SERVICE PROCEDURES FOR CLUTCH HYDRAULIC UNITS

SAFETY PROCEDURES
Always follow the vehicle manufacturer's recommended safety procedures in your Shop and Owners Manual.

REQUIRED TOOLS
Flat blade screwdriver, 3mm (7/64 in) drift punch, Socket wrench set, 4mm (5/32 in) hex key, hydraulic line Quick Disconnect tool DB1AD9602A(where required).

HYDRAULIC BLEEDING OF MASTER CYLINDERS AND EXTERNAL SLAVE CYLINDERS WITH BLEED SCREW (Assuming the system is already installed in the vehicle)

1. Carefully clean the top and sides of the reservoir before opening to prevent contamination of the system with dirt, water, and other foreign material.

2. Remove the reservoir cap and diaphragm and fill the reservoir to approx. 12mm from the top with DOT 3 brake fluid from a sealed container.

   NOTE: Do not use fluid that has been bled from a system to fill the reservoir, as it may be contaminated. Never use transmission fluid, motor oil, power steering fluids or any mineral oil fluids to fill or lubricate the Clutch Hydraulic System.

3. Using short quick strokes, push the master cylinder pushrod in and out using your hand or foot at the pedal approximately 10-20 times or until the pushrod is firm. This motion will allow air in the system to escape through the master cylinder reservoir.

4. Refill the reservoir if it is necessary with DOT 3 fluid.

HYDRAULIC BLEEDING Instructions

1. Depress the clutch pedal and hold it down.

2. Using the Hex wrench set, open the bleed screw on the Slave Cylinder to let air and brake fluid escape.

3. Torque the bleed screw quickly then release the clutch pedal. Do not over tighten bleed screw. (Torque 1.75 to 2.45 Nm)

   NOTE: Check and refill the reservoir as needed while bleeding the system to prevent air from being drawn back into the system.

4. Pump clutch pedal several times, if clutch engagement is not satisfactory, repeat steps 5, 6, and 7 until all of the air is removed.

5. After bleeding the system, reinstall diaphragm and reservoir cap.

   Note: Under normal usage, small amounts of air will eventually work its way out of the system.
HYDRAULIC BLEEDING OF EXTERNAL SLAVE CYLINDERS WITHOUT BLEED SCREWS

1. Push the slave cylinder pushrod in and disconnect both retaining bands of the retaining strap, release the pushrod and allow it to fully extend.

   NOTE: **DO NOT CUT OR DISCARD RETAINING STRAP.**

2. Tip the slave cylinder up at approximately 45 degrees and pour brake hydraulic fluid into the hydraulic port until all air has been expelled.

3. With the slave cylinder still tipped up, insert the clutch hydraulic tube in the slave cylinder hydraulic output port (replace the small rubber quad seal on the end of the metal tube connector and lubricate with clutch fluid), insert retaining pin and drive in with drift punch.

   **IMPORTANT!** : Original replacements and components must be used

4. Hold slave cylinder vertically with pushrod facing the ground. Hold pushrod against the palm of the hand in a position which allows the slave cylinder to be lower than the master cylinder.

5. Slowly depress the pushrod into slave cylinder bore approximately 25 – 30 mm while watching the master cylinder reservoir for air bubbles. Stroke the slave cylinder in this manner until air bubbles are no longer entering reservoir, approximately 10 – 15 strokes.

6. With the master cylinder reservoir cap removed, slowly push the slave cylinder pushrod back in and reconnect the two bands of the retaining strap. The slave cylinder is now ready to be installed on the vehicle.

7. Using short quick strokes, push the master cylinder pushrod in and out using your hand or foot at the pedal approximately 15 to 20 times, or until the pushrod is firm.
MASTER CYLINDER - REMOVAL AND INSTALLATION

1. Disconnect master cylinder pushrod from clutch pedal. Inspect and replace pedal pin bushing if worn or damaged.

2. If the safety interlock switch is fitted to the pushrod, disconnect the switch connector.
   
   NOTE: Some Ford Aerostar vans require the master cylinder pushrod to be removed from the master cylinder **BEFORE** the master cylinder can be removed from the vehicle.

3. Using a 3mm (7/64) diameter punch, drive out the retaining pin that holds the hydraulic tube to the master cylinder. Be careful not to damage the master cylinder body.
   
   NOTE: On some vehicles the hydraulic line will have an in-line tube connector which can be disconnected using the hydraulic line Quick Disconnect tool.

4. On master cylinders having a remote reservoir, remove the fasteners holding the reservoir to the front of the dash.

5. Remove the two fasteners retaining the master cylinder assembly to the front of dash.
   
   NOTE: On some vehicles a "Twist & Lock" type of attachment is used to secure the master cylinder to the front of the dash. To remove the master cylinder with this type of attachment the master cylinder body must be rotated approximately 45 degrees clockwise except for Saturn vehicles, which require a counterclockwise rotation. The front of the dash or bracket is keyed so the master cylinder can only be reinstalled with the correct body and reservoir orientation. When reinstalling a master cylinder with this type of attachment, be careful not to over rotate the master cylinder or damage to the body will occur.

6. Carefully remove the master cylinder from the front of the dash.

7. For reinstallation complete steps 1 through 6 in reverse order.

8. Bleed the master cylinder per the HYDRAULIC BLEEDING instructions indicated on page 1.

9. For Slave Cylinders without bleed screw see HYDRAULIC BLEEDING OF EXTERNAL SLAVE CYLINDERS WITHOUT BLEED SCREWS
Concentric Slave Cylinder – Removal, Installation and Bleeding

Servicing the FTE automotive USA Inc. concentric slave cylinder (CSC) requires the transmission to be removed and reinstalled. Consult your vehicle manufacturer's Shop Manual for complete procedures on the removal and reinstallation of your transmission.

1. Carefully clean off the hydraulic tube coupling. Disconnect the hydraulic tube coupling at the transmission with the hydraulic line Quick Connect tool by sliding the white plastic sleeve toward the slave cylinder.

2. Remove the transmission per your vehicle manufacturer's Shop Manual.

3. Remove the bolts retaining the concentric slave cylinder to the transmission.

4. Remove the concentric slave cylinder from the transmission.

5. Clean the transmission input shaft and install the new concentric slave cylinder. Make sure the slave cylinder is installed flat against the transmission mounting surface.

6. Install the slave cylinder attaching bolts and tighten per the vehicle manufacturer Shop Manual requirements. Check to make sure the slave cylinder is not cocked.
   - Plastic CSC (torque 7 to 9 Nm)
   - Aluminum CSC (15 to 20 Nm)

7. Reinstall the transmission per your vehicle manufacturers Shop Manual.

8. Inspect the hydraulic tube coupling for damage and contamination, replace the O ring and lube with clutch hydraulic fluid.

   IMPORTANT! : Original replacements and components must be used

9. Reconnect the hydraulic tube by inserting the male coupling into the female coupling on the concentric slave cylinder. Make sure the coupling is secure (by pulling both ends). If the two halves of the coupling will not couple, check to be sure the two halves of the coupling are the same color. If they are the same color and the coupling still will not connect, open the bleedscrew. Re-tighten the bleed screw and then connect the coupling.

10. Carefully clean the top and sides of the master cylinder reservoir before opening to prevent contamination of the system with dirt, water, and other foreign material.

11. Remove the reservoir cap.

12. Remove the reservoir diaphragm when checking or adding fluid.

13. Fill the reservoir with new clutch hydraulic fluid or an approved DOT 3 brake fluid.

   NOTE: Do not use fluid that has been bled from a system to fill the reservoir, as it may be contaminated. Never use transmission fluid, motor oil, power steering fluids or any mineral oil fluids to fill or lubricate the Clutch Hydraulic System.

14. Pump the clutch pedal 15-20 times making sure that the pedal is allowed to return completely after each stroke.
NOTE: During step #14 the concentric slave cylinder will fill with clutch fluid and the release bearing will begin to move. Continued pedal strokes will bleed the system of all air and the release bearing will move through its entire stroke with each pedal application.

15. Depress the clutch pedal and hold it down.

16. Using the socket wrench set, slowly open the bleed screw located on the concentric slave cylinder and allow any trapped air to escape. Fluid will emerge from the CSC bleed port. When it is a solid stream, close the port.

17. Torque the bleed screw quickly and release the clutch pedal. Do not over tighten bleed screw. Bleed screw of Plastic CSC (torque 7 to 9 Nm) Bleed screw of Aluminum CSC (15 to 20 Nm)

18. If clutch engagement is not satisfactory, repeat steps 15 to 17 until all the air is pumped out of the concentric slave cylinder and clean, bubble free clutch fluid is visible in the reservoir.

NOTE: Check and refill the reservoir as needed while bleeding to prevent air from being drawn back into the system.

19. Reinstall diaphragm and reservoir cap.

NOTE: Under normal usage, small amounts of air will eventually work its way out of the system.

EXTERNAL SLAVE CYLINDER - REMOVAL AND INSTALLATION

NOTE: Prior to any vehicle service that requires removal of the slave cylinder; the master cylinder pushrod should be disconnected from the clutch pedal pin. If not disconnected, permanent damage to the slave cylinder will occur if the clutch pedal is depressed while the slave cylinder is disconnected from the transmission.

NOTE: Some external slave cylinders do not have bleed screws. These cylinders must be filled with clutch hydraulic fluid before they are installed on the transmission. Refer to the page No. 2 - HYDRAULIC BLEEDING OF EXTERNAL SLAVE CYLINDERS WITHOUT BLEED SCREWS instructions for this operation. All slave cylinders are shipped with a plastic pushrod retaining strap. This strap retains the pushrod during shipping and also provides a nonmetallic end for the pushrod, which helps prevent wear and squeaks when the clutch is actuated. Make sure the pushrod retaining strap is in place and secure when the slave cylinder is reinstalled to the vehicle. The pushrod retaining strap retaining bands are designed to break during the first clutch application.

1. Using a 3mm (7/64 in) diameter drift punch, drive out the pin that holds the hydraulic tube to the slave cylinder. Be careful not to damage the slave cylinder body.

   NOTE: On some vehicles the hydraulic line will have an in-line tube connector which can be disconnected using the hydraulic line Quick Connect tool.

2. Remove the bolts or retainer holding the slave cylinder to the transmission.

3. Remove the slave cylinder from the transmission.

4. Using the new slave cylinder push the slave cylinder pushrod in and disconnect both retaining bands of the retaining strap, release the pushrod and allow it to fully extend.

   DO NOT CUT OR DISCARD RETAINING STRAP.

5. Tip the slave cylinder up at approximately 45 degrees and pour brake hydraulic fluid into the hydraulic port until all air has been expelled.
6. With the slave cylinder still tipped up, insert the clutch hydraulic tube in the slave cylinder hydraulic output port (replace the small rubber quad seal on the end of the metal tube connector and lubricate with clutch fluid), insert retaining pin and drive in with drift punch. Be careful not to damage the slave cylinder body.

   **IMPORTANT!** Original replacements and components must be used

7. Install the new slave cylinder. Make sure the pushrod is securely seated in the cup end of the clutch release lever.

8. Install the slave cylinder retainer or attaching bolts and tighten per the vehicle manufacturer Shop Manual requirements.

9. For bleeding the slave cylinder refer to page 2 for the instructions.

10. If the new Slave Cylinder does have the bleed screw, then just replace the components i.e. small rubber quad seal and the retaining pin. Bleed the slave cylinder per the HYDRAULIC BLEEDING instructions indicated on page 1.

**CLUTCH HYDRAULIC TUBE - REMOVAL AND INSTALLATION**

1. Before removing the hydraulic tube assembly from the vehicle, carefully inspect the tube and take note of the tubes routing. When reinstalling the new tube it must be routed exactly as the tube being replaced.

2. Using a 3mm (7/64 in) diameter punch, drive out the pin that holds the hydraulic tube to the master cylinder and external slave cylinder. Be careful not to damage the master cylinder or slave cylinder bodies.

   **NOTE:** On some vehicles the hydraulic line will have an in-line tube connector which can be disconnected using the hydraulic line Quick Connect tool.

3. Lubricate the two small quad seals with clutch hydraulic fluid and install on the new tube fittings.

4. Reinstall the new tube assembly. Pay careful attention to tube routing. Do not kink tube or allow the tube to be closer than four inches (102.00mm) to any engine exhaust manifold.

5. Insert the tube fitting into master cylinder fluid port and replace the retaining pin. Be careful not to damage the master cylinder body.

6. Insert tube fitting into slave cylinder fluid port and replace the retaining pin. Be careful not to damage the slave cylinder body.

7. Where applicable reconnect the in-line tube connector.

8. Bleed system per the HYDRAULIC BLEEDING OF MASTER CYLINDERS AND EXTERNAL SLAVE CYLINDERS WITH BLEED SCREWS or HYDRAULIC BLEEDING OF EXTERNAL SLAVE CYLINDERS WITHOUT BLEED SCREWS.
P150 & UP-207 Bleed Procedure
(Ranger/Explorer/Navajo/Ranger supercab/Fseries)

CAUTION: Brake fluid is harmful to painted or plastic surfaces. If the brake fluid is spilled onto painted or plastic surfaces, wash the surface immediately with water.

MASTER CYLINDER BLEED PROCEDURE:

MASTER CYLINDER ASSEMBLY REMOVAL:

1. Locate and clean the quick disconnect coupling near the transmission bell housing.
2. Uncouple the quick disconnect fitting using the proper disconnect tool DB1AD9602A (T88T-70552-A).
3. Disconnect the master cylinder pushrod from the pedal pin. This may break the bushing in the eye end of the pushrod and it must be replaced at re-assembly.
4. Remove the interlock switch cover.
5. Remove the interlock switch from the pushrod.
6. Disconnect the battery, reposition the Power Distribution Center (PDC) to allow access to the master cylinder assembly.
7. Remove the inner fender from the vehicle driver side.
8. Remove the clutch master cylinder by rotating it 45 degrees counter-clockwise to unlock it then pull the master cylinder through the engine bulkhead (dash panel).
9. Remove the clutch reservoir from inner fender.
10. Remove the hydraulic master cylinder, tube, supply hose and reservoir from the vehicle. Take care not to damage the O-ring on the male coupling. Note the clutch tube routing before removing the master cylinder and tube from the vehicle.

BLEED PROCEDURE:

1. Place the reservoir mounting flange in a vice. (Care must be taken not to crush or crack the flange.)
2. Clean the reservoir cap and the surrounding area to ensure that contamination will not enter the reservoir.
3. Remove the reservoir cap and diaphragm and fill the reservoir to the top with DOT 3 brake fluid from a sealed container.
4. Position the master cylinder with the reservoir above the clutch master and the male coupling below the master cylinder. With the master cylinder reservoir port pointed upward at a 45º.
5. Depress the internal mechanism of the male coupling with a clean blunt tool and hold in this position.
6. Allow sufficient time for the fluid to flow from the reservoir filling the supply hose, master cylinder and tube assembly. DO NOT ALLOW THE RESERVOIR TO RUN OUT OF FLUID DURING THIS PROCEDURE.
7. When a solid stream of fluid is noted flowing from the male connector, release the connector internal mechanism.
8. Using short quick strokes, push the master cylinder pushrod in and out using the palm of your hand approximately 10-20 times or until the pushrod is firm. This motion will allow air in the system to escape through the master cylinder reservoir. (Maintain master cylinder reservoir end pointed up at a 45º angle.
9. Refill the reservoir with Dot 3 brake fluid to within 12 mm from the top of the reservoir.
10. Install the diaphragm and cap.
11. Repeat steps 3 through 9 if necessary.

12. After re-installing the master cylinder assembly (following the instructions below) stroke the clutch pedal fully several times until the pedal is firm.

**MASTER CYLINDER RE-INSTALLATION PROCEDURE:**

1. Re-install the master cylinder in the vehicle ensuring that the supply hose and tube are routed correct.

2. Replace the master cylinder into bulkhead (dash panel). Place your hand on the master cylinder body, push the master cylinder toward the bulkhead while turning it 45 degrees clockwise to lock it into place.

3. Slide the rubber grommet on the master cylinder body toward the bulkhead until it is seated firmly in place.

4. Inspect the clutch interlock switch for damage that may have occurred during disassembly and replace as necessary.

5. Install the clutch interlock switch, ensuring that the tab on the master cylinder body is aligned with the slot on the switch. This is accomplished by rotating the switch until it locks into place around the positioning tab. Be sure the metal lower portion of the pushrod is snapped down into the switch before fitting the cover.

6. Replace the switch cover.

7. Slide the eye end of the master cylinder pushrod on to the clutch pedal pivot pin until the bushing snaps into place. The bushing in the eye end of the pushrod must be replaced.

8. Reconnect the quick disconnect fitting by pushing the male portion of the fitting into the female portion of the fitting. Pull back on the male portion to ensure that the connection is secure. If the two halves of the disconnect fitting will not couple, check to be sure the two parts of the coupling are the same color. If they are the same color and still will not connect, open the bleedscrew. Close and tighten the bleed screw, then connect the two halves of the coupling.

**CSC BLEED PROCEDURE:**

1. Actuate the clutch pedal 10 times, at a normal rate, to stabilize the clutch hydraulic system.

2. With one technician sitting in the driver seat.

3. Remove the dust cap from the CSC bleed screw.

4. Have the technician in the driver seat push the clutch pedal down to the floor and hold it there.

5. Open the bleed screw by rotating it counter-clockwise approximately ¼ turn, with the end of the bleed screw covered to minimize any fluid spill.

6. Close the bleed screw by rotating it clockwise until tight.

7. Refill the master cylinder fluid reservoir if needed.

8. Stroke the pedal fully 3 times.

9. Repeat steps 4 through 8 four times.

**FINAL SYSTEM CHECK:**

1. Apply the emergency brake pedal fully.

2. With the vehicle in neutral, push the clutch pedal to the floor and start the engine.

3. Move the shift lever into reverse and slowly release the clutch pedal.
Note: The pedal position when the clutch begins to engage. The engagement should begin at approximately 35 mm above the down stop.