

Borg-Warner 1345 Transfer Case

**PART
16-86**

APPLIES TO F-250, F-350 (4x4)

SUBJECT	PAGE	SUBJECT	PAGE
DESCRIPTION	16-86-1	DISASSEMBLY AND ASSEMBLY (Cont'd.)	
DIAGNOSIS AND TESTING	16-86-1	Planetary Gear Set	16-86-7
DISASSEMBLY AND ASSEMBLY		Transfer Case	16-86-2
Case	16-86-2	REMOVAL AND INSTALLATION	16-86-1
Cover	16-86-8	SPECIFICATIONS	16-86-9

DESCRIPTION

The Borg-Warner 1345 is a two-piece all aluminum part time transfer case (Figs. 1 and 2). The unit is lubricated by a positive displacement oil pump that channels oil flow through drilled holes in the rear output

shaft. The pump turns with the rear output shaft and allows towing of the vehicle for extended distances without disconnecting the rear driveshaft.

DIAGNOSIS AND TESTING

Refer to Part 16-10, General Manual Transmission Service, for diagnosis and testing procedures.

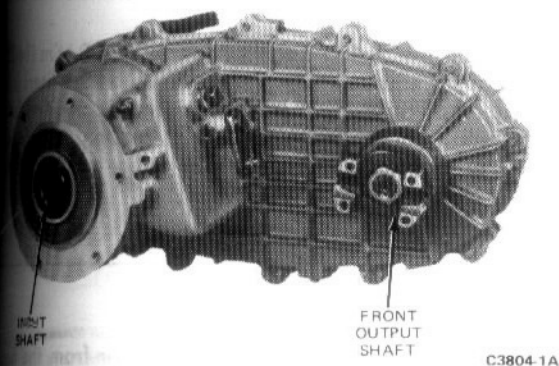


FIG. 1 Borg-Warner 1345 Transfer Case—Front View Case Half

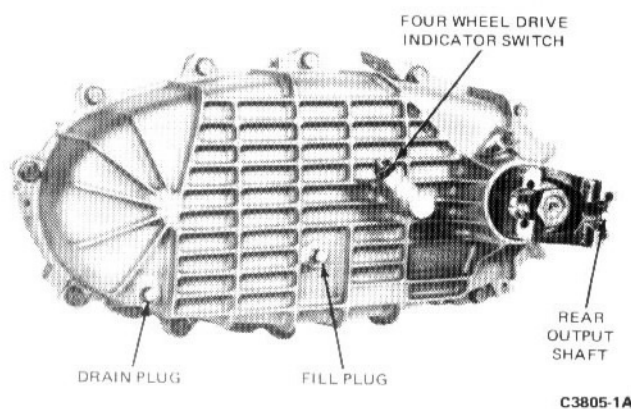


FIG. 2 Borg-Warner 1345 Transfer Case—Rear View Cover Half

REMOVAL AND INSTALLATION

Refer to Fig. 3.

Removal

Raise vehicle on a hoist.

Place a drain pan under transfer case, remove drain plug and drain fluid from transfer case.

Disconnect four wheel drive indicator switch wire connector at transfer case.

If so equipped, remove skid plate from frame.

5. Disconnect front driveshaft from front output yoke.
6. Disconnect rear driveshaft from rear output shaft yoke.
7. Disconnect speedometer driven gear from transfer case rear bearing retainer.
8. Remove retaining rings and shift rod from the transfer case shift lever and transfer case shift lever.

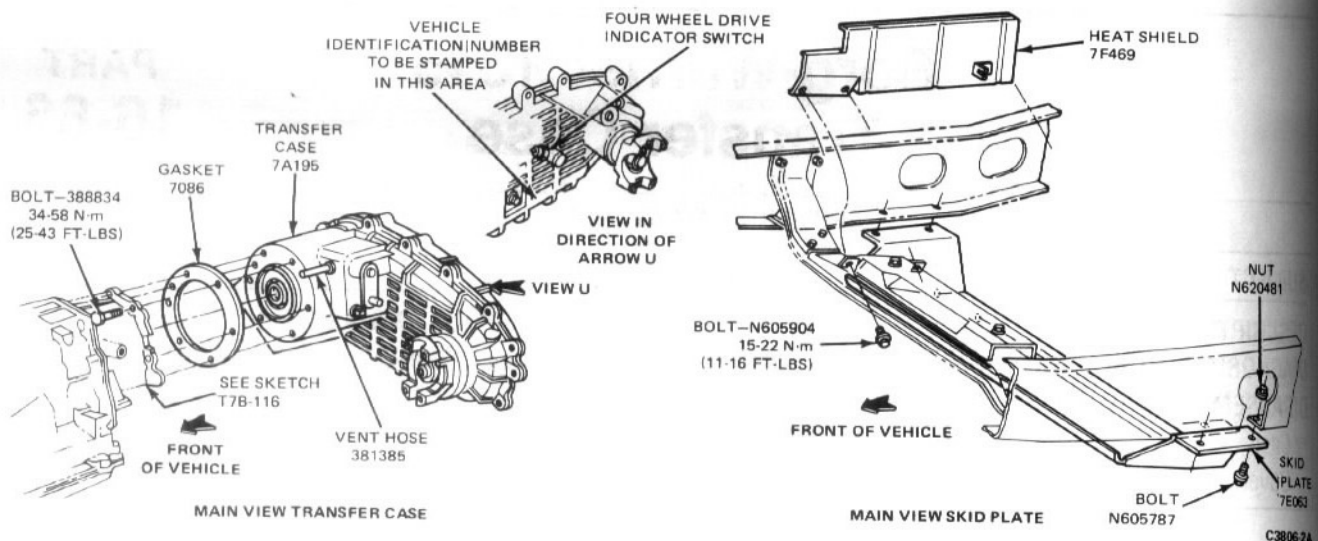


FIG. 3 Borg-Warner 1345 Transfer Case and Skid Plate Installation

9. Disconnect vent hose from transfer case.
10. Remove heat shield from frame.
CAUTION: Catalytic converter is located beside heat shield. Be careful when working around catalytic converter because of the extremely high temperatures generated by the converter.
11. Support transfer case with a transmission jack.
12. Remove the bolts retaining transfer case to transmission adapter.
13. Lower transfer case from vehicle and remove gasket between transfer case and adapter.

Installation

1. Place a new gasket between transfer case and adapter.
2. Raise transfer case with transmission jack so transmission output shaft aligns with splined transfer case input shaft. Install bolts retaining transfer case to adapter. Tighten bolts to specification.
3. Remove transmission jack from transfer case.
4. Connect rear driveshaft to rear output shaft yoke. Tighten nut to specifications.
5. Install shift lever to transfer case. Install retaining nut.
6. Connect speedometer driven gear to transfer case.
7. Connect four wheel drive indicator switch wire connector at transfer case.
8. Connect front driveshaft to front output yoke. Tighten nut to specifications.
9. Position heat shield to frame crossmember and mounting lug on transfer case. Install and tighten bolts to specification.
10. Install skid plate to frame. Tighten nuts and bolts to specification.
11. Install drain plug and tighten to 19-29 N·m (14-22 ft. lb). Remove filler plug and install 2.9 liters (6.0 pints) of automatic transmission fluid meeting Ford specification ESP-M2C138-CJ, or Dexron II, Series D or equivalent. Install filler plug and tighten to 19-29 N·m (14-22 ft. lb).
12. Lower vehicle.

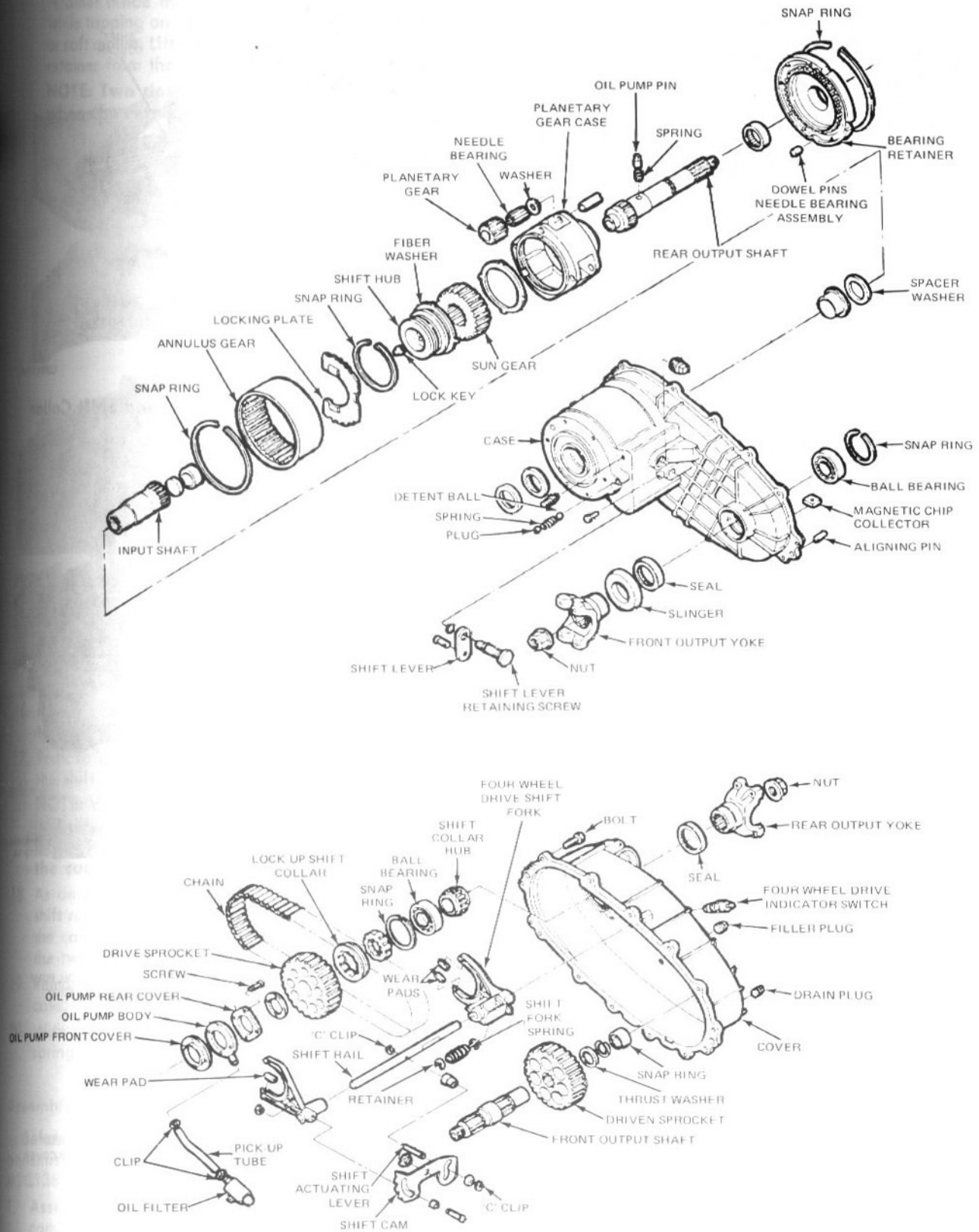
DISASSEMBLY AND ASSEMBLY

TRANSFER CASE

Refer to Fig. 4.

Disassembly

1. Remove transfer case from vehicle as described in this Part.
2. Drain fluid from case by removing filler plug from case half (Fig. 1).
3. Remove both output shaft yoke nuts and remove the rear output yoke and the front output yoke.
4. Remove the four-wheel drive indicator switch.
5. Separate the cover from the case by removing the attaching bolts. Pry the case and cover apart by inserting a flat-blade screwdriver or 1/2 inch square drive ratchet or breaker bar in the pry bosses (Fig. 5).
6. Remove the magnetic chip collector from the boss in the bottom of the case half.
7. Slide the shift collar hub off the rear output shaft (Fig. 6).
8. Compress the shift fork spring (Fig. 7) and remove the upper and lower spring retainers from the shaft.
9. As an assembly lift out from the case the four-wheel drive lockup fork and the lockup shift collar (Fig. 8). Remove the thrust washer. Be careful not to lose the nylon wear pads on the lockup fork.
10. Remove the snap ring from the front output shaft and remove the thrust washer.
11. Grip the chain and both sprockets, (Fig. 9) and lift straight up to remove the drive sprocket, driven sprocket and chain from the output shafts.
12. Lift the front output shaft out from the case.



C3807 2A

FIG. 4 Borg-Warner 1345 Transfer Case Exploded View

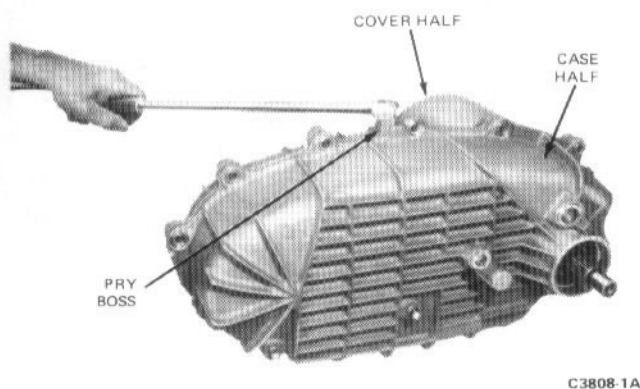


FIG. 5 Separating Case and Cover Halves

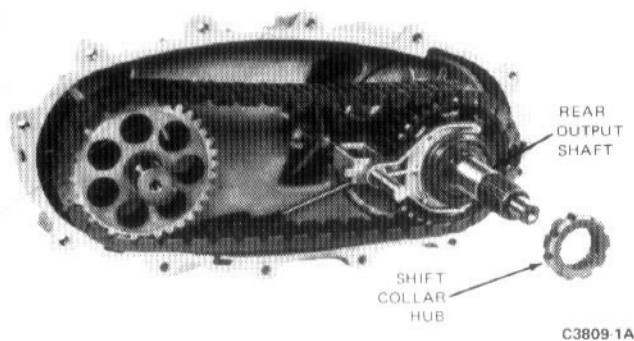


FIG. 6 Removing Shift Collar Hub

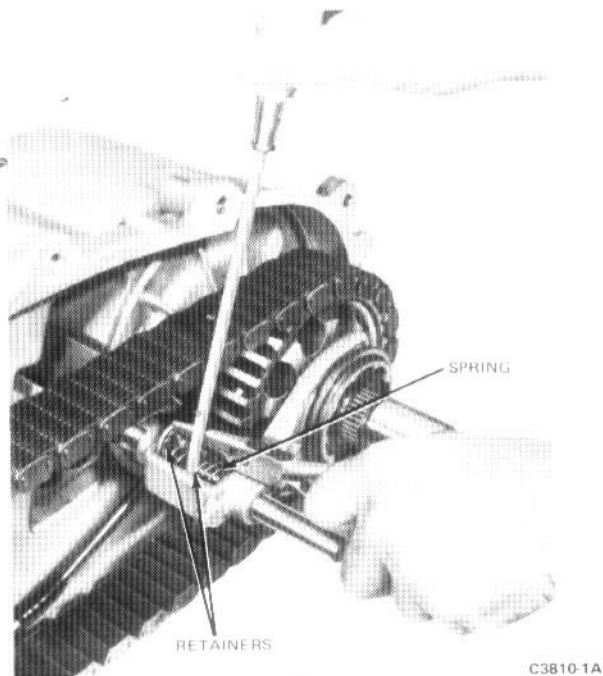


FIG. 7 Removing Spring Retainers

13. Remove the four oil pump attaching screws and remove the oil pump rear cover, pickup tube, filter and pump body, two pump pins, pump spring, and oil pump front cover from the rear output shaft (Fig. 10).

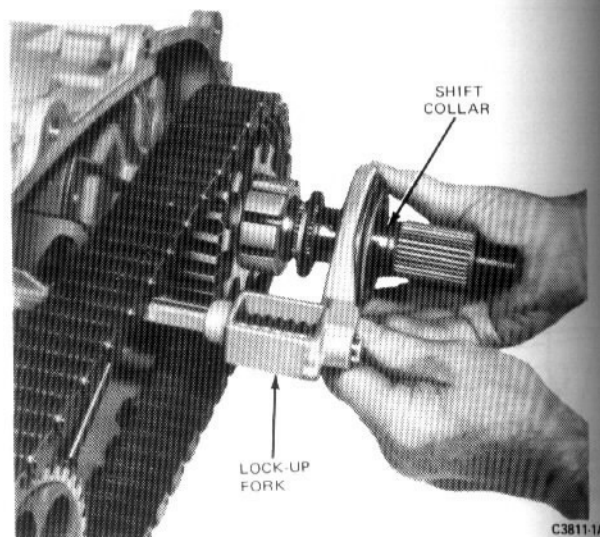


FIG. 8 Removing Lock-up Fork and Shift Collar

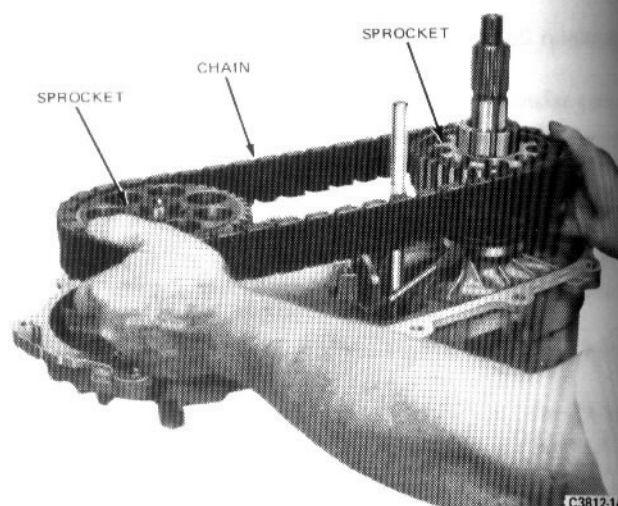


FIG. 9 Removing Sprockets and Chain

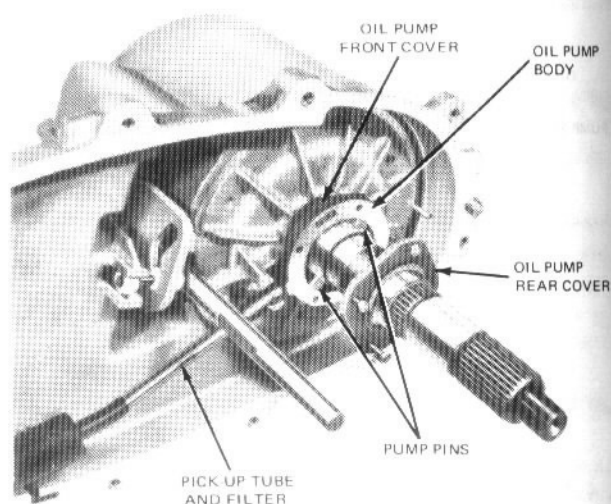


FIG. 10 Removing Oil Pump Assembly

14. Remove the snap ring that holds the bearing retainer inside the case. Lift the rear output shaft while tapping on the bearing retainer with a plastic or soft mallet. Lift the rear output shaft and bearing retainer from the case (Fig. 11).

NOTE: Two dowel pins will fall into the case when the retainer is removed.



C3814-1A

FIG. 11 Removing Rear Output Shaft

15. Remove the rear output shaft from the bearing retainer. If necessary, press the needle bearing assembly out from the bearing retainer.
16. Remove the C-clip that holds the shift cam (Fig. 12) to the shift actuating lever inside the case.
17. Remove the shift lever retaining screw and remove the shift lever from the case.

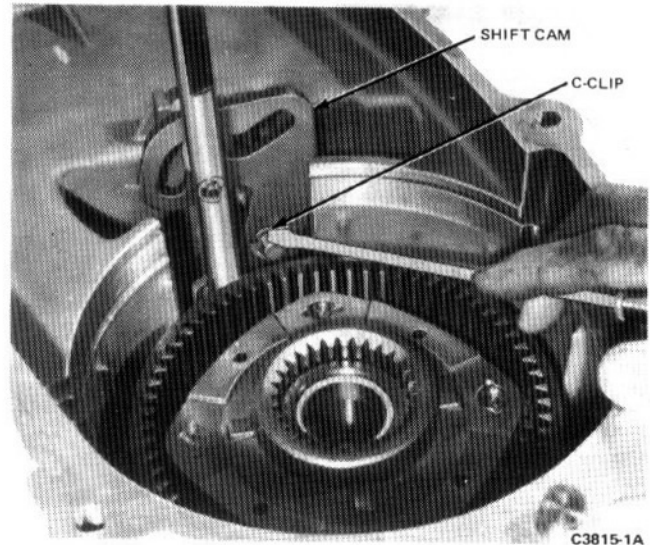
NOTE: When removing the lever, the shift cam will disengage from the shift lever shaft and may release the detent ball and spring from the case.

18. As an assembly, remove the planetary gear set, shift rail, input shaft and shift forks from the case (Figs. 13 and 14). Be careful not to lose the two nylon wear pads on the shift fork.
19. Remove the spacer washer from the bottom of the case.
20. With a drift, drive out the plug from the detent spring bore (Fig. 15).

Assembly

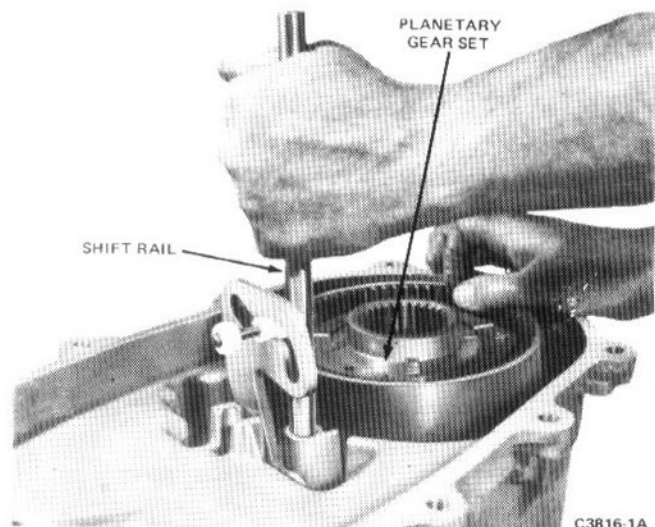
Before assembly, lubricate all part with automatic transmission fluid meeting Ford specification ESP-M2C138-CJ or Dexron II, Series D or equivalent.

1. Assemble the planetary gear set, shift rail, shift cam, input shaft and shift fork together as a unit (Fig. 16). Make sure the boss on the shift cam is installed toward the case. Install the spacer washer on the input shaft.
2. Place the rear output shaft in the planetary gear set, making sure the shift cam engages the shift fork actuating pin (Fig. 17).



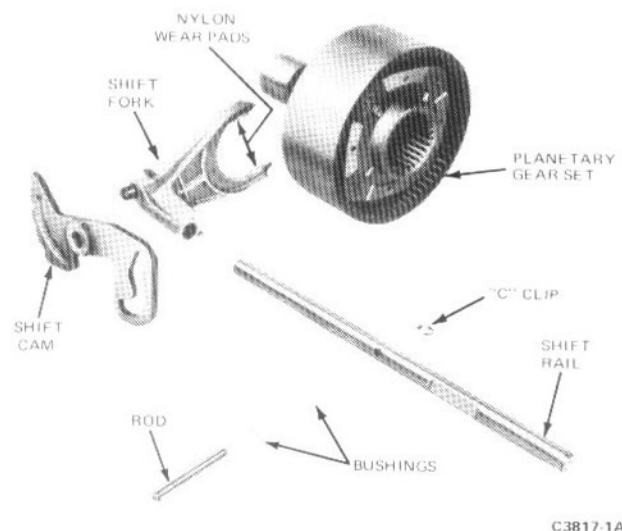
C3815-1A

FIG. 12 Removing Shift Cam C-Clip



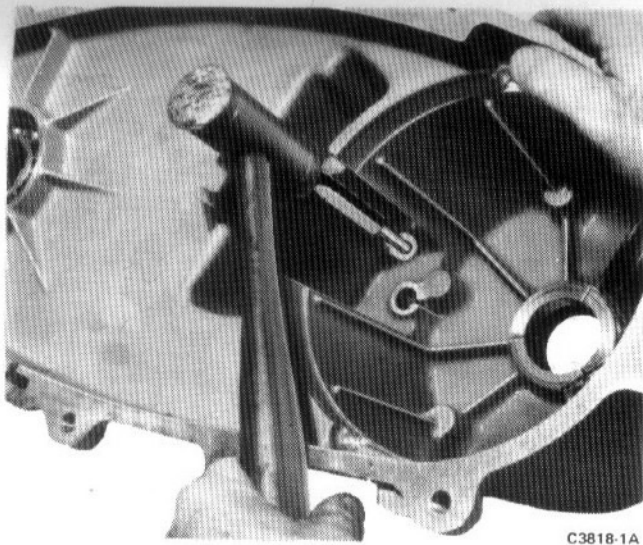
C3816-1A

FIG. 13 Removing Shift Rail



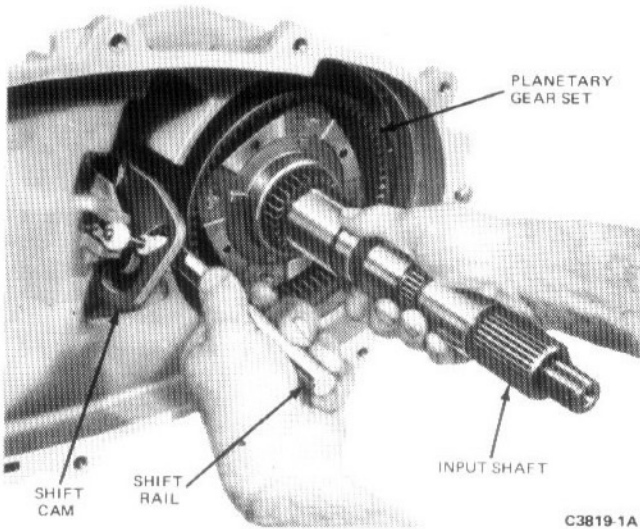
C3817-1A

FIG. 14 Shifter Mechanisms



C3818-1A

FIG. 15 Removing Detent Ball Plug



C3819-1A

FIG. 16 Installing Planetary Gear Set and Shifter Mechanism

3. Lay the case on its side. Insert the rear output shaft and planetary gear set into the case. Make sure the spacer washer remains on the input shaft.
4. Install the shift rail into the hole in the case. Install the outer roller bushing into the guide in the case.
5. Remove the rear output shaft and position the shift fork in neutral.
6. Place the shift control lever shaft through the cam, and install the clip ring. Make sure the shift control lever is pointed downward and is parallel to the front face of the case.
7. Check shift fork and planetary gear engagement. Unit should operate freely without any binding.
8. If removed during disassembly, press new needle bearing into the bearing retainer using Tool T80T-7127-C.
9. Insert output shaft through the bearing retainer from the bottom side outward.

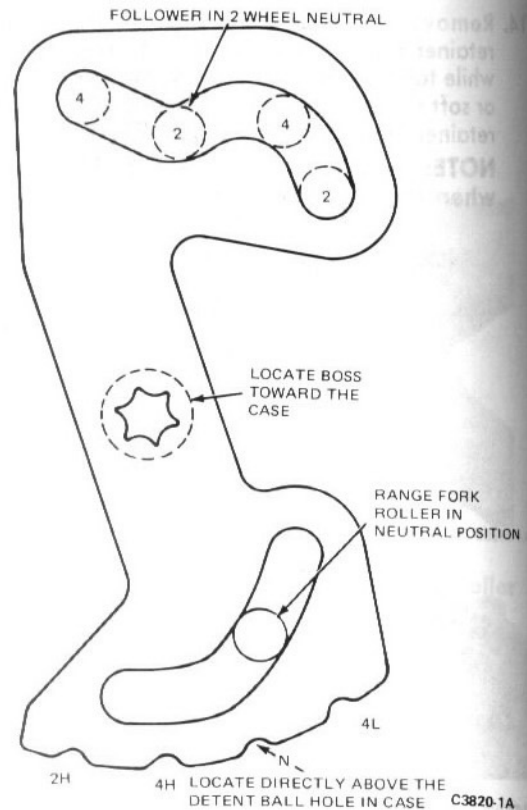


FIG. 17 Connect Shift Cam Engagement

10. Insert the rear output shaft pilot into the input shaft rear bushing. Align the dowel holes and lower the bearing into position.
11. Install dowel pins. Install snap ring that retains the bearing retainer in case.
12. Insert detent ball and spring in detent bore in case half (Fig. 18). Coat the seal plug with RTV sealant or equivalent. Drive plug into case until the lip of the plug is 0.79mm (1/32 inch) below the surface of the case. Peen the case over the plug in two places.
13. Install the oil pump front cover over the output shaft with the flanged side down. The word "Top" must be facing the top of the transfer case as the position the case is installed in the vehicle.
14. Install the oil pump spring and two pump pins with the flat side outward in the hole in the output shaft. Push in both pins to install the oil pump body, pickup tube and filter.
15. Place the oil pump rear cover on the output shaft with the flanged side outward. The word "Top" is positioned toward the top of the transfer case in the position the transfer case is installed in the vehicle. Apply Loctite or equivalent to oil pump bolts and install in pump cover. Tighten to 4.0-4.5 N·m (36-40 in-lb).
16. Install the thrust washer on the rear output shaft next to the oil pump.
17. Place drive sprocket on front output shaft. Install snap ring and thrust washer.
18. Install chain on drive sprocket and driven sprocket. Lower the chain and sprockets into position in the

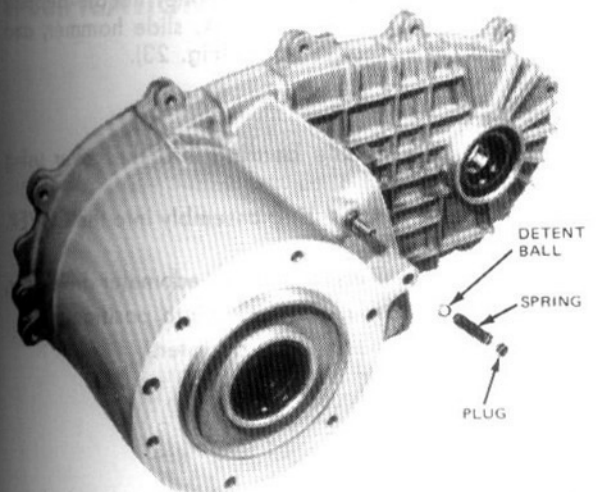


FIG. 18 Installing Detent Ball

case. The driven sprocket is installed through the front output shaft bearing and the drive sprocket is placed on the rear output shaft.

19. Engage the four-wheel drive shift fork on the shift collar. Slide the shift fork over the shift shaft and the shift collar over the rear output shaft. Make sure the nylon wear pads are installed on the shift fork tips and that the necked down part of the shift collar is facing rearward.
20. Push the four-wheel drive shift spring downward and install the upper spring retainer. Push the spring upward and install the lower retainer.
21. Install the shift collar hub on the rear output shaft.
22. Apply a bead of RTV sealant or equivalent on the case mounting surface. Lower the cover over the rear output shaft. Align the shift rail to its blind hole in cover. Make sure the front output shaft is fully seated in its support bearing. Install attaching bolts and tighten to 55-61 N·m (40-45 ft. lb). Allow one hour curing time for gasket material prior to operating vehicle.
23. Install the four-wheel drive indicator switch. Torque to 11-16 N·m (8-12 ft. lbs).
24. Press an oil slinger on the front yoke. Install front and rear output shaft yokes. Coat nuts with Loctite or equivalent and tighten to 136-176 N·m (100-130 ft. lb).
25. Refill transfer case with 2.9 liters (6.0 pints) of automatic transmission fluid meeting Ford specification ESP-M2C138-CJ, or Dexron, Series II, or equivalent. Tighten level and drain plugs to 9-18 N·m (6-14 ft. lb). Tighten fill plug to 21-33 N·m (15-25 ft. lb).
26. Install transfer case in vehicle as described in this Part.
27. Start engine and check transfer case for correct operation. Stop engine and check fluid level. Fluid should drip from level hole. If fluid flows out level hole in a stream, the pump may not be operating properly.

PLANETARY GEAR SET

Disassembly

1. Slide the input shaft rearward out of the planetary gear set (Fig. 19).
2. Remove the snap ring from the annulus gear. Remove the shift hub and planetary gear case from the annulus gear.
3. Unlock the locking plate (Fig. 20) from the hub. Remove the shift hub snap ring and "T" shaped lock key. Lift the shift hub from the assembly (Fig. 21).
4. Remove the outer fiber washer, sun gear and inner fiber washer (Fig. 21). Rotate inner fiber washer slightly upon removal to allow positioning tabs to clear planetary gears. Replace fiber washers upon assembly.

Assembly

1. Place a new inner fiber washer into the planetary gear housing.
2. Install sun gear.
3. Coat new outer fiber washer with vaseline or equivalent. Install outer washer on hub.

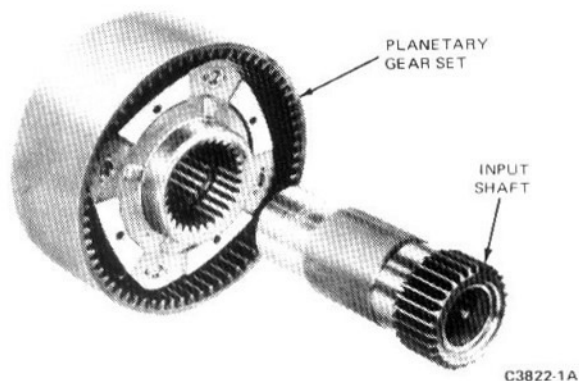


FIG. 19 Removing Input Shaft From Planetary Gear Set

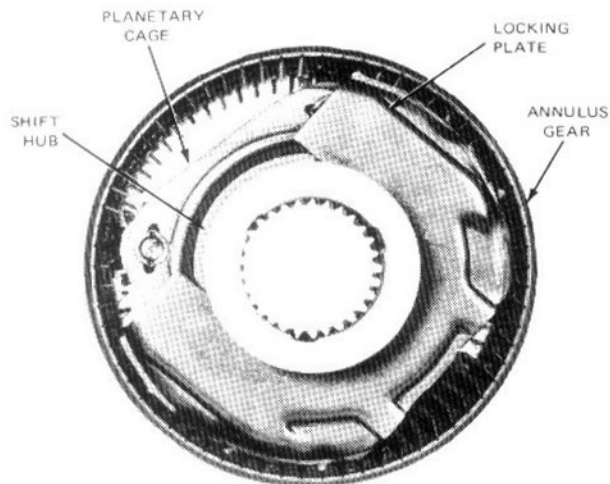


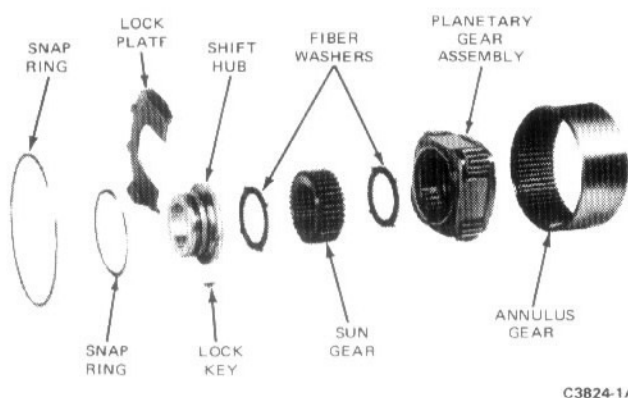
FIG. 20 Lock Plate Removal

- Place hub in planetary gear cage and install "T" shape lock key and snap ring.
- Install locking plate, with dished side toward the planetary gear set, on the shift hub.
- Lower the planetary assembly into the annulus gear. Be sure the tabs on the locking plate engage the annulus gear teeth. Install snap ring.

COVER

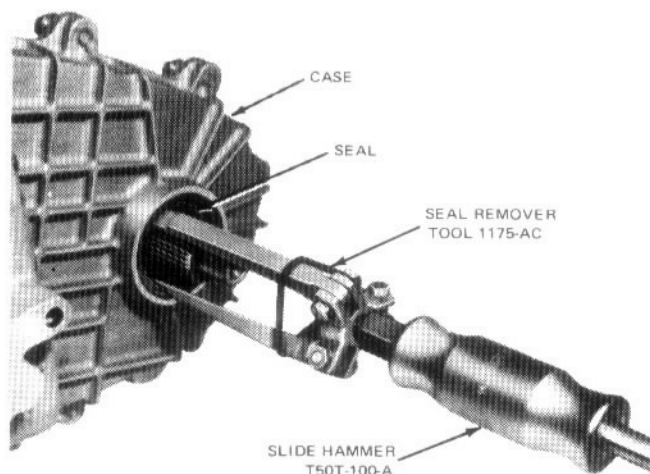
Disassembly

- Remove snap ring retaining the rear output shaft ball bearing assembly in the cover.
- Turn cover over and remove the rear output shaft seal with T50T-100-A, slide hammer, and Tool 1175-AG, seal remover (Fig. 22).
- Remove speedometer drive gear.
- Press the rear output shaft ball bearing out from the cover.
- Remove speedometer gear adapter.



C3824-1A

FIG. 21 Planetary Gear Set



C3825-1A

FIG. 22 Removing Front Output Shaft Seal From Case

- Remove front output shaft inner needle bearing from cover with T50T-100-A, slide hammer, and OTC 33864, seal remover (Fig. 23).

Assembly

- Press a new needle bearing into the cover using Tool T80T-7127-B.
- Press a new ball bearing assembly into the COVER. Install snap ring.
- Turn cover over and install speedometer drive gear.
- Install new output shaft seal into position.
- Install speedometer gear adapter.

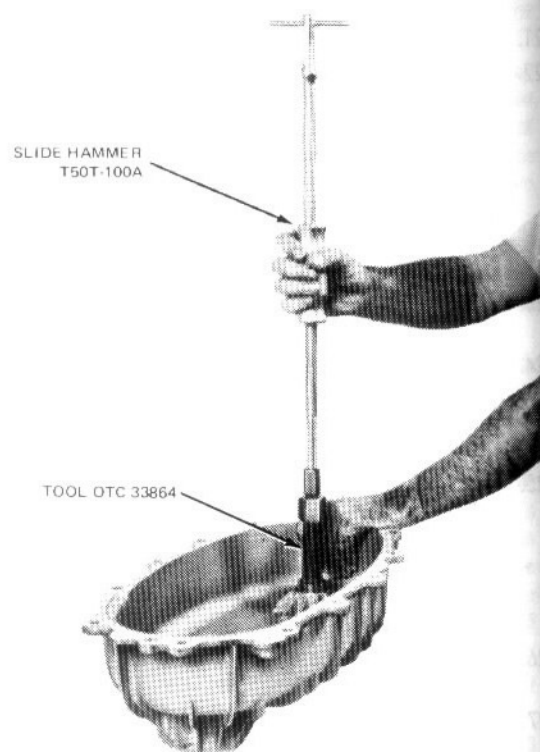
CASE

Disassembly

- Remove snap ring retaining front output shaft ball bearing assembly in case.
- Remove output shaft seal and both input shaft seals.
- Press the front output shaft bearing and input shaft bushing from the case.

Assembly

- Press new input shaft bushing into case. Make sure lug is in downward position.
- Install new output shaft ball bearing. Install snap ring.
- Press both input shaft seals into case.
- Press front output shaft seal into case.



C3826-1A

FIG. 23 Removing Needle Bearing

SPECIFICATIONS**SPECIAL TOOLS**

Number	Description
T80T-7127-B	Front Output Shaft Bearing Replacer
T80T-7127-C	Rear Output Shaft Bearing Replacer
D80L-100-T	Blind Hole Puller
D80L-100-H	Blind Hole Puller
TOOL 1175-AC	Seal Remover
T50T-100-A	Slide Hammer
OTC-33864	Seal Remover

CC3876-1A

New Process Gear 208 Transfer Case

**PART
16-82**

APPLIES TO BRONCO, F-150 — F-250

SUBJECT	PAGE	SUBJECT	PAGE
ADJUSTMENTS	16-82-1	DISASSEMBLY AND ASSEMBLY (Cont'd.)	
DESCRIPTION	16-82-1	Front Output Shaft	16-82-8
DIAGNOSIS AND TESTING	16-82-1	Rear Bearing Retainer	16-82-8
DISASSEMBLY AND ASSEMBLY		Rear Case Half	16-82-8
Transfer Case	16-82-4	REMOVAL AND INSTALLATION	16-82-2
Front Case Half	16-82-8	SPECIFICATIONS	16-82-9

DESCRIPTION

The New Process 208 is a part-time transfer case. The case itself is a two piece aluminum housing. On the front case half, (Fig. 1) the front output shaft, front input shaft, four-wheel drive indicator switch, and shift lever

assembly are located. On the rear case half, (Fig. 2) the rear output shaft, bearing retainer, and drain and fill plugs are located.

DIAGNOSIS AND TESTING

For diagnosis and testing procedures, refer to Part 16-10, General Manual Transmission Service.

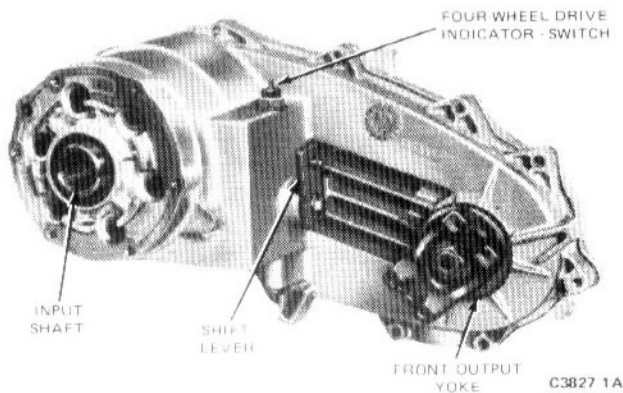


FIG. 1 NPG 208 Front Case Half

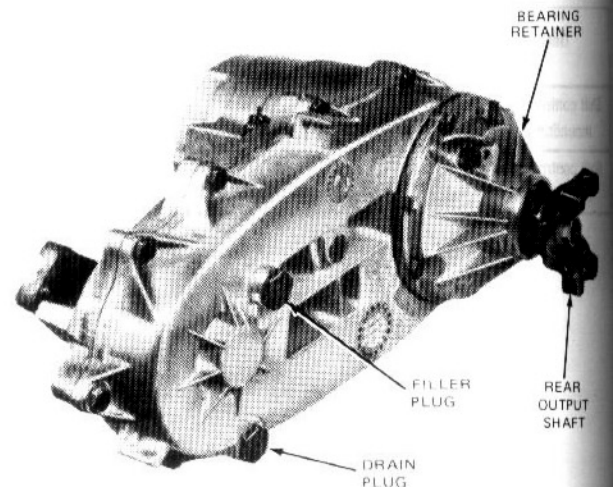


FIG. 2 NPG 208 Rear Case Half

ADJUSTMENTS

Fluid Level Check

Remove fill plug from rear case half. Fluid level should be just below the fill plug. If fluid is below the

level, fill with automatic transmission fluid meeting Ford specification ESP-M2C138-CJ, or Dexron II Series D or equivalent to correct level.

REMOVAL AND INSTALLATION

Refer to Fig. 3.

Removal

1. Raise vehicle on a hoist.
2. Place a drain pan under transfer case, remove drain plug and drain fluid from transfer case.
3. Disconnect four wheel drive indicator switch wire connector at transfer case.
4. Disconnect speedometer driven gear from transfer case rear bearing retainer.
5. Remove nut retaining transmission shift lever assembly to transfer case.
6. If so equipped, remove skid plate from frame.
7. Remove heat shield from frame.

CAUTION: Catalytic converter is located beside the heat shield. Be careful when working around catalytic converter because of the extremely high temperatures generated by the converter.

8. Support transfer case with transmission jack.
9. Disconnect front driveshaft from front output shaft yoke.
10. Disconnect rear driveshaft from rear output shaft yoke.
11. Remove the bolts retaining transfer case to transmission adapter. Remove gasket between transfer case and adapter.
12. Lower transfer case from vehicle.

Installation

1. Place a new gasket between transfer case and adapter.
2. Raise transfer case with transmission jack so transmission output shaft aligns with splined transfer case input shaft. Install bolts retaining transfer case to adapter. Tighten bolts to specification.
3. Connect rear driveshaft to rear output shaft yoke. Tighten nut to specifications.
4. Connect front driveshaft to front output yoke. Tighten nut to specifications.
5. Remove transmission jack from transfer case.
6. Position heat shield to frame crossmember and mounting lug on transfer case. Install and tighten bolts and screw to 15-21 N·m (11-16 ft-lbs).
7. Install skid plate to frame. Tighten nuts and bolts to specification.
8. Install shift lever to transfer case. Install retaining nut.
9. Connect speedometer driven gear to transfer case.
10. Connect four-wheel drive indicator switch wire connector at transfer case.
11. Install drain plug. Remove filler plug and install 2.8 liters (six pints) of automatic transmission fluid meeting Ford specification ESP-M2C138-CJ or Dexron II, Series D or equivalent. Install filler plug.
12. Lower vehicle.

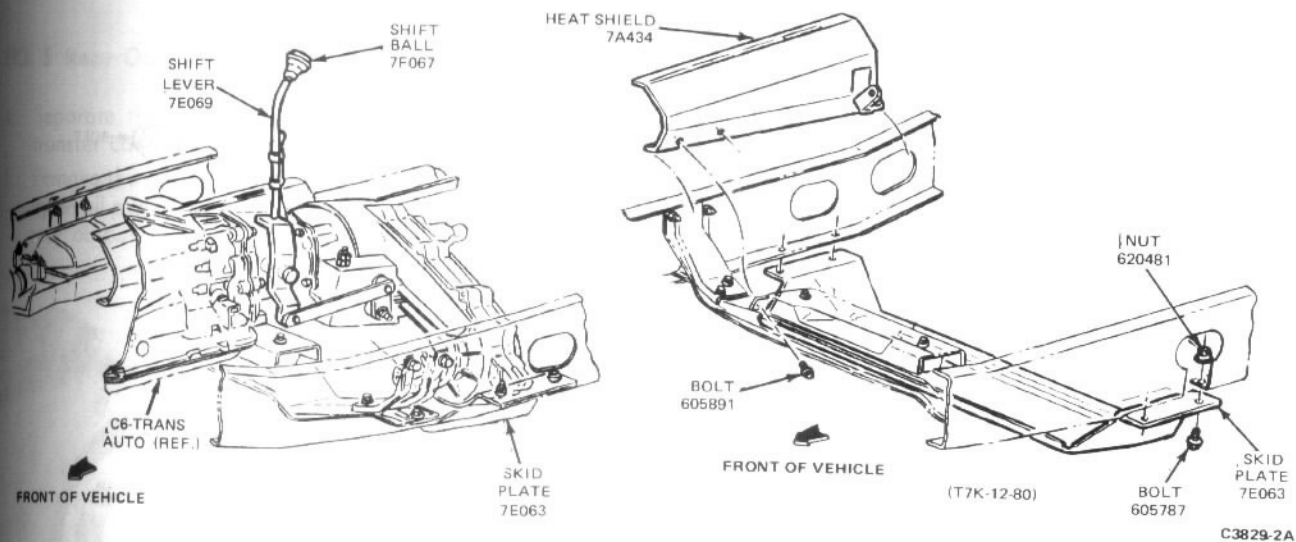


FIG. 3 Transfer Case Installation

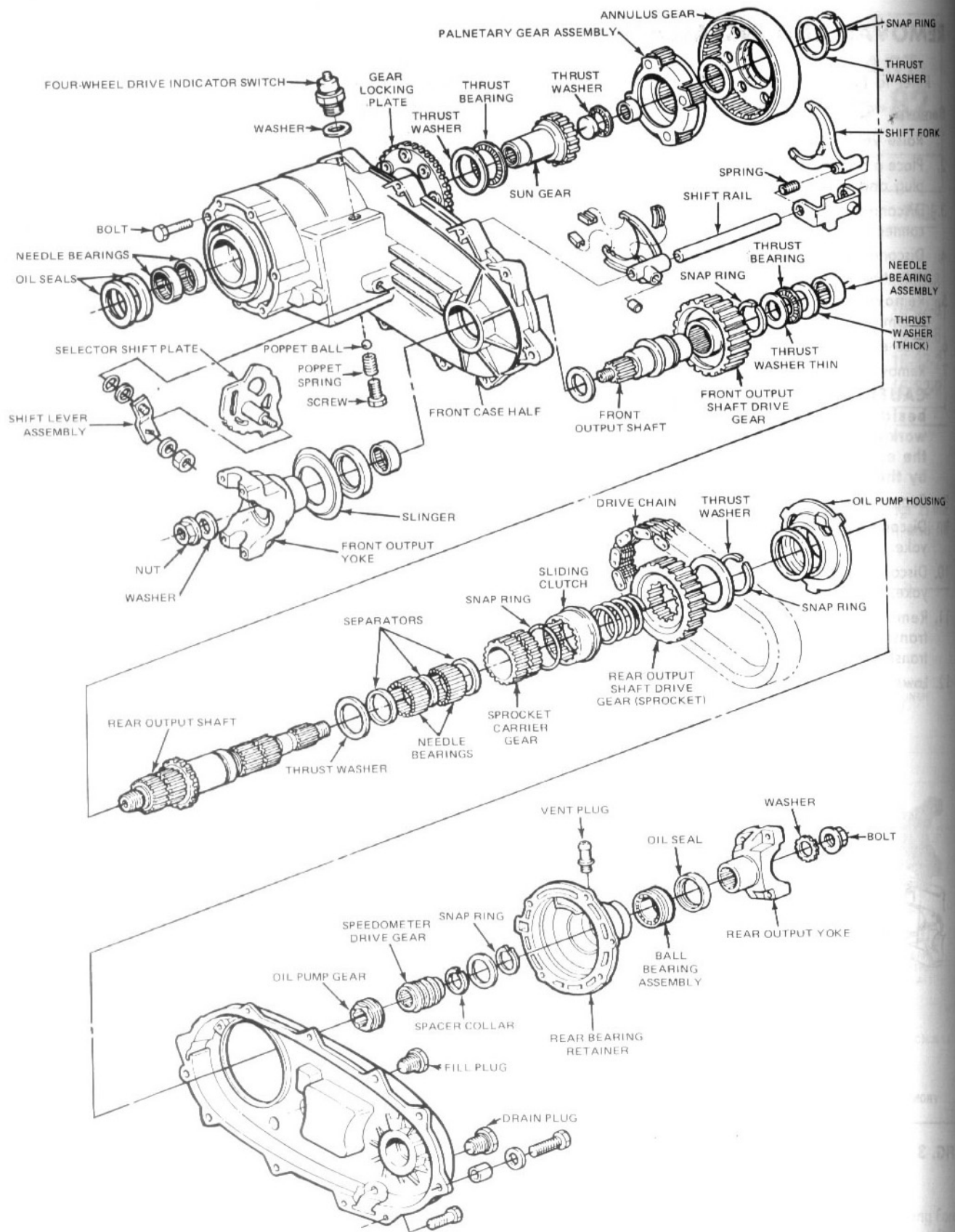


FIG. 4 NPG 208 Transfer Case—Exploded View

DISASSEMBLY AND ASSEMBLY

NEW PROCESS GEAR 208 TRANSFER CASE

Refer to Fig. 4.

Disassembly

1. Remove the transfer case from the vehicle as described in this part.
2. Position transfer case on work bench or suitable work table. If lubricant was not drained from transfer case during removal, drain fluid. Remove drain plug from the rear case half and drain fluid into a suitable container.
3. From both output yokes (front and rear), remove the attaching nuts, and remove yokes and sealing washers (Fig. 5).

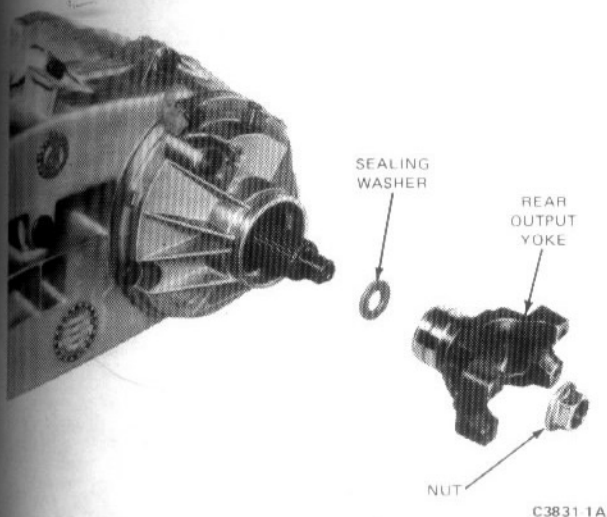


FIG. 5 Rear Output Yolk

4. Separate the rear bearing retainer from the rear transfer case half by removing the four bolts.
5. Remove the retaining ring, speedometer drive gear, nylon oil pump housing, and oil pump gear from the rear output shaft (Fig. 6).

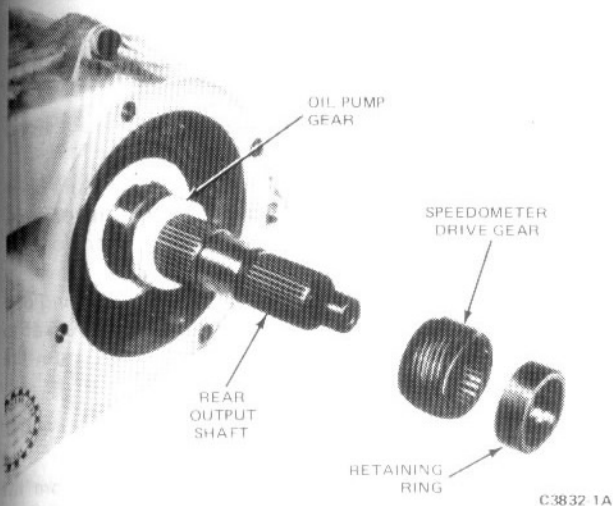


FIG. 6 Speedometer and Oil Pump Assemblies

6. Separate the transfer case by removing the eleven bolts. The case halves may be separated by inserting a flat blade screwdriver in the pry slots on the case housing (Fig. 7). With the case halves separated, remove the magnetic chip collector from the bottom of the rear transfer case half.

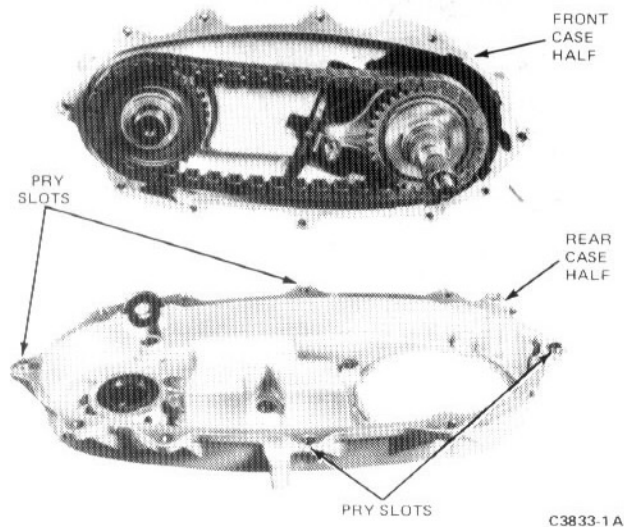


FIG. 7 Case Halves Assemblies

7. Slide the thick thrust washer, thrust bearing and thin thrust washer off the front output shaft assembly (Fig. 8).

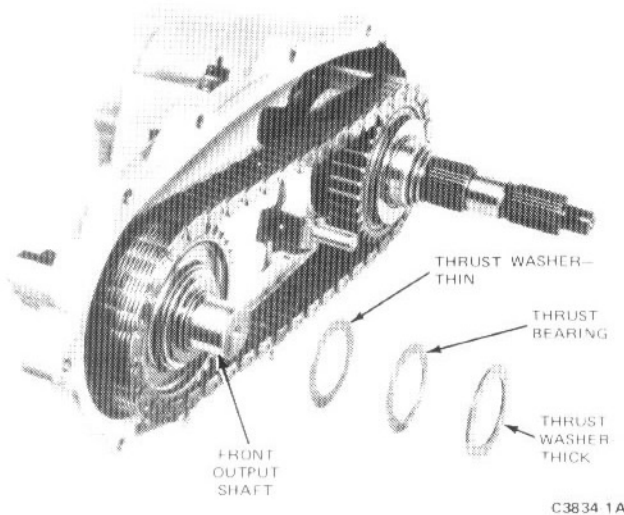


FIG. 8 Removing Front Output Shaft Washers Assemblies

8. Remove the drive chain by pushing the front input shaft inward, and by angling the gear slightly adequate clearance is obtained to remove the drive chain (Fig. 9).
9. Remove the output shaft from the front case half assembly and slide the thick thrust washer, thrust bearing, and thin thrust washer off the output side of the front output shaft.

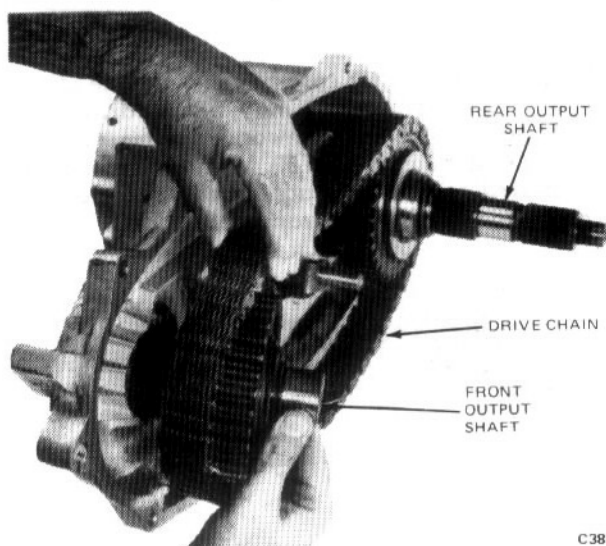


FIG. 9 Removing Drive Chain

10. From the bottom of the front case half, remove the screw, poppet spring and check ball from the case (Fig. 10).

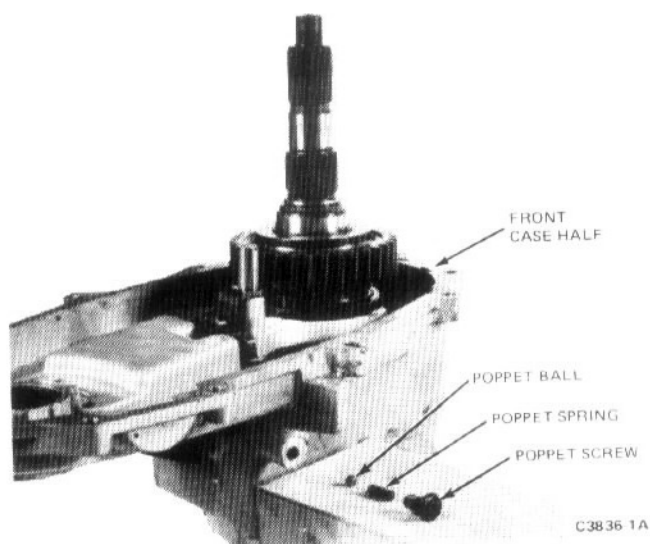


FIG. 10 Removing Poppet Assembly

11. From the top of the front case half, remove the four-wheel-drive indicator switch and washer.
12. Position the front case half as shown in Fig. 11 and lift out the rear output shaft, sliding clutch, clutch shift fork and clutch shift spring from the case (Fig. 12).
13. Place a shop towel and vise grip pliers on the shift rail. Remove the shift rail by prying up on the vise grips with a pry bar as shown in Fig. 13.
14. Remove the snap ring and thrust washer from the planetary gear set assembly in the front case half (Fig. 14).
15. Remove the annulus gear assembly and shift fork from the case (Fig. 15).
16. Lift the planetary gear assembly and thrust washer from the front case half (Fig. 16).

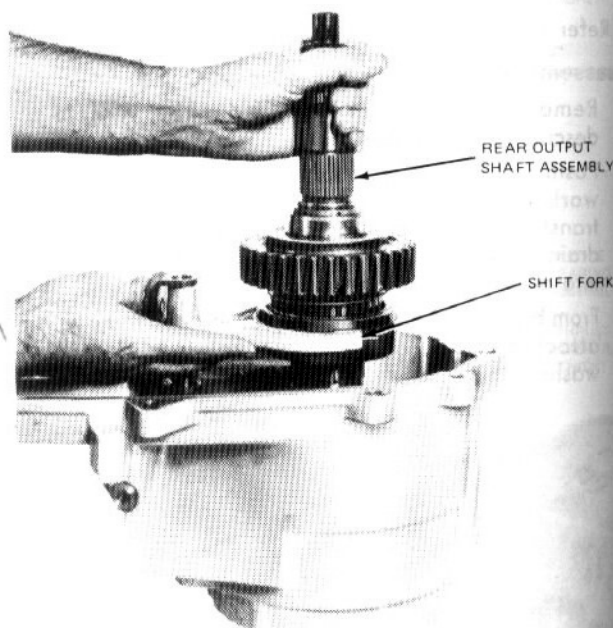


FIG. 11 Removing Rear Output Shaft Assembly

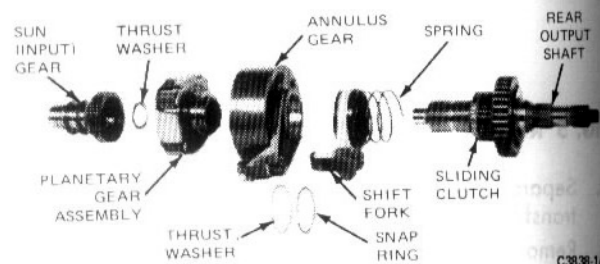


FIG. 12 Rear Output Shaft, Input shaft and Gear Transfer Components

17. Lift out the thrust bearing, sun (input) gear, another thrust bearing and thrust washer (Fig. 17).
18. From the front case half remove the six bolts and remove the gear locking plate.
19. Remove the nut retaining the external shift lever and washer. Press the shift control shaft inward and remove the shift selector plate and washer from the case (Fig. 18).
20. On the rear output shaft, remove the snap ring and thrust washer retaining the chain drive sprocket to the output shaft, and slide the sprocket from the drive gear (Fig. 19).
21. Remove the retaining ring from the sprocket carrier gear.
22. Carefully slide the sprocket carrier gear from the rear output shaft. Remove the two rows of sixty loose needle bearing (120 together). Remove the



FIG. 13 Removing Shift Rail



FIG. 14 Removing Planetary Gear Set Snap Ring

three separator rings and thrust washer from the output shaft.

Assembly

1. Start transfer case assembly by sliding the thrust washer against the gear on the rear output shaft.
2. Place the three space rings in position on the rear output shaft. Liberally coat the output shaft with petroleum jelly and install 120 needle bearings (two rows of sixty needle bearings) in position on the rear output shaft.
3. Carefully slide the sprocket carrier gear over the needle bearings. Be careful not to dislodge any bearings from their position on the output shaft.
4. Install the retaining ring on the sprocket carrier gear.
5. Slide the chain drive sprocket onto the sprocket carrier gear.
6. Install thrust washer and snap ring on rear output shaft.
7. Install the shift selector plate and washer through

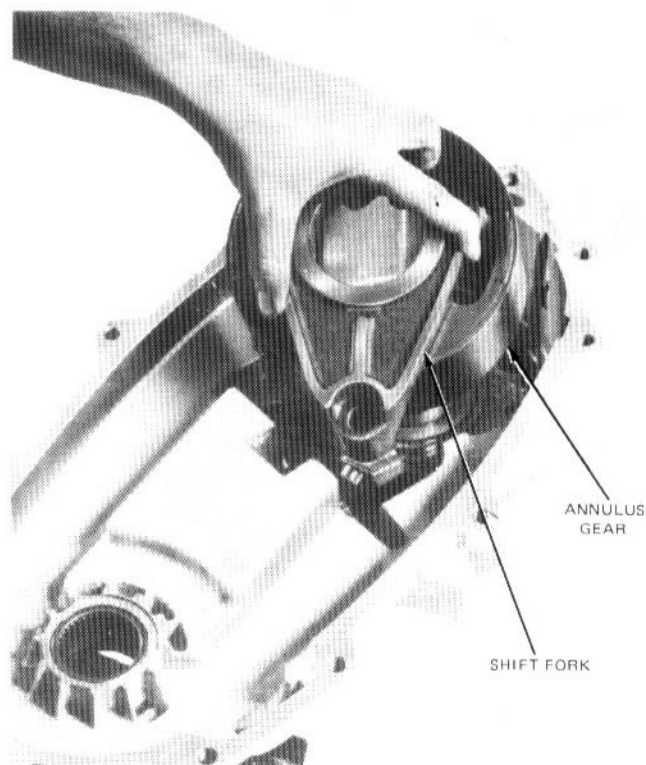


FIG. 15 Removing Annulus Gear and Shift Fork

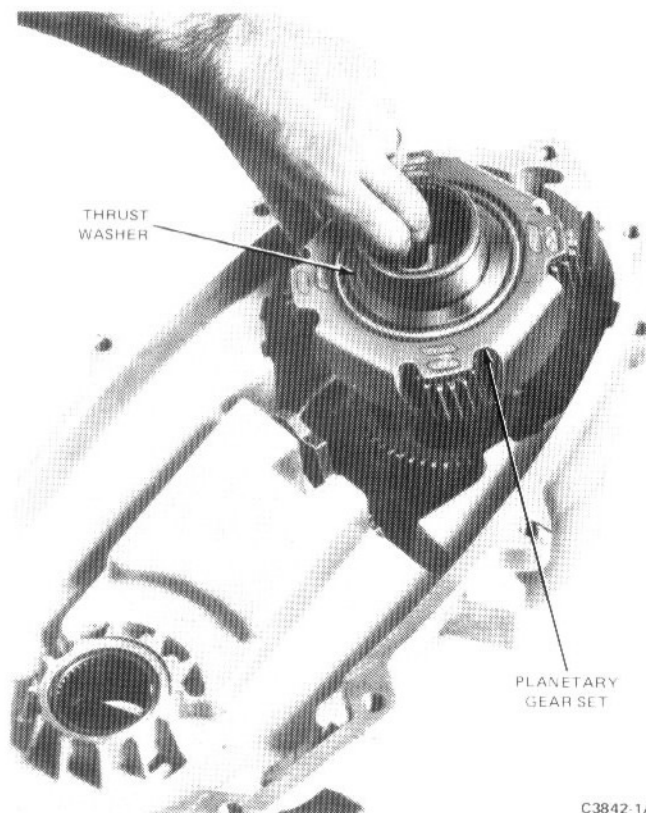


FIG. 16 Removing Planetary Gear Set

the front case half. Place shift lever assembly on shift control shaft and attach nut. Tighten to 19-27 N·m (14-20 ft.lb.).

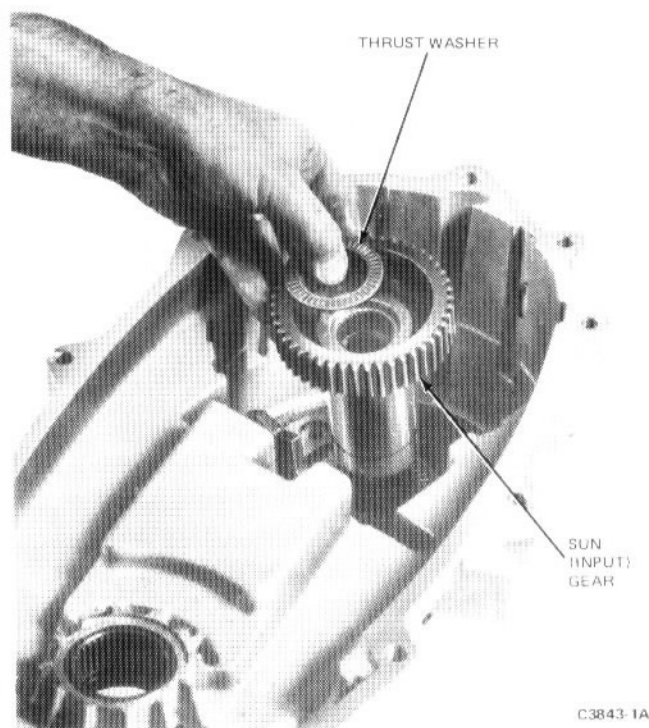


FIG. 17 Removing Sun Gear

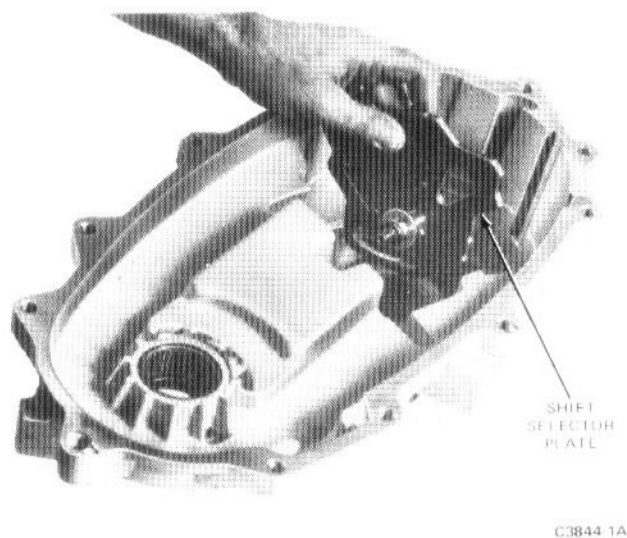


FIG. 18 Removing Shift Selector Plate

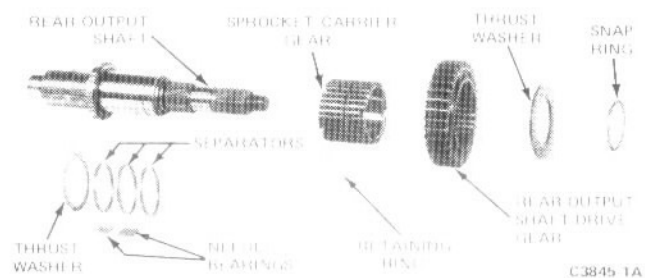


FIG. 19 Rear Output Shaft Assembly

8. Position the locking plate in the front case half and install six bolts. Tighten to 34-47 N·m (25-35 ft. lb.).
9. Place the thrust bearing and washer over the input shaft of the sun (input) gear. Insert the input shaft through the front case half from the inside and insert the thrust bearing.
10. Install the planetary gear assembly so the fixed plate and planetary gears engage the sun (input) gear.
11. Slide the annulus gear and clutch assembly with the shift fork assembly engaged, over the hub of the planetary gear assembly. The shift fork pin must engage the slot in the shift selector plate. Install the thrust washer and snap ring.
12. Position the shift rail through the shift fork hub in the front case half. Tap lightly with a soft hammer to seat rail in hole.
13. Position the sliding clutch shift fork on the shift rail and place the sliding clutch and clutch shift spring into the front case half.
14. Slide the rear output shaft into the case.
15. On the output side of the front output shaft, assemble the thin thrust washer, thrust bearing, and thick thrust washer and partially insert the front output shaft into the case.
16. Place the drive chain on the rear output shaft drive gear. Insert the rear output shaft into the front case half and engage the drive chain on the front output shaft drive gear. Push the front output shaft into position in the case.
17. Assemble the thin thrust washer, thrust bearing and thick thrust washer on the inside of the front output shaft drive gear.
18. Position the magnetic chip collector into the slot in the case half.
19. Apply a bead of RTV sealant or equivalent completely around the face of the front case half. Carefully reassemble the case halves making sure the shift rail and forward output shaft are properly retained.
20. Install the bolts in the case and tighten the bolts alternately to 28-33 N·m (20-25 ft. lb.).
21. Slide the oil pump gear over the output shaft and slide the spacer collar into position.
22. Engage the speedometer drive gear onto the rear output shaft and slide the retaining ring into position.
23. Use petroleum jelly to hold the nylon oil pump housing in position to the rear bearing retainer. Apply a bead of RTV sealant or equivalent around the mounting surface of the retainer and carefully position the retainer assembly over the output shaft and onto the rear case half. The retainer must be installed so the vent plug is vertical when the transfer case is installed.
24. Install the four bolts in the retainer assembly and tighten alternately to 28-33 N·m (20-25 ft. lb.).
25. Place a new washer under each yoke and install yokes on respective output shafts. Remember to place the oil slinger under the front output yoke. Install and tighten nut to 123-176 N·m (90-130 ft. lb.).

26. Install poppet ball, spring and screw in front case half. Tighten screw to 28-33 N·m (20-25 ft. lb.).
27. Install the four wheel drive indicator switch and tighten to 21-27 N·m (15-20 ft. lb.).
28. Remove fill plug and install 2.8 litres (6 pints) of transmission fluid meeting Ford specification ESP-M2C138-CJ, or Dexron II, Series D or equivalent. Install fill plug and tighten to 21-27 N·m (15-20 ft. lb.).

SUB-ASSEMBLIES

FRONT OUTPUT SHAFT

Refer to Fig. 20.

Disassembly

1. Remove snap ring holding drive gear to front output shaft.
2. Slide drive gear from shaft.

Assembly

1. Slide drive gear on front output shaft.
2. Install snap ring.

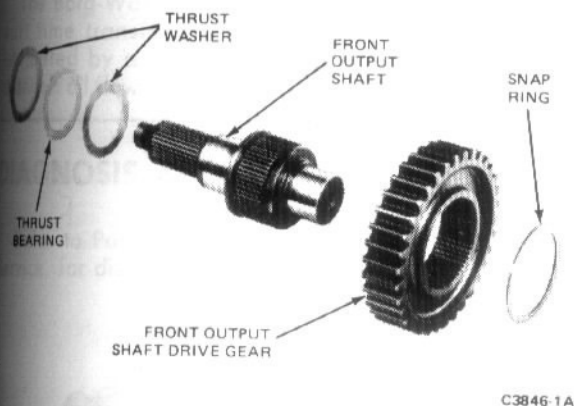


FIG. 20 Front Output Shaft Assembly

REAR BEARING RETAINER

Disassembly

1. Use special Tool 1175-AC and remove the rear output shaft oil seal from the retainer.
- CAUTION: Do not nick aluminum case.**
2. From inside the case, remove the ball bearing retainer snap ring.
3. Support the inner face of the output shaft bore. Install special tool and press the ball bearing assembly from the bore.
- CAUTION: The ball bearing assembly can only be removed by pressing it inward. A lip in the output shaft bore prevents its removal out the end.**

Assembly

1. Inspect the bearing and replace if necessary.
2. Using special tool T80T-4000-Z and T80T-4000-R, press the ball bearing assembly into its seat from

inside the case. The ball bearings should be visible from inside the case.

3. Insert the ball bearing retainer snap ring.
4. Turn case over, and with special tool press the oil seal into the bore.

REAR CASE HALF

Disassembly

1. Remove drain and fill plugs.
2. Install puller special tool to the needle bearing assembly and attach slide hammer T50T-100-A. Pull the bearing from the bore.

Assembly

1. Using special tool T80T-4000-R, press the needle bearing into the bore in the rear case half.
2. Install fill and drain plugs.

FRONT CASE HALF

Disassembly

1. Using special Tool 1175-AC, remove the first oil seal from the front input shaft bore.
- Caution: Be careful not to nick aluminum case.**
2. Using special Tool 1175-AC, remove second oil seal from input shaft bore.
- CAUTION: Be careful not to nick the aluminum case.**
3. Using special tool D80L-100-U and D80L-100-H, remove the first needle bearing from the front input shaft bore.
4. Using special tool D80L-100-W and D80L-100-H, remove the second needle bearing from the input shaft bore.
5. Remove the 'o' ring retainer and 'o' ring from the shift control shaft bore.
6. Using special Tool 1175-AC, remove the oil seal from the front output shaft bore.
7. Using special tool D80L-100-U and D80L-100-H, remove the needle bearing from the front output shaft bore.

Assembly

1. Using special tool T80T-4000-R and T80T-4000-Z, press the needle bearing into the front output shaft bore.
2. Press the oil seal into the front output shaft bore.
3. Install a new shift control 'o' ring seal and retainer into the case bore.
4. Using special tool T80T-4000-Z and T80T-4000-R, press the inner needle bearing in the input shaft bore.
5. Press the outer needle bearing in the input shaft bore.
6. Press the inner oil seal in the input shaft bore.
7. Press the outer oil seal in the input shaft bore.

Warner T-18 Four-Speed Transmission

**PART
16-23**

APPLIES TO F-150 — F-350 (4x2) (4x4)

SUBJECT	PAGE	SUBJECT	PAGE
DESCRIPTION	16-23-1	SPECIFICATIONS	16-23-11
DIAGNOSIS AND TESTING	16-23-3	SUB-ASSEMBLIES	
DISASSEMBLY AND ASSEMBLY	16-23-5	Countershaft Gear	16-23-9
REMOVAL AND INSTALLATION		Gear Shift Housing	16-23-9
F-150 — F-350 (4x2)	16-23-4	Output Shaft	16-23-8
F-150 — F-250 (4x4), Bronco	16-23-4	Reverse Idler Gear	16-23-9

DESCRIPTION

The four-speed Model T-18 transmission, (Fig. 1), is equipped with a center, floor-mounted gear shift lever.

The first and reverse gears are spur gears and the second, third and fourth speed gears are helical and are synchronized for ease in shifting.

The input shaft is supported by a ball bearing (Fig. 2), which is pressed onto the shaft and into the transmission case.

The front end of the output shaft is supported by a pilot bearing installed in the input shaft. The rear end of the output shaft is supported by a ball bearing which is pressed onto the shaft and into the transmission case. The bearing and shaft are retained in the case by a snap ring. The rear oil seal, speedometer gear, and rear bushing are contained in the extension housing, which is bolted to the rear of the case.

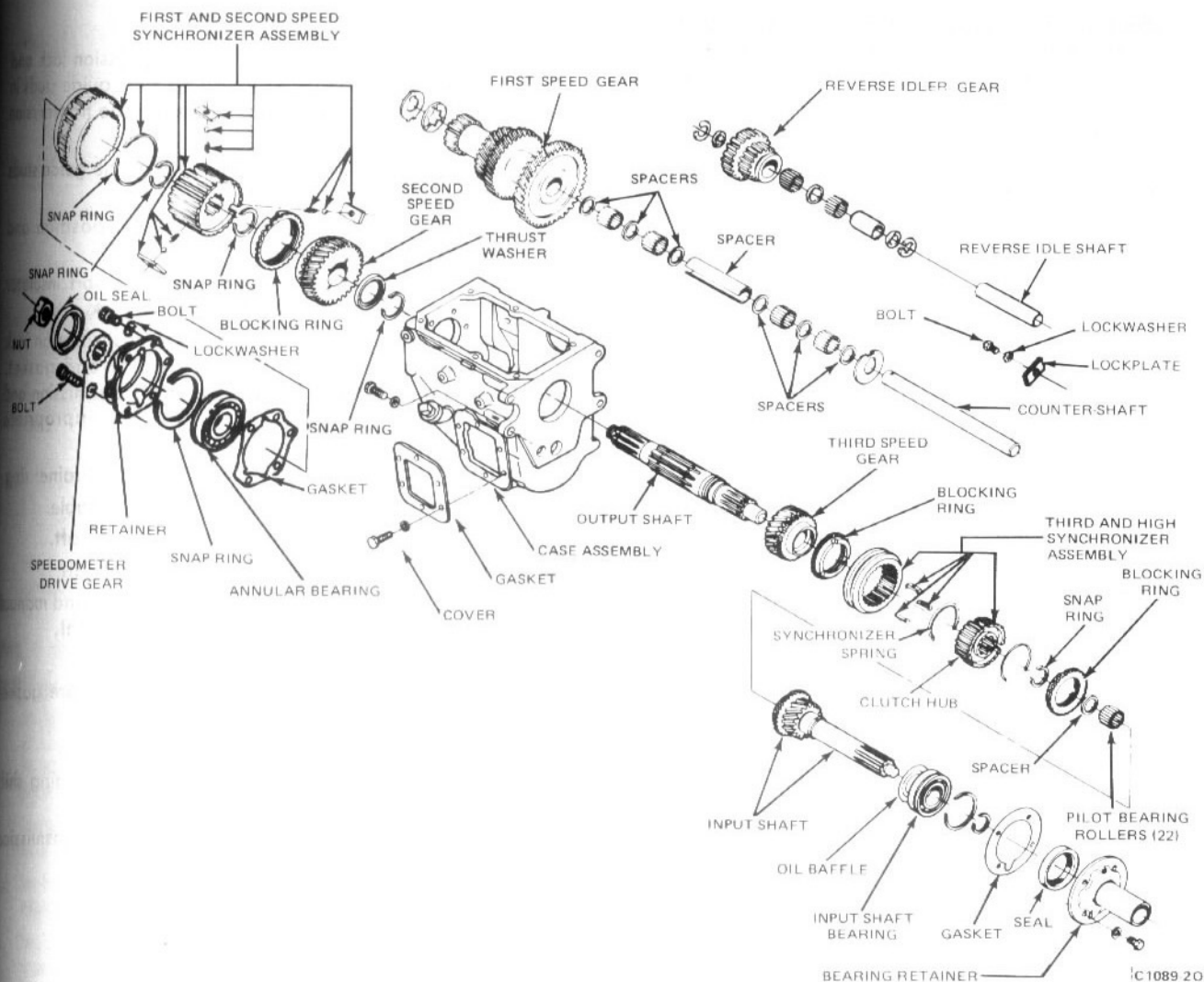


FIG. 2 Typical Warner Four-Speed Transmission

DIAGNOSIS AND TESTING

* Refer to Part 16-10, General Manual Transmission Service.

REMOVAL AND INSTALLATION

F-150—F-250 (4X2)

Removal

1. Disconnect the back-up lamp switch located at the rear of the gear shift housing cover.
2. Remove the rubber boot, floor mat, and the body floor pan cover, and remove the gearshift lever. Remove the weather pad.
3. Raise the vehicle and position safety stands. Position a transmission jack under the transmission, and disconnect the speedometer cable.
4. Disconnect the drive shaft or coupling shaft and clutch linkage from the transmission and wire it to one side.

5. Remove the transmission rear support.
6. Remove the transmission attaching bolts.
7. Move the transmission to the rear until the input shaft clears the clutch housing. Lower the transmission.

Installation

Before installing the transmission, apply a light film of lubricant ESA-M1C75-B or equivalent to the clutch release bearing inner hub surfaces, release lever fulcrum and forks, and the transmission front bearing retainer. Avoid excessive grease, as it would contaminate the clutch disc.

1. Place the transmission on a transmission jack, and raise the transmission until the input shaft splines are aligned with the clutch disc splines. The clutch release bearing and hub must be properly positioned in the release lever fork.
2. Install guide studs in the clutch housing and slide the transmission forward on the guide studs until it is in position on the clutch housing. Install the attaching bolts and tighten them to 48-67 N·m (35-50 ft-lb). Remove the guide studs and install the two lower attaching bolts.
3. Connect the speedometer cable and driven gear and clutch linkage.
4. Install the bolts attaching the front U-joint of the coupling shaft to the transmission output shaft flange. Tighten the bolts and nuts to specifications as listed in the specifications section of 15-60, Driveshaft—Single Snap Ring Type U-Joint. Install the transmission rear support.
5. Connect the back-up lamp switch.
6. Install the shift lever and lubricate the spherical ball seat with lubricant ESA-M1C75-B or equivalent.
7. Install the weather pad. Install the floor pan cover, floor mat and boot.

F-150—F-250 (4X4) BRONCO

Removal

1. Open door cover seat.
2. Remove shift knobs.
3. Remove the four screws attaching the transmission shift lever boot assembly.
4. Remove the four screw holding the floor mat.
5. Remove the eleven screws holding the access cover to the floor pan. Place the shift lever in the reverse position and remove the cover.
6. Remove the insulator and dust cover.
7. Remove the transfer case shift lever.
8. Remove transmission shift lever.
9. Raise the vehicle on a hoist.
10. Remove the drain plug and drain the transmission.
11. Disconnect the rear driveshaft from the transfer case and wire it out of the way.
12. Disconnect the front driveshaft from the transfer case and wire it out of the way.
13. Remove the retainer ring that holds the shift link in place and remove the shift link from transfer case.
14. Remove the speedometer cable from the transfer case.
15. Position a transmission jack under the transfer case. Remove the six bolts holding the transfer case to the transmission and lower the transfer case from the vehicle.
16. Remove the eight bolts that hold the rear support bracket to the transmission.
17. Position a transmission jack under the transmission and remove the rear support bracket and brace.
18. Remove the four bolts that hold the transmission to the bell housing.
19. Remove the transmission from the vehicle.

Installation

1. Place the transmission on a transmission jack and install it in the vehicle installing two guide studs in the bell housing top holes, to guide the transmission into position.
2. Install the two lower bolts. Remove the guide studs and install the upper bolts.
3. Place the rear support bracket in position and install the eight retaining bolts.
4. Install the two bolts at the rear support insulator bracket. Remove the transmission jack.
5. Position the transfer case on the transmission jack and install the six retaining bolts and gasket. Position the transfer case on the transmission and tighten the bolts as listed in the appropriate transfer case part.
6. Install the transfer case shift link and retainer ring.
7. Position and install the speedometer cable.
8. Remove wire and connect front driveshaft.
9. Remove wire and connect rear driveshaft.
10. Fill transfer case with ESP-M2C138-C5 and manual transmission with ESP-M2C83-C lubricant.
11. Lower vehicle.
12. Remove fabricated dirt shield and prepare gasket area.
13. Position gasket and shift cover.
14. Install two pilot bolts, then install remaining shift cover retaining bolts.
15. Install transfer case shift handle and transmission shift lever.
16. Install dust cover and insulator.
17. Install access cover to floor pan screws.
18. Install the four floor mat screws.
19. Install the four boot area screws.
20. Install the shift knobs.

F-150—350 (4x4)

Refer to Fig. 3.

Removal

1. Raise vehicle on hoist.
 2. Remove skid plate, if so equipped. Remove heat shield from catalytic converter.
- CAUTION: Use extreme caution when working in the area of the catalytic converter because of the extremely high temperatures generated by the converter.**
3. Remove two nuts connecting upper gusset to frame on both sides of the frame.
 4. Remove nut and bolt assembly connecting gusset to crossmember. Remove gusset on left side.
 5. Remove bolts holding transmission to transmission support plate on crossmember.
 6. Raise transmission with a transmission jack.
 7. Remove the nut and bolt assemblies connecting the support plate to crossmember. Remove support plate. Remove right gusset.
 8. Remove nut and bolt assemblies connecting crossmember to frame. Remove crossmember.

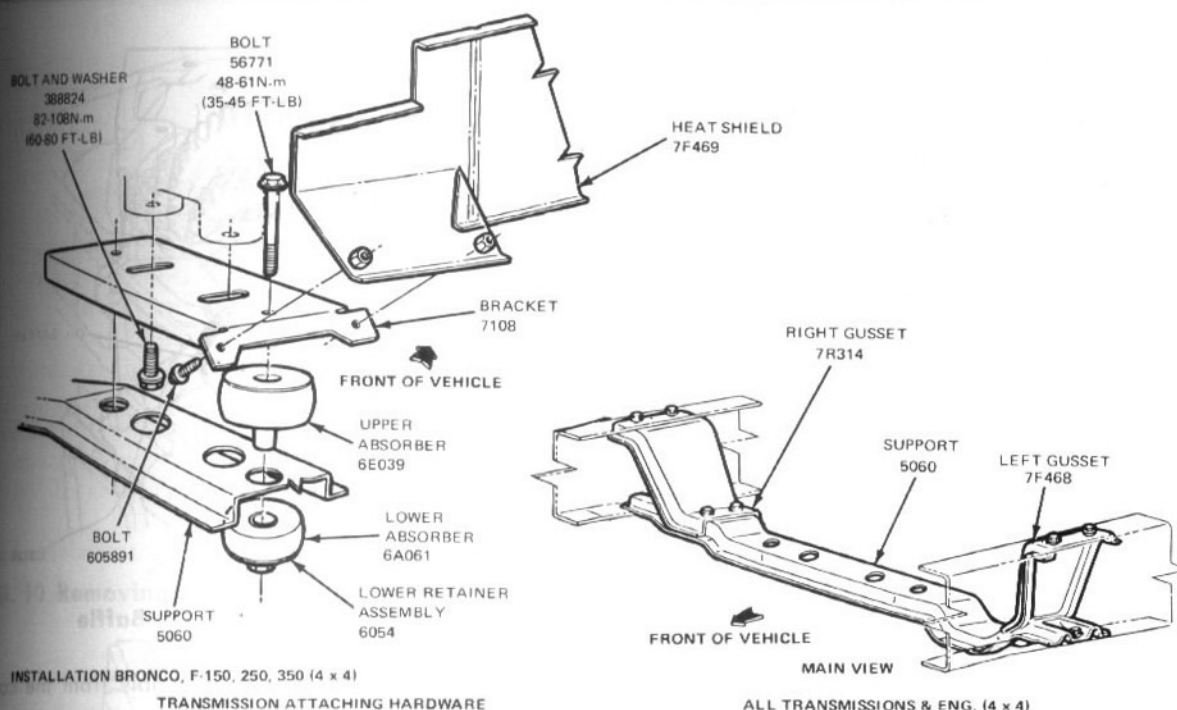


FIG. 3 Crossmember Installation F-150—350, Bronco (4x4)

Installation

1. Install crossmember and transmission support plate, and position right and left gussets on bolts in frame. Install nuts on upper gusset to frame bolts and tighten to specification.
2. Install crossmember to frame nut and bolt assembly and tighten to specification.
3. Install nut and bolt assembly connecting gusset to crossmember and tighten to specification.
4. Install nut and bolt assemblies connecting transmission support plate to crossmember and tighten to specification.
5. Lower the transmission.
6. Install bolts connecting transmission support plate to transmission and tighten to specification.
7. Install skid plate, if so equipped. Install heat shield over catalytic converter. Tighten all nuts and bolts to specification.
8. Lower vehicle.

DISASSEMBLY AND ASSEMBLY

Refer to Fig. 2.

Disassembly

1. Position the transmission assembly in a suitable holding fixture, (Fig. 4). Drain the transmission and remove the gearshift housing assembly.
2. Lock the transmission in two gears; then, remove the U-joint flange and oil seal.
3. Remove the speedometer driven gear and bearing assembly.
4. Remove the output shaft bearing retainer (or extension housing).
5. Remove the speedometer drive gear snap ring retainer. Slide the speedometer drive gear off the output shaft.
6. Remove the output shaft bearing snap ring retainers from the output shaft and from the bearing, (Fig. 5).
7. Install tool on the output shaft and over the output shaft bearing (Fig. 6). Remove the output shaft bearing and remove bearing spacer.
8. Remove the input shaft bearing snap ring retainers from the input shaft and from the bearing, (Fig. 7).

9. Install tool on the input shaft and over the input shaft bearing. Remove the input shaft bearing.
10. Remove the input shaft oil baffle (Fig. 8).

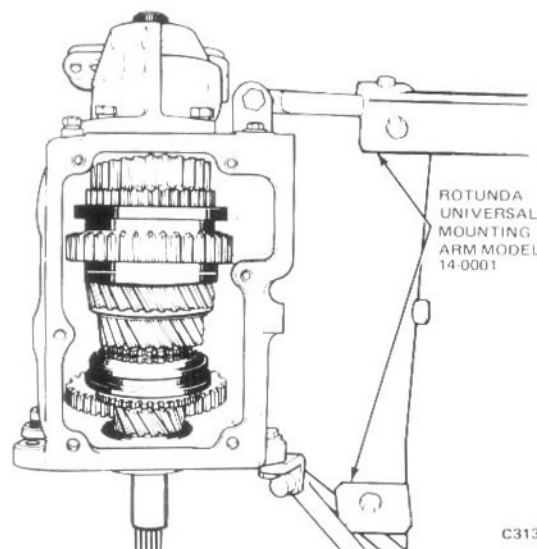
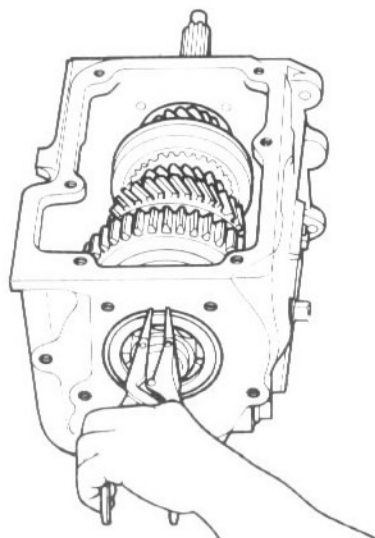


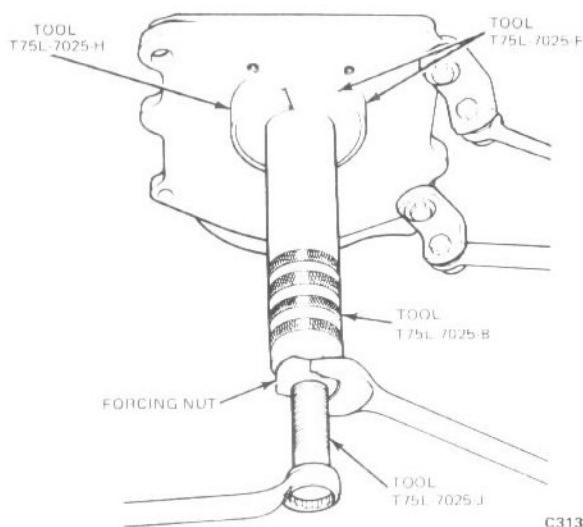
FIG. 4 Transmission in Holding Fixture

C3135-1C



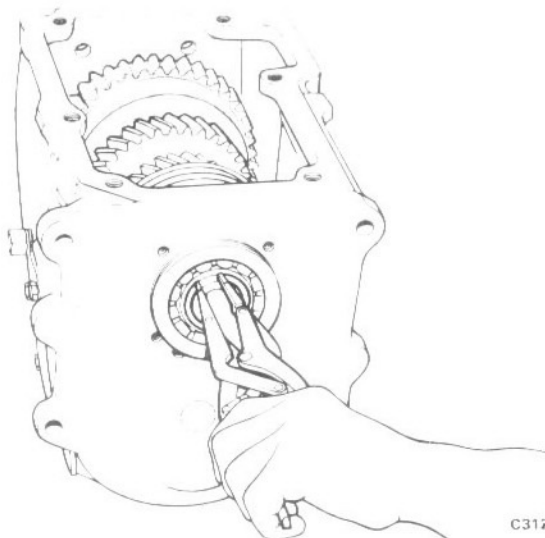
C3127-1A

FIG. 5 Removing Output Shaft Bearing Snap Ring



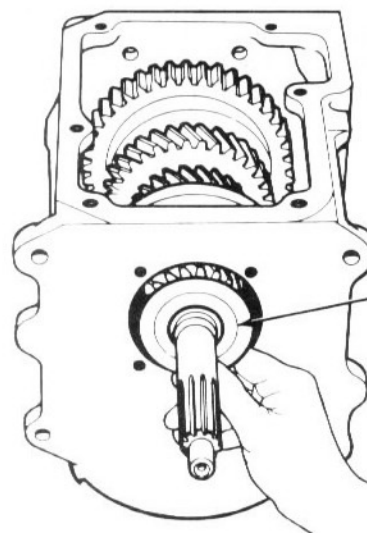
C3136-1A

FIG. 6 Removing Output Shaft Bearing



C3128-1A

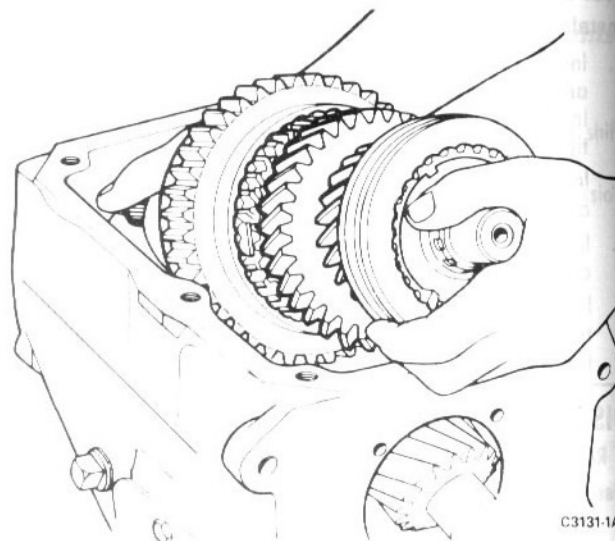
FIG. 7 Removing Input Shaft Bearing Snap Ring



C3129-1A

FIG. 8 Removing Input Shaft Oil Baffle

11. Remove the output shaft assembly from the case (Fig. 9).



C3131-1A

FIG. 9 Removing Output Shaft Assembly

12. Remove the input shaft assembly from the case (Fig. 10). Do not lose the 22 pilot bearing rollers from the inner end of the shaft.
13. Remove the reverse idler gear shaft and the countershaft retainer from the end of the transmission case (Fig. 11).
14. Remove the reverse idler gear shaft, using the tools shown in Fig. 12.
15. Remove the reverse idler gear from the case.
16. Remove the countershaft with the same tools used to remove the reverse idler gear shaft.
17. Remove the countershaft gear assembly from the case. Guide to bearing shaft (tool into the gear assembly here as the countershaft is being removed). Use care so that the roller bearings and spacers which remain in the countershaft gear here are not lost.

14. Install the input shaft bearing using the tools shown in Fig. 14 and install the snap ring. Use the thickest select fit snap rings which will fit on the bearing.

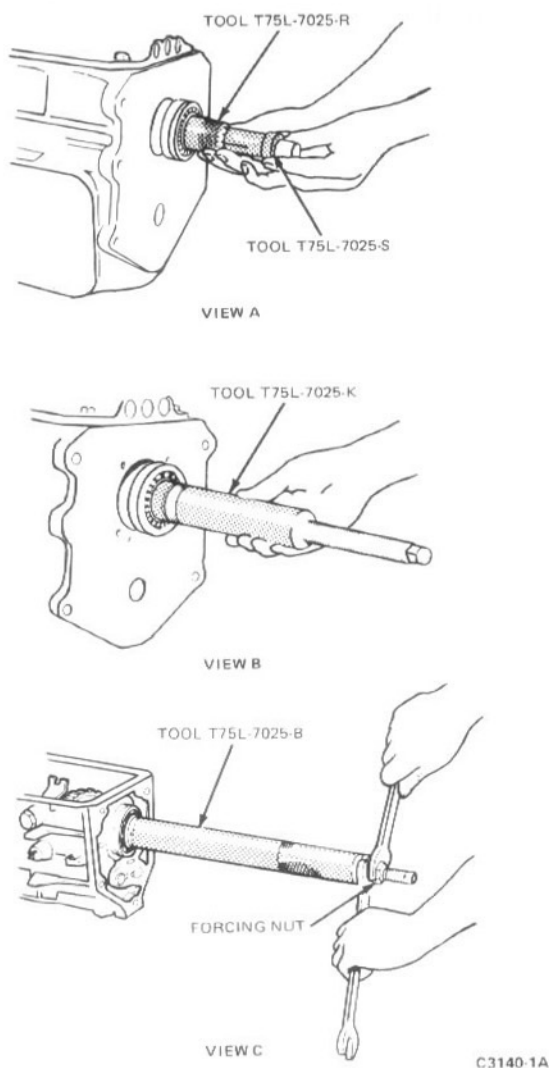


FIG. 14 Installing Input Shaft Bearing

15. Install the input shaft bearing retainer gasket and retainer. Tighten the bolts to specification.
16. Position the speedometer drive gear (and spacer, if used) on the output shaft over lock ball and install the speedometer drive gear retaining snap ring.
17. Using a new gasket install the output shaft bearing retainer (or extension housing). Tighten the bolts to specification.
18. Lubricate the extension housing bushing and seal and the U-joint flange with ball joint grease.
19. Install the U-joint flange. Lock the transmission in two gears and tighten the retaining nut to specifications.
20. Install the gear shift housing assembly on the transmission and tighten the cover bolts to specification.
21. Fill the transmission to the proper level with recommended lubricant ESP-MC83C or equivalent. Add 1/4 liter (1/2 pint) of lubricant through the

speedometer cable hole in the rear transmission extension housing.

SUB-ASSEMBLIES

OUTPUT SHAFT

Disassembly

1. Remove the third- and high-speed synchronizer hub snap ring from the output shaft, and slide the third- and high-speed synchronizer assembly and the third-speed gear off the shaft.
2. Remove the synchronizer sleeve and the inserts from the hub.
3. Before removing the two snap rings from the ends of the hub, check the end play of the second speed gear. There should be 0.127-0.609mm (0.005 to 0.024 inch) of end play.
4. Slide the low and second speed gear off the hub. Be careful not to lose any of the balls, springs, or plates nor the anti-rattle spring and ball (Fig. 15 and 16).

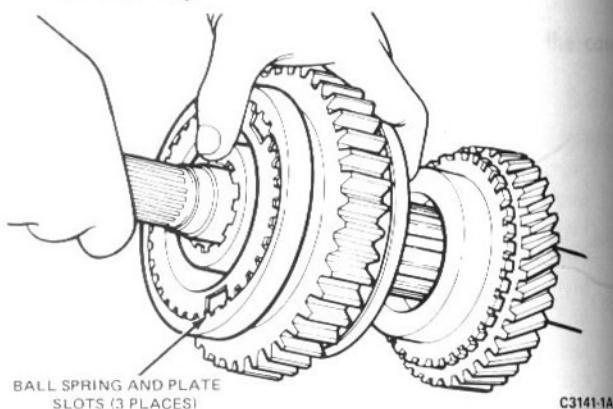


FIG. 15 Removing Second Gear Synchronizer—Assembly

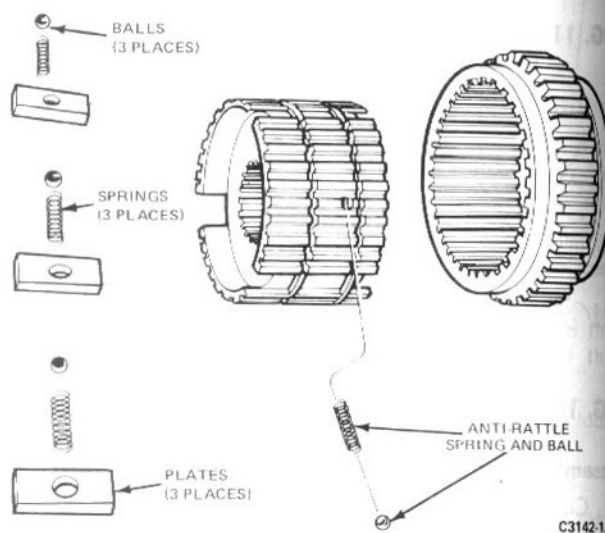


FIG. 16 Second Speed Synchronizer—Disassembled

5. Remove the snap ring from behind the synchronizer hub. Pull synchronizer hub from the shaft. Remove the blocking ring.

6. Remove the snap ring from behind the second speed gear and remove the gear and thrust washer from the output shaft (Fig. 17).

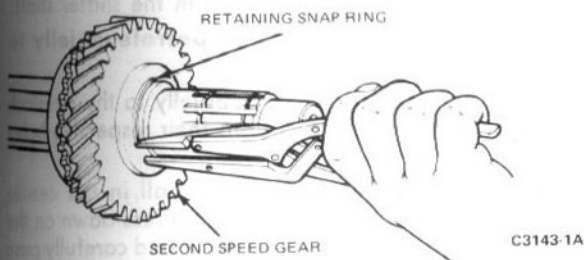


FIG. 17 Removing Second Speed Gear Retaining Snap Ring

Assembly

1. Place output shaft with threaded end up in a soft-jawed vise.
2. Place an output shaft snap ring in the third groove from the threaded end of shaft. Place the recessed side of second speed gear thrust washer over snap ring.
3. Place second speed gear against washer and assemble snap ring in groove behind gear.
4. Place blocking ring on second speed gear.
5. Assemble the second speed synchronizer assembly over splines of main shaft, aligning the three blocking ring cut-outs with shifting plates. The low and second gear shift fork groove should be located to rear of transmission.
6. Place a snap ring in the main shaft groove behind clutch hub.
7. Turn output shaft over and assemble third speed gear against output shaft shoulder.
8. Place blocking ring on third speed gear.
9. Assemble third and high synchronizer assembly over output shaft splines. Align the three blocking ring slots with shifting plates and position the end of the hub which has the long chamfer to the front of the transmission.
10. Place snap ring in output shaft groove in front of third and high synchronizer assembly.
11. Assemble spacer on output shaft.

COUNTERSHAFT GEAR

Disassembly

Remove the dummy shaft, bearing rollers, bearing spacers, and the center spacer from the countershaft gear.

Assembly

1. Slide the long bearing spacer (Fig. 2) into the countershaft gear bore, and insert the dummy shaft in the spacer.
2. Apply a film of petroleum jelly to the countershaft gear bore and install one of the bearing spacers. Position the 22 bearing rollers in the gear bore.
3. Place a spacer on top of the rollers, and install 22 more rollers and another spacer.

4. Hold a large thrust washer against the end of the countershaft gear to prevent the rollers from dropping out, and turn the assembly over. Install bearing spacer, 22 rollers, spacer, 22 rollers and spacer.

REVERSE IDLER GEAR

Disassembly

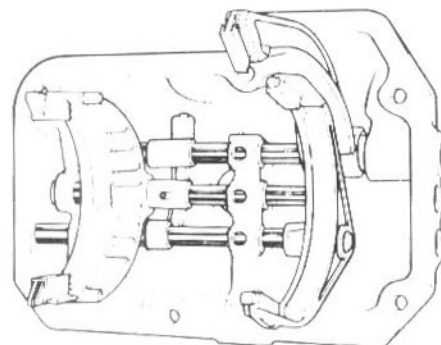
Replace the reverse idler gear if the gear or bushing is badly worn or if the teeth are chipped or burred. Replace the reverse idler gear shaft if it is excessively worn or scored.

GEAR SHIFT HOUSING

Disassembly

1. Remove the floor mat or carpet, rubber boot cover and floor pan cover. Remove front seat assembly if necessary.
2. Remove the foam weather pad from the gear shift housing.
3. Remove the gear shift lever from the transmission. Then, disconnect the back-up lamp switch from the connector and remove the back-up lamp switch from the rear of the gear shift housing.
4. Position the three shift rails and forks so that the three shift gates are in the normal "neutral" position in the gear shift housing assembly. Then, shift the transmission into "Second Gear" (Fig. 18). This will allow the shift housing tower to be removed from the transmission.

NOTE: After the shift housing tower is removed, inspect all internal transmission components for damage, chips and/or foreign material within the transmission case assembly.



C3144-1A

FIG. 18 Shift Housing Removed—Second Gear Position

5. Remove the three expansion plugs from the forward end of the shift housing (Fig. 19). Using a pin punch, remove the three lock pins from the shift forks and the three lock (roll) pins from the gear shifter shaft gates.
6. Tap the shifter shaft(s) out of the housing (forward) while holding a shop towel over the poppet ball(s), (Fig. 20), and spring hole(s) in the housing to prevent loss of spring(s) and/or poppet ball(s).

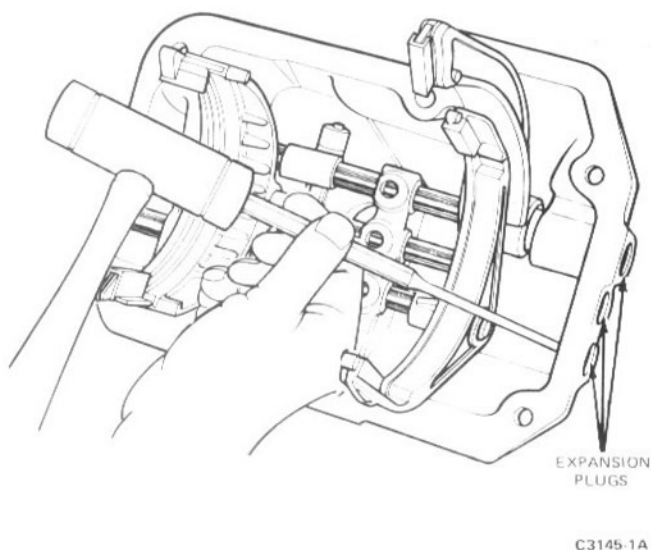


FIG. 19 Removing Expansion Plugs from Shift Housing

7. Remove the interlock pins from the shift rails (Fig. 20).
8. Remove the shift forks and shift gates.
9. Remove the poppet balls and springs from the housing. Then, remove the interlock plungers from the housing.

Assembly

1. Install the spring and plunger in the reverse gate, press the plunger through the gate and fasten it in place with the clip, if the reverse gate assembly has been disassembled.
2. Place the poppet spring and ball in the reverse shifter shaft hole in the gear shift housing. Insert the shaft part way into the housing. Install the reverse shift fork on the shaft (reverse shifter) then, press down on the poppet ball and spring with a long thin drift and position the reverse shifter ball notch so that it does not slide over the ball.
3. Slide the reverse gate onto the shaft (long end forward), and drive the shaft into the housing until the ball snaps into the groove of the shaft. Install the lock pin that fastens the gate to the shaft.
4. Insert the two interlocking plungers in the pockets between the shifter shaft holes. Place the poppet spring and ball in the low-and-second shifter shaft hole. Press down on the poppet ball and spring with a long thin drift and insert the shifter shaft part way into the housing.
5. Slide the low-and-second shifter shaft gate onto the shaft, and install the low-and-second shifter fork on the shaft so that the off-set of the fork is toward the rear of the housing. Push the shaft all the way into the housing until the poppet ball snaps into the

shaft groove. Then, install the lock pins that fastens the fork and gate to the shaft.

6. Insert the three-four shifter shaft through the center rear hole of the housing. Then, insert the interlock pin into the interlock pin hole in the shifter shaft.

Note: Apply a daub of petroleum jelly to hold the pin in position.

7. Apply a coating of petroleum jelly to the interlock plungers and insert them into their respective holes in the housing.
8. Place the poppet spring and ball in the center shifter shaft hole in the housing. Press down on the poppet ball with a long thin drift, and carefully push the shifter shaft into the housing over poppet ball and spring.
9. Position the third-fourth shift gate onto the shifter shaft. The spring loaded-ball tang should be installed facing front of transmission.

Note: It is extremely important that the shift gate be installed on the shifter shaft with the long flat "tang" end of the gate area facing forward of the gear shift housing. To insure proper installation, measure the two flat "tangs" of the shift gate, note the longer dimension 18-25mm (23/32 inch) and apply a daub of bright paint. This tang should be installed facing forward on the shifter shaft.

10. Position the three-four shifter fork on the shifter shaft so that the lockpin hole in the shifter fork is toward the rear of the housing. Push the shifter shaft into the housing until the poppet ball seats into the second detent (neutral). Install the lock pins attaching the shifter fork and shifter gate to the shifter rail.

Note: Install the shifter gate lock pin so that the pin is flush with the bottom of the notch in the shifter gate.

11. Install new expansion plugs in front and rear of transmission housing.
12. Shift the gear shift housing into the "second gear" position. Shift the transmission gears into the "second gear" position. Install the back-up lamp switch and connect the wiring. Then, place the transmission gear shift housing onto the transmission.
13. Apply Loctite Sealer (19554 ESG-M4G-194-A or equivalent) to the six shift gear housing-to-transmission case attaching bolts. Tighten the bolts to 24-27 N·m (17-20 ft-lb) torque.
14. Position the foam weather pad on the gear shift housing. Install the gear shift lever. Install cab floor pan cover, rubber boot and floor mat or carpet. Install front seat.
15. Fill transmission with specified lubricant, ESW-M2C83-B or equivalent, ADD 1/4 litre (1/2 pint) of lubricant through the speedometer cable hole in the rear transmission retainer.

SPECIFICATIONS

SPECIAL TOOLS

Tool Number	Description
T75L-7025-B	Output Shaft Bearing Installation-Removal Tool
T75L-7025-F	Output Shaft Bearing Removal Tool
T75L-7025-H	Output Shaft Bearing Removal Tool
T75L-7025-K	Input Shaft Bearing Installation Tool
T75L-7025-L	Output Shaft Bearing Installation Tool
T75L-7025-R	Input Shaft Bearing Installation Tool
T75L-7025-S	Input Shaft Bearing Installation Tool
T50T-100-A	Slide Hammer
T50T-7140-B	Reverse Idler Gearshaft Removal Tool
T75L-7025-J	Output Shaft Bearing Removal Tool
T75L-7025-Q	Dummy Bearing
14-0001	Universal Mounting Arm

CC3592-28

APPROXIMATE REFILL CAPACITY — WARNER T-18

Transmission Type and Make	Approximate Capacity		
	U.S. (Pints)	Imperial (Pints)	Liters
Warner T-18 Four-Speed (ESW-M2C83-B or C)	7.0	5.5	3.3

CC3593-20

TORQUE SPECIFICATIONS — WARNER T18 — TRANSMISSION

Description	Size	Torque Limits	
		(ft-lbs)	N·m
Back Up Light Switch	9/16-	15-25	20-47
Clutch Housing to Transmission Mounting Bolts	7/16-14	35-50	47-67
Case Cover	3/8-16	25-35	34-47
Countershaft Rear Retainer	3/8-16	25-35	34-47
Drain Plug	3/4-14	25-40	34-54
Filler Plug	3/4-14	25-40	34-54
Output Shaft Flange Nut	3/4-20	75-110	102-149
Mainshaft Rear Retainer	3/8-16	25-35	34-47
	1/2-13	40-50	54-67
P.T.O. Cover Bolt	3/8-16	25-35	34-47
Reverse Idler Shaft/Countershaft Locking Bolt	3/8-16	25-35	34-47
Front Bearing Retainer to Case	5/16-18	10-15	14-20
Clutch Housing to Engine Block	7/16-14	40-50	54-67

CC3877-2A