BOOSTED MASTER CYLINDER
(Master Cylinder Section)

Service Instructions

TABLE 1

Model Number	Master Cylinder Repair Kit Number	Uses Seat (6), Check Valve (7), and Spring (9)
02-460-342 (HO)	* 02-400-270	Yes
02-461-342 (HO)	* 02-400-270	No
02-460-370 (BF)	02-400-170	Yes
02-460-480 (BF)	02-400-170	Yes
02-461-480 (BF)	02-400-170	No

BF = Brake Fluid used in Master Cylinder Section
HO = Mineral Base Hydraulic Oil used in Master Cylinder Section
All models use Mineral Base Hydraulic Oil in Booster Section
* Repair Kit 02-400-270 does not include cup (25), see Figure 4.
NOTE: If your product number is not listed, contact ZF Off-Highway Solutions Minnesota Inc. for information.

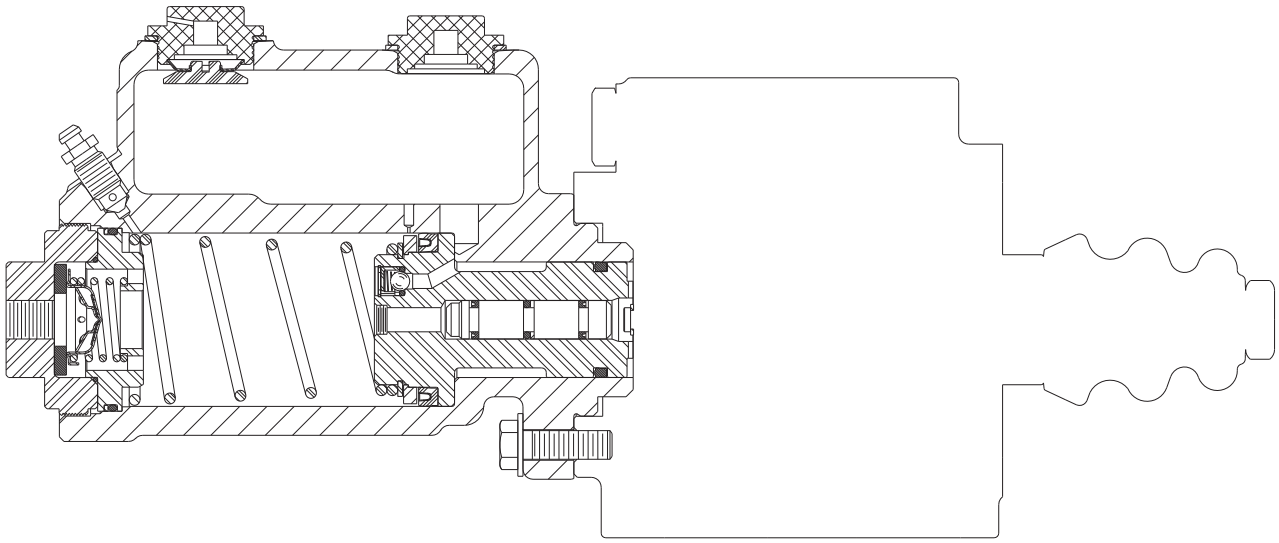

FIGURE 1

TYPICAL SYSTEM SCHEMATIC (This circuit may not apply to your installation)

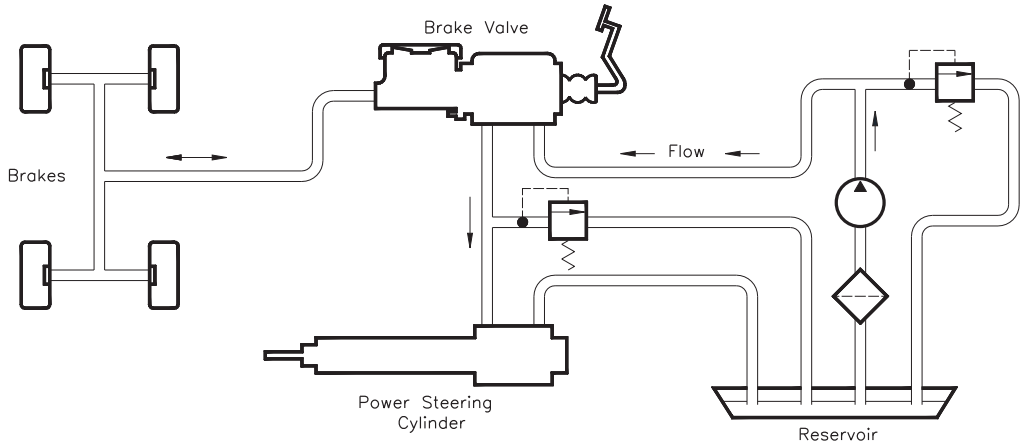

FIGURE 2

REMOVING BRAKE VALVE FROM THE MACHINE AND SEPARATING SECTIONS

(Refer to Figures 1 and 3)

1. Remove the master cylinder assembly from the machine by disconnecting the necessary fluid lines, disconnecting the push rod, and removing mounting bolts. Drain fluid from the assembly.
2. Separate the master cylinder section from the power assist section by removing three cap screws and three washers.

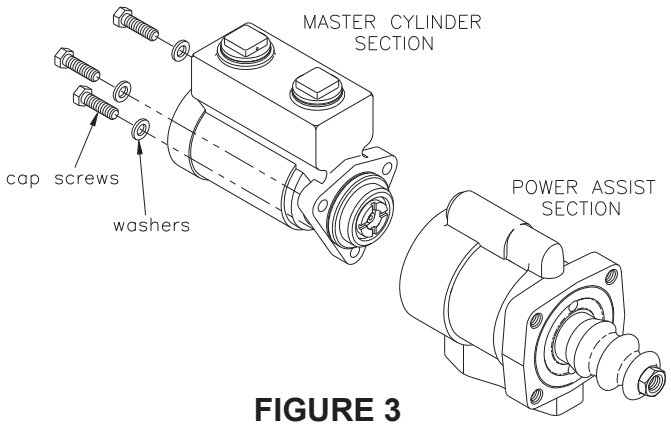

FIGURE 3

CONNECTING THE SECTIONS AND MOUNTING MASTER CYLINDER ON MACHINE

(Refer to Figures 1 and 3)

2. Attach the master cylinder section to the power assist section with three cap screws and three washers. Torque cap screws 47.5-61.0 N·m (35-45 lb·ft)
3. Install the unit on the machine. Connect the push rod. Connect the fluid lines. Bleed the system of air. Tighten fittings if leaks occur. Make several applications to be sure the master cylinder is working properly. **NOTE: All fittings must be inspected for leaks and tightened if leaks occur.**

NOTE

This literature services various master cylinder models. The components shown in Figures 1, 3, and 4 may appear different than what is found in your cylinder.

DISASSEMBLY

(Refer to Figures 1 and 4)

1. Drain fluid from the unit before disassembling.
2. Remove line bolt (1), washer (2), fitting block (3), and washer (4) from end plug (5). **NOTE: Not all models use line bolt (1), washer (2), fitting block (3) or washer (4).**
3. Remove end plug (1) using a large box end wrench.

⚠ CAUTION

End plug (5) is under tension of spring (14).

4. Remove spring (8), check valve (7), and seat (6) from end plug (5). **NOTE: Not all models use seat (6), check valve (7), or spring (8).**
5. Retainer assembly (9) should follow end plug (5) as it is removed. Remove o-rings (6 & 13) and back-up ring (12) from retainer (11).
6. Remove spring (14) from housing (27).
7. Remove piston assembly (15) from housing (27) by pushing on piston assembly (15) with a wooden dowel from the small diameter end of housing (27).
8. Remove retaining ring (21), retainer (22), and cups (23 & 25) from piston (24). **NOTE: The repair kit for model numbers 02-460-342 and 02-461-342 does not include new cup (25) and does not need to be removed.**
9. Remove piston assembly (26) from piston (24) by pushing on piston assembly (26) with a wooden dowel from the small diameter end of piston (24). Note direction of piston assembly (26).
10. Remove retaining ring (16), cage (17), spring (18), ball (19), and o-ring (20) from piston (24). Note direction of cage (17) and spring (18).
11. Remove filler caps (29 & 30) and gaskets (28 & 31) from housing (27).

ASSEMBLY

(Refer to Figures 1 and 4)

Use only automotive brake fluid in master cylinder section.

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KIT WITH CLEAN TYPE FLUID USED IN THE SYSTEM.

1. Clean all parts thoroughly before assembling.
2. Install new piston assembly (26) in piston (24). Note direction of piston assembly (26).
3. Install new o-ring (20), new ball (19), new spring (18), new cage (17) and new retaining ring (16) in piston (24). Note, small end of spring (18) faces ball (19).
4. Install new cups (25 & 23), retainer (22), and retaining ring (21) on piston (24). **NOTE: The repair kit for model numbers 02-460-342 and 02-461-342 does not include new cup (25).**
5. Install new o-rings (10 & 13) and new back-up ring (12) on retainer (11).
6. Install piston assembly (15), spring (14), and retainer assembly (9) in housing (27). Note direction of spring (14) and retainer assembly (9).
7. Install new seat (6), new check valve (7), and new spring (8) in end plug (5). **NOTE: Not all models use use seat (6), check valve (7), or spring (8).**
8. Install end plug (5) in housing (27). Torque end plug (5) 67.8-108.5 N·m (50-80 lb·ft).
9. Install new washer (4), fitting block (3), new washer (2), and line bolt (1) in end plug (5). Finger tighten line bolt (1). **NOTE: Not all models use washer (4), fitting block (3), washer (2), or line bolt (1).**
10. **NOTE: Before installing filler cap (30) be sure the filler cap breather hole is free of all contaminants. Use air pressure to clean and dry this hole.** Install new gaskets (28 & 31) and filler caps (29 & 30) on housing (27).

● Items included in Repair Kit

✻ Not used in all models

NOTE: The repair kit for model numbers 02-460-342 and 02-461-342 does not include new cup (25).

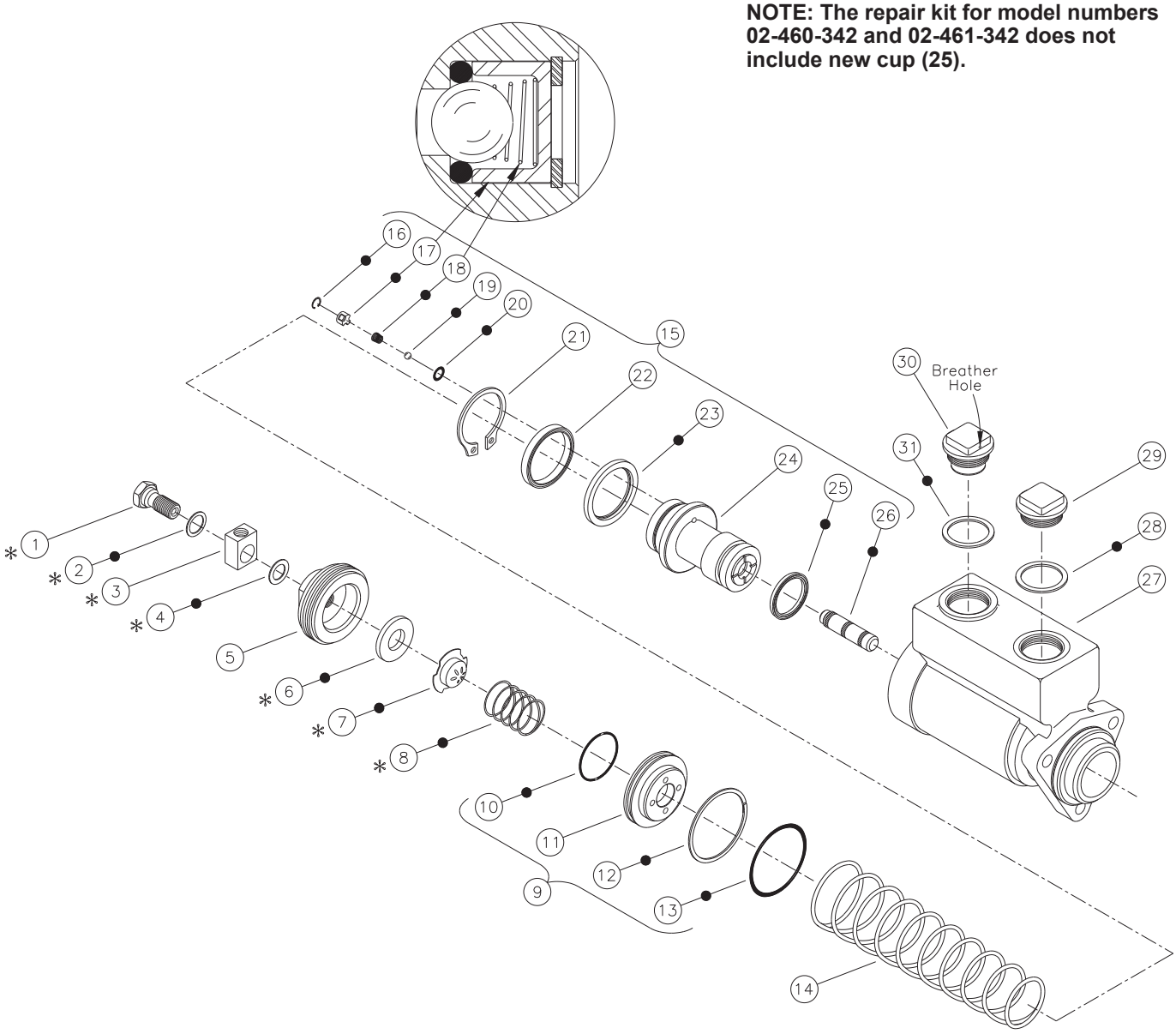

FIGURE 4

BLEEDING PROCEDURES

NOTE

Use only proper fluid specified by machine manufacture. Never reuse fluid that has been drained from the system. Be sure that you maintain a high level of fluid in the reservoir during and after the entire bleeding process.

PRESSURE BLEEDING INSTRUCTIONS

1. The master cylinder must be mounted to the power assist section.
2. Fill the reservoir with proper fluid.
3. Be sure all fittings are tight to avoid leaking.
4. DO NOT DEPRESS THE PEDAL.
5. Connect the pressure bleeder to the reservoir adapter. Recommended bleeding pressure is 2.07 bar (30 PSI) maximum. **NOTE: Be sure to use the correct pressure bleeder for type fluid used in system.**
6. Open the bleeder screw closest to the master cylinder outlet. Most of the air contained in the system will escape by this route. Close the bleeder screw.
7. Continue to the next bleeder screw and so on. At each point when air bubbles disappear close the bleeder screw.
8. Remove the pressure bleeder.
9. Open the bleeder screw at the master cylinder. Actuate the master cylinder to remove any residual air. Tighten the bleeder screw before allowing the pedal to return.
10. Depress the pedal several times. If pedal is spongy, check for system leaks and repeat bleeding process.
11. Fill reservoir to within 12.7 mm (0.50 in) of top. Install filler cap and torque 33.9-47.5 N·m (25-35 lb·ft).

BENCH BLEEDING INSTRUCTIONS

(Refer to Figure 5)

1. This process can be done in a bench vise or on the machine with the master cylinder mounted to the power assist section.
2. Remove the master cylinder filler cap.
3. Connect a length of tubing to an outlet port and immerse the other end below the fluid level in the master cylinder reservoir. Keep the reservoir fluid within 12.7 mm (0.50 in) of the inside reservoir top.
4. Actuate the master cylinder piston using a smooth object large enough to hold the small internal piston from coming out. Slowly stroke and release the master cylinder piston. **See CAUTION below.** Repeat until air bubbles in reservoir have ceased.
5. Remove the tubing. This should be done quickly so the loss of fluid will be minimal.
6. If the master cylinder was bench bled in a vise, it must now be attached securely to the power assist section and mounted on the machine. Complete all plumbing connections before continuing to step 7.
7. Bleed the remaining air from the system by depressing the brake pedal and opening the bleeder fitting closest to the master cylinder. Close the bleeder fitting before the brake pedal is released. Continue to the next bleeder port. In all cases the bleeder fittings must be closed before the brake pedal is released or air will be pulled in through the bleeder and ingest unwanted air in the system.
8. Fill the reservoir to within 12.7 mm (0.50 in) of top. Install filler cap and torque 33.9-47.5 N·m (25-35 lb·ft).
9. Be sure all fittings are tight to avoid leaking.
10. Depress pedal several times. If the brake pedal feels spongy, check for system leaks and repeat the bleeding process.

⚠ CAUTION

Be careful not to overstroke this master cylinder. It does not incorporate a piston stop. Over stroking this master cylinder may cause it to leak from the push rod end of the cylinder. Maximum recommended stroke for this cylinder is 31.8 mm (1.25 in).

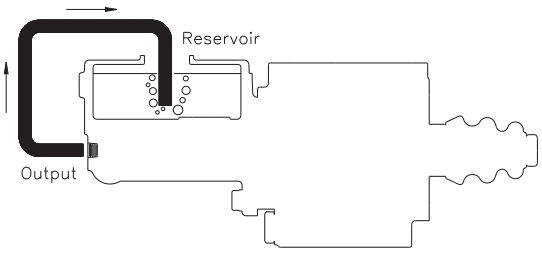

FIGURE 5

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