1995 Clutch Hydraulic

DESCRIPTION

The hydraulic clutch control consists of the hydraulic master cylinder, slave cylinder, reservoir, clutch pedal position switch, and connecting hydraulic lines. The clutch disc and pressure plate are single-disc type. The clutch release bearing or bearing arm is activated by hydraulic pressure. The clutch linkage or pedal position requires no adjustments.

TRANSMISSION APPLICATION

Vehicle Model	Transmission Model
Aerostar, Explorer & Ranger	Mazda M50D 5-Speed O/D

TRANSFER CASE APPLICATION

Vehicle Model	Transfer Case Model
Explorer & Ranger	(1) Borg-Warner 1354
(1) Equipped with manual or electronic shift.	

ADJUSTMENTS

CLUTCH PEDAL FREE PLAY

NOTE: Clutches are a single, dry disc type. Adjustment for wear is not possible. Clutch is actuated through hydraulic master cylinder and slave cylinder, and is self-adjusting.

CLUTCH RELEASE BEARING TRAVEL MEASUREMENT

Externally Mounted Slave Cylinder

1. Remove slave cylinder dust shield. With clutch pedal fully depressed, measure external slave cylinder push rod travel.
2. Push rod should travel a minimum of 0.43" (10.9 mm). **DO NOT** replace clutch hydraulic system if measurement exceeds specification. If slave cylinder travel is less than specification, check hydraulic reservoir fluid level.

Internally Mounted Slave Cylinder

1. Remove rubber plug from inspection port in transmission bellhousing. Position Bearing Travel Measurement Tool (D87T-4201-A) through opening and against slave cylinder. See **Fig. 1** .
2. Using rear edge of Black plastic bearing retainer as an indicator, take a reading with clutch pedal fully up. With clutch pedal fully depressed, take another measurement.
3. Difference between 2 readings is total bearing travel. If bearing travel is greater than 0.3" (7.5 mm), replace clutch pressure plate and/or clutch disc.
4. If bearing travel is less than 0.3" (7.5 mm), check hydraulic reservoir fluid level and inspect hydraulic system for leaks.

5. If leak is found, repair leak and bleed system. If no leak is found, bleed system. See **HYDRAULIC SYSTEM BLEEDING** under IN-VEHICLE SERVICE. Recheck bearing travel after repairs have been completed.

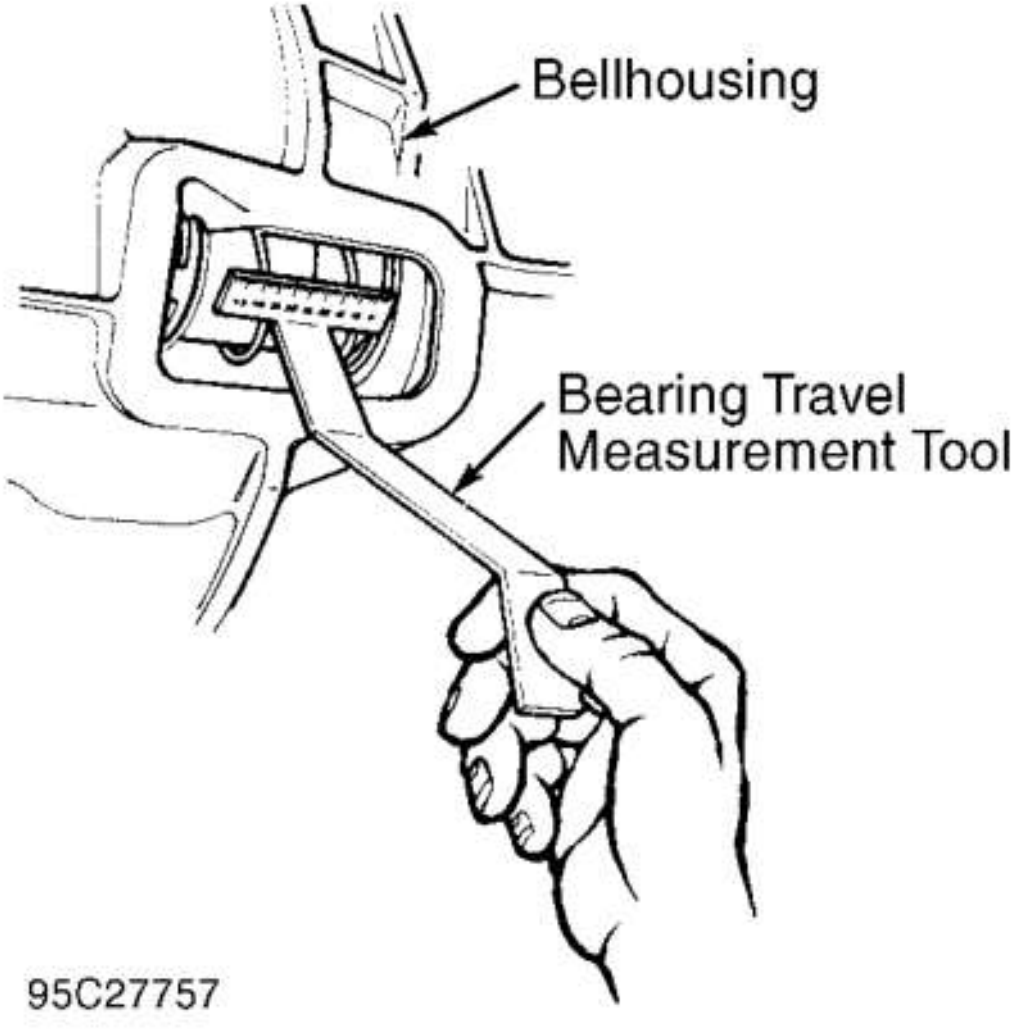

Fig. 1: Measuring Clutch Release Bearing Travel
Courtesy of FORD MOTOR CO.

IN-VEHICLE SERVICE

CLUTCH PEDAL POSITION (CPP) SWITCH

Disconnect wiring harness from CPP switch. Using an ohmmeter, check for continuity between pins No. 1 and 2. See **Fig. 2** . Switch should be open (infinity) when pedal is up and clutch is engaged. Switch should be closed (zero ohms) when clutch pedal is pressed to floor. If switch does not function as specified, replace switch. See **Fig. 3** .

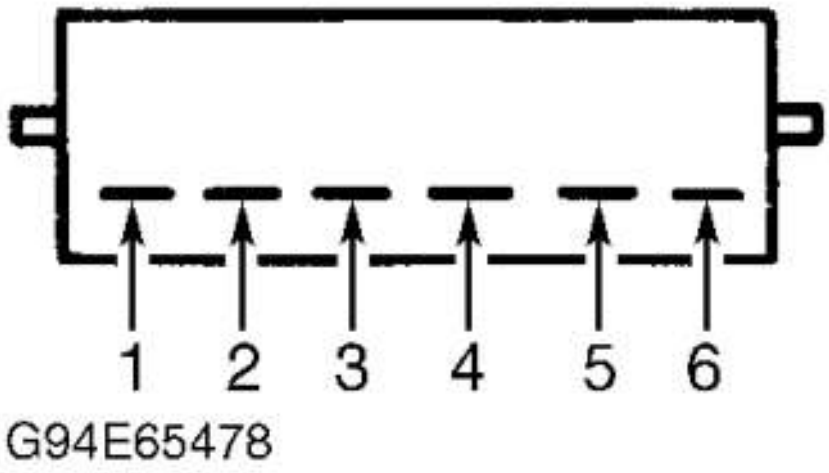

Fig. 2: Identifying Clutch Pedal Position (CPP) Switch Pins
Courtesy of FORD MOTOR CO.

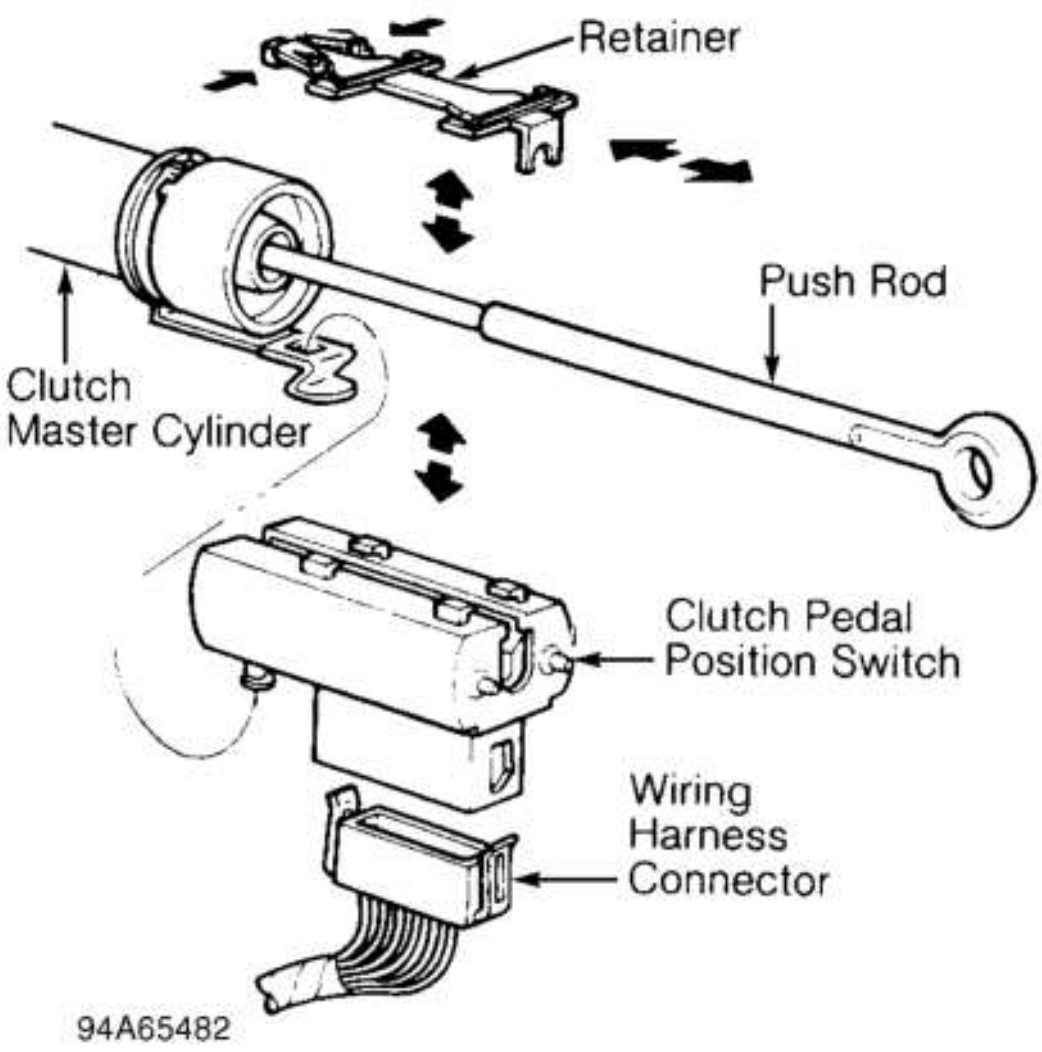

Fig. 3: Identifying Clutch Pedal Position Switch & Components
Courtesy of FORD MOTOR CO.

HYDRAULIC SYSTEM BLEEDING

Externally Mounted Slave Cylinder

1. Remove slave cylinder from transmission bellhousing. Using a 3/32" diameter punch, remove pin that holds hydraulic line in slave cylinder. Remove hydraulic line from slave cylinder. Place end of hydraulic line into container for wastefluid.
2. Hold slave cylinder so hydraulic line port is at highest point. Fill slave cylinder through hydraulic line port with DOT 3 brake fluid. Gently push on slave cylinder push rod to expel all air.
3. When all air has been expelled, install slave cylinder. Remove clutch master cylinder reservoir cap and diaphragm. While maintaining fluid level in reservoir, observe hydraulic line until all air has been expelled, a steady stream of fluid is flowing, and fluid is level with step in clutch master cylinder reservoir.

4. Install reservoir cap and diaphragm. Install hydraulic line and retaining pin. Remove slave cylinder. Ensure reservoir is full. Hold slave cylinder so hydraulic line port is at highest point. Slowly push pushrod into cylinder and let it return. Repeat 2 more times. Install slave cylinder.
5. Rapidly depress clutch pedal 10 times. Top off brake fluid. With transmission in Neutral and parking brake set, start vehicle. Shift vehicle into Reverse. If gears grind, check for air in system. Repeat bleeding procedure if necessary. If no air is found and gears grind, clutch components may be defective or worn out.

Internally Mounted Slave Cylinder

1. Using Disconnect Tool (T88T-70522-A), disconnect coupling at transmission by lightly tugging on clutch tube while sliding White plastic sleeve toward slave cylinder. See **Fig. 5** . Clean area around reservoir cap. Fill reservoir with DOT 3 brake fluid. Using hand pressure, apply 10-15 pounds to clutch pedal. If pedal is hard, go to step 3). If pedal is spongy, go to next step.
2. Using a screwdriver, open valve of male coupling. Slowly depress clutch pedal to floor and hold. Remove screwdriver to close valve, and release clutch pedal. Ensuring reservoir is full, repeat step.
3. Close reservoir and reconnect coupling. Rapidly depress clutch pedal 5-10 times, wait 1-3 minutes, then repeat procedure 3 more times. Place hose on bleeder screw to prevent brake fluid from entering bellhousing. Loosen bleeder screw and maintain fluid level in reservoir.
4. Fluid and bubbles will flow from hose attached to slave cylinder bleeder screw. Close bleeder screw when fluid stream is free of air bubbles. Ensure fluid level is correct and install reservoir cap.
5. Place light pressure on clutch pedal and open bleeder screw. Maintain pressure until pedal contacts floor. Close bleeder screw while pedal is fully depressed. **DO NOT** allow pedal to return before bleeder screw is fully closed. Recheck fluid level.
6. Test system operation by starting vehicle, depressing clutch and placing gearshift in Reverse. No grinding should be heard or felt when clutch pedal is within 1/2" (13 mm) of floor. If noise is heard, check for air in system. Repeat bleeding procedure if necessary.

REMOVAL & INSTALLATION

WARNING: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

TRANSFER CASE

WARNING: Use care when working around transfer case. Catalytic converter, located next to transfer case, can generate high temperatures.

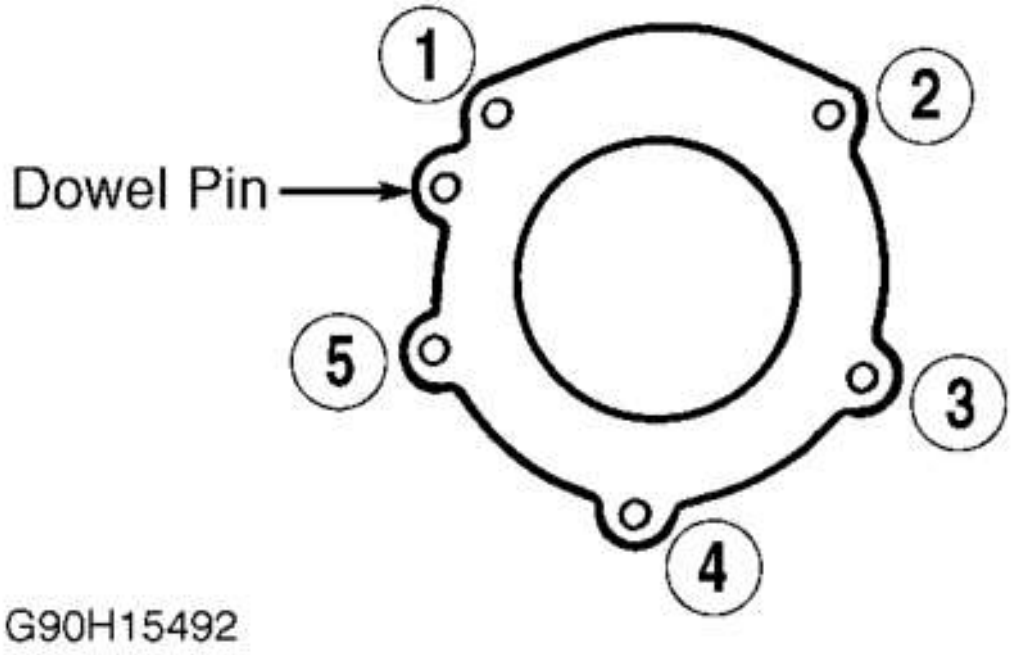

Fig. 4: Transfer Case-To-Extension Housing Tightening Sequence (Borg-Warner 1354)
Courtesy of FORD MOTOR CO.

Removal (Explorer & Ranger)

1. Raise vehicle on hoist, and position jackstands under vehicle. Remove skid plate (if equipped). Remove damper from transfer case (if equipped). If disassembling transfer case, drain fluid from transfer case. Install plug.
2. On manual shift transfer cases, disconnect 4WD indicator switch at transfer case. On electronic shift transfer cases, remove wire connector from feed wire harness at rear of transfer case.
3. Disconnect front and rear drive shafts from transfer case output shaft yokes. Disconnect speedometer cable from transfer case rear cover. Disconnect vent hose from shift control selector lever and housing.
4. On manual shift transfer cases, remove shift lever retaining nut and lever. Remove both large and small bolt retaining shifter to extension housing. Remove shift control selector lever assembly and bushing.
5. Support transfer case with a jack. Remove bolts attaching transfer case to transmission extension housing. Slide transfer case rearward off transmission output shaft. Lower transfer case from vehicle. Remove gasket from transfer case and transmission extension housing.

Installation

1. Clean gasket surfaces and install new transfer case-to-extension housing gasket. To complete installation, reverse removal procedure. Tighten transfer case-to-extension housing bolts in sequence. See **Fig. 4** .

2. Ensure White marking on vent hose is positioned in notch on shifter (upper end of tube should be 3/4" above top of shifter and just below floor pan). When installing shift lever assembly, ensure large bolt is tightened first, then small bolt.
3. Tighten retaining bolts to specifications. Refer to the **TORQUE SPECIFICATIONS** table. Fill transfer case to bottom of filler hole with Mercon ATF (XT-2-QDX or DDX).

TRANSMISSION

CAUTION: On some vehicles with 2.3L and 4.0L engines, shims may be located between transmission oil pan and transmission case. These shims must be in place during installation, or damage to transmission oil pan may occur.

Removal (Aerostar, Explorer & Ranger)

1. Disconnect negative battery cable from battery. Shift transmission into Neutral. Remove boot assembly-to-floor bolts. Remove boot from shift lever assembly.
2. Remove shift lever retaining bolt. Remove shift lever, ball and boot assembly. Raise vehicle on hoist. Scribe a mark on drive shaft and rear axle flange for installation reference.
3. Disconnect drive shaft at rear drive axle flange. On Ranger SuperCab, remove drive shaft center bearing bracket. On all models, remove drive shaft. Cap transmission extension housing to prevent lubricant spillage.
4. Using Disconnect Tool (T88T-70522-A), disconnect clutch slave cylinder hydraulic line at transmission case. See **Fig. 5** . Cap end of line to prevent fluid leakage and contamination.
5. Disconnect back-up lamp switch from sender on transmission. Remove speedometer cable from extension housing or transfer case (if equipped). Disconnect starter cable and wires.
6. On V6 models, remove exhaust system components as necessary to obtain clearance. On all models, position jack under engine, protecting oil pan with wood block. On 4WD models, remove transfer case. See **TRANSFER CASE** . On all models, remove starter.
7. Position transmission jack under transmission. Remove bolts, lockwashers and flatwashers attaching transmission to rear plate of engine. Remove rear engine support insulator-to-crossmember nuts and bolts. Remove nuts retaining crossmember to frame. Remove crossmember.
8. Slide transmission rearward to separate bellhousing from dowel pins on rear of engine block. When spline on input shaft clears clutch disc, lower transmission from vehicle.

Installation

1. Ensure mating surfaces and locating dowels are clean and free of burrs. Ensure transmission input shaft splines are clean. Place transmission on transmission jack and position under vehicle.
2. Raise transmission into position and start input shaft into clutch disc. Align splines on input shaft with splines on clutch disc. Move transmission forward until case seats on locating dowels.
3. Install bellhousing-to-engine block bolts. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** . To complete installation, reverse removal procedure.
4. Bleed hydraulic system. See **HYDRAULIC SYSTEM BLEEDING** under IN-VEHICLE SERVICE. For recommended fluid and capacity, refer to the **TRANSMISSION SERVICING - M/T** article in MANUAL TRANS SERVICE.

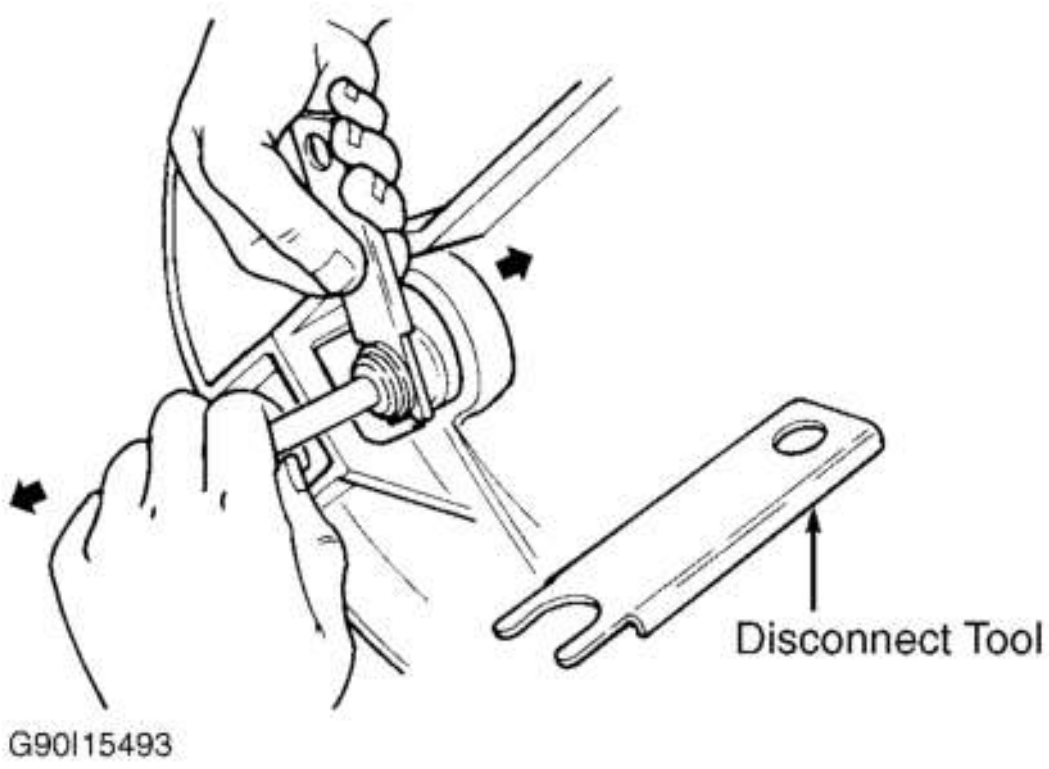

Fig. 5: Removing Clutch Hydraulic Line (Internally Mounted Slave Cylinder)
Courtesy of FORD MOTOR CO.

CLUTCH DISC & PRESSURE PLATE

Removal

1. Disconnect negative battery cable. Disconnect clutch master cylinder push rod. Raise vehicle and remove starter. Disconnect clutch slave cylinder hydraulic line by pressing White retainer bushing with Disconnect Tool (T88T-70522-A) while pulling on line. See **Fig. 5** .
2. Remove transmission. See **TRANSMISSION** . Place reference mark on pressure plate and flywheel for reassembly reference. Loosen pressure plate-to-flywheel bolts evenly until springs are expanded. Remove pressure plate and clutch disc.

Installation

1. Clean pressure plate and flywheel surface with alcohol-based solvent. Place clutch disc on flywheel. Align disc center with pilot bearing using old input shaft or clutch pilot shaft.
2. Place pressure plate on flywheel and align reference mark. Tighten bolts evenly in a crisscross sequence. Remove clutch pilot shaft. To complete installation, reverse removal procedure.

CLUTCH MASTER CYLINDER & RESERVOIR

CAUTION: On vehicles equipped with external slave cylinders, the master cylinder

pushrod must be disconnected from clutch pedal prior to removal of slave cylinder. Permanent damage to master cylinder will occur if master cylinder is activated with slave cylinder disconnected.

Removal

1. Prying retainer bushing and push rod off clutch pedal pin, disconnect master cylinder push rod from clutch pedal. Remove Clutch Pedal Position (CPP) switch. See **CLUTCH PEDAL POSITION (CPP) SWITCH** .
2. On Aerostar, slide clutch master cylinder reservoir out of relay bracket. On Explorer and Ranger, remove clutch master cylinder reservoir screw from cowl access cover. Disconnect clutch slave cylinder hydraulic line by pressing White retainer bushing with Disconnect Tool (T88T-70522-A) while pulling on line. See**Fig. 5** . Plug line to prevent leakage.
3. Disconnect line from mounting clips. Remove clutch master cylinder bolts from dash panel. Remove clutch master cylinder.

Installation

To install, reverse removal procedure. Ensure retainer and push rod are installed on clutch pedal pin with flange portion of bushing facing away from pedal blade of clutch pedal. Bleed hydraulic system, if necessary. See **HYDRAULIC SYSTEM BLEEDING** under IN-VEHICLE SERVICE. Depress clutch pedal at least 10 times to check for proper release and smooth operation.

CLUTCH RELEASE BEARING

Removal (Internally Mounted Slave Cylinder)

With transmission removed, twist release bearing and carrier assembly until resistance is felt. Turning assembly further will allow preload spring to push bearing assembly from slave cylinder. See **Fig. 6** .

Installation

Prior to installation, lubricate bearing bore and bearing carrier with multipurpose grease. Install release bearing assembly to clutch slave cylinder by pushing into place.

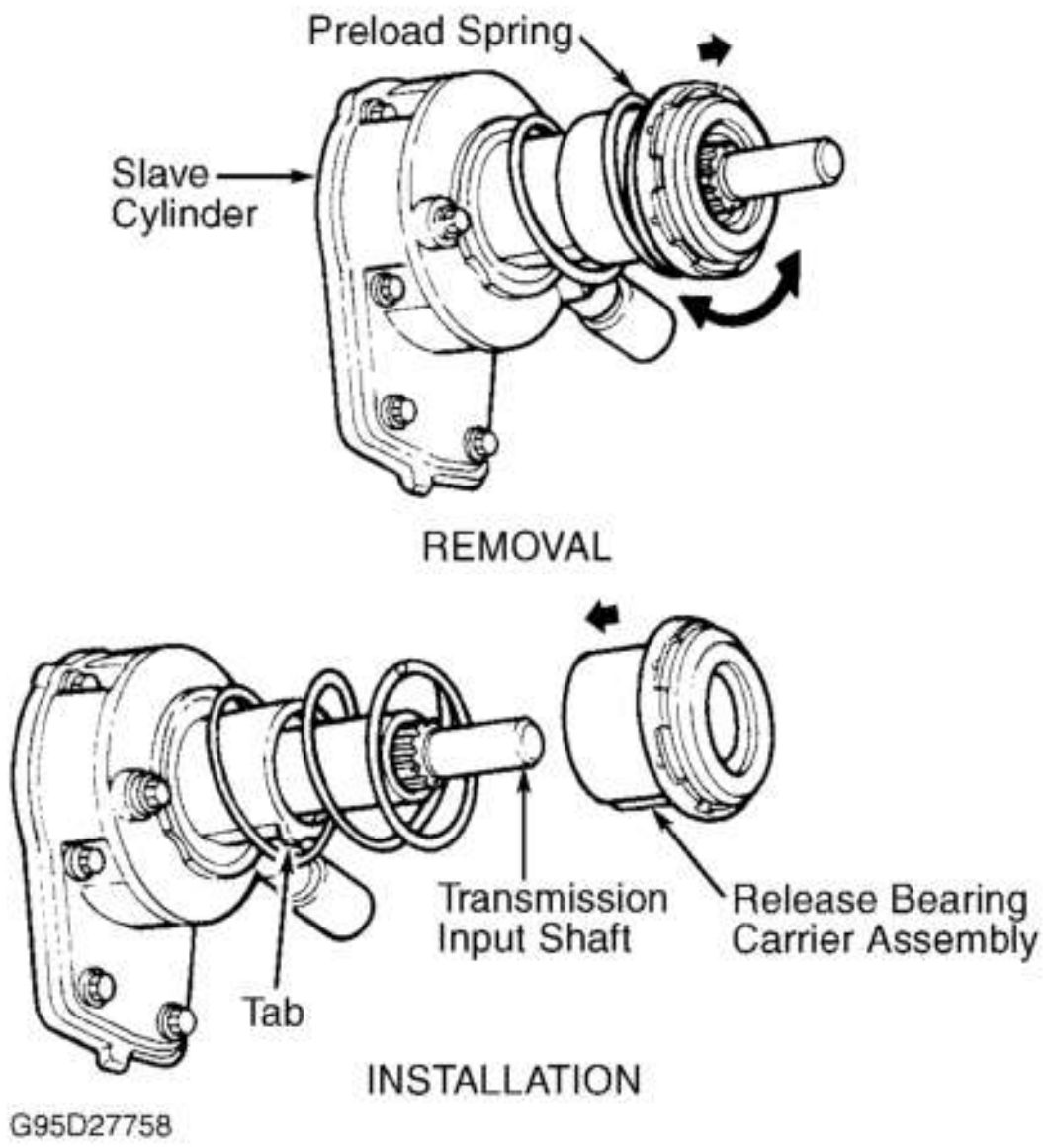

Fig. 6: Servicing Clutch Release Bearing
Courtesy of FORD MOTOR CO.

CLUTCH PEDAL

Removal & Installation (Aerostar)

1. Disconnect master cylinder push rod from clutch pedal. Remove Powertrain Control Module (PCM). Remove retainer clip from pedal shaft. Remove brake and clutch pedal bushings from bracket.
2. To install, reverse removal procedure. Inspect and lubricate bushings with a light film of SAE 30 engine oil. Replace bushings if worn.

Removal & Installation (Explorer & Ranger)

1. Pry retainer bushing and push rod off pedal pin to disconnect clutch master cylinder push rod from clutch pedal. Remove left kick panel. Remove parking brake assembly, and secure away from work area. Remove retainer ring. Remove clutch pedal from pedal support bracket.

NOTE: When clutch pedal shaft is removed from bracket, brake pedal, bushings and spring washer will fall.

2. To install, reverse removal procedure. Inspect and lubricate bushings with a light film of SAE 30 engine oil. Replace bushings if worn.

CLUTCH PEDAL POSITION (CPP) SWITCH

Removal & Installation

1. Disconnect wiring harness from CPP switch. Pull orientation clip away from switch to separate it from locating pin. See **Fig. 3** . Rotate switch until White plastic retainer is exposed.
2. Push tabs together and slide retainer toward push rod eye to separate it from switch. Remove switch from push rod. To install, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Back-Up Light Switch	18-26 (25-35)
Drive Shaft Retaining Bolt (Aerostar)	22-29 (30-40)
Drive Shaft-To-Rear "U" Joint Flange Bolt	70-95 (95-129)
Drive Shaft-To-Transfer Case Bolt	13-16 (17-22)
Extension Housing Retaining Bolt	24-34 (32-46)
Flywheel-To-Crankshaft Bolts	
Step 1	10 (14)
Step 2	53 (72)
Pressure Plate-To-Flywheel	15-24 (21-32)
Rear Crossmember Nuts	
3.0L	48-63 (65-85)
2.3L & 4.0L	65-85 (88-115)
Shifter Lever	20-30 (27-40)
Starter Bolt	
2.3L & 3.0L	15-20 (21-27)
4.0L	18-25 (25-34)
Transfer Case-To-Extension Housing	
(Explorer & Ranger Borg-Warner 1354) (1)	25-35 (34-47)
Transmission-To-Engine Bolt	28-38 (38-52)
(1) Tighten in sequence. See **Fig. 4** .	