

1990 Chevrolet Beretta

1983-92 AUTOMATIC TRANSMISSIONS General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul

1983-92 AUTOMATIC TRANSMISSIONS**General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul****APPLICATIONS****THM 3T40 APPLICATIONS**

Application	Engine
Buick	
Century	2.5L, 2.8L & 3.3L
Skyhawk	1.8L & 2.0L
Skylark	2.3L, 2.5L, 3.0L & 3.3L
Somerset	2.5L & 3.0L
Cadillac	
Cimarron	1.8L, 2.0L & 2.8L
Chevrolet	
Beretta	2.2L, 2.3L & 3.1L
Cavalier	2.0L, 2.2L & 3.1L
Celebrity	2.5L, 2.8L & 4.3L
Citation	2.5L & 2.8L
Corsica	2.2L, 2.3L, 2.8L & 3.1L
Lumina	2.5L & 3.1L
Lumina APV	3.1L
Oldsmobile	
Achieva	2.3L & 3.3L
Cutlass Calais	2.3L, 2.5L & 3.3L
Cutlass Ciera & Cutlass Cruiser	2.5L & 3.3L
Cutlass Supreme	2.3L & 3.1L
Firenza	1.8L & 2.8L
Omega	2.5L & 2.8L
Silhouette	3.1L
Pontiac	
Fiero	2.5L & 2.8L
Grand Am	2.3L, 2.5L & 3.3L
Grand Prix	2.3L & 3.1L
LeMans	1.6 & 2.0L
Phoenix	2.5L & 2.8L
Sunbird	1.8L, 2.0L & 3.1L
Trans Sport	3.1L
6000	2.5L, 2.8L & 3.1L & 4.3L

IDENTIFICATION

Transaxle identification plate is attached to transaxle case. See **Fig. 1** . Transaxle model is printed on the service parts identification label located inside vehicle.

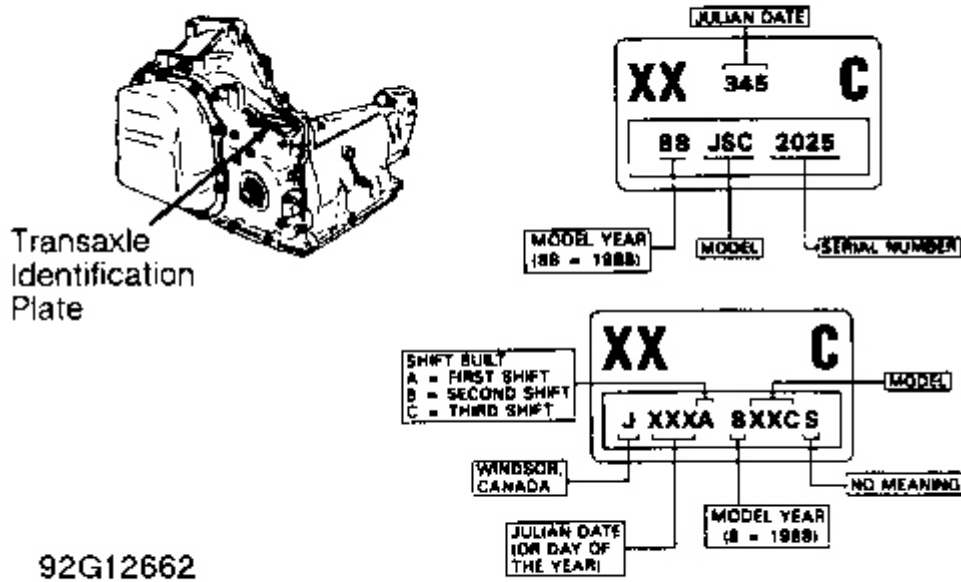


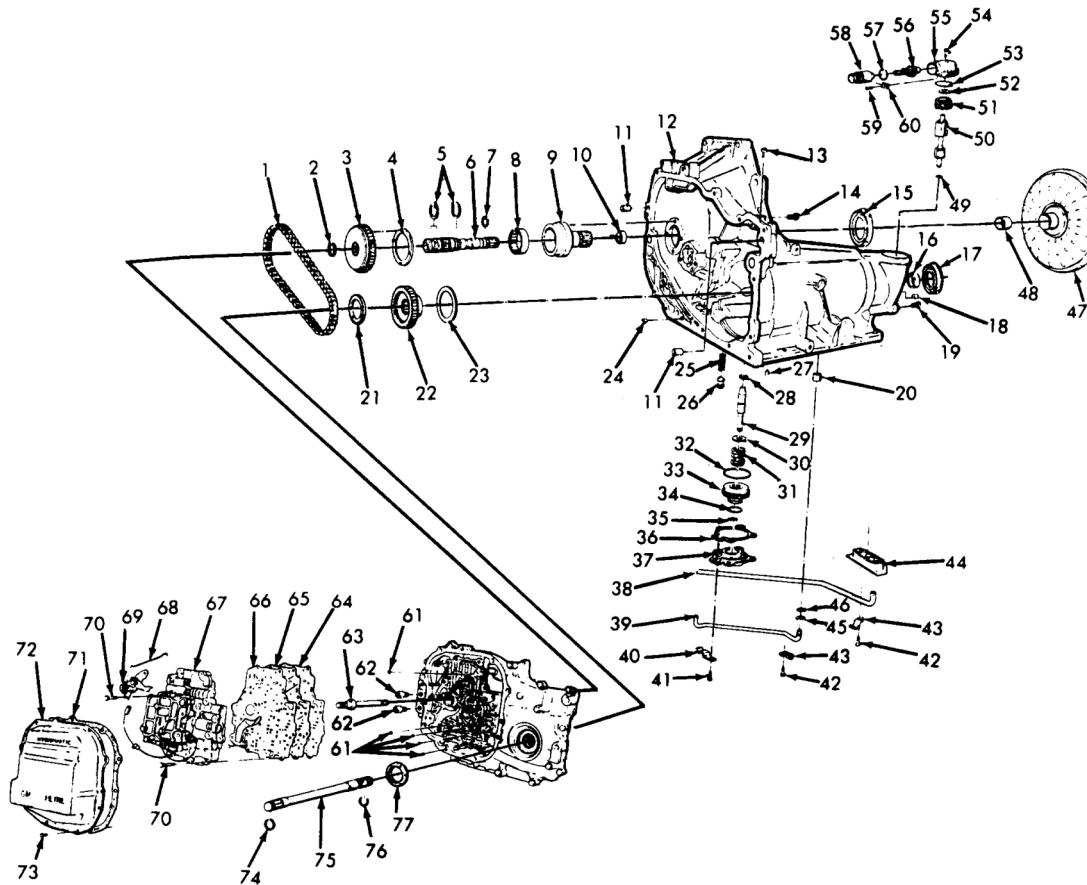
Fig. 1: Locating Transaxle Identification Plate
Courtesy of GENERAL MOTORS CORP.

DESCRIPTION

Transaxle consists of a torque converter, automatic 3-speed transmission, final drive gear and differential. The 4-element torque converter couples the engine crankshaft to the planetary gear set through a sprocket and drive link assembly. See **Fig. 2** .

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- | | | |
|------------------------------------|----------------------------------|-------------------------------------|
| 1. Drive Link | 27. Low-Reverse Orifice Cup Plug | 53. "O" Ring |
| 2. Snap Ring | 28. Oil Seal Ring | 54. Screw |
| 3. Drive Sprocket | 29. Intermediate Band Apply Pin | 55. Governor Cover |
| 4. Thrust Washer | 30. Intermediate Spring Retainer | 56. Speedometer Driven Gear |
| 5. Seal Ring | 31. Intermediate Servo Spring | 57. "O" Ring |
| 6. Turbine Shaft | 32. Intermediate Oil Seal Ring | 58. Sleeve |
| 7. "O" Ring | 33. Intermediate Servo Piston | 59. Gear Retainer |
| 8. Drive Sprocket Support Bearing | 34. Intermediate Oil Seal Ring | 60. Gear Retainer Bolt |
| 9. Drive Sprocket Support | 35. Intermediate Snap Ring | 61. Valve Body Check Balls |
| 10. Bushing | 36. Intermediate Gasket | 62. Cooler Line Connector |
| 11. Dowel Pin | 37. Intermediate Servo Cover | 63. Oil Pump Drive Shaft |
| 12. Transaxle Case | 38. Governor Oil Pipe | 64. Spacer Plate Gasket |
| 13. Manual Shift Seal Assembly | 39. Rev. Oil Pipe | 65. Spacer Plate |
| 14. Screw | 40. Rev. Oil Pipe Retainer | 66. Spacer Plate Gasket |
| 15. Converter Seal | 41. Servo Cover Bolt | 67. Cont. Valve & Oil Pump Assembly |
| 16. Bushing | 42. Pipe Retaining Bolt | 68. Throttle Cable Link |
| 17. Axle Seal | 43. Pipe Retainer | 69. Throttle Lever & Bracket |
| 18. Cup Plug | 44. Oil Weir | 70. Valve Body Bolt |
| 19. Plug | 45. Seal Ring | 71. Gasket |
| 20. Case Oil Seal | 46. Seal | 72. Valve Body Cover |
| 21. Thrust Bearing | 47. Converter | 73. Cover Screw |
| 22. Driven Sprocket | 48. Converter Pump Bushing | 74. Retaining Ring |
| 23. Thrust Washer | 49. Oil Seal Ring | 75. Output Shaft |
| 24. 3rd Oil Cup Plug | 50. Governor Assembly | 76. Snap Ring |
| 25. 3rd Accumulator Exhaust Spring | 51. Speedometer Drive Gear | 77. Axle Seal |
| 26. 3rd Accumulator Exhaust Valve | 52. Thrust Bearing | |

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Fig. 2: Exploded View of Transaxle Case & Related Components
Courtesy of GENERAL MOTORS CORP.

NOTE: For information on converter clutch system used in the THM 3T40 transaxle, see GM TORQUE CONVERTER CLUTCH article.

LUBRICATION & ADJUSTMENTS

See appropriate AUTOMATIC TRANSMISSION SERVICING article in the TRANSMISSION SERVICING section.

ON-VEHICLE SERVICE

CONTROL VALVE BODY

See **CONTROL VALVE BODY & OIL PUMP ASSEMBLY** under TRANSAXLE DISASSEMBLY.

DRIVE AXLE SHAFTS

See FWD AXLE SHAFTS article in the AXLE SHAFTS & TRANSFER CASES section.

OIL COOLER FLUSHING

1. If flusher tool is available, fill line flusher with solution, and install Oil Cooler and Line Flusher (J-35944) to top transaxle cooler line on transaxle. Follow manufacturer's instructions to flush oil cooler and cooler lines.
2. If flusher tool is not available, flush cooler and cooler lines with a mixture of clean solvent and water. Flush cooler in both directions until all old fluid and debris are removed. If necessary, replace plugged or damaged cooler and/or lines.

TROUBLE SHOOTING

NOTE: For illustration of hydraulic circuit operation, see **HYDRA-MATIC 3T40** article in the **OIL CIRCUIT DIAGRAMS** section.

CHATTERS OR SLIPS IN 1ST GEAR

Check oil level, Throttle Valve (T.V.) cable, oil pressure, forward clutch, driven sprocket support and case cover gasket.

INOPERATIVE OR SLIPS IN 1ST GEAR

If vehicle is inoperative or transaxle slips in 1st gear, check for a leaking forward clutch piston seal. A new Viton Forward Clutch Piston Seal (8631986) is available to correct this condition. Viton seal went into production October 6, 1989 (Julian Date 279), for all Hydra-Matic 3T40 transaxles built by Willow Run. Viton seal may be used on all Hydra-Matic 3T40 transaxles.

INOPERATIVE OR SLIPS IN REVERSE

Check for low line pressure. Check forward clutch, restricted low-reverse clutch housing cup plug, low-reverse pipe "O" ring, low-reverse clutch plates, case-to-cover gasket and direct clutch plates.

Some units built in 1989-90 may have an incorrectly installed low-reverse piston snap ring, which may cause this condition. When installing low-reverse clutch piston snap ring, the step on the outside diameter of the snap ring must be positioned toward the low-reverse clutch retainer. Retainer must rest inside the snap ring to allow correct piston travel.

DELAYED OR NO UPSHIFTS

Check manual linkage, Throttle Valve (T.V.) cable, oil level, governor, intermediate servo and band, control valve assembly, valve body spacer, case cover and case.

SLIPPING OR ROUGH 1-2 SHIFT

Check oil level, Throttle Valve (T.V.) cable, oil pressure, intermediate servo and band, T.V. link, control valve assembly, 1-2 accumulator piston and seal, spacer plate, case and case cover.

DELAYED OR ROUGH 2-3 SHIFT

Check oil level, T.V. valve, manual linkage, oil pressure, direct clutch, direct clutch exhaust No. 1 check ball and control valve assembly.

SLIPPING, SOFT OR EARLY 2-3 SHIFT

Check oil level, Throttle Valve (T.V.) cable, manual linkage, oil pressure, intermediate servo, accumulator exhaust check valve, spacer plate, check ball No. 5, case cover and direct clutch.

DELAYED OR NO 2-3 SHIFT

Check oil level, T.V. valve or linkage, governor, intermediate servo, accumulator exhaust check valve, direct clutch accumulator cup plug, case-to-governor shaft sleeve, center gasket, case cover, throttle lever and bracket assembly, control valve assembly, spacer plate, case-to-governor shaft sleeve and direct clutch.

DELAYED NEUTRAL-TO-DRIVE SHIFT

Check for lack of oil feed to forward clutch.

DELAYS IN DRIVE & REVERSE

Check oil level, oil pressure, converter-driven sprocket support bushings and turbine shaft. Some vehicles may have a delayed reverse-to-drive shift during cold weather operation. This condition may be caused by the manual valve and thermal element. Revised manual valve and thermal element use larger cross-drilled holes through the manual valve, and a second cold window has been added to the thermal element.

The new Manual Valve/Thermal Element Assembly (8666494) went into production June 12, 1989 (Julian Date 163) and can be used on all previous models.

When installing new thermal element, ensure the retainer clip for the temperature orifice is 0.436-0.452" (11.0-11.4 mm) inside the link end of manual valve.

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NO 2ND GEAR IN "D"

Check low roller clutch for galled or missing rollers and missing springs.

ALL GEARS INOPERATIVE

Check oil level and pressure, drive link, manual linkage, input shaft, reaction carrier, differential and torque converter.

This condition may also be caused by the thermal element moving forward, because a retaining clip has fallen out. The clip may be located in the bottom oil pan.

INOPERATIVE IN "D"

Check oil level and pressure. Check forward clutch and case cover for leaks or incorrect gaskets between case cover and driven sprocket support passages.

FORWARD GEARS INOPERATIVE

Check oil pressure, manual linkage, driven sprocket support for turned sleeve, case cover, forward clutch and control valve assembly.

TRANSAXLE STARTS IN 2ND GEAR

Check governor and control valve assembly for a stuck 1-2 shift. Check throttle valve for sticking.

TRANSAXLE SKIPS 2ND GEAR

Check intermediate servo and band, accumulator exhaust valve and control valve assembly. Check spacer plate gaskets, case cover and case, governor feed to 1-2 shift valve, intermediate band apply feed orifice and spacer plate.

A no-2nd gear condition may be the result of fluid leaking past the intermediate servo piston. This may be caused by a worn inner servo piston lip seal. Check lip seal, intermediate band and direct clutch assembly for wear. Replace intermediate band and direct clutch assembly if necessary. New intermediate servo parts are available to correct this problem. See **NEW INTERMEDIATE SERVO COVER, PISTON & SEALS**.

NEW INTERMEDIATE SERVO COVER, PISTON & SEALS

Application	Piston & Seal	Servo Cover
.79 Ratio ⁽¹⁾	8652901	8631702
.71 Ratio ⁽¹⁾	8652900	8631703
.64 Ratio ⁽¹⁾	8652911	8631704
(1) Ratio is determined by dealer's parts department based on year and model of transaxle.		

SHIFTS FROM 3RD TO 1ST AT HIGH SPEEDS

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Check governor or speed sensor, intermediate servo, direct clutch orifice No. 2 check ball and 1-2 accumulator.

NO FULL THROTTLE DETENT DOWNSHIFT

Check Throttle Valve (T.V.) cable, throttle cable assembly, control valve assembly and spacer plate.

NO OVERRUN BRAKING IN "1" (REVERSE OKAY)

Check manual linkage, low-reverse clutch and control valve assembly.

BINDS IN 3RD GEAR

Check for damaged direct clutch center seal.

INOPERATIVE IN "2"

Check intermediate servo and band. Check 1-2 accumulator.

ENGINE STALLS IN "R" OR "D"

Check for missing or clogged Torque Converter Clutch (TCC) auxiliary valve body filter. Also check for TCC engaging too soon. Some 1990 Grand Am 2.3L, produced through VIN LC238417, may stall after start-up, fail to start, store trouble Code 26 or 62 in ECM memory, or cause ECM fuse to blow.

Fault may result from TCC wiring harness contacting valve body cover of transaxle. To correct this, repair any damaged wiring, and tape TCC wiring harness to larger main wire conduit.

NOISE IN ALL GEARS

Check torque converter.

HIGH PITCHED WHINE OR POPPING

Check oil pump system for pump cavitation or out-of-position filter.

BUZZING OR HIGH PITCHED RATTLE

NOTE: For vehicle body code identification, see **GENERAL MOTORS BODY IDENTIFICATION CODES** in **APPLICATIONS & IDENTIFICATION**.

Check for binding, pinching or touching cooler lines (near radiator). Some of the following 1991-92 vehicles may exhibit buzzing noise during slight throttle in forward gears: 2.3L "N" and "W" Bodies, and 3.1L "J" and "L" Bodies. This noise may be caused by vibration of the 1-2 accumulator valve. Revised spacer plates with smaller 1-2 accumulator orifice are now available to correct this problem. See **SPACER PLATE (1-2 ACCUMULATOR)**.

SPACER PLATE (1-2 ACCUMULATOR)

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Transaxle Model	Spacer Plate
KDC	8678035
KKC	8678489
KNC	8678488
KXC (1991 Only)	8678038
LJC	8678163
LKC	8678164
LLC	8678164

WHINE OR GROWL UNDER LIGHT ACCELERATION

Check drive link assembly, sprockets, chain and related bearings.

NOISE IN 1ST OR REVERSE GEAR

Check input gear, input internal gear, input carrier or input sun gear for damage.

NOISE IN 2ND GEAR

Check for worn or pitted reaction gear set, reaction internal gear, reaction carrier, reaction sun gear, or related bearings and thrust washers.

HUM DURING LIGHT ACCELERATION (ALL GEARS)

Check differential or final drive gear and related parts for wear or damage.

LIGHT RATTLE IN 2ND OR 3RD AT 25-40 MPH

Check for warped steel plates, excess clutch pack clearance or parallel-grooved fiber plates in low-reverse clutch pack. Also check case for excess case-to-plate spline clearance.

TESTING

NOTE: Engine coolant temperature must be greater than 130°F (54°C) before TCC will engage.

UPSHIFT & DOWNSHIFT

Test drive vehicle and note shifting points. Shifting points should agree with those listed in chart. See **Fig. 3** or **Fig. 4**.

NOTE: Specifications are for 1991 & 1992 models; others are similar. Values may vary by as much as 10% due to vehicle configuration, production tolerances, vehicle loads and engine performance. The following charts are provided as a general reference.

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1991 HYDRA-MATIC 3T40 SHIFT SPEED CHART

UPSHIFTS

MODEL	1-2 SHIFT										2-3 SHIFT									
BYC, BZC	TPS	10	15	20	25	30	35	40	45	50	10	15	20	25	30	35	40	45	50	
	MPH	18.0	17.8	19.5	20.7	22.1	23.2	24.5	25.7	26.9	24.8	27.3	32.5	36.6	41.2	44.5	47.9	51.0	53.9	
PJC	MPH	14.6	15.8	17.5	18.7	20.0	21.3	22.0	23.4	24.4	23.9	25.9	27.1	29.2	31.9	34.5	37.0	39.3	41.4	
PNC	MPH	14.6	15.8	17.1	17.8	18.9	20.2	20.9	22.0	22.8	24.6	25.5	27.1	30.8	33.9	36.6	39.8	42.1	44.7	
PDC	MPH	14.6	15.9	17.1	18.2	19.1	20.2	21.0	22.1	22.8	24.3	25.5	27.5	30.6	34.0	36.7	40.0	42.5	44.6	
LUC	MPH	16.3	17.7	19.4	20.7	22.0	23.1	24.5	25.6	26.8	26.2	27.8	29.4	30.7	33.4	36.8	40.0	43.2	45.9	
BUC	MPH	16.0	18.0	19.5	20.8	22.2	23.4	24.7	25.9	27.2	25.0	26.8	29.4	33.8	38.1	41.8	45.0	48.2	50.9	
KDC	MPH	16.7	18.7	20.4	22.1	23.3	24.6	26.8	30.4	33.8	28.0	31.7	35.7	40.2	44.2	47.8	51.2	54.1	57.5	
KKC	MPH	15.2	17.3	19.1	20.3	21.8	22.9	24.3	25.0	27.4	24.7	27.4	32.7	36.9	41.4	45.4	48.9	51.9	54.9	
KXC	MPH	15.3	17.2	18.5	20.2	21.5	22.9	24.1	25.3	28.1	22.9	25.0	28.7	33.2	37.9	41.9	45.4	49.2	51.8	
LAC	MPH	15.6	17.5	18.7	20.3	21.6	22.9	23.8	25.3	26.2	25.7	27.5	28.9	30.3	34.8	38.4	42.2	45.6	48.3	
LLC	MPH	15.8	17.5	19.1	20.4	21.6	22.8	24.1	25.4	26.6	24.7	27.0	31.9	36.3	40.1	43.6	46.7	49.8	52.9	
LJC	MPH	16.2	17.7	19.2	20.6	21.9	23.1	24.4	25.6	26.7	26.2	27.8	29.4	32.9	36.9	41.0	44.7	48.4	51.4	
LYC	MPH	16.3	17.7	19.4	20.6	21.9	23.1	24.4	25.4	26.6	26.9	28.3	30.2	34.8	39.0	43.1	46.5	50.1	52.9	
PRC	MPH	15.3	16.6	17.6	18.8	19.7	20.5	21.4	22.3	23.3	23.9	26.8	31.7	34.7	37.8	40.9	43.2	45.9	48.4	
PTC	MPH	14.3	15.5	16.1	17.2	18.1	19.1	20.0	20.6	21.5	21.7	24.2	28.1	31.3	34.1	36.9	39.1	41.6	43.7	
TRC	MPH	16.0	17.5	18.9	20.0	21.2	22.1	23.1	24.2	25.0	25.5	30.0	33.8	37.5	41.1	43.8	46.7	49.0	51.8	
AYC	MPH	16.9	18.1	19.4	20.3	21.3	22.6	23.3	24.1	25.3	25.6	26.9	29.4	32.8	36.3	39.1	42.5	45.3	48.1	
CHC	MPH	14.6	15.9	17.3	18.4	20.0	20.8	22.1	23.1	24.1	24.2	25.5	26.8	28.7	32.7	35.8	39.2	41.8	44.9	

FINAL DRIVE / SPROCKETS / OVERALL RATIOS / COASTDOWNS

MODEL	FINAL DRIVE RATIO	SPROCKETS	OVERALL	3-2 PART THROTTLE	3-2 COAST DOWN	2-1 COAST DOWN	2-1 MAN LOW
AYC	2.84	35/35	2.84	56-64	21-23	7-12	33-42
BUC	2.84	38/32	2.39	47-54	17-19	6-11	46-52
BYC	3.06	37/33	2.73	45-51	17-19	6-11	46-51
BZC	3.06	37/33	2.73	45-51	17-19	6-11	46-51
CHC	2.84	35/35	2.84	44-52	18-20	6-10	36-43
KDC	2.84	35/35	2.84	46-52	17-19	6-12	37-43
KKC	2.84	33/37	3.18	43-50	17-19	5-9	31-38
KXC	2.84	33/37	3.18	43-50	16-18	6-11	40-47
LAC	2.84	37/33	2.53	52-62	19-21	5-11	38-46
LJC	2.84	37/33	2.53	54-62	20-22	6-11	40-48
LLC	2.84	35/35	2.84	42-48	16-18	6-11	45-50
LUC	2.84	33/37	3.18	46-53	20-22	6-11	36-43
LYC	2.84	33/37	3.18	50-57	21-22	10-14	33-41
PDC	2.84	35/35	2.84	42-48	18-19	7-11	38-42
PJC	2.84	33/37	3.18	39-44	18-19	7-11	37-42
PNC	2.84	35/35	2.84	42-49	18-19	7-11	38-42
PRC	2.84	33/37	3.18	46-52	19-20	9-12	47-53
PTC	3.06	33/37	3.43	42-48	18-19	9-12	32-38
TRC	2.84	33/37	3.18	52-59	20-22	9-13	43-50

NOTES:

1. ALL SPEEDS INDICATED ARE IN MILES PER HOUR. CONVERSION TO KM/H = MPH $\times$ 1.609.
2. SHIFT POINTS WILL VARY SLIGHTLY DUE TO ENGINE LOADS AND VEHICLE OPTIONS.
3. 1-2 AND 2-3 SHIFT SPEEDS ARE BASED USING THROTTLE POSITION SENSOR (TPS) DATA AS A REFERENCE -- USE A TECH 1 OR OTHER SCAN TOOL TO MONITOR THIS DATA.

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Fig. 3: Shift Speed Chart (1991)

Courtesy of GENERAL MOTORS CORP.

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1983-92 AUTOMATIC TRANSMISSIONS General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul

1992 HYDRA-MATIC 3T40 SHIFT SPEED CHART

UPSHIFTS

MODEL	1-2 SHIFT SPEED IN TPS ± 3 MPH										2-3 SHIFT SPEED IN TPS ± 4 MPH									
	TPS	10	15	20	25	30	35	40	45	50	10	15	20	25	30	35	40	45	50	
AJC	MPH	14.0	16.0	17.0	18.0	20.0	21.0	22.0	23.0	24.0	26.0	27.0	30.0	32.0	33.0	36.0	37.0	39.0	41.0	
AKC	MPH	14.0	15.0	16.0	17.0	21.0	22.0	23.0	24.0	25.0	25.0	24.0	26.0	27.0	28.0	33.0	36.0	40.0	43.0	
AZC	MPH	14.0	16.0	17.0	18.0	19.0	21.0	22.0	23.0	25.0	27.0	30.0	32.0	34.0	36.0	36.0	37.0	39.0	42.0	
BUC	MPH	16.0	18.0	19.5	20.8	22.2	23.4	24.7	25.9	27.2	28.5	29.8	29.4	33.8	38.1	41.8	45.0	48.2	50.9	
BYC	MPH	16.0	17.8	19.5	20.7	22.1	23.2	24.5	25.7	26.9	24.8	27.3	32.5	36.8	41.2	44.5	47.9	51.0	53.9	
CHC	MPH	14.6	15.9	17.3	18.4	20.0	20.8	22.1	23.1	24.1	24.2	25.5	26.8	28.7	32.7	35.8	39.2	41.8	44.9	
KDC	MPH	16.7	18.7	20.4	22.1	23.3	24.6	26.8	30.4	33.8	26.0	31.7	35.7	40.2	44.2	47.8	51.2	54.1	57.5	
KKC	MPH	15.2	17.3	19.1	20.3	21.8	22.9	24.3	25.0	27.4	24.7	27.4	32.7	36.9	41.4	45.4	48.9	51.9	54.9	
KNC	MPH	15.0	16.0	17.0	18.0	21.0	23.0	26.0	27.0	29.0	25.0	26.0	27.0	28.0	30.0	36.0	41.0	44.0	46.0	
KSC	MPH	16.0	18.0	20.0	22.0	24.0	25.0	26.0	29.0	34.0	25.0	27.0	29.0	32.0	34.0	36.0	38.0	41.0	44.0	
LFC	MPH	16.0	18.0	19.0	21.0	22.0	24.0	25.0	26.0	26.0	25.0	27.0	29.0	32.0	35.0	37.0	40.0	43.0	45.0	
LJC	MPH	16.2	17.7	19.2	20.6	21.9	23.1	24.4	25.6	26.7	28.2	27.8	29.4	32.9	36.9	41.0	44.7	48.4	51.4	
LKC	MPH	16.0	17.0	18.0	21.0	22.0	23.0	24.0	25.0	26.0	25.0	27.0	30.0	33.0	36.0	37.0	40.0	43.0	44.0	
LLC	MPH	15.8	17.5	19.1	20.4	21.6	22.8	24.1	25.4	26.6	24.7	27.0	31.9	36.3	40.1	43.6	46.7	49.8	52.9	
LUC	MPH	16.3	17.7	19.4	20.7	22.0	23.1	24.5	25.6	26.8	26.2	27.8	29.4	30.7	33.4	36.8	40.0	43.2	45.9	
LZC	MPH	14.0	16.0	17.0	18.0	21.0	22.0	24.0	25.0	26.0	24.0	29.0	32.0	36.0	40.0	43.0	44.0	45.0	46.0	
PDC	MPH	14.6	15.9	17.1	18.2	19.1	20.2	21.0	22.1	22.8	24.3	25.5	27.5	30.6	34.0	36.7	40.0	42.5	44.8	
PJC	MPH	14.6	15.8	17.5	18.7	20.0	21.3	22.0	23.4	24.4	23.9	25.9	27.1	29.2	31.9	34.5	37.0	39.3	41.4	
PNC	MPH	14.6	15.8	17.1	17.8	18.9	20.2	20.9	22.3	22.8	24.6	25.5	27.1	30.8	33.9	36.6	39.8	42.1	44.7	
PRC	MPH	15.3	16.6	17.6	18.8	19.7	20.5	21.4	22.3	23.9	28.8	31.7	34.7	37.8	40.9	43.2	45.9	48.4		
PTC	MPH	14.3	15.5	16.1	17.2	18.1	19.1	20.0	20.6	21.5	21.7	24.2	26.1	31.3	34.1	36.9	39.1	41.6	43.7	
PXC	MPH	16.0	16.0	18.0	20.0	22.0	23.0	24.0	26.0	27.0	23.0	25.0	27.0	30.0	33.0	35.0	37.0	40.0	43.0	
TRC	MPH	16.0	17.5	18.9	20.0	21.2	22.1	23.1	24.2	25.0	25.5	30.0	33.8	37.5	41.1	43.8	46.7	49.0	51.8	

FINAL DRIVE / SPROCKETS / OVERALL RATIOS / COASTDOWNS

MODEL	RATIOS FINAL DRIVE	SPROCKETS*	OVERALL	3-2 PART THROTTLE	3-2 COAST DOWN	2-1 COAST DOWN	2-1 MAN LOW
AJC	2.84	33/37	3.18	42-50	18-20	6-10	50-57
AKC	2.84	33/37	3.18	42-50	18-20	6-10	30-37
AZC	2.84	35/35	2.84	41-50	18-20	6-10	38-49
BUC	2.84	38/32	2.39	47-54	17-19	6-11	46-52
BYC	3.06	37/33	2.73	45-51	17-19	6-11	46-51
CHC	2.84	35/35	2.84	44-52	18-20	6-10	36-43
KDC	2.84	35/35	2.84	46-52	17-19	6-12	37-43
KKC	2.84	33/37	3.18	43-50	17-19	5-9	31-38
KNC	2.84	33/37	3.18	43-52	19-21	6-11	31-41
KSC	2.84	35/35	2.84	47-53	17-19	5-11	38-44
LFC	2.84	37/33	2.53	48-56	20-22	6-11	41-48
LJC	2.84	37/33	2.53	54-62	20-22	6-11	40-48
LKC	2.84	35/35	2.84	42-48	16-18	6-11	45-50
LLC	2.84	35/35	2.84	42-48	16-18	6-11	45-50
LUC	2.84	33/37	3.18	46-53	20-22	6-11	36-43
LZC	2.84	33/37	3.18	42-52	20-22	5-11	45-50
PDC	2.84	35/35	2.84	42-48	18-19	7-11	38-42
PJC	2.84	33/37	3.18	39-44	18-19	7-11	37-42
PNC	2.84	35/35	2.84	42-49	18-19	7-11	38-42
PRC	2.84	33/37	3.18	46-52	19-20	9-12	47-53
PTC	3.06	33/37	3.43	42-48	18-19	9-12	32-38
PXC	2.84	33/37	3.18	58-64	19-22	5-10	39-44
TRC	2.84	33/37	3.18	52-59	20-22	9-13	43-50

- ALL SPEEDS INDICATED ARE IN MILES PER HOUR. CONVERSION TO KM/H = MPH x 1.609.
 - SHIFT POINTS WILL VARY SLIGHTLY DUE TO ENGINE LOAD AND VEHICLE OPTIONS.
 - 1-2 AND 2-3 SHIFT SPEEDS ARE BASED USING THROTTLE POSITION SENSOR (TPS) DATA AS A REFERENCE - USE A TECH 1 OR OTHER SCAN TOOL TO MONITOR THIS DATA.
- * DESIGNATES THE NUMBER OF TEETH ON THE DRIVE/DRIVEN SPROCKETS, RESPECTIVELY.

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Fig. 4: Shift Speed Chart (1992)

Courtesy of GENERAL MOTORS CORP.

MANUAL GEAR RANGE SELECT

Manual 2nd

With vehicle stopped, place gear selector in "2" position. Accelerate vehicle, and note 1st-2nd gearshift point. See **Fig. 3** or **Fig. 4** . Accelerate vehicle to 25 MPH, and ensure 2nd-3rd gearshift does not occur and TCC does not engage.

Manual 1st

With vehicle stopped, place gear selector in "1" position. Accelerate vehicle to 15 MPH, and ensure no upshift occurs and TCC does not engage.

Reverse

With vehicle stopped, shift lever to Reverse position, and slowly accelerate to check Reverse gear operation.

LINE PRESSURE TESTS

CAUTION: Parking brakes must be applied during test. Ensure test DOES NOT exceed 2 minutes.

1. Check ATF level, Throttle Valve (T.V.) adjustment and manual control linkages. See appropriate AUTOMATIC TRANSMISSION SERVICING article in the TRANSMISSION SERVICING section. Ensure engine is tuned properly.
2. Connect tachometer to engine. Connect pressure gauge to pressure test port on transaxle case. Pressure test port is on bellhousing side, above valve body cover.
3. Line pressure is controlled by pump output and pressure regulator valve. Line pressure is boosted by reverse boost valve in "R", "2" and "1" positions. Line pressure should increase with throttle opening in "N", "D" and "R" positions.

Minimum Throttle Valve (T.V.) Pressure Check

Ensure T.V. cable is properly adjusted. See appropriate AUTOMATIC TRANSMISSION SERVICING article in the TRANSMISSION SERVICING section. Check line pressure with transaxle and engine speed in the indicated gears and RPM, respectively. See **Fig. 5** or **Fig. 6** .

Maximum Throttle Valve (T.V.) Pressure Check

With T.V. cable supported at full extent of travel, check line pressure with transaxle and engine speed in the indicated gears and RPM, respectively. See **Fig. 5** or **Fig. 6** .

NOTE: **Specifications are for 1991 & 1992 models; others are similar. Values may vary by as much as 10% due to vehicle configuration, production tolerances and engine performance. The following charts are provided as a general reference.**

1990 Chevrolet Beretta

1983-92 AUTOMATIC TRANSMISSIONS General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul

RANGE	MODEL	MINIMUM TL		MAXIMUM TL	
		KPa	P.S.I.	KPa	P.S.I.
Park @ 1000 RPM	DBUC, DBYC, DCHC, DHCC, DHXC, DHZC, DLJC, DKDC, DKKC, DKXC, DLJC, DLUC, DPDC, DPJC, DPNC, DPHC, DRUC, DTRC, 1HMC, 1KNC, 1LAC, 1LLC	459-505	66-73	459-505	66-73
	DAYC, DHWC, GJYC, GYTC, OTAC, OTBC	398-436	57-62	398-436	57-62
Reverse @ 1000 RPM	DKDC, DPJC	805-885	116-128	1783-1888	255-265
	DLJC	693-784	100-110	1851-1844	236-237
	DRUC	805-885	116-128	1882-2101	272-284
	DBYC, DCHC	805-885	116-128	1827-2034	264-284
	DPNC	805-885	116-128	1843-1831	236-235
	1LAC	882-970	127-140	1881-1905	240-278
	DHCC	805-885	116-128	1730-1941	252-281
	DKKC	882-970	127-140	1792-1899	258-288
	DHWC	780-837	110-121	1756-1855	254-283
	DHXC	780-837	110-121	1831-1815	236-268
	DHZC	882-970	127-140	1792-1899	258-288
	DLUC	774-852	112-123	1574-1756	228-254
	GJYC	780-837	110-121	1670-1885	258-270
	DKKC, DKXC, 1HMC, 1KNC, 1LLC	805-885	116-128	1836-1824	237-284
	DLJC, 1RUC	805-885	116-128	1843-1831	236-265
	DLUC	805-885	116-128	805-885	116-128
	DPDC	805-885	116-128	1843-1831	236-265
	DPJC	693-784	100-110	1624-1702	221-248
	OTAC, OTBC	887-735	96-106	1367-1528	198-227
	DTRC	805-885	116-128	1800-1778	232-258
Neutral/ Drive @ 1000 RPM	DKDC, DPJC	459-505	66-73	1008-1122	145-162
	DAYC, GYTC	398-436	57-62	943-1053	136-152
	DRUC	459-505	66-73	1075-1200	155-174
	DBYC, DCHC	459-505	66-73	1043-1181	151-168
	DPNC	459-505	66-73	938-1045	136-151
	DHCC	459-505	66-73	983-1108	144-180
	DHXC, DHZC, DLJC, DKKC, DKXC, DPNC, 1HMC, 1KNC	459-505	66-73	934-1042	135-151
	DHWC	398-436	57-62	915-1018	132-147
	DHXC, DPJC	398-436	57-62	870-972	126-140
	GJYC	398-436	57-62	870-972	126-140
	DLJC, 1RUC	459-505	66-73	938-1045	136-151
	DLUC	459-505	66-73	934-1042	135-151
	DPDC	459-505	66-73	938-1045	136-151
	1LAC	398-436	57-62	948-1088	137-157
	1LLC	459-505	66-73	934-1042	135-151
	OTAC, OTBC	387-436	57-63	811-905	117-131
	DTRC	459-505	66-73	914-1018	132-147
Intermediate/ Lo @ 1000 RPM	DBUC, DBYC, DCHC, DHCC, 1HMC	788-888	114-125	788-888	114-125
	DAYC, GYTC, DPJC	678-748	96-108	878-748	98-108
	DKDC, DKKC, DKXC, DLJC, DPDC, DPJC, DPNC, DRUC, DTRC, 1KNC, 1LAC, 1LLC	788-888	114-125	788-888	114-125
	DKKC, DHZC, DPNC	958-1055	138-153	858-1055	136-153
	DHWC, DHXC, GJYC	828-910	118-131	828-910	118-131
	DLUC	1151-1287	166-183	1151-1287	166-183
	OTAC, OTBC	982-1082	143-158	982-1082	143-158

Line pressure is basically controlled by pump output and the pressure regulator valve. In addition, line pressure is boosted in Reverse, Intermediate and Lo by the reverse boost valve.

Also, in the Neutral, Drive and Reverse positions of the selector lever, the line pressure should increase with throttle opening because of the T.V. system. The T.V. system is controlled by the T.V. cable, the throttle lever and bracket assembly and the T.V. link, as well as the control valve pump assembly.

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Fig. 5: Checking Throttle Valve Line Pressure (1991)
Courtesy of GENERAL MOTORS CORP.

1990 Chevrolet Beretta

1983-92 AUTOMATIC TRANSMISSIONS General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul

RANGE	MODEL	MINIMUM T.V.		MAXIMUM T.V.	
		kPa	P.S.I.	kPa	P.S.I.
Park @ 1000 RPM	2AJC, 2AKC, 2AZC, 2BUC, 2BYC, 2CHC, 2KDC, 2KKC, 2KNC, 2KSC, 2KXC, 2LFC, 2LJC, 2LUC, 2LZC, 2PDC, 2PJC, 2PNC, 2PRC, 2PXC, 2TRC	459-505	66-73	459-505	66-73
	2PTC	398-438	57-62	398-438	57-62
Reverse @ 1000 RPM	2KDC, 2PJC	805-885	116-128	1783-1986	255-285
	2BUC	805-885	116-128	1862-2101	272-294
	2BYC, 2CHC	805-885	116-128	1827-2034	264-294
	2PNC	805-885	116-128	1843-1831	238-285
	2PRC	882-970	127-140	1782-1998	259-288
	2AKC, 2AMC, 2AZC, 2KNC, 2KSC, 2LFC, 2LZC, 2PXC	781-859	113-124	1553-1726	225-250
	2KKC, 1LLC	805-885	116-128	1838-1824	237-264
	2LJC	805-885	116-128	1843-1831	238-285
	2LUC	805-885	116-128	805-885	116-128
	2PDC	805-885	116-128	1843-1831	238-285
	2PTC	693-764	100-110	1524-1702	221-246
	2TRC	805-885	116-128	1800-1778	232-258
Neutral/ Drive @ 1000 RPM	2AJC, 2AKC, 2AZC, 2KDC, 2KNC, 2KSC, 2LFC, 2LZC, 2PJC, 2PXC	459-505	66-73	1006-1122	145-162
	2AYC	398-438	57-62	943-1053	136-152
	2BUC	459-505	66-73	1075-1200	155-174
	2BYC, 2CHC	459-505	66-73	1043-1181	151-168
	2PNC	459-505	66-73	938-1045	136-151
	2KNC, 2PRC	459-505	66-73	934-1042	135-151
	2PTC	398-438	57-62	870-972	126-140
	2LJC	459-505	66-73	936-1045	136-151
	2LUC	459-505	66-73	934-1042	135-151
	2PDC	459-565	66-73	938-1045	136-151
	1LLC	459-505	66-73	934-1042	135-151
	2TRC	459-505	66-73	914-1018	132-147
Intermediate/ Lo @ 1000 RPM	2BUC, 2BYC, 2CHC	788-888	114-125	788-888	114-125
	2PTC	678-748	98-108	678-748	98-108
	2KDC, 2KKC, 2LJC, 2PDC, 2PJC, 2PNC, 2TRC, 1LLC	788-888	114-125	788-888	114-125
	2AJC, 2AKC, 2AZC, 2KNC, 2KSC, 2LFC, 2LZC, 2PNC, 2PXC	958-1055	138-153	858-1055	138-153
	2TRC	992-1092	143-158	882-1082	143-158

Line pressure is basically controlled by pump output and the pressure regulator valve. In addition, line pressure is boosted in Reverse, Intermediate and Lo by the reverse boost valve.

Also, in the Neutral, Drive and Reverse positions of the selector lever, the line pressure should increase with throttle opening because of the T.V. system. The T.V. system is controlled by the T.V. cable, the throttle lever and bracket assembly and the T.V. link, as well as the control valve pump assembly.

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Fig. 6: Checking Throttle Valve Line Pressure (1992)
Courtesy of GENERAL MOTORS CORP.

LINE PRESSURE TEST RESULTS

Line Pressure Too Low

1. Check fluid level. Check oil strainer "O" ring seal for leakage or damage. Check for plugged oil strainer. If pressure is low in "N" and "D" positions, and low to normal in "2" and "R" positions, Throttle Valve (T.V.) cable may be out of adjustment or bound.
2. Inspect control valve and pump assembly for loose bolts or internal leaks. Check T.V. valve and plunger, shift T.V. valve, pressure regulator valve, T.V. boost valve and pressure relief valve for sticking or damage. Check for missing or misplaced No. 5 or 6 check ball.

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1983-92 AUTOMATIC TRANSMISSIONS General Motors Corp. - Hydra-Matic 125C/3T40 Overhaul

3. Check 1-2 accumulator piston and/or seal. If pressure is low in "1" position only, check for damaged low blow-off valve and missing or misplaced No. 4 check ball. If pressure is low in "R" position only, inspect low-reverse clutch housing-to-case cup plug for leaks.
4. Inspect oil pump for loose bolts and damaged or missing pump valve seals. Check intermediate oil passages to pressure regulator for blockage. Check driven sprocket support-to-case cover for leaks.

Line Pressure Too High

1. With pressure high in "N" and "D" positions, and normal to high in "2" and "R" positions, check for broken, sticking or misadjusted Throttle Valve (T.V.) cable.
2. Inspect T.V. linkage for binding or incorrect cable. Check throttle valve or shift T.V. valve for sticking. Inspect T.V. lifter for bend or damage. Check if lifter length is too short.
3. Inspect components of control valve and pump assembly for sticking or damaged T.V. valve and plunger, shift T.V. valve, pressure regulator valve, T.V. boost valve and/or pump slide.
4. Check for worn or missing pressure regulator valve retaining pin. If line pressure is too high in "1" position only, check low blow-off valve for sticking. Inspect internal pump case or case cover for leaks. See **Fig. 2**.

CLUTCH & BAND APPLICATION CHART

CLUTCH & BAND APPLICATION CHART

Selector Lever Position	Elements In Use
"D" (Drive)	
1st Gear	Forward Clutch & Low Roller Clutch
2nd Gear	Forward Clutch & Intermediate Band
3rd Gear	Direct Clutch & Forward Clutch
"2" (Intermediate)	
1st Gear	Forward Clutch & Low Roller Clutch
2nd Gear	Forward Clutch & Intermediate Band
"1" (Low)	
1st Gear	Forward Clutch, Low-Reverse Clutch & Low Roller Clutch
"R" (Reverse)	Direct Clutch & Low-Reverse Clutch
"N" & "P" (Neutral & Park)	All Clutches & Bands Released Or Ineffective

REMOVAL & INSTALLATION

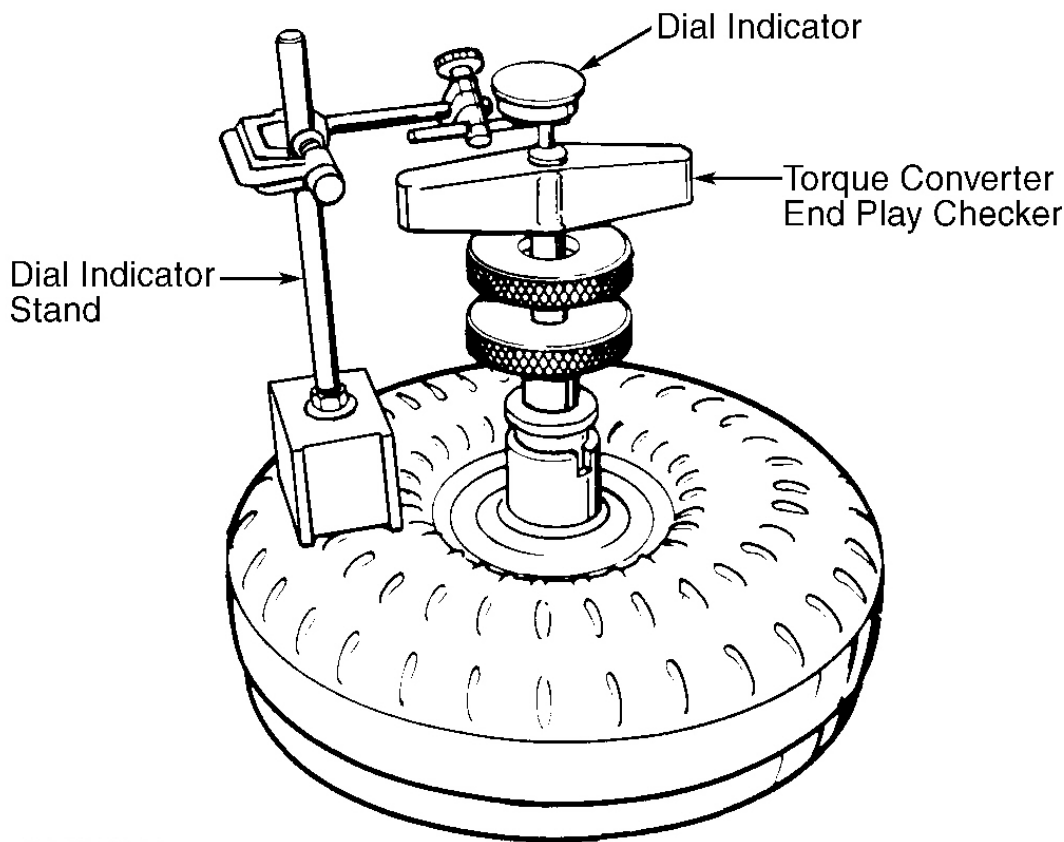
See appropriate AUTOMATIC TRANSMISSION REMOVAL article in the TRANSMISSION SERVICING section.

TORQUE CONVERTER

NOTE: Torque converter is a sealed unit and cannot be disassembled.

INSPECTION

1. Insert a finger into splined inner race of roller clutch, and ensure stator turns freely clockwise, but does not turn or is very difficult to turn counterclockwise. **DO NOT** use driven sprocket support or shafts to turn race, as result may not be correct.
2. Install a tachometer, and warm engine to normal operation temperature. With vehicle in 3rd gear and speed between 50-55 MPH, converter clutch should engage. Engine speed should drop 200 RPM when clutch is engaged.
3. Using Torque Converter End Play Checker (J-35138), measure torque converter end play. See **Fig. 7**. End play for 245-mm torque converter is 0-.020" (0-.5 mm). End play for 298-mm torque converter is 0-.024" (0-.6 mm). Converter must be replaced if it leaks, is imbalanced or is contaminated with antifreeze.
4. Check torque converter bushing-to-stator support clearance by cutting a narrow strip of paper about .003" (.07 mm) thick. Lay paper against the inside diameter of torque converter bushing. Install stator support into torque converter. No clearance should be present.



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Fig. 7: Measuring Torque Converter End Play
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE DISASSEMBLY

Clean exterior of transaxle case. Clean parts with solvent, and air dry them. Never use rags to dry parts. Remove torque converter by pulling straight out. Place transaxle in Holding Fixture (J-28664) and Bench Base (J-3289-20) so right axle end is down to drain fluid.

SPEEDOMETER DRIVE GEAR/SPEED SENSOR & GOVERNOR ASSEMBLY

Internal Transaxle Speed Sensor (ITSS)

Remove speed sensor housing bolts, speed sensor housing and oil seal. Remove thrust bearing, speed sensor rotor and governor assembly. See **Fig. 36**.

Speedometer Drive Gear

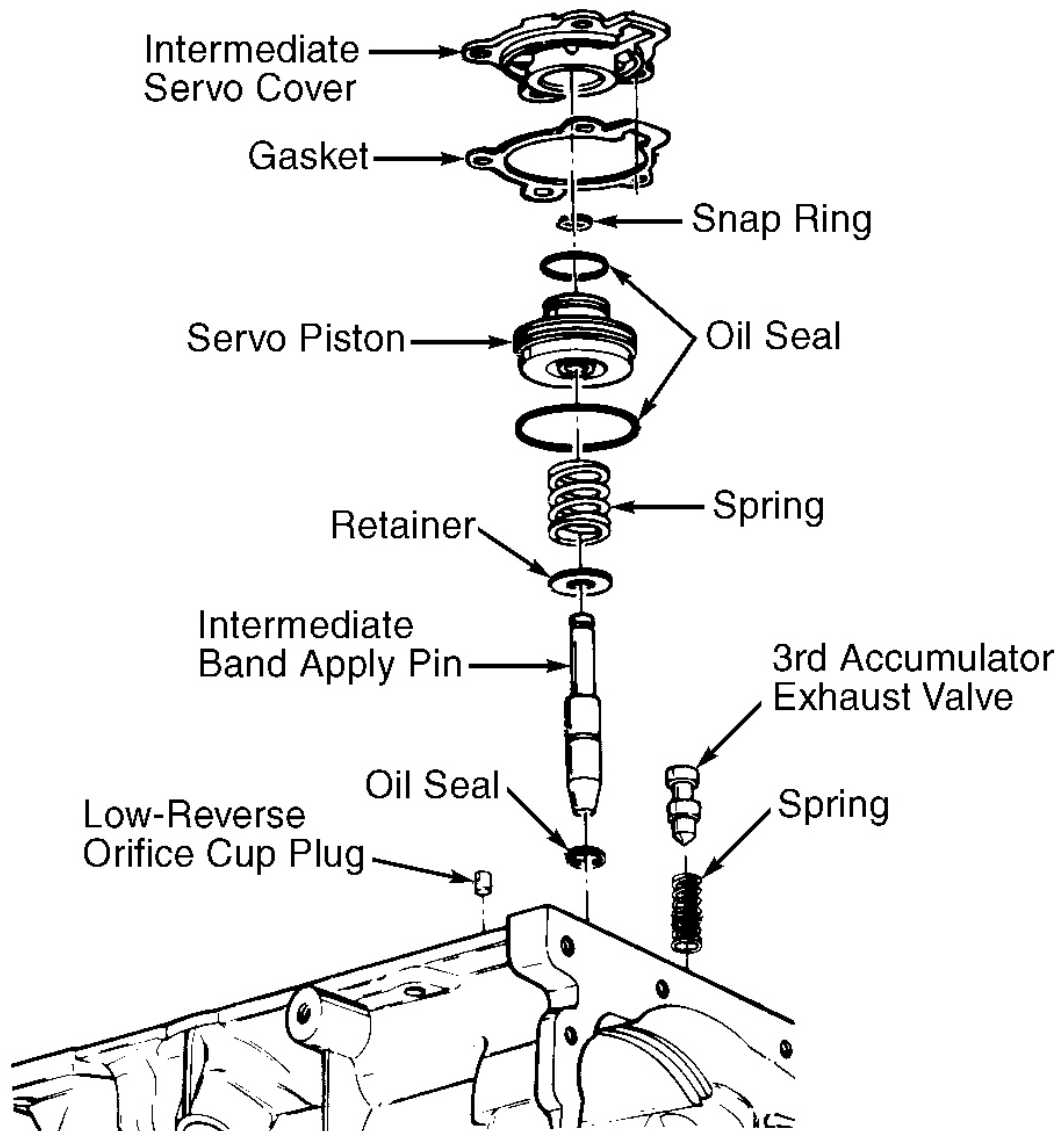
Remove speedometer driven gear mount bolt with retainer. Withdraw speedometer driven gear assembly from governor cover. Remove governor cover bolts, cover and "O" ring. Lift out unit as an assembly. See **Fig. 35**.

INTERMEDIATE SERVO ASSEMBLY

1. Remove all, except 2, oil pan bolts. Leave these 2 bolts finger tight. Tap oil pan loose with rubber mallet. Remove oil pan and oil strainer. Discard oil strainer "O" ring.

NOTE: **DO NOT remove servo piston oil seals unless servo piston is to be replaced.**

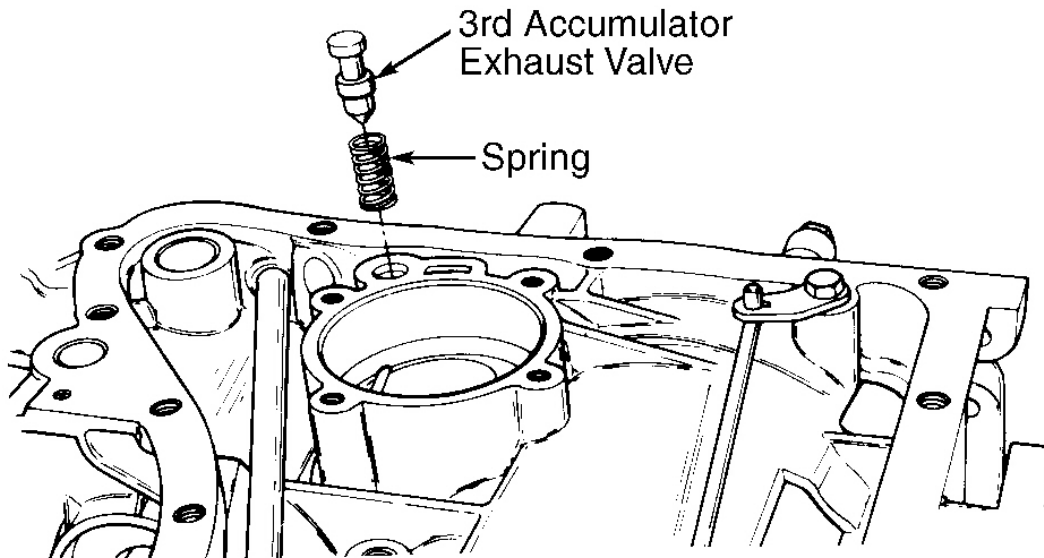
2. Remove reverse oil pipe retaining bracket-to-servo cover bolt. Remove remaining servo cover bolts. Lift off intermediate servo cover and gasket. Remove intermediate servo assembly. See **Fig. 8**.



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Fig. 8: Removing Intermediate Servo Assembly
Courtesy of GENERAL MOTORS CORP.

3. If necessary, detach snap ring, and remove intermediate band apply pin from intermediate servo piston. Discard oil seals. Remove 3rd accumulator exhaust valve and spring. See **Fig. 8** . Inspect spring and exhaust valve for wear or damage. See **Fig. 9** .



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Fig. 9: Removing 3rd Accumulator Exhaust Valve & Spring
Courtesy of GENERAL MOTORS CORP.

NOTE: Perform **BAND APPLY PIN SELECTION CHECK** to determine correct pin to be used during reassembly.

Band Apply Pin Selection Check

1. Install Band Apply Pin Gauge (J-28535) over intermediate servo bore, and retain it with 2 servo cover bolts. See **Fig. 10** . Remove band apply pin from intermediate servo assembly.
2. Install Band Apply Pin Gauge Extension (J-28535-4) onto servo piston end of band apply pin. Install band apply pin and gauge extension into gauge on servo bore.

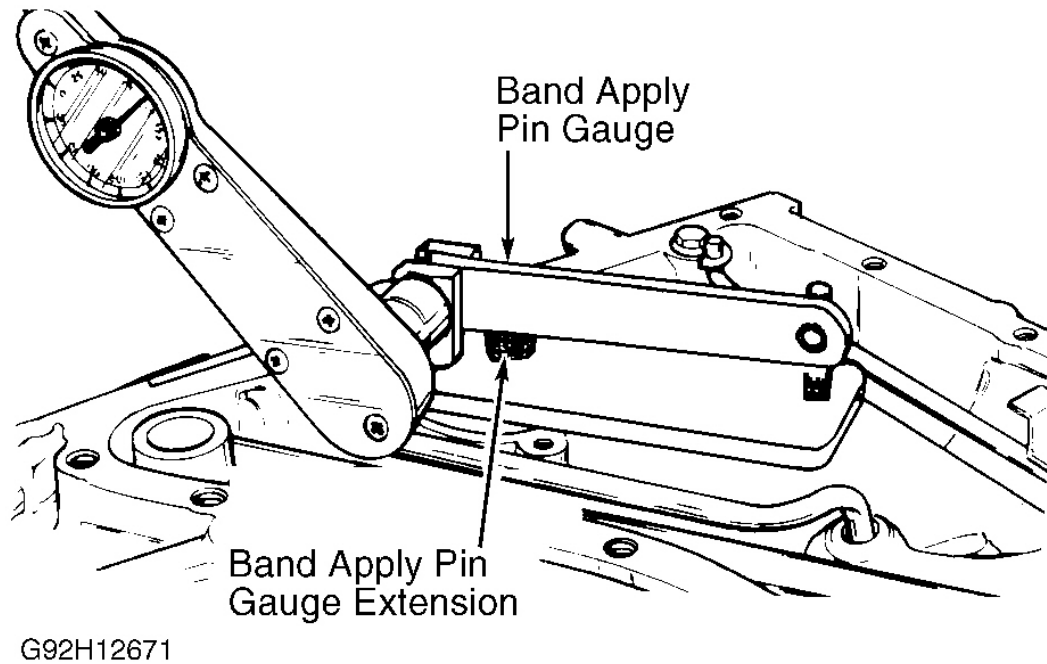


Fig. 10: Checking Band Apply Pin
 Courtesy of GENERAL MOTORS CORP.

- Using an INCH lb. torque wrench, apply torque of 100 INCH lbs. (11.3 N.m) to hex nut on gauge tool. If pin is correct size, White line on gauge extension will appear in window.
- If White line does not appear in window, use a longer or shorter pin as necessary. See **INTERMEDIATE BAND APPLY PIN** . Repeat step 3) to ensure pin size is correct. Set selected pin aside until transaxle reassembly procedure.

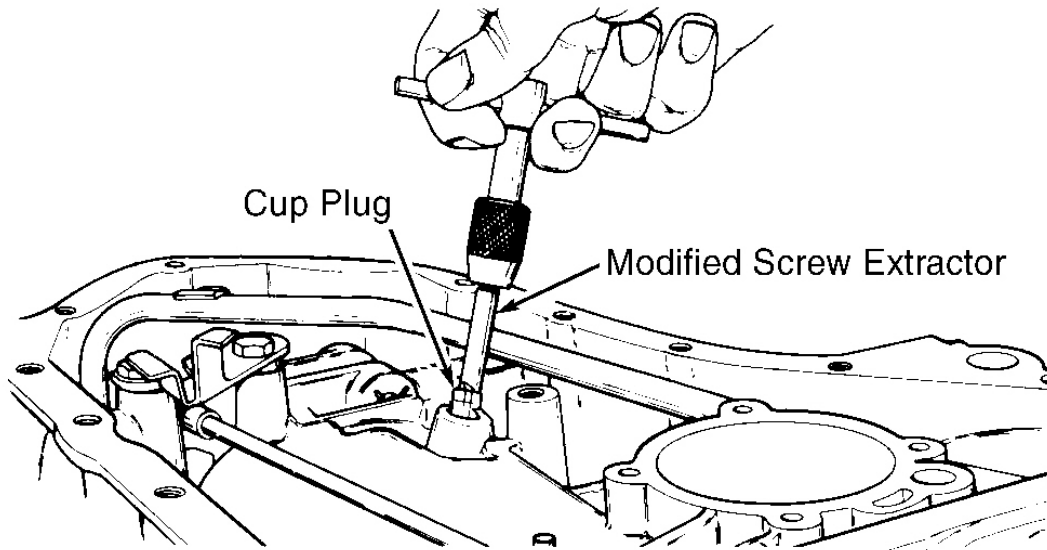
INTERMEDIATE BAND APPLY PIN

Length	Identification
Short	2 Grooves
Medium	1 Groove
Long	No Groove

OUTPUT SHAFT & LOW-REVERSE SEAL

- Detach low-reverse oil pipe, oil pipe seal back-up washer and "O" ring seal. Grind about 3/4" from end of a No. 4 screw extractor. Insert modified screw extractor into low-reverse cup plug. See **Fig. 11** . **DO NOT** hammer or force screw extractor into cup plug. Carefully twist screw extractor to remove cup plug.
- Remove dipstick stop and parking lock bracket from above parking pawl and parking pawl actuator rod. Rotate final drive unit until open ends of output shaft retaining "C" ring are visible.
- Using output shaft "C" Ring Remover (J-34757), push both ends of retaining "C" ring down to partially

dislodge from output shaft. Rotate output shaft/final drive until "C" ring is visible. Carefully remove "C" ring with needle-nose pliers. Remove output shaft.



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Fig. 11: Removing Low-Reverse Cup Plug Assembly
Courtesy of GENERAL MOTORS CORP.

CONTROL VALVE BODY & OIL PUMP ASSEMBLY

1. Remove all control valve body mount bolts except 2. Leave these 2 bolts finger tight. Tap pan edge with rubber mallet to loosen control valve cover and gasket. **DO NOT** pry on cover during removal.

NOTE: **DO NOT remove lower left bolt marked "A" from control valve and pump assembly unless auxiliary valve body removal is necessary. See Fig. 12 .**

2. Remove 2 bolts securing throttle lever and bracket assembly to control valve. Lift off throttle lever and bracket assembly with throttle valve cable link. Use care not to bend link.
3. Remove all auxiliary valve body bolts except lower left bolt. See [Fig. 12](#) . Remove remaining control valve assembly bolts. Carefully lift off control valve and pump assembly. Place assembly on bench with machined surface up.
4. Remove No. 1 check ball from direct clutch passage on spacer plate. Lift out oil pump drive shaft. Remove spacer plate and spacer plate gaskets. Remove 5 check balls from case cover. See [Fig. 13](#) .

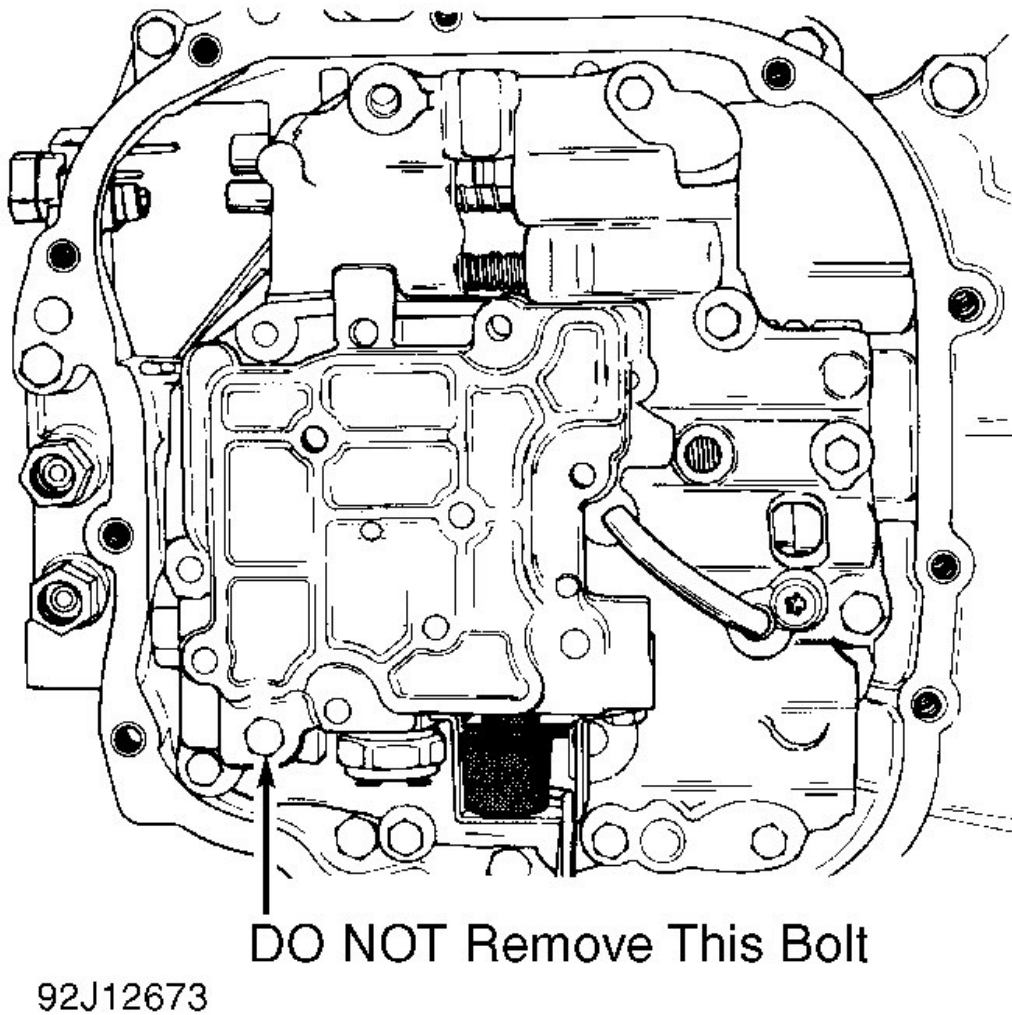


Fig. 12: Locating Control Valve & Pump Assembly Lower Left Bolt
Courtesy of GENERAL MOTORS CORP.

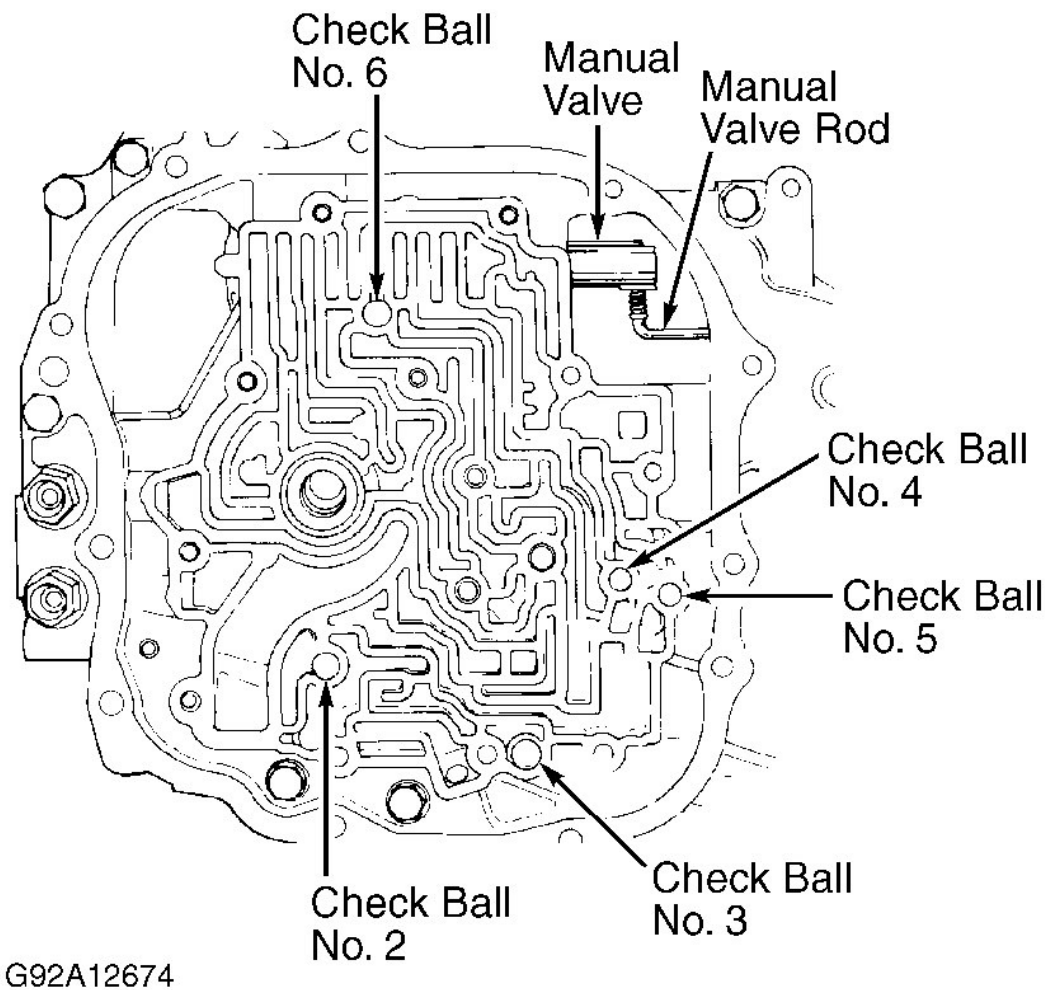


Fig. 13: Locating Case Cover Check Balls
 Courtesy of GENERAL MOTORS CORP.

Input Shaft-To-Case Cover End Play

1. Install Output Shaft Loader Adapter Plug (J-26958-10) into right axle end. See **Fig. 14** . Mount Output Shaft Aligner/Loader (J-26958) and Bracket (J-26958-11) to right axle end of case. Adjust loader by turning handle until knob bottoms.
2. Install Input Shaft Lifter (J-28544) into input shaft bore and tighten. Install dial indicator with Extension Post (J-25025-7). Place indicator plunger on end of lifter. Press down on lifter, zero dial indicator, and lift up tool. End play should be .004-.033" (.10-.84 mm).
3. End play snap ring is located on input shaft, beneath driven sprocket. See **INPUT SHAFT END PLAY SELECTIVE SNAP RINGS** .

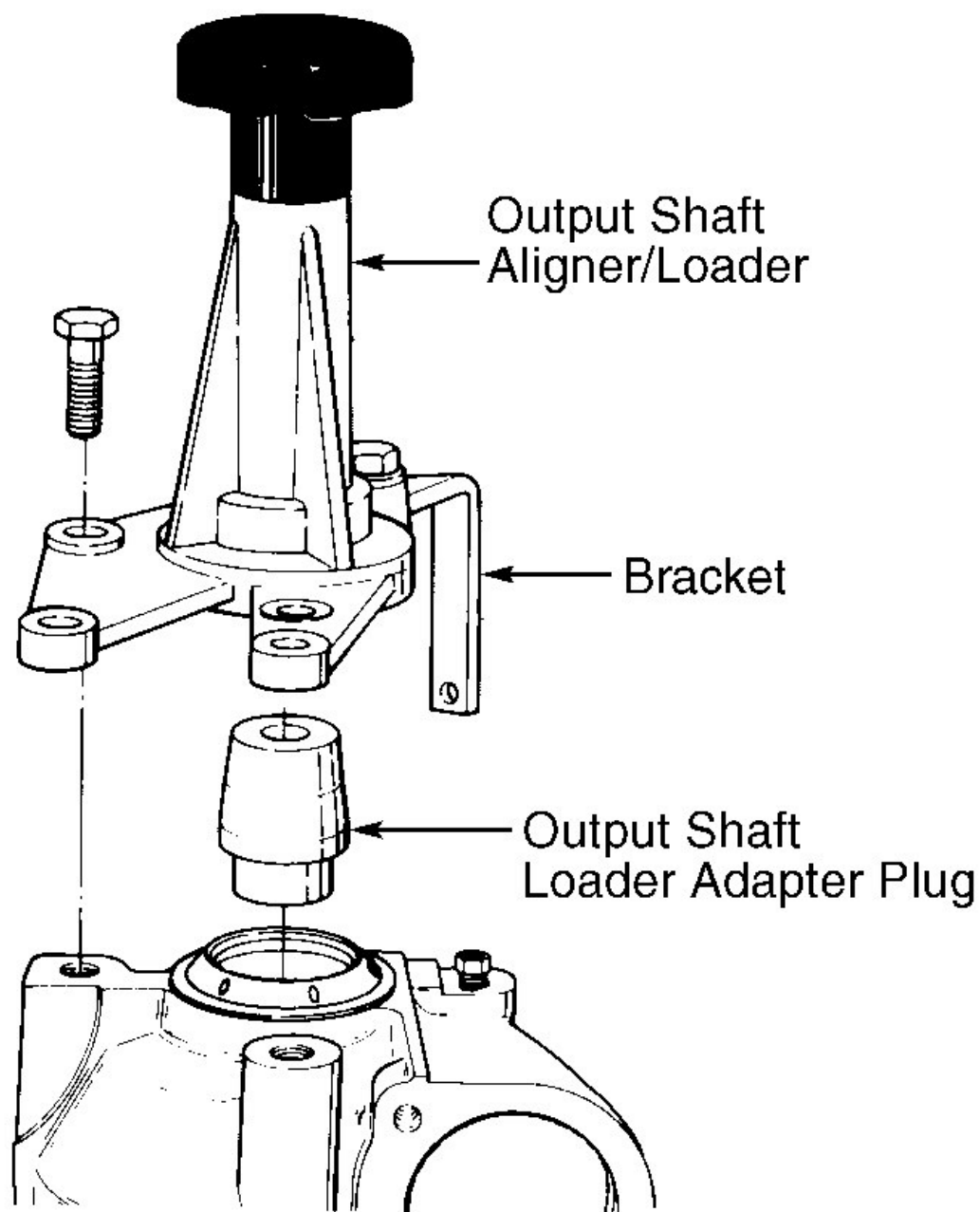
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CAUTION: Oil soaked snap rings may discolor. Measure snap ring for actual thickness.

INPUT SHAFT END PLAY SELECTIVE SNAP RINGS

Thickness: In (mm)	Color Code
.071-.076 (1.80-1.93)	White
.078-.084 (1.98-2.13)	Blue
.088-.092 (2.23-2.33)	Brown
.095-.099 (2.41-2.51)	Yellow
.103-.107 (2.62-2.72)	Green



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Fig. 14: Installing Output Shaft Aligner/Loader
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE CASE COVER & INPUT UNIT ASSEMBLY

1. Disconnect manual valve rod from manual valve. Remove remaining transmission case cover mount bolts. Install 2 bolts (12 x 1.75 x 50 mm) into case cover dowel pin holes. See **Fig. 15**.
2. Bolts will bottom out on dowel pins and separate case cover from case. **DO NOT** pry cover from case. Remove case cover, and lay side with 1-2 accumulator up, as 1-2 accumulator pin may drop out of cover.
3. Remove 1-2 accumulator spring, piston and center case-to-cover gasket. Remove case cover-to-drive sprocket thrust washer and driven sprocket thrust bearing assembly. Case cover-to-drive sprocket thrust washer may come off with case cover.
4. Remove and discard turbine shaft "O" ring. Remove drive sprocket, driven sprocket and chain as an assembly. See **Fig. 2**. Remove drive and driven sprocket-to-support thrust washers. These washers may come off with sprockets.

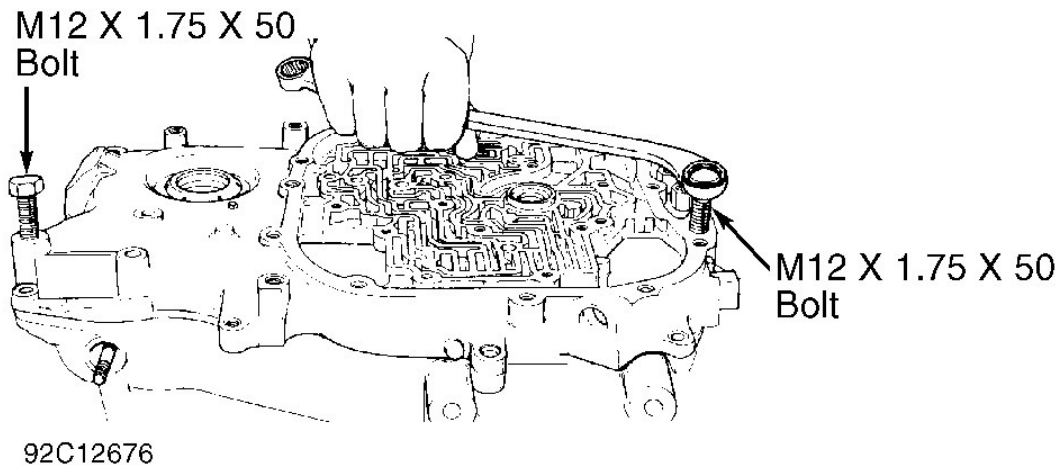
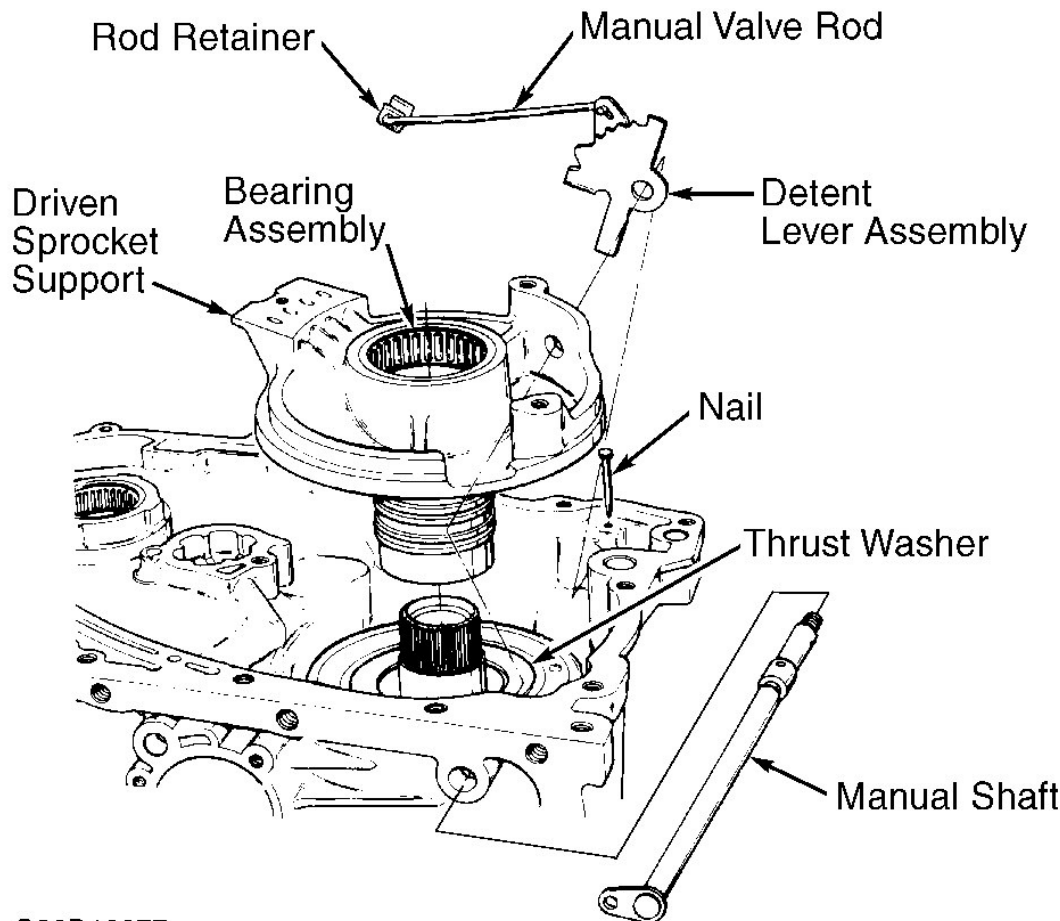


Fig. 15: Removing Transaxle Case Cover from Case
 Courtesy of GENERAL MOTORS CORP.

5. Using 3/16" drift, remove detent lever-to-manual shaft pin. Remove manual shaft-to-case nail. See **Fig. 16**. Withdraw manual shaft from case, and lift out manual valve rod and detent lever assembly. Remove park lock actuator rod.
6. Remove driven sprocket support and thrust washer on direct clutch side. See **Fig. 16**. Thrust washer may come out with driven sprocket support. Remove intermediate band anchor hole plug and intermediate band assembly.
7. While lifting input shaft, remove and separate direct and forward clutch assemblies. Remove input internal gear-to-input shaft thrust washer, and remove input internal gear.
8. Remove input carrier assembly, input carrier-to-input internal gear thrust washer and input carrier-to-input sun gear thrust washer. Remove input sun gear and input drum.



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Fig. 16: Removing Manual Shaft & Driven Sprocket Support
Courtesy of GENERAL MOTORS CORP.

REACTION UNIT

NOTE: Before disassembling reaction unit, measure reaction sun gear-to-input drum snap ring and low-reverse clutch housing-to-low race end play. This will determine appropriate snap ring and thrust washer to be used during transaxle reassembly procedure. See REACTION SUN GEAR-TO-INPUT DRUM END PLAY and LOW-REVERSE CLUTCH HOUSING-TO-LOW ROLLER CLUTCH RACE THRUST WASHER END PLAY.

Reaction Sun Gear-To-Input Drum End Play

1. Install Output Shaft Aligner/Loader (J-26958) in fully loaded position. See **Fig. 14**. Using 2 case cover bolts, install Reaction Sun Gear Snap Ring Gauge (J-28588) to case. See **Fig. 17**. Position gauge extension between open ends of selective snap ring.

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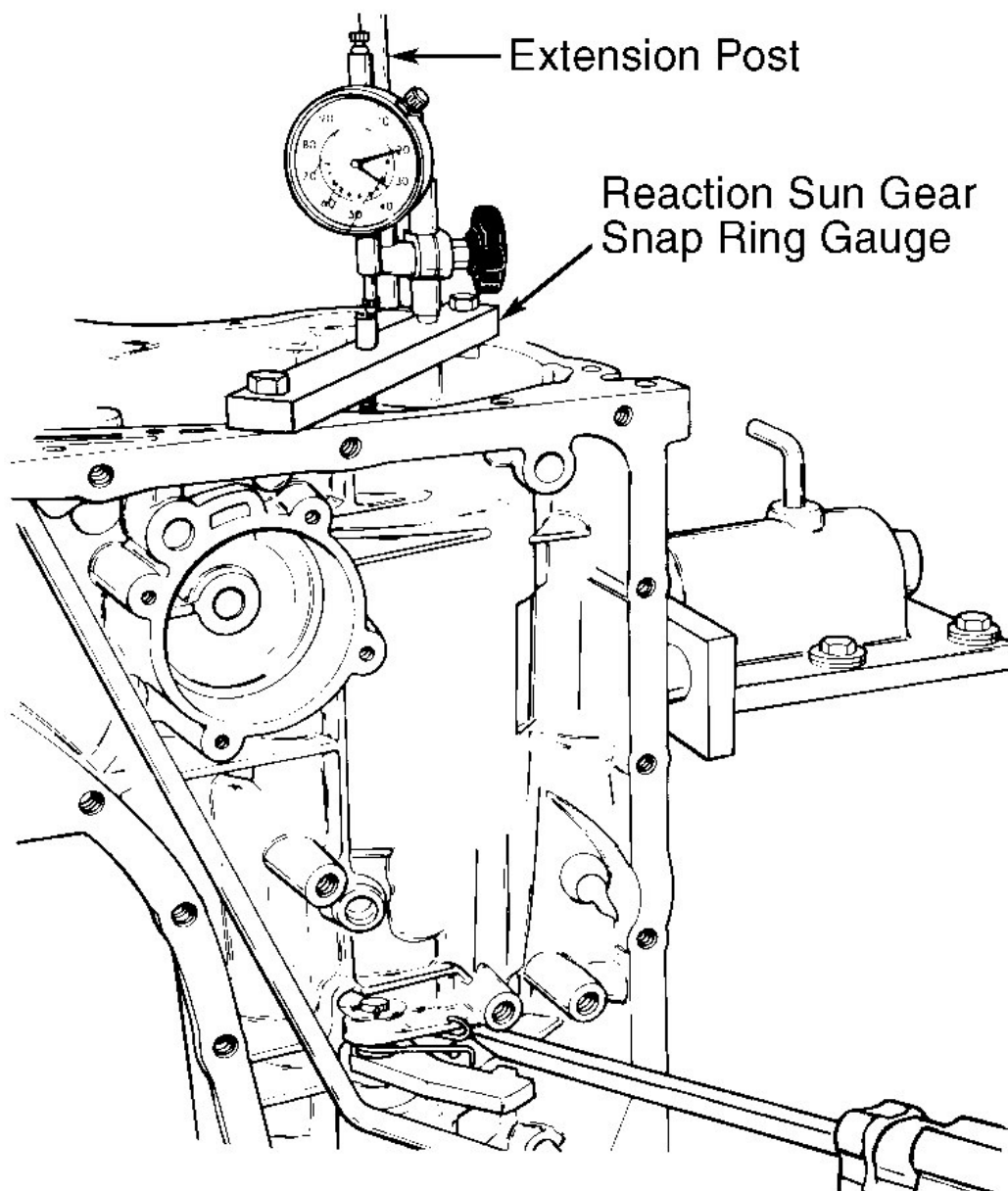
2. Press reaction sun gear down to seat. Position gauge extension between open ends of snap ring. Install dial indicator onto Extension Post (J-25025-7). Position feeler gauge beneath shoulder of gauge extension, and zero dial indicator.
3. Rotate selective snap ring under gauge extension. Remove gauge from under shoulder. Dial indicator should read .005-.013" (.13-.33 mm).
4. Snap ring is located on reaction sun gear shaft. Measure thickness of snap ring for proper identification. See **REACTION SUN GEAR-TO-INPUT DRUM SNAP RING**.

REACTION SUN GEAR-TO-INPUT DRUM SNAP RING

Thickness: In (mm)	Color Code
.089-.093 (2.26-2.36)	Pink
.096-.100 (2.44-2.54)	Brown
.103-.107 (2.62-2.72)	Light Blue
.109-.113 (2.77-2.87)	White
.116-.120 (2.95-3.05)	Yellow
.123-.127 (3.12-3.22)	Light Green
.129-.133 (3.28-3.38)	Orange
.136-.140 (3.45-3.56)	No Color

Low-Reverse Clutch Housing-To-Low Roller Clutch Race Thrust Washer End Play

1. With dial indicator, gauge and output shaft aligner/loader still installed from previous procedure (REACTION SUN GEAR-TO-INPUT DRUM END PLAY), press down reaction sun gear to seat and zero dial indicator.
2. Insert screwdriver through parking pawl case opening. See **Fig. 17**. Lift reaction internal gear, and read low-reverse clutch selective end play. **DO NOT** rest screwdriver on spacer in parking pawl case opening, as spacer damage will result.
3. End play should be .003-.046" (.08-1.17 mm). Select appropriate washer to correct end play if necessary. See **LOW-REVERSE CLUTCH HOUSING-TO-LOW ROLLER WASHER**. Washer controlling end play is located between low-reverse clutch housing and low roller clutch assembly.



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Fig. 17: Installing Dial Indicator & Reaction Sun Gear Snap Ring Gauge
Courtesy of GENERAL MOTORS CORP.

LOW-REVERSE CLUTCH HOUSING-TO-LOW ROLLER WASHER

Thickness In (mm)	Identification Code
.039-.043 (0.99-1.09)	1
.056-.060 (1.42-1.52)	2

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.072-.076 (1.83-1.93)	3
.089-.093 (2.26-2.36)	4
.105-.109 (2.67-2.77)	5
.122-.126 (3.10-3.20)	6

Reaction Unit Disassembly

1. Remove dial indicator, gauge and output shaft aligner/loader. Leave output shaft loader adapter in place.
2. Remove reaction sun gear. Remove low-reverse clutch housing-to-case snap ring. Snap ring is .092" (2.34 mm) thick. Using Low-Reverse Clutch Housing Remover/Installer (J-28542 or J-34008), remove low-reverse clutch housing. See **Fig. 18**.
3. Remove low-reverse clutch housing-to-case spacer ring from groove in case. Lift out final drive sun gear shaft and reaction gear set as an assembly. Remove roller clutch and reaction carrier assembly from final drive sun gear shaft.

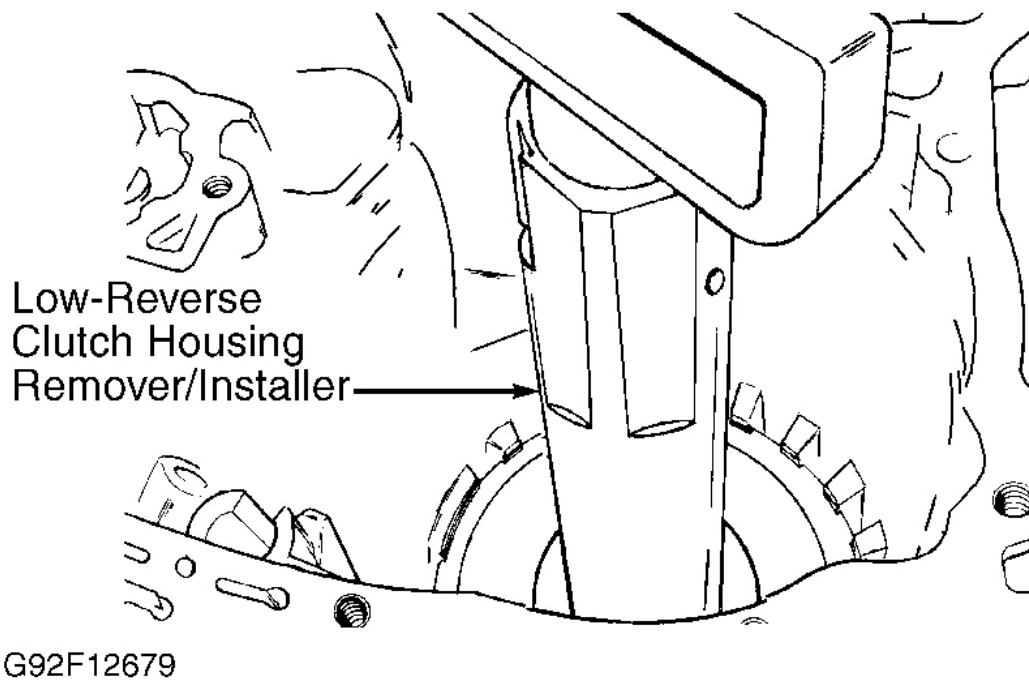


Fig. 18: Removing & Installing Low-Reverse Clutch Housing
Courtesy of GENERAL MOTORS CORP.

FINAL DRIVE UNIT

NOTE: Before disassembling unit, check final drive-to-case end play. This will determine the appropriate final drive differential-to-case thrust washer to be

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used during transaxle reassembly procedure. See FINAL DRIVE-TO-CASE END PLAY .

Final Drive-To-Case End Play

1. Position transaxle so right axle is up. Using Output Shaft Aligner/Loader Adapter Plug (J-26958-10), press down adapter to seat final drive onto final drive internal gear-to-case snap ring.
2. Install dial indicator onto post, and install post in motor mount bolt hole. See **Fig. 20** . Ensure indicator plunger rests on top of adapter. Zero dial indicator while pressing down on adapter.
3. Insert large screwdriver into transaxle governor bore, and lift final drive by prying up on governor drive gear. Dial indicator should indicate .005-.032" (.12-.81 mm) end play.
4. Select appropriate thrust washer to correct end play if necessary. See **FINAL DRIVE-TO-CASE THRUST WASHER** . Thrust washer controlling end play is located between differential carrier and differential carrier case thrust bearing assembly.

FINAL DRIVE-TO-CASE THRUST WASHER

Thickness: In. (mm)	Identification No. (Color Code)
.055-.059 (1.40-1.50)	0 (Orange)
.059-.062 (1.50-1.60)	1 (White)
.062-.066 (1.60-1.70)	2 (Blue)
.066-.070 (1.70-1.80)	3 (Pink)
.070-.074 (1.80-1.90)	4 (Brown)
.074-.078 (1.90-2.00)	5 (Green)
.078-.082 (2.00-2.10)	6 (Black)
.082-.086 (2.10-2.20)	7 (Purple)
.086-.091 (2.20-2.30)	8 (Purple/White)
.091-.095 (2.30-2.40)	9 (Purple/Blue)

Final Drive Unit Disassembly

1. Remove dial indicator, indicator post and loader/aligner adapter. Remove final drive internal gear spacer-to-case snap ring. Snap ring is .092" (2.34 mm) thick. Remove final drive internal gear spacer. Use care not to deform or bend spacer.
2. Using Final Drive Unit Remover/Installer (J-33381), lift final drive unit from case. Remove final drive differential-to-case selective thrust washer. Remove differential carrier-to-case thrust roller bearing assembly from final drive assembly. If thrust washer and thrust bearing did not come out with final drive assembly, remove from case.

COMPONENT DISASSEMBLY & REASSEMBLY

NOTE: Some procedures in **COMPONENT DISASSEMBLY & REASSEMBLY** may provide instructions for installing component(s) in transaxle case.

TRANSAXLE CASE

NOTE: Disassembly procedures provide instructions for removing drive sprocket roller bearing, drive sprocket support, 3rd oil cup plug, parking pawl and governor oil pipe. **DO NOT** remove components unless necessary.

Disassembly

1. Using slide hammer and Adapter (J-26941), remove driven sprocket support bearing. See **Fig. 2** or **Fig. 38**. Inspect bearing bore and roller bearing race on driven sprocket for wear or damage and replace if necessary.
2. To remove drive sprocket support, remove converter oil seal. Remove Torx bolts, and remove drive sprocket support.
3. Using a screw extractor, remove parking pawl shaft cup plug from oil pan side of case. Remove parking pawl components as necessary.
4. To remove governor pipe, remove governor oil pipe clamp screw and clamp. See **Fig. 2**. Remove right axle end first. Use a piece of wood to protect machined case surface if pipe must be pried out.
5. Grind 1/2" from end of No. 3 screw extractor. Install No. 3 screw extractor into 3rd oil cup plug. Remove cup plug. See **Fig. 2**.
6. With final drive assembly and right axle shaft removed from case, inspect final drive case bushing for wear or scoring. Use Bushing Remover (J-28537-6) and Driver Handle (J-8092) to remove bushing.

Inspection

1. Inspect case assembly for damage, cracks, porosity and interconnected oil passages. Ensure exhaust vent holes are open. Inspect for stripped bolt holes.
2. Check case lugs, intermediate servo bore and snap ring grooves. Inspect case bushings for wear or scoring. Inspect drive and driven sprocket support bearing assemblies for pitting and scoring to carrier and rollers. Check rollers for excessive clearance.
3. Inspect drive and driven sprocket supports for damage to journal splines. Check for heat discoloration and cracks on support assembly. Inspect governor pipe for damage, cracks and leakage. Check parking pawl shaft cup plug, parking pawl shaft and parking pawl for damage and excessive wear.
4. Inspect 3rd oil cup plug for tightness in bore or damage. Check all sealing and mating surfaces for straightness.

Reassembly

1. Install new final drive case bushing using Bushing Installer (J-28537-2) and Driver Handle (J-8092). Drive in bushing until tool bottoms.
2. Using Seal Driver (J-26938 or J-29130) and driver handle, install new right axle seal assembly. **DO NOT** damage seal guard during installation. Using a 1/2" socket, install manual shaft oil seal with lip up.
3. Using a 1/4" drift, install new cup plug. See **Fig. 2**. Cup plug should seat fully in bore. Before installing, coat ends of governor oil pipe with Loctite sealer. Install governor pipe and retaining clamp.
4. Install parking pawl and spring, parking pawl shaft and retainer. Ensure large loop of pawl spring is positioned on right side of pawl. Coat parking pawl shaft cup plug with sealant, and install plug using a 3/8" drift.
5. Install driven sprocket support roller bearing assembly with bearing identification facing up. Lightly tap

driven sprocket support bearing into position using Bearing Installer (J-28677). Install new converter oil seal using Driver (J-28540).

DIFFERENTIAL & FINAL DRIVE

Disassembly & Inspection

1. Remove final drive internal gear and final drive internal gear thrust bearing. Lift out final drive sun gear and thrust bearing. See **Fig. 19**. Inspect final drive internal gear and sun gear for cracks, damage, heat discoloration and worn or missing teeth.
2. Inspect differential side gears and pinions for wear or damage. Using a 3/16" pin punch, drive out differential pinion shaft retaining pin. Remove differential pinion gears and thrust washers. Push pinion gears from differential. Ensure dished pinion thrust washers are removed with pinion gears. See **Fig. 19**.

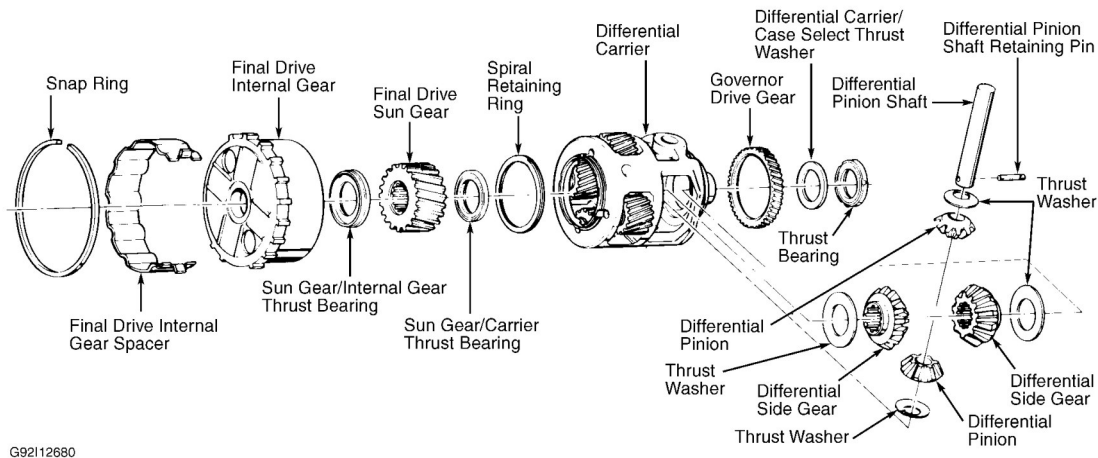


Fig. 19: Exploded View of Differential & Final Drive Unit
Courtesy of GENERAL MOTORS CORP.

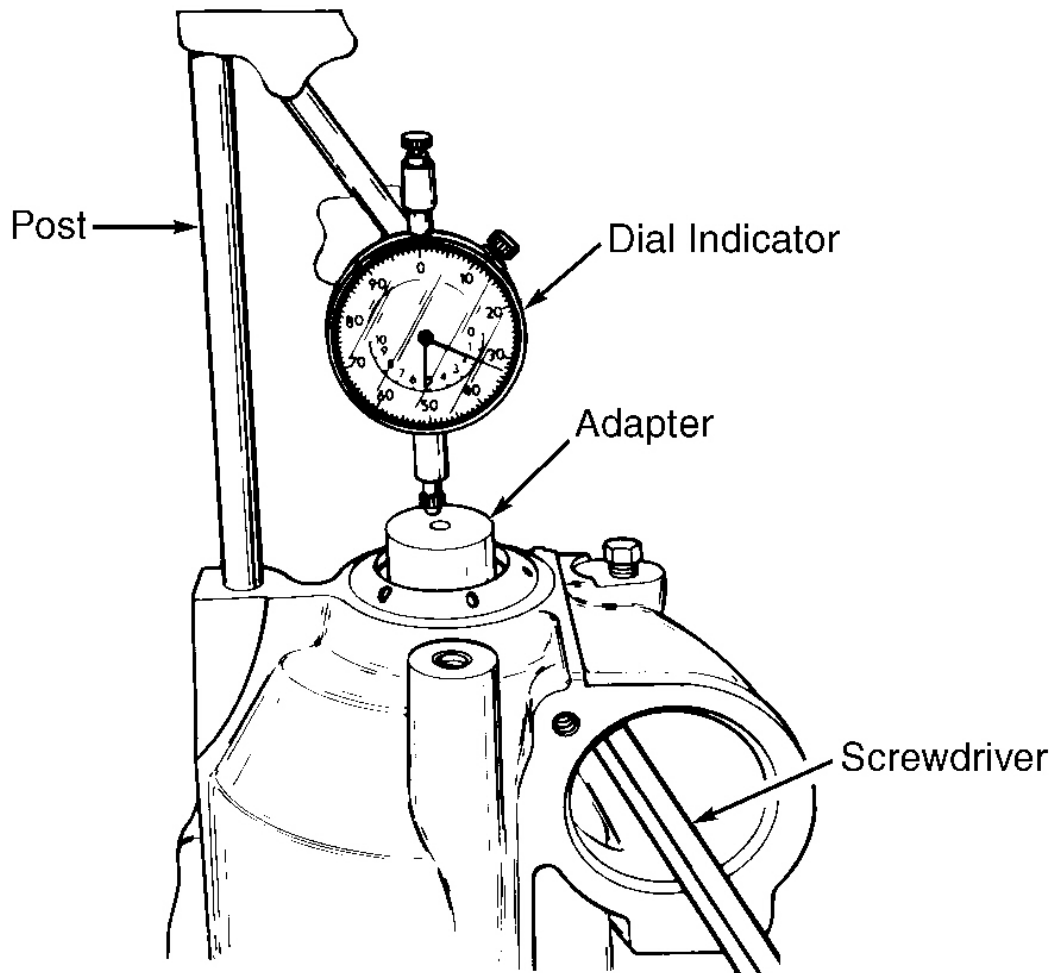
3. Slide differential side gears toward center of carrier and remove. Remove side gear thrust washers. Keep thrust washers with gears for reassembly reference. Ensure end play between carrier and final drive pinion is .009-.025" (.23-.64 mm).
4. Inspect final drive pinions for damage. If pinions must be removed, detach spiral pinion pin snap ring, and withdraw pinion pins. Carefully remove pinion gears and thrust washers together to prevent dropping needle roller bearings. Remove needle bearings from each pinion gear and check for damage. Remove governor drive gear only if replacement is necessary. Using Puller (J-8433) and a thick, flat washer, pull governor drive gear from differential.

Reassembly

1. If governor drive gear is removed, lightly tap it into place with a plastic mallet. Install needle bearings. Install steel pinion thrust washer onto end of pin (side opposite first thrust washer). Install one bronze pinion thrust washer to each end of pin. Slide pinion pin from assembly, keeping bearings intact in gear.
2. Install pinion gear assembly into final drive carrier. Install pinion pin (stepped end last) into carrier

through pinion gear assembly. Install other final drive pinion gears using same procedure. Install spiral pinion pin snap ring.

3. Install pinion pin so step is outside. Ensure bronze thrust washer is present on each end of final drive pinion, between carrier and steel thrust washer.
4. Install internal gear thrust bearing, sun gear with stepped side facing upward, thrust bearing with outside race to internal gear, and internal gear into final drive internal carrier. Install differential side gear thrust washers and side gears. Hold them in place with petroleum jelly. Coat side gear pinion dished thrust washers with petroleum jelly, and install them onto side gear pinions. Install pinion gears in differential carrier windows.
5. Install differential carrier case selective thrust washer into differential carrier case. Install thrust bearing into carrier assembly. Use petroleum jelly to hold bearing in place. Using Final Drive Unit Remover/Installer (J-33381), install differential carrier assembly into final drive internal case.
6. Install final drive internal gear spacer into case. Ensure parking pawl moves freely after spacer installation. Install snap ring into groove. Ensure final drive-to-case end play is .005-.032" (.12-.81 mm). See **FINAL DRIVE UNIT** under TRANSAXLE DISASSEMBLY. See **Fig. 20**.



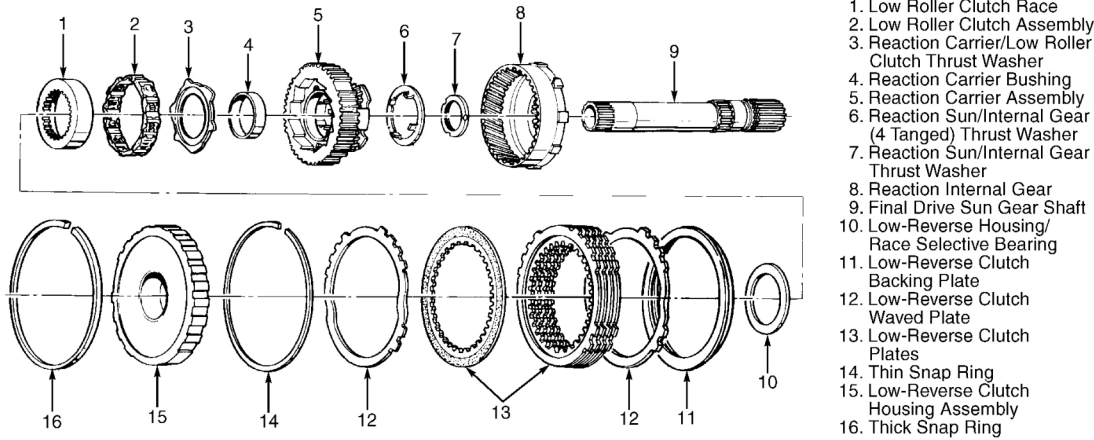
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Fig. 20: Checking Final Drive End Play
Courtesy of GENERAL MOTORS CORP.

REACTION INTERNAL GEAR

Inspection

Check final drive sun gear shaft, reaction internal gear and reaction sun/internal gear thrust bearing for excessive wear or damage. See **Fig. 21**. Check rear portion of center spline. If spline has a step (due to wear), replace reaction internal gear and shaft.



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Fig. 21: View of Reaction Carrier & Low-Reverse Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

LOW ROLLER CLUTCH & REACTION CARRIER ASSEMBLY

Disassembly

Remove selective bearing and low roller clutch race. Pull low roller clutch from reaction carrier assembly. Remove reaction carrier-to-low roller clutch thrust washer from carrier. Pull final drive sun gear shaft from reaction internal gear. See **Fig. 21**.

Inspection

1. Inspect low roller clutch race and roller clutch bearings for damage. Inspect 4-tanged thrust washer for scoring, excessive wear and distorted tangs. Inspect reaction carrier, roller clutch cam ramps and bushing for damage or scoring.
2. Inspect reaction carrier pinions for damage, rough bearings or excessive wear. Ensure pinion pins **DO NOT** rotate. Using a feeler gauge, check pinion end play. Pinion end play should be .009-.027" (.23-.69 mm).

Reassembly

1. Install thrust washer into reaction carrier. Ensure all rollers are installed in cage, and install roller clutch into carrier. Install clutch race. See **Fig. 21**. Install 4-tanged thrust washer. Use petroleum jelly to hold washer in position.
2. Install reaction carrier and clutch assembly into reaction internal gear. Install selective bearing and reaction gear assembly. Ensure gear does not contact final drive internal gear spacer.
3. Install low-reverse clutch backing plate into case with stepped side down. Install low-reverse clutch waved plate. Lubricate composition plates with ATF. Install composition plates first and then install steel plate. See **Fig. 21**. Install low-reverse clutch waved plate and snap ring. Snap ring is .042" (1.07 mm) thick.

LOW-REVERSE CLUTCH HOUSING

Disassembly

Compress low-reverse clutch spring retainer, and remove snap ring. Lift out low-reverse clutch spring retainer. Remove waved release spring and clutch piston from housing. Remove inner and outer piston seals. See **Fig. 21** and **Fig. 22**.

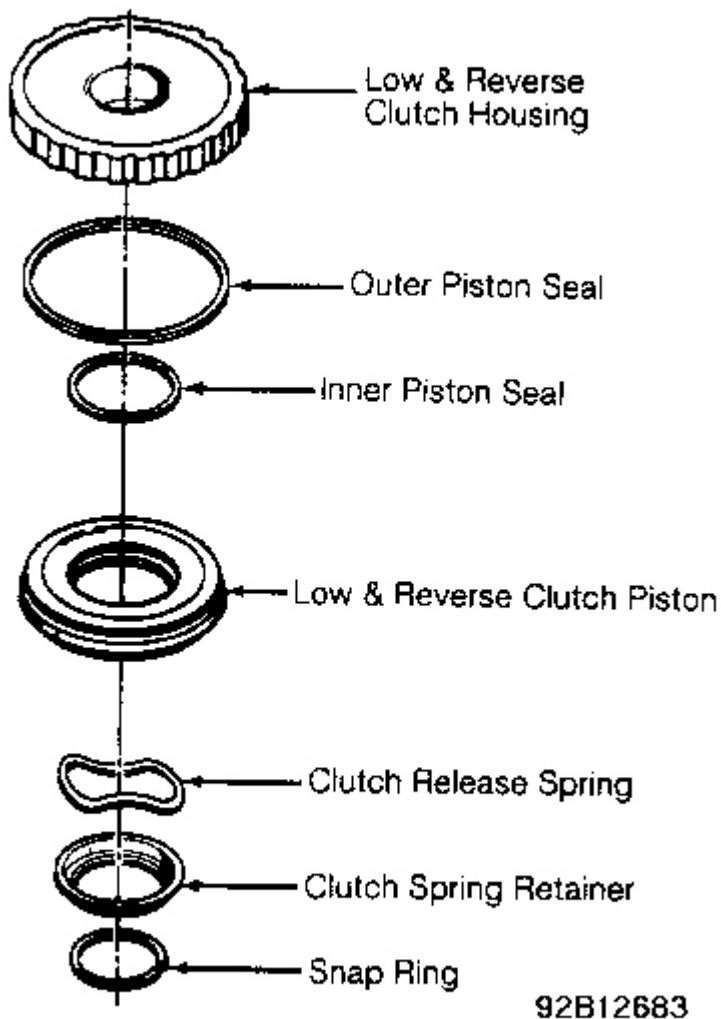


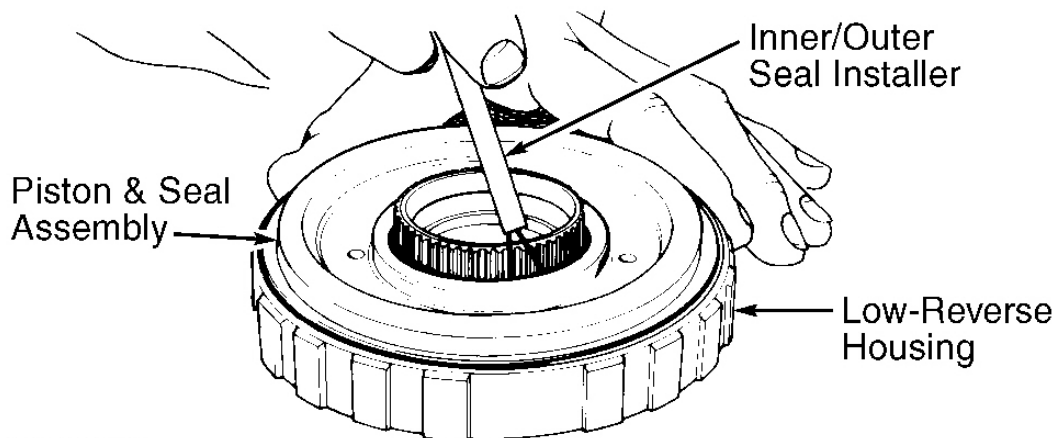
Fig. 22: Exploded View of Low-Reverse Clutch Housing Assembly
Courtesy of GENERAL MOTORS CORP.

Inspection

Inspect clutch housing for damage or plugged feed hole. Check backing plate for cracks, damage or warpage. Inspect clutch splines and snap ring groove for damage or burrs. Remove any burrs on splines or snap ring groove. Inspect clutch piston and apply ring for distortion, cracks or damage. Inspect piston seals for nicks, cuts or hardening.

Reassembly

1. Install seals onto piston. Using Inner/Outer Seal Installer (J-26744-A), install clutch piston. See **Fig. 23** . Install clutch release spring and retainer (cupped side down). Compress retainer, and install snap ring. Apply maximum air pressure of 50 psi (3.5 kg/cm(2)) to feed hole to check for proper operation.
2. Using Handle (J-34008), install low-reverse clutch housing. See **Fig. 18** . Ensure oil feed hole in housing lines up with feed hole in case. If housing does not go past snap ring groove, remove tool and install sun gear. Rotate sun gear back and forth until housing is in place. Install .097" (2.46 mm) thick snap ring.



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Fig. 23: Installing Low-Reverse Piston
Courtesy of GENERAL MOTORS CORP.

REACTION SUN GEAR & INPUT DRUM END PLAY

Inspection

1. Check reaction sun gear for cracks, splits, spline damage, gear-to-journal wear and plugged lubrication passages. Inspect input drum for distortion, damaged splines and pins. To check and adjust reaction sun gear-to-input drum end play, see **REACTION UNIT** under TRANSAXLE DISASSEMBLY.
2. Install correct thickness low-reverse housing/low race selective washer as previously determined. See **LOW-REVERSE CLUTCH HOUSING-TO-LOW ROLLER CLUTCH RACE THRUST WASHER END PLAY** under REACTION UNIT. See **Fig. 17** and **Fig. 21** .

INPUT CARRIER, INPUT SUN GEAR & INTERNAL GEAR

Inspection

1. Check all parts for pitting, scoring, damaged gear teeth and cracks. Ensure lubrication holes are open. Check input carrier thrust washers for wear and distortion of tangs. See **Fig. 24**.
2. Check carrier pinion pins for tightness. Ensure pins **DO NOT** rotate. Ensure input carrier pinion end play is .009-.027" (.23-.69 mm).

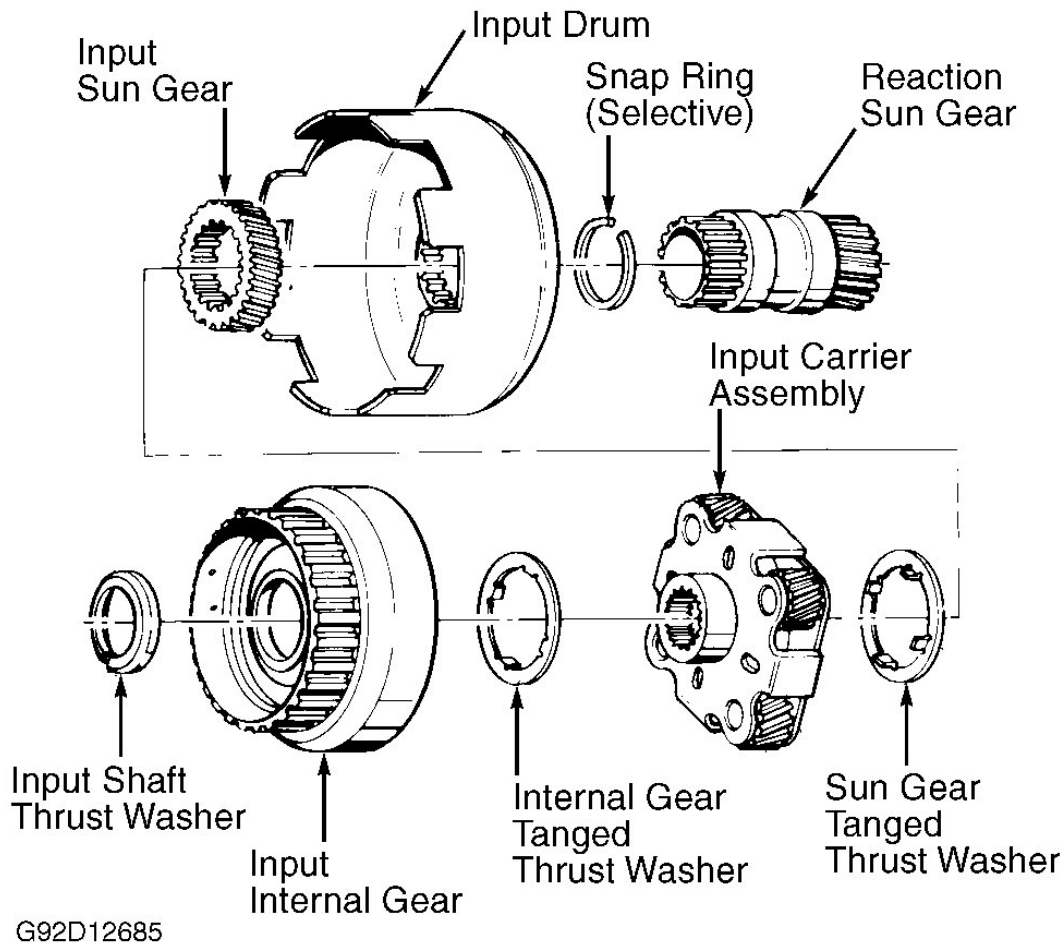


Fig. 24: Exploded View of Input Unit
Courtesy of GENERAL MOTORS CORP.

FORWARD CLUTCH ASSEMBLY

Disassembly

1. Place forward clutch housing in a holding fixture with clutch pack facing up. Remove snap ring, backing

plate, waved steel clutch plate, composite and steel clutch plates from housing. See **Fig. 25** . Remove other waved steel clutch plates.

2. Using Clutch Pack Compressor (J-23456) and Adapter (J-23327-1), compress retainer and spring assembly in order to remove snap ring. Remove tools, retainer and spring assembly from clutch housing. Remove piston and insert from housing, and remove seals from piston.

Inspection

Inspect input shaft oil seal rings for damage. **DO NOT** remove seal rings unless replacement is necessary. Inspect clutch plates and all components for excessive wear or damage and replace if necessary. See **Fig. 26** .

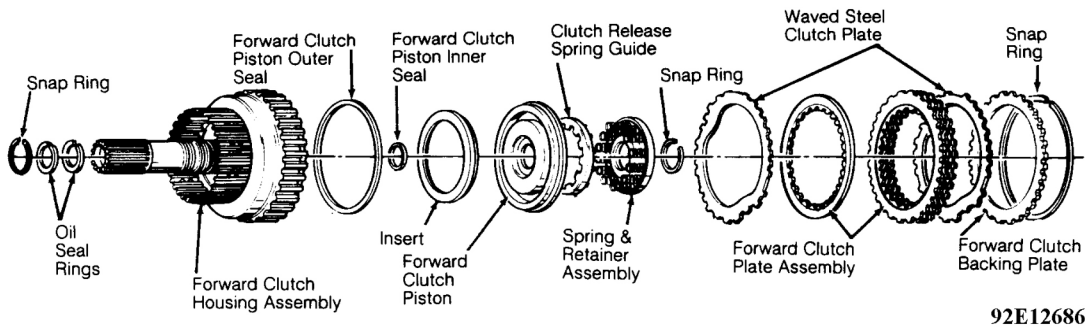


Fig. 25: Exploded View of Forward Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

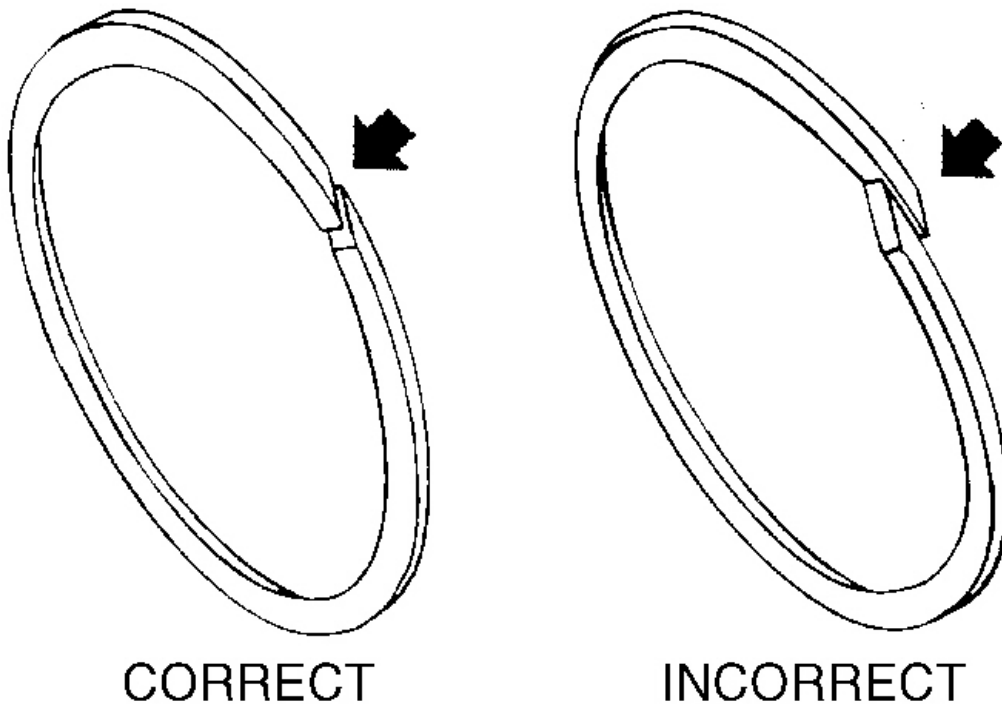
3T40 CLUTCH PLATE AND APPLY RING USAGE CHART							
CLUTCH	FLAT STEEL PLATE		COMP. FACED PLATE	WAVED PLATE		APPLY RING	
	No.	Thick- ness	No.	No.	Thick- ness	L.D.	Thick- ness
<u>DIRECT</u>	5	2.3mm (0.09")	5	—	—	7	19.0mm (0.75")
	3	2.3mm (0.09")	3	—	—	2	27.4mm (1.08")
	4	2.3mm (0.09")	4	—	—	1	23.1mm (0.91")
FORWARD ALL	3	1.9mm (0.07")	4	2	1.25mm (0.05")	—	—
LO & REVERSE ALL	4	2.2mm (0.09")	5	2	1.94mm (0.08")	—	—

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Fig. 26: Clutch Plate & Apply Ring Usage Chart
 Courtesy of GENERAL MOTORS CORP.

Reassembly

1. If necessary, install inner and outer seals on piston with lips facing housing. Lubricate seals, and install piston into clutch housing using Inner/Outer Seal Installer (J-26744-A).
2. Position spring guide, retainer and spring assembly into clutch housing. Compress retainer and spring assembly using compressor tool, and install snap ring. Remove compressor tool.
3. Install waved steel clutch plate. Lubricate and alternately install composition and steel plates. Install waved steel clutch plate. Install backing plate with identification side facing upward. See **Fig. 25**.
4. Install snap ring and new seal rings (if necessary). Using a feeler gauge, measure snap ring-to-backing plate clearance. Clearance must be .040-.060" (1.0-1.5 mm). Backing plates are available in different sizes. See **FORWARD CLUTCH BACKING PLATE**.
5. If removed, install new input shaft seal rings. Ensure cut ends are assembled as shown, and rings are seated in groove. See **Fig. 27**. Hold rings in place with petroleum jelly.



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Fig. 27: Assembling Input Shaft Seal Ring
 Courtesy of GENERAL MOTORS CORP.

FORWARD CLUTCH BACKING PLATE

Thickness: In. (mm)	Code: Steel/Powered Metal
.191-.197 (4.9-5.0)	A/6
.170-.175 (4.3-4.4)	B/7
.148-.154 (3.8-3.9)	C/8
.126-.132 (3.2-3.3)	D/9

DIRECT CLUTCH ASSEMBLY

NOTE: If transaxle is being serviced for a burnt intermediate band and direct clutch, new dual-land 3rd accumulator exhaust valve and conical spring must be installed.

Disassembly

1. Remove clutch pack snap ring. Remove backing plate, composite and steel clutch plates from clutch

housing. See **Fig. 28** . If forward clutch is disassembled, keep direct clutch plates separate from forward clutch plates.

2. Remove snap ring holding apply ring and release spring assembly. Remove apply ring and release spring assembly from housing. Remove direct clutch piston from clutch housing. Remove inner and outer seals from piston. Remove center seal from clutch housing.

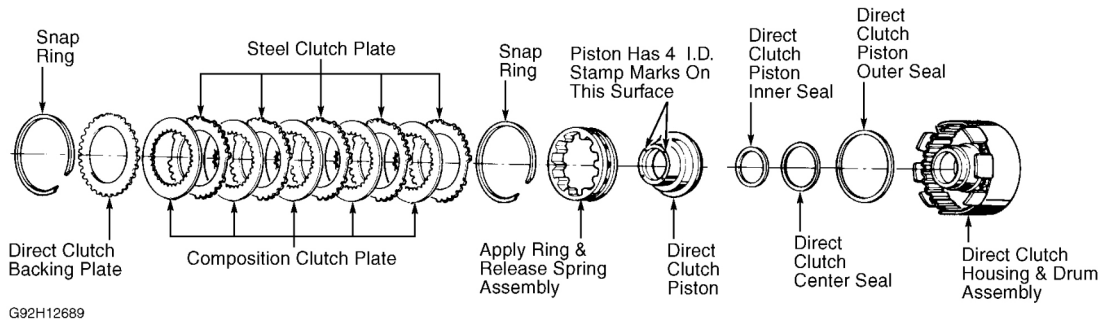
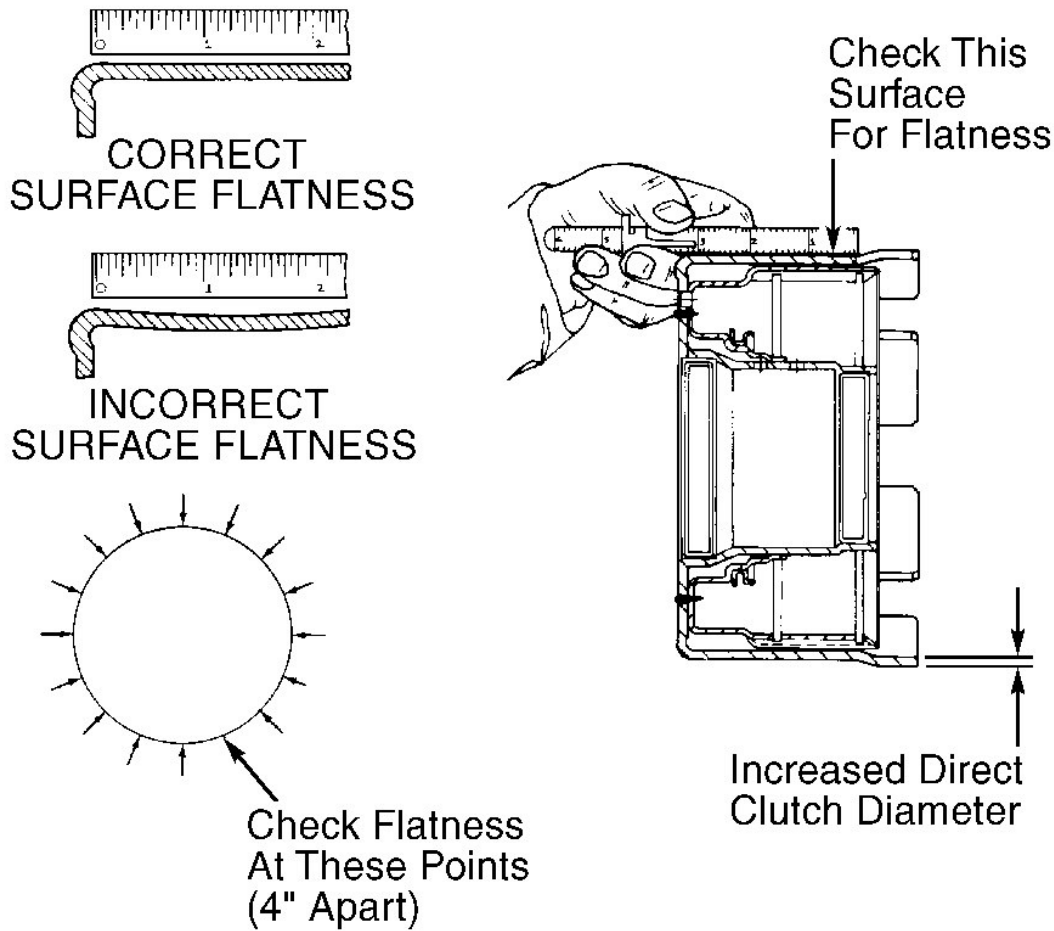


Fig. 28: Exploded View of Direct Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

Inspection

1. Inspect direct clutch housing bushings for damage, cracking or scoring. Inspect composition plates, steel plates and backing plate for wear, burning or scoring. Inspect apply ring, retainer and release spring assembly for damage.
2. Inspect direct clutch piston for distortion, cracks or damage. Inspect clutch housing for excessive wear. If there is intermediate band failure, inspect outer surface of direct clutch. See **Fig. 29** .
3. If removal is necessary, drive check ball capsule (toward direct clutch side of housing) from housing using a 3/8" drift. Install new capsule from direct clutch side of housing, and seat with a 3/8" drift.
4. If intermediate band/direct clutch is burned, remove intermediate servo cover and gasket. Remove 3rd accumulator exhaust valve and spring. Inspect 3rd accumulator exhaust valve bore for presence of valve seat and excessive seat wear.
5. Plug feed and release holes in bore with petroleum jelly. Install a dual-land 3rd accumulator exhaust valve. Ensure valve is centered in seat. Pour solvent into valve bore, and check for leakage on inside of case. Small amount of seepage is okay.
6. If valve leaks, replace transmission case. If valve does not leak, remove check valve, and install new conical spring onto valve (small end first). Install valve with spring into bore. Replace servo gasket and cover.



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Fig. 29: Inspecting Direct Clutch Outer Surface
Courtesy of GENERAL MOTORS CORP.

Reassembly

1. Install inner and outer seals onto pistons with lips facing away from capsule. Install center seal on housing with lip facing away from capsule. Lubricate all seals, then install piston into clutch housing.
2. Install apply ring, retainer and release spring assembly, and snap ring. Lubricate direct clutch plates with ATF and install into housing, starting with a flat steel plate, and then alternating between composition and flat steel plates. Ensure smooth fiber composition plates are used. See **Fig. 26** and **Fig. 28**.
3. Install snap ring. Install backing plate into housing with chamfered or polished side facing up. Install second snap ring. Ensure composition plates turn freely.

INTERMEDIATE BAND

Inspection

Inspect intermediate band for burns, flakes or damage. Install intermediate band, aligning lugged end with apply pin bore. Install band anchor hole plug.

DRIVEN SPROCKET SUPPORT**Inspection**

1. Inspect driven sprocket support and sleeve for damage. Ensure sleeve is tight in bore and aligns with holes in support. Inspect driven sprocket support bushing and bearing assembly for damage and wear. See **Fig. 16**.
2. Pull out bearing assembly using slide hammer and Bearing Remover (J-26941). Using Bearing Installers (J-28677 and J-8092), install bearing with identification facing up.
3. Check bearing race on driven sprocket. If race needs replacement, replace driven sprocket support. Inspect seal rings for nicks or cuts. Replace worn or damaged components as needed.

MANUAL SHAFT**Inspection**

1. Inspect manual valve rod, rod retainer and detent lever for damage. See **Fig. 16**. Check threads of manual shaft, and file any raised edges.
2. Inspect parking lock actuator rod for damage or broken retainer lugs. If removed, install parking lock actuator rod into manual shaft lever. Use a 3/16" drift and install roll pin into detent lever. Tap nail into place.

DRIVE LINK ASSEMBLY (CHAIN, SPROCKETS & TURBINE SHAFT)**Inspection**

1. Inspect drive chain for damage. With drive link assembly installed, check chain slack. If slack is more than 7/8", replace drive chain.
2. Inspect driven sprocket thrust bearing race. See **Fig. 38**. If damaged, replace driven sprocket, drive sprocket (flat side up) and drive support bearing assembly. Inspect drive sprocket teeth for nicks, burrs, scoring and wear.
3. Check internal splines for nicks, burrs and excessive wear. Inspect turbine shaft for excessive wear or damage. Inspect turbine shaft seal ring grooves and seal rings for damage.
4. **DO NOT** remove seal rings unless they are being replaced. If turbine shaft seal ring removal is necessary, carefully cut old seals from turbine shaft.
5. To install new seals, use Seal Installer (J-29569-1) for 2 seal rings on valve body side of sprocket. Use Seal Installer (J-29829-1) for seal ring on case side of sprocket.
6. Use Sizer (J-29569-2) on 2 seal rings on valve body side of sprocket. Use Seal Installer (J-29829-2) on seal ring on case side of sprocket. Push sizer down over seal and turn. Remove sizer, and inspect seal to ensure it is seated in groove.

CASE COVER

NOTE: DO NOT disassemble case cover unless repair or replacement of cover or components is necessary.

Disassembly

1. Remove detent spring/roller assembly retaining screw, and remove spring/roller assembly. Remove 2 thermostatic roll pin retainers. Remove thermostatic element and plate. Remove axle oil seal and guard if necessary.
2. Using a drift, drive out manual valve cup plug. Carefully withdraw manual valve. **DO NOT** use manual valve to drive out cup plug.

Inspection

1. Inspect case cover and threads for damage. Inspect vent assembly for damage and clogging. Check manual valve movement.
2. Check manual valve electrical connector and replace if necessary. Inspect manual detent spring and roller assembly. Check case cover sleeve. Ensure hole in sleeve aligns with case cover passages that intersect case cover (pump shaft) bore.
3. Inspect 1-2 accumulator piston seals for damage and free fit in grooves. Inspect thermostatic element for damage or distortion. Inspect vent assembly and cooler line connectors for damage. Replace components if necessary.

Reassembly

1. Using Seal Installer (J-26938 or J-29130), install new axle oil seal and seal guard. Install detent spring and roller assembly. If 1-2 accumulator piston seal was removed, install new seal ring. Install 1-2 accumulator piston (flat side down).
2. Install 1-2 accumulator piston pin. Install manual valve assembly with small diameter first. Using a 3/8" drift, replace manual valve cup plug. Coat cup plug with sealant before installation. With new "O" ring on electrical connector, install connector with tab located at case slot.
3. If removed, install thermostatic element roll pins into case. Using Roll Pin Height Checker (J-29023), adjust installed height of center roll pin to .24" (6 mm). See **Fig. 30** . Recheck thermostatic element roll pin installed height. Install thermostatic element plate.
4. Install thermostatic element onto roll pins. Place Roll Pin Height Checker (J-29023) against roll pin, between case surface and thermostatic element.
5. Install roll pin retainers, and tap down onto roll pins until element contacts touch. Set roll pin washer height after installing and setting center roll pin height.
6. Set roll pin retainer height to .21" (5.3 mm). See **Fig. 31** . Adjustment is important for thermostatic element operation. Thermostatic element controls fluid level in control valve cover oil sump.

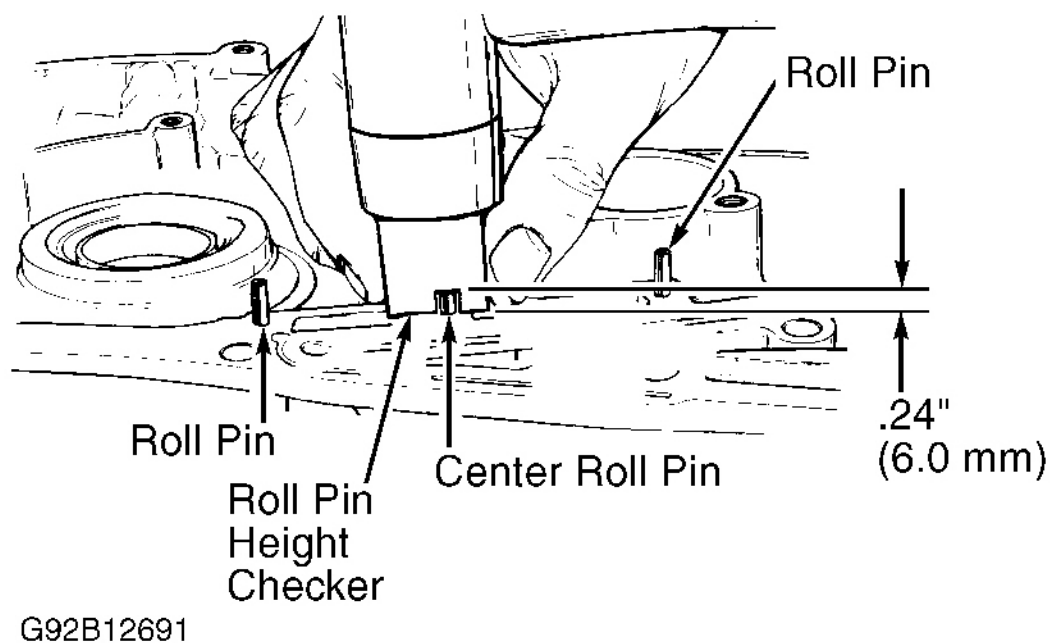
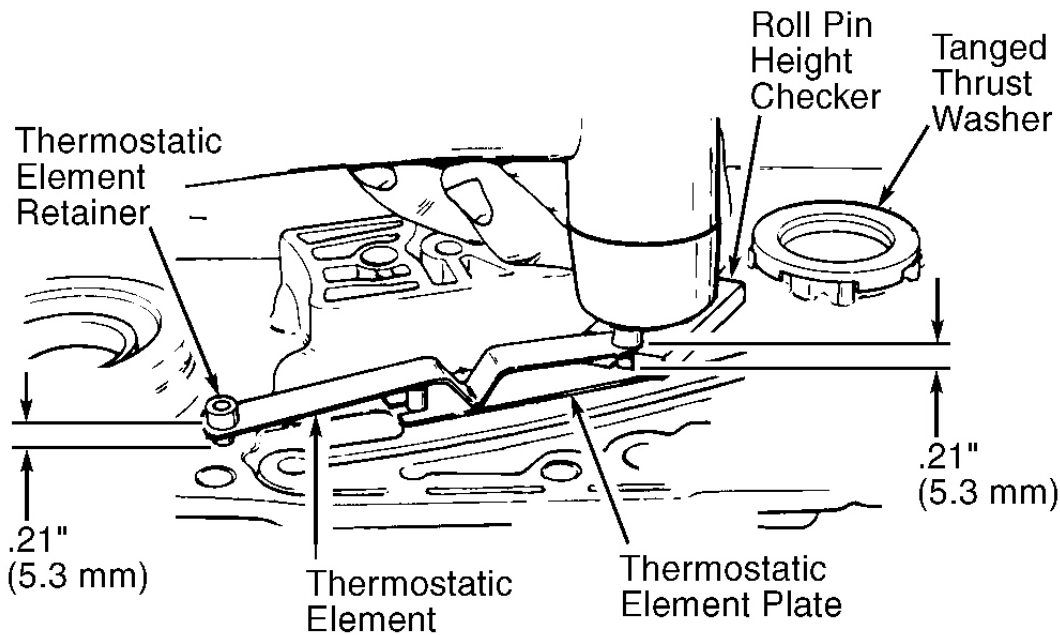


Fig. 30: Measuring Center Roll Pin Installed Height
Courtesy of GENERAL MOTORS CORP.



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Fig. 31: Adjusting Roll Pin Retainer Height

Courtesy of GENERAL MOTORS CORP.

CONTROL VALVE BODY & OIL PUMP ASSEMBLIES

NOTE: As valve components are removed from valve body bore, place individual parts, in correct order, in relative position to valve body. Valves, bushings and springs are not interchangeable. See [Fig. 32](#) .

Disassembly

1. Position control valve body with cored face up and line boost valve at top. Remove roll pins. Pull all blind hole roll pins from valve body. If valve body is cleaned in solvent, low blow-off assembly must be replaced.

CAUTION: Many roll pins in valve body have pressure exerted against them. Use caution when removing pins.

2. Remove auxiliary valve body cover screw, auxiliary valve body, gasket and cover. Remove pump slide, rotor, vanes and vane rings.

CAUTION: DO NOT service oil pump rotor if pump pocket or auxiliary valve body/pump cover surfaces are scored. Service oil pump rotor and slide

ONLY if selective pump rotor, pump drive shaft or pump slide is worn.

Inspection

1. Clean all components. **DO NOT** clean pump seals in solvent. Check all parts for wear or damage.
2. Replace pump shaft bearing assembly using Bearing Remover/Installers (J-28698 and J-7092-2). Drive bearing out toward case cover side. Using bearing installers, press bearing and seal assembly flush to .012" (.3 mm) below pump pocket.
3. Measure the pump rotor and/or slide thickness. Measure on flat, undamaged surface. Use original measurement when obtaining replacement parts. Pump rotor thicknesses range from .7052-.7071" (17.912-17.962 mm) in .0005" (.013 mm) increments. Hone both sides of replacement rotor and/or slide to remove burrs.

Reassembly

1. Install pump slide into pump pocket. Install pump slide seal and seal support. Use petroleum jelly to retain slide parts.
2. Align slide with pump slide pivot hole, and install pump slide pivot pin. Install vane ring and pump rotor into pump pocket. Install pump vanes into pump.
3. Ensure pump vane wear pattern is against centering ring, and each pump vane is seated flush with rotor. Install top vane ring and slide "O" ring seal in pump slide.
4. Install pump slide-to-auxiliary valve body oil seal ring. Check auxiliary valve body sleeve for damage. Install auxiliary valve body, gasket and cover. Align pump rotor step with auxiliary valve body sleeve. To complete reassembly, reverse disassembly procedure. See **Fig. 32**.

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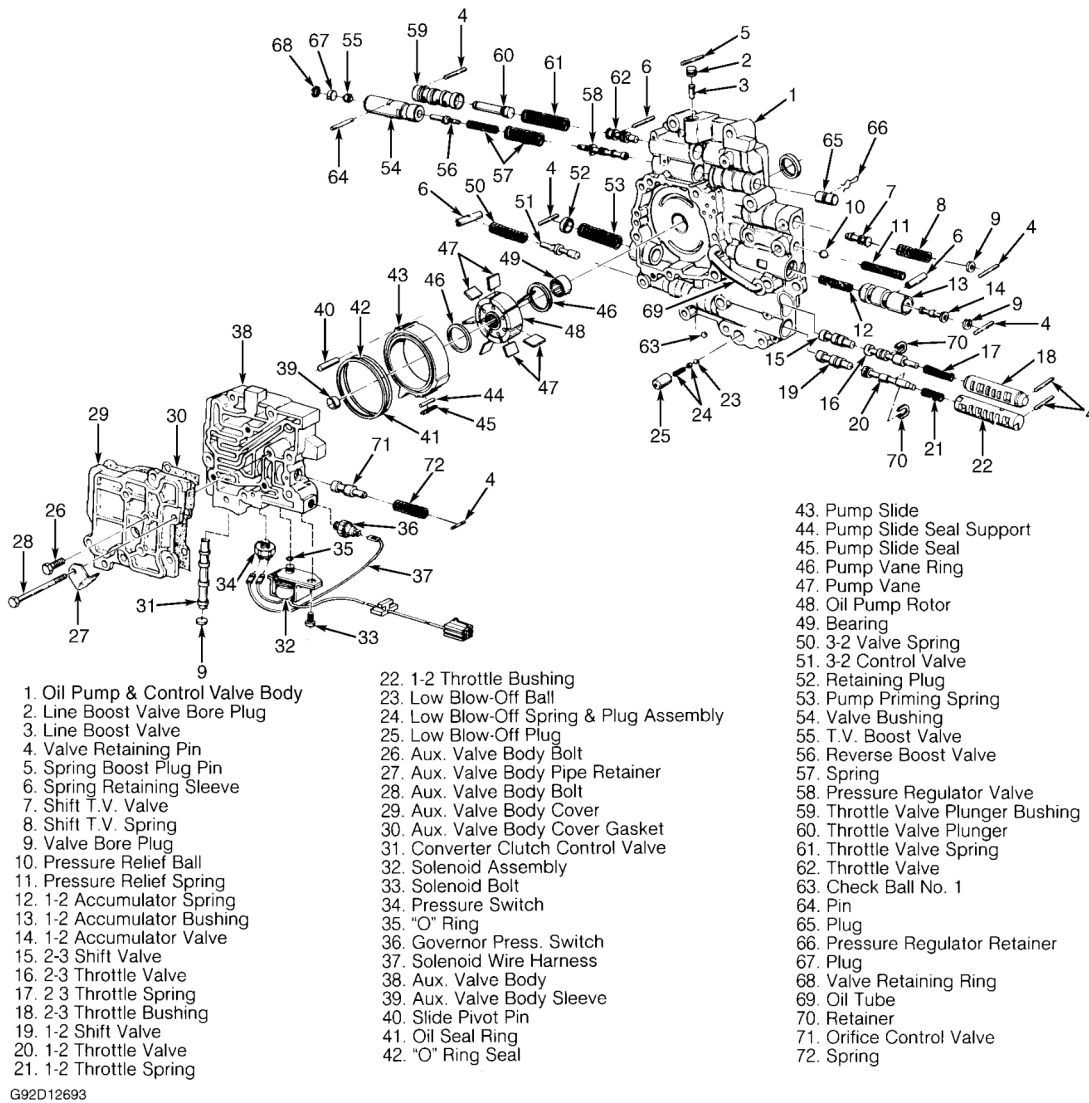
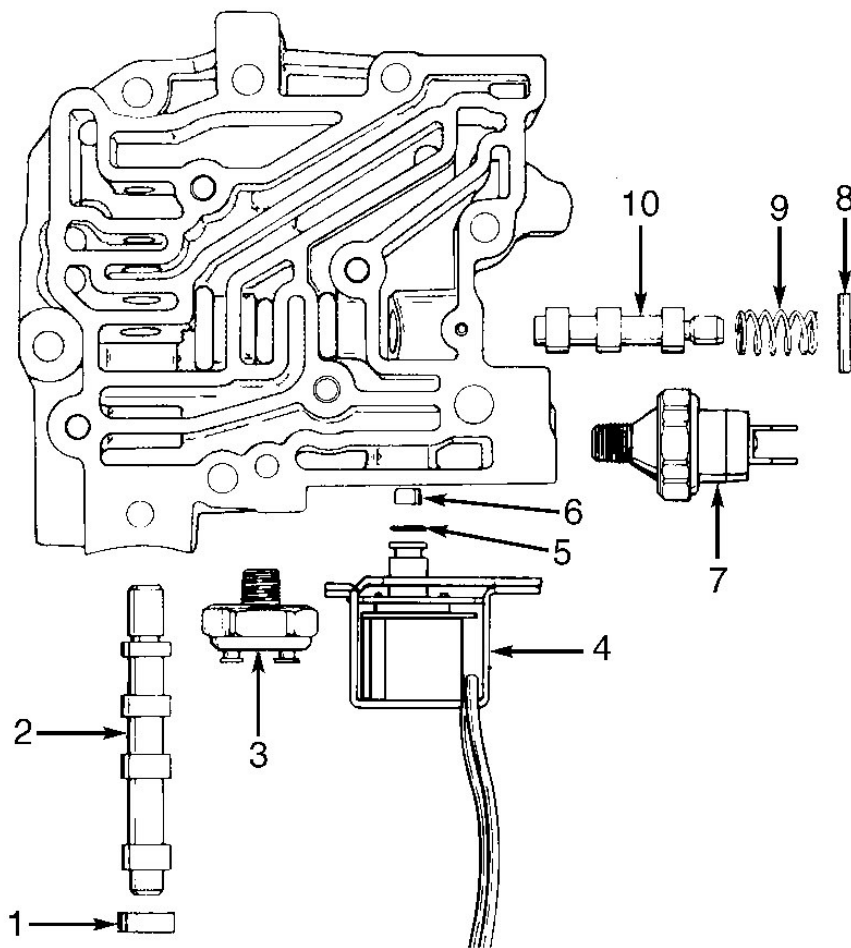


Fig. 32: Exploded View of Control Valve Body & Oil Pump Assembly
 Courtesy of GENERAL MOTORS CORP.



1. Valve Bore Plug
2. Converter Clutch Control Valve
3. Pressure Switch
4. Solenoid
5. "O" Ring Seal
6. Orifice Cup Plug
7. Governor Pressure Switch
8. Retaining Pin
9. Orifice Control Valve Spring
10. Orifice Control Valve

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Fig. 33: Identifying Auxiliary Valve Body Components
 Courtesy of GENERAL MOTORS CORP.

AUXILIARY VALVE BODY

Disassembly

Remove auxiliary valve body components. See **Fig. 32** or **Fig. 33** . Keep parts in order for reassembly reference.

Inspection

Clean all parts, except solenoid and switches, in solvent. Inspect all parts for wear or damage.

Reassembly

1. To reassemble, reverse disassembly procedure. Ensure auxiliary valve body sleeve is aligned with step in pump rotor. Before installing solenoid, locate metal clip attached to valve body and discard. Install solenoid with new "O" ring and plastic wire routing clip. Install cover gasket and screw.
2. Ensure valve body bolt sizes are correct. Coat threads of bolt "F" with sealant before installation. See **Fig. 42** . Tighten bolts to specifications. See **TORQUE SPECIFICATIONS** .

INTERMEDIATE SERVO**Disassembly**

Remove snap ring from apply pin (if not previously done). Separate intermediate servo piston, spring retainer and apply pin. Remove and discard "O" ring seals. See **Fig. 34** . Check all parts for wear or damage.

Reassembly

Intermediate servo is assembled during transaxle assembly. See **TRANSAXLE REASSEMBLY** .

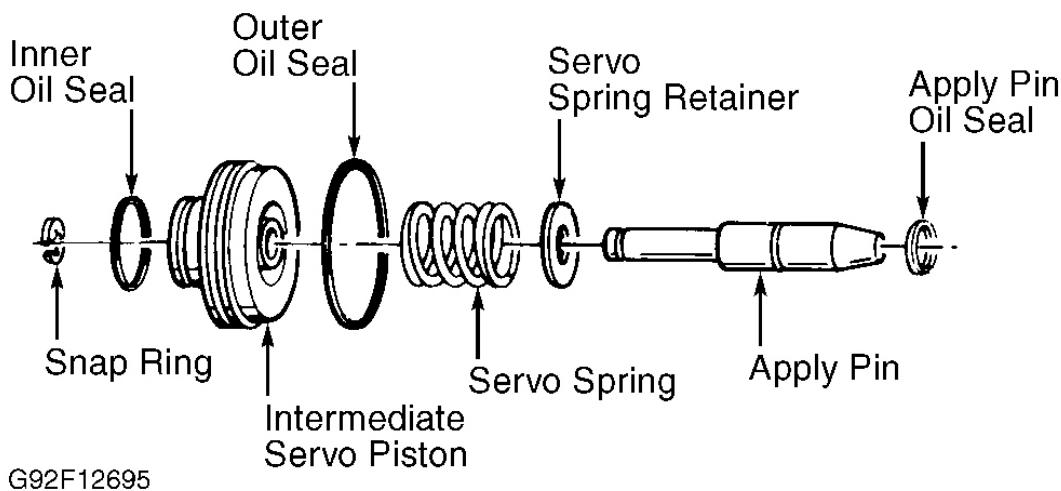
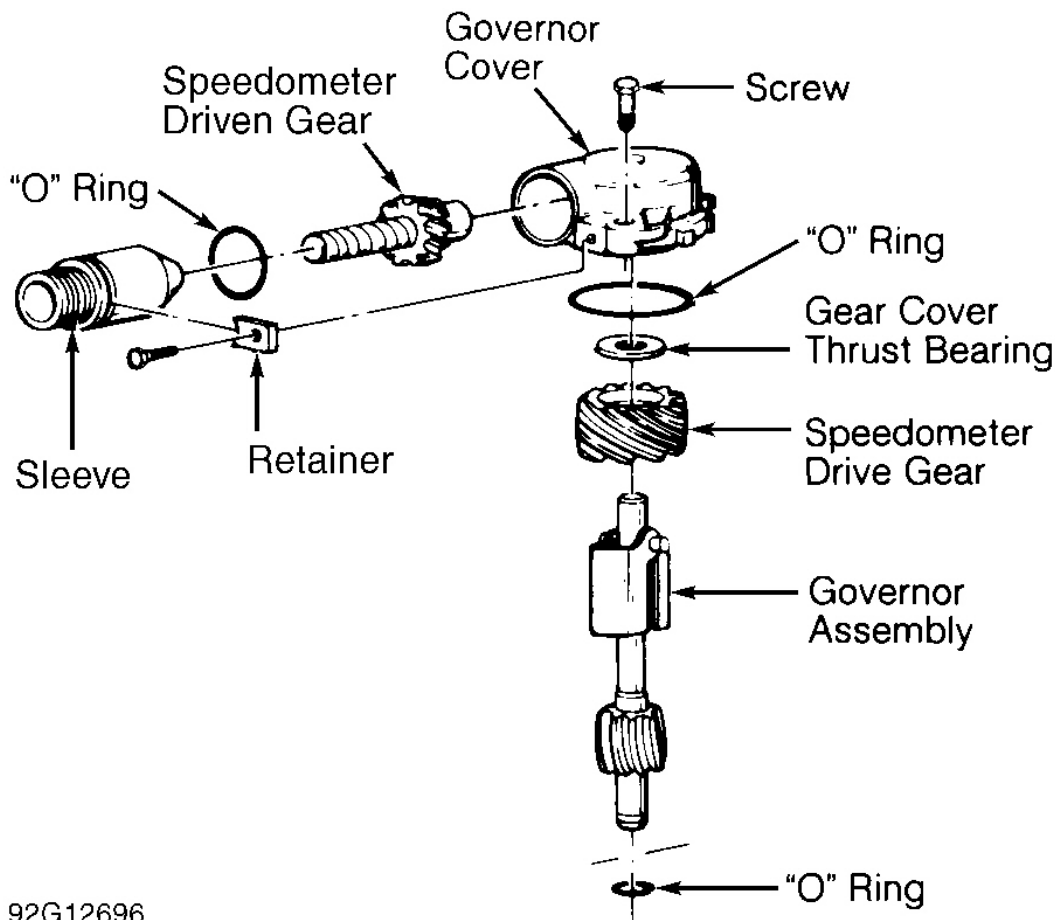


Fig. 34: Exploded View of Intermediate Servo Assembly
Courtesy of GENERAL MOTORS CORP.

GOVERNOR/SPEEDOMETER GEAR OR GOVERNOR/SPEED SENSOR ASSEMBLY

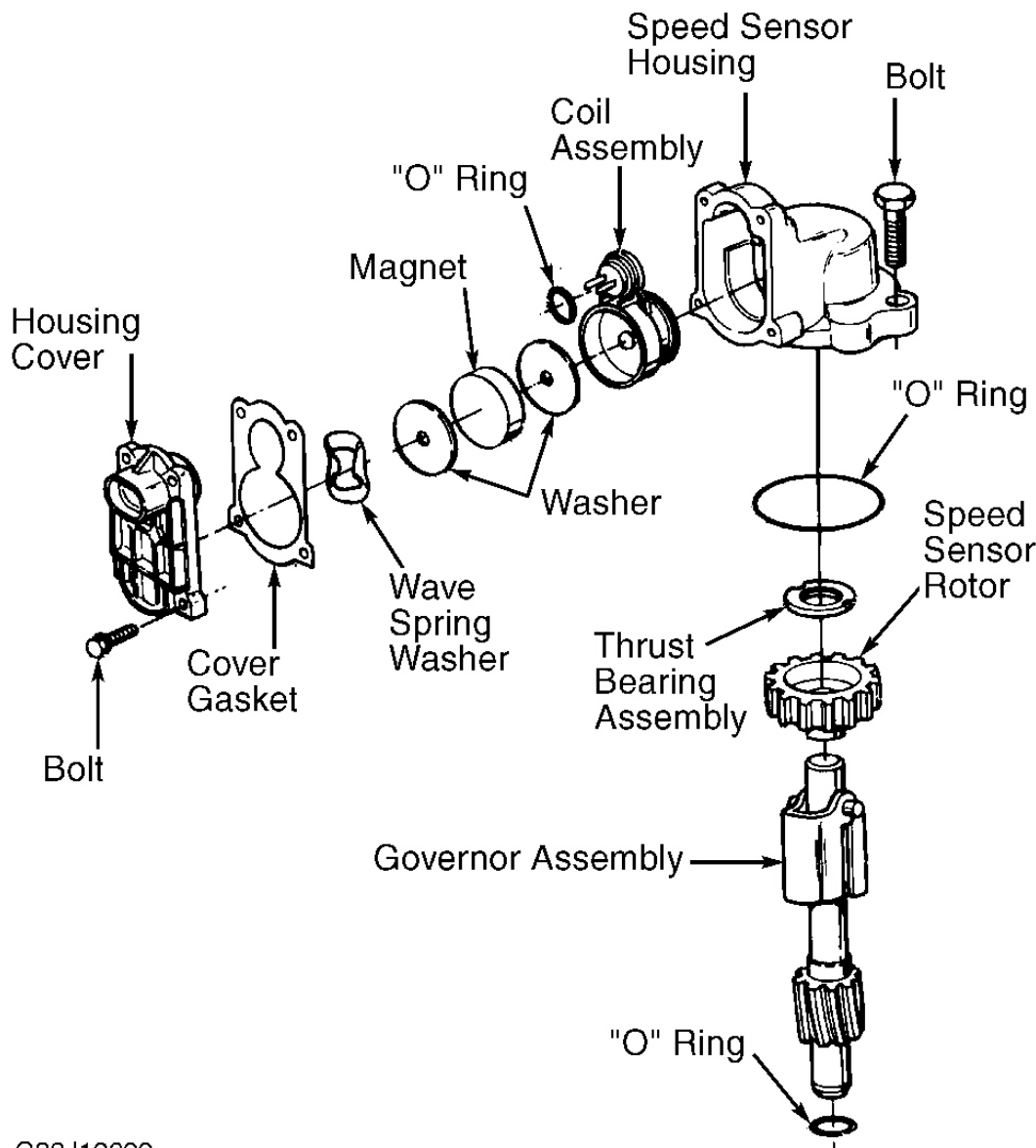
Inspection

1. Check governor assembly for wear or damage. Ensure governor weights operate freely and independently of each other. Check for damaged, mispositioned or tilted springs.
2. Install governor cover with new "O" ring. Ensure governor shaft is piloted in cover before tightening retaining bolts. Install speedometer drive gear/speed sensor housing. See **Fig. 35** or **Fig. 36**.



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Fig. 35: Exploded View of Governor/Speedometer Gear Assembly
Courtesy of GENERAL MOTORS CORP.

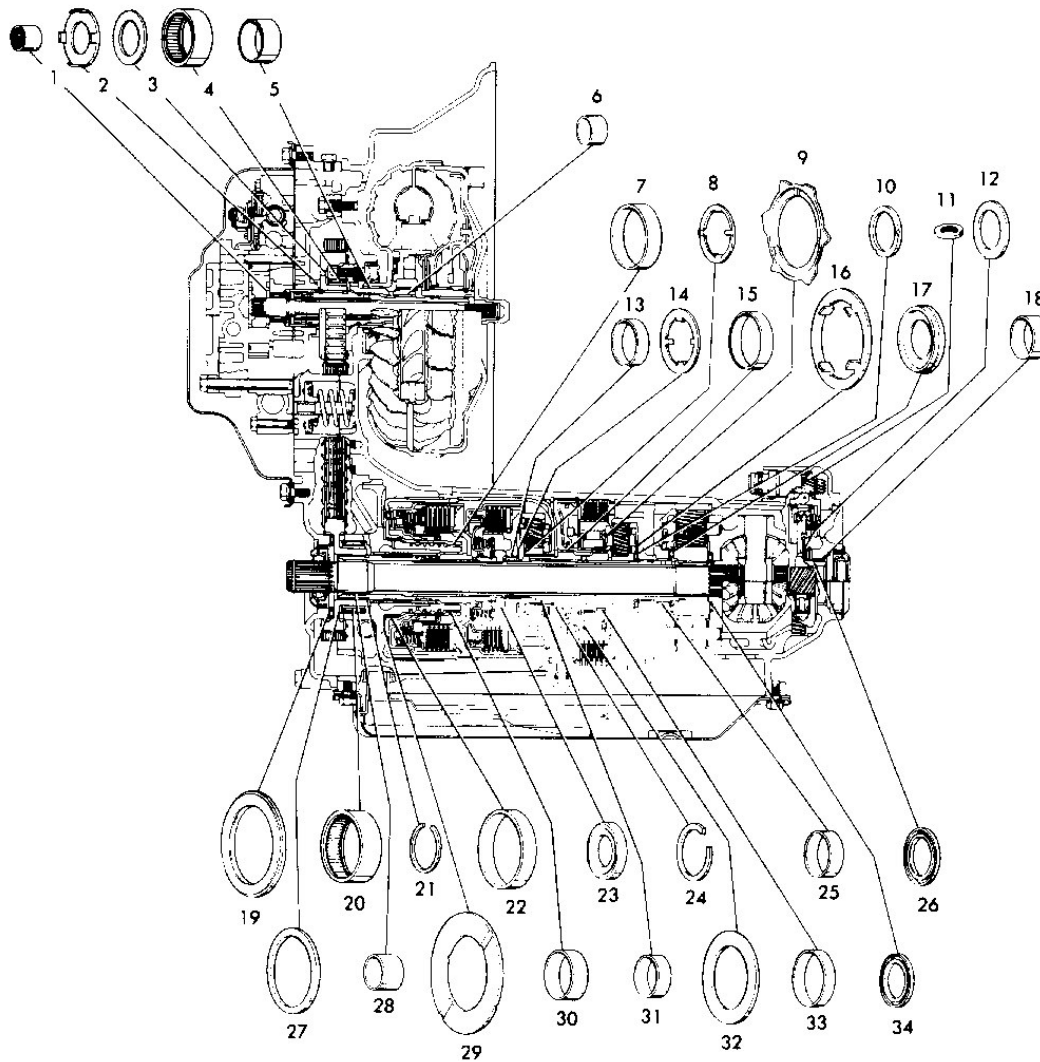


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Fig. 36: Exploded View of Governor/Speed Sensor Assembly
Courtesy of GENERAL MOTORS CORP.

TRANSAXLE REASSEMBLY

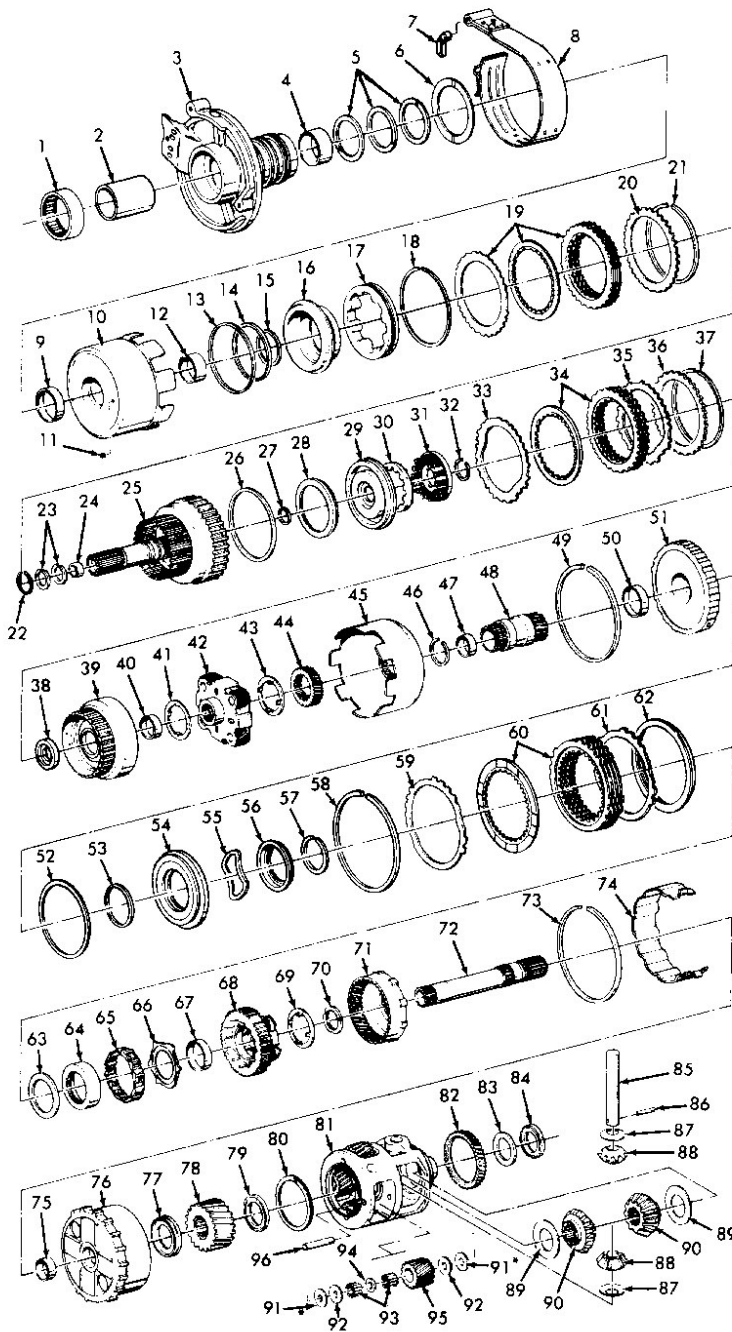
NOTE: Note location of all gear sets, clutch plates, thrust bearings, thrust washers and bushings. See [Fig. 37](#) and [Fig. 38](#) . Recheck snap ring and thrust washer measurements taken during disassembly. See appropriate procedures under [TRANSAXLE DISASSEMBLY](#) .



- | | |
|--|---|
| 1. Pump Shaft Bearing Assembly | 19. Driven Sprocket Thrust Bearing Assembly |
| 2. Case Cover-To-Driven Sprocket Thrust Washer | 20. Driven Sprocket Support Sleeve |
| 3. Drive Sprocket Support-To-Drive Sprocket Washer | 21. Selective Snap Ring |
| 4. Drive Sprocket Support Bearing Assembly | 22. Direct Clutch Bushing |
| 5. Converter Bushing | 23. Input Shaft Thrust Washer |
| 6. Drive Sprocket Support Bushing | 24. Selective Snap Ring |
| 7. Direct Clutch Drum Bushing | 25. Case Bushing |
| 8. Input Carrier-To-Input Sun Gear Thrust Washer | 26. Differential Case Thrust Bearing Assembly |
| 9. Reaction Carrier-To-Low Race Thrust Washer | 27. Driven Sprocket Support Thrust Washer |
| 10. Reaction Sun Gear-To-Internal Gear Thrust Bearing | 28. Input Shaft Bushing |
| 11. Thrust Bearing Assembly | 29. Thrust Washer |
| 12. Differential Carrier-To-Case Selective Thrust Washer | 30. Driven Sprocket Support Bushing |
| 13. Input Internal Gear Bushing | 31. Reaction Sun Gear Bushing |
| 14. Input Carrier-To-Input Internal Gear Thrust Washer | 32. Reverse Housing-To-Low Race Selective Thrust Washer |
| 15. Reaction Carrier Bushing | 33. Reaction Carrier Bushing |
| 16. Reaction Carrier-To-Internal Gear Thrust Washer | 34. Sun Gear-To-Carrier Thrust Bearing |
| 17. Sun Gear-To-Internal Gear Thrust Bearing | |
| 18. Case Bushing | |

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Fig. 37: Locating Thrust Bearing, Thrust Washer & Bushing
 Courtesy of GENERAL MOTORS CORP.



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Fig. 38: Exploded View of Gear Sets & Clutch Plates
 Courtesy of GENERAL MOTORS CORP.

LEGEND FOR FIGURE 38

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Item No.	Component
1	Driven Sprocket Support Bearing
2	Driven Sprocket Support Sleeve
3	Driven Sprocket Support Assembly
4	Driven Sprocket Support Bushing
5	Driven Sprocket Support Ring Oil Seals
6	Driven Sprocket Support-To-Washer
7	Band Anchor Hole Plug
8	Intermediate Band
9	Direct Clutch Housing Bushing
10	Direct Clutch Housing & Drum
11	Direct Clutch Check Valve Retainer & Ball Assembly
12	Direct Clutch Drum Bushing
13	Direct Clutch Piston Outer Lip Seal
14	Direct Clutch Center Lip Seal
15	Direct Clutch Piston Inner Lip Seal
16	Direct Clutch Piston
17	Apply Ring & Release Spring Assembly
18	Snap Ring
19	Direct Clutch Plate Assembly
20	Direct Clutch Backing Plate
21	Snap Ring
22	Selective Input Shaft Snap Ring
23	Input Shaft Seal Rings
24	Input Shaft Bushing
25	Forward Clutch Housing Assembly
26	Forward Clutch Piston Outer Lip Seal
27	Forward Clutch Piston Inner Lip Seal
28	Forward Clutch Piston Insert
29	Forward Clutch Piston
30	Forward Clutch Release Spring Guide
31	Forward Clutch Retainer & Spring Assembly
32	Forward Clutch Snap Spring Retainer Ring
33	Forward Clutch Waved Plate
34	Forward Clutch Plate Assembly
35	Forward Clutch Waved Plate
36	Forward Clutch Backing Selective Plate
37	Snap Ring
38	Input Shaft Thrust Washer
39	Input Internal Gear
40	Input Internal Gear Bushing
41	

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	Input Carrier/Input Internal Gear Tanged Thrust Washer
42	Input Carrier Assembly
43	Input Carrier/Input Sun Gear Tanged Thrust Washer
44	Input Sun Gear
45	Input Drum
46	Selective Input Drum/Sun Gear Snap Ring
47	Reaction Sun Gear Bushing
48	Reaction Sun Gear
49	Case Splines Snap Ring (Thick)
50	Reaction Carrier Bushing
51	Low-Reverse Clutch Housing Assembly
52	Low-Reverse Piston Outer Lip Seal
53	Low-Reverse Piston Inner Lip Seal
54	Low-Reverse Clutch Piston
55	Low-Reverse Clutch Release Spring
56	Low-Reverse Clutch Spring Retainer
57	Low-Reverse Piston Snap Ring
58	Case Splines Snap Ring (Thin)
59	Low-Reverse Clutch Waved Plate
60	Low-Reverse Clutch Plate Assembly
61	Low-Reverse Clutch Waved Plate
62	Low-Reverse Clutch Backing Selective Plate
63	Reverse Housing/Low Roller Race Selective Spacer
64	Low Roller Clutch Race
65	Low Roller Clutch Roller Assembly
66	Reaction Carrier/Low Roller Race Thrust Washer
67	Reaction Carrier Bushing
68	Reaction Carrier Assembly
69	Reaction Carrier/Reaction Internal Gear 4-Tanged Thrust Washer
70	Reaction Sun/Reaction Internal Gear Thrust Bearing
71	Reaction Internal Gear
72	Final Drive Sun Gear Shaft
73	Case Splines Snap Ring (Thick)
74	Final Drive Internal Gear Spacer
75	Final Drive Internal Gear Bushing
76	Final Drive Internal Gear
77	Thrust Sun Gear/Final Drive Internal Gear Bearing
78	Final Drive Sun Gear
79	Thrust Sun Gear/Differential Carrier Bearing
80	Spiral Pinion Retainer Ring
81	Carrier Assembly Differential
82	

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	Governor Drive Gear
83	Selective Differential Carrier/Case Thrust Washer
84	Differential Carrier/Case Thrust Bearing Assembly
85	Differential Pinion Shaft
86	Differential Pinion Shaft Retainer Pin
87	Differential Pinion Thrust Washer
88	Differential Pinion
89	Differential Side Gear Thrust Washer
90	Differential Side Gear
91	Pinion Thrust Washer * Bronze (Steel For Replacement)
92	Pinion Thrust Washer (Steel)
93	Needle Bearing Roller
94	Pinion Needle Bearing
95	Final Drive Planetary Pinion
96	Planetary Pinion Pin

1. Lubricate all bushings, seals, thrust bearings and internal mating surfaces with transmission fluid during reassembly. Use petroleum jelly to hold thrust washers in place.
2. Install selected differential carrier/case thrust washer. See **Fig. 19** . Install thrust bearing assembly to final drive unit (inner race of bearing against selective washer). Install differential and final drive assembly into case.
3. Install final drive internal gear spacer (cupped side against final drive internal gear). Ensure opening in spacer aligns with parking pawl opening in case. Ensure parking pawl passes through spacer.
4. Install final drive spacer-to-case snap ring with ring gap away from parking pawl opening in case. Install reaction sun gear set into case. See **Fig. 21** .
5. Install low-reverse clutch backing plate (stepped side down) and clutch plates into case. See **Fig. 21** . Start with a composition plate, and then alternate between steel and composition plates.
6. Install low-reverse clutch wave plate and thin housing-to-case spacer ring. Install low-reverse clutch housing assembly into transaxle case. See **Fig. 21** . Ensure clutch feed hole in housing lines up with clutch feed hole in case.
7. Install selective snap ring onto reaction sun gear. Install reaction sun gear onto final drive sun gear shaft in transaxle. See **Fig. 21** and **Fig. 24** . Rotate reaction sun gear while pushing down on low-reverse clutch housing until clutch housing drops below snap ring groove in case.
8. Install thick low-reverse clutch housing-to-case snap ring. See **Fig. 21** . Install input drum onto reaction sun gear. See **Fig. 24** . Install input sun gear into input drum. Install input sun gear tang thrust washer to pinion side of carrier.
9. Install input internal gear tang thrust washer to internal gear side of carrier (input internal gear tang thrust washer is larger than input sun gear tang thrust washer). See **Fig. 24** . Install input pinion carrier onto input sun gear.
10. Install input internal gear over input carrier. Place forward clutch assembly on bench with input shaft up. Install direct clutch assembly over input shaft, onto forward clutch housing. When clutch housings are fully seated, distance from tang end of direct clutch housing to end of forward clutch housing should be 1.406" (35.71 mm). See **Fig. 39** .

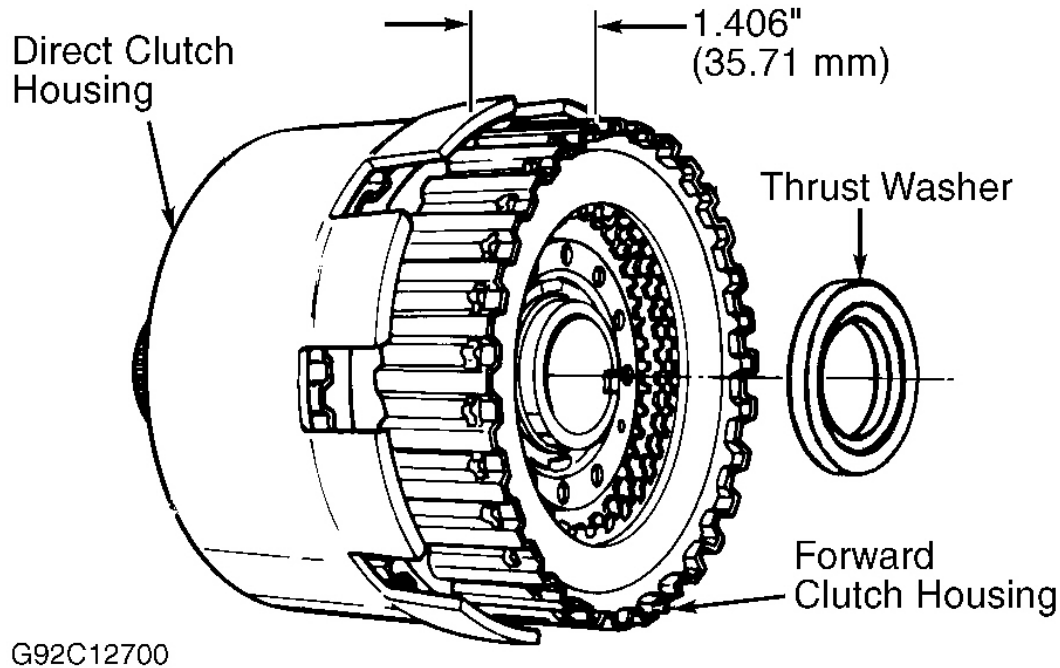


Fig. 39: Measuring Forward Clutch-to-Direct Clutch Height
 Courtesy of GENERAL MOTORS CORP.

11. Install input shaft-to-input internal gear thrust washer onto forward and direct clutch assembly. See **Fig. 24** and **Fig. 37** . Ensure rounded side is against input shaft, and stepped side faces outward, onto forward and direct clutch assembly.
12. Install direct and forward clutch assemblies into case. Rotate clutch assemblies, without pushing down, until they drop into fully seated position in case. When correctly installed, case face-to-direct clutch housing distance should be 1 1/6". See **Fig. 40** .

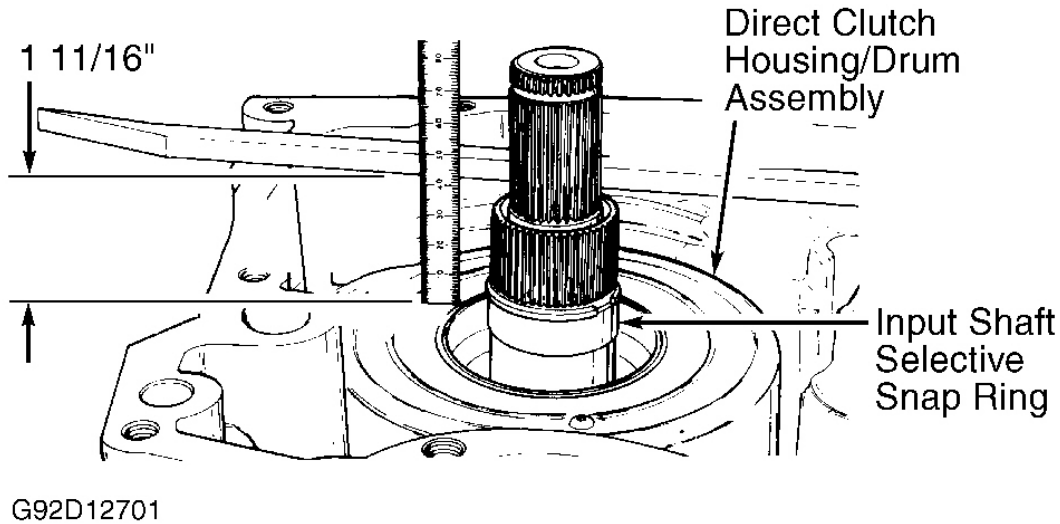
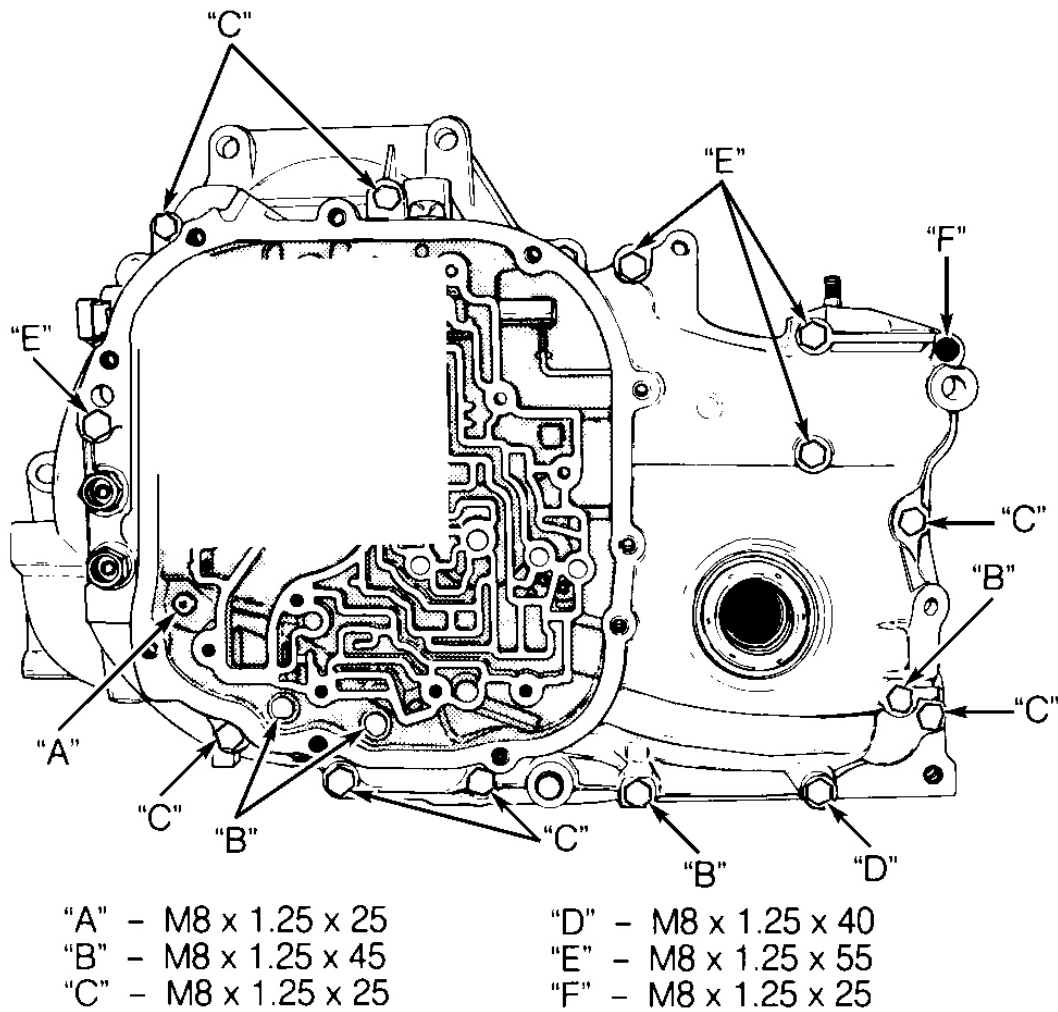


Fig. 40: Installed Position of Direct & Forward Clutch
Courtesy of GENERAL MOTORS CORP.

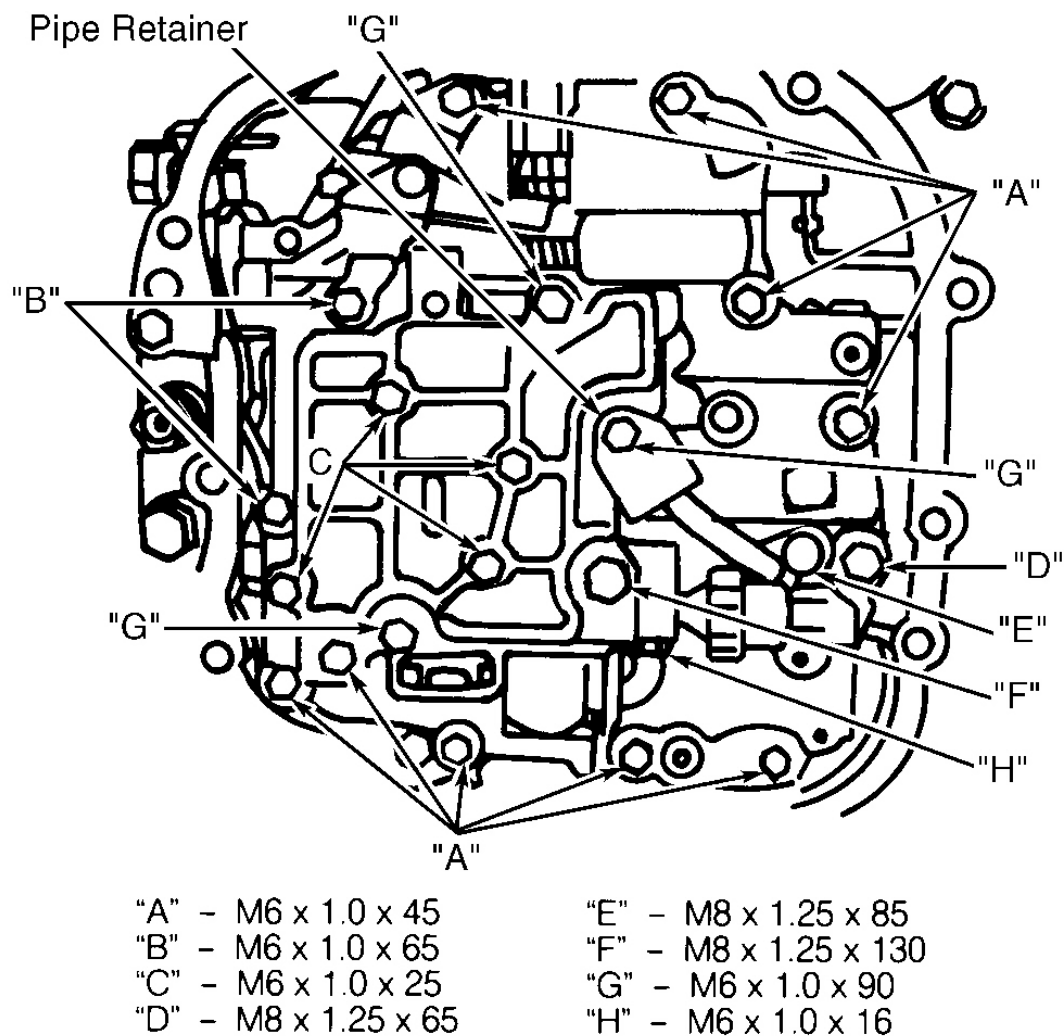
13. Install intermediate band. Install band anchor hole plug. Install driven sprocket support-to-direct clutch housing thrust washer. Install driven sprocket support. See **Fig. 16**.
14. Install manual shaft and parking lock actuator rod into case through driven sprocket support. Install detent lever on manual shaft (hub side away from driven sprocket support), and push manual shaft in place. Install detent lever-to-manual shaft retaining pin. Install manual shaft-to-case retaining nail. See **Fig. 16**.
15. Assemble drive and driven sprockets with link assembly, and install drive and driven thrust washers to sprockets. Install drive link assembly onto transaxle. See **Fig. 2**. The colored guide link must face case cover.
16. Install case cover-to-driven sprocket roller bearing thrust washer (outer race against sprocket). Install 1-2 accumulator piston. Install thermostatic spring (if removed). See **CONTROL VALVE BODY & OIL PUMP ASSEMBLIES** under COMPONENT DISASSEMBLY & REASSEMBLY.
17. Install 1-2 accumulator spring into bore in case. Install inner and outer case-to-cover gaskets and case cover. Install and tighten all case cover bolts. See **Fig. 41**. Install 2 case cover bolts from inside torque converter housing (M8 x 1.25 x 14 mm). Install remaining case cover bolts. The 3 bolts that mate sprocket support-to-case cover must be tightened evenly to avoid cocking sprocket support.
18. Connect manual valve rod to manual valve. Install check balls No. 2-6 into case cover. See **Fig. 13**.
19. Install No. 1 check ball on direct clutch passage on spacer plate. Install oil pump shaft into bore in case cover. Install 2 guide pins (M6 x 1.0 x 75 mm) in case cover-to-valve body bolt holes.
20. Install control valve body and along with bolts and tighten. See **Fig. 42**. Install valve body wiring harness. See GM TORQUE CONVERTER CLUTCH article in AUTOMATIC TRANSMISSIONS article for information on converter clutch system. Connect lever link to T.V. bracket. Install T.V. bracket onto valve body.
21. Remove guide bolts used to install valve body, and install remaining 2 valve body bolts. Thoroughly clean valve body cover. Install cover with new gasket. Apply Loctite sealant to indicated cover bolts. See

Fig. 43 .



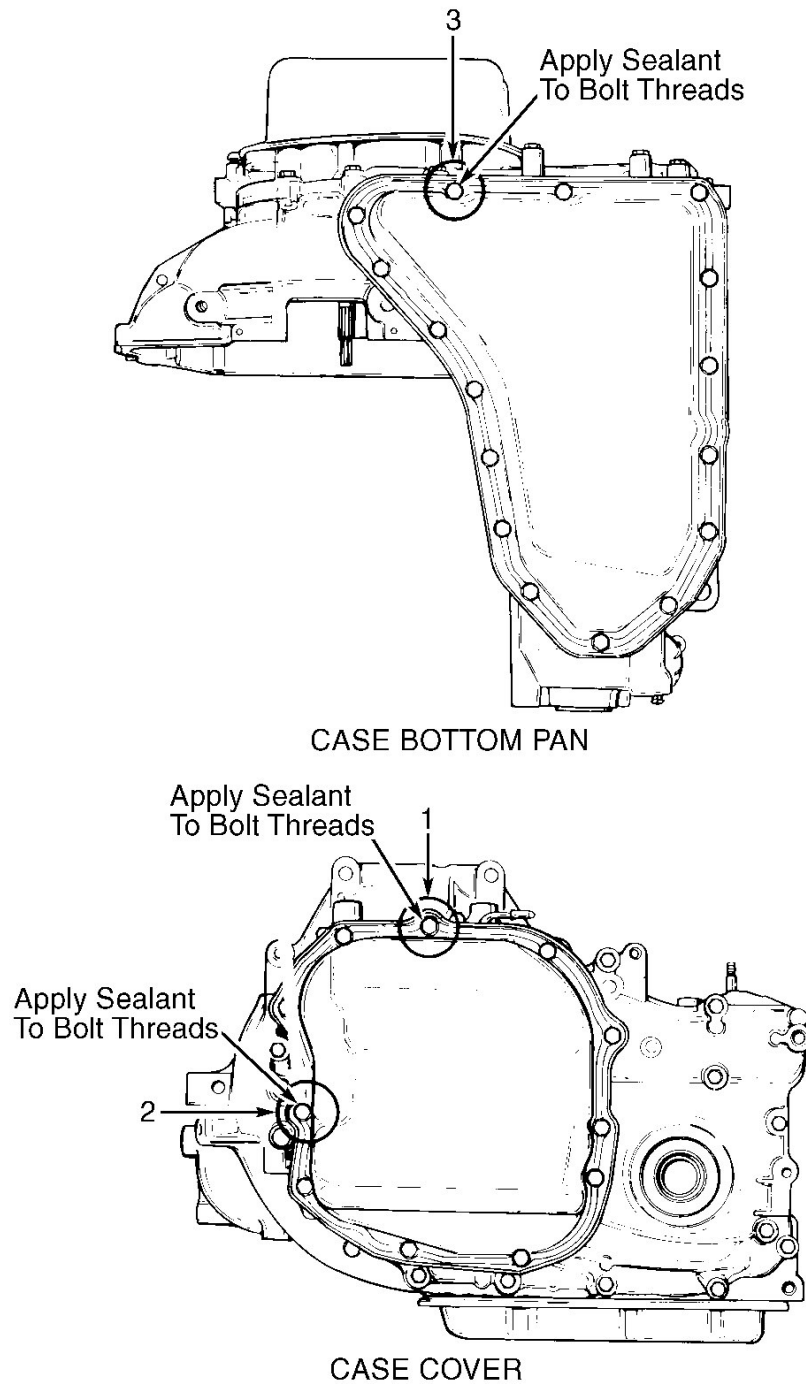
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Fig. 41: Locating Case Cover Bolts
Courtesy of GENERAL MOTORS CORP.



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Fig. 42: Locating Control Valve Body Bolts
 Courtesy of GENERAL MOTORS CORP.



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Fig. 43: Applying Sealant to Case Cover & Oil Pan Bolts
Courtesy of GENERAL MOTORS CORP.

22. Turn transaxle so oil pan side is up. Install output shaft into transaxle. See **Fig. 2** . Rotate final drive so retaining ring groove is visible through access window in case. Install new retaining ring onto shaft

groove.

23. Install parking lock bracket and dipstick stop. Using a 3/8" drift, install new low-reverse oil pipe seal assembly. Install "O" ring backup washer and "O" ring seal onto end of low-reverse pipe. Install pipe and retainer bracket.
24. Install intermediate servo piston assembly. Use new inner and outer oil seals on piston and new seal on apply pin (apply pin size was determined during transaxle disassembly procedure). Install 3rd accumulator exhaust valve and spring into check valve bore next to servo piston. Install intermediate servo cover and 3 bolts. See **Fig. 8**.
25. Install reverse oil pipe bracket to oil pipe and servo cover. Install remaining servo cover bolt through bracket and cover. Tighten servo cover bolts. Install new oil strainer and "O" ring. Install oil pan gasket and oil pan. Apply Loctite sealant to oil pan bolt threads. See **Fig. 43**. Rotate transaxle so oil pan side is down. Install governor assembly. Install new "O" ring to governor cover, and install cover onto case. Install speedometer/speed sensor driven gear assembly into governor cover.
26. Ensure governor shaft is piloted in governor cover before tightening cover bolts. Install torque converter.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Auxiliary Valve Body-To-Case Bolt	
Case Cover-To-Case Bolt	18 (24)
Case-To-Drive Sprocket Support Bolt	18 (24)
M6 Bolt	(1)
M8 Bolt	18 (24)
Cooling Line Connector	26 (38)
Engine-To-Transaxle	55 (75)
Flywheel-To-Torque Converter Bolt	45-59 (61-80)
Parking Lock Bracket-To-Case Bolt	18 (24)
Pipe Retainer-To-Case Bolt	18 (24)
Pump Cover-To-Case Cover Bolt	18 (24)
Upper Bracket-To-Mount	83 (113)
Upper Bracket Mount-To-Transaxle	38 (52)
Valve Body-To-Case Bolt	
M6 Bolt	(1)
M8 Bolt	18 (24)
	INCH Lbs. (N.m)
Governor Cover-To-Case Bolt	96 (11)
Intermediate Servo Cover Bolt	96 (11)
Line Pressure Take-Off Bolt	96 (11)
Manual Detent Spring Assembly-To-Case Bolt	96 (11)
Oil Pan & Valve Body Cover Bolt	96 (11)
Pressure Switch	96 (11)

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Pump Cover-To-Valve Body Bolt	96 (11)
Solenoid-To-Valve Body Bolt	96 (11)
Speedometer Driven Gear-To-Governor Cover Bolt	75 (8)
T.V. Cable-To-Case Bolt	75 (8)
(1) Tighten bolt to 96 INCH lbs. (11 N.m).	