

TRANSMISSION REASSEMBLY

1. Install mainshaft assembly into transmission case. Install 1st-2nd and 3rd-4th shift forks into their respective synchronizer sleeves. Ensure roll pin bosses on forks face each other. Install countershaft assembly into case.

NOTE: If necessary, move mainshaft to one side in order to ease countershaft installation.

2. Choose and install a NEW selective snap ring in front of input shaft bearing. Select thickest snap ring that will fit in groove. See **INPUT SHAFT SELECTIVE SNAP RING** table for available sizes and identification colors.

INPUT SHAFT SELECTIVE SNAP RING

Identification Color	Thickness: In. (mm)
Blue	.085 (2.15)
None	.087 (2.22)
Brown	.090 (2.29)
White	.093 (2.36)

3. Install small caged needle bearing inside input gear. Install synchronizer ring on input shaft. Check clearance between ring and gear. If clearance is less than .009" (.23 mm), replace ring and/or input shaft.
4. Install synchronizer ring and input shaft in case. Rotate input shaft so flats face countershaft (to provide installation clearance). If necessary, tap input shaft into position with brass hammer.
5. Install a NEW snap ring on NEW outer bearing race and install race in case. Ensure widest portion of race is installed into case. Slide NEW outer ball bearing onto mainshaft.
6. Press bearing on mainshaft and in race using Tube (T85T-7025-A), Shaft Sleeve Replacer (T75L-7025-K), Shaft Collar (T75L-7025-M) and Forcing Screw (T84T-7025-B). After pressing into position, ensure all gears rotate freely.
7. Using Oil Seal Installer (T85T-7011-A) and Driver Handle (T80T-4000-W), drive NEW oil seal into input shaft front bearing retainer. Install large snap ring that retains input shaft bearing to case.
8. Check input shaft front bearing retainer-to-bearing clearance. Remove front bearing retainer selective shim. Using a depth micrometer, measure distance between top machined surface to spacer surface (second land) of front bearing retainer. See **Fig. 11** . Add .008" (.20 mm) to allow for gasket thickness. Record total.
9. Bottom input shaft bearing so snap ring is flush against transmission case. Using depth micrometer, measure distance from top of outer front bearing race to machined surface of case. See **Fig. 11** . Record reading.
10. Subtract reading obtained in step 9) from dimension recorded in step 8). This will give required maximum shim size to obtain a 0-.004" (0-.10 mm) clearance. Install appropriate size selective shim in front bearing retainer. Refer to **INPUT SHAFT BEARING RETAINER SELECTIVE SHIM** table for available shim sizes and identification colors.

INPUT SHAFT BEARING RETAINER SELECTIVE SHIM

Identification Color	Thickness: In. (mm)
Black	.033 (.84)

None	.037 (.93)
Red	.040 (1.02)
White	.044 (1.11)
Yellow	.047 (1.20)
Blue	.051 (1.29)
Green	.054 (1.38)

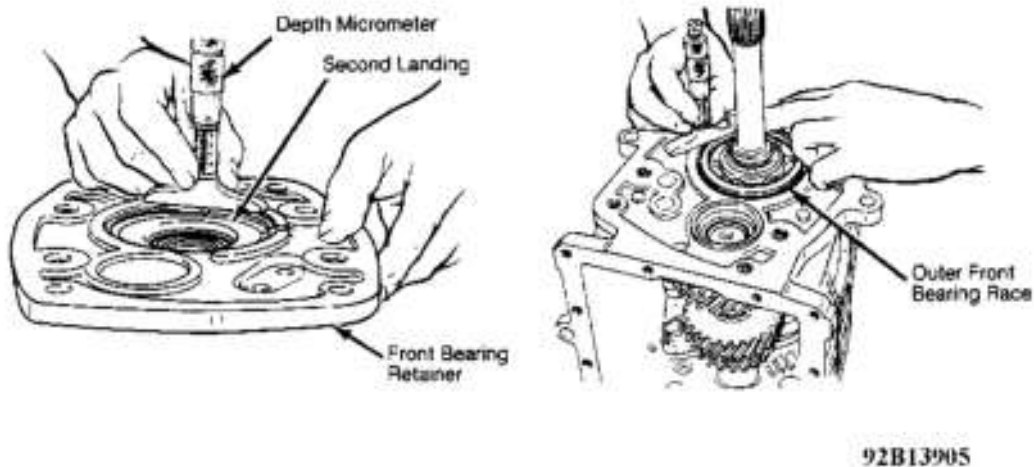
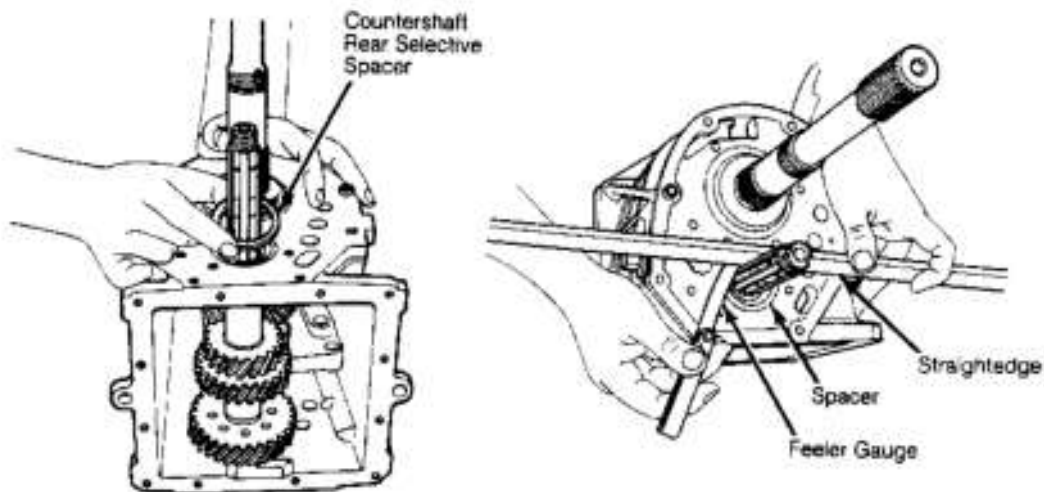


Fig. 11: Checking Input Shaft Front Bearing Retainer-To-Bearing Clearance
 Courtesy of FORD MOTOR CO.

11. Install countershaft front outer bearing race and non-selective spacer. Install countershaft rear outer bearing race. Install NEW gasket between front bearing retainer and case. Position retainer on case (with selective shim installed). Install 4 bolts and 4 studs. Tighten to specification. See **TORQUE SPECIFICATIONS** .
12. Check and adjust countershaft end play. Place transmission so rear of mainshaft and countershaft face upward. Install countershaft rear selective spacer. See **Fig. 12** . Force countershaft downward so it bottoms against front bearing retainer.
13. Place straightedge across rear countershaft selective spacer in case. See **Fig. 12** . Try to turn spacer. If spacer turns easily, replace spacer with next larger size.
14. Install a spacer so clearance between spacer and straightedge is 0-.002" (0-.05 mm). Refer to **COUNTERSHAFT END PLAY SELECTIVE SPACER** table for available sizes and identification markings on spacer. Install correct size spacer over countershaft rear bearing race.
15. Install and tighten rear bearing retainer onto case with 4 6-mm Allen head bolts. See **TORQUE SPECIFICATIONS** . Ensure spacer installed in step 14) does not fall out of place when installing rear bearing retainer.
16. Position reverse idler gear shaft assembly on case. Install 6-mm Allen head bolts to act as a pilot. Install Reverse Idler Gear Shaft Remover (T85T-7140-A) on shaft, and drive reverse idler gear shaft assembly into place. Tighten Allen bolts to specification. See **TORQUE SPECIFICATIONS** .
17. Install 2 caged needle bearings, reverse idler gear and thrust washer on idler shaft. Boss on idler gear faces away from transmission. Install lock nut and tighten to specification. See **TORQUE**

SPECIFICATIONS . If necessary, advance nut to next castellation and install NEW cotter pin.

CAUTION: When installed, ensure cotter pin does not cause interference with countershaft overdrive gear. Bend and/or cut end of cotter pin if necessary.



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Fig. 12: Checking Countershaft End Play
 Courtesy of FORD MOTOR CO.

COUNTERSHAFT END PLAY SELECTIVE SPACER

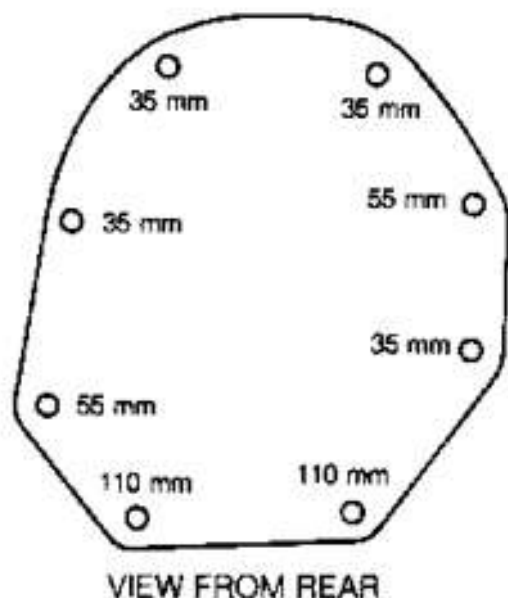
Identification Mark	Thickness: In. (mm)
84	.0724 (1.840)
87	.0736 (1.870)
90	.0748 (1.900)
93	.0760 (1.930)
96	.0772 (1.960)
99	.0783 (1.990)
02	.0795 (2.020)
06	.0807 (2.050)
08	.0819 (2.080)
11	.0831 (2.110)
14	.0843 (2.140)
17	.0854 (2.170)
20	.0866 (2.200)
23	.0878 (2.230)
26	.0890 (2.260)
29	.0902 (2.290)

32	.0913 (2.320)
35	.0925 (2.350)
38	.0937 (2.380)
41	.0949 (2.410)
44	.0961 (2.440)
47	.0972 (2.470)
50	.0984 (2.500)
53	.0996 (2.530)
56	.1008 (2.560)
59	.1020 (2.590)
62	.1031 (2.620)
65	.1043 (2.650)
68	.1055 (2.680)

18. Install spacers and countershaft reverse gear on countershaft. Press reverse gear sleeve onto mainshaft using Tube (T85T-7025-A), Shaft Sleeve Replacer (T75L-7025-K), Shaft Collar (T75L-7025-M) and Forcing Screw (T84T-7025-B).
19. Install caged needle bearing, reverse gear and synchronizer ring onto mainshaft. Assemble overdrive synchronizer hub and sleeve by first installing hub into sleeve. Ensure shift fork groove on sleeve faces toward rear of transmission. Large boss on hub must face front of transmission.
20. When installing hub and 3 keys in sleeve, ensure single tooth between 2 spaces will touch key. See **Fig. 9** . Install springs so open ends do not face each other. Install overdrive synchronizer on mainshaft with shift fork groove in sleeve toward rear of transmission.
21. Press overdrive gear sleeve onto mainshaft using Remover-Replacer Tube (T75L-7025-B) and previously used shaft sleeve replacer, shaft collar and Overdrive Gear Bearing Replacer (T85T-7061-A). Install ring onto overdrive synchronizer.
22. Slide small spacer, caged needle bearing and overdrive gear onto mainshaft. Check clearance between overdrive gear and synchronizer ring. If clearance is less than .009" (.23 mm), replace ring and/or overdrive gear.
23. Install countershaft overdrive gear and ball bearing onto countershaft along with 1st-2nd shift rail. Seat bearing into position using Countershaft Bearing Replacer Collet (T85T-7121-A), Rear countershaft Bearing Installer Adapter (T85T-7111-A) and Remover-Replacer Tube (T77J-7025-B). Ensure rail engages forks.
24. Install lock ball and thrust washer onto mainshaft. Place NEW rear bearing over mainshaft. Press bearing into position using previously used tube, shaft sleeve replacer, shaft collar and Rack Bushing Holder (T81P-3504-D).
25. Install NEW lock nuts on countershaft and mainshaft. Double engage transmission in 2 gears to prevent shafts from turning. Using Mainshaft Lock Nut Wrench (T77J-7025-C), tighten mainshaft lock nut to specification. See **TORQUE SPECIFICATIONS** .
26. Using 30-mm socket, tighten countershaft lock nut to specification. See **TORQUE SPECIFICATIONS** . Disengage transmission. Stake lock nuts on mainshaft and countershaft using Lock Nut Staker (T77J-7025-F). Install mainshaft oil seal sleeve with outer chamfered edge facing rear of transmission.
27. Install interlock plunger in bore between 1st-2nd and 3rd-4th shift rails. Reposition 1st-2nd shift rail so flats for poppet ball and spring and interlock plunger are in correct position. Ensure roll pin holes for shift forks are in alignment.
28. Install overdrive-reverse shift fork on synchronizer sleeve. Slide 3rd-4th shift rail through overdrive-

reverse shift fork, into case and into 3rd-4th shift fork (inside case). Position shift rail flats to accept poppet balls and interlock plunger.

29. Insert interlock plunger in bore between 3rd-4th shift rail and overdrive-reverse shift rail. Ensure roll pin holes in fork are in alignment. Insert overdrive-reverse shift rail so it engages forks in case. Ensure roll pin holes in fork and rail align.
30. Insert poppet ball and spring in reverse/overdrive (upper) bore in case. Ensure small end of spring is installed toward ball. Install screw type plug and tighten until screw head is .24" (6 mm) below top of bore.
31. Insert poppet springs and balls into 1st-2nd and 3rd-4th bore (2 bores on side of case). Ensure small end of each spring faces ball. Install and tighten bolt type plugs.
32. Install roll pins in shift forks. If removed, install switch actuator and roll pin. Install shift gates on appropriate shift rails. Move 1st-2nd gate to rear of rail. Position NEW gasket between transmission case and transfer case adapter.
33. Ensure selector arm for control shaft assembly is out of gates and shift lever socket on control shaft assembly is at rear of adapter. Position adapter on case (ensure shift gates clear adapter). Check that shift rails and rear bearings line up with bores in adapter.
34. Install 3 different sizes of bolts in appropriate holes in adapter. See **Fig. 13** . Tighten retaining bolts to specification. See **TORQUE SPECIFICATIONS** . Install output shaft oil seal into transfer case adapter. Install neutral return plungers, springs and bolts in adapter. Longer plunger (with slot for detent ball) is installed on right side of adapter.



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Fig. 13: Locating Transfer Case Adapter Bolts

Courtesy of FORD MOTOR CO.

35. Position shift gates so roll pin holes in gates and rails are in alignment. Install roll pins through access holes. Install access hole plugs. Position transmission case pan and NEW gasket on case. Install and tighten bolts. Do not overtighten. Install drain plug (if necessary) and tighten. See **TORQUE SPECIFICATIONS** .
36. Insert plunger detent ball and spring in hole above neutral return plunger in adapter case. Ensure reverse lockout assembly on cover (for transfer case adapter) moves smoothly. Position NEW gasket on adapter and install transfer cover assembly. Install and tighten bolts. See **TORQUE SPECIFICATIONS** .
37. Install back-up light switch in adapter. Remove filler plug and fill transmission to bottom of fill hole with SAE 80W gear oil. Fluid capacity is 4.8 pts. (2.3L).
38. Install filler plug and tighten. Position clutch slave cylinder on input shaft. Position clutch bellhousing on transmission case and tighten bolts to specification. See **TORQUE SPECIFICATIONS** .