Description

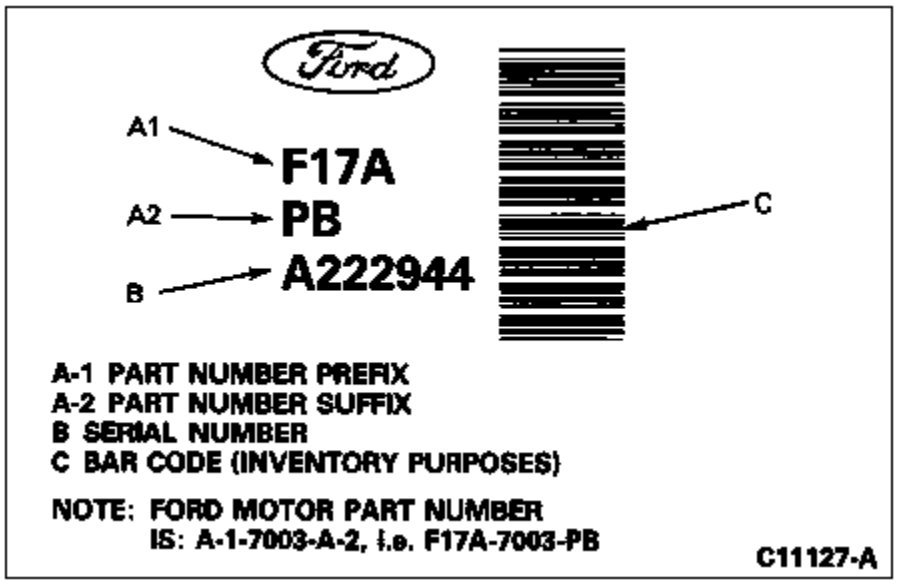
The M5OD is a top-shift, fully-synchronized, five-speed manual transmission (7003), equipped with an overdrive fifth gear ratio. All gear changes (including reverse) are accomplished with synchronizer sleeves.

The case (7005), case cover (7222), and extension housing (7A039) are constructed of aluminum alloy. Steel bearing race inserts provide durability in appropriate areas.

Transmission Identification

The Vehicle Safety Compliance Certification Label (located on the driver's door lock pillar) lists applicable transmission identification codes. For identification of the label codes, refer to Section 00-01 .

Manual transmissions (7003) are equipped with service identification tags. The M5OD transmission service tag is located on the driver's side of the transmission.



Powerflow

Powerflow is accomplished with a series of gears and synchronizers as follows:

Neutral

The synchronizer sleeves are centered. The input gear drives the countershaft (7111). Since no gears are locked to the output shaft, it is not driven.

First Gear

The first/second synchronizer is splined to the output shaft. The first/second synchronizer sleeve locks the first gear (1GR) (7100) to the output shaft through the synchronizer. The input gear drives the countershaft. First gear on the countershaft drives the first gear on the output shaft, which is driven in reduction at 3.72:1.

Second Gear

The synchronizer is splined to the output shaft. The synchronizer sleeve locks second gear (2GR) (7102) to the output shaft through the synchronizer. The input gear drives the countershaft. Second gear on the countershaft drives second gear on the output shaft. The output shaft is driven in reduction at 2.20:1.

Third Gear

The third/fourth synchronizer is splined to the output shaft. The synchronizer sleeve locks third gear to the output shaft through the synchronizer. The input gear drives the countershaft. Third gear on the countershaft drives third gear on the output shaft. The output shaft is driven in reduction at 1.50:1.

Fourth Gear

The third/fourth synchronizer is splined to the output shaft. The synchronizer locks the input shaft (7017) to the output shaft. The input shaft and output shaft turn at the same speed (1:1 ratio).

Fifth Gear (Overdrive)

The fifth/reverse gear synchronizer is splined to the countershaft. The synchronizer sleeve locks fifth gear to the countershaft. The input gear drives the countershaft. Fifth gear on the countershaft drives fifth gear which is splined to the output shaft. The output shaft is overdriven at a ratio of 0.79:1.

Reverse Gear

A reverse idler gear produces rotation in the opposite direction of output shaft rotation. The fifth/reverse synchronizer is splined to the countershaft. The synchronizer sleeve locks reverse gear to the countershaft. The input gear drives the countershaft. The countershaft reverse gear drives the reverse idler gear. The reverse idler gear drives reverse gear (which is splined to the output shaft) at a reduction ratio of 3.40:1.

Symptom Chart — Transmission, Manual

TRANSMISSION, MANUAL

Condition	Possible Source	Action
• Transmission Shifts Hard	• Transmission oil low or improper type.	• ADD lubricant or CHANGE lubricant as required.
	• Shift lever binding or worn.	• REMOVE cap from shift tower. ELIMINATE binding condition or REPLACE components as required.
	• Worn or damaged internal shift mechanism.	• REMOVE transmission cover. CHECK internal shift mechanism by shifting into and out of all gears. REPAIR or REPLACE as required.
	• Binding of sliding gears and/or synchronizers.	• CHECK for free movement of gears and synchronizers. REPAIR or REPLACE as required.
	• Housings and/or shafts out of alignment.	• REMOVE transmission and CHECK for binding condition between input shaft and engine crankshaft pilot bearing or bushing. CHECK flywheel housing alignment. REPAIR or REPLACE as required.
	• Incomplete clutch disengagement.	• SEE Section 08-00 , Clutch General Service for reserve measurement test.
• Noisy in Forward Gears **NOTE: While verifying the condition, determine whether the noise is gear rollover noise, release bearing rub or some other transmission related noise. Gear rollover noise, inherent in manual transmissions, is caused by the constant mesh gears turning at engine idle speed, while the clutch is engaged and the transmission is in neutral; and release bearing rub is sometimes mistaken for mainshaft bearing noise. Gear rollover noise will**	• Lubricant level low, or improper type.	• ADD lubricant, or REFILL with specified lubricant.

disappear when the clutch is disengaged or when the transmission is engaged in gear. Release bearing rub will disappear when the clutch is engaged. In the event that a bearing is damaged, the noise is more pronounced while engaged in gear under load or coast than in neutral.		
	• Components grinding on transmission.	• CHECK for screws, bolts, etc., of cab or other components grinding. CORRECT as required.
	• Component housing bolts loose.	• CHECK torque on transmission-to-flywheel housing bolts, output shaft flange nut and flywheel housing-to-engine block bolts. TIGHTEN bolts to specification.
	• Flywheel housing-to-engine crankshaft alignment.	• CHECK and ALIGN flywheel housing to engine crankshaft.
	• Noisy bearings or gears.	• REMOVE and DISASSEMBLE transmission. INSPECT input, output and countershaft bearings. INSPECT speedometer gear and gear teeth for wear or damage. REPLACE as required.
• Gears Clash when Shifting from One Forward Gear to Another	• Incomplete clutch disengagement.	• REFER to Section 08-00 for clutch reserve measurement test.
	• Pilot bearing binding.	• REMOVE transmission and CHECK for binding condition between input shaft and engine crankshaft pilot bearing. REPLACE as required.
	• Damaged gear teeth and/or synchronizer.	• DISASSEMBLE transmission, REPAIR or REPLACE as required.
	• Engine idle speed too high.	• ADJUST engine idle speed.
	• Improper manual shift linkage.	• ADJUST and REPAIR manual shift linkage as required.
• Transmission Jumps Out of Gear	• Loose transmission-to-engine block	• TIGHTEN transmission-to-engine block bolts to specifications. LOOSEN all

	bolts, or loose levers.	bolts and RESEAT flywheel housing. TIGHTEN all bolts. TIGHTEN levers if necessary.
	• Crankshaft pilot bearing worn.	• REPLACE bearing.
	• Interior components damage.	• DISASSEMBLE transmission. INSPECT the synchronizer sleeves for free movement on their hubs. INSPECT the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surface. CHECK countershaft cluster gear for excessive end play. CHECK shift forks for loose mounting on shift rails. INSPECT synchronizer sliding sleeve and gear clutch teeth for wear or damage. REPAIR or REPLACE as required.
	• Worn gear teeth due to partial engagement.	• REPLACE worn or damaged gears.
• Transmission Will Not Shift into One Gear — All Others OK	• Backup switch ball frozen.	• If reverse is problem, CHECK backup switch for ball frozen in extended position (if so equipped).
	• Internal components.	• REMOVE transmission. If transmission will not shift into reverse, CHECK for damaged reverse gear train, in single rail shift transmission. Also, CHECK for misaligned reverse relay lever. INSPECT shift rail and fork system synchronizer system and gear clutch teeth for restricted travel. REPAIR or REPLACE as required.
• Transmission Is Locked in One Gear. It Cannot Be Shifted Out of That Gear	• Internal components.	• REMOVE transmission. INSPECT problem gears, shift rails and forks and synchronizer for wear or damage. REPAIR as required. CHECK for broken fork slot tabs on single rail transmissions.
	• Loose fork on rail.	• On single rail shift, CHECK for broken selector arm pin or selector plate. REPAIR or REPLACE as necessary.
• Transmission Leaks	• Improper amount or type of lubricant.	• CHECK level and type. FILL to bottom of filler plug hole.

	• Other component leaking.	• IDENTIFY leaking fluid as from engine, power steering or transmission. REPAIR as required.
	• False report.	• REMOVE all traces of lube on exposed transmission surfaces. CHECK vent for free breathing. OPERATE transmission and INSPECT for new leakage. REPAIR as required.
	• Internal components.	• REMOVE transmission. INSPECT for leaks at the input shaft bearing retainer seal and gasket and shift rail expansion plug. INSPECT for leaks at the top cover gasket. INSPECT case for sand holes or cracks. REPAIR or REPLACE as required.
	• Improper installation torque.	• TIGHTEN to specified torque value.
• Shift Lever Loose	• Retaining bolts loose.	• TIGHTEN to specified torque.
• Shift Lever Tight	• Worn or damaged shift lever lower bushing.	• INSPECT shift lever assembly. REMOVE and REPLACE parts as required.
• Noise from Transfer Case	• Incorrect tire inflation pressures and/or incorrect size tires and wheels.	• MAKE sure that all tires and wheels are the same size, and that inflation pressures are correct.
	• Excessive tire tread wear.	• CHECK tire tread wear to see if there is more than .06 inch difference in tread wear between front and rear. INTERCHANGE one front and one rear wheel. REINFLATE tires to specifications.
	• Internal components.	• OPERATE vehicle in all transmission gears with transfer case in 2HI, or HI range. If there is noise in transmission in neutral gear, or in some gears and not in others, REMOVE and REPAIR transmission.If there is noise in all gears, OPERATE vehicle in all transfer case ranges. If

		noisy in all ranges, DISASSEMBLE transfer case. CHECK input gear, planetary gear assembly, sprockets, chain and single cardan U-joint for damage. REPLACE as necessary.
• Transfer Case Jumps Out of Gear	• Incomplete shift linkage travel. • Loose mounting bolts. • Front and rear driveshaft slip-yokes dry or loose. • Internal components.	• CHECK for interference to shift boot or body. • TIGHTEN mounting bolts. • LUBRICATE and REPAIR slip-yokes as required. TIGHTEN flange yoke attaching nut to specifications. • DISASSEMBLE transfer case. INSPECT input gear, planetary gear assembly, sliding shift collar hubs and detent spring for damage. REPLACE as required.

Transmission

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Clutch Coupling Tool	T88T-70522-A
Seal Remover	T74P-77248-A

Removal

1. Shift the transmission (7003) into neutral position.
2. Remove the retainer screws and slide the gearshift lever boot (7277) up the shaft of gearshift lever (7210).
3. Remove the retaining bolt and remove the gearshift lever. Remove the stub shaft through the floor opening.
4. Disconnect the battery ground cable (14301) from the battery terminal.
5. Raise the vehicle on hoist and position suitable safety stands under vehicle.
6. **NOTE: Drain transmission only if disassembly is required.**

   Place drain pan under transmission. Using a 24mm wrench, remove case plug (7A010) and drain transmission.
7. Disconnect the driveshaft (4602) at the rear axle. On Ranger SuperCab, remove the driveshaft center bearing bracket (4A499).
8. Pull the driveshaft rearward and disconnect from the transmission. Install a suitable plug in the extension housing (7A039) to prevent lubricant leakage if transmission was not drained. On 4x4 models, unbolt driveshaft from rear case yoke (7B214) at the case (7005). Remove driveshaft.
9. Disconnect the hydraulic clutch hose (7T504) at the case using Clutch Coupling Tool T88T-70522-A. Plug both ends of the hydraulic clutch hose to prevent fluid leakage and entry of contaminants.
10. Remove the speedometer cable (17260) from the extension housing or driveshaft center bearing bracket.
11. Disconnect starter motor (11001) wires and backup lamp switch (15520).
12. Remove exhaust system components for adequate clearance (V-6 engines only). Refer to Section 09-00 .
13. Place a jack under the engine (6007), protecting theoil pan (6675) with a wood block.
14. On 4x4 vehicles, remove the transfer case (7A195), as described in Section 07-07A , Section 07-

07B , Section 07-07C or Section 07-07D .

15. Remove the starter motor. Position Hi-Lift Transmission Jack 014-00942 or equivalent under the transmission.

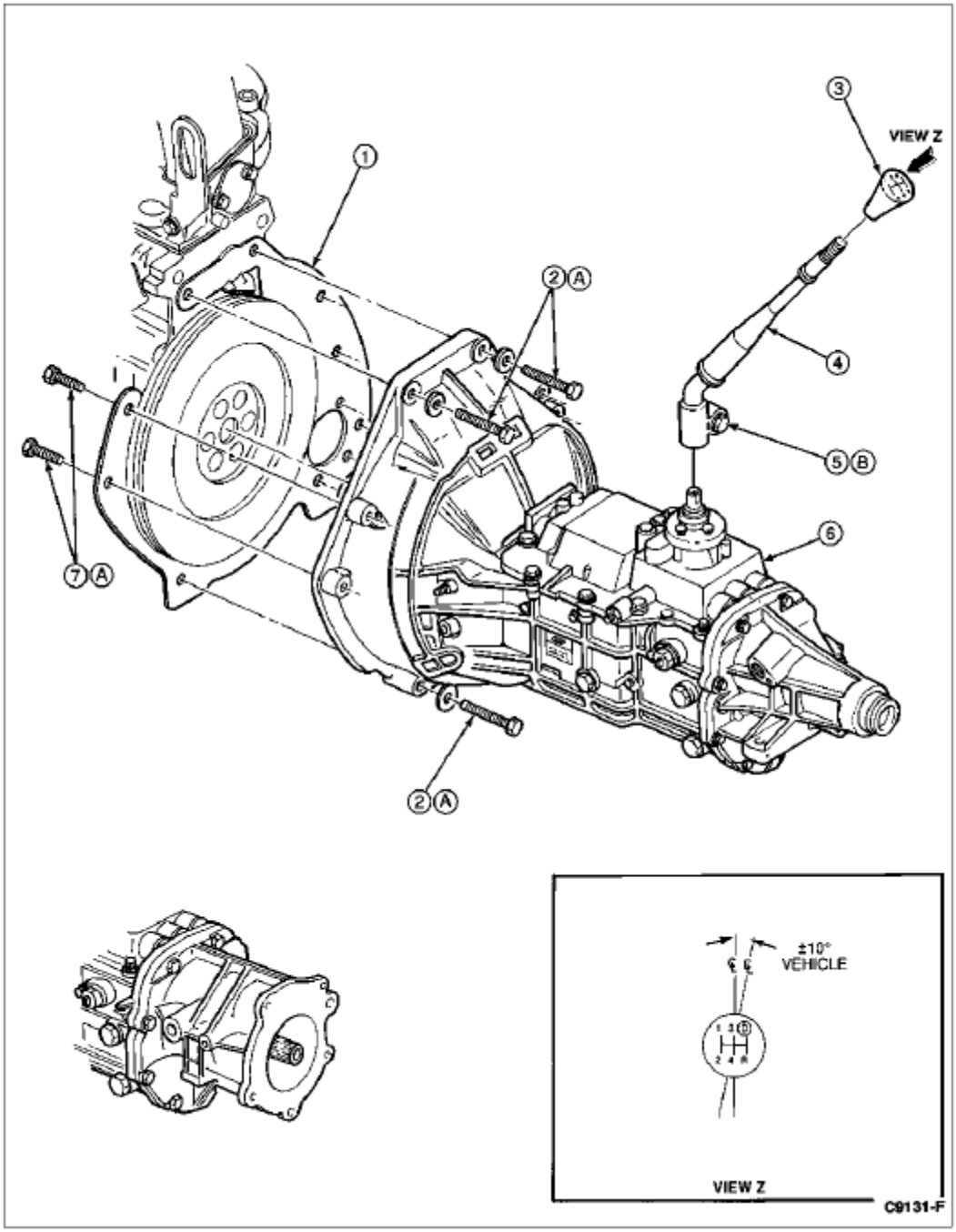
16. Remove the bolts, lockwashers and flatwashers attaching thetransmission to the rear plate of engine.

17. Remove the nuts and bolts attaching the transmission support insulator (6068) to the crossmember.

18. Remove the nuts attaching the crossmember to the frame side rails and remove the crossmember. Refer to Section 02-03 .

19. Work the transmission off the locating dowels and slide the transmission rearward until the spline on input shaft (7017) clears the clutch disc (7550). Lower the transmission from the vehicle.

Transmission Assembly, Typical



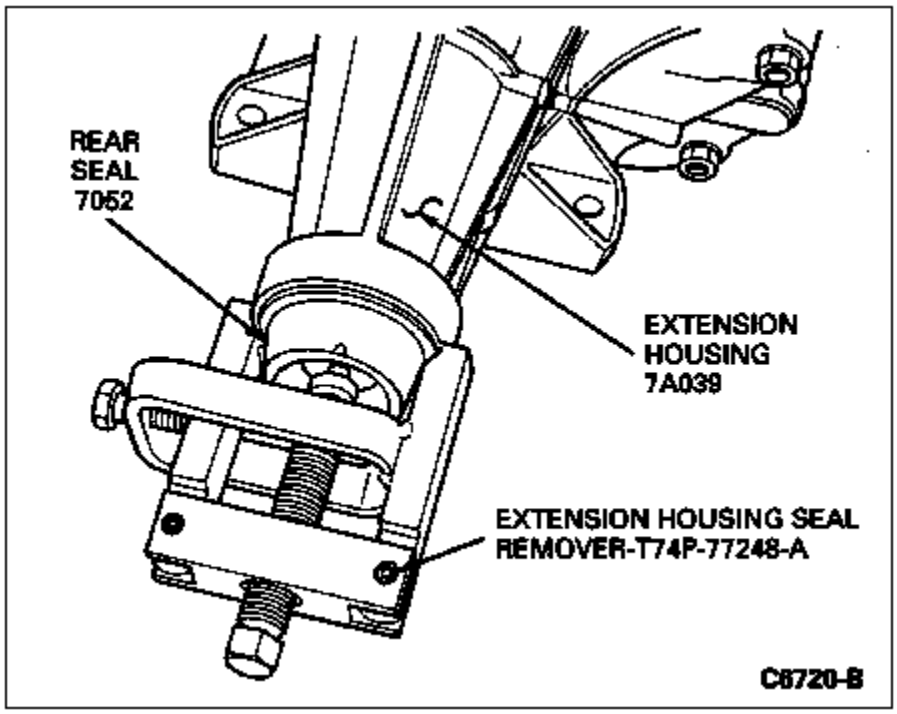
Item	Part Number	Description
1	7007	Engine Rear Plate
2	N802244-S100	Bolt
3	7213	Gearshift Lever Knob
4	7210	Gearshift Lever
5	N605906-S100	Bolt
6	7003	Transmission
7	N8023281-S100	Bolt

A	—	Tighten to 38-51 Nm (28-38 Lb-Ft)
B	—	Tighten to 27-40 Nm (20-30 Lb-Ft)

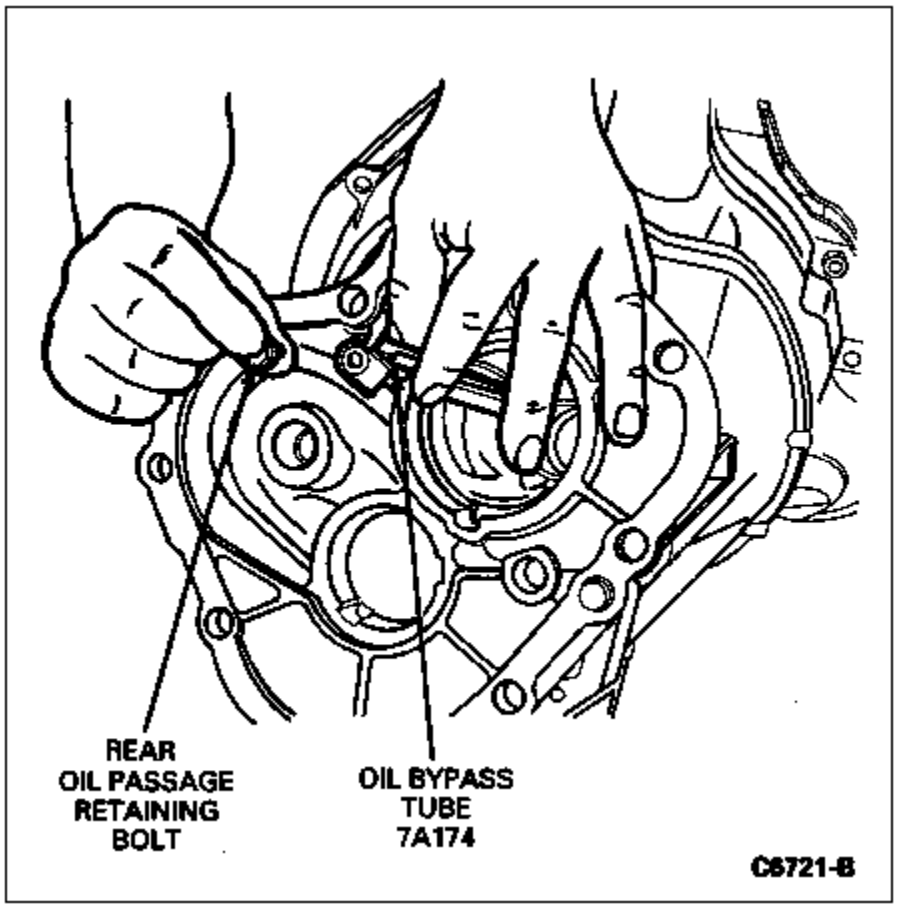
Extension Housing

1. **NOTE: On 4x2 vehicles, if it is necessary to remove oil seal (7052), the extension housing (7A039) must be installed to case (7005). Remove oil seal using extension housing Seal Remover T74P-77248-A.**

   Using a 14mm wrench, remove eight retaining bolts from extension housing. Pry gently at locations provided on extension housing and case. Remove extension housing from case.



2. If necessary, remove rear oil bypass tube (7A174) from extension housing using a 10mm socket (4x2 vehicles only).



Shift Lever and Boot

1. Place gearshift in neutral position.
2. Remove the retaining screws and slide gearshift lever boot up the shift lever shaft.
3. Remove retaining bolt and remove shift lever shaft.

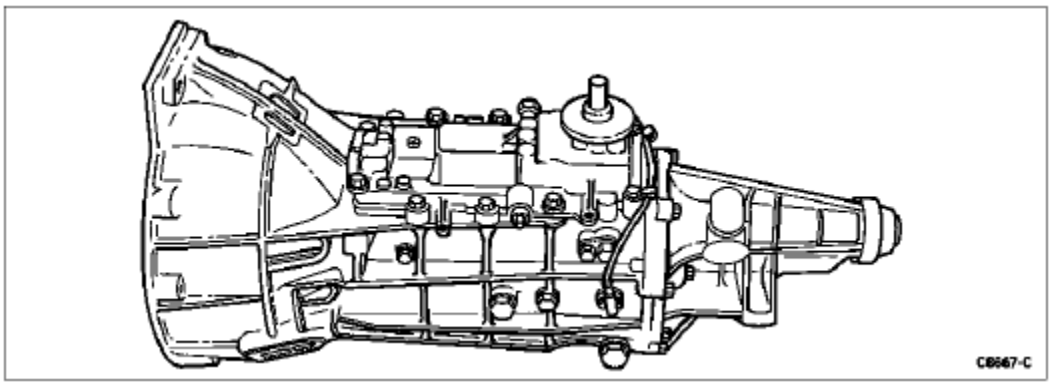
Transmission

SPECIAL SERVICE TOOL(S) REQUIRED

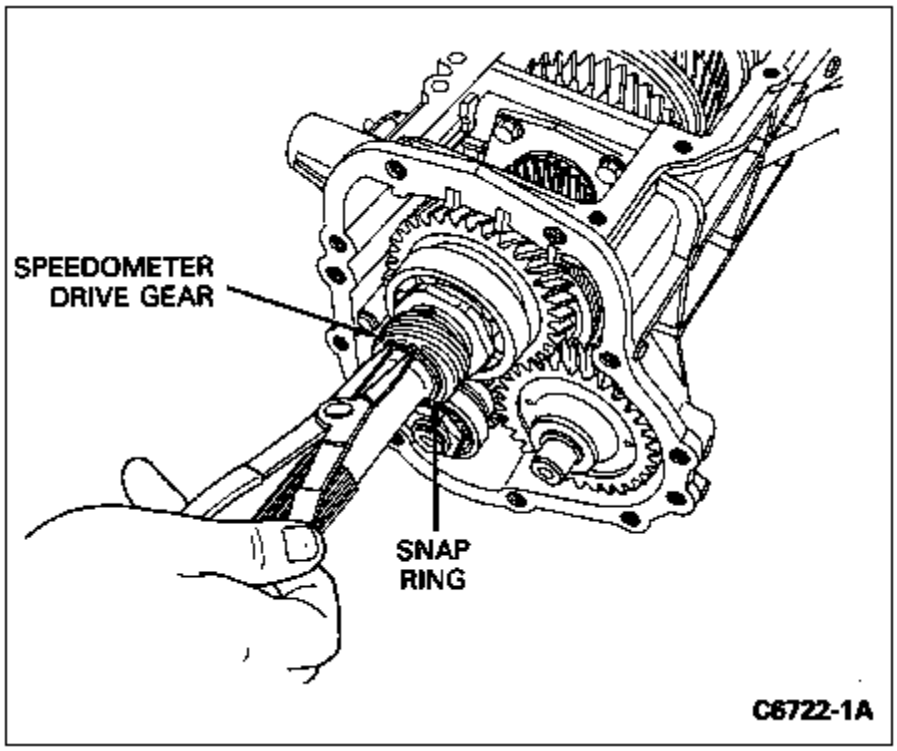
Description	Tool Number
Remover/Replacer Tube	T75L-7025-B
TOD Forcing Screw	T84T-7025-B
Bearing Puller	T77J-7025-H

1. Remove transmission (7003) from vehicle as outlined in Removal, Transmission in this section. Set transmission on workbench.

M5OD Transmission Assembly

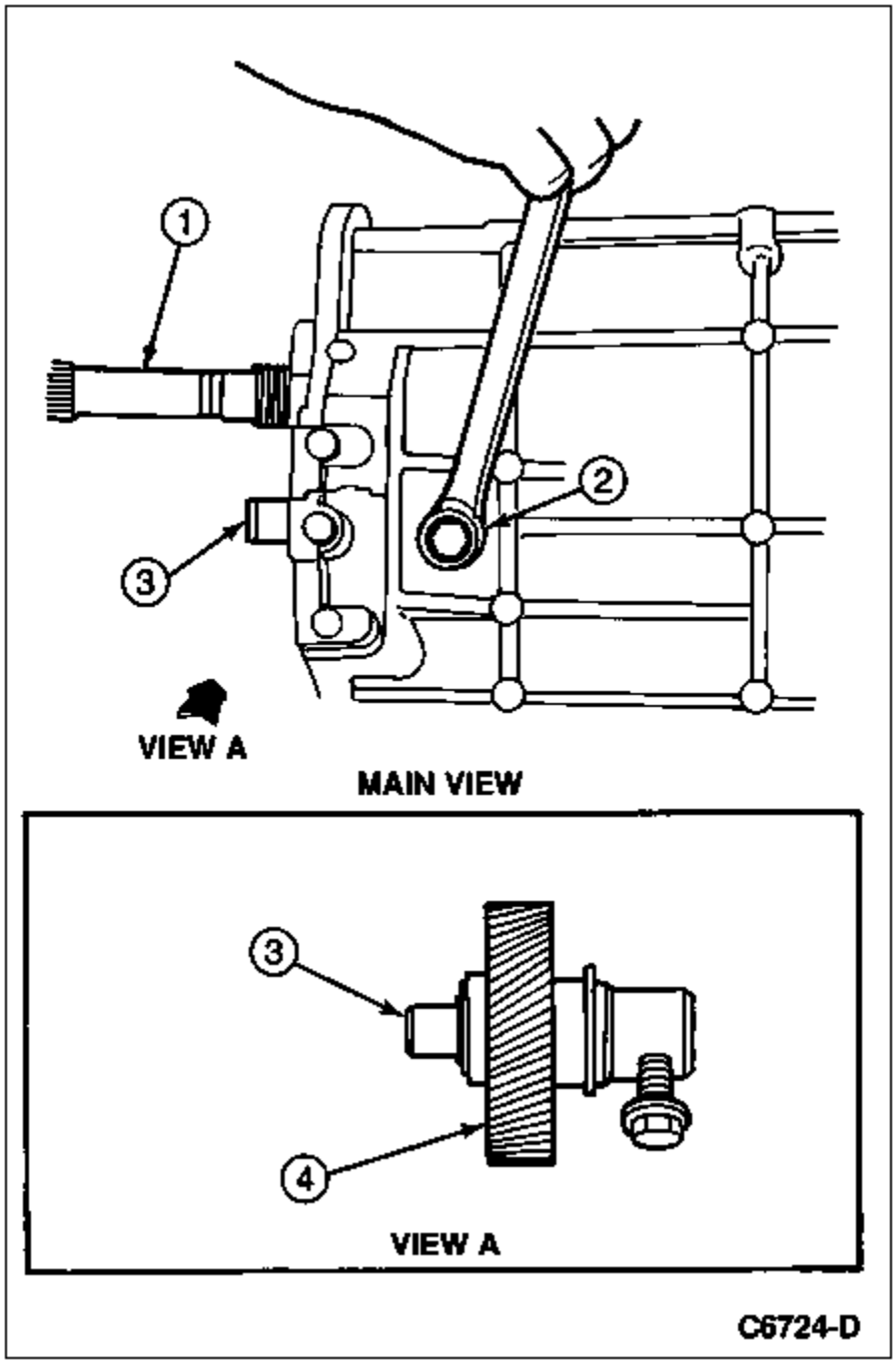


2. Remove gearshift lever (7210) and gearshift lever boot (7277) if necessary.
3. Using a 12mm wrench, remove 10 retaining bolts and remove case cover (7222).
4. Remove output shaft seal from output shaft (4x2 vehicles only).
5. Remove the speedometer drive gear and steel ball (4x2 vehicles only).



6. Remove thrust bearing (7C096) and thrust washer.

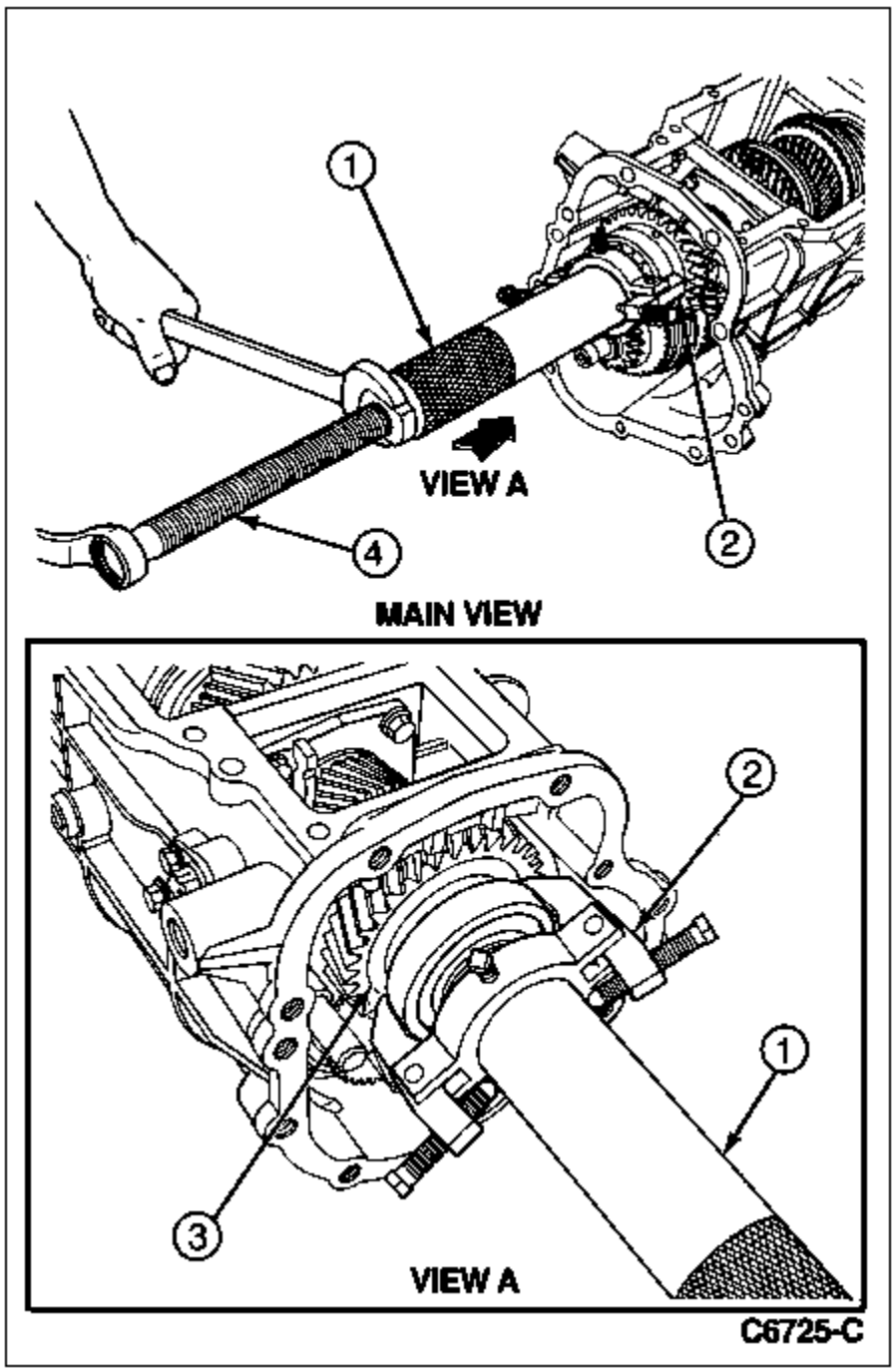
7. Using a 17mm wrench, remove holding bolt from reverse idler gear shaft (7140). Remove reverse idler gear and bushing (7141) by grasping and pulling rearward.



Item	Part Number	Description
1	7061	Output Shaft
2	7214	Bolt
3	7140	Reverse Idler Gear Shaft
4	7141	Reverse Idler Gear and Bushing

8. **CAUTION: Be sure tools are properly positioned so as not to damage parts being removed.**

Remove output shaft bearing (7065) from mainshaft using Remover/Replacer Tube T75L-7025-B, TOD Forcing Screw T84T-7025-B, Bearing Puller T77J-7025-H.

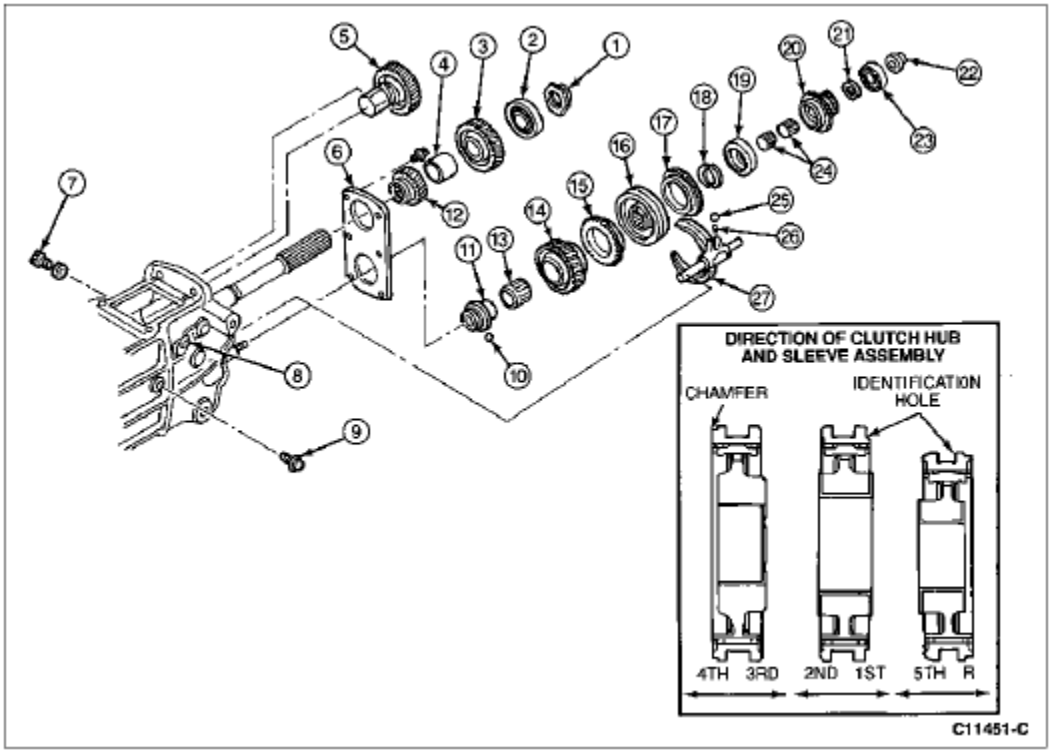


Item	Part Number	Description
1	T75L-7025-B	Remover/Replacer Tube
2	T77J-7025-H	Bearing Puller
3	7R205	Output Shaft Rear Bearing

4	T84T-7025-B	TOD Forcing Screw

9. Remove reverse idler gear and bushing from output shaft.
10. Remove sleeve from output shaft.
11. Remove countershaft reverse gear (7N040) with two reverse idler gear bearings (7E139) and reversesynchronizer blocking ring (7107).

Transmission, Rear Housing



Item	Part Number	Description
1	7B364	Locknut
2	7R205	Output Shaft Rear Bearing
3	7142	Output Shaft Reverse Gear
4	7072	Spacer or Sleeve
5	7141	Reverse Idler Gear and Bushing
6	7085	Bearing Retainer
7	7K179	Reverse Idler Gear Holding Bolt
8	99796-0612	Bolt
9	7214	Fifth and Reverse Shift Rod Bolt
10	99611-2000	Ball

11	7173	Input Bearing Spacer
12	7112	Fifth Gear
13	7R130	Needle Bearing, Fifth Gear
14	7142	Fifth Gear, Countershaft
15	7107	Synchronizer Blocking Ring
16	7124	Synchronizer
17	7107	Synchronizer Blocking Ring
18	7R482	Synchronizer Split Washer
19	7C340	Thrust Washer
20	7N040	Countershaft Reverse Gear
21	7L324	Thrust Washer
22	7N170	Locknut
23	7D283	Countershaft Rear Bearing
24	7N270	Needle Bearing
25	7289	Lockball (Steel) Shift Rail
26	99796-0612	Bolt
27	7289	Shift Fork (Fifth and Reverse)

12. Remove thrust washer and split washer from countershaft (7111).

13. Using a 12mm wrench, remove holding bolt from reverse gear shift rail (7240).

14. **NOTE: When performing the following, do not separate steel ball and shifter interlock spring (7234) (removed from shift fork groove) unless necessary.**

    Remove the following parts as an assembly:

    - Fifth/reverse synchronizer (7124) (countershaft)
    - Fifth/reverse gear shifter fork (7230) and reverse gear shift rail

15. Remove fifth gear synchronizer blocking ring.

16. **NOTE: Do not remove the Torx® nut retaining theshift lever connecting pin (7F301) at this time.**

    Remove the lockplate retaining bolt and inner circlip. Remove fifth and reverse shift lever (7243) from case (7005).

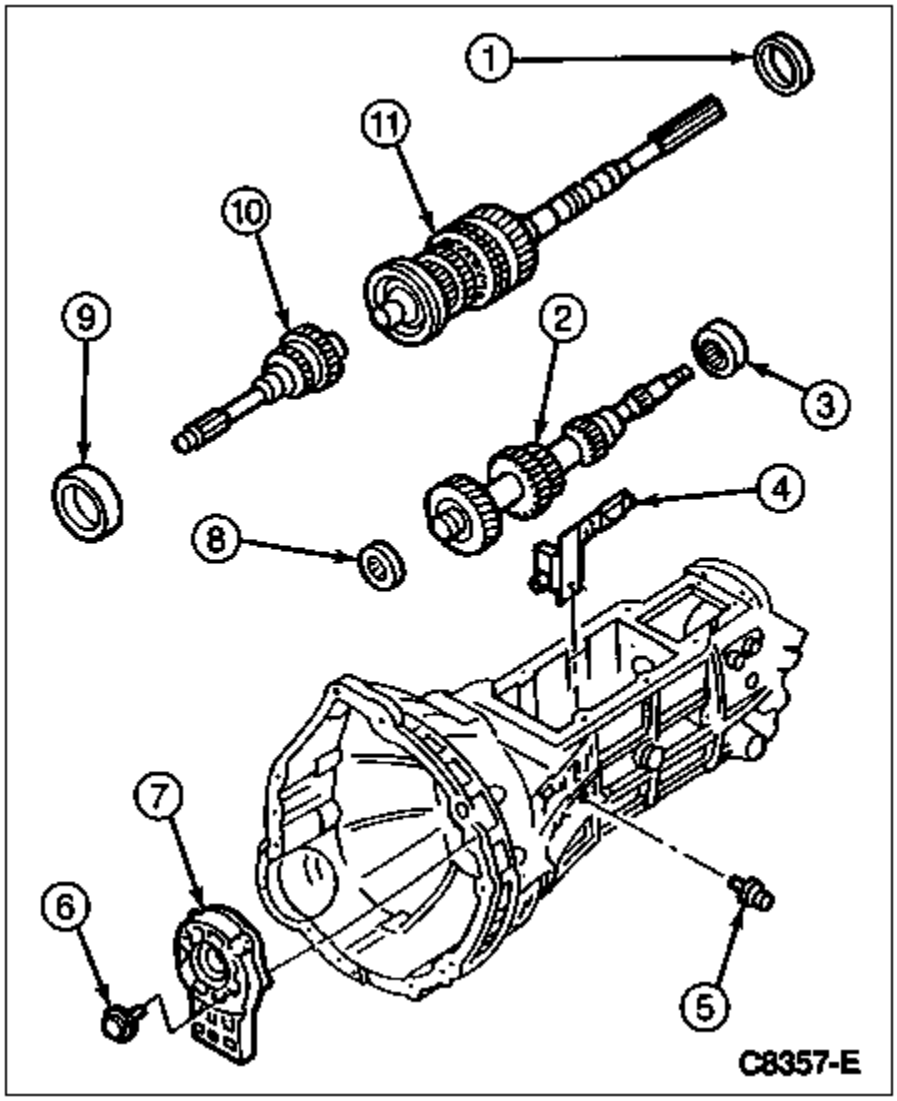
17. Remove fifth speed gear (7K316) with needle bearing.

18. Remove fifth speed gear from output shaft.

19. Remove fifth gear spacer or sleeve (7072) and (positioning) ball.

20. Remove front and rear bearing retainers. Refer to procedures in this section.

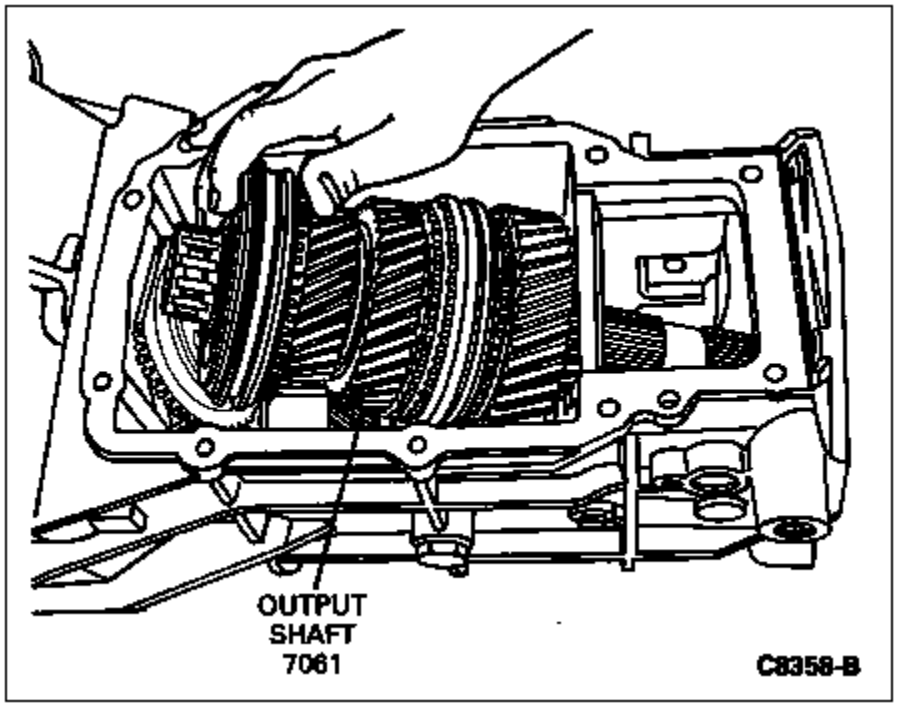
21. Using a 10mm socket, remove retaining bolt and oil bypass tube (7A174) from upper case.



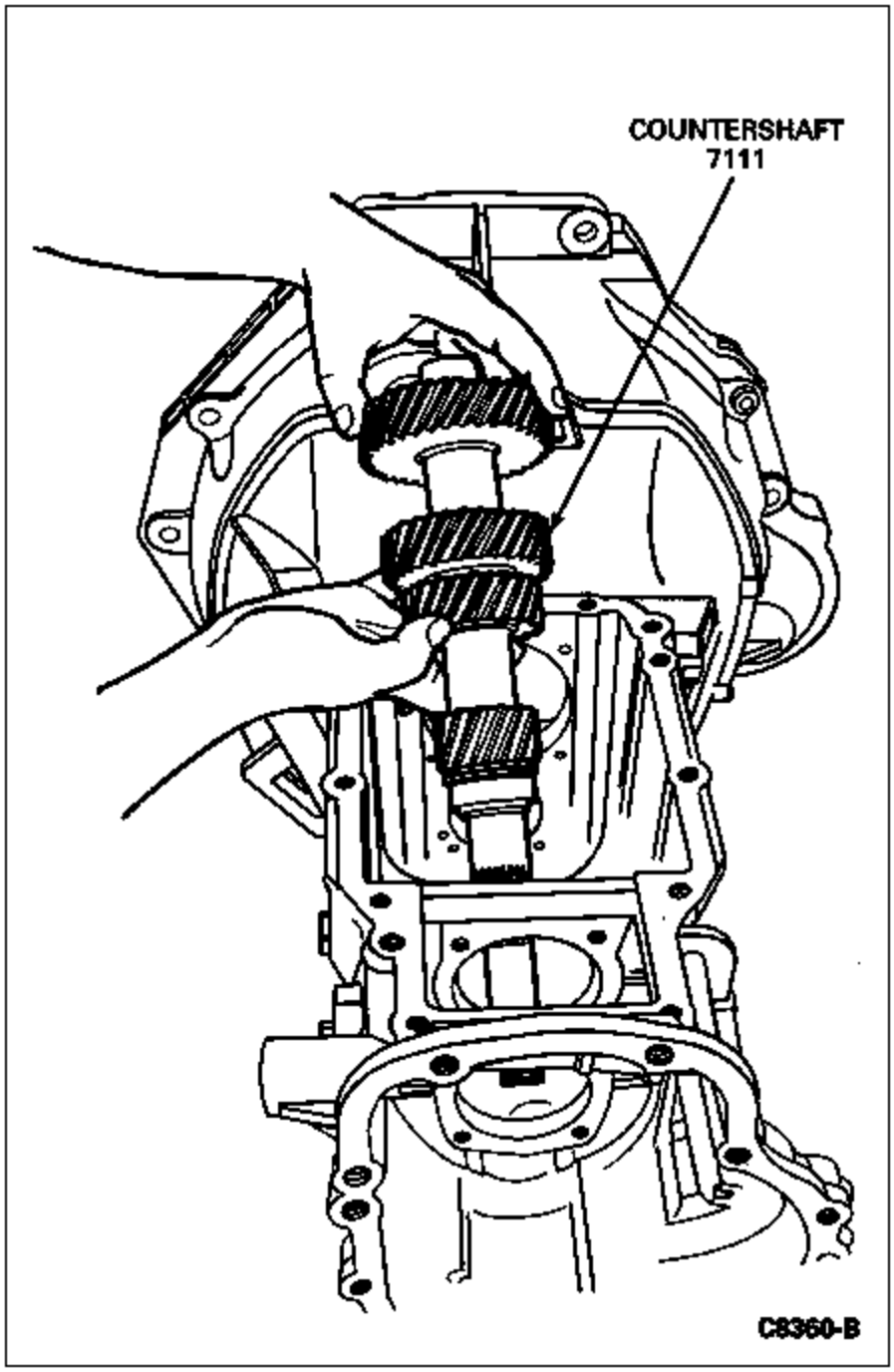
Item	Part Number	Description
1	7052	Center Bearing Outer Race
2	7111	Countershaft
3	7C096	Thrust Bearing
4	7A174	Oil Bypass Tube
5	99796-0620	Bolt
6	99796-0825	Bolt
7	7050	Main Drive Gear Bearing Retainer
8	7065	Output Shaft Bearing
9	7025	Bearing

10	7017	Input Shaft
11	7061	Output Shaft

22. Pull input shaft (7017) forward and remove bearing (7025). Pull mainshaft rearward.
23. Pull input shaft forward and separate it from mainshaft.
24. Incline mainshaft upward and lift from case.



25. Tip (angle) input shaft and remove fromcase.
26. Remove countershaft through upper opening of case.



Shift Control Housing

SPECIAL SERVICE TOOL(S) REQUIRED

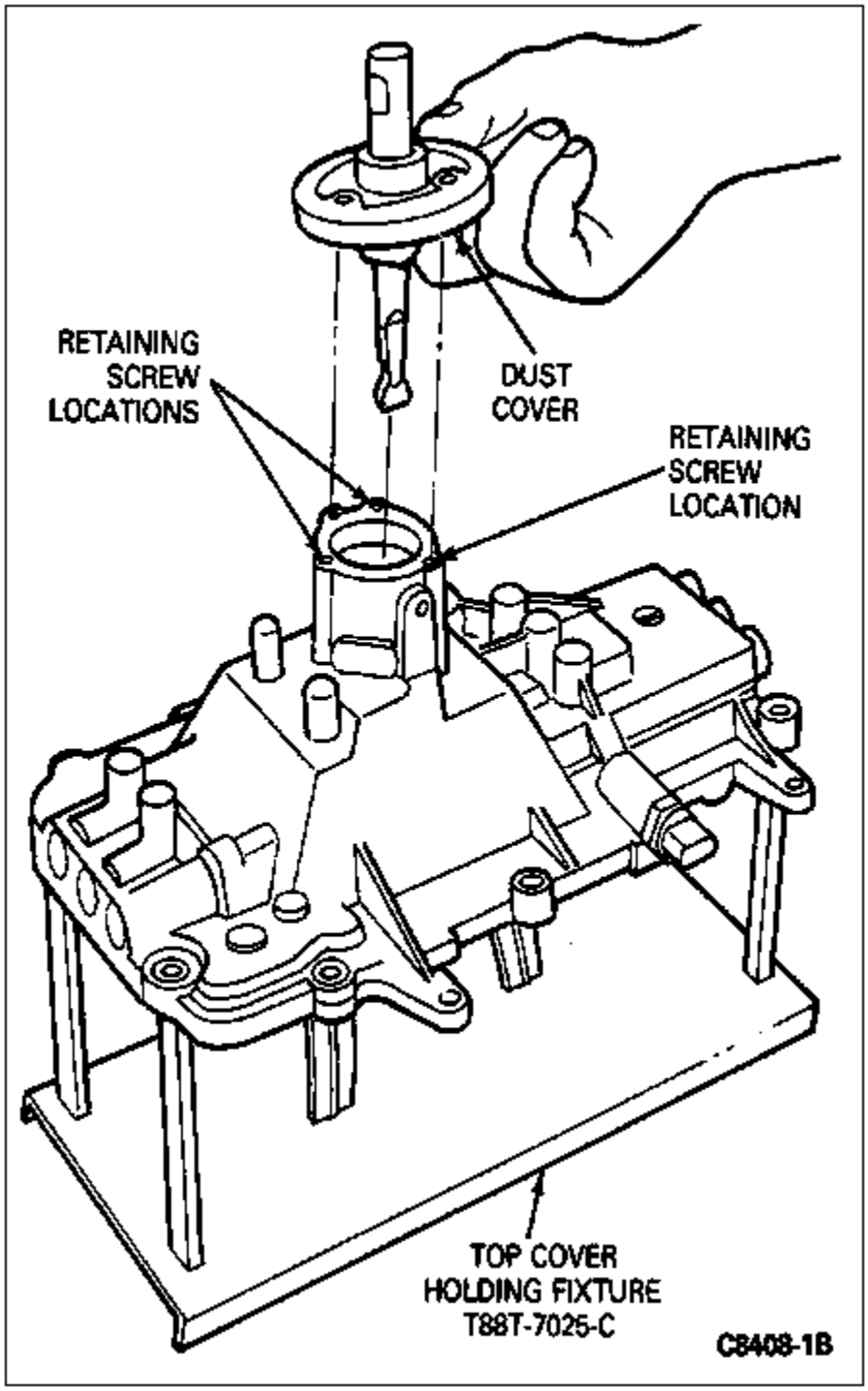
Description	Tool Number
Top Cover Holding Fixture	T88T-7025-C

Disassembly

1. **NOTE: For reference during assembly, notice that grooves in bushing align with slots in lower shift lever pivot ball. Notice that the notch in the lower gearshift lever (7210) faces toward front of transmission (7003).**

   If necessary, remove gearshift lever boot (7277) and gearshift lever from case cover (7222) if not removed during disassembly. Remove three dust cover retaining screws using a T30 Torx® Allen wrench. Remove dust cover.

2. Position case cover into Top Cover Holding Fixture T88T-7025-C.



3. Remove backup lamp switch (15520) from case cover. Remove backup lamp switch pin from groove in case cover.

4. Remove manual lever position (MLP) switch and pin from case cover.

5. Invert case cover on Top Cover Holding Fixture T88T-7025-C. Using a 5/32-inch drift punch, remove and discard spring pins retaining gear shifter forks (7230) to the shift rail.

6. Make sure all shift rails and gates are positioned in NEUTRAL. Remove and discard spring pins

retaining shift gates to shift rails. Remove shift gates.

7. Remove three rubber plugs sealing service bores.

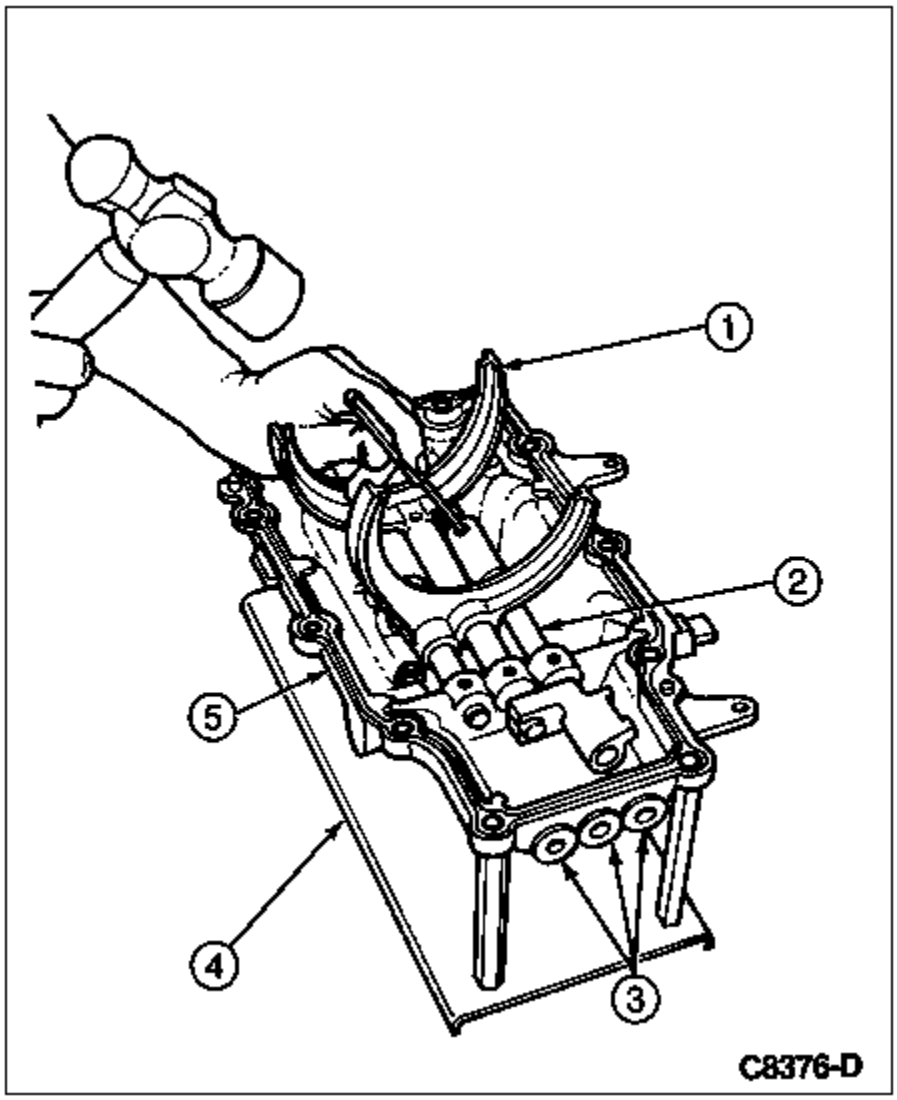
8. **WARNING: WEAR SAFETY GLASSES WHILE PERFORMING SHIFT RAIL REMOVAL PROCEDURE.**

   CAUTION: Perform the following shift rail removal procedures with great care. Cover the lockball and friction device bores and spring seats with a clean cloth held firmly in place during shift rail removal. Failure to firmly cover lockball and friction device bores can result in component loss when the ball/friction device and spring forcefully leave their installed positions.

   Remove fifth/reverse shift rail from case cover through service bore. If necessary, insert a 5/16-inch drift punch through spring pin bore and gently rock shift rail from side to side while maintaining rearward pressure.

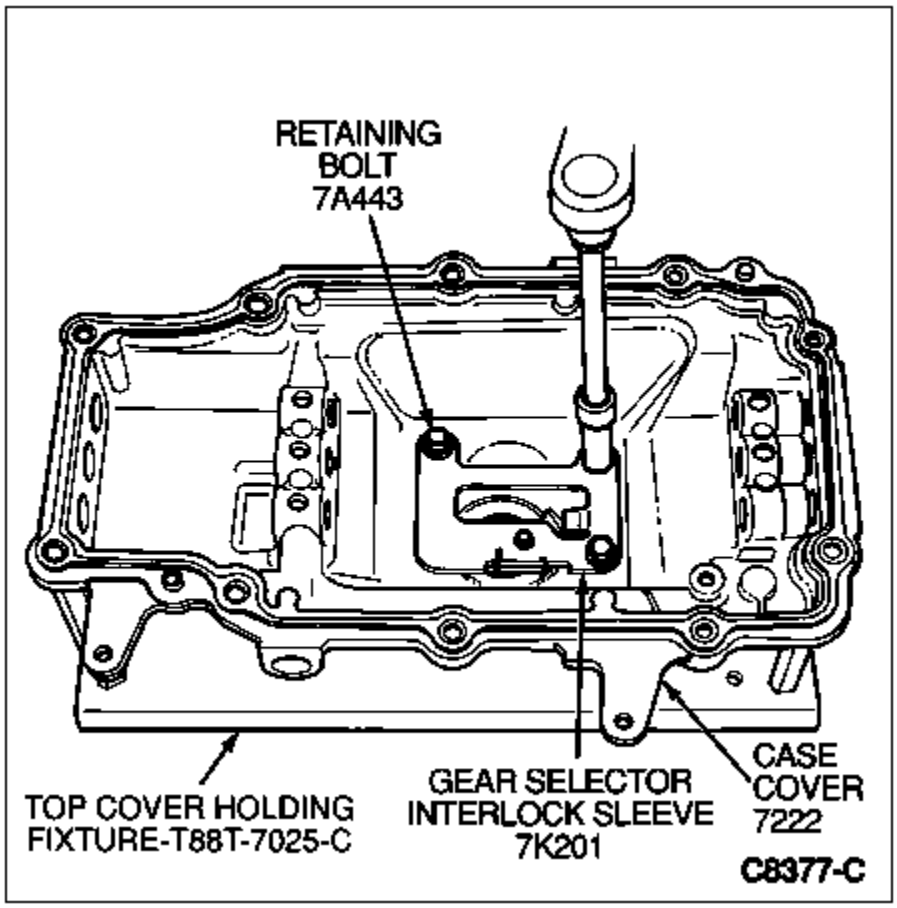
9. Remove first/second shift rail from case cover through service bore. If necessary, insert a 5/16-inch drift punch through spring pin bore and gently rock shift rail from side to side while maintaining rearward pressure.

10. Remove third/fourth shift rail from case cover through service bore. If necessary, insert a 5/16 drift punch through spring pin bore and gently rock shift rail from side to side while maintaining rearward pressure.



Item	Part Number	Description
1	7230	Shift Fork
2	7240	Shift Rail
3	—	Service Bore Plugs (Part of 7222)
4	T88T-7025-C	Top Cover Holding Fixture
5	7222	Case Cover

11. Remove retaining bolts using a 10mm socket. Remove gear selector interlock sleeve (7K201).



Assembly

1. **NOTE: During installation, apply Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX or equivalent MERCON® fluid to all moving parts.**

   Position case cover into Top Cover Holding Fixture T88T-7025-C.

2. Position fifth/reverse cam lockout plate to top case cover. Install retaining bolts and tighten to 8-10 Nm (6-7 lb-ft).

3. Position third/fourth shift control shaft into case cover through service bore. If necessary, insert a 5/16-inch drift punch through spring pin bore and gently rock third/fourth shift control shaft from side to side while maintaining forward pressure. Position detent ball and shifter interlock spring (7234) into shift rod spring seats (7D210). Compress the detent ball and spring assembly using a suitable tool, and push third/fourth shift control shaft into position over detent ball. Engage third/fourth gear shifter fork with third/fourth shift control shaft. Position friction device and spring into shift rod spring seats. Compress the friction device and spring assembly using a suitable tool, and push third/fourth shift control shaft into position over friction device. Install spring pins retaining third/fourth shift control shaft to case cover. Install shifter interlock spring retaining third/fourth gear shifter fork to third/fourth shift control shaft.

4. Position first/second shift control shaft into case cover through service bore. If necessary, insert a 5/16-inch drift punch through spring pin bore and gently rock shift control shaft from side to side while maintaining forward pressure. Position detent ball and shifter interlock spring into shift rod spring

seats. Compress the detent ball and spring assembly using a suitable tool and push reverse shift control shaft (7241) into position over detent ball. Engage first/second gear shifter fork with shift control shaft. Position friction device and shifter interlock spring into shift rod spring seats. Compress friction device and spring assembly using a suitable tool, and push shift control shaft into position over friction device. Install spring pins retaining shift control shaft to case cover. Install spring pin retaining first/second gear shifter fork to shift control shaft.

5. Position fifth/reverse shift control shaft to case cover through service bore. If necessary, insert a 5/16-inch drift punch through spring pin bore and gently rock fifth/reverse shift control shaft from side to side while maintaining forward pressure. Position detent ball and shifter interlock spring into shift rod spring seats. Compress the detent ball and shifter interlock spring using a suitable tool, and push fifth/reverse shift control shaft into position over detent ball. Engage fifth/reverse gear shifter fork with fifth/reverse shift control shaft. Install spring pins retaining fifth/reverse shift control shaft tocase cover. Install spring pin retaining fifth/reverse gear shifter fork to fifth/reverse shift control shaft.

6. Install rubber plugs into service bores.

7. **NOTE: Improper installation of interlock pins will prevent activation of manual lever position (MLP) switch and backup lamp switch.**

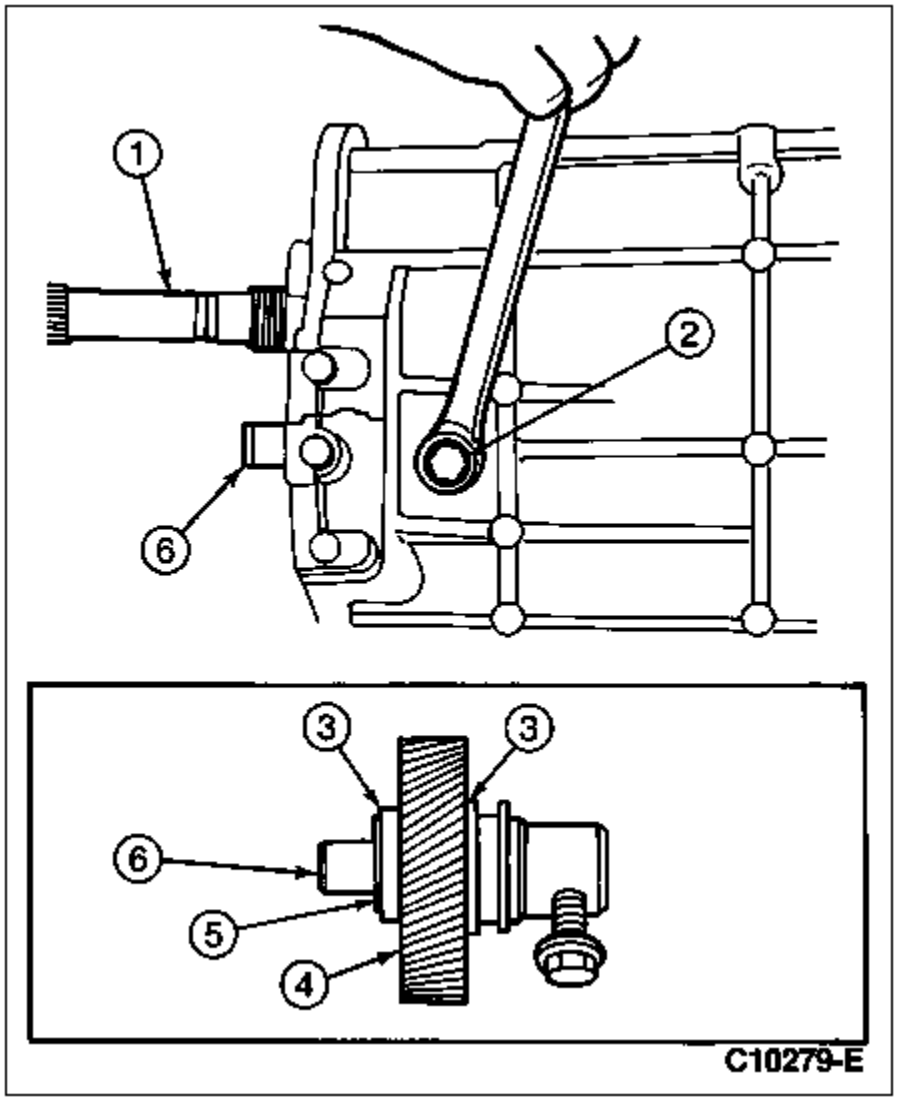
   Install interlock pins into shift rails. Make sure that large and small interlock pins are installed into their original positions.

8. Apply sealant to backup lamp switch and manual lever position switch threads. Install switches tocase cover and tighten to 25-35 Nm (18-26 lb-ft).

9. Position lower gearshift lever and dust cover assembly to case cover. Install three retaining screws and tighten to 8-11 Nm (6-8 lb-ft).

Reverse Idler Gear Shaft

1. Using a 17mm wrench, remove holding bolt from reverse idler gear shaft (7140) and pull rearward.



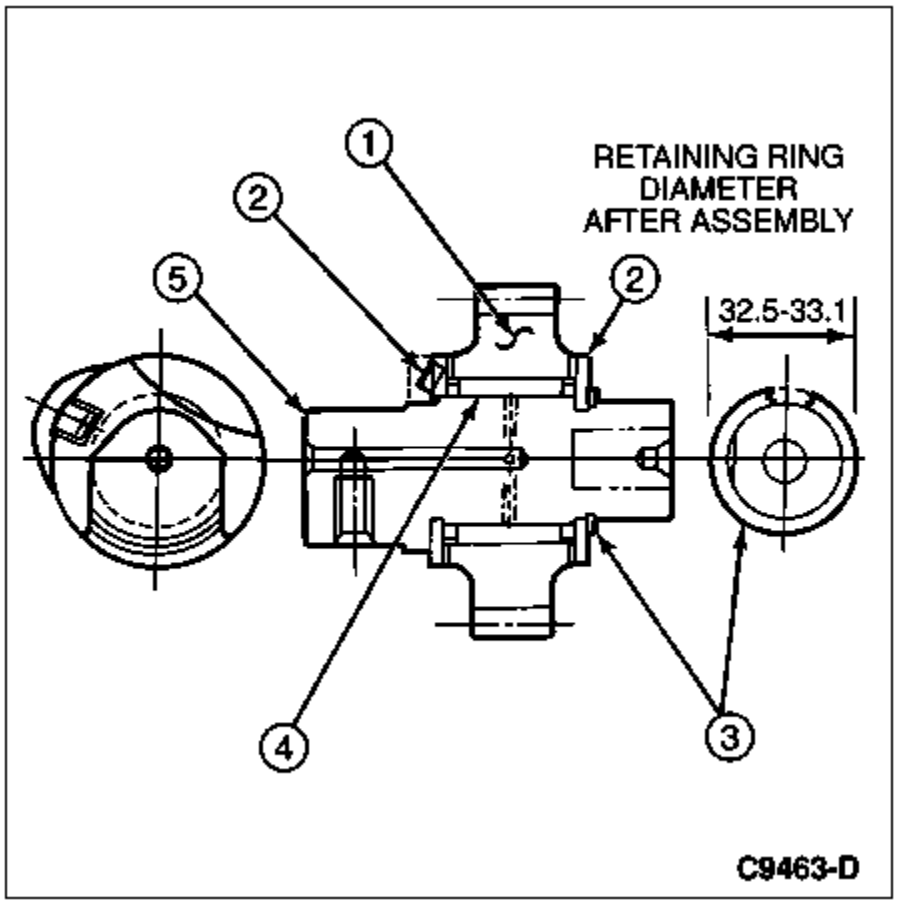
Item	Part Number	Description
1	7061	Output Shaft
2	7214	Bolt
3	7N037	Thrust Washer with Tang
4	7141	Reverse Idler Gear and Bushing
5	7156	Retaining Ring

6	7140	Reverse Idler Gear Shaft

Reverse Idler Gear Retaining Rings

Disassembly

1. Remove the following parts from reverse idler gear shaft (7140):
    - Reverse idler gear retaining ring (7156)
    - Spacer
    - Reverse idler gear and bushing (7141)
    - Reverse idler gear bearings (7E139)
    - Reverse idler gear thrust washer (7N037)



Item	Part Number	Description
1	7141	Reverse Idler Gear and Bushing
2	7N037	Reverse Idler Gear Thrust Washer
3	7064	Reverse Idler Gear Retaining Ring
4	7E139	Reverse Idler Gear Bearing

5	7140	Reverse Idler Gear Shaft

Assembly

1. **NOTE: During installation, apply Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX or equivalent MERCON® fluid to all rotating or sliding parts.**

   Install reverse idler gear thrust washer onto reverse idler gear shaft. Make sure that tab on reverse idler gear thrust washer mates with groove on reverse idler gear shaft to prevent rotation of reverse idler gear thrust washer.

2. Install the following parts onto reverse idler gear shaft in the order listed.

   - Reverse idler gear bearings
   - Reverse idler gear and bushing
   - Spacer

3. Install original reverse idler gear retaining ring onto reverse idler gear shaft. Insert a feeler gauge between reverse idler gear retaining ring and reverse idler gear and bushing to measure end play. Using the chart, adjust end play to 0.1mm-0.2mm (0.0039-0.0078 inch) by installing a retaining ring of necessary thickness.

REVERSE IDLER GEAR RETAINING RINGS

Part Number	Thickness
E8TZ-7156-A	1.5mm (0.059 In.)
E8TZ-7156-G	1.6mm (0.0629 In.)
E8TZ-7156-H	1.7mm (0.0669 In.)
E8TZ-7156-J	1.8mm (0.0708 In.)
E8TZ-7156-K	1.9mm (0.0748 In.)

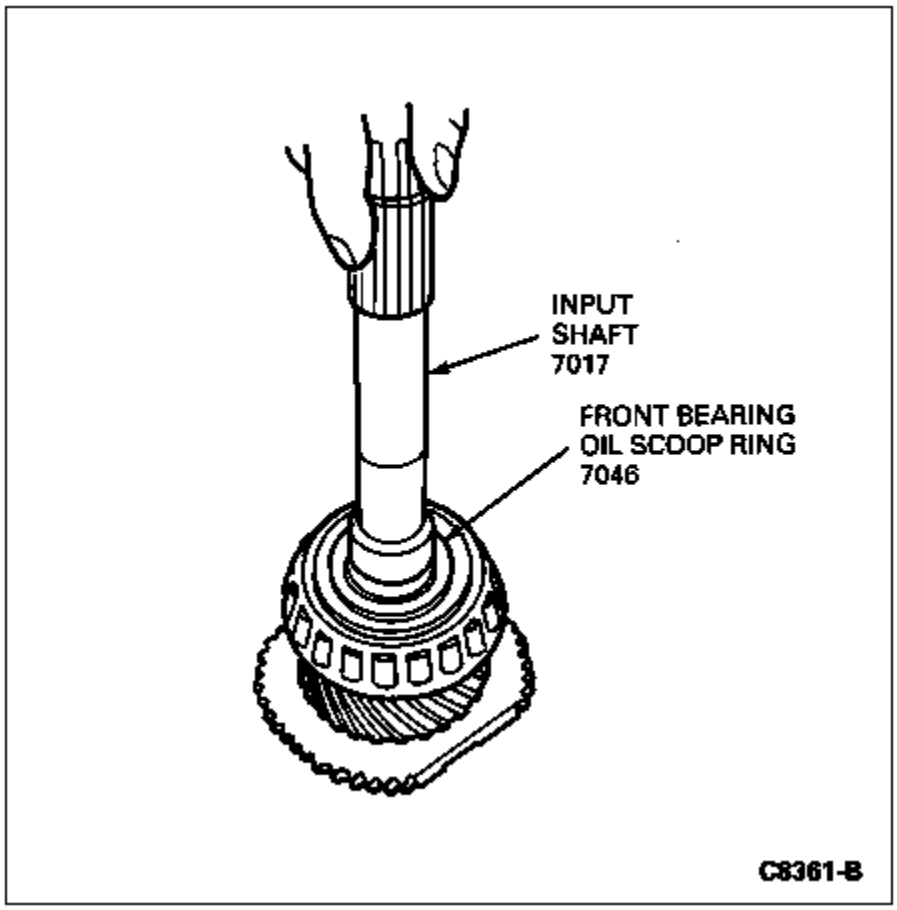
Input Shaft and Bearing

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Pinion Bearing Cone Remover	T71P-4621-B
Bearing Cone Replacer	T88T-7025-B

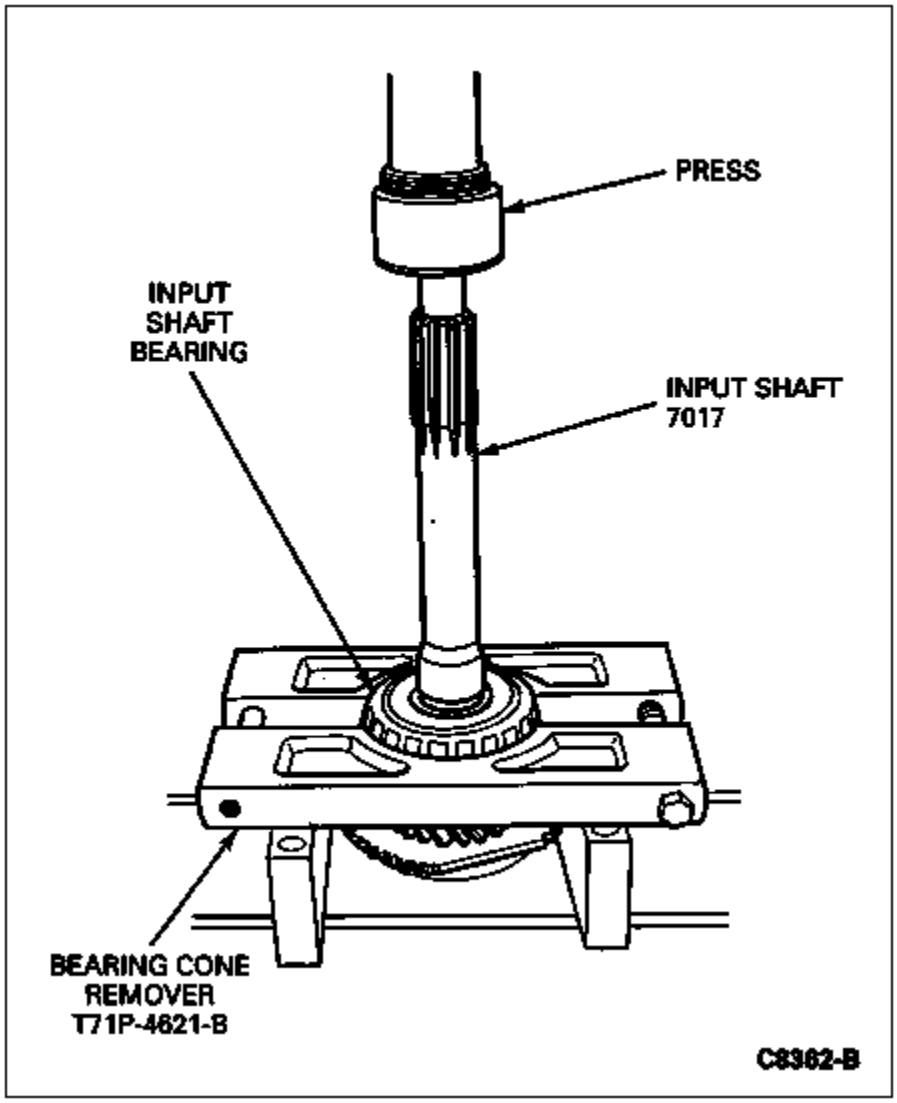
Disassembly

1. Remove and discard front bearing oil scoop ring (7046).



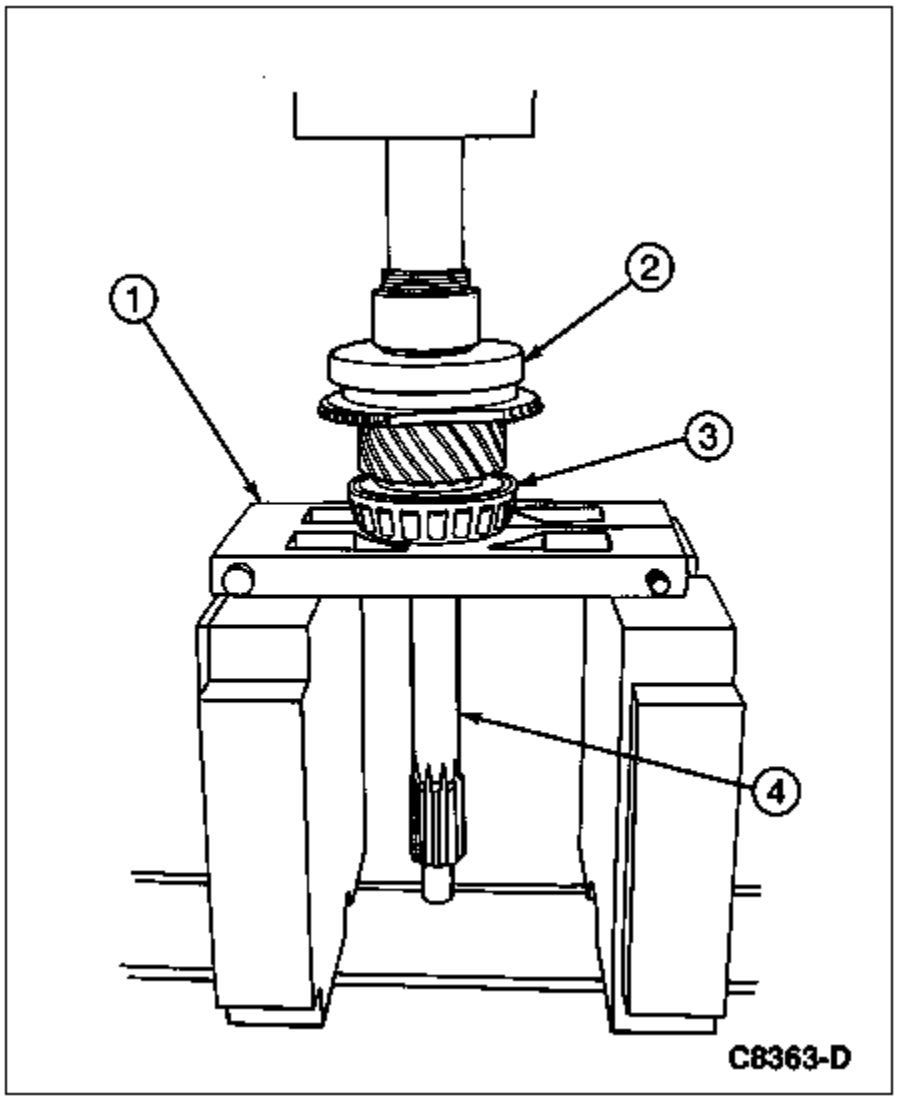
2. **CAUTION: Use of essential tools may cause damage to the bearings being removed.**

   Press bearing from input shaft (7017) using Pinion Bearing Cone Remover T71P-4621-B and arbor press.



Assembly

1. Press tapered roller bearing onto input shaft using Bearing Cone Replacer T88T-7025-B and Pinion Bearing Cone Remover T71P-4621-B as a press plate.



Item	Part Number	Description
1	T71P-4621-B	Bearing Cone Remover
2	T88T-7025-B	Bearing Cone Replacer
3	7025	Bearing
4	7017	Input Shaft

2. Install front bearing oil scoop ring onto input shaft. (Manually rotate clockwise to make sure that input shaft oil holes properly engage front bearing oil scoop ring. A click should be heard as scoop ring notches align with input shaft oil holes.)

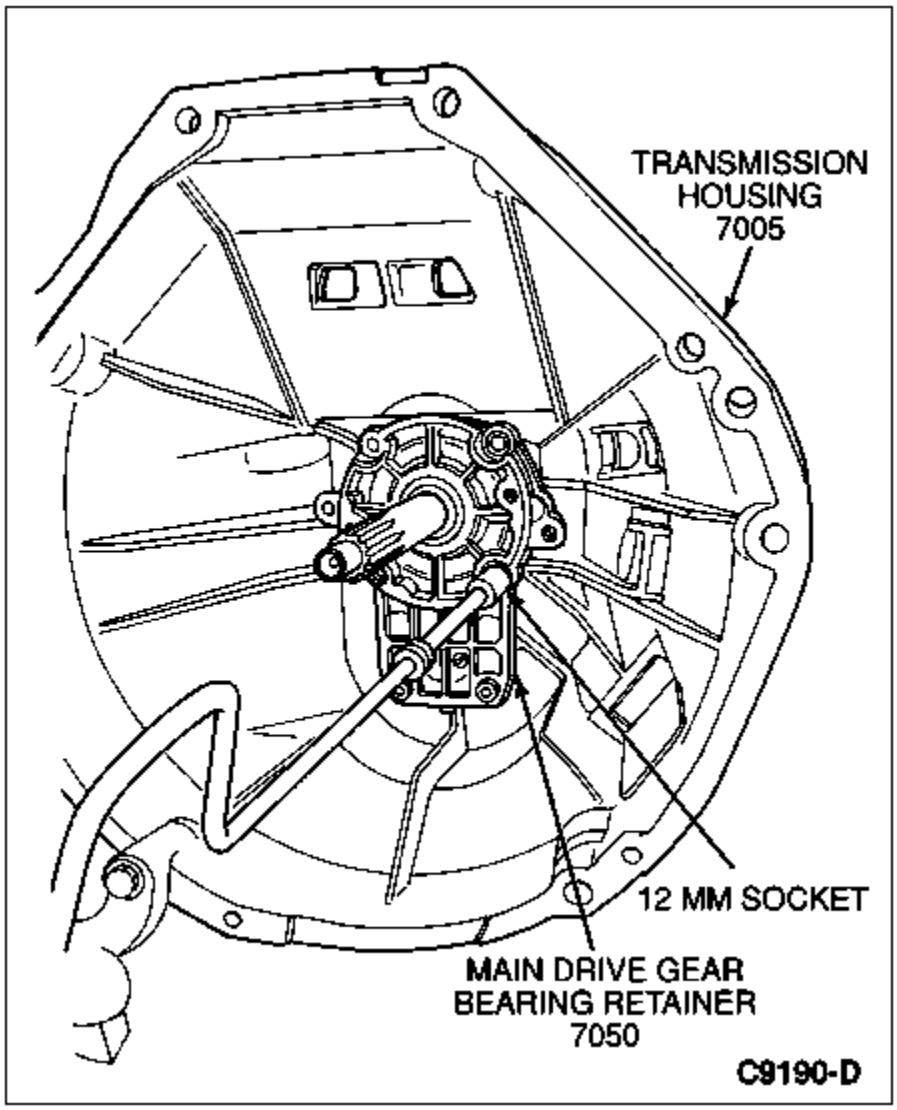
Bearing Retainer, Front

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Bell Housing Seal Replacer	T77J-7025-G

Disassembly

1. Using a 12mm socket, remove six attaching bolts from main drive gear bearing retainer (7050).



2. **NOTE: Bolts threaded into slave cylinder bolt locations will bottom out and lift main drive gear bearing retainer away from case (7005).**

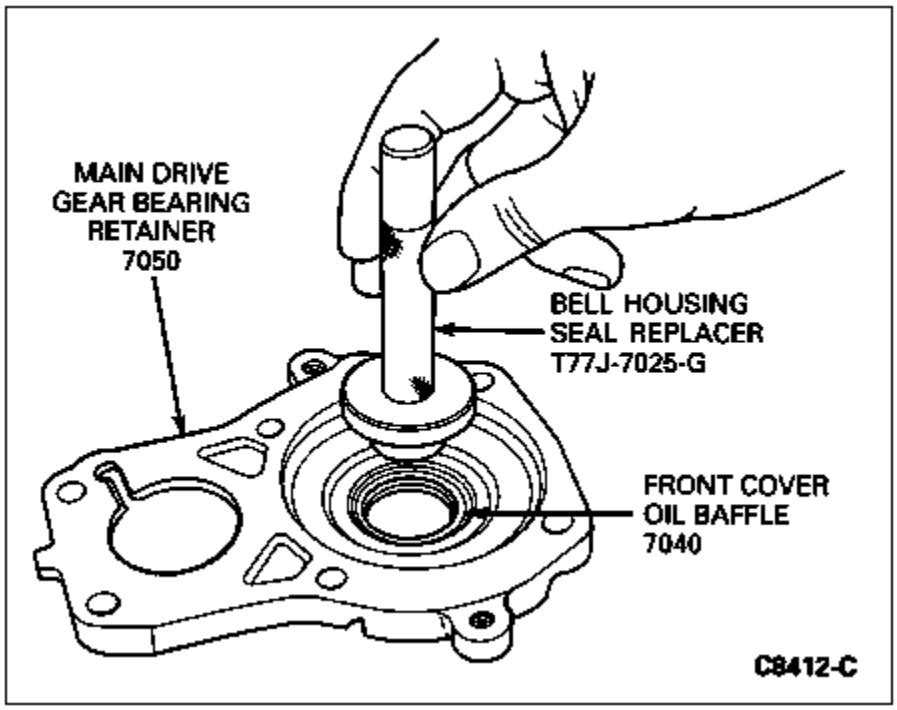
NOTE: Do not remove front bearing oil scoop ring (7046) at this time.

Remove main drive gear bearing retainer by threading two M8 x 1.25 (40mm or longer) bolts into the bearing retainer slave cylinder bolt locations. Alternately tighten bolts until main drive gear bearing retainer can be lifted away by hand.

Assembly

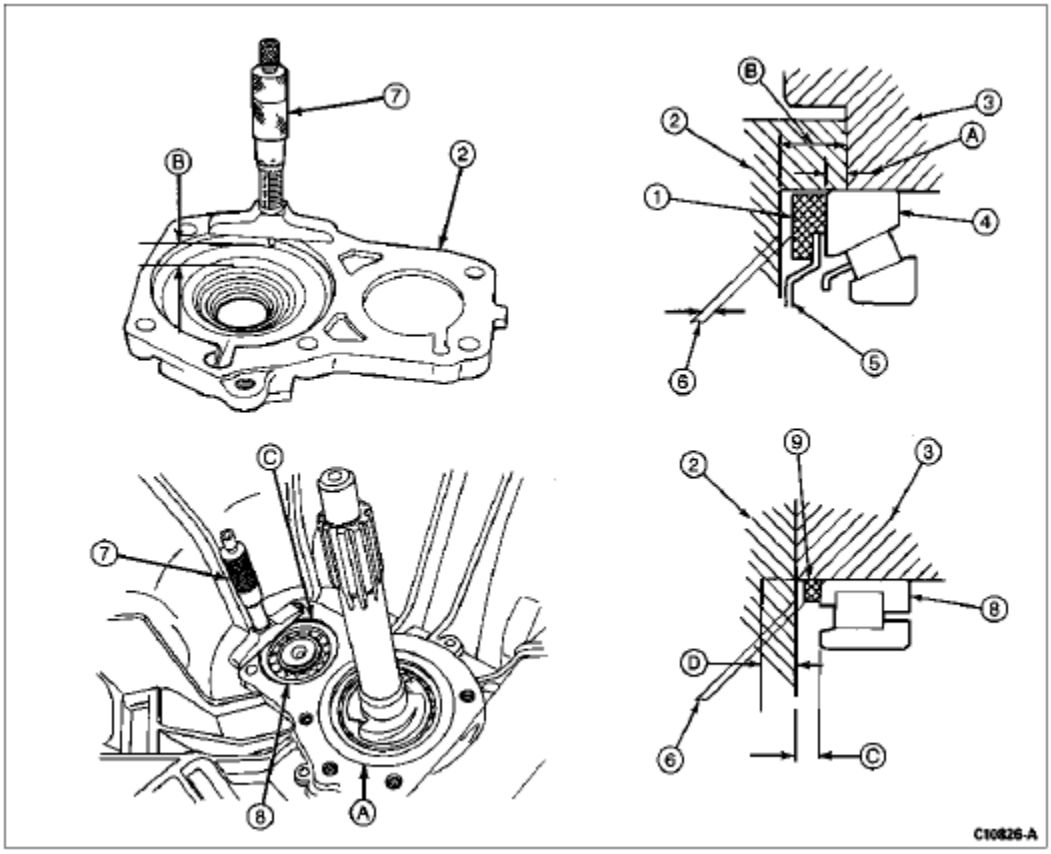
1. **NOTE: If any related parts (such as output shaft, bearing, etc.) have been replaced, measure dimensions A, B, C, and D as illustrated. After measuring all dimensions, select bearing shim to maintain end play within specified limits.**

   Position transmission (7003) vertically (input shaft (7017) and flywheel housing (6392) facing upward). Make sure that bearing (7025) is squarely positioned in bore. If removed, install front cover oil baffle (7040) using Bell Housing Seal Replacer T77J-7025-G.



2. Install output shaft bearing (7065) by hand.

Measuring to Select Shim Thickness



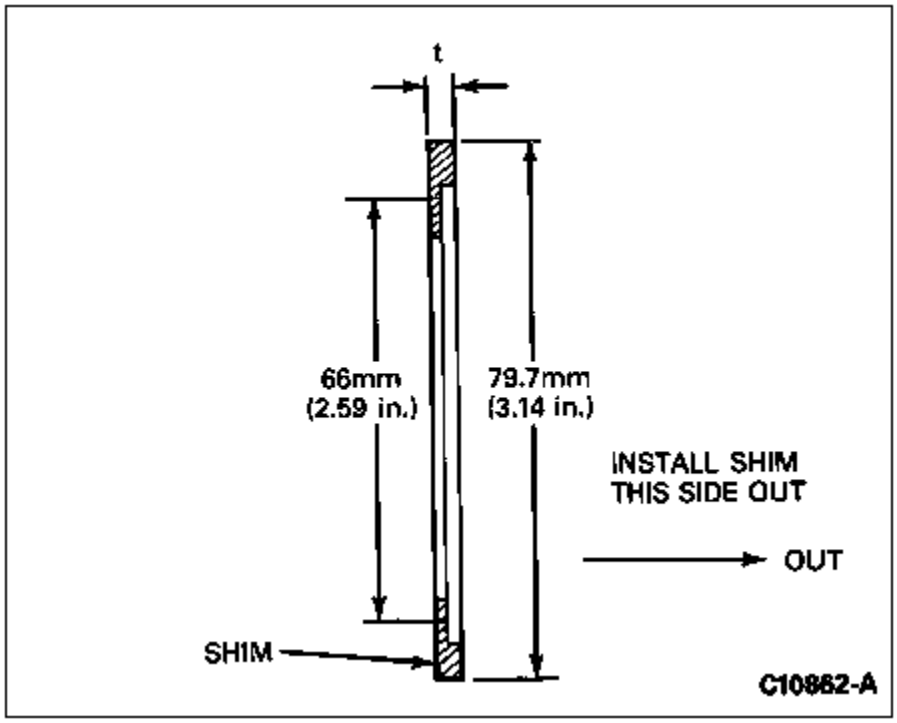
Item	Part Number	Description
1	7029	Selective Shim (Output Shaft)
2	7050	Main Drive Gear Bearing Retainer
3	7005	Case
4	7025	Bearing
5	7040	Oil Baffle
6	—	End Play Area
7	D82L-4201-C	Depth Micrometer
8	7065	Output Shaft Bearing
9	7C434	Selective Shim (Countershaft)
A	—	Dimension "A"
B	—	Dimension "B"
C	—	Dimension "C"
D	—	Dimension "D"

- **Dimension A:** Height of bearing above mating surface of main drive gear bearing retainer.
- **Dimension B:** Depth of bearing retainer bore (input shaft).
- **Dimension C:** Depth of countershaft front bearing race (transmission case-to-retainer mating surface).
- **Dimension D:** Depth of main drive gear bearing retainer bore (countershaft).

- Shim computation equations are as follows:

Dimension B - [Dimension A + shim thickness] = 0.05 to 0.15mm (0.002-0.006 inch)

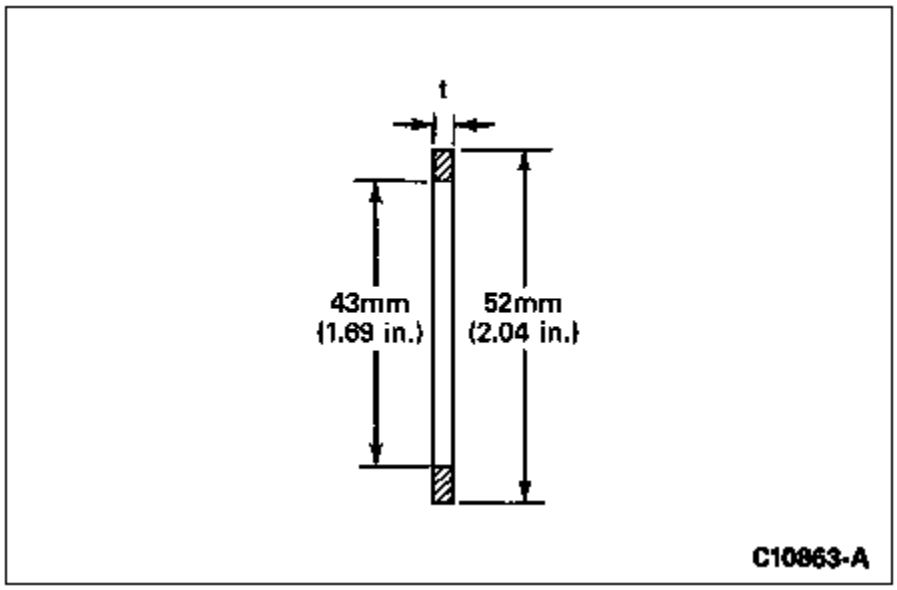
Dimension C + [Dimension D - shim thickness] = 0.15 to 0.25mm (0.006-0.010 inch)



Output Shaft Shim Select Chart — M5OD — R1

Part Number	Thickness (t)
E8TZ-7029-C	2.7mm (0.106 In.)
E8TZ-7029-D	2.8mm (0.110 In.)
E8TZ-7029-E	2.9mm (0.114 In.)
E8TZ-7029-F	3.0mm (0.118 In.)
E8TZ-7029-G	3.1mm (0.122 In.)
E8TZ-7029-H	3.2mm (0.125 In.)
E8TZ-7029-J	3.3mm (0.129 In.)
E8TZ-7029-K	3.4mm (0.133 In.)
E8TZ-7029-L	3.5mm (0.137 In.)
E8TZ-7029-M	3.6mm (0.141 In.)
E8TZ-7029-N	3.7mm (0.145 In.)
E8TZ-7029-P	3.8mm (0.149 In.)

E8TZ-7029-R	3.9mm (0.153 In.)
E8TZ-7029-A	4.0mm (0.157 In.)
E8TZ-7029-B	4.1mm (0.161 In.)



Countershaft Spacer
Select Chart — M5OD — R1

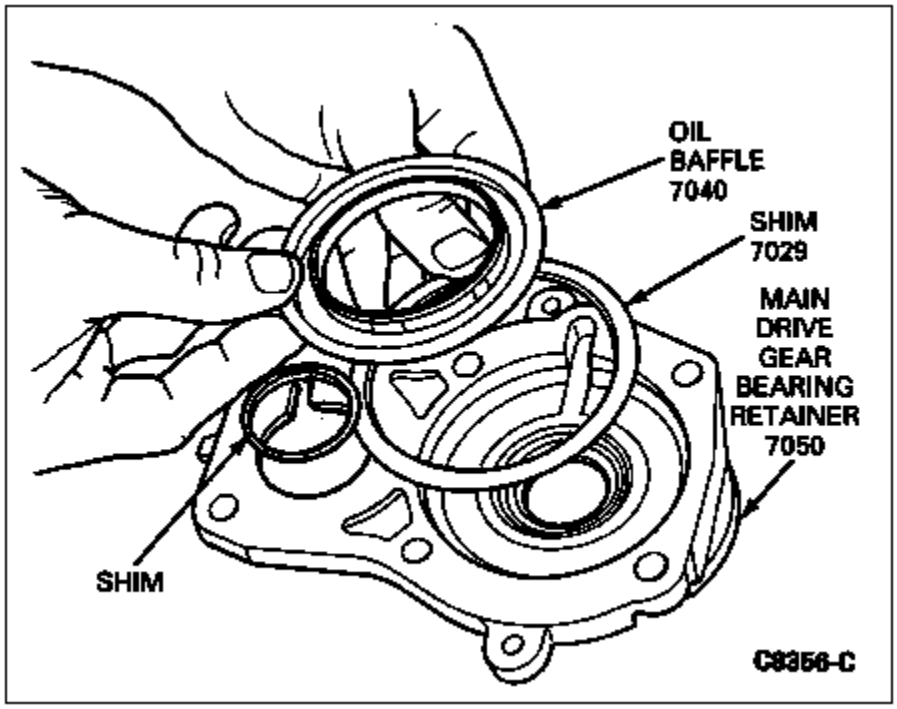
Part Number	Thickness (t)
E8TZ-7C434-A	2.3mm (0.090 In.)
E8TZ-7C434-B	2.4mm (0.094 In.)
E8TZ-7C434-C	2.5mm (0.098 In.)
E8TZ-7C434-D	2.6mm (0.102 In.)
E8TZ-7C434-E	2.7mm (0.106 In.)
E8TZ-7C434-F	2.8mm (0.110 In.)
E8TZ-7C434-G	2.9mm (0.114 In.)
E8TZ-7C434-H	3.0mm (0.118 In.)
E8TZ-7C434-J	3.1mm (0.122 In.)

3. Remove any sealant residue remaining on mating surfaces of transmission and main drive gear bearing retainer.

4. **NOTE: To prevent damage to oil seal lip during assembly, tape the input shaft splines along their entire length.**

   NOTE: If necessary, apply a sufficient quantity of grease to shim, main drive gear bearing retainer and oil baffle to retain them in position during assembly.

Apply a thin coat of oil to oil seal lip. Position bearing shim and oil baffle into main drive gear bearing retainer (install shim with groove showing). Install spacer to bore of output shaft bearing.



5. **NOTE: Make sure that retaining bolt heads are marked with a "6."**

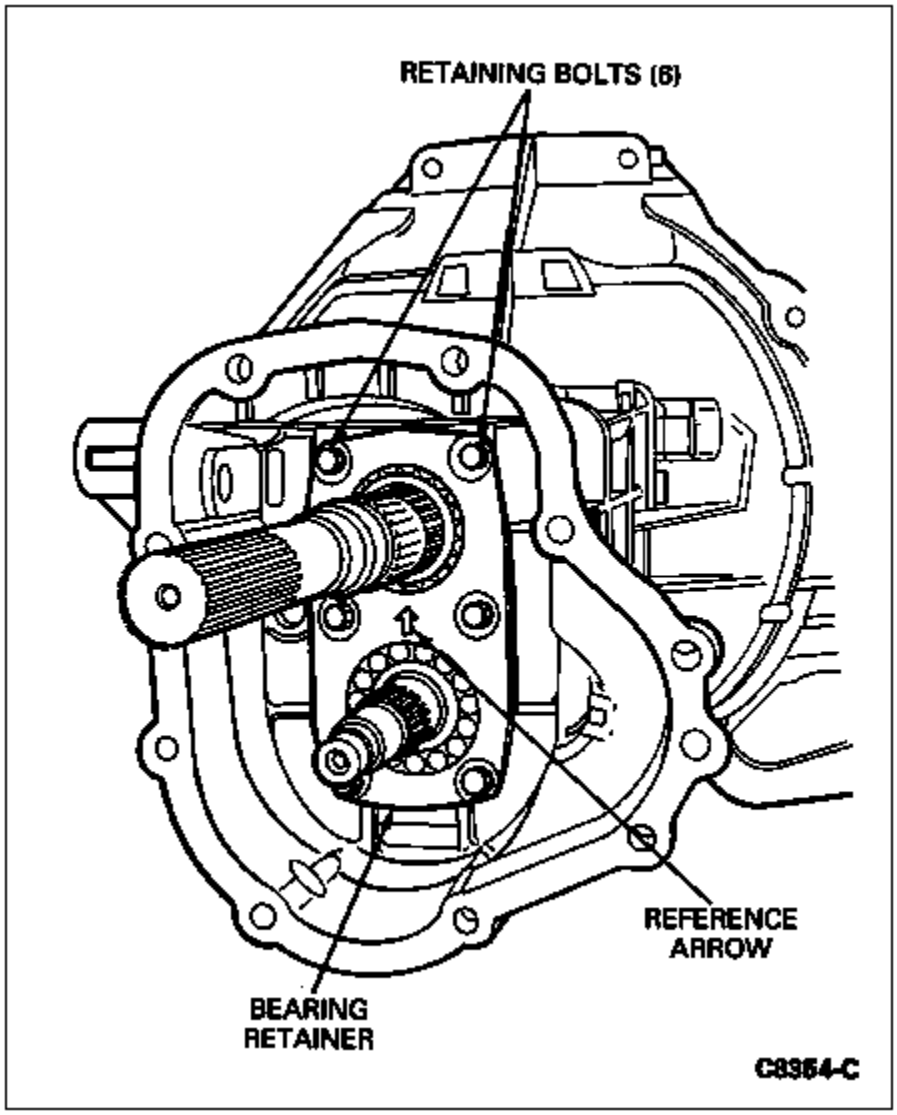
   Apply a 3.18mm (1/8-inch) bead of silicone rubber D6AZ-19562-AA or equivalent meeting Ford specification ESB-M4G92-A or ESE-M4G195-A to main drive gear bearing retainer and retaining bolt threads. Install main drive gear bearing retainer to case. Install and tighten front bearing cover retaining bolts to 16-22 Nm (12-16 lb-ft).

Bearing Retainer, Rear

Disassembly

1. **NOTE: For reference during assembly, observe that reference arrow in middle of bearing retainer points upward. Observe that flanged side faces inward.**

   Using a 12mm socket, remove retaining bolts. Remove bearing retainer (7085).



Assembly

1. **NOTE: Make sure that all retaining bolt heads are marked with an "8."**

Position bearing retainer to case with reference arrow pointing upward. Install and tighten retaining bolts to 18-26 Nm (13-19 lb-ft).

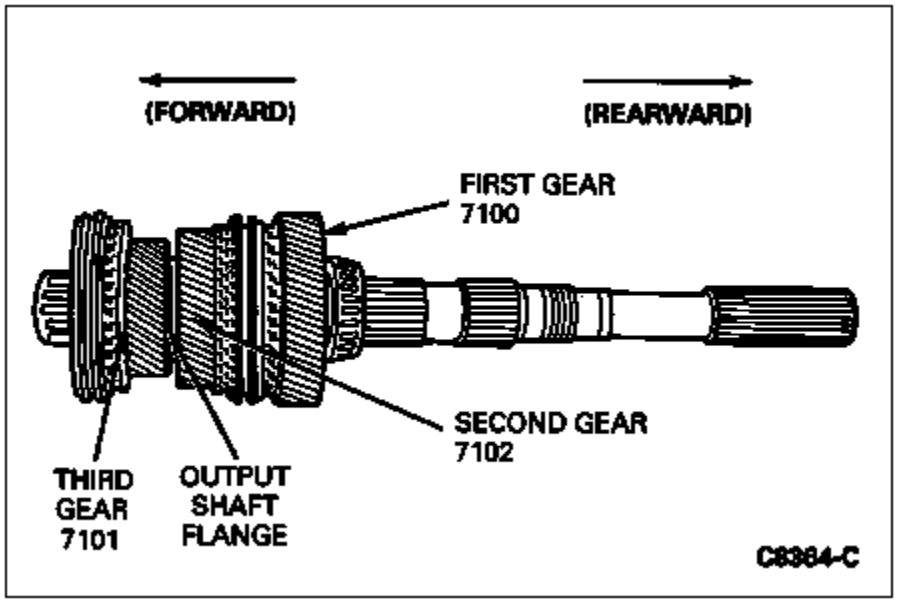
Output Shaft

SPECIAL SERVICE TOOL(S) REQUIRED

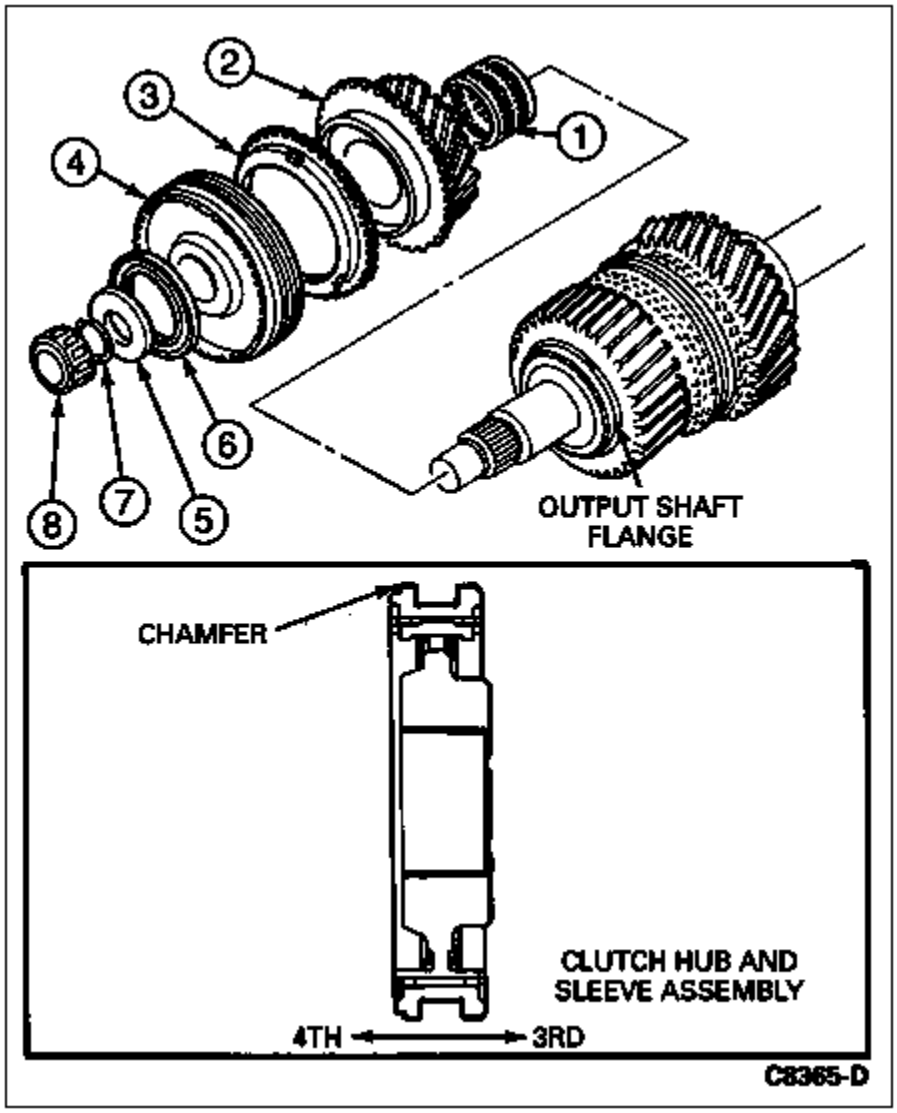
Description	Tool Number
Remover/Replacer Tube	T75L-7025-B
Pinion Bearing Cone Replacer	T53T-4621-B
Axle Bearing/Seal Plate	T57L-1165-B
Bearing Cone Replacer	T88T-7025-B

Disassembly

1. Position front flange of output shaft forward as shown in the following illustration. Use this flange as a reference point and dividing line during assembly and disassembly procedures.



2. Remove transmission input shaft pilot bearing (7118), bearing outer snap ring (7030), thrust bearing (7C096), and third and fourth synchronizer spacer (7N112) from front (short side of flange) of output shaft.



Item	Part Number	Description
1	7127	Gear Bearing
2	7101	Third Gear
3	7124	Synchronizer
4	7124	Synchronizer
5	7N112	Third and Fourth Synchronizer Spacer
6	7C096	Thrust Bearing
7	7030	Bearing Outer Snap Ring
8	7118	Transmission Input Shaft Pilot Bearing

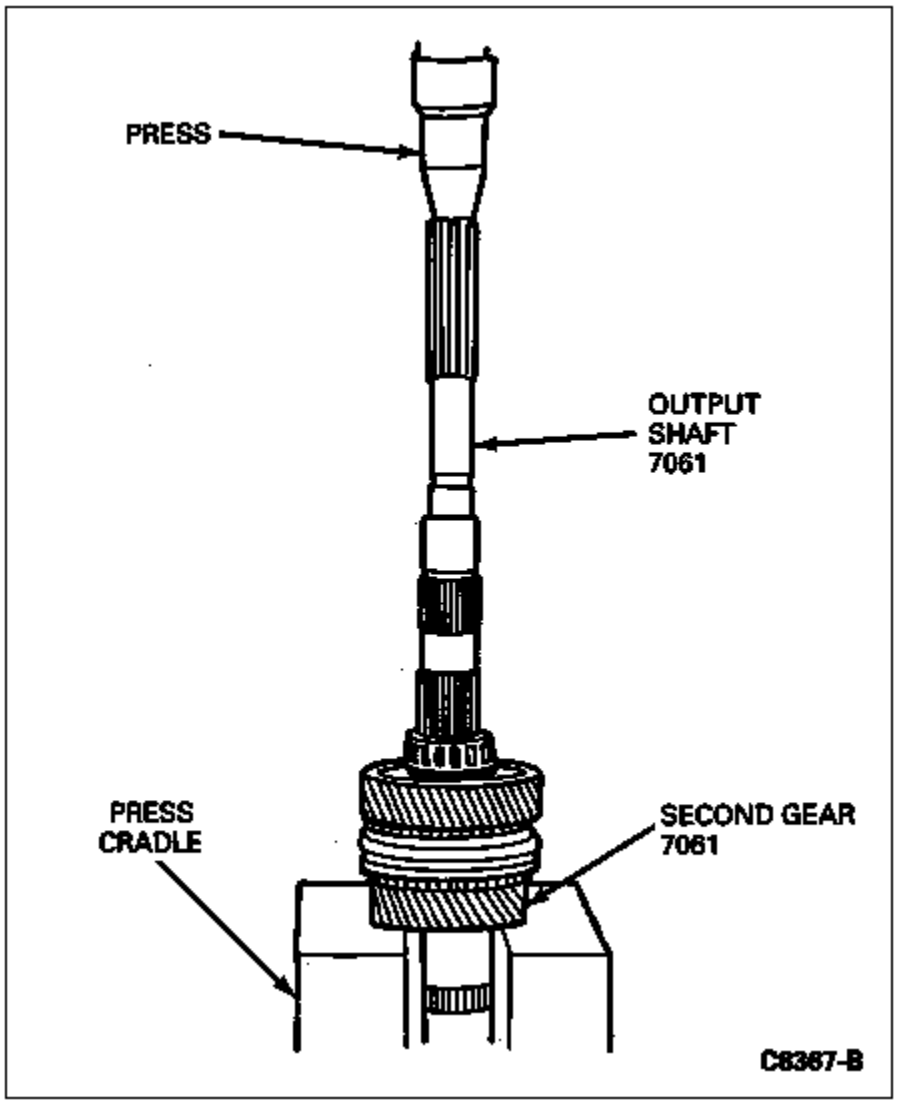
3. Position the front (short side of flange) of the mainshaft so that it faces upward. Lift off the following components as a unit:

    - Synchronizer (7124) (third/fourth).

- Synchronizer blocking ring (7107) (third).
- Third gear.
- Gear bearing (7127).

4. **CAUTION: Make sure that flange does not contact or ride up onto press cradle. Improper positioning can result in component damage.**

   Position mainshaft, with rear end (long side of flange) facing upwards into press using Pinion Bearing Cone Replacer T53T-4621-B as a press plate, and Bearing Cone Replacer T88T-7025-B to protect inner race rollers.



5. Press off the following components as a unit:

   - Bearing (7025)
   - Input bearing spacer (7173)
   - First gear (1GR) (7100)

- First and second speed gear bearing (7133)
- First/second synchronizer
- First/second Synchronizer blocking rings
- Second gear (2GR) (7102)
- First and second speed gear bearing.

Assembly

NOTE: Make note of the differences between the third gear synchronizer blocking ring and the first, second and fourth gear synchronizer blocking rings. The third gear synchronizer blocking ring has three teeth cut out 120 degrees apart from each other. Directly adjacent to one side of the missing teeth, two teeth have been bridged together. This is to help eliminate any upshift "crunch" that may occur.

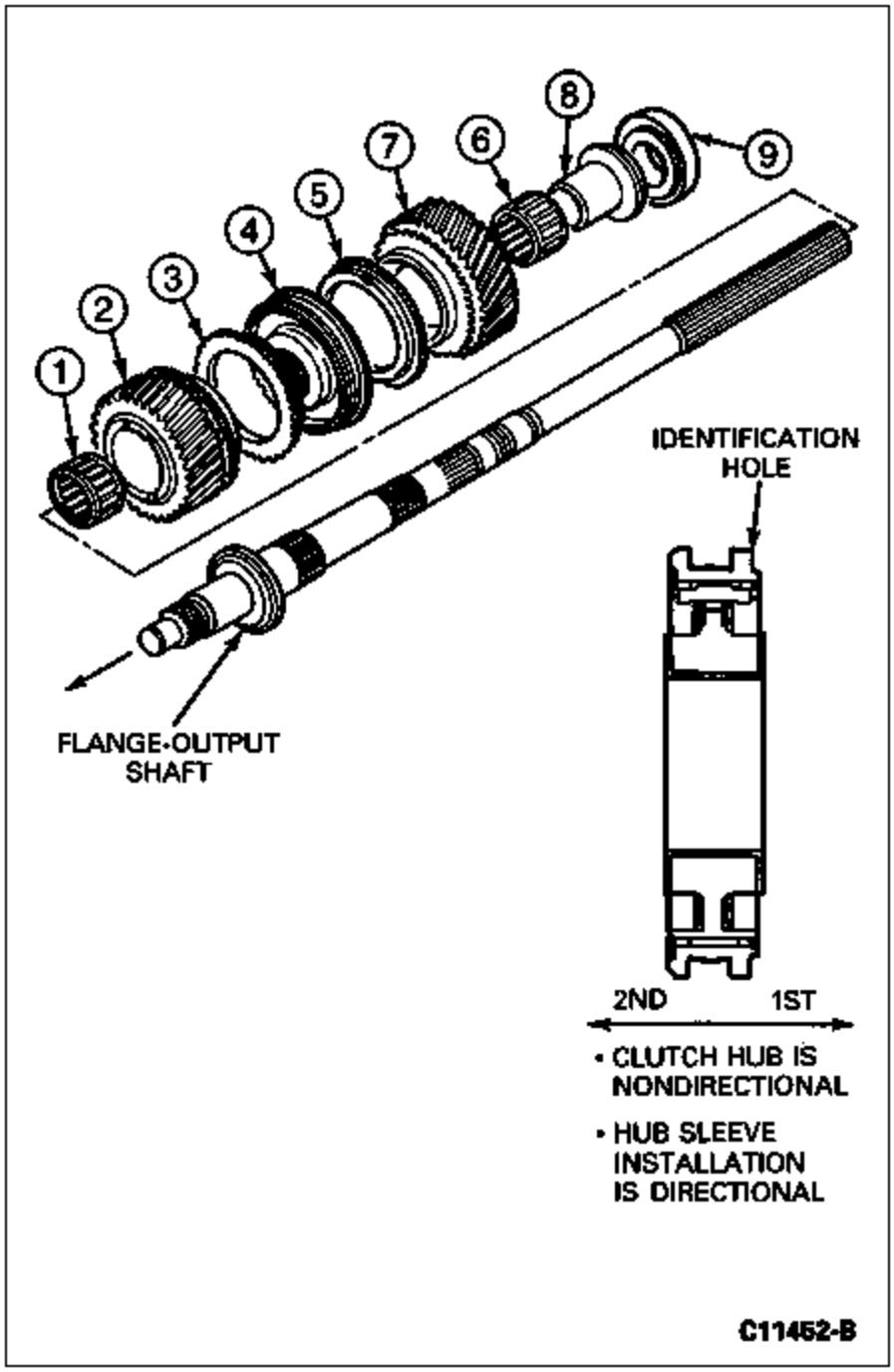
NOTE: To install components onto output shaft, position components as illustrated. Press components into position using Pinion Bearing Cone Replacer T53T-4621-B and Axle Bearing/Seal Plate T75L-1165-B.

NOTE: Make sure that bearing is still positioned in case (7005).

1. **NOTE: During installation, apply Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX or equivalent MERCON® fluid to all rotating or sliding parts.**

   Position mainshaft so that the rear end (long side of flange) faces upward. Install the following parts in the order listed:

   - Second gear needle bearing
   - Second gear
   - Second gear synchronizer blocking ring
   - First/second synchronizer
   - First gear synchronizer blocking ring
   - First gear needle bearing
   - First gear
   - Input bearing spacer
   - Bearing



Item	Part Number	Description
1	7133	First and Second Speed Gear Bearing
2	7102	Second Gear
3	7107	Synchronizer Blocking Ring
4	7124	Synchronizer
5	7107	Synchronizer Blocking Ring
6	7133	First and Second Speed Gear Bearing

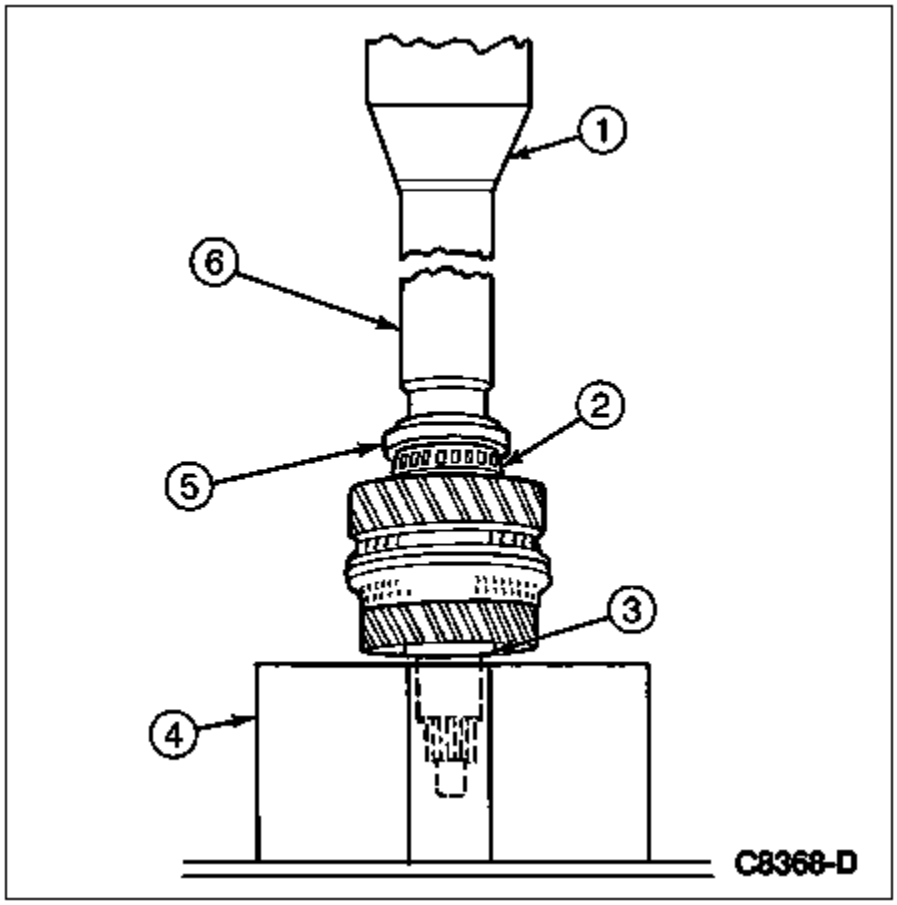
7	7100	First Gear
8	7173	Input Bearing Spacer
9	7025	Bearing

2. **NOTE: When installing first/second synchronizer, make sure that smaller width of sleeve faces second gear (front) side. Make sure that reference marks face rear of transmission (7003); they reference installation position of synchronizer hub insert (7A044).**

   Press the center bearing onto the mainshaft using the following tools:

   - Remover/Replacer Tube T75L-7025-B.
   - Locally fabricated sleeve where the inside diameter is large enough to fit over the output shaft but small enough to engage the inner bearing race.

   Position the mainshaft on a press cradle as shown in the following illustration. Using the sleeve and replacer tube as a press ram, seat the center bearing.



Item	Part Number	Description
1	—	Press
2	7C096	Thrust Bearing

3	7061	Output Shaft
4	—	Bearing Plate
5	T83T-7025-B	Output Shaft Bearing Replacer
6	T75L-7025-B	Remover/Replacer Tube

3. **NOTE: Make note of the differences between the third gearsynchronizer blocking ring and the first, second and fourth gear synchronizer blocking rings. The third gear synchronizer blocking ring has three teeth cut out 120 degrees apart from each other. Directly adjacent to one side of the missing teeth, two teeth have been bridged together. This is to help eliminate any upshift "crunch" that may occur.**

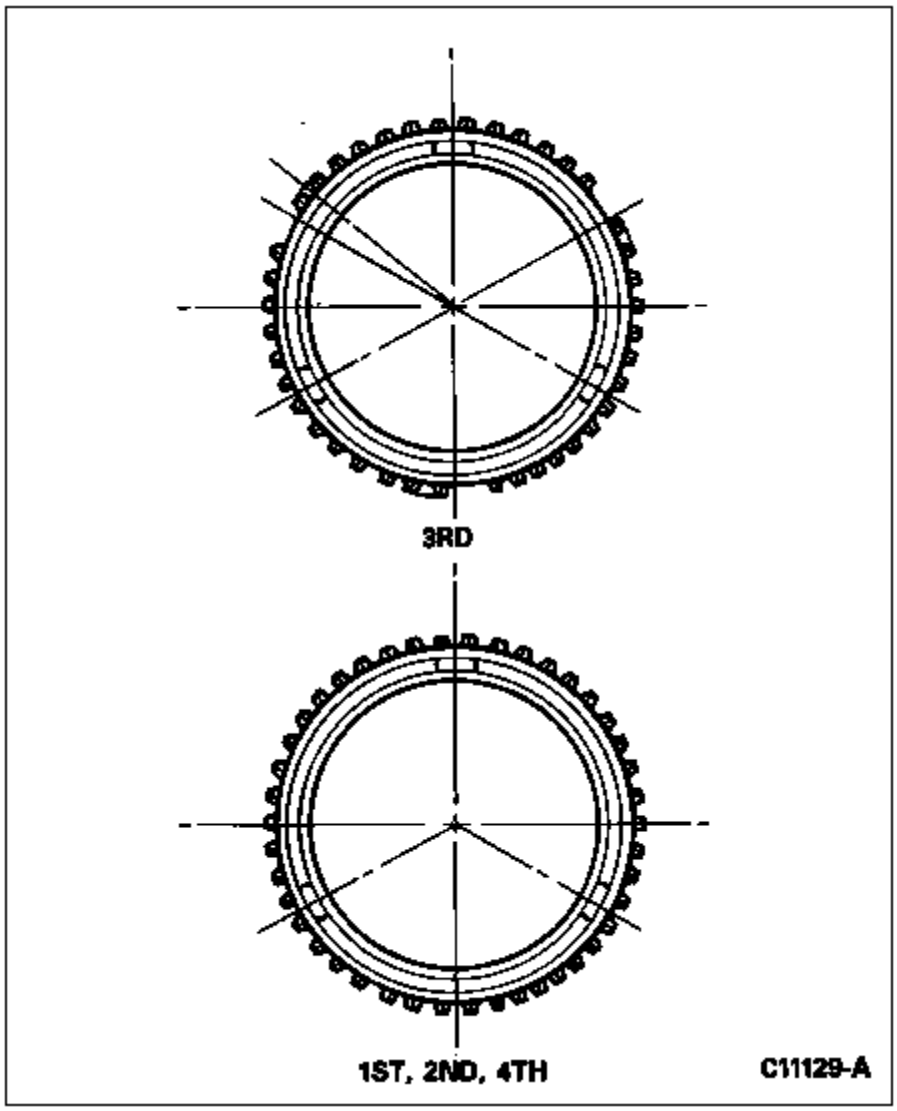
   Position output shaft so that the front (short side) of flange faces upward. Install the following parts in the order listed.

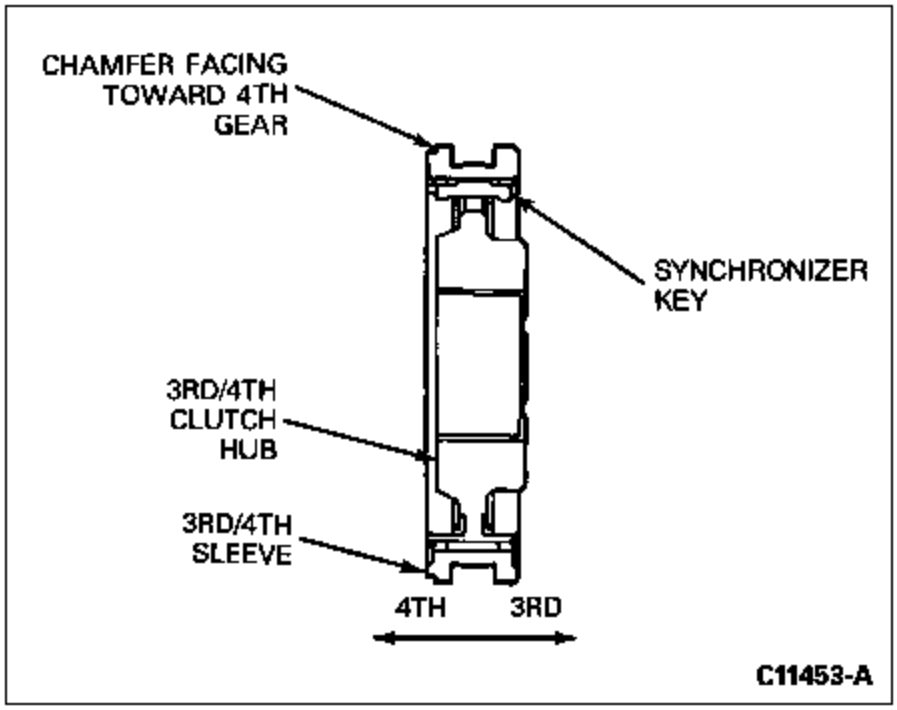
   - Gear bearing
   - Third gear
   - Third gear synchronizer blocking ring

4. **NOTE: The front and rear sides of the clutch hub may appear to be similar. Be sure to install it with the chamfer facing toward fourth gear (4GR) (7112).**

   Install third/fourth synchronizer as follows:

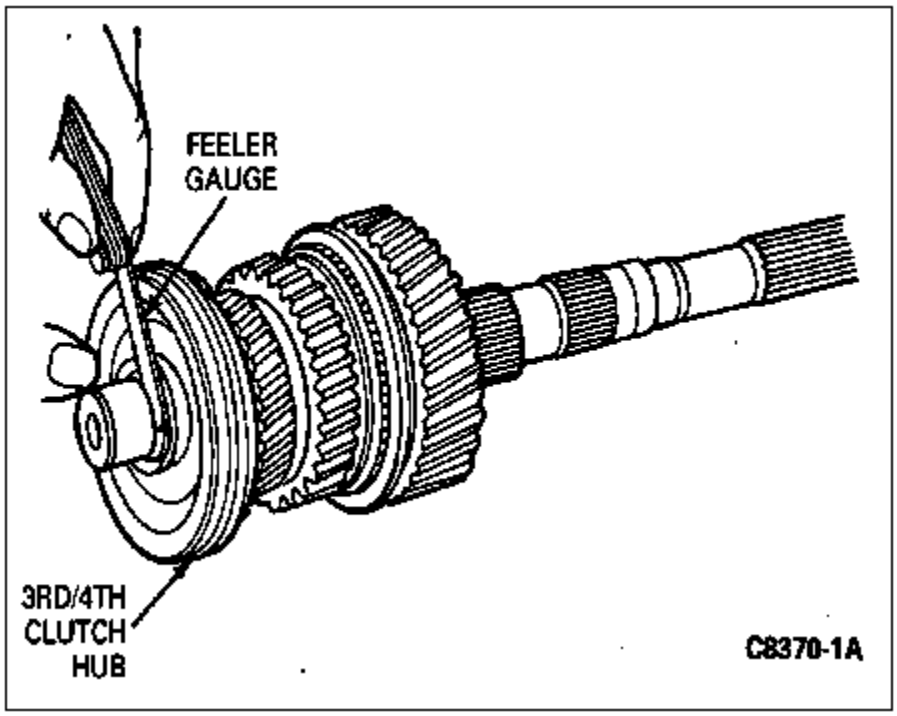
   - Mate clutch hub synchronizer key groove with the slants on the inner surface of the clutch hub sleeve. The turned edge of the clutch hub sleeve should face toward fourth gear.
   - Install longer flange on clutch hub sleeve toward third gear (rear) side.





5. Install the spacer and bearing outer snap ring onto the output shaft.

6. With the original bearing outer snap ring installed, measure the clutch hub end play using a feeler gauge.



7. If necessary adjust third/fourth clutch hub end play to 0.00-0.05mm (0.00-0.0019 inch) by selecting required bearing outer snap ring according to the chart.

8. After determining the correct retaining ring, install the needle bearing (with the rollers visible), bearing outer snap ring and pilot bearing.

BEARING OUTER SNAP RING SELECT CHART

Part Number	Thickness
E8TZ-7030-A	1.50mm (0.059 In.)
E8TZ-7030-B	1.55mm (0.061 In.)
E8TZ-7030-C	1.60mm (0.0629 In.)
E8TZ-7030-D	1.65mm (0.0649 In.)
E8TZ-7030-E	1.70mm (0.0669 In.)
E8TZ-7030-F	1.75mm (0.0688 In.)
E8TZ-7030-G	1.80mm (0.0708 In.)
E8TZ-7030-H	1.85mm (0.0728 In.)
E8TZ-7030-J	1.90mm (0.0748 In.)
E8TZ-7030-K	1.95mm (0.0767 In.)

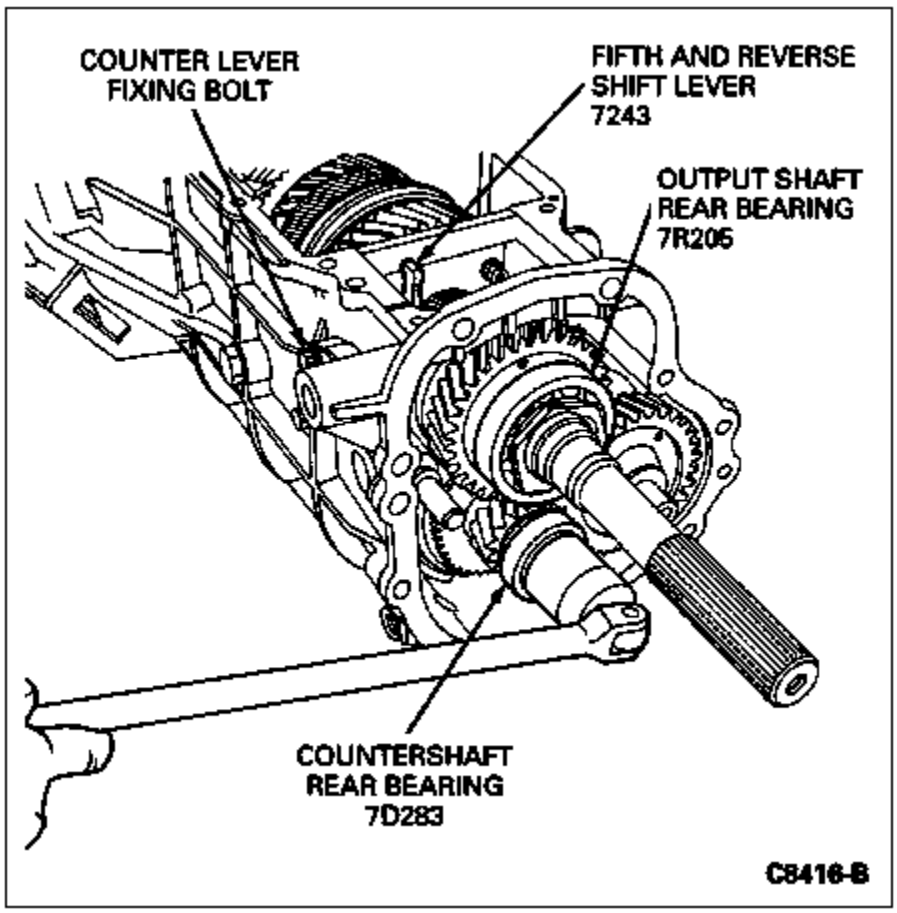
Bearing, Countershaft

SPECIAL SERVICE TOOL(S) REQUIRED

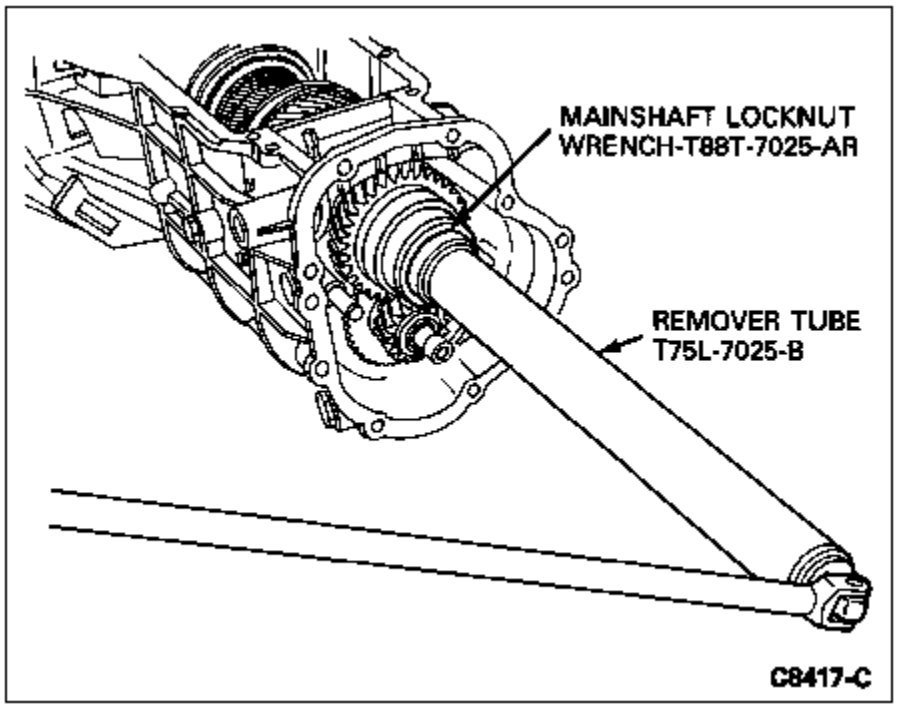
Description	Tool Number
Mainshaft Locknut Wrench	T88T-7025-AR
Remover/Replacer Tube	T75L-7025-B

1. Lock transmission (7003) into first and third gears.

2. Using a 32mm socket, remove and discard locknut, then remove the countershaft rear bearing (7D283) and thrust washer.

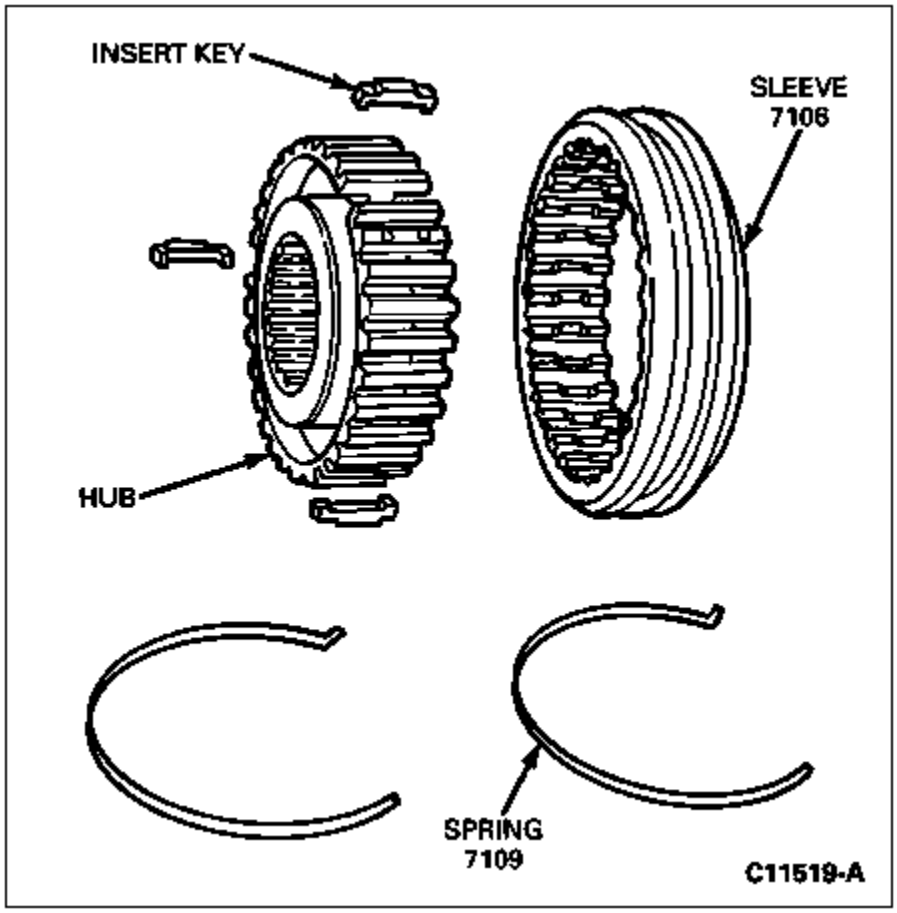


3. Using Mainshaft Locknut Wrench T88T-7025-AR and Remover/Replacer Tube T75L-7025-B, remove and discard locknut from output shaft.



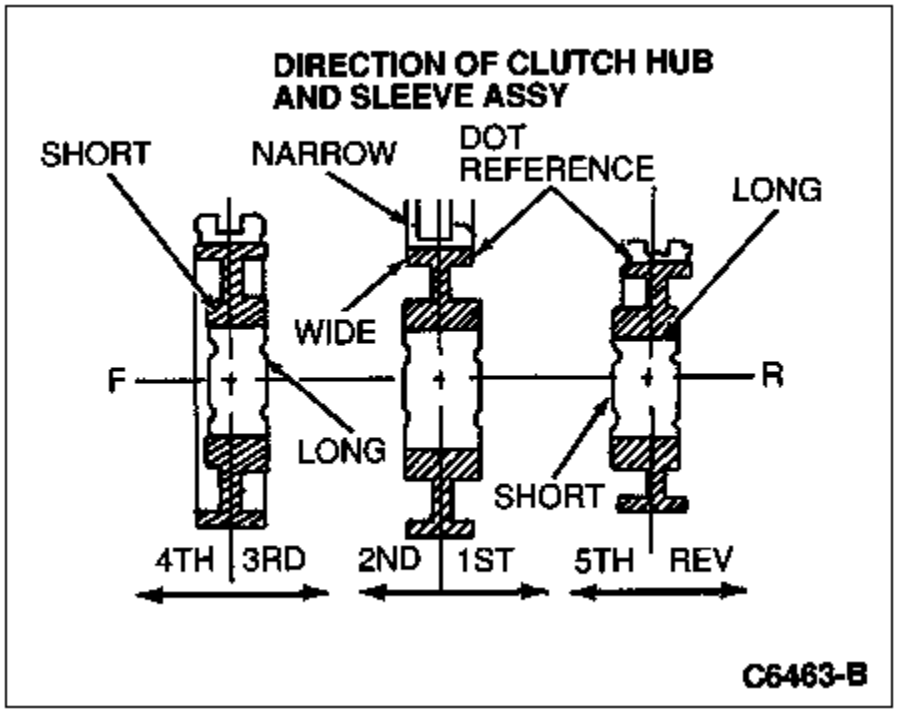
Synchronizers

1. Lay synchronizer (7124) face down and remove one synchronizer blocking spring (7109), using a suitable tool.
2. Hold synchronizer sleeve (7106) and hub assembly in place and turn assembly over to the opposite face and lay flat on work table.
3. Remove second synchronizer blocking spring and three insert keys.
4. Slide synchronizer sleeve from hub. Replace parts as necessary.



Assembly

1. Locate indented dot reference mark on the shoulder of one face side of synchronizer sleeve. Check drawing for direction of clutch hub to sleeve assembly. Insert hub into synchronizer sleeve with one of the three insert slots of hub aligned with reference mark. This will make certain of proper orientation of hub to sleeve splines. Make sure hub moves freely on synchronizer sleeve.



2. Lay hub and sleeve assembly face down on work table and place three insert keys into hub slots.

3. Insert one synchronizer blocking spring into clip hole located in inner shoulder of synchronizer sleeve, and place synchronizer blocking spring under protruding edge of each insert key.

4. Holding hub and synchronizer sleeve together, turn assembly over to opposite face side.

5. Insert second synchronizer blocking spring just like the first, but in the opposite direction. One synchronizer blocking spring should be counterclockwise to the other.

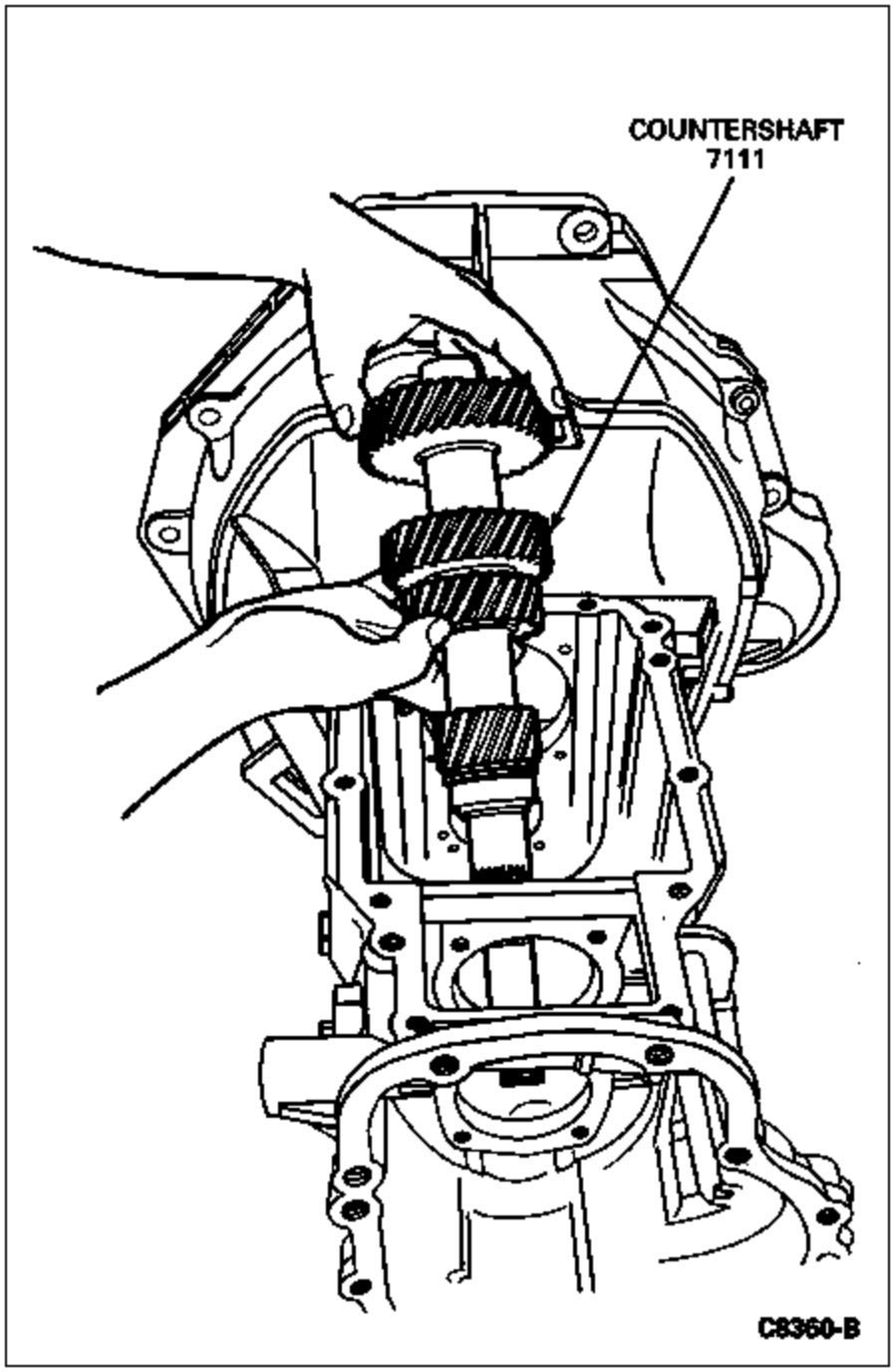
6. When sliding synchronizer assembly onto shaft, do not allow excessive movement between hub and sleeve. This will cause insert keys to pop out of hub slots and require reassembly.

Transmission

SPECIAL SERVICE TOOL(S) REQUIRED

Description	Tool Number
Gear Replacing Spacer	T88T-7025-F
Gear Replacing Spacer	T88T-7025-E
Shaft Collar	T75L-7025-M
Shaft Collar	T75L-7025-P
Shaft Sleeve — Replacer	T75L-7025-K
Remover/Replacer Tube	T75L-7025-B
Remover/Replacer Tube	T85T-7025-A
Shaft Adapter — Replacer	T75L-7025-L
Adapter	T88T-7025-J2

1. Position countershaft (7111) into case (7005) through top opening.



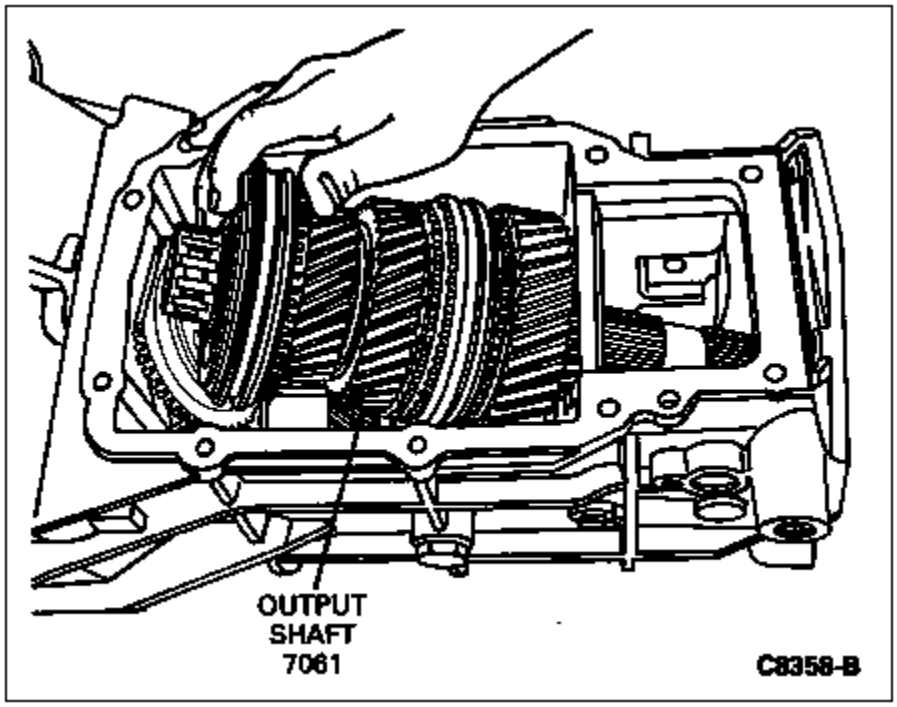
2. **NOTE: Make sure that needle roller bearing is installed into input shaft (7017).**

   NOTE: Needle bearing is symmetric.

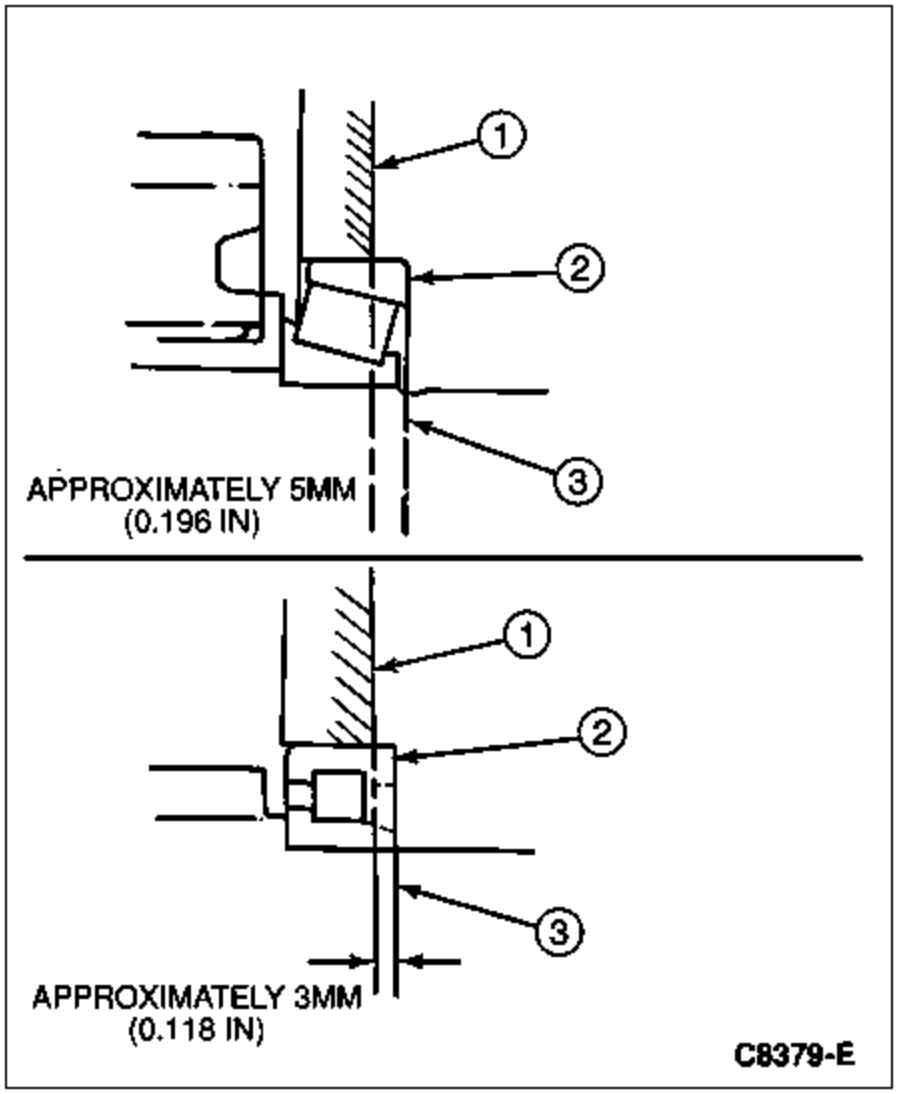
   Position input shaft into case through top opening.

3. **NOTE: Make sure that fourth gear synchronizer blocking ring (7107) is installed at this time.**

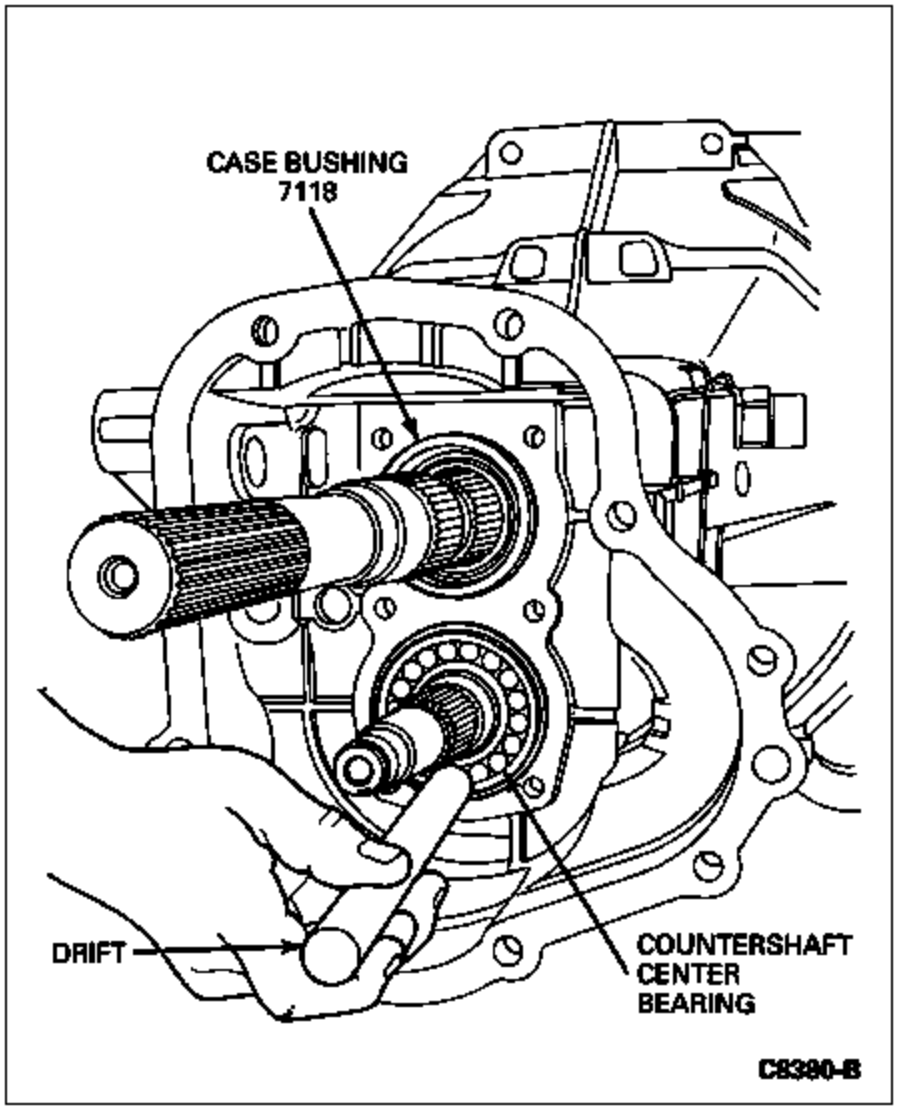
   Position output shaft into case. Mate input shaft and output shaft by positioning them at an upward angle and setting them together.



4. Install bearing (7025) using a brass drift.



Item	Part Number	Description
1	—	Transmission Case Wall (Part of 7003)
2	7118	Bearing
3	7061	Output Shaft



5. **NOTE: Make sure that center bearing outer races are squarely positioned in bores.**

   Install countershaft center bearing.

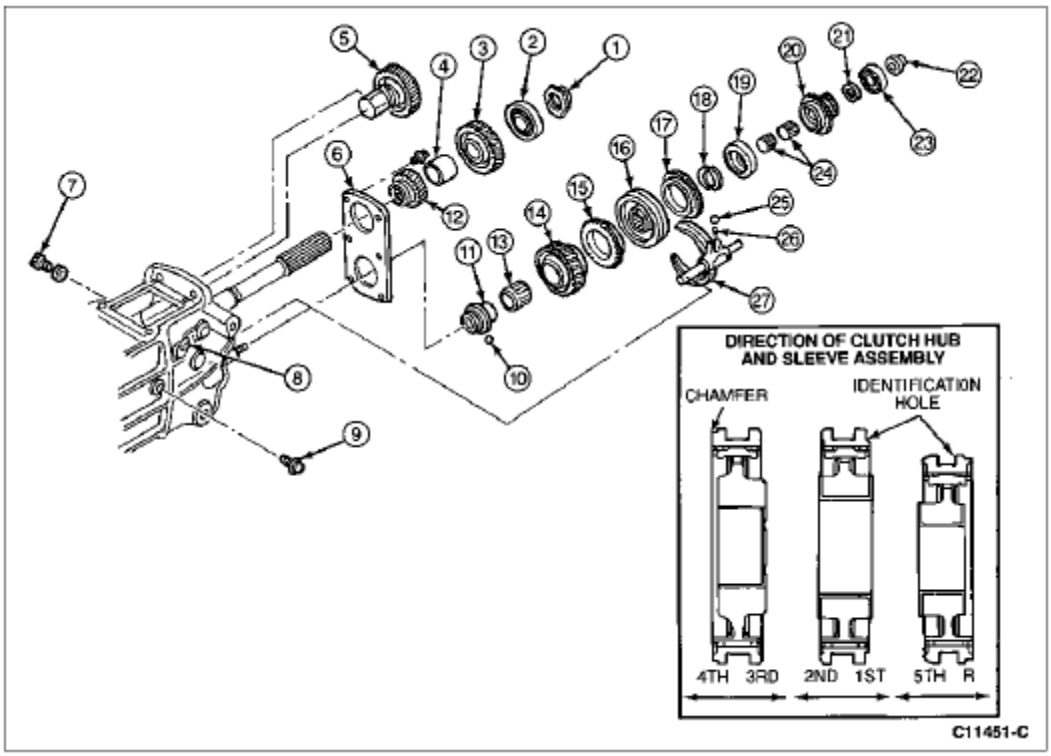
6. Install bearing retainer (7085) to case.

7. **NOTE: Install fifth gear sleeve using nut, Shaft Adapter — Replacer T75L-7025L, Adapter T88T-7025-J2 and Remover/Replacer Tube T75L-7025-B.**

   Position transmission (7003) horizontally in holding fixture. Assemble the following parts in the order listed.

   - Ball
   - Fifth gear sleeve

Transmission, Rear Housing

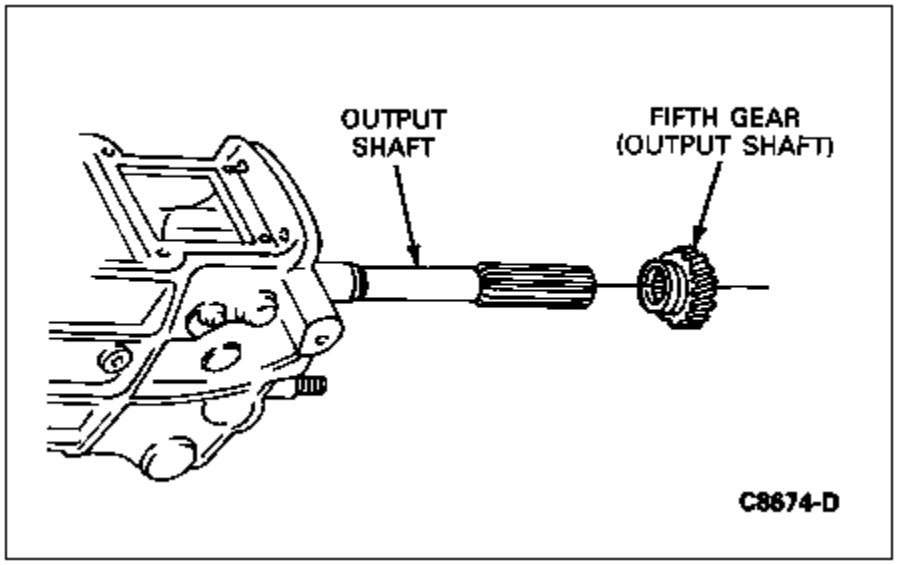


Item	Part Number	Description
1	7B364	Locknut
2	7R205	Output Shaft Rear Bearing
3	7142	Output Shaft Reverse Gear
4	7072	Spacer or Sleeve
5	7141	Reverse Idler Gear and Bushing
6	7085	Bearing Retainer
7	7K179	Reverse Idler Gear Holding Bolt
8	99796-0612	Bolt
9	7214	Fifth and Reverse Shift Rod Bolt
10	99611-2000	Ball
11	7173	Input Bearing Spacer
12	7112	Fifth Gear
13	7R130	Needle Bearing, Fifth Gear
14	7142	Fifth Gear, Countershaft
15	7107	Synchronizer Blocking Ring
16	7124	Synchronizer
17	7107	Synchronizer Blocking Ring
18	7R482	Synchronizer Split Washer
19	7C340	Thrust Washer
20	7N040	Countershaft Reverse Gear

21	7L324	Thrust Washer
22	7N170	Locknut
23	7D283	Countershaft Rear Bearing
24	7N270	Needle Bearing
25	7289	Lockball (Steel) Shift Rail
26	99796-0612	Bolt
27	7289	Shift Fork (5th and Reverse)

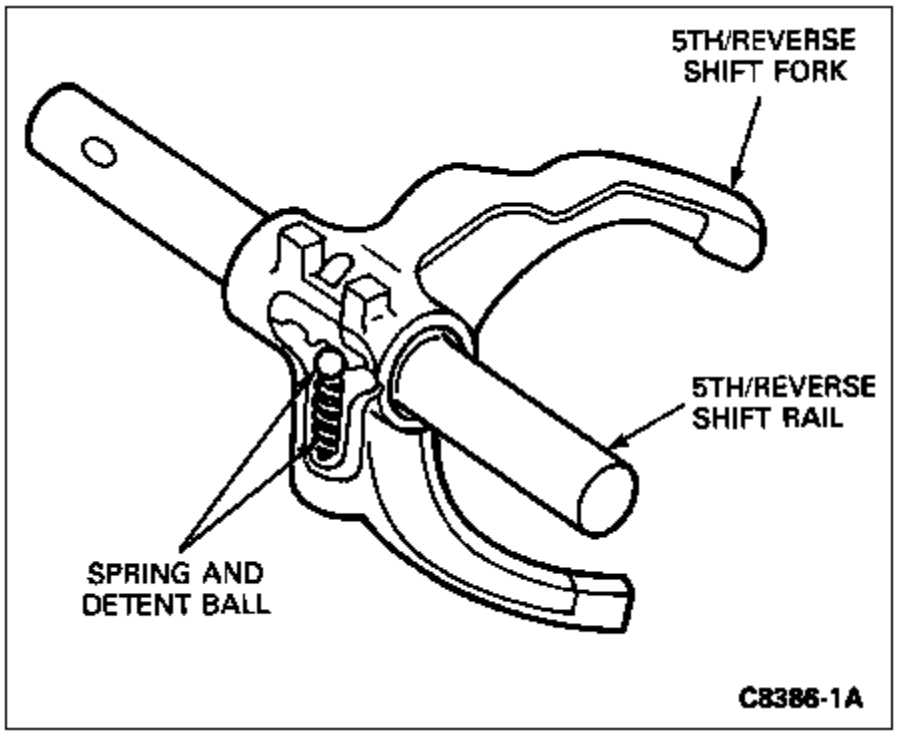
8. Install fifth gear (countershaft) and needle bearing onto countershaft.

9. Install fifth gear onto output shaft. Make sure that long flange on fifth gear faces forward.



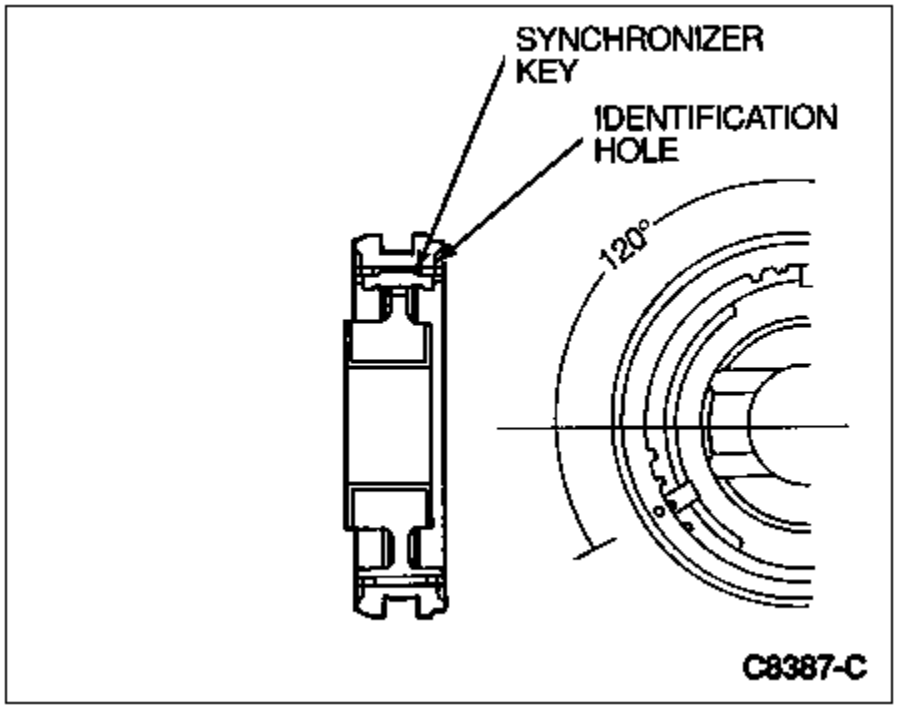
10. Position counter lever shaft assembly to transmission and install thrust washer and retaining ring. Apply sealant to holding bolt threads. Install bolt and tighten to 8-10 Nm (6-7 lb-ft).

11. If disassembled, install shifter interlock spring (7234) and detent ball into fifth/reverse gear shifter fork (7230). Depress ball and insert fifth/reverse shift rail. Locate to neutral position.



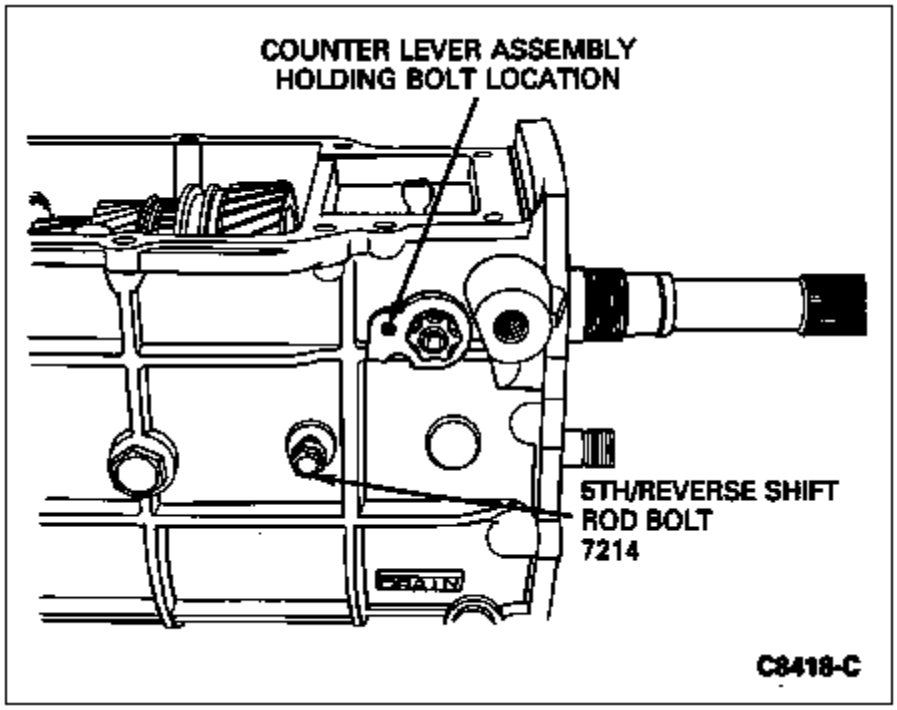
12. **NOTE: Install the longer flange (on the fifth/reverse synchronizer (7124)) toward the front of transmission. The reference mark on synchronizer sleeve must be installed toward reverse gear side.**

    Assemble the fifth/reverse synchronizer to fifth/reverse gear shifter fork and rail assembly.

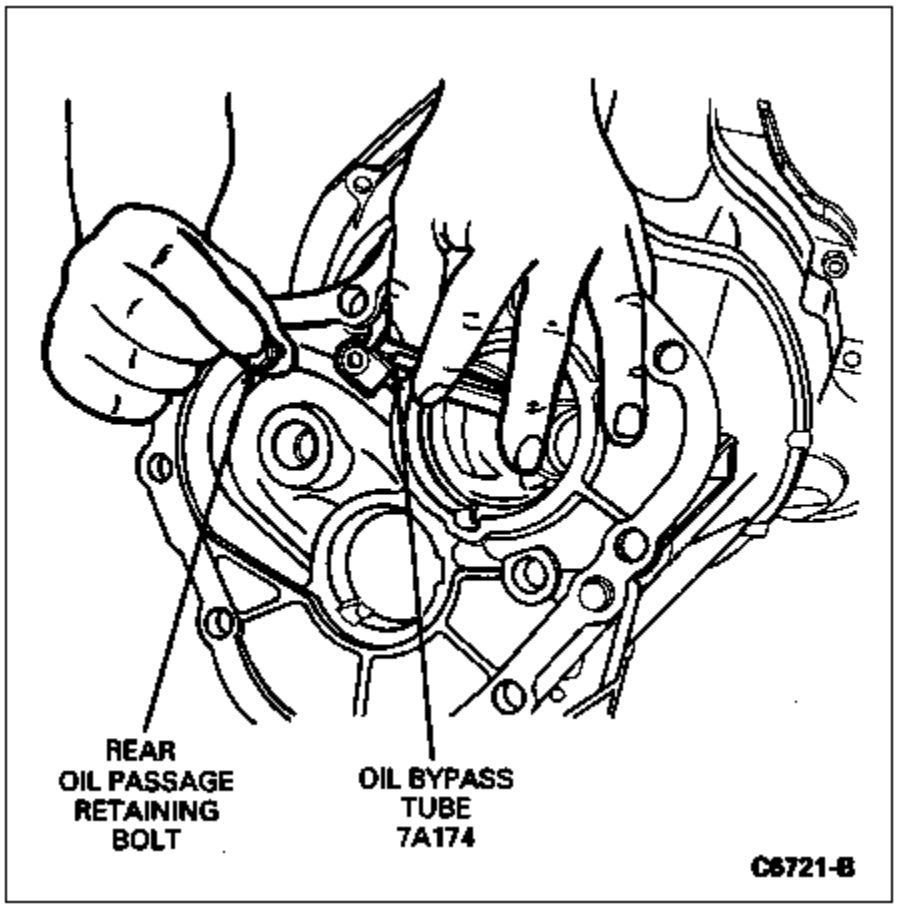


13. Install fifth/reverse shift fork and shift rail assembly (including fifth/reverse synchronizer) to countershaft. Mate shift fork gate to end of fifth/reverse counter lever end. Install fifth/reverse fork and shift rail assembly with threaded holding bolt bores (in rail and case) aligned with each other.

    a. Apply sealant to holding bolt threads. Install holding bolt to case. Tighten to 20-30 Nm (15-22 lb-ft).



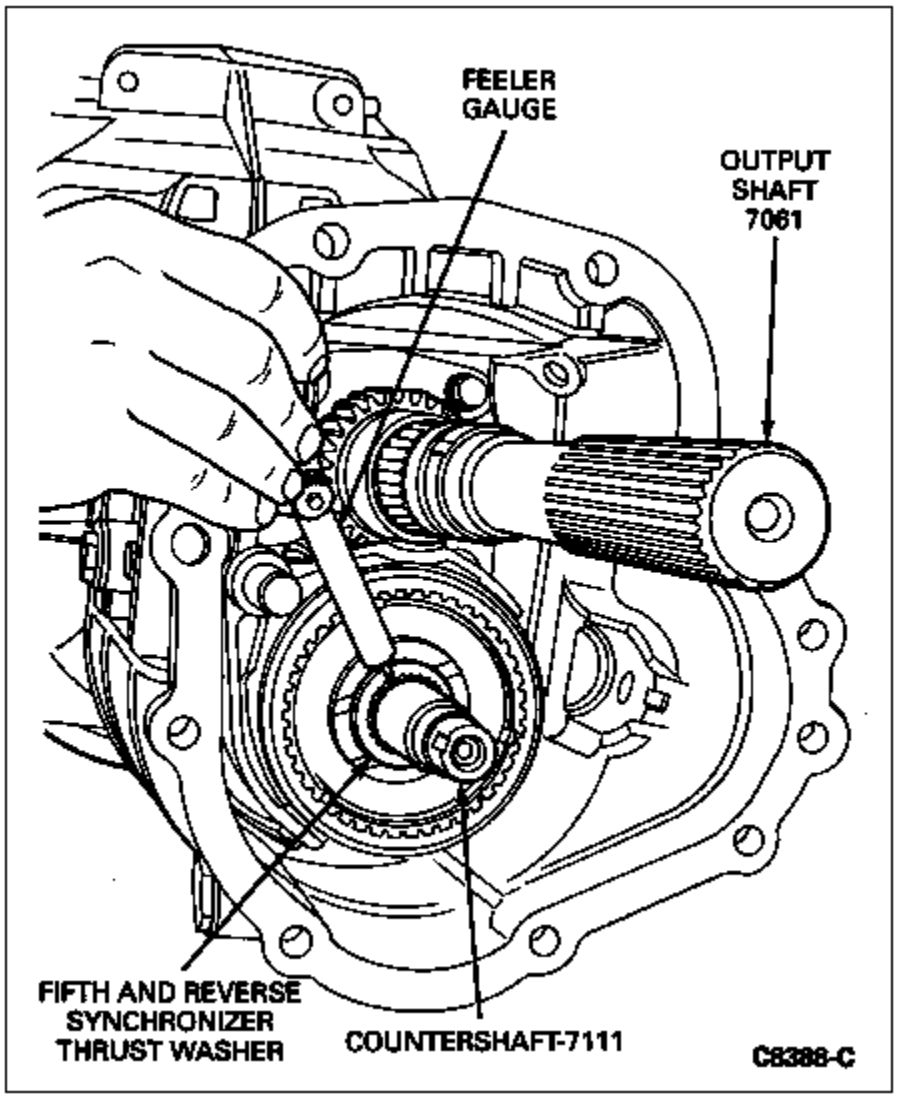
14. Position oil bypass tube (7A174) to case and install retaining bolt. Tighten bolt to 8-10 Nm (6-7 lb-ft).



15. If original clutch hub and/or counter reverse gear are being used, install original split and thrust washers, then proceed to Step 22.

16. **NOTE: Make sure new synchronizer split washers (7R482) are matched, having identical thickness. Refer to Specifications for end play specifications.**

    If clutch hub and/or counter reverse gear have been replaced, measure end play using a feeler gauge. Select replacement synchronizer split washer using the following chart and install new synchronizer split washers onto output shaft.



SPLIT WASHER SELECT CHART

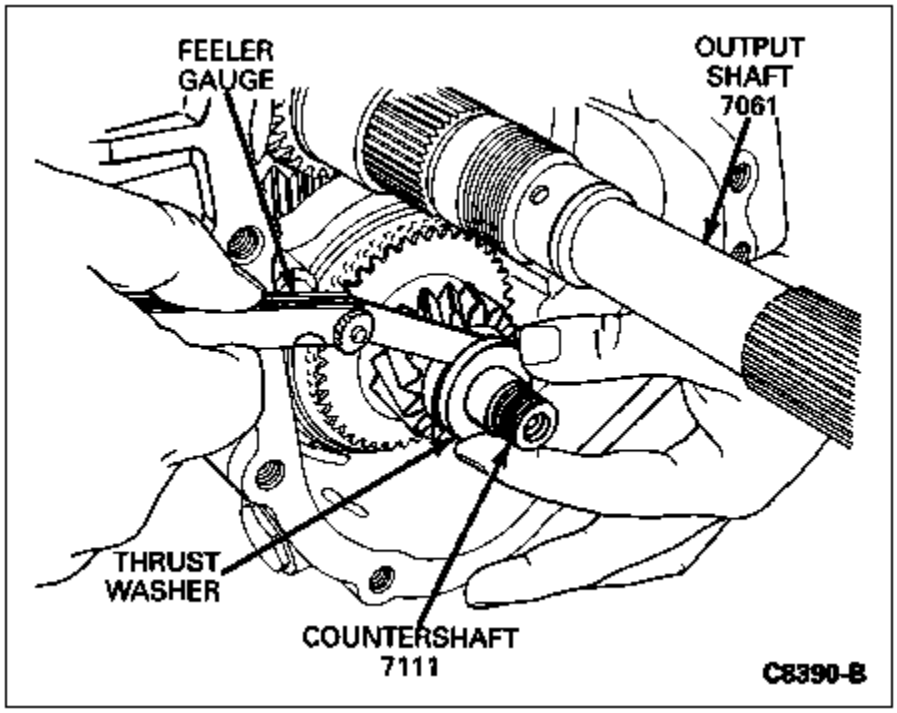
Part Number	Thickness
E8TZ-7R482-A	3.0mm (0.118 In.)
E8TZ-7R482-B	3.1mm (0.122 In.)
E8TZ-7R482-C	3.2mm (0.125 In.)
E8TZ-7R482-D	3.3mm (0.129 In.)
E8TZ-7R482-E	3.4mm (0.133 In.)
E8TZ-7R482-F	3.05mm (0.120 In.)
E8TZ-7R482-G	3.15mm (0.124 In.)
E8TZ-7R482-H	3.25mm (0.127 In.)
E8TZ-7R482-J	3.35mm (0.131 In.)
E8TZ-7R482-K	3.45mm (0.135 In.)

E8TZ-7R482-L	3.50mm (0.137 In.)

17. Install reverse synchronizer blocking ring and needle bearings into counter reverse gear. Install counter reverse gear and needle bearings onto countershaft as an assembly. Install thrust washer to countershaft.

18. **NOTE: If end play is not correct, the thrust washer that must be replaced is called out as item No. 21. Refer to the exploded view of the transmission rear housing.**

    Press thrust washer forward (by hand) against shoulder on countershaft. Maintain forward pressure against thrust washer and insert feeler gauge between thrust washer and counter reverse gear. Using the chart, determine correct thrust washer to obtain specified end play. Counter reverse gear end play: 0.25-0.35mm (0.010-0.014 inch).



THRUST WASHER SELECT CHART

Part Number	Thickness
E8TZ-7C340-A	7.45mm (0.293 In.)
E8TZ-7C340-B	7.65mm (0.301 In.)
E8TZ-7C340-C	7.85mm (0.309 In.)
E8TZ-7C340-D	7.35mm (0.289 In.)
E8TZ-7C340-E	7.55mm (0.297 In.)
E8TZ-7C340-F	7.75mm (0.305 In.)

19. **NOTE: Installation of a suitable spacer prevents thrust washer and split washers from slipping off shaft, and avoids interference with reverse idler gears.**

    Temporarily install a suitable spacer (inner bore larger than 21mm [.83 inch], outer bore smaller than 36mm [1.4 inch], 15-20mm [.59-.78 inch] overall length) in place of countershaft bearing. Loosely install countershaft locknut to retain components.

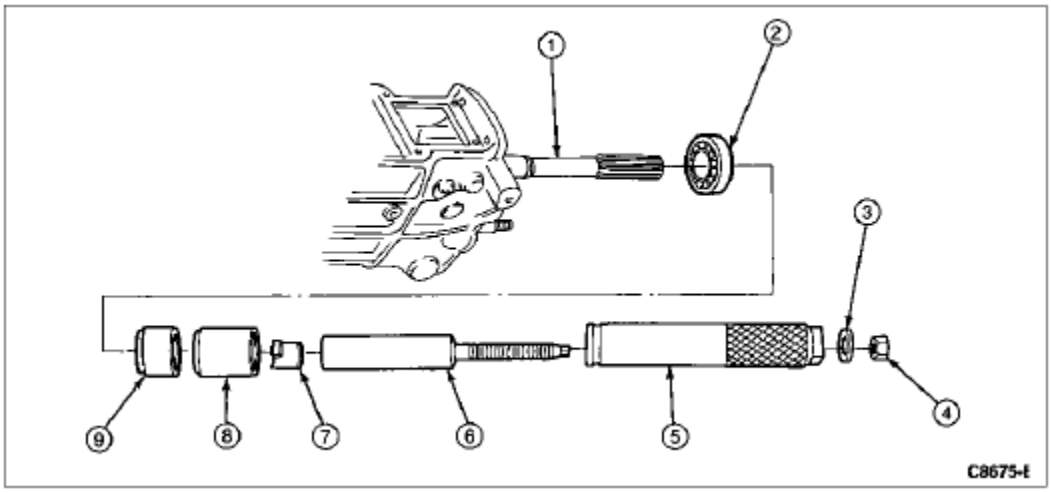
20. Install reverse idler gear and bushing (7141). Apply sealant Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specifications ESB-M4G92-A or ESE-M4G195-A to holding bolt threads. Install and tighten holding bolt to 79-117 Nm (58-86 lb-ft).

21. **NOTE: Install reverse gear with longer flange facing forward.**

    Install sleeve and reverse gear assembly onto mainshaft.

22. Install output shaft rear bearing (7R205) using Gear Installing Spacer T88T-7025-F (4x2 models only), Gear Installing Spacer T88T-7025-E, Shaft Adapter T75L-7025-P (4x2 models only), Shaft Adapter T75L-7025-M (4x4 models only), Shaft Sleeve — Replacer T75L-7025-K, Remover/Replacer Tube T75L-7025-B, nut and washer. (This procedure employs the same tools as fifth gear installation.)

Output Shaft Rear Bearing Installation



Item	Part Number	Description
1	7061	Output Shaft
2	7R205	Output Shaft Rear Bearing
3	—	Washer (Part of T75L-7025-K)
4	—	Nut (Part of T75L-7025-K)
5	T75L-7025-B	Remover/Replacer Tube
6	T75L-7025-K	Shaft Adapter Screw
7	T75L-7025-P	Shaft Adapter

8	T88T-7025-F	Gear Replacing Spacer
9	T88T-7025-G	Gear Replacing Spacer

23. Remove temporary spacer from countershaft.

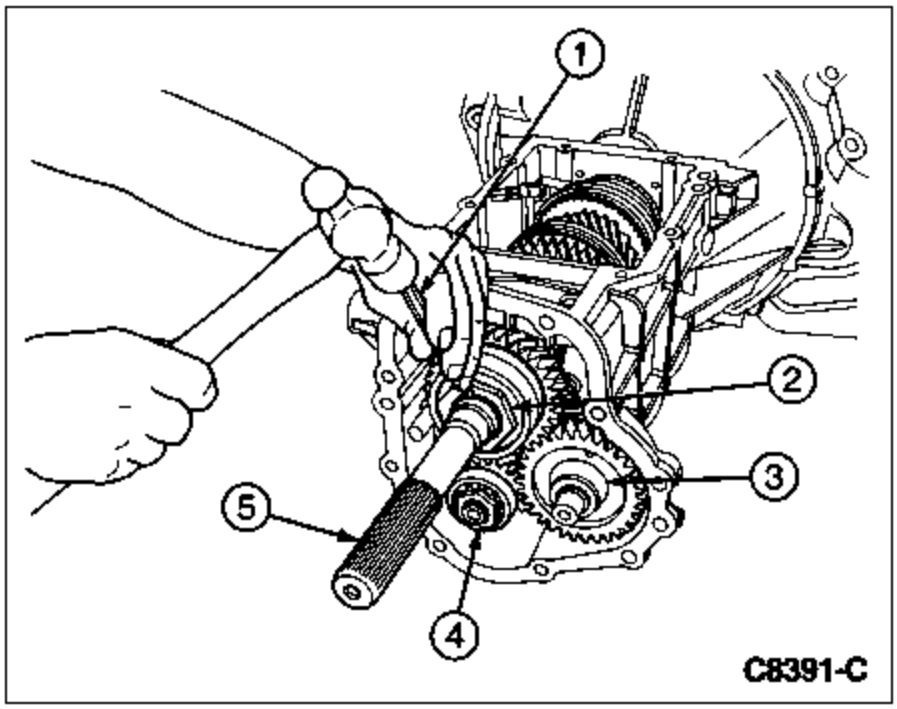
24. **NOTE: Tightening shaft locknuts without fully seating bearing can cause damage to mainshaft threads.**

    Install countershaft rear bearing (7D283) by hand.

25. **NOTE: Always install new output and countershaft locknuts when assembling transmission. Locknuts unstaked during disassembly cannot be reused.**

    Lock transmission into first and third gear. Install new output and countershaft locknuts hand-tight. Tighten output shaft locknut to 216-274 Nm (160-202 lb-ft). Tighten countershaft locknut to 128-196 Nm (94-144 lb-ft).

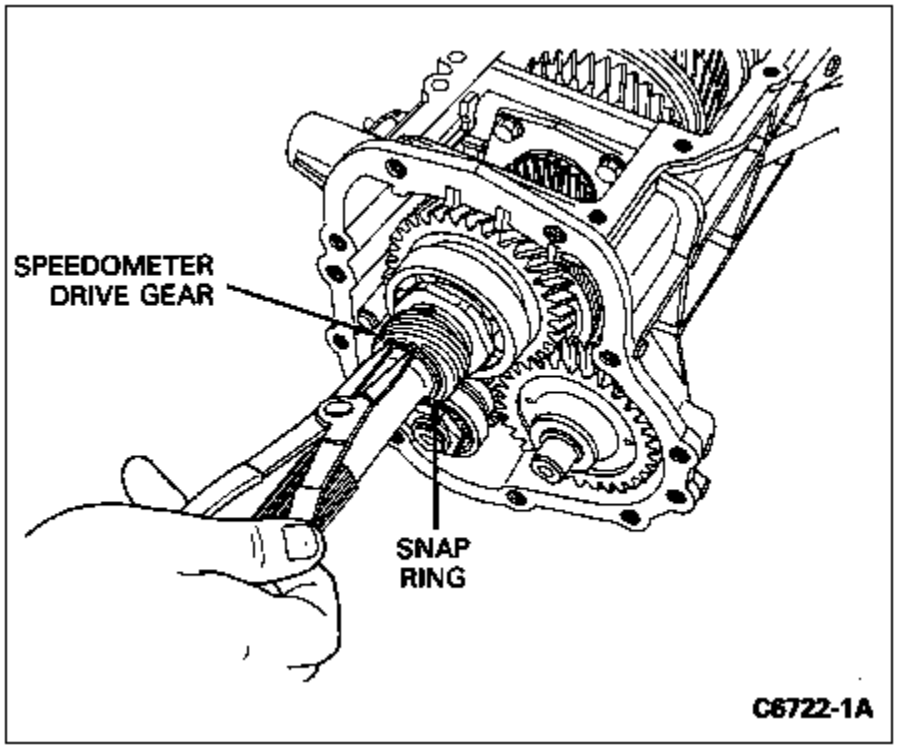
26. Stake (secure) locknuts to bottom of shaft groove using Countershaft Locknut Staking Tool T77J-7025-F.



Item	Part Number	Description
1	T77J-7025-F	Countershaft Locknut Staking Tool
2	7B364	Output Shaft Rear Bearing Lock Nut
3	7141	Reverse Idler Gear and Bushing
4	7N170	Countershaft Locknut
5	7061	Output Shaft

27. **NOTE: The speedometer drive gear contains three detents into which the steel drive ball can be installed. The steel drive ball can be installed into any of the three detents.**

    Install speedometer drive gear and steel ball to output shaft. Install speedometer gear snap ring (7059) retaining speedometer drive gear to output shaft (4x2 vehicles only).



28. Remove any sealant residue from mating surfaces of case and extension housing (7A039). Apply a 3.18mm (1/8-inch) bead of Silicone Rubber D6AZ-19562-AA or equivalent meeting Ford specification ESB-M4G92-A or ESE-M4G195-A to case.

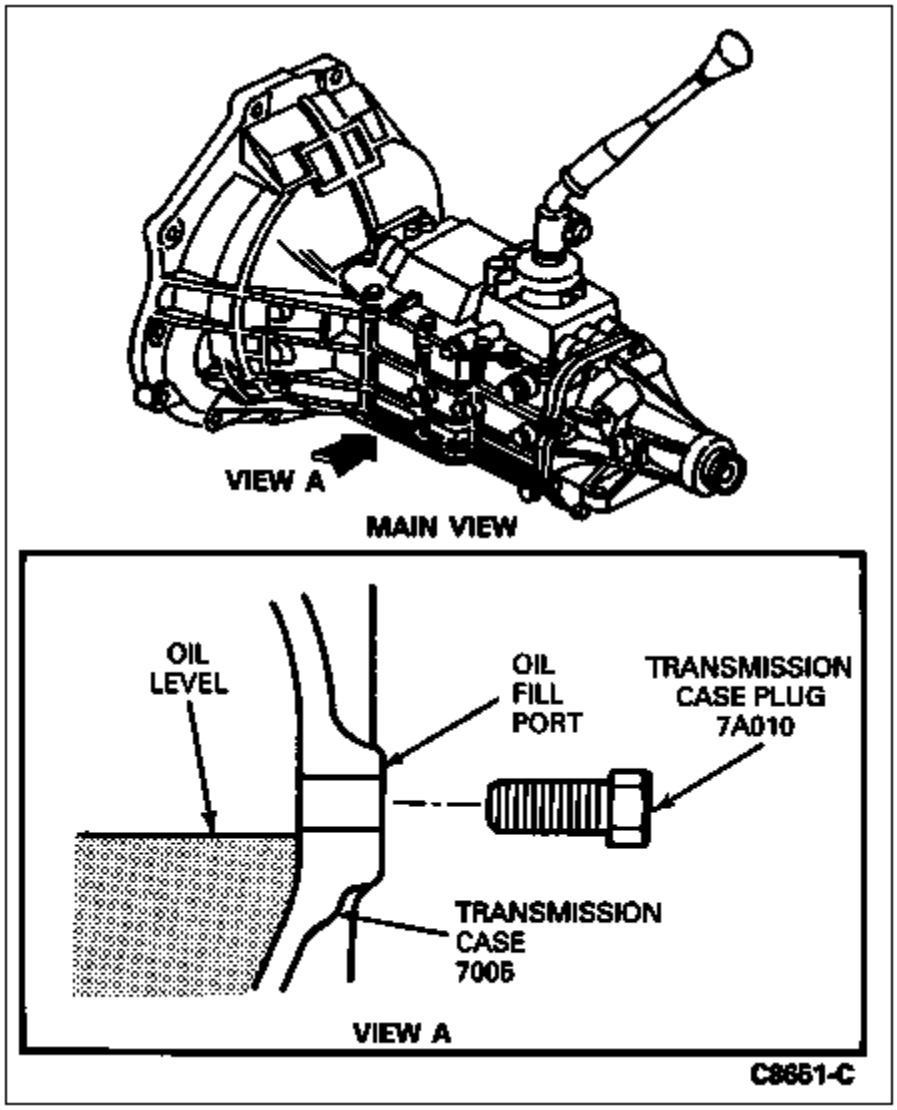
29. Place synchronizers into neutral gear position. Make sure that shift forks on case cover (7222) are in neutral gear position.

30. **NOTE: When performing this next step, do not apply sealant to mating surfaces of case cover or case. If necessary, apply a small quantity of grease to case cover gasket (7223) to retain case cover gasket in position during assembly.**

    Position new case cover gasket and case cover to case, and carefully engage shift forks with synchronizers. Install the retaining bolts (no sealant). Tighten bolts to 16-22 Nm (12-16 lb-ft).

31. Install case plug (7A010) and tighten to 40-58 Nm (30-43 lb-ft).

32. Fill transmission with specified quantity of Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX or equivalent MERCON® fluid.



Shift Lever and Boot

1. Install the retaining bolt in the shift lever hole such that the flat aligns with the mating flat on the transmission stub shaft. Push bolt fully into position. Install nut and tighten to 16-22 Nm (12-16 lb-ft).

2. Slide the gearshift lever boot into position on the shift control selector lever and housing, and install the retaining screws.

3. Install the isolator pad assembly. Install the floor pan cover and floor carpet (13000) if previously removed.

Extension Housing Bushing

SPECIAL SERVICE TOOL(S) REQUIRED

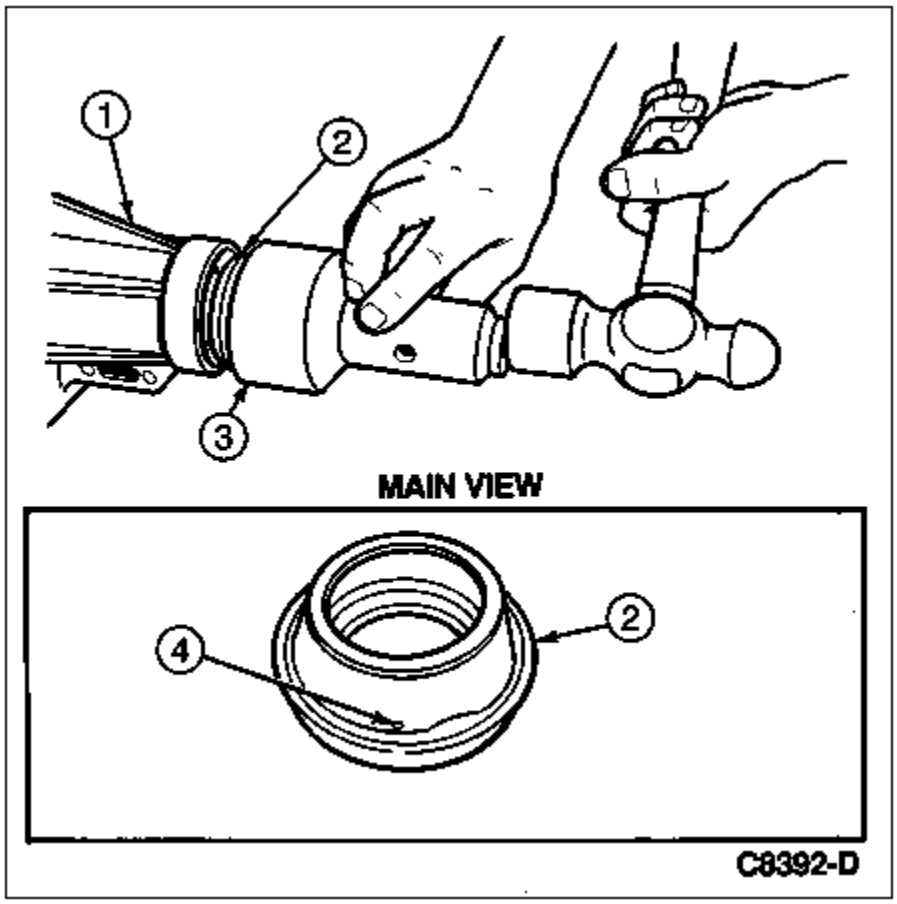
Description	Tool Number
Extension Housing Seal Replacer	T61L-7657-A

NOTE: Extension housing bushing cannot be serviced. If bushing requires service, extension housing (7A039) must be replaced as a unit.

Extension Housing

1. Position extension housing (7A039) to case and install retaining bolts. Tighten bolts to 32-46 Nm (24-34 lb-ft).

2. If removed, install input shaft (7017) and extension housing seal using Extension Housing Seal Replacer T61L-7657-A. Make sure that oil seal drain hole faces downward.



Item	Part Number	Description
1	7A039	Extension Housing
2	7052	Input Shaft and Extension Housing Seal
3	T61L-7657-A	Extension Housing Seal Replacer
4	—	Drain Hole to Face Downward (Part of 7025)

Transmission

1. Make sure that the machined mating surfaces and the locating dowels on the engine (6007) are free of burrs, dirt or paint. Check the mating face of the transmission (7003) and the locating dowel holes for burrs, dirt or paint.

2. Mount the transmission on a transmission jack such as Hi-Lift Transmission Jack 014-00942 or equivalent. Position it under the vehicle and start the input shaft (7017) into the clutch disc (7550). Align the splines on the input shaft with the splines in the clutch disc. Move the transmission forward and carefully seat the case (7005) on the locating dowels of the engine. The dowels must not shave or burr the dowel holes.

3. Install the bolts and flatwashers that attach the transmission to the engine and tighten to 38-51 Nm (28-38 lb-ft).

4. Install the starter motor (11001). Tighten the attaching bolts to specifications.

5. Raise the engine and install the rear crossmember, transmission support insulator (6068), and attaching nuts and washers. Tighten nuts to 65-85 Nm (48-63 lb-ft) for 3.0L applications. Tighten nuts to 88-115 Nm (65-85 lb-ft) for all other applications. Refer to Section 02-03 . Remove the transmission jack.

6. On 4x4 vehicles, install the transfer case (7A195) as described in Section 07-07A , Section 07-07B , Section 07-07C , or Section 07-07D .

7. On SuperCab vehicles, insert the driveshaft into theextension housing (7A039) and install the center bearing attaching nuts, washers and lockwashers. Tighten the nuts to specification.

8. Connect the driveshaft (4602) to the rear axle drive flange. Tighten the attaching nuts to specifications. Refer to Section 05-01 for torque specification.

9. Connect wires for the starter motor and backup lamp switch (15520).

10. Reinstall exhaust system (V-6 engines only). Refer to Section 09-00 .

11. Connect the hydraulic clutch hose (7T504) and bleed the system per instructions in Section 08-02 .

12. Install the speedometer cable (17260).

13. Check fluid level. Fill transmission with Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX or equivalent MERCON® fluid.

14. Remove safety stands and lower the vehicle.

15. **NOTE: When the battery has been disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM) (12A650) relearns its adaptive strategy. The vehicle may need to be driven 16 km (10 miles) or more to relearn the strategy.**

    Connect the battery ground cable (14301) to the battery terminal.

Transmission

Cleaning

NOTE: Do not clean, wash or soak transmission seals in cleaning solvent.

1. Wash all parts, except ball bearings and seals, in a suitable cleaning solvent.
2. Brush or scrape all foreign matter from the parts. Be careful not to damage any parts with the scraper.
3. Dry all parts with compressed air.

Inspection

NOTE: If a transmission case thread is damaged, service kits may be purchased from local jobbers. To service a damaged thread, refer to Case Thread Service in this section.

1. Inspect case (7005) for cracks, worn or damaged bores, stripped or damaged threads, or any other damage that could affect operation of the transmission (7003).
2. Inspect the gasket surfaces and machined mating surfaces for burrs, nicks or damage.
3. Check the vent for obstructions, and check all fluid passages for obstructions and leakage.
4. Inspect the case bushing for scores.
5. Check all parking linkage parts for wear or damage.

Case Service

1. Drill out the damaged threads, **using the same drill size as the thread outside diameter** . For example, use a 5/16-inch drill for a 5/16-18 thread.
2. Select the proper special tap and tap the drilled hole. The tap is marked for the size of the thread being repaired. Thus, the special tap marked 5/16-18 will not cut the same thread as a standard 5/16-18 tap. It does cut a thread large enough to accommodate the insert, and after the insert is installed, the original thread size (5/16-18) is restored.
3. Select the proper coil inserting tool. These tools are marked with the thread size being repaired. Place the insert on the tool and adjust the sleeve to the length of the insert being used. Press the insert against the face of the tapped hole. Turn the tool clockwise and wind the insert into the hole until the insert is one-half turn below the face.
4. Working through the insert, bend the insert tang straight up and down until it breaks off at the notch.
5. Improperly installed inserts can be removed with the extractor tool. Place the extractor tool in the insert with the blade resting against the top coil, one-quarter to one-half turn away from the end of the coil. Tap the tool sharply with a hammer until the blade cuts into the insert. Exert downward pressure on the tool and turn it counterclockwise until the insert is removed.

Extension Housing

1. **NOTE: The extension housing rear bushing cannot be serviced. If it requires service, the extension housing (7A039) must be replaced as a unit (4x2 vehicles only).**

   Inspect the extension housing for cracks.

2. Make sure that the machined mating surfaces are free from burrs, nicks, or any other damage.

   If necessary, replace the oil seal (7052) after the extension housing has been installed on the transmission (7003).

Bearings

1. Rotate the bearings in a cleaning solvent until all lubricant is removed. Hold the bearing assembly to prevent it from rotating while drying it with compressed air.

2. Lubricate the bearings with Motorcraft MERCON® Automatic Transmission Fluid XT-2-DDX or -QDX or equivalent MERCON® fluid. Wrap them in a clean, lint-free cloth or paper, until ready for use.

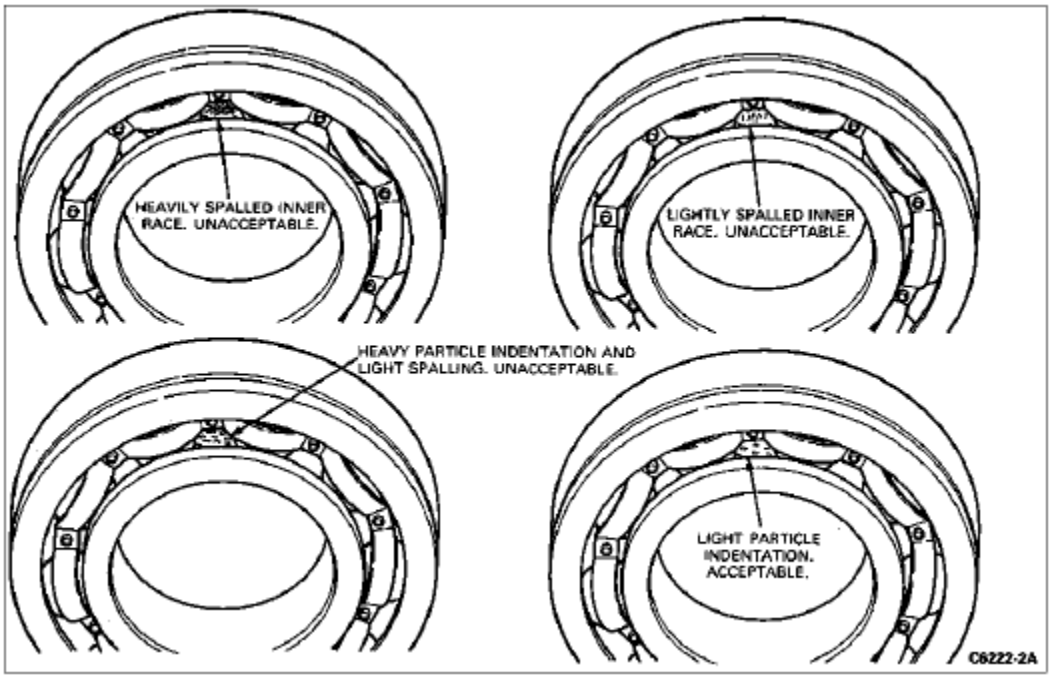
Raceways

1. **NOTE: Bearings that have been removed using special service tools may have been damaged simply due to the tool design. Be sure the following checks are made to determine if the bearing can be put back into service.**

   Inner Ring Raceway — While holding outer ring stationary, rotate inner ring at least three revolutions. Examine raceway of inner ring for pits or spalling. If pits or spalling are unacceptable, replace the bearing assembly. Light particle indentation is acceptable.

2. Outer Ring Raceway — While holding inner ring stationary, rotate outer ring at least three revolutions. Examine raceway of the outer ring from the same side as the raceway of the inner ring. If raceway is spalled or pitted, replace the bearing assembly. Light particle indentation is acceptable.

Bearing Inspection



External Surfaces

The bearing must be replaced if damage in any of the following areas is found:

1. Radial cracks on front and rear faces of outer or inner rings.
2. Cracks on outside diameter or outer ring (particularly around snap ring groove).
3. Deformation or cracks in ball cage (particularly around rivets).

Spin Test

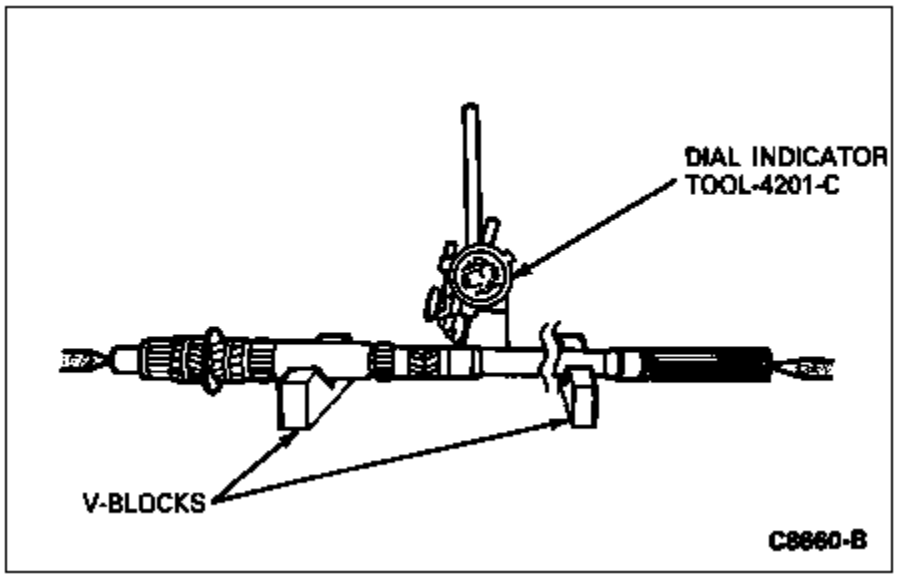
1. Lubricate bearing raceways with a slight amount of clean oil. Turn the bearing back and forth slowly until raceways and balls are coated with oil.
2. Hold bearing by inner ring in a vertical position. Vertical movement between the inner and outer rings is acceptable. Spin outer ring several times by hand (do not use compressed air). If roughness or vibration is noticeable or the outer ring stops abruptly, the bearing should be cleaned again and lubricated. Roughness in a bearing is usually caused by foreign particles in the bearing, which comes from inside the transmission case. If bearing is still rough after cleaning and relubricating three times, it must be replaced.
3. Hold bearing by the inner ring in a horizontal position with the snap ring groove up. Spin outer ring several times by hand (do not use compressed air). If bearing is still rough after cleaning and relubricating three times (if not done in Step 2), it must be replaced. If bearing passes the visual inspection and spin tests, it can be reinstalled in transmission.

Gears

Inspect the teeth of each gear. If excessively worn (scratched, very shiny, etc), broken or chipped, replace the gear. Excessive wear increases backlash, which results in noise and unacceptable operating characteristics.

Output Shaft

Check output shaft for runout by mounting the shaft between V-blocks and applying Dial Indicator with Bracketry TOOL-4201-C or equivalent to several places along shaft. The standard reading of the indicator for runout should be less then 0.05mm (0.002 inch). If runout exceeds 0.05mm (0.002 inch), replace mainshaft.

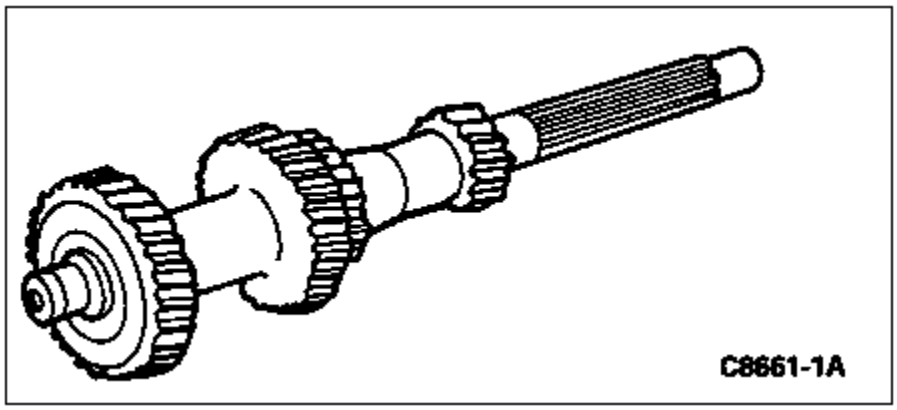


Input Shaft

Replace input shaft (7017) if splines are damaged. If needle bearing surface is worn or rough, or if other bearing contact surfaces are damaged, replace input shaft.

Countershaft

Check countershaft gear teeth and countershaft splines for wear or damage. Replace countershaft (7111) if bent, scored, or worn.



Synchronizers

1. **NOTE: Make note of the differences between the 3rd gear synchronizer blocking ring (7107) and the 1st, 2nd and 4th gear synchronizer blocking rings. The 3rd gear synchronizer blocking ring has three teeth cut out 120 degrees apart from each other. Directly adjacent to one side of the missing teeth, two teeth have been bridged together. This is to help eliminate any upshift "crunch" that may occur.**

   Inspect gear teeth on synchronizer blocking ring. If there is evidence of chipping or excessively worn teeth, replace with new parts.

2. **NOTE: First/second, third/fourth and fifth reverse synchronizer-to-gear clearance specifications are the same.**

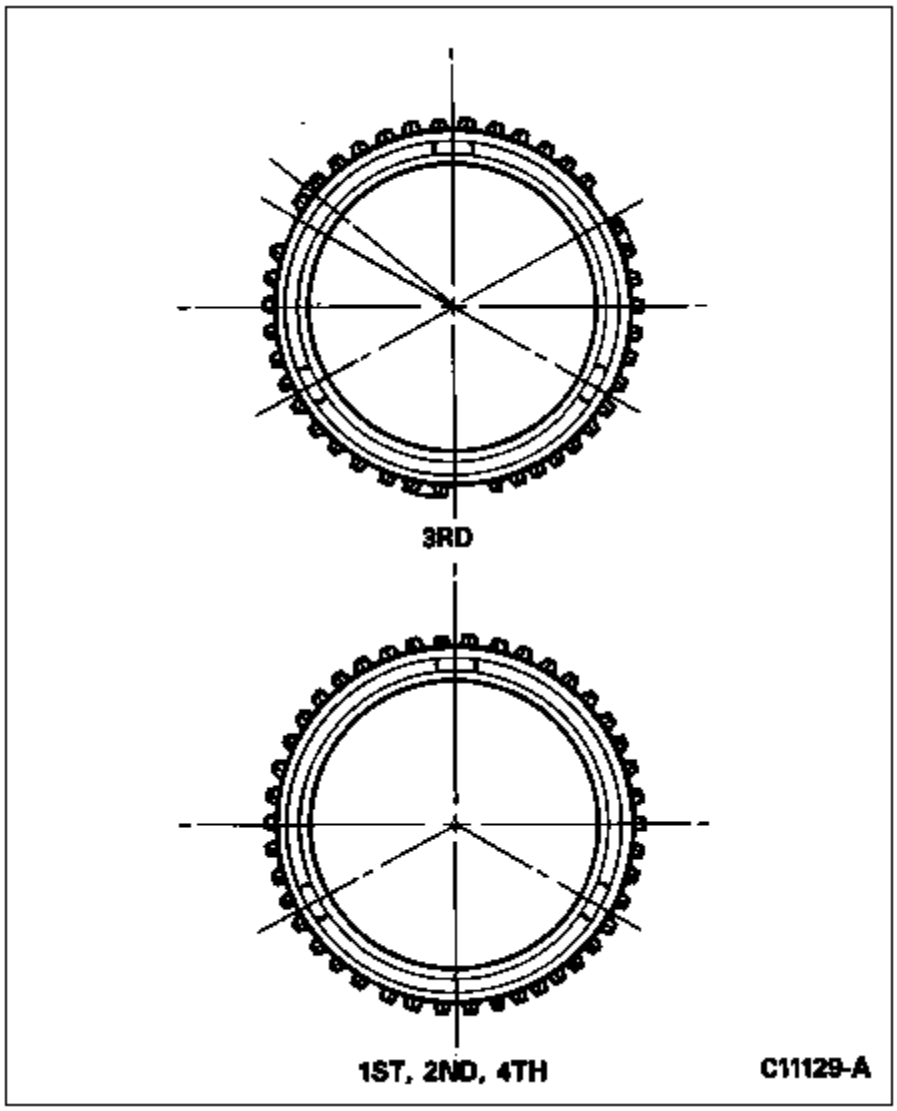
   Inspect synchronizer blocking ring for wear. To check the wear, fit synchronizer blocking ring evenly to gear cone. Measure clearance between side faces of synchronizer blocking ring and gear with a feeler gauge. If clearance is less than 0.8mm (0.031 inch), replace synchronizer blocking ring or gear.

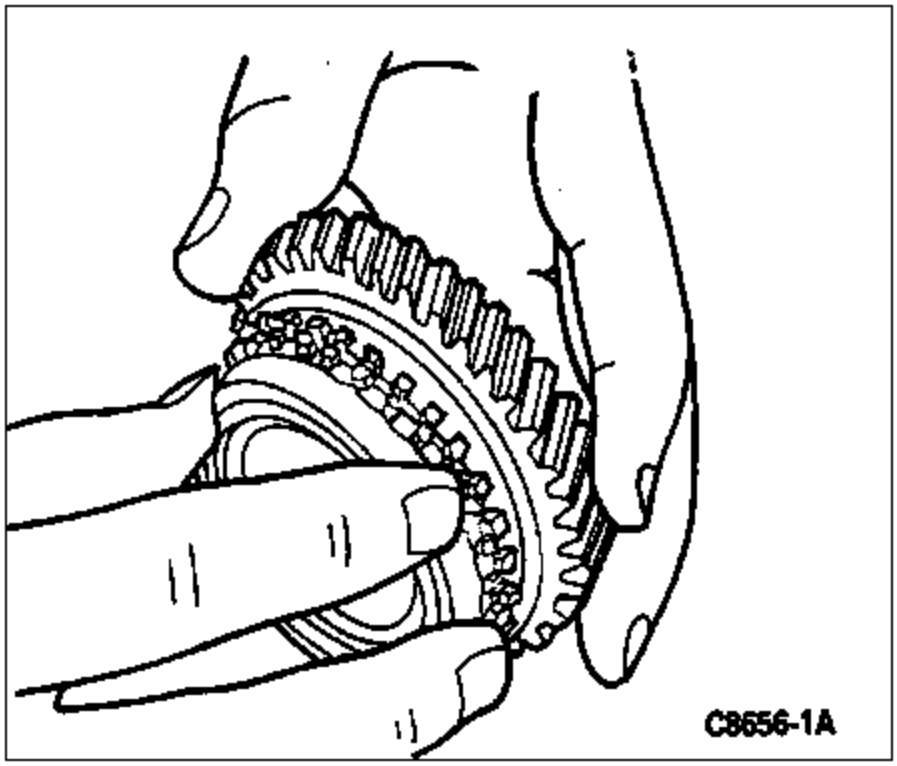
3. Inspect contact between inner surface of synchronizer blocking ring and cone surface of gear. To inspect, apply a thin coat of Prussian Blue or equivalent on cone surface of gear and fit it into the synchronizer blocking ring. If the contact pattern is poor, correct this by applying compound and lapping surfaces together.

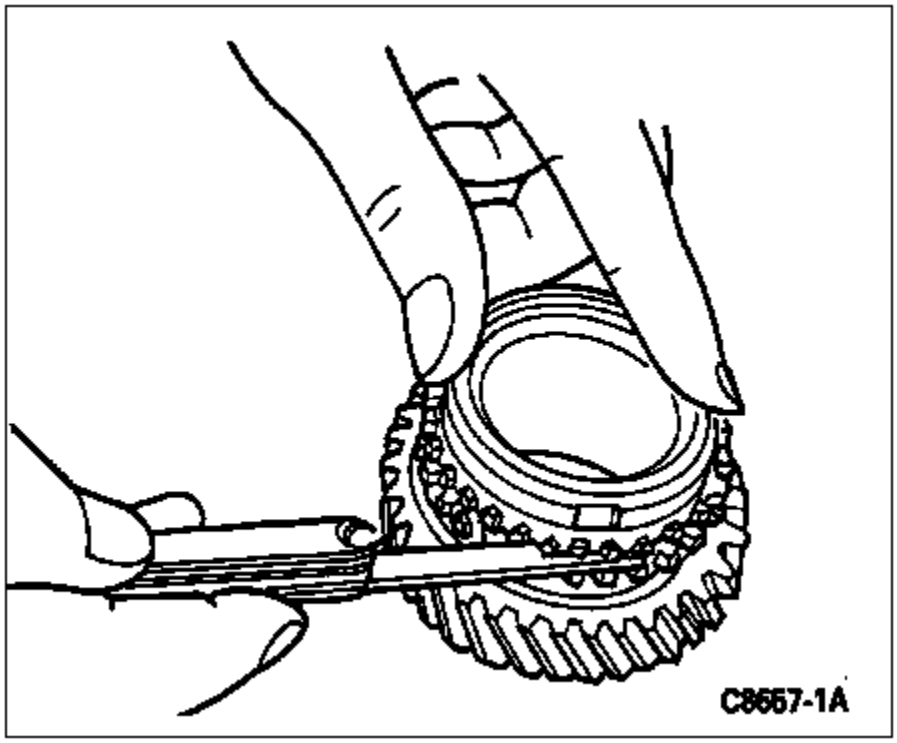
4. Make sure clutch sleeve slides easily onto clutch hub.

5. Check synchronizer hub inserts (7A044), inner surface of clutch sleeve, and insert groove on clutch hub for wear.

6. Check synchronizer insert spring for tension.

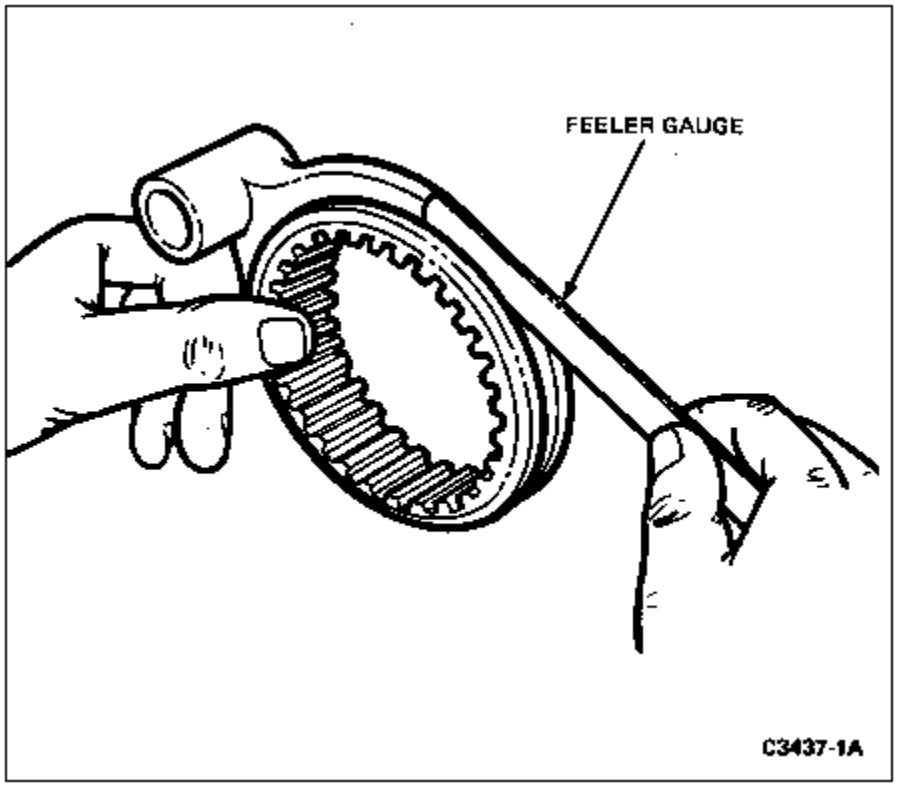






Shift Fork/Clutch Hub Sleeve

Check the contact surfaces of the shift fork and clutch hub sleeve for evidence of wear or damage. Measure from shift fork to the clutch hub sleeve. Clearance should not exceed 0.8mm (0.031 inch).



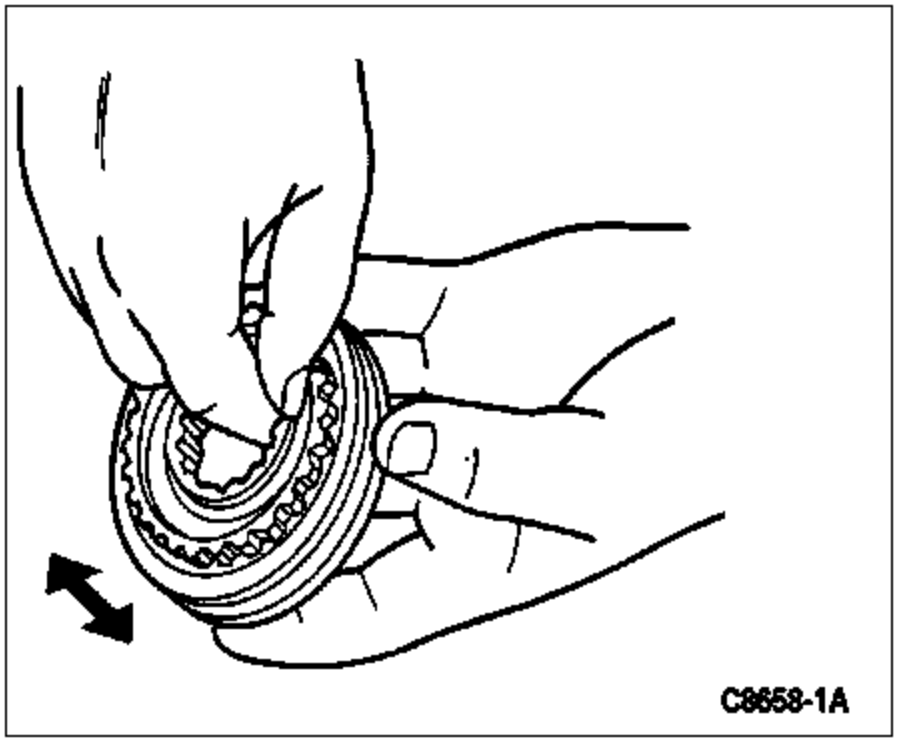
Clutch Hub

CLUTCH HUB SLEEVE-TO-SHIFT FORK CLEARANCE

Standard	Maximum
1st/2nd 0.05-0.37mm (0.0019-0.014 In.)	0.8mm (0.0314 In.)
3rd/4th 0.1-0.37mm (0.003-0.014 In.)	0.8mm (0.0314 In.)
5th/Rev. 0.1-0.37mm (0.003-0.014 In.)	0.8mm (0.0314 In.)

1. Check operation of clutch hub sleeve installed onto hub.

2. Position clutch hub and sleeve horizontally. Lift the hub approximately three-quarters of the way off the sleeve. Release the hub, and observe downward motion. Hub should slide downward into sleeve on its own. It should not be necessary to push hub into sleeve. Service as necessary.



Speedometer Gears

Check the drive gear and driven gear, and the driven gear shaft for wear or damage. Check the O-ring and oil seal for weakness or damage (4x2 vehicles only).

Thrust Washers

1. Check the surfaces of all thrust washers that are scored or reduced in thickness.

Bearing Retainers

1. Replace bearing covers that are grooved or showing wear from the thrust or adjacent bearings. Check the oil return threads in the bearing covers. If the sealing action of the threads has been destroyed by contact from the input shaft (7017) or output shaft, replace the covers.

SPECIFICATIONS

Gear Ratios

Gear	Ratio R1	Ratio R2
First	3.72	3.90
Second	2.20	2.25
Third	1.50	1.50
Fourth	1.00	1.00
Fifth	.79	.80
Reverse	3.40	3.41

Inspection Standards And Tolerance

Component	Inches	Millimeters
Mainshaft Runout Not To Exceed	0.002	0.05
Shift Fork to Clutch Sleeve Not To Exceed	0.031	0.8
Synchronizer Ring to Conical Face of Gear	0.059	1.5
Synchronizer Blocking Ring Clearance	0.031	0.8

Assembly Standards

Component	Tolerance	
	Inches	Millimeters
3rd/4th Clutch Hub Play	0.00-0.0019	0.00-0.05
Reverse Idler Gear End Play	0.0039-0.0078	0.1-0.2
5th/Rev. Hub End Play	0.00-0.0019	0.00-0.05
Counter Reverse Gear	0.0098-0.0138	0.25-0.35

Lubricant Refill Capacities

Transmission	U.S. Pints	Imperial Pints	Liters
Five-Speed Manual Overdrive Transmission (Ford Manual Transmission) Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX or -DDX (E4XZ-19582-B) or Equivalent	5.6	4.5	2.65

Torque Specifications

Description	Nm	Lb-Ft
Output Shaft Locknut	216-274	160-202
Countershaft Locknut	128-196	94-144
Extension Housing Retaining Bolts	32-46	24-34
Reverse Idler Shaft Fixing Bolt	79-117	58-86
Center Bearing Cover	18-26	14-19
Front Bearing Cover Bolts	16-22	12-16
Fifth/Reverse Cam Lockout Plate	8-10	6-7
Dust Cover	8-11	6-8
Case Cover Retaining Bolt	16-22	12-16
Case Plug	40-58	30-43
Front Oil Passage	8-10	6-8
Counter Lever Shaft Fixing Bolt	8-10	6-7
Rock Plate	8-10	6-7
Filler Plug	40-58	29-43
Backup Lamp Switch	25-35	18-26
Neutral Switch (if Equipped)	25-35	18-26
Rear Oil Passage Retaining Bolt	8-10	6-7
5th/Reverse Shift Rail Fixing Bolt	20-30	15-22
Starter, 2.3L and 3.0L Engines	20-27	15-20
Starter, 4.0L Engine	25-34	18-25
Crossmember, 3.0L Engine	65-85	48-63
Crossmember, 2.3L, 4.0L Engines	88-115	65-85
Transmission Housing to Engine	38-51	28-38
Gear Shift Lever Bolt	27-40	20-30
Rear Bearing Retainer	18-26	13-19