfer case. In situations where transaxle related failures circulate debris into transfer case, transfer case must be disassembled, cleaned, and inspected for damage.

1. Remove output shaft snap ring. See **Fig. 24**. Rotate transaxle 90 degrees. Remove transfer case lower brace bolt. See **Fig. 25**. Rotate transaxle 90 degrees.
2. Remove transfer case side brace. See **Fig. 26**. Remove transfer case-to-transaxle bolts. See **Fig. 27**.

CAUTION: During transfer case/output shaft removal, DO NOT use excessive

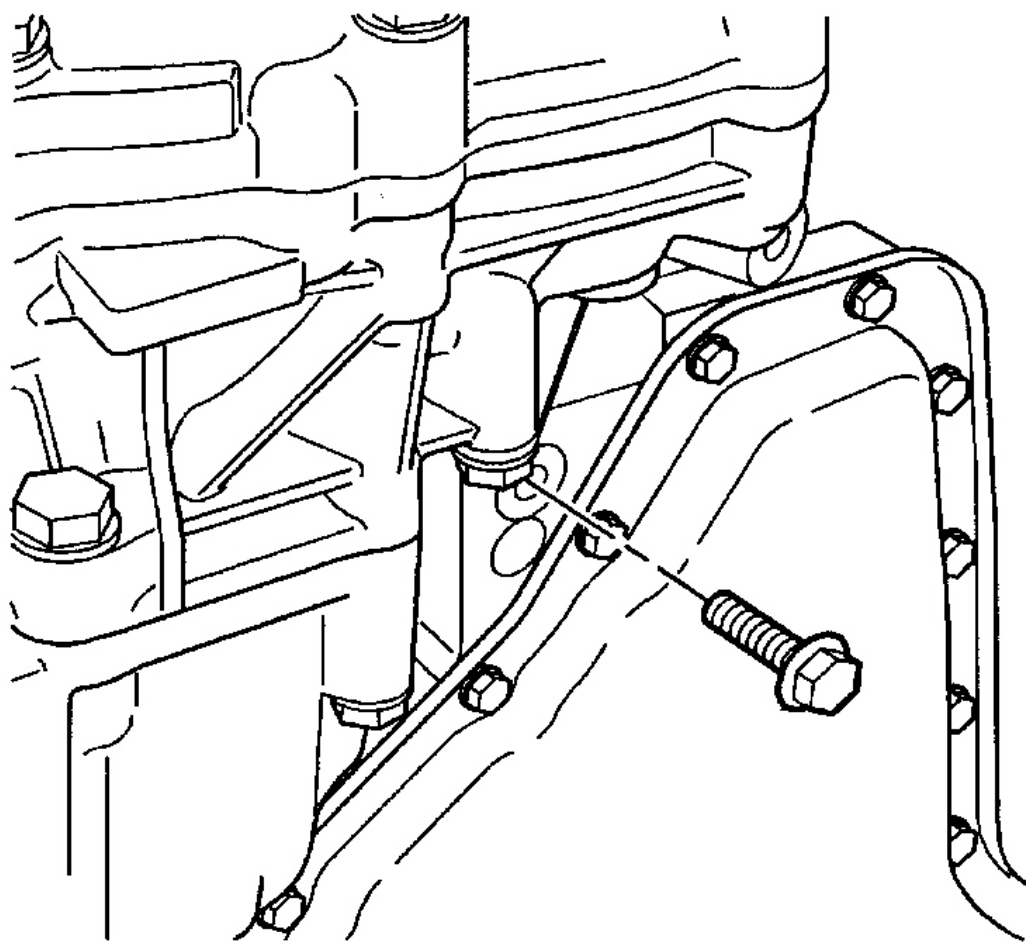
force or damage to bushings may occur.

3. Remove transfer case assembly from transaxle. See **Fig. 28**. Remove transfer case lower brace. See **Fig. 29**. Remove case extension seal from transfer case. See **Fig. 30**.
4. Position transaxle with case side cover facing down. Remove oil dam from transaxle. See **Fig. 31**. Install transfer case assembly onto Holding Fixture (J 44755). See **Fig. 32**.
5. Using Slide Hammer (J-6125-1B) and Adapter (J-44467), remove output shaft. See **Fig. 33**. Remove final drive sun gear. See **Fig. 34**.
6. Remove sun gear thrust washer from transaxle. See **Fig. 35**. Remove parking gear and thrust bearing. See **Fig. 36**. Remove final drive sun gear shaft. See **Fig. 37**.



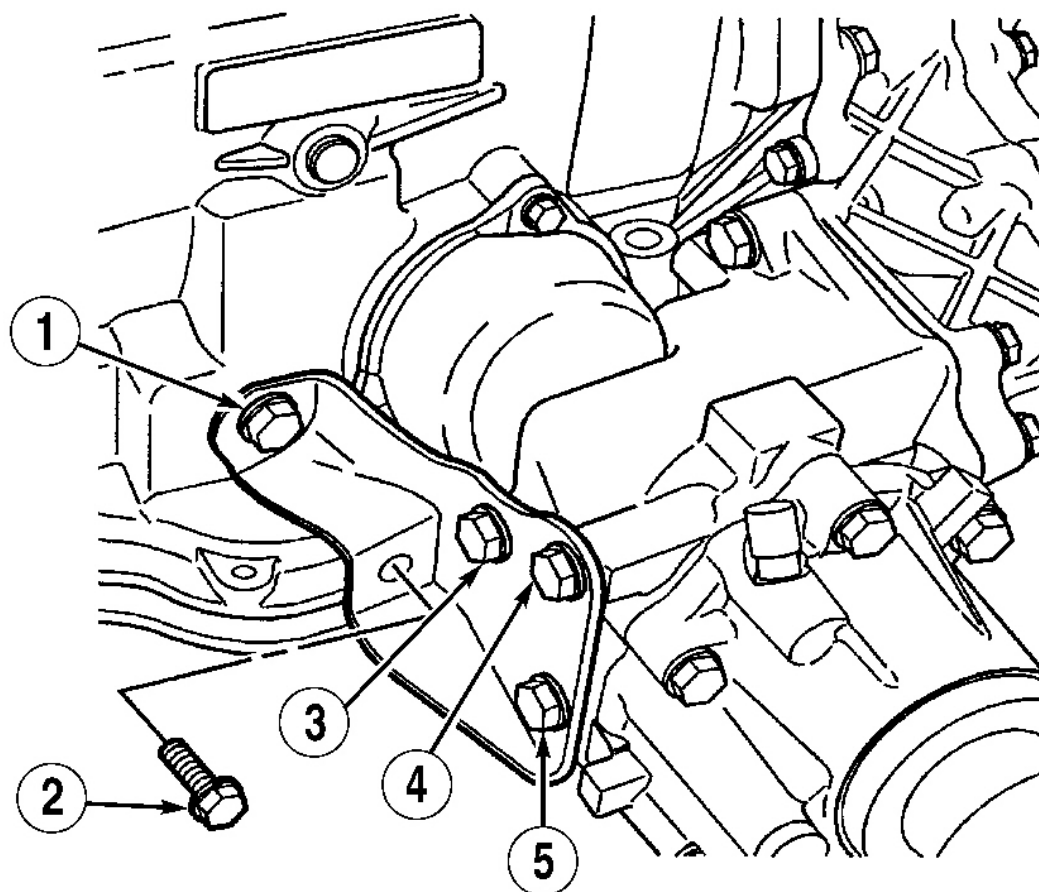
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Fig. 24: Locating Output Shaft Snap Ring
Courtesy of GENERAL MOTORS CORP.



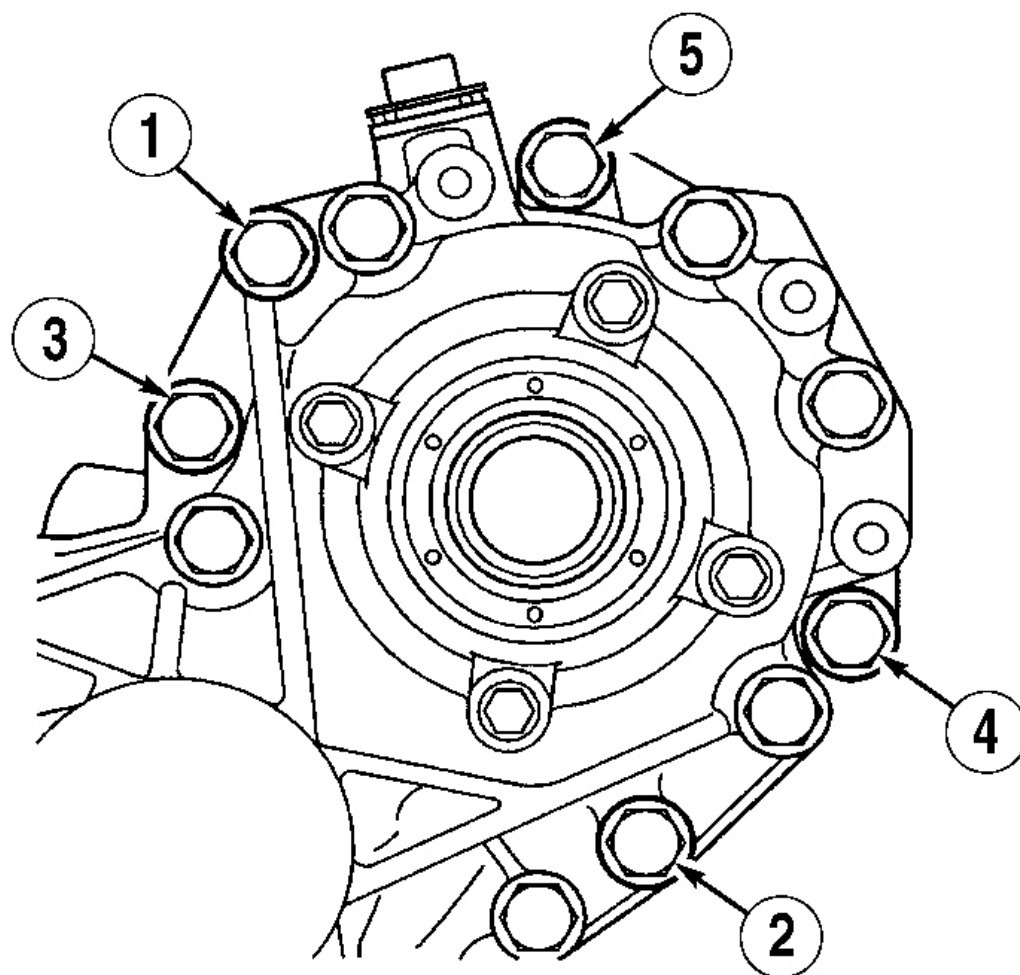
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Fig. 25: Locating Transfer Case Lower Brace Bolt
Courtesy of GENERAL MOTORS CORP.



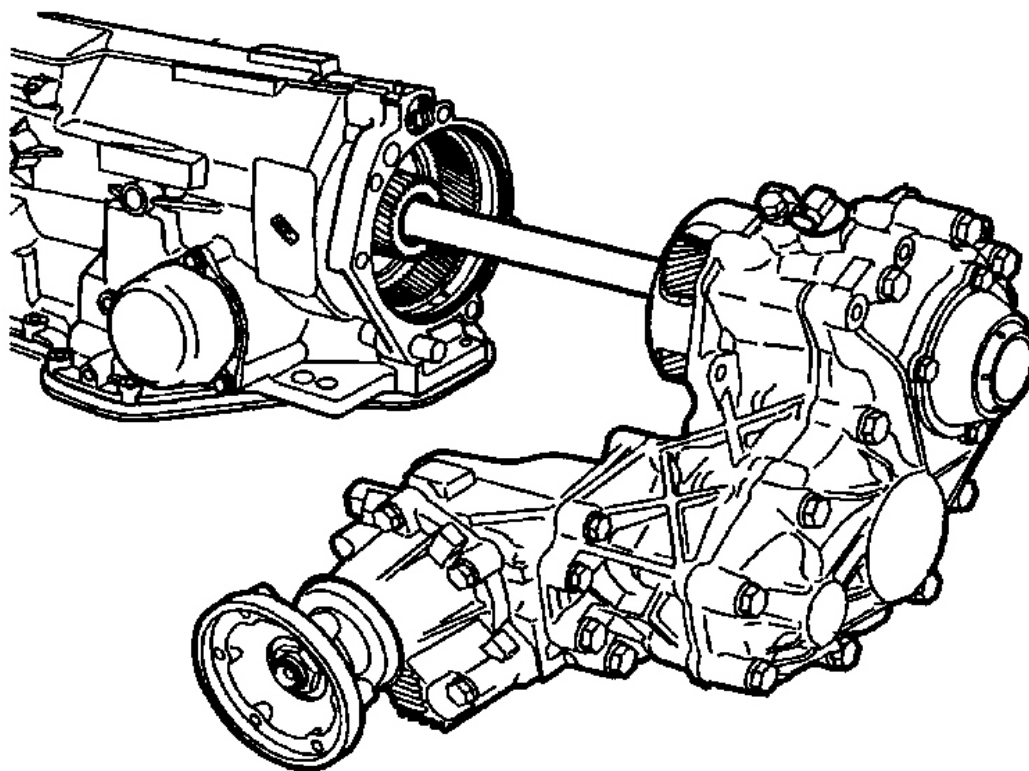
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Fig. 26: Locating Transfer Case Side Brace
Courtesy of GENERAL MOTORS CORP.



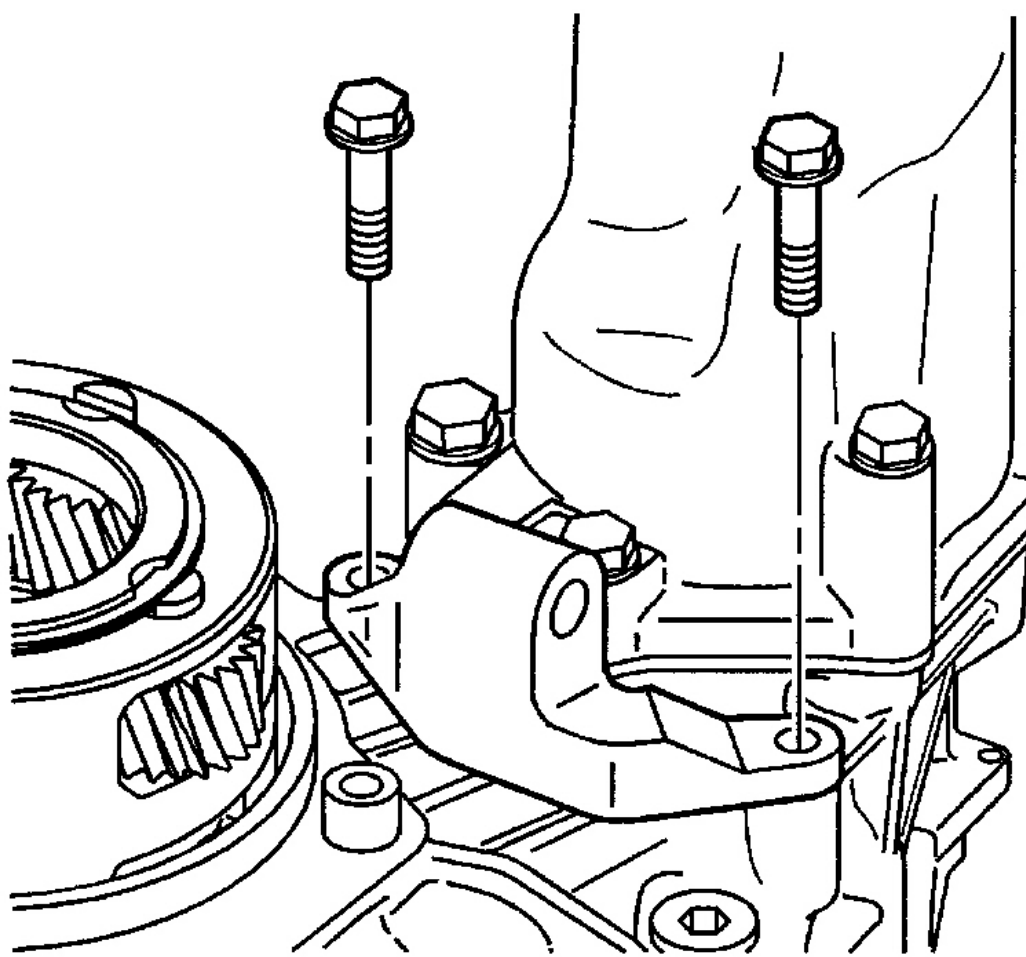
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Fig. 27: Locating Transfer Case-To-Transaxle Bolts
Courtesy of GENERAL MOTORS CORP.



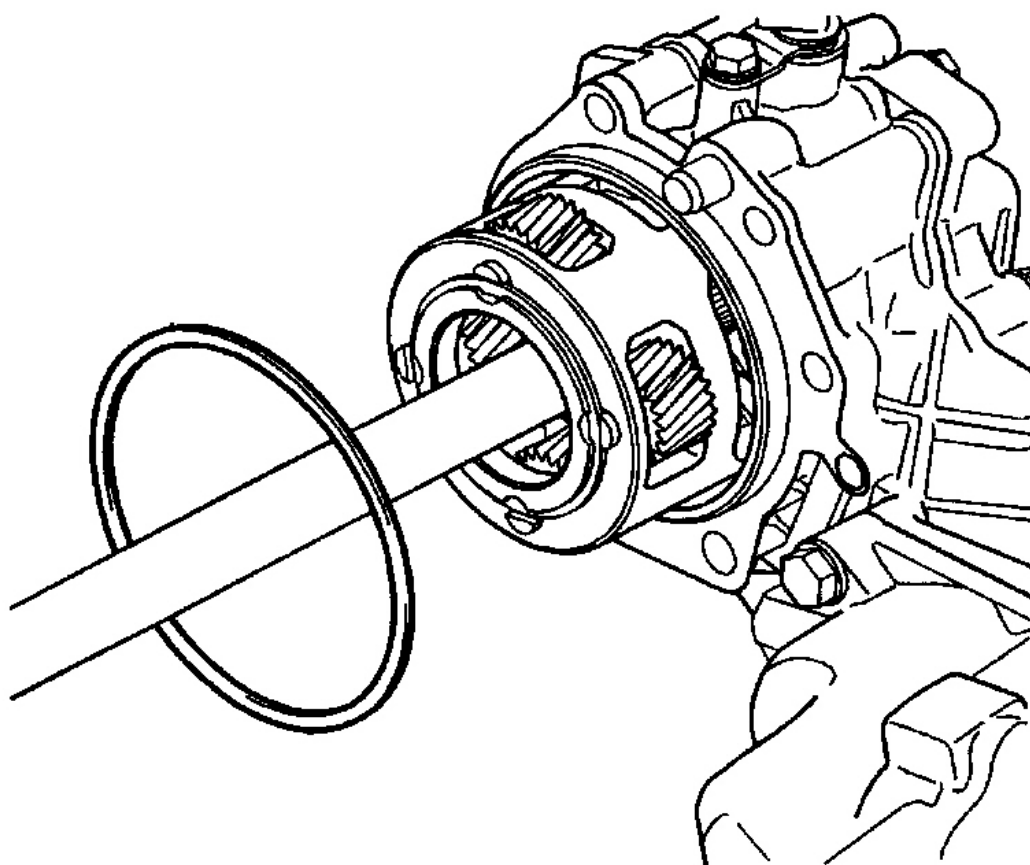
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Fig. 28: Removing & Installing Transfer Case Assembly
Courtesy of GENERAL MOTORS CORP.



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Fig. 29: Locating Transfer Case Lower Brace
Courtesy of GENERAL MOTORS CORP.



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Fig. 30: Removing & Installing Case Extension Seal (AWD)
Courtesy of GENERAL MOTORS CORP.

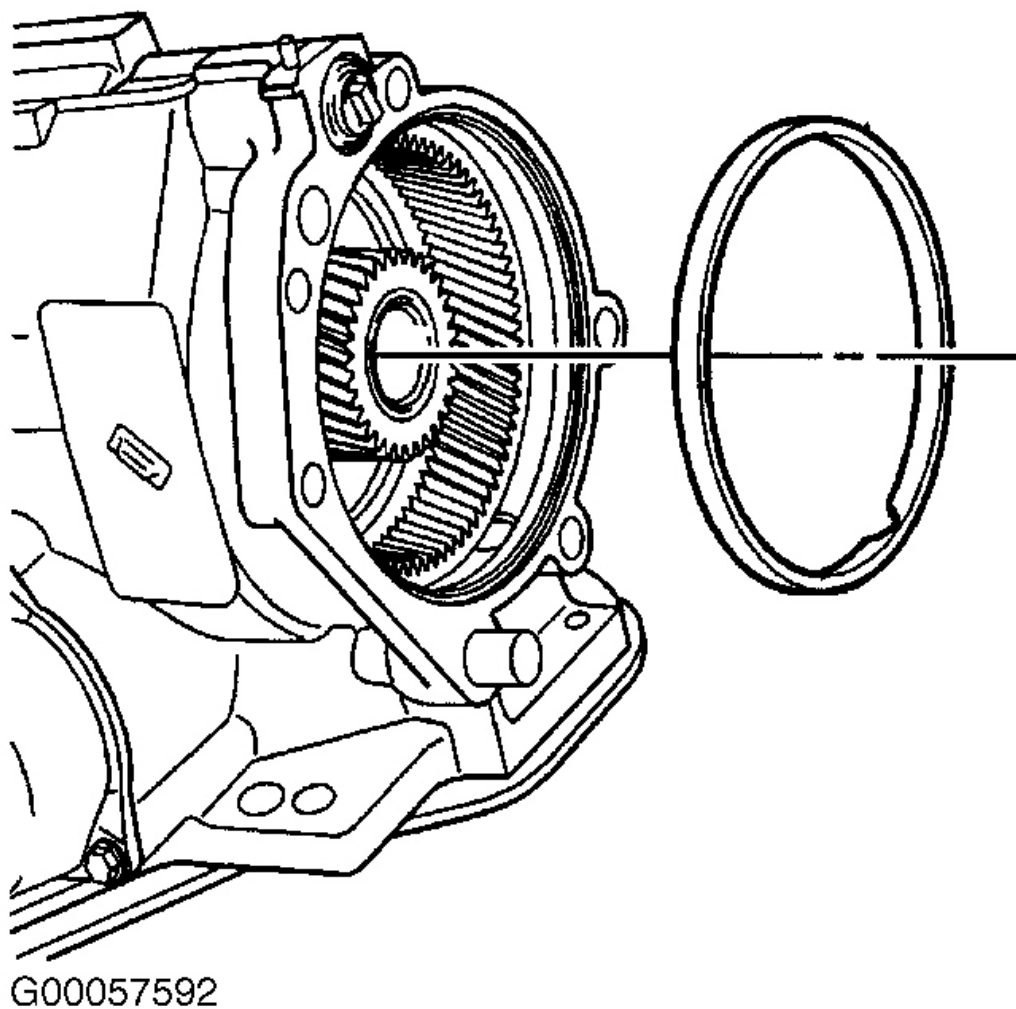


Fig. 31: Removing & Installing Oil Dam (AWD)
Courtesy of GENERAL MOTORS CORP.

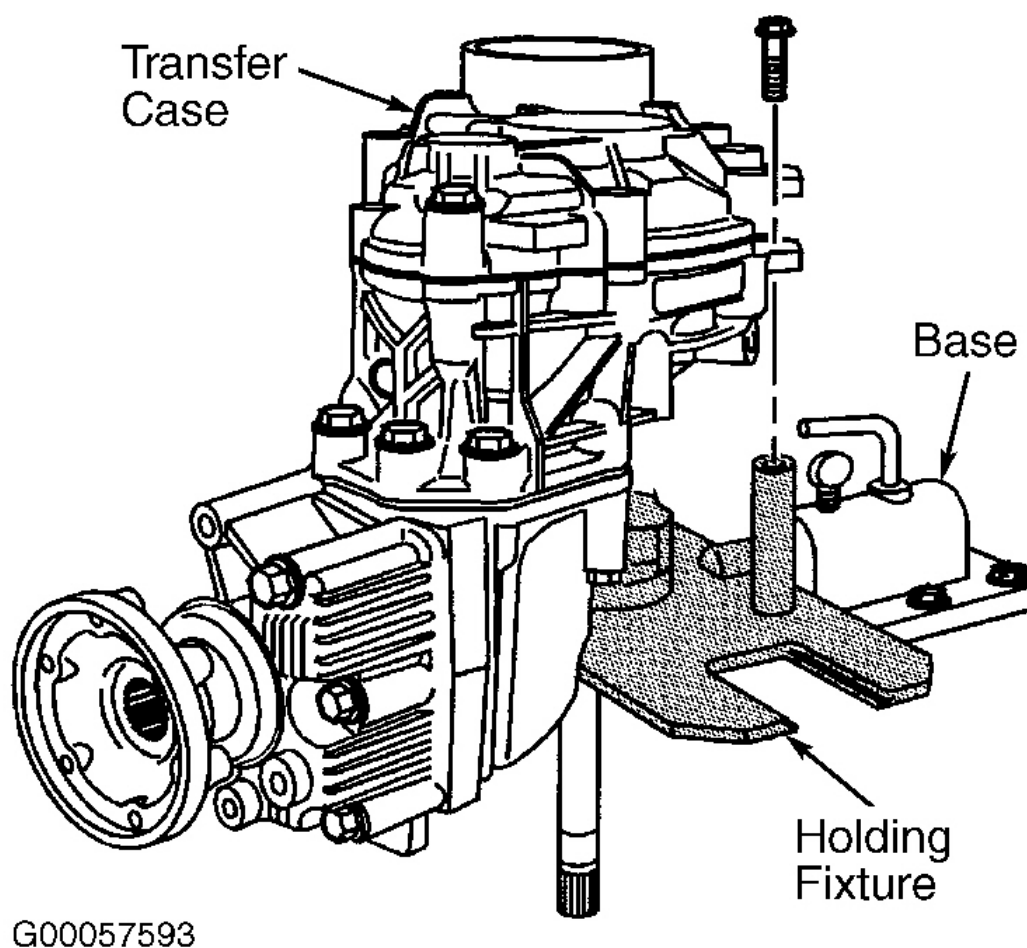
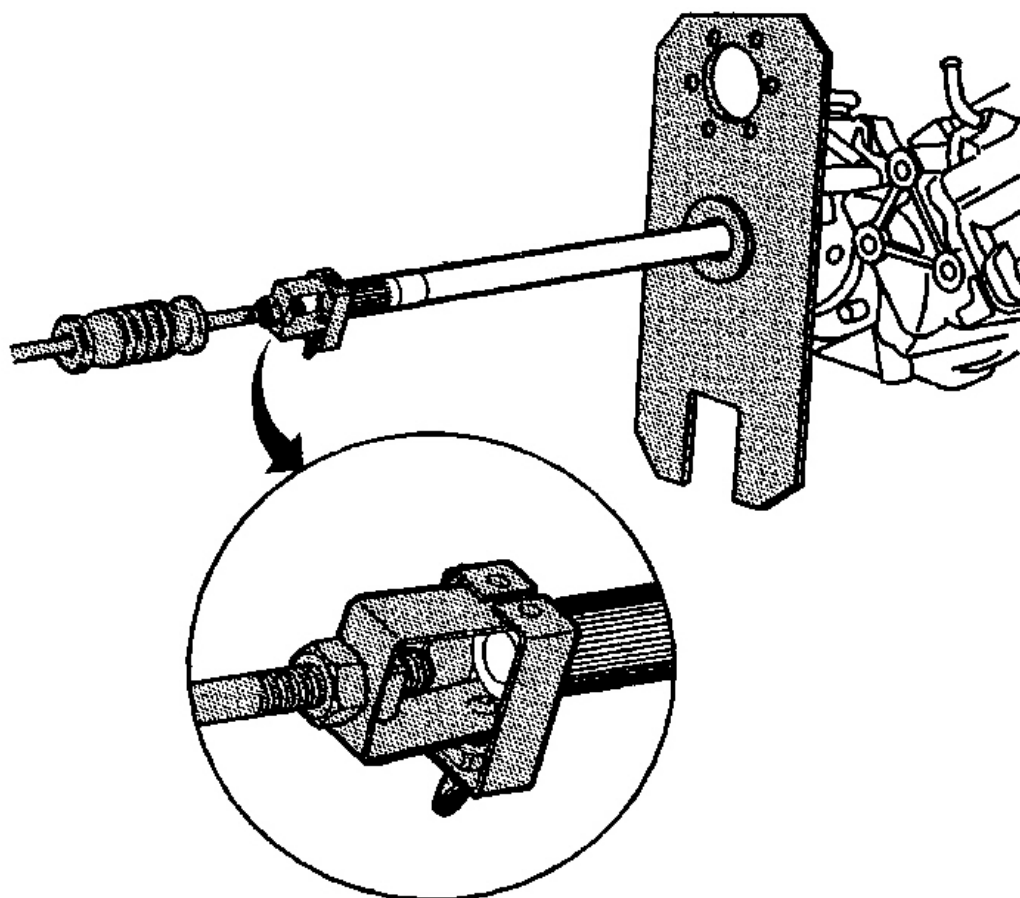
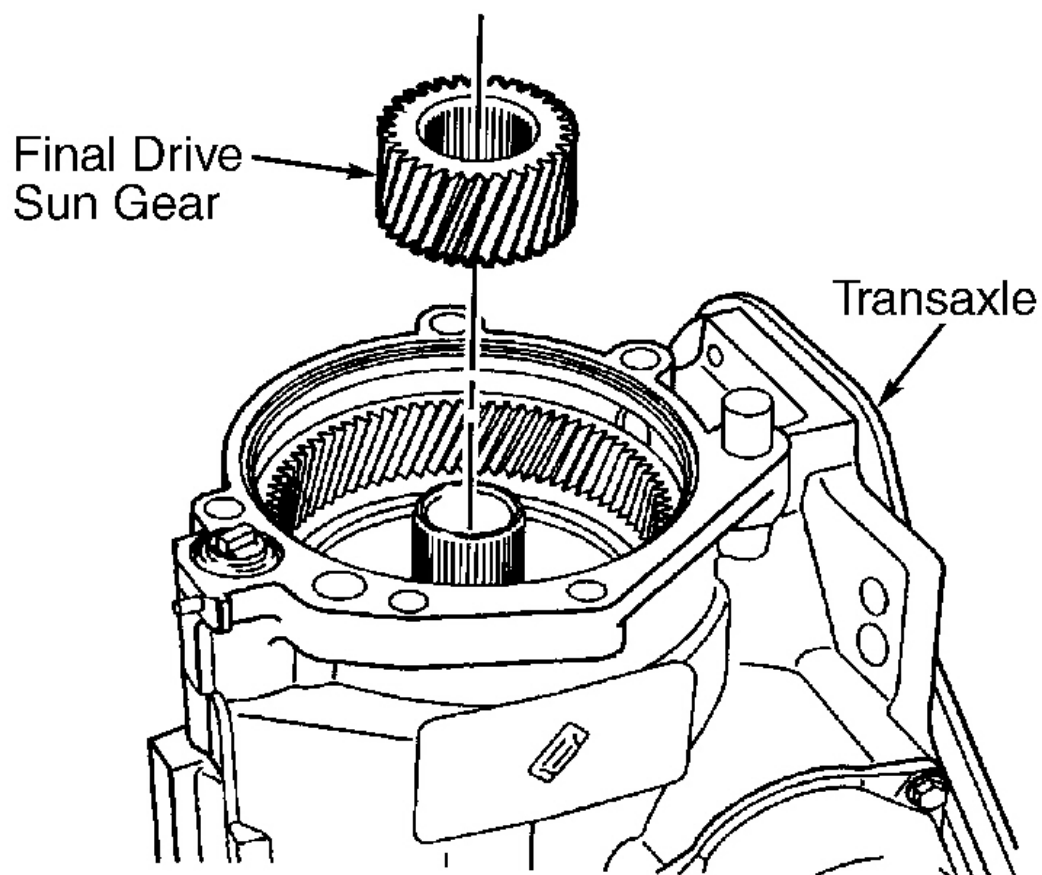


Fig. 32: Installing Transfer Case Holding Fixture & Base
Courtesy of GENERAL MOTORS CORP.



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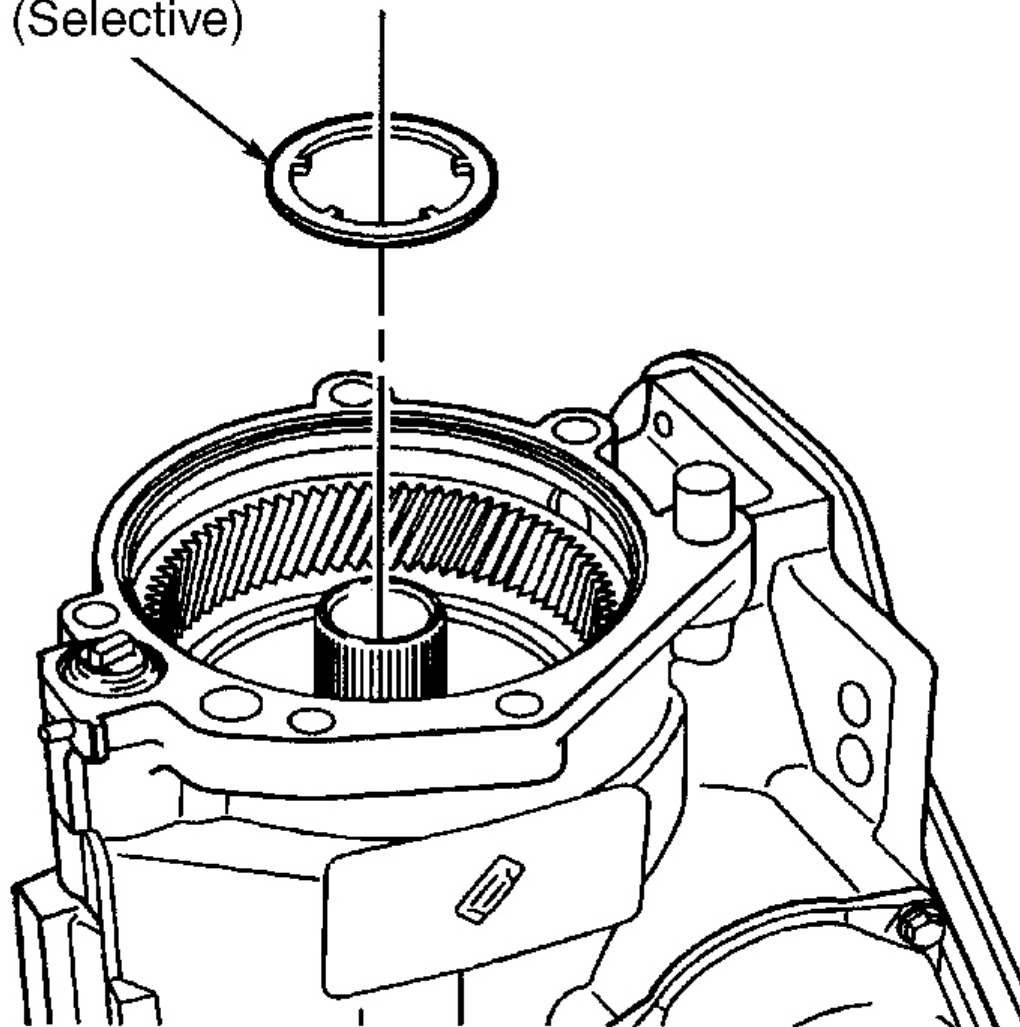
Fig. 33: Removing Output Shaft (AWD)
Courtesy of GENERAL MOTORS CORP.



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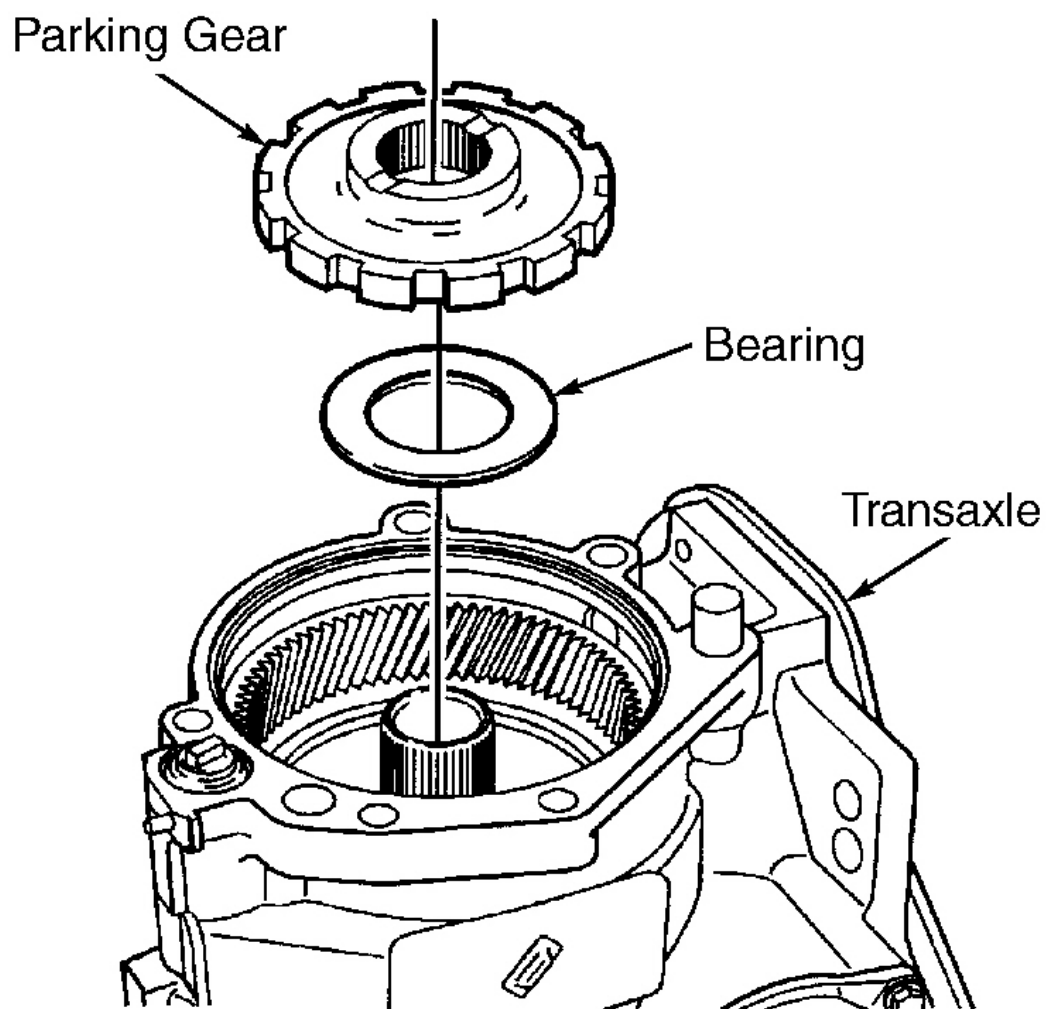
Fig. 34: Removing & Installing Final Drive Sun Gear (AWD)
Courtesy of GENERAL MOTORS CORP.

Thrust Washer
(Selective)



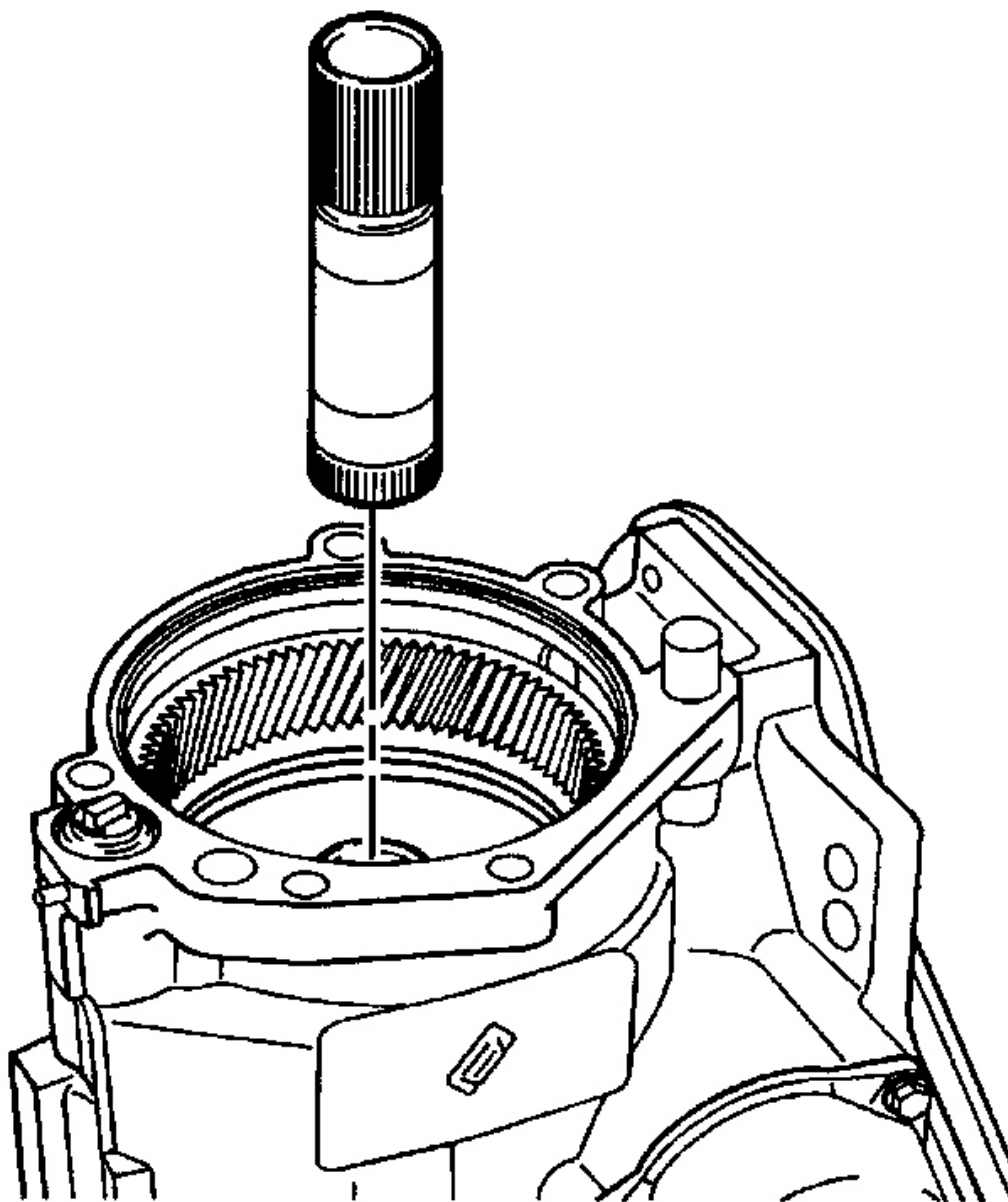
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Fig. 35: Removing & Installing Sun Gear Thrust Washer (AWD)
Courtesy of GENERAL MOTORS CORP.



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Fig. 36: Removing & Installing Parking Gear & Bearing (AWD)
Courtesy of GENERAL MOTORS CORP.

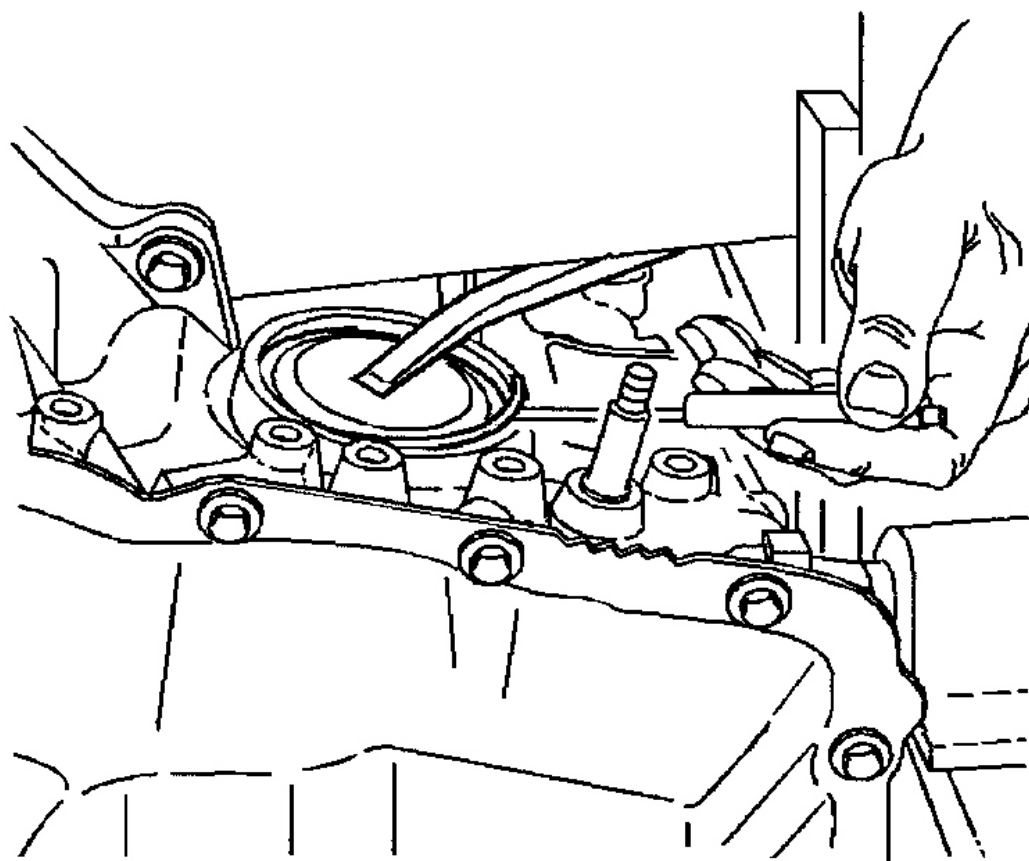


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Fig. 37: Removing & Installing Final Drive Sun Gear Shaft (AWD)
Courtesy of GENERAL MOTORS CORP.

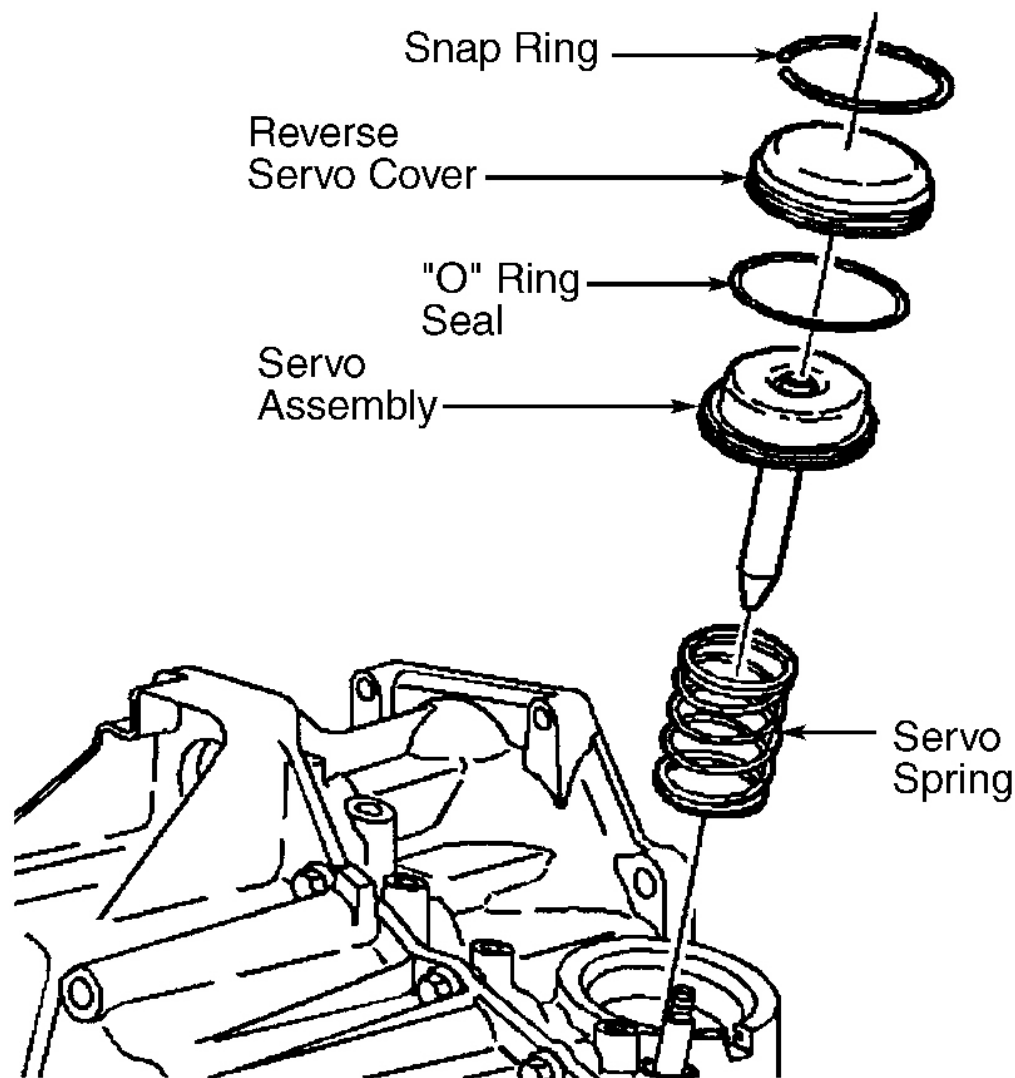
REVERSE BAND SERVO

1. Using long screwdriver, depress reverse band servo cover by prying against holding fixture. Pry retaining ring from reverse band servo cover. See **Fig. 38**.
2. Remove screwdriver. Servo assembly will push servo cover up. Using small screwdriver, pull servo cover "O" ring seal out through slot in case. Cut servo "O" ring seal. Depress reverse band servo cover. Grasp one end of cut seal and pull from servo cover. Servo assembly will push servo cover up. Remove servo cover, reverse band servo assembly and reverse band servo piston return spring. See **Fig. 39**.



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Fig. 38: Removing & Installing Reverse Servo Assembly Cover
Courtesy of GENERAL MOTORS CORP.

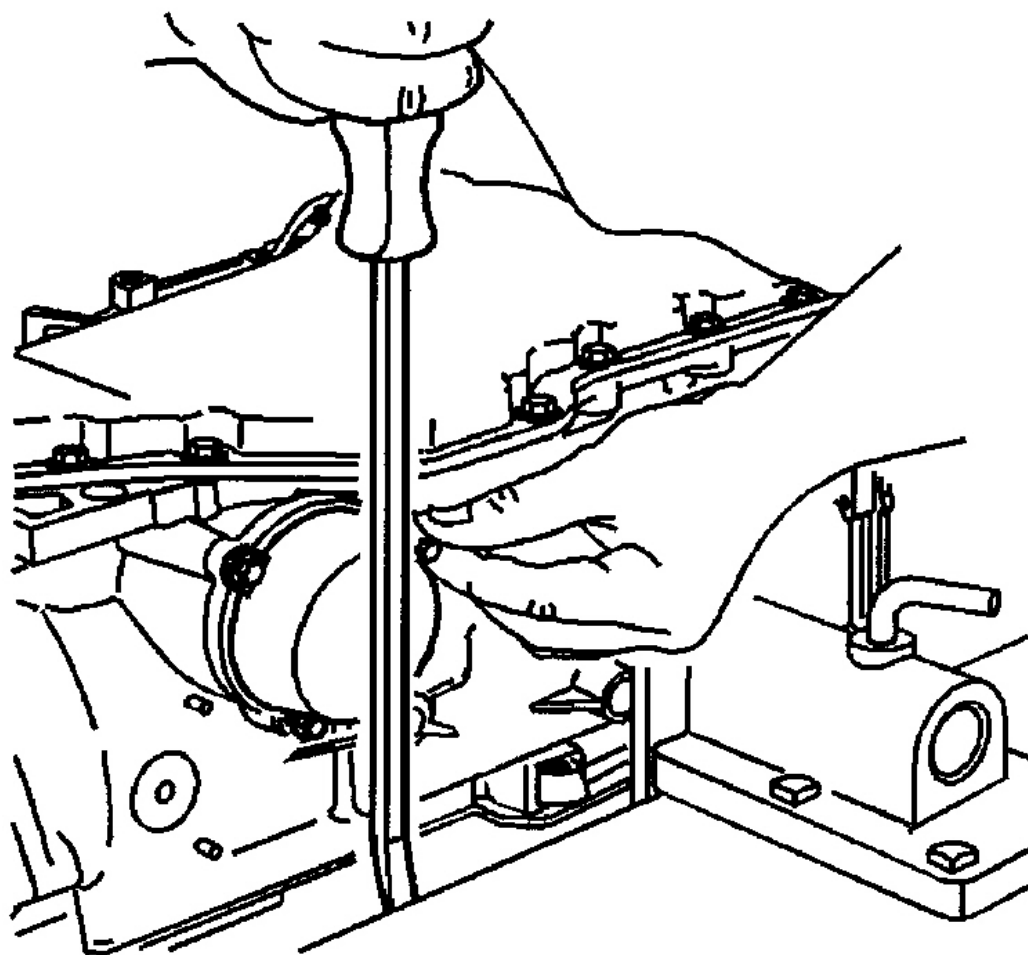


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Fig. 39: Removing & Installing Reverse Servo Assembly
 Courtesy of GENERAL MOTORS CORP.

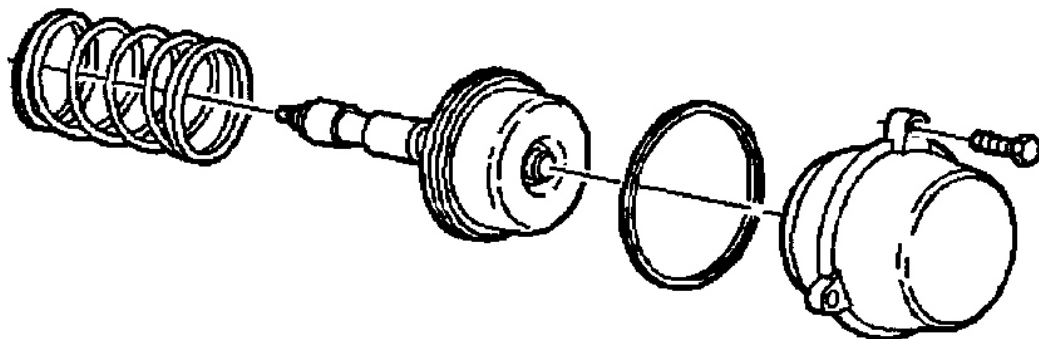
FORWARD BAND SERVO

Position transaxle with oil pan facing up. Using long screwdriver, depress forward band servo assembly cover by prying against work bench. Hold servo assembly and remove forward band servo cover bolts. See **Fig. 40**. Remove screwdriver. Servo assembly will push servo cover out. If cover does not move, tap cover with mallet. Remove servo cover and cover seal. Remove servo assembly. Remove piston return spring from forward band servo. See **Fig. 41**.



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Fig. 40: Removing & Installing Forward Band Servo Cover
Courtesy of GENERAL MOTORS CORP.



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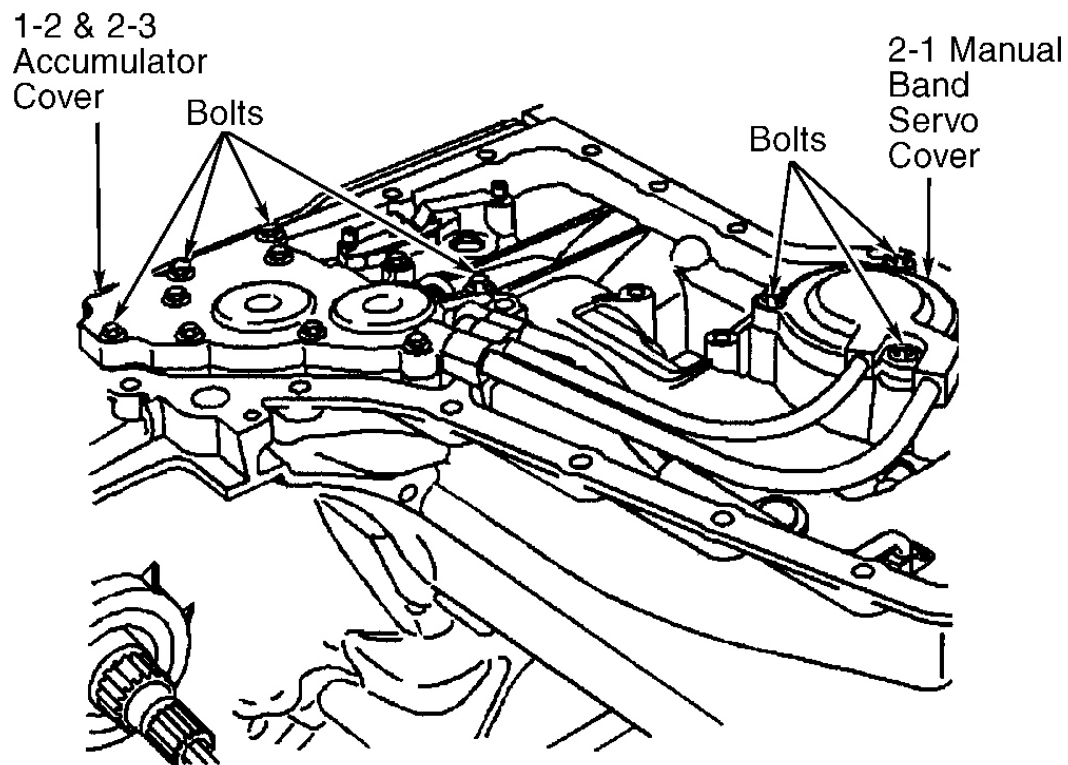
Fig. 41: Removing & Installing Forward Band Servo
Courtesy of GENERAL MOTORS CORP.

OIL PAN & FILTER

Remove oil pan bolts. Remove oil pan and gasket. Using screwdriver, pry oil filter out of case. Pry oil filter seal out of case. DO NOT damage case sealing surface. See **Fig. 16**. Inspect oil pan magnet for steel particles. Excessive amounts of steel shavings indicates internal transaxle damage. Using screwdriver, pry metal crimping away from top of oil filter and pull oil filter apart. Inspect oil filter for clutch plate friction material, steel particles and Bronze slivers, indicating bushing damage or internal transaxle damage.

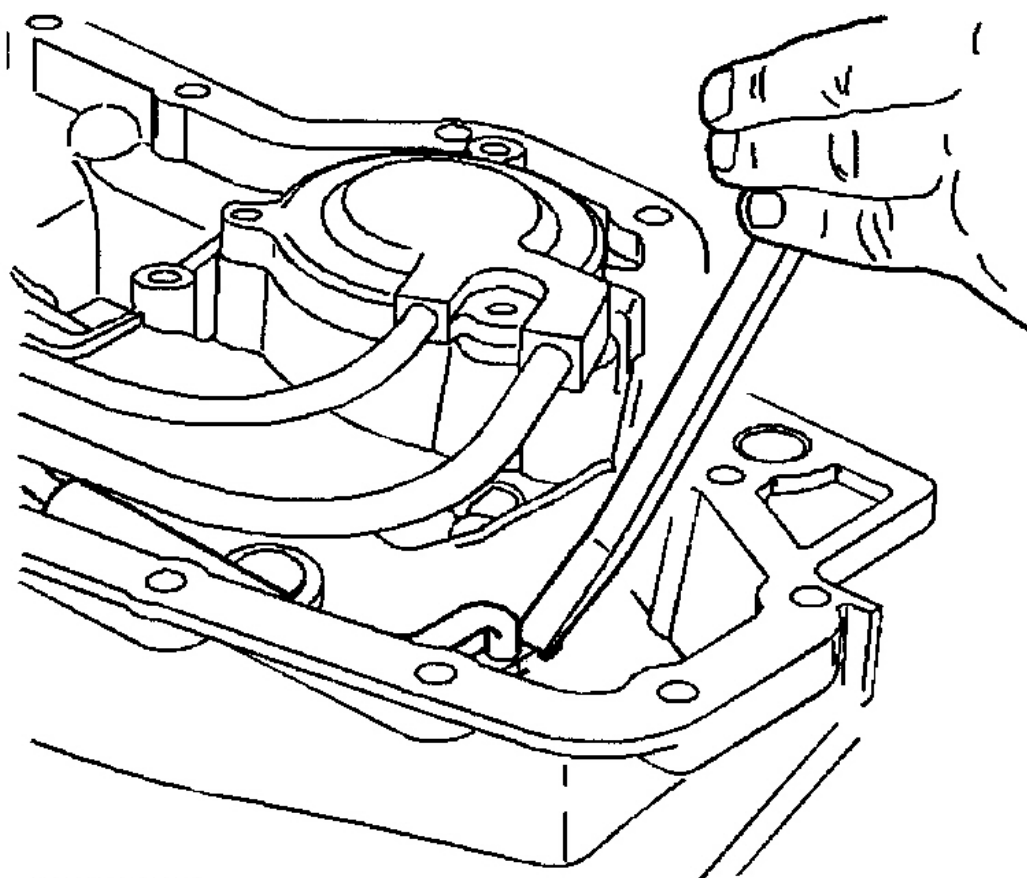
ACCUMULATOR ASSEMBLY & 2-1 MANUAL BAND SERVO

1. Remove accumulator cover bolts from 1-2 and 2-3 accumulator cover. See **Fig. 42**. Remove bolts from 2-1 manual band servo cover. Using screwdriver, gently pry lube oil pipe retainer from case. See **Fig. 43**. Remove lube oil pipe from front differential carrier internal gear lube hole. See **Fig. 44**.
2. Remove 1-2 and 2-3 accumulator assembly and 2-1 manual band servo assembly together. Remove pipe assembly. DO NOT twist pipe assembly. Remove cover gasket from 2-1 manual band servo.



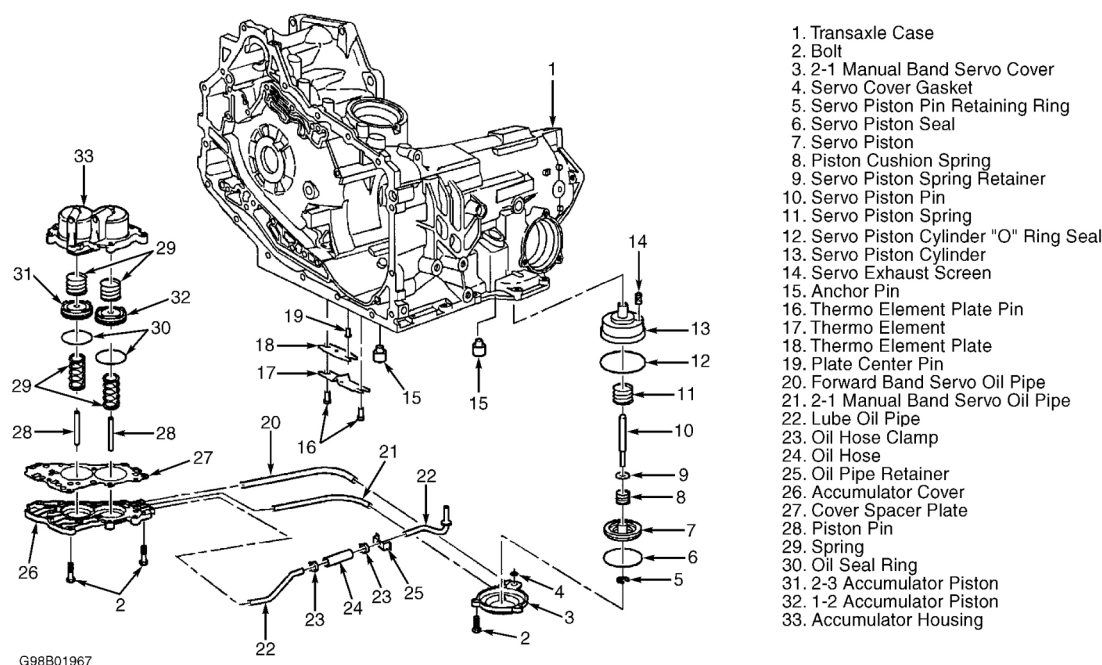
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Fig. 42: Removing & Installing Accumulator & 2-1 Manual Band Covers
Courtesy of GENERAL MOTORS CORP.



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Fig. 43: Removing & Installing Lube Oil Pipe Retainer
Courtesy of GENERAL MOTORS CORP.

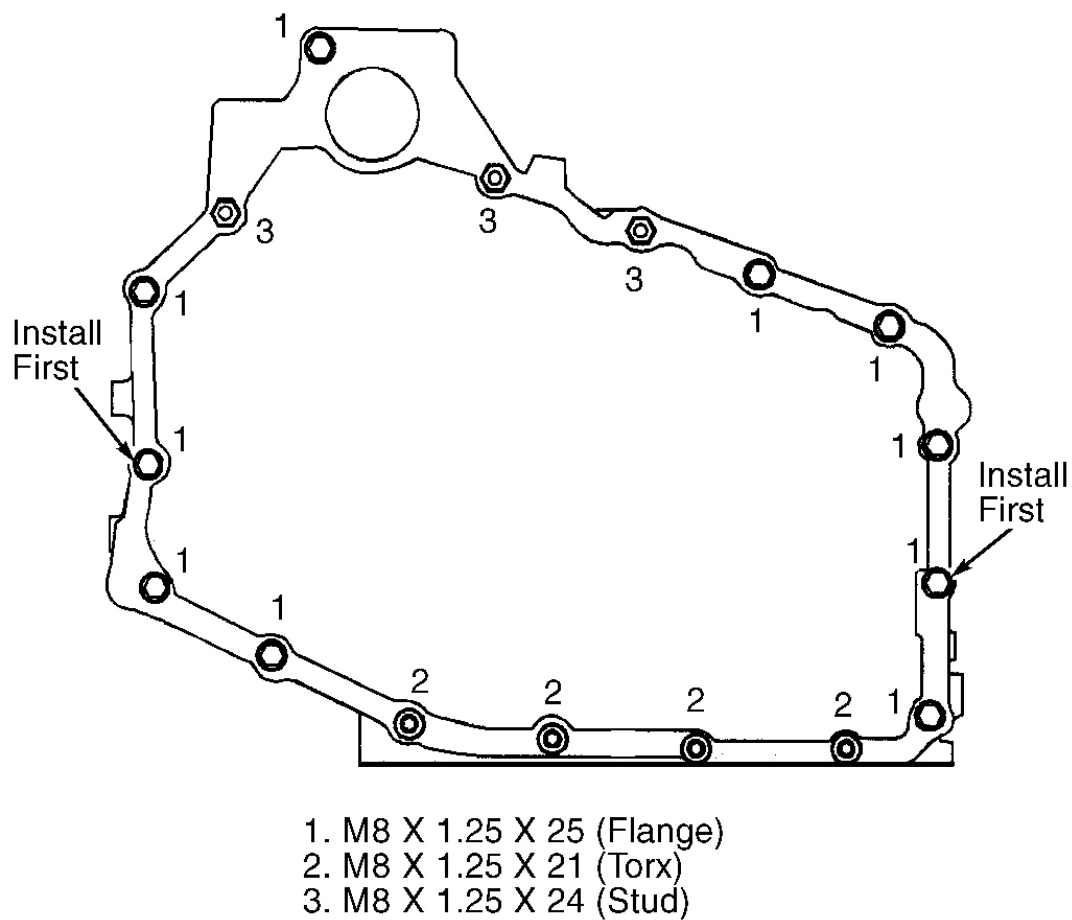


1. Transaxle Case
2. Bolt
3. 2-1 Manual Band Servo Cover
4. Servo Cover Gasket
5. Servo Piston Pin Retaining Ring
6. Servo Piston Seal
7. Servo Piston
8. Piston Cushion Spring
9. Servo Piston Spring Retainer
10. Servo Piston Pin
11. Servo Piston Spring
12. Servo Piston Cylinder "O" Ring Seal
13. Servo Piston Cylinder
14. Servo Exhaust Screen
15. Anchor Pin
16. Thermo Element Plate Pin
17. Thermo Element
18. Thermo Element Plate
19. Plate Center Pin
20. Forward Band Servo Oil Pipe
21. 2-1 Manual Band Servo Oil Pipe
22. Lube Oil Pipe
23. Oil Hose Clamp
24. Oil Hose
25. Oil Pipe Retainer
26. Accumulator Cover
27. Cover Spacer Plate
28. Piston Pin
29. Spring
30. Oil Seal Ring
31. 2-3 Accumulator Piston
32. 1-2 Accumulator Piston
33. Accumulator Housing

Fig. 44: Exploded View Of Accumulator Components & 2-1 Manual Band Servo
Courtesy of GENERAL MOTORS CORP.

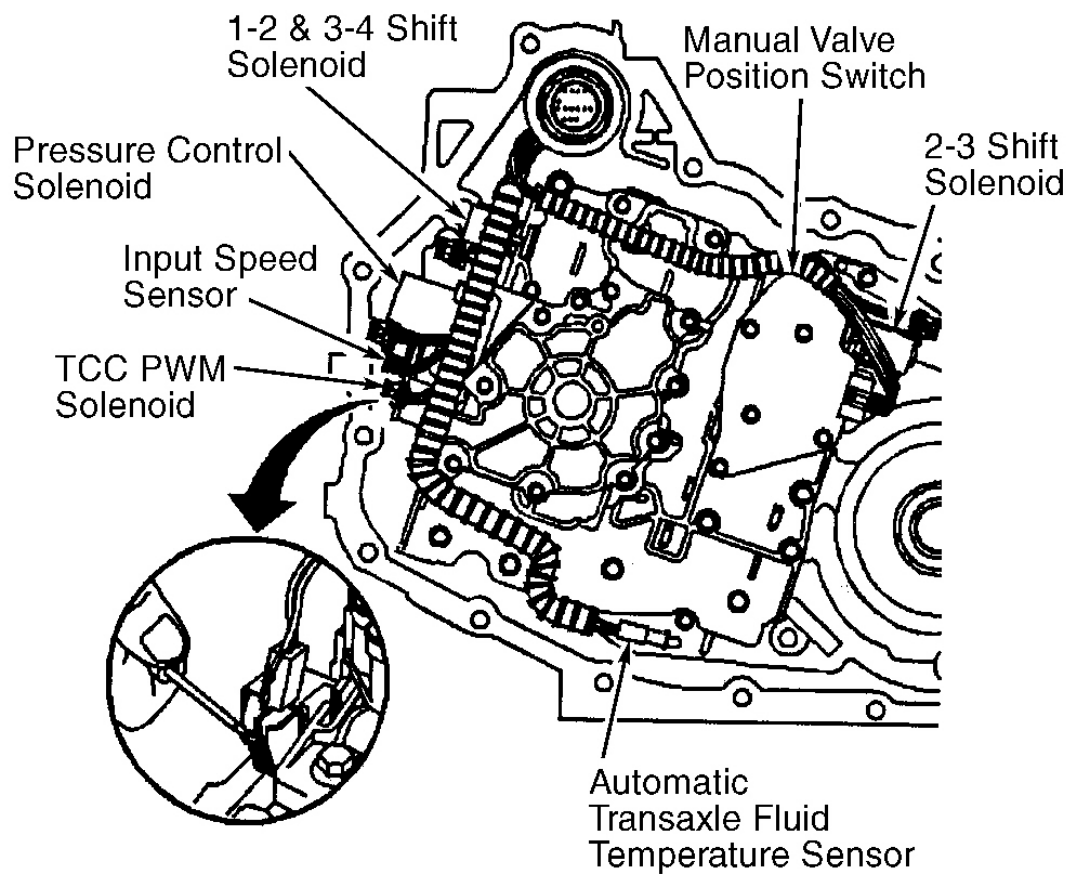
CONTROL VALVE BODY, OIL PUMP & VEHICLE SPEED SENSOR

1. Position transaxle with control valve body cover facing up. Remove case side cover (control valve body cover) bolts. See **Fig. 45**. Remove cover and gaskets. See **Fig. 15**. Using small screwdriver, pry wiring harness electrical connectors off transaxle fluid pressure manual valve position switch, 1-2 and 3-4 shift solenoid, 2-3 shift solenoid, TCC PWM solenoid, pressure control solenoid and input speed sensor. Gently pull transaxle fluid temperature sensor from clip. See **Fig. 46** and **Fig. 47**.
2. Lift wiring harness assembly off transaxle. Remove oil pump assembly bolts. DO NOT remove No. 1 oil pump cover bolt at this time. See **Fig. 48**. Remove wiring harness clip. Lift oil pump assembly off control valve body. See **Fig. 49**. Set oil pump assembly on its cover.
3. Remove control valve body bolts. See **Fig. 50**. Manual valve position switch is very delicate, use care when handling. Carefully lift manual valve position switch off control valve body. See **Fig. 51**. Remove control valve body. See **Fig. 52**. Remove 4 check balls from case cover. See **Fig. 53**. Remove 2 bolts retaining spacer plate and gaskets to valve body. Remove spacer plate with 2 screen/seal assemblies and gaskets from valve body. Remove 6 check balls from valve body. See **Fig. 54**. Remove case cover pin.
4. Remove oil pump drive shaft from case cover. See **Fig. 55**. Position transaxle so Vehicle Speed Sensor (VSS) is facing up. Remove VSS bolt and VSS. See **Fig. 16**.



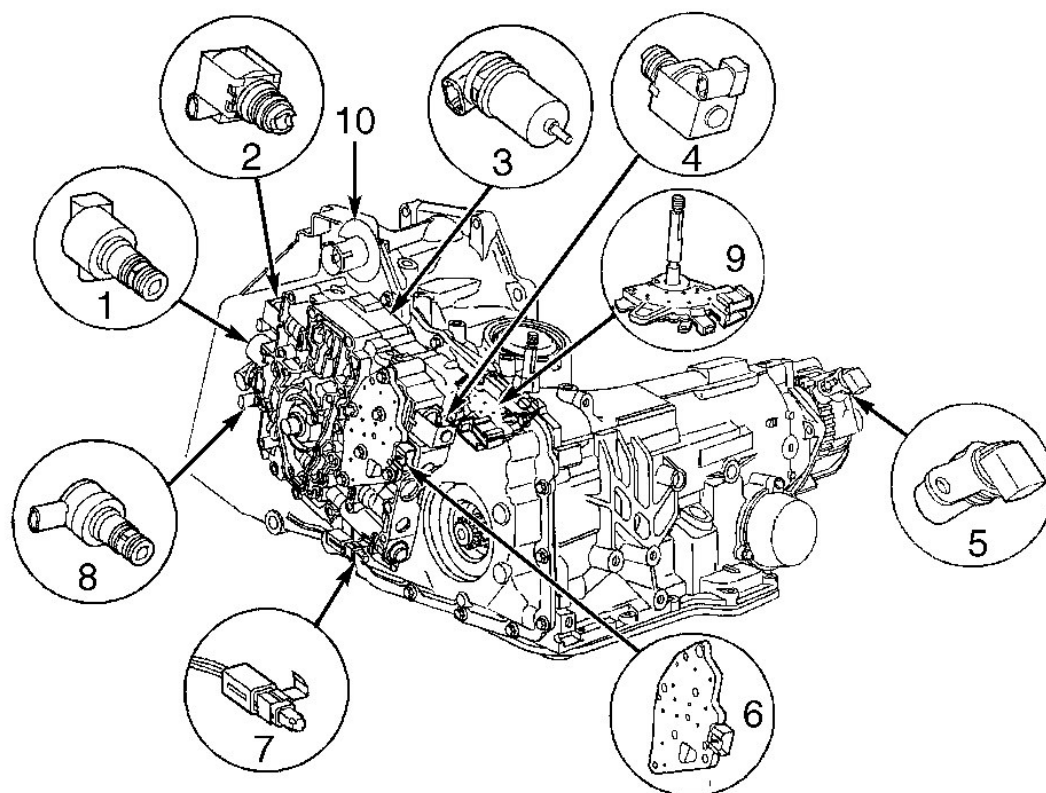
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Fig. 45: Identifying Case Side Cover Bolt Locations
Courtesy of GENERAL MOTORS CORP.



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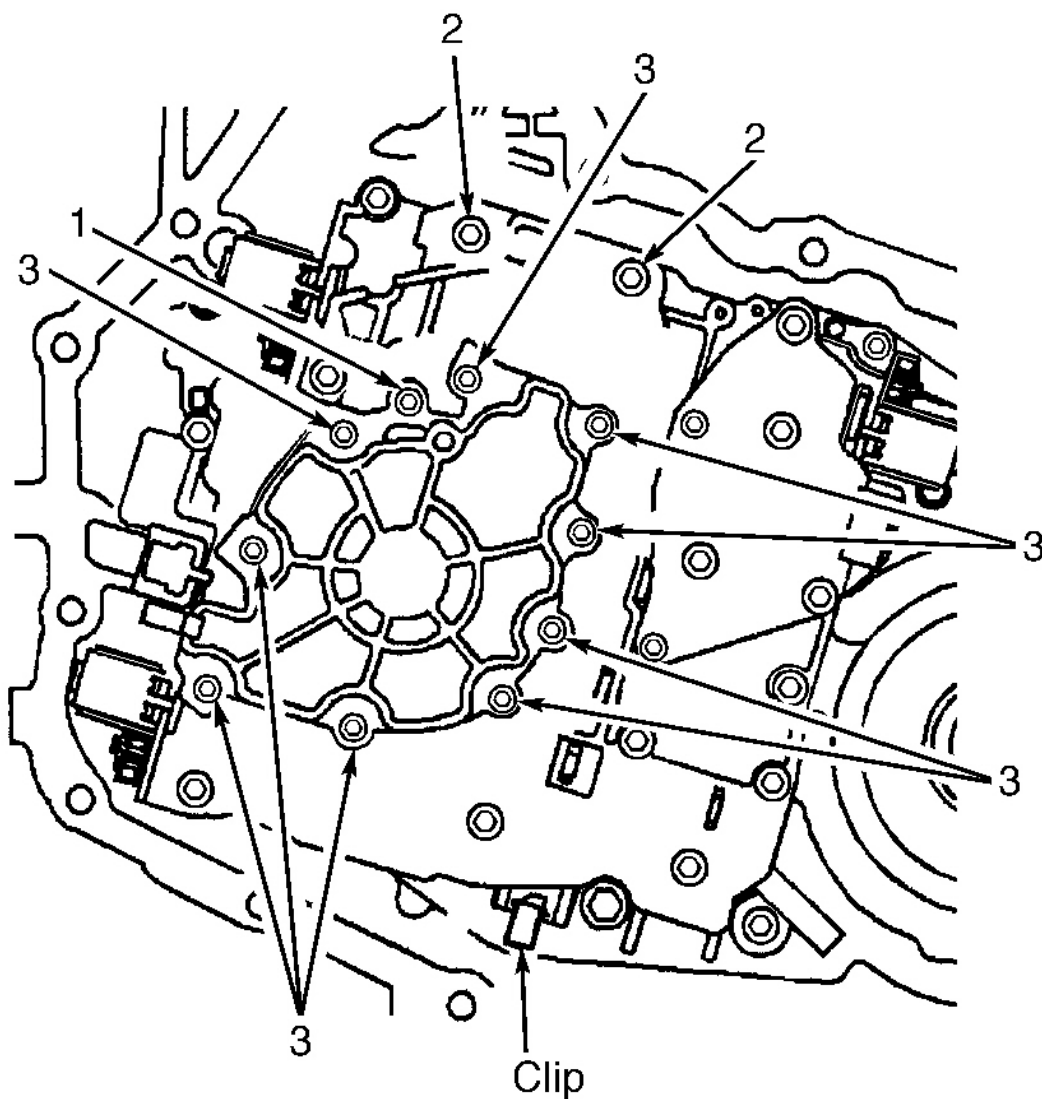
Fig. 46: Routing Transaxle Wire Harness
Courtesy of GENERAL MOTORS CORP.



- | | |
|-------------------------------|-------------------------------------|
| 1. Pressure Control Solenoid | 6. TFP Manual Valve Position Switch |
| 2. 1-2 Shift Solenoid | 7. TFT Sensor |
| 3. Input Speed Sensor | 8. TCC PWM Solenoid |
| 4. 2-3 Shift Solenoid | 9. Internal Mode Switch |
| 5. Vehicle Speed Sensor (VSS) | 10. 20-Pin Connector |

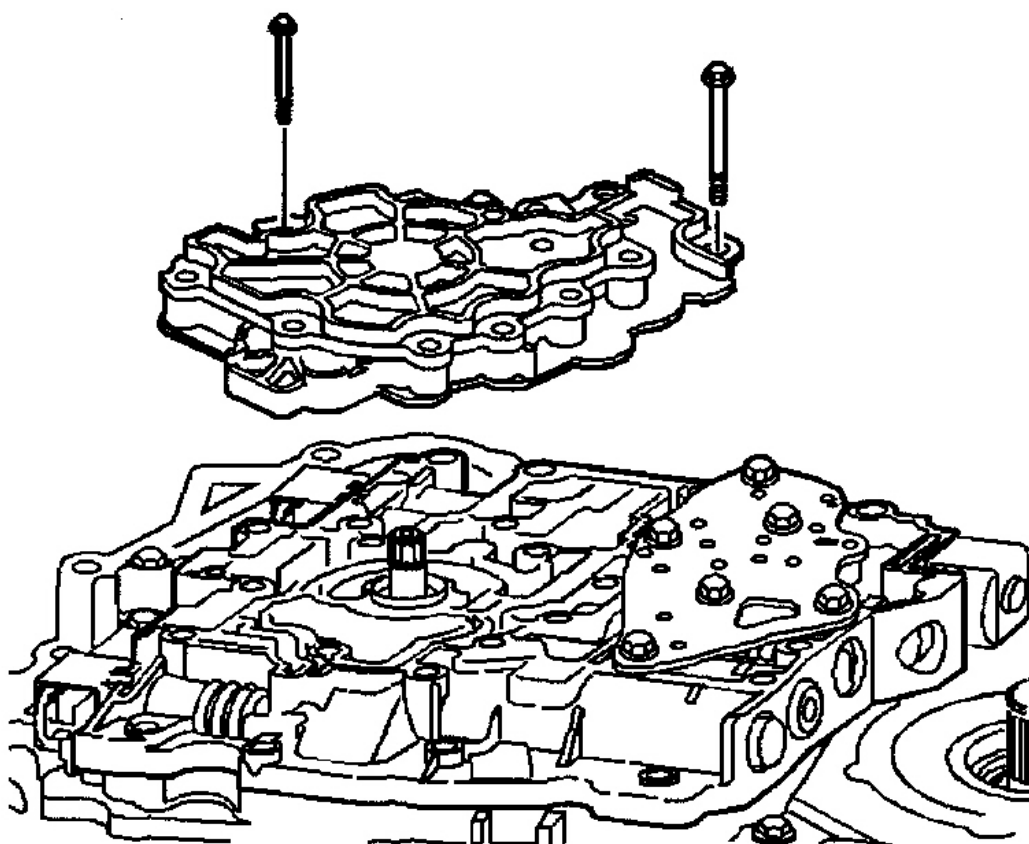
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Fig. 47: Identifying Transaxle Electronic Component Locations
 Courtesy of GENERAL MOTORS CORP.



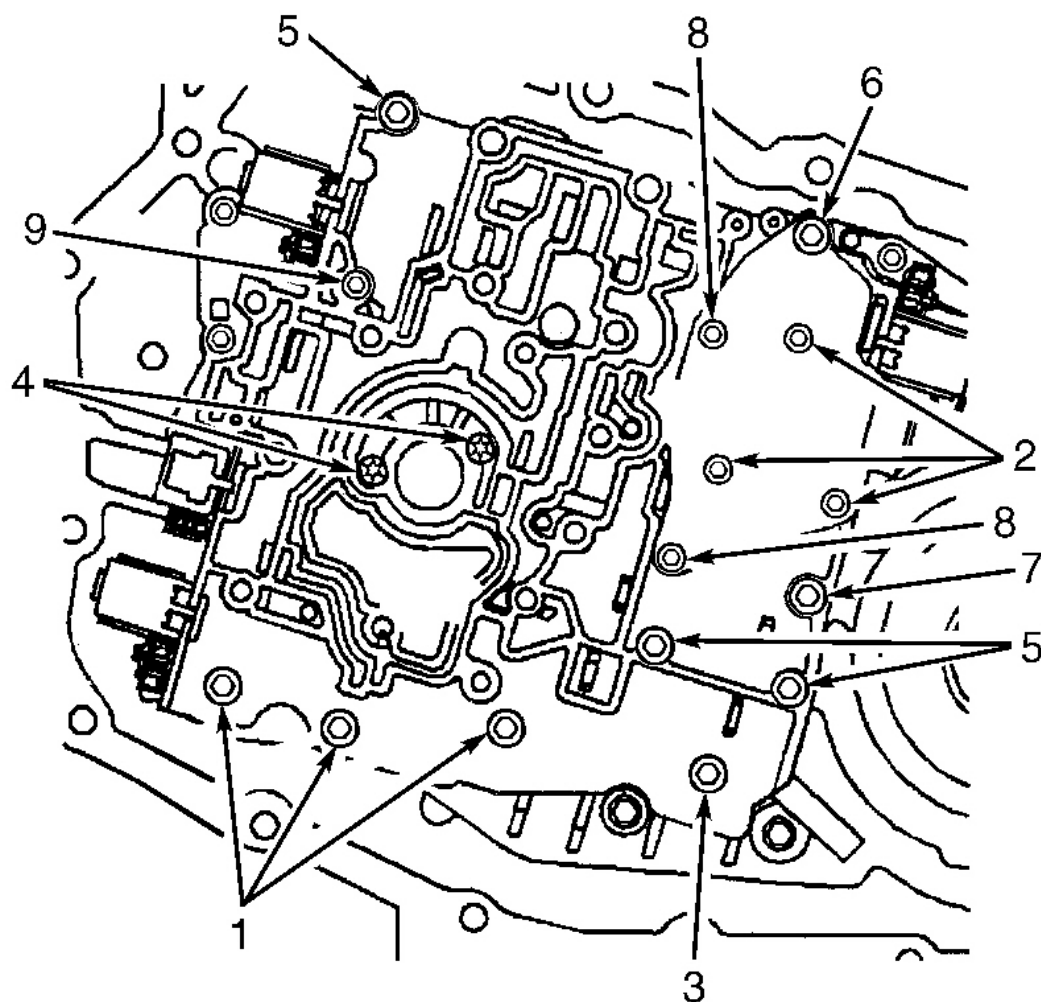
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Fig. 48: Identifying Oil Pump Bolt Locations
Courtesy of GENERAL MOTORS CORP.



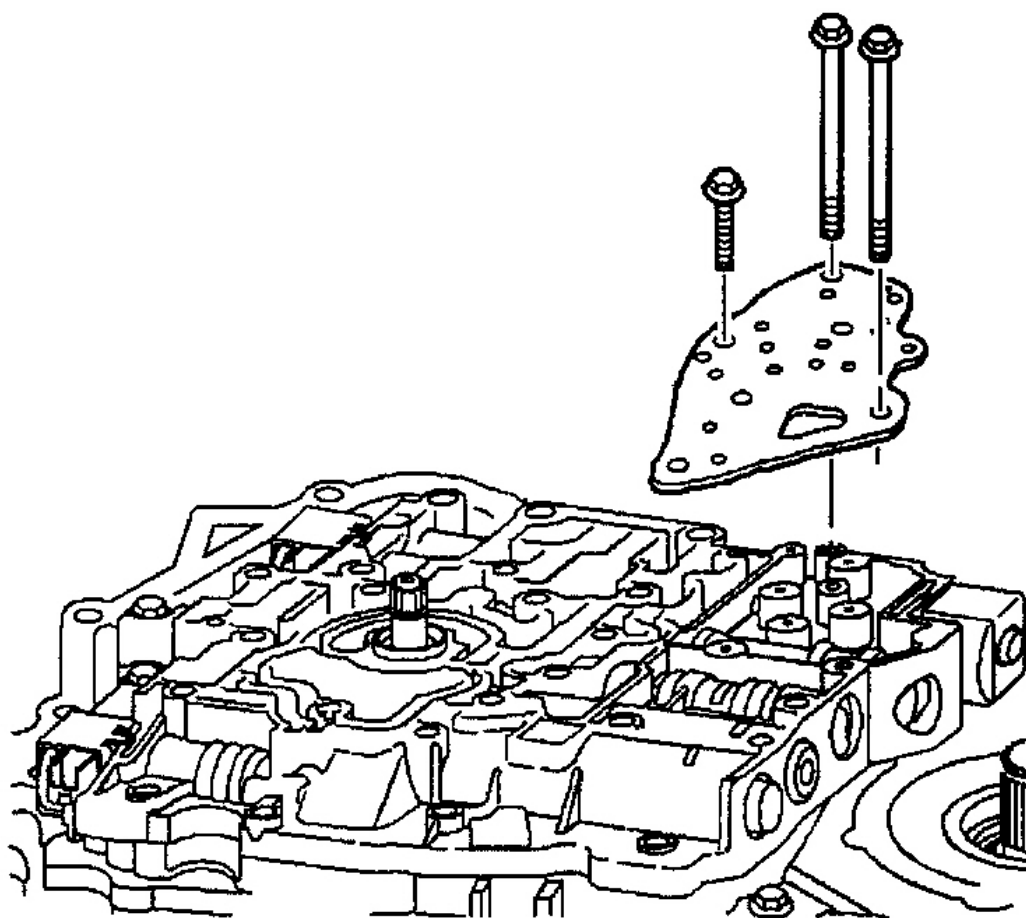
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Fig. 49: Removing & Installing Oil Pump Assembly
Courtesy of GENERAL MOTORS CORP.



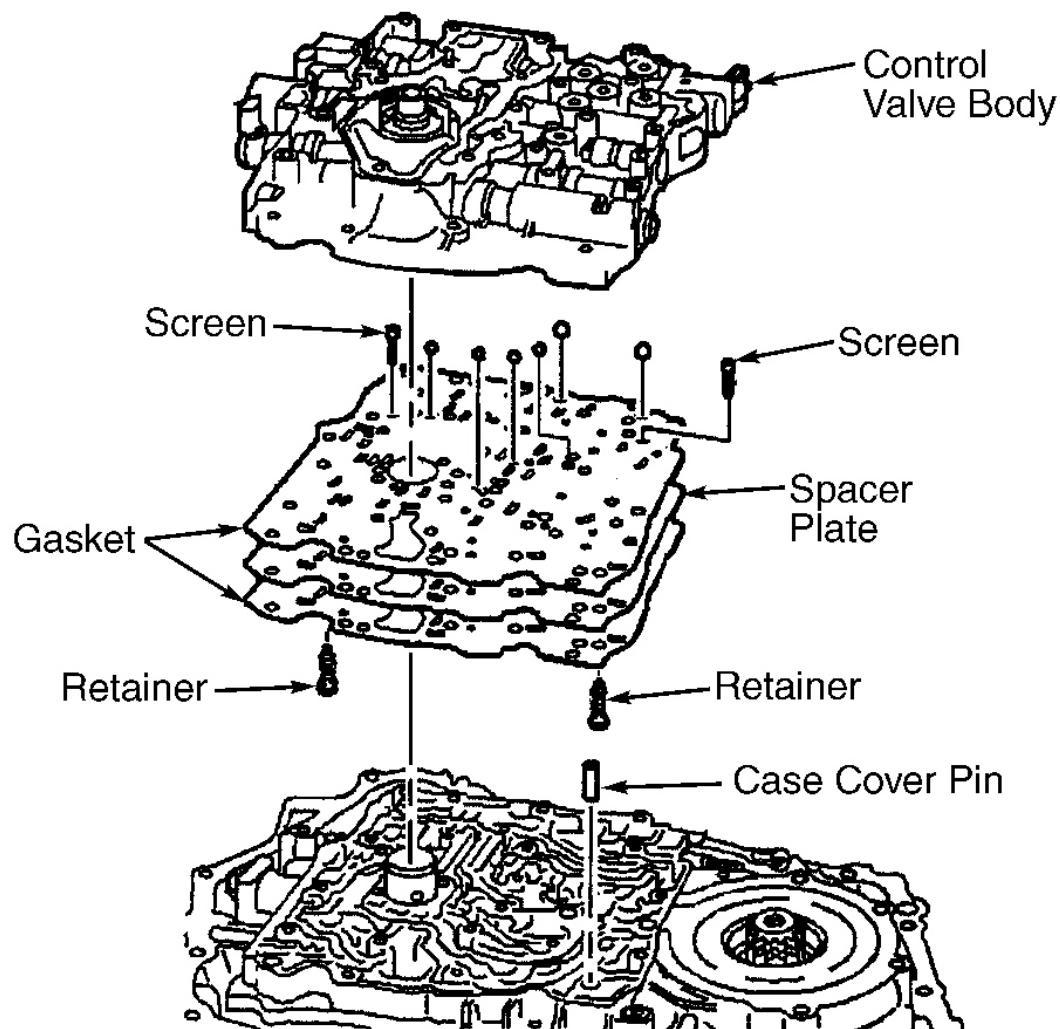
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Fig. 50: Identifying Valve Body Bolt Locations
 Courtesy of GENERAL MOTORS CORP.



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Fig. 51: Removing & Installing Manual Valve Position Switch
Courtesy of GENERAL MOTORS CORP.



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Fig. 52: Removing Control Valve Body Assembly
 Courtesy of GENERAL MOTORS CORP.

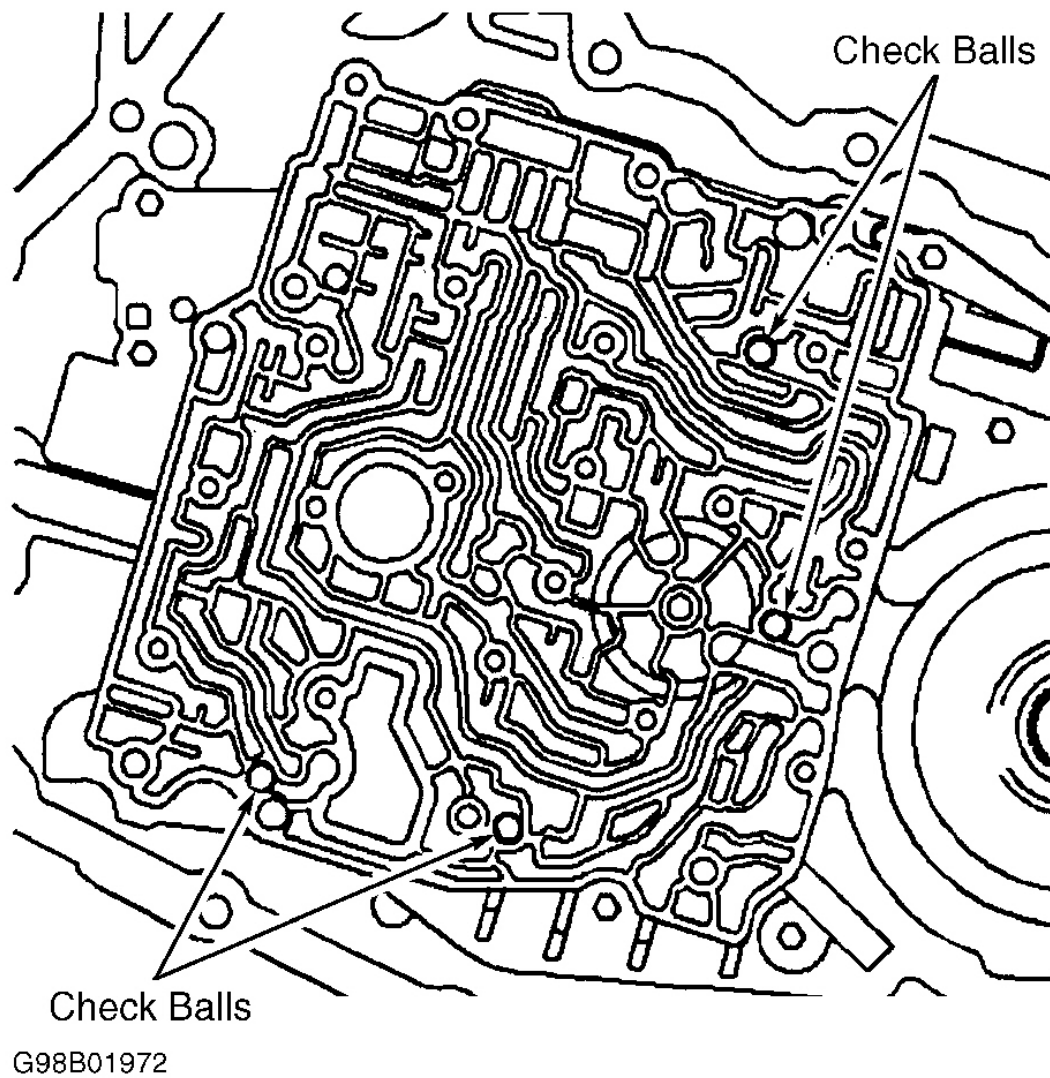
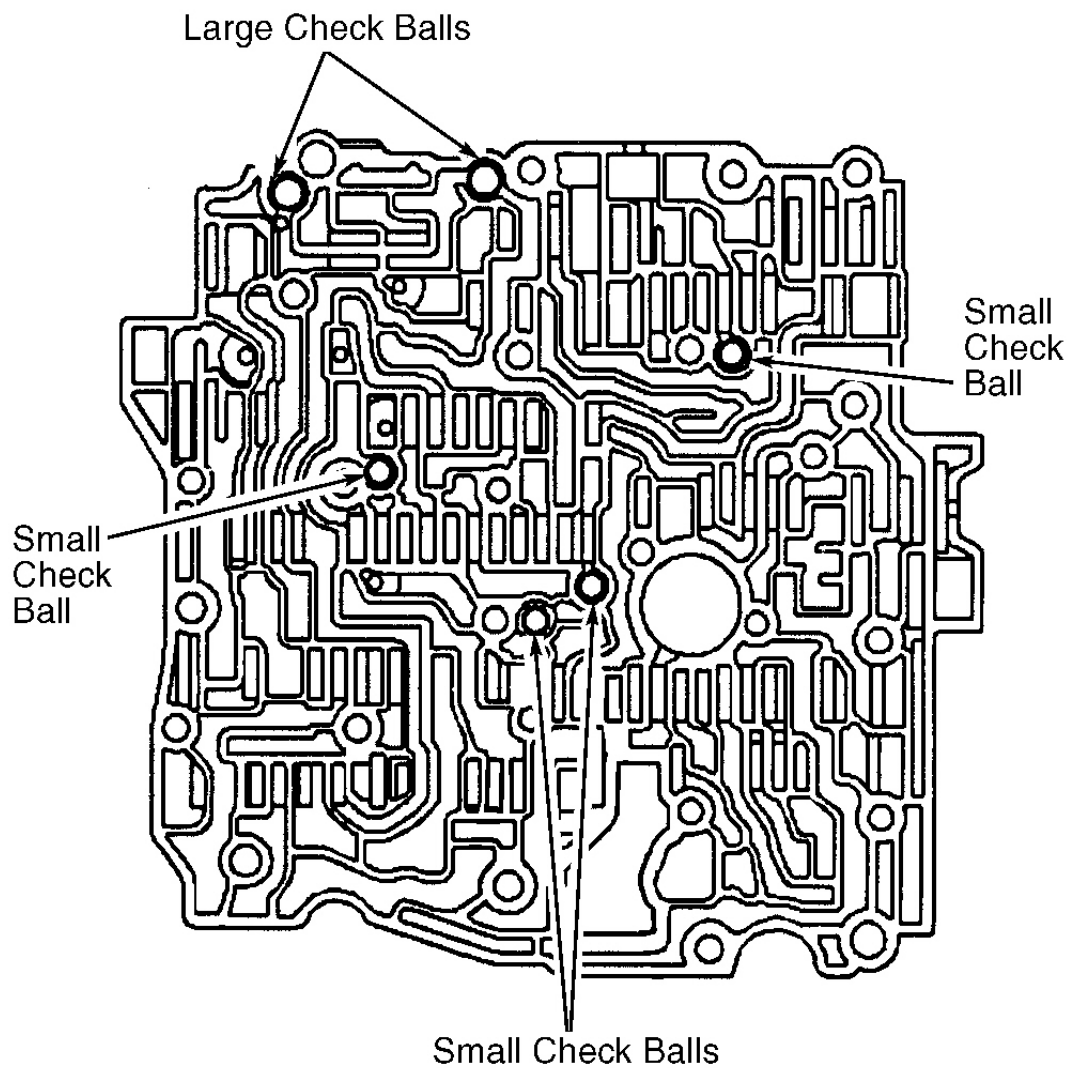
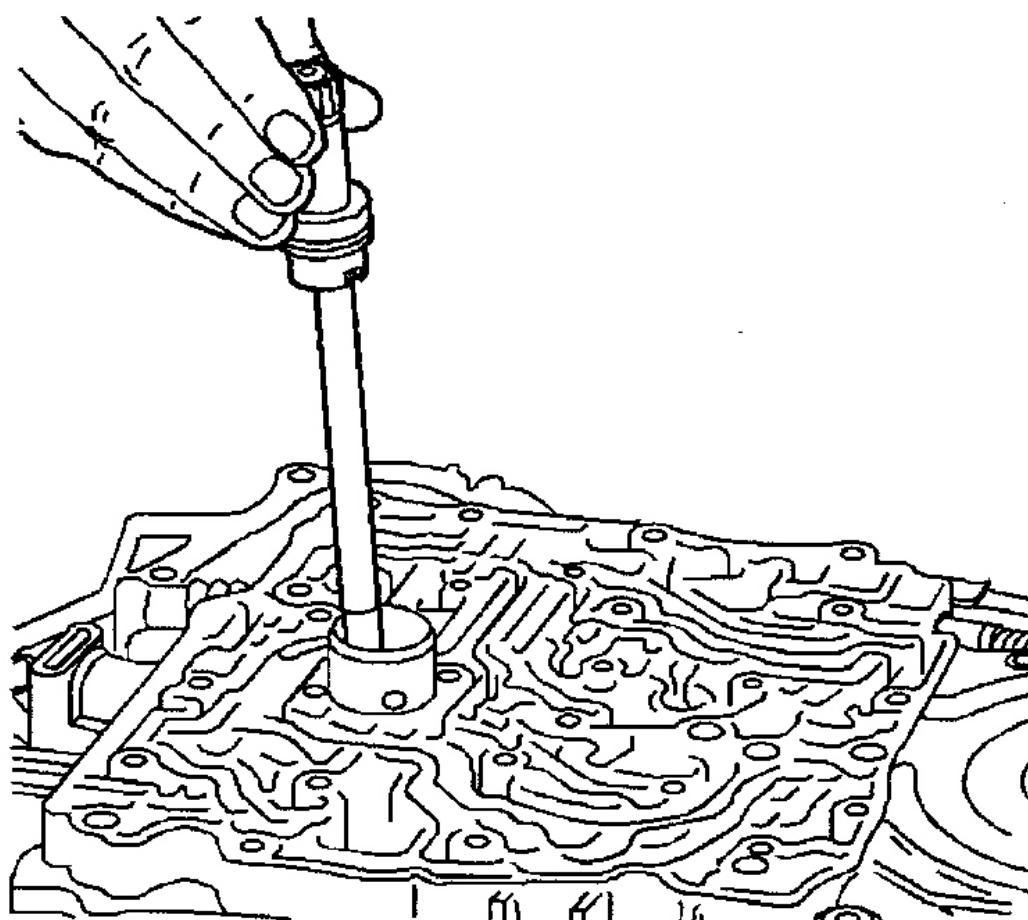


Fig. 53: Locating Case Cover Check Balls
Courtesy of GENERAL MOTORS CORP.



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Fig. 54: Locating Control Valve Body Check Balls
Courtesy of GENERAL MOTORS CORP.

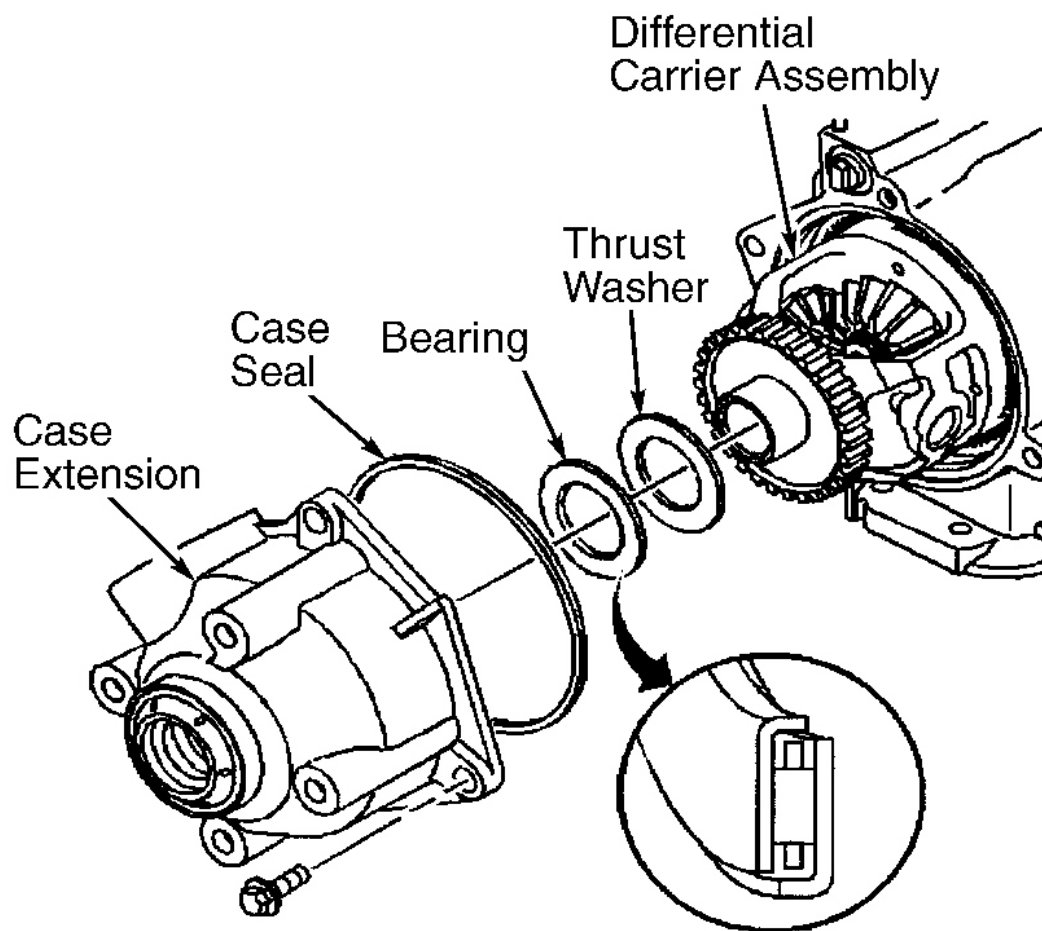


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Fig. 55: Removing & Installing Oil Pump Drive Shaft
Courtesy of GENERAL MOTORS CORP.

OUTPUT SHAFT

1. Remove case extension bolts. Remove case extension and extension seal. See **Fig. 56**. Leave front differential carrier thrust washer and bearing on carrier. Rotate differential carrier until differential carrier pinion shaft is in horizontal position.
2. Place Axle Remover Wedge (J 42562) between end of output shaft and differential pinion shaft. Using hammer, strike axle removal wedge to compress snap ring and push output shaft from differential side gear. See **Fig. 57**. Remove differential carrier assembly and snap ring from output shaft. See **Fig. 58**. Remove output shaft assembly. See **Fig. 59**.



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Fig. 56: Removing & Installing Case Extension
Courtesy of GENERAL MOTORS CORP.

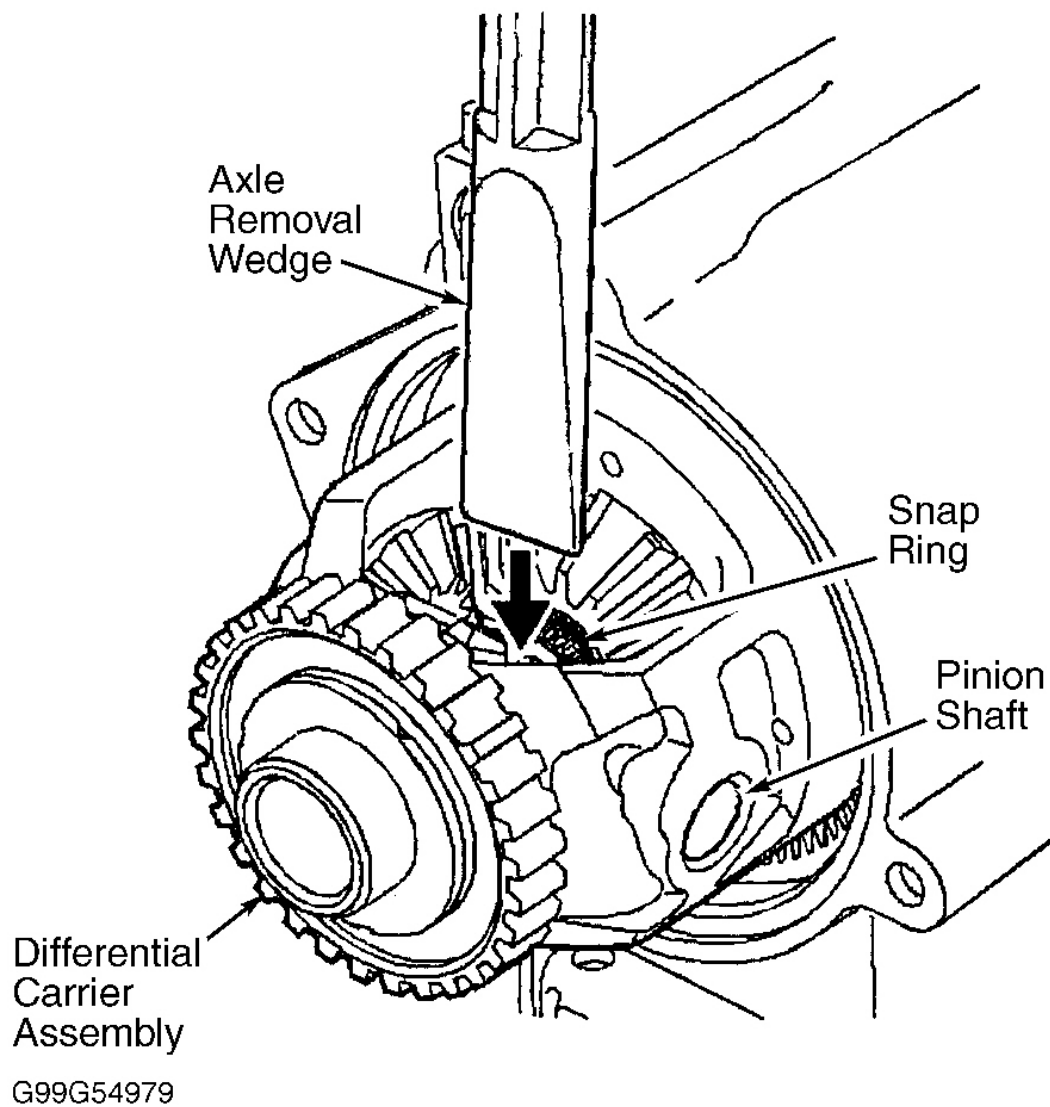
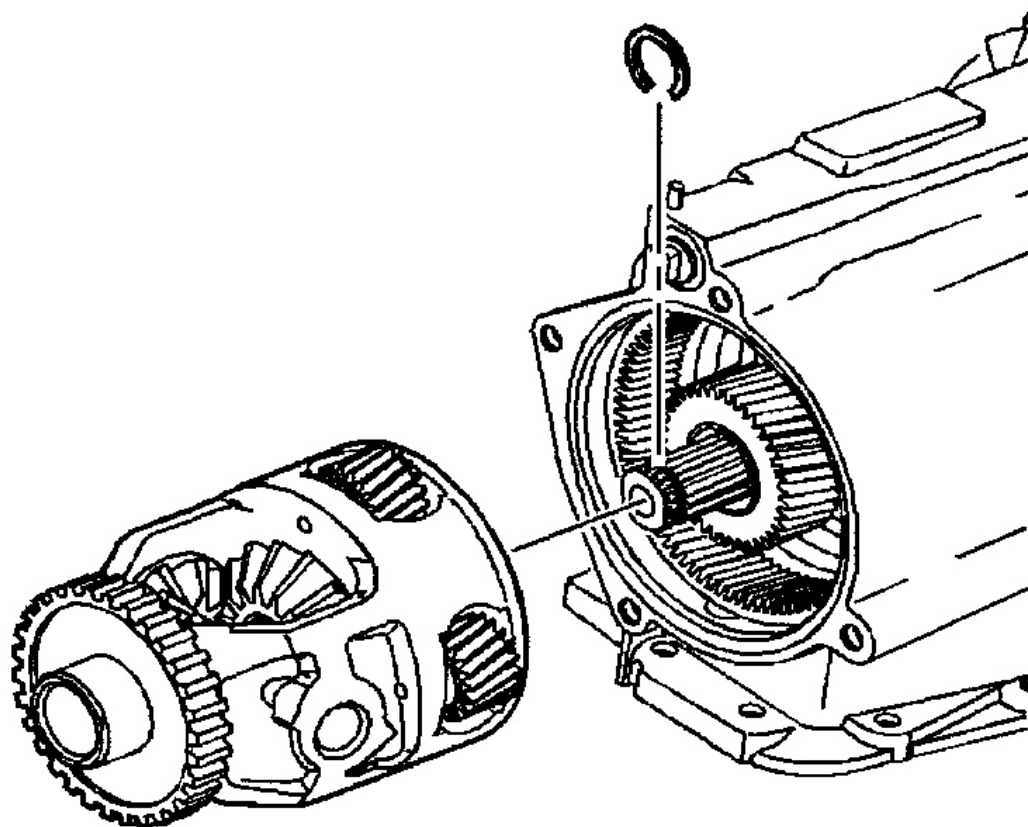
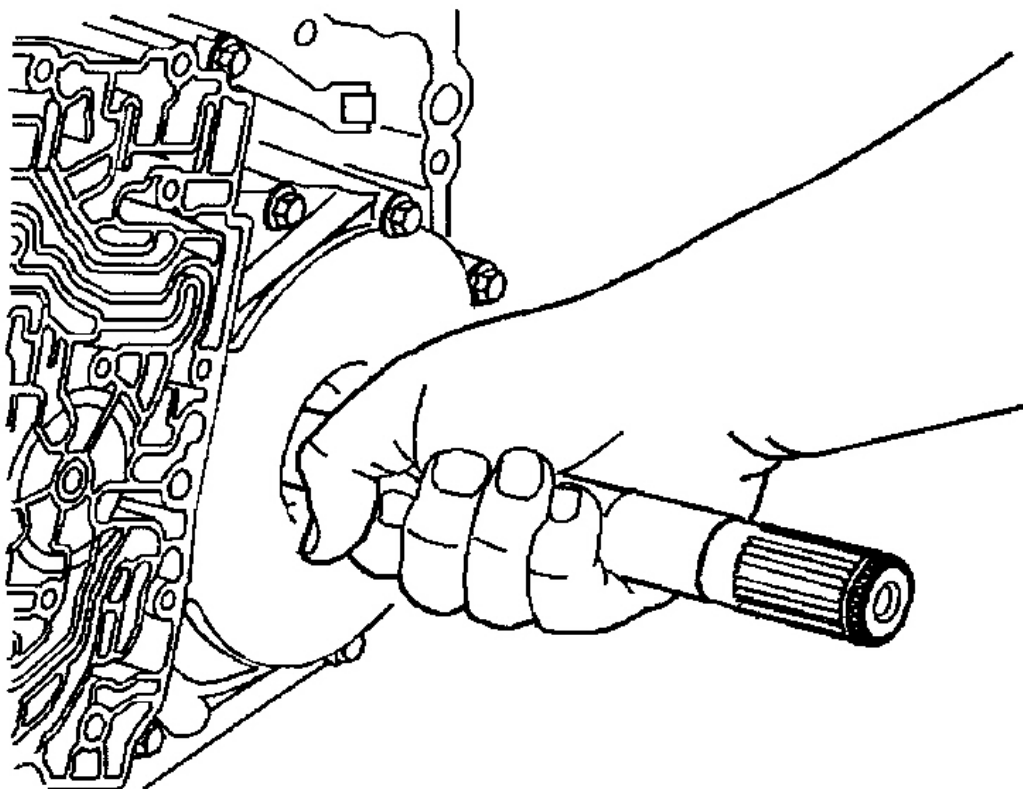


Fig. 57: Compressing Output Shaft Snap Ring
Courtesy of GENERAL MOTORS CORP.



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Fig. 58: Removing Differential Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

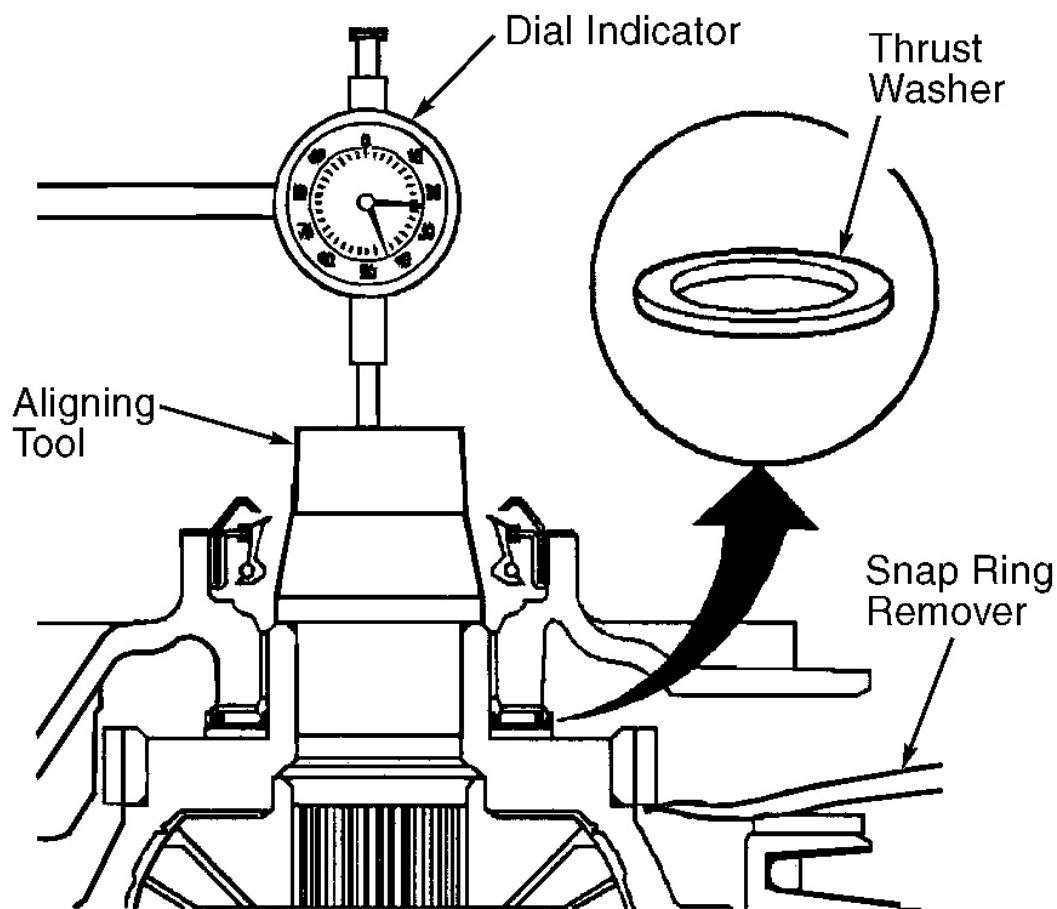


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Fig. 59: Removing Output Shaft
Courtesy of GENERAL MOTORS CORP.

FRONT DIFFERENTIAL CARRIER END PLAY CHECK

1. Ensure thrust washer and bearing are on front differential carrier. Install case extension seal onto case extension, if removed. Install case extension onto transaxle. See **Fig. 56**. Install 2 case extension bolts. DO NOT tighten bolts to specification. Only tighten bolts until case extension is fully seated.
2. Position transaxle with case extension facing up. Install Aligning Tool (J-26958) and dial indicator. See **Fig. 60**. Zero dial indicator. Use Snap Ring Remover (J-28585) or large screwdriver to lift front differential carrier. Pry up on VSS reluctor wheel through sensor hole in case extension.
3. Note dial indicator measurement. End play should be .005-.025" (.13-.64 mm). Record measurement for reassembly reference. If dial indicator reading is less than .005" (.13 mm), install next smaller size thrust washer, and check end play. If dial indicator reading is more than .025" (.64 mm), install next larger size thrust washer, and check end play. For available thrust washer sizes, see **CARRIER-TO-CASE SELECTIVE THRUST WASHER SIZES** table under TRANSAXLE REASSEMBLY.

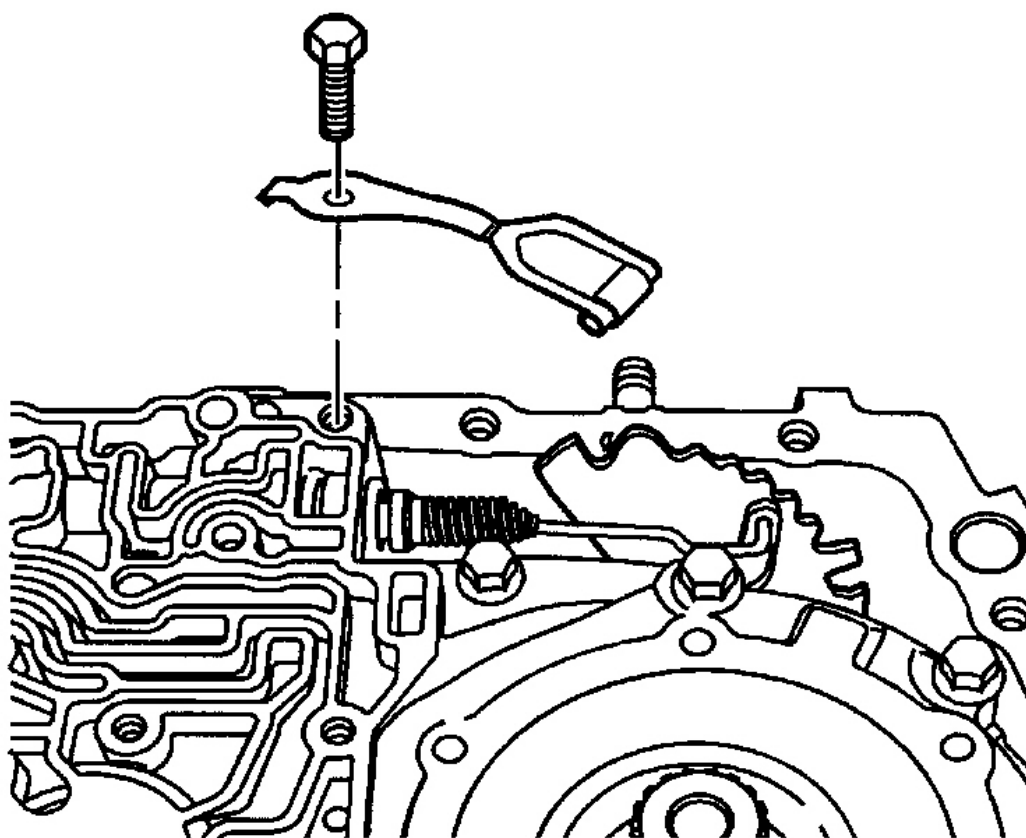


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Fig. 60: Measuring Front Differential Carrier End Play
Courtesy of GENERAL MOTORS CORP.

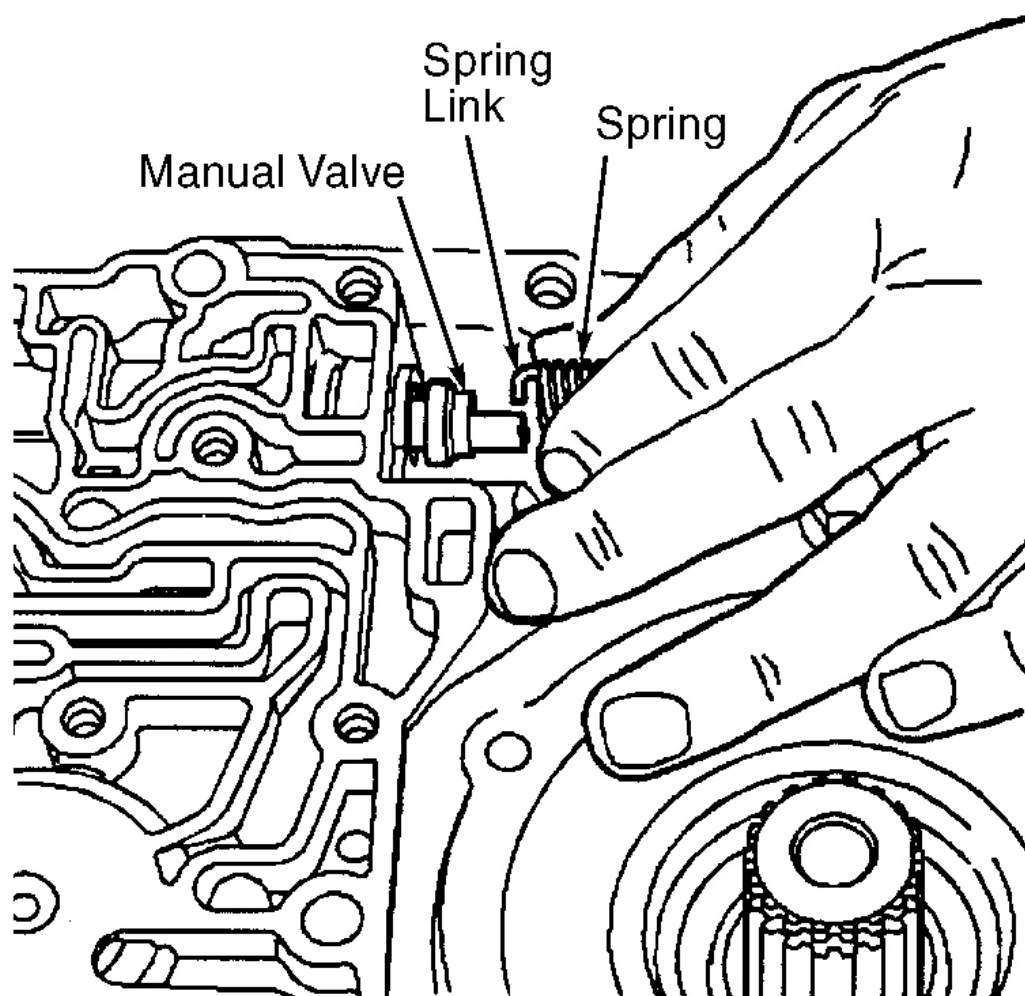
MANUAL VALVE LINK & OIL DAM

1. Remove manual shift detent bolt and manual shift detent. See **Fig. 61**. Compress manual valve link spring. Lift link off manual valve. See **Fig. 62**.
2. Position manual valve so valve will not interfere with case cover removal. Remove oil dam from case. See **Fig. 63**. Using small screwdriver, pry input speed sensor clip out of case cover. Use care when handling speed sensor. Carefully pull input speed sensor out of case cover. See **Fig. 64**.



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Fig. 61: Removing & Installing Manual Shift Detent
Courtesy of GENERAL MOTORS CORP.



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Fig. 62: Removing Spring Link From Manual Valve
Courtesy of GENERAL MOTORS CORP.

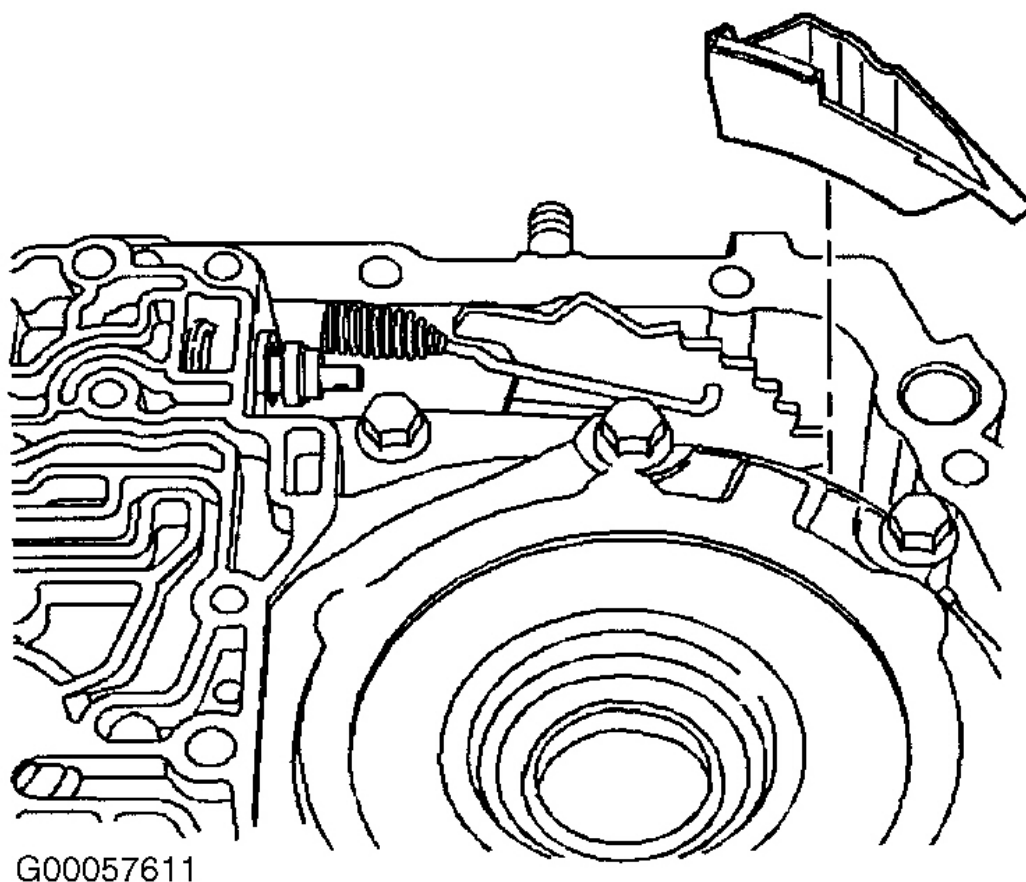
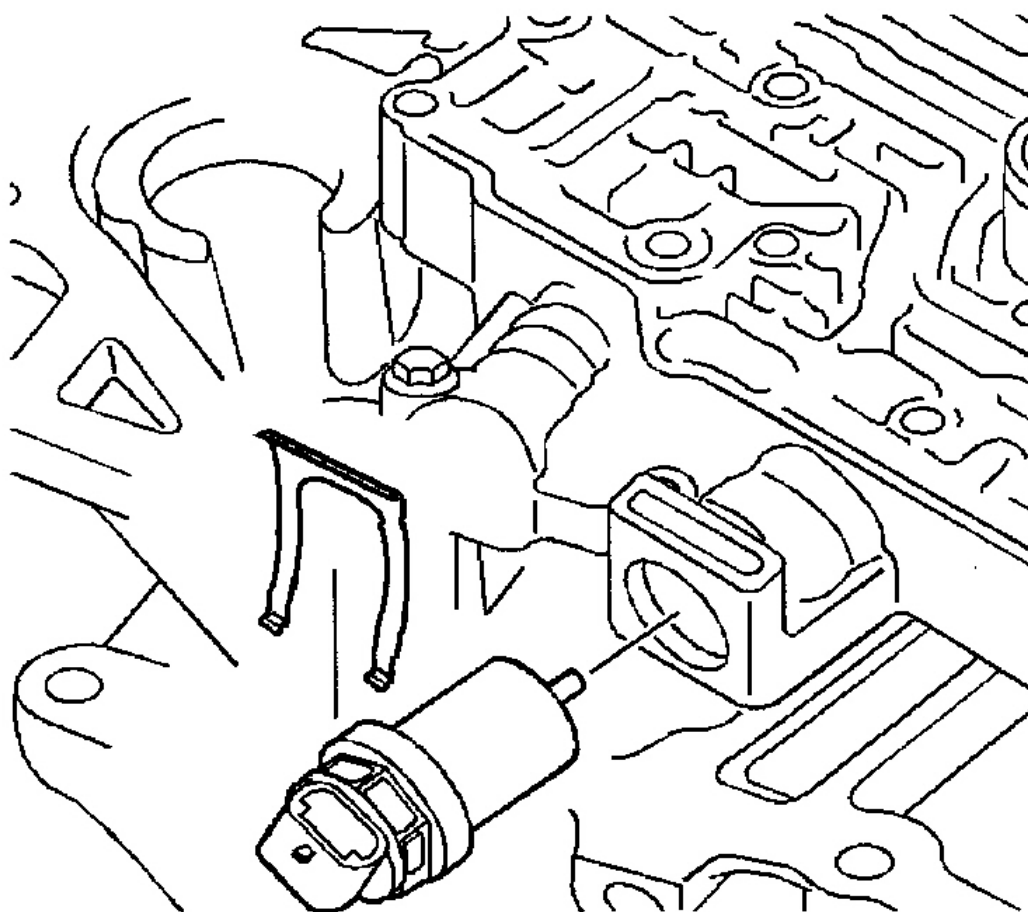


Fig. 63: Removing & Installing Oil Dam
Courtesy of GENERAL MOTORS CORP.

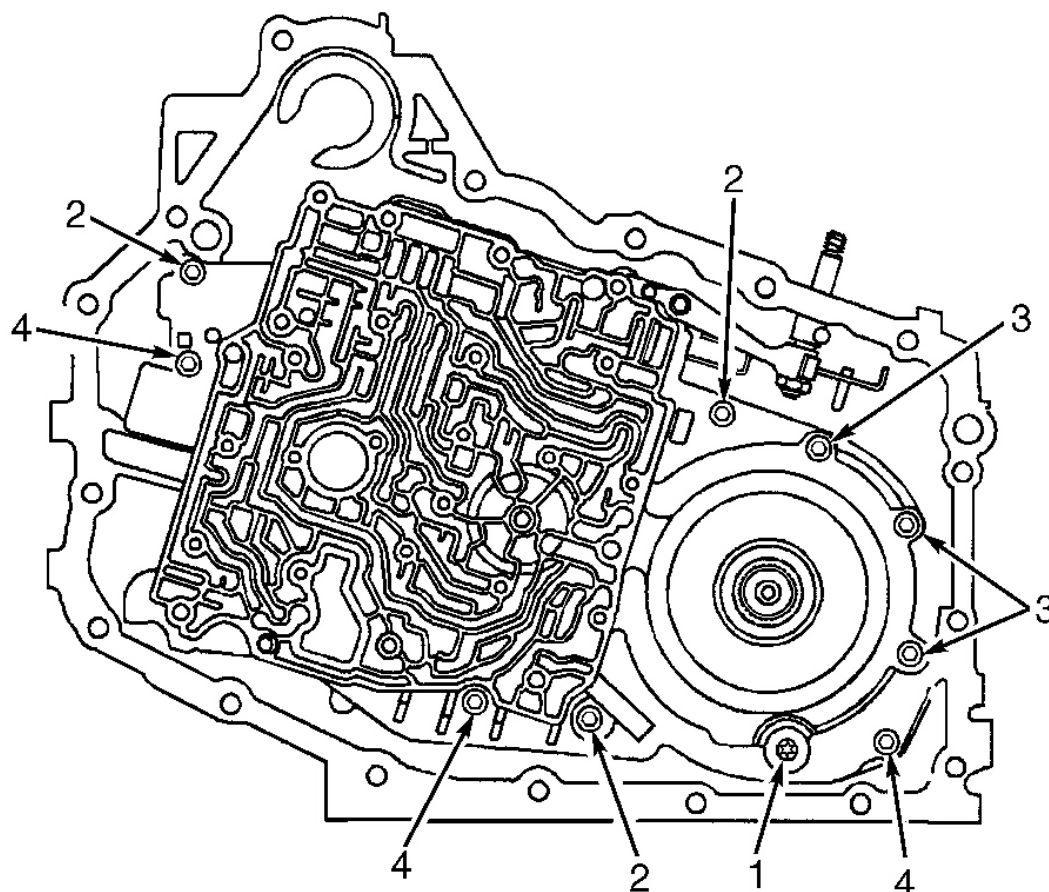


G00057612

Fig. 64: Removing & Installing Input Speed Sensor
Courtesy of GENERAL MOTORS CORP.

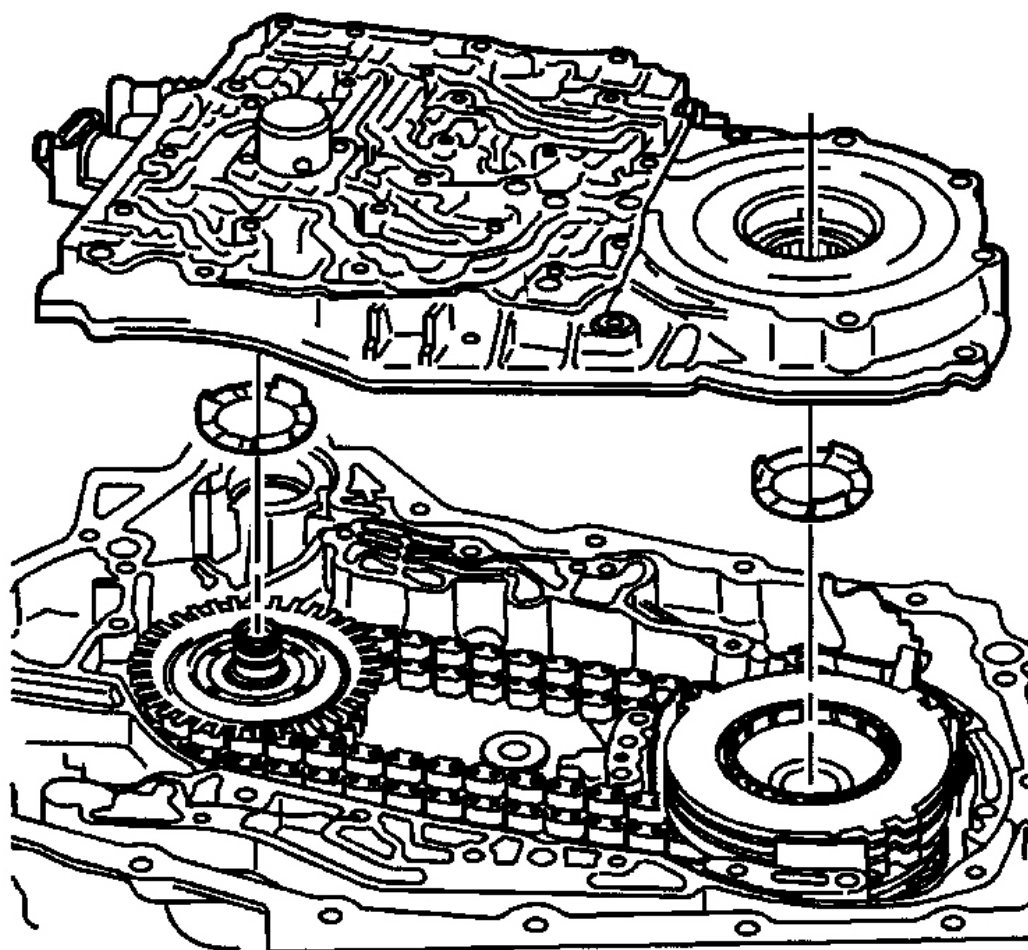
CASE COVER & GASKETS

Remove indicated case cover bolts. See **Fig. 65**. Hold manual valve in place. Lift case cover and thrust washers off case. See **Fig. 66**. Remove upper and lower case cover gaskets. See **Fig. 67**.



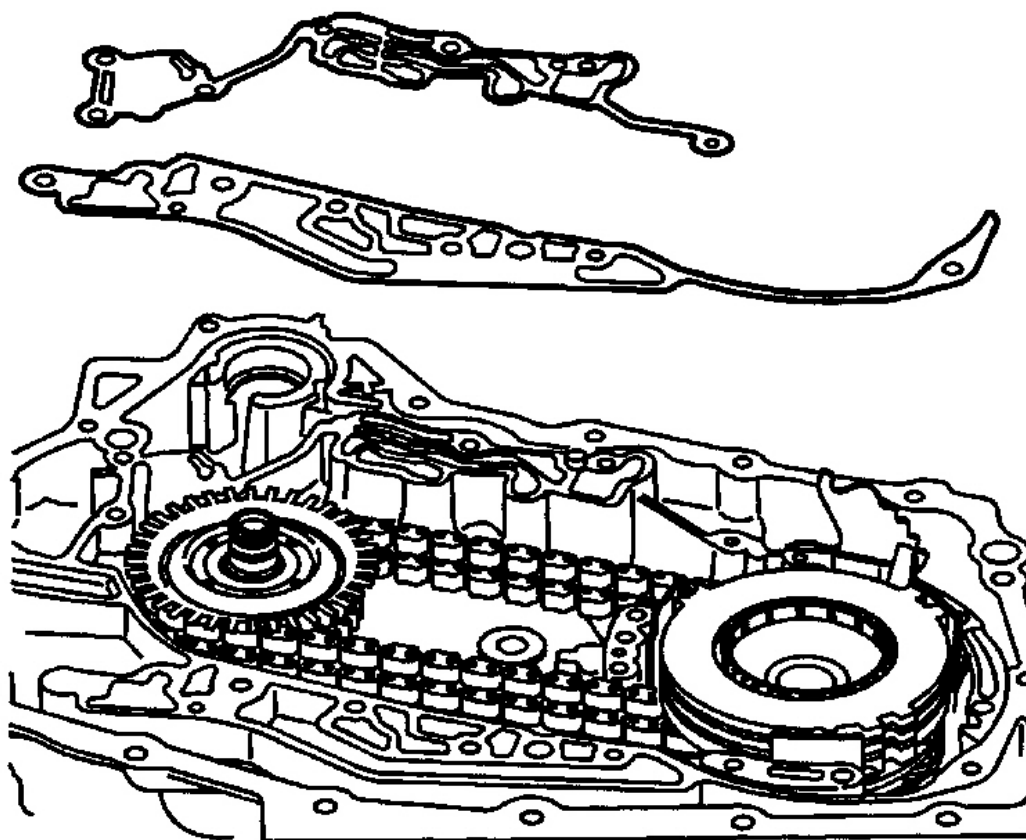
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Fig. 65: Identifying Case Cover Bolt Locations
Courtesy of GENERAL MOTORS CORP.



G00057613

Fig. 66: Removing & Installing Case Cover
Courtesy of GENERAL MOTORS CORP.



G00057614

Fig. 67: Removing & Installing Case Cover Gaskets
Courtesy of GENERAL MOTORS CORP.

4TH CLUTCH SHAFT & PLATES

Remove 4th clutch backing plate, composition plates and steel plates. Remove 4th clutch shaft. Remove drive link lube scoop. See **Fig. 68**.

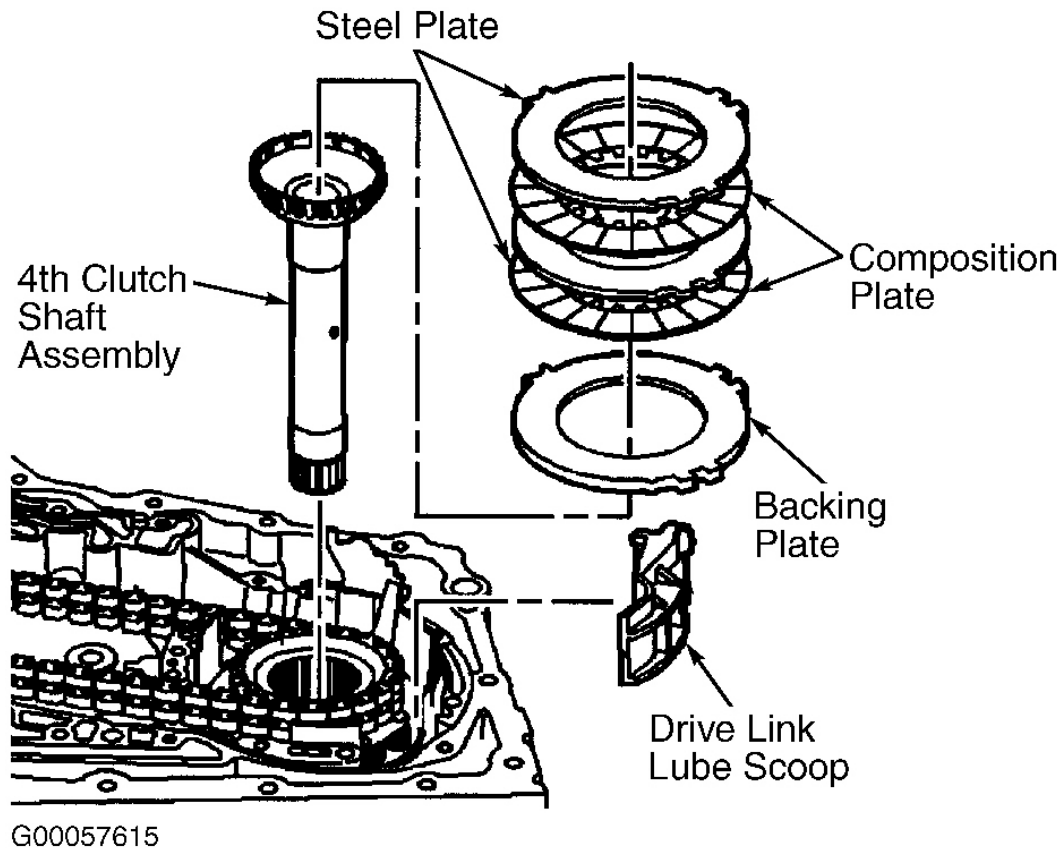


Fig. 68: Removing & Installing 4th Clutch Components
 Courtesy of GENERAL MOTORS CORP.

DRIVE & DRIVEN SPROCKETS

Drive Chain (Drive Link) Stretch Check

Ensure driven sprocket support assembly and both sprockets are fully seated. Pull drive link toward case at indicated location. See **Fig. 69**. Measure distance between case and drive link. If measurement is .126" (3.2 mm) or more, drive link may be reused. If measurement is less than .126" (3.2 mm), replace drive link.

Drive & Driven Sprocket Disassembly

1. Remove 4th clutch shaft thrust washer. Remove drive sprocket thrust washer. Washer may be stuck to case cover. Remove VSS reluctor wheel. Note location of drive link assembly master link. Master link is different color than other links and may be facing up or down toward case.

CAUTION: Note drive link direction prior to removal. Drive link must be installed in same direction during reassembly.

2. Lift drive and driven sprockets with drive link out of case. Lift both sides evenly. It may be necessary to tap turbine shaft up gently with a rubber mallet. Remove drive and driven sprocket thrust washers. See **Fig. 70**. Thrust washers may be stuck to sprockets.

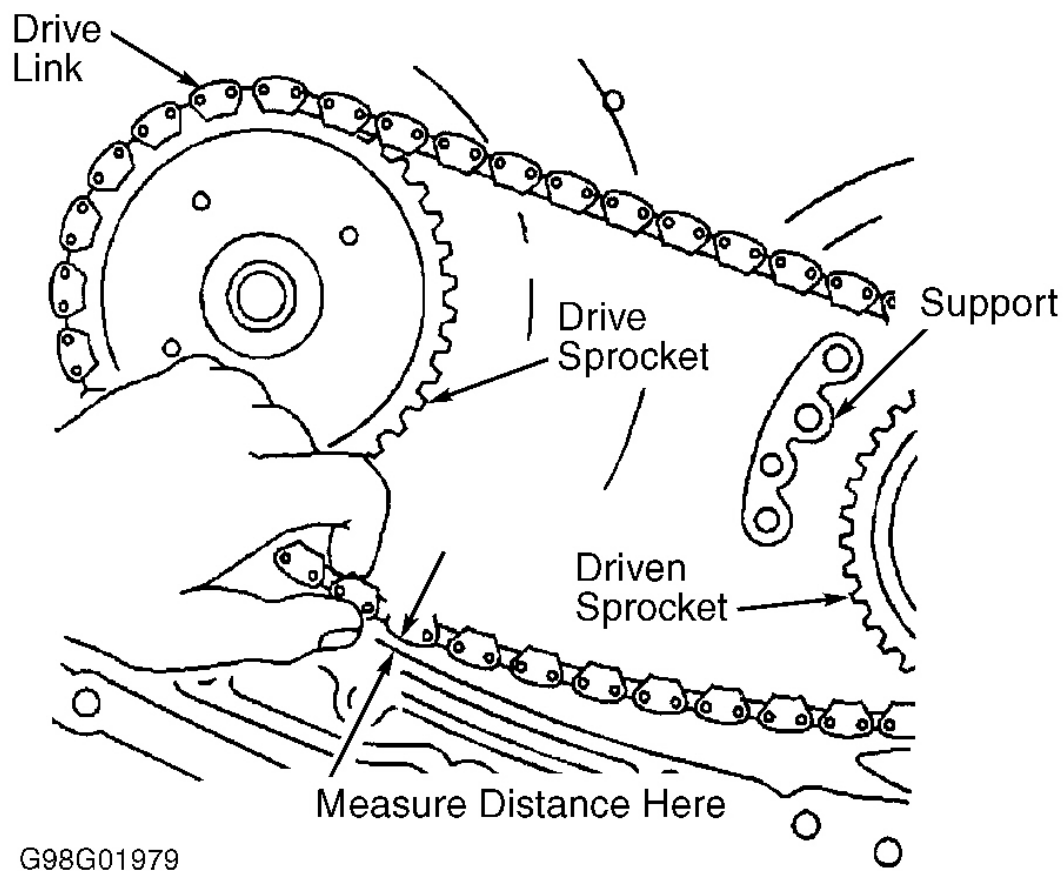
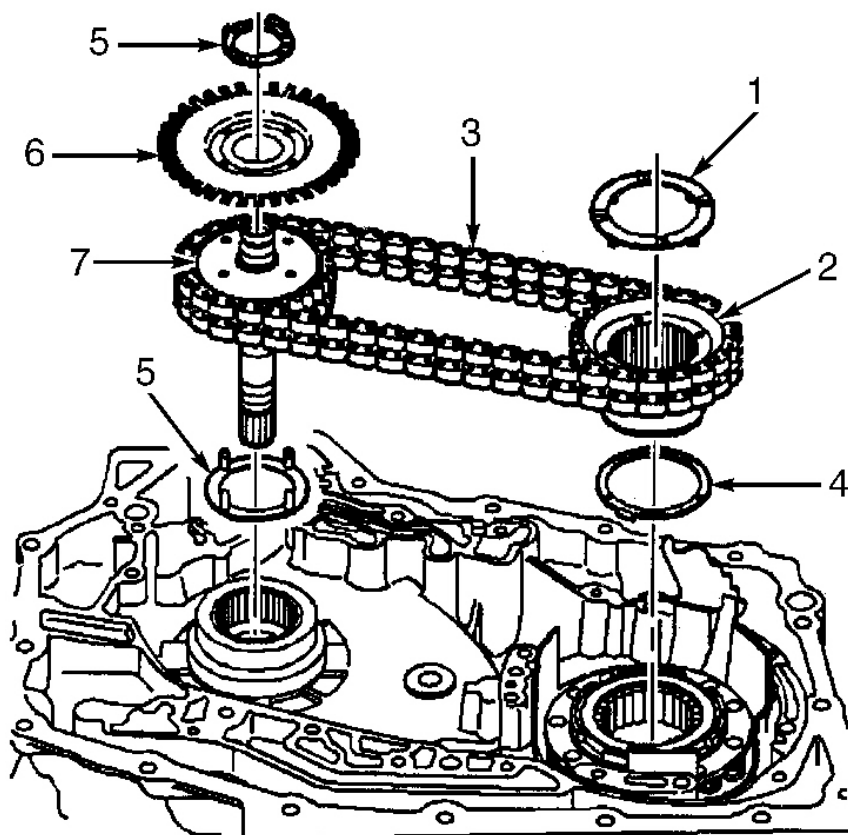


Fig. 69: Checking Drive Chain (Drive Link) Stretch
Courtesy of GENERAL MOTORS CORP.



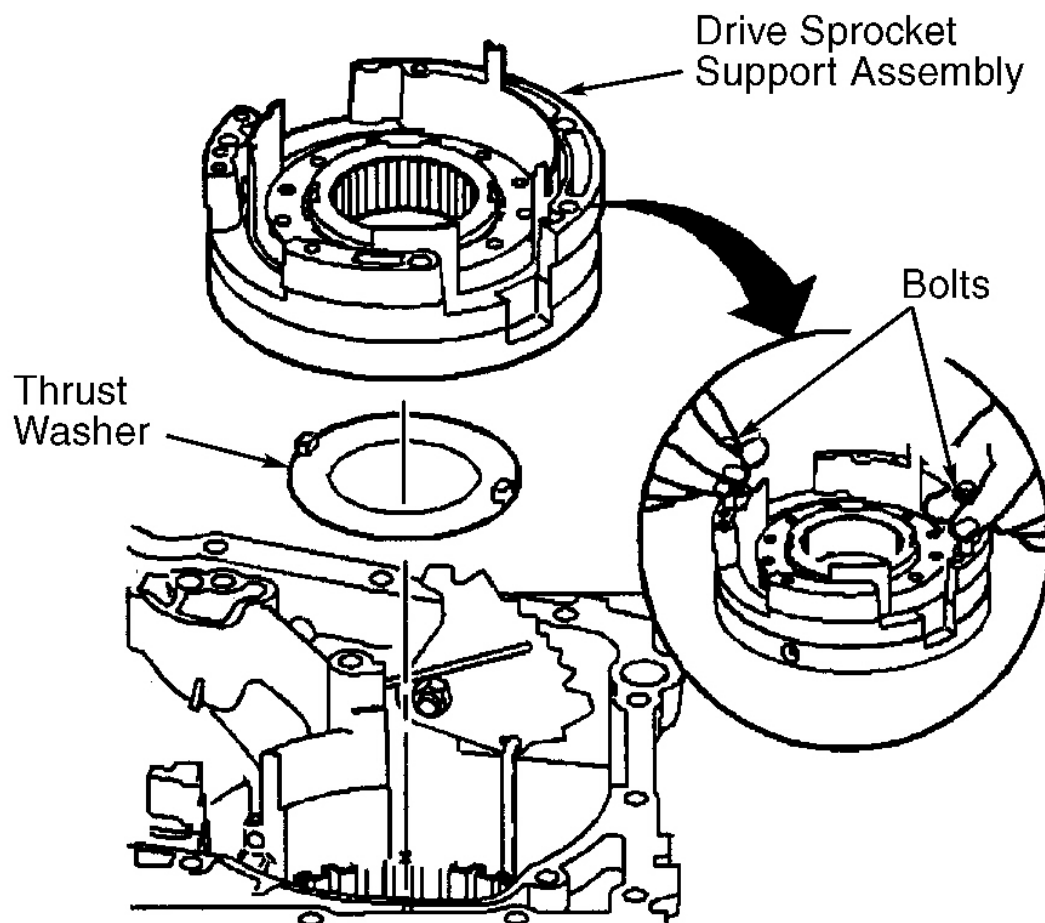
- | | |
|----------------------------------|---------------------------------|
| 1. Thrust Washer (4th Clutch) | 5. Drive Sprocket Thrust Washer |
| 2. Driven Sprocket | 6. VSS Reluctor Wheel |
| 3. Drive Link Assembly | 7. Drive Sprocket |
| 4. Driven Sprocket Thrust Washer | |

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Fig. 70: Removing & Installing Drive & Driven Sprockets
 Courtesy of GENERAL MOTORS CORP.

DRIVEN SPROCKET SUPPORT ASSEMBLY

Insert 2 case cover bolts into driven sprocket support assembly. See **Fig. 71**. Grasp bolts and lift support assembly. Remove thrust washer from 2nd clutch housing. Washer may be stuck to support assembly.

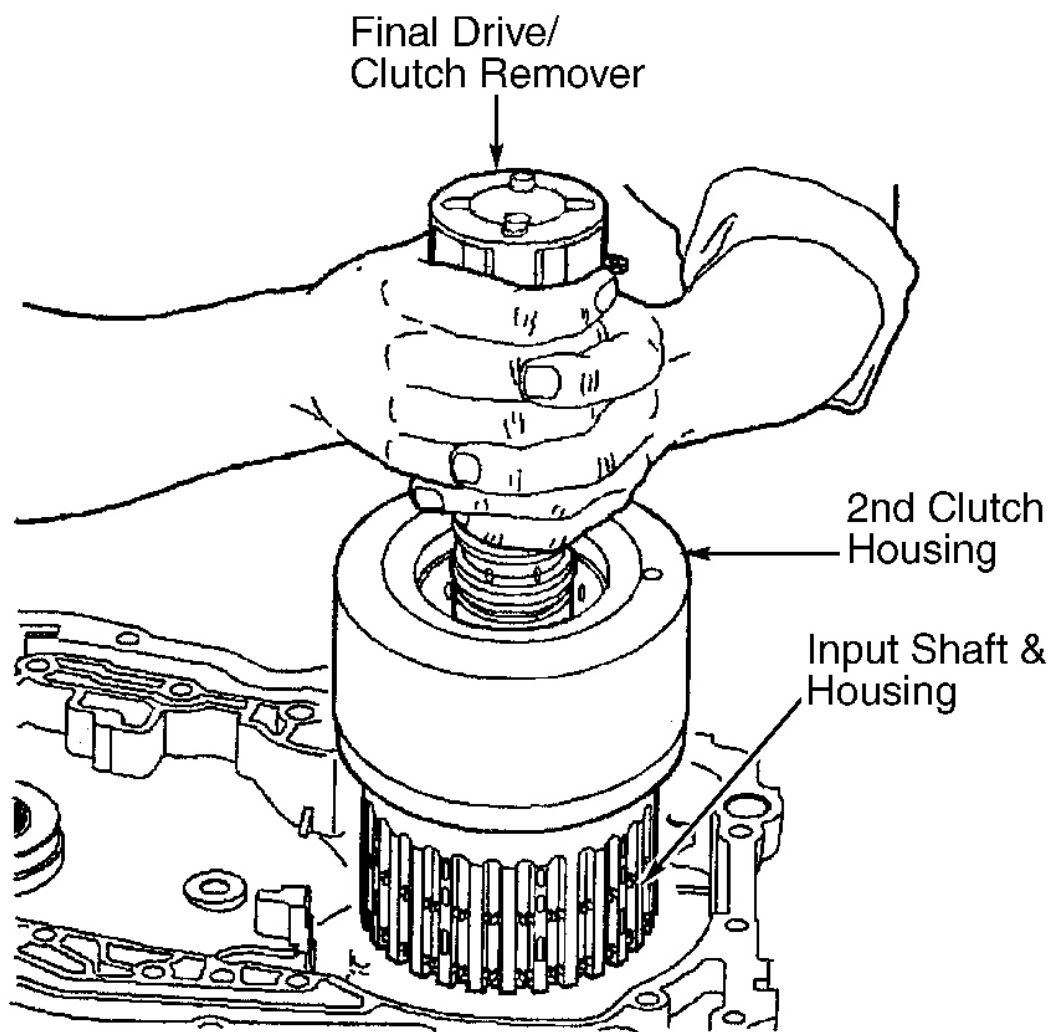


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Fig. 71: Removing & Installing Driven Sprocket Support Assembly
Courtesy of GENERAL MOTORS CORP.

INPUT & 2ND CLUTCH ASSEMBLIES

1. Adjust collar on Final Drive/Clutch Remover/Installer (J-33381-A) to ensure threaded rod is fully loosened. Install Remover/Installer into 2nd clutch housing assembly. Tighten threaded rod until rod is finger tight. Lift up on remover/installer with 2nd clutch and input clutch assemblies attached. Sprag clutch assemblies will also be attached. See **Fig. 72**.
2. Place complete assembly on bench. Loosen threaded rod and remove remover/installer. Lift 2nd clutch housing assembly off input clutch housing. Remove input clutch housing thrust bearing from input housing. Remove selective thrust washer from input clutch housing. See **Fig. 73**.



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Fig. 72: Removing & Installing Input & 2nd Clutch Assemblies
Courtesy of GENERAL MOTORS CORP.

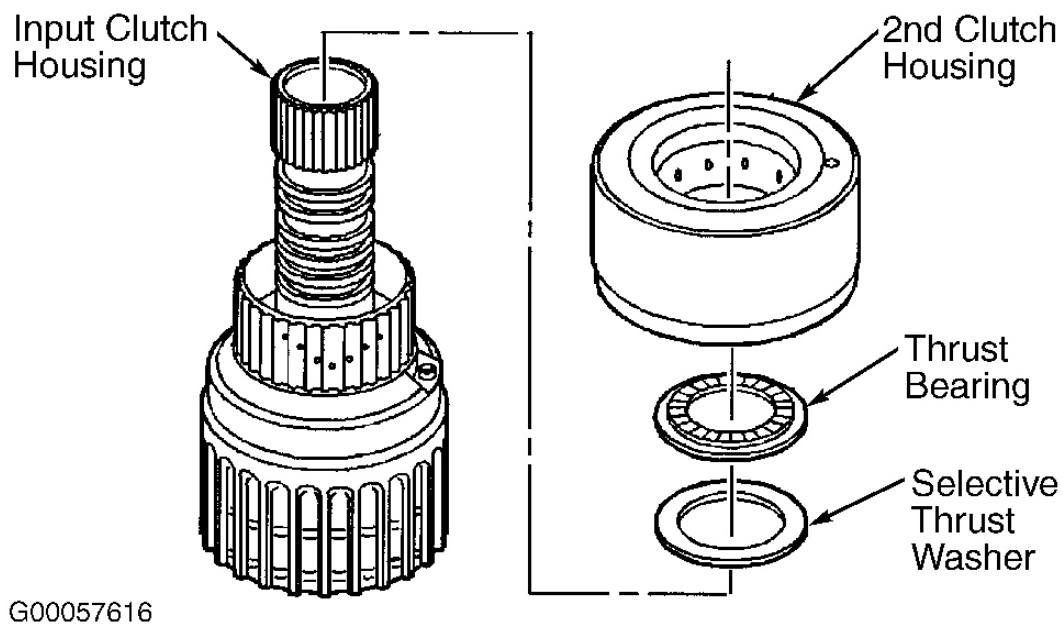
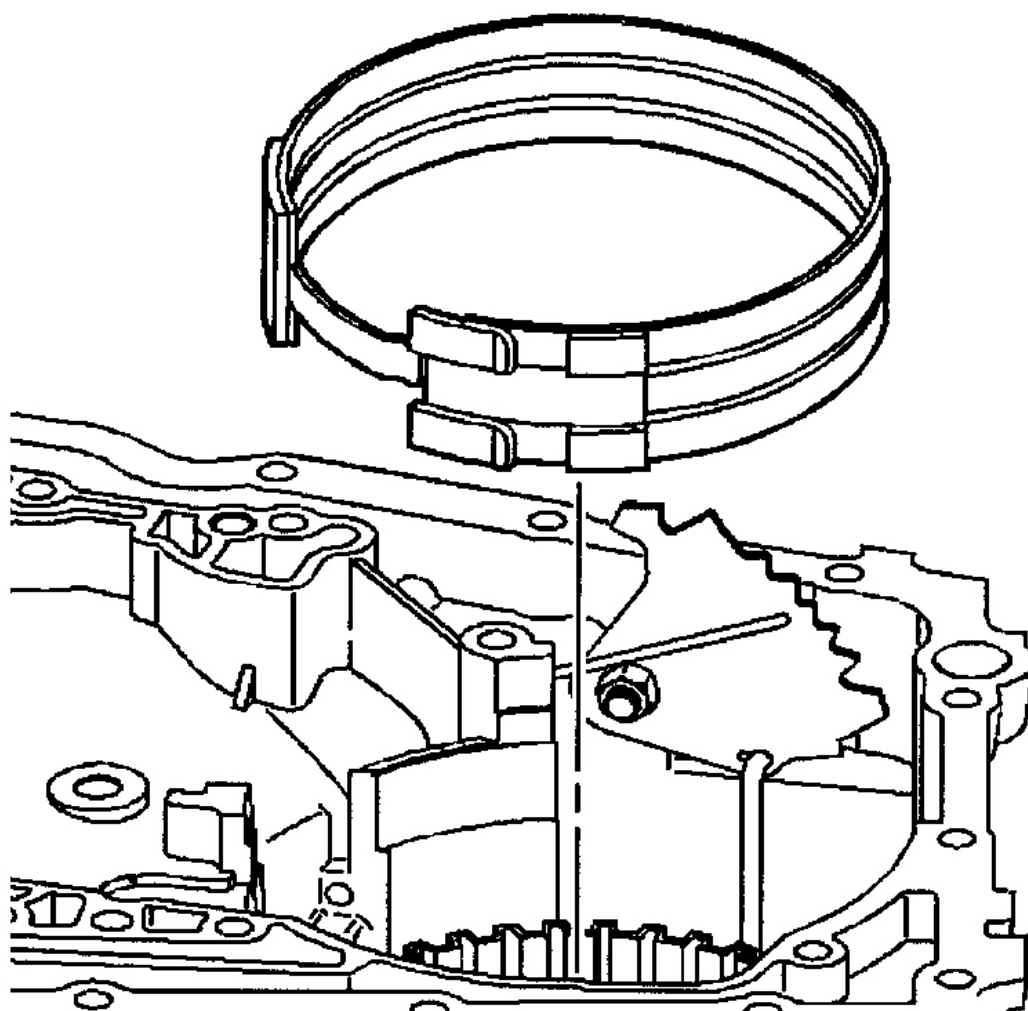


Fig. 73: Removing & Installing 2nd Clutch Housing
Courtesy of GENERAL MOTORS CORP.

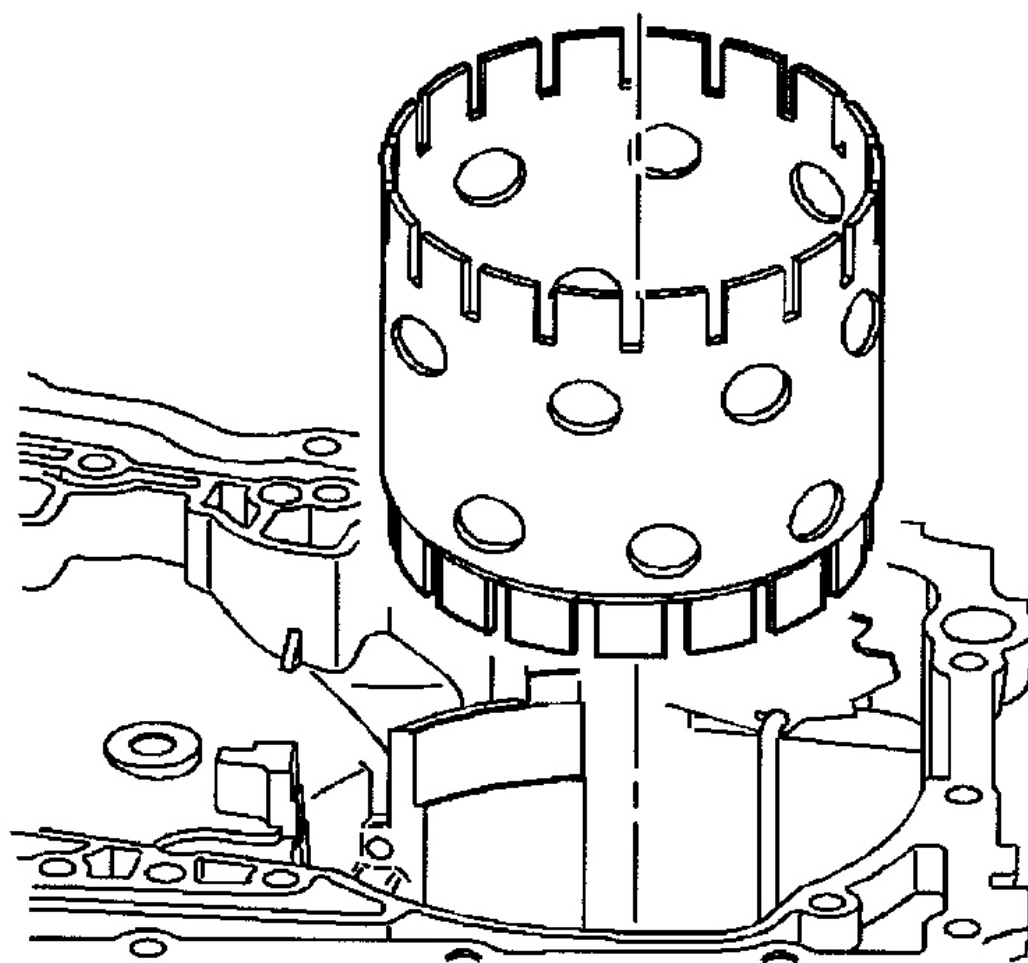
REVERSE BAND & REACTION DRUM

Tilt band to disengage band from anchor pin in case. Remove reverse band. See **Fig. 74**. Lift reverse reaction drum from transaxle case. See **Fig. 75**.



G00057617

Fig. 74: Removing & Installing Reverse Band
Courtesy of GENERAL MOTORS CORP.



G00057618

Fig. 75: Removing & Installing Reverse Reaction Drum
Courtesy of GENERAL MOTORS CORP.

INPUT CLUTCH HOUSING END PLAY CHECK

All Wheel Drive

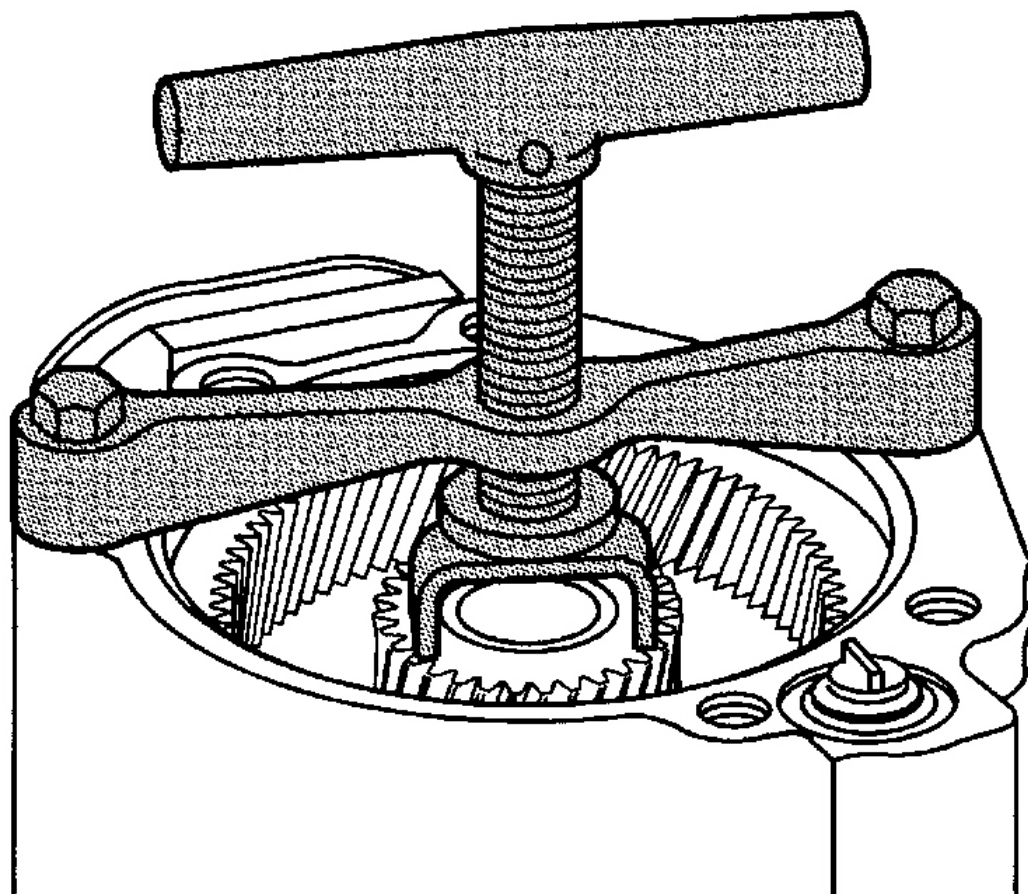
1. Install final drive sun gear shaft. See **Fig. 37**. Use petroleum jelly to retain parking gear thrust bearing to parking gear. Install parking gear thrust bearing and parking gear. See **Fig. 36**. Install final drive sun gear. See **Fig. 34**.
2. Install End Play Checking Tool (J-44472). See **Fig. 76**. Install bolts and tighten securely to prevent tool deflection during end play measurement.
3. Install Final Drive/Clutch Remover/Installer (J-33381-A) into input clutch housing and sprag clutch assemblies. Tighten threaded rod until rod is finger tight. Use Remover/Installer to lift input clutch

housing. See **Fig. 72**. Install input clutch housing assembly into case. Ensure assembly is fully seated. Ensure selective thrust washer is NOT installed with input clutch housing.

4. Using 2 bolts, install End Play Gauge (J-33386) onto case. See **Fig. 77**. Tighten bolts to securely hold end play gauge. Tighten end play checking tool finger tight to eliminate differential carrier end play.
5. Install thrust washer from input clutch housing into end play gauge. If thrust washer will not fit into gauge, select next size smaller thrust washer and recheck. Using a feeler gauge, measure end play between end play gauge and thrust washer.
6. Record measurement for proper end play clearance during reassembly. End play should be 0-.006" (0-.15 mm). If end play is within specification, use original thrust washer during transaxle reassembly. If end play is greater than .006" (.15 mm), select next size larger thrust washer and recheck. For input clutch thrust washer identification, see **INPUT CLUTCH THRUST WASHER IDENTIFICATION** table under TRANSAXLE REASSEMBLY.
7. Remove end play checking tool. See **Fig. 76**. Install remover/installer into input clutch housing. Tighten threaded rod of remover/installer until rod is finger tight. Using remover/installer, lift input clutch housing assembly (sprag clutch assemblies will also be attached) from case.
8. Position transaxle so oil pan is facing down. Remove final drive sun gear, parking gear, parking gear thrust bearing and final drive sun gear shaft.

Except All Wheel Drive

1. Install Final Drive/Clutch Remover/Installer (J-33381-A) into input clutch housing and sprag clutch assemblies. Tighten threaded rod until rod is finger tight. Use Remover/Installer to lift input clutch housing. See **Fig. 72**. Install input clutch housing assembly into case. Ensure assembly is fully seated. Ensure selective thrust washer is NOT installed with input clutch housing.
2. Remove remover/installer from input clutch housing. Install case extension with Output Shaft Loading/Aligning Tool (J-26958), Adapter Plug (J-26958-10) and Loading Tool Adapter (J-43425) attached to case extension. See **Fig. 78**. Using 2 bolts, install End Play Gauge (J-33386) onto case. See **Fig. 77**. Tighten bolts to securely hold gauge. Tighten aligning tool finger tight in order to eliminate differential carrier end play. See **Fig. 78**.
3. Install thrust washer from input clutch housing into end play gauge. If thrust washer will not fit into gauge, select next size smaller thrust washer and recheck. Using a feeler gauge, measure end play between end play gauge and thrust washer.
4. Record measurement for proper end play clearance during reassembly. End play should be 0-.006" (0-.15 mm). If end play is within specification, use original thrust washer during transaxle reassembly. If end play is greater than .006" (.15 mm), select next size larger thrust washer and recheck. For input clutch thrust washer identification, see **INPUT CLUTCH THRUST WASHER IDENTIFICATION** table under TRANSAXLE REASSEMBLY.
5. Remove end play gauge. Install remover/installer into input clutch housing. Lift input clutch housing from case. Remove aligning tool, adapter plug and loading tool adapter from case extension.



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Fig. 76: Installing End Play Checking Tool (AWD)
Courtesy of GENERAL MOTORS CORP.

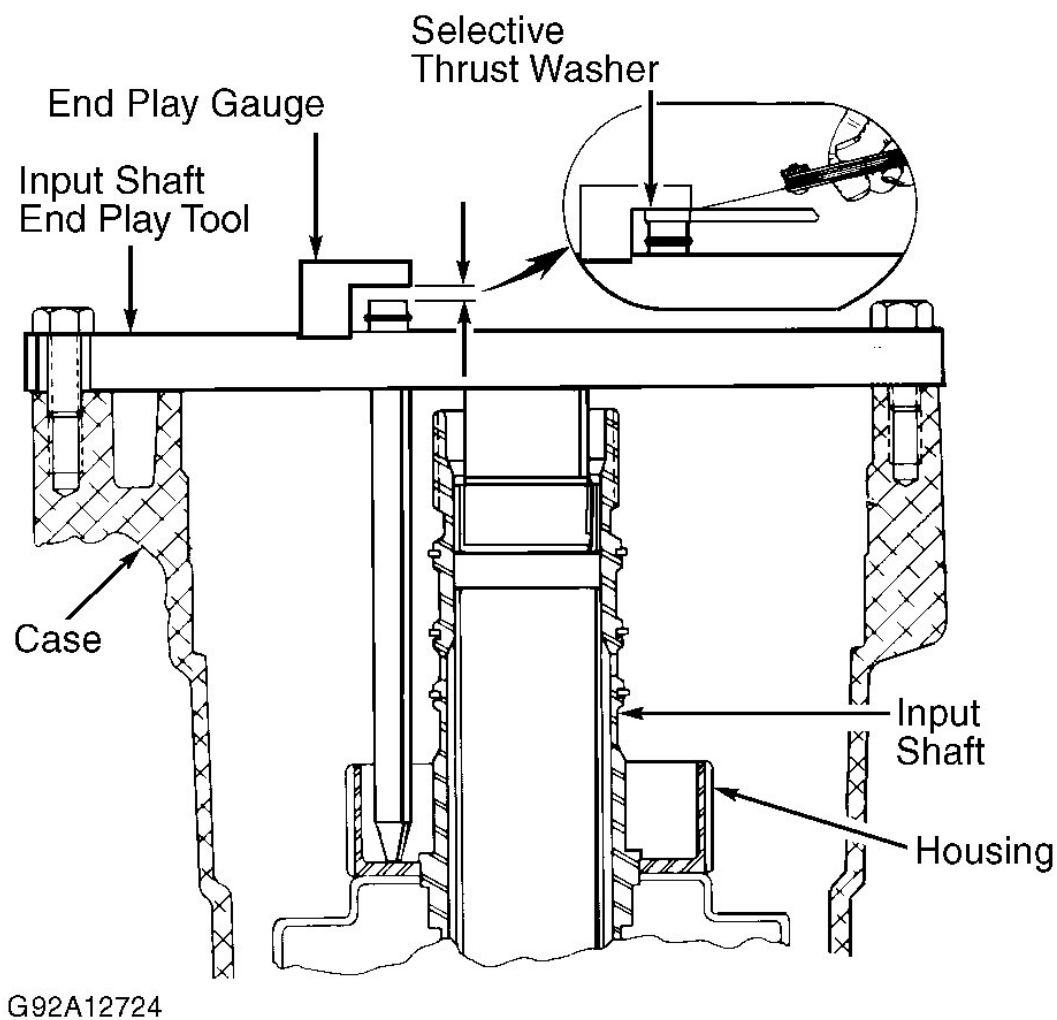
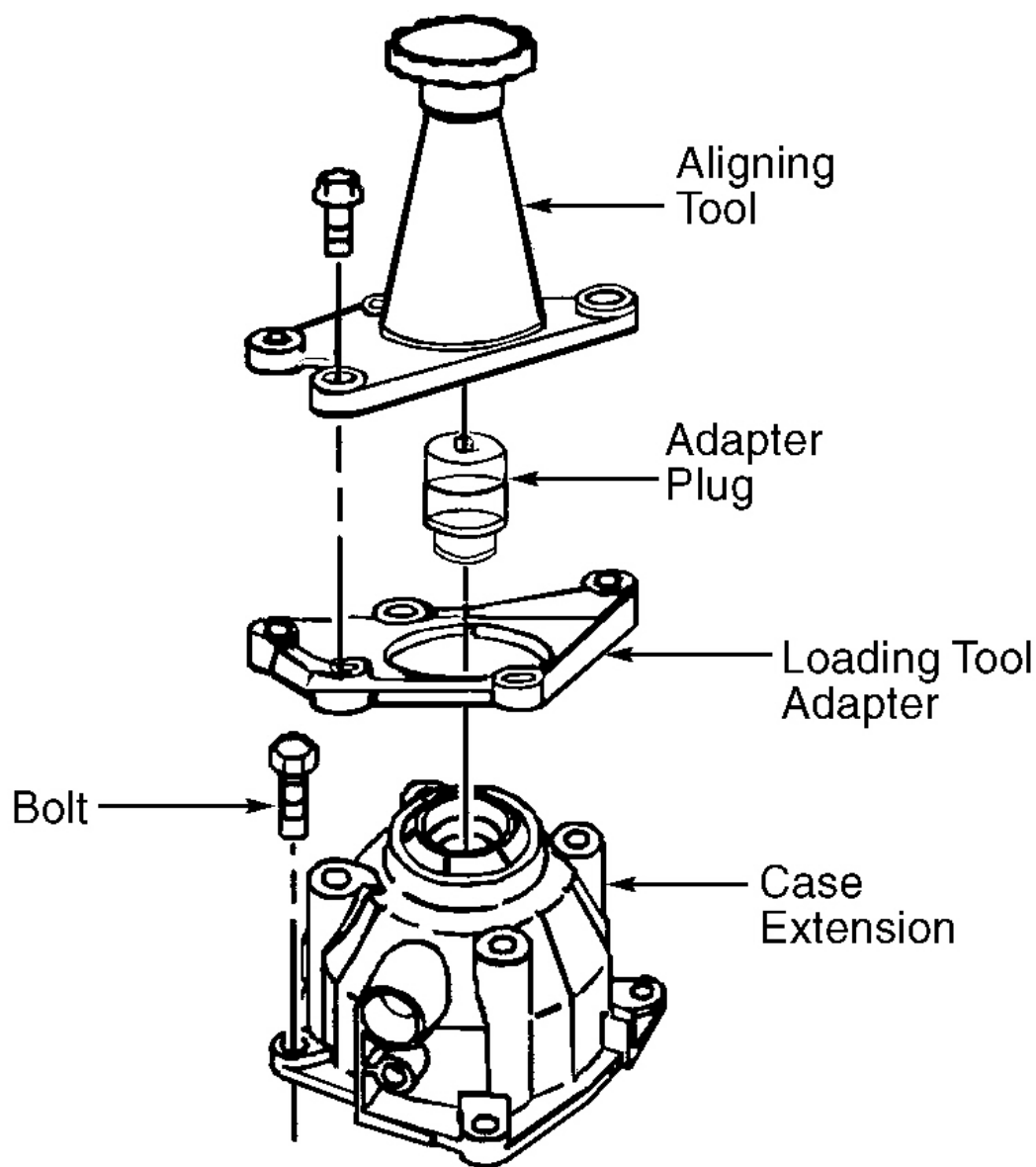


Fig. 77: Checking Input Clutch Housing End Play
 Courtesy of GENERAL MOTORS CORP.



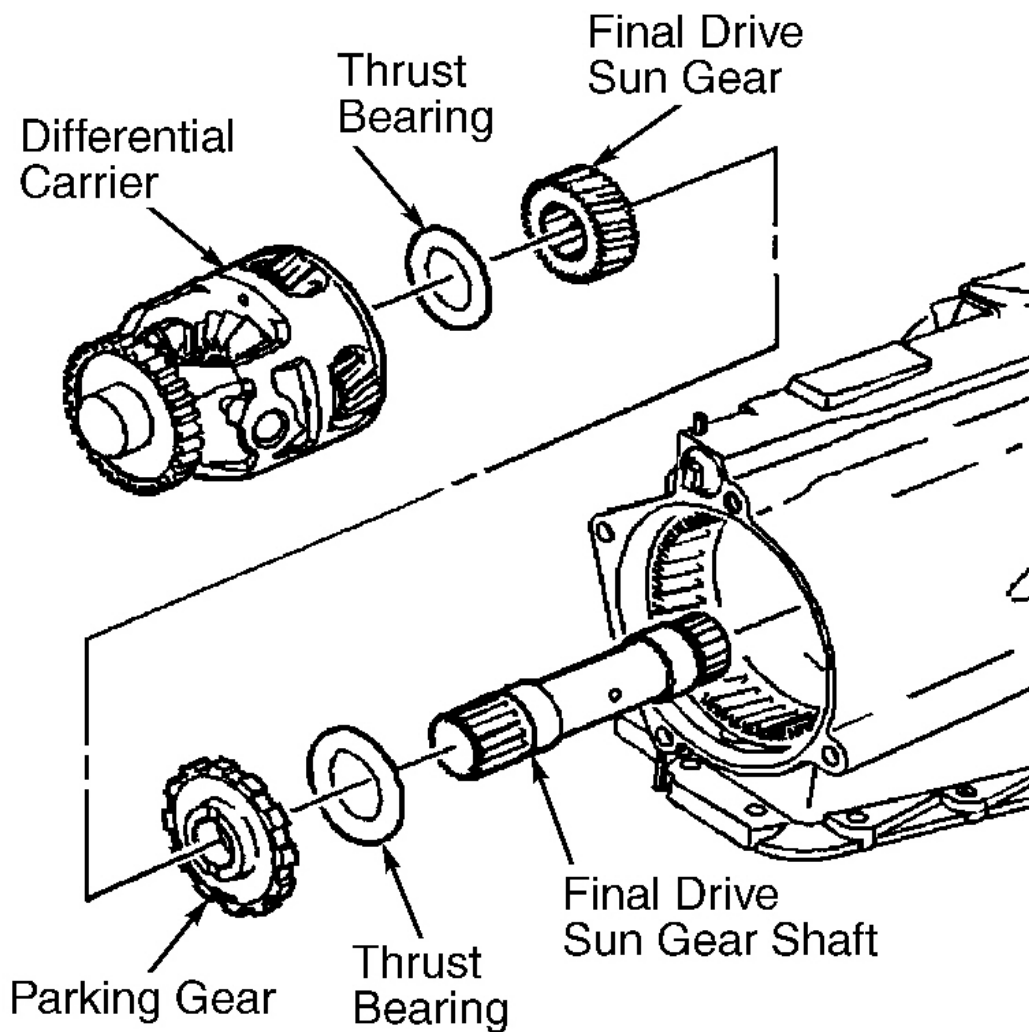
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Fig. 78: Installing Aligning Tool & Adapters To Case Extension
Courtesy of GENERAL MOTORS CORP.

CASE EXTENSION & DIFFERENTIAL CARRIER

Remove case extension bolts. Remove case extension and remove seal. Remove differential carrier thrust washer and thrust bearing. See [Fig. 56](#). Remove differential carrier assembly. Remove differential sun gear shaft. Remove thrust bearing from differential carrier sun gear. Bearing may be stuck to carrier assembly.

Remove differential carrier (final drive) sun gear. Remove parking gear. Remove thrust bearing from differential carrier internal gear. See **Fig. 79**.



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Fig. 79: Removing & Installing Differential Carrier Components
Courtesy of GENERAL MOTORS CORP.

INPUT & REACTION CARRIER

Position transaxle with case cover facing up. Remove input carrier assembly. See **Fig. 80**. Remove input carrier and reaction carrier lube dam. See **Fig. 81**. Lube dam may be stuck to input carrier assembly. Remove thrust bearing from reaction carrier. Remove reaction carrier assembly.

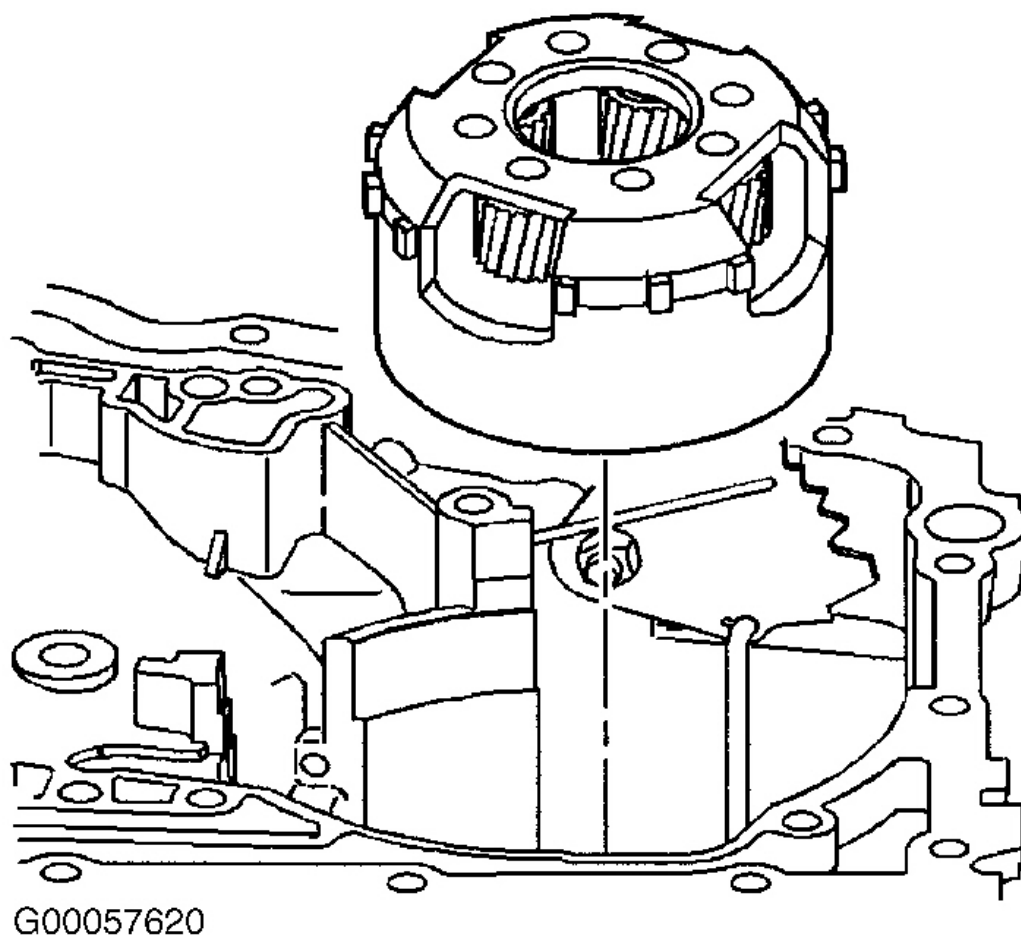


Fig. 80: Removing Input Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

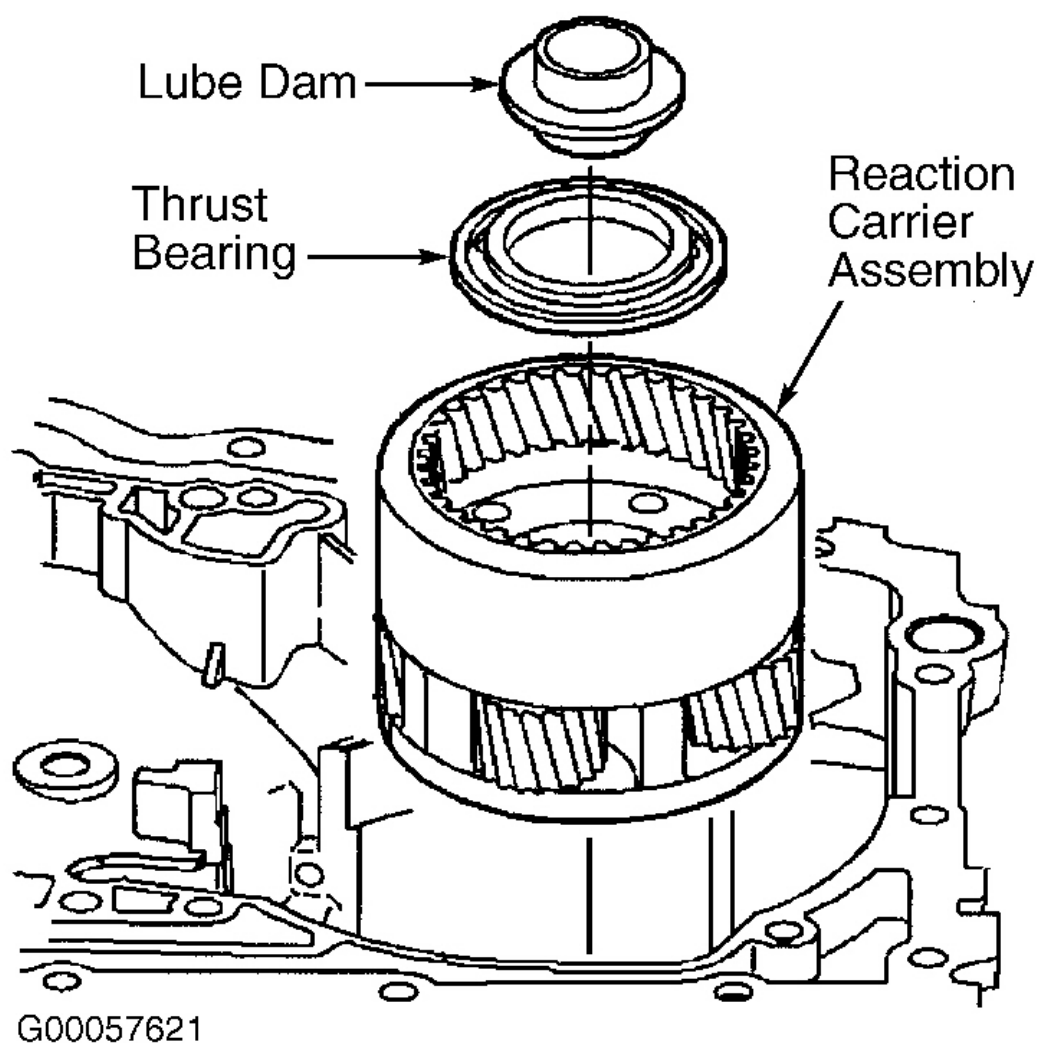
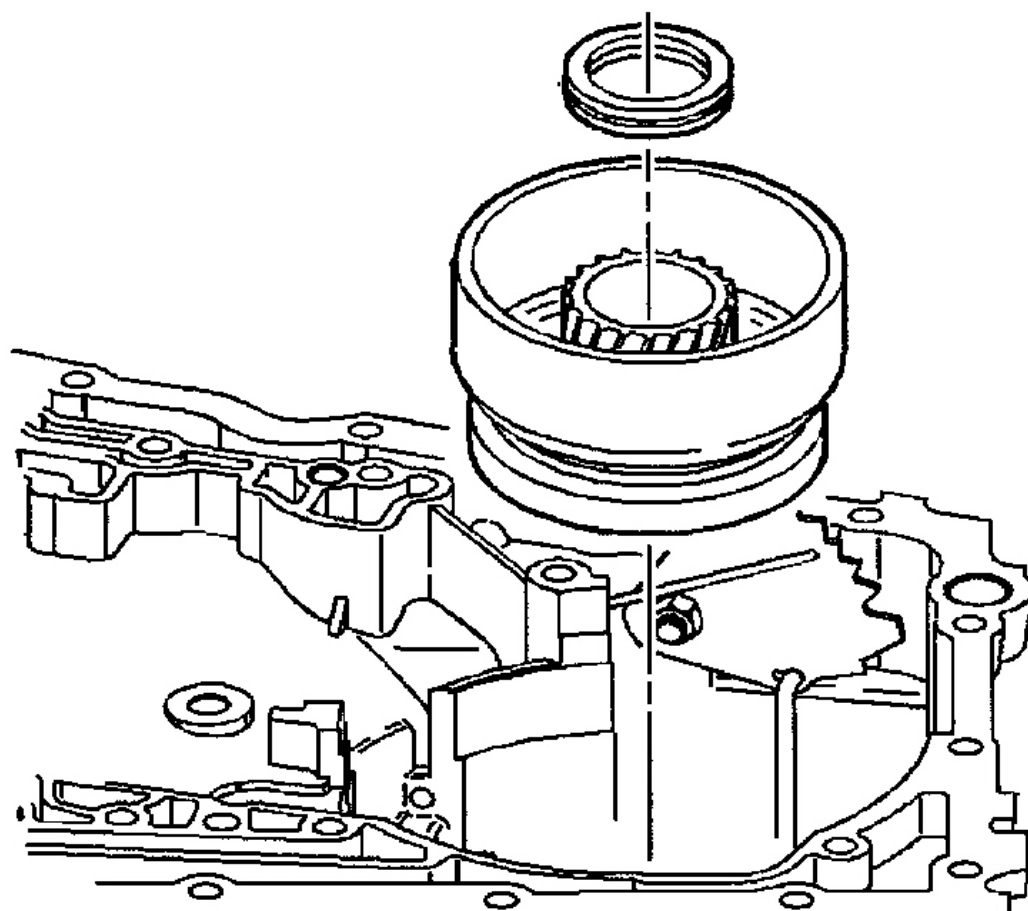


Fig. 81: Removing Reaction Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

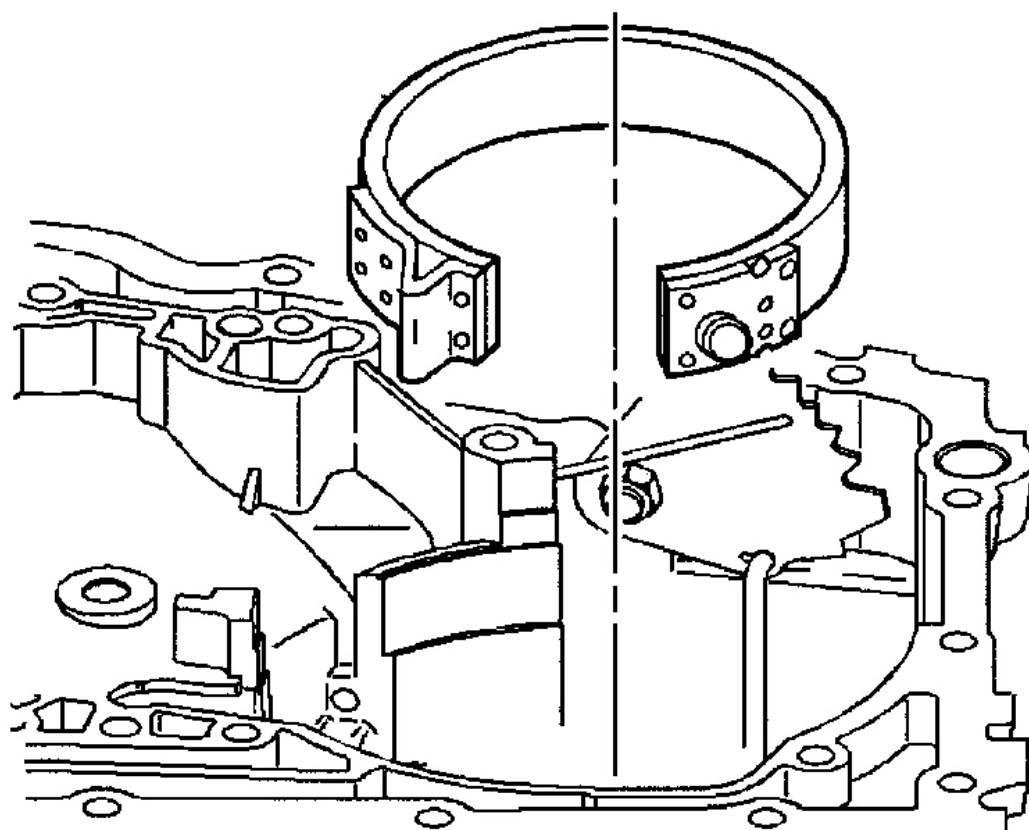
REACTION SUN GEAR & 2-1 MANUAL BAND

Remove thrust bearing from reaction sun gear. Remove reaction sun gear assembly. See **Fig. 82**. Tilt band to disengage 2-1 manual band assembly from anchor pin. Remove 2-1 manual band from case. See **Fig. 83**.



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Fig. 82: Removing & Installing Reaction Sun Gear
Courtesy of GENERAL MOTORS CORP.

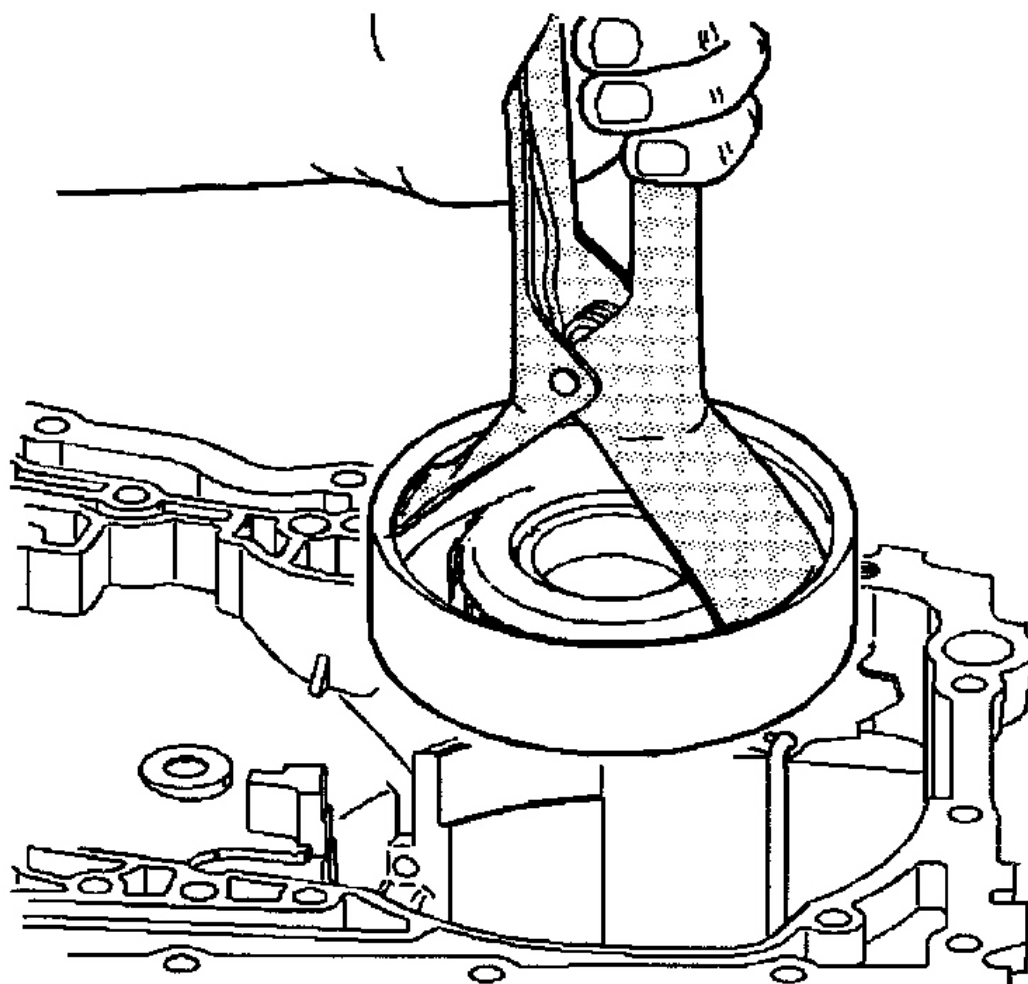


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Fig. 83: Removing & Installing 2-1 Manual Band
Courtesy of GENERAL MOTORS CORP.

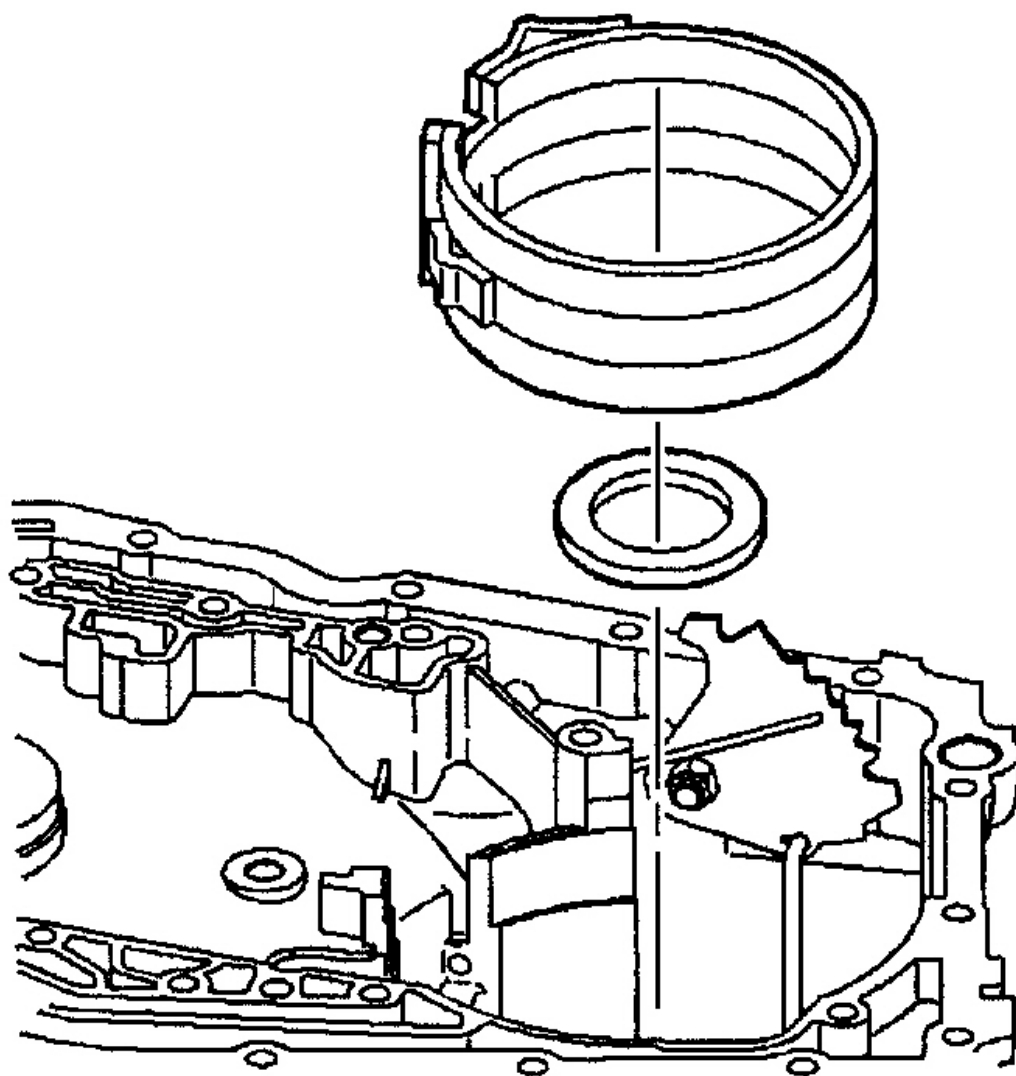
1-2 SUPPORT DRUM & FORWARD BAND

Install Support Remover/Installer (J-38358) onto 1-2 support drum assembly. Lift remover/installer with 1-2 support drum out of case. See **Fig. 84**. Tilt band to disengage band from anchor pin. Remove forward band from case. See **Fig. 85**.



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Fig. 84: Removing & Installing 1-2 Support Drum
Courtesy of GENERAL MOTORS CORP.

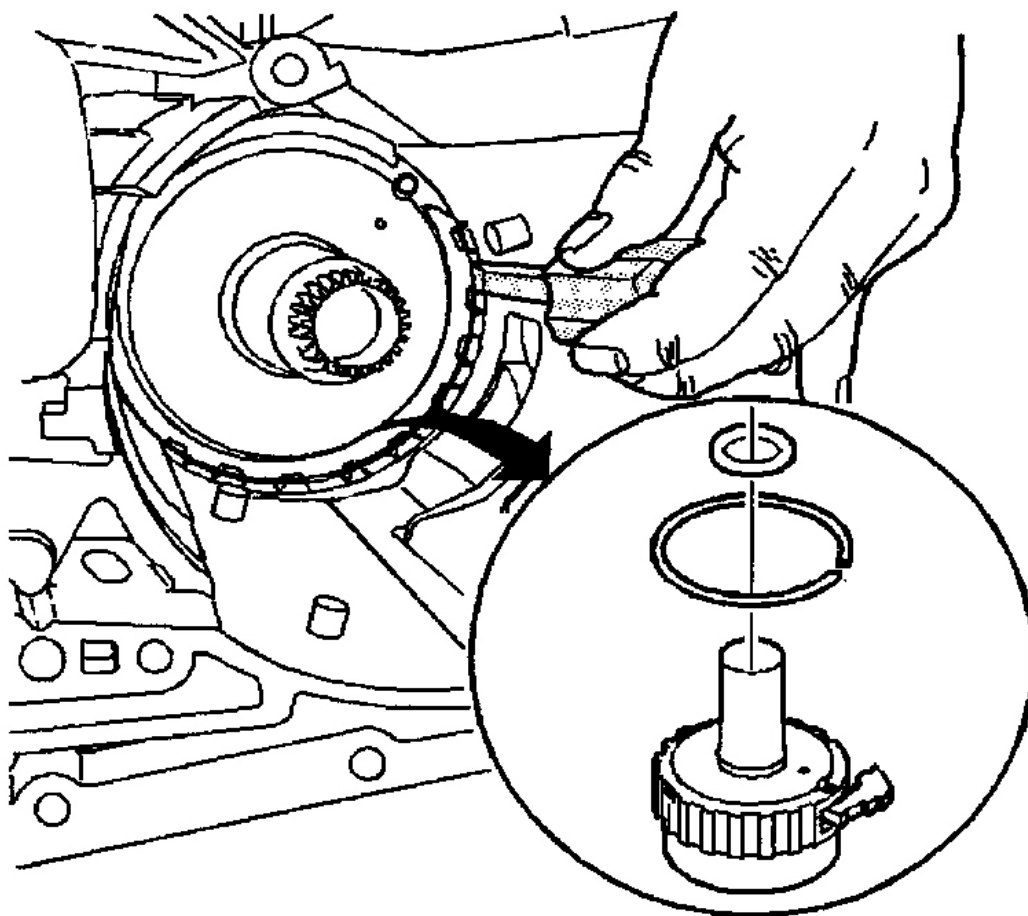


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Fig. 85: Removing & Installing Forward Band & Thrust Washer
Courtesy of GENERAL MOTORS CORP.

FINAL DRIVE INTERNAL GEAR

Remove thrust washer from final drive internal gear. Use snap ring remover or large screwdriver to remove final drive internal gear retaining ring. Lift final drive internal gear out of case by depressing parking pawl to clear case. See **Fig. 86**.

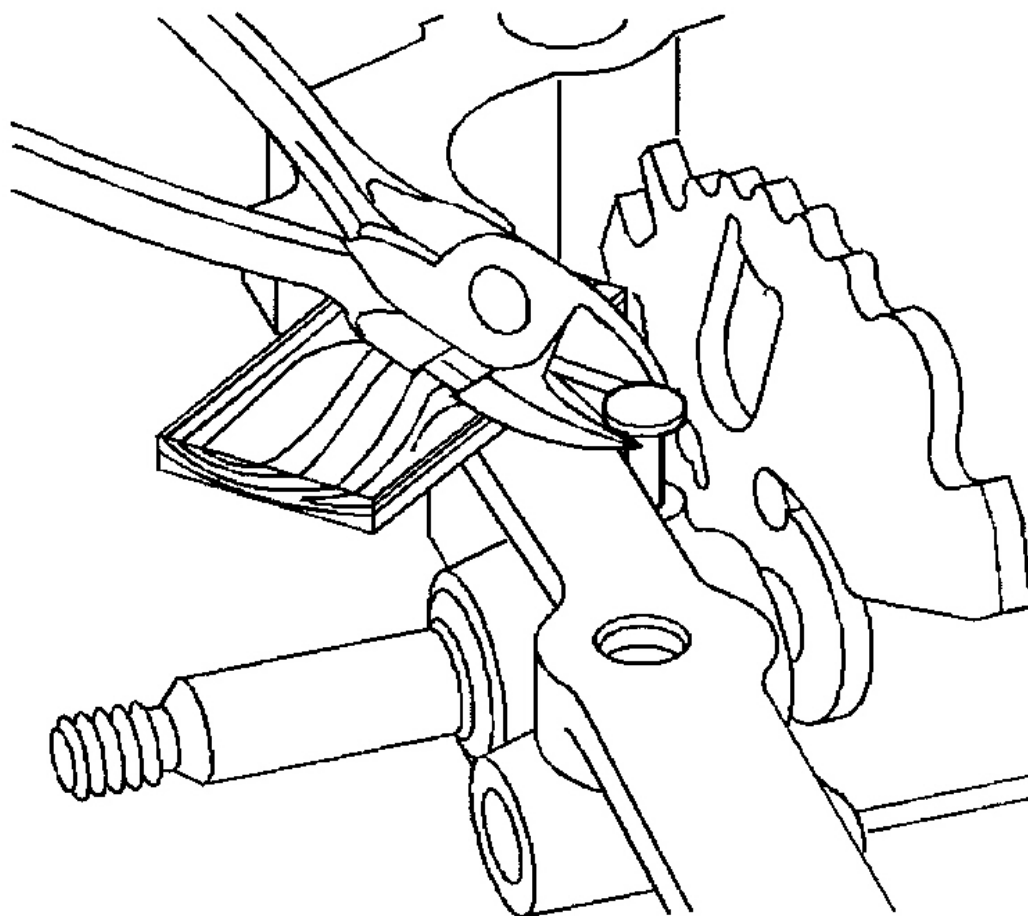


G00073309

Fig. 86: Removing & Installing Final Drive Internal Gear
Courtesy of GENERAL MOTORS CORP.

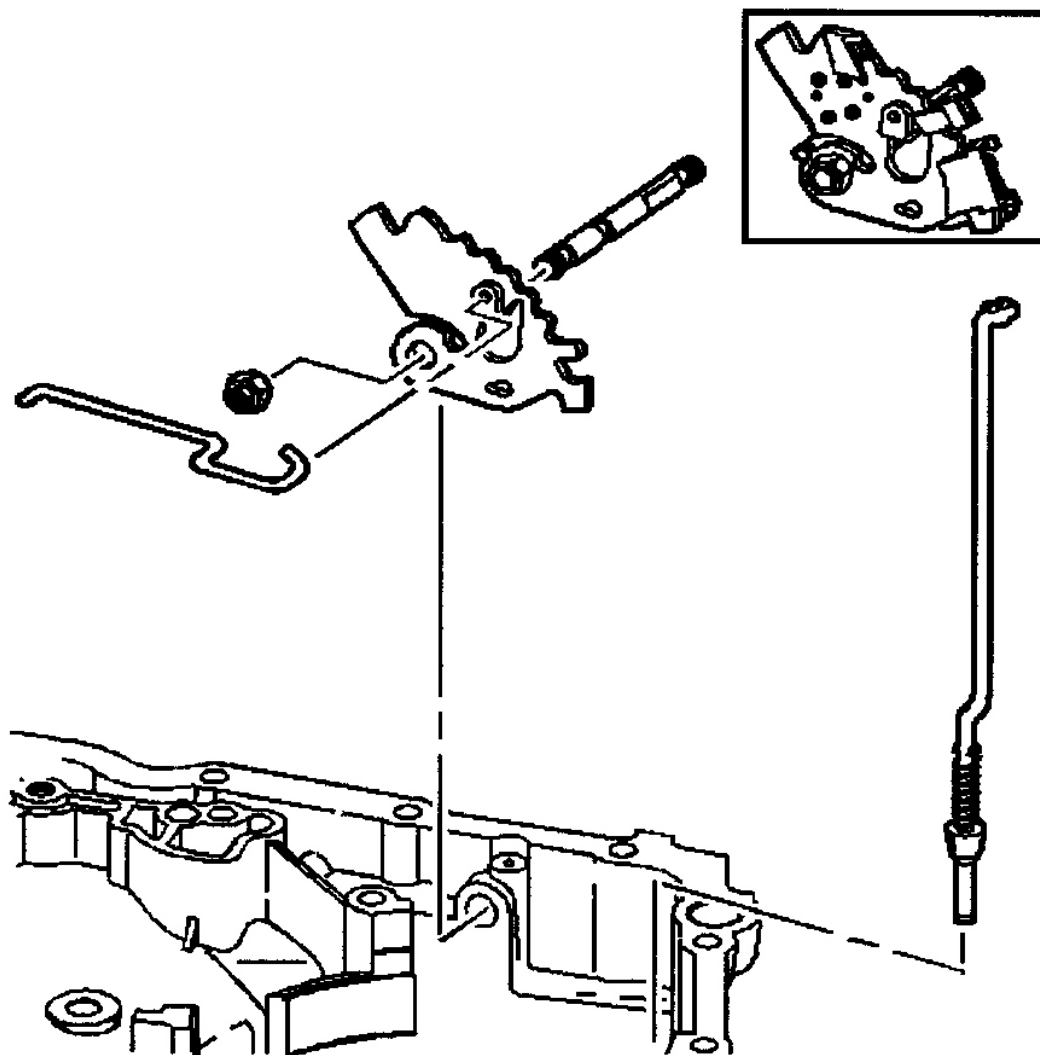
PARKING SYSTEM COMPONENTS

1. Using side cutting pliers, remove manual shift shaft pin. DO NOT cut through pin. Protect case with piece of wood or rubber under pliers when removing pin. See **Fig. 87**. Remove manual valve link and spring from manual shift detent lever. Remove manual shift detent lever nut from manual shift shaft. Remove manual shift detent lever and remove parking pawl actuator. See **Fig. 88**.
2. Position transaxle with reverse band servo bore facing up. Pull manual shift shaft out of case. Using small screwdriver, pry manual shift shaft seal from case. Remove parking pawl actuator guide pin. Remove parking pawl actuator guide from case. Remove actuator guide seal from guide. See **Fig. 89**.



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Fig. 87: Removing Manual Shift Shaft Pin
Courtesy of GENERAL MOTORS CORP.



G00073311

Fig. 88: Removing Manual Shift Shaft Components & Parking Pawl Actuator
Courtesy of GENERAL MOTORS CORP.

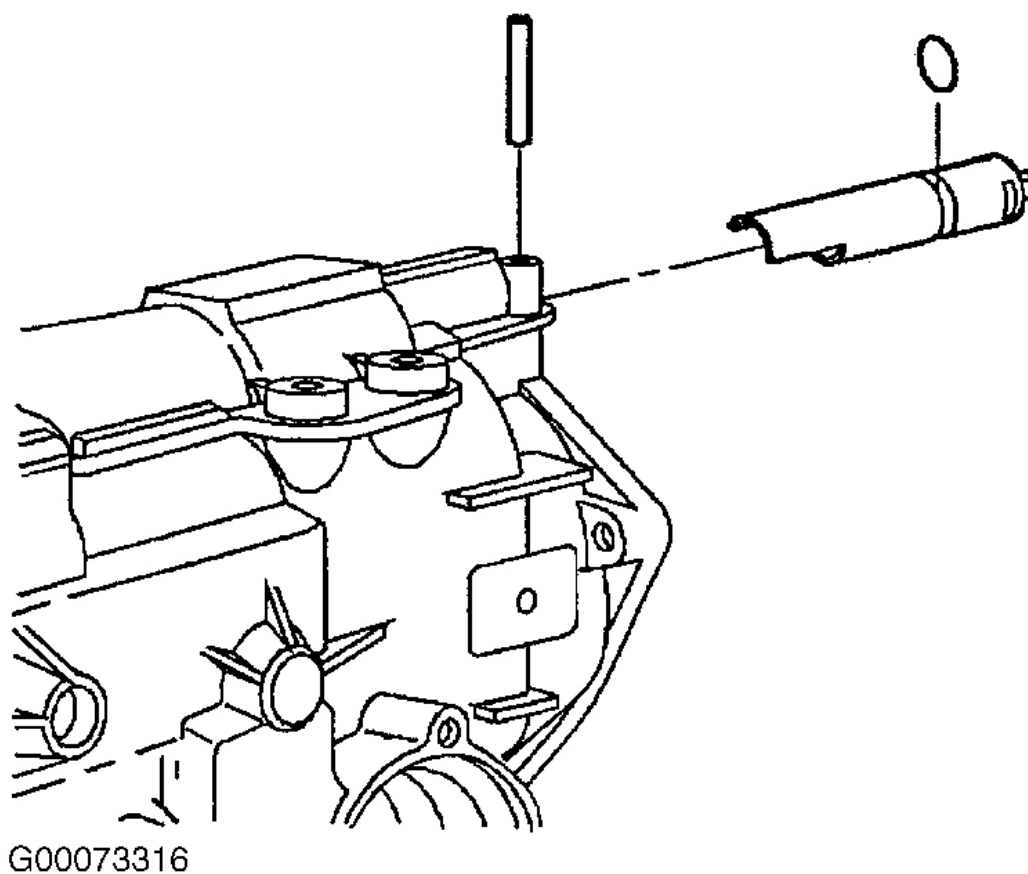


Fig. 89: Removing & Installing Parking Pawl Actuator Guide
Courtesy of GENERAL MOTORS CORP.

COMPONENT DISASSEMBLY & REASSEMBLY

CASE COMPONENTS

Inspection

1. Inspect components still on transaxle case for the following:
 - Loose, cross-threaded, or damaged ATF cooler pipe fittings.
 - Loose, missing, or damaged transaxle name plate.
 - Loose, plugged, or damaged vent assembly.
 - Loose, cross-threaded, or damaged oil pressure test hole plug.
2. Inspect transaxle case for the following:
 - Damaged or porous gasket sealing surfaces.

- Stripped or damaged bolt or screw holes (repair with thread insert).
- Damaged or porous case oil passages.
- Damaged snap ring grooves or housing splines.
- Loose, missing, or damaged band anchor pins.
- Damaged or porous case surfaces.
- Plugged drain back holes for torque converter oil seal.

Disassembly & Reassembly

If vent is damaged, use pliers and pry bar to remove vent. See **Fig. 90**. Use hammer and punch to install vent. If oil pressure test hole plug was removed, install plug and tighten to specification. See **TORQUE SPECIFICATIONS**.

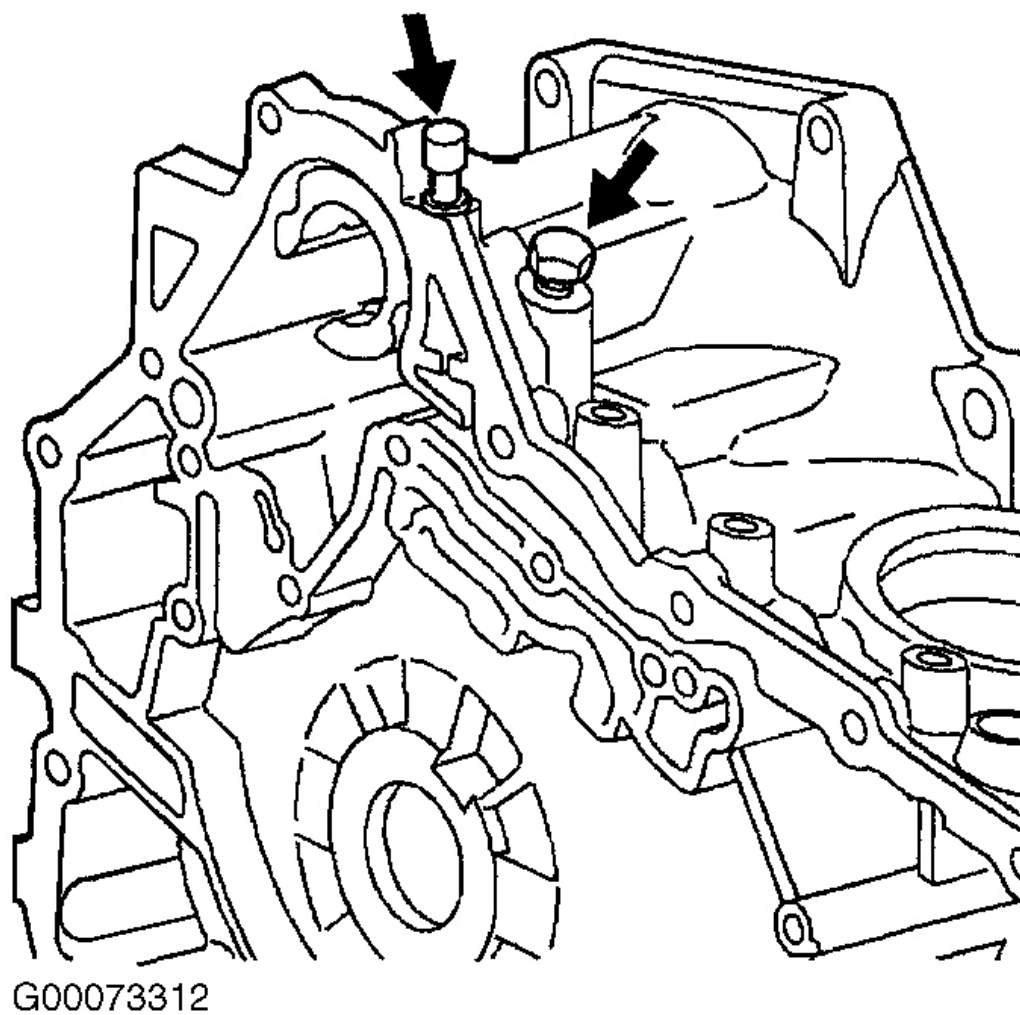


Fig. 90: Locating Transaxle Vent & Oil Pressure Test Hole Plug
Courtesy of GENERAL MOTORS CORP.

DRIVE SPROCKET SUPPORT

Inspection

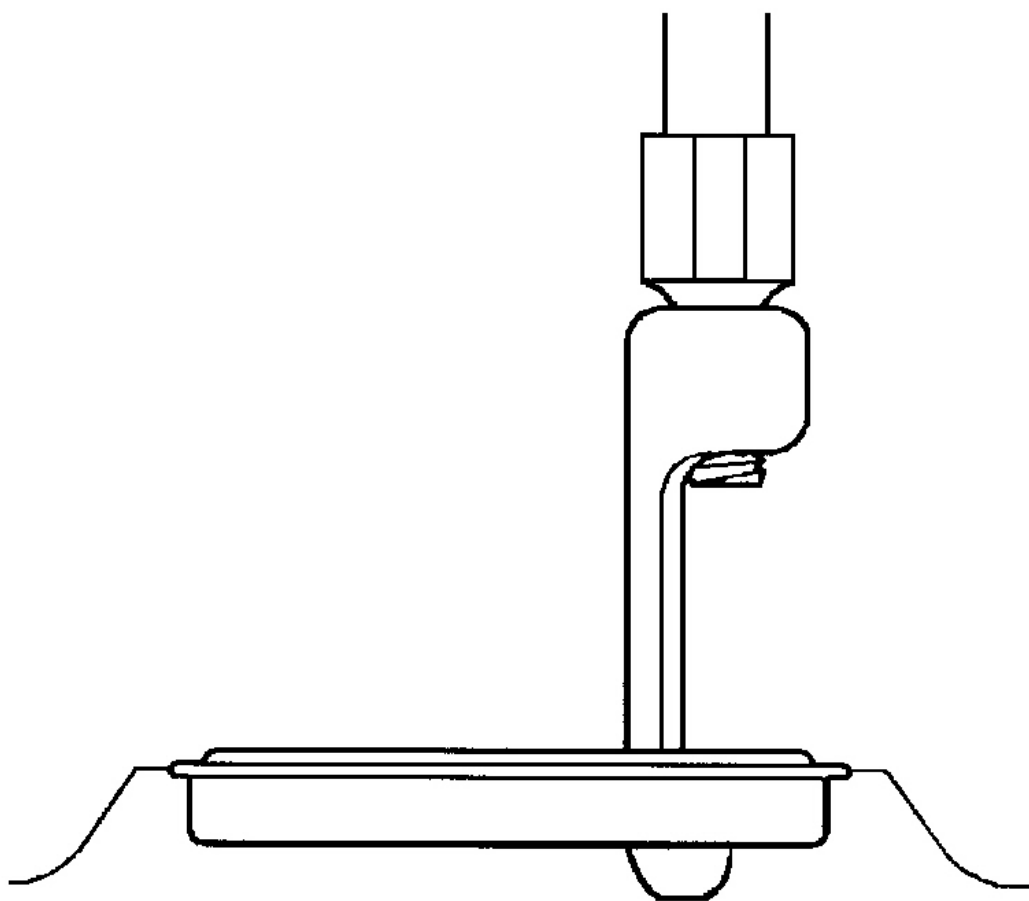
Inspect drive sprocket support for the following:

- Damaged splines.
- Damaged drive sprocket support bearing.
- Damaged turbine shaft bushing (pressed inside support).

Remove drive sprocket support bearing and/or drive sprocket support assembly only if damaged.

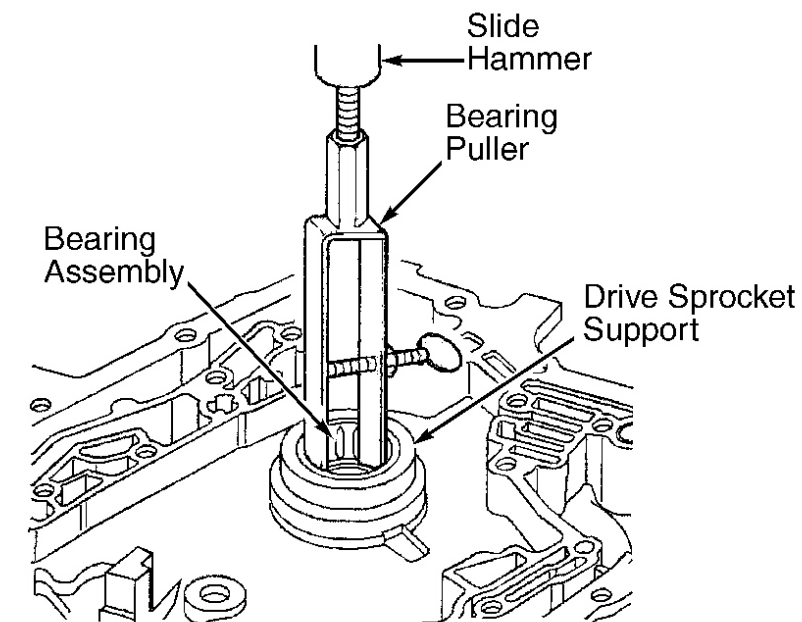
Disassembly & Reassembly

Using slide hammer and Universal Seal Remover (J-23129), remove torque converter seal. See **Fig. 91**. If damage is visible to drive sprocket support bearing, use slide hammer and Bushing/Bearing Remover (J-26941) to remove bearing from drive sprocket support. See **Fig. 92**. Remove drive sprocket support bolts and remove drive sprocket. See **Fig. 93**. Install NEW bearing using drive handle and bearing installer. See **Fig. 92**. Install drive sprocket support. Install and tighten drive sprocket support bolts to specification. See **TORQUE SPECIFICATIONS**. Using Seal Installer (J-28540) and mallet, install NEW torque converter seal.

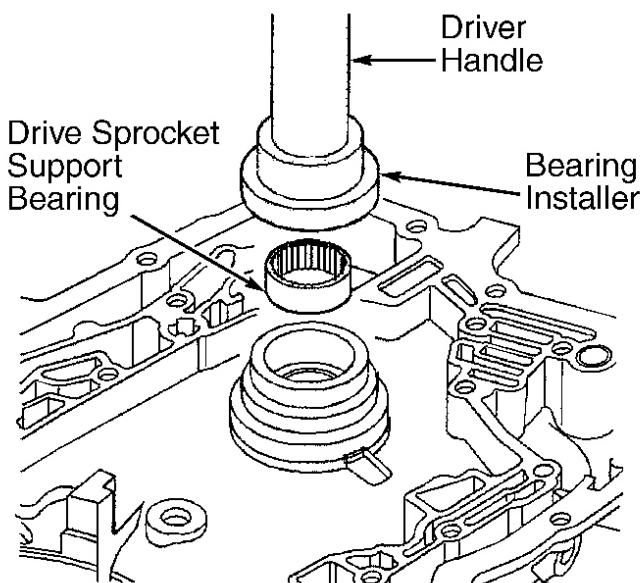


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Fig. 91: Removing Torque Converter Seal
Courtesy of GENERAL MOTORS CORP.



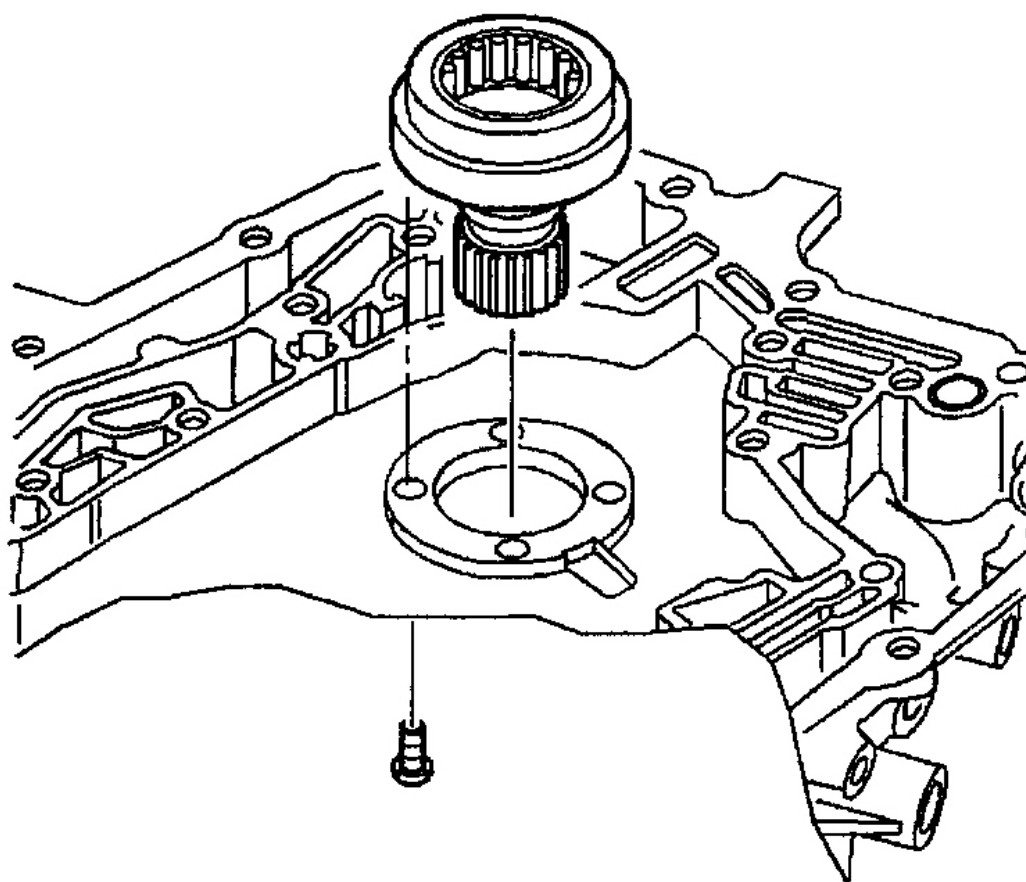
REMOVAL



INSTALLATION

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Fig. 92: Removing & Installing Drive Sprocket Bearing
 Courtesy of GENERAL MOTORS CORP.



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Fig. 93: Removing & Installing Drive Sprocket Support
Courtesy of GENERAL MOTORS CORP.

PARKING SYSTEM COMPONENTS

Inspection & Reassembly

1. Inspect park system components for the following:
 - Worn park pawl actuator guide.
 - Damaged or bent park pawl actuator assembly.
 - Damaged manual shift shaft detent lever or IMS detent lever.
 - Worn, stripped, or bent manual shift shaft.
 - Bent or damaged manual valve link.
 - Kinked or bent manual valve link spring.

Replace components as necessary. See **Fig. 94**.

2. Install NEW shift shaft seal into case using 9/16" socket and hammer. See **Fig. 95**. Install NEW parking pawl actuator guide "O" ring seal onto parking pawl actuator guide. Install actuator guide into case. Align slot for actuator guide pin in parking pawl with pin hole in case. Install actuator guide pin using mallet. See **Fig. 89**.
3. Install manual shift shaft detent lever onto manual shift shaft. Install nut on shift shaft and tighten to specification. See **TORQUE SPECIFICATIONS**. Install detent lever onto parking pawl actuator. Install manual shift shaft detent lever assembly and parking pawl actuator assembly into case. See **Fig. 96**.
4. Align groove for manual shift shaft pin with pin hole in case. Install manual shift shaft pin using mallet. See **Fig. 97**.

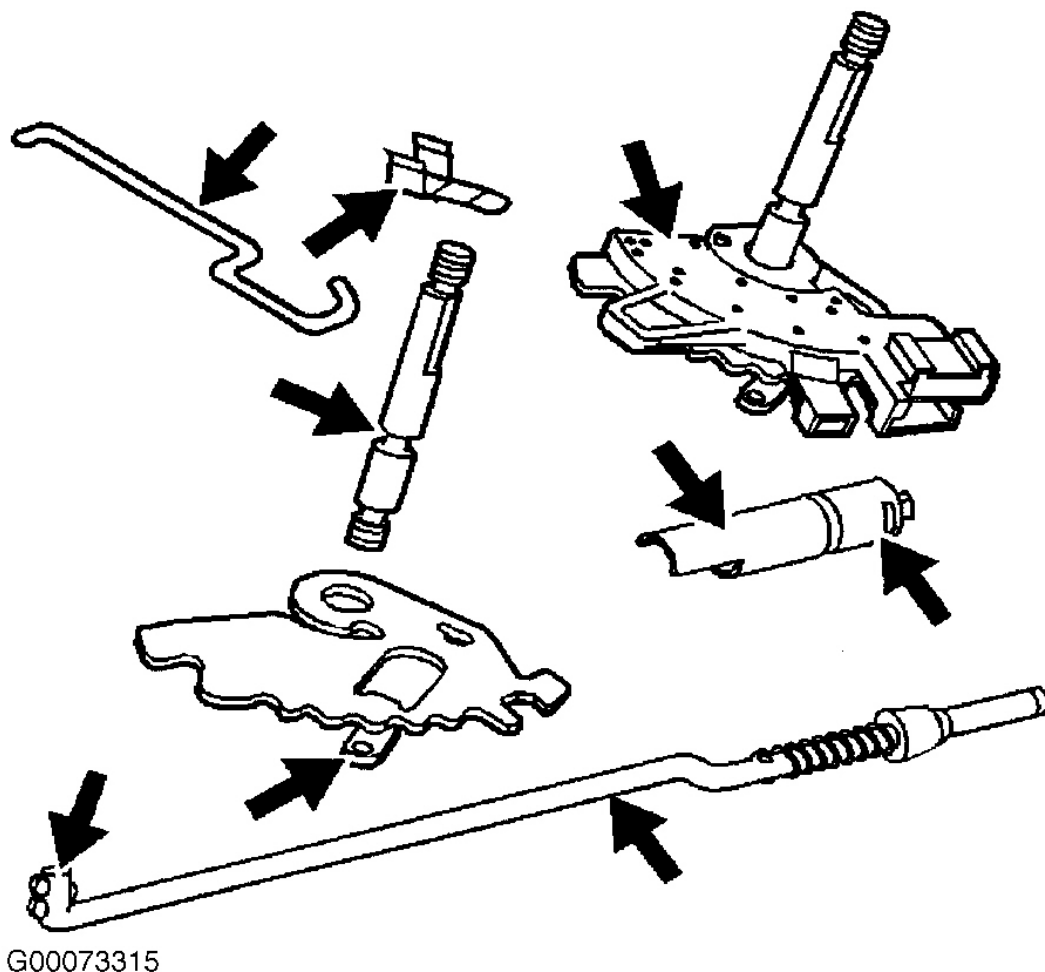
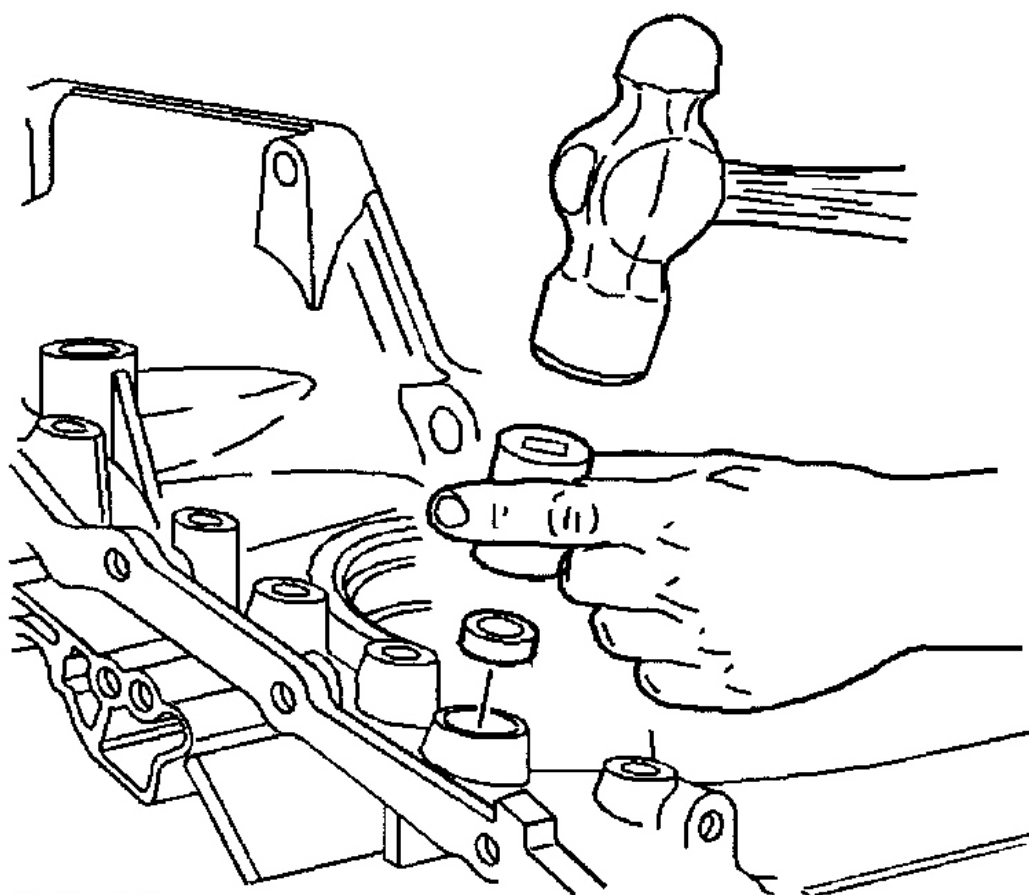


Fig. 94: Inspecting Parking System Components
Courtesy of GENERAL MOTORS CORP.



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Fig. 95: Installing Shift Shaft Seal
Courtesy of GENERAL MOTORS CORP.

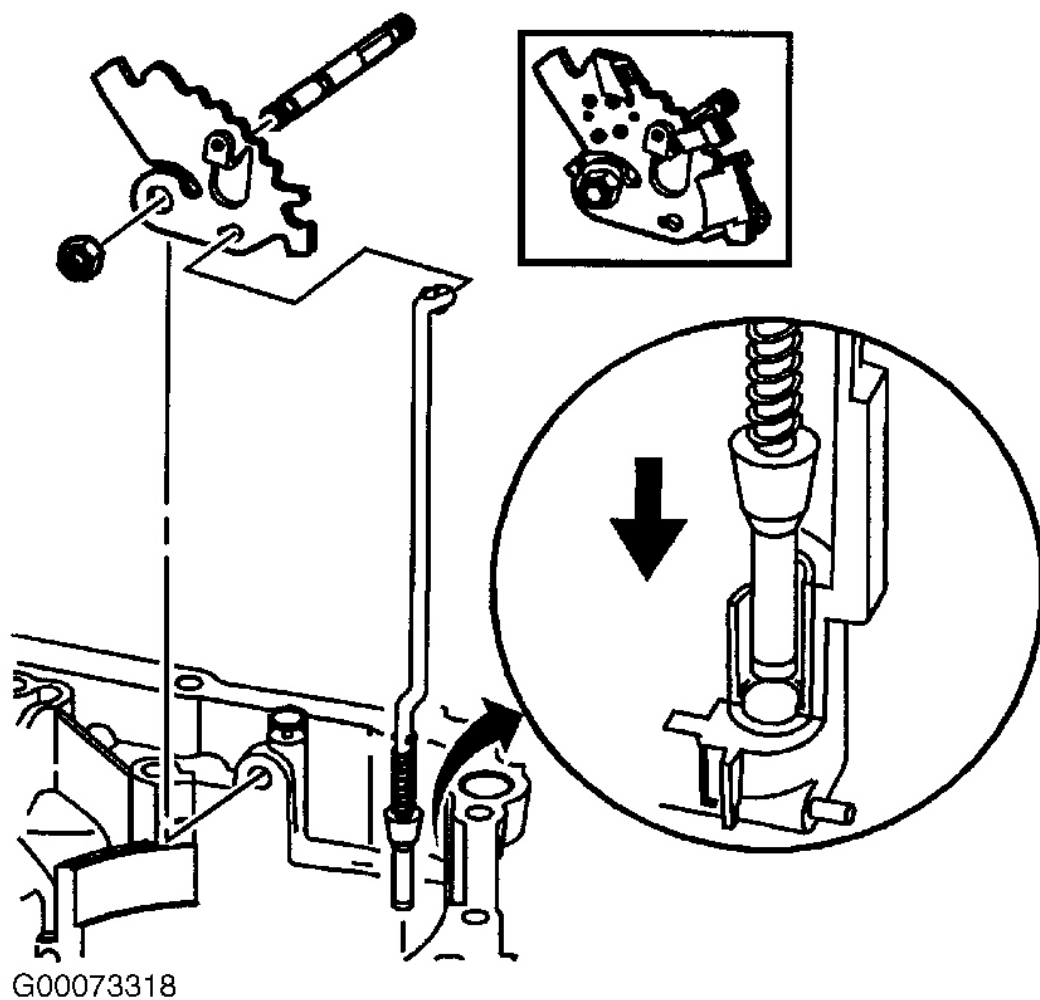
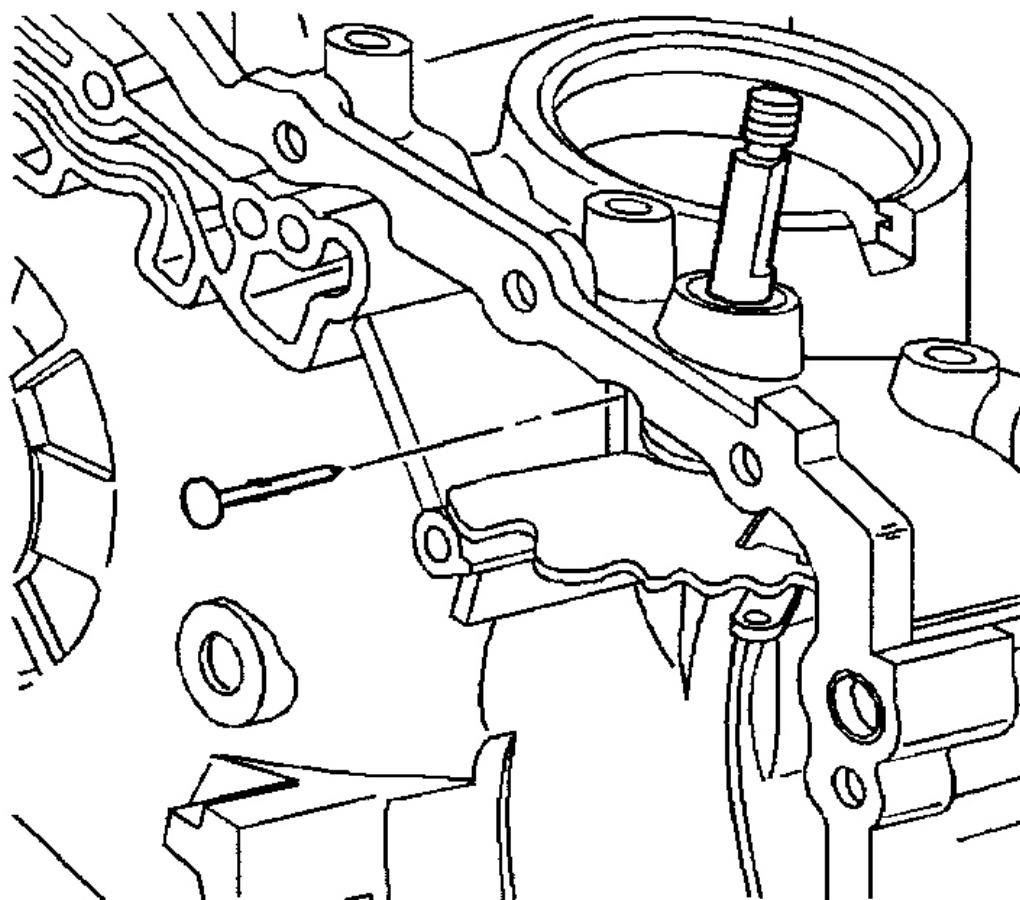


Fig. 96: Installing Manual Shift Shaft Components & Pawl Actuator
Courtesy of GENERAL MOTORS CORP.



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Fig. 97: Installing Manual Shift Shaft Pin
Courtesy of GENERAL MOTORS CORP.

DIFFERENTIAL CARRIER INTERNAL GEAR

Inspection

Inspect differential carrier internal gear assembly for the following:

- Damaged or worn bushings.
- Plugged lube oil holes.
- Damaged case splines.
- Damaged or worn gear teeth.
- Damaged or worn park pawl assembly.

- Damaged snap ring.

Replace components as necessary. See **Fig. 98**.

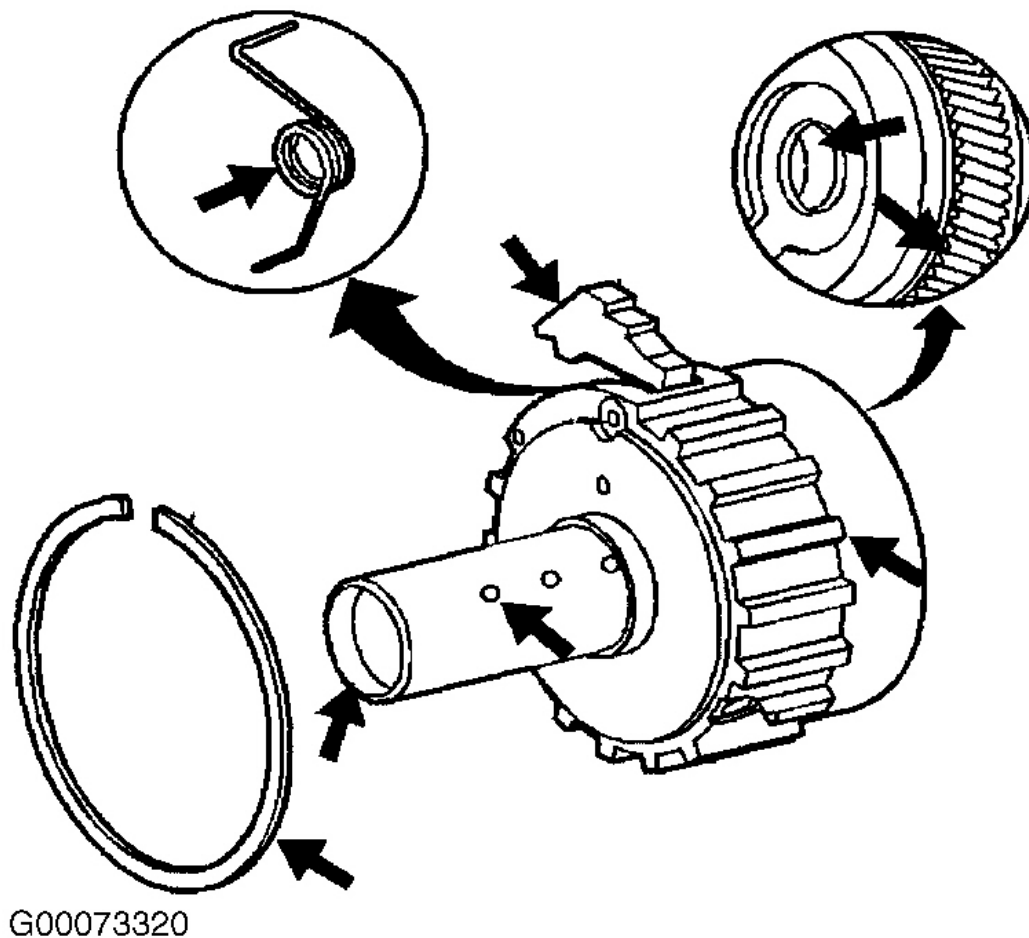


Fig. 98: Inspecting Differential Carrier Internal Gear Assembly
Courtesy of GENERAL MOTORS CORP.

DIFFERENTIAL CARRIER

Disassembly

1. Using feeler gauge, measure differential carrier planetary pinion gear end play. End play should be .009-.025" (.23-.64 mm). See **Fig. 99**. If end play is not as specified, repair differential carrier assembly as necessary.

NOTE: Ensure pinion gears are installed in same direction as removed. If gears are installed upside down, noise may result due to change in wear pattern.

2. Using screwdriver remove retaining ring from front differential carrier. See **Fig. 100**. Remove planetary pinion gear pin, thrust washers, roller bearings, spacer and pinion gear. See **Fig. 101**. Remove remaining planetary pinions in same manner. Remove differential carrier sun gear thrust bearing.
3. Place final drive carrier components into oil pan to ensure roller bearings are not lost. Using drift pin and hammer remove differential pinion shaft retaining pin. See **Fig. 102**. Remove differential pinion gear shaft, gears, pinion gear thrust washers, side gears and side gear thrust washers. See **Fig. 103**.

Inspection

1. Inspect differential carrier assembly for the following:
 - Damaged or worn teeth, bearing rollers, washers, or pins on differential planetary pinion gear.
 - Damaged or worn teeth or splines on final drive sun gear.
 - Damaged or worn teeth, splines, or thrust washers on differential side gear.
 - Damaged or worn teeth, thrust washers, or shaft on differential pinion gear.
 - Damaged or worn lugs or splines on parking gear.
 - Damaged VSS reluctor wheel.
 - Damaged internal gear/parking gear thrust bearing, differential carrier/sun gear thrust bearing or differential carrier/case thrust bearing.
 - Damaged or worn differential carrier/case selective thrust washer.
 - Damaged differential/final drive carrier housing.

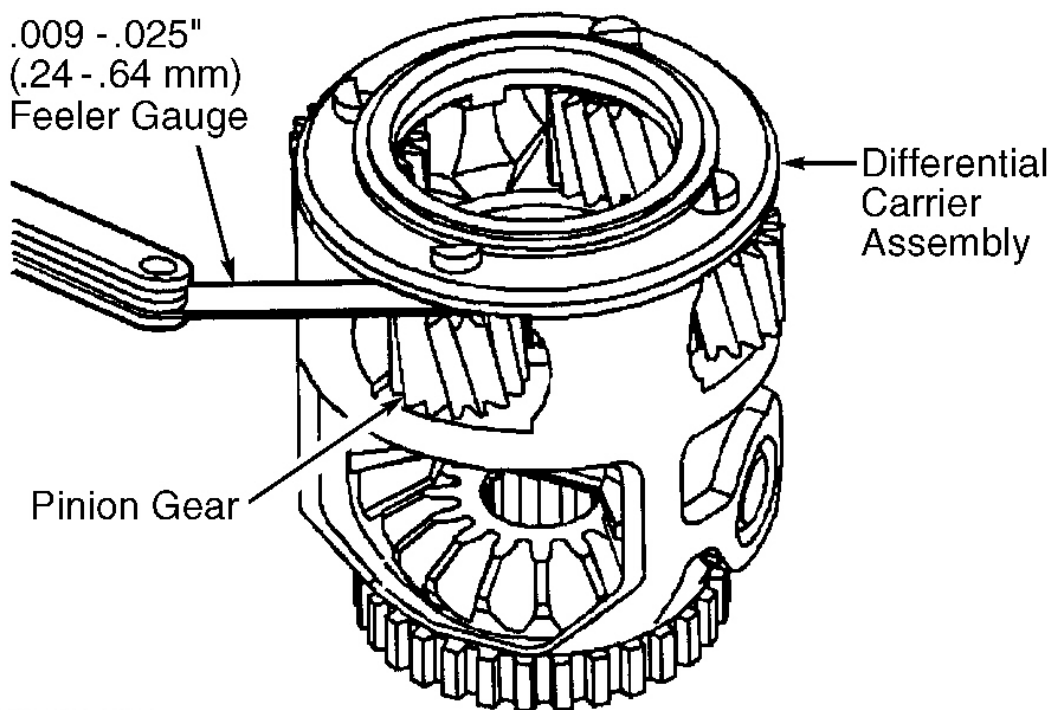
Replace components as necessary. See **Fig. 56**, **Fig. 101**, **Fig. 103** and **Fig. 104**. If VSS reluctor wheel is damaged, see **VEHICLE SPEED SENSOR RELUCTOR WHEEL**.

2. Inspect final drive sun gear shaft for the following:
 - Damaged or worn splines.
 - Cracks at lube oil holes.
 - Damaged or worn bearing journals.

Reassembly

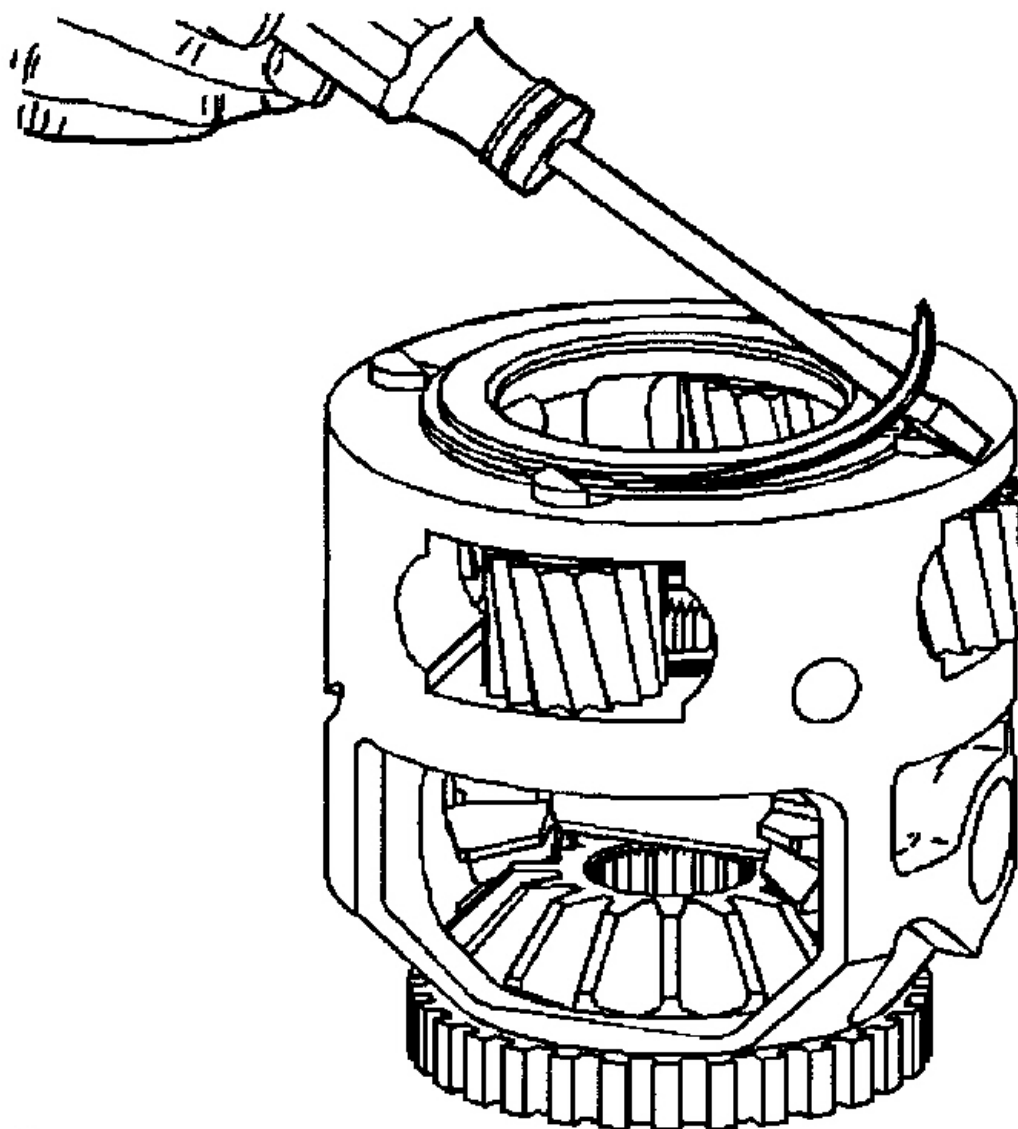
1. Assemble differential side gears and thrust washers into carrier. Using petroleum jelly, stick thrust washers onto pinion gears. Assemble pinion gears and thrust washers into differential carrier. See **Fig. 103**. Rotate gears into position. Slide differential pinion shaft into carrier through pinion gears. Align holes in pinion shaft retaining pin to hole in carrier housing. Using drift pin and hammer, install pinion shaft retaining pin into carrier. See **Fig. 102**.
2. Apply petroleum jelly to inside of differential carrier planetary pinion gear. For each planetary pinion gear, insert roller bearing spacer onto pin. Spacer must be inserted between 2 rows of roller bearings. Install roller bearings into gear one at a time. Differential ratio of 2.86:1 or 2.84:1 has 2 rows of 18 rollers. All other gear ratios have 2 rows of 22 rollers. See **Fig. 105**. Occasionally twist pinion gear pin to help align rollers.

3. Install differential carrier sun gear thrust bearing into carrier housing. See **Fig. 101**. Remove planetary pinion gear pin from its pinion gear. DO NOT move rollers out of position. Attach 2 pinion gear thrust washers on each side of pinion gear. Ensure position of pinion gears in housing is same as when disassembled. Install pinion gear assemblies into carrier housing. Install planetary pinion gear pins. Install retaining ring over planetary pinion gear pins. See **Fig. 100**.
4. Install final drive sun gear with chamfered side toward parking gear into carrier assembly. Install parking gear onto final drive sun gear shaft. Install final drive sun gear shaft/parking gear assembly into final drive sun gear. Apply petroleum jelly to parking gear side of parking gear thrust bearing and install onto parking gear. See **Fig. 104**.



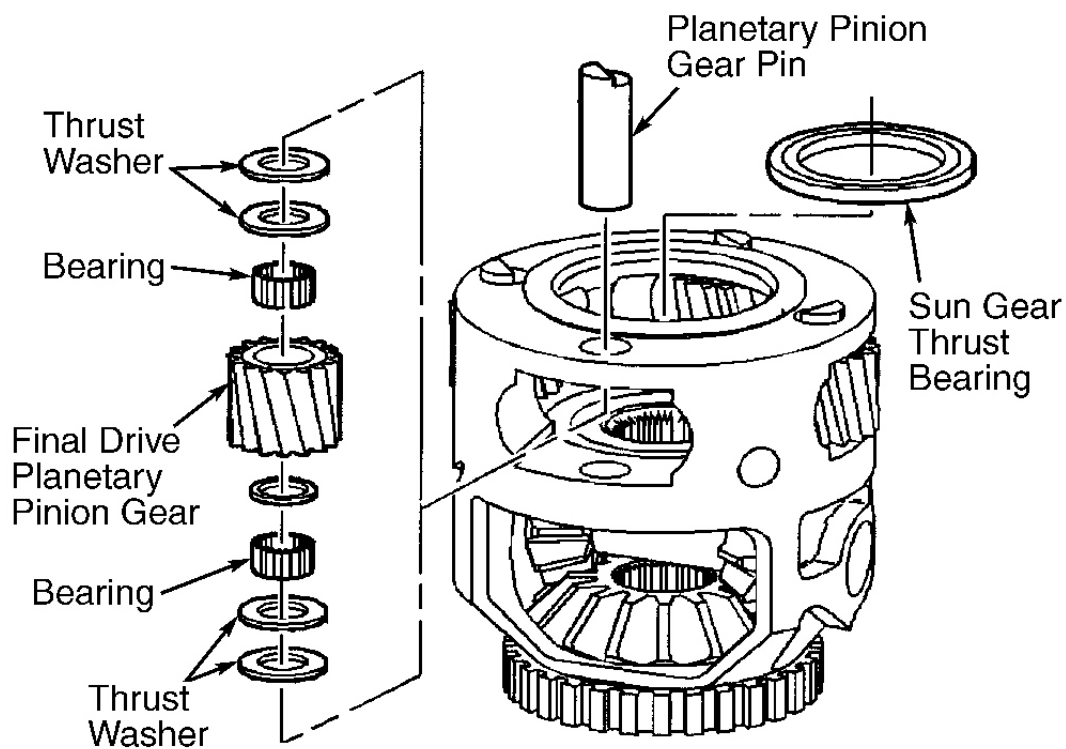
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Fig. 99: Checking Differential Carrier Pinion Gear End Play
Courtesy of GENERAL MOTORS CORP.



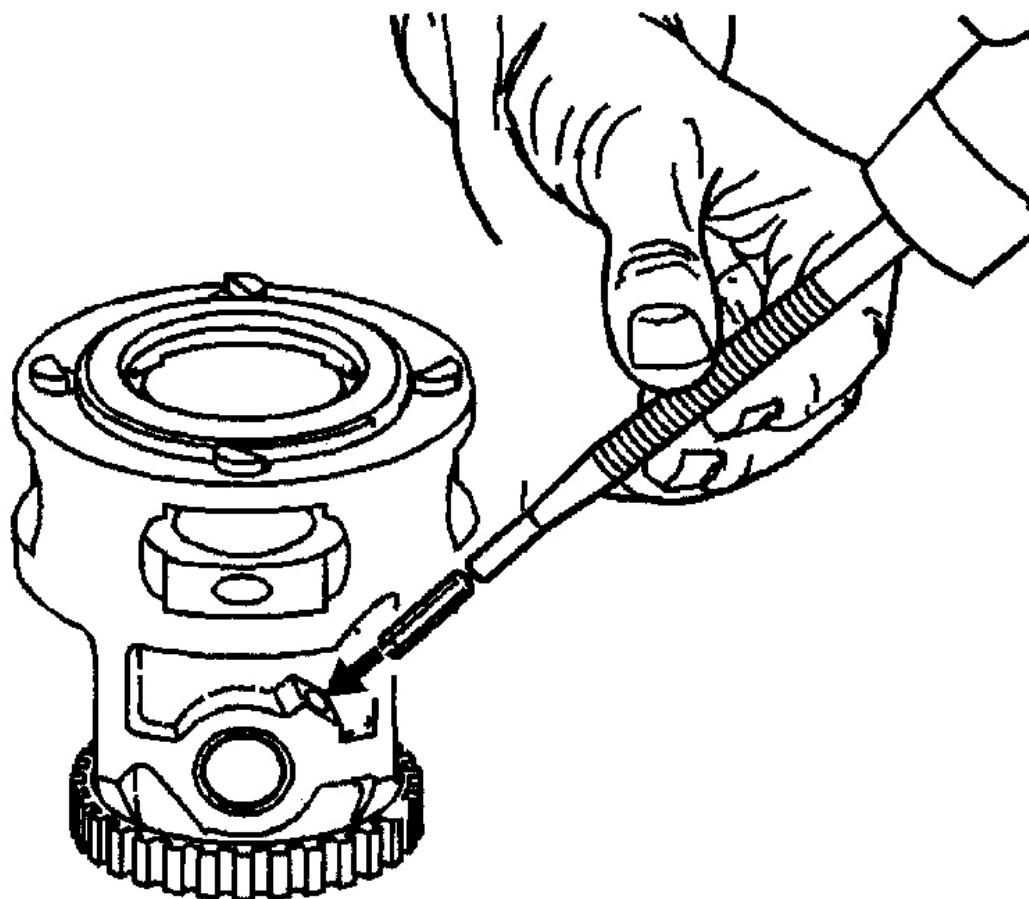
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Fig. 100: Removing & Installing Differential Carrier Snap Ring
Courtesy of GENERAL MOTORS CORP.



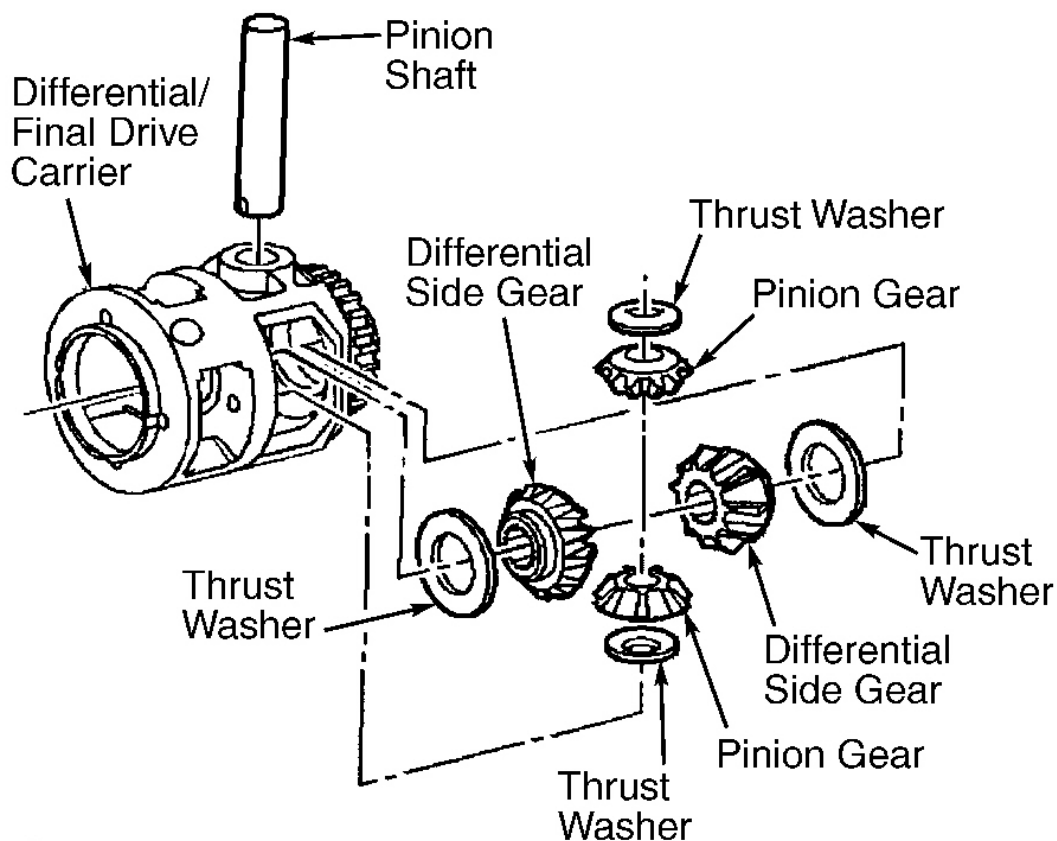
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Fig. 101: Exploded View Of Final Drive Planetary Pinion
 Courtesy of GENERAL MOTORS CORP.



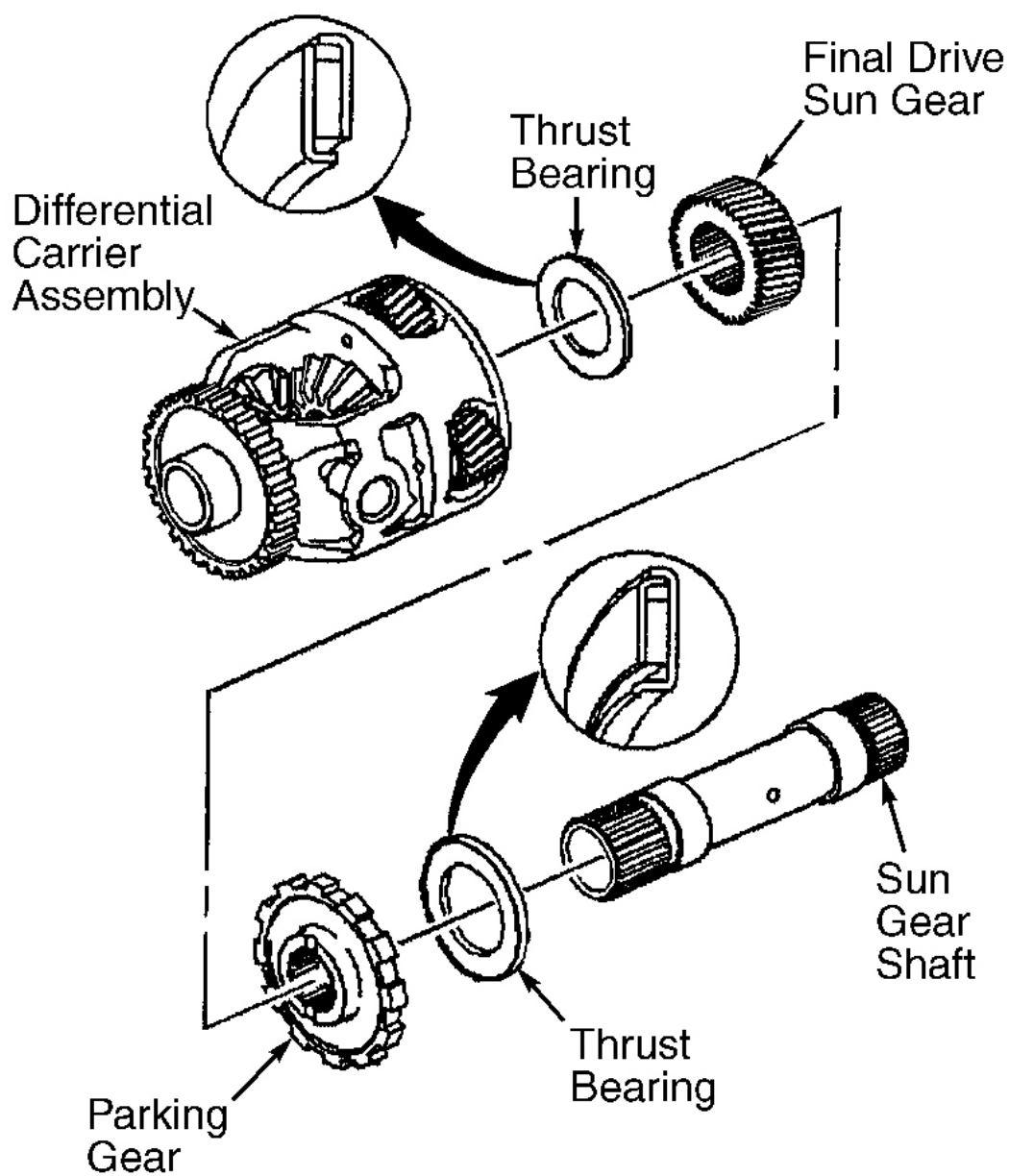
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Fig. 102: Removing & Installing Differential Pinion Gear Shaft Roll Pin
Courtesy of GENERAL MOTORS CORP.



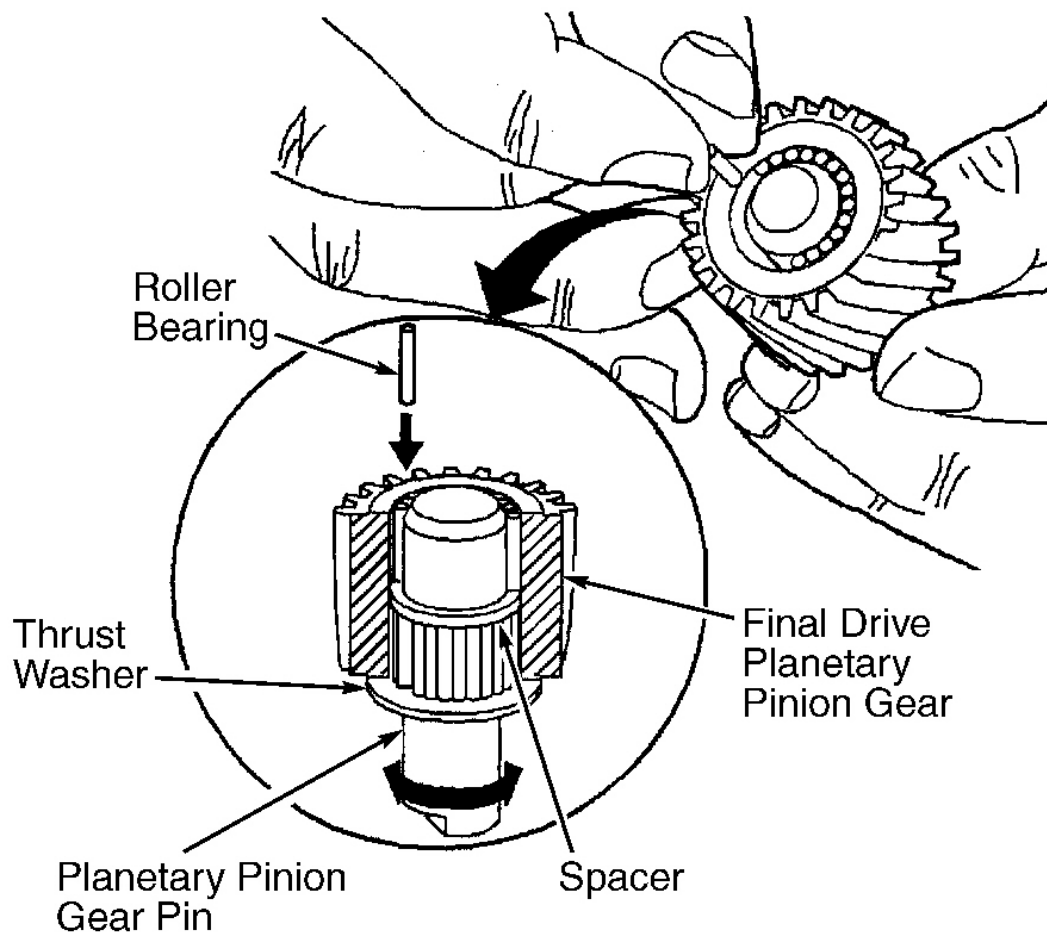
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Fig. 103: Exploded View Of Differential Side & Pinion Gears
 Courtesy of GENERAL MOTORS CORP.



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Fig. 104: Differential Carrier Thrust Washer Installation
Courtesy of GENERAL MOTORS CORP.



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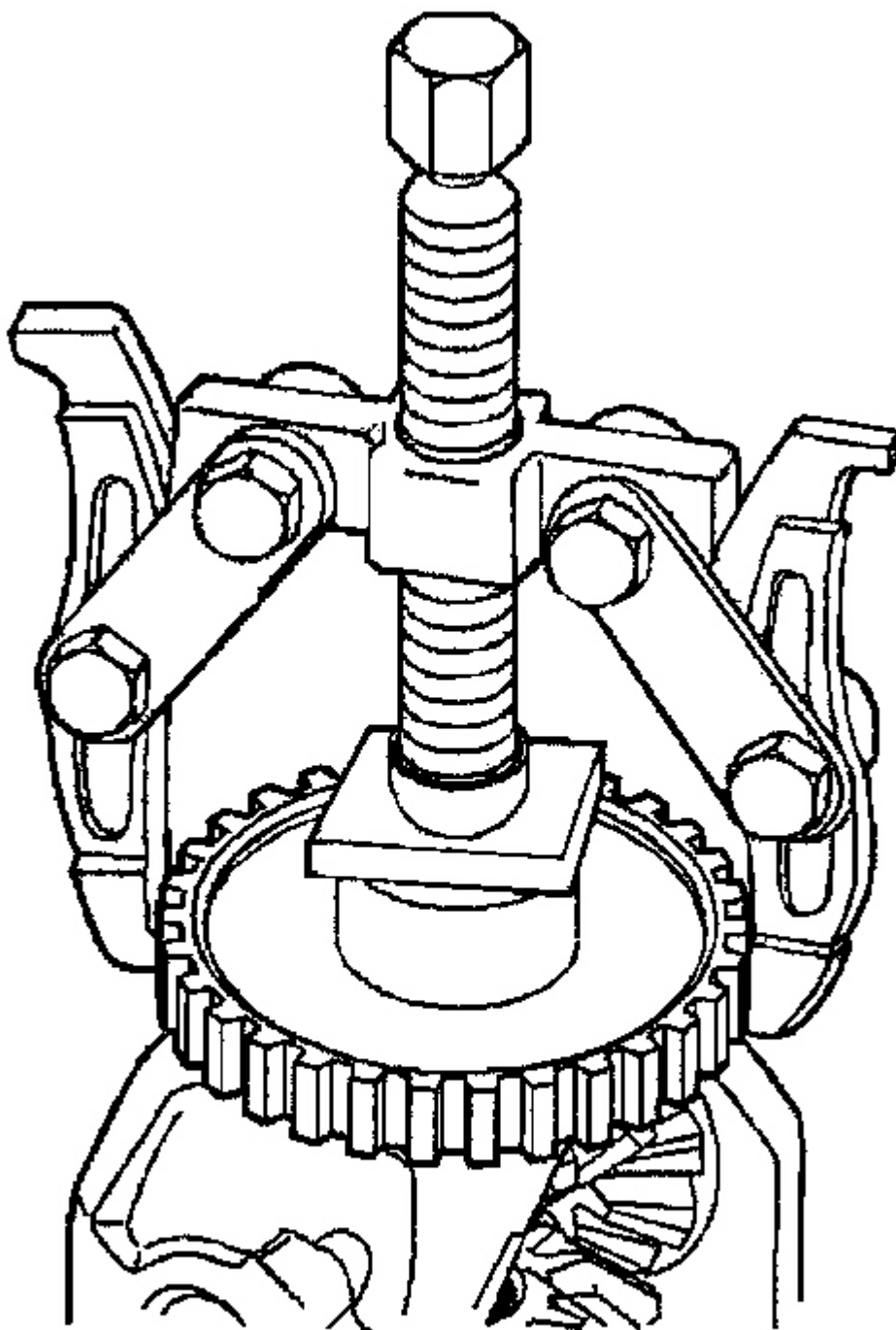
Fig. 105: Installing Final Drive Planetary Gear Roller Bearings
Courtesy of GENERAL MOTORS CORP.

VEHICLE SPEED SENSOR RELUCTOR WHEEL

NOTE: DO NOT remove reluctor wheel unless damaged.

Disassembly & Reassembly

To remove reluctor wheel, install flat metal stock over output shaft opening. Position Bearing Remover (J-22888) arms onto outer edges of reluctor wheel. Position bearing remover shaft onto flat metal stock. Pull wheel off of carrier. See **Fig. 106**. To reassemble, heat reluctor wheel slightly. Using plastic mallet, install reluctor wheel onto carrier by tapping evenly around reluctor wheel edge.



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Fig. 106: Removing VSS Reluctor Wheel
Courtesy of GENERAL MOTORS CORP.

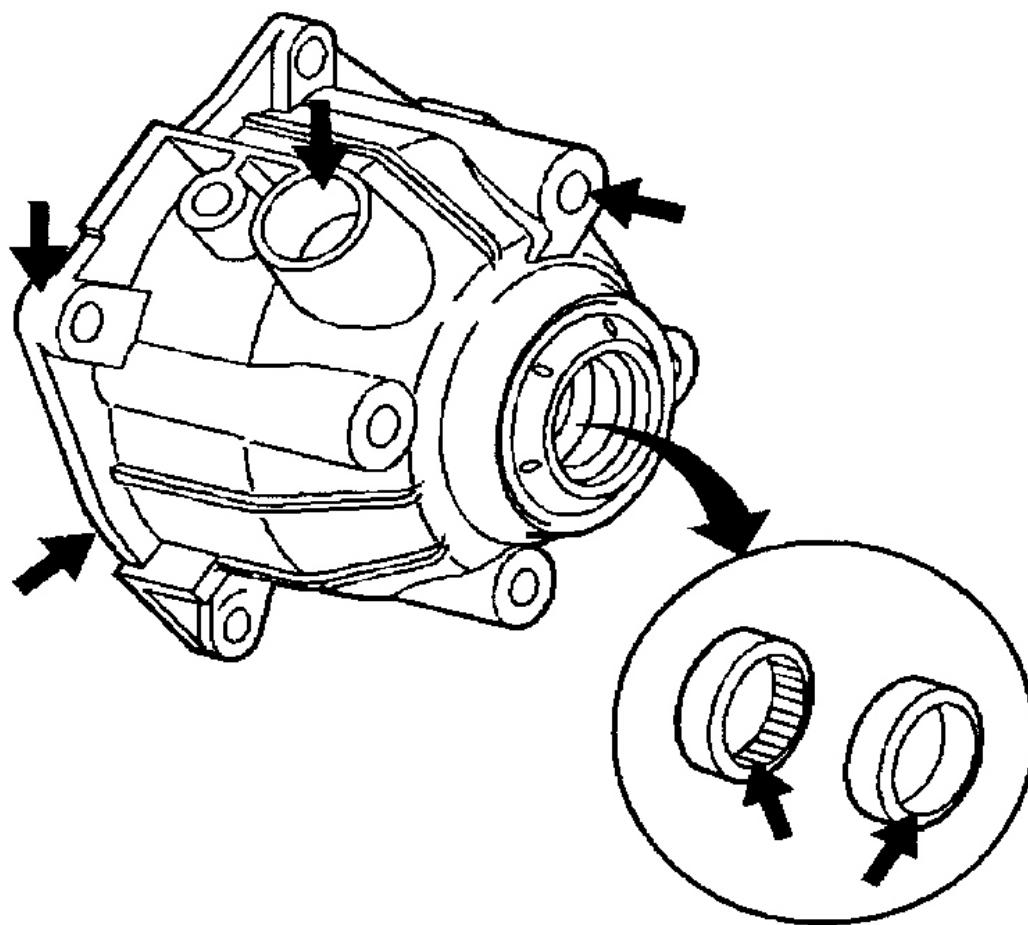
CASE EXTENSION

Inspection

Inspect case extension for the following:

- Damaged or porous sealing surface for case extension seal.
- Damaged or porous sealing surface for VSS.
- Damaged or porous sealing surface for right drive shaft oil seal.
- Damaged bolt holes.
- Worn or damaged front differential carrier bushing or output shaft bearing assembly.
- Porous or damaged case extension housing.

Repair as necessary. See **Fig. 107**.



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Fig. 107: Inspecting Case Extension
Courtesy of GENERAL MOTORS CORP.

FORWARD BAND

Inspection

1. Inspect forward band assembly for the following:
 - Damaged or severely worn friction material.
 - Damaged apply or anchor pin features.
2. Inspect differential carrier internal gear thrust washer for damage. Replace components as necessary. See **Fig. 85**.

1-2 SUPPORT ROLLER CLUTCH

Disassembly

Using small screwdriver, gently pry thrust bearing off of 1-2 support drum. Lift 1-2 support roller clutch assembly out of 1-2 support drum. See **Fig. 108**.

Inspection

Inspect 1-2 support roller clutch components for the following:

- Scored or burned contact surface for manual 2-1 band on 1-2 support drum.
- Damaged or worn forward drum bushing.
- Damaged or worn inner race of 1-2 support roller clutch.
- Damaged or worn 1-2 clutch roller assembly.
- Damaged thrust bearing.

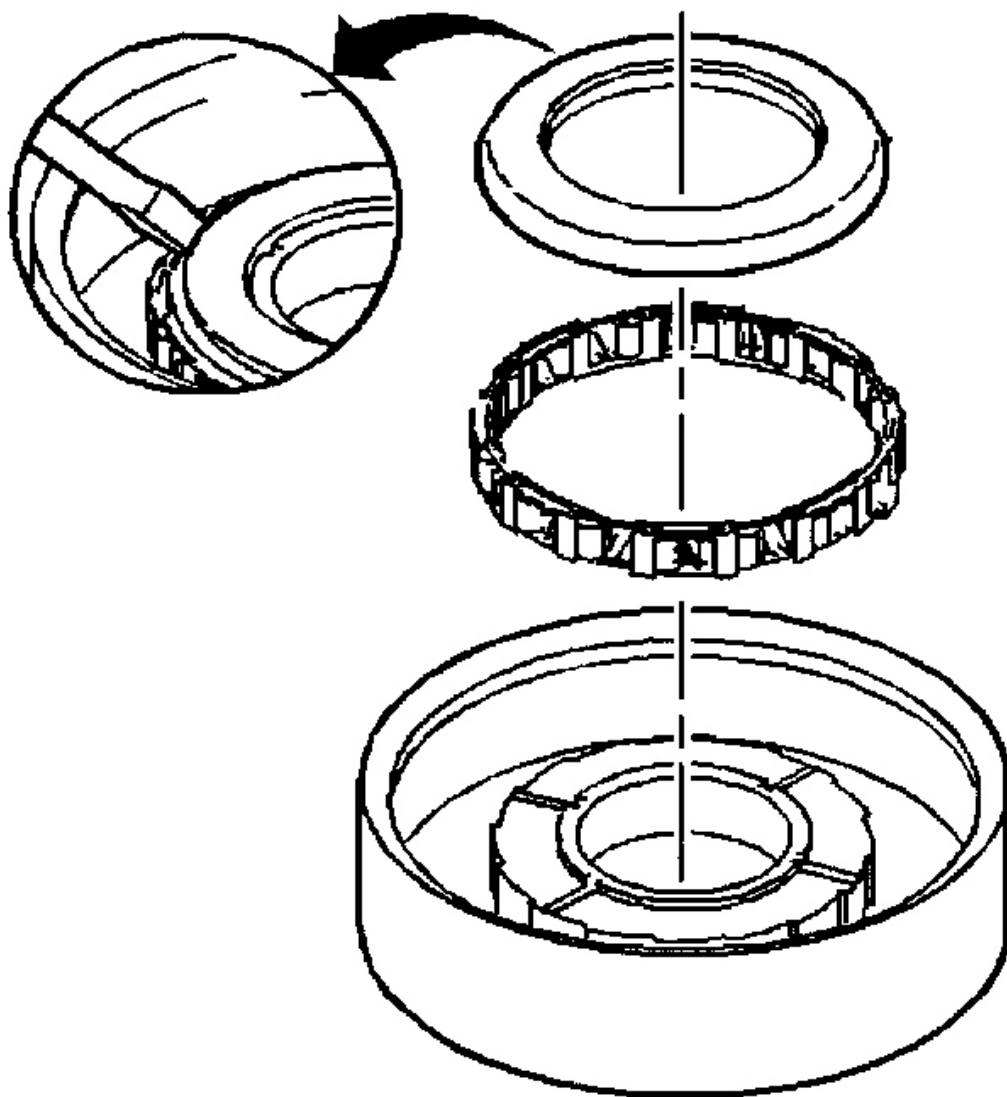
Replace components as necessary. See **Fig. 109**.

Reassembly

Install 1-2 roller clutch assembly into 1-2 support drum. Note position of cage assembly to inner race. See **Fig. 110**. Install thrust bearing onto 1-2 support drum. Press down with hand pressure only.

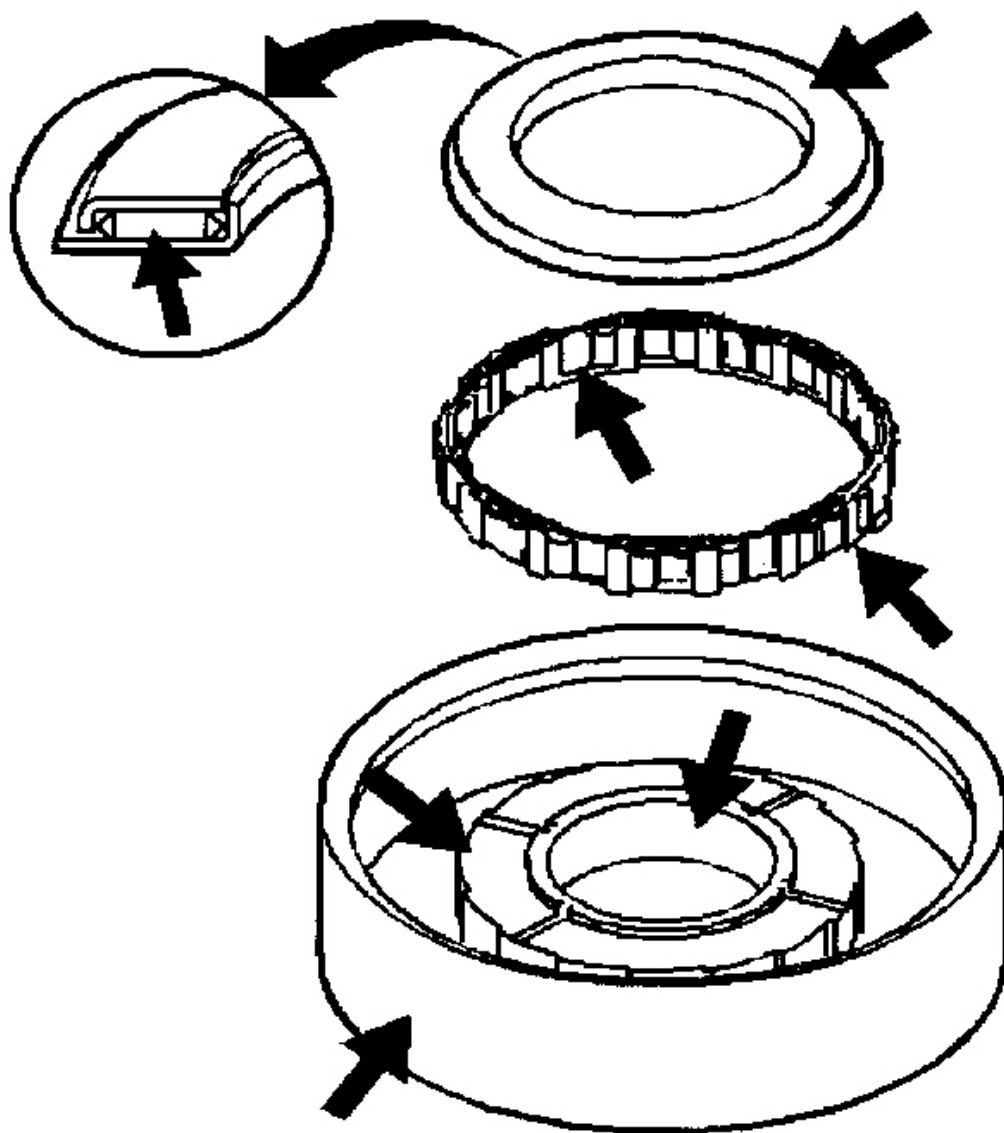
Functional Check

Position 1-2 support drum on bench. Install reaction sun gear assembly into 1-2 support drum. Rotate reaction sun gear counterclockwise. Rotate 1-2 support drum clockwise. See **Fig. 111**. Roller clutch should move freely in indicated directions. Roller clutch should lock in opposite direction. If roller clutch does not function as described, clutch is not assembled correctly. Reassemble as necessary.



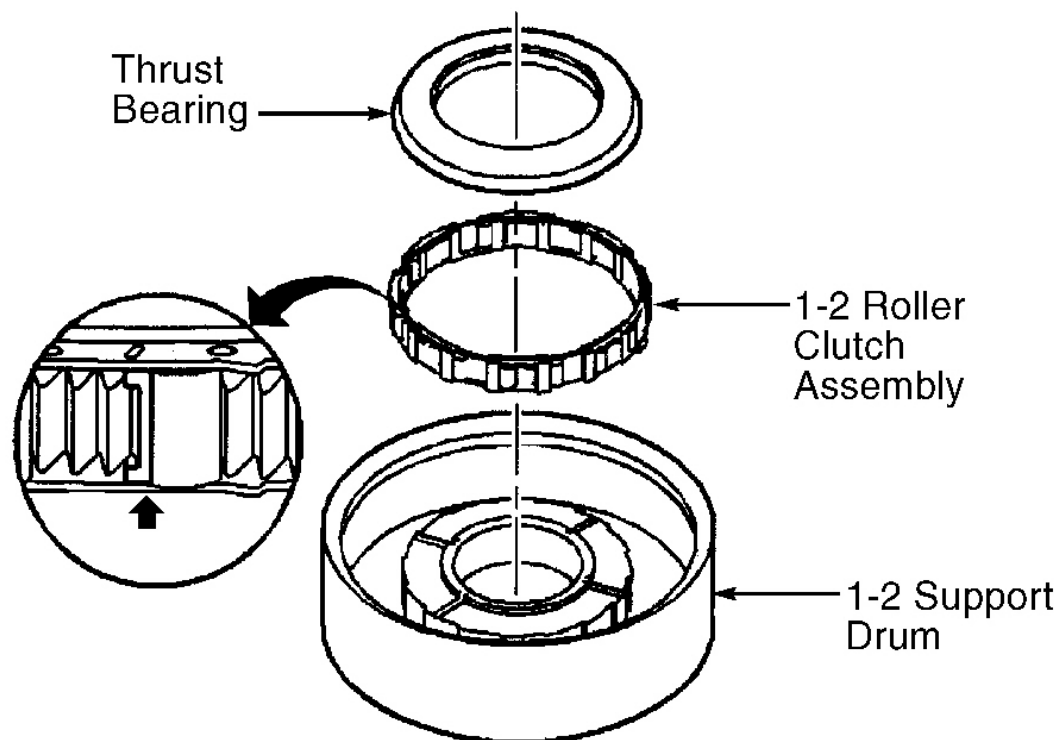
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Fig. 108: Removing 1-2 Roller Clutch
Courtesy of GENERAL MOTORS CORP.



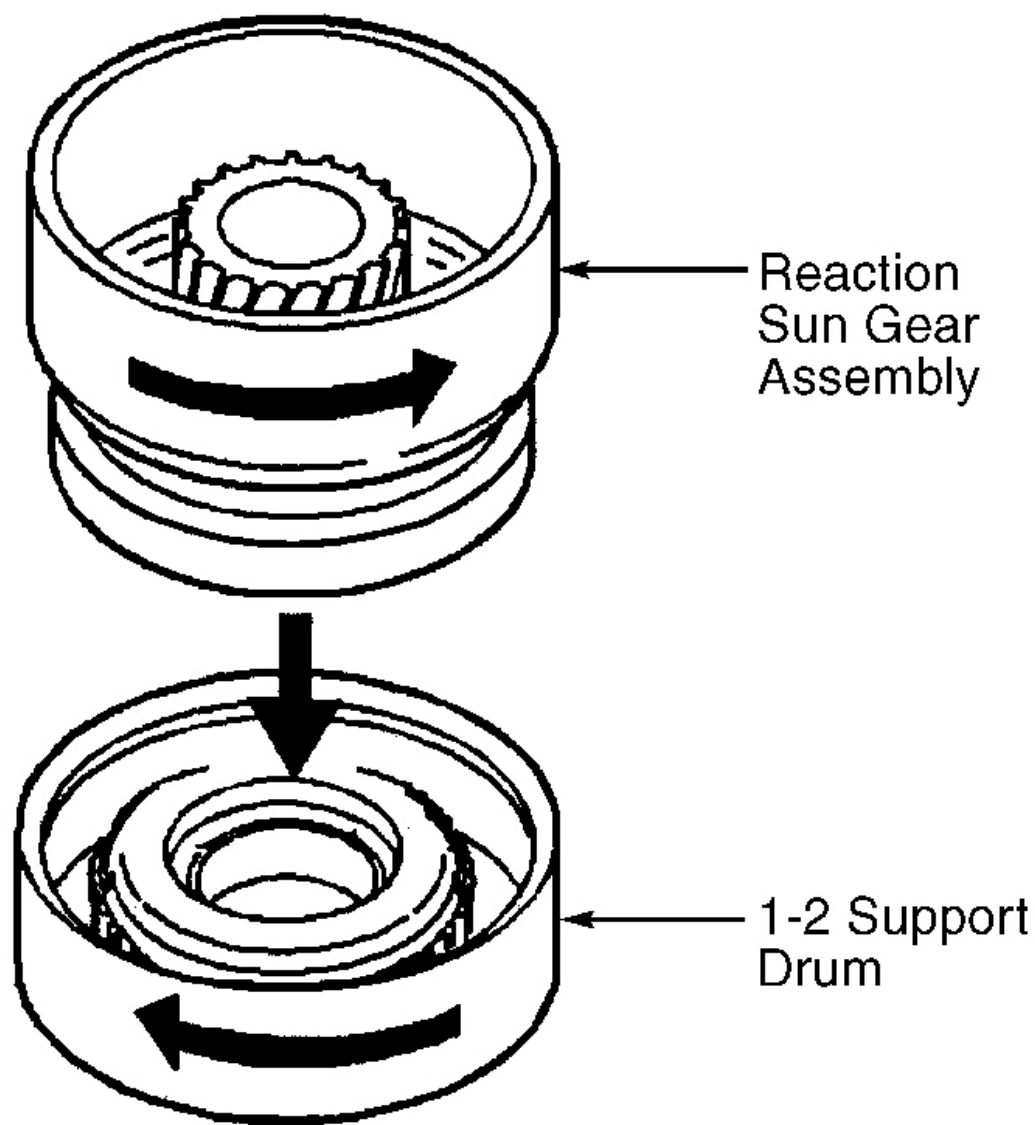
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Fig. 109: Inspecting 1-2 Roller Clutch & 1-2 Support Drum
Courtesy of GENERAL MOTORS CORP.



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Fig. 110: Installing 1-2 Roller Clutch Into 1-2 Support Drum
Courtesy of GENERAL MOTORS CORP.



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Fig. 111: Checking 1-2 Support Roller Clutch Operation
Courtesy of GENERAL MOTORS CORP.

2-1 MANUAL BAND

Inspection

Inspect 2-1 manual band for cracked, separated or worn friction material. Inspect for cracks around apply lugs.

Replace components as necessary. See **Fig. 83**.

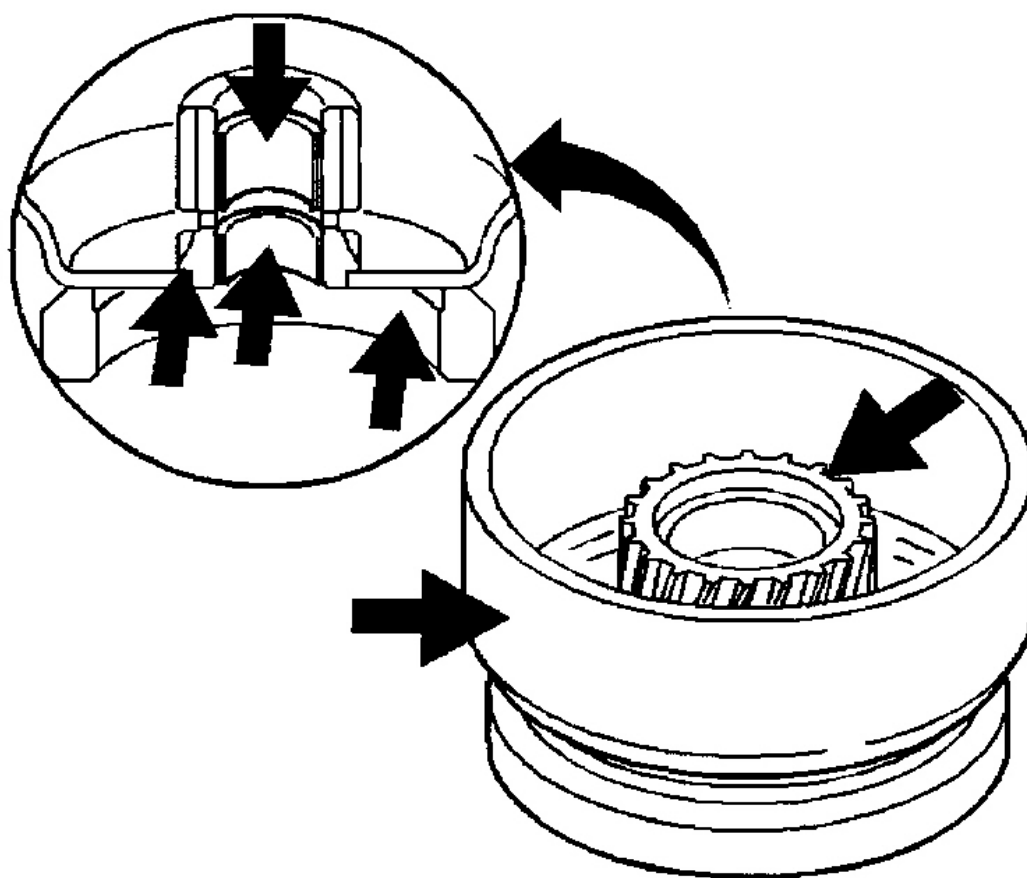
REACTION SUN GEAR & DRUM

Inspection

Inspect reaction sun gear and drum for the following:

- Worn or scored bushings.
- Damaged reaction sun gear teeth.
- Band apply area of drum for discoloration or wear.
- Welds connecting sun gear to drum for voids or cracks.
- Worn or damaged 1-2 support outer race.

Replace components as necessary. See **Fig. 112**.



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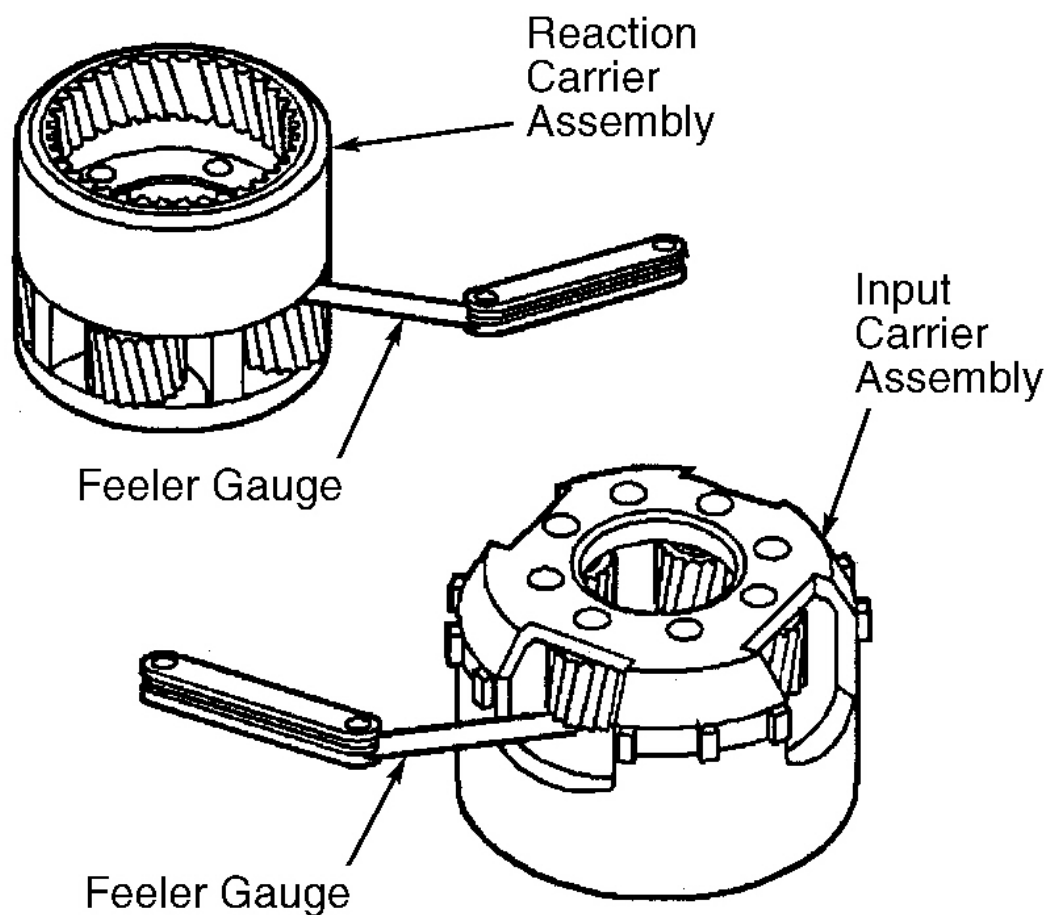
Fig. 112: Inspecting Reaction Sun Gear Assembly
Courtesy of GENERAL MOTORS CORP.

INPUT & REACTION CARRIER

Inspection

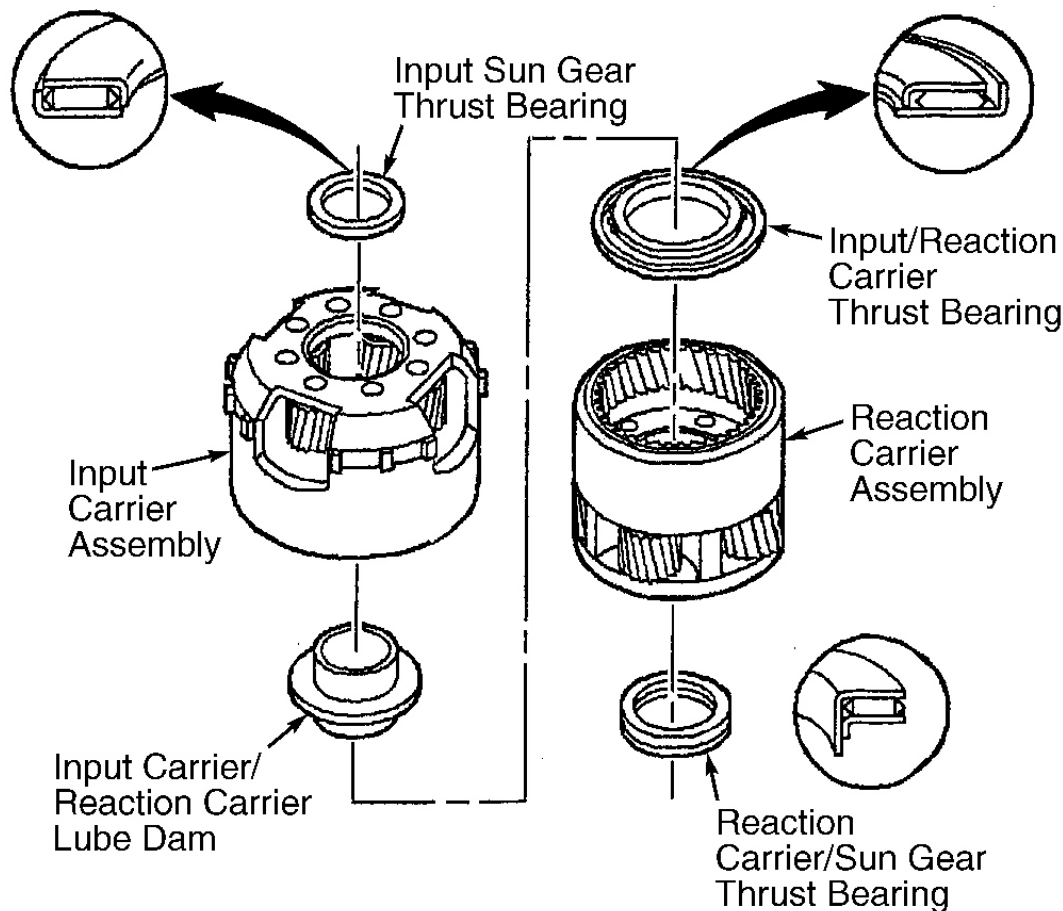
1. Using feeler gauge, check for excessive pinion gear end play in input carrier and reaction carrier assemblies. End play should be .009-.030" (.23-.76 mm). If end play is not as specified, replace appropriate component. See [Fig. 113](#).
2. Inspect thrust bearings, reaction carrier and input carrier for the following:
 - Damaged cage.
 - Damaged or missing rollers.
 - Damage to pinion teeth.
 - Damage to internal gear teeth.
 - Damage to spline teeth.

Replace components as necessary. See [Fig. 114](#).



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Fig. 113: Measuring Input & Reaction Carrier Pinion End Play
Courtesy of GENERAL MOTORS CORP.



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Fig. 114: Input & Reaction Carrier Thrust Bearing Installation

Courtesy of GENERAL MOTORS CORP.

REVERSE REACTION DRUM**Inspection**

NOTE: This step has been revised due to ATRA TSB No. 579, dated November 2000.

1. Inspect for damaged 2nd clutch and reverse reaction drum splines. Original 2nd clutch and reverse reaction drums have splines with 25-degree sides and have tendency to strip. New design 2nd clutch and reverse reaction drum kit (GM P/N 24213402) have splines with 10-degree sides.
2. Inspect reverse reaction drum for cracks, damaged splines or distortion. See **Fig. 75**. Replace drum if necessary.

INPUT & 3RD SPRAG CLUTCHES

Disassembly

1. Remove input and 3rd sprag clutch assemblies from input clutch housing. See **Fig. 115**. Remove and discard spiral lock retaining ring from input clutch sprag outer race retainer. Remove 3rd clutch sprag assembly and input clutch sprag assembly from input and 3rd clutch sprag inner race. See **Fig. 116**. Remove input and 3rd clutch sprag inner race and input sun gear spacer from input sun gear.

NOTE: **DO NOT disassemble sprag elements.**

2. Remove 3rd clutch sprag outer race retainer. Remove input and 3rd clutch sprag end bearings and input and 3rd clutch sprag center bearing from sprag outer races. Remove 3rd clutch and input clutch sprag assemblies from sprag outer races. See **Fig. 117**.

Inspection

Inspect outer races for worn or damaged splines, scoring on inside diameter of races, wear or cracks. Inspect sprag components for flat spots. Inspect cage assemblies for distortion or broken ribbon tabs. Inspect end bearings and center bearing for cracks. Check input sun gear spacer for worn or damaged splines, or wear and cracks. Inspect input sun gear for worn or damaged splines or plugged lube holes or cracks. See **Fig. 116** and **Fig. 117**. Replace components as necessary.

Reassembly

1. Position input clutch sprag outer race on flat surface with flat side facing down. Insert end bearing with flat side down into input clutch sprag outer race. Insert input sprag into outer race. See **Fig. 117**.
2. Position 3rd clutch sprag outer race on flat surface with beveled side facing down. Install center bearing into 3rd clutch. Install 3rd sprag into 3rd clutch outer race. Lip on sprag cage must be facing up. Insert input and 3rd clutch sprag end bearing into third clutch sprag outer race with flat side up. See **Fig. 117**.
3. Install input clutch sprag assembly onto input and 3rd clutch sprag inner race with flat side of input clutch sprag outer race facing down. Install 3rd clutch sprag assembly onto input and 3rd clutch sprag inner race with beveled side of 3rd clutch sprag outer race facing input clutch sprag assembly. Install 3rd clutch sprag outer race retainer onto 3rd clutch sprag outer race. See **Fig. 117**.

NOTE: **Use new retaining ring. DO NOT attempt to reinstall old retaining ring. Ensure spiral lock retaining ring is seated in groove on inner race. Tabs and slots on retaining ring must lock.**

4. Using small flat-blade screwdriver, install retaining ring onto input clutch sprag. Assemble spacer onto input sun gear. Install input and 3rd sprag clutch assemblies onto input sun gear. See **Fig. 118**.

Input Clutch & 3rd Sprag Clutch Functional Check

Hold input sun gear stationary. 3rd sprag clutch outer race should rotate only in counterclockwise direction and lock in clockwise direction. Input sprag clutch outer race should rotate in clockwise direction and lock in counterclockwise direction. See **Fig. 119**.

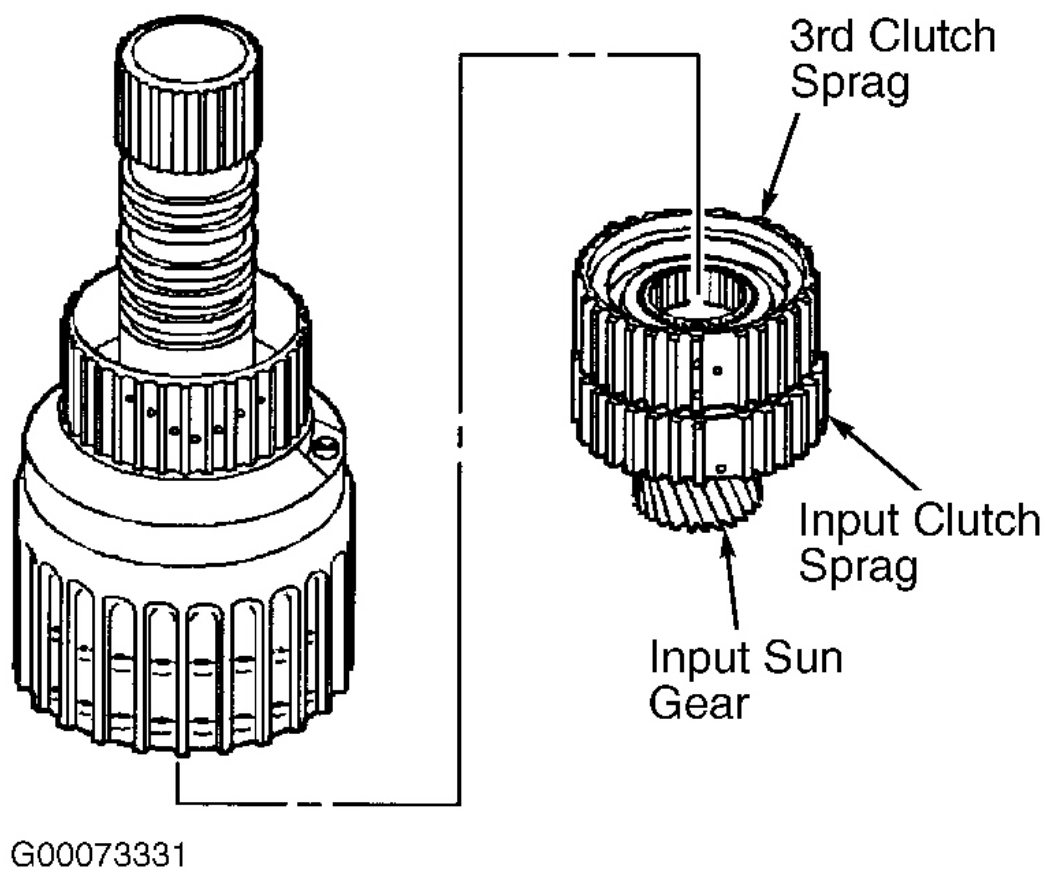


Fig. 115: Removing & Installing Input & 3rd Clutch Sprag Assemblies
Courtesy of GENERAL MOTORS CORP.

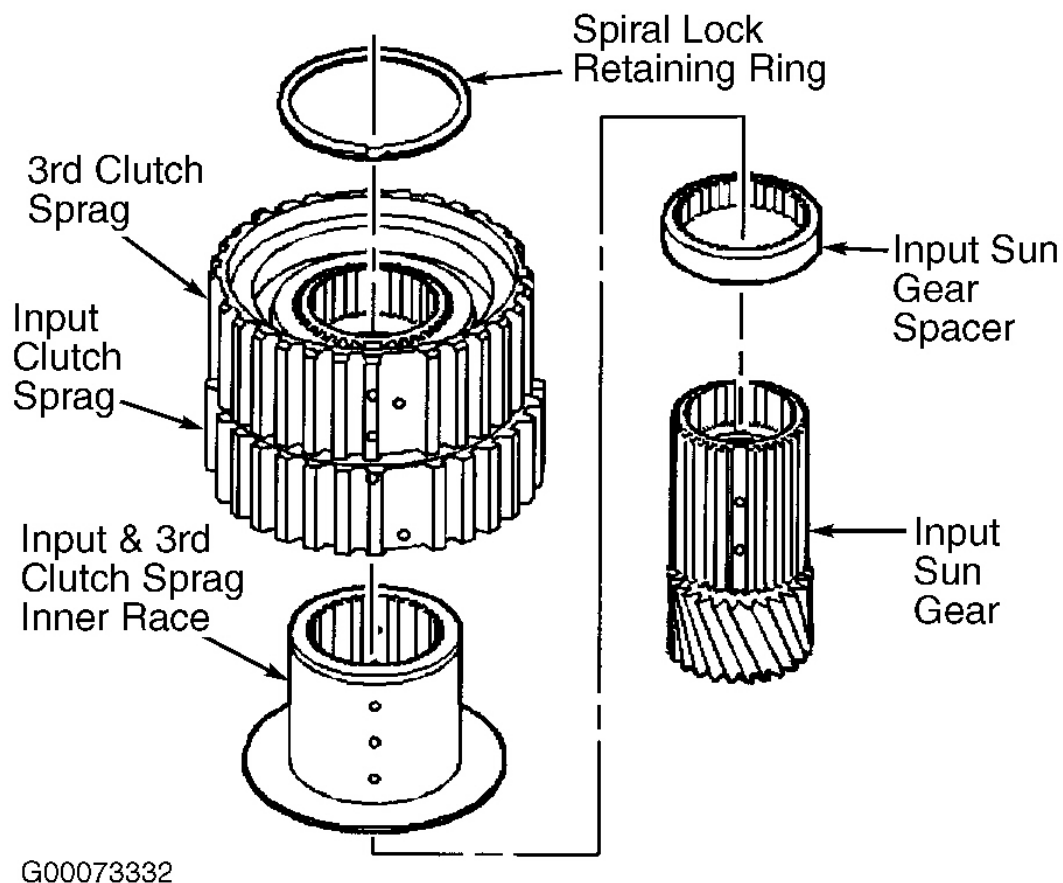


Fig. 116: Disassembling Input & 3rd Clutch Sprag Assembly
 Courtesy of GENERAL MOTORS CORP.

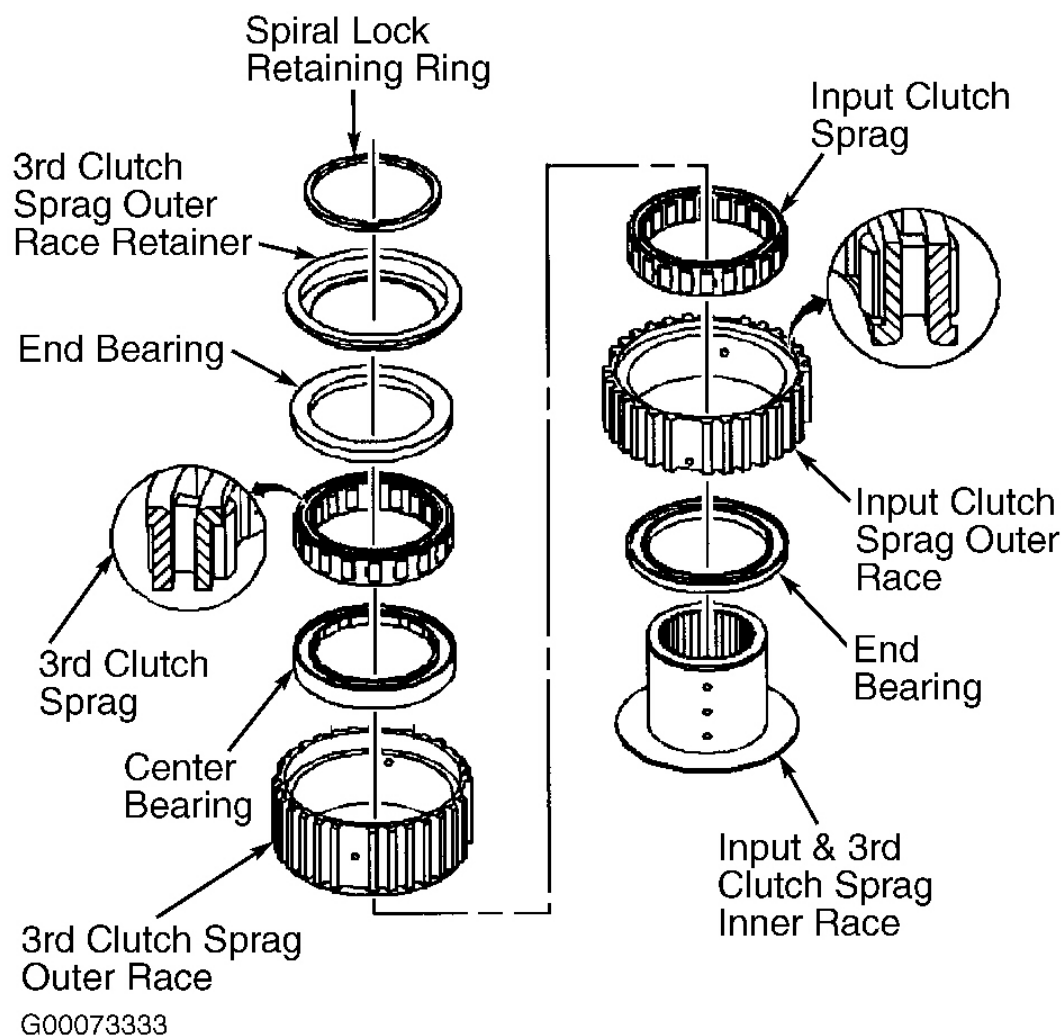


Fig. 117: Exploded View of Input & 3rd Clutch Sprag Assemblies
 Courtesy of GENERAL MOTORS CORP.

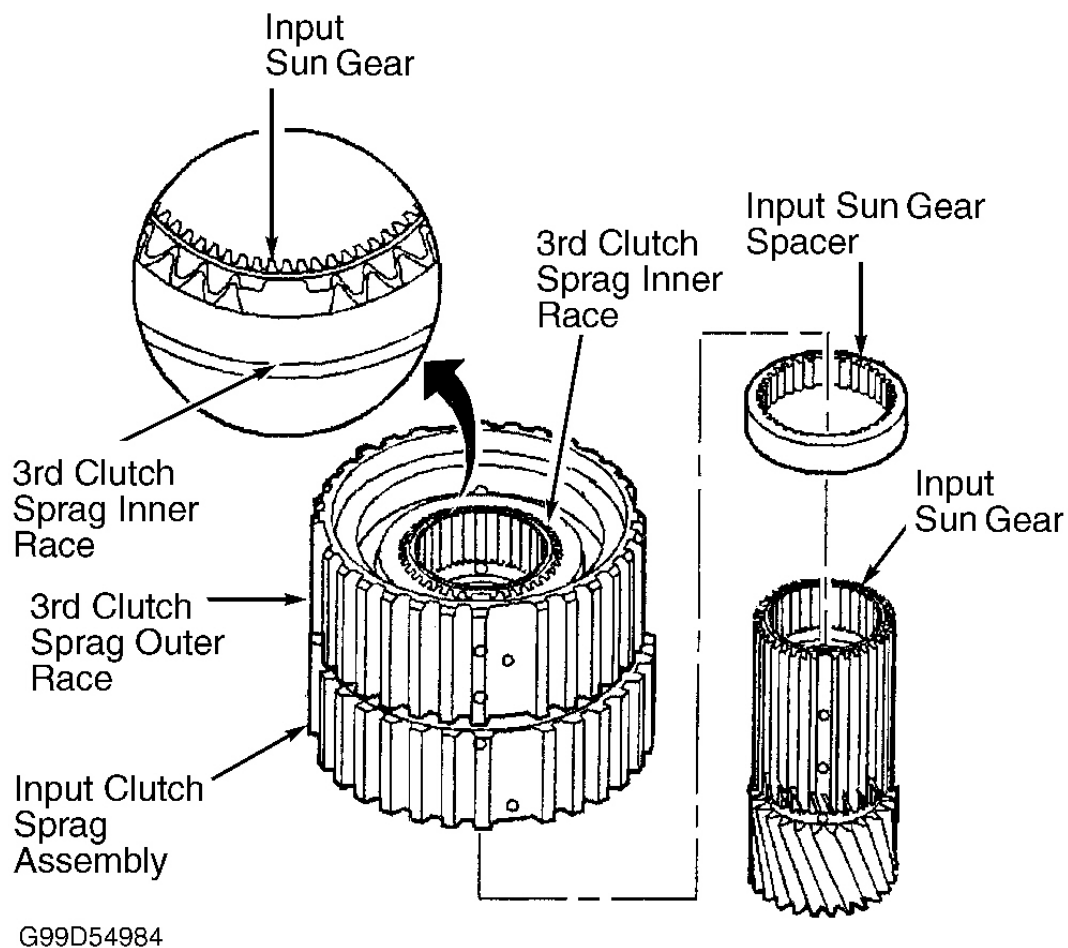
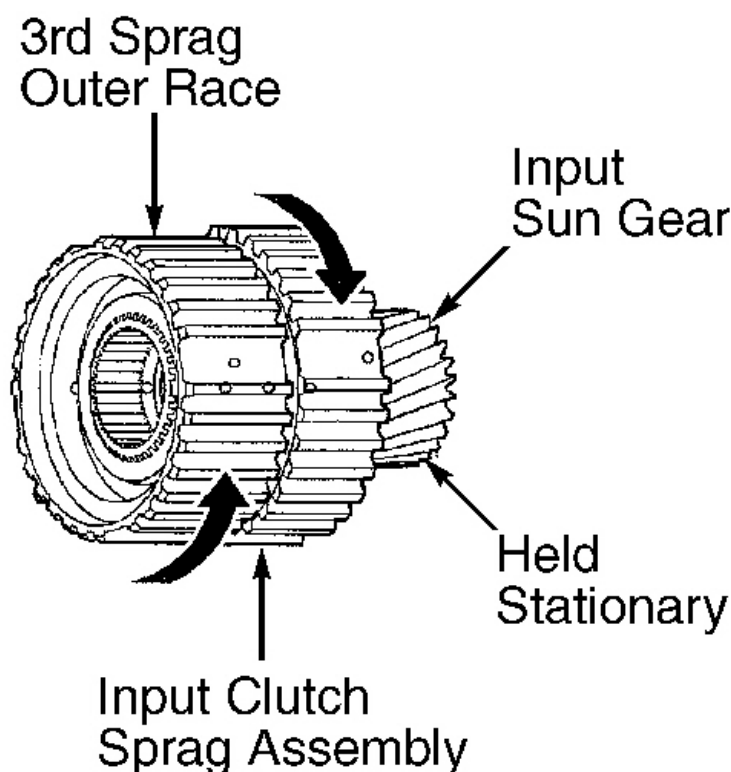


Fig. 118: Assembling 3rd Clutch Sprag Assembly & Input Sun Gear
 Courtesy of GENERAL MOTORS CORP.



NOTE: Must free wheel in direction of arrows and hold in opposite direction.

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Fig. 119: Checking Rotation Of Input & 3rd Sprag Assemblies
Courtesy of GENERAL MOTORS CORP.

INPUT CLUTCH & 3RD CLUTCH

Disassembly

1. Using flat-blade screwdriver, remove retaining ring from input clutch housing. Remove input clutch backing plate. Remove all input clutch plate assemblies. Remove input clutch waved plate and input clutch apply plate. See [Fig. 120](#).
2. Using flat-blade screwdriver, remove retaining ring from input clutch housing. Remove 3rd clutch backing plate. Remove 3rd clutch plate assembly. Remove 3rd clutch waved plate. See [Fig. 121](#). Remove input shaft thrust bearing. See [Fig. 122](#).

3. Using spring compressor and adapter, compress 3rd clutch spring assembly. Using snap ring pliers, remove retaining ring from input clutch housing. See **Fig. 123**. DO NOT over expand retaining ring during removal. Remove adapter, spring compressor and 3rd clutch spring assembly. Remove 3rd clutch piston and seal. See **Fig. 124**.
4. Using spring compressor, compress input clutch spring and retainer assembly. Using snap ring pliers, remove retaining ring from input clutch housing. See **Fig. 125**. DO NOT over expand retaining ring during removal. Remove spring compressor. Remove 3rd clutch piston housing, spring assembly and input clutch piston. See **Fig. 126**.
5. Remove 3rd clutch piston inner seal, 3rd clutch housing "O" ring seal and input clutch piston inner seal. Cut and remove input shaft oil seal rings. DO NOT damage grooves on shaft when oil seal ring is removed. See **Fig. 127**

Inspection

1. Inspect input clutch housing for the following:
 - Plugged feed passages.
 - Worn or damaged splines.
 - Input shaft bushing wear.
 - Seal ring groove nicks or burrs.
 - Crack or blocked fluid passages in input shaft.
 - Damage or wear to thrust bearing in input clutch housing.

Replace components as necessary. See **Fig. 128**.

2. With check ball in seated position, add ATF to input clutch housing, and inspect for leaks. If check ball assembly leaks, see **INPUT CLUTCH HOUSING CHECK BALL VALVE**. Inspect input clutch piston for cracks or damage to seal grooves. Inspect for wear on piston lugs. Inspect input clutch and 3rd clutch spring assemblies for damaged cage or distorted or missing springs. DO NOT attempt to reuse 3rd clutch piston and seal. See **Fig. 124** and **Fig. 126**. Check input shaft thrust bearing for damage or wear. See **Fig. 122**. Replace components as necessary.

Reassembly

1. Lubricate NEW input clutch piston inner seal with ATF. Using Input Clutch Inner Piston Seal Protector (J-37361), install input clutch piston inner seal onto input clutch housing. See **Fig. 129**. Install NEW "O" ring seal in input clutch housing. See **Fig. 130**. Lubricate NEW 3rd clutch piston inner seal with ATF. Using Third Clutch Inner Piston Seal Protector (J-37362), install 3rd clutch piston inner seal onto input clutch housing. See **Fig. 131**.
2. Lubricate NEW input clutch piston outer seal with ATF, install seal onto piston. See **Fig. 132**. Install input clutch piston into input clutch housing. Install input clutch spring and retainer into input clutch housing. Install 3rd clutch piston housing into input clutch housing. See **Fig. 126**. Using spring compressor and snap ring pliers, install retaining ring in 3rd clutch housing. See **Fig. 125**. Remove spring compressor.
3. Lubricate NEW 3rd clutch piston assembly with ATF and install into input housing. Install 3rd clutch spring assembly into input housing. See **Fig. 124**. Using spring compressor, adapter and snap ring pliers,

install 3rd clutch housing retaining ring. See **Fig. 123**.

4. Insert 3rd clutch waved plate into input housing. Install first external splined plate with steel side against waved plate. Place composition side of all plates facing up. Install 3rd clutch plates into input housing. Start by inserting a steel 3rd clutch plate with external splines. Alternate with internal splined plates. Install 3rd clutch backing plate with UP marking facing up. Install retaining ring into input housing. See **Fig. 121**.
5. Install input clutch apply plate into input housing with notched side of teeth facing downward against retaining ring on 3rd clutch backing plate. Install input clutch waved plate. Install input clutch plates starting with an input clutch steel plate and alternating with input clutch composition plate. Install input clutch backing plate with tapered teeth side facing up. Install retaining ring on input clutch housing. See **Fig. 120**. Install input shaft thrust bearing into input clutch housing. See **Fig. 122**.

Input Clutch & 3rd Clutch Functional Check

Using rubber tipped air nozzle, apply a maximum of 20 psi (1.4 kg/cm²) air pressure at indicated fluid passage holes. See **Fig. 133**. Ensure input clutch and 3rd clutch apply. If clutch does not apply, recheck component reassembly.

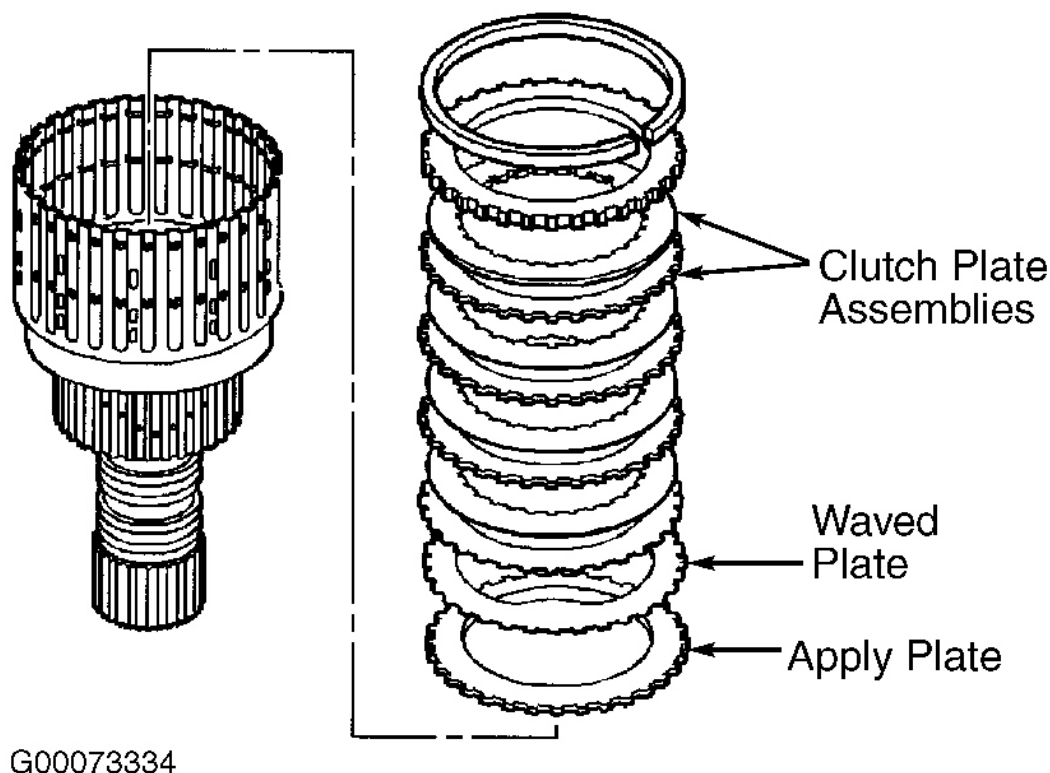


Fig. 120: Removing & Installing Input Clutch Components
Courtesy of GENERAL MOTORS CORP.

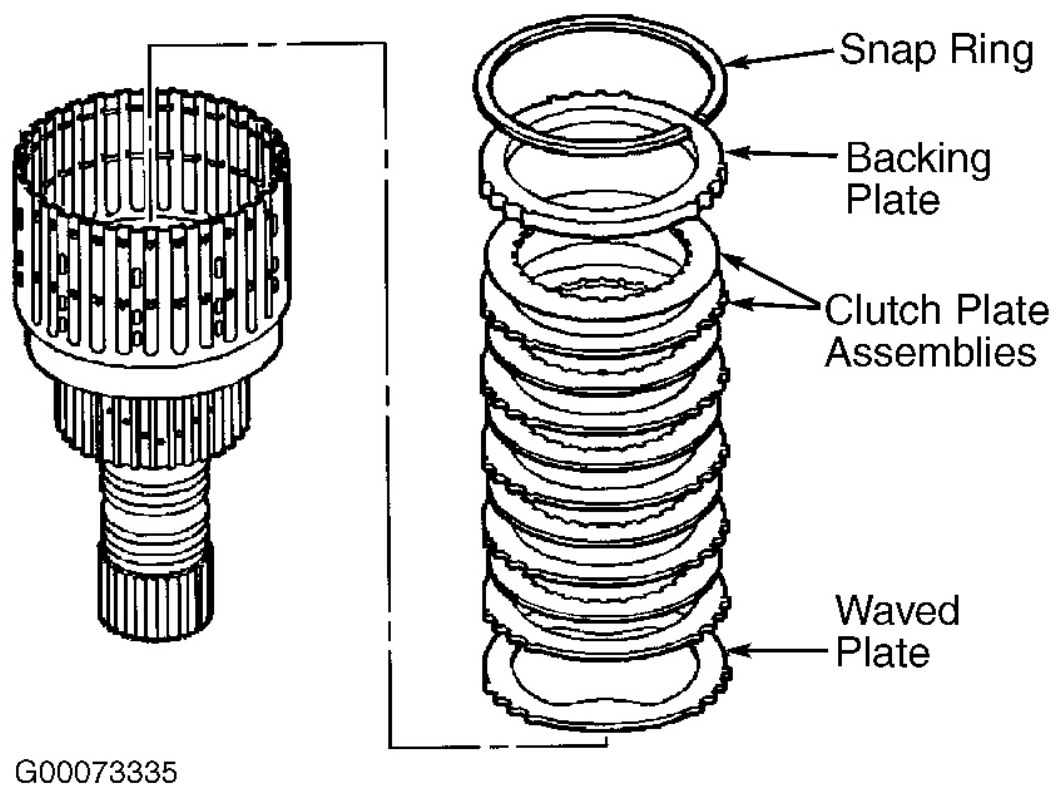


Fig. 121: Removing & Installing 3rd Clutch Components
Courtesy of GENERAL MOTORS CORP.

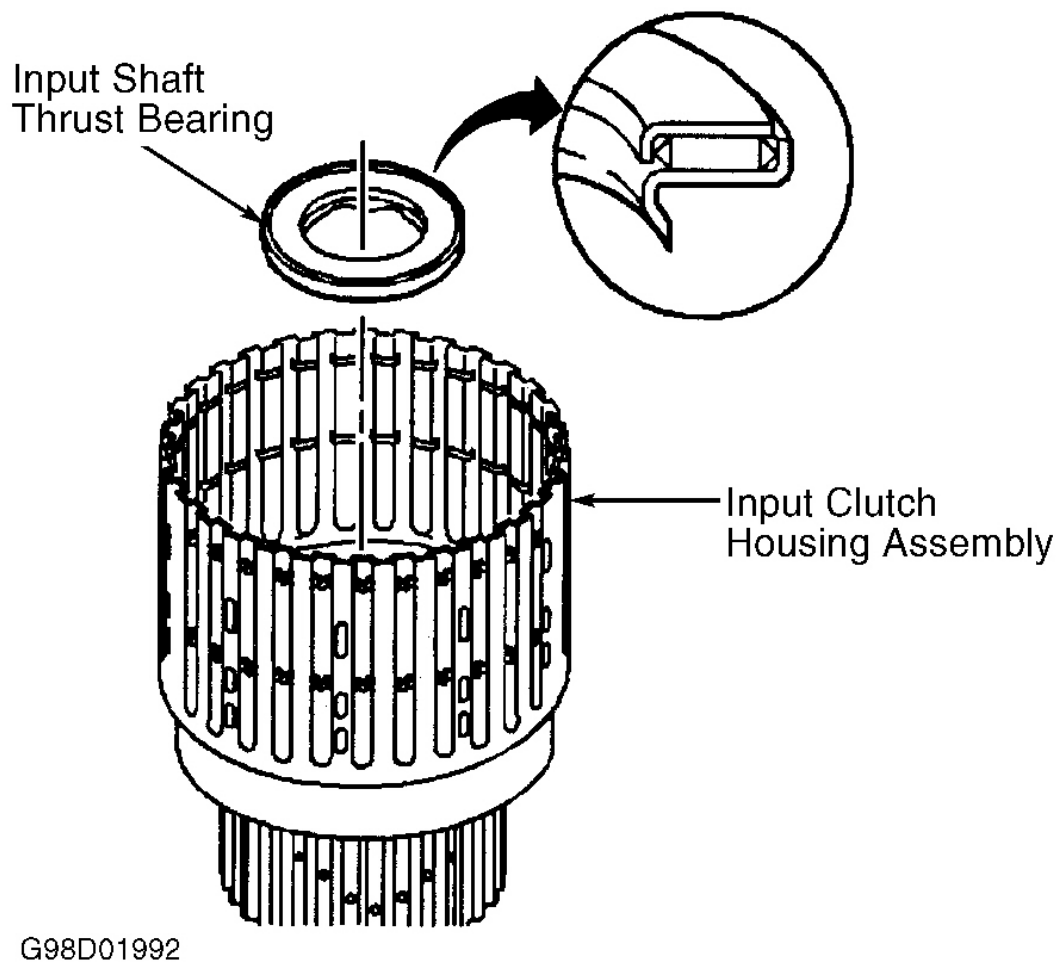
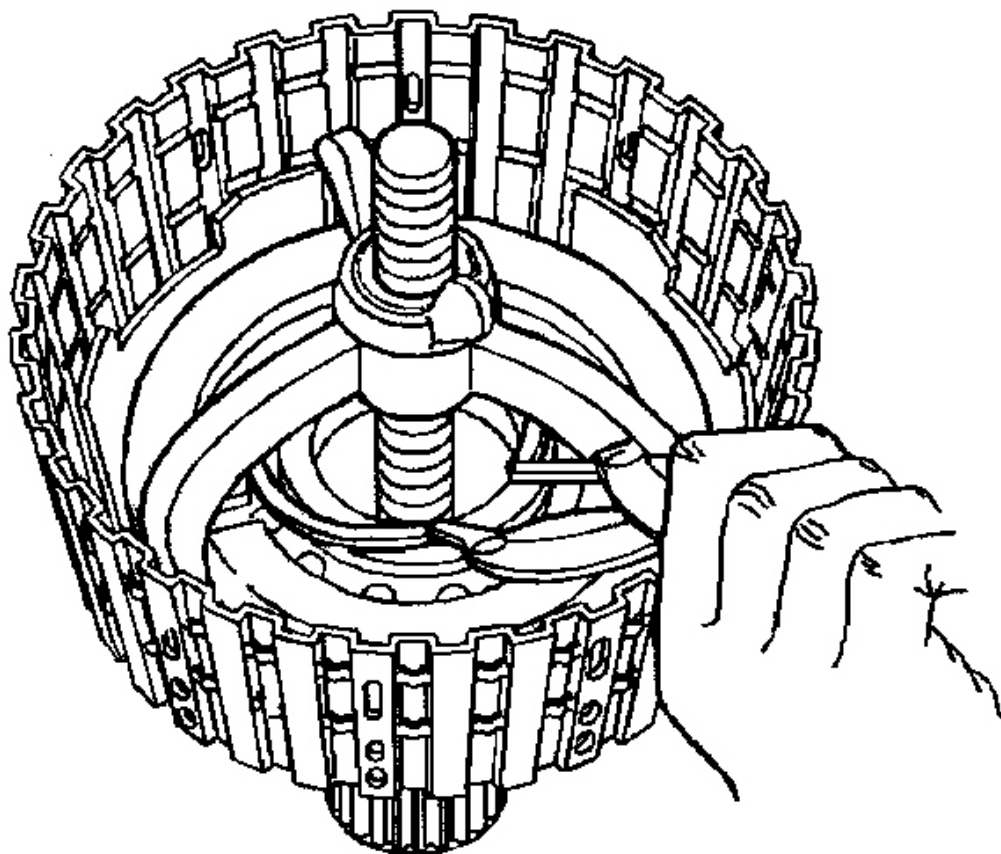
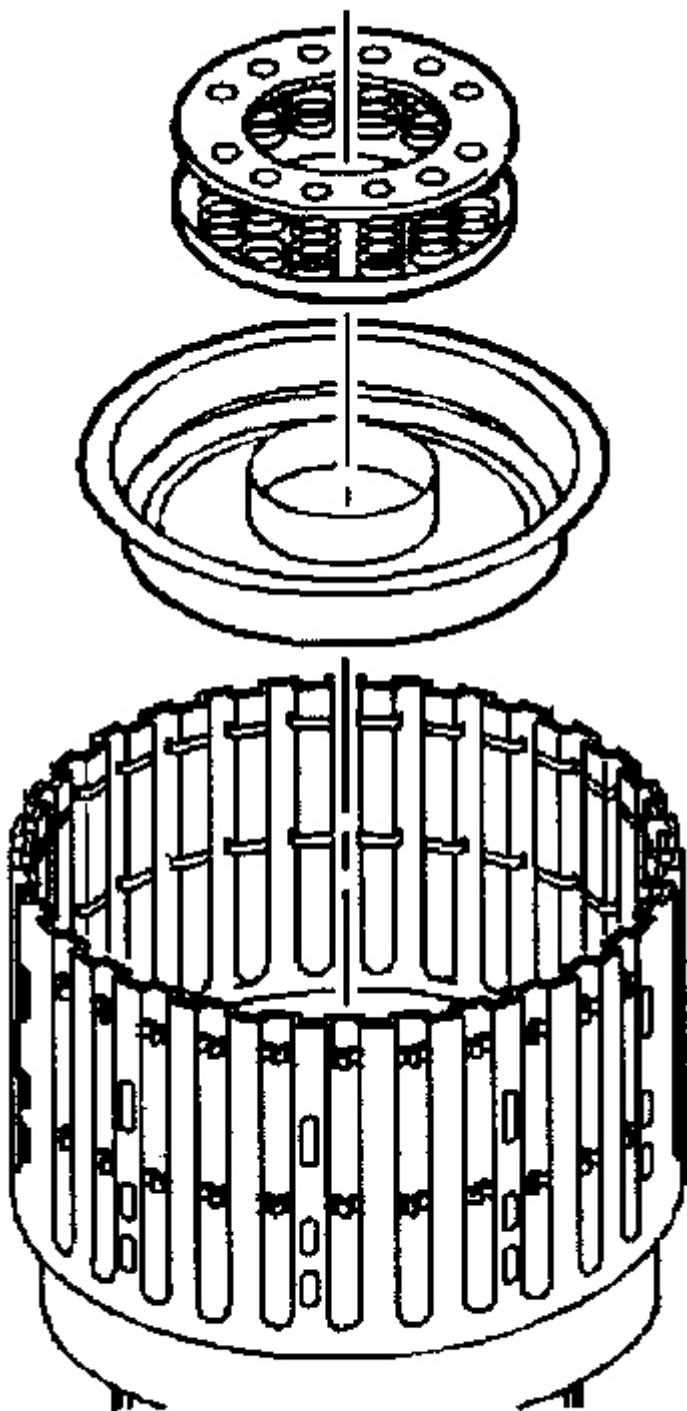


Fig. 122: Removing & Installing Input Shaft Thrust Bearing
Courtesy of GENERAL MOTORS CORP.



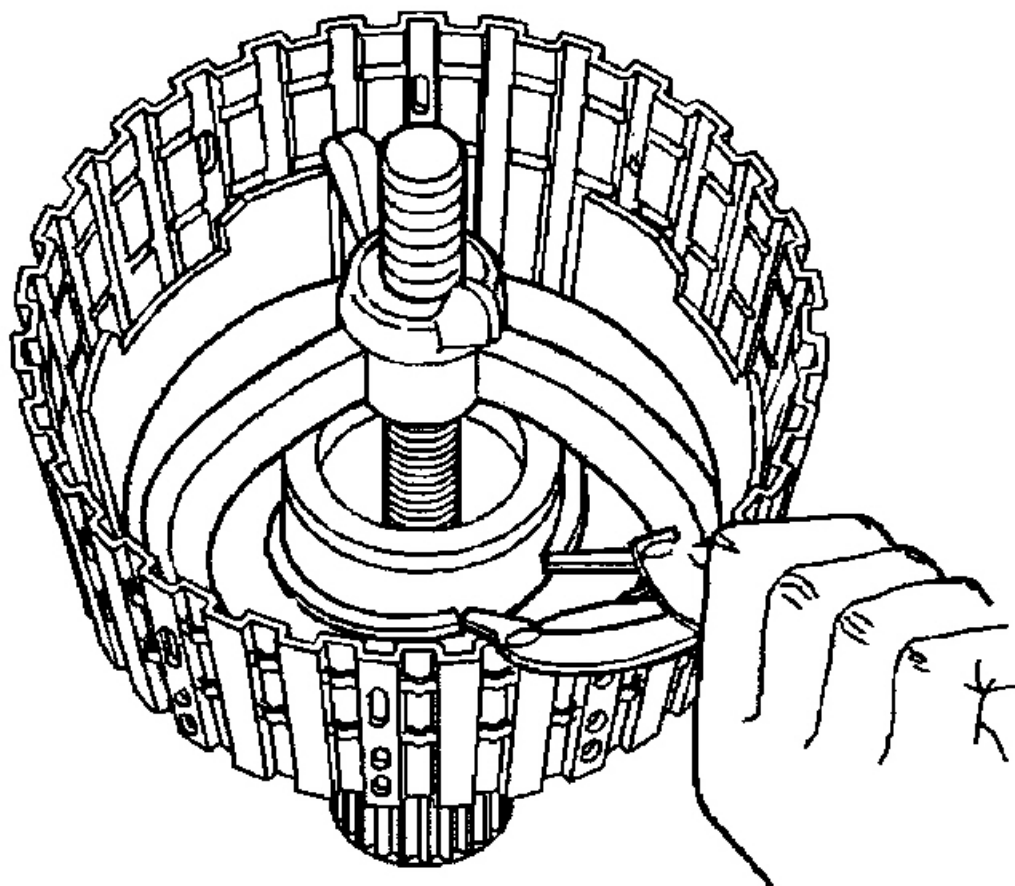
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Fig. 123: Removing & Installing 3rd Clutch Spring Retaining Ring
Courtesy of GENERAL MOTORS CORP.



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Fig. 124: Removing & Installing 3rd Clutch Piston
Courtesy of GENERAL MOTORS CORP.



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Fig. 125: Removing & Installing Input Clutch Retaining Ring
Courtesy of GENERAL MOTORS CORP.

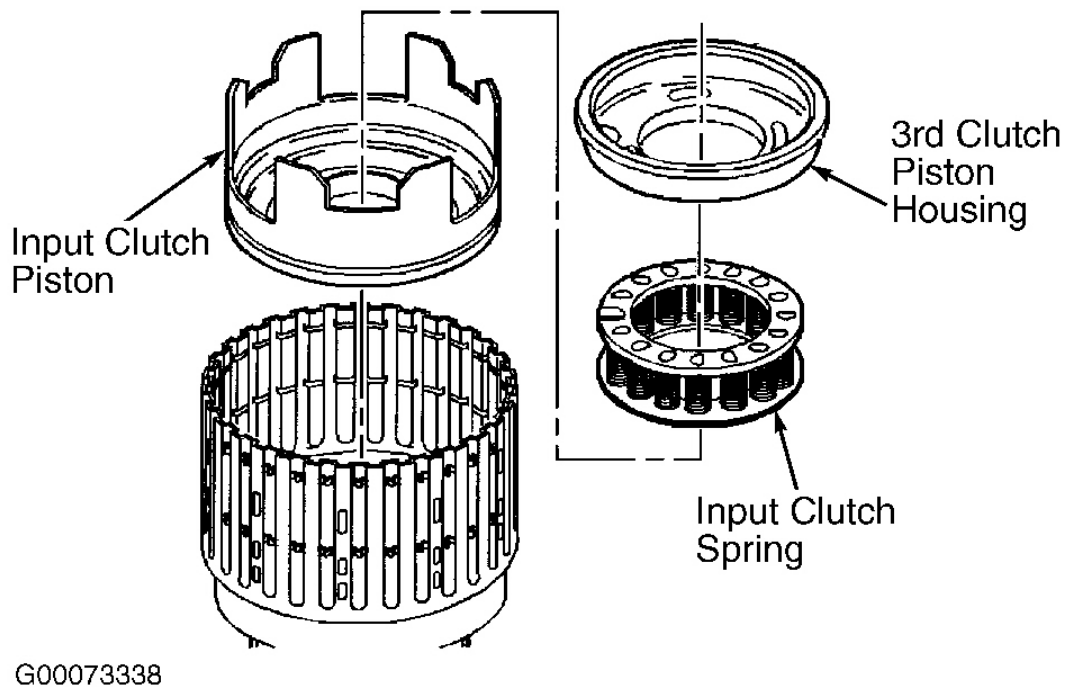


Fig. 126: Removing & Installing Input Clutch Piston Components
Courtesy of GENERAL MOTORS CORP.

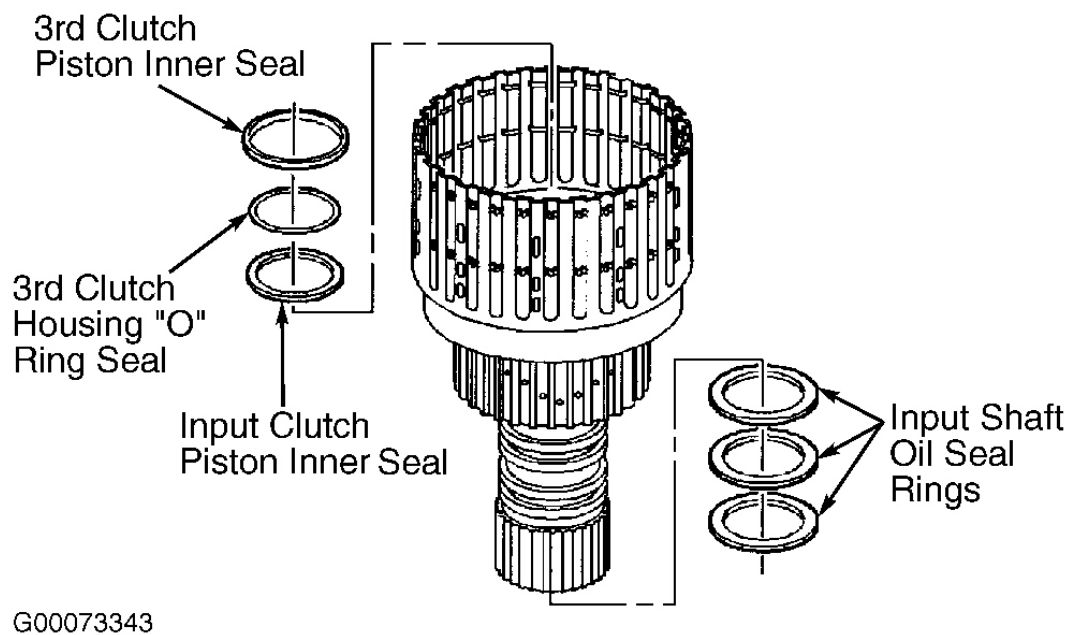
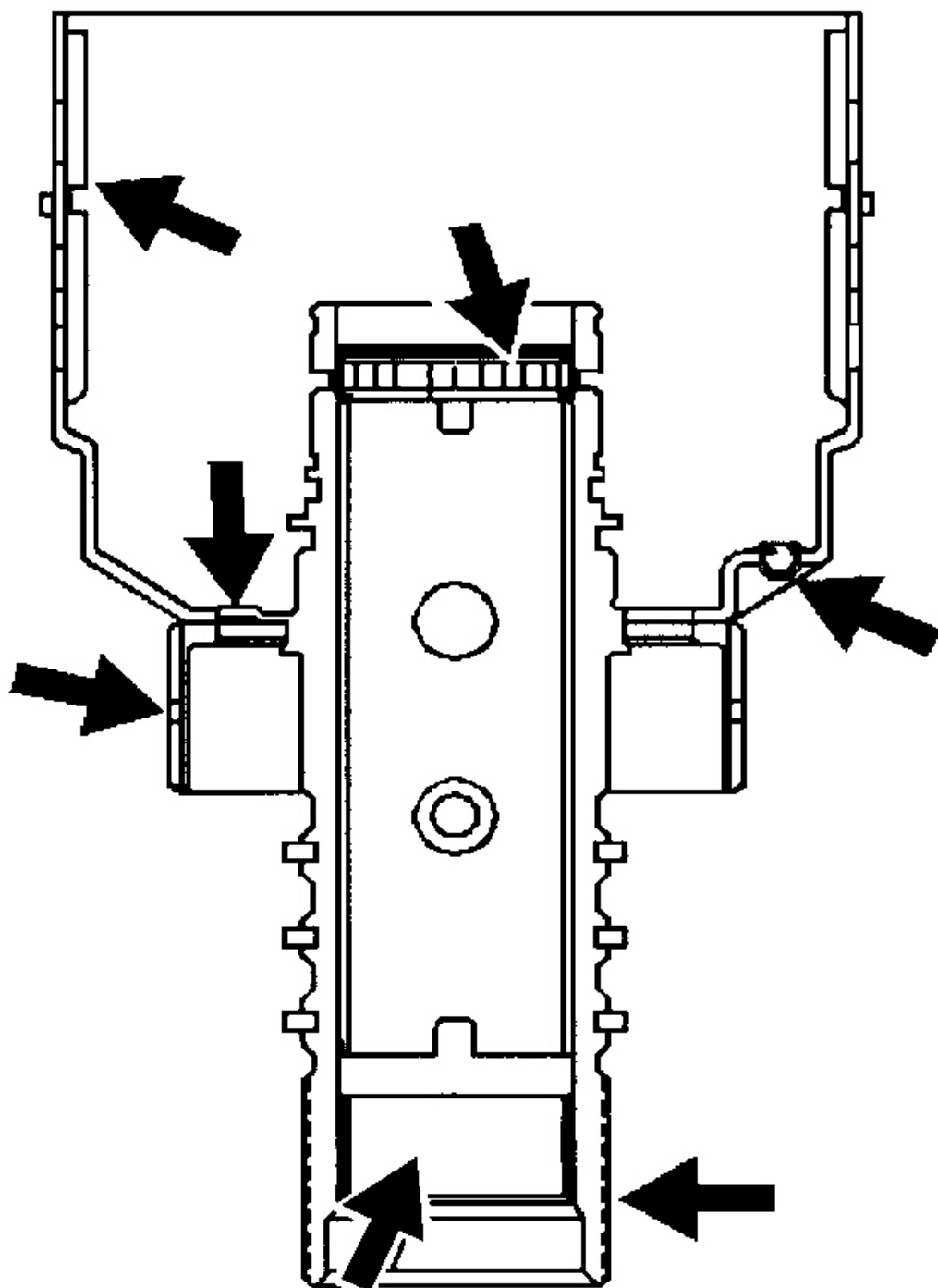
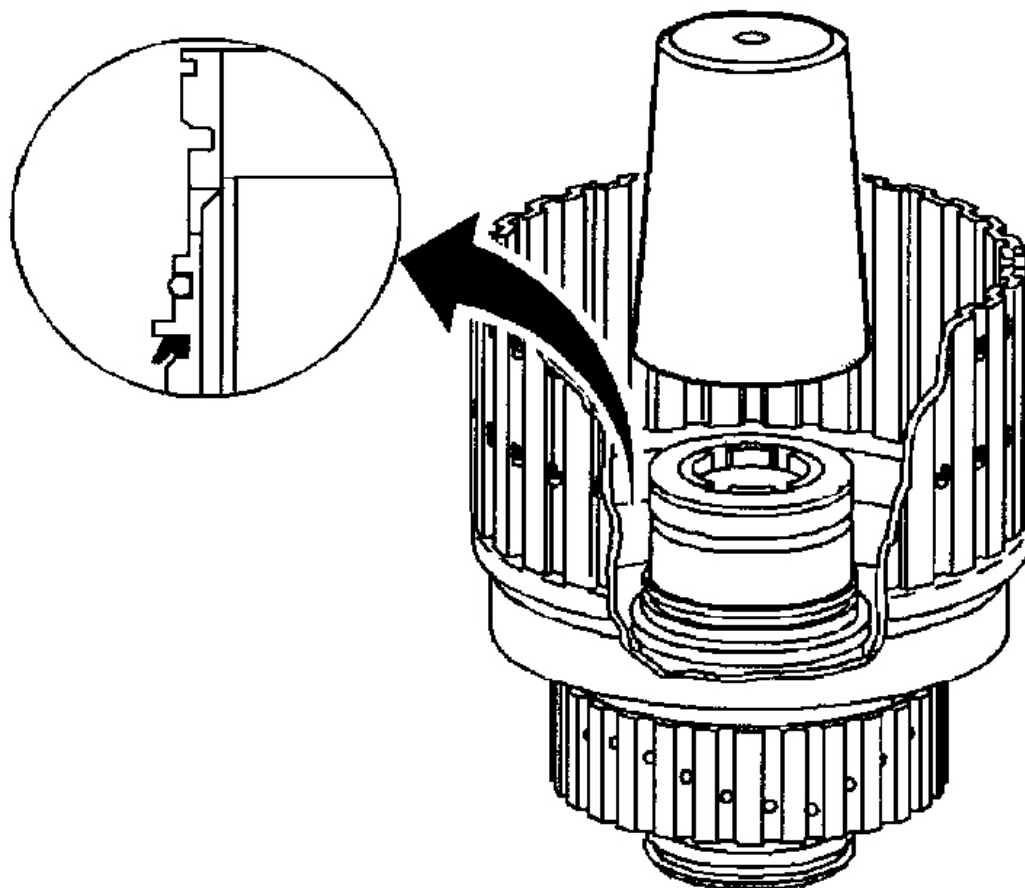


Fig. 127: Removing Input Clutch Housing Seals
 Courtesy of GENERAL MOTORS CORP.



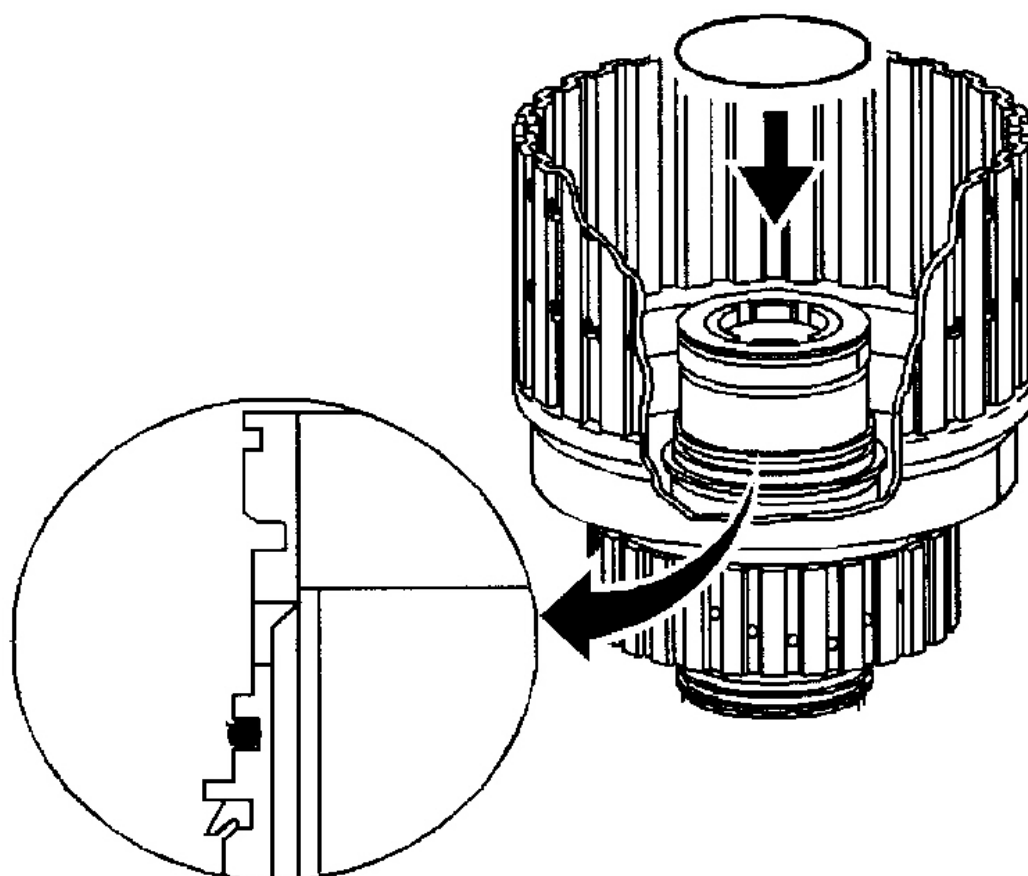
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Fig. 128: Inspecting Input Clutch Housing
Courtesy of GENERAL MOTORS CORP.



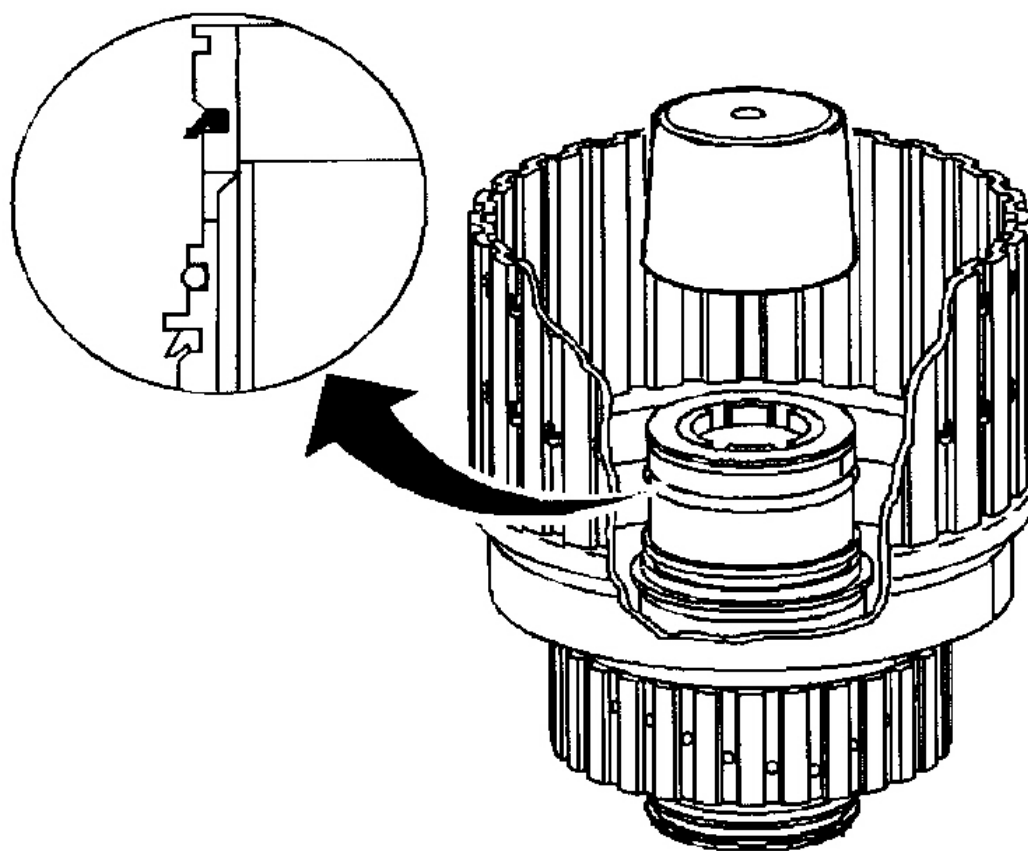
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Fig. 129: Installing Input Clutch Piston Inner Seal
Courtesy of GENERAL MOTORS CORP.



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Fig. 130: Installing 3rd Clutch Housing "O" Ring Seal
Courtesy of GENERAL MOTORS CORP.



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Fig. 131: Installing 3rd Clutch Piston Inner Seal
Courtesy of GENERAL MOTORS CORP.

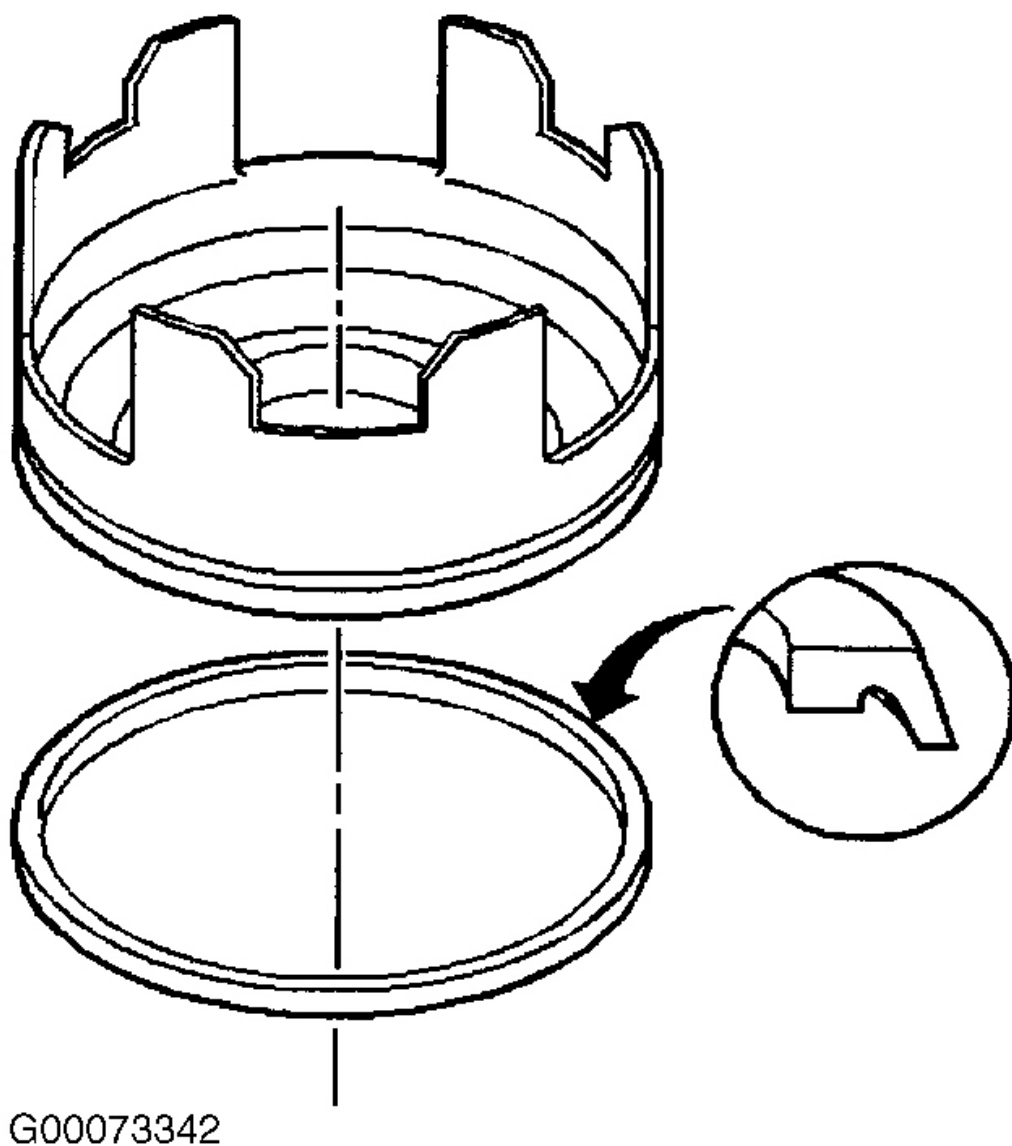
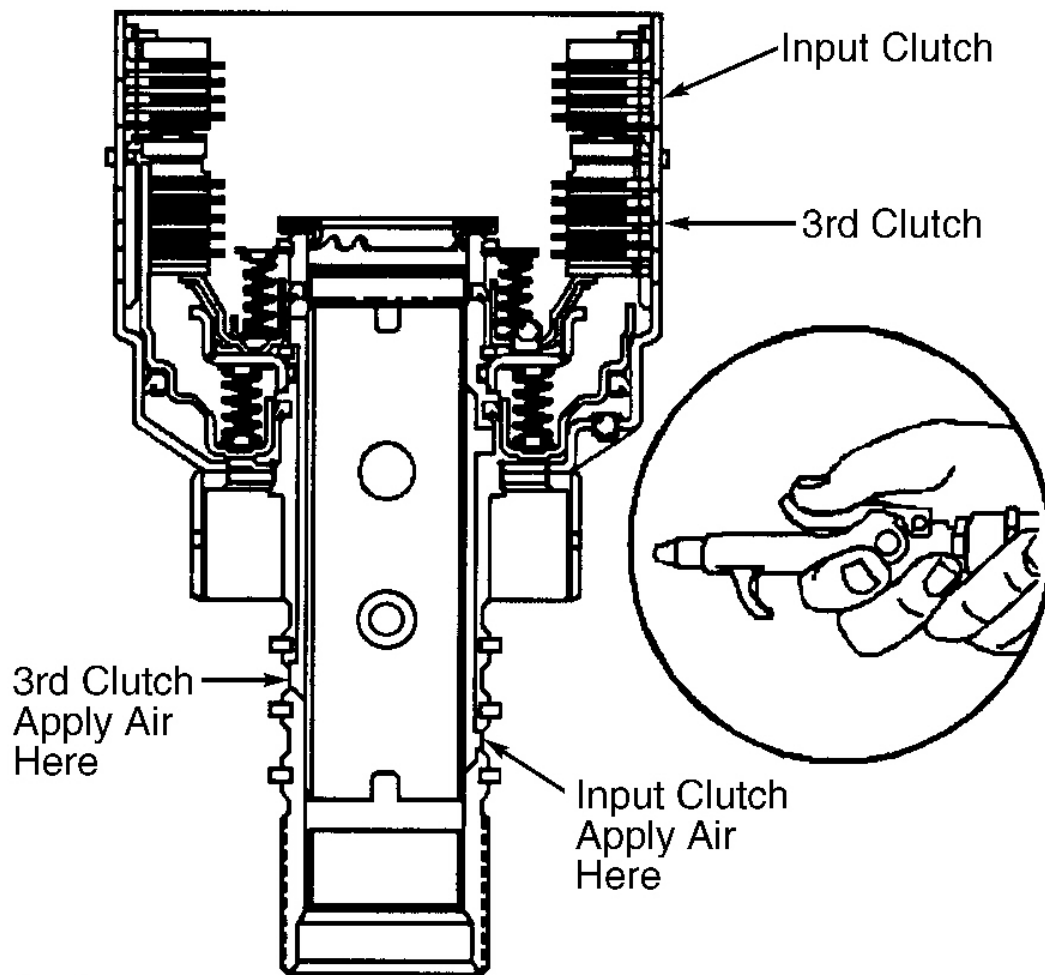


Fig. 132: Removing & Installing Input Clutch Piston Outer Seal
Courtesy of GENERAL MOTORS CORP.



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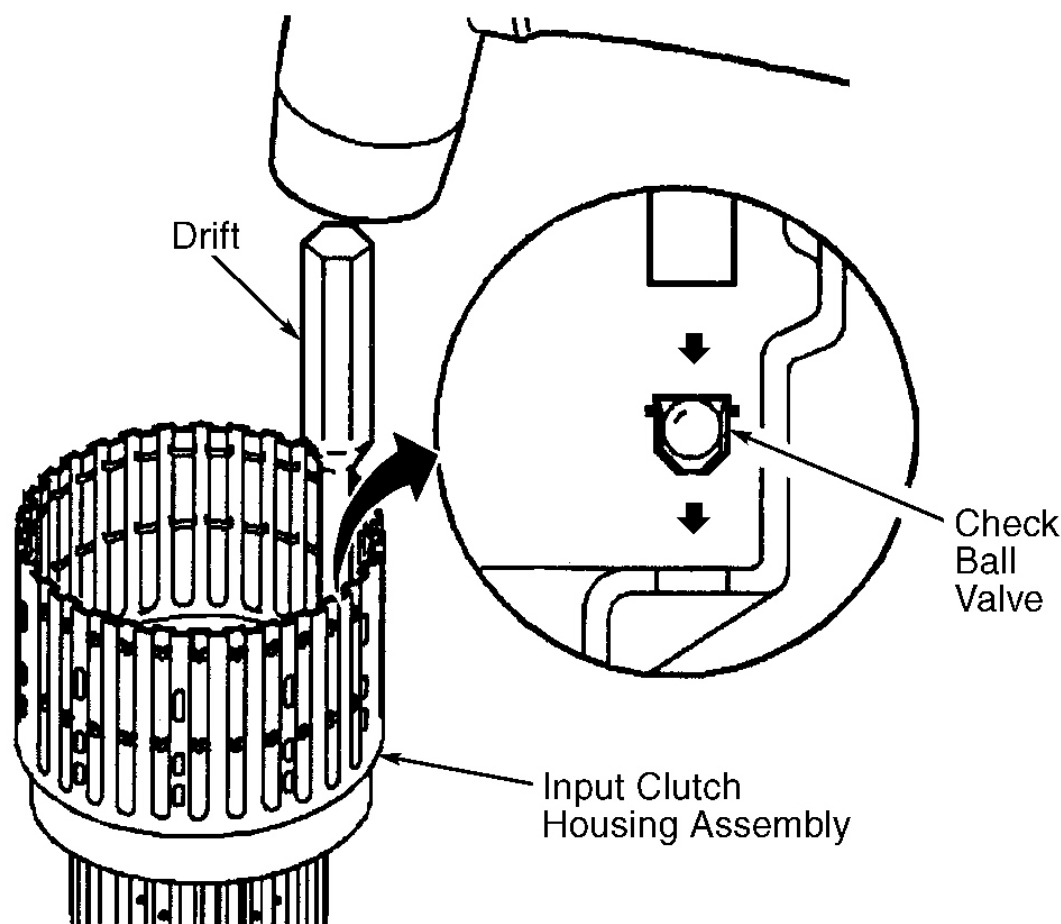
Fig. 133: Checking Input & 3rd Clutch Operation
Courtesy of GENERAL MOTORS CORP.

INPUT CLUTCH HOUSING CHECK BALL VALVE

NOTE: Remove check ball valve only if inspection or leak check indicates problem with check ball valve.

Disassembly & Reassembly

Using 1/4" drift and hammer, remove check ball valve from input clutch housing. To reassemble, use 3/8" drift and hammer to install check ball valve into input clutch housing. See **Fig. 134**.



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Fig. 134: Installing Input Clutch Housing Check Ball Valve
Courtesy of GENERAL MOTORS CORP.

INPUT SHAFT OIL SEAL RINGS

Input Shaft Oil Seal Ring Replacement

1. Remove solid oil seal rings from input shaft. Inspect seal ring grooves for nicks or burrs. Lubricate each oil seal ring, and position individually onto Seal Protector (J-34741-1). See **Fig. 135**.
2. Quickly slide each seal into ring groove when protector is in position. Using Seal Driver (J-34741-2), push ring over seal protector. Size seal with Seal Sizer (J-34741-3). Gently twist seal sizer over each seal. Leave sizer in place until input clutch housing installation.

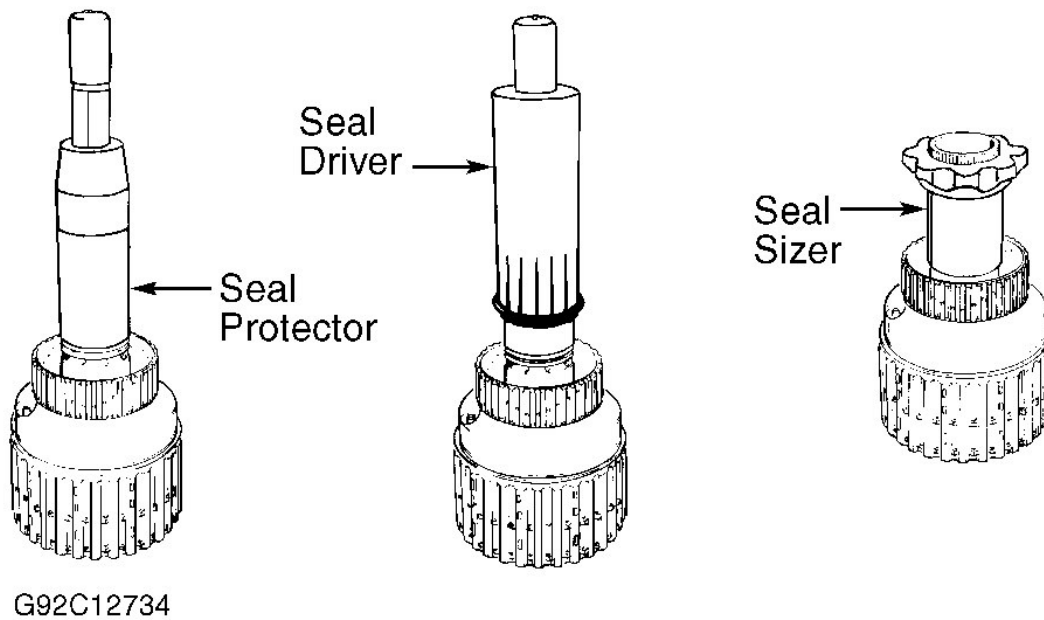


Fig. 135: Installing & Sizing Seal Rings To Housing
Courtesy of GENERAL MOTORS CORP.

INPUT CLUTCH HOUSING & SPRAG CLUTCHES

Reassembly

Using small screwdriver, align teeth of input clutch plate assembly with 3rd clutch plate assembly. Ensure sprag assembly is fully seated into housing. Insert combined input sprag clutch and 3rd sprag clutch assembly into input clutch housing assembly. See **Fig. 115**.

2ND CLUTCH ASSEMBLY

Disassembly

Using flat-blade screwdriver, remove retaining ring from 2nd clutch housing. Remove backing plate, composition plates, steel plates, apply plate and waved plate. See **Fig. 136**. Using spring compressor, compress 2nd clutch piston spring. Remove retaining ring. See **Fig. 137**. Remove 2nd clutch spring assembly and 2nd clutch piston. See **Fig. 138**.

Inspection

1. Inspect 2nd clutch housing for the following:
 - Leaking or damaged ball check valve. Turn housing to seat check ball. Using ATF, check for leaking or damaged check ball valve in 2nd clutch housing. If check ball assembly leaks, replace check ball assembly. See **2ND CLUTCH HOUSING CHECK BALL VALVE**.

- Scored or worn bushings.
- Discolored band surface or wear on drum caused by excess heat.
- Flatness of band surface on drum.
- Damaged reverse reaction drum splines.
- Cracks in welds.

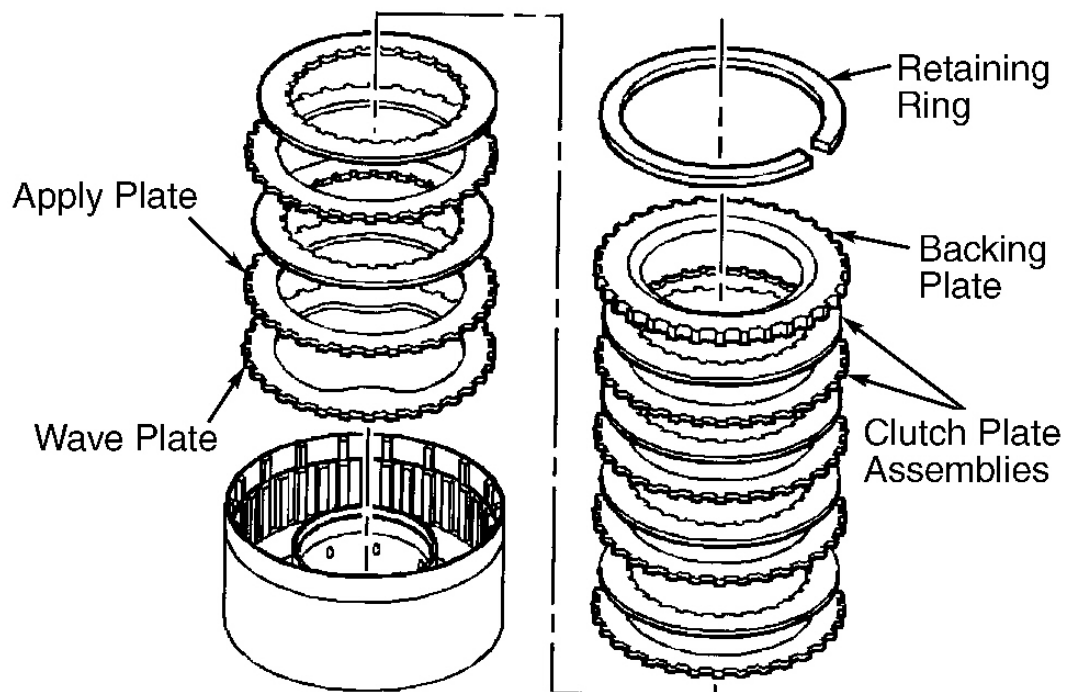
Replace components as necessary. See **Fig. 139**.

NOTE: This step has been revised due to ATRA TSB No. 579, dated November 2000.

2. Check for damaged reverse reaction drum splines. See **Fig. 75**. Original 2nd clutch and reverse reaction drums have splines with 25-degree sides and have tendency to strip. New design 2nd clutch and reverse reaction drum kit (GM P/N 24213402) have splines with 10-degree sides. Check for cracks in welds. Inspect backing plate and waved plate for cracks and heat spots. Inspect steel and composition plates for wear, lining separation, pitting, flaking or damage. See **Fig. 136**.
3. Inspect apply ring and spring assembly for damage. Inspect piston and piston seals for damage. Inspect 2nd clutch housing for damaged inner piston seal. See **Fig. 138**.

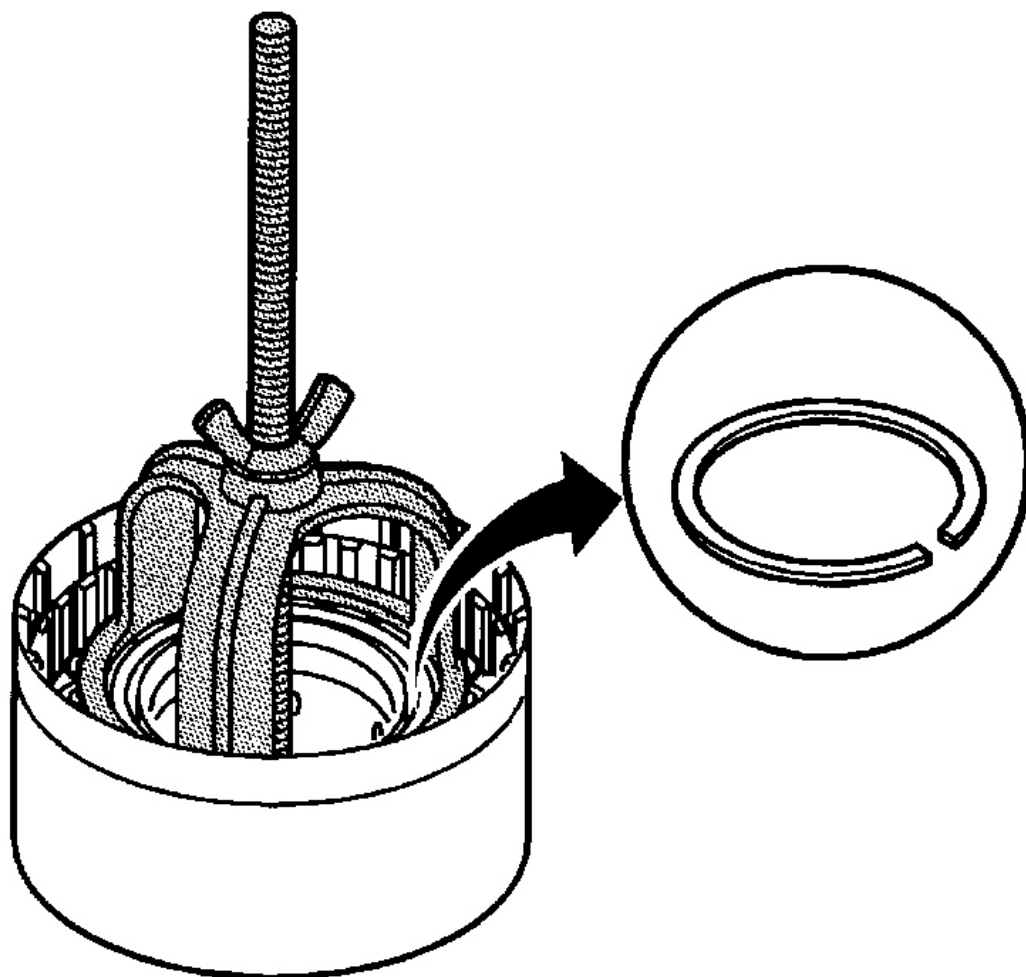
Reassembly

1. Install Adapter (J-41992-3) into NEW 2nd clutch piston. Install piston and adapter into Protector (J-41992-1). Install piston assembly into 2nd clutch housing. Center inner seal protector onto hub by pressing down on center of protector. Install Piston Installer (J-41992-2) onto protector. Legs of installer go into slots of protector. Use hand pressure to press down on installer until piston is seated. See **Fig. 140**.
2. Install 2nd clutch spring assembly into housing. Install retaining ring. See **Fig. 137**. Install waved plate. Install apply plate into 2nd clutch housing with DN or DOWN marking toward piston. Install composition plates and steel plates, starting with composition plate and alternating each plate. Install backing plate and retaining ring. See **Fig. 136**.



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Fig. 136: Exploded View Of 2nd Clutch Friction Components
Courtesy of GENERAL MOTORS CORP.



G00073347

Fig. 137: Removing & Installing 2nd Clutch Piston Spring Retaining Ring
Courtesy of GENERAL MOTORS CORP.

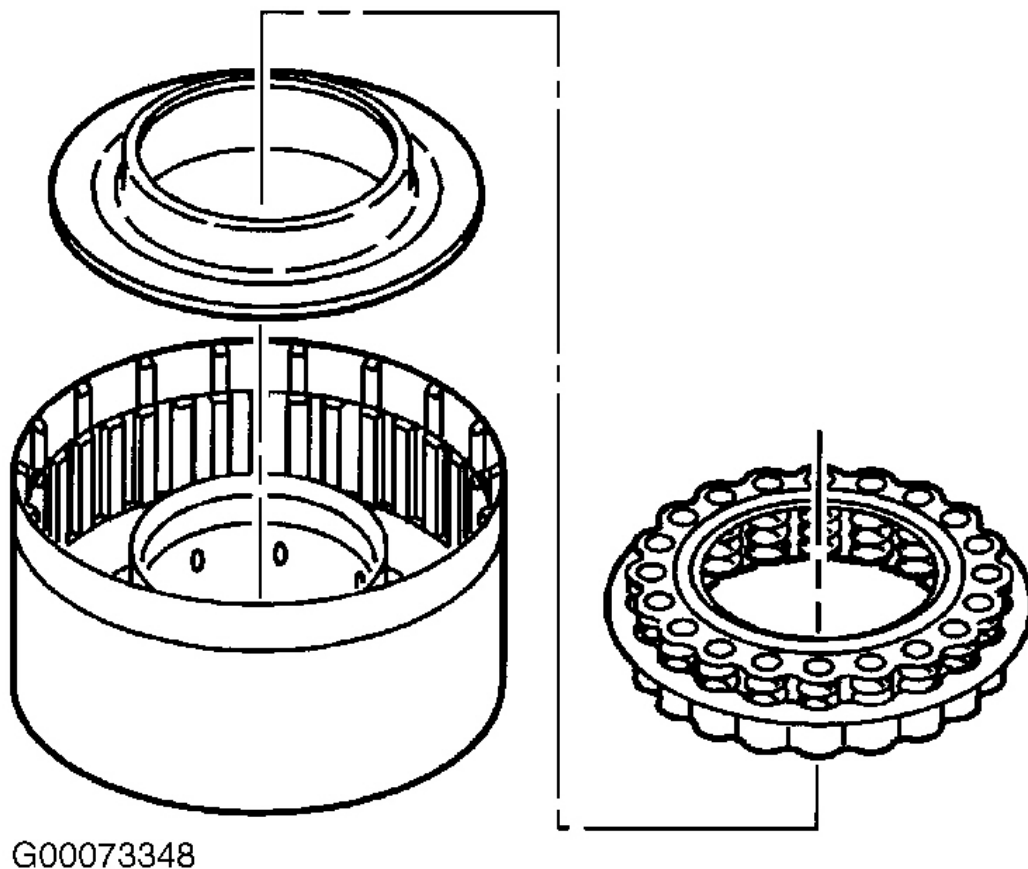
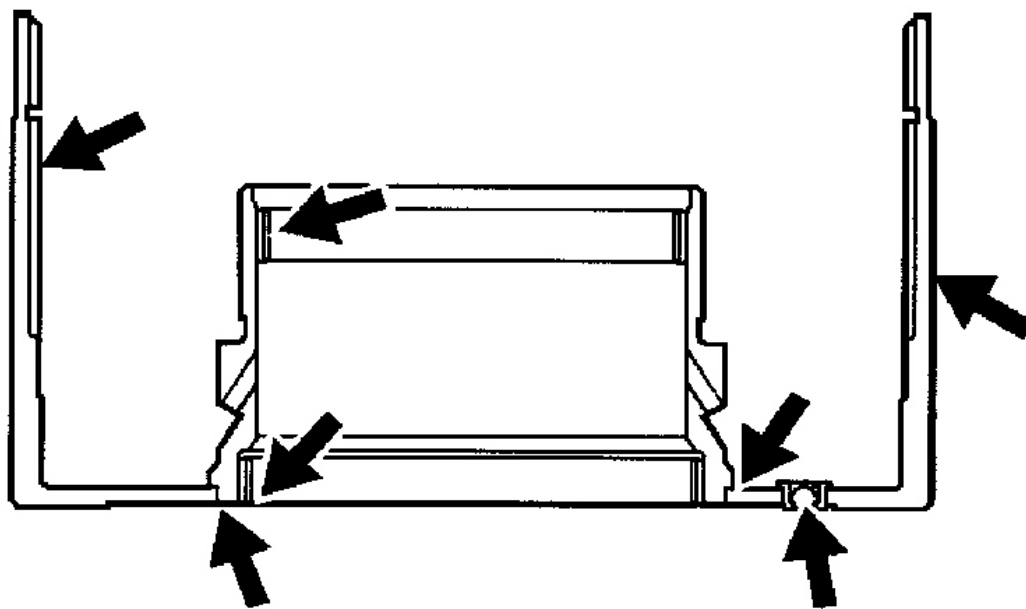


Fig. 138: Exploded View Of 2nd Clutch Piston & Spring
Courtesy of GENERAL MOTORS CORP.



G00073349

Fig. 139: Inspecting 2nd Clutch Housing
Courtesy of GENERAL MOTORS CORP.

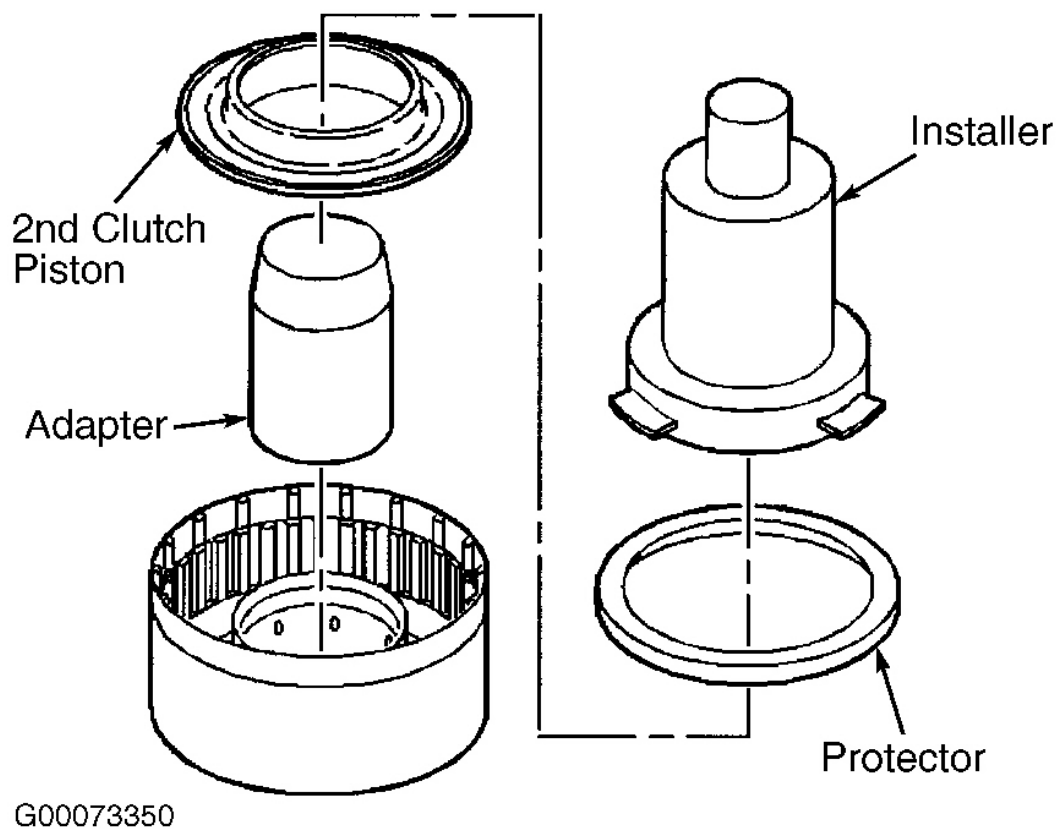


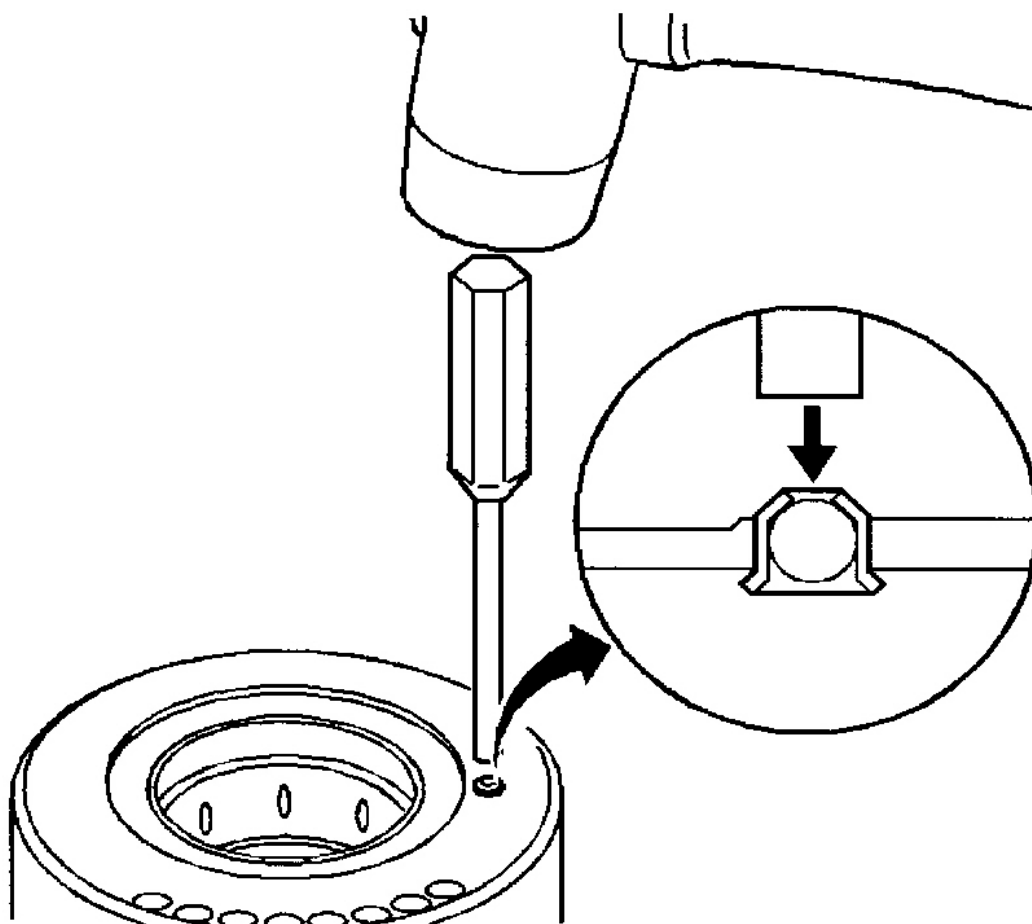
Fig. 140: Installing 2nd Clutch Piston
Courtesy of GENERAL MOTORS CORP.

2ND CLUTCH HOUSING CHECK BALL VALVE

Disassembly & Reassembly

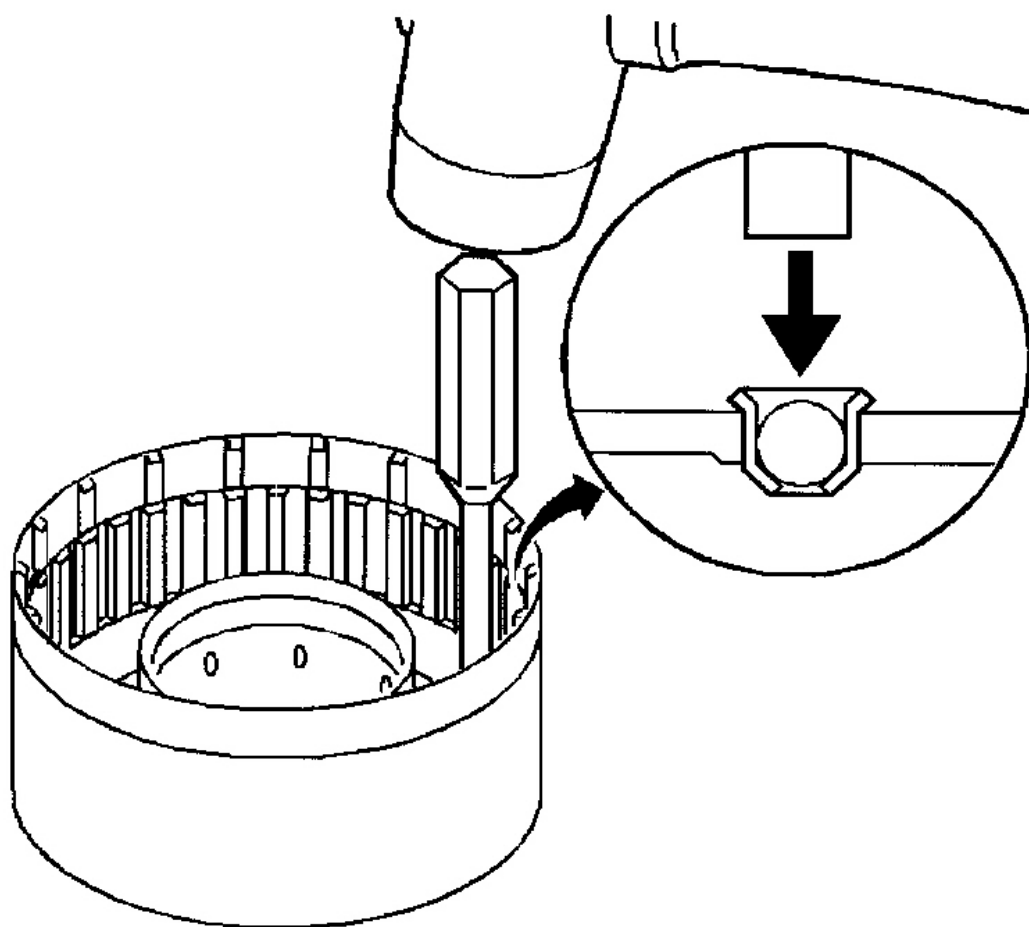
NOTE: If check ball valve does not leak, **DO NOT** replace.

Remove check ball valve from housing using 1/4" drift and hammer. See **Fig. 141**. Tap in NEW check ball assembly using same drift and hammer. See **Fig. 142**.



G00073351

Fig. 141: Removing 2nd Clutch Housing Check Ball Valve
Courtesy of GENERAL MOTORS CORP.



G00073352

Fig. 142: Installing 2nd Clutch Housing Check Ball Valve
Courtesy of GENERAL MOTORS CORP.

REVERSE BAND

Inspection

Inspect reverse band for cracks, scoring, lining separation or wear on fiber material. Inspect apply lug for cracks. Replace components as necessary. See **Fig. 74**.

DRIVEN SPROCKET SUPPORT ASSEMBLY

Disassembly

Using appropriate spring compressor, compress 4th clutch spring assembly. Remove snap ring from driven

sprocket support assembly. See **Fig. 143**. Remove spring compressor, spring assembly and 4th clutch piston from driven sprocket support assembly. Remove inner seal from driven sprocket support assembly hub. Remove oil seal rings and 4-lobed ring seals from driven sprocket support assembly. See **Fig. 144**. Remove outer seal from piston. See **Fig. 145**.

Inspection

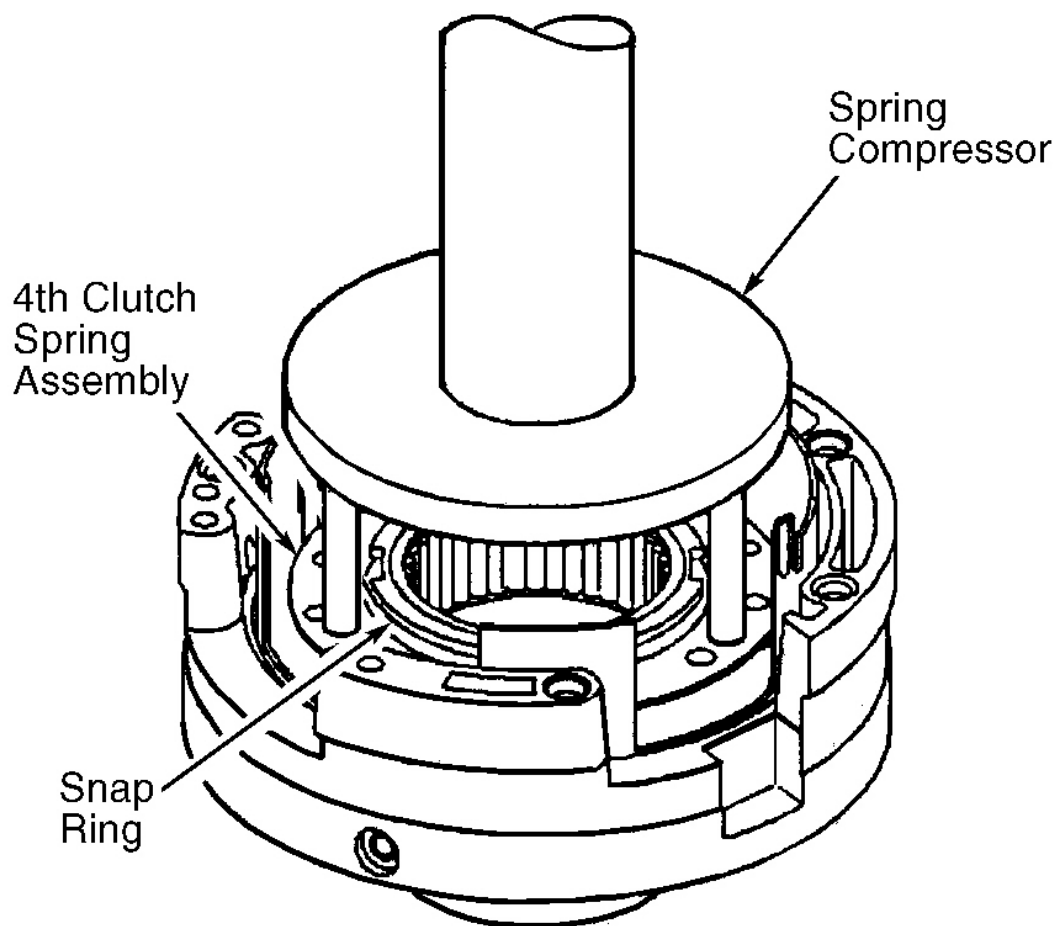
1. Inspect driven sprocket support components for the following:
 - Worn or cut oil seal rings.
 - Rolled or cut second clutch housing oil seal ring seals.
 - Damage to piston seal surface in driven sprocket support.
 - Blocked or porous oil passages in driven sprocket support.
 - A leaking or missing cup plug.
 - Damaged 4th clutch piston.
 - Cracked or distorted 2nd clutch housing thrust washer.
 - Distorted or missing springs in 4th clutch spring assembly.
 - Driven sprocket bearing assembly for foreign material and missing, flat or damaged rollers.
2. Replace Teflon oil seal rings if cut or damaged, or if complete overhaul is being performed. Check all seal ring grooves for debris, burrs or damage. See **Fig. 144**.

Reassembly

1. Lubricate NEW inner and outer seal with ATF prior to installation. Install outer seal on 4th clutch piston. See **Fig. 145**. Install inner 4th clutch piston seal onto driven sprocket support hub. See **Fig. 146**.
2. Install 4th clutch piston into driven sprocket support and align components. Install 4th clutch spring assembly into piston. See **Fig. 144**. Using spring compressor, compress spring assembly and install snap ring. See **Fig. 143**. Lubricate NEW oil seal rings for 2nd clutch housing. Install oil seal rings and 4-lobed ring seals onto driven sprocket support hub. See **Fig. 144**.

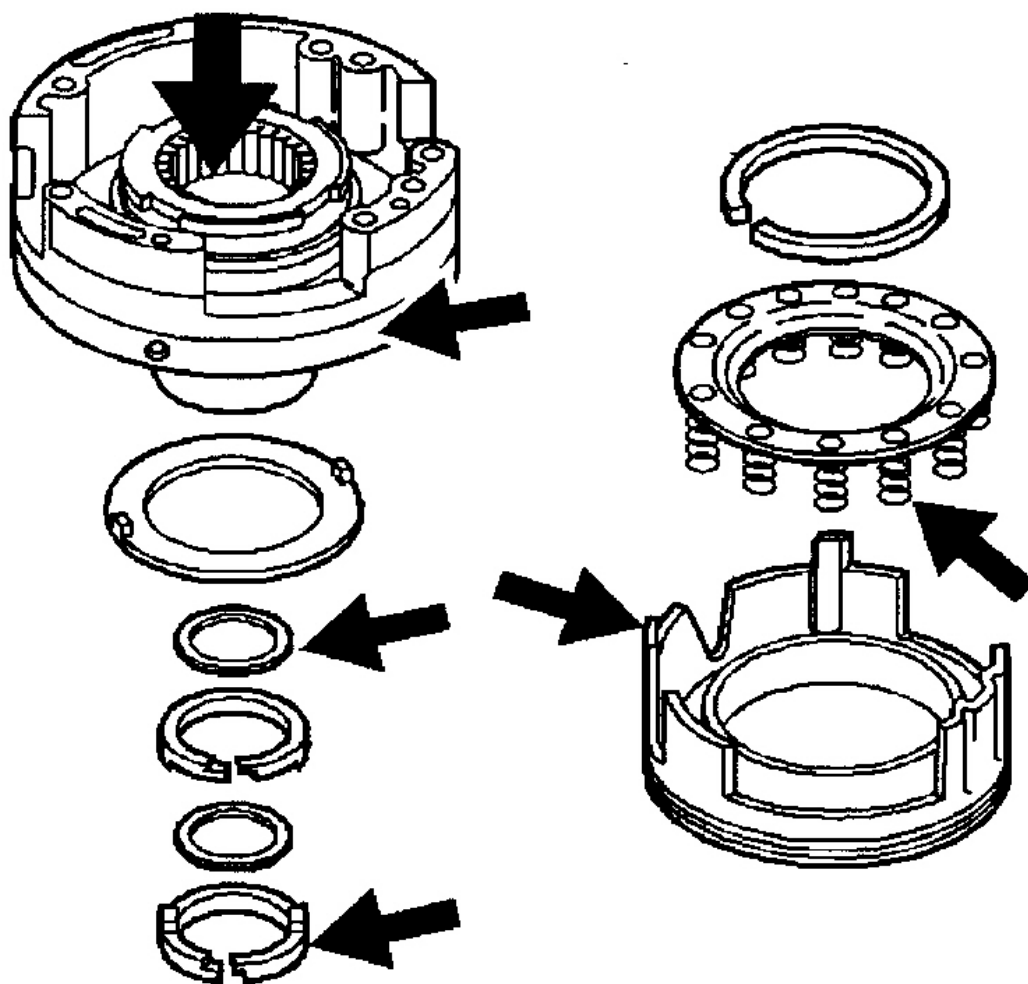
2nd & 4th Clutch Functional Check

1. For this test, attach driven sprocket support assembly and 2nd clutch housing thrust washer onto 2nd clutch housing assembly. See **Fig. 147**.
2. Apply 20 psi (138 kPa) of compressed air to feed holes marked 2 and 4, and listen for 2nd and 4th clutch application. See **Fig. 148**. Hold pressure for 5 seconds. If clutches do not apply and hold, disassemble driven sprocket support components.
3. Inspect all seals and clutches for proper assembly. Reassemble and repeat functional check. When clutches apply and hold correctly, remove driven sprocket support assembly and 2nd clutch housing thrust washer from 2nd clutch housing assembly. See **Fig. 147**.



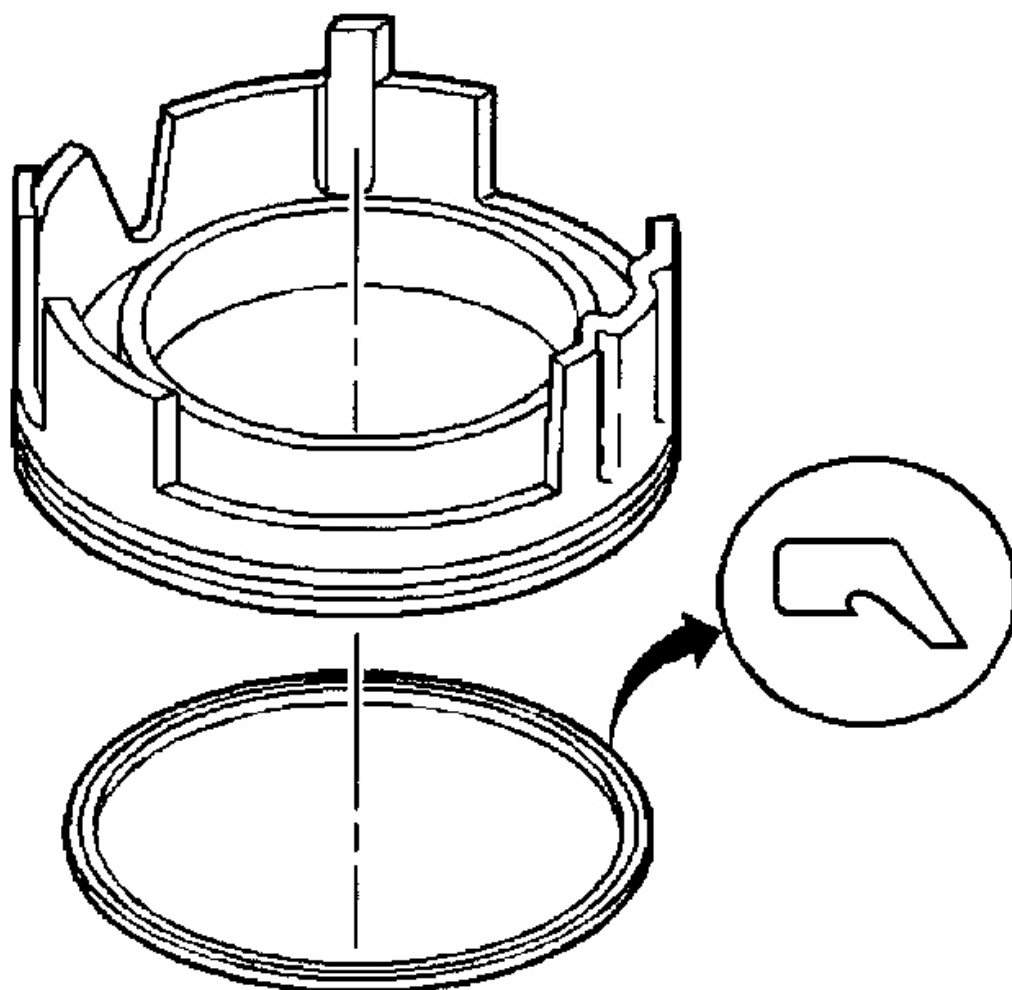
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Fig. 143: Compressing 4th Clutch Spring Assembly
Courtesy of GENERAL MOTORS CORP.



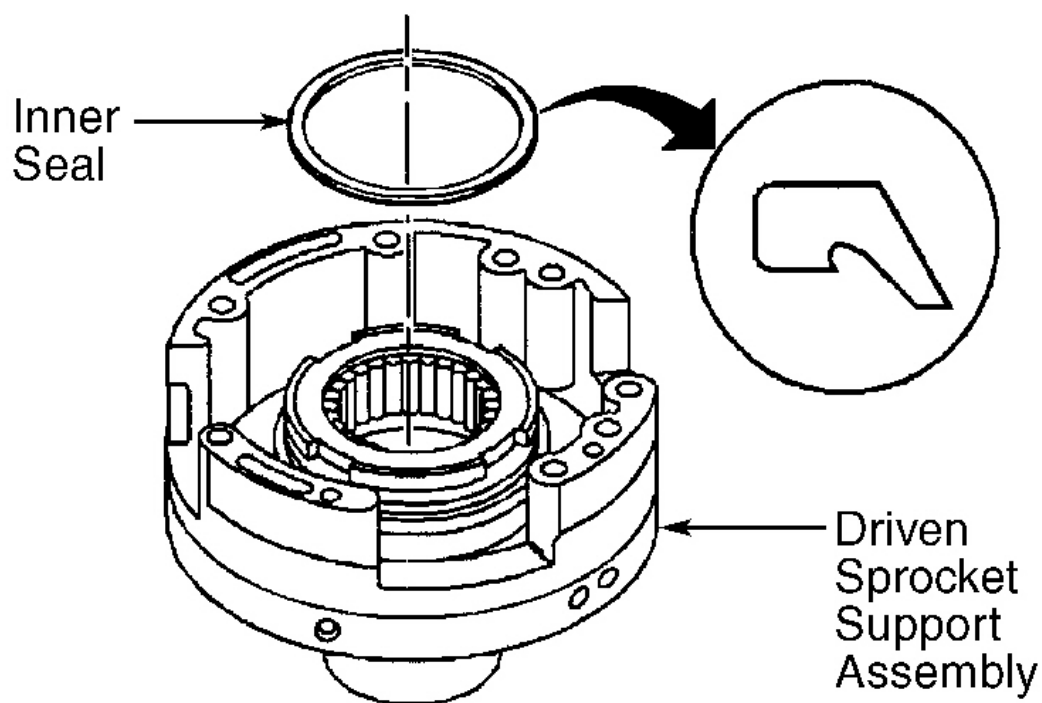
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Fig. 144: Exploded View Of Driven Sprocket Support
Courtesy of GENERAL MOTORS CORP.



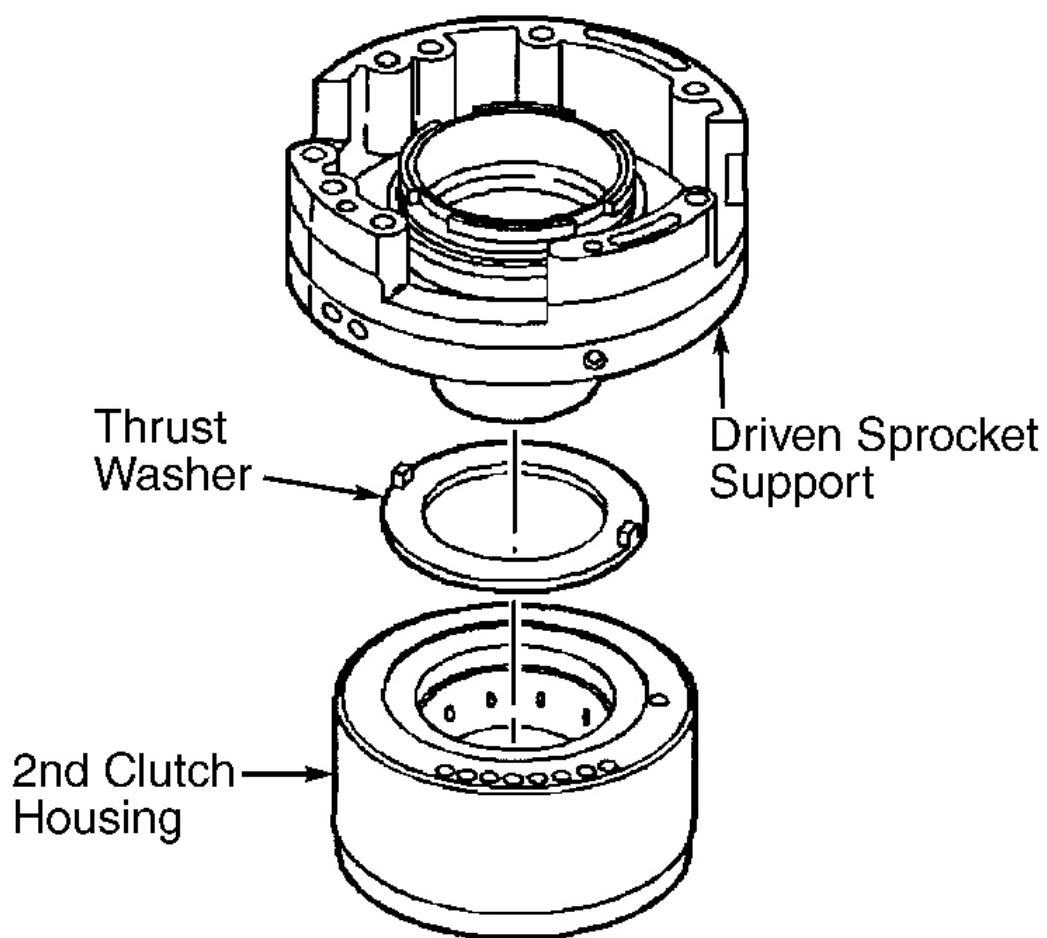
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Fig. 145: Removing & Installing 4th Clutch Piston Outer Seal
Courtesy of GENERAL MOTORS CORP.



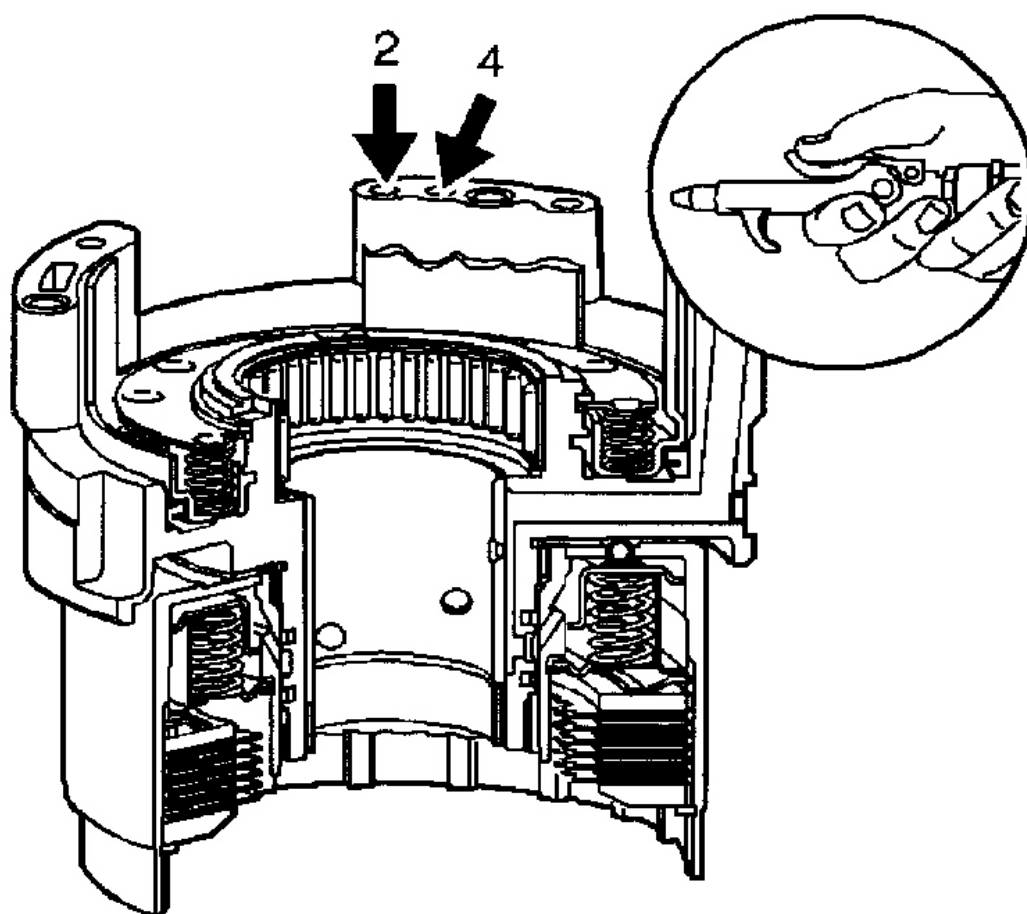
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Fig. 146: Removing & Installing 4th Clutch Inner Seal To Driven Sprocket Support Hub
Courtesy of GENERAL MOTORS CORP.



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Fig. 147: Assembling Components For 2nd & 4th Clutch Functional Air Check
Courtesy of GENERAL MOTORS CORP.



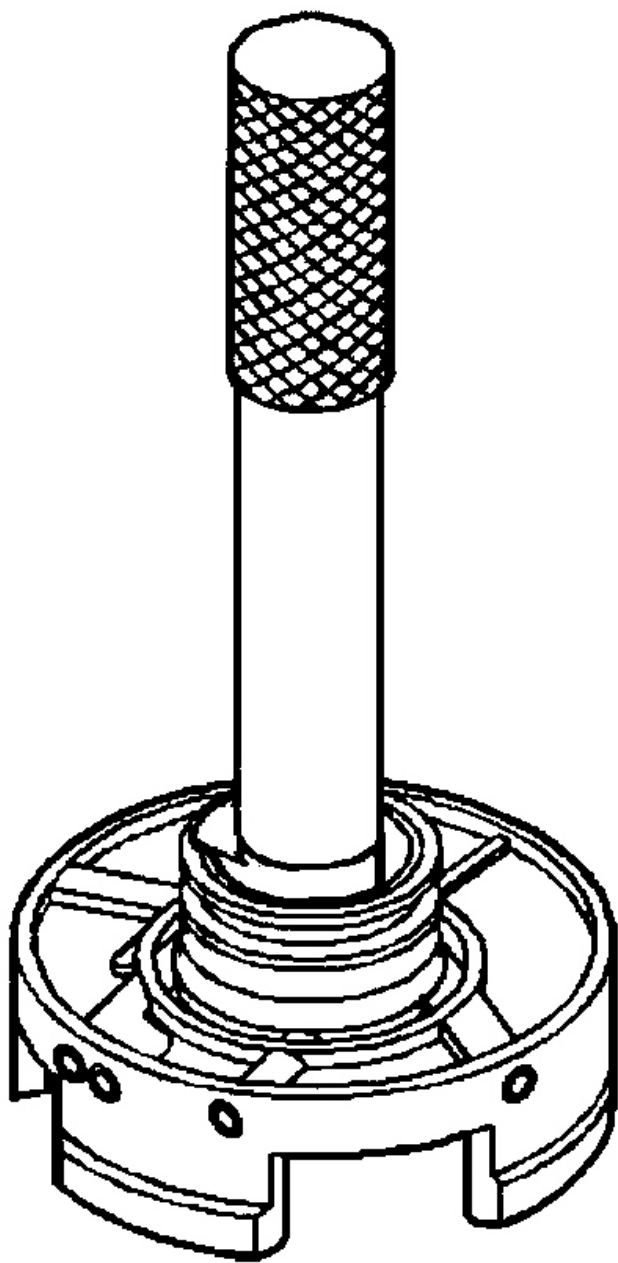
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Fig. 148: Checking 2nd & 4th Clutch Operation
 Courtesy of GENERAL MOTORS CORP.

DRIVEN SPROCKET SUPPORT BEARING

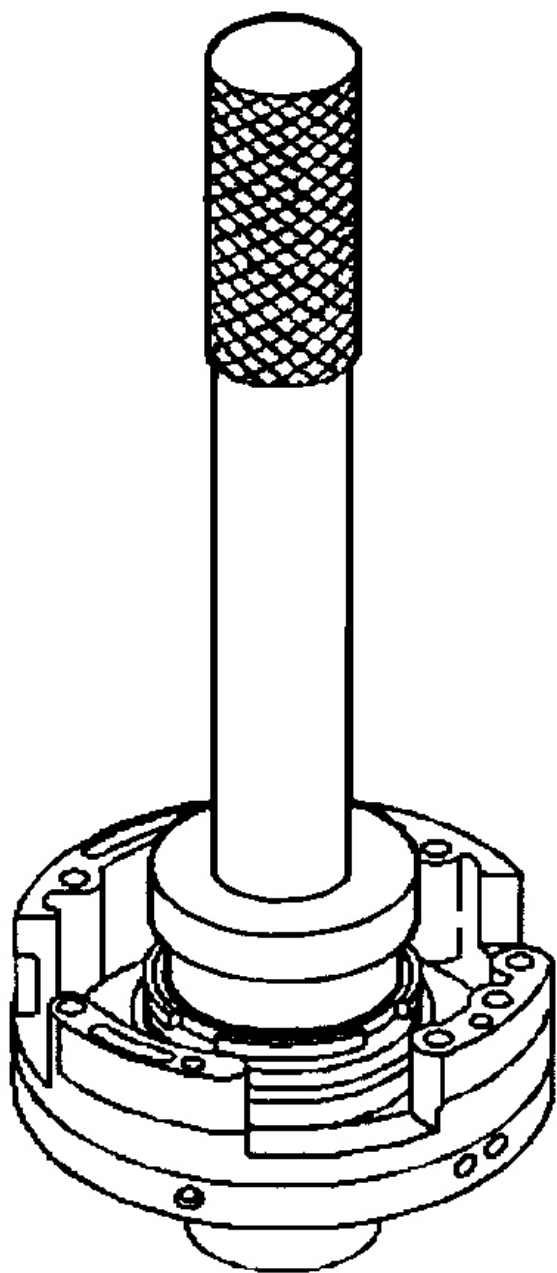
Disassembly & Reassembly

Using Driver Handle (J-8092), Bearing Remover (J-34129) and hammer, drive driven sprocket support bearing from support. See **Fig. 149**. To reassemble, position driven sprocket support bearing assembly so markings on edge of bearing are facing up. Using Driver Handle (J-8092), Bearing Installer (J-34126) and hammer, seat bearing flush to or below support hub. See **Fig. 150**.



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Fig. 149: Removing Driven Sprocket Support Bearing
Courtesy of GENERAL MOTORS CORP.



G00073358

Fig. 150: Installing Driven Sprocket Support Bearing
Courtesy of GENERAL MOTORS CORP.

INPUT, 2ND, 3RD & SPRAG CLUTCHES

Reassembly

1. Install selective thrust washer and thrust bearing assembly onto input clutch housing assembly. See **Fig. 73**. Using small screwdriver, align 2nd clutch teeth. Install 2nd clutch housing assembly onto 2nd clutch hub of input clutch housing assembly.
2. Install Final Drive/Clutch Remover/Installer (J-33381-A) into 2nd clutch housing and input clutch housing. Sprag clutch assemblies will also be attached. See **Fig. 72**. Tighten threaded rod until rod is finger tight.

DRIVE SPROCKET & TURBINE SHAFT

NOTE: **DO NOT damage grooves under oil seal rings.**

Disassembly

Cut oil seal rings from turbine shaft. Remove oil seal rings. Remove drive sprocket retaining ring. Remove drive sprocket from turbine shaft. See **Fig. 151**.

Inspection

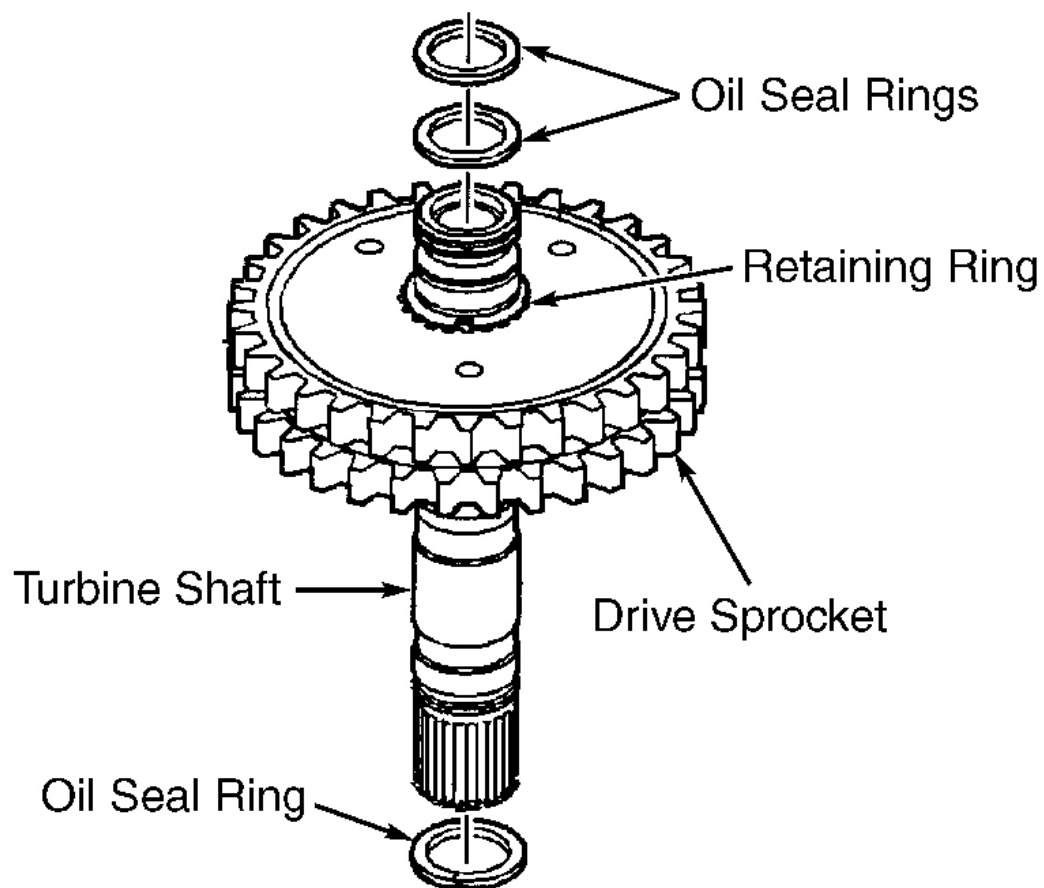
1. Inspect driven sprocket and drive sprocket for the following:
 - Worn or chipped teeth.
 - Uniform teeth size.
 - Stripped or damaged splines.
 - Bearing surface damage.

Replace components as necessary. See **Fig. 152** and **Fig. 153**.

2. Inspect 4th clutch shaft, driven sprocket and drive sprocket thrust washers for wear or cracks.
3. Inspect turbine shaft for a cracked sleeve, damaged bushing journals or stripped or damaged splines. Replace components as necessary.

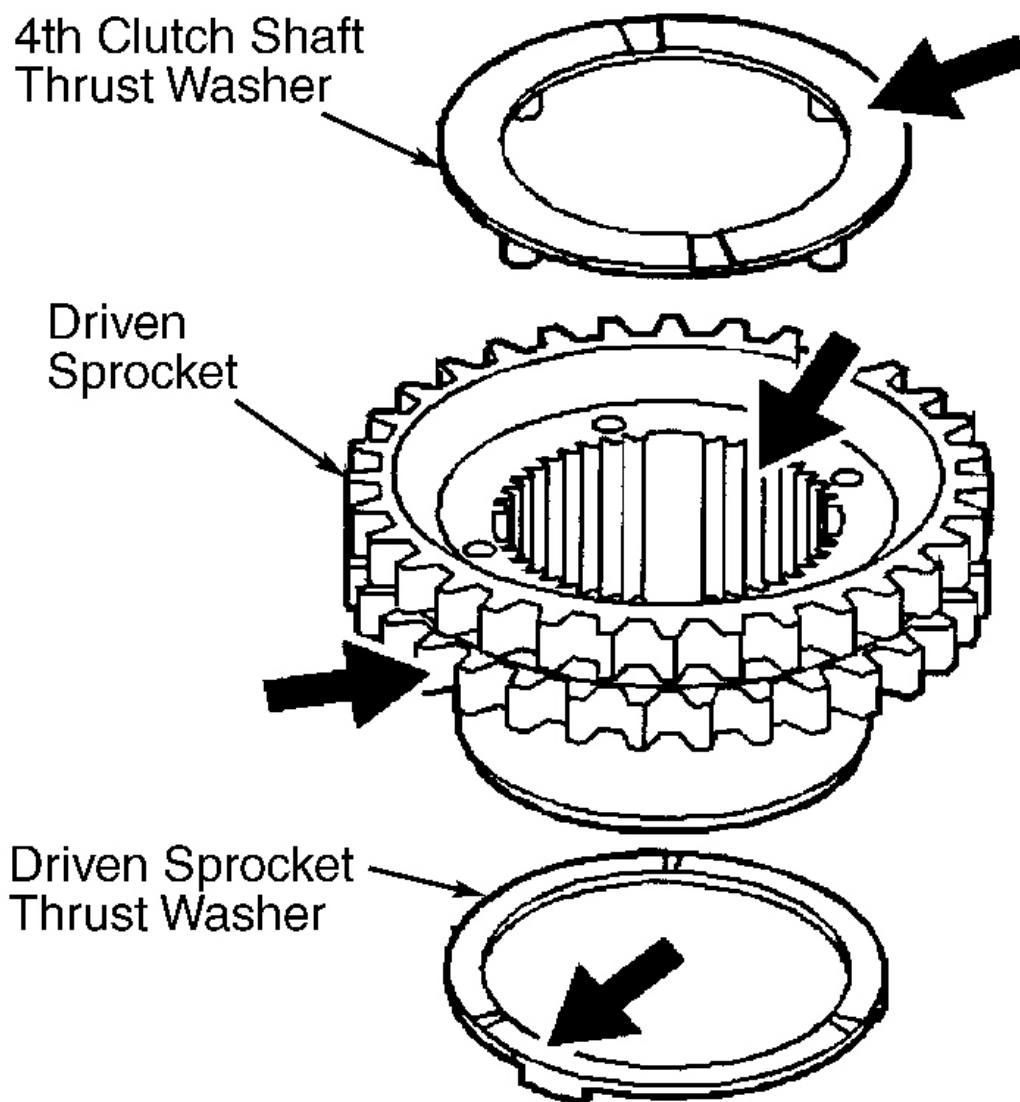
Reassembly

1. Insert turbine shaft into drive sprocket and install retaining ring. See **Fig. 151**.
2. Install Turbine Shaft Seal Installer/Expander (J-29569-1) onto chain side of turbine shaft. Coat turbine shaft seal installer/expander with petroleum jelly. Slide turbine shaft oil seal rings into position. See **Fig. 154**.
3. Using Turbine Shaft Seal Installer/Compressor (J-29569-2), size chain side turbine shaft oil seal rings. See **Fig. 155**.
4. Install Turbine Shaft Seal Installer/Expander (J-29829-1A) onto converter side of turbine shaft. Coat turbine shaft seal installer/expander with petroleum jelly. Slide turbine shaft oil seal ring into position. See **Fig. 156**.
5. Using Turbine Shaft Seal Installer/Compressor (J-29829-2), size converter side turbine shaft oil seal ring. See **Fig. 157**.



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Fig. 151: Removing Turbine Shaft Oil Seal Rings & Drive Sprocket
Courtesy of GENERAL MOTORS CORP.



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Fig. 152: Inspecting Driven Sprocket Assembly
Courtesy of GENERAL MOTORS CORP.

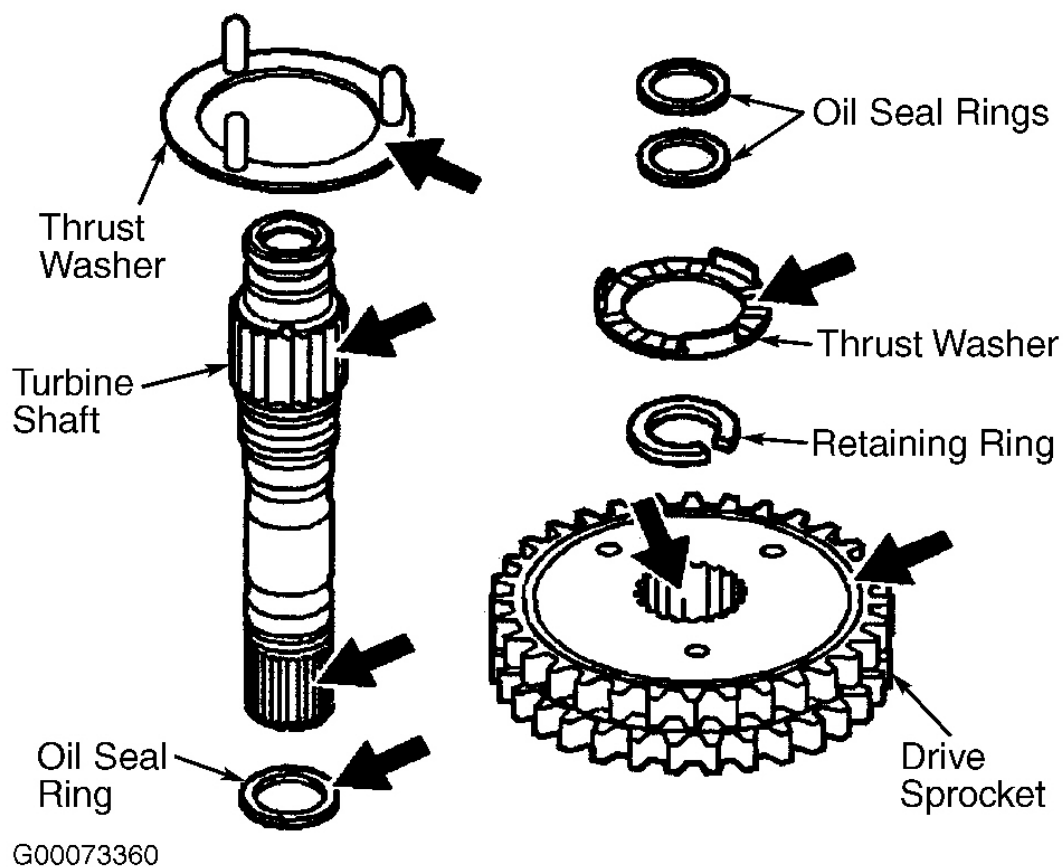
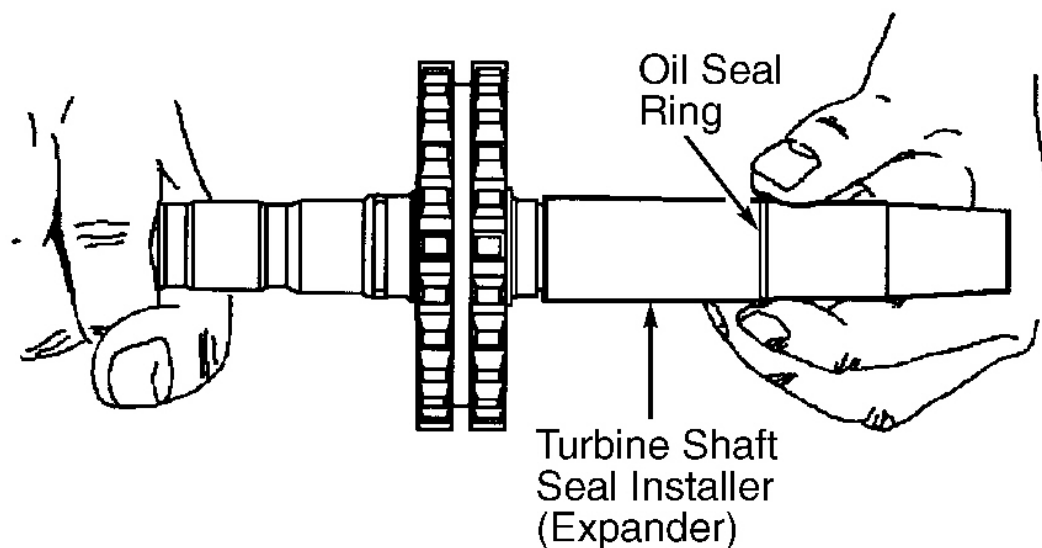
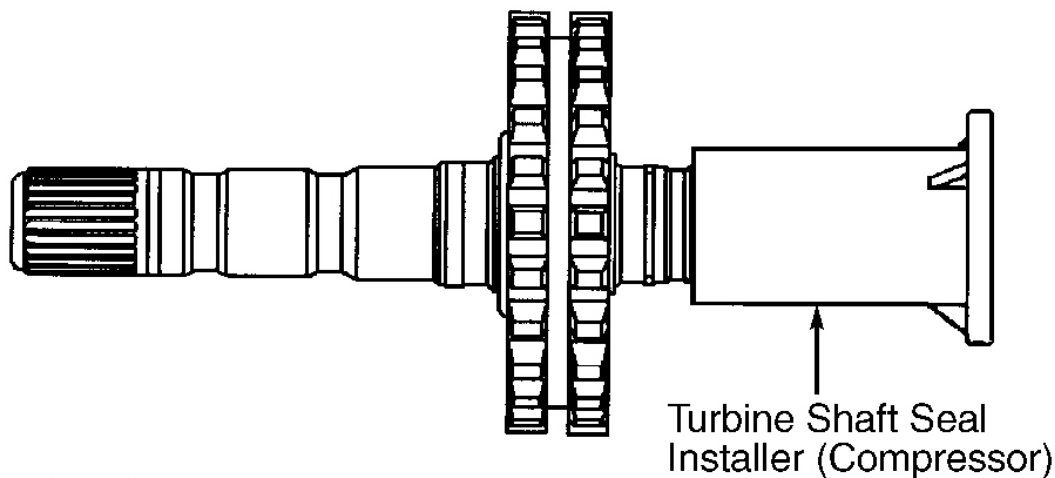


Fig. 153: Inspecting Drive Sprocket & Turbine Shaft Assembly
 Courtesy of GENERAL MOTORS CORP.



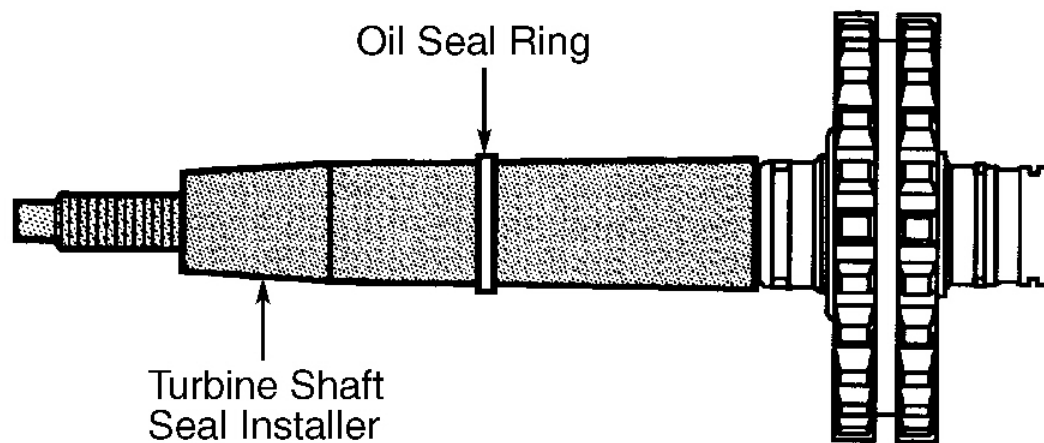
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Fig. 154: Installing Turbine Shaft Oil Seal Rings (Chain Side)
Courtesy of GENERAL MOTORS CORP.



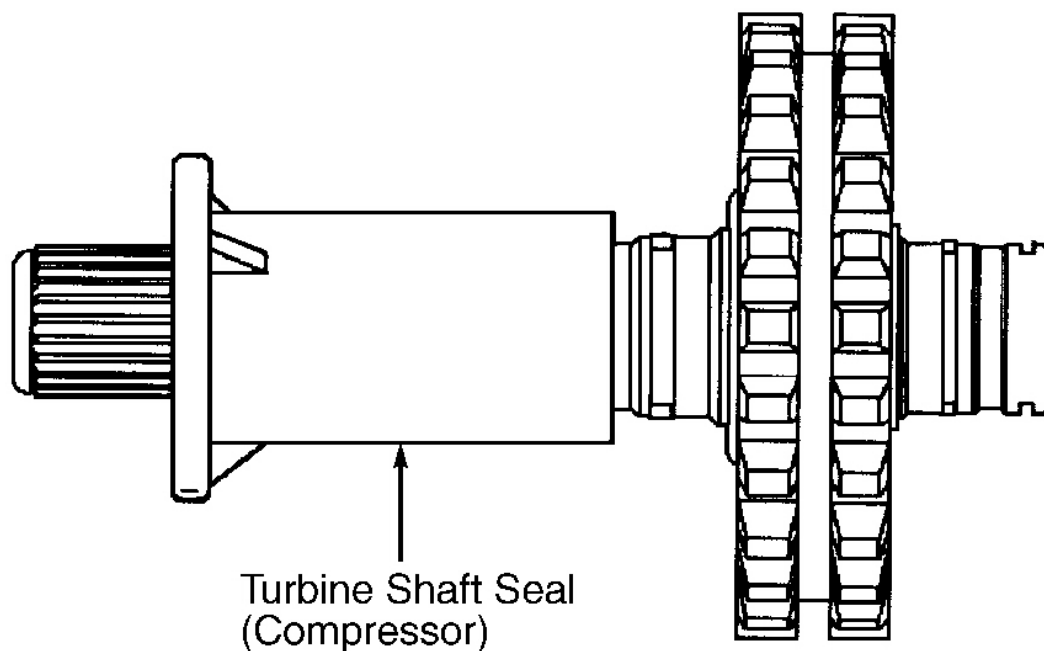
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Fig. 155: Sizing Turbine Shaft Oil Seal Rings (Chain Side)
Courtesy of GENERAL MOTORS CORP.



G00073364

Fig. 156: Installing Turbine Shaft Oil Seal Rings (Converter Side)
Courtesy of GENERAL MOTORS CORP.



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Fig. 157: Sizing Turbine Shaft Oil Seal Rings (Converter Side)
Courtesy of GENERAL MOTORS CORP.

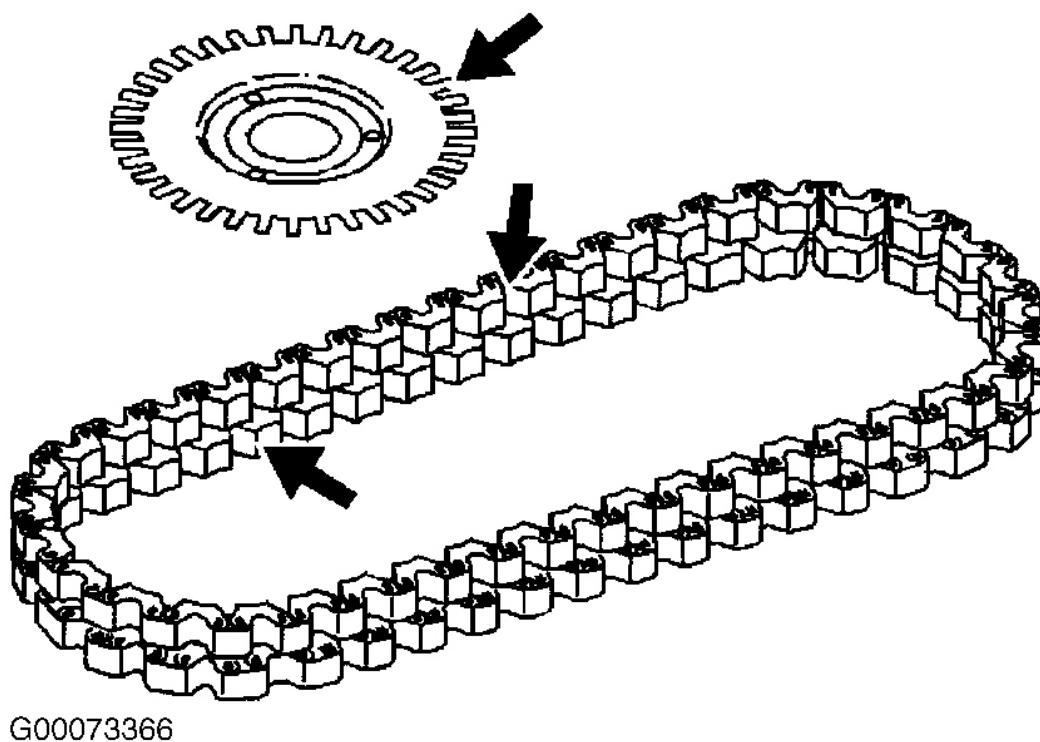
DRIVE & DRIVEN SPROCKET COMPONENTS

Inspection

Inspect drive chain assembly for cracks, binding links or damage. Check input speed sensor reluctor wheel for damaged teeth, worn or damaged thrust surface and damaged or missing locating pins. Replace components as necessary. See **Fig. 158**.

Reassembly

NOTE: For drive and driven sprocket component reassembly, see **TRANSAXLE REASSEMBLY**.



G00073366

Fig. 158: Inspecting Drive Link Assembly & Input Speed Sensor Reluctor Wheel
Courtesy of GENERAL MOTORS CORP.

4TH CLUTCH COMPONENTS

Inspection

1. Inspect 4th clutch for the following conditions:
 - Wear or damage to steel plates.

- Peened splines, flaking, or worn composition plates.
2. Inspect 4th clutch shaft for the following:
 - Cut or worn 4th clutch plate splines.
 - Stripped input sun gear splines.
 - Damaged bushing journal.
 - Cracks or damage to hub or shaft.

Replace components as necessary. See **Fig. 68**.

NOTE: For 4th clutch component reassembly, see **TRANSAXLE REASSEMBLY**.

CASE COVER COMPONENTS

CAUTION: Valve springs can be tightly compressed. Use care when removing retainers and plugs.

NOTE: DO NOT remove any bore plugs unless inspection indicates replacement is necessary.

Disassembly

Remove manual valve. Remove 3-4 accumulator piston cylinder and 3-4 accumulator piston "O" ring seal. Use low pressure compressed air from valve body side if necessary for removal. Remove 3-4 accumulator piston outer and inner spring, piston and pin from valve body side of case cover. Remove actuator feed limit valve spring retainer, spring and valve. See **Fig. 159**.

Inspection

1. Inspect 3-4 accumulator piston cylinder for porosity, scored pin or nicked or grooved piston sleeve. Inspect piston pin for scoring and free movement in piston bore. Inspect springs for distorted or broken coils. Inspect piston cylinder for porosity or cracks. Inspect for rough or scored seal surface, or cut seal. Inspect check ball, spring and bore plug. See **Fig. 159**.
2. DO NOT remove blow-off check balls unless damaged. Inspect manual valve, link and spring link for damage. Check manual valve for binding or looseness in case cover. Check case cover plugs and orifice cup plug. Replace plugs if loose, plugged or missing.
3. Inspect shaft bearing for damage. DO NOT remove bearing unless bearing is damaged. Inspect oil seal for missing garter spring or for cut lip seal.
4. Inspect case cover for porosity, interconnected fluid passages, cracks or rough machined surfaces.
5. Inspect input speed sensor for damaged or missing magnet, damaged housing, bent or missing electrical terminals, or damaged speed sensor clip.

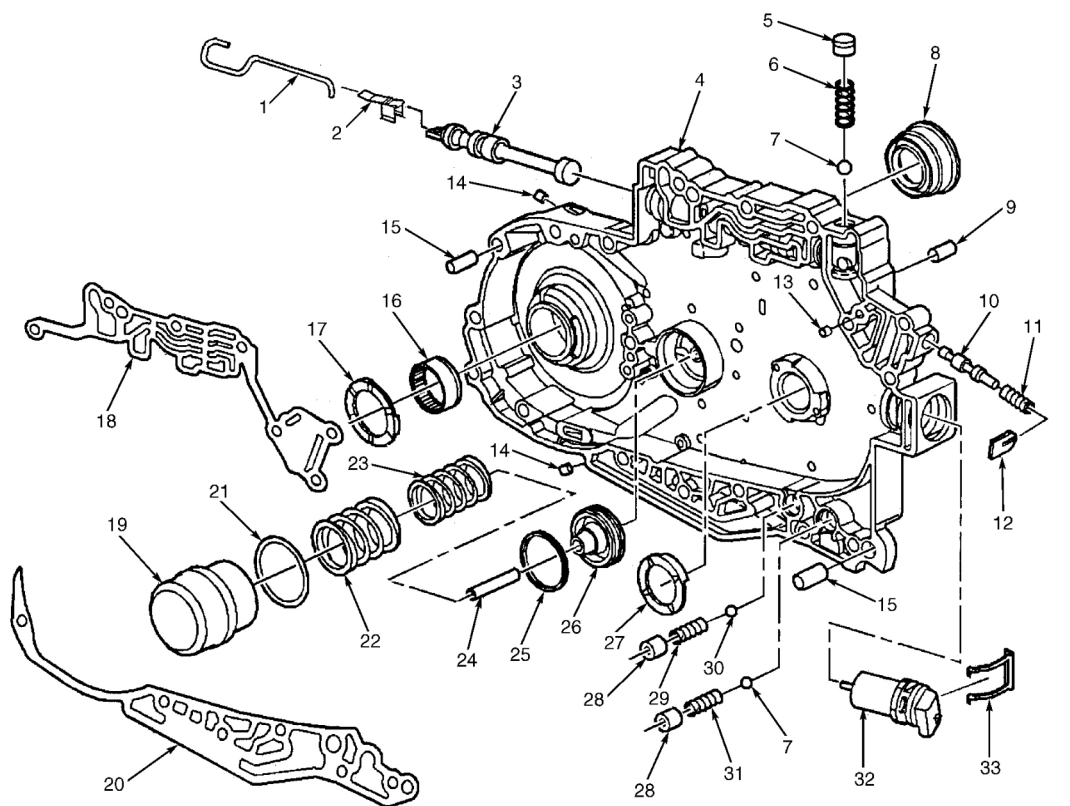
Bearing Replacement

NOTE: When installing NEW bearing, part number should be visible (facing upward).

Place case cover on clean flat surface with spacer plate mating surface up. Using Driver Handle (J-8092), Bearing Remover/Installer (J-41991) and hammer, drive out bearing from case cover. See **Fig. 160**. To install, place case cover on clean flat surface with case mating surface up. Drive bearing into case cover. See **Fig. 161**.

Reassembly

Install NEW 3-4 accumulator piston cylinder "O" ring seal onto 3-4 accumulator piston cylinder. Install 3-4 accumulator piston outer and inner spring into 3-4 accumulator piston cylinder. Install NEW 3-4 accumulator piston seal onto 3-4 accumulator piston. Insert 3-4 accumulator piston into 3-4 accumulator piston cylinder. Using a slight twisting motion, insert 3-4 accumulator piston cylinder into case cover. Insert 3-4 accumulator piston pin through front of case cover and into 3-4 accumulator piston. Install manual valve into case cover. Install actuator feed limit valve, spring and spring retainer into case cover. See **Fig. 159**.



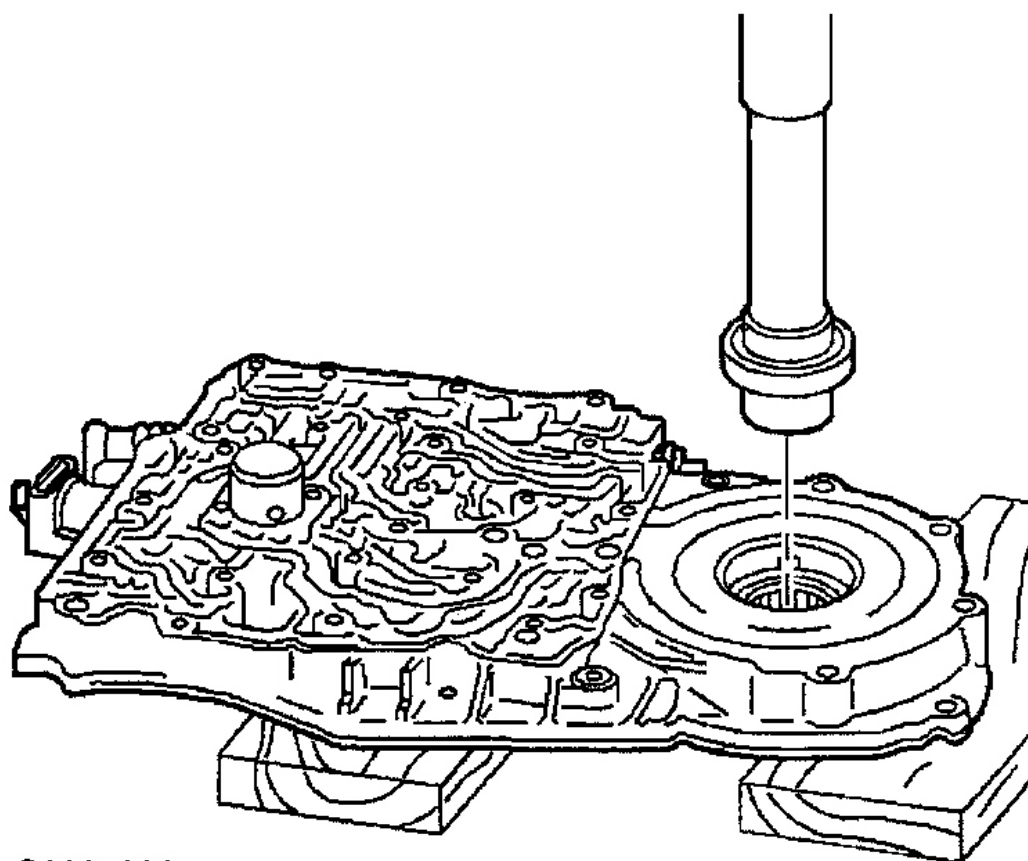
1. Manual Valve Link
2. Manual Valve Clip
3. Manual Valve
4. Case Cover Assembly
5. Low Blow-Off Check Ball Bore Plug
6. Check Ball Spring
7. Low Blow-Off Check Ball
8. Left Side Axle Oil Seal
9. Control Body Alignment Sleeve
10. Actuator Feed Limit Valve
11. Limit Valve Spring

12. Limit Valve Spring Retainer
13. Orificed Cup Plug
14. Bore Plug
15. Case Cover Dowel Pin
16. Shaft Bearing
17. 4th Clutch Thrust Washer
18. Case Cover Upper Gasket
19. 3-4 Accumulator Piston Cylinder
20. Case Cover Lower Gasket
21. 3-4 Accumulator Piston Cylinder "O" Ring Seal

22. 3-4 Accumulator Piston Outer Spring
23. 3-4 Accumulator Piston Inner Spring
24. 3-4 Accumulator Piston Pin
25. 3-4 Accumulator Piston Oil Seal Ring
26. 3-4 Accumulator Piston
27. Drive Sprocket/Case Cover Thrust Washer
28. Check Ball Bore Plug
29. TCC Blow-Off Check Ball Spring
30. TCC Blow-Off Check Ball
31. Cooler Check Ball Spring
32. Input Speed Sensor
33. Clip

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Fig. 159: Exploded View Of Case Cover Components
Courtesy of GENERAL MOTORS CORP.



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Fig. 160: Removing Case Cover Bearing
Courtesy of GENERAL MOTORS CORP.

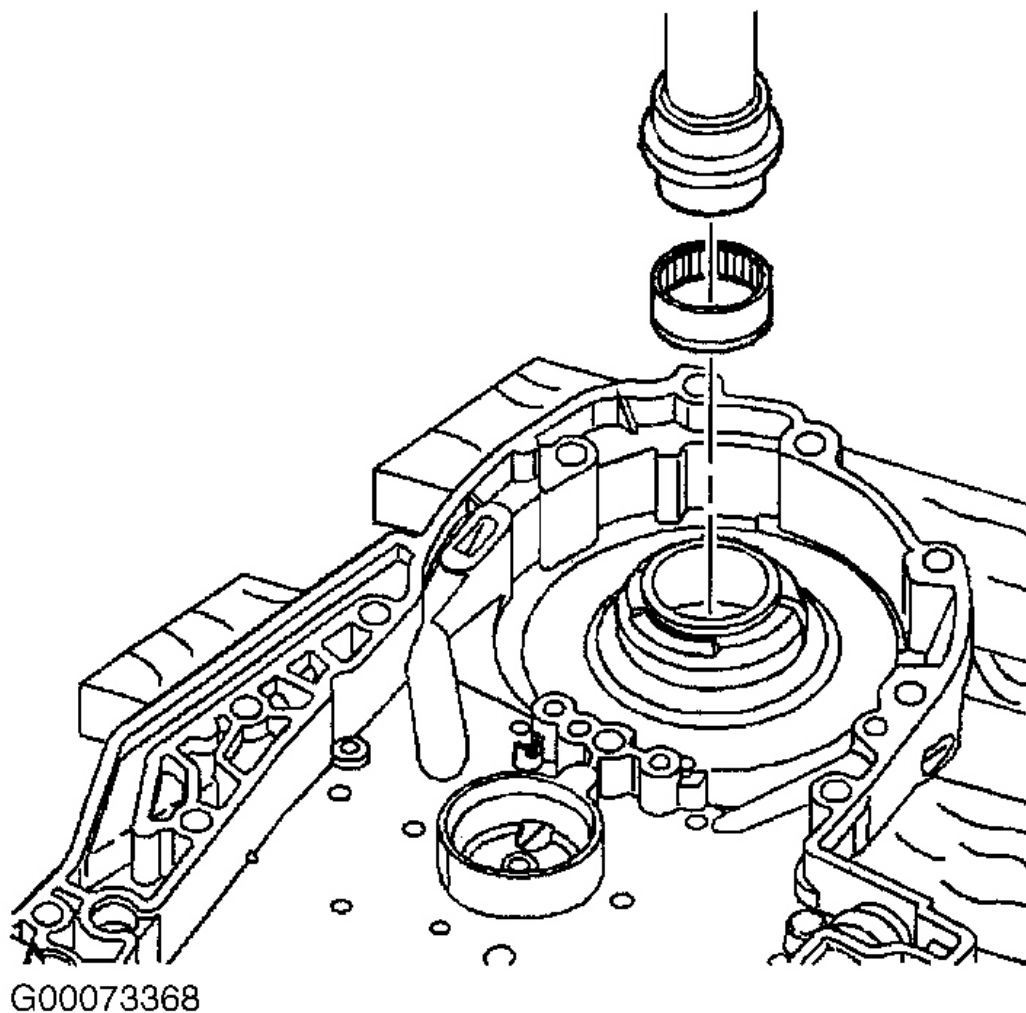


Fig. 161: Installing Case Cover Bearing
Courtesy of GENERAL MOTORS CORP.

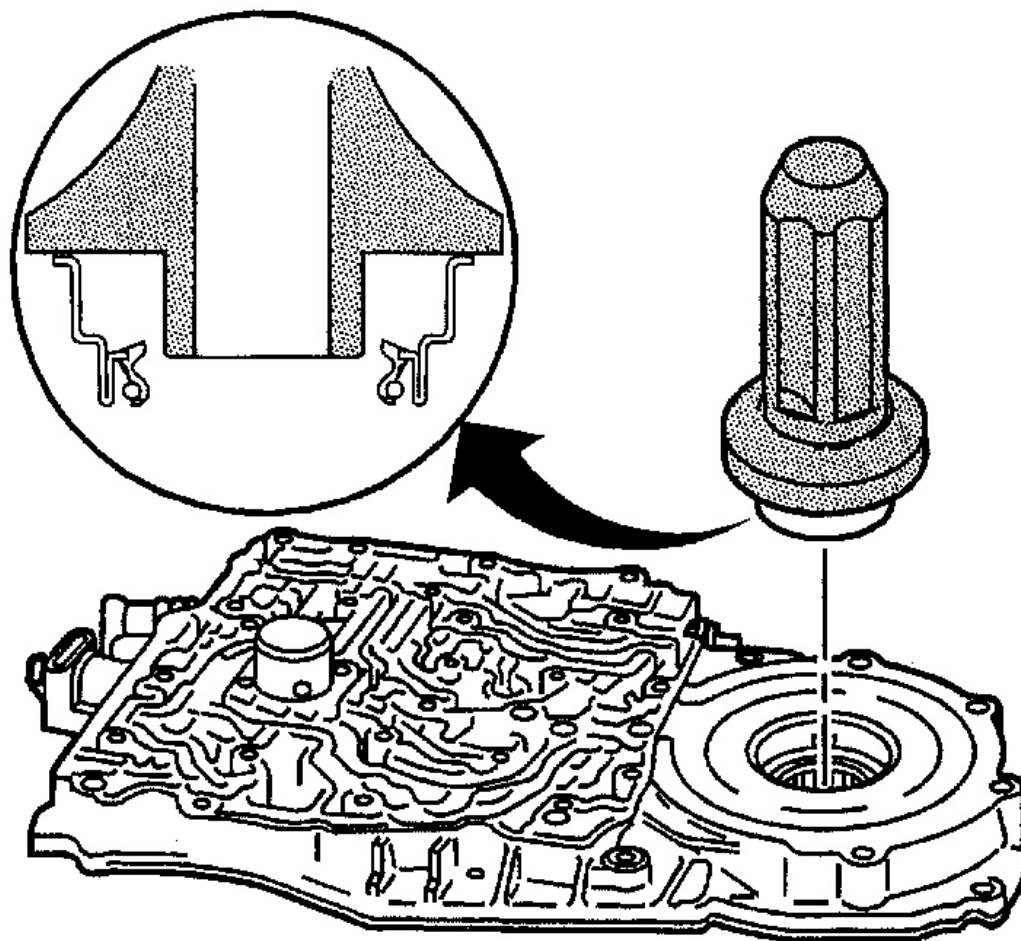
LEFT AXLE SHAFT OIL SEAL

Reassembly

NOTE: When drive axle is removed from transaxle for any reason, inspect axle sealing surface (tripot shank) for corrosion. If corrosion is evident, clean surface with 320-grit cloth or equivalent. Clean off any remaining debris with ATF. Wipe surface dry and reinstall drive axle free of any build up.

Install NEW left axle shaft oil seal onto Left Side Axle Seal Installer (J-34115). Using left side axle seal

installer and mallet, install left side axle oil seal assembly. See **Fig. 162**.



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Fig. 162: Installing Left Side Axle Oil Seal
Courtesy of GENERAL MOTORS CORP.

OUTPUT SHAFT

Inspection

Inspect output shaft for damaged bushing journals, stripped splines or retaining ring groove damage. See **Fig. 17**.

VEHICLE SPEED SENSOR

Inspection

Check for damaged connector, cracked housing, signs of rotor damage or cuts or nicks on seal. See **Fig. 16**.

CONTROL VALVE BODY

Cleaning

CAUTION: DO NOT use solvent to clean solenoid valves or neoprene seals. DO NOT use shop rags to clean valve body components. Handle parts carefully to avoid nicks and scratches.

Clean control valve body thoroughly in clean solvent. Move valves with a pick or small screwdriver to dislodge any dirt or debris. Use air nozzle to dry control valve body and to blow out all passages. Gently probe small passages with a piece of identification tag wire or equivalent.

Inspection

1. Inspect control valve body for worn or damaged oil pump drive shaft bearing journal (not serviceable separately from control valve body), damaged or porous casting, damaged sealing surfaces and debris in fluid passages.
2. Before disassembly, inspect control valve body components using small pick or screwdriver for valves binding or sticking in bores or bushings, broken, missing or damaged springs, missing or damaged retainers, damaged solenoid valves or debris in valve line-ups or solenoid valves.
3. During disassembly, inspect control valve body for worn or damaged valves, valve bores or bushings, broken, missing or damaged springs, missing or damaged retainers, damaged solenoid valves, debris in valve line-ups or solenoid valves.
4. Inspect Transmission Fluid Pressure (TFP) manual valve position switch assembly for damaged electrical connector terminals, damaged seals, damaged switch membranes or debris on switch membranes. See **Fig. 47**.

Disassembly

WARNING: Control valve body springs can be tightly compressed. Use care when removing retainers and plugs.

Thoroughly clean and air dry control valve body. Remove each valve train, noting location of each component. Some valves are under spring pressure, cover bores when removing retainers. Remove retainers with small screwdriver. Position valves, springs and bushings on clean surface in order removed. See **Fig. 163** & **Fig. 164**.

Reassembly

To reassemble valve body components, reverse disassembly procedure. Ensure all components are installed in original locations. See **Fig. 163** & **Fig. 164**.

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

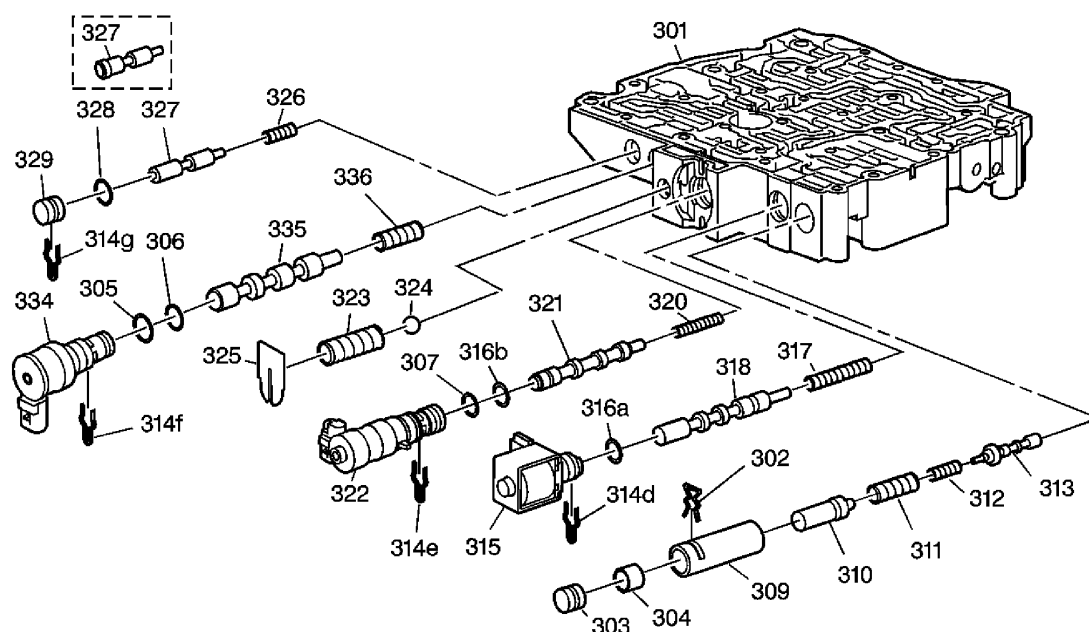


Fig. 163: Control Valve Body Assembly Disassembled View - (1 of 2)
Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
301	Control Valve Body Machined
302	Line Boost Valve and Bushing Retainer
303	Line Boost Valve Bore Plug
304	Line Boost Valve
305	TCC PWM Solenoid Valve O-Ring Seal
306	TCC PWM Solenoid Valve O-Ring Seal
307	Pressure Control Solenoid Valve O-Ring Seal
309	Reverse Boost Valve Bushing
310	Reverse Boost Valve
311	Pressure Regulator Valve Spring Outer
312	Pressure Regulator Valve Inner Spring
313	Pressure Regulator Valve
314d	1-2, 3-4 Shift Solenoid Valve Retainer
314e	Pressure Control Solenoid Valve Retainer
314f	TCC PWM Solenoid Valve Retainer
314g	TCC Regulator Apply Valve Bore Plug Retainer
315	1-2, 3-4 Shift Solenoid Valve Assembly
316a	1-2, 3-4 Shift Solenoid Valve O-Ring Seal
316b	Pressure Control Solenoid Valve O-Ring Seal
317	1-2 Shift Valve Spring

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318	1-2 Shift Valve
320	Torque Signal Regulator Valve Spring
321	Torque Signal Regulator Valve
322	Pressure Control Solenoid Valve Assembly
323	Line Pressure Relief Valve Spring
324	Line Pressure Relief Valve
325	Line Pressure Relief Valve Spring Retainer
326	TCC Regulator Apply Valve Spring
327	TCC Regulator Apply Valve - Some Models have touch activated Power
327	TCC Regulator Apply Valve - Some Models have touch activated Power
328	TCC Regulator Apply Valve Bore Plug O-Ring Seal
329	TCC Regulator Apply Valve Bore Plug
334	TCC PWM Solenoid Valve Assembly
335	TCC Control Valve
336	TCC Control Valve Spring

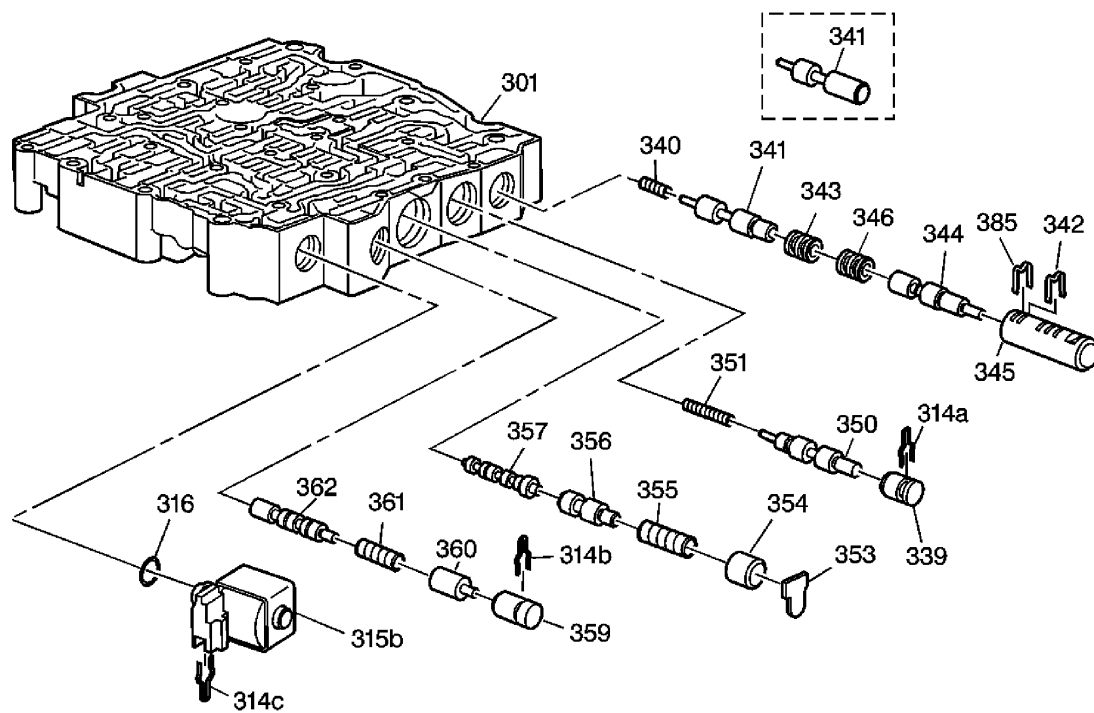


Fig. 164: Control Valve Body Assembly Disassembled View - (2 of 2)
 Courtesy of GENERAL MOTORS CORP.

Callout	Component Name
301	Machined Control Valve Body
314a	1-2 Accumulator Valve Retainer

2003 Chevrolet Venture LS

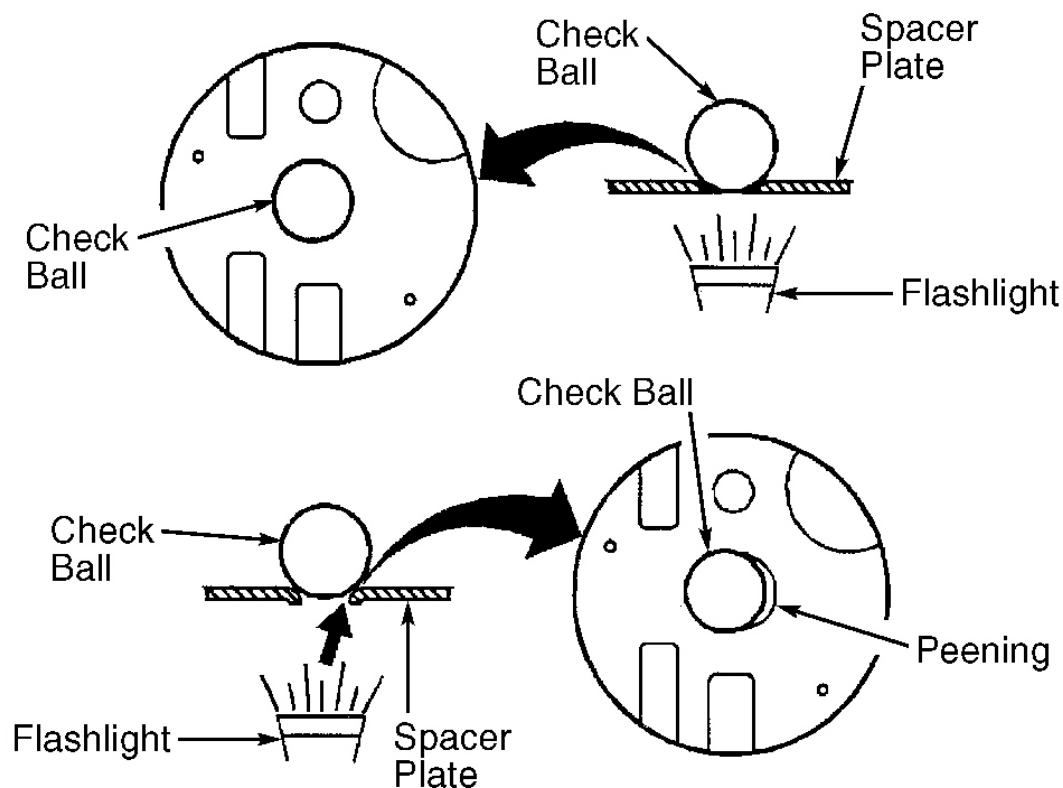
2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

314b	4-3 Manual Downshift Valve Retainer
314c	2-3 Shift Solenoid Valve Retainer
315b	2-3 Shift Solenoid Valve Assembly
316	O-Ring Seal
339	1-2 Accumulator Valve Bore Plug
340	3-4 Accumulator Valve Spring
341	3-4 Accumulator Valve - Some Models have touch activated Power
341	3-4 Accumulator Valve - Some Models have touch activated Power
342	2-3 Accumulator Valve Bore Plug Retainer
343	2-3 Accumulator Valve Bore Plug
344	2-3 Accumulator Valve
345	2-3 Accumulator Valve Bushing
346	2-3 Accumulator Valve Spring
350	1-2 Accumulator Valve
351	1-2 Accumulator Valve Spring
353	3-2 Manual Downshift Valve Retainer
354	3-2 Manual Downshift Valve Bore Plug
355	3-2 Manual Downshift Valve Spring
356	3-2 Manual Downshift Valve
357	2-3 Shift Valve
359	4-3 Manual Downshift Valve Bore Plug
360	4-3 Manual Downshift Valve
361	4-3 Manual Downshift Valve Spring
362	3-4 Shift Valve
385	2-3 Accumulator Valve Bushing Assembly Retainer

CONTROL VALVE BODY SPACER PLATE

Inspection

1. Inspect control valve body spacer plate for plugged holes, damaged sealing surfaces, or plugged or damaged screen/seal assemblies. Inspect each check ball seat on spacer plate for excessive peening. Place check ball on each seat. Using flashlight, look for visible light between check ball and seat. See **Fig. 165**. If light is visible between check ball and seat, replace spacer plate. For check ball locations, see **Fig. 53** and **Fig. 54**.



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Fig. 165: Checking Spacer Plate For Excessive Peening
 Courtesy of GENERAL MOTORS CORP.

OIL PUMP ASSEMBLY

WARNING: Valve springs can be tightly compressed. Use care when removing retainers and plugs.

CAUTION: Oil pump slide, seal, vanes and rotor are factory selected for size. DO NOT switch parts with another pump.

Disassembly

Remove oil pump cover bolt and oil pump cover. Remove pump rotor, vane rings, vanes, oil seal ring and slide "O" ring seal. Remove outer and inner oil pump prime springs, slide seal and slide seal support. Remove slide pivot pin. Remove outlet screen. See **Fig. 166**.

Inspection & Reassembly

CAUTION: Laser marks on oil pump body indicate size of selective parts used in assembly. If correct parts are not selected for replacement, damage to oil pump and transaxle will occur.

1. Inspect oil pump for the following:
 - Worn, scored or gouged pump slide.
 - Cracks, wear or damage to rotor or vanes.
 - Cuts or damage to seals.
 - Broken priming springs.
 - Damaged oil pump drive shaft bearing (bearing is not serviced separately from rotor).

See **Fig. 166**.

2. Inspect oil pump body for the following:
 - Porosity
 - Worn, scored or damaged pump pocket.
 - Interconnected oil passages.
 - Damaged machined surfaces.
3. Inspect pump outlet screen for damage or debris. Inspect oil pump cover for cracks, wear or gouges from pump vanes.
4. Measure pump rotor, oil pump vanes and oil pump slide. See **Fig. 167**. Select proper replacement size. See **OIL PUMP COMPONENT SPECIFICATIONS** table.
5. Install outlet screen into oil pump body. Install slide seal support and slide seal into slot on pump slide. Install pump slide and slide pivot pin into pump body.
6. Install outer and inner priming springs into pump body. Install 1st vane ring into pump body. Insert pump slide "O" ring seal and slide oil seal ring into pump slide. See **Fig. 166**.
7. Insert rotor into pump body. Install pump vanes into rotor. Pump vanes must be flush with top of rotor. Install 2nd vane ring onto rotor. Install pump cover and bolt. Tighten bolt to specification. See **TORQUE SPECIFICATIONS**.

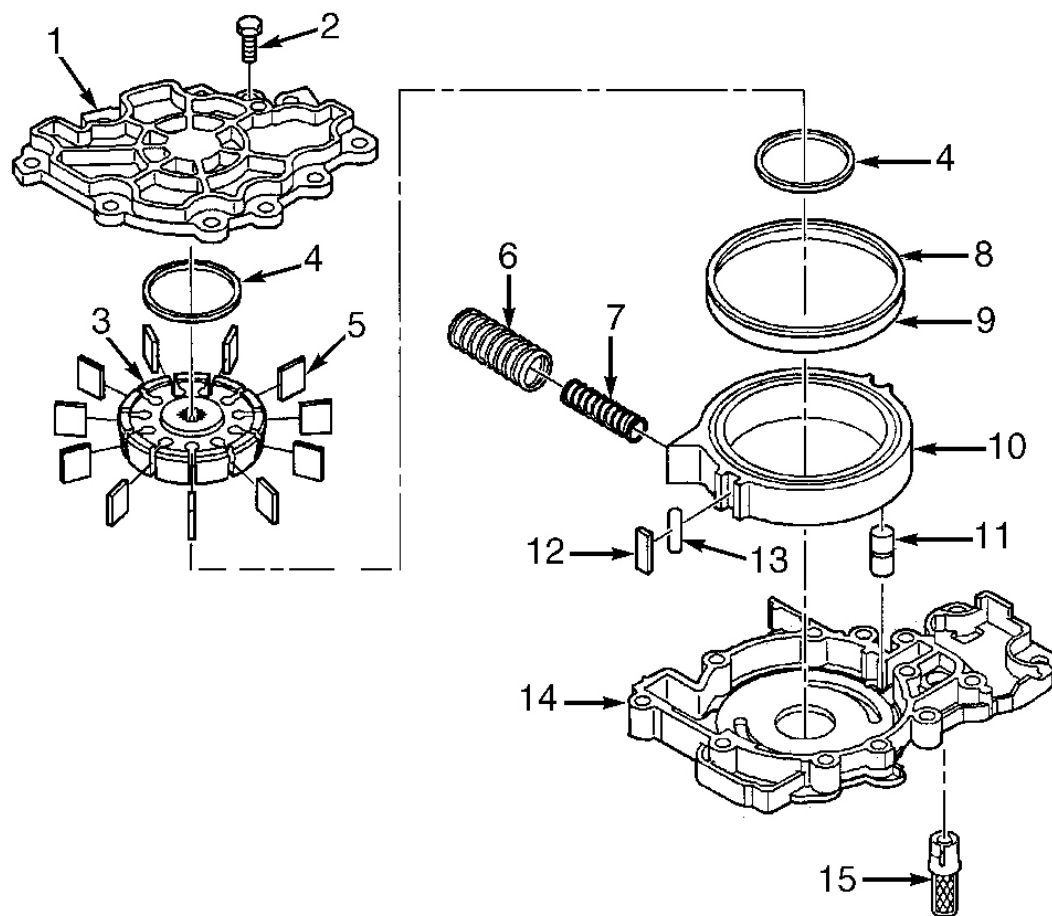
OIL PUMP COMPONENT SPECIFICATIONS

Component	Thickness - In. (mm)
Pump Rotor	.7068-.7072 (17.953-17.963)
	.7072-.7076 (17.963-17.973)
	.7076-.7080 (17.973-17.983)
	.7080-.7084 (17.983-17.993)
Pump Slide	.7070-.7074 (17.957-17.967)
	.7074-.7078 (17.967-17.977)
	.7078-.7081 (17.977-17.987)
	.7081-.7085 (17.987-17.997)
Pump Vane	.7064-.7071 (17.943-17.961)
	.7071-.7078 (17.961-17.979)

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	.7078-.7085 (17.979-17.997)
Pump Body (Depth Measurement)	.7087-.7091 (18.000-18.010)
	.7091-.7094 (18.010-18.020)
	.7094-.7098 (18.020-18.030)
	.7098-.7102 (18.030-18.040)



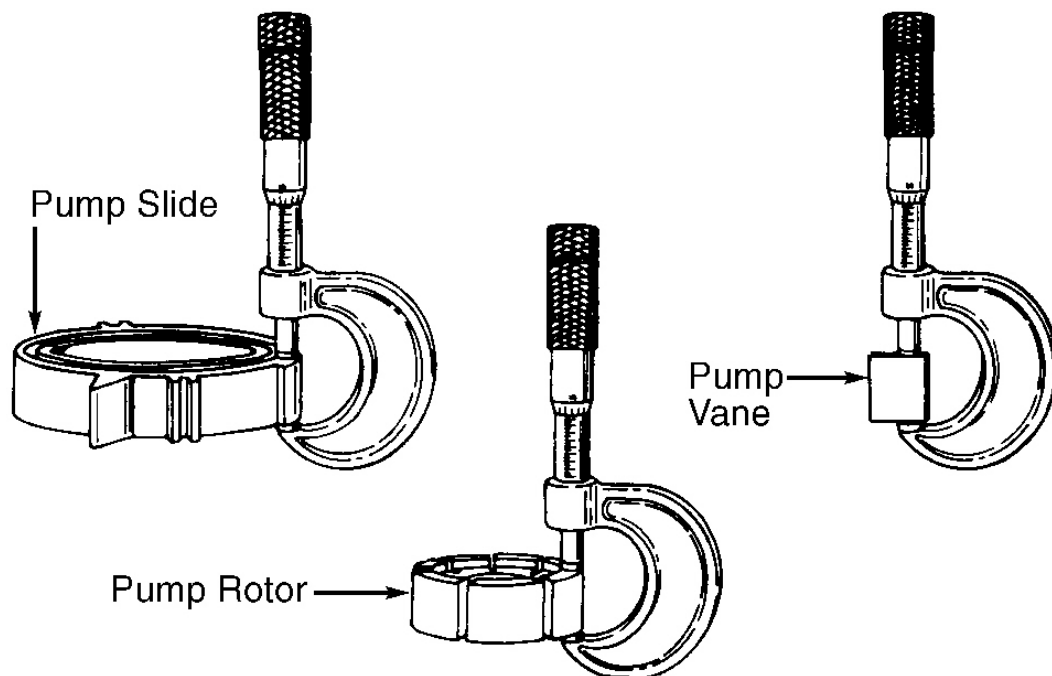
1. Pump Cover
2. Bolt
3. Rotor
4. Vane Ring
5. Vane
6. Outer Spring
7. Inner Spring
8. Slide Oil Seal Ring

9. Slide "O" Ring Seal
10. Slide
11. Slide Pivot Pin
12. Slide Seal
13. Slide Seal Support
14. Oil Pump Body
15. Outlet Screen

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Fig. 166: Exploded View Of Oil Pump Assembly

Courtesy of GENERAL MOTORS CORP.



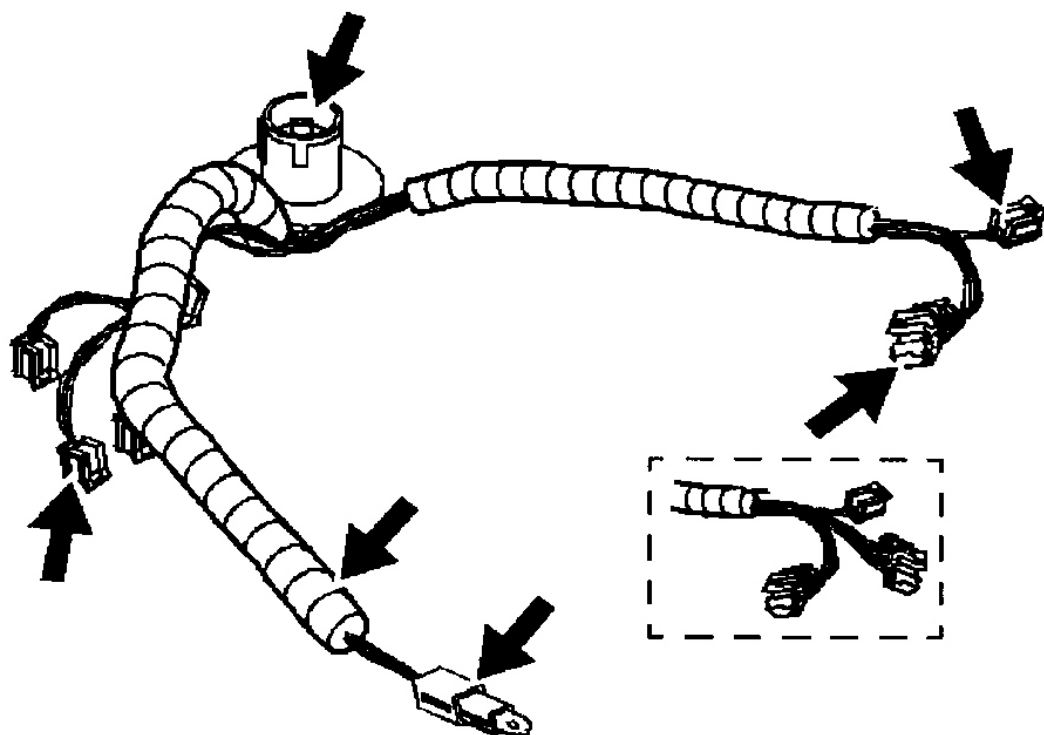
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Fig. 167: Measuring Pump Slide, Rotor & Vanes
Courtesy of GENERAL MOTORS CORP.

WIRING HARNESS

Inspection

Inspect wiring harness for cut or pinched wires, cut wire insulation, bent or broken electrical connectors or damaged terminals. See **Fig. 168**.



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Fig. 168: Inspecting Wire Harness

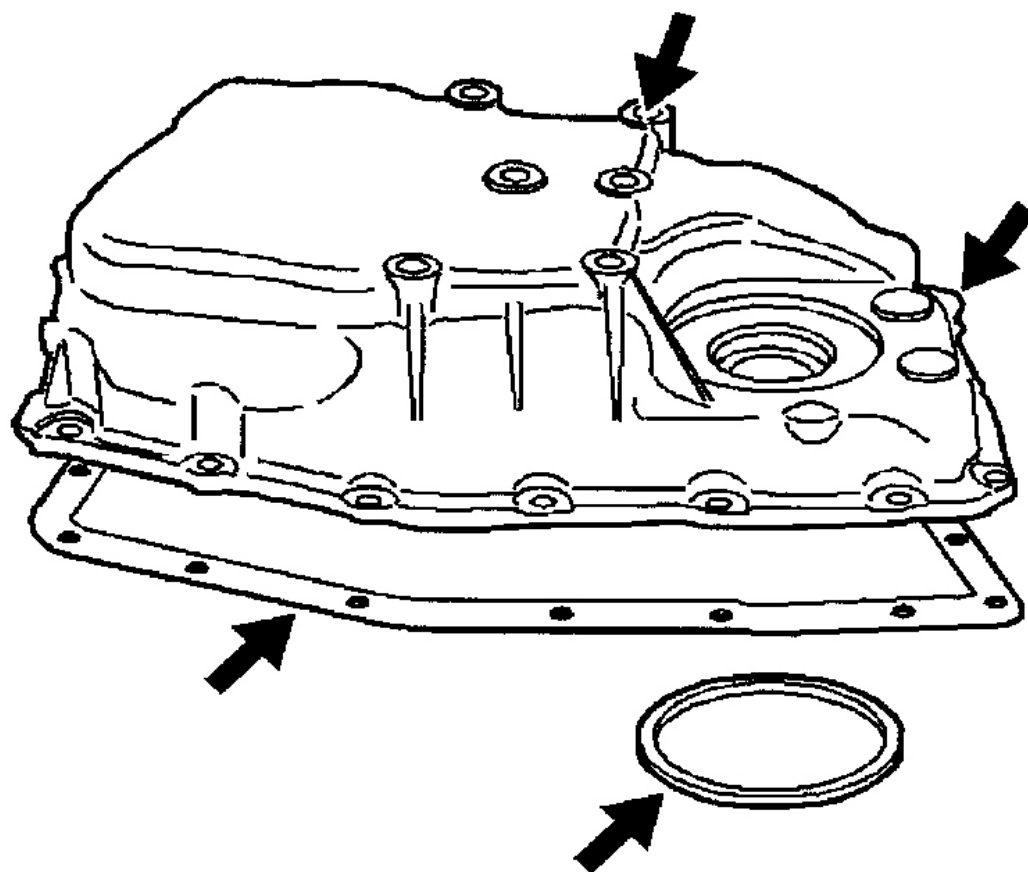
Courtesy of GENERAL MOTORS CORP.

CASE SIDE COVER

NOTE: Case side cover gasket and channel plate seal may be reused if not damaged.

Inspection

Inspect case side cover for damaged or porous gasket sealing surfaces, and damaged or stripped bolt holes. Inspect case side cover gasket and channel plate seal for damage. See **Fig. 169**.

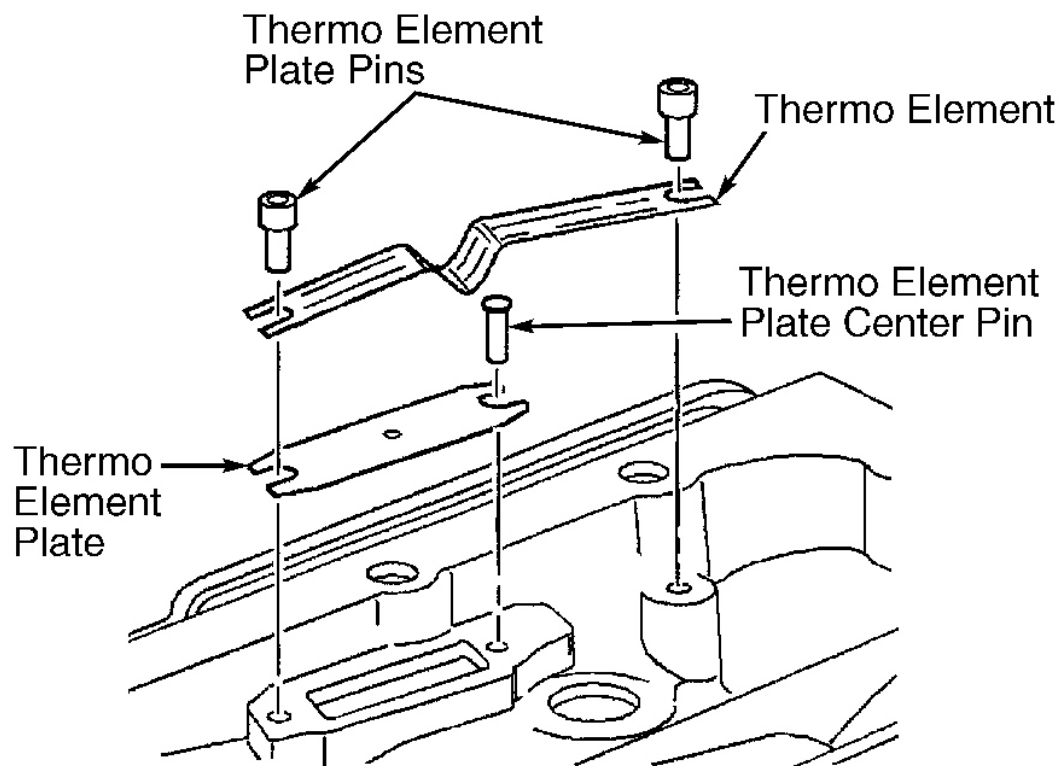


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Fig. 169: Inspecting Case Side Cover & Gaskets
Courtesy of GENERAL MOTORS CORP.

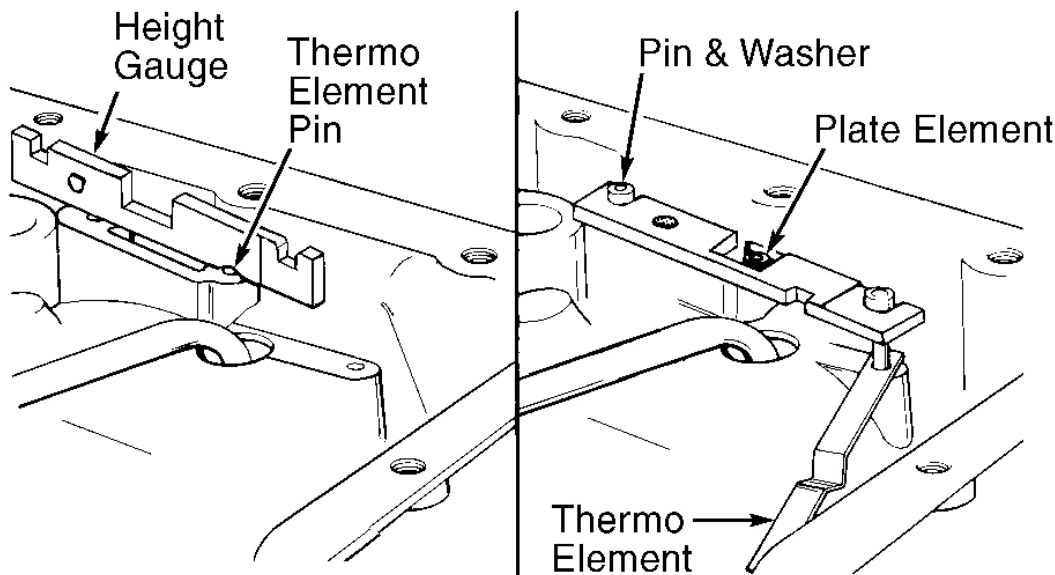
THERMO ELEMENT ADJUSTMENT

If thermo element replacement is necessary, remove retainers, pins and thermo element. Remove plate element. See **Fig. 170**. For NEW element, set thermo pin height with Height Gauge (J-34094-A). See **Fig. 171**. Install plate element. Install pin and retainer assemblies, and set height with height gauge. Install NEW thermo element. "V" shape in thermo element must contact element plate.



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Fig. 170: Exploded View Of Thermo Element
Courtesy of GENERAL MOTORS CORP.



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Fig. 171: Using Thermo Element Height Gauge
 Courtesy of GENERAL MOTORS CORP.

2-1 MANUAL BAND SERVO

Disassembly

Remove servo piston cylinder from servo cover. Remove "O" ring seal from servo piston cylinder. Remove piston assembly, servo piston spring and servo exhaust screen from cylinder. Remove servo piston seal from piston. Using small screwdriver, remove retaining ring from servo piston pin. Remove servo piston, cushion spring and spring retainer from servo piston pin. See **Fig. 172**.

Inspection

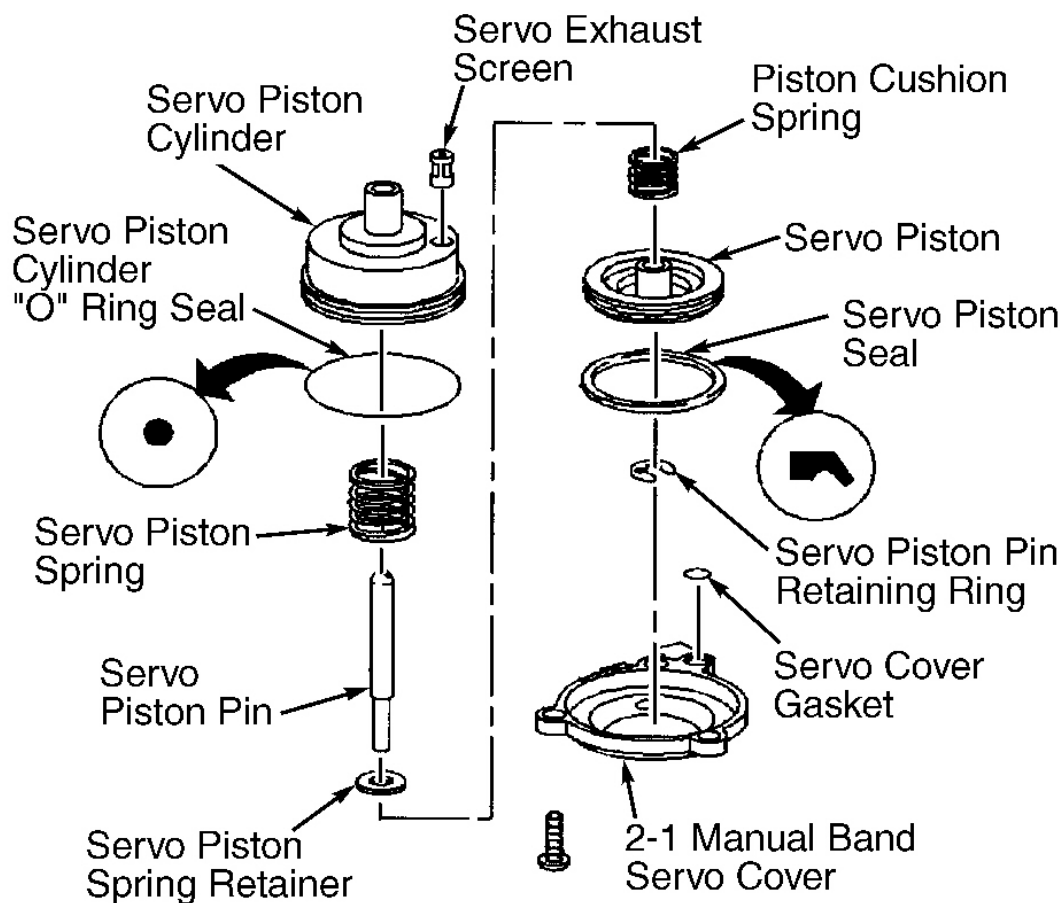
Inspect 2-1 manual band servo components for the following:

- Damaged, worn or porous servo piston cylinder.
- Damaged, worn or porous servo piston.
- Damaged or worn servo piston pin.
- Broken or damaged servo piston spring.
- Broken or damaged servo piston cushion spring.
- Damaged or plugged servo exhaust screen.
- Damaged servo cover seal.
- Damaged servo piston seal.

- Damaged servo piston cylinder "O" ring seal.

Reassembly

Install servo piston spring retainer, cushion spring and servo piston onto servo piston pin. Install servo piston pin retaining ring. Install servo piston seal onto piston. Lubricate seal with ATF. Install servo exhaust screen and servo piston cylinder "O" ring seal onto cylinder. Lubricate "O" ring seal with ATF. Attach servo piston spring to piston assembly. Install servo piston assembly into cylinder assembly and set assemblies aside.



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Fig. 172: Exploded View Of 2-1 Manual Servo
Courtesy of GENERAL MOTORS CORP.

ACCUMULATOR COMPONENTS

Disassembly

CAUTION: DO NOT mix up springs or pistons. Be sure to install correct springs in correct bore.

1. Remove 7 remaining accumulator cover bolts from accumulator assembly. Remove accumulator cover and spacer plate from accumulator housing. Disassemble 1-2 and 2-3 accumulator pistons, piston pins, outer springs and cushion springs from accumulator housing (springs are model dependent). Remove piston oil seal rings from 1-2 and 2-3 accumulator pistons. See **Fig. 173**.
2. Disassemble 2-1 manual band servo and forward band servo oil pipes, lube oil pipe assembly from accumulator cover, and 2-1 manual band servo cover. Disassemble lube oil pipe, hose clamps, oil hose, lube oil pipe retainer and lube oil pipe with washer. See **Fig. 174**.

Inspection

1. Inspect accumulator housing, accumulator cover spacer plate and accumulator cover for the following:
 - Damaged oil pipe holes in accumulator cover.
 - Damaged, improperly machined or porous accumulator cover.
 - Bent or damaged accumulator cover spacer plate.
 - Stripped or damaged bolt holes in accumulator housing.
 - Damaged, worn, improperly machined or porous accumulator housing.
 - Leaking, loose or missing cup plugs in accumulator housing.
2. Inspect accumulator pistons, springs, seals and pins for the following:
 - Broken or collapsed piston outer springs.
 - Broken or collapsed piston cushion springs.
 - Bent or worn accumulator piston pins.
 - Damaged, worn or porous accumulator pistons.
 - Damaged accumulator piston seals.
3. Inspect servo and lube oil pipe components and 2-1 manual band servo cover for the following:
 - Damaged lube, and servo oil pipe holes in servo cover.
 - Damaged, improperly machined or porous servo cover.
 - Bent, plugged or damaged lube and servo oil pipes.
 - Plugged or damaged lube oil hose.
 - Damaged hose clamps and/or lube oil pipe retainer.
 - Missing lube oil pipe washer.

Reassembly

1. Install piston oil seal rings onto 1-2 and 2-3 accumulator pistons. Lubricate oil seal ring with ATF. Assemble 1-2 and 2-3 piston pins and pistons. Assemble 1-2 and 2-3 accumulator piston springs and piston assembly into accumulator housing. See **Fig. 173**.
2. Assemble accumulator spacer plate and cover onto accumulator housing. Install accumulator bolts and tighten to specification. See **TORQUE SPECIFICATIONS**.
3. Assemble lube oil pipe, oil hose, hose clamps, pipe retainer and pipe with washer. See **Fig. 174**. Install 2-

1 manual band servo and forward band servo oil pipes into accumulator assembly. Install 2-1 manual band servo and forward band servo oil pipes into 2-1 manual band servo cover. Install lube oil pipe assembly into accumulator assembly.

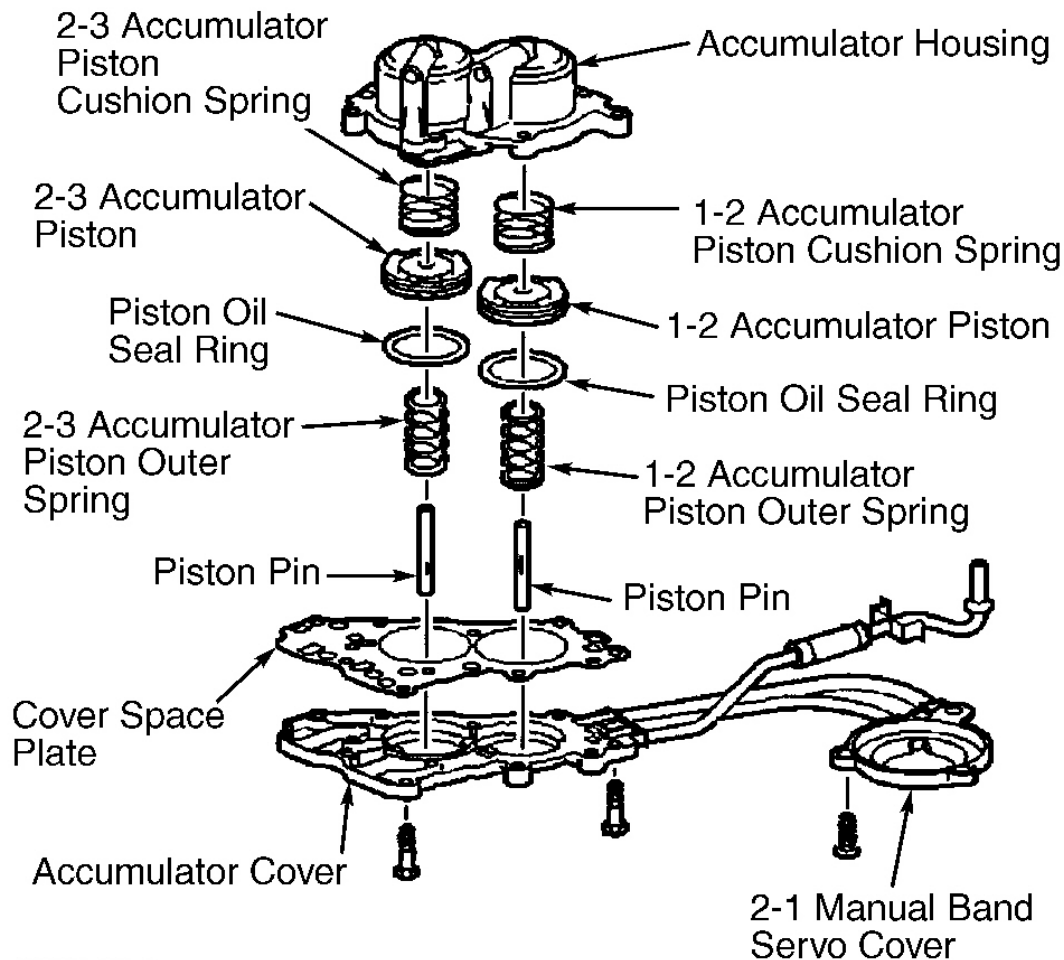
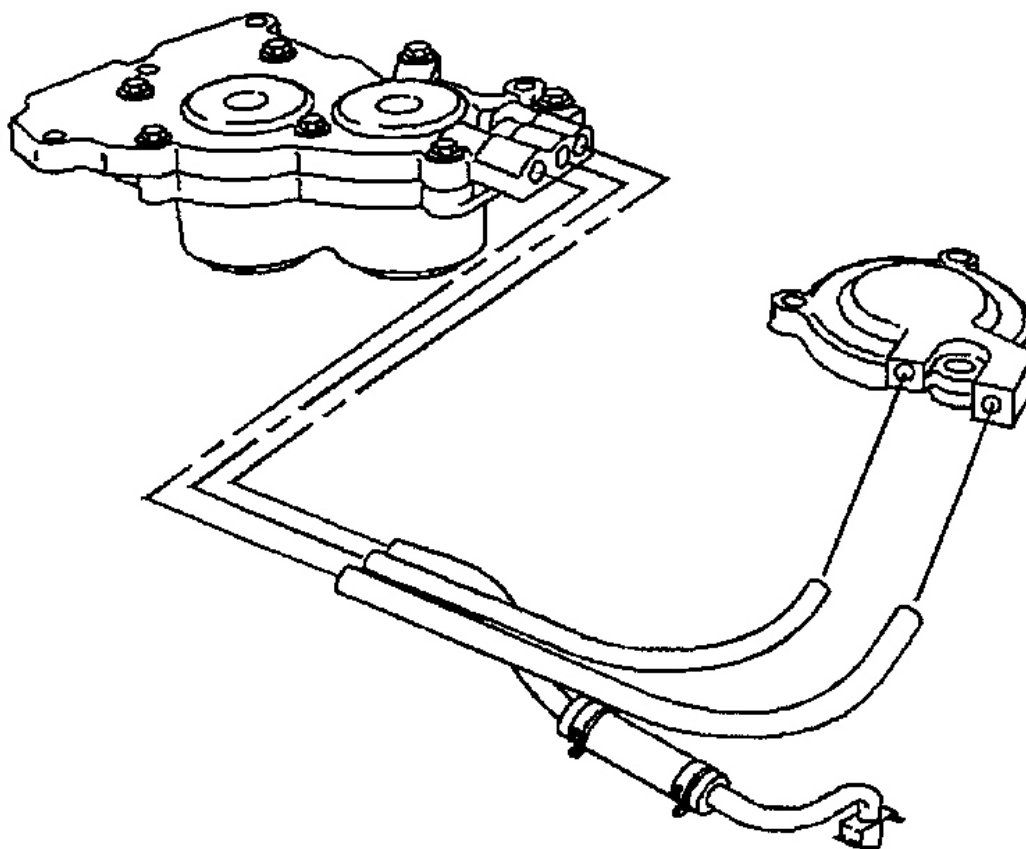


Fig. 173: Exploded View Of Accumulator Components
Courtesy of GENERAL MOTORS CORP.



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Fig. 174: Removing & Installing 2-1 Manual Band Servo Pipes
Courtesy of GENERAL MOTORS CORP.

OIL PAN & FILTER

Inspection

1. Inspect for damaged sealing surface. Inspect for dented or cracked bottom pan surface. Inspect oil pan gasket for bent or damaged seal core, damaged rubber seal surface or damaged gasket. Check oil pan magnet for damage or misalignment. Clean oil pan, gasket and magnet. See **Fig. 16**.

FORWARD BAND SERVO

Disassembly

Disassemble servo piston spring from servo assembly. Remove servo piston oil seal ring from servo piston. Remove servo pin retaining ring from servo piston pin. Disassemble servo piston, servo piston cushion spring, retainer and servo piston pin. See **Fig. 16**.

Inspection

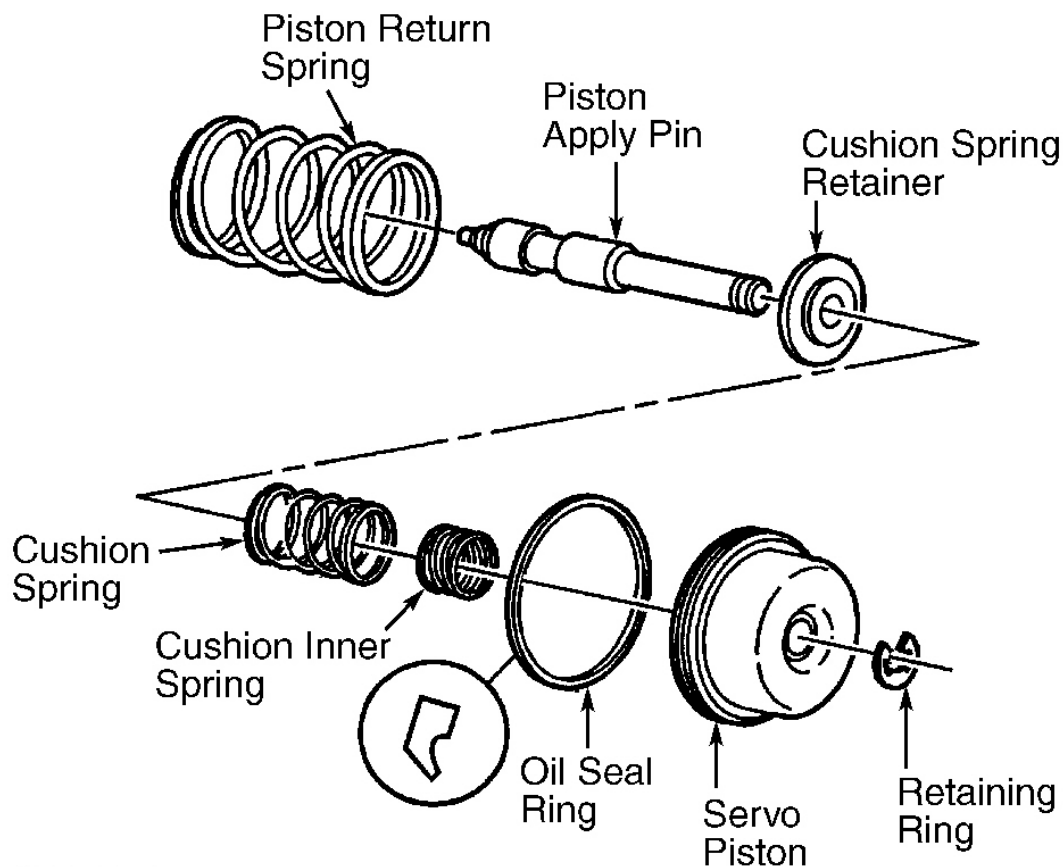
Inspect forward band servo components for the following:

- Damaged, worn or porous servo piston.
- Damaged servo piston oil seal ring.
- Damaged, worn or porous servo cover.
- Damaged servo cover seal.
- Broken or collapsed servo piston return spring.
- Broken or collapsed servo piston cushion inner spring.
- Broken or collapsed servo piston cushion outer spring.
- Damaged or worn servo piston apply pin.

See **Fig. 175**.

Reassembly

Assemble servo piston, servo piston cushion springs, retainer and servo piston pin. Install servo pin retaining ring onto servo piston pin. Install servo piston oil seal ring onto servo piston. Install servo piston spring onto servo assembly. See **Fig. 175**.



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Fig. 175: Exploded View Of Forward Band Servo
 Courtesy of GENERAL MOTORS CORP.

REVERSE BAND SERVO

Disassembly

Remove return spring from reverse band servo assembly. Remove oil seal ring from servo piston. Using a small screwdriver, remove retaining ring from servo piston apply pin. Disassemble servo piston, servo piston cushion springs, servo piston cushion spring retainer and servo piston apply pin. See **Fig. 176**.

Inspection

Inspect reverse band servo components for the following:

- Damaged, worn or porous servo piston.
- Damaged servo piston oil seal ring.
- Damaged, worn or porous servo cover.

- Damaged servo cover "O" ring seal.
- Damaged servo cover retaining ring.
- Broken or collapsed servo piston return spring.
- Broken or collapsed servo piston cushion springs.
- Damaged or worn servo piston apply pin.

See **Fig. 176**.

Reassembly

Assemble servo piston, cushion springs, cushion spring retainer and servo piston apply pin. Install retaining ring onto servo piston apply pin. Install oil seal ring onto servo piston. Install return spring onto servo assembly. See **Fig. 176**.

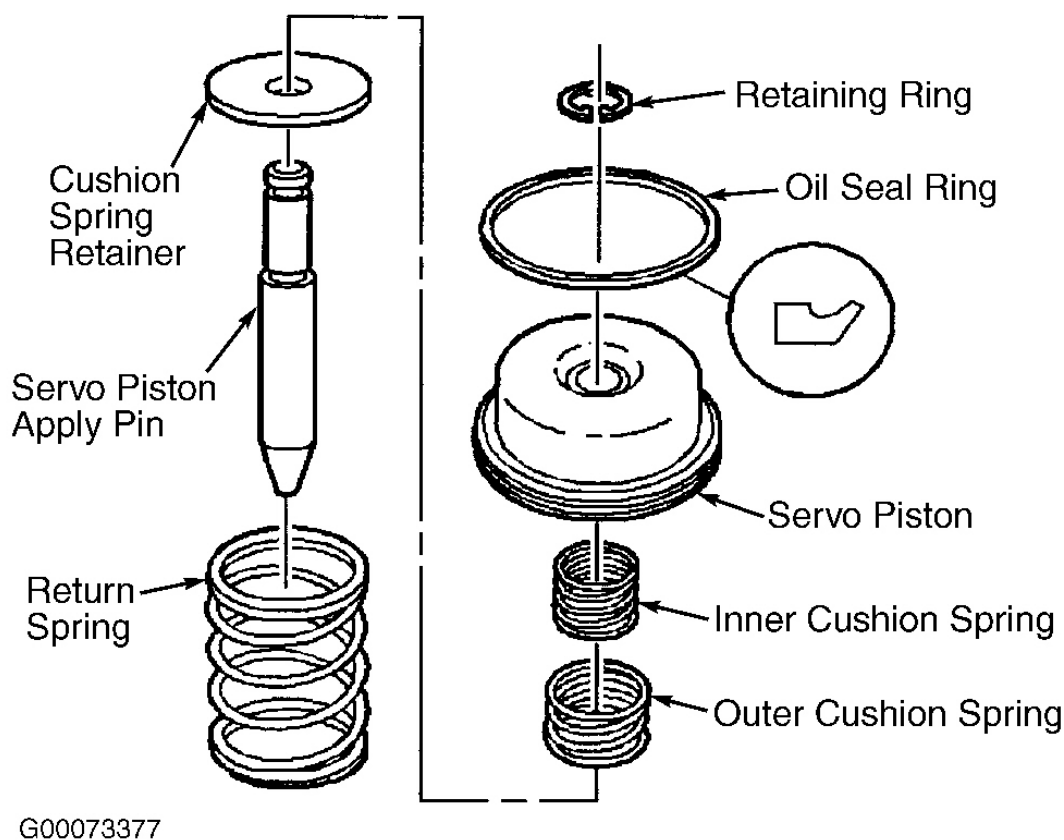


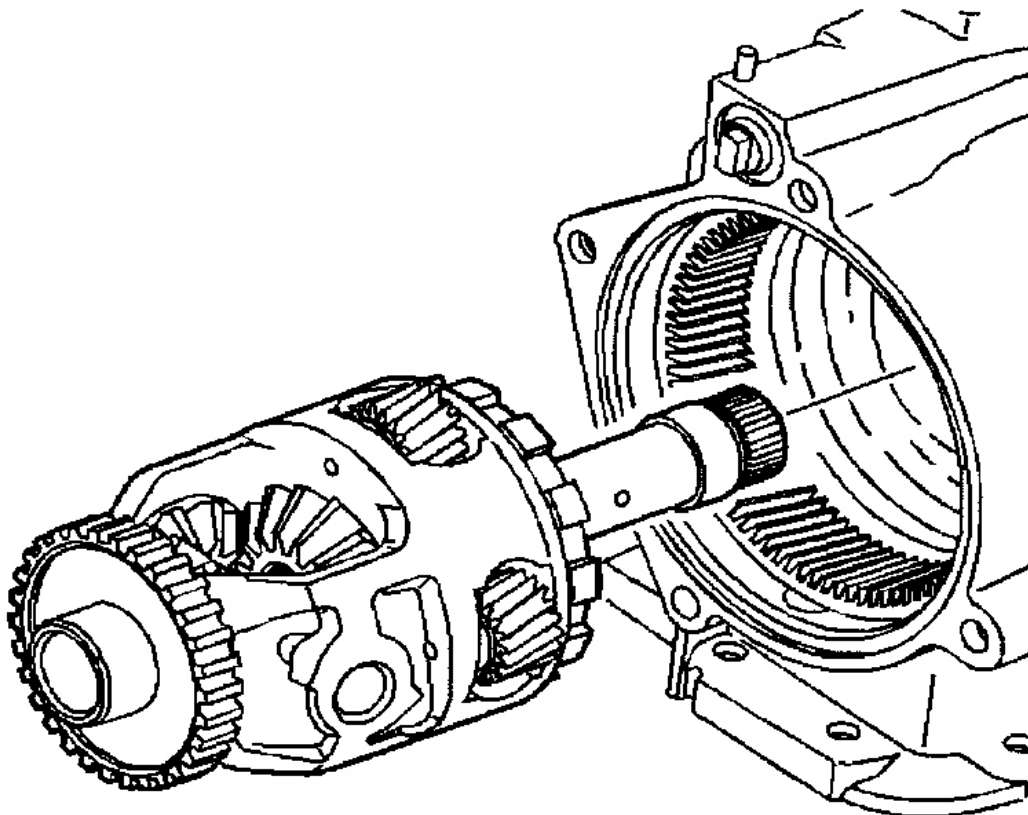
Fig. 176: Exploded View Of Reverse Band Servo
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE REASSEMBLY

NOTE: End play checks performed during TRANSAXLE DISASSEMBLY procedure must be rechecked at appropriate reassembly stage. For thrust washer, thrust bearing, bushing and seal installation direction and location during reassembly, refer to appropriate illustration. See Fig. 188-Fig. 192 .

TRANSAXLE

1. Install shift and park linkage components into case. See PARKING SYSTEM COMPONENTS under COMPONENT DISASSEMBLY & REASSEMBLY. Install final drive internal gear assembly into case. Align parking pawl with parking pawl actuator. Using long screwdriver, install retaining ring into case. See Fig. 86.
2. Position transaxle with oil pan flange facing down. Ensure sun gear thrust bearing is installed into differential carrier. Install differential carrier sun gear. Step in sun gear must be pointing toward parking gear. Install parking gear. Install internal gear thrust bearing into differential carrier. Ensure bearing is positioned properly. Install sun gear shaft into differential carrier. See Fig. 104. Install differential carrier into case. See Fig. 177.



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Fig. 177: Installing Differential Carrier Assembly

Courtesy of GENERAL MOTORS CORP.

3. Install selective thrust washer and thrust bearing onto differential carrier. Install seal onto case extension. Install case extension onto transaxle case. See **Fig. 56**. Install and tighten 2 case extension bolts only until case extension is seated into case. DO NOT torque bolts.
4. Position transaxle case with flange for case cover facing up. Install forward band into case. Locate band onto forward band anchor pin and apply pin feature in case opening. Install thrust washer onto final drive internal gear. See **Fig. 85**.
5. Install 1-2 support drum. See **Fig. 84**. Position 2-1 band on anchor pin. See **Fig. 83**. Install reaction sun gear and drum. See **Fig. 82**. Ensure sun gear and drum fully engage 1-2 support roller clutch. Check roller clutch for correct operation. See **Fig. 111**.
6. Install reaction carrier/sun gear thrust bearing onto reaction carrier. Install reaction carrier into transaxle case and rotate carrier so pinions engage reaction sun gear. Install thrust bearing and lube dam onto input carrier. Install input carrier into transaxle case and rotate carrier so pinions engage reaction carrier internal gear. See **Fig. 114**.
7. Install sprag, roller clutch and input sun gear assembly into input clutch assembly. Clutch hubs must engage clutch plates. Install input clutch roller clutch and sprag assemblies into case using Final Drive/Clutch Installer (J-33381). DO NOT install 2nd clutch housing, thrust bearing or thrust washer at this time.
8. Check input clutch housing end play. See **INPUT CLUTCH HOUSING END PLAY CHECK** under TRANSAXLE DISASSEMBLY. Using feeler gauge, check clearance between thrust washer and end play gauge. Clearance must be .0-.006" (.0-.15 mm). If clearance is not as specified, use different thrust washer. See **INPUT CLUTCH THRUST WASHER IDENTIFICATION** table. Remove input clutch assembly.

INPUT CLUTCH THRUST WASHER IDENTIFICATION

Washer ID No.	Color	Thickness - In. (mm)
1	Orange/Green	.114-.118 (2.90-3.00)
2	Orange/Black	.120-.124 (3.05-3.15)
3	No Color	.126-.130 (3.20-3.30)
4	White	.132-.136 (3.35-3.45)
5	Blue	.138-.142 (3.50-3.60)
6	Pink	.144-.148 (3.65-3.75)
7	Brown	.150-.154 (3.80-3.90)
8	Green	.156-.159 (3.95-4.05)
9	Black	.161-.165 (4.10-4.20)
10	Purple	.167-.171 (4.25-4.35)
11	Purple/White	.173-.177 (4.40-4.50)

NOTE: This step has been revised due to ATRA TSB No. 579, dated November 2000.

9. Check for damaged 2nd clutch and reverse reaction drum splines. Original 2nd clutch and reverse

reaction drums have splines with 25-degree sides and have tendency to strip. New design 2nd clutch and reverse reaction drum kit (GM P/N 24213402) has splines with 10-degree sides. Install reverse reaction drum. See **Fig. 75**.

10. Install reverse band into case, locating band on anchor pins. See **Fig. 74**. Install selective thrust washer and thrust bearing onto input clutch assembly. Install thrust bearing with large race facing down. Install 2nd clutch assembly onto input clutch assembly. Clutch plates must engage input clutch hub. See **Fig. 73**.
11. Install final drive/clutch installer into assembled input and second clutch housing assemblies. Tighten threaded rod of final drive/clutch installer until rod is finger tight. Using final drive/clutch installer, lift input and second clutch housing assembly, and install input and second clutch housing assembly into case. See **Fig. 72**. Ensure input clutch housing assembly is fully seated. Ensure second clutch housing is .500" (13 mm) above top of reverse band assembly.
12. Install thrust washer onto driven sprocket support, and hold washer in position with petroleum jelly. Install driven sprocket support into case. See **Fig. 71**. Ensure support is flush with or below case.
13. Use petroleum jelly to hold thrust washer onto drive and driven sprockets. **Fig. 70**. Assemble drive and driven sprockets into drive chain assembly as follows: If old drive link is being reinstalled, assemble drive link and sprockets with master link (different color link) facing in same direction as removed. See **DRIVE & DRIVEN SPROCKETS** under TRANSAXLE DISASSEMBLY. If NEW drive link assembly is being installed, assemble drive link and sprockets with master link facing upward.
14. Install drive link assembly and sprockets into case. A slight rocking motion may be required to work sprockets into place. Install input speed sensor reluctor wheel onto drive sprocket. See **Fig. 70**. Perform **DRIVE CHAIN (DRIVE LINK) STRETCH CHECK**. See **DRIVE & DRIVEN SPROCKETS** under TRANSAXLE DISASSEMBLY.
15. Install 4th clutch shaft thrust washer onto driven sprocket. Insert 4th clutch shaft into transaxle case through driven sprocket. See **Fig. 68**. Shaft must fully seat into input sun gear. Install drive link lube scoop into case.
16. Install fourth clutch apply plate over fourth clutch shaft assembly and into driven sprocket support with machined side towards driven sprocket. Install remaining 4th clutch plates, starting with composition plate and alternating with steel plates. Clutch plates should align in driven sprocket support. See **Fig. 68**.
17. Install pistons and pins into case cover. Install springs into case cover. See **Fig. 159**. Install case cover gaskets. See **Fig. 67**. Install 4th clutch shaft and drive sprocket thrust washers onto case cover. See **Fig. 66**.
18. Install case cover onto transaxle case. Case cover lugs must align with tangs on 4th clutch plates. See **Fig. 17**. Install case cover bolts. See **CASE COVER BOLT SPECIFICATIONS** table. Tighten case cover bolts to specification. See **TORQUE SPECIFICATIONS**.

CASE COVER BOLT SPECIFICATIONS

Bolt No. ⁽¹⁾	Diameter - In. (mm)	Length - In. (mm)
1	0.24 (6)	1.3 (32)
2	0.24 (6)	1.6 (40)
3	0.31 (8)	2.0 (50)
4	0.24 (6)	1.2 (30)
(1) For bolt location, refer to illustration. See Fig. 65 .		

19. Install oil dam into case. See **Fig. 63**. Connect manual valve link to manual valve. See **Fig. 62**. Install manual shift detent and bolt. See **Fig. 61**. Tighten bolt to specification. See **TORQUE SPECIFICATIONS**.
20. Install input speed sensor and clip into case cover. See **Fig. 64**.
21. On 2 wheel drive models, check front differential carrier end play. See **FRONT DIFFERENTIAL CARRIER END PLAY CHECK** under TRANSAXLE DISASSEMBLY. Install appropriate thrust washer on to input shaft and hold in position with petroleum jelly. See **CARRIER-TO-CASE SELECTIVE THRUST WASHER SIZES** table. Tighten case extension bolts to specification. See **TORQUE SPECIFICATIONS**.
22. Install oil pump drive shaft. See **Fig. 55**. Install 2 large check balls and 4 small check balls into control valve body. See **Fig. 54**. Install 4 check balls into case cover. See **Fig. 53**. Use petroleum jelly to hold check balls in position.
23. Install solenoid screen/seal assemblies into spacer plate. Install case cover guide pin into case cover. Install valve body-to-spacer plate gasket, spacer plate and case cover-to-spacer plate gasket onto control valve body. Install bolts to hold spacer plate and gaskets onto control valve body. See **Fig. 178**.

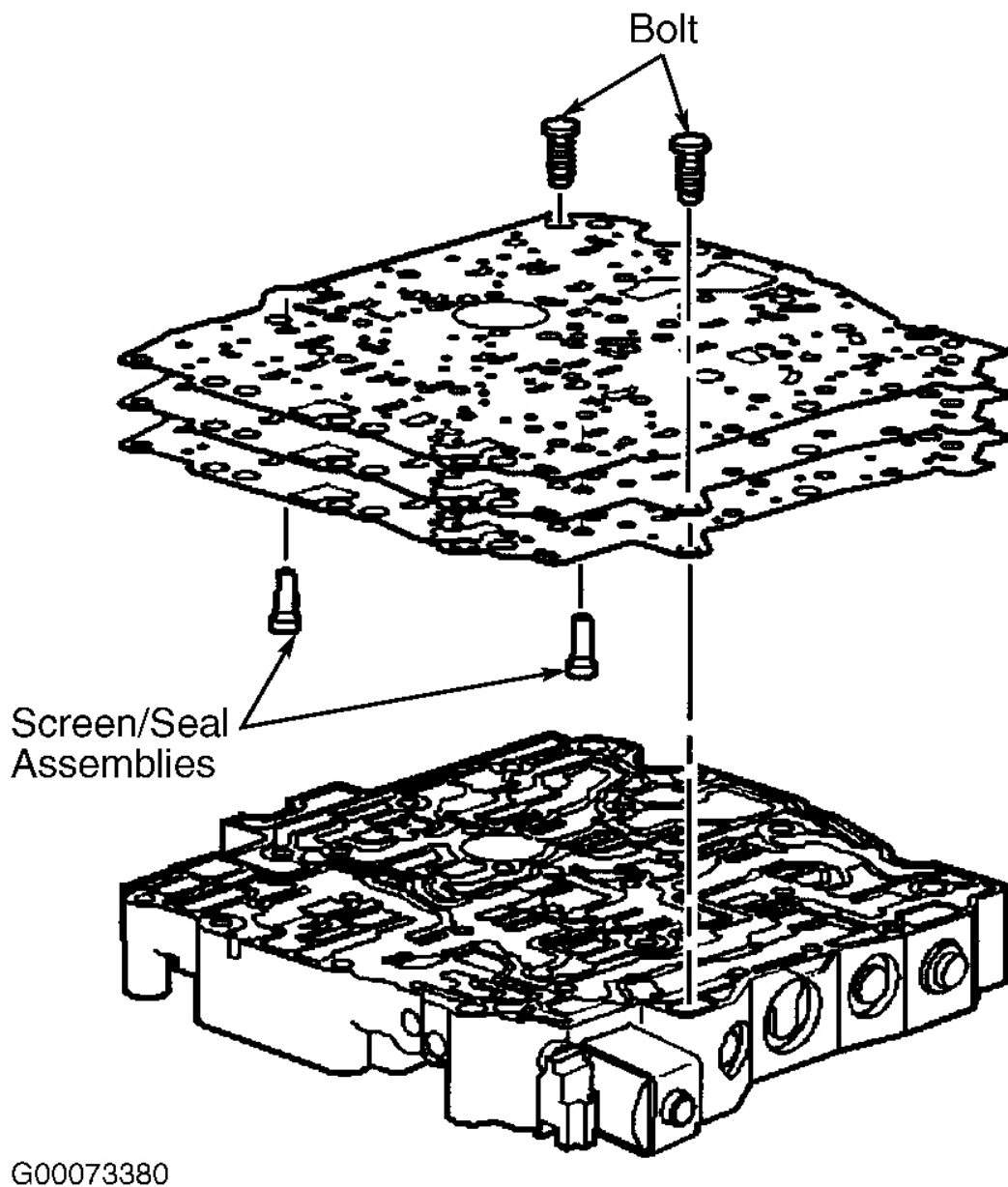


Fig. 178: Installing Control Valve Body Spacer Plate & Gaskets
Courtesy of GENERAL MOTORS CORP.

24. Install control valve body onto case cover. Use case cover pin and turbine sleeve in case cover as guides. Ensure check balls do not drop out of control valve body during reassembly. See **Fig. 179**. Install manual valve position switch onto control valve body. See **Fig. 51**.

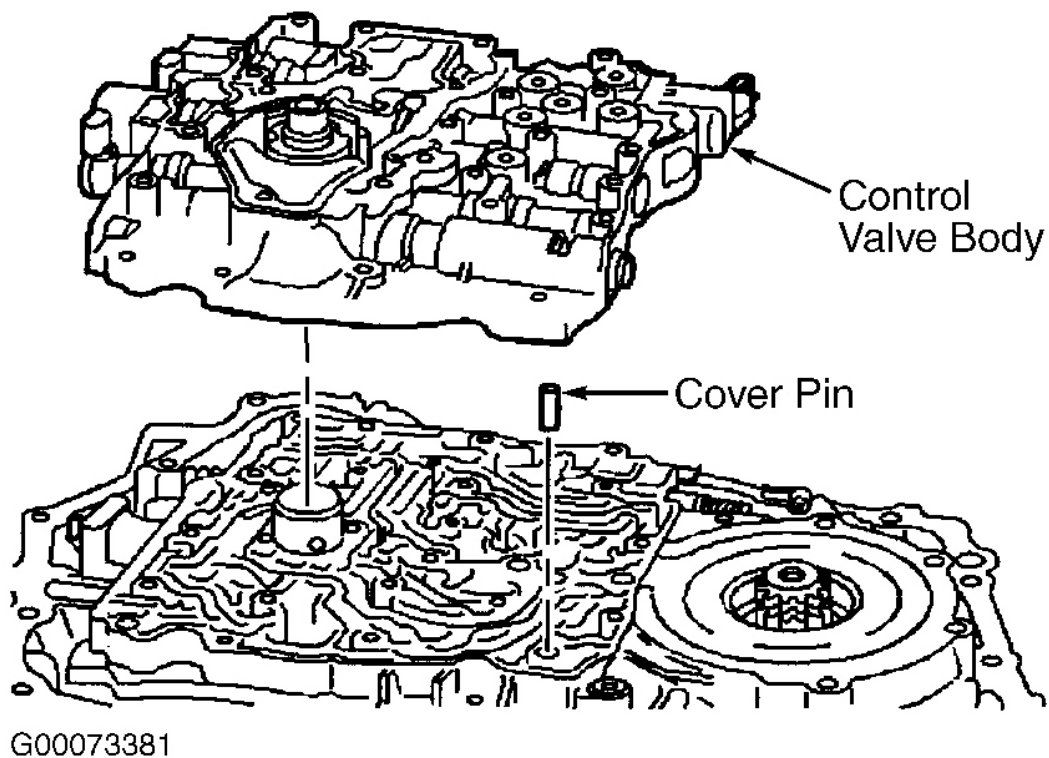


Fig. 179: Installing Control Valve Body
 Courtesy of GENERAL MOTORS CORP.

25. Install control valve body bolts. See **VALVE BODY BOLT SPECIFICATIONS** table. Finger tighten bolts to prevent cross-threading. Tighten bolts in a spiral pattern starting with bolts at center of control valve body. If bolts are tightened at random, valve bores may become distorted and prevent proper valve operation. Tighten valve body bolts to specification. See **TORQUE SPECIFICATIONS**.
26. Install oil pump assembly onto control valve body. See **Fig. 49**. Install oil pump bolts in specified locations. See **OIL PUMP BOLT SPECIFICATIONS** table. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. Install electronic components and wiring harness. Ensure wire connectors are installed in correct locations. See **Fig. 46**.

VALVE BODY BOLT SPECIFICATIONS

Bolt No. (1)	Diameter - In. (mm)	Length - In. (mm)
1	0.24 (6)	2.6 (65)
2	0.24 (6)	2.4 (60)
3	0.24 (6)	1.2 (30)
4	0.24 (6)	1.8 (45)
5	0.24 (6)	2.2 (55)
6	0.24 (6)	3.7 (95)

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7	0.31 (8)	3.5 (90)
8	0.24 (6)	0.8 (20)
9	0.24 (6)	3.3 (85)

(1) For bolt location, refer to illustration. See **Fig. 50**

OIL PUMP BOLT SPECIFICATIONS

Bolt No. (1)	Diameter - In. (mm)	Length - In. (mm)
1	0.24 (6)	0.8 (20)
2	0.24 (6)	3.7 (95)
3	0.24 (6)	3.3 (85)

(1) For bolt location, refer to illustration. See **Fig. 48**

27. Install side cover gasket and seal onto transaxle case. See **Fig. 15**. Install case side cover. See **Fig. 45**. Tighten side cover bolts to specification. See **TORQUE SPECIFICATIONS**.

NOTE: 2-1 manual servo pipe should be installed in accumulator housing center hole, and lube oil pipe should be installed in right side hole. See **Fig. 44**. Forward servo pipe cannot be installed in incorrect hole due to a larger pipe diameter.

28. Install 2-1 manual band servo and cover gasket into case. Lubricate gasket with ATF. See **Fig. 180**. Ensure servo piston pin engages band. Install accumulator and 2-1 manual band servo cover assembly into case. See **Fig. 181**. Install lube oil pipe into case at lube hole for differential carrier internal gear. Lock lube oil pipe retainer into case. See **Fig. 43**. Install cover bolts for 2-1 manual band servo. Install accumulator cover and bolts. See **Fig. 42**. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.
29. Using socket and mallet, install NEW oil filter seal. See **Fig. 182**. Install oil filter and pan gasket into case. Install oil pan and tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

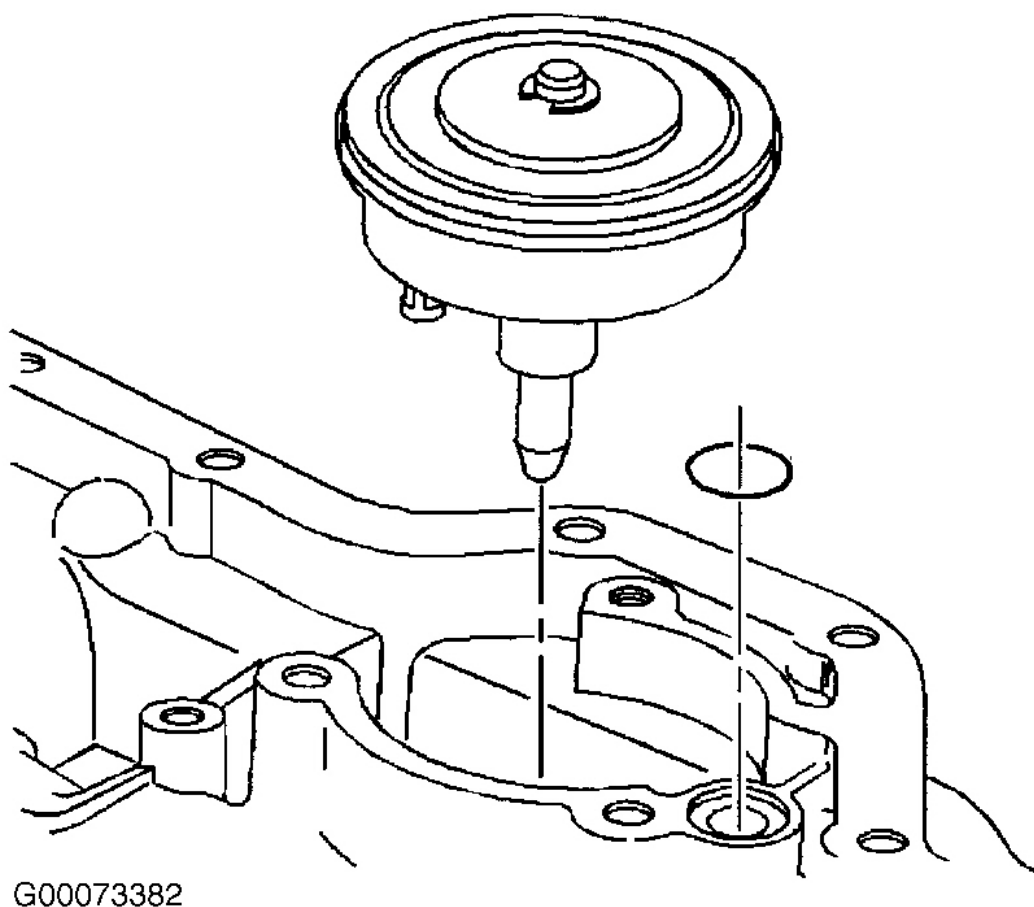
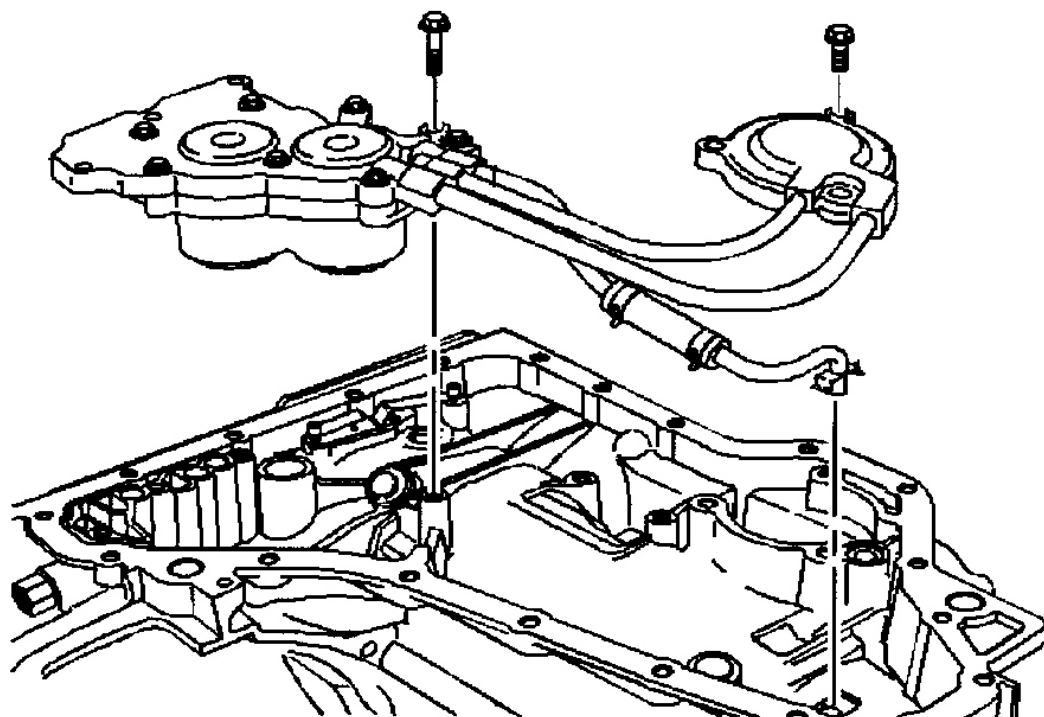
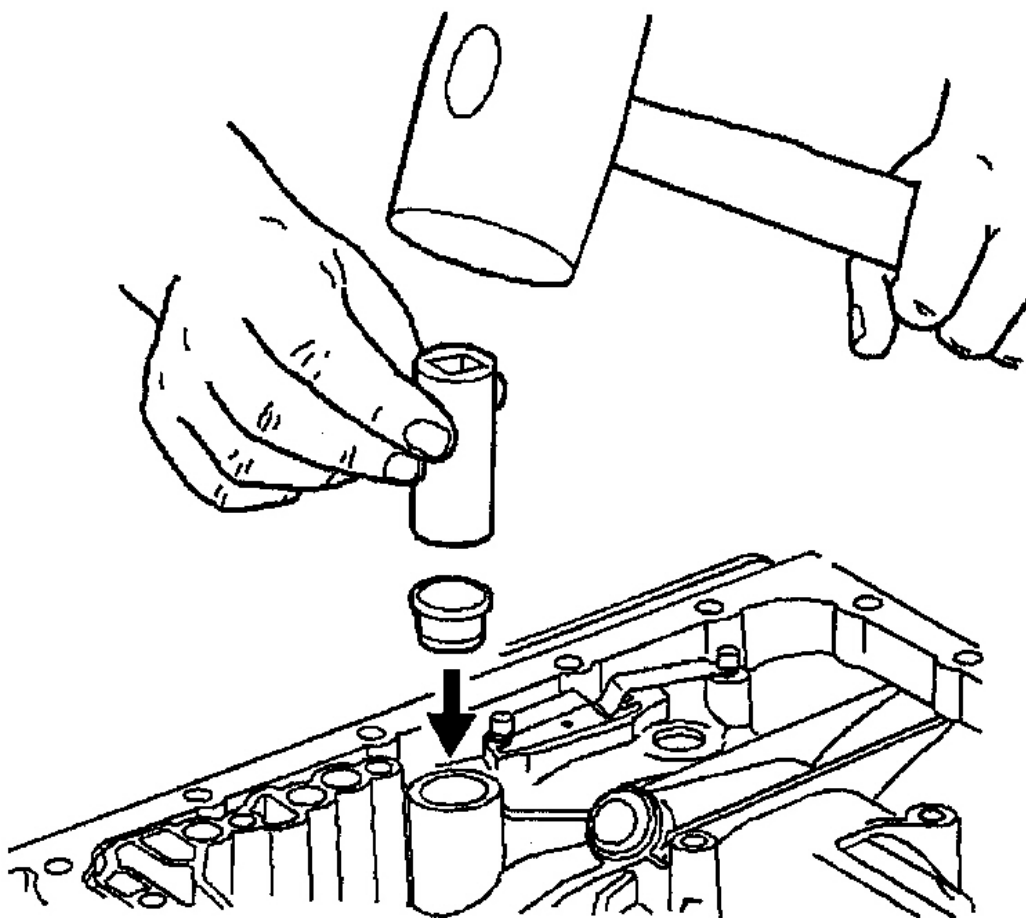


Fig. 180: Installing 2-1 Manual Band Servo & Seal
Courtesy of GENERAL MOTORS CORP.



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Fig. 181: Installing Accumulator & 2-1 Manual Band Servo Cover Assembly
Courtesy of GENERAL MOTORS CORP.



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Fig. 182: Installing Oil Filter Seal
Courtesy of GENERAL MOTORS CORP.

30. Position transaxle so oil pan is facing up. Install servo cover seal onto forward band servo cover. Install forward band servo assembly into servo cover. Pivot servo assembly into servo cover to prevent piston oil seal ring from being damaged. Install servo and cover assembly into case. See **Fig. 41**.
31. Using long screwdriver, pry against work bench to compress forward band servo assembly. See **Fig. 40**. Hold servo assembly compressed. Install 3 forward band servo cover bolts and tighten to specification. See **TORQUE SPECIFICATIONS**.
32. Position transaxle so oil pan is facing down. Install "O" ring seal onto reverse servo cover. Install servo and cover assembly into case. See **Fig. 39**. Use a long screwdriver to depress reverse band servo cover by prying against transaxle holding fixture. See **Fig. 38**. Hold reverse band servo assembly compressed. Using a small screwdriver, install reverse band servo cover retaining ring.
33. Install VSS. Install "O" ring onto turbine shaft. Install torque converter.

34. On 2WD models, affix outboard and inboard drive shaft retaining rings onto output shaft. DO NOT push to hard during installation of output shaft, or damage to bushings or bearings may occur. Carefully install output shaft into transaxle. Extend shaft through differential side gear. On AWD models, DO NOT install output shaft until after performing **TRANSMISSION-TO-TRANSFER CASE END PLAY CHECK** and reinstalling transfer case.

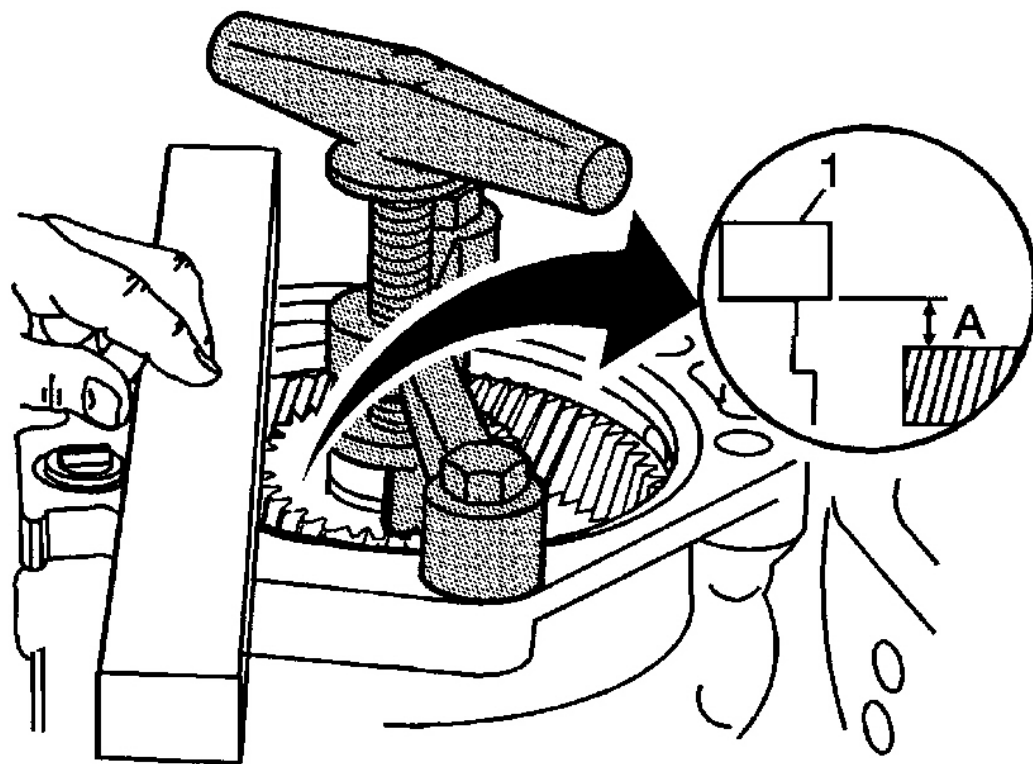
CARRIER-TO-CASE SELECTIVE THRUST WASHER SIZES

Washer ID No.	Color	Thickness - In. (mm)
1	Orange	.055-.059 (1.40-1.50)
2	White	.059-.063 (1.50-1.60)
3	Blue	.063-.067 (1.60-1.70)
4	Pink	.067-.071 (1.70-1.80)
5	Brown	.071-.075 (1.80-1.90)
6	Green	.075-.079 (1.90-2.00)
7	Black	.079-.083 (2.00-2.10)
8	Purple	.083-.087 (2.10-2.20)
9	Purple/White	.087-.091 (2.20-2.30)
10	Purple/Blue	.091-.094 (2.30-2.40)

TRANSMISSION-TO-TRANSFER CASE END PLAY CHECK

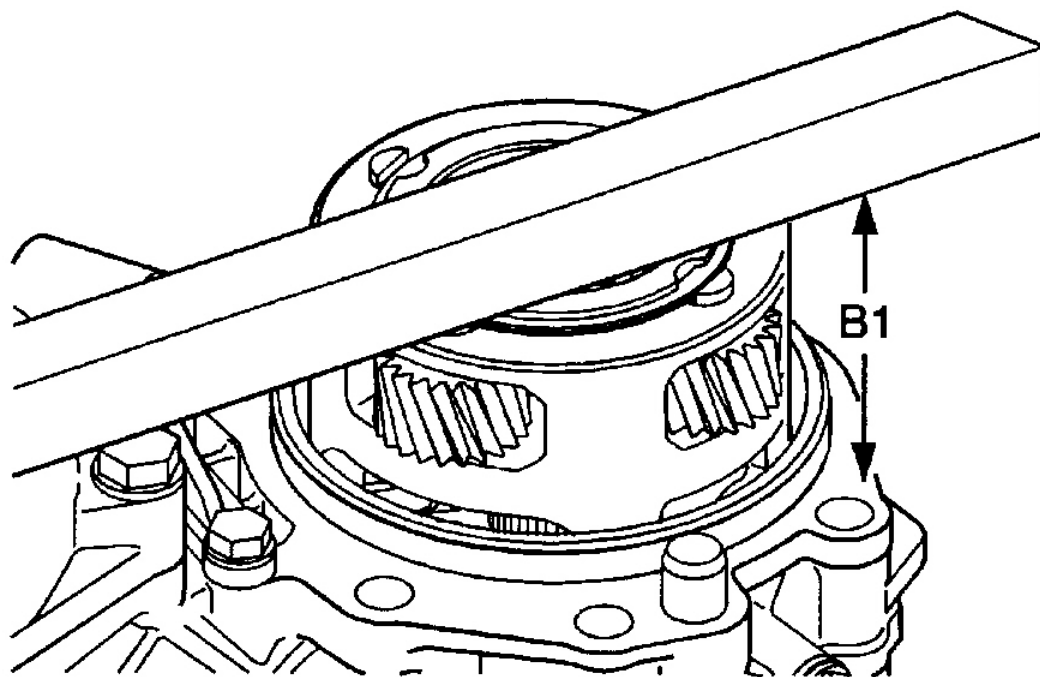
NOTE: ATF circulates between transaxle and transfer case. In situations where transaxle related failures circulate debris into transfer case, transfer case must be disassembled, cleaned, and inspected for damage.

1. Position transaxle so case side cover is facing down. Install final drive sun gear shaft. See **Fig. 37**. Use petroleum jelly to retain parking gear thrust bearing to parking gear. Install parking gear thrust bearing and parking gear. See **Fig. 36**. Install final drive sun gear. See **Fig. 34**.
2. Install bolts to end play checking tool and tighten securely to prevent tool deflection during end play measurement. See **Fig. 76**. Hand tighten end play checking tool to remove end play. Install gauge bar onto case mounting surface.
3. Measure distance from case mounting surface, bottom of gauge bar to top of final drive sun gear. See **Fig. 183**. This measurement is dimension "A". Remove gauge bar and end play checking tool.
4. Install gauge bar onto carrier. Measure distance from bottom of gauge bar to transfer case. See **Fig. 184**. This measurement is Dimension B1. Measure distance from bottom of gauge bar to thrust bearing. See **Fig. 185**. This measurement is Dimension B2. Subtract Dimension B2 from Dimension B1. This is Dimension "B". For available thrust washer sizes, refer to illustration. See **Fig. 186**.
5. Remove gauge bar from transfer case. Remove final drive sun gear. Install selective washer. See **Fig. 35**. Install final drive sun gear. See **Fig. 34**.



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Fig. 183: Checking Transaxle-To-Transfer Case End Play (1 Of 3)
Courtesy of GENERAL MOTORS CORP.



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Fig. 184: Checking Transaxle-To-Transfer Case End Play (2 Of 3)
Courtesy of GENERAL MOTORS CORP.

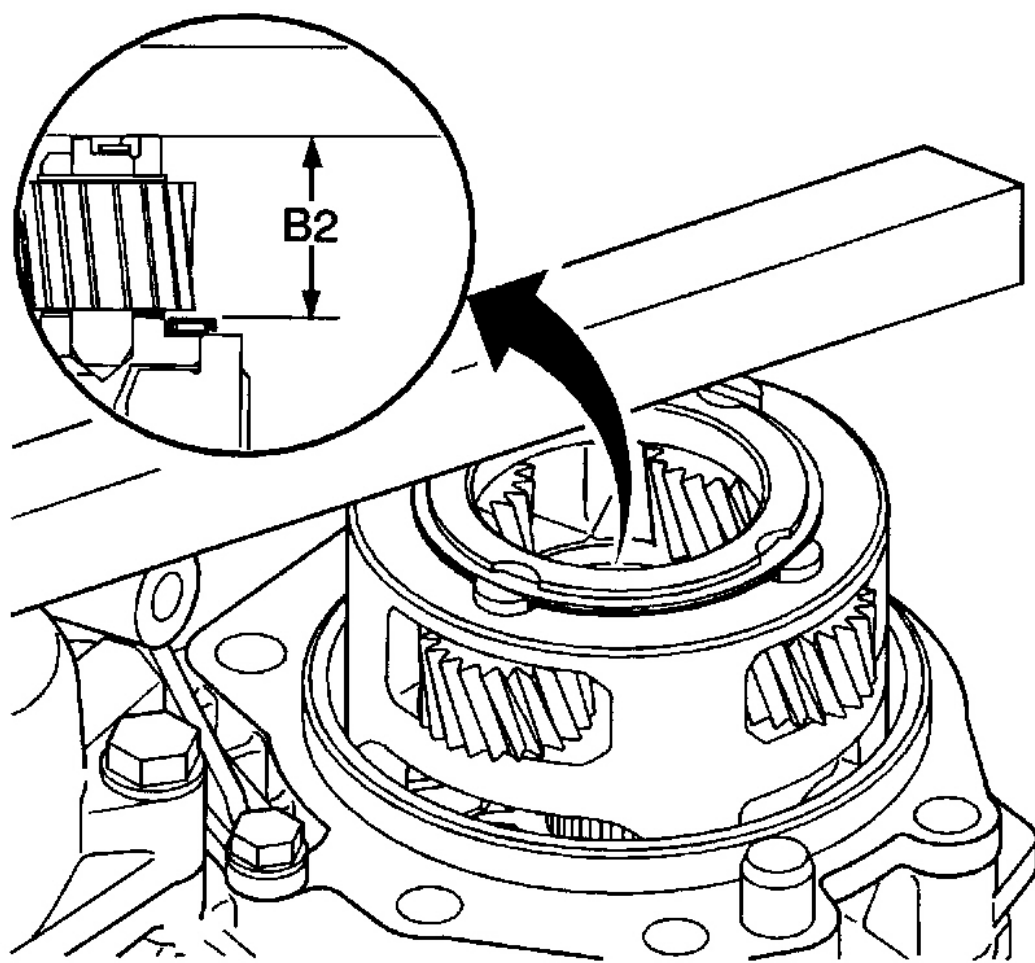


Fig. 185: Checking Transaxle-To-Transfer Case End Play (3 Of 3)
Courtesy of GENERAL MOTORS CORP.

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Dimension A		Dimension B		End Play without Selective Washer		Selective Washer Color	Selective Washer Size	
Metric	English	Metric	English	Metric	English		Metric	English
23.23–23.12 mm	0.914–0.910 in	19.98–20.23 mm	0.786–0.796 in	3.25–2.89 mm	0.128–0.114 in	Light Blue	2.67 mm	0.105 in
23.12–23.01 mm	0.910–0.906 in	19.98–20.23 mm	0.786–0.796 in	3.14–2.78 mm	0.124–0.109 in	Light Green	2.56 mm	0.100 in
23.01–22.90 mm	0.906–0.901 in	19.98–20.23 mm	0.786–0.796 in	3.03–2.67 mm	0.119–0.105 in	White	2.45 mm	0.096 in
22.90–22.79 mm	0.901–0.897 in	19.96–20.23 mm	0.786–0.796 in	2.92–2.56 mm	0.115–0.101 in	Orange	2.34 mm	0.092 in
22.79–22.68 mm	0.897–0.892 in	19.98–20.23 mm	0.786–0.796 in	2.81–2.45 mm	0.110–0.096 in	Pink	2.23 mm	0.088 in
22.68–22.57 mm	0.892–0.888 in	19.98–20.23 mm	0.786–0.796 in	2.70–2.34 mm	0.106–0.092 in	No Color	2.12 mm	0.083 in
22.57–22.46 mm	0.888–0.884 in	19.98–20.23 mm	0.786–0.796 in	2.59–2.23 mm	0.102–0.087 in	Black	2.01 mm	0.079 in
23.23–23.12 mm	0.914–0.910 in	20.23–20.48 mm	0.796–0.806 in	3.00–2.64 mm	0.118–0.103 in	White	2.45 mm	0.096 in
23.12–23.01 mm	0.910–0.906 in	20.23–20.48 mm	0.796–0.806 in	2.89–2.53 mm	0.114–0.099 in	Orange	2.34 mm	0.092 in
23.01–22.90 mm	0.906–0.901 in	20.23–20.48 mm	0.796–0.806 in	2.78–2.42 mm	0.110–0.095 in	Pink	2.23 mm	0.088 in
22.90–22.79 mm	0.901–0.897 in	20.23–20.48 mm	0.796–0.806 in	2.67–2.31 mm	0.105–0.090 in	No Color	2.12 mm	0.083 in
22.79–22.68 mm	0.897–0.892 in	20.23–20.48 mm	0.796–0.806 in	2.56–2.20 mm	0.101–0.086 in	Black	2.01 mm	0.079 in
22.68–22.57 mm	0.892–0.888 in	20.23–20.48 mm	0.796–0.806 in	2.45–2.09 mm	0.096–0.082 in	Purple	1.90 mm	0.074 in
22.57–22.46 mm	0.888–0.884 in	20.23–20.48 mm	0.796–0.806 in	2.34–1.98 mm	0.092–0.077 in	Brown	1.79 mm	0.070 in
23.23–23.12 mm	0.914–0.910 in	20.48–20.72 mm	0.806–0.816 in	2.75–2.40 mm	0.108–0.094 in	Pink	2.23 mm	0.088 in
23.12–23.01 mm	0.910–0.906 in	20.48–20.72 mm	0.806–0.816 in	2.64–2.29 mm	0.104–0.090 in	No Color	2.12 mm	0.083 in
23.01–22.90 mm	0.906–0.901 in	20.48–20.72 mm	0.806–0.816 in	2.53–2.18 mm	0.100–0.085 in	Black	2.01 mm	0.079 in
22.90–22.79 mm	0.901–0.897 in	20.48–20.72 mm	0.806–0.816 in	2.42–2.07 mm	0.095–0.081 in	Purple	1.90 mm	0.074 in
22.79–22.68 mm	0.897–0.892 in	20.48–20.72 mm	0.806–0.816 in	2.31–1.96 mm	0.091–0.077 in	Brown	1.79 mm	0.070 in
22.68–22.57 mm	0.892–0.888 in	20.48–20.72 mm	0.806–0.816 in	2.20–1.85 mm	0.087–0.072 in	Dark Blue	1.68 mm	0.066 in
22.57–22.46 mm	0.888–0.884 in	20.48–20.72 mm	0.806–0.816 in	2.09–1.74 mm	0.082–0.068 in	Dark Green	1.57 mm	0.061 in

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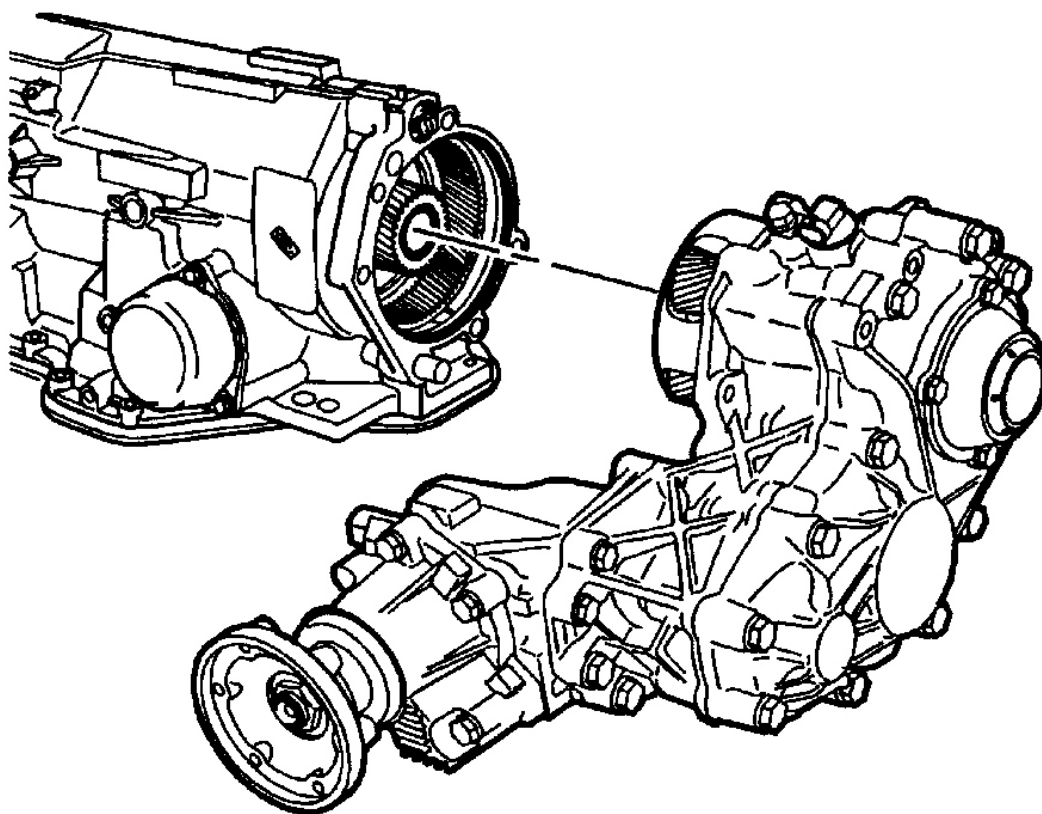
Fig. 186: Transfer Case Selective Washer Specifications
Courtesy of GENERAL MOTORS CORP.

TRANSFER CASE INSTALLATION

NOTE: Oil dam must be installed with oil passage notch aligned to passage in case. Incorrect alignment will cause oil flow stoppage and damage to transaxle.

1. Install case extension seal. See **Fig. 30**. Line up notch to hole in case and install oil dam. See **Fig. 31**.
2. Install transfer case lower brace. See **Fig. 29**. Install and hand tighten transfer case lower brace bolts. Rotate transaxle so oil pan is facing floor. Install transfer case assembly onto transaxle. See **Fig. 187**.

3. Install 5 transfer case-to-transaxle bolts. See **Fig. 27**. Torque bolts in sequence. Tighten transfer case bolts No. 1 and 2 in 2 passes; 1st pass 26 ft. lbs. (35 N.m), and 2nd pass an additional 160 degrees. Tighten transfer case bolt No. 3; 1st pass 26 ft. lbs. (35 N.m), and 2nd pass an additional 70 degrees. Tighten transfer case bolts No. 4 and 5 to 30 ft. lbs. (40 N.m).
4. Install transfer case side brace to case and hand tighten bolts. Tighten bolts to 23 ft. lbs. (31 N.m) in numerical sequence (1, 2, 3, 4, 5). See **Fig. 26**. Install transfer case lower brace-to-transaxle bolt and tighten to 42 ft. lbs. (56 N.m) See **Fig. 25**. Tighten transfer case lower brace-to-transaxle bolts to 23 ft. lbs. (31 N.m).
5. Affix outboard and inboard drive shaft retaining rings onto output shaft. DO NOT push to hard during installation of output shaft, or damage to bushings or bearings may occur. Carefully install output shaft into transaxle. Extend shaft through differential side gear.



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Fig. 187: Installing Transfer Case
Courtesy of GENERAL MOTORS CORP.

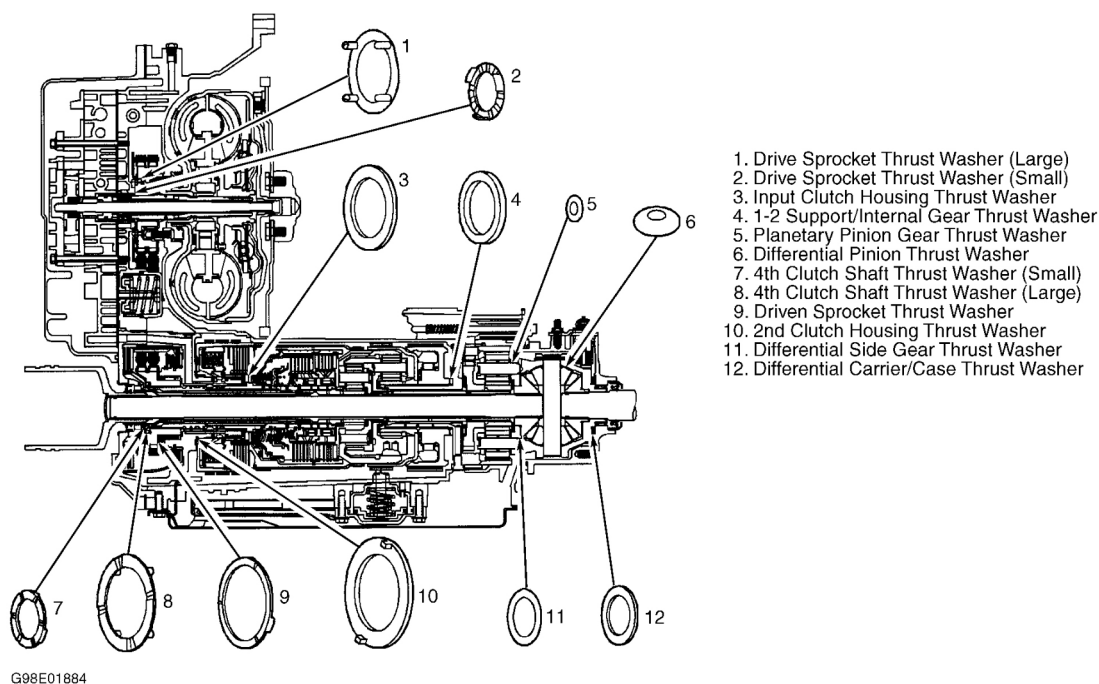


Fig. 188: Identifying Thrust Washer Locations
Courtesy of GENERAL MOTORS CORP.

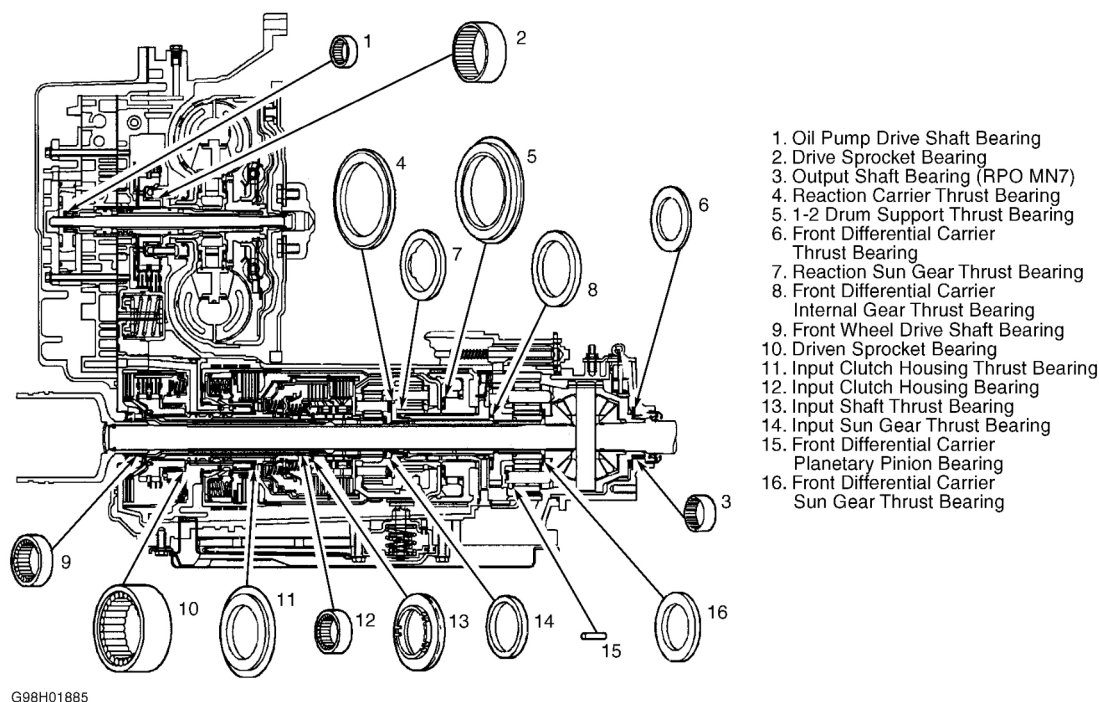
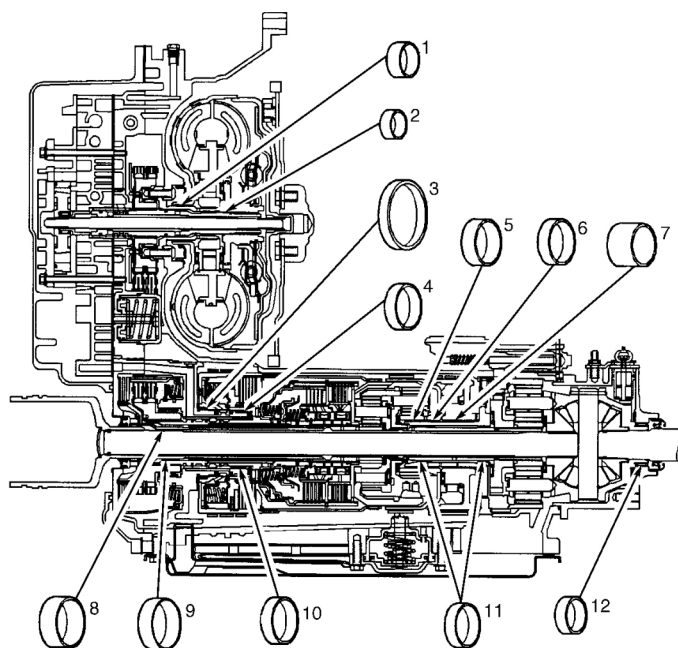


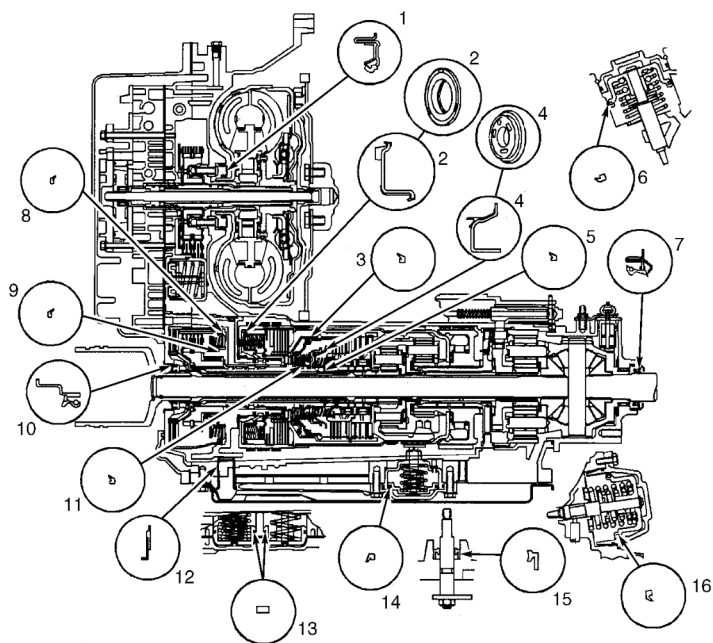
Fig. 189: Identifying Thrust Bearing Locations
Courtesy of GENERAL MOTORS CORP.



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1. Torque Converter Bushing
2. Turbine Shaft Bushing
3. 2nd Clutch Housing Front Bushing
4. 2nd Clutch Housing Rear Bushing
5. Reaction Sun Gear Bushing (Left Side)
6. Reaction Sun Gear Bushing (Right Side)
7. Forward Drum Bushing
8. 4th Clutch Shaft Bearing Bushing
9. Input Shaft Bushing
10. 2nd Clutch Housing Bushing
11. Front Differential Carrier Internal Gear Bushing
12. Front Differential Carrier Bushing (RPO M15 & MN3)

Fig. 190: Identifying Bushing Locations
Courtesy of GENERAL MOTORS CORP.



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1. Torque Converter Oil Seal
2. 2nd Clutch Piston & Seal
3. Input Clutch Piston Outer Seal
4. 3rd Clutch Piston & Seal
5. 3rd Clutch Piston Inner Seal
6. Reverse Band Servo Piston Oil Seal Ring
7. Front Wheel Drive Shaft Oil Seal (Right Side)
8. 4th Clutch Piston Outer Seal
9. 4th Clutch Piston Inner Seal
10. Front Wheel Drive Shaft Oil Seal (Left Side)
11. Input Clutch Piston Inner Seal
12. Transaxle Oil Filter Seal
13. Accumulator Piston Oil Seal
14. 2-1 Manual Band Servo Piston Seal
15. Manual Shift Shaft Seal
16. Forward Band Servo Piston Oil Seal Ring

Fig. 191: Identifying Lip Seal Locations
Courtesy of GENERAL MOTORS CORP.



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Fig. 192: Identifying "O" Ring & Seal Locations
 Courtesy of GENERAL MOTORS CORP.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Case Cover Bolt ⁽¹⁾	
Bolt No. 3	18 (25)
Bolts No. 1, 2 & 4	(2)
Case Extension Bolt	26 (35)
Case Side Cover Bolt ⁽³⁾	18 (25)
Control Valve Body Bolt ⁽⁴⁾	
Bolts No. 1-5	(2)
Bolt No. 6	12 (16)
Bolt No. 7	18 (25)
Bolt No. 8	(5)
Bolt No. 9	(2)
Drive Sprocket Support Bolt	18 (25)
Manual Shaft-To-Detent Lever Nut	24 (32)
Oil Cooler Fitting	28 (38)
Shift Shaft Nut	23 (31)

2003 Chevrolet Venture LS

2001-03 AUTOMATIC TRANSMISSIONS Hydra-Matic 4T65-E Overhaul

Transfer Case-To-Transaxle Bolt

Bolts No. 1 & 2	(6)
Bolt No. 3	(7)
Bolts No. 4 & 5	30 (40)
Transfer Case Lower Brace-To-Transaxle Bolt	23 (31)
Transfer Case Lower Brace-To-Transaxle Lower Bolt	42 (56)
Transfer Case Side Brace Bolt	23 (31)
2-1 Manual Band Servo Cover Bolt	18 (25)
INCH Lbs. (N.m)	
Accumulator Bolt	106 (12)
Accumulator Cover-To-Case Bolt	106 (12)
Forward Band Servo Cover Bolt	106 (12)
Manual Valve Shift Detent Bolt	106 (12)
Oil Pan Bolt	120 (14)
Oil Pressure Test Plug	106 (12)
Oil Pump Bolt ⁽⁸⁾	
Bolt No. 1	71 (8)
Bolts No. 2 & 3	106 (12)
Vehicle Speed Sensor Bolt	106 (12)

(1) See **Fig. 65**.

(2) Tighten bolts to 106 INCH lbs. (12 N.m).

(3) See **Fig. 45**.

(4) See **VALVE BODY BOLT SPECIFICATIONS** table.

(5) Tighten bolts to 71 INCH lbs. (8 N.m).

(6) Tighten bolts in 2 passes, 1st pass 26 ft. lbs. (35 N.m) and 2nd pass an additional 160 degrees.

(7) Tighten bolt in 2 passes, 1st pass 26 ft. lbs. (35 N.m) and 2nd pass an additional 70 degrees.

(8) See **OIL PUMP BOLT SPECIFICATIONS** table.

TRANSAXLE SPECIFICATIONS

TRANSAXLE SPECIFICATIONS

Application	End Play - In. (mm)
Differential Carrier Planetary Pinion Gears	.009-.025 (.23-.64)
Front Differential Carrier	.005-.025 (.13-.64)
Input Carrier Pinion Gears	.009-.030 (.23-.76)
Input Clutch Housing	0-.006 (0-.15)
Reaction Carrier Pinion Gear	.009-.030 (.23-.76)
Torque Converter	0-.020 (0-.50)