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INTRODUCTION

THM 180 (TRI-MATIC)

We thank GENERAL MOTORS CORPORATION for the information and illustrations that have made this booklet possible. This booklet contains the general description, diagnosis and overhaul procedures necessary to service the THM 180 and 180C (Tri-matic) transmission.

The THM 180 is a rear wheel drive three speed transmission, used in both domestic and foreign vehicles. It consists of three clutch packs, one band and one overrun clutch, along with a compound planetary gearset.

In the converter clutch units, a single disc torque converter clutch has been added to increase overall transmission efficiency and fuel economy.

Through the use of this manual you will be able to more readily service the THM 180, and provide greater customer satisfaction.

ROBERT D. CHERRNAY
Technical Director

C. W. SMITH
Field Service Consultant

AUTOMATIC TRANSMISSION SERVICE GROUP
9300 South Dadeland Blvd.
Suite 312
Miami, Florida 33156

NOTES

NOTES

SECTION 180C

180C AUTOMATIC TRANSMISSION

GENERAL DESCRIPTION

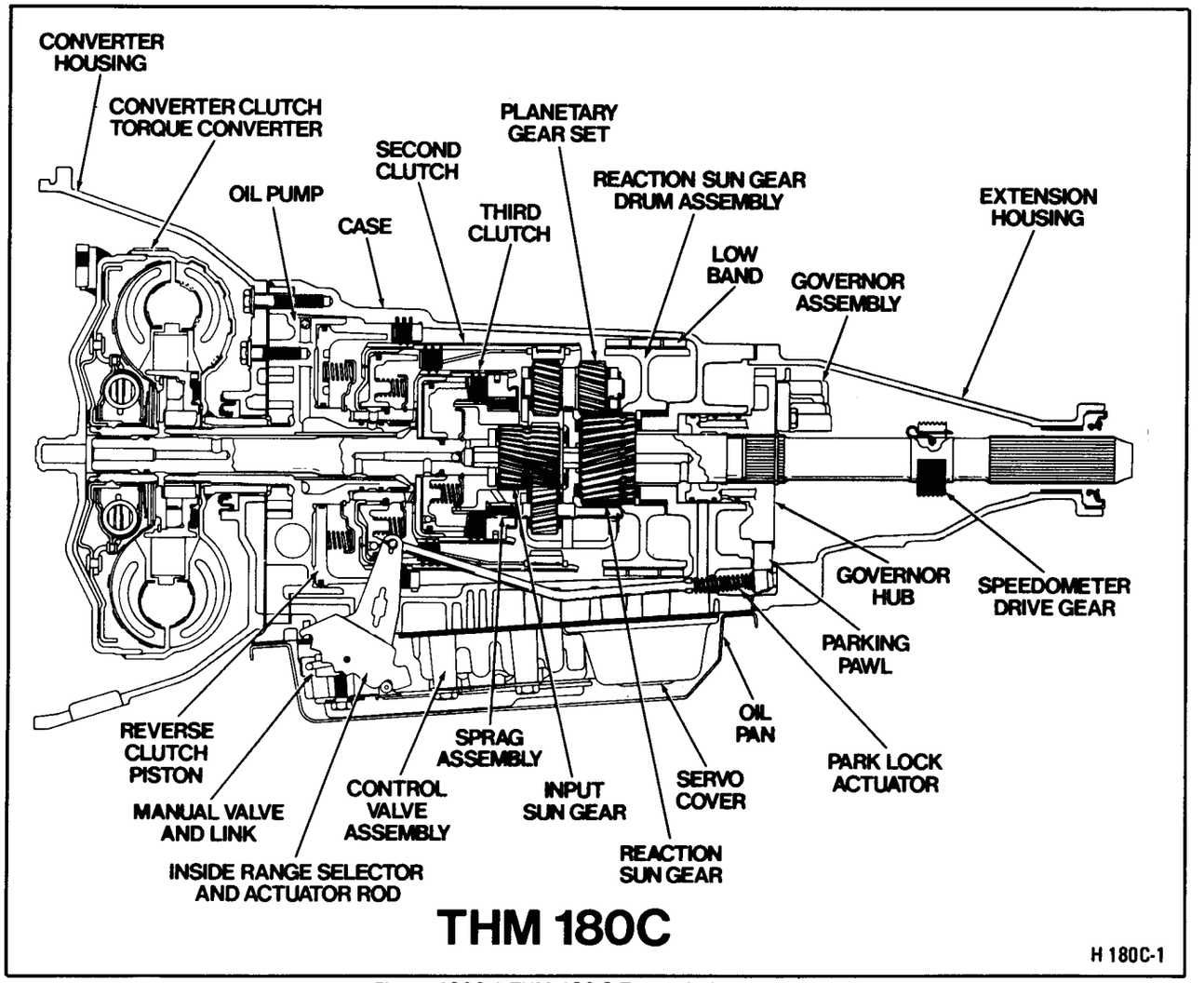

Figure 180C-1 THM 180-C Transmission

The 180C transmission is a fully automatic unit consisting primarily of a 4-element hydraulic torque converter and a compound planetary gear set. Three multiple-disc clutches, a roller clutch, and a band provide the friction elements required to obtain the desired function of the compound planetary gear set. See Figure 1.

A hydraulic system pressurized by a gear type pump provides the working pressure required to operate the friction elements and automatic controls.

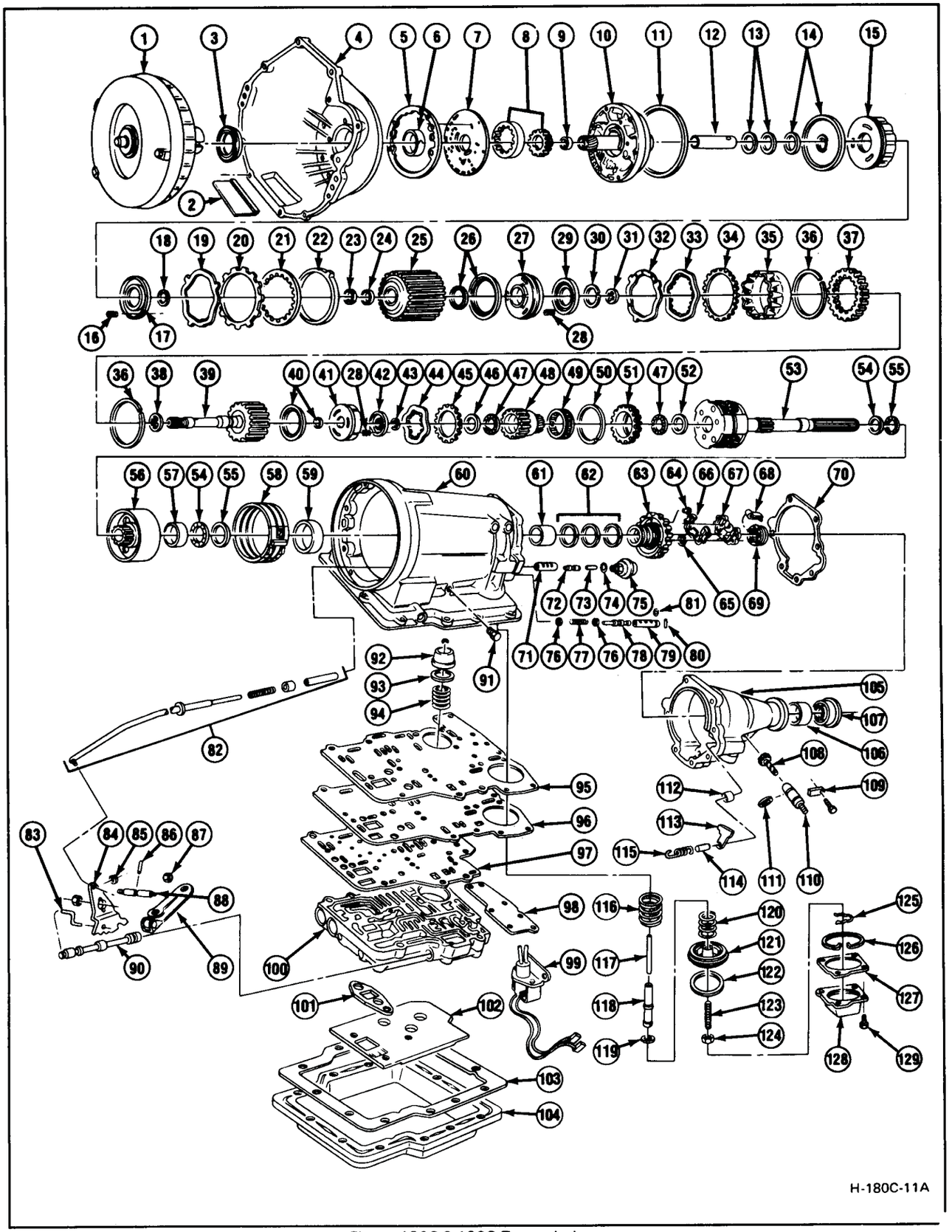

Figure 180C-2 180C Transmission

1. CONVERTER, Trans.
2. PLATE, Converter Housing Protection-Lower
3. SEAL, Converter Hub to Housing
4. HOUSING, Trans. Converter w/Bushing
5. SEAL KIT, Converter Housing w/Gasket
6. BUSHING, Converter Housing
7. PLATE, Trans. Oil Pump Wear
8. GEAR, Oil Pump
9. BUSHING, Oil Pump
10. PUMP, Oil w/Gasket & Wear Plate
11. SEAL KIT, Converter Housing w/Gasket
12. BUSHING, Trans. Oil Pump Housing
13. SEAL, Second Speed Clutch to Oil Pump
14. SEAL KIT, Reverse Clutch Piston Inner & Outer
15. PISTON, Reverse Clutch
16. SPRING KIT, Reverse Clutch Piston Return (24 Springs)
17. SEAT, Reverse Clutch Piston Retaining Spring
18. RING, Reverse Clutch Piston Return Spring Seat Retainer
19. SPRING, Reverse Clutch Cushion w/3 Prongs
20. PLATE, Reverse Clutch Driven
21. PLATE, Reverse Clutch Drive
22. PLATE, Reverse Clutch Pressure
23. THRUST WASHER, Between Oil Pump & Second Speed Clutch
24. BUSHING, Clutch Drum Second Speed
25. CLUTCH DRUM, Second Speed Outer (Includes Bushing)
26. SEAL RING SET, Clutch Piston Second Speed-Inner & Outer
27. Piston, Clutch 2nd Speed (w/5/32" Ball)
28. SPRING KIT, Second Speed Clutch Piston Return (24 Springs)
29. SEAT, Clutch Piston Return Spring Second Speed
30. RING, Clutch Piston Return Spring Seat Retainer Second Speed Snap
31. WASHER, Second & Third Speed Clutch Connection-Thrust (Bronze)
32. PLATE, Clutch Cushion-Second Speed
33. PLATE, Clutch Second Speed-Drive
34. PLATE, Clutch Second Speed-Driven
35. SPACER, Clutch Plate Second Speed
36. RING, Retaining Ring Gear
37. GEAR, Ring
38. WASHER, Second & Third Speed Clutch Connection-Thrust (Steel)
39. DRUM, Clutch Third Speed w/Input Shaft-Inner
40. SEAL SET, Third Speed Clutch Piston Inner & Outer
41. PISTON, Clutch Third Speed w/5/32" Ball
42. SEAT, Clutch Piston Return Spring Third Speed
43. RING, Clutch Piston Return Spring Seat Retainer Third Speed Snap
44. PLATE, Clutch Third Speed-Drive
45. PLATE, Clutch Third Speed-Driven
46. RACE, Input Sun Gear to Input Shaft
47. Bearing, Input Sun Gear
48. Gear, Input Sun
49. SPRAG, Third Speed Clutch Input
50. RING, Clutch Input Sprag Race Retaining Third Speed
51. RACE & RETAINER, Third Speed Clutch Input Sprag
52. RACE, Input Sun Gear to Planetary Carrier
53. CARRIER, Planetary
54. RACE, Sun Gear Reaction
55. BEARING, Sun Gear Reaction
56. GEAR, Reaction Sun w/Drum
57. BUSHING, Input Sun Gear
58. BAND, Low Brake
59. SLEEVE, Reaction Sun Gear Drum Bearing
60. CASE, Trans. w/Bushing
61. BUSHING, Trans. Case
62. RING, Governor Hub-Seal
63. GOVERNOR, Hub
64. SCREEN, Oil Pump Governor
65. RING, Governor Hub to Input Shaft-Snap
66. GASKET, Governor
67. GOVERNOR, Body
68. CLIP, Speedometer Drive Gear
69. GEAR, Speedometer Drive
70. GASKET, Extension to Trans. Case
71. SLEEVE, Vacuum Modulator Valve
72. VALVE, Vacuum Modulator
73. SLEEVE, Vacuum Modulator
74. GASKET, Vacuum Modulator
75. MODULATOR, Vacuum
76. SEAT, Pressure Regulator Valve Spring
77. SPRING, Oil Pump Pressure Regulator Valve
78. VALVE, Oil Pump Pressure Regulator Boost
79. SLEEVE, Oil Pump Pressure Regulator Valve
80. PIN, Pressure Regulator Valve Retainer
81. "O" RING SEAL
82. ACTUATOR, Parking Lock
83. LINK, Trans. Manual Valve Lever
84. LEVER, Trans. Parking Lock
85. RING, Parking Lock Actuator on Lever-Snap
86. PIN, Manual Shaft Plug Lock Trans. Case Side
87. NUT, Parking Lock Lever
88. SHAFT, Parking Lock & Range Selector
89. SPRING, Detent w/Roller
90. VALVE, Trans. Manual
91. PLUG, Pressure Tap
92. PISTON, Trans. Accumulator
93. RING, Accumulator Piston
94. SPRING, Accumulator Piston Thrust
95. GASKET, Transfer Plate to Trans. Case
96. PLATE, Valve Body Transfer (See Parts Catalog)
97. GASKET, Transfer Plate to Valve Body
98. PLATE, Reinf. Oil Pump Suction Transfer
99. SOLENOID
100. BODY, Trans. Valve Complete
101. GASKET, Oil Pump Suction Screen
102. SCREEN, Oil Pump Suction
103. GASKET, Trans. Oil Pan
104. PAN, Trans. Oil
105. EXTENSION, Trans. w/Bushing
106. BUSHING, Trans. Case Extension
107. SEAL, Trans. Case Extension
108. GEAR, Speedometer Driven
109. BRACKET, Speedometer & Guide on Trans.
110. GUIDE, Speedometer Drive
111. RING, Speedometer Drive Gear Seal
112. SLEEVE, Parking Lock Pawl Actuator (in Extension Housing)
113. PAWL, Trans. Parking Lock
114. SHAFT, Parking Lock Pawl in Extension
115. SPRING, Trans. Parking Lock Pawl Disengaging
116. SPRING, Low Servo Piston Return
117. ROD, Low Servo Piston Apply
118. SLEEVE, Low Servo Piston Adjusting
119. SEAT, Low Servo Piston Cushion Spring
120. SPRING, Low Servo Piston Cushion
121. PISTON, Low Servo
122. RING, Low Servo Piston Oil Seal
123. STUD, Low Servo Piston Adjusting
124. NUT, Hex Head Low Servo Piston Adjusting
125. RING, Low Servo Piston Retaining-Inner
126. RING, Low Servo Piston Retaining-Outer
127. GASKET, Low Servo Cover on Trans. Case
128. COVER, Low Servo on Trans. Case
129. BOLT, Low Servo Cover on Trans. Case

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Figure 180C-3 180C Transmission Parts

Condition	Possible Cause
CONCERNS TRANSMISSION OIL	
1. Low oil level.	A) Oil coming out of oil filler tube. B) External oil leak. C) Failed vacuum modulator.
2. Oil coming out of oil filler tube.	A) Oil level too high. B) Coolant in transmission oil. C) External vent clogged with mud. D) Leak in oil pump suction circuit.
3. External oil leaks in the area of the torque converter housing.	A) Leaking torque converter. B) Converter housing seal. C) Converter housing to case seal. D) Loose attaching bolts on front of transmission.
4. External oil leaks in the area of transmission case and extension.	A) Shifter shaft seal. B) Extension seal. C) Oil pan gasket. D) Extension to case gasket. E) Vacuum modulator gasket. F) Drain plug gasket. G) Cooler line fittings. H) Oil filler tube seal ring. I) Detent cable seal ring. J) Line pressure gauge connection. K) Electrical connector seal.
5. Low oil pressure.	A) Low oil level. B) Clogged suction screen. C) Leak in oil pump suction circuit. D) Leak in oil pressure circuit. E) Pressure regulator valve malfunction. F) Sealing ball in valve body dropped out.
6. High oil pressure.	A) Modulator vacuum line leaky or interrupted. B) Failed vacuum modulator. C) Leak in any part of engine or accessory vacuum system. D) Pressure regulator valve malfunction.
7. Excessive smoke coming from exhaust.	A) Failed vacuum modulator. B) Oil from vent valve or leak on hot exhaust pipe.
CONCERNS CONVERTER	
1. No converter clutch apply.	A) 12 volts not being supplied to transmission. B) Ground inside of transmission. C) Defective connector, wiring harness, or solenoid. D) Defective pressure switch. E) Sticking converter clutch apply valve F) Solenoid "O" ring cut or leaking. G) Oil pump wear plate or gasket mispositioned or damaged. H) High or uneven bolt torque on oil pump to converter housing bolts. I) Cut "O" ring seal on turbine shaft.

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Figure 180C-4 Diagnosis Chart A

Condition	Possible Cause
CONCERNS CONVERTER (CON'T)	
2. No converter clutch release or shudder.	A) Sticking converter clutch apply valve. B) Restricted converter clutch apply passage. C) Low oil or pressure. D) Engine not tuned properly. E) Cut "O" ring seal on turbine shaft.
STARTING	
1. No starting in any drive range.	A) Low oil level. B) Clogged suction screen. C) Manual valve linkage or inner transmission selector lever disconnected. D) Input shaft broken. E) Pressure regulator valve stuck in open position. F) Failed oil pump.
2. No starting in any drive range for a time. Driving possible only after repeatedly moving selector lever to and fro.	Manual valve position does not coincide with valve body channels: A) Selector lever shaft retaining pin dropped out. B) Connecting rod to manual valve shifting. C) Selector lever shaft nut loose.
3. No starting after shifting lever from "P" to "D", "L_2" or "L_1" (inadequate engine acceleration).	Parking pawl does not disengage.
4. Sudden starting only after increase of engine RPM.	A) Band servo piston jamming. B) Low oil level. C) Oil pump defective. D) Oil screen missing. E) Sealing ball in valve body dropped out.
5. Heavy jerking when starting.	A) Low oil pressure. B) Wrong modulator valve. C) Pressure regulator valve stuck. D) Sealing ball in valve body dropped out.
6. No starting in "D" or "L_2" range, but in "L_1" and "R" range.	A) Input sprag installed backwards. B) Input sprag failure.
7. No starting in "D" or "L_2" and "L_1" (proper driving in "R"; see also point 9).	A) Band worn, does not grip. B) Band servo piston jamming. C) Excessive leak in band servo. D) Parking pawl does not disengage.
8. No starting in "R" range (proper driving in all other ranges).	Reverse clutch failure.
9. Drive in selector lever position "N".	A) Inadequate selector lever linkage. B) Planetary gear set broken. C) improper adjustment of band.

H-180C-3

Figure 180C-5 Diagnosis Chart B

Condition	Possible Cause
GEAR CHANGE	
1. No 1-2 upshift in "D" and "L_2" (transmission remains in 1st gear at all speeds).	A) Governor valves stuck. B) 1-2 shift valve stuck in 1st gear position. C) Seal rings (oil pump hub) leaky. D) Large leak in governor pressure circuit. E) Governor screen clogged.
2. No 2-3 upshift in "D" (transmission remains in 2nd gear at all speeds).	A) 2-3 shift valve stuck. B) Large leak in governor pressure circuit.
3. Upshifts in "D" and "L_2" only at full throttle.	A) Failed vacuum modulator. B) Modulator vacuum line leaky or interrupted. C) Leak in any part of engine or accessory vacuum system. D) Detent valve or cable stuck.
4. Upshifts in "D" and "L_2" only at part throttle (no detent upshift).	A) Detent pressure regulator valve stuck. B) Detent cable broken or misadjusted.
5. Driving only in 1st gear of "D" and "L_2" range (transmission blocks in 2nd gear and "R").	"L_1" and "R" control valve stuck in "L_1" or "R" position.
6. No part throttle 3-2 downshift at low vehicle speeds.	3-2 downshift control valve stuck.
7. No forced downshift.	A) Detent cable broken or improperly adjusted. B) Detent pressure regulator valve stuck.
8. After full throttle upshifting transmission shifts immediately into lower gear upon easing off accelerator pedal.	A) Detent valve stuck in open position. B) Detent cable stuck. C) Modulator vacuum line interrupted.
9. At higher speeds, transmission shifts into lower gear.	A) Retaining pin of selector lever shaft in transmission dropped out. B) Loose connection of selector lever linkage to manual valve. C) Pressure loss at governor.
10. Hard disengagement of selector lever from "P" position.	A) Steel guide bushing of parking pawl actuating rod missing. B) Manual selector lever stuck. H-180C-4

Figure 180C-6 Diagnosis Chart C

Condition	Possible Cause
SHIFTS	
1. Slipping 1-2 upshifts (engine flares).	A) Low oil pressure. B) Sealing ball in valve body dropped out. C) Second clutch piston seals leaking. D) Second clutch piston centrifugal ball stuck open. E) Second clutch piston cracked or broken. F) Second clutch plates worn. G) Seal rings of oil pump hub leaky.
2. Slipping 2-3 upshifts (engine flares).	A) Low oil pressure. B) Band adjustment loose. C) Third clutch piston seals leaking. D) Third clutch piston centrifugal ball stuck open. E) Third clutch piston cracked or broken. F) Wear of input shaft bushing. G) Sealing ball in valve body dropped out.
3. Abrupt 1-2 upshift.	A) High oil pressure. B) 1-2 accumulator valve stuck. C) Spring cushion of second clutch broken. D) Second gear ball valve missing.
4. Abrupt 2-3 upshift.	A) High oil pressure. B) Incorrect band adjustment.
5. Abrupt 3-2 detent downshift at high speed.	A) High speed downshift valve stuck open. B) Band adjustment.
6. Abrupt 3-2 coast downshift.	Low speed downshift timing valve stuck open.
7. Flare on high speed forced downshift.	A) Low oil pressure. B) Band adjustment loose.
8. Flare on low speed forced downshift.	A) Low oil pressure. B) Band adjustment loose. C) High speed downshift timing valve stuck in closed position. D) Sprag race does not grip on 3-1 down shifting.
	H-180C-5

Figure 180C-7 Diagnosis Chart D

Condition	Possible Cause
ENGINE BRAKING	
1. No engine braking in "L_1" range.	A) Selector lever linkage improperly adjusted. B) Manual low control valve stuck.
2. No engine braking in "L_2" range.	Selector lever linkage improperly adjusted.
3. No park.	A) Selector lever linkage improperly adjusted. B) Parking lock actuator spring. C) Parking pawl. D) Governor hub.
NOISES	
1. Excessive noises in all drive ranges.	A) Too much backlash between sun gear and planetary gears. B) Lock plate on planetary carrier loose. C) Thrust bearing defective. D) Bearing bushings worn. E) Excessive transmission axial play. F) Unhooked parking pawl spring contacts governor hub. G) Converter balancing weights loose. H) Converter housing attaching bolt loose and contacting converter.
2. Screeching noise when starting.	Converter failure.
3. Short vibrating, hissing noise shortly before 1-2 upshift.	Dampening cushion of reverse clutch wearing into transmission case.
4. Buzzing noise.	Replace oil filter and gasket.
ABRASIVE	
1. Excessive amount of iron dust (can be picked up by magnet in oil pan).	A) Oil pump. B) Governor hub. C) Second clutch hub.
2. Excessive amount of aluminum dust (cannot be picked up by magnet) in oil pan.	A) Thrust face in case. B) Rear bore of case. C) Stator thrust washer - check converter end clearance.

H-180C-6

Figure 180C-8 Diagnosis Chart E

PRESSURE TAP CAN BE MADE ACCESSIBLE BY:

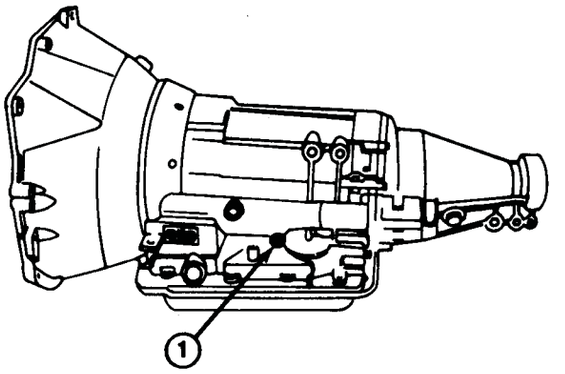
1. Provide proper transmission support.
2. Remove rear transmission crossmember side bolts.
3. Lower transmission enough to remove pressure tap plug which is located on the left side of the transmission.

NOTE: ON REPLACING PLUG, TORQUE TO 5-7 LB-FT.

4. After pressure gage and hose is installed, replace rear crossmember and side bolts and proceed with pressure checking procedure.

NOTE: PRESSURES ARE OFF OF THE SERVO APPLY.

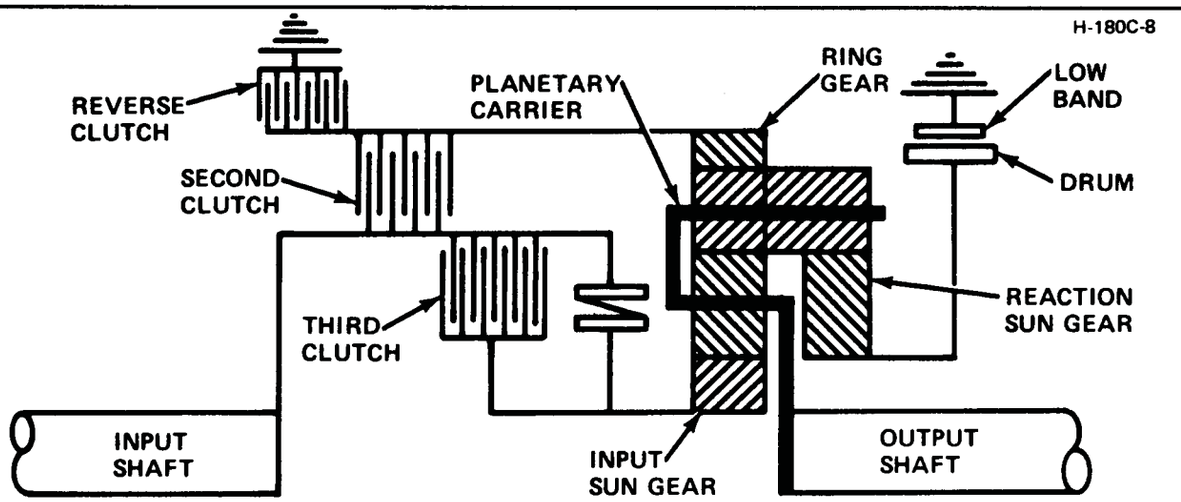
Car Coasting @ 30 MPH; Vacuum Line Connected; Foot Off Throttle	Zero Output Shaft Speed; Vacuum Line Disc from the Mod; Engine RPM at 1500
Min. PSI	Max. PSI
D 65	D 118
L_2 65	L_2 118
L_1 95	L_1 160



1. SERVO APPLY PLUG LOCATION

H-180C-7

Figure 180C-9 Oil Pressure Chart



	REVERSE CLUTCH	SECOND CLUTCH	THIRD CLUTCH	LOW BAND	SPRAG
A. NEUTRAL/PARK	Released	Released	Released	Released	Locked
B. DRIVE RANGE, First Gear	Released	Released	Released	Applied	Locked
C. L_1 RANGE	Released	Released	Applied	Applied	Locked
D. DRIVE RANGE, Second Gear	Released	Applied	Released	Applied	Overrunning
E. L_2 RANGE	Released	Applied	Released	Applied	Overrunning
F. DRIVE RANGE, Third Gear	Released	Applied	Applied	Released	Locked
G. REVERSE RANGE	Applied	Released	Applied	Released	Locked

Figure 180C-10 Clutch Apply Chart

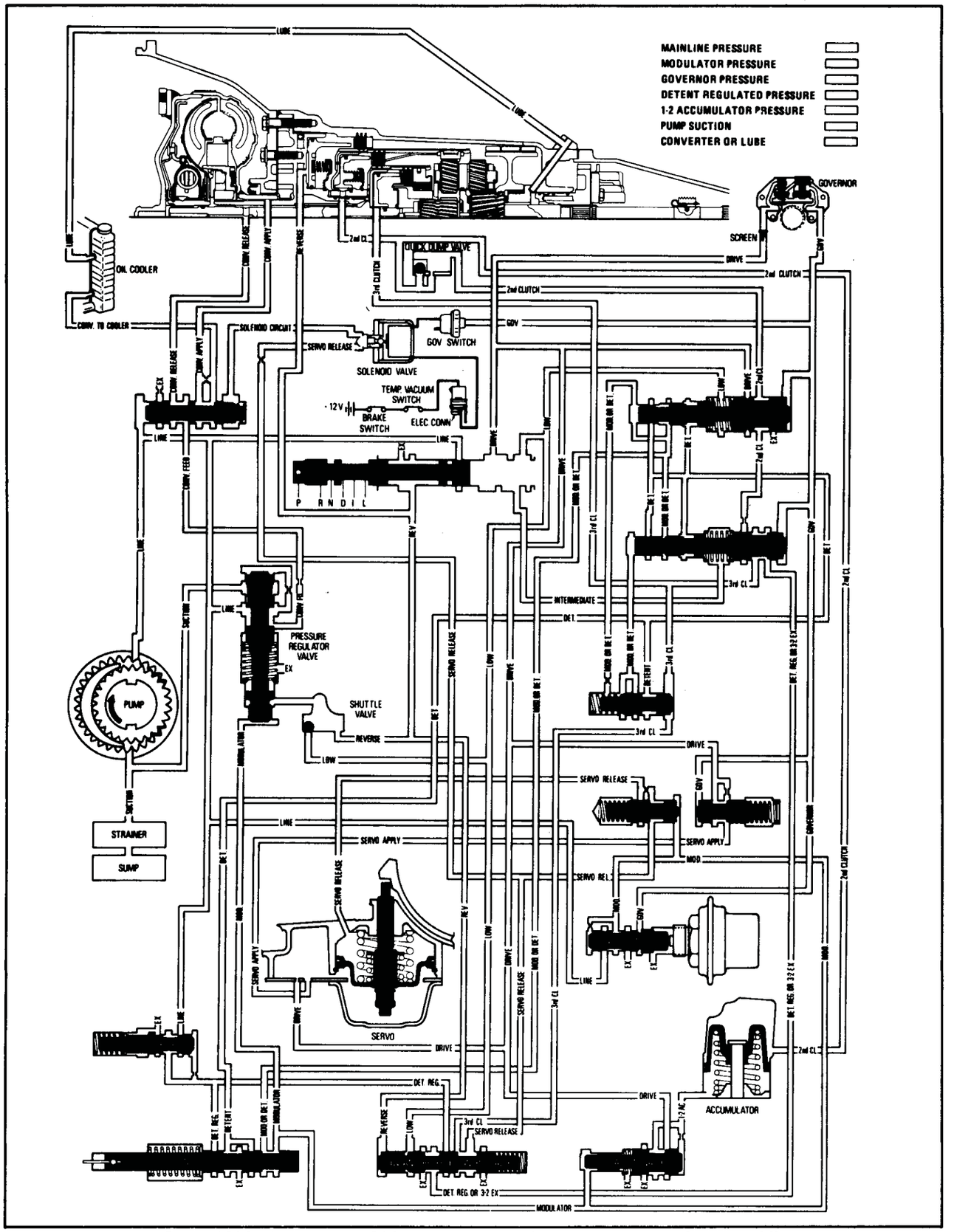


Figure 180C-11 Automatic 180C Transmission Oil Circuit - Park -Torque Converter Off

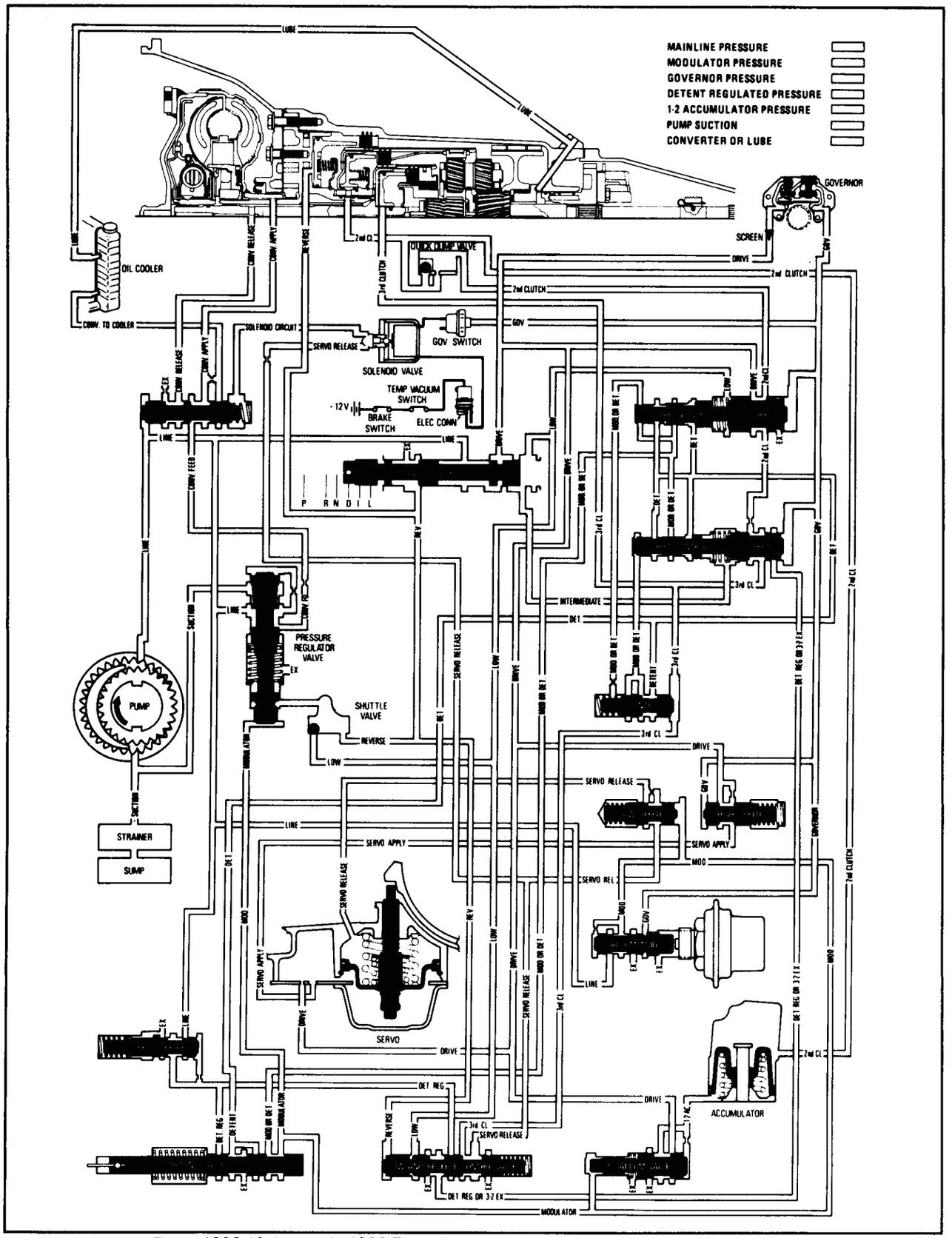
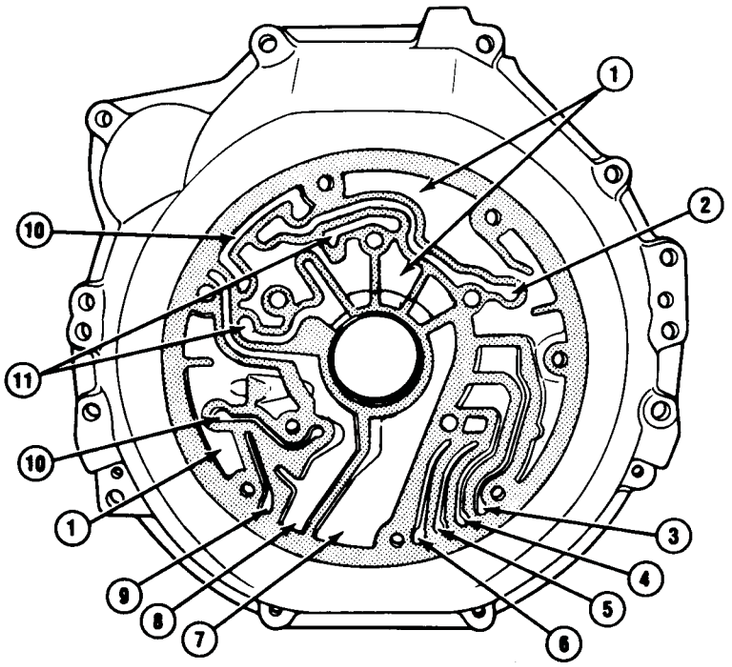


Figure 180C-12 Automatic 180C Transmission Oil Circuit - Drive 3 - Torque Converter On



1. EXHAUST
2. CONVERTER OUT
3. 2ND CLUTCH
4. 3RD CLUTCH
5. MODULATOR
6. BOOST
7. SUCTION
8. LINE
9. REVERSE CLUTCH
10. CONVERTER IN
11. CONVERTER IN/OUT

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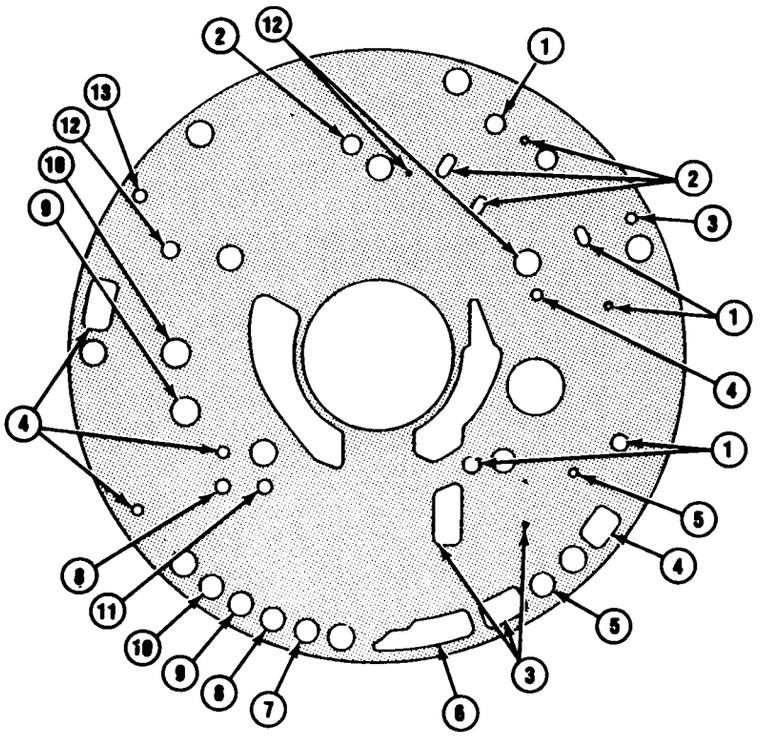
Figure 180C-13 Converter Housing Oil Passages



1. CONVERTER IN
2. CONVERTER IN/OUT
3. LINE
4. EXHAUST
5. REVERSE CLUTCH
6. SUCTION
7. 3RD CLUTCH
10. 2ND CLUTCH
11. INTERMEDIATE
12. CONVERTER OUT
13. VENT

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Figure 180C-14 Wear Plate Oil Passages

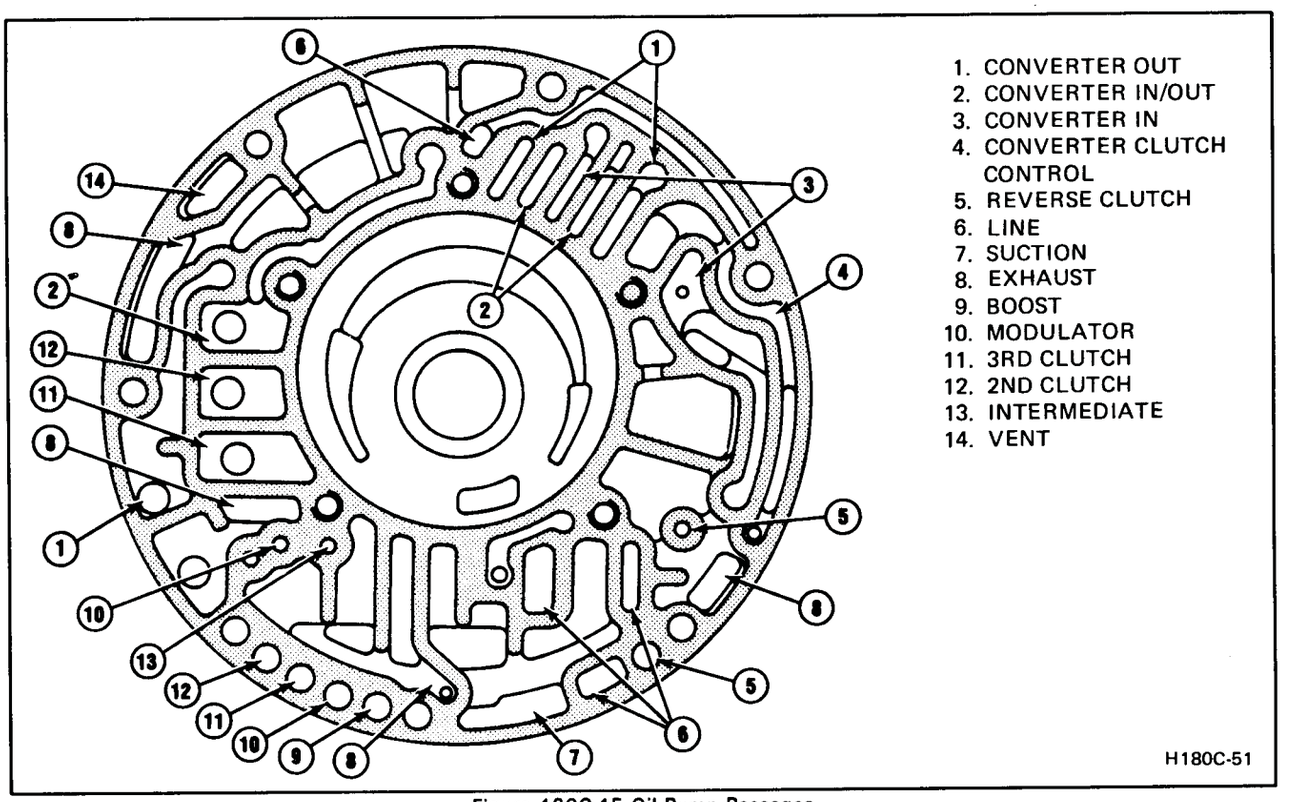


Figure 180C-15 Oil Pump Passages

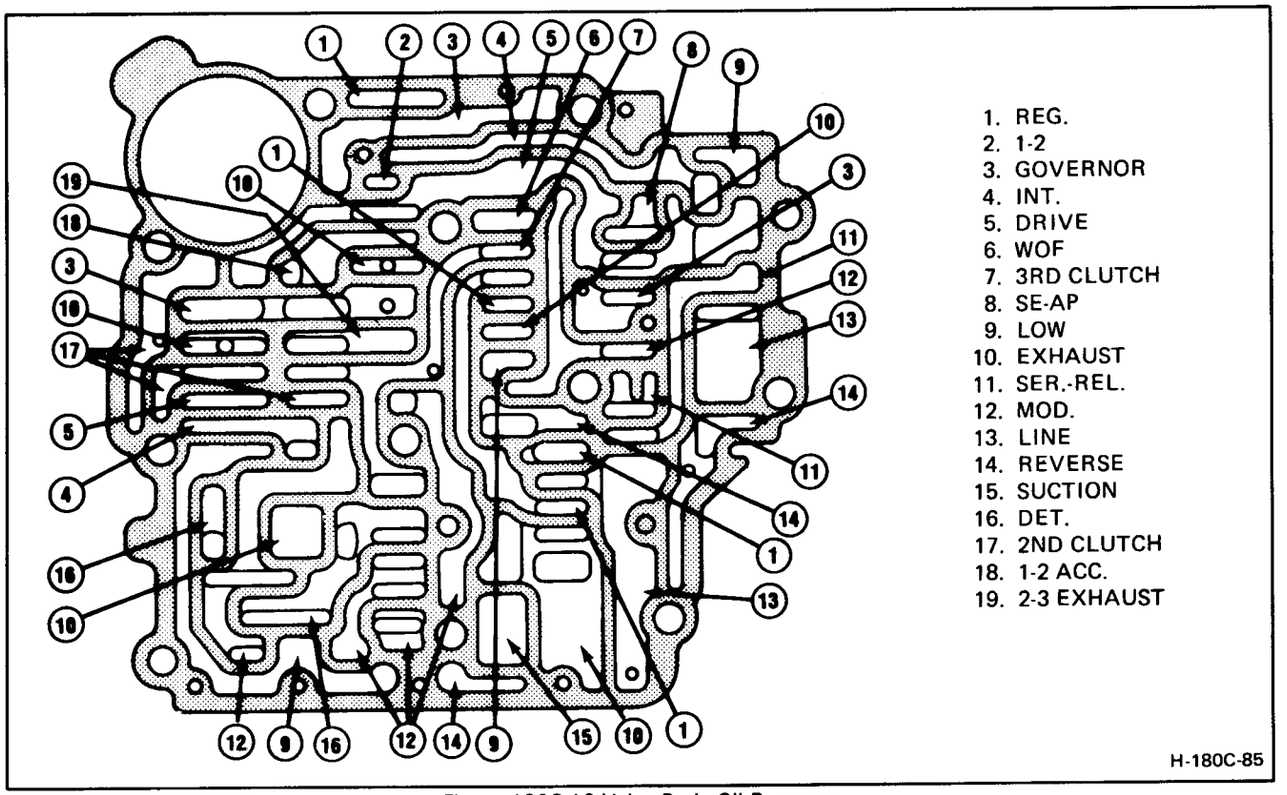


Figure 180C-16 Valve Body Oil Passages

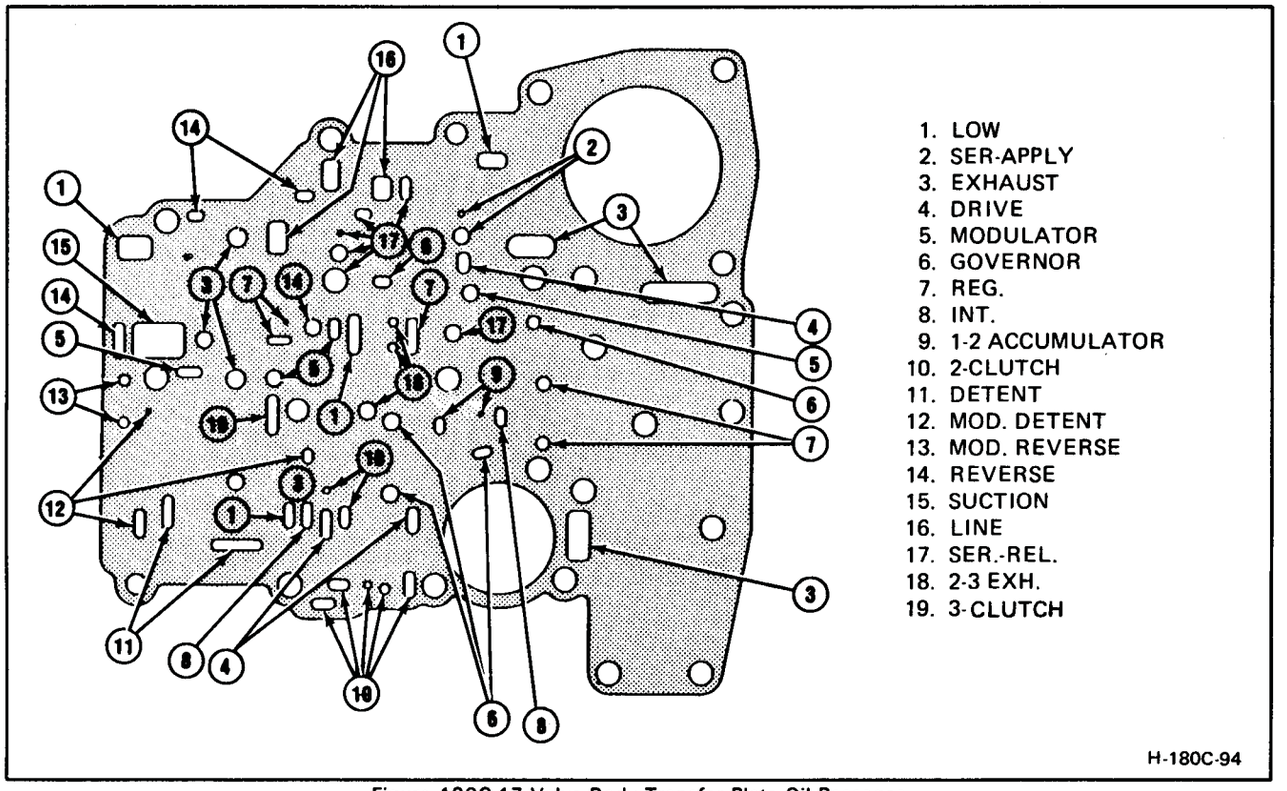


Figure 180C-17 Valve Body Transfer Plate Oil Passages

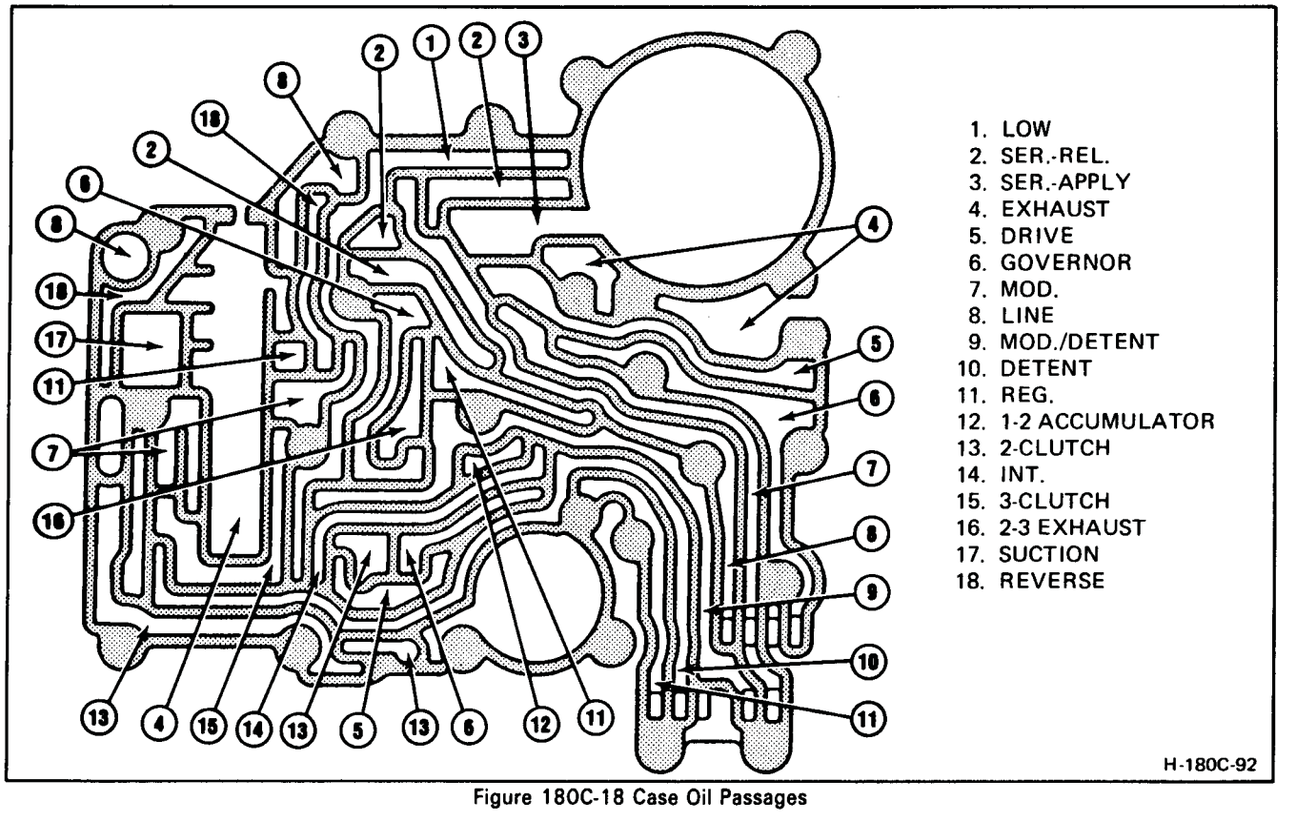


Figure 180C-18 Case Oil Passages

UNIT REPAIR

EXTERNAL PARTS

Removal

See Figure 19

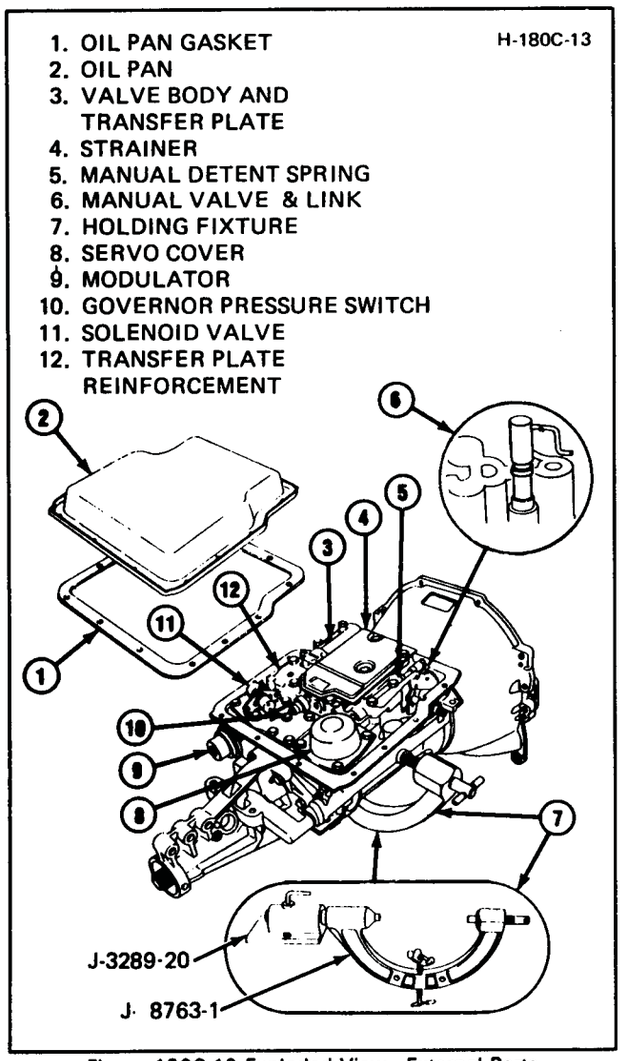


Figure 180C-19 Exploded View - External Parts

1. Remove the converter assembly.
2. Install holding fixture, J-8763-01, on the transmission. Do not over-torque the holding fixture screw.
3. Install the holding fixture and the transmission into the holding base tool J-3289-20 with the oil pan down.
4. Position the transmission with the converter housing up and drain the transmission fluid through the rear extension.
5. Remove the oil pan attaching bolts, oil pan, and gasket. Standard english size tools will be required to service this transmission.
6. Remove the manual detent roller and spring assembly.
7. Remove the oil strainer assembly and gasket.
8. Disconnect the governor pressure switch electrical connector and the solenoid wiring harness.
9. Remove the governor pressure switch, the converter clutch solenoid and the solenoid pipes. It is necessary to unbolt and remove the converter clutch solenoid before removing the solenoid pipes. Do not bend the solenoid pipes when removing.
10. Remove the transfer plate reinforcment.
11. Remove the servo cover and gasket.
12. Remove the valve body with its gasket and transfer plate. Care must be taken so that the manual valve and manual valve link are not damaged or lost during valve body removal. To prevent the manual link from falling into the transmission case, place a piece of paper toweling in the case void below it, before removing the valve body.
13. Compress the servo piston using compressor tool J-23075. The offset of the tool must be positioned toward the rear of the case when installing the tool. See Figure 20.
14. Use needle nose pliers and remove the servo piston to case snap ring. See Figure 20.
15. Before removing installation bolts on tool J-23075, loosen the compression screw to relieve servo spring tension. Remove the tool, the servo piston assembly, the return spring and the servo apply rod. See Figure 20.

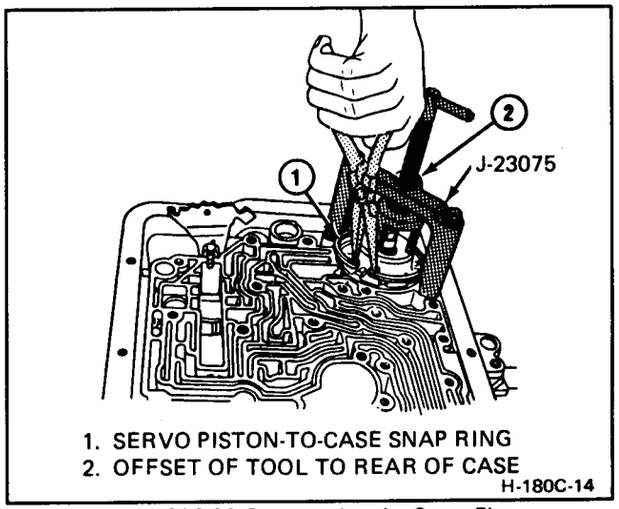


Figure 180C-20 Compressing the Servo Piston

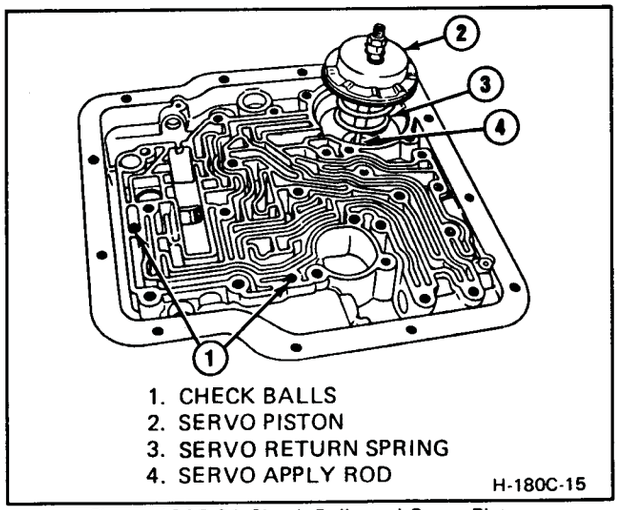


Figure 180C-21 Check Balls and Servo Piston

16. Remove the two check balls located in the oil passages of the transmission case. See Figure 21.
17. Remove the selector inner lever hex. nut from the selector lever shaft. See Figure 22. To prevent dropping the hex nut

into the transmission case, place a piece of paper toweling in the area under the hex nut before removing it from the shaft.

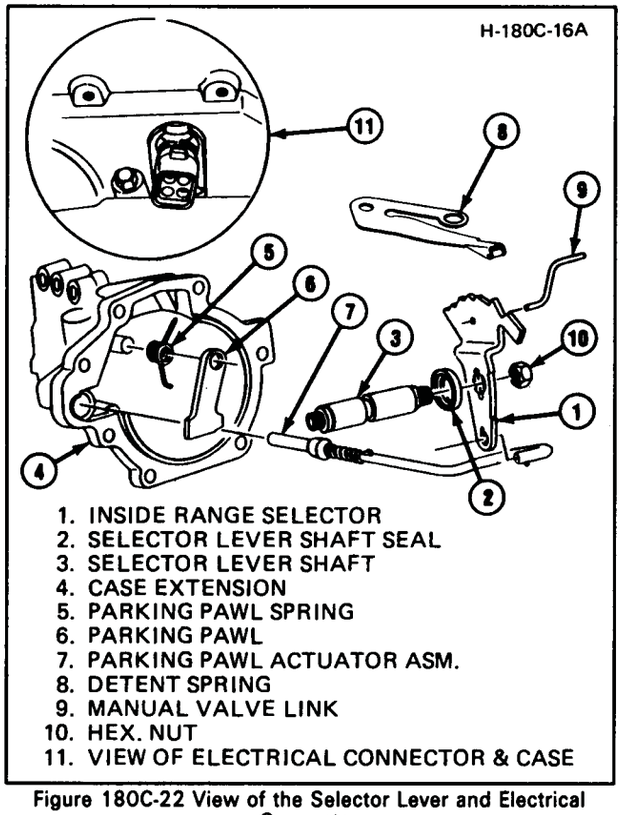


Figure 180C-22 View of the Selector Lever and Electrical Connector

18. Remove the selector inner lever from the selector lever shaft.
19. Remove the selector lever shaft spring pin by pulling upwards with pointed nose diagnal pliers as shown in Figure 23. To prevent collapse of the spring pin, during removal, insert a wire into the middle of the spring pin.

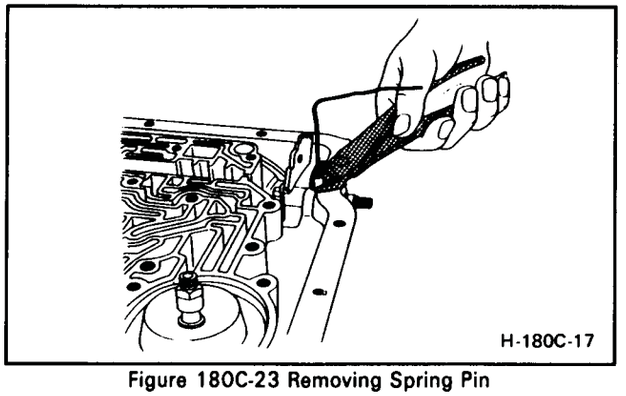


Figure 180C-23 Removing Spring Pin

20. Install the outside attaching nut on the selector lever shaft, place the tip of a screwdriver on the face of the nut and drive the selector lever shaft out of the case with a hammer.

21. Remove the selector lever shaft oil seal with a small screwdriver, if necessary.

22. Remove the electrical connector from the case.

23. Remove the vacuum modulator and "O" ring seal using tool J-23100. See Figure 24. Care should be taken not to lose the modulator plunger.

Use of another tool to remove the modulator may result in internal damage to the modulator.

24. Remove the modulator valve and sleeve from the transmission case using snap ring pliers, such as J-8059.

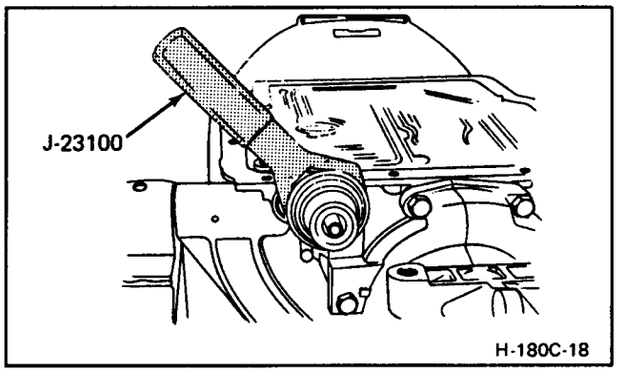


Figure 180C-24 Removing the Vacuum Modulator

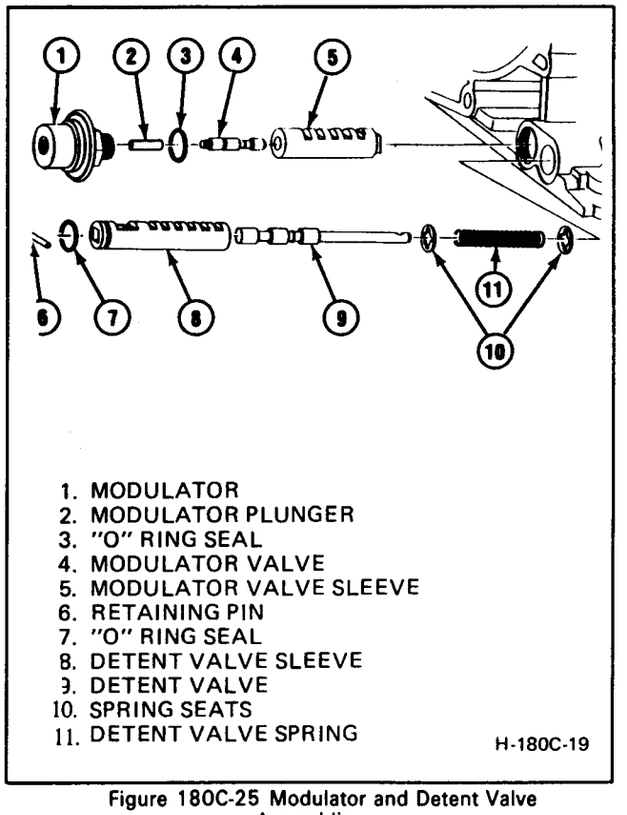


Figure 180C-25 Modulator and Detent Valve Assemblies

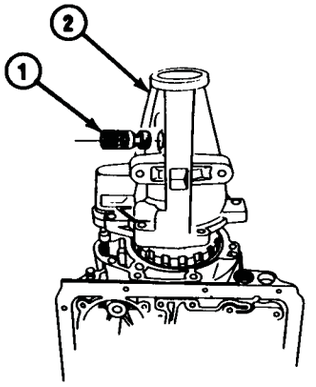
25. Remove the detent valve retaining spring pin by pulling upward with pointed nose diagnal pliers. To prevent collapse of the spring pin, insert a wire into the middle of the spring pin.

26. Remove the detent sleeve, valve, spring and spring seats. See Figure 25.

Extension Housing, Speedometer Driven Gear and Governor Assembly

Removal

1. Remove the speedometer driven gear housing retainer and pull the speedometer driven gear assembly from the extension housing. See Figure 26

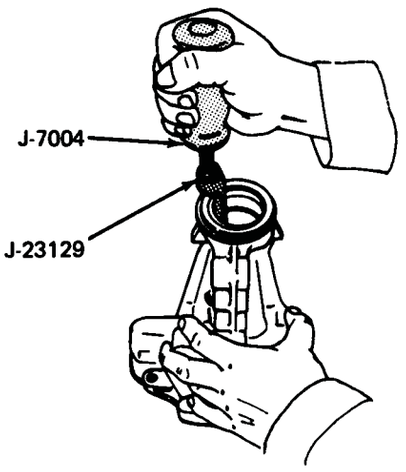


1. SPEEDOMETER DRIVEN GEAR
2. EXTENSION HOUSING

H-180C-74

Figure 180C-26 View of Extension Housing and Speedometer Driven Gear

2. Remove the extension housing oil seal using tool J-23129 and slide hammer J-7004, if necessary. See Figure 27.



H-180C-111

Figure 180C-27 Removing Extension Housing Oil Seal

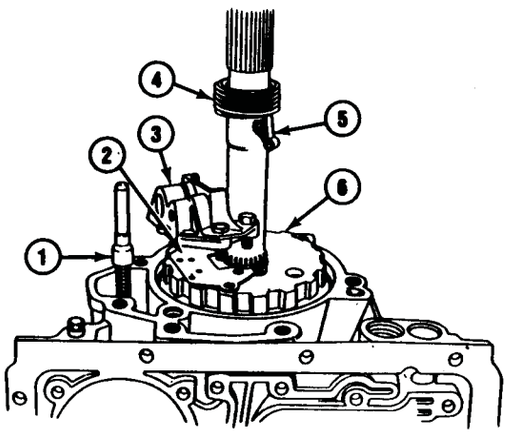
3. Remove the extension housing and gasket.

4. Depress the speedometer drive gear retaining clip and remove the speedometer drive gear by sliding it off the output shaft. See Figure 28.

5. Remove the governor body and gasket.

6. Remove the governor hub snap ring from the output shaft using pliers such as J-8059.

7. Slide the governor hub off the output shaft. Use care not to lose the governor hub oil screen.



1. PARKING LOCK ACTUATOR ROD
2. GOVERNOR GASKET
3. GOVERNOR ASSEMBLY
4. SPEEDOMETER DRIVE GEAR
5. RETAINING CLIP
6. GOVERNOR HUB

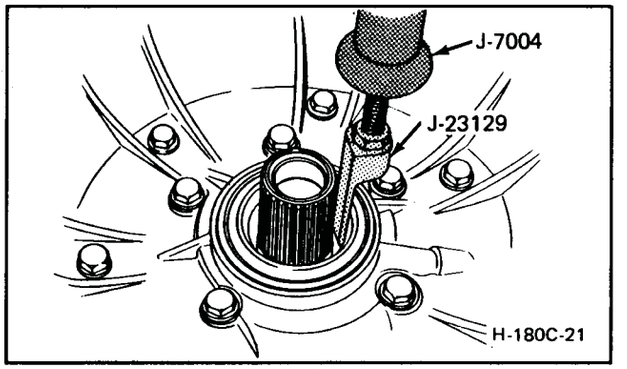
H-180C-20

Figure 180C-28 Speedometer Drive Gear and Governor

Internal Parts

Removal

1. Remove the converter housing oil seal using tools J-23129 and J-7004, if necessary. Figure 180C-29
2. Remove the seven converter housing attaching bolts, which are the outer bolts in the housing. See Figure 180C-30. Loosen, but do not remove, the five inner bolts.



H-180C-21

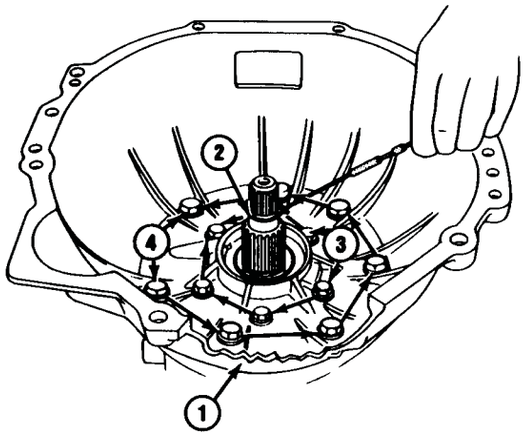
Figure 180C-29 Removing Converter Housing Oil Seal

3. Remove the rubber "O" ring seal from the input shaft. See Figure 30.

If the rubber seal is not removed, the second clutch and third clutch will come out with the converter housing. The rubber seal may shear, while you are holding the parts, allowing the second clutch and third clutch to fall - possibly causing personal injury.

4. Remove the converter housing with the oil pump, oil pump flange gasket and the reverse clutch assemblies. Do not lose

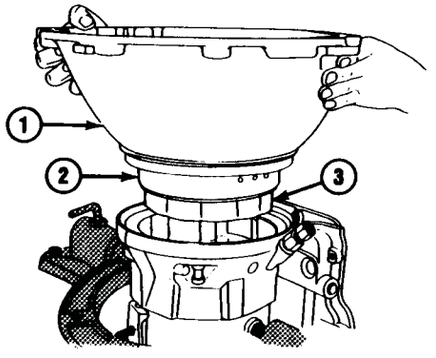
the selective thrust washer, located between oil pump hub and second clutch drum. See Figure 31.



1. CUT-AWAY VIEW CONVERTER HOUSING
2. INPUT SHAFT "O" RING SEAL
3. INNER CIRCLE OF BOLTS ARE OIL PUMP ATTACHING BOLTS (5)
4. OUTER CIRCLE OF BOLTS ARE CONVERTER HOUSING ATTACHING BOLTS (7)

H-180C-22

Figure 180C-30 Converter Housing Attaching Bolts and "O" Ring Seal

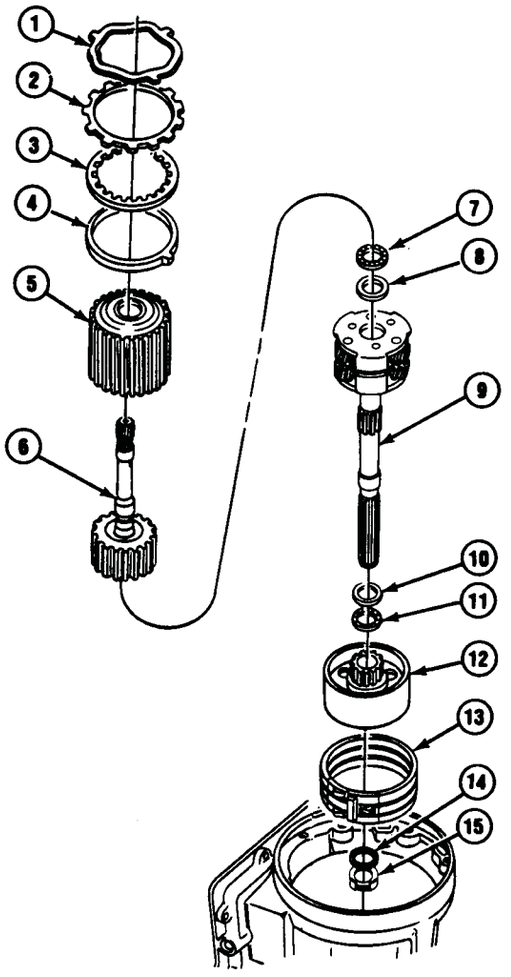


1. CONVERTER HOUSING
2. OIL PUMP
3. REVERSE CLUTCH PISTON

H-180C-23

Figure 180C-31 Removing Converter Housing

5. Remove the second clutch and third clutch assemblies by lifting up on input shaft. See Figure 32.
6. Separate the second clutch and third clutch assemblies.
7. Remove the reverse clutch plates and the aluminum pressure plate from the transmission case.
8. Remove the inside selector lever and parking lock actuator rod from the transmission case.
9. Remove the planetary carrier and the output shaft along with the two Torrington Bearings and one thrust washer.
10. Remove the reaction sun gear and drum.



1. REV. CL. WAVED PLATE
2. REVERSE CLUTCH PLATE
3. REV. CL. COMPOSITION PLATE
4. PRESSURE PLATE
5. 2ND CLUTCH ASM.
6. 3RD CLUTCH ASM.
7. BEARING ASSEMBLY
8. THRUST WASHER
9. PLANETARY CARRIER ASM.
10. THRUST WASHER
11. BEARING ASSEMBLY
12. SUN GEAR DRUM
13. LOW BAND
14. BEARING ASSEMBLY
15. THRUST WASHER

H-180C-24A

Figure 180C-32 Removing Internal Parts

11. Remove the Torrington bearing and thrust washer from the rear of the case.

12. Remove the low band.
13. If necessary, remove the case vent and install a new case vent. Do not attempt to reinstall the old vent.

INTERNAL PARTS

Disassembly, Inspection and Reassembly

When reassembling the transmission, do not use any "O" rings, gaskets or oil seals that have been removed. See Section 7A "Service Methods."

Case

Inspection

1. Inspect case for damage.
2. Inspect and clean oil passages with cleaning solvent and air dry.
3. Check for good retention of band anchor pins.
4. Inspect all threaded holes for thread damage.
5. Inspect detent valve and modulator valve bores for scratches or scoring.
6. Replace case if required.

Selector Lever and Shaft

Inspection and Installation

See Figure 180C-34

1. Install a new selector lever shaft oil seal in the case, if removed during disassembly. See Figure 33. Insert the selector lever shaft through the case from the outside. Care should be exercised so that the oil seal is not damaged. See Figure 34.

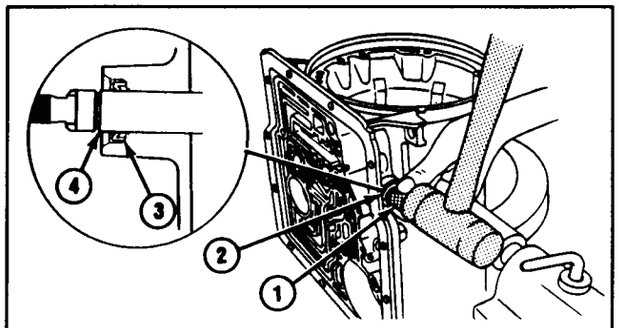


Figure 180C-33 Selector Lever Shaft Oil Seal Installation

2. Insert a spring pin in the case to secure the selector lever shaft. Check the selector lever for free movement after installation.
3. Assemble the selector lever and the parking pawl actuator rod, if disassembled.
4. Insert the parking pawl actuator rod from the front of the case and through the hole in case at rear. See Figure 35.
5. Guide the selector lever over the selector lever shaft and secure with a nut. Check for correct installation. See Figure 36.
6. Lubricate with petrolatum and install a new "O" ring seal on the case electrical connector, if necessary.

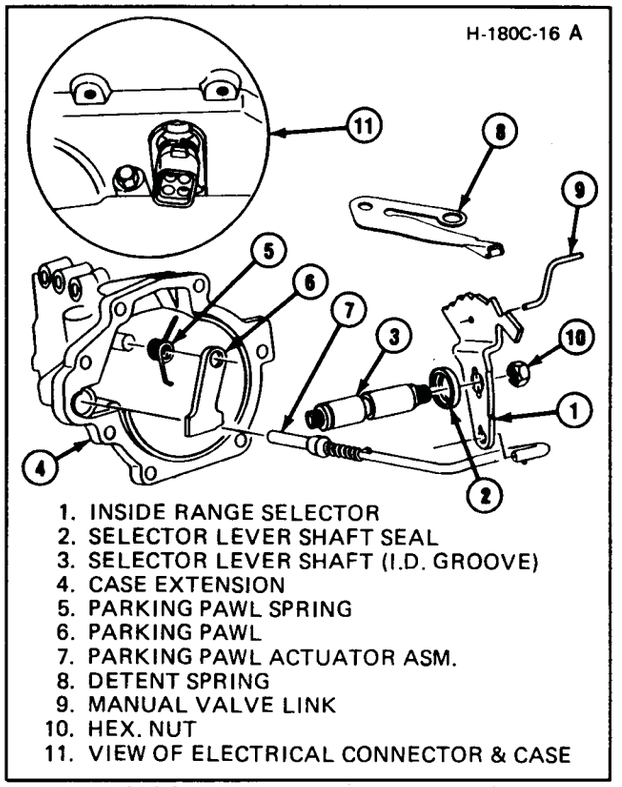


Figure 180C-34 Selector Lever Assembly and Electrical Connector

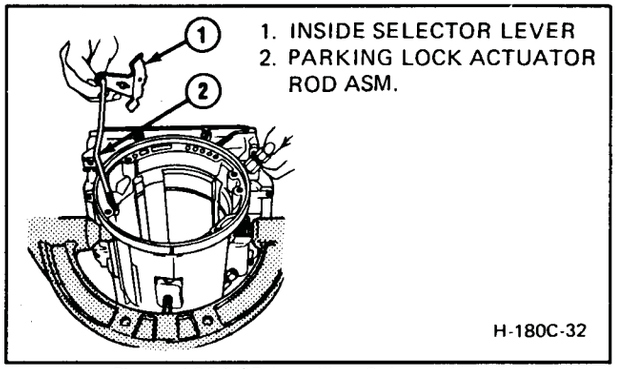


Figure 180C-35 Installing Selector Lever

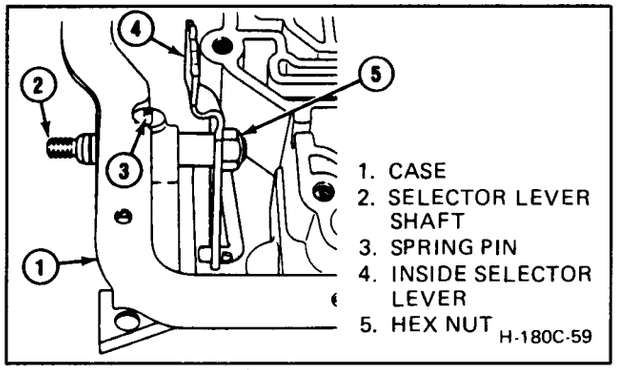


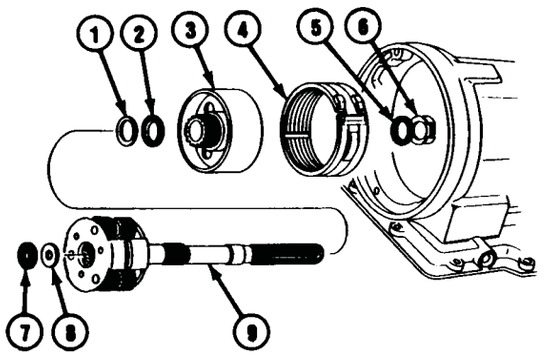
Figure 180C-36 Selector Lever Installed

7. Install the electrical connector, positioning locator tab in the notch on the side of the case.

Low Band

Inspection and Installation

1. Turn the transmission case so that the front of the case is upward.
2. Inspect the low band for wear, cracks, flaking, burring or looseness. Replace if required.
3. Place the band in the case and locate the band onto the anchor pins in the case. See Figure 37.



1. THRUST WASHER
2. BEARING ASSEMBLY
3. SUN GEAR DRUM
4. LOW BAND
5. BEARING ASSEMBLY
6. THRUST WASHER
7. BEARING ASSEMBLY
8. THRUST WASHER
9. PLANETARY CARRIER ASM.

H-180C-26

Figure 180C-37 Installing Low Band, Sun Gear Drum, and Planetary Carrier

Reaction Sun Gear and Drum

Inspection and Installation

1. Inspect the reaction sun gear for chipped or nicked teeth and inspect the sun gear drum for scoring. If necessary, replace the entire assembly.
2. Inspect the reaction sun gear drum bushing.
3. If necessary, replace the bushing.
4. Place the thrust washer and the bearing into the case. See Figure 37. Retain with petrolatum. The case bushing acts as a guide to center the bearing.
5. Insert the reaction sun gear and drum assembly into the case with the reaction sun gear facing upward. Figure 37.
6. Place the bearing and thrust washer onto the sun gear. See Figure 37. Retain with petrolatum.

Planetary Carrier

Inspection and Installation

1. Inspect the planetary carrier and the output shaft for distortion or damage.
2. Inspect the planetary pinions for excessive wear or damage, such as chipped teeth.
3. Check the end clearance of all planetary pinions with a feeler gauge at points "A" and "B" as shown in Figure 38. Clearance should be between .127/.889 mm (.005" and .035") See Figure 38.

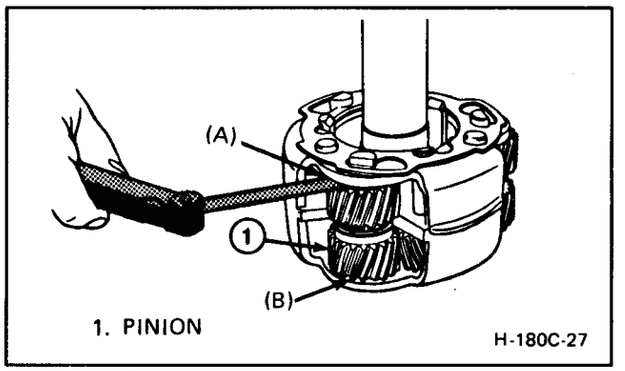


Figure 180C-38 Planetary Carrier and Pinion Clearance

4. Replace the entire assembly if damage or excessive wear is noted.
5. Insert the output shaft and planetary carrier assembly from the front of the case to spline with the reaction sun gear. See Figure 37.
6. Install the thrust washer, then the Torrington bearing into the planetary carrier. Secure with petrolatum.

Third Clutch Assembly

Disassembly

1. Mount the third clutch assembly in a soft jawed vise at a 90 degree angle. Install tool J-29351 onto the third clutch drum. Position the five (5) pins of the tool in the elongated slots (Do not put a pin into a slot, if the internal ring is not visible in that slot). Slide the compressing ring over the pin cage, as shown in Figure 39.

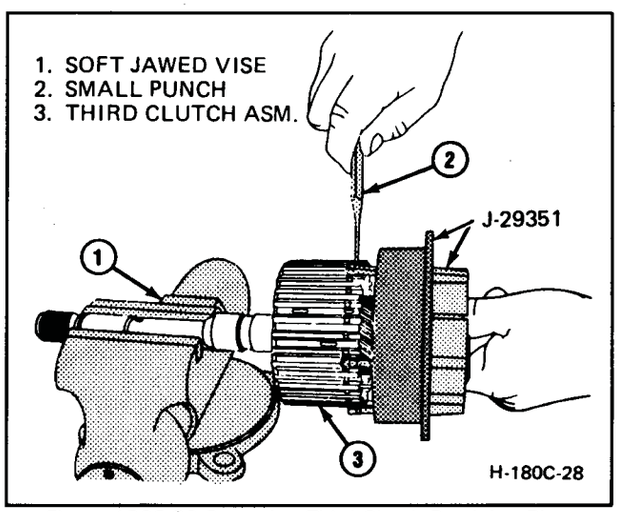


Figure 180C-39 Removing Third Clutch Retaining Ring

2. Pull on the pin cage handle or input sun gear. If the ring is hanging up on one side causing the clutch hub to cock, insert a punch in the slot, to compress the ring. See Figure 39. Mounting the clutch pack at a 90 degree angle will prevent the ring from sliding back into its groove, during tool removal.
3. After the retaining ring has been pressed out of the clutch drum groove, remove the sprag assembly. See Figure 40.

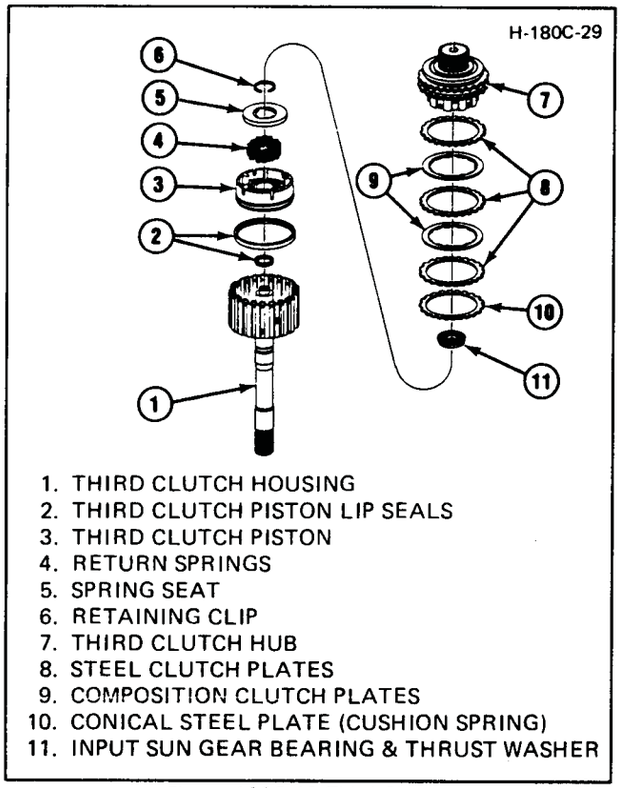


Figure 180C-40 Third Clutch

4. Remove the input shaft-to-input sun gear thrust washer and Torrington Bearing. This bearing and thrust washer may be staked together. See Figure 40.
5. Remove the third clutch plates from the third clutch drum. See Figure 40. The plates should be kept in the same sequence as they were installed in the clutch.
6. Remove the input sprag race and retainer assembly from the third clutch hub and input sun gear assembly.
7. Push the sprag assembly and retaining rings from the sprag race and retainer. See Figure 45.
8. Using compressor tool J-23075 on the third clutch piston retaining seat, compress the third clutch piston return springs using an arbor press. See Figure 41.

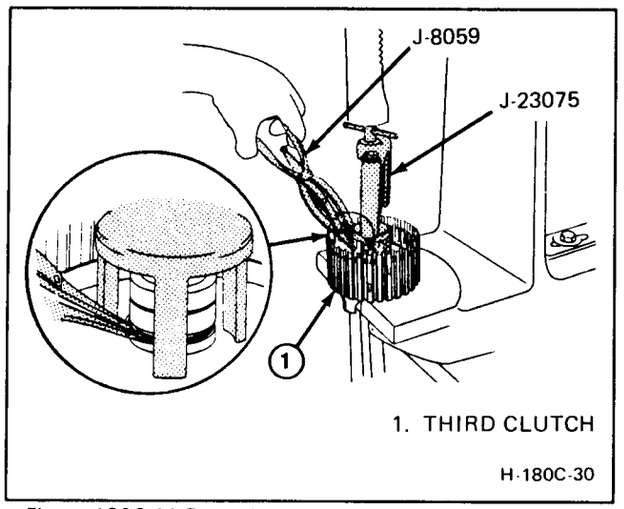


Figure 180C-41 Removing or Installing Third Clutch Piston

9. Remove the snap ring using pliers such as J-8059. See Figure 41. Use care not to let the retaining seat catch in the snap ring groove. Remove tool J-23075.
10. Remove the retaining seat and the (12) return springs.
11. Remove the third clutch piston from the third clutch drum.

Inspection

1. Inspect all third clutch piston return springs. See Section 7A "Clutch Plate and Piston Spring Diagnosis."
2. Inspect the check ball in the third clutch piston. Shake the piston and listen for movement of the check ball, which will indicate proper operation. If the ball is missing, falls out upon inspection or piston is damaged, replace the piston. Install a new lip seal on the piston, if necessary. See Figure 42.

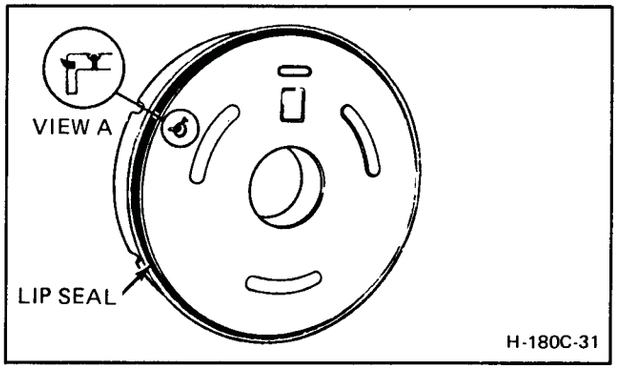


Figure 180C-42 Third Clutch Piston

3. Remove the oil lip seal from the input shaft inside of the third clutch drum and install a new lip seal, if necessary, with the lip pointing downward. See Figure 43.

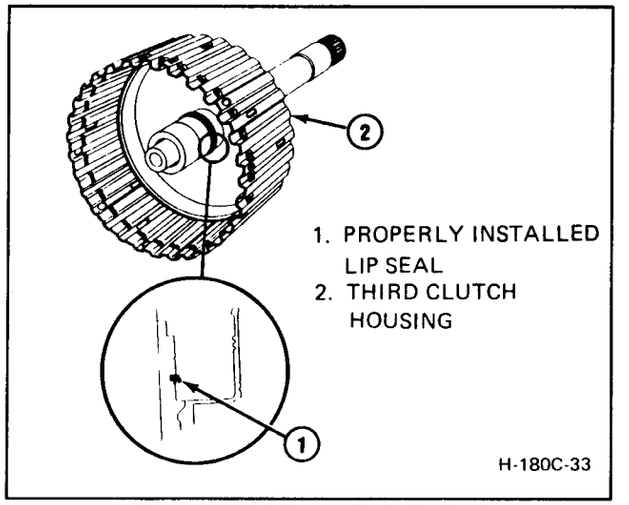


Figure 180C-43 Input Shaft Lip Seal

4. Inspect the steel thrust washer on the front face of the third clutch drum. Replace if scored or damaged.
5. Air check the oil passages in the input shaft.

Installation

1. Install the third clutch piston into third clutch drum. Use a liberal amount of transmission fluid, so that the lip seal is not damaged upon installation. Tool J-23084 can be used to protect the seal during installation, if needed.
2. Install the (12) third clutch piston return springs onto the piston.

3. Install the retaining seat.
4. Use compressor tool J-23075 on the retaining seat and compress the piston return springs. Care must be taken so that the retaining seat does not catch in the snap ring groove and damage the retainer. See Figure 180C-44.

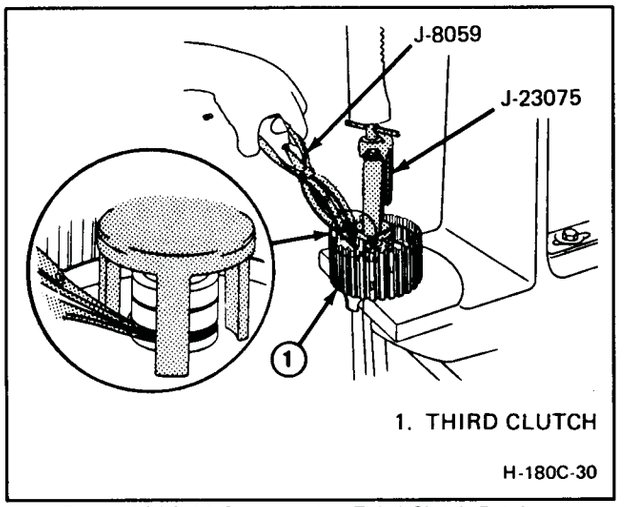


Figure 180C-44 Compressing Third Clutch Retainer

5. Install the snap ring using pliers such as J-8059. See Figure 44. Remove tool J-23075.
6. Inspect the thick thrust washer and bearing for damage. Replace, if necessary.
7. Install the thrust washer and bearing onto the input shaft. The bearing will face the input sun gear if properly installed. Secure with petrolatum.
8. Inspect the sprag assembly for wear, damage, or sprags that freely fall out of the cage. Inspect the input sun gear for chipped or nicked teeth or abnormal wear. Replace the part , if necessary.
9. Install the sprag cage and two retaining rings on the third clutch hub with the flared shoulder on the sprag cage outer diameter toward the input sun gear. See Figure 45.

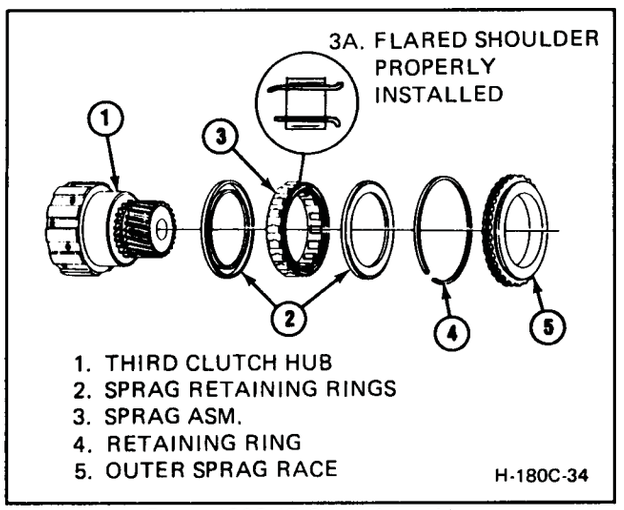


Figure 180C-45 Sprag Assembly

10. Install the outer sprag race and retainer assembly over the sprag assembly. Holding the input sun gear with the left hand, the sprag race and retainer assembly should hold firm when turned with your right hand in a clockwise direction and should rotate freely when turned counterclockwise. See Figure 46.

This procedure must be followed exactly as shown in Figure 46 to be sure that the sprag has not been installed backwards.

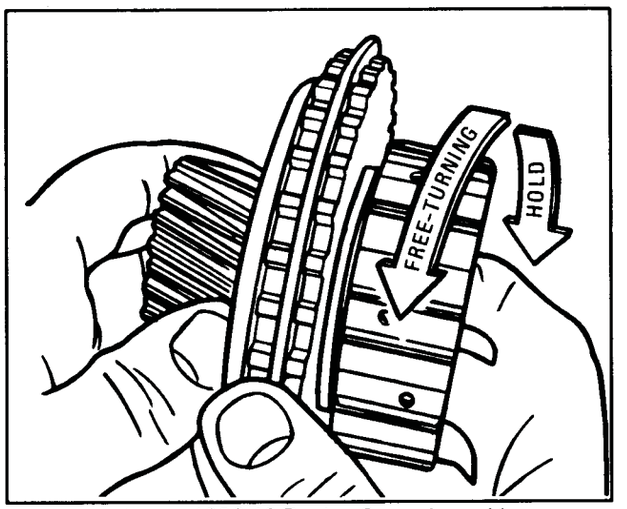


Figure 180C-46 Testing Sprag Assembly

11. Inspect the condition of the third clutch composition and steel clutch plates. See Section 7A "Clutch Plate and Piston Spring Diagnosis."
12. Install the third clutch plates on the third clutch hub in the following order - steel plate, composition plate, steel plate, composition plate, steel plate, conical steel plate. When installed correctly, the I.D. of the conical plate will touch the steel plate below it but, the O.D. will not.
13. Mount the third clutch housing in a vise (protect shaft from vise jaws) at a 90° angle.
14. Install the third clutch hub and sprag assembly into the third clutch housing until the sprag race rests on the third clutch drum. See Figure 47.

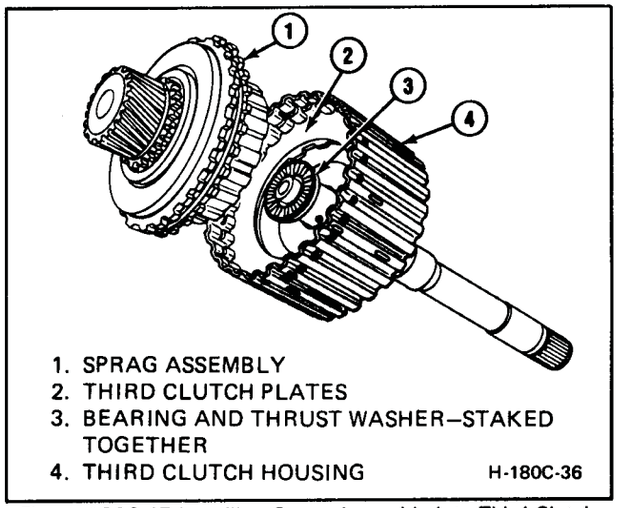
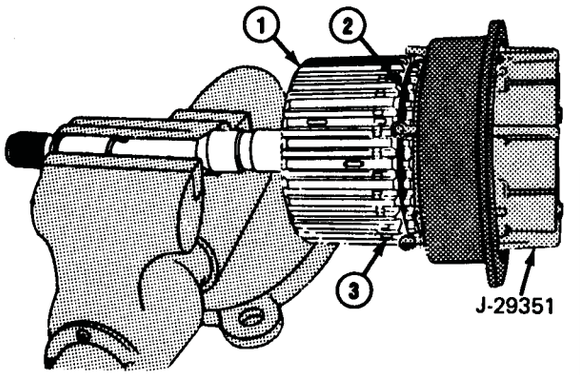


Figure 180C-47 Installing Sprag Assembly Into Third Clutch Assembly

15. Install tool J-29351 on the sprag race so the pins in the tool fingers compress the retaining ring. See Figure 48.
16. Slide the sprag assembly into the third clutch drum until the retaining ring is inside the drum. See Figure 48. **Do not push**



1. THIRD CLUTCH HOUSING
2. SNAP RING (COMPRESSED BY TOOL FINGERS)
3. SNAP RING GROOVE

H-180C-37

Figure 180C-48 Installing Retaining Ring in Third Clutch

on the input sun gear while installing the sprag assembly or the clutch plates will slip off location and prevent assembly.

17 Remove tool J-29351. Slide the sprag assembly into the third clutch drum until the retaining ring catches in the retaining ring groove. If necessary, use a small screwdriver to help compress the retaining ring while installing the sprag assembly.

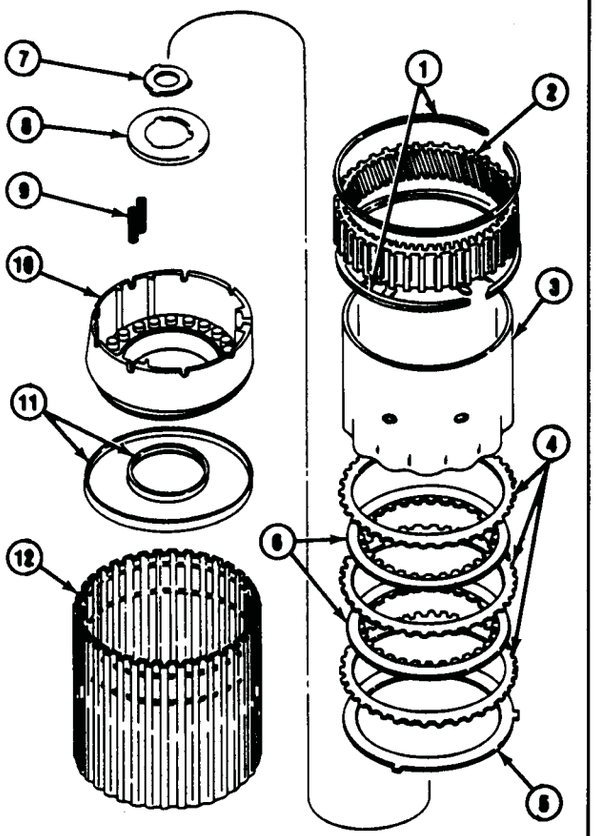
Second Clutch

Disassembly

1. Remove the ring gear retaining ring from the second clutch drum. See Figure 49.
2. Remove the ring gear. See Figure 49.
3. Remove the second clutch spacer retaining ring.
4. Remove the second clutch spacer. See Figure 49.
5. Remove the second clutch steel and composition plates. The plates should be kept in the same sequence as they were installed in the clutch. See Figure 49.
6. Remove the second clutch assembly to third clutch assembly thrust washer. See Figure 49.
7. Install clutch spring compressor tool J-23327 on the second clutch piston return spring retainer and compress the second clutch piston return springs. See Figure 50. Tool J-23327 must be adapted to fit in second clutch piston, by using three sockets of the same height or Tool J-29838 as a spacer. See Figure 50.
8. Remove the snap ring using pliers such as J-8059. See Figure 50. Remove tool J-23327.
9. Remove the second clutch piston retaining seat and (22) piston return springs.
10. Remove the second clutch piston.

Inspection

1. Inspect the second clutch piston. See Figure 51. If the piston is damaged or if the check ball falls out upon inspection, replace the piston. If necessary, install two new piston lip seals. (One seal on the piston O.D. and one on the second clutch drum hub. Install with lips down as shown in Figure 52).
2. Inspect the piston return springs. See Section 7A "Clutch Plate and Piston Spring Diagnosis."
3. Inspect the second clutch hub bushing for scoring or wear, replace if necessary.



1. RETAINING RING
2. RING GEAR
3. SPACER
4. STEEL CLUTCH PLATES
5. WAVED PLATE (CUSHION)
6. COMPOSITION PLATES
7. THRUST WASHER
8. RETAINING RING
9. PISTON RETURN SPRINGS (22)
10. SECOND CLUTCH
11. PISTON SEALS
12. SECOND CLUTCH HOUSING

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Figure 180C-49 Second Clutch

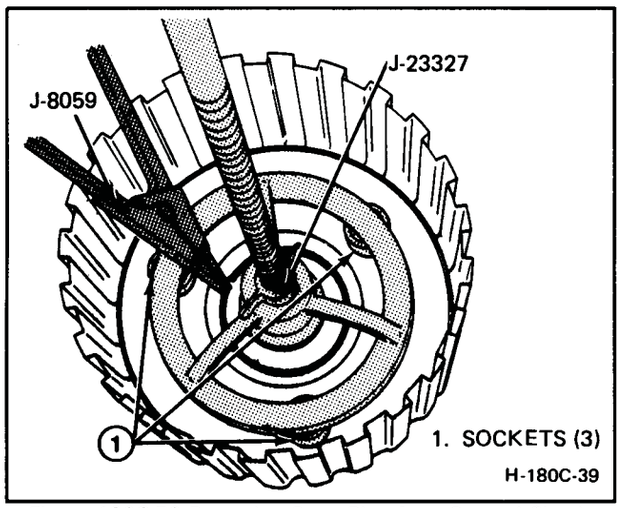


Figure 180C-50 Removing Snap Ring from Second Clutch Piston

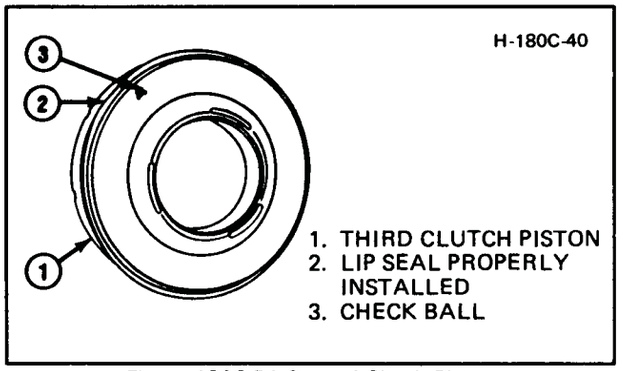


Figure 180C-51 Second Clutch Piston

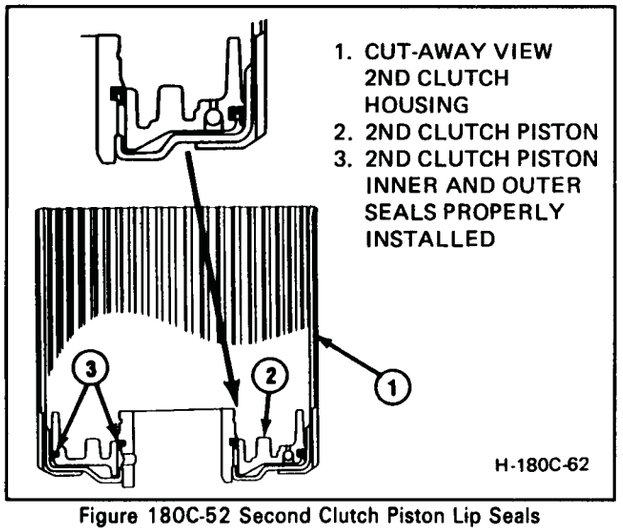


Figure 180C-52 Second Clutch Piston Lip Seals

Installation

1. To Install the second clutch piston into the second clutch drum, use tool J-23080 to prevent damaging the outer lip seal. See Figure 53. Use a liberal amount of transmission fluid for ease of installation and to prevent seal damage.
2. Remove J-23080.
3. Install (22) piston springs and the retaining seat on the second clutch piston.

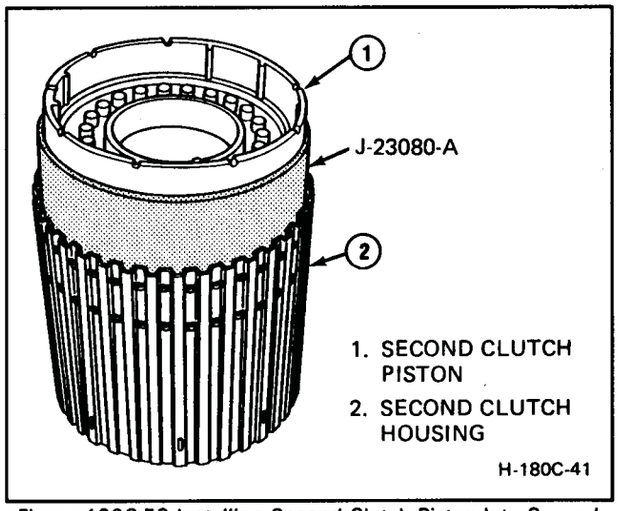


Figure 180C-53 Installing Second Clutch Piston Into Second Clutch Drum

4. Using spring compressor tool J-23327 and three sockets or Tool J-29838 on the retaining seat, compress the second clutch piston return springs. Care should be taken so that the retainer does not catch in the snap ring groove and damage the retainer. See Figure 50.
5. Install the snap ring with pliers such as J-8059. See Figure 50.
6. Install the second-to-third clutch thrust washer so that the tang seats in the slot of the second clutch hub. Secure with petrolatum. See Figure 54.
7. Inspect the condition of the composition and steel plates. See Section 7A "Clutch Plate and Piston Spring Diagnosis."
8. Install the second clutch plates into the second clutch drum with the waved clutch plate first, then a steel plate, a composition plate, a steel plate, etc. Use a liberal amount of transmission fluid. See Figure 49.
9. Install the second clutch spacer plate into the second clutch drum with the wavy end toward the clutch plates. See Figure 49.
10. Install the second clutch spacer retaining ring.
11. Install the ring gear into the second clutch drum with the grooved edge facing upward.
12. Install the ring gear retaining ring.

Second Clutch and Third Clutch Assembly

Installation

1. Align the tangs of the second clutch drive plates in the second clutch drum.
2. Insert the third clutch drum and the input shaft through the top of the second clutch drum, seating the third clutch drum splines into the second clutch plate splines. See Figure 54.
3. Holding the second and third clutch assemblies by the input shaft, lower into the transmission case, indexing the ring gear in the second clutch drum with the long planetary pinion gear teeth. See Figure 55.

Reverse Clutch Plates

Inspection

1. Inspect the condition of the composition and steel plates. See Section 7A "Clutch Plate and Piston Spring Diagnosis."

Installation

1. Install the aluminum pressure plate into the case, with the flat side up. See Figure 55. Make sure that the lug on the

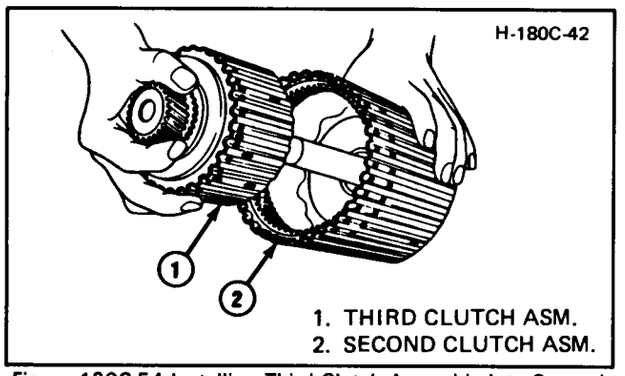


Figure 180C-54 Installing Third Clutch Assembly Into Second Clutch Assembly

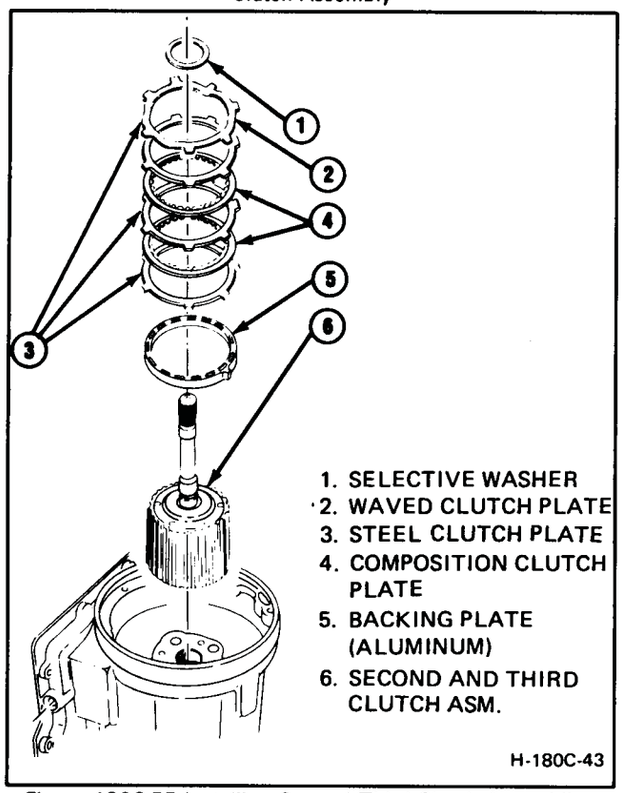


Figure 180C-55 Installing Second/Third Clutch Assemblies Into Case

pressure plate engages with one of the narrow notches in the case.

2. Install a reverse clutch steel plate (with notch on O.D.), a composition plate, a steel plate, a composition plate, etc., into the case. Use a liberal amount of transmission fluid.
3. Install the reverse clutch waved clutch plate into the case, so that all three of its lugs are engaged into the narrow notches in the case.

Determining Selective Washer Thickness

1. Place gaging tool J-23085 on the case flange and aginst the input shaft. See Figure 56.
2. Loosen the thumb screw on J-23085 to allow the inner shaft of the tool to drop on the second clutch housing thrust face.
3. Tighten the thumb screw, then remove tool J-23085.
4. Compare the thickness of the selective washer removed earlier from the transmission to the protruding portion of the inner shaft of tool J-23085. The selective washer used in reassembly should be the thickest washer available without

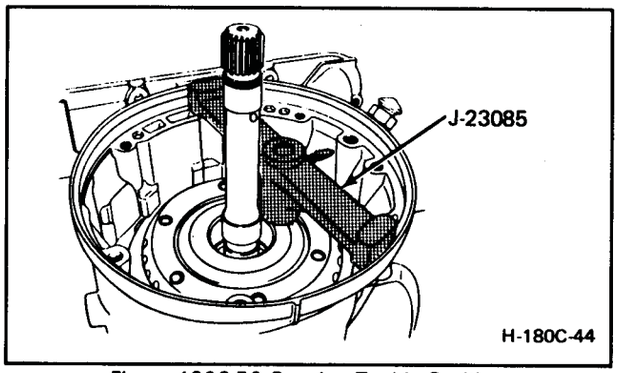


Figure 180C-56 Gageing Tool in Position

exceeding the dimension of the shaft protruding from tool J-23085. See Figure 57. The dimension of the washer selected should be equal to or slightly less than the inner shaft for correct end play in the transmission.

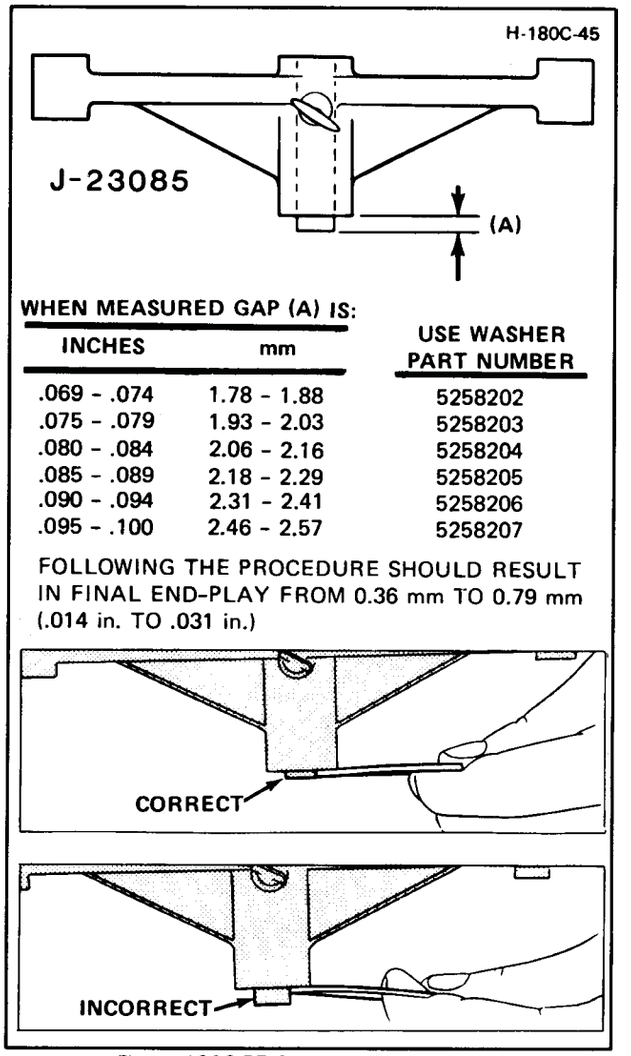


Figure 180C-57 Selective Washer Chart

Converter Housing, Oil Pump and Reverse Clutch

Disassembly

1. Remove the selective washer from the oil pump shaft if not already removed.

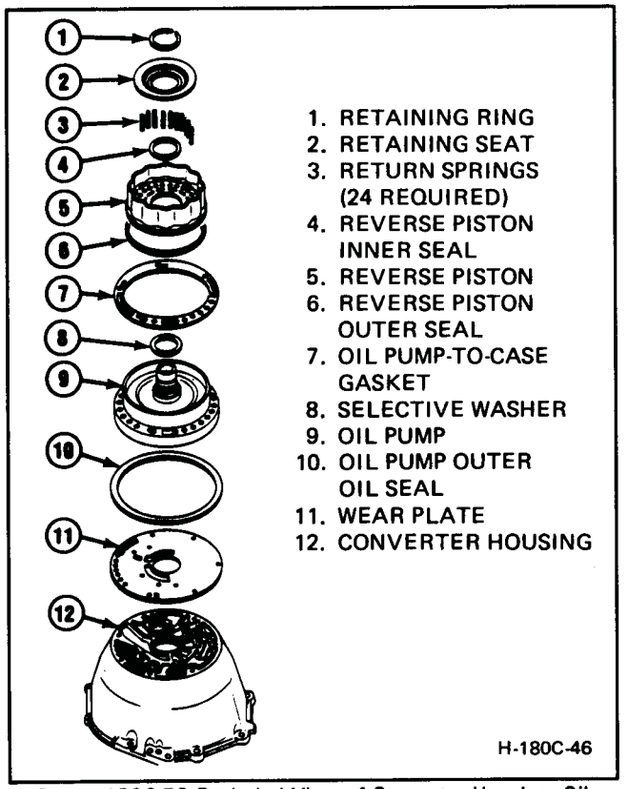


Figure 180C-58 Exploded View of Converter Housing, Oil Pump and Reverse Clutch

2. Remove the oil pump outer oil seal. See Figure 58. Observe the position of the square-cut oil seal. Be sure to position the seal in the same location upon reassembly.
3. Remove the five bolts holding the converter housing to the oil pump. Separate the converter housing and oil pump.
4. Remove the oil pump wear plate. See Figure 58.
5. Check the converter pump hub for nicks, burrs or damage which could have caused the oil seal to leak or have worn the bushing. Remove any nicks and burrs.
6. Mark the relative location of the oil pump gears and remove them. See Figure 59.

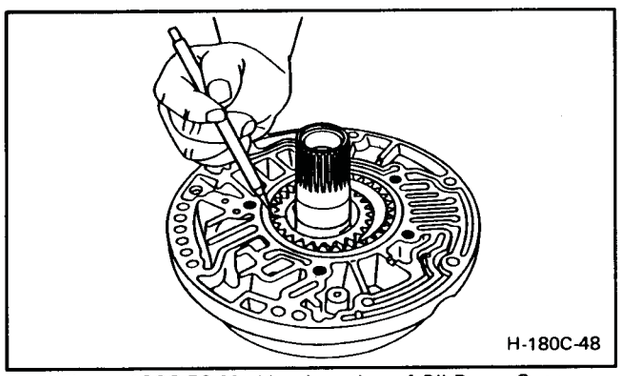


Figure 180C-59 Marking Location of Oil Pump Gear

7. Using compressor tool J-23327 on the reverse clutch retaining seat, compress the clutch return springs. See Figure 60.
8. Remove the snap ring using pliers such as J-8059. See Figure 60.

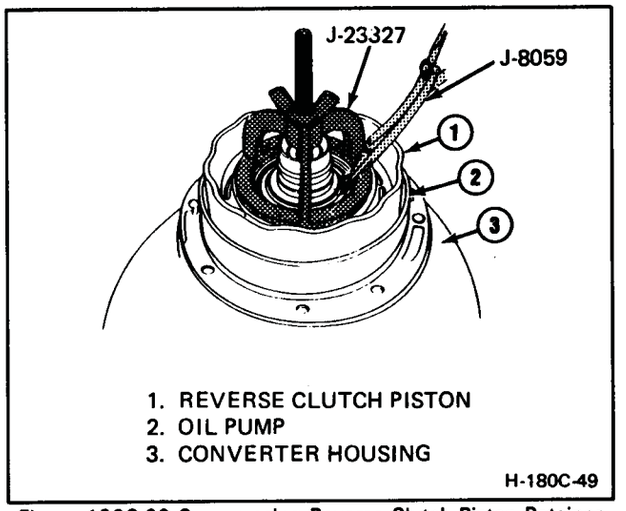


Figure 180C-60 Compressing Reverse Clutch Piston Retainer

9. Loosen compressor tool J-23327 and remove the reverse clutch retaining ring and 24 reverse clutch springs. Use care not to let the spring retainer catch in the ring groove.
10. Remove the reverse clutch piston. The reverse clutch piston may be removed by blowing compressed air into the piston apply passage of the oil pump.
11. The valves, located in the oil pump, may be removed by using a pair of needle nose pliers to remove the retaining pin. However, it is not recommended that these valves be disassembled during overhaul, unless they were determined by oil pressure checks to have been malfunctioning.
    USE CARE WHEN DISASSEMBLING THE VALVES AS THEY ARE UNDER SPRING PRESSURE. Hold a shop towel over the bore while removing the pin, to prevent possible loss of valve train parts.
12. Remove from the pressure regulator bore the retaining pin, the pressure regulator boost valve sleeve, boost valve, the pressure regulator spring, the two spring seats, and the pressure regulator valve. See Figure 61.
13. Remove from the converter clutch actuator bore the retaining pin, bore plug, spring and the converter clutch actuator valve. See Figure 61.

Inspection and Installation

1. Inspect the pressure regulator boost valve, the pressure regulator valve and the converter clutch actuator valve for nicks or damage.
2. Thoroughly clean the pressure regulator boost valve, the pressure regulator valve, and the converter clutch actuator valve. Immerse valves in transmission fluid before installing in their bores.
3. Install the pressure regulator valve, the two spring seats, the spring, the boost valve and the sleeve in the oil pump pressure regulator bore. See Figure 61. Depress the pressure regulator boost valve sleeve until the back end lines up with the pin hole and insert the retaining pin to secure.
4. Install the converter clutch actuator valve, spring and bore plug in the oil pump converter clutch actuator bore. Depress the bore plug past the pinhole and insert the retaining pin to secure. See Figure 61.
5. Inspect the oil pump hub oil seal rings. Replace if damage or side wear is found. See Figure 61.

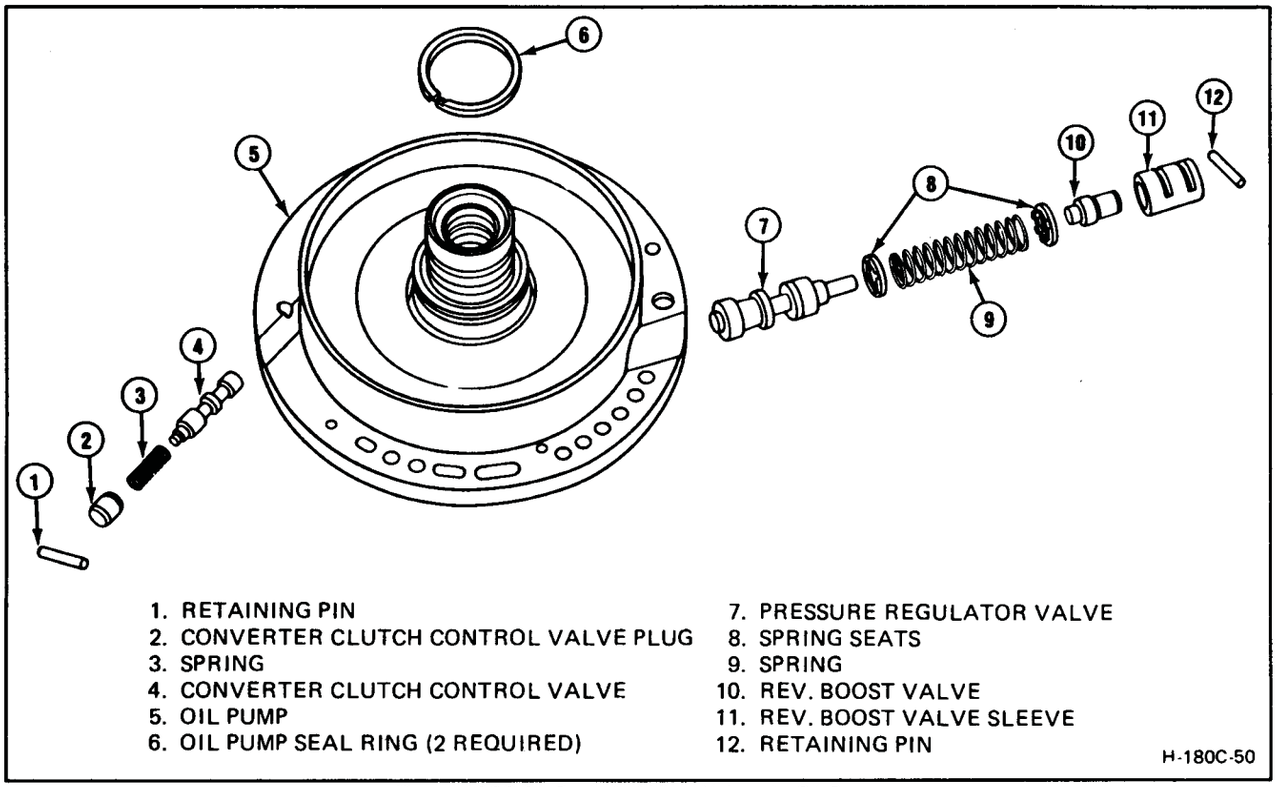


Figure 180C-61 Exploded View-Valves in Oil Pump

6. Inspect the reverse clutch piston for damage. Replace, if necessary. See Figure 62.

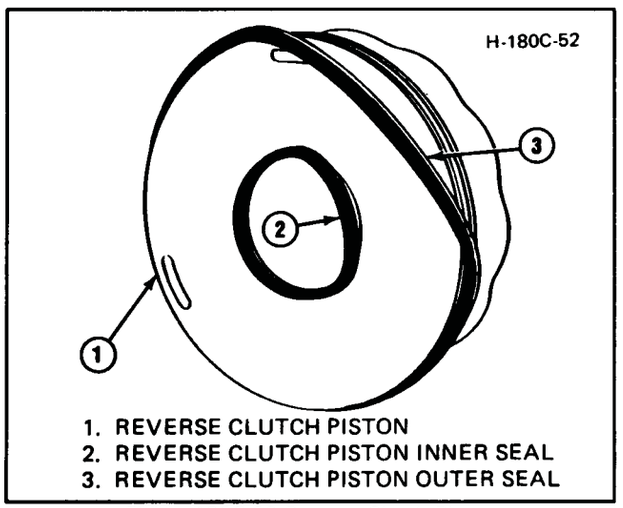


Figure 180C-62 Reverse Clutch Piston

7. Install two new oil seals on the reverse clutch piston if necessary. See Figure 62.
8. Install the reverse clutch piston onto the rear face of the oil pump using a liberal amount of transmission fluid. See Figure 63. Tool J-28241 may be used to protect the seal while installing the piston.
9. Inspect the reverse clutch piston springs. See Section 7A "Clutch Plate and Piston Spring Diagnosis."
10. Install the 24 reverse clutch piston return springs.
11. Set the retaining seat and snap ring in place.

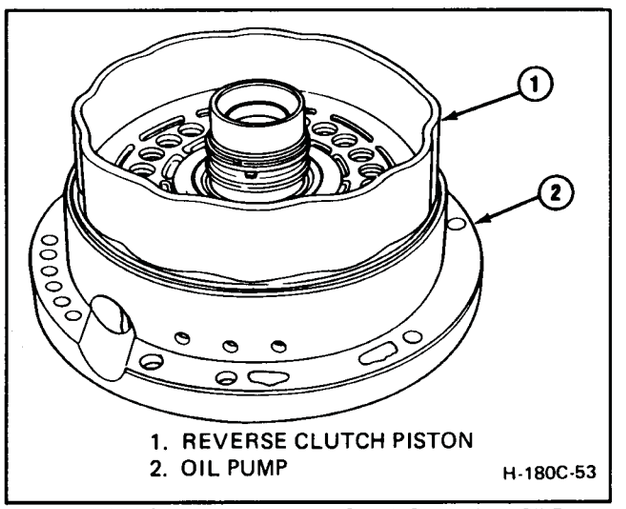


Figure 180C-63 Installing Reverse Clutch Piston Into Oil Pump

12. Compress the return springs using compressor tool J-23327. Care should be taken not to damage the retainer, should it catch in snap ring groove. See Figure 64.
13. Install the snap ring using pliers such as J-8059. See Figure 64. Do not air check the reverse clutch at this time, as the clutch is not complete and damage to the return spring retaining seat may occur.
14. Install the oil pump gears using the location mark made before disassembly.
15. Check the end clearance of both gears to the oil pump face. (Be sure to measure between the face of the gears and the pump face, not between the crescent and the pump face.) Use a straight edge and a feeler gage. Clearance should be between .0127/.0839 mm or .0005 to .00325 inch. See Figure 65.

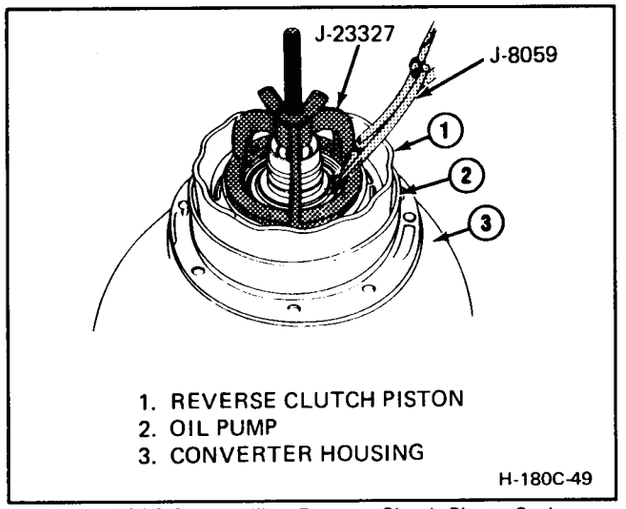


Figure 180C-64 Installing Reverse Clutch Piston Spring Retainer

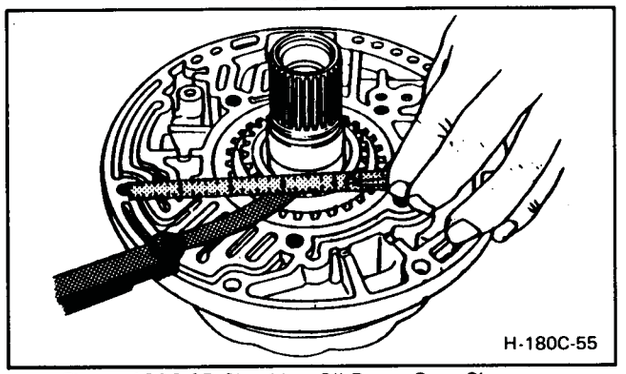


Figure 180C-65 Checking Oil Pump Gear Clearance

16. Install the oil pump wear plate onto the oil pump.
17. Insert guide pins into the oil pump for alignment with the converter housing.
18. Inspect the front face of the converter housing for oil leaks.
19. Install a new converter housing oil seal using tool J-21359. See Figure 66.

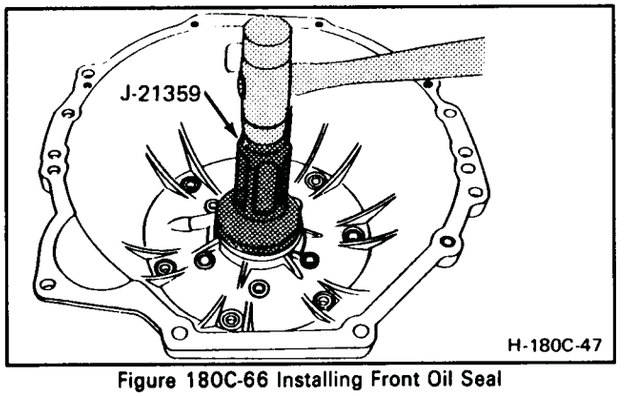


Figure 180C-66 Installing Front Oil Seal

20. Install the converter housing on the oil pump.
21. Loosely install the oil pump bolts into the converter housing.
22. Use converter housing to oil pump aligning tool J-23082 to align the converter housing to the pump. See Figure 67. Tool should bottom on the oil pump gear.

Failure to use tool J-23082 will cause pump damage when transmission is operated after assembly.

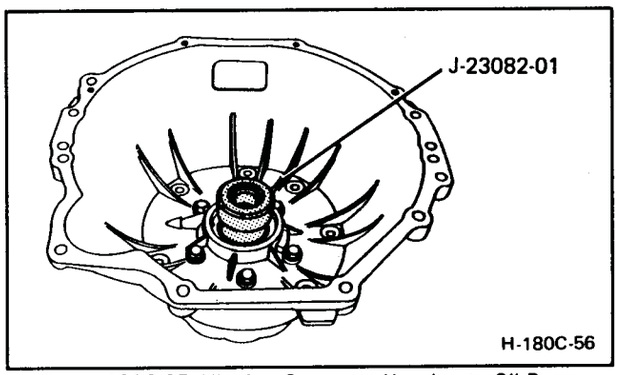


Figure 180C-67 Aligning Converter Housing to Oil Pump

23. Tighten the five inner bolts, to half-torque, then alternately 19 N·m or 14 ft. lbs. and remove aligning tool J-23082.
24. Rotate Tool J-23082-01 to check for freeness.

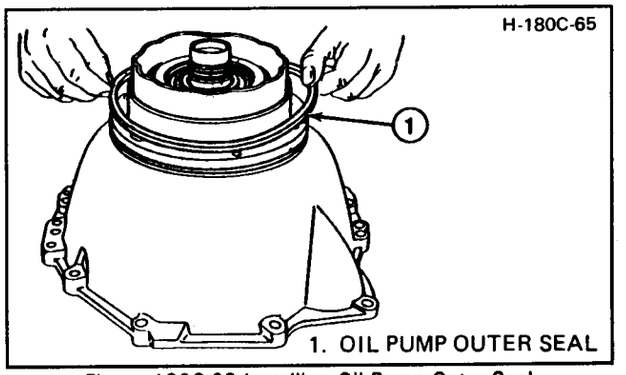


Figure 180C-68 Installing Oil Pump Outer Seal

25. Install a new pump flange gasket and rubber seal.
26. Place the proper selective washer, as previously determined,onto the oil pump shaft and retain with petrolatum.
27. Install two guide pins in the case and lower the converter housing and oil pump into the case.

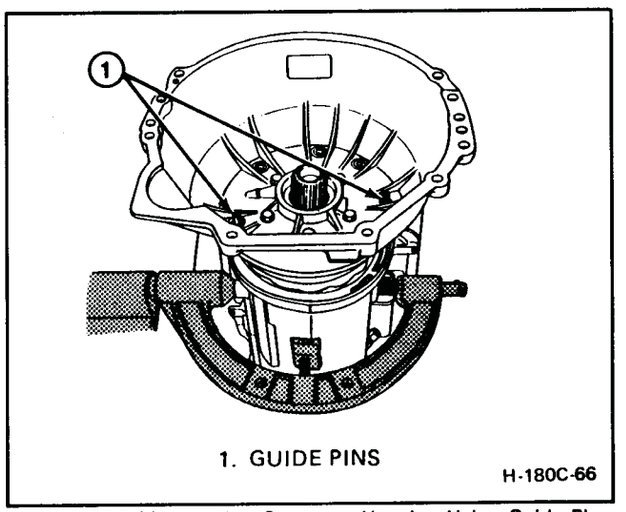


Figure 180C-69 Installing Converter Housing Using Guide Pins

28. Bolt the converter housing to the case. Torque to 33 N·m or 25 ft. lbs.
28. Check for correct assembly by turning the input shaft by hand.
30. Install a new "O" ring seal on the input shaft. Figure 70.

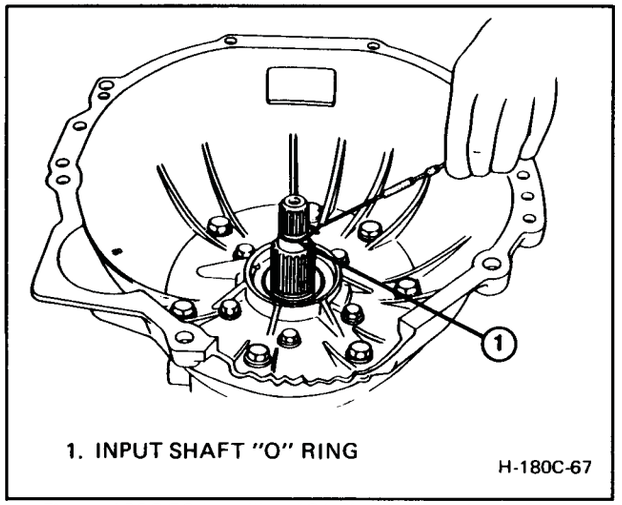


Figure 180C-70 Installing "O" Ring Seal on Input Shaft

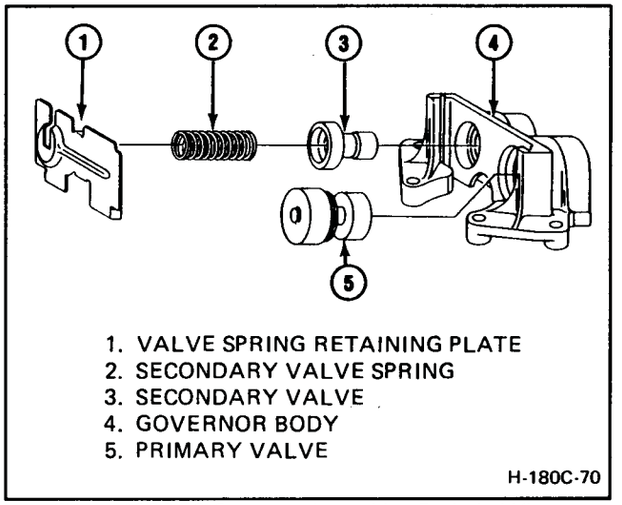


Figure 180C-72 Governor Assembly - Exploded View

Governor Hub

Inspection and Reassembly

1. Inspect the three seal rings on the governor hub.
2. Remove the governor hub oil screen. Use care not to damage or lose the oil screen. See Figure 71. Inspect the screen, clean it with solvent and air dry. Replace, if necessary.
3. Install the oil screen flush with the governor hub.
4. Inspect the governor hub splines for cracks or chipped teeth. Replace the governor hub if required.
5. Turn the case so that the bottom of the transmission is facing upward.
6. Slide the governor hub along the output shaft and seat it into the case. Use a liberal amount of transmission fluid on the oil seal rings.
7. Install the snap ring over the output shaft using pliers such as J-8059. See Figure 71.

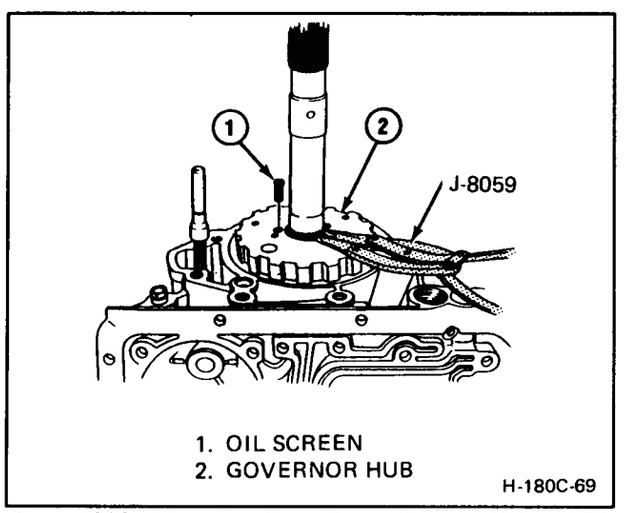


Figure 180C-71 Installing Snap Ring to Governor Hub and Oil Screen

Governor Body and Speedometer Drive Gear

Disassembly

1. Depress the secondary valve spring with a small screwdriver and remove the secondary valve spring retainer.
2. Remove the secondary valve spring, secondary valve and primary valve from the governor body. See Figure 72.

Inspection and Installation

1. Inspect the primary and secondary valve for nicks, burrs, etc. If necessary, use crocus cloth to remove any small burrs. Do not remove the sharp edges of the valve since these edges perform a cleaning action with the valve bore.
2. Inspect the secondary valve spring for distortion or breakage.
3. Clean in solvent, air dry and blow out all oil passages. Inspect all oil passages and valve bores for nicks, burrs or varnish. Replace, if necessary.
4. Install the primary valve in the governor placing the small portion of the valve in first. Use a liberal amount of transmission fluid. There is no spring for the primary valve.
5. Install the secondary valve in the governor with the small spool portion of the valve first.
6. Install the secondary valve spring.
7. Depress the secondary valve spring with a small screwdriver and install the retainer. See Figure 72.
8. Install a new governor body gasket. See Figure 73.
9. Bolt the governor body to the governor hub. Torque to 8 N·m or 6 ft. lbs. The two governor valves should move freely after the governor body is torqued. Figure 73.
10. Install the speedometer drive gear retaining clip onto the output shaft. See Figure 73.
11. While depressing the retaining clip, slide the speedometer gear over the output shaft and install the gear and retaining clip.

Extension Housing and Speedometer Driven Gear

Inspection and Reassembly

1. Inspect the extension housing for damage. Replace the housing, if necessary. See Figure 74.
2. Inspect the parking pawl and spring for damage. Replace, if necessary. See Figure 74.
3. Install a new extension housing seal using installer tool J-21426 if necessary. See Figure 75.
4. Install a new extension housing gasket.
5. Slide the extension housing over the output shaft and align holes.
6. Align the parking pawl actuator rod into the extension housing.
7. Bolt the extension housing to the rear of the case. Torque to 31 N·m or 23 ft. lbs. See Figure 76.
8. Install the speedometer driven gear housing into the extension housing. See Figure 76.

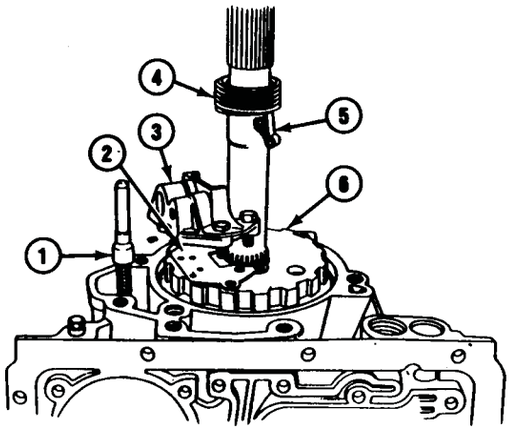


Figure 180C-73 Installing Governor Body and Speedometer Drive Gear

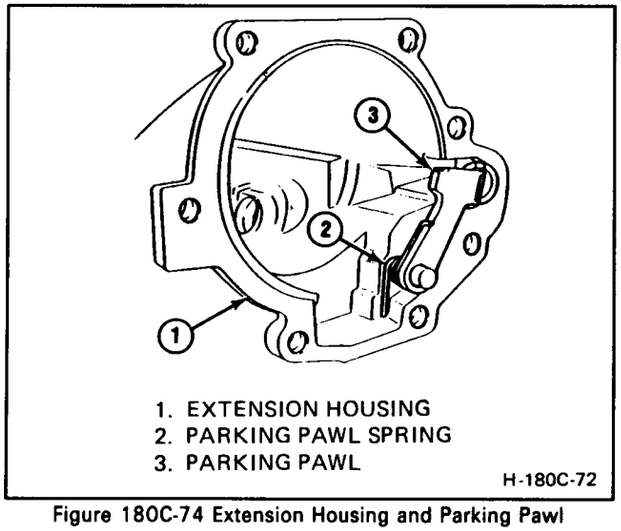


Figure 180C-74 Extension Housing and Parking Pawl

9. Install the speedometer driven gear housing retainer into the slot provided in the speedometer driven gear housing. Bolt the retainer to the extension housing. Torque to 9.5 N·m or 7 ft. lbs.

Detent Valve and Modulator Valve

Inspection and Installation

1. Inspect the detent valve sleeve oil seal and replace, if necessary.
2. Install the detent valve, spring, spring seats, and sleeve into the case bore using a liberal amount of transmission fluid. See Figure 77.

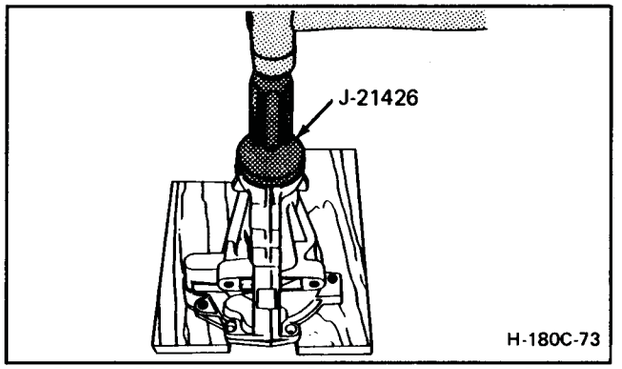


Figure 180C-75 Installing Extension Housing Oil Seal

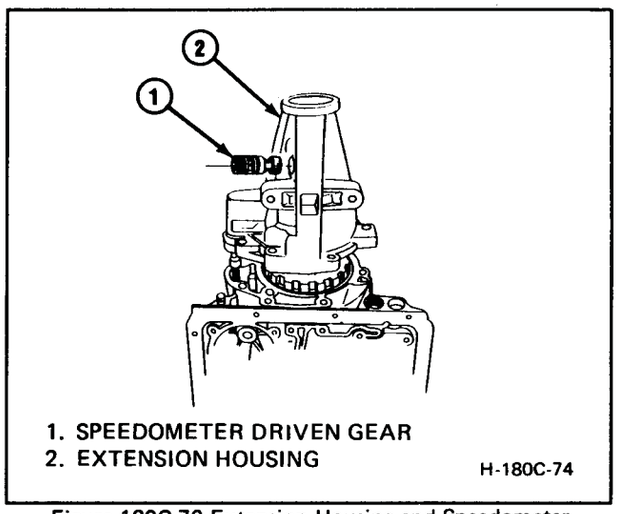


Figure 180C-76 Extension Housing and Speedometer Driven Gear

3. Depress the detent valve sleeve and insert the spring pin to secure the detent valve assembly. The detent valve sleeve must be installed with its slots facing the oil pan. Care should be taken so that the spring pin is inserted into the groove provided in the sleeve and not into one of the oil passage slots in the sleeve.
4. Install the modulator valve into the sleeve with the small end of the modulator valve first. Install the modulator sleeve into the case. The tab on the end of the modulator sleeve must engage in the slot at the rear of the modulator valve bore.
5. Install a new modulator "O" ring on the modulator assembly, if necessary. Install the plunger and thread the modulator assembly into the case. Tighten to 52 N·m or 38 ft. lbs. using tool J-23100. See Figure 78. **Do not use any other tool to install the modulator as damage to modulator may result.**

Servo Piston

Disassembly

1 Remove the servo piston return spring and apply rod.
2. Hold the servo piston sleeve at the flat portion of the sleeve with a wrench, loosen the adjusting bolt locknut and remove. See Figure 79.
3. Use an Arbor Press to depress the servo piston sleeve and remove the piston sleeve retaining ring. See Figure 79.
4. Push the sleeve through the piston and remove the cushion spring and spring retainer.
5. Remove the servo piston ring.

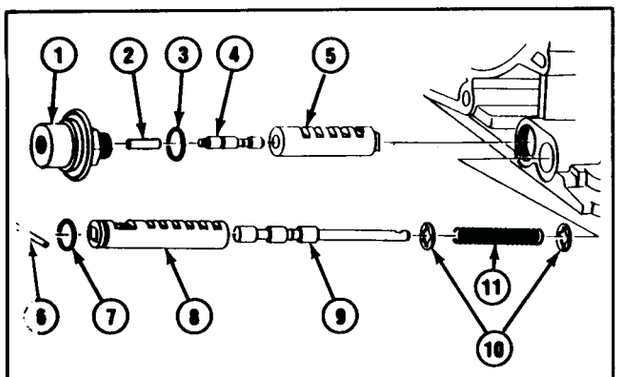


Figure 180C-77 Installing Detent Valve and Modulator Valve

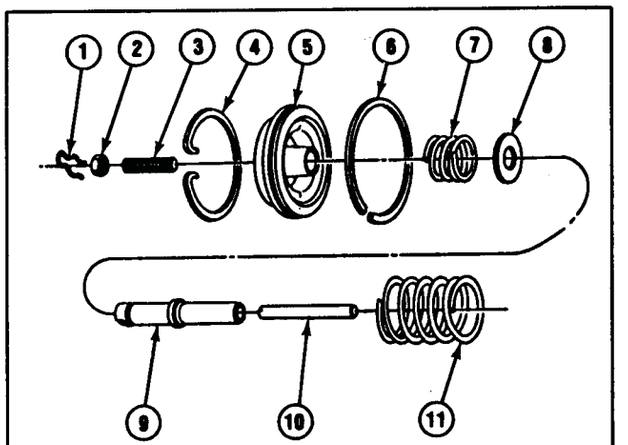


Figure 180C-79 Servo Piston - Exploded View

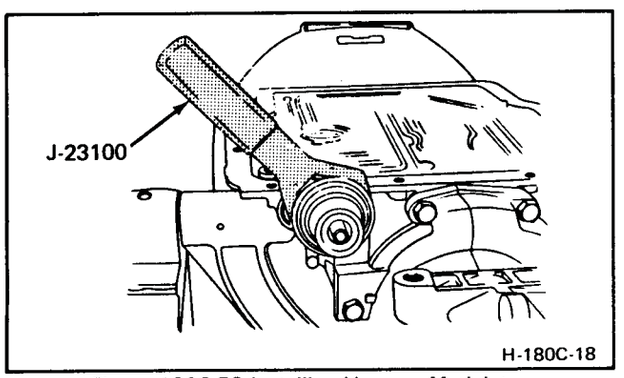


Figure 180C-78 Installing Vacuum Modulator

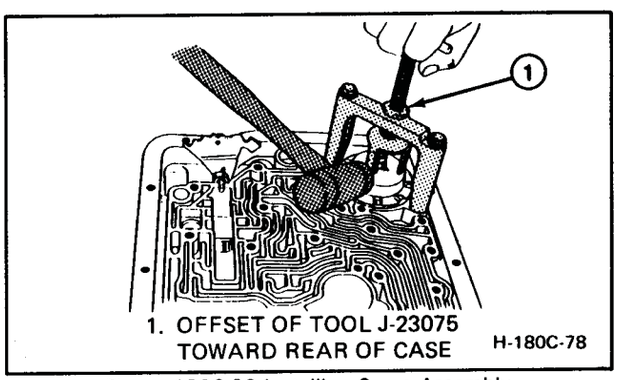


Figure 180C-80 Installing Servo Assembly

6. Inspect the cushion spring, adjusting bolt and piston sleeve for damage. Inspect the piston for damage and the piston ring for side wear, replace if necessary. See Figure 79.

Inspection and Installation

1. Reassemble the servo piston, reversing the disassembly procedure.
2. Install the servo apply rod, spring and piston into the case, using a liberal amount of transmission fluid.
3. Compress the servo piston spring using tool J-23075. Tap the servo piston with a rubber mallet while compressing, until the piston is seated, to avoid damage to the oil seal ring or case. See Figure 80.
4. Install the servo retaining ring. See Figure 81. Remove tool J-23075.
5. Use a 3/16" hex head wrench on the servo adjusting bolt and adjust the servo apply rod by tightening the adjusting bolt to 4.5 N·m or 40 in. lbs. Be certain that the locknut remains loose. Back off the bolt five (5) turns **exactly.** See Figure 82.
6. Tighten the nut, holding the adjusting bolt and sleeve firmly. See Figure 83.

Valve Body

Disassembly

1. Remove the manual valve and manual valve link from the valve body. Do not drop the manual valve.
2. Turn the valve body so that the transfer plate is facing upward and remove the two bolts holding the transfer plate to the valve body. See Figure 84.
3. Remove the transfer plate and gasket.
4. Use tool J-22269-01 or C clamp on the valve body and compress the actuator piston. See Figure 85.
5. Remove the accumulator piston retaining ring with a screwdriver or needle nose pliers.
6. Carefully loosen the C-clamp as the accumulator piston is under spring tension.

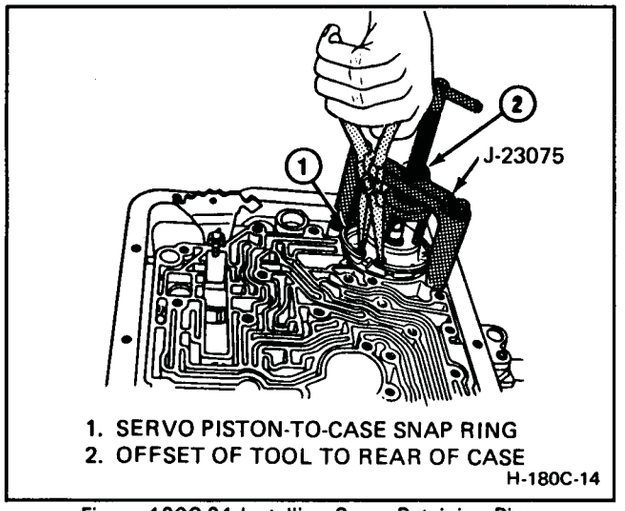


Figure 180C-81 Installing Servo Retaining Ring

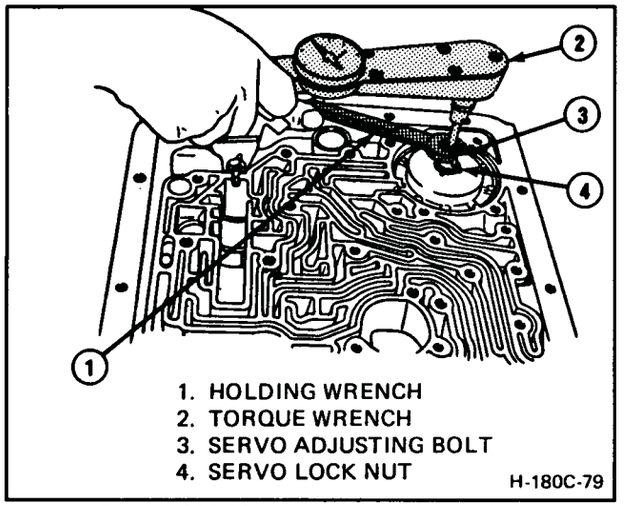


Figure 180C-82 Adjusting Servo Apply Rod

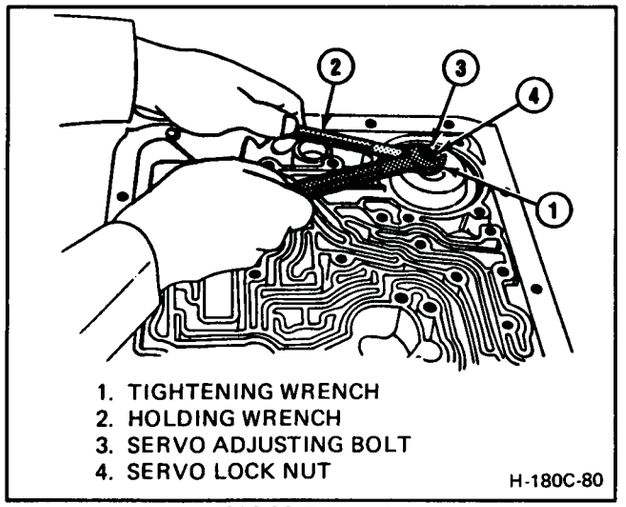


Figure 180C-83 Tighten Servo Nut

7. Remove the accumulator piston, oil ring, and spring. See Figure 86.

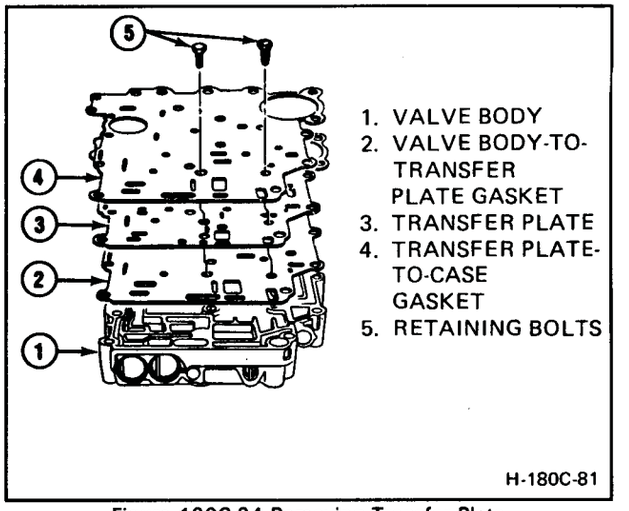


Figure 180C-84 Removing Transfer Plate

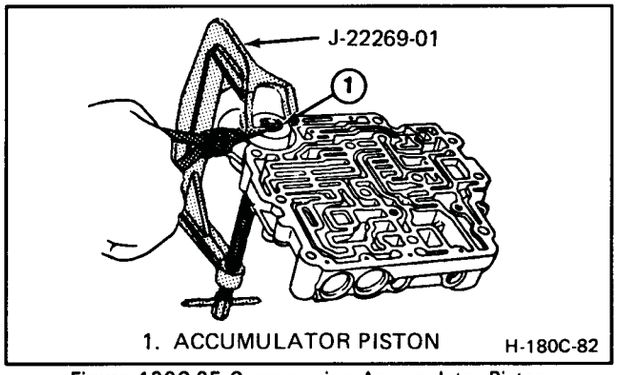


Figure 180C-85 Compressing Accumulator Piston

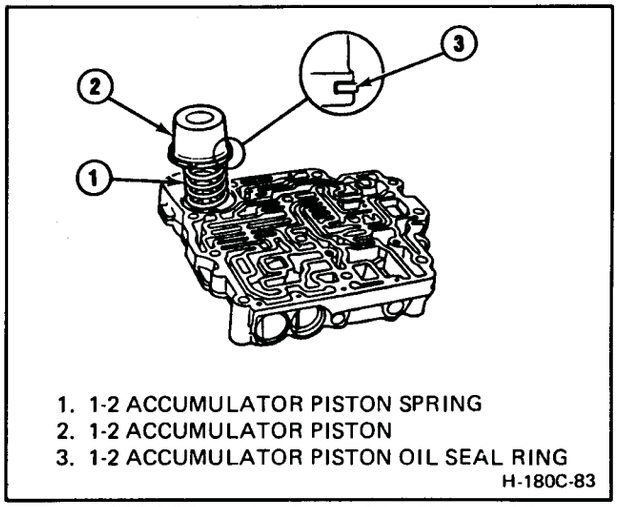
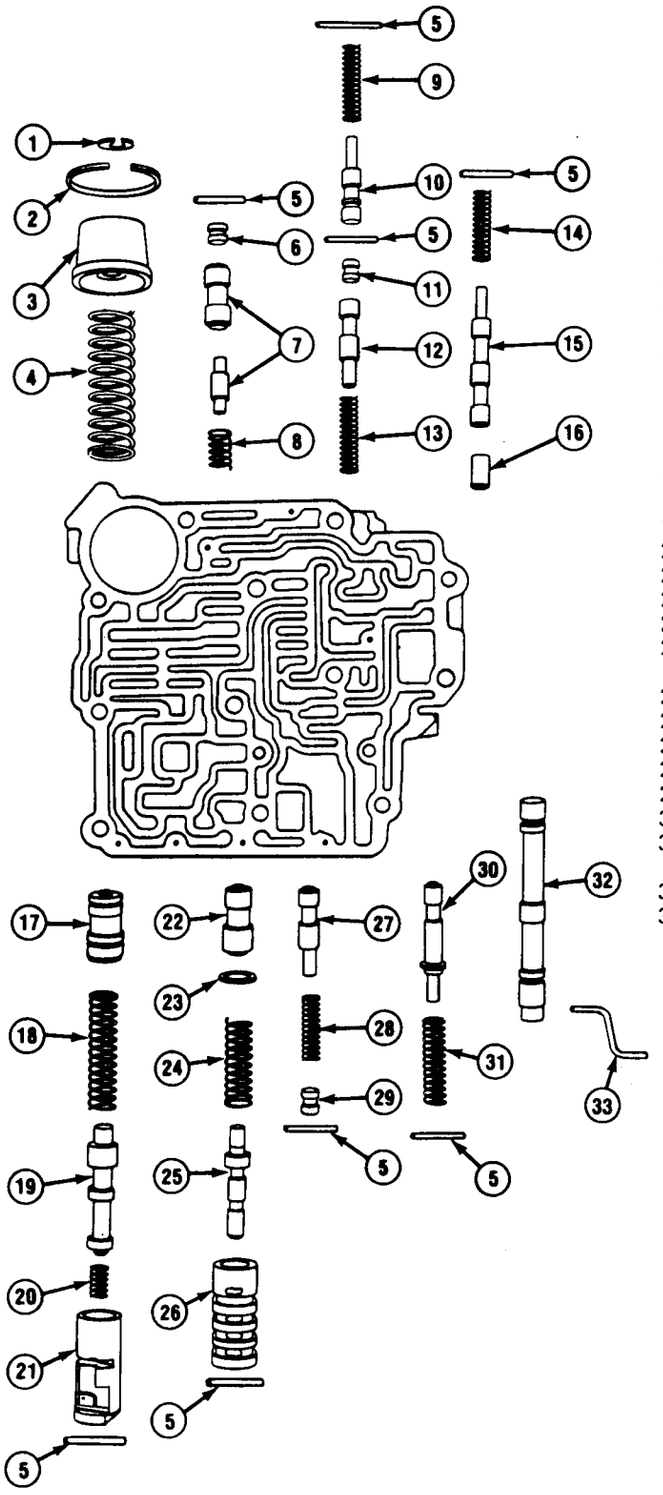


Figure 180C-86 Removing Accumulator Piston and Spring

8. Inspect the accumulator oil ring for damage or edge wear and the piston for damage. Replace, if necessary.

For steps 9 through 16 refer to Figure 87.

9. Remove the 1-2 shift control valve retaining pin, 1-2 shift control valve sleeve, control valve, 1-2 shift valve spring and 1-2 shift valve. It may be necessary to remove burrs in valve body bore made by retaning pin prior to removal of the sleeves and valves.



1. RETAINING CLIP
2. OIL RING
3. 1-2 ACCUMULATOR PISTON
4. 1-2 ACCUMULATOR SPRING
5. RETAINING PIN
6. 1-2 ACCUMULATOR VALVE PLUG
7. 1-2 ACCUMULATOR VALVE
8. 1-2 ACCUMULATOR VALVE SPRING 1/2" x 1-1/16"
9. HIGH SPEED DOWNSHIFT TIMING VALVE SPRING 7/16" x 1-5/16"
10. HIGH SPEED DOWNSHIFT TIMING VALVE
11. TIMING AND CONTROL VALVE PLUG
12. LOW SPEED DOWNSHIFT TIMING VALVE
13. LOW SPEED DOWNSHIFT TIMING VALVE SPRING 7/16" x 1-3/8"
14. MANUAL LOW CONTROL VALVE SPRING 7/16" x 1-5/16"
15. MANUAL LOW CONTROL VALVE
16. REVERSE CONTROL VALVE
17. 1-2 SHIFT VALVE
18. 1-2 SHIFT CONTROL VALVE SPRING 3/4" x 2-7/16"
19. 1-2 SHIFT CONTROL VALVE
20. 1-2 SHIFT CONTROL VALVE SPRING
21. 1-2 SHIFT CONTROL VALVE SLEEVE
22. 2-3 SHIFT VALVE
23. 2-3 SHIFT CONTROL VALVE SPRING SEAT
24. 2-3 SHIFT CONTROL VALVE SPRING 11/16" x 1-3/4"
25. 2-3 SHIFT CONTROL VALVE
26. 2-3 SHIFT CONTROL VALVE SLEEVE
27. 3-2 CONTROL VALVE
28. 3-2 CONTROL VALVE SPRING 7/16" x 1-3/4"
29. 3-2 CONTROL VALVE PLUG
30. DETENT PRESSURE REGULATOR VALVE
31. DETENT PRESSURE REGULATOR VALVE SPRING 1/2" x 1-5/8"
32. MANUAL VALVE
33. MANUAL LINK

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Figure 180C-87 Typical Valve Body

10. Remove the 2-3 shift control valve retaining pin and sleeve. Also, remove the 2-3 shift control valve, spring seat, spring and 2-3 shift valve.
11. Remove the 3-2 control valve retaining pin and plug. Remove 3-2 control valve spring and control valve.
12. Remove the detent pressure regulator valve retaining pin, spring and detent pressure regulator valve.
13. Remove the high speed downshift timing valve retaining pin and spring. Remove the valve.
14. Remove the downshift timing valve plug retaining pin and remove downshift timing valve plug. Remove the low speed downshift timing valve and spring.
15. Remove the manual low and reverse control valve retaining pin. Remove the spring, the manual low control valve, and the reverse control valve.
16. Remove the 1-2 accumulator valve retaining pin and remove the 1-2 accumulator valve plug, 1-2 accumulator valve and spring.

Inspection and Installation

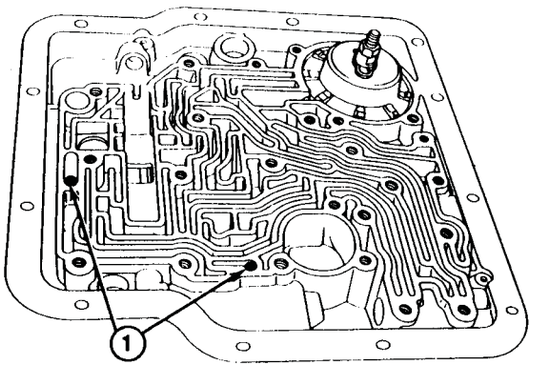
1. A clean work area which is free of dirt and dust should be used to inspect, clean and install the valves in the valve body. Handle the valve components with clean hands and tools. Since many valve failures are caused initially by dirt or other foreign matter pretenting a valve from functioning properly, a thorough cleaning of all the components with a cleaning solvent is essential. Do not use paraffin to clean out the valve body passages and valve bore. Compressed air may be used to blow out the passages.
2. Inspect each valve for free movement in its respective bore in the valve body. If necessary, use crocus cloth to remove small burrs on a valve. Do not remove the sharp edges of the valves as these edges perform a cleaning action within the bore.
3. Inspect the valve springs for distortion or collapsed coils. Replace the entire valve body assembly if any parts are damaged.
4. Inspect the transfer plate for dents or distortion. Replace the transfer plate if necessary.
5. Reassemble the valves, springs, plugs and retaining pins in their proper location and order into the valve body using a liberal amount of transmission fluid. See Figure 87.
6. Install the accumulator spring and piston in the valve body.
7. Compress the accumulator piston with tool J-22269-01 and install the retaining ring.
8. Install a new valve body gasket and the transfer plate.
9. Bolt the transfer plate and gasket to the valve body. Torque 9.5 N·m or 7 ft. lbs.
10. Install the steel check balls in the case. See Figure 88.
11. Install a new case-to-transfer plate gasket on the case.
12. Install a guide pin in the transmission case for correct alignment of the valve body and transfer plate. See Figure 89.
13. Install the manual valve into the valve body bore using liberal amount of transmission fluid. Install the long side of the manual valve link pin into manual valve and position the manual valve as shown in Figure 89.
14. Install the valve body onto the case and position the short side of the link pin into the inside selector lever.
16. The valve body bolts should be torqued starting in the center of the valve body and working outward. Torque to 19 N·m or 14 ft. lbs.

External Parts

Inspection and Installation

See Figure 90

1. Install the selector lever roller spring and retainer. Torque to 13 N·m or 9 ft. lbs.
2. Install the reinforcement plate and bolt it to the case. Torque to 19 N·m or 14 ft. lbs.
3. Install the governor pressure switch and torque to 10 N·m (7 ft. lbs.).
4. Install solenoid valve and piping. Torque solenoid valve bolts to 19 N·m (14 ft. lbs.) Figure 91.
5. Connect the electrical wires as shown in Figure 91. The negative wire connects to the governor pressure switch and the positive wire connects to the case electrical connector.
6. Inspect the oil strainer. If foreign matter is present, install a new strainer.
7. Install the oil strainer assembly using a new gasket. Torque to 18.9 N·m or 14 ft. lbs.
8. Install a new servo cover gasket.
9. Install the servo cover. Torque to 24.4 N·m or 18 ft. lbs.
10. Install a new oil pan gasket.
11. Bolt the oil pan to the transmission case. Torque to 11 N·m or 8 ft. lbs.
12. Install the torque converter.
13. Make certain the converter is seated and rotate to check for free movement. See Figure 92.



1. CHECK BALL LOCATIONS

H-180C-86

Figure 180C-88 Installing Check Balls in Oil Passges

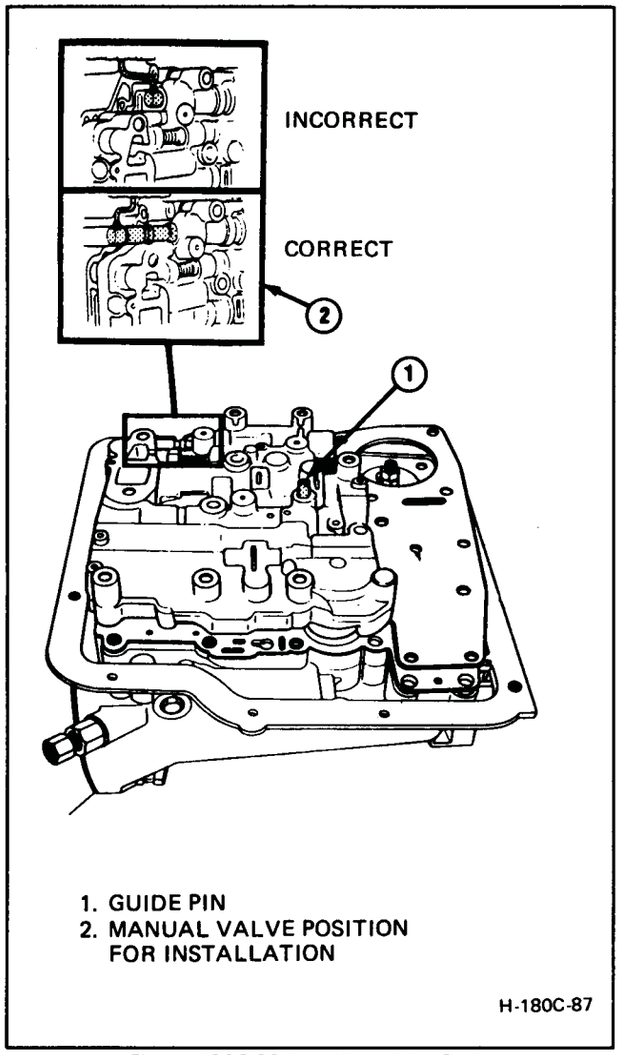


Figure 180C-89 Installing Valve Body

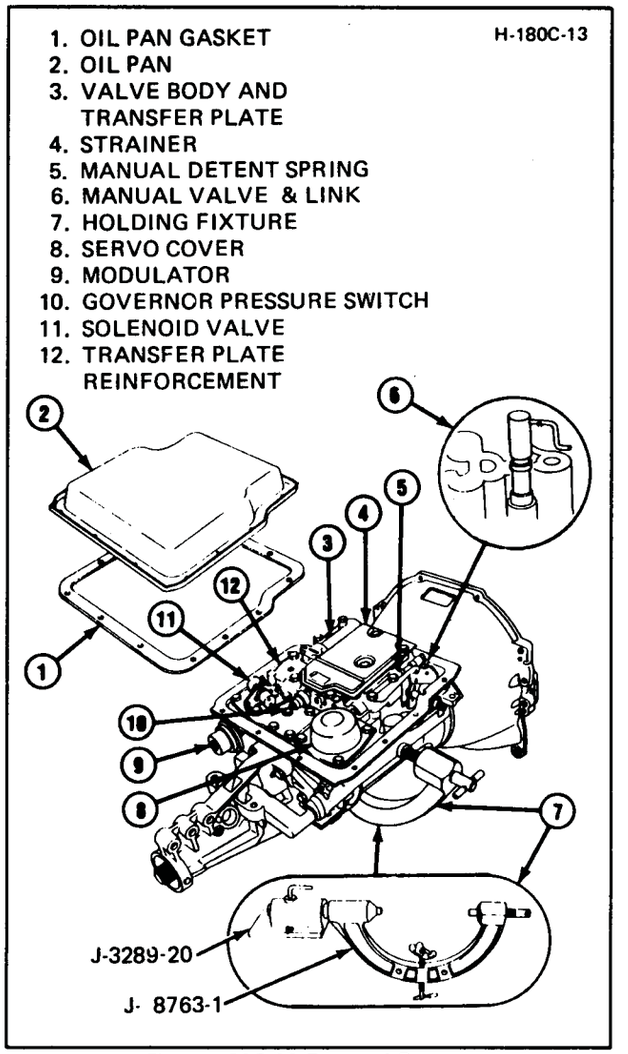


Figure 180C-90 External Parts

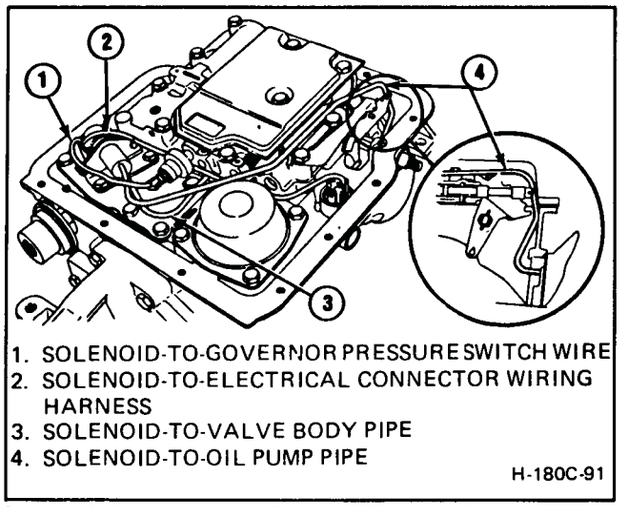


Figure 180C-91 Hookup of Solenoid Pipes and Electrical Wires

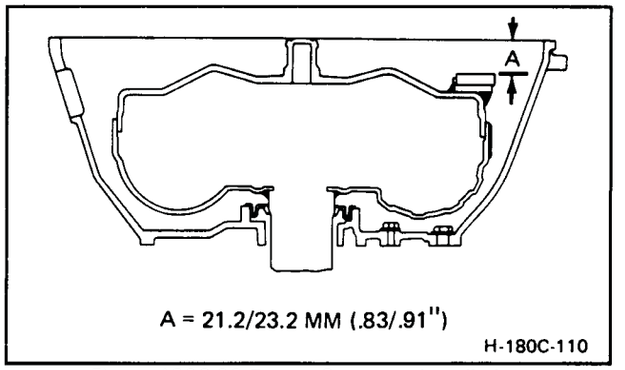
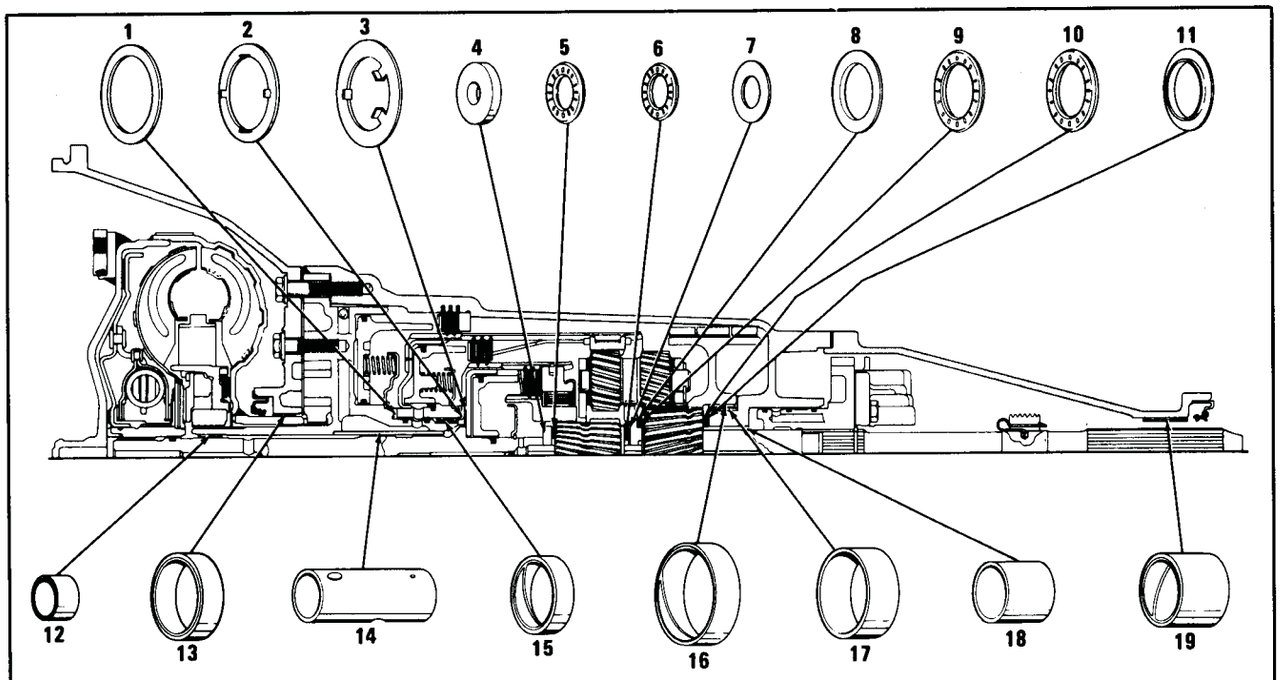


Figure 180C-92 Proper Converter Installation

TORQUE SPECIFICATIONS		
ITEM	**N·m**	**LB.FT.**
OIL PAN-TO-CASE	11	8
MODULATOR ASSEMBLY	52	33
EXTENSION HOUSING-TO-CASE	31	23
OIL PRESSURE CHECK PLUG	8	6
CONVERTER HOUSING-TO-CYLINDER BLOCK	34	25
TRANSMISSION SUPPORT-TO-EXTENSION	44	33
SHIFT LEVER-TO-SELECTOR LEVER SHAFT	27	20
DETENT CABLE, RETAINER-TO-CASE	9	6
OIL COOLER FITTINGS-TO-CASE	20	15
OIL COOLER FITTINGS-TO-RADIATOR	27	20
OIL COOLER HOSE CLAMPS-TO-COOLER LINES	1	.7
SHIFTER ASS'Y-TO-CONSOLE	9	7
NEUTRAL SAFETY SWITCH-TO-BRACKET	2	1
LOWER COVER-TO-CONVERTER HOUSING	10	7
FLEXPLATE-TO-CONVERTER	48	35
TRANSFER PLATE-TO-VALVE BODY	9	7
REINFORCEMENT PLATE-TO-CASE	19	14
VALVE BODY-TO-CASE	19	14
SERVO COVER-TO-CASE	24	18
CONVERTER HOUSING-TO-OIL PUMP	19	14
CONVERTER HOUSING-TO-CASE	33	25
SELECTOR LEVER LOCKNUT	12	9
GOVERNOR BODY-TO-GOVERNOR HUB	8	6
SERVO ADJUSTING BOLT LOCKNUT	18	14
GOVERNOR PRESSURE SWITCH	10	7
SOLENOID	19	14
OIL STRAINER	18.9	14
		H-180C-93

Figure 180C-93 Torque Specifications



1. SELECTIVE THRUST WASHER (OIL PUMP HUB-TO-2ND CLUTCH)
2. BRONZE THRUST WASHER (2ND CLUTCH-TO-3RD CLUTCH)
3. STEEL THRUST WASHER (2ND CLUTCH-TO-3RD CLUTCH)
4. THRUST WASHER (INPUT SHAFT-TO-INPUT SUN GEAR)
5. TORRINGTON BEARING (INPUT SHAFT-TO-INPUT SUN GEAR)
   NO'S. 4 & 5 MAY BE STAKED TOGETHER
6. TORRINGTON BEARING (SUN GEAR-TO-OUTPUT SHAFT)
7. THRUST WASHER
8. THRUST WASHER (OUTPUT SHAFT-TO-REACTION SUN GEAR)
9. TORRINGTON BEARING
10. TORRINGTON BEARING (REACTION SUN GEAR-TO-CASE)
11. THRUST WASHER
12. OIL PUMP HUB BUSHING (FRONT)
13. CONVERTER HOUSING BUSHING
14. OIL PUMP BODY BUSHING (REAR)
15. SECOND CLUTCH HUB BUSHING
16. REACTION SUN GEAR DRUM BUSHING
17. REACTION SUN GEAR DRUM BUSHING SLEEVE
18. CASE BUSHING
19. EXTENSION BUSHING

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Figure 180C-94 Washer and Bushing Location

AUTOMATIC 180C TRANSMISSION BUSHING SERVICE

If during disassembly and inspection of the transmission, a bushing is found galled, scored or excessively worn, replace the bushing using the following procedure:

The replacement bushings used for field service are precision fit and do not require boring or reaming after installation.

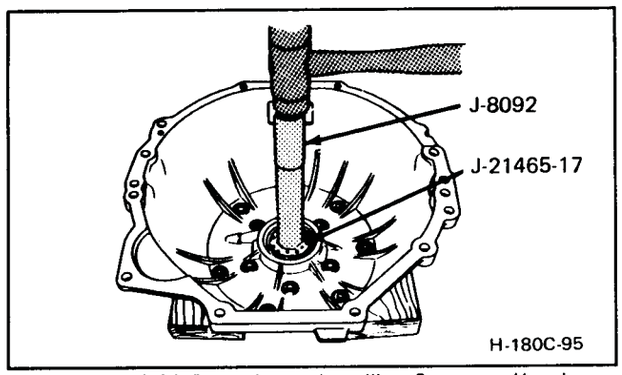


Figure 180C-95 Removing or Installing Converter Housing Bushing

Converter Housing Bushing

1. Remove the converter housing bushing, using tool tool J-21465-17 with driver handle J-8092, from the converter side of the housing. Figure 95.

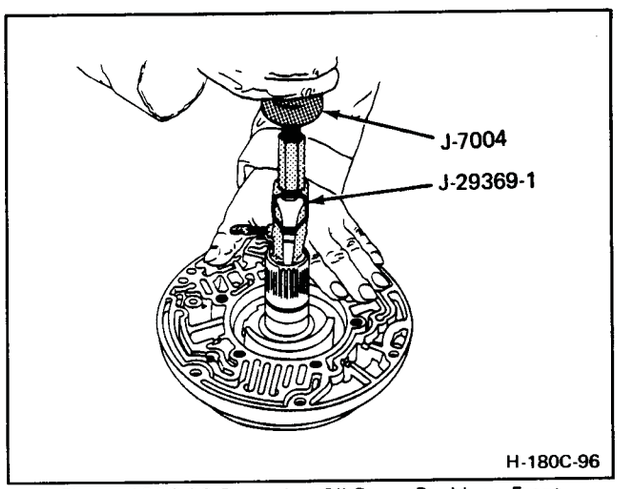


Figure 180C-96 Removing Oil Pump Bushing - Front

2. Clean the converter housing thoroughly. Install a new converter housing bushing flush with the front face of the housing using tool J-21465-17 and driver handle J-8092. See Figure 95.

Oil Pump Bushing

Front Bushing

1. Using tool J-29369-1 and J-7004 remove the front oil pump bushing. Figure 96.
2. Using tool J-25019-2 and J-8092 install a new front oil pump bushing. Figure 97.

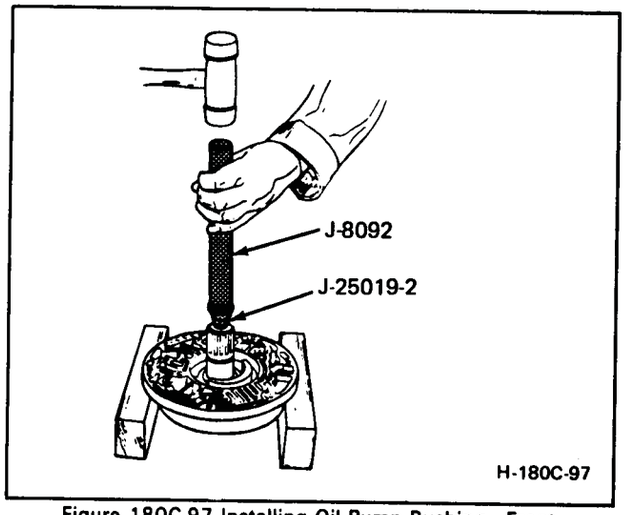


Figure 180C-97 Installing Oil Pump Bushing - Front

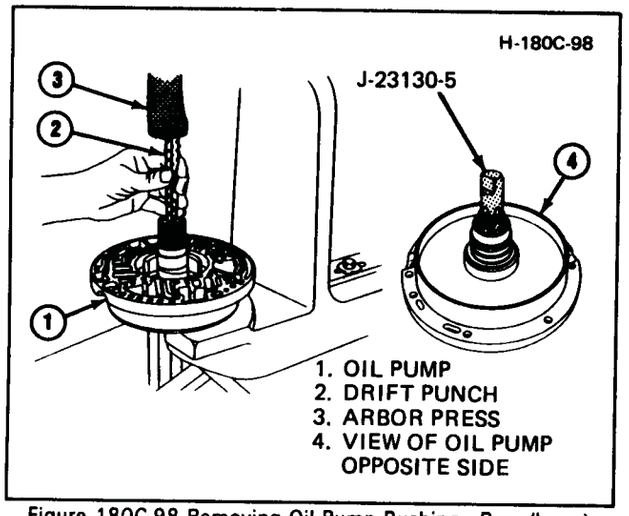


Figure 180C-98 Removing Oil Pump Bushing - Rear (Inner)

Rear Bushing - Inner

1. Inspect, and if necessary, replace the inner oil pump hub bushing by threading a 3/4" standard pipe tap such as tool J-23130-5 into bushing. See Figure 98.
2. Place the oil pump on an arbor press with the hub down and insert a drift punch through the stator shaft. Apply pressure on the drift punch, with the arbor press, to remove the bushing. Use rag or cloth to protect oil pump face.

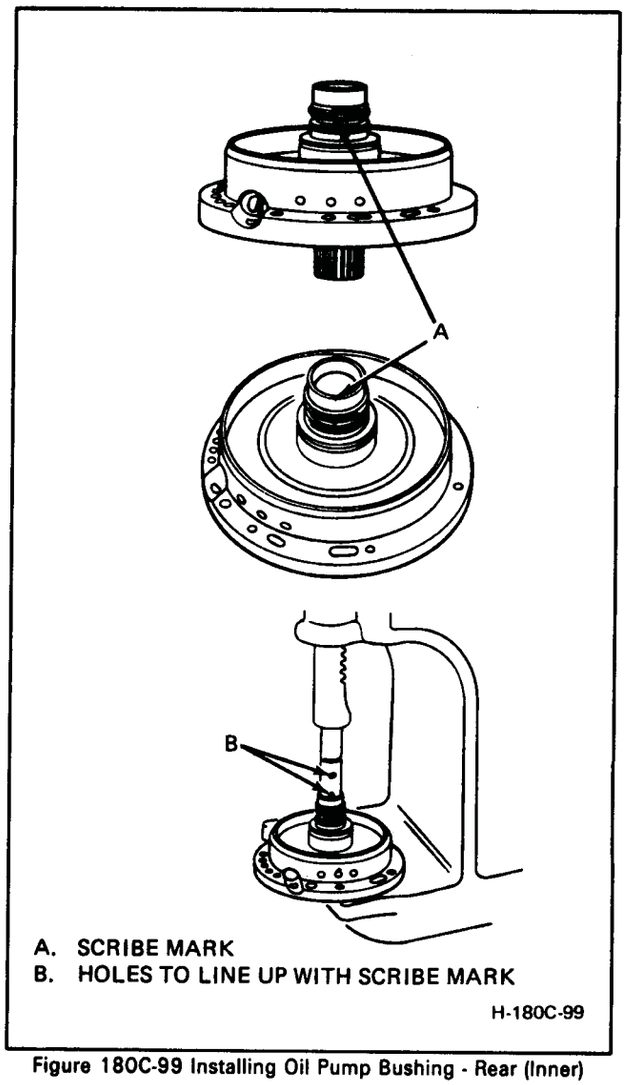


Figure 180C-99 Installing Oil Pump Bushing - Rear (Inner)

3. Install a new oil pump hub bushing with the arbor press and tool J-23130-1 as follows: See Figure 99.

   a. Clean the pump body, including all holes and pockets thoroughly. Place the oil pump on a bench with hole "A" facing downward, scribe a mark on the oil pump shaft inner diameter at the center of the oil groove to the right of hole "A." Scribe a mark on the outer diameter of the bushing through the center of the small and large drilled holes "B." Place the bushing into the oil pump hub with the small hole up and align the scribe mark on the bushing with the scribe mark made in the oil pump shaft. Use the arbor press and tool J-23130-1 to drive the bushing into the oil pump shaft until it is seated in the bore.

   Care must be taken so that the bushing is pressed in straight, using the scribe marks as a guide until firmly seated.

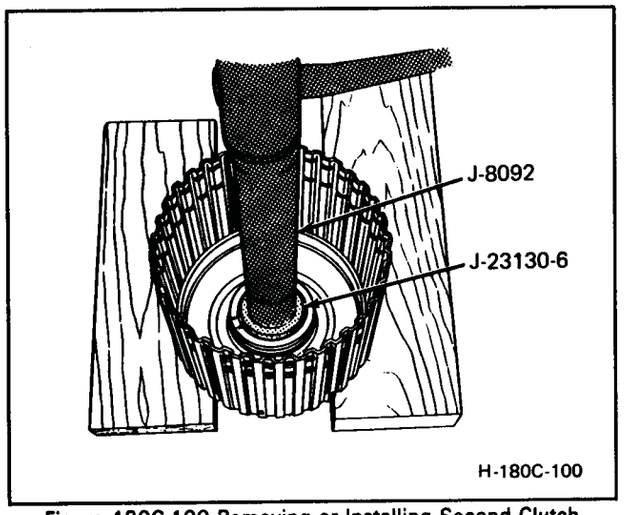


Figure 180C-100 Removing or Installing Second Clutch Bushing

Second Clutch Bushing

1. If necessary, remove the second clutch hub bushing using remover and installer J-23130-6 with driver handle J-8092 See Figure 100.
2. Clean in solvent to remove any foreign matter. Install a new second clutch hub bushing using tool J-23130-6 and driver handle J-8092. Bushing must be driven in until tool bottoms on bench. See Figure 100.

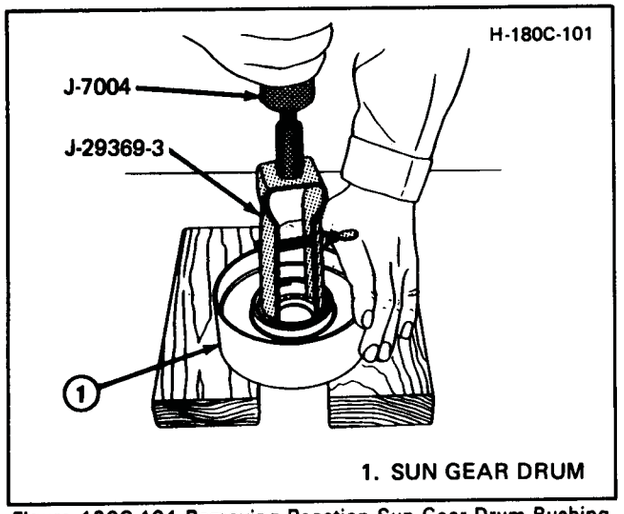


Figure 180C-101 Removing Reaction Sun Gear Drum Bushing

Reaction Sun Gear Drum Bushing

1. Remove the reaction sun gear drum bushing with either tool J-8400-1 at the bushing joint or with tools J-29369-3 and J-7004. See Figure 101.

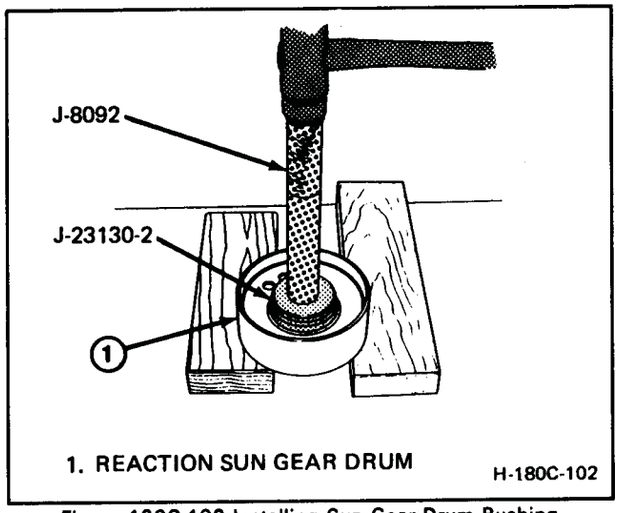


Figure 180C-102 Installing Sun Gear Drum Bushing

2. Install a new bushing with installer tool J-23130-2 and driver handle J-8092. Bushing must be installed flush with rear face of the sun gear drum hub. See Figure 102.

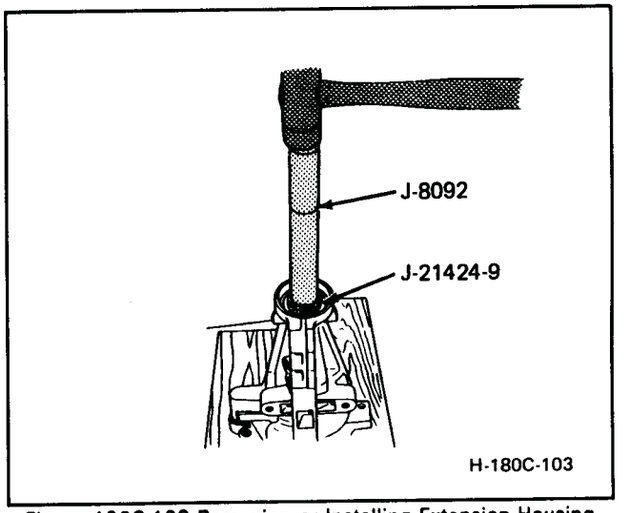


Figure 180C-103 Removing or Installing Extension Housing Bushing

Extension Housing Bushing

1. Inspect the extension housing bushing. If worn, scored or damaged, the bushing can be removed with tool J-21424-9 and driver handle J-8092. See Figure 103.
2. Clean the extension housing of dirt and foreign matter. Install a new extension housing bushing using J-21424-9 with driver handle J-8092. The bushing must be installed flush to the shoulder of the extension housing. See Figure 103.

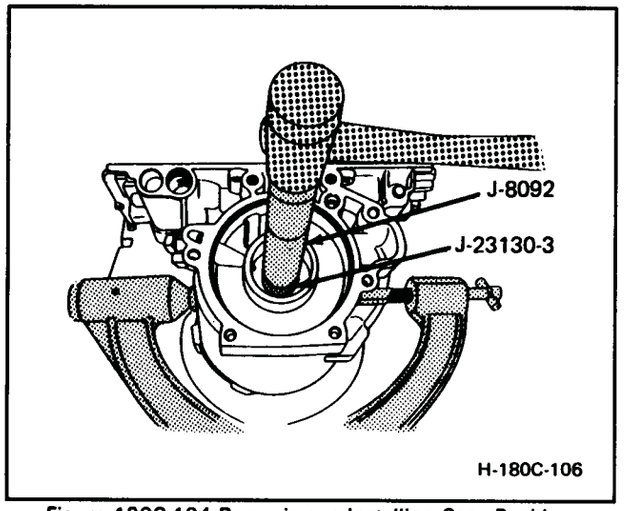


Figure 180C-104 Removing or Installing Case Bushing

Case Bushing and Reaction Sun Gear Drum Bushing Sleeve

1. Remove the bushing with remover and installer tool J-23130-3 and driver handle J-8092. See Figure 104.

2. Install a new case bushing using tool J-23130-3 and driver handle J-8092. The bushing should be installed flush with the case at rear. See Figure 104.

   If the reaction sun gear drum bushing sleeve requires replacement, this must be done before installing the case bushing.

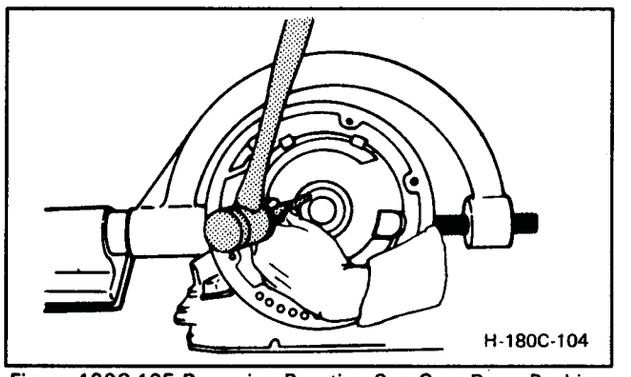


Figure 180C-105 Removing Reaction Sun Gear Drum Bushing Sleeve

3. Remove the reaction sun gear drum bushing sleeve, inside rear of case, with cape chisel J-8400-1. See Figure 105.

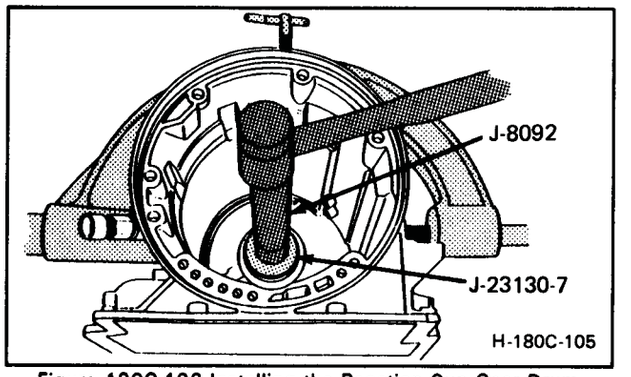
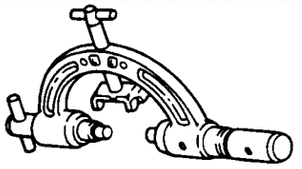


Figure 180C-106 Installing the Reaction Sun Gear Drum Bushing Sleeve

4. Install a new sleeve with installer tool J-23130-7 and J-8092. See Figure 106.

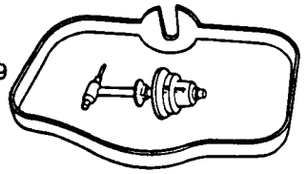
   The case bushing must be removed before installing the reaction sun gear drum bushing sleeve, because J-23130-7 pilots in the bushing bore, not the bushing itself.

J-8763-01



TRANSMISSION HOLDING FIXTURE

J-21369

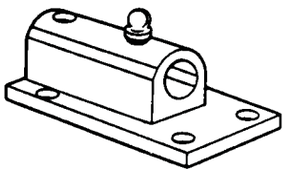


CONVERTER LEAK TEST FIXTURE

J-8400-1

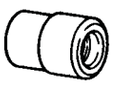
CAPE CHISEL

J-3289-20



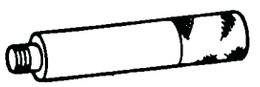
HOLDING FIXTURE BASE

J-23130-3



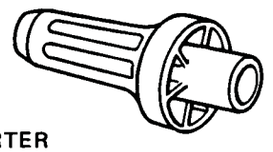
REAR CASE BUSHING
REMOVER/INSTALLER

J-8092



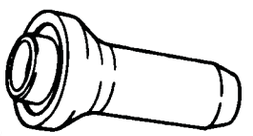
DRIVER HANDLE

J-21359



CONVERTER
HOUSING OIL SEAL INSTALLER

J-21426

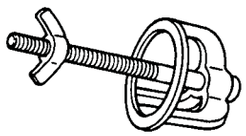


EXTENSION
HOUSING OIL SEAL INSTALLER

J-23129

CONVERTER
HOUSING SEAL REMOVER

J-23327

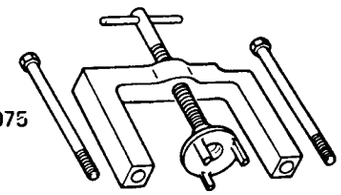


CLUTCH PISTON COMPRESSOR

J-23130-7

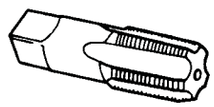
REACTION SUN GEAR
DRUM BUSHING SLEEVE INSTALLER

J-23075



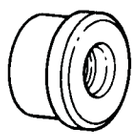
SERVO/3RD CLUTCH
PISTON SPRING COMPRESSOR

J-23130-5



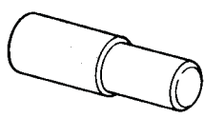
OIL PUMP BUSHING
REMOVER (3/4 - 14 NPT)

J-23130-6



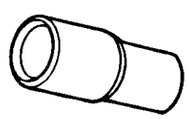
2ND CLUTCH DRUM
BUSHING REMOVER/ INSTALLER

J-23130-1



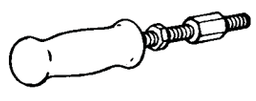
OIL PUMP BUSHING INSTALLER

J-21424-9



EXTENSION HOUSING
BUSHING REMOVER/ INSTALLER

J-7004



SLIDE HAMMER

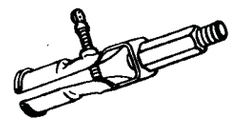
J-21465-17

CONVERTER HOUSING
BUSHING REMOVER/ INSTALLER

J-23080-A

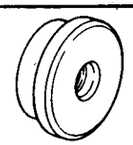
2ND CLUTCH PISTON
SEAL INSTALLER

J-29369-1



BUSHING REMOVER

J-23130-2

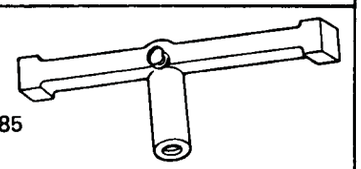


REACTION SUN GEAR
DRUM BUSHING INSTALLER

J-23082-01

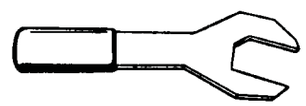
CONVERTER-TO-OIL
PUMP ALIGNMENT TOOL

J-23085

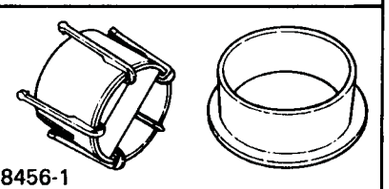


OIL PUMP-TO-2ND
CLUTCH DRUM GAGING TOOL

J-23100

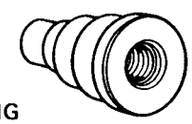


VACUUM MODULATOR WRENCH



J-28456-1
SPRAG RETAINER RING REMOVER

J-25019-2



OIL PUMP BUSHING
INSTALLER (FRONT)

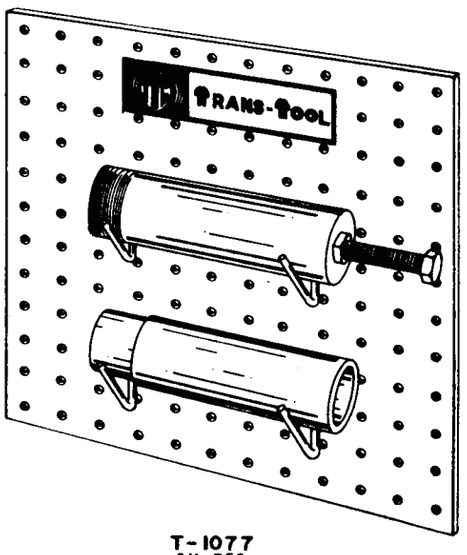
H-180C-107A

Figure 180C-107 Transmission, Special Tools

THE FOLLOWING LIST OF TOOLS IS AVAILABLE FROM
YOUR LOCAL SUPPLIER OR CONTACT TRANS-TOOL, INC.
DIRECT FOR THE NAME OF THE NEAREST SUPPLIER.

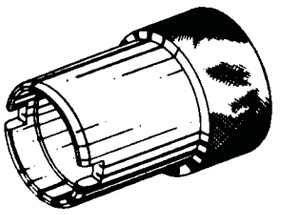
T-85	Front Pump Sealer Tool
T-99	Universal Seal Remover
T-131	Rear Seal Installer
T-134	Front Seal Installer
T-154-HD	Slide Hammer, Heavey Duty
T-156-B	Holding Fixture, Trans. and Engine
T-158-HD	Clutch Spring Compressor Tool
T-160	Extension Housing Bushing Tool
T-162	Vacuum Modulator Wrench
T-163-A	Vacuum Pump Heavey Duty
T-163-D	Pressure Gage 0-300psi
T-220-180	Bushing Driver Kit
T-1001	Selector Shaft Seal Rem/Installer
T-1052	Torque Converter Leak Tester
T-1077	Pump Body Bushing Rem/Installer
T-1080	Pump Body to Bell Housing Alignment Tool
T-1081	Seal Remover
T-1082	Second Clutch Piston Seal Installer
T-1083	Servo and Third Clutch Spring Compressor
T-1084	End Play Gaging Tool
T-1085	Third Clutch Compressor
T-1085-A	Third Clutch Compressor (1979 and up)

Trans-Tool is located in San Antonio, Texas
1-512-225-6745 1-800-531-5978

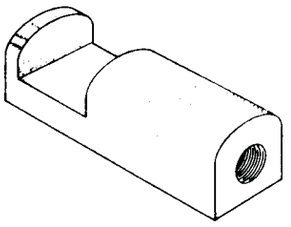


T-1077
G.M.- TF8

T-1080
Turbo-Hydramatic 180 Trimatic
CONVERTER HOUSING TO OIL PUMP ALIGNING TOOL



TO PREVENT EXCESSIVE WEAR TO THE FRONT SEAL AND BEARINGS, IT IS NECESSARY TO MAKE SURE THERE IS NO MISALIGNMENT BETWEEN THE CONVERTER HOUSING AND TRANSMISSION CASE THE T-1080 CAN ALSO BE USED TO CHECK THE CLEARANCES IN THE FRONT PUMP. REFER TO SERVICE MANUEL.



T1081

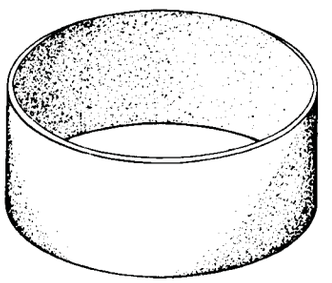
TH 180 TRIMATIC
CONVERTER HOUSING SEAL REMOVER
(USE WITH T-154 SLIDE HAMMER)

FRONT & REAR SEAL REMOVER

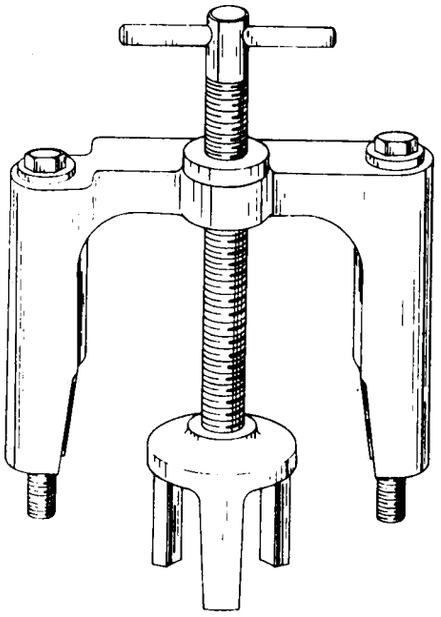
REMOVES THE MAJORITY OF ALL FRONT & REAR SEALS.

T-1082

TH 180 TRIMATIC
SECOND CLUTCH PISTON SEAL INSTALLER



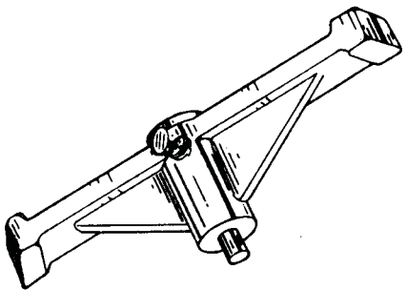
THE T-1082 COMPRESSES THE SECOND CLUTCH PISTON SEAL AND THEN GUIDES IT INTO ITS BORE. IF THIS TOOL WERE NOT UTILIZED, DAMAGE TO THE PISTON SEAL COULD RESULT.



T-1083

TH180 TRIMATIC
CLUTCH PISTON SPRING COMPRESSOR

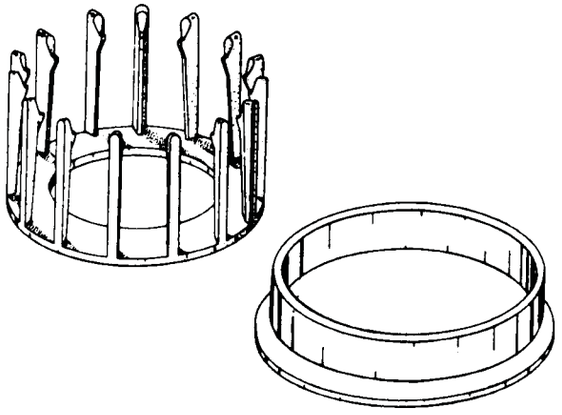
THE T-1083 IS A DUAL-PURPOSE TOOL THAT IS USED TO DEPRESS THE SERVO COVER SO THE SERVO RETAINING RING MAY BE REMOVED OR REPLACED. THE T-1083 IS ALSO USED TO DEPRESS THE CLUTCH PISTON IN THE THIRD CLUTCH ASSEMBLY SO THAT A RETAINING RING CAN ALSO BE REMOVED. REMOVAL OF THE RETAINING RING PERMITS ACCESS TO THE THIRD CLUTCH PLATES.



T-1084

TH180 TRIMATIC
OIL PUMP TO SECOND CLUTCH GAUGE

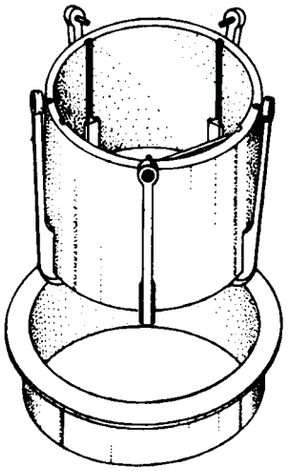
IN ORDER TO OBTAIN THE PROPER END-PLAY ON THE AUTOMATIC TRANSMISSION, IT IS NECESSARY TO MEASURE THE DISTANCE BETWEEN THE OIL PUMP HUB AND THE SECOND CLUTCH. THE T-1084 PROVIDES A MEANS FOR THE PROPER SELECTION OF THE THRUST WASHER.



T-1085

TH-180
THIRD CLUTCH RING COMPRESSOR

THE 3RD CLUTCH PACK IS HELD IN PLACE WITH AN INTERNAL SNAP RING. THE T-1085 PROVIDES A MEANS OF COMPRESSING THIS RING AT MANY DIFFERENT POINTS AROUND ITS CIRCUMFERENCE SO THAT ACCESS TO THE 3RD CLUTCH PLATES CAN BE GAINED. THIS PARTICULAR TYPE OF SNAP RING MUST BE COMPRESSED AT A MINIMUM OF 6 DIFFERENT PLACES ON ITS CIRCUMFERENCE TO ENABLE THE CLUTCH PACK TO BE DISASSEMBLED.



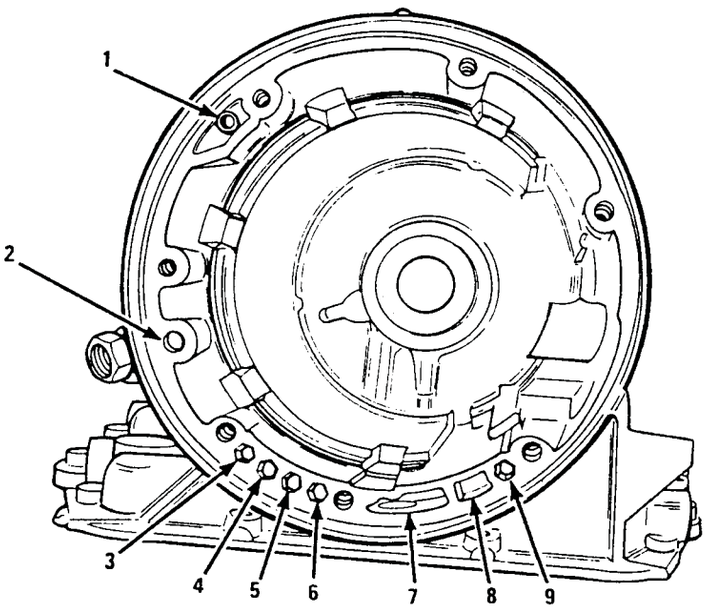
T-1085A

TH-180 THIRD CLUTCH RING COMPRESSION (1979½ ON)

THE T-1085A IS REQUIRED TO COMPRESS THE SNAP RING TO REMOVE OR INSTALL THE THIRD CLUTCH PACK.

Thm 180/180C

To aid in the rebuilding of Thm 180/180C this illustration identifies the passages to the different drive components making air checks possible

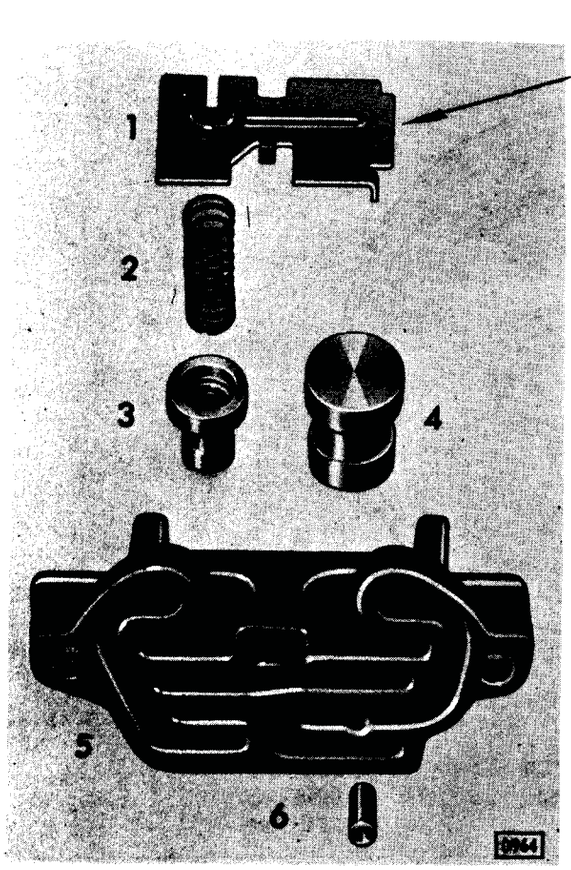


1. CASE VENT
2. CONVERTER OUT
3. 2ND CLUTCH
4. 3RD CLUTCH
5. MODULATOR
6. BOOST
7. SUCTION
8. LINE
9. REVERSE

Thm 180/180C No Upshift

COMPLAINT: NO UPSHIFTS, OR GOVERNOR CAME APART

CORRECTION: THE PRIMARY VALVE IN THE GOVERNOR WEARS THE STEEL RETAINER, CAUSING THE GOVERNOR WEIGHTS TO COME OUT. EACH TIME A 180 THM IS REBUILT, THE PLATE SHOULD BE INSPECTED. ANY SIGNS OF WEAR, AND THE PLATE SHOULD BE REPLACED.



Governor assembly

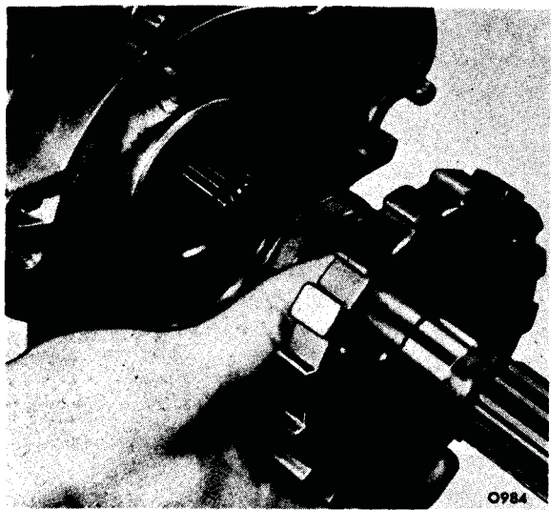
1. Governor secondary valve spring retainer
2. Governor secondary valve spring
3. Governor secondary valve
4. Governor primary valve
5. Governor body
6. Retaining pin

Thm 180/180C No Drive

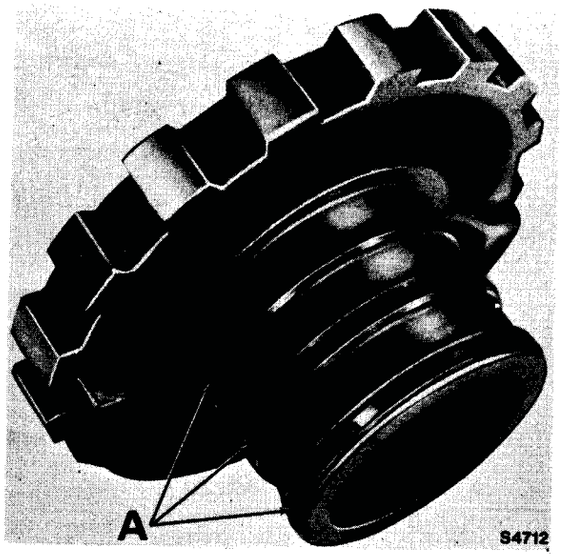
PROBLEM - No drive, slips in drive, klunks when stopping, goes to neutral on kickdown shift at 20 mph, or goes to neutral when you stop followed by a jerk.

CORRECTION - All of the above may be related, or occur at the same time. To properly diagnose the problem, the following items should be checked.

1) Inspect the vacuum system. Make sure you have good vacuum to the transmission by using a gage.
2) Check the modulator. The Chevette uses a different modulator than an Opel or Fiat, and interchanging them could cause these problems. It is smart to keep the old modulator around to try if you suspect you may have gotten the wrong one.
3) Inspect the governor sealing rings, being careful to check for a hanging ring. Although the rings visually look good, they may hang when rotated in the grooves. If the ring is hanging, make sure to replace it and also clean the grooves.
4) Double check your band adjustment to specifications.
5) Lastly, inspect the sprag assembly for wear. If everything looks good, you still may want to replace it on the chance that it is slipping.



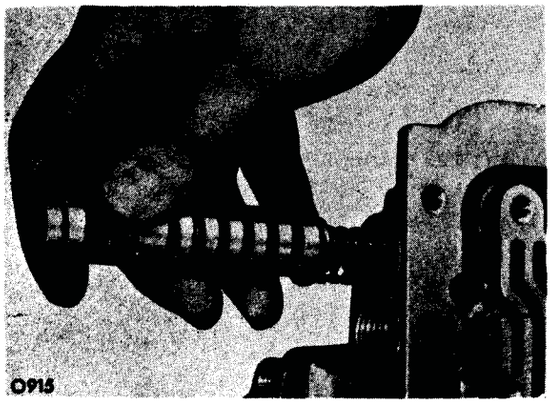
Inspect the three oil seal rings 'A'. If they are broken or side wear is noted replace rings



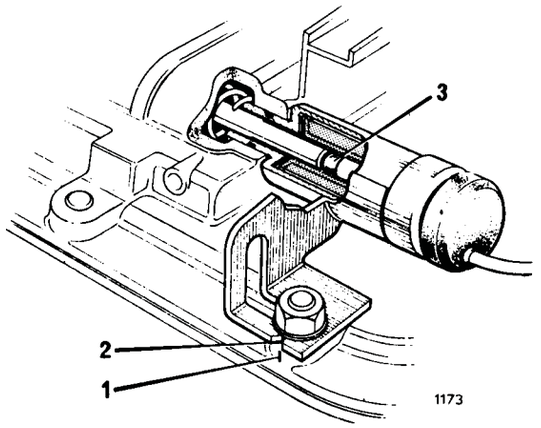
Thm 180/180C Modulator

DETENT VALVE, MODULATOR VALVE AND MODULATOR ASSEMBLY

1. Inspect detent valve sleeve oil seal and replace if necessary.



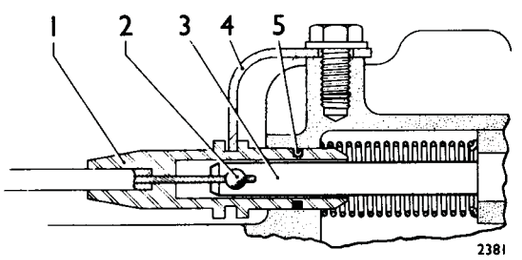
2. Install detent valve, sleeve, spring seat and spring into case. Slots in sleeve should face oil pan. Depress valve spring and insert spring pin into groove provided, not into one of the oil passage slots in sleeve. Detent valve spring varies according to whether valve is solenoid or cable-operated, see 'Specifications'.



3. On models with a solenoid place a 0.25 in. diameter steel ball (3) inside solenoid and temporarily install into transmission case. Holding solenoid in position make a mark (1) on transmission case in line with notch (2) on mounting bracket.

4. Withdraw solenoid and remove steel ball. Reinstall solenoid and align notch on mounting bracket with mark previously made on transmission case. Attach lockwasher and tighten nut.

5. Check operation of solenoid by connecting to a 12 volt supply, with an ammeter in series. Movement of detent valve should be audible and 'hold-in' current should not exceed 1 amp. If movement of detent valve is not heard, and current consumption remains high (approximately 12 amps), misalignment of solenoid with detent valve is indicated. Do not maintain a closed circuit under these conditions as solenoid 'pull-in' winding cannot be switched out and solenoid will be damaged.



6. On models with a cable-operated detent valve, rear cable (1) is a push fit into the transmission case after locating inner cable (2) into the detent valve (3). The cable is retained by a bracket (4). Oil leakage is prevented by a rubber O-ring (5).

MODULATOR RELATED COMPLAINTS

Any of the following complaints could be the result of using the incorrect modulator or a malfunctioning modulator.

1) Erratic shift points, sometimes late, sometimes O.K.
2) Very late shifts
3) Engine runaway or flare on kickdown
4) Klunk or jerk when stopping.
5) Harsh engagement into drive or reverse.

Be very careful when replacing a modulator assembly, as the Chevette uses a different one than an Opel or Fiat. The late model can be seen to have a round hole for the modulator pin, where the old style has a cross shape hole. If you use the fluted type, be sure the flutes extend all the way down into the modulator not just half way. Refer to figure #2.

It might be smart to keep the old modulator around until you test drive the vehicle, just in case you suspect a mismatched modulator from your test drive.

If the modulator and vacuum system check out to be good, the erratic shift points may be due to a modulator valve sleeve that is moving in the case bore. To correct this you can add an "O" ring in behind the sleeve to prevent it from moving as shown in figure #1.

Figure #1

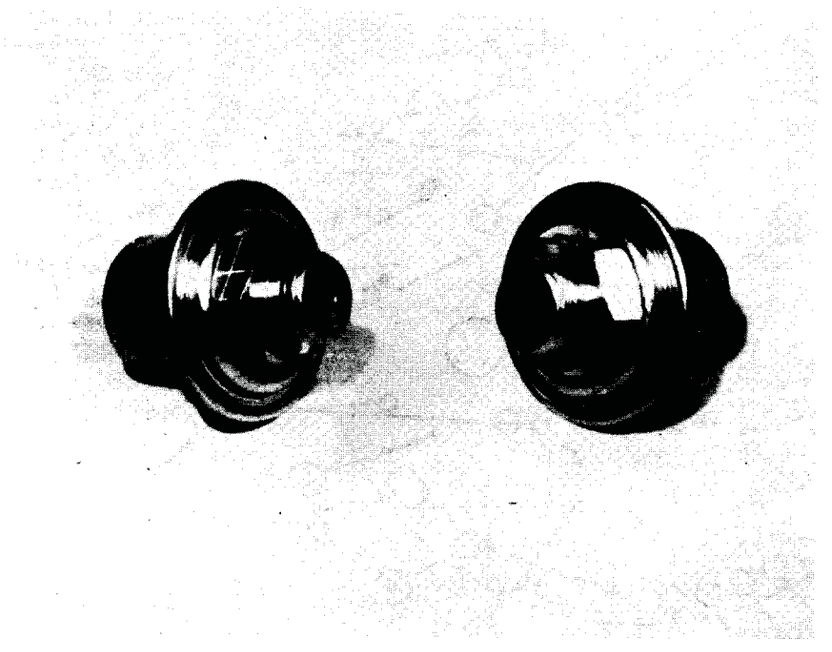


Figure #2

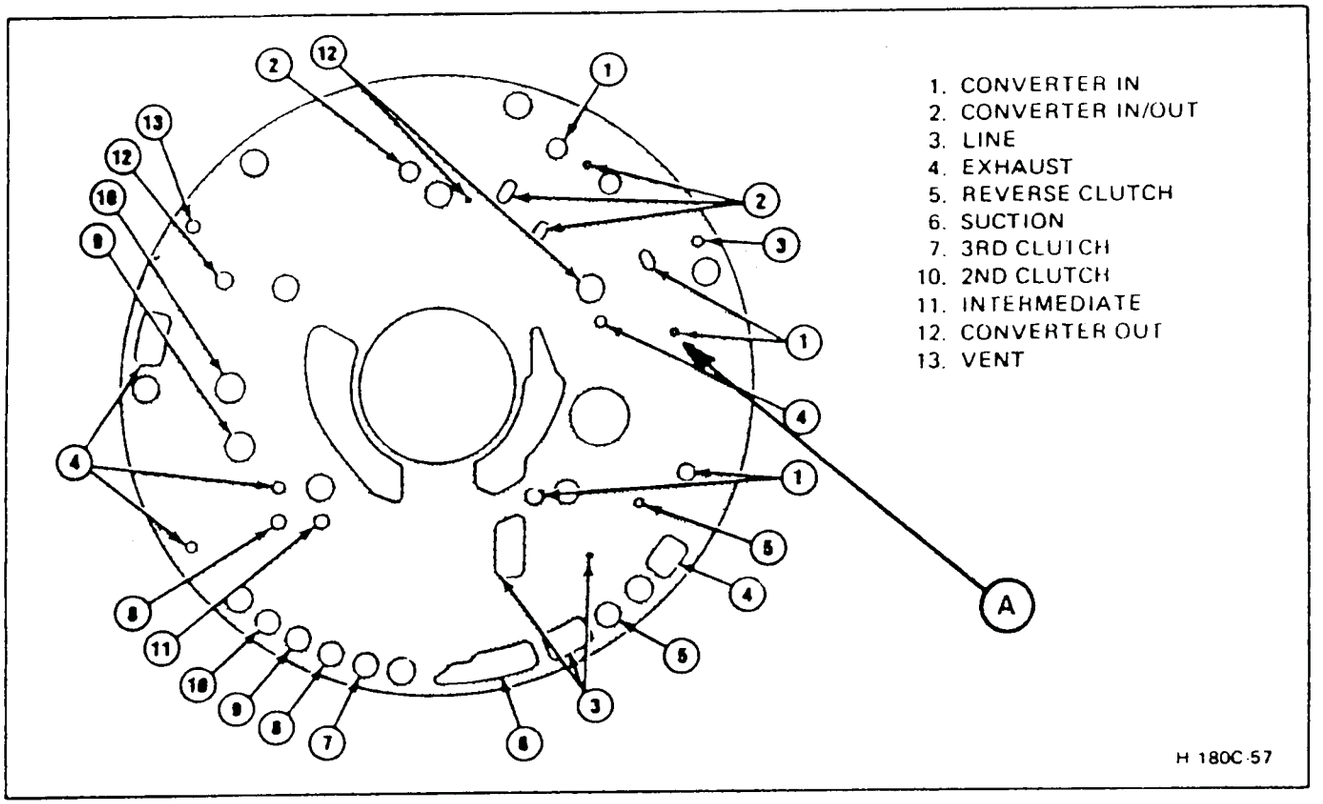
Thm180C Whistle or Moan

PROBLEM: A whistle or maon may be heard on the THM 180C transmissions.

CAUSE: The cause may be a restricted filter, a misaligned pump or just a problem in the pump seperator plate.

CORRECTION: After replacing the filter and checking pump alignment, the pump wear plate can be modified or replaced to correct the problem noise.

To modify the plate, enlarge hole located at position "A" as shown below, and chamfer both sides. This should then eliminate any whistling noise.

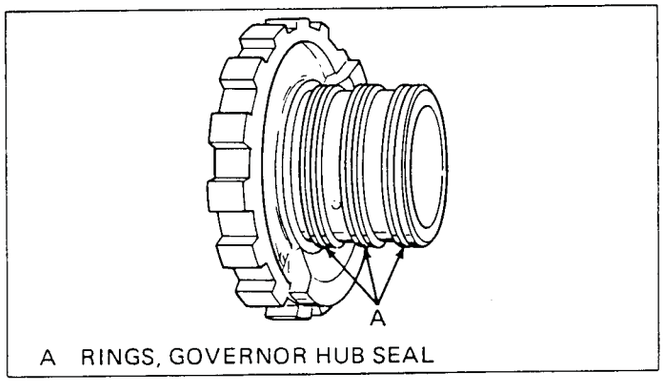


Thm 180C Delayed Engagement

Subject: Delayed Engagement

Model: 1982-83 THM 180-C

Some 1982 and 1983 THM 180-C transmissions may experience delayed engagement in first gear. This condition may be the governor hub seal rings seized in their grooves (Figure 1). When servicing any 1982 or 1983 THM 180-C transmission with a delayed engagement condition, refer to the service procedure below.



A RINGS, GOVERNOR HUB SEAL

Figure 1

SERVICE PROCEDURE:

1. Check engine vacuum using a vacuum gage to ensure there is sufficient vacuum to the transmission. Refer to your service manual for specifications and correct as required.

2. Check the modulator to ensure that it is the correct part number. Refer to the parts manual for specific part numbers.

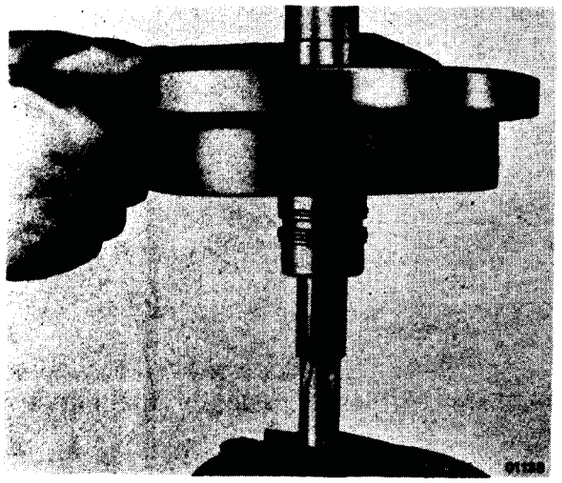
3. Check for freeness of the governor hub seal rings. The rings should rotate freely in the grooves. If not, remove the rings, clean the grooves with cleaning solvent, and inspect the governor hub ring grooves for nicks or burrs. Remove all burrs, if any are present. Replace the governor hub and governor hub seal rings, if necessary. Refer to your parts manual for specific part numbers.

4. Check the band adjustment per specifications outlined in your service manual.

5. Check the third speed clutch input sprag for wear. If the sprag is worn, refer to your parts manual and replace it.

Thm180/180C Bushings

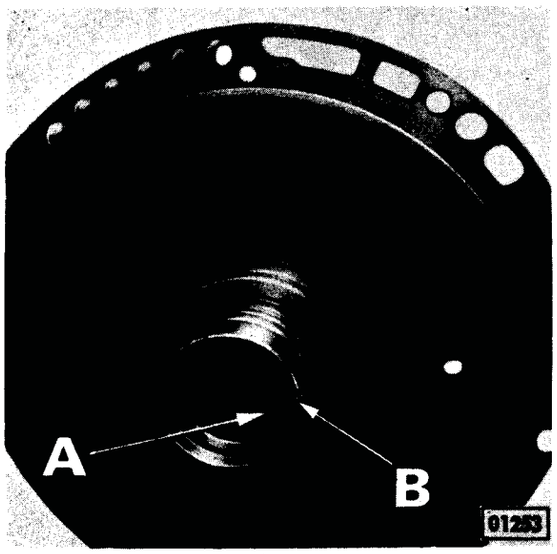
The bushing in the pump assembly for the input shaft, also acts as the sealing rings for the third clutch. Any sign of wear on this bushing could result in a failure of the third clutch. Service the bushing as follows:



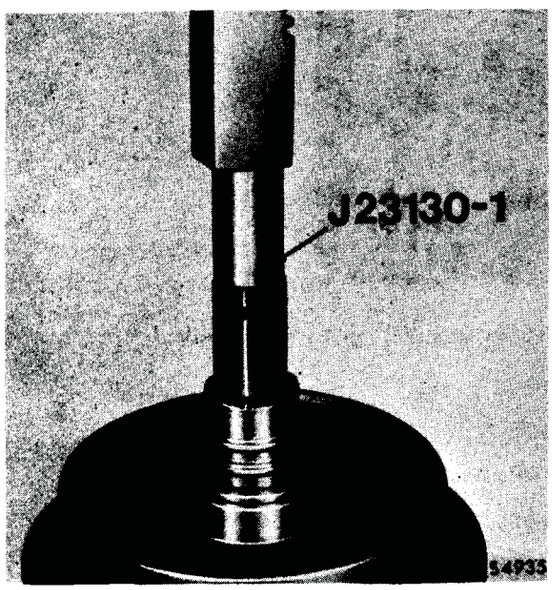
Inspect and if necessary remove oil pump bush, by threading a ¾in. standard pipe tap into bush.

Using a suitable drift on the tap press out bush from stator shaft side. Use cloth to protect face of reverse clutch housing.

Clean pump body including all holes and pockets thoroughly, and install new bush as follows:



Position oil pump hub so that hole 'A' is facing downwards, and scribe a mark 'B' on hub at centre of oil groove to right of hole 'A'.

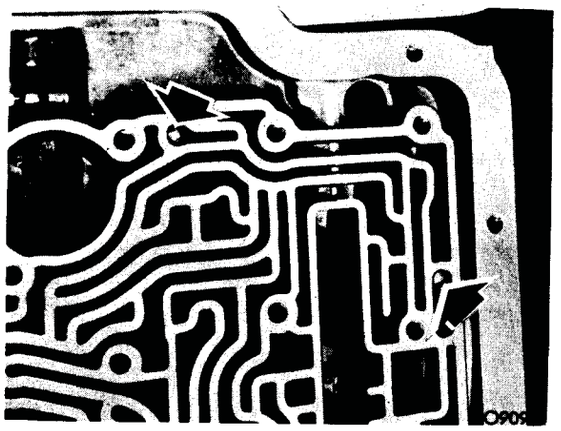


Place bush into hub with small hole uppermost, and hole centres in line with scribed mark on hub. Use Installer J23130 1 to press in bush until seated in bore.

Thm 180/180C Check Ball Locations

CHECK BALL LOCATIONS

In figure one shows where the two check balls are located in the case. Some units will not have the 2nd clutch check ball shown at the top of the picture. Make note of how many check balls are in the unit that you are working on.



- If the boost check ball is left out, you will get a tie-up or slipping in reverse and low ranges.

- If you add a 2nd clutch check ball where there wasn't one before, you may get a soft or harsh 1-2 shift, and in time possibly a burnt second clutch.

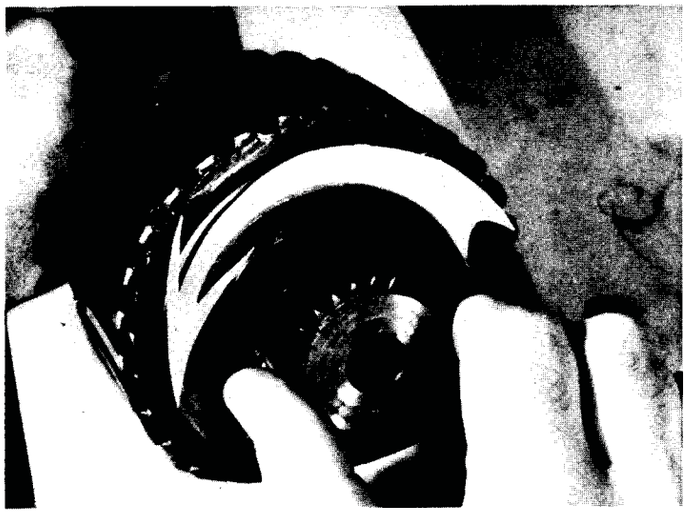
- If the 2nd clutch check ball is left out, you will get a harsh 1-2 shift.

Thm 180/180C Flare on Kickdown

PROBLEM - Flare on kick-down or slipping on hard drive away in drive or intermediate.

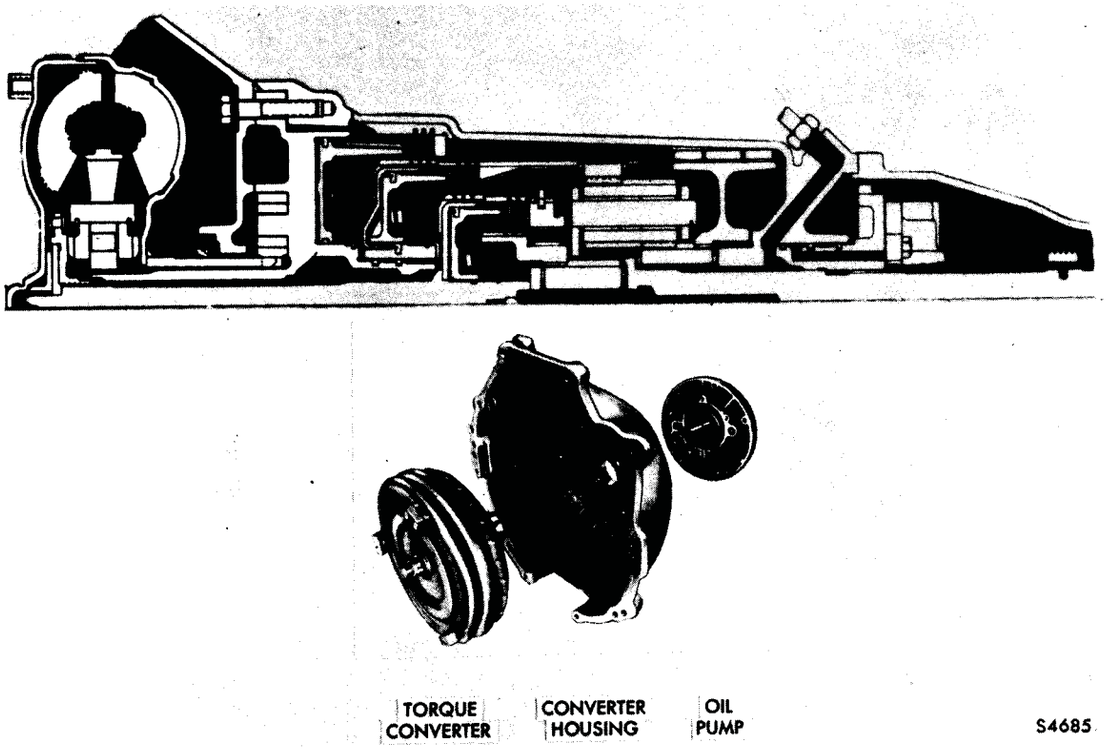
CAUSE - The cause may be a sprag clutch that is not holding.

CORRECTION - Replace the sprag assembly. Be sure to use an assembly that has 24 sprags instead of the origanal 16. Never use a remanufactured sprag, unless each little sprag has been replaced in the assembly.



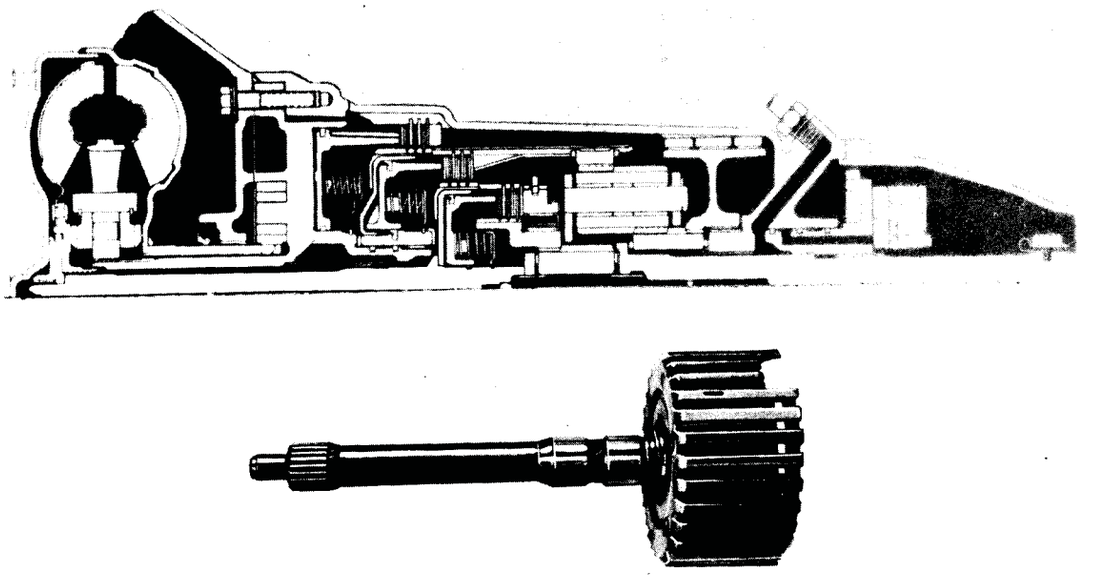
Remember that the sprag "locks to the clock" when holding the input shaft and turning the sun gear, and it rotates counter-clockwise. If it is put in backwards, the car won't move in drive range.

SERVICE INFORMATION FROM



S4685

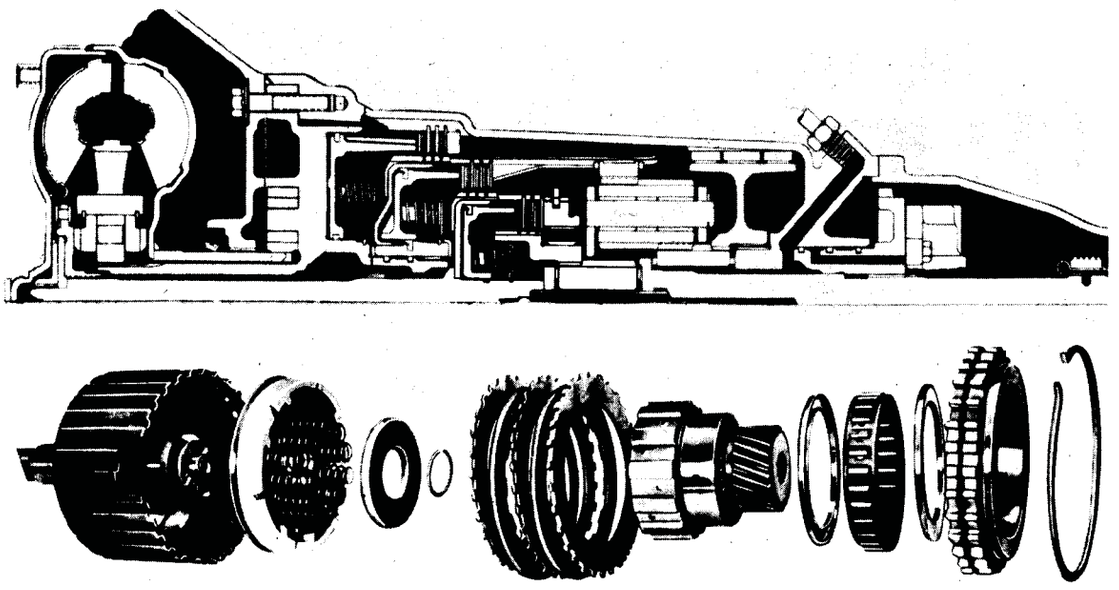
The torque converter is connected to the engine by means of a flexplate which is bolted directly to the engine crankshaft and to the converter cover. The converter cover is welded to the converter pump. The converter pump hub fits into the transmission oil pump, driving the pump whenever the engine is operating.



INPUT SHAFT AND THIRD CLUTCH DRUM

S4686

The transmission input shaft is splined into the hub of the turbine delivering the converter output torque to the transmission gear train.



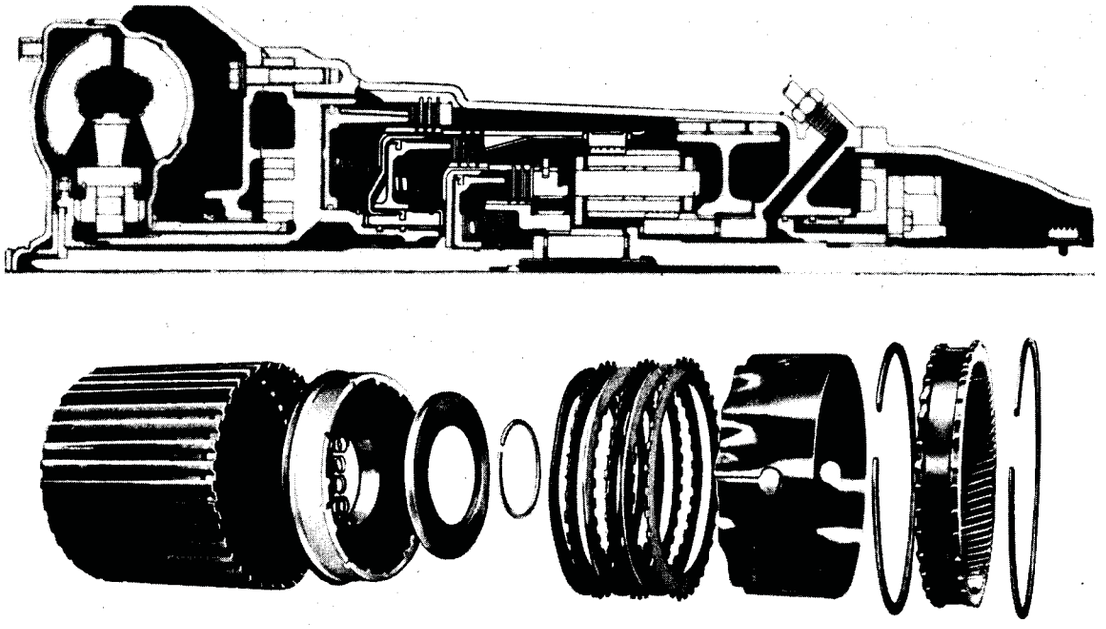
THIRD CLUTCH ASSEMBLY

S4687

THIRD CLUTCH HUB

SPRAG RACE AND RETAINER ASSEMBLY

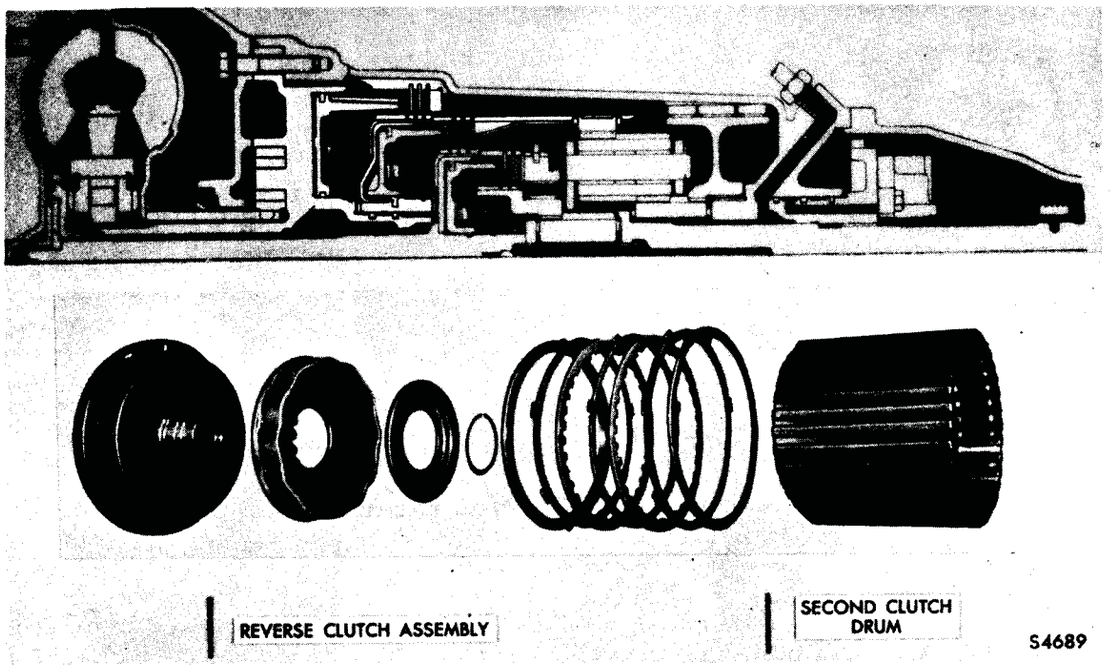
The input shaft is welded to the third clutch drum. The sprag outer race is splined to the third clutch drum and the inner race is splined to the input sun gear.



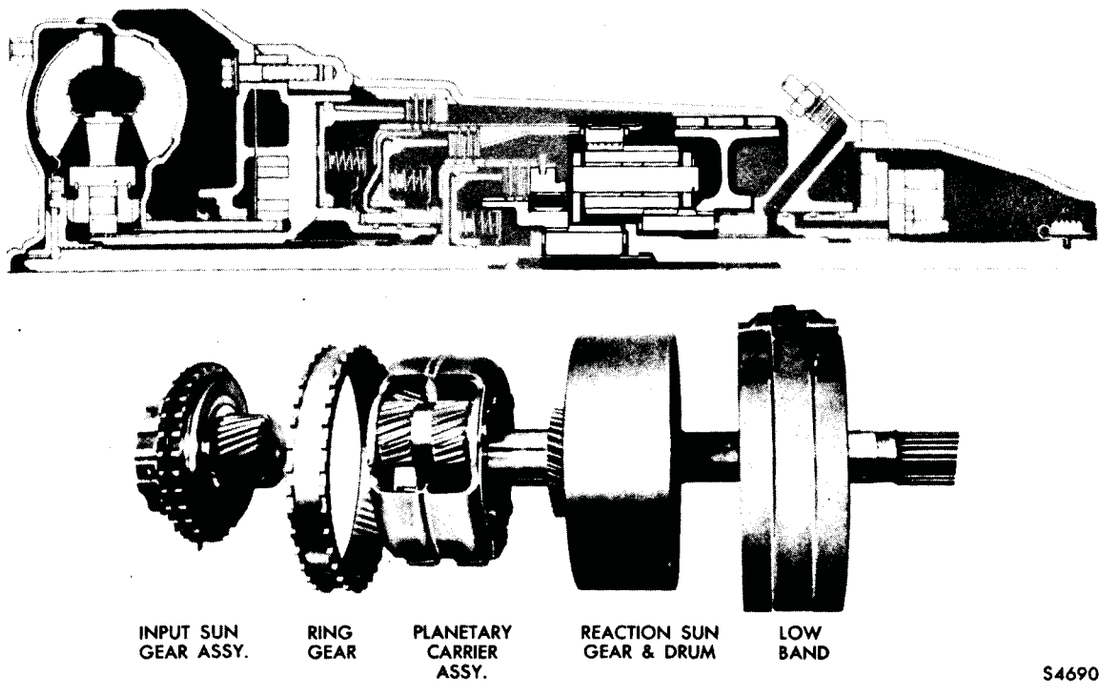
SECOND CLUTCH ASSEMBLY.

S4688

The second clutch is supported by the oil pump hub. The second clutch composition plates are splined to the outside of the third clutch drum making the third clutch drum the hub for the second clutch. The ring gear is splined to the second clutch drum.



The reverse clutch piston is housed at the rear of the oil pump body. The reverse clutch steel plates are splined to the transmission case and the composition plates are splined to the outside of the second clutch drum. The clutch serves to hold the second clutch drum and ring gear stationary in reverse.

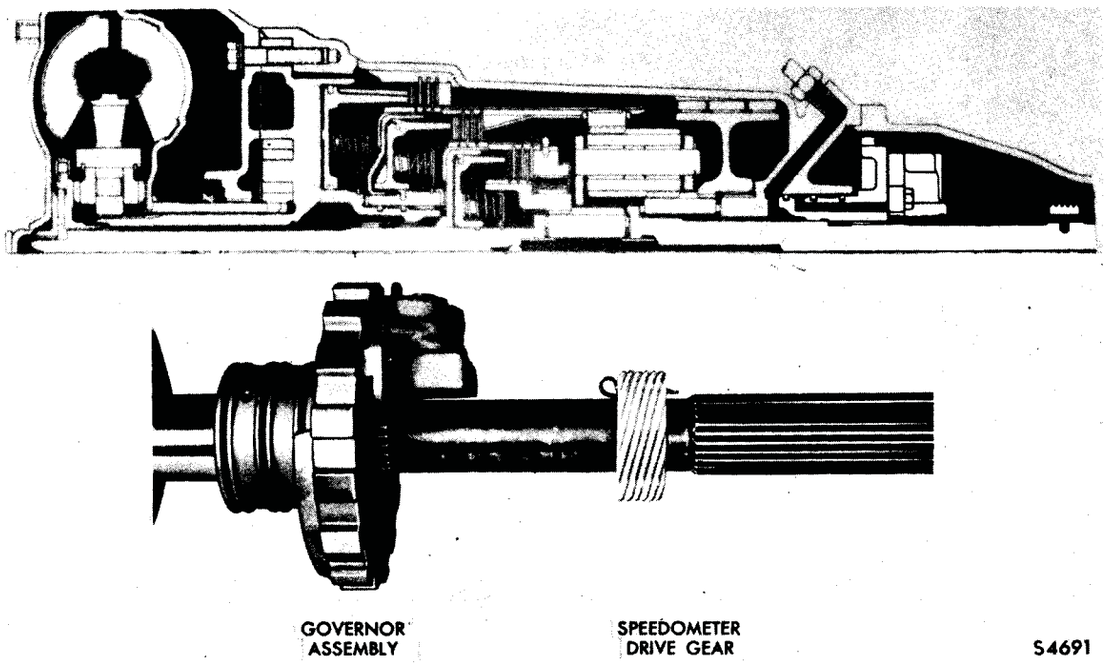


The ring gear surrounds the planet carrier and the teeth mesh with the front portion of the long planet pinions. The reaction sun gear is pressed into the reaction sun gear drum. The low band is wrapped around the reaction sun gear drum to function as the holding member for the reaction sun gear.

The shafts which support the planet pinions are secured to the carrier by a lock plate at the rear of the carriage preventing the pinion shafts from rotating or working loose. The lock plate is secured to the carrier by screws.

The planet carrier is welded to the output shaft, therefore, the directional movement of the carrier delivers the transmission torque to the output shaft.

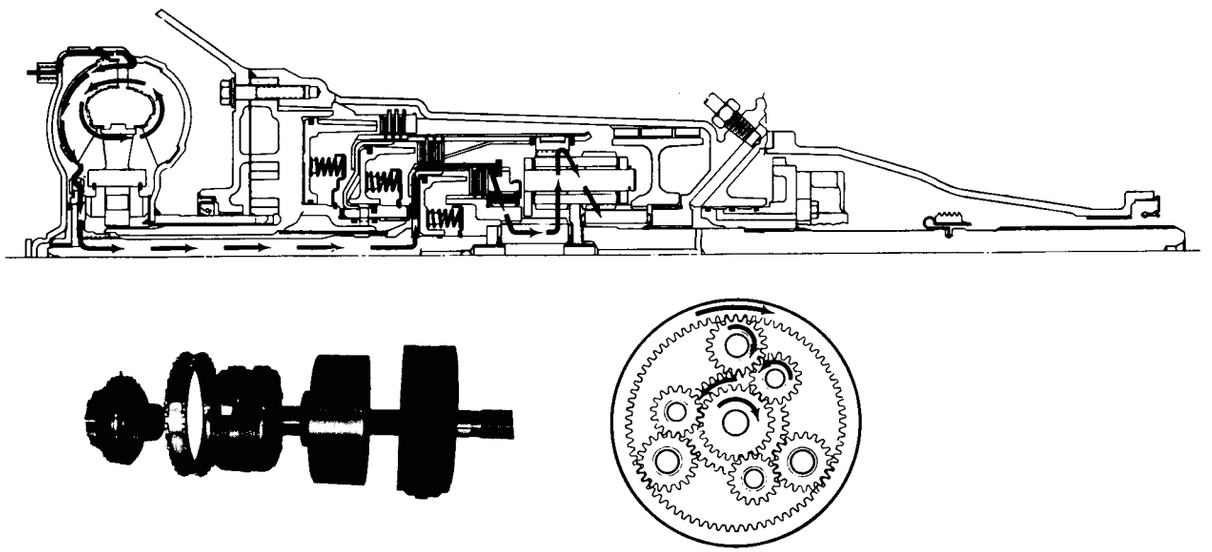
COMPONENT OPERATION AND LOCATION (contd)



The governor hub is splined to and driven by the output shaft. The governor body is bolted to the governor hub. The speedometer drive gear is secured to the output shaft by a retaining clip.

POWER FLOW

The following information describes how engine torque is transmitted through the transmission for each range selected. In every case, with the engine running, torque is transmitted via the flex plate and converter cover to the pump member of the converter. The converter is always filled with oil from the transmission oil pump, and the converter pump transmits the torque through oil to the driven member of the converter. Power is then transmitted via the input shaft and third clutch drum.

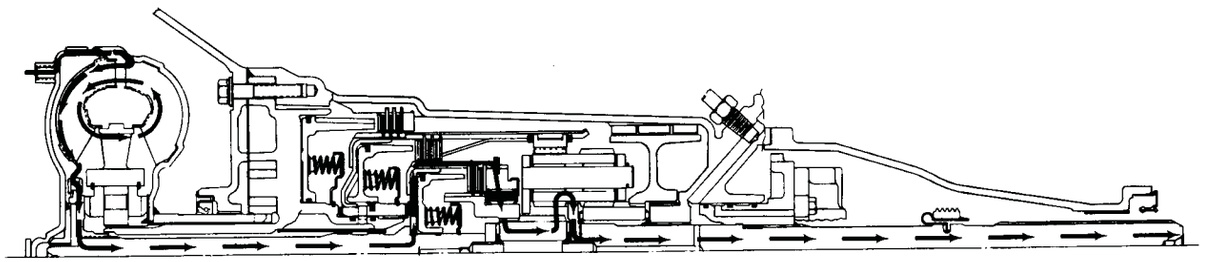


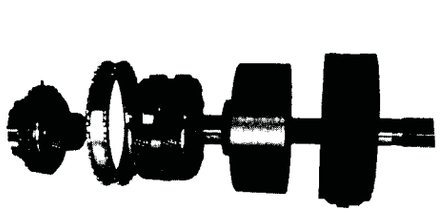
Neutral and Park — Engine Running

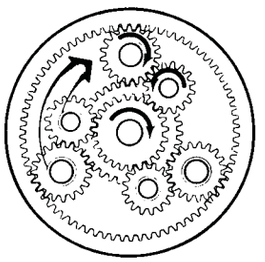
Reverse clutch — Released
Second clutch — Released
Third clutch — Released
Low band — Released
Sprag clutch — Locked

In this condition, no member of the planetary gear set is held and there is no reaction member. All gears are free to rotate around their own axes and no torque is transmitted to the planet carrier and output shaft.

The power flow conditions are the same in park as in neutral. In addition a mechanical linkage actuates the parking pawl which engages with teeth on the periphery of the governor hub. Since the governor is splined to the output shaft, the parking pawl holds the output shaft locked to the extension housing, preventing the vehicle from moving.







Drive and Intermediate Range – First Gear

Reverse clutch – Released
Second clutch – Released
Third clutch – Released
Low band – Applied
Sprag clutch – Locked

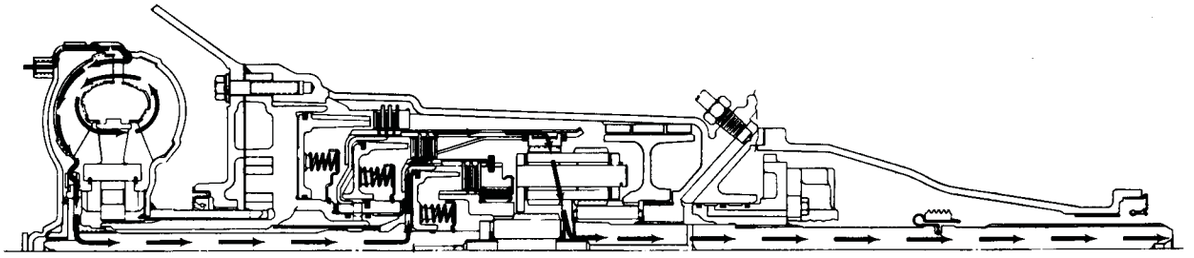
The low band holds the reaction sun gear and drum stationary, which serves as the reaction member of the planetary gear set in first gear. The input shaft drives the third clutch drum clockwise, which turns the sprag race clockwise. The sprags wedge and drive the input sun gear, which drives the short planet pinions anti-clockwise. The short planet pinions then turn the long planet pinions which walk around the held reaction sun gear, driving the ring gear, planet carrier and output shaft clockwise. On the over-run the transmission free wheels.

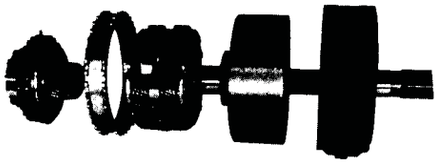
The ratio in first gear is 2.40 to 1.

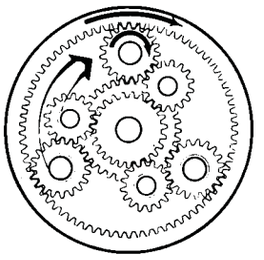
Low Range – First Gear

In low range the power flow is exactly the same as in drive and intermediate except that the third clutch is applied together with the low band and prevents the sprag clutch from over-running, thus providing engine braking.

POWER FLOW (contd)





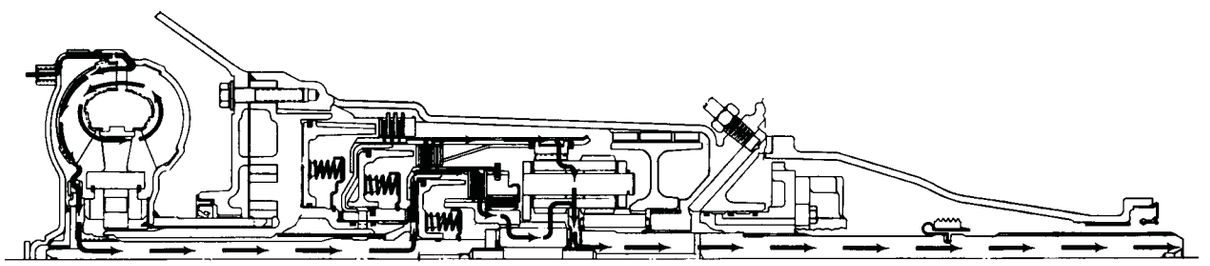


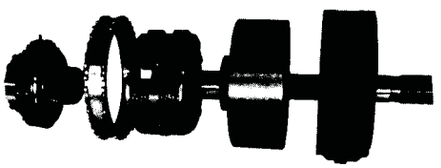
Drive and Intermediate Range — Second Gear

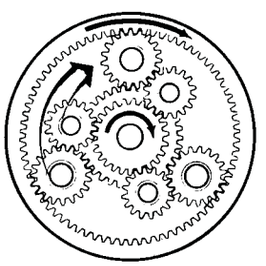
Reverse clutch — Released
Second clutch — Applied
Third clutch — Released
Low band — Applied
Sprag Clutch — Over-running

The input shaft drives the third clutch drum and the second clutch composition plates. When the second clutch piston is applied, the rotating composition plates are locked to the steel plates. Since the second clutch drum is now rotating clockwise, the ring gear is also driven clockwise, turning the long planet pistons in the same direction. Since the reaction sun gear is held by the low band, the long planet pinions walk around the stationary reaction sun gear, driving the planet carrier and output shaft clockwise. The long planet pinions also drive the short planet pinions which drive the input sun gear clockwise causing the sprag clutch to over-run.

The ratio in second gear is 1.48 to 1.



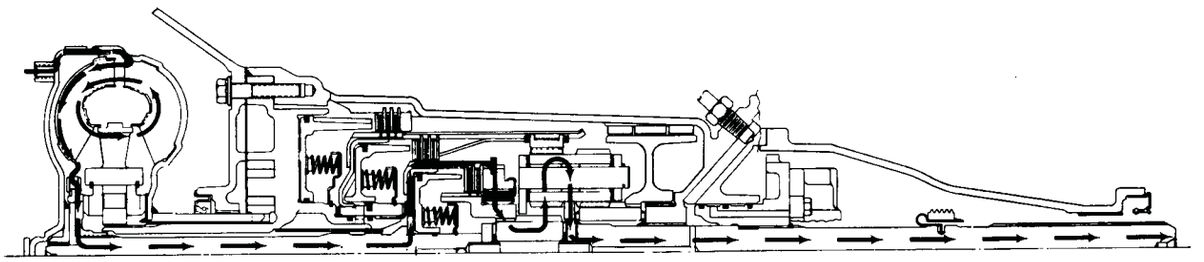


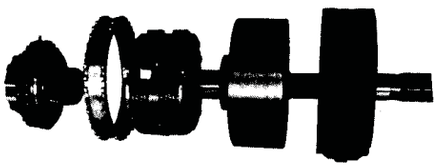


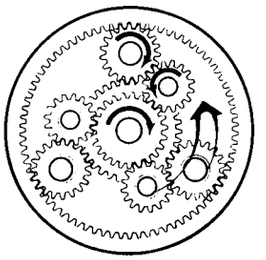
Drive Range — Third Gear

Reverse clutch — Released
Second clutch — Applied
Third clutch — Applied
Low band — Released
Sprag clutch — Locked

In this condition the second clutch drum drives the ring gear clockwise and the input sun gear is also driven clockwise. The long and short planet pinions are unable to rotate on their shafts, causing the entire planetary system to rotate as a solid unit, and provide a direct drive. The input is split between the ring gear and the input sun gear. The planet carrier is the output member.







Reverse

Reverse clutch – Applied
Second clutch – Released
Third clutch – Applied
Low band – Released
Sprag clutch – Locked

With the reverse clutch applied, the ring gear and second clutch drum are held stationary. The input sun gear is driven clockwise by the sprag clutch. This causes the short planet pinions to turn anti-clockwise, and the long planet pinions clockwise. The long planet pinions then walk around the stationary ring gear, driving the planet carrier in a reverse direction. With the third clutch applied the sprag clutch cannot over-run thereby preventing a freewheel condition in reverse.

The ratio in reverse is 1.92 to 1.

HYDRAULIC UNITS

The following describes the hydraulic system that applies the clutches and the low band, and which controls the manually selected and automatic shifts.

In the hydraulic control circuit, there are four major types of control elements. These categories along with the specific items are listed below.

Selector Valves (manually and hydraulically controlled)

Manual valve
Detent valve
1–2 shift valve
2–3 shift valve
3–2 control valve
Manual low and reverse control valve
Boost control valve

Accumulators

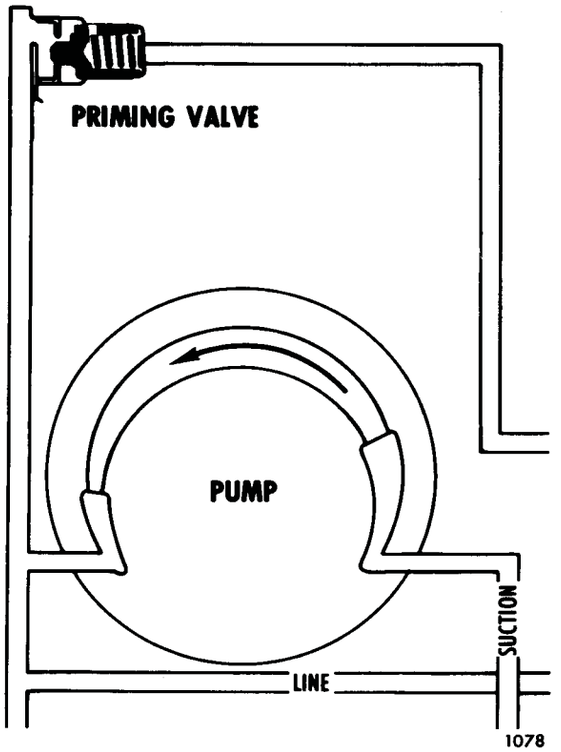
1–2 accumulator
Low servo piston

Pressure Regulating Valves

Main pressure regulator valve
Modulator valve
Detent pressure regulator valve
1–2 accumulator valve
Governor

Timing Valves

Low speed downshift timing valve
High speed downshift timing valve
Second clutch orifice valve

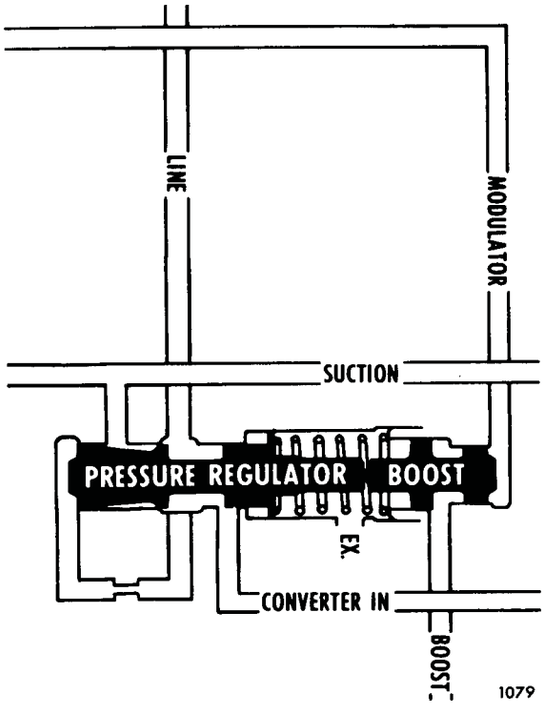


The transmission uses an internal-external type gear pump which draws oil through a screen in the oil pan. Since the pump drive gear is keyed to the converter driving member, it turns whenever the engine is operating and turns the driven gear, which causes the oil to be lifted from the oil pan. The oil is carried past the crescent section of the pump, beyond which the gear teeth begin to come together, pressurizing the oil as it is squeezed from between the gear teeth. The pressurized oil is then delivered through the pump outlet to the hydraulic control system.

If the vehicle has not been operated for a while the oil in the pump cavity tends to drain back to the oil pan. If the pump cavity is filled with air, the pump cannot develop enough suction to lift oil from the oil pan. For this reason a priming valve is provided in the pump pressure passage. As the air in the pump is compressed by the gears, it is forced out through the bleed orifice in the priming valve and exhausted into the cavity behind the reverse piston. This permits the pump to prime and draw oil from the oil pan. As soon as the hydraulic pressure reaches 15 lb/sq in. the valve moves against the spring, closing off the bleed orifice, and pressure in the pump circuit builds up immediately.

MAIN PRESSURE REGULATOR VALVE

Pressure from the pump is delivered to the 'line' port of the main pressure regulator valve. The line port is connected through a damping orifice to the regulating port at the end of the regulator valve. As the pressure in this port increases, it moves the valve against the spring force until the second spool of the valve just opens to the 'line' port. This permits the pump pressure to be by-passed into the pump suction passage. Therefore, the valve will regulate at a fixed minimum pressure as determined by the spring force, and all excess pump delivery will be exhausted back into the pump suction passage. In moving from the 'bottomed' to the regulating position the valve also opens line pressure to the converter feed passage. This oil is directed to and through the converter, through the oil cooler to the transmission lubrication system, then back to the oil pan.



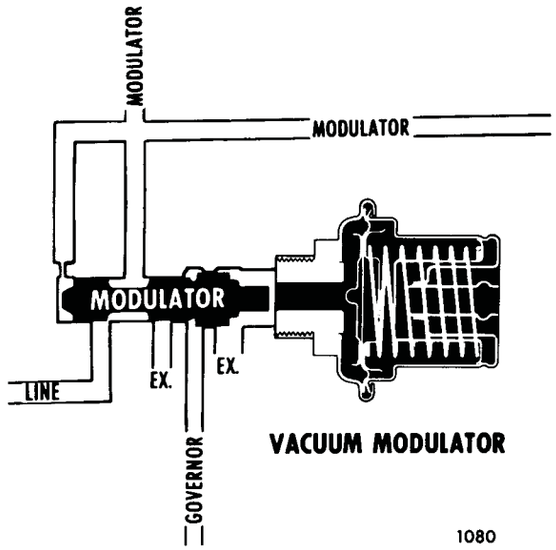
In order to provide the required capacity in the band and clutches, it is desirable to have a variable line pressure that will increase with engine torque. This is accomplished by introducing a 'modulator' pressure on the end of the boost valve. The force of the boost valve acts against the end of the pressure regulator valve and increases the line pressure above the base pressure as established by the spring force.

In 'intermediate', 'low' and 'reverse' an additional pressure increase is required. This is achieved by introducing line pressure to the stepped area between the spools of the boost valve and a further increase in pressure is obtained.

The regulated line pressure is then fed to the manual valve, modulator valve and detent pressure regulator valve.

MODULATOR VALVE AND VACUUM MODULATOR

Line pressure is directed to the second port of the modulator valve. This pressure passes between the spools of the valve and into the modulator port. The modulator port is connected to the regulating port at the end of the valve through a damping orifice. As the pressure in the regulating port increases, it moves the valve outward against the spring force of the vacuum modulator until the end spool just closes the line port. If excess pressure has built up in the regulating port, the valve will continue to move until the second spool just opens to the exhaust port. Thus the valve tends to regulate between the line port and the exhaust port.



Even though the vacuum modulator spring force may be constant, thereby causing the modulator valve to regulate at a fixed pressure, the pressure requirements decrease as vehicle speed increases. For this reason governor pressure, which is a function of vehicle speed, is directed to the area between the two different diameter spools at the outer end of the valve. As governor pressure increases, it creates an outward force on the modulator valve and in effect reduces the spring force of the vacuum modulator.

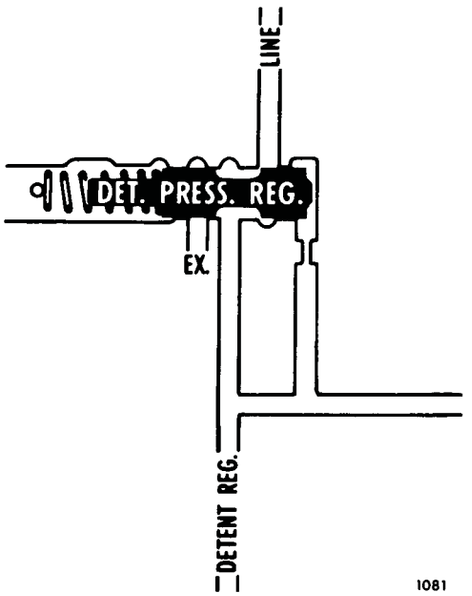
The vacuum modulator consists of two chambers separated by a diaphragm. The chamber towards the valve is open to atmosphere and the other chamber is connected to engine vacuum. The vacuum chamber also contains a spring. At low engine vacuum, the full spring force bears against the diaphragm and is transmitted to the modulator valve through a plunger. This is the spring force which establishes the regulated pressure of the modulator valve. As the vacuum in the outer chamber increases, an outward force is created on the diaphragm which partially cancels out the spring force. This continues up to 16 in. of vacuum, at which point the diaphragm force cancels out the spring force and the modulator pressure becomes zero.

In addition, higher vehicle speeds will produce a somewhat lower modulator and line pressure for any given vacuum by virtue of the governor pressure acting on the modulator valve.

Modulator pressure is then directed to:

- Pressure regulator boost valve
- 1–2 shift control valve
- 2–3 shift control valve via 3–2 control valve
- Detent valve
- 1–2 accumulator valve
- Low speed downshift timing valve

DETENT PRESSURE REGULATOR VALVE

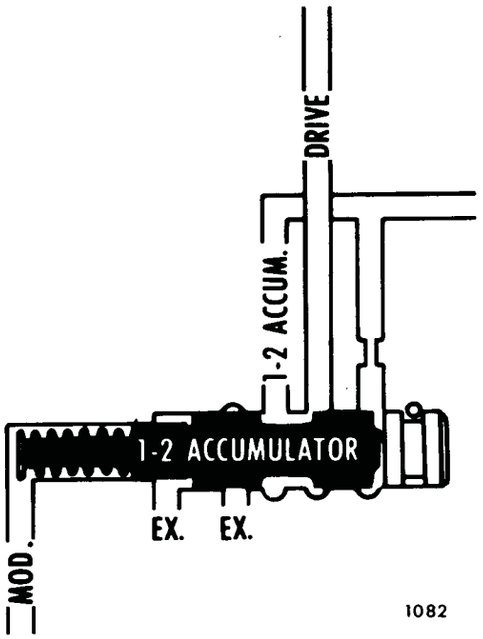


The regulating action of the detent pressure regulator valve is essentially the same as that of the modulator valve, except that it regulates at a constant pressure. The feed port, regulating port, and exhaust port, all function in the same manner as the modulator valve. Since the force set up by the pressure in the regulating port acts only against a fixed spring force, the resulting detent pressure is constant. The detent regulator pressure is directed to the detent valve and to the manual low and reverse control valves.

1–2 ACCUMULATOR VALVE

The 1–2 accumulator valve is used to establish a desired pressure to ultimately control the rate of apply of the second clutch during a first to second shift. The regulating action of this valve is essentially the same as that of the modulator valve or detent pressure regulator valve.The ports and spools operate as previously described. However, for increased engine torque, it is necessary to increase the accumulator pressure. This is accomplished by introducing modulator pressure to the small end of the 1–2 accumulator valve. As the modulator pressure increases, it adds to the spring force and increases the 1–2 accumulator pressure.

The 1–2 accumulator pressure is fed to the spring-loaded side of the 1–2 accumulator piston.

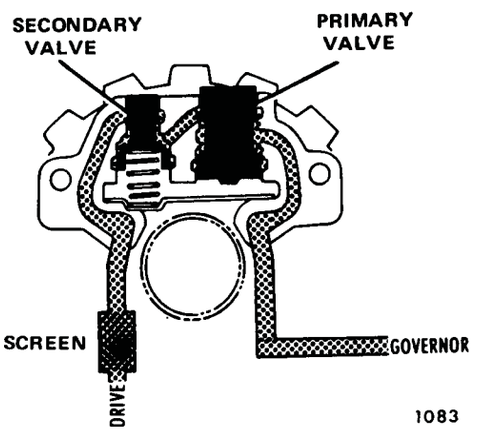


GOVERNOR

The governor is mounted on the output shaft and contains two interconnected regulating valves. Its purpose is to supply a pressure that is a function of output shaft or vehicle speed. Line pressure is supplied to the governor from the manual valve.

Drive pressure is directed to the outermost port of the secondary valve. The secondary spring holds the valve in an outward position, so that the outer spool of the valve is open to drive pressure. As the pressure builds up between the spools, it exerts a force on the larger diameter inner spool to start counteracting the spring. When the hydraulic force is large enough, it moves the valve inward against the spring force until the outer spool closes the drive port. If the pressure between the spools still creates a force larger than the spring force, the valve will continue to move inward until the excess pressure opens to the exhaust port. The valve then regulates between the drive port and exhaust port.

A fixed governor pressure in the secondary valve has now been established with the output shaft stationary. As the governor begins to rotate, the outward force, due to the weight of the secondary valve, is added to the force of the spring. Therefore, as the speed increases, the secondary valve pressure increases.



GOVERNOR (contd)

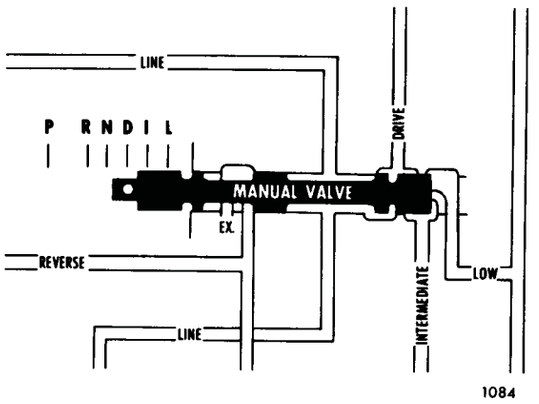
The secondary valve pressure is directed to the feed port of the primary valve. With the governor stationary, the pressure acts against the larger inner spool and forces it open to the exhaust port. Since there is no spring force on the primary valve, it will continue to keep the feed port closed and the exhaust port open. The final governor pressure is then zero. As the governor begins to rotate, the weight of the primary valve creates an outward force working against the oil pressure. The pressure in the primary valve port now increases as a function of speed. This continues until the speed of the output shaft finally holds the primary valve outward, keeping the feed port open.

In summary, at zero speed, the governor pressure is zero. As the speed increases the governor pressure will increase as dictated by the primary valve until the speed is great enough to hold the primary valve all the way out. At speeds above this point, the governor pressure is established by the secondary valve.

Governor pressure is then directed to:

- Modulator valve
- 1–2 shift valve
- 2–3 shift valve
- High speed downshift timing valve

MANUAL VALVE



The manual valve is mechanically connected to the selector lever. Its function is to direct hydraulic pressure to the various circuits to establish the base hydraulic range of the transmission.

Line pressure is fed to the manual valve. In 'park' and 'neutral', the valve seals line pressure from entering any of the circuits. At the same time all circuits are open to exhaust so that the transmission remains in neutral.

In 'reverse', pressure is directed to the reverse clutch piston, boost control valve and the reverse control valve. All other manual control circuits are open to exhaust.

In 'drive' the manual valve directs oil to the governor, 1–2 shift valve, 1–2 accumulator valve, and to the apply side of the low servo piston by way of the high speed downshift timing valve. The 'reverse', 'intermediate' and 'low' ports are exhausted.

In 'intermediate', the 'drive' circuits remain pressurized. In addition, pressure is supplied to the boost control valve and to the 2–3 shift valve. The 'reverse' and 'low' ports are exhausted.

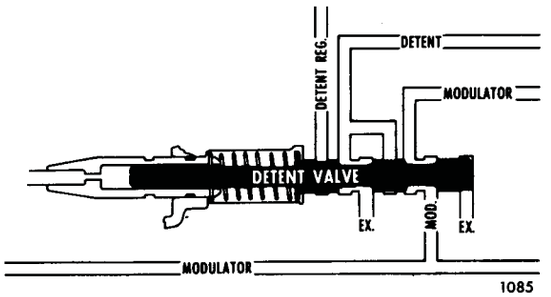
In 'low', pressure is supplied to the 1–2 shift valve and to the low control valve, in addition to the circuits already pressurized in 'drive' and 'intermediate'. The 'reverse' port is exhausted.

DETENT VALVE

The function of the detent valve is to cause the transmission to shift to a lower gear when the accelerator is fully depressed.

The detent valve is solenoid-operated from a switch on the carburetter. A spring holds the detent valve in a retracted position. Two pressures, 'detent regulator' and 'modulator', are supplied to the detent valve.

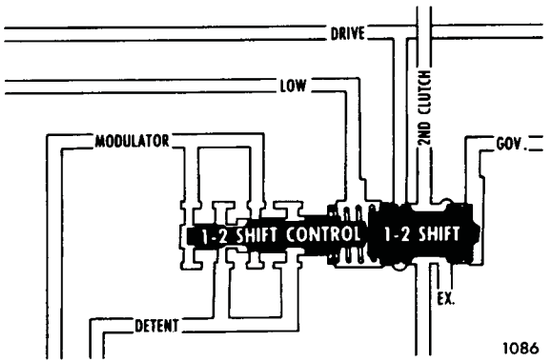
In the retracted or 'part throttle' position, the detent valve directs modulator pressure to the 1—2 and 2—3 shift control valves and to the 3—2 control valve. In the full throttle position, modulator pressure is blocked and the passages previously receiving modulator pressure now receive detent regulator pressure. In this position, detent regulator pressure is also supplied to additional ports of the 1—2 and 2—3 shift control valves and the 3—2 control valve.



1--2 SHIFT VALVE

The 1—2 shift and shift control valves determine whether the transmission is in first or second gear. With the shift valve bottomed in its bore, the valve blocks 'drive' pressure and the second clutch is open to exhaust. The valve is held in this position by the spring and any modulator pressure that may be acting against the two end spools of the 1—2 shift control valve.

As vehicle speed and governor pressure increase, a force is developed on the end of the shift valve. When this force is great enough to overcome the spring pressure and the force of the 1—2 shift control valve, the shift valve moves, closing the exhaust and opening the line pressure port to the second clutch port.



To prevent a 'hunting' condition of the shift valve, modulator pressure to the second spool of the shift control valve is cut off as the shift valve opens 'drive' pressure to the second clutch. The oil in this pocket is exhausted through the detent passage. An additional force keeping the valve in an 'upshifted' position is obtained by 'drive' pressure acting on the larger diameter second spool of the shift valve. Therefore, even though the governor pressure might be constant after the valve upshifts, a higher modulator pressure is required to cause the valve to downshift.

At wide throttle openings, the vacuum will drop and modulator pressure will increase. If the spring force plus the modulator pressure acting against the end spool of the shift control valve is great enough to overcome the governor and 'drive' pressure acting on the shift valve, a part throttle forced downshift will occur. If not, the transmission will remain in the higher gear.

If the accelerator pedal is fully depressed, the detent valve supplies detent regulator pressure to all three spools of the shift control valve, and a higher downshifting force is obtained as compared to the part throttle condition. Because of this a forced downshift can be obtained at a speed higher than for the part throttle condition. However, there is still a limiting speed at which a forced downshift will occur.

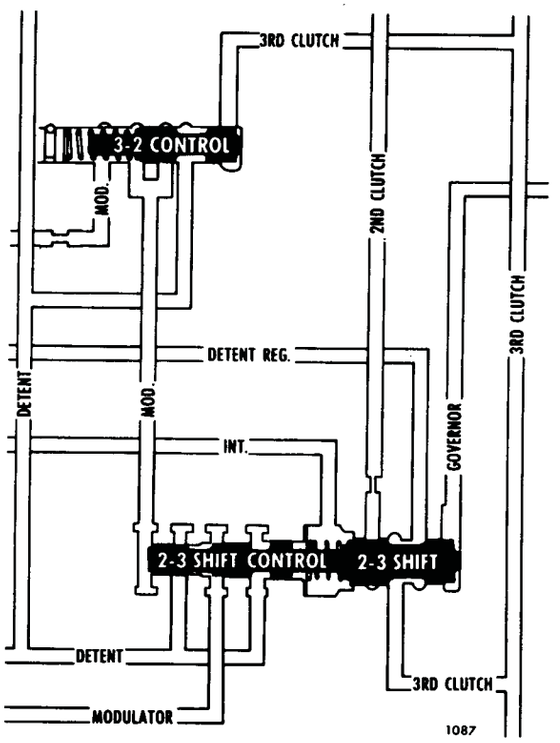
If the selector lever is placed in 'low', line pressure is supplied directly to the spring pocket between the valves. Since line pressure can never be less than governor pressure, the force established by line pressure on the shift valve, plus the spring force, will move the valve to a downshifted position regardless of vehicle speed.

2–3 SHIFT VALVE AND 3–2 CONTROL VALVE

The function and operation of the 2–3 shift and shift control valves is similar to that of the 1–2 shift valve.

Modulator pressure is supplied to the end spool of the 2–3 shift control valve through the 3–2 control valve. When the shift valve moves to the upshifted position, pressure is introduced to the third clutch circuit. The third clutch circuit also directs pressure to the end spool of the 3–2 control valve.

At light throttle conditions, third clutch pressure acting on the end of the 3–2 control valve moves the valve against the spring and the force established by the modulator pressure. This exhausts the modulator pressure from behind the end spool of the 2–3 shift control valve and the spring is the only remaining force acting on the shift valve to produce a downshift. In this condition, it is not possible to obtain a part throttle forced downshift.



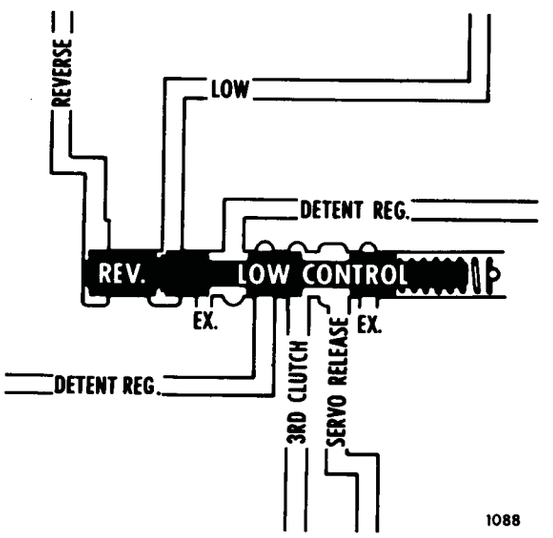
If the accelerator is depressed far enough to cause a substantial drop in vacuum, the increased modulator pressure on the 3–2 control valve plus the spring will overcome the force of the third clutch pressure. This feeds modulator pressure back to the 2–3 shift control valve and a part throttle forced downshift will occur. As with the 1–2 shift valve, there is a limiting speed at which this can occur.

When the selector lever is placed in 'intermediate', pressure is directed to the spring pocket between the 2–3 shift and shift control valves and the shift valve will be held in a downshifted, or second gear, condition regardless of vehicle speed.

MANUAL LOW AND REVERSE CONTROL VALVES

The third clutch is applied in 'low', and in 'reverse' to prevent a free wheeling condition. In drive range – third gear, third clutch pressure is also directed to the release side of the low servo. This is the pressure which causes the low band to release during a 2–3 shift. However, in 'low' the band must remain applied even though the third clutch is on.

The above conditions are achieved by routing third clutch pressure to the release side of the low servo through the manual low and reverse control valves. In drive range, the spring holds the valve in its 'bottomed' position and permits the third clutch pressure to be directed to the servo release circuit.



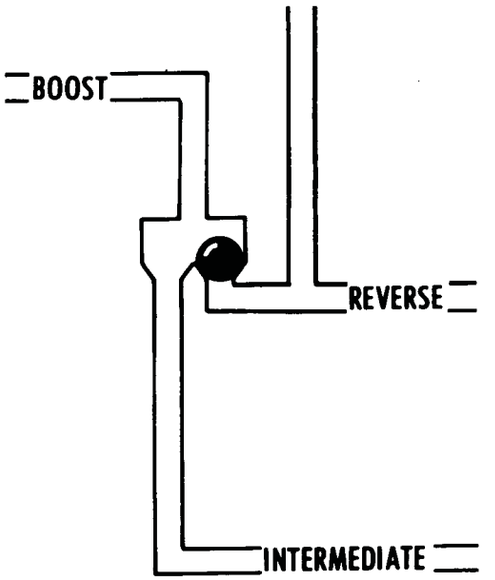
When the selector lever is placed in 'low', line pressure is introduced between the manual low and reverse control valves. This forces the low control valve over against the spring. In this position, third clutch pressure is cut off from servo release which is opened to exhaust. The third clutch passage is now open to detent regulator pressure which applies the third clutch since the 2–3 shift valve is in the downshifted position. The servo released passage is open to exhaust therefore the low band will remain applied.

When the selector lever is placed in 'reverse', line pressure acts on the end of the reverse control valve and forces the low control valve into the same position as in 'low'. This causes the third clutch to be applied.

BOOST CONTROL VALVE

To obtain the required pressure increase for 'intermediate', 'low' and 'reverse', pressure is introduced to the stepped area between the two spools of the pressure regulator boost valve. In 'intermediate' or 'low', some means has to be provided to prevent the pressure to the boost valve from being exhausted through the reverse passage. It is also necessary to prevent reverse pressure from being exhausted through the intermediate passage when in 'reverse'.

The boost control valve consists of a steel ball in a flow and pressure sensitive chamber. When the reverse passage is pressurized, the pressure and flow seat the ball against the intermediate passage and the pressure is directed to the boost passage. In 'intermediate' or 'low', the ball is seated against the reverse passage and the pressure is directed to the boost passage.



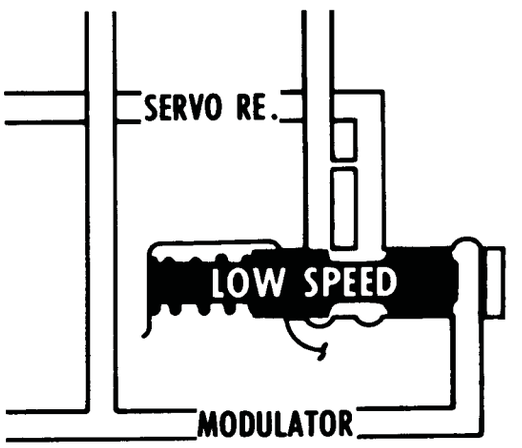
1089

LOW SPEED DOWNSHIFT TIMING VALVE

When the throttle is closed and the vehicle decelerates, a 3–2 shift takes place, during which it is necessary to delay the application of the band while the third clutch is being released. This is accomplished by directing the servo release pressure through the low speed downshift timing valve.

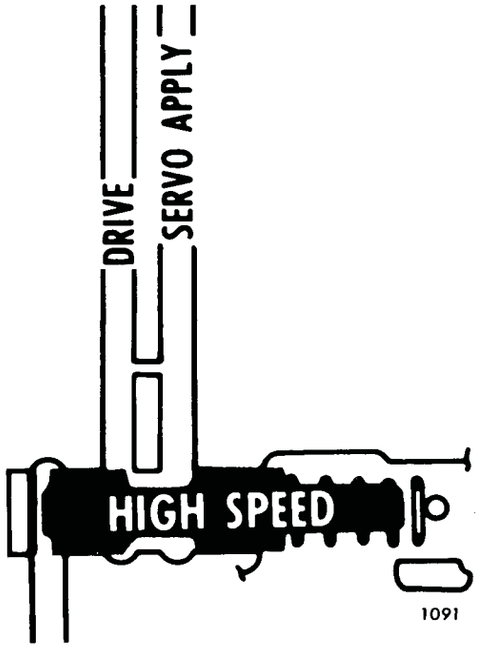
Under these conditions the vacuum is high and the resulting modulator pressure is zero. The spring holds the timing valve in a bottomed position and the servo release pressure is exhausted through a restricting orifice thus delaying the apply of the servo.

During a forced 3–2 shift at lower vehicle speeds the servo must be applied rapidly. During such a shift, the vacuum will be somewhat lower and the resulting modulator pressure will force the valve over against the spring. This provides an unrestricted passage for servo release, thus permitting rapid apply of the servo.



1090

HIGH SPEED DOWNSHIFT TIMING VALVE

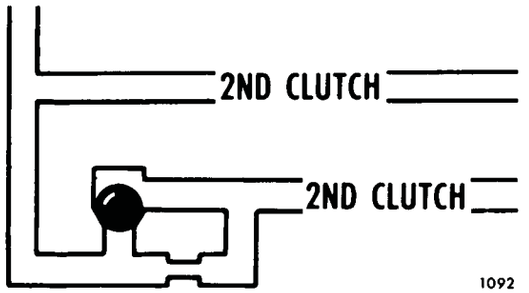


When a 3—2 shift is forced at high speed, the application of the band must be delayed. Servo apply pressure is directed through the high speed downshift timing valve.

The timing valve is held in a bottomed position by the spring at lower vehicle speeds. This permits an unrestricted flow for servo apply.

At higher vehicle speeds, governor pressure forces the valve over against the spring. This closes off the direct feed to servo apply and the feed is controlled by a fixed orifice.

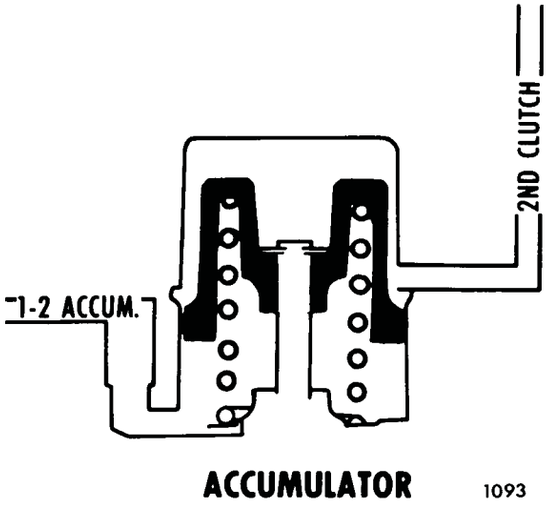
SECOND CLUTCH ORIFICE VALVE



For reasons of shift timing it is necessary to have different restricting orifice sizes for the feed and exhaust of the second clutch. This is accomplished by introducing a check ball in the second clutch circuit.

When the second clutch is being applied, the pressure seats the ball and the feed is directed through a single orifice. During the release of the clutch, the ball is unseated and the clutch can exhaust at a faster rate through the two orifices.

1—2 ACCUMULATOR



In order to obtain a smooth 1—2 upshift, it is necessary to control the rate of pressure build-up on the second clutch piston. This is accomplished by introducing a hydraulic modulator into the clutch circuit.

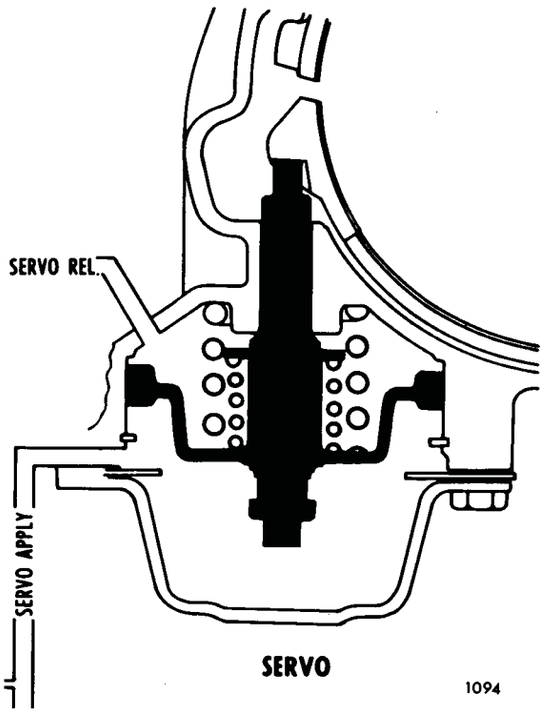
Prior to the second clutch being applied, the spring holds the accumulator piston in an upward position. When line pressure is introduced to the second clutch circuit by way of the 1—2 shift valve, the pressure in the second clutch will be permitted to build up rapidly until the clutch pressure acting on the accumulator piston is sufficient to overcome the accumulator spring. As the clutch pressure increases on the upper side of the accumulator piston, the piston will start to move against the spring force until the piston is forced all the way down. This provides a time delay for the

apply of the second clutch before the pressure reaches its maximum value. When upshifts are made at heavier throttle, it is necessary to increase the pressure at which this time delay occurs. This is accomplished by introducing a vacuum sensitive pressure from the 1–2 accumulator valve to the bottom side of the accumulator piston. This pressure assists the spring and the clutch pressure will have to build up to a higher value before the accumulator piston will move downwards.

BAND SERVO

The band servo provides a dual function. It is the means by which the band is applied and it provides an accumulator action for the third clutch during a 2–3 shift.

In first and second gear, servo apply pressure acting on the underside of the low servo piston moves the piston against the spring force thus applying the band. During a 2–3 shift, third clutch pressure is introduced to the top of the servo piston. When third clutch pressure acting on the top of the piston and assisted by the servo release spring is sufficient to overcome the servo apply force, the servo will move downwards. This removes the apply force from the band allowing it to release, while the third clutch is being applied. During the downward movement of the piston, a time interval occurs which cushions the apply of the third clutch in the same manner that the 1–2 accumulator cushions the apply of the second clutch.

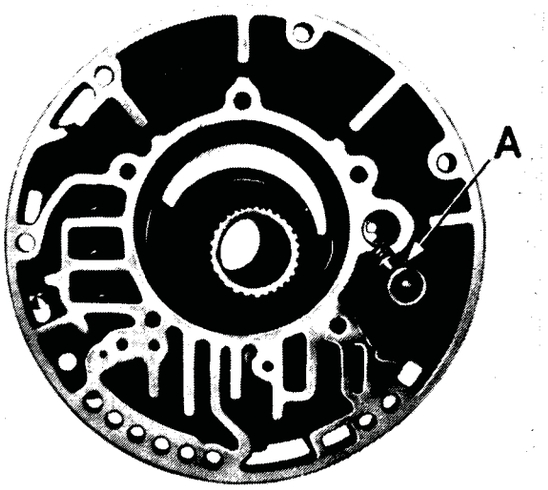


OIL PUMP

On later models, the oil pump incorporates a revised pressure regulator valve spring. This spring is used to obtain a higher pressure and can be identified by its colour, yellow.

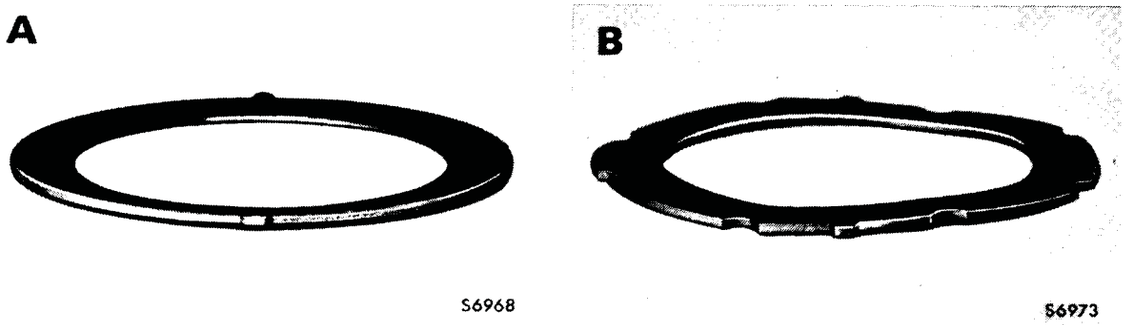
On Bedford CF with GM 2,1 litre diesel engine, the identification colour of the spring is yellow and white.

At transmission Serial No. 667826 the oil pump body was revised by the deletion of the oil pump priming valve (A) and the blanking off of the appropriate oil drilling. It is important to note that on no account should the priming valve be omitted from oil pumps that are drilled to accommodate the valve.



0977

THIRD CLUTCH

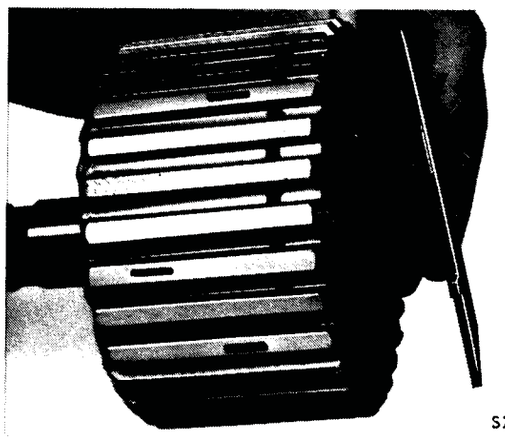


S6968

S6973

The cushion plate incorporated in the third clutch of later transmissions was revised from the wave washer type (B) to a dished plate type (A).

The dished cushion plate is installed in the clutch drum so that the concave side faces into the drum.



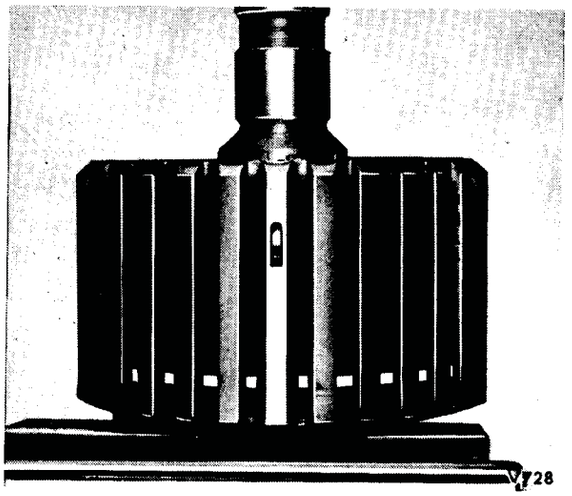
S7799

When reworking early transmissions which had the wave type cushion plate washer installed in the third clutch, it is recommended that the new dished cushion plate washer is installed on reassembly.

It is important to note that some earlier transmissions did not include a wave or dished type cushion plate washer in the third clutch, therefore when rebuilding these transmissions neither type of washer is to be used in the third clutch assembly.

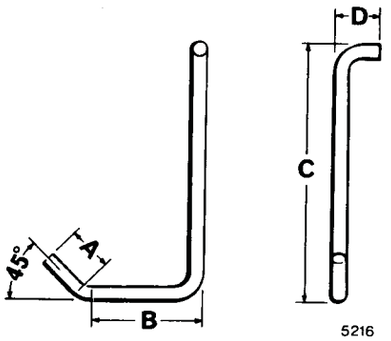
The nominal heights of the third clutch pistons used in conjunction with the cushion plate are as follows: 24,8 mm (0,98 in.) for a 1256 cm^3 engine; 19,9 mm (0,78 in.) for a 1759 cm^3 engine, GM 2,1 litre diesel engine and on the Cavalier for both the 16S and 19S engines; 15,1 mm (0,59 in.) for the 2279 and 3293 cm^3 engines.

The third clutch on later transmissions incorporates a sprag clutch retaining ring with plain ends.

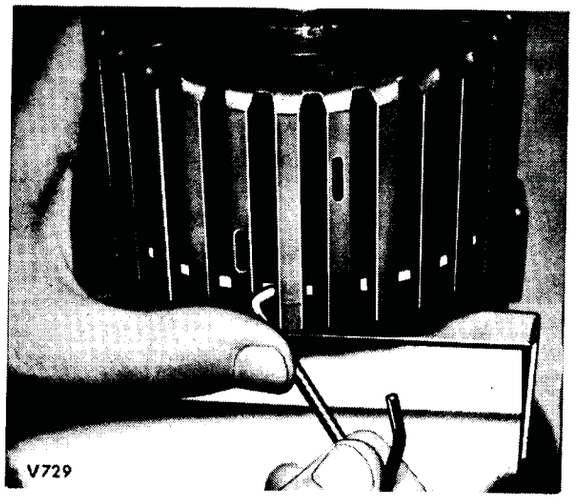


To disassemble this type of third clutch, make up a hook from 2,4 mm ($^3/_{32}$ in.) diameter welding wire to the following dimensions:

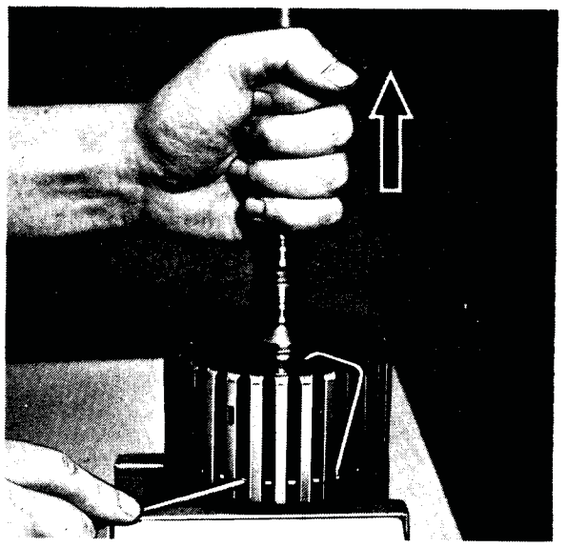
A = 9 mm (0,36 in.) B = 22 mm (0,86 in.)
C = 57 mm (2,24 in.) D = 8 mm (0,32 in.)



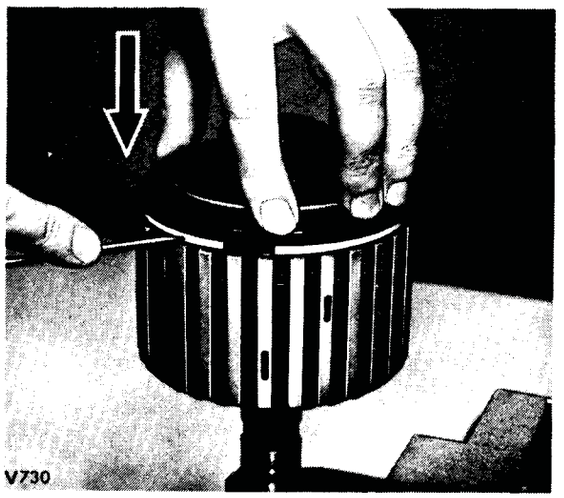
Depress one end of retaining ring out of groove in clutch drum and use hook to hold ring in this position.



Using a small screwdriver, continue to depress retaining ring out of groove in clutch drum while at the same time applying a direct upward load on input shaft. This prevents the retaining ring from jumping back into its groove. Remove wire hook and withdraw clutch drum and input shaft assembly from sprag clutch.

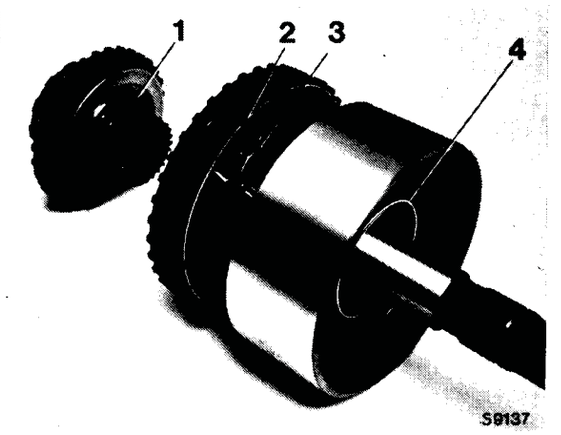


When reassembling, use screwdriver to compress retaining ring while simultaneously pressing down on the sprag clutch race.



PLANETARY GEAR SET

At transmission Serial No. 677494 the machining of the planetary gear set and associated parts was revised to reduced gear whine. From the above serial number the angle at which the gear teeth are machined has been revised from 15° to 17° 30'. The revised parts can be identified by a groove machined on the input sun gear (1), the ring gear (2), on the long pinion of the carrier assembly (3), and on the reaction sun gear and drum assembly (4).



It is important to note that the revised parts can only be installed to a transmission if installed as a complete set and must not be mixed with parts from earlier transmissions.

CLUTCH PLATES

All transmissions used with a 2279 or 3293 cm^3 engine have four clutch plates in each clutch.

On models with a 1256 or 1759 cm^3 engine the number of plates in each clutch are two and three respectively.

On Cavalier both the 16S and 19S engines have three plates in each clutch. On the GM 2,1 litre diesel engine, three plates are used in the reverse and third clutches and four plates in the second clutch.

SPRAG ASSEMBLY

On models with a 1256 or 1759 cm^3 engine and also on Cavalier with a 16S engine, a sprag assembly with 16 sprags is used. All other models use a sprag assembly with 26 sprags.

SERVO PISTON RELEASE SPRING IDENTIFICATION

The servo piston release spring identification colour is white on models with a 1256 or 1759 cm^3 engine and on Cavalier for both the 16S and 19S engines. The identification colour for models with a 2279 cm^3 engine and for the GM 2,1 litre diesel engine is yellow. On models with the 3293 cm^3 engine, the identification colour is green.

Some early models with a 1256 or 1759 cm^3 engine used a release spring with an identification colour of orange.

SERVO PISTON CUSHION SPRING IDENTIFICATION

A servo piston cushion spring with an identification colour of green is used on models with a 3293 cm^3 engine, on Cavalier for both the 16S and 19S engines and on the GM 2,1 litre diesel engine. A spring with four coils is used on models with a 1256, 1759 or a 2279 cm^3 engine.

DETENT VALVE AND SPRING

At Serial No. 922910 on all models a new detent valve and spring were introduced. The new valve can be identified by measuring its overall length, which is 131,8 mm (5,20 in.). The overall length of the old valve is 128,3 mm (5,05 in.). The new spring incorporates 12 coils. The new valve and spring can be installed to earlier vehicles but only as an assembly.

ACCUMULATOR SPRING IDENTIFICATION

On models with a 1759 or 2279 cm^3 engine and on Cavalier for both the 16S and 19S engines, the accumulator spring identification colour is light green. The accumulator spring for models with a 1256 cm^3 engine and for the GM 2,1 litre diesel engine incorporates eight coils. The identification colour for models with a 3293 cm^3 engine has changed from red to yellow.

SECOND CLUTCH SPACER NOMINAL LENGTH

On later models, the second clutch spacer nominal length is as follows: 1256 cm^3 engine, 53,16 mm (2,093 in.); 1759 cm^3 engine and Cavalier for both the 16S and 19S engines, 48,23 mm (1,899 in.); 2279 and 3293 cm^3 engines and GM 2,1 litre diesel engine, 43,31 mm (1,705 in.).

REVERSE CLUTCH PISTON NOMINAL HEIGHT

The nominal height of the reverse clutch piston for later models is as follows: 1256 cm^3 engine, 43,30 mm (1,705 in.); 1759 cm^3 engine, Cavalier for both the 16S and 19S engines and the GM 2,1 litre diesel engine, 38,40 mm (1,512 in.); 2279 and 3293 cm^3 engines, 33,45 mm (1,317 in.).

VACUUM MODULATOR AND VALVE – 1759 cm^3 Engine

On some earlier models with a 1759 cm^3 engine, the standard zinc-coloured vacuum modulator is used.

In addition to the vacuum modulator, the standard modulator valve and sleeve are used. The modulator sleeve identification colour is orange.

MODULATOR SLEEVE

On models with a 1256, 1759, 2279 or a 3293 cm^3 engine, the modulator sleeve identification colour is white. On Cavalier for both the 16S and 19S engines and for the GM 2,1 litre diesel engine, the identification colour is green.

VACUUM MODULATOR

A new vacuum modulator for all models was introduced at Serial No. 919661. The new modulator incorporates an '0'-ring to improve oil sealing between the transmission casing and the modulator threads. The identification colour of the new modulator is light blue. The new modulator cannot be installed to earlier vehicles.

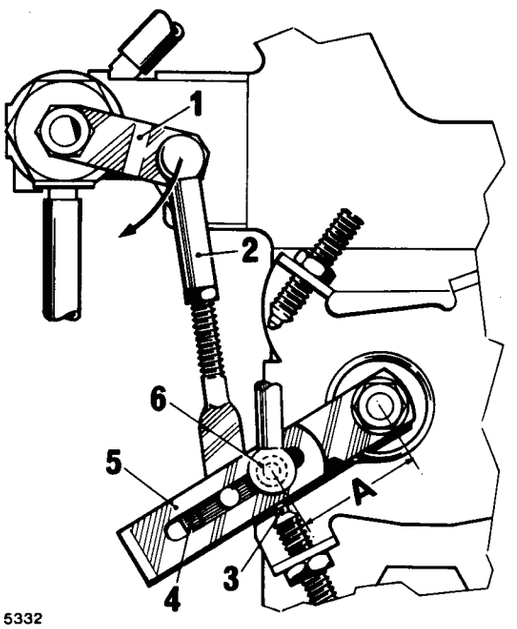
VACUUM METERING VALVE – GM 2,1 litre Diesel Engine

On the GM 2,1 litre diesel engine, a vacuum metering valve connected to the accelerator pedal linkage, is used to control the amount of vacuum acting on the modulator in relation to accelerator pedal position. The valve is located adjacent to the fuel injection pump.

The ball (6) for the accelerator cable is connected by a link plate (4) to the metering valve connecting rod (2). Therefore, when checking the metering valve linkage setting, it is first necessary to ensure that the centre of accelerator cable ball (5) is 30 mm (1,18 in.) from the centre of the fuel injection pump lever spindle (dimension 'A'). Dimension can be adjusted by slackening cable ball which clamps the link plate to the pump lever (5).

To check the valve linkage setting, disconnect the connecting rod (2) from valve lever (1). Rotate valve lever fully in direction of arrow.

With the fuel injection pump lever (5) contacting the stop screw (3), the connecting rod ball socket should be in alignment with the valve lever ball.



5332

A guide to fault diagnosis is as follows:

Metering valve incorrectly adjusted or 'T'-piece in vacuum hose to metering valve blocked could cause:—

a) high oil pressure

b) upshifts only at high speed

c) abrupt upshifts

d) abrupt 3-1 coast downshift at low speed

Metering valve air filter or air-bleed slot blocked could cause:—

a) low oil pressure at full throttle

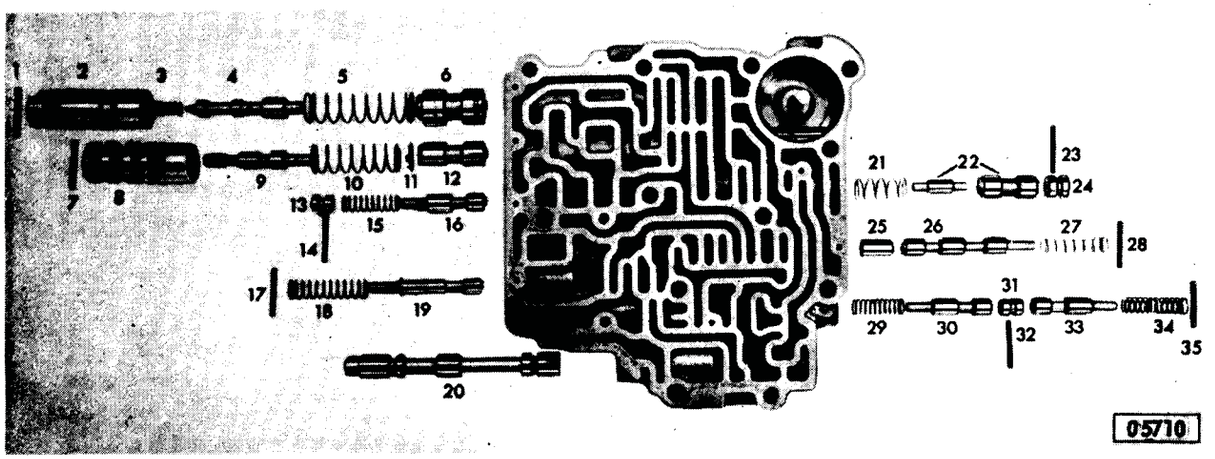
b) slipping upshifts

c) slipping 3-2 detent downshift at high speed

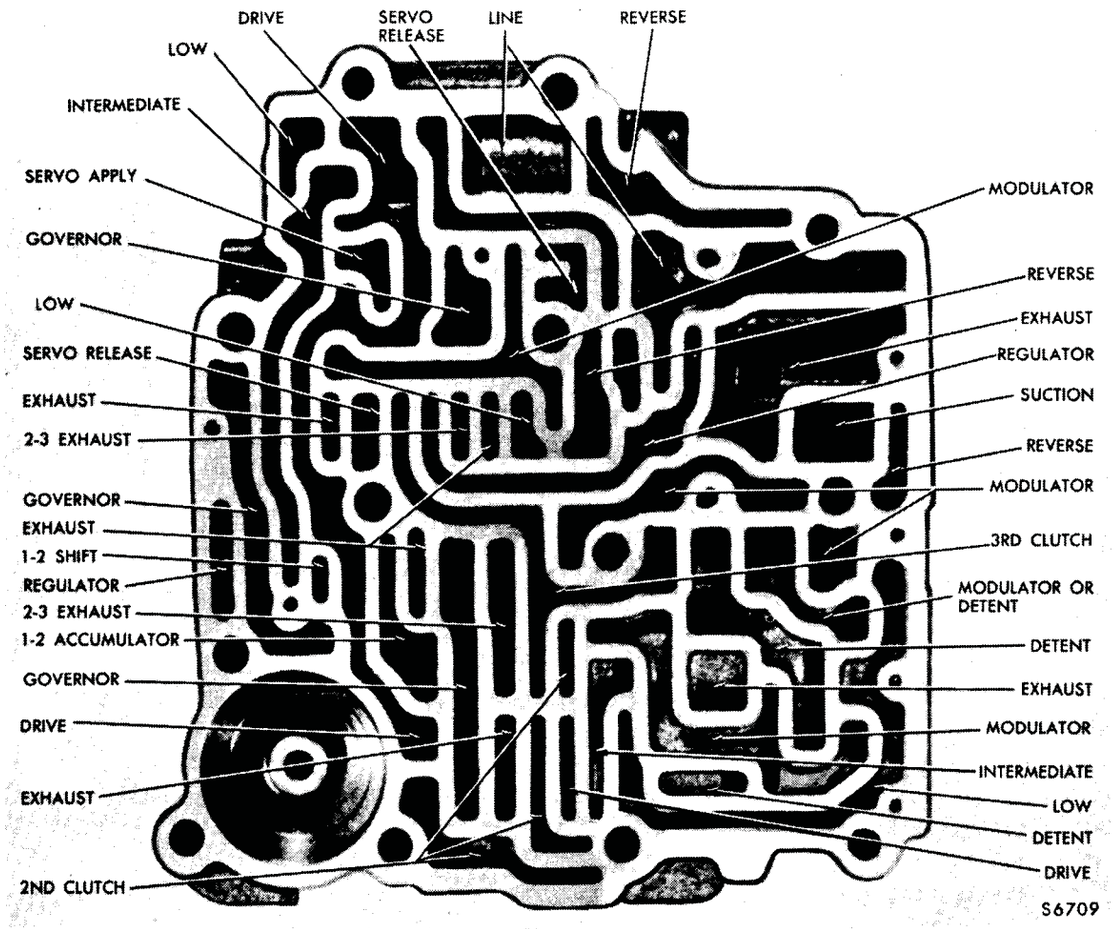
d) slipping 3-1 detent downshift at low speed

VALVE BODY AND TRANSFER PLATE

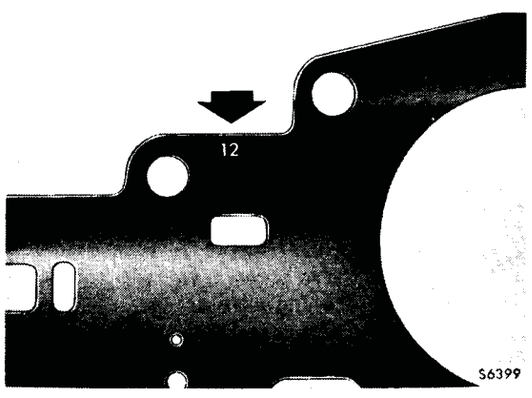
On all later models, a valve body with internal changes is used. Details of this assembly are as follows:

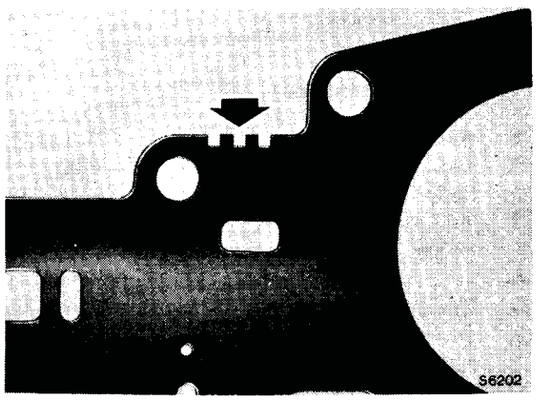


1. Retaining pin
2. 1—2 shift control valve sleeve
3. 1—2 shift control valve spring
4. 1—2 shift control valve
5. 1—2 shift valve spring
6. 1—2 shift valve
7. Retaining pin
8. 2—3 shift control valve sleeve
9. 2—3 shift control valve
10. 2—3 shift control valve spring
11. 2—3 shift control valve spring seat
12. 2—3 shift valve
13. Plug
14. Retaining pin
15. 3—2 control valve spring
16. 3—2 control valve
17. Retaining pin
18. Detent pressure regulator valve spring
19. Detent pressure regulator valve
20. Manual valve
21. 1—2 accumulator valve spring
22. 1—2 accumulator valve
23. Retaining pin
24. Plug
25. Reverse control valve
26. Intermediate control valve
27. Intermediate control valve spring
28. Retaining pin
29. Low speed downshift timing valve spring
30. Low speed downshift timing valve
31. Plug
32. Retaining pin
33. High speed downshift timing valve
34. High speed downshift timing valve spring
35. Retaining pin



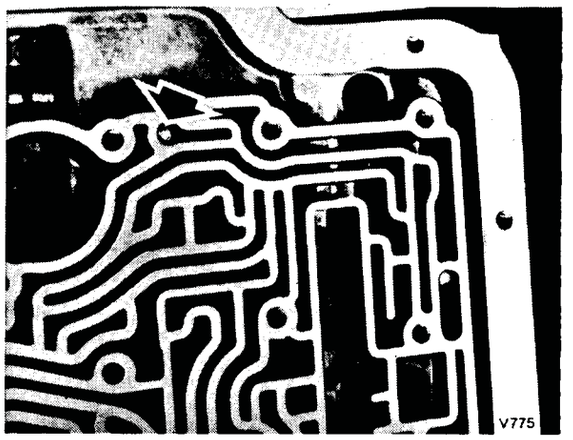
Oil passages in revised valve body





On four-cylinder models a revised transfer plate is also used with the revised valve body. The revised transfer plate can be identified by the number 12 on models with a 1256 cm^3 engine, three square notches on models with a 1759 cm^3 engine and one square notch on models with a 2279 cm^3 engine.

On later models with 1759 or 2279 cm^3 engines with H4 and L1 calibration respectively, the 2nd clutch orifice check ball (arrowed) was deleted and a revised transfer plate installed.



Later models use the following transfer plate identification numbers: 30 for 1759 cm^3 engine; 31 for 2279 cm^3 engine; 15 for the GM 2,1 litre diesel engine; 33 for Cavalier with a 16S engine and 22 for Cavalier with a 19S engine. The transfer plate of some early Cavalier models with the 16S engine are identified by 6V-notches.